

The ENEA logo features the word "ENEA" in a bold, white, sans-serif font. To the left of the text is a stylized graphic of a sun or energy source with a bright yellow and orange glow, set against a dark blue background with a grid pattern.

AGENZIA NAZIONALE
PER LE NUOVE TECNOLOGIE, L'ENERGIA
E LO SVILUPPO ECONOMICO SOSTENIBILE

kSEMAWc software

Spectrophotometric (SP),
Ellipsometric (ELI) and
photothermal deflection spectroscopy (PDS)
Measurements
Analysis **W**orkbench

k stands for the use of Qt libraries
c stands for full C++ language

Marco Montecchi
ENEA-Casaccia
marco.montecchi@enea.it

Summary

Part I - what is kSEMAWc intended for?

Part II - some software details:

- Language and libraries
- Where to find it?
- Installation

Part III – How to use it?

Part I : what is it for?

kSEMAWc deals with optical devices

- composed by layers (from 1 to 9) of
- homogeneous or not (EMA, graded index, ect.) materials
- thin ($d \leq \frac{\lambda^2}{\Delta\lambda}$) or thick,
- with plane and parallel interfaces,
- eventually, with moderate roughness ($\sigma \ll \lambda$)

Part I : what can it do?



kSEMAWc can:

1) Simulate spectrophotometric, ellipsometric, PDS spectra

Part I : what can do?



kSEMAWc can:

- 1) Simulate** spectrophotometric, ellipsometric, PDS spectra
- 2) Calculate** complex refractive index ($n - i k$) and thickness of a given thin layer, when the surrounding layers are known

Part I : what can do?

kSEMAWc can:

- 1) Simulate** spectrophotometric, ellipsometric, PDS spectra
- 2) Calculate** complex refractive index ($n - i k$) and thickness of a given thin layer, when the surrounding layers are known
- 3) Evaluate** mean value of Transmittance / Reflectance weighted on a given international or customized spectrum (D65, ASTM-G173, etc.)

Part I : what can do?

kSEMAWc can:

- 1) Simulate** spectrophotometric, ellipsometric, PDS spectra
- 2) Calculate** complex refractive index ($n - i k$) and thickness of a given thin layer, when the surrounding layers are known
- 3) Evaluate** mean value of Transmittance / Reflectance weighted on a given international or customized spectrum (D65, ASTM-G173, etc.)
- 4) Predict** Transmittance / Reflectance once a realistic or an equivalent model of the optical device has been set

Part II : some details



Language: full C++ (since v1.0.0)

Graphical User Interface: based on Qt library

Plots: based on Qwt library

Non linear least square: C/C++ MINPACK library, for Levenberg-Marquardt algorithm

Distribution: free open source under GNU v3 license

Downloadable from

<https://github.com/mmonty1960/ksemaw>



ksemaw Public

Unpin Unwatch 1 Fork 0 Star 2

master

Go to file

Code

About

kSEMAW: a workspace for the analysis of Spectrophotometric (SP), Ellipsometric (ELI) and Photothermal Deflection Spectroscopy (PDS) measurements

- Readme
- GPL-3.0 license
- Activity
- 2 stars
- 1 watching
- 0 forks

Releases 11

v2.6 Latest yesterday

+ 10 releases

Packages

mmonty1960 v2.6		adca841 · 2 minutes ago	31 Commits
Workspace	v2.6		2 minutes ago
LICENSE.txt	version 0.9.6		3 years ago
OpenResEu_ksemaw_V2.pdf	v2.6		3 minutes ago
README.md	v2.6		3 minutes ago
gsl-2.7.zip	ksemawc-v2.1		7 months ago
ksemawc_WinExecLauncher.bat	version 1.0.0		2 years ago
manuale_ksemawc_V2.5.pdf	v2.5		2 months ago

README GPL-3.0 license

ksemaw_v2.6

Part II : the Workspace

Please note: users are asked to download the whole

Workspace

folder, containing:

- source files
 - configuration files
 - exemplary data files
 - MS Windows executable
- and**
- MS launcher
 - user-manual
 - ORE paper with some use cases



Option #1: compilation of source files

- OS: Linux, MS Windows, Mac (not tested)
- For MS Windows, preliminary installation of MinGW
- Libraries: Qt, Qwt, C/C++MINPACK
- Qt Creator (IDE): load ksemawc.pro and compile

Option #1: compilation of source files

- OS: Linux, MS Windows, Mac (not tested)
- For MS Windows, preliminary installation of MinGW
- Libraries: Qt, Qwt, C/C++MINPACK
- Qt Creator (IDE): load ksemawc.pro and compile

Option #2: only in MS Windows

Click on

ksemawc_WinExecLauncher.bat

Part III : please note



Important points:

- kSEMAWc works embedded in the Workspace folder
- All data files concerning a given optical device should be named with a unique code, adding suitable extensions (see the manual)
- Since version 1.0.0, kSEMAWc offers 3 different approaches for evaluating the unknown complex refractive index:
 - 1) **Exhaustive Numerical search** in λ - n space
 - 2) **Standard Fit** method
 - 3) **IbridOne** method (best-fit of R / Ψ with n modeled by oscillators, and k computed to reproduce T spectrum)

Part III : GUI and terminal



ksemawc

Valin Model Simulation Numerical Search Data Fit Graph Range

nk data keep k>=0 when loaded

Load nk_1	vetri/bk071.1	Clear	vetrino SUPERFROST nk da Autos 27/apr/2012	3000	25000
Load nk_2	vetri/bk071.2	Clear	Vetrino Superfrost; nk Ibridone; 27/apr/2012	3000	25000
Load nk_3	ito_/_ve001.4	Clear	INDESIT ITO-4/1A; IbrdiOne 22/nov/2022	3000	25000
Load nk_4	mate/aa999.9	Clear			
Load nk_5	mate/aa999.9	Clear			
Load nk_6	mate/aa999.9	Clear			
Load nk_7	mate/aa999.9	Clear			
Load nk_8	mate/aa999.9	Clear			

Select Sample

Spectrophotometric measurements: Tp & Rp Teta_inc (deg) Error: DBase/Base DRref/Rref ErrReading

<input checked="" type="checkbox"/> Tnorm	v1	ITO 4/1-A		2500	25000	
<input type="checkbox"/> Tpol						
<input checked="" type="checkbox"/> Rnorm	v1	ITO4_1_A		2500	25000	
<input type="checkbox"/> Rpol						
<input type="checkbox"/> R1norm						
<input type="checkbox"/> Apds						
<input checked="" type="checkbox"/> hemispherical measurements			<input checked="" type="checkbox"/> multiply Rn, Rp, R1 by the reference mirror	RIF08_since_13_December_2011	2500	25000

Ellipsometric measurements force resampling to cross experimental data

<input type="checkbox"/> ELI-1					
<input type="checkbox"/> ELI-2					
<input type="checkbox"/> ELI-3					
<input type="checkbox"/> ELI-4					

Wavelength range (Angstrom) From to N. Points resample with eV step Manual setting of Graph WL-Range Verbose

Load Spj! Save Spj! info: INDESIT: ITO-4/1A Mag 2012

Load nk! Clear nk! info: INDESIT ITO-4/1A; IbrdiOne 22/nov/2022

ksemawc: ksemawc — Konsole

Nuova scheda Vista divisa Copia Incolla Trova

```

RRcomparator: bash x ksemawc: ksemawc x
[marco@MM-hpz440 ksemawc] $ ./ksemawc
*****
Program C++ kSEMAW

Spectro-Ellipsometric Measurement Analysis Workbench
(spectrophotometric, ellipsometric and PDS)

version 2.6 8 January 2024

Main author: Marco Montecchi, ENEA (Italy)
email: marco.montecchi@enea.it
Porting to Windows and advanced oscillators by
Alberto Mittiga, ENEA (Italy)
email: alberto.mittiga@enea.it
*****
pathroot= /home/marco/Workspace/
-> RefMir #1 -> a1_/_RIF05corr.txt
-> RefMir #2 -> a1_/_RIF06before5Dic1994corr.txt
-> RefMir #3 -> a1_/_RIF06after5Dic1994corr.txt
-> RefMir #4 -> a1_/_RIF05after18March1996corr.txt
-> RefMir #5 -> a1_/_ri008.v2.rn
-> RefMir #6 -> a1_/_ri008.v3.rn
-> RefMir #7 -> a1_/_rifPVenea.v1.rn
-> RefMir #8 -> Spectralon/LabspherePTFE8715.txt
-> StdSpectrum #0: VIS_10_wl (Glass in building) -> stnd/media.1
-> StdSpectrum #1: VIS_30_wl (Glass in building) -> stnd/media.2
-> StdSpectrum #2: VIS_D65 (Glass in building) -> stnd/media.3
-> StdSpectrum #3: solar_10_wl (Glass in building) -> stnd/media.4
-> StdSpectrum #4: solar_global_radiation (Glass in building) -> stnd/media.5
-> StdSpectrum #5: DNI_100_wl direct normal radiation -> stnd/media.6
-> StdSpectrum #6: PWO_scintillation -> stnd/pwtdr.1
-> StdSpectrum #7: PWO_scint*APDqe -> stnd/pwiqe.1
-> StdSpectrum #8: IEC_60904-3 -> stnd/IEC60904b3Step5nm.txt
-> StdSpectrum #9: ASTM_G173 solar normal direct radiation AM=1.5 -> stnd/ASTMG173SP.txt
-> StdSpectrum #10: ISO_9050 solar global radiation AM=1.5 -> stnd/ISO9050.txt
-> StdSpectrum #11: ISO_9845-1 solar normal direct radiation AM=1.5 -> stnd/ISO9845b1.txt
-> StdSpectrum #12: E_891 solar normal direct radiation AM=1.5 -> stnd/E891.txt
setting-file exists! /home/marco/.config/ksemawc/ksemawc.conf
-> SaveSetting (with option iCall=-1) to /home/marco/Workspace/temp/defau.1.Spj
-> LoadProject
-> ReadSetting from /home/marco/Workspace/ito_/_ve001.1.Spj
date: 2023-06-14 14:53:55
The project version is up-to-date
->Setnk(1) with fnk[1]=/home/marco/Workspace/vetri/bk071.1.nk
->Setnk(2) with fnk[2]=/home/marco/Workspace/vetri/bk071.2.nk
    
```


Part III : initial GUI -Valin tab



GUI organized in 6 tabs

ordered according to the workflow:

- 1) **Valin**: load known *nk*-files and experimental spectra, re-sampled on 201 points (default)
- 2) **Model**: set the model of the optical device
- 3) **Simulation**: set and draw simulations
- 4) **Numerical Search**: search in **n-k space** @ λ or exhaustive solution search in λ -*n* space
- 5) **Data Fit**: standard best fit or IbridOne
- 6) **Graph range**: plot and GUI graphic management

nk data keep k=0 when loaded

Load nk	File	Clear	Description	Wavelength	Points
Load nk_1	vetr/bk071.1	Clear	vetrino SUPERFROST nk da Autos 27/apr/2012	3000	25000
Load nk_2	vetr/bk071.2	Clear	Vetrino Superfrost; nk Ibridone; 27/apr/2012	3000	25000
Load nk_3	ito_/_ve001.4	Clear	INDESIT ITO-4/1A; IbrdiOne 22/nov/2022	3000	25000
Load nk_4	mate/aa999.9	Clear			
Load nk_5	mate/aa999.9	Clear			
Load nk_6	mate/aa999.9	Clear			
Load nk_7	mate/aa999.9	Clear			
Load nk_8	mate/aa999.9	Clear			

Select Sample:

Spectrophotometric measurements: Tp & Rp Teta_inc (deg) 0.00 s-polarized Error: DBase/Base 0.0022 DRref/Rref 0.0050 ErrReading 0.0005

Tnorm v1 ITO 4/1-A 2500 25000
 Tpol
 Rnorm v1 ITO4_1_A 2500 25000
 Rpol
 R1norm
 Apds

hemispherical measurements multiply Rn, Rp, R1 by the reference mirror RIF08_since_13_December_2011 2500 25000

Ellipsometric measurements force resampling to cross experimental data

Wavelength range (Angstrom) From 3000 to 25000 4.133<->0.496 eV N. Points 201 resample with eV step Manual setting of Graph WL-Range Verbose

Load Spj! Save Spj! ito_/_ve001.1.Spj info: INDESIT: ITO-4/1A Mag 2012
Load nk! Clear nk! ito_/_ve001.4.nk info: INDESIT ITO-4/1A; IbrdiOne 22/nov/2022

Part III : Model tab

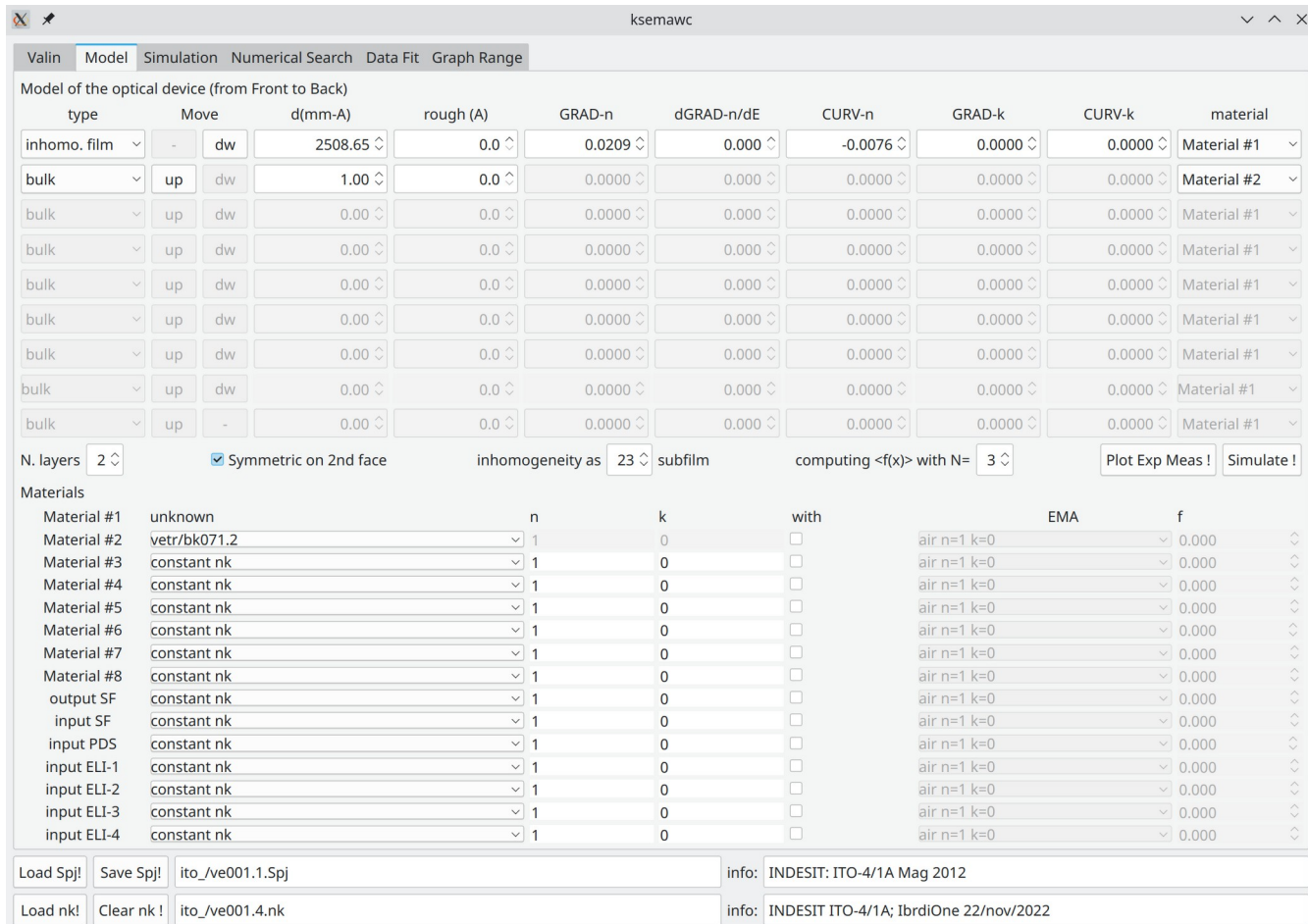
Layered model
(max 9 layers)

Type of layer:

- 1) bulk = thick = incoherent interfaces
- 2) homo. film = thin film
- 3) inhomo. film = graded-index thin film

Materials (up to 8):
are set in Material#J
(#1 is the unknown !)

Then, "material" has to be assigned for each layer



Model of the optical device (from Front to Back)

type	Move	d(mm-A)	rough (A)	GRAD-n	dGRAD-n/dE	CURV-n	GRAD-k	CURV-k	material
inhomo. film	- dw	2508.65	0.0	0.0209	0.000	-0.0076	0.0000	0.0000	Material #1
bulk	up dw	1.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #2
bulk	up dw	0.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #1
bulk	up dw	0.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #1
bulk	up dw	0.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #1
bulk	up dw	0.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #1
bulk	up dw	0.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #1
bulk	up dw	0.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #1
bulk	up -	0.00	0.0	0.0000	0.000	0.0000	0.0000	0.0000	Material #1

N. layers: 2 Symmetric on 2nd face inhomogeneity as 23 subfilm computing <f(x)> with N= 3

Materials

Material #	unknown	n	k	with	EMA	f
Material #2	vetr/bk071.2	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
Material #3	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
Material #4	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
Material #5	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
Material #6	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
Material #7	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
Material #8	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
output SF	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
input SF	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
input PDS	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
input ELI-1	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
input ELI-2	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
input ELI-3	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000
input ELI-4	constant nk	1	0	<input type="checkbox"/>	air n=1 k=0	0.000

Load Spj! Save Spj! ito_/_ve001.1.Spj info: INDESIT: ITO-4/1A Mag 2012

Load nk! Clear nk! ito_/_ve001.4.nk info: INDESIT ITO-4/1A; IbrdiOne 22/nov/2022

Part III : Simulation tab

To compare simulated with experimental

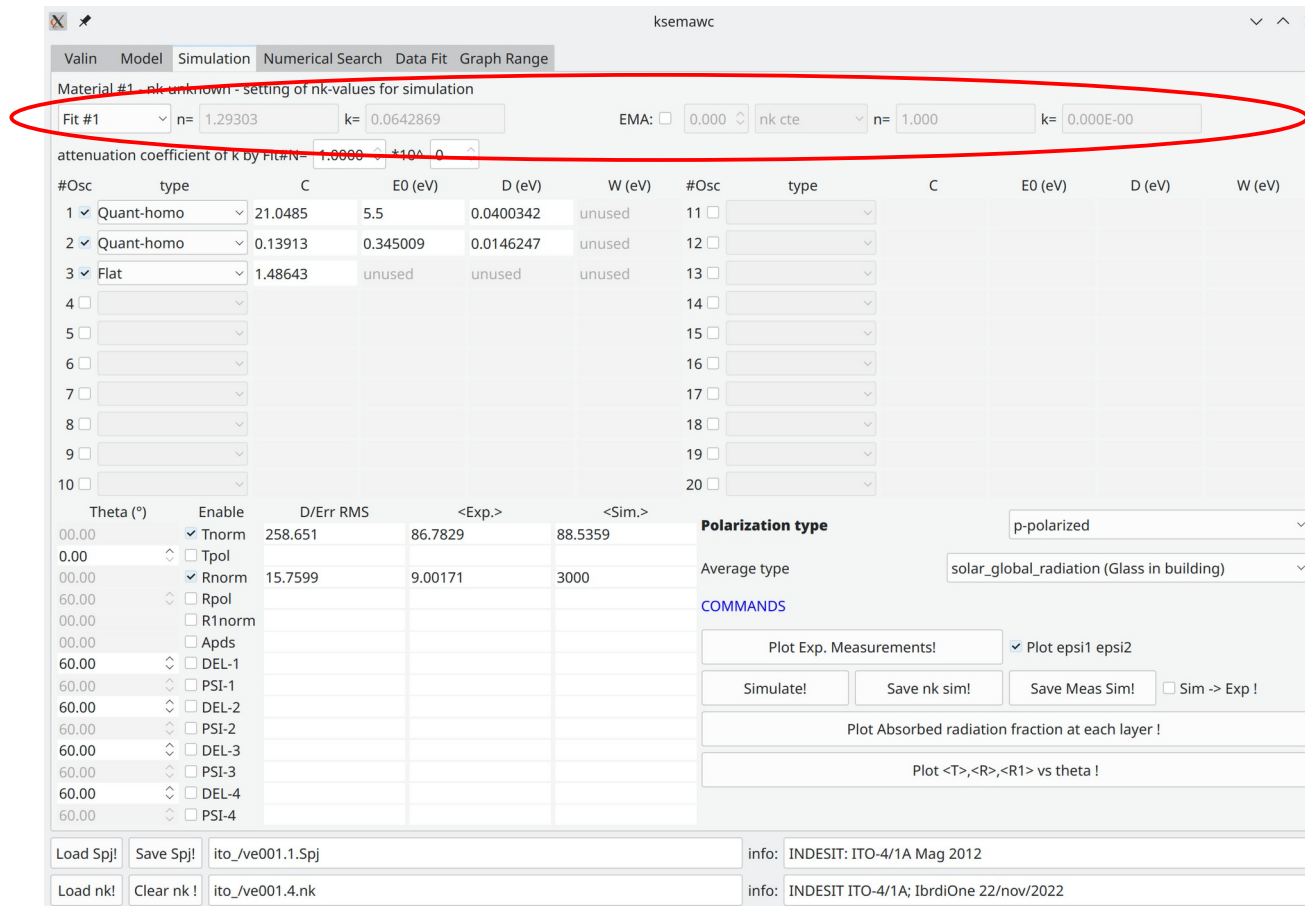
nk-unknown has to be set among:

- Constant nk
- Fit #M $1 \leq M \leq 7$
- Nk-file #M $1 \leq M \leq 8$
- Nk-DataFit from the last computation

Two different materials can be combined according to the Effective Medium Approximation

Available actions:

- 1) Plot experimental spectra
- 2) Plot simulated spectra
- 3) Set the weights for computing mean values
- 4) Plot mean values versus incidence angle
- 5) Plot Absorptance at each layer



Material #1: nk-unknown - setting of nk-values for simulation

Fit #1: n= k= EMA: nk cte: n= k=

attenuation coefficient of k by Fit#N=

#Osc	type	C	E0 (eV)	D (eV)	W (eV)	#Osc	type	C	E0 (eV)	D (eV)	W (eV)
1	Quant-homo	21.0485	5.5	0.0400342	unused	11					
2	Quant-homo	0.13913	0.345009	0.0146247	unused	12					
3	Flat	1.48643	unused	unused	unused	13					
4						14					
5						15					
6						16					
7						17					
8						18					
9						19					
10						20					

Theta (°) Enable D/Err RMS <Exp.> <Sim.>

Theta (°)	Enable	D/Err RMS	<Exp.>	<Sim.>
00.00	<input checked="" type="checkbox"/> Tnorm	258.651	86.7829	88.5359
0.00	<input type="checkbox"/> Tpol			
00.00	<input checked="" type="checkbox"/> Rnorm	15.7599	9.00171	3000
60.00	<input type="checkbox"/> Rpol			
00.00	<input type="checkbox"/> R1norm			
00.00	<input type="checkbox"/> Apds			
60.00	<input type="checkbox"/> DEL-1			
60.00	<input type="checkbox"/> PSI-1			
60.00	<input type="checkbox"/> DEL-2			
60.00	<input type="checkbox"/> PSI-2			
60.00	<input type="checkbox"/> DEL-3			
60.00	<input type="checkbox"/> PSI-3			
60.00	<input type="checkbox"/> DEL-4			
60.00	<input type="checkbox"/> PSI-4			

Polarization type:

Average type:

COMMANDS

Plot Exp. Measurements! Plot epsi1 epsi2

Simulate! Save nk sim! Save Meas Sim! Sim -> Exp !

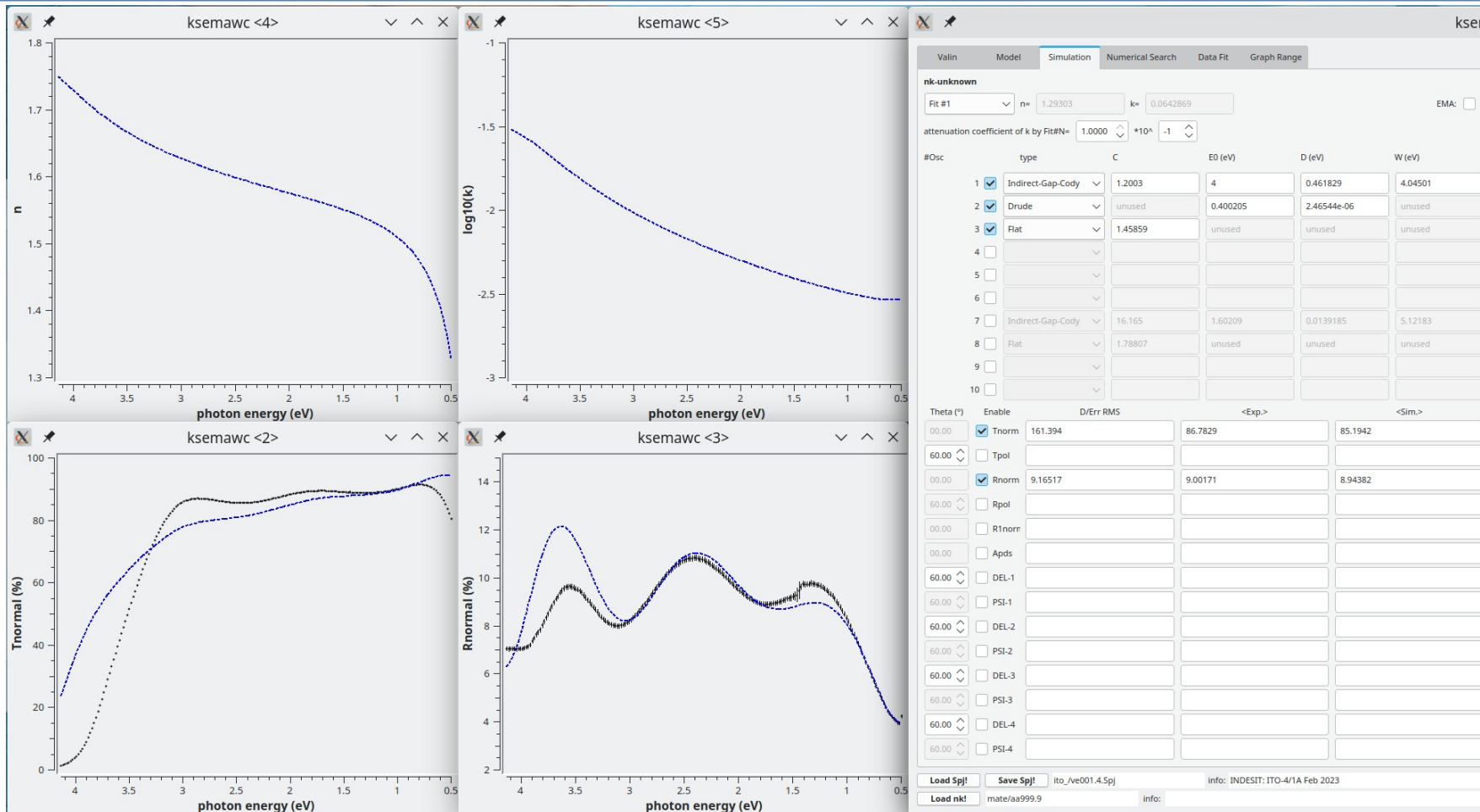
Plot Absorbed radiation fraction at each layer !

Plot <T>,<R>,<R1> vs theta !

Load Spj! Save Spj! info: INDESIT: ITO-4/1A Mag 2012

Load nk! Clear nk! info: INDESIT ITO-4/1A; IbrdiOne 22/nov/2022

Part III : Simulation tab

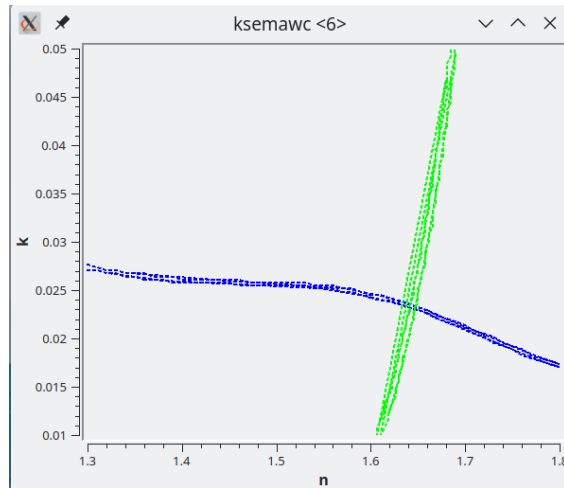


Part III : Numerical Search

Numerical search of solution $n-k$

Available methods:

1) Search in $n-k$ space @ λ



Theta (°)	Enable	Theta (°)	Enable
00.00	<input checked="" type="checkbox"/> Tn	00.00	<input checked="" type="checkbox"/> Rn
60.00	<input type="checkbox"/> Tp	60.00	<input type="checkbox"/> Rp
00.00	<input type="checkbox"/> Apds	00.00	<input type="checkbox"/> R1
60.00	<input type="checkbox"/> DEL-1	idem	<input type="checkbox"/> PSI-1
60.00	<input type="checkbox"/> DEL-2	idem	<input type="checkbox"/> PSI-2
60.00	<input type="checkbox"/> DEL-3	idem	<input type="checkbox"/> PSI-3
60.00	<input type="checkbox"/> DEL-4	idem	<input type="checkbox"/> PSI-4

Part III : Numerical Search

Numerical search of solution $n-k$

Available methods:

- 1) Search in $n-k$ space @ λ
- 2) Exhaustive numerical search in $\lambda-n$ space

Experimental measurements

Theta (°)	Enable	Theta (°)	Enable
00.00	<input checked="" type="checkbox"/> Tn	00.00	<input checked="" type="checkbox"/> Rn
60.00	<input type="checkbox"/> Tp	60.00	<input type="checkbox"/> Rp
00.00	<input type="checkbox"/> Apds	00.00	<input type="checkbox"/> R1
60.00	<input type="checkbox"/> DEL-1	idem	<input type="checkbox"/> PSI-1
60.00	<input type="checkbox"/> DEL-2	idem	<input type="checkbox"/> PSI-2
			<input type="checkbox"/> PSI-3
			<input type="checkbox"/> PSI-4

Numerical search in $n-k$ space

! Search in $n-k$ space @ $wl =$ 3000.0

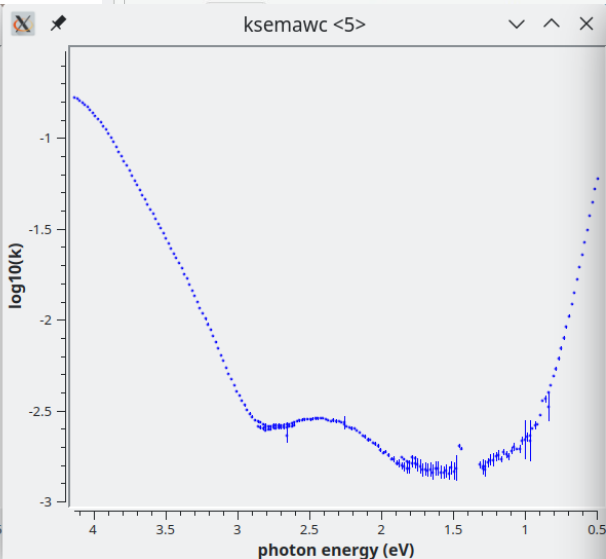
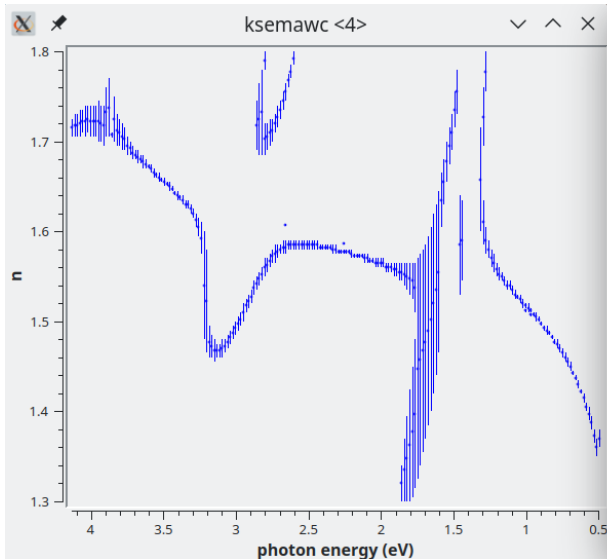
Exhaustive Numerical Search in $wl-n$ space

Save fresh graphs!

Exhaustive numerical search! Include relative minima

Select n-solutions!

Save nk!



Part III : Data Fit tab

Available actions:

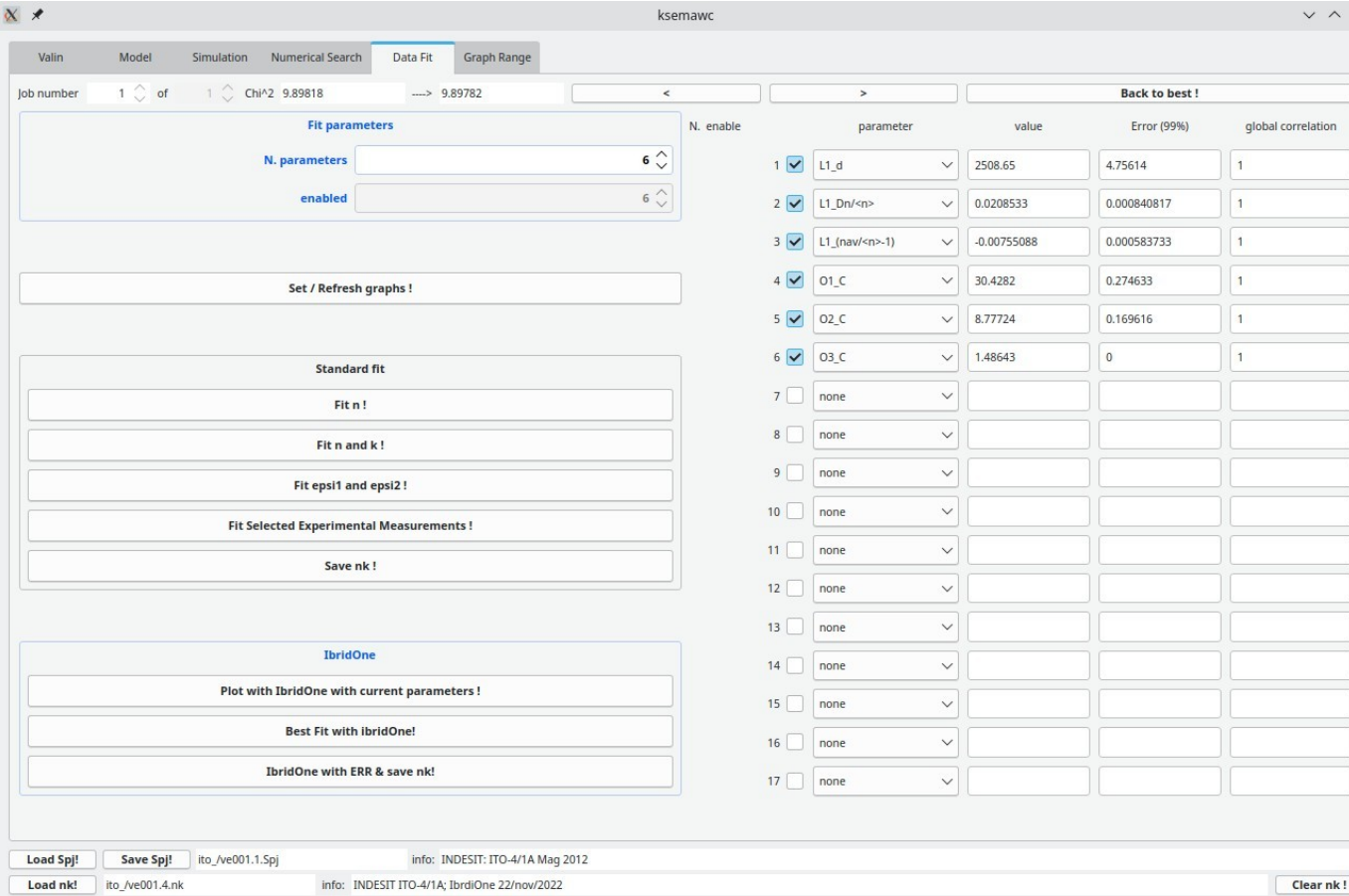
- 1) Fit of n data
- 2) Fit of n and k data
- 3) Fit of ε_1 and ε_2 data
- 4) Fit of experimental spectra
- 5) **IbridOne**:

Step-1: fit $R(\lambda)$ with

$$n = n(\lambda, p_1, p_2, \dots, p_M)$$

Step-2: compute $k(\lambda)$ from $T(\lambda)$
given $n(\lambda)$

Called by Levenberg-Marquardt



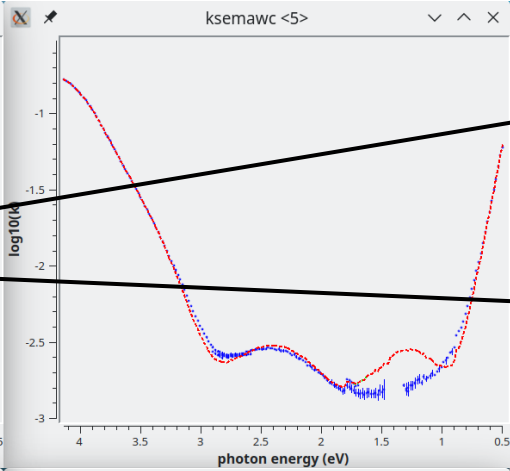
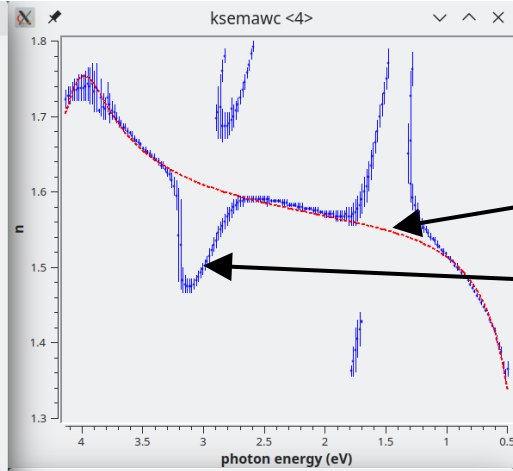
	parameter	value	Error (99%)	global correlation
1	<input checked="" type="checkbox"/> L1_d	2508.65	4.75614	1
2	<input checked="" type="checkbox"/> L1_Dn/<n>	0.0208533	0.000840817	1
3	<input checked="" type="checkbox"/> L1_(nav/<n>-1)	-0.00755088	0.000583733	1
4	<input checked="" type="checkbox"/> O1_C	30.4282	0.274633	1
5	<input checked="" type="checkbox"/> O2_C	8.77724	0.169616	1
6	<input checked="" type="checkbox"/> O3_C	1.48643	0	1
7	<input type="checkbox"/> none			
8	<input type="checkbox"/> none			
9	<input type="checkbox"/> none			
10	<input type="checkbox"/> none			
11	<input type="checkbox"/> none			
12	<input type="checkbox"/> none			
13	<input type="checkbox"/> none			
14	<input type="checkbox"/> none			
15	<input type="checkbox"/> none			
16	<input type="checkbox"/> none			
17	<input type="checkbox"/> none			

Part III : Data Fit tab

Back to best !

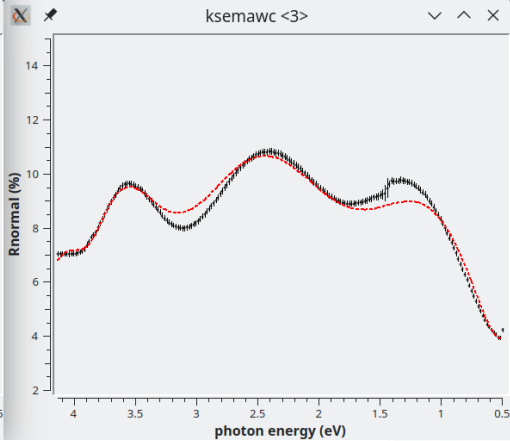
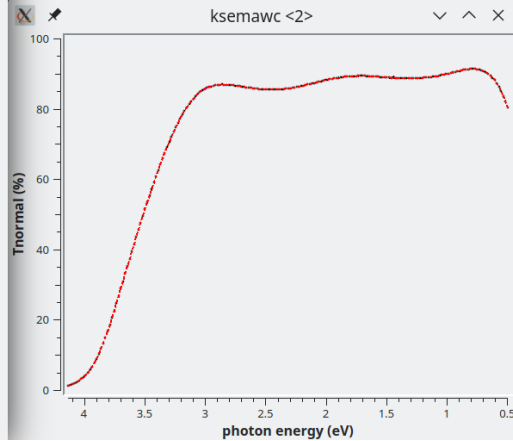
	parameter	value	Error (99%)	global correlation
1	<input checked="" type="checkbox"/> L1_d	2531.43	1.87275	1
2	<input checked="" type="checkbox"/> L1_Dn/<n>	0.0231121	0.000805105	1
3	<input checked="" type="checkbox"/> L1_(nav/<n>-1)	-0.00241305	0.000380341	0.710438
4	<input checked="" type="checkbox"/> O1_C	1.44794	0	1
5	<input checked="" type="checkbox"/> O2_D	7.51106e-06	1.35351e-06	0.695184
6	<input checked="" type="checkbox"/> O3_C	1.52865	0.000863875	0.627676
7	<input checked="" type="checkbox"/> O1_D	0.299312	0.000501632	1
8	<input checked="" type="checkbox"/> O1_W	0.856474	0.0112353	1
9	<input type="checkbox"/> O2_E	0.400205	0	0
10	<input type="checkbox"/> none			
11	<input type="checkbox"/> none			
12	<input type="checkbox"/> none			
13	<input type="checkbox"/> none			
14	<input type="checkbox"/> none			
15	<input type="checkbox"/> none			
16	<input type="checkbox"/> none			
17	<input type="checkbox"/> none			

Clear nk !



IbridOne (red)

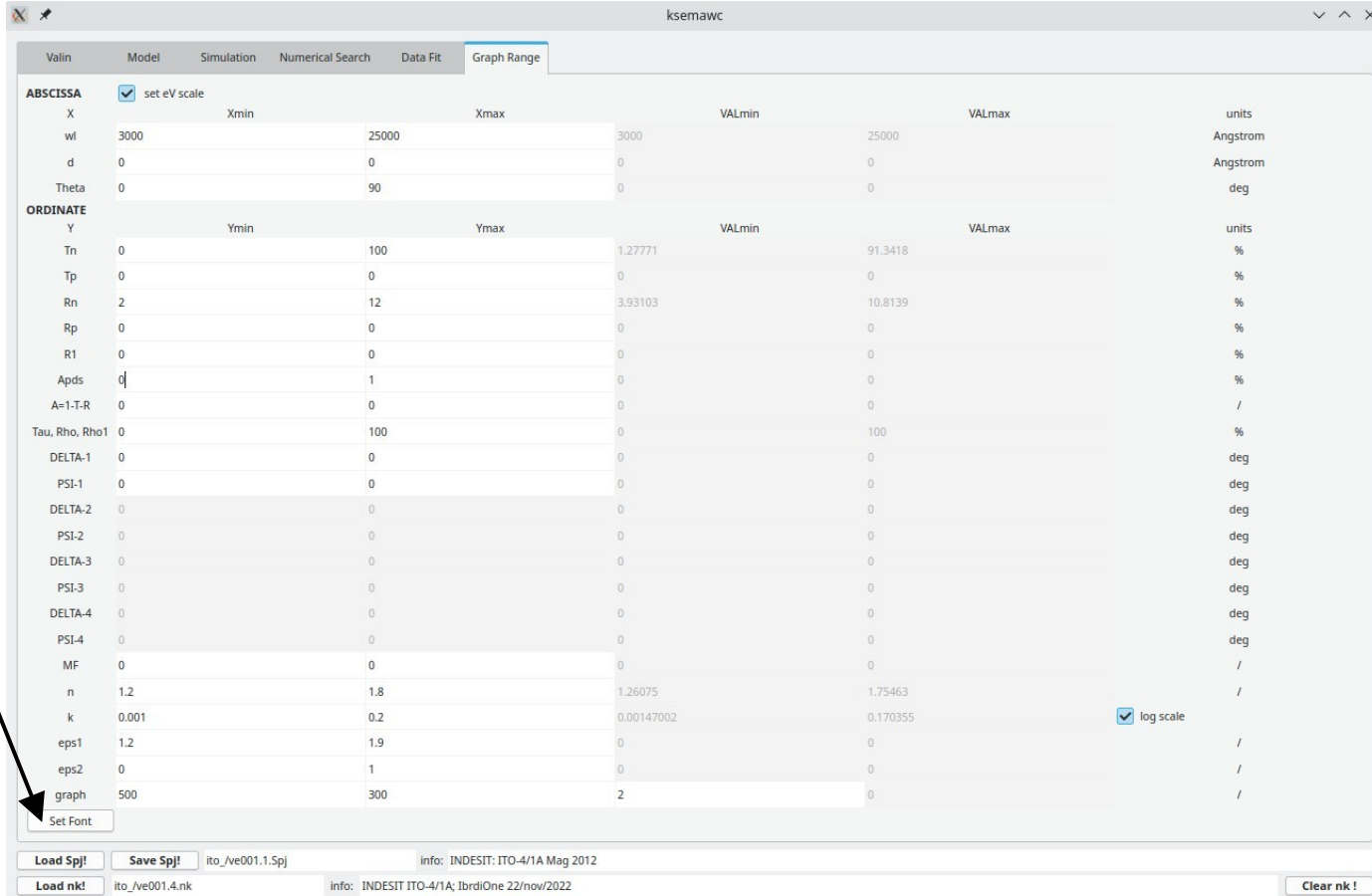
Exhaustive Numerical Search (blue)



Part III : Graph Range tab

Option management of

- Plots (X-Y range, Energy/Wavelength abscissa, log scale for k)
- GUI (font type and size)



The screenshot shows the 'Graph Range' tab in the ksemaWc software. The interface is divided into 'ABSCISSA' (X-axis) and 'ORDINATE' (Y-axis) sections. The 'ABSCISSA' section includes parameters like 'wl', 'd', and 'Theta'. The 'ORDINATE' section includes parameters like 'Tn', 'Tp', 'Rn', 'Rp', 'R1', 'Apds', 'A=1-T-R', 'Tau, Rho, Rho1', 'DELTA-1' through 'DELTA-4', 'PSI-1' through 'PSI-4', 'MF', 'n', 'k', 'eps1', 'eps2', and 'graph'. The 'k' parameter has a 'log scale' checkbox checked. The 'graph' parameter has a value of 500. The interface also includes a 'Set Font' button and a status bar at the bottom with 'Load Spj!', 'Save Spj!', 'Load nk!', and 'Clear nk!' buttons.

Parameter	Value	Xmin	Xmax	VALmin	VALmax	Units
ABSCISSA X						
wl	3000		25000	3000	25000	Angstrom
d	0		0	0	0	Angstrom
Theta	0		90	0	0	deg
ORDINATE Y						
Tn	0		100	1.27771	91.3418	%
Tp	0		0	0	0	%
Rn	2		12	3.93103	10.8139	%
Rp	0		0	0	0	%
R1	0		0	0	0	%
Apds	0		1	0	0	%
A=1-T-R	0		0	0	0	/
Tau, Rho, Rho1	0		100	0	100	%
DELTA-1	0		0	0	0	deg
PSI-1	0		0	0	0	deg
DELTA-2	0		0	0	0	deg
PSI-2	0		0	0	0	deg
DELTA-3	0		0	0	0	deg
PSI-3	0		0	0	0	deg
DELTA-4	0		0	0	0	deg
PSI-4	0		0	0	0	deg
MF	0		0	0	0	/
n	1.2		1.8	1.26075	1.75463	/
k	0.001		0.2	0.00147002	0.170355	/
eps1	1.2		1.9	0	0	/
eps2	0		1	0	0	/
graph	500		300	2	0	/

How can you help?



BETA-TESTER:

- 1) **Testing kSEMAWc and reporting bugs**
- 2) **Proposing improvements to make GUI and usage clearer**
- 3) **Asking for new features (of general relevance)**
- 4) ...

Anyone interested in participating at any level is welcome!

How can you help?



BETA-TESTER:

- 1) **Testing kSEMAWc and reporting bugs**
- 2) **Proposing improvements to make GUI and usage clearer**
- 3) **Asking for new features (of general relevance)**
- 4) ...

Computer experts:

- **Testing installation from source**
- **Improving the code structure**
- ...

Anyone interested in participating at any level is welcome!

Contributors



Alberto Mittiga, for his factual collaboration in improving optical constant models about electronic transitions in materials with continuous state density, in the Windows porting as well as in the drafting of the manual

Enrico Nichelatti, for the wise search for analytical solutions of the integrals on the density of the states, as well as for the transfer in LaTeX of this manual

Claudia Malerba and Francesca Menchini, for their constant goad to test and improve `kSEMAWc` to characterize semiconductor materials

Francesco Biccari, for his useful suggestions for simplifying the software distribution

Luca Serenelli, for his support in outlining the Linux installation procedure

What's next?

Alberto Mittiga, will present an overview of the oscillators used for modeling the dielectric constant

You can ask for further webinars on specific topics, for instance

- Substrate characterization
- Dielectric thin film characterization
- Semiconductor thin film characterization
-