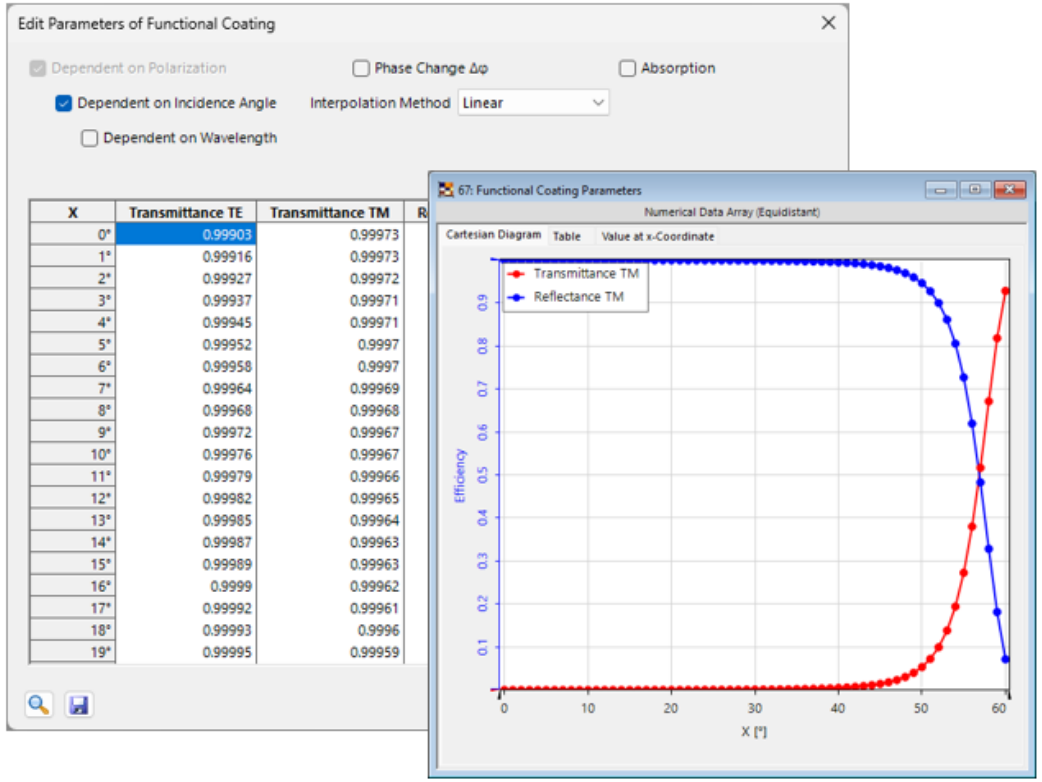
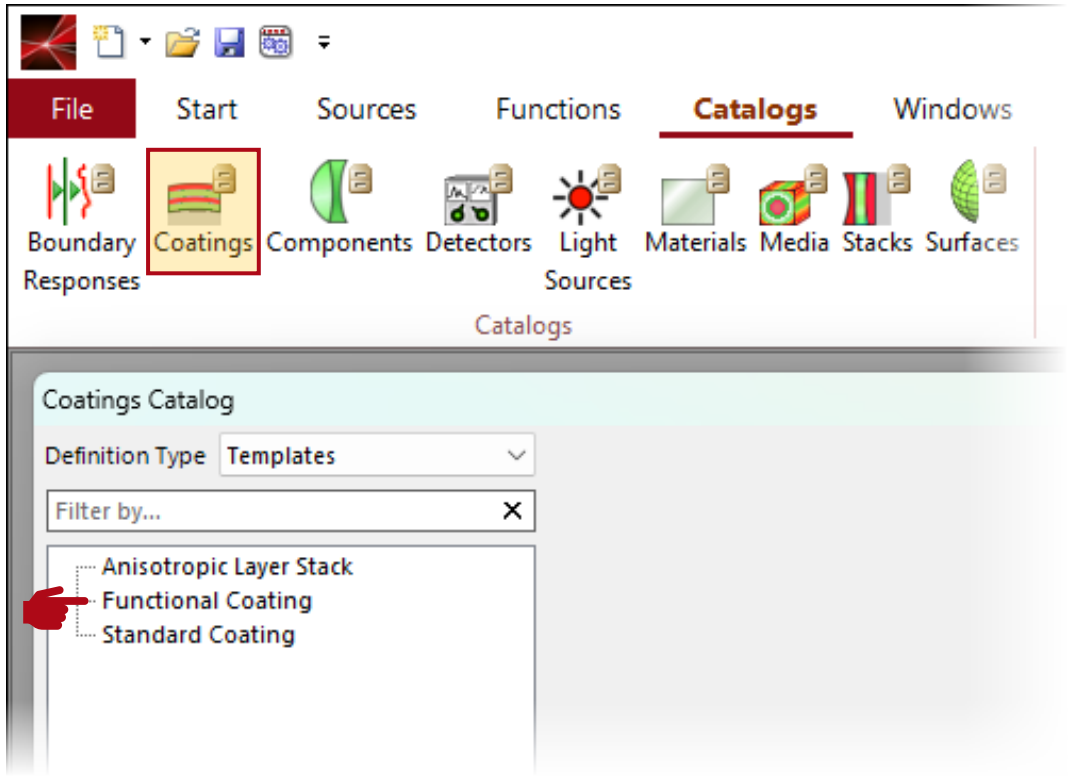
Functional Coatings

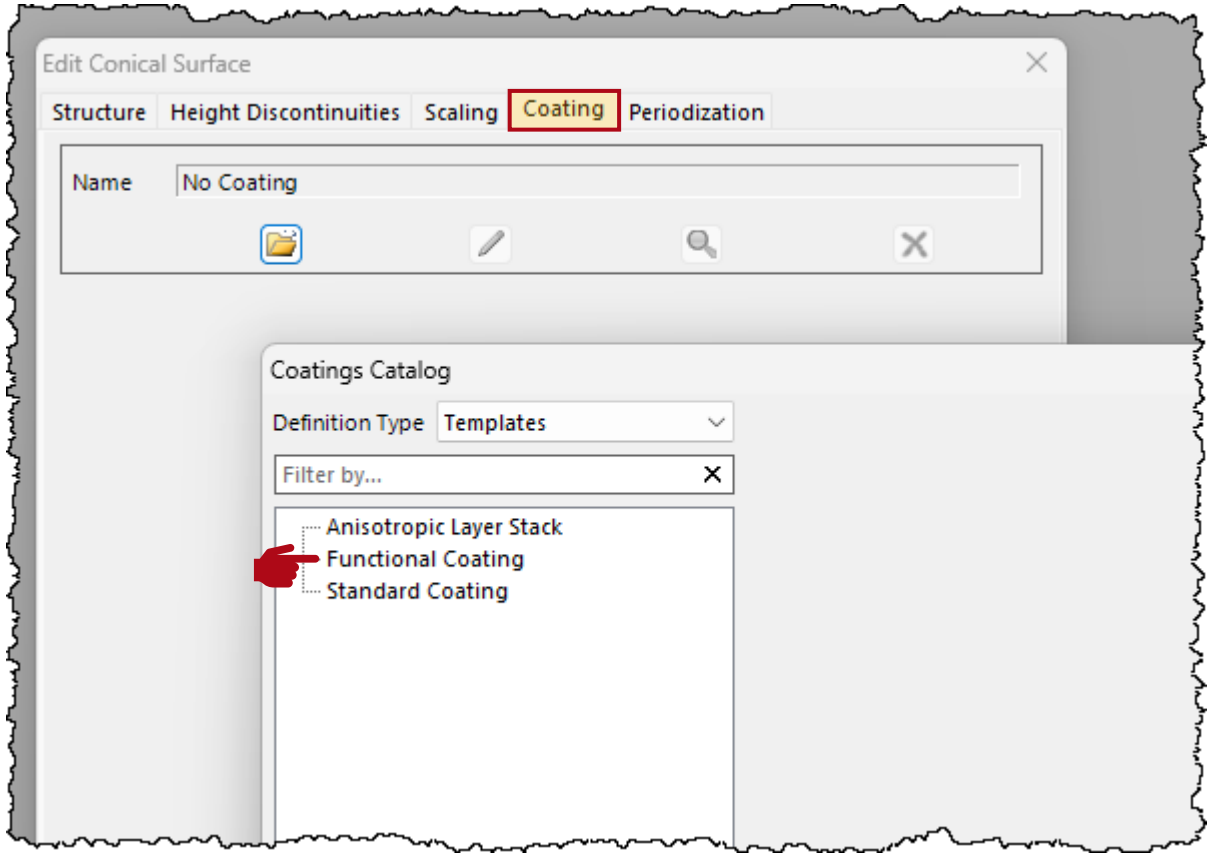
Abstract



Modern coatings are complex structures often including 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/or transmittance data.

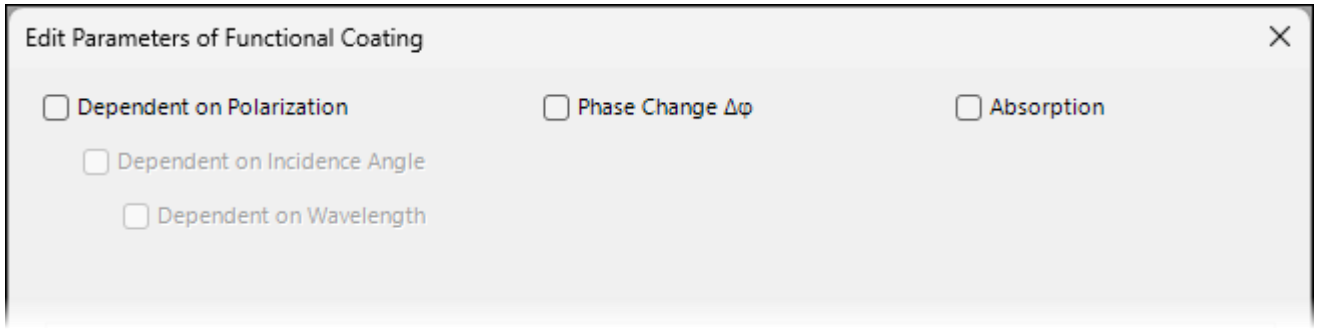
Where to find the Functional Coatings?





A *Functional Coating* 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*.

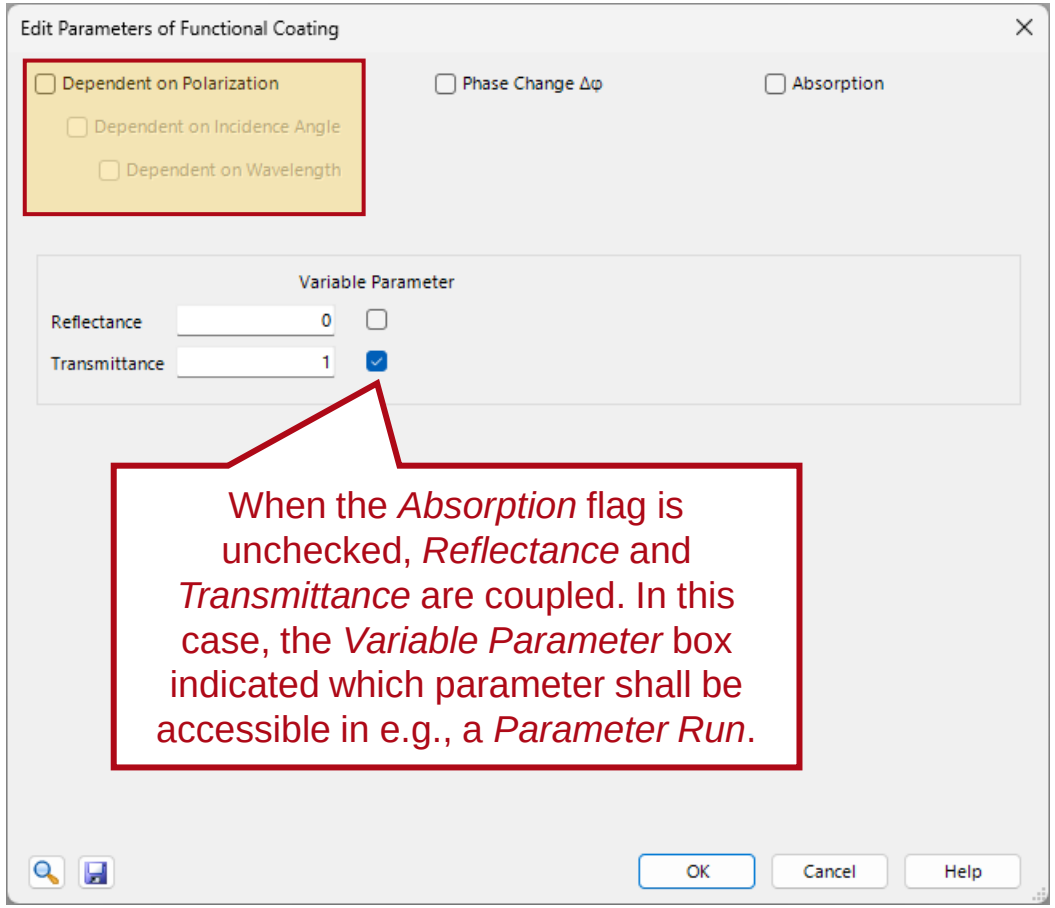
Main Parameters



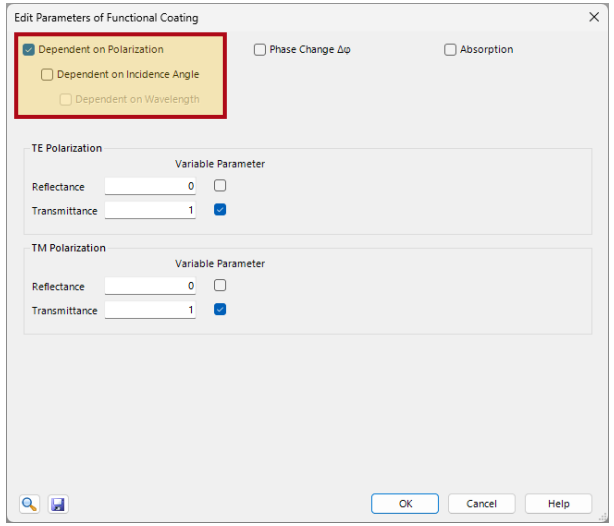
The options window of the functional coatings offer three main parameters that may introduce additional parameters to the window:

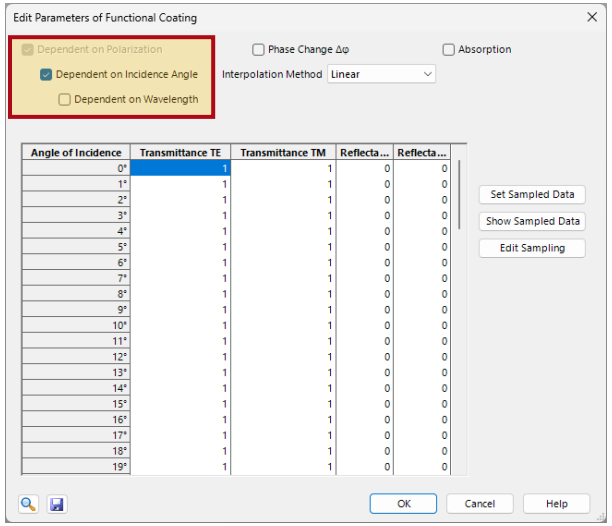
- ***Dependent on …*** **:** Determine if reflectance and transmittance of the surface shall be dependent on polarization, incidence angle and/or wavelength.
- ***Phase Change ΔΦ*****:** Specify how much phase shall be added to the field when interacting with the surface. If unchecked, a π phase will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

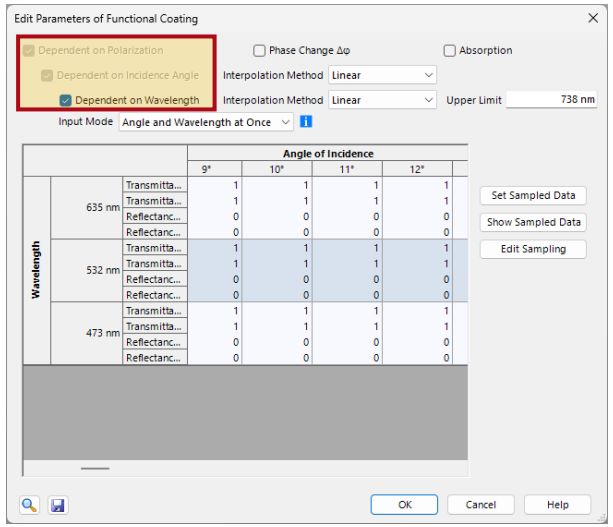
Dependent on ….



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*.

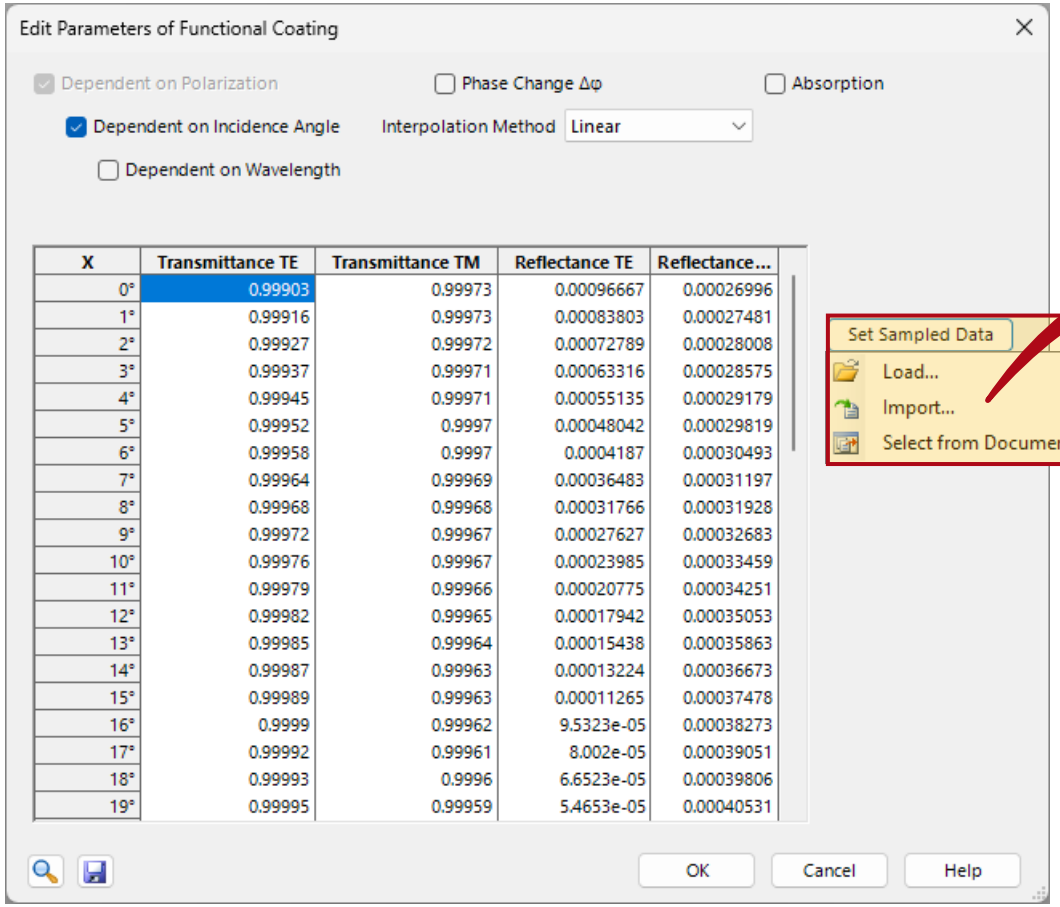


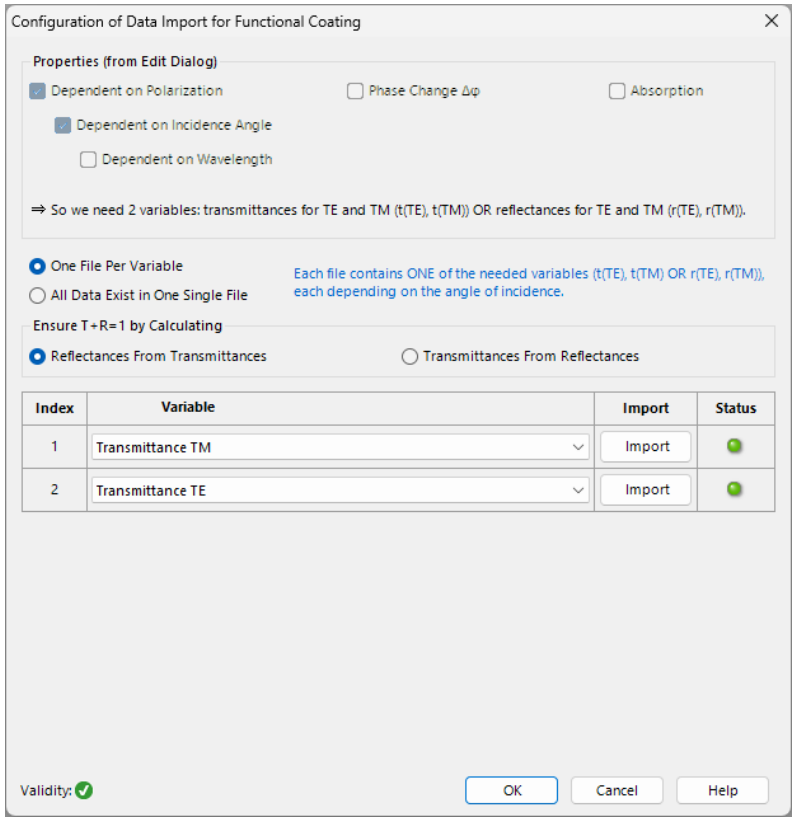




Functional Coatings can be specified depending on polarization, incidence angle and wavelength. As the latter two require the input of data points, interpolation methods can also be specified.

Import of Measured Data

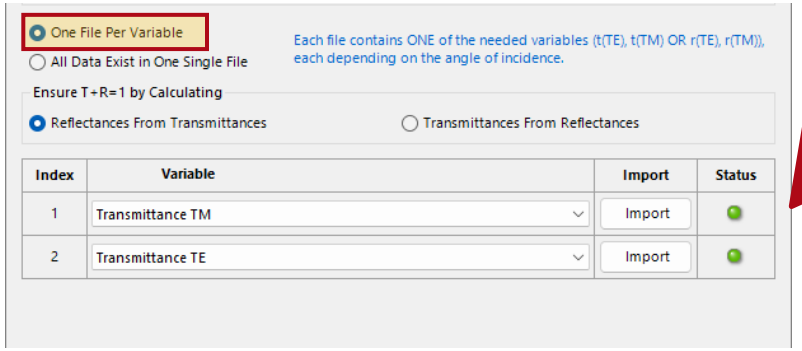


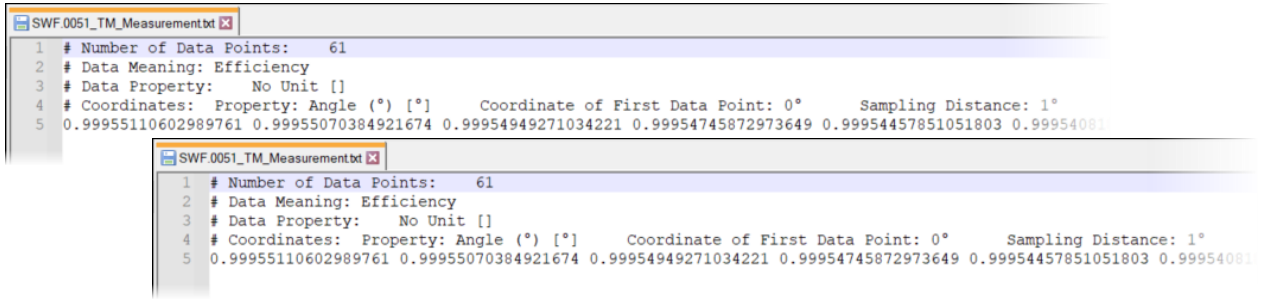


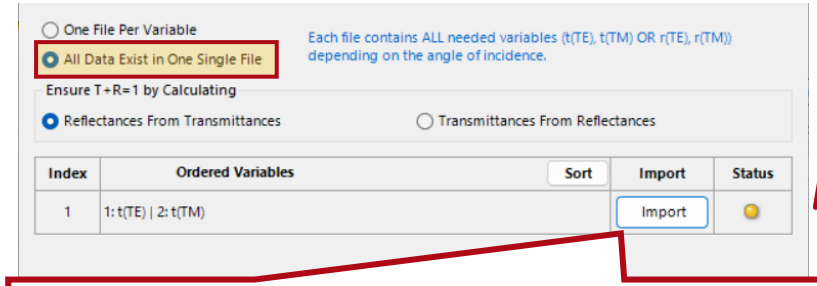
Under *Set Sampled Data* wavelength and/or angle dependent transmittance/reflectance data can be either selected or imported. When using the import option, a wizard will automatically open to guide one through the process.

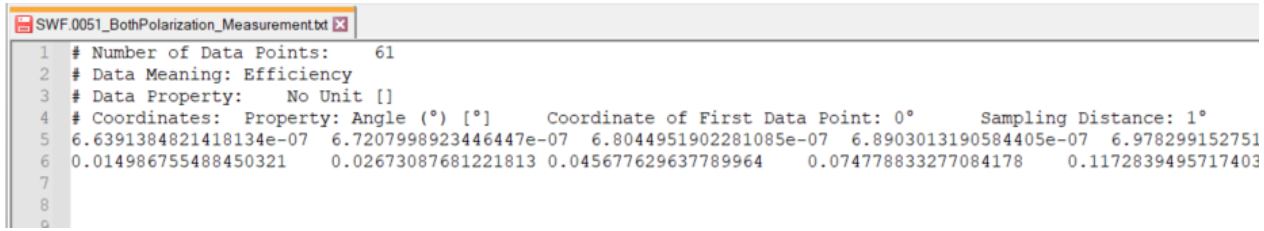
Import of Measured Data – Data Format

The functional coatings offer two possibilities to import data. Either for each quantity (meaning: transmittance and reflectance per wavelength/angle) a single file is presented, or all information are encoded as rows in a single file. If the Absorption option remains unchecked, only transmittance or reflectance has to be imported, as the other one is calculated automatically



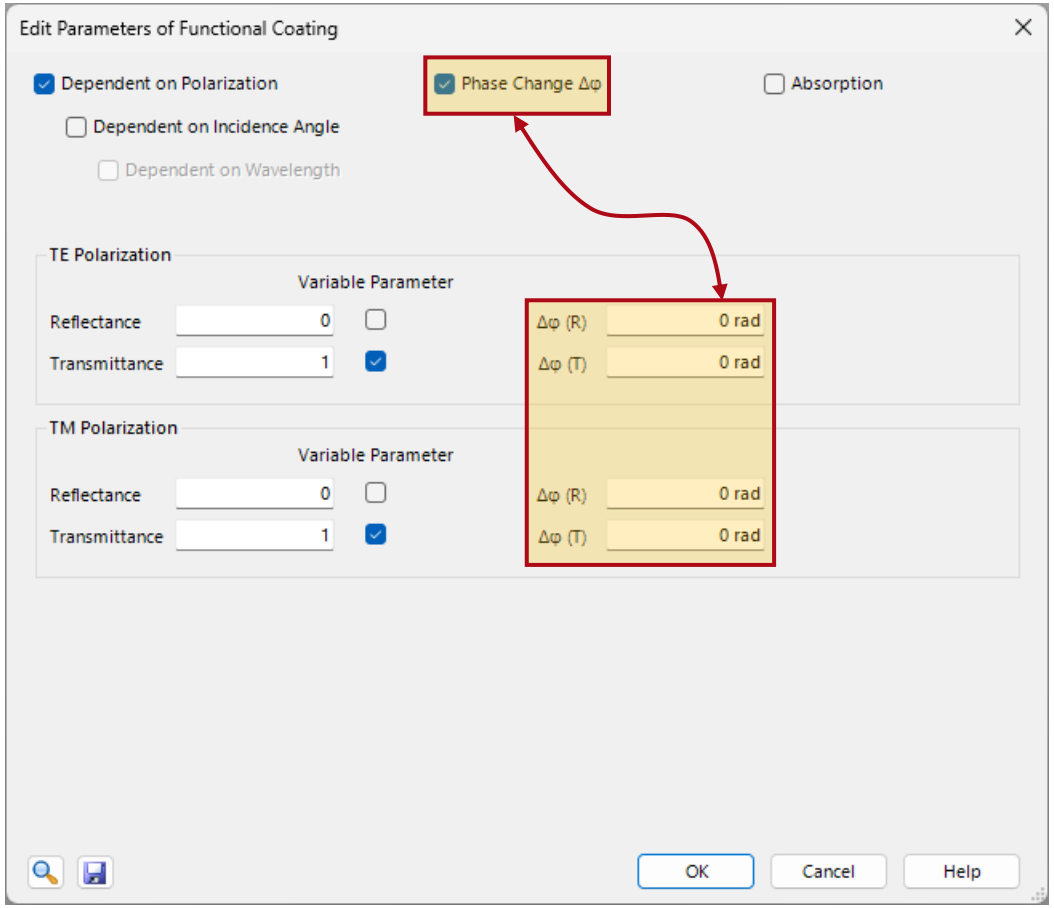


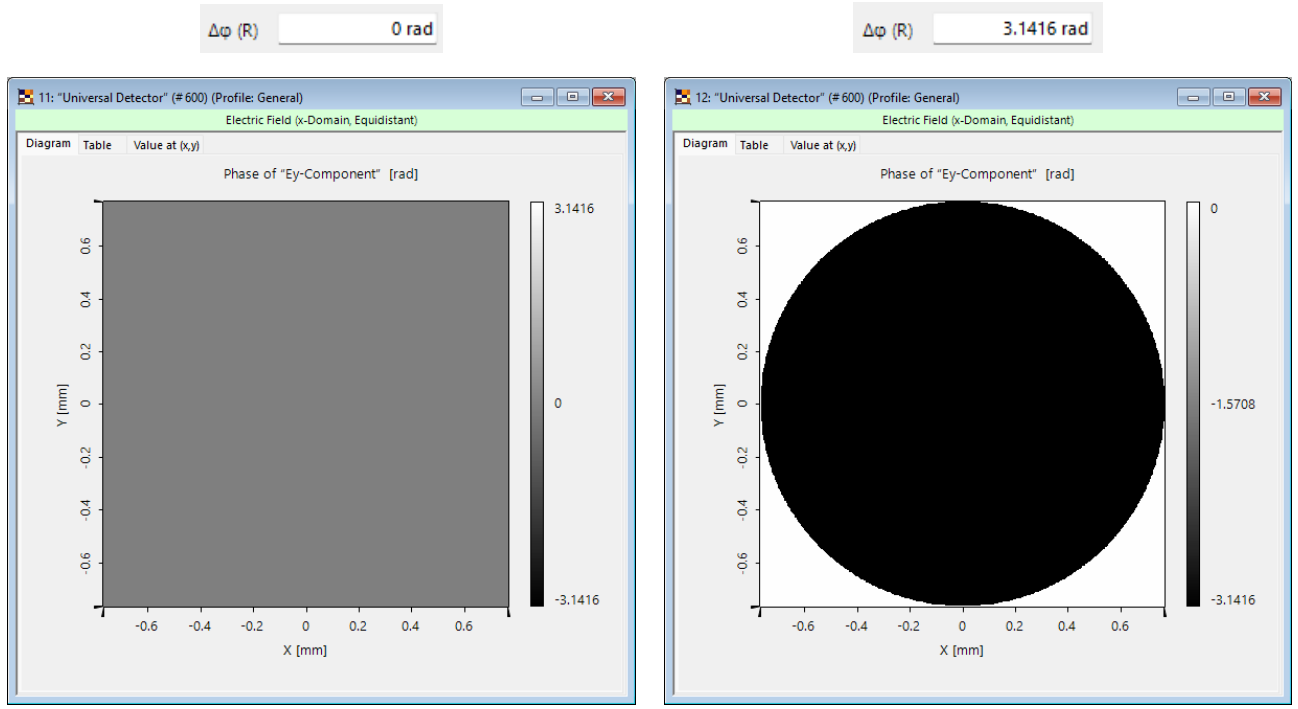




With the *Sort* button the order in which the imported information shall be interpreted as can be changed. Specifying e.g. which row is supposed to represent the TE-polarization depended transmission etc.

Phase Change ΔΦ

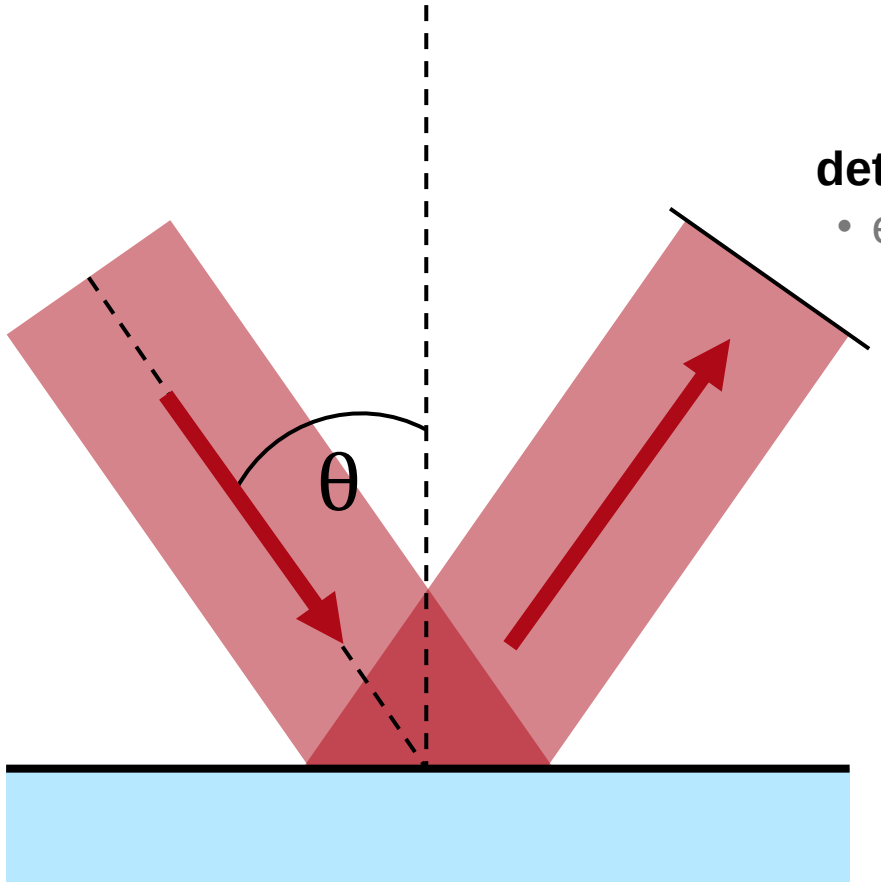




Phase of the field after reflection on the *Functional Coating,* when the phase of the input field is zero.

Example: Angle Dependency of a HR Coating

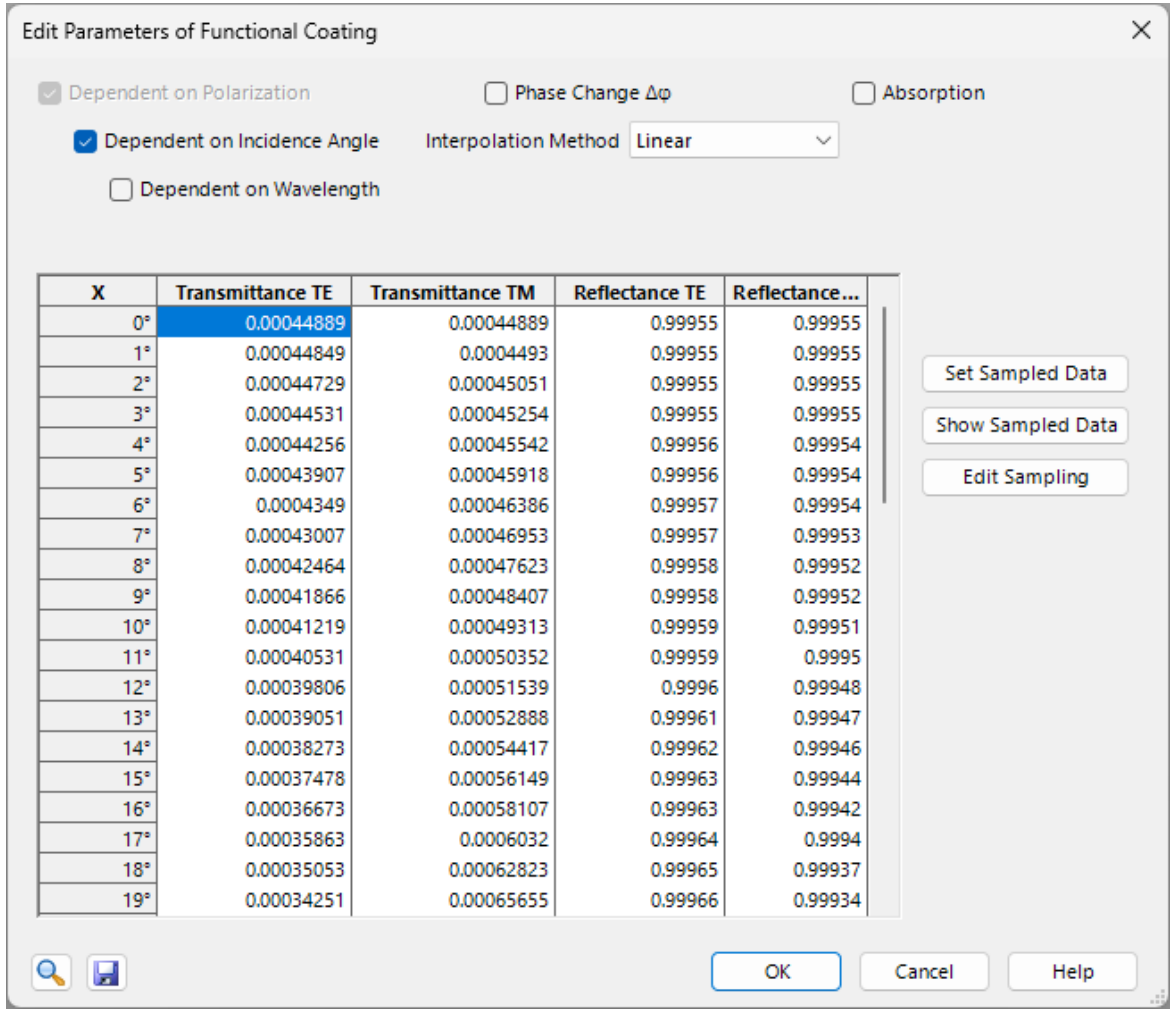
plane wave
- monochromatic
- wavelength: 632.8nm
- incident angle θ: 0°-60°
- TE & TM - polarization



detector
- efficiency

Fused Silica with HR-Coating
- imported angle dependent data of the coating

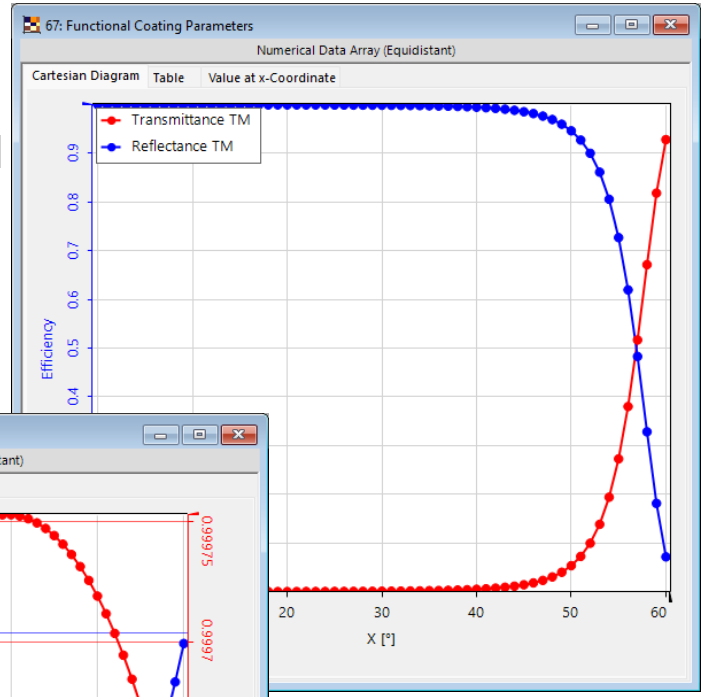
Example: Angle Dependency of a HR Coating

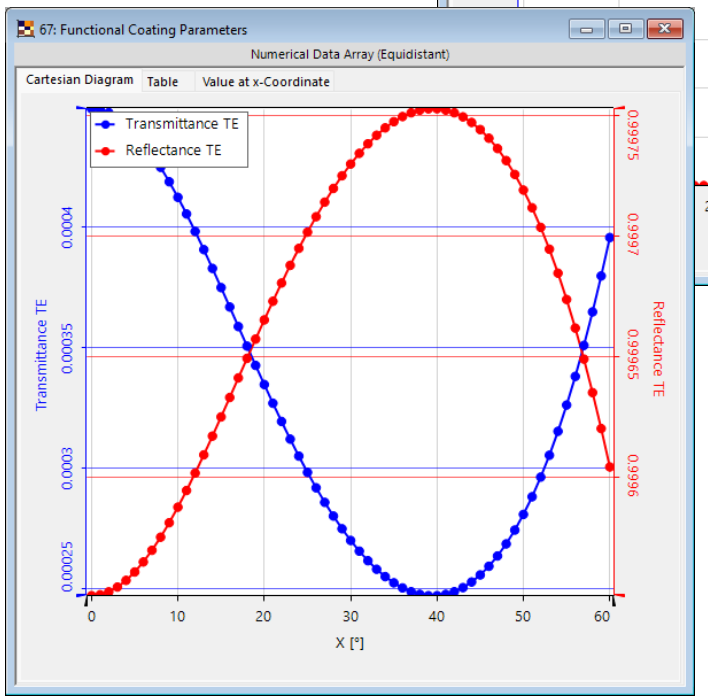


X	Transmittance TE	Transmittance TM	Reflectance TE	Reflectance...
0°	0.00044889	0.00044889	0.99955	0.99955
1°	0.00044849	0.0004493	0.99955	0.99955
2°	0.00044729	0.00045051	0.99955	0.99955
3°	0.00044531	0.00045254	0.99955	0.99955
4°	0.00044256	0.00045542	0.99956	0.99954
5°	0.00043907	0.00045918	0.99956	0.99954
6°	0.0004349	0.00046386	0.99957	0.99954
7°	0.00043007	0.00046953	0.99957	0.99953
8°	0.00042464	0.00047623	0.99958	0.99952
9°	0.00041866	0.00048407	0.99958	0.99952
10°	0.00041219	0.00049313	0.99959	0.99951
11°	0.00040531	0.00050352	0.99959	0.9995
12°	0.00039806	0.00051539	0.9996	0.99948
13°	0.00039051	0.00052888	0.99961	0.99947
14°	0.00038273	0.00054417	0.99962	0.99946
15°	0.00037478	0.00056149	0.99963	0.99944
16°	0.00036673	0.00058107	0.99963	0.99942
17°	0.00035863	0.0006032	0.99964	0.9994
18°	0.00035053	0.00062823	0.99965	0.99937
19°	0.00034251	0.00065655	0.99966	0.99934

imported data of the functional coating

reflected & transmitted efficiency, TM polarization





reflected & transmitted efficiency, TE polarization

Document Information

title	Functional Coatings
document code	SWF.0051
document version	1.1
required packages	-
software version	2024.1 (Build 1.132)
category	Feature Use Case
further reading	- Stratified Media Component