

Auto Importance Sampling

Requirements

Models: Lens_DoubleGauss.oml

Properties: None

Editions: TracePro Standard or Expert

Introduction

Importance sampling is defined for surfaces to improve the performance of the raytrace. Each surface may have zero or more importance sampling targets, causing one or more rays to be traced into the solid angle defined by each importance sampling target. For stray light analyses of complex optical imaging systems, defining importance sampling targets manually can be a chore. TracePro provides a feature for you to do this automatically, using the **Define | Auto Importance Sampling** selection. When you use this feature, TracePro will define an annular or rectangular importance sampling target for each surface in the prescription. Before you automatically set up targets, you must first define the model's Prescription. Use the **Prescription** tab of the **Define | Apply Properties** dialog box to do this.

TracePro needs three or four rays to determine the location and size of importance sampling targets. A gut ray, marginal ray, and one or two chief rays are needed. Within TracePro, they are defined as follows:

- Gut Ray – a ray passing through the center of the aperture stop and the center of the field of view.
- Marginal Ray – a ray passing through the edge of the aperture stop and the center of the field of view.
- Chief Ray – a ray passing through the center of the aperture stop and the edge of the field of view.

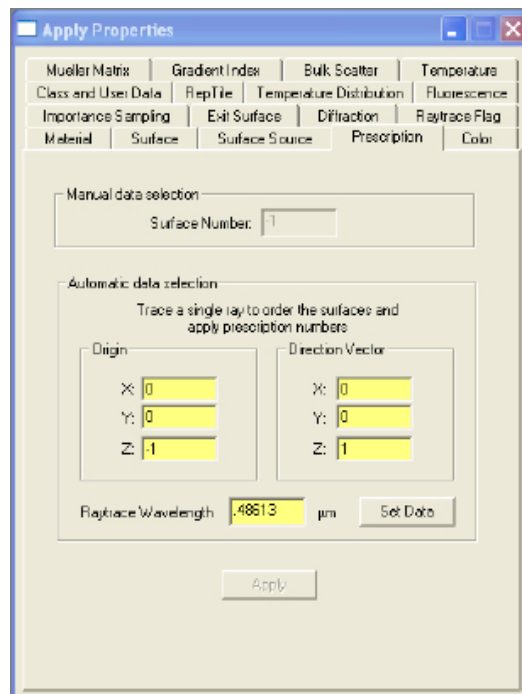
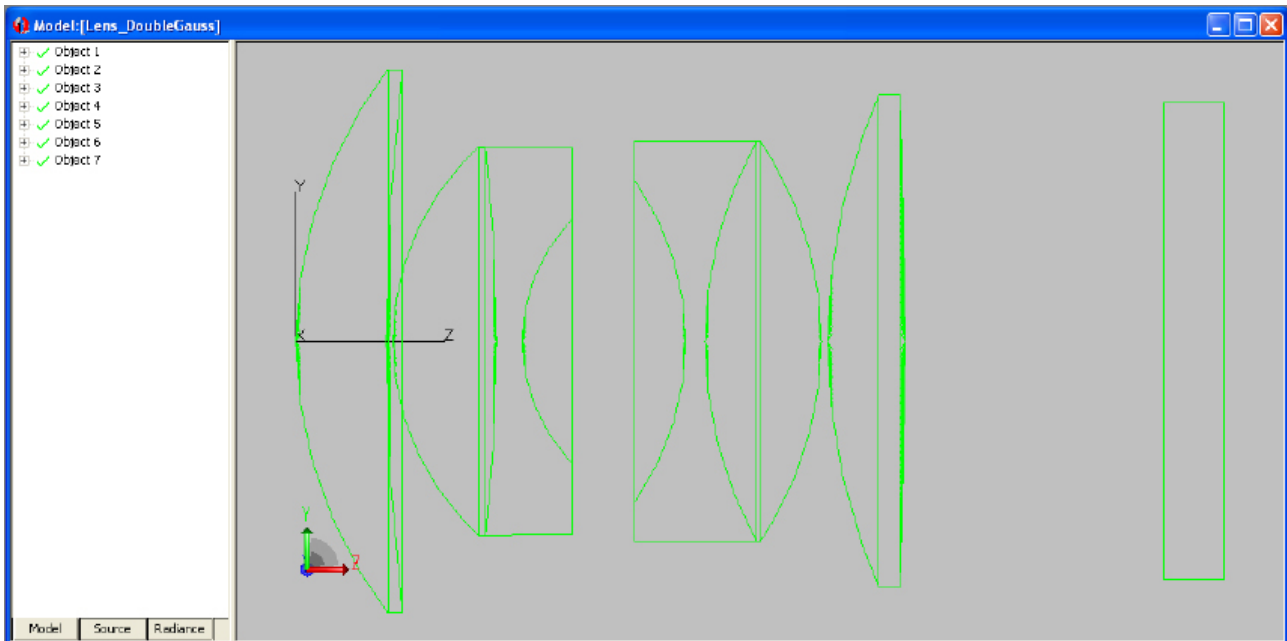
You may find it helpful to use a lens design program to determine the starting positions and directions of these rays. Two chief rays are needed to define rectangular or annular targets.

This tutorial illustrates the steps required to use Auto Importance Sampling.

For a detailed explanation, please see the technical reference section of the TracePro User's Manual.

Double Gauss - Define Prescription

1. Open the Lens_DoubleGauss.OML model file.
2. Define the Prescription using the Set Data feature
 - Select **Define | Apply Properties** dialog box
 - Then the **Prescription** tab
3. Enter the data as shown below and click the Set Data button.
 - The origin is changed so the ray starts to the left of the first lens
4. TracePro will trace a ray through the lens and assign a prescription number to each surface it intersects in sequence.
5. The image surface must absorb the ray completely.



Verify Prescription

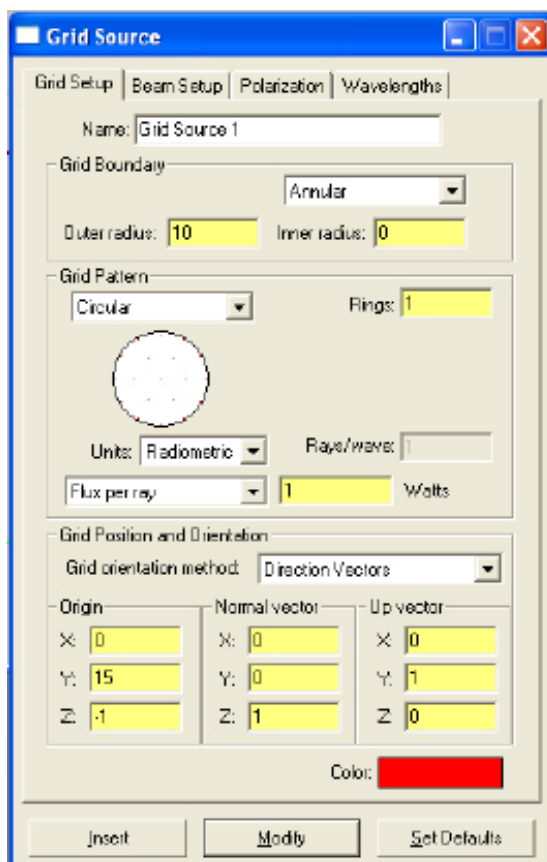
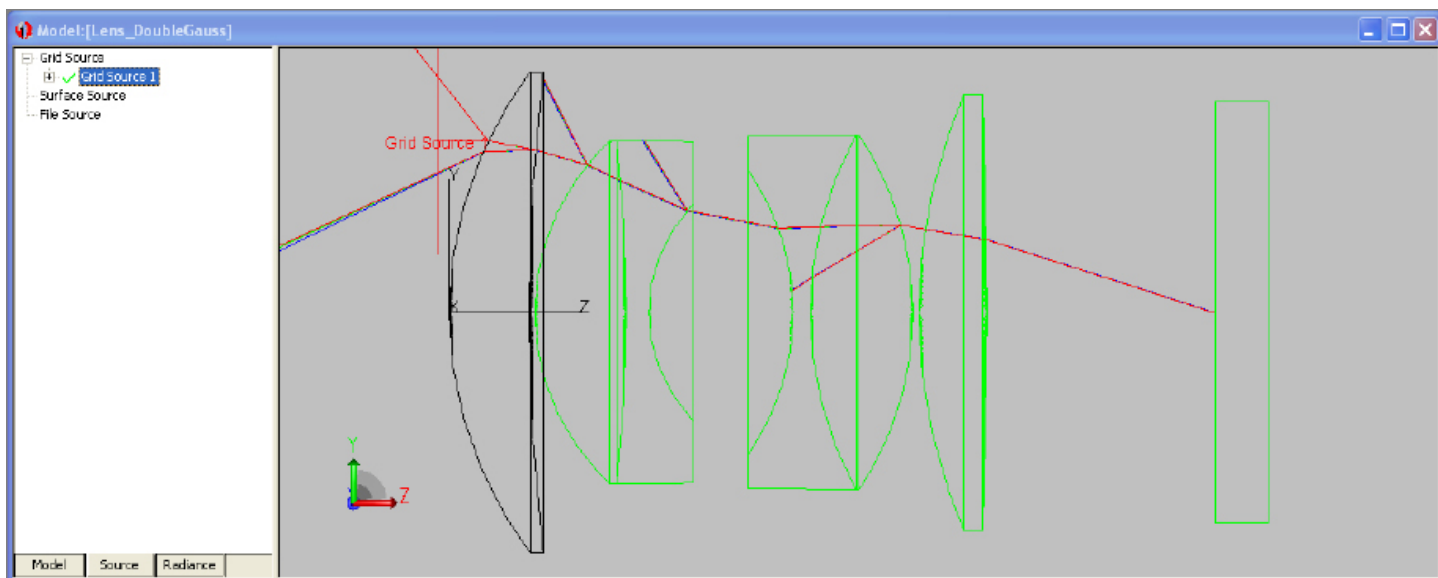
1. Examine the System Tree to verify prescription numbers.
2. Cemented groups have two coincident surfaces at each cemented interface.
3. You can also use the Property Report (**Reports | Property Data**) to view the Prescription information

The screenshot displays the TracePro Expert interface. The main window shows a 3D model of a lens system with five surfaces. The System Tree on the left lists the surfaces and their properties. The Property Report window at the bottom provides a detailed table of the lens elements.

Object Name	Type	Material Catalog	Material Property	Fluorescence Catalog/Property	Importance	Bulk Scatter	Trace	Mueller	Data	Temperature	Class Name	User Data	GRIN
Surface Name	Type	Surface Catalog	Surface Property	Source	Importance	Prescription	Ext.	Diffraction		Temperature			RepFile
Object 1	Lens	SCHOTT	BAF51						OSLO				
Surface 0		Default	<None>			Number 2							
Surface 1		Default	<None>			Number 1							
Surface 2		Default	<None>										
Object 2	Lens	SCHOTT	LAK7						OSLO				
Surface 0		Default	<None>			Number 4							
Surface 1		Default	<None>										
Surface 2		Default	<None>			Number 3							
Object 3		SCHOTT	SP1						OSLO				
Surface 0		Default	<None>										
Surface 1		Default	<None>			Number 6							
Surface 2		Default	<None>										
Surface 3		Default	<None>			Number 5							

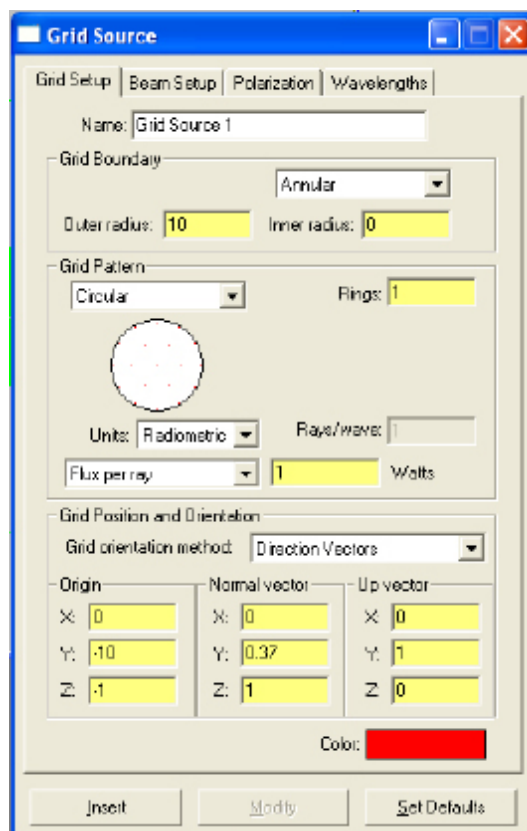
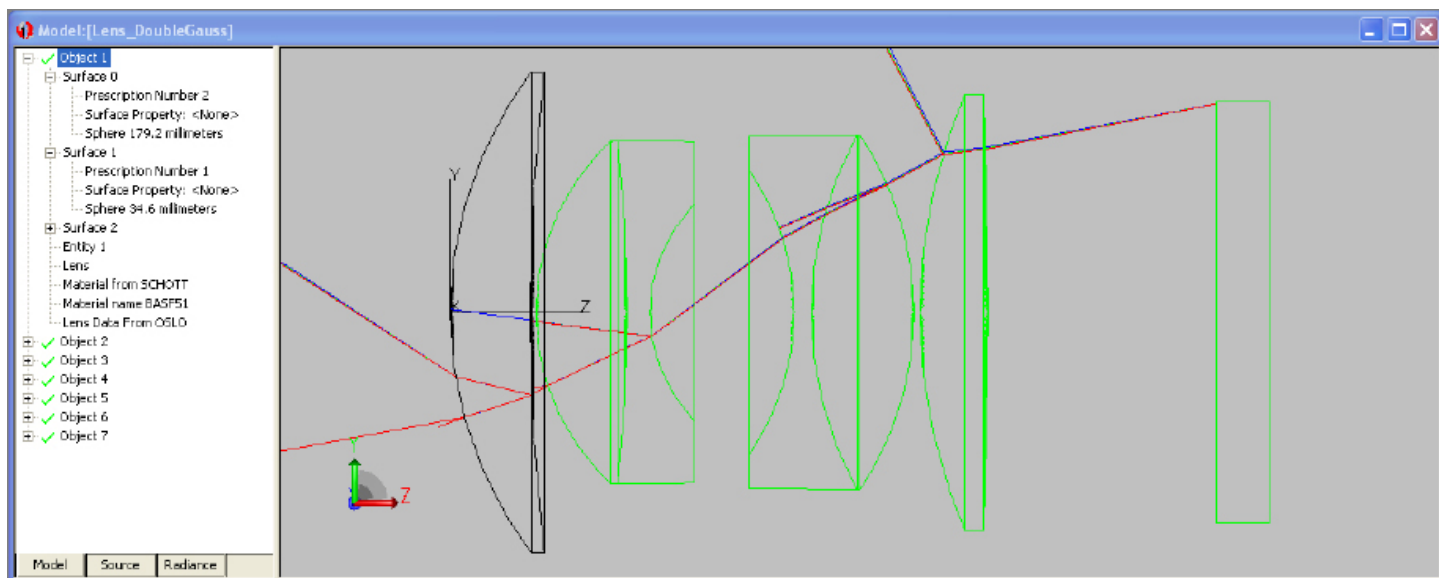
Marginal Ray

1. Empirically locate the origin of a marginal ray by tracing rays using **Define | Grid Source**.
2. The Y position of the origin may be set to the Entrance Beam Size of the lens.
3. Note ray parameters - you must later enter them in the Auto Importance Sampling dialog box.



Chief Ray

1. Empirically determine the origin and direction of the chief ray.
2. In this example, we have assumed that the stop is in the center of the lens, $z = 20.4$.
3. The chief ray will intersect the center of the stop at the optical axis and intersect the edge of the image.



Auto Importance Sampling Dialog

1. Select **Define|Auto Importance Sampling** from the TracePro Menu, and enter the marginal, chief and gut ray data into the **Auto Importance Sampling** dialog.
2. The Gut Ray defines the optical axis. The Inner and Outer rays are chief rays to define the inside and outside of the annual target. Setting the Inner ray to zeros defines a circular region.
3. Enter the values as shown and press OK. TracePro traces rays and calculates locations, sizes, and senses of targets.

	Gut Ray	Marginal Ray	Outer Ray	Inner Ray
Target Shape	<input checked="" type="radio"/> Annular <input type="radio"/> Rectangular			
X position	0	0	0	0
Y position	0	15	-10	0
Z position	-1	-1	-1	0
X direction	0	0	0	0
Y direction	0	0	0.37	0
Z direction	1	1	1	1
Raytrace Wavelength	48613 μm			
Buttons	OK	Cancel	Save	

Verify Target Definitions

1. The new importance targets will be visible in the System Tree and the Property Report.
2. Select **Define | Apply Properties**, and then the **Importance Sampling** tab for details of each target.
3. The targets may also be viewed in the Model Window using the **View | Display Importance** menu. (The target origin is indicated by the IT label)

