**How to build basic setup using ZEMAX Black Box of Top Hat beam shaper?**
**Holo/Or 2016**

1. **Download Top Hat model** file from our standard elements and place ZBB file into ZEMAX Black Boxes folder C:\Users\?????\Documents\Zemax\BlackBoxes

2. **Open new ZEMAX file** with follow surfaces:
   2.1. Dummy surface (1) before Black Box Lens surface
   2.2. Black Box Lens: in Comment parameter enter ZBB file name
   2.3. Paraxial lens (just for example): enter values of Focal Length and Thickness, or user system with objective or real lenses.

3. **Define environment parameters**:
   3.1. Change wavelength to desired one
   3.2. Modify beam size
   3.3. Apodization Type should be Gaussian
   3.4. Apodization Factor 6.25 (equivalent to 2.5 times beam size) recommended
   3.5. Aperture Value should be nominal beam size x2.5 recommended

View of Lens Data Editor (in the example below, the beam size is 10mm at 1/e2)

Lens Data

Update: All Windows

Surface 2 Properties — Configuration 1/1

| | Surf:Type | | Comment | Radius | Thickness | Material | Coating | Semi-Diameter | | Conic | TCE x 1E-6 | Par 1(unuse |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | OBJECT | Standard | | Infinity | Infinity | | | 0.000 | | 0.000 | 0.000 | |
| 1 | | Standard | DUMMY | Infinity | 0.000 | | | 12.500 | | 0.000 | 0.000 | |
| 2 | STOP (aper) | Black Box Lens | TH258.ZBB | | <3.000> | | | 12.700 | U | | 0.000 | |
| 3 | | Paraxial | | | 100.000 | | | 12.500 | | | 0.000 | 100.000 |
| 4 | IMAGE | Standard | | Infinity | - | | | 0.024 | | 0.000 | 0.000 | |

Wavelength definition

System Explorer

Update: All Windows

- Aperture
- Fields
- Wavelengths
  - Settings
  - Wavelength 1 (1.064 um, Weight = 1.0)
    - Enable
    - Primary
    - Wavelength (µm): 1.064

Aperture definition

System Explorer

Update: All Windows

- Aperture
  - Aperture Type: Entrance Pupil Diameter
  - Aperture Value: 25.0
  - Apodization Type: Gaussian
  - Apodization Factor: 6.25

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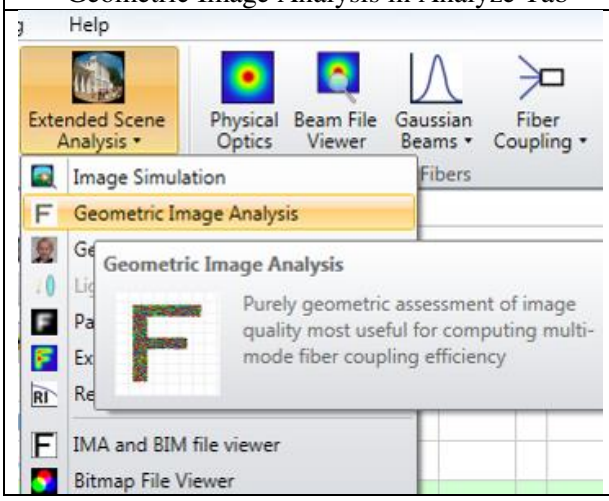
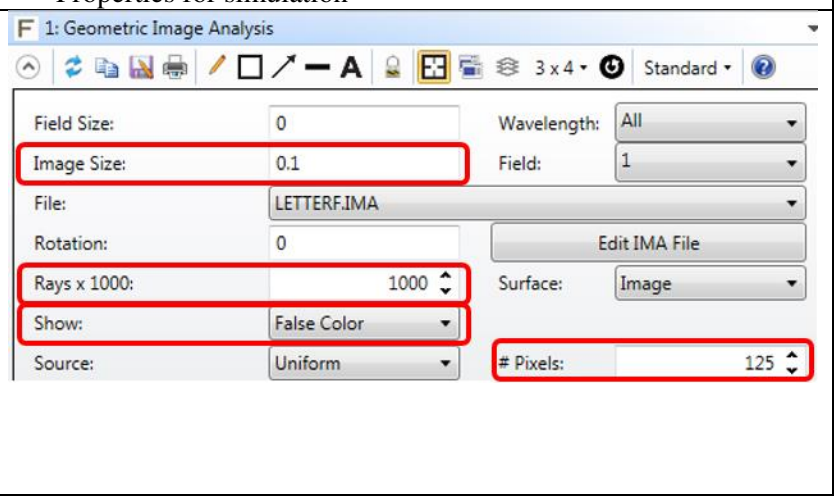
4. **Results analysis**

There are many possible analysis methods presented in ZEMAX. Unfortunately Using Black Box Lens model limited to geometric optics method, so the effects of diffraction and interference will not be seen.

4.1. One of the commons can be performed with using Geometric Image Analysis
Edit parameters of as follow

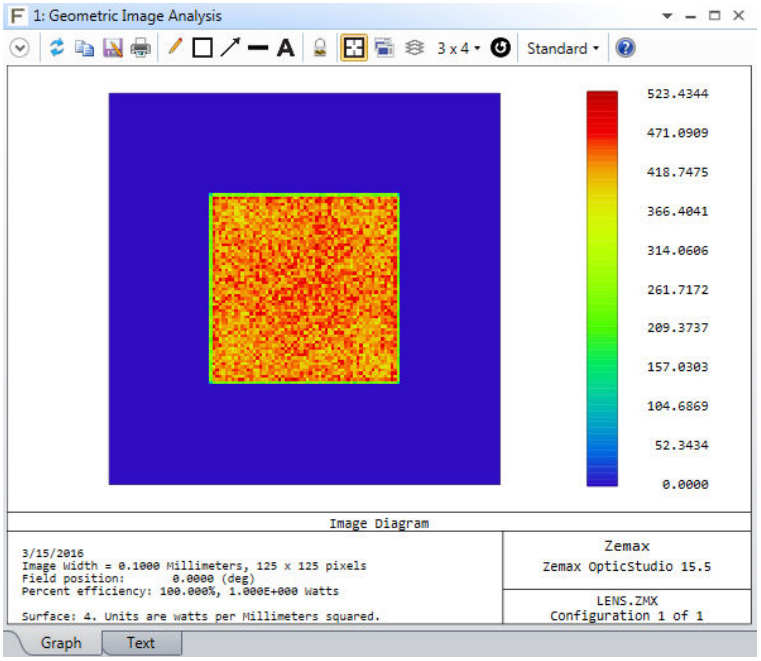
4.1.1. Image Size to be big enough to see whole shape of Top Hat
4.1.2. Show in False Color
4.1.3. Rays number and pixels – more is better

| Geometric Image Analysis in Analyze Tab | Properties for simulation |
|---|---|
|  |  |





5. **Geometric Image Analysis result**:





6. **Link to example file for downloading**

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