

# **How to integrate a Diffractive Axicon Lens into an optical system in ZEMAX**

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## 1. Preliminary reading

- HOLO/OR's application note for Axicon Lens:  
<https://www.holor.com.il/application/diffractive-axicon-application-notes/>
- ZEMAX manual for Radial Grating surface

## 2. Design example based on DA-039-I-Y-A

### 2.1. Specifications table

#### INPUT PARAMETERS

Wavelength [nm]: **1064**  
 Minimum Beam Diameter [mm]: **0.36**  
 Beam Mode (SM/MM): **SM or MM**

#### ELEMENT PARAMETERS

Element Type: **Window**  
 Material: **Fused Silica**  
 Element Size [mm]: **25.4**  
 Clear Aperture [mm]: **22.9**  
 Thickness [mm]: **3**  
 Coating: **AR/AR coating**

#### OUTPUT PARAMETERS

Ring Angle P2P [deg]: **1.02**  
 Axicon Type: **Negative**  
 Transmission efficiency: **Close to 100%**  
 Overall Efficiency: **~ 95%**  
 Zero-Order relative to the incident beam [%]: **<1**

### 2.2. Modeling of Axicon Lens in Sequential mode by steps

- Input the general parameters of the simulation – aperture size, and wavelength
- Input a Radial Grating surface and set the following parameters:
  - Define **Diffraction Order** (Par 0) value -1 for positive Axicon and +1 for negative Axicon
  - Set 1 in **Maximum Term #** (Par 13)
  - Calculate period size of Axicon using HOLO/OR [calculator for Beam Splitter](#) by setting the Full angle in the calculator to be the Axicon Ring Angle, and Number of spots in the calculator to be 2.
  - Set period size in um in **Coeff. on p^0** (Par 15). For example: period of 120um:

**BEAM SPLITTER CALCULATOR**

Full angle  $\theta_f$ : 1.016 deg

Effective Focal Length (EFL): 100 mm

Number of spots<sup>\*\*</sup>: 2

Wavelength: 1064 nm

**RESULTS**

Minimum beam diameter: 0.4 mm

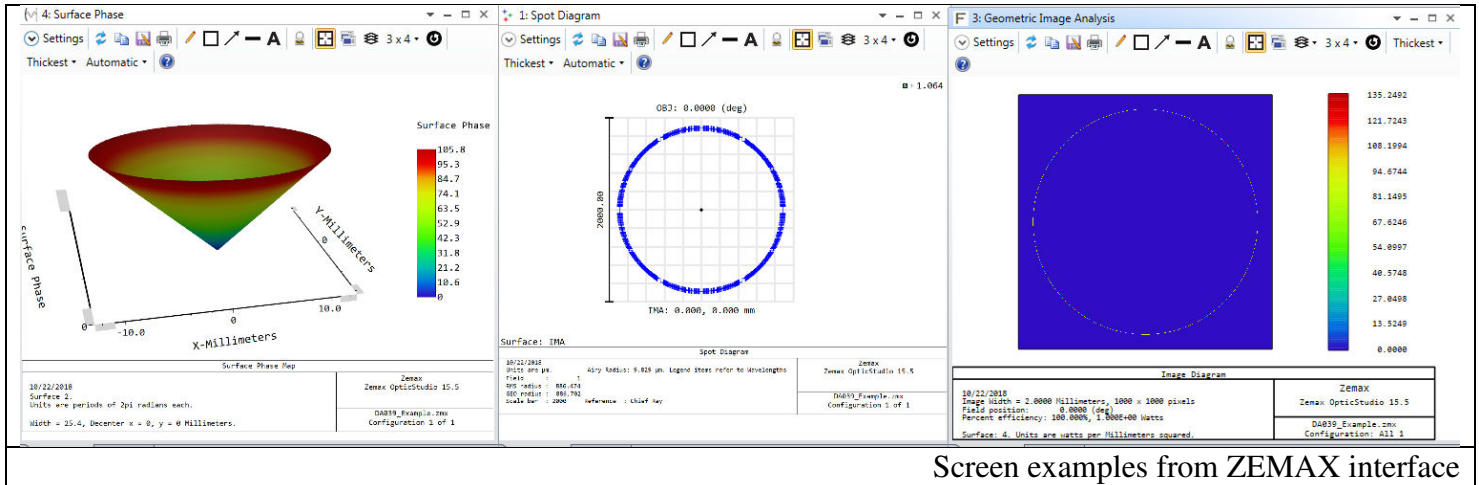
Period: 120.007 um

	Surface Type	Diffract Order	Maximum Te	Norm Radius	Coeff. on p <sup>0</sup>
0	OBJECT Standard				
1	Radial Grating	1.000	1	100.000	120.000

Period calculation example
Parameters for Radial Grating Surface

### 3. Analysis methods

The analysis can be made by standard analysis tools for example Surface Phase, Spot Diagram, and Geometric Image Analysis.



### 4. Summary:

We show a method to model Diffractive Axicon Lenses in ZEMAX sequential mode

### 5. Examples file for download:

[Example DA039](#)