

How to build basic setup using ZEMAX Black Box of Top Hat beam shaper? Holo/Or 2019

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)

Surf.#	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

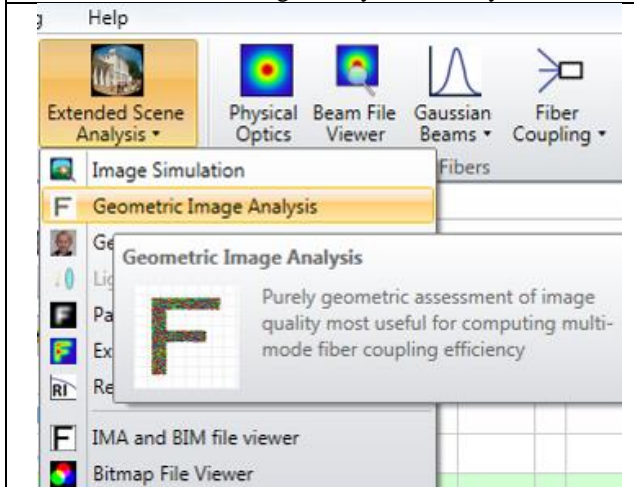
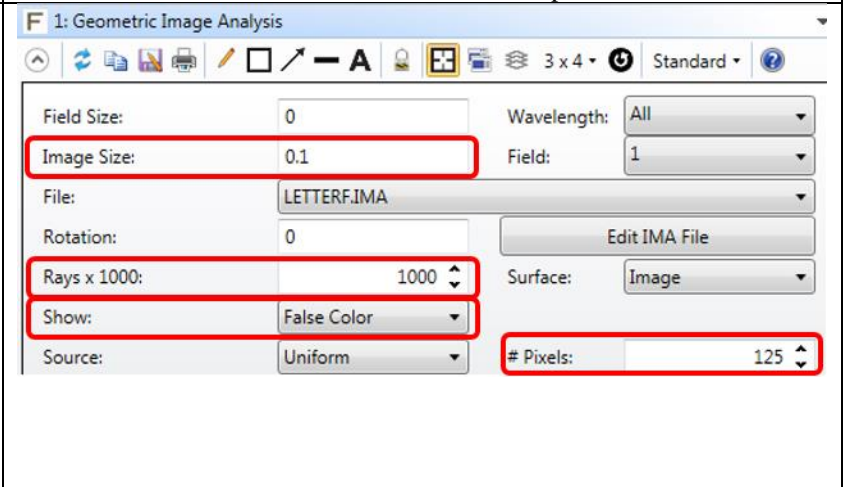
Aperture definition

4. Results analysis

There are many possible analysis methods presented in ZEMAX not including POP (physical optics propagation)

4.1 To use Geometric Image Analysis Edit the parameters of as follows

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

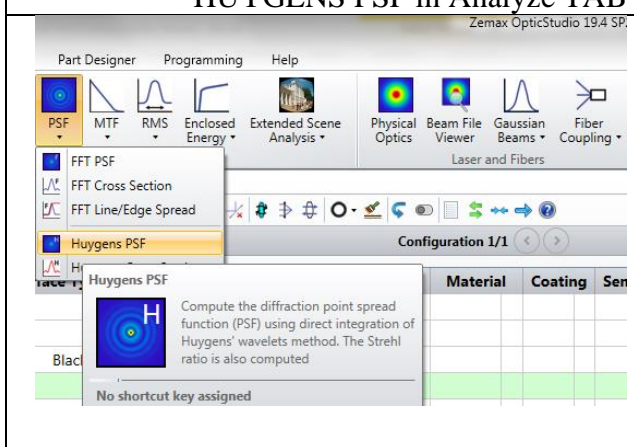
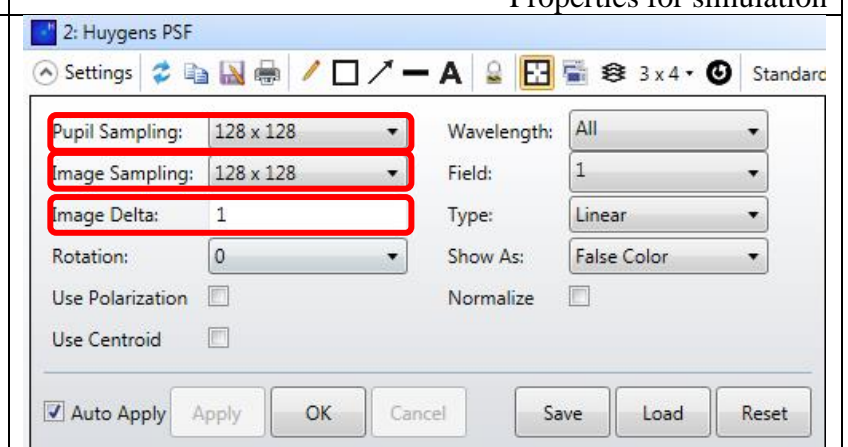
Geometric Image Analysis in Analyze Tab	Properties for simulation
	

4.2 To Huygens PSF analysis (more accurate than geometrical analysis) edit parameters of as follows:

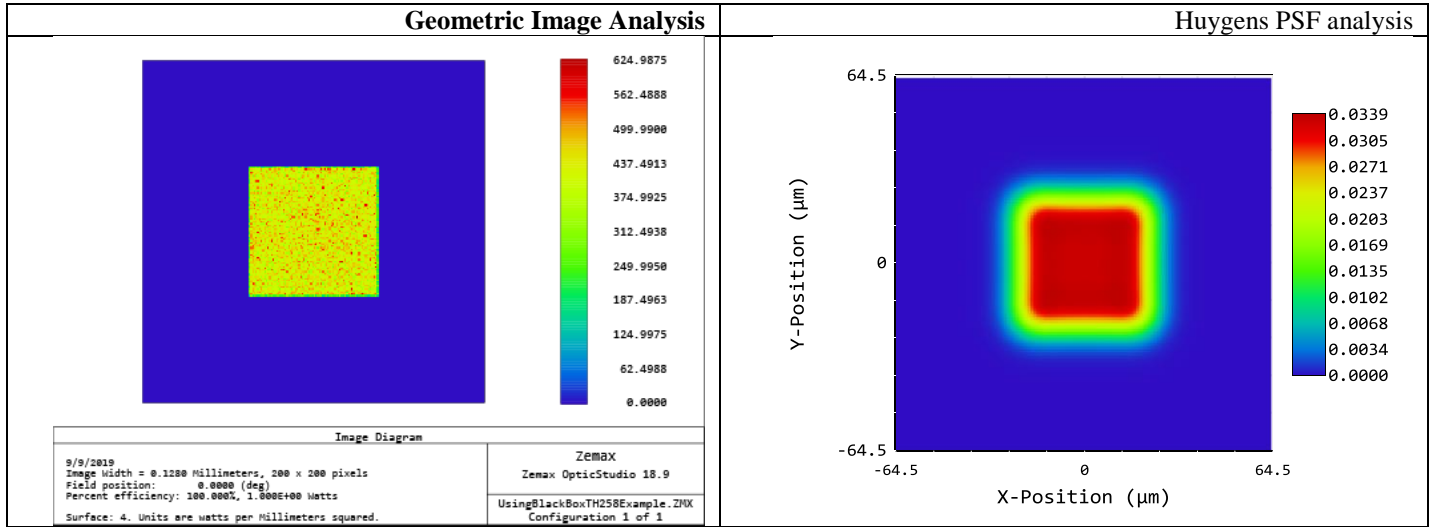
4.2.2. Pupil Sampling to define result precision (higher=better precision)

4.2.3. Image Sampling to define number of pixels in image plane (higher= more detailed result)

4.2.4. Image Delta defines pixel size in um units in image plane

HUYGENS PSF in Analyze TAB	Properties for simulation
	

5. Analysis results:



Comparison between the analysis methods.

Geometrical Image Analysis is faster than Huygens PSF. Huygens PSF gives much better evaluation of transfer region, aberrations and tolerances.

6. [Link to example file for downloading](#)