

Scenario 90.01 : Simulation of scattering at rough surface

The simulation of scattering at a rough surface is demonstrated. The surface profile is modeled by discrete data points that are imported from an ASCII file.

Keywords: scattering, diffraction, rough surface, ASCII import, text import, import

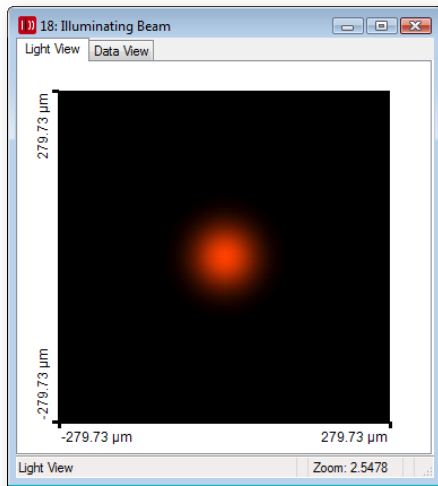
Required Toolboxes: Starter Toolbox

Related Scenarios: 23.01, 87.01

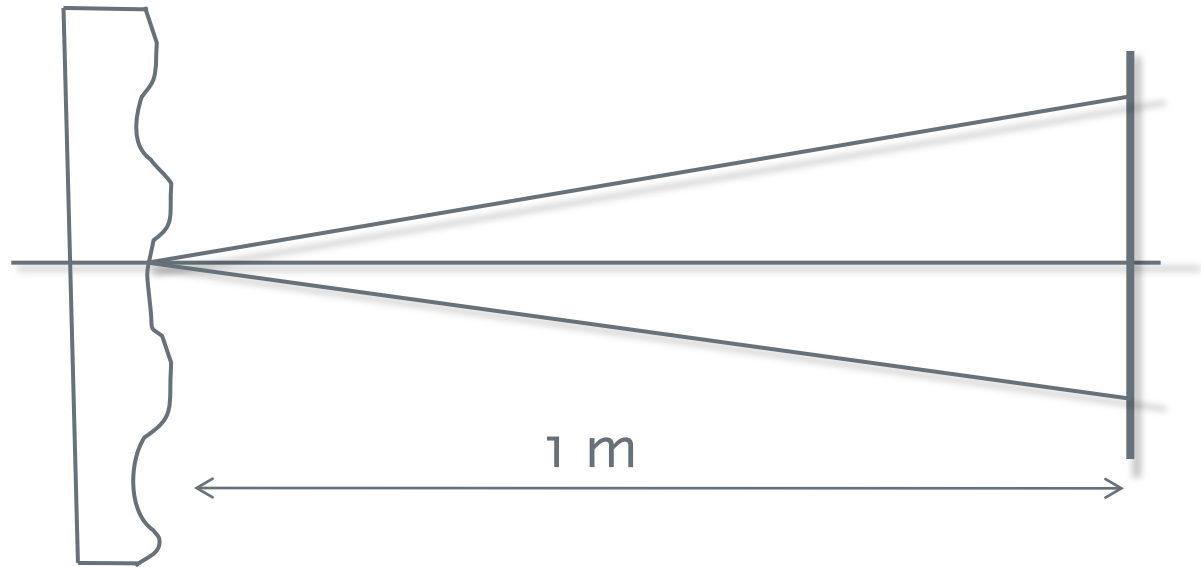


Modeling Task

Optical System Setup



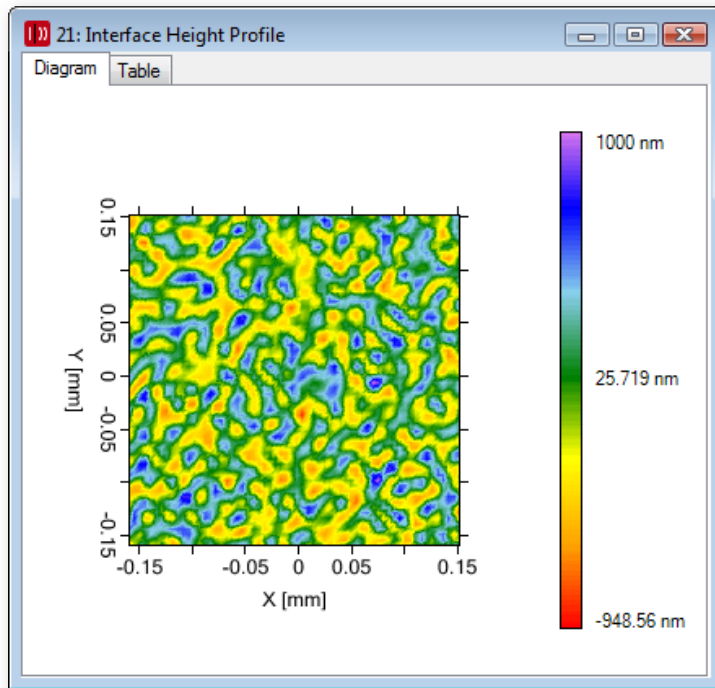
Laser beam
100 μm diameter ($1/e^2$)



Height Profile
Fused Silica

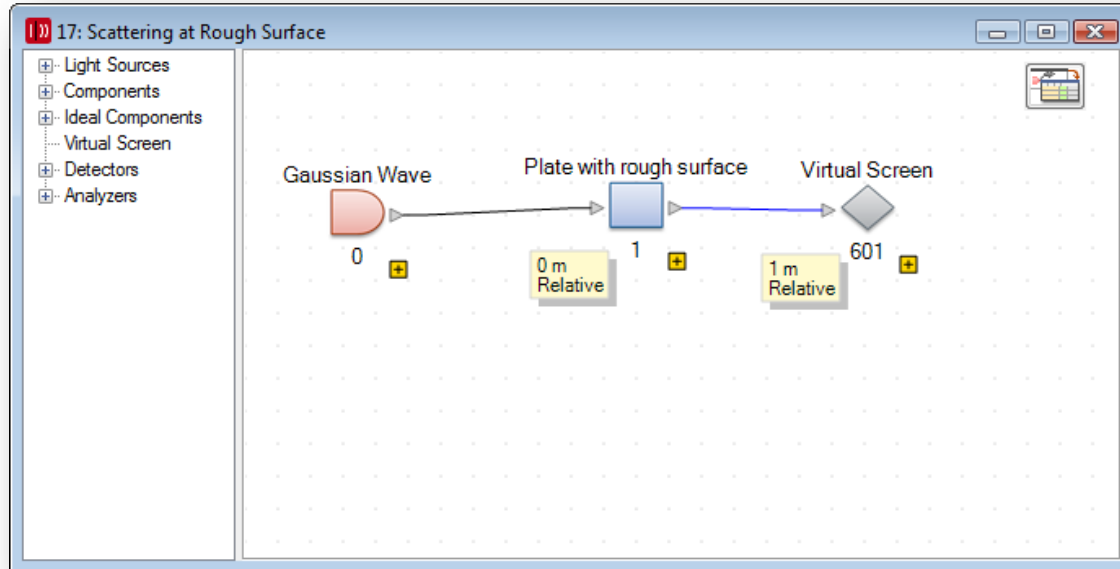
Field on Screen

Modeling Task



- Measured profile data stored in file 'Scenario_90.01_Scattering_rough_surface_o2.txt'
- Data can be imported using VirtualLab™'s ASCII import.

Simulation of Scattering at Rough Surface



- Click **Go!** button to start simulate of system.

16: Scattering at Rough Surface

Path Detectors Analyzers

Start Element				Target Element		Linkage		
Index	Type	Channel	Medium	Index	Type	Propagation Method	On/Off	Color
✓ 0	Gaussian Wave	-	Standard Air	1	Plate with rough surface	Combined SPW/Fresnel Operator	On	—
1	Plate with rough surface	T	Standard Air					

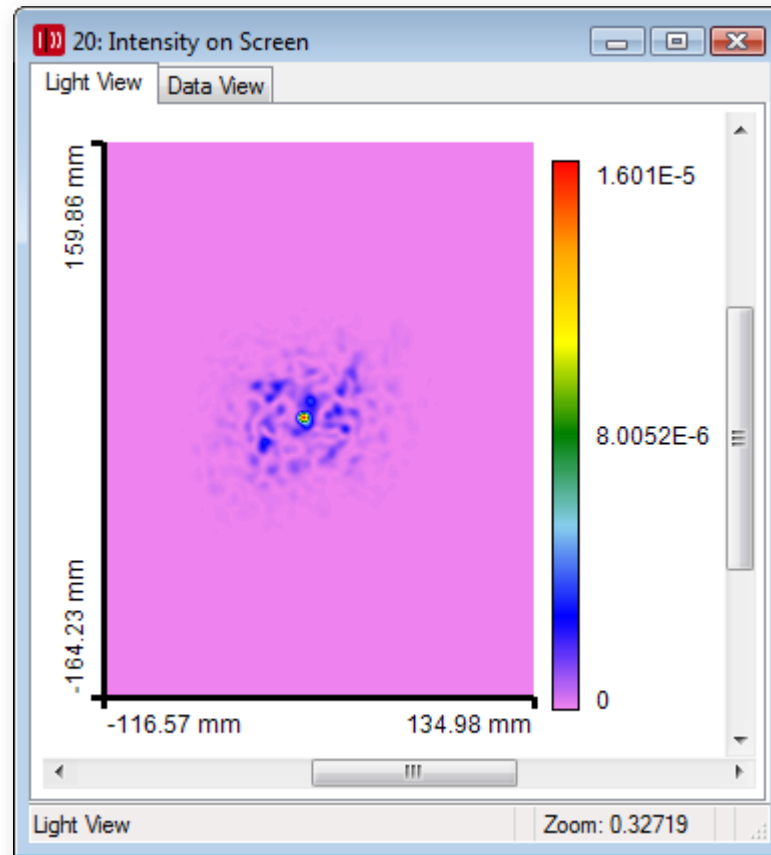
Light Path Tools

☐ Re-Use Automatic Settings

Simulation Type: Light Path Diagram

Go!

Diffraction Pattern



Intensity on screen

Appendix: How to Import ASCII-Data to a Sampled Interface

Select Text File

1. Click on the **File > Import** menu item.
2. In the resulting dialog, navigate to the text file with the height profile data and click **OK**.

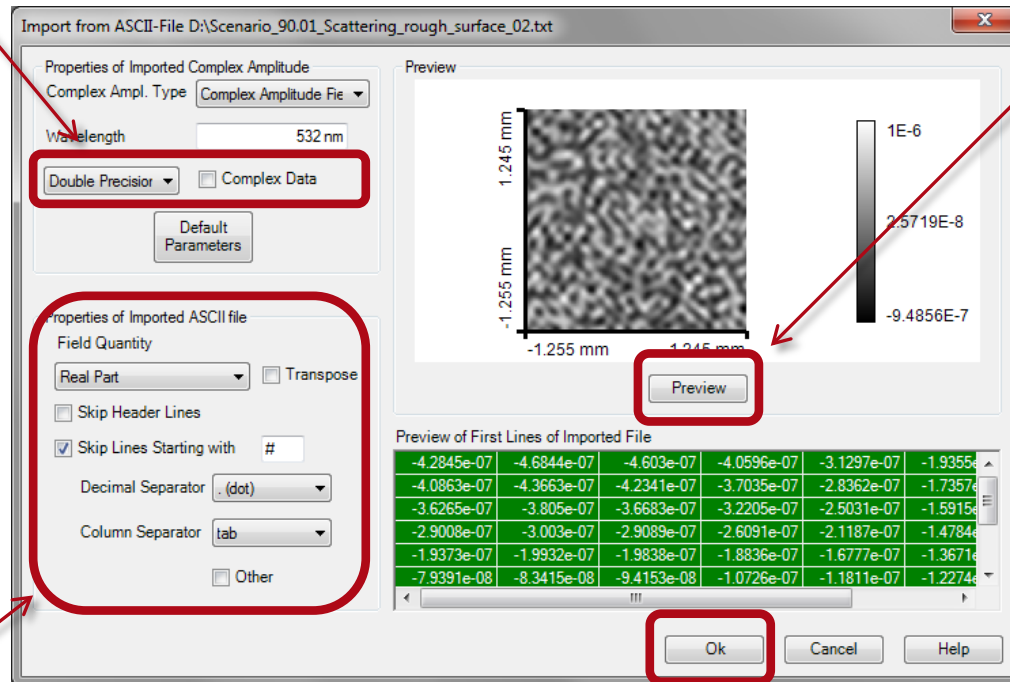
Results in



Settings in the Import Dialog

- Height profile is not complex-valued.
- Use *Double Precision* for high precision data.

Click to show or update the preview. Check it a data import ist possible.

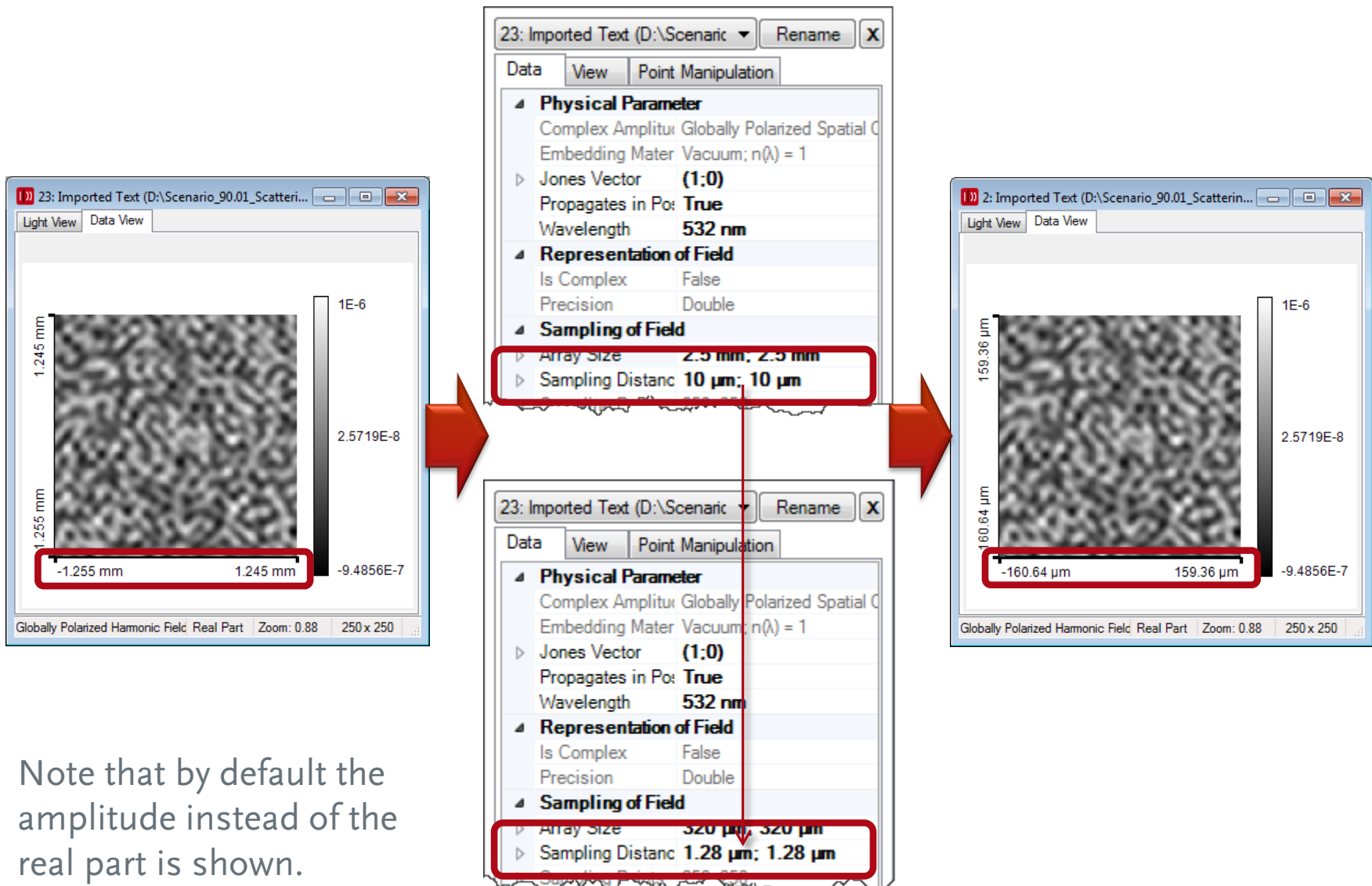


- Choose the settings that correspond to your ASCII file.
- *Transpose* the field if necessary.

Results in



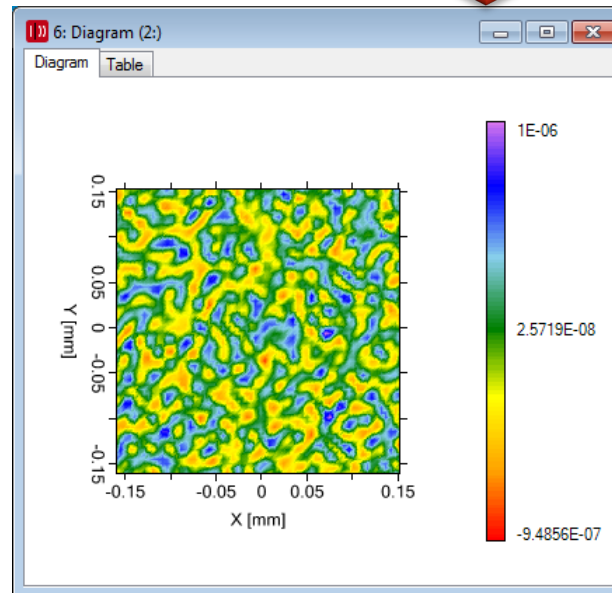
Adjust the Sampling Distance



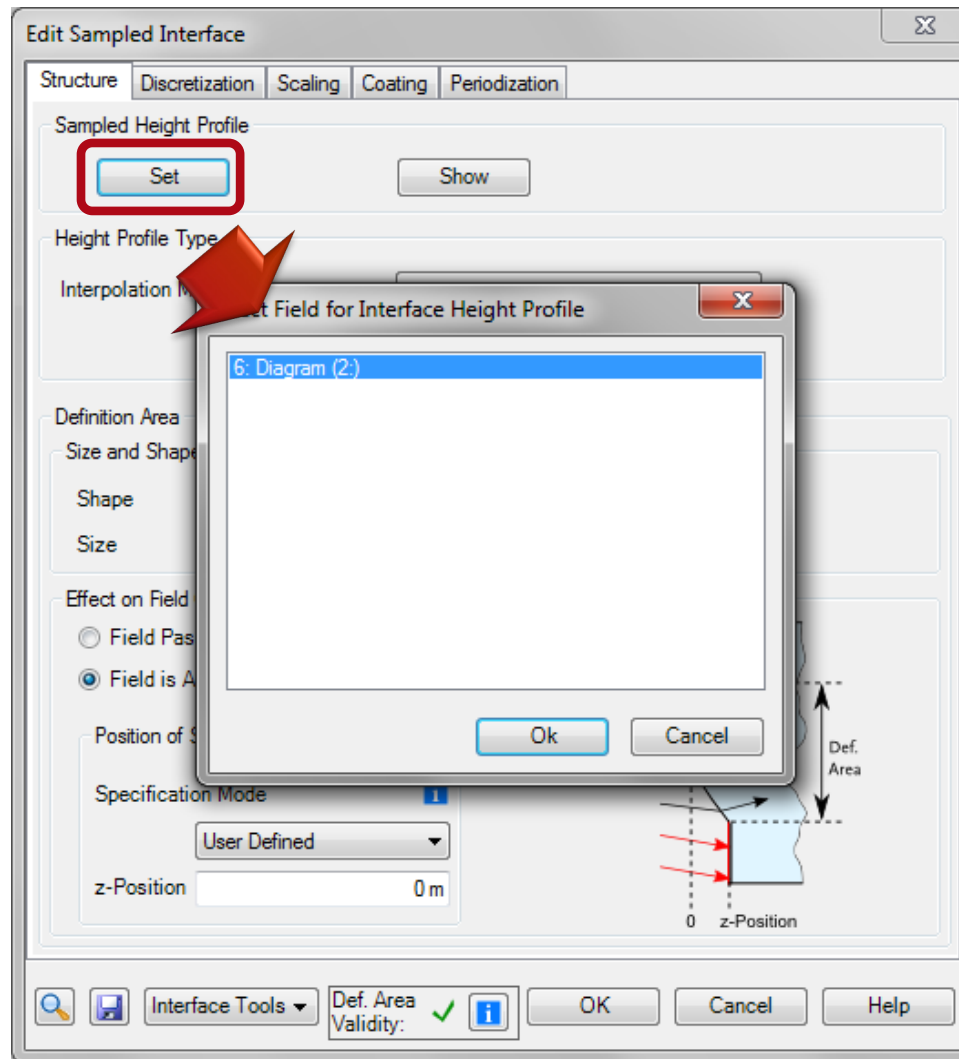
Convert to Diagram

- Convert the imported data to a diagram using the **Edit > Conversion > Create Diagram** menu item.
- Keep the default settings in the edit dialog for this conversion (*Field Quantity* is *Real Part*, *Use Physical Coordinates*).

Results in

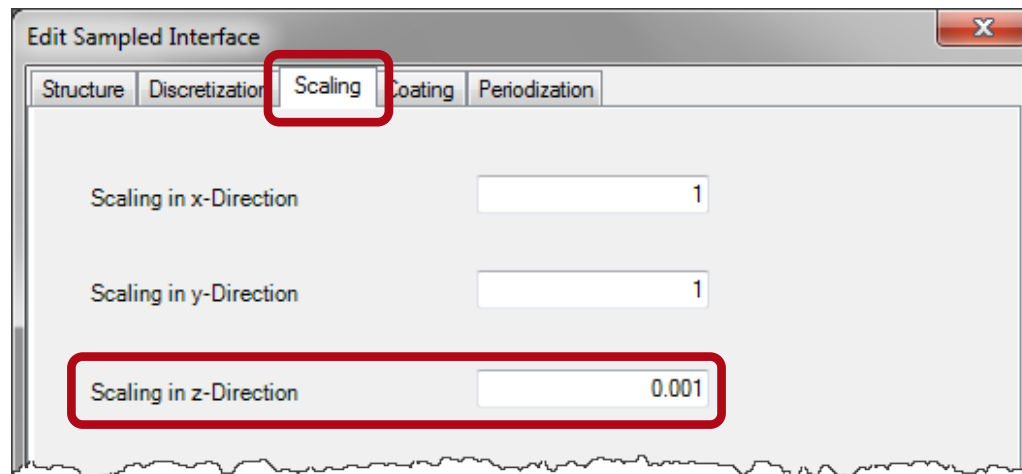


Set the Diagram into the Sampled Interface

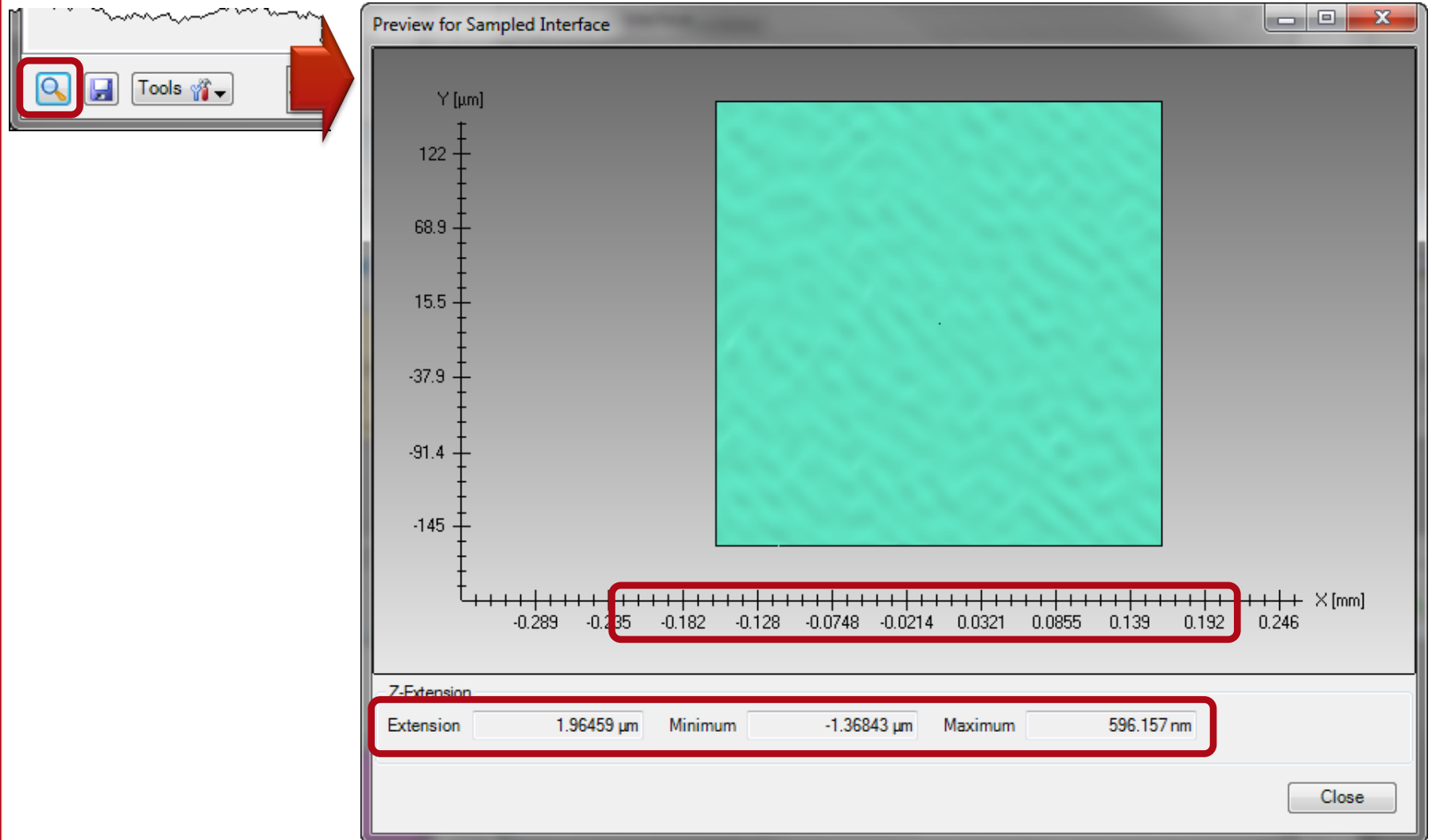


Scale the Height Data

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



Verify the Import in the 3D-View



Conclusion

- VIRTUALLAB™ enables the simulation of scattering at rough surfaces.
- Measurement data can be imported from ASCII files.
- Allows the simulation of fabrication tolerances of surfaces.