



Lighting Design Using TracePro: A Step-by-Step Approach

Presented by :

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Moderator:

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Presenter:

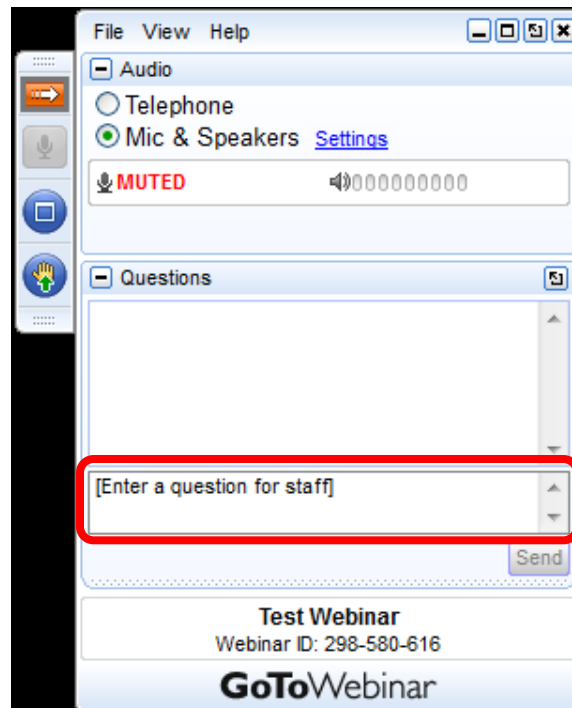
Dave Jacobsen

Senior Application Engineer

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





Lighting Design Using TracePro: A Step-by-Step Approach

Webinar Topics

- Using the capabilities and utilities in TracePro as part of a step-by-step approach to speed and simplify the lighting design process
- The role of TracePro utilities such as the Surface Source Property Generator, 3D Interactive Optimizer, and the IES/LDT Import utility in the lighting design process
- Importing existing CAD designs into TracePro

Webinar Topics

- Using the analysis tools in TracePro to analyze and improve the results of a light design
- Exporting the design for manufacture
- Questions and Answers

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

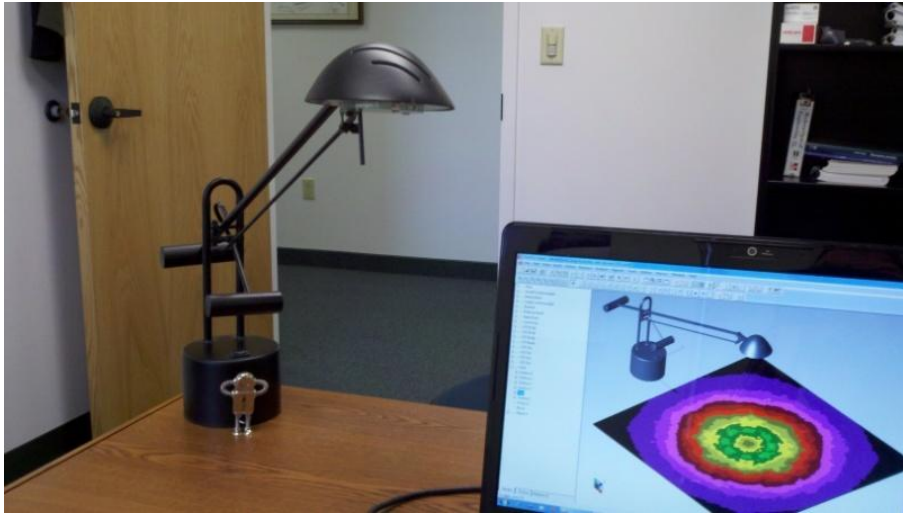
- http://www.lambdares.com/technical_support/training/

Current TracePro Release

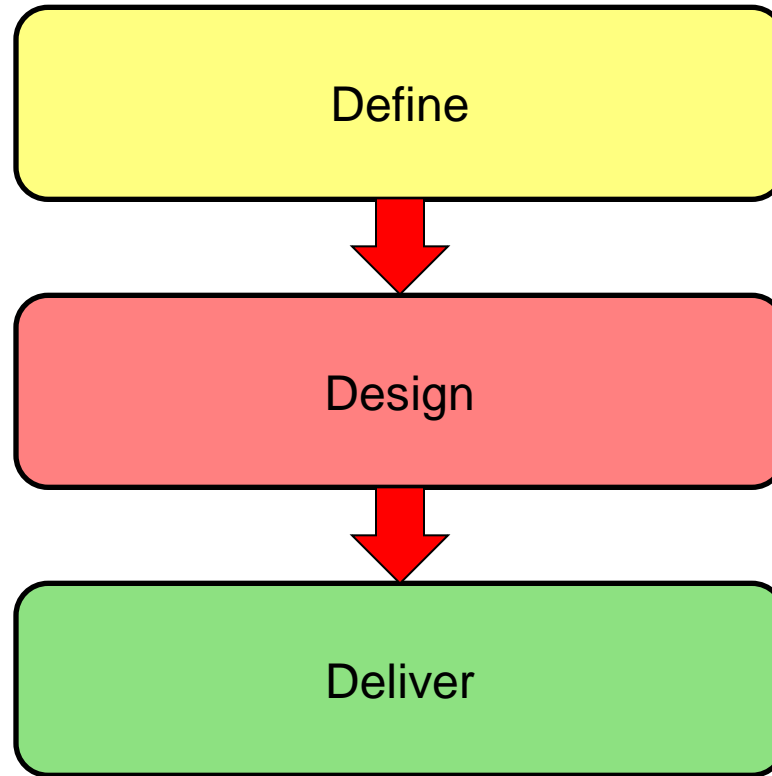
- **TracePro 7.2.4** – Released Oct. 23, 2012
- Can be downloaded by anyone with a current Maintenance and Support Agreement
- www.lambdares.com

Lighting Design Using TracePro

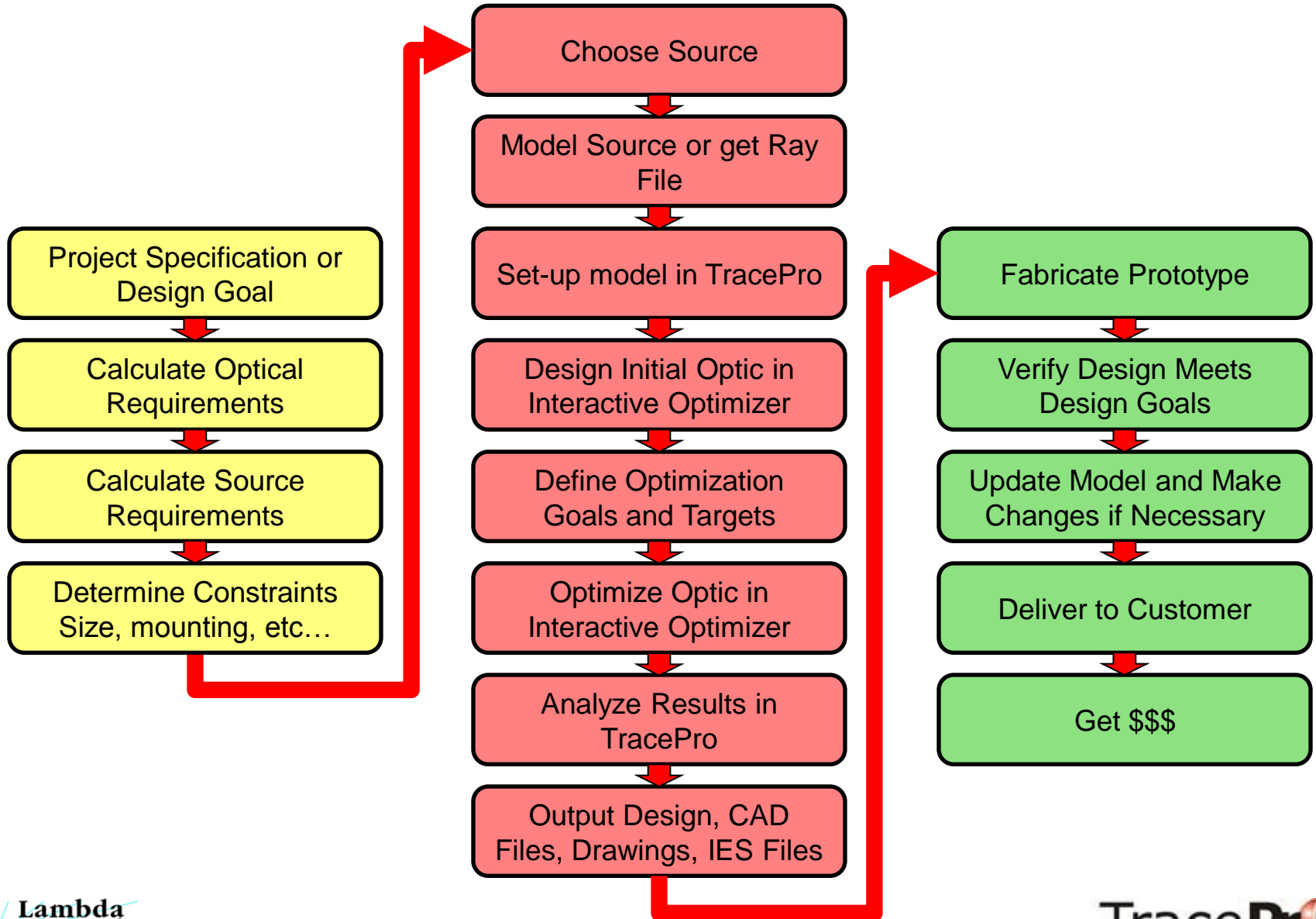
What is Lighting Design?



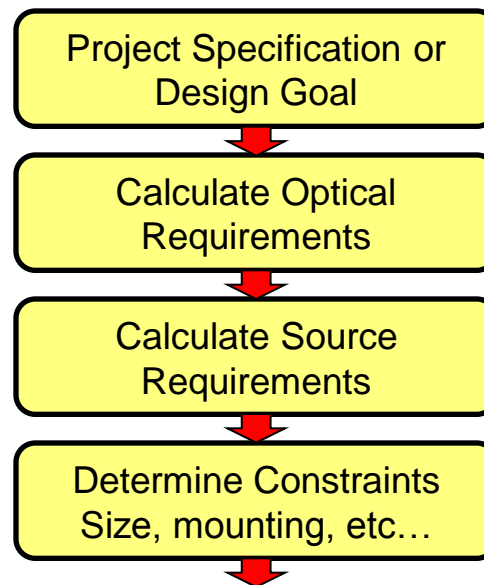
Lighting Design - A Step-by-Step Approach



Lighting Design - A Step-by-Step Approach



Lighting Design – Define Specifications



Lighting Design – Define Specifications

Examples of Lighting Specifications

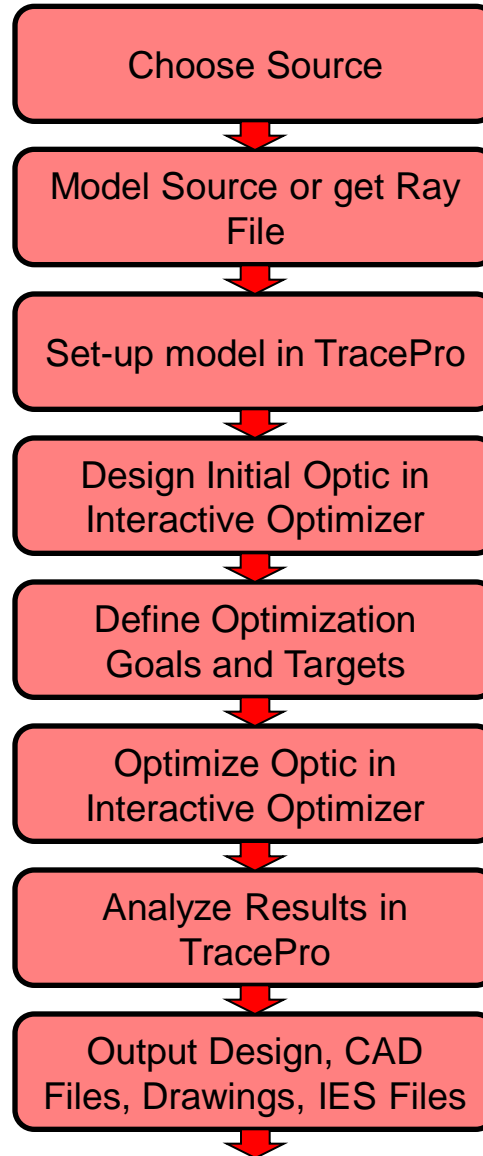
- Area to be illuminated
 - Type of source
 - Total lumens
 - Illuminance requirements
 - Beam pattern / Candela distribution
 - Spectrum / color requirements
 - Mechanical size
 - Power requirements
 - Life expectancy
 - Regulatory/Certification requirements
-
- This can sometimes be the most difficult part of the process
 - Example : IR surveillance light specified in lumens

Lighting Design – Define Specifications

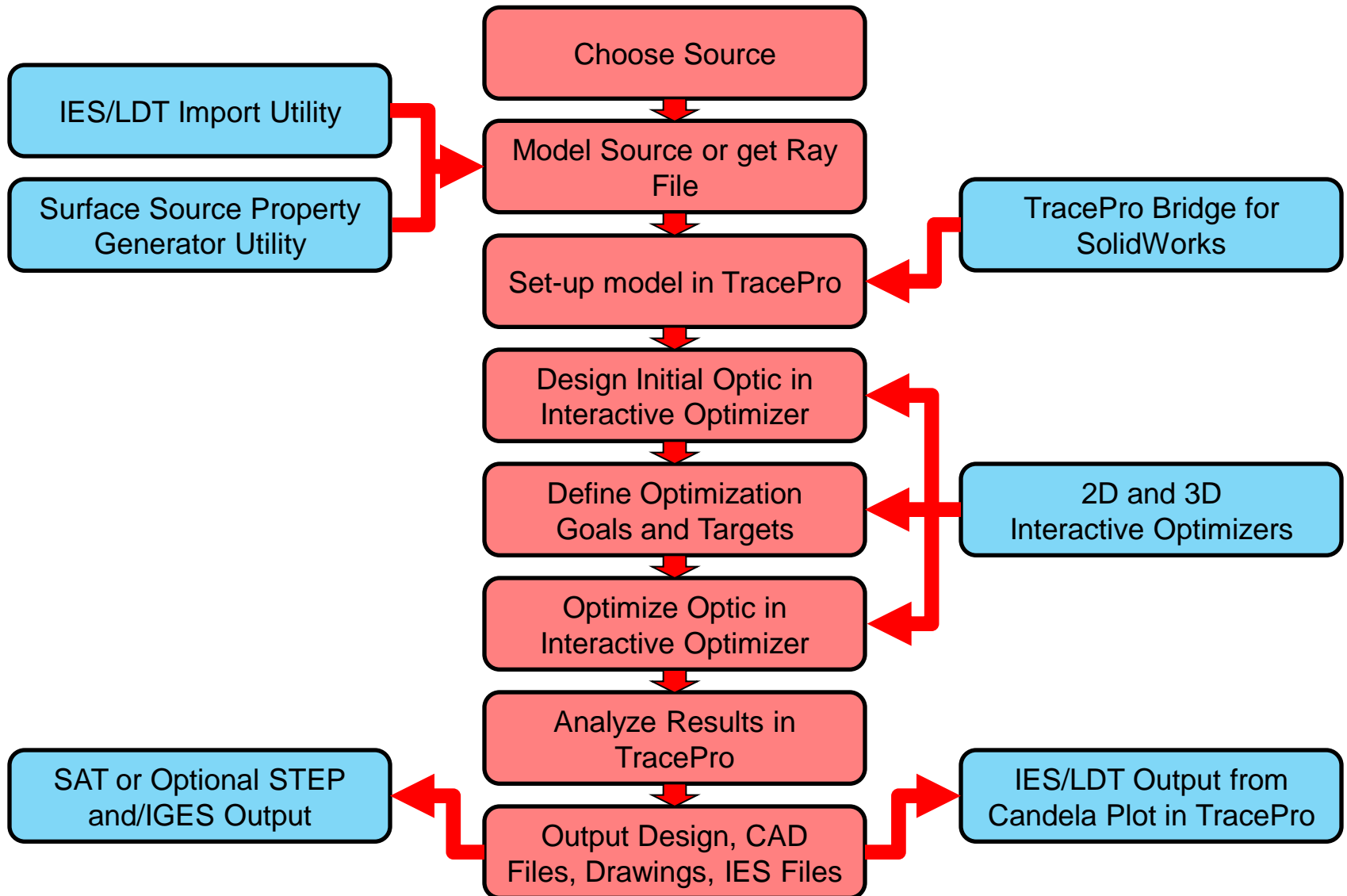
Use Specifications to Calculate System Requirements

- Calculate lumens requirement
- Calculate beam angle needed
- Calculate source requirements, number of LEDs if using LEDs. Allow for a margin-of-error when calculating the number of LEDs or the source power.
- Choose the source that meets the requirements
- Choose the source before starting the optical design
- Please see our June 2011 webinar “*LED Lighting Design*” for example calculations

Lighting Design – Design Process



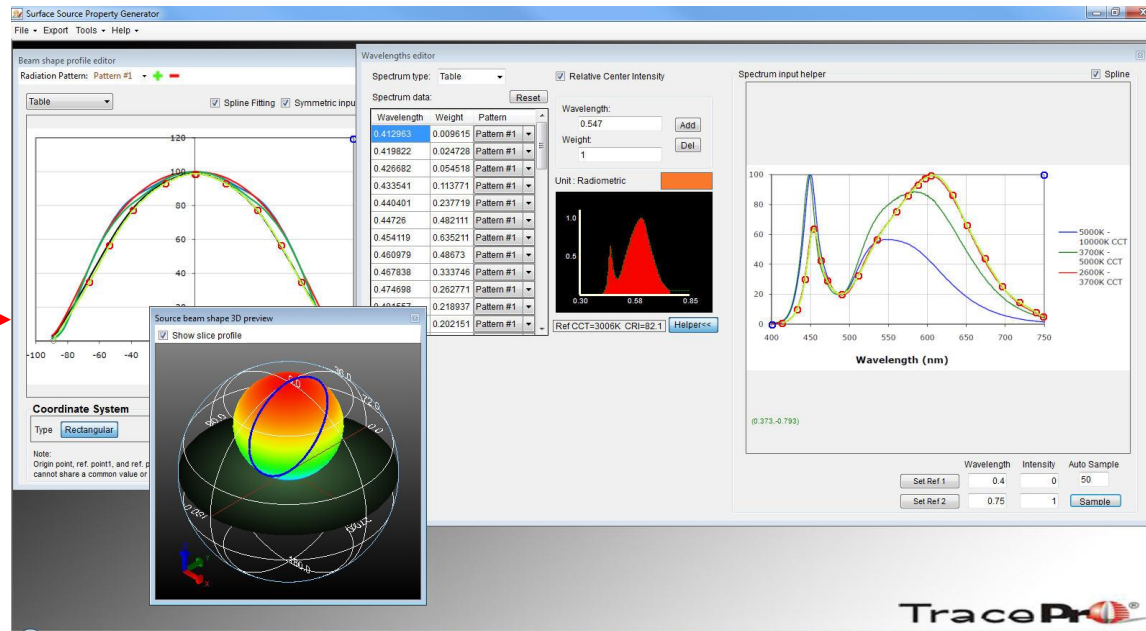
Lighting Design – TracePro Utilities



Lighting Design – Modeling the Source

Surface Source Property Generator Utility

Datasheet



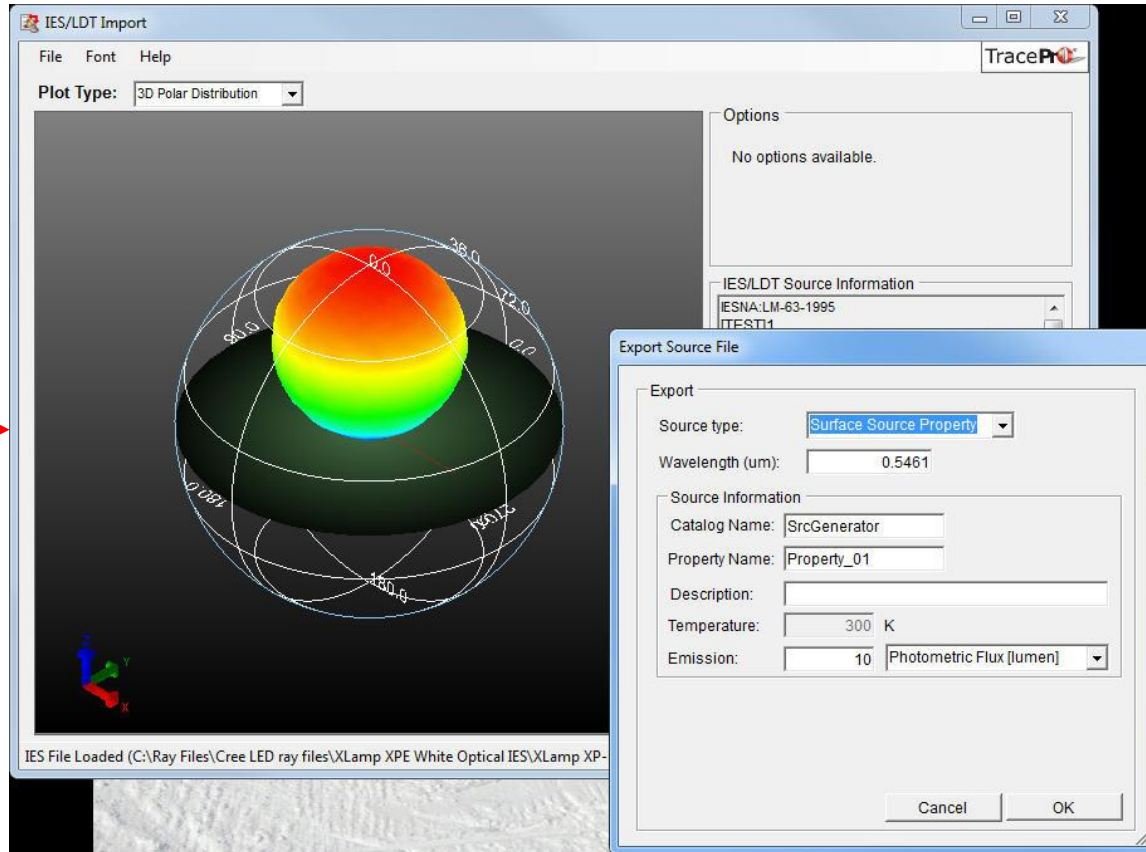
Surface Source Property

Please see our Video Tutorials “Making and LED Surface Property” and “Making an Asymmetric LED Surface Property” for more details on Surface Source Property Generator Utility.

Lighting Design – Modeling the Source

IES/LDT Import Utility

IES/LDT File



File Source or Surface Source Property

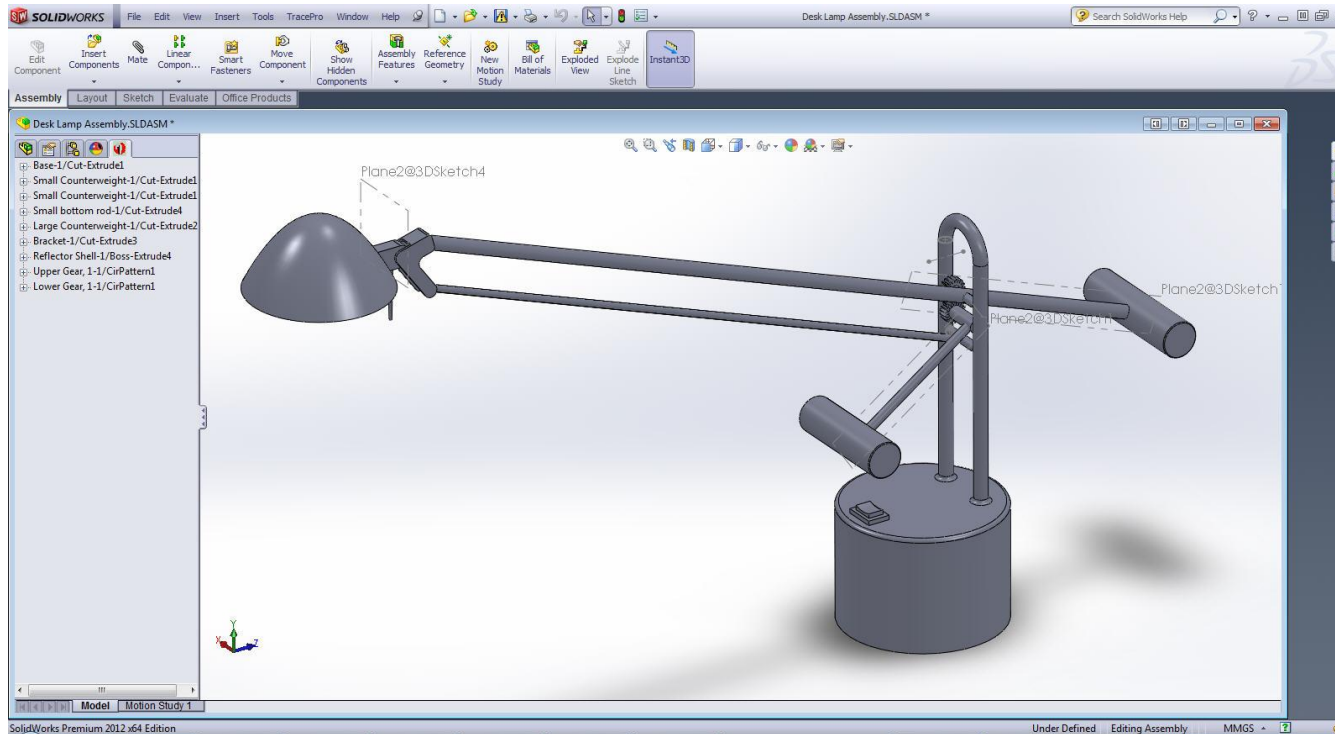
Please see our October 2010 webinar
“IES Files – Import, Export, Use in TracePro”

Lighting Design – Modeling the Source

- Rays files are another option for modeling the source. They can typically be downloaded from the manufacturer's website. They are usually available in formats for most optical design and analysis programs, so make sure to download the TracePro version. Ray files are used as File Sources in TracePro.
- IES files are a type of ray file. Though note that ray files treat the source as a point source, so this can be a problem with some types of design.
- Please see our July 2012 webinar on “*Accurate LED Source Modeling using TracePro*” for more information on modeling sources in TracePro.

Lighting Design – TracePro Model

TracePro Bridge for SolidWorks



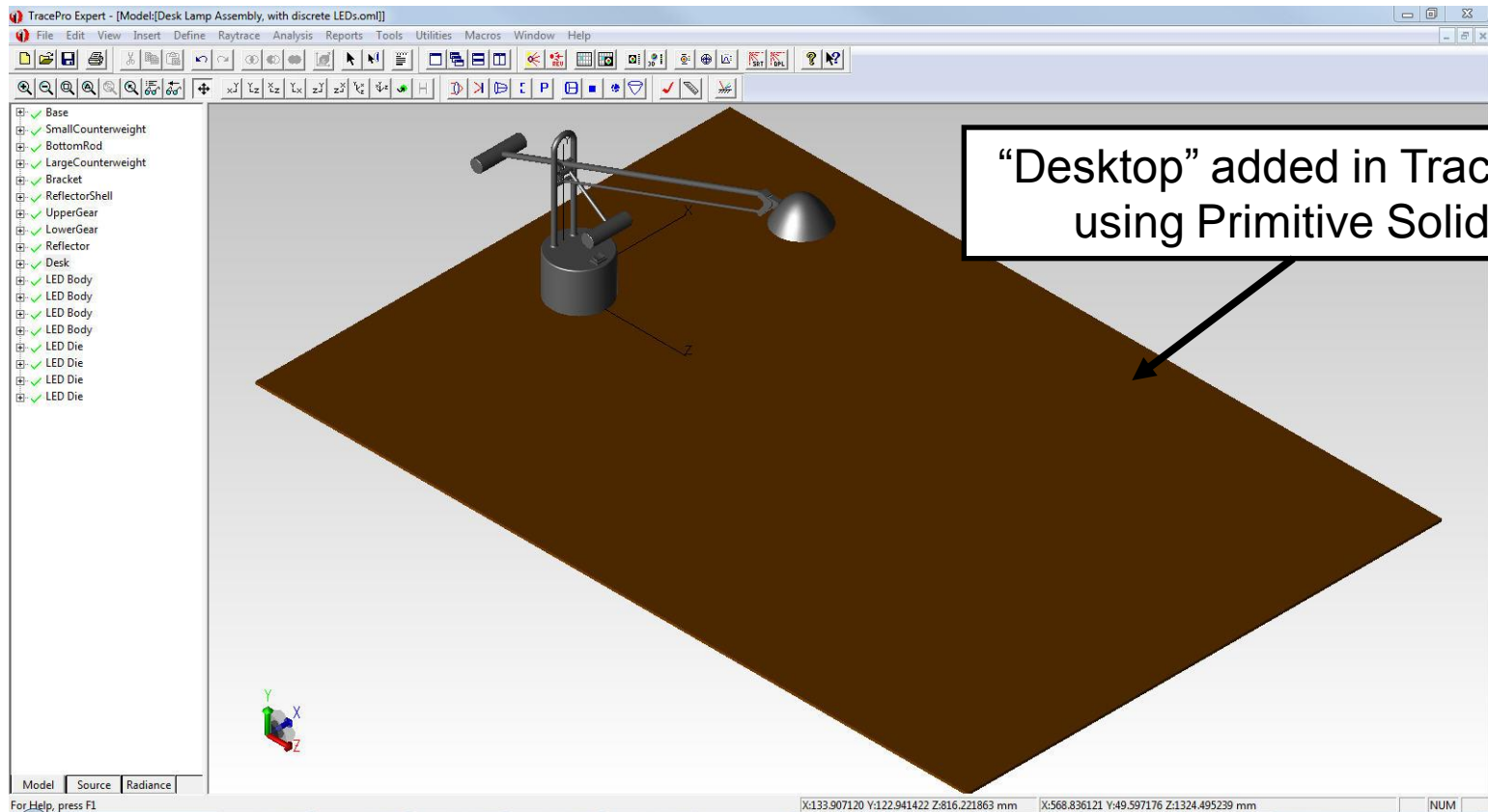
Export
SolidWorks
model to
TracePro as
.OML, .SAT,
STEP, or
IGES file

Please see our April 2011 webinar
“*TracePro Bridge for SolidWorks*”

Lighting Design – TracePro Model

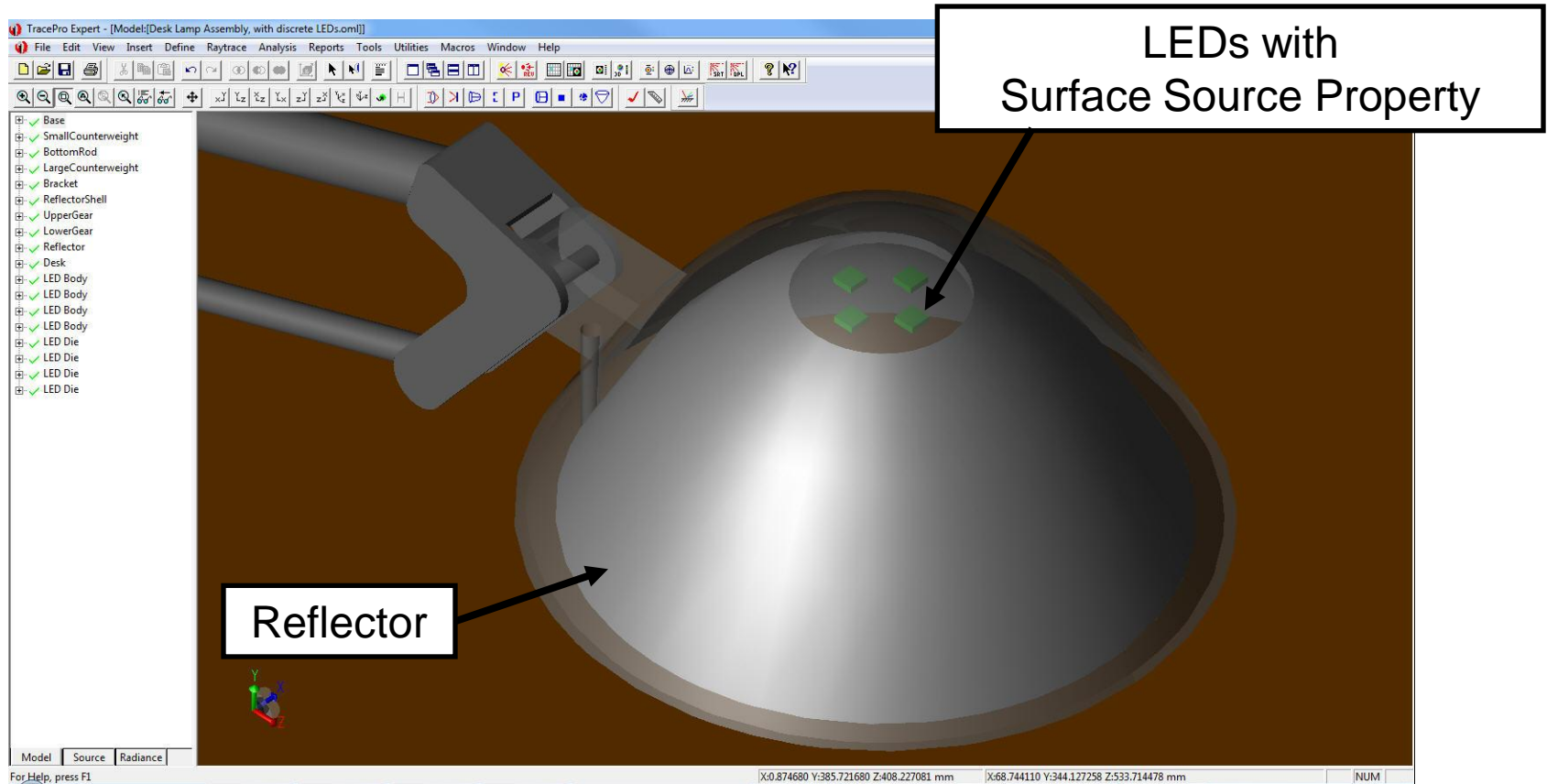
- 3D Solid Models can also be exported to TracePro from most CAD programs including Pro/Engineer, Inventor, CATIA, Rhino, etc...
- The most common file formats are .SAT, .STP, and .IGS.
- IGES and STEP require an optional translator for TracePro.
- No translator is required for .SAT files. Also known as ACIS.
- Geometry can also be created directly in TracePro as well as in the TracePro 2D and 3D Interactive Optimizers.

Lighting Design – TracePro Model



SolidWorks assembly in TracePro. Saves as .OML using the TracePro Bridge for SolidWorks and then imported into TracePro.

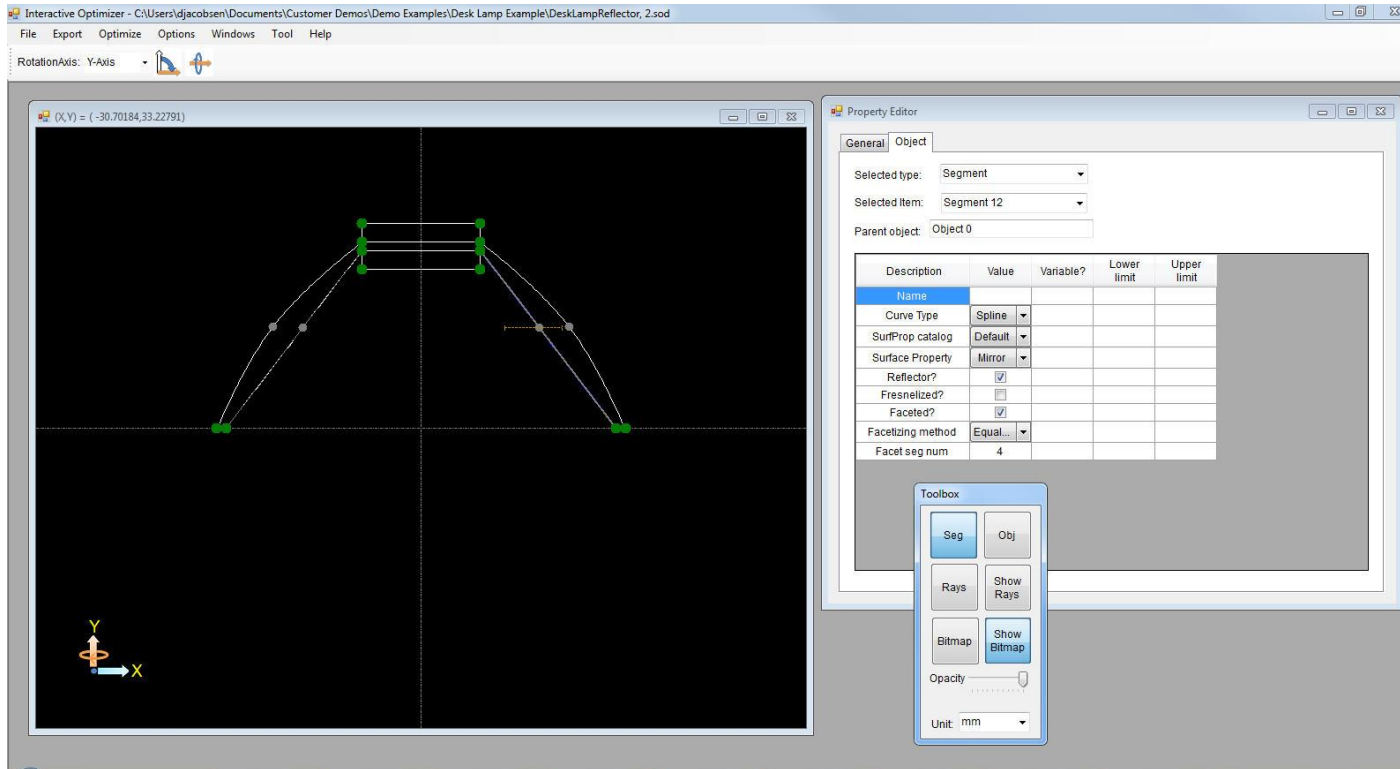
Lighting Design – TracePro Model



Four LEDs added in TracePro using Primitive Solids to model the LEDs. A Surface Source Property was applied to each LED. The reflector was created with the 2D Interactive Optimizer Utility.

Lighting Design – Optimization

TracePro 2D Interactive Optimizer

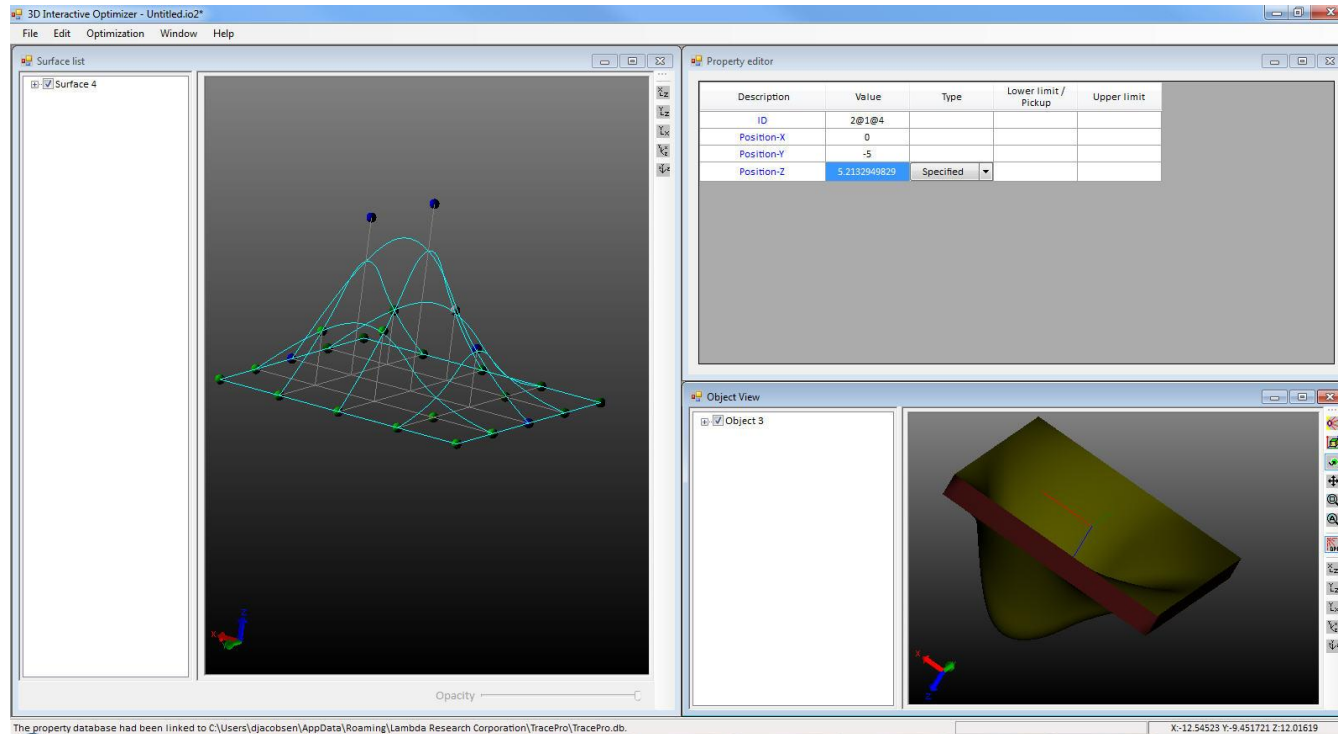


Send initial reflector design and optimization iterations to TracePro

Please see our January 2012 webinar “*2D Interactive Optimizer to Design Optical Reflectors*” for more details on reflector design using the TracePro Interactive Optimizers.

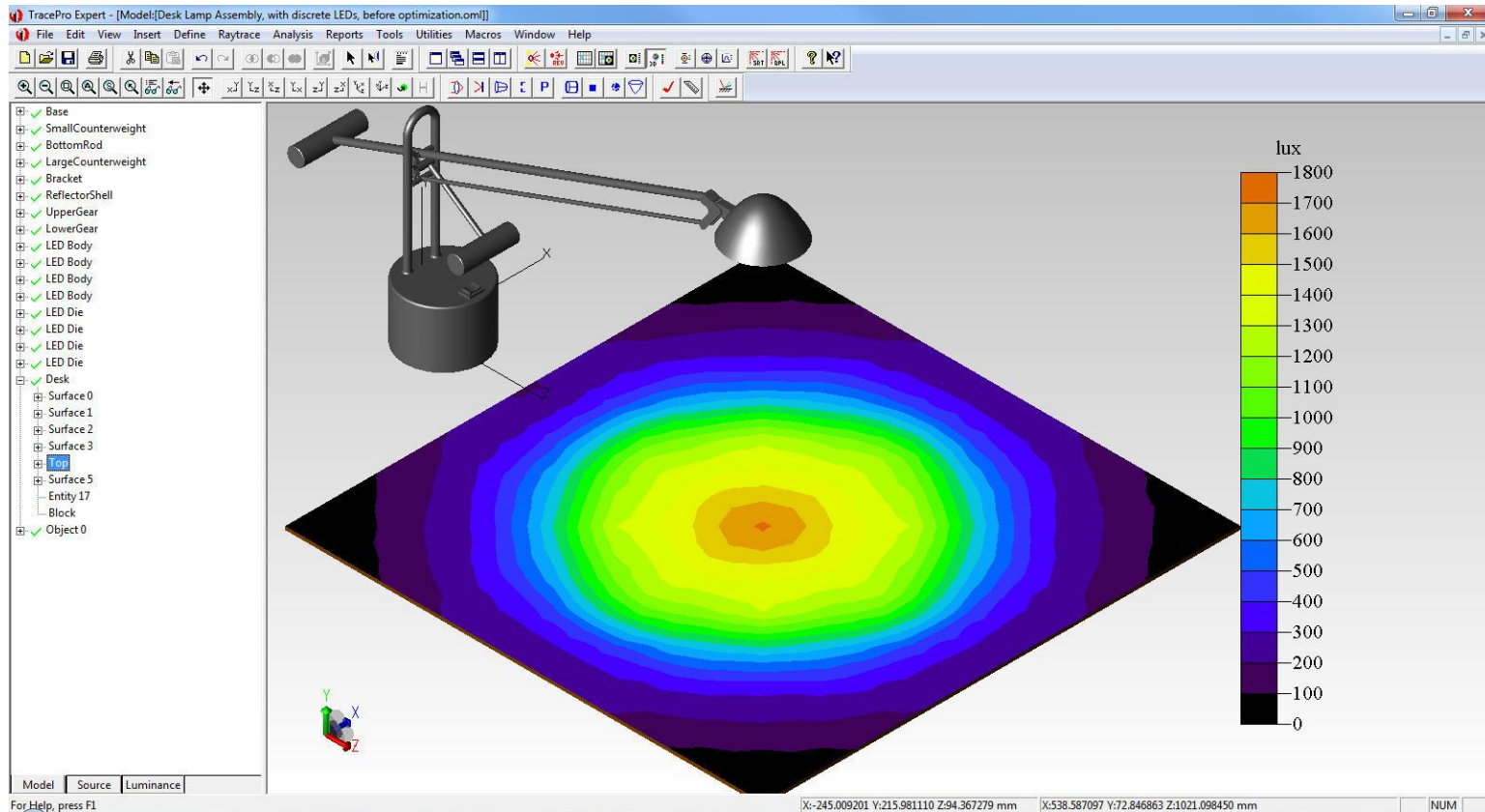
Lighting Design – Optimization

TracePro 3D Interactive Optimizer



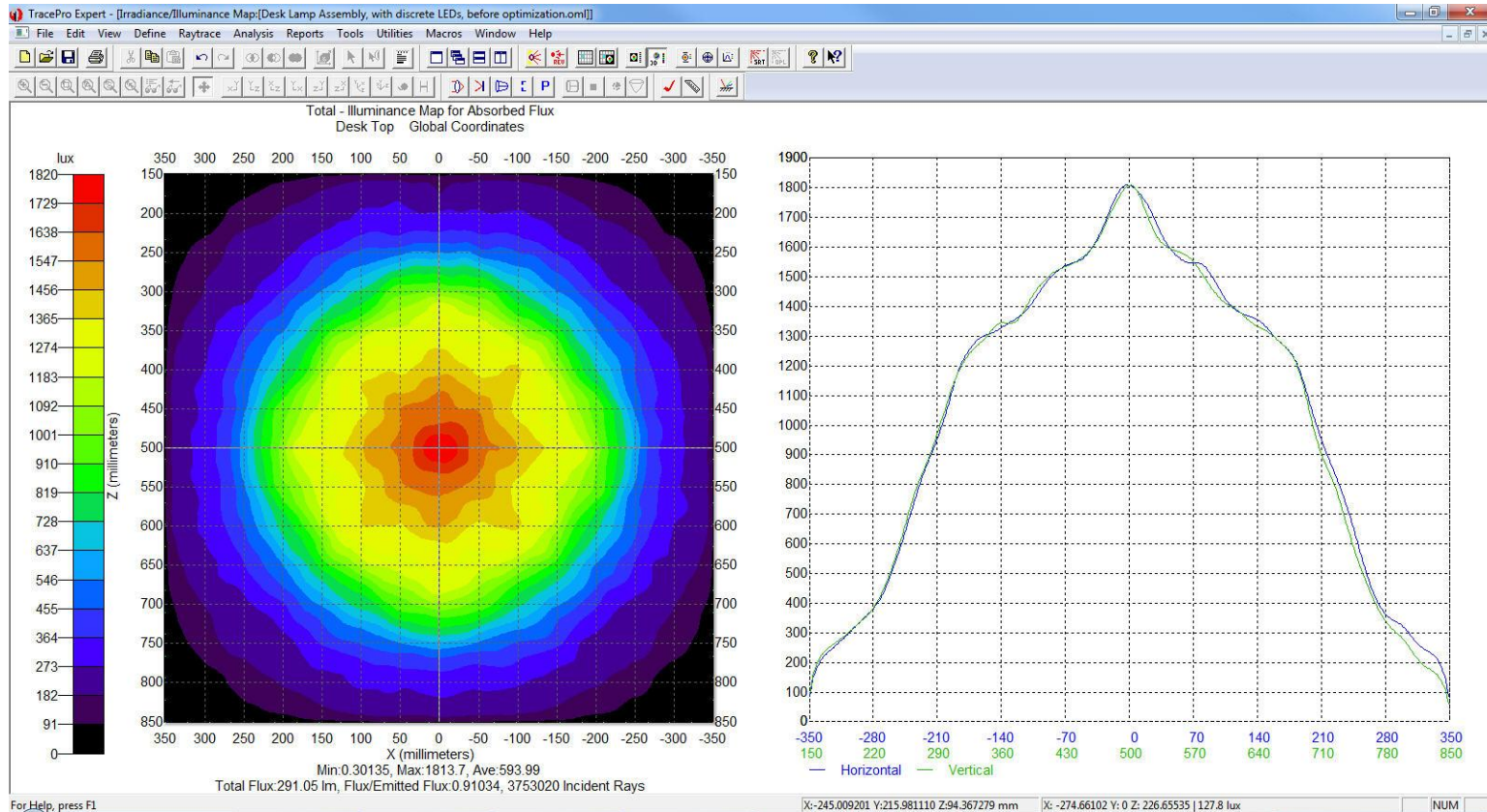
Optic designs and optimization can also be done in the new TracePro 3D Interactive Optimizer, especially useful for asymmetric designs.

Lighting Design – Optimization



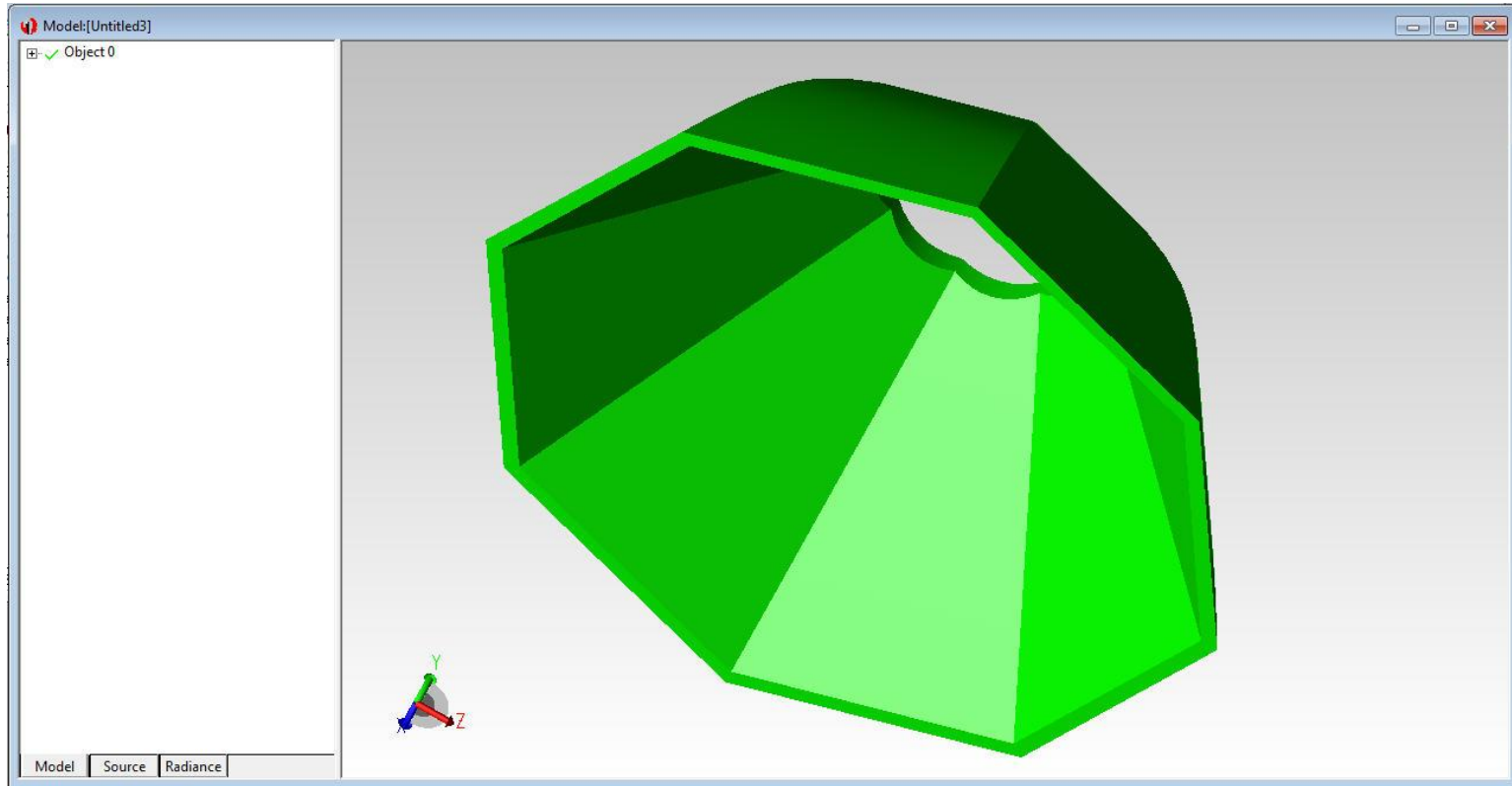
Initial Model in TracePro with sources and “target” defined. Initial reflector from the 2D Interactive Optimizer has also been added.

Lighting Design – Optimization



Illuminance Map - before optimization

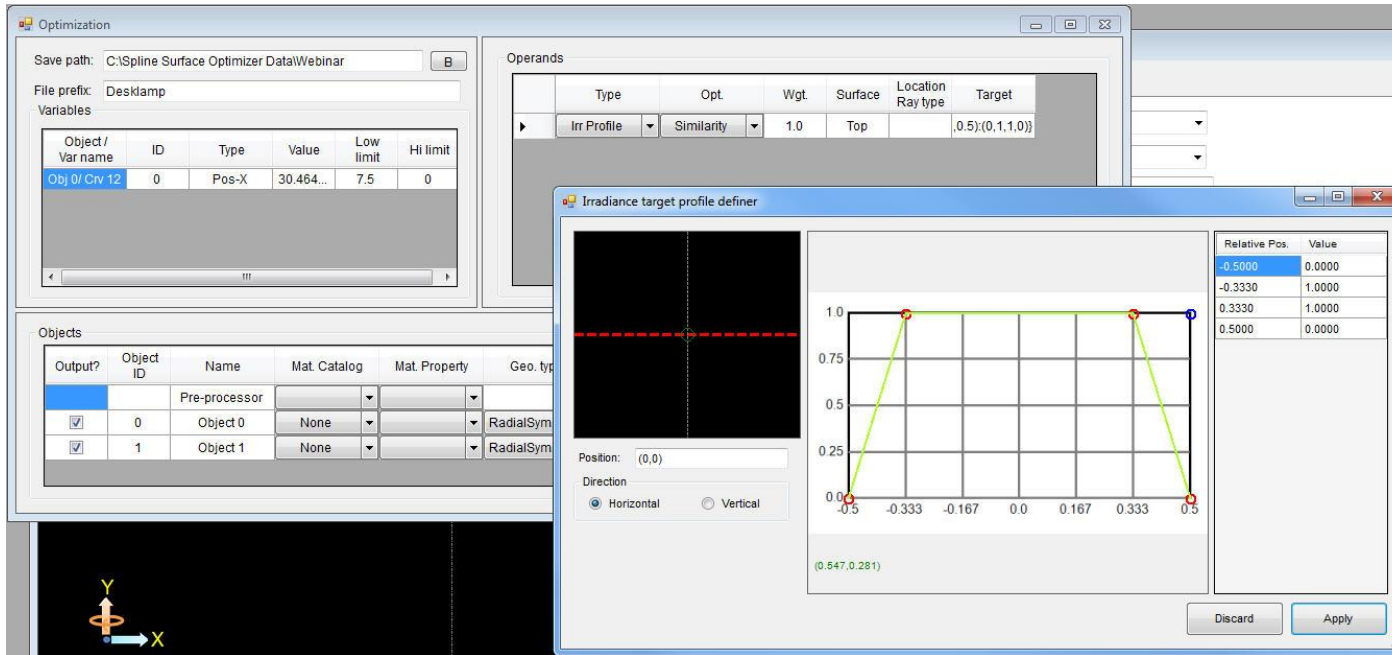
Lighting Design – Optimization



Initial reflector sent from the optimizer to TracePro.

Lighting Design – Optimization

TracePro 2D Interactive Optimizer

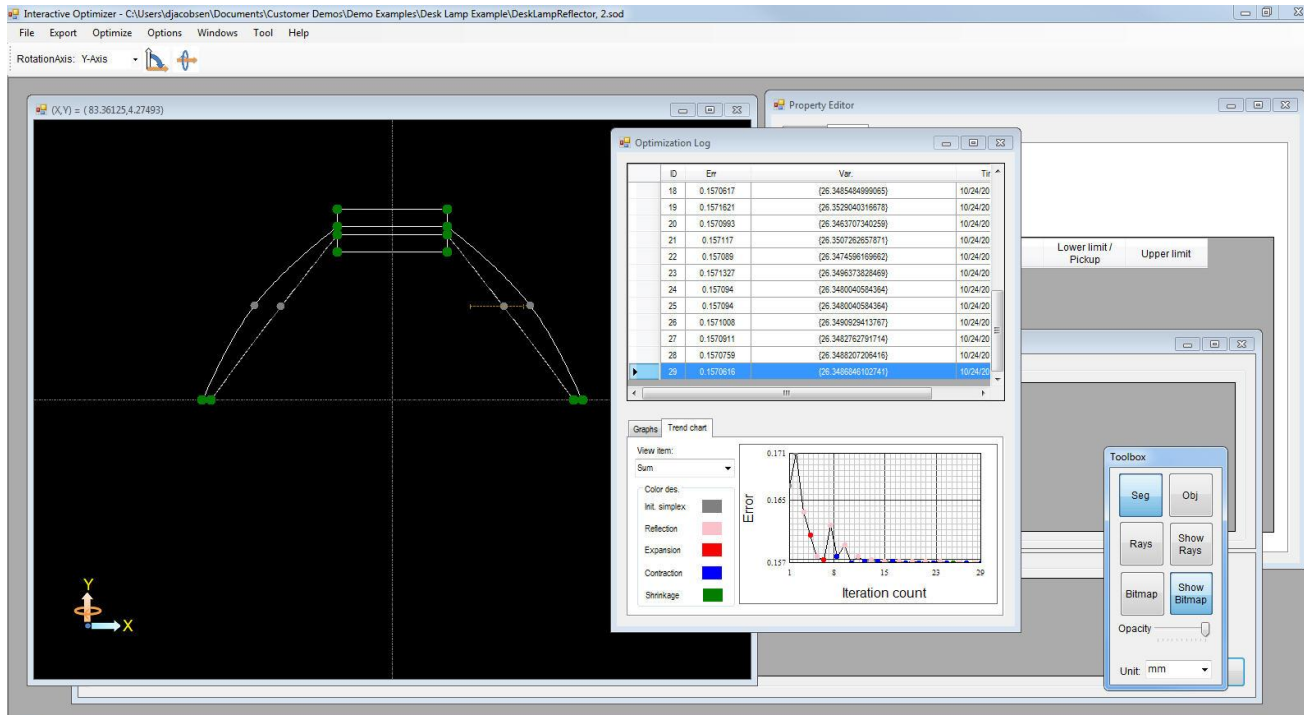


Results from TracePro are compared to optimization target to generate optimization error function

An Irradiance Profile is used as the optimization target in this case. The goal is uniform irradiance in the center portion of the target.

Lighting Design – Optimization

TracePro 2D Interactive Optimizer

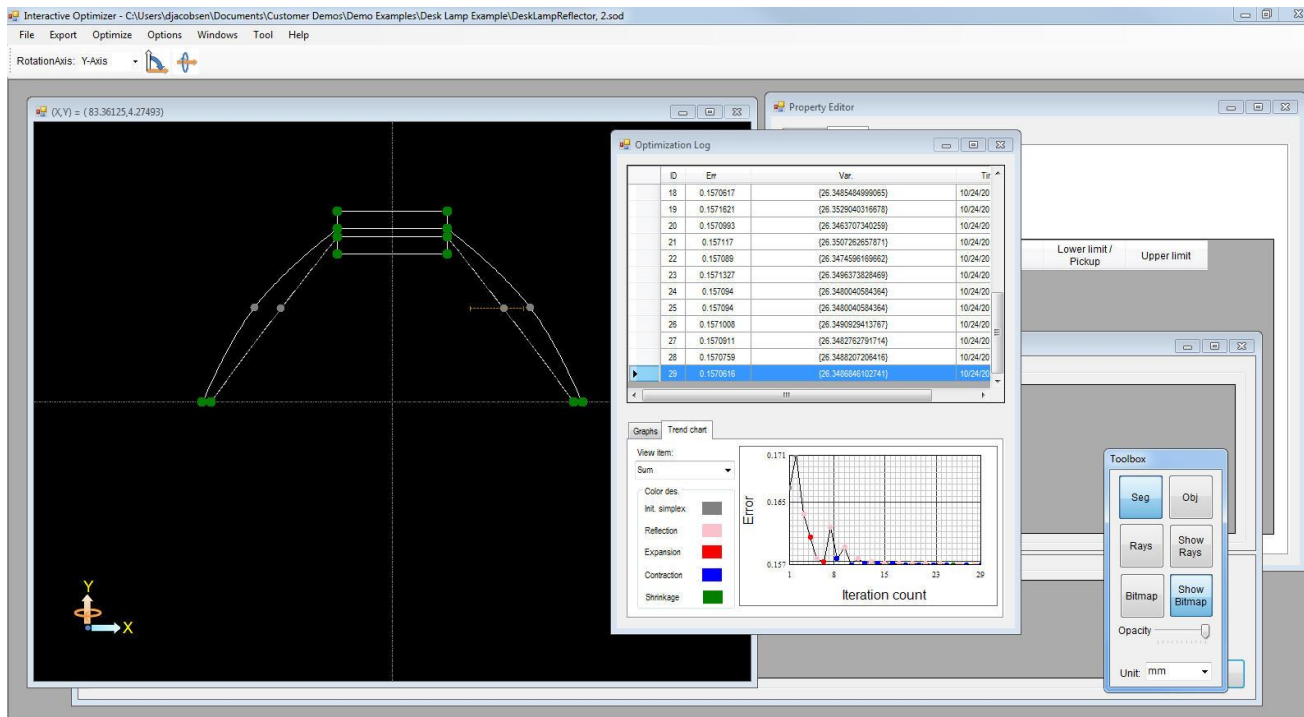


Results from TracePro are compared to optimization target to generate optimization error function

Optimization Trend Chart and Results

Lighting Design – Optimization

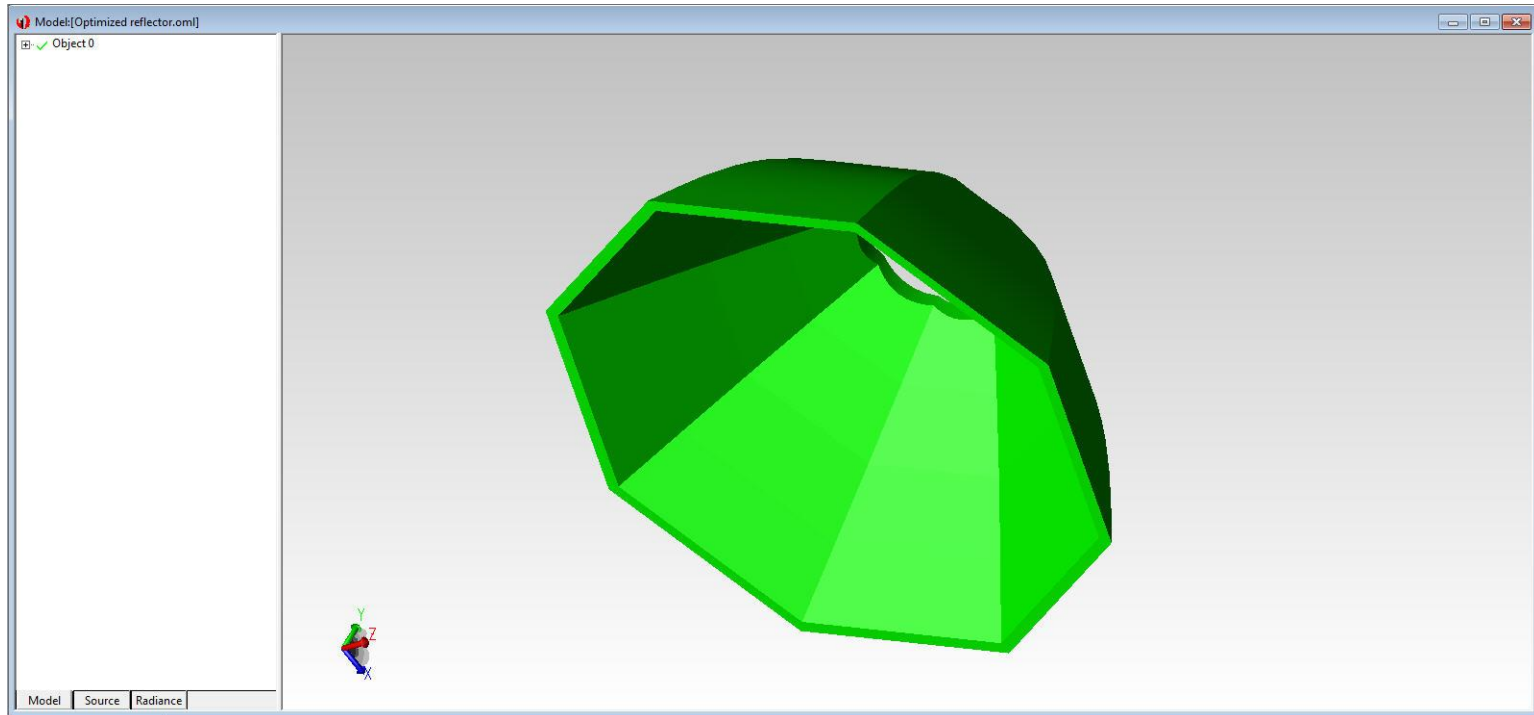
TracePro 2D Interactive Optimizer



Optimized design is sent back to TracePro

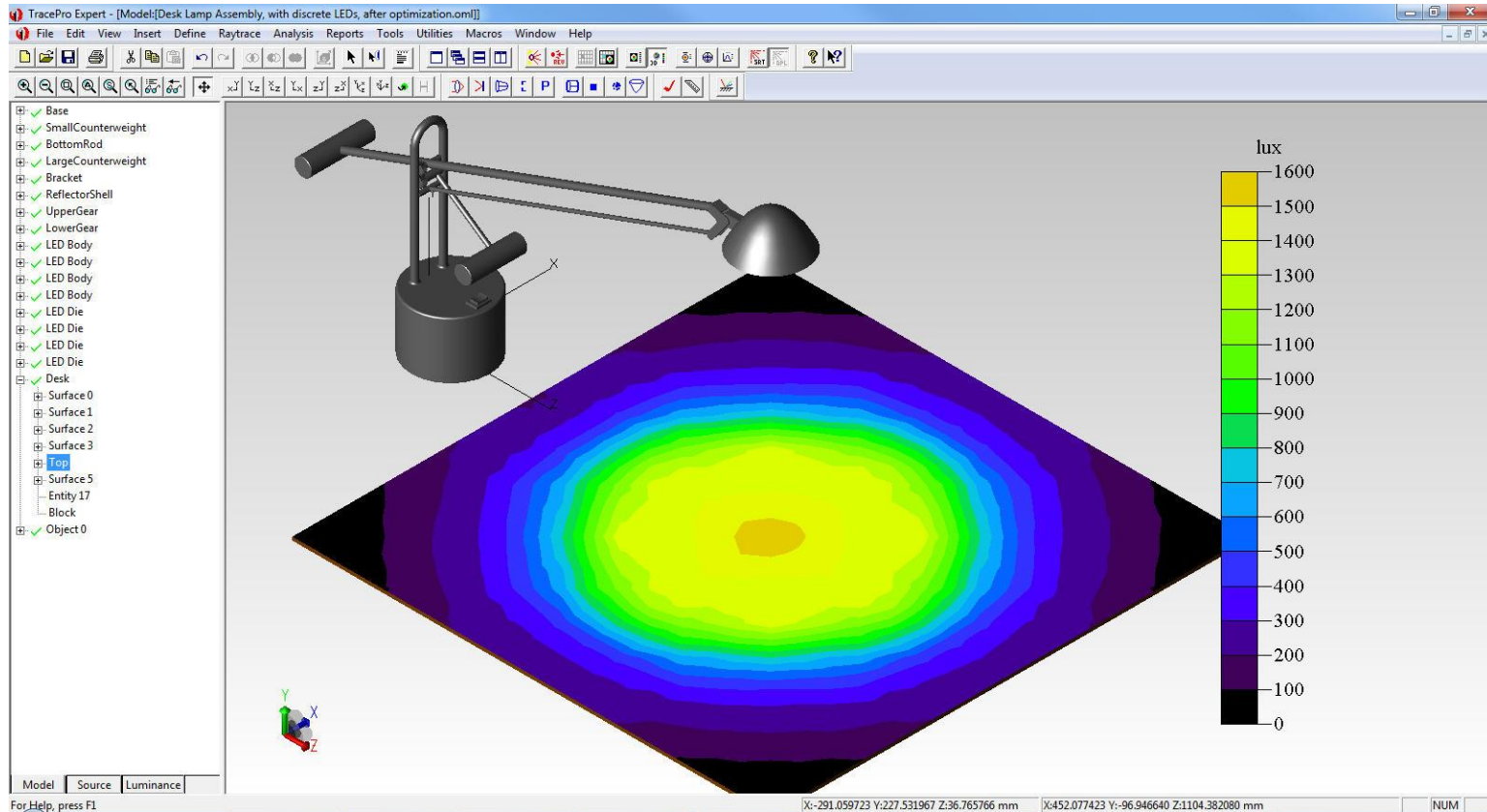
Optimization Trend Chart and Results

Lighting Design – Optimization



Optimized reflector sent from the optimizer to TracePro.

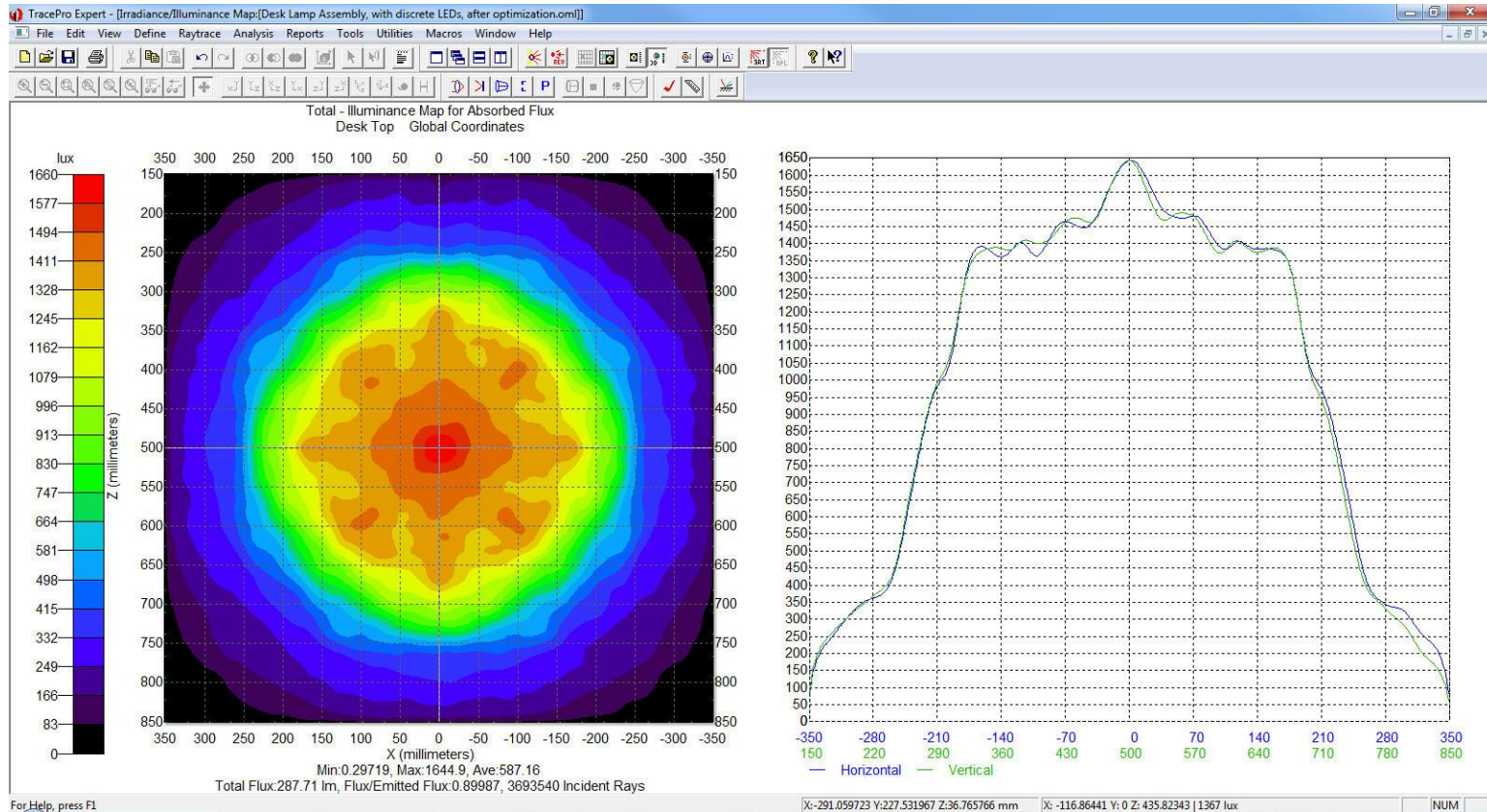
Lighting Design – Optimization



3D Illuminance Map - after optimization

Please see our February 2011 webinar
“Design and Verification Analysis Tools”

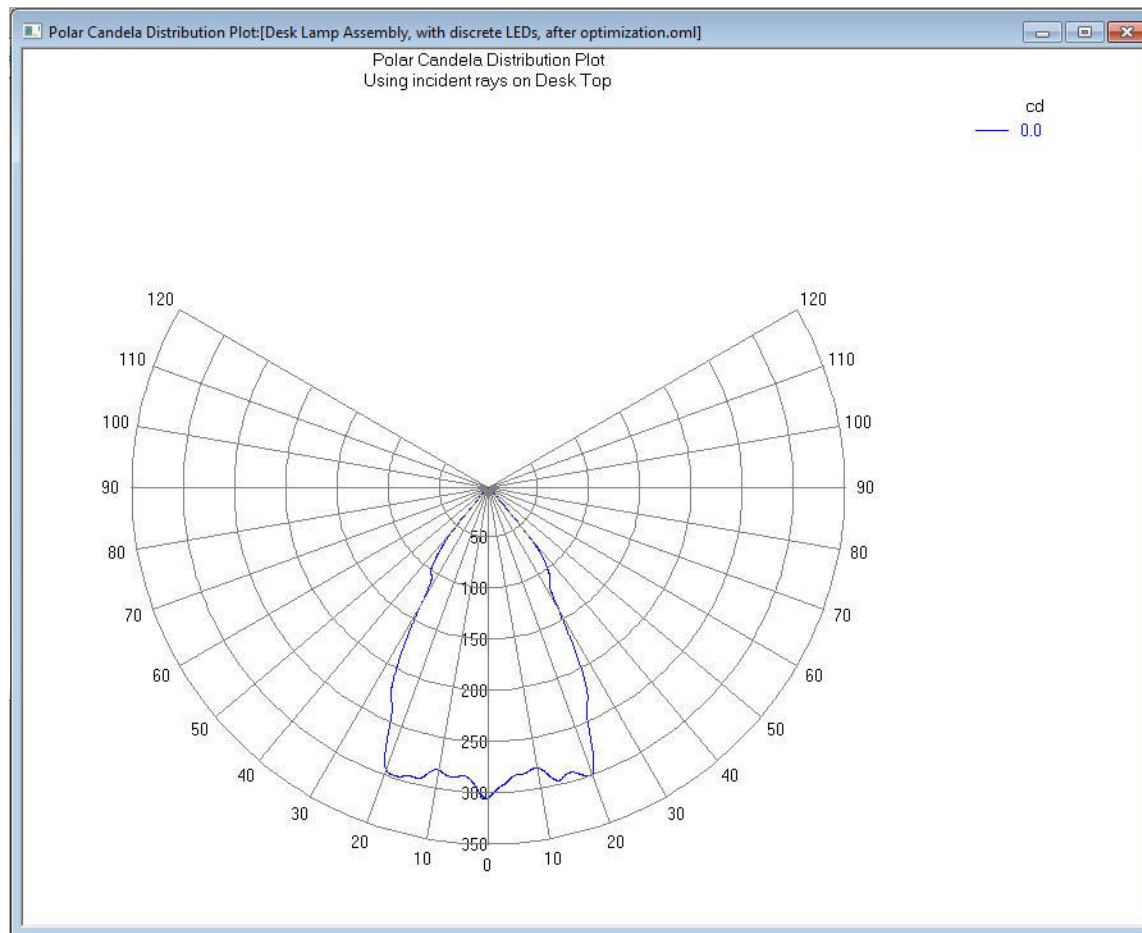
Lighting Design – Optimization



Illuminance Map - after optimization

Please see our February 2011 webinar
“Design and Verification Analysis Tools”

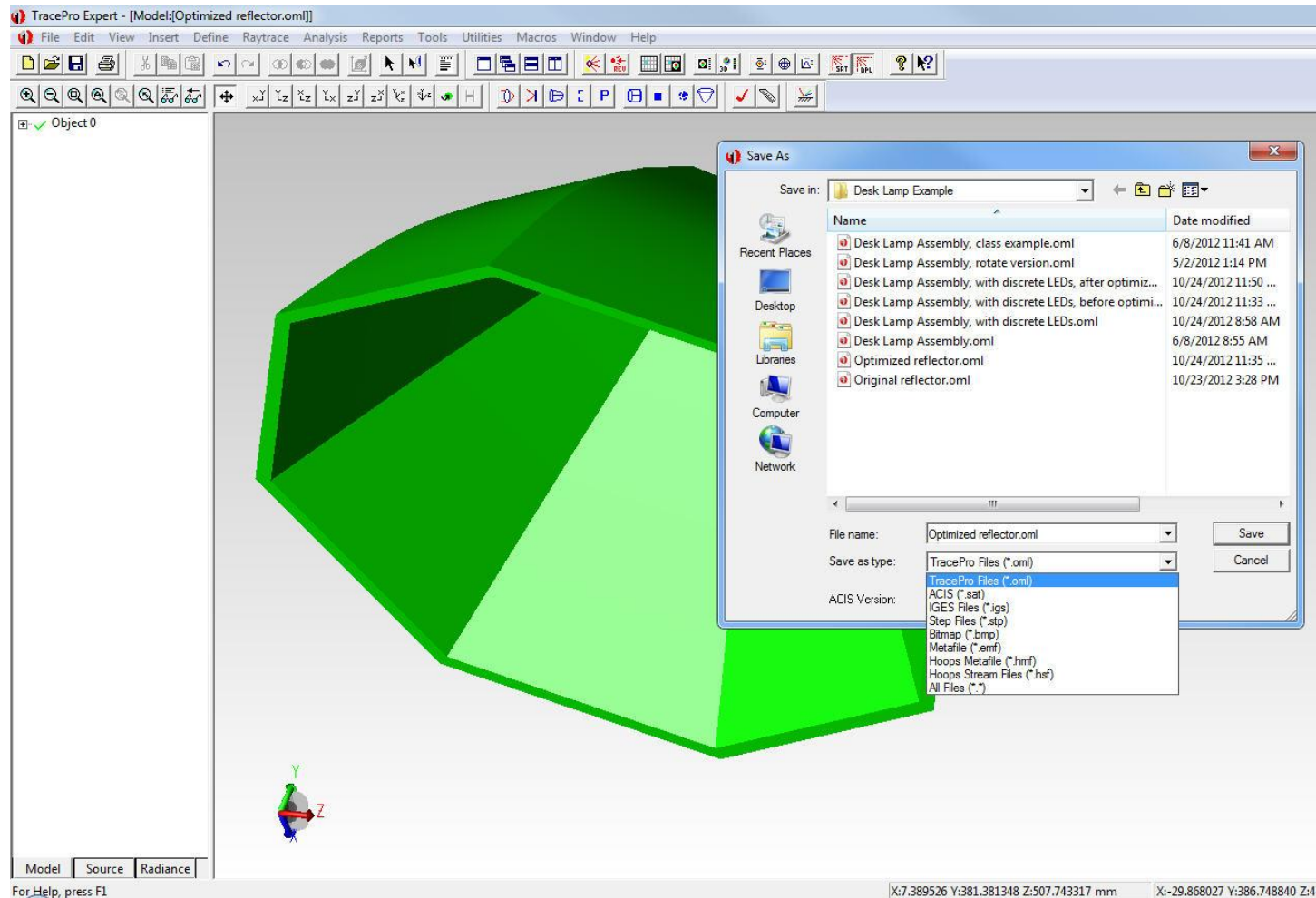
Lighting Design – Optimization



Candela Plot - after optimization

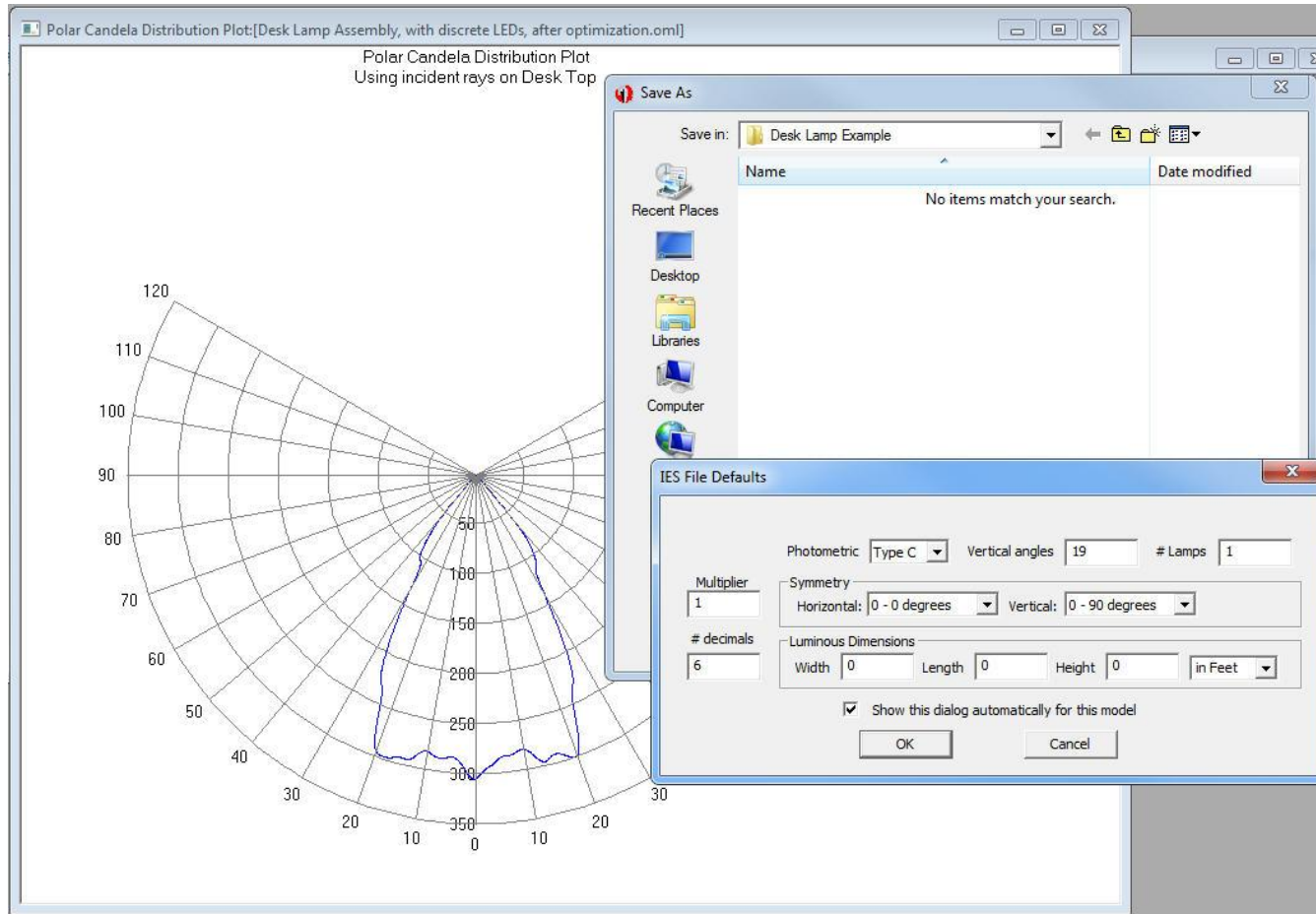
Please see our February 2011 webinar
“Design and Verification Analysis Tools”

Lighting Design – Design Output



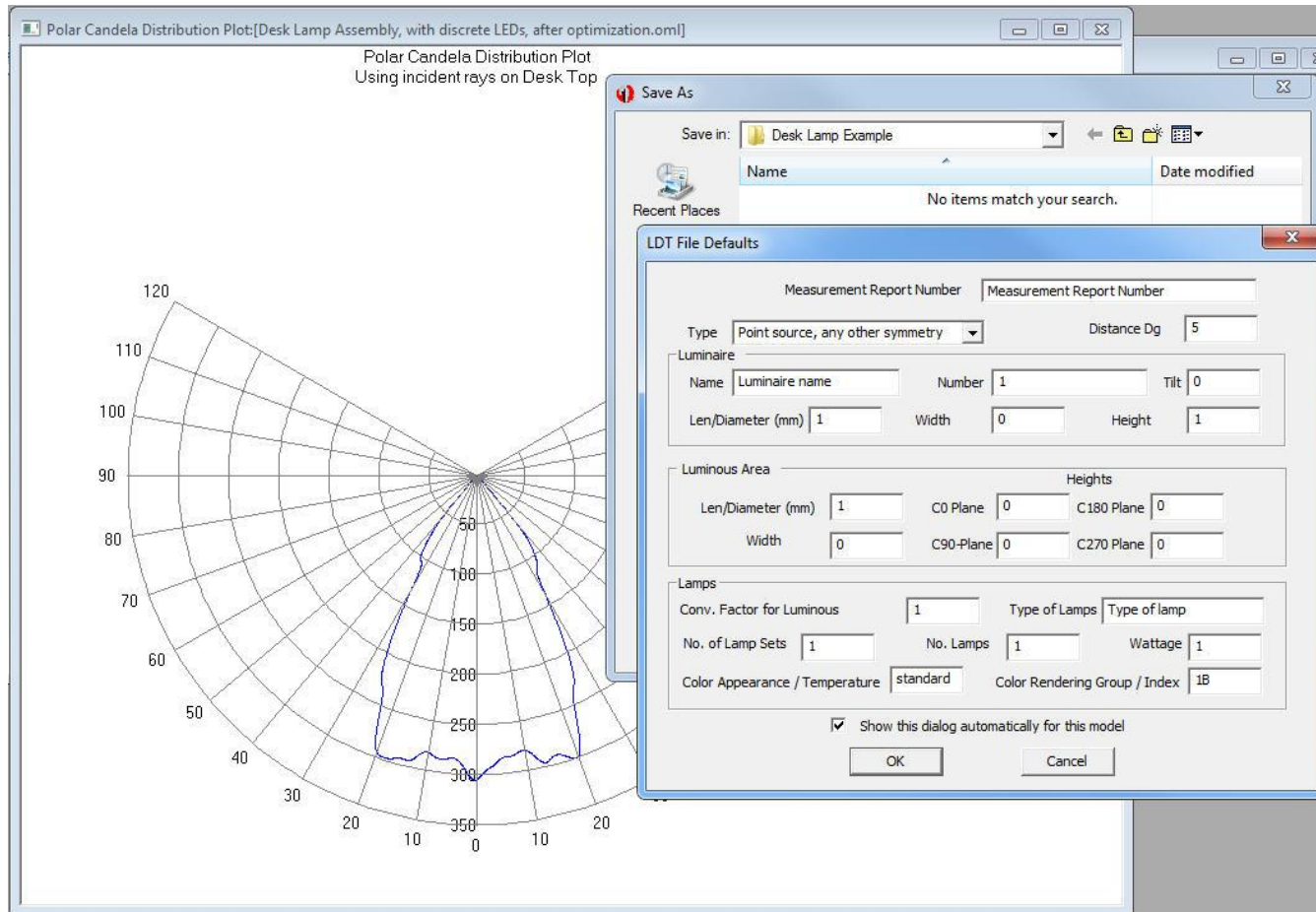
Export CAD Files
Options include SAT, STEP, and IGES

Lighting Design – Design Output



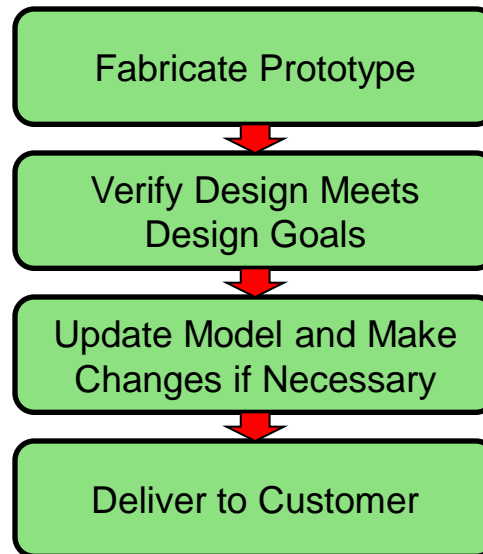
Exporting IES file from Candela Plot for use in other optical analysis programs such as OxyTech's LITESTAR 4D

Lighting Design – Design Output



Exporting LDT file from Candela Plot for use in other optical analysis programs such as OxyTech's LITESTAR 4D

Lighting Design – Final Steps



Summary

- We have shown how you can use TracePro and the TracePro utilities in a step-by-step methodology for lighting design.
- Specifications and requirements were discussed.
- The use of the Surface Source Property Generator, IES/LDT Import, and 2D and 3D Interactive Optimizer utilities was described.
- Some of the analysis tools in TracePro applicable to lighting design were discussed.
- A representative example was used to illustrate the process.

Thank You

Questions and Answers

**For Additional Information
Please Contact:**

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