

UseCase.0079 (1.1)

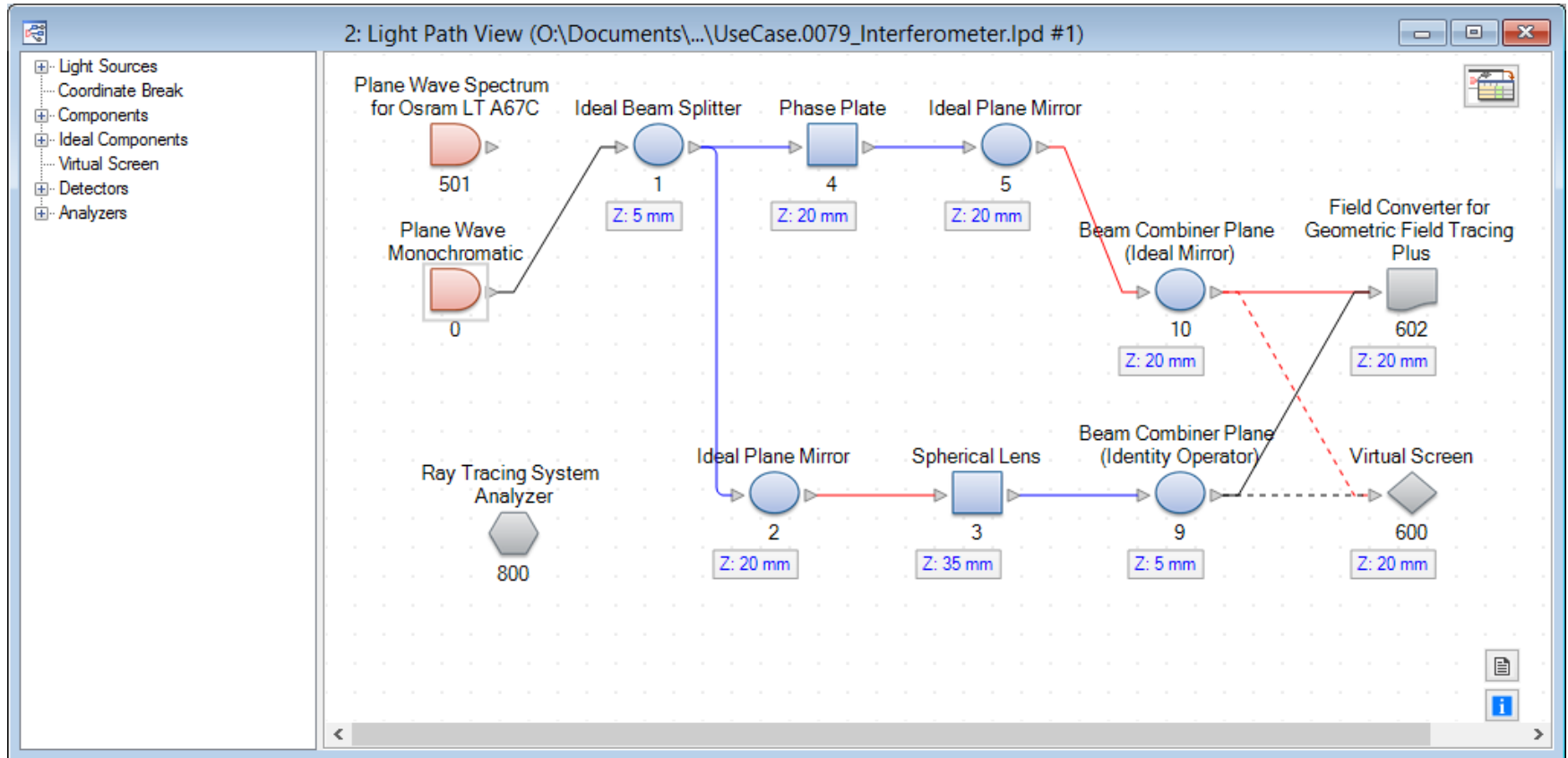
Interferometer Analysis with Geometric Field Tracing

Keywords: interference, coherence, combiner, beam splitter

Description

- This use case demonstrates the usage of the Geometric Field Tracing Plus engine to analyze an interferometer.
- The calculation of the interference pattern for one wavelength will be discussed.
- The results will be shown and discussed for the analysis by the Ray Tracing System analyzer, the Ray Tracing engine and the Geometric Field Tracing Plus engine.
- Also the effect of temporal coherence on the interference pattern will be shown, by using the spectrum of a real LED light source (OSRAM LT A67C).
- **The lateral coherence of the LED is neglected in this use case, but can of course be modeled with VirtualLab.**

The System



File name: UseCase.0079_Interferometer.Ipd

System Configuration

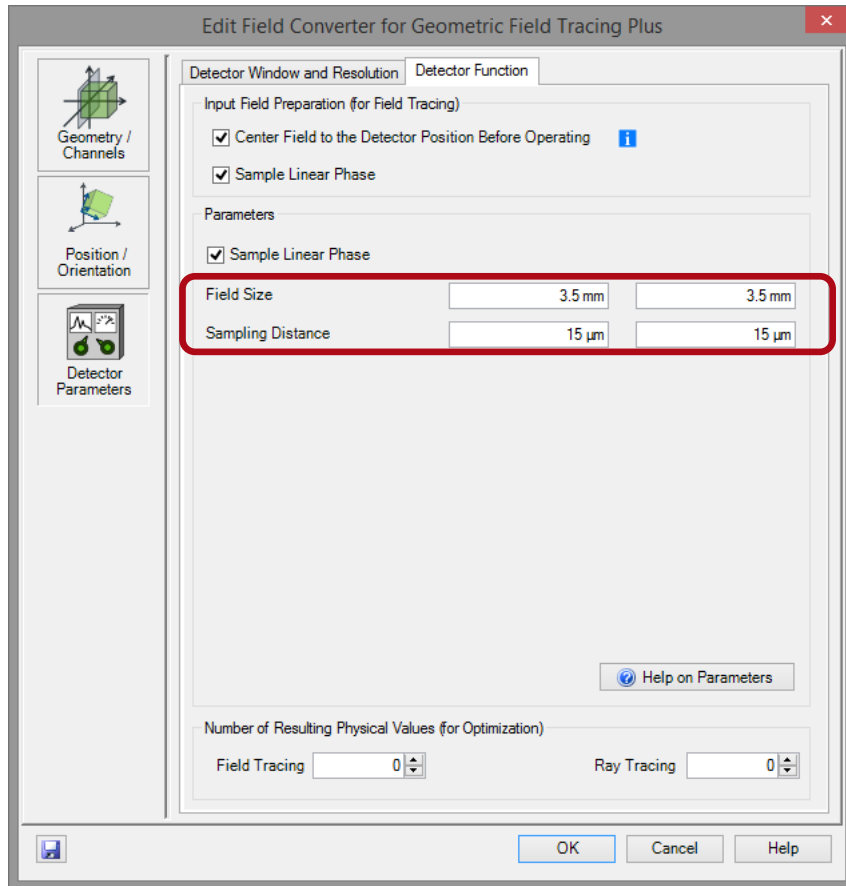
- The light source within the system is a monochromatic plane wave with a wavelength of 524 nm.
- In addition an alternative source is stored in the LPD, which is configured to use the spectrum of the OSRAM LED LT A67C.
- The interferometer has two light paths. In one light path the light goes through a lens. In the other path the light propagates through a plate.
- The detectors are set to summation mode.

Sum
Yes
- This realizes the combination of the light paths for a coherent combination of the incident light fields.

System Configuration

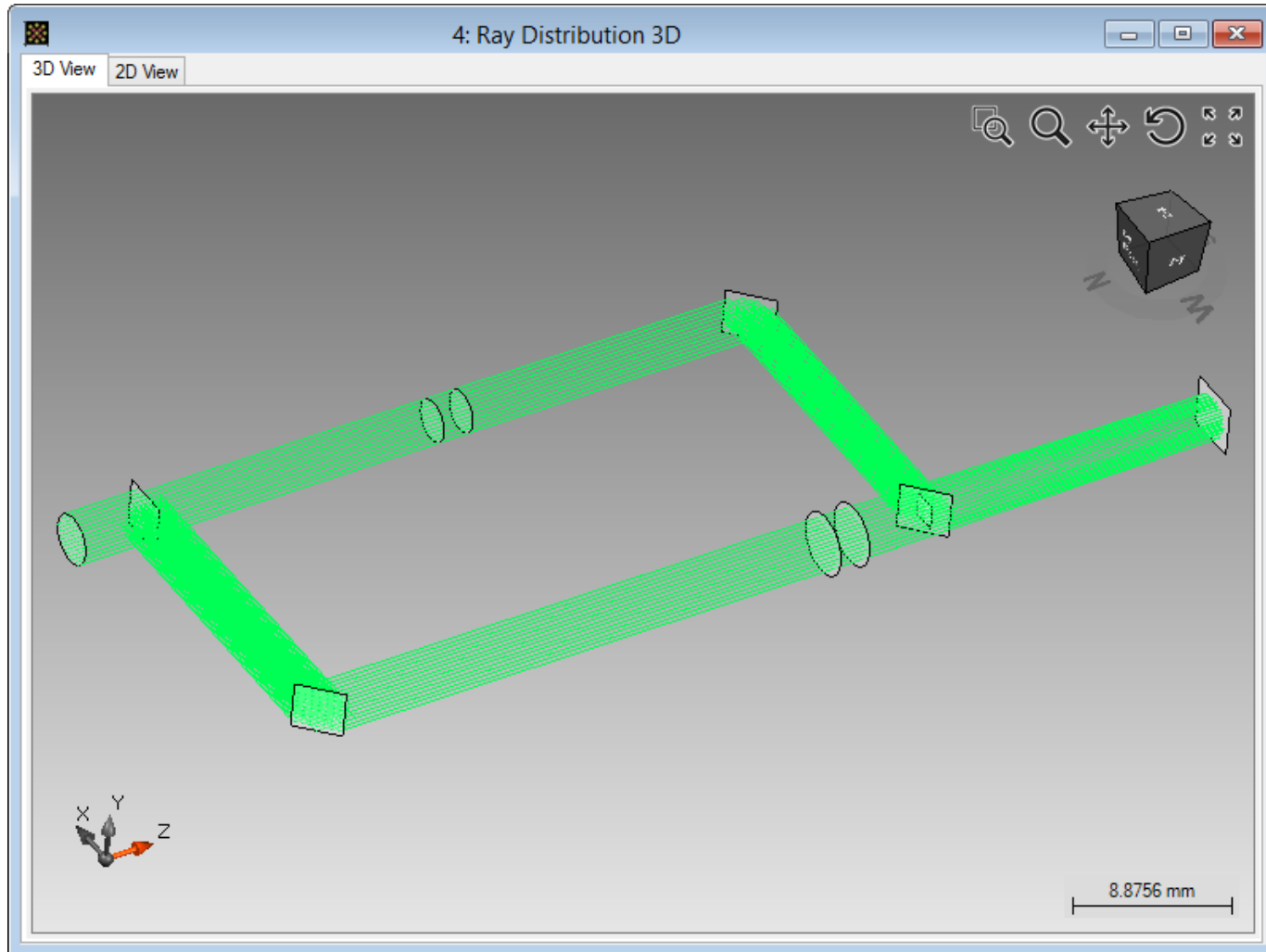
- Within the optical setup we use two detectors:
 - Virtual Screen (in summation mode)
 - Field Converter for Geometric Field Tracing Plus (in summation mode)
- The converter is part of the User Experience Program. It is not yet available as integrated component.
- **The conversion of the result data of the Geometric Field Tracing Plus engine into a harmonic field (set) will be automatized soon. This is part of the User Experience Program.**

Edit Options of the Converter

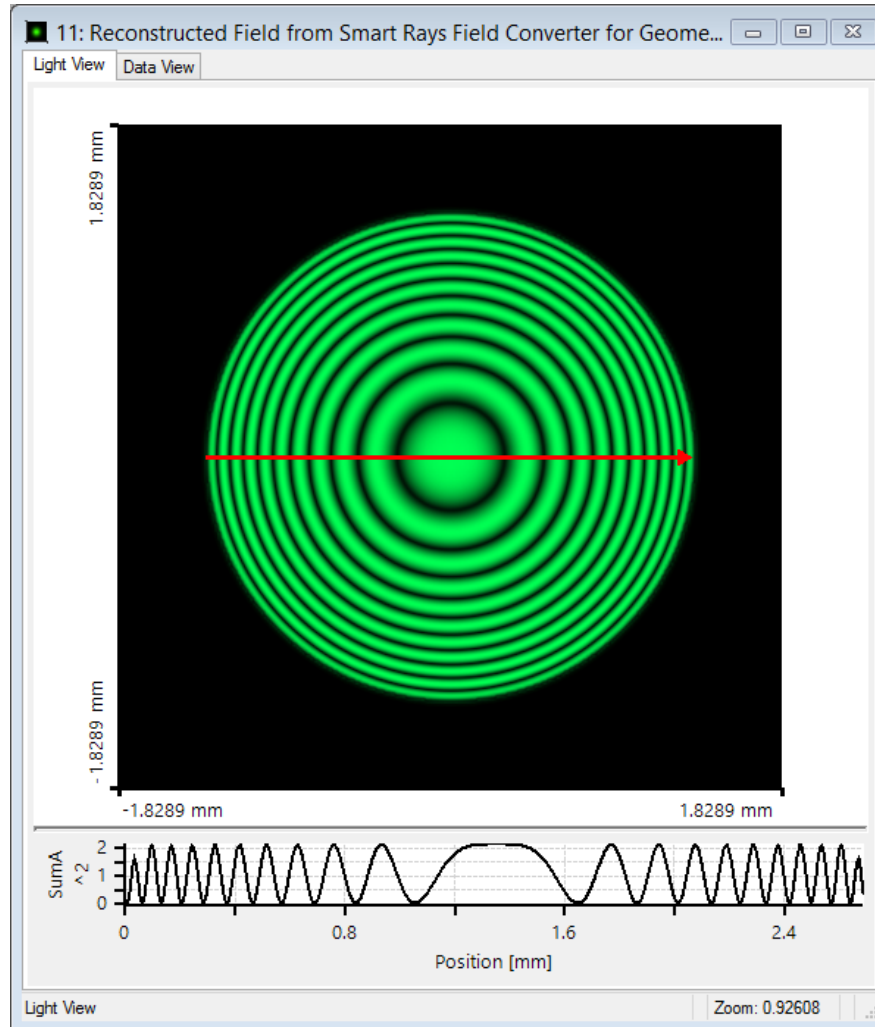


- On the left side the edit dialog of the field converter is shown.
- The user can enter
 - Field Size
 - Sampling Distance
- These parameters will be used for conversion.
- This function will be automated soon.

Result for Ray Tracing System Analyzer

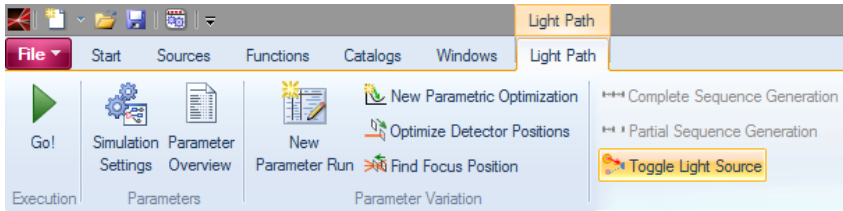


Results of Geometric Field Tracing Plus

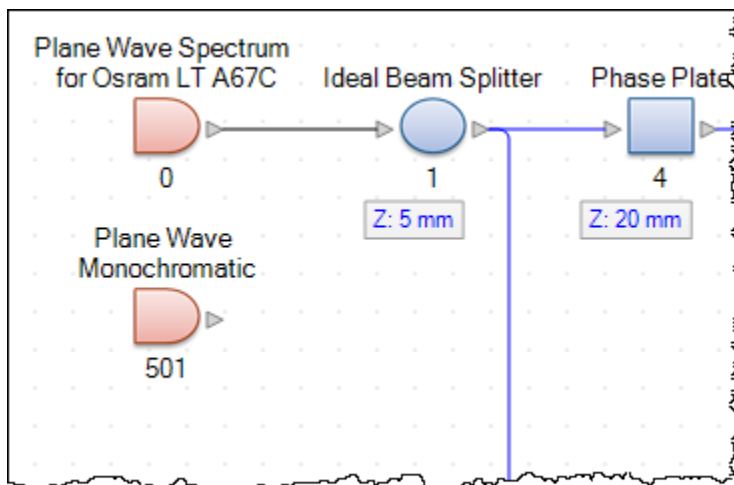


Simulation took
2 seconds for
1 wavelength.

Change the Light Source

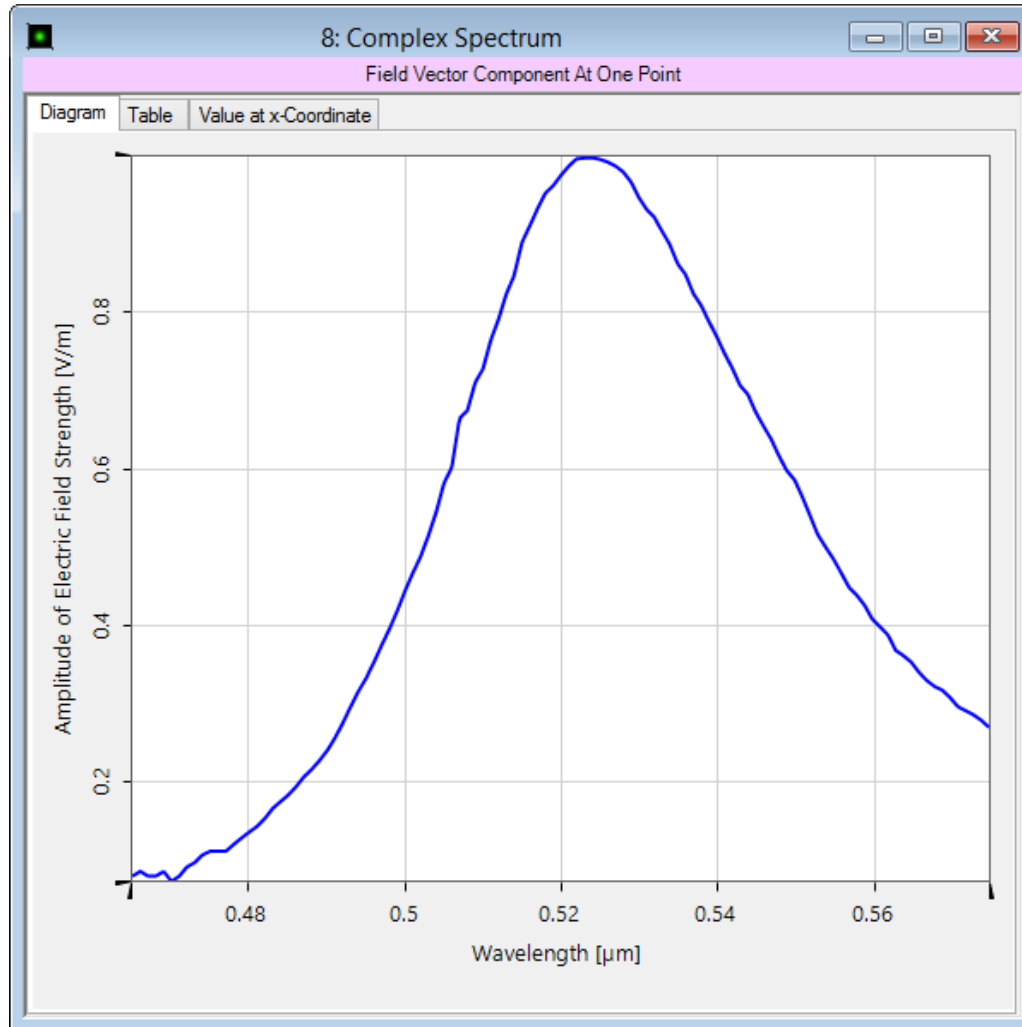


Results in

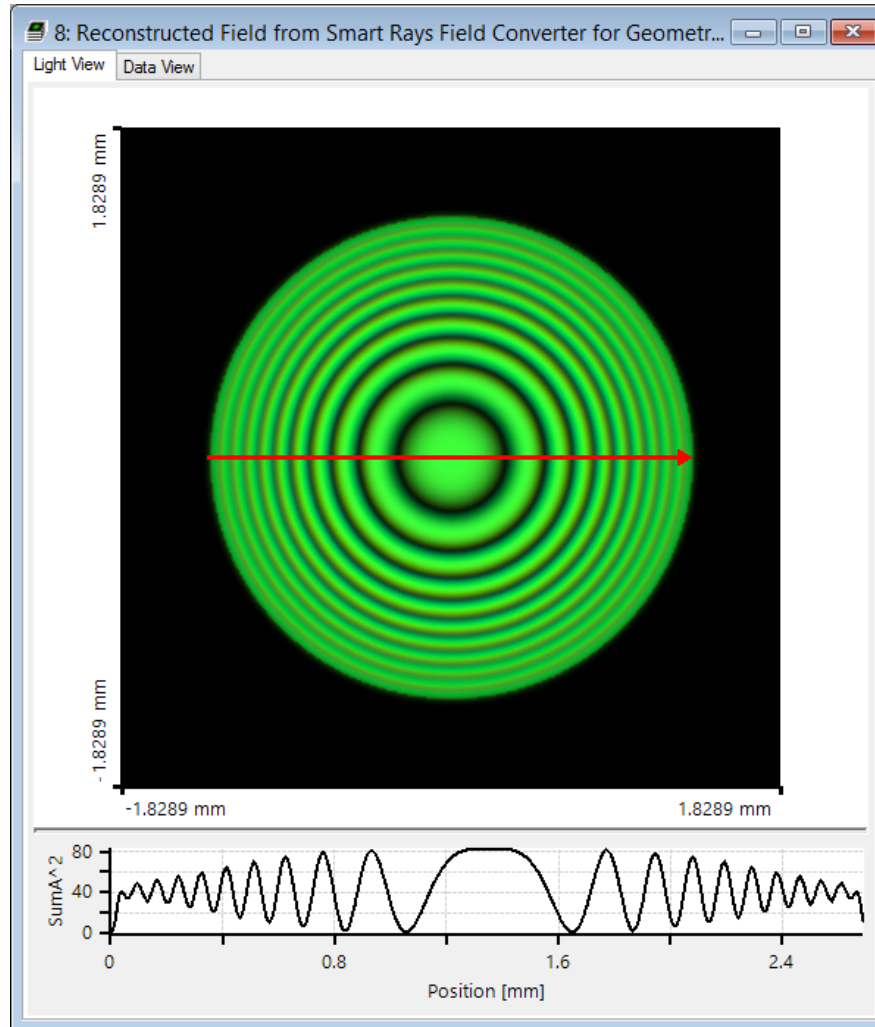


- By using the **Toggle Light Source** tool within the **Light Path** ribbon the active source can be changed easily.
- After the light source is toggled the simulation can be simply performed by clicking on the **Go!** button.

Spectrum of the OSRAM LED LT A56C



Results of Geometric Field Tracing Plus



Simulation took less than 3 min for 111 wavelengths.

Summary

- Within the Geometric Field Tracing Plus engine included in VirtualLab, interference, polarization and also temporal and spatial coherence are included.
- The simulation of Geometric Field Tracing Plus is as fast as Ray Tracing.
- The conversion into equidistantly sampled harmonic fields (sets) may cost some additional time.
- Currently the conversion between geometric and diffractive field tracing data has to be done manually. This will be improved soon.