

Lightpipe Tutorial

This is a general tutorial for users of TracePro LC, TracePro and TracePro Expert.



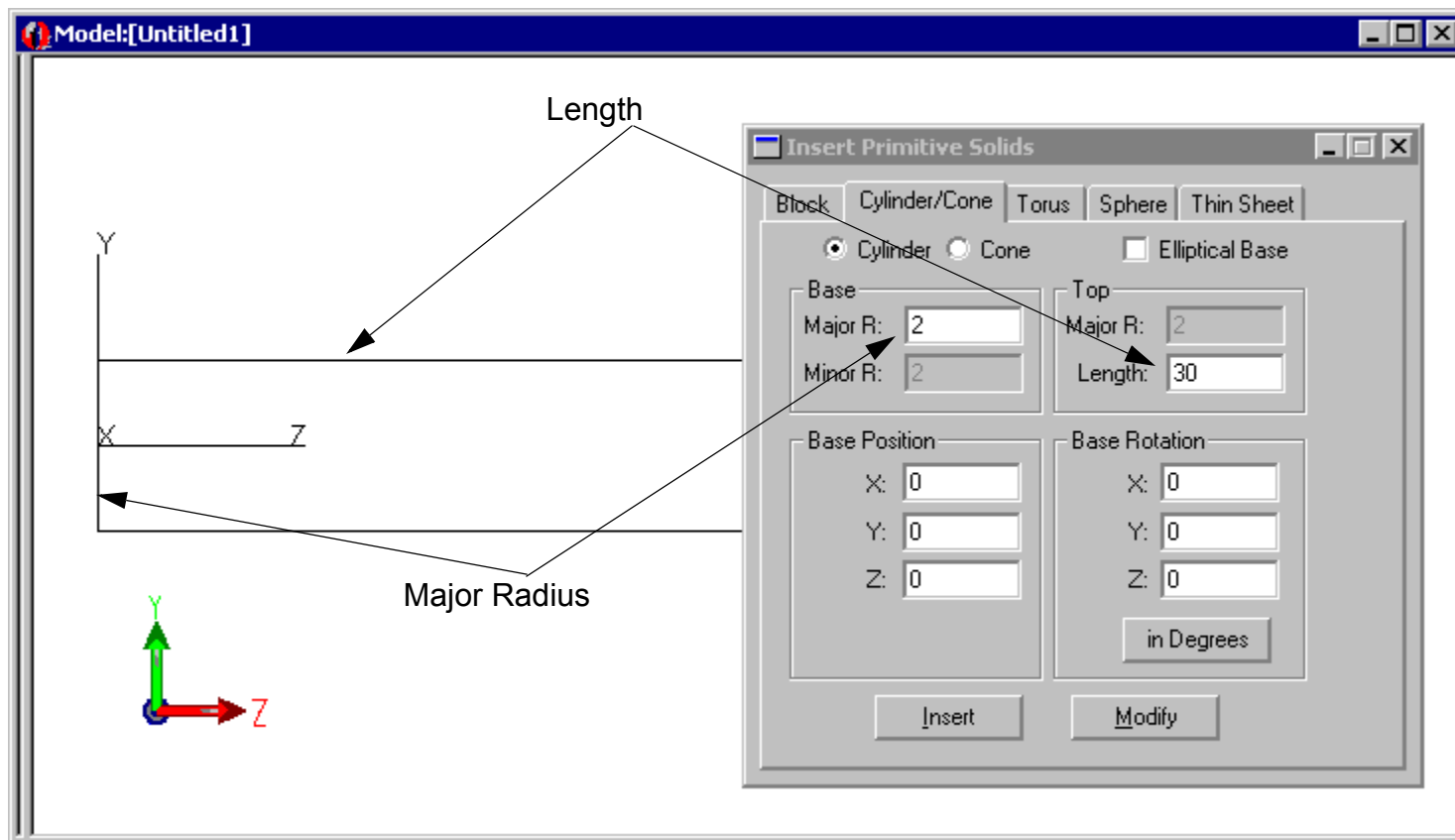
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This example demonstrates the creation and analysis of a lightpipe in TracePro.

Start by creating a cylinder in TracePro



1. Start TracePro and open a new model with **File|New**.
2. Open the **Insert|Primitive solid** dialog and select the **cyLinder/Cone** tab.
3. Enter a **Major R**(adius) of 2, a **Length** of 3 and press the **Insert** Button.
4. Press the Zoom All button or select the **view|zoom|A11** menu to see the new object.



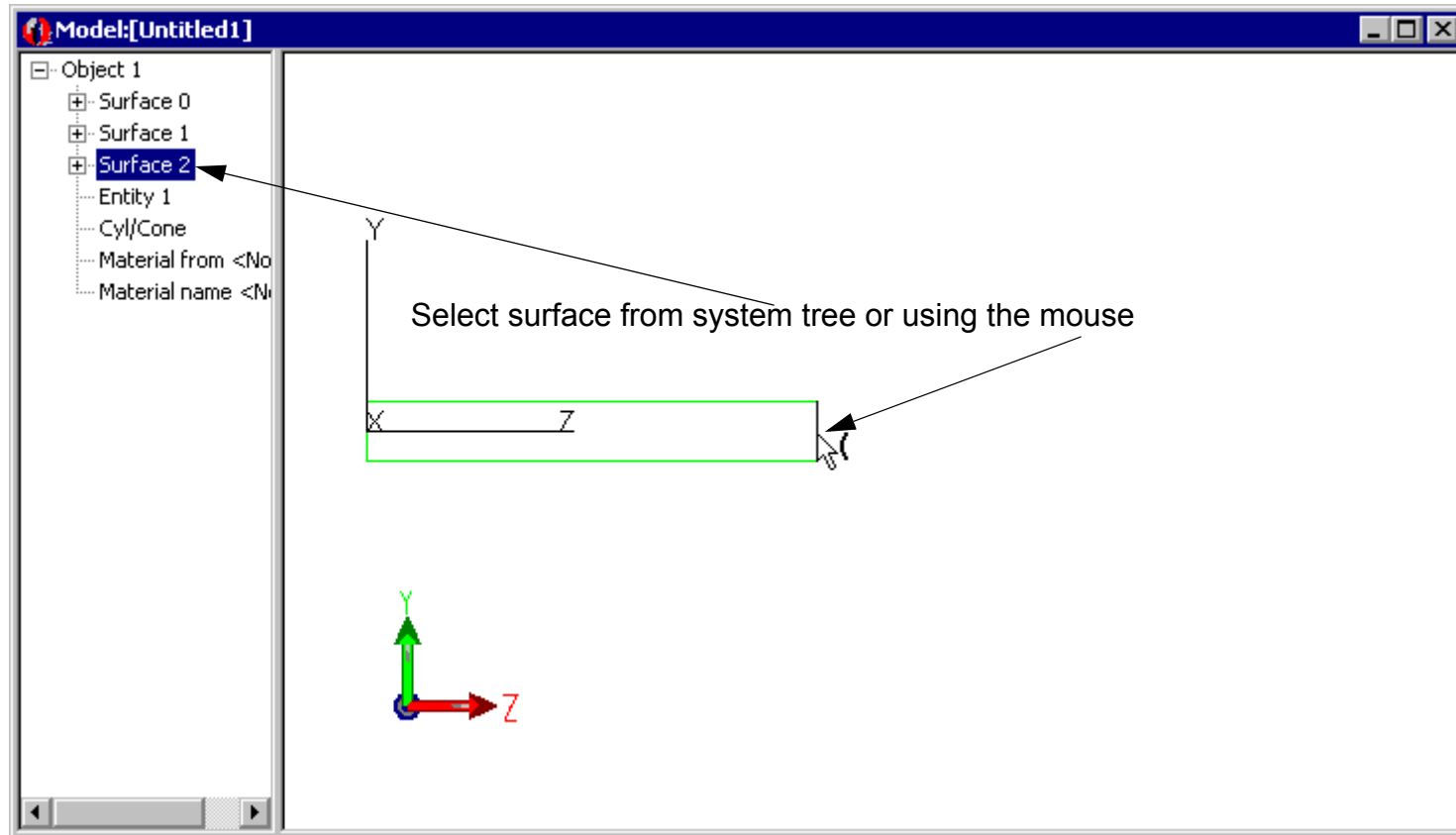
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Selecting a Surface

TracePro uses surface and object selections for many operations.



1. Select the right end of the rod using the **Edit|Select|Surface** menu (or Select Surface tool), use the mouse to “pick” the rod end. You may want to use the system tree by opening the system tree with **window|Split** and selecting the surface.

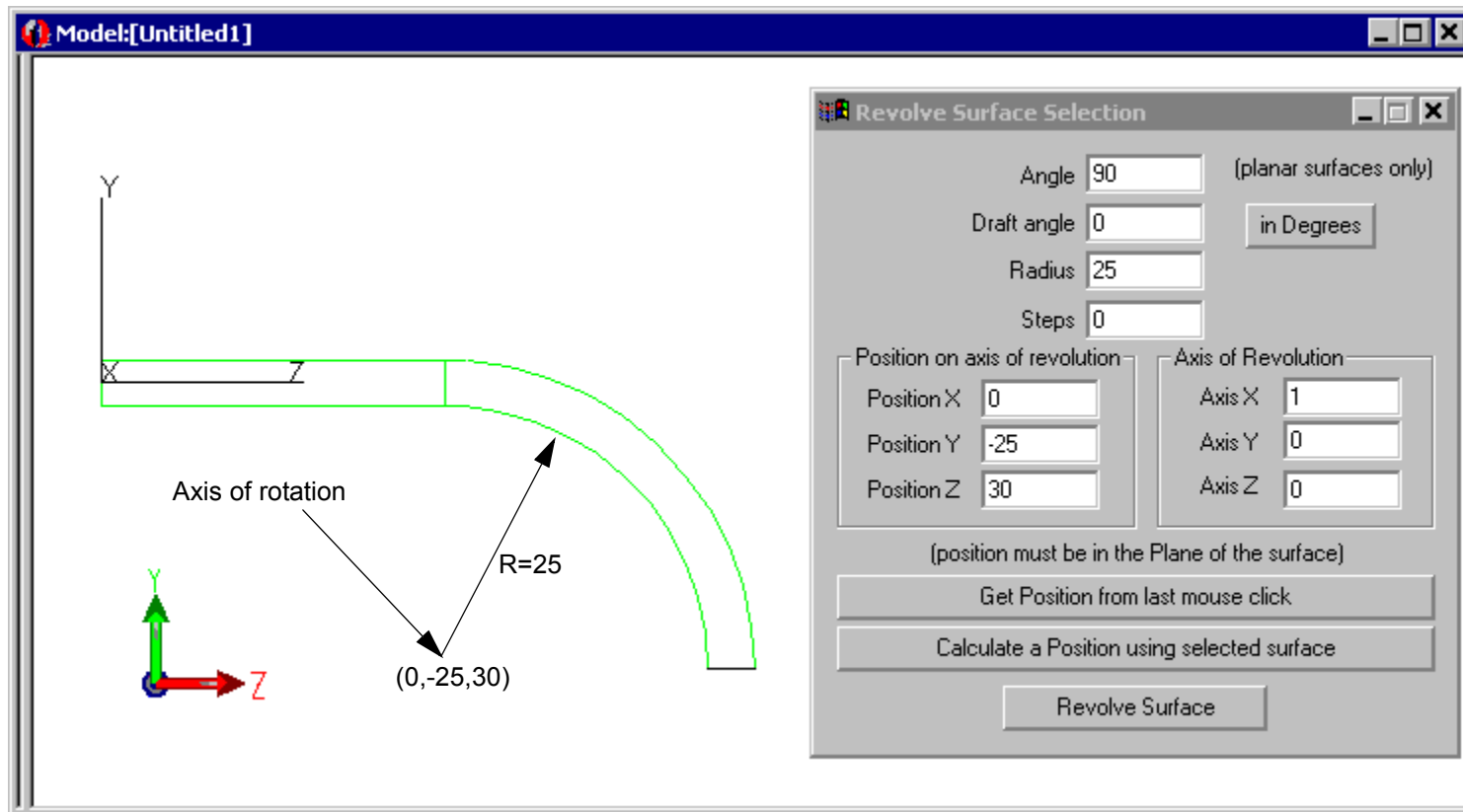


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Add a Bend

Add a bend to the selected surface by revolving the face along an arc.

1. Select **Edit | Surface | Revolve** to open the Revolve Surface Selection
2. Enter 90 for the **Angle** and 25 for the bend **Radius**.
3. The surface will be “swept” or “revolved about an axis defined by a position in space and a vector. Locate the Axis at the point (0,-25, 30) and define the axis to be pointing along the X axis in model space.
4. Press the Revolve Surface button to perform the bend.

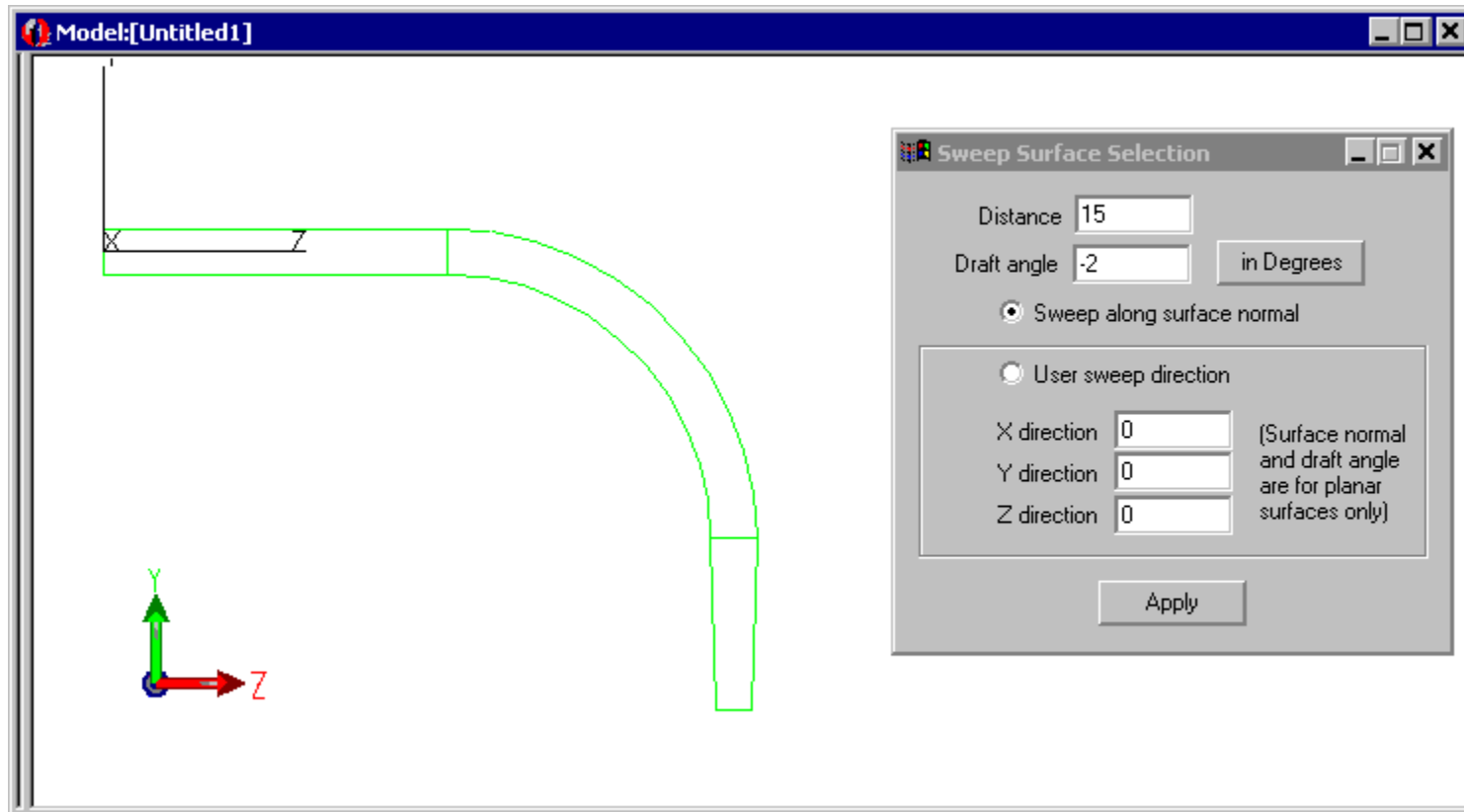


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Add a taper

You can sweep the surface with a taper to finish the lightpipe.

1. Open the Sweep Surface Selection dialog with **Edit | Surface | Sweep**.
2. Enter a sweep length of 15 in the Distance box and a draft angle of -2 degrees. The surface will taper in by 2 degrees as it is swept along its distance.

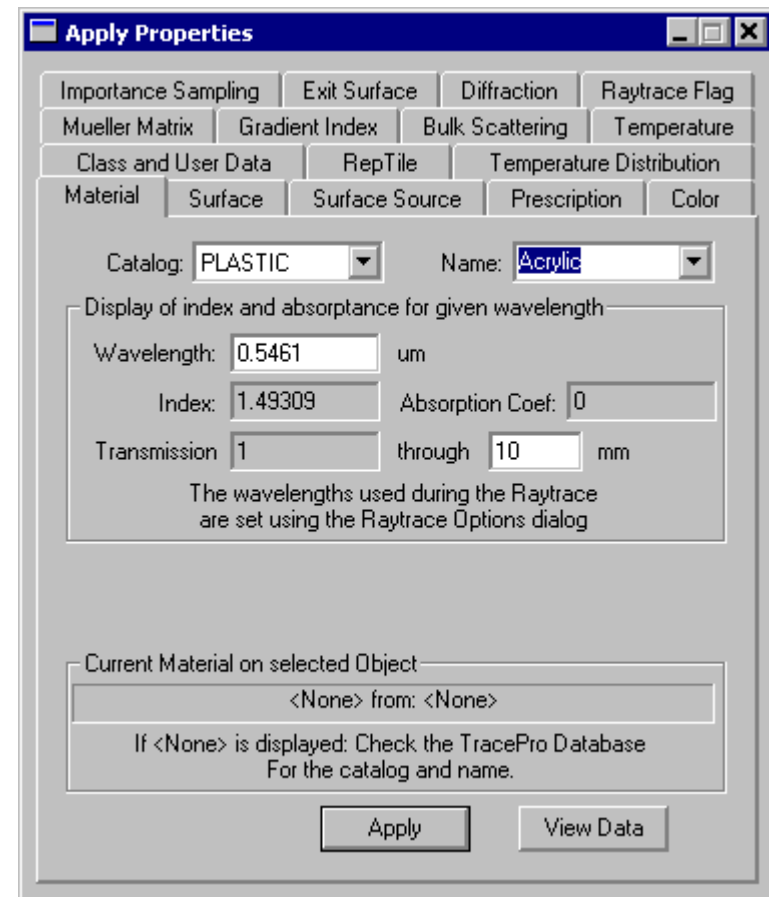
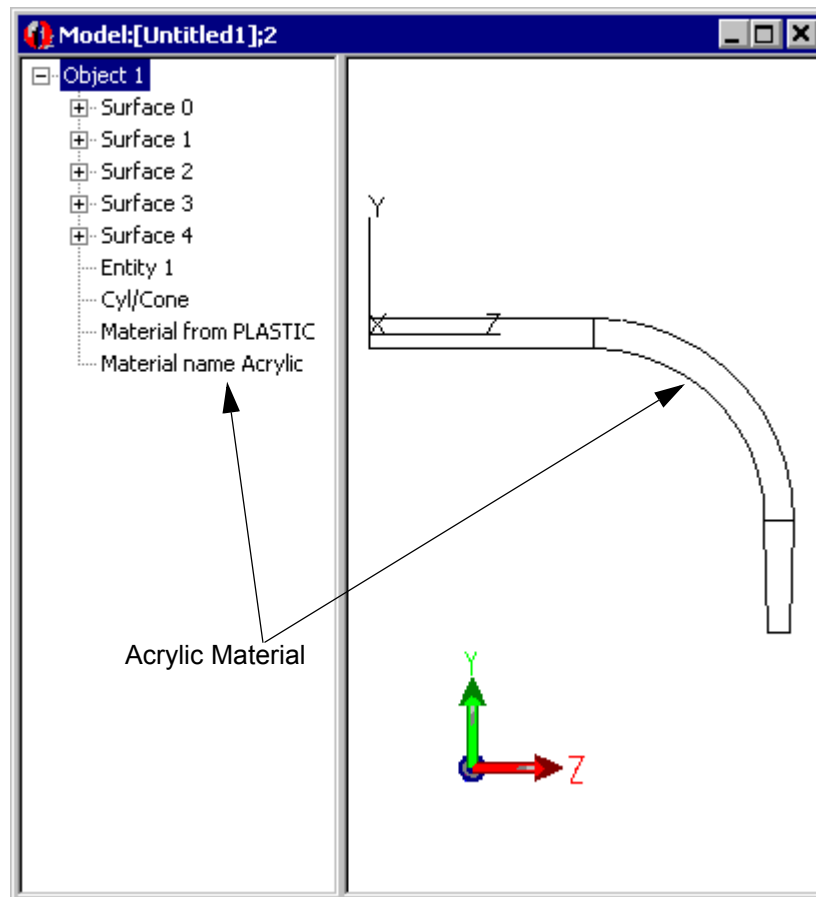


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Apply a Material Property

TracePro uses properties to “make the model optical”. Material properties are define the bulk or volume data for an object, in this case the index of refraction.

1. Select the lightpipe using the **Edit|Select|Object** menu (or press the Select Object button) and click on the lightpipe with the mouse.
2. Open the Apply Properties Dialog with **Define|Apply Properties**
3. Select the Plastic Catalog, select Acrylic and press the Apply button. You can see the Material property Name by expanding Object 1 in the System Tree.

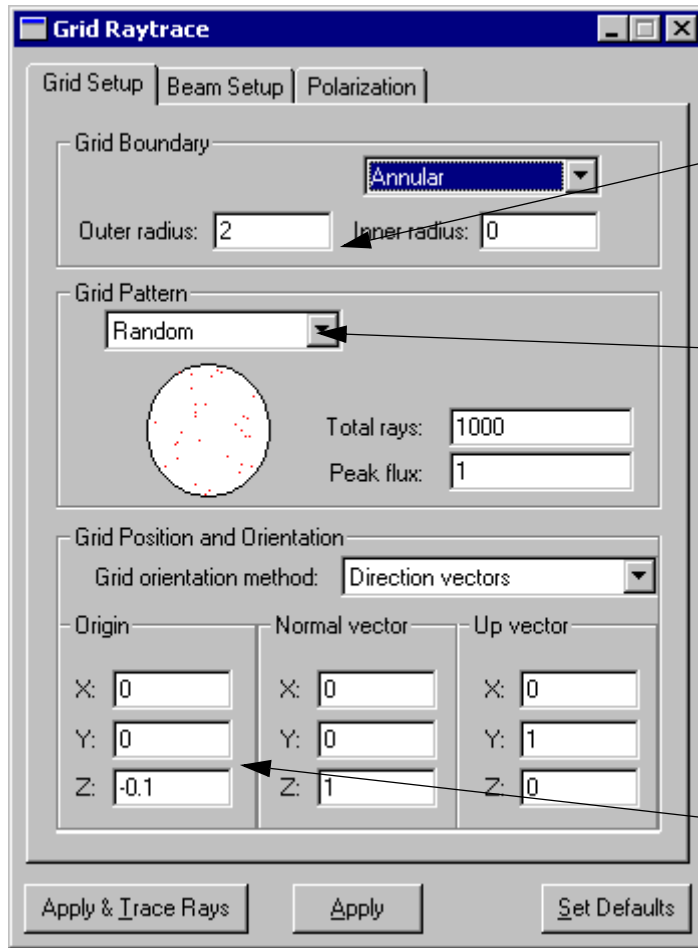


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Setup a Grid of Rays

Now you have an optical model ready for raytracing. This step will set up a gaussian beam in for a Grid Raytrace.

1. Open the Grid Raytrace dialog with **Analysis|Grid Raytrace**.
2. Update the Grid Setup tab so the **Outer radius** is 2, the **Grid Pattern** is Random and the **Total rays** is set to 1000. You define the location of the grid with the **Origin** which should be set to (0,0,-0.1) as shown on the left.
3. Modify the Beam Setup tab to have an **Angular profile** of Gaussian with 30 degree **Half angles** as shown on the right.

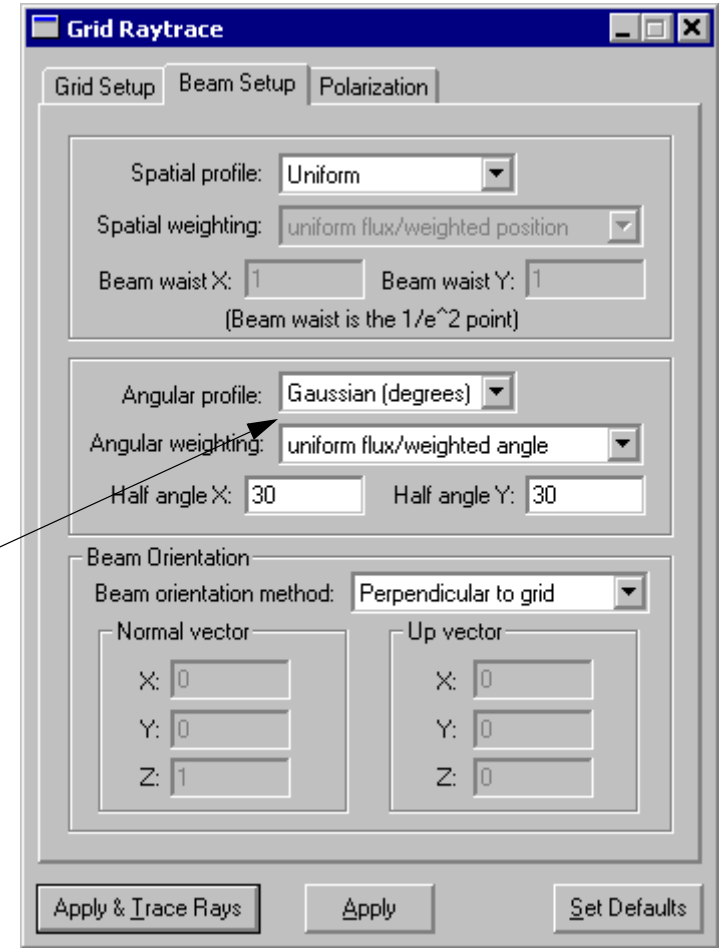


Size of Grid

Ray Pattern

Angular Profile

Grid location and orientation

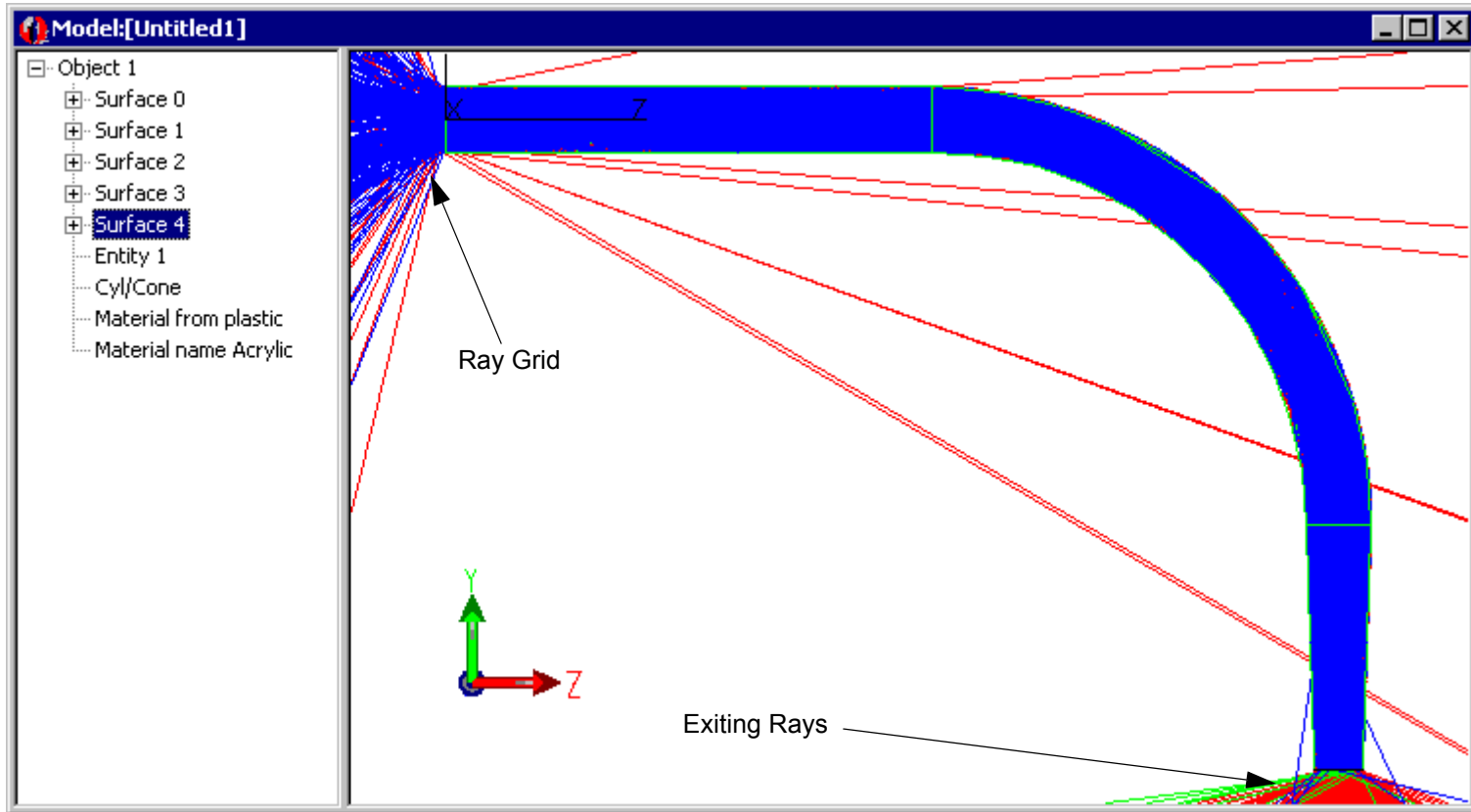


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Trace the Rays

Press the Apply & Trace Rays button in the Grid Raytrace dialog to perform the raytrace. TracePro starts by performing an Audit which updates the model with property information from the database. The output is shown below.

You can turn off the rays using the **Analysis|Display Rays** menu or try **Analysis|Ray Sorting** to reduce the number of ray drawn.



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Setting Irradiance Map Options

The next step is to set the Irradiance Map Options. The options may be set at any time to modify the display of the Irradiance Plot.

1. Open the Options Dialog with the **Analysis | Irradiance/Illuminance options** menu, update the options as shown and press Apply

The screenshot shows the 'Irradiance Options' dialog box with several annotations pointing to specific settings:

- Select Incident Rays:** Points to the 'Rays to plot' dropdown menu, which is set to 'Incident'.
- Normalize Flux:** Points to the 'Normalize to emitted flux' checkbox, which is checked.
- Enable Smoothing:** Points to the 'Smoothing' checkbox, which is checked.
- Reduce the Map Count to 20:** Points to the 'Map Count' input field, which is set to '20'.
- Define the Plot's Orientation:** Points to the 'Orientation of plot plane' section, specifically the 'Normal Vector' fields (X: 0, Y: 1, Z: 0).
- Apply the changes to TracePro:** Points to the 'Apply' button at the bottom of the dialog.

The dialog box contains the following sections and options:

- Map Data:**
 - Quantities to plot: Irradiance
 - 1/2 angle for radiance: 10
 - Rays to plot: Incident
 - Normalize to emitted flux:
 - Set Max: 0
 - Set Min: 0
- Display Options:**
 - Smoothing:
 - Log Scale:
 - Map Count: 20
 - Contour Plot:
 - Relief Plot:
 - Resolution: 128x128
 - Local Coordinates:
 - Profiles:
 - Symmetry: None
 - Gradient Display:
 - Color Map: Grayscale on Black
 - Convert to foot-candles (fc):
 - Auto Update is ON
- Contour Levels:**
 - Auto. levels:
 - Use percent of Max. (1.0 = 100%):
 - Selection: []
 - Number: 15
- Orientation of plot plane:**
 - Automatically calculate Normal and Up Vectors:
 - Normal Vector: X: 0, Y: 1, Z: 0
 - Up Vector: X: 1, Y: 0, Z: 0

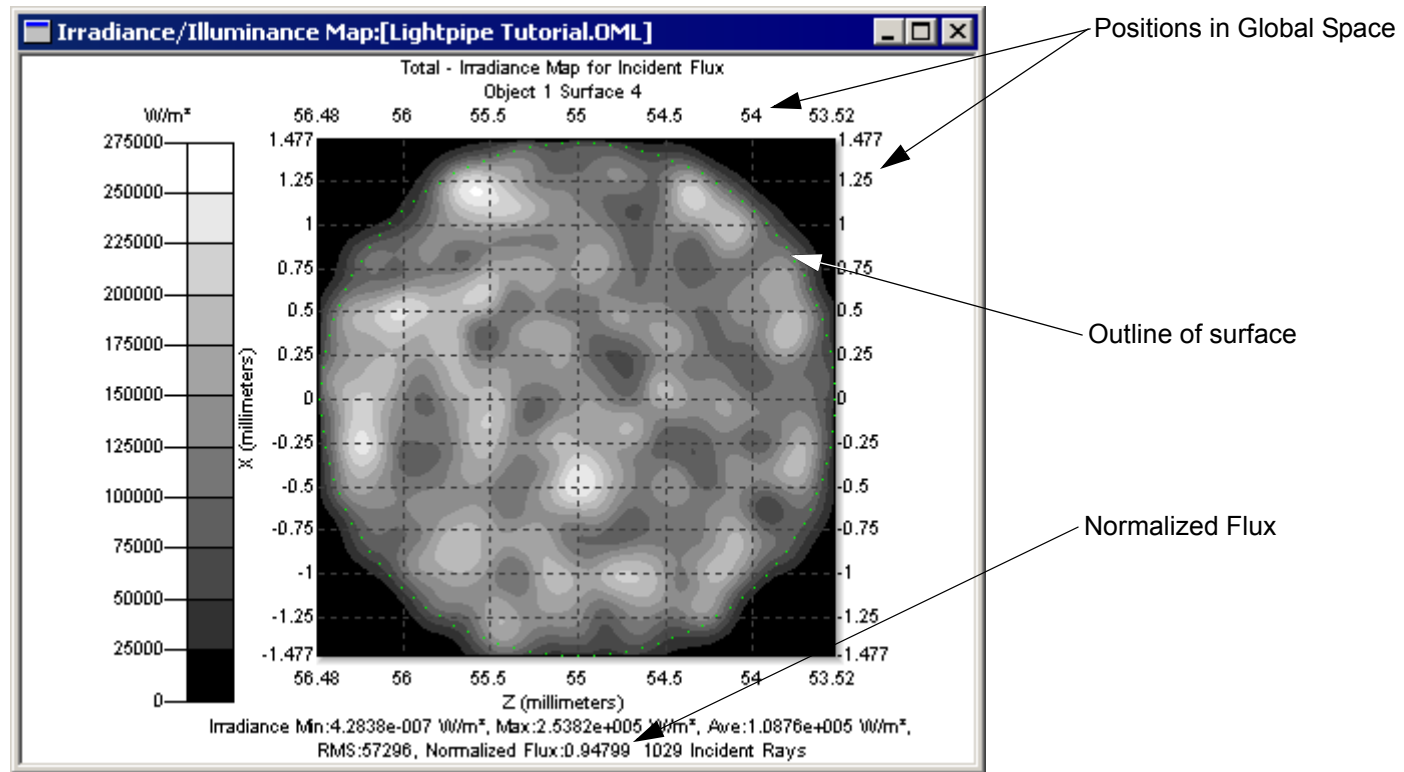
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Display the Irradiance Plot



With the end of the lightpipe selected you can display raytrace results. An irradiance map displays the flux per unit area over a surface.

1. Open an Irradiance Map window using the **Analysis|Irradiance/Illuminance Maps** menu or press the Irradiance Map button.
2. A summary of the plot is located on the bottom of the plot. The Normalized Flux displays the ratio of the Incident Light on the surface relative to the light emitted from the source, in this case the grid of rays.

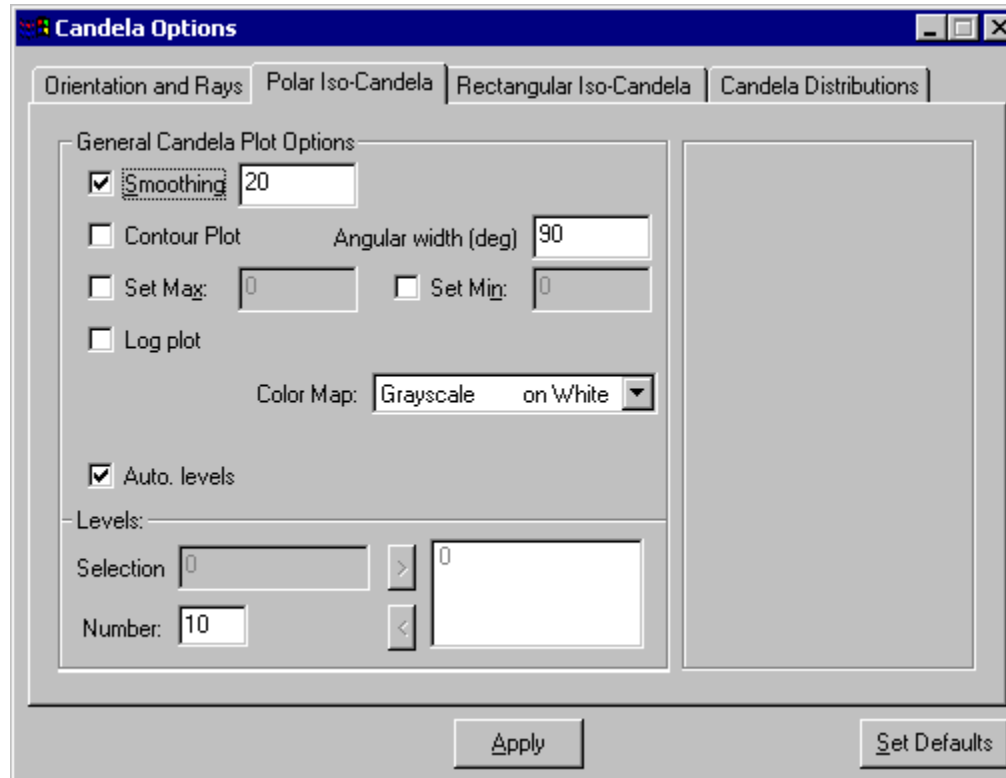


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Candela Options

The next step is to set the Candela Map Options. The options may be set at any time to modify the display of the Candela Plots.

1. Open the Options Dialog with the **Analysis | Candela options** menu, update the options as shown and press Apply



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Polar Iso-Candela Plots

Candela Plots provide information on the angular distribution of flux and are often based on “Missed Rays” in TracePro.



1. Open an Irradiance Map window using the **Analysis|Candela Plots|Polar Iso-Candela** menu or press the Polar Iso-Candela button.
2. A summary of the plot is located on the bottom of the plot.

