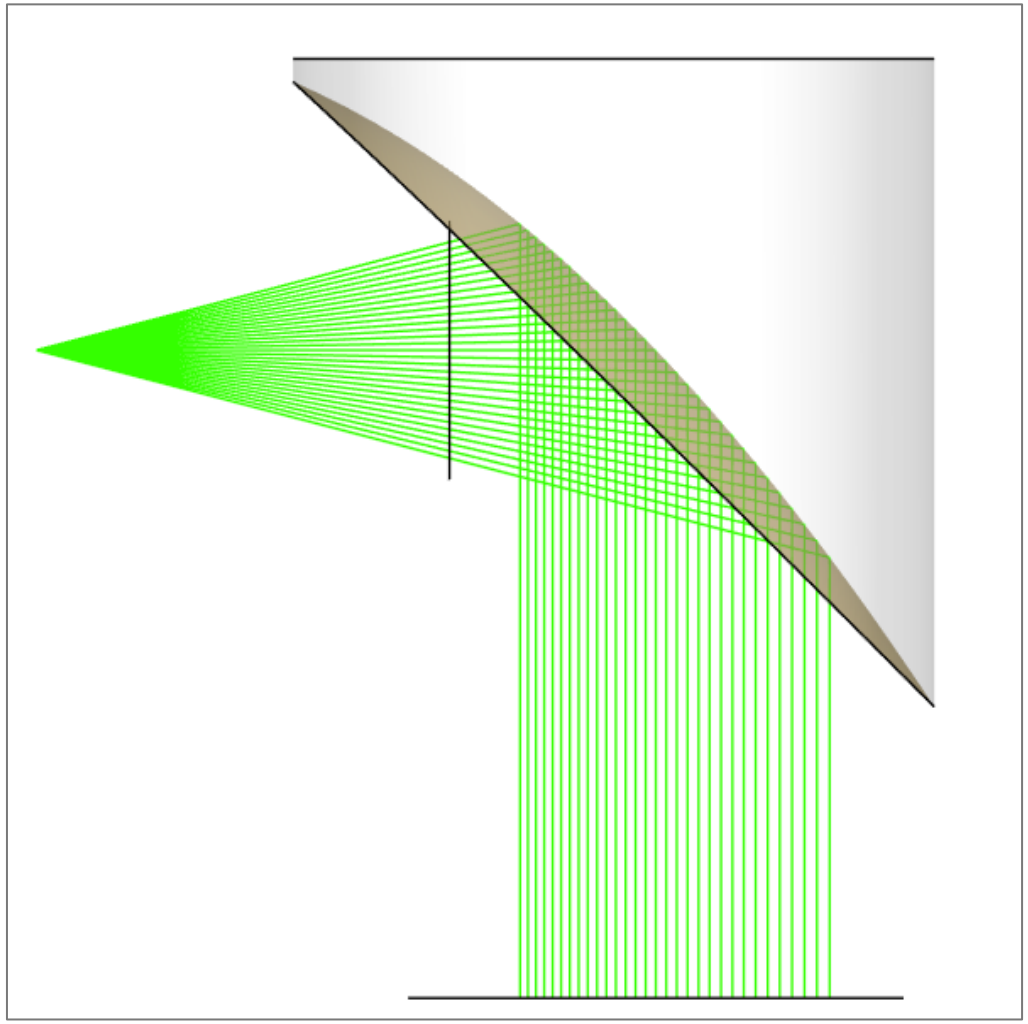
# Collimation of a Spherical Wave by an Off-Axis Parabolic Mirror

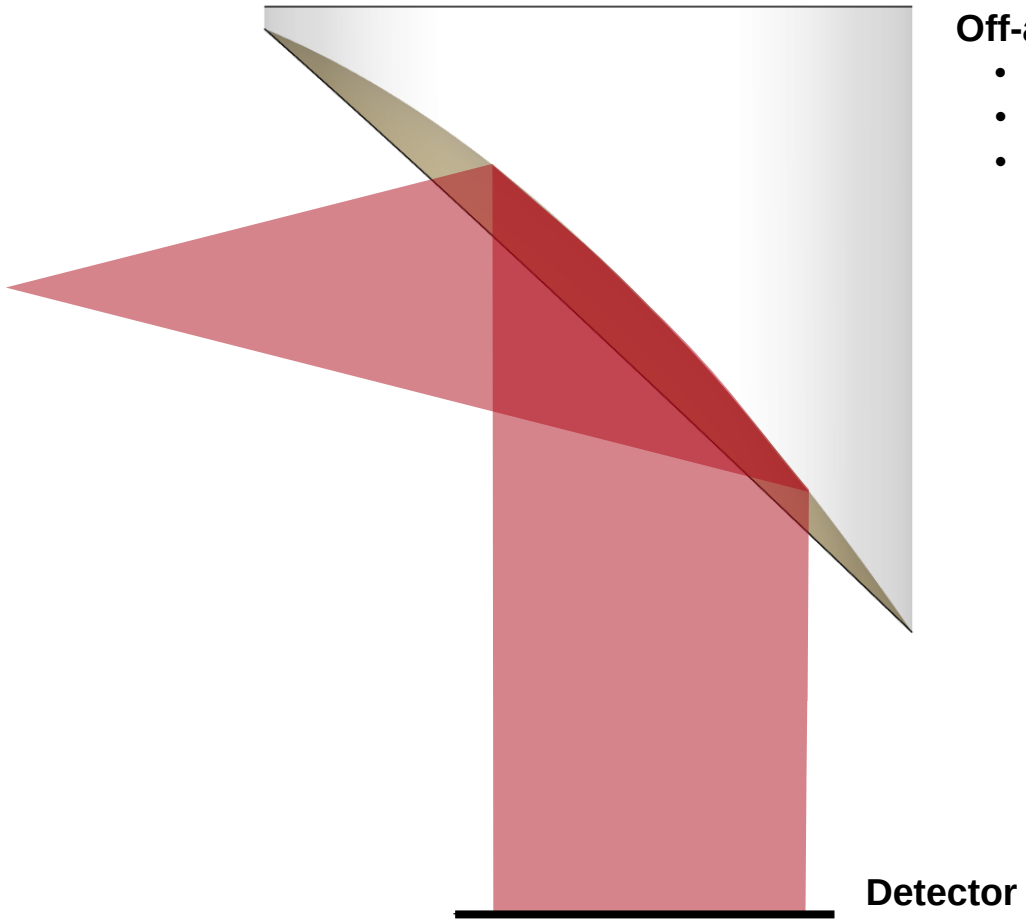
# Abstract



This use case presents a simulation of a spherical wave collimated by an off-axis parabolic (OAP) mirror with different off-axis angle configurations.. In addition, the effects of misalignment due to incorrect OAP tilt were analyzed to assess system sensitivity.

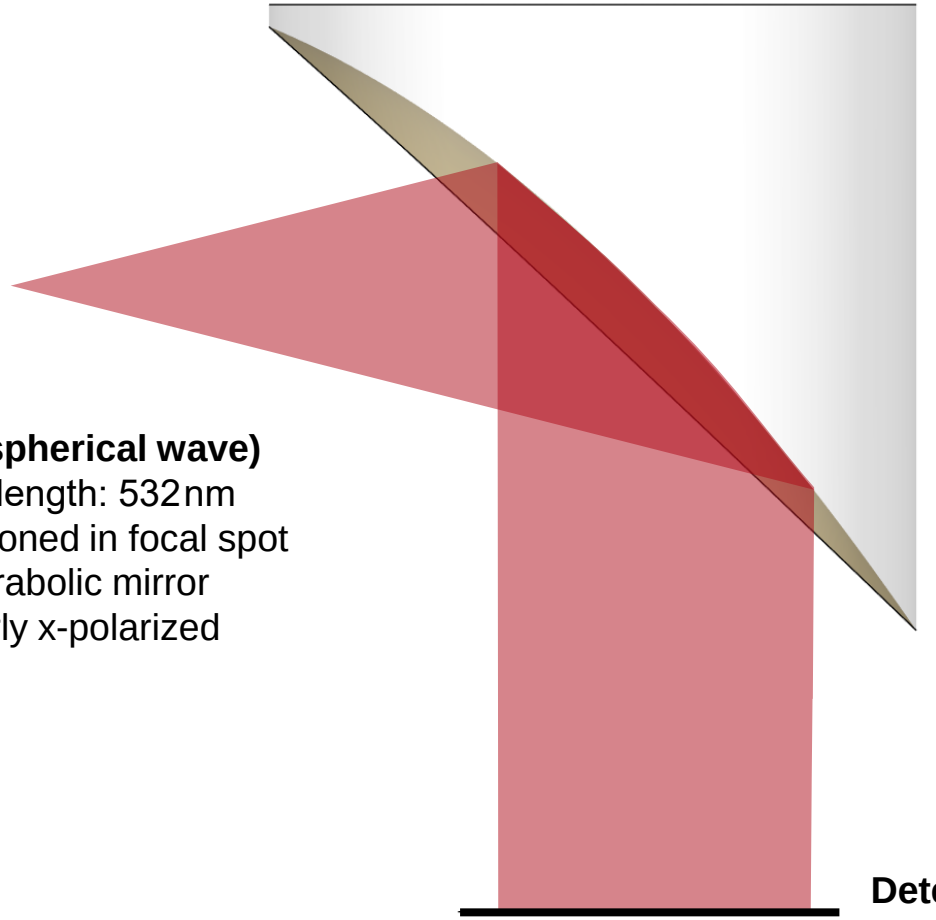
# Application Scenario: System

**Source (spherical wave)**
- wavelength: 532 nm
- positioned in focal region parabolic mirror
- linearly x-polarized




**Off-axis parabolic mirror**
- Focal length: 30 mm
- Off-axis angle: (0°,30°,60°,90°)
- Medium: Ideal mirror medium

# Application Scenario: Task



**Off-axis parabolic mirror**
- Focal length: 30 mm
- **Off-axis angle: (0°,30°,60°,90°)**
- Medium: Ideal mirror medium

**Source (spherical wave)**
- wavelength: 532 nm
- positioned in focal spot of parabolic mirror
- linearly x-polarized

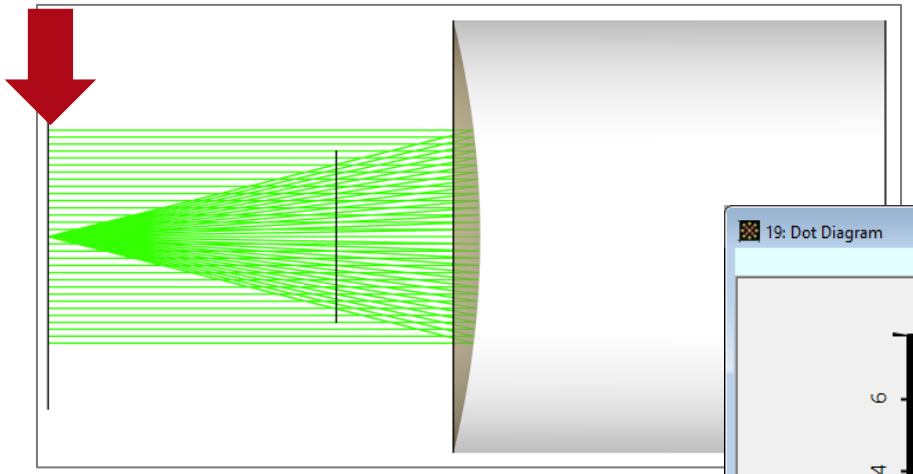
**Detector**
- **Irradiance**

**Task 1:** Detect irradiance at detector for different off-axis angle configurations.

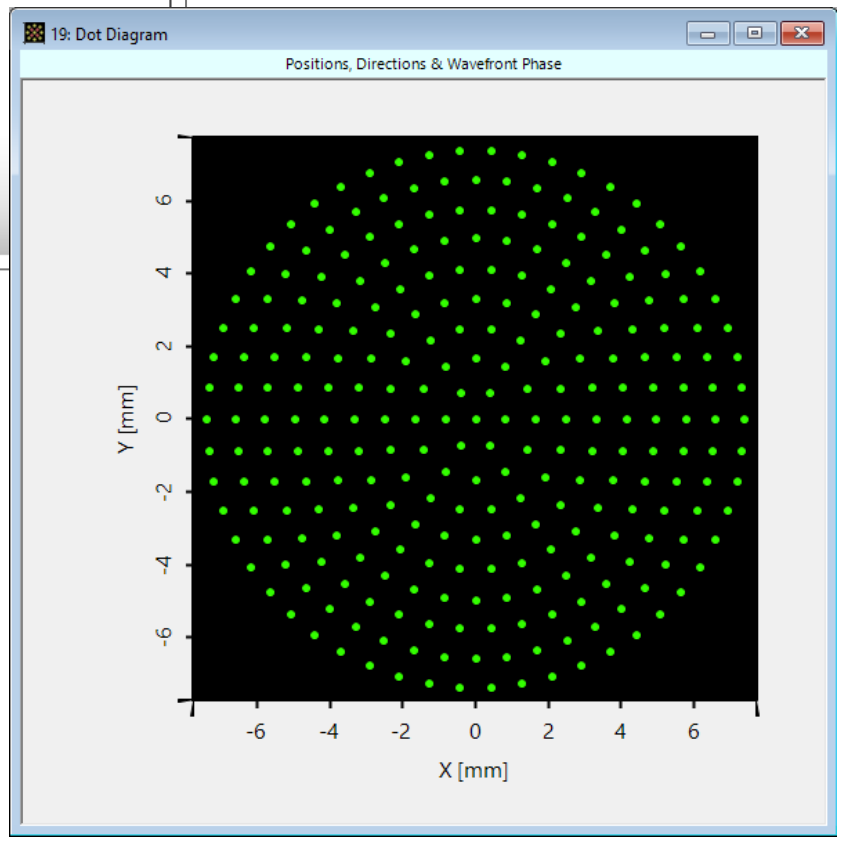
**Task 2:** Detect irradiance at detector for 90° off-axis while tilting the mirror by ±5°

# Task 1: Collimation with Different Off-Axis Angles

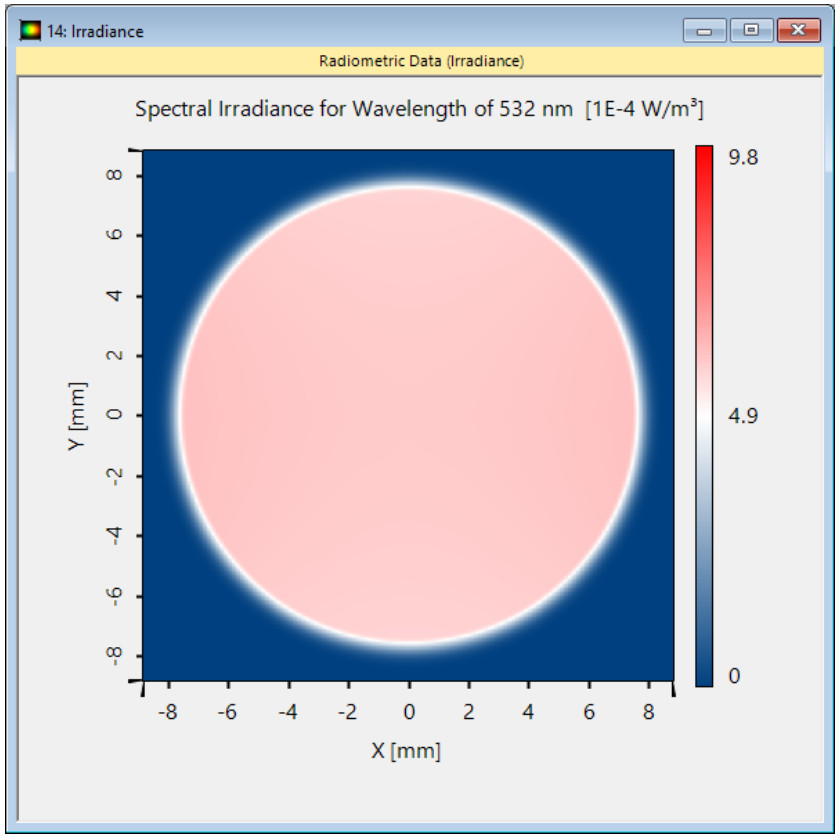
# 0° Off-Axis Angle



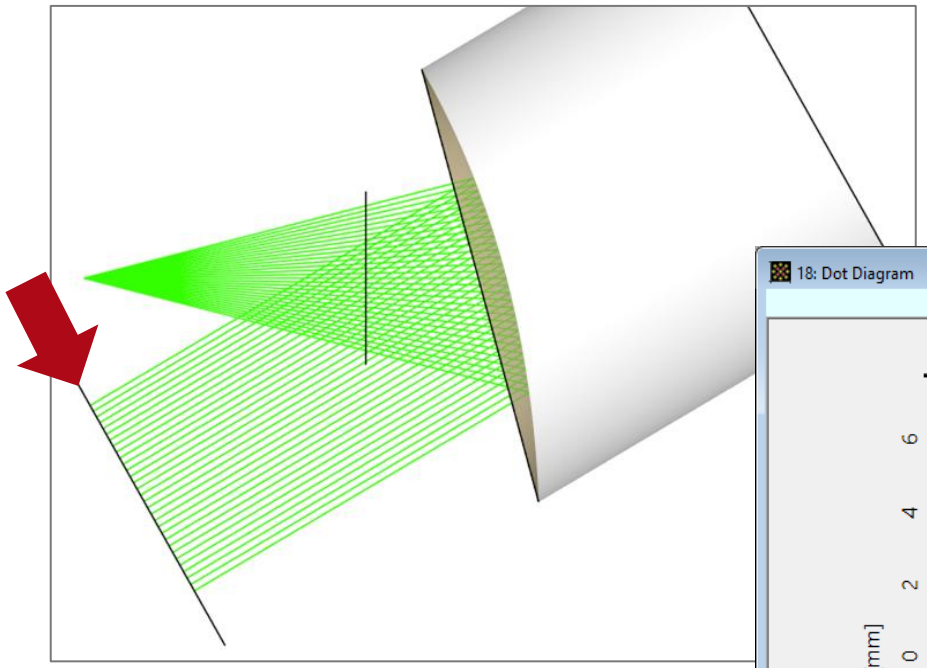
Dot Diagram



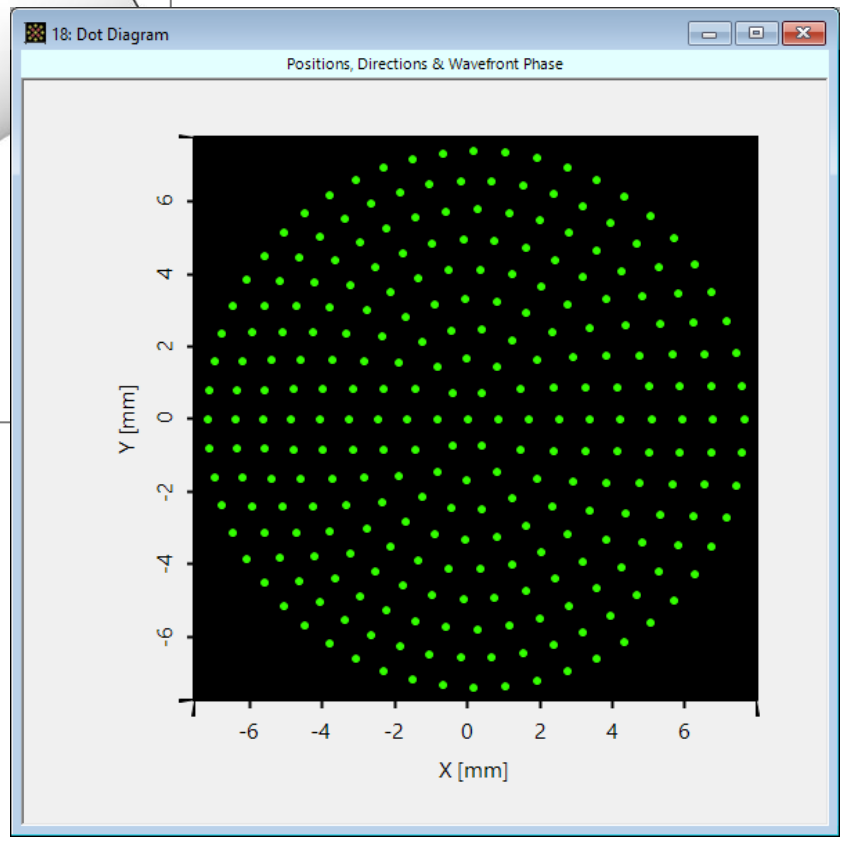

Irradiance



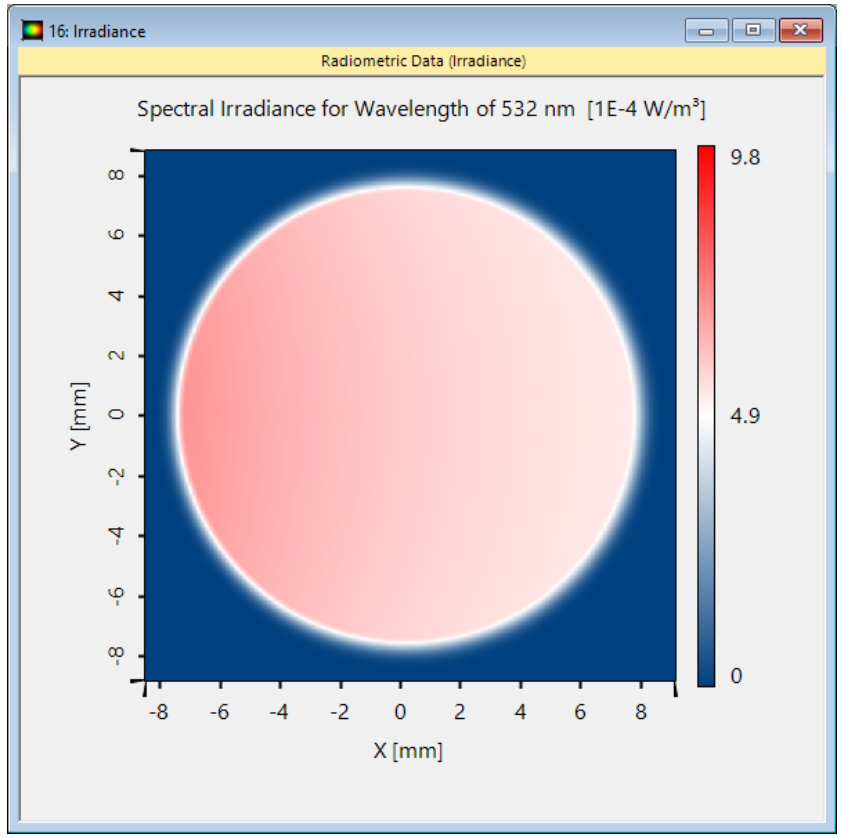
# 30° Off-Axis Angle



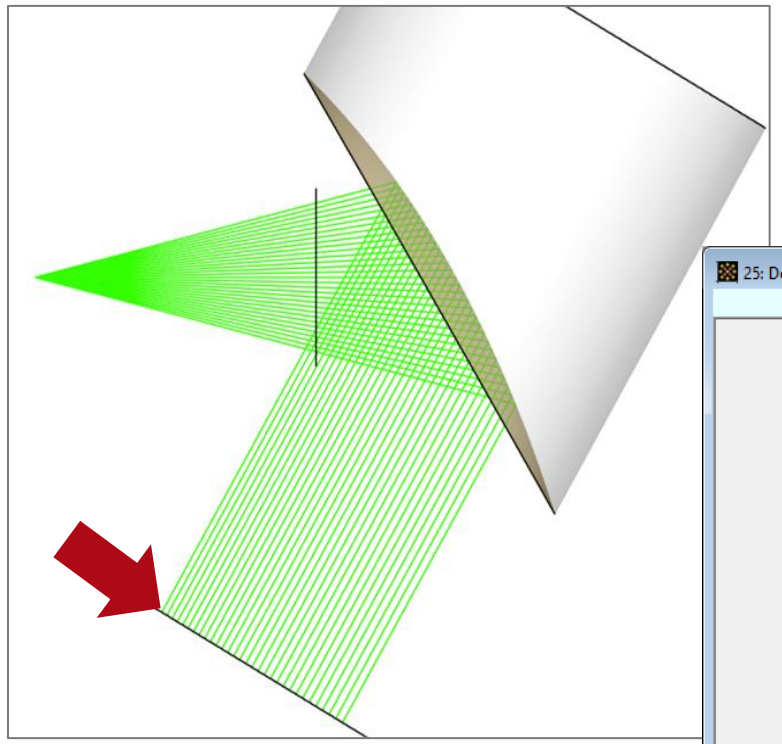
Dot Diagram



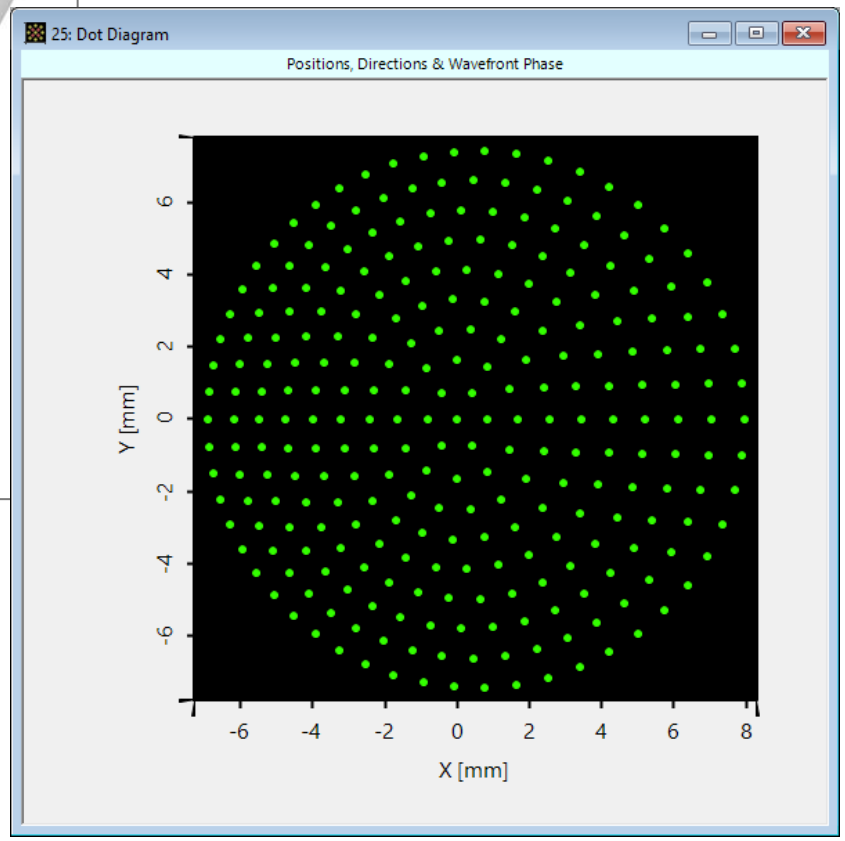

Irradiance



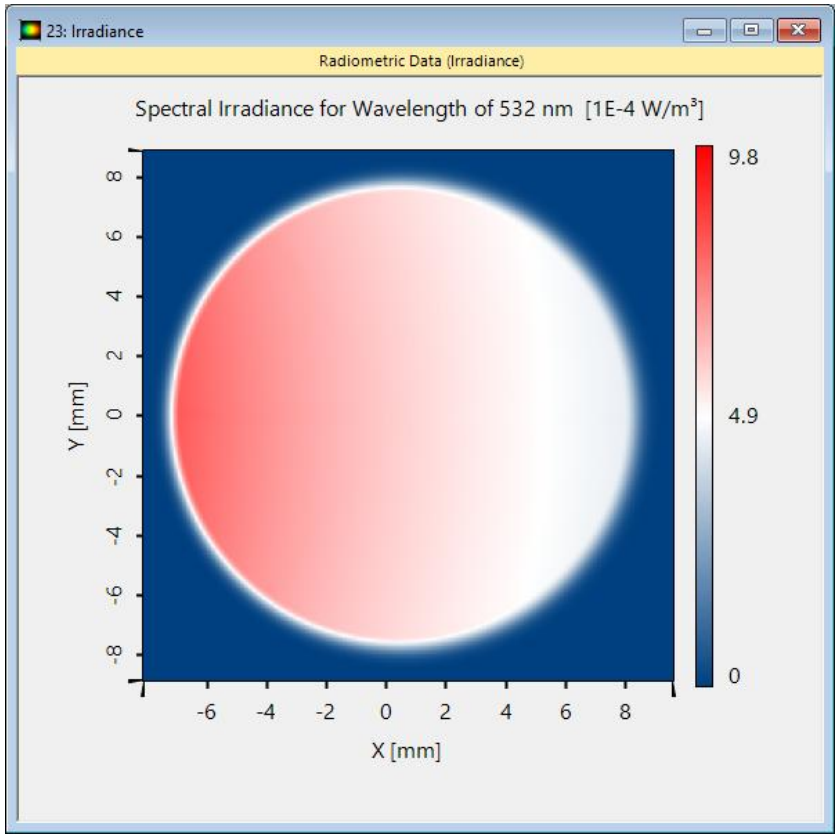
# 60° Off-Axis Angle



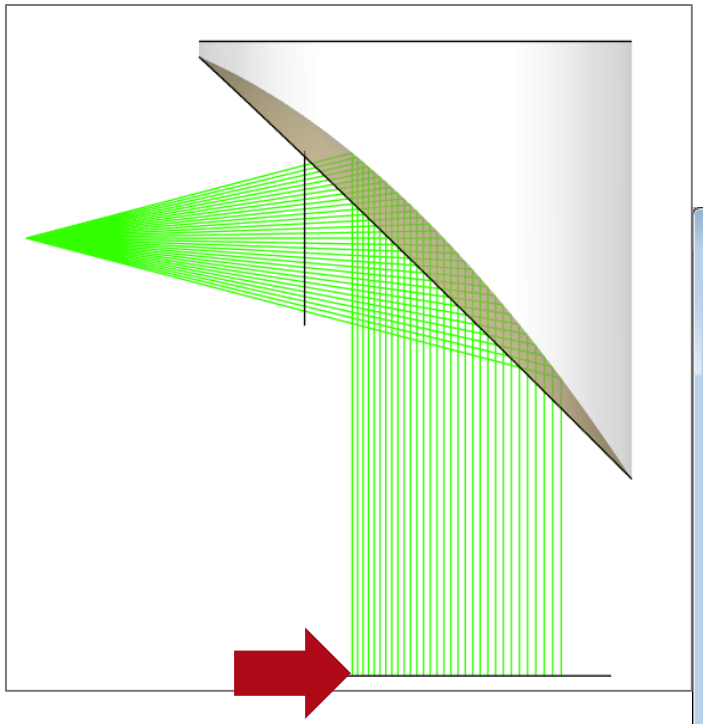
Dot Diagram



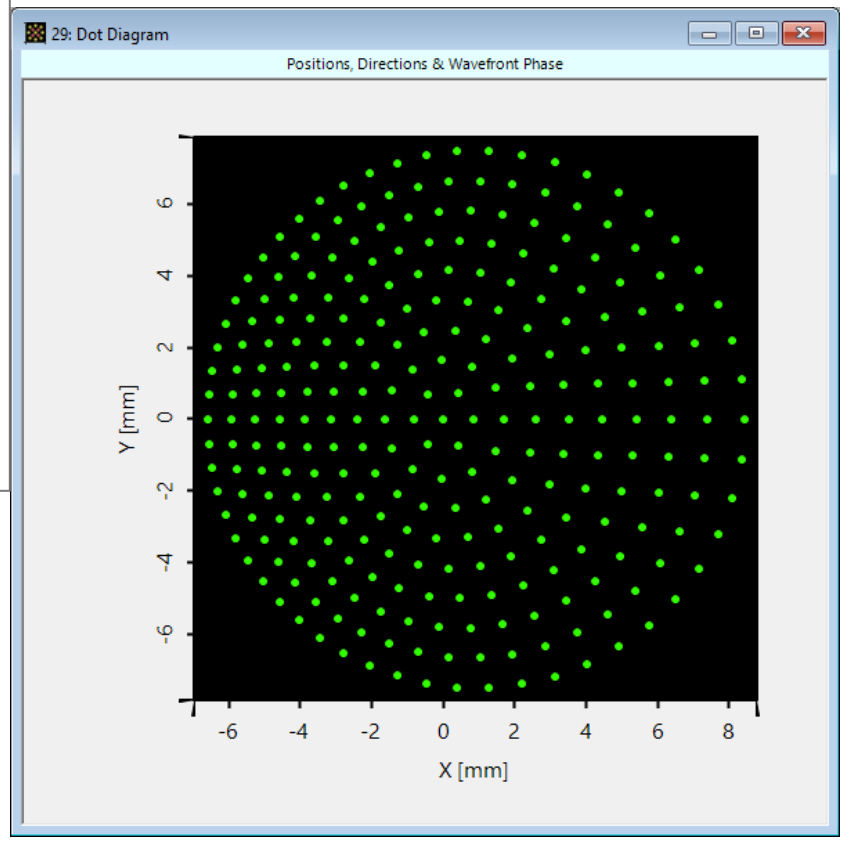

Irradiance



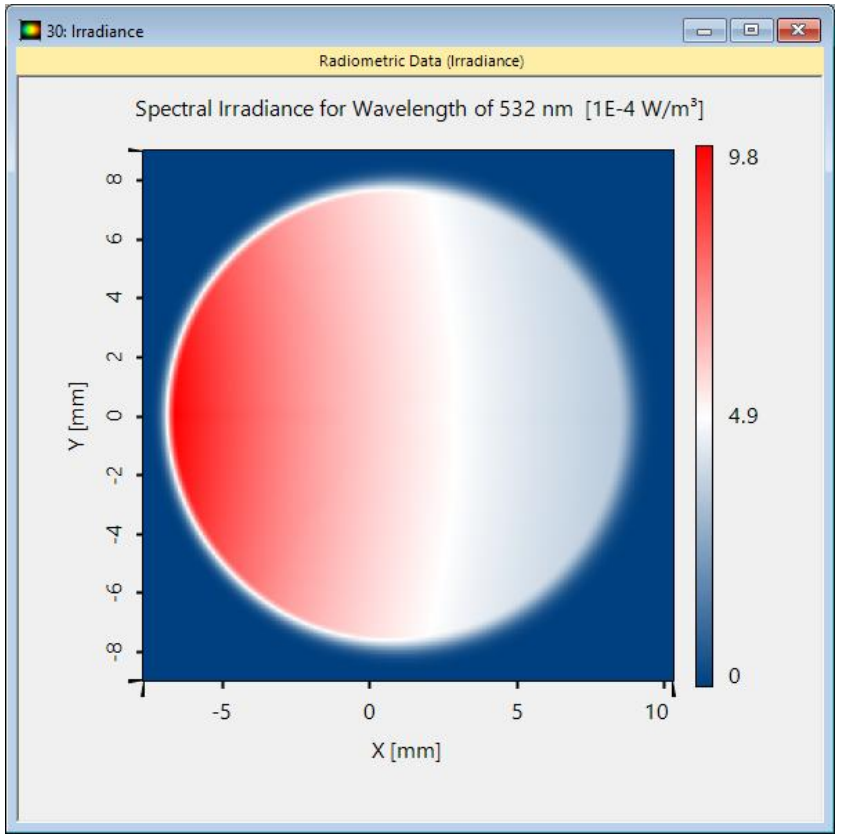
# 90° Off-Axis Angle



Dot Diagram

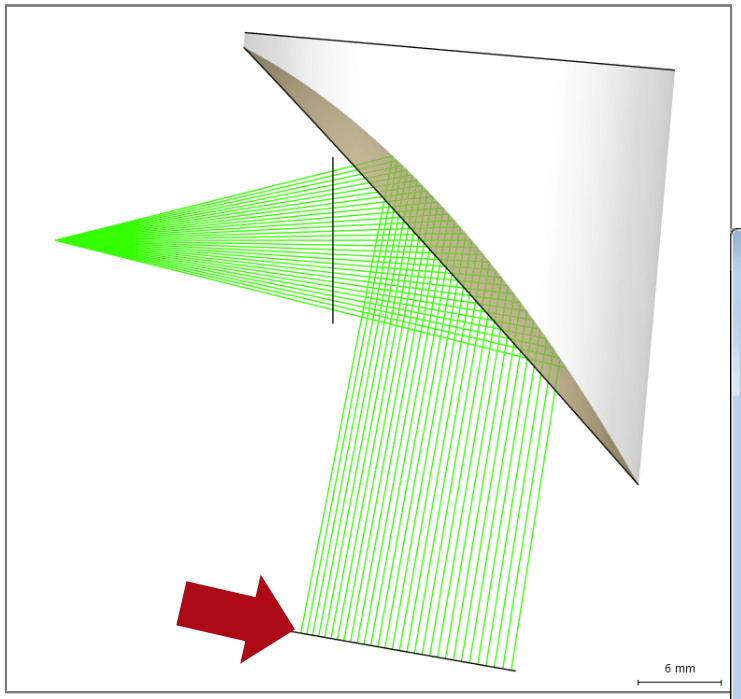



Irradiance

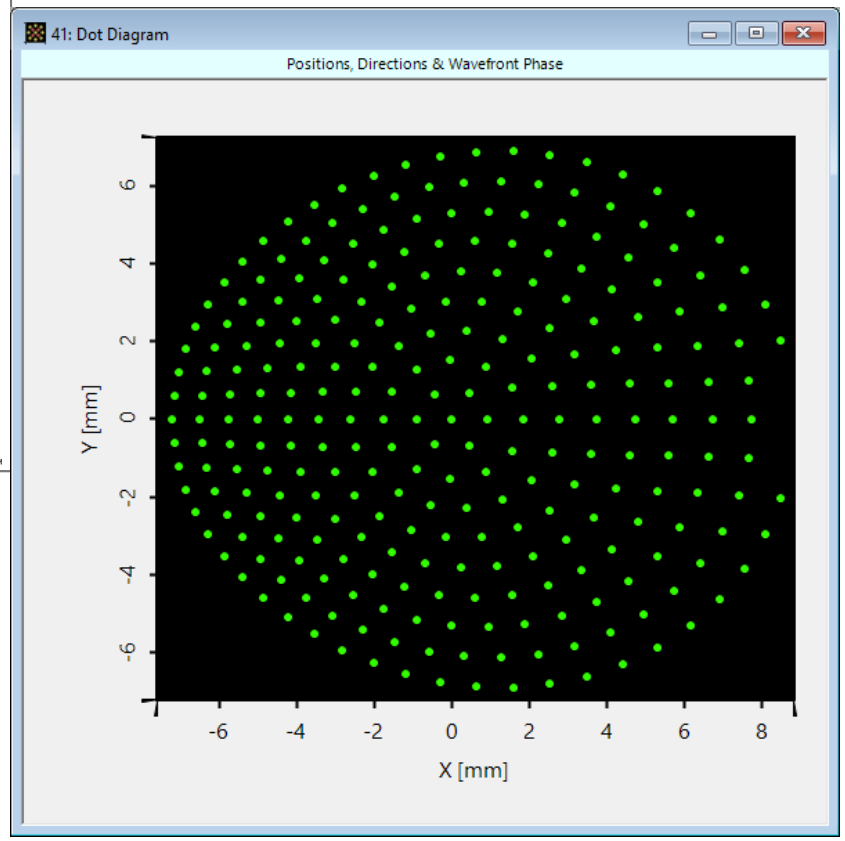


# Task 2: Tolerancing for a Given Off-Axis Angle

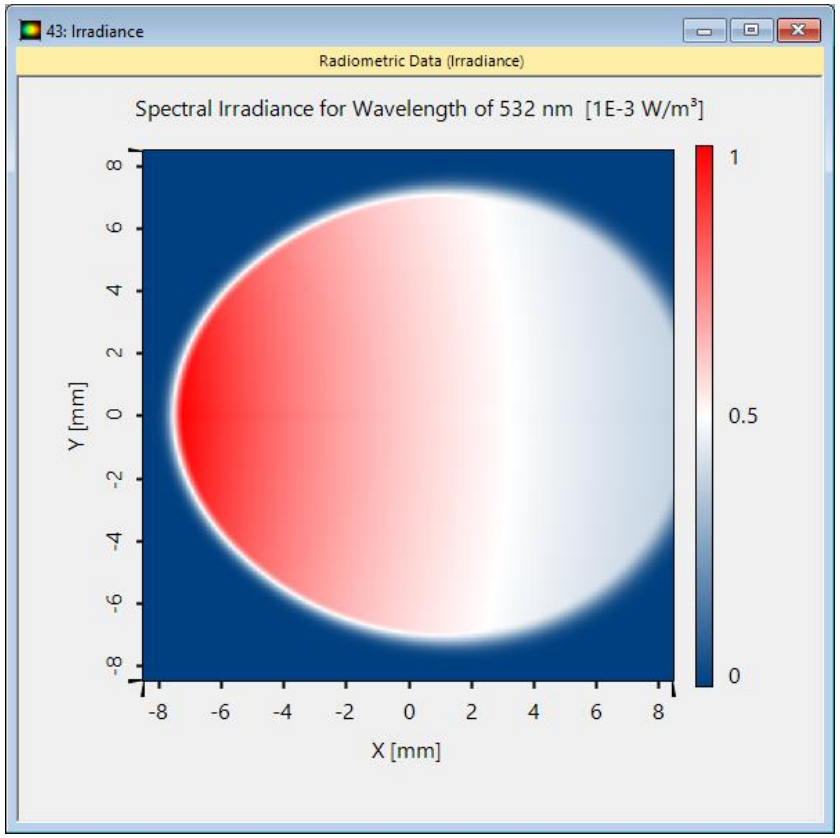
# 5° Tilt



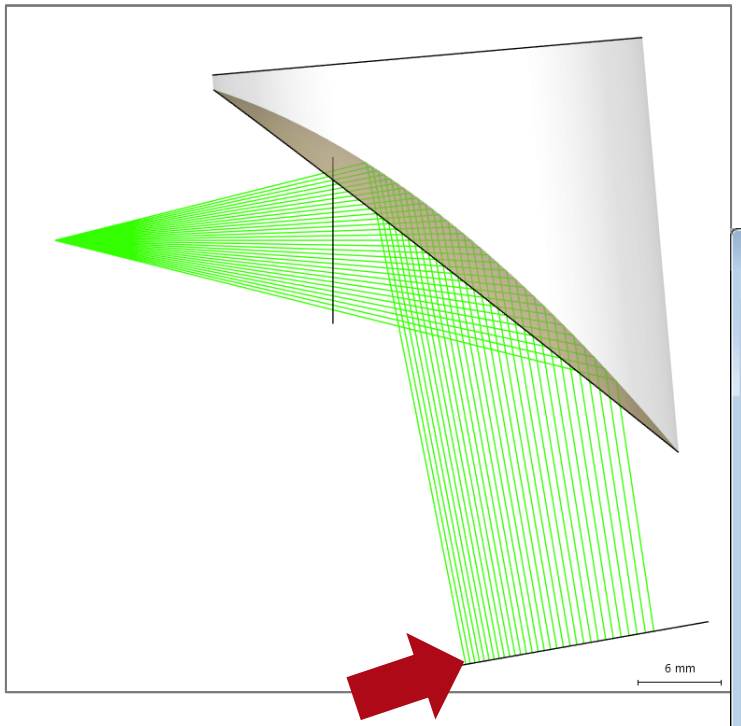

Dot Diagram



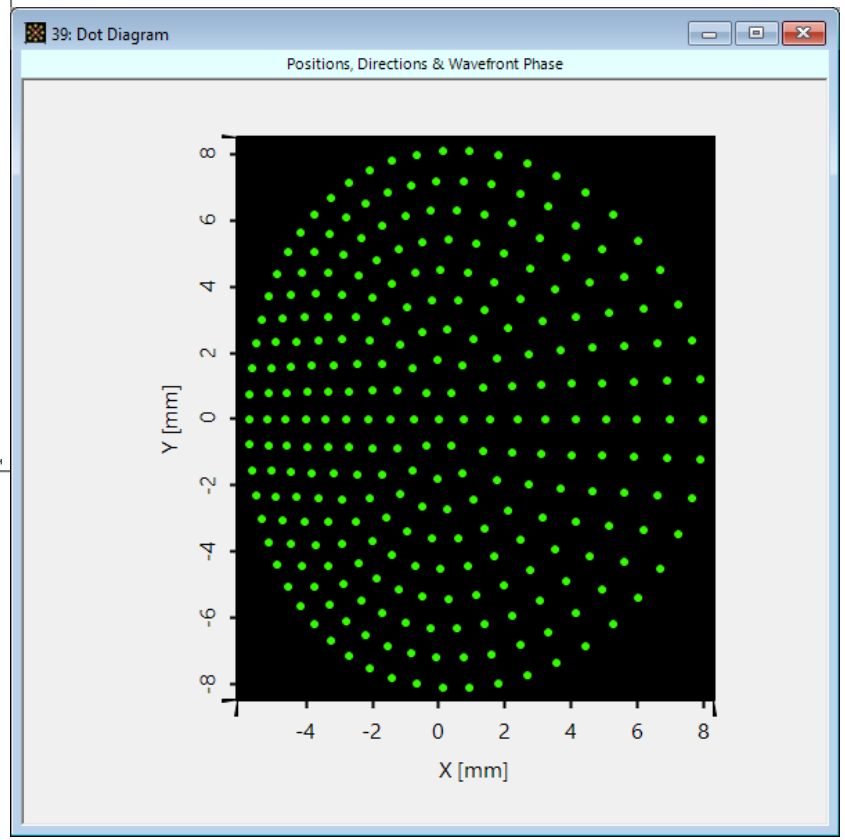

Irradiance



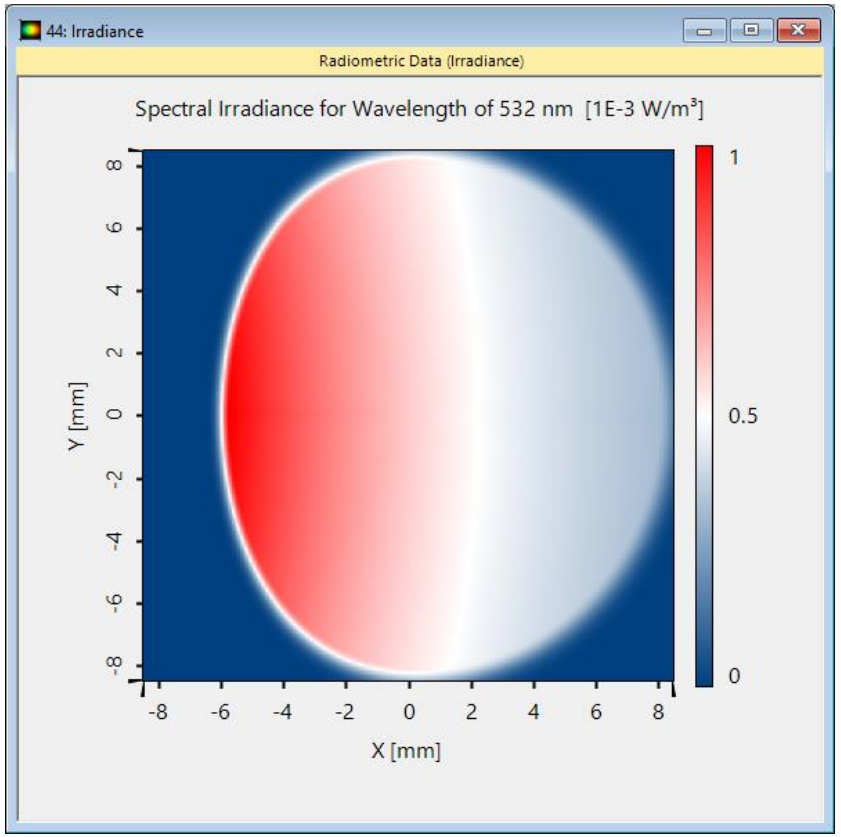
# -5° Tilt




Dot Diagram




Irradiance



# Workflows

# LP Mode Source

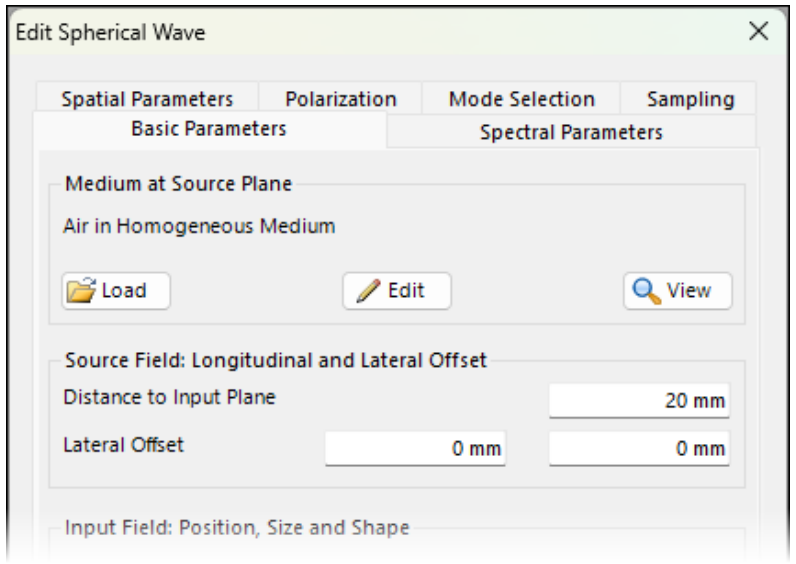
Source selection

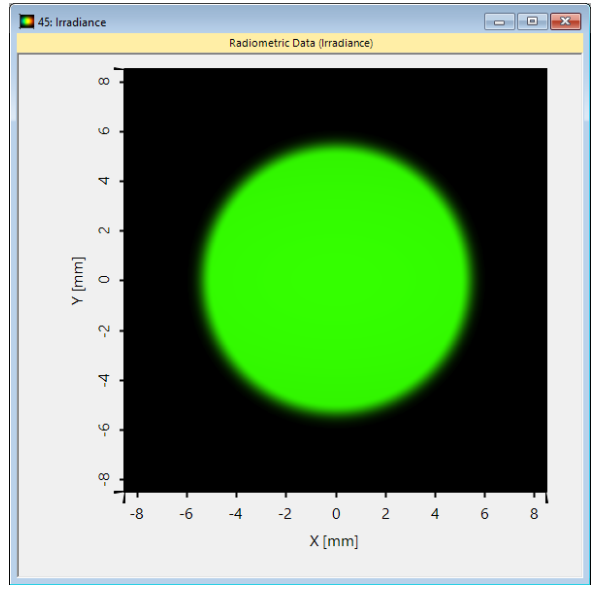
System setup

Detector selection

## Getting it done in VirtualLab Fusion:

- Spherical Wave



# System Setup

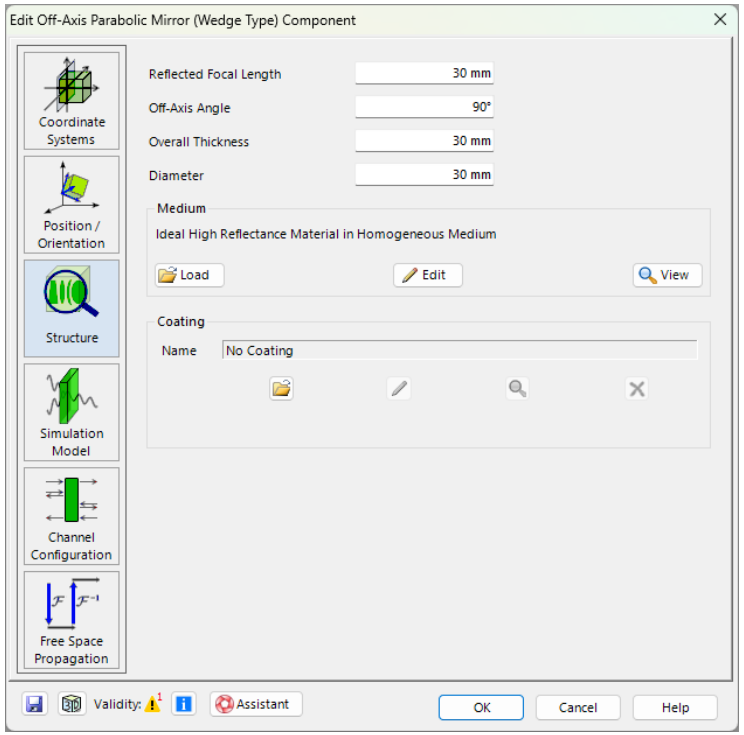
Source selection

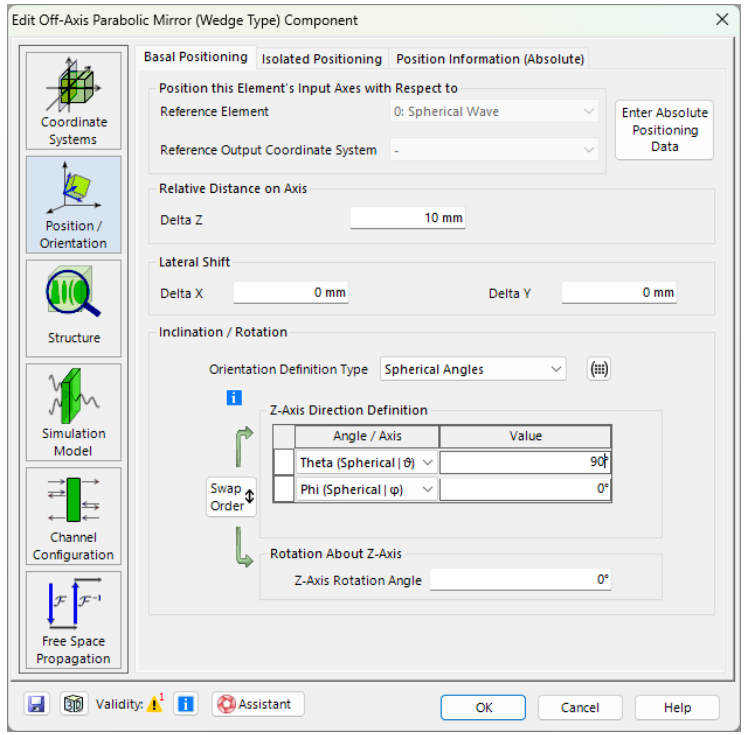
System setup

Detector selection

## Getting it done in VirtualLab Fusion:

- Setup Off-Axis Parabolic Mirror



# Detector Selection

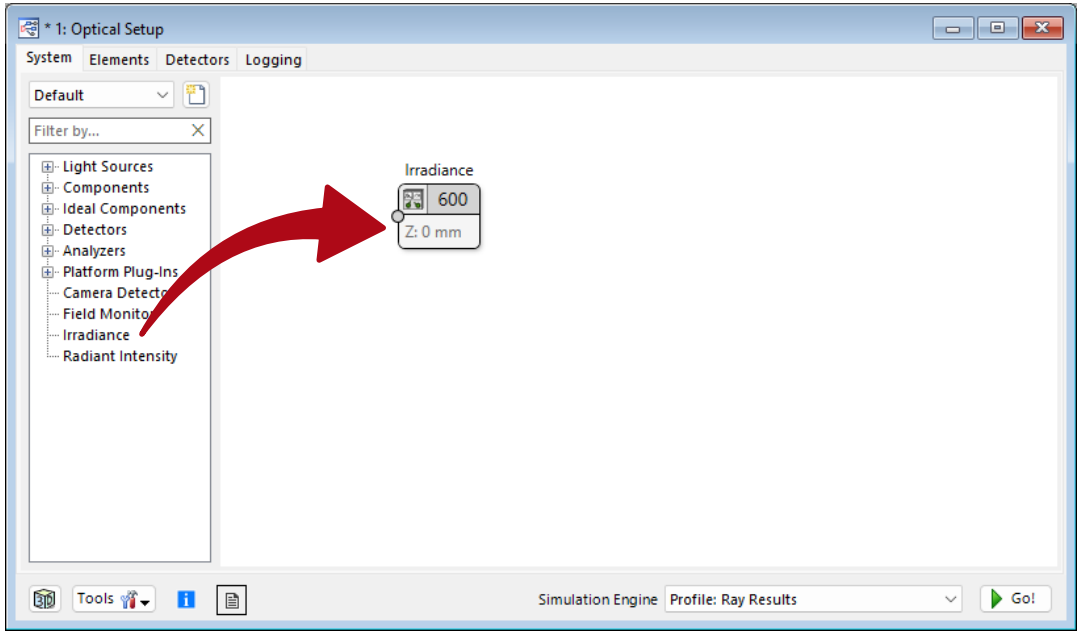
Source selection

System setup

Detector selection

## Getting it done in VirtualLab Fusion:

- Add Irradiance detector to your system.



# Document Information

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| Required packages | - |
| Software version | 2025.2 (Build 1.118)* |
| Category | Use Case |
| Further reading | - Focusing of Femtosecond Pulse by Using a High-NA Off-Axis Parabolic Mirror<br>- Collimation of Astigmatic Diode Laser Beam by Objective Lens |

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

# Marketing Picture