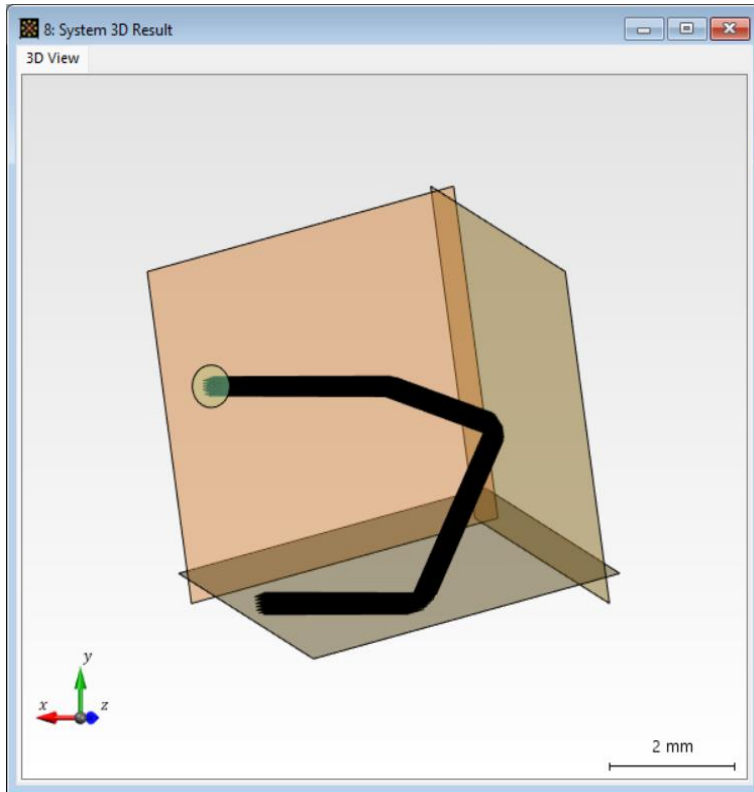


Reflection at a Retroreflector with Rough Surfaces

Abstract



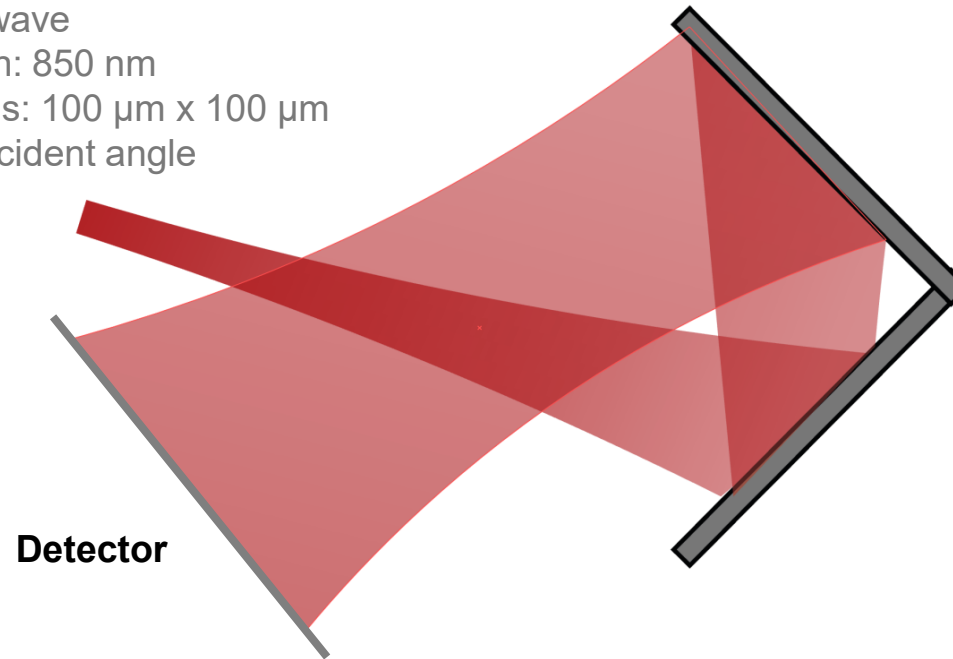
Retroreflectors are commonly used when trying to reflect light independent from its incident direction roughly back into the same direction. This use case shows how to model such kind of structure with the help of Non-Sequential Field Tracing. It also includes rough surfaces for the walls of the reflector. These are modeled by applying random functions onto the surfaces.

Application Scenario

Application Scenario: System

Source

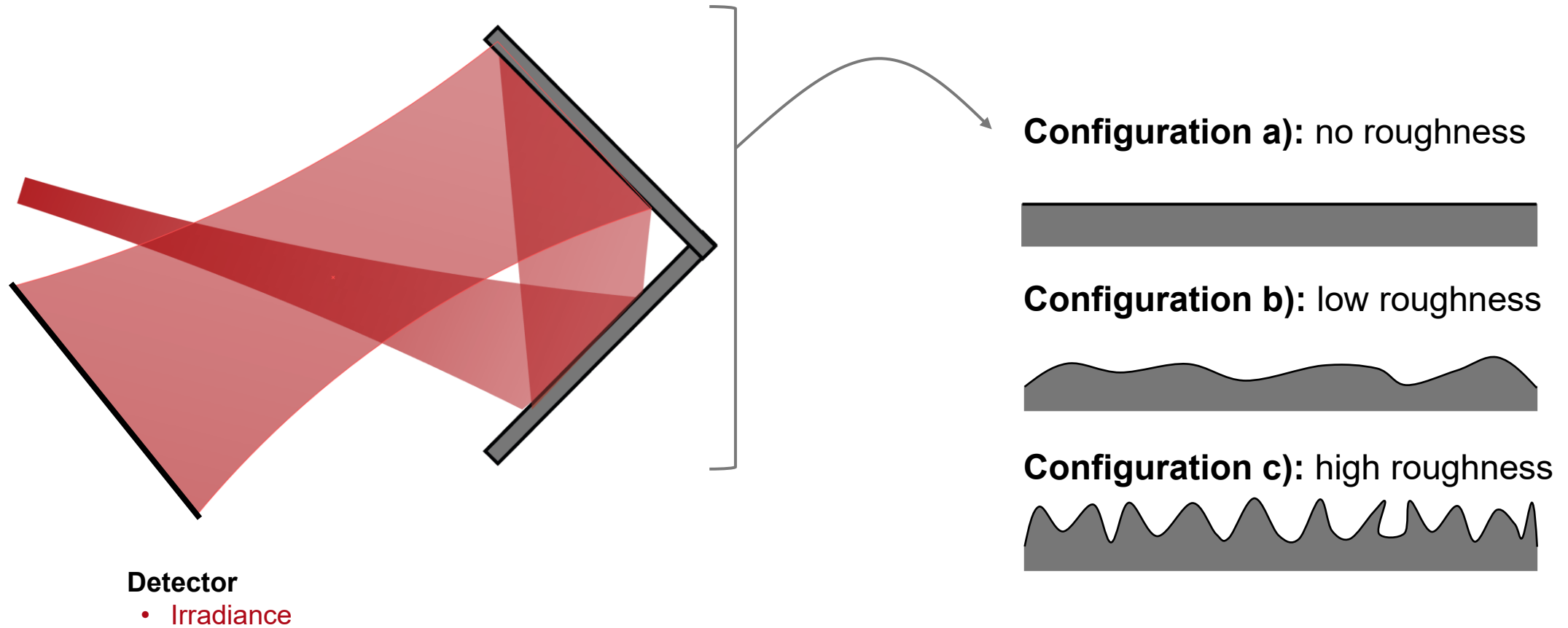
- Gaussian wave
- Wavelength: 850 nm
- Waist radius: $100\text{ }\mu\text{m} \times 100\text{ }\mu\text{m}$
- Different incident angle



Retroreflector

- 5 mm x 5 mm x 5mm
- Silver surface with different roughness

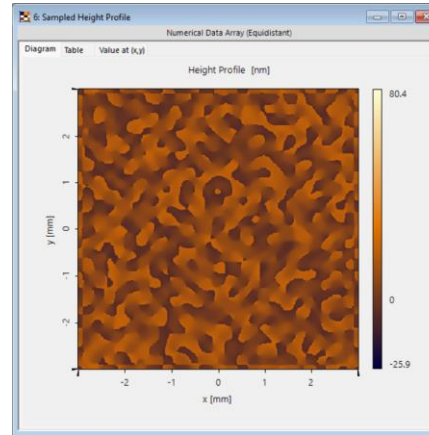
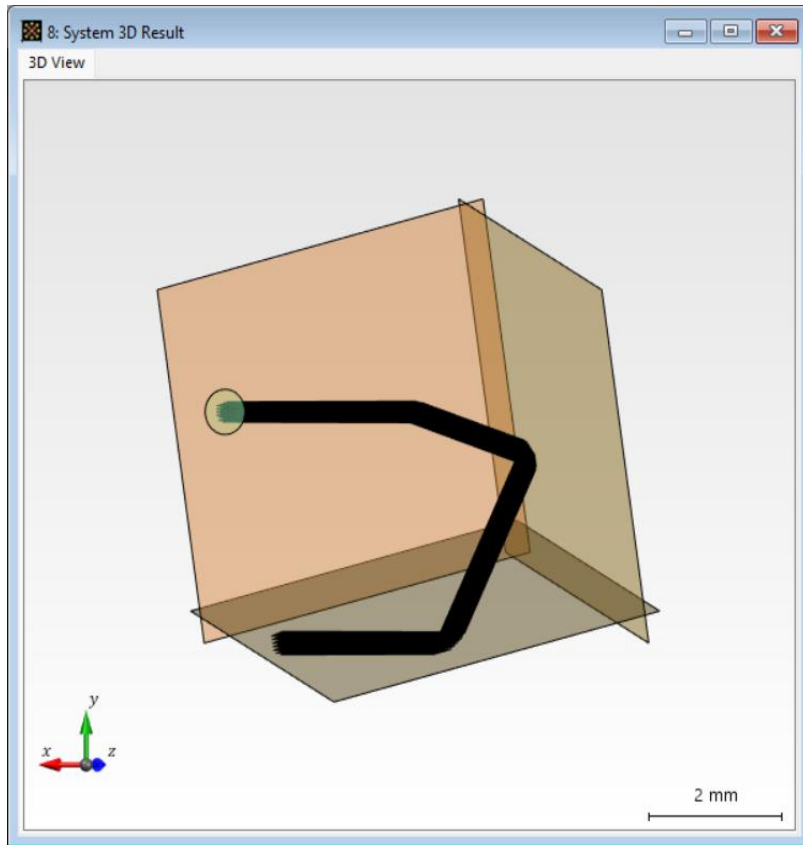
Application Scenario: Task



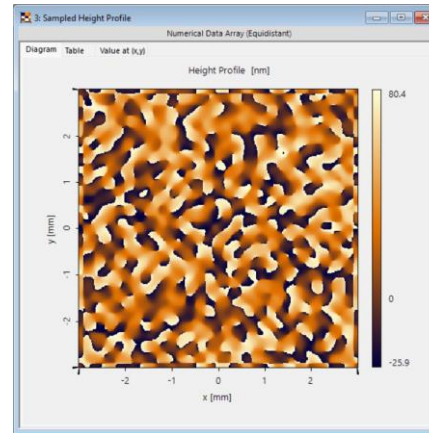
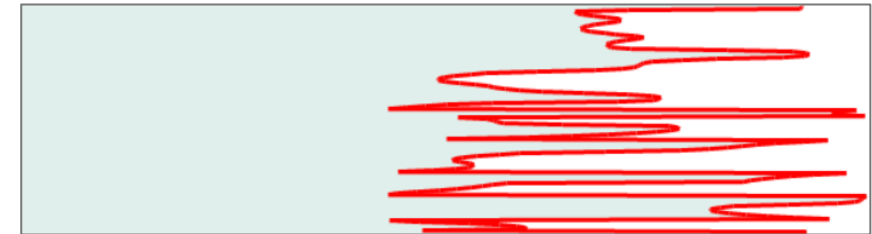
Simulation Results

Create Roughness by Random Phase Functions

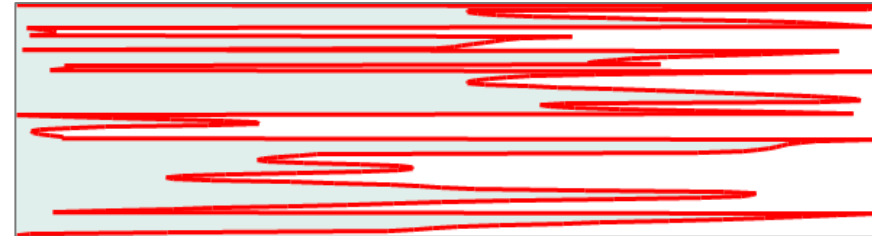
3D View of the System



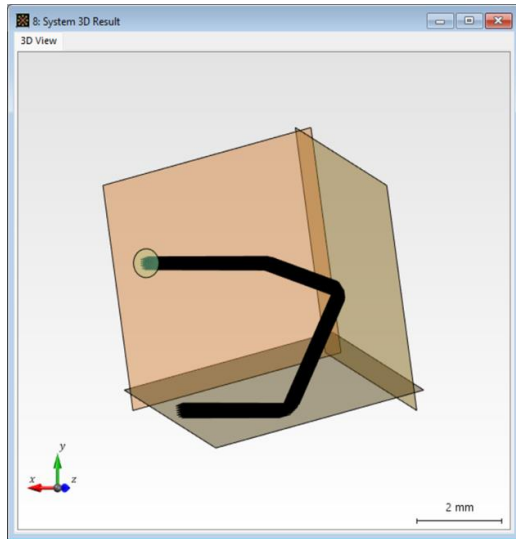
low roughness



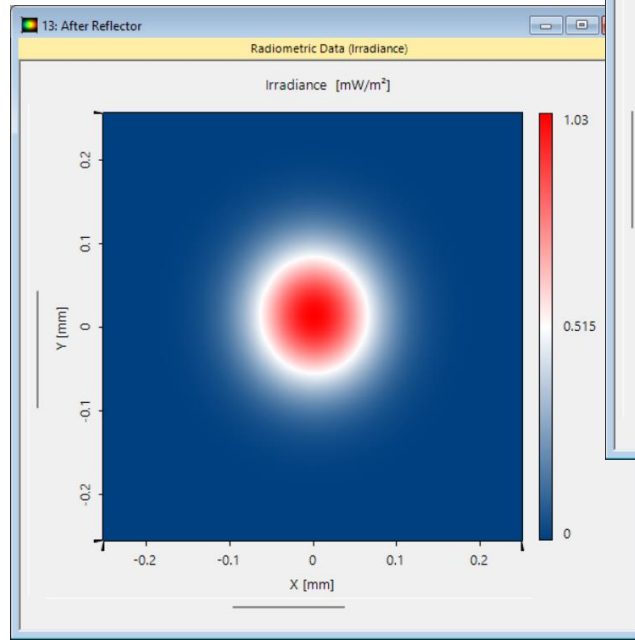
high roughness



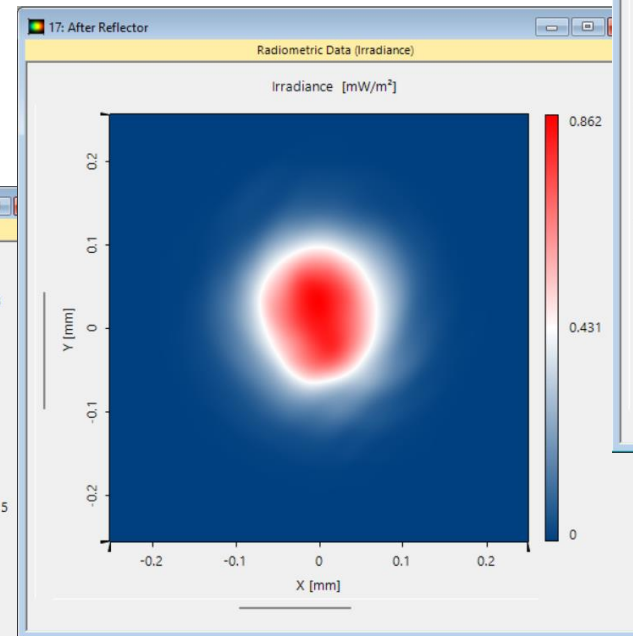
Results with Different Surface Roughness



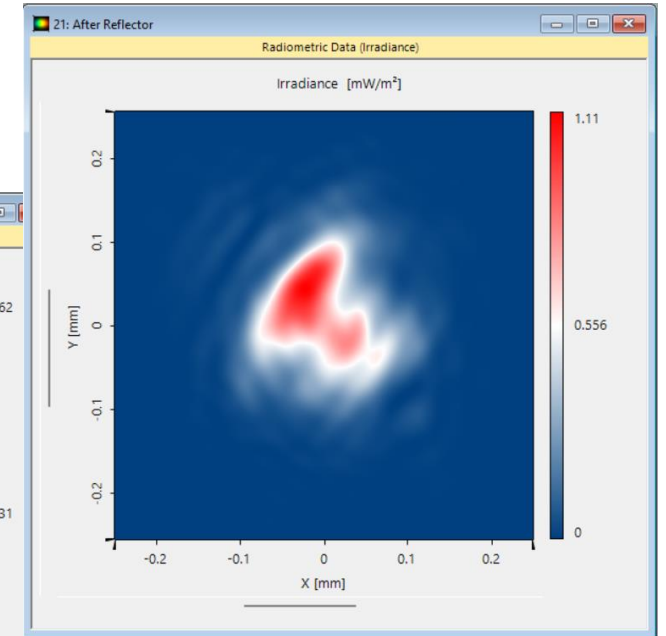
3D View of the system



no roughness

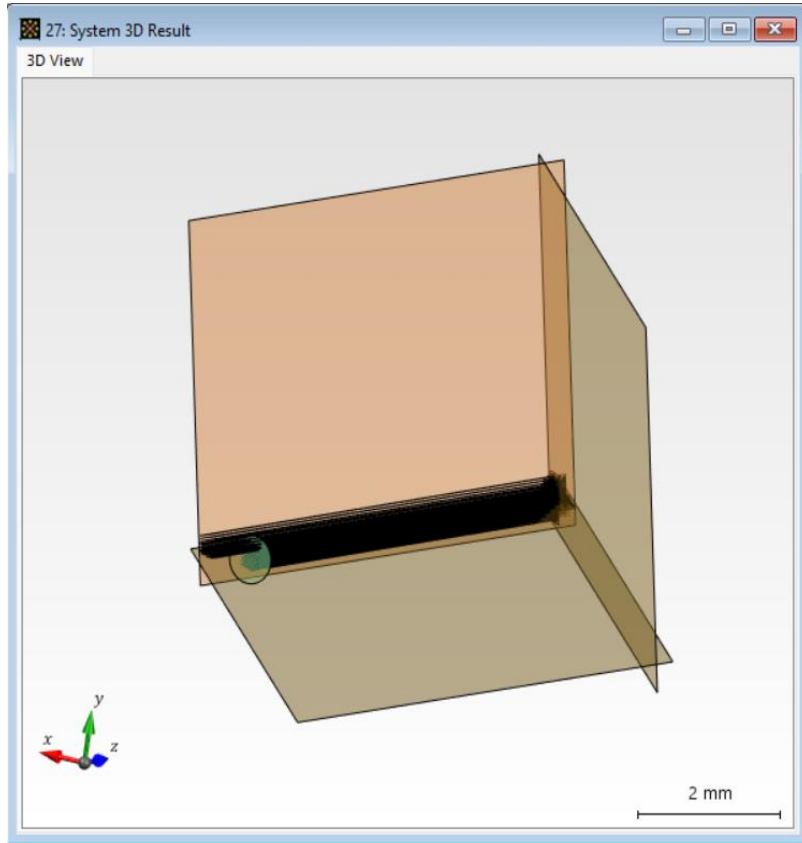


low roughness

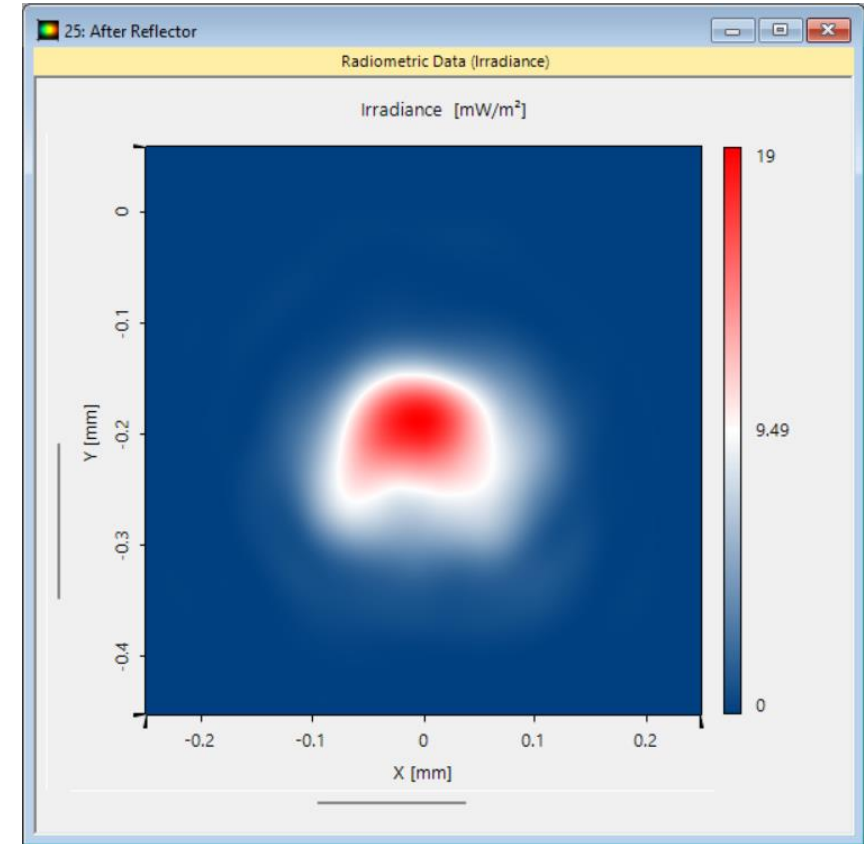


high roughness

Propagation Into the Vortex



The incident angle can be adjusted so that the Gaussian beam directly hits the center of the reflector.



result at detector plane with high surface roughness

Workflows

Source Selection

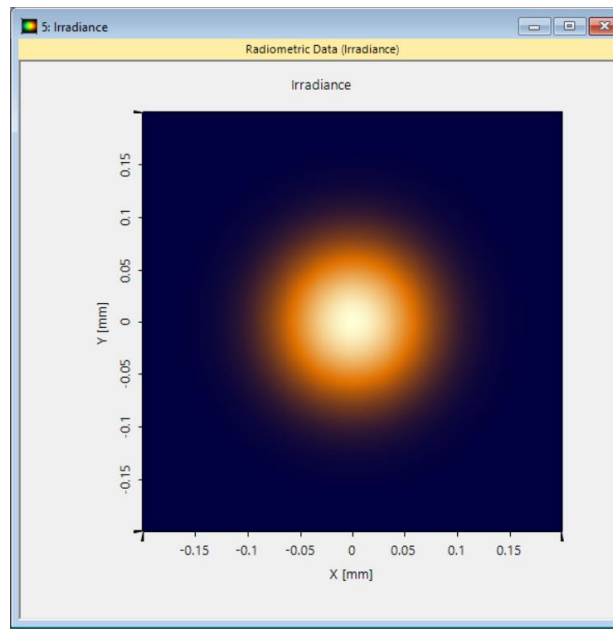
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

➤ Gaussian Wave



Irradiance of source

Source settings

System Setup

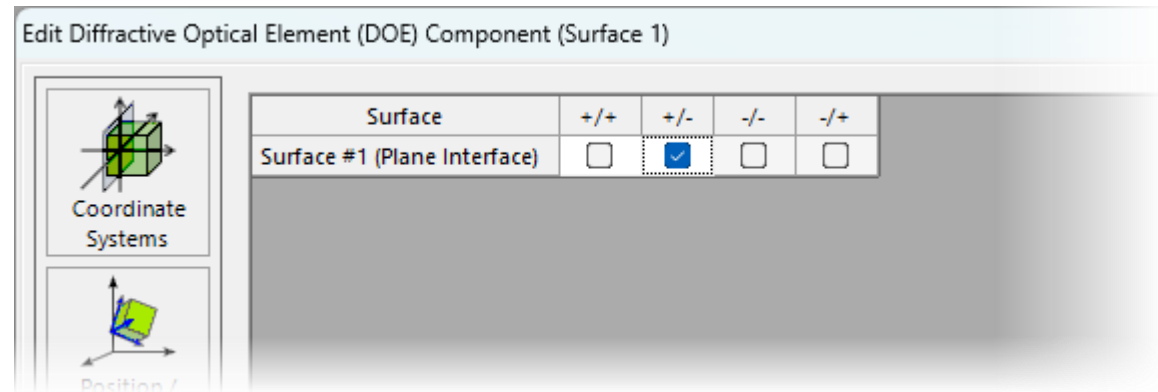
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

- Position and orientation of elements in the optical setup
- Channel configuration for non-sequential field tracing
- Diffractive Optical Element Component



In this case, the channel +/- (forward/backward) are selected to represent the mirror-like behavior of the retroreflector surfaces. Non-sequential field tracing enables modeling of light propagation between the mirrors.

Detector Selection

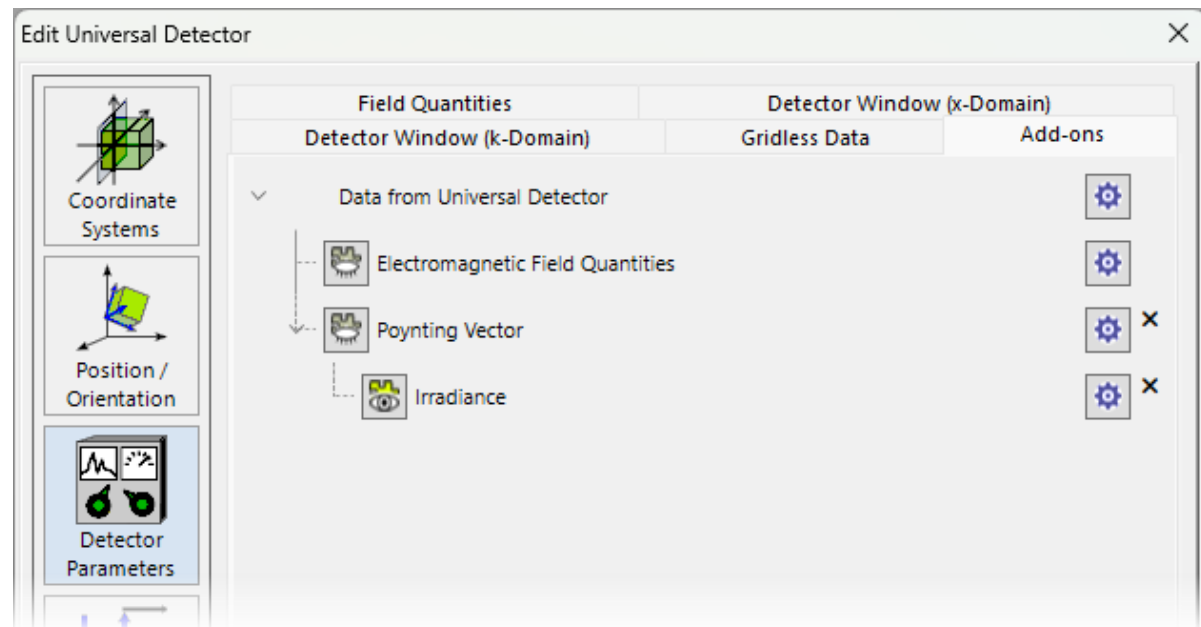
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

➤ Universal Detector



Document Information

Title	Reflection at a Retroreflector with Rough Surfaces
Document code	USC.0451
Publication date	02.05.2025
Required packages	-
Software version	2024.1 (Build 2.74)*
Category	Use Case
Further reading	<ul style="list-style-type: none">- Reflection at a Rough Surface- Diffractive Optical Element Component

** The files attached to this document require the specific version or later.*