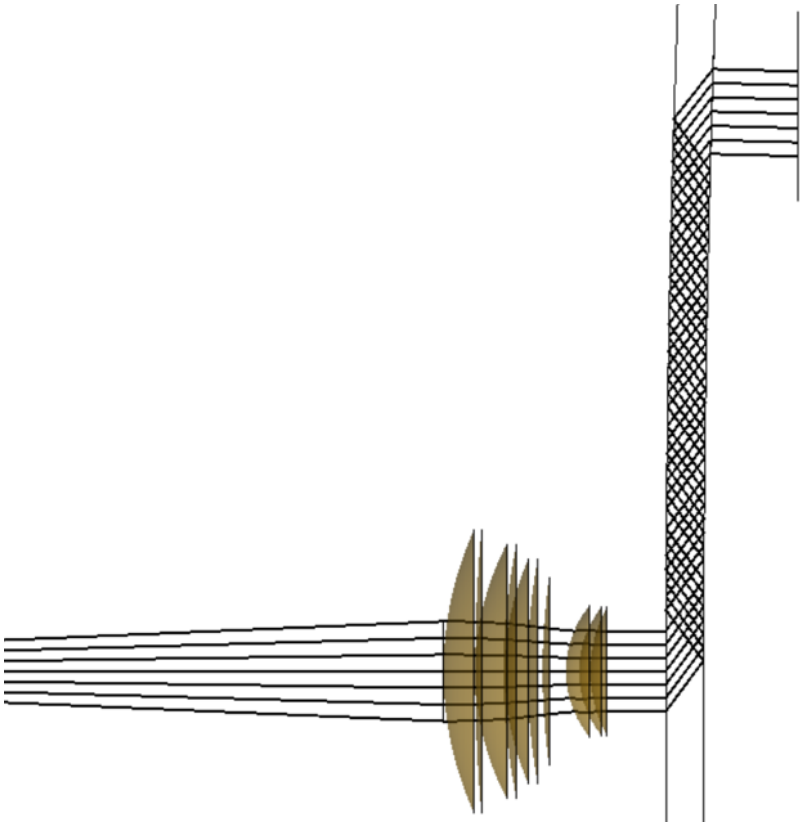
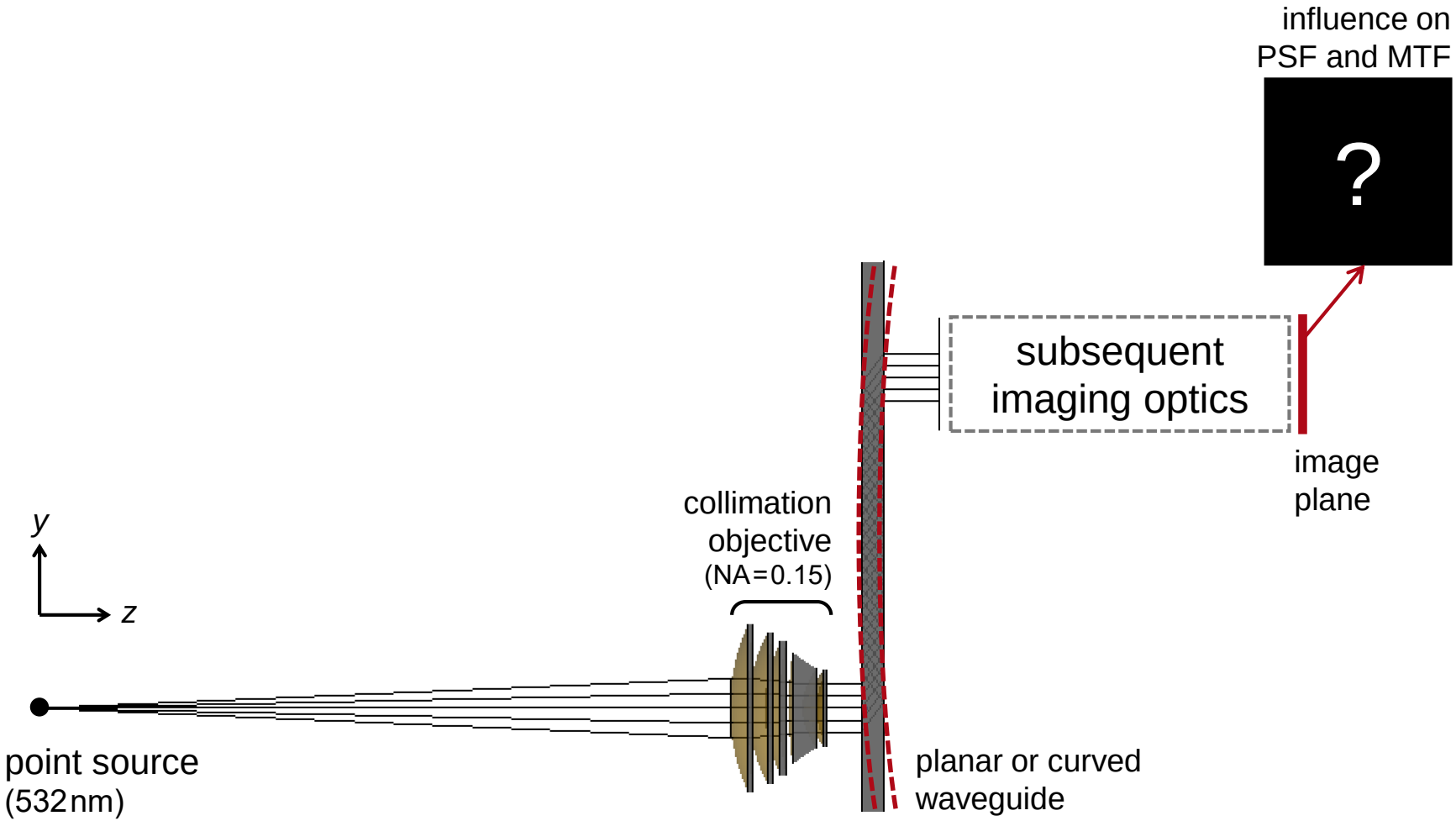
Analysis of Folded Imaging System with Planar or Curved Waveguide

Abstract

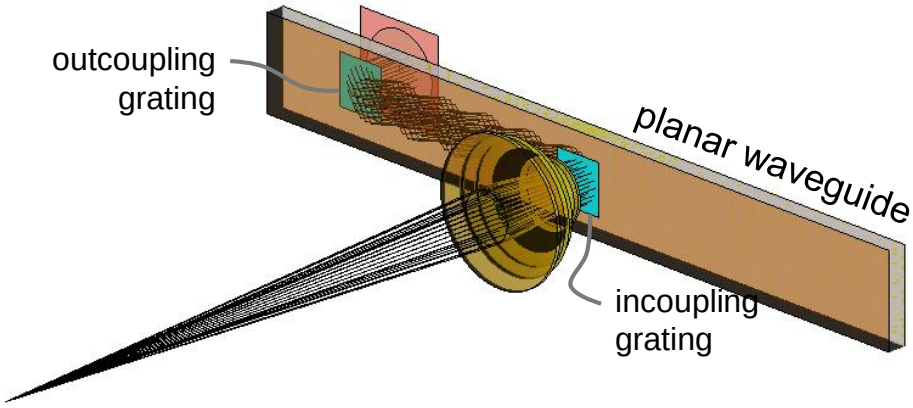


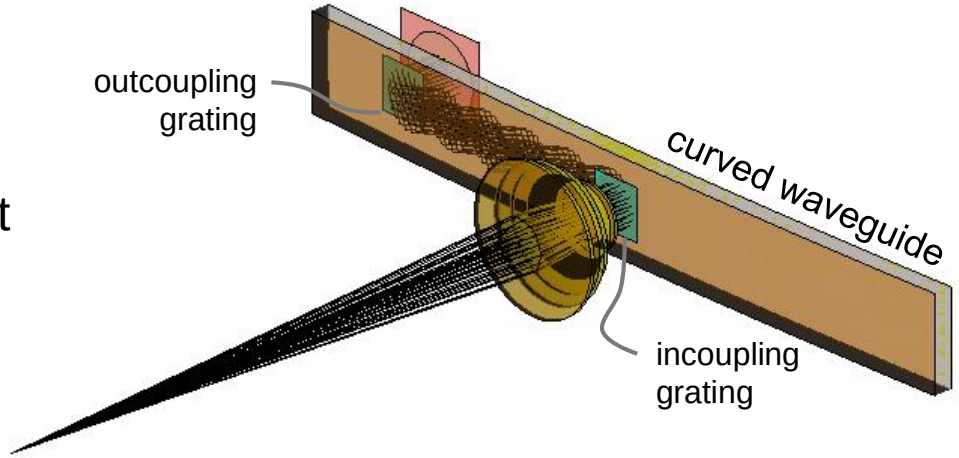
In a near-to-eye display system, the image generation unit, the collimation optics, the waveguide and the in- and outcoupling gratings, form a complex folded imaging system. To evaluate the image quality of such systems, it is important to include the influence from the waveguide structure. In this example, a folded imaging system, with either a planar waveguide or a curved waveguide, is modeled, and the PSF and MTF on image plane are calculated.

Modeling Task



Results



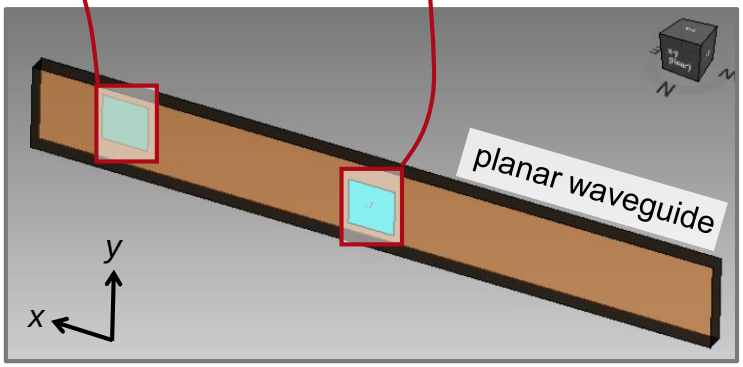


Ray-tracing analysis provides a fast overview of the complete system in space, with either planar or curved waveguide.

Results

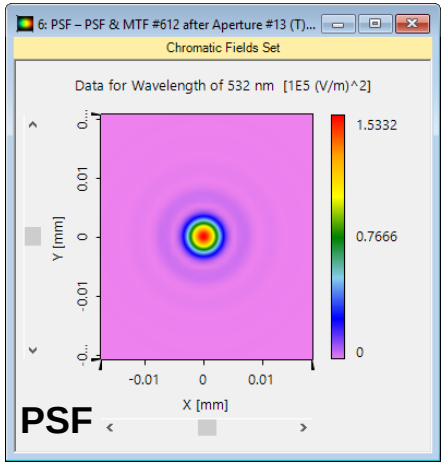
outcoupling grating region
- center at (15, 0 mm)
- size 2.7×2.7 mm

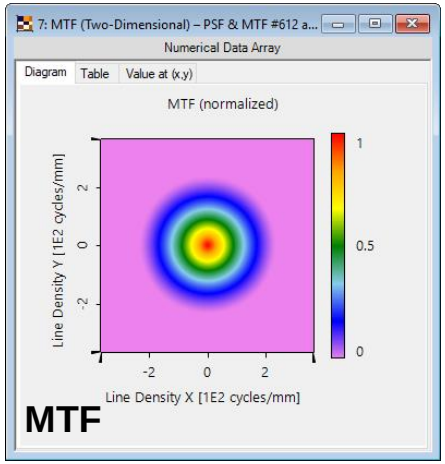
incoupling grating region
- center at (0, 0 mm)
- size 2.7×2.7 mm



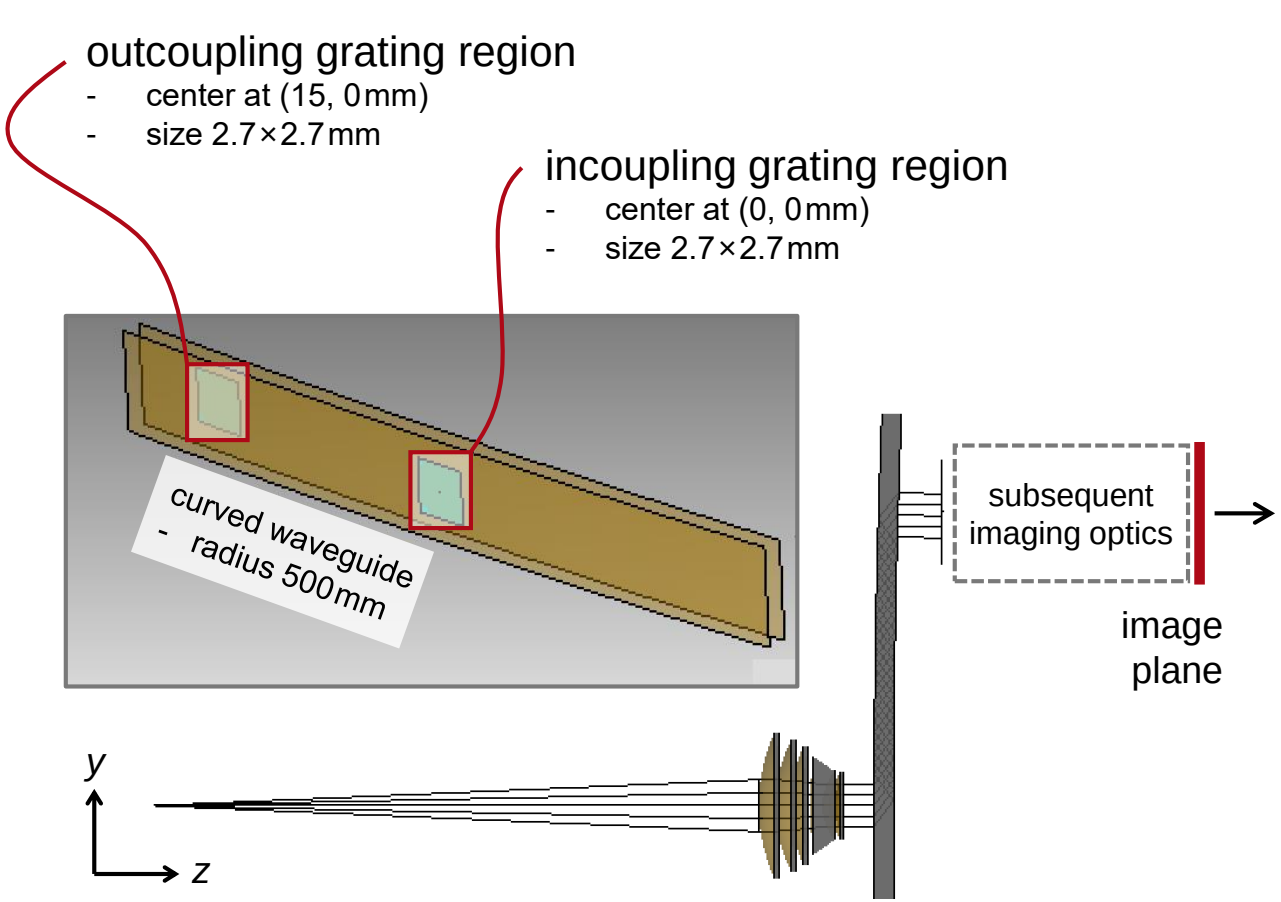
subsequent imaging optics

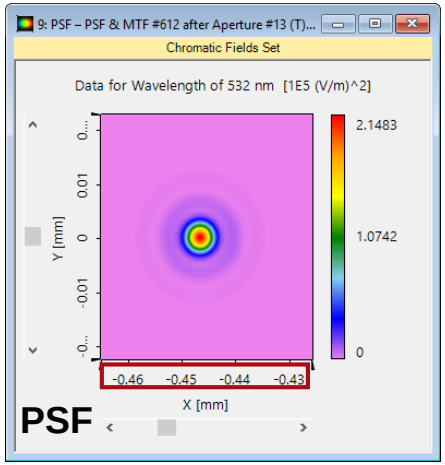
image plane

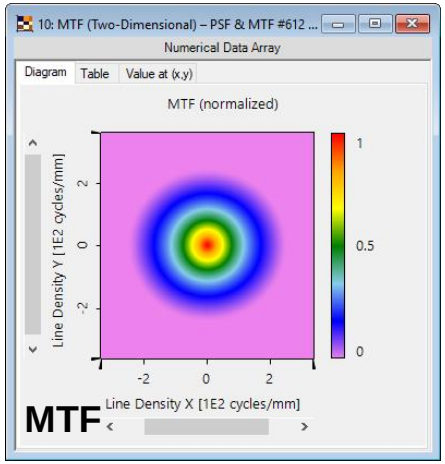




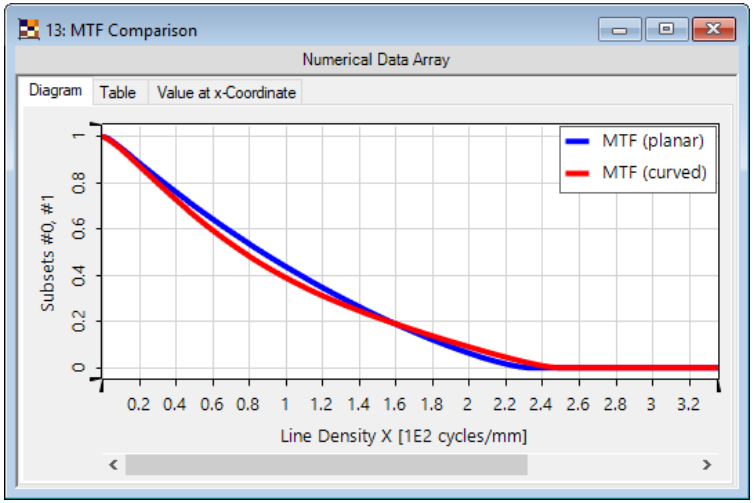
Results


outcoupling grating region
- center at (15, 0 mm)
- size 2.7×2.7 mm
incoupling grating region
- center at (0, 0 mm)
- size 2.7×2.7 mm
curved waveguide
- radius 500 mm
subsequent imaging optics
image plane
y
z

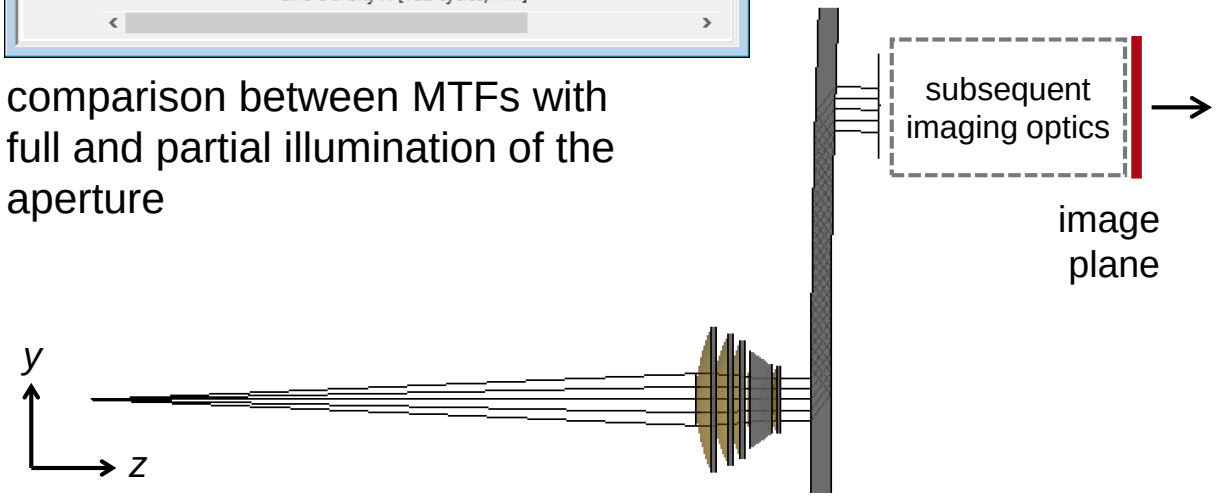

9: PSF – PSF & MTF #612 after Aperture #13 (T)...
Chromatic Fields Set
Data for Wavelength of 532 nm [1E5 (V/m)^2]
2.1483
1.0742
0
Y [mm]
0.01
0
-0.01
-0.46
-0.45
-0.44
-0.43
X [mm]
PSF

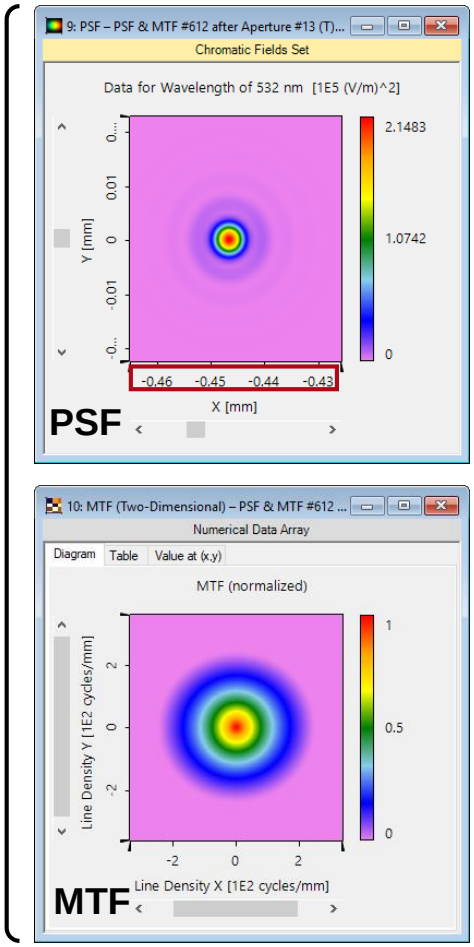

10: MTF (Two-Dimensional) – PSF & MTF #612 ...
Numerical Data Array
Diagram
Table
Value at (x,y)
MTF (normalized)
1
0.5
0
Line Density Y [1E2 cycles/mm]
2
0
-2
-2
0
2
Line Density X [1E2 cycles/mm]
MTF

Results



comparison between MTFs with full and partial illumination of the aperture





Document Information

title	Analysis of Folded Imaging System with Planar or Curved Waveguide
version	1.1
VL version used for simulations	7.4.0.45
category	Application Use Case