

Tutorial 229.01 (2.0)

Handling of Databased Interfaces in VirtualLab™

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Related Tutorials: [337.01](#) (Introduction to the Data Array Import Wizard)

Requirements: VirtualLab™ 5.5.0 – Starter Toolbox, Grating Toolbox, or Laser Resonator Toolbox

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Overview of data-based Interfaces

- VirtualLab™ allows the investigation of data-based interfaces within your optical simulation.
- The data-based interfaces can be used for the evaluation of measured data.
- There are two different types of data-based interfaces available in VirtualLab™:
 - Sampled Interface
 - Transition Point List Interface

Sampled Interface

Overview Sampled Interface

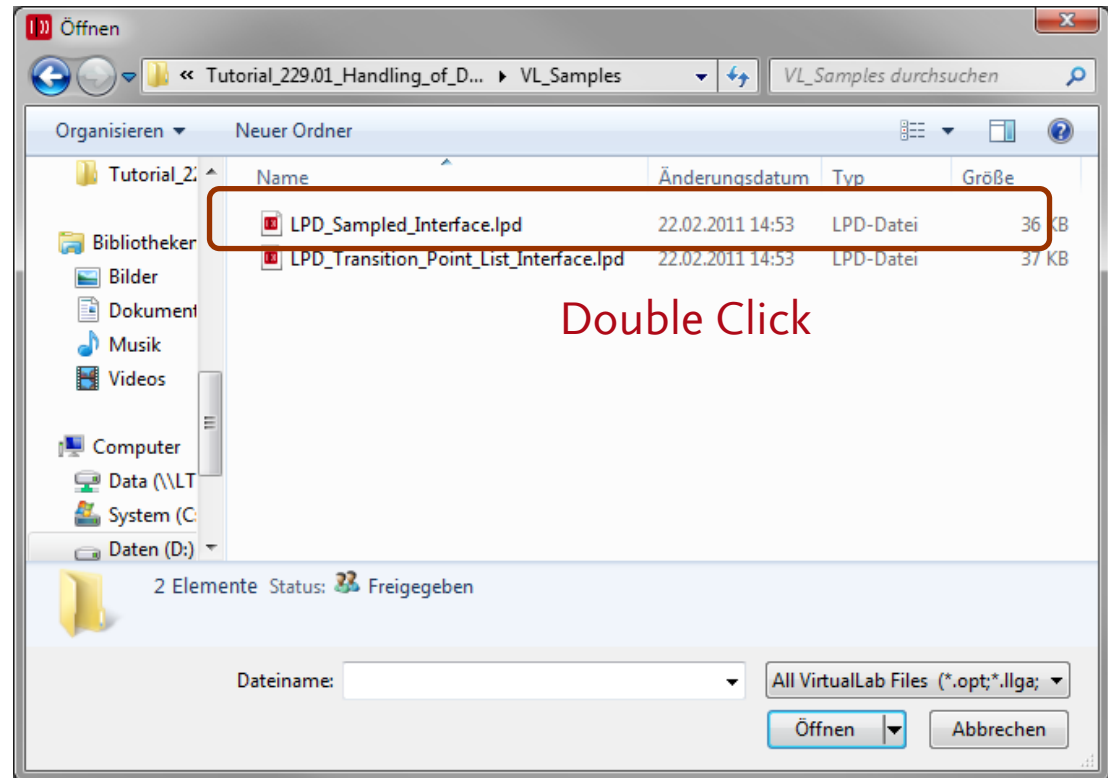
- The Sampled Interface can be used to simulate a interface which is specified by a set of equidistant data points.
- The Sampled Interface can handle 1D- and 2D-modulated measurement data.
- The Sampled interface offers a variety of interpolation methods to interpret the stored data points.
- It is also possible to apply quantization, scaling and pixelation on the Sampled Interface. This is handled in general for all interface types in VirtualLab™.

IMPORT DATA

Sampled Interface – Sample File

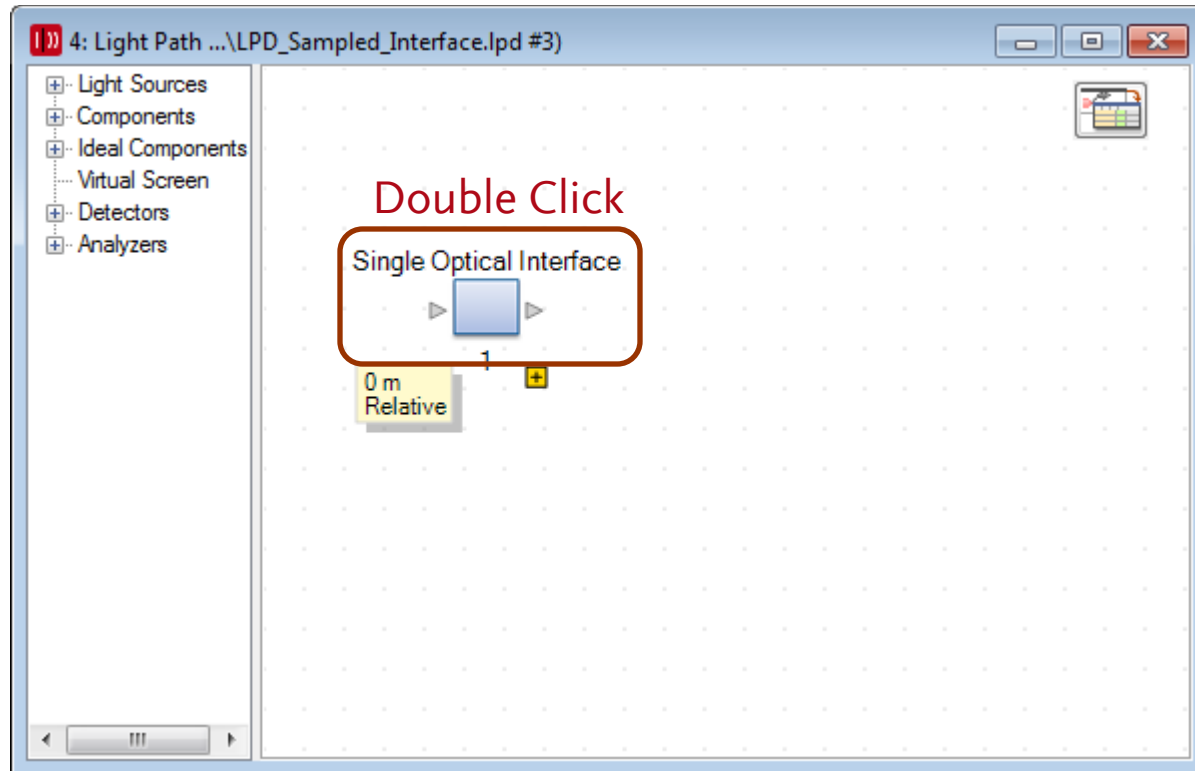


Results in



Sampled Interface – Sample File

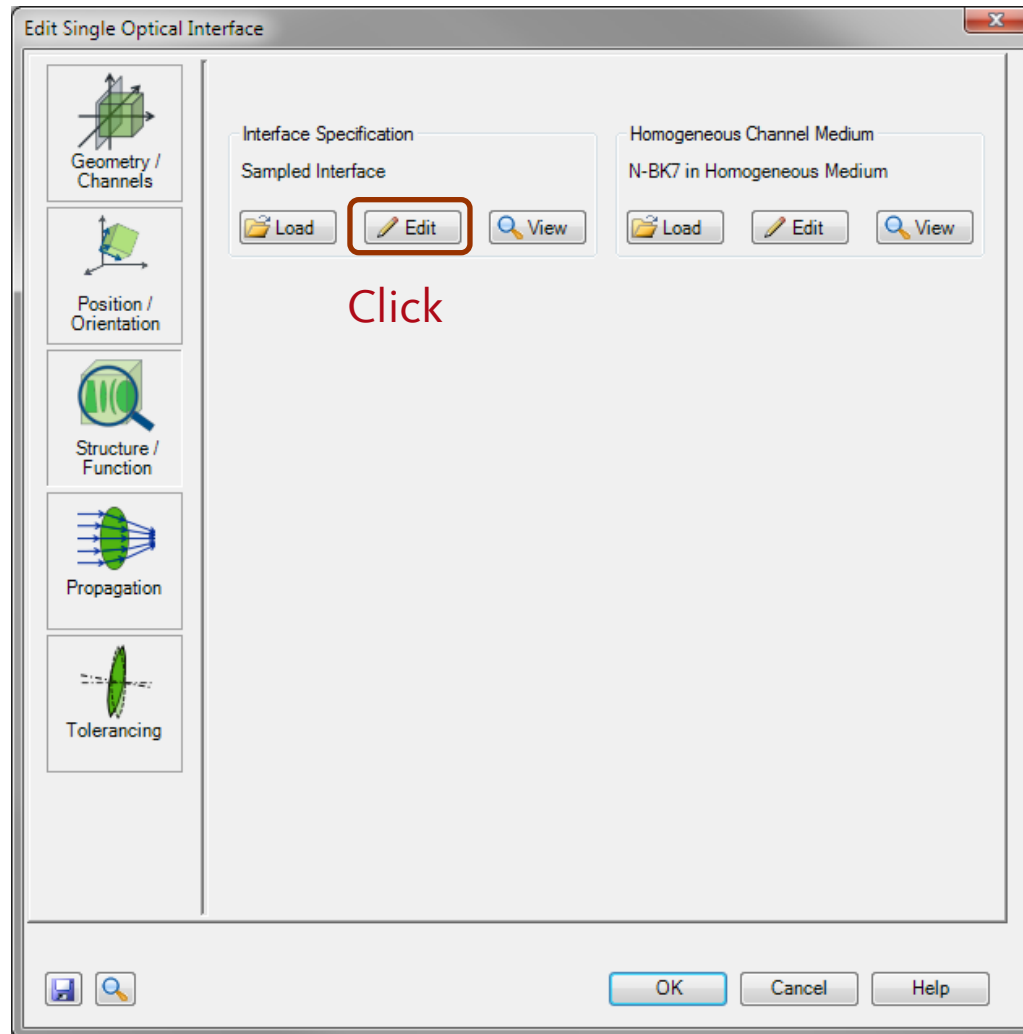
Results in



Results in



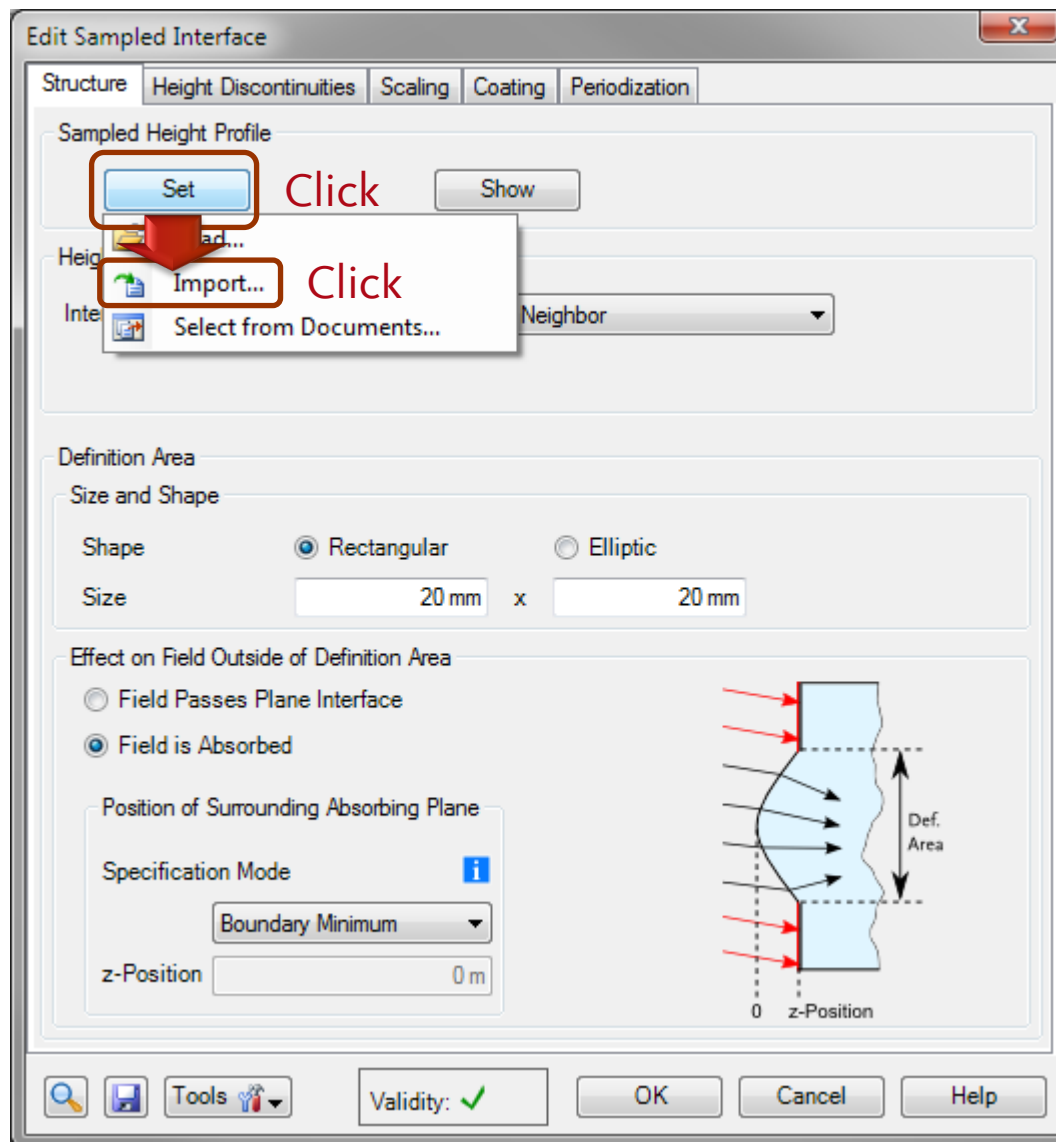
Edit dialog of Single Optical Interface



Results in



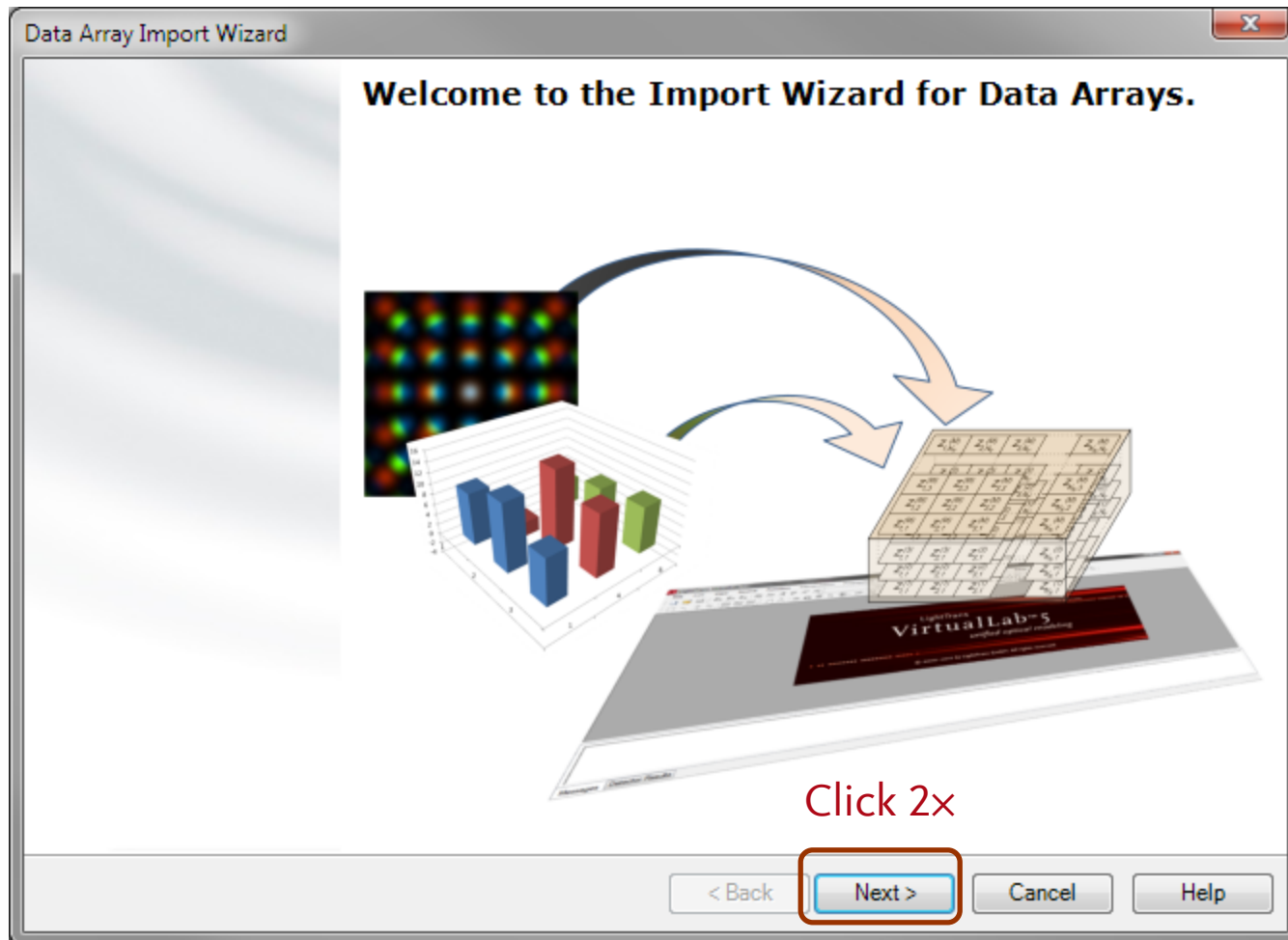
Edit dialog of Sampled Interface



Results in



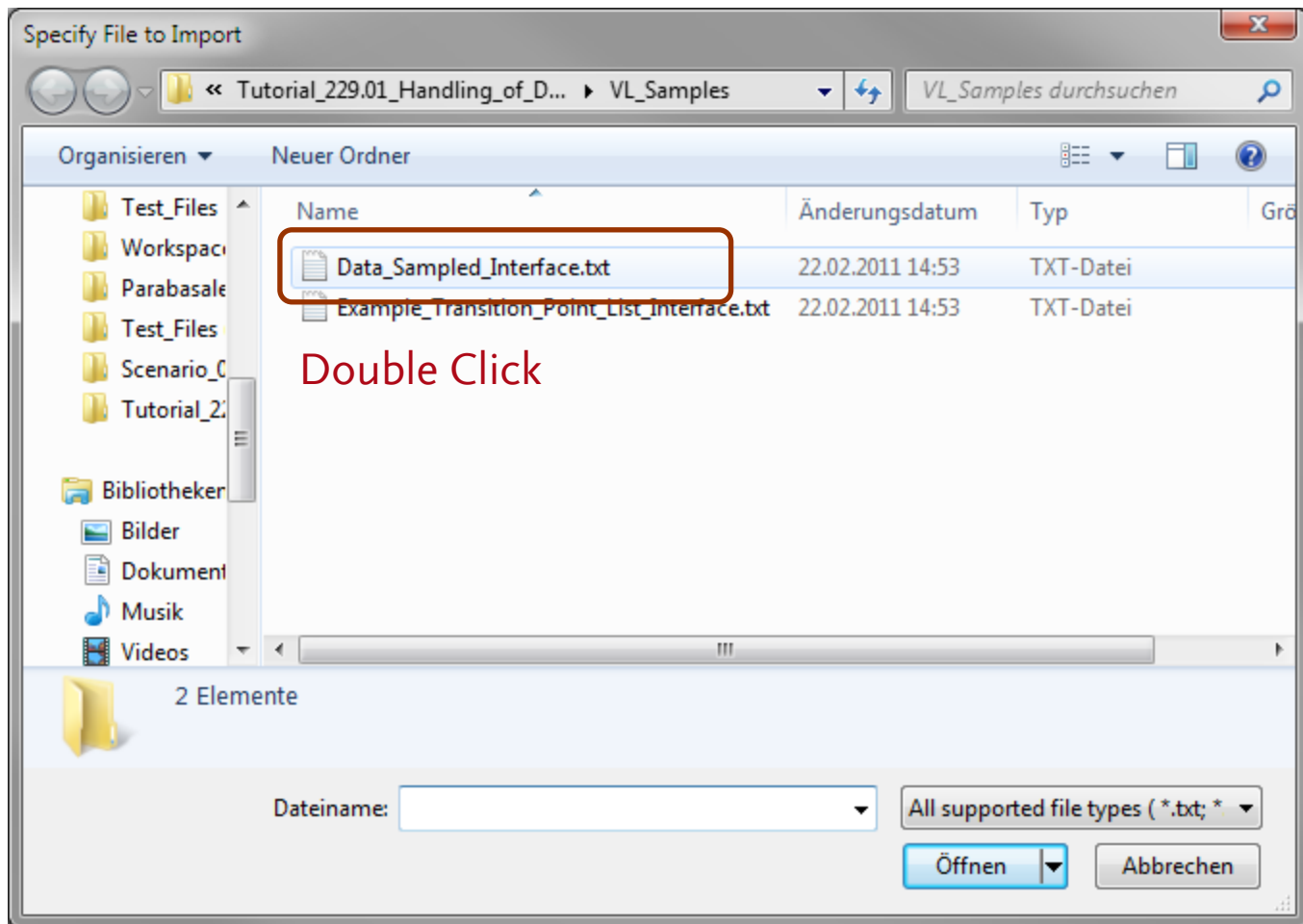
Import Measured Data I



Results in



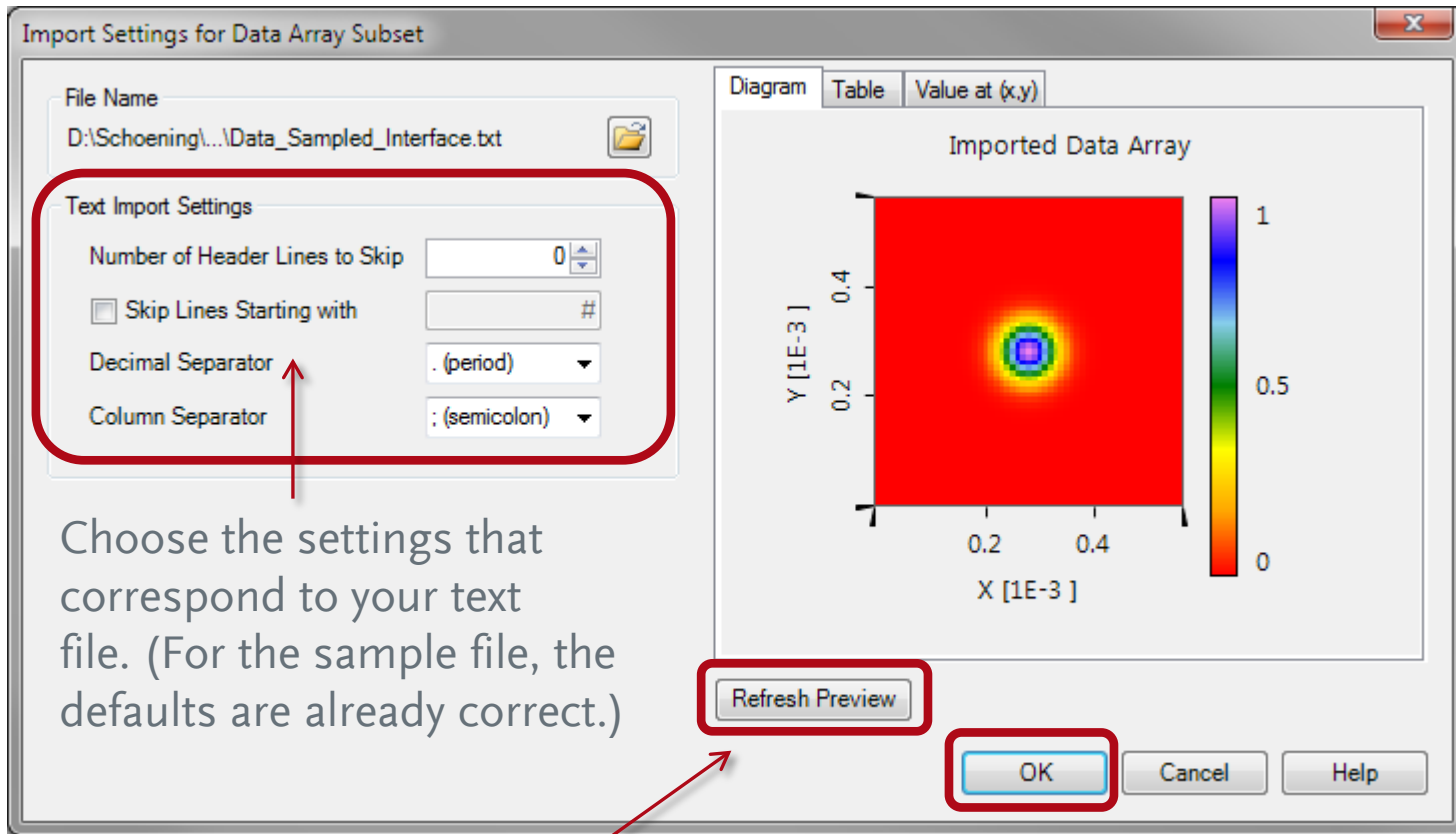
Import Measured Data II



Results in



Import Measured Data III



Choose the settings that correspond to your text file. (For the sample file, the defaults are already correct.)

Click to show or update the preview. Check if a data import is possible.

Click

Results in



Import Measured Data IV

Data Array Import Wizard

Import of Data Subsets

On this page, you can import an arbitrary number of data array subsets. Note that all subsets must have the same number of data points both in x- and y-direction.

Subset #	Description	Physical Property	Interpretation	File Import	File Name	Data Points
1	Imported Data	Length	Real-Valued	Import	D:\Tutorial_229.0	(57;57)

Results in



Click

Import Measured Data V

Data Array Import Wizard

Coordinate Settings
Set up the coordinates of the data array here, equidistantly sampled in both x- and y-direction.

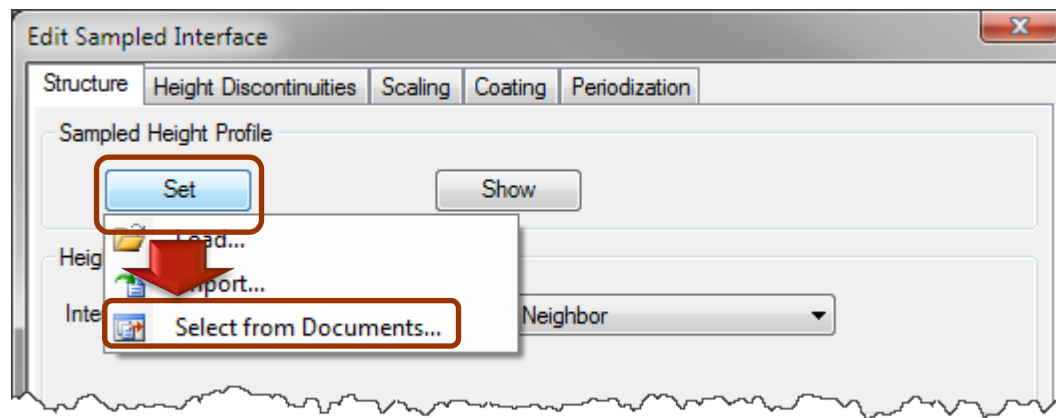
x-Axis		y-Axis	
Description	X	Description	Y
Physical Property	Length	Physical Property	Length
Interpolation Method	Nearest Neighbor	Interpolation Method	Nearest Neighbor
Dimensions		Dimensions	
Sampling Distance	20 μm	Sampling Distance	20 μm
Positioning	Center Around Zero	Positioning	Center Around Zero

Click

< Back Finish Cancel Help

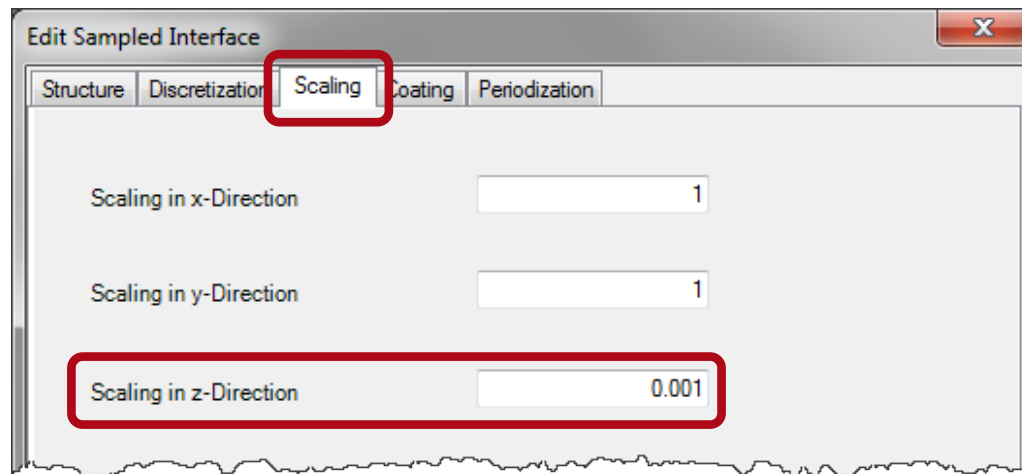
Constraints

- The imported data array must fulfill the following constraints:
 - Only one real-valued, equidistantly sampled subset
 - The coordinates must have the unit length.
 - The data must have the unit length.
- If this is not the case, the imported data array is shown as separate document so that you can change it accordingly.
- The changed data array can then be set via

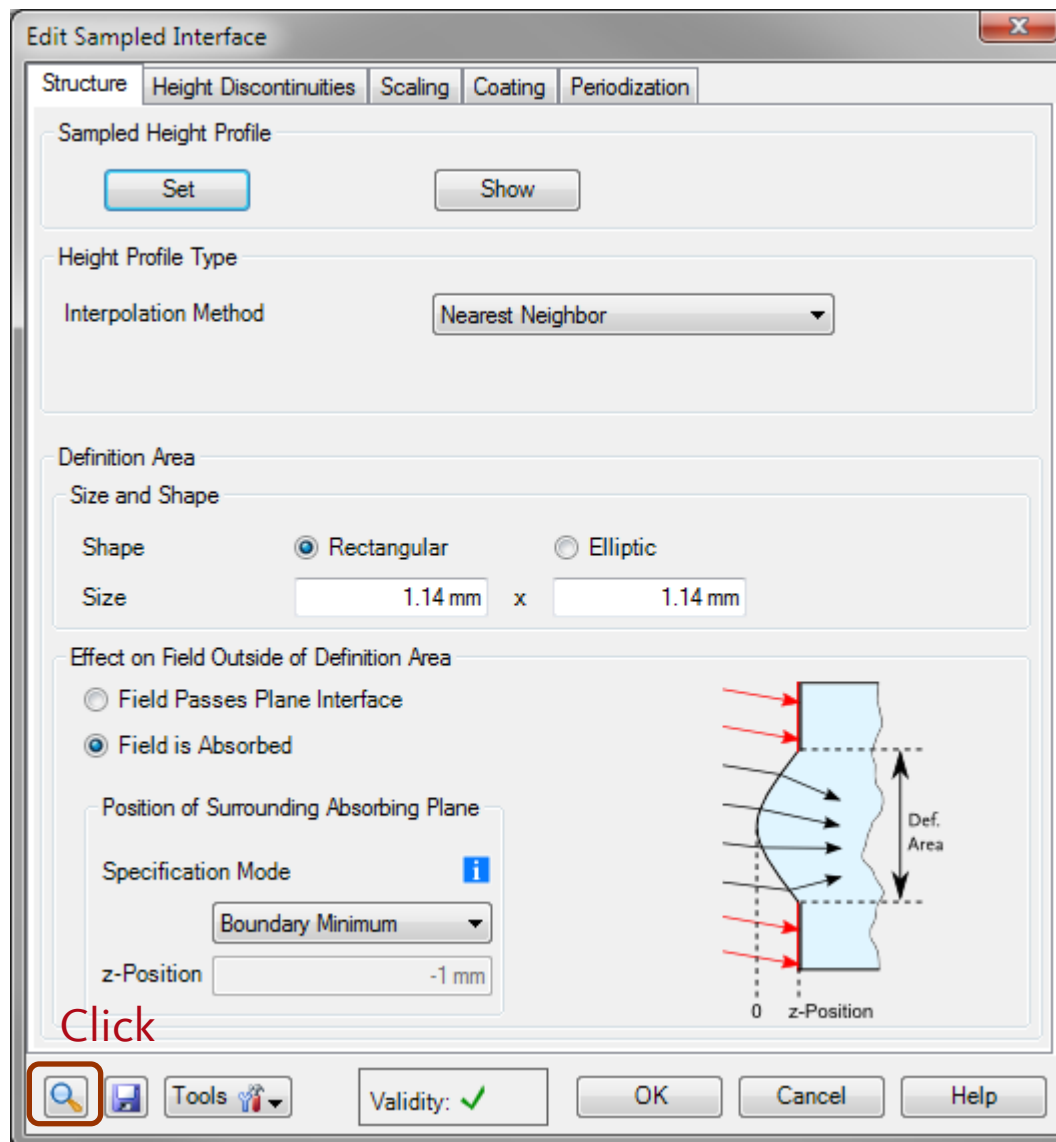


Scale the Height Data

- VIRTUALLAB™ assumes that the given height values have the unit „meters“. If this is not the case, you can scale the interface accordingly. In the sample file the heights are given in millimeters instead.



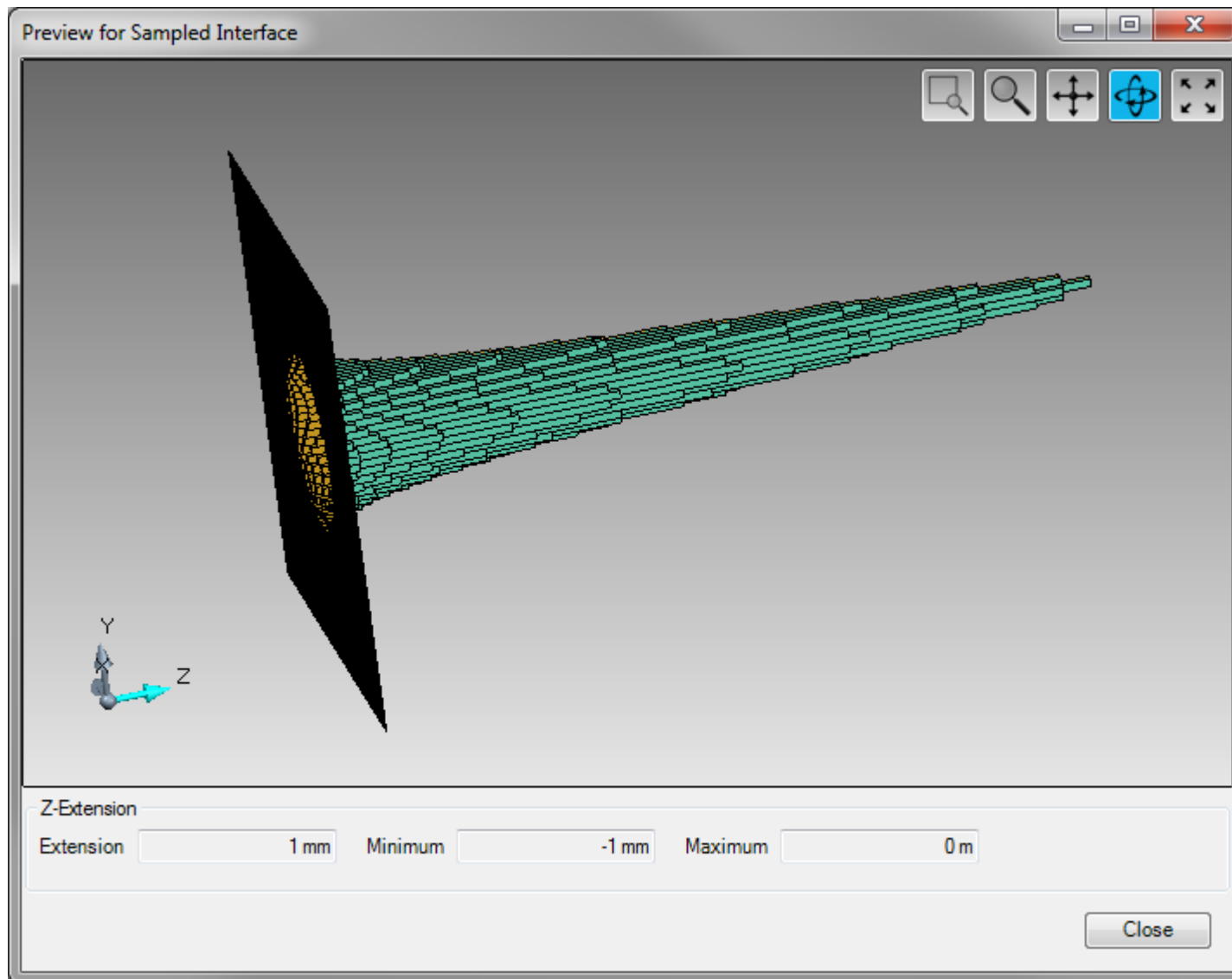
Edit Dialog of Sampled Interface



Results in



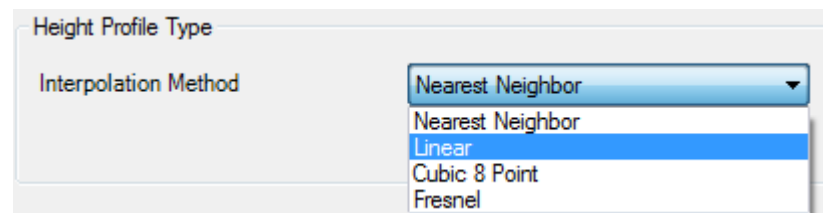
3D View of Sampled Interface



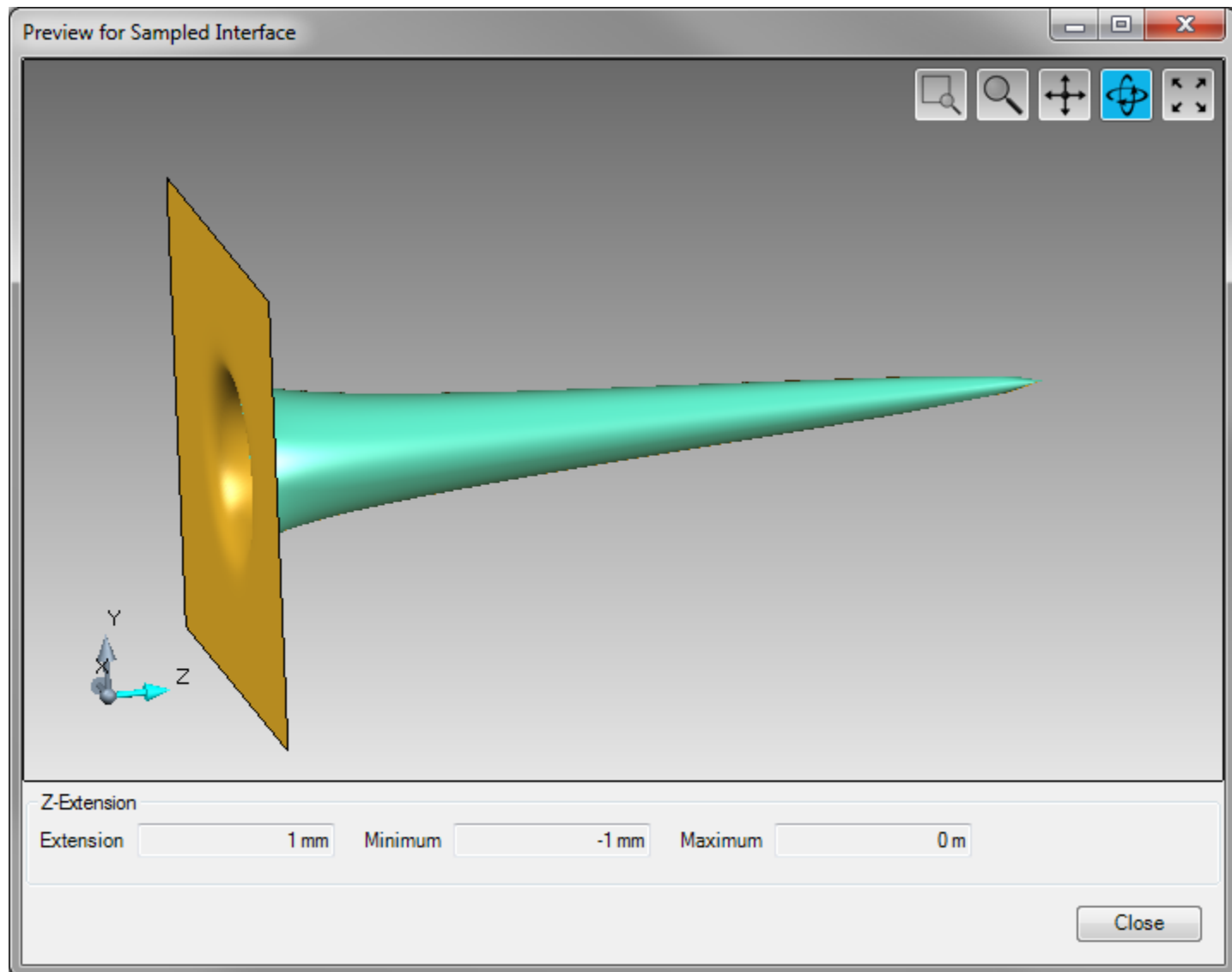
INTERPOLATION OF HEIGHT VALUES

Interpolation Types for Sampled Interface

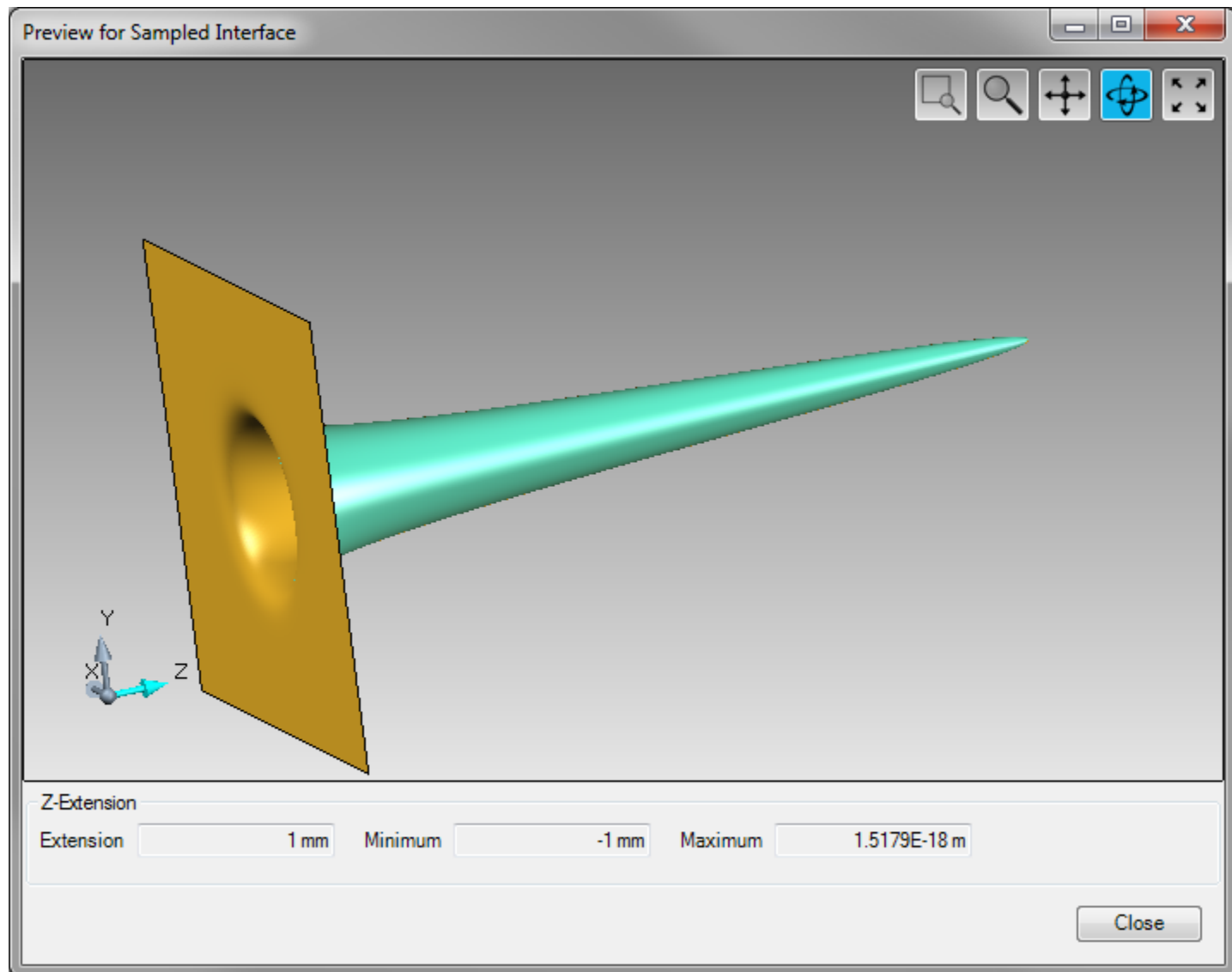
- For Sampled Interface several interpolation methods are available :
 - Nearest Neighbor
 - Linear
 - Cubic 8 Point
 - Fresnel (for sampled data which contains already Fresnel zones, therefore the total profile height has to be specified by the user)
- The interpolation method is set up by



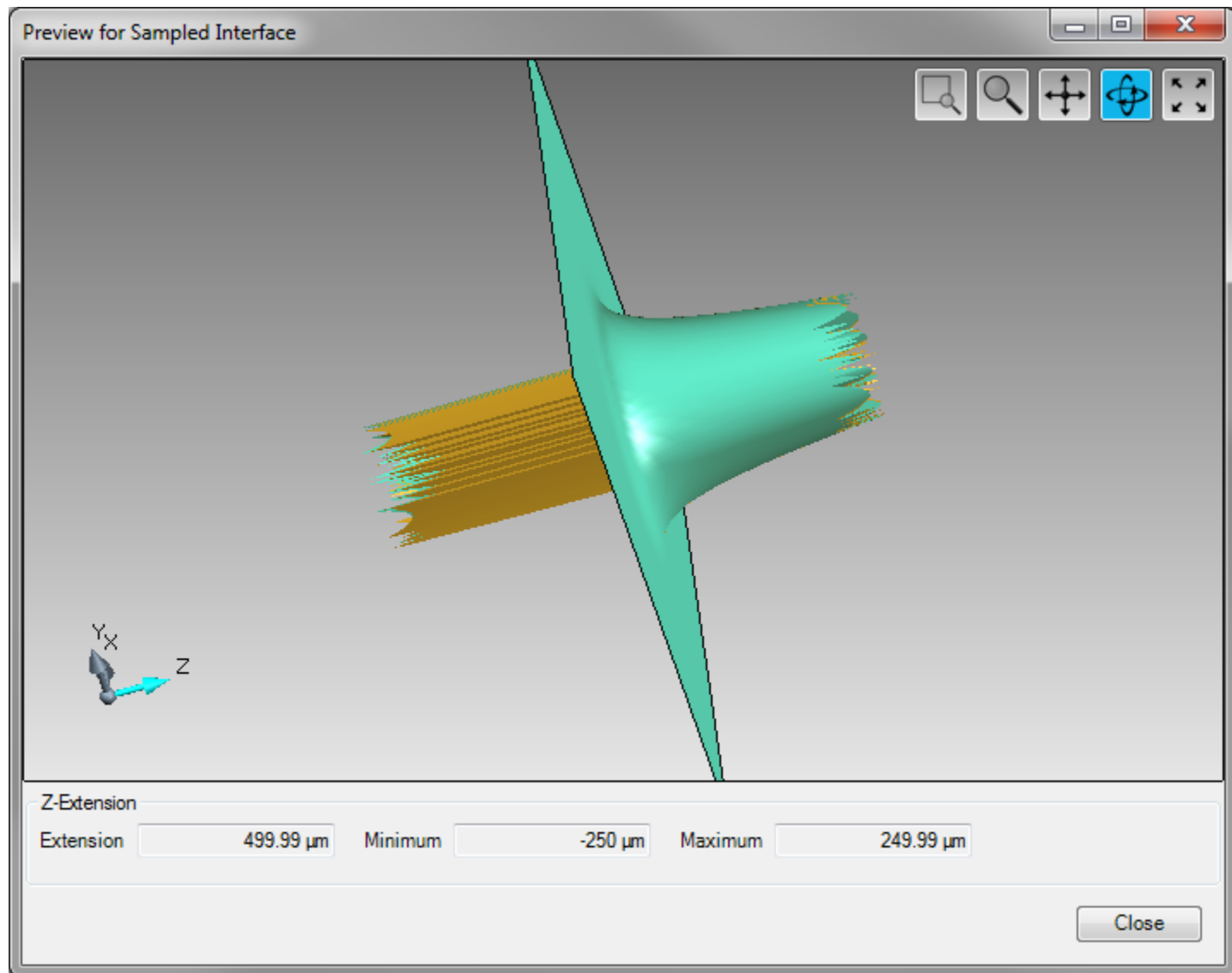
Sampled Interface (Linear Interpolation)



Sampled Interface (Cubic 8 Point Interpolation)



Sampled Interface (Fresnel Interpolation)



Transition Point List Interface

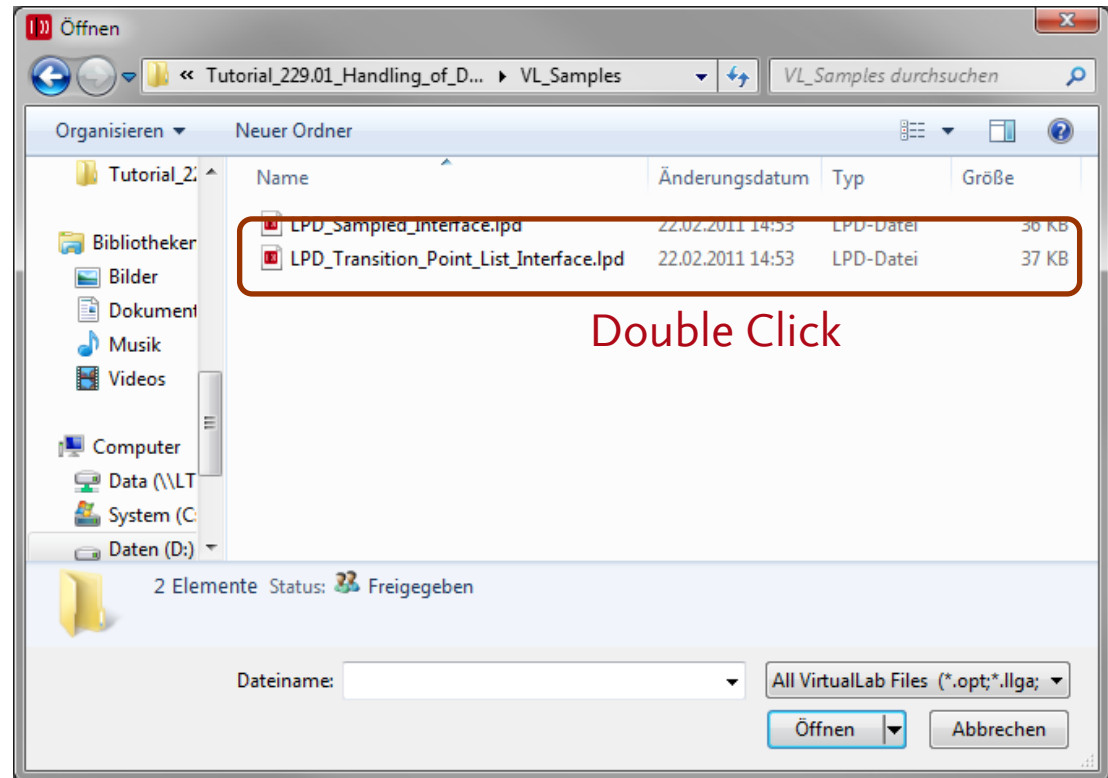
Overview Transition Point List Interface

- The Transition Point List Interface can be used for the configuration of a data-based interface with non-equidistant data points.
- The modulation can only be done in the x-direction, the y-direction is always invariant.
- The user can select two different interpolation methods:
 - Constant Interval (therefore the user need to specify the end of the last data interval)
 - Linear Interpolation
- The interface can be manipulated for instance by scaling and discretization.

Transition Point List Interface – Sample File

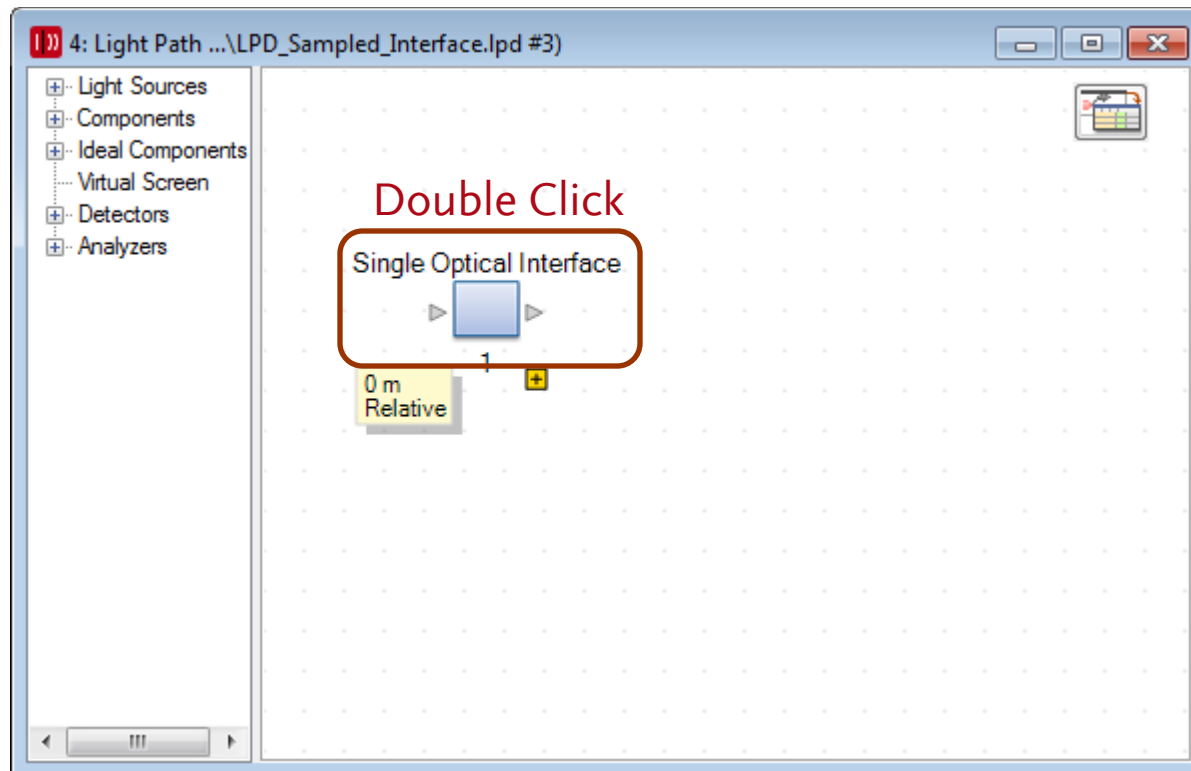


Results in



Loaded Light Path Diagram

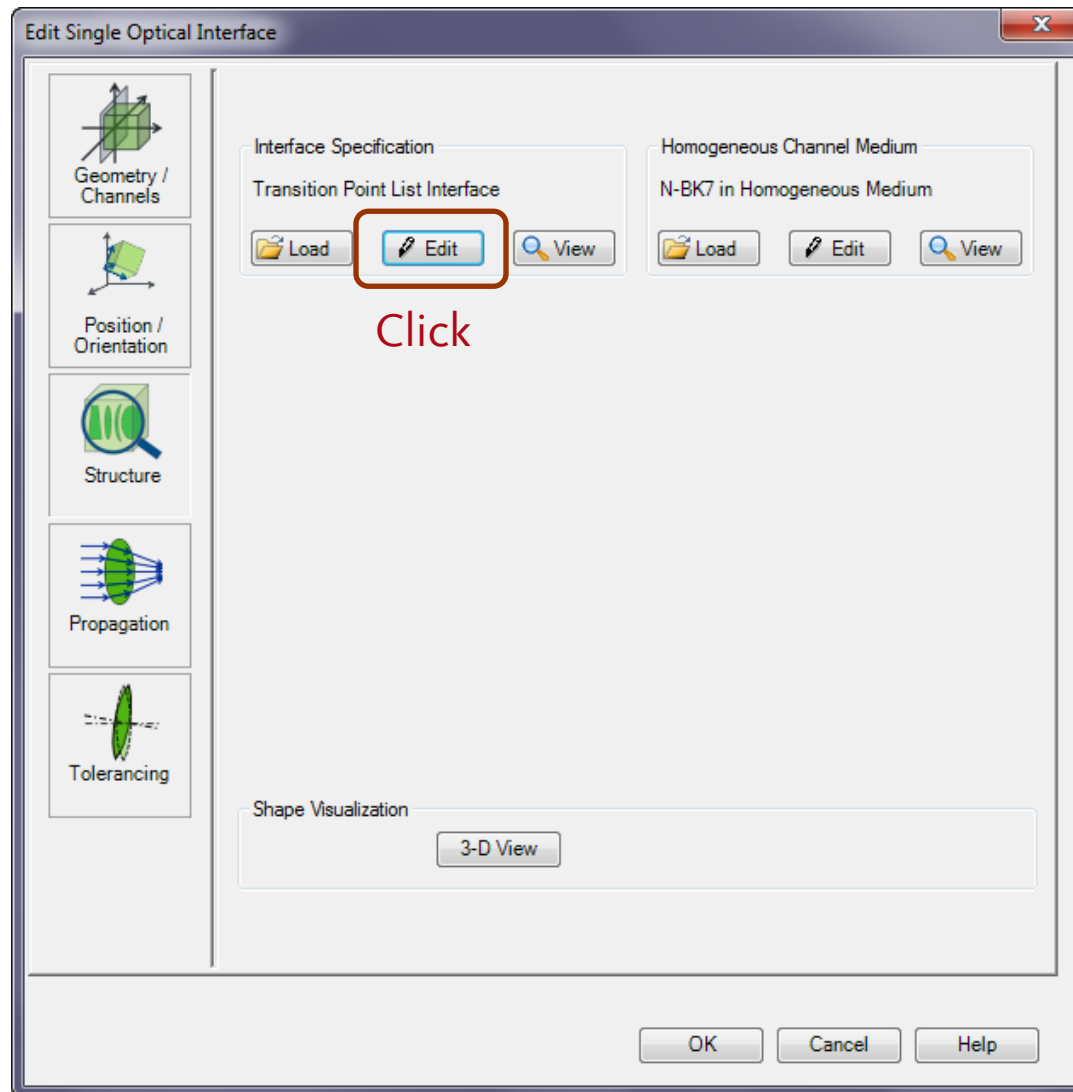
Results in



Results in



Edit dialog of Single Optical Interface



Results in



Edit dialog of Transition Point List Interface

Edit Transition Point List Interface

Structure Discretization Scaling Coating Periodization

x-Position	Height
-5 μm	1 μm
1 μm	10 μm
4 μm	0 m

Click

Add Datum

New Data Set

Interpolation Method
Constant Interval

Upper Limit
5 μm

Invert Heights

Shift Positions

Definition Area

Size and Shape

Shape
☒ Rectangular ☐ Elliptic

Size
20 mm x 20 mm

Effect on Field Outside of Definition Area

☐ Field Passes Plane Interface ☒ Field is Absorbed

z-Position of Outer Absorbing Plane

Specification Mode
Boundary Minimum

z-Position
-1 μm

Interface Tools

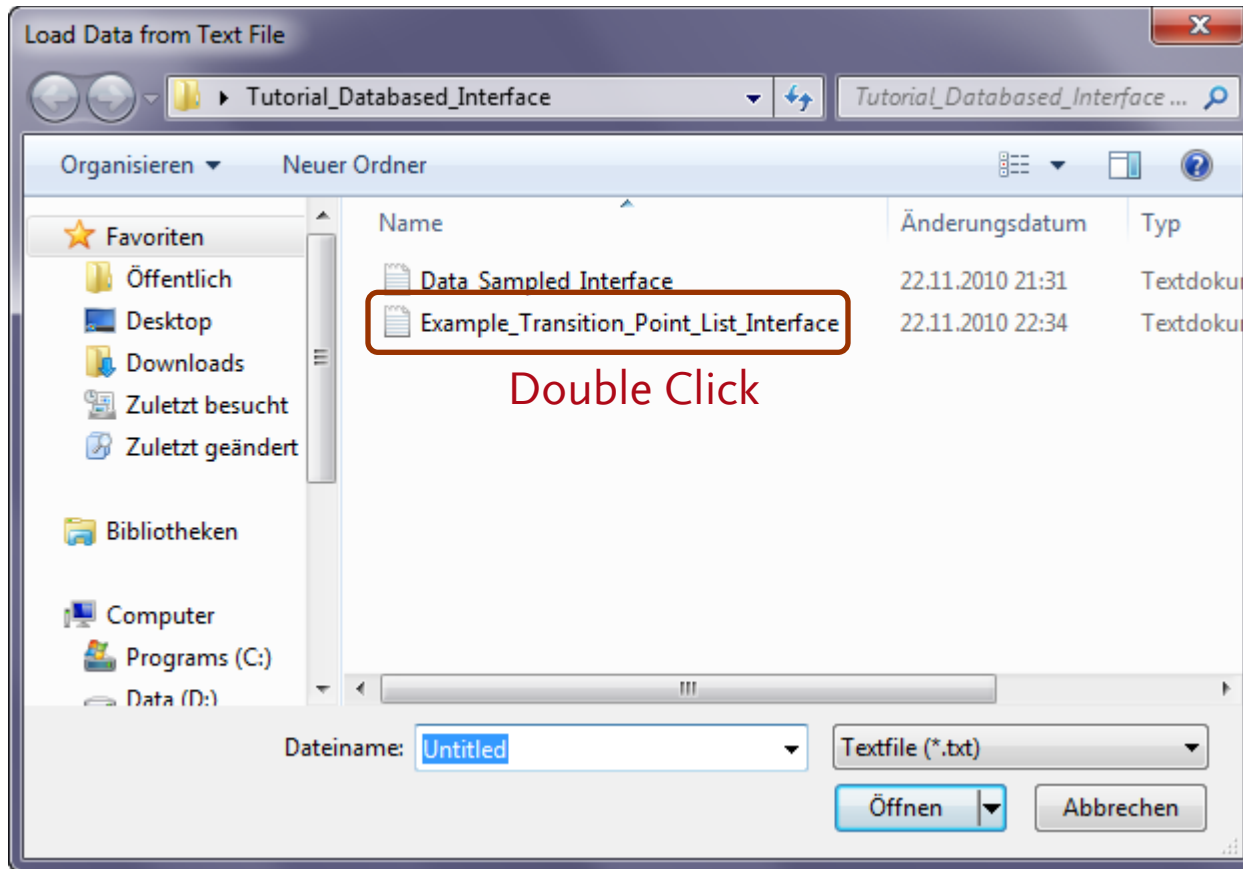
Validity:

OK Cancel Help

Results in



Select file with stored data



Results in



Edit dialog of Transition Point List Interface

Edit Transition Point List Interface

Structure Discretization Scaling Coating Periodization

x-Position	Height
-10 mm	0 m
-8 mm	1 mm
-2 mm	2 mm
0 m	3 mm
1 mm	4 mm
2 mm	5 mm
5 mm	6 mm
6 mm	5 mm
6.5 mm	4 mm
8 mm	3 mm
9 mm	2 mm
9.2 mm	1 mm
9.5 mm	0 m

Interpolation Method
Constant Interval

Upper Limit
11 mm

Definition Area


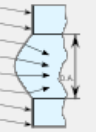
Size and Shape

Shape ☒ Rectangular ☐ Elliptic

Size 20 mm x 20 mm

Effect on Field Outside of Definition Area

☐ Field Passes Plane Interface ☒ Field is Absorbed

z-Position of Outer Absorbing Plane

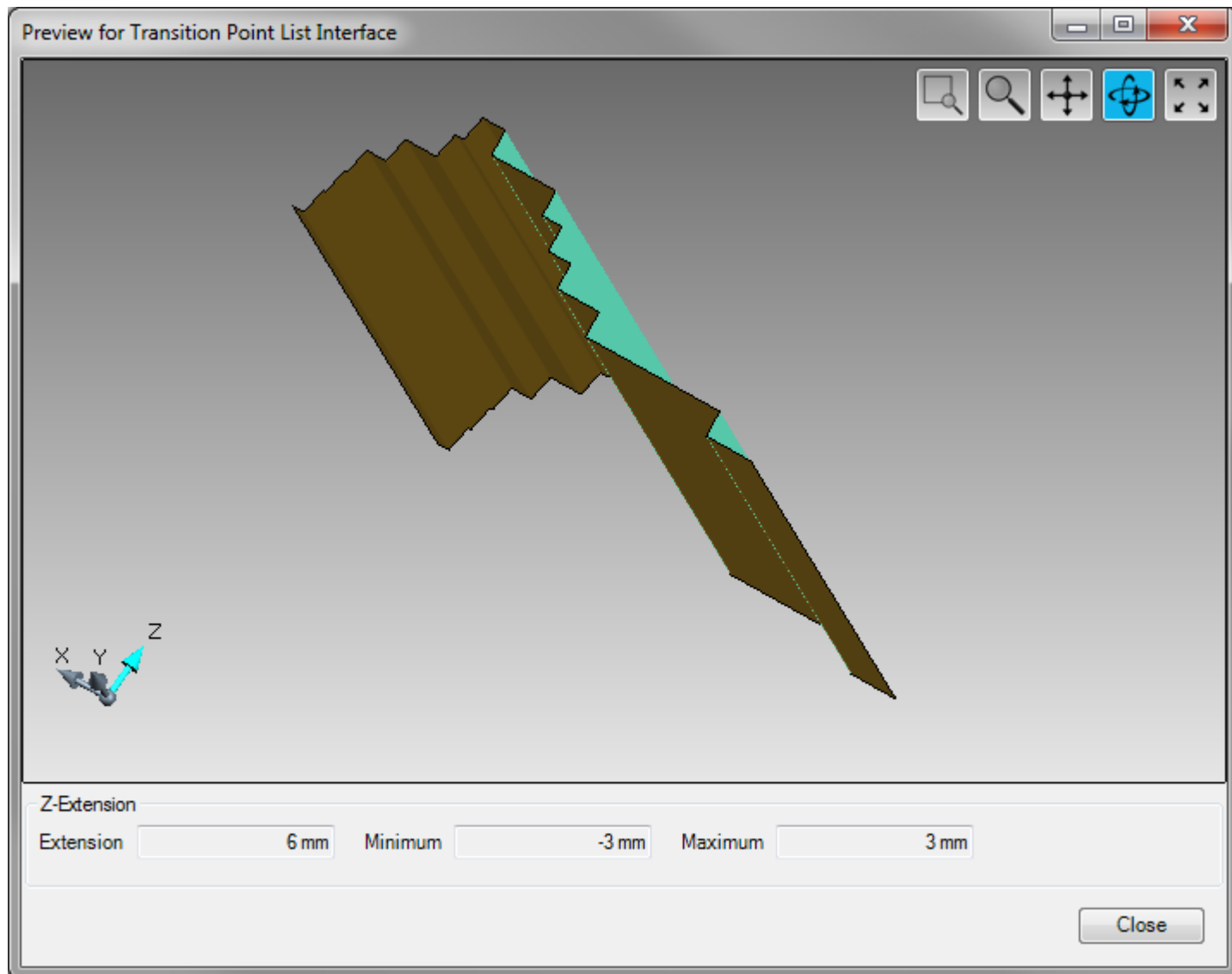
Specification Mode Boundary Minimum z-Position -1 μm

Click

Results in



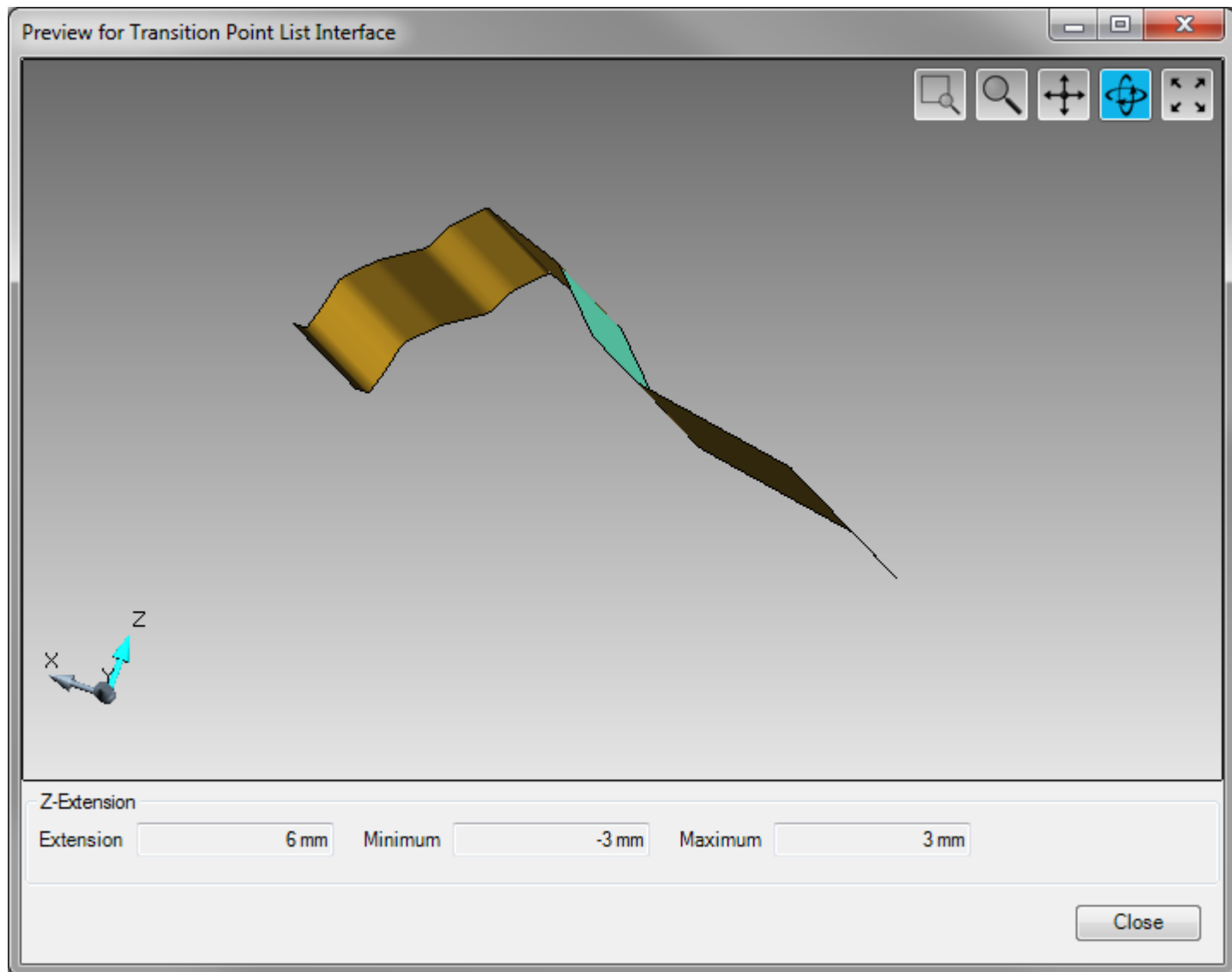
3D view of Transition Point Interface



Tools and Settings

- The Transition Point List Interface offers two tools to manipulate the non-equidistant data:
 - Invert Profile (inverts the height values)
 - Shift Positions (shifts the positions of the non-equidistant height values by a user-defined value)
- Two different interpolation methods are available for the Transition Point Interface:
 - Constant Interval (additionally the user needs to specify the end position of the last interval)
 - Linear interpolation (linear interpolation between the non-equidistant data points)

Transition Point List Interface (Linear Interpolation)



Transition Point List Interface (Inverted)

