



Tips, Tricks, and Shortcuts to Improve Productivity and Efficiency with TracePro

Presented by :
Lambda Research Corporation
25 Porter Rd.
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www.lambdares.com





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Lambda Research Corporation

Format

- A 25-30 minute presentation followed by a question and answer session
- Please submit your questions anytime using Question box in the GoToWebinar control panel



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Webinar Topics:

- Using Simulation Mode : how, when, and why.
- Determining memory usage using the Windows Task Manager and the TracePro Raytrace Report
- Modifying multiple Surface Sources at one time using the Surface Source Editor
- Grouping and moving System Tree items for better organization
- Display options, shortcuts to move and orbit the model view

Webinar Topics:

- What is the “Detect Rays Starting in Bodies” setting and when you should use it
- Irradiance Map and Candela Plot tools to get more information out of your results
- Interactive Optimizer settings
- And many other topics.....
- Question and Answer session

Additional Resources

- Past TracePro Webinars

- <http://www.lambdares.com/webinars/>

- TracePro Tutorial Videos

- <http://www.lambdares.com/videos/>

- TracePro Tutorials

- http://www.lambdares.com/technical_support/tracepro/tutorials/

- TracePro Training Classes

- http://www.lambdares.com/technical_support/training/

Current TracePro Release

- TracePro 7.1.2
- TracePro 7.1.3 Early Access
- Can be downloaded by anyone with a current Maintenance and Support Agreement
- www.lambdares.com

Tips, Tricks, and Shortcuts to Improve Productivity and Efficiency with TracePro

The Simulation Mode Raytrace

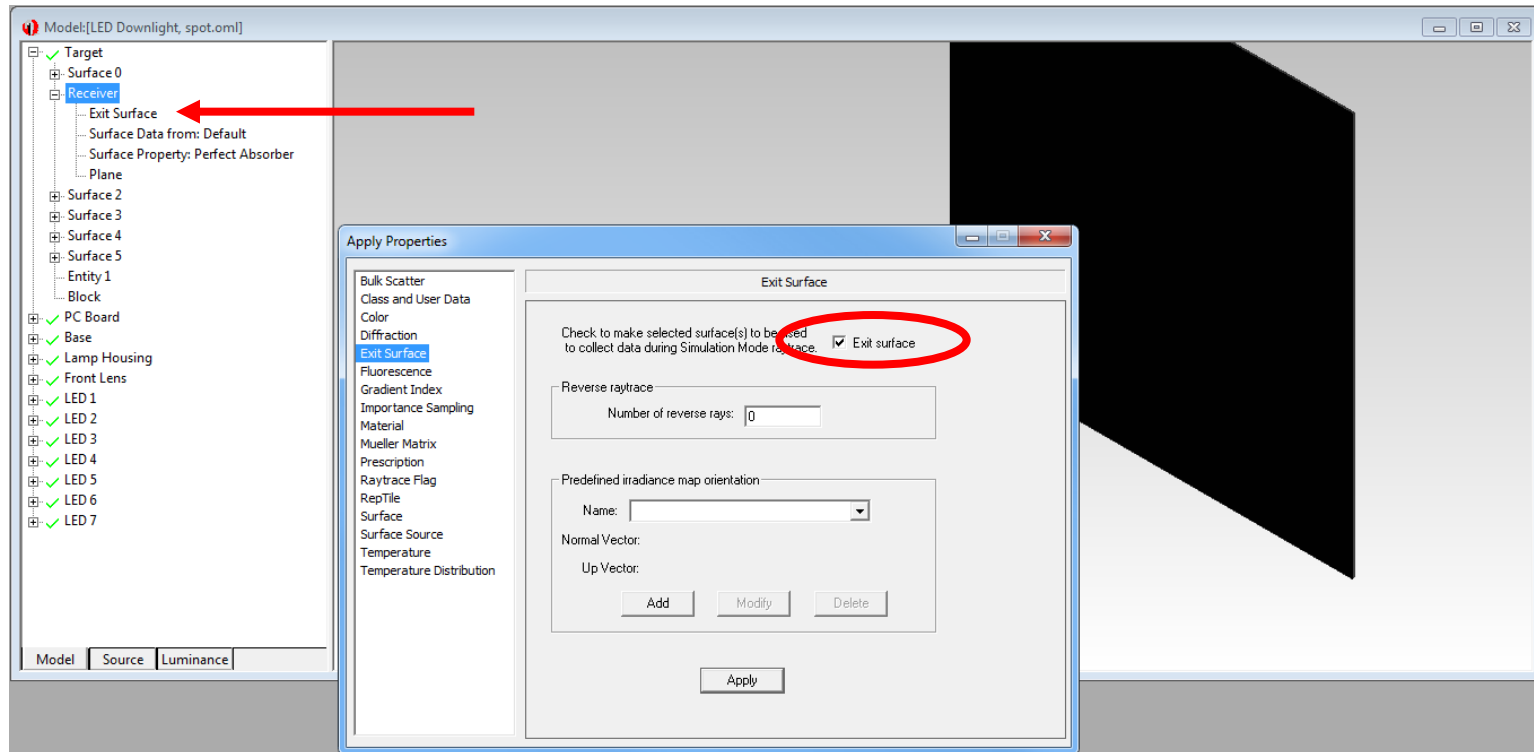
Analysis Mode

- The default raytrace mode in TracePro is Analysis Mode
 - Ray data is saved on every surface in the model, in RAM. This can use large amounts of memory, but it allows you to view plots such as Irradiance Maps, 3D Irradiance Maps, and Candela Plots on any surface at any time
 - 32-bit TracePro can only use up to 2GB of RAM, so it is easy to exceed the available amount of RAM with large or complex models and raytraces
 - 64-bit TracePro can use as much RAM as is available on your computer. This is better, but large raytraces may still exceed the available RAM.
- Simulation Mode is the solution

Simulation Mode

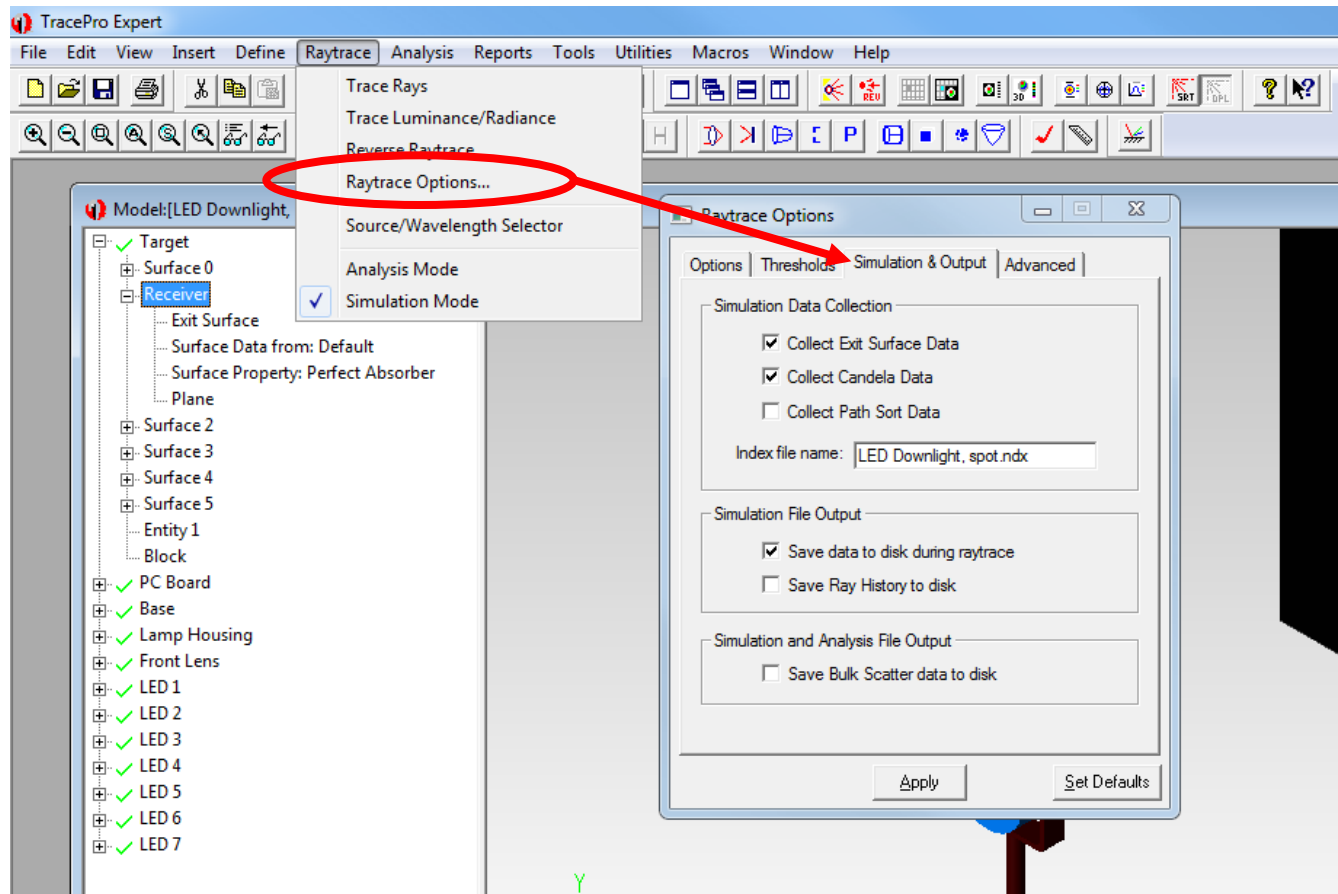
- Simulation Mode raytrace
 - Predefine Exit Surface or Surfaces where you want to save the ray data
 - User can also choose to save Candela and Ray Path data
 - Ray data is saved to the hard drive instead of RAM
 - Creates a .sim file in the same directory as the model
 - Rays are not shown

Simulation Mode



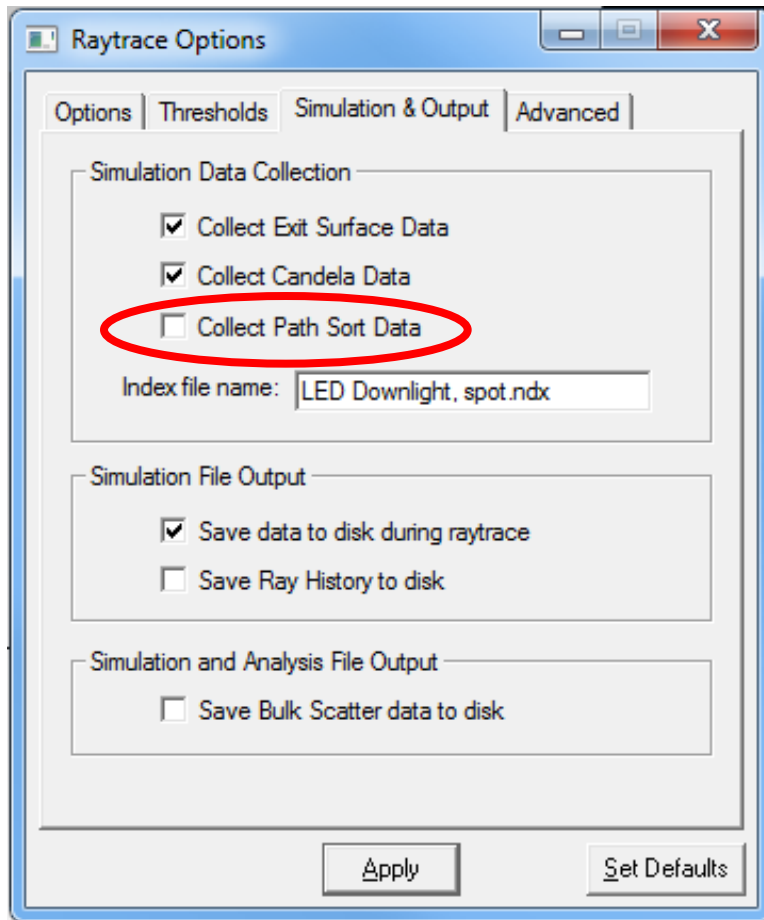
Defining an Exit Surface, or Exit Surfaces

Simulation Mode



Simulation Mode Options

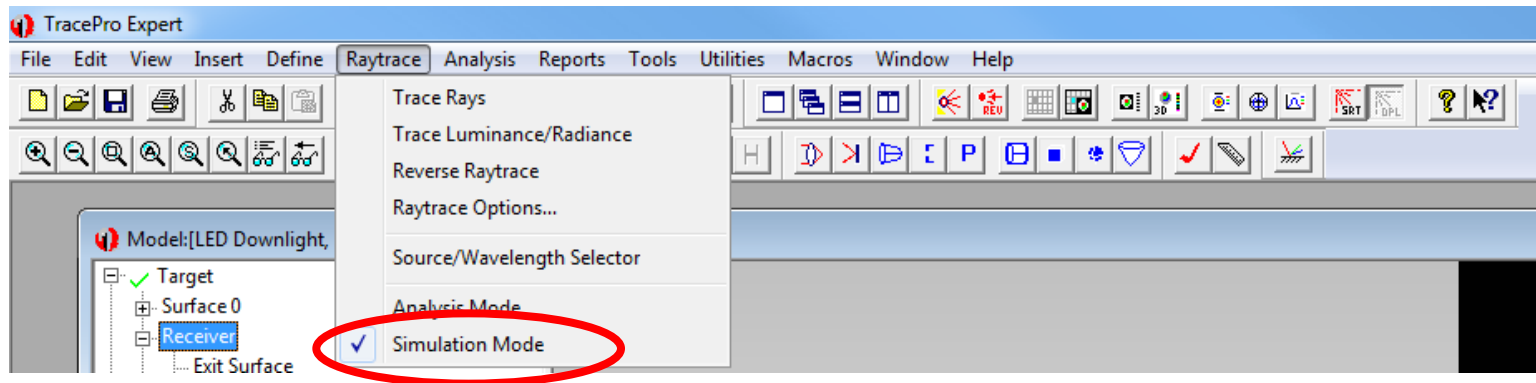
Simulation Mode



Checking “Collect Path Sort Data” can increase raytrace times. If you are not looking at Path Sort data, leave this unchecked. The default setting is unchecked in the newest releases of TracePro

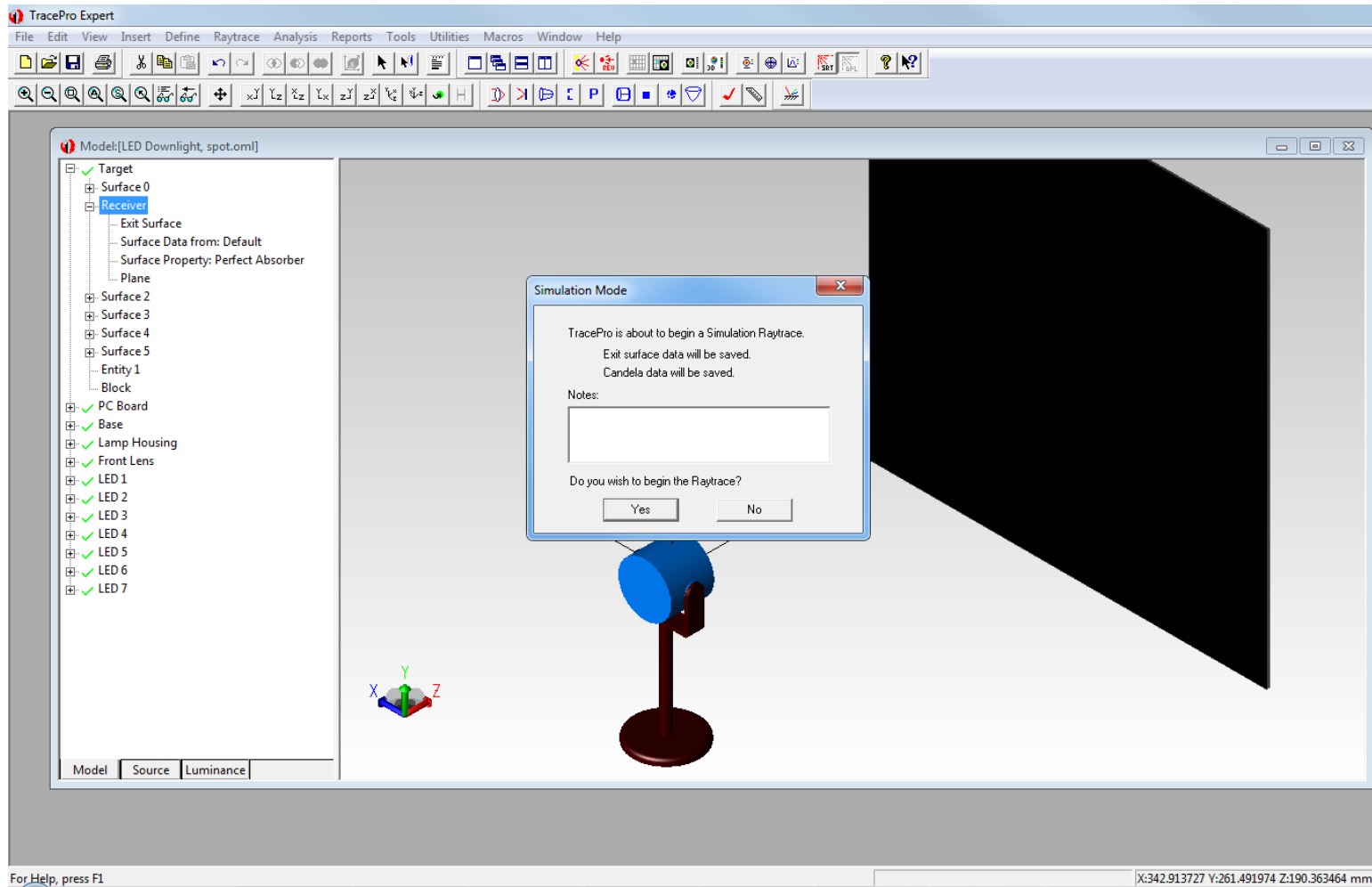
Simulation Mode Options

Simulation Mode



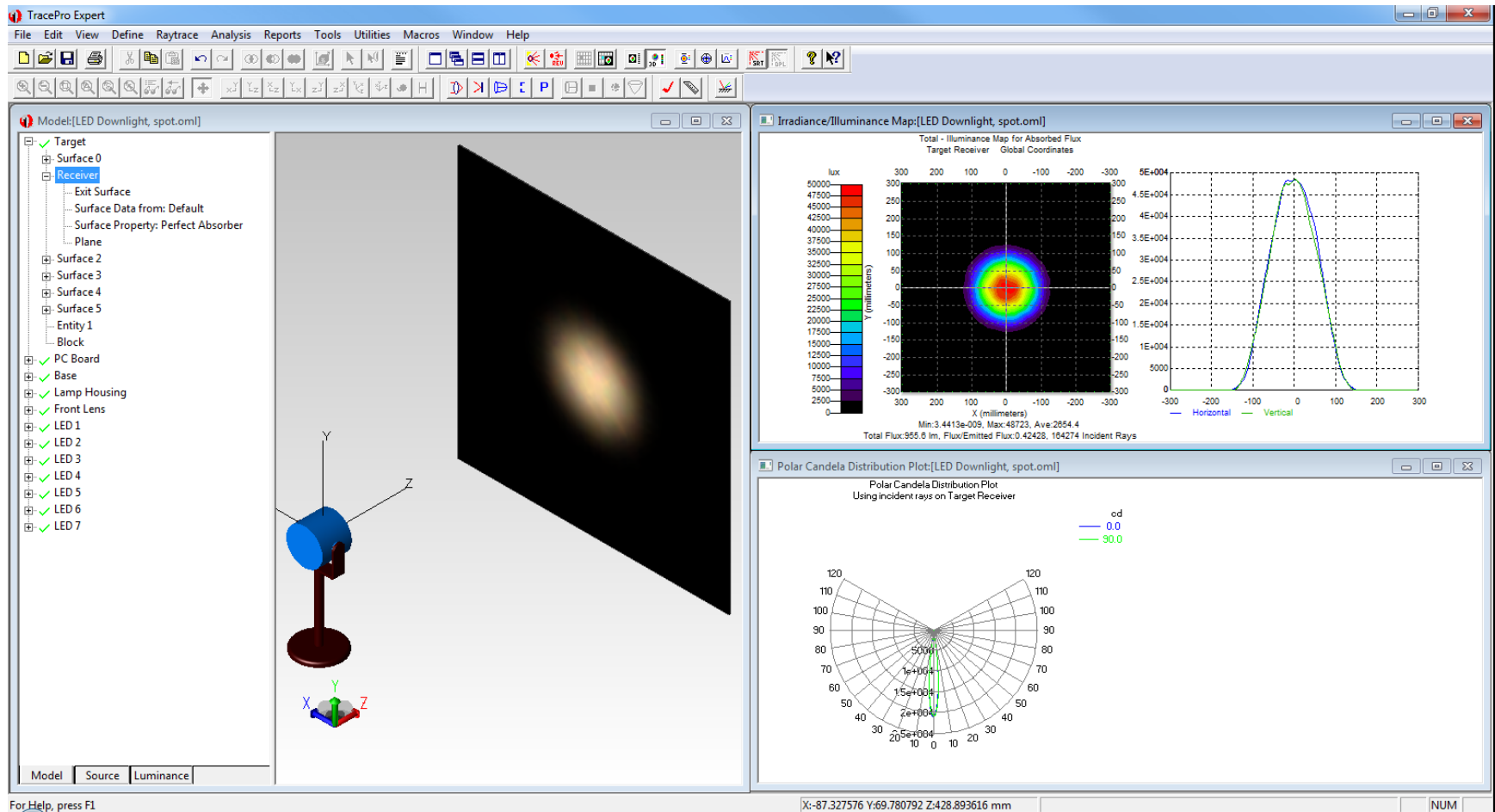
Switching to Simulation Mode

Simulation Mode



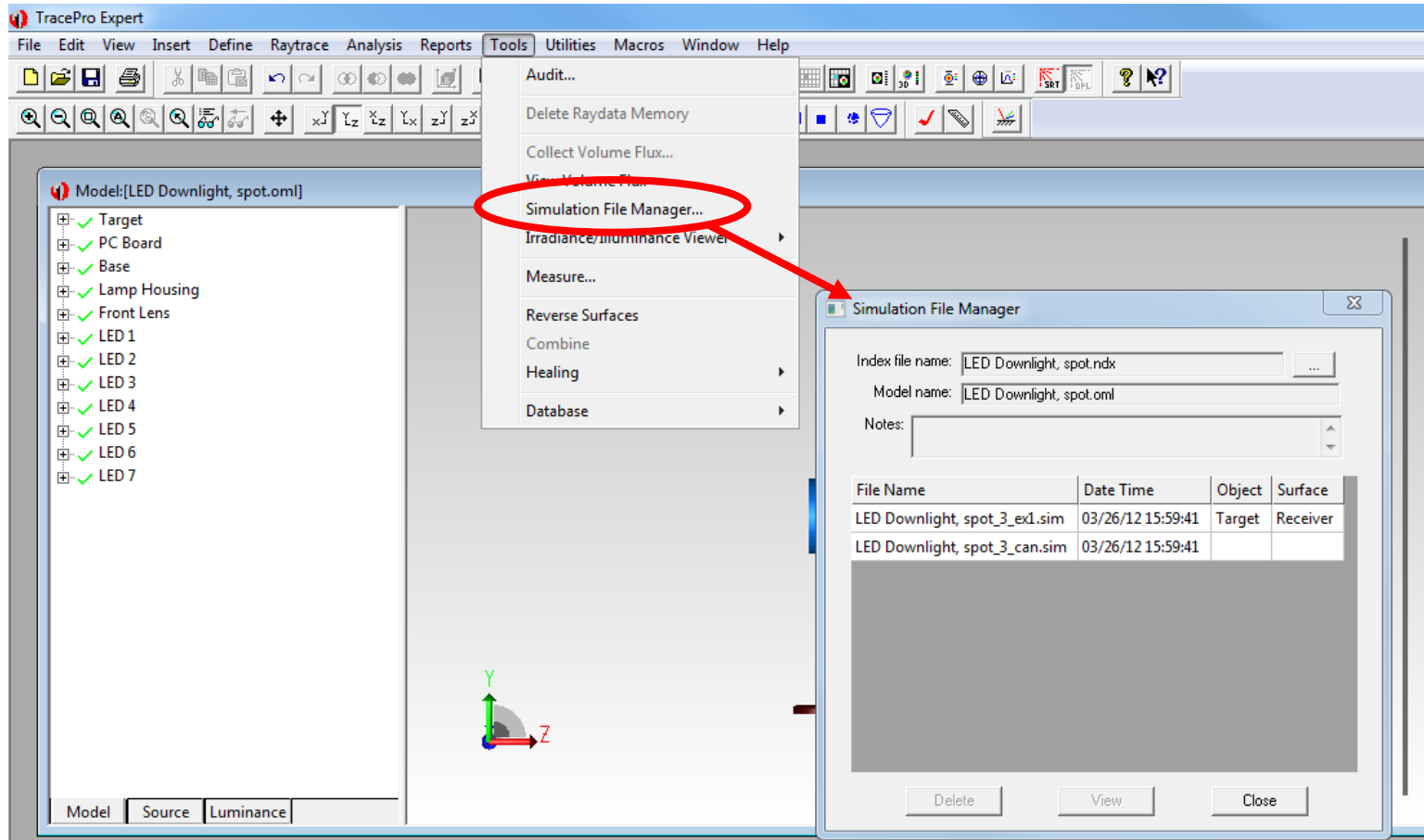
Running a Simulation Mode Raytrace

Simulation Mode



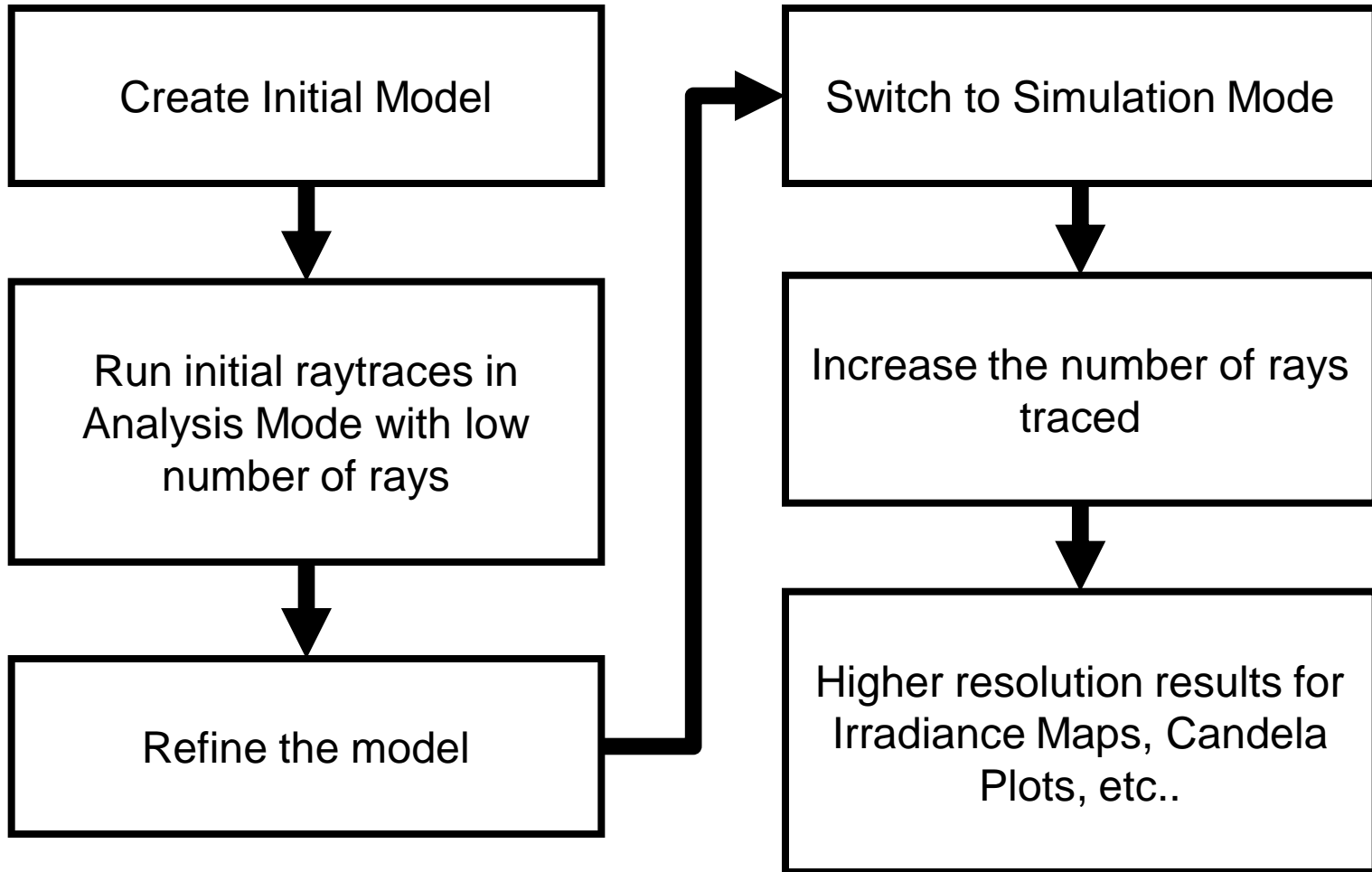
Simulation Mode Raytrace Results

Simulation Mode



Use the Simulation File Manager and the .sim file to open an Irradiance Map for a previous Simulation Mode raytrace

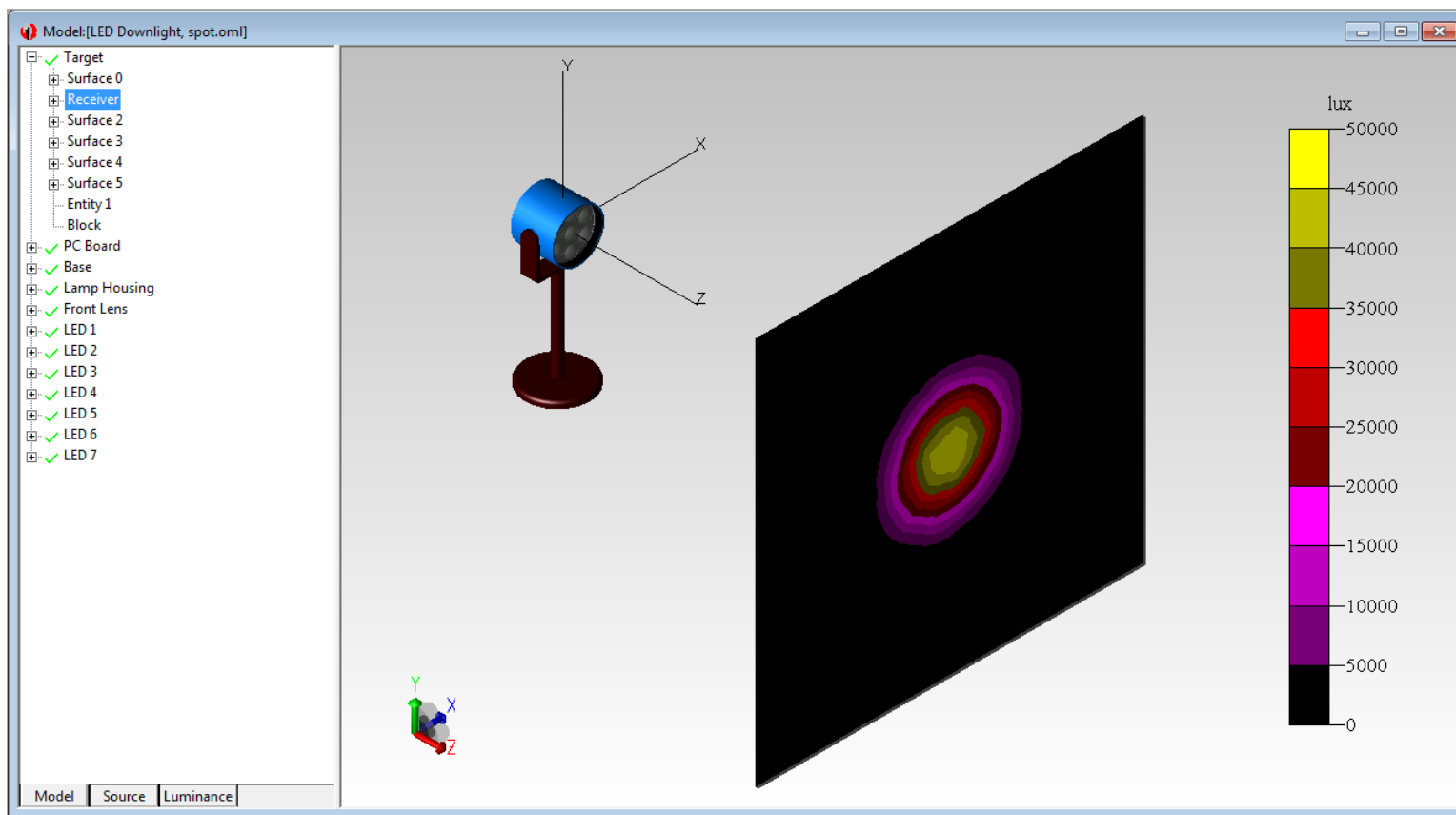
Simulation Mode



Typical Workflow using Simulation Mode

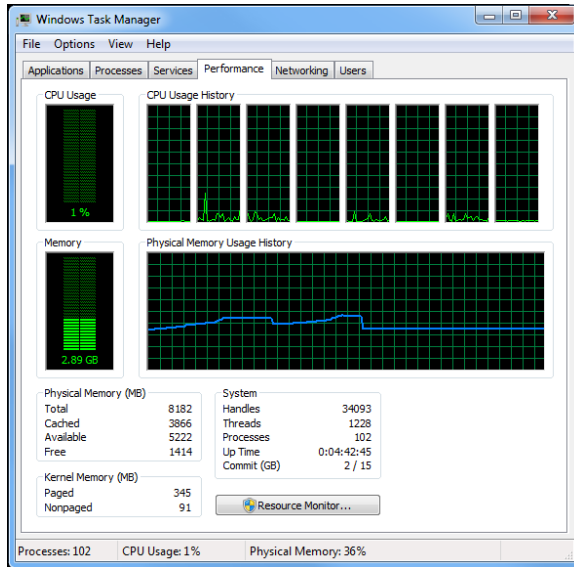
Determining Memory Usage by TracePro

Determining Memory Usage

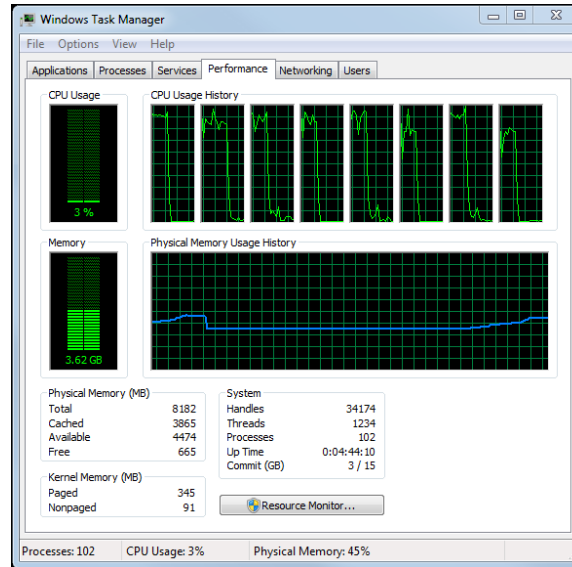


Example Model - LED light with 7 LEDs and circular lens array

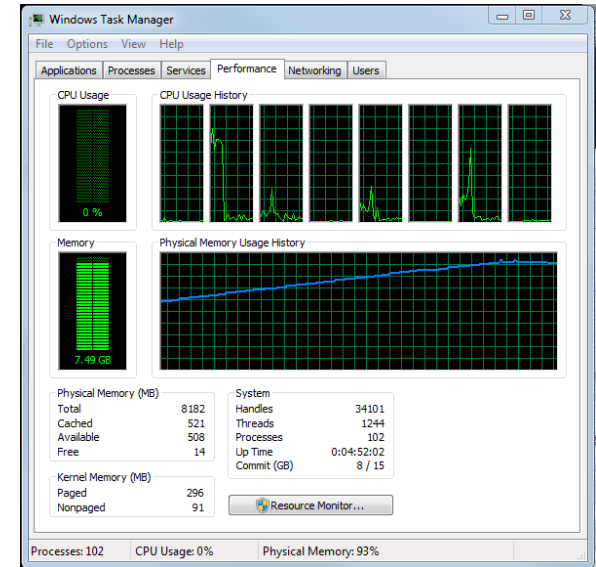
Determining Memory Usage



No rays traced
2.89GB of RAM
Model and other
programs open



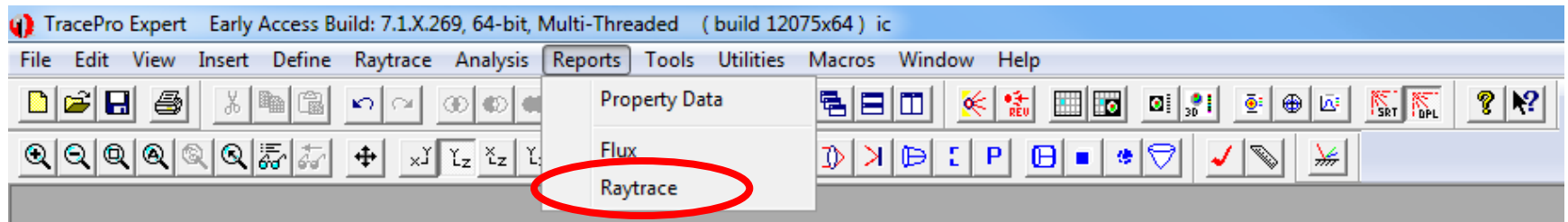
350k rays traced
3.62GB of RAM
0.73GB used



3.5M rays traced
7.49GB of RAM
4.6GB used

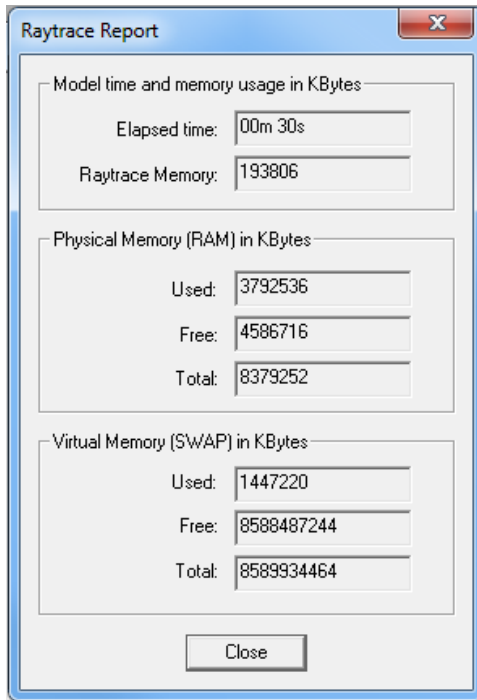
Windows Task Manager Performance Tab – Windows 7 64-bit
Run a smaller number of rays initially to determine memory usage

Determining Memory Usage



TracePro Raytrace Report – Reports->Raytrace

Determining Memory Usage



Raytrace Report

Model time and memory usage in KBytes

Elapsed time: 00m 30s

Raytrace Memory: 193806

Physical Memory (RAM) in KBytes

Used: 3792536

Free: 4586716

Total: 8379252

Virtual Memory (SWAP) in KBytes

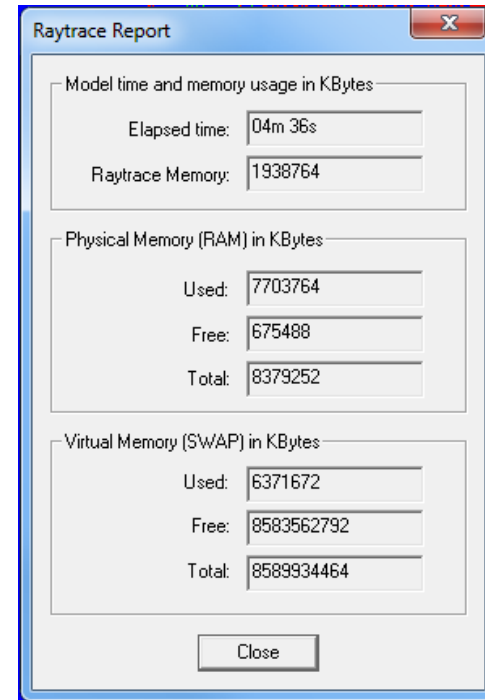
Used: 1447220

Free: 8588487244

Total: 8589934464

Close

350k rays traced
0.194GB used for raytrace



Raytrace Report

Model time and memory usage in KBytes

Elapsed time: 04m 36s

Raytrace Memory: 1938764

Physical Memory (RAM) in KBytes

Used: 7703764

Free: 675488

Total: 8379252

Virtual Memory (SWAP) in KBytes

Used: 6371672

Free: 8583562792

Total: 8589934464

Close

3.5M rays traced
1.94GB used for raytrace

TracePro Raytrace Report – Reports->Raytrace

Determining Memory Usage

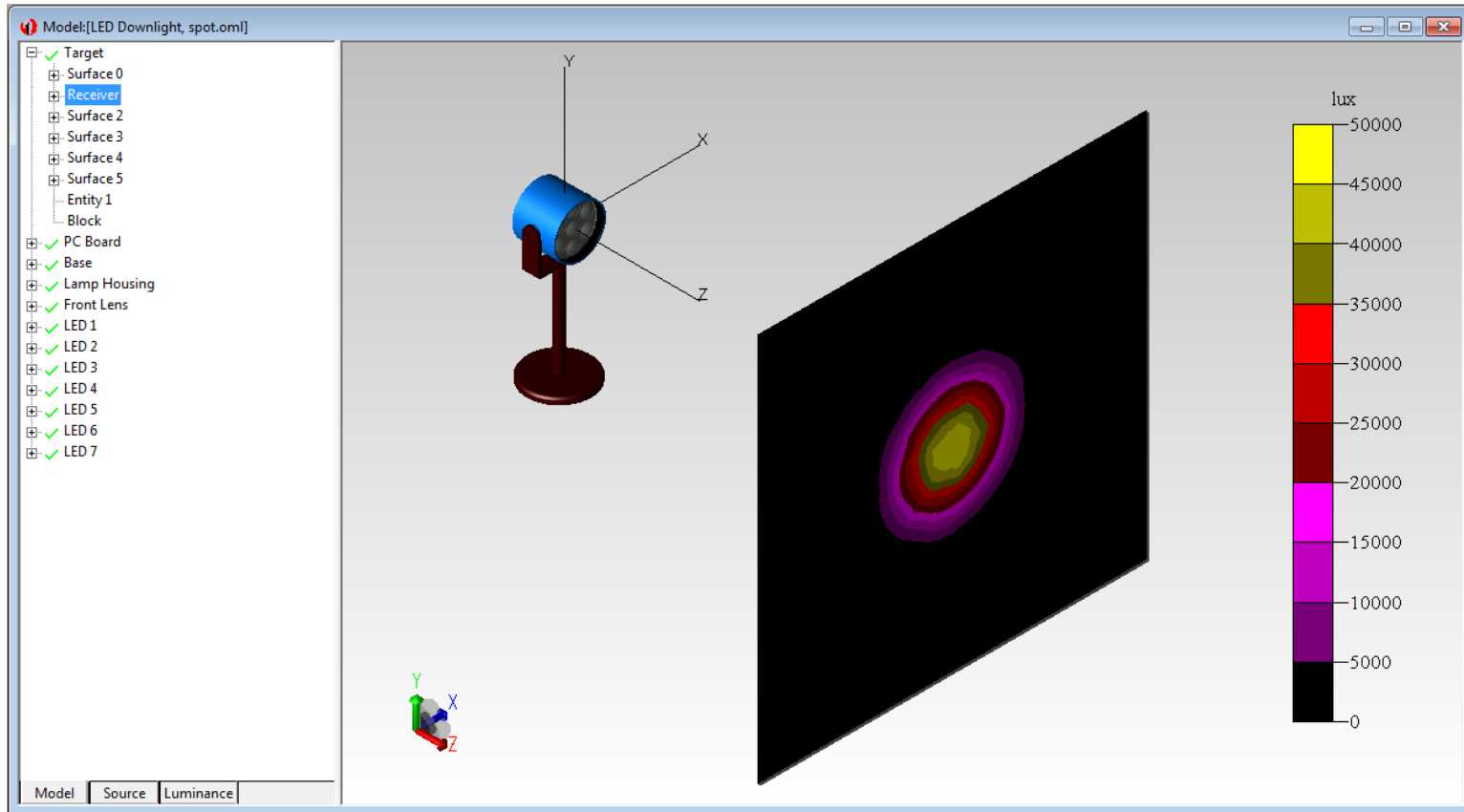
Why is there a difference in the RAM used as reported by the Windows Task Manager opposed to the TracePro Raytrace Report?

The TracePro Raytrace Report only shows the amount of memory used for the raytrace itself. Additional tasks such as displaying the rays, opening an Irradiance Map or a Candela Plot, etc... consume additional memory.

The Windows Task Manager is the more accurate method for determining memory usage and availability.

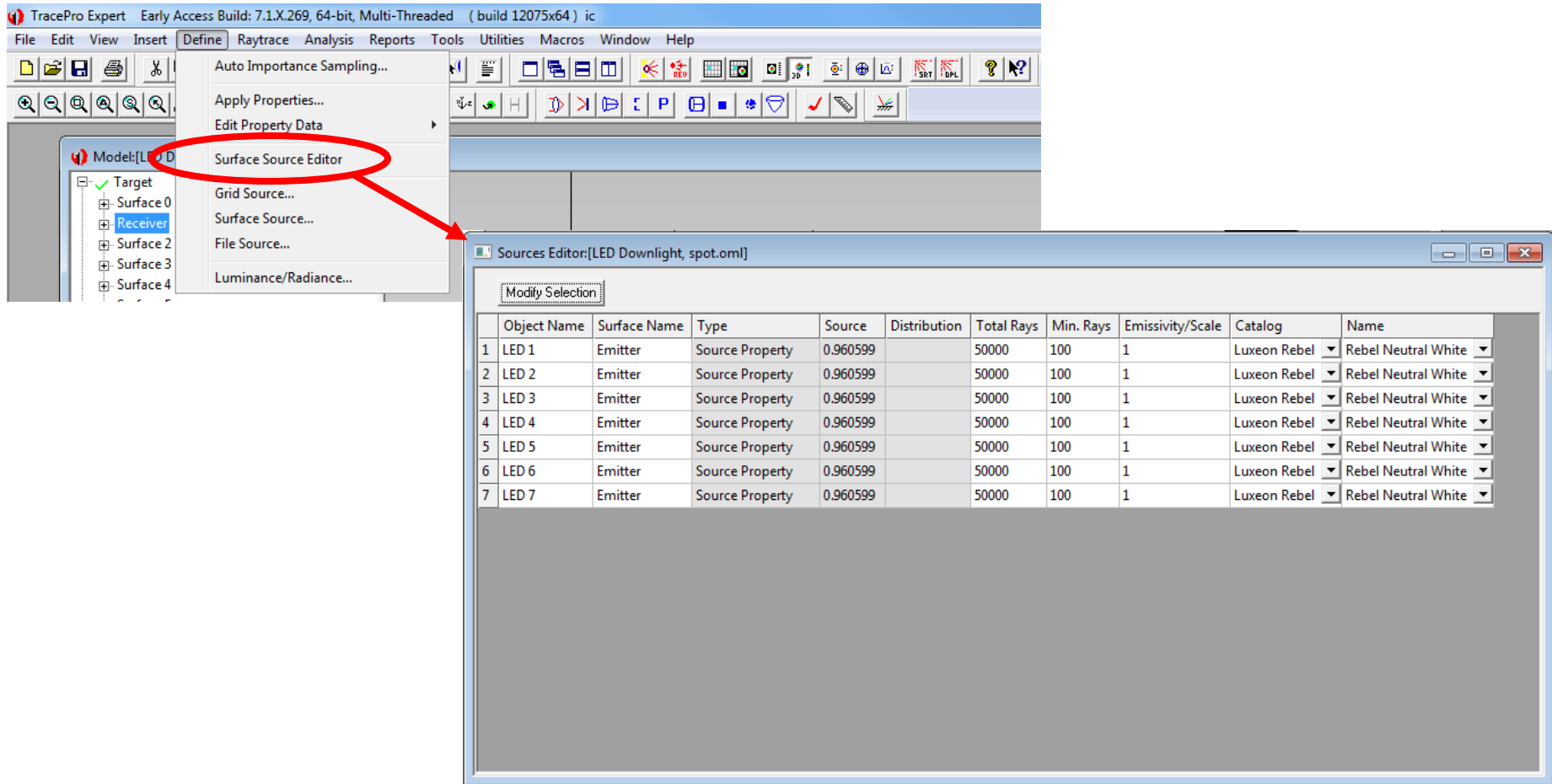
Using the Surface Source Editor to Modify Applied Surface Source Properties

Surface Source Editor



Example Model - LED light with 7 LEDs and circular lens array

Surface Source Editor



The screenshot shows the TracePro Expert software interface. The 'Define' menu is open, and 'Surface Source Editor' is highlighted with a red circle and an arrow pointing to the 'Sources Editor' dialog box. The dialog box displays a table of surface sources for a model named 'LED Downlight, spot.oml'.

Object Name	Surface Name	Type	Source	Distribution	Total Rays	Min. Rays	Emissivity/Scale	Catalog	Name
1	LED 1	Emitter	Source Property	0.960599	50000	100	1	Luxeon Rebel	Rebel Neutral White
2	LED 2	Emitter	Source Property	0.960599	50000	100	1	Luxeon Rebel	Rebel Neutral White
3	LED 3	Emitter	Source Property	0.960599	50000	100	1	Luxeon Rebel	Rebel Neutral White
4	LED 4	Emitter	Source Property	0.960599	50000	100	1	Luxeon Rebel	Rebel Neutral White
5	LED 5	Emitter	Source Property	0.960599	50000	100	1	Luxeon Rebel	Rebel Neutral White
6	LED 6	Emitter	Source Property	0.960599	50000	100	1	Luxeon Rebel	Rebel Neutral White
7	LED 7	Emitter	Source Property	0.960599	50000	100	1	Luxeon Rebel	Rebel Neutral White

Use the Surface Source Editor to modify any or all of the Surface Sources in a TracePro model – Define->Surface Source Editor

Surface Source Editor

Sources Editor:[LED Downlight, spot.om]

Modify Selection

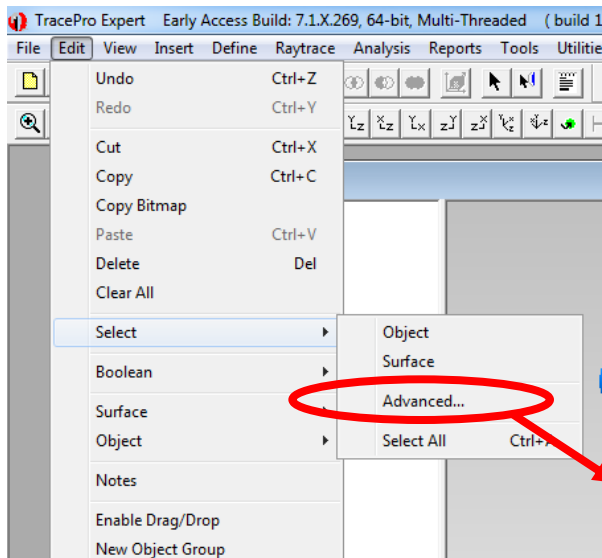
	Object Name	Surface Name	Type	Source	Distribution	Total Rays	Min. Rays	Emissivity/Scale	Catalog	Name
1	LED 1	Emitter	Source Property	0.960599		50000	100	1	Luxeon Rebel	Rebel Neutral White
2	LED 2	Emitter	Source Property	0.960599		50000	100	1	Luxeon Rebel	Rebel Neutral White
3	LED 3	Emitter	Source Property	0.960599		50000	100	1	Luxeon Rebel	Rebel Neutral White
4	LED 4	Emitter	Source Property	0.960599		50000	100	1	Luxeon Rebel	Rebel Neutral White
5	LED 5	Emitter	Source Property	0.960599		50000	100	1	Luxeon Rebel	Rebel Neutral White
6	LED 6	Emitter	Source Property	0.960599		50000	100	1	Luxeon Rebel	Rebel Neutral White
7	LED 7	Emitter	Source Property	0.960599		50000	100	1	Luxeon Rebel	Rebel Neutral White

Modify Selected Source Parameters

Scale/Setting: 1

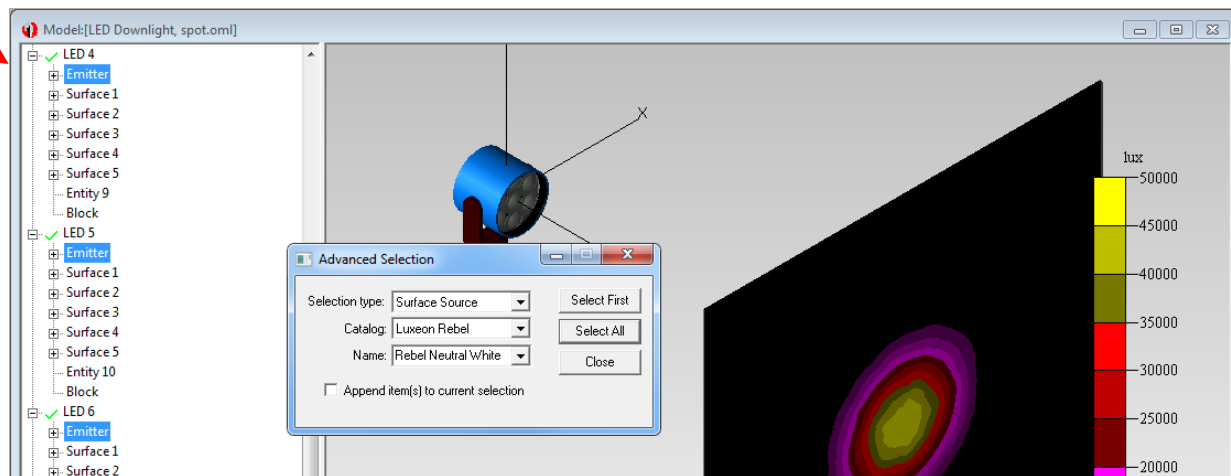
Scale Set To Cancel

Click on a column header to select all of the Surface Sources, or select individual sources in the spreadsheet, then click Modify to enter changes. Values can be Scaled or Set To a discrete value. Catalog and Name can only be edited one at a time in the Surface Source Editor.



Advanced Select

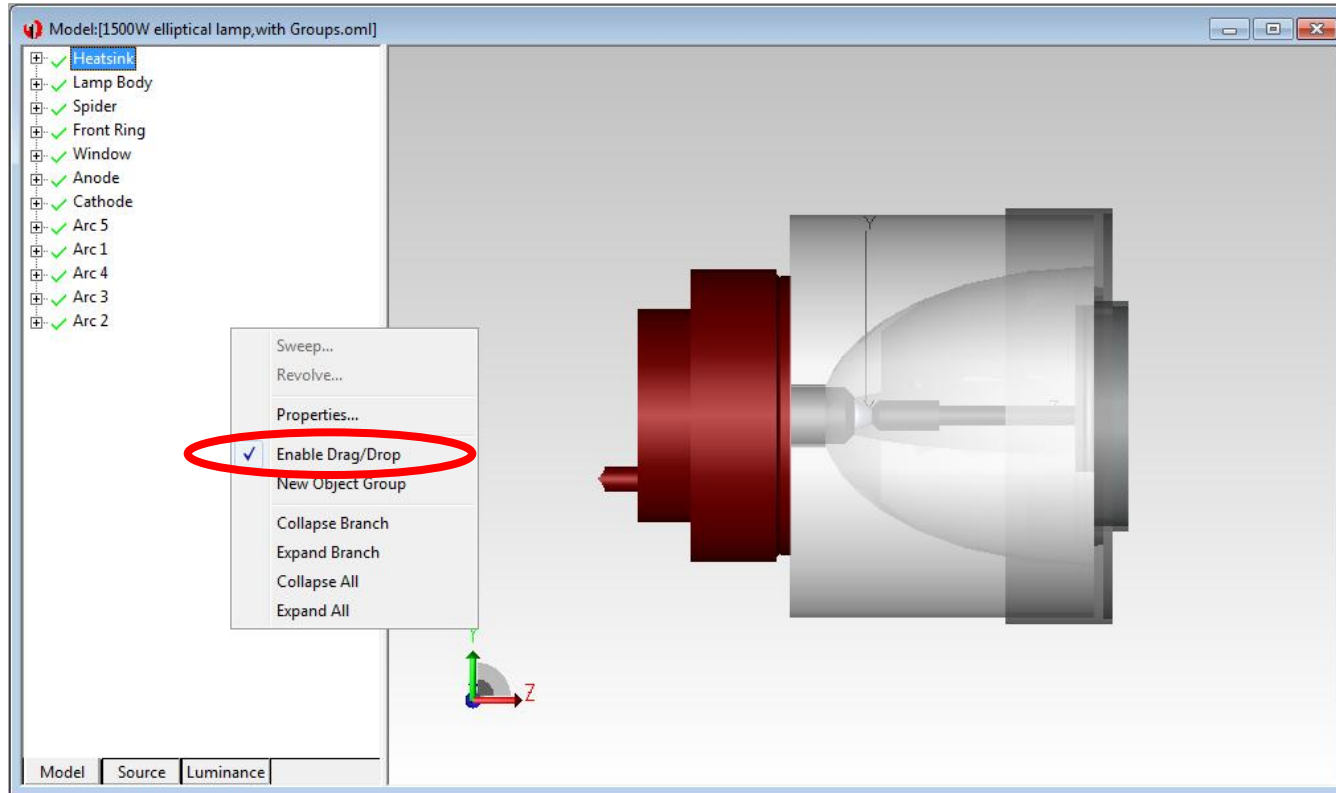
Valid in TracePro 7.1.3 EA



To apply a different Surface Source Property to each source in the model at one time, use Edit->Select->Advanced to select all of the Surface Sources with a given name. The Surface Source Property can then be changed for all of the selected sources using the Apply Properties Dialog Box.

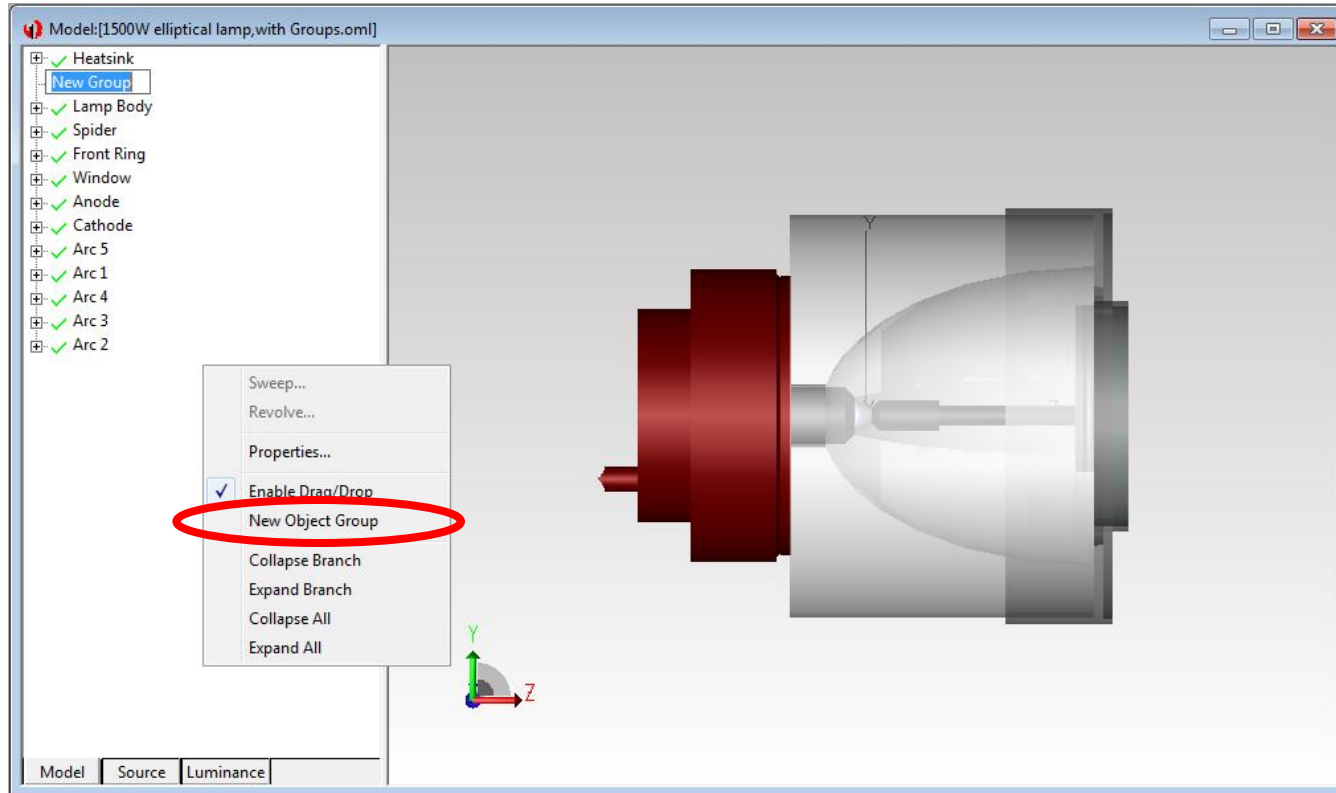
Moving and Grouping Objects in the Model Tree for Better Organization

Organizing the Model Tree



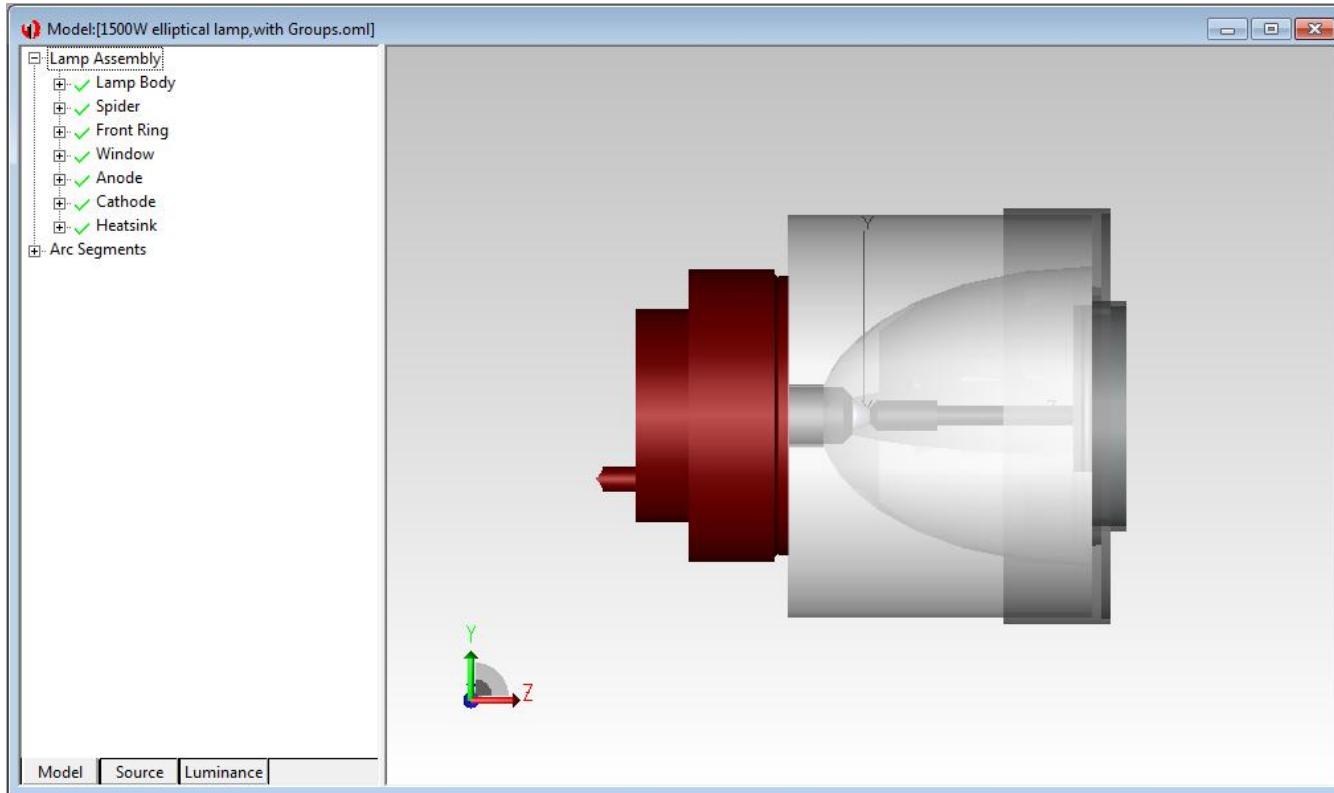
To move objects in the Model Tree, right click in the Model Tree and select Enable Drag/Drop. Then select the object to move with the left mouse button and move it to its new location

Organizing the Model Tree



To add Object Groups to the Model Tree, right click in the Model Tree and select New Group Object. Then name the new Object Group and drag the objects into that group.

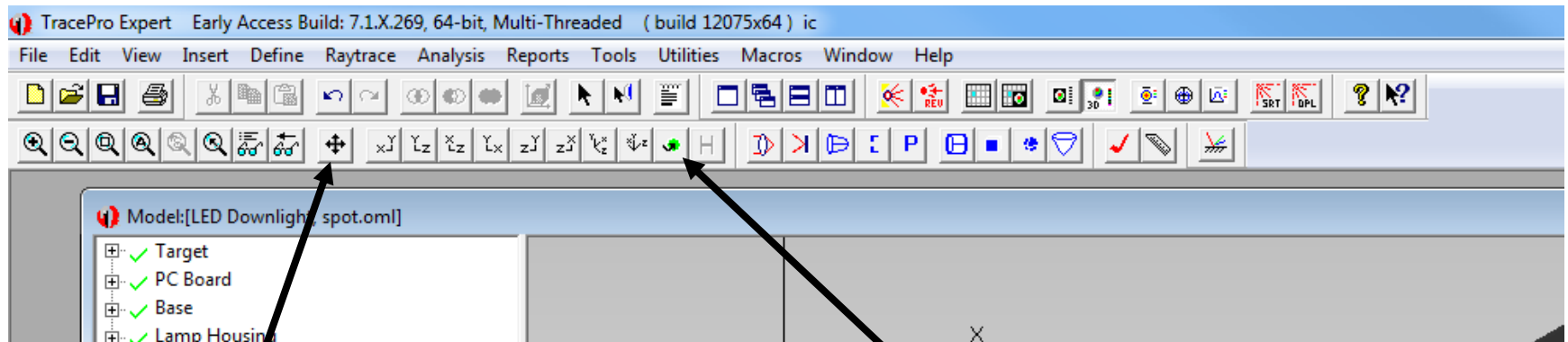
Organizing the Model Tree



Adding Object Groups can help organize the Model Tree and make objects easier to identify and locate. It can also make for a more compact Model Tree as Groups can be collapsed when not being used.

Shortcuts for Panning and Orbiting the Model View

Panning and Orbiting the Model View



Pan icon

Orbit icon

Select the appropriate icon in the toolbar and hold down the left mouse button in the model window to pan or orbit the model

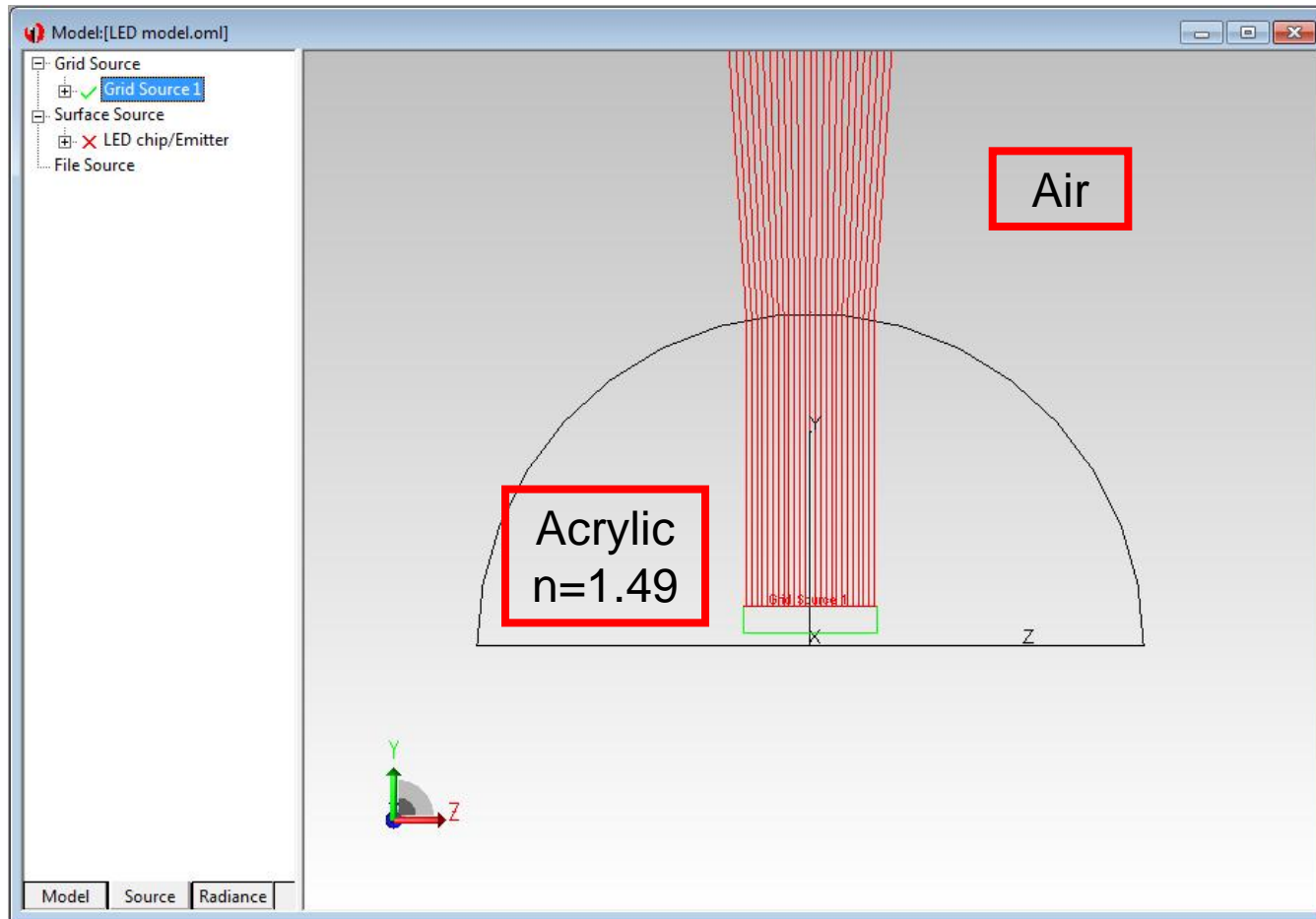
Panning and Orbiting the Model View

- **Ctrl-right click** and drag to pan the view
- **Shift-right click** and drag to orbit the view
- Drag on one of the axes of the 3 colored XYZ axes to rotate the view
- Double click on an axis to make it point into the screen
- Double click on the shaded arc between the colored axes to display a plan view



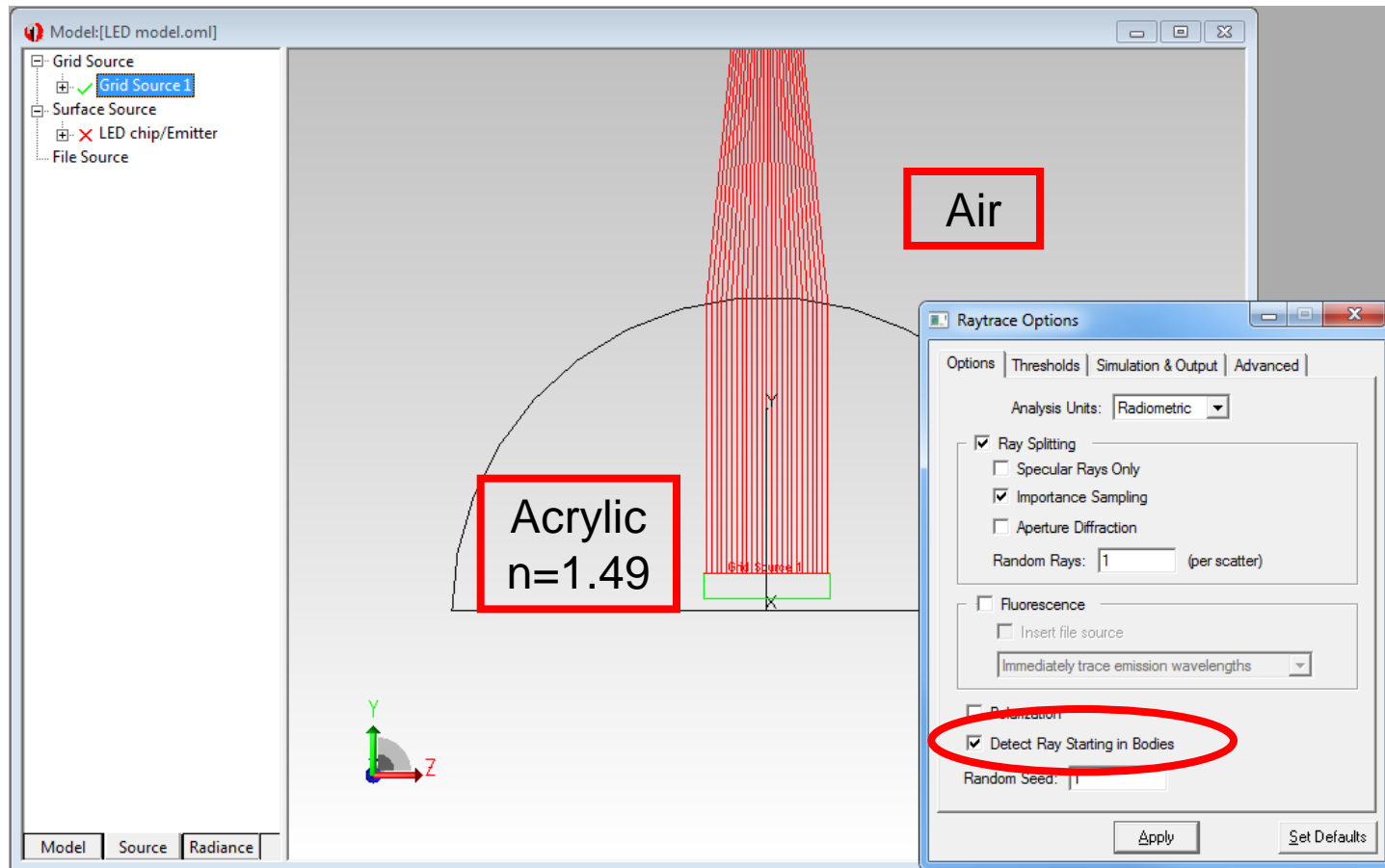
Detect Rays Starting in Bodies

Detect Rays Starting in Bodies



TracePro assumes rays are starting in air. This can give the wrong result if rays are started inside an object with a different index of refraction.

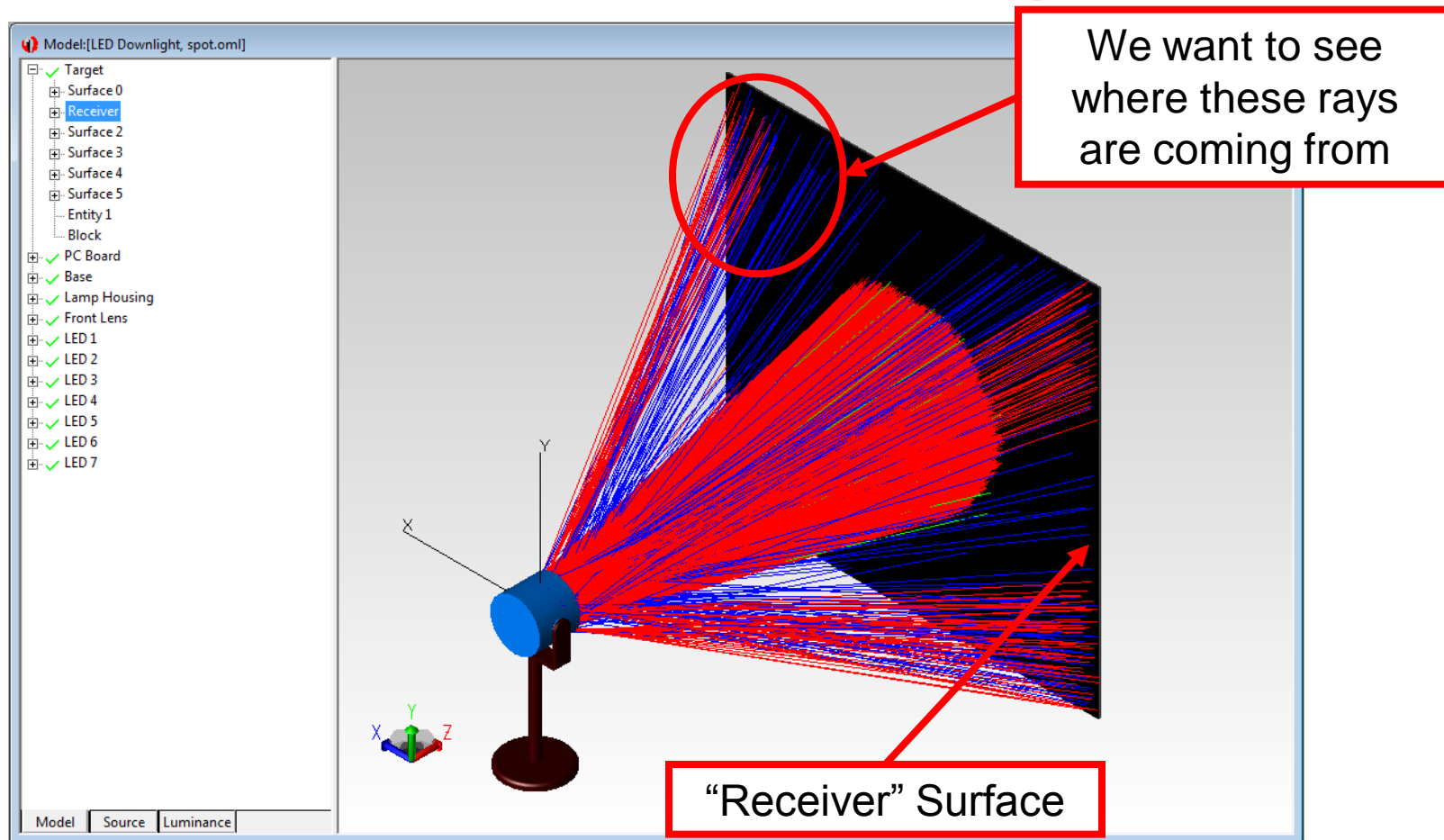
Detect Rays Starting in Bodies



When starting rays inside an object, check the box for “Detect Ray Starting in Bodies” at Raytrace->Raytrace Options->Options

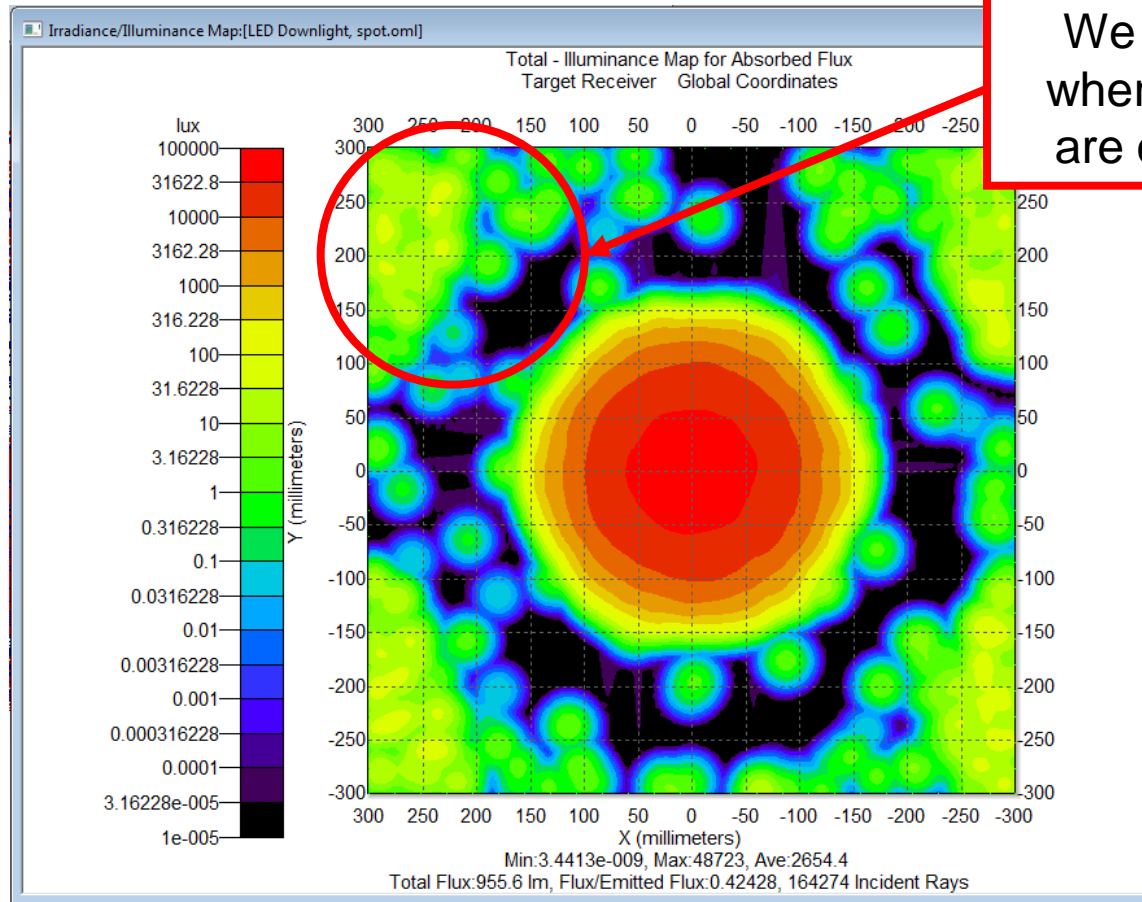
Getting More Information from the Irradiance/Illuminance Maps and Candela Plots

Irradiance/Illuminance Maps



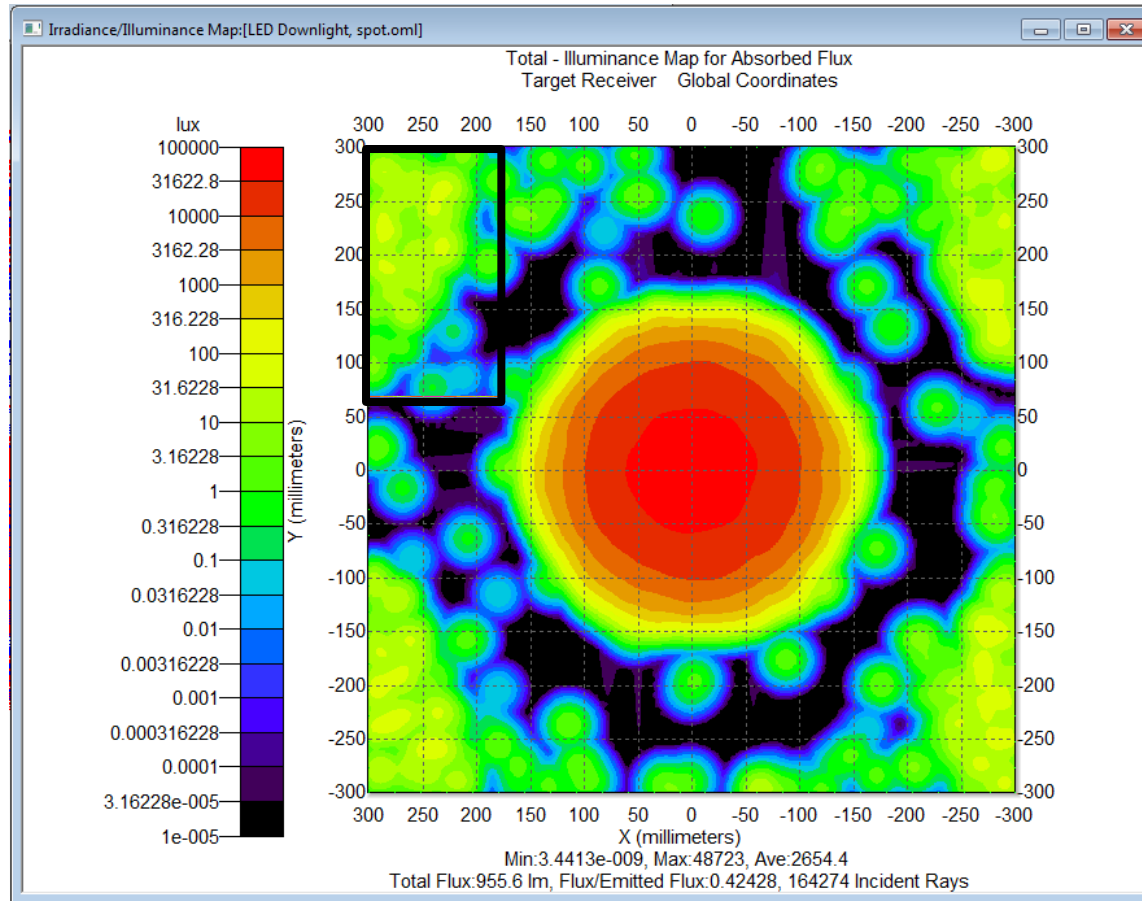
Example Model - LED light with 7 LEDs and circular lens array

Irradiance/Illuminance Maps



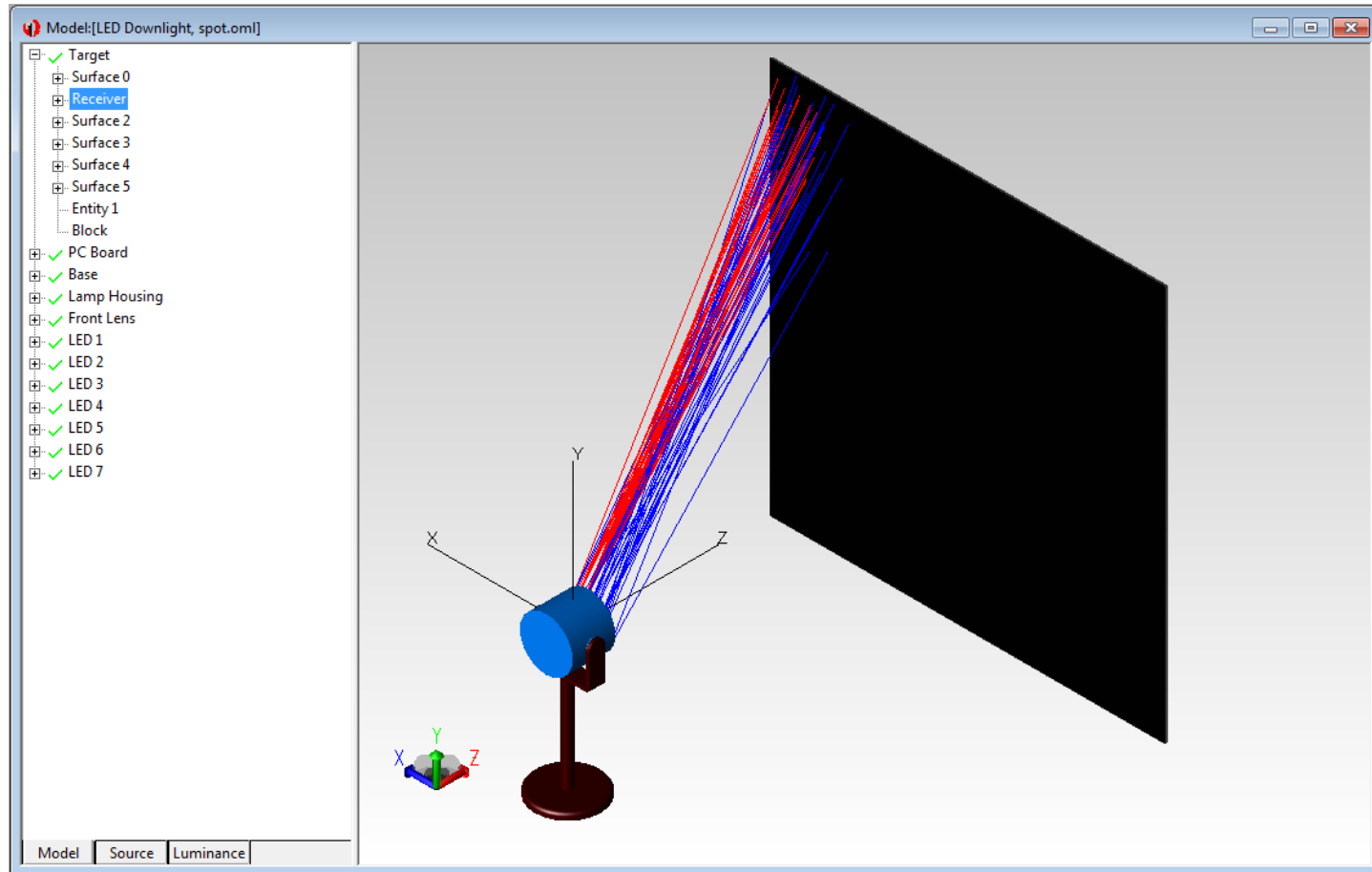
Illuminance Map on “Receiver” Surface – Log Scale

Irradiance/Illuminance Maps



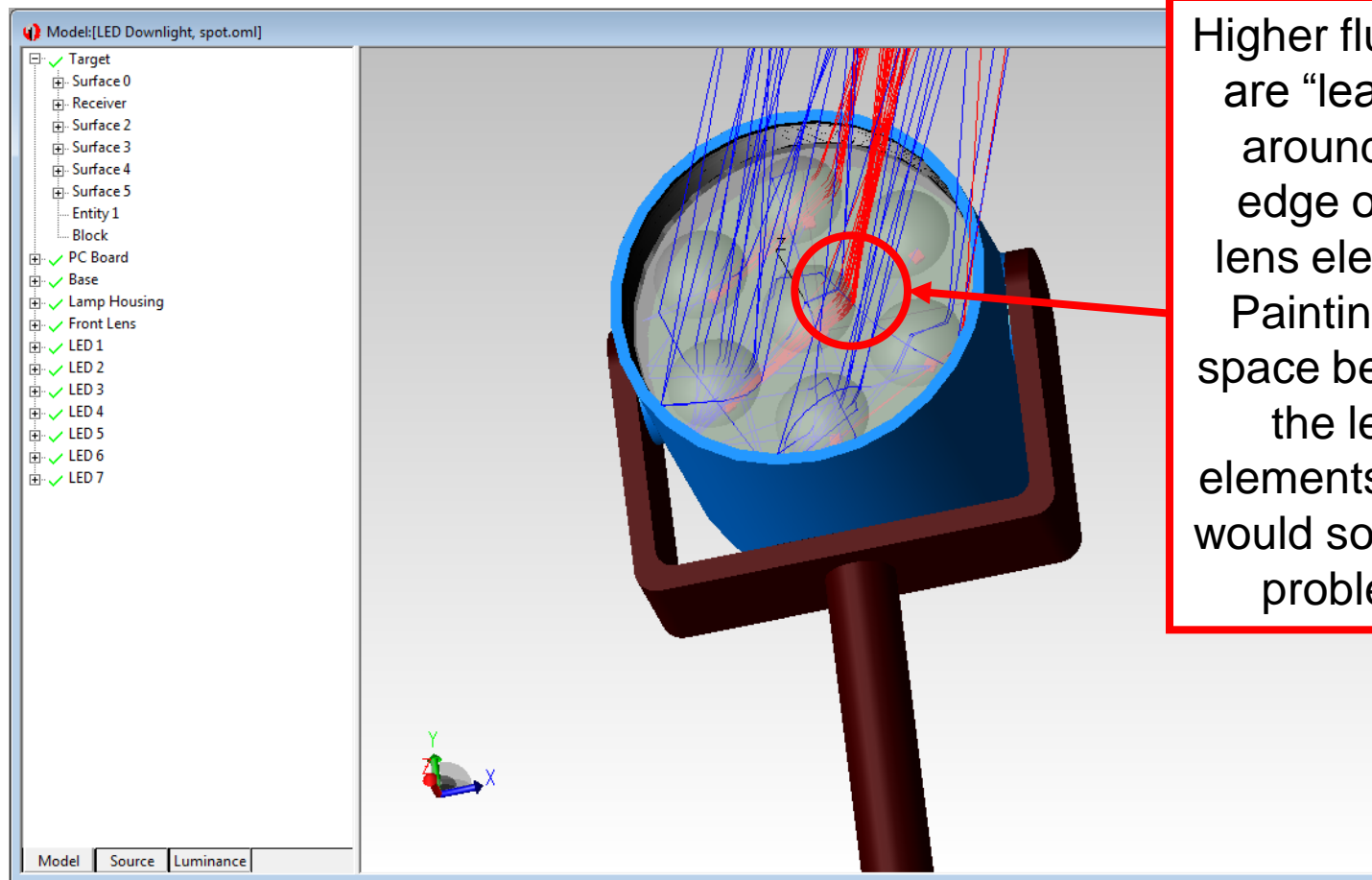
Select area of interest by **Shift- left mouse click** and dragging a box around the area of interest

Irradiance/Illuminance Maps



To display the selected rays, go to Analysis->Display Selected Rays, or right click in the Irradiance/Illuminance Map window and choose Display Selected Rays

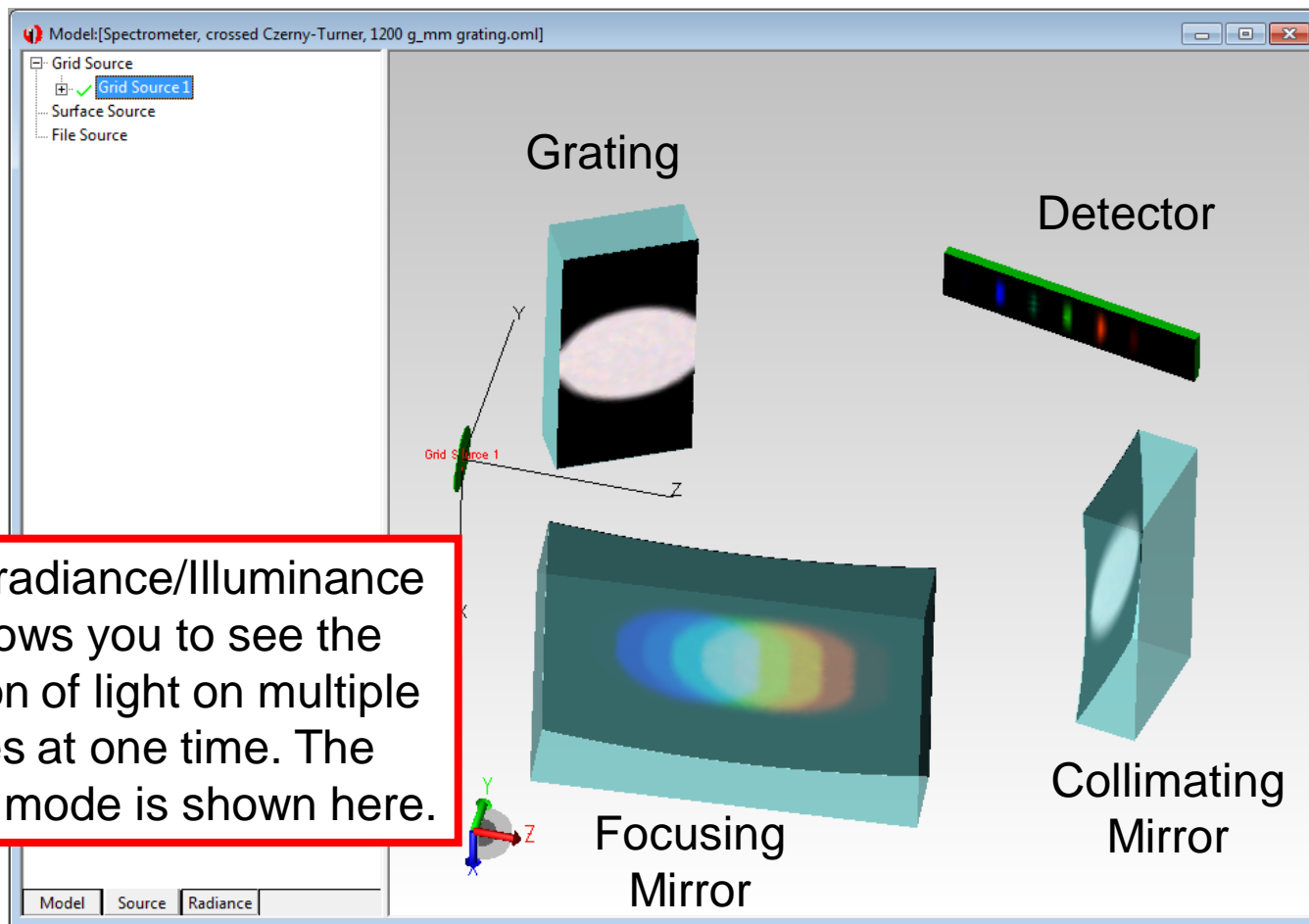
Irradiance/Illuminance Maps



Higher flux rays are “leaking” around the edge of the lens element. Painting the space between the lens elements black would solve the problem.

To display the selected rays, go to Analysis->Display Selected Rays, or right click in the Irradiance/Illuminance Map window and choose Display Selected Rays

3D Irradiance/Illuminance Maps



3D Irradiance/Illuminance Map shows the flux distribution on multiple surfaces in this crossed Czerny-Turner spectrometer model.

Path Sort Table and Display Selected Paths

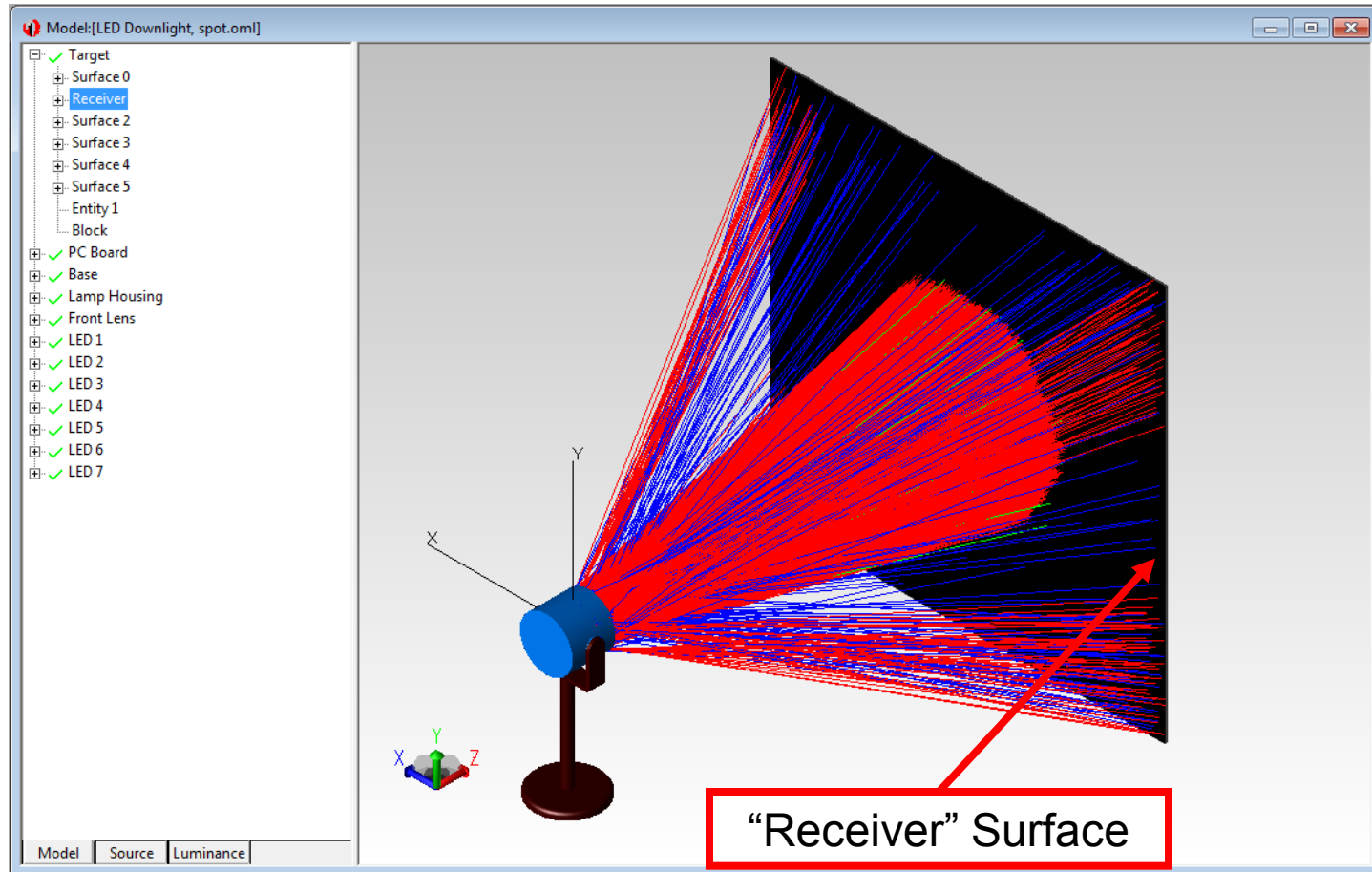
The screenshot displays the TracePro software interface. The main window shows a 3D model of a spectrometer with a red beam path. The left sidebar lists components like Collimating Mirror, Focusing Mirror, Grating, and Detector. The top right window shows an Irradiance Map with a green spot. The bottom right window shows the Ray Path Sorting table.

Irradiance Map showing rays selected in the Path Sort Table

Ray Path	Source	Wavelength	No. Rays	Absorbed Flux	% of Total	Incident Flux	% of Total	Path Type	No.
1	Grid Source1	0.55	48086	34621.3834051765	14.33	34621.3834051765	14.33	Specular	
2	Grid Source1	0.65	48078	34615.623494449	14.33	34615.623494449	14.33	Specular	
3	Grid Source1	0.7	47961	34531.3848000593	14.29	34531.3848000593	14.29	Specular	
4	Grid Source1	0.5	47940	34516.2650343996	14.29	34516.2650343996	14.29	Specular	
5	Grid Source1	0.4	47926	34506.1851906265	14.28	34506.1851906265	14.28	Specular	
6	Grid Source1	0.45	47863	34460.8258936474	14.26	34460.8258936474	14.26	Specular	
7	Grid Source1	0.6	47659	34313.9481700961	14.20	34313.9481700961	14.20	Specular	
8	Grid Source1	0.4	53	5.02747971736337	0.00	5.02747971736337	0.00	Single Surf Scat	
9	Grid Source1	0.65	52	4.93262160948859	0.00	4.93262160948859	0.00	Single Surf Scat	
10	Grid Source1	0.7	39	3.69946620711644	0.00	3.69946620711644	0.00	Single Surf Scat	
11	Grid Source1	0.45	38	3.60460809924166	0.00	3.60460809924166	0.00	Single Surf Scat	
12	Grid Source1	0.6	36	3.4148918834921	0.00	3.4148918834921	0.00	Single Surf Scat	
13	Grid Source1	0.55	35	3.32003377561732	0.00	3.32003377561732	0.00	Single Surf Scat	
14	Grid Source1	0.5	32	3.03545945199298	0.00	3.03545945199298	0.00	Single Surf Scat	

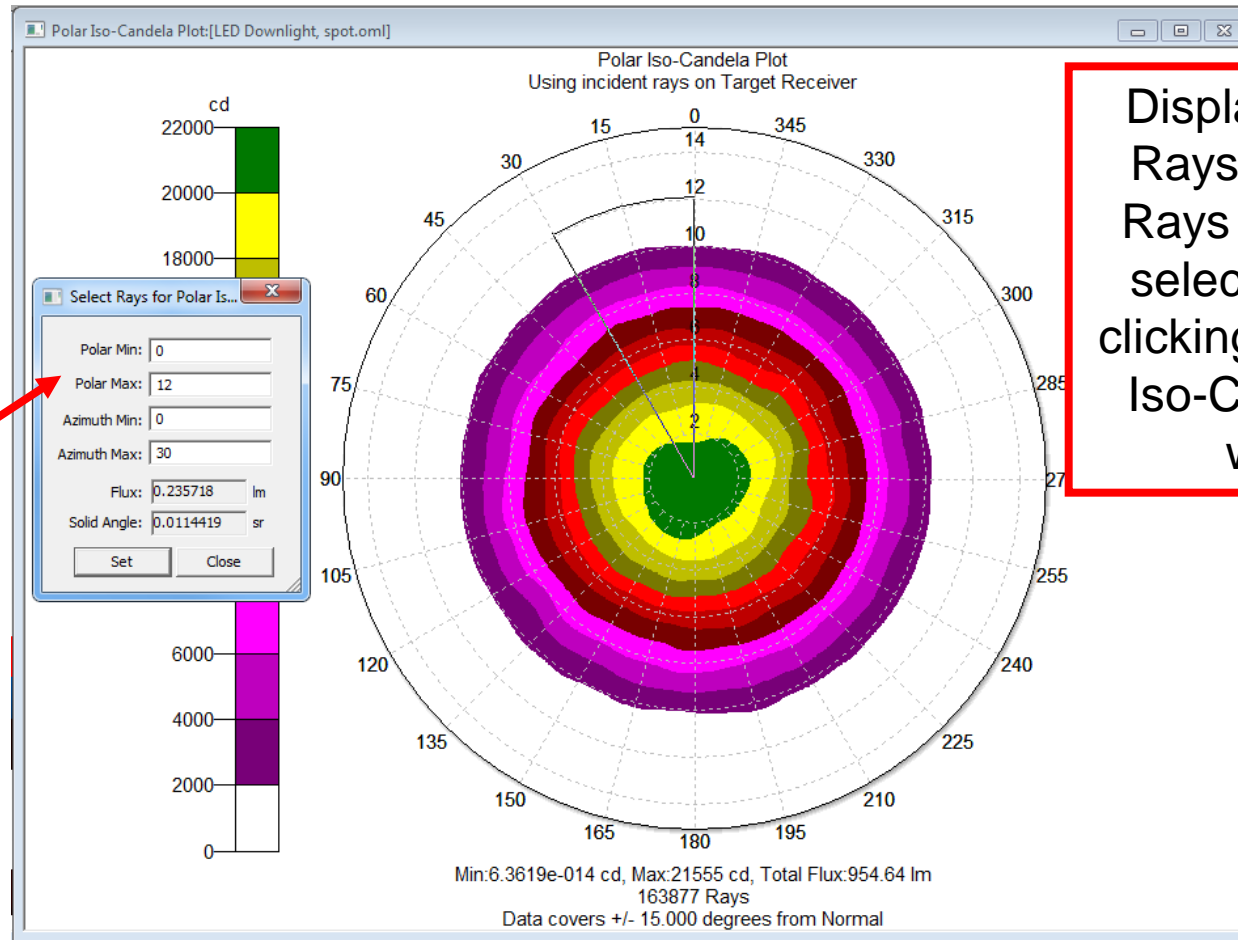
Analysis->Path Sort Table will open a table showing all the paths in a model. To display a path, select it in the Path Sort Table and then go to Analysis->Display Selected Paths

Candela Plots



Example Model - LED light with 7 LEDs and circular lens array

Polar Iso-Candela Plot

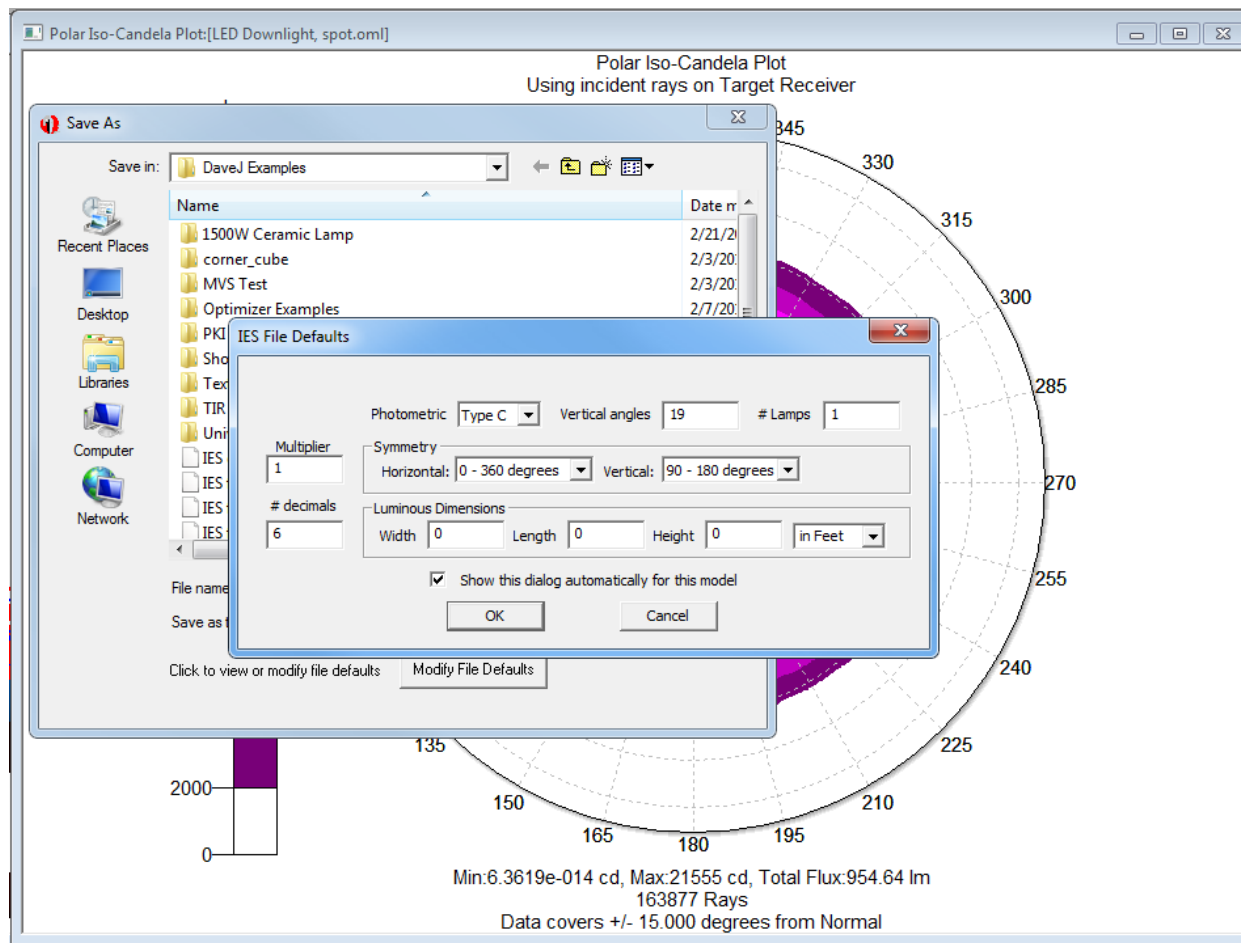


Enter Polar and Azimuth angles here to define the "zone"

Display Selected Rays and Select Rays can also be selected by right clicking in the Polar Iso-Candela Plot window

To find the lumens in a given "zone", go to Analysis->Display Selected Rays. Then go to Analysis->Select Rays to open the Select Rays dialog box.

Making an IES File



Please see our October 2010 webinar for more information on IES and LDT files in TracePro

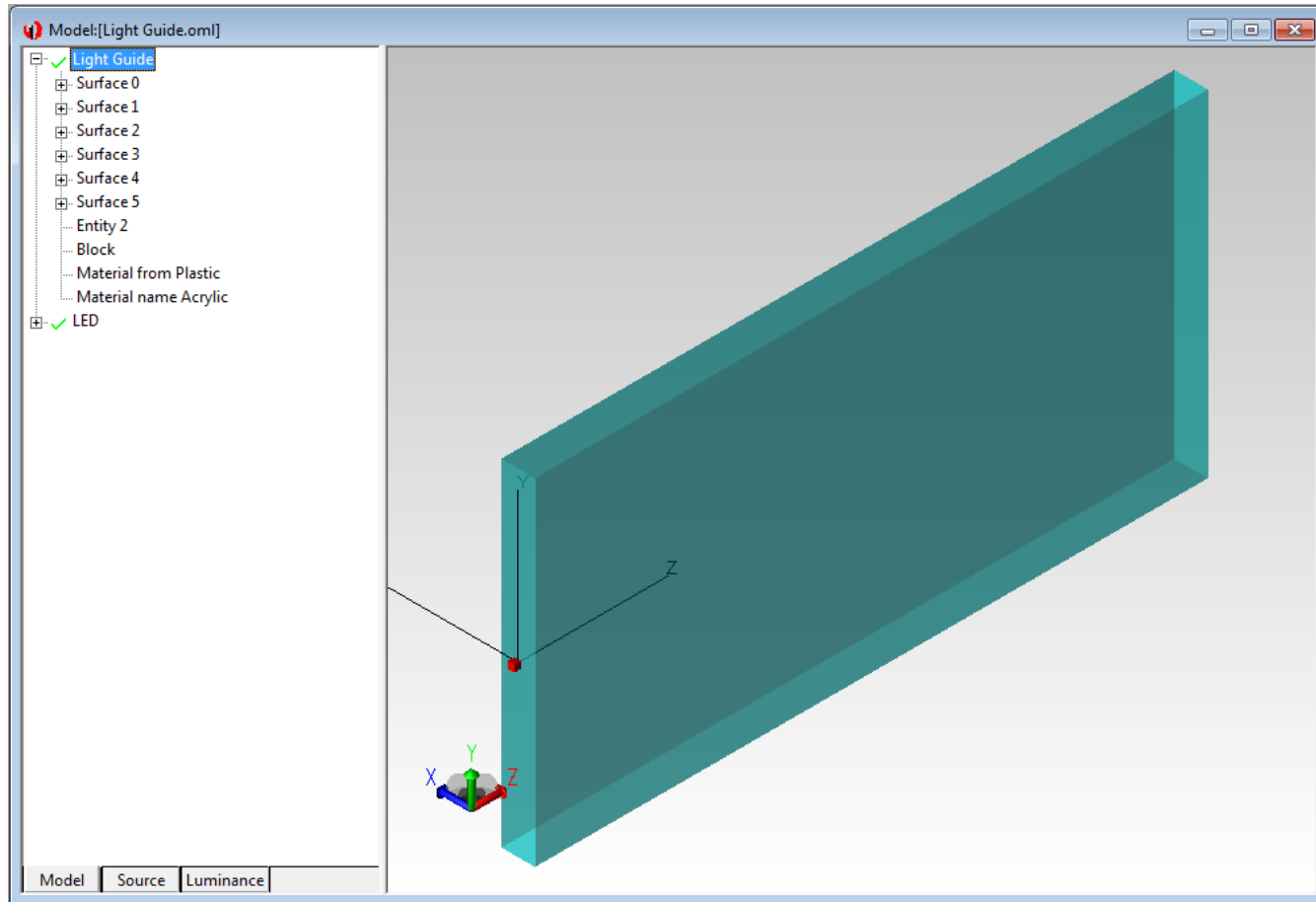
Right click in the Candela Plot window, choose SaveAs, and change the File Type to IESNA LM-63 (*.ies)

The Flux Threshold Setting

Flux Threshold

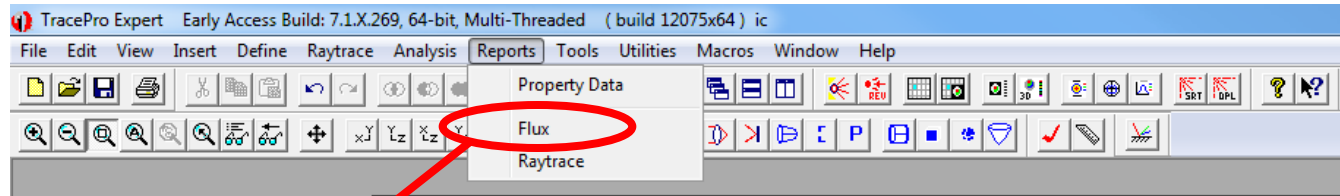
- The Flux Threshold setting in TracePro determines when TracePro will stop keeping track of rays.
- Once rays fall below the Flux Threshold they are terminated
- The default setting for the Flux Threshold is 0.05, or 5% of the initial flux value of the ray
- The Flux Threshold setting can be changed at
•Raytrace->Raytrace Options->Thresholds
- The Flux Report can be used to see if rays are falling below the Flux Threshold

Flux Threshold



Example Model - Simple light guide with LED source

Flux Threshold



Flux Report:[Light Guide.om]

Source selection: All Sources Display Selected Objects
Wavelength selection: wavelength totals Display All Objects

Object Name	Material Catalog	Material Property	Surface Area	Number	Incident	Absorbed	Lost (All Types)	Lost->Escaped Model	Lost->Flux Threshold	Lost->Total Intercepts	Lost->Total Scatters	Lost->Random Scatters
Surface Name	Surface Catalog	Surface Property	[sq mm]	of rays	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]
Light Guide	Plastic	Acrylic			99.939999999999	0						
Surface 0	Default	<None>	250	10705	91.6872274008007	0	86.6733387104878	84.1367754047138	2.53656330577399	0	0	0
Surface 1	Default	<None>	250	14637	104.953888690312	0	11.054953354773	8.15329846356917	2.90165489120379	0	0	0
Surface 2	Default	<None>	500	5806	30.3191600122822	0	0	0	0	0	0	0
Surface 3	Default	<None>	5000	58373	319.361988321289	0	0	0	0	0	0	0
Surface 4	Default	<None>	500	5830	30.6352965570107	0	0	0	0	0	0	0
Surface 5	Default	<None>	5000	58433	320.123570473222	0	0	0	0	0	0	0
LED	<None>	<None>			2.21170793473914	0						
Emitter	Default	<None>	1	2452	2.17839343541105	0	0.06	0.06	0	0	0	0
Surface 1	Default	<None>	1	16	0.0131203030180237	0	0.0131203030180237	0.0131203030180237	0	0	0	0
Surface 2	Default	<None>	1	613	0.545337429188301	0	0.536359372129354	0.536359372129354	0	0	0	0
Surface 3	Default	<None>	1	615	0.578697379629748	0	0.568987091301987	0.568987091301987	0	0	0	0
Surface 4	Default	<None>	1	593	0.51953874263927	0	0.511448807032928	0.511448807032928	0	0	0	0
Surface 5	Default	<None>	1	677	0.58832857959189	0	0.581792361256849	0.581792361256849	0	0	0	0

Default Flux Threshold of 5% - 5.44 lumens out of 99.9 lumens are lost due to falling below the Flux Threshold. This is about 5.44% lost.

Flux Threshold

Change Flux Threshold to 0.5%

Flux Report:[Light Guide.om]

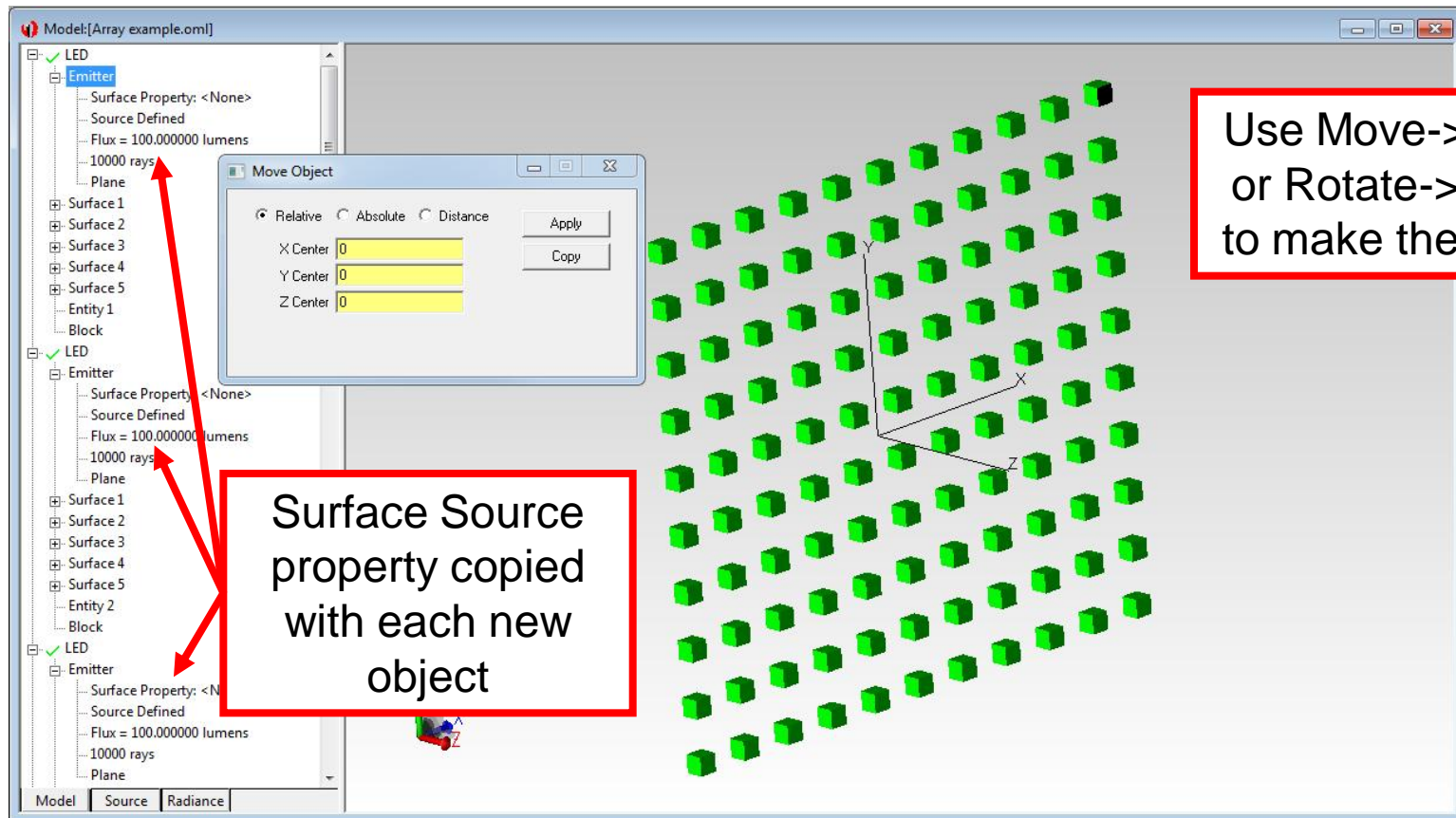
Source selection: All Sources Display Selected Objects
Wavelength selection: wavelength totals Display All Objects

Object Name	Material Catalog	Material Property	Surface Area	Number	Incident	Absorbed	Lost (All Types)	Lost->Escaped Model	Lost->Flux Threshold	Lost->Total Intercepts	Lost->Total Scatters	Lost->Random Scatters	Lost
Surface Name	Surface Catalog	Surface Property	[sq mm]	of rays	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]	[lumens]
Light Guide	Plastic	Acrylic			99.9399999999985	0							
Surface 0	Default	<None>	250	13844	92.1940263354679	0	84.687510825219	84.6320466100703	0.0554642151487358	0	0	0	0
Surface 1	Default	<None>	250	21564	107.446515510247	0	11.1558686986609	10.9764166258829	0.179452072778029	0	0	0	0
Surface 2	Default	<None>	500	9513	31.2807955246193	0	0	0	0	0	0	0	0
Surface 3	Default	<None>	5000	93660	328.399950016893	0	0	0	0	0	0	0	0
Surface 4	Default	<None>	500	9552	31.5952194493674	0	0	0	0	0	0	0	0
Surface 5	Default	<None>	5000	93799	329.173547798277	0	0	0	0	0	0	0	0
LED	<None>	<None>			4.09662047612004	0							
Emitter	Default	<None>	1	6958	4.05385287874063	0	0.06	0.06	0	0	0	0	0
Surface 1	Default	<None>	1	1626	0.654423627594247	0	0.654423627594247	0.654423627594247	0	0	0	0	0
Surface 2	Default	<None>	1	1341	0.831433572483233	0	0.837876637153981	0.837876637153981	0	0	0	0	0
Surface 3	Default	<None>	1	1340	0.887056127716842	0	0.876569911068172	0.876569911068172	0	0	0	0	0
Surface 4	Default	<None>	1	1359	0.842772202014191	0	0.831817090558056	0.831817090558056	0	0	0	0	0
Surface 5	Default	<None>	1	1418	0.903702543690932	0	0.895933209745581	0.895933209745581	0	0	0	0	0

Flux Threshold of 0.5% - 0.234 lumens out of 99.9 lumens are lost due to falling below the Flux Threshold. Now only 0.23% is lost.

Apply Properties Before Copying

Apply Properties Before Copying



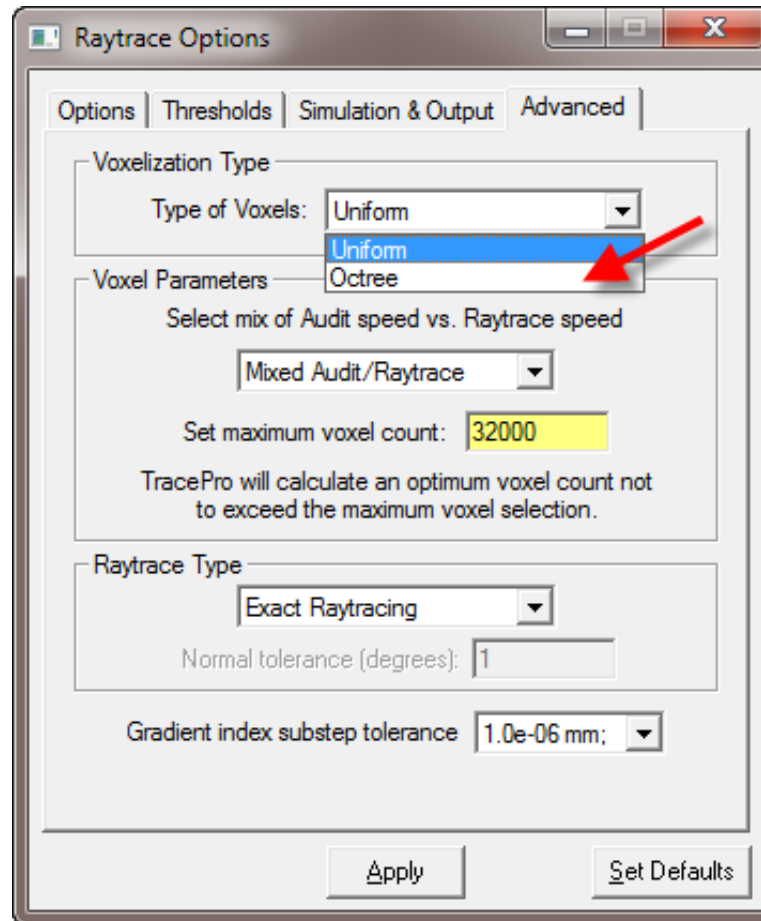
If you need to make an array of multiple objects, apply all properties to the base object before making the array. The properties will then be copied with the object.

Speeding Up Raytracing

Speeding up Raytracing

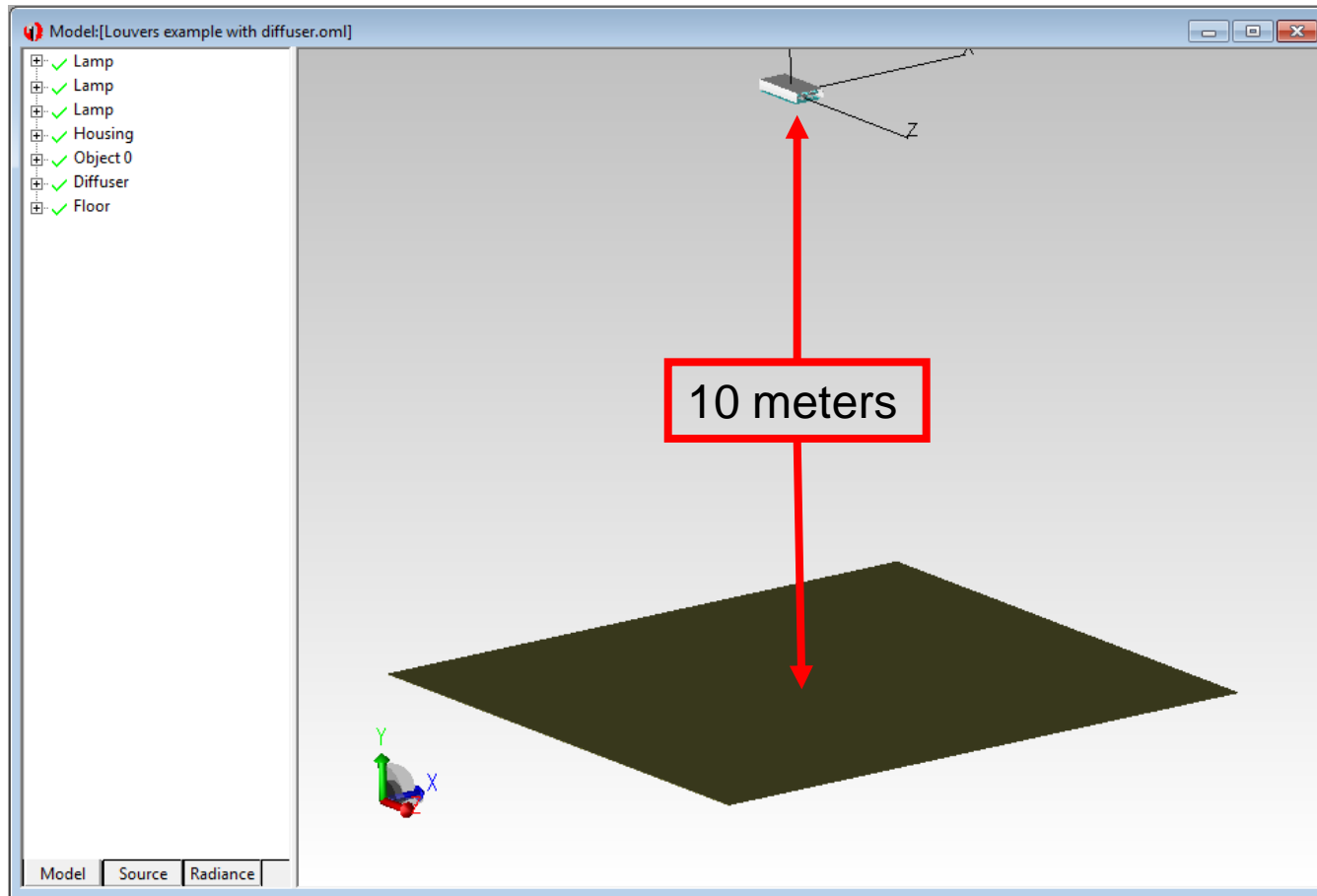
- Voxelization is a method of “allocating” the geometry in the model to specific zones to improve raytrace speed
- Increasing the number of voxels improves raytrace speed at the expense of Audit speed
- There are two types of voxels in TracePro, Octree and Uniform
- The default is Uniform, which creates equally sized 3D voxels across the system
- Octree voxelization concentrates voxels near objects and places fewer voxels in empty spaces in the model. This is best for models with large spaces between objects. For example, a luminaire and the floor.

Speeding up Raytracing



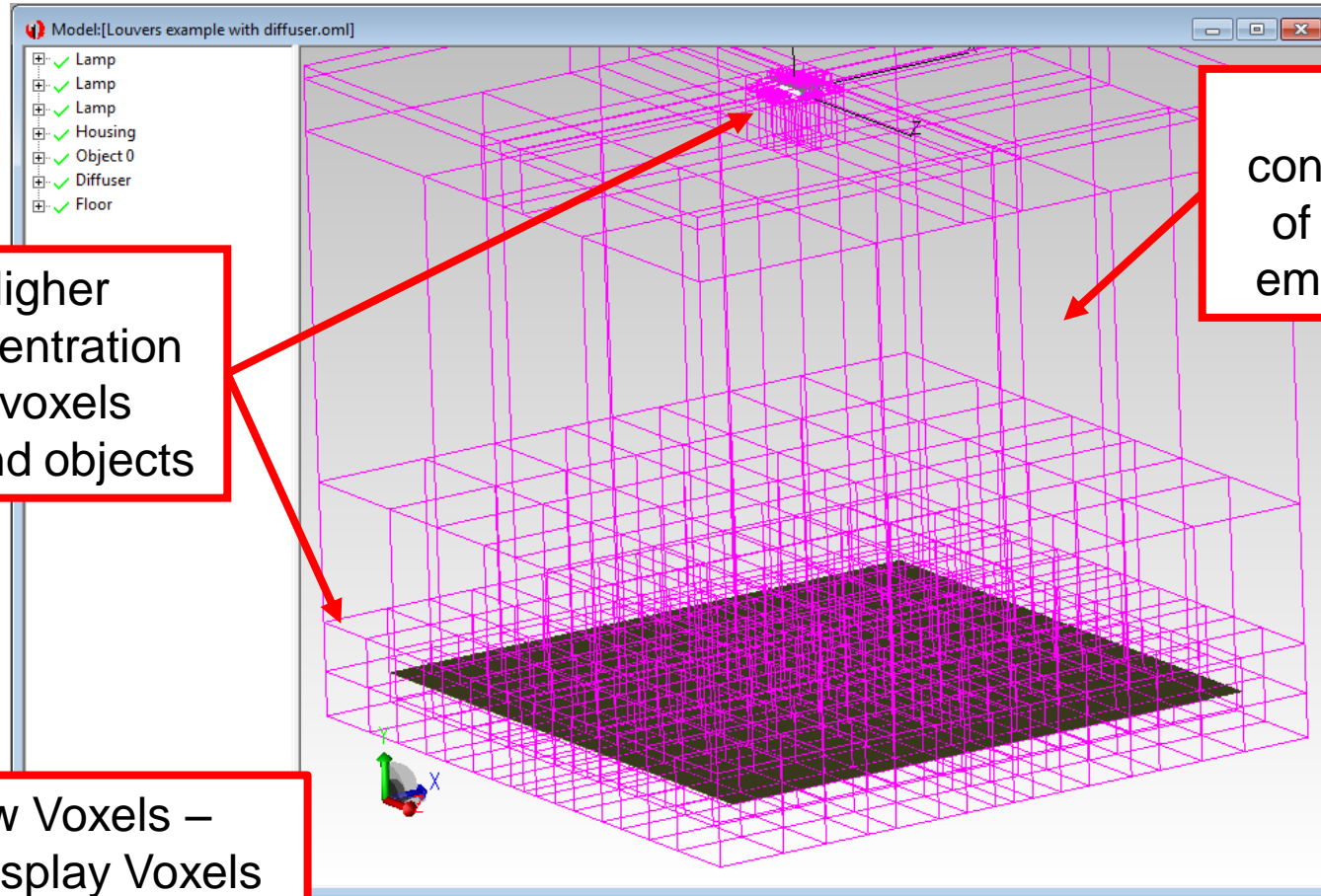
Voxel settings can be changed at Raytrace->Raytrace Options->Advanced

Speeding up Raytracing



Fluorescent fixture and floor model – 10 meters from fixture to floor

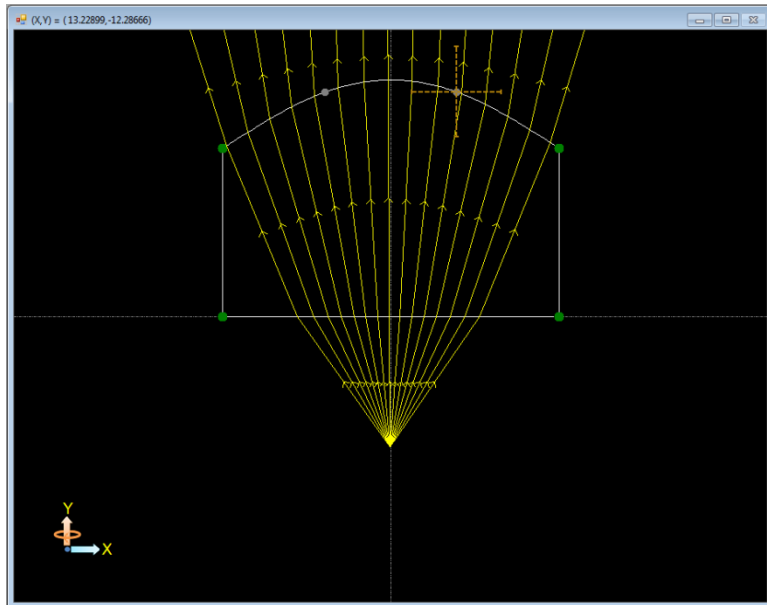
Speeding up Raytracing



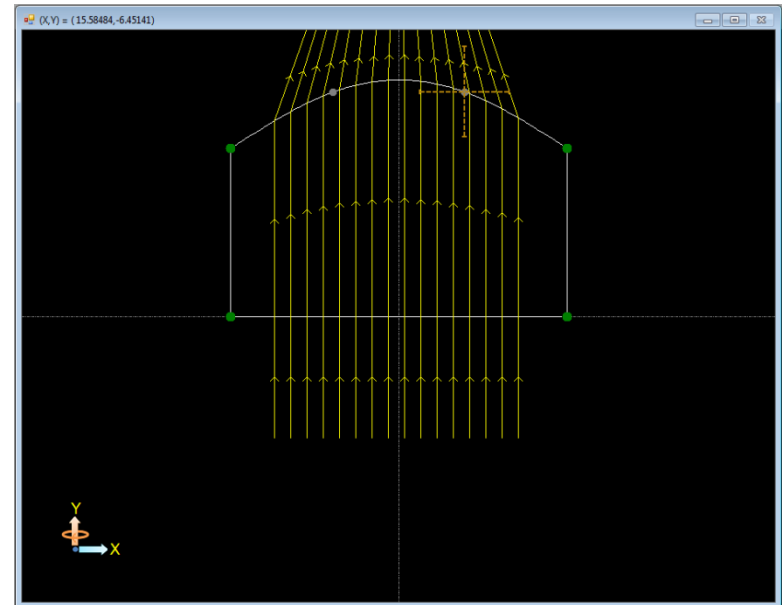
The Octree voxels version of this model raytraced 56% faster than the Uniform voxels version

Interactive Optimizer Tips

Interactive Optimizer Tips



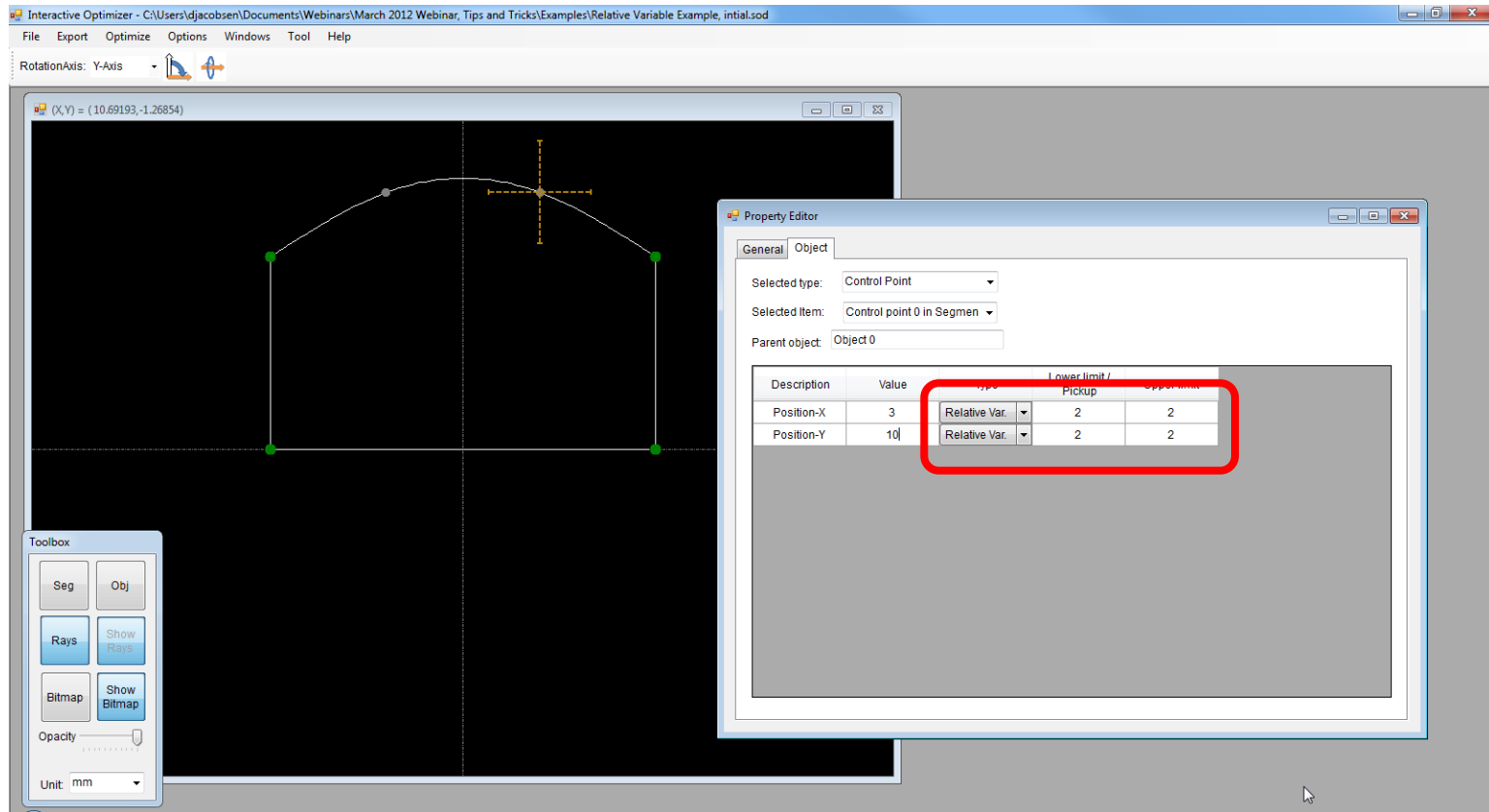
To make a Ray Fan, draw the initial ray by left clicking and dragging in the desired direction. Then press CTRL and make the fan by dragging left or right.



To make a Beam, draw the initial ray by left clicking and dragging in the desired direction. Then press Shift and make the beam by dragging left or right.

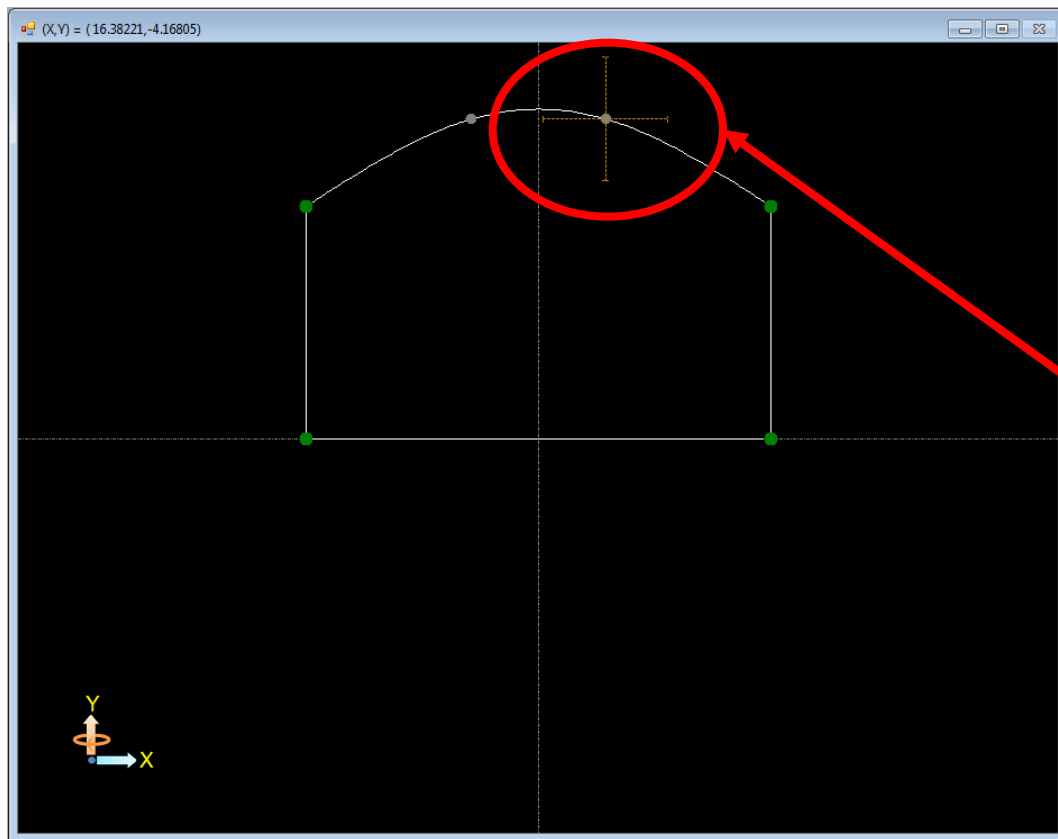
Making Ray Fans and Beams in the Interactive Optimizer Sketch Window

Interactive Optimizer Tips



Relative Variables are defined as being relative to the position of the control point on the segment

Interactive Optimizer Tips

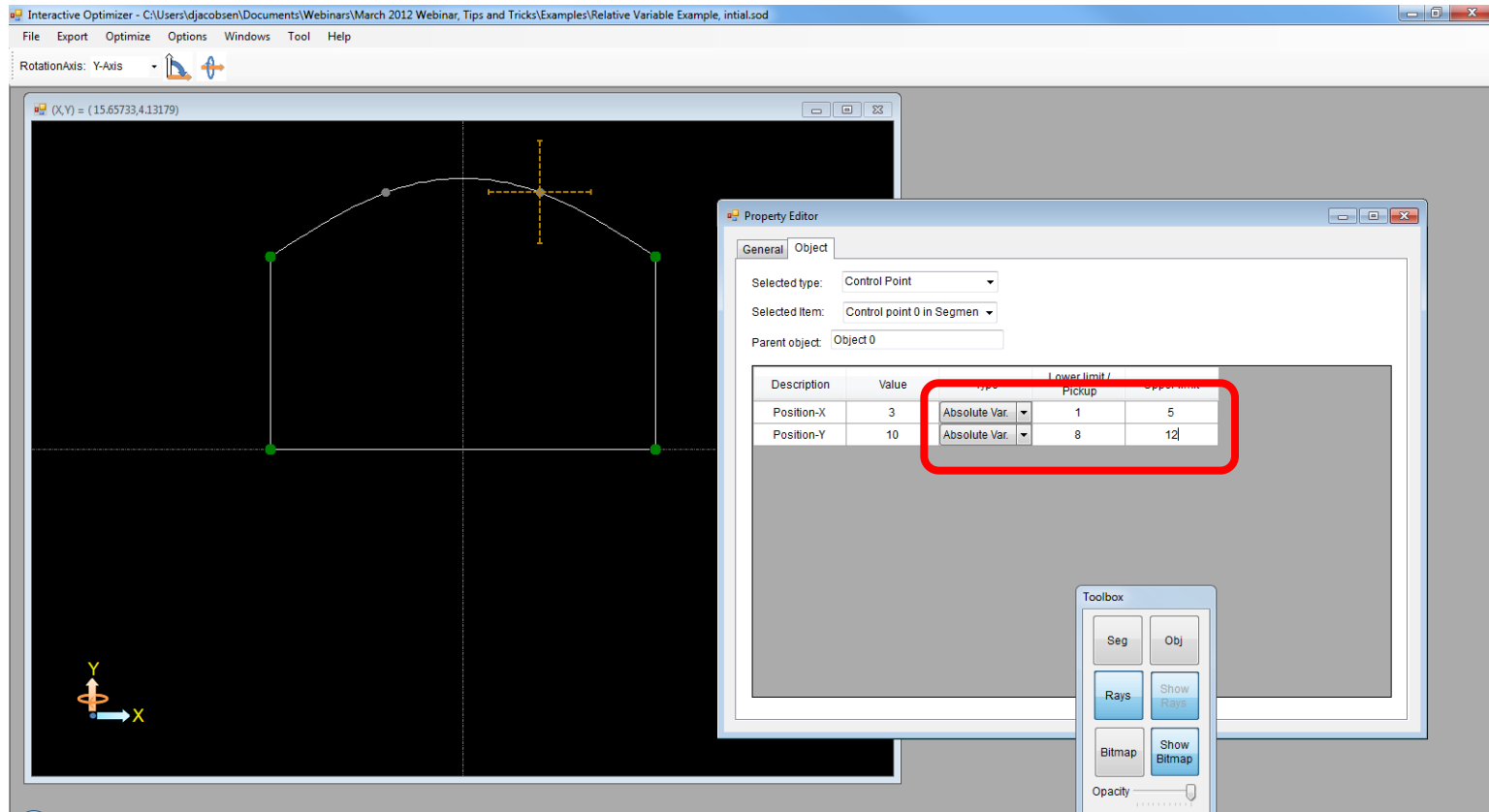


If you stop the optimization after the control point has moved, save the .SOD with the same name, and then re-open, the variable will be defined as relative to the new position of the control point.

This could lead to the creation of bad geometry such as self intersecting segments.

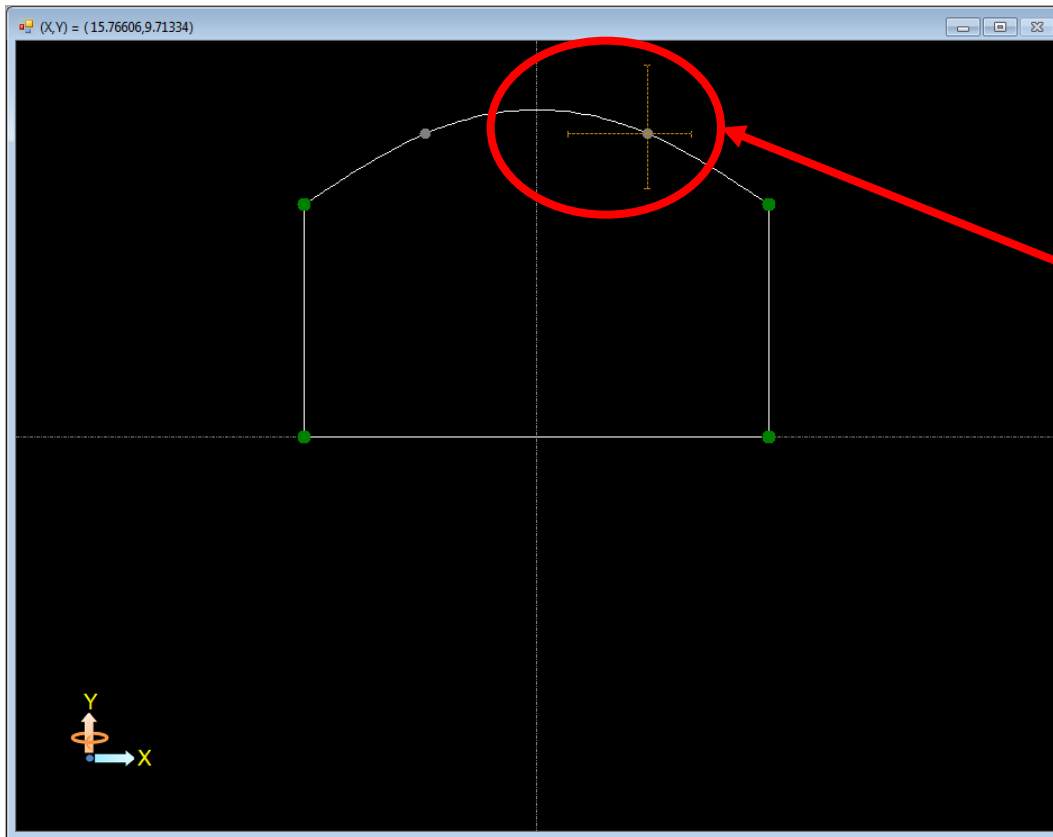
Relative Variables are defined as being relative to the position of the control point on the segment

Interactive Optimizer Tips



Absolute Variables are defined by absolute coordinates and are not tied to the current location of the control point

Interactive Optimizer Tips



If you stop the optimization after the control point has moved, save the .SOD with the same name, and then re-open, the variable will still have the same “range” as initially defined.

Absolute Variables are defined by absolute coordinates and are not tied to the current location of the control point

Current Promotions

OSLO Promotion

Customer who have purchased OSLO in the past, and are currently out of support ,can update to the current release of OSLO, OSLO 6.6, with one free year of support, for one low price. The price will depending on their edition of OSLO. Details of the promotion are shown below:

OSLO PROMOTION LIMITED TIME : APRIL 1, 2012 THROUGH JUNE 30, 2012

Note: * Good for anyone who previously owned OSLO * Multiple license discounts do not apply *

OSLO Node Locked License	<u>OSLO Promotional Pricing</u>
OSLO PREMIUM	\$1,500
OSLO STANDARD	\$1,125
OSLO LIGHT	\$750
Example:	
OSLO Premium Node Locked two years out of support -- Cost to customer \$1500.00	
OSLO Premium Node Locked ten years out of support -- Cost to customer \$1500.00	
OSLO Network License	<u>OSLO Promotional Pricing</u>
OSLO PREMIUM	\$1,875
OSLO STANDARD	\$1,500

Thank You

Questions and Answers

**For Additional Information
Please Contact:**

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