

## Modeling, Analyzing, and Optimizing Solar Collectors

Lambda Research Corporation Webinar

June 3, 2020

# Presenter

- **Presenter**

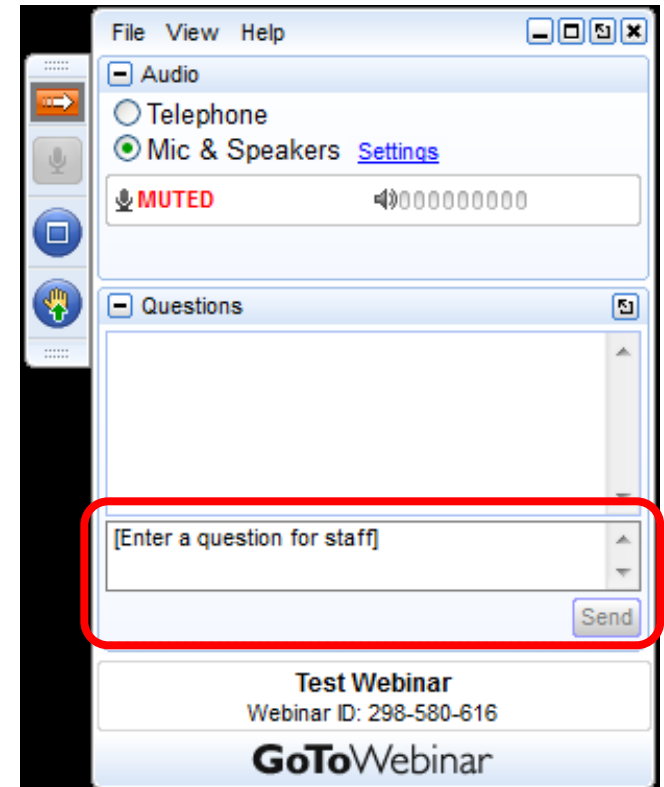
Dave Jacobsen

Sr. Application Engineer

Lambda Research Corporation

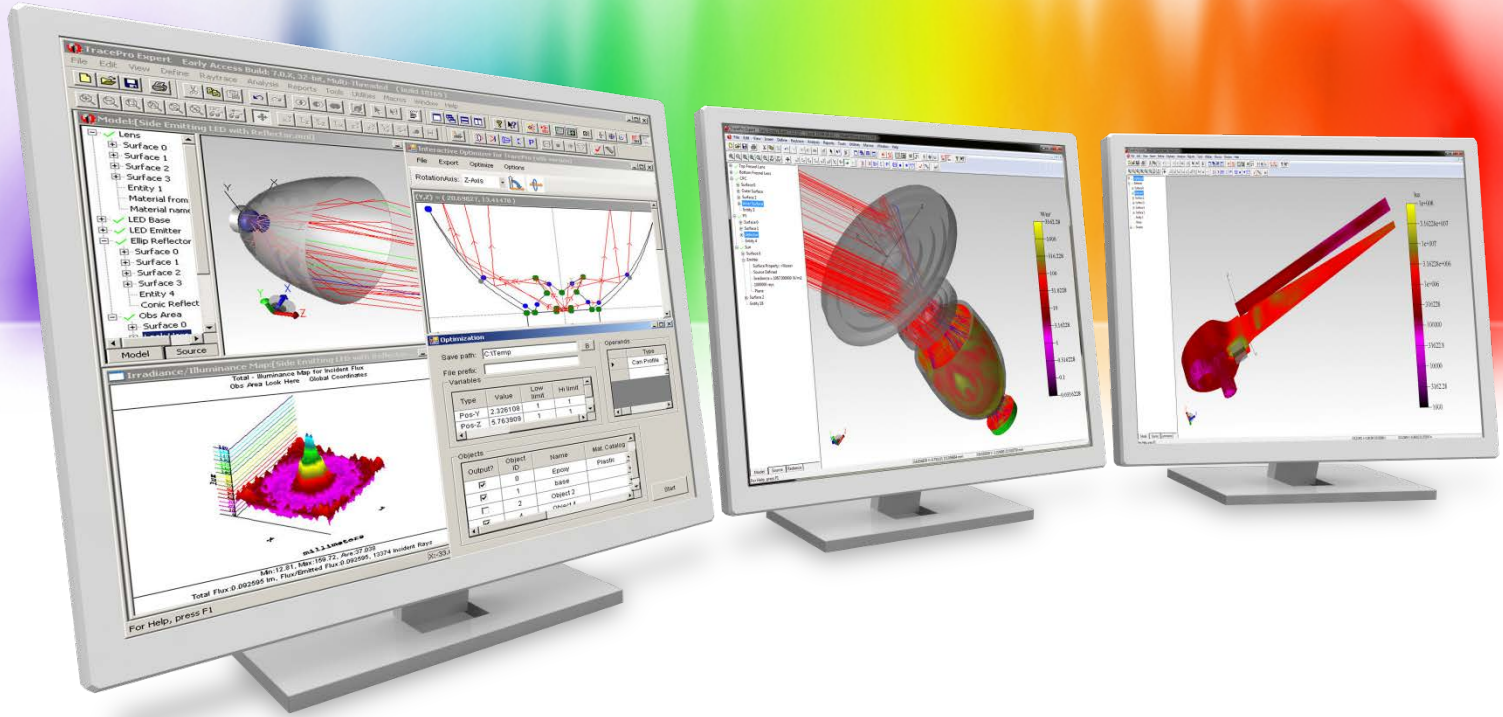
# Format

- 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



# Additional Resources

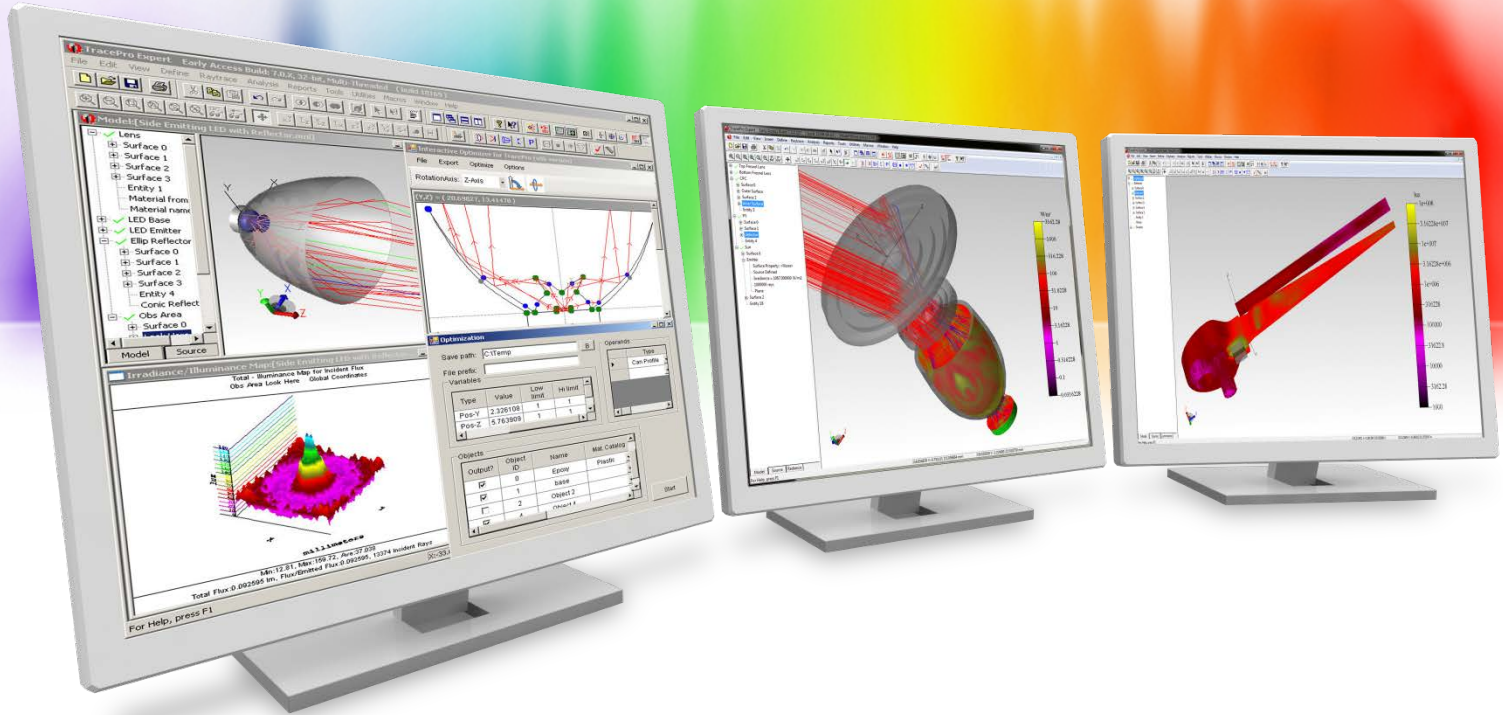
- Webinars and Tutorial Videos
  - <https://www.lambdares.com/su/tracepro-videos/>
  - <https://www.lambdares.com/su/oslo-videos/>
- Tutorials
  - <https://www.lambdares.com/su/tracepro-tutorials/>
  - <https://www.lambdares.com/su/oslo-tutorials/>
- Information on upcoming training classes
  - <https://www.lambdares.com/training/>



## Introduction

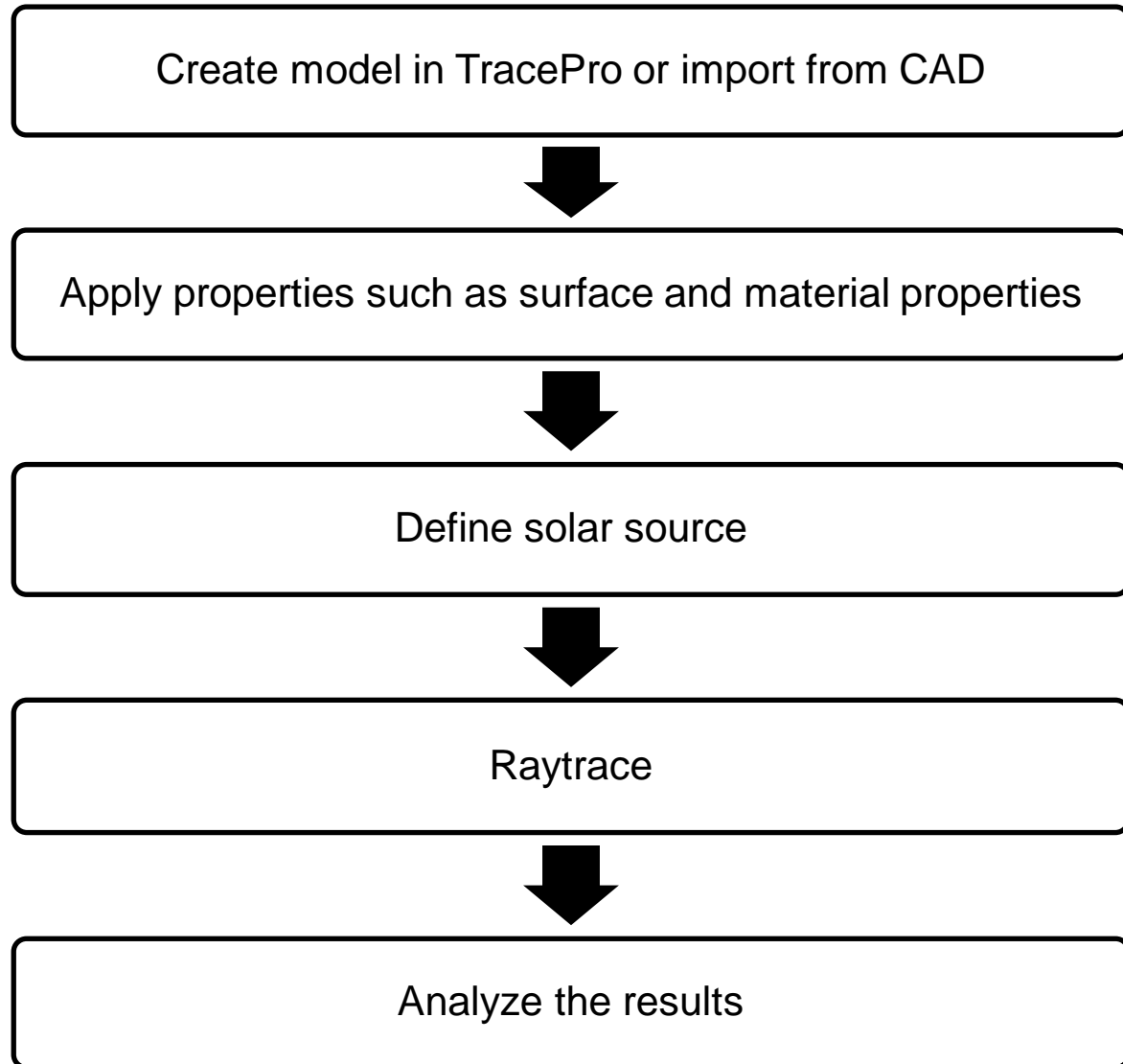
# Topics

- Setting up and modeling solar collection systems in TracePro
- Using the Solar Emulator to analyze the performance of the system at different times and locations
- Solar tracking using the Solar Emulator
- Optimizing a solar collector in the Interactive Optimizer
- Optimizing a fixed collector for multiple sun locations
- Question and Answer session



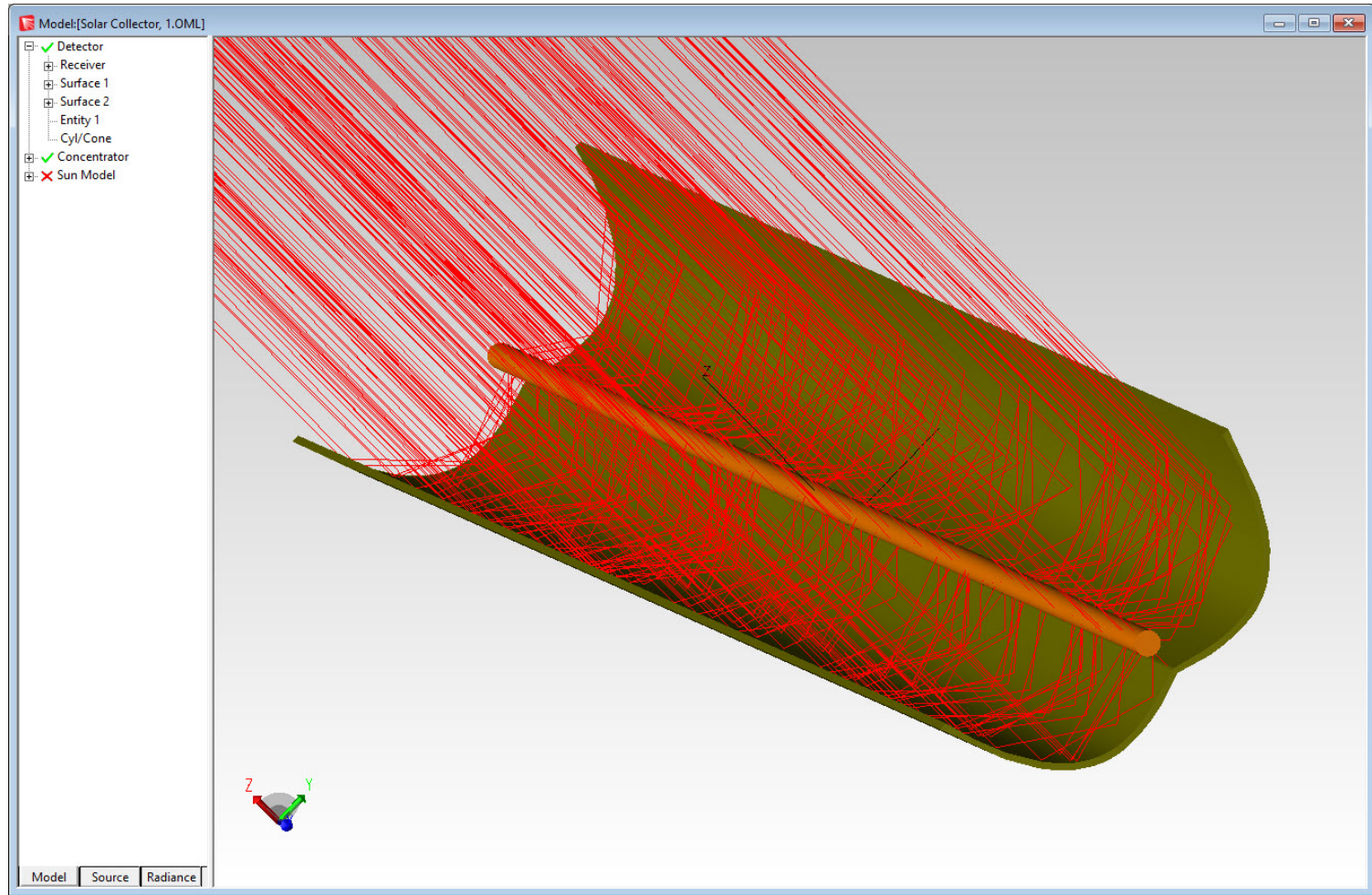
## Modeling solar collectors in TracePro

# TracePro Workflow

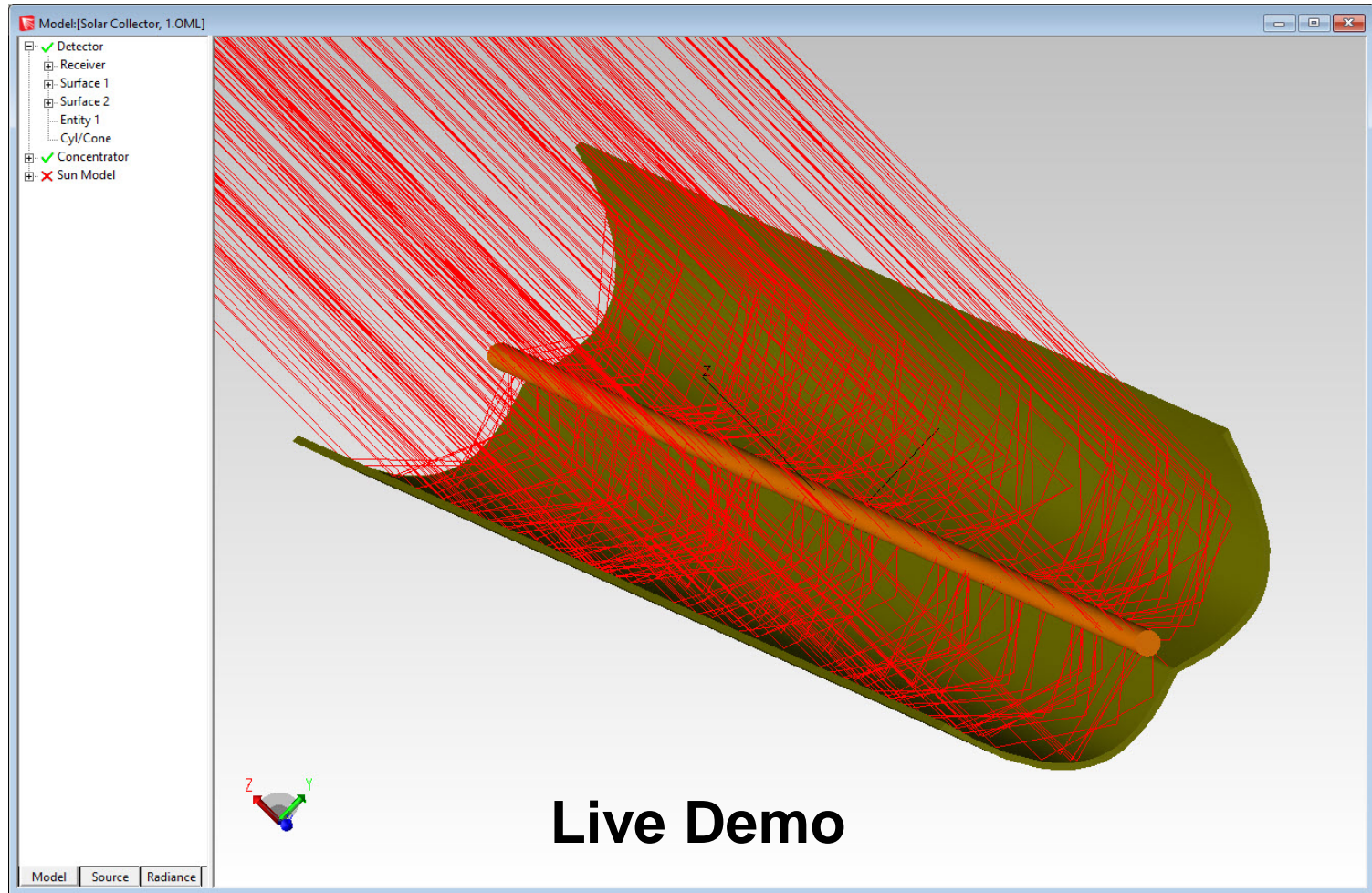


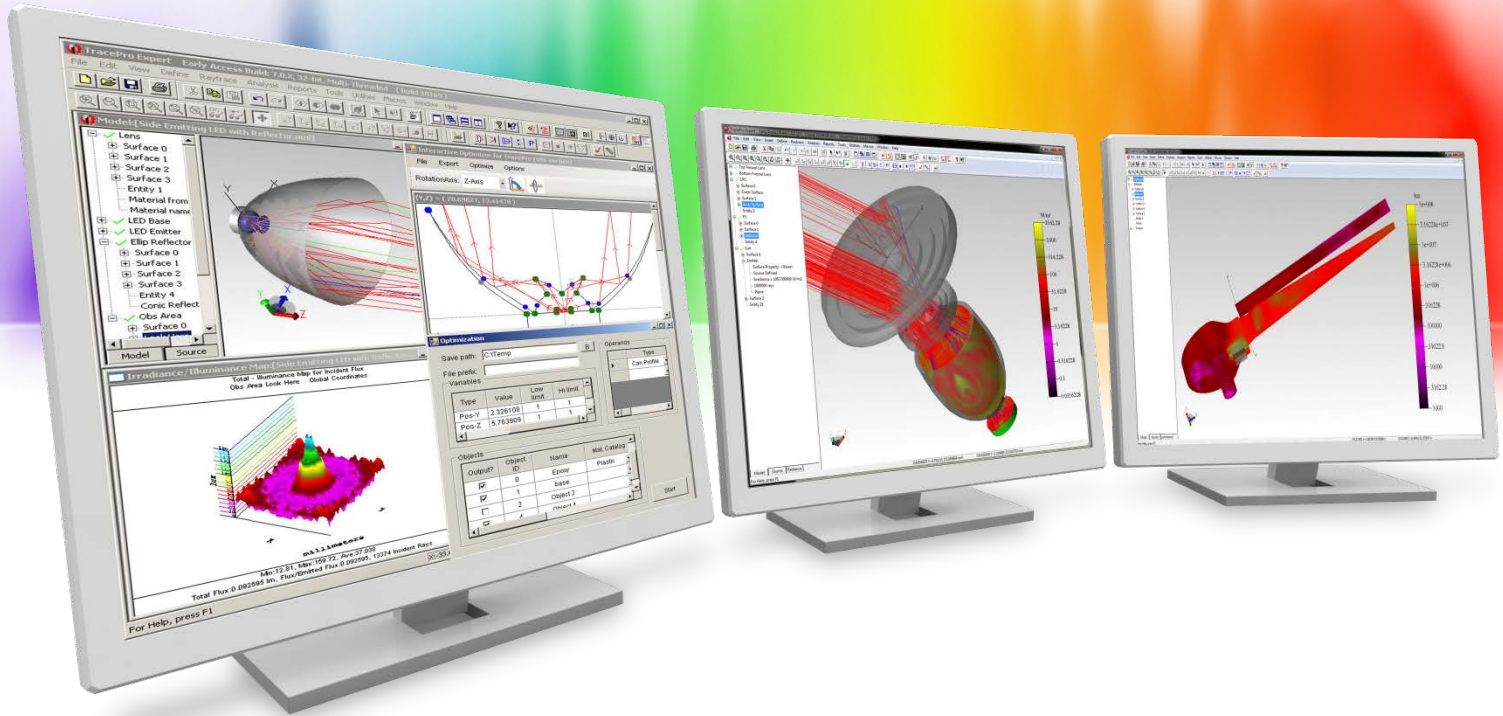


# Solar Collector in TracePro



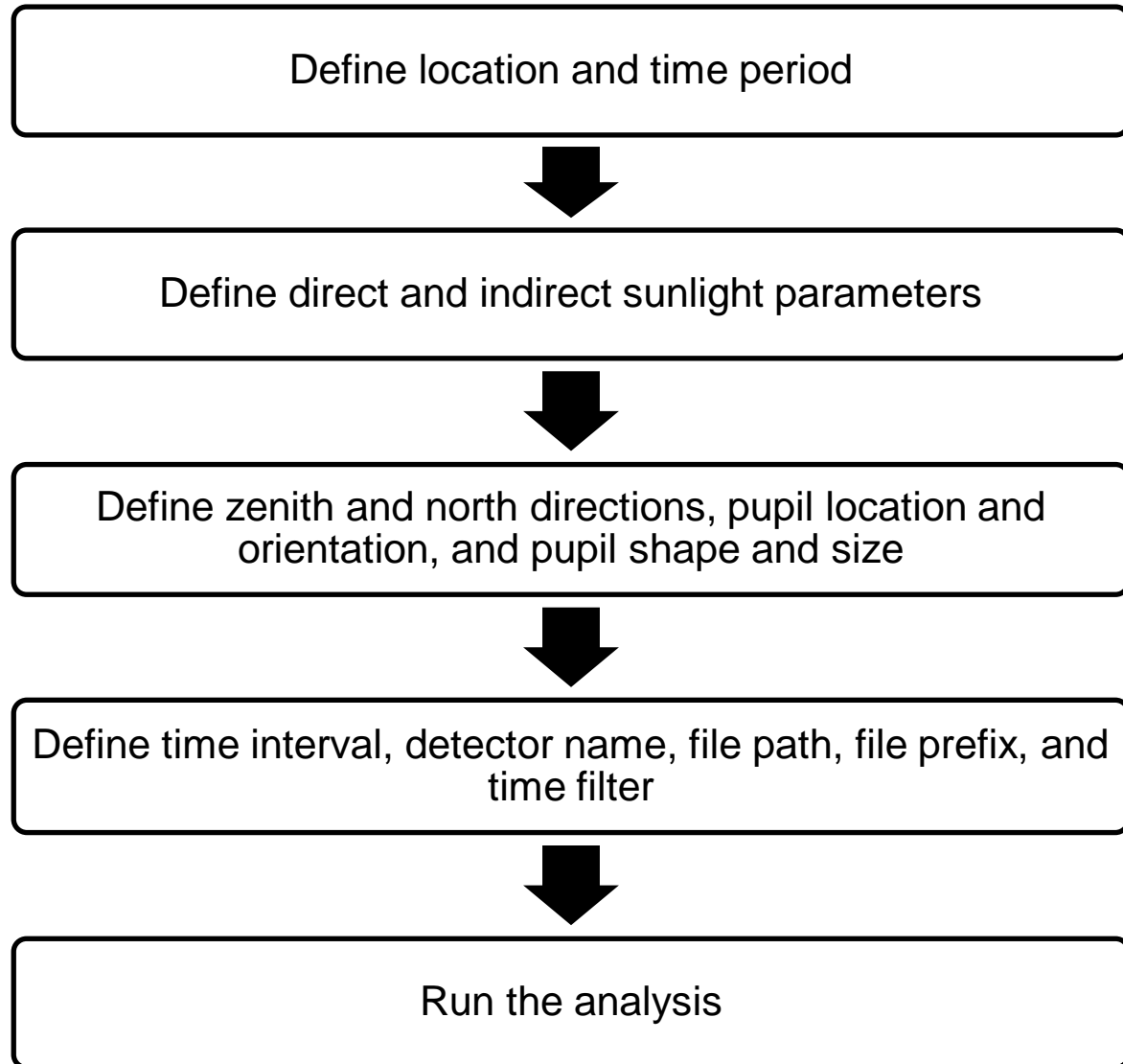
# Solar Collector in TracePro



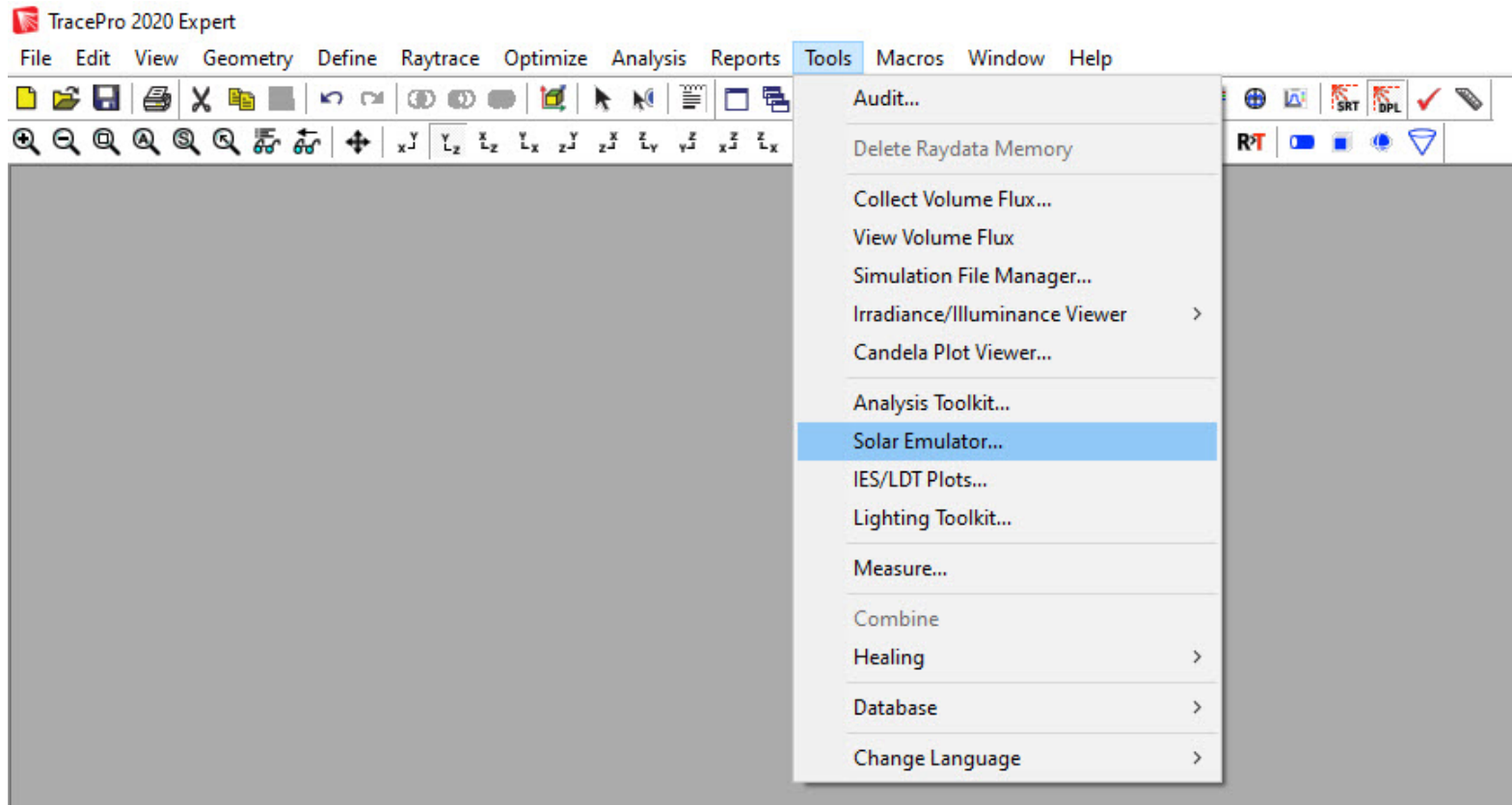


## Using the TracePro Solar Emulator

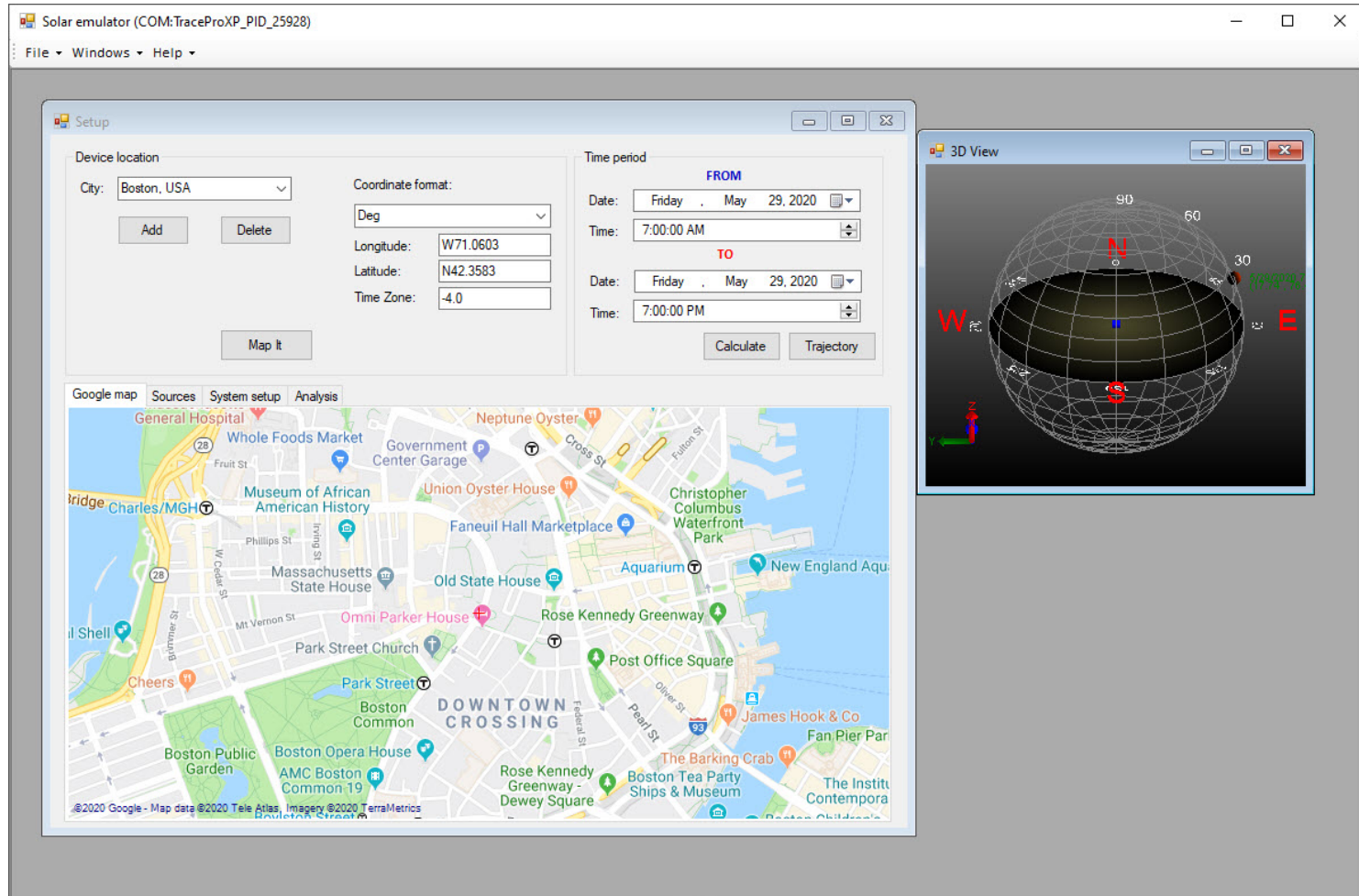
# Solar Emulator Workflow



# Solar Emulator in TracePro



# Solar Emulator in TracePro



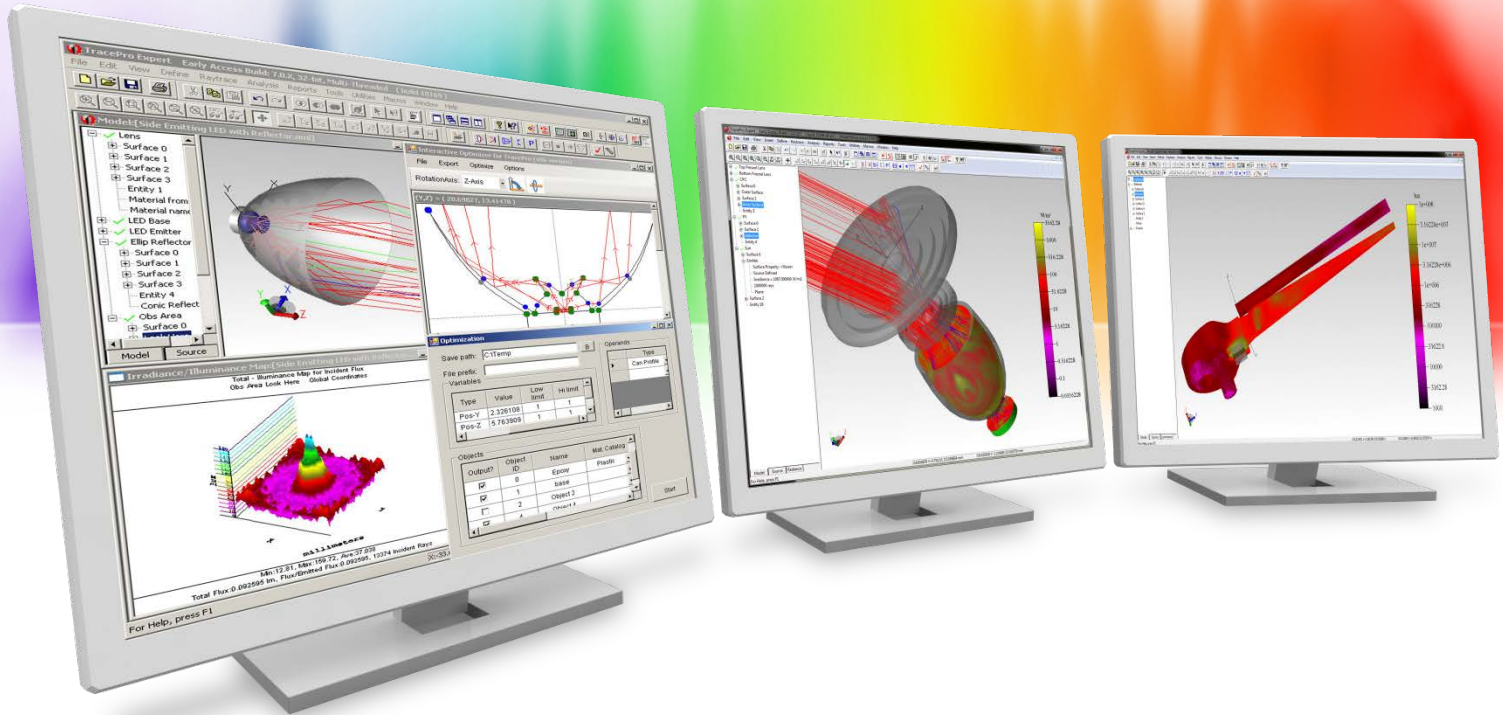
# Solar Emulator in TracePro

The screenshot displays the 'Solar emulator (COM:TraceProXP\_PID\_25928)' application window. It features a 'Setup' dialog box with the following configuration:

- Device location:** City: Boston, USA; Coordinate format: Deg; Longitude: W71.0603; Latitude: N42.3583; Time Zone: -4.0.
- Time period:** FROM: Friday, May 29, 2020, 7:00:00 AM; TO: Friday, May 29, 2020, 7:00:00 PM.

Below the setup window is a Google map of downtown Boston, showing various landmarks and streets. To the right is a '3D View' window displaying a 3D wireframe globe with a coordinate system (N, S, E, W) and a small red and blue object on the surface.

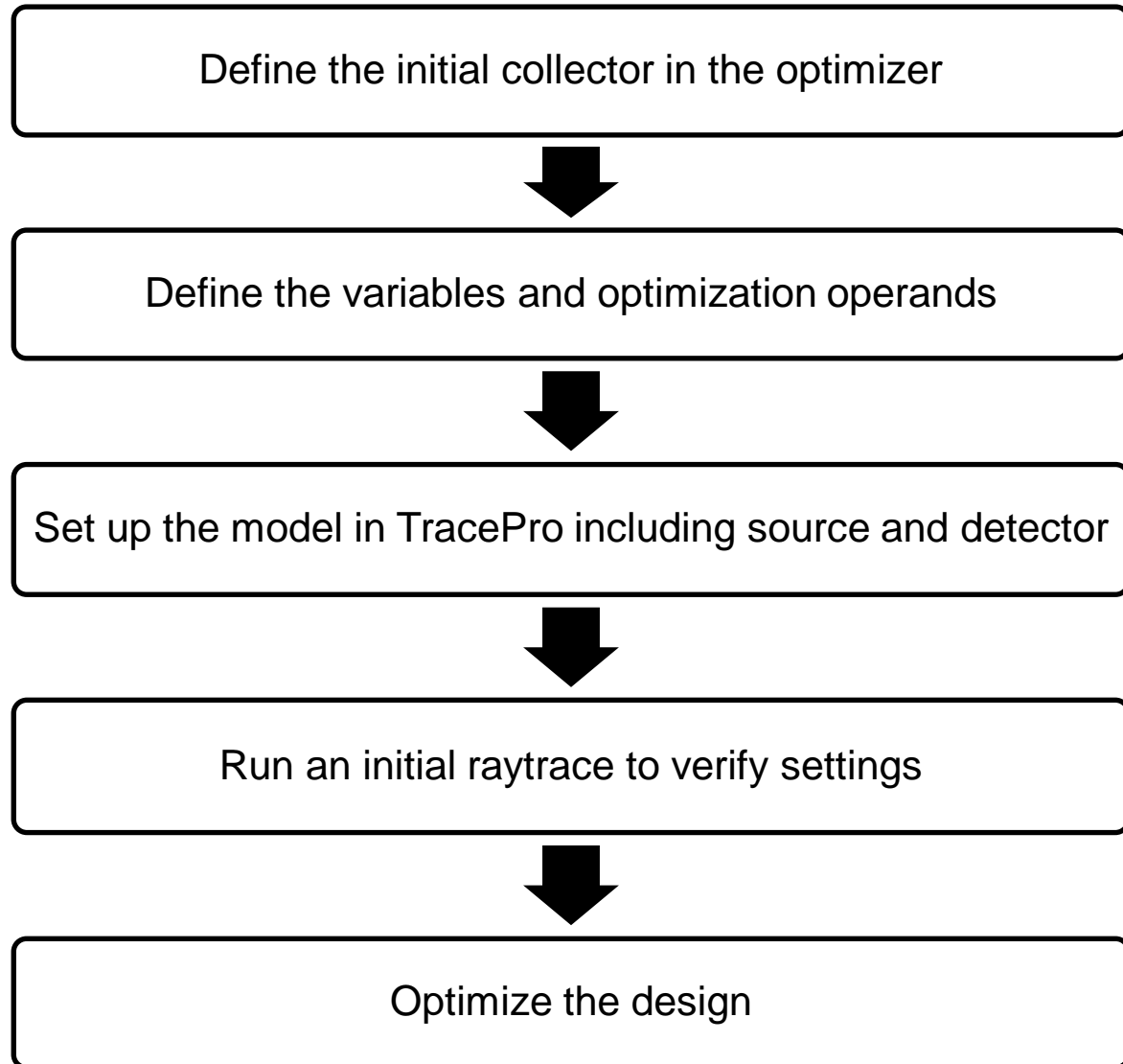
**Live Demo**



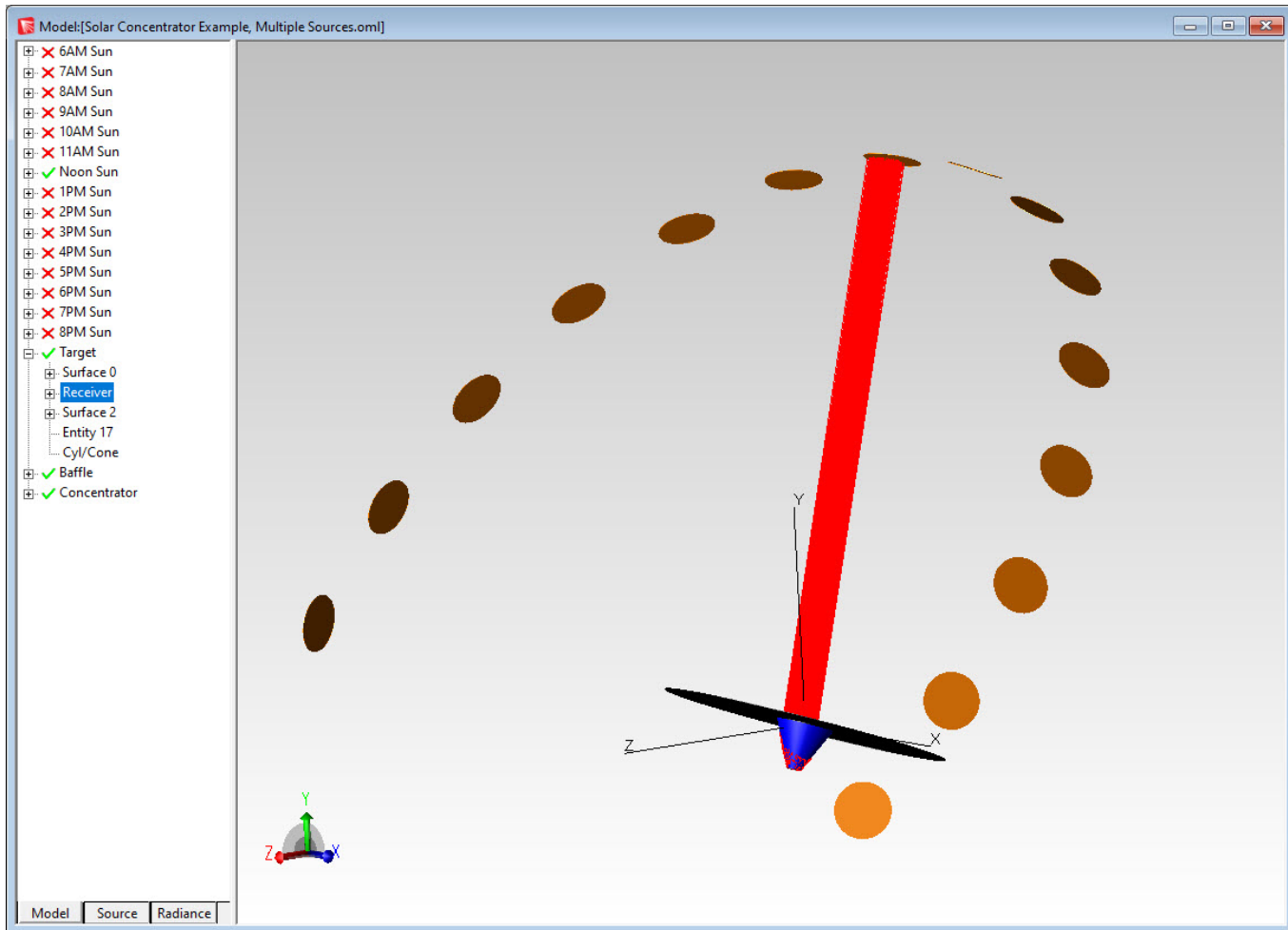
# Optimizing a solar collector using the TracePro Interactive Optimizer



# Optimizing a solar collector Workflow



# Optimizing a solar collector in TracePro



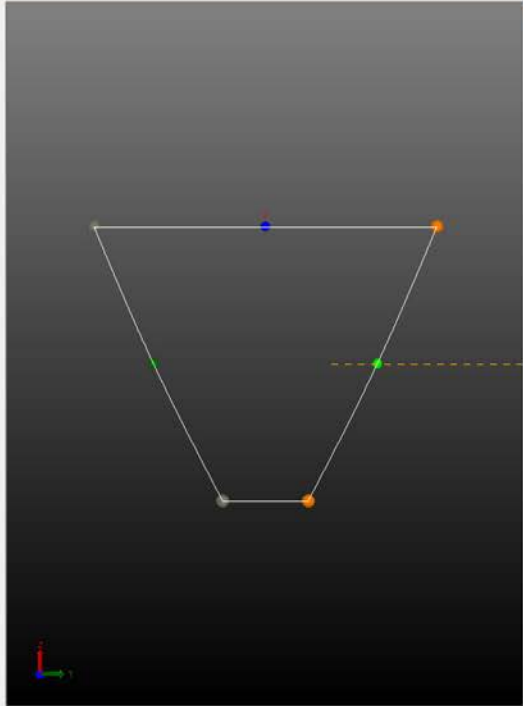
# Optimizing a solar collector in TracePro

Interactive Optimizer - C:\Users\djacobsen\Documents\Dave\Documents\Webinars\June 2020\_Solar Modeling in TracePro\Examples\Solar Concentrator, Single Sources

File Edit Optimization Window Tools Help

Surface list

(1) Surface 3



Info

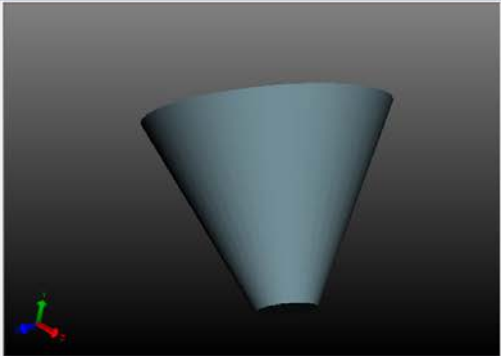
Opacity

Property editor

Description	Value	Type	Lower limit / Pickup	Upper limit
Name	Concentrator			
ID	1			
Local origin	(0,0,0)			
Local tilt center	(0,0,0)			
Tilt X Angle	-111	Specified		
Tilt Y Angle	0	Specified		
Tilt Z Angle	0	Specified		
Tilt then Shift	<input checked="" type="checkbox"/>			
Material catalog	SCHOTT			
Material property	BK7			
Refractive index	1.5			
Steps	0			

Object View

(1) Concentrator



X-94.55341 Y-42.2753 Z-18.75104

The property database had been linked to C:\Users\djacobsen\AppData\Roaming\Lambda Research Corporation\TracePro\TracePro.db.

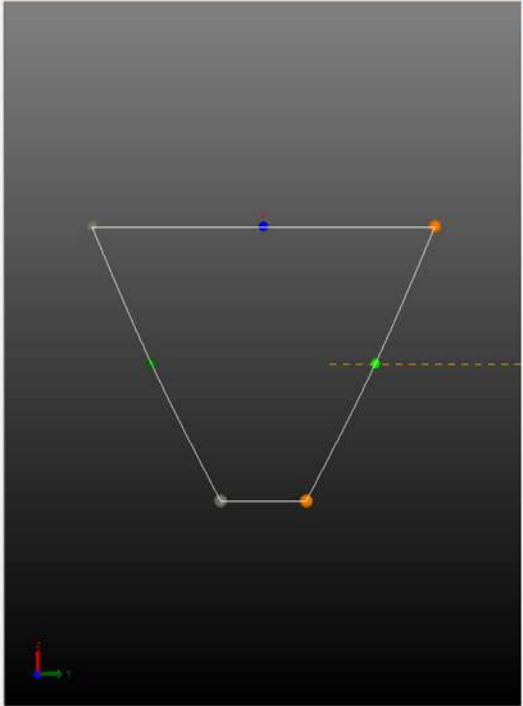
# Optimizing a solar collector in TracePro

Interactive Optimizer - C:\Users\djacobsen\Documents\Dave\Documents\Webinars\June 2020\_Solar Modeling in TracePro\Examples\Solar Concentrator, Single Sources

File Edit Optimization Window Tools Help

Surface list

(1) Surface 3



Info

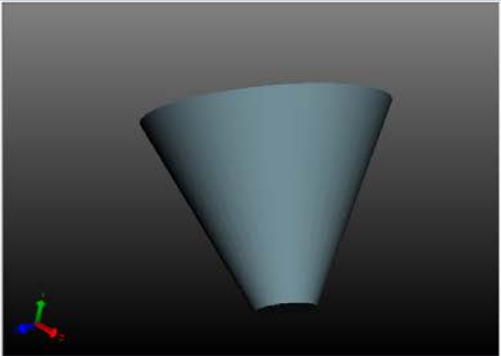
Opacity

Property editor

Description	Value	Type	Lower limit / Pickup	Upper limit
Name	Concentrator			
ID	1			
Local origin	(0,0,0)			
Local tilt center	(0,0,0)			
Tilt X Angle	-111	Specified		
Tilt Y Angle	0	Specified		
Tilt Z Angle	0	Specified		
Tilt then Shift	<input checked="" type="checkbox"/>			
Material catalog	SCHOTT			
Material property	BK7			
Refractive index	1.5			
Steps	0			

Object View

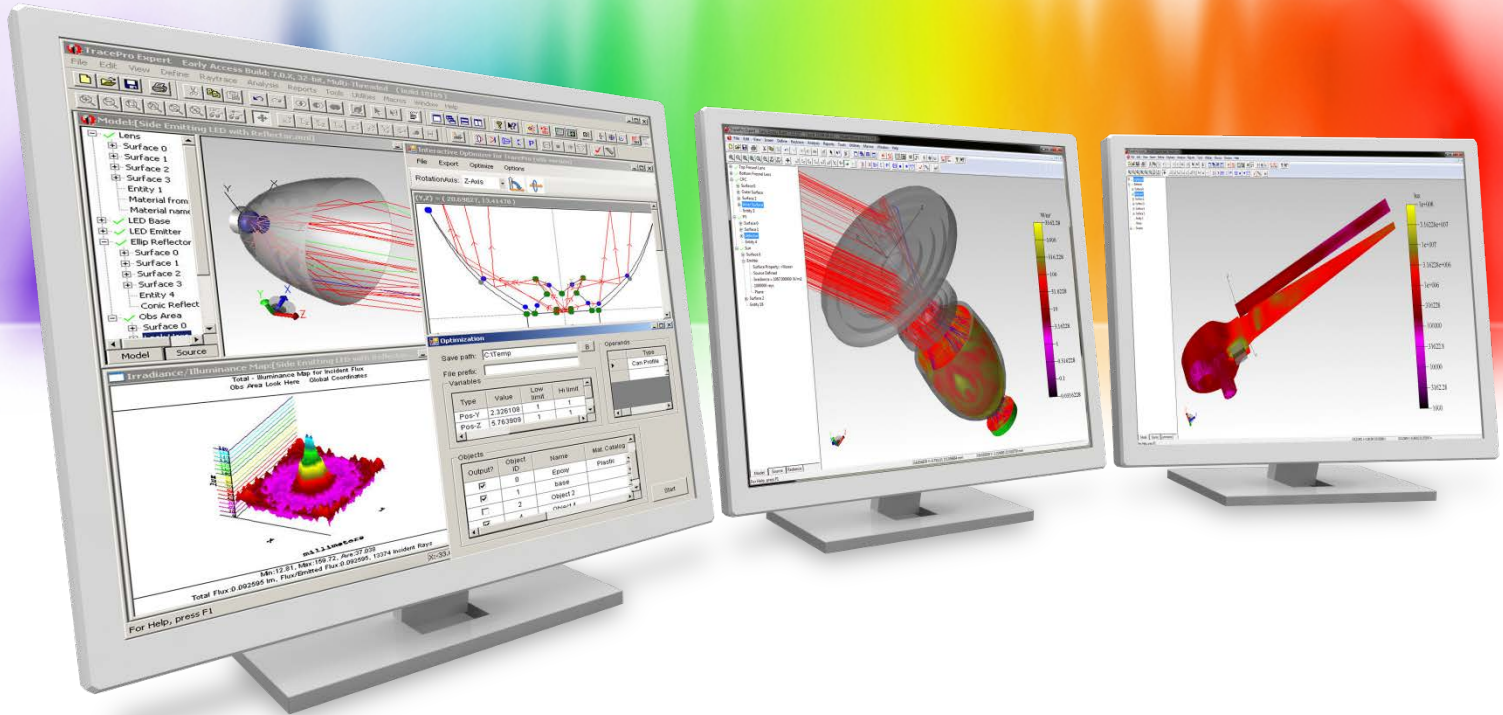
(1) Concentrator



X-94.55341 Y-42.2753 Z-18.75104

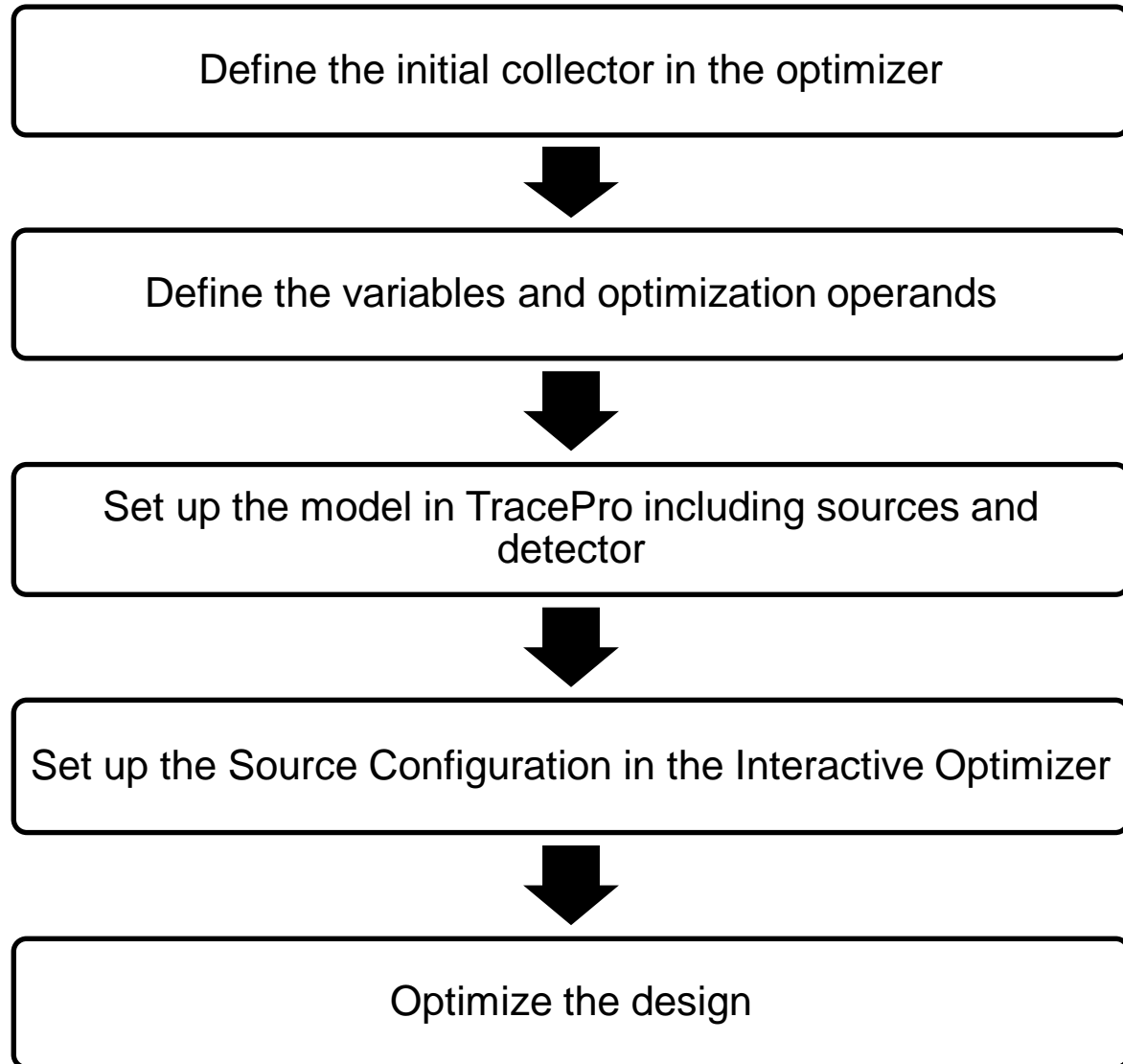
The property database had been linked to C:\Users\djacobsen\AppData\Roaming\Lambda Research Corporation\TracePro\TracePro.db.

Live Demo

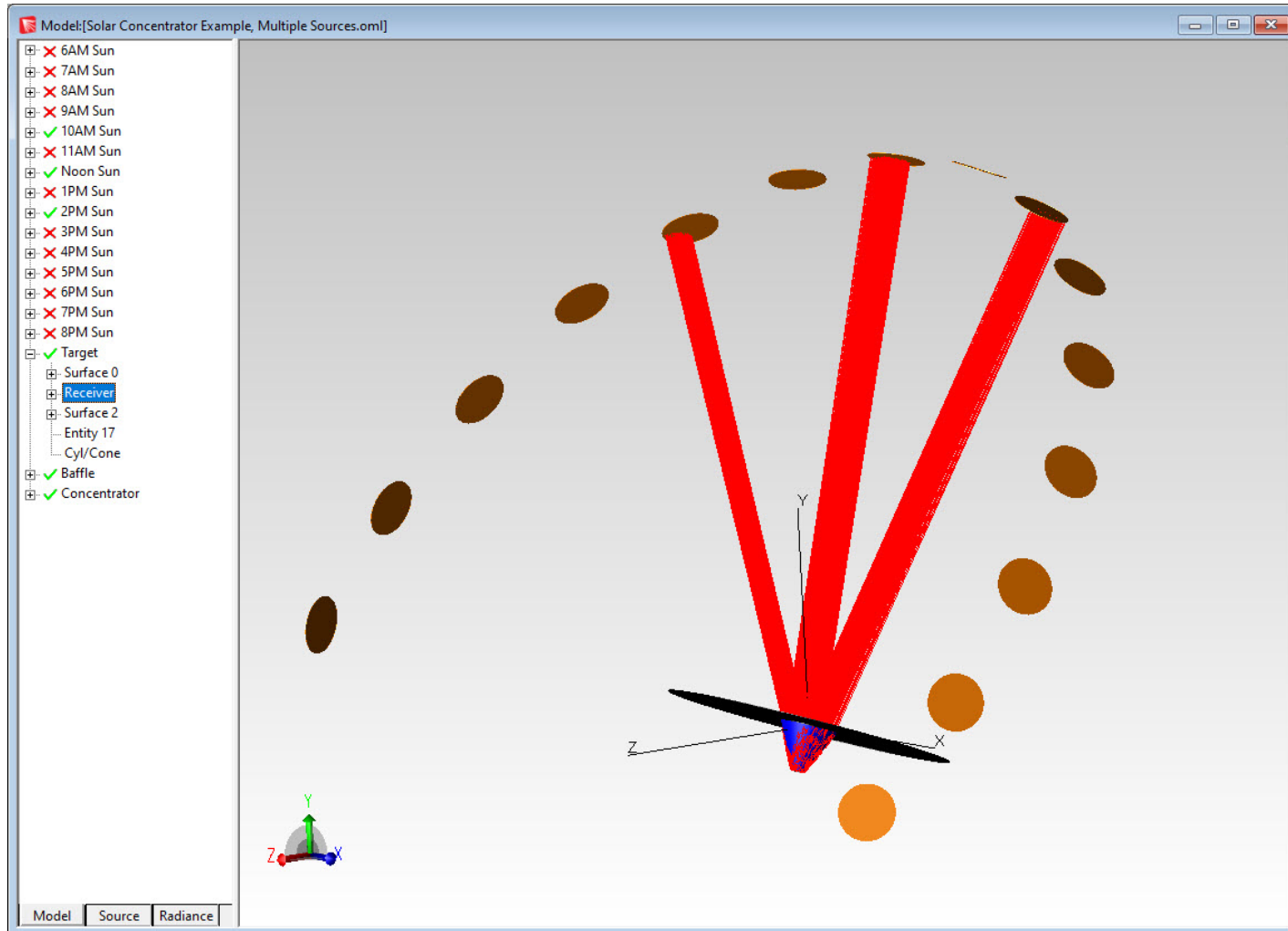


# Optimizing a fixed collector for multiple sun positions

# Workflow



# Optimizing a solar collector with multiple sources



## Introduction



Macro language ahead!



# Optimizing a solar collector with multiple sources

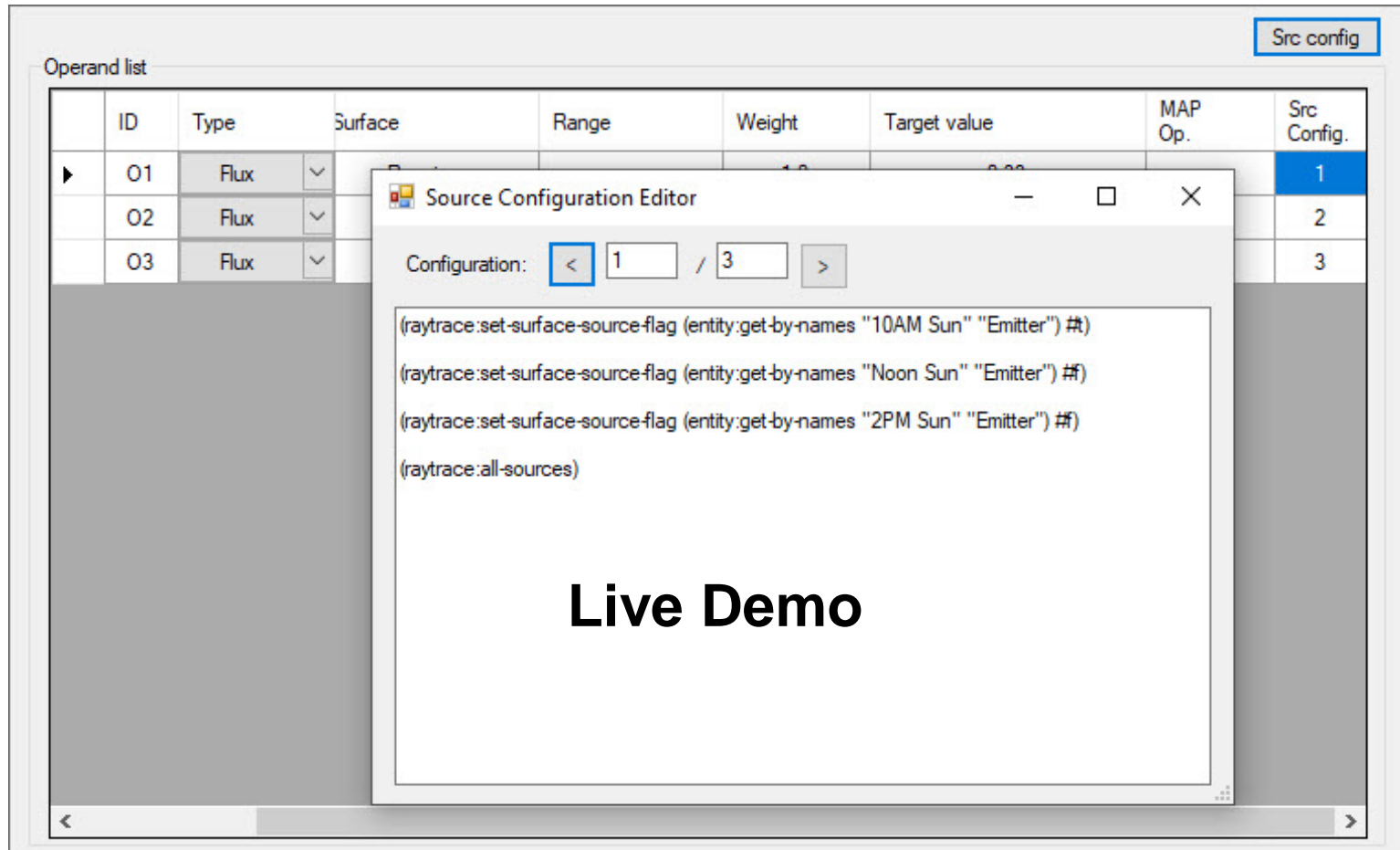
The screenshot displays the TracePro software interface. In the background, there is an 'Operand list' table with the following data:

ID	Type	Surface	Range	Weight	Target value	MAP Op.	Src Config.
01	Flux			1.0	0.00		1
02	Flux						2
03	Flux						3

Overlaid on this table is a 'Source Configuration Editor' dialog box. The dialog has a title bar with a close button and a 'Src config' button in the top right corner. The configuration is set to '1 / 3'. The main text area contains the following configuration script:

```
(raytrace:set-surface-source-flag (entity:get-by-names "10AM Sun" "Emitter") #f)  
(raytrace:set-surface-source-flag (entity:get-by-names "Noon Sun" "Emitter") #f)  
(raytrace:set-surface-source-flag (entity:get-by-names "2PM Sun" "Emitter") #f)  
(raytrace:all-sources)
```

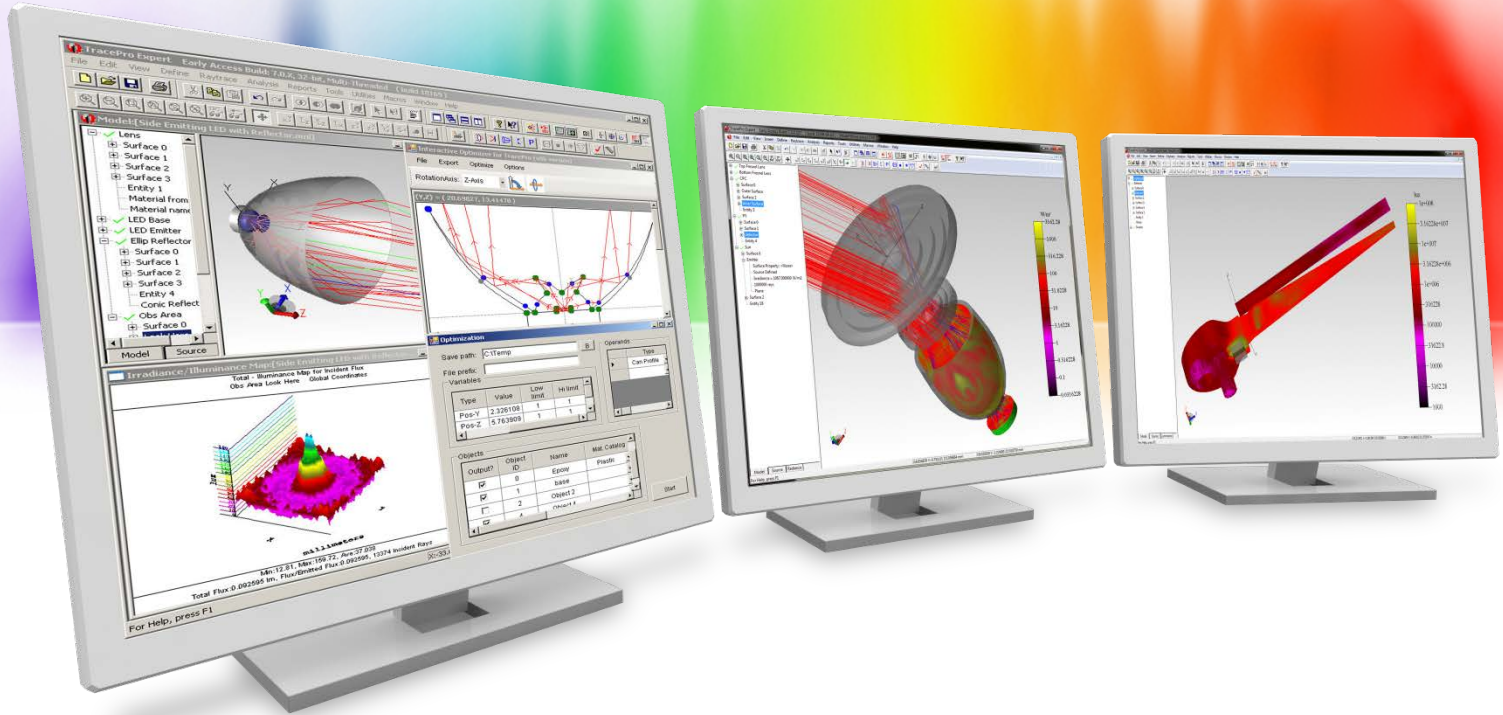
# Optimizing a solar collector with multiple sources



The screenshot shows a software interface with a table of operands and a modal dialog box. The table has columns for ID, Type, Surface, Range, Weight, Target value, MAP Op., and Src Config. The dialog box, titled 'Source Configuration Editor', shows a configuration for three sources, with the first source selected. The configuration code is as follows:

```
Configuration: < 1 / 3 >  
  
(raytrace:set-surface-source-flag (entity:get-by-names "10AM Sun" "Emitter") #f)  
(raytrace:set-surface-source-flag (entity:get-by-names "Noon Sun" "Emitter") #f)  
(raytrace:set-surface-source-flag (entity:get-by-names "2PM Sun" "Emitter") #f)  
(raytrace:all-sources)
```

**Live Demo**



## Summary and Questions

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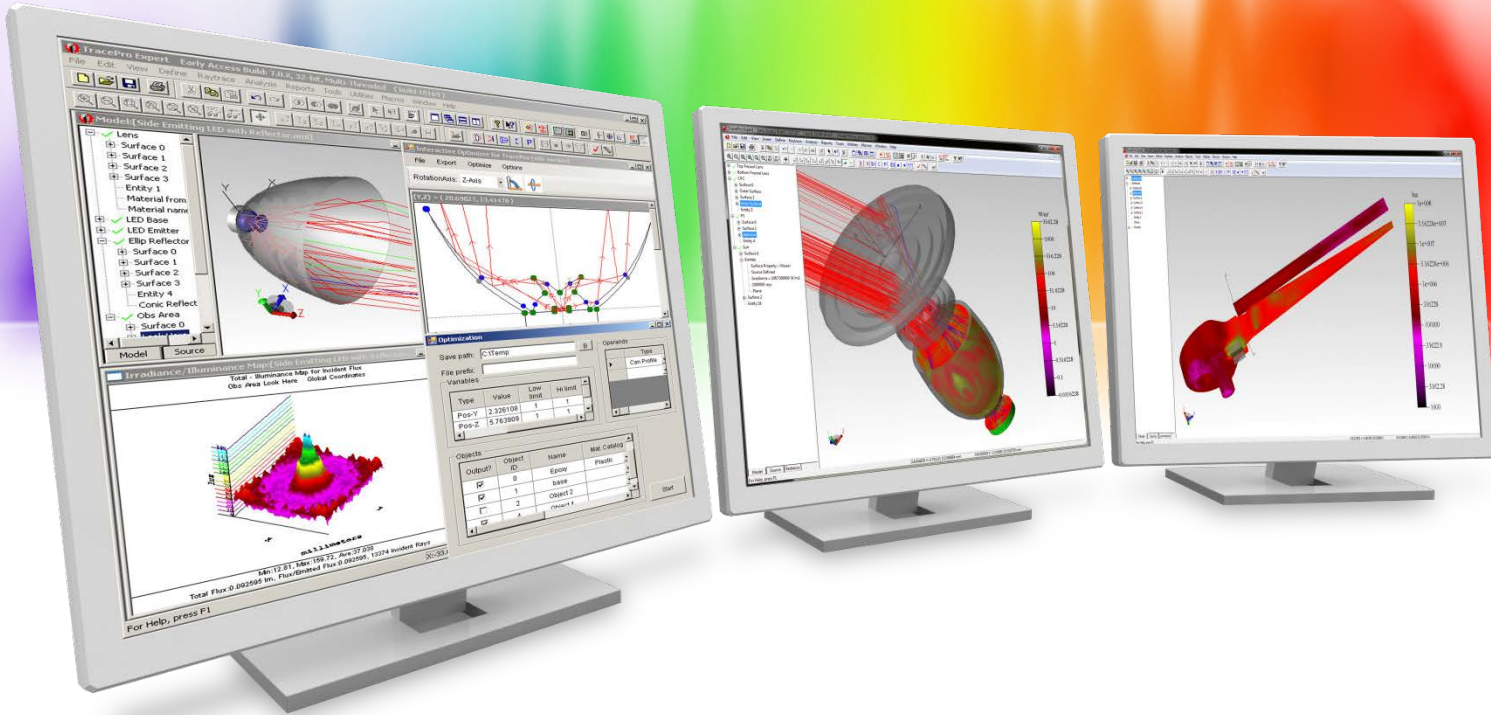
- ✓ TracePro has many tools for analyzing and optimizing solar applications
- ✓ TracePro can be used to analyze existing or new solar collectors
- ✓ The Solar Emulator allows you to model the performance of a system in different locations and time periods
- ✓ The interactive optimizer can be used to easily optimizer a variety of solar collectors

For more information or for a free 14-day trial for qualified users,  
please contact us at:

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Phone: +1 978-486-0766

E-mail: [sales@lambdares.com](mailto:sales@lambdares.com)



## Thank You!