

Hints, Tips and Solutions

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Q. I am currently using *ATLAS/ Blaze* to model the electrical properties of an LED device that I am investigating. Is it possible to examine the reverse ray trace from my simulated structure so that I can examine the angular distribution properties of the optical output of the device?

A. *ATLAS* enables users to perform a reverse ray trace on their LED device allowing the calculation of the optical coupling efficiency of LED/OLED devices. The optical coupling efficiency is defined as the portion of the luminous power that exits the device. The reverse ray tracing algorithm is performed on a structure file containing previously simulated electrical / optical characteristics of the device in question. To perform a reverse ray trace on the device use is made of the save statement. An example of the *ATLAS* syntax for a reverse ray trace is given as the following:

```
save fast angpower=angle1_
fast.log rayplot=ray_angle1_
fast.log x=2.0 y=1.01 l.wave=0.9
reflects=4
```

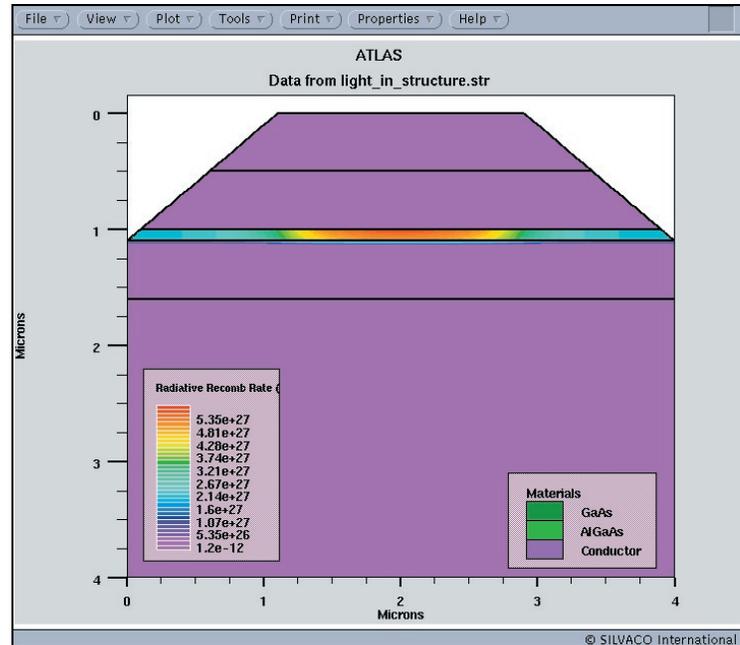


Figure 1. Simulated device.

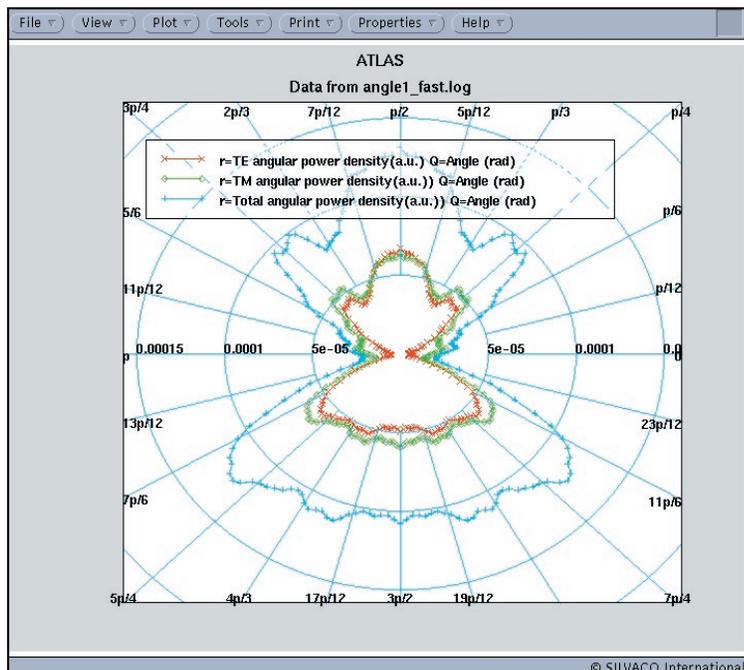


Figure 2. TE and TM angular power distributions: no mirror.

where:

ANGPOWER specifies the name of the output file containing the angular power density versus output angle dependence obtained by reverse ray-tracing.

RAYPLOT specifies the name of the output file containing the information on each ray exciting the device in the process of reverse ray-tracing. This information includes relative ray power, polarization ratio, output angle, and initial angle at the origin (X,Y) of reverse ray-tracing. This file should be specified for the ray-tracing to proceed.

X, Y are the coordinates of the origin of the rays in the reverse ray-tracing. The origin should be located in the active region of the device.

L.WAVE is the wavelength of output radiation (needed for using appropriate refractive indexes of the materials). Should be specified for the ray-tracing to proceed.

In the above syntax readers will also notice the keyword fast. This is a new addition to the reverse ray tracing algorithm in Atlas that significantly increases the speed of the computation.

Figure 1 shows the simulated device with the photogeneration rate evident in the active region of the device. Figure 2 shows the transverse electrical and magnetic angular power density of the device as a function of angular distribution.

Using this method users may optimize their device structure for a more focussed beam. For example, users may wish to see what the effect of placing a mirror on the top of the device is on the angular distribution of the ray trace. The ray trace syntax would be written as:

```
save fast angpower=angle1_fast_
mirror.log rayplot=ray_angle1_
fast_mirror.log x=2.0 y=1.01
l.wave=0.9 mir.bottom numrays=360
reflects=4
```

where the effect of such a mirror is shown in Figure 3.

It is noted that the list of keywords related to the reverse ray trace is not exhaustive; a full list is given in the *ATLAS* manual.

A brief note on viewing the information in *TonyPlot*: In order to display the angular data a built in feature of *TonyPlot* is used, see Figure 4. To create such a plot as in Figure 2, firstly the respective file is loaded into *TonyPlot*, in this case the angpower file is used. Then within *TonyPlot*, plot...display is selected, which brings up the *TonyPlot*: Display (XY Graph) gui. Within the GUI there are several types of graphs that can be displayed; for the case of Figure 2 the polar type graph is selected by clicking on the respective symbol in the Type area of the GUI. After this type has been selected Convert Data is clicked. The *TonyPlot*: Display (XY Graph) gui now allows four polar graphs to be plotted which will be overlaid on each other to produce a graph as in Figure 2.

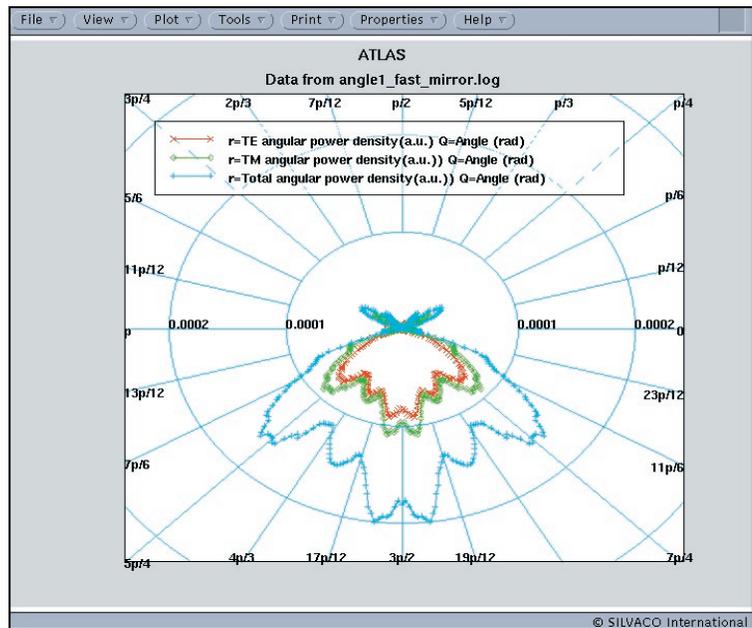


Figure 3. TE and TM angular power distributions: with mirror.

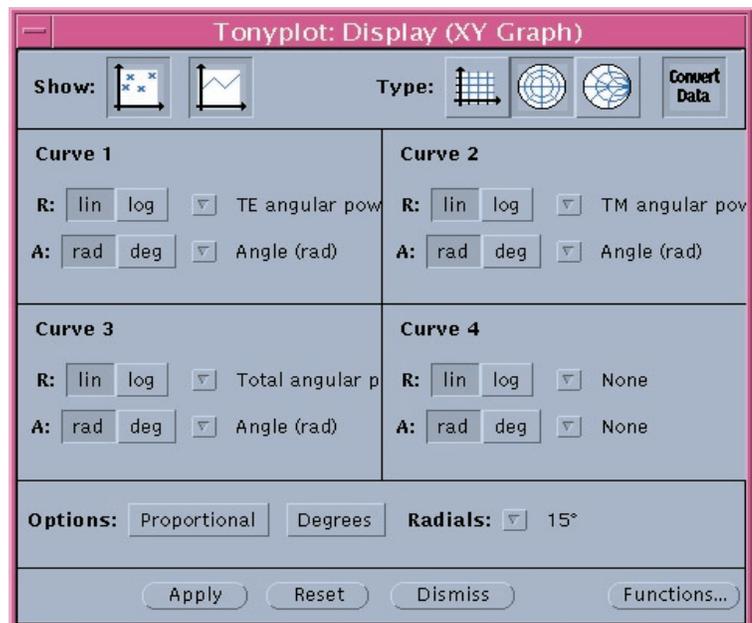


Figure 4. *TonyPlot* display.

Call for Questions

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