



Using the Photorealistic Rendering Capability in TracePro

Presented by :

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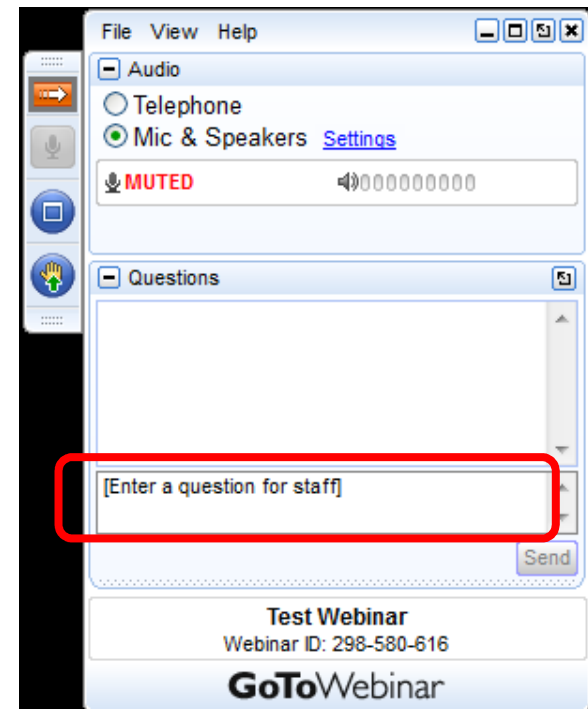
Vice President of Sales

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





Additional Resources

- Past TracePro Webinars
 - <http://www.lambdares.com/webinars/>
- TracePro Tutorial Videos
 - <http://www.lambdares.com/technical-support/videos>
- TracePro Tutorials
 - http://secure.lambdares.com/technical_support/tracepro/tutorials/
- Information on upcoming TracePro Training Classes
 - <http://www.lambdares.com/training/software-training>



Current TracePro Releases

- **TracePro 7.4** – Released today, Dec 19, 2013
- This release can be downloaded by anyone with a current Maintenance and Support Agreement
- www.lambdares.com



Webinar Topics

- Setting up the eye and target positions for the render
- Using both ambient and user defined sources
- Understanding the Photorealistic Render calculation
- Luminaire, Lightpipe and LED examples
- Best Methods to get good results
- Problem Resolution



Using the Photorealistic Rendering Capability in TracePro



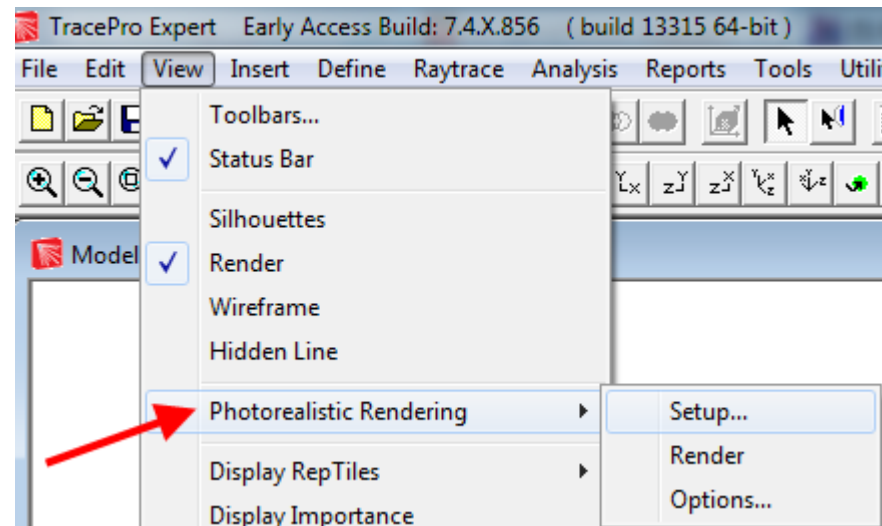
Photorealistic Rendering Basics

- The size of the system view sets the number of rays needed for the render. A smaller view correlates to a faster render.
- The rendering quality sets the number of rays for each rendering pass, each higher setting correlates to 10x number of rays traced
- After you render the view, you can set the brightness and contrast to increase or lower the intensity of the image for better results.



Photorealistic Rendering Basics - Setup

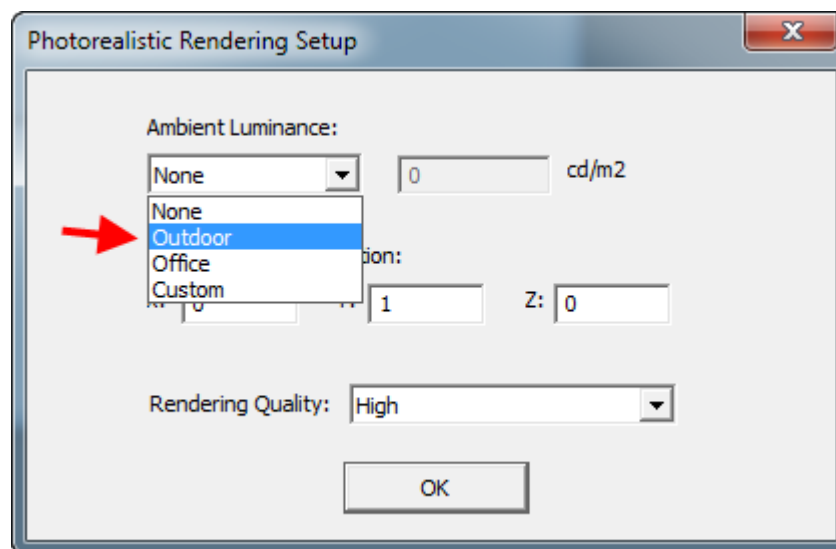
- The Photorealistic Rendering setup and render capability is launched from the View Menu in TracePro





Photorealistic Rendering Basics - Setup

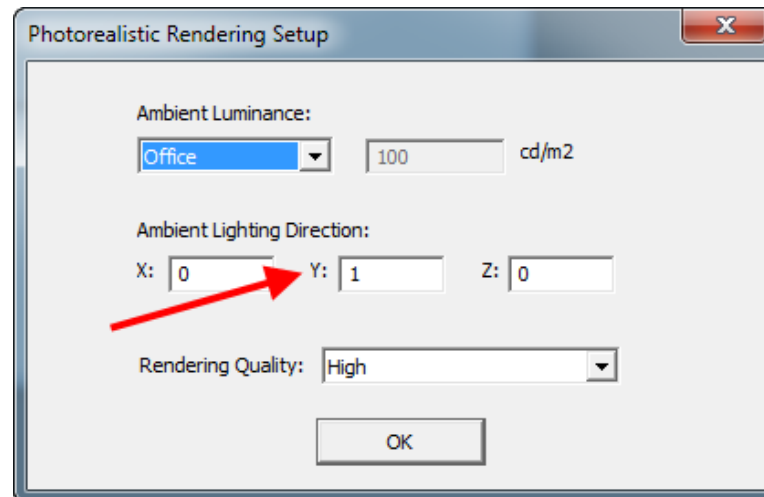
The Photorealistic Rendering setup has three options to set up ambient luminance sources using outdoor, office, and custom settings. Selecting the Outdoor source specifies a 30000 cd/m² source. The office selection is a 100 cd/m² source. These Ambient Luminance sources specify a hemispherical white light source emitting from the direction selected in the dialog. When you specify Y=1, this means the hemispherical source is positioned in the positive Y direction shining downward. The custom setting allows you to define the luminance level.





Photorealistic Rendering Basics - Setup

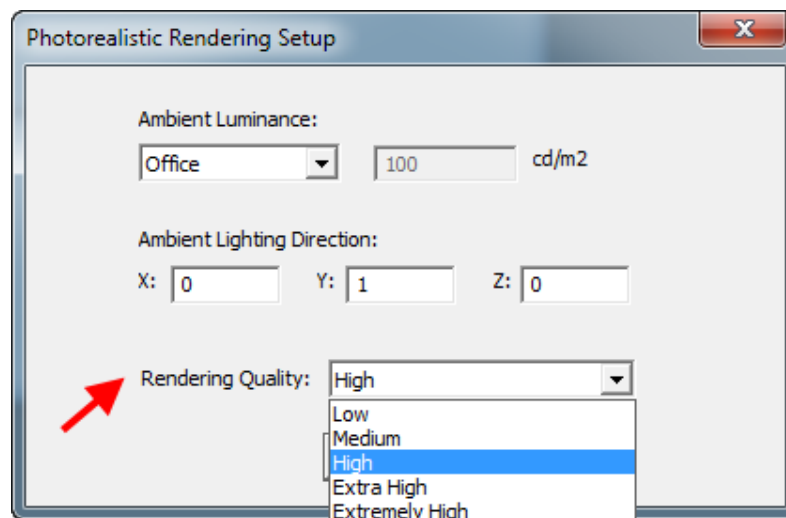
- Once you have selected an Ambient Luminance source, you can setup the source direction using the X, Y and Z direction fields. Setting the source to a positive Y direction sets the source to illuminate the system from above in the standard Y-Z projection for normal TracePro defined optical systems, as shown below.





Photorealistic Rendering Basics - Setup

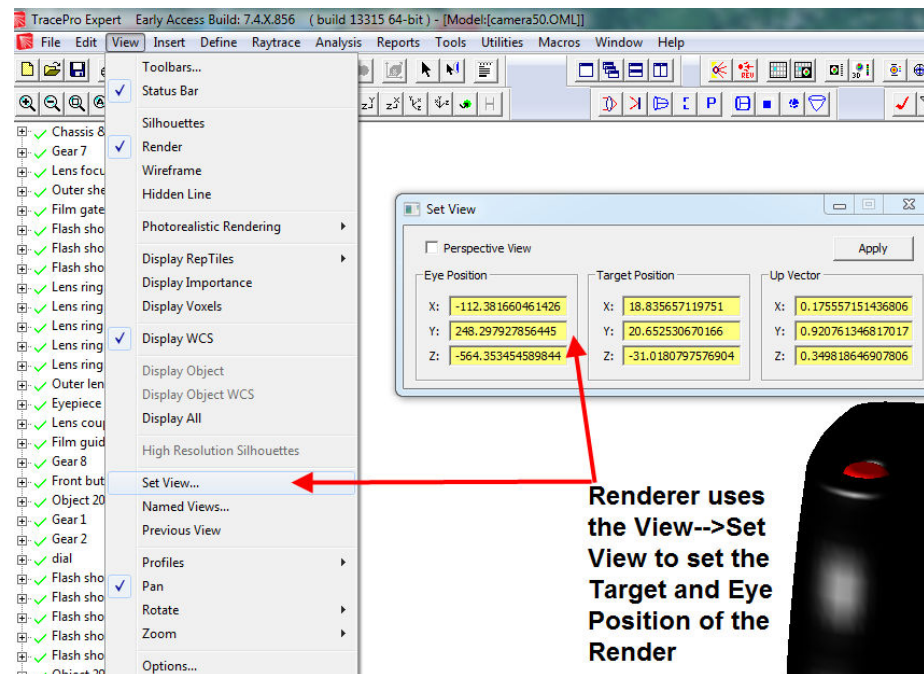
- The Photorealistic Rendering quality option has five settings: Low, Medium, High, Extra High, and Extremely High. Each higher setting sets the number of rays 10x higher for each photorendering calculation. The number of rays for Low resolution rendering is 10 rays per pixel, Medium is 100 rays per pixel, with 10X more rays for each higher setting.





Photorealistic Rendering Basics – Set View

- The View → Set View menu is the dialog to check to verify the Eye and Target Positions for the Render or you can just use the system view to setup the render. This dialog also sets the up Vector for the Rendered scene.





Photorealistic Rendering Basics – How it works

Wikipedia has an excellent article discussing the photon mapping capability as we have implemented it into TracePro. The link is:

http://en.wikipedia.org/wiki/Photon_mapping

Construction of the photon map (1st pass) forward raytracing

With photon mapping, light packets called *photons* are sent out into the scene from the defined TracePro light sources or ambient light sources. Whenever a photon intersects with a surface, the intersection point and incoming direction are stored in a cache called the *photon map*.

Rendering – Reverse Raytracing (2nd pass) In this step of the algorithm, the photon map created in the first pass is used to estimate the radiance of every pixel of the output image using reverse raytracing. For each pixel, the scene is ray traced until the closest surface of intersection is found.



Photorealistic Render– Examples

- Camera rendered model for low and medium settings using an ambient light source



Low Setting - Few Minutes to raytrace, 10 rays per pixel



Medium Setting – Couple of hours to raytrace, 100 rays per pixel,

Ambient Light Source



Photorealistic Render– Examples

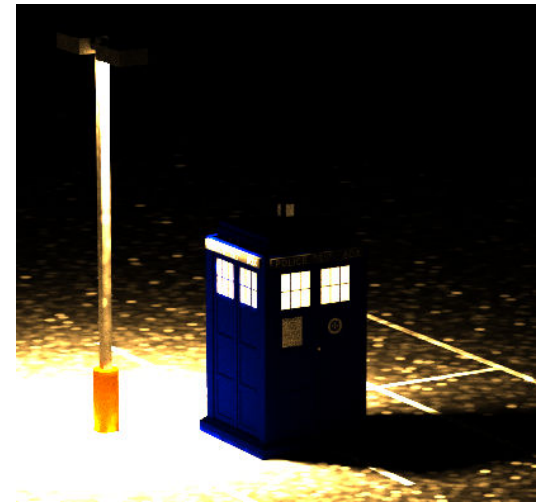
- Phone booth where we are using a TracePro defined light source emitting from above the phone booth.



Low Setting – Few Minutes



Medium Setting – Few hours to raytrace



High Setting – 90 Hours to raytrace and render

TracePro Defined Surface Source Emission



Photorealistic Render– Examples

- TracePro logo lightbar example



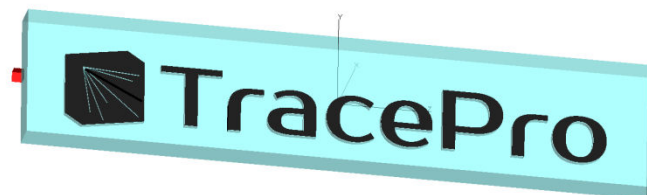
Low Setting – One Minute



Medium Setting – Ten Minutes



High Setting – 4 Hours to render



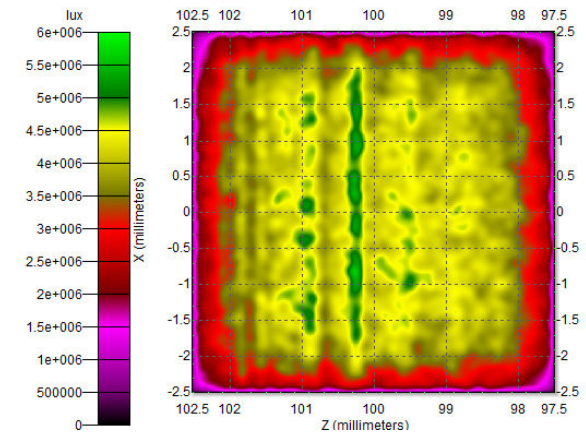
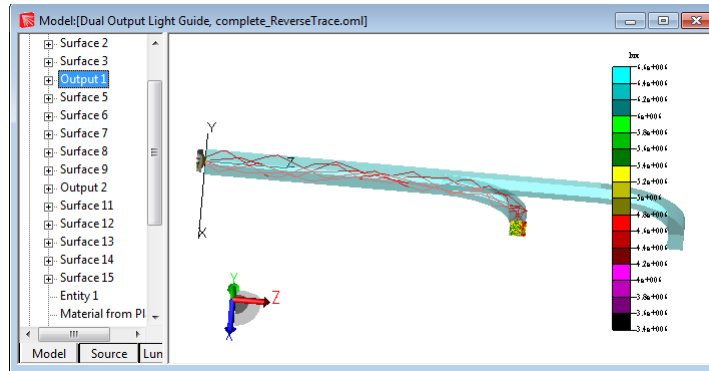
Extra High Setting – 40 Hours to render

TracePro Defined Surface Source Emission

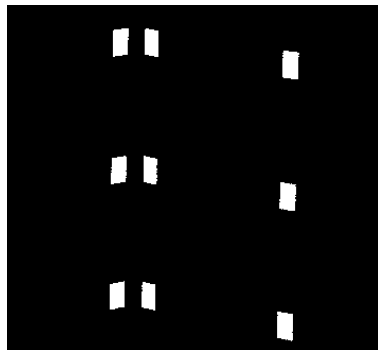


Photorealistic Render– Examples

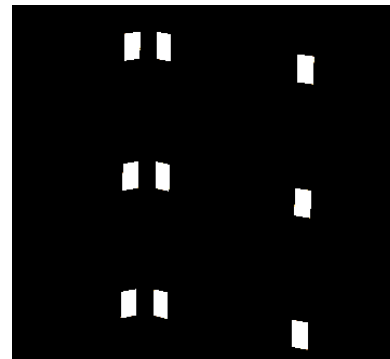
- TracePro dual lightpipe example



Irradiance Map on output surface



Low Setting – One Minute



Medium Setting – 10 Minutes



Medium Setting – 30 Minutes,
Moldtech Texture on output face,
much better uniformity

TracePro Defined Surface Source Emission



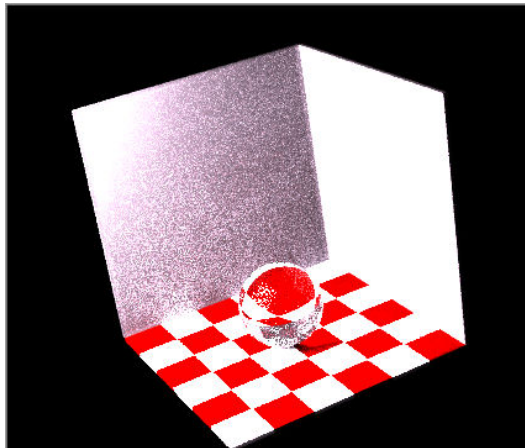
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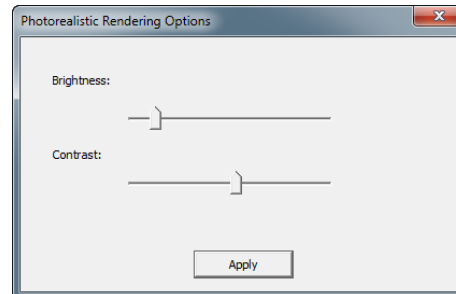
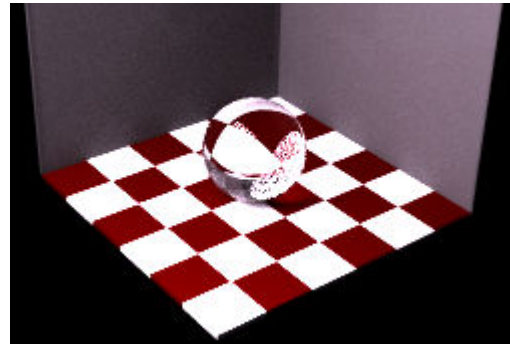


Photorealistic Render– Comparison to Luminance Calculation

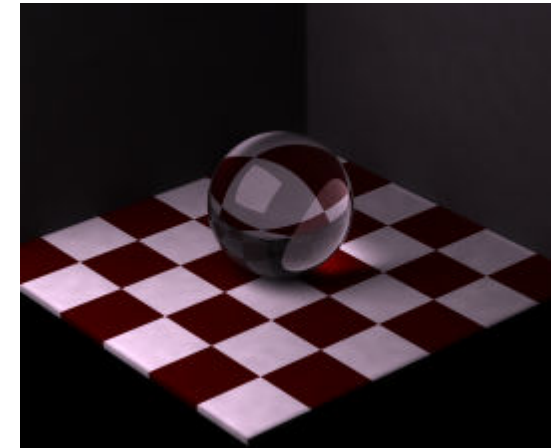
- Chessboard with glass sphere



Low Setting – Fifteen Minutes, 10 rays per pixel, brightness and contrast normal settings



Medium Setting – 2 hours, Brightness at 15 percent



Luminance Calculation – Ten Hours

Ambient Light Source from Above



Photorealistic Rendering - Dell Lightpipe Simulation versus Measured Results

- A full presentation on TracePro's photorealistic rendering versus simulation results can be downloaded at:

http://www.lambdares.com/images/modules/documents/2013_TracePro_Dell_Conf_Taipei.pdf

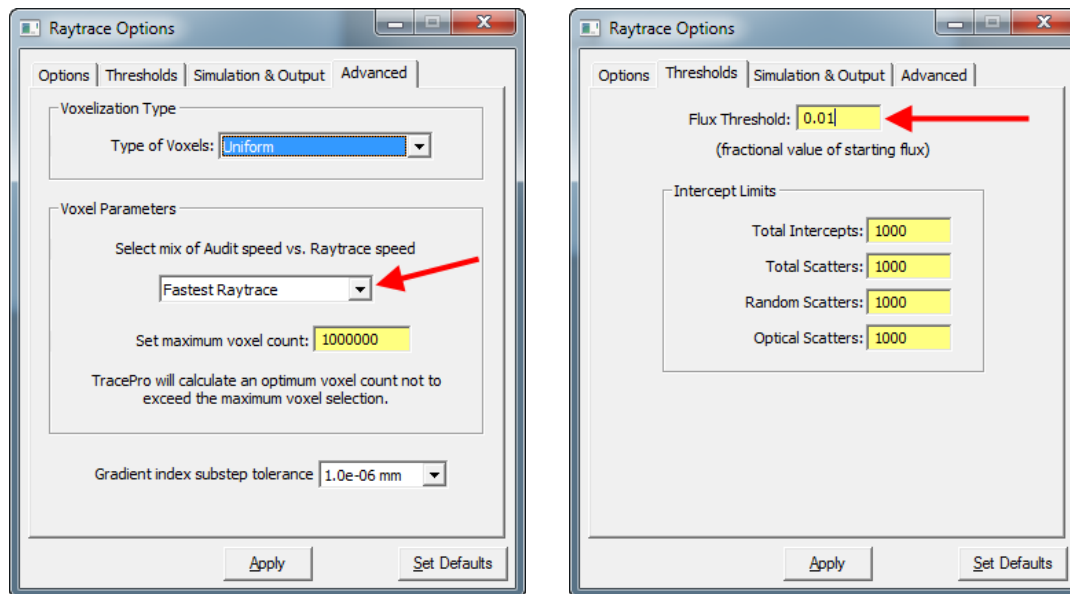
- This presentation shows measured lit appearance versus TracePro's photorealistic rendering. It is 2.6MB in size.

- This talk was given at the Taiwan user conference, November 2013.



Photorealistic Rendering – Best Methods

- Set the Raytrace→RayTrace Options→Advanced Tab setting to Fastest Raytrace, and Thresholds→Set Flux Threshold to .01.

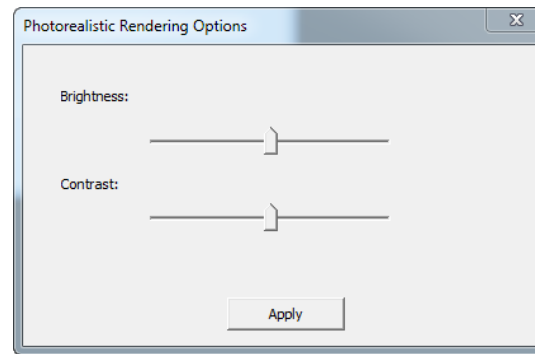


- Next, set the view size to a small window size, say 100 pixels by 100 pixels and set the Render Quality to Low. Then check the results to get an idea of how long your Photorealistic Render will take.



Photorealistic Rendering – Best Methods

- You can change the Brightness and Contrast Settings after you render using the Views→PhotoRealistic Render→Options, by default these setting are set to 50 percent maximum.



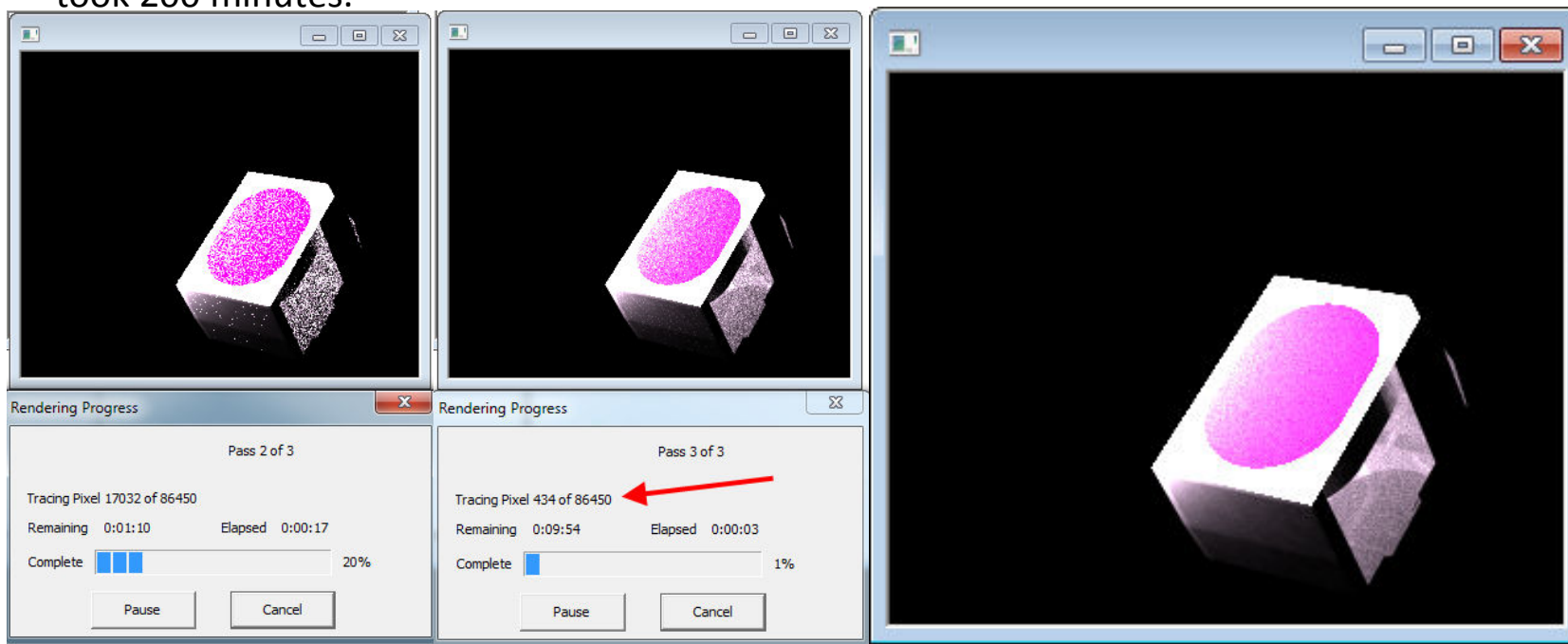
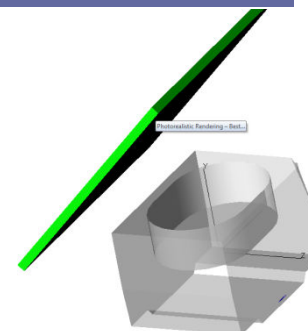
- After you are satisfied with a low resolution plot set the Render Quality and View to higher quality setting and pixel resolution as desired. Remember that each higher render setting takes 10x the time of a lower setting, and a view size twice as big will take four times longer to raytrace.

- If you select the High Render Quality setting, each progressive render pass is shown, in this case both the Low and Medium pass results are shown after each pass is completed with the final figure showing the High Render Quality pass.



Photorealistic Rendering – Pass Info

• If you set the Render Quality setting to High, each progressive rendering pass is shown on completion. The LED Emission from the LED emitting phosphor at .4 microns is shown below for each pass, Low, Medium and High. This example uses two light sources, the LED emission from its phosphor layer and an lambertian emitter above. The first pass took 2 minutes, the second Medium pass took 20 minutes and the High pass took 200 minutes.





Photorealistic Rendering – Problem Resolution

• If you have problems with no light output shown in your render use the following steps to reverse raytrace the system and verify that your target surface is able to get light based on the view that was set. The reverse raytrace steps are shown below:

1. Create target surfaces that are eye positions where you want to check the luminance at
2. Specify that these eye positions are Exit surfaces (targets) in TracePro
3. Create Importance sampling targets (IT) for these Exit surfaces (you can view these importance targets by using View → Display Importance)
4. Reverse Raytrace (Raytrace → Reverse Raytrace)
5. Look at the irradiance maps for each of the exit surfaces



Photorealistic Rendering – File Sources

- Ray File Sources are not supported in the 7.4 release. Expect this in a future release of TracePro.
- If you want to use Ray Files use the following procedure to export a ray file to a surface source using the Surface Source Utility
 1. Create the Ray File Source in TracePro
 2. Put a Sphere in front of the source or use the missed rays option to create a candela plot
 3. Do a Candela plot
 4. Screen capture this plot and copy it into the Surface Source Utility
 5. Then digitize in the full angular information, add spectral information if desired and then export as a surface source property.



Questions & Answers

QUESTIONS & ANSWERS



A recording of this webinar and a copy of the slides will be available shortly in the Webinars section of our website:

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



Thank You



For Additional Information Please Contact:

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