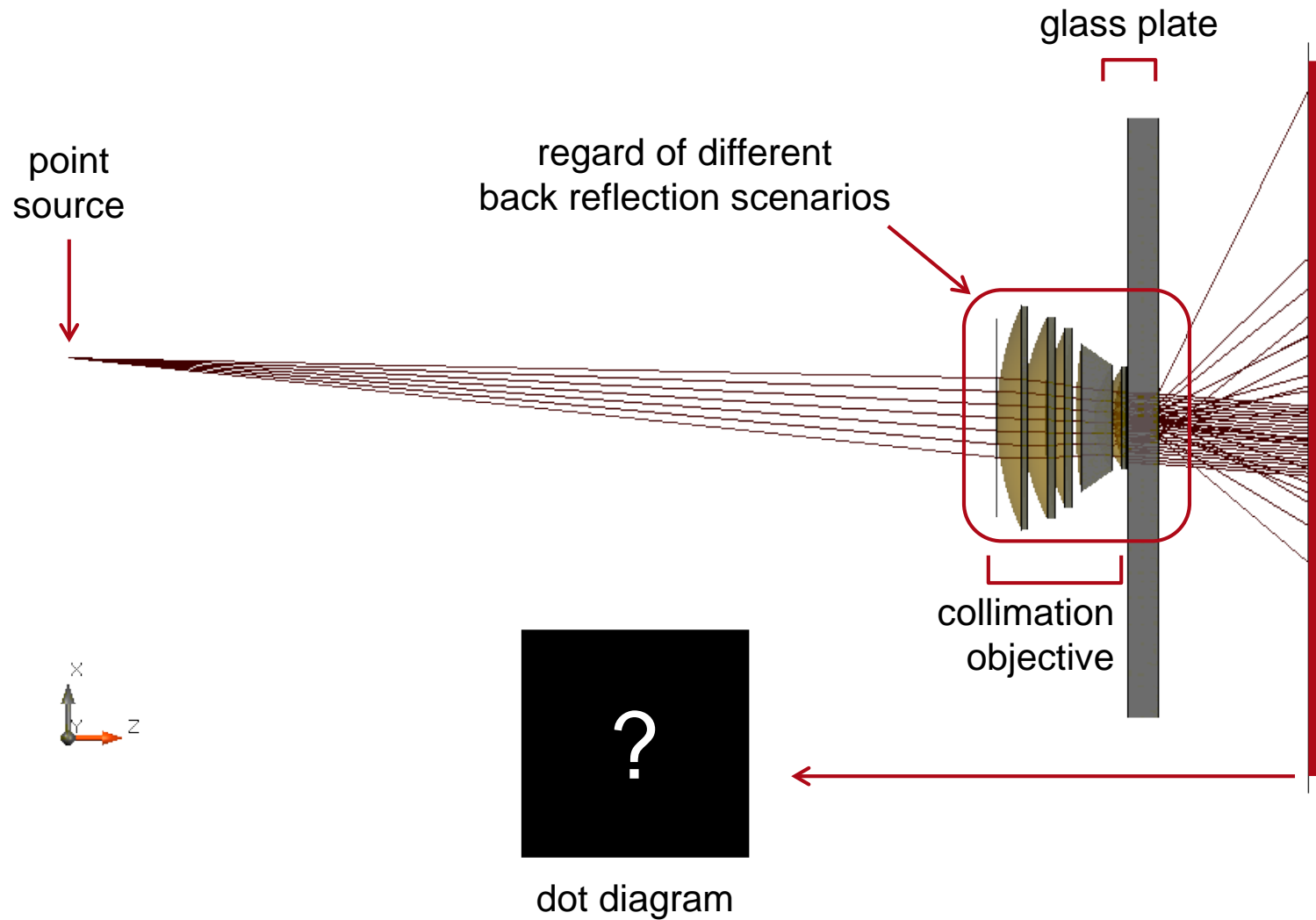


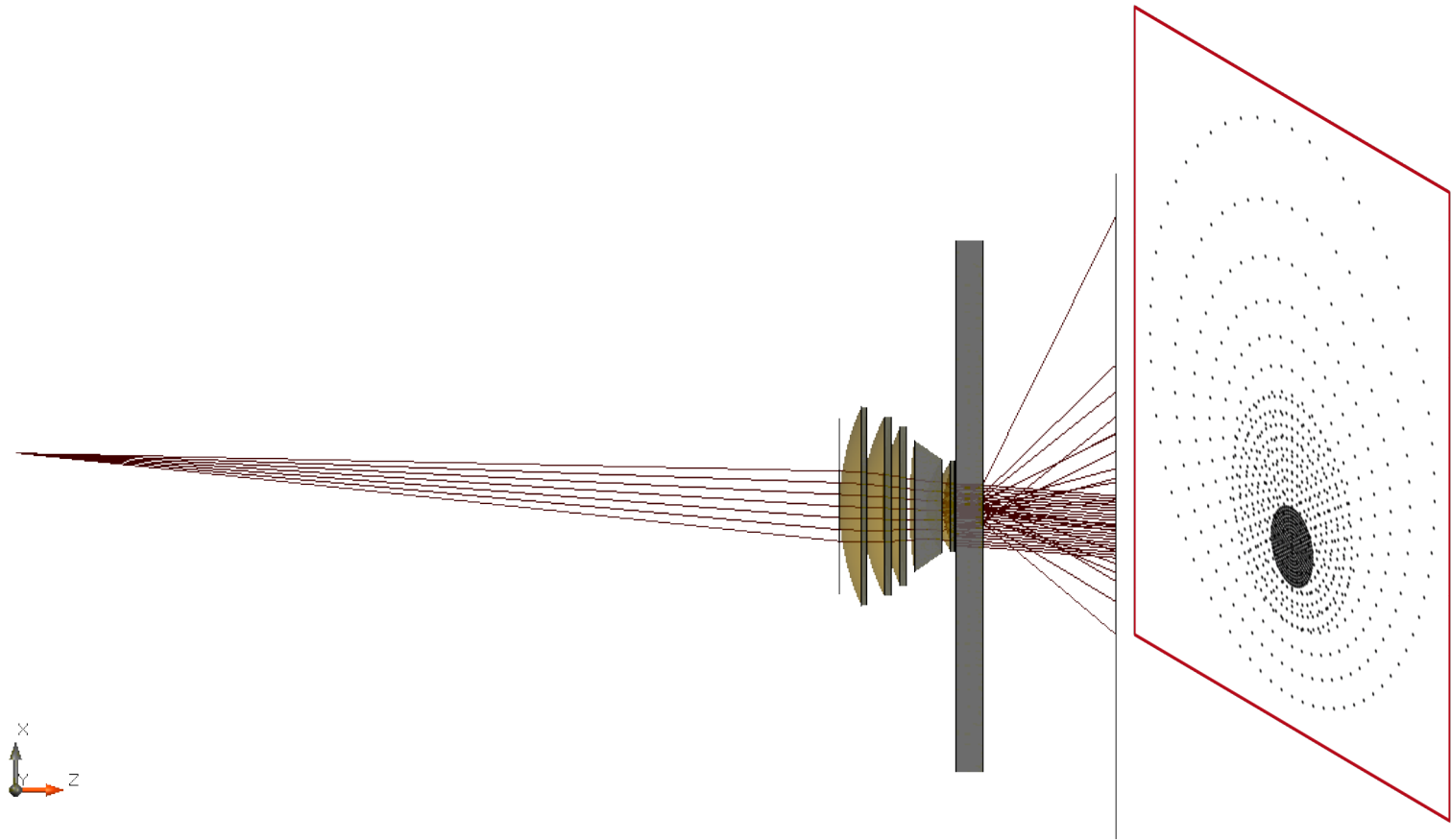
Virtual & Mixed Reality > Near-Eye Displays

Non-Sequential Ray Tracing through Glass Plate

Task/System Illustration

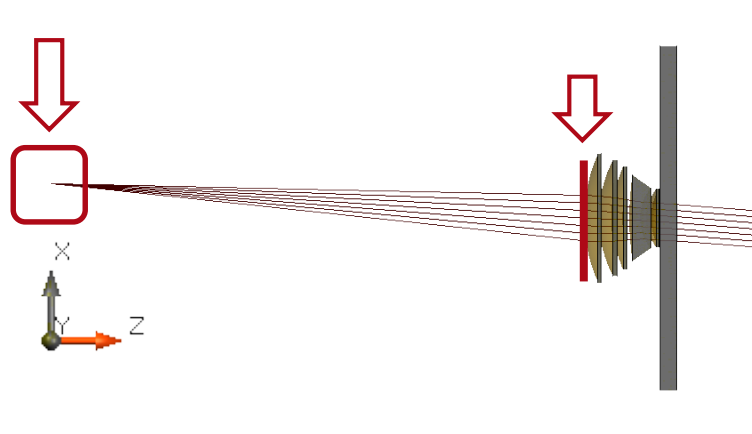


Highlights



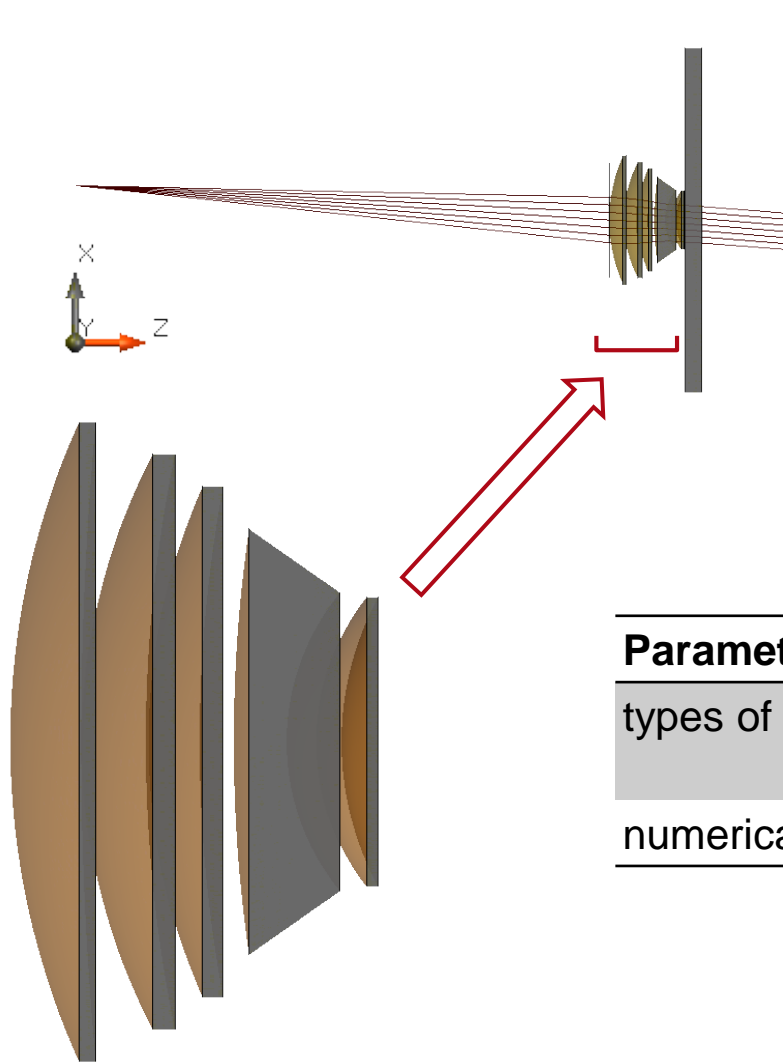
non-sequential ray tracing with controllable input / output forward and backward channel logic

Specification: Light Source



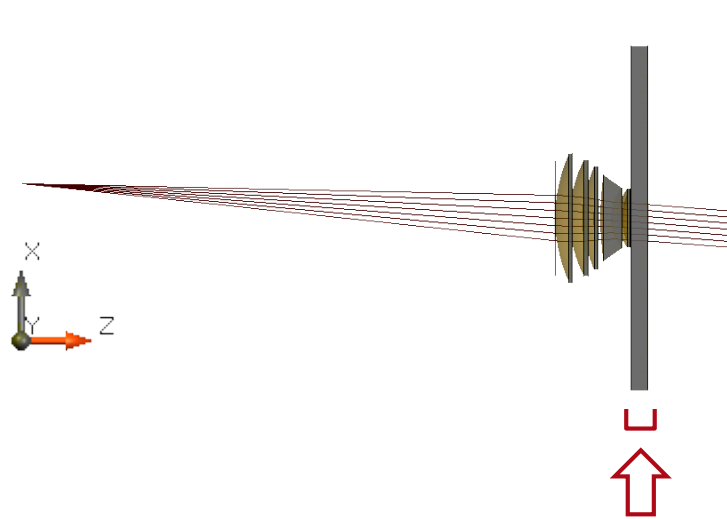
| Parameter | Description / Value & Unit |
|--------------------------|-------------------------------|
| type/number | spherical wave (point source) |
| wavelength | 532nm |
| polarization | linear in x-direction (0°) |
| lateral offset | 2mm × 0 mm |
| distance to next surface | 30.955mm |
| aperture at next surface | 2.5mm × 2.5mm |

Specification: Collimating Lens



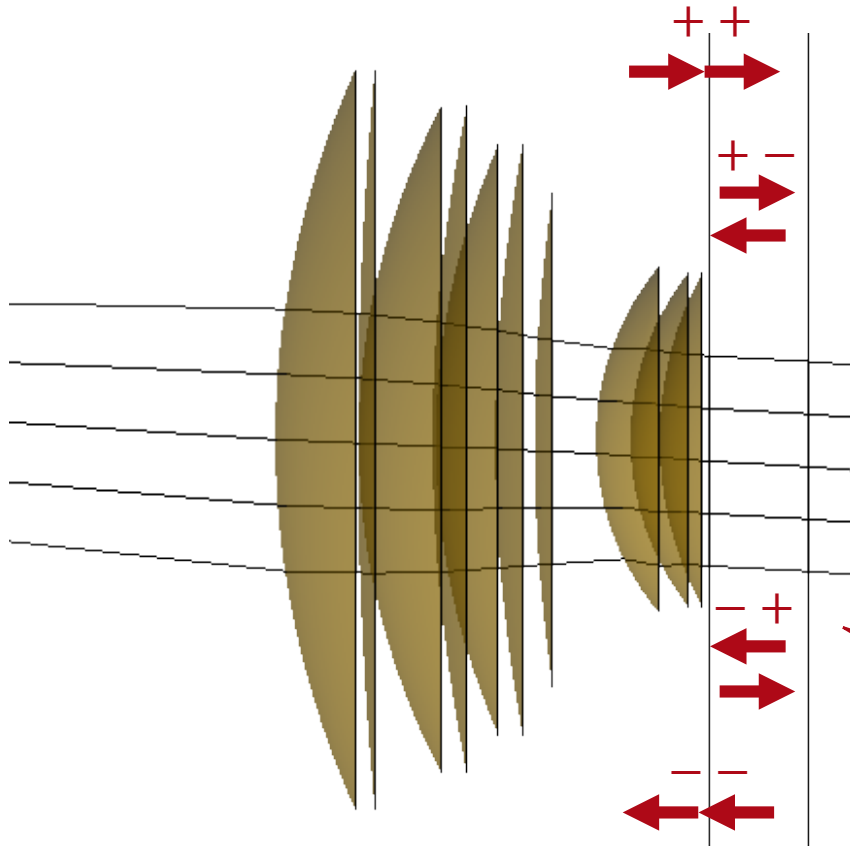
| Parameter | Value & Unit |
|-------------------------|-------------------------------------|
| types of lens surfaces | 5 lenses with 10 spherical surfaces |
| numerical aperture (NA) | 0.15 |

Specification: Glass Plate



| Parameter | Value & Unit |
|-----------|-----------------|
| type | parallel planes |
| thickness | 1 mm |
| material | fused silica |

Specification: Channel Logic

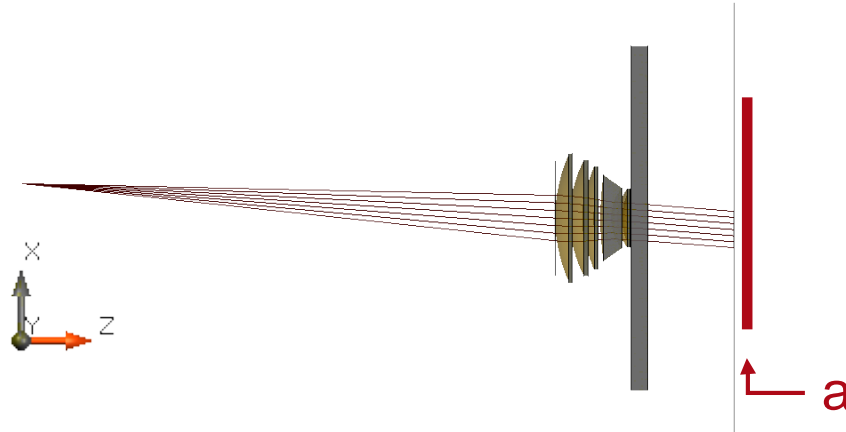


Channel Description

| | |
|-------|------------------------------|
| [+ +] | transmitted forward channel |
| [+ -] | reflected forward channel |
| [- +] | reflected backward channel |
| [- -] | transmitted backward channel |

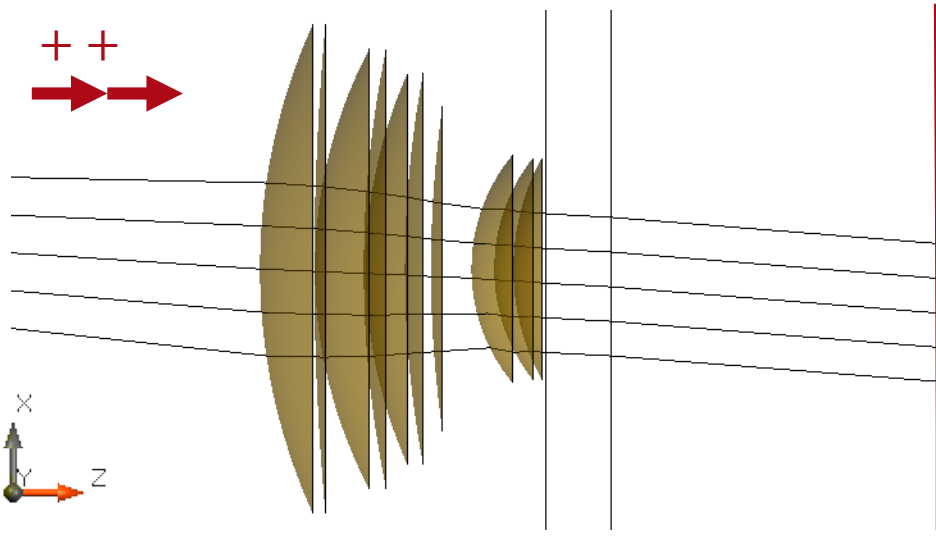
for each surface
all these channel options
can be selected to be considered

Specification: Detectors



| Position | Modeling Technique | Detector/Analyzer |
|-------------|--------------------------------|---|
| full system | 3D ray tracing system analyzer | 3D ray tracing view with different channels activated |
| a | ray tracing | dot diagram |

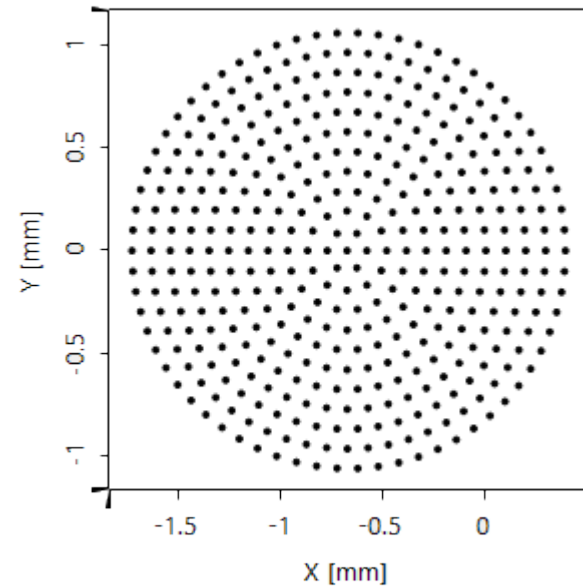
Results: 3D Ray Tracing & Spot Diagram



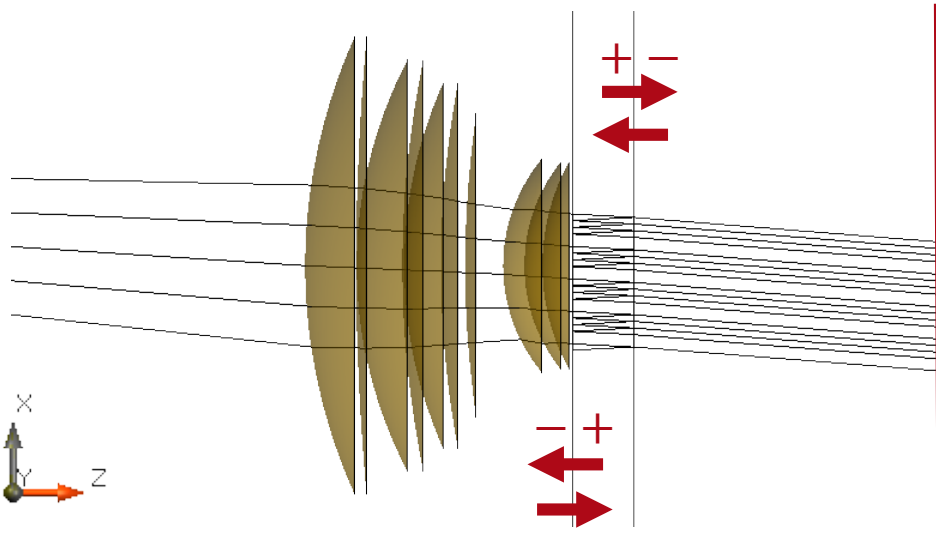
all [+ +] channels activated

Highlight

non-sequential ray tracing with
controllable input / output forward
and backward channel logic



Results: 3D Ray Tracing & Spot Diagram

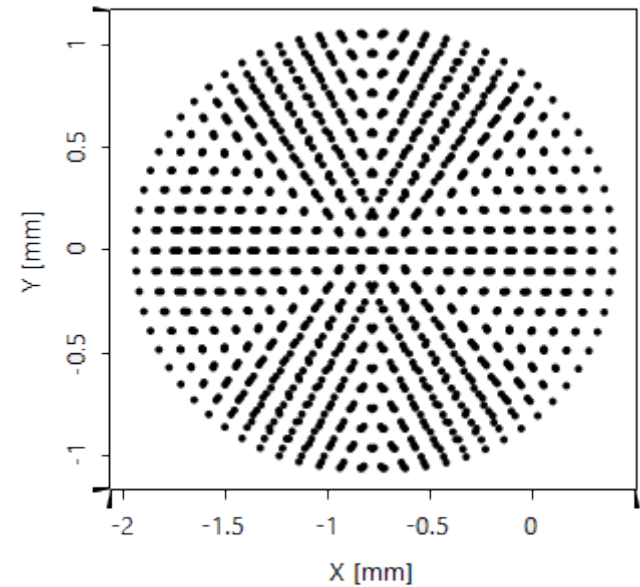


Highlight

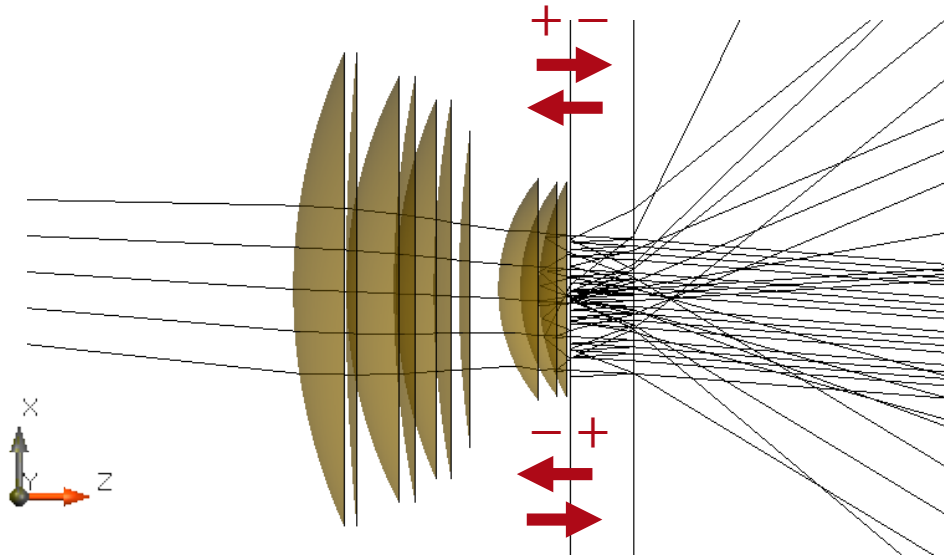
non-sequential ray tracing with controllable input / output forward and backward channel logic

[+ -] reflected forward channel at second surface of glass plate activated

[- +] reflected backward channel at first surface of glass plate activated



Results: 3D Ray Tracing & Dot Diagram

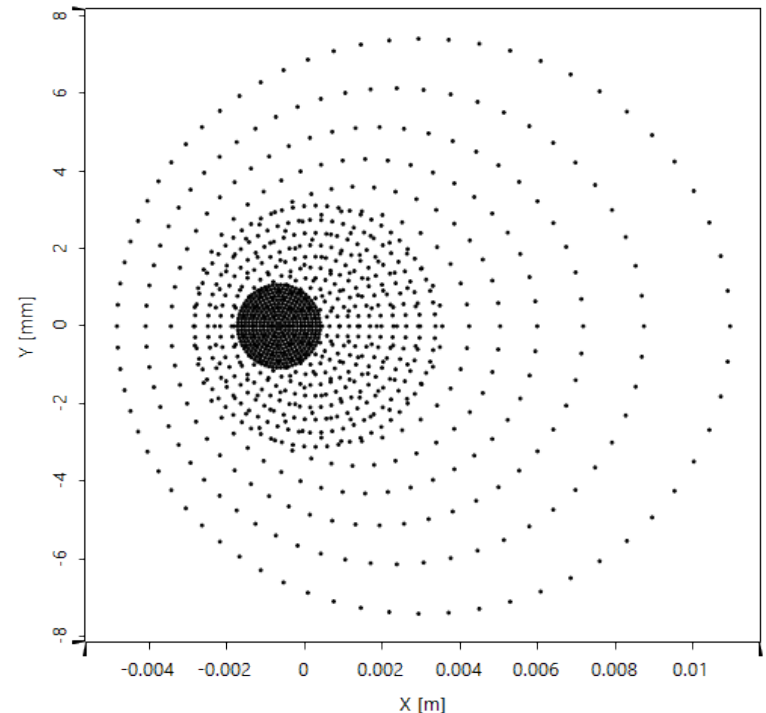


[+ -] reflected forward channel at first surface of glass plate activated

[- +] reflected backward channel at last surface of collimation objective

Highlight

non-sequential ray tracing with controllable input / output forward and backward channel logic



Document & Technical Info

| | |
|---------------------|---|
| code | NED.0002 |
| version of document | 1.0 |
| title | Non-Sequential Ray Tracing through Glass Plate |
| category | Virtual & Mixed Reality > Near-Eye Displays (NED) |
| author | Roberto Knoth (LightTrans) |
| used VL version | 7.0.0.29 |

Specifications of PC Used for Simulation

| | |
|------------------|-------------------------|
| Processor | i7-4910MQ (4 CPU cores) |
| RAM | 32 GB |
| Operating System | Windows 10 |