

## 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/e<sup>2</sup>)

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			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

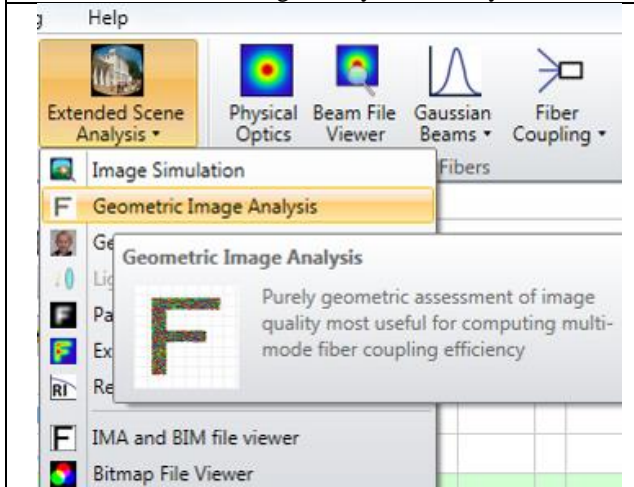
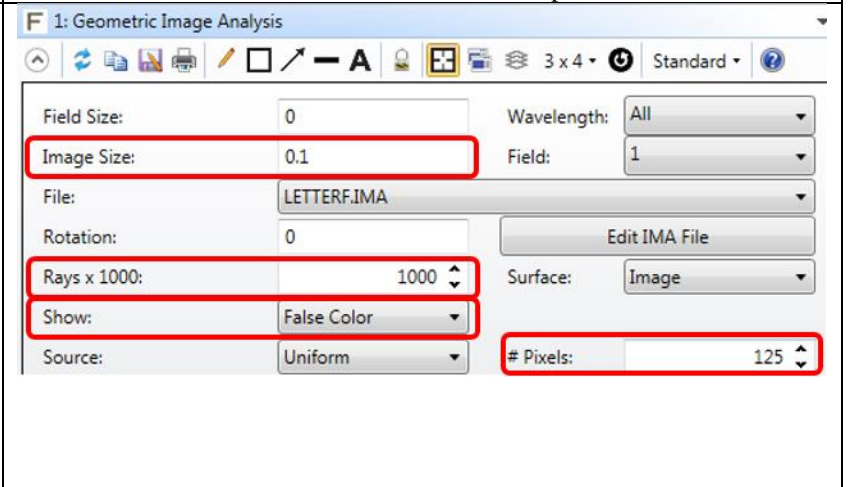
Aperture definition

## 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

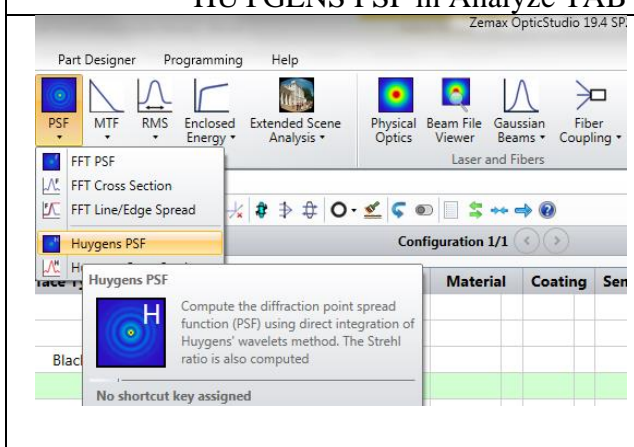
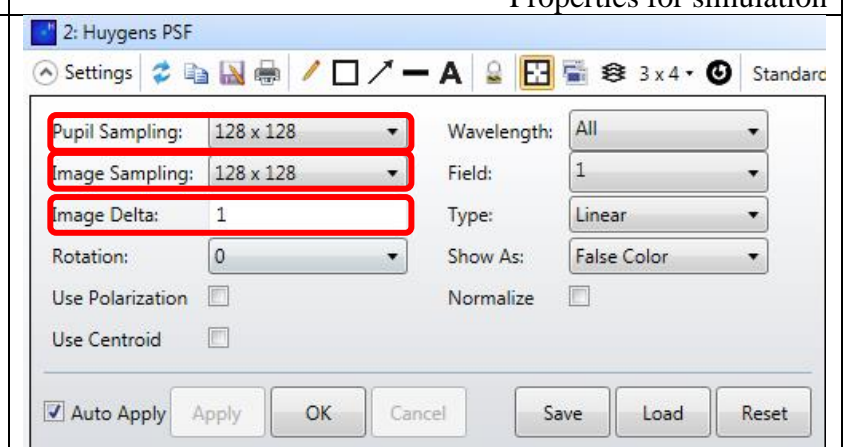
Geometric Image Analysis in Analyze Tab	Properties for simulation
	

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

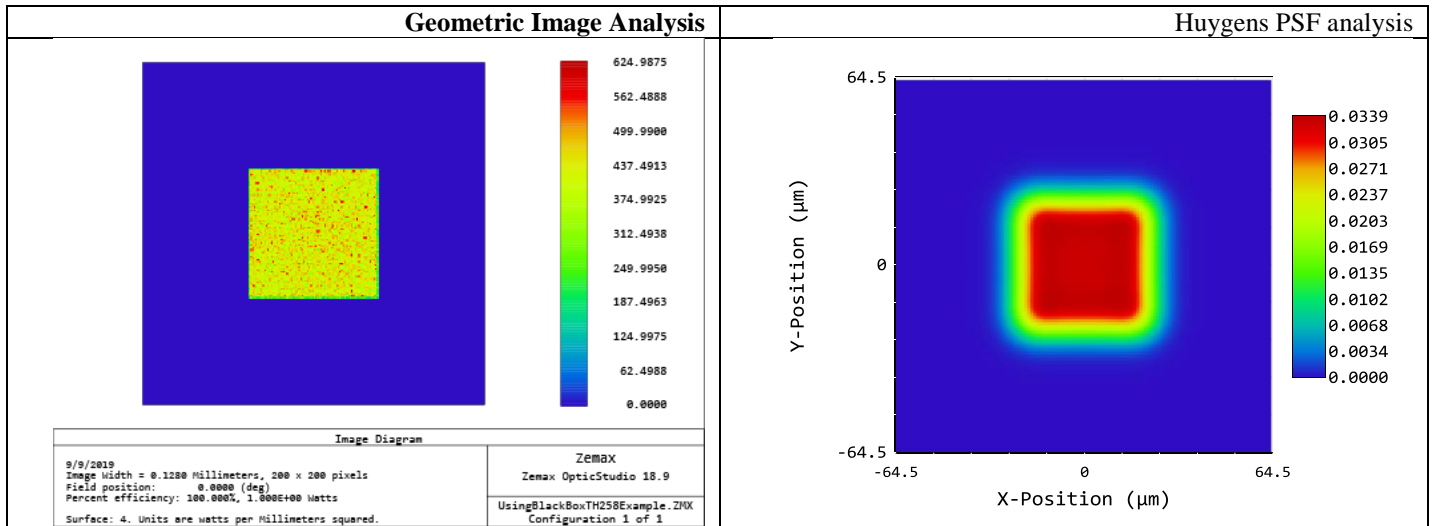
4.2.2. Pupil Sampling to define result precision (higher=better precision )

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](#)