



# COLOR MIXING OPTIMIZATION

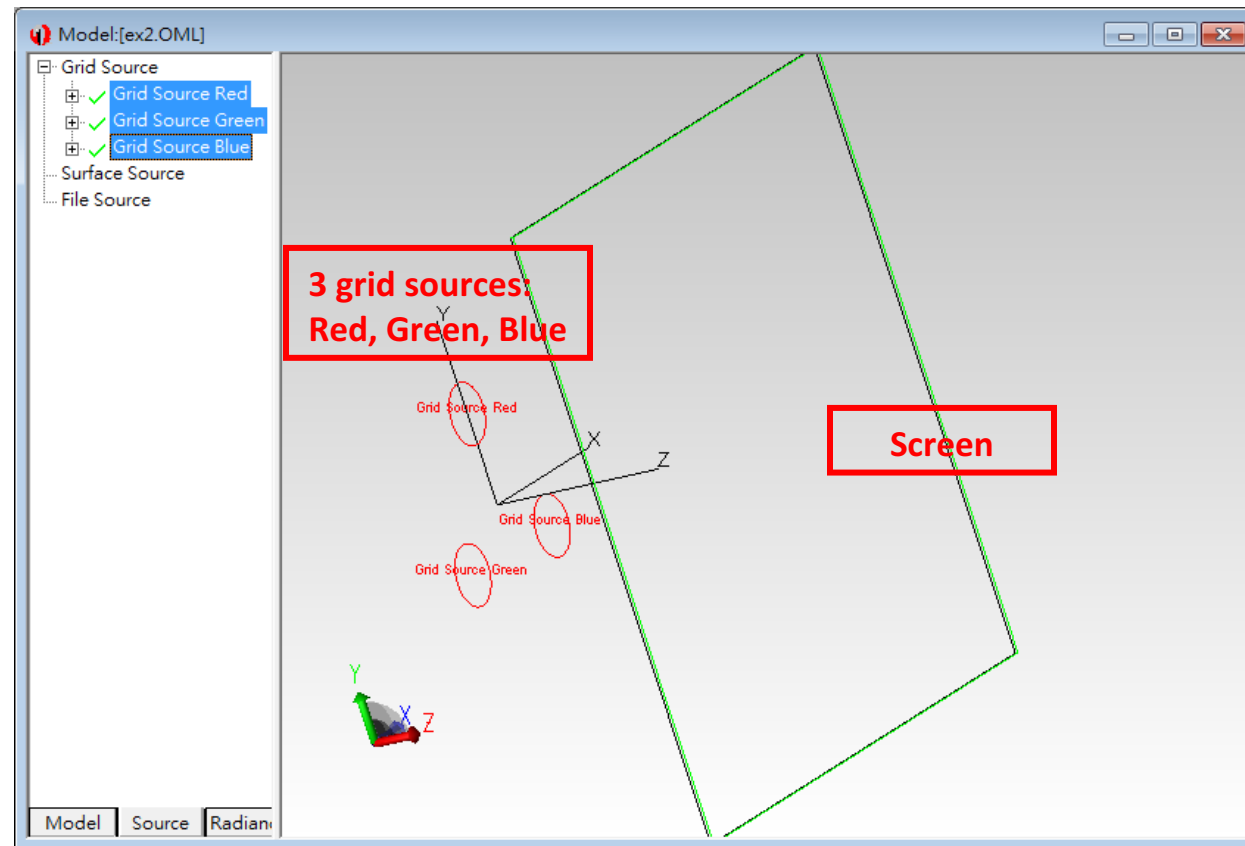
Trace**Pro**



# Color mixing optimization

**Model in TracePro (ex2.oml)**

TracePro





# Color mixing optimization

## Grid sources

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Grid Source

Grid Setup | Beam Setup | Polarization | Wavelengths

Name: Grid Source Red

Grid Boundary: Annular

Outer radius: 1 Inner radius: 0

Grid Pattern: Random

Units: Radiometric Rays/wave: 100000

Flux per ray: 8.0432659387 Watts

Grid Position and Orientation: Direction Vectors

Origin	Normal vector	Up vector
X: 0	X: 0	X: 0
Y: 3	Y: 0	Y: 1
Z: 0	Z: 1	Z: 0

Color: ■

Insert Modify Set Defaults

Red(0.6328um)

Grid Source

Grid Setup | Beam Setup | Polarization | Wavelengths

Name: Grid Source Green

Grid Boundary: Annular

Outer radius: 1 Inner radius: 0

Grid Pattern: Random

Units: Radiometric Rays/wave: 100000

Flux per ray: 8.9256352186 Watts

Grid Position and Orientation: Direction Vectors

Origin	Normal vector	Up vector
X: -2.5980762	X: 0	X: -0.8660254
Y: -1.5	Y: 0	Y: -0.5
Z: 0	Z: 1	Z: 0

Color: ■

Insert Modify Set Defaults

Green(0.5461um)

Grid Source

Grid Setup | Beam Setup | Polarization | Wavelengths

Name: Grid Source Blue

Grid Boundary: Annular

Outer radius: 1 Inner radius: 0

Grid Pattern: Random

Units: Radiometric Rays/wave: 100000

Flux per ray: 7.3176860809 Watts

Grid Position and Orientation: Direction Vectors

Origin	Normal vector	Up vector
X: 2.5980762	X: 0	X: 0.8660254
Y: -1.5	Y: 0	Y: -0.5
Z: 0	Z: 1	Z: 0

Color: ■

Insert Modify Set Defaults

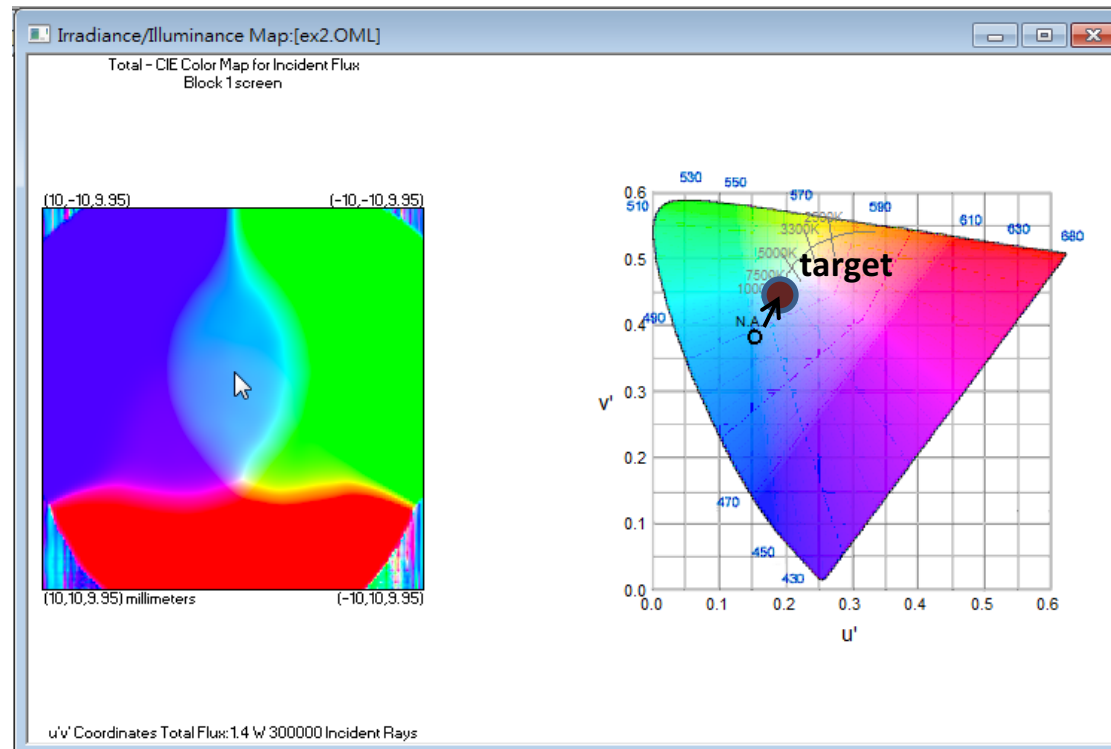
Blue(0.45um)



# Color mixing optimization

## Target

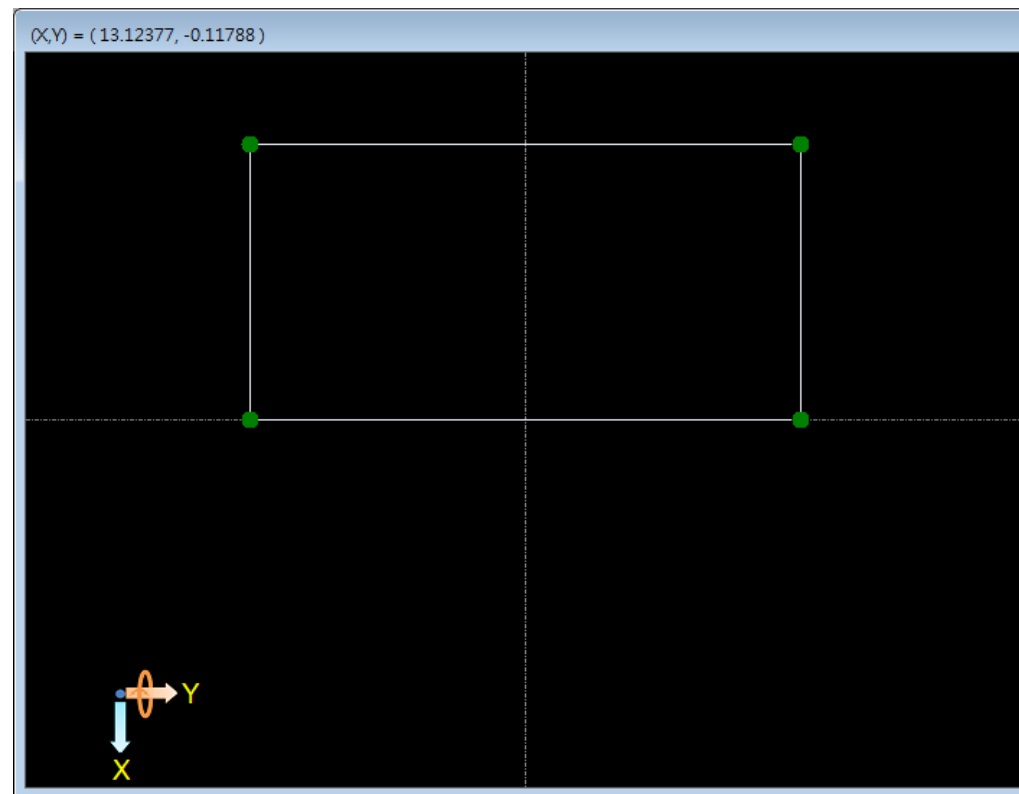
- Adjust the flux of each grid source to make the color in the central area is close to white  $(u',v')=(0.2,0.466)$





# Color mixing optimization

Start a new design in the Interactive Optimizer. No need to make any change to the initial object, since in this example, the goal is not to optimize the optics but the flux of each grid source.



TracePro



# Color mixing optimization

Launch the Optimization window.

In the Variables grid view, insert three user-defined variables and name them as “r”, “g” and “b”. Set the initial values and lower/upper limits are follows.

Save path:  B

File prefix:

Variables

Object	ID	Type	Value	Lo limit/Pickup value	Hi limit
r		User-defined	0.1	0.1	1
g		User-defined	0.5	0.5	1
b		User-defined	0.8	0.5	0.5

Objects



# Color mixing optimization

Insert a new operand as the target. In this case, we want to get a white color in the central area, so drag a rectangle as the analysis location and choose white  $(u',v')=(0.2, 0.46)$  as our target color.

TracePro

The screenshot shows the TracePro software interface. At the top, the 'Operands' table is visible:

Type	Opt.	Wgt.	Surface	Location	Target
CIEuV	Average	50	screen	(-0.074...	(0.2004878...

Below the table, two dialog boxes are shown:

- Region selector (0.2587302,-0.4587302)**: This dialog has 'Type' set to 'Region'. It shows a black square with a red rectangle in the center. The 'Selected region' is  $(-0.07460318, 0.07142857) - (0.07460318, 0.07142857)$ .
- Color selector (0.4273171,-0.05147059) CCT = 3383...**: This dialog shows a color triangle with a 'Target' point. The 'Selected color' is  $(0.2004878, 0.4661765)$ .



# Color mixing optimization

In this example, there is no need to really create any optics in TracePro. Uncheck all object and then double-click on the after-scheme cell at the 1<sup>st</sup> row to open the scheme editor. Type in the codes as the picture below.

TracePro

The screenshot shows the 'Objects' table in TracePro. The table has columns: Output?, Object ID, Name, Mat. Catalog, Mat. Property, Geo. type, Linked Obj / Length, and After-scheme. The first row is highlighted in blue and has the 'After-scheme' cell containing '(raytrace:set-grid-total...'. A red arrow points from this cell to the 'Scheme editor' dialog box. The dialog box contains the following text:

```
(raytrace:set-grid-total-flux $var("r")$ "Grid Source Red")  
(raytrace:set-grid-total-flux $var("g")$ "Grid Source Green")  
(raytrace:set-grid-total-flux $var("b")$ "Grid Source Blue")
```

At the bottom of the dialog box are 'Discard' and 'Apply' buttons.





# Color mixing optimization

TracePro

```
Scheme editor
(raytrace:set-grid-total-flux $var("r")$ "Grid Source Red")
(raytrace:set-grid-total-flux $var("g")$ "Grid Source Green")
(raytrace:set-grid-total-flux $var("b")$ "Grid Source Blue")
Discard Apply
```

More details about the supported commands can be referred in the document entitled "Commands of Interactive Optimization"

## Code explanations:

(raytrace:set-grid-total-flux) is a scheme command which is to set the flux value for the specified grid source.

Interactive optimizer now can embed its own commands into a pure scheme sentence.

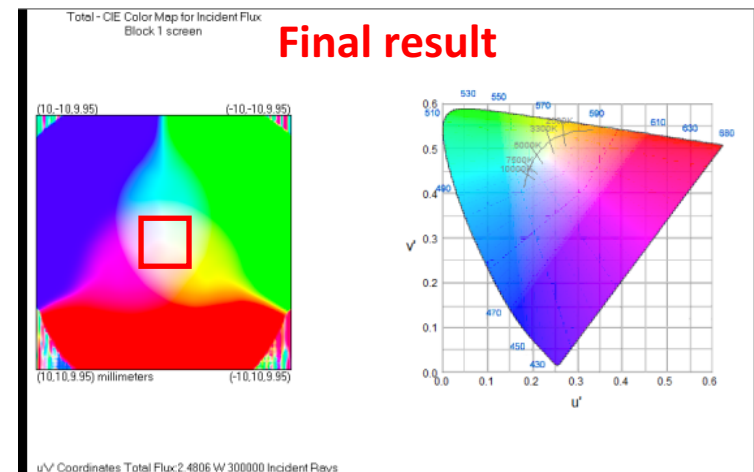
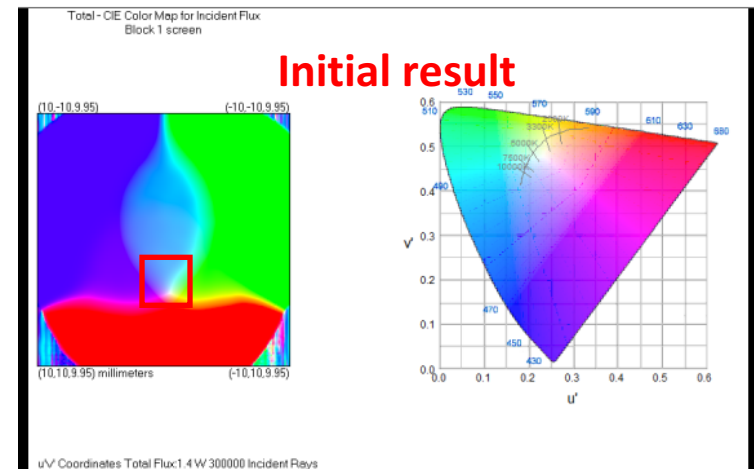
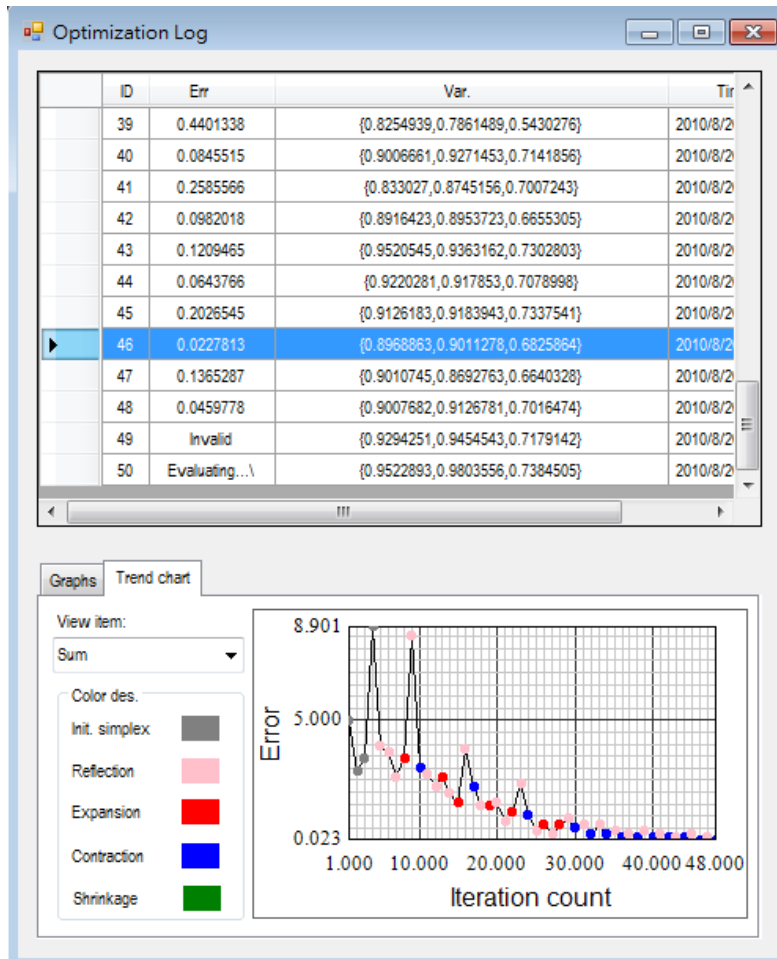
On this page, we had already inserted 3 user-defined variable named "r", "g" and "b". The built-in command var(var\_name) can retrieve the corresponding user-defined value when optimizing.

**But please note, a pair of dollar signs is necessary for the interpreter to recognize the embedded command.**



# Color mixing optimization

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# Color mixing optimization

shows a very important new possibility created by the Interactive Optimizer. Combining a user-defined variable and scheme language, the Interactive Optimizer can be an optimization platform. Users can take the advantage of using both the Scheme macro language and variables to optimize more complicated systems.

TracePro

Following this concept, we can add powerful optimization algorithms, such as Global Explorer, to search for global minima. Look for this new feature in an upcoming release of the interactive optimizer.