# DISEÑO DE UNA HERRAMIENTA DE SOFTWARE PARA DETERMINAR CONSTANTES ÓPTICAS EN PELÍCULAS DELGADAS SEMICONDUCTORAS EMPLEADAS EN CELDAS SOLARES

**HEINER ALEXANDER VARGAS PEREA**
**ROBINSON ROCHA GONZÁLEZ**

**UNIVERSIDAD INDUSTRIAL DE SANTANDER**
**FACULTAD DE INGENIERÍAS FÍSICO-MECÁNICAS**
**ESCUELA DE INGERIERÍA ELÉCTRICA, ELECTRÓNICA Y DE TELECOMUNICACIONES**
**BUCARAMANGA**
**2016**

# DISEÑO DE UNA HERRAMIENTA DE SOFTWARE PARA DETERMINAR CONSTANTES ÓPTICAS EN PELÍCULAS DELGADAS SEMICONDUCTORAS EMPLEADAS EN CELDAS SOLARES

**HEINER ALEXANDER VARGAS PEREA**
**ROBINSON ROCHA GONZÁLEZ**

**Trabajo de grado para optar al título de**
**Ingeniero Electrónico**

**Directora**
**Mónica Andrea Botero Londoño**
**Doctora en Ciencias Físicas**
**Co-Director**
**Franklin Alexander Sepúlveda S.**
**Doctor en Ingeniería**

**UNIVERSIDAD INDUSTRIAL DE SANTANDER**
**FACULTAD DE INGENIERÍAS FÍSICO-MECÁNICAS**
**ESCUELA DE INGERIERÍA ELÉCTRICA, ELECTRÓNICA Y DE TELECOMUNICACIONES**
**BUCARAMANGA**
**2016**

Universidad Industrial de Santander

## *AGRADECIMIENTOS*

*A mi excelente madre Gladys Perea Rivera por haber formado mi carácter, por haberme apoyado durante este proceso y confiado en mí.*

*A mi querido padre Guillermo Vargas Sarmiento por enseñarme a ser perseverante y el valor de la humildad.*

*A mi abuela Margarita Perea, Mi tía Isabel Perea y mi hermana Yolet Daniela Vargas, por haber estado presentes de alguna u otra forma durante el transcurso de mi carrera, con sus continuos consejos, oraciones y compañía.*

*A aquellas demás personas que me rodearon y aportaron un grano de arena para culminar con éxito esta etapa de la vida.*

*Heiner A. Vargas Perea.*

Universidad Industrial de Santander

***AGRADECIMIENTOS***

*A mi padre Melecio y a mi madre Mercedes por su gran apoyo y confianza que han depositado en mí, y sobre todo por los valores que me han inculcado lo cual me han hecho una persona de bien.*

*A mis Hermanos Oscar, Olinto y René por la motivación y aliento a salir adelante.*

*A mi novia Leidy Johana por su cariño y apoyo incondicional, por animarme y fundamentalmente por dar a mi vida paz y tranquilidad.*

*A mi familia en general que nunca han dudado en ayudarme durante mi desarrollo académico.*

*A mis amigos y compañeros que a lo largo de la carrera han contribuido de alguna u otra forma a culminar esta etapa.*

*Robinson Rocha González.*

Universidad Industrial de Santander

## TABLA DE CONTENIDO

Página.

CONTENIDO

Universidad Industrial de Santander

## LISTA DE FIGURAS

Página.

Universidad Industrial de Santander

## LISTA DE ANEXOS

Página

Universidad Industrial de Santander

## RESUMEN


**TÍTULO:** DISEÑO DE UNA HERRAMIENTA DE SOFTWARE PARA DETERMINAR CONSTANTES ÓPTICAS EN PELÍCULAS DELGADAS SEMICONDUCTORAS EMPLEADAS EN CELDAS SOLARES *****

**AUTOR:** HEINER ALEXANDER VARGAS PEREA, ROBINSON ROCHA GONZÁLEZ******

**PALABRAS CLAVES:** Películas delgadas semiconductoras, Constantes ópticas, Swanepoel, Energía Solar fotovoltaica, Software.

**DESCRIPCIÓN:** El gran crecimiento poblacional ha impulsado a muchos países a buscar alternativas para abastecer la creciente demanda energética. La población a nivel mundial alcanzará 9.600 millones de habitantes aproximadamente para el año 2050, según un estudio de la ONU 'Perspectivas de la Población Mundial'. La energía solar fotovoltaica, como parte de la solución a este problema, tuvo en el año 2015 un crecimiento significativo en el mercado anual aumentando un 25% con respecto a 2014 (Datos obtenidos del REN21-2016). Dentro de este tipo de energía (solar fotovoltaica) la tecnología actual de celdas solares, foto detectores y en otros sectores de la electrónica y microelectrónica se está optando por el desarrollo de dispositivos con base en películas delgadas debido a la disminución de costos en comparación con dispositivos fabricados con otras tecnologías. Por tal motivo, es necesario un riguroso conocimiento de las propiedades tanto eléctricas como ópticas de las películas delgadas semiconductoras.

Con este trabajo se desarrolló una herramienta de software que sirve de apoyo a entidades que trabajan en propiedades ópticas de materiales semiconductores, específicamente en el área de síntesis de materiales empleados en celdas solares tipo película delgada. Determinando las constantes ópticas de películas delgadas semiconductoras que son usadas como capa absorbente en dispositivos fotovoltaicos.

El desarrollo de esta herramienta de software para la determinación de las constantes ópticas se basó en el método propuesto por R. Swanepoel [7] que se centra en un análisis de las curvas de transmitancia espectral experimental.


---

* Trabajo de grado.

** Facultad de ingenierías Fisicomecánicas. Escuela de Ingenierías Eléctrica, Electrónica y de Telecomunicaciones. Directora Dra. Mónica Andrea Botero Londoño. Codirector Dr. Alexander. Sepúlveda S.

## ABSTRACT

**TITLE:** DESIGN OF A SOFTWARE TOOL FOR DETERMINING OPTICAL CONSTANTS OF THIN FILMS SEMICONDUCTORS USED IN SOLAR CELLS *

**AUTHOR:** HEINER ALEXANDER VARGAS PEREA, ROBINSON ROCHA GONZÁLEZ**

**KEYWORDS:** Semiconducting thin films, optical constants, Swanepoel, Photovoltaic solar energy, Software.

**DESCRIPTION**: The great population growth has led many countries to seek alternatives to meet growing energy demand. The global population will reach approximately 9,600 million inhabitants by 2050, according to the ONU study 'World Population Prospects'. Photovoltaic solar energy, as part of the solution to this problem, has increased significantly in 2015 in the annual market, which corresponds to 25% compared to 2014 (Data obtained from REN21-2016).

Within this type of energy (solar photovoltaic) current technology of solar cells, photodetectors and other sectors of electronics and microelectronics are opting for the development of devices based on thin films due to lower costs compared to devices made with other technologies. Therefore, a thorough knowledge of both electrical and optical properties of Semiconducting thin films is required.

Part of this work was developed a software tool that provides support to organizations that works in optical properties of semiconductor materials, specifically in the area of synthesis of materials used in thin film type solar cells. Determining the optical constants of semiconductor thin films which are used as absorber layer in photovoltaic devices.

To the develope of this software and the determination of the optical constants was based on the method proposed by R. Swanepoel [7] which focuses on an analysis of experimental spectral transmittance curves.


---

* Degree Project.


**Physical-Mechanical Engineering Faculty. School of Electrical, Electronics and Telecommunication Engineering. Director Dra. Monica Andrea Botero Londoño, Co-director Dr.Alexander. Sepúlveda S.

Universidad Industrial de Santander

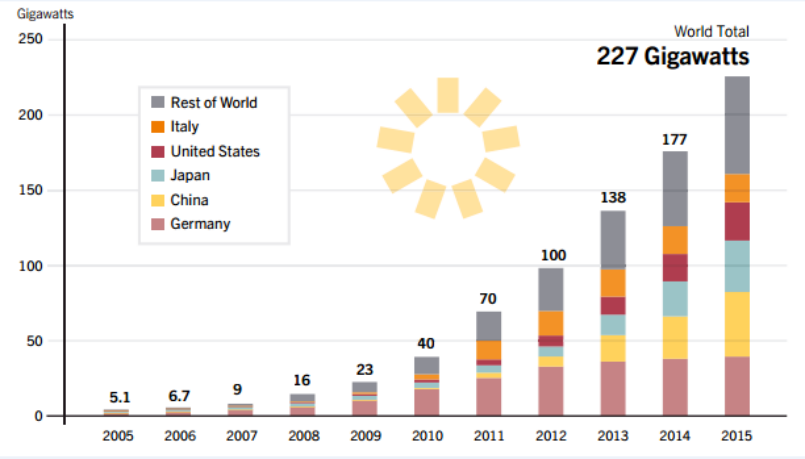
# INTRODUCCIÓN

La creciente demanda mundial de energía, tan vital actualmente, ha guiado a los seres humanos a la búsqueda permanente de nuevos combustibles y fuentes alternativas de energía; por ejemplo, aquellas que provienen del uso de fuentes naturales como la energía eólica, la mareomotriz y la energía solar. Esta última, entre otras ventajas, ofrece un bajo nivel de contaminación al medio ambiente comparado con energías no renovables tal como lo hace la quema de combustibles fósiles.

La primera celda solar fue diseñada en el año de 1884 por el científico estadounidense Charles Fritts quien recubrió una muestra de selenio semiconductor con una hoja de oro transparente, la cual bajo la exposición al sol produce una corriente continua y constante. Desde ese momento la tecnología ha avanzado en gran forma diseñando mecanismos y dispositivos que son cada vez más eficientes y de menores costos [1].

Los análisis de expertos en relación con los requerimientos de energía anual arrojan que existe un gran reto para el sector energético en pro de suplir las necesidades de energía eléctrica, las cuales aumentan rápidamente en todo el mundo gracias al crecimiento de la población. Estos incrementos en la demanda de energía deberían ser atendidos en un buen porcentaje por las energías renovables teniendo en cuenta su abundancia en el planeta y su consideración con el medio ambiente. De estas una de las más importantes es la energía solar. Es allí donde las celdas solares toman su papel fundamental gracias a su asequibilidad en comparación con las demás fuentes de energía. El mercado de las celdas solares está en aumento gracias, en parte, a la disminución de los costos de fabricación y el aumento en los precios en los combustibles fósiles. Este aumento en la demanda se puede evidenciar en la figura 1 en donde se observa que en la última década ha incrementado cerca de un 30% en su aporte al mercado y continúa aumentando [2].

Figura 1. Capacidad global de energía solar fotovoltaica, 2005-2015.




Fuente: [3]

En la actualidad, el 80-90% del mercado de la tecnología de celdas solares está dominado por materiales basados en silicio, el cual ha demostrado ser una tecnología robusta en los módulos fotovoltaicos, pero teniendo en cuenta el alto costo de las láminas de silicio, su probabilidad de reducción del mismo tiende a disminuir, lo que lleva a la búsqueda de nuevas tecnologías y nuevos materiales que además puedan ofrecer ventajas como mayor disponibilidad, menor toxicidad y estabilidad. Entre los materiales más estudiados se encuentran películas delgadas de *CdTe, CZTS, SnSbS, CIGS* y materiales compuestos *CuO / ZnO, CIS / TiO2*. [4]

Las celdas fotovoltaicas de película delgada tienen la ventaja de lograr costos de fabricación de módulo muy por debajo de $US 1 por vatio pico, adicionalmente las tecnologías fotovoltaicas de película delgada basadas en materiales inorgánicos se están desarrollando rápidamente, tanto en el laboratorio como en la industria, donde los investigadores están haciendo esfuerzos para mejorar su eficiencia. [2]

Los gobiernos han diseñado programas con el fin de fomentar y fortalecer el uso de energías alternativas. Por ejemplo, las autoridades colombianas han formulado leyes y normas con el fin de incentivar el uso racional y eficiente de la energía. Ejemplo de estas son las Leyes 697 de 2001 y 1715 de 2014 mediante las cuales se busca fomentar el aprovechamiento de las fuentes no convencionales de energía. Razón por la cual el enfoque de este proyecto pretende aportar al sector de las energías renovables, específicamente en la caracterización de la capa absorbente de celdas solares tipo película delgada.

Universidad Industrial de Santander

# 1. JUSTIFICACIÓN

Se ha determinado que alrededor del 15% de la capa terrestre de nuestro planeta es de silicio, este hecho ha facilitado la utilización de este material en la elaboración de módulos fotovoltaicos concretamente el silicio mono y policristalino, con estos semiconductores se han logrado eficiencias en celdas solares en torno al 25 y 20% respectivamente siendo el costo de producción su principal limitante [5].

Como alternativa para disminuir el costo de producción de este tipo de módulos surge la tecnología de capa delgada, debido a esto el grupo *GISEL* de la *E3T* está comenzando la línea de investigación en la síntesis y fabricación de celdas solares tipo película delgada, las cuales son un enfoque innovador al tema de la energía fotovoltaica terrestre y espacial. Estas celdas cuentan con una amplia variedad de diseños y métodos de fabricación y están conformadas por diferentes capas: contacto metálico, capa absorbente, capa buffer y TCO (Oxido Conductor Transparente), las cuales se adaptan con el fin de mejorar el rendimiento del dispositivo.

Las investigaciones acerca de los dispositivos fotovoltaicos que utilizan la tecnología de película delgada se enfocan en el estudio, adecuación, y optimización de cada uno de las capas constituyentes, en especial la capa donde se lleva a cabo la absorción óptica útil, es decir la capa absorbente. Dicha capa requiere materiales semiconductores (películas delgadas semiconductoras) con ciertas características específicas que permitan un buen aprovechamiento del espectro solar, además de generar grandes porcentajes de fotocorriente en espesores muy pequeños ($\mu m$) esto con el fin de garantizar una eficiencia fotovoltaica aceptable [6].

Las propiedades ópticas de un material semiconductor se determinan generalmente a través del conocimiento de sus constantes ópticas. El enfoque principal de este trabajo fue diseñar una herramienta de software que permite la caracterización óptica de la capa absorbente con el fin de determinar la brecha de energía prohibida ($Eg$), el coeficiente de absorción ($\alpha$) y el índice de refracción ($\eta$) del material. Este software tomó como referencia el método propuesto por *R. Swanepoel* [7] que utiliza un análisis de los espectros de transmitancia espectral experimental para hallar aquellas constantes y se basó en algunas adaptaciones propuestas por *Eduard Romero* [8].

# 2. OBJETIVOS GENERALES Y ESPECÍFICOS

## 2.1. OBJETIVO GENERAL

Desarrollar una herramienta de software basada en el método de R. Swanepoel para el cálculo de constantes ópticas en películas delgadas semiconductoras.

## 2.2. OBJETIVOS ESPECÍFICOS

- Implementar un método que permita hallar las constantes ópticas en películas delgadas semiconductoras dentro de Python, utilizadas en celdas solares a partir de medidas experimentales de transmitancia.

- Crear una interfaz gráfica de usuario dentro del lenguaje de programación seleccionado, para modelar los cálculos y exportar los datos de constantes ópticas en la capa de absorción de dispositivos fotovoltaicos requeridos por el usuario.

- Realizar pruebas que permitan evaluar el funcionamiento del software diseñado.

Universidad Industrial de Santander

# 3. MARCO TEÓRICO

## 3.1. ANTECEDENTES

El desarrollo de la tecnología de celdas solares de películas delgadas [9] se originó en el año de 1960 con *Cu2S/CdS*, las cuales alcanzaron un 10% de eficiencia. Durante los años 70´s y 80´s, los materiales mayormente utilizados en la fabricación de las celdas solares tipo película delgada fueron Diseleniurio de cobre e indio ($CuInSe_2$), Teluro de cadmio (*CdTe*), Silicio amorfo (*a-Si*) y Diseleniuro de Cobre-Indio-Galio (CIGS), las cuales garantizaban el 10% de eficiencia y un costo promedio de $US 1 por vatio. Gracias a los avances tecnológicos, las películas delgadas de los tres diferentes materiales han mejorado progresivamente sus niveles de rendimiento, llegando al 19% para el *CdTe*, 15% para el *a-Si* y 21% para el CIGS.

En el año de 1999 fue creada la compañía Norte americana *Firts Solar* [10], empresa dedicada a la fabricación de paneles fotovoltaicos y enfocada en la fabricación de celdas de películas delgadas de *CdTe* sobre sustratos de vidrio con una eficiencia de transformación de 11.8%. *Firts Solar* ha sido galardonada como una de las diez compañías de mayor crecimiento en el mundo y una de las empresas de fabricación de sistemas fotovoltaicos con mayor sostenimiento mundial. Adicionalmente, fue la primera compañía en demostrar que la fabricación a gran escala de celdas solares tipo película delgada reduce significativamente los costos de producción alcanzando el coste de fabricación más bajo en la industria [11].

Para el siglo XXI los avances en tecnologías y el desarrollo de diferentes aplicaciones de los nuevos materiales en forma de películas delgadas se convierte en uno de los pilares de la Ciencia e Ingeniería de los Materiales. Con ello se mejoran las propiedades de los materiales, permitiendo el desarrollo de múltiples aplicaciones que van desde la electrónica hasta los bio-materiales, al tiempo que aumenta el uso de energías renovables a nivel mundial. Es así como en el año 2008 la producción de energía solar fotovoltaica llegó a ser aproximadamente 6,85 GW. Una de las principales razones que fomentó el crecimiento en la producción de paneles solares de películas delgadas fue la escasez de Silicio provocado por el alza en la demanda en los últimos años que supera los niveles de producción [12].

Durante los últimos años no se ha evidenciado gran avance en los niveles de eficiencia de las películas de *CdTe y a-Si*, debido en gran parte por la concentración en la fabricación a gran escala.

Sin embargo la investigación de nuevos materiales semiconductores de bajo costo y buenas perspectivas se hace día a día más importante, como por ejemplo la *Kesterita* como $Cu_2ZnSnS_4$ y $Cu_2ZnSnSe_4$ en reemplazo de los convencionales tipo *Calcopirita*

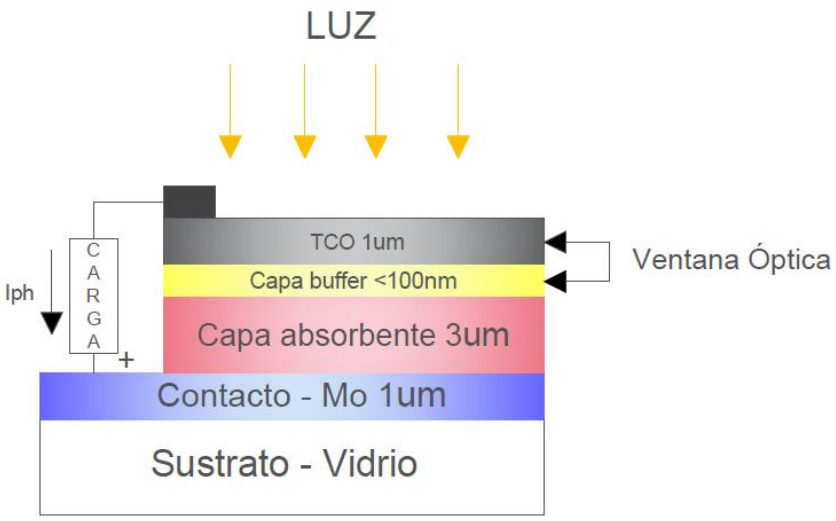
además se ha incursionado en el desarrollo de celdas solares orgánicas basadas en polímeros conductores funcionalizados con grafeno, celdas hibridas con contactos puntuales de nano estructuras de *ZnO* e incorporación de estructuras tipo *Perovskita* [13].

## 3.2 MARCO TEÓRICO CONCEPTUAL

Las celdas Solares basadas en Películas Delgadas, también llamadas de segunda generación son dispositivos diseñados de manera estratificada en capas de varios materiales semiconductores sobre un sustrato de vidrio. Los espesores de cada una de las capas que conforman este tipo de celdas están entre los 20*nm* y 5*µm*, lo que les da su nombre de película delgada [14].

Las celdas solares de película delgada tienen una configuración ventana óptica/capa absorbente y cuentan además con un material de contacto eléctrico y un sustrato de vidrio (ver figura. 2).

Figura 2. Sección transversal de una celda solar de tipo heterojuntura.




La ventana óptica está conformada por un óxido conductor transparente (*TCO*) y la capa buffer. El *TCO* es una capa conductora cuya función es proporcionar un contacto eléctrico superior, dicha capa es transparente para permitir que la luz solar penetre hasta la capa absorbente.

La capa buffer debe ser menor a 100 *nm* de espesor y además debe tener un bajo coeficiente de absorción, lo cual evita que los fotones sean absorbidos allí y así la mayor

cantidad de radiación solar llegue a la capa absorbente. Esta capa proporciona un empalme entre la capa absorbente y la capa *TCO*.

La capa más importante de la celda es la absorbente, ya que en esta se genera fotocorriente a partir de la radiación solar incidente en ella, es decir se generan portadores de carga mediante absorción de fotones [14] [15].

El contacto eléctrico cumple con varias funciones tales como un contacto óhmico posterior, amortiguamiento entre el sustrato de vidrio y la capa absorbente, y refleja parte de la luz que pasa a través de las capas anteriores [1].

El sustrato de vidrio es básicamente la estructura de la celda solar, este sustrato es de bajo costo y sobre él se hace el proceso de crecimiento de películas delgadas [16].

### 3.2.1. Propiedades ópticas de películas delgadas semiconductoras.

Las celdas solares están constituidas por diferentes películas delgadas, como se evidencia cada una cumple funciones específicas y por lo tanto deben tener propiedades diferentes. Para mejorar la eficiencia de la celda solar es necesario conocer muy bien las propiedades ópticas de las películas delgadas a utilizar en su fabricación y que estas propiedades se acerquen en lo posible a las óptimas para lograr el mejor desempeño. Por ejemplo la capa buffer debe tener una brecha de energía prohibida (*gap*) grande, mayor a 2 *eV*, para evitar absorber la radiación solar, y por otro lado la capa absorbente debe tener un coeficiente de absorción alto para aprovechar la mayor parte de la radiación solar que incida sobre ella.

Para conocer las propiedades ópticas es necesario determinar las constantes ópticas (índice de refracción, brecha de energía prohibida y coeficiente de absorción), estas constantes pueden ser obtenidas con cálculos y modelos matemáticos a partir de medidas experimentales del espectro de transmitancia [17].

- INDICE DE REFRACCIÓN (*n*): Se define como una medida óptica que demuestra la reducción de la velocidad de la luz al propagarse en un medio homogéneo, en forma técnica se define como el valor de la velocidad de la luz en un medio de referencia, generalmente el vacío ($C_0$) dividido entre la velocidad de transmisión de la luz en ese medio (*V*). El vacío es el medio por el cual la luz viaja más rápido, por lo tanto el índice de refracción siempre es mayor o igual a uno [18].

$$n = \frac{C_0}{V} \tag{1}$$

- COEFICIENTE DE ABSORCIÓN ( $\alpha$ ): Es la relación de cantidad de energía radiante absorbida entre la cantidad de energía que incide sobre cierta superficie. La absorción es el proceso por el cual dicha radiación es captada por un material y se denomina absorción óptica cuando la absorción se produce dentro del rango de la luz visible. Esta radiación, al ser absorbida, puede, bien ser reemitida o bien transformarse en otro tipo de energía, como calor o energía eléctrica.

  El coeficiente de absorción se relaciona con la luz incidente en el material por medio de la siguiente ecuación:

$$I = I_0 e^{(-\alpha d)} \tag{2}$$

- Donde $I$ es la intensidad del rayo incidente, $I_0$ es la intensidad del rayo reflejado, $\alpha$ es el coeficiente de absorción y $d$ es el espesor del material [19].

- BRECHA DE ENERGÍA PROHIBIDA: La Brecha de Energía Prohibida, Banda Prohibida o gap es aquella separación que existe entre la banda de valencia y la banda de conducción. Es muy variable en cuanto a su espesor y este depende del material que se esté trabajando, es así que la banda prohibida de un material no conductor es bastante grande y la de un conductor es tan pequeña que puede ser confundida con la banda de conducción y por tanto los electrones pueden fácilmente pasar de la banda de valencia a la banda de conducción [20]. En particular para materiales semiconductores la banda prohibida es de aproximadamente de 1 *eV*. Debido a que esta banda es bastante angosta, es más fácil para los electrones trasladarse de la banda de valencia a la de conducción. Por ejemplo, si aumenta la temperatura, los electrones absorben la energía necesaria para saltar a la banda de conducción. De esta forma aumenta la cantidad de electrones en la banda de conducción y disminuyen en la de valencia, pareciéndose más a un metal (conductor). Que haya menos electrones en la banda de valencia también contribuye a aumentar la conductividad, ya que aumentan los denominados huecos que son considerados como portadores de carga positivos [21].

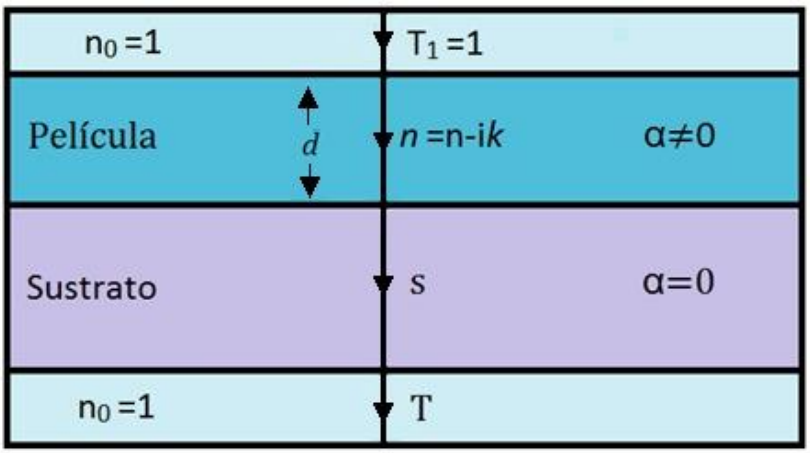
### 3.2.2. Cálculo de constantes ópticas.

Swanepoel [7] desarrolló un modelo matemático con el cual se pueden deducir las constantes ópticas de películas delgadas semiconductoras a partir de medidas experimentales de transmitancia espectral. La transmitancia se refiere a la cantidad de luz que atraviesa la película, en una determinada longitud de onda.

Este procedimiento aplica para una película delgada homogénea en espesor y con índice de refracción complejo $\eta = n\text{-}ik$ que es depositada sobre un sustrato transparente de espesor mayor que el de la película e índice de refracción *s*, tal como se puede ver en la Figura 3. La parte real *n* del índice de refracción determina la velocidad con que la radiación se propaga en el material y el coeficiente de absorción ($\alpha$) es expresado en términos del coeficiente de extinción (*k*), mediante la ecuación:

$$\alpha = \frac{4\pi k}{\lambda} \tag{3}$$

Figura 3. Sistema compuesto por una película delgada absorbente sobre un sustrato transparente finito.




A partir de los efectos de interferencia de la superposición de los haces reflejados y transmitidos en las interfaces película/aire y sustrato/película que se observan en los espectros de transmitancia se obtiene una expresión de la transmitancia $T$ en función de la longitud de onda $\lambda$ y de los parámetros $\alpha$, *n*, *s* y espesor $d$.

$$T = \frac{Ax}{B - Cx + Dx^2} \tag{4}$$

Universidad Industrial de Santander

Donde se tienen que los parámetros A, B, C y D son:

$$
\begin{aligned}
A &= 16s(n^2+k^2) \\
B &= \{(n+1)^2+k^2\}\{(n+1)(n+s^2)+k^2\} \\
C &= \{(n^2-1+k^2)(n^2-s^2+k^2)-2k^2(s^2+1)\}2\cos\phi \\
&\quad -k\{2(n^2-s^2+k^2)+(s^2+1)(n^2-1+k^2)\}2sen\phi \\
D &= \{(n-1)^2-k^2\}\{(n-1)(n-s^2)+k^2\}
\end{aligned}
\tag{5}
$$

$$
\phi = \frac{4\pi nd}{\lambda}
$$

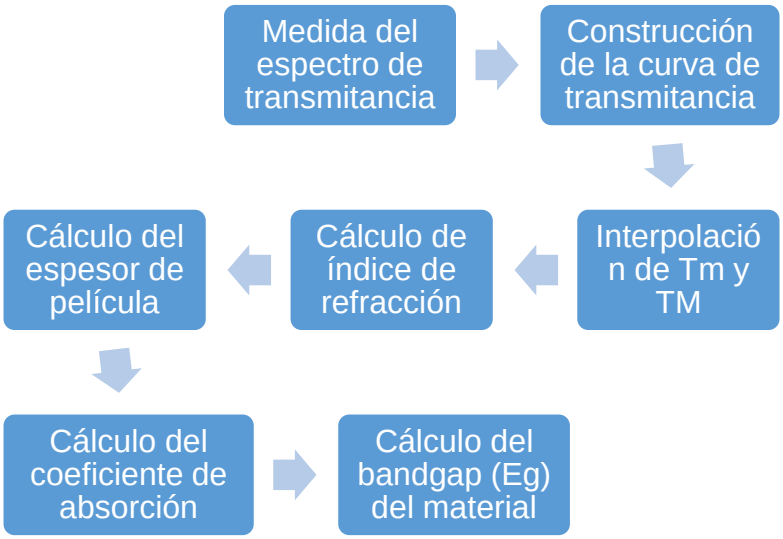
$$
x = e^{-\alpha d}
$$

$$
\alpha = \frac{4\pi k}{\lambda}.
$$

Es decir la transmitancia (T) en este caso es una función compleja que depende de la $\lambda$, del índice de refracción de la película *n* y del sustrato *s*, del espesor *d* y de $\alpha$. *T=T* ($\lambda$, *s, n, d,* $\alpha$), pero esta expresión es mucho más simple si asumimos $k \approx 0$, como lo veremos a continuación.

*Eduardo Romero* [22] en sus estudios de doctorado en Ciencias-Químicas de la Universidad Nacional de Colombia, desarrolló un proceso para determinar las constantes ópticas de películas delgadas semiconductoras de múltiples materiales basado en el método de Swanepoel, este proceso está resumido en el diagrama de flujo de la figura 4.

Figura 4. Diagrama de flujo que resume el procedimiento desarrollado para el cálculo de las constantes ópticas.




Fuente: [23]

A partir de las medidas de transmitancia espectral que son obtenidas por medio de un espectrofotómetro las cuales deben presentar máximos y mínimos asociados a efectos de interferencia, se trazan envolventes que pasan por los puntos máximos y mínimos de dicho espectro (las envolventes se presentarán como $TM = T_{Máximo}$ para los máximos y $Tm = T_{Mínimo}$ para los mínimos) (Figura 5) y a partir de estas y por interpolación se hallan los valores de las longitudes de onda correspondientes a los puntos donde se presentan aquellos máximos y mínimos de interferencia.

El espectro de transmitancia se divide en 4 regiones:

**Región Transparente:** $\alpha = 0$ y la transmisión se encuentra determinada por *n* y *s* a través de múltiples reflexiones.

**Región débil:** $\alpha \approx 0$ (muy pequeño) pero la transmisión empieza a reducirse.

**Región media:** $\alpha > 0$ (grande) y la transmisión disminuye debido al efecto de $\alpha$ .

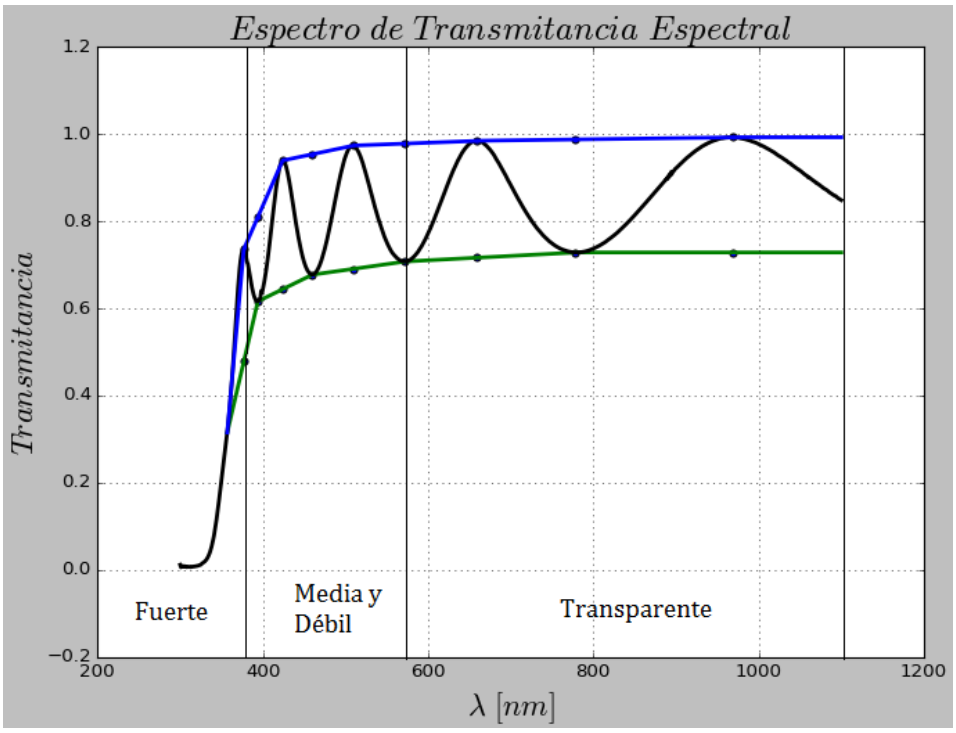
**Región fuerte:** $\alpha >> 0$ (muy grande) la transmisión disminuye drásticamente debido, casi exclusivamente a la influencia de $\alpha$ .

Con los valores *TM* y *Tm* y bajo las siguientes condiciones se calcula el índice de Refracción (*n*).

**Condición 1:** En la zona de baja absorción $k \approx 0$.
**Condición 2:** Para los máximos de interferencia en el espectro de transmitancia se cumple la diferencia de fase $\phi = 0, 2\pi, 4\pi, 6\pi, 8\pi, \ldots$
**Condición 3:** Para los mínimos de interferencia en el espectro de transmitancia se cumple la diferencia de fase $\phi = \pi, 3\pi, 5\pi, 7\pi, \ldots$

Sí k≈ 0, implica que la solución obtenida para el índice de refracción está en el plano de los números reales. Esta simplificación de las ecuaciones resulta ser una aproximación válida en la mayor parte de la región espectral presentada en la figura 5.

Figura 5. Espectro de transmitancia típico de una película delgada semiconductora, mostrando las curvas envolventes de los máximos y los mínimos.



Aplicando las anteriores condiciones a las ecuaciones 4 y 5 se obtiene:

$$T_{Máximo} = \frac{A'}{B' - C' + D'} \tag{6}$$

$$T_{Mínimo} = \frac{A'}{B' + C' + D'} \tag{7}$$

$$A' = 16sn^2 \tag{8}$$

$$B' = (n+1)^2(n+1)(n+s^2) \tag{9}$$

$$C' = 2 \cdot (n^2 - 1)(n^2 - s^2) \tag{10}$$

$$D' = (n-1)^2(n-1)(n-s^2) \tag{11}$$

En la región transparente el indice de refracción del sustrato se puede calcular facilmente reemplazando las varibles A, B, C y D en la ecuación para la transmitancia máxima y como en esta región el coeficiente de absorción es 0, entonces $x=e^{-\alpha d}=e^0=1$ además $k=\alpha\lambda/4\pi \rightarrow k=0$ y se despeja la única incognita es *s* que es el indice de refracción del sustrato. Cuando el sustrato es vidrio se puede considerar que *s* es una constante y es igual a 1.5.

$$T_M = \frac{2s}{s^2+1} \Rightarrow s = \frac{1}{T_M} + \left(\frac{1}{T_M^2} - 1\right)^{1/2} \tag{12}$$

En la región de absorción media y débil, $\alpha \neq 0$ y $x<1$, se halla una expresión simplificada donde no se tenga la absorbancia (x) entonces haciendo una diferencia entre el recíproco de la transmitancia máxima y el recíproco de la transmitancia mínima se halla una ecuación de la cual se puede obtener el índice de refracción de la película como una función de la longitud de onda.

$$\frac{1}{T_{Mínimo}} - \frac{1}{T_{Máximo}} = \frac{2C'}{A'} \tag{13}$$

Para el calculo de *n* en la región de absorción media y débil los valores de Tm y TM en diferentes $\lambda$ deben ser obtenidos. La exacitud a la cual $\lambda$ puede ser medida depende de la escala. Para obtener una exactitud de 1% en *n*; TM y Tm deben ser medidos con una exactitud absoluta alrededor de 0.2% para todos los cálculos se supone $k=0$ porque esta

situación es válida en una región muy amplia del espectro y al final calculamos el valor de *k* con el valor que se obtendrá de $\alpha$.

Sustituyendo las ecuaciones (8) y (10) en (13) y despejando *n* se obtiene:

$$n = \left[ N + \left( N^2 - s^2 \right)^{\frac{1}{2}} \right]^{\frac{1}{2}} \tag{14}$$

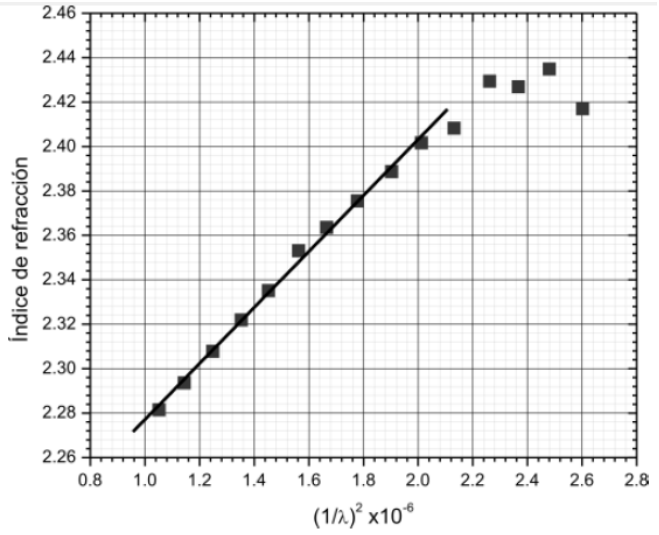
Donde *N* es igual a:

$$N = 2s\left( \frac{1}{T_{Mínimo}} - \frac{1}{T_{Máximo}} \right) + \frac{s^2 + 1}{2} \tag{15}$$

Para hallar el índice de refracción para todo el rango de medida de transmitancia se grafica $n$ en función de $(1/\lambda^2)$ con ayuda de la ecuación de *Cauchy* (16), con lo cual se obtiene una línea recta con las constantes *a* y *b* (Figura 6). Ecuación de Cauchy:

$$n = \frac{a}{\lambda^2} - b \tag{16}$$

Figura 6. Curva de $n$ vs $(1/\lambda^2)$ usada para determinar los parámetros *a* y *b* de la ecuación de Cauchy.




Fuente: [23]

En la zona de fuerte absorción no hay franjas de interferencia por lo tanto no hay una via para calcular *n* en esta región a partir del espectro de transmitancia , entonces, los valores de *n* pueden ser calculados extrapolando los valores determinados en otras regiones del espectro. La derivada de *n* respecto a $\lambda$ debe es creciente en el espectro visible (dispersion normal). Como las envolventes no existen en la zona de alta absorción no se puede hallar el índice de refracción de una forma análitica, por lo tanto se aproxima por la ecuación Cauchy.

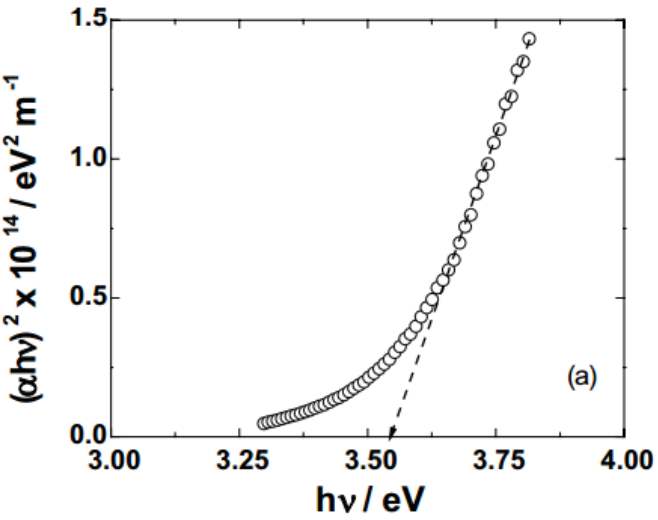
El coeficiente de absorción se halla resolviendo numéricamente la siguiente ecuación de forma iterativa:

$$e = \left[T_{\exp}(\lambda) - T_{cal}(k)\right] \leq 1 \times 10^{-7} \quad (17)$$

Donde $T_{\exp}(\lambda)$ se obtiene de los datos de transmitancia hallados experimentalmente y $T_{cal}(k)$ se obtiene de la ecuación (4).

Para materiales semiconductores de gap directo o brecha de energía prohibida $E_g$ se obtiene con la expresión $\alpha(h\nu) = (E_g - h\nu)^{1/2}$ haciendo uso de los valores obtenidos anteriormente. El valor de $E_g$ se halla gráficamente trazando la curva $(\alpha h\nu)^2$ vs. $h\nu$ (Figura 7), donde $E_g$ es el valor de la curva cuando $\alpha h\nu$=0 [24].

Figura 7. Curva de $(\alpha h\nu)^2$ vs. $h\nu$, usada para determinar el gap óptico.




Fuente: [25]

### 3.2.3 Lenguaje de programación (Python)

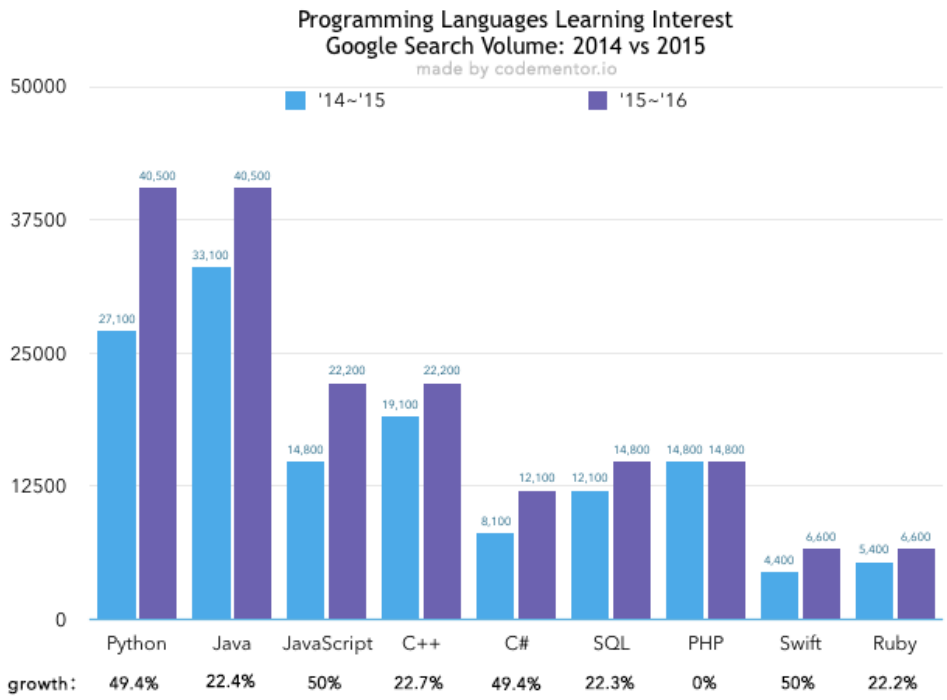
El software producto de este trabajo está escrito en el lenguaje de programación Python, este es un lenguaje creado por *Guido van Rossum* a principios de los años 90 cuyo nombre está inspirado en el grupo de cómicos ingleses “Monty Python”. Es un lenguaje similar a Perl, pero con una sintaxis muy limpia y que favorece un código legible. Se trata de un lenguaje semi interpretado o de script, con tipado dinámico, multiplataforma y orientado a objetos.

El intérprete de Python está disponible en: *UNIX, Solaris, Linux, DOS, Windows, OS/2, Mac OS*, etc. por lo que si no utilizamos librerías específicas de cada plataforma nuestro programa podrá correr en todos estos sistemas sin grandes cambios.

Dentro de las librerías que se usaron para la construcción de la interfaz gráfica tenemos: *Tkinter, Matplotlib, Scipy, numpy*, entre otras. Todas aquellas con tareas específicas dentro del software producto de este proyecto.

.

FIGURA 8. Lenguajes de Programación – interés de aprendizaje 2014-2015.




Fuente: [26]

Universidad Industrial de Santander

Se seleccionó este lenguaje debido al gran crecimiento en cuanto a aplicaciones desarrolladas en él, también por la progresiva acogida que ha tenido en los dos últimos años que lo ha posicionado en el top 5 de los mejores lenguajes de programación a nivel mundial. Todo esto contribuye a crear comunidades alrededor de Python y hacer más accesible información que favorece al desarrollo de aplicaciones más robustas.

Algunos casos de éxito en el uso de Python son Google, Yahoo, la NASA, Industrias Light & Magic, y todas las distribuciones Linux, en las que Python cada vez representa un tanto por ciento mayor de los programas disponibles [27].

Universidad Industrial de Santander

# 4. RESULTADOS

Luego de varios meses de trabajo, en los que se hicieron investigaciones, deducción de fórmulas, rutinas de código y demás actividades, se obtiene como resultado una herramienta de software que lleva como nombre *C.O.P.S* ® (Constates Ópticas de Películas delgadas Semiconductoras), que permite hallar las constantes ópticas de películas delgadas semiconductoras (*índice de refracción, coeficiente de absorción y Gap o Brecha de energía prohibida*) y una aproximación de su *espesor*, dentro de una interfaz sencilla inglés-español. Basada en el método propuesto por Swanepoel [7] que parte de medidas de espectros de transmitancia experimentales.

## 4.1. PROGRAMACIÓN EN PYTHON

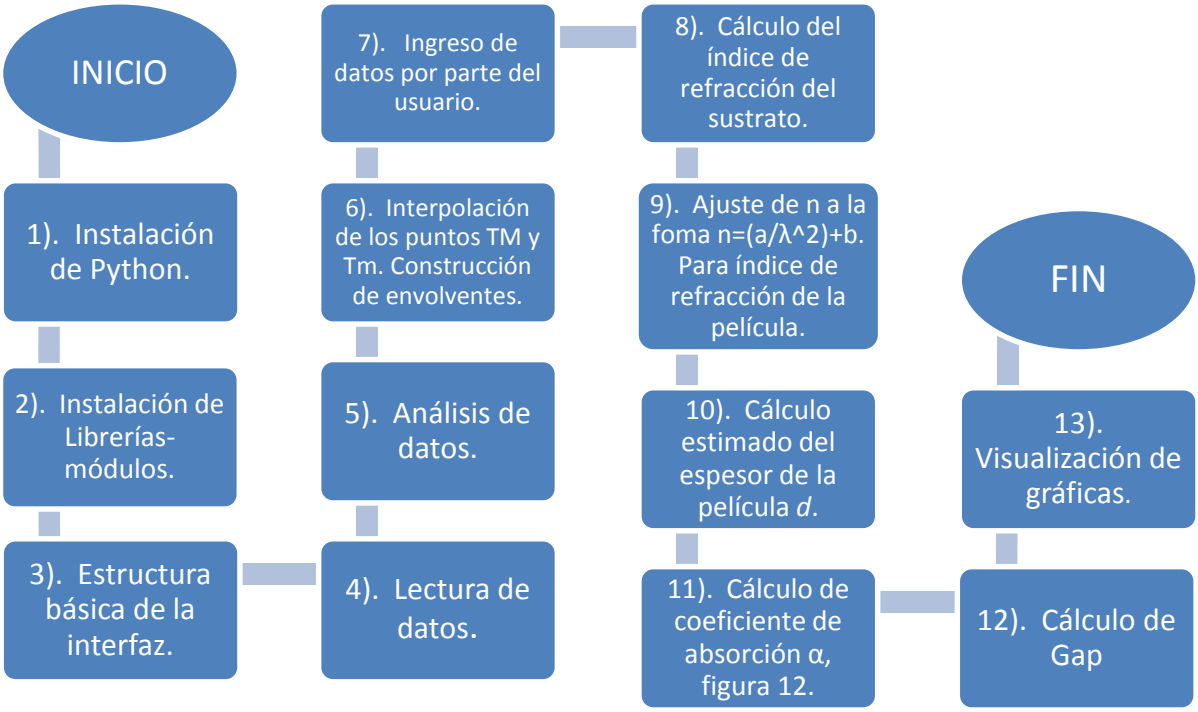
Para la programación en Python se realizó una investigación acerca de los módulos científicos [28] que este posee y su aplicación como entorno de desarrollo científico [29]. Esto con el fin de adaptar los diferentes métodos para el cálculo de constantes, registro de datos, interpretación de los mismos y su posterior visualización.

Dentro de las herramientas más completas que para nuestro caso son importantes a lo largo del proceso de programación del software, se pudieron encontrar varios módulos, se hará mención de algunos que se consideran los más relevantes, dentro de ellos tenemos a *Tkinter* [30] que hace parte de la biblioteca gráfica Tcl/Tk para el lenguaje de programación Python. Gracias a *Tkinter* podemos interactuar con el usuario pidiéndole el ingreso de datos, capturando la pulsación de teclas, movimientos del mouse, entre otras cosas más. *Scipy* [31] es una biblioteca de funciones matemáticas, tiene gran aplicación en el campo de la ingeniería. Existen diferentes aplicaciones para este módulo, ya que algunas de sus funciones son Integrales, problemas de optimización, álgebra lineal e interpolación de funciones especiales. Por último tenemos a *Numpy* [32] que es una de las librerías más importantes de este lenguaje, es el encargado de añadir toda la capacidad matemática y vectorial a Python haciendo posible operar con cualquier dato numérico o array. Incorpora operaciones básicas como la suma o la multiplicación y otras más complejas como la transformada de Fourier.

Varios módulos más fueron instalados pero los mencionados anteriormente cumplen tareas estructurales dentro de la programación de *C.O.P.S.*

En la figura 9 se presenta un diagrama donde se evidencia el proceso de construcción del software partiendo incluso desde la instalación del lenguaje de programación seleccionado.

Figura 9. Diagrama de construcción de C.O.P.S.




*1)* Se empezó el proceso instalando Python, se trabajó con la versión *2.7.12*, se decidió por esta versión pues hay unos cuantos inconvenientes en cuanto a la versión *3.x*, como un soporte de bibliotecas ligeramente menor.

*2)* Luego de tener instalado el lenguaje de programación Python se procedió a instalar las librerías-módulos necesarios para la construcción de *C.O.P.S*, algunas de ellas no se mencionan ya que no cumplen funciones estructurales dentro del software [33].

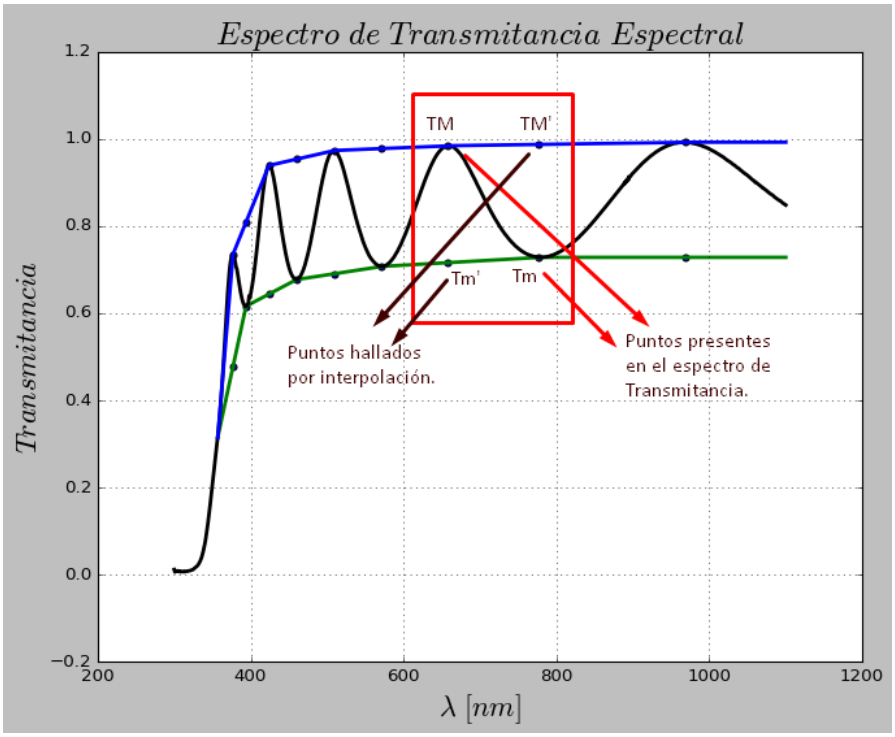
*3)* Construcción de la estructura principal y básica de *C.O.P.S.* por medio de la librería *Tkinter*, se definieron dimensiones de las ventanas, locación de botones, etiquetas, inserción de imágenes, ingreso de datos y cuadros de información.

*4)* Creación de la rutina encargada de abrir un archivo de texto donde está registrado el espectro de transmitancia espectral experimental, doble columna (*λ vs T*).

*5)* Análisis de los datos ingresados, se determina si cumplen con los requerimientos para ser procesados, de no ser así el software detendrá el proceso en este paso hasta que se carguen datos válidos, las especificaciones del archivo correcto están impresas en la ventana de cálculos dentro del software.

6) Se realiza la detección de los puntos máximos y mínimos del espectro de transmitancia, una vez extraídos estos puntos con sus respectivos valores de *λ(nm)* se procede a realizar una interpolación para hallar las envolventes continuas TM y Tm. Con las envolventes podemos hallar los puntos TM' y Tm', que son los valores de un máximo correspondiente a un mínimo dentro de la envolvente y viceversa. Estos puntos se detallan de una manera más clara en la Figura 10.

Figura 10. Puntos TM' y Tm' dentro del espectro de transmitancia.




En la figura 11 se presenta el método implementado en C.O.P.S para hallar los máximos y mínimos de transmitancia.

7) El usuario debe ingresar un valor de espesor *(d)* si lo tiene, además del índice de refracción del sustrato *(s)*, si no es ingresado ninguno de estos valores el software hará los cálculos con el valor calculado automáticamente y el valor por defecto respectivamente.

8) El cálculo del índice de refracción del sustrato *(s)*, se calculará para para muestras que el usuario decida no tomar este valor como constante a lo largo de todo el espectro de transmitancia como se presenta a continuación en la ecuación 18.

$$S = 1/TM + (1/TM^2 - 1)^2 \quad (18)$$

Universidad Industrial de Santander

Donde TM son los correspondientes valores de los puntos máximos dentro de la matriz de máximos y mínimos calculados luego de realizar la interpolación.

*9)* La derivada de *n* respecto a $\lambda$ debe ser creciente en el rango visible (dispersión normal). Como las envolventes no existen en la zona de alta absorción no se puede hallar el índice de refracción de una forma analítica, por lo tanto se aproxima por la ecuación Cauchy (15) este procedimiento se presenta en la imagen de flujo doble de la figura 12.

*10)* El Una vez calculado el índice de refracción para todo el rango del espectro experimental se procede con el cálculo del espesor de película si el usuario no ha ingresado algún valor previamente. Teniendo en cuenta la condición 2 y 3 y la ecuación de transmitancia junto con las expresiones de sus constantes que se presentaron en el sección 3.2.2. se puede deducir la ecuación 19.
Donde m es el orden de interferencia, cuando m es par corresponde a un máximo y cuando es impar a un mínimo. Por lo tanto, si asignamos un valor ($m_1$) al primer orden de interferencia que aparece en el espectro de transmitancia, entonces la expresión anterior se transforma la ecuación 20.

$$(2nd/\lambda) = (m/2); \quad m = 0,1,2,3... \tag{19}$$

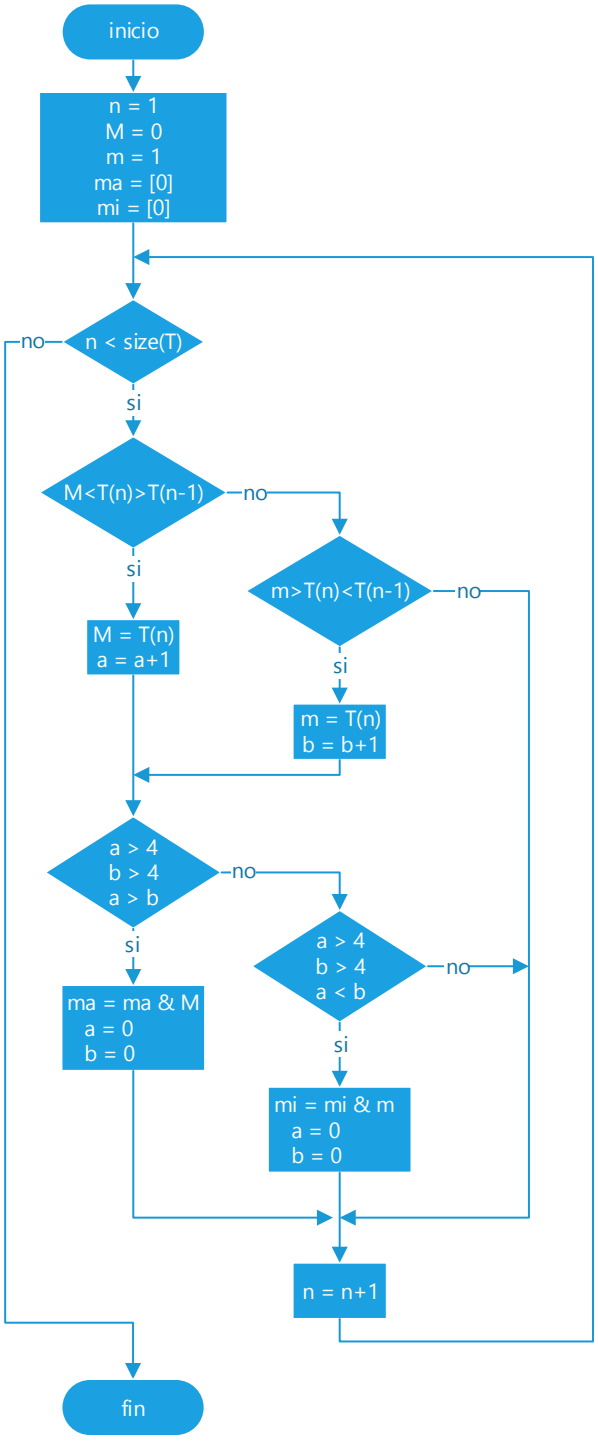
$$(2nd/\lambda) = (m_1 + l/2); \quad l = 0,1,2,3... \tag{20}$$

*11)* Para el cálculo de las constantes correspondientes al coeficiente de absorción *α*, se presenta el método de bisección de la figura 13.

*12)* En el cálculo del Gap se crean dos matrices, en una de ellas cada elemento es igual a 1240/$\lambda$ y en la otra cada elemento es igual a ($\alpha$ *1240/$\lambda$)$^2$. Lambda ($\lambda$) se refiere a cada una de las longitudes de onda de los datos de transmitancia. Con las matrices obtenidas se genera la curva: '1240/$\lambda$' vs '($\alpha$ *1240/$\lambda$)$^2$', se calcula la pendiente punto a punto y se establece la región con mayor pendiente sobre la cual se traza un recta tangente y se define el punto de corte de la recta con el eje x como el valor del Gap. Este proceso se muestra en la figura 14.

*13)* La visualización de las gráficas que responden a los botones "*Interpolar*", "*Índice de Refracción*", "*Coeficiente de absorción*" y "*Gap*" están a cargo de la librería *Matplotlib* [34], la cual es una biblioteca para la generación de gráficos a partir de datos contenidos en listas o arrays.

Figura 11. Rutina para el cálculo de los máximos y mínimos de transmitancia.

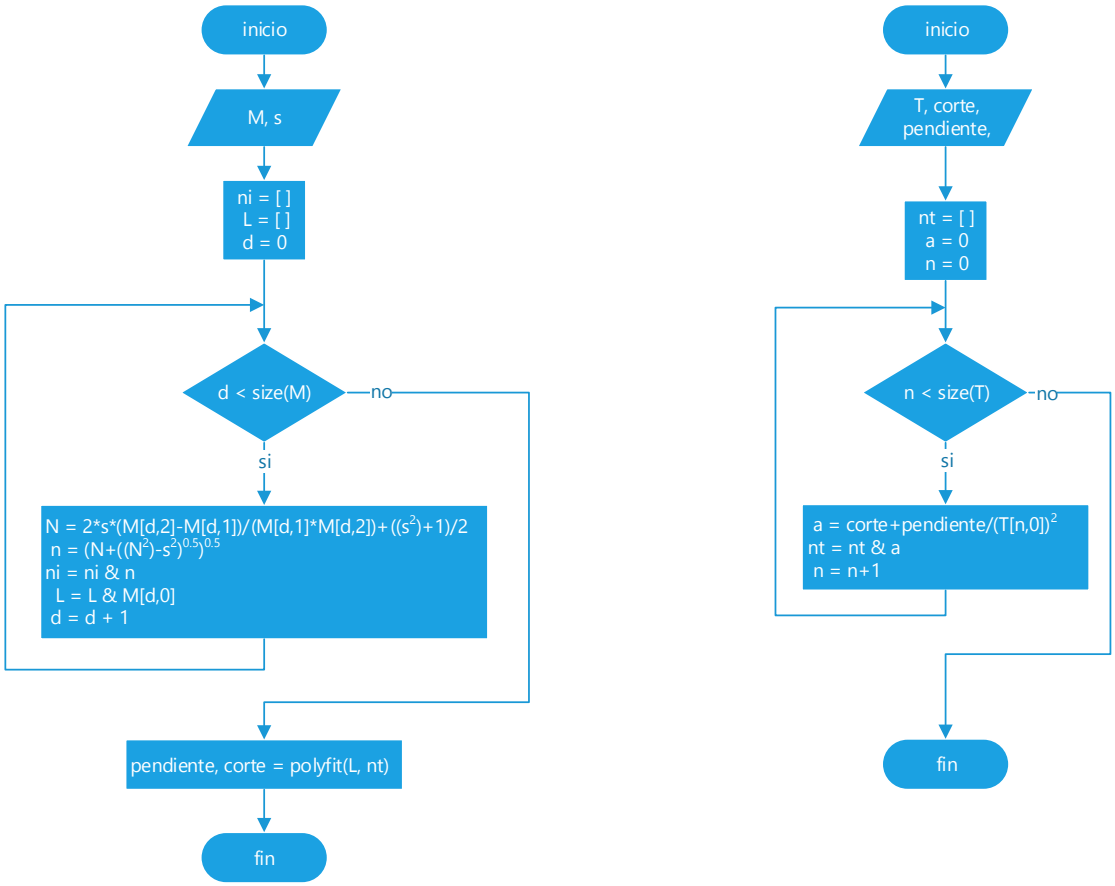



T es el vector de transmitancia, ma es el vector de puntos máximos y mi es el vector de puntos mínimos.

Para hallar los máximos se compara cada punto de transmitancia con respecto al anterior y si cumple que es mayor se almacena en una variable, se aumenta un conteo llamado *conteo de crecimiento (a)* y luego si cada punto empieza a decrecer con respecto al punto anterior entonces se aumenta un conteo llamado *conteo de decrecimiento (b)*, si *a* y *b* son superiores *a* 4 y además *a* es mayor a *b* se toma el valor almacenado como valor máximo, y se reinician los contadores.

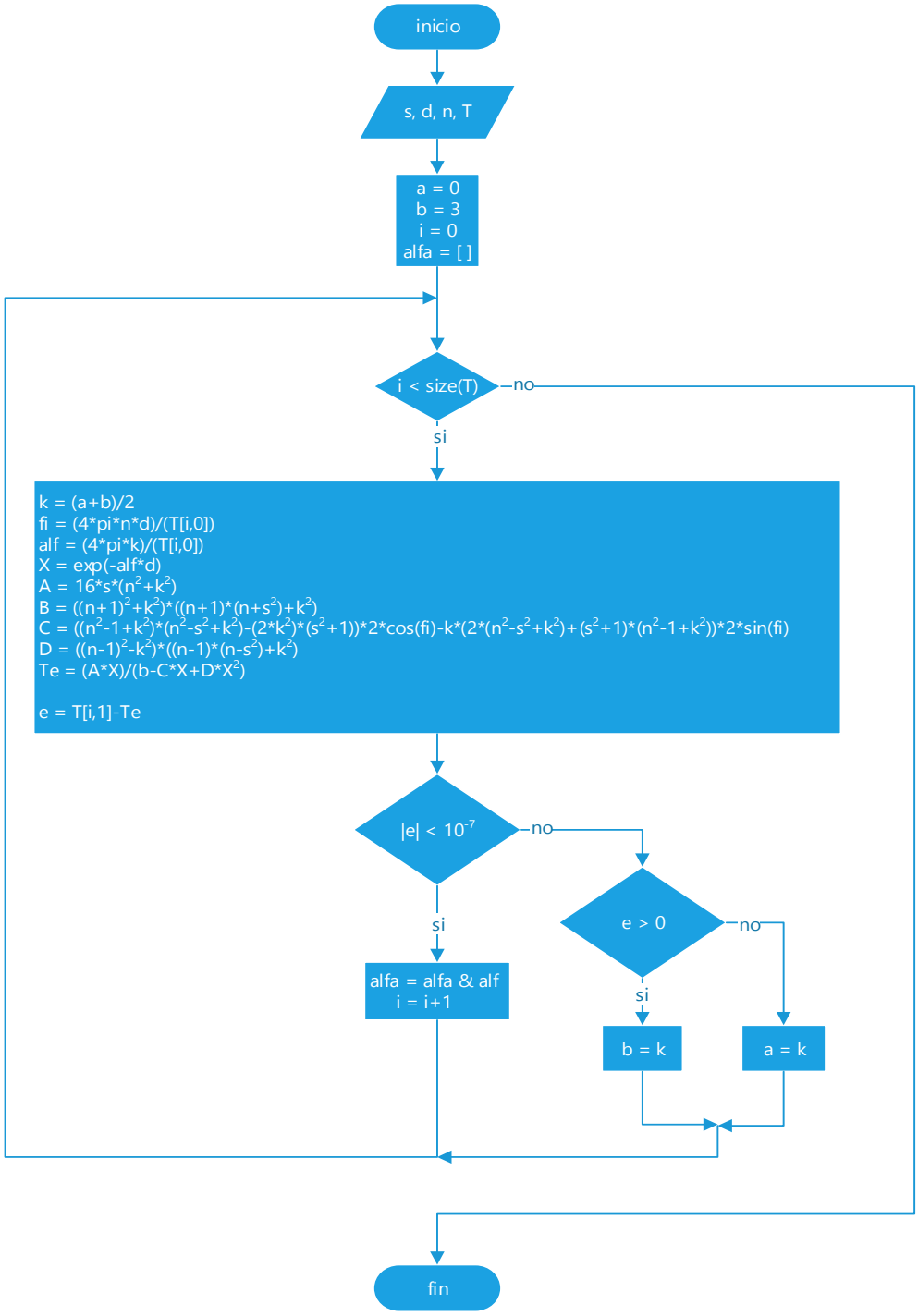
Para hallar los mínimos se compara cada punto de transmitancia con respecto al anterior, si cumple que es menor se almacena en una variable y se aumenta el *conteo de decrecimiento (b)* y luego si cada punto empieza a crecer con respecto al punto anterior se aumenta el *conteo de crecimiento (a)*, si *a* y *b* son superiores a 4 y además *a* es menor a *b* entonces se toma el valor almacenado como valor mínimo, y se reinician los contadores.

Figura 12. Método para el cálculo del índice de Refracción.



M es una matriz con los máximos, mínimos y sus respectivas longitudes de onda, s es índice de refracción del sustrato. Como resultado de este proceso se obtiene el vector nt el cual contiene el índice de refracción de la película para todo el espectro en estudio.

Figura 13. Rutina del Método numérico para el cálculo del coeficiente de absorción.



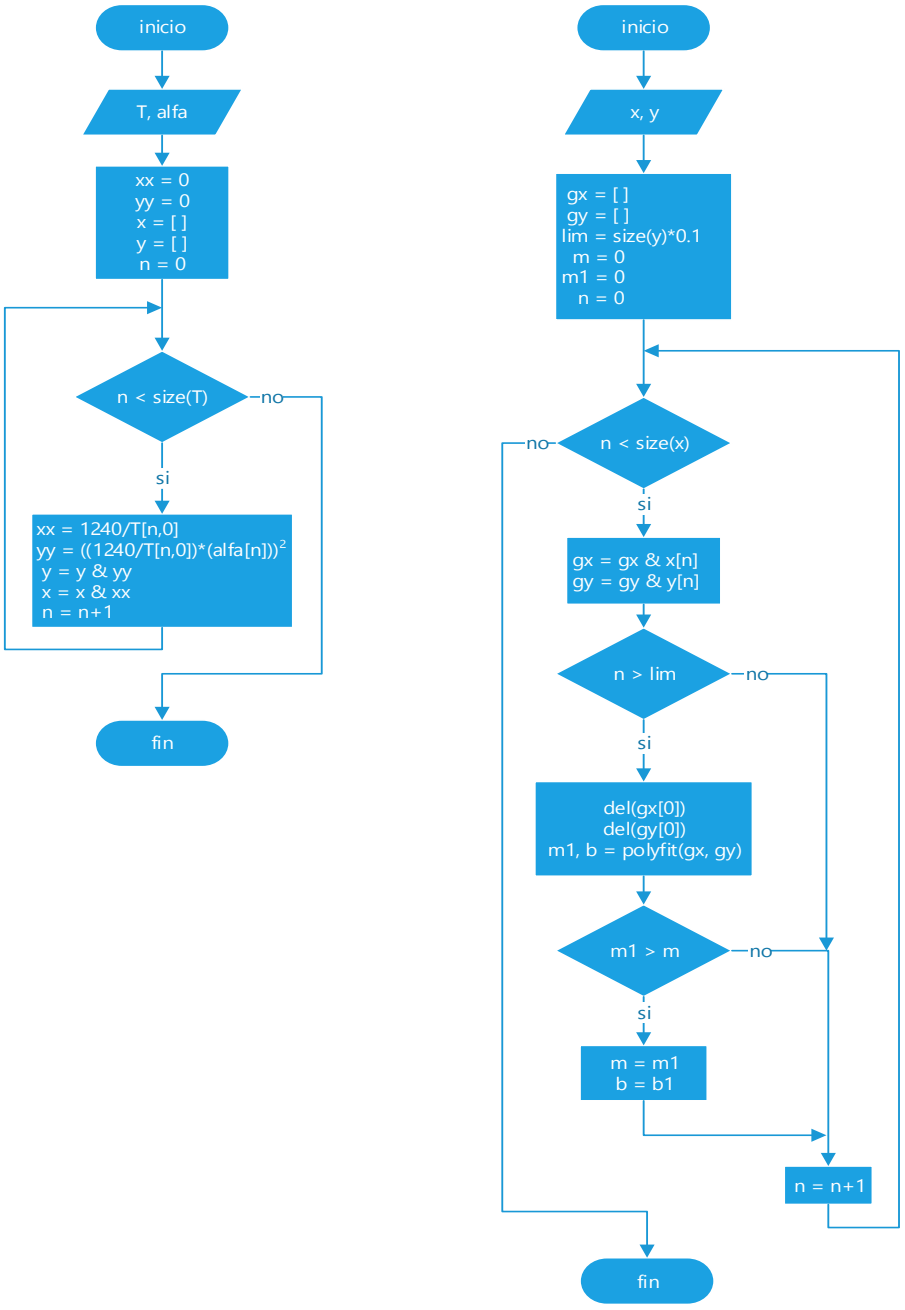
Universidad Industrial de Santander

Para resolver la ecuación (16) presentada en una sección anterior se utiliza la rutina de la figura 13. *s* es el índice de refracción del sustrato, *d* es el espesor de la película, *n* es el vector de índice de refracción de la película en el rango de espectro estudiado y *T* es la matriz de transmitancia. *a* y *b* se definen al inicio de dicha rutina y son los límites del rango de *k*.

La expresión *e=T[i,1]-Te* se refiere a la diferencia entre el valor de la transmitancia experimental y el valor de transmitancia teórico calculado con el valor de *k*.

Las iteraciones dentro de la rutina se realizan para cada valor de la longitud de onda hasta que el valor de *e* sea menor a *10-7* , si esto se cumple durante *n* iteraciones se da por terminado el ciclo, si no, se procede a preguntar por el valor de *e* de nuevo, si este es mayor a *cero (0)* se asigna el valor de *k* a *b* y vuelve a realizarse el proceso con un nuevo rango de *k* y si por el contrario es menor a cero (0) se le asigna el valor de *k* a *a* y se realiza el mismo proceso; el método reduce el rango de *k* en un 50% por cada iteración.

Figura 14. Método para el cálculo del Gap




*T* es la matriz de transmitancia, *alfa* es el vector de coeficientes de absorción, *x* es el vector $hv$ y *y* es el vector $(\alpha hv)^2$ .En la rutina de la izquierda se crean los vectores $hv$ y $(\alpha hv)^2$ y en la rutina de la derecha se halla la región de mayor pendiente sobre la cual se traza un recta paralela y su punto de corte con el eje x ($hv$) es el valor del GAP.

## 4.2. GUÍA DE USUARIO PARA EL USO DEL SOFTWARE C.O.P.S ® (CONSTANTES ÓPTICAS DE PELICULAS DELGADAS SEMICONDUCTORAS)

### 4.2.1. Selección idioma.

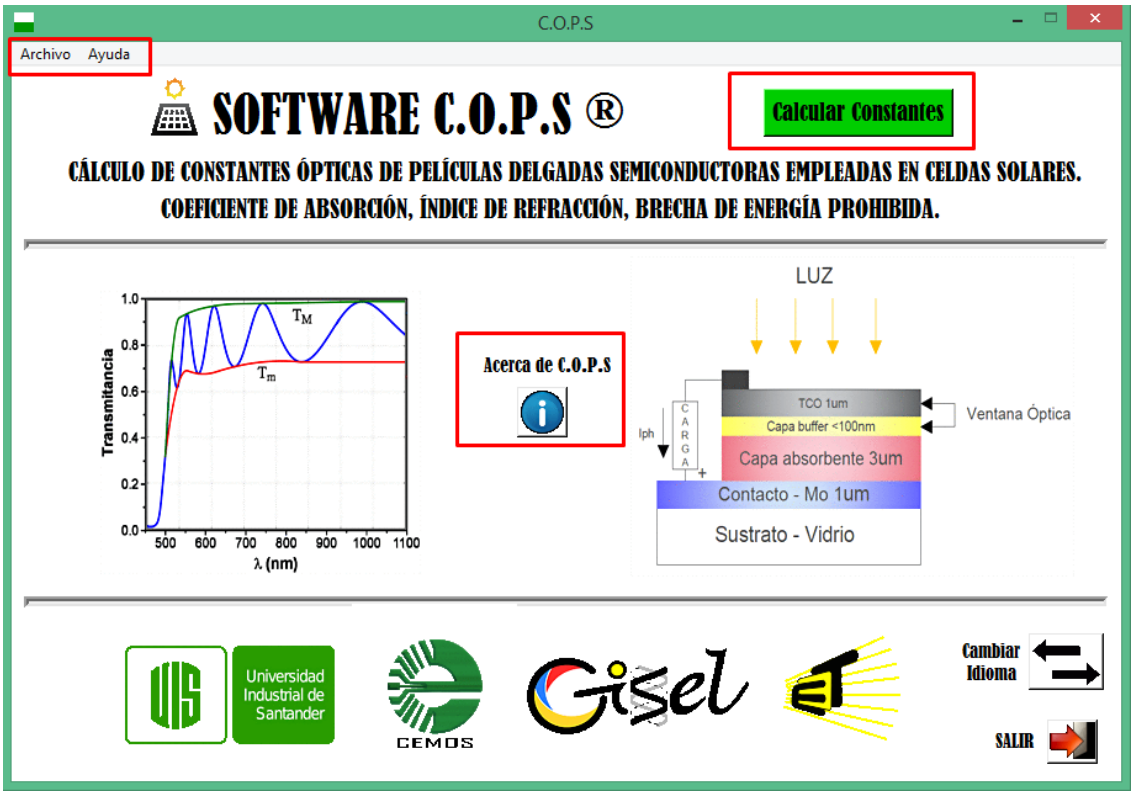
El primer paso para utilizar el software para el análisis de una curva espectral experimental de transmitancia y el cálculo de sus constantes ópticas será seleccionar el idioma de interés, tal como se presenta en la figura 15.

Figura 15. Selección de idioma Español.


### 4.2.2. Ventana de transición e información.

Posterior a la selección del idioma se abrirá una ventana de transición donde el usuario podrá acceder a información de *C.O.P.S*, también cambiar nuevamente el idioma si eligió una opción incorrecta y desplegar una ventana donde se realizan los cálculos de las constantes ópticas (figura 16).

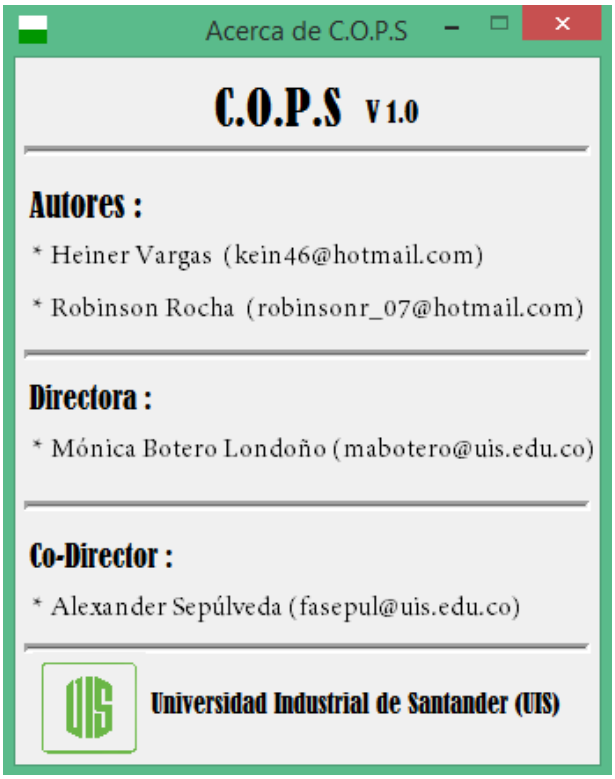
Figura 16. Ventana de transición (C.O.P.S).




Dentro de la información disponible para el usuario en la ventana de transición esta los nombres de los autores del software, así como un correo de contacto de cada uno de ellos, la versión del mismo y los diferentes grupos académicos y entidades que hacen parte del desarrollo del mismo (*UIS, GISEL, CEMOS, E3T*).

En la figura 17 se observa una ventana con la información de los autores mencionada anteriormente, se puede acceder a ella presionando un botón llamado "*Acerca de C.O.P.S*" que se encuentra ubicado en la parte central de la ventana de transición, también desde la barra de menú en la opción desplegable "A*yuda*", luego opción "*Acerca de C.O.P.S*".
El contenido de las figuras que se mostrarán a partir de ahora está en español asumiendo que el usuario eligió este idioma en primera instancia, para la parte en inglés del software las posiciones de los botones dentro de las ventanas y su funcionalidad es idéntica.

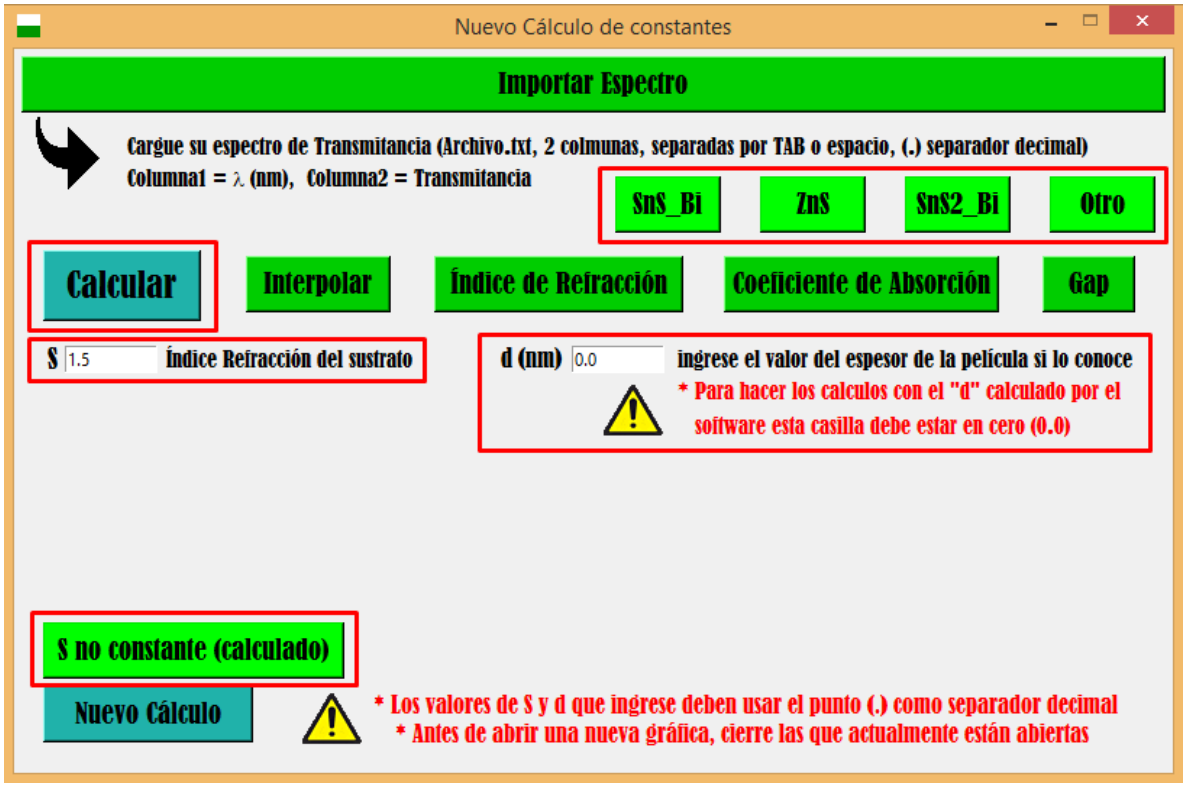
Figura 17. Ventana de información (Acerca de C.O.P.S).




### 4.2.3. Ventana de cálculos.

Al presionar el botón "*Calcular Constantes*" ubicado dentro de la ventana de transición en la parte superior derecha se abrirá la ventana presentada en la figura 18 (también se puede acceder desde la misma ventana de transición dirigiéndose a la barra de menú en la opción desplegable "*Archivo*" luego opción "*Calcular*").

Figura 18. Ventana de cálculos (Nuevo Cálculo de constantes).




En esta ventana el usuario puede ingresar dos valores, el espesor de la película $d$ (*nm*) y el índice de refracción del sustrato ($S$) que por defecto viene con un valor igual a *1.5* (*vidrio soda-lime*), se asume como constante en buen parte del espectro de transmitancia [35] si el usuario desea analizar el espectro ingresado y hacer que C.O.P.S calcule un índice de refracción del sustrato no constante, debe pulsar el botón "*s no constante (calculado)*" ubicado en la parte inferior izquierda de esta ventana, el espesor es calculado automáticamente por el software empleando el método propuesto por Swanepoel [7], si se tiene el dato de una medida de espesor que se haya realizado con anterioridad puede ingresarla y el programa ajusta los cálculos a este nuevo espesor entregado (cada vez que ingrese un nuevo dato debe pulsar sobre el botón calcular). Adicionalmente se deberá seleccionar el tipo de compuesto del que se fabricó la película donde se presentan tres opciones, si dispone de una diferente se pulsa el botón "*Otro*".

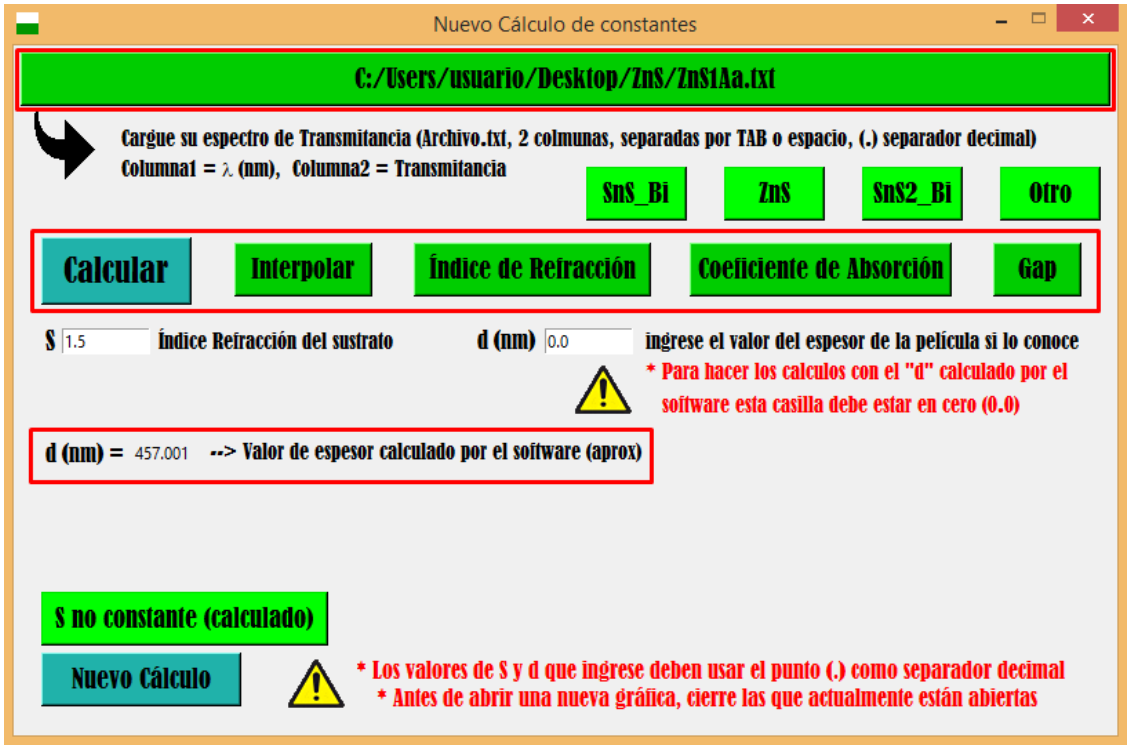
Si el usuario no ingresa ningún valor de espesor el software toma el valor que se calcula automáticamente, para hacer los cálculos, si después de oprimir "*Calcular*" con este valor por defecto desea ingresar un nuevo valor de espesor se podrá hacer y oprimir nuevamente el botón "C*alcular*", de igual manera con el índice de refracción del sustrato.

Una vez definidos estos valores con los que se desea trabajar se procede a cargar el espectro de transmitancia espectral como un archivo .txt (archivo generado por la mayoría de los espectrofotómetros comerciales) que bebe tener dos columnas, la primera con los valores de $\lambda(nm)$ y la segunda con los valores de la Transmitancia (a.u), separadas por espacio o Tabulación y utilizando el punto (.) como separador decimal en las cantidades que las componen.

Esta carga del archivo se hace por el botón que se encuentra en la parte superior de la ventana de cálculo "*Importar Espectro*", una vez seleccionado el archivo .txt que contiene el espectro de transmitancia experimental se procede a oprimir el botón "Calcular", este proceso de cálculo toma alrededor de 0.5 a 2 segundos dependiendo la capacidad de computo del equipo donde se esté ejecutando C.O.P.S (el botón "Calcular" toma un color claro y permanece bloqueado el tiempo que toma procesar los datos y hacer los cálculos, cuando esto termina retorna a su estado inicial).

Cuando el proceso de cálculo ha terminado (figura 19) la ventana de cálculo imprime el valor del espesor aproximado calculado de la película ( $d$ ) y habilita los botones para poder ver las gráficas de la Interpolación (TM, Tm, $\lambda$), índice de refracción ( $n$ ), coeficiente de absorción ( $\alpha$ ) y Gap.

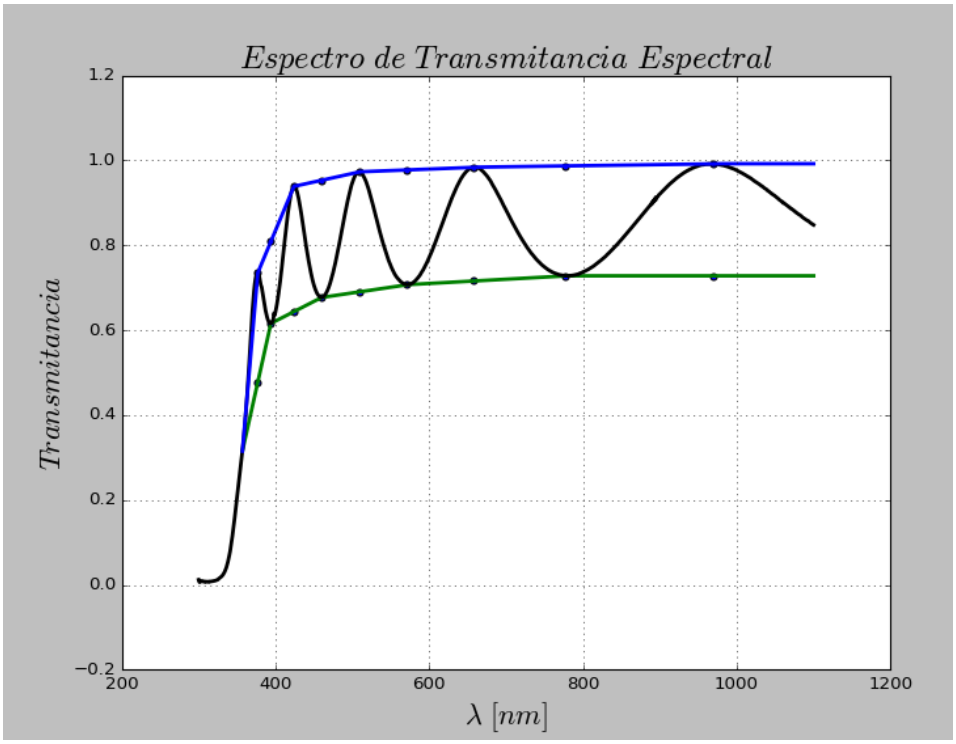
Figura 19. Espesor calculado.



La gráfica que se obtiene al oprimir el botón "*Interpolar*" se muestra para un archivo (compuesto: ZnS) en la figura 20.

Para películas delgadas semiconductoras de espesor homogéneo y cuya superficie no presenta irregularidades, se ha encontrado que el espectro de transmitancia (*T*) en función de la longitud de onda de la luz ($\lambda$) tiene la forma dada en la figura 20.

Figura 20. Espectro de transmitancia con sus respectivas curvas de TM y Tm.

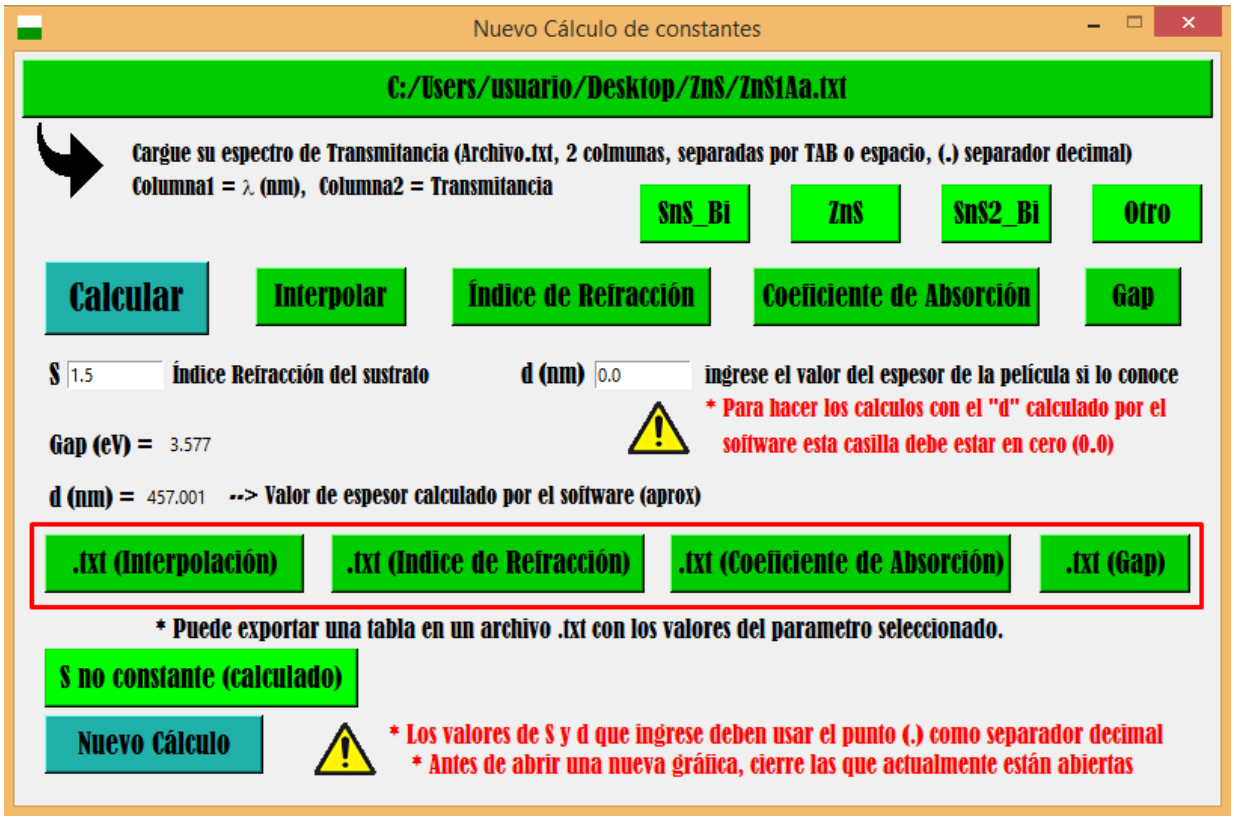



Cada vez que un usuario abra una gráfica deberá cerrarla para abrir una nueva, esto evitará que las gráficas se sobrepongan dando lecturas erróneas, las gráficas se pueden mostrar aleatoriamente, una vez los botones estén habilitados no existe restricción en su orden.

Luego de presionar un botón cualquiera para visualizar su respectiva gráfica ("*Interpolar*", "*Índice de Refracción*", "*Coeficiente de Absorción*", "*Gap*") aparecerá en la parte inferior de la ventana de cálculos un botón correspondiente a cada gráfica con el mismo nombre, que permitirá al usuario extraer los datos de dicha gráfica en un archivo .txt, adicional a esto cuando la gráfica se esté mostrando se podrá guardar en diferentes formatos como: png, jpg, pdf, etc.

Aquellos nuevos botones que permiten al usuario exportar los datos de las gráficas en archivos .txt se muestran en la figura 21.

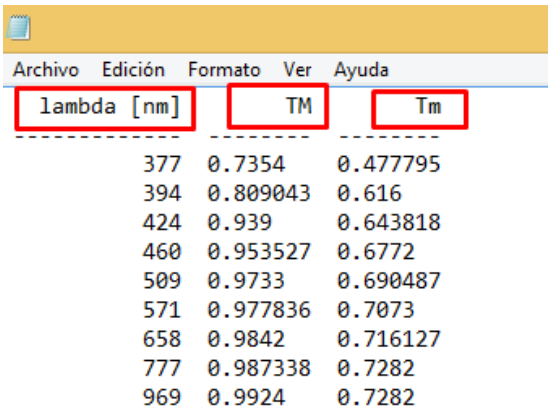
Figura 21. Botones para exportar archivos .txt.




Los archivos .txt son guardados en el directorio que el usuario le indique, poseen su respectiva demarcación es decir nombre para cada columna según el tipo de gráfica seleccionada.

En la figura 22 se muestra un archivo .txt extraído del mismo espectro que se ha mostrado en los pasos anteriores luego de pulsar en el botón "*Interpolar*".

Figura 22. Archivo .txt de interpolación de un espectro de transmitancia espectral.



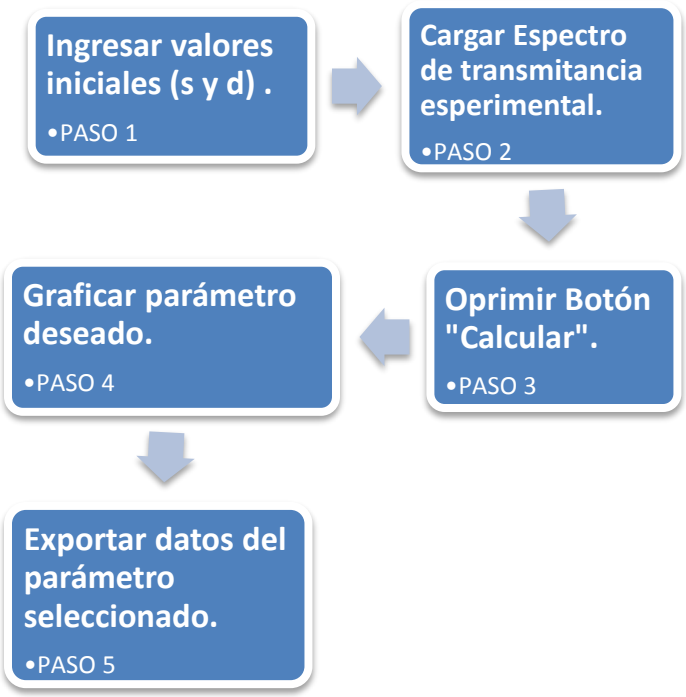
Archivo Edición Formato Ver Ayuda

| lambda [nm] | TM | Tm |
|---|---|---|
| 377 | 0.7354 | 0.477795 |
| 394 | 0.809043 | 0.616 |
| 424 | 0.939 | 0.643818 |
| 460 | 0.953527 | 0.6772 |
| 509 | 0.9733 | 0.690487 |
| 571 | 0.977836 | 0.7073 |
| 658 | 0.9842 | 0.716127 |
| 777 | 0.987338 | 0.7282 |
| 969 | 0.9924 | 0.7282 |

Para cado uno de los botones presentes en la ventana de cálculos el procedimiento es igual, inicialmente todos están bloqueados hasta que se carga un espectro, luego de que el espectro este cargado se desbloquea sólo el botón "*Calcular*", paso seguido hay que presionar el botón "*Calcular*" para que se habiliten el resto de botones y se haga todo el procesamiento de datos.

En la figura 23 se ha resumido el proceso para el cálculo de las constantes ópticas de películas delgadas semiconductoras en el software C.O.P.S.

Figura 23. Pasos para el cálculo de constantes ópticas en C.O.P.S. dentro de la ventana "Calcular Constantes".

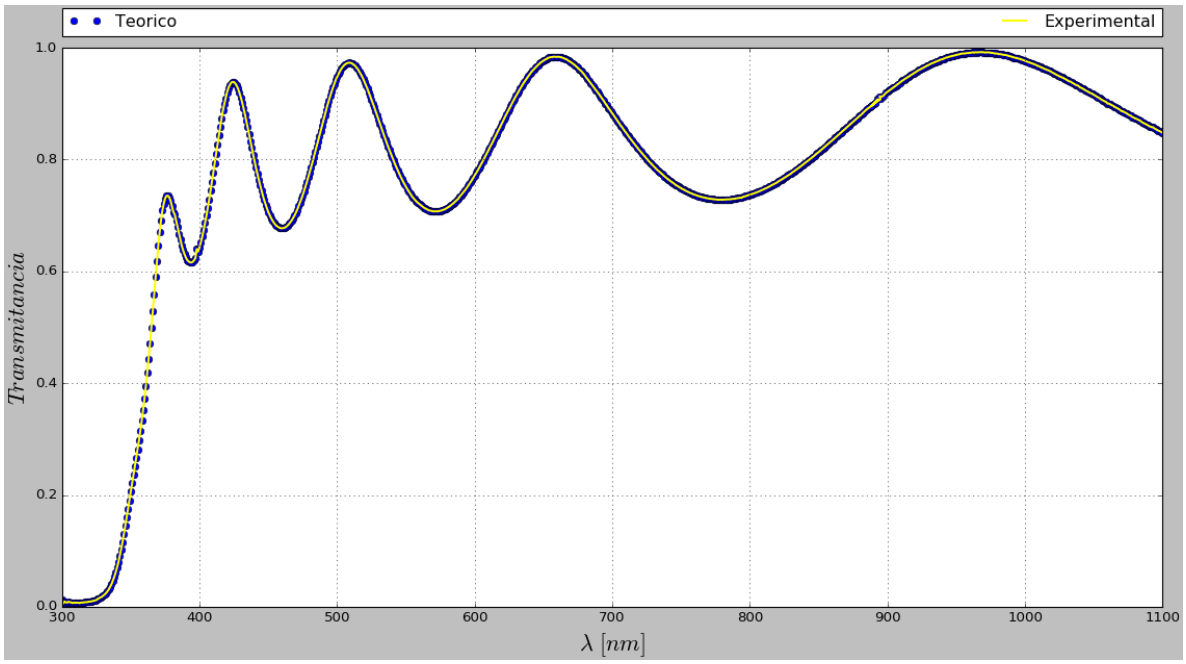



## 4.2 COMPARACIÓN DE RESULTADOS TEÓRICO-EXPERIMENTALES

### 4.2.1. Espectro de transmitancia experimental vs teórico.

En esta parte se presentará la comparación de los datos experimentales con los datos obtenidos de forma teórica para el espectro de transmitancia retomando la ecuación (4), de la cual ya han sido calculados los valores de las constantes y con la que se puede reconstruir el espectro de transmitancia espectral experimental, en la figura 24 podemos ver de forma gráfica esta reconstrucción.

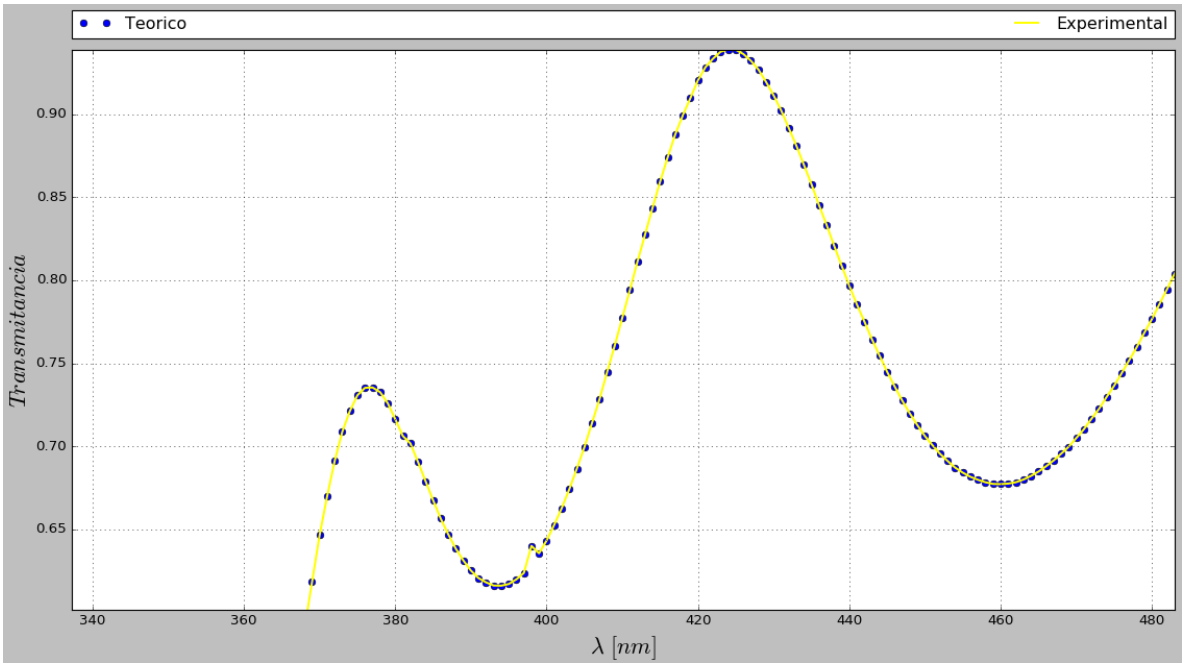
Figura 24. Espectro de transmitancia espectral Experimental vs Teórico.




La gráfica del espectro espectral experimental se presenta dentro de la figura 24 como una línea continua de color amarillo, el teórico está representado por una sucesión de puntos azules, a simple vista se puede deducir que la aproximación que Swanepoel [7] propuso para reconstruir un espectro medido de transmitancia es lo suficientemente buena así como este software que la puede representar de manera correcta, para obtener valores confiables en las constantes ópticas de películas delgadas semiconductoras de espesor homogéneo, por ende es también muy buena la

En la figura 25 se realiza un acercamiento de la figura 24 para poder detallar más la comparación de las dos gráficas.

Figura 25. Acercamiento figura 21.




Para este ejemplo en particular el cual se utilizó también para explicar la sección de la ventana de cálculos, se le extrajeron sus datos, los vectores para los valores de $\lambda$ y de $T$ tanto para el espectro experimental como para el teórico luego de ser calculado por C.O.P.S.

A continuación se calculó el error de $T$ para cada valor de $\lambda$ y se obtuvo el porcentaje de error promedio con dichos valores.

$$\%_{Error} = \left| \frac{ValorTeorico - ValorExperimental}{ValorTeorico} \right| * 100 \qquad (21)$$

Dicho porcentaje de error arrojó el siguiente resultado: $2.21*10^{-5}$ (ANEXO A), los errores obtenidos están en este orden o incluso más bajo para los espectros de transmitancia estudiados. Eso depende de la calidad de la película.

Universidad Industrial de Santander

### 4.2.2. Cálculo de error para índice de refracción, coeficiente de absorción y gap para diferentes películas.

Para el cálculo de error de las constantes se tomó como referencia archivos facilitados por la Dra. Mónica Botero que hizo parte del grupo de materiales semiconductores y energía solar (GMS&ES) [36] dirigido por el Dr. Gerardo Gordillo Guzmán de la Universidad Nacional De Colombia, dicho grupo centra sus actividades de investigación prioritariamente en el estudio de materiales semiconductores usados en la fabricación de Celdas Solares.

En estos archivos se pueden encontrar películas delgadas semiconductoras que fueron analizadas por el mismo método propuesto por Swanepoel [7] y por medio del cual se extrajeron sus constantes.

Se hace el análisis para películas fabricadas con compuestos de *ZnS, SnS:Bi* y $SnS_2$*:Bi* compuestos que son usados como capa absorbente en celdas solares.

Para cada película se hizo una comparación punto a punto (para cada valor de $\lambda$) del índice de refracción y del coeficiente de absorción de. Para el Gap se verificó el error asociado con base al valor 'teórico' presentado en los archivos de GMS&ES (Tesis Dr Mónica Botero) [17] el cual está alrededor de 1,3 *eV* para materiales de SnS y de 3.6 *eV* para materiales *ZnS*, los cuales son valores adecuados para películas empleadas en celdas solares [37].

En las figuras que se presentarán están los resultados del cálculo de las constantes ópticas obtenidos en películas fabricadas con diferentes compuestos, (se mostrará en esta sección sólo los resultados de la primera película los demás estarán disponibles en los Anexos) por parte de GMS&ES y de C.O.P.S. En dichas figuras se muestran el índice de refracción y coeficiente de absorción, para el Gap se realiza el porcentaje de error sin mostrar su gráfica correspondiente (sólo se mostrará para la primera película). Se tomaron los valores de las gráficas de los archivos de la Dra. Mónica como el valor teórico pues poseen resultados confiables adicional a esto se utilizó la nomenclatura de las películas manejada internamente por el grupo (GMS&ES) con fines prácticos.

**COMPUESTO $SnS_2$:Bi:**

Película #1: "$SnS_2$-Bi203a":

*Índice de Refracción (ANEXO B):*

Figura 26. Índice de Refracción (GMS&ES - SnS2-Bi203a).

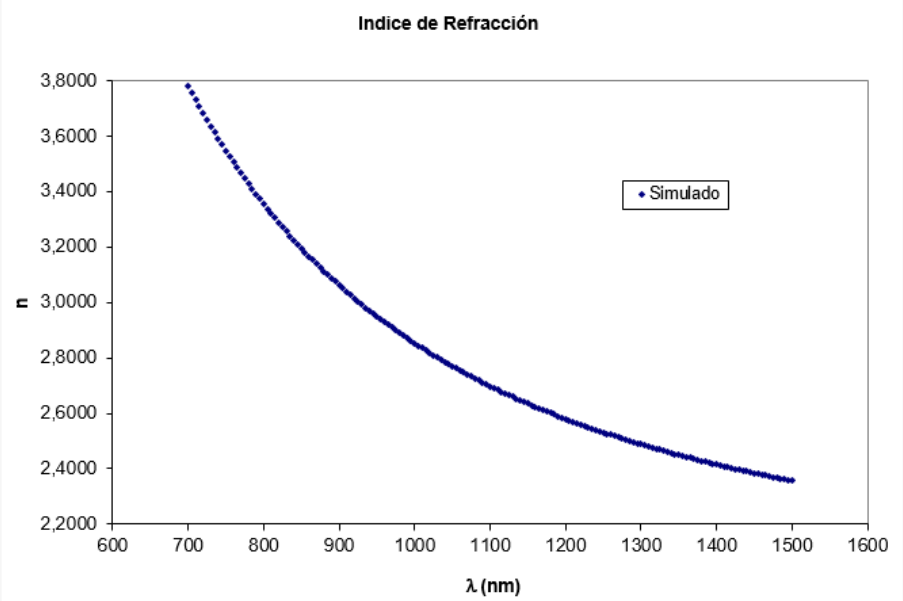
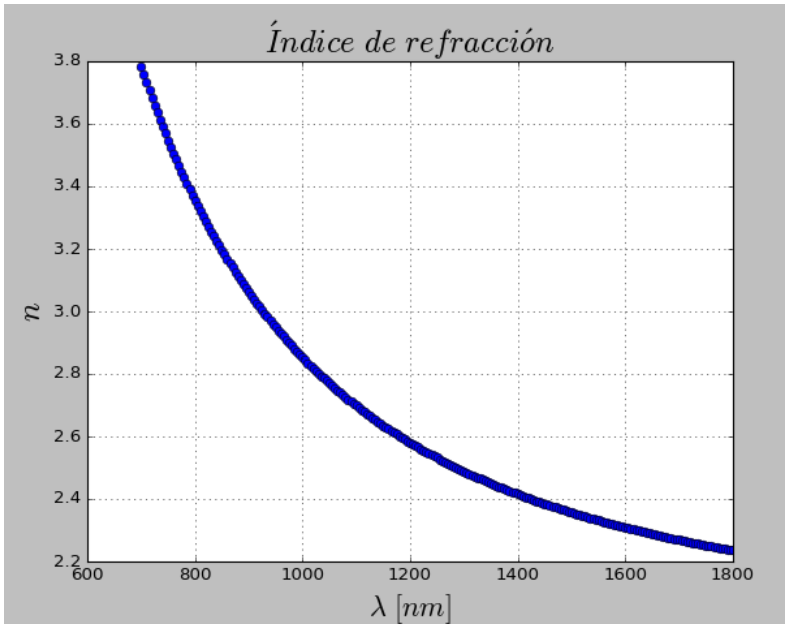



Figura 27. Índice de Refracción (C.O.P.S- SnS2-Bi203a).




Error total promedio (21): $1.03 * 10^{-4}\%$

*Coeficiente de Absorción (ANEXO C):*

Figura 28. Coeficiente de Absorción (GMS&ES - SnS2-Bi203a).

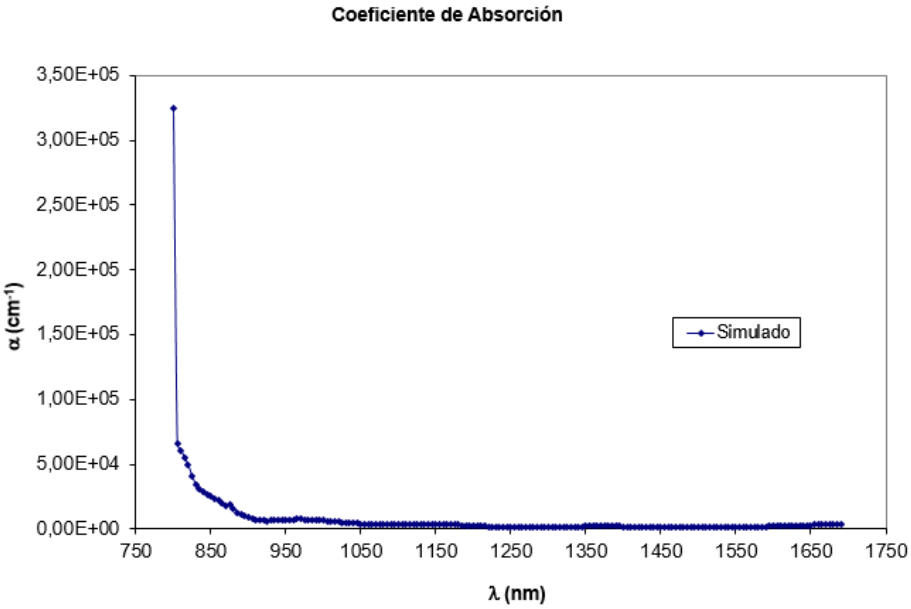
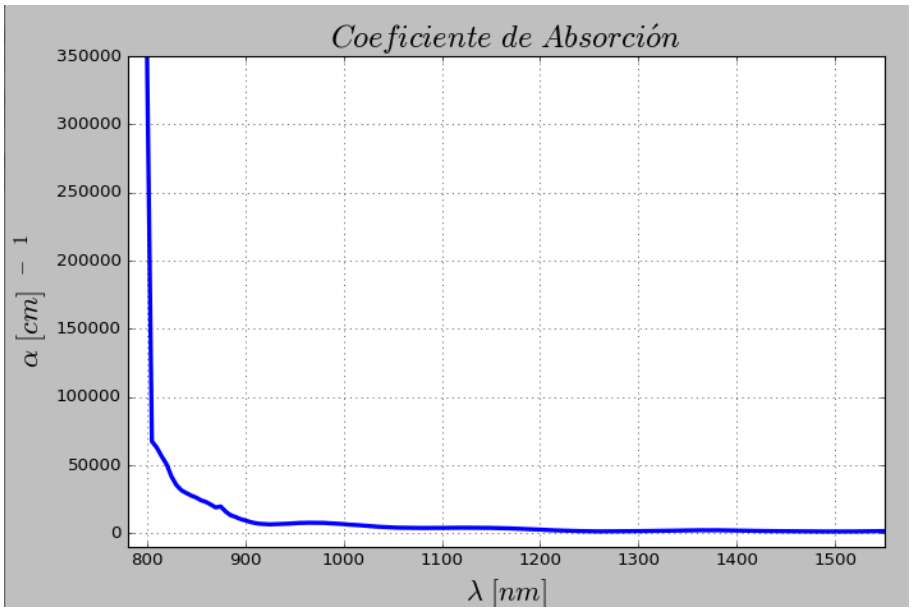



Figura 29. Coeficiente de Absorción (C.O.P.S- SnS2-Bi203a).




Error total promedio (21) : 3.062%

*Gap:*

Figura 30. Gap directo (GMS&ES - SnS2-Bi203a)

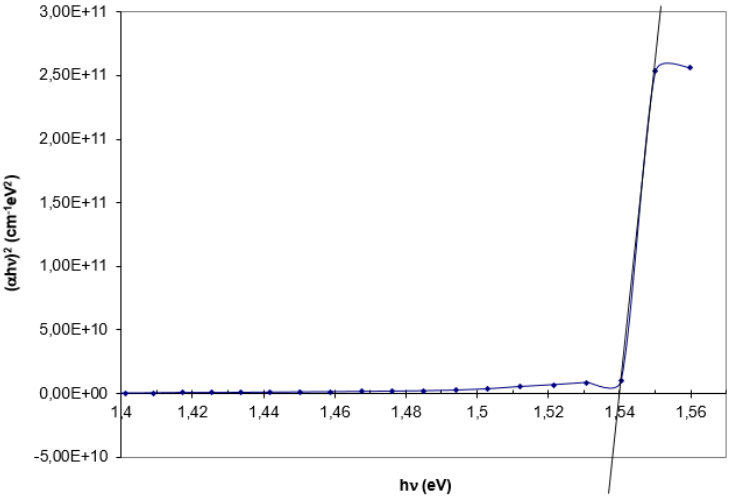
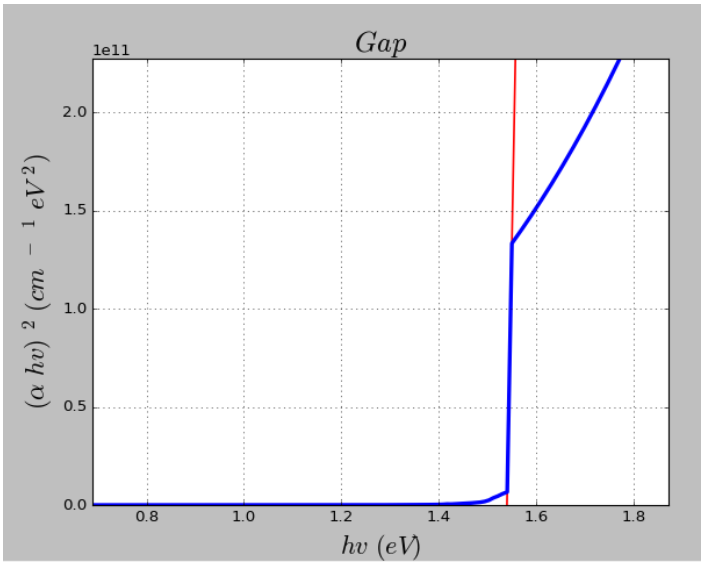



FIGURA 31. Gap directo (C.O.P.S.- SnS2-Bi203a)




Gap (GMS&ES - $SnS_2$-Bi203a): 1.54 eV

Gap (C.O.P.S- $SnS_2$-Bi203a) = 1.539 eV

Error (21): 0.0649 %

## 4.3 ANÁLISIS DE LOS RESULTADOS OBTENIDOS

El porcentaje de error para diferentes películas fabricadas con 3 tipos de compuestos (*ZnS, SnS:Bi* y *$SnS_2$:Bi*), es pequeño para los datos que fueron tomados como referencia. La parte real ($\eta$) del índice de refracción que se define en la fórmula (1) refiere que este valor se expresa como la velocidad de la luz en un medio de referencia generalmente vacío ($C_0$) dividido entre la velocidad de transmisión de la luz en ese medio ($V$). El vacío es el medio por el cual la luz viaja más rápido, por lo tanto el índice de refracción siempre es mayor o igual a uno, para los datos analizados se calculó este valor a lo largo de todo el espectro de transmitancia es decir para cada valor de la longitud de onda ($\lambda$) como se evidencia en el Anexos correspondientes de cada película.

El porcentaje de error que presentan los cálculos hechos por C.O.P.S para el índice de refracción se remonta al ajuste automático que este hizo para para la determinación de los puntos máximos y mínimos de transmitancia con sus respectivas envolventes (*TM y Tm*), ya que estos valores son utilizados para calcular con ayuda de la ecuación de Cauchy (15) las constantes a y b (figura6), con las que se construye el índice de refracción para todo el rango de $\lambda$(*nm*).

Para el cálculo del coeficiente de absorción ($\alpha$) el software realiza la rutina de la figura 7 como se presentó anteriormente. Este proceso tiene asociado el mismo porcentaje de error que el cálculo del índice de refracción en cuanto a la ubicación de los puntos máximos y mínimos, dentro de la matriz que se extrae para calcular las envolventes del espectro de transmitancia. Adicionalmente el método numérico propuesto no tiene una precisión favorable para cierto rango de longitudes de onda ($\lambda$), esto es cuando el coeficiente de absorción se hace negativo, aquello no afecta el resultado requerido por el usuario pero si al momento de comparar punto a punto con la base de datos compartida por GMS&ES ya que en los archivos que se trabajan allí se realiza un método que realiza iteraciones sin importar en que rango de longitud de onda el coeficiente de absorción deje de ser positivo.

La aproximación del espesor de la película se hace tomando como base los datos de la matriz donde se han calculado los valores de las parejas TM-Tm y TM'-Tm' (estos últimos se refieren a la ubicación dentro de la envolvente continua TM y Tm donde aparecen máximos y mínimos interpolados). Los cuales sirven para calcular a su vez el índice de refracción que forma parte de las ecuaciones (20) y (21)

Donde m1; es el número de orden (entero o semientero) del primer extremo de la trasmisión, se grafica $l/2$ en función de $n/\lambda$ y se realiza un ajuste por mínimos cuadrados, se calcula la pendiente y se despeja el valor del espesor [7].
El cálculo de errores para el coeficiente de absorción se presenta en los Anexos para cada película.

El valor del espesor entregado por C.O.P.S no es confiable en un 100% pues se están analizando materiales del orden de los *nm* ($1*10^{-9}$), un error considerable puede afectar en gran medida el valor real, por esta misma razón el software permite al usuario ingresar un valor de espesor $d$, del que se tenga certeza sin que esto quite veracidad al cálculo del espesor hallado automáticamente por el software.

El valor del Gap (análisis para materiales de Gap directo) se obtuvo a partir de la extrapolación lineal del coeficiente de absorción en función de la energía, en la región de alta absorción (Figura 8). Para nuestro caso se obtuvieron valores del Gap entre los 1.3 y 3.6 eV para las películas analizadas.

Aunque en las pruebas realizadas no se tiene en cuenta el factor temperatura es bueno saber que temperaturas superiores a la considerada producen cambios en la fase del compuesto y variaciones significativas en sus propiedades ópticas que no benefician su aplicación en celdas solares.

Universidad Industrial de Santander

# 5. CONCLUSIONES

- Se desarrolló una herramienta de software, la cual se nombró C.O.P.S. Se realizó en el lenguaje de programación Python, se logró condensar todo dentro de un archivo *.exe* con el fin de ejecutarse sin la necesidad de tener instalado el lenguaje y sus múltiples librerías necesarias para el correcto funcionamiento de C.O.P.S. El software tomó como referencia el método propuesto por Swanepoel que basa sus cálculos en medidas de transmitancia espectral experimentales. La herramienta permite hacer un ajuste automático para hallar los puntos máximos y mínimos de las envolventes del espectro de transmitancia experimental para determinar las constantes ópticas en películas delgadas semiconductoras empleadas como capa absorbente en celdas solares.

- Se diseñó una interfaz gráfica amigable, multilenguaje (inglés-español) que permite al usuario de una manera sencilla entender los pasos que debe realizar para determinar las constantes ópticas a partir del espectro de transmitancia tomado previamente y cargado en un archivo .txt que es el formato que manejan los espectrofotómetros convencionales.

- Los resultados de las constantes se contrastaron con los tomados por la Dra. Mónica Botero en el laboratorio de Celdas Solares de la Universidad Nacional de Colombia, se puede observar que los datos arrojados por C.O.P.S tienen porcentajes de error pequeños comparados con los obtenidos en dicho laboratorio como se evidencia en los anexos.

- Este software, aporta al análisis y selección de dispositivos fotovoltaicos más eficientes, puntualmente con celdas solares tipo película delgada, que utilizan películas delgadas semiconductoras como capa absorbente, se analizaron películas de diferentes compuestos, SnS, ZnS, SnS:Bi, calculando sus constantes ópticas, para que posteriormente sean analizadas en base a esos datos y así se determine si cumplen con los requerimientos para utilizarse dentro de esta tecnología.

- Se seleccionó el método de bisección para realizar las iteraciones en el cálculo de las constantes ópticas por facilidad y aplicabilidad, para este caso el método se ajustó correctamente y no consume una memoria computacional considerable, otros métodos numéricos pueden llegar a la respuesta en un tiempo más corto pero se debe tener cuidado en la selección de las condiciones para su evaluación ya que pueden alejar el valor esperado en vez de acerarlo en cada iteración.

Universidad Industrial de Santander

# 6. RECOMENDACIONES

- Para la determinación de las constantes ópticas de películas delgadas semiconductoras y de su espesor, usualmente se requiere una medición del espectro de transmitancia de dicha película, tal método ha sido tratado en gran medida por Swanepoel y presenta dos factores importantes que pueden llegar a hacer susceptible al error el cálculo de las constantes y por ende el de C.O.P.S, el primer aspecto se refiere a la medición como tal, ya que esta necesita sumo cuidado para lograr captar la parte difusa de la reflexión en el espectro, el segundo tiene que ver con el procesamiento de los datos ya que ese deriva de que tan buena sea esta medida inicial.

- Se hace una recomendación especial al momento de generar las gráficas dentro del software, C.O.P.S sólo puede mostrar una gráfica a la vez, si estando dentro de una gráfica se pulsa la opción para generar una nueva el software entenderá que el usuario quiere ver las dos graficas en una misma y las sobrepondrá, es necesario cerrar la gráfica que se tiene actualmente abierta para generar una nueva, la exportación de los datos de cada gráfica es independiente a este suceso aun si las dos graficas están en una misma ventana los datos serán exportados independientemente.

Universidad Industrial de Santander

## 7. REFERENCIAS BIBLIOGRAFICAS.


[1]. ANTONIO LUQUE and STEVEN HEGEDUS, Handbook of Photovoltaic Science, Institute of Energy Conversion, University of Delaware, USA, John Wiley & Sons Ltd, 2003.

[2]. ARMIN G ABERLE, 'Thin- Film Solar Cells', nº 517, pp. 1-5, 2009. [en línea]. http://dx.doi.org/10.1016/j.tsf.2009.03.056.

[3]. GREG WETSTONE and OTHERS, Renewables 2016 Global Status Report 2016, 2016. [en línea]. http.//www.ren21.net.

[4]. A. N., A. HUSSAIN, R. AHMED, W. M.K., Z. C., U. H. B. Y F. Y.Q., Advances in nanostructured thin film materials for solar cell applications, Renewable and Sustainable Energy Reviews, nº 59, pp. 1-12, 2016.

[5]. F. VILLAR LOPÉZ, Dispositivos fotovoltaicos de capa delgada a baja temperatura, Barcelona, 2010.

[6]. C. GUILLEN Y J. HERRERO, Comportamiento del CuInSe2 Basado en precursores Electrodepositados Como Absorbente Fotovoltaico En Células Solares de Lámina Delgada, 2000.

[7]. R SWANEPOEL, 'Determination of the Thickness and Optical Constants of Amorphous Silicon', Printed in Great Britain 1214, Department of Physics, Rand Afrikaans University, Johannesburg, South Africa, J. Phps. E: Sci. Instrum. Vol. 16, 1983.

[8]. E. ROMERO, Estudio de propiedades ópticas y estructurales de materiales usados en la fabricación de celdas solares basadas en Cu(In,Ga)Se2 y SnS, Tesis de Doctorado, Bogotá, Universidad Nacional de Colombia, 2008.

[9]. P. LARRY Y F. LEWIS, Solar Cells And Their Applications, Second ed, 2010.

[10]. R. STEVENSON, First solar quest for the 1-watt, IEEE Spectrum, 2008.

[11]. Glass Needs for a Growing Photovoltaics Industry, Center for Life Cycle Analysis - Columbia University, New York, 2015, P. 2-9.

[12]. F. GARCIA ROSILLO, La Energía solar fotovoltaica en la encrucijada, Revista Ecologistas en Acción No. 45, 2005, P.3-5.

[13]. MIKEL FERNANDO and HURTADO MORALES, Síntesis y caracterización de películas delgadas del semiconductor cu2znsns4 y su uso como capa absorbente en celdas solares, Tesis de Doctorado, 2014.

[14]. W. A. VALLEJO LOZADA, Síntesis de capas buffer para celdas solares de película delgada, Bogotá, Universidad América, 2012.

[15]. M. F. HURTADO MORALES, Síntesis de películas delgadas de ZnS por el método CBD y uso como capa buffer en celdas solares basadas en Cu (In, Ga) (S, Se)2, Bogotá, Universidad Nacional de Colombia, 2010.

[16]. P. WÜRFEL, Physics of Solar Cells, Berlin: WILEY-VCH Verlag GmbH & Co. KGaA, 2005.

[17]. M. BOTERO LONDOÑO, Síntesis y caracterización de nuevos materiales no tóxicos empleados como capa buffer y capa, Tesis de Doctorado, Bogotá, Universidad Nacional de Colombia, 2008.

[18]. R. A. SERWAY Y J. W. JEWETT, Física para ciencias e ingeniería con física moderna, Séptima ed., vol. 2, Cengage Learning Editores, 2009.

[19]. D. R. ASKELAND, P. P. FULAY Y W. J. WRIGHT, Ciencia e ingeniería de materiales, Sexta ed, Cengage Learning Editores, 2012.

[20]. M. Á. ZETINA Y C. Á. ZETINA, Electrónica Básica, México, Noriega Editores, 1995.

[21]. TRAVIZANO, MATÍAS, ROMANO Y S. Y. KAMIENKOWSKI, Determinación de la banda prohibida, Departamento de física, UBA- 2002.

[22]. E. ROMERO, Estudio de propiedades ópticas y estructurales de materiales usados en la fabricación de celdas solares basadas en Cu (In,Ga)Se2 y SnS, Tesis de Doctorado, Bogotá: Universidad Nacional de Colombia, 2008.

[23]. J. I. CLAVIJO PENAGOS, Síntesis y caracterización de las películas delgadas de CuIn1-xGaxSe2 e In2Se3 para ser usadas en la fabricación de celdas solares tipo tándem, Tesis de Doctorado, Bogotá: Universidad Nacional de Colombia, 2011.

[24]. YU PETER and CARDONA MANUEL, Fundamentals of Semiconductors, Physics and Materials Properties, Fourth Edition, Boston University, Springer, 2010.

[25]. F. MARTIN, J. RAMOS BARRADO and HUMBERTO GOMEZ, 'Pss', 2013, [en línea]. http://dx.doi.org/10.1002/pssa.201228534.

[26]. Y. J. CHEN, What Programming Language Should a Beginner Learn in 2016?, [en línea]. https://www.codementor.io/learn-programming/beginner-programming-language-job-salary-community.

[27]. R. GONZÁLEZ DUQUE, Python para todos, [en línea]. http://mundogeek.net/tutorial-python/.

[28]. LUIS MIGUEL, PIMCD2013-Python, 2015.

[29]. GUILLEM BORRELL NOGUERAS, Python Como Entorno de Desarrollo Científico., 2008, p.1–18.

[30]. A. ALVAREZ, Guia Tkinter Documentation, 2016.

[31]. SCIPY COMMUNITY, SciPy Reference Guide, 2013.

[32]. NUMPY COMMUNITY, NumPy Reference, 2016.

[33]. PyPA, Python Packaging Guide, 2016.

[34]. J. HUNTER, D. DALE, E. FIRING, Matplotlib, 20016.

[35]. G. CEDIEL, F. ROJAS, H. L. INFANTE Y G. GORDILLO, Determinación de constantes ópticas y simulación teórica del espectro de transmitancia de películas delgadas de cds, cdte y cd(s,te) depositadas por evaporación, Universidad Nacional de Colombia, Bogotá, 2002.

[36]. FERNANDO AND MORALES, 'Estado Actual de Las Celdas Solares Basadas En Capas Absorbentes de Bajo Costo Cu 2 ZnSnS4 , Perspectivas Y Nuevos Aportes Realizados', Universidad Nacional de Colombia, Bogotá, Colombia,2012.

[37]. C. CALDERÓN, G. GORDILLO, E. BANGUERO, P. BARTOLO-PÉREZ, M. BOTERO, Estudio de propiedades fotoeléctricas de películas delgadas de SnS y SnS:Bi, Revista Mexicana de Física, 2016.

Universidad Industrial de Santander

## 8. BIBLIOGRAFÍA


- D. R. ASKELAND, P. P. FULAY Y W. J. WRIGHT, Ciencia e ingeniería de materiales, Sexta ed, Cengage Learning Editores, 2012.

- R. A. SERWAY Y J. W. JEWETT, Física para ciencias e ingeniería con física moderna, Séptima ed., vol. 2, Cengage Learning Editores, 2009.

- YU PETER AND CARDONA MANUEL, Fundamentals of Semiconductors, Physics and Materials Properties, Fourth Edition, Boston University,Springer , 2010.

Universidad Industrial de Santander

# 9. ANEXOS

ANEXO A. TRANSMITANCIA ZnS1Aa

| Transmitancia ZnS1Aa | | | |
|---|---|---|---|
| Lamda [nm] | T-GruLac | T-software | Error % |
| 300 | 0.01199990 | 0.01200000 | 8.33E-04 |
| 301 | 0.00610003 | 0.00610000 | 4.92E-04 |
| 302 | 0.00939995 | 0.00940000 | 5.32E-04 |
| 303 | 0.00790008 | 0.00790000 | 1.01E-03 |
| 304 | 0.00769999 | 0.00770000 | 1.30E-04 |
| 305 | 0.00909999 | 0.00910000 | 1.10E-04 |
| 306 | 0.00790007 | 0.00790000 | 8.86E-04 |
| 307 | 0.00779990 | 0.00780000 | 1.28E-03 |
| 308 | 0.00659992 | 0.00660000 | 1.21E-03 |
| 309 | 0.00769993 | 0.00770000 | 9.09E-04 |
| 310 | 0.00700010 | 0.00700000 | 1.43E-03 |
| 311 | 0.00740002 | 0.00740000 | 2.70E-04 |
| 312 | 0.00719998 | 0.00720000 | 2.78E-04 |
| 313 | 0.00660006 | 0.00660000 | 9.09E-04 |
| 314 | 0.00790002 | 0.00790000 | 2.53E-04 |
| 315 | 0.00749995 | 0.00750000 | 6.67E-04 |
| 316 | 0.00790004 | 0.00790000 | 5.06E-04 |
| 317 | 0.00829992 | 0.00830000 | 9.64E-04 |
| 318 | 0.00820004 | 0.00820000 | 4.88E-04 |
| 319 | 0.00889994 | 0.00890000 | 6.74E-04 |
| 320 | 0.00920000 | 0.00920000 | 0.00E+00 |
| 321 | 0.00950007 | 0.00950000 | 7.37E-04 |
| 322 | 0.01020000 | 0.01020000 | 0.00E+00 |
| 323 | 0.01060000 | 0.01060000 | 0.00E+00 |
| 324 | 0.01140000 | 0.01140000 | 0.00E+00 |
| 325 | 0.01210000 | 0.01210000 | 0.00E+00 |
| 326 | 0.01409990 | 0.01410000 | 7.09E-04 |
| 327 | 0.01550010 | 0.01550000 | 6.45E-04 |
| 328 | 0.01660000 | 0.01660000 | 0.00E+00 |
| 329 | 0.01789990 | 0.01790000 | 5.59E-04 |
| 330 | 0.01990010 | 0.01990000 | 5.03E-04 |
| 331 | 0.02200000 | 0.02200000 | 0.00E+00 |
| 332 | 0.02440000 | 0.02440000 | 0.00E+00 |
| 333 | 0.02750000 | 0.02750000 | 0.00E+00 |
| 334 | 0.03110000 | 0.03110000 | 0.00E+00 |
| 335 | 0.03550010 | 0.03550000 | 2.82E-04 |
| 336 | 0.04030000 | 0.04030000 | 0.00E+00 |
| 337 | 0.04670010 | 0.04670000 | 2.14E-04 |
| 338 | 0.05330000 | 0.05330000 | 0.00E+00 |
| 339 | 0.06090000 | 0.06090000 | 0.00E+00 |
| 340 | 0.06990000 | 0.06990000 | 0.00E+00 |
| 341 | 0.07919990 | 0.07920000 | 1.26E-04 |
| 342 | 0.09090010 | 0.09090000 | 1.10E-04 |
| 343 | 0.10300000 | 0.10300000 | 0.00E+00 |
| 344 | 0.11580000 | 0.11580000 | 0.00E+00 |
| 345 | 0.12980000 | 0.12980000 | 0.00E+00 |
| 346 | 0.14440000 | 0.14440000 | 0.00E+00 |
| 347 | 0.15930000 | 0.15930000 | 0.00E+00 |
| 348 | 0.17500000 | 0.17500000 | 0.00E+00 |
| 349 | 0.19040000 | 0.19040000 | 0.00E+00 |
| 350 | 0.20590000 | 0.20590000 | 0.00E+00 |
| 351 | 0.22120000 | 0.22120000 | 0.00E+00 |
| 352 | 0.23650000 | 0.23650000 | 0.00E+00 |
| 353 | 0.25140000 | 0.25140000 | 0.00E+00 |
| 354 | 0.26670000 | 0.26670000 | 0.00E+00 |
| 355 | 0.28200000 | 0.28200000 | 0.00E+00 |
| 356 | 0.29790000 | 0.29790000 | 0.00E+00 |
| 357 | 0.31520000 | 0.31520000 | 0.00E+00 |
| 358 | 0.33270000 | 0.33270000 | 0.00E+00 |
| 359 | 0.35180000 | 0.35180000 | 0.00E+00 |
| 360 | 0.37230000 | 0.37230000 | 0.00E+00 |
| 361 | 0.39480000 | 0.39480000 | 0.00E+00 |
| 362 | 0.41860000 | 0.41860000 | 0.00E+00 |
| 363 | 0.44400000 | 0.44400000 | 0.00E+00 |
| 364 | 0.47100000 | 0.47100000 | 0.00E+00 |
| 365 | 0.49910000 | 0.49910000 | 0.00E+00 |
| 366 | 0.52880000 | 0.52880000 | 0.00E+00 |
| 367 | 0.55870000 | 0.55870000 | 0.00E+00 |
| 368 | 0.58980000 | 0.58980000 | 0.00E+00 |
| 369 | 0.61820000 | 0.61820000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 370 | 0.64640000 | 0.64640000 | 0.00E+00 |
| 371 | 0.66990000 | 0.66990000 | 0.00E+00 |
| 372 | 0.69120000 | 0.69120000 | 0.00E+00 |
| 373 | 0.70870000 | 0.70870000 | 0.00E+00 |
| 374 | 0.72120000 | 0.72120000 | 0.00E+00 |
| 375 | 0.73070000 | 0.73070000 | 0.00E+00 |
| 376 | 0.73520000 | 0.73520000 | 0.00E+00 |
| 377 | 0.73540000 | 0.73540000 | 0.00E+00 |
| 378 | 0.73260000 | 0.73260000 | 0.00E+00 |
| 379 | 0.72600000 | 0.72600000 | 0.00E+00 |
| 380 | 0.71630000 | 0.71630000 | 0.00E+00 |
| 381 | 0.70620000 | 0.70620000 | 0.00E+00 |
| 382 | 0.70170000 | 0.70170000 | 0.00E+00 |
| 383 | 0.69060000 | 0.69060000 | 0.00E+00 |
| 384 | 0.67900000 | 0.67900000 | 0.00E+00 |
| 385 | 0.66750000 | 0.66750000 | 0.00E+00 |
| 386 | 0.65650000 | 0.65650000 | 0.00E+00 |
| 387 | 0.64700000 | 0.64700000 | 0.00E+00 |
| 388 | 0.63830000 | 0.63830000 | 0.00E+00 |
| 389 | 0.63120000 | 0.63120000 | 0.00E+00 |
| 390 | 0.62510000 | 0.62510000 | 0.00E+00 |
| 391 | 0.62060000 | 0.62060000 | 0.00E+00 |
| 392 | 0.61800000 | 0.61800000 | 0.00E+00 |
| 393 | 0.61610000 | 0.61610000 | 0.00E+00 |
| 394 | 0.61600000 | 0.61600000 | 0.00E+00 |
| 395 | 0.61700000 | 0.61700000 | 0.00E+00 |
| 396 | 0.61980000 | 0.61980000 | 0.00E+00 |
| 397 | 0.62370000 | 0.62370000 | 0.00E+00 |
| 398 | 0.64000000 | 0.64000000 | 0.00E+00 |
| 399 | 0.63550000 | 0.63550000 | 0.00E+00 |
| 400 | 0.64320000 | 0.64320000 | 0.00E+00 |
| 401 | 0.65260000 | 0.65260000 | 0.00E+00 |
| 402 | 0.66270000 | 0.66270000 | 0.00E+00 |
| 403 | 0.67410000 | 0.67410000 | 0.00E+00 |
| 404 | 0.68650000 | 0.68650000 | 0.00E+00 |
| 405 | 0.69950000 | 0.69950000 | 0.00E+00 |
| 406 | 0.71390000 | 0.71390000 | 0.00E+00 |
| 407 | 0.72840000 | 0.72840000 | 0.00E+00 |
| 408 | 0.74470000 | 0.74470000 | 0.00E+00 |
| 409 | 0.76060000 | 0.76060000 | 0.00E+00 |
| 410 | 0.77730000 | 0.77730000 | 0.00E+00 |
| 411 | 0.79400000 | 0.79400000 | 0.00E+00 |
| 412 | 0.81100000 | 0.81100000 | 0.00E+00 |
| 413 | 0.82740000 | 0.82740000 | 0.00E+00 |
| 414 | 0.84360000 | 0.84360000 | 0.00E+00 |
| 415 | 0.85940000 | 0.85940000 | 0.00E+00 |
| 416 | 0.87400000 | 0.87400000 | 0.00E+00 |
| 417 | 0.88780000 | 0.88780000 | 0.00E+00 |
| 418 | 0.89930000 | 0.89930000 | 0.00E+00 |
| 419 | 0.90970000 | 0.90970000 | 0.00E+00 |
| 420 | 0.92040000 | 0.92040000 | 0.00E+00 |
| 421 | 0.92840000 | 0.92840000 | 0.00E+00 |
| 422 | 0.93350000 | 0.93350000 | 0.00E+00 |
| 423 | 0.93770000 | 0.93770000 | 0.00E+00 |
| 424 | 0.93900000 | 0.93900000 | 0.00E+00 |
| 425 | 0.93880000 | 0.93880000 | 0.00E+00 |
| 426 | 0.93630000 | 0.93630000 | 0.00E+00 |
| 427 | 0.93220000 | 0.93220000 | 0.00E+00 |
| 428 | 0.92690000 | 0.92690000 | 0.00E+00 |
| 429 | 0.91950000 | 0.91950000 | 0.00E+00 |
| 430 | 0.91140000 | 0.91140000 | 0.00E+00 |
| 431 | 0.90230000 | 0.90230000 | 0.00E+00 |
| 432 | 0.89170000 | 0.89170000 | 0.00E+00 |
| 433 | 0.88120000 | 0.88120000 | 0.00E+00 |
| 434 | 0.86950000 | 0.86950000 | 0.00E+00 |
| 435 | 0.85790000 | 0.85790000 | 0.00E+00 |
| 436 | 0.84530000 | 0.84530000 | 0.00E+00 |
| 437 | 0.83340000 | 0.83340000 | 0.00E+00 |
| 438 | 0.82080000 | 0.82080000 | 0.00E+00 |
| 439 | 0.80870000 | 0.80870000 | 0.00E+00 |
| 440 | 0.79680000 | 0.79680000 | 0.00E+00 |
| 441 | 0.78550000 | 0.78550000 | 0.00E+00 |
| 442 | 0.77510000 | 0.77510000 | 0.00E+00 |
| 443 | 0.76440000 | 0.76440000 | 0.00E+00 |
| 444 | 0.75460000 | 0.75460000 | 0.00E+00 |
| 445 | 0.74490000 | 0.74490000 | 0.00E+00 |
| 446 | 0.73600000 | 0.73600000 | 0.00E+00 |
| 447 | 0.72750000 | 0.72750000 | 0.00E+00 |
| 448 | 0.71980000 | 0.71980000 | 0.00E+00 |
| 449 | 0.71270000 | 0.71270000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 450 | 0.70610000 | 0.70610000 | 0.00E+00 |
| 451 | 0.70060000 | 0.70060000 | 0.00E+00 |
| 452 | 0.69540000 | 0.69540000 | 0.00E+00 |
| 453 | 0.69110000 | 0.69110000 | 0.00E+00 |
| 454 | 0.68710000 | 0.68710000 | 0.00E+00 |
| 455 | 0.68410000 | 0.68410000 | 0.00E+00 |
| 456 | 0.68160000 | 0.68160000 | 0.00E+00 |
| 457 | 0.67980000 | 0.67980000 | 0.00E+00 |
| 458 | 0.67830000 | 0.67830000 | 0.00E+00 |
| 459 | 0.67730000 | 0.67730000 | 0.00E+00 |
| 460 | 0.67720000 | 0.67720000 | 0.00E+00 |
| 461 | 0.67750000 | 0.67750000 | 0.00E+00 |
| 462 | 0.67830000 | 0.67830000 | 0.00E+00 |
| 463 | 0.67990000 | 0.67990000 | 0.00E+00 |
| 464 | 0.68210000 | 0.68210000 | 0.00E+00 |
| 465 | 0.68470000 | 0.68470000 | 0.00E+00 |
| 466 | 0.68790000 | 0.68790000 | 0.00E+00 |
| 467 | 0.69140000 | 0.69140000 | 0.00E+00 |
| 468 | 0.69550000 | 0.69550000 | 0.00E+00 |
| 469 | 0.69970000 | 0.69970000 | 0.00E+00 |
| 470 | 0.70490000 | 0.70490000 | 0.00E+00 |
| 471 | 0.71020000 | 0.71020000 | 0.00E+00 |
| 472 | 0.71650000 | 0.71650000 | 0.00E+00 |
| 473 | 0.72250000 | 0.72250000 | 0.00E+00 |
| 474 | 0.72960000 | 0.72960000 | 0.00E+00 |
| 475 | 0.73640000 | 0.73640000 | 0.00E+00 |
| 476 | 0.74400000 | 0.74400000 | 0.00E+00 |
| 477 | 0.75190000 | 0.75190000 | 0.00E+00 |
| 478 | 0.75970000 | 0.75970000 | 0.00E+00 |
| 479 | 0.76840000 | 0.76840000 | 0.00E+00 |
| 480 | 0.77660000 | 0.77660000 | 0.00E+00 |
| 481 | 0.78570000 | 0.78570000 | 0.00E+00 |
| 482 | 0.79460000 | 0.79460000 | 0.00E+00 |
| 483 | 0.80400000 | 0.80400000 | 0.00E+00 |
| 484 | 0.81370000 | 0.81370000 | 0.00E+00 |
| 485 | 0.82310000 | 0.82310000 | 0.00E+00 |
| 486 | 0.83270000 | 0.83270000 | 0.00E+00 |
| 487 | 0.84220000 | 0.84220000 | 0.00E+00 |
| 488 | 0.85160000 | 0.85160000 | 0.00E+00 |
| 489 | 0.86110000 | 0.86110000 | 0.00E+00 |
| 490 | 0.87060000 | 0.87060000 | 0.00E+00 |
| 491 | 0.87970000 | 0.87970000 | 0.00E+00 |
| 492 | 0.88870000 | 0.88870000 | 0.00E+00 |
| 493 | 0.89750000 | 0.89750000 | 0.00E+00 |
| 494 | 0.90580000 | 0.90580000 | 0.00E+00 |
| 495 | 0.91360000 | 0.91360000 | 0.00E+00 |
| 496 | 0.92180000 | 0.92180000 | 0.00E+00 |
| 497 | 0.92910000 | 0.92910000 | 0.00E+00 |
| 498 | 0.93570000 | 0.93570000 | 0.00E+00 |
| 499 | 0.94270000 | 0.94270000 | 0.00E+00 |
| 500 | 0.94800000 | 0.94800000 | 0.00E+00 |
| 501 | 0.95300000 | 0.95300000 | 0.00E+00 |
| 502 | 0.95810000 | 0.95810000 | 0.00E+00 |
| 503 | 0.96220000 | 0.96220000 | 0.00E+00 |
| 504 | 0.96580000 | 0.96580000 | 0.00E+00 |
| 505 | 0.96850000 | 0.96850000 | 0.00E+00 |
| 506 | 0.97070000 | 0.97070000 | 0.00E+00 |
| 507 | 0.97240000 | 0.97240000 | 0.00E+00 |
| 508 | 0.97310000 | 0.97310000 | 0.00E+00 |
| 509 | 0.97330000 | 0.97330000 | 0.00E+00 |
| 510 | 0.97300000 | 0.97300000 | 0.00E+00 |
| 511 | 0.97190000 | 0.97190000 | 0.00E+00 |
| 512 | 0.96980000 | 0.96980000 | 0.00E+00 |
| 513 | 0.96810000 | 0.96810000 | 0.00E+00 |
| 514 | 0.96480000 | 0.96480000 | 0.00E+00 |
| 515 | 0.96210000 | 0.96210000 | 0.00E+00 |
| 516 | 0.95780000 | 0.95780000 | 0.00E+00 |
| 517 | 0.95360000 | 0.95360000 | 0.00E+00 |
| 518 | 0.94930000 | 0.94930000 | 0.00E+00 |
| 519 | 0.94410000 | 0.94410000 | 0.00E+00 |
| 520 | 0.93840000 | 0.93840000 | 0.00E+00 |
| 521 | 0.93310000 | 0.93310000 | 0.00E+00 |
| 522 | 0.92680000 | 0.92680000 | 0.00E+00 |
| 523 | 0.92030000 | 0.92030000 | 0.00E+00 |
| 524 | 0.91390000 | 0.91390000 | 0.00E+00 |
| 525 | 0.90720000 | 0.90720000 | 0.00E+00 |
| 526 | 0.90040000 | 0.90040000 | 0.00E+00 |
| 527 | 0.89370000 | 0.89370000 | 0.00E+00 |
| 528 | 0.88630000 | 0.88630000 | 0.00E+00 |
| 529 | 0.87950000 | 0.87950000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 530 | 0.87230000 | 0.87230000 | 0.00E+00 |
| 531 | 0.86510000 | 0.86510000 | 0.00E+00 |
| 532 | 0.85830000 | 0.85830000 | 0.00E+00 |
| 533 | 0.85070000 | 0.85070000 | 0.00E+00 |
| 534 | 0.84400000 | 0.84400000 | 0.00E+00 |
| 535 | 0.83700000 | 0.83700000 | 0.00E+00 |
| 536 | 0.83020000 | 0.83020000 | 0.00E+00 |
| 537 | 0.82340000 | 0.82340000 | 0.00E+00 |
| 538 | 0.81710000 | 0.81710000 | 0.00E+00 |
| 539 | 0.81080000 | 0.81080000 | 0.00E+00 |
| 540 | 0.80430000 | 0.80430000 | 0.00E+00 |
| 541 | 0.79860000 | 0.79860000 | 0.00E+00 |
| 542 | 0.79230000 | 0.79230000 | 0.00E+00 |
| 543 | 0.78670000 | 0.78670000 | 0.00E+00 |
| 544 | 0.78100000 | 0.78100000 | 0.00E+00 |
| 545 | 0.77560000 | 0.77560000 | 0.00E+00 |
| 546 | 0.77030000 | 0.77030000 | 0.00E+00 |
| 547 | 0.76520000 | 0.76520000 | 0.00E+00 |
| 548 | 0.76050000 | 0.76050000 | 0.00E+00 |
| 549 | 0.75580000 | 0.75580000 | 0.00E+00 |
| 550 | 0.75150000 | 0.75150000 | 0.00E+00 |
| 551 | 0.74730000 | 0.74730000 | 0.00E+00 |
| 552 | 0.74340000 | 0.74340000 | 0.00E+00 |
| 553 | 0.73980000 | 0.73980000 | 0.00E+00 |
| 554 | 0.73580000 | 0.73580000 | 0.00E+00 |
| 555 | 0.73240000 | 0.73240000 | 0.00E+00 |
| 556 | 0.72940000 | 0.72940000 | 0.00E+00 |
| 557 | 0.72670000 | 0.72670000 | 0.00E+00 |
| 558 | 0.72430000 | 0.72430000 | 0.00E+00 |
| 559 | 0.72210000 | 0.72210000 | 0.00E+00 |
| 560 | 0.72010000 | 0.72010000 | 0.00E+00 |
| 561 | 0.71800000 | 0.71800000 | 0.00E+00 |
| 562 | 0.71610000 | 0.71610000 | 0.00E+00 |
| 563 | 0.71420000 | 0.71420000 | 0.00E+00 |
| 564 | 0.71280000 | 0.71280000 | 0.00E+00 |
| 565 | 0.71150000 | 0.71150000 | 0.00E+00 |
| 566 | 0.71010000 | 0.71010000 | 0.00E+00 |
| 567 | 0.70900000 | 0.70900000 | 0.00E+00 |
| 568 | 0.70840000 | 0.70840000 | 0.00E+00 |
| 569 | 0.70780000 | 0.70780000 | 0.00E+00 |
| 570 | 0.70740000 | 0.70740000 | 0.00E+00 |
| 571 | 0.70730000 | 0.70730000 | 0.00E+00 |
| 572 | 0.70740000 | 0.70740000 | 0.00E+00 |
| 573 | 0.70740000 | 0.70740000 | 0.00E+00 |
| 574 | 0.70790000 | 0.70790000 | 0.00E+00 |
| 575 | 0.70850000 | 0.70850000 | 0.00E+00 |
| 576 | 0.70900000 | 0.70900000 | 0.00E+00 |
| 577 | 0.71020000 | 0.71020000 | 0.00E+00 |
| 578 | 0.71070000 | 0.71070000 | 0.00E+00 |
| 579 | 0.71220000 | 0.71220000 | 0.00E+00 |
| 580 | 0.71370000 | 0.71370000 | 0.00E+00 |
| 581 | 0.71540000 | 0.71540000 | 0.00E+00 |
| 582 | 0.71680000 | 0.71680000 | 0.00E+00 |
| 583 | 0.71880000 | 0.71880000 | 0.00E+00 |
| 584 | 0.72100000 | 0.72100000 | 0.00E+00 |
| 585 | 0.72300000 | 0.72300000 | 0.00E+00 |
| 586 | 0.72540000 | 0.72540000 | 0.00E+00 |
| 587 | 0.72780000 | 0.72780000 | 0.00E+00 |
| 588 | 0.73000000 | 0.73000000 | 0.00E+00 |
| 589 | 0.73350000 | 0.73350000 | 0.00E+00 |
| 590 | 0.73640000 | 0.73640000 | 0.00E+00 |
| 591 | 0.73900000 | 0.73900000 | 0.00E+00 |
| 592 | 0.74190000 | 0.74190000 | 0.00E+00 |
| 593 | 0.74530000 | 0.74530000 | 0.00E+00 |
| 594 | 0.74870000 | 0.74870000 | 0.00E+00 |
| 595 | 0.75230000 | 0.75230000 | 0.00E+00 |
| 596 | 0.75600000 | 0.75600000 | 0.00E+00 |
| 597 | 0.75960000 | 0.75960000 | 0.00E+00 |
| 598 | 0.76360000 | 0.76360000 | 0.00E+00 |
| 599 | 0.76780000 | 0.76780000 | 0.00E+00 |
| 600 | 0.77160000 | 0.77160000 | 0.00E+00 |
| 601 | 0.77600000 | 0.77600000 | 0.00E+00 |
| 602 | 0.77980000 | 0.77980000 | 0.00E+00 |
| 603 | 0.78420000 | 0.78420000 | 0.00E+00 |
| 604 | 0.78860000 | 0.78860000 | 0.00E+00 |
| 605 | 0.79290000 | 0.79290000 | 0.00E+00 |
| 606 | 0.79780000 | 0.79780000 | 0.00E+00 |
| 607 | 0.80250000 | 0.80250000 | 0.00E+00 |
| 608 | 0.80730000 | 0.80730000 | 0.00E+00 |
| 609 | 0.81210000 | 0.81210000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 610 | 0.81670000 | 0.81670000 | 0.00E+00 |
| 611 | 0.82190000 | 0.82190000 | 0.00E+00 |
| 612 | 0.82640000 | 0.82640000 | 0.00E+00 |
| 613 | 0.83120000 | 0.83120000 | 0.00E+00 |
| 614 | 0.83640000 | 0.83640000 | 0.00E+00 |
| 615 | 0.84110000 | 0.84110000 | 0.00E+00 |
| 616 | 0.84640000 | 0.84640000 | 0.00E+00 |
| 617 | 0.85100000 | 0.85100000 | 0.00E+00 |
| 618 | 0.85600000 | 0.85600000 | 0.00E+00 |
| 619 | 0.86110000 | 0.86110000 | 0.00E+00 |
| 620 | 0.86650000 | 0.86650000 | 0.00E+00 |
| 621 | 0.87110000 | 0.87110000 | 0.00E+00 |
| 622 | 0.87610000 | 0.87610000 | 0.00E+00 |
| 623 | 0.88100000 | 0.88100000 | 0.00E+00 |
| 624 | 0.88580000 | 0.88580000 | 0.00E+00 |
| 625 | 0.89030000 | 0.89030000 | 0.00E+00 |
| 626 | 0.89530000 | 0.89530000 | 0.00E+00 |
| 627 | 0.90020000 | 0.90020000 | 0.00E+00 |
| 628 | 0.90500000 | 0.90500000 | 0.00E+00 |
| 629 | 0.90940000 | 0.90940000 | 0.00E+00 |
| 630 | 0.91400000 | 0.91400000 | 0.00E+00 |
| 631 | 0.91820000 | 0.91820000 | 0.00E+00 |
| 632 | 0.92250000 | 0.92250000 | 0.00E+00 |
| 633 | 0.92670000 | 0.92670000 | 0.00E+00 |
| 634 | 0.93070000 | 0.93070000 | 0.00E+00 |
| 635 | 0.93470000 | 0.93470000 | 0.00E+00 |
| 636 | 0.93870000 | 0.93870000 | 0.00E+00 |
| 637 | 0.94230000 | 0.94230000 | 0.00E+00 |
| 638 | 0.94620000 | 0.94620000 | 0.00E+00 |
| 639 | 0.94930000 | 0.94930000 | 0.00E+00 |
| 640 | 0.95270000 | 0.95270000 | 0.00E+00 |
| 641 | 0.95610000 | 0.95610000 | 0.00E+00 |
| 642 | 0.95910000 | 0.95910000 | 0.00E+00 |
| 643 | 0.96170000 | 0.96170000 | 0.00E+00 |
| 644 | 0.96450000 | 0.96450000 | 0.00E+00 |
| 645 | 0.96710000 | 0.96710000 | 0.00E+00 |
| 646 | 0.96920000 | 0.96920000 | 0.00E+00 |
| 647 | 0.97140000 | 0.97140000 | 0.00E+00 |
| 648 | 0.97370000 | 0.97370000 | 0.00E+00 |
| 649 | 0.97550000 | 0.97550000 | 0.00E+00 |
| 650 | 0.97710000 | 0.97710000 | 0.00E+00 |
| 651 | 0.97860000 | 0.97860000 | 0.00E+00 |
| 652 | 0.97990000 | 0.97990000 | 0.00E+00 |
| 653 | 0.98110000 | 0.98110000 | 0.00E+00 |
| 654 | 0.98250000 | 0.98250000 | 0.00E+00 |
| 655 | 0.98310000 | 0.98310000 | 0.00E+00 |
| 656 | 0.98340000 | 0.98340000 | 0.00E+00 |
| 657 | 0.98380000 | 0.98380000 | 0.00E+00 |
| 658 | 0.98420000 | 0.98420000 | 0.00E+00 |
| 659 | 0.98370000 | 0.98370000 | 0.00E+00 |
| 660 | 0.98390000 | 0.98390000 | 0.00E+00 |
| 661 | 0.98400000 | 0.98400000 | 0.00E+00 |
| 662 | 0.98360000 | 0.98360000 | 0.00E+00 |
| 663 | 0.98300000 | 0.98300000 | 0.00E+00 |
| 664 | 0.98200000 | 0.98200000 | 0.00E+00 |
| 665 | 0.98120000 | 0.98120000 | 0.00E+00 |
| 666 | 0.97990000 | 0.97990000 | 0.00E+00 |
| 667 | 0.97900000 | 0.97900000 | 0.00E+00 |
| 668 | 0.97700000 | 0.97700000 | 0.00E+00 |
| 669 | 0.97570000 | 0.97570000 | 0.00E+00 |
| 670 | 0.97410000 | 0.97410000 | 0.00E+00 |
| 671 | 0.97210000 | 0.97210000 | 0.00E+00 |
| 672 | 0.97050000 | 0.97050000 | 0.00E+00 |
| 673 | 0.96860000 | 0.96860000 | 0.00E+00 |
| 674 | 0.96610000 | 0.96610000 | 0.00E+00 |
| 675 | 0.96390000 | 0.96390000 | 0.00E+00 |
| 676 | 0.96150000 | 0.96150000 | 0.00E+00 |
| 677 | 0.95930000 | 0.95930000 | 0.00E+00 |
| 678 | 0.95690000 | 0.95690000 | 0.00E+00 |
| 679 | 0.95380000 | 0.95380000 | 0.00E+00 |
| 680 | 0.95090000 | 0.95090000 | 0.00E+00 |
| 681 | 0.94720000 | 0.94720000 | 0.00E+00 |
| 682 | 0.94390000 | 0.94390000 | 0.00E+00 |
| 683 | 0.94090000 | 0.94090000 | 0.00E+00 |
| 684 | 0.93770000 | 0.93770000 | 0.00E+00 |
| 685 | 0.93470000 | 0.93470000 | 0.00E+00 |
| 686 | 0.93160000 | 0.93160000 | 0.00E+00 |
| 687 | 0.92780000 | 0.92780000 | 0.00E+00 |
| 688 | 0.92470000 | 0.92470000 | 0.00E+00 |
| 689 | 0.92140000 | 0.92140000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 690 | 0.91820000 | 0.91820000 | 0.00E+00 |
| 691 | 0.91470000 | 0.91470000 | 0.00E+00 |
| 692 | 0.91110000 | 0.91110000 | 0.00E+00 |
| 693 | 0.90770000 | 0.90770000 | 0.00E+00 |
| 694 | 0.90430000 | 0.90430000 | 0.00E+00 |
| 695 | 0.90030000 | 0.90030000 | 0.00E+00 |
| 696 | 0.89700000 | 0.89700000 | 0.00E+00 |
| 697 | 0.89300000 | 0.89300000 | 0.00E+00 |
| 698 | 0.88990000 | 0.88990000 | 0.00E+00 |
| 699 | 0.88640000 | 0.88640000 | 0.00E+00 |
| 700 | 0.88280000 | 0.88280000 | 0.00E+00 |
| 701 | 0.87910000 | 0.87910000 | 0.00E+00 |
| 702 | 0.87560000 | 0.87560000 | 0.00E+00 |
| 703 | 0.87220000 | 0.87220000 | 0.00E+00 |
| 704 | 0.86860000 | 0.86860000 | 0.00E+00 |
| 705 | 0.86500000 | 0.86500000 | 0.00E+00 |
| 706 | 0.86130000 | 0.86130000 | 0.00E+00 |
| 707 | 0.85820000 | 0.85820000 | 0.00E+00 |
| 708 | 0.85460000 | 0.85460000 | 0.00E+00 |
| 709 | 0.85120000 | 0.85120000 | 0.00E+00 |
| 710 | 0.84810000 | 0.84810000 | 0.00E+00 |
| 711 | 0.84450000 | 0.84450000 | 0.00E+00 |
| 712 | 0.84100000 | 0.84100000 | 0.00E+00 |
| 713 | 0.83780000 | 0.83780000 | 0.00E+00 |
| 714 | 0.83480000 | 0.83480000 | 0.00E+00 |
| 715 | 0.83140000 | 0.83140000 | 0.00E+00 |
| 716 | 0.82820000 | 0.82820000 | 0.00E+00 |
| 717 | 0.82520000 | 0.82520000 | 0.00E+00 |
| 718 | 0.82220000 | 0.82220000 | 0.00E+00 |
| 719 | 0.81880000 | 0.81880000 | 0.00E+00 |
| 720 | 0.81590000 | 0.81590000 | 0.00E+00 |
| 721 | 0.81300000 | 0.81300000 | 0.00E+00 |
| 722 | 0.81010000 | 0.81010000 | 0.00E+00 |
| 723 | 0.80710000 | 0.80710000 | 0.00E+00 |
| 724 | 0.80420000 | 0.80420000 | 0.00E+00 |
| 725 | 0.80150000 | 0.80150000 | 0.00E+00 |
| 726 | 0.79880000 | 0.79880000 | 0.00E+00 |
| 727 | 0.79600000 | 0.79600000 | 0.00E+00 |
| 728 | 0.79360000 | 0.79360000 | 0.00E+00 |
| 729 | 0.79080000 | 0.79080000 | 0.00E+00 |
| 730 | 0.78830000 | 0.78830000 | 0.00E+00 |
| 731 | 0.78580000 | 0.78580000 | 0.00E+00 |
| 732 | 0.78340000 | 0.78340000 | 0.00E+00 |
| 733 | 0.78080000 | 0.78080000 | 0.00E+00 |
| 734 | 0.77900000 | 0.77900000 | 0.00E+00 |
| 735 | 0.77670000 | 0.77670000 | 0.00E+00 |
| 736 | 0.77420000 | 0.77420000 | 0.00E+00 |
| 737 | 0.77200000 | 0.77200000 | 0.00E+00 |
| 738 | 0.77000000 | 0.77000000 | 0.00E+00 |
| 739 | 0.76780000 | 0.76780000 | 0.00E+00 |
| 740 | 0.76590000 | 0.76590000 | 0.00E+00 |
| 741 | 0.76420000 | 0.76420000 | 0.00E+00 |
| 742 | 0.76210000 | 0.76210000 | 0.00E+00 |
| 743 | 0.76030000 | 0.76030000 | 0.00E+00 |
| 744 | 0.75880000 | 0.75880000 | 0.00E+00 |
| 745 | 0.75670000 | 0.75670000 | 0.00E+00 |
| 746 | 0.75480000 | 0.75480000 | 0.00E+00 |
| 747 | 0.75340000 | 0.75340000 | 0.00E+00 |
| 748 | 0.75190000 | 0.75190000 | 0.00E+00 |
| 749 | 0.75020000 | 0.75020000 | 0.00E+00 |
| 750 | 0.74900000 | 0.74900000 | 0.00E+00 |
| 751 | 0.74730000 | 0.74730000 | 0.00E+00 |
| 752 | 0.74630000 | 0.74630000 | 0.00E+00 |
| 753 | 0.74470000 | 0.74470000 | 0.00E+00 |
| 754 | 0.74340000 | 0.74340000 | 0.00E+00 |
| 755 | 0.74240000 | 0.74240000 | 0.00E+00 |
| 756 | 0.74100000 | 0.74100000 | 0.00E+00 |
| 757 | 0.74010000 | 0.74010000 | 0.00E+00 |
| 758 | 0.73910000 | 0.73910000 | 0.00E+00 |
| 759 | 0.73790000 | 0.73790000 | 0.00E+00 |
| 760 | 0.73720000 | 0.73720000 | 0.00E+00 |
| 761 | 0.73620000 | 0.73620000 | 0.00E+00 |
| 762 | 0.73530000 | 0.73530000 | 0.00E+00 |
| 763 | 0.73460000 | 0.73460000 | 0.00E+00 |
| 764 | 0.73390000 | 0.73390000 | 0.00E+00 |
| 765 | 0.73310000 | 0.73310000 | 0.00E+00 |
| 766 | 0.73250000 | 0.73250000 | 0.00E+00 |
| 767 | 0.73210000 | 0.73210000 | 0.00E+00 |
| 768 | 0.73140000 | 0.73140000 | 0.00E+00 |
| 769 | 0.73080000 | 0.73080000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 770 | 0.73040000 | 0.73040000 | 0.00E+00 |
| 771 | 0.73000000 | 0.73000000 | 0.00E+00 |
| 772 | 0.72950000 | 0.72950000 | 0.00E+00 |
| 773 | 0.72940000 | 0.72940000 | 0.00E+00 |
| 774 | 0.72910000 | 0.72910000 | 0.00E+00 |
| 775 | 0.72880000 | 0.72880000 | 0.00E+00 |
| 776 | 0.72870000 | 0.72870000 | 0.00E+00 |
| 777 | 0.72820000 | 0.72820000 | 0.00E+00 |
| 778 | 0.72840000 | 0.72840000 | 0.00E+00 |
| 779 | 0.72840000 | 0.72840000 | 0.00E+00 |
| 780 | 0.72820000 | 0.72820000 | 0.00E+00 |
| 781 | 0.72840000 | 0.72840000 | 0.00E+00 |
| 782 | 0.72840000 | 0.72840000 | 0.00E+00 |
| 783 | 0.72860000 | 0.72860000 | 0.00E+00 |
| 784 | 0.72890000 | 0.72890000 | 0.00E+00 |
| 785 | 0.72890000 | 0.72890000 | 0.00E+00 |
| 786 | 0.72900000 | 0.72900000 | 0.00E+00 |
| 787 | 0.72960000 | 0.72960000 | 0.00E+00 |
| 788 | 0.72970000 | 0.72970000 | 0.00E+00 |
| 789 | 0.73020000 | 0.73020000 | 0.00E+00 |
| 790 | 0.73070000 | 0.73070000 | 0.00E+00 |
| 791 | 0.73100000 | 0.73100000 | 0.00E+00 |
| 792 | 0.73140000 | 0.73140000 | 0.00E+00 |
| 793 | 0.73190000 | 0.73190000 | 0.00E+00 |
| 794 | 0.73150000 | 0.73150000 | 0.00E+00 |
| 795 | 0.73360000 | 0.73360000 | 0.00E+00 |
| 796 | 0.73390000 | 0.73390000 | 0.00E+00 |
| 797 | 0.73480000 | 0.73480000 | 0.00E+00 |
| 798 | 0.73560000 | 0.73560000 | 0.00E+00 |
| 799 | 0.73650000 | 0.73650000 | 0.00E+00 |
| 800 | 0.73720000 | 0.73720000 | 0.00E+00 |
| 801 | 0.73790000 | 0.73790000 | 0.00E+00 |
| 802 | 0.73870000 | 0.73870000 | 0.00E+00 |
| 803 | 0.73960000 | 0.73960000 | 0.00E+00 |
| 804 | 0.74050000 | 0.74050000 | 0.00E+00 |
| 805 | 0.74130000 | 0.74130000 | 0.00E+00 |
| 806 | 0.74240000 | 0.74240000 | 0.00E+00 |
| 807 | 0.74350000 | 0.74350000 | 0.00E+00 |
| 808 | 0.74470000 | 0.74470000 | 0.00E+00 |
| 809 | 0.74580000 | 0.74580000 | 0.00E+00 |
| 810 | 0.74680000 | 0.74680000 | 0.00E+00 |
| 811 | 0.74790000 | 0.74790000 | 0.00E+00 |
| 812 | 0.74910000 | 0.74910000 | 0.00E+00 |
| 813 | 0.75020000 | 0.75020000 | 0.00E+00 |
| 814 | 0.75150000 | 0.75150000 | 0.00E+00 |
| 815 | 0.75290000 | 0.75290000 | 0.00E+00 |
| 816 | 0.75450000 | 0.75450000 | 0.00E+00 |
| 817 | 0.75550000 | 0.75550000 | 0.00E+00 |
| 818 | 0.75690000 | 0.75690000 | 0.00E+00 |
| 819 | 0.75830000 | 0.75830000 | 0.00E+00 |
| 820 | 0.75950000 | 0.75950000 | 0.00E+00 |
| 821 | 0.76140000 | 0.76140000 | 0.00E+00 |
| 822 | 0.76280000 | 0.76280000 | 0.00E+00 |
| 823 | 0.76430000 | 0.76430000 | 0.00E+00 |
| 824 | 0.76580000 | 0.76580000 | 0.00E+00 |
| 825 | 0.76740000 | 0.76740000 | 0.00E+00 |
| 826 | 0.76880000 | 0.76880000 | 0.00E+00 |
| 827 | 0.77060000 | 0.77060000 | 0.00E+00 |
| 828 | 0.77230000 | 0.77230000 | 0.00E+00 |
| 829 | 0.77400000 | 0.77400000 | 0.00E+00 |
| 830 | 0.77520000 | 0.77520000 | 0.00E+00 |
| 831 | 0.77750000 | 0.77750000 | 0.00E+00 |
| 832 | 0.77900000 | 0.77900000 | 0.00E+00 |
| 833 | 0.78080000 | 0.78080000 | 0.00E+00 |
| 834 | 0.78260000 | 0.78260000 | 0.00E+00 |
| 835 | 0.78450000 | 0.78450000 | 0.00E+00 |
| 836 | 0.78630000 | 0.78630000 | 0.00E+00 |
| 837 | 0.78790000 | 0.78790000 | 0.00E+00 |
| 838 | 0.79010000 | 0.79010000 | 0.00E+00 |
| 839 | 0.79180000 | 0.79180000 | 0.00E+00 |
| 840 | 0.79390000 | 0.79390000 | 0.00E+00 |
| 841 | 0.79570000 | 0.79570000 | 0.00E+00 |
| 842 | 0.79750000 | 0.79750000 | 0.00E+00 |
| 843 | 0.79950000 | 0.79950000 | 0.00E+00 |
| 844 | 0.80140000 | 0.80140000 | 0.00E+00 |
| 845 | 0.80350000 | 0.80350000 | 0.00E+00 |
| 846 | 0.80540000 | 0.80540000 | 0.00E+00 |
| 847 | 0.80730000 | 0.80730000 | 0.00E+00 |
| 848 | 0.80970000 | 0.80970000 | 0.00E+00 |
| 849 | 0.81160000 | 0.81160000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 850 | 0.81360000 | 0.81360000 | 0.00E+00 |
| 851 | 0.81550000 | 0.81550000 | 0.00E+00 |
| 852 | 0.81780000 | 0.81780000 | 0.00E+00 |
| 853 | 0.81990000 | 0.81990000 | 0.00E+00 |
| 854 | 0.82200000 | 0.82200000 | 0.00E+00 |
| 855 | 0.82390000 | 0.82390000 | 0.00E+00 |
| 856 | 0.82620000 | 0.82620000 | 0.00E+00 |
| 857 | 0.82840000 | 0.82840000 | 0.00E+00 |
| 858 | 0.83020000 | 0.83020000 | 0.00E+00 |
| 859 | 0.83240000 | 0.83240000 | 0.00E+00 |
| 860 | 0.83480000 | 0.83480000 | 0.00E+00 |
| 861 | 0.83690000 | 0.83690000 | 0.00E+00 |
| 862 | 0.83910000 | 0.83910000 | 0.00E+00 |
| 863 | 0.84150000 | 0.84150000 | 0.00E+00 |
| 864 | 0.84340000 | 0.84340000 | 0.00E+00 |
| 865 | 0.84560000 | 0.84560000 | 0.00E+00 |
| 866 | 0.84800000 | 0.84800000 | 0.00E+00 |
| 867 | 0.85010000 | 0.85010000 | 0.00E+00 |
| 868 | 0.85220000 | 0.85220000 | 0.00E+00 |
| 869 | 0.85440000 | 0.85440000 | 0.00E+00 |
| 870 | 0.85660000 | 0.85660000 | 0.00E+00 |
| 871 | 0.85870000 | 0.85870000 | 0.00E+00 |
| 872 | 0.86090000 | 0.86090000 | 0.00E+00 |
| 873 | 0.86350000 | 0.86350000 | 0.00E+00 |
| 874 | 0.86530000 | 0.86530000 | 0.00E+00 |
| 875 | 0.86790000 | 0.86790000 | 0.00E+00 |
| 876 | 0.86990000 | 0.86990000 | 0.00E+00 |
| 877 | 0.87230000 | 0.87230000 | 0.00E+00 |
| 878 | 0.87420000 | 0.87420000 | 0.00E+00 |
| 879 | 0.87640000 | 0.87640000 | 0.00E+00 |
| 880 | 0.87840000 | 0.87840000 | 0.00E+00 |
| 881 | 0.88060000 | 0.88060000 | 0.00E+00 |
| 882 | 0.88320000 | 0.88320000 | 0.00E+00 |
| 883 | 0.88550000 | 0.88550000 | 0.00E+00 |
| 884 | 0.88790000 | 0.88790000 | 0.00E+00 |
| 885 | 0.89000000 | 0.89000000 | 0.00E+00 |
| 886 | 0.89180000 | 0.89180000 | 0.00E+00 |
| 887 | 0.89370000 | 0.89370000 | 0.00E+00 |
| 888 | 0.89560000 | 0.89560000 | 0.00E+00 |
| 889 | 0.89730000 | 0.89730000 | 0.00E+00 |
| 890 | 0.89910000 | 0.89910000 | 0.00E+00 |
| 891 | 0.90200000 | 0.90200000 | 0.00E+00 |
| 888 | 0.89600000 | 0.89600000 | 0.00E+00 |
| 893 | 0.90800000 | 0.90800000 | 0.00E+00 |
| 891 | 0.90200000 | 0.90200000 | 0.00E+00 |
| 895 | 0.90800000 | 0.90800000 | 0.00E+00 |
| 894 | 0.91300000 | 0.91300000 | 0.00E+00 |
| 896 | 0.91300000 | 0.91300000 | 0.00E+00 |
| 897 | 0.91500000 | 0.91500000 | 0.00E+00 |
| 899 | 0.91980000 | 0.91980000 | 0.00E+00 |
| 900 | 0.92110000 | 0.92110000 | 0.00E+00 |
| 901 | 0.92320000 | 0.92320000 | 0.00E+00 |
| 902 | 0.92490000 | 0.92490000 | 0.00E+00 |
| 903 | 0.92680000 | 0.92680000 | 0.00E+00 |
| 904 | 0.92850000 | 0.92850000 | 0.00E+00 |
| 905 | 0.93020000 | 0.93020000 | 0.00E+00 |
| 906 | 0.93210000 | 0.93210000 | 0.00E+00 |
| 907 | 0.93400000 | 0.93400000 | 0.00E+00 |
| 908 | 0.93590000 | 0.93590000 | 0.00E+00 |
| 909 | 0.93770000 | 0.93770000 | 0.00E+00 |
| 910 | 0.93990000 | 0.93990000 | 0.00E+00 |
| 911 | 0.94160000 | 0.94160000 | 0.00E+00 |
| 912 | 0.94320000 | 0.94320000 | 0.00E+00 |
| 913 | 0.94490000 | 0.94490000 | 0.00E+00 |
| 914 | 0.94620000 | 0.94620000 | 0.00E+00 |
| 915 | 0.94790000 | 0.94790000 | 0.00E+00 |
| 916 | 0.94930000 | 0.94930000 | 0.00E+00 |
| 917 | 0.95110000 | 0.95110000 | 0.00E+00 |
| 918 | 0.95270000 | 0.95270000 | 0.00E+00 |
| 919 | 0.95420000 | 0.95420000 | 0.00E+00 |
| 920 | 0.95570000 | 0.95570000 | 0.00E+00 |
| 921 | 0.95730000 | 0.95730000 | 0.00E+00 |
| 922 | 0.95920000 | 0.95920000 | 0.00E+00 |
| 923 | 0.96030000 | 0.96030000 | 0.00E+00 |
| 924 | 0.96160000 | 0.96160000 | 0.00E+00 |
| 925 | 0.96310000 | 0.96310000 | 0.00E+00 |
| 926 | 0.96410000 | 0.96410000 | 0.00E+00 |
| 927 | 0.96540000 | 0.96540000 | 0.00E+00 |
| 928 | 0.96690000 | 0.96690000 | 0.00E+00 |
| 929 | 0.96830000 | 0.96830000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 930 | 0.96940000 | 0.96940000 | 0.00E+00 |
| 931 | 0.97080000 | 0.97080000 | 0.00E+00 |
| 932 | 0.97200000 | 0.97200000 | 0.00E+00 |
| 933 | 0.97280000 | 0.97280000 | 0.00E+00 |
| 934 | 0.97400000 | 0.97400000 | 0.00E+00 |
| 935 | 0.97490000 | 0.97490000 | 0.00E+00 |
| 936 | 0.97630000 | 0.97630000 | 0.00E+00 |
| 937 | 0.97670000 | 0.97670000 | 0.00E+00 |
| 938 | 0.97820000 | 0.97820000 | 0.00E+00 |
| 939 | 0.97910000 | 0.97910000 | 0.00E+00 |
| 940 | 0.97960000 | 0.97960000 | 0.00E+00 |
| 941 | 0.98060000 | 0.98060000 | 0.00E+00 |
| 942 | 0.98160000 | 0.98160000 | 0.00E+00 |
| 943 | 0.98280000 | 0.98280000 | 0.00E+00 |
| 944 | 0.98300000 | 0.98300000 | 0.00E+00 |
| 945 | 0.98420000 | 0.98420000 | 0.00E+00 |
| 946 | 0.98470000 | 0.98470000 | 0.00E+00 |
| 947 | 0.98550000 | 0.98550000 | 0.00E+00 |
| 948 | 0.98580000 | 0.98580000 | 0.00E+00 |
| 949 | 0.98660000 | 0.98660000 | 0.00E+00 |
| 950 | 0.98710000 | 0.98710000 | 0.00E+00 |
| 951 | 0.98790000 | 0.98790000 | 0.00E+00 |
| 952 | 0.98830000 | 0.98830000 | 0.00E+00 |
| 953 | 0.98900000 | 0.98900000 | 0.00E+00 |
| 954 | 0.98970000 | 0.98970000 | 0.00E+00 |
| 955 | 0.98970000 | 0.98970000 | 0.00E+00 |
| 956 | 0.98980000 | 0.98980000 | 0.00E+00 |
| 957 | 0.99020000 | 0.99020000 | 0.00E+00 |
| 958 | 0.99060000 | 0.99060000 | 0.00E+00 |
| 959 | 0.99070000 | 0.99070000 | 0.00E+00 |
| 960 | 0.99120000 | 0.99120000 | 0.00E+00 |
| 961 | 0.99130000 | 0.99130000 | 0.00E+00 |
| 962 | 0.99200000 | 0.99200000 | 0.00E+00 |
| 963 | 0.99130000 | 0.99130000 | 0.00E+00 |
| 964 | 0.99220000 | 0.99220000 | 0.00E+00 |
| 965 | 0.99180000 | 0.99180000 | 0.00E+00 |
| 966 | 0.99210000 | 0.99210000 | 0.00E+00 |
| 967 | 0.99220000 | 0.99220000 | 0.00E+00 |
| 968 | 0.99210000 | 0.99210000 | 0.00E+00 |
| 969 | 0.99240000 | 0.99240000 | 0.00E+00 |
| 970 | 0.99180000 | 0.99180000 | 0.00E+00 |
| 971 | 0.99160000 | 0.99160000 | 0.00E+00 |
| 972 | 0.99180000 | 0.99180000 | 0.00E+00 |
| 973 | 0.99170000 | 0.99170000 | 0.00E+00 |
| 974 | 0.99180000 | 0.99180000 | 0.00E+00 |
| 975 | 0.99110000 | 0.99110000 | 0.00E+00 |
| 976 | 0.99110000 | 0.99110000 | 0.00E+00 |
| 977 | 0.99060000 | 0.99060000 | 0.00E+00 |
| 978 | 0.98970000 | 0.98970000 | 0.00E+00 |
| 979 | 0.99010000 | 0.99010000 | 0.00E+00 |
| 980 | 0.98940000 | 0.98940000 | 0.00E+00 |
| 981 | 0.98870000 | 0.98870000 | 0.00E+00 |
| 982 | 0.98870000 | 0.98870000 | 0.00E+00 |
| 983 | 0.98820000 | 0.98820000 | 0.00E+00 |
| 984 | 0.98790000 | 0.98790000 | 0.00E+00 |
| 985 | 0.98720000 | 0.98720000 | 0.00E+00 |
| 986 | 0.98700000 | 0.98700000 | 0.00E+00 |
| 987 | 0.98650000 | 0.98650000 | 0.00E+00 |
| 988 | 0.98540000 | 0.98540000 | 0.00E+00 |
| 989 | 0.98500000 | 0.98500000 | 0.00E+00 |
| 990 | 0.98420000 | 0.98420000 | 0.00E+00 |
| 991 | 0.98350000 | 0.98350000 | 0.00E+00 |
| 992 | 0.98240000 | 0.98240000 | 0.00E+00 |
| 993 | 0.98200000 | 0.98200000 | 0.00E+00 |
| 994 | 0.98180000 | 0.98180000 | 0.00E+00 |
| 995 | 0.98080000 | 0.98080000 | 0.00E+00 |
| 996 | 0.98030000 | 0.98030000 | 0.00E+00 |
| 997 | 0.97950000 | 0.97950000 | 0.00E+00 |
| 998 | 0.97860000 | 0.97860000 | 0.00E+00 |
| 999 | 0.97770000 | 0.97770000 | 0.00E+00 |
| 1000 | 0.97670000 | 0.97670000 | 0.00E+00 |
| 1001 | 0.97590000 | 0.97590000 | 0.00E+00 |
| 1002 | 0.97470000 | 0.97470000 | 0.00E+00 |
| 1003 | 0.97420000 | 0.97420000 | 0.00E+00 |
| 1004 | 0.97290000 | 0.97290000 | 0.00E+00 |
| 1005 | 0.97220000 | 0.97220000 | 0.00E+00 |
| 1006 | 0.97130000 | 0.97130000 | 0.00E+00 |
| 1007 | 0.97040000 | 0.97040000 | 0.00E+00 |
| 1008 | 0.96930000 | 0.96930000 | 0.00E+00 |
| 1009 | 0.96790000 | 0.96790000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 1010 | 0.96710000 | 0.96710000 | 0.00E+00 |
| 1011 | 0.96580000 | 0.96580000 | 0.00E+00 |
| 1012 | 0.96490000 | 0.96490000 | 0.00E+00 |
| 1013 | 0.96380000 | 0.96380000 | 0.00E+00 |
| 1014 | 0.96240000 | 0.96240000 | 0.00E+00 |
| 1015 | 0.96170000 | 0.96170000 | 0.00E+00 |
| 1016 | 0.96030000 | 0.96030000 | 0.00E+00 |
| 1017 | 0.95970000 | 0.95970000 | 0.00E+00 |
| 1018 | 0.95850000 | 0.95850000 | 0.00E+00 |
| 1019 | 0.95730000 | 0.95730000 | 0.00E+00 |
| 1020 | 0.95550000 | 0.95550000 | 0.00E+00 |
| 1021 | 0.95440000 | 0.95440000 | 0.00E+00 |
| 1022 | 0.95310000 | 0.95310000 | 0.00E+00 |
| 1023 | 0.95150000 | 0.95150000 | 0.00E+00 |
| 1024 | 0.95040000 | 0.95040000 | 0.00E+00 |
| 1025 | 0.94900000 | 0.94900000 | 0.00E+00 |
| 1026 | 0.94800000 | 0.94800000 | 0.00E+00 |
| 1027 | 0.94710000 | 0.94710000 | 0.00E+00 |
| 1028 | 0.94590000 | 0.94590000 | 0.00E+00 |
| 1029 | 0.94450000 | 0.94450000 | 0.00E+00 |
| 1030 | 0.94330000 | 0.94330000 | 0.00E+00 |
| 1031 | 0.94180000 | 0.94180000 | 0.00E+00 |
| 1032 | 0.94010000 | 0.94010000 | 0.00E+00 |
| 1033 | 0.93950000 | 0.93950000 | 0.00E+00 |
| 1034 | 0.93790000 | 0.93790000 | 0.00E+00 |
| 1035 | 0.93630000 | 0.93630000 | 0.00E+00 |
| 1036 | 0.93490000 | 0.93490000 | 0.00E+00 |
| 1037 | 0.93360000 | 0.93360000 | 0.00E+00 |
| 1038 | 0.93280000 | 0.93280000 | 0.00E+00 |
| 1039 | 0.93140000 | 0.93140000 | 0.00E+00 |
| 1040 | 0.92910000 | 0.92910000 | 0.00E+00 |
| 1041 | 0.92830000 | 0.92830000 | 0.00E+00 |
| 1042 | 0.92680000 | 0.92680000 | 0.00E+00 |
| 1043 | 0.92540000 | 0.92540000 | 0.00E+00 |
| 1044 | 0.92390000 | 0.92390000 | 0.00E+00 |
| 1045 | 0.92240000 | 0.92240000 | 0.00E+00 |
| 1046 | 0.92130000 | 0.92130000 | 0.00E+00 |
| 1047 | 0.91960000 | 0.91960000 | 0.00E+00 |
| 1048 | 0.91870000 | 0.91870000 | 0.00E+00 |
| 1049 | 0.91760000 | 0.91760000 | 0.00E+00 |
| 1050 | 0.91580000 | 0.91580000 | 0.00E+00 |
| 1051 | 0.91460000 | 0.91460000 | 0.00E+00 |
| 1052 | 0.91280000 | 0.91280000 | 0.00E+00 |
| 1053 | 0.91140000 | 0.91140000 | 0.00E+00 |
| 1054 | 0.91020000 | 0.91020000 | 0.00E+00 |
| 1055 | 0.90810000 | 0.90810000 | 0.00E+00 |
| 1056 | 0.90670000 | 0.90670000 | 0.00E+00 |
| 1057 | 0.90550000 | 0.90550000 | 0.00E+00 |
| 1058 | 0.90410000 | 0.90410000 | 0.00E+00 |
| 1059 | 0.90330000 | 0.90330000 | 0.00E+00 |
| 1060 | 0.90010000 | 0.90010000 | 0.00E+00 |
| 1061 | 0.90020000 | 0.90020000 | 0.00E+00 |
| 1062 | 0.89880000 | 0.89880000 | 0.00E+00 |
| 1063 | 0.89750000 | 0.89750000 | 0.00E+00 |
| 1064 | 0.89630000 | 0.89630000 | 0.00E+00 |
| 1065 | 0.89450000 | 0.89450000 | 0.00E+00 |
| 1066 | 0.89320000 | 0.89320000 | 0.00E+00 |
| 1067 | 0.89170000 | 0.89170000 | 0.00E+00 |
| 1068 | 0.89060000 | 0.89060000 | 0.00E+00 |
| 1069 | 0.88900000 | 0.88900000 | 0.00E+00 |
| 1070 | 0.88680000 | 0.88680000 | 0.00E+00 |
| 1071 | 0.88660000 | 0.88660000 | 0.00E+00 |
| 1072 | 0.88500000 | 0.88500000 | 0.00E+00 |
| 1073 | 0.88370000 | 0.88370000 | 0.00E+00 |
| 1074 | 0.88250000 | 0.88250000 | 0.00E+00 |
| 1075 | 0.88070000 | 0.88070000 | 0.00E+00 |
| 1076 | 0.87920000 | 0.87920000 | 0.00E+00 |
| 1077 | 0.87830000 | 0.87830000 | 0.00E+00 |
| 1078 | 0.87620000 | 0.87620000 | 0.00E+00 |
| 1079 | 0.87530000 | 0.87530000 | 0.00E+00 |
| 1080 | 0.87370000 | 0.87370000 | 0.00E+00 |
| 1081 | 0.87290000 | 0.87290000 | 0.00E+00 |
| 1082 | 0.87170000 | 0.87170000 | 0.00E+00 |
| 1083 | 0.87040000 | 0.87040000 | 0.00E+00 |
| 1084 | 0.86910000 | 0.86910000 | 0.00E+00 |
| 1085 | 0.86690000 | 0.86690000 | 0.00E+00 |
| 1086 | 0.86560000 | 0.86560000 | 0.00E+00 |
| 1087 | 0.86420000 | 0.86420000 | 0.00E+00 |
| 1088 | 0.86280000 | 0.86280000 | 0.00E+00 |
| 1089 | 0.86190000 | 0.86190000 | 0.00E+00 |

| | | | |
|---|---|---|---|
| 1090 | 0.86010000 | 0.86010000 | 0.00E+00 |
| 1091 | 0.85900000 | 0.85900000 | 0.00E+00 |
| 1092 | 0.85810000 | 0.85810000 | 0.00E+00 |
| 1093 | 0.85790000 | 0.85790000 | 0.00E+00 |
| 1094 | 0.85590000 | 0.85590000 | 0.00E+00 |
| 1095 | 0.85440000 | 0.85440000 | 0.00E+00 |
| 1096 | 0.85290000 | 0.85290000 | 0.00E+00 |
| 1097 | 0.85160000 | 0.85160000 | 0.00E+00 |
| 1098 | 0.85080000 | 0.85080000 | 0.00E+00 |
| 1099 | 0.84910000 | 0.84910000 | 0.00E+00 |
| 1100 | 0.84810000 | 0.84810000 | 0.00E+00 |

ANEXO B. ÍNDICE DE REFRACCIÓN SnS2-Bi203a

| índice de refracción SnS2-Bi203a | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 3.7824 | 3.7824 | 1.62E-05 |
| 3.7567 | 3.7567 | 2.09E-05 |
| 3.7315 | 3.7315 | 8.75E-05 |
| 3.7068 | 3.7068 | 7.90E-05 |
| 3.6826 | 3.6826 | 1.31E-04 |
| 3.6589 | 3.6589 | 1.11E-04 |
| 3.6357 | 3.6357 | 4.39E-05 |
| 3.6130 | 3.6130 | 2.79E-05 |
| 3.5907 | 3.5907 | 1.28E-04 |
| 3.5689 | 3.5689 | 3.91E-05 |
| 3.5475 | 3.5475 | 9.40E-05 |
| 3.5266 | 3.5266 | 5.31E-05 |
| 3.5060 | 3.5060 | 5.37E-05 |
| 3.4859 | 3.4859 | 8.07E-05 |
| 3.4661 | 3.4661 | 1.05E-04 |
| 3.4468 | 3.4468 | 3.47E-05 |
| 3.4278 | 3.4278 | 2.88E-06 |
| 3.4091 | 3.4091 | 2.70E-05 |
| 3.3908 | 3.3908 | 1.34E-04 |
| 3.3729 | 3.3729 | 6.17E-05 |
| 3.3553 | 3.3553 | 1.49E-04 |
| 3.3380 | 3.3380 | 1.49E-04 |
| 3.3210 | 3.3210 | 1.20E-04 |
| 3.3044 | 3.3044 | 1.26E-04 |
| 3.2880 | 3.2880 | 6.04E-05 |
| 3.2720 | 3.2720 | 5.64E-05 |
| 3.2562 | 3.2562 | 7.74E-05 |
| 3.2407 | 3.2408 | 2.84E-05 |
| 3.2255 | 3.2256 | 1.16E-04 |
| 3.2106 | 3.2106 | 7.82E-05 |
| 3.1959 | 3.1959 | 4.76E-05 |
| 3.1815 | 3.1815 | 8.90E-05 |
| 3.1674 | 3.1674 | 1.10E-04 |
| 3.1534 | 3.1534 | 1.50E-04 |
| 3.1398 | 3.1398 | 1.52E-04 |
| 3.1263 | 3.1263 | 1.31E-05 |
| 3.1131 | 3.1131 | 7.96E-05 |
| 3.1001 | 3.1001 | 4.02E-05 |
| 3.0873 | 3.0873 | 1.10E-04 |
| 3.0748 | 3.0748 | 5.11E-05 |
| 3.0624 | 3.0624 | 4.84E-05 |
| 3.0503 | 3.0503 | 1.16E-05 |
| 3.0383 | 3.0383 | 1.58E-05 |
| 3.0266 | 3.0266 | 1.10E-04 |
| 3.0150 | 3.0150 | 1.32E-04 |
| 3.0036 | 3.0036 | 5.76E-05 |
| 2.9924 | 2.9924 | 1.49E-04 |
| 2.9814 | 2.9814 | 6.44E-05 |
| 2.9706 | 2.9706 | 1.20E-04 |
| 2.9599 | 2.9599 | 1.08E-04 |
| 2.9494 | 2.9494 | 6.76E-05 |
| 2.9391 | 2.9391 | 1.25E-04 |
| 2.9289 | 2.9289 | 1.42E-05 |
| 2.9189 | 2.9189 | 1.67E-04 |
| 2.9090 | 2.9090 | 1.31E-04 |
| 2.8993 | 2.8993 | 1.40E-04 |
| 2.8898 | 2.8898 | 8.85E-05 |
| 2.8803 | 2.8804 | 1.29E-04 |
| 2.8711 | 2.8711 | 8.11E-05 |
| 2.8619 | 2.8619 | 7.59E-05 |
| 2.8529 | 2.8529 | 0.00E+00 |

| | | |
|---|---|---|
| 2.8441 | 2.8441 | 1.36E-04 |
| 2.8353 | 2.8353 | 1.26E-04 |
| 2.8267 | 2.8267 | 8.21E-06 |
| 2.8183 | 2.8183 | 7.69E-05 |
| 2.8099 | 2.8099 | 5.95E-05 |
| 2.8017 | 2.8017 | 1.48E-04 |
| 2.7936 | 2.7936 | 8.58E-05 |
| 2.7856 | 2.7856 | 1.55E-04 |
| 2.7777 | 2.7777 | 1.25E-04 |
| 2.7699 | 2.7699 | 1.30E-04 |
| 2.7623 | 2.7623 | 1.43E-04 |
| 2.7547 | 2.7547 | 8.79E-05 |
| 2.7473 | 2.7473 | 1.09E-04 |
| 2.7399 | 2.7399 | 1.56E-04 |
| 2.7327 | 2.7327 | 1.23E-04 |
| 2.7255 | 2.7255 | 7.85E-05 |
| 2.7185 | 2.7185 | 9.01E-05 |
| 2.7116 | 2.7116 | 1.44E-04 |
| 2.7047 | 2.7047 | 1.79E-04 |
| 2.6979 | 2.6980 | 1.53E-05 |
| 2.6913 | 2.6913 | 1.67E-04 |
| 2.6847 | 2.6847 | 4.83E-05 |
| 2.6782 | 2.6782 | 1.75E-04 |
| 2.6718 | 2.6718 | 1.49E-04 |
| 2.6655 | 2.6655 | 6.95E-05 |
| 2.6593 | 2.6593 | 4.94E-05 |
| 2.6531 | 2.6531 | 1.11E-04 |
| 2.6471 | 2.6471 | 1.78E-04 |
| 2.6411 | 2.6411 | 1.16E-04 |
| 2.6352 | 2.6352 | 1.31E-04 |
| 2.6293 | 2.6293 | 1.04E-04 |
| 2.6236 | 2.6236 | 1.60E-04 |
| 2.6179 | 2.6179 | 1.34E-05 |
| 2.6123 | 2.6123 | 8.34E-05 |
| 2.6067 | 2.6067 | 9.66E-05 |
| 2.6013 | 2.6013 | 9.91E-05 |
| 2.5959 | 2.5959 | 1.36E-04 |
| 2.5905 | 2.5905 | 1.32E-04 |
| 2.5853 | 2.5853 | 1.08E-04 |
| 2.5801 | 2.5801 | 1.29E-04 |
| 2.5749 | 2.5749 | 2.85E-05 |
| 2.5699 | 2.5699 | 6.47E-05 |
| 2.5648 | 2.5649 | 6.11E-05 |
| 2.5599 | 2.5599 | 0.00E+00 |
| 2.5550 | 2.5550 | 7.97E-05 |
| 2.5502 | 2.5502 | 1.40E-04 |
| 2.5454 | 2.5454 | 1.42E-04 |
| 2.5407 | 2.5407 | 4.91E-05 |
| 2.5360 | 2.5361 | 1.76E-04 |
| 2.5314 | 2.5315 | 1.74E-04 |
| 2.5269 | 2.5269 | 2.07E-05 |
| 2.5224 | 2.5224 | 2.19E-05 |
| 2.5180 | 2.5180 | 6.04E-05 |
| 2.5136 | 2.5136 | 1.63E-04 |
| 2.5093 | 2.5093 | 7.12E-05 |
| 2.5050 | 2.5050 | 6.55E-05 |
| 2.5007 | 2.5007 | 1.93E-04 |
| 2.4966 | 2.4966 | 1.77E-05 |
| 2.4924 | 2.4924 | 1.77E-04 |
| 2.4883 | 2.4883 | 1.59E-04 |
| 2.4843 | 2.4843 | 1.83E-04 |
| 2.4803 | 2.4803 | 3.00E-05 |
| 2.4763 | 2.4763 | 2.24E-05 |
| 2.4724 | 2.4724 | 1.79E-04 |
| 2.4686 | 2.4686 | 1.44E-04 |
| 2.4648 | 2.4648 | 1.57E-04 |
| 2.4610 | 2.4610 | 6.15E-05 |
| 2.4572 | 2.4573 | 3.76E-05 |
| 2.4536 | 2.4536 | 7.39E-05 |
| 2.4499 | 2.4499 | 7.22E-05 |
| 2.4463 | 2.4463 | 5.70E-05 |
| 2.4427 | 2.4427 | 5.24E-05 |
| 2.4392 | 2.4392 | 8.23E-05 |
| 2.4357 | 2.4357 | 1.70E-04 |
| 2.4323 | 2.4323 | 7.14E-05 |
| 2.4288 | 2.4288 | 2.02E-04 |
| 2.4255 | 2.4255 | 1.90E-04 |
| 2.4221 | 2.4221 | 8.67E-05 |
| 2.4188 | 2.4188 | 1.94E-04 |
| 2.4155 | 2.4155 | 1.10E-04 |

| | | |
|---|---|---|
| 2.4123 | 2.4123 | 1.87E-04 |
| 2.4091 | 2.4091 | 1.12E-04 |
| 2.4059 | 2.4059 | 1.58E-04 |
| 2.4028 | 2.4028 | 7.01E-05 |
| 2.3997 | 2.3997 | 1.76E-04 |
| 2.3966 | 2.3966 | 1.78E-04 |
| 2.3936 | 2.3936 | 9.53E-05 |
| 2.3906 | 2.3906 | 5.42E-05 |
| 2.3876 | 2.3876 | 1.66E-04 |
| 2.3847 | 2.3847 | 6.23E-05 |
| 2.3817 | 2.3817 | 1.16E-04 |
| 2.3789 | 2.3789 | 1.22E-04 |
| 2.3760 | 2.3760 | 8.28E-05 |
| 2.3732 | 2.3732 | 9.47E-05 |
| 2.3704 | 2.3704 | 2.05E-04 |
| 2.3676 | 2.3676 | 1.54E-04 |
| 2.3649 | 2.3649 | 1.91E-04 |
| 2.3622 | 2.3622 | 9.11E-05 |
| 2.3595 | 2.3595 | 1.70E-04 |
| 2.3568 | 2.3568 | 1.41E-04 |
| 2.3542 | 2.3542 | 1.61E-04 |
| 2.3516 | 2.3516 | 1.26E-04 |
| 2.3490 | 2.3490 | 1.69E-04 |
| 2.3464 | 2.3464 | 2.01E-05 |
| 2.3439 | 2.3439 | 0.00E+00 |
| 2.3414 | 2.3414 | 1.84E-04 |
| 2.3389 | 2.3389 | 1.30E-04 |
| 2.3365 | 2.3365 | 1.75E-04 |
| 2.3340 | 2.3340 | 1.11E-04 |
| 2.3316 | 2.3316 | 1.20E-04 |
| 2.3292 | 2.3292 | 1.63E-04 |
| 2.3269 | 2.3269 | 1.09E-04 |
| 2.3245 | 2.3245 | 6.29E-05 |
| 2.3222 | 2.3222 | 1.18E-04 |
| 2.3199 | 2.3199 | 1.70E-04 |
| 2.3176 | 2.3176 | 4.89E-05 |
| 2.3154 | 2.3154 | 9.87E-05 |
| 2.3131 | 2.3132 | 1.94E-04 |
| 2.3109 | 2.3109 | 1.85E-04 |
| 2.3087 | 2.3087 | 1.62E-04 |
| 2.3066 | 2.3066 | 1.58E-04 |
| 2.3044 | 2.3044 | 1.63E-04 |
| 2.3023 | 2.3023 | 1.64E-04 |
| 2.3002 | 2.3002 | 1.52E-04 |
| 2.2981 | 2.2981 | 1.16E-04 |
| 2.2960 | 2.2960 | 4.54E-05 |
| 2.2940 | 2.2940 | 6.97E-05 |
| 2.2919 | 2.2919 | 1.96E-04 |
| 2.2899 | 2.2899 | 3.83E-05 |
| 2.2879 | 2.2879 | 8.91E-05 |
| 2.2859 | 2.2859 | 1.32E-04 |
| 2.2840 | 2.2840 | 8.19E-05 |
| 2.2820 | 2.2820 | 7.21E-05 |
| 2.2801 | 2.2801 | 9.96E-05 |
| 2.2782 | 2.2782 | 1.50E-04 |
| 2.2763 | 2.2763 | 6.87E-05 |
| 2.2744 | 2.2744 | 1.52E-04 |
| 2.2726 | 2.2726 | 8.24E-05 |
| 2.2707 | 2.2707 | 1.70E-04 |
| 2.2689 | 2.2689 | 1.68E-05 |
| 2.2671 | 2.2671 | 2.91E-05 |
| 2.2653 | 2.2653 | 1.42E-04 |
| 2.2635 | 2.2635 | 6.23E-05 |
| 2.2618 | 2.2618 | 1.82E-04 |
| 2.2600 | 2.2600 | 6.80E-05 |
| 2.2583 | 2.2583 | 1.69E-04 |
| 2.2566 | 2.2566 | 5.08E-05 |
| 2.2549 | 2.2549 | 1.64E-04 |
| 2.2532 | 2.2532 | 7.19E-05 |
| 2.2515 | 2.2515 | 2.18E-04 |
| 2.2498 | 2.2499 | 1.91E-04 |
| 2.2482 | 2.2482 | 2.76E-05 |
| 2.2466 | 2.2466 | 2.22E-05 |
| 2.2450 | 2.2450 | 9.75E-05 |
| 2.2433 | 2.2434 | 6.59E-05 |
| 2.2418 | 2.2418 | 7.35E-05 |
| 2.2402 | 2.2402 | 6.80E-05 |
| 2.2386 | 2.2386 | 9.41E-05 |
| 2.2371 | 2.2371 | 1.20E-04 |
| 2.2355 | 2.2355 | 1.66E-05 |

Universidad Industrial de Santander

ANEXO C. COEFICIENTE DE ABSORCIÓN SnS2-Bi203a

| coeficiente de absorción SnS2-Bi203a | | |
|---|---|---|
| **T- GMS&ES** | **T-software** | **Error %** |
| 324619.4795 | 353429.1735 | 8.87E+00 |
| 65424.2691 | 67398.8715 | 3.02E+00 |
| 60974.0543 | 62814.6200 | 3.02E+00 |
| 54689.3185 | 56339.9461 | 3.02E+00 |
| 49039.7959 | 50519.7972 | 3.02E+00 |
| 40295.1439 | 41510.5782 | 3.02E+00 |
| 34262.4265 | 35295.4881 | 3.02E+00 |
| 30638.4679 | 31562.8425 | 3.02E+00 |
| 28649.4341 | 29514.5249 | 3.02E+00 |
| 26875.3120 | 27687.9282 | 3.02E+00 |
| 25442.1883 | 26212.7664 | 3.03E+00 |
| 23506.1859 | 24219.3250 | 3.03E+00 |
| 22293.4038 | 22970.8123 | 3.04E+00 |
| 20400.8920 | 21021.7711 | 3.04E+00 |
| 18371.1586 | 18930.9617 | 3.05E+00 |
| 19076.6781 | 19657.5301 | 3.04E+00 |
| 15477.1465 | 15948.8218 | 3.05E+00 |
| 12909.5151 | 13302.6517 | 3.05E+00 |
| 11617.0107 | 11969.9877 | 3.04E+00 |
| 10176.0664 | 10484.3049 | 3.03E+00 |
| 9116.8642 | 9391.9926 | 3.02E+00 |
| 8082.6768 | 8325.5826 | 3.01E+00 |
| 7287.0477 | 7505.1237 | 2.99E+00 |
| 6767.9300 | 6969.7538 | 2.98E+00 |
| 6523.7856 | 6717.8109 | 2.97E+00 |
| 6361.4865 | 6550.3973 | 2.97E+00 |
| 6464.0220 | 6655.8949 | 2.97E+00 |
| 6598.8957 | 6794.9153 | 2.97E+00 |
| 6751.2943 | 6952.1807 | 2.98E+00 |
| 6906.2168 | 7112.2730 | 2.98E+00 |
| 7188.6546 | 7403.7905 | 2.99E+00 |
| 7371.2386 | 7592.6163 | 3.00E+00 |
| 7472.4443 | 7697.7030 | 3.01E+00 |
| 7515.0915 | 7742.5140 | 3.03E+00 |
| 7529.1556 | 7757.8826 | 3.04E+00 |
| 7448.1071 | 7675.2079 | 3.05E+00 |
| 7396.5143 | 7622.8007 | 3.06E+00 |
| 7203.5233 | 7424.5648 | 3.07E+00 |
| 7031.2781 | 7247.5822 | 3.08E+00 |
| 6817.0997 | 7027.2353 | 3.08E+00 |
| 6548.2081 | 6750.3639 | 3.09E+00 |
| 6204.7831 | 6396.5098 | 3.09E+00 |
| 6025.7375 | 6211.9164 | 3.09E+00 |
| 5774.7586 | 5953.1006 | 3.09E+00 |
| 5495.6144 | 5665.0952 | 3.08E+00 |
| 5238.4009 | 5399.6148 | 3.08E+00 |
| 4923.2673 | 5074.4278 | 3.07E+00 |
| 4688.6028 | 4832.0823 | 3.06E+00 |
| 4496.1749 | 4633.2832 | 3.05E+00 |
| 4348.6834 | 4480.7939 | 3.04E+00 |
| 4154.6929 | 4280.3974 | 3.03E+00 |
| 4006.2930 | 4127.0021 | 3.01E+00 |
| 3945.4250 | 4063.8523 | 3.00E+00 |
| 3879.0490 | 3995.0305 | 2.99E+00 |
| 3805.8271 | 3919.2262 | 2.98E+00 |
| 3764.4511 | 3876.2413 | 2.97E+00 |
| 3786.3490 | 3898.5064 | 2.96E+00 |
| 3787.6096 | 3899.5350 | 2.96E+00 |
| 3766.9906 | 3878.1127 | 2.95E+00 |
| 3787.6607 | 3899.2715 | 2.95E+00 |
| 3837.6449 | 3950.6492 | 2.94E+00 |
| 3877.1703 | 3991.2914 | 2.94E+00 |
| 3927.8316 | 4043.5065 | 2.95E+00 |
| 3929.2569 | 4045.0332 | 2.95E+00 |
| 3978.2076 | 4095.6166 | 2.95E+00 |
| 3967.7082 | 4084.9805 | 2.96E+00 |
| 4008.0202 | 4126.7083 | 2.96E+00 |
| 4000.8674 | 4119.6545 | 2.97E+00 |
| 3965.2722 | 4083.2925 | 2.98E+00 |
| 3897.8185 | 4014.1649 | 2.98E+00 |
| 3833.5309 | 3948.3069 | 2.99E+00 |
| 3767.2570 | 3880.4139 | 3.00E+00 |
| 3713.7378 | 3825.6628 | 3.01E+00 |
| 3580.6949 | 3688.9742 | 3.02E+00 |
| 3476.1023 | 3581.5787 | 3.03E+00 |

| | | |
|---|---|---|
| 3346.1614 | 3448.0581 | 3.05E+00 |
| 3192.0836 | 3289.6203 | 3.06E+00 |
| 3069.7087 | 3163.8256 | 3.07E+00 |
| 2910.3204 | 2999.8486 | 3.08E+00 |
| 2753.6952 | 2838.6771 | 3.09E+00 |
| 2604.8366 | 2685.4715 | 3.10E+00 |
| 2410.5353 | 2485.3724 | 3.10E+00 |
| 2273.8548 | 2344.6329 | 3.11E+00 |
| 2100.9844 | 2166.5109 | 3.12E+00 |
| 1980.6025 | 2042.4977 | 3.13E+00 |
| 1878.6261 | 1937.4465 | 3.13E+00 |
| 1731.3560 | 1785.6289 | 3.13E+00 |
| 1659.6502 | 1711.7106 | 3.14E+00 |
| 1574.4654 | 1623.8837 | 3.14E+00 |
| 1503.2690 | 1550.4722 | 3.14E+00 |
| 1477.1036 | 1523.4662 | 3.14E+00 |
| 1417.4210 | 1461.8819 | 3.14E+00 |
| 1350.8423 | 1393.1882 | 3.13E+00 |
| 1367.5196 | 1410.3214 | 3.13E+00 |
| 1351.2609 | 1393.4972 | 3.13E+00 |
| 1330.5797 | 1372.1033 | 3.12E+00 |
| 1434.4524 | 1479.0984 | 3.11E+00 |
| 1404.8825 | 1448.5163 | 3.11E+00 |
| 1435.2863 | 1479.7560 | 3.10E+00 |
| 1493.4737 | 1539.6279 | 3.09E+00 |
| 1544.6405 | 1592.2416 | 3.08E+00 |
| 1587.1822 | 1635.9296 | 3.07E+00 |
| 1619.5445 | 1669.1358 | 3.06E+00 |
| 1675.8591 | 1727.0149 | 3.05E+00 |
| 1719.6884 | 1772.0215 | 3.04E+00 |
| 1785.3715 | 1839.5662 | 3.04E+00 |
| 1836.2809 | 1891.8415 | 3.03E+00 |
| 1871.4130 | 1927.8587 | 3.02E+00 |
| 1925.2272 | 1983.1195 | 3.01E+00 |
| 1961.5208 | 2020.3299 | 3.00E+00 |
| 2049.0691 | 2110.3269 | 2.99E+00 |
| 2116.9427 | 2180.0817 | 2.98E+00 |
| 2164.8450 | 2229.2369 | 2.97E+00 |
| 2192.6578 | 2257.7064 | 2.97E+00 |
| 2134.9088 | 2198.0740 | 2.96E+00 |
| 2188.8476 | 2253.4845 | 2.95E+00 |
| 2189.8240 | 2254.3390 | 2.95E+00 |
| 2140.2200 | 2203.1339 | 2.94E+00 |
| 2103.3687 | 2165.0991 | 2.93E+00 |
| 2019.1283 | 2078.2597 | 2.93E+00 |
| 2005.4882 | 2064.1160 | 2.92E+00 |
| 1916.8676 | 1972.8304 | 2.92E+00 |
| 1867.6461 | 1922.0761 | 2.91E+00 |
| 1774.9559 | 1826.6308 | 2.91E+00 |
| 1719.0744 | 1769.0469 | 2.91E+00 |
| 1621.7972 | 1668.8961 | 2.90E+00 |
| 1607.0016 | 1653.6374 | 2.90E+00 |
| 1573.3665 | 1619.0197 | 2.90E+00 |
| 1544.7281 | 1589.5049 | 2.90E+00 |
| 1475.5629 | 1518.3363 | 2.90E+00 |
| 1433.4264 | 1474.9822 | 2.90E+00 |
| 1415.5044 | 1456.5258 | 2.90E+00 |
| 1378.2983 | 1418.2655 | 2.90E+00 |
| 1342.5715 | 1381.5243 | 2.90E+00 |
| 1326.9360 | 1365.4334 | 2.90E+00 |
| 1291.3433 | 1328.8549 | 2.90E+00 |
| 1310.4584 | 1348.5505 | 2.91E+00 |
| 1289.5695 | 1327.0876 | 2.91E+00 |
| 1283.6943 | 1321.0851 | 2.91E+00 |
| 1273.9368 | 1311.0897 | 2.92E+00 |
| 1311.0198 | 1349.3123 | 2.92E+00 |
| 1291.4419 | 1329.2162 | 2.92E+00 |
| 1299.9360 | 1338.0183 | 2.93E+00 |
| 1318.4780 | 1357.1732 | 2.93E+00 |
| 1314.1679 | 1352.8228 | 2.94E+00 |
| 1350.9229 | 1390.7200 | 2.95E+00 |
| 1364.2822 | 1404.5688 | 2.95E+00 |
| 1385.8821 | 1426.8736 | 2.96E+00 |
| 1430.7788 | 1473.1946 | 2.96E+00 |
| 1498.6043 | 1543.1343 | 2.97E+00 |
| 1512.1366 | 1557.1679 | 2.98E+00 |
| 1564.0753 | 1610.7628 | 2.98E+00 |
| 1608.2608 | 1656.3806 | 2.99E+00 |
| 1660.2419 | 1710.0382 | 3.00E+00 |
| 1720.3046 | 1772.0152 | 3.01E+00 |

| | | |
|---|---|---|
| 1773.2685 | 1826.6936 | 3.01E+00 |
| 1819.3477 | 1874.2893 | 3.02E+00 |
| 1890.1576 | 1947.3689 | 3.03E+00 |
| 1970.8030 | 2030.5906 | 3.03E+00 |
| 2062.0198 | 2124.7169 | 3.04E+00 |
| 2115.9339 | 2180.4149 | 3.05E+00 |
| 2230.2250 | 2298.3407 | 3.05E+00 |
| 2257.9305 | 2327.0423 | 3.06E+00 |
| 2381.4419 | 2454.4845 | 3.07E+00 |
| 2468.5196 | 2544.4030 | 3.07E+00 |
| 2552.7460 | 2631.3642 | 3.08E+00 |
| 2634.3909 | 2715.6881 | 3.09E+00 |
| 2695.8794 | 2779.2355 | 3.09E+00 |
| 2827.7286 | 2915.3200 | 3.10E+00 |
| 2941.3141 | 3032.5754 | 3.10E+00 |
| 3073.8890 | 3169.4156 | 3.11E+00 |
| 3130.2474 | 3227.6822 | 3.11E+00 |
| 3323.0256 | 3426.5996 | 3.12E+00 |
| 3419.4078 | 3526.1224 | 3.12E+00 |
| 3536.9574 | 3647.4867 | 3.12E+00 |
| 3656.2588 | 3770.6649 | 3.13E+00 |
| 3756.3071 | 3873.9861 | 3.13E+00 |
| 3901.4959 | 4023.8501 | 3.14E+00 |
| 4005.8083 | 4131.5993 | 3.14E+00 |
| 4135.0055 | 4264.9697 | 3.14E+00 |
| 4221.3595 | 4354.1575 | 3.15E+00 |
| 4333.1177 | 4469.5329 | 3.15E+00 |
| 4423.9714 | 4563.3328 | 3.15E+00 |
| 4541.5542 | 4684.7165 | 3.15E+00 |
| 4637.8184 | 4784.1309 | 3.15E+00 |
| 4812.8632 | 4964.7514 | 3.16E+00 |
| 4839.2043 | 4991.9993 | 3.16E+00 |
| 4944.7126 | 5100.8939 | 3.16E+00 |
| 5053.7012 | 5213.3727 | 3.16E+00 |
| 5139.3354 | 5301.7620 | 3.16E+00 |
| 5227.9335 | 5393.1968 | 3.16E+00 |
| 5319.6551 | 5487.8452 | 3.16E+00 |
| 5358.1559 | 5527.6053 | 3.16E+00 |
| 5427.0800 | 5598.7272 | 3.16E+00 |
| 5440.8391 | 5612.9584 | 3.16E+00 |
| 5543.8232 | 5719.1847 | 3.16E+00 |
| 5591.1239 | 5767.9786 | 3.16E+00 |
| 5580.7495 | 5757.2895 | 3.16E+00 |
| 5541.3999 | 5716.7148 | 3.16E+00 |
| 5624.6055 | 5802.5061 | 3.16E+00 |
| 5649.3439 | 5827.9994 | 3.16E+00 |

ANEXO D. ÍNDICE DE REFRACCIÓN SnS2-Bi204a

| índice de refracción SnS2-Bi204a | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 3.5340 | 3.5340 | 1.21E-04 |
| 3.5168 | 3.5168 | 1.31E-04 |
| 3.5000 | 3.5000 | 1.31E-04 |
| 3.4835 | 3.4835 | 5.57E-05 |
| 3.4674 | 3.4674 | 8.01E-05 |
| 3.4516 | 3.4516 | 5.17E-06 |
| 3.4361 | 3.4361 | 3.42E-05 |
| 3.4209 | 3.4209 | 8.78E-05 |
| 3.4060 | 3.4061 | 2.47E-05 |
| 3.3915 | 3.3915 | 1.57E-05 |
| 3.3772 | 3.3772 | 0.00E+00 |
| 3.3632 | 3.3632 | 9.19E-05 |
| 3.3495 | 3.3495 | 3.97E-05 |
| 3.3361 | 3.3361 | 7.35E-05 |
| 3.3229 | 3.3229 | 1.45E-04 |
| 3.3100 | 3.3100 | 1.09E-04 |
| 3.2973 | 3.2973 | 1.27E-04 |
| 3.2848 | 3.2849 | 9.92E-05 |
| 3.2726 | 3.2726 | 9.53E-05 |
| 3.2607 | 3.2607 | 2.98E-05 |
| 3.2489 | 3.2489 | 3.85E-05 |
| 3.2374 | 3.2374 | 1.01E-04 |
| 3.2261 | 3.2261 | 7.36E-05 |
| 3.2150 | 3.2150 | 1.18E-04 |
| 3.2040 | 3.2041 | 8.08E-05 |
| 3.1933 | 3.1933 | 1.14E-04 |

| | | |
|---|---|---|
| 3.1828 | 3.1828 | 5.33E-05 |
| 3.1725 | 3.1725 | 4.33E-05 |
| 3.1623 | 3.1623 | 9.03E-05 |
| 3.1524 | 3.1524 | 1.06E-04 |
| 3.1426 | 3.1426 | 1.33E-04 |
| 3.1330 | 3.1330 | 1.20E-04 |
| 3.1235 | 3.1235 | 1.27E-04 |
| 3.1142 | 3.1142 | 1.57E-04 |
| 3.1051 | 3.1051 | 1.30E-04 |
| 3.0961 | 3.0961 | 9.23E-05 |
| 3.0873 | 3.0873 | 7.36E-05 |
| 3.0786 | 3.0786 | 2.49E-05 |
| 3.0701 | 3.0701 | 1.63E-04 |
| 3.0617 | 3.0617 | 5.62E-05 |
| 3.0535 | 3.0535 | 7.28E-05 |
| 3.0454 | 3.0454 | 3.14E-06 |
| 3.0374 | 3.0374 | 1.42E-04 |
| 3.0296 | 3.0296 | 5.46E-05 |
| 3.0218 | 3.0218 | 1.60E-04 |
| 3.0142 | 3.0142 | 1.15E-04 |
| 3.0068 | 3.0068 | 1.29E-04 |
| 2.9994 | 2.9994 | 1.27E-04 |
| 2.9922 | 2.9922 | 2.41E-05 |
| 2.9851 | 2.9851 | 7.15E-05 |
| 2.9781 | 2.9781 | 1.46E-04 |
| 2.9712 | 2.9712 | 3.60E-05 |
| 2.9644 | 2.9644 | 1.05E-05 |
| 2.9577 | 2.9577 | 1.45E-04 |
| 2.9511 | 2.9511 | 1.63E-04 |
| 2.9446 | 2.9446 | 1.67E-04 |
| 2.9383 | 2.9383 | 1.34E-04 |
| 2.9320 | 2.9320 | 3.89E-06 |
| 2.9258 | 2.9258 | 2.76E-05 |
| 2.9197 | 2.9197 | 1.64E-04 |
| 2.9137 | 2.9137 | 0.00E+00 |
| 2.9078 | 2.9078 | 1.58E-04 |
| 2.9019 | 2.9019 | 1.09E-04 |
| 2.8962 | 2.8962 | 1.72E-04 |
| 2.8905 | 2.8905 | 9.10E-05 |
| 2.8850 | 2.8850 | 8.12E-05 |
| 2.8795 | 2.8795 | 5.87E-05 |
| 2.8741 | 2.8741 | 1.29E-04 |
| 2.8687 | 2.8687 | 1.04E-04 |
| 2.8635 | 2.8635 | 1.14E-04 |
| 2.8583 | 2.8583 | 5.00E-05 |
| 2.8532 | 2.8532 | 1.15E-05 |
| 2.8481 | 2.8481 | 2.75E-06 |
| 2.8432 | 2.8432 | 4.57E-05 |
| 2.8383 | 2.8383 | 7.09E-05 |
| 2.8334 | 2.8334 | 3.28E-05 |
| 2.8287 | 2.8287 | 1.13E-04 |
| 2.8240 | 2.8240 | 5.80E-05 |
| 2.8193 | 2.8193 | 1.58E-04 |
| 2.8148 | 2.8148 | 1.37E-04 |
| 2.8102 | 2.8103 | 1.62E-04 |
| 2.8058 | 2.8058 | 6.72E-05 |
| 2.8014 | 2.8014 | 2.63E-05 |
| 2.7971 | 2.7971 | 8.05E-05 |
| 2.7928 | 2.7928 | 5.75E-05 |
| 2.7886 | 2.7886 | 7.97E-05 |
| 2.7844 | 2.7844 | 8.61E-06 |
| 2.7803 | 2.7803 | 1.23E-04 |
| 2.7763 | 2.7763 | 9.88E-05 |
| 2.7723 | 2.7723 | 3.15E-05 |
| 2.7683 | 2.7684 | 1.26E-04 |
| 2.7645 | 2.7645 | 1.17E-04 |
| 2.7606 | 2.7606 | 8.18E-06 |
| 2.7568 | 2.7568 | 1.24E-04 |
| 2.7531 | 2.7531 | 5.33E-05 |
| 2.7494 | 2.7494 | 1.48E-04 |
| 2.7457 | 2.7457 | 1.30E-04 |
| 2.7421 | 2.7421 | 3.05E-05 |
| 2.7386 | 2.7386 | 3.97E-06 |
| 2.7350 | 2.7351 | 1.60E-04 |
| 2.7316 | 2.7316 | 1.83E-04 |
| 2.7281 | 2.7282 | 9.24E-05 |
| 2.7248 | 2.7248 | 8.66E-05 |
| 2.7214 | 2.7214 | 3.88E-05 |
| 2.7181 | 2.7181 | 1.27E-04 |
| 2.7149 | 2.7149 | 1.66E-04 |

| | | |
|---|---|---|
| 2.7116 | 2.7116 | 8.05E-05 |
| 2.7084 | 2.7085 | 4.04E-05 |
| 2.7053 | 2.7053 | 1.50E-04 |
| 2.7022 | 2.7022 | 1.10E-04 |
| 2.6991 | 2.6991 | 1.04E-04 |
| 2.6961 | 2.6961 | 1.48E-04 |
| 2.6931 | 2.6931 | 1.18E-04 |
| 2.6901 | 2.6901 | 1.81E-04 |
| 2.6872 | 2.6872 | 6.18E-05 |
| 2.6843 | 2.6843 | 1.52E-04 |
| 2.6815 | 2.6815 | 9.98E-05 |
| 2.6786 | 2.6786 | 7.60E-05 |
| 2.6758 | 2.6758 | 1.74E-05 |
| 2.6731 | 2.6731 | 2.55E-05 |
| 2.6704 | 2.6704 | 3.32E-05 |
| 2.6677 | 2.6677 | 1.41E-04 |
| 2.6650 | 2.6650 | 9.55E-05 |
| 2.6624 | 2.6624 | 5.66E-05 |
| 2.6597 | 2.6598 | 1.71E-04 |
| 2.6572 | 2.6572 | 4.33E-05 |
| 2.6546 | 2.6546 | 4.71E-05 |
| 2.6521 | 2.6521 | 8.38E-05 |
| 2.6496 | 2.6496 | 5.05E-05 |
| 2.6471 | 2.6472 | 6.86E-05 |
| 2.6447 | 2.6447 | 8.87E-05 |
| 2.6423 | 2.6423 | 1.30E-04 |
| 2.6399 | 2.6399 | 3.87E-05 |
| 2.6376 | 2.6376 | 1.80E-04 |
| 2.6352 | 2.6352 | 1.61E-04 |
| 2.6329 | 2.6329 | 3.45E-05 |
| 2.6306 | 2.6307 | 3.95E-05 |
| 2.6284 | 2.6284 | 1.32E-04 |
| 2.6262 | 2.6262 | 8.74E-05 |
| 2.6240 | 2.6240 | 1.88E-04 |
| 2.6218 | 2.6218 | 5.45E-05 |
| 2.6196 | 2.6196 | 4.08E-05 |
| 2.6175 | 2.6175 | 1.40E-04 |
| 2.6154 | 2.6154 | 4.38E-05 |
| 2.6133 | 2.6133 | 1.39E-04 |
| 2.6112 | 2.6112 | 1.59E-04 |

| | | |
|---|---|---|
| 2.6091 | 2.6092 | 1.14E-04 |
| 2.6071 | 2.6071 | 1.68E-05 |
| 2.6051 | 2.6051 | 1.23E-04 |
| 2.6031 | 2.6031 | 9.15E-05 |
| 2.6012 | 2.6012 | 9.78E-05 |
| 2.5992 | 2.5992 | 8.86E-05 |
| 2.5973 | 2.5973 | 1.08E-04 |
| 2.5954 | 2.5954 | 9.37E-05 |
| 2.5935 | 2.5935 | 6.74E-05 |
| 2.5916 | 2.5916 | 1.90E-04 |
| 2.5898 | 2.5898 | 1.05E-04 |
| 2.5880 | 2.5880 | 7.20E-05 |
| 2.5861 | 2.5862 | 1.02E-04 |
| 2.5844 | 2.5844 | 1.83E-04 |
| 2.5826 | 2.5826 | 0.00E+00 |
| 2.5808 | 2.5808 | 1.13E-04 |
| 2.5791 | 2.5791 | 1.27E-04 |
| 2.5774 | 2.5774 | 3.17E-05 |
| 2.5757 | 2.5757 | 1.81E-04 |
| 2.5740 | 2.5740 | 1.32E-04 |
| 2.5723 | 2.5723 | 1.71E-04 |
| 2.5706 | 2.5706 | 5.86E-05 |
| 2.5690 | 2.5690 | 5.06E-05 |
| 2.5674 | 2.5674 | 1.87E-04 |
| 2.5658 | 2.5658 | 1.33E-04 |
| 2.5642 | 2.5642 | 1.51E-04 |
| 2.5626 | 2.5626 | 1.39E-04 |
| 2.5610 | 2.5610 | 1.61E-04 |
| 2.5595 | 2.5595 | 1.30E-04 |
| 2.5580 | 2.5580 | 1.55E-04 |
| 2.5564 | 2.5564 | 1.65E-04 |
| 2.5549 | 2.5549 | 7.58E-05 |
| 2.5534 | 2.5534 | 8.84E-05 |
| 2.5520 | 2.5520 | 1.35E-04 |
| 2.5505 | 2.5505 | 1.84E-04 |
| 2.5491 | 2.5491 | 1.39E-04 |
| 2.5476 | 2.5476 | 6.61E-05 |
| 2.5462 | 2.5462 | 8.85E-06 |
| 2.5448 | 2.5448 | 7.49E-05 |
| 2.5434 | 2.5434 | 1.35E-04 |

| | | |
|---|---|---|
| 2.5420 | 2.5420 | 1.59E-04 |
| 2.5406 | 2.5406 | 1.65E-04 |
| 2.5393 | 2.5393 | 1.24E-04 |
| 2.5379 | 2.5379 | 7.36E-05 |
| 2.5366 | 2.5366 | 3.58E-05 |
| 2.5353 | 2.5353 | 6.41E-05 |
| 2.5340 | 2.5340 | 1.67E-05 |
| 2.5327 | 2.5327 | 1.01E-04 |
| 2.5314 | 2.5314 | 1.12E-04 |
| 2.5301 | 2.5301 | 1.29E-04 |
| 2.5289 | 2.5289 | 2.82E-05 |
| 2.5276 | 2.5276 | 2.40E-05 |
| 2.5264 | 2.5264 | 3.31E-05 |
| 2.5251 | 2.5251 | 4.22E-06 |
| 2.5239 | 2.5239 | 5.76E-05 |
| 2.5227 | 2.5227 | 1.47E-04 |
| 2.5215 | 2.5215 | 1.36E-04 |
| 2.5203 | 2.5203 | 5.69E-06 |
| 2.5192 | 2.5192 | 1.38E-04 |
| 2.5180 | 2.5180 | 1.06E-04 |
| 2.5168 | 2.5168 | 5.08E-05 |
| 2.5157 | 2.5157 | 1.91E-04 |
| 2.5145 | 2.5146 | 4.02E-05 |
| 2.5134 | 2.5134 | 1.01E-04 |
| 2.5123 | 2.5123 | 1.71E-04 |
| 2.5112 | 2.5112 | 6.25E-05 |
| 2.5101 | 2.5101 | 2.26E-05 |
| 2.5090 | 2.5090 | 8.07E-05 |
| 2.5079 | 2.5079 | 1.07E-04 |
| 2.5069 | 2.5069 | 9.84E-05 |
| 2.5058 | 2.5058 | 4.99E-05 |
| 2.5047 | 2.5048 | 4.24E-05 |
| 2.5037 | 2.5037 | 1.83E-04 |
| 2.5027 | 2.5027 | 2.52E-05 |
| 2.5016 | 2.5016 | 1.78E-04 |

ANEXO E. COEFICIENTE DE ABSORCIÓN SnS2-Bi204a

| coeficiente de absorción SnS2-Bi204a | | |
|---|---|---|
| **T- GMS&ES** | **T-software** | **Error %** |
| 297322.9347 | 234155.9742 | 2.12E+01 |
| 63994.6172 | 66351.0607 | 3.68E+00 |
| 44618.6028 | 46261.1234 | 3.68E+00 |
| 37719.1690 | 39106.6071 | 3.68E+00 |
| 30112.7168 | 31219.6699 | 3.68E+00 |
| 24930.2676 | 25846.4436 | 3.67E+00 |
| 21842.7251 | 22645.8042 | 3.68E+00 |
| 20202.7643 | 20946.5784 | 3.68E+00 |
| 19512.3464 | 20231.9119 | 3.69E+00 |
| 18684.1612 | 19374.4453 | 3.69E+00 |
| 18196.4886 | 18869.9924 | 3.70E+00 |
| 17407.7339 | 18053.0222 | 3.71E+00 |
| 16813.9752 | 17438.1152 | 3.71E+00 |
| 16944.1891 | 17573.4329 | 3.71E+00 |
| 15832.5128 | 16420.7571 | 3.72E+00 |
| 13763.6368 | 14275.3031 | 3.72E+00 |
| 12437.2358 | 12899.3618 | 3.72E+00 |
| 11316.2189 | 11736.1247 | 3.71E+00 |
| 10243.3822 | 10622.6684 | 3.70E+00 |
| 9197.7641 | 9537.3783 | 3.69E+00 |
| 8163.3642 | 8463.8049 | 3.68E+00 |
| 7238.8419 | 7504.2889 | 3.67E+00 |
| 6448.8624 | 6684.4565 | 3.65E+00 |
| 5849.0130 | 6061.9821 | 3.64E+00 |
| 5504.3348 | 5704.2102 | 3.63E+00 |
| 5212.2435 | 5401.1370 | 3.62E+00 |
| 5127.3365 | 5312.9957 | 3.62E+00 |
| 5089.6382 | 5273.9282 | 3.62E+00 |
| 5174.4988 | 5362.0609 | 3.62E+00 |
| 5195.8170 | 5384.4768 | 3.63E+00 |
| 5394.2972 | 5590.6428 | 3.64E+00 |
| 5507.4024 | 5708.4620 | 3.65E+00 |
| 5587.5317 | 5792.1963 | 3.66E+00 |
| 5662.1113 | 5870.2075 | 3.68E+00 |
| 5723.2810 | 5934.3877 | 3.69E+00 |

| | | |
|---|---|---|
| 5689.3381 | 5899.9490 | 3.70E+00 |
| 5630.7270 | 5839.9109 | 3.72E+00 |
| 5539.8965 | 5746.3727 | 3.73E+00 |
| 5435.5878 | 5638.7640 | 3.74E+00 |
| 5267.6165 | 5465.0655 | 3.75E+00 |
| 5077.9788 | 5268.7339 | 3.76E+00 |
| 4916.7127 | 5101.7074 | 3.76E+00 |
| 4723.7082 | 4901.6332 | 3.77E+00 |
| 4544.7482 | 4715.9912 | 3.77E+00 |
| 4331.0221 | 4494.1907 | 3.77E+00 |
| 4124.8341 | 4280.1151 | 3.76E+00 |
| 3937.0074 | 4085.0323 | 3.76E+00 |
| 3737.3552 | 3877.5931 | 3.75E+00 |
| 3609.8850 | 3745.0103 | 3.74E+00 |
| 3396.3981 | 3523.1622 | 3.73E+00 |
| 3262.0480 | 3383.4114 | 3.72E+00 |
| 3082.7414 | 3197.0185 | 3.71E+00 |
| 2986.1548 | 3096.4704 | 3.69E+00 |
| 2802.6024 | 2905.7246 | 3.68E+00 |
| 2701.5719 | 2800.6085 | 3.67E+00 |
| 2678.6300 | 2776.4599 | 3.65E+00 |
| 2492.5342 | 2583.2400 | 3.64E+00 |
| 2535.1804 | 2627.1641 | 3.63E+00 |
| 2420.7311 | 2508.2914 | 3.62E+00 |
| 2441.5394 | 2529.6404 | 3.61E+00 |
| 2415.2040 | 2502.1850 | 3.60E+00 |
| 2437.8410 | 2525.5027 | 3.60E+00 |
| 2469.5534 | 2558.2642 | 3.59E+00 |
| 2477.6501 | 2566.5802 | 3.59E+00 |
| 2537.2115 | 2628.2547 | 3.59E+00 |
| 2585.9976 | 2678.8221 | 3.59E+00 |
| 2619.3528 | 2713.4570 | 3.59E+00 |
| 2612.0595 | 2705.9790 | 3.60E+00 |
| 2662.7653 | 2758.6621 | 3.60E+00 |
| 2717.3621 | 2815.4205 | 3.61E+00 |
| 2732.0411 | 2830.8406 | 3.62E+00 |
| 2756.5308 | 2856.4591 | 3.63E+00 |
| 2766.5331 | 2867.0891 | 3.63E+00 |
| 2693.8714 | 2792.0576 | 3.64E+00 |
| 2664.6621 | 2762.0730 | 3.66E+00 |

| | | |
|---|---|---|
| 2655.9865 | 2753.3829 | 3.67E+00 |
| 2589.2385 | 2684.4891 | 3.68E+00 |
| 2539.1011 | 2632.8127 | 3.69E+00 |
| 2445.5083 | 2536.0609 | 3.70E+00 |
| 2338.9074 | 2425.8013 | 3.72E+00 |
| 2220.6930 | 2303.4592 | 3.73E+00 |
| 2139.1120 | 2219.0913 | 3.74E+00 |
| 2006.4104 | 2081.6585 | 3.75E+00 |
| 1871.9624 | 1942.3777 | 3.76E+00 |
| 1757.4864 | 1823.7785 | 3.77E+00 |
| 1601.8612 | 1662.4583 | 3.78E+00 |
| 1513.8758 | 1571.2727 | 3.79E+00 |
| 1395.7650 | 1448.7967 | 3.80E+00 |
| 1229.6692 | 1276.4793 | 3.81E+00 |
| 1177.8914 | 1222.8091 | 3.81E+00 |
| 1068.7850 | 1109.5826 | 3.82E+00 |
| 987.8491 | 1025.5807 | 3.82E+00 |
| 895.5570 | 929.7892 | 3.82E+00 |
| 842.2770 | 874.4789 | 3.82E+00 |
| 809.7621 | 840.7379 | 3.83E+00 |
| 775.2258 | 804.8562 | 3.82E+00 |
| 794.7727 | 825.1187 | 3.82E+00 |
| 787.8417 | 817.9011 | 3.82E+00 |
| 780.9141 | 810.6555 | 3.81E+00 |
| 773.2873 | 802.7030 | 3.80E+00 |
| 796.0170 | 826.2255 | 3.79E+00 |
| 850.5473 | 882.7647 | 3.79E+00 |
| 837.2552 | 868.9086 | 3.78E+00 |
| 887.1170 | 920.5454 | 3.77E+00 |
| 932.8582 | 967.9236 | 3.76E+00 |
| 1008.0637 | 1045.8544 | 3.75E+00 |
| 1040.8900 | 1079.8033 | 3.74E+00 |
| 1136.6948 | 1179.0686 | 3.73E+00 |
| 1150.3883 | 1193.1438 | 3.72E+00 |
| 1188.7045 | 1232.7533 | 3.71E+00 |
| 1323.6580 | 1372.5607 | 3.69E+00 |
| 1335.5413 | 1384.7363 | 3.68E+00 |
| 1441.6859 | 1494.6407 | 3.67E+00 |
| 1459.4405 | 1512.8886 | 3.66E+00 |
| 1496.9948 | 1551.6909 | 3.65E+00 |

| | | |
|---|---|---|
| 1447.2474 | 1499.9739 | 3.64E+00 |
| 1348.2380 | 1397.2186 | 3.63E+00 |
| 1372.4576 | 1422.1870 | 3.62E+00 |
| 1346.1874 | 1394.8636 | 3.62E+00 |
| 1272.0530 | 1317.9292 | 3.61E+00 |
| 1216.9330 | 1260.7092 | 3.60E+00 |
| 1148.3926 | 1189.6071 | 3.59E+00 |
| 1097.6509 | 1136.9721 | 3.58E+00 |
| 1033.9027 | 1070.8596 | 3.57E+00 |
| 986.6271 | 1021.8495 | 3.57E+00 |
| 899.1258 | 931.1564 | 3.56E+00 |
| 908.6212 | 940.9370 | 3.56E+00 |
| 824.6242 | 853.9185 | 3.55E+00 |
| 806.0114 | 834.6018 | 3.55E+00 |
| 749.3462 | 775.9029 | 3.54E+00 |
| 728.1236 | 753.9066 | 3.54E+00 |
| 693.2285 | 717.7716 | 3.54E+00 |
| 689.1500 | 713.5272 | 3.54E+00 |
| 670.0452 | 693.7346 | 3.54E+00 |
| 657.0976 | 680.3368 | 3.54E+00 |
| 649.0000 | 671.9656 | 3.54E+00 |
| 663.6271 | 687.0925 | 3.54E+00 |
| 697.9867 | 722.7026 | 3.54E+00 |
| 677.7363 | 701.7262 | 3.54E+00 |
| 693.7769 | 718.3778 | 3.55E+00 |

ANEXO F. ÍNDICE DE REFRACCIÓN SnS2-Bi206a

| índice de refracción SnS2-Bi206a | | |
|---|---|---|
| **T-GMS&ES** | **T-software** | **Error %** |
| 5.3926 | 5.3926 | 1.14E-05 |
| 5.3337 | 5.3337 | 4.69E-05 |
| 5.2761 | 5.2761 | 8.49E-05 |
| 5.2197 | 5.2197 | 1.51E-05 |
| 5.1645 | 5.1645 | 3.71E-05 |
| 5.1104 | 5.1104 | 8.19E-05 |
| 5.0574 | 5.0574 | 3.97E-05 |
| 5.0055 | 5.0055 | 1.06E-05 |
| 4.9546 | 4.9546 | 8.40E-06 |
| 4.9048 | 4.9048 | 5.79E-06 |
| 4.8559 | 4.8559 | 9.15E-05 |
| 4.8081 | 4.8081 | 8.66E-05 |
| 4.7611 | 4.7611 | 1.92E-05 |
| 4.7151 | 4.7151 | 7.33E-06 |
| 4.6700 | 4.6700 | 8.12E-05 |
| 4.6257 | 4.6257 | 3.22E-05 |
| 4.5823 | 4.5823 | 3.41E-05 |
| 4.5397 | 4.5397 | 3.10E-05 |
| 4.4980 | 4.4980 | 6.29E-05 |
| 4.4570 | 4.4570 | 3.04E-05 |
| 4.4168 | 4.4168 | 8.49E-05 |
| 4.3773 | 4.3773 | 2.31E-05 |
| 4.3385 | 4.3385 | 1.05E-04 |
| 4.3005 | 4.3005 | 2.33E-05 |
| 4.2632 | 4.2632 | 6.78E-05 |
| 4.2265 | 4.2265 | 4.98E-05 |
| 4.1905 | 4.1905 | 5.44E-05 |
| 4.1551 | 4.1551 | 4.37E-05 |
| 4.1204 | 4.1204 | 4.40E-05 |
| 4.0863 | 4.0863 | 7.03E-05 |
| 4.0528 | 4.0528 | 5.38E-05 |
| 4.0198 | 4.0198 | 2.41E-05 |
| 3.9875 | 3.9875 | 7.30E-05 |
| 3.9557 | 3.9557 | 9.47E-05 |
| 3.9244 | 3.9244 | 9.58E-05 |
| 3.8937 | 3.8937 | 1.05E-05 |
| 3.8635 | 3.8635 | 8.66E-05 |
| 3.8338 | 3.8338 | 8.37E-05 |
| 3.8047 | 3.8047 | 3.57E-05 |
| 3.7760 | 3.7760 | 4.86E-05 |
| 3.7477 | 3.7477 | 5.27E-05 |
| 3.7200 | 3.7200 | 3.88E-05 |
| 3.6927 | 3.6927 | 3.67E-05 |
| 3.6658 | 3.6658 | 1.15E-05 |
| 3.6394 | 3.6394 | 1.08E-04 |
| 3.6134 | 3.6134 | 2.95E-05 |
| 3.5879 | 3.5879 | 5.57E-06 |

| | | |
|---|---|---|
| 3.5627 | 3.5627 | 6.49E-06 |
| 3.5380 | 3.5380 | 4.48E-06 |
| 3.5136 | 3.5136 | 7.16E-05 |
| 3.4896 | 3.4896 | 3.97E-05 |
| 3.4660 | 3.4660 | 1.26E-05 |
| 3.4428 | 3.4428 | 5.04E-06 |
| 3.4199 | 3.4199 | 6.49E-06 |
| 3.3973 | 3.3973 | 9.34E-05 |
| 3.3752 | 3.3752 | 5.34E-05 |
| 3.3533 | 3.3533 | 2.76E-05 |
| 3.3318 | 3.3318 | 5.60E-05 |
| 3.3106 | 3.3106 | 6.93E-05 |
| 3.2898 | 3.2898 | 1.51E-04 |
| 3.2692 | 3.2692 | 1.36E-14 |
| 3.2490 | 3.2490 | 3.06E-05 |
| 3.2290 | 3.2290 | 6.10E-05 |
| 3.2093 | 3.2094 | 9.24E-05 |
| 3.1900 | 3.1900 | 1.35E-05 |
| 3.1709 | 3.1709 | 1.09E-04 |
| 3.1521 | 3.1521 | 2.72E-06 |
| 3.1336 | 3.1336 | 1.54E-04 |
| 3.1153 | 3.1153 | 9.21E-05 |
| 3.0973 | 3.0973 | 2.17E-05 |
| 3.0795 | 3.0795 | 2.72E-05 |
| 3.0620 | 3.0620 | 9.06E-05 |
| 3.0448 | 3.0448 | 5.71E-05 |
| 3.0278 | 3.0278 | 1.02E-04 |
| 3.0110 | 3.0110 | 7.80E-05 |
| 2.9945 | 2.9945 | 1.65E-04 |
| 2.9782 | 2.9782 | 1.03E-04 |
| 2.9621 | 2.9621 | 1.26E-04 |
| 2.9462 | 2.9462 | 4.60E-05 |
| 2.9306 | 2.9306 | 1.44E-04 |
| 2.9151 | 2.9151 | 1.05E-04 |
| 2.8999 | 2.8999 | 2.20E-05 |
| 2.8849 | 2.8849 | 3.21E-05 |
| 2.8701 | 2.8701 | 1.42E-04 |
| 2.8555 | 2.8555 | 1.67E-04 |
| 2.8410 | 2.8410 | 3.04E-05 |
| 2.8268 | 2.8268 | 8.67E-05 |
| 2.8128 | 2.8128 | 6.84E-05 |
| 2.7989 | 2.7989 | 2.52E-05 |
| 2.7852 | 2.7852 | 2.43E-05 |
| 2.7717 | 2.7717 | 4.71E-05 |
| 2.7584 | 2.7584 | 6.11E-05 |
| 2.7452 | 2.7452 | 1.23E-04 |
| 2.7322 | 2.7322 | 2.19E-05 |
| 2.7194 | 2.7194 | 2.56E-05 |
| 2.7068 | 2.7068 | 1.52E-04 |
| 2.6943 | 2.6943 | 7.22E-05 |
| 2.6819 | 2.6819 | 5.49E-06 |
| 2.6697 | 2.6698 | 1.18E-04 |
| 2.6577 | 2.6577 | 1.34E-04 |
| 2.6458 | 2.6458 | 1.47E-04 |
| 2.6341 | 2.6341 | 1.27E-04 |
| 2.6225 | 2.6225 | 1.62E-04 |
| 2.6111 | 2.6111 | 3.47E-05 |
| 2.5998 | 2.5998 | 1.35E-04 |
| 2.5886 | 2.5886 | 8.04E-06 |
| 2.5776 | 2.5776 | 6.74E-06 |
| 2.5667 | 2.5667 | 1.23E-04 |
| 2.5559 | 2.5559 | 7.78E-05 |
| 2.5453 | 2.5453 | 9.11E-05 |
| 2.5348 | 2.5348 | 1.58E-04 |
| 2.5244 | 2.5244 | 4.07E-05 |
| 2.5141 | 2.5141 | 5.63E-05 |
| 2.5040 | 2.5040 | 1.29E-04 |
| 2.4940 | 2.4940 | 1.82E-04 |
| 2.4841 | 2.4841 | 1.40E-04 |
| 2.4743 | 2.4743 | 7.18E-05 |
| 2.4646 | 2.4646 | 1.23E-04 |
| 2.4550 | 2.4551 | 8.31E-05 |
| 2.4456 | 2.4456 | 2.22E-05 |
| 2.4363 | 2.4363 | 9.72E-06 |
| 2.4270 | 2.4270 | 1.15E-04 |
| 2.4179 | 2.4179 | 7.71E-06 |
| 2.4089 | 2.4089 | 1.22E-04 |
| 2.4000 | 2.4000 | 1.55E-04 |
| 2.3911 | 2.3911 | 1.54E-04 |
| 2.3824 | 2.3824 | 1.84E-04 |

| | | |
|---|---|---|
| 2.3738 | 2.3738 | 1.15E-04 |
| 2.3653 | 2.3653 | 1.61E-04 |
| 2.3568 | 2.3568 | 1.93E-04 |
| 2.3485 | 2.3485 | 1.52E-04 |
| 2.3403 | 2.3403 | 1.91E-05 |
| 2.3321 | 2.3321 | 2.04E-04 |
| 2.3240 | 2.3240 | 2.19E-05 |
| 2.3161 | 2.3161 | 8.16E-05 |
| 2.3082 | 2.3082 | 5.01E-05 |
| 2.3004 | 2.3004 | 1.72E-04 |
| 2.2926 | 2.2926 | 2.05E-04 |
| 2.2850 | 2.2850 | 9.94E-05 |
| 2.2774 | 2.2774 | 9.37E-05 |
| 2.2700 | 2.2700 | 1.17E-04 |
| 2.2626 | 2.2626 | 9.81E-05 |
| 2.2553 | 2.2553 | 1.94E-04 |
| 2.2480 | 2.2480 | 1.58E-04 |
| 2.2409 | 2.2409 | 1.62E-04 |
| 2.2338 | 2.2338 | 1.77E-04 |
| 2.2268 | 2.2268 | 1.21E-04 |
| 2.2198 | 2.2198 | 1.14E-04 |
| 2.2129 | 2.2129 | 2.04E-04 |
| 2.2061 | 2.2062 | 1.05E-04 |
| 2.1994 | 2.1994 | 4.76E-05 |
| 2.1928 | 2.1928 | 1.66E-04 |
| 2.1862 | 2.1862 | 2.06E-04 |
| 2.1797 | 2.1797 | 1.25E-04 |
| 2.1732 | 2.1732 | 1.21E-04 |

ANEXO G. COEFICIENTE DE ABSORCIÓN SnS2-Bi206a

| coeficiente de absorción SnS2-Bi206a | | |
|---|---|---|
| **T-GMS&ES** | **T-software** | **Error %** |
| 90904.5244 | 96009.4448 | 5.62E+00 |
| 66375.2210 | 70109.4385 | 5.63E+00 |
| 47966.5653 | 50669.1844 | 5.63E+00 |
| 31339.5108 | 33106.1634 | 5.64E+00 |
| 16279.9604 | 17195.1451 | 5.62E+00 |
| 8818.2633 | 9310.0458 | 5.58E+00 |
| 1477.3253 | 1558.6036 | 5.50E+00 |
| 471.3498 | 497.0555 | 5.45E+00 |
| 1382.0890 | 1457.2353 | 5.44E+00 |
| 2928.6882 | 3087.9557 | 5.44E+00 |
| 4580.3122 | 4830.4615 | 5.46E+00 |
| 6466.9394 | 6822.3244 | 5.50E+00 |
| 8027.8542 | 8472.1368 | 5.53E+00 |
| 9186.1717 | 9698.2286 | 5.57E+00 |
| 9797.6595 | 10347.9024 | 5.62E+00 |
| 10303.1502 | 10885.9626 | 5.66E+00 |
| 10323.1604 | 10911.1815 | 5.70E+00 |
| 10074.4243 | 10651.9645 | 5.73E+00 |
| 9749.9637 | 10311.8919 | 5.76E+00 |
| 9169.3712 | 9700.1768 | 5.79E+00 |
| 8616.8563 | 9117.1893 | 5.81E+00 |
| 8049.5600 | 8517.5174 | 5.81E+00 |
| 7401.9823 | 7832.1808 | 5.81E+00 |
| 7235.5918 | 7654.9476 | 5.80E+00 |
| 6831.5740 | 7225.9660 | 5.77E+00 |
| 6423.1083 | 6791.9803 | 5.74E+00 |
| 5996.5021 | 6338.6746 | 5.71E+00 |
| 5961.7776 | 6299.5094 | 5.66E+00 |
| 5781.0778 | 6106.1230 | 5.62E+00 |
| 5549.4069 | 5859.1290 | 5.58E+00 |
| 5366.7815 | 5664.1096 | 5.54E+00 |
| 5138.6957 | 5421.4801 | 5.50E+00 |
| 5045.5826 | 5321.6510 | 5.47E+00 |
| 4759.9533 | 5019.0792 | 5.44E+00 |
| 4675.1087 | 4928.6710 | 5.42E+00 |
| 4552.3656 | 4798.6474 | 5.41E+00 |
| 4500.7333 | 4743.8839 | 5.40E+00 |
| 4386.2321 | 4623.2403 | 5.40E+00 |
| 4329.8986 | 4564.1568 | 5.41E+00 |
| 4244.1574 | 4474.3139 | 5.42E+00 |
| 4199.4198 | 4427.9419 | 5.44E+00 |
| 4020.2978 | 4239.9626 | 5.46E+00 |
| 3891.0265 | 4104.6985 | 5.49E+00 |
| 3654.7953 | 3856.6195 | 5.52E+00 |
| 3366.0480 | 3553.0962 | 5.56E+00 |

| | | |
|---|---|---|
| 2977.0475 | 3143.5746 | 5.59E+00 |
| 2585.5884 | 2731.2326 | 5.63E+00 |
| 2044.5911 | 2160.6116 | 5.67E+00 |
| 1506.5090 | 1592.6108 | 5.72E+00 |
| 909.1039 | 961.4762 | 5.76E+00 |
| 264.5143 | 279.8654 | 5.80E+00 |
| -456.2404 | -482.8891 | 5.84E+00 |
| -1106.6922 | -1171.8023 | 5.88E+00 |
| -1746.5295 | -1849.9731 | 5.92E+00 |
| -2394.2318 | -2536.8347 | 5.96E+00 |
| -3047.1526 | -3229.5318 | 5.99E+00 |
| -3572.8114 | -3787.4935 | 6.01E+00 |
| -4060.3142 | -4304.9826 | 6.03E+00 |
| -4363.9807 | -4627.3375 | 6.03E+00 |
| -4643.1970 | -4923.4287 | 6.04E+00 |
| -4800.9533 | -5090.3839 | 6.03E+00 |
| -4817.8109 | -5107.4774 | 6.01E+00 |
| -4729.8470 | -5013.1859 | 5.99E+00 |
| -4535.9563 | -4806.4151 | 5.96E+00 |
| -4349.1746 | -4607.0752 | 5.93E+00 |
| -4074.2955 | -4314.4660 | 5.89E+00 |
| -3720.1736 | -3938.0277 | 5.86E+00 |
| -3356.5956 | -3551.8258 | 5.82E+00 |
| -2938.5079 | -3108.2363 | 5.78E+00 |
| -2537.9586 | -2683.5416 | 5.74E+00 |
| -2167.4874 | -2290.9340 | 5.70E+00 |
| -1777.4402 | -1877.9963 | 5.66E+00 |
| -1377.2907 | -1454.7125 | 5.62E+00 |
| -975.6427 | -1030.1169 | 5.58E+00 |
| -638.4417 | -673.8785 | 5.55E+00 |
| -312.1316 | -329.3226 | 5.51E+00 |
| -58.1378 | -61.3047 | 5.45E+00 |
| 122.9302 | 129.6970 | 5.50E+00 |
| 339.6290 | 358.1207 | 5.44E+00 |
| 533.1332 | 562.0480 | 5.42E+00 |
| 651.0336 | 686.1519 | 5.39E+00 |
| 795.1236 | 837.8458 | 5.37E+00 |
| 864.8248 | 911.1451 | 5.36E+00 |
| 956.6475 | 1007.6879 | 5.34E+00 |
| 976.8901 | 1028.8926 | 5.32E+00 |
| 1016.1627 | 1070.1519 | 5.31E+00 |
| 1070.1373 | 1126.8302 | 5.30E+00 |
| 1015.6384 | 1069.3713 | 5.29E+00 |
| 938.9668 | 988.5255 | 5.28E+00 |
| 913.5609 | 961.7390 | 5.27E+00 |
| 896.3206 | 943.5903 | 5.27E+00 |
| 850.2588 | 895.0516 | 5.27E+00 |
| 743.6738 | 782.8421 | 5.27E+00 |
| 675.0440 | 710.5989 | 5.27E+00 |
| 638.0429 | 671.6648 | 5.27E+00 |
| 568.8890 | 598.8879 | 5.27E+00 |
| 524.9625 | 552.6705 | 5.28E+00 |
| 447.1579 | 470.7861 | 5.28E+00 |
| 442.3871 | 465.8353 | 5.30E+00 |
| 399.6140 | 420.8392 | 5.31E+00 |
| 420.6950 | 443.0987 | 5.33E+00 |
| 425.8740 | 448.6151 | 5.34E+00 |
| 463.3400 | 488.1524 | 5.36E+00 |
| 506.6364 | 533.8523 | 5.37E+00 |
| 602.1101 | 634.5687 | 5.39E+00 |
| 654.1612 | 689.5454 | 5.41E+00 |
| 710.3208 | 748.8815 | 5.43E+00 |
| 839.9358 | 885.7025 | 5.45E+00 |
| 950.3315 | 1002.3135 | 5.47E+00 |
| 1135.1227 | 1197.4629 | 5.49E+00 |
| 1279.3319 | 1349.8681 | 5.51E+00 |
| 1501.2802 | 1584.3897 | 5.54E+00 |
| 1661.3819 | 1753.7230 | 5.56E+00 |
| 1903.8433 | 2010.0896 | 5.58E+00 |
| 2135.4587 | 2255.1051 | 5.60E+00 |
| 2382.2313 | 2516.2112 | 5.62E+00 |
| 2646.4250 | 2795.8713 | 5.65E+00 |
| 2930.6365 | 3096.7304 | 5.67E+00 |
| 3210.9803 | 3393.6277 | 5.69E+00 |
| 3542.7650 | 3745.0031 | 5.71E+00 |
| 3819.8352 | 4038.6333 | 5.73E+00 |
| 4209.9241 | 4451.8513 | 5.75E+00 |
| 4547.5911 | 4809.7468 | 5.76E+00 |
| 4949.4773 | 5235.6222 | 5.78E+00 |
| 5329.0194 | 5637.9431 | 5.80E+00 |

| | | |
|---|---|---|
| 5748.3039 | 6082.3603 | 5.81E+00 |
| 6080.6107 | 6434.8908 | 5.83E+00 |
| 6486.4664 | 6865.2484 | 5.84E+00 |
| 6937.8712 | 7343.8428 | 5.85E+00 |
| 7262.0283 | 7687.8315 | 5.86E+00 |
| 7666.0846 | 8116.3855 | 5.87E+00 |
| 8082.1442 | 8557.6570 | 5.88E+00 |
| 8472.9304 | 8972.1612 | 5.89E+00 |
| 8875.3198 | 9398.9885 | 5.90E+00 |
| 9170.0954 | 9711.9243 | 5.91E+00 |

ANEXO H. ÍNDICE DE REFRACCIÓN SnS2-Bi207a

| índice de refracción SnS2-Bi207a | | |
|---|---|---|
| **T-GMS&ES** | **T-software** | **Error %** |
| 2.8969 | 2.8969 | 1.20E-04 |
| 2.8885 | 2.8885 | 1.67E-04 |
| 2.8804 | 2.8804 | 6.78E-05 |
| 2.8723 | 2.8724 | 2.30E-06 |
| 2.8645 | 2.8645 | 1.41E-04 |
| 2.8568 | 2.8568 | 9.99E-06 |
| 2.8493 | 2.8493 | 8.90E-05 |
| 2.8420 | 2.8420 | 6.16E-05 |
| 2.8347 | 2.8347 | 9.64E-05 |
| 2.8277 | 2.8277 | 7.09E-05 |
| 2.8207 | 2.8207 | 7.88E-05 |
| 2.8139 | 2.8140 | 1.21E-05 |
| 2.8073 | 2.8073 | 2.57E-05 |
| 2.8008 | 2.8008 | 6.86E-05 |
| 2.7944 | 2.7944 | 3.86E-06 |
| 2.7881 | 2.7881 | 4.93E-05 |
| 2.7819 | 2.7819 | 1.15E-04 |
| 2.7759 | 2.7759 | 8.43E-05 |
| 2.7700 | 2.7700 | 1.51E-04 |
| 2.7641 | 2.7641 | 2.70E-05 |
| 2.7584 | 2.7584 | 1.59E-04 |
| 2.7528 | 2.7528 | 1.45E-04 |
| 2.7473 | 2.7473 | 1.08E-04 |
| 2.7419 | 2.7419 | 3.29E-05 |
| 2.7366 | 2.7366 | 1.17E-04 |
| 2.7314 | 2.7314 | 5.51E-05 |
| 2.7263 | 2.7263 | 1.30E-04 |
| 2.7213 | 2.7213 | 1.08E-04 |
| 2.7164 | 2.7164 | 3.34E-06 |
| 2.7115 | 2.7116 | 1.74E-06 |
| 2.7068 | 2.7068 | 1.79E-04 |
| 2.7021 | 2.7021 | 1.31E-04 |
| 2.6975 | 2.6975 | 1.17E-04 |
| 2.6930 | 2.6930 | 7.97E-05 |
| 2.6886 | 2.6886 | 4.87E-05 |
| 2.6842 | 2.6842 | 3.80E-05 |
| 2.6799 | 2.6800 | 9.64E-05 |
| 2.6757 | 2.6757 | 1.42E-04 |
| 2.6716 | 2.6716 | 1.58E-04 |
| 2.6675 | 2.6675 | 1.71E-04 |
| 2.6635 | 2.6635 | 3.71E-05 |
| 2.6596 | 2.6596 | 1.35E-04 |
| 2.6557 | 2.6557 | 3.50E-05 |
| 2.6519 | 2.6519 | 5.93E-05 |
| 2.6482 | 2.6482 | 1.57E-04 |
| 2.6445 | 2.6445 | 1.00E-04 |
| 2.6408 | 2.6408 | 5.95E-06 |
| 2.6373 | 2.6373 | 1.43E-05 |
| 2.6338 | 2.6338 | 8.66E-05 |
| 2.6303 | 2.6303 | 2.54E-05 |
| 2.6269 | 2.6269 | 7.38E-05 |
| 2.6235 | 2.6236 | 4.74E-05 |
| 2.6203 | 2.6203 | 6.29E-05 |
| 2.6170 | 2.6170 | 1.66E-04 |
| 2.6138 | 2.6138 | 1.01E-05 |
| 2.6107 | 2.6107 | 1.09E-04 |
| 2.6076 | 2.6076 | 1.54E-04 |
| 2.6045 | 2.6045 | 8.63E-05 |
| 2.6015 | 2.6015 | 1.31E-04 |
| 2.5985 | 2.5986 | 1.48E-04 |
| 2.5956 | 2.5956 | 0.00E+00 |
| 2.5928 | 2.5928 | 1.06E-04 |

| | | |
|---|---|---|
| 2.5899 | 2.5899 | 1.13E-04 |
| 2.5871 | 2.5871 | 5.30E-05 |
| 2.5844 | 2.5844 | 4.18E-05 |
| 2.5817 | 2.5817 | 1.41E-04 |
| 2.5790 | 2.5790 | 1.73E-04 |
| 2.5764 | 2.5764 | 1.55E-04 |
| 2.5738 | 2.5738 | 1.67E-04 |
| 2.5712 | 2.5712 | 1.09E-05 |
| 2.5687 | 2.5687 | 6.00E-05 |
| 2.5662 | 2.5662 | 3.57E-05 |
| 2.5638 | 2.5638 | 6.51E-05 |
| 2.5614 | 2.5614 | 5.29E-05 |
| 2.5590 | 2.5590 | 2.46E-05 |
| 2.5567 | 2.5567 | 1.26E-04 |
| 2.5543 | 2.5543 | 1.66E-05 |
| 2.5521 | 2.5521 | 8.45E-05 |
| 2.5498 | 2.5498 | 1.00E-04 |
| 2.5476 | 2.5476 | 8.66E-05 |
| 2.5454 | 2.5454 | 6.49E-05 |
| 2.5432 | 2.5432 | 5.69E-05 |
| 2.5411 | 2.5411 | 8.34E-05 |
| 2.5390 | 2.5390 | 1.65E-04 |
| 2.5369 | 2.5369 | 7.19E-05 |
| 2.5349 | 2.5349 | 1.80E-04 |
| 2.5329 | 2.5329 | 1.52E-04 |
| 2.5309 | 2.5309 | 1.38E-04 |
| 2.5289 | 2.5289 | 1.19E-04 |
| 2.5270 | 2.5270 | 1.51E-04 |
| 2.5251 | 2.5251 | 2.62E-05 |
| 2.5232 | 2.5232 | 1.90E-06 |
| 2.5213 | 2.5213 | 1.44E-04 |
| 2.5195 | 2.5195 | 5.17E-05 |
| 2.5176 | 2.5176 | 1.01E-04 |
| 2.5158 | 2.5158 | 1.22E-04 |
| 2.5141 | 2.5141 | 1.64E-04 |
| 2.5123 | 2.5123 | 1.47E-04 |
| 2.5106 | 2.5106 | 1.88E-04 |
| 2.5089 | 2.5089 | 5.88E-05 |
| 2.5072 | 2.5072 | 1.22E-04 |
| 2.5055 | 2.5055 | 5.89E-05 |
| 2.5039 | 2.5039 | 1.83E-04 |
| 2.5023 | 2.5023 | 3.59E-05 |
| 2.5007 | 2.5007 | 1.15E-04 |
| 2.4991 | 2.4991 | 1.19E-04 |
| 2.4975 | 2.4975 | 7.67E-05 |
| 2.4960 | 2.4960 | 8.68E-05 |
| 2.4944 | 2.4944 | 1.97E-04 |
| 2.4929 | 2.4929 | 1.60E-04 |
| 2.4914 | 2.4914 | 1.93E-04 |
| 2.4900 | 2.4900 | 8.68E-05 |
| 2.4885 | 2.4885 | 1.36E-04 |
| 2.4871 | 2.4871 | 6.77E-05 |
| 2.4856 | 2.4857 | 1.22E-04 |
| 2.4842 | 2.4842 | 9.22E-05 |
| 2.4829 | 2.4829 | 1.63E-04 |
| 2.4815 | 2.4815 | 8.01E-05 |
| 2.4801 | 2.4801 | 1.67E-04 |
| 2.4788 | 2.4788 | 1.86E-04 |
| 2.4775 | 2.4775 | 1.43E-05 |
| 2.4762 | 2.4762 | 2.14E-05 |
| 2.4749 | 2.4749 | 1.75E-04 |
| 2.4736 | 2.4736 | 1.80E-04 |
| 2.4723 | 2.4723 | 1.49E-06 |
| 2.4711 | 2.4711 | 5.39E-05 |
| 2.4698 | 2.4698 | 5.91E-05 |
| 2.4686 | 2.4686 | 7.59E-05 |
| 2.4674 | 2.4674 | 6.24E-05 |
| 2.4662 | 2.4662 | 9.17E-05 |
| 2.4650 | 2.4650 | 2.73E-05 |
| 2.4638 | 2.4638 | 2.17E-05 |
| 2.4627 | 2.4627 | 1.01E-04 |
| 2.4615 | 2.4615 | 7.35E-05 |
| 2.4604 | 2.4604 | 1.46E-04 |
| 2.4593 | 2.4593 | 1.24E-04 |
| 2.4582 | 2.4582 | 1.52E-05 |
| 2.4571 | 2.4571 | 1.74E-04 |
| 2.4560 | 2.4560 | 2.99E-05 |
| 2.4549 | 2.4549 | 4.81E-05 |
| 2.4539 | 2.4539 | 6.65E-05 |
| 2.4528 | 2.4528 | 3.19E-05 |

| | | |
|---|---|---|
| 2.4518 | 2.4518 | 4.93E-05 |
| 2.4508 | 2.4508 | 1.71E-04 |
| 2.4497 | 2.4497 | 8.21E-05 |
| 2.4487 | 2.4487 | 1.01E-04 |
| 2.4477 | 2.4477 | 1.03E-04 |
| 2.4468 | 2.4468 | 1.18E-04 |
| 2.4458 | 2.4458 | 6.09E-05 |
| 2.4448 | 2.4448 | 1.73E-04 |
| 2.4439 | 2.4439 | 2.92E-06 |
| 2.4429 | 2.4429 | 1.87E-04 |
| 2.4420 | 2.4420 | 2.60E-05 |
| 2.4411 | 2.4411 | 1.89E-04 |

ANEXO I. COEFICIENTE DE ABSORCIÓN SnS2-Bi207a

| coeficiente de absorción SnS2-Bi207a | | |
|---|---|---|
| **T-GMS&ES** | **T-software** | **Error %** |
| 88543.8635 | 88178.6297 | 4.12E-01 |
| 53802.5049 | 53580.6179 | 4.12E-01 |
| 39936.9699 | 39772.5093 | 4.12E-01 |
| 27367.1125 | 27254.6349 | 4.11E-01 |
| 18365.2124 | 18289.9485 | 4.10E-01 |
| 13746.6143 | 13690.4561 | 4.09E-01 |
| 11107.3257 | 11062.0814 | 4.07E-01 |
| 9267.4550 | 9229.7887 | 4.06E-01 |
| 7553.7169 | 7523.0534 | 4.06E-01 |
| 6197.6057 | 6172.4500 | 4.06E-01 |
| 5096.2612 | 5075.5488 | 4.06E-01 |
| 4229.0817 | 4211.8726 | 4.07E-01 |
| 3600.4345 | 3585.7706 | 4.07E-01 |
| 2977.8648 | 2965.7015 | 4.08E-01 |
| 2559.8627 | 2549.3608 | 4.10E-01 |
| 2229.4037 | 2220.2359 | 4.11E-01 |
| 1932.8719 | 1924.8779 | 4.14E-01 |
| 1675.2292 | 1668.2741 | 4.15E-01 |
| 1575.3027 | 1568.7380 | 4.17E-01 |
| 1463.9917 | 1457.8833 | 4.17E-01 |
| 1407.9179 | 1402.0082 | 4.20E-01 |
| 1387.6043 | 1381.7673 | 4.21E-01 |
| 1357.6531 | 1351.9339 | 4.21E-01 |
| 1394.6635 | 1388.7869 | 4.21E-01 |
| 1442.5177 | 1436.4389 | 4.21E-01 |
| 1466.9518 | 1460.7765 | 4.21E-01 |
| 1395.3331 | 1389.4634 | 4.21E-01 |
| 1345.1585 | 1339.5074 | 4.20E-01 |
| 1269.2015 | 1263.8778 | 4.19E-01 |
| 1137.8154 | 1133.0688 | 4.17E-01 |
| 1005.0933 | 1000.9036 | 4.17E-01 |
| 872.4502 | 868.8216 | 4.16E-01 |
| 620.7410 | 618.1751 | 4.13E-01 |
| 399.6660 | 398.0347 | 4.08E-01 |
| 242.0115 | 241.0402 | 4.01E-01 |
| 29.6765 | 29.5598 | 3.93E-01 |
| -145.8557 | -145.2522 | 4.14E-01 |
| -256.2081 | -255.1345 | 4.19E-01 |
| -470.7931 | -468.8532 | 4.12E-01 |
| -670.9841 | -668.2456 | 4.08E-01 |
| -703.3918 | -700.5274 | 4.07E-01 |
| -806.6662 | -803.3828 | 4.07E-01 |
| -786.3041 | -783.1275 | 4.04E-01 |
| -858.7514 | -855.2923 | 4.03E-01 |
| -907.2709 | -903.6217 | 4.02E-01 |
| -859.0196 | -855.5677 | 4.02E-01 |
| -824.9085 | -821.6018 | 4.01E-01 |
| -806.5176 | -803.3000 | 3.99E-01 |
| -772.6154 | -769.5250 | 4.00E-01 |
| -683.8169 | -681.0660 | 4.02E-01 |
| -583.3409 | -580.9952 | 4.02E-01 |
| -464.3197 | -462.4652 | 3.99E-01 |
| -361.8616 | -360.4001 | 4.04E-01 |
| -266.2680 | -265.1881 | 4.06E-01 |
| -194.4042 | -193.6136 | 4.07E-01 |
| -112.0212 | -111.5633 | 4.09E-01 |
| 11.8597 | 11.8079 | 4.37E-01 |
| 66.4134 | 66.1458 | 4.03E-01 |
| 133.8777 | 133.3348 | 4.05E-01 |
| 212.4819 | 211.6174 | 4.07E-01 |
| 267.4868 | 266.3955 | 4.08E-01 |

| | | |
|---|---|---|
| 322.6989 | 321.3751 | 4.10E-01 |
| 356.3526 | 354.8863 | 4.11E-01 |
| 381.8511 | 380.2742 | 4.13E-01 |
| 413.8052 | 412.0897 | 4.15E-01 |
| 418.9779 | 417.2334 | 4.16E-01 |
| 437.4879 | 435.6601 | 4.18E-01 |
| 435.2715 | 433.4482 | 4.19E-01 |
| 414.6721 | 412.9159 | 4.24E-01 |
| 420.4139 | 418.6342 | 4.23E-01 |
| 401.1982 | 399.5089 | 4.21E-01 |
| 358.2221 | 356.7170 | 4.20E-01 |
| 324.2913 | 322.9107 | 4.26E-01 |
| 287.6421 | 286.4233 | 4.24E-01 |
| 234.1359 | 233.1432 | 4.24E-01 |
| 200.4628 | 199.6120 | 4.24E-01 |
| 98.8051 | 98.3818 | 4.28E-01 |
| 39.2246 | 39.0578 | 4.25E-01 |
| -31.1815 | -31.0472 | 4.31E-01 |
| -70.4832 | -70.1694 | 4.45E-01 |
| -202.3860 | -201.5128 | 4.31E-01 |
| -280.3450 | -279.1421 | 4.29E-01 |
| -320.7674 | -319.3877 | 4.30E-01 |
| -366.3572 | -364.7884 | 4.28E-01 |
| -513.3685 | -511.1673 | 4.29E-01 |
| -523.1428 | -520.9111 | 4.27E-01 |
| -561.5726 | -559.1718 | 4.28E-01 |
| -630.8431 | -628.1480 | 4.27E-01 |
| -654.4308 | -651.6500 | 4.25E-01 |
| -656.7773 | -653.9869 | 4.25E-01 |
| -718.2565 | -715.2080 | 4.24E-01 |
| -732.5545 | -729.4499 | 4.24E-01 |
| -753.5160 | -750.3489 | 4.20E-01 |
| -754.1959 | -751.0367 | 4.19E-01 |
| -762.5456 | -759.3598 | 4.18E-01 |
| -779.1993 | -775.9540 | 4.16E-01 |
| -776.8030 | -773.5747 | 4.16E-01 |
| -700.1549 | -697.2340 | 4.17E-01 |
| -689.2914 | -686.4247 | 4.16E-01 |
| -633.5260 | -630.8968 | 4.15E-01 |
| -644.2476 | -641.5852 | 4.13E-01 |
| -611.4052 | -608.8877 | 4.12E-01 |
| -563.6237 | -561.3119 | 4.10E-01 |
| -501.9091 | -499.8567 | 4.09E-01 |
| -480.1621 | -478.1914 | 4.10E-01 |
| -497.1965 | -495.1688 | 4.08E-01 |
| -551.3388 | -549.1005 | 4.06E-01 |
| -590.7053 | -588.3022 | 4.07E-01 |
| -591.8623 | -589.4676 | 4.05E-01 |
| -605.1598 | -602.7215 | 4.03E-01 |
| -630.0624 | -627.5185 | 4.04E-01 |
| -688.5970 | -685.8289 | 4.02E-01 |
| -645.6521 | -643.0664 | 4.00E-01 |
| -681.7252 | -678.9933 | 4.01E-01 |
| -643.9385 | -641.3673 | 3.99E-01 |
| -661.2747 | -658.6298 | 4.00E-01 |
| -650.0456 | -647.4581 | 3.98E-01 |
| -612.9295 | -610.4876 | 3.98E-01 |
| -590.2455 | -587.8902 | 3.99E-01 |
| -618.1060 | -615.6507 | 3.97E-01 |
| -567.8631 | -565.6072 | 3.97E-01 |
| -550.6141 | -548.4147 | 3.99E-01 |
| -513.5015 | -511.4717 | 3.95E-01 |
| -475.2316 | -473.3410 | 3.98E-01 |
| -468.6328 | -466.7769 | 3.96E-01 |
| -444.9208 | -443.1640 | 3.95E-01 |
| -436.5369 | -434.7962 | 3.99E-01 |
| -383.4774 | -381.9599 | 3.96E-01 |
| -391.1973 | -389.6369 | 3.99E-01 |
| -328.5420 | -327.2334 | 3.98E-01 |
| -325.5640 | -324.2639 | 3.99E-01 |

ANEXO J. ÍNDICE DE REFRACCIÓN ZnS1Aa

| índice de refracción ZnS1Aa | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 2.6624 | 2.6624 | 4.17E-05 |
| 2.6567 | 2.6567 | 1.71E-04 |
| 2.6511 | 2.6511 | 1.33E-04 |

| | | |
|---|---|---|
| 2.6455 | 2.6455 | 1.49E-04 |
| 2.6400 | 2.6400 | 1.43E-04 |
| 2.6346 | 2.6346 | 9.80E-05 |
| 2.6292 | 2.6292 | 8.82E-05 |
| 2.6238 | 2.6238 | 1.81E-04 |
| 2.6185 | 2.6185 | 3.19E-05 |
| 2.6133 | 2.6133 | 1.88E-04 |
| 2.6081 | 2.6081 | 5.15E-05 |
| 2.6029 | 2.6030 | 8.51E-05 |
| 2.5979 | 2.5979 | 1.39E-04 |
| 2.5928 | 2.5928 | 7.06E-05 |
| 2.5878 | 2.5878 | 3.34E-05 |
| 2.5829 | 2.5829 | 4.18E-05 |
| 2.5780 | 2.5780 | 6.95E-05 |
| 2.5731 | 2.5731 | 6.47E-05 |
| 2.5683 | 2.5683 | 3.37E-05 |
| 2.5635 | 2.5635 | 1.86E-04 |
| 2.5588 | 2.5588 | 1.65E-04 |
| 2.5541 | 2.5541 | 1.08E-04 |
| 2.5495 | 2.5495 | 1.49E-04 |
| 2.5449 | 2.5449 | 1.30E-04 |
| 2.5404 | 2.5404 | 1.87E-04 |
| 2.5358 | 2.5359 | 3.50E-05 |
| 2.5314 | 2.5314 | 1.73E-04 |
| 2.5270 | 2.5270 | 2.17E-05 |
| 2.5226 | 2.5226 | 1.14E-04 |
| 2.5182 | 2.5182 | 1.43E-04 |
| 2.5139 | 2.5139 | 2.01E-05 |
| 2.5097 | 2.5097 | 1.73E-04 |
| 2.5054 | 2.5054 | 9.24E-05 |
| 2.5012 | 2.5013 | 3.82E-05 |
| 2.4971 | 2.4971 | 8.14E-05 |
| 2.4930 | 2.4930 | 1.61E-04 |
| 2.4889 | 2.4889 | 1.31E-04 |
| 2.4849 | 2.4849 | 1.73E-04 |
| 2.4809 | 2.4809 | 1.88E-05 |
| 2.4769 | 2.4769 | 2.56E-05 |
| 2.4730 | 2.4730 | 1.71E-04 |
| 2.4691 | 2.4691 | 1.83E-04 |
| 2.4652 | 2.4652 | 2.58E-05 |

| | | |
|---|---|---|
| 2.4614 | 2.4614 | 1.22E-04 |
| 2.4576 | 2.4576 | 8.08E-05 |
| 2.4538 | 2.4538 | 8.21E-05 |
| 2.4501 | 2.4501 | 5.63E-05 |
| 2.4464 | 2.4464 | 1.04E-04 |
| 2.4427 | 2.4427 | 7.57E-05 |
| 2.4391 | 2.4391 | 1.41E-05 |
| 2.4354 | 2.4354 | 1.51E-04 |
| 2.4319 | 2.4319 | 9.11E-05 |
| 2.4283 | 2.4283 | 9.59E-05 |
| 2.4248 | 2.4248 | 1.25E-04 |
| 2.4213 | 2.4213 | 5.56E-05 |
| 2.4179 | 2.4179 | 2.01E-04 |
| 2.4144 | 2.4144 | 8.19E-05 |
| 2.4110 | 2.4110 | 1.40E-05 |
| 2.4077 | 2.4077 | 1.07E-05 |
| 2.4043 | 2.4043 | 8.56E-05 |
| 2.4010 | 2.4010 | 1.65E-04 |
| 2.3977 | 2.3977 | 1.06E-04 |
| 2.3945 | 2.3945 | 7.63E-05 |
| 2.3912 | 2.3912 | 1.76E-04 |
| 2.3880 | 2.3880 | 2.53E-07 |
| 2.3849 | 2.3849 | 2.18E-05 |
| 2.3817 | 2.3817 | 1.23E-04 |
| 2.3786 | 2.3786 | 2.67E-05 |
| 2.3755 | 2.3755 | 1.21E-04 |
| 2.3724 | 2.3724 | 2.78E-06 |
| 2.3693 | 2.3693 | 8.76E-05 |
| 2.3663 | 2.3663 | 1.83E-05 |
| 2.3633 | 2.3633 | 1.13E-04 |
| 2.3603 | 2.3603 | 7.07E-05 |
| 2.3574 | 2.3574 | 1.36E-04 |
| 2.3544 | 2.3544 | 7.17E-05 |
| 2.3515 | 2.3515 | 1.50E-04 |
| 2.3486 | 2.3487 | 6.45E-05 |
| 2.3458 | 2.3458 | 1.58E-04 |
| 2.3429 | 2.3430 | 1.39E-04 |
| 2.3401 | 2.3401 | 1.78E-05 |
| 2.3373 | 2.3373 | 1.96E-04 |
| 2.3346 | 2.3346 | 6.34E-05 |

| | | |
|---|---|---|
| 2.3318 | 2.3318 | 3.55E-06 |
| 2.3291 | 2.3291 | 6.52E-06 |
| 2.3264 | 2.3264 | 6.30E-05 |
| 2.3237 | 2.3237 | 1.64E-04 |
| 2.3210 | 2.3210 | 1.31E-04 |
| 2.3184 | 2.3184 | 2.98E-05 |
| 2.3157 | 2.3157 | 2.08E-04 |
| 2.3131 | 2.3131 | 3.87E-05 |
| 2.3106 | 2.3106 | 1.46E-04 |
| 2.3080 | 2.3080 | 1.13E-04 |
| 2.3054 | 2.3054 | 4.25E-05 |
| 2.3029 | 2.3029 | 1.71E-04 |
| 2.3004 | 2.3004 | 1.72E-04 |
| 2.2979 | 2.2979 | 1.24E-04 |
| 2.2954 | 2.2955 | 1.29E-04 |
| 2.2930 | 2.2930 | 1.96E-04 |
| 2.2906 | 2.2906 | 1.04E-04 |
| 2.2881 | 2.2882 | 1.09E-04 |
| 2.2858 | 2.2858 | 2.86E-05 |
| 2.2834 | 2.2834 | 7.33E-05 |
| 2.2810 | 2.2810 | 1.67E-05 |
| 2.2787 | 2.2787 | 1.49E-04 |
| 2.2763 | 2.2763 | 6.96E-06 |
| 2.2740 | 2.2740 | 3.90E-05 |
| 2.2717 | 2.2717 | 6.09E-05 |
| 2.2695 | 2.2695 | 1.40E-04 |
| 2.2672 | 2.2672 | 1.95E-04 |
| 2.2650 | 2.2650 | 9.51E-05 |
| 2.2627 | 2.2627 | 1.66E-04 |
| 2.2605 | 2.2605 | 1.54E-04 |
| 2.2583 | 2.2583 | 1.25E-04 |
| 2.2562 | 2.2562 | 2.21E-04 |
| 2.2540 | 2.2540 | 1.30E-04 |
| 2.2518 | 2.2519 | 1.60E-04 |
| 2.2497 | 2.2497 | 2.09E-04 |
| 2.2476 | 2.2476 | 2.26E-05 |
| 2.2455 | 2.2455 | 5.32E-05 |
| 2.2434 | 2.2434 | 1.38E-04 |
| 2.2413 | 2.2413 | 1.00E-04 |
| 2.2393 | 2.2393 | 1.74E-04 |
| 2.2372 | 2.2372 | 2.02E-04 |
| 2.2352 | 2.2352 | 1.18E-04 |
| 2.2332 | 2.2332 | 2.01E-04 |
| 2.2312 | 2.2312 | 1.89E-04 |
| 2.2292 | 2.2292 | 5.00E-05 |
| 2.2273 | 2.2273 | 1.48E-05 |
| 2.2253 | 2.2253 | 1.49E-04 |
| 2.2233 | 2.2234 | 3.16E-06 |
| 2.2214 | 2.2214 | 2.70E-06 |
| 2.2195 | 2.2195 | 1.61E-04 |
| 2.2176 | 2.2176 | 1.61E-05 |
| 2.2157 | 2.2157 | 1.25E-05 |
| 2.2138 | 2.2138 | 1.45E-04 |
| 2.2120 | 2.2120 | 4.26E-05 |
| 2.2101 | 2.2101 | 1.05E-04 |
| 2.2083 | 2.2083 | 4.65E-05 |
| 2.2065 | 2.2065 | 1.27E-04 |
| 2.2046 | 2.2046 | 4.12E-05 |
| 2.2028 | 2.2028 | 1.05E-04 |
| 2.2010 | 2.2011 | 6.78E-05 |
| 2.1993 | 2.1993 | 6.48E-05 |
| 2.1975 | 2.1975 | 1.67E-04 |
| 2.1958 | 2.1958 | 1.43E-04 |
| 2.1940 | 2.1940 | 7.80E-05 |
| 2.1923 | 2.1923 | 8.96E-05 |
| 2.1906 | 2.1906 | 1.73E-04 |
| 2.1889 | 2.1889 | 1.34E-04 |
| 2.1872 | 2.1872 | 7.90E-05 |
| 2.1855 | 2.1855 | 1.08E-04 |
| 2.1838 | 2.1838 | 2.17E-04 |
| 2.1821 | 2.1821 | 1.32E-04 |
| 2.1805 | 2.1805 | 9.19E-05 |
| 2.1789 | 2.1789 | 9.16E-05 |
| 2.1772 | 2.1772 | 1.27E-04 |
| 2.1756 | 2.1756 | 1.94E-04 |
| 2.1740 | 2.1740 | 1.72E-04 |
| 2.1724 | 2.1724 | 5.48E-05 |
| 2.1708 | 2.1708 | 8.10E-05 |
| 2.1692 | 2.1692 | 2.29E-04 |
| 2.1677 | 2.1677 | 6.84E-05 |

| | | |
|---|---|---|
| 2.1661 | 2.1661 | 9.93E-05 |
| 2.1646 | 2.1646 | 1.92E-04 |
| 2.1630 | 2.1630 | 2.38E-05 |
| 2.1615 | 2.1615 | 1.40E-04 |
| 2.1600 | 2.1600 | 1.69E-04 |
| 2.1585 | 2.1585 | 2.88E-05 |
| 2.1570 | 2.1570 | 9.48E-05 |
| 2.1555 | 2.1555 | 1.98E-04 |
| 2.1540 | 2.1540 | 1.88E-04 |
| 2.1525 | 2.1526 | 1.39E-04 |
| 2.1511 | 2.1511 | 1.22E-04 |
| 2.1496 | 2.1496 | 1.40E-04 |
| 2.1482 | 2.1482 | 1.99E-04 |
| 2.1468 | 2.1468 | 1.66E-04 |
| 2.1453 | 2.1453 | 1.79E-05 |
| 2.1439 | 2.1439 | 1.80E-04 |
| 2.1425 | 2.1425 | 3.39E-05 |
| 2.1411 | 2.1411 | 1.91E-04 |
| 2.1397 | 2.1397 | 1.79E-04 |
| 2.1384 | 2.1384 | 1.46E-04 |
| 2.1370 | 2.1370 | 1.81E-04 |
| 2.1356 | 2.1356 | 1.82E-04 |
| 2.1343 | 2.1343 | 1.94E-06 |
| 2.1329 | 2.1329 | 2.14E-04 |
| 2.1316 | 2.1316 | 1.24E-04 |
| 2.1303 | 2.1303 | 7.73E-05 |
| 2.1289 | 2.1289 | 1.17E-04 |
| 2.1276 | 2.1276 | 2.22E-04 |
| 2.1263 | 2.1263 | 1.28E-06 |
| 2.1250 | 2.1250 | 1.49E-04 |
| 2.1237 | 2.1237 | 1.99E-04 |
| 2.1225 | 2.1225 | 1.47E-04 |
| 2.1212 | 2.1212 | 1.06E-05 |

ANEXO K. COEFICIENTE DE ABSORCIÓN ZnS1Aa

| coeficiente de absorción ZnS1Aa | | |
|---|---|---|
| **T- GMS&ES** | **T-software** | **Error %** |
| 90982.3763 | 89401.1000 | 1.74E+00 |
| 106137.1156 | 104292.0000 | 1.74E+00 |
| 96535.1933 | 94856.7000 | 1.74E+00 |
| 100456.6483 | 98709.4000 | 1.74E+00 |
| 101069.6010 | 99311.8000 | 1.74E+00 |
| 97386.7235 | 95693.1000 | 1.74E+00 |
| 100570.8381 | 98821.4000 | 1.74E+00 |
| 100885.2312 | 99130.7000 | 1.74E+00 |
| 104634.5306 | 102815.0000 | 1.74E+00 |
| 101223.2496 | 99462.6000 | 1.74E+00 |
| 103368.9262 | 101570.0000 | 1.74E+00 |
| 102148.5833 | 100372.0000 | 1.74E+00 |
| 102777.0529 | 100990.0000 | 1.74E+00 |
| 104736.2752 | 102915.0000 | 1.74E+00 |
| 100736.5555 | 98985.3000 | 1.74E+00 |
| 101913.4395 | 100142.0000 | 1.74E+00 |
| 100768.5621 | 99017.8000 | 1.74E+00 |
| 99681.8080 | 97950.7000 | 1.74E+00 |
| 99973.2540 | 98237.2000 | 1.74E+00 |
| 98165.0450 | 96458.3000 | 1.74E+00 |
| 97448.2673 | 95753.9000 | 1.74E+00 |
| 96758.1056 | 95075.6000 | 1.74E+00 |
| 95197.6607 | 93542.5000 | 1.74E+00 |
| 94369.0075 | 92730.1000 | 1.74E+00 |
| 92778.3715 | 91166.7000 | 1.74E+00 |
| 91485.5216 | 89895.8000 | 1.74E+00 |
| 88109.2754 | 86578.0000 | 1.74E+00 |
| 86040.3135 | 84544.4000 | 1.74E+00 |
| 84556.7560 | 83086.6000 | 1.74E+00 |
| 82922.3612 | 81480.6000 | 1.74E+00 |
| 80609.7448 | 79208.1000 | 1.74E+00 |
| 78422.8686 | 77059.4000 | 1.74E+00 |
| 76164.4316 | 74840.4000 | 1.74E+00 |
| 73548.6001 | 72270.0000 | 1.74E+00 |
| 70854.7859 | 69622.9000 | 1.74E+00 |
| 67951.0216 | 66769.3000 | 1.74E+00 |
| 65162.0693 | 64028.8000 | 1.74E+00 |
| 61909.0295 | 60832.3000 | 1.74E+00 |
| 58979.0517 | 57953.1000 | 1.74E+00 |
| 56008.4706 | 55033.8000 | 1.74E+00 |
| 52917.6005 | 51996.4000 | 1.74E+00 |

| | | |
|---|---|---|
| 50089.8211 | 49217.6000 | 1.74E+00 |
| 46949.8908 | 46132.1000 | 1.74E+00 |
| 44067.2948 | 43299.6000 | 1.74E+00 |
| 41332.8993 | 40612.8000 | 1.74E+00 |
| 38640.7940 | 37967.6000 | 1.74E+00 |
| 36098.2950 | 35469.5000 | 1.74E+00 |
| 33733.5204 | 33146.0000 | 1.74E+00 |
| 31459.0708 | 30911.4000 | 1.74E+00 |
| 29413.0403 | 28901.2000 | 1.74E+00 |
| 27523.9326 | 27045.2000 | 1.74E+00 |
| 25815.2879 | 25366.7000 | 1.74E+00 |
| 24254.8146 | 23833.7000 | 1.74E+00 |
| 22874.2658 | 22477.5000 | 1.73E+00 |
| 21589.5408 | 21215.5000 | 1.73E+00 |
| 20434.7312 | 20081.0000 | 1.73E+00 |
| 19354.6047 | 19019.9000 | 1.73E+00 |
| 18289.4668 | 17973.5000 | 1.73E+00 |
| 17331.3487 | 17032.2000 | 1.73E+00 |
| 16378.8750 | 16096.3000 | 1.73E+00 |
| 15450.3238 | 15183.9000 | 1.72E+00 |
| 14513.0358 | 14262.9000 | 1.72E+00 |
| 13609.2525 | 13374.7000 | 1.72E+00 |
| 12719.3586 | 12500.2000 | 1.72E+00 |
| 11839.9507 | 11635.8000 | 1.72E+00 |
| 10986.1524 | 10796.7000 | 1.72E+00 |
| 10127.9438 | 9953.1200 | 1.73E+00 |
| 9307.8489 | 9147.0500 | 1.73E+00 |
| 8474.8333 | 8328.2700 | 1.73E+00 |
| 7741.0142 | 7606.9200 | 1.73E+00 |
| 7002.6216 | 6881.1200 | 1.74E+00 |
| 6374.7624 | 6263.9600 | 1.74E+00 |
| 5764.0126 | 5663.6500 | 1.74E+00 |
| 5202.3314 | 5111.6100 | 1.74E+00 |
| 4712.3119 | 4629.9900 | 1.75E+00 |
| 4236.2720 | 4162.1300 | 1.75E+00 |
| 3829.0413 | 3761.9000 | 1.75E+00 |
| 3478.4916 | 3417.3800 | 1.76E+00 |
| 3159.5344 | 3103.9700 | 1.76E+00 |
| 2908.1780 | 2856.9400 | 1.76E+00 |
| 2721.5430 | 2673.5800 | 1.76E+00 |
| 2534.7301 | 2490.0300 | 1.76E+00 |
| 2164.8698 | 2126.6800 | 1.76E+00 |
| 2010.0660 | 1974.6100 | 1.76E+00 |
| 1892.7522 | 1859.3600 | 1.76E+00 |
| 1802.9518 | 1771.1500 | 1.76E+00 |
| 1734.3795 | 1703.8100 | 1.76E+00 |
| 1654.5073 | 1625.3800 | 1.76E+00 |
| 1593.1436 | 1565.1200 | 1.76E+00 |
| 1520.9772 | 1494.2700 | 1.76E+00 |
| 1463.5561 | 1437.9100 | 1.75E+00 |
| 1396.8963 | 1372.4400 | 1.75E+00 |
| 1307.8286 | 1284.9800 | 1.75E+00 |
| 1247.8739 | 1226.1200 | 1.74E+00 |
| 1169.6095 | 1149.2700 | 1.74E+00 |
| 1103.0859 | 1083.9400 | 1.74E+00 |
| 1017.7032 | 1000.0800 | 1.73E+00 |
| 943.4735 | 927.1690 | 1.73E+00 |
| 408.4459 | 401.4200 | 1.72E+00 |
| 796.5039 | 782.7840 | 1.72E+00 |
| 730.8852 | 718.3110 | 1.72E+00 |
| 649.5851 | 638.4380 | 1.72E+00 |
| 591.3144 | 581.1760 | 1.71E+00 |
| 530.8650 | 521.7880 | 1.71E+00 |
| 477.8945 | 469.7220 | 1.71E+00 |
| 443.7062 | 436.1370 | 1.71E+00 |
| 397.7677 | 390.9720 | 1.71E+00 |
| 380.1997 | 373.7160 | 1.71E+00 |
| 332.9232 | 327.2480 | 1.70E+00 |
| 320.4841 | 315.0030 | 1.71E+00 |
| 301.2420 | 296.0810 | 1.71E+00 |
| 293.2201 | 288.2400 | 1.70E+00 |
| 282.8714 | 278.0200 | 1.72E+00 |
| 287.7153 | 282.8130 | 1.70E+00 |
| 291.4805 | 286.4810 | 1.72E+00 |
| 293.5222 | 288.5100 | 1.71E+00 |
| 306.7050 | 301.4380 | 1.72E+00 |
| 316.1289 | 310.7140 | 1.71E+00 |
| 349.0142 | 343.0170 | 1.72E+00 |
| 374.5126 | 368.0670 | 1.72E+00 |
| 360.9647 | 354.7420 | 1.72E+00 |

| | | |
|---|---|---|
| 366.9167 | 360.5820 | 1.73E+00 |
| 392.8664 | 386.0740 | 1.73E+00 |
| 397.4593 | 390.5740 | 1.73E+00 |
| 419.3431 | 412.0670 | 1.74E+00 |
| 431.1569 | 423.6620 | 1.74E+00 |
| 449.5815 | 441.7500 | 1.74E+00 |
| 462.6264 | 454.5520 | 1.75E+00 |
| 464.5565 | 456.4350 | 1.75E+00 |
| 476.4989 | 468.1540 | 1.75E+00 |
| 473.2784 | 464.9560 | 1.76E+00 |
| 464.3130 | 456.1660 | 1.75E+00 |
| 464.5880 | 456.3960 | 1.76E+00 |
| 442.9424 | 435.1510 | 1.76E+00 |
| 432.4171 | 424.7660 | 1.77E+00 |
| 407.1229 | 399.9240 | 1.77E+00 |
| 397.2980 | 390.2780 | 1.77E+00 |
| 365.1424 | 358.6710 | 1.77E+00 |
| 349.2213 | 343.0450 | 1.77E+00 |
| 322.0625 | 316.3780 | 1.77E+00 |
| 294.2927 | 289.0750 | 1.77E+00 |
| 257.0960 | 252.5420 | 1.77E+00 |
| 203.2553 | 199.6530 | 1.77E+00 |
| 170.4901 | 167.4790 | 1.77E+00 |
| 124.7142 | 122.5060 | 1.77E+00 |
| 92.4647 | 90.8422 | 1.75E+00 |
| 52.8977 | 51.9689 | 1.76E+00 |
| 20.1837 | 19.8425 | 1.69E+00 |
| -18.3075 | -17.9534 | 1.93E+00 |
| -55.1234 | -54.1364 | 1.79E+00 |
| -86.1037 | -84.5633 | 1.79E+00 |
| -132.8444 | -130.4650 | 1.79E+00 |
| -165.7703 | -162.8340 | 1.77E+00 |
| -207.1363 | -203.4700 | 1.77E+00 |
| -234.0792 | -229.9390 | 1.77E+00 |
| -273.5192 | -268.6860 | 1.77E+00 |
| -306.2688 | -300.8890 | 1.76E+00 |
| -340.3256 | -334.3580 | 1.75E+00 |
| -360.0463 | -353.7380 | 1.75E+00 |
| -373.5317 | -367.0000 | 1.75E+00 |
| -397.0158 | -390.0810 | 1.75E+00 |
| -410.9801 | -403.8150 | 1.74E+00 |
| -419.8007 | -412.4990 | 1.74E+00 |
| -435.7380 | -428.1710 | 1.74E+00 |
| -451.2292 | -443.4090 | 1.73E+00 |
| -458.9265 | -450.9670 | 1.73E+00 |
| -467.0520 | -458.9700 | 1.73E+00 |
| -464.6591 | -456.6400 | 1.73E+00 |
| -463.7989 | -455.8090 | 1.72E+00 |
| -446.4374 | -438.7590 | 1.72E+00 |
| -446.5413 | -438.8540 | 1.72E+00 |
| -431.6152 | -424.2050 | 1.72E+00 |
| -434.5925 | -427.1480 | 1.71E+00 |
| -410.3517 | -403.3110 | 1.72E+00 |
| -408.2639 | -401.2740 | 1.71E+00 |
| -381.4441 | -374.9300 | 1.71E+00 |
| -367.7519 | -361.4560 | 1.71E+00 |
| -351.2515 | -345.2570 | 1.71E+00 |
| -320.6006 | -315.1410 | 1.70E+00 |
| -307.8671 | -302.6160 | 1.71E+00 |
| -271.3802 | -266.7630 | 1.70E+00 |
| -254.1585 | -249.8280 | 1.70E+00 |
| -224.8812 | -221.0670 | 1.70E+00 |
| -204.7275 | -201.2570 | 1.70E+00 |
| -188.7903 | -185.5860 | 1.70E+00 |
| -162.1845 | -159.4260 | 1.70E+00 |
| -139.5976 | -137.2240 | 1.70E+00 |
| -114.4678 | -112.5290 | 1.69E+00 |
| -88.2063 | -86.7020 | 1.71E+00 |
| -66.8753 | -65.7263 | 1.72E+00 |
| -49.0337 | -48.2048 | 1.69E+00 |
| -26.5684 | -26.1268 | 1.66E+00 |
| -7.7248 | -7.5875 | 1.78E+00 |
| 8.7514 | 8.6143 | 1.57E+00 |
| 28.3312 | 27.8375 | 1.74E+00 |
| 49.6954 | 48.8295 | 1.74E+00 |

Universidad Industrial de Santander

ANEXO L. ÍNDICE DE REFRACCIÓN ZnS13A1

| índice de refracción ZnS13A1 | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 2.7423 | 2.7423 | 6.01E-06 |
| 2.7405 | 2.7405 | 2.50E-05 |
| 2.7386 | 2.7386 | 1.23E-04 |
| 2.7368 | 2.7368 | 7.27E-05 |
| 2.7350 | 2.7350 | 1.75E-04 |
| 2.7332 | 2.7332 | 1.13E-04 |
| 2.7313 | 2.7313 | 1.61E-04 |
| 2.7295 | 2.7295 | 1.02E-04 |
| 2.7277 | 2.7277 | 1.71E-04 |
| 2.7259 | 2.7259 | 4.58E-05 |
| 2.7241 | 2.7242 | 9.42E-05 |
| 2.7224 | 2.7224 | 5.00E-05 |
| 2.7206 | 2.7206 | 1.90E-05 |
| 2.7188 | 2.7188 | 1.79E-04 |
| 2.7170 | 2.7170 | 1.63E-04 |
| 2.7153 | 2.7153 | 3.16E-05 |
| 2.7135 | 2.7135 | 3.68E-05 |
| 2.7118 | 2.7118 | 1.47E-04 |
| 2.7100 | 2.7100 | 1.50E-04 |
| 2.7083 | 2.7083 | 2.75E-05 |
| 2.7065 | 2.7065 | 1.85E-05 |
| 2.7048 | 2.7048 | 1.77E-04 |
| 2.7031 | 2.7031 | 1.81E-04 |
| 2.7013 | 2.7013 | 1.60E-05 |
| 2.6996 | 2.6996 | 2.77E-05 |
| 2.6979 | 2.6979 | 1.47E-04 |
| 2.6962 | 2.6962 | 1.38E-04 |
| 2.6945 | 2.6945 | 5.31E-05 |
| 2.6928 | 2.6928 | 5.60E-05 |
| 2.6911 | 2.6911 | 1.31E-04 |
| 2.6894 | 2.6894 | 1.37E-04 |
| 2.6877 | 2.6877 | 3.82E-05 |
| 2.6860 | 2.6860 | 2.11E-05 |
| 2.6844 | 2.6844 | 1.83E-04 |
| 2.6827 | 2.6827 | 1.52E-04 |
| 2.6810 | 2.6810 | 7.37E-05 |
| 2.6794 | 2.6794 | 1.22E-04 |
| 2.6777 | 2.6777 | 6.70E-06 |
| 2.6760 | 2.6761 | 6.14E-05 |
| 2.6744 | 2.6744 | 4.66E-05 |
| 2.6728 | 2.6728 | 4.39E-05 |
| 2.6711 | 2.6711 | 4.04E-05 |
| 2.6695 | 2.6695 | 7.53E-05 |
| 2.6679 | 2.6679 | 1.73E-05 |
| 2.6662 | 2.6662 | 1.61E-04 |
| 2.6646 | 2.6646 | 1.32E-04 |
| 2.6630 | 2.6630 | 6.92E-05 |
| 2.6614 | 2.6614 | 6.66E-05 |
| 2.6598 | 2.6598 | 1.41E-04 |
| 2.6582 | 2.6582 | 1.78E-04 |
| 2.6566 | 2.6566 | 4.51E-05 |
| 2.6550 | 2.6550 | 1.19E-04 |
| 2.6534 | 2.6534 | 2.43E-05 |
| 2.6518 | 2.6518 | 1.38E-04 |
| 2.6502 | 2.6503 | 8.40E-05 |
| 2.6487 | 2.6487 | 1.37E-04 |
| 2.6471 | 2.6471 | 1.48E-04 |
| 2.6455 | 2.6455 | 5.25E-05 |
| 2.6440 | 2.6440 | 8.77E-05 |
| 2.6424 | 2.6424 | 4.23E-05 |
| 2.6409 | 2.6409 | 4.14E-05 |
| 2.6393 | 2.6393 | 3.90E-05 |
| 2.6378 | 2.6378 | 9.58E-05 |
| 2.6362 | 2.6362 | 6.76E-05 |
| 2.6347 | 2.6347 | 1.23E-04 |
| 2.6332 | 2.6332 | 9.70E-05 |
| 2.6316 | 2.6317 | 1.48E-04 |
| 2.6301 | 2.6301 | 1.49E-04 |
| 2.6286 | 2.6286 | 1.55E-04 |
| 2.6271 | 2.6271 | 8.23E-05 |
| 2.6256 | 2.6256 | 9.84E-05 |
| 2.6241 | 2.6241 | 1.07E-04 |
| 2.6226 | 2.6226 | 1.55E-04 |
| 2.6211 | 2.6211 | 4.38E-05 |
| 2.6196 | 2.6196 | 1.57E-04 |

| | | |
|---|---|---|
| 2.6181 | 2.6181 | 1.13E-04 |
| 2.6166 | 2.6166 | 8.80E-05 |
| 2.6151 | 2.6151 | 6.29E-05 |
| 2.6137 | 2.6137 | 1.89E-04 |
| 2.6122 | 2.6122 | 9.67E-05 |
| 2.6107 | 2.6107 | 1.55E-04 |
| 2.6092 | 2.6093 | 1.64E-05 |
| 2.6078 | 2.6078 | 3.38E-05 |
| 2.6063 | 2.6063 | 1.02E-04 |
| 2.6049 | 2.6049 | 7.32E-06 |
| 2.6034 | 2.6034 | 6.47E-05 |
| 2.6020 | 2.6020 | 1.10E-04 |
| 2.6005 | 2.6006 | 1.34E-04 |
| 2.5991 | 2.5991 | 6.40E-06 |
| 2.5977 | 2.5977 | 1.13E-04 |
| 2.5962 | 2.5963 | 7.03E-05 |
| 2.5948 | 2.5948 | 1.22E-04 |
| 2.5934 | 2.5934 | 7.89E-05 |
| 2.5920 | 2.5920 | 1.84E-04 |
| 2.5906 | 2.5906 | 5.15E-05 |
| 2.5892 | 2.5892 | 6.66E-05 |
| 2.5878 | 2.5878 | 1.57E-04 |
| 2.5864 | 2.5864 | 1.52E-04 |
| 2.5850 | 2.5850 | 1.66E-04 |
| 2.5836 | 2.5836 | 4.94E-05 |
| 2.5822 | 2.5822 | 2.29E-05 |
| 2.5808 | 2.5808 | 1.42E-04 |
| 2.5794 | 2.5794 | 1.73E-05 |
| 2.5780 | 2.5780 | 3.71E-05 |
| 2.5766 | 2.5767 | 1.87E-04 |
| 2.5753 | 2.5753 | 1.19E-04 |
| 2.5739 | 2.5739 | 1.81E-04 |
| 2.5725 | 2.5725 | 3.55E-06 |
| 2.5712 | 2.5712 | 4.63E-05 |
| 2.5698 | 2.5698 | 5.25E-05 |
| 2.5685 | 2.5685 | 9.68E-05 |
| 2.5671 | 2.5671 | 1.06E-04 |
| 2.5658 | 2.5658 | 2.61E-05 |
| 2.5644 | 2.5644 | 9.23E-05 |
| 2.5631 | 2.5631 | 7.13E-05 |

| | | |
|---|---|---|
| 2.5618 | 2.5618 | 8.88E-05 |
| 2.5604 | 2.5604 | 2.88E-06 |
| 2.5591 | 2.5591 | 4.35E-05 |
| 2.5578 | 2.5578 | 1.63E-04 |
| 2.5564 | 2.5564 | 1.58E-04 |
| 2.5551 | 2.5551 | 1.65E-04 |
| 2.5538 | 2.5538 | 3.84E-05 |
| 2.5525 | 2.5525 | 1.31E-05 |
| 2.5512 | 2.5512 | 7.11E-05 |
| 2.5499 | 2.5499 | 1.02E-04 |
| 2.5486 | 2.5486 | 1.39E-04 |
| 2.5473 | 2.5473 | 4.29E-05 |
| 2.5460 | 2.5460 | 1.88E-04 |
| 2.5447 | 2.5447 | 1.60E-04 |
| 2.5434 | 2.5434 | 1.29E-04 |
| 2.5421 | 2.5421 | 1.09E-04 |
| 2.5409 | 2.5409 | 8.61E-05 |
| 2.5396 | 2.5396 | 1.95E-04 |
| 2.5383 | 2.5383 | 4.20E-05 |
| 2.5370 | 2.5370 | 2.00E-05 |
| 2.5358 | 2.5358 | 1.29E-04 |
| 2.5345 | 2.5345 | 2.61E-05 |
| 2.5332 | 2.5332 | 5.11E-05 |
| 2.5320 | 2.5320 | 5.36E-05 |
| 2.5307 | 2.5307 | 1.07E-04 |
| 2.5295 | 2.5295 | 1.39E-04 |
| 2.5282 | 2.5282 | 4.31E-05 |
| 2.5270 | 2.5270 | 1.82E-04 |
| 2.5257 | 2.5257 | 1.39E-04 |
| 2.5245 | 2.5245 | 1.73E-04 |
| 2.5233 | 2.5233 | 3.79E-05 |
| 2.5220 | 2.5220 | 2.04E-05 |
| 2.5208 | 2.5208 | 4.75E-05 |
| 2.5196 | 2.5196 | 1.55E-04 |
| 2.5184 | 2.5184 | 1.64E-04 |
| 2.5171 | 2.5172 | 1.86E-04 |
| 2.5159 | 2.5159 | 1.31E-05 |
| 2.5147 | 2.5147 | 1.14E-04 |
| 2.5135 | 2.5135 | 9.03E-05 |
| 2.5123 | 2.5123 | 5.69E-05 |

| | | |
|---|---|---|
| 2.5111 | 2.5111 | 7.07E-05 |
| 2.5099 | 2.5099 | 7.54E-05 |
| 2.5087 | 2.5087 | 4.26E-05 |
| 2.5075 | 2.5075 | 1.16E-04 |
| 2.5063 | 2.5063 | 1.53E-04 |
| 2.5051 | 2.5051 | 6.77E-05 |
| 2.5039 | 2.5039 | 1.39E-04 |
| 2.5028 | 2.5028 | 6.61E-05 |
| 2.5016 | 2.5016 | 1.14E-04 |
| 2.5004 | 2.5004 | 1.17E-04 |
| 2.4992 | 2.4992 | 1.71E-04 |
| 2.4981 | 2.4981 | 1.78E-04 |
| 2.4969 | 2.4969 | 9.59E-05 |
| 2.4957 | 2.4957 | 1.49E-04 |
| 2.4946 | 2.4946 | 1.12E-04 |
| 2.4934 | 2.4934 | 1.93E-04 |
| 2.4923 | 2.4923 | 9.20E-06 |
| 2.4911 | 2.4911 | 9.45E-05 |
| 2.4900 | 2.4900 | 6.28E-05 |
| 2.4888 | 2.4888 | 8.56E-05 |
| 2.4877 | 2.4877 | 5.15E-05 |
| 2.4865 | 2.4865 | 7.28E-05 |
| 2.4854 | 2.4854 | 2.16E-05 |
| 2.4843 | 2.4843 | 1.71E-04 |
| 2.4831 | 2.4831 | 1.54E-04 |
| 2.4820 | 2.4820 | 1.91E-04 |
| 2.4809 | 2.4809 | 6.11E-05 |
| 2.4797 | 2.4798 | 1.99E-04 |
| 2.4786 | 2.4786 | 1.80E-04 |
| 2.4775 | 2.4775 | 1.35E-04 |
| 2.4764 | 2.4764 | 6.72E-05 |
| 2.4753 | 2.4753 | 2.20E-05 |
| 2.4742 | 2.4742 | 1.07E-06 |
| 2.4731 | 2.4731 | 1.36E-04 |
| 2.4720 | 2.4720 | 2.13E-05 |
| 2.4709 | 2.4709 | 6.76E-05 |
| 2.4698 | 2.4698 | 2.81E-06 |
| 2.4687 | 2.4687 | 1.73E-04 |
| 2.4676 | 2.4676 | 5.37E-05 |
| 2.4665 | 2.4665 | 4.46E-05 |
| 2.4654 | 2.4654 | 1.45E-04 |
| 2.4643 | 2.4643 | 5.01E-05 |
| 2.4632 | 2.4632 | 1.37E-04 |
| 2.4621 | 2.4622 | 1.14E-04 |
| 2.4611 | 2.4611 | 1.66E-05 |
| 2.4600 | 2.4600 | 1.51E-04 |
| 2.4589 | 2.4589 | 1.96E-04 |
| 2.4579 | 2.4579 | 1.62E-04 |
| 2.4568 | 2.4568 | 6.68E-06 |
| 2.4557 | 2.4557 | 1.51E-04 |
| 2.4547 | 2.4547 | 1.89E-04 |
| 2.4536 | 2.4536 | 1.21E-04 |
| 2.4526 | 2.4526 | 5.35E-05 |
| 2.4515 | 2.4515 | 7.40E-05 |
| 2.4504 | 2.4505 | 9.61E-05 |
| 2.4494 | 2.4494 | 1.31E-05 |
| 2.4484 | 2.4484 | 1.75E-04 |
| 2.4473 | 2.4473 | 5.91E-05 |
| 2.4463 | 2.4463 | 4.75E-05 |
| 2.4452 | 2.4452 | 1.40E-04 |
| 2.4442 | 2.4442 | 7.31E-05 |
| 2.4432 | 2.4432 | 1.83E-04 |
| 2.4421 | 2.4421 | 1.90E-04 |
| 2.4411 | 2.4411 | 9.34E-05 |
| 2.4401 | 2.4401 | 1.05E-04 |
| 2.4391 | 2.4391 | 3.52E-06 |
| 2.4380 | 2.4380 | 1.05E-05 |
| 2.4370 | 2.4370 | 8.42E-05 |
| 2.4360 | 2.4360 | 1.30E-04 |
| 2.4350 | 2.4350 | 1.67E-04 |
| 2.4340 | 2.4340 | 1.55E-04 |
| 2.4330 | 2.4330 | 1.68E-04 |
| 2.4320 | 2.4320 | 1.97E-05 |
| 2.4310 | 2.4310 | 1.03E-04 |
| 2.4300 | 2.4300 | 1.27E-04 |
| 2.4290 | 2.4290 | 5.10E-05 |
| 2.4280 | 2.4280 | 1.24E-04 |
| 2.4270 | 2.4270 | 1.39E-05 |
| 2.4260 | 2.4260 | 5.34E-05 |
| 2.4250 | 2.4250 | 5.39E-06 |

| | | |
|---|---|---|
| 2.4240 | 2.4240 | 1.62E-04 |
| 2.4230 | 2.4230 | 4.22E-06 |
| 2.4220 | 2.4221 | 5.64E-05 |
| 2.4211 | 2.4211 | 1.99E-05 |
| 2.4201 | 2.4201 | 1.14E-04 |
| 2.4191 | 2.4191 | 6.96E-05 |
| 2.4181 | 2.4182 | 1.57E-04 |
| 2.4172 | 2.4172 | 1.47E-04 |
| 2.4162 | 2.4162 | 4.24E-05 |
| 2.4152 | 2.4152 | 1.58E-04 |
| 2.4143 | 2.4143 | 4.03E-05 |
| 2.4133 | 2.4133 | 1.72E-05 |
| 2.4124 | 2.4124 | 8.89E-05 |
| 2.4114 | 2.4114 | 1.60E-04 |
| 2.4105 | 2.4105 | 1.01E-04 |
| 2.4095 | 2.4095 | 4.07E-05 |
| 2.4086 | 2.4086 | 7.41E-05 |
| 2.4076 | 2.4076 | 2.01E-04 |
| 2.4067 | 2.4067 | 5.73E-06 |
| 2.4057 | 2.4057 | 9.67E-05 |
| 2.4048 | 2.4048 | 1.07E-04 |
| 2.4038 | 2.4038 | 2.39E-05 |
| 2.4029 | 2.4029 | 1.51E-04 |
| 2.4020 | 2.4020 | 1.61E-06 |
| 2.4010 | 2.4010 | 5.62E-05 |
| 2.4001 | 2.4001 | 2.26E-05 |
| 2.3992 | 2.3992 | 1.02E-04 |
| 2.3983 | 2.3983 | 9.88E-05 |
| 2.3973 | 2.3973 | 2.08E-04 |
| 2.3964 | 2.3964 | 1.88E-04 |
| 2.3955 | 2.3955 | 1.60E-04 |
| 2.3946 | 2.3946 | 2.70E-07 |
| 2.3937 | 2.3937 | 1.68E-04 |
| 2.3928 | 2.3928 | 1.72E-04 |
| 2.3918 | 2.3918 | 1.82E-04 |
| 2.3909 | 2.3909 | 1.37E-04 |
| 2.3900 | 2.3900 | 5.17E-05 |
| 2.3891 | 2.3891 | 9.00E-05 |
| 2.3882 | 2.3882 | 1.44E-04 |
| 2.3873 | 2.3873 | 1.09E-04 |

| | | |
|---|---|---|
| 2.3864 | 2.3864 | 1.28E-05 |
| 2.3855 | 2.3855 | 1.97E-04 |
| 2.3846 | 2.3846 | 1.00E-04 |
| 2.3838 | 2.3838 | 6.51E-05 |
| 2.3829 | 2.3829 | 1.17E-04 |
| 2.3820 | 2.3820 | 1.65E-04 |
| 2.3811 | 2.3811 | 5.93E-05 |
| 2.3802 | 2.3802 | 5.02E-05 |
| 2.3793 | 2.3793 | 7.39E-05 |
| 2.3784 | 2.3785 | 1.20E-05 |
| 2.3776 | 2.3776 | 1.35E-04 |
| 2.3767 | 2.3767 | 5.29E-05 |
| 2.3758 | 2.3758 | 1.56E-04 |
| 2.3750 | 2.3750 | 1.75E-04 |
| 2.3741 | 2.3741 | 1.09E-04 |
| 2.3732 | 2.3732 | 4.07E-05 |
| 2.3724 | 2.3724 | 1.47E-04 |
| 2.3715 | 2.3715 | 1.71E-04 |
| 2.3706 | 2.3706 | 1.51E-04 |
| 2.3698 | 2.3698 | 2.08E-04 |
| 2.3689 | 2.3689 | 6.14E-05 |
| 2.3681 | 2.3681 | 1.68E-04 |
| 2.3672 | 2.3672 | 5.74E-05 |
| 2.3664 | 2.3664 | 2.94E-05 |
| 2.3655 | 2.3655 | 8.35E-05 |
| 2.3647 | 2.3647 | 2.03E-04 |
| 2.3638 | 2.3638 | 1.47E-05 |
| 2.3630 | 2.3630 | 1.09E-04 |
| 2.3621 | 2.3621 | 1.51E-04 |
| 2.3613 | 2.3613 | 1.12E-04 |
| 2.3605 | 2.3605 | 7.25E-06 |
| 2.3596 | 2.3596 | 2.08E-04 |
| 2.3588 | 2.3588 | 6.48E-05 |
| 2.3580 | 2.3580 | 2.13E-06 |
| 2.3571 | 2.3571 | 1.94E-05 |
| 2.3563 | 2.3563 | 1.17E-04 |
| 2.3555 | 2.3555 | 1.31E-04 |
| 2.3547 | 2.3547 | 1.25E-04 |
| 2.3538 | 2.3538 | 3.56E-05 |
| 2.3530 | 2.3530 | 2.52E-05 |

| | | |
|---|---|---|
| 2.3522 | 2.3522 | 9.36E-05 |
| 2.3514 | 2.3514 | 1.85E-04 |
| 2.3506 | 2.3506 | 4.06E-05 |
| 2.3497 | 2.3498 | 8.14E-05 |
| 2.3489 | 2.3489 | 1.26E-04 |
| 2.3481 | 2.3481 | 9.21E-05 |
| 2.3473 | 2.3473 | 1.90E-05 |
| 2.3465 | 2.3465 | 2.07E-04 |
| 2.3457 | 2.3457 | 4.69E-05 |
| 2.3449 | 2.3449 | 3.70E-05 |
| 2.3441 | 2.3441 | 4.41E-05 |
| 2.3433 | 2.3433 | 2.52E-05 |
| 2.3425 | 2.3425 | 1.71E-04 |
| 2.3417 | 2.3417 | 3.44E-05 |
| 2.3409 | 2.3409 | 1.64E-04 |
| 2.3401 | 2.3401 | 2.10E-04 |
| 2.3393 | 2.3394 | 1.96E-04 |
| 2.3386 | 2.3386 | 9.91E-05 |
| 2.3378 | 2.3378 | 7.30E-05 |
| 2.3370 | 2.3370 | 1.08E-04 |
| 2.3362 | 2.3362 | 2.14E-04 |
| 2.3354 | 2.3354 | 1.82E-04 |
| 2.3346 | 2.3347 | 2.03E-04 |
| 2.3339 | 2.3339 | 8.68E-05 |
| 2.3331 | 2.3331 | 1.04E-04 |
| 2.3323 | 2.3323 | 6.05E-05 |
| 2.3315 | 2.3316 | 1.51E-04 |
| 2.3308 | 2.3308 | 1.69E-04 |
| 2.3300 | 2.3300 | 1.13E-04 |
| 2.3292 | 2.3292 | 1.51E-05 |
| 2.3285 | 2.3285 | 2.13E-04 |
| 2.3277 | 2.3277 | 6.09E-05 |
| 2.3269 | 2.3270 | 2.24E-05 |
| 2.3262 | 2.3262 | 3.35E-05 |
| 2.3254 | 2.3254 | 2.74E-05 |
| 2.3247 | 2.3247 | 1.60E-04 |
| 2.3239 | 2.3239 | 6.58E-05 |
| 2.3232 | 2.3232 | 2.10E-04 |
| 2.3224 | 2.3224 | 1.27E-04 |
| 2.3217 | 2.3217 | 1.15E-04 |

| | | |
|---|---|---|
| 2.3209 | 2.3209 | 1.73E-04 |
| 2.3202 | 2.3202 | 1.29E-04 |
| 2.3194 | 2.3194 | 7.13E-05 |
| 2.3187 | 2.3187 | 8.97E-05 |
| 2.3179 | 2.3179 | 1.81E-04 |
| 2.3172 | 2.3172 | 2.02E-04 |
| 2.3165 | 2.3165 | 1.53E-04 |
| 2.3157 | 2.3157 | 3.47E-05 |
| 2.3150 | 2.3150 | 1.53E-04 |
| 2.3142 | 2.3143 | 2.17E-05 |
| 2.3135 | 2.3135 | 1.28E-04 |
| 2.3128 | 2.3128 | 1.65E-04 |
| 2.3121 | 2.3121 | 1.33E-04 |
| 2.3113 | 2.3113 | 3.30E-05 |
| 2.3106 | 2.3106 | 1.36E-04 |
| 2.3099 | 2.3099 | 6.06E-05 |
| 2.3092 | 2.3092 | 1.89E-04 |
| 2.3084 | 2.3084 | 1.84E-04 |
| 2.3077 | 2.3077 | 1.91E-04 |
| 2.3070 | 2.3070 | 1.67E-04 |
| 2.3063 | 2.3063 | 2.54E-05 |
| 2.3056 | 2.3056 | 1.84E-04 |
| 2.3049 | 2.3049 | 2.63E-05 |
| 2.3041 | 2.3041 | 6.46E-05 |
| 2.3034 | 2.3034 | 8.89E-05 |
| 2.3027 | 2.3027 | 4.68E-05 |
| 2.3020 | 2.3020 | 6.17E-05 |
| 2.3013 | 2.3013 | 1.98E-04 |
| 2.3006 | 2.3006 | 4.23E-05 |
| 2.2999 | 2.2999 | 8.61E-05 |
| 2.2992 | 2.2992 | 1.49E-04 |
| 2.2985 | 2.2985 | 1.46E-04 |
| 2.2978 | 2.2978 | 7.85E-05 |
| 2.2971 | 2.2971 | 5.44E-05 |
| 2.2964 | 2.2964 | 1.83E-04 |
| 2.2957 | 2.2957 | 7.97E-05 |
| 2.2950 | 2.2950 | 2.86E-05 |
| 2.2943 | 2.2943 | 7.24E-05 |
| 2.2936 | 2.2936 | 5.20E-05 |
| 2.2930 | 2.2930 | 3.25E-05 |

| | | |
|---|---|---|
| 2.2923 | 2.2923 | 1.81E-04 |
| 2.2916 | 2.2916 | 4.30E-05 |
| 2.2909 | 2.2909 | 2.03E-04 |
| 2.2902 | 2.2902 | 1.36E-04 |
| 2.2895 | 2.2895 | 1.02E-04 |
| 2.2889 | 2.2889 | 1.32E-04 |
| 2.2882 | 2.2882 | 2.13E-04 |
| 2.2875 | 2.2875 | 5.79E-05 |
| 2.2868 | 2.2868 | 1.60E-04 |
| 2.2862 | 2.2862 | 3.03E-06 |
| 2.2855 | 2.2855 | 9.16E-05 |
| 2.2848 | 2.2848 | 1.24E-04 |
| 2.2841 | 2.2841 | 9.47E-05 |
| 2.2835 | 2.2835 | 3.32E-06 |
| 2.2828 | 2.2828 | 1.50E-04 |
| 2.2821 | 2.2821 | 7.36E-05 |
| 2.2815 | 2.2815 | 2.03E-04 |
| 2.2808 | 2.2808 | 1.02E-04 |
| 2.2802 | 2.2802 | 6.20E-05 |
| 2.2795 | 2.2795 | 8.32E-05 |
| 2.2788 | 2.2788 | 1.65E-04 |
| 2.2782 | 2.2782 | 1.31E-04 |
| 2.2775 | 2.2775 | 7.19E-05 |
| 2.2769 | 2.2769 | 1.04E-04 |
| 2.2762 | 2.2762 | 2.19E-04 |
| 2.2756 | 2.2756 | 1.65E-04 |
| 2.2749 | 2.2749 | 1.69E-04 |
| 2.2743 | 2.2743 | 2.07E-04 |
| 2.2736 | 2.2736 | 8.31E-05 |
| 2.2730 | 2.2730 | 1.00E-04 |
| 2.2723 | 2.2723 | 9.76E-05 |
| 2.2717 | 2.2717 | 2.04E-04 |
| 2.2710 | 2.2710 | 1.25E-04 |
| 2.2704 | 2.2704 | 1.04E-04 |
| 2.2698 | 2.2698 | 1.42E-04 |
| 2.2691 | 2.2691 | 2.02E-04 |
| 2.2685 | 2.2685 | 4.75E-05 |
| 2.2679 | 2.2679 | 1.66E-04 |
| 2.2672 | 2.2672 | 3.84E-06 |
| 2.2666 | 2.2666 | 1.16E-04 |
| 2.2660 | 2.2660 | 1.70E-04 |
| 2.2653 | 2.2653 | 1.66E-04 |
| 2.2647 | 2.2647 | 1.05E-04 |
| 2.2641 | 2.2641 | 1.41E-05 |
| 2.2634 | 2.2634 | 1.90E-04 |
| 2.2628 | 2.2628 | 1.87E-05 |
| 2.2622 | 2.2622 | 1.71E-04 |
| 2.2616 | 2.2616 | 1.77E-04 |
| 2.2610 | 2.2610 | 1.38E-04 |
| 2.2603 | 2.2603 | 1.56E-04 |
| 2.2597 | 2.2597 | 2.12E-04 |
| 2.2591 | 2.2591 | 8.08E-05 |
| 2.2585 | 2.2585 | 1.06E-04 |
| 2.2579 | 2.2579 | 9.37E-05 |
| 2.2573 | 2.2573 | 2.05E-04 |
| 2.2566 | 2.2566 | 1.17E-04 |
| 2.2560 | 2.2560 | 8.42E-05 |
| 2.2554 | 2.2554 | 1.07E-04 |
| 2.2548 | 2.2548 | 1.85E-04 |
| 2.2542 | 2.2542 | 1.26E-04 |
| 2.2536 | 2.2536 | 6.26E-05 |
| 2.2530 | 2.2530 | 1.38E-04 |
| 2.2524 | 2.2524 | 1.60E-04 |
| 2.2518 | 2.2518 | 6.86E-05 |
| 2.2512 | 2.2512 | 3.17E-05 |
| 2.2506 | 2.2506 | 4.92E-05 |
| 2.2500 | 2.2500 | 1.21E-04 |
| 2.2494 | 2.2494 | 1.98E-04 |
| 2.2488 | 2.2488 | 1.81E-05 |
| 2.2482 | 2.2482 | 2.16E-04 |
| 2.2476 | 2.2476 | 5.82E-05 |
| 2.2470 | 2.2470 | 4.57E-05 |
| 2.2464 | 2.2464 | 9.62E-05 |
| 2.2458 | 2.2458 | 9.35E-05 |
| 2.2452 | 2.2453 | 3.75E-05 |
| 2.2447 | 2.2447 | 7.15E-05 |
| 2.2441 | 2.2441 | 2.12E-04 |
| 2.2435 | 2.2435 | 2.65E-06 |
| 2.2429 | 2.2429 | 1.76E-04 |
| 2.2423 | 2.2423 | 1.44E-04 |

| | | |
|---|---|---|
| 2.2417 | 2.2417 | 7.11E-05 |
| 2.2412 | 2.2412 | 4.99E-05 |
| 2.2406 | 2.2406 | 8.09E-05 |
| 2.2400 | 2.2400 | 1.64E-04 |
| 2.2394 | 2.2394 | 1.48E-04 |
| 2.2389 | 2.2389 | 3.91E-05 |
| 2.2383 | 2.2383 | 1.69E-04 |
| 2.2377 | 2.2377 | 1.21E-04 |
| 2.2371 | 2.2371 | 1.54E-05 |
| 2.2366 | 2.2366 | 3.88E-05 |
| 2.2360 | 2.2360 | 4.19E-05 |
| 2.2354 | 2.2354 | 6.03E-06 |
| 2.2349 | 2.2349 | 1.05E-04 |
| 2.2343 | 2.2343 | 1.93E-04 |
| 2.2337 | 2.2337 | 7.38E-06 |
| 2.2332 | 2.2332 | 1.89E-04 |
| 2.2326 | 2.2326 | 1.12E-04 |
| 2.2320 | 2.2320 | 1.58E-05 |
| 2.2315 | 2.2315 | 3.02E-05 |
| 2.2309 | 2.2309 | 2.62E-05 |
| 2.2304 | 2.2304 | 2.77E-05 |
| 2.2298 | 2.2298 | 1.31E-04 |
| 2.2292 | 2.2292 | 1.64E-04 |
| 2.2287 | 2.2287 | 3.95E-05 |
| 2.2281 | 2.2281 | 1.57E-04 |
| 2.2276 | 2.2276 | 1.45E-04 |
| 2.2270 | 2.2270 | 4.77E-05 |
| 2.2265 | 2.2265 | 9.48E-07 |
| 2.2259 | 2.2259 | 5.99E-07 |
| 2.2254 | 2.2254 | 4.86E-05 |
| 2.2248 | 2.2248 | 1.47E-04 |
| 2.2243 | 2.2243 | 1.56E-04 |
| 2.2237 | 2.2237 | 3.89E-05 |
| 2.2232 | 2.2232 | 1.67E-04 |
| 2.2226 | 2.2226 | 1.25E-04 |
| 2.2221 | 2.2221 | 1.50E-05 |
| 2.2216 | 2.2216 | 4.68E-05 |
| 2.2210 | 2.2210 | 6.06E-05 |
| 2.2205 | 2.2205 | 2.66E-05 |
| 2.2199 | 2.2199 | 5.51E-05 |

| | | |
|---|---|---|
| 2.2194 | 2.2194 | 1.85E-04 |
| 2.2189 | 2.2189 | 8.92E-05 |
| 2.2183 | 2.2183 | 1.35E-04 |
| 2.2178 | 2.2178 | 4.42E-05 |
| 2.2173 | 2.2173 | 1.76E-04 |
| 2.2167 | 2.2167 | 1.90E-04 |
| 2.2162 | 2.2162 | 1.51E-04 |
| 2.2157 | 2.2157 | 1.60E-04 |
| 2.2151 | 2.2151 | 2.15E-04 |
| 2.2146 | 2.2146 | 1.34E-04 |
| 2.2141 | 2.2141 | 1.41E-05 |
| 2.2136 | 2.2136 | 2.09E-04 |
| 2.2130 | 2.2130 | 1.73E-06 |
| 2.2125 | 2.2125 | 1.66E-04 |
| 2.2120 | 2.2120 | 1.67E-04 |
| 2.2115 | 2.2115 | 9.44E-05 |
| 2.2110 | 2.2110 | 6.76E-05 |
| 2.2104 | 2.2104 | 8.65E-05 |
| 2.2099 | 2.2099 | 1.51E-04 |
| 2.2094 | 2.2094 | 1.92E-04 |
| 2.2089 | 2.2089 | 3.62E-05 |
| 2.2084 | 2.2084 | 1.65E-04 |
| 2.2078 | 2.2079 | 4.24E-05 |
| 2.2073 | 2.2073 | 2.04E-04 |
| 2.2068 | 2.2068 | 1.32E-04 |
| 2.2063 | 2.2063 | 5.98E-05 |
| 2.2058 | 2.2058 | 3.25E-05 |
| 2.2053 | 2.2053 | 4.98E-05 |
| 2.2048 | 2.2048 | 1.12E-04 |
| 2.2043 | 2.2043 | 2.18E-04 |
| 2.2038 | 2.2038 | 8.50E-05 |
| 2.2033 | 2.2033 | 1.10E-04 |
| 2.2028 | 2.2028 | 1.05E-04 |
| 2.2023 | 2.2023 | 1.79E-04 |
| 2.2018 | 2.2018 | 5.17E-05 |
| 2.2012 | 2.2013 | 3.14E-05 |
| 2.2007 | 2.2008 | 7.08E-05 |
| 2.2002 | 2.2003 | 6.65E-05 |
| 2.1997 | 2.1998 | 1.88E-05 |
| 2.1993 | 2.1993 | 7.25E-05 |

| | | |
|---|---|---|
| 2.1988 | 2.1988 | 2.07E-04 |
| 2.1983 | 2.1983 | 7.00E-05 |
| 2.1978 | 2.1978 | 1.51E-04 |
| 2.1973 | 2.1973 | 4.00E-05 |
| 2.1968 | 2.1968 | 1.88E-04 |
| 2.1963 | 2.1963 | 1.62E-04 |
| 2.1958 | 2.1958 | 9.92E-05 |
| 2.1953 | 2.1953 | 7.92E-05 |
| 2.1948 | 2.1948 | 1.02E-04 |
| 2.1943 | 2.1943 | 1.67E-04 |
| 2.1938 | 2.1938 | 1.82E-04 |
| 2.1933 | 2.1934 | 3.24E-05 |
| 2.1929 | 2.1929 | 1.59E-04 |
| 2.1924 | 2.1924 | 6.29E-05 |
| 2.1919 | 2.1919 | 2.13E-04 |
| 2.1914 | 2.1914 | 7.43E-05 |
| 2.1909 | 2.1909 | 2.26E-05 |
| 2.1904 | 2.1905 | 7.79E-05 |
| 2.1900 | 2.1900 | 9.16E-05 |
| 2.1895 | 2.1895 | 6.39E-05 |
| 2.1890 | 2.1890 | 5.21E-06 |
| 2.1885 | 2.1885 | 1.16E-04 |
| 2.1881 | 2.1881 | 1.90E-04 |
| 2.1876 | 2.1876 | 2.91E-06 |
| 2.1871 | 2.1871 | 2.21E-04 |
| 2.1866 | 2.1866 | 5.41E-05 |
| 2.1862 | 2.1862 | 8.78E-05 |
| 2.1857 | 2.1857 | 1.89E-04 |
| 2.1852 | 2.1852 | 2.08E-04 |
| 2.1847 | 2.1847 | 1.88E-04 |
| 2.1843 | 2.1843 | 2.08E-04 |
| 2.1838 | 2.1838 | 1.89E-04 |
| 2.1833 | 2.1833 | 8.79E-05 |
| 2.1829 | 2.1829 | 5.32E-05 |
| 2.1824 | 2.1824 | 2.24E-04 |
| 2.1819 | 2.1819 | 2.62E-06 |
| 2.1815 | 2.1815 | 2.00E-04 |
| 2.1810 | 2.1810 | 1.01E-04 |
| 2.1805 | 2.1806 | 1.68E-05 |
| 2.1801 | 2.1801 | 9.51E-05 |

| | | |
|---|---|---|
| 2.1796 | 2.1796 | 1.34E-04 |
| 2.1792 | 2.1792 | 1.33E-04 |
| 2.1787 | 2.1787 | 9.33E-05 |
| 2.1782 | 2.1783 | 1.41E-05 |
| 2.1778 | 2.1778 | 1.04E-04 |
| 2.1773 | 2.1773 | 1.97E-04 |
| 2.1769 | 2.1769 | 9.32E-07 |
| 2.1764 | 2.1764 | 2.25E-04 |
| 2.1760 | 2.1760 | 4.93E-05 |
| 2.1755 | 2.1755 | 9.73E-05 |
| 2.1751 | 2.1751 | 2.05E-04 |
| 2.1746 | 2.1746 | 1.85E-04 |
| 2.1742 | 2.1742 | 1.54E-04 |
| 2.1737 | 2.1737 | 1.61E-04 |
| 2.1733 | 2.1733 | 2.07E-04 |
| 2.1728 | 2.1728 | 1.69E-04 |
| 2.1724 | 2.1724 | 4.74E-05 |
| 2.1719 | 2.1719 | 1.13E-04 |
| 2.1715 | 2.1715 | 1.50E-04 |
| 2.1710 | 2.1710 | 8.59E-05 |
| 2.1706 | 2.1706 | 1.01E-04 |
| 2.1701 | 2.1701 | 2.10E-04 |
| 2.1697 | 2.1697 | 9.84E-05 |
| 2.1693 | 2.1693 | 2.41E-05 |
| 2.1688 | 2.1688 | 1.28E-05 |
| 2.1684 | 2.1684 | 1.24E-05 |
| 2.1679 | 2.1679 | 2.52E-05 |
| 2.1675 | 2.1675 | 1.00E-04 |
| 2.1671 | 2.1671 | 2.12E-04 |
| 2.1666 | 2.1666 | 1.01E-04 |
| 2.1662 | 2.1662 | 8.54E-05 |
| 2.1658 | 2.1658 | 1.54E-04 |
| 2.1653 | 2.1653 | 1.06E-04 |
| 2.1649 | 2.1649 | 5.95E-05 |
| 2.1645 | 2.1645 | 1.89E-04 |
| 2.1640 | 2.1640 | 1.81E-04 |
| 2.1636 | 2.1636 | 1.25E-04 |
| 2.1632 | 2.1632 | 1.05E-04 |
| 2.1627 | 2.1627 | 1.22E-04 |
| 2.1623 | 2.1623 | 1.74E-04 |

| | | |
|---|---|---|
| 2.1619 | 2.1619 | 1.99E-04 |
| 2.1614 | 2.1615 | 7.45E-05 |
| 2.1610 | 2.1610 | 8.63E-05 |
| 2.1606 | 2.1606 | 1.80E-04 |
| 2.1602 | 2.1602 | 5.27E-05 |
| 2.1597 | 2.1598 | 1.42E-04 |
| 2.1593 | 2.1593 | 1.62E-04 |
| 2.1589 | 2.1589 | 3.84E-05 |
| 2.1585 | 2.1585 | 4.98E-05 |
| 2.1581 | 2.1581 | 1.03E-04 |
| 2.1576 | 2.1576 | 1.20E-04 |
| 2.1572 | 2.1572 | 1.02E-04 |
| 2.1568 | 2.1568 | 4.95E-05 |
| 2.1564 | 2.1564 | 3.85E-05 |
| 2.1560 | 2.1560 | 1.62E-04 |
| 2.1555 | 2.1556 | 1.44E-04 |
| 2.1551 | 2.1551 | 4.84E-05 |
| 2.1547 | 2.1547 | 1.88E-04 |
| 2.1543 | 2.1543 | 7.44E-05 |
| 2.1539 | 2.1539 | 9.29E-05 |
| 2.1535 | 2.1535 | 2.26E-04 |
| 2.1531 | 2.1531 | 1.41E-04 |
| 2.1527 | 2.1527 | 7.67E-05 |
| 2.1522 | 2.1522 | 4.71E-05 |
| 2.1518 | 2.1518 | 5.17E-05 |
| 2.1514 | 2.1514 | 9.05E-05 |
| 2.1510 | 2.1510 | 1.63E-04 |
| 2.1506 | 2.1506 | 1.95E-04 |
| 2.1502 | 2.1502 | 5.38E-05 |
| 2.1498 | 2.1498 | 1.21E-04 |
| 2.1494 | 2.1494 | 1.36E-04 |
| 2.1490 | 2.1490 | 1.07E-04 |
| 2.1486 | 2.1486 | 8.28E-05 |
| 2.1482 | 2.1482 | 2.27E-04 |
| 2.1478 | 2.1478 | 1.04E-04 |
| 2.1474 | 2.1474 | 1.54E-05 |
| 2.1470 | 2.1470 | 4.03E-05 |
| 2.1466 | 2.1466 | 6.28E-05 |
| 2.1462 | 2.1462 | 5.20E-05 |
| 2.1458 | 2.1458 | 8.13E-06 |
| 2.1454 | 2.1454 | 6.88E-05 |
| 2.1450 | 2.1450 | 1.79E-04 |
| 2.1446 | 2.1446 | 1.45E-04 |
| 2.1442 | 2.1442 | 3.11E-05 |
| 2.1438 | 2.1438 | 2.27E-04 |
| 2.1434 | 2.1434 | 1.45E-05 |
| 2.1430 | 2.1430 | 1.78E-04 |
| 2.1426 | 2.1426 | 1.28E-04 |
| 2.1422 | 2.1422 | 6.22E-07 |
| 2.1418 | 2.1418 | 9.47E-05 |
| 2.1414 | 2.1414 | 1.58E-04 |
| 2.1410 | 2.1410 | 1.88E-04 |
| 2.1406 | 2.1407 | 1.87E-04 |
| 2.1403 | 2.1403 | 1.53E-04 |
| 2.1399 | 2.1399 | 8.79E-05 |
| 2.1395 | 2.1395 | 9.79E-06 |
| 2.1391 | 2.1391 | 1.39E-04 |
| 2.1387 | 2.1387 | 1.67E-04 |
| 2.1383 | 2.1383 | 2.66E-05 |
| 2.1379 | 2.1379 | 2.16E-04 |
| 2.1376 | 2.1376 | 4.06E-05 |
| 2.1372 | 2.1372 | 1.39E-04 |
| 2.1368 | 2.1368 | 1.81E-04 |
| 2.1364 | 2.1364 | 6.44E-05 |
| 2.1360 | 2.1360 | 2.09E-05 |
| 2.1356 | 2.1356 | 7.49E-05 |
| 2.1353 | 2.1353 | 9.77E-05 |
| 2.1349 | 2.1349 | 8.93E-05 |
| 2.1345 | 2.1345 | 4.98E-05 |
| 2.1341 | 2.1341 | 2.07E-05 |
| 2.1337 | 2.1337 | 1.22E-04 |
| 2.1334 | 2.1334 | 2.14E-04 |
| 2.1330 | 2.1330 | 5.07E-05 |
| 2.1326 | 2.1326 | 1.43E-04 |
| 2.1322 | 2.1322 | 1.01E-04 |
| 2.1319 | 2.1319 | 1.55E-04 |
| 2.1315 | 2.1315 | 2.81E-05 |
| 2.1311 | 2.1311 | 1.81E-04 |
| 2.1307 | 2.1307 | 1.67E-04 |
| 2.1304 | 2.1304 | 7.48E-05 |

Universidad Industrial de Santander

ANEXO M. COEFICIENTE DE ABSORCIÓN ZnS13A1

| coeficiente de absorción ZnS13A1 | | |
|---|---|---|
| T- GMS&ES | T-software | Error % |
| 129423.4078 | 139985.0000 | 8.16E+00 |
| 128602.2729 | 139097.0000 | 8.16E+00 |
| 126969.2029 | 137330.0000 | 8.16E+00 |
| 110668.9572 | 119693.0000 | 8.15E+00 |
| 114333.7923 | 123658.0000 | 8.16E+00 |
| 126633.5790 | 136967.0000 | 8.16E+00 |
| 127614.1025 | 138029.0000 | 8.16E+00 |
| 125017.5635 | 135219.0000 | 8.16E+00 |
| 127113.8074 | 137487.0000 | 8.16E+00 |
| 126006.1391 | 136289.0000 | 8.16E+00 |
| 125374.1365 | 135605.0000 | 8.16E+00 |
| 124206.5077 | 134342.0000 | 8.16E+00 |
| 124034.3469 | 134156.0000 | 8.16E+00 |
| 111607.8186 | 120711.0000 | 8.16E+00 |
| 123479.8525 | 133557.0000 | 8.16E+00 |
| 123950.7518 | 134067.0000 | 8.16E+00 |
| 123993.9060 | 134114.0000 | 8.16E+00 |
| 122769.1557 | 132789.0000 | 8.16E+00 |
| 122294.9955 | 132277.0000 | 8.16E+00 |
| 122440.3652 | 132435.0000 | 8.16E+00 |
| 121465.2366 | 131380.0000 | 8.16E+00 |
| 122420.7695 | 132414.0000 | 8.16E+00 |
| 120949.8403 | 130824.0000 | 8.16E+00 |
| 112497.7966 | 121679.0000 | 8.16E+00 |
| 121030.4324 | 130912.0000 | 8.16E+00 |
| 120971.8939 | 130848.0000 | 8.16E+00 |
| 120228.8458 | 130045.0000 | 8.16E+00 |
| 119881.5698 | 129670.0000 | 8.17E+00 |
| 120014.8776 | 129815.0000 | 8.17E+00 |
| 119007.8470 | 128726.0000 | 8.17E+00 |
| 119137.5397 | 128867.0000 | 8.17E+00 |
| 119549.5768 | 129313.0000 | 8.17E+00 |
| 118278.6011 | 127939.0000 | 8.17E+00 |
| 111779.6087 | 120909.0000 | 8.17E+00 |
| 111656.9642 | 120777.0000 | 8.17E+00 |
| 117378.7531 | 126968.0000 | 8.17E+00 |
| 117052.6691 | 126616.0000 | 8.17E+00 |
| 116552.9858 | 126076.0000 | 8.17E+00 |
| 116059.0151 | 125542.0000 | 8.17E+00 |
| 115399.8949 | 124830.0000 | 8.17E+00 |
| 115256.6775 | 124676.0000 | 8.17E+00 |
| 114860.4893 | 124248.0000 | 8.17E+00 |
| 114550.6588 | 123913.0000 | 8.17E+00 |
| 108752.3118 | 117642.0000 | 8.17E+00 |
| 111314.3739 | 120414.0000 | 8.17E+00 |
| 112984.7213 | 122222.0000 | 8.18E+00 |
| 113245.8518 | 122505.0000 | 8.18E+00 |
| 113264.8987 | 122526.0000 | 8.18E+00 |
| 112091.5098 | 121258.0000 | 8.18E+00 |
| 112108.2282 | 121277.0000 | 8.18E+00 |
| 111424.7952 | 120538.0000 | 8.18E+00 |
| 111208.7056 | 120305.0000 | 8.18E+00 |
| 109864.8318 | 118852.0000 | 8.18E+00 |
| 105511.6070 | 114145.0000 | 8.18E+00 |
| 109887.4677 | 118878.0000 | 8.18E+00 |
| 109234.2585 | 118173.0000 | 8.18E+00 |
| 109023.9578 | 117946.0000 | 8.18E+00 |
| 108453.3452 | 117329.0000 | 8.18E+00 |
| 107960.0144 | 116796.0000 | 8.18E+00 |
| 107261.3532 | 116041.0000 | 8.19E+00 |
| 106917.3869 | 115670.0000 | 8.19E+00 |
| 106506.3580 | 115226.0000 | 8.19E+00 |
| 104695.1260 | 113268.0000 | 8.19E+00 |
| 101773.9754 | 110110.0000 | 8.19E+00 |
| 104496.1683 | 113054.0000 | 8.19E+00 |
| 104167.3785 | 112699.0000 | 8.19E+00 |
| 103518.4431 | 111997.0000 | 8.19E+00 |
| 102940.7863 | 111373.0000 | 8.19E+00 |
| 102119.9016 | 110487.0000 | 8.19E+00 |
| 102050.4577 | 110412.0000 | 8.19E+00 |
| 101000.9288 | 109277.0000 | 8.19E+00 |
| 99973.6973 | 108167.0000 | 8.20E+00 |
| 99317.0192 | 107457.0000 | 8.20E+00 |
| 95142.7386 | 102943.0000 | 8.20E+00 |
| 95445.0665 | 103270.0000 | 8.20E+00 |

| | | |
|---|---|---|
| 97114.9169 | 105076.0000 | 8.20E+00 |
| 96711.8108 | 104641.0000 | 8.20E+00 |
| 95768.5169 | 103621.0000 | 8.20E+00 |
| 95160.8715 | 102964.0000 | 8.20E+00 |
| 94507.2131 | 102257.0000 | 8.20E+00 |
| 93602.7491 | 101280.0000 | 8.20E+00 |
| 93120.2952 | 100758.0000 | 8.20E+00 |
| 91891.3091 | 99429.1000 | 8.20E+00 |
| 89127.7756 | 96440.5000 | 8.20E+00 |
| 90282.4036 | 97689.2000 | 8.20E+00 |
| 89779.5503 | 97145.3000 | 8.20E+00 |
| 88860.0971 | 96151.0000 | 8.20E+00 |
| 88093.7618 | 95322.2000 | 8.21E+00 |
| 87203.1395 | 94359.0000 | 8.21E+00 |
| 86459.8650 | 93555.1000 | 8.21E+00 |
| 85726.5123 | 92762.0000 | 8.21E+00 |
| 84745.8738 | 91701.3000 | 8.21E+00 |
| 83533.0075 | 90389.6000 | 8.21E+00 |
| 81068.7234 | 87724.6000 | 8.21E+00 |
| 82111.3838 | 88852.1000 | 8.21E+00 |
| 81155.8927 | 87818.1000 | 8.21E+00 |
| 80294.9374 | 86886.7000 | 8.21E+00 |
| 79294.5872 | 85804.6000 | 8.21E+00 |
| 78350.3334 | 84783.0000 | 8.21E+00 |
| 77349.1073 | 83699.8000 | 8.21E+00 |
| 76402.5003 | 82675.6000 | 8.21E+00 |
| 75507.7735 | 81707.5000 | 8.21E+00 |
| 74558.2577 | 80680.1000 | 8.21E+00 |
| 72315.8133 | 78254.3000 | 8.21E+00 |
| 72541.5386 | 78497.9000 | 8.21E+00 |
| 71643.0710 | 77525.6000 | 8.21E+00 |
| 70598.7768 | 76395.4000 | 8.21E+00 |
| 69637.6545 | 75355.3000 | 8.21E+00 |
| 68600.9202 | 74233.4000 | 8.21E+00 |
| 67584.1547 | 73133.1000 | 8.21E+00 |
| 66646.2551 | 72117.7000 | 8.21E+00 |
| 65666.2327 | 71057.0000 | 8.21E+00 |
| 64135.6552 | 69400.7000 | 8.21E+00 |
| 62951.9371 | 68119.6000 | 8.21E+00 |
| 62776.2697 | 67928.6000 | 8.21E+00 |
| 61838.4432 | 66913.4000 | 8.21E+00 |
| 60890.7210 | 65887.4000 | 8.21E+00 |
| 59907.9273 | 64823.4000 | 8.21E+00 |
| 58994.8570 | 63834.8000 | 8.20E+00 |
| 58072.7216 | 62836.4000 | 8.20E+00 |
| 57142.3832 | 61829.1000 | 8.20E+00 |
| 56132.0475 | 60735.0000 | 8.20E+00 |
| 55308.4988 | 59843.1000 | 8.20E+00 |
| 53774.2175 | 58182.4000 | 8.20E+00 |
| 53057.2421 | 57405.7000 | 8.20E+00 |
| 52714.1579 | 57033.4000 | 8.19E+00 |
| 51835.0610 | 56081.4000 | 8.19E+00 |
| 50972.0906 | 55146.7000 | 8.19E+00 |
| 50124.8971 | 54229.2000 | 8.19E+00 |
| 49250.5205 | 53282.2000 | 8.19E+00 |
| 48497.5660 | 52466.4000 | 8.18E+00 |
| 47633.5107 | 51530.6000 | 8.18E+00 |
| 46867.3731 | 50700.6000 | 8.18E+00 |
| 45655.6362 | 49388.6000 | 8.18E+00 |
| 45218.1868 | 48914.2000 | 8.17E+00 |
| 44572.7356 | 48214.8000 | 8.17E+00 |
| 43919.1318 | 47506.5000 | 8.17E+00 |
| 43087.6029 | 46605.8000 | 8.17E+00 |
| 42328.6831 | 45783.7000 | 8.16E+00 |
| 41676.3081 | 45076.7000 | 8.16E+00 |
| 41035.7775 | 44382.8000 | 8.16E+00 |
| 40335.7865 | 43624.3000 | 8.15E+00 |
| 39543.7629 | 42766.4000 | 8.15E+00 |
| 38561.1580 | 41702.3000 | 8.15E+00 |
| 38351.1960 | 41474.1000 | 8.14E+00 |
| 37670.4778 | 40736.6000 | 8.14E+00 |
| 37087.0668 | 40104.5000 | 8.14E+00 |
| 36449.3500 | 39413.6000 | 8.13E+00 |
| 35841.1580 | 38754.5000 | 8.13E+00 |
| 35309.4645 | 38178.3000 | 8.12E+00 |
| 34709.4356 | 37528.2000 | 8.12E+00 |
| 34106.5128 | 36875.0000 | 8.12E+00 |
| 33501.1839 | 36219.3000 | 8.11E+00 |
| 32727.5834 | 35381.6000 | 8.11E+00 |
| 32464.6289 | 35096.2000 | 8.11E+00 |

| | | |
|---|---|---|
| 31955.6487 | 34544.7000 | 8.10E+00 |
| 31443.2101 | 33989.6000 | 8.10E+00 |
| 30970.9560 | 33477.9000 | 8.09E+00 |
| 30480.7349 | 32946.8000 | 8.09E+00 |
| 29973.5167 | 32397.4000 | 8.09E+00 |
| 29491.8022 | 31875.6000 | 8.08E+00 |
| 29007.5424 | 31351.1000 | 8.08E+00 |
| 28534.5952 | 30838.8000 | 8.08E+00 |
| 27860.4602 | 30109.1000 | 8.07E+00 |
| 27438.5672 | 29652.1000 | 8.07E+00 |
| 27194.8011 | 29387.8000 | 8.06E+00 |
| 26765.0397 | 28922.5000 | 8.06E+00 |
| 26333.2042 | 28454.9000 | 8.06E+00 |
| 25911.9332 | 27998.7000 | 8.05E+00 |
| 25525.5788 | 27580.3000 | 8.05E+00 |
| 25136.6354 | 27159.2000 | 8.05E+00 |
| 24697.6047 | 26684.0000 | 8.04E+00 |
| 24340.3564 | 26297.2000 | 8.04E+00 |
| 23759.8720 | 25669.1000 | 8.04E+00 |
| 23572.1886 | 25465.7000 | 8.03E+00 |
| 23230.9492 | 25096.3000 | 8.03E+00 |
| 22909.5493 | 24748.4000 | 8.03E+00 |
| 22530.1701 | 24337.9000 | 8.02E+00 |
| 22225.7755 | 24008.5000 | 8.02E+00 |
| 21896.8609 | 23652.6000 | 8.02E+00 |
| 21565.8889 | 23294.5000 | 8.02E+00 |
| 21253.8505 | 22956.9000 | 8.01E+00 |
| 20939.4905 | 22616.8000 | 8.01E+00 |
| 20480.8956 | 22120.9000 | 8.01E+00 |
| 20364.8029 | 21995.1000 | 8.01E+00 |
| 20073.5238 | 21680.1000 | 8.00E+00 |
| 19799.3268 | 21383.6000 | 8.00E+00 |
| 19512.8865 | 21073.8000 | 8.00E+00 |
| 19252.6819 | 20792.4000 | 8.00E+00 |
| 18942.6158 | 20457.2000 | 8.00E+00 |
| 18732.9594 | 20230.5000 | 7.99E+00 |
| 18500.9681 | 19979.7000 | 7.99E+00 |
| 18166.3319 | 19618.0000 | 7.99E+00 |
| 17857.7754 | 19284.6000 | 7.99E+00 |
| 17749.9414 | 19168.0000 | 7.99E+00 |
| 17514.3421 | 18913.4000 | 7.99E+00 |
| 17301.3792 | 18683.2000 | 7.99E+00 |
| 17076.2168 | 18440.1000 | 7.99E+00 |
| 16864.5414 | 18211.4000 | 7.99E+00 |
| 16674.0116 | 18005.6000 | 7.99E+00 |
| 16463.0743 | 17777.8000 | 7.99E+00 |
| 16264.6399 | 17563.5000 | 7.99E+00 |
| 15975.0331 | 17250.7000 | 7.99E+00 |
| 15809.2911 | 17071.7000 | 7.99E+00 |
| 15747.3622 | 17004.9000 | 7.99E+00 |
| 15563.4119 | 16806.3000 | 7.99E+00 |
| 15360.0762 | 16586.8000 | 7.99E+00 |
| 15257.7519 | 16476.4000 | 7.99E+00 |
| 15075.2341 | 16279.4000 | 7.99E+00 |
| 14924.9749 | 16117.3000 | 7.99E+00 |
| 14791.2305 | 15973.1000 | 7.99E+00 |
| 14652.0624 | 15823.0000 | 7.99E+00 |
| 14486.2462 | 15644.1000 | 7.99E+00 |
| 14287.6281 | 15429.8000 | 7.99E+00 |
| 14133.2841 | 15263.3000 | 8.00E+00 |
| 14124.4072 | 15254.1000 | 8.00E+00 |
| 13992.0412 | 15111.4000 | 8.00E+00 |
| 13833.8960 | 14940.7000 | 8.00E+00 |
| 13750.1915 | 14850.6000 | 8.00E+00 |
| 13620.1986 | 14710.5000 | 8.01E+00 |
| 13529.9279 | 14613.3000 | 8.01E+00 |
| 13413.5420 | 14487.9000 | 8.01E+00 |
| 13252.5156 | 14314.3000 | 8.01E+00 |
| 13130.2650 | 14182.6000 | 8.01E+00 |
| 13089.6511 | 14139.2000 | 8.02E+00 |
| 13010.1752 | 14053.7000 | 8.02E+00 |
| 12973.0155 | 14014.0000 | 8.02E+00 |
| 12848.2608 | 13879.6000 | 8.03E+00 |
| 12777.8222 | 13803.9000 | 8.03E+00 |
| 12675.8325 | 13694.1000 | 8.03E+00 |
| 12608.8472 | 13622.1000 | 8.04E+00 |
| 12504.5353 | 13509.8000 | 8.04E+00 |
| 12493.4369 | 13498.3000 | 8.04E+00 |
| 12327.4967 | 13319.4000 | 8.05E+00 |
| 12352.9554 | 13347.4000 | 8.05E+00 |

| | | |
|---|---|---|
| 12253.8833 | 13240.8000 | 8.05E+00 |
| 12210.6530 | 13194.5000 | 8.06E+00 |
| 12153.5248 | 13133.4000 | 8.06E+00 |
| 12094.1695 | 13069.7000 | 8.07E+00 |
| 12043.7695 | 13015.7000 | 8.07E+00 |
| 11974.0127 | 12940.8000 | 8.07E+00 |
| 11968.9711 | 12935.9000 | 8.08E+00 |
| 11760.8435 | 12711.4000 | 8.08E+00 |
| 11822.3071 | 12778.4000 | 8.09E+00 |
| 11715.0027 | 12662.9000 | 8.09E+00 |
| 11747.8976 | 12699.0000 | 8.10E+00 |
| 11629.9076 | 12571.9000 | 8.10E+00 |
| 11650.9243 | 12595.2000 | 8.10E+00 |
| 11538.4526 | 12474.1000 | 8.11E+00 |
| 11601.6894 | 12543.0000 | 8.11E+00 |
| 11483.4356 | 12415.7000 | 8.12E+00 |
| 11518.3324 | 12454.0000 | 8.12E+00 |
| 11324.8977 | 12245.3000 | 8.13E+00 |
| 11289.1891 | 12207.3000 | 8.13E+00 |
| 11340.6921 | 12263.5000 | 8.14E+00 |
| 11319.6294 | 12241.3000 | 8.14E+00 |
| 11279.3650 | 12198.3000 | 8.15E+00 |
| 11209.4140 | 12123.2000 | 8.15E+00 |
| 11205.0422 | 12119.0000 | 8.16E+00 |
| 11076.0156 | 11980.0000 | 8.16E+00 |
| 10740.4093 | 11617.5000 | 8.17E+00 |
| 10705.4527 | 11580.2000 | 8.17E+00 |
| 10641.2219 | 11511.3000 | 8.18E+00 |
| 10589.4088 | 11455.7000 | 8.18E+00 |
| 10570.5988 | 11435.8000 | 8.18E+00 |
| 10579.5881 | 11446.2000 | 8.19E+00 |
| 10512.7257 | 11374.4000 | 8.20E+00 |
| 10530.9415 | 11394.6000 | 8.20E+00 |
| 10457.6145 | 11315.8000 | 8.21E+00 |
| 10443.4677 | 11301.0000 | 8.21E+00 |
| 10405.3681 | 11260.3000 | 8.22E+00 |
| 10390.1682 | 11244.3000 | 8.22E+00 |
| 10345.8192 | 11196.9000 | 8.23E+00 |
| 10298.3721 | 11146.0000 | 8.23E+00 |
| 10300.1898 | 11148.4000 | 8.23E+00 |
| 10262.3630 | 11108.0000 | 8.24E+00 |
| 10237.2919 | 11081.3000 | 8.24E+00 |
| 10209.3170 | 11051.6000 | 8.25E+00 |
| 10189.0106 | 11030.1000 | 8.25E+00 |
| 10134.2227 | 10971.3000 | 8.26E+00 |
| 10129.4617 | 10966.6000 | 8.26E+00 |
| 10053.0518 | 10884.4000 | 8.27E+00 |
| 10058.8630 | 10891.2000 | 8.27E+00 |
| 9976.9200 | 10802.9000 | 8.28E+00 |
| 9950.8883 | 10775.2000 | 8.28E+00 |
| 9943.8484 | 10767.9000 | 8.29E+00 |
| 9912.8655 | 10734.9000 | 8.29E+00 |
| 9852.4615 | 10669.9000 | 8.30E+00 |
| 9843.6191 | 10660.8000 | 8.30E+00 |
| 9794.5196 | 10608.1000 | 8.31E+00 |
| 9770.3504 | 10582.3000 | 8.31E+00 |
| 9733.1271 | 10542.4000 | 8.31E+00 |
| 9693.6381 | 10500.0000 | 8.32E+00 |
| 9629.9019 | 10431.5000 | 8.32E+00 |
| 9591.5836 | 10390.4000 | 8.33E+00 |
| 9601.2449 | 10401.2000 | 8.33E+00 |
| 9520.0621 | 10313.7000 | 8.34E+00 |
| 9492.6398 | 10284.4000 | 8.34E+00 |
| 9457.8434 | 10247.1000 | 8.34E+00 |
| 9410.0002 | 10195.6000 | 8.35E+00 |
| 9349.0196 | 10129.9000 | 8.35E+00 |
| 9326.0492 | 10105.4000 | 8.36E+00 |
| 9273.0199 | 10048.3000 | 8.36E+00 |
| 9218.3321 | 9989.3500 | 8.36E+00 |
| 9185.1128 | 9953.6800 | 8.37E+00 |
| 9144.7407 | 9910.2500 | 8.37E+00 |
| 9108.8375 | 9871.6500 | 8.37E+00 |
| 9054.1181 | 9812.6700 | 8.38E+00 |
| 8998.0328 | 9752.2000 | 8.38E+00 |
| 8958.3551 | 9709.4800 | 8.38E+00 |
| 8911.6411 | 9659.1300 | 8.39E+00 |
| 8851.9507 | 9594.6600 | 8.39E+00 |
| 8791.0224 | 9528.9100 | 8.39E+00 |
| 8722.9584 | 9455.4100 | 8.40E+00 |
| 8714.2865 | 9446.2700 | 8.40E+00 |

| | | |
|---|---|---|
| 8662.5589 | 9390.4500 | 8.40E+00 |
| 8609.9865 | 9333.7100 | 8.41E+00 |
| 8544.3290 | 9262.7800 | 8.41E+00 |
| 8508.6441 | 9224.3700 | 8.41E+00 |
| 8441.4825 | 9151.7700 | 8.41E+00 |
| 8423.4909 | 9132.4500 | 8.42E+00 |
| 8361.3517 | 9065.3000 | 8.42E+00 |
| 8260.8318 | 8956.5100 | 8.42E+00 |
| 8203.7167 | 8894.7600 | 8.42E+00 |
| 8178.0073 | 8867.0400 | 8.43E+00 |
| 8126.6477 | 8811.5300 | 8.43E+00 |
| 8068.5938 | 8748.7400 | 8.43E+00 |
| 8029.6768 | 8706.6900 | 8.43E+00 |
| 7958.2245 | 8629.3800 | 8.43E+00 |
| 7899.5453 | 8565.8900 | 8.44E+00 |
| 7834.1833 | 8495.1500 | 8.44E+00 |
| 7795.0996 | 8452.9000 | 8.44E+00 |
| 7729.6619 | 8382.0600 | 8.44E+00 |
| 7670.8681 | 8318.4200 | 8.44E+00 |
| 7545.1783 | 8182.2500 | 8.44E+00 |
| 7567.0846 | 8206.0700 | 8.44E+00 |
| 7468.1646 | 8098.9100 | 8.45E+00 |
| 7457.5015 | 8087.4500 | 8.45E+00 |
| 7386.1171 | 8010.1000 | 8.45E+00 |
| 7321.8107 | 7940.4100 | 8.45E+00 |
| 7237.1032 | 7848.6000 | 8.45E+00 |
| 7201.1376 | 7809.6500 | 8.45E+00 |
| 7117.0347 | 7718.5200 | 8.45E+00 |
| 7061.2170 | 7658.0500 | 8.45E+00 |
| 7020.1635 | 7613.5000 | 8.45E+00 |
| 6951.5173 | 7539.0800 | 8.45E+00 |
| 6904.7494 | 7488.3800 | 8.45E+00 |
| 6823.0561 | 7399.8200 | 8.45E+00 |
| 6784.9323 | 7358.4800 | 8.45E+00 |
| 6697.2860 | 7263.4400 | 8.45E+00 |
| 6668.1214 | 7231.8200 | 8.45E+00 |
| 6552.8162 | 7106.7200 | 8.45E+00 |
| 6525.5166 | 7077.0900 | 8.45E+00 |
| 6433.3542 | 6977.1400 | 8.45E+00 |
| 6408.1930 | 6949.8000 | 8.45E+00 |
| 6332.4708 | 6867.6700 | 8.45E+00 |
| 6287.3684 | 6818.7100 | 8.45E+00 |
| 6206.0783 | 6730.5200 | 8.45E+00 |
| 6140.6792 | 6659.5600 | 8.45E+00 |
| 6091.3978 | 6606.0600 | 8.45E+00 |
| 6020.6456 | 6529.2900 | 8.45E+00 |
| 5966.1526 | 6470.1500 | 8.45E+00 |
| 5874.8533 | 6371.0200 | 8.45E+00 |
| 5784.4760 | 6272.9400 | 8.44E+00 |
| 5725.8222 | 6209.2600 | 8.44E+00 |
| 5699.2908 | 6180.4100 | 8.44E+00 |
| 5627.8848 | 6102.9000 | 8.44E+00 |
| 5581.0249 | 6052.0100 | 8.44E+00 |
| 5496.6281 | 5960.4100 | 8.44E+00 |
| 5460.3773 | 5921.0000 | 8.44E+00 |
| 5362.8781 | 5815.2000 | 8.43E+00 |
| 5329.5668 | 5778.9800 | 8.43E+00 |
| 5242.5457 | 5684.5300 | 8.43E+00 |
| 5156.8180 | 5591.4900 | 8.43E+00 |
| 5096.3405 | 5525.7600 | 8.43E+00 |
| 5085.1950 | 5513.5500 | 8.42E+00 |
| 5003.8225 | 5425.2100 | 8.42E+00 |
| 4964.0271 | 5381.9400 | 8.42E+00 |
| 4901.7457 | 5314.3100 | 8.42E+00 |
| 4849.1135 | 5257.1200 | 8.41E+00 |
| 4773.8055 | 5175.3800 | 8.41E+00 |
| 4700.0286 | 5095.2700 | 8.41E+00 |
| 4676.7019 | 5069.8500 | 8.41E+00 |
| 4557.1741 | 4940.1700 | 8.40E+00 |
| 4594.6520 | 4980.6400 | 8.40E+00 |
| 4609.7578 | 4996.8800 | 8.40E+00 |
| 4618.7482 | 5006.4700 | 8.39E+00 |
| 4654.7032 | 5045.2800 | 8.39E+00 |
| 4593.1633 | 4978.4400 | 8.39E+00 |
| 4525.0023 | 4904.4400 | 8.39E+00 |
| 4500.2600 | 4877.4700 | 8.38E+00 |
| 4410.5631 | 4780.0600 | 8.38E+00 |
| 4355.9480 | 4720.7100 | 8.37E+00 |
| 4252.7598 | 4608.7600 | 8.37E+00 |
| 4252.0717 | 4607.8500 | 8.37E+00 |

| | | |
|---|---|---|
| 4185.9884 | 4536.0900 | 8.36E+00 |
| 4113.2332 | 4457.1200 | 8.36E+00 |
| 4059.1371 | 4398.3500 | 8.36E+00 |
| 4040.7368 | 4378.2600 | 8.35E+00 |
| 3973.3899 | 4305.1500 | 8.35E+00 |
| 3907.8423 | 4233.9700 | 8.35E+00 |
| 3861.1146 | 4183.2200 | 8.34E+00 |
| 3799.2250 | 4116.0000 | 8.34E+00 |
| 3730.6479 | 4041.5800 | 8.33E+00 |
| 3638.3115 | 3941.4100 | 8.33E+00 |
| 3675.8878 | 3981.9500 | 8.33E+00 |
| 3595.7881 | 3895.0400 | 8.32E+00 |
| 3543.2022 | 3837.9400 | 8.32E+00 |
| 3501.0663 | 3792.1500 | 8.31E+00 |
| 3443.6777 | 3729.8600 | 8.31E+00 |
| 3396.7512 | 3678.8900 | 8.31E+00 |
| 3351.7220 | 3629.9800 | 8.30E+00 |
| 3308.5939 | 3583.1300 | 8.30E+00 |
| 3198.6017 | 3463.8900 | 8.29E+00 |
| 3176.4404 | 3439.7500 | 8.29E+00 |
| 3156.2132 | 3417.7100 | 8.29E+00 |
| 3120.7608 | 3379.1000 | 8.28E+00 |
| 3069.9319 | 3323.9400 | 8.27E+00 |
| 3021.0036 | 3270.8300 | 8.27E+00 |
| 2982.5904 | 3229.1000 | 8.26E+00 |
| 2937.4655 | 3180.1100 | 8.26E+00 |
| 2842.5744 | 3077.2600 | 8.26E+00 |
| 2801.2520 | 3032.3900 | 8.25E+00 |
| 2822.1003 | 3054.8200 | 8.25E+00 |
| 2767.3411 | 2995.4200 | 8.24E+00 |
| 2714.4828 | 2938.0900 | 8.24E+00 |
| 2680.7304 | 2901.4200 | 8.23E+00 |
| 2614.4607 | 2829.5700 | 8.23E+00 |
| 2601.6698 | 2815.6100 | 8.22E+00 |
| 2573.5519 | 2785.0600 | 8.22E+00 |
| 2530.1198 | 2737.9400 | 8.21E+00 |
| 2497.1459 | 2702.1300 | 8.21E+00 |
| 2431.7305 | 2631.2400 | 8.20E+00 |
| 2385.3568 | 2580.9500 | 8.20E+00 |
| 2375.0891 | 2569.7300 | 8.20E+00 |
| 2332.4182 | 2523.4400 | 8.19E+00 |
| 2300.1469 | 2488.4200 | 8.19E+00 |
| 2295.3162 | 2483.0800 | 8.18E+00 |
| 2249.6121 | 2433.5300 | 8.18E+00 |
| 2205.7579 | 2385.9900 | 8.17E+00 |
| 2172.2497 | 2349.6300 | 8.17E+00 |
| 2157.5416 | 2333.6200 | 8.16E+00 |
| 2076.7231 | 2246.1000 | 8.16E+00 |
| 2023.2554 | 2188.1700 | 8.15E+00 |
| 2047.7304 | 2214.5500 | 8.15E+00 |
| 2014.7154 | 2178.7500 | 8.14E+00 |
| 2000.3411 | 2163.1100 | 8.14E+00 |
| 1945.5790 | 2103.8000 | 8.13E+00 |
| 1901.0600 | 2055.5700 | 8.13E+00 |
| 1891.8833 | 2045.5500 | 8.12E+00 |
| 1875.9985 | 2028.2900 | 8.12E+00 |
| 1853.3704 | 2003.7900 | 8.12E+00 |
| 1790.7887 | 1936.0600 | 8.11E+00 |
| 1730.0661 | 1870.3200 | 8.11E+00 |
| 1762.5202 | 1905.3200 | 8.10E+00 |
| 1713.5315 | 1852.2800 | 8.10E+00 |
| 1707.6706 | 1845.8600 | 8.09E+00 |
| 1695.1339 | 1832.2400 | 8.09E+00 |
| 1667.7165 | 1802.5100 | 8.08E+00 |
| 1641.9500 | 1774.5900 | 8.08E+00 |
| 1617.8177 | 1748.4300 | 8.07E+00 |
| 1578.9476 | 1706.3600 | 8.07E+00 |
| 1549.9169 | 1674.9100 | 8.06E+00 |
| 1506.2437 | 1627.6500 | 8.06E+00 |
| 1512.9407 | 1634.8100 | 8.06E+00 |
| 1496.7833 | 1617.2800 | 8.05E+00 |
| 1457.9375 | 1575.2300 | 8.05E+00 |
| 1460.9855 | 1578.4600 | 8.04E+00 |
| 1417.2648 | 1531.1700 | 8.04E+00 |
| 1423.2328 | 1537.5500 | 8.03E+00 |
| 1390.6435 | 1502.2800 | 8.03E+00 |
| 1375.5474 | 1485.9100 | 8.02E+00 |
| 1369.8500 | 1479.7000 | 8.02E+00 |
| 1294.3329 | 1398.0700 | 8.01E+00 |
| 1315.2683 | 1420.6200 | 8.01E+00 |

| | | |
|---|---|---|
| 1321.6987 | 1427.5000 | 8.00E+00 |
| 1298.0416 | 1401.9000 | 8.00E+00 |
| 1291.4806 | 1394.7700 | 8.00E+00 |
| 1247.2923 | 1346.9900 | 7.99E+00 |
| 1227.9781 | 1326.0700 | 7.99E+00 |
| 1217.7462 | 1315.0400 | 7.99E+00 |
| 1216.6219 | 1313.7700 | 7.99E+00 |
| 1201.3725 | 1297.2500 | 7.98E+00 |
| 1156.8082 | 1249.0800 | 7.98E+00 |
| 1159.5923 | 1252.0500 | 7.97E+00 |
| 1148.3496 | 1239.8600 | 7.97E+00 |
| 1145.9697 | 1237.2300 | 7.96E+00 |
| 1122.1164 | 1211.4400 | 7.96E+00 |
| 1114.6692 | 1203.3600 | 7.96E+00 |
| 1093.4280 | 1180.3900 | 7.95E+00 |
| 1095.9202 | 1183.0300 | 7.95E+00 |
| 1062.2821 | 1146.6700 | 7.94E+00 |
| 1044.8601 | 1127.8300 | 7.94E+00 |
| 1028.6789 | 1110.3300 | 7.94E+00 |
| 1006.3553 | 1086.1800 | 7.93E+00 |
| 1021.9631 | 1103.0000 | 7.93E+00 |
| 1016.6032 | 1097.1800 | 7.93E+00 |
| 1005.0623 | 1084.6900 | 7.92E+00 |
| 1001.8528 | 1081.2500 | 7.93E+00 |
| 992.5407 | 1071.1600 | 7.92E+00 |
| 984.3221 | 1062.2500 | 7.92E+00 |
| 984.3459 | 1062.2400 | 7.91E+00 |
| 971.0816 | 1047.9000 | 7.91E+00 |
| 923.3582 | 996.3580 | 7.91E+00 |
| 940.7144 | 1015.0600 | 7.90E+00 |
| 916.5775 | 988.9870 | 7.90E+00 |
| 921.6725 | 994.4440 | 7.90E+00 |
| 927.6596 | 1000.8800 | 7.89E+00 |
| 878.7930 | 948.1280 | 7.89E+00 |
| 900.5903 | 971.6210 | 7.89E+00 |
| 860.9465 | 928.8150 | 7.88E+00 |
| 905.0403 | 976.3640 | 7.88E+00 |
| 874.2872 | 943.1660 | 7.88E+00 |
| 865.0524 | 933.2450 | 7.88E+00 |
| 870.3841 | 938.9560 | 7.88E+00 |
| 835.9302 | 901.7640 | 7.88E+00 |
| 849.7028 | 916.5910 | 7.87E+00 |
| 857.4587 | 924.9300 | 7.87E+00 |
| 832.5611 | 898.0480 | 7.87E+00 |
| 821.9451 | 886.5660 | 7.86E+00 |
| 832.0263 | 897.4230 | 7.86E+00 |
| 803.2531 | 866.3570 | 7.86E+00 |
| 808.2468 | 871.7290 | 7.85E+00 |
| 774.7660 | 835.5930 | 7.85E+00 |
| 807.2519 | 870.6190 | 7.85E+00 |
| 801.3383 | 864.2220 | 7.85E+00 |
| 802.5460 | 865.5690 | 7.85E+00 |
| 785.2403 | 846.8700 | 7.85E+00 |
| 794.2748 | 856.5920 | 7.85E+00 |
| 784.8051 | 846.3610 | 7.84E+00 |
| 795.0268 | 857.3560 | 7.84E+00 |
| 786.8759 | 848.5520 | 7.84E+00 |
| 766.8636 | 826.9460 | 7.83E+00 |
| 747.6267 | 806.1830 | 7.83E+00 |
| 778.8216 | 839.8180 | 7.83E+00 |
| 779.3846 | 840.4120 | 7.83E+00 |
| 774.2943 | 834.9490 | 7.83E+00 |
| 775.9727 | 836.7280 | 7.83E+00 |
| 772.0513 | 832.4830 | 7.83E+00 |
| 750.4559 | 809.1770 | 7.82E+00 |
| 753.7247 | 812.6920 | 7.82E+00 |
| 757.4543 | 816.6960 | 7.82E+00 |
| 767.6396 | 827.6250 | 7.81E+00 |
| 760.1914 | 819.6560 | 7.82E+00 |
| 711.8400 | 767.4860 | 7.82E+00 |
| 752.8998 | 811.7420 | 7.82E+00 |
| 746.9916 | 805.3600 | 7.81E+00 |
| 759.1070 | 818.3850 | 7.81E+00 |
| 748.1347 | 806.5980 | 7.81E+00 |
| 755.0809 | 814.0830 | 7.81E+00 |
| 733.4681 | 790.7780 | 7.81E+00 |
| 746.8739 | 805.2390 | 7.81E+00 |
| 737.6203 | 795.2570 | 7.81E+00 |
| 723.0868 | 779.5900 | 7.81E+00 |
| 742.9876 | 801.0510 | 7.81E+00 |

| | | |
|---|---|---|
| 751.7281 | 810.4920 | 7.82E+00 |
| 738.2780 | 795.9250 | 7.81E+00 |
| 725.1798 | 781.8020 | 7.81E+00 |
| 740.2746 | 798.0740 | 7.81E+00 |
| 727.7952 | 784.6090 | 7.81E+00 |
| 737.7136 | 795.2910 | 7.80E+00 |
| 747.7680 | 806.1260 | 7.80E+00 |
| 736.0894 | 793.5260 | 7.80E+00 |
| 713.8478 | 769.5370 | 7.80E+00 |
| 746.1120 | 804.3120 | 7.80E+00 |
| 735.0934 | 792.4940 | 7.81E+00 |
| 745.8401 | 804.0780 | 7.81E+00 |
| 708.5826 | 763.9140 | 7.81E+00 |
| 735.5681 | 793.0060 | 7.81E+00 |
| 730.6892 | 787.7580 | 7.81E+00 |
| 720.6958 | 776.9870 | 7.81E+00 |
| 726.6179 | 783.3830 | 7.81E+00 |
| 722.1304 | 778.5480 | 7.81E+00 |
| 712.5582 | 768.2400 | 7.81E+00 |
| 718.6478 | 774.8180 | 7.82E+00 |
| 709.3488 | 764.7280 | 7.81E+00 |
| 720.6195 | 776.8820 | 7.81E+00 |
| 726.7117 | 783.4540 | 7.81E+00 |
| 712.4299 | 768.0530 | 7.81E+00 |
| 728.6373 | 785.5290 | 7.81E+00 |
| 704.3831 | 759.3730 | 7.81E+00 |
| 725.4630 | 782.1040 | 7.81E+00 |
| 716.3557 | 772.2750 | 7.81E+00 |
| 702.3096 | 757.1270 | 7.81E+00 |
| 683.3129 | 736.7170 | 7.82E+00 |
| 708.8178 | 764.2300 | 7.82E+00 |
| 709.4850 | 764.9570 | 7.82E+00 |
| 690.5013 | 744.4960 | 7.82E+00 |
| 681.3076 | 734.5980 | 7.82E+00 |
| 701.1432 | 755.9940 | 7.82E+00 |
| 701.3832 | 756.2690 | 7.83E+00 |
| 696.6738 | 751.2090 | 7.83E+00 |
| 706.2759 | 761.5020 | 7.82E+00 |
| 691.7479 | 745.8440 | 7.82E+00 |
| 696.1546 | 750.5960 | 7.82E+00 |
| 681.4337 | 734.7270 | 7.82E+00 |
| 699.5926 | 754.3190 | 7.82E+00 |
| 698.6438 | 753.2950 | 7.82E+00 |
| 688.1451 | 741.9820 | 7.82E+00 |
| 677.5066 | 730.5080 | 7.82E+00 |
| 680.5448 | 733.8600 | 7.83E+00 |
| 669.5270 | 721.9890 | 7.84E+00 |
| 695.1079 | 749.5920 | 7.84E+00 |
| 674.4300 | 727.3070 | 7.84E+00 |
| 681.0011 | 734.4080 | 7.84E+00 |
| 669.0589 | 721.5490 | 7.85E+00 |
| 675.0116 | 727.9800 | 7.85E+00 |
| 671.6636 | 724.3100 | 7.84E+00 |
| 654.4871 | 705.7960 | 7.84E+00 |
| 668.4298 | 720.8430 | 7.84E+00 |
| 673.0182 | 725.8060 | 7.84E+00 |
| 659.4563 | 711.1940 | 7.85E+00 |
| 663.3406 | 715.3970 | 7.85E+00 |
| 653.6024 | 704.8990 | 7.85E+00 |
| 643.5611 | 694.0830 | 7.85E+00 |
| 655.0933 | 706.5300 | 7.85E+00 |
| 639.9797 | 690.2450 | 7.85E+00 |
| 646.3026 | 697.0770 | 7.86E+00 |
| 656.5061 | 708.0880 | 7.86E+00 |
| 640.3144 | 690.6350 | 7.86E+00 |
| 645.3191 | 696.0500 | 7.86E+00 |
| 636.9902 | 687.0780 | 7.86E+00 |
| 632.5465 | 682.2980 | 7.87E+00 |
| 640.4577 | 690.8430 | 7.87E+00 |
| 635.1195 | 685.0940 | 7.87E+00 |
| 629.3479 | 678.8840 | 7.87E+00 |
| 623.1374 | 672.2010 | 7.87E+00 |
| 629.0958 | 678.6370 | 7.87E+00 |
| 630.3344 | 679.9910 | 7.88E+00 |
| 626.8416 | 676.2850 | 7.89E+00 |
| 635.4085 | 685.5430 | 7.89E+00 |
| 610.1796 | 658.3350 | 7.89E+00 |
| 625.9911 | 675.4130 | 7.89E+00 |
| 599.8978 | 647.2750 | 7.90E+00 |
| 585.7777 | 632.0560 | 7.90E+00 |

| | | |
|---|---|---|
| 599.9125 | 647.3200 | 7.90E+00 |
| 605.2402 | 653.0890 | 7.91E+00 |
| 589.5817 | 636.2010 | 7.91E+00 |
| 589.7247 | 636.3710 | 7.91E+00 |
| 585.2427 | 631.5540 | 7.91E+00 |
| 584.2579 | 630.5030 | 7.92E+00 |
| 590.7714 | 637.5550 | 7.92E+00 |
| 580.5638 | 626.5520 | 7.92E+00 |
| 569.8207 | 614.9730 | 7.92E+00 |
| 558.5385 | 602.8080 | 7.93E+00 |
| 562.6818 | 607.2980 | 7.93E+00 |
| 566.1987 | 611.1110 | 7.93E+00 |
| 573.0623 | 618.5330 | 7.93E+00 |
| 575.3115 | 620.9770 | 7.94E+00 |
| 565.0576 | 609.9250 | 7.94E+00 |
| 562.1197 | 606.7780 | 7.94E+00 |
| 538.8800 | 581.7000 | 7.95E+00 |
| 558.3168 | 602.7010 | 7.95E+00 |
| 549.5894 | 593.2960 | 7.95E+00 |
| 540.2564 | 583.2370 | 7.96E+00 |
| 534.2176 | 576.7350 | 7.96E+00 |
| 519.7652 | 561.1450 | 7.96E+00 |
| 524.1414 | 565.8850 | 7.96E+00 |
| 516.2069 | 557.3370 | 7.97E+00 |
| 523.1199 | 564.8170 | 7.97E+00 |
| 521.6130 | 563.2090 | 7.97E+00 |
| 507.8737 | 548.3890 | 7.98E+00 |
| 505.0566 | 545.3670 | 7.98E+00 |
| 493.8911 | 533.3250 | 7.98E+00 |
| 493.5860 | 533.0070 | 7.99E+00 |
| 511.7420 | 552.6320 | 7.99E+00 |
| 502.3952 | 542.5550 | 7.99E+00 |
| 496.2082 | 535.8900 | 8.00E+00 |
| 496.9709 | 536.7290 | 8.00E+00 |
| 489.4298 | 528.6020 | 8.00E+00 |
| 481.2175 | 519.7480 | 8.01E+00 |
| 479.9171 | 518.3610 | 8.01E+00 |
| 481.7091 | 520.3080 | 8.01E+00 |
| 460.1071 | 496.9910 | 8.02E+00 |
| 452.9674 | 489.2980 | 8.02E+00 |
| 456.4524 | 493.0770 | 8.02E+00 |
| 451.6925 | 487.9480 | 8.03E+00 |
| 438.7175 | 473.9480 | 8.03E+00 |
| 451.3593 | 487.6250 | 8.03E+00 |
| 452.0087 | 488.3380 | 8.04E+00 |
| 444.4489 | 480.1860 | 8.04E+00 |
| 432.4518 | 467.2440 | 8.05E+00 |
| 434.7314 | 469.7170 | 8.05E+00 |
| 421.3483 | 455.2770 | 8.05E+00 |
| 418.4785 | 452.1910 | 8.06E+00 |
| 407.4443 | 440.2790 | 8.06E+00 |
| 388.2714 | 419.5780 | 8.06E+00 |
| 398.1886 | 430.3090 | 8.07E+00 |
| 385.0672 | 416.1410 | 8.07E+00 |
| 397.2672 | 429.3360 | 8.07E+00 |
| 390.1692 | 421.6830 | 8.08E+00 |
| 374.9484 | 405.2420 | 8.08E+00 |
| 373.8721 | 404.0930 | 8.08E+00 |
| 360.9693 | 390.1620 | 8.09E+00 |
| 358.4839 | 387.4900 | 8.09E+00 |
| 362.6982 | 392.0580 | 8.09E+00 |
| 358.8007 | 387.8560 | 8.10E+00 |
| 343.1042 | 370.9020 | 8.10E+00 |
| 341.5058 | 369.1850 | 8.11E+00 |
| 328.1192 | 354.7260 | 8.11E+00 |
| 339.9019 | 367.4800 | 8.11E+00 |
| 325.1209 | 351.5070 | 8.12E+00 |
| 309.6527 | 334.7950 | 8.12E+00 |
| 308.2594 | 333.3010 | 8.12E+00 |
| 302.4818 | 327.0690 | 8.13E+00 |
| 299.7034 | 324.0730 | 8.13E+00 |
| 299.9257 | 324.3260 | 8.14E+00 |
| 299.4607 | 323.8310 | 8.14E+00 |
| 305.6944 | 330.5830 | 8.14E+00 |
| 274.3348 | 296.6840 | 8.15E+00 |
| 275.5083 | 297.9630 | 8.15E+00 |
| 268.6623 | 290.5290 | 8.14E+00 |
| 272.1744 | 294.3330 | 8.14E+00 |
| 263.9370 | 285.4350 | 8.15E+00 |
| 255.0270 | 275.8130 | 8.15E+00 |

| | | |
|---|---|---|
| 252.8345 | 273.4490 | 8.15E+00 |
| 235.1978 | 254.3850 | 8.16E+00 |
| 231.6730 | 250.5800 | 8.16E+00 |
| 223.7917 | 242.0630 | 8.16E+00 |
| 244.8453 | 264.8510 | 8.17E+00 |
| 209.7511 | 226.8920 | 8.17E+00 |
| 218.4062 | 236.2630 | 8.18E+00 |
| 200.5010 | 216.9080 | 8.18E+00 |
| 204.1706 | 220.8810 | 8.18E+00 |
| 188.6705 | 204.1220 | 8.19E+00 |
| 194.7789 | 210.7380 | 8.19E+00 |
| 189.1298 | 204.6370 | 8.20E+00 |
| 167.9909 | 181.7670 | 8.20E+00 |
| 161.0713 | 174.2860 | 8.20E+00 |
| 149.8068 | 162.1030 | 8.21E+00 |
| 160.2441 | 173.4090 | 8.22E+00 |
| 151.4644 | 163.9120 | 8.22E+00 |
| 153.2540 | 165.8570 | 8.22E+00 |
| 143.2502 | 155.0360 | 8.23E+00 |
| 121.4309 | 131.4220 | 8.23E+00 |
| 117.6721 | 127.3590 | 8.23E+00 |
| 113.3204 | 122.6530 | 8.24E+00 |
| 108.3791 | 117.3110 | 8.24E+00 |
| 117.8515 | 127.5690 | 8.25E+00 |
| 104.2475 | 112.8460 | 8.25E+00 |
| 97.5646 | 105.6140 | 8.25E+00 |
| 75.2603 | 81.4723 | 8.25E+00 |
| 101.3080 | 109.6760 | 8.26E+00 |
| 70.2983 | 76.1096 | 8.27E+00 |
| 68.8727 | 74.5663 | 8.27E+00 |
| 51.7852 | 56.0684 | 8.27E+00 |
| 49.2523 | 53.3272 | 8.27E+00 |
| 42.3928 | 45.9023 | 8.28E+00 |
| 42.5760 | 46.0995 | 8.28E+00 |
| 30.8065 | 33.3957 | 8.40E+00 |
| 29.9378 | 32.4576 | 8.42E+00 |
| 5.7299 | 6.2085 | 8.35E+00 |
| -6.2749 | -6.7867 | 8.16E+00 |
| -5.3945 | -5.8342 | 8.15E+00 |
| -5.0003 | -5.4072 | 8.14E+00 |

| | | |
|---|---|---|
| -35.7679 | -38.7506 | 8.34E+00 |
| -24.8624 | -26.9353 | 8.34E+00 |
| -45.1743 | -48.9424 | 8.34E+00 |
| -42.8971 | -46.4731 | 8.34E+00 |
| -37.2105 | -40.3197 | 8.36E+00 |
| -39.6948 | -43.0063 | 8.34E+00 |
| -54.2617 | -58.7945 | 8.35E+00 |
| -73.2004 | -79.3174 | 8.36E+00 |
| -73.2102 | -79.3288 | 8.36E+00 |
| -77.5462 | -84.0322 | 8.36E+00 |
| -90.1263 | -97.6697 | 8.37E+00 |
| -99.2656 | -107.5730 | 8.37E+00 |
| -112.7674 | -122.2130 | 8.38E+00 |
| -111.0454 | -120.3460 | 8.38E+00 |
| -125.4348 | -135.9520 | 8.38E+00 |
| -140.2753 | -152.0410 | 8.39E+00 |
| -116.1307 | -125.8720 | 8.39E+00 |
| -139.6997 | -151.4230 | 8.39E+00 |
| -143.9427 | -156.0260 | 8.39E+00 |
| -148.5774 | -161.0550 | 8.40E+00 |
| -165.5239 | -179.4300 | 8.40E+00 |
| -174.9363 | -189.6400 | 8.41E+00 |
| -172.7739 | -187.2960 | 8.41E+00 |
| -170.9523 | -185.3310 | 8.41E+00 |
| -193.5139 | -209.7990 | 8.42E+00 |
| -212.4889 | -230.3740 | 8.42E+00 |
| -203.7190 | -220.8730 | 8.42E+00 |
| -219.4289 | -237.9160 | 8.43E+00 |
| -227.4474 | -246.6140 | 8.43E+00 |
| -227.7194 | -246.9170 | 8.43E+00 |
| -236.4185 | -256.3550 | 8.43E+00 |
| -253.5921 | -274.9820 | 8.43E+00 |
| -262.9896 | -285.1880 | 8.44E+00 |
| -276.8042 | -300.1740 | 8.44E+00 |
| -274.5994 | -297.7940 | 8.45E+00 |
| -276.7663 | -300.1490 | 8.45E+00 |
| -295.6631 | -320.6520 | 8.45E+00 |
| -314.9115 | -341.5390 | 8.46E+00 |
| -297.3509 | -322.4980 | 8.46E+00 |
| -321.3567 | -348.5460 | 8.46E+00 |

Universidad Industrial de Santander

ANEXO N. ÍNDICE DE REFRACCIÓN ZnS13A2

| índice de refracción ZnS13A2 | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 2.5168 | 2.5168 | 6.13E-05 |
| 2.5155 | 2.5155 | 7.68E-05 |
| 2.5141 | 2.5141 | 6.28E-05 |
| 2.5128 | 2.5128 | 4.08E-05 |
| 2.5115 | 2.5115 | 9.74E-06 |
| 2.5102 | 2.5102 | 1.84E-04 |
| 2.5089 | 2.5089 | 1.73E-04 |
| 2.5076 | 2.5076 | 1.15E-04 |
| 2.5063 | 2.5063 | 1.49E-04 |
| 2.5050 | 2.5050 | 1.65E-04 |
| 2.5037 | 2.5038 | 6.75E-05 |
| 2.5025 | 2.5025 | 1.50E-04 |
| 2.5012 | 2.5012 | 8.18E-05 |
| 2.4999 | 2.4999 | 1.36E-04 |
| 2.4986 | 2.4986 | 1.02E-04 |
| 2.4974 | 2.4974 | 1.84E-04 |
| 2.4961 | 2.4961 | 7.91E-05 |
| 2.4949 | 2.4949 | 8.87E-05 |
| 2.4936 | 2.4936 | 1.56E-04 |
| 2.4923 | 2.4923 | 1.47E-04 |
| 2.4911 | 2.4911 | 1.95E-04 |
| 2.4898 | 2.4899 | 1.29E-05 |
| 2.4886 | 2.4886 | 7.63E-05 |
| 2.4874 | 2.4874 | 4.82E-06 |
| 2.4861 | 2.4861 | 1.72E-04 |
| 2.4849 | 2.4849 | 1.97E-04 |
| 2.4837 | 2.4837 | 9.65E-05 |
| 2.4825 | 2.4825 | 1.56E-04 |
| 2.4812 | 2.4812 | 1.47E-04 |
| 2.4800 | 2.4800 | 1.23E-04 |
| 2.4788 | 2.4788 | 1.51E-04 |
| 2.4776 | 2.4776 | 1.62E-04 |
| 2.4764 | 2.4764 | 8.98E-05 |
| 2.4752 | 2.4752 | 2.02E-04 |
| 2.4740 | 2.4740 | 1.76E-04 |
| 2.4728 | 2.4728 | 1.05E-05 |
| 2.4716 | 2.4716 | 1.11E-04 |
| 2.4704 | 2.4704 | 7.40E-05 |
| 2.4692 | 2.4692 | 1.01E-04 |
| 2.4680 | 2.4680 | 7.08E-06 |
| 2.4669 | 2.4669 | 5.01E-05 |
| 2.4657 | 2.4657 | 1.76E-04 |
| 2.4645 | 2.4645 | 1.38E-04 |
| 2.4633 | 2.4633 | 1.82E-04 |
| 2.4622 | 2.4622 | 4.47E-05 |
| 2.4610 | 2.4610 | 1.38E-04 |
| 2.4599 | 2.4599 | 9.72E-05 |
| 2.4587 | 2.4587 | 7.69E-05 |
| 2.4575 | 2.4576 | 2.28E-05 |
| 2.4564 | 2.4564 | 9.86E-06 |
| 2.4553 | 2.4553 | 1.75E-04 |
| 2.4541 | 2.4541 | 6.38E-05 |
| 2.4530 | 2.4530 | 8.40E-05 |
| 2.4518 | 2.4518 | 1.73E-04 |
| 2.4507 | 2.4507 | 1.08E-04 |
| 2.4496 | 2.4496 | 1.12E-04 |
| 2.4484 | 2.4485 | 1.64E-04 |
| 2.4473 | 2.4473 | 9.76E-05 |
| 2.4462 | 2.4462 | 7.95E-05 |
| 2.4451 | 2.4451 | 1.89E-04 |
| 2.4440 | 2.4440 | 1.82E-05 |
| 2.4429 | 2.4429 | 2.58E-05 |
| 2.4418 | 2.4418 | 5.71E-05 |
| 2.4406 | 2.4407 | 1.43E-04 |
| 2.4395 | 2.4395 | 1.93E-04 |
| 2.4384 | 2.4385 | 1.66E-04 |
| 2.4374 | 2.4374 | 1.08E-05 |
| 2.4363 | 2.4363 | 9.78E-05 |
| 2.4352 | 2.4352 | 8.20E-05 |
| 2.4341 | 2.4341 | 5.79E-05 |
| 2.4330 | 2.4330 | 8.94E-05 |
| 2.4319 | 2.4319 | 1.14E-04 |
| 2.4308 | 2.4308 | 1.49E-05 |
| 2.4298 | 2.4298 | 2.05E-04 |
| 2.4287 | 2.4287 | 1.38E-04 |

| | | |
|---|---|---|
| 2.4276 | 2.4276 | 1.92E-04 |
| 2.4266 | 2.4266 | 4.54E-05 |
| 2.4255 | 2.4255 | 1.62E-04 |
| 2.4244 | 2.4244 | 1.58E-04 |
| 2.4234 | 2.4234 | 3.40E-05 |
| 2.4223 | 2.4223 | 2.03E-04 |
| 2.4213 | 2.4213 | 1.60E-04 |
| 2.4202 | 2.4202 | 1.83E-04 |
| 2.4192 | 2.4192 | 4.40E-06 |
| 2.4181 | 2.4181 | 1.03E-04 |
| 2.4171 | 2.4171 | 9.24E-05 |
| 2.4161 | 2.4161 | 3.55E-05 |
| 2.4150 | 2.4150 | 1.33E-04 |
| 2.4140 | 2.4140 | 1.86E-04 |
| 2.4130 | 2.4130 | 1.22E-04 |
| 2.4119 | 2.4119 | 5.79E-05 |
| 2.4109 | 2.4109 | 6.13E-05 |
| 2.4099 | 2.4099 | 6.53E-05 |
| 2.4089 | 2.4089 | 4.55E-05 |
| 2.4079 | 2.4079 | 1.44E-04 |
| 2.4069 | 2.4069 | 1.95E-04 |
| 2.4058 | 2.4059 | 1.83E-04 |
| 2.4048 | 2.4048 | 3.15E-05 |
| 2.4038 | 2.4038 | 1.83E-04 |
| 2.4028 | 2.4028 | 1.94E-04 |
| 2.4018 | 2.4018 | 1.49E-04 |
| 2.4008 | 2.4008 | 3.59E-05 |
| 2.3998 | 2.3999 | 8.39E-05 |
| 2.3989 | 2.3989 | 9.26E-05 |
| 2.3979 | 2.3979 | 9.66E-06 |
| 2.3969 | 2.3969 | 1.95E-04 |
| 2.3959 | 2.3959 | 1.28E-04 |
| 2.3949 | 2.3949 | 1.44E-04 |
| 2.3939 | 2.3940 | 1.49E-04 |
| 2.3930 | 2.3930 | 8.56E-05 |
| 2.3920 | 2.3920 | 1.07E-05 |
| 2.3910 | 2.3910 | 4.43E-05 |
| 2.3901 | 2.3901 | 1.86E-04 |
| 2.3891 | 2.3891 | 1.70E-05 |
| 2.3881 | 2.3881 | 4.47E-05 |

| | | |
|---|---|---|
| 2.3872 | 2.3872 | 6.39E-07 |
| 2.3862 | 2.3862 | 1.53E-04 |
| 2.3853 | 2.3853 | 7.71E-06 |
| 2.3843 | 2.3843 | 6.23E-05 |
| 2.3834 | 2.3834 | 1.11E-05 |
| 2.3824 | 2.3824 | 1.46E-04 |
| 2.3815 | 2.3815 | 1.25E-05 |
| 2.3805 | 2.3805 | 6.59E-05 |
| 2.3796 | 2.3796 | 1.48E-05 |
| 2.3787 | 2.3787 | 1.40E-04 |
| 2.3777 | 2.3777 | 2.11E-05 |
| 2.3768 | 2.3768 | 7.93E-05 |
| 2.3759 | 2.3759 | 3.43E-05 |
| 2.3749 | 2.3749 | 1.14E-04 |
| 2.3740 | 2.3740 | 5.73E-05 |
| 2.3731 | 2.3731 | 1.26E-04 |
| 2.3722 | 2.3722 | 9.29E-05 |
| 2.3713 | 2.3713 | 4.18E-05 |
| 2.3703 | 2.3704 | 1.44E-04 |
| 2.3694 | 2.3694 | 1.93E-04 |
| 2.3685 | 2.3685 | 2.08E-04 |
| 2.3676 | 2.3676 | 9.79E-05 |
| 2.3667 | 2.3667 | 1.18E-04 |
| 2.3658 | 2.3658 | 1.09E-05 |
| 2.3649 | 2.3649 | 3.18E-06 |
| 2.3640 | 2.3640 | 9.45E-05 |
| 2.3631 | 2.3631 | 1.38E-04 |
| 2.3622 | 2.3622 | 1.50E-04 |
| 2.3613 | 2.3613 | 1.14E-04 |
| 2.3604 | 2.3604 | 1.75E-04 |
| 2.3596 | 2.3596 | 9.00E-05 |
| 2.3587 | 2.3587 | 1.66E-04 |
| 2.3578 | 2.3578 | 9.52E-05 |
| 2.3569 | 2.3569 | 1.21E-04 |
| 2.3560 | 2.3560 | 1.81E-04 |
| 2.3552 | 2.3552 | 3.66E-05 |
| 2.3543 | 2.3543 | 7.42E-05 |
| 2.3534 | 2.3534 | 8.96E-05 |
| 2.3525 | 2.3526 | 9.83E-06 |
| 2.3517 | 2.3517 | 1.65E-04 |

| | | |
|---|---|---|
| 2.3508 | 2.3508 | 8.94E-06 |
| 2.3500 | 2.3500 | 5.28E-05 |
| 2.3491 | 2.3491 | 2.06E-05 |
| 2.3482 | 2.3482 | 1.05E-04 |
| 2.3474 | 2.3474 | 1.01E-04 |
| 2.3465 | 2.3465 | 2.12E-04 |
| 2.3457 | 2.3457 | 1.91E-04 |
| 2.3448 | 2.3448 | 1.63E-04 |
| 2.3440 | 2.3440 | 7.61E-07 |
| 2.3431 | 2.3432 | 1.70E-04 |
| 2.3423 | 2.3423 | 1.79E-04 |
| 2.3415 | 2.3415 | 1.91E-04 |
| 2.3406 | 2.3406 | 1.32E-04 |
| 2.3398 | 2.3398 | 6.30E-05 |
| 2.3390 | 2.3390 | 7.89E-05 |
| 2.3381 | 2.3381 | 1.31E-04 |
| 2.3373 | 2.3373 | 9.22E-05 |
| 2.3365 | 2.3365 | 3.61E-05 |
| 2.3356 | 2.3357 | 1.74E-04 |
| 2.3348 | 2.3348 | 1.33E-04 |
| 2.3340 | 2.3340 | 1.01E-04 |
| 2.3332 | 2.3332 | 1.58E-04 |
| 2.3324 | 2.3324 | 1.26E-04 |
| 2.3316 | 2.3316 | 1.08E-04 |
| 2.3307 | 2.3307 | 2.10E-08 |
| 2.3299 | 2.3299 | 1.99E-05 |
| 2.3291 | 2.3291 | 4.75E-05 |
| 2.3283 | 2.3283 | 2.02E-04 |
| 2.3275 | 2.3275 | 1.42E-05 |
| 2.3267 | 2.3267 | 8.73E-05 |
| 2.3259 | 2.3259 | 1.03E-04 |
| 2.3251 | 2.3251 | 3.16E-05 |
| 2.3243 | 2.3243 | 1.25E-04 |
| 2.3235 | 2.3235 | 6.26E-05 |
| 2.3227 | 2.3227 | 1.65E-04 |
| 2.3219 | 2.3219 | 1.83E-04 |
| 2.3211 | 2.3212 | 1.16E-04 |
| 2.3204 | 2.3204 | 3.62E-05 |
| 2.3196 | 2.3196 | 1.59E-04 |
| 2.3188 | 2.3188 | 1.62E-04 |
| 2.3180 | 2.3180 | 1.35E-04 |
| 2.3172 | 2.3172 | 1.91E-04 |
| 2.3165 | 2.3165 | 1.00E-04 |
| 2.3157 | 2.3157 | 1.23E-04 |
| 2.3149 | 2.3149 | 3.49E-06 |
| 2.3141 | 2.3141 | 4.70E-05 |
| 2.3134 | 2.3134 | 8.18E-06 |
| 2.3126 | 2.3126 | 1.13E-04 |
| 2.3118 | 2.3118 | 1.17E-04 |
| 2.3111 | 2.3111 | 1.68E-04 |
| 2.3103 | 2.3103 | 1.01E-04 |
| 2.3096 | 2.3096 | 1.15E-04 |
| 2.3088 | 2.3088 | 2.10E-04 |
| 2.3080 | 2.3080 | 4.70E-05 |
| 2.3073 | 2.3073 | 2.09E-04 |
| 2.3065 | 2.3065 | 1.13E-04 |
| 2.3058 | 2.3058 | 9.55E-05 |
| 2.3050 | 2.3050 | 1.58E-04 |
| 2.3043 | 2.3043 | 1.33E-04 |
| 2.3035 | 2.3035 | 8.80E-05 |
| 2.3028 | 2.3028 | 4.56E-05 |
| 2.3021 | 2.3021 | 1.01E-04 |
| 2.3013 | 2.3013 | 7.70E-05 |
| 2.3006 | 2.3006 | 2.49E-05 |
| 2.2998 | 2.2998 | 2.05E-04 |
| 2.2991 | 2.2991 | 2.80E-05 |
| 2.2984 | 2.2984 | 7.13E-05 |
| 2.2976 | 2.2977 | 9.34E-05 |
| 2.2969 | 2.2969 | 3.83E-05 |
| 2.2962 | 2.2962 | 9.39E-05 |
| 2.2955 | 2.2955 | 1.33E-04 |
| 2.2947 | 2.2947 | 1.53E-04 |
| 2.2940 | 2.2940 | 7.86E-05 |
| 2.2933 | 2.2933 | 8.06E-05 |
| 2.2926 | 2.2926 | 1.58E-04 |
| 2.2919 | 2.2919 | 1.24E-04 |
| 2.2912 | 2.2912 | 1.05E-04 |
| 2.2904 | 2.2904 | 2.78E-05 |
| 2.2897 | 2.2897 | 8.53E-05 |
| 2.2890 | 2.2890 | 6.81E-05 |

| | | |
|---|---|---|
| 2.2883 | 2.2883 | 2.37E-05 |
| 2.2876 | 2.2876 | 1.90E-04 |
| 2.2869 | 2.2869 | 7.12E-06 |
| 2.2862 | 2.2862 | 1.30E-04 |
| 2.2855 | 2.2855 | 1.80E-04 |
| 2.2848 | 2.2848 | 1.56E-04 |
| 2.2841 | 2.2841 | 5.88E-05 |
| 2.2834 | 2.2834 | 1.11E-04 |
| 2.2827 | 2.2827 | 8.35E-05 |
| 2.2820 | 2.2820 | 2.06E-04 |
| 2.2813 | 2.2813 | 1.82E-04 |
| 2.2806 | 2.2806 | 2.05E-04 |
| 2.2799 | 2.2800 | 1.40E-04 |
| 2.2793 | 2.2793 | 2.62E-05 |
| 2.2786 | 2.2786 | 1.75E-04 |
| 2.2779 | 2.2779 | 1.34E-04 |
| 2.2772 | 2.2772 | 7.52E-05 |
| 2.2765 | 2.2765 | 8.74E-05 |
| 2.2759 | 2.2759 | 1.70E-04 |
| 2.2752 | 2.2752 | 1.16E-04 |
| 2.2745 | 2.2745 | 1.08E-04 |
| 2.2738 | 2.2738 | 3.74E-05 |
| 2.2732 | 2.2732 | 1.13E-04 |
| 2.2725 | 2.2725 | 1.19E-04 |
| 2.2718 | 2.2718 | 5.56E-05 |
| 2.2712 | 2.2712 | 7.73E-05 |
| 2.2705 | 2.2705 | 1.61E-04 |
| 2.2698 | 2.2698 | 1.10E-04 |
| 2.2692 | 2.2692 | 9.56E-06 |
| 2.2685 | 2.2685 | 2.25E-05 |
| 2.2678 | 2.2678 | 1.37E-05 |
| 2.2672 | 2.2672 | 1.18E-04 |
| 2.2665 | 2.2665 | 1.51E-04 |
| 2.2659 | 2.2659 | 8.98E-05 |
| 2.2652 | 2.2652 | 4.36E-05 |
| 2.2646 | 2.2646 | 1.10E-04 |
| 2.2639 | 2.2639 | 1.09E-04 |
| 2.2633 | 2.2633 | 4.04E-05 |
| 2.2626 | 2.2626 | 9.46E-05 |
| 2.2620 | 2.2620 | 1.46E-04 |

| | | |
|---|---|---|
| 2.2613 | 2.2613 | 1.23E-04 |
| 2.2607 | 2.2607 | 1.49E-05 |
| 2.2600 | 2.2601 | 2.67E-05 |
| 2.2594 | 2.2594 | 2.47E-06 |
| 2.2588 | 2.2588 | 8.75E-05 |
| 2.2581 | 2.2581 | 2.00E-04 |
| 2.2575 | 2.2575 | 2.12E-05 |
| 2.2569 | 2.2569 | 1.36E-04 |
| 2.2562 | 2.2562 | 2.16E-04 |
| 2.2556 | 2.2556 | 1.88E-04 |
| 2.2550 | 2.2550 | 2.17E-04 |
| 2.2543 | 2.2544 | 1.16E-04 |
| 2.2537 | 2.2537 | 5.05E-05 |
| 2.2531 | 2.2531 | 1.63E-04 |
| 2.2525 | 2.2525 | 1.31E-04 |
| 2.2519 | 2.2519 | 4.54E-05 |
| 2.2512 | 2.2512 | 2.30E-05 |
| 2.2506 | 2.2506 | 6.39E-05 |
| 2.2500 | 2.2500 | 1.68E-04 |
| 2.2494 | 2.2494 | 1.09E-04 |
| 2.2488 | 2.2488 | 1.21E-04 |
| 2.2481 | 2.2482 | 3.12E-05 |
| 2.2475 | 2.2475 | 1.21E-04 |
| 2.2469 | 2.2469 | 1.48E-04 |
| 2.2463 | 2.2463 | 1.13E-04 |
| 2.2457 | 2.2457 | 1.63E-05 |
| 2.2451 | 2.2451 | 1.42E-04 |
| 2.2445 | 2.2445 | 8.27E-05 |
| 2.2439 | 2.2439 | 1.99E-04 |
| 2.2433 | 2.2433 | 9.67E-05 |
| 2.2427 | 2.2427 | 5.53E-05 |
| 2.2421 | 2.2421 | 7.49E-05 |
| 2.2415 | 2.2415 | 1.55E-04 |
| 2.2409 | 2.2409 | 1.50E-04 |
| 2.2403 | 2.2403 | 5.14E-05 |
| 2.2397 | 2.2397 | 1.33E-04 |
| 2.2391 | 2.2391 | 1.89E-04 |
| 2.2385 | 2.2385 | 1.24E-04 |
| 2.2379 | 2.2379 | 1.19E-04 |
| 2.2373 | 2.2373 | 1.74E-04 |

| | | |
|---|---|---|
| 2.2368 | 2.2368 | 1.59E-04 |
| 2.2362 | 2.2362 | 1.42E-05 |
| 2.2356 | 2.2356 | 2.00E-04 |
| 2.2350 | 2.2350 | 9.11E-05 |
| 2.2344 | 2.2344 | 5.83E-06 |
| 2.2338 | 2.2338 | 4.42E-05 |
| 2.2333 | 2.2333 | 2.41E-05 |
| 2.2327 | 2.2327 | 5.43E-05 |
| 2.2321 | 2.2321 | 1.91E-04 |
| 2.2315 | 2.2315 | 6.25E-05 |
| 2.2310 | 2.2310 | 1.90E-04 |
| 2.2304 | 2.2304 | 5.20E-05 |
| 2.2298 | 2.2298 | 2.85E-05 |
| 2.2292 | 2.2292 | 5.17E-05 |
| 2.2287 | 2.2287 | 1.77E-05 |
| 2.2281 | 2.2281 | 7.34E-05 |
| 2.2275 | 2.2275 | 2.21E-04 |
| 2.2270 | 2.2270 | 2.28E-05 |
| 2.2264 | 2.2264 | 2.10E-04 |
| 2.2258 | 2.2258 | 1.07E-04 |
| 2.2253 | 2.2253 | 3.24E-05 |
| 2.2247 | 2.2247 | 1.35E-05 |
| 2.2242 | 2.2242 | 5.05E-05 |
| 2.2236 | 2.2236 | 1.43E-04 |
| 2.2230 | 2.2231 | 1.58E-04 |
| 2.2225 | 2.2225 | 4.64E-05 |
| 2.2219 | 2.2219 | 1.44E-04 |
| 2.2214 | 2.2214 | 1.71E-04 |
| 2.2208 | 2.2208 | 9.07E-05 |
| 2.2203 | 2.2203 | 6.54E-05 |
| 2.2197 | 2.2197 | 9.49E-05 |
| 2.2192 | 2.2192 | 1.79E-04 |
| 2.2186 | 2.2186 | 1.33E-04 |
| 2.2181 | 2.2181 | 6.00E-05 |
| 2.2175 | 2.2176 | 1.44E-04 |
| 2.2170 | 2.2170 | 1.58E-04 |
| 2.2165 | 2.2165 | 6.19E-05 |
| 2.2159 | 2.2159 | 1.99E-05 |
| 2.2154 | 2.2154 | 3.14E-05 |
| 2.2148 | 2.2148 | 9.64E-05 |

| | | |
|---|---|---|
| 2.2143 | 2.2143 | 2.15E-04 |
| 2.2138 | 2.2138 | 6.53E-05 |
| 2.2132 | 2.2132 | 1.59E-04 |
| 2.2127 | 2.2127 | 1.49E-05 |
| 2.2122 | 2.2122 | 1.36E-04 |
| 2.2116 | 2.2116 | 2.06E-04 |
| 2.2111 | 2.2111 | 2.22E-04 |
| 2.2106 | 2.2106 | 1.86E-04 |
| 2.2100 | 2.2101 | 9.84E-05 |
| 2.2095 | 2.2095 | 4.17E-05 |
| 2.2090 | 2.2090 | 2.19E-04 |
| 2.2085 | 2.2085 | 2.48E-05 |
| 2.2079 | 2.2080 | 1.32E-04 |
| 2.2074 | 2.2074 | 2.15E-04 |
| 2.2069 | 2.2069 | 1.60E-04 |
| 2.2064 | 2.2064 | 1.57E-04 |
| 2.2059 | 2.2059 | 2.05E-04 |
| 2.2053 | 2.2054 | 1.50E-04 |
| 2.2048 | 2.2048 | 2.16E-07 |
| 2.2043 | 2.2043 | 2.00E-04 |
| 2.2038 | 2.2038 | 2.59E-06 |
| 2.2033 | 2.2033 | 1.55E-04 |
| 2.2028 | 2.2028 | 1.97E-04 |
| 2.2023 | 2.2023 | 1.45E-04 |
| 2.2018 | 2.2018 | 1.43E-04 |
| 2.2012 | 2.2012 | 1.91E-04 |
| 2.2007 | 2.2007 | 1.66E-04 |
| 2.2002 | 2.2002 | 1.86E-05 |
| 2.1997 | 2.1997 | 1.78E-04 |
| 2.1992 | 2.1992 | 3.01E-05 |
| 2.1987 | 2.1987 | 1.89E-04 |
| 2.1982 | 2.1982 | 1.55E-04 |
| 2.1977 | 2.1977 | 9.41E-05 |
| 2.1972 | 2.1972 | 8.18E-05 |
| 2.1967 | 2.1967 | 1.18E-04 |
| 2.1962 | 2.1962 | 2.03E-04 |
| 2.1957 | 2.1957 | 1.19E-04 |
| 2.1952 | 2.1952 | 6.30E-05 |
| 2.1947 | 2.1947 | 1.63E-04 |
| 2.1942 | 2.1942 | 1.16E-04 |

| | | |
|---|---|---|
| 2.1937 | 2.1937 | 1.39E-05 |
| 2.1932 | 2.1933 | 9.57E-05 |
| 2.1928 | 2.1928 | 1.30E-04 |
| 2.1923 | 2.1923 | 1.16E-04 |
| 2.1918 | 2.1918 | 5.54E-05 |
| 2.1913 | 2.1913 | 5.29E-05 |
| 2.1908 | 2.1908 | 2.08E-04 |
| 2.1903 | 2.1903 | 4.53E-05 |
| 2.1898 | 2.1898 | 2.04E-04 |
| 2.1894 | 2.1894 | 4.43E-05 |
| 2.1889 | 2.1889 | 6.92E-05 |
| 2.1884 | 2.1884 | 1.36E-04 |
| 2.1879 | 2.1879 | 1.57E-04 |
| 2.1874 | 2.1874 | 1.31E-04 |
| 2.1869 | 2.1870 | 5.84E-05 |
| 2.1865 | 2.1865 | 5.99E-05 |
| 2.1860 | 2.1860 | 2.24E-04 |
| 2.1855 | 2.1855 | 2.29E-05 |
| 2.1850 | 2.1851 | 2.24E-04 |
| 2.1846 | 2.1846 | 7.73E-05 |
| 2.1841 | 2.1841 | 3.31E-05 |
| 2.1836 | 2.1836 | 9.82E-05 |
| 2.1832 | 2.1832 | 1.18E-04 |
| 2.1827 | 2.1827 | 9.26E-05 |
| 2.1822 | 2.1822 | 2.21E-05 |
| 2.1818 | 2.1818 | 9.33E-05 |
| 2.1813 | 2.1813 | 2.05E-04 |
| 2.1808 | 2.1808 | 1.65E-07 |
| 2.1804 | 2.1804 | 2.09E-04 |
| 2.1799 | 2.1799 | 8.54E-05 |
| 2.1794 | 2.1794 | 3.48E-05 |
| 2.1790 | 2.1790 | 1.11E-04 |
| 2.1785 | 2.1785 | 1.43E-04 |
| 2.1780 | 2.1781 | 1.30E-04 |
| 2.1776 | 2.1776 | 7.43E-05 |
| 2.1771 | 2.1771 | 2.56E-05 |
| 2.1767 | 2.1767 | 1.69E-04 |
| 2.1762 | 2.1762 | 1.03E-04 |
| 2.1758 | 2.1758 | 1.28E-04 |
| 2.1753 | 2.1753 | 5.77E-05 |

| | | |
|---|---|---|
| 2.1749 | 2.1749 | 2.00E-04 |
| 2.1744 | 2.1744 | 1.61E-04 |
| 2.1740 | 2.1740 | 1.04E-04 |
| 2.1735 | 2.1735 | 9.11E-05 |
| 2.1731 | 2.1731 | 1.21E-04 |
| 2.1726 | 2.1726 | 1.93E-04 |
| 2.1722 | 2.1722 | 1.53E-04 |
| 2.1717 | 2.1717 | 4.69E-06 |
| 2.1713 | 2.1713 | 2.04E-04 |
| 2.1708 | 2.1708 | 1.42E-05 |
| 2.1704 | 2.1704 | 1.91E-04 |
| 2.1699 | 2.1699 | 1.36E-04 |
| 2.1695 | 2.1695 | 4.31E-05 |
| 2.1690 | 2.1691 | 7.64E-06 |
| 2.1686 | 2.1686 | 1.67E-05 |
| 2.1682 | 2.1682 | 1.59E-05 |
| 2.1677 | 2.1677 | 9.01E-05 |
| 2.1673 | 2.1673 | 2.06E-04 |
| 2.1669 | 2.1669 | 9.89E-05 |
| 2.1664 | 2.1664 | 9.92E-05 |
| 2.1660 | 2.1660 | 1.23E-04 |
| 2.1656 | 2.1656 | 1.57E-04 |
| 2.1651 | 2.1651 | 1.65E-05 |
| 2.1647 | 2.1647 | 8.33E-05 |
| 2.1643 | 2.1643 | 1.42E-04 |
| 2.1638 | 2.1638 | 1.61E-04 |
| 2.1634 | 2.1634 | 1.39E-04 |
| 2.1630 | 2.1630 | 7.69E-05 |
| 2.1625 | 2.1625 | 2.57E-05 |
| 2.1621 | 2.1621 | 1.68E-04 |
| 2.1617 | 2.1617 | 1.11E-04 |
| 2.1613 | 2.1613 | 1.12E-04 |
| 2.1608 | 2.1608 | 8.82E-05 |
| 2.1604 | 2.1604 | 2.14E-04 |
| 2.1600 | 2.1600 | 9.40E-05 |
| 2.1596 | 2.1596 | 1.30E-05 |
| 2.1591 | 2.1592 | 2.85E-05 |
| 2.1587 | 2.1587 | 3.07E-05 |
| 2.1583 | 2.1583 | 6.47E-06 |
| 2.1579 | 2.1579 | 8.28E-05 |

| | | |
|---|---|---|
| 2.1575 | 2.1575 | 1.98E-04 |
| 2.1571 | 2.1571 | 1.11E-04 |
| 2.1566 | 2.1566 | 8.25E-05 |
| 2.1562 | 2.1562 | 1.49E-04 |
| 2.1558 | 2.1558 | 1.22E-04 |
| 2.1554 | 2.1554 | 3.24E-05 |
| 2.1550 | 2.1550 | 1.48E-04 |
| 2.1546 | 2.1546 | 2.26E-04 |
| 2.1542 | 2.1542 | 1.99E-04 |
| 2.1538 | 2.1538 | 1.98E-04 |
| 2.1533 | 2.1534 | 2.29E-04 |
| 2.1529 | 2.1529 | 1.54E-04 |
| 2.1525 | 2.1525 | 4.04E-05 |
| 2.1521 | 2.1521 | 1.11E-04 |
| 2.1517 | 2.1517 | 1.65E-04 |
| 2.1513 | 2.1513 | 6.13E-05 |
| 2.1509 | 2.1509 | 1.40E-04 |
| 2.1505 | 2.1505 | 1.62E-04 |
| 2.1501 | 2.1501 | 3.62E-05 |
| 2.1497 | 2.1497 | 5.26E-05 |
| 2.1493 | 2.1493 | 1.04E-04 |
| 2.1489 | 2.1489 | 1.19E-04 |
| 2.1485 | 2.1485 | 9.61E-05 |
| 2.1481 | 2.1481 | 3.66E-05 |
| 2.1477 | 2.1477 | 5.97E-05 |
| 2.1473 | 2.1473 | 1.93E-04 |
| 2.1469 | 2.1469 | 1.03E-04 |
| 2.1465 | 2.1465 | 1.03E-04 |
| 2.1461 | 2.1461 | 1.20E-04 |
| 2.1457 | 2.1457 | 1.59E-04 |
| 2.1453 | 2.1453 | 8.85E-06 |
| 2.1449 | 2.1449 | 1.05E-04 |
| 2.1445 | 2.1446 | 1.84E-04 |
| 2.1442 | 2.1442 | 2.26E-04 |
| 2.1438 | 2.1438 | 2.32E-04 |
| 2.1434 | 2.1434 | 2.03E-04 |
| 2.1430 | 2.1430 | 1.37E-04 |
| 2.1426 | 2.1426 | 3.65E-05 |
| 2.1422 | 2.1422 | 1.00E-04 |
| 2.1418 | 2.1418 | 1.95E-04 |
| 2.1414 | 2.1414 | 1.29E-05 |
| 2.1411 | 2.1411 | 2.11E-04 |
| 2.1407 | 2.1407 | 6.70E-05 |
| 2.1403 | 2.1403 | 8.67E-05 |
| 2.1399 | 2.1399 | 2.05E-04 |
| 2.1395 | 2.1395 | 1.78E-04 |
| 2.1391 | 2.1391 | 1.29E-04 |
| 2.1388 | 2.1388 | 1.15E-04 |
| 2.1384 | 2.1384 | 1.36E-04 |
| 2.1380 | 2.1380 | 1.91E-04 |
| 2.1376 | 2.1376 | 1.87E-04 |
| 2.1372 | 2.1373 | 6.23E-05 |
| 2.1369 | 2.1369 | 9.64E-05 |
| 2.1365 | 2.1365 | 1.78E-04 |
| 2.1361 | 2.1361 | 4.89E-05 |
| 2.1357 | 2.1358 | 1.58E-04 |
| 2.1354 | 2.1354 | 1.38E-04 |
| 2.1350 | 2.1350 | 6.94E-07 |
| 2.1346 | 2.1346 | 1.05E-04 |
| 2.1343 | 2.1343 | 1.76E-04 |
| 2.1339 | 2.1339 | 2.14E-04 |
| 2.1335 | 2.1335 | 2.17E-04 |
| 2.1331 | 2.1332 | 1.87E-04 |
| 2.1328 | 2.1328 | 1.24E-04 |
| 2.1324 | 2.1324 | 2.72E-05 |
| 2.1320 | 2.1320 | 1.03E-04 |
| 2.1317 | 2.1317 | 2.02E-04 |
| 2.1313 | 2.1313 | 5.81E-06 |
| 2.1309 | 2.1309 | 2.24E-04 |
| 2.1306 | 2.1306 | 1.76E-05 |
| 2.1302 | 2.1302 | 1.56E-04 |
| 2.1299 | 2.1299 | 1.73E-04 |
| 2.1295 | 2.1295 | 6.49E-05 |
| 2.1291 | 2.1291 | 1.04E-05 |
| 2.1288 | 2.1288 | 5.31E-05 |
| 2.1284 | 2.1284 | 6.32E-05 |
| 2.1280 | 2.1281 | 4.09E-05 |
| 2.1277 | 2.1277 | 1.38E-05 |
| 2.1273 | 2.1273 | 1.01E-04 |
| 2.1270 | 2.1270 | 2.20E-04 |

| | | |
|---|---|---|
| 2.1266 | 2.1266 | 9.87E-05 |
| 2.1263 | 2.1263 | 8.49E-05 |
| 2.1259 | 2.1259 | 1.70E-04 |
| 2.1256 | 2.1256 | 7.76E-05 |
| 2.1252 | 2.1252 | 1.13E-04 |
| 2.1248 | 2.1248 | 1.98E-04 |
| 2.1245 | 2.1245 | 7.01E-05 |
| 2.1241 | 2.1241 | 2.59E-05 |
| 2.1238 | 2.1238 | 9.05E-05 |
| 2.1234 | 2.1234 | 1.24E-04 |
| 2.1231 | 2.1231 | 1.25E-04 |
| 2.1227 | 2.1227 | 9.57E-05 |
| 2.1224 | 2.1224 | 3.48E-05 |
| 2.1220 | 2.1220 | 5.73E-05 |
| 2.1217 | 2.1217 | 1.81E-04 |
| 2.1213 | 2.1214 | 1.37E-04 |
| 2.1210 | 2.1210 | 4.86E-05 |
| 2.1207 | 2.1207 | 2.07E-04 |
| 2.1203 | 2.1203 | 4.02E-05 |
| 2.1200 | 2.1200 | 1.54E-04 |
| 2.1196 | 2.1196 | 1.55E-04 |
| 2.1193 | 2.1193 | 2.21E-05 |
| 2.1189 | 2.1189 | 8.01E-05 |
| 2.1186 | 2.1186 | 1.52E-04 |
| 2.1183 | 2.1183 | 1.93E-04 |
| 2.1179 | 2.1179 | 2.05E-04 |
| 2.1176 | 2.1176 | 1.85E-04 |
| 2.1172 | 2.1172 | 1.36E-04 |
| 2.1169 | 2.1169 | 5.68E-05 |
| 2.1166 | 2.1166 | 5.26E-05 |
| 2.1162 | 2.1162 | 1.92E-04 |
| 2.1159 | 2.1159 | 1.11E-04 |
| 2.1156 | 2.1156 | 8.79E-05 |
| 2.1152 | 2.1152 | 1.56E-04 |
| 2.1149 | 2.1149 | 1.03E-04 |
| 2.1145 | 2.1146 | 8.20E-05 |
| 2.1142 | 2.1142 | 2.36E-04 |
| 2.1139 | 2.1139 | 1.10E-04 |
| 2.1136 | 2.1136 | 1.39E-05 |
| 2.1132 | 2.1132 | 5.31E-05 |

| | | |
|---|---|---|
| 2.1129 | 2.1129 | 9.09E-05 |
| 2.1126 | 2.1126 | 9.94E-05 |
| 2.1122 | 2.1122 | 7.89E-05 |
| 2.1119 | 2.1119 | 2.93E-05 |
| 2.1116 | 2.1116 | 4.93E-05 |
| 2.1112 | 2.1112 | 1.57E-04 |
| 2.1109 | 2.1109 | 1.80E-04 |
| 2.1106 | 2.1106 | 1.52E-05 |
| 2.1103 | 2.1103 | 1.79E-04 |
| 2.1099 | 2.1099 | 7.25E-05 |
| 2.1096 | 2.1096 | 1.79E-04 |
| 2.1093 | 2.1093 | 1.54E-05 |
| 2.1090 | 2.1090 | 1.81E-04 |
| 2.1086 | 2.1086 | 1.55E-04 |
| 2.1083 | 2.1083 | 4.64E-05 |
| 2.1080 | 2.1080 | 3.45E-05 |
| 2.1077 | 2.1077 | 8.73E-05 |
| 2.1074 | 2.1074 | 1.12E-04 |
| 2.1070 | 2.1070 | 1.08E-04 |
| 2.1067 | 2.1067 | 7.70E-05 |
| 2.1064 | 2.1064 | 1.77E-05 |
| 2.1061 | 2.1061 | 6.96E-05 |
| 2.1058 | 2.1058 | 1.85E-04 |
| 2.1054 | 2.1055 | 1.47E-04 |
| 2.1051 | 2.1051 | 2.31E-05 |
| 2.1048 | 2.1048 | 2.21E-04 |
| 2.1045 | 2.1045 | 2.81E-05 |
| 2.1042 | 2.1042 | 2.25E-04 |
| 2.1039 | 2.1039 | 3.06E-05 |
| 2.1036 | 2.1036 | 1.37E-04 |
| 2.1032 | 2.1032 | 1.99E-04 |
| 2.1029 | 2.1029 | 8.61E-05 |
| 2.1026 | 2.1026 | 5.63E-07 |
| 2.1023 | 2.1023 | 5.79E-05 |
| 2.1020 | 2.1020 | 8.94E-05 |
| 2.1017 | 2.1017 | 9.39E-05 |
| 2.1014 | 2.1014 | 7.15E-05 |
| 2.1011 | 2.1011 | 2.21E-05 |
| 2.1008 | 2.1008 | 5.40E-05 |
| 2.1005 | 2.1005 | 1.57E-04 |

| | | |
|---|---|---|
| 2.1001 | 2.1002 | 1.90E-04 |
| 2.0998 | 2.0998 | 3.35E-05 |
| 2.0995 | 2.0995 | 1.49E-04 |
| 2.0992 | 2.0992 | 1.18E-04 |
| 2.0989 | 2.0989 | 1.18E-04 |
| 2.0986 | 2.0986 | 9.62E-05 |
| 2.0983 | 2.0983 | 1.92E-04 |
| 2.0980 | 2.0980 | 3.05E-05 |
| 2.0977 | 2.0977 | 1.05E-04 |
| 2.0974 | 2.0974 | 2.15E-04 |
| 2.0971 | 2.0971 | 1.79E-04 |
| 2.0968 | 2.0968 | 1.21E-04 |
| 2.0965 | 2.0965 | 9.00E-05 |
| 2.0962 | 2.0962 | 8.44E-05 |
| 2.0959 | 2.0959 | 1.05E-04 |
| 2.0956 | 2.0956 | 1.51E-04 |
| 2.0953 | 2.0953 | 2.23E-04 |
| 2.0950 | 2.0950 | 1.57E-04 |
| 2.0947 | 2.0947 | 3.41E-05 |
| 2.0944 | 2.0944 | 1.15E-04 |
| 2.0941 | 2.0941 | 1.89E-04 |
| 2.0938 | 2.0938 | 1.09E-05 |
| 2.0935 | 2.0935 | 2.36E-04 |
| 2.0932 | 2.0932 | 8.70E-06 |
| 2.0929 | 2.0929 | 1.93E-04 |
| 2.0926 | 2.0926 | 1.08E-04 |
| 2.0923 | 2.0924 | 4.42E-05 |
| 2.0921 | 2.0921 | 1.71E-04 |
| 2.0918 | 2.0918 | 2.06E-04 |
| 2.0915 | 2.0915 | 1.29E-04 |
| 2.0912 | 2.0912 | 7.71E-05 |
| 2.0909 | 2.0909 | 5.02E-05 |
| 2.0906 | 2.0906 | 4.81E-05 |
| 2.0903 | 2.0903 | 7.08E-05 |
| 2.0900 | 2.0900 | 1.18E-04 |
| 2.0897 | 2.0897 | 1.90E-04 |
| 2.0894 | 2.0895 | 1.92E-04 |
| 2.0892 | 2.0892 | 7.06E-05 |
| 2.0889 | 2.0889 | 7.51E-05 |
| 2.0886 | 2.0886 | 2.34E-04 |
| 2.0883 | 2.0883 | 3.91E-05 |
| 2.0880 | 2.0880 | 1.80E-04 |
| 2.0877 | 2.0877 | 5.60E-05 |
| 2.0874 | 2.0874 | 2.11E-04 |
| 2.0872 | 2.0872 | 2.40E-05 |
| 2.0869 | 2.0869 | 1.39E-04 |
| 2.0866 | 2.0866 | 2.00E-04 |
| 2.0863 | 2.0863 | 8.50E-05 |
| 2.0860 | 2.0860 | 6.44E-06 |
| 2.0857 | 2.0858 | 7.40E-05 |
| 2.0855 | 2.0855 | 1.18E-04 |
| 2.0852 | 2.0852 | 1.38E-04 |
| 2.0849 | 2.0849 | 1.34E-04 |
| 2.0846 | 2.0846 | 1.07E-04 |
| 2.0843 | 2.0844 | 5.57E-05 |
| 2.0841 | 2.0841 | 1.89E-05 |
| 2.0838 | 2.0838 | 1.17E-04 |
| 2.0835 | 2.0835 | 2.39E-04 |
| 2.0832 | 2.0832 | 9.61E-05 |
| 2.0830 | 2.0830 | 7.23E-05 |
| 2.0827 | 2.0827 | 2.16E-04 |
| 2.0824 | 2.0824 | 9.46E-07 |
| 2.0821 | 2.0821 | 2.37E-04 |
| 2.0819 | 2.0819 | 1.86E-05 |
| 2.0816 | 2.0816 | 1.77E-04 |
| 2.0813 | 2.0813 | 1.31E-04 |
| 2.0810 | 2.0810 | 1.90E-05 |
| 2.0808 | 2.0808 | 1.46E-04 |
| 2.0805 | 2.0805 | 2.31E-04 |
| 2.0802 | 2.0802 | 1.50E-04 |
| 2.0800 | 2.0800 | 9.17E-05 |
| 2.0797 | 2.0797 | 5.62E-05 |
| 2.0794 | 2.0794 | 4.35E-05 |
| 2.0791 | 2.0791 | 5.33E-05 |
| 2.0789 | 2.0789 | 8.58E-05 |
| 2.0786 | 2.0786 | 1.41E-04 |
| 2.0783 | 2.0783 | 2.18E-04 |
| 2.0781 | 2.0781 | 1.63E-04 |
| 2.0778 | 2.0778 | 4.03E-05 |
| 2.0775 | 2.0775 | 1.05E-04 |

| | | |
|---|---|---|
| 2.0773 | 2.0773 | 2.10E-04 |
| 2.0770 | 2.0770 | 2.03E-05 |
| 2.0767 | 2.0767 | 1.91E-04 |
| 2.0765 | 2.0765 | 5.63E-05 |
| 2.0762 | 2.0762 | 2.00E-04 |
| 2.0759 | 2.0759 | 3.83E-06 |
| 2.0757 | 2.0757 | 1.85E-04 |
| 2.0754 | 2.0754 | 1.37E-04 |
| 2.0751 | 2.0752 | 9.67E-07 |
| 2.0749 | 2.0749 | 1.17E-04 |
| 2.0746 | 2.0746 | 2.11E-04 |
| 2.0744 | 2.0744 | 1.99E-04 |
| 2.0741 | 2.0741 | 1.48E-04 |
| 2.0738 | 2.0738 | 1.19E-04 |
| 2.0736 | 2.0736 | 1.12E-04 |
| 2.0733 | 2.0733 | 1.27E-04 |
| 2.0731 | 2.0731 | 1.63E-04 |
| 2.0728 | 2.0728 | 2.20E-04 |
| 2.0725 | 2.0726 | 1.84E-04 |
| 2.0723 | 2.0723 | 8.34E-05 |
| 2.0720 | 2.0720 | 3.82E-05 |
| 2.0718 | 2.0718 | 1.81E-04 |
| 2.0715 | 2.0715 | 1.37E-04 |
| 2.0713 | 2.0713 | 4.83E-05 |
| 2.0710 | 2.0710 | 2.28E-04 |
| 2.0708 | 2.0708 | 2.57E-08 |
| 2.0705 | 2.0705 | 2.34E-04 |
| 2.0702 | 2.0702 | 3.61E-05 |
| 2.0700 | 2.0700 | 1.56E-04 |
| 2.0697 | 2.0697 | 1.56E-04 |
| 2.0695 | 2.0695 | 5.96E-06 |
| 2.0692 | 2.0692 | 1.23E-04 |
| 2.0690 | 2.0690 | 2.32E-04 |
| 2.0687 | 2.0687 | 1.64E-04 |
| 2.0685 | 2.0685 | 9.65E-05 |
| 2.0682 | 2.0682 | 5.02E-05 |
| 2.0680 | 2.0680 | 2.44E-05 |
| 2.0677 | 2.0677 | 1.92E-05 |
| 2.0675 | 2.0675 | 3.46E-05 |
| 2.0672 | 2.0672 | 7.04E-05 |

| | | |
|---|---|---|
| 2.0670 | 2.0670 | 1.27E-04 |
| 2.0667 | 2.0667 | 2.04E-04 |
| 2.0665 | 2.0665 | 1.83E-04 |
| 2.0662 | 2.0662 | 6.58E-05 |
| 2.0660 | 2.0660 | 7.20E-05 |
| 2.0657 | 2.0657 | 2.30E-04 |
| 2.0655 | 2.0655 | 7.58E-05 |
| 2.0652 | 2.0652 | 1.23E-04 |
| 2.0650 | 2.0650 | 1.43E-04 |
| 2.0648 | 2.0648 | 9.56E-05 |
| 2.0645 | 2.0645 | 1.30E-04 |
| 2.0643 | 2.0643 | 1.49E-04 |
| 2.0640 | 2.0640 | 3.71E-05 |
| 2.0638 | 2.0638 | 2.03E-04 |
| 2.0635 | 2.0635 | 1.36E-04 |
| 2.0633 | 2.0633 | 9.27E-06 |
| 2.0630 | 2.0631 | 9.72E-05 |
| 2.0628 | 2.0628 | 1.84E-04 |
| 2.0626 | 2.0626 | 2.34E-04 |
| 2.0623 | 2.0623 | 1.86E-04 |
| 2.0621 | 2.0621 | 1.58E-04 |
| 2.0618 | 2.0618 | 1.50E-04 |
| 2.0616 | 2.0616 | 1.61E-04 |
| 2.0614 | 2.0614 | 1.92E-04 |
| 2.0611 | 2.0611 | 2.42E-04 |
| 2.0609 | 2.0609 | 1.73E-04 |
| 2.0606 | 2.0607 | 8.46E-05 |
| 2.0604 | 2.0604 | 2.37E-05 |
| 2.0602 | 2.0602 | 1.51E-04 |
| 2.0599 | 2.0599 | 1.87E-04 |
| 2.0597 | 2.0597 | 2.15E-05 |
| 2.0595 | 2.0595 | 1.64E-04 |
| 2.0592 | 2.0592 | 1.18E-04 |
| 2.0590 | 2.0590 | 1.06E-04 |
| 2.0588 | 2.0588 | 1.38E-04 |
| 2.0585 | 2.0585 | 1.24E-04 |
| 2.0583 | 2.0583 | 8.14E-05 |
| 2.0581 | 2.0581 | 2.18E-04 |
| 2.0578 | 2.0578 | 5.04E-05 |
| 2.0576 | 2.0576 | 9.84E-05 |

Universidad Industrial de Santander

ANEXO O. COEFICIENTE DE ABSORCIÓN ZnS13A2

| coeficiente de absorción ZnS13A2 | | |
|---|---|---|
| T- GMS&ES | T-software | Error % |
| 126156.4657 | 130910.0000 | 3.77E+00 |
| 125367.5643 | 130092.0000 | 3.77E+00 |
| 123811.3820 | 128478.0000 | 3.77E+00 |
| 108457.9184 | 112544.0000 | 3.77E+00 |
| 111877.8965 | 116094.0000 | 3.77E+00 |
| 123442.9192 | 128095.0000 | 3.77E+00 |
| 124350.0997 | 129037.0000 | 3.77E+00 |
| 121879.0073 | 126473.0000 | 3.77E+00 |
| 123837.1842 | 128506.0000 | 3.77E+00 |
| 122771.2941 | 127400.0000 | 3.77E+00 |
| 122152.7959 | 126758.0000 | 3.77E+00 |
| 121027.0046 | 125590.0000 | 3.77E+00 |
| 120841.4783 | 125398.0000 | 3.77E+00 |
| 109069.0909 | 113182.0000 | 3.77E+00 |
| 120269.9875 | 124805.0000 | 3.77E+00 |
| 120692.0301 | 125243.0000 | 3.77E+00 |
| 120708.9230 | 125261.0000 | 3.77E+00 |
| 119523.6060 | 124031.0000 | 3.77E+00 |
| 119048.9369 | 123539.0000 | 3.77E+00 |
| 119161.5680 | 123656.0000 | 3.77E+00 |
| 118210.4226 | 122670.0000 | 3.77E+00 |
| 119092.1669 | 123585.0000 | 3.77E+00 |
| 117668.7586 | 122108.0000 | 3.77E+00 |
| 109604.6887 | 113741.0000 | 3.77E+00 |
| 117693.0433 | 122134.0000 | 3.77E+00 |
| 117610.2475 | 122048.0000 | 3.77E+00 |
| 116876.4432 | 121287.0000 | 3.77E+00 |
| 116519.1614 | 120916.0000 | 3.77E+00 |
| 116619.8987 | 121021.0000 | 3.77E+00 |
| 115633.1336 | 119997.0000 | 3.77E+00 |
| 115730.5428 | 120099.0000 | 3.77E+00 |
| 116097.9475 | 120480.0000 | 3.77E+00 |
| 114858.0220 | 119194.0000 | 3.78E+00 |
| 108616.8447 | 112718.0000 | 3.78E+00 |
| 108470.6575 | 112566.0000 | 3.78E+00 |
| 113920.3491 | 118221.0000 | 3.78E+00 |
| 113582.9587 | 117871.0000 | 3.78E+00 |
| 113079.3787 | 117349.0000 | 3.78E+00 |
| 112581.2524 | 116832.0000 | 3.78E+00 |
| 111924.7499 | 116151.0000 | 3.78E+00 |
| 111763.1825 | 115984.0000 | 3.78E+00 |
| 111359.1759 | 115564.0000 | 3.78E+00 |
| 111038.3284 | 115232.0000 | 3.78E+00 |
| 105440.0512 | 109423.0000 | 3.78E+00 |
| 107881.1708 | 111956.0000 | 3.78E+00 |
| 109465.6204 | 113600.0000 | 3.78E+00 |
| 109695.4279 | 113839.0000 | 3.78E+00 |
| 109693.0397 | 113836.0000 | 3.78E+00 |
| 108542.9196 | 112643.0000 | 3.78E+00 |
| 108539.3268 | 112639.0000 | 3.78E+00 |
| 107861.5605 | 111936.0000 | 3.78E+00 |
| 107634.7417 | 111701.0000 | 3.78E+00 |
| 106320.3709 | 110337.0000 | 3.78E+00 |
| 102097.7968 | 105956.0000 | 3.78E+00 |
| 106308.4040 | 110325.0000 | 3.78E+00 |
| 105661.7936 | 109654.0000 | 3.78E+00 |
| 105443.5630 | 109427.0000 | 3.78E+00 |
| 104877.8098 | 108840.0000 | 3.78E+00 |
| 104387.3089 | 108332.0000 | 3.78E+00 |
| 103698.8095 | 107617.0000 | 3.78E+00 |
| 103354.0220 | 107259.0000 | 3.78E+00 |
| 102945.0340 | 106835.0000 | 3.78E+00 |
| 101181.0246 | 105005.0000 | 3.78E+00 |
| 98340.9099 | 102058.0000 | 3.78E+00 |
| 100969.8650 | 104786.0000 | 3.78E+00 |
| 100643.4328 | 104447.0000 | 3.78E+00 |
| 100007.6029 | 103787.0000 | 3.78E+00 |
| 99441.5980 | 103200.0000 | 3.78E+00 |
| 98641.0531 | 102369.0000 | 3.78E+00 |
| 98569.3307 | 102295.0000 | 3.78E+00 |
| 97547.9883 | 101235.0000 | 3.78E+00 |
| 96549.5012 | 100199.0000 | 3.78E+00 |
| 95910.6196 | 99535.5000 | 3.78E+00 |
| 91856.6343 | 95328.8000 | 3.78E+00 |
| 92151.5241 | 95634.7000 | 3.78E+00 |

| | | |
|---|---|---|
| 93774.6286 | 97319.0000 | 3.78E+00 |
| 93385.7627 | 96915.5000 | 3.78E+00 |
| 92474.1232 | 95969.0000 | 3.78E+00 |
| 91888.8451 | 95361.5000 | 3.78E+00 |
| 91259.9294 | 94708.8000 | 3.78E+00 |
| 90389.0828 | 93805.0000 | 3.78E+00 |
| 89928.3753 | 93326.8000 | 3.78E+00 |
| 88744.1993 | 92097.9000 | 3.78E+00 |
| 86071.0247 | 89323.9000 | 3.78E+00 |
| 87203.3982 | 90498.6000 | 3.78E+00 |
| 86727.4192 | 90004.6000 | 3.78E+00 |
| 85848.4303 | 89092.2000 | 3.78E+00 |
| 85119.2423 | 88335.3000 | 3.78E+00 |
| 84270.8006 | 87454.7000 | 3.78E+00 |
| 83566.5460 | 86723.7000 | 3.78E+00 |
| 82873.1964 | 86004.0000 | 3.78E+00 |
| 81941.5832 | 85037.1000 | 3.78E+00 |
| 80786.5275 | 83838.2000 | 3.78E+00 |
| 78421.1292 | 81383.5000 | 3.78E+00 |
| 79453.2472 | 82454.2000 | 3.78E+00 |
| 78551.8331 | 81518.1000 | 3.78E+00 |
| 77743.3359 | 80678.9000 | 3.78E+00 |
| 76801.6175 | 79701.3000 | 3.78E+00 |
| 75915.7180 | 78781.7000 | 3.78E+00 |
| 74976.4325 | 77806.6000 | 3.77E+00 |
| 74091.5303 | 76888.0000 | 3.77E+00 |
| 73258.2916 | 76023.1000 | 3.77E+00 |
| 72373.8707 | 75104.9000 | 3.77E+00 |
| 70246.1317 | 72896.9000 | 3.77E+00 |
| 70496.8995 | 73156.5000 | 3.77E+00 |
| 69666.4582 | 72294.6000 | 3.77E+00 |
| 68697.9625 | 71289.1000 | 3.77E+00 |
| 67811.1839 | 70368.4000 | 3.77E+00 |
| 66853.8111 | 69374.4000 | 3.77E+00 |
| 65917.2882 | 68402.3000 | 3.77E+00 |
| 65058.0491 | 67510.1000 | 3.77E+00 |
| 64160.3526 | 66578.2000 | 3.77E+00 |
| 62739.0541 | 65102.9000 | 3.77E+00 |
| 61651.4781 | 63973.9000 | 3.77E+00 |
| 61525.9654 | 63843.2000 | 3.77E+00 |
| 60675.6622 | 62960.4000 | 3.77E+00 |
| 59817.6788 | 62069.7000 | 3.76E+00 |
| 58928.1618 | 61146.2000 | 3.76E+00 |
| 58106.4904 | 60293.2000 | 3.76E+00 |
| 57277.8537 | 59432.9000 | 3.76E+00 |
| 56443.0802 | 58566.2000 | 3.76E+00 |
| 55534.2319 | 57622.6000 | 3.76E+00 |
| 54803.5080 | 56863.7000 | 3.76E+00 |
| 53405.6455 | 55412.7000 | 3.76E+00 |
| 52778.2312 | 54761.2000 | 3.76E+00 |
| 52502.1388 | 54474.3000 | 3.76E+00 |
| 51724.1829 | 53666.5000 | 3.76E+00 |
| 50962.5549 | 52875.8000 | 3.75E+00 |
| 50216.8128 | 52101.5000 | 3.75E+00 |
| 49446.8300 | 51302.1000 | 3.75E+00 |
| 48790.8552 | 50621.0000 | 3.75E+00 |
| 48032.4384 | 49833.6000 | 3.75E+00 |
| 47365.7422 | 49141.3000 | 3.75E+00 |
| 46287.4684 | 48022.0000 | 3.75E+00 |
| 45926.0202 | 47646.8000 | 3.75E+00 |
| 45372.5061 | 47072.0000 | 3.75E+00 |
| 44811.5830 | 46489.6000 | 3.74E+00 |
| 44087.1674 | 45737.5000 | 3.74E+00 |
| 43429.9165 | 45055.1000 | 3.74E+00 |
| 42870.5321 | 44474.3000 | 3.74E+00 |
| 42321.9971 | 43904.7000 | 3.74E+00 |
| 41718.7335 | 43278.4000 | 3.74E+00 |
| 41031.5167 | 42565.0000 | 3.74E+00 |
| 40170.9231 | 41671.7000 | 3.74E+00 |
| 40013.2230 | 41507.7000 | 3.73E+00 |
| 39426.6267 | 40898.8000 | 3.73E+00 |
| 38927.8454 | 40380.9000 | 3.73E+00 |
| 38379.1210 | 39811.4000 | 3.73E+00 |
| 37856.4020 | 39268.7000 | 3.73E+00 |
| 37402.0658 | 38797.1000 | 3.73E+00 |
| 36885.2228 | 38260.5000 | 3.73E+00 |
| 36364.7998 | 37720.2000 | 3.73E+00 |
| 35841.2780 | 37176.8000 | 3.73E+00 |
| 35165.5751 | 36475.5000 | 3.73E+00 |
| 34947.5222 | 36249.1000 | 3.72E+00 |

| | | |
|---|---|---|
| 34507.1223 | 35792.0000 | 3.72E+00 |
| 34062.3071 | 35330.2000 | 3.72E+00 |
| 33652.1149 | 34904.5000 | 3.72E+00 |
| 33224.3938 | 34460.5000 | 3.72E+00 |
| 32780.0127 | 33999.3000 | 3.72E+00 |
| 32356.8221 | 33560.2000 | 3.72E+00 |
| 31929.9394 | 33117.2000 | 3.72E+00 |
| 31511.5581 | 32682.9000 | 3.72E+00 |
| 30912.2367 | 32061.0000 | 3.72E+00 |
| 30536.1225 | 31670.6000 | 3.72E+00 |
| 30316.9674 | 31443.1000 | 3.71E+00 |
| 29930.2459 | 31041.9000 | 3.71E+00 |
| 29539.8960 | 30636.8000 | 3.71E+00 |
| 29157.1375 | 30239.7000 | 3.71E+00 |
| 28803.6004 | 29872.8000 | 3.71E+00 |
| 28445.8997 | 29501.7000 | 3.71E+00 |
| 28041.7925 | 29082.5000 | 3.71E+00 |
| 27708.5144 | 28736.7000 | 3.71E+00 |
| 27174.8950 | 28183.1000 | 3.71E+00 |
| 26988.5406 | 27989.8000 | 3.71E+00 |
| 26663.7858 | 27652.8000 | 3.71E+00 |
| 26354.7705 | 27332.3000 | 3.71E+00 |
| 25992.2769 | 26956.2000 | 3.71E+00 |
| 25694.4814 | 26647.4000 | 3.71E+00 |
| 25373.0989 | 26314.0000 | 3.71E+00 |
| 25047.8745 | 25976.7000 | 3.71E+00 |
| 24737.6142 | 25654.9000 | 3.71E+00 |
| 24423.3977 | 25329.0000 | 3.71E+00 |
| 23978.6519 | 24867.7000 | 3.71E+00 |
| 23837.5507 | 24721.5000 | 3.71E+00 |
| 23538.3528 | 24411.2000 | 3.71E+00 |
| 23252.7677 | 24115.0000 | 3.71E+00 |
| 22954.2542 | 23805.4000 | 3.71E+00 |
| 22677.4538 | 23518.4000 | 3.71E+00 |
| 22354.2468 | 23183.2000 | 3.71E+00 |
| 22119.3115 | 22939.6000 | 3.71E+00 |
| 21862.7173 | 22673.5000 | 3.71E+00 |
| 21512.1967 | 22310.1000 | 3.71E+00 |
| 21183.4375 | 21969.1000 | 3.71E+00 |
| 21033.6738 | 21813.9000 | 3.71E+00 |
| 20767.2996 | 21537.8000 | 3.71E+00 |
| 20519.8794 | 21281.3000 | 3.71E+00 |
| 20260.0647 | 21012.0000 | 3.71E+00 |
| 20010.9310 | 20753.7000 | 3.71E+00 |
| 19779.5584 | 20513.9000 | 3.71E+00 |
| 19528.3430 | 20253.5000 | 3.71E+00 |
| 19287.1495 | 20003.5000 | 3.71E+00 |
| 18961.7096 | 19666.1000 | 3.71E+00 |
| 18747.5743 | 19444.1000 | 3.72E+00 |
| 18627.1177 | 19319.4000 | 3.72E+00 |
| 18394.4052 | 19078.1000 | 3.72E+00 |
| 18142.7519 | 18817.2000 | 3.72E+00 |
| 17982.5811 | 18651.3000 | 3.72E+00 |
| 17747.9549 | 18408.1000 | 3.72E+00 |
| 17541.9951 | 18194.7000 | 3.72E+00 |
| 17350.4673 | 17996.2000 | 3.72E+00 |
| 17153.0808 | 17791.6000 | 3.72E+00 |
| 16930.3010 | 17560.7000 | 3.72E+00 |
| 16676.3470 | 17297.5000 | 3.72E+00 |
| 16462.5017 | 17076.0000 | 3.73E+00 |
| 16383.1618 | 16993.9000 | 3.73E+00 |
| 16188.7108 | 16792.4000 | 3.73E+00 |
| 15969.5870 | 16565.3000 | 3.73E+00 |
| 15819.4493 | 16409.8000 | 3.73E+00 |
| 15625.6955 | 16209.0000 | 3.73E+00 |
| 15468.7309 | 16046.4000 | 3.73E+00 |
| 15286.9919 | 15858.1000 | 3.74E+00 |
| 15062.9713 | 15625.9000 | 3.74E+00 |
| 14875.1348 | 15431.3000 | 3.74E+00 |
| 14764.0114 | 15316.2000 | 3.74E+00 |
| 14616.2148 | 15163.1000 | 3.74E+00 |
| 14508.4521 | 15051.6000 | 3.74E+00 |
| 14317.8309 | 14854.0000 | 3.74E+00 |
| 14178.6396 | 14709.8000 | 3.75E+00 |
| 14009.5312 | 14534.6000 | 3.75E+00 |
| 13873.7578 | 14393.9000 | 3.75E+00 |
| 13702.6010 | 14216.6000 | 3.75E+00 |
| 13620.7226 | 14131.9000 | 3.75E+00 |
| 13390.9167 | 13893.7000 | 3.75E+00 |
| 13344.8057 | 13846.1000 | 3.76E+00 |

| | | |
|---|---|---|
| 13179.5984 | 13674.9000 | 3.76E+00 |
| 13068.4354 | 13559.8000 | 3.76E+00 |
| 12944.4239 | 13431.3000 | 3.76E+00 |
| 12818.6606 | 13301.1000 | 3.76E+00 |
| 12702.0572 | 13180.3000 | 3.77E+00 |
| 12567.2460 | 13040.7000 | 3.77E+00 |
| 12495.7824 | 12966.7000 | 3.77E+00 |
| 12227.6148 | 12688.7000 | 3.77E+00 |
| 12222.1433 | 12683.2000 | 3.77E+00 |
| 12053.0860 | 12508.0000 | 3.77E+00 |
| 12021.4959 | 12475.5000 | 3.78E+00 |
| 11843.2542 | 12290.7000 | 3.78E+00 |
| 11801.7737 | 12247.9000 | 3.78E+00 |
| 11630.3385 | 12070.2000 | 3.78E+00 |
| 11632.1328 | 12072.3000 | 3.78E+00 |
| 11456.5578 | 11890.3000 | 3.79E+00 |
| 11432.4300 | 11865.5000 | 3.79E+00 |
| 11184.2994 | 11608.2000 | 3.79E+00 |
| 11092.4612 | 11513.1000 | 3.79E+00 |
| 11087.8208 | 11508.5000 | 3.79E+00 |
| 11012.5415 | 11430.6000 | 3.80E+00 |
| 10919.2714 | 11334.0000 | 3.80E+00 |
| 10797.5566 | 11207.8000 | 3.80E+00 |
| 10741.9540 | 11150.3000 | 3.80E+00 |
| 10563.5037 | 10965.3000 | 3.80E+00 |
| 10180.2379 | 10567.6000 | 3.81E+00 |
| 10097.0906 | 10481.5000 | 3.81E+00 |
| 9985.8409 | 10366.2000 | 3.81E+00 |
| 9888.0143 | 10264.8000 | 3.81E+00 |
| 9824.3803 | 10199.0000 | 3.81E+00 |
| 9789.8690 | 10163.3000 | 3.81E+00 |
| 9680.4981 | 10050.0000 | 3.82E+00 |
| 9657.5279 | 10026.4000 | 3.82E+00 |
| 9544.0288 | 9908.6800 | 3.82E+00 |
| 9491.1159 | 9853.9100 | 3.82E+00 |
| 9415.3668 | 9775.4300 | 3.82E+00 |
| 9363.9197 | 9722.1200 | 3.83E+00 |
| 9284.3012 | 9639.6400 | 3.83E+00 |
| 9202.7572 | 9555.1900 | 3.83E+00 |
| 9172.1303 | 9523.4900 | 3.83E+00 |
| 9102.8513 | 9451.6900 | 3.83E+00 |
| 9047.6807 | 9394.5500 | 3.83E+00 |
| 8990.7598 | 9335.6700 | 3.84E+00 |
| 8942.9116 | 9286.1300 | 3.84E+00 |
| 8861.4726 | 9201.7100 | 3.84E+00 |
| 8831.8668 | 9171.1100 | 3.84E+00 |
| 8731.1023 | 9066.6200 | 3.84E+00 |
| 8714.7220 | 9049.7400 | 3.84E+00 |
| 8610.7538 | 8941.9100 | 3.85E+00 |
| 8564.6472 | 8894.1600 | 3.85E+00 |
| 8538.9709 | 8867.6100 | 3.85E+00 |
| 8490.4320 | 8817.2600 | 3.85E+00 |
| 8413.2447 | 8737.2300 | 3.85E+00 |
| 8389.5500 | 8712.7500 | 3.85E+00 |
| 8326.3270 | 8647.2200 | 3.85E+00 |
| 8289.5361 | 8609.1200 | 3.86E+00 |
| 8240.6715 | 8558.4900 | 3.86E+00 |
| 8190.7851 | 8506.7800 | 3.86E+00 |
| 8117.5547 | 8430.8400 | 3.86E+00 |
| 8071.2562 | 8382.8600 | 3.86E+00 |
| 8074.7995 | 8386.6300 | 3.86E+00 |
| 7987.3837 | 8295.9500 | 3.86E+00 |
| 7955.5938 | 8263.0800 | 3.87E+00 |
| 7917.5513 | 8223.6400 | 3.87E+00 |
| 7867.4183 | 8171.6500 | 3.87E+00 |
| 7805.0963 | 8106.9900 | 3.87E+00 |
| 7782.4308 | 8083.5200 | 3.87E+00 |
| 7730.3994 | 8029.5400 | 3.87E+00 |
| 7677.8132 | 7974.9700 | 3.87E+00 |
| 7647.9958 | 7944.1000 | 3.87E+00 |
| 7612.0065 | 7906.8200 | 3.87E+00 |
| 7581.6740 | 7875.3200 | 3.87E+00 |
| 7533.2876 | 7825.1300 | 3.87E+00 |
| 7484.5539 | 7774.5600 | 3.87E+00 |
| 7453.4360 | 7742.3000 | 3.88E+00 |
| 7416.1989 | 7703.6800 | 3.88E+00 |
| 7366.7718 | 7652.3800 | 3.88E+00 |
| 7317.1466 | 7600.8900 | 3.88E+00 |
| 7261.2821 | 7542.9000 | 3.88E+00 |
| 7266.2487 | 7548.1700 | 3.88E+00 |

| | | |
|---|---|---|
| 7228.7421 | 7509.2300 | 3.88E+00 |
| 7191.2902 | 7470.3500 | 3.88E+00 |
| 7141.5457 | 7418.7000 | 3.88E+00 |
| 7122.9150 | 7399.3600 | 3.88E+00 |
| 7073.3750 | 7347.9200 | 3.88E+00 |
| 7074.1617 | 7348.7200 | 3.88E+00 |
| 7031.3216 | 7304.2800 | 3.88E+00 |
| 6950.7413 | 7220.6200 | 3.88E+00 |
| 6914.5843 | 7183.0900 | 3.88E+00 |
| 6910.6912 | 7179.0800 | 3.88E+00 |
| 6881.8753 | 7149.1000 | 3.88E+00 |
| 6847.0366 | 7112.9400 | 3.88E+00 |
| 6832.0660 | 7097.3900 | 3.88E+00 |
| 6785.2372 | 7048.7500 | 3.88E+00 |
| 6751.8716 | 7014.1100 | 3.88E+00 |
| 6712.4984 | 6973.2100 | 3.88E+00 |
| 6699.9905 | 6960.2200 | 3.88E+00 |
| 6661.8113 | 6920.5700 | 3.88E+00 |
| 6630.8644 | 6888.4200 | 3.88E+00 |
| 6533.9475 | 6787.7700 | 3.88E+00 |
| 6584.5027 | 6840.2000 | 3.88E+00 |
| 6515.4115 | 6768.4200 | 3.88E+00 |
| 6534.5368 | 6788.2700 | 3.88E+00 |
| 6493.8291 | 6745.9700 | 3.88E+00 |
| 6460.6550 | 6711.4900 | 3.88E+00 |
| 6407.7880 | 6656.5700 | 3.88E+00 |
| 6403.6217 | 6652.2100 | 3.88E+00 |
| 6352.3209 | 6598.9100 | 3.88E+00 |
| 6329.4109 | 6575.0900 | 3.88E+00 |
| 6321.3603 | 6566.7100 | 3.88E+00 |
| 6286.5425 | 6530.5000 | 3.88E+00 |
| 6273.6336 | 6517.0800 | 3.88E+00 |
| 6226.7209 | 6468.3200 | 3.88E+00 |
| 6223.0267 | 6464.3900 | 3.88E+00 |
| 6170.9723 | 6410.2800 | 3.88E+00 |
| 6176.5775 | 6416.0700 | 3.88E+00 |
| 6098.0094 | 6334.4200 | 3.88E+00 |
| 6105.9257 | 6342.6000 | 3.88E+00 |
| 6050.6491 | 6285.1400 | 3.88E+00 |
| 6061.0547 | 6295.9000 | 3.87E+00 |
| 6022.3022 | 6255.6100 | 3.87E+00 |
| 6013.5964 | 6246.5200 | 3.87E+00 |
| 5969.8248 | 6201.0100 | 3.87E+00 |
| 5941.7005 | 6171.7500 | 3.87E+00 |
| 5929.3803 | 6158.9000 | 3.87E+00 |
| 5896.3379 | 6124.5300 | 3.87E+00 |
| 5879.1834 | 6106.6600 | 3.87E+00 |
| 5826.4094 | 6051.8000 | 3.87E+00 |
| 5774.7278 | 5998.0700 | 3.87E+00 |
| 5753.8172 | 5976.3100 | 3.87E+00 |
| 5764.0161 | 5986.7700 | 3.86E+00 |
| 5730.8607 | 5952.2700 | 3.86E+00 |
| 5721.3878 | 5942.3700 | 3.86E+00 |
| 5675.7777 | 5894.9400 | 3.86E+00 |
| 5676.4827 | 5895.6100 | 3.86E+00 |
| 5618.3070 | 5835.1300 | 3.86E+00 |
| 5621.7390 | 5838.6200 | 3.86E+00 |
| 5573.6000 | 5788.5600 | 3.86E+00 |
| 5526.6876 | 5739.7800 | 3.86E+00 |
| 5503.8297 | 5715.9800 | 3.85E+00 |
| 5528.0773 | 5741.0800 | 3.85E+00 |
| 5485.0971 | 5696.3700 | 3.85E+00 |
| 5481.6911 | 5692.7700 | 3.85E+00 |
| 5456.6997 | 5666.7500 | 3.85E+00 |
| 5440.7589 | 5650.1100 | 3.85E+00 |
| 5403.0939 | 5610.9300 | 3.85E+00 |
| 5366.7509 | 5573.1300 | 3.85E+00 |
| 5378.1435 | 5584.8800 | 3.84E+00 |
| 5298.0707 | 5501.6600 | 3.84E+00 |
| 5366.6480 | 5572.8000 | 3.84E+00 |
| 5413.6822 | 5621.5500 | 3.84E+00 |
| 5454.5958 | 5663.9500 | 3.84E+00 |
| 5520.6534 | 5732.4500 | 3.84E+00 |
| 5494.2817 | 5704.9900 | 3.84E+00 |
| 5461.4296 | 5670.8000 | 3.83E+00 |
| 5469.2641 | 5678.8400 | 3.83E+00 |
| 5415.5564 | 5623.0100 | 3.83E+00 |
| 5394.7007 | 5601.2600 | 3.83E+00 |
| 5327.9643 | 5531.8400 | 3.83E+00 |
| 5357.2327 | 5562.1500 | 3.83E+00 |

| | | |
|---|---|---|
| 5324.7481 | 5528.3200 | 3.82E+00 |
| 5285.7214 | 5487.7300 | 3.82E+00 |
| 5263.8960 | 5464.9900 | 3.82E+00 |
| 5275.1757 | 5476.6000 | 3.82E+00 |
| 5240.2854 | 5440.2900 | 3.82E+00 |
| 5206.7660 | 5405.4000 | 3.81E+00 |
| 5190.5080 | 5388.4500 | 3.81E+00 |
| 5159.7436 | 5356.4200 | 3.81E+00 |
| 5122.4034 | 5317.5700 | 3.81E+00 |
| 5062.5819 | 5255.3800 | 3.81E+00 |
| 5123.4679 | 5318.5100 | 3.81E+00 |
| 5074.3285 | 5267.4100 | 3.81E+00 |
| 5050.4496 | 5242.5300 | 3.80E+00 |
| 5035.9109 | 5227.3500 | 3.80E+00 |
| 5006.8098 | 5197.0600 | 3.80E+00 |
| 4987.0452 | 5176.4600 | 3.80E+00 |
| 4968.6475 | 5157.2900 | 3.80E+00 |
| 4951.6135 | 5139.5100 | 3.79E+00 |
| 4872.2071 | 5057.0000 | 3.79E+00 |
| 4873.8167 | 5058.6000 | 3.79E+00 |
| 4876.7840 | 5061.5900 | 3.79E+00 |
| 4865.1687 | 5049.4400 | 3.79E+00 |
| 4838.9686 | 5022.1600 | 3.79E+00 |
| 4814.1150 | 4996.2800 | 3.78E+00 |
| 4798.5603 | 4980.0500 | 3.78E+00 |
| 4776.3823 | 4956.9500 | 3.78E+00 |
| 4707.8571 | 4885.7600 | 3.78E+00 |
| 4688.3630 | 4865.4300 | 3.78E+00 |
| 4725.7593 | 4904.1600 | 3.78E+00 |
| 4692.9976 | 4870.0900 | 3.77E+00 |
| 4661.5677 | 4837.3800 | 3.77E+00 |
| 4647.3076 | 4822.4900 | 3.77E+00 |
| 4602.6814 | 4776.1100 | 3.77E+00 |
| 4606.8419 | 4780.3500 | 3.77E+00 |
| 4596.4535 | 4769.4800 | 3.76E+00 |
| 4571.5438 | 4743.5400 | 3.76E+00 |
| 4555.8136 | 4727.1400 | 3.76E+00 |
| 4509.8414 | 4679.3600 | 3.76E+00 |
| 4480.9385 | 4649.3000 | 3.76E+00 |
| 4484.7532 | 4653.1700 | 3.76E+00 |

| | | |
|---|---|---|
| 4458.3784 | 4625.7200 | 3.75E+00 |
| 4441.1143 | 4607.7400 | 3.75E+00 |
| 4448.5852 | 4615.4000 | 3.75E+00 |
| 4418.1253 | 4583.7300 | 3.75E+00 |
| 4388.9346 | 4553.3600 | 3.75E+00 |
| 4368.7997 | 4532.4000 | 3.74E+00 |
| 4365.4622 | 4528.8500 | 3.74E+00 |
| 4301.1210 | 4462.0200 | 3.74E+00 |
| 4261.4238 | 4420.7600 | 3.74E+00 |
| 4292.6840 | 4453.1300 | 3.74E+00 |
| 4270.8631 | 4430.4200 | 3.74E+00 |
| 4265.6849 | 4424.9600 | 3.73E+00 |
| 4223.1135 | 4380.7300 | 3.73E+00 |
| 4189.5048 | 4345.8000 | 3.73E+00 |
| 4187.7647 | 4343.9700 | 3.73E+00 |
| 4179.5283 | 4335.3600 | 3.73E+00 |
| 4164.7638 | 4319.9800 | 3.73E+00 |
| 4112.9842 | 4266.1900 | 3.72E+00 |
| 4062.5051 | 4213.7700 | 3.72E+00 |
| 4096.8408 | 4249.3100 | 3.72E+00 |
| 4056.2877 | 4207.1700 | 3.72E+00 |
| 4054.7766 | 4205.5400 | 3.72E+00 |
| 4046.7632 | 4197.1600 | 3.72E+00 |
| 4024.7492 | 4174.2500 | 3.71E+00 |
| 4003.8549 | 4152.5200 | 3.71E+00 |
| 3984.0684 | 4131.9200 | 3.71E+00 |
| 3950.4231 | 4096.9700 | 3.71E+00 |
| 3925.3941 | 4070.9500 | 3.71E+00 |
| 3886.6003 | 4030.6500 | 3.71E+00 |
| 3893.4880 | 4037.7400 | 3.70E+00 |
| 3879.1098 | 4022.7600 | 3.70E+00 |
| 3843.6188 | 3985.8900 | 3.70E+00 |
| 3846.0745 | 3988.3700 | 3.70E+00 |
| 3805.4022 | 3946.1400 | 3.70E+00 |
| 3809.8171 | 3950.6600 | 3.70E+00 |
| 3778.6169 | 3918.2400 | 3.70E+00 |
| 3763.0693 | 3902.0600 | 3.69E+00 |
| 3755.7772 | 3894.4400 | 3.69E+00 |
| 3684.2681 | 3820.2300 | 3.69E+00 |
| 3700.6680 | 3837.1800 | 3.69E+00 |

| | | |
|---|---|---|
| 3703.4714 | 3840.0400 | 3.69E+00 |
| 3678.4145 | 3814.0100 | 3.69E+00 |
| 3668.6828 | 3803.8700 | 3.68E+00 |
| 3624.1855 | 3757.6800 | 3.68E+00 |
| 3602.0857 | 3734.7700 | 3.68E+00 |
| 3588.1052 | 3720.2200 | 3.68E+00 |
| 3582.1053 | 3713.9400 | 3.68E+00 |
| 3562.8672 | 3693.9400 | 3.68E+00 |
| 3516.4701 | 3645.7800 | 3.68E+00 |
| 3513.1621 | 3642.3100 | 3.68E+00 |
| 3496.7131 | 3625.2100 | 3.67E+00 |
| 3488.1059 | 3616.2300 | 3.67E+00 |
| 3459.5306 | 3586.5600 | 3.67E+00 |
| 3445.7232 | 3572.2000 | 3.67E+00 |
| 3418.9910 | 3544.4300 | 3.67E+00 |
| 3413.7665 | 3538.9700 | 3.67E+00 |
| 3375.1231 | 3498.8700 | 3.67E+00 |
| 3351.0991 | 3473.9200 | 3.67E+00 |
| 3327.9578 | 3449.8900 | 3.66E+00 |
| 3298.9226 | 3419.7500 | 3.66E+00 |
| 3304.4860 | 3425.4800 | 3.66E+00 |
| 3290.5521 | 3411.0000 | 3.66E+00 |
| 3270.7024 | 3390.3800 | 3.66E+00 |
| 3258.3345 | 3377.5300 | 3.66E+00 |
| 3240.0124 | 3358.5600 | 3.66E+00 |
| 3222.5380 | 3340.3900 | 3.66E+00 |
| 3212.4308 | 3329.8800 | 3.66E+00 |
| 3189.8817 | 3306.4600 | 3.65E+00 |
| 3135.3899 | 3249.9400 | 3.65E+00 |
| 3140.6151 | 3255.3300 | 3.65E+00 |
| 3107.4229 | 3220.8800 | 3.65E+00 |
| 3100.9666 | 3214.1600 | 3.65E+00 |
| 3095.1477 | 3208.0900 | 3.65E+00 |
| 3038.5610 | 3149.4100 | 3.65E+00 |
| 3046.9550 | 3158.0700 | 3.65E+00 |
| 2998.4879 | 3107.8100 | 3.65E+00 |
| 3027.1260 | 3137.4600 | 3.64E+00 |
| 2986.5081 | 3095.3400 | 3.64E+00 |
| 2965.6408 | 3073.6800 | 3.64E+00 |
| 2958.0070 | 3065.7400 | 3.64E+00 |
| 2913.4473 | 3019.5300 | 3.64E+00 |
| 2913.2623 | 3019.3600 | 3.64E+00 |
| 2907.4319 | 3013.2900 | 3.64E+00 |
| 2871.2492 | 2975.7600 | 3.64E+00 |
| 2848.1316 | 2951.7700 | 3.64E+00 |
| 2844.0379 | 2947.5100 | 3.64E+00 |
| 2803.8299 | 2905.8100 | 3.64E+00 |
| 2794.7657 | 2896.3800 | 3.64E+00 |
| 2749.9188 | 2849.8800 | 3.64E+00 |
| 2766.1009 | 2866.6300 | 3.63E+00 |
| 2746.5703 | 2846.3800 | 3.63E+00 |
| 2733.5835 | 2832.9000 | 3.63E+00 |
| 2703.1963 | 2801.4400 | 3.63E+00 |
| 2697.2219 | 2795.2100 | 3.63E+00 |
| 2673.9618 | 2771.0800 | 3.63E+00 |
| 2668.8978 | 2765.8000 | 3.63E+00 |
| 2646.6669 | 2742.7500 | 3.63E+00 |
| 2613.3083 | 2708.1500 | 3.63E+00 |
| 2580.5753 | 2674.2200 | 3.63E+00 |
| 2594.6846 | 2688.8300 | 3.63E+00 |
| 2580.2186 | 2673.8300 | 3.63E+00 |
| 2560.4581 | 2653.3400 | 3.63E+00 |
| 2546.8667 | 2639.2400 | 3.63E+00 |
| 2528.0045 | 2619.6800 | 3.63E+00 |
| 2492.6038 | 2582.9900 | 3.63E+00 |
| 2480.3301 | 2570.2400 | 3.62E+00 |
| 2468.4312 | 2557.8900 | 3.62E+00 |
| 2462.4874 | 2551.7100 | 3.62E+00 |
| 2440.0697 | 2528.5200 | 3.62E+00 |
| 2379.3411 | 2465.5800 | 3.62E+00 |
| 2402.1203 | 2489.1800 | 3.62E+00 |
| 2380.9699 | 2467.2600 | 3.62E+00 |
| 2376.6299 | 2462.7600 | 3.62E+00 |
| 2350.7217 | 2435.9100 | 3.62E+00 |
| 2341.5079 | 2426.3700 | 3.62E+00 |
| 2305.5291 | 2389.0800 | 3.62E+00 |
| 2302.3151 | 2385.7500 | 3.62E+00 |
| 2277.8555 | 2360.4200 | 3.62E+00 |
| 2248.4869 | 2329.9200 | 3.62E+00 |
| 2251.3384 | 2332.8800 | 3.62E+00 |

| | | |
|---|---|---|
| 2243.7254 | 2324.9800 | 3.62E+00 |
| 2215.2240 | 2295.4500 | 3.62E+00 |
| 2187.0850 | 2266.2800 | 3.62E+00 |
| 2185.4141 | 2264.5500 | 3.62E+00 |
| 2157.8455 | 2235.9700 | 3.62E+00 |
| 2151.3237 | 2229.2100 | 3.62E+00 |
| 2144.9424 | 2222.5900 | 3.62E+00 |
| 2118.1334 | 2194.8100 | 3.62E+00 |
| 2081.3877 | 2156.7200 | 3.62E+00 |
| 2095.8899 | 2171.7900 | 3.62E+00 |
| 2069.7756 | 2144.7400 | 3.62E+00 |
| 2064.1308 | 2138.8900 | 3.62E+00 |
| 2013.2771 | 2086.2000 | 3.62E+00 |
| 2022.9849 | 2096.2600 | 3.62E+00 |
| 2002.6877 | 2075.2300 | 3.62E+00 |
| 1977.5914 | 2049.2300 | 3.62E+00 |
| 1967.5400 | 2038.8300 | 3.62E+00 |
| 1947.6991 | 2018.2800 | 3.62E+00 |
| 1923.0896 | 1992.7800 | 3.62E+00 |
| 1913.3089 | 1982.6600 | 3.62E+00 |
| 1888.9650 | 1957.4400 | 3.63E+00 |
| 1884.2221 | 1952.4700 | 3.62E+00 |
| 1874.5785 | 1942.4900 | 3.62E+00 |
| 1845.7107 | 1912.5700 | 3.62E+00 |
| 1845.7375 | 1912.6000 | 3.62E+00 |
| 1807.5202 | 1873.0000 | 3.62E+00 |
| 1812.2739 | 1877.9300 | 3.62E+00 |
| 1788.4981 | 1853.2900 | 3.62E+00 |
| 1760.0931 | 1823.8600 | 3.62E+00 |
| 1727.1107 | 1789.6800 | 3.62E+00 |
| 1736.3251 | 1799.2300 | 3.62E+00 |
| 1722.0008 | 1784.4500 | 3.63E+00 |
| 1689.1450 | 1750.4000 | 3.63E+00 |
| 1665.6380 | 1726.0500 | 3.63E+00 |
| 1669.7598 | 1730.3400 | 3.63E+00 |
| 1655.3517 | 1715.4200 | 3.63E+00 |
| 1636.3141 | 1695.7000 | 3.63E+00 |
| 1630.8893 | 1690.0900 | 3.63E+00 |
| 1602.6552 | 1660.8400 | 3.63E+00 |
| 1592.4973 | 1650.3200 | 3.63E+00 |
| 1564.2229 | 1621.0400 | 3.63E+00 |
| 1567.3672 | 1624.2500 | 3.63E+00 |
| 1552.3645 | 1608.7100 | 3.63E+00 |
| 1528.3509 | 1583.8300 | 3.63E+00 |
| 1504.2830 | 1558.9000 | 3.63E+00 |
| 1493.3913 | 1547.6200 | 3.63E+00 |
| 1469.1388 | 1522.4900 | 3.63E+00 |
| 1479.8612 | 1533.6000 | 3.63E+00 |
| 1446.5772 | 1499.1200 | 3.63E+00 |
| 1439.3675 | 1491.6500 | 3.63E+00 |
| 1414.5920 | 1465.9800 | 3.63E+00 |
| 1406.9227 | 1458.1000 | 3.64E+00 |
| 1390.4610 | 1441.0400 | 3.64E+00 |
| 1360.9501 | 1410.4800 | 3.64E+00 |
| 1361.2534 | 1410.8000 | 3.64E+00 |
| 1352.7258 | 1401.9700 | 3.64E+00 |
| 1326.9547 | 1375.2800 | 3.64E+00 |
| 1317.9561 | 1365.9700 | 3.64E+00 |
| 1296.0362 | 1343.2600 | 3.64E+00 |
| 1274.0032 | 1320.3600 | 3.64E+00 |
| 1272.6374 | 1318.9600 | 3.64E+00 |
| 1245.8855 | 1291.2400 | 3.64E+00 |
| 1239.7516 | 1284.8900 | 3.64E+00 |
| 1237.4440 | 1282.5100 | 3.64E+00 |
| 1209.9736 | 1254.0500 | 3.64E+00 |
| 1202.8648 | 1246.7400 | 3.65E+00 |
| 1183.1371 | 1226.2900 | 3.65E+00 |
| 1167.2405 | 1209.8300 | 3.65E+00 |
| 1163.2964 | 1205.7500 | 3.65E+00 |
| 1146.7665 | 1188.6300 | 3.65E+00 |
| 1129.9325 | 1171.1900 | 3.65E+00 |
| 1112.7898 | 1153.4300 | 3.65E+00 |
| 1107.4340 | 1147.8900 | 3.65E+00 |
| 1097.6676 | 1137.7800 | 3.65E+00 |
| 1083.5209 | 1123.1300 | 3.66E+00 |
| 1081.0248 | 1120.5500 | 3.66E+00 |
| 1046.1994 | 1084.4600 | 3.66E+00 |
| 1050.8971 | 1089.3400 | 3.66E+00 |
| 1015.4672 | 1052.6200 | 3.66E+00 |
| 991.6503 | 1027.9500 | 3.66E+00 |

| | | |
|---|---|---|
| 995.0997 | 1031.5300 | 3.66E+00 |
| 990.2100 | 1026.4800 | 3.66E+00 |
| 965.2690 | 1000.6300 | 3.66E+00 |
| 955.6366 | 990.6580 | 3.66E+00 |
| 941.6783 | 976.1980 | 3.67E+00 |
| 931.2044 | 965.3470 | 3.67E+00 |
| 928.0659 | 962.1050 | 3.67E+00 |
| 908.9642 | 942.3160 | 3.67E+00 |
| 889.4669 | 922.1080 | 3.67E+00 |
| 869.5709 | 901.4950 | 3.67E+00 |
| 864.6440 | 896.3970 | 3.67E+00 |
| 859.2392 | 890.8000 | 3.67E+00 |
| 857.1823 | 888.6810 | 3.67E+00 |
| 850.8078 | 882.0820 | 3.68E+00 |
| 832.5154 | 863.1270 | 3.68E+00 |
| 821.3927 | 851.6060 | 3.68E+00 |
| 790.8337 | 819.9280 | 3.68E+00 |
| 801.5169 | 831.0150 | 3.68E+00 |
| 785.1874 | 814.0960 | 3.68E+00 |
| 768.3971 | 796.6950 | 3.68E+00 |
| 754.9052 | 782.7180 | 3.68E+00 |
| 733.4255 | 760.4510 | 3.68E+00 |
| 730.2227 | 757.1420 | 3.69E+00 |
| 715.2746 | 741.6510 | 3.69E+00 |
| 714.7695 | 741.1400 | 3.69E+00 |
| 706.2699 | 732.3360 | 3.69E+00 |
| 686.0949 | 711.4230 | 3.69E+00 |
| 676.5796 | 701.5650 | 3.69E+00 |
| 659.1337 | 683.4820 | 3.69E+00 |
| 652.2904 | 676.3930 | 3.70E+00 |
| 663.3875 | 687.9100 | 3.70E+00 |
| 648.0687 | 672.0340 | 3.70E+00 |
| 635.9227 | 659.4470 | 3.70E+00 |
| 630.6083 | 653.9430 | 3.70E+00 |
| 617.4019 | 640.2560 | 3.70E+00 |
| 603.6701 | 626.0260 | 3.70E+00 |
| 596.7344 | 618.8440 | 3.71E+00 |
| 592.9079 | 614.8800 | 3.71E+00 |
| 566.6140 | 587.6200 | 3.71E+00 |
| 554.4067 | 574.9680 | 3.71E+00 |
| 552.5825 | 573.0890 | 3.71E+00 |
| 542.9176 | 563.0690 | 3.71E+00 |
| 525.4390 | 544.9520 | 3.71E+00 |
| 532.8257 | 552.6200 | 3.71E+00 |
| 528.7499 | 548.3950 | 3.72E+00 |
| 516.8646 | 536.0820 | 3.72E+00 |
| 500.8120 | 519.4390 | 3.72E+00 |
| 498.6721 | 517.2260 | 3.72E+00 |
| 481.5188 | 499.4410 | 3.72E+00 |
| 474.6421 | 492.3130 | 3.72E+00 |
| 459.9951 | 477.1310 | 3.73E+00 |
| 437.6014 | 453.9090 | 3.73E+00 |
| 443.4348 | 459.9620 | 3.73E+00 |
| 427.1232 | 443.0500 | 3.73E+00 |
| 435.3976 | 451.6420 | 3.73E+00 |
| 425.1397 | 441.0080 | 3.73E+00 |
| 407.1477 | 422.3470 | 3.73E+00 |
| 402.9400 | 417.9870 | 3.73E+00 |
| 387.4179 | 401.8910 | 3.74E+00 |
| 382.0776 | 396.3560 | 3.74E+00 |
| 383.3260 | 397.6580 | 3.74E+00 |
| 376.8480 | 390.9450 | 3.74E+00 |
| 359.0796 | 372.5160 | 3.74E+00 |
| 355.0483 | 368.3390 | 3.74E+00 |
| 339.7359 | 352.4590 | 3.74E+00 |
| 348.8589 | 361.9300 | 3.75E+00 |
| 332.4202 | 344.8760 | 3.75E+00 |
| 315.4640 | 327.2500 | 3.74E+00 |
| 312.1819 | 323.8500 | 3.74E+00 |
| 304.7708 | 316.1700 | 3.74E+00 |
| 300.3662 | 311.6040 | 3.74E+00 |
| 298.9685 | 310.1630 | 3.74E+00 |
| 297.0130 | 308.1360 | 3.74E+00 |
| 301.6364 | 312.9390 | 3.75E+00 |
| 270.0366 | 280.1610 | 3.75E+00 |
| 269.9799 | 280.1070 | 3.75E+00 |
| 262.2399 | 272.0800 | 3.75E+00 |
| 264.6491 | 274.5810 | 3.75E+00 |
| 255.8092 | 265.4150 | 3.76E+00 |
| 246.4215 | 255.6770 | 3.76E+00 |

| | | |
|---|---|---|
| 243.6241 | 252.7780 | 3.76E+00 |
| 226.0085 | 234.5070 | 3.76E+00 |
| 222.1242 | 230.4770 | 3.76E+00 |
| 214.1308 | 222.1880 | 3.76E+00 |
| 234.1804 | 242.9990 | 3.77E+00 |
| 200.1013 | 207.6370 | 3.77E+00 |
| 208.3691 | 216.2210 | 3.77E+00 |
| 191.0843 | 198.2860 | 3.77E+00 |
| 194.7275 | 202.0710 | 3.77E+00 |
| 179.9557 | 186.7450 | 3.77E+00 |
| 186.1397 | 193.1660 | 3.77E+00 |
| 181.0647 | 187.9020 | 3.78E+00 |
| 161.1298 | 167.2150 | 3.78E+00 |
| 155.0125 | 160.8680 | 3.78E+00 |
| 144.7923 | 150.2700 | 3.78E+00 |
| 155.6056 | 161.4900 | 3.78E+00 |
| 147.9612 | 153.5620 | 3.79E+00 |
| 150.6032 | 156.3070 | 3.79E+00 |
| 141.9526 | 147.3260 | 3.79E+00 |
| 121.9903 | 126.6130 | 3.79E+00 |
| 119.5376 | 124.0700 | 3.79E+00 |
| 116.5972 | 121.0200 | 3.79E+00 |
| 113.1715 | 117.4630 | 3.79E+00 |
| 123.7281 | 128.4210 | 3.79E+00 |
| 112.1122 | 116.3680 | 3.80E+00 |
| 107.2518 | 111.3260 | 3.80E+00 |
| 87.4118 | 90.7345 | 3.80E+00 |
| 114.2638 | 118.6070 | 3.80E+00 |
| 86.1924 | 89.4706 | 3.80E+00 |
| 86.7157 | 90.0165 | 3.81E+00 |
| 72.2220 | 74.9713 | 3.81E+00 |
| 71.8306 | 74.5641 | 3.81E+00 |
| 67.3450 | 69.9102 | 3.81E+00 |
| 69.7180 | 72.3749 | 3.81E+00 |
| 60.6835 | 62.9970 | 3.81E+00 |
| 62.1859 | 64.5599 | 3.82E+00 |
| 41.2567 | 42.8336 | 3.82E+00 |
| 38.1762 | 39.6684 | 3.91E+00 |
| 34.7071 | 36.0653 | 3.91E+00 |
| 38.1697 | 39.6643 | 3.92E+00 |
| 41.2319 | 42.8462 | 3.92E+00 |
| 14.3848 | 14.9455 | 3.90E+00 |
| 27.6889 | 28.7718 | 3.91E+00 |
| 11.0400 | 11.4700 | 3.89E+00 |
| 16.1744 | 16.8062 | 3.91E+00 |
| 24.6473 | 25.6117 | 3.91E+00 |
| 25.3268 | 26.3151 | 3.90E+00 |
| 14.4556 | 15.0216 | 3.92E+00 |
| -0.5777 | -0.5761 | 2.88E-01 |
| 2.6843 | 2.7864 | 3.80E+00 |
| 1.8125 | 1.8971 | 4.67E+00 |
| -6.9082 | -7.1670 | 3.75E+00 |
| -12.2760 | -12.7336 | 3.73E+00 |
| -21.7841 | -22.5921 | 3.71E+00 |
| -16.5883 | -17.2086 | 3.74E+00 |
| -26.8375 | -27.8353 | 3.72E+00 |
| -37.4163 | -38.8592 | 3.86E+00 |
| -10.5498 | -10.9472 | 3.77E+00 |
| -29.4632 | -30.5626 | 3.73E+00 |
| -29.7441 | -30.8581 | 3.75E+00 |
| -30.3521 | -31.4880 | 3.74E+00 |
| -42.6925 | -44.3396 | 3.86E+00 |
| -47.7870 | -49.6339 | 3.86E+00 |
| -41.7284 | -43.3419 | 3.87E+00 |
| -35.9899 | -37.3444 | 3.76E+00 |
| -53.5200 | -55.5893 | 3.87E+00 |
| -67.5982 | -70.2114 | 3.87E+00 |
| -55.0276 | -57.1599 | 3.88E+00 |
| -65.8857 | -68.4349 | 3.87E+00 |
| -69.3269 | -72.0104 | 3.87E+00 |
| -65.3030 | -67.8345 | 3.88E+00 |
| -69.3152 | -72.0043 | 3.88E+00 |
| -81.4060 | -84.5665 | 3.88E+00 |
| -86.0066 | -89.3438 | 3.88E+00 |
| -94.7989 | -98.4770 | 3.88E+00 |
| -88.2131 | -91.6383 | 3.88E+00 |
| -85.7794 | -89.1059 | 3.88E+00 |
| -99.3260 | -103.1800 | 3.88E+00 |
| -113.1711 | -117.5710 | 3.89E+00 |
| -91.7565 | -95.3222 | 3.89E+00 |

Universidad Industrial de Santander

ANEXO P. ÍNDICE DE REFRACCIÓN ZnS14Aindio1

| índice de refracción ZnS14Aindio1 | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 2.7345 | 2.7345 | 1.40E-04 |
| 2.7326 | 2.7326 | 3.07E-05 |
| 2.7308 | 2.7308 | 1.23E-04 |
| 2.7290 | 2.7290 | 5.03E-05 |
| 2.7271 | 2.7271 | 1.78E-04 |
| 2.7253 | 2.7253 | 1.39E-04 |
| 2.7235 | 2.7235 | 6.72E-05 |
| 2.7217 | 2.7217 | 7.54E-05 |
| 2.7199 | 2.7199 | 1.14E-04 |
| 2.7181 | 2.7181 | 1.34E-04 |
| 2.7163 | 2.7163 | 1.79E-05 |
| 2.7145 | 2.7145 | 2.62E-05 |
| 2.7127 | 2.7127 | 1.03E-04 |
| 2.7109 | 2.7110 | 3.73E-05 |
| 2.7092 | 2.7092 | 1.47E-04 |
| 2.7074 | 2.7074 | 6.25E-05 |
| 2.7056 | 2.7057 | 1.55E-04 |
| 2.7039 | 2.7039 | 5.55E-05 |
| 2.7021 | 2.7021 | 1.34E-04 |
| 2.7004 | 2.7004 | 2.20E-05 |
| 2.6986 | 2.6987 | 8.99E-05 |
| 2.6969 | 2.6969 | 3.19E-05 |
| 2.6952 | 2.6952 | 2.81E-05 |
| 2.6935 | 2.6935 | 1.00E-04 |
| 2.6917 | 2.6917 | 4.53E-05 |
| 2.6900 | 2.6900 | 1.78E-04 |
| 2.6883 | 2.6883 | 1.25E-04 |
| 2.6866 | 2.6866 | 1.15E-04 |
| 2.6849 | 2.6849 | 1.69E-04 |
| 2.6832 | 2.6832 | 3.80E-05 |
| 2.6815 | 2.6815 | 9.58E-05 |
| 2.6798 | 2.6798 | 3.00E-05 |
| 2.6781 | 2.6781 | 3.44E-05 |
| 2.6765 | 2.6765 | 8.35E-05 |
| 2.6748 | 2.6748 | 9.65E-06 |
| 2.6731 | 2.6731 | 1.17E-04 |
| 2.6715 | 2.6715 | 3.07E-05 |
| 2.6698 | 2.6698 | 1.24E-04 |
| 2.6682 | 2.6682 | 2.30E-05 |
| 2.6665 | 2.6665 | 1.00E-04 |
| 2.6649 | 2.6649 | 1.90E-05 |
| 2.6632 | 2.6632 | 3.92E-05 |
| 2.6616 | 2.6616 | 1.01E-04 |
| 2.6600 | 2.6600 | 6.47E-05 |
| 2.6583 | 2.6583 | 1.48E-04 |
| 2.6567 | 2.6567 | 1.59E-04 |
| 2.6551 | 2.6551 | 3.07E-05 |
| 2.6535 | 2.6535 | 4.65E-05 |
| 2.6519 | 2.6519 | 1.11E-04 |
| 2.6503 | 2.6503 | 6.55E-05 |
| 2.6487 | 2.6487 | 1.85E-04 |
| 2.6471 | 2.6471 | 1.13E-04 |
| 2.6455 | 2.6455 | 1.72E-04 |
| 2.6439 | 2.6439 | 9.19E-05 |
| 2.6423 | 2.6423 | 1.48E-04 |
| 2.6408 | 2.6408 | 4.76E-06 |
| 2.6392 | 2.6392 | 1.18E-05 |
| 2.6376 | 2.6376 | 1.82E-04 |
| 2.6361 | 2.6361 | 1.72E-04 |
| 2.6345 | 2.6345 | 6.52E-05 |
| 2.6330 | 2.6330 | 1.35E-04 |
| 2.6314 | 2.6314 | 3.89E-05 |
| 2.6299 | 2.6299 | 1.56E-04 |
| 2.6283 | 2.6283 | 1.08E-04 |
| 2.6268 | 2.6268 | 1.05E-04 |
| 2.6253 | 2.6253 | 1.02E-04 |
| 2.6237 | 2.6238 | 1.18E-04 |
| 2.6222 | 2.6222 | 1.74E-04 |
| 2.6207 | 2.6207 | 6.78E-05 |
| 2.6192 | 2.6192 | 1.81E-04 |
| 2.6177 | 2.6177 | 1.31E-04 |
| 2.6162 | 2.6162 | 7.95E-05 |
| 2.6147 | 2.6147 | 6.90E-05 |
| 2.6132 | 2.6132 | 1.64E-04 |

| | | |
|---|---|---|
| 2.6117 | 2.6117 | 1.46E-04 |
| 2.6102 | 2.6102 | 1.50E-04 |
| 2.6087 | 2.6087 | 9.56E-05 |
| 2.6072 | 2.6072 | 1.16E-04 |
| 2.6058 | 2.6058 | 8.87E-05 |
| 2.6043 | 2.6043 | 1.36E-04 |
| 2.6028 | 2.6028 | 2.72E-05 |
| 2.6014 | 2.6014 | 1.46E-04 |
| 2.5999 | 2.5999 | 1.08E-04 |
| 2.5985 | 2.5985 | 8.44E-05 |
| 2.5970 | 2.5970 | 4.74E-05 |
| 2.5956 | 2.5956 | 1.65E-04 |
| 2.5941 | 2.5941 | 5.11E-05 |
| 2.5927 | 2.5927 | 9.08E-05 |
| 2.5912 | 2.5912 | 1.02E-04 |
| 2.5898 | 2.5898 | 1.43E-04 |
| 2.5884 | 2.5884 | 3.15E-05 |
| 2.5870 | 2.5870 | 1.55E-04 |
| 2.5855 | 2.5855 | 1.27E-04 |
| 2.5841 | 2.5841 | 5.13E-05 |
| 2.5827 | 2.5827 | 6.97E-06 |
| 2.5813 | 2.5813 | 8.45E-05 |
| 2.5799 | 2.5799 | 6.22E-05 |
| 2.5785 | 2.5785 | 6.03E-05 |
| 2.5771 | 2.5771 | 9.01E-05 |
| 2.5757 | 2.5757 | 3.55E-07 |
| 2.5743 | 2.5743 | 5.80E-05 |
| 2.5729 | 2.5729 | 1.26E-04 |
| 2.5716 | 2.5716 | 1.64E-04 |
| 2.5702 | 2.5702 | 5.51E-05 |
| 2.5688 | 2.5688 | 1.90E-04 |
| 2.5674 | 2.5674 | 1.80E-04 |
| 2.5661 | 2.5661 | 2.52E-05 |
| 2.5647 | 2.5647 | 1.16E-04 |
| 2.5633 | 2.5634 | 6.25E-05 |
| 2.5620 | 2.5620 | 1.34E-04 |
| 2.5606 | 2.5606 | 8.35E-05 |
| 2.5593 | 2.5593 | 1.75E-04 |
| 2.5580 | 2.5580 | 1.85E-05 |
| 2.5566 | 2.5566 | 3.14E-06 |
| 2.5553 | 2.5553 | 1.29E-04 |
| 2.5539 | 2.5539 | 4.26E-06 |
| 2.5526 | 2.5526 | 1.98E-05 |
| 2.5513 | 2.5513 | 1.75E-04 |
| 2.5500 | 2.5500 | 7.82E-05 |
| 2.5486 | 2.5486 | 1.20E-04 |
| 2.5473 | 2.5473 | 9.17E-05 |
| 2.5460 | 2.5460 | 1.66E-04 |
| 2.5447 | 2.5447 | 1.02E-04 |
| 2.5434 | 2.5434 | 9.97E-05 |
| 2.5421 | 2.5421 | 4.49E-05 |
| 2.5408 | 2.5408 | 1.27E-04 |
| 2.5395 | 2.5395 | 4.92E-05 |
| 2.5382 | 2.5382 | 8.95E-05 |
| 2.5369 | 2.5369 | 5.45E-06 |
| 2.5356 | 2.5357 | 1.59E-04 |
| 2.5344 | 2.5344 | 1.89E-04 |
| 2.5331 | 2.5331 | 8.50E-05 |
| 2.5318 | 2.5318 | 1.53E-04 |
| 2.5305 | 2.5305 | 1.29E-04 |
| 2.5293 | 2.5293 | 1.57E-04 |
| 2.5280 | 2.5280 | 8.41E-05 |
| 2.5268 | 2.5268 | 6.20E-05 |
| 2.5255 | 2.5255 | 1.72E-04 |
| 2.5242 | 2.5242 | 1.65E-05 |
| 2.5230 | 2.5230 | 7.95E-06 |
| 2.5217 | 2.5217 | 9.81E-05 |
| 2.5205 | 2.5205 | 6.24E-05 |
| 2.5193 | 2.5193 | 9.34E-05 |
| 2.5180 | 2.5180 | 4.95E-06 |
| 2.5168 | 2.5168 | 1.65E-04 |
| 2.5156 | 2.5156 | 1.91E-04 |
| 2.5143 | 2.5143 | 1.20E-04 |
| 2.5131 | 2.5131 | 9.42E-05 |
| 2.5119 | 2.5119 | 3.80E-05 |
| 2.5107 | 2.5107 | 1.09E-04 |
| 2.5094 | 2.5095 | 9.22E-05 |
| 2.5082 | 2.5082 | 1.67E-04 |
| 2.5070 | 2.5070 | 1.16E-04 |
| 2.5058 | 2.5058 | 6.00E-05 |

| | | |
|---|---|---|
| 2.5046 | 2.5046 | 3.76E-05 |
| 2.5034 | 2.5034 | 1.06E-05 |
| 2.5022 | 2.5022 | 1.41E-04 |
| 2.5010 | 2.5010 | 1.66E-05 |
| 2.4998 | 2.4998 | 1.58E-05 |
| 2.4987 | 2.4987 | 1.38E-04 |
| 2.4975 | 2.4975 | 1.66E-05 |
| 2.4963 | 2.4963 | 4.91E-05 |
| 2.4951 | 2.4951 | 4.05E-05 |
| 2.4939 | 2.4939 | 1.49E-04 |
| 2.4928 | 2.4928 | 1.84E-04 |
| 2.4916 | 2.4916 | 1.64E-04 |
| 2.4904 | 2.4904 | 9.24E-06 |
| 2.4893 | 2.4893 | 9.84E-05 |
| 2.4881 | 2.4881 | 8.61E-05 |
| 2.4870 | 2.4870 | 4.59E-05 |
| 2.4858 | 2.4858 | 1.05E-04 |
| 2.4846 | 2.4847 | 1.37E-04 |
| 2.4835 | 2.4835 | 5.07E-05 |
| 2.4824 | 2.4824 | 1.54E-04 |
| 2.4812 | 2.4812 | 7.39E-05 |
| 2.4801 | 2.4801 | 1.11E-04 |
| 2.4789 | 2.4789 | 1.38E-04 |
| 2.4778 | 2.4778 | 1.34E-04 |
| 2.4767 | 2.4767 | 1.18E-04 |
| 2.4755 | 2.4756 | 1.85E-04 |
| 2.4744 | 2.4744 | 3.10E-05 |
| 2.4733 | 2.4733 | 4.14E-05 |
| 2.4722 | 2.4722 | 1.30E-06 |
| 2.4711 | 2.4711 | 1.59E-04 |
| 2.4700 | 2.4700 | 2.62E-05 |
| 2.4688 | 2.4688 | 7.54E-06 |
| 2.4677 | 2.4677 | 1.03E-04 |
| 2.4666 | 2.4666 | 9.40E-05 |
| 2.4655 | 2.4655 | 1.78E-04 |
| 2.4644 | 2.4644 | 1.49E-04 |
| 2.4633 | 2.4633 | 7.24E-06 |
| 2.4622 | 2.4622 | 1.60E-04 |
| 2.4611 | 2.4612 | 2.00E-04 |
| 2.4601 | 2.4601 | 1.29E-04 |

| | | |
|---|---|---|
| 2.4590 | 2.4590 | 5.27E-05 |
| 2.4579 | 2.4579 | 6.11E-05 |
| 2.4568 | 2.4568 | 6.44E-05 |
| 2.4557 | 2.4557 | 4.25E-05 |
| 2.4547 | 2.4547 | 1.48E-04 |
| 2.4536 | 2.4536 | 1.78E-04 |
| 2.4525 | 2.4525 | 2.01E-04 |
| 2.4514 | 2.4515 | 6.39E-05 |
| 2.4504 | 2.4504 | 1.82E-04 |
| 2.4493 | 2.4493 | 1.28E-04 |
| 2.4483 | 2.4483 | 1.82E-04 |
| 2.4472 | 2.4472 | 6.49E-05 |
| 2.4462 | 2.4462 | 2.04E-04 |
| 2.4451 | 2.4451 | 1.72E-04 |
| 2.4441 | 2.4441 | 1.63E-04 |
| 2.4430 | 2.4430 | 1.70E-05 |
| 2.4420 | 2.4420 | 1.06E-04 |
| 2.4409 | 2.4409 | 1.23E-04 |
| 2.4399 | 2.4399 | 3.42E-05 |
| 2.4389 | 2.4389 | 1.60E-04 |
| 2.4378 | 2.4378 | 4.83E-05 |
| 2.4368 | 2.4368 | 4.16E-05 |
| 2.4358 | 2.4358 | 1.39E-04 |
| 2.4347 | 2.4347 | 6.99E-05 |
| 2.4337 | 2.4337 | 1.75E-04 |
| 2.4327 | 2.4327 | 1.78E-04 |
| 2.4317 | 2.4317 | 7.65E-05 |
| 2.4307 | 2.4307 | 1.27E-04 |
| 2.4297 | 2.4297 | 2.25E-05 |
| 2.4286 | 2.4286 | 1.97E-05 |
| 2.4276 | 2.4276 | 1.19E-04 |
| 2.4266 | 2.4266 | 9.23E-05 |
| 2.4256 | 2.4256 | 2.02E-04 |
| 2.4246 | 2.4246 | 2.01E-04 |
| 2.4236 | 2.4236 | 1.19E-04 |
| 2.4226 | 2.4226 | 7.32E-05 |
| 2.4216 | 2.4216 | 4.69E-05 |
| 2.4206 | 2.4207 | 6.71E-05 |
| 2.4197 | 2.4197 | 1.23E-05 |
| 2.4187 | 2.4187 | 1.91E-04 |

| | | |
|---|---|---|
| 2.4177 | 2.4177 | 5.56E-05 |
| 2.4167 | 2.4167 | 1.88E-05 |
| 2.4157 | 2.4157 | 8.05E-05 |
| 2.4148 | 2.4148 | 1.74E-04 |
| 2.4138 | 2.4138 | 8.44E-05 |
| 2.4128 | 2.4128 | 2.58E-05 |
| 2.4118 | 2.4118 | 6.47E-05 |
| 2.4109 | 2.4109 | 2.01E-04 |
| 2.4099 | 2.4099 | 1.87E-05 |
| 2.4089 | 2.4090 | 6.68E-05 |
| 2.4080 | 2.4080 | 5.60E-05 |
| 2.4070 | 2.4070 | 5.08E-05 |
| 2.4061 | 2.4061 | 1.62E-04 |
| 2.4051 | 2.4051 | 1.36E-04 |
| 2.4042 | 2.4042 | 1.14E-04 |
| 2.4032 | 2.4032 | 1.87E-04 |
| 2.4023 | 2.4023 | 6.20E-05 |
| 2.4013 | 2.4013 | 2.00E-04 |
| 2.4004 | 2.4004 | 1.40E-04 |
| 2.3995 | 2.3995 | 1.73E-04 |
| 2.3985 | 2.3985 | 1.16E-04 |
| 2.3976 | 2.3976 | 1.04E-04 |
| 2.3967 | 2.3967 | 1.21E-06 |
| 2.3957 | 2.3957 | 9.25E-06 |
| 2.3948 | 2.3948 | 7.29E-05 |
| 2.3939 | 2.3939 | 1.70E-04 |
| 2.3929 | 2.3929 | 9.64E-05 |
| 2.3920 | 2.3920 | 3.71E-05 |
| 2.3911 | 2.3911 | 6.93E-05 |
| 2.3902 | 2.3902 | 1.93E-04 |
| 2.3893 | 2.3893 | 1.09E-05 |
| 2.3884 | 2.3884 | 1.24E-04 |
| 2.3874 | 2.3875 | 1.47E-04 |
| 2.3865 | 2.3865 | 7.89E-05 |
| 2.3856 | 2.3856 | 7.89E-05 |
| 2.3847 | 2.3847 | 9.27E-05 |
| 2.3838 | 2.3838 | 1.75E-04 |
| 2.3829 | 2.3829 | 1.68E-04 |
| 2.3820 | 2.3820 | 7.14E-05 |
| 2.3811 | 2.3811 | 1.14E-04 |
| 2.3802 | 2.3802 | 3.25E-05 |
| 2.3793 | 2.3794 | 9.05E-05 |
| 2.3785 | 2.3785 | 6.05E-05 |
| 2.3776 | 2.3776 | 5.74E-05 |
| 2.3767 | 2.3767 | 1.58E-04 |
| 2.3758 | 2.3758 | 1.35E-04 |
| 2.3749 | 2.3749 | 9.46E-05 |
| 2.3740 | 2.3740 | 1.41E-04 |
| 2.3732 | 2.3732 | 1.48E-04 |
| 2.3723 | 2.3723 | 7.13E-05 |
| 2.3714 | 2.3714 | 4.48E-05 |
| 2.3705 | 2.3706 | 7.51E-05 |
| 2.3697 | 2.3697 | 1.97E-05 |
| 2.3688 | 2.3688 | 1.21E-04 |
| 2.3679 | 2.3680 | 7.49E-05 |
| 2.3671 | 2.3671 | 1.86E-04 |
| 2.3662 | 2.3662 | 2.10E-04 |
| 2.3654 | 2.3654 | 1.55E-04 |
| 2.3645 | 2.3645 | 1.23E-05 |
| 2.3637 | 2.3637 | 2.09E-04 |
| 2.3628 | 2.3628 | 1.02E-04 |
| 2.3620 | 2.3620 | 7.24E-05 |
| 2.3611 | 2.3611 | 1.27E-04 |
| 2.3603 | 2.3603 | 1.60E-04 |
| 2.3594 | 2.3594 | 6.06E-05 |
| 2.3586 | 2.3586 | 6.02E-05 |
| 2.3577 | 2.3577 | 9.86E-05 |
| 2.3569 | 2.3569 | 5.48E-05 |
| 2.3561 | 2.3561 | 7.11E-05 |
| 2.3552 | 2.3552 | 1.46E-04 |
| 2.3544 | 2.3544 | 1.44E-04 |
| 2.3536 | 2.3536 | 8.97E-05 |
| 2.3527 | 2.3527 | 1.17E-04 |
| 2.3519 | 2.3519 | 2.00E-04 |
| 2.3511 | 2.3511 | 1.14E-05 |
| 2.3502 | 2.3503 | 1.67E-04 |
| 2.3494 | 2.3494 | 1.82E-04 |
| 2.3486 | 2.3486 | 1.86E-04 |
| 2.3478 | 2.3478 | 1.55E-04 |
| 2.3470 | 2.3470 | 8.21E-06 |

| | | |
|---|---|---|
| 2.3462 | 2.3462 | 1.75E-04 |
| 2.3453 | 2.3453 | 1.47E-04 |
| 2.3445 | 2.3445 | 1.23E-04 |
| 2.3437 | 2.3437 | 1.76E-04 |
| 2.3429 | 2.3429 | 1.18E-04 |
| 2.3421 | 2.3421 | 9.26E-05 |
| 2.3413 | 2.3413 | 4.56E-05 |
| 2.3405 | 2.3405 | 1.06E-04 |
| 2.3397 | 2.3397 | 8.85E-05 |
| 2.3389 | 2.3389 | 6.39E-06 |
| 2.3381 | 2.3381 | 1.79E-04 |
| 2.3373 | 2.3373 | 2.79E-07 |
| 2.3365 | 2.3365 | 1.01E-04 |
| 2.3357 | 2.3357 | 1.26E-04 |
| 2.3349 | 2.3350 | 7.48E-05 |
| 2.3342 | 2.3342 | 5.30E-05 |
| 2.3334 | 2.3334 | 1.72E-04 |
| 2.3326 | 2.3326 | 1.08E-04 |
| 2.3318 | 2.3318 | 3.49E-05 |
| 2.3310 | 2.3310 | 3.72E-05 |
| 2.3303 | 2.3303 | 1.15E-04 |
| 2.3295 | 2.3295 | 1.62E-04 |
| 2.3287 | 2.3287 | 6.54E-05 |
| 2.3279 | 2.3279 | 6.20E-05 |
| 2.3272 | 2.3272 | 1.15E-04 |
| 2.3264 | 2.3264 | 9.37E-05 |
| 2.3256 | 2.3256 | 1.68E-06 |
| 2.3249 | 2.3249 | 1.71E-04 |
| 2.3241 | 2.3241 | 1.62E-05 |
| 2.3233 | 2.3233 | 1.30E-04 |
| 2.3226 | 2.3226 | 1.71E-04 |
| 2.3218 | 2.3218 | 1.38E-04 |
| 2.3210 | 2.3211 | 3.29E-05 |
| 2.3203 | 2.3203 | 1.45E-04 |
| 2.3195 | 2.3195 | 3.52E-05 |
| 2.3188 | 2.3188 | 1.43E-04 |
| 2.3180 | 2.3180 | 1.79E-04 |
| 2.3173 | 2.3173 | 1.44E-04 |
| 2.3165 | 2.3165 | 3.60E-05 |
| 2.3158 | 2.3158 | 1.43E-04 |

| | | |
|---|---|---|
| 2.3150 | 2.3151 | 3.80E-05 |
| 2.3143 | 2.3143 | 1.48E-04 |
| 2.3136 | 2.3136 | 1.87E-04 |
| 2.3128 | 2.3128 | 1.56E-04 |
| 2.3121 | 2.3121 | 5.37E-05 |
| 2.3114 | 2.3114 | 1.19E-04 |
| 2.3106 | 2.3106 | 7.07E-05 |
| 2.3099 | 2.3099 | 1.90E-04 |
| 2.3092 | 2.3092 | 1.93E-04 |
| 2.3084 | 2.3084 | 2.13E-04 |
| 2.3077 | 2.3077 | 1.31E-04 |
| 2.3070 | 2.3070 | 2.72E-05 |
| 2.3062 | 2.3063 | 1.78E-04 |
| 2.3055 | 2.3055 | 1.18E-04 |
| 2.3048 | 2.3048 | 5.04E-05 |
| 2.3041 | 2.3041 | 5.10E-05 |
| 2.3034 | 2.3034 | 1.20E-04 |
| 2.3026 | 2.3027 | 1.77E-04 |
| 2.3019 | 2.3019 | 2.84E-05 |
| 2.3012 | 2.3012 | 1.33E-04 |
| 2.3005 | 2.3005 | 2.08E-04 |
| 2.2998 | 2.2998 | 1.83E-04 |
| 2.2991 | 2.2991 | 2.11E-04 |
| 2.2984 | 2.2984 | 1.02E-04 |
| 2.2977 | 2.2977 | 7.33E-05 |
| 2.2970 | 2.2970 | 1.19E-04 |
| 2.2963 | 2.2963 | 1.90E-04 |
| 2.2956 | 2.2956 | 1.30E-04 |
| 2.2949 | 2.2949 | 1.37E-04 |
| 2.2942 | 2.2942 | 2.10E-04 |
| 2.2935 | 2.2935 | 8.74E-05 |
| 2.2928 | 2.2928 | 1.17E-04 |
| 2.2921 | 2.2921 | 4.86E-05 |
| 2.2914 | 2.2914 | 1.49E-04 |
| 2.2907 | 2.2907 | 1.84E-04 |
| 2.2900 | 2.2900 | 1.54E-04 |
| 2.2893 | 2.2893 | 5.94E-05 |
| 2.2886 | 2.2886 | 1.00E-04 |
| 2.2879 | 2.2880 | 1.12E-04 |
| 2.2873 | 2.2873 | 1.77E-04 |

| | | |
|---|---|---|
| 2.2866 | 2.2866 | 9.30E-05 |
| 2.2859 | 2.2859 | 7.33E-05 |
| 2.2852 | 2.2852 | 1.17E-04 |
| 2.2845 | 2.2846 | 2.12E-04 |
| 2.2839 | 2.2839 | 4.05E-05 |
| 2.2832 | 2.2832 | 1.95E-04 |
| 2.2825 | 2.2825 | 5.53E-05 |
| 2.2818 | 2.2819 | 2.10E-05 |
| 2.2812 | 2.2812 | 3.44E-05 |
| 2.2805 | 2.2805 | 1.51E-05 |
| 2.2798 | 2.2798 | 1.27E-04 |
| 2.2792 | 2.2792 | 1.37E-04 |
| 2.2785 | 2.2785 | 1.00E-04 |
| 2.2778 | 2.2779 | 3.92E-05 |
| 2.2772 | 2.2772 | 1.17E-04 |
| 2.2765 | 2.2765 | 1.33E-04 |
| 2.2759 | 2.2759 | 8.66E-05 |
| 2.2752 | 2.2752 | 2.10E-05 |
| 2.2746 | 2.2746 | 1.90E-04 |
| 2.2739 | 2.2739 | 1.94E-05 |
| 2.2732 | 2.2733 | 1.68E-04 |
| 2.2726 | 2.2726 | 1.85E-04 |
| 2.2719 | 2.2719 | 1.58E-04 |
| 2.2713 | 2.2713 | 1.92E-04 |
| 2.2706 | 2.2707 | 1.54E-04 |
| 2.2700 | 2.2700 | 7.14E-07 |
| 2.2694 | 2.2694 | 2.16E-04 |
| 2.2687 | 2.2687 | 5.00E-05 |
| 2.2681 | 2.2681 | 5.58E-05 |
| 2.2674 | 2.2674 | 1.02E-04 |
| 2.2668 | 2.2668 | 8.87E-05 |
| 2.2661 | 2.2662 | 1.59E-05 |
| 2.2655 | 2.2655 | 1.16E-04 |
| 2.2649 | 2.2649 | 1.34E-04 |
| 2.2642 | 2.2642 | 1.16E-04 |
| 2.2636 | 2.2636 | 1.65E-05 |
| 2.2630 | 2.2630 | 9.05E-05 |
| 2.2623 | 2.2624 | 1.06E-04 |
| 2.2617 | 2.2617 | 6.31E-05 |
| 2.2611 | 2.2611 | 3.81E-05 |
| 2.2605 | 2.2605 | 1.97E-04 |
| 2.2598 | 2.2598 | 2.79E-05 |
| 2.2592 | 2.2592 | 1.95E-04 |
| 2.2586 | 2.2586 | 1.37E-04 |
| 2.2580 | 2.2580 | 8.50E-05 |
| 2.2574 | 2.2574 | 8.99E-05 |
| 2.2567 | 2.2567 | 1.52E-04 |
| 2.2561 | 2.2561 | 1.72E-04 |
| 2.2555 | 2.2555 | 4.28E-06 |
| 2.2549 | 2.2549 | 2.06E-04 |
| 2.2543 | 2.2543 | 8.35E-05 |
| 2.2537 | 2.2537 | 1.39E-05 |
| 2.2530 | 2.2531 | 5.49E-05 |
| 2.2524 | 2.2524 | 3.98E-05 |
| 2.2518 | 2.2518 | 3.15E-05 |
| 2.2512 | 2.2512 | 1.59E-04 |
| 2.2506 | 2.2506 | 1.03E-04 |
| 2.2500 | 2.2500 | 1.36E-04 |
| 2.2494 | 2.2494 | 1.39E-05 |
| 2.2488 | 2.2488 | 1.09E-04 |
| 2.2482 | 2.2482 | 1.48E-04 |
| 2.2476 | 2.2476 | 1.33E-04 |
| 2.2470 | 2.2470 | 6.25E-05 |
| 2.2464 | 2.2464 | 6.28E-05 |
| 2.2458 | 2.2458 | 2.02E-04 |
| 2.2452 | 2.2452 | 3.23E-05 |
| 2.2446 | 2.2446 | 1.24E-04 |
| 2.2440 | 2.2440 | 2.20E-04 |
| 2.2434 | 2.2434 | 1.72E-04 |
| 2.2429 | 2.2429 | 1.78E-04 |
| 2.2423 | 2.2423 | 2.08E-04 |
| 2.2417 | 2.2417 | 9.43E-05 |
| 2.2411 | 2.2411 | 7.31E-05 |
| 2.2405 | 2.2405 | 1.52E-04 |
| 2.2399 | 2.2399 | 1.22E-04 |
| 2.2393 | 2.2393 | 3.47E-06 |
| 2.2388 | 2.2388 | 6.23E-05 |
| 2.2382 | 2.2382 | 7.50E-05 |
| 2.2376 | 2.2376 | 3.50E-05 |
| 2.2370 | 2.2370 | 5.78E-05 |

| | | |
|---|---|---|
| 2.2364 | 2.2364 | 2.03E-04 |
| 2.2359 | 2.2359 | 4.61E-05 |
| 2.2353 | 2.2353 | 2.04E-04 |
| 2.2347 | 2.2347 | 5.94E-05 |
| 2.2341 | 2.2342 | 3.35E-05 |
| 2.2336 | 2.2336 | 7.45E-05 |
| 2.2330 | 2.2330 | 6.37E-05 |
| 2.2324 | 2.2324 | 1.14E-06 |
| 2.2319 | 2.2319 | 1.13E-04 |
| 2.2313 | 2.2313 | 1.70E-04 |
| 2.2307 | 2.2307 | 4.73E-05 |
| 2.2302 | 2.2302 | 1.33E-04 |
| 2.2296 | 2.2296 | 1.86E-04 |
| 2.2291 | 2.2291 | 1.08E-04 |
| 2.2285 | 2.2285 | 8.07E-05 |
| 2.2279 | 2.2279 | 1.04E-04 |
| 2.2274 | 2.2274 | 1.78E-04 |
| 2.2268 | 2.2268 | 1.47E-04 |
| 2.2263 | 2.2263 | 2.75E-05 |
| 2.2257 | 2.2257 | 1.97E-04 |
| 2.2252 | 2.2252 | 7.80E-05 |
| 2.2246 | 2.2246 | 4.65E-05 |
| 2.2240 | 2.2241 | 1.21E-04 |
| 2.2235 | 2.2235 | 1.46E-04 |
| 2.2229 | 2.2230 | 1.22E-04 |
| 2.2224 | 2.2224 | 4.77E-05 |
| 2.2219 | 2.2219 | 7.57E-05 |
| 2.2213 | 2.2213 | 2.02E-04 |
| 2.2208 | 2.2208 | 2.00E-05 |
| 2.2202 | 2.2202 | 1.59E-04 |
| 2.2197 | 2.2197 | 1.60E-04 |
| 2.2191 | 2.2191 | 7.84E-05 |
| 2.2186 | 2.2186 | 4.51E-05 |
| 2.2181 | 2.2181 | 6.03E-05 |
| 2.2175 | 2.2175 | 1.24E-04 |
| 2.2170 | 2.2170 | 2.15E-04 |
| 2.2164 | 2.2164 | 5.51E-05 |
| 2.2159 | 2.2159 | 1.53E-04 |
| 2.2154 | 2.2154 | 4.20E-05 |
| 2.2148 | 2.2148 | 1.89E-04 |
| 2.2143 | 2.2143 | 1.62E-04 |
| 2.2138 | 2.2138 | 1.10E-04 |
| 2.2132 | 2.2132 | 1.06E-04 |
| 2.2127 | 2.2127 | 1.48E-04 |
| 2.2122 | 2.2122 | 2.14E-04 |
| 2.2117 | 2.2117 | 7.65E-05 |
| 2.2111 | 2.2111 | 1.08E-04 |
| 2.2106 | 2.2106 | 1.13E-04 |
| 2.2101 | 2.2101 | 1.65E-04 |
| 2.2096 | 2.2096 | 3.68E-05 |
| 2.2090 | 2.2090 | 4.44E-05 |
| 2.2085 | 2.2085 | 7.92E-05 |
| 2.2080 | 2.2080 | 6.76E-05 |
| 2.2075 | 2.2075 | 9.82E-06 |
| 2.2070 | 2.2070 | 9.42E-05 |
| 2.2064 | 2.2065 | 2.09E-04 |
| 2.2059 | 2.2059 | 1.30E-05 |
| 2.2054 | 2.2054 | 2.25E-04 |
| 2.2049 | 2.2049 | 6.30E-05 |
| 2.2044 | 2.2044 | 5.74E-05 |
| 2.2039 | 2.2039 | 1.32E-04 |
| 2.2034 | 2.2034 | 1.62E-04 |
| 2.2029 | 2.2029 | 1.46E-04 |
| 2.2023 | 2.2024 | 8.53E-05 |
| 2.2018 | 2.2018 | 2.06E-05 |
| 2.2013 | 2.2013 | 1.72E-04 |
| 2.2008 | 2.2008 | 8.69E-05 |
| 2.2003 | 2.2003 | 1.54E-04 |
| 2.1998 | 2.1998 | 1.56E-05 |
| 2.1993 | 2.1993 | 1.40E-04 |
| 2.1988 | 2.1988 | 2.21E-04 |
| 2.1983 | 2.1983 | 1.98E-04 |
| 2.1978 | 2.1978 | 2.06E-04 |
| 2.1973 | 2.1973 | 1.97E-04 |
| 2.1968 | 2.1968 | 1.01E-04 |
| 2.1963 | 2.1963 | 3.94E-05 |
| 2.1958 | 2.1958 | 2.23E-04 |
| 2.1953 | 2.1953 | 4.41E-06 |
| 2.1948 | 2.1948 | 1.89E-04 |
| 2.1943 | 2.1943 | 1.26E-04 |

| | | |
|---|---|---|
| 2.1939 | 2.1939 | 2.87E-05 |
| 2.1934 | 2.1934 | 2.55E-05 |
| 2.1929 | 2.1929 | 3.66E-05 |
| 2.1924 | 2.1924 | 4.57E-06 |
| 2.1919 | 2.1919 | 7.04E-05 |
| 2.1914 | 2.1914 | 1.88E-04 |
| 2.1909 | 2.1909 | 1.07E-04 |
| 2.1904 | 2.1904 | 9.61E-05 |
| 2.1899 | 2.1900 | 1.14E-04 |
| 2.1895 | 2.1895 | 1.74E-04 |
| 2.1890 | 2.1890 | 4.83E-05 |
| 2.1885 | 2.1885 | 3.52E-05 |
| 2.1880 | 2.1880 | 7.66E-05 |
| 2.1875 | 2.1875 | 7.59E-05 |
| 2.1871 | 2.1871 | 3.33E-05 |
| 2.1866 | 2.1866 | 5.13E-05 |
| 2.1861 | 2.1861 | 1.78E-04 |
| 2.1856 | 2.1856 | 1.12E-04 |
| 2.1852 | 2.1852 | 9.79E-05 |
| 2.1847 | 2.1847 | 1.08E-04 |
| 2.1842 | 2.1842 | 1.84E-04 |
| 2.1837 | 2.1837 | 6.04E-05 |
| 2.1833 | 2.1833 | 2.22E-05 |
| 2.1828 | 2.1828 | 6.38E-05 |
| 2.1823 | 2.1823 | 6.43E-05 |
| 2.1818 | 2.1819 | 2.40E-05 |
| 2.1814 | 2.1814 | 5.72E-05 |
| 2.1809 | 2.1809 | 1.79E-04 |
| 2.1804 | 2.1805 | 1.17E-04 |
| 2.1800 | 2.1800 | 8.64E-05 |
| 2.1795 | 2.1795 | 1.29E-04 |
| 2.1791 | 2.1791 | 1.55E-04 |
| 2.1786 | 2.1786 | 2.09E-05 |
| 2.1781 | 2.1781 | 7.35E-05 |
| 2.1777 | 2.1777 | 1.28E-04 |
| 2.1772 | 2.1772 | 1.42E-04 |
| 2.1767 | 2.1768 | 1.17E-04 |
| 2.1763 | 2.1763 | 5.15E-05 |
| 2.1758 | 2.1758 | 5.35E-05 |
| 2.1754 | 2.1754 | 1.98E-04 |
| 2.1749 | 2.1749 | 7.73E-05 |
| 2.1745 | 2.1745 | 1.46E-04 |
| 2.1740 | 2.1740 | 5.04E-05 |
| 2.1736 | 2.1736 | 2.08E-04 |
| 2.1731 | 2.1731 | 1.34E-04 |
| 2.1727 | 2.1727 | 5.41E-05 |
| 2.1722 | 2.1722 | 1.36E-05 |
| 2.1718 | 2.1718 | 1.20E-05 |
| 2.1713 | 2.1713 | 4.93E-05 |
| 2.1709 | 2.1709 | 1.25E-04 |
| 2.1704 | 2.1704 | 2.21E-04 |
| 2.1700 | 2.1700 | 6.78E-05 |
| 2.1695 | 2.1695 | 1.24E-04 |
| 2.1691 | 2.1691 | 1.07E-04 |
| 2.1686 | 2.1686 | 1.61E-04 |
| 2.1682 | 2.1682 | 6.67E-06 |
| 2.1677 | 2.1677 | 1.10E-04 |
| 2.1673 | 2.1673 | 1.88E-04 |
| 2.1669 | 2.1669 | 2.29E-04 |
| 2.1664 | 2.1664 | 2.30E-04 |
| 2.1660 | 2.1660 | 1.97E-04 |
| 2.1655 | 2.1655 | 1.24E-04 |
| 2.1651 | 2.1651 | 1.40E-05 |
| 2.1647 | 2.1647 | 1.34E-04 |
| 2.1642 | 2.1642 | 1.43E-04 |
| 2.1638 | 2.1638 | 7.96E-05 |
| 2.1634 | 2.1634 | 1.23E-04 |
| 2.1629 | 2.1629 | 1.74E-04 |
| 2.1625 | 2.1625 | 4.63E-05 |
| 2.1621 | 2.1621 | 4.49E-05 |
| 2.1616 | 2.1616 | 9.92E-05 |
| 2.1612 | 2.1612 | 1.17E-04 |
| 2.1608 | 2.1608 | 9.75E-05 |
| 2.1603 | 2.1603 | 4.16E-05 |
| 2.1599 | 2.1599 | 5.09E-05 |
| 2.1595 | 2.1595 | 1.80E-04 |
| 2.1591 | 2.1591 | 1.18E-04 |
| 2.1586 | 2.1586 | 8.41E-05 |
| 2.1582 | 2.1582 | 1.41E-04 |
| 2.1578 | 2.1578 | 1.33E-04 |

| | | |
|---|---|---|
| 2.1574 | 2.1574 | 1.98E-05 |
| 2.1569 | 2.1569 | 1.37E-04 |
| 2.1565 | 2.1565 | 2.18E-04 |
| 2.1561 | 2.1561 | 2.00E-04 |
| 2.1557 | 2.1557 | 1.91E-04 |
| 2.1553 | 2.1553 | 2.17E-04 |
| 2.1548 | 2.1548 | 1.85E-04 |
| 2.1544 | 2.1544 | 8.82E-05 |
| 2.1540 | 2.1540 | 4.45E-05 |
| 2.1536 | 2.1536 | 2.13E-04 |
| 2.1532 | 2.1532 | 4.84E-05 |
| 2.1528 | 2.1528 | 1.90E-04 |
| 2.1523 | 2.1523 | 5.08E-07 |
| 2.1519 | 2.1519 | 1.56E-04 |
| 2.1515 | 2.1515 | 1.88E-04 |
| 2.1511 | 2.1511 | 1.02E-04 |
| 2.1507 | 2.1507 | 5.06E-05 |
| 2.1503 | 2.1503 | 3.41E-05 |
| 2.1499 | 2.1499 | 5.23E-05 |
| 2.1495 | 2.1495 | 1.05E-04 |
| 2.1491 | 2.1491 | 1.92E-04 |
| 2.1486 | 2.1487 | 1.51E-04 |
| 2.1482 | 2.1482 | 4.97E-06 |
| 2.1478 | 2.1478 | 1.95E-04 |
| 2.1474 | 2.1474 | 4.56E-05 |
| 2.1470 | 2.1470 | 2.13E-04 |
| 2.1466 | 2.1466 | 4.04E-05 |
| 2.1462 | 2.1462 | 9.86E-05 |
| 2.1458 | 2.1458 | 2.04E-04 |
| 2.1454 | 2.1454 | 1.91E-04 |
| 2.1450 | 2.1450 | 1.54E-04 |
| 2.1446 | 2.1446 | 1.50E-04 |
| 2.1442 | 2.1442 | 1.79E-04 |
| 2.1438 | 2.1438 | 2.24E-04 |
| 2.1434 | 2.1434 | 1.27E-04 |
| 2.1430 | 2.1430 | 2.76E-06 |
| 2.1426 | 2.1426 | 1.66E-04 |
| 2.1422 | 2.1422 | 1.04E-04 |
| 2.1418 | 2.1418 | 1.26E-04 |
| 2.1414 | 2.1414 | 7.82E-05 |

| | | |
|---|---|---|
| 2.1410 | 2.1410 | 2.18E-04 |
| 2.1407 | 2.1407 | 7.97E-05 |
| 2.1403 | 2.1403 | 2.56E-05 |
| 2.1399 | 2.1399 | 9.82E-05 |
| 2.1395 | 2.1395 | 1.38E-04 |
| 2.1391 | 2.1391 | 1.45E-04 |
| 2.1387 | 2.1387 | 1.20E-04 |
| 2.1383 | 2.1383 | 6.21E-05 |
| 2.1379 | 2.1379 | 2.82E-05 |
| 2.1375 | 2.1375 | 1.51E-04 |
| 2.1371 | 2.1372 | 1.62E-04 |
| 2.1368 | 2.1368 | 2.52E-05 |
| 2.1364 | 2.1364 | 2.23E-04 |
| 2.1360 | 2.1360 | 2.80E-05 |
| 2.1356 | 2.1356 | 1.57E-04 |
| 2.1352 | 2.1352 | 1.59E-04 |
| 2.1348 | 2.1348 | 3.80E-05 |
| 2.1345 | 2.1345 | 5.12E-05 |
| 2.1341 | 2.1341 | 1.09E-04 |
| 2.1337 | 2.1337 | 1.34E-04 |
| 2.1333 | 2.1333 | 1.29E-04 |
| 2.1329 | 2.1329 | 9.14E-05 |
| 2.1326 | 2.1326 | 2.27E-05 |
| 2.1322 | 2.1322 | 7.75E-05 |
| 2.1318 | 2.1318 | 2.09E-04 |
| 2.1314 | 2.1314 | 9.74E-05 |
| 2.1311 | 2.1311 | 9.66E-05 |
| 2.1307 | 2.1307 | 1.48E-04 |
| 2.1303 | 2.1303 | 1.09E-04 |
| 2.1299 | 2.1299 | 7.37E-05 |
| 2.1296 | 2.1296 | 2.25E-04 |
| 2.1292 | 2.1292 | 1.24E-04 |
| 2.1288 | 2.1288 | 3.40E-05 |
| 2.1284 | 2.1284 | 2.51E-05 |
| 2.1281 | 2.1281 | 5.37E-05 |
| 2.1277 | 2.1277 | 5.17E-05 |
| 2.1273 | 2.1273 | 1.91E-05 |
| 2.1270 | 2.1270 | 4.39E-05 |
| 2.1266 | 2.1266 | 1.37E-04 |
| 2.1262 | 2.1262 | 2.09E-04 |

| | | |
|---|---|---|
| 2.1259 | 2.1259 | 5.54E-05 |
| 2.1255 | 2.1255 | 1.29E-04 |
| 2.1251 | 2.1251 | 1.27E-04 |
| 2.1248 | 2.1248 | 1.17E-04 |
| 2.1244 | 2.1244 | 7.94E-05 |
| 2.1240 | 2.1240 | 2.25E-04 |
| 2.1237 | 2.1237 | 8.85E-05 |
| 2.1233 | 2.1233 | 1.83E-05 |
| 2.1229 | 2.1230 | 9.55E-05 |
| 2.1226 | 2.1226 | 1.43E-04 |
| 2.1222 | 2.1222 | 1.61E-04 |
| 2.1219 | 2.1219 | 1.49E-04 |
| 2.1215 | 2.1215 | 1.08E-04 |
| 2.1211 | 2.1212 | 3.76E-05 |
| 2.1208 | 2.1208 | 6.23E-05 |
| 2.1204 | 2.1204 | 1.92E-04 |
| 2.1201 | 2.1201 | 1.22E-04 |
| 2.1197 | 2.1197 | 6.60E-05 |
| 2.1194 | 2.1194 | 1.89E-04 |
| 2.1190 | 2.1190 | 5.67E-05 |
| 2.1187 | 2.1187 | 1.40E-04 |
| 2.1183 | 2.1183 | 1.63E-04 |
| 2.1180 | 2.1180 | 2.38E-05 |
| 2.1176 | 2.1176 | 8.69E-05 |
| 2.1172 | 2.1173 | 1.69E-04 |
| 2.1169 | 2.1169 | 2.22E-04 |
| 2.1165 | 2.1165 | 2.25E-04 |
| 2.1162 | 2.1162 | 2.29E-04 |
| 2.1158 | 2.1159 | 2.11E-04 |
| 2.1155 | 2.1155 | 1.51E-04 |
| 2.1151 | 2.1152 | 6.15E-05 |
| 2.1148 | 2.1148 | 5.58E-05 |
| 2.1145 | 2.1145 | 2.01E-04 |
| 2.1141 | 2.1141 | 9.77E-05 |
| 2.1138 | 2.1138 | 1.04E-04 |
| 2.1134 | 2.1134 | 1.39E-04 |
| 2.1131 | 2.1131 | 1.19E-04 |
| 2.1127 | 2.1127 | 6.81E-05 |
| 2.1124 | 2.1124 | 2.28E-04 |
| 2.1120 | 2.1120 | 1.14E-04 |
| 2.1117 | 2.1117 | 1.04E-05 |
| 2.1114 | 2.1114 | 6.58E-05 |
| 2.1110 | 2.1110 | 1.14E-04 |
| 2.1107 | 2.1107 | 1.35E-04 |
| 2.1103 | 2.1103 | 1.29E-04 |
| 2.1100 | 2.1100 | 9.48E-05 |
| 2.1097 | 2.1097 | 3.34E-05 |
| 2.1093 | 2.1093 | 5.53E-05 |
| 2.1090 | 2.1090 | 1.71E-04 |
| 2.1086 | 2.1087 | 1.59E-04 |
| 2.1083 | 2.1083 | 1.11E-05 |
| 2.1080 | 2.1080 | 2.09E-04 |
| 2.1076 | 2.1076 | 4.08E-05 |
| 2.1073 | 2.1073 | 2.11E-04 |
| 2.1070 | 2.1070 | 1.53E-05 |
| 2.1066 | 2.1066 | 1.54E-04 |
| 2.1063 | 2.1063 | 1.79E-04 |
| 2.1060 | 2.1060 | 6.36E-05 |
| 2.1056 | 2.1056 | 2.50E-05 |
| 2.1053 | 2.1053 | 8.70E-05 |
| 2.1050 | 2.1050 | 1.22E-04 |
| 2.1046 | 2.1047 | 1.31E-04 |
| 2.1043 | 2.1043 | 1.14E-04 |
| 2.1040 | 2.1040 | 6.95E-05 |
| 2.1037 | 2.1037 | 1.06E-06 |
| 2.1033 | 2.1033 | 9.79E-05 |
| 2.1030 | 2.1030 | 2.21E-04 |
| 2.1027 | 2.1027 | 1.05E-04 |
| 2.1024 | 2.1024 | 7.06E-05 |
| 2.1020 | 2.1020 | 2.03E-04 |
| 2.1017 | 2.1017 | 2.44E-05 |
| 2.1014 | 2.1014 | 1.98E-04 |
| 2.1011 | 2.1011 | 8.23E-05 |
| 2.1007 | 2.1007 | 8.79E-05 |
| 2.1004 | 2.1004 | 2.32E-04 |
| 2.1001 | 2.1001 | 1.25E-04 |
| 2.0998 | 2.0998 | 3.23E-05 |
| 2.0994 | 2.0994 | 3.49E-05 |
| 2.0991 | 2.0991 | 7.65E-05 |
| 2.0988 | 2.0988 | 9.26E-05 |

Universidad Industrial de Santander

ANEXO Q. COEFICIENTE DE ABSORCIÓN ZnS14Aindio1

| coeficiente de absorción ZnS14Aindio1 | | |
|---|---|---|
| T- GMS&ES | T-software | Error % |
| 126309.7814 | 136008.0000 | 7.68E+00 |
| 129285.7561 | 139213.0000 | 7.68E+00 |
| 128445.0788 | 138307.0000 | 7.68E+00 |
| 127380.3632 | 137160.0000 | 7.68E+00 |
| 127783.0421 | 137594.0000 | 7.68E+00 |
| 119930.7954 | 129136.0000 | 7.68E+00 |
| 102466.9881 | 110325.0000 | 7.67E+00 |
| 127779.1157 | 137589.0000 | 7.68E+00 |
| 126622.5119 | 136343.0000 | 7.68E+00 |
| 128469.9580 | 138333.0000 | 7.68E+00 |
| 130010.8203 | 139993.0000 | 7.68E+00 |
| 125354.2987 | 134977.0000 | 7.68E+00 |
| 125970.6063 | 135641.0000 | 7.68E+00 |
| 128878.0426 | 138773.0000 | 7.68E+00 |
| 128063.5873 | 137895.0000 | 7.68E+00 |
| 126444.5224 | 136151.0000 | 7.68E+00 |
| 110298.5407 | 118760.0000 | 7.67E+00 |
| 113925.7050 | 122667.0000 | 7.67E+00 |
| 126108.1487 | 135789.0000 | 7.68E+00 |
| 127078.8748 | 136835.0000 | 7.68E+00 |
| 124503.6599 | 134062.0000 | 7.68E+00 |
| 126579.0681 | 136297.0000 | 7.68E+00 |
| 125479.5103 | 135113.0000 | 7.68E+00 |
| 124851.1739 | 134437.0000 | 7.68E+00 |
| 123691.8834 | 133188.0000 | 7.68E+00 |
| 123518.9569 | 133003.0000 | 7.68E+00 |
| 111203.4489 | 119738.0000 | 7.67E+00 |
| 122964.4569 | 132406.0000 | 7.68E+00 |
| 123428.5744 | 132907.0000 | 7.68E+00 |
| 123468.6637 | 132950.0000 | 7.68E+00 |
| 122251.8305 | 131640.0000 | 7.68E+00 |
| 121778.8812 | 131131.0000 | 7.68E+00 |
| 121919.9922 | 131284.0000 | 7.68E+00 |
| 120950.1664 | 130240.0000 | 7.68E+00 |
| 121894.3840 | 131257.0000 | 7.68E+00 |
| 120432.7178 | 129684.0000 | 7.68E+00 |
| 112049.2379 | 120654.0000 | 7.68E+00 |
| 120505.9602 | 129764.0000 | 7.68E+00 |
| 120444.5519 | 129697.0000 | 7.68E+00 |
| 119704.1656 | 128900.0000 | 7.68E+00 |
| 119356.1972 | 128526.0000 | 7.68E+00 |
| 119484.8548 | 128665.0000 | 7.68E+00 |
| 118482.3175 | 127586.0000 | 7.68E+00 |
| 118607.3132 | 127721.0000 | 7.68E+00 |
| 119012.4410 | 128158.0000 | 7.68E+00 |
| 117747.7493 | 126797.0000 | 7.69E+00 |
| 111295.3374 | 119848.0000 | 7.68E+00 |
| 111169.4064 | 119714.0000 | 7.69E+00 |
| 116843.5828 | 125825.0000 | 7.69E+00 |
| 116516.1982 | 125473.0000 | 7.69E+00 |
| 116016.4816 | 124936.0000 | 7.69E+00 |
| 115522.3903 | 124404.0000 | 7.69E+00 |
| 114864.3132 | 123696.0000 | 7.69E+00 |
| 114718.3585 | 123540.0000 | 7.69E+00 |
| 114321.2618 | 123113.0000 | 7.69E+00 |
| 114009.9032 | 122778.0000 | 7.69E+00 |
| 108248.1502 | 116574.0000 | 7.69E+00 |
| 110788.6260 | 119311.0000 | 7.69E+00 |
| 112443.8002 | 121094.0000 | 7.69E+00 |
| 112699.5562 | 121370.0000 | 7.69E+00 |
| 112714.9552 | 121387.0000 | 7.69E+00 |
| 111545.8984 | 120129.0000 | 7.69E+00 |
| 111559.0654 | 120144.0000 | 7.70E+00 |
| 110876.7045 | 119410.0000 | 7.70E+00 |
| 110658.6857 | 119176.0000 | 7.70E+00 |
| 109320.0842 | 117735.0000 | 7.70E+00 |
| 104990.5655 | 113074.0000 | 7.70E+00 |
| 109336.2325 | 117754.0000 | 7.70E+00 |
| 108684.0100 | 117052.0000 | 7.70E+00 |
| 108472.0307 | 116824.0000 | 7.70E+00 |
| 107901.9886 | 116211.0000 | 7.70E+00 |
| 107408.8118 | 115681.0000 | 7.70E+00 |
| 106711.5685 | 114930.0000 | 7.70E+00 |
| 106366.9946 | 114560.0000 | 7.70E+00 |
| 105955.8278 | 114118.0000 | 7.70E+00 |

| | | |
|---|---|---|
| 104152.4872 | 112176.0000 | 7.70E+00 |
| 101245.2870 | 109047.0000 | 7.71E+00 |
| 103950.0606 | 111960.0000 | 7.71E+00 |
| 103620.9817 | 111606.0000 | 7.71E+00 |
| 102972.9639 | 110909.0000 | 7.71E+00 |
| 102396.6955 | 110289.0000 | 7.71E+00 |
| 101579.1058 | 109409.0000 | 7.71E+00 |
| 101508.3711 | 109333.0000 | 7.71E+00 |
| 100462.8018 | 108208.0000 | 7.71E+00 |
| 99440.6005 | 107107.0000 | 7.71E+00 |
| 98785.0510 | 106402.0000 | 7.71E+00 |
| 94630.4919 | 101929.0000 | 7.71E+00 |
| 94930.3081 | 102252.0000 | 7.71E+00 |
| 96590.6670 | 104040.0000 | 7.71E+00 |
| 96188.8579 | 103608.0000 | 7.71E+00 |
| 95249.6581 | 102597.0000 | 7.71E+00 |
| 94644.5992 | 101946.0000 | 7.71E+00 |
| 93993.8926 | 101245.0000 | 7.71E+00 |
| 93094.2224 | 100277.0000 | 7.72E+00 |
| 92614.0676 | 99759.7000 | 7.72E+00 |
| 91391.1588 | 98443.1000 | 7.72E+00 |
| 88640.6940 | 95482.2000 | 7.72E+00 |
| 89790.6477 | 96719.9000 | 7.72E+00 |
| 89290.7563 | 96181.6000 | 7.72E+00 |
| 88376.4161 | 95197.2000 | 7.72E+00 |
| 87614.6138 | 94377.0000 | 7.72E+00 |
| 86729.2791 | 93423.8000 | 7.72E+00 |
| 85990.7549 | 92628.5000 | 7.72E+00 |
| 85262.2764 | 91844.2000 | 7.72E+00 |
| 84287.8756 | 90795.1000 | 7.72E+00 |
| 83083.0425 | 89497.3000 | 7.72E+00 |
| 80632.6456 | 86858.9000 | 7.72E+00 |
| 81672.6118 | 87978.3000 | 7.72E+00 |
| 80723.7460 | 86956.4000 | 7.72E+00 |
| 79869.4820 | 86036.2000 | 7.72E+00 |
| 78876.7164 | 84967.0000 | 7.72E+00 |
| 77939.9862 | 83958.1000 | 7.72E+00 |
| 76946.7899 | 82888.3000 | 7.72E+00 |
| 76008.1657 | 81877.2000 | 7.72E+00 |
| 75121.3855 | 80921.9000 | 7.72E+00 |
| 74180.3292 | 79908.2000 | 7.72E+00 |
| 71953.3520 | 77509.8000 | 7.72E+00 |
| 72181.8787 | 77755.3000 | 7.72E+00 |
| 71292.3342 | 76796.9000 | 7.72E+00 |
| 70258.0078 | 75682.5000 | 7.72E+00 |
| 69306.5983 | 74657.5000 | 7.72E+00 |
| 68280.3771 | 73551.8000 | 7.72E+00 |
| 67274.2061 | 72467.8000 | 7.72E+00 |
| 66346.7701 | 71468.2000 | 7.72E+00 |
| 65377.6950 | 70424.0000 | 7.72E+00 |
| 63861.7007 | 68790.8000 | 7.72E+00 |
| 62690.8231 | 67529.3000 | 7.72E+00 |
| 62521.9220 | 67346.5000 | 7.72E+00 |
| 61595.8806 | 66348.5000 | 7.72E+00 |
| 60660.2818 | 65340.1000 | 7.71E+00 |
| 59690.1265 | 64294.6000 | 7.71E+00 |
| 58789.4967 | 63323.9000 | 7.71E+00 |
| 57880.1322 | 62343.7000 | 7.71E+00 |
| 56963.1333 | 61355.0000 | 7.71E+00 |
| 55966.5444 | 60280.8000 | 7.71E+00 |
| 55155.8287 | 59406.8000 | 7.71E+00 |
| 53640.1930 | 57773.6000 | 7.71E+00 |
| 52935.7794 | 57014.0000 | 7.70E+00 |
| 52602.3556 | 56653.9000 | 7.70E+00 |
| 51737.4723 | 55721.5000 | 7.70E+00 |
| 50888.8109 | 54806.5000 | 7.70E+00 |
| 50056.0106 | 53908.6000 | 7.70E+00 |
| 49196.4864 | 52981.9000 | 7.69E+00 |
| 48457.4753 | 52184.9000 | 7.69E+00 |
| 47608.5803 | 51269.7000 | 7.69E+00 |
| 46856.8532 | 50459.0000 | 7.69E+00 |
| 45664.1239 | 49173.5000 | 7.69E+00 |
| 45238.1305 | 48713.6000 | 7.68E+00 |
| 44606.2965 | 48032.1000 | 7.68E+00 |
| 43966.4731 | 47342.0000 | 7.68E+00 |
| 43150.7285 | 46462.4000 | 7.67E+00 |
| 42406.9320 | 45660.3000 | 7.67E+00 |
| 41768.5758 | 44971.7000 | 7.67E+00 |
| 41142.1162 | 44296.0000 | 7.67E+00 |
| 40456.6037 | 43556.9000 | 7.66E+00 |

| | | |
|---|---|---|
| 39680.4809 | 42719.9000 | 7.66E+00 |
| 38716.0958 | 41680.4000 | 7.66E+00 |
| 38514.8844 | 41462.7000 | 7.65E+00 |
| 37848.7026 | 40744.3000 | 7.65E+00 |
| 37278.5758 | 40129.4000 | 7.65E+00 |
| 36654.8062 | 39456.7000 | 7.64E+00 |
| 36059.9945 | 38815.2000 | 7.64E+00 |
| 35540.7150 | 38255.1000 | 7.64E+00 |
| 34953.9396 | 37622.4000 | 7.63E+00 |
| 34364.2335 | 36986.5000 | 7.63E+00 |
| 33772.2039 | 36348.0000 | 7.63E+00 |
| 33014.0906 | 35530.8000 | 7.62E+00 |
| 32759.1780 | 35255.4000 | 7.62E+00 |
| 32261.6134 | 34718.9000 | 7.62E+00 |
| 31760.4857 | 34178.5000 | 7.61E+00 |
| 31298.7789 | 33680.5000 | 7.61E+00 |
| 30819.1939 | 33163.4000 | 7.61E+00 |
| 30322.6868 | 32628.1000 | 7.60E+00 |
| 29850.9897 | 32119.6000 | 7.60E+00 |
| 29376.7074 | 31608.3000 | 7.60E+00 |
| 28913.3540 | 31108.8000 | 7.59E+00 |
| 28251.7747 | 30395.9000 | 7.59E+00 |
| 27838.2474 | 29950.0000 | 7.59E+00 |
| 27599.7549 | 29692.7000 | 7.58E+00 |
| 27178.0884 | 29238.2000 | 7.58E+00 |
| 26754.0152 | 28781.1000 | 7.58E+00 |
| 26340.0823 | 28334.9000 | 7.57E+00 |
| 25960.2372 | 27925.5000 | 7.57E+00 |
| 25577.5785 | 27513.1000 | 7.57E+00 |
| 25145.3865 | 27047.4000 | 7.56E+00 |
| 24793.3595 | 26668.1000 | 7.56E+00 |
| 24221.5129 | 26052.2000 | 7.56E+00 |
| 24035.6852 | 25851.7000 | 7.56E+00 |
| 23698.5609 | 25488.5000 | 7.55E+00 |
| 23380.5682 | 25146.0000 | 7.55E+00 |
| 23005.3886 | 24741.9000 | 7.55E+00 |
| 22703.6588 | 24416.8000 | 7.55E+00 |
| 22377.6115 | 24065.7000 | 7.54E+00 |
| 22049.1412 | 23711.9000 | 7.54E+00 |
| 21739.0052 | 23377.9000 | 7.54E+00 |
| 21426.3010 | 23041.2000 | 7.54E+00 |
| 20971.4526 | 22551.5000 | 7.53E+00 |
| 20853.1175 | 22424.1000 | 7.53E+00 |
| 20562.3046 | 22110.9000 | 7.53E+00 |
| 20288.0895 | 21815.7000 | 7.53E+00 |
| 20001.4545 | 21507.1000 | 7.53E+00 |
| 19740.2850 | 21226.1000 | 7.53E+00 |
| 19429.8339 | 20892.0000 | 7.53E+00 |
| 19217.9894 | 20663.9000 | 7.52E+00 |
| 18983.7950 | 20412.0000 | 7.52E+00 |
| 18648.3356 | 20051.0000 | 7.52E+00 |
| 18338.3876 | 19717.5000 | 7.52E+00 |
| 18225.7454 | 19596.3000 | 7.52E+00 |
| 17986.9653 | 19339.5000 | 7.52E+00 |
| 17770.2927 | 19106.5000 | 7.52E+00 |
| 17541.4808 | 18860.4000 | 7.52E+00 |
| 17325.6564 | 18628.3000 | 7.52E+00 |
| 17130.4444 | 18418.4000 | 7.52E+00 |
| 16914.9135 | 18186.7000 | 7.52E+00 |
| 16711.5909 | 17968.0000 | 7.52E+00 |
| 16418.1383 | 17652.4000 | 7.52E+00 |
| 16246.4837 | 17467.9000 | 7.52E+00 |
| 16177.0868 | 17393.5000 | 7.52E+00 |
| 15987.2123 | 17189.4000 | 7.52E+00 |
| 15778.0427 | 16964.6000 | 7.52E+00 |
| 15668.3589 | 16846.8000 | 7.52E+00 |
| 15479.3168 | 16643.7000 | 7.52E+00 |
| 15322.0235 | 16474.7000 | 7.52E+00 |
| 15180.9906 | 16323.3000 | 7.52E+00 |
| 15034.4020 | 16165.9000 | 7.53E+00 |
| 14861.3739 | 15980.0000 | 7.53E+00 |
| 14655.8169 | 15759.2000 | 7.53E+00 |
| 14493.8705 | 15585.3000 | 7.53E+00 |
| 14475.6596 | 15565.9000 | 7.53E+00 |
| 14335.2768 | 15415.2000 | 7.53E+00 |
| 14169.2231 | 15236.9000 | 7.54E+00 |
| 14076.7699 | 15137.8000 | 7.54E+00 |
| 13938.4775 | 14989.4000 | 7.54E+00 |
| 13839.4153 | 14883.1000 | 7.54E+00 |
| 13714.4655 | 14749.1000 | 7.54E+00 |

| | | |
|---|---|---|
| 13545.1955 | 14567.4000 | 7.55E+00 |
| 13414.3996 | 14427.1000 | 7.55E+00 |
| 13364.3333 | 14373.6000 | 7.55E+00 |
| 13275.7770 | 14278.7000 | 7.55E+00 |
| 13229.1313 | 14229.0000 | 7.56E+00 |
| 13095.7020 | 14085.8000 | 7.56E+00 |
| 13016.0868 | 14000.6000 | 7.56E+00 |
| 12905.2854 | 13881.7000 | 7.57E+00 |
| 12829.0416 | 13800.1000 | 7.57E+00 |
| 12715.8723 | 13678.8000 | 7.57E+00 |
| 12695.1820 | 13657.0000 | 7.58E+00 |
| 12520.9128 | 13469.9000 | 7.58E+00 |
| 12536.5888 | 13487.2000 | 7.58E+00 |
| 12428.7328 | 13371.6000 | 7.59E+00 |
| 12376.3540 | 13315.7000 | 7.59E+00 |
| 12310.2370 | 13245.1000 | 7.59E+00 |
| 12241.9707 | 13172.1000 | 7.60E+00 |
| 12182.6669 | 13108.8000 | 7.60E+00 |
| 12104.2023 | 13024.8000 | 7.61E+00 |
| 12090.1284 | 13010.1000 | 7.61E+00 |
| 11874.2671 | 12778.3000 | 7.61E+00 |
| 11926.4849 | 12835.0000 | 7.62E+00 |
| 11810.9981 | 12711.2000 | 7.62E+00 |
| 11835.0391 | 12737.6000 | 7.63E+00 |
| 11709.0573 | 12602.4000 | 7.63E+00 |
| 11721.5102 | 12616.4000 | 7.63E+00 |
| 11601.2420 | 12487.4000 | 7.64E+00 |
| 11656.0071 | 12546.8000 | 7.64E+00 |
| 11530.1930 | 12411.9000 | 7.65E+00 |
| 11556.9764 | 12441.2000 | 7.65E+00 |
| 11356.4989 | 12225.9000 | 7.66E+00 |
| 11313.2113 | 12179.8000 | 7.66E+00 |
| 11356.9434 | 12227.4000 | 7.66E+00 |
| 11328.5277 | 12197.3000 | 7.67E+00 |
| 11281.1155 | 12146.7000 | 7.67E+00 |
| 11204.2491 | 12064.5000 | 7.68E+00 |
| 11192.8902 | 12052.7000 | 7.68E+00 |
| 11057.3932 | 11907.3000 | 7.69E+00 |
| 10715.9648 | 11540.2000 | 7.69E+00 |
| 10674.5010 | 11496.0000 | 7.70E+00 |
| 10603.9864 | 11420.6000 | 7.70E+00 |
| 10545.9439 | 11358.5000 | 7.70E+00 |
| 10521.0453 | 11332.2000 | 7.71E+00 |
| 10524.1459 | 11336.0000 | 7.71E+00 |
| 10451.6078 | 11258.4000 | 7.72E+00 |
| 10464.1448 | 11272.3000 | 7.72E+00 |
| 10385.4669 | 11188.1000 | 7.73E+00 |
| 10366.0277 | 11167.6000 | 7.73E+00 |
| 10322.9084 | 11121.5000 | 7.74E+00 |
| 10302.7428 | 11100.3000 | 7.74E+00 |
| 10253.6320 | 11047.8000 | 7.75E+00 |
| 10201.5902 | 10992.2000 | 7.75E+00 |
| 10198.8537 | 10989.7000 | 7.75E+00 |
| 10156.7655 | 10944.8000 | 7.76E+00 |
| 10127.5866 | 10913.9000 | 7.76E+00 |
| 10095.6056 | 10879.9000 | 7.77E+00 |
| 10071.5339 | 10854.4000 | 7.77E+00 |
| 10013.1791 | 10792.0000 | 7.78E+00 |
| 10004.9749 | 10783.5000 | 7.78E+00 |
| 9925.4013 | 10698.2000 | 7.79E+00 |
| 9928.0933 | 10701.5000 | 7.79E+00 |
| 9843.2936 | 10610.5000 | 7.79E+00 |
| 9814.4844 | 10579.9000 | 7.80E+00 |
| 9804.7639 | 10569.8000 | 7.80E+00 |
| 9771.2890 | 10534.2000 | 7.81E+00 |
| 9708.6703 | 10467.1000 | 7.81E+00 |
| 9697.7340 | 10455.7000 | 7.82E+00 |
| 9646.8116 | 10401.1000 | 7.82E+00 |
| 9620.8713 | 10373.5000 | 7.82E+00 |
| 9581.9814 | 10332.0000 | 7.83E+00 |
| 9541.0008 | 10288.2000 | 7.83E+00 |
| 9476.0320 | 10218.5000 | 7.84E+00 |
| 9436.5990 | 10176.4000 | 7.84E+00 |
| 9445.2884 | 10186.1000 | 7.84E+00 |
| 9363.3187 | 10098.0000 | 7.85E+00 |
| 9335.2485 | 10068.1000 | 7.85E+00 |
| 9299.9606 | 10030.4000 | 7.85E+00 |
| 9251.7826 | 9978.7600 | 7.86E+00 |
| 9190.6228 | 9913.1200 | 7.86E+00 |
| 9167.6124 | 9888.6000 | 7.86E+00 |

| | | |
|---|---|---|
| 9114.7012 | 9831.8400 | 7.87E+00 |
| 9060.2797 | 9773.4400 | 7.87E+00 |
| 9027.4658 | 9738.3400 | 7.87E+00 |
| 8987.6456 | 9695.6600 | 7.88E+00 |
| 8952.4350 | 9657.9500 | 7.88E+00 |
| 8898.5573 | 9600.1100 | 7.88E+00 |
| 8843.5182 | 9540.9200 | 7.89E+00 |
| 8804.9413 | 9499.5800 | 7.89E+00 |
| 8759.4690 | 9450.7700 | 7.89E+00 |
| 8701.1032 | 9388.0600 | 7.90E+00 |
| 8641.7057 | 9324.2200 | 7.90E+00 |
| 8575.3089 | 9252.8300 | 7.90E+00 |
| 8568.3885 | 9245.5700 | 7.90E+00 |
| 8518.4995 | 9192.0400 | 7.91E+00 |
| 8467.9814 | 9137.7100 | 7.91E+00 |
| 8404.5095 | 9069.4200 | 7.91E+00 |
| 8371.1472 | 9033.5900 | 7.91E+00 |
| 8306.4155 | 8963.8800 | 7.92E+00 |
| 8290.8084 | 8947.2800 | 7.92E+00 |
| 8231.3567 | 8883.2400 | 7.92E+00 |
| 8133.6090 | 8777.9400 | 7.92E+00 |
| 8079.3382 | 8719.5300 | 7.92E+00 |
| 8056.5321 | 8695.0500 | 7.93E+00 |
| 8008.2179 | 8643.0500 | 7.93E+00 |
| 7953.3230 | 8583.9500 | 7.93E+00 |
| 7917.6307 | 8545.5500 | 7.93E+00 |
| 7849.5603 | 8472.2100 | 7.93E+00 |
| 7794.3354 | 8412.7300 | 7.93E+00 |
| 7732.5355 | 8346.1400 | 7.94E+00 |
| 7697.0472 | 8307.9300 | 7.94E+00 |
| 7635.3509 | 8241.4400 | 7.94E+00 |
| 7580.3692 | 8182.1800 | 7.94E+00 |
| 7458.6815 | 8051.0200 | 7.94E+00 |
| 7484.3821 | 8078.7800 | 7.94E+00 |
| 7389.6451 | 7976.5800 | 7.94E+00 |
| 7383.0307 | 7969.4600 | 7.94E+00 |
| 7315.9118 | 7897.0200 | 7.94E+00 |
| 7255.8294 | 7832.2800 | 7.94E+00 |
| 7175.5238 | 7745.6500 | 7.95E+00 |
| 7143.8666 | 7711.5400 | 7.95E+00 |
| 7064.3862 | 7625.7500 | 7.95E+00 |
| 7013.1213 | 7570.4200 | 7.95E+00 |
| 6976.5314 | 7530.9500 | 7.95E+00 |
| 6912.5631 | 7461.9200 | 7.95E+00 |
| 6870.4412 | 7416.4600 | 7.95E+00 |
| 6793.5839 | 7333.5200 | 7.95E+00 |
| 6760.1653 | 7297.4300 | 7.95E+00 |
| 6677.4793 | 7208.2000 | 7.95E+00 |
| 6653.1375 | 7181.8400 | 7.95E+00 |
| 6542.9666 | 7062.9200 | 7.95E+00 |
| 6520.4850 | 7038.6100 | 7.95E+00 |
| 6433.4841 | 6944.6900 | 7.95E+00 |
| 6413.1909 | 6922.7400 | 7.95E+00 |
| 6342.6184 | 6846.5300 | 7.94E+00 |
| 6302.5373 | 6803.2300 | 7.94E+00 |
| 6226.4863 | 6721.1000 | 7.94E+00 |
| 6166.2681 | 6656.0500 | 7.94E+00 |
| 6122.0993 | 6608.3200 | 7.94E+00 |
| 6056.6009 | 6537.5800 | 7.94E+00 |
| 6007.3600 | 6484.3000 | 7.94E+00 |
| 5921.4137 | 6391.4700 | 7.94E+00 |
| 5836.4670 | 6299.7200 | 7.94E+00 |
| 5783.0612 | 6242.0000 | 7.94E+00 |
| 5761.5781 | 6218.7200 | 7.93E+00 |
| 5695.5138 | 6147.3400 | 7.93E+00 |
| 5653.8374 | 6102.2700 | 7.93E+00 |
| 5574.8802 | 6016.9700 | 7.93E+00 |
| 5543.7384 | 5983.2700 | 7.93E+00 |
| 5451.7762 | 5883.9300 | 7.93E+00 |
| 5423.5417 | 5853.3600 | 7.93E+00 |
| 5341.9809 | 5765.2600 | 7.92E+00 |
| 5261.7028 | 5678.5400 | 7.92E+00 |
| 5206.4820 | 5618.7700 | 7.92E+00 |
| 5200.1937 | 5611.8500 | 7.92E+00 |
| 5124.2070 | 5529.7600 | 7.91E+00 |
| 5089.4533 | 5492.1200 | 7.91E+00 |
| 5032.3741 | 5430.4200 | 7.91E+00 |
| 4984.8454 | 5379.0200 | 7.91E+00 |
| 4914.8086 | 5303.3300 | 7.91E+00 |
| 4846.2709 | 5229.2500 | 7.90E+00 |

| | | |
|---|---|---|
| 4827.7257 | 5209.1100 | 7.90E+00 |
| 4713.7883 | 5086.0600 | 7.90E+00 |
| 4755.4471 | 5130.8700 | 7.89E+00 |
| 4774.8832 | 5151.6900 | 7.89E+00 |
| 4788.2117 | 5165.9300 | 7.89E+00 |
| 4828.2080 | 5208.9300 | 7.89E+00 |
| 4771.5646 | 5147.6800 | 7.88E+00 |
| 4708.3282 | 5079.3300 | 7.88E+00 |
| 4688.0606 | 5057.3200 | 7.88E+00 |
| 4603.4182 | 4965.8100 | 7.87E+00 |
| 4553.4845 | 4911.8100 | 7.87E+00 |
| 4455.4168 | 4805.8800 | 7.87E+00 |
| 4458.7917 | 4809.3800 | 7.86E+00 |
| 4397.3769 | 4742.9900 | 7.86E+00 |
| 4329.3156 | 4669.4400 | 7.86E+00 |
| 4279.6785 | 4615.7700 | 7.85E+00 |
| 4265.3182 | 4600.1300 | 7.85E+00 |
| 4202.4698 | 4532.1900 | 7.85E+00 |
| 4141.3549 | 4466.1400 | 7.84E+00 |
| 4098.8102 | 4420.1200 | 7.84E+00 |
| 4041.2143 | 4357.8600 | 7.84E+00 |
| 3976.9528 | 4288.4200 | 7.83E+00 |
| 3889.1422 | 4193.6100 | 7.83E+00 |
| 3929.7591 | 4237.2400 | 7.82E+00 |
| 3853.9413 | 4155.3500 | 7.82E+00 |
| 3805.2770 | 4102.7400 | 7.82E+00 |
| 3766.8876 | 4061.2100 | 7.81E+00 |
| 3713.3602 | 4003.3600 | 7.81E+00 |
| 3670.1174 | 3956.6000 | 7.81E+00 |
| 3628.6902 | 3911.7900 | 7.80E+00 |
| 3589.0814 | 3868.9500 | 7.80E+00 |
| 3483.3305 | 3754.8200 | 7.79E+00 |
| 3464.3228 | 3734.1900 | 7.79E+00 |
| 3447.1608 | 3715.5500 | 7.79E+00 |
| 3414.8258 | 3680.5600 | 7.78E+00 |
| 3367.2959 | 3629.1900 | 7.78E+00 |
| 3321.5812 | 3579.7900 | 7.77E+00 |
| 3286.1909 | 3541.5100 | 7.77E+00 |
| 3244.1058 | 3496.0300 | 7.77E+00 |
| 3152.8613 | 3397.5100 | 7.76E+00 |
| 3114.4067 | 3355.9300 | 7.76E+00 |
| 3137.2892 | 3380.4500 | 7.75E+00 |
| 3085.4300 | 3324.4500 | 7.75E+00 |
| 3035.3838 | 3270.3800 | 7.74E+00 |
| 3004.1397 | 3236.5900 | 7.74E+00 |
| 2940.7198 | 3168.1500 | 7.73E+00 |
| 2930.0407 | 3156.5100 | 7.73E+00 |
| 2904.1597 | 3128.5000 | 7.72E+00 |
| 2863.0914 | 3084.1300 | 7.72E+00 |
| 2832.2821 | 3050.8300 | 7.72E+00 |
| 2769.3786 | 2982.9600 | 7.71E+00 |
| 2725.2085 | 2935.2600 | 7.71E+00 |
| 2716.6146 | 2925.8700 | 7.70E+00 |
| 2675.9666 | 2881.9800 | 7.70E+00 |
| 2645.5178 | 2849.0600 | 7.69E+00 |
| 2642.0882 | 2845.2700 | 7.69E+00 |
| 2598.2473 | 2797.9300 | 7.69E+00 |
| 2556.1669 | 2752.5100 | 7.68E+00 |
| 2524.2324 | 2718.0000 | 7.68E+00 |
| 2510.7873 | 2703.4100 | 7.67E+00 |
| 2432.0291 | 2618.5200 | 7.67E+00 |
| 2380.2008 | 2562.6000 | 7.66E+00 |
| 2405.1703 | 2589.4500 | 7.66E+00 |
| 2373.3981 | 2555.1300 | 7.66E+00 |
| 2359.9579 | 2540.5500 | 7.65E+00 |
| 2306.5959 | 2483.0200 | 7.65E+00 |
| 2263.2794 | 2436.2900 | 7.64E+00 |
| 2254.7775 | 2427.0300 | 7.64E+00 |
| 2239.5927 | 2410.5900 | 7.64E+00 |
| 2217.7510 | 2386.9800 | 7.63E+00 |
| 2156.3584 | 2320.8000 | 7.63E+00 |
| 2096.7392 | 2256.5400 | 7.62E+00 |
| 2129.0066 | 2291.1800 | 7.62E+00 |
| 2080.8447 | 2239.2600 | 7.61E+00 |
| 2075.1818 | 2233.0800 | 7.61E+00 |
| 2062.8715 | 2219.7500 | 7.60E+00 |
| 2035.8176 | 2190.5400 | 7.60E+00 |
| 2010.3343 | 2163.0400 | 7.60E+00 |
| 1986.4057 | 2137.2100 | 7.59E+00 |
| 1947.8757 | 2095.6600 | 7.59E+00 |

| | | |
|---|---|---|
| 1918.9985 | 2064.5100 | 7.58E+00 |
| 1875.6148 | 2017.7700 | 7.58E+00 |
| 1881.8842 | 2024.4300 | 7.57E+00 |
| 1865.5443 | 2006.7800 | 7.57E+00 |
| 1826.7588 | 1964.9800 | 7.57E+00 |
| 1829.2650 | 1967.6000 | 7.56E+00 |
| 1785.5607 | 1920.5100 | 7.56E+00 |
| 1790.8440 | 1926.1200 | 7.55E+00 |
| 1758.0209 | 1890.7500 | 7.55E+00 |
| 1742.4120 | 1873.8900 | 7.55E+00 |
| 1736.0296 | 1866.9600 | 7.54E+00 |
| 1660.6817 | 1785.8700 | 7.54E+00 |
| 1680.4884 | 1807.1000 | 7.53E+00 |
| 1685.9308 | 1812.9000 | 7.53E+00 |
| 1661.6260 | 1786.6900 | 7.53E+00 |
| 1654.0928 | 1778.5800 | 7.53E+00 |
| 1609.4295 | 1730.4900 | 7.52E+00 |
| 1589.2754 | 1708.7600 | 7.52E+00 |
| 1578.0995 | 1696.6900 | 7.51E+00 |
| 1575.8104 | 1694.1600 | 7.51E+00 |
| 1559.5327 | 1676.6000 | 7.51E+00 |
| 1514.2677 | 1627.8900 | 7.50E+00 |
| 1515.7104 | 1629.3700 | 7.50E+00 |
| 1503.2624 | 1615.9500 | 7.50E+00 |
| 1499.5258 | 1611.8700 | 7.49E+00 |
| 1474.5449 | 1584.9600 | 7.49E+00 |
| 1465.7261 | 1575.4300 | 7.48E+00 |
| 1443.2464 | 1551.2100 | 7.48E+00 |
| 1444.1683 | 1552.1600 | 7.48E+00 |
| 1409.3695 | 1514.7100 | 7.47E+00 |
| 1390.5497 | 1494.4400 | 7.47E+00 |
| 1372.9195 | 1475.4500 | 7.47E+00 |
| 1349.1868 | 1449.9000 | 7.46E+00 |
| 1362.8896 | 1464.5800 | 7.46E+00 |
| 1355.7887 | 1456.9600 | 7.46E+00 |
| 1342.6142 | 1442.7600 | 7.46E+00 |
| 1337.6965 | 1437.4300 | 7.46E+00 |
| 1326.6546 | 1425.5200 | 7.45E+00 |
| 1316.6631 | 1414.7500 | 7.45E+00 |
| 1314.7867 | 1412.6700 | 7.44E+00 |
| 1299.7515 | 1396.4800 | 7.44E+00 |
| 1250.6343 | 1343.6700 | 7.44E+00 |
| 1265.8028 | 1359.9300 | 7.44E+00 |
| 1239.9383 | 1332.1100 | 7.43E+00 |
| 1242.9385 | 1335.3000 | 7.43E+00 |
| 1246.7967 | 1339.4000 | 7.43E+00 |
| 1196.4099 | 1285.2300 | 7.42E+00 |
| 1215.8486 | 1306.0800 | 7.42E+00 |
| 1174.5275 | 1261.6700 | 7.42E+00 |
| 1215.9668 | 1306.1500 | 7.42E+00 |
| 1183.3331 | 1271.1200 | 7.42E+00 |
| 1172.0743 | 1259.0000 | 7.42E+00 |
| 1175.1306 | 1262.2400 | 7.41E+00 |
| 1138.8265 | 1223.2200 | 7.41E+00 |
| 1150.1921 | 1235.3800 | 7.41E+00 |
| 1155.5913 | 1241.1600 | 7.40E+00 |
| 1128.6795 | 1212.2300 | 7.40E+00 |
| 1115.8741 | 1198.4400 | 7.40E+00 |
| 1123.5243 | 1206.6400 | 7.40E+00 |
| 1092.7262 | 1173.5300 | 7.39E+00 |
| 1095.3141 | 1176.2900 | 7.39E+00 |
| 1059.8259 | 1138.1600 | 7.39E+00 |
| 1089.5854 | 1170.0900 | 7.39E+00 |
| 1081.2879 | 1161.2100 | 7.39E+00 |
| 1080.1442 | 1159.9600 | 7.39E+00 |
| 1060.6026 | 1138.9400 | 7.39E+00 |
| 1067.1144 | 1145.9100 | 7.38E+00 |
| 1055.3046 | 1133.2000 | 7.38E+00 |
| 1062.9730 | 1141.4200 | 7.38E+00 |
| 1052.4493 | 1130.0900 | 7.38E+00 |
| 1030.1757 | 1106.1500 | 7.37E+00 |
| 1008.6595 | 1083.0300 | 7.37E+00 |
| 1037.0579 | 1113.5100 | 7.37E+00 |
| 1035.0793 | 1111.4200 | 7.38E+00 |
| 1027.6060 | 1103.3600 | 7.37E+00 |
| 1026.7640 | 1102.4300 | 7.37E+00 |
| 1020.3735 | 1095.5400 | 7.37E+00 |
| 996.4778 | 1069.8700 | 7.37E+00 |
| 997.1988 | 1070.6400 | 7.36E+00 |
| 998.3770 | 1071.8700 | 7.36E+00 |

| | | |
|---|---|---|
| 1005.8774 | 1079.9500 | 7.36E+00 |
| 996.0662 | 1069.3900 | 7.36E+00 |
| 945.6245 | 1015.2100 | 7.36E+00 |
| 983.7685 | 1056.1500 | 7.36E+00 |
| 975.3890 | 1047.1200 | 7.35E+00 |
| 984.8639 | 1057.2700 | 7.35E+00 |
| 971.4542 | 1042.9300 | 7.36E+00 |
| 975.8066 | 1047.5900 | 7.36E+00 |
| 951.8628 | 1021.8900 | 7.36E+00 |
| 962.6179 | 1033.4300 | 7.36E+00 |
| 950.9217 | 1020.8700 | 7.36E+00 |
| 933.9942 | 1002.7000 | 7.36E+00 |
| 951.1945 | 1021.1800 | 7.36E+00 |
| 957.3389 | 1027.7800 | 7.36E+00 |
| 941.4932 | 1010.7000 | 7.35E+00 |
| 925.9980 | 994.0640 | 7.35E+00 |
| 938.4531 | 1007.4300 | 7.35E+00 |
| 923.5789 | 991.4540 | 7.35E+00 |
| 930.9134 | 999.3270 | 7.35E+00 |
| 938.3894 | 1007.3400 | 7.35E+00 |
| 924.3236 | 992.2360 | 7.35E+00 |
| 899.7889 | 965.8860 | 7.35E+00 |
| 929.3073 | 997.5630 | 7.34E+00 |
| 915.9740 | 983.2430 | 7.34E+00 |
| 924.1154 | 992.0500 | 7.35E+00 |
| 884.7134 | 949.7490 | 7.35E+00 |
| 909.0337 | 975.8600 | 7.35E+00 |
| 901.7596 | 968.0550 | 7.35E+00 |
| 889.4207 | 954.8200 | 7.35E+00 |
| 892.8779 | 958.5270 | 7.35E+00 |
| 886.0185 | 951.1760 | 7.35E+00 |
| 874.1242 | 938.4140 | 7.35E+00 |
| 877.7777 | 942.3490 | 7.36E+00 |
| 866.1676 | 929.8330 | 7.35E+00 |
| 874.9826 | 939.3020 | 7.35E+00 |
| 878.6710 | 943.2530 | 7.35E+00 |
| 862.1535 | 925.5310 | 7.35E+00 |
| 875.9032 | 940.2840 | 7.35E+00 |
| 849.5107 | 911.9490 | 7.35E+00 |
| 868.1214 | 931.9390 | 7.35E+00 |
| 856.7847 | 919.7590 | 7.35E+00 |
| 840.5576 | 902.3410 | 7.35E+00 |
| 819.4365 | 879.7260 | 7.36E+00 |
| 842.4953 | 904.4870 | 7.36E+00 |
| 840.9133 | 902.7970 | 7.36E+00 |
| 819.8366 | 880.1840 | 7.36E+00 |
| 808.4917 | 868.0130 | 7.36E+00 |
| 825.9824 | 886.8050 | 7.36E+00 |
| 824.0330 | 884.7240 | 7.37E+00 |
| 817.1840 | 877.3870 | 7.37E+00 |
| 824.4965 | 885.2560 | 7.37E+00 |
| 807.9805 | 867.4700 | 7.36E+00 |
| 810.2273 | 869.8870 | 7.36E+00 |
| 793.4943 | 851.9240 | 7.36E+00 |
| 809.4304 | 869.0450 | 7.37E+00 |
| 806.4063 | 865.8000 | 7.37E+00 |
| 793.9129 | 852.3850 | 7.37E+00 |
| 781.2959 | 838.8450 | 7.37E+00 |
| 782.3476 | 839.9780 | 7.37E+00 |
| 769.3320 | 826.0790 | 7.38E+00 |
| 792.7454 | 851.2270 | 7.38E+00 |
| 770.2228 | 827.0600 | 7.38E+00 |
| 774.7873 | 831.9750 | 7.38E+00 |
| 760.9766 | 817.1620 | 7.38E+00 |
| 764.9622 | 821.4530 | 7.38E+00 |
| 759.6543 | 815.7740 | 7.39E+00 |
| 740.7559 | 795.4260 | 7.38E+00 |
| 752.7334 | 808.2980 | 7.38E+00 |
| 755.4349 | 811.2130 | 7.38E+00 |
| 740.1184 | 794.7770 | 7.39E+00 |
| 742.1569 | 796.9700 | 7.39E+00 |
| 730.6761 | 784.6560 | 7.39E+00 |
| 718.9123 | 772.0330 | 7.39E+00 |
| 728.6076 | 782.4540 | 7.39E+00 |
| 711.8394 | 764.4590 | 7.39E+00 |
| 716.3957 | 769.3680 | 7.39E+00 |
| 724.8287 | 778.4410 | 7.40E+00 |
| 707.0449 | 759.3480 | 7.40E+00 |
| 710.3492 | 762.9100 | 7.40E+00 |
| 700.4188 | 752.2580 | 7.40E+00 |

| | | |
|---|---|---|
| 694.3696 | 745.7730 | 7.40E+00 |
| 700.6221 | 752.5000 | 7.40E+00 |
| 693.7228 | 745.1060 | 7.41E+00 |
| 686.4121 | 737.2640 | 7.41E+00 |
| 678.6846 | 728.9760 | 7.41E+00 |
| 683.0753 | 733.7120 | 7.41E+00 |
| 682.7483 | 733.4180 | 7.42E+00 |
| 677.8265 | 728.1470 | 7.42E+00 |
| 684.8716 | 735.7320 | 7.43E+00 |
| 658.3328 | 707.2350 | 7.43E+00 |
| 672.6219 | 722.6050 | 7.43E+00 |
| 645.2626 | 693.2210 | 7.43E+00 |
| 629.8285 | 676.6520 | 7.43E+00 |
| 642.5117 | 690.2980 | 7.44E+00 |
| 646.4578 | 694.5550 | 7.44E+00 |
| 629.5540 | 676.4090 | 7.44E+00 |
| 628.3846 | 675.1670 | 7.44E+00 |
| 622.6360 | 669.0040 | 7.45E+00 |
| 620.3859 | 666.6020 | 7.45E+00 |
| 625.6137 | 672.2340 | 7.45E+00 |
| 614.2318 | 660.0190 | 7.45E+00 |
| 602.3373 | 647.2540 | 7.46E+00 |
| 589.9268 | 633.9300 | 7.46E+00 |
| 592.8794 | 637.1250 | 7.46E+00 |
| 595.2296 | 639.6630 | 7.46E+00 |
| 600.9294 | 645.8040 | 7.47E+00 |
| 602.0600 | 647.0380 | 7.47E+00 |
| 590.7744 | 634.9240 | 7.47E+00 |
| 586.7863 | 630.6500 | 7.48E+00 |
| 562.6236 | 604.6990 | 7.48E+00 |
| 580.9336 | 624.3930 | 7.48E+00 |
| 571.2477 | 614.0020 | 7.48E+00 |
| 560.9796 | 602.9780 | 7.49E+00 |
| 554.0087 | 595.5030 | 7.49E+00 |
| 538.6882 | 579.0450 | 7.49E+00 |
| 542.1189 | 582.7540 | 7.50E+00 |
| 533.3231 | 573.3100 | 7.50E+00 |
| 539.3184 | 579.7730 | 7.50E+00 |
| 536.9577 | 577.2510 | 7.50E+00 |
| 522.4474 | 561.6690 | 7.51E+00 |
| 518.8235 | 557.7850 | 7.51E+00 |
| 506.9141 | 544.9990 | 7.51E+00 |
| 505.8296 | 543.8460 | 7.52E+00 |
| 523.1324 | 562.4660 | 7.52E+00 |
| 513.0925 | 551.6860 | 7.52E+00 |
| 506.2163 | 544.3080 | 7.52E+00 |
| 506.2745 | 544.3850 | 7.53E+00 |
| 498.0908 | 535.6020 | 7.53E+00 |
| 489.2590 | 526.1160 | 7.53E+00 |
| 487.3240 | 524.0540 | 7.54E+00 |
| 488.4855 | 525.3200 | 7.54E+00 |
| 466.3906 | 501.5710 | 7.54E+00 |
| 458.7045 | 493.3190 | 7.55E+00 |
| 461.6093 | 496.4580 | 7.55E+00 |
| 456.3302 | 490.7950 | 7.55E+00 |
| 442.8965 | 476.3640 | 7.56E+00 |
| 454.9705 | 489.3650 | 7.56E+00 |
| 455.1314 | 489.5510 | 7.56E+00 |
| 447.1435 | 480.9710 | 7.57E+00 |
| 434.7595 | 467.6670 | 7.57E+00 |
| 436.5998 | 469.6550 | 7.57E+00 |
| 422.8746 | 454.9080 | 7.58E+00 |
| 419.6291 | 451.4270 | 7.58E+00 |
| 408.2788 | 439.2340 | 7.58E+00 |
| 388.8492 | 418.3430 | 7.58E+00 |
| 398.3826 | 428.6120 | 7.59E+00 |
| 385.0114 | 414.2370 | 7.59E+00 |
| 396.8531 | 426.9930 | 7.59E+00 |
| 389.5119 | 419.1040 | 7.60E+00 |
| 374.1068 | 402.5460 | 7.60E+00 |
| 372.7934 | 401.1430 | 7.60E+00 |
| 359.7310 | 387.1020 | 7.61E+00 |
| 357.0516 | 384.2310 | 7.61E+00 |
| 361.0561 | 388.5540 | 7.62E+00 |
| 357.0072 | 384.2060 | 7.62E+00 |
| 341.2365 | 367.2440 | 7.62E+00 |
| 339.5104 | 365.4000 | 7.63E+00 |
| 326.0731 | 350.9510 | 7.63E+00 |
| 337.6952 | 363.4670 | 7.63E+00 |
| 322.9051 | 347.5580 | 7.63E+00 |

| | | |
|---|---|---|
| 307.4486 | 330.9330 | 7.64E+00 |
| 306.0127 | 329.3950 | 7.64E+00 |
| 300.2317 | 323.1890 | 7.65E+00 |
| 297.4513 | 320.2030 | 7.65E+00 |
| 297.6730 | 320.4520 | 7.65E+00 |
| 297.2274 | 319.9830 | 7.66E+00 |
| 303.4625 | 326.7050 | 7.66E+00 |
| 272.3518 | 293.1840 | 7.65E+00 |
| 273.5851 | 294.5180 | 7.65E+00 |
| 266.8164 | 287.2400 | 7.65E+00 |
| 270.4083 | 291.1160 | 7.66E+00 |
| 262.3272 | 282.4260 | 7.66E+00 |
| 253.5928 | 273.0300 | 7.66E+00 |
| 251.5566 | 270.8490 | 7.67E+00 |
| 234.1722 | 252.1390 | 7.67E+00 |
| 230.8416 | 248.5630 | 7.68E+00 |
| 223.1926 | 240.3330 | 7.68E+00 |
| 244.3416 | 263.1170 | 7.68E+00 |
| 209.6529 | 225.7680 | 7.69E+00 |
| 218.4980 | 235.3020 | 7.69E+00 |
| 200.9378 | 216.4010 | 7.70E+00 |
| 204.8530 | 220.6230 | 7.70E+00 |
| 189.7147 | 204.3280 | 7.70E+00 |
| 196.0840 | 211.1920 | 7.70E+00 |
| 190.7727 | 205.4790 | 7.71E+00 |
| 170.0690 | 183.1860 | 7.71E+00 |
| 163.5223 | 176.1440 | 7.72E+00 |
| 152.6682 | 164.4560 | 7.72E+00 |
| 163.4120 | 176.0330 | 7.72E+00 |
| 155.0564 | 167.0360 | 7.73E+00 |
| 157.2259 | 169.3810 | 7.73E+00 |
| 147.6796 | 159.0980 | 7.73E+00 |
| 126.3960 | 136.1810 | 7.74E+00 |
| 123.0869 | 132.6200 | 7.74E+00 |
| 119.2011 | 128.4330 | 7.74E+00 |
| 114.7416 | 123.6310 | 7.75E+00 |
| 124.6281 | 134.2920 | 7.75E+00 |
| 111.5790 | 120.2370 | 7.76E+00 |
| 105.4248 | 113.6060 | 7.76E+00 |
| 83.7493 | 90.2529 | 7.77E+00 |
| 110.1655 | 118.7230 | 7.77E+00 |
| 79.8582 | 86.0652 | 7.77E+00 |
| 78.9796 | 85.1204 | 7.78E+00 |
| 62.5399 | 67.4067 | 7.78E+00 |
| 60.5835 | 65.2955 | 7.78E+00 |
| 54.3364 | 58.5658 | 7.78E+00 |
| 55.1026 | 59.3939 | 7.79E+00 |
| 44.0309 | 47.4597 | 7.79E+00 |
| 43.7714 | 47.1830 | 7.79E+00 |
| 20.2713 | 21.8738 | 7.91E+00 |
| 15.1974 | 16.4008 | 7.92E+00 |
| 9.6204 | 10.3805 | 7.90E+00 |
| 11.1400 | 12.0175 | 7.88E+00 |
| 12.1876 | 13.1548 | 7.94E+00 |
| -17.7638 | -19.1180 | 7.62E+00 |
| -6.2216 | -6.6950 | 7.61E+00 |
| -25.7144 | -27.7344 | 7.86E+00 |
| -22.7541 | -24.5372 | 7.84E+00 |
| -16.4249 | -17.6833 | 7.66E+00 |
| -18.1819 | -19.5751 | 7.66E+00 |
| -31.9047 | -34.4082 | 7.85E+00 |
| -49.9945 | -53.9216 | 7.86E+00 |
| -49.2621 | -53.1323 | 7.86E+00 |
| -52.8209 | -56.9757 | 7.87E+00 |
| -64.5641 | -69.6472 | 7.87E+00 |
| -72.8791 | -78.6161 | 7.87E+00 |
| -85.5208 | -92.2557 | 7.88E+00 |
| -83.0257 | -89.5656 | 7.88E+00 |
| -96.5328 | -104.1370 | 7.88E+00 |
| -110.4797 | -119.1910 | 7.88E+00 |
| -85.6812 | -92.4372 | 7.88E+00 |
| -108.2856 | -116.8300 | 7.89E+00 |
| -111.6795 | -120.4910 | 7.89E+00 |
| -115.4554 | -124.5700 | 7.89E+00 |
| -131.4563 | -141.8390 | 7.90E+00 |
| -139.9644 | -151.0220 | 7.90E+00 |
| -136.9661 | -147.7900 | 7.90E+00 |
| -134.3000 | -144.9160 | 7.90E+00 |
| -155.8505 | -168.1770 | 7.91E+00 |
| -173.8307 | -187.5850 | 7.91E+00 |

Universidad Industrial de Santander

ANEXO R. ÍNDICE DE REFRACCIÓN SnS-Bi107a

| índice de refracción SnS-Bi107a | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 6.4814 | 6.4814 | 6.30E-05 |
| 6.4112 | 6.4112 | 7.38E-05 |
| 6.3424 | 6.3424 | 6.76E-05 |
| 6.2751 | 6.2751 | 2.44E-05 |
| 6.2091 | 6.2091 | 5.37E-05 |
| 6.1445 | 6.1445 | 2.05E-05 |
| 6.0813 | 6.0813 | 2.97E-05 |
| 6.0193 | 6.0193 | 2.68E-05 |
| 5.9586 | 5.9586 | 5.26E-05 |
| 5.8991 | 5.8991 | 7.70E-06 |
| 5.8408 | 5.8408 | 0.00E+00 |
| 5.7836 | 5.7836 | 7.25E-05 |
| 5.7276 | 5.7276 | 4.79E-05 |
| 5.6727 | 5.6727 | 6.43E-05 |
| 5.6188 | 5.6188 | 5.91E-05 |
| 5.5660 | 5.5660 | 6.69E-05 |
| 5.5142 | 5.5142 | 2.58E-05 |
| 5.4633 | 5.4633 | 3.89E-05 |
| 5.4135 | 5.4135 | 1.38E-05 |
| 5.3645 | 5.3645 | 2.63E-05 |
| 5.3165 | 5.3165 | 4.70E-05 |
| 5.2694 | 5.2694 | 3.15E-05 |
| 5.2231 | 5.2231 | 7.96E-05 |
| 5.1777 | 5.1777 | 2.59E-05 |
| 5.1332 | 5.1332 | 2.38E-05 |
| 5.0894 | 5.0894 | 3.57E-05 |
| 5.0464 | 5.0464 | 2.07E-05 |
| 5.0042 | 5.0042 | 1.35E-06 |
| 4.9627 | 4.9627 | 1.23E-05 |
| 4.9220 | 4.9220 | 1.00E-04 |
| 4.8820 | 4.8820 | 8.51E-05 |
| 4.8427 | 4.8427 | 7.00E-05 |
| 4.8041 | 4.8041 | 2.09E-05 |
| 4.7661 | 4.7661 | 6.86E-05 |
| 4.7288 | 4.7288 | 4.02E-05 |
| 4.6921 | 4.6921 | 1.30E-05 |
| 4.6561 | 4.6561 | 7.81E-05 |
| 4.6207 | 4.6207 | 2.83E-05 |
| 4.5858 | 4.5858 | 3.91E-05 |
| 4.5516 | 4.5516 | 9.99E-05 |
| 4.5179 | 4.5179 | 7.38E-05 |
| 4.4847 | 4.4847 | 9.80E-05 |
| 4.4521 | 4.4522 | 1.89E-05 |
| 4.4201 | 4.4201 | 1.03E-04 |
| 4.3886 | 4.3886 | 6.72E-05 |
| 4.3575 | 4.3575 | 9.05E-06 |
| 4.3270 | 4.3270 | 7.26E-05 |
| 4.2970 | 4.2970 | 3.94E-05 |
| 4.2674 | 4.2674 | 1.06E-04 |
| 4.2383 | 4.2383 | 1.11E-04 |
| 4.2097 | 4.2097 | 9.87E-05 |
| 4.1815 | 4.1815 | 3.68E-05 |
| 4.1538 | 4.1538 | 4.51E-05 |
| 4.1265 | 4.1265 | 1.17E-04 |
| 4.0996 | 4.0996 | 6.91E-05 |
| 4.0731 | 4.0731 | 8.57E-05 |
| 4.0470 | 4.0470 | 3.93E-05 |
| 4.0213 | 4.0213 | 1.49E-05 |
| 3.9960 | 3.9961 | 3.79E-05 |
| 3.9711 | 3.9711 | 5.34E-05 |
| 3.9466 | 3.9466 | 0.00E+00 |
| 3.9224 | 3.9224 | 6.51E-05 |
| 3.8986 | 3.8986 | 7.69E-05 |
| 3.8751 | 3.8752 | 9.74E-06 |
| 3.8520 | 3.8520 | 1.17E-05 |
| 3.8292 | 3.8293 | 3.18E-05 |
| 3.8068 | 3.8068 | 5.05E-05 |
| 3.7847 | 3.7847 | 5.18E-05 |
| 3.7629 | 3.7629 | 1.12E-04 |
| 3.7414 | 3.7414 | 3.41E-05 |
| 3.7202 | 3.7202 | 1.10E-05 |
| 3.6993 | 3.6993 | 2.74E-05 |
| 3.6787 | 3.6787 | 7.26E-05 |
| 3.6584 | 3.6584 | 8.25E-05 |
| 3.6384 | 3.6384 | 7.36E-05 |

| | | |
|---|---|---|
| 3.6186 | 3.6186 | 2.88E-05 |
| 3.5992 | 3.5992 | 8.23E-05 |
| 3.5800 | 3.5800 | 9.51E-05 |
| 3.5610 | 3.5610 | 7.15E-05 |
| 3.5424 | 3.5424 | 8.74E-06 |
| 3.5239 | 3.5239 | 7.74E-05 |
| 3.5058 | 3.5058 | 1.07E-04 |
| 3.4878 | 3.4878 | 1.36E-04 |
| 3.4701 | 3.4701 | 7.37E-05 |
| 3.4527 | 3.4527 | 1.17E-04 |
| 3.4355 | 3.4355 | 9.70E-05 |
| 3.4185 | 3.4185 | 1.34E-04 |
| 3.4017 | 3.4017 | 5.12E-05 |
| 3.3852 | 3.3852 | 3.60E-05 |
| 3.3688 | 3.3688 | 1.42E-05 |
| 3.3527 | 3.3527 | 6.82E-05 |
| 3.3368 | 3.3368 | 8.90E-05 |
| 3.3211 | 3.3211 | 3.22E-05 |
| 3.3056 | 3.3056 | 1.01E-04 |
| 3.2903 | 3.2903 | 8.21E-05 |
| 3.2752 | 3.2752 | 1.13E-04 |
| 3.2603 | 3.2603 | 1.12E-04 |
| 3.2455 | 3.2455 | 7.87E-05 |
| 3.2310 | 3.2310 | 1.18E-04 |
| 3.2166 | 3.2166 | 7.24E-05 |
| 3.2025 | 3.2025 | 0.00E+00 |
| 3.1884 | 3.1884 | 1.21E-04 |
| 3.1746 | 3.1746 | 3.05E-05 |
| 3.1609 | 3.1610 | 4.70E-05 |
| 3.1475 | 3.1475 | 1.17E-04 |
| 3.1341 | 3.1341 | 1.21E-04 |
| 3.1210 | 3.1210 | 1.25E-04 |
| 3.1079 | 3.1080 | 6.37E-05 |
| 3.0951 | 3.0951 | 9.75E-05 |
| 3.0824 | 3.0824 | 1.51E-05 |
| 3.0699 | 3.0699 | 1.30E-04 |
| 3.0575 | 3.0575 | 3.83E-05 |
| 3.0452 | 3.0452 | 1.18E-04 |
| 3.0331 | 3.0331 | 3.24E-05 |
| 3.0212 | 3.0212 | 3.38E-05 |
| 3.0093 | 3.0093 | 4.94E-05 |
| 2.9977 | 2.9977 | 6.52E-06 |
| 2.9861 | 2.9861 | 1.67E-04 |
| 2.9747 | 2.9747 | 1.27E-04 |
| 2.9634 | 2.9634 | 1.51E-04 |
| 2.9523 | 2.9523 | 1.66E-04 |
| 2.9412 | 2.9412 | 1.22E-04 |
| 2.9303 | 2.9304 | 6.59E-05 |
| 2.9196 | 2.9196 | 1.17E-04 |
| 2.9089 | 2.9089 | 9.38E-05 |
| 2.8984 | 2.8984 | 5.90E-05 |
| 2.8880 | 2.8880 | 7.50E-05 |
| 2.8777 | 2.8777 | 1.44E-04 |
| 2.8675 | 2.8675 | 1.59E-04 |
| 2.8575 | 2.8575 | 1.81E-06 |
| 2.8475 | 2.8475 | 1.30E-04 |
| 2.8377 | 2.8377 | 8.90E-05 |
| 2.8279 | 2.8279 | 1.02E-04 |
| 2.8183 | 2.8183 | 5.27E-05 |
| 2.8088 | 2.8088 | 1.73E-04 |
| 2.7993 | 2.7994 | 1.62E-04 |
| 2.7900 | 2.7900 | 7.25E-05 |
| 2.7808 | 2.7808 | 4.42E-05 |
| 2.7717 | 2.7717 | 1.36E-04 |
| 2.7627 | 2.7627 | 1.51E-04 |
| 2.7538 | 2.7538 | 3.71E-05 |
| 2.7449 | 2.7449 | 1.08E-04 |
| 2.7362 | 2.7362 | 4.81E-05 |
| 2.7275 | 2.7276 | 1.17E-04 |
| 2.7190 | 2.7190 | 1.44E-04 |
| 2.7105 | 2.7105 | 1.78E-04 |
| 2.7022 | 2.7022 | 1.07E-04 |
| 2.6939 | 2.6939 | 7.61E-05 |
| 2.6857 | 2.6857 | 3.10E-05 |
| 2.6776 | 2.6776 | 1.74E-04 |
| 2.6695 | 2.6695 | 1.75E-04 |
| 2.6616 | 2.6616 | 7.79E-05 |
| 2.6537 | 2.6537 | 7.72E-05 |
| 2.6459 | 2.6459 | 1.30E-04 |
| 2.6382 | 2.6382 | 1.53E-05 |

| | | |
|---|---|---|
| 2.6306 | 2.6306 | 9.39E-05 |
| 2.6231 | 2.6231 | 6.54E-05 |
| 2.6156 | 2.6156 | 1.11E-04 |
| 2.6082 | 2.6082 | 9.15E-05 |
| 2.6009 | 2.6009 | 8.62E-05 |
| 2.5936 | 2.5936 | 1.71E-14 |
| 2.5864 | 2.5864 | 3.08E-06 |
| 2.5793 | 2.5793 | 4.06E-05 |
| 2.5723 | 2.5723 | 9.50E-05 |
| 2.5653 | 2.5653 | 1.24E-04 |
| 2.5584 | 2.5584 | 9.24E-05 |
| 2.5516 | 2.5516 | 3.57E-05 |
| 2.5448 | 2.5448 | 9.74E-05 |
| 2.5381 | 2.5381 | 6.58E-05 |
| 2.5315 | 2.5315 | 1.65E-04 |
| 2.5249 | 2.5249 | 1.61E-04 |
| 2.5184 | 2.5184 | 1.74E-04 |
| 2.5119 | 2.5119 | 1.41E-05 |
| 2.5056 | 2.5056 | 1.85E-04 |
| 2.4992 | 2.4992 | 7.88E-05 |
| 2.4930 | 2.4930 | 5.18E-05 |
| 2.4868 | 2.4868 | 1.94E-04 |
| 2.4806 | 2.4806 | 1.86E-05 |
| 2.4745 | 2.4745 | 8.68E-05 |
| 2.4685 | 2.4685 | 7.75E-05 |
| 2.4625 | 2.4625 | 7.61E-05 |
| 2.4566 | 2.4566 | 3.24E-06 |
| 2.4507 | 2.4508 | 1.19E-04 |
| 2.4449 | 2.4449 | 6.29E-05 |
| 2.4392 | 2.4392 | 1.45E-04 |
| 2.4335 | 2.4335 | 6.81E-05 |
| 2.4278 | 2.4278 | 8.92E-05 |
| 2.4222 | 2.4222 | 1.83E-04 |
| 2.4167 | 2.4167 | 9.08E-05 |
| 2.4112 | 2.4112 | 6.99E-05 |
| 2.4057 | 2.4058 | 1.89E-04 |
| 2.4003 | 2.4004 | 6.20E-05 |
| 2.3950 | 2.3950 | 1.09E-05 |
| 2.3897 | 2.3897 | 5.09E-06 |
| 2.3844 | 2.3845 | 1.04E-04 |
| 2.3792 | 2.3792 | 7.90E-05 |
| 2.3741 | 2.3741 | 1.12E-04 |
| 2.3690 | 2.3690 | 3.02E-05 |
| 2.3639 | 2.3639 | 5.23E-05 |
| 2.3589 | 2.3589 | 8.61E-05 |
| 2.3539 | 2.3539 | 4.41E-05 |
| 2.3490 | 2.3490 | 1.57E-04 |
| 2.3441 | 2.3441 | 7.05E-05 |
| 2.3392 | 2.3392 | 9.99E-05 |
| 2.3344 | 2.3344 | 2.03E-04 |
| 2.3296 | 2.3297 | 4.06E-06 |
| 2.3249 | 2.3249 | 1.80E-04 |
| 2.3202 | 2.3202 | 1.08E-04 |
| 2.3156 | 2.3156 | 2.05E-05 |
| 2.3110 | 2.3110 | 1.56E-04 |
| 2.3064 | 2.3064 | 1.15E-04 |
| 2.3019 | 2.3019 | 9.26E-05 |
| 2.2974 | 2.2974 | 6.92E-05 |
| 2.2930 | 2.2930 | 1.48E-04 |
| 2.2886 | 2.2886 | 1.24E-04 |
| 2.2842 | 2.2842 | 2.25E-05 |
| 2.2799 | 2.2799 | 1.29E-04 |
| 2.2756 | 2.2756 | 1.23E-04 |
| 2.2713 | 2.2713 | 6.00E-05 |
| 2.2671 | 2.2671 | 2.51E-06 |
| 2.2629 | 2.2629 | 1.47E-04 |

ANEXO S. COEFICIENTE DE ABSORCIÓN SnS-Bi107a

| coeficiente de absorción SnS-Bi107a | | |
|---|---|---|
| **T- GMS&ES** | **T-software** | **Error %** |
| 150764.4842 | 141679.0000 | 6.03E+00 |
| 87256.9350 | 82006.0000 | 6.02E+00 |
| 53299.4186 | 50113.6000 | 5.98E+00 |
| 27363.0318 | 25746.8000 | 5.91E+00 |
| 17198.2528 | 16190.6000 | 5.86E+00 |

| | | |
|---|---|---|
| 12884.7306 | 12132.7000 | 5.84E+00 |
| 11963.6586 | 11265.2000 | 5.84E+00 |
| 12658.7058 | 11917.3000 | 5.86E+00 |
| 13621.7662 | 12820.3000 | 5.88E+00 |
| 14853.9800 | 13975.1000 | 5.92E+00 |
| 15976.6301 | 15025.4000 | 5.95E+00 |
| 16737.5278 | 15734.5000 | 5.99E+00 |
| 16990.0956 | 15965.2000 | 6.03E+00 |
| 16987.4910 | 15955.9000 | 6.07E+00 |
| 16716.3845 | 15694.5000 | 6.11E+00 |
| 15937.2552 | 14956.6000 | 6.15E+00 |
| 14849.0993 | 13929.4000 | 6.19E+00 |
| 14027.8122 | 13153.9000 | 6.23E+00 |
| 12716.6995 | 11919.8000 | 6.27E+00 |
| 11123.4028 | 10422.4000 | 6.30E+00 |
| 9881.6085 | 9256.2500 | 6.33E+00 |
| 8515.7915 | 7975.0800 | 6.35E+00 |
| 7654.7876 | 7167.9400 | 6.36E+00 |
| 6891.4447 | 6453.1900 | 6.36E+00 |
| 6072.7594 | 5686.9200 | 6.35E+00 |
| 5547.6931 | 5196.0700 | 6.34E+00 |
| 5139.1973 | 4814.7800 | 6.31E+00 |
| 4817.7885 | 4515.2000 | 6.28E+00 |
| 4544.5743 | 4260.8900 | 6.24E+00 |
| 4042.2487 | 3791.4200 | 6.21E+00 |
| 3743.6994 | 3513.0500 | 6.16E+00 |
| 3390.5325 | 3183.2300 | 6.11E+00 |
| 2966.1807 | 2786.2500 | 6.07E+00 |
| 2235.5618 | 2101.0400 | 6.02E+00 |
| 1674.9740 | 1575.0100 | 5.97E+00 |
| 1277.0732 | 1201.4600 | 5.92E+00 |
| 828.1827 | 779.5730 | 5.87E+00 |
| 349.9414 | 329.6690 | 5.79E+00 |
| 397.1682 | 374.2550 | 5.77E+00 |
| 381.8776 | 359.9400 | 5.74E+00 |
| 18.3226 | 17.3544 | 5.28E+00 |
| -44.1166 | -41.5758 | 5.76E+00 |
| 5.7395 | 5.3874 | 6.13E+00 |
| 27.6308 | 26.0216 | 5.82E+00 |
| 240.5394 | 226.8880 | 5.68E+00 |
| 399.1426 | 376.6060 | 5.65E+00 |
| 422.6296 | 398.8030 | 5.64E+00 |
| 575.6174 | 543.1430 | 5.64E+00 |
| 741.4921 | 699.6200 | 5.65E+00 |
| 902.1375 | 851.1210 | 5.66E+00 |
| 1101.5273 | 1039.0800 | 5.67E+00 |
| 1201.5549 | 1133.3300 | 5.68E+00 |
| 1306.3485 | 1231.9700 | 5.69E+00 |
| 1440.6122 | 1358.3100 | 5.71E+00 |
| 1534.0248 | 1445.9900 | 5.74E+00 |
| 1614.2756 | 1521.2300 | 5.76E+00 |
| 1626.1376 | 1531.9500 | 5.79E+00 |
| 1634.3629 | 1539.2600 | 5.82E+00 |
| 1657.2926 | 1560.3400 | 5.85E+00 |
| 1613.2353 | 1518.3300 | 5.88E+00 |
| 1561.9355 | 1469.5200 | 5.92E+00 |
| 1495.5941 | 1406.5700 | 5.95E+00 |
| 1287.0319 | 1209.9500 | 5.99E+00 |
| 1212.5149 | 1139.4300 | 6.03E+00 |
| 1087.8494 | 1021.8600 | 6.07E+00 |
| 947.6813 | 889.8130 | 6.11E+00 |
| 798.2391 | 749.1750 | 6.15E+00 |
| 648.0335 | 607.9170 | 6.19E+00 |
| 442.5242 | 414.9510 | 6.23E+00 |
| 256.0841 | 240.0560 | 6.26E+00 |
| 138.2614 | 129.5510 | 6.30E+00 |
| 38.1712 | 35.7350 | 6.38E+00 |
| -66.1804 | -61.9864 | 6.34E+00 |
| -162.3774 | -151.9440 | 6.43E+00 |
| -194.9583 | -182.3920 | 6.45E+00 |
| -231.3366 | -216.3280 | 6.49E+00 |
| -216.1134 | -202.0140 | 6.52E+00 |
| -182.0017 | -170.0500 | 6.57E+00 |
| -119.6836 | -111.8080 | 6.58E+00 |
| -129.1590 | -120.6270 | 6.61E+00 |
| 10.9140 | 10.1942 | 6.60E+00 |
| 145.4037 | 135.7670 | 6.63E+00 |
| 273.5778 | 255.3510 | 6.66E+00 |
| 393.7681 | 367.4850 | 6.67E+00 |
| 573.1170 | 534.8030 | 6.69E+00 |

| | | |
|---|---|---|
| 745.2402 | 695.3570 | 6.69E+00 |
| 906.4275 | 845.7150 | 6.70E+00 |
| 1131.0404 | 1055.2000 | 6.71E+00 |
| 1341.4839 | 1251.5100 | 6.71E+00 |
| 1532.4066 | 1429.6500 | 6.71E+00 |
| 1698.0881 | 1584.2500 | 6.70E+00 |
| 2012.6232 | 1877.8500 | 6.70E+00 |
| 2300.4727 | 2146.6200 | 6.69E+00 |
| 2364.2640 | 2206.2800 | 6.68E+00 |
| 2475.9760 | 2310.7400 | 6.67E+00 |
| 2736.2461 | 2553.9900 | 6.66E+00 |
| 2846.1623 | 2656.9000 | 6.65E+00 |
| 3001.1867 | 2802.0100 | 6.64E+00 |
| 3201.2493 | 2989.3100 | 6.62E+00 |
| 3123.6843 | 2917.2300 | 6.61E+00 |
| 3407.2078 | 3182.6800 | 6.59E+00 |
| 3623.4537 | 3385.3800 | 6.57E+00 |
| 3766.9776 | 3520.1800 | 6.55E+00 |
| 3832.9125 | 3582.5800 | 6.53E+00 |
| 3931.2951 | 3675.2900 | 6.51E+00 |
| 4061.1218 | 3797.4800 | 6.49E+00 |
| 4105.7520 | 3840.0200 | 6.47E+00 |
| 4062.1910 | 3800.0700 | 6.45E+00 |
| 3928.2347 | 3675.5000 | 6.43E+00 |
| 3586.2598 | 3356.0200 | 6.42E+00 |
| 3268.2506 | 3059.0000 | 6.40E+00 |
| 2858.1843 | 2675.6700 | 6.39E+00 |
| 2356.9560 | 2206.8400 | 6.37E+00 |
| 2110.4482 | 1976.4600 | 6.35E+00 |
| 1543.7925 | 1446.0400 | 6.33E+00 |
| 1003.4502 | 940.0910 | 6.31E+00 |
| 377.0523 | 353.3200 | 6.29E+00 |
| -110.0945 | -103.0840 | 6.37E+00 |
| -791.5388 | -741.8760 | 6.27E+00 |
| -1225.0052 | -1148.5100 | 6.24E+00 |
| -1848.7725 | -1733.6600 | 6.23E+00 |
| -2336.5475 | -2191.5600 | 6.21E+00 |
| -2902.5784 | -2723.0700 | 6.18E+00 |
| -3646.2360 | -3421.4100 | 6.17E+00 |
| -4151.9708 | -3896.8700 | 6.14E+00 |
| -4729.9863 | -4440.3600 | 6.12E+00 |
| -5376.0383 | -5047.9800 | 6.10E+00 |
| -5892.4581 | -5534.2000 | 6.08E+00 |
| -6380.0231 | -5993.5700 | 6.06E+00 |
| -6839.5718 | -6426.8600 | 6.03E+00 |
| -7363.5994 | -6920.8400 | 6.01E+00 |
| -7857.8617 | -7387.2100 | 5.99E+00 |
| -8411.3672 | -7909.3900 | 5.97E+00 |
| -8847.5396 | -8321.5500 | 5.95E+00 |

ANEXO T. ÍNDICE DE REFRACCIÓN SnS-Bi102a

| índice de refracción SnS-Bi102a | | |
|---|---|---|
| T-GMS&ES | T-software | Error % |
| 5,9923 | 5,9923 | 2,04E-05 |
| 5,9256 | 5,9257 | 6,15E-05 |
| 5,8604 | 5,8604 | 6,62E-05 |
| 5,7966 | 5,7966 | 8,13E-05 |
| 5,7341 | 5,7341 | 1,94E-05 |
| 5,6728 | 5,6728 | 5,93E-05 |
| 5,6128 | 5,6129 | 6,97E-05 |
| 5,5541 | 5,5541 | 8,17E-05 |
| 5,4965 | 5,4965 | 3,47E-05 |
| 5,4401 | 5,4401 | 6,72E-05 |
| 5,3848 | 5,3848 | 0,00E+00 |
| 5,3306 | 5,3306 | 2,35E-05 |
| 5,2775 | 5,2775 | 2,47E-05 |
| 5,2254 | 5,2254 | 8,70E-05 |
| 5,1743 | 5,1743 | 3,71E-05 |
| 5,1242 | 5,1242 | 9,36E-05 |
| 5,0751 | 5,0751 | 3,96E-05 |
| 5,0269 | 5,0269 | 5,76E-05 |
| 4,9796 | 4,9796 | 2,95E-05 |
| 4,9332 | 4,9332 | 1,25E-05 |
| 4,8876 | 4,8876 | 5,11E-05 |
| 4,8430 | 4,8430 | 2,89E-05 |
| 4,7991 | 4,7991 | 5,43E-06 |

| | | |
|---|---|---|
| 4,7560 | 4,7560 | 8,21E-05 |
| 4,7138 | 4,7138 | 5,86E-05 |
| 4,6723 | 4,6723 | 4,60E-05 |
| 4,6315 | 4,6315 | 1,66E-05 |
| 4,5915 | 4,5915 | 7,96E-05 |
| 4,5522 | 4,5522 | 1,79E-05 |
| 4,5135 | 4,5135 | 1,18E-05 |
| 4,4756 | 4,4756 | 3,09E-05 |
| 4,4383 | 4,4383 | 9,27E-05 |
| 4,4017 | 4,4017 | 3,07E-05 |
| 4,3657 | 4,3657 | 1,08E-04 |
| 4,3303 | 4,3303 | 9,06E-06 |
| 4,2956 | 4,2956 | 1,90E-05 |
| 4,2614 | 4,2614 | 5,82E-06 |
| 4,2278 | 4,2278 | 4,74E-05 |
| 4,1947 | 4,1947 | 2,31E-05 |
| 4,1623 | 4,1623 | 9,41E-05 |
| 4,1303 | 4,1303 | 2,69E-05 |
| 4,0989 | 4,0989 | 1,01E-04 |
| 4,0680 | 4,0680 | 8,91E-05 |
| 4,0376 | 4,0376 | 4,26E-05 |
| 4,0077 | 4,0077 | 7,08E-05 |
| 3,9783 | 3,9783 | 9,55E-06 |
| 3,9493 | 3,9493 | 1,20E-04 |
| 3,9209 | 3,9209 | 1,03E-04 |
| 3,8928 | 3,8928 | 1,01E-04 |
| 3,8652 | 3,8652 | 4,72E-05 |
| 3,8381 | 3,8381 | 5,12E-05 |
| 3,8114 | 3,8114 | 6,74E-05 |
| 3,7851 | 3,7851 | 1,65E-05 |
| 3,7592 | 3,7592 | 2,15E-05 |
| 3,7337 | 3,7337 | 4,03E-05 |
| 3,7085 | 3,7086 | 2,39E-05 |
| 3,6838 | 3,6838 | 8,34E-05 |
| 3,6595 | 3,6595 | 7,15E-05 |
| 3,6355 | 3,6355 | 4,80E-06 |
| 3,6119 | 3,6119 | 4,52E-05 |
| 3,5886 | 3,5886 | 0,00E+00 |
| 3,5657 | 3,5657 | 5,45E-05 |
| 3,5431 | 3,5431 | 1,21E-04 |
| 3,5208 | 3,5209 | 1,07E-04 |
| 3,4989 | 3,4989 | 9,10E-05 |
| 3,4773 | 3,4773 | 4,79E-06 |
| 3,4560 | 3,4560 | 2,87E-05 |
| 3,4350 | 3,4351 | 1,13E-05 |
| 3,4144 | 3,4144 | 3,47E-06 |
| 3,3940 | 3,3940 | 9,58E-05 |
| 3,3739 | 3,3739 | 1,15E-04 |
| 3,3541 | 3,3541 | 1,19E-04 |
| 3,3346 | 3,3346 | 6,66E-05 |
| 3,3153 | 3,3153 | 1,19E-04 |
| 3,2963 | 3,2963 | 1,82E-05 |
| 3,2776 | 3,2776 | 2,64E-05 |
| 3,2591 | 3,2591 | 5,30E-05 |
| 3,2409 | 3,2409 | 6,29E-05 |
| 3,2230 | 3,2230 | 1,31E-04 |
| 3,2053 | 3,2053 | 1,54E-04 |
| 3,1878 | 3,1878 | 1,56E-04 |
| 3,1706 | 3,1706 | 5,57E-05 |
| 3,1536 | 3,1536 | 2,69E-05 |
| 3,1368 | 3,1368 | 5,97E-05 |
| 3,1202 | 3,1202 | 1,47E-05 |
| 3,1039 | 3,1039 | 3,58E-05 |
| 3,0878 | 3,0878 | 3,40E-05 |
| 3,0719 | 3,0719 | 2,42E-05 |
| 3,0562 | 3,0562 | 5,53E-05 |
| 3,0407 | 3,0407 | 8,13E-05 |
| 3,0254 | 3,0254 | 6,00E-05 |
| 3,0104 | 3,0104 | 6,53E-05 |
| 2,9955 | 2,9955 | 1,35E-05 |
| 2,9808 | 2,9808 | 5,66E-06 |
| 2,9662 | 2,9663 | 6,76E-05 |
| 2,9519 | 2,9519 | 2,33E-05 |
| 2,9378 | 2,9378 | 1,66E-04 |
| 2,9238 | 2,9238 | 6,03E-05 |
| 2,9100 | 2,9100 | 1,02E-04 |
| 2,8964 | 2,8964 | 4,91E-05 |
| 2,8830 | 2,8830 | 0,00E+00 |
| 2,8697 | 2,8697 | 5,28E-05 |
| 2,8566 | 2,8566 | 4,46E-05 |

| | | |
|---|---|---|
| 2,8436 | 2,8436 | 1,52E-04 |
| 2,8308 | 2,8308 | 3,42E-05 |
| 2,8182 | 2,8182 | 4,37E-05 |
| 2,8057 | 2,8057 | 8,33E-05 |
| 2,7933 | 2,7933 | 9,81E-05 |
| 2,7812 | 2,7812 | 3,93E-05 |
| 2,7691 | 2,7691 | 5,25E-05 |
| 2,7572 | 2,7572 | 1,45E-04 |
| 2,7455 | 2,7455 | 8,89E-05 |
| 2,7338 | 2,7339 | 5,39E-05 |
| 2,7224 | 2,7224 | 7,54E-05 |
| 2,7110 | 2,7110 | 3,19E-05 |
| 2,6998 | 2,6998 | 1,05E-04 |
| 2,6887 | 2,6888 | 1,53E-04 |
| 2,6778 | 2,6778 | 7,43E-05 |
| 2,6670 | 2,6670 | 1,06E-04 |
| 2,6563 | 2,6563 | 5,42E-05 |
| 2,6457 | 2,6457 | 4,25E-05 |
| 2,6353 | 2,6353 | 9,09E-05 |
| 2,6249 | 2,6249 | 1,61E-04 |
| 2,6147 | 2,6147 | 6,02E-05 |
| 2,6046 | 2,6046 | 1,24E-04 |
| 2,5946 | 2,5946 | 3,94E-05 |
| 2,5848 | 2,5848 | 1,11E-04 |
| 2,5750 | 2,5750 | 1,56E-04 |
| 2,5653 | 2,5653 | 1,52E-04 |
| 2,5558 | 2,5558 | 2,84E-05 |
| 2,5464 | 2,5464 | 1,94E-05 |
| 2,5370 | 2,5370 | 1,57E-04 |
| 2,5278 | 2,5278 | 1,70E-04 |
| 2,5187 | 2,5187 | 1,52E-04 |
| 2,5096 | 2,5096 | 1,26E-04 |
| 2,5007 | 2,5007 | 3,30E-05 |
| 2,4919 | 2,4919 | 1,84E-04 |
| 2,4831 | 2,4831 | 1,81E-04 |
| 2,4745 | 2,4745 | 1,02E-05 |
| 2,4659 | 2,4659 | 1,30E-04 |
| 2,4575 | 2,4575 | 1,91E-04 |
| 2,4491 | 2,4491 | 1,63E-04 |
| 2,4408 | 2,4408 | 6,51E-05 |
| 2,4326 | 2,4326 | 1,31E-04 |
| 2,4245 | 2,4245 | 6,31E-05 |
| 2,4165 | 2,4165 | 1,94E-04 |
| 2,4085 | 2,4086 | 1,59E-04 |
| 2,4007 | 2,4007 | 4,96E-06 |
| 2,3929 | 2,3929 | 1,97E-04 |
| 2,3852 | 2,3852 | 5,20E-05 |
| 2,3776 | 2,3776 | 1,41E-04 |
| 2,3701 | 2,3701 | 1,87E-05 |
| 2,3626 | 2,3626 | 6,44E-05 |
| 2,3552 | 2,3552 | 4,92E-05 |
| 2,3479 | 2,3479 | 5,82E-05 |
| 2,3407 | 2,3407 | 8,21E-05 |
| 2,3335 | 2,3335 | 8,67E-05 |
| 2,3264 | 2,3264 | 3,33E-06 |
| 2,3194 | 2,3194 | 1,47E-04 |
| 2,3125 | 2,3125 | 1,28E-04 |
| 2,3056 | 2,3056 | 0,00E+00 |
| 2,2988 | 2,2988 | 6,07E-05 |
| 2,2921 | 2,2921 | 1,37E-05 |
| 2,2854 | 2,2854 | 1,81E-04 |
| 2,2788 | 2,2788 | 1,24E-04 |
| 2,2722 | 2,2722 | 1,49E-04 |
| 2,2657 | 2,2657 | 1,61E-04 |
| 2,2593 | 2,2593 | 1,28E-04 |
| 2,2530 | 2,2530 | 1,32E-04 |
| 2,2467 | 2,2467 | 1,96E-05 |
| 2,2404 | 2,2405 | 5,81E-05 |
| 2,2343 | 2,2343 | 1,35E-04 |
| 2,2282 | 2,2282 | 2,02E-04 |
| 2,2221 | 2,2221 | 2,31E-05 |
| 2,2161 | 2,2161 | 1,93E-04 |
| 2,2102 | 2,2102 | 2,24E-04 |
| 2,2043 | 2,2043 | 9,68E-05 |
| 2,1985 | 2,1985 | 2,18E-04 |
| 2,1927 | 2,1927 | 1,07E-04 |
| 2,1870 | 2,1870 | 1,87E-04 |
| 2,1813 | 2,1813 | 2,87E-05 |
| 2,1757 | 2,1757 | 1,14E-04 |
| 2,1701 | 2,1701 | 9,91E-05 |

| | | |
|---|---|---|
| 2,1646 | 2,1646 | 1,17E-05 |
| 2,1592 | 2,1592 | 1,19E-04 |
| 2,1538 | 2,1538 | 2,01E-04 |
| 2,1484 | 2,1484 | 7,09E-05 |
| 2,1431 | 2,1431 | 1,61E-05 |
| 2,1378 | 2,1378 | 3,23E-05 |
| 2,1326 | 2,1326 | 5,05E-05 |
| 2,1275 | 2,1275 | 2,10E-04 |
| 2,1223 | 2,1224 | 1,54E-04 |
| 2,1173 | 2,1173 | 2,27E-04 |
| 2,1122 | 2,1123 | 3,48E-05 |
| 2,1073 | 2,1073 | 7,53E-05 |
| 2,1023 | 2,1023 | 9,99E-05 |
| 2,0974 | 2,0974 | 9,73E-06 |
| 2,0926 | 2,0926 | 4,67E-05 |
| 2,0878 | 2,0878 | 2,33E-04 |
| 2,0830 | 2,0830 | 8,43E-05 |
| 2,0783 | 2,0783 | 1,66E-05 |
| 2,0736 | 2,0736 | 1,99E-05 |
| 2,0690 | 2,0690 | 7,11E-05 |
| 2,0644 | 2,0644 | 1,47E-04 |
| 2,0598 | 2,0598 | 2,26E-04 |
| 2,0553 | 2,0553 | 2,01E-04 |
| 2,0508 | 2,0508 | 1,86E-04 |
| 2,0464 | 2,0464 | 2,36E-04 |
| 2,0420 | 2,0420 | 1,18E-04 |
| 2,0376 | 2,0376 | 1,27E-04 |
| 2,0333 | 2,0333 | 1,00E-05 |
| 2,0290 | 2,0290 | 4,39E-05 |
| 2,0247 | 2,0247 | 2,44E-04 |
| 2,0205 | 2,0205 | 1,55E-04 |
| 2,0163 | 2,0163 | 2,23E-04 |
| 2,0122 | 2,0122 | 1,28E-04 |
| 2,0081 | 2,0081 | 2,37E-04 |
| 2,0040 | 2,0040 | 1,21E-04 |
| 2,0000 | 2,0000 | 2,01E-04 |
| 1,9960 | 1,9960 | 2,11E-04 |
| 1,9920 | 1,9920 | 1,12E-04 |

ANEXO U. COEFICIENTE DE ABSORCIÓN SnS-Bi102a

| **coeficiente de absorción SnS-Bi102a** | | |
|---|---|---|
| **T- GMS&ES** | **T-software** | **Error %** |
| 176159,3772 | 178079,0000 | 1,09E+00 |
| 90707,6528 | 91694,7000 | 1,09E+00 |
| 62617,1070 | 63298,0000 | 1,09E+00 |
| 42604,8822 | 43067,3000 | 1,09E+00 |
| 31372,7542 | 31713,2000 | 1,09E+00 |
| 27238,3770 | 27534,3000 | 1,09E+00 |
| 28214,4293 | 28521,8000 | 1,09E+00 |
| 26205,2770 | 26491,9000 | 1,09E+00 |
| 25385,8026 | 25664,7000 | 1,10E+00 |
| 24256,7403 | 24524,5000 | 1,10E+00 |
| 23348,7557 | 23607,8000 | 1,11E+00 |
| 21962,5944 | 22207,5000 | 1,12E+00 |
| 20394,5667 | 20623,2000 | 1,12E+00 |
| 17977,2434 | 18179,7000 | 1,13E+00 |
| 15981,7598 | 16162,4000 | 1,13E+00 |
| 13480,5154 | 13633,4000 | 1,13E+00 |
| 10520,9796 | 10640,5000 | 1,14E+00 |
| 7663,0919 | 7750,1400 | 1,14E+00 |
| 4571,5852 | 4623,2600 | 1,13E+00 |
| 1231,5852 | 1245,4800 | 1,13E+00 |
| -1209,9381 | -1223,3100 | 1,11E+00 |
| -3686,1376 | -3726,1300 | 1,08E+00 |
| -5618,6757 | -5678,5600 | 1,07E+00 |
| -7302,3847 | -7378,3900 | 1,04E+00 |
| -8000,8272 | -8082,7200 | 1,02E+00 |
| -8272,3851 | -8355,8600 | 1,01E+00 |
| -7871,1838 | -7950,1700 | 1,00E+00 |
| -7075,1695 | -7146,0500 | 1,00E+00 |
| -6037,9925 | -6098,7000 | 1,01E+00 |
| -4833,4822 | -4882,3600 | 1,01E+00 |
| -3440,7325 | -3475,8300 | 1,02E+00 |
| -2192,7432 | -2215,3000 | 1,03E+00 |
| -859,0848 | -867,9860 | 1,04E+00 |
| 201,8444 | 203,9200 | 1,03E+00 |
| 1174,5229 | 1186,9300 | 1,06E+00 |

| | | |
|---|---|---|
| 2040,2732 | 2061,9600 | 1,06E+00 |
| 2713,3062 | 2742,4000 | 1,07E+00 |
| 3213,2342 | 3247,9400 | 1,08E+00 |
| 3512,8665 | 3551,1100 | 1,09E+00 |
| 3720,0846 | 3760,8900 | 1,10E+00 |
| 3745,3590 | 3786,7500 | 1,11E+00 |
| 3659,4301 | 3700,1700 | 1,11E+00 |
| 3462,8259 | 3501,6400 | 1,12E+00 |
| 3130,0678 | 3165,3800 | 1,13E+00 |
| 2814,6369 | 2846,5800 | 1,13E+00 |
| 2344,1741 | 2370,9200 | 1,14E+00 |
| 1846,6161 | 1867,8000 | 1,15E+00 |
| 1289,8947 | 1304,8000 | 1,16E+00 |
| 964,9764 | 976,1510 | 1,16E+00 |
| 506,2479 | 512,0890 | 1,15E+00 |
| 160,8008 | 162,6550 | 1,15E+00 |
| -188,2373 | -190,4400 | 1,17E+00 |
| -471,5371 | -477,0260 | 1,16E+00 |
| -605,8995 | -612,9260 | 1,16E+00 |
| -703,0095 | -711,1300 | 1,16E+00 |
| -694,2183 | -702,2040 | 1,15E+00 |
| -730,7001 | -739,0910 | 1,15E+00 |
| -674,5015 | -682,1740 | 1,14E+00 |
| -612,9880 | -619,9470 | 1,14E+00 |
| -391,4176 | -395,8110 | 1,12E+00 |
| -273,8465 | -276,8690 | 1,10E+00 |
| -104,4274 | -105,5290 | 1,05E+00 |
| -69,8107 | -70,5054 | 9,95E-01 |
| 259,1684 | 262,1040 | 1,13E+00 |
| 432,7311 | 437,5500 | 1,11E+00 |
| 531,5335 | 537,3840 | 1,10E+00 |
| 722,4781 | 730,4240 | 1,10E+00 |
| 911,2344 | 921,1300 | 1,09E+00 |
| 1091,9341 | 1103,7000 | 1,08E+00 |
| 1179,7874 | 1192,4600 | 1,07E+00 |
| 1489,2351 | 1505,1100 | 1,07E+00 |
| 1619,0492 | 1636,2400 | 1,06E+00 |
| 1654,5389 | 1672,0600 | 1,06E+00 |
| 1813,5231 | 1832,5900 | 1,05E+00 |
| 1876,2426 | 1895,8900 | 1,05E+00 |
| 1915,5132 | 1935,4900 | 1,04E+00 |
| 2056,2777 | 2077,6700 | 1,04E+00 |
| 2043,7544 | 2064,9900 | 1,04E+00 |
| 2008,9586 | 2029,7000 | 1,03E+00 |
| 2171,0045 | 2193,4400 | 1,03E+00 |
| 2240,1406 | 2263,2800 | 1,03E+00 |
| 2274,8076 | 2298,1900 | 1,03E+00 |
| 2228,0559 | 2250,9200 | 1,03E+00 |
| 2245,1693 | 2268,2700 | 1,03E+00 |
| 2315,2792 | 2339,0700 | 1,03E+00 |
| 2301,9628 | 2325,6200 | 1,03E+00 |
| 2333,4943 | 2357,4800 | 1,03E+00 |
| 2362,5700 | 2386,8800 | 1,03E+00 |
| 2348,8873 | 2373,0700 | 1,03E+00 |
| 2330,1429 | 2354,1600 | 1,03E+00 |
| 2303,8912 | 2327,6700 | 1,03E+00 |
| 2301,4820 | 2325,3100 | 1,04E+00 |
| 2317,9512 | 2342,0100 | 1,04E+00 |
| 2349,1257 | 2373,5700 | 1,04E+00 |
| 2391,6331 | 2416,5900 | 1,04E+00 |
| 2382,5511 | 2407,4900 | 1,05E+00 |
| 2441,3788 | 2467,0100 | 1,05E+00 |
| 2475,9889 | 2502,0800 | 1,05E+00 |
| 2515,0967 | 2541,6900 | 1,06E+00 |
| 2557,7567 | 2584,9000 | 1,06E+00 |
| 2603,4061 | 2631,1400 | 1,07E+00 |
| 2596,5833 | 2624,3500 | 1,07E+00 |
| 2648,1473 | 2676,5800 | 1,07E+00 |
| 2648,1717 | 2676,7200 | 1,08E+00 |
| 2624,9779 | 2653,3900 | 1,08E+00 |
| 2525,2721 | 2552,7100 | 1,09E+00 |
| 2431,0774 | 2457,5900 | 1,09E+00 |
| 2262,4711 | 2287,2400 | 1,09E+00 |
| 2207,0410 | 2231,3000 | 1,10E+00 |
| 2239,1978 | 2263,9200 | 1,10E+00 |
| 2280,6962 | 2305,9800 | 1,11E+00 |
| 2278,4486 | 2303,8100 | 1,11E+00 |
| 2232,7019 | 2257,6600 | 1,12E+00 |
| 2367,4233 | 2394,0000 | 1,12E+00 |
| 2350,2453 | 2376,7100 | 1,13E+00 |

| | | |
|---|---|---|
| 2407,1099 | 2434,3300 | 1,13E+00 |
| 2484,2913 | 2512,5000 | 1,14E+00 |
| 2584,3660 | 2613,8300 | 1,14E+00 |
| 2618,5778 | 2648,5500 | 1,14E+00 |
| 2770,8836 | 2802,7100 | 1,15E+00 |
| 2764,4049 | 2796,2700 | 1,15E+00 |
| 2849,1953 | 2882,1500 | 1,16E+00 |
| 2867,3998 | 2900,6900 | 1,16E+00 |
| 2949,9267 | 2984,2700 | 1,16E+00 |
| 3067,3221 | 3103,1500 | 1,17E+00 |
| 3118,2239 | 3154,7300 | 1,17E+00 |
| 3205,6374 | 3243,2700 | 1,17E+00 |
| 3332,3607 | 3371,5700 | 1,18E+00 |
| 3427,5965 | 3468,0200 | 1,18E+00 |
| 3527,4424 | 3569,1400 | 1,18E+00 |
| 3670,7795 | 3714,2600 | 1,18E+00 |
| 3743,4656 | 3787,8900 | 1,19E+00 |
| 3900,4596 | 3946,8300 | 1,19E+00 |
| 4065,8422 | 4114,2500 | 1,19E+00 |
| 4240,0918 | 4290,6400 | 1,19E+00 |
| 4507,7851 | 4561,5800 | 1,19E+00 |
| 4745,5263 | 4802,2100 | 1,19E+00 |
| 4863,7588 | 4921,9200 | 1,20E+00 |
| 4945,1114 | 5004,3000 | 1,20E+00 |
| 5077,7454 | 5138,5600 | 1,20E+00 |
| 5127,1806 | 5188,6300 | 1,20E+00 |
| 5182,2653 | 5244,4100 | 1,20E+00 |
| 5243,1873 | 5306,1000 | 1,20E+00 |
| 5263,0126 | 5326,1700 | 1,20E+00 |
| 5335,5308 | 5399,5800 | 1,20E+00 |
| 5366,2054 | 5430,6300 | 1,20E+00 |
| 5402,2363 | 5467,0900 | 1,20E+00 |
| 5345,9201 | 5410,1000 | 1,20E+00 |
| 5342,7884 | 5406,9200 | 1,20E+00 |
| 5344,4327 | 5408,5700 | 1,20E+00 |
| 5201,4282 | 5263,8400 | 1,20E+00 |
| 5261,8489 | 5324,9500 | 1,20E+00 |
| 5176,6056 | 5238,6600 | 1,20E+00 |
| 5044,7458 | 5105,1900 | 1,20E+00 |
| 5017,8285 | 5077,9000 | 1,20E+00 |
| 4944,3928 | 5003,5300 | 1,20E+00 |
| 4874,9681 | 4933,2300 | 1,20E+00 |
| 4758,4183 | 4815,2200 | 1,19E+00 |
| 4748,2020 | 4804,8200 | 1,19E+00 |
| 4639,4202 | 4694,7000 | 1,19E+00 |
| 4585,9463 | 4640,5300 | 1,19E+00 |
| 4484,8853 | 4538,2200 | 1,19E+00 |
| 4336,1875 | 4387,6500 | 1,19E+00 |
| 4139,8726 | 4188,9400 | 1,19E+00 |
| 3998,8981 | 4046,2300 | 1,18E+00 |
| 3759,3693 | 3803,8000 | 1,18E+00 |
| 3422,4420 | 3462,8300 | 1,18E+00 |
| 3141,5249 | 3178,5700 | 1,18E+00 |
| 2966,3817 | 3001,2700 | 1,18E+00 |
| 2644,7804 | 2675,8400 | 1,17E+00 |
| 2528,3603 | 2558,0000 | 1,17E+00 |
| 2365,9388 | 2393,6300 | 1,17E+00 |
| 2158,0195 | 2183,2300 | 1,17E+00 |
| 1954,6156 | 1977,4100 | 1,17E+00 |
| 1755,7100 | 1776,1400 | 1,16E+00 |
| 1659,0117 | 1678,2800 | 1,16E+00 |
| 1419,8627 | 1436,3300 | 1,16E+00 |
| 1282,3573 | 1297,1900 | 1,16E+00 |
| 1100,5806 | 1113,2900 | 1,15E+00 |
| 923,1096 | 933,7470 | 1,15E+00 |
| 749,8920 | 758,5180 | 1,15E+00 |
| 628,1151 | 635,3170 | 1,15E+00 |
| 556,9671 | 563,3370 | 1,14E+00 |
| 442,0223 | 447,0650 | 1,14E+00 |
| 237,4856 | 240,1870 | 1,14E+00 |
| 129,8234 | 131,2980 | 1,14E+00 |
| 163,4217 | 165,2700 | 1,13E+00 |
| 107,2132 | 108,4230 | 1,13E+00 |
| -37,5850 | -38,0002 | 1,10E+00 |
| 2,4415 | 2,4721 | 1,25E+00 |
| -91,4673 | -92,4834 | 1,11E+00 |

Película #2: "$SnS_2$-Bi204a":

*Índice de Refracción (ANEXO D):*

**Figura 32. Índice de Refracción (GMS&ES SnS2-Bi204a).**

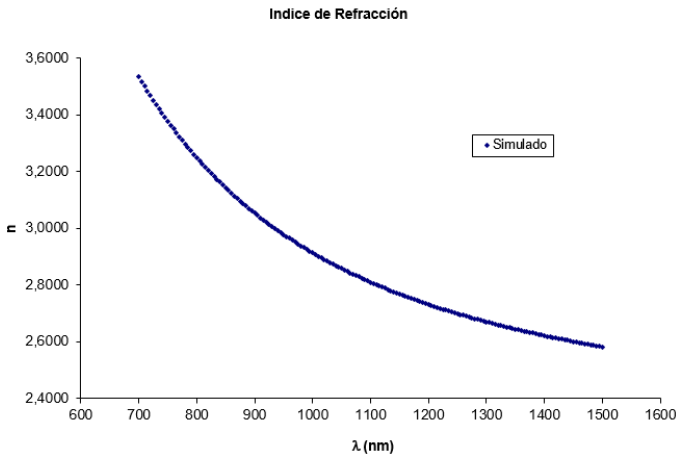
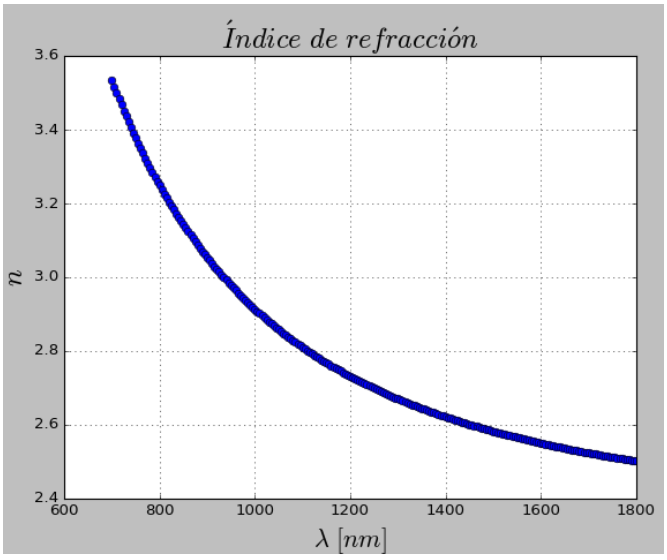



**Figura 33. Índice de Refracción (C.O.P.S-- SnS2-Bi204a).**




Error total promedio: $9.34 * 10^{-5}\%$

*Coeficiente de Absorción (ANEXO E):*

**Figura 34. Coeficiente de Absorción (GMS&ES - SnS2-Bi204a).**

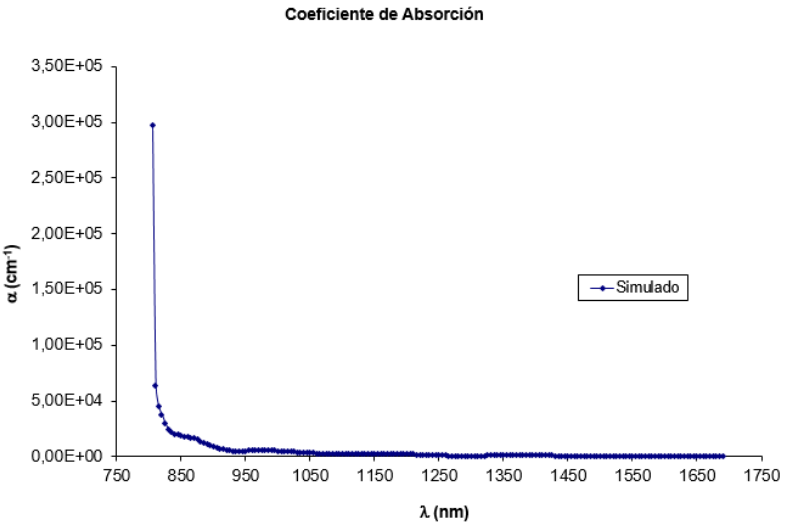
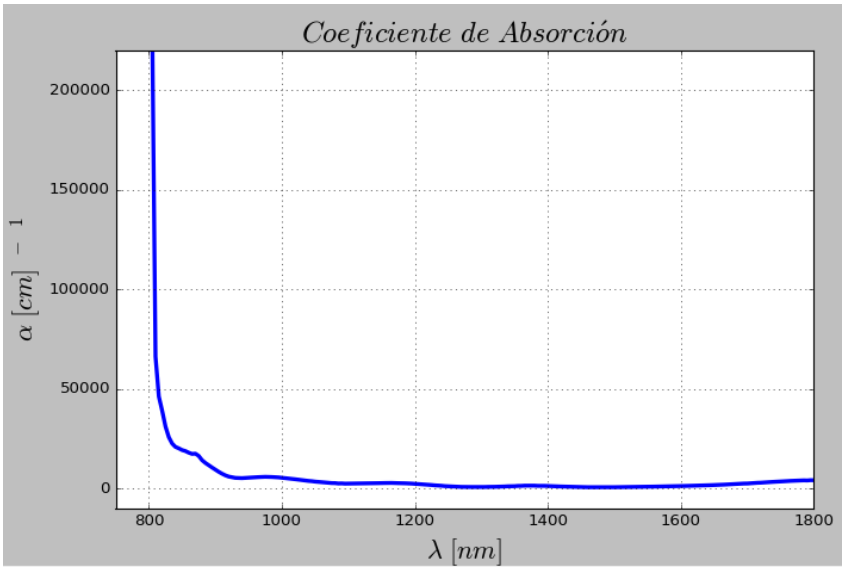



**Figura 35. Coeficiente de Absorción (C.O.P.S- SnS2-Bi204a).**




Error total promedio: 3.8042%

*Gap:*

Gap (GMS&ES - $SnS_2$-Bi204a): 1.542 eV

Gap (C.O.P.S- $SnS_2$-Bi204a) = 1.530eV

Error : $7.782*10^{-3}$ %

Película #3: "$SnS_2$-Bi206a":

*Índice de Refracción (ANEXO F):*

**Figura 36. Índice de Refracción (GMS&ES - SnS2-Bi206a).**

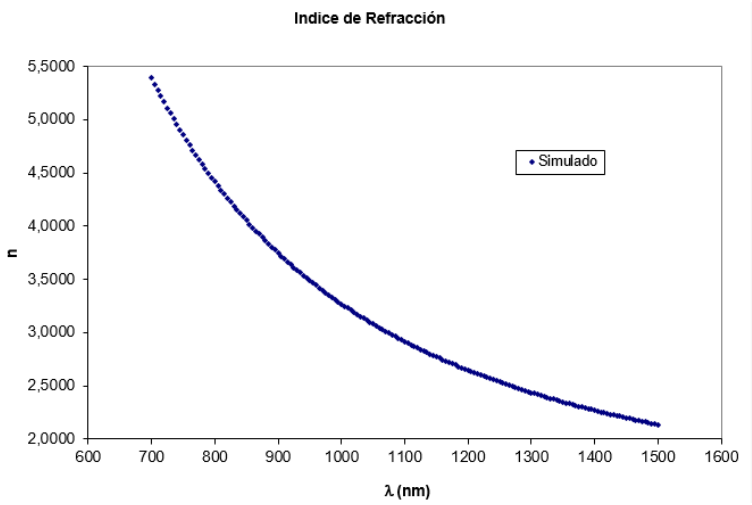
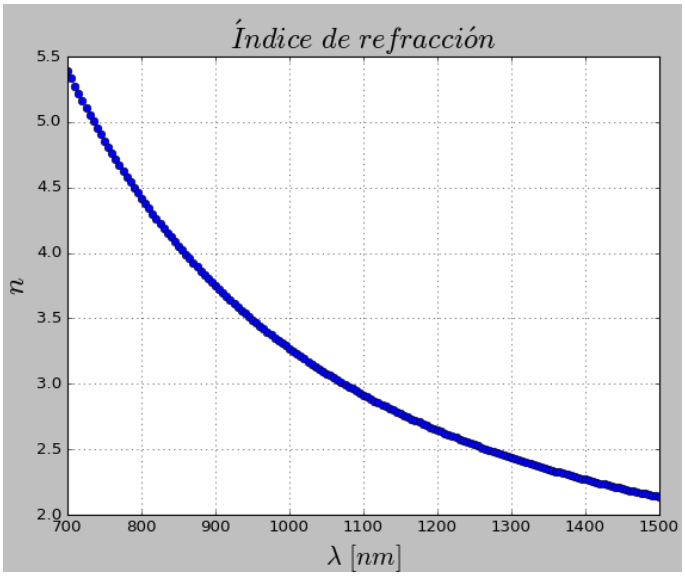


**Figura 37. Índice de Refracción (C.O.P.S- SnS2-Bi206a).**




Error total promedio: $7.96 * 10^{-5}\%$

*Coeficiente de Absorción (ANEXO G):*

**Figura 38. Coeficiente de Absorción (GMS&ES - SnS2-Bi206a).**

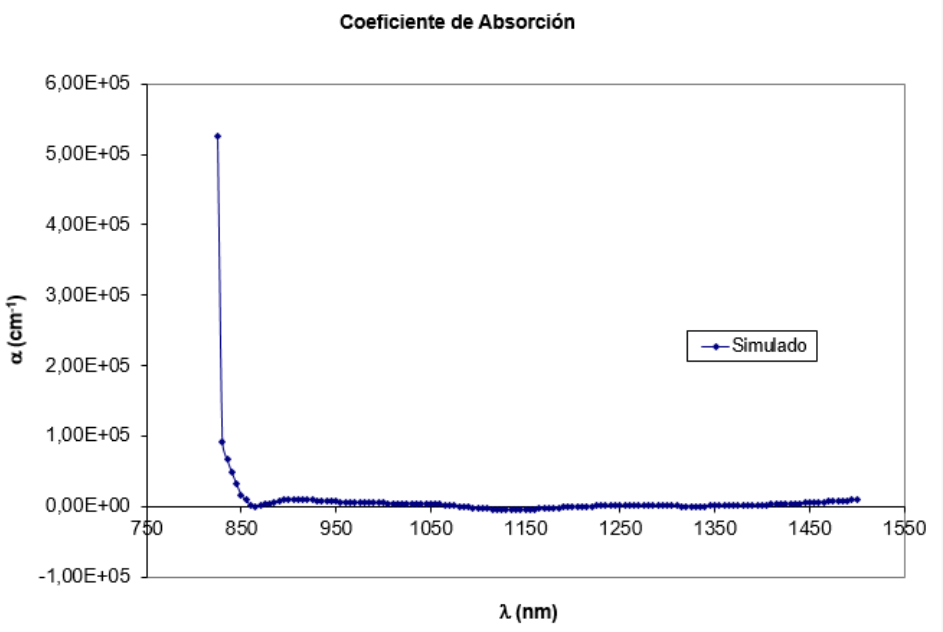
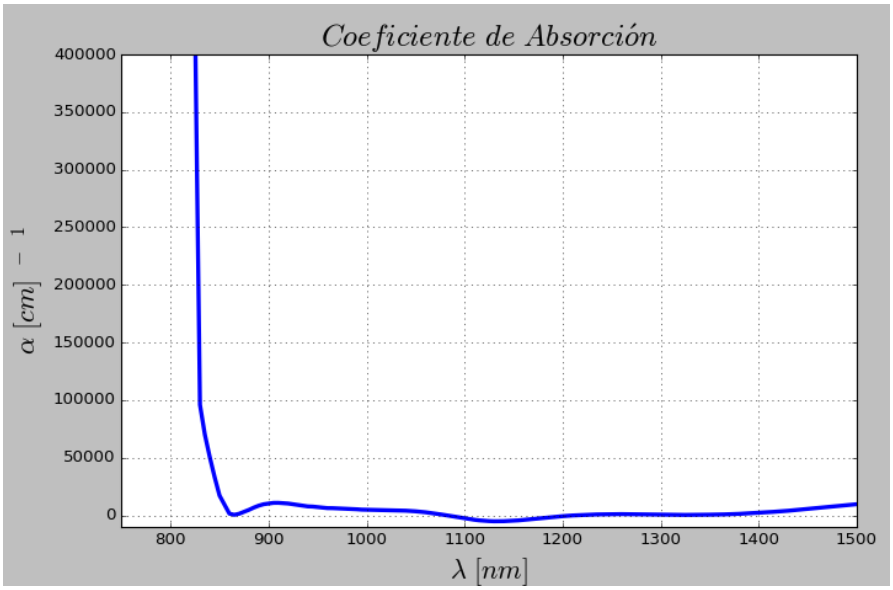


**Figura 39. Coeficiente de Absorción (C.O.P.S- SnS2-Bi206a).**




Error total promedio: $5.607\%$

*Gap:*

Gap (GMS&ES - $SnS_2$-Bi206a): 1.495 eV

Gap (C.O.P.S- $SnS_2$-Bi206a) = 1.493 eV

Error: $1.337 * 10^{-3}$ %

Película #4: "$SnS_2$-Bi207a":

*Índice de Refracción (ANEXO H):*

**Figura 40. Índice de Refracción (GMS&ES - SnS2-Bi207a).**

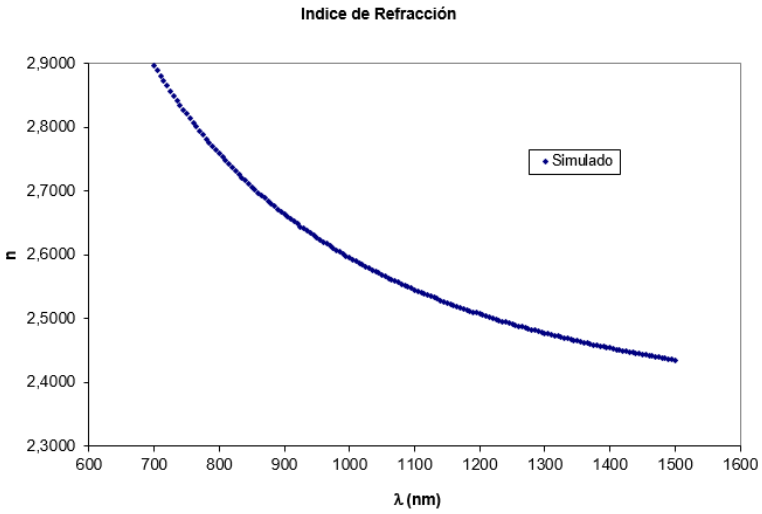
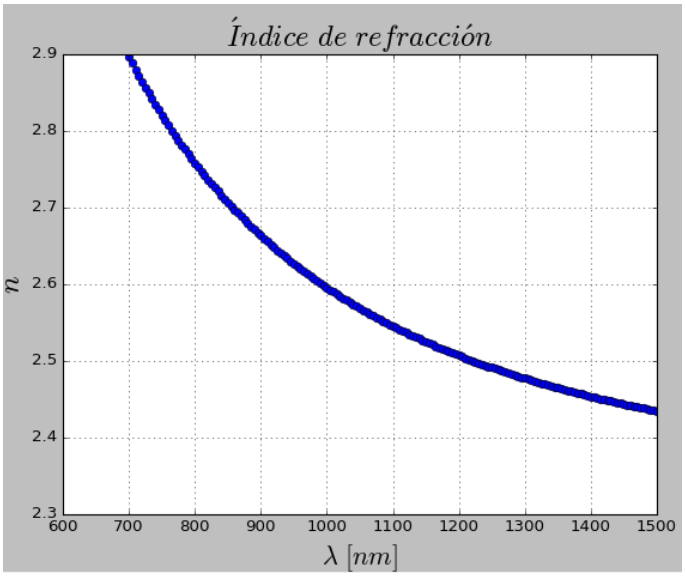



**Figura 41. Índice de Refracción (C.O.P.S- SnS2-Bi207a).**




Error total promedio: $9.32 * 10^{-5}\%$

*Coeficiente de Absorción (ANEXO I):*

**Figura 42. Coeficiente de Absorción (GMS&ES - SnS2-Bi207a).**

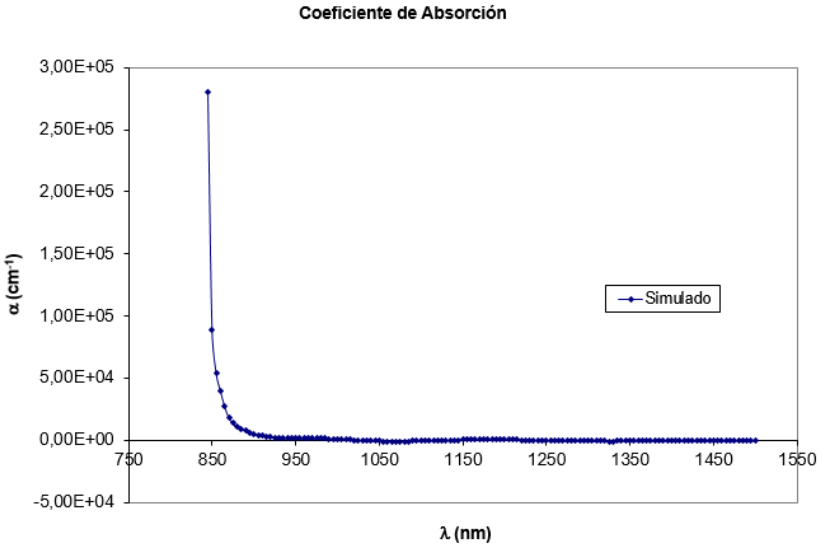
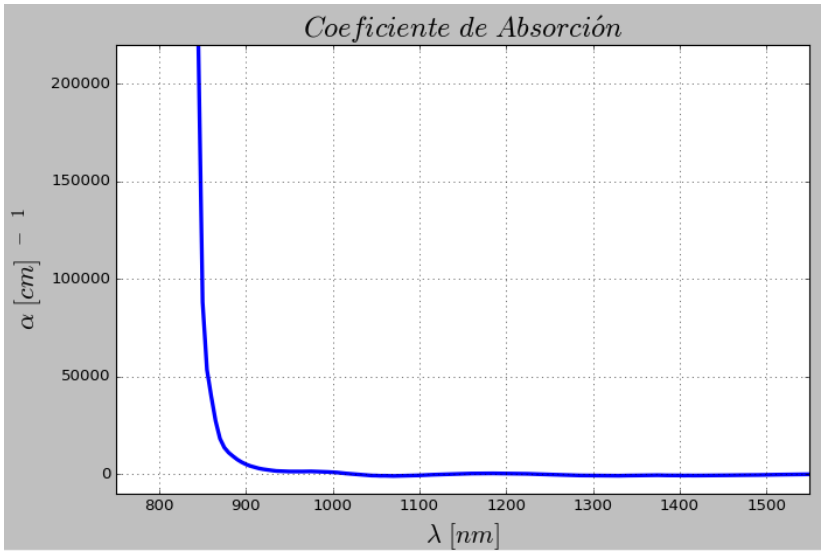



**Figura 43. Coeficiente de Absorción (C.O.P.S -SnS2-Bi207a).**




Error total promedio: $4.118 * 10^{-1}\%$

*Gap:*

Gap (GMS&ES - $SnS_2$-Bi207a): 1.459 eV

Gap (C.O.P.S- $SnS_2$-Bi207a) = 1.457 eV

Error: $1.37*10^{-3}$ %

**COMPUESTO ZNS:**

Película #1: “ZnS1Aa”:

*Índice de Refracción (ANEXO J):*

**Figura 44. Índice de Reacción (GMS&ES - ZnS1Aa).**

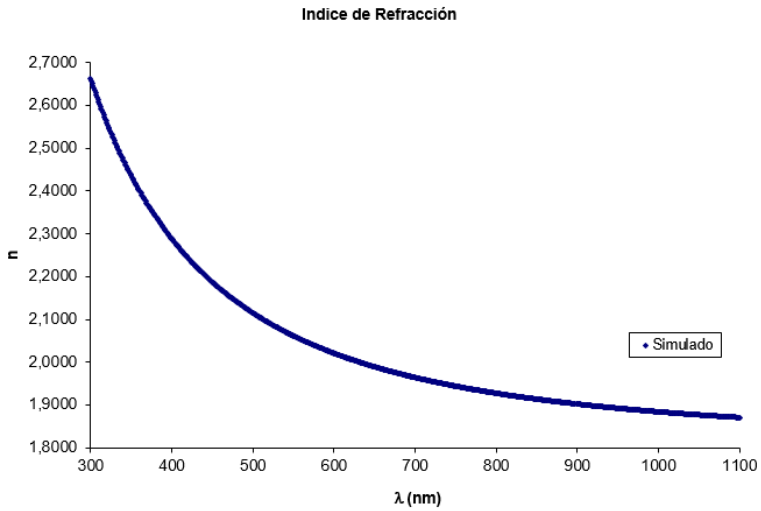
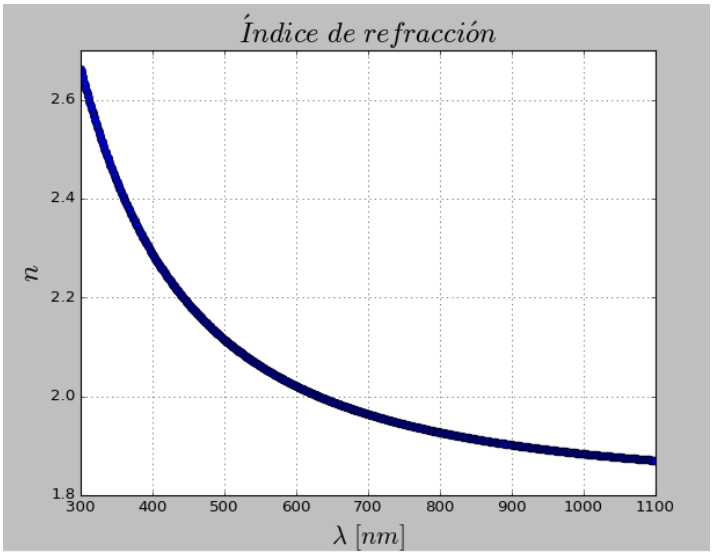


**Figura 45. Índice de Reacción (C.O.P.S- ZnS1Aa).**




Error total promedio: $1.07 * 10^{-4}\%$

*Coeficiente de Absorción (ANEXO K):*

**Figura 46. Coeficiente de Absorción (GMS&ES - ZnS1Aa).**

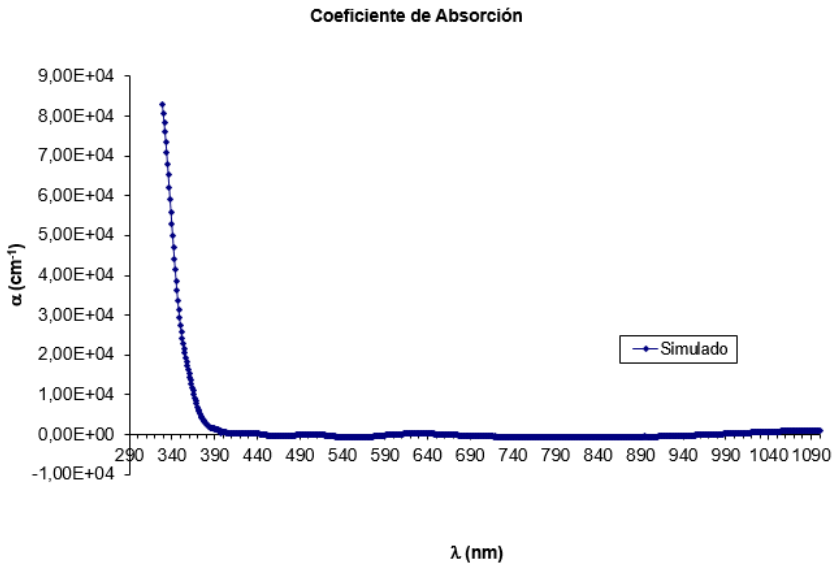
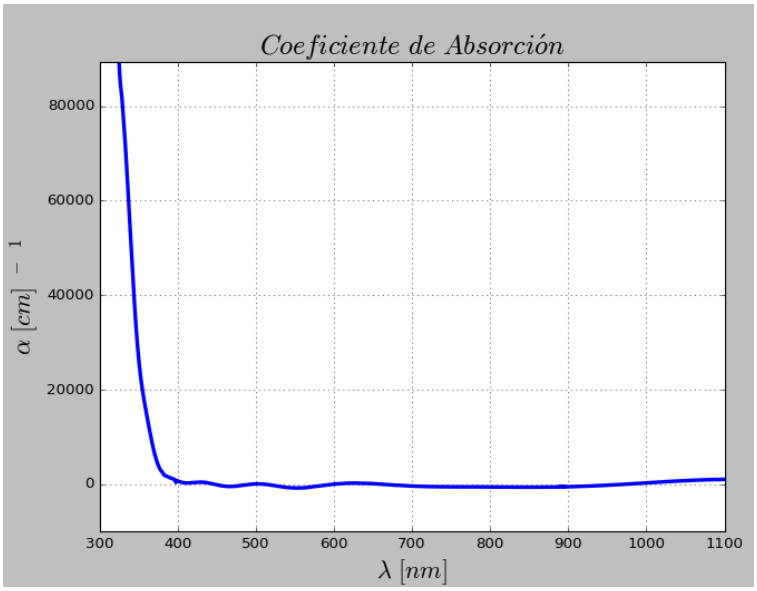


**Figura 47. Coeficiente de Absorción (C.O.P.S- ZnS1Aa).**




Error total promedio: $1.7365\%$

*Gap:*

Gap (GMS&ES - ZnS1Aa): 3.58 eV

Gap (C.O.P.S- ZnS1Aa) = 3.5772 eV

Error: $78.21*10^{-3}\%$

Película #2: “ZnS13A1”:

*Índice de Refracción (ANEXO L):*

**Figura 48. Índice de Refracción (GMS&ES - ZnS13A1).**

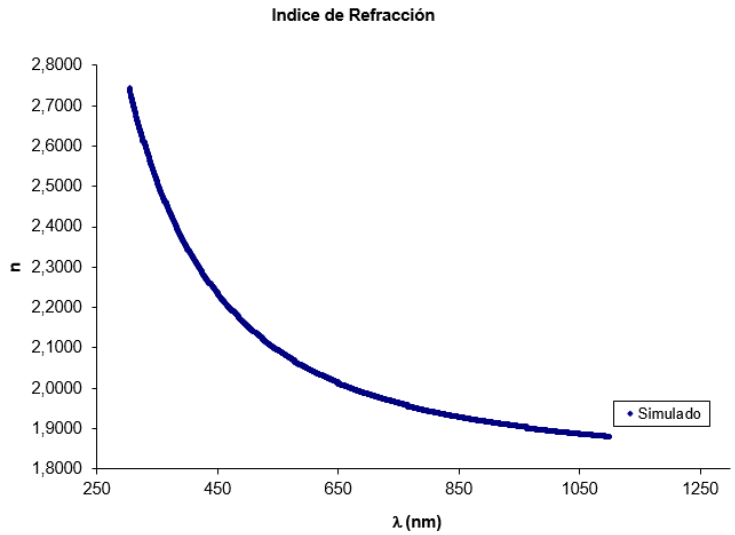
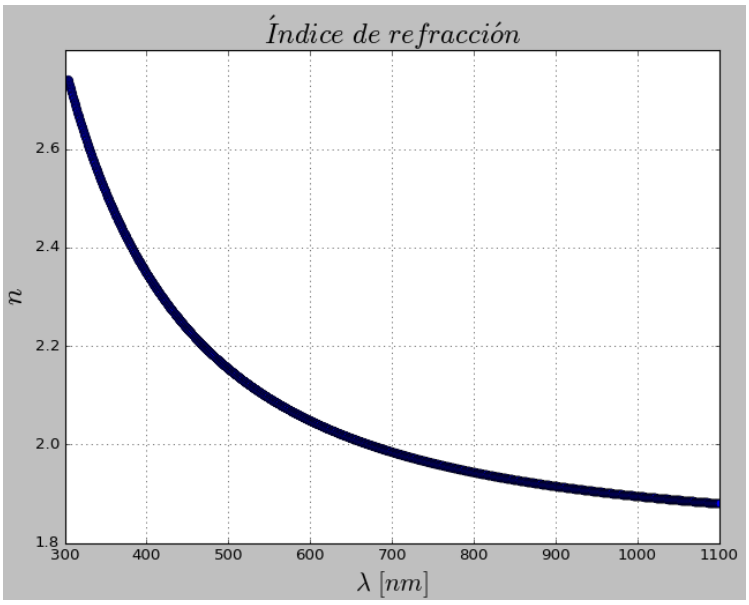



**Figura 49. Índice de Refracción (C.O.P.S- ZnS13A1).**




Error total promedio: $1.04 * 10^{-4}\%$

*Coeficiente de Absorción (ANEXO M):*

**Figura 50. Coeficiente de Absorción (GMS&ES - ZnS13A1).**

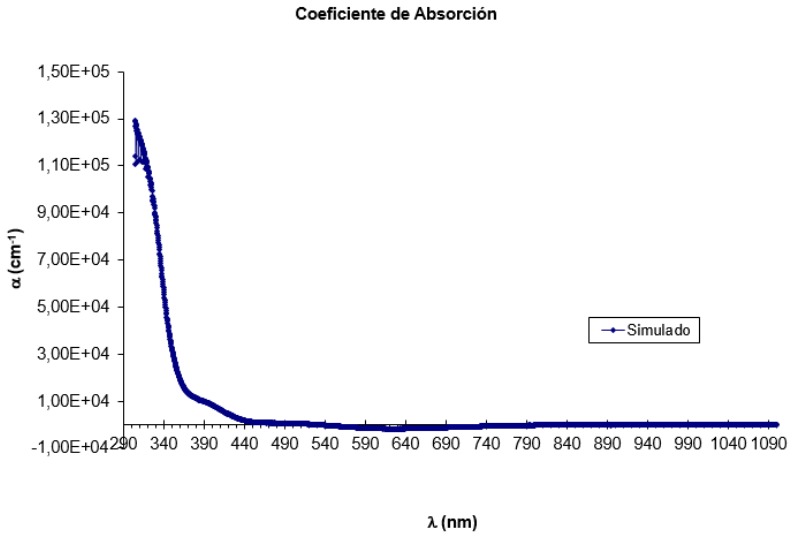
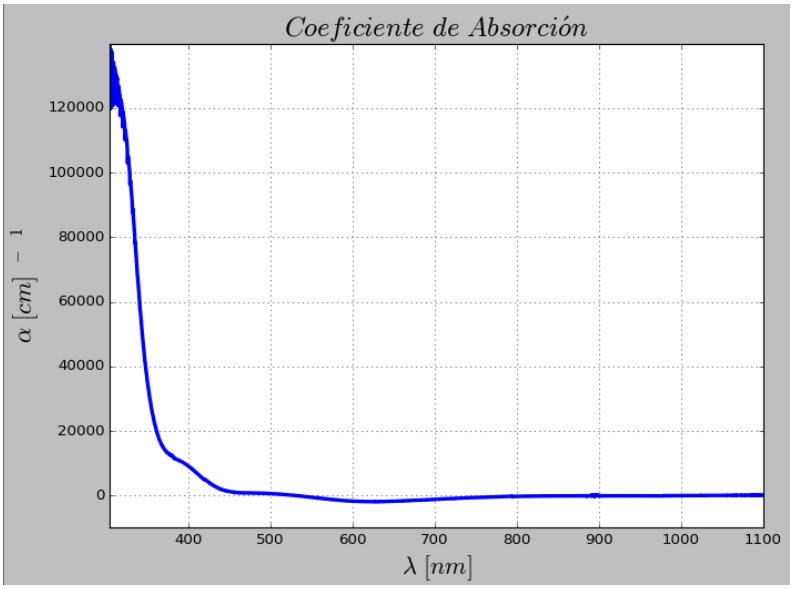



**Figura 51. Coeficiente de Absorción (C.O.P.S- ZnS13A1).**




Error total promedio: 8.1310%

*Gap:*

Gap (GMS&ES - ZnS13A1): 3.59 eV

Gap (C.O.P.S- ZnS13A1) = 3.5963 eV

Error: 0.175%

Película #3: “ZnS13A2”:

*Índice de Refracción (ANEXO N):*

**Figura 52. Índice de Refracción (GMS&ES - ZnS13A2).**

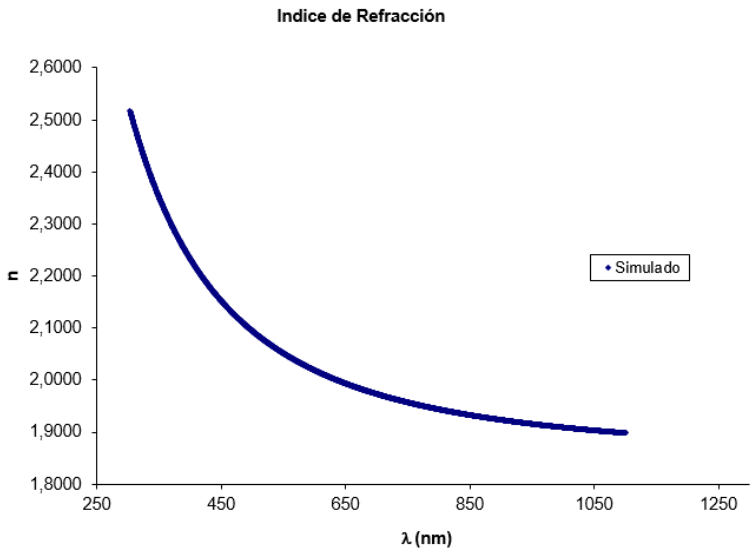
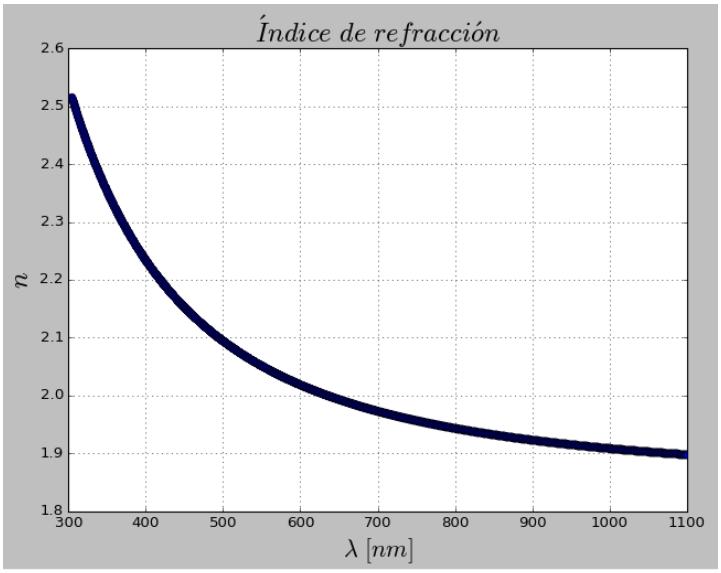


**Figura 53. Índice de Refracción (C.O.P.S- ZnS13A2).**




Error total promedio: $1.10 * 10^{-4}\%$

*Coeficiente de Absorción (ANEXO O):*

**Figura 54. Coeficiente de Absorción (GMS&ES - ZnS13A2).**

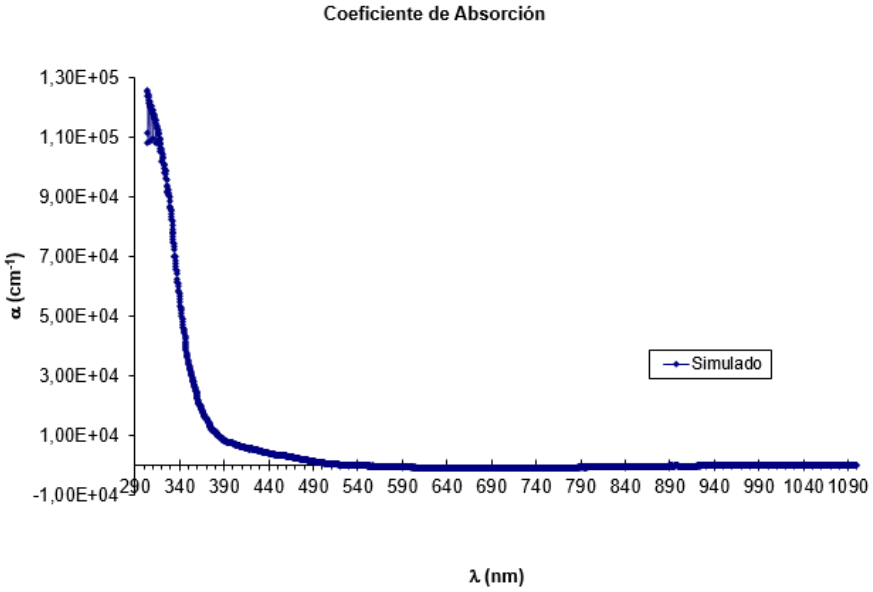
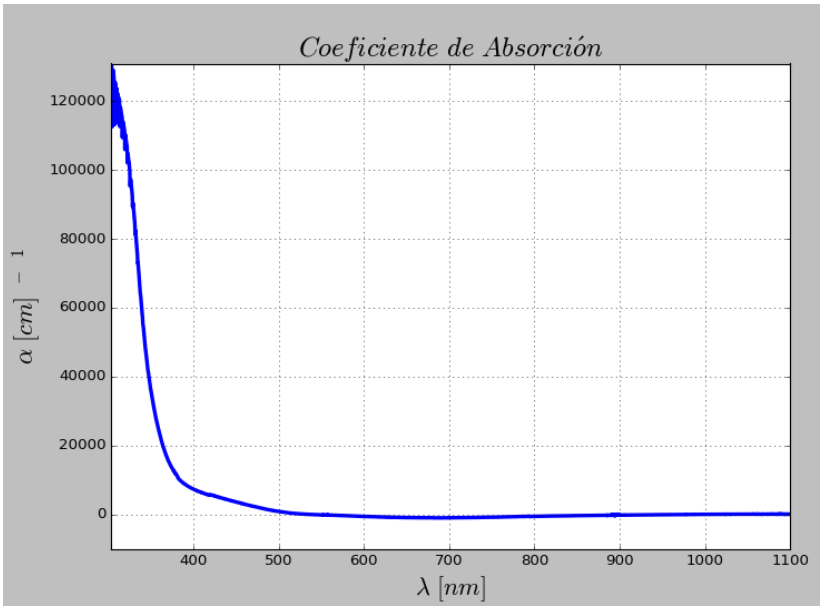


**Figura 55. Coeficiente de Absorción (C.O.P.S- ZnS13A2).**




Error total promedio: 3.7490%

*Gap:*

Gap (GMS&ES - ZnS13A2): 3.59 eV

Gap (C.O.P.S- ZnS13A2) = 3.5992 eV

Error: 0.256%

Película #4: “ZnS14Aindio1”:

*Índice de Refracción (ANEXO P):*

**Figura 56. Índice de Refracción (GMS&ES - ZnS14Aindio1).**

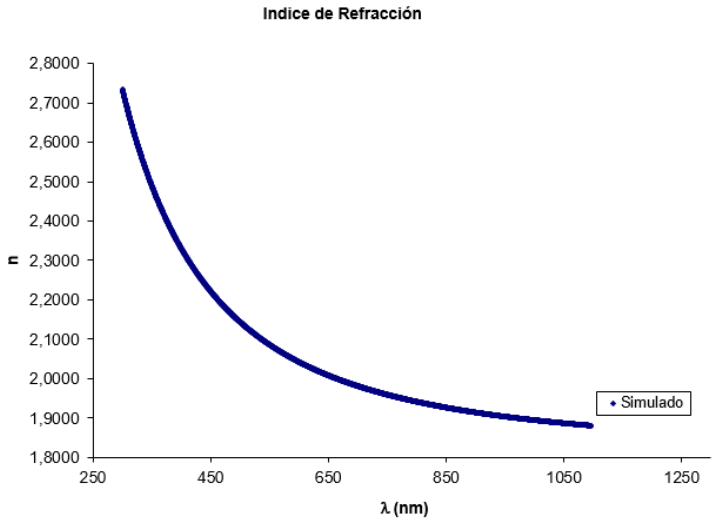
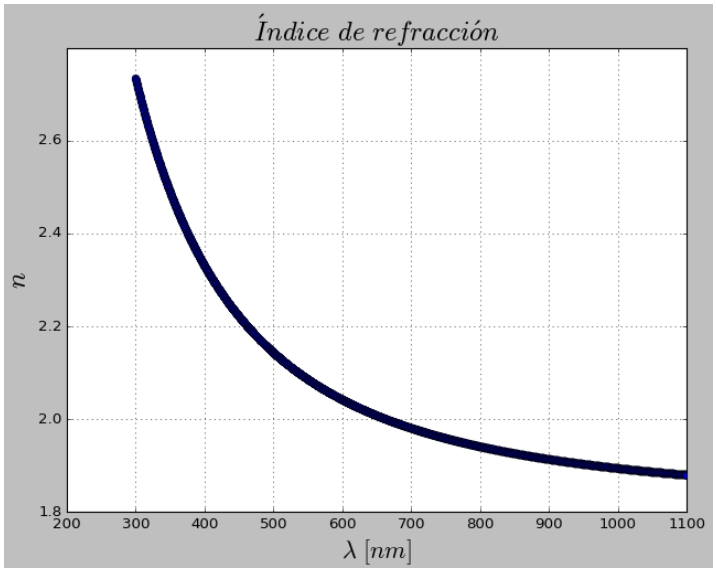



**Figura 57. Índice de Refracción (C.O.P.S- ZnS14Aindio1).**




Error total promedio: $1.05*10^{-4}\%$

*Coeficiente de Absorción (ANEXO Q):*

**Figura 58. Coeficiente de Absorción (GMS&ES - ZnS14Aindio1).**

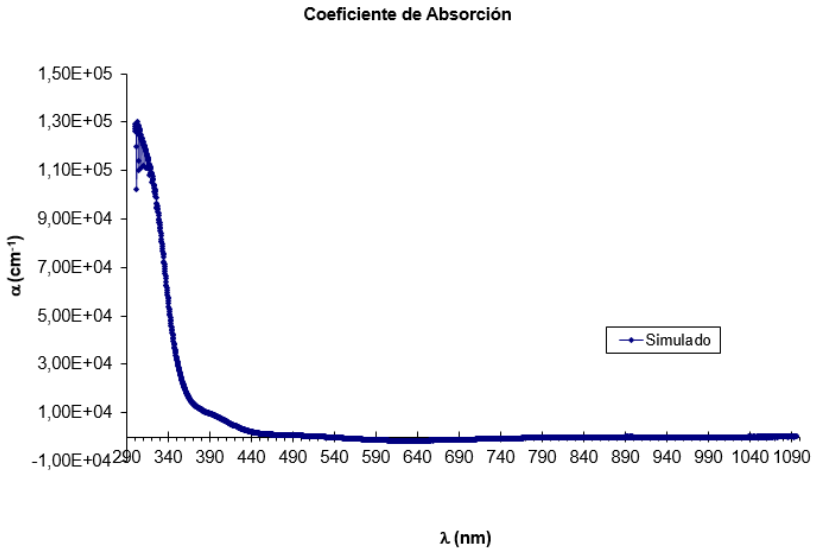
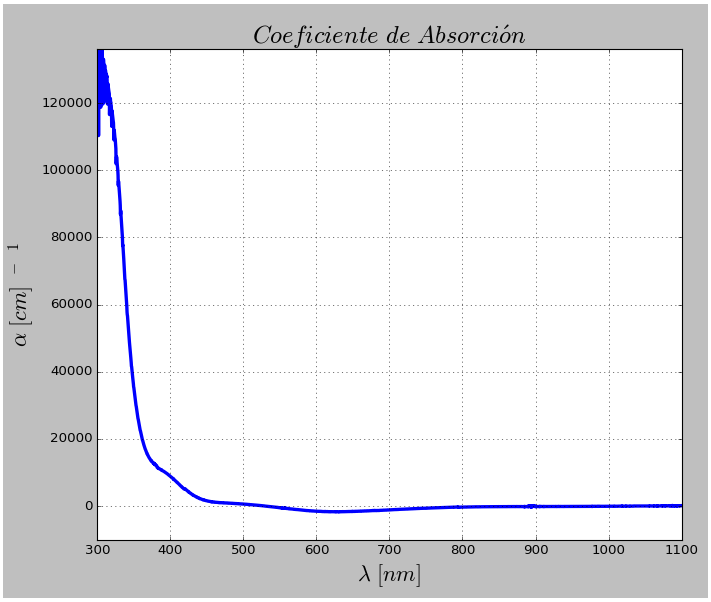



**Figura 59. Coeficiente de Absorción (C.O.P.S- ZnS14Aindio1).**




Error total promedio: 7.6448%

*Gap:*

Gap (GMS&ES - ZnS14Aindio1): 3.59 eV

Gap (C.O.P.S- ZnS14Aindio1) = 3.5967 eV

Error: 0.1866%

**COMPUESTO SnS-Bi:**

Película #1: “SnS-Bi107a”:

*Índice de Refracción (ANEXO R):*

**Figura 60. Índice de Refracción (GMS&ES - SnS- Bi107a).**

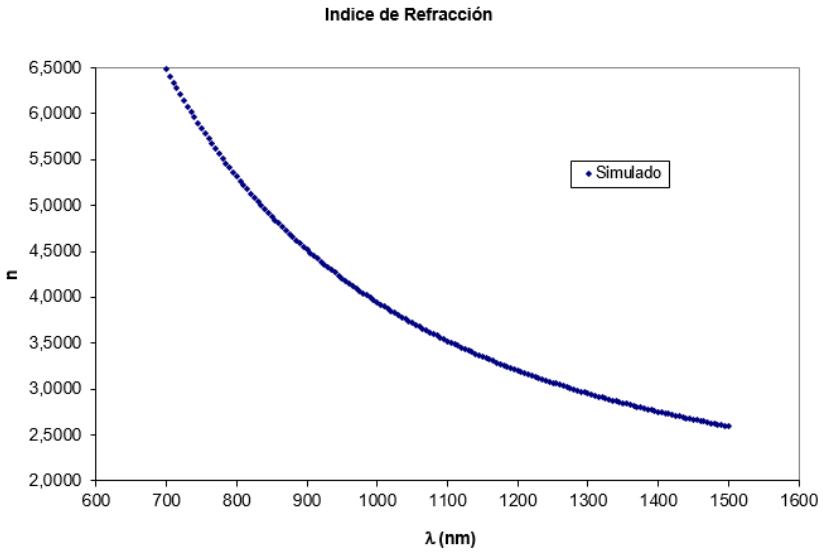
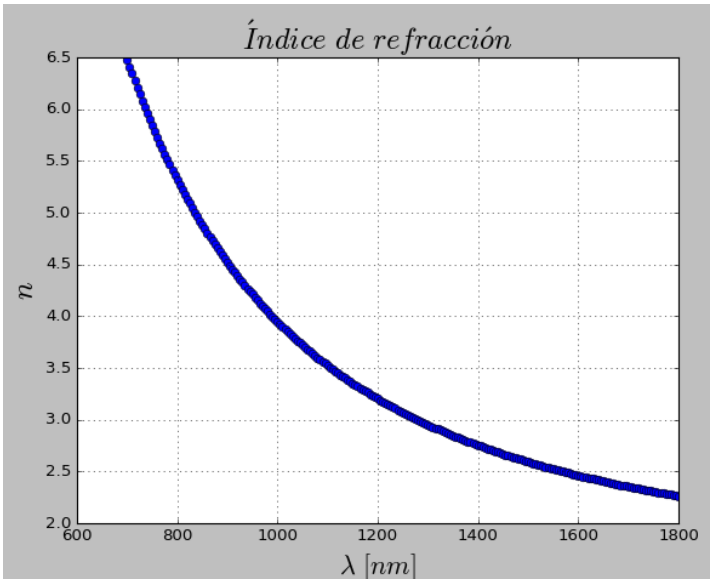


**Figura 61. Coeficiente de Absorción (C.O.P.S - SnS- Bi107a).**




Error total promedio: $7.57*10^{-5}$ %

*Coeficiente de Absorción (ANEXO S):*

**Figura 62. Coeficiente de Absorción (GMS&ES - SnS- Bi107a).**

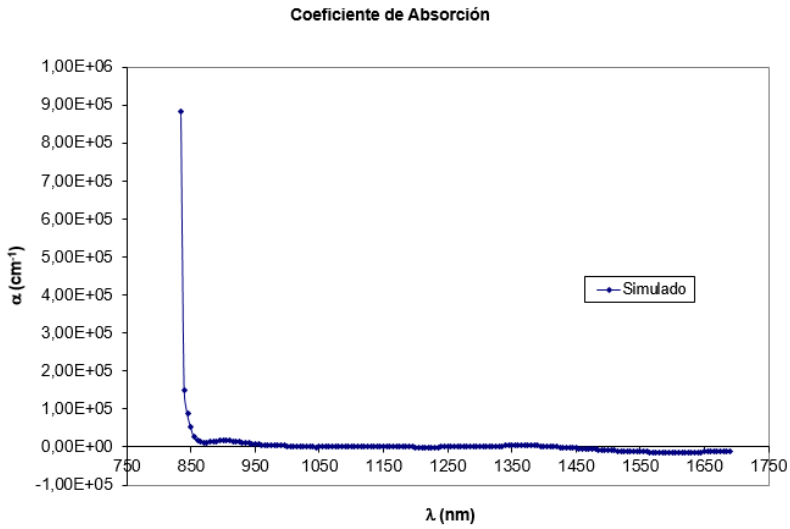
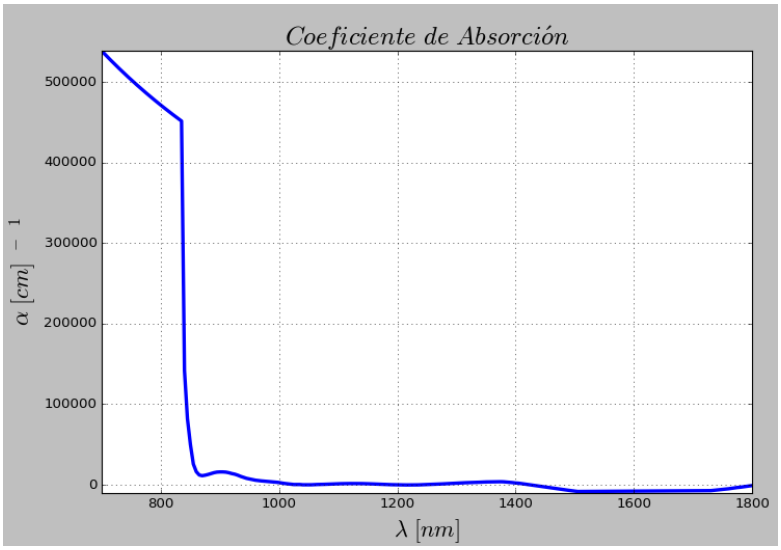


**Figura 63. Coeficiente de Absorción (C.O.P.S - SnS- Bi107a).**




Error total promedio: 6.204 %

*Gap:*

Gap (GMS&ES SnS-Bi107a): 1.48 eV

Gap (C.O.P.S- SnS-Bi107a) = 1.4752eV

Error: 0.3243 %

Película #2: “SnS. BiS102a”:

*Índice de Refracción (ANEXO T):*

**Figura 64. Índice de Refracción (GMS&ES - SnS-Bi102a).**

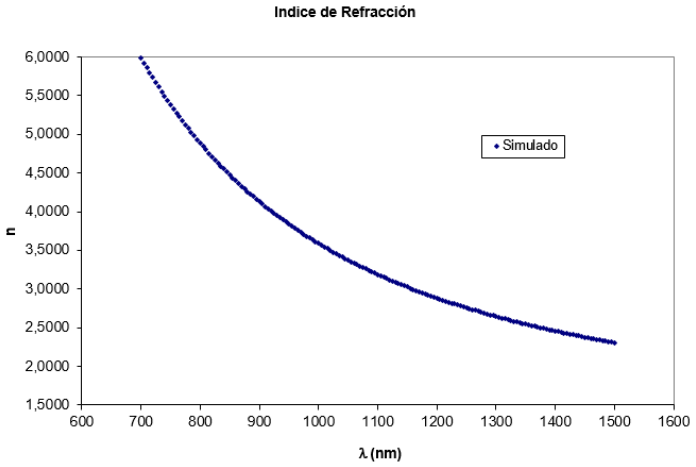
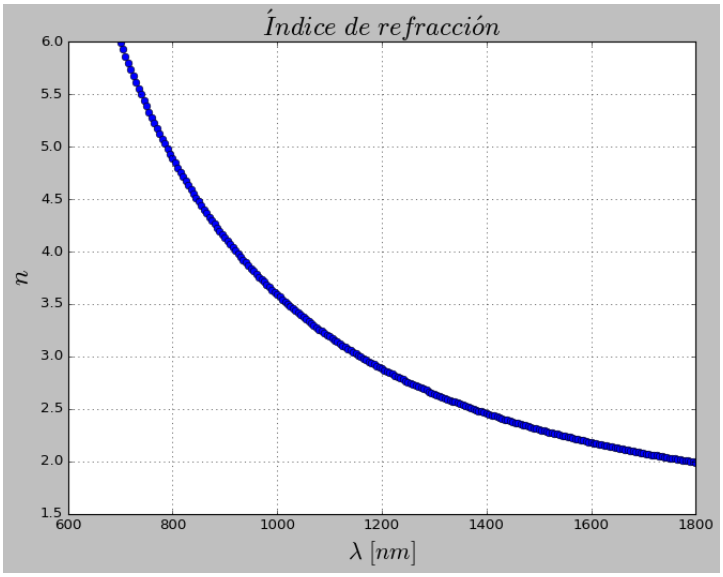



**Figura 65. Índice de Refracción (C.O.P.S- SnS-Bi102a).**




Error total promedio: $7.96*10^{-5}$ %

*Coeficiente de Absorción (ANEXO U):*

**Figura 66. Coeficiente de Absorción (GMS&ES - SnS-Bi102a).**

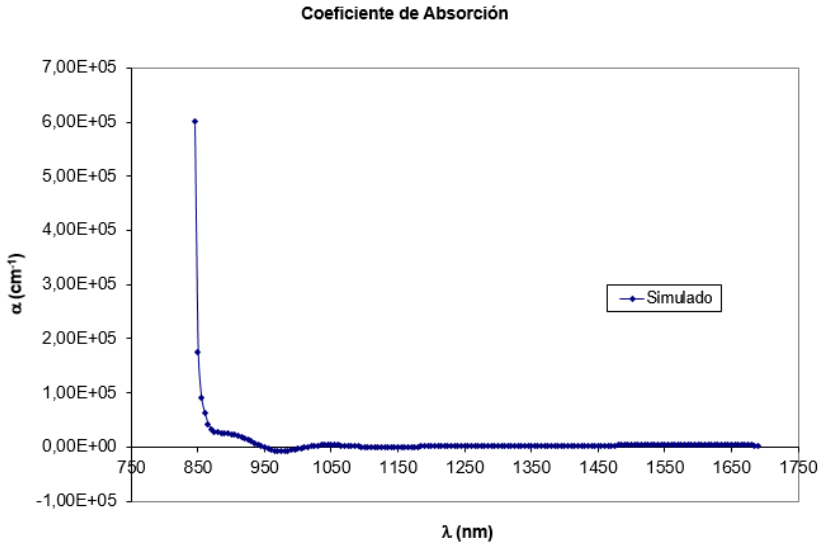
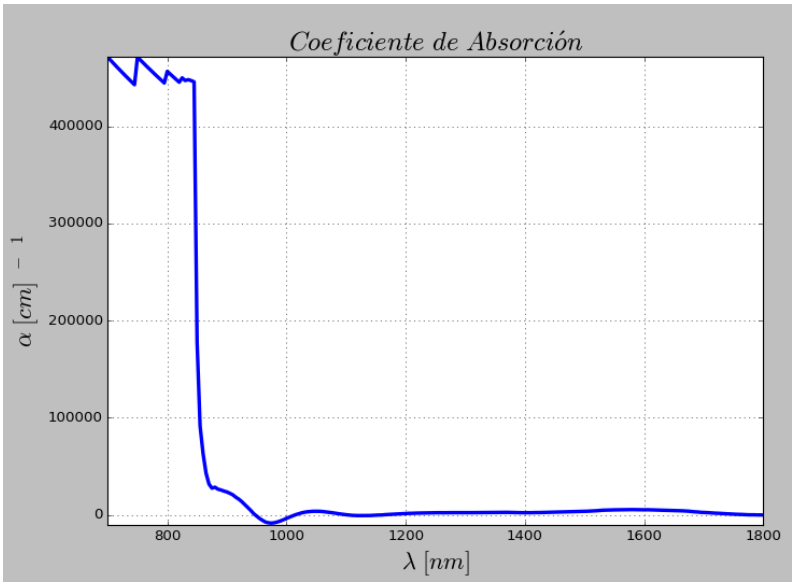



**Figura 67. Coeficiente de Absorción (C.O.P.S - SnS-Bi102a).**




Error total promedio: 1.0792 %


*Gap:*

Gap (GMS&ES - SnS-Bi102a): 1.45 eV

Gap (C.O.P.S-SnS-Bi102a) = 1.4572eV

Error: 0.4965 %