

Functional Coatings

Abstract

Edit Parameters of Functional Coating

Dependent on Polarization Phase Change $\Delta\phi$ Absorption

Dependent on Incidence Angle Interpolation Method: Linear

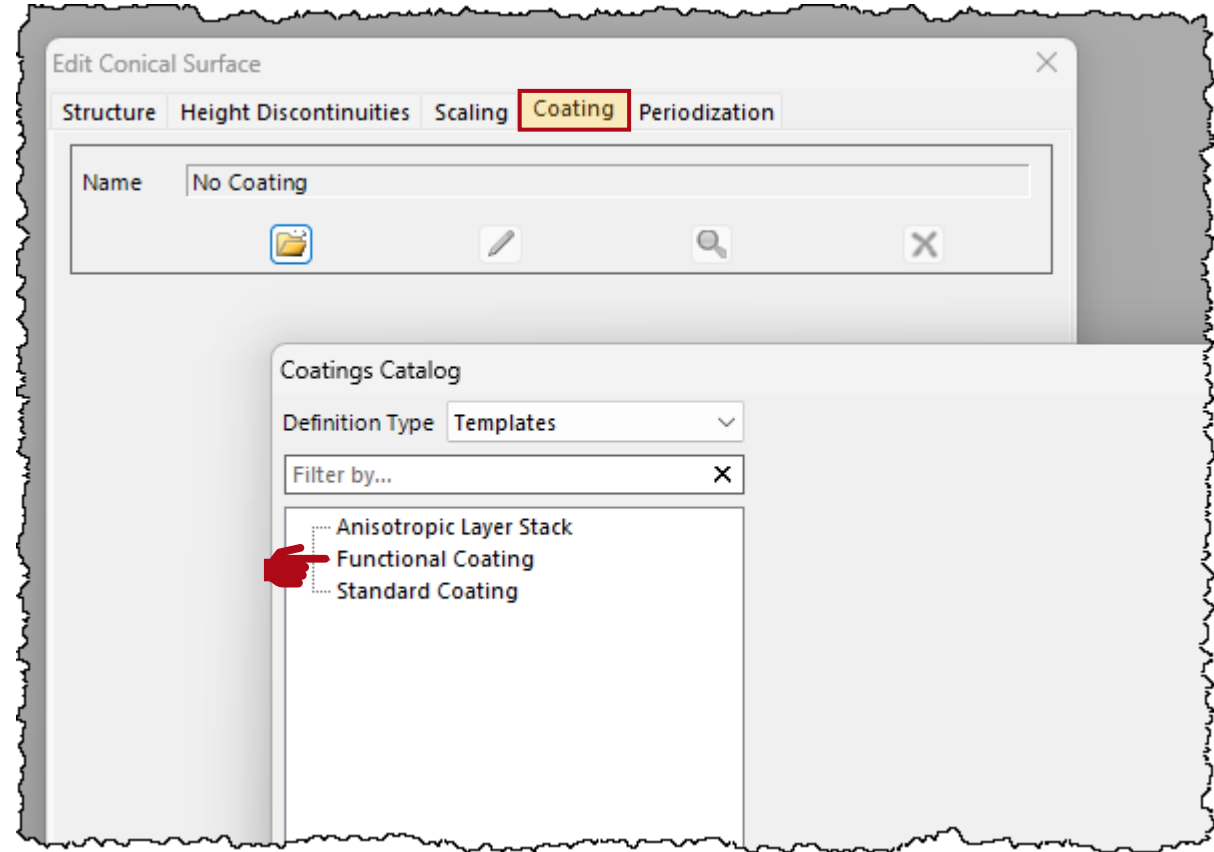
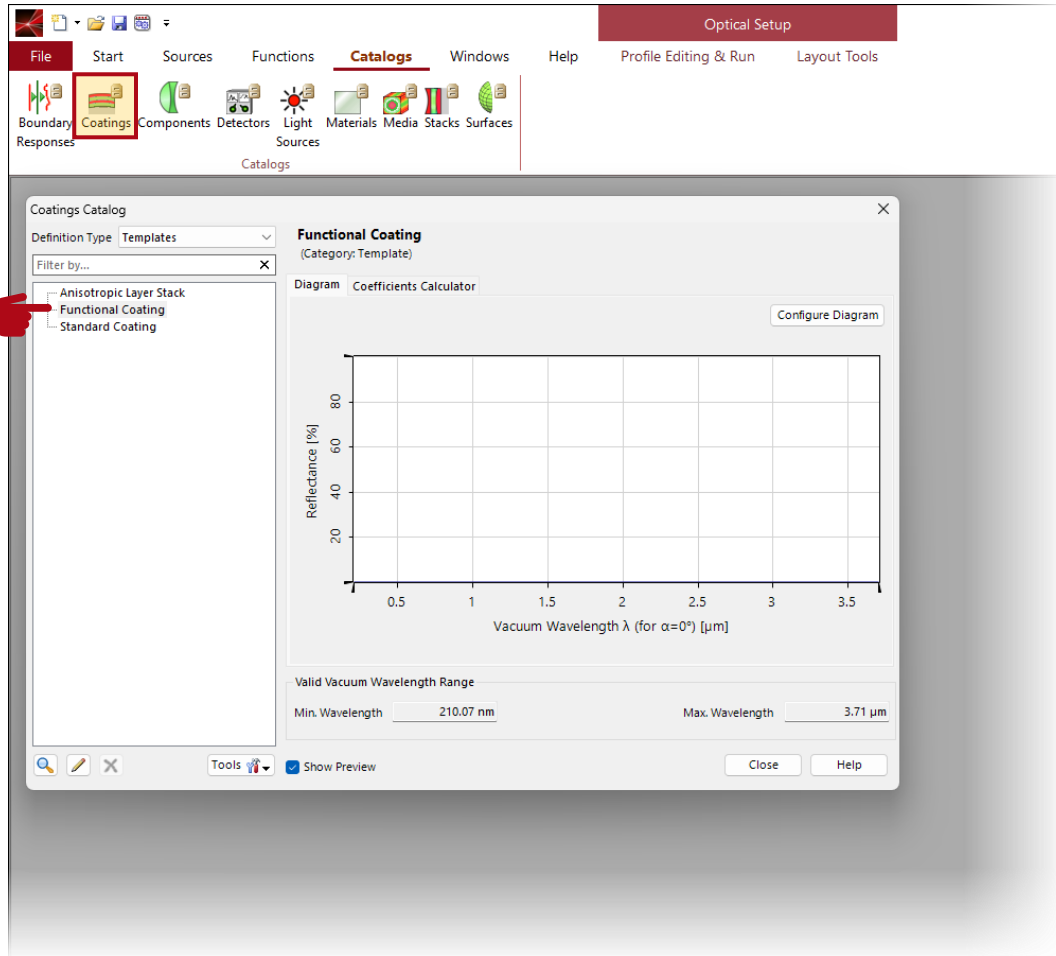
Dependent on Wavelength

X	Transmittance TE	Transmittance TM	Reflectance TE	Reflectance...
0°	0.99903	0.99973	0.00096667	0.00026996
1°	0.99916	0.99973	0.00083803	0.00027481
2°	0.99927	0.99972	0.00072789	0.00028008
3°	0.99937	0.99971	0.00063316	0.00028575
4°	0.99945	0.99971	0.00055135	0.00029179
5°	0.99952	0.9997	0.00048042	0.00029819
6°	0.99958	0.9997	0.0004187	0.00030493
7°	0.99964	0.99969	0.00036483	0.00031197
8°	0.99968	0.99968	0.00031766	0.00031928
9°	0.99972	0.99967	0.00027627	0.00032683
10°	0.99976	0.99967	0.00023985	0.00033459
11°	0.99979	0.99966	0.00020775	0.00034251
12°	0.99982	0.99965	0.00017942	0.00035053
13°	0.99985	0.99964	0.00015438	0.00035863
14°	0.99987	0.99963	0.00013224	0.00036673
15°	0.99989	0.99963	0.00011265	0.00037478
16°	0.9999	0.99962	9.5323e-05	0.00038273
17°	0.99992	0.99961	8.002e-05	0.00039051
18°	0.99993	0.9996	6.6523e-05	0.00039806
19°	0.99995	0.99959	5.4653e-05	0.00040531

Buttons: Set Sampled Data, Show Sampled Data, Edit Sampling, OK, Cancel, Help

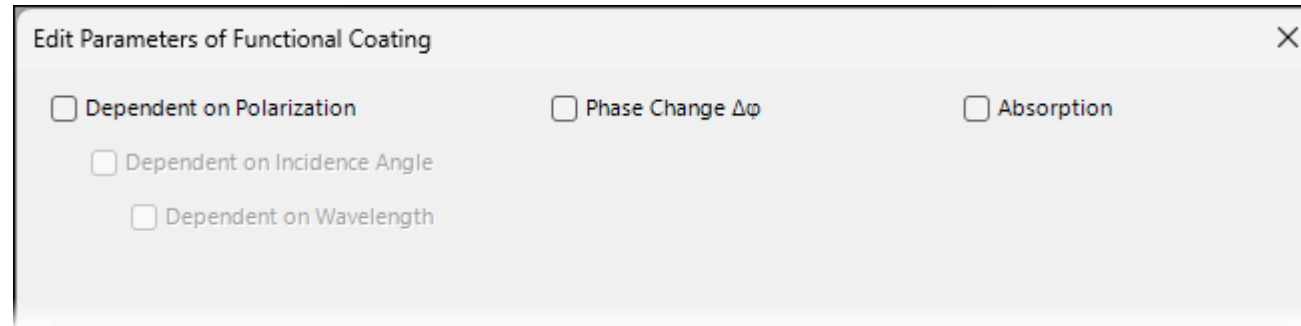
Modern coatings are complex structures including oftentimes hundreds of different layers. In many cases however, a full modeling of the entire structure is either unnecessary or impossible, if e.g. structure parameters are not given. For such cases, VirtualLab Fusion offers Functional Coatings, where the user can generate an ideal coating by specifying or importing reflectance and transmittance data.

Where to find the Components?



Functional Coatings can be defined in the Coatings catalogue of the main window or in the Coatings section of all surfaces that support it, such as Plane or Curved Surfaces.

Main Parameter



The options window of the functional coatings offer three main parameters that may introduce additional parameters to the window:

- ***Dependent on ...*** : Determine if reflectance and transmittance of the surface shall be defined uniformly or depended on polarization, incidence angle or wavelength.
- ***Phase Change $\Delta\Phi$*** : Specify how much phase shall be added to the field when interacting with the surface. If unchecked, a π phase will be added for a transition from a medium with lower optical density to higher optical density.
- ***Absorption***: When unchecked reflectance and transmittance can be defined independently from each other, otherwise their sum will be always 1.

Dependent on

When the *Absorption* flag is unchecked, *Reflectance* and *Transmittance* are coupled. In this case, the *Variable Parameter* box indicated which parameter shall be accessible in e.g., a *Parameter Run*.

Angle of Incidence	Transmittance TE	Transmittance TM	Reflecta...	Reflecta...
0°	1	1	0	0
1°	1	1	0	0
2°	1	1	0	0
3°	1	1	0	0
4°	1	1	0	0
5°	1	1	0	0
6°	1	1	0	0
7°	1	1	0	0
8°	1	1	0	0
9°	1	1	0	0
10°	1	1	0	0
11°	1	1	0	0
12°	1	1	0	0
13°	1	1	0	0
14°	1	1	0	0
15°	1	1	0	0
16°	1	1	0	0
17°	1	1	0	0
18°	1	1	0	0
19°	1	1	0	0

Wavelength	Angle of Incidence			
	9°	10°	11°	12°
635 nm	Transmitta...	1	1	1
	Transmitta...	1	1	1
	Reflectanc...	0	0	0
	Reflectanc...	0	0	0
532 nm	Transmitta...	1	1	1
	Transmitta...	1	1	1
	Reflectanc...	0	0	0
	Reflectanc...	0	0	0
473 nm	Transmitta...	1	1	1
	Transmitta...	1	1	1
	Reflectanc...	0	0	0
	Reflectanc...	0	0	0

Functional Coatings can be specified depending on polarization, incidence angle and wavelength. As the latter two require the input of data points, interpolation methods can also be specified.

Import of Measured Data

Edit Parameters of Functional Coating

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Set Sampled Data

- Load...
- Import...
- Select from Documents...

OK Cancel Help

Configuration of Data Import for Functional Coating

Properties (from Edit Dialog)

Dependent on Polarization Phase Change $\Delta\phi$ Absorption

Dependent on Incidence Angle

Dependent on Wavelength

⇒ So we need 2 variables: transmittances for TE and TM (t(TE), t(TM)) OR reflectances for TE and TM (r(TE), r(TM)).

One File Per Variable Each file contains ONE of the needed variables (t(TE), t(TM) OR r(TE), r(TM)), each depending on the angle of incidence.

All Data Exist in One Single File

Ensure T+R=1 by Calculating

Reflectances From Transmittances Transmittances From Reflectances

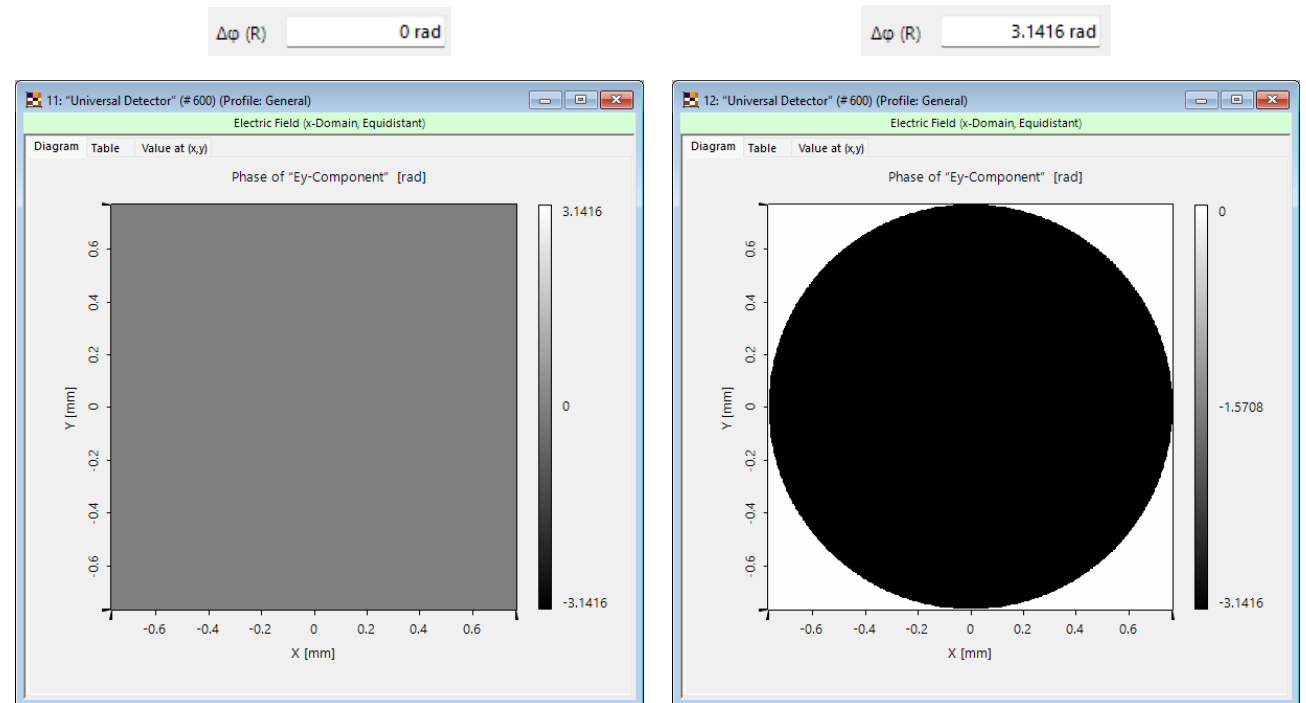
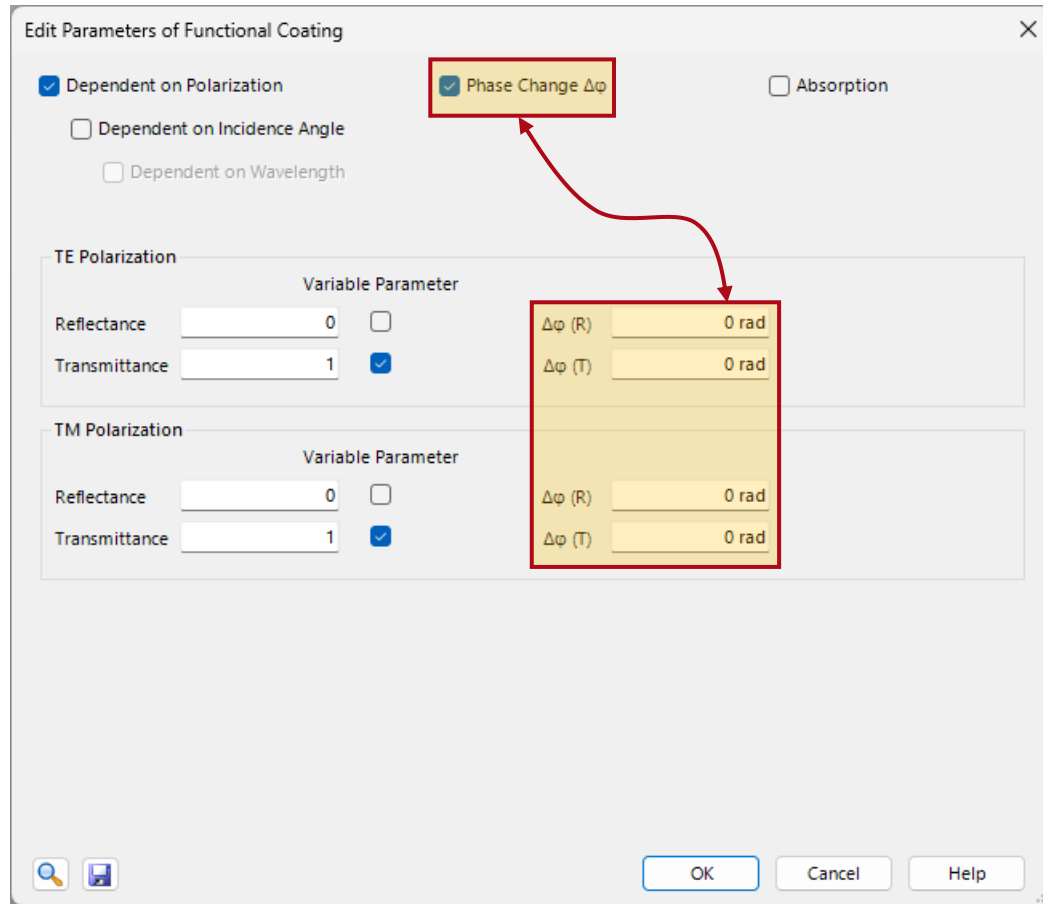
Index	Variable	Import	Status
1	Transmittance TM	Import	●
2	Transmittance TE	Import	●

Validity:

OK Cancel Help

Under *Set Sampled Data* wavelength and/or angle dependent transmittance/reflectance data can be either selected or imported. When using the import option, a wizard will automatically open to guide one through the process.

Phase Change $\Delta\Phi$

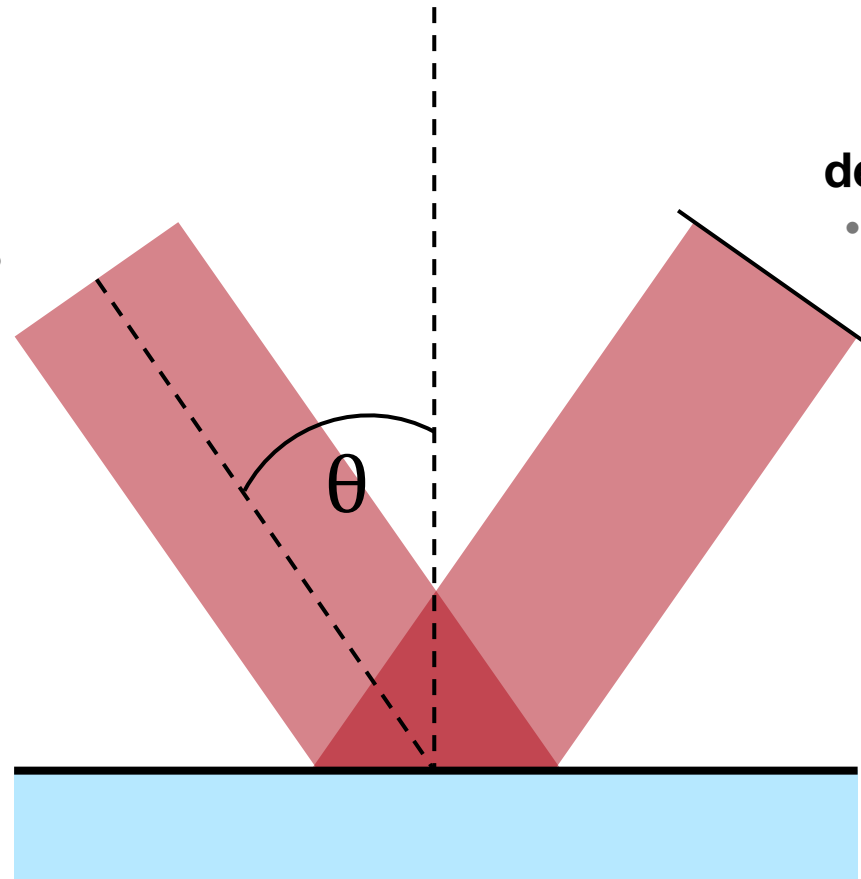


phase of the field after reflection on the *Functional Coating*

Example: Angle Dependency of a HR Coating

plane wave

- monochromatic
- wavelength: 632.8 nm
- Incident angle θ : 0° - 60°
- TE & TM - polarization



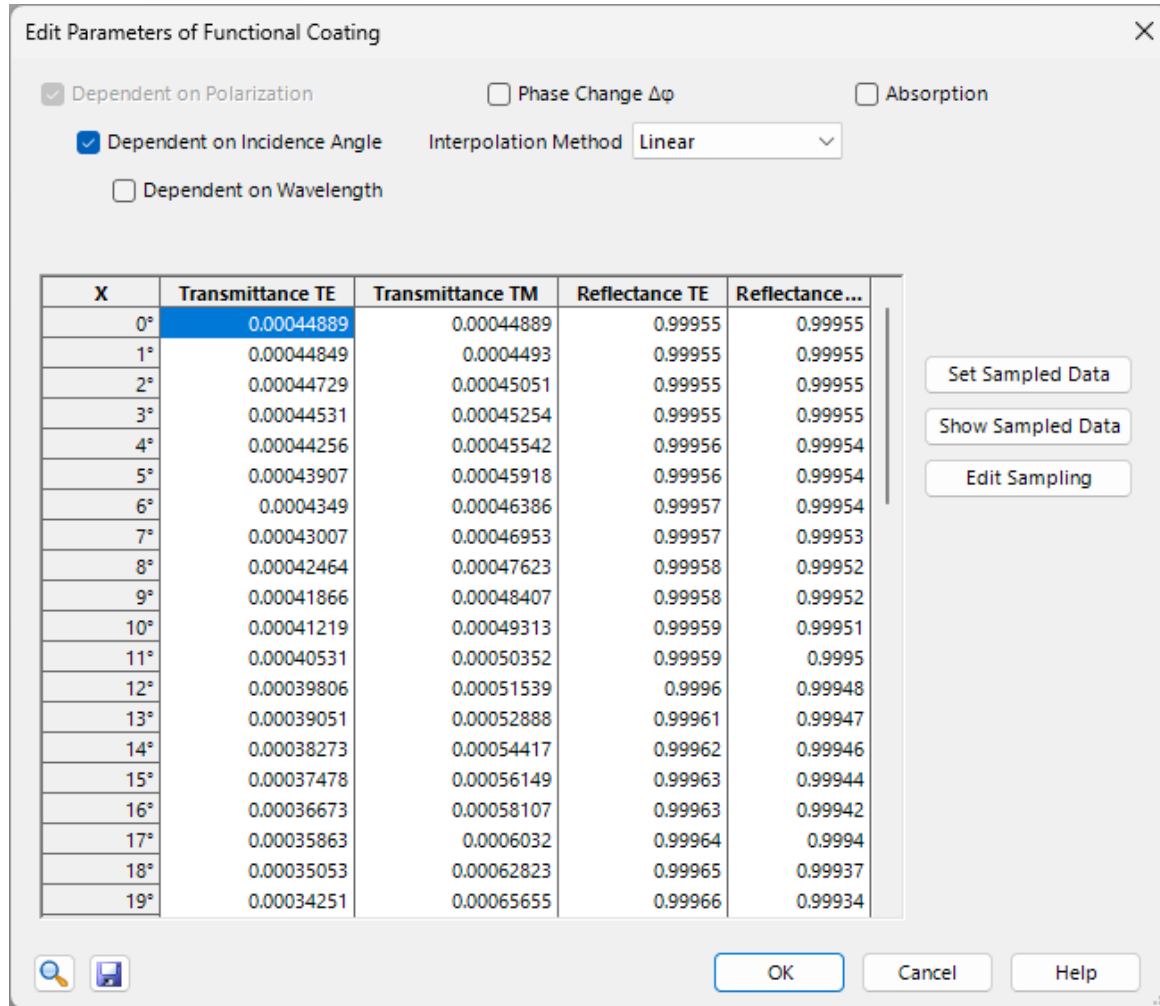
detector

- efficiency

Fused Silica with HR-Coating

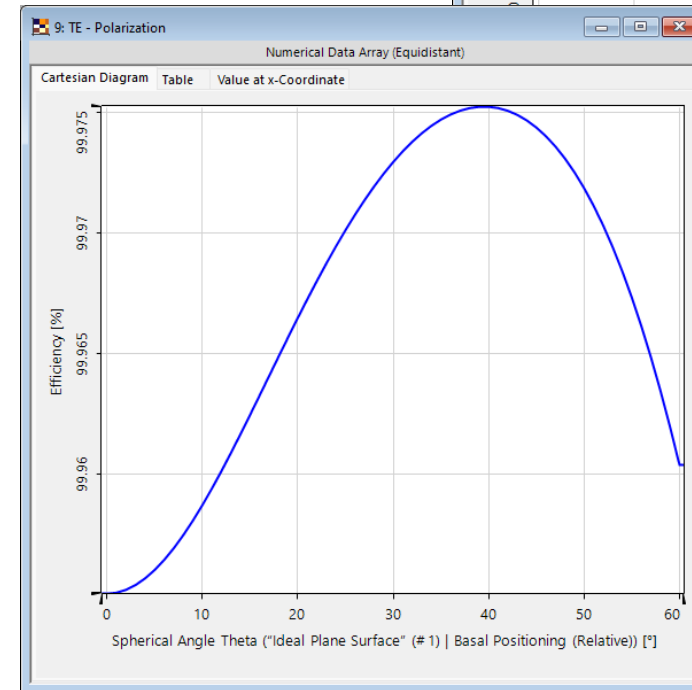
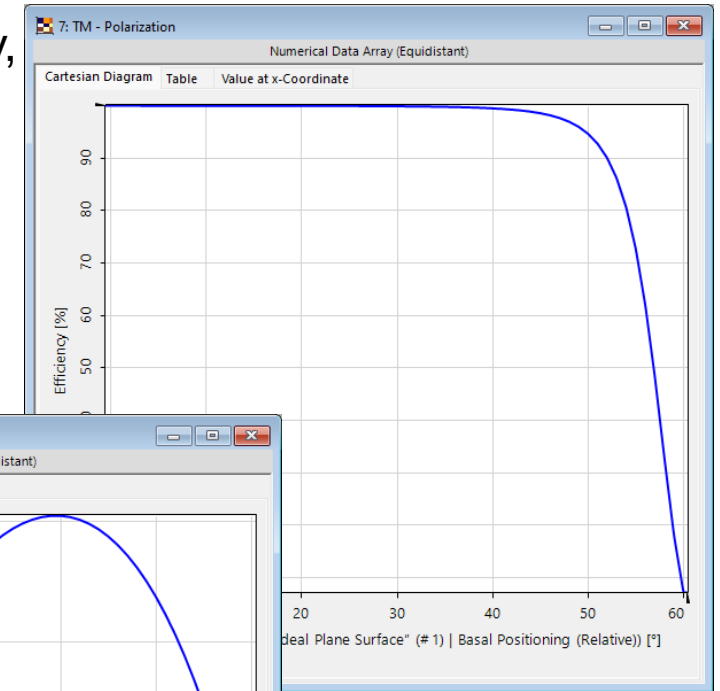
- imported angle dependent data of the coating

Example: Angle Scan of a HR Coating



imported data of the functional coating

reflected efficiency,
TM polarization



reflected efficiency,
TE polarization

Document Information

title	Functional Coatings
document code	SWF.0051
document version	1.0
required packages	-
software version	2024.1 (Build 1.134)
category	Feature Use Case
further reading	- Stratified Media Component