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GP Lens Modeling Notes For Zemax

Currently, ImagineOptix and uses TracePro (Expert Edition) to model the GP Lens for non-sequential ray tracing. There is a GPH_win32_v2.2.dll file designed for TracePro that allows for accurate modeling of the GP Lens and PG and keeps track of the polarization aspects. This is the best way to model these elements.

If this package is not available and Zemax is needed to model the GP Lens, there are some methods to mimic the lens surface. This document will try to give some guidance on how to implement the GP Lens in general.

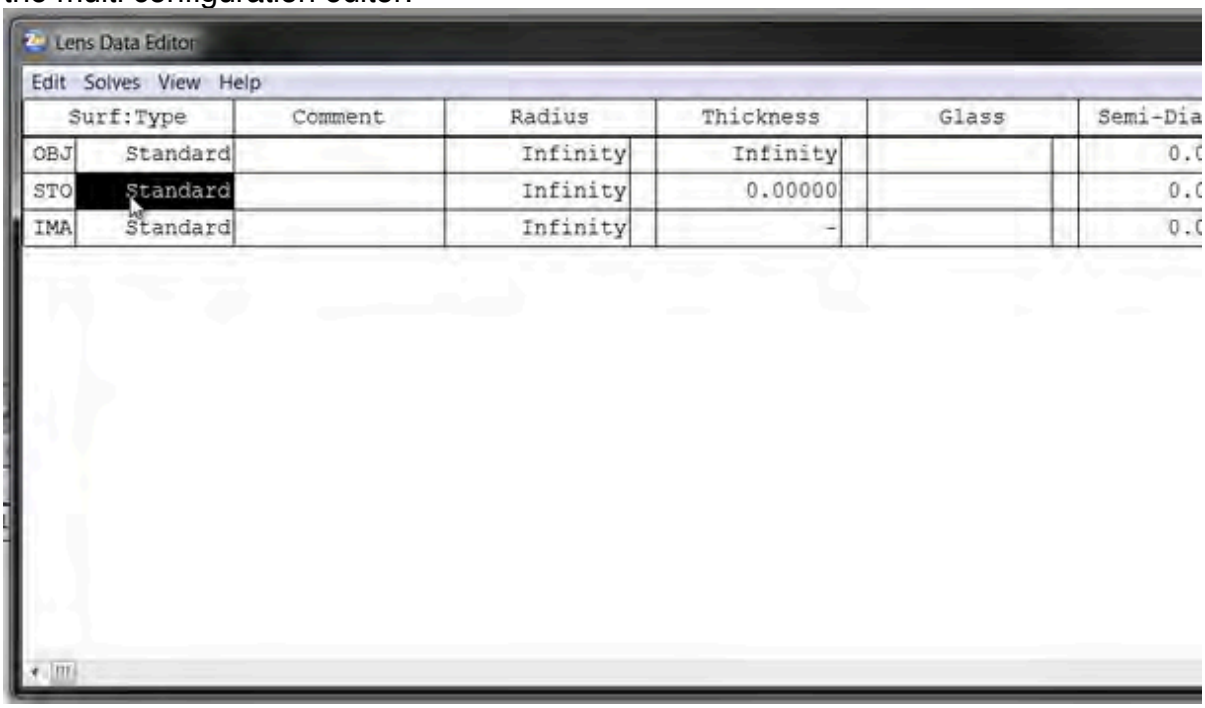
To implement a basic GP Lens, we will use the parameters shown below.

GP Lens Parameters

- Focal Length: 100mm (Positive)
- Initial Wavelength: 550nm
- Pupil: 20mm

Modeling With Zemax

When modeling with Zemax, the GP Lens should be defined as a simple hologram 1 surface using the multi configuration editor.



The lens is initially set up in the Lens Data Editor and placed at the stop surface (STO) as a Hologram 1 surface.

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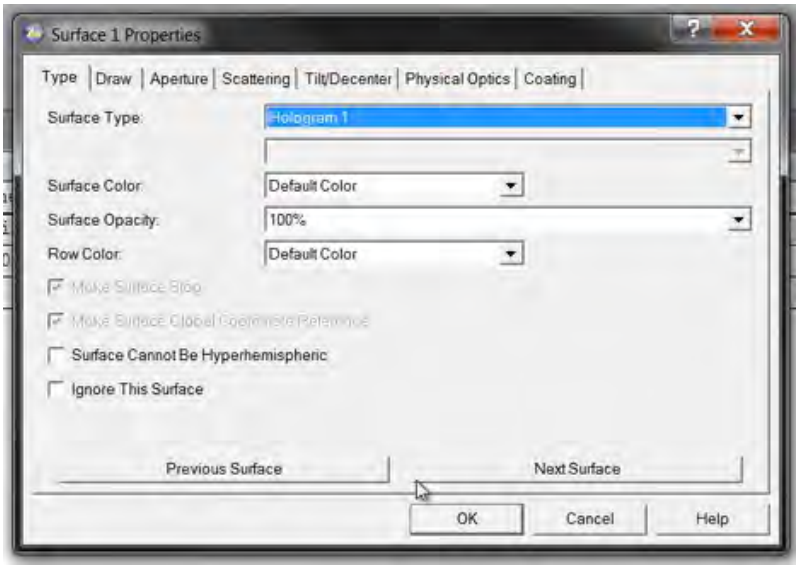
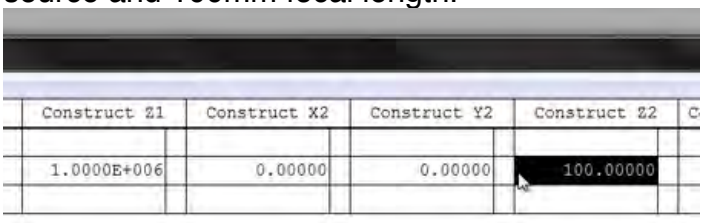
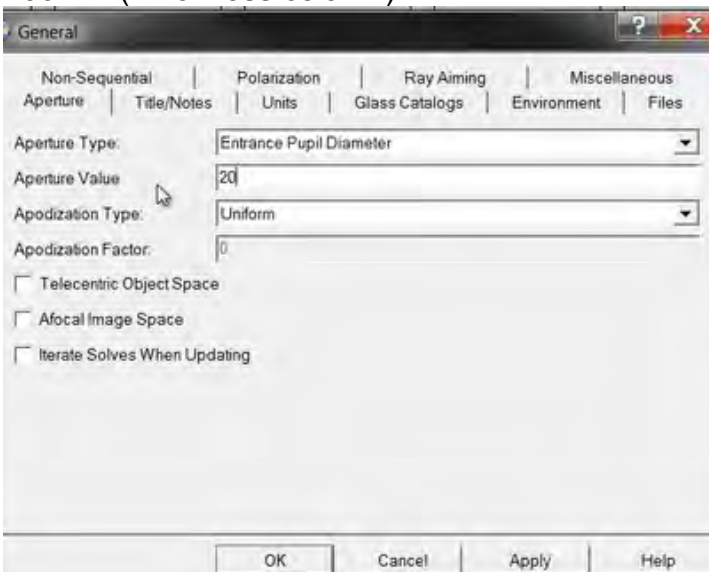


To place the lens with a positive 100mm focal length, you then set Construct Z1 to a large number (near infinity) and the Construct Z2 to the focal length of the lens. This sets up the lens with a point source and 100mm focal length.



Next, set the entrance pupil (20mm) so that the lens can be viewed and set the image plane to 100mm (Thickness column).



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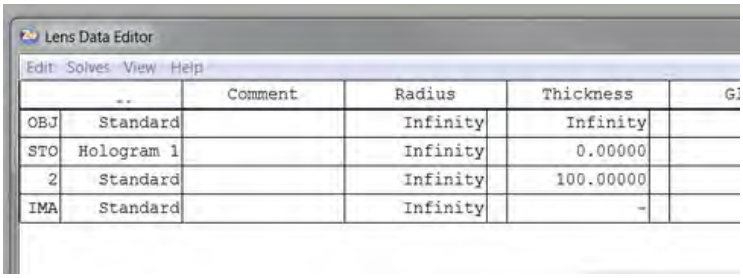
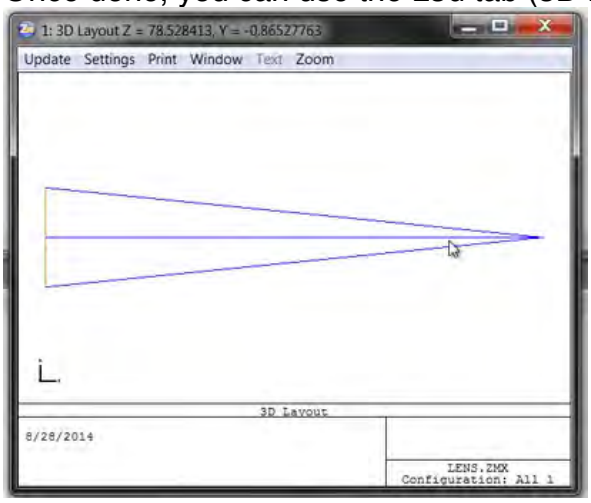


Once done, you can use the L3d tab (3D Layout) to see the lens focusing 550nm light to a point.



To see how the GP Lens behaves with multiple wavelengths, you can go to the Wavelength Data and select RGB ("F, d, C (Visible)") to show full color and then set the 3D Layout Settings to display based on color (Color Rays by "Wavelength").

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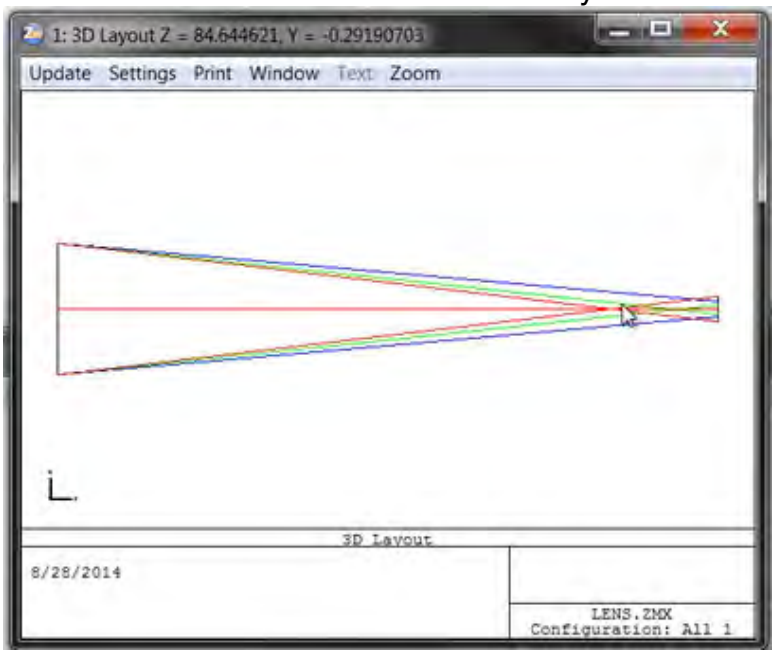
You will then see the chromatic dispersion (shift in focus, based on wavelength) as you would expect to see for a GP Lens. This also looks very similar like the dispersion of a Fresnel lens.



Of course, this is only showing how the element operates with a single circular polarization (we'll call this one Right Circular). To add the operation for the opposite order (or Left Circular), you add an additional configuration to the multi-configuration editor. This is done by going to Parameter 8 in the Multi-Configuration Editor and inserting an additional configuration (Config 2).

Set the Operand to "PRAM", the Surface to "1" and the Param# to "8".

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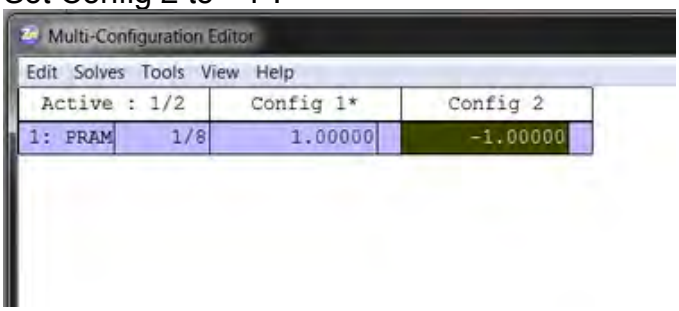
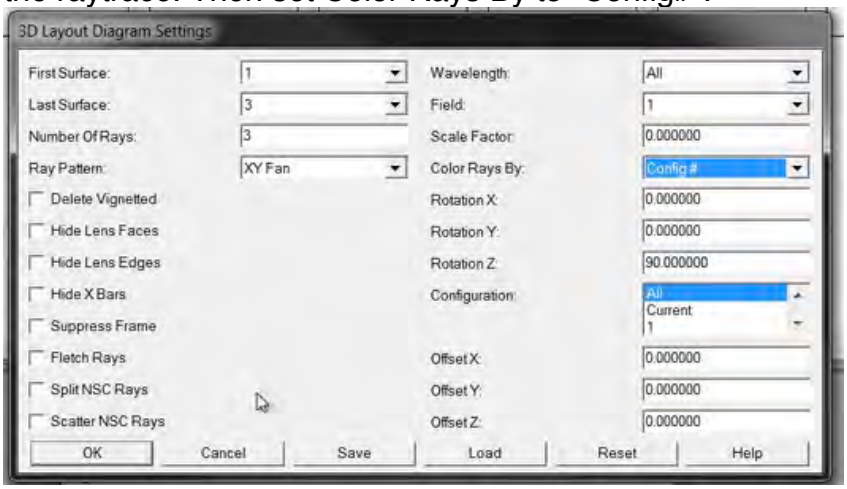
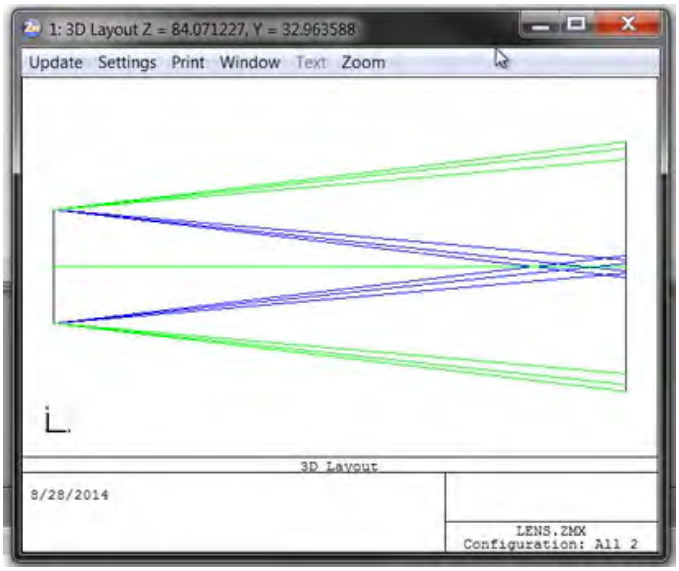
Set Config 2 to “-1”.



Now go to the 3D Layout settings and set Configuration to “All”. This will allow both orders to show in the raytrace. Then set Color Rays By to “Config#”.



This will make it easier to see which rays correspond to each order and it will be more obvious as to which is the positive and negative focal lengths of the GP Lens.



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Raytracing With Polarization in Zemax

Since the Zemax modeling software does not track polarization, a different method is needed to pseudo model the GP Lens in the software to see how the different polarizations pass through the optical model.

The best way to raytrace, preserve and utilize polarization requires that two different traces are run for each GP Lens model. For each polarization, a single trace is run with all the orders set for a single configuration. In the case of right circular polarization, Configuration 1 would be used and displayed. To run the trace for left circular polarization, you would then use and display Configuration 2.

If you want to see the effect of both polarizations at once (to see stray light, etc), make sure to use and display both configurations simultaneously.