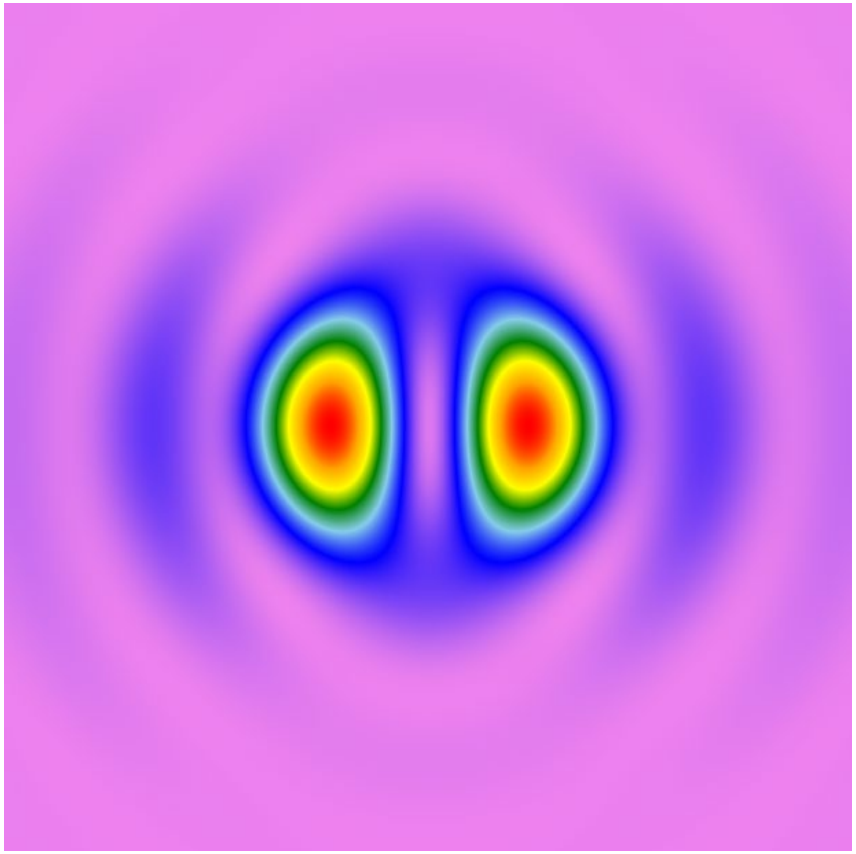
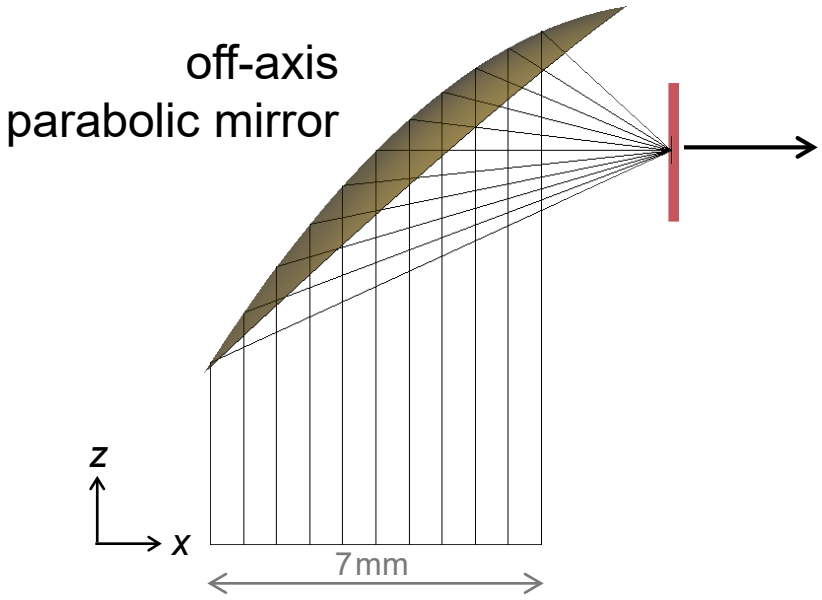
Focusing of Femtosecond Pulse by Using a High-NA Off-Axis Parabolic Mirror

Abstract



To fully characterize the focusing behavior of an ultrashort pulse, different electromagnetic properties must be considered. That includes both spatial distribution, temporal / spectral distribution, vectorial effect, and the possible coupling amongst all the above. As an example, the focusing process of a 10-fs pulse by using a high-NA parabolic mirror is modeled in VirtualLab Fusion, and both the spatial and temporal behaviors are investigated.

Modeling Task

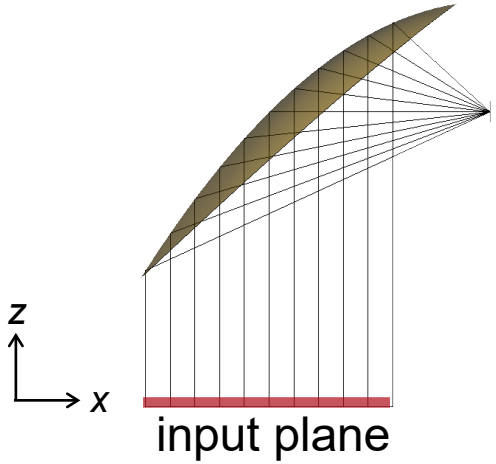


How to calculate output pulse in the focal plane, including the spectral / temporal profile and the spatial distribution of the focal spot for all vectorial field components?

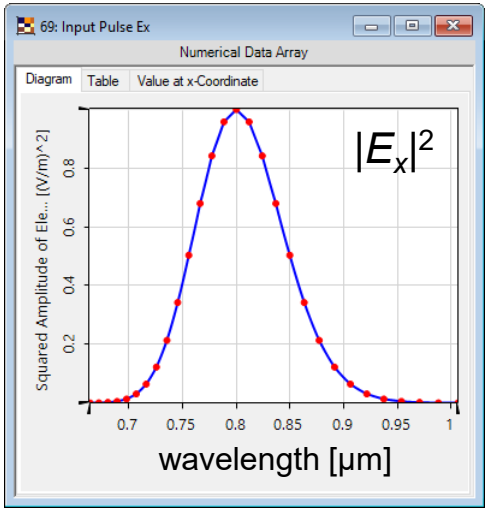
input pulse

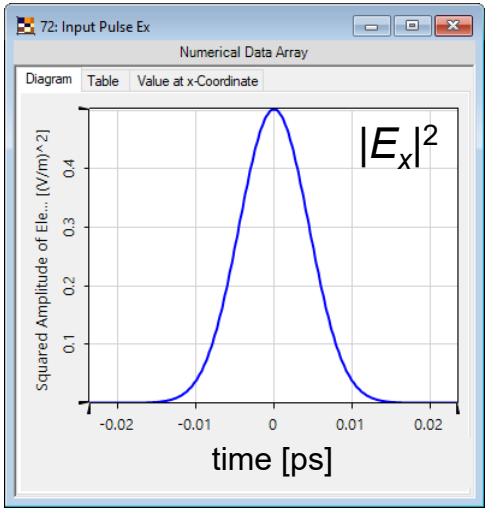
- time duration 10 fs (FWHM)
- carrier wavelength 800 nm
- beam diameter 7 mm
- linearly poalrized in *x* direction

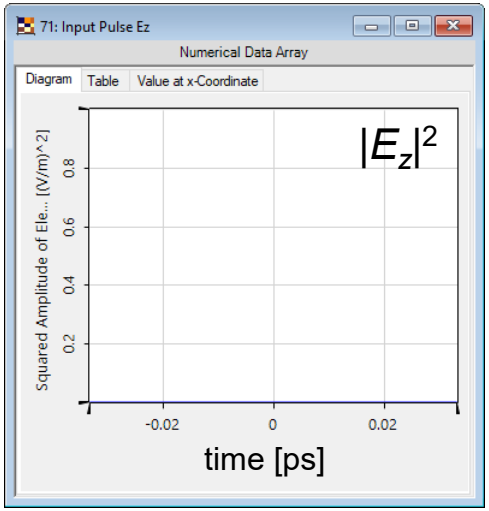
Results



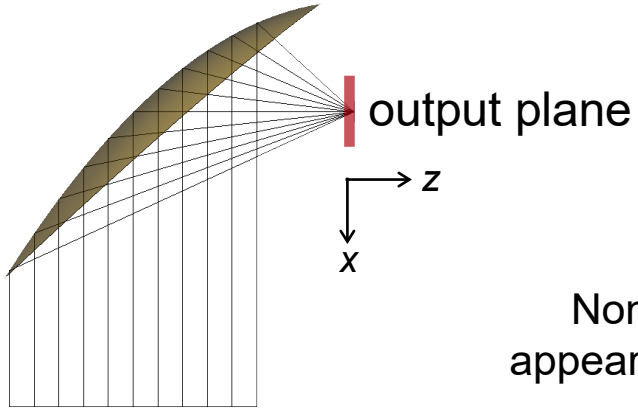
The linearly polarized input pulse has an E_z component with almost zero amplitude.





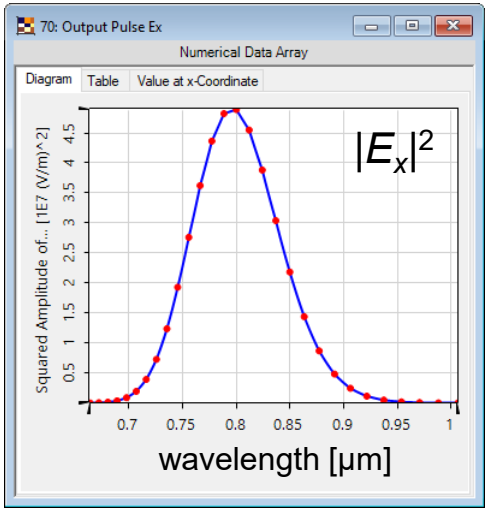


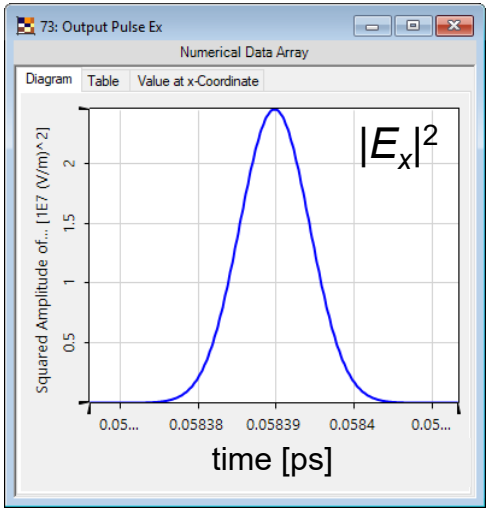
Results

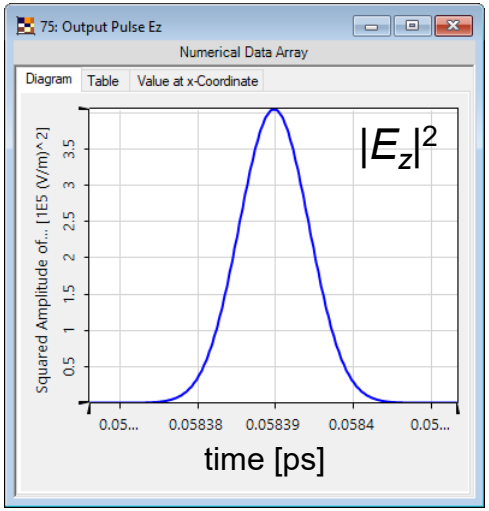


The slight change in the output spectrum is due to different focus size of different wavelength.

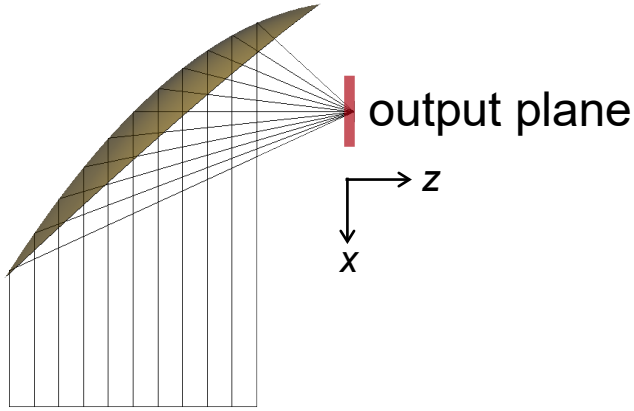
Non-zero E_z component appears due to polarization crosstalk in high-NA focusing situation.



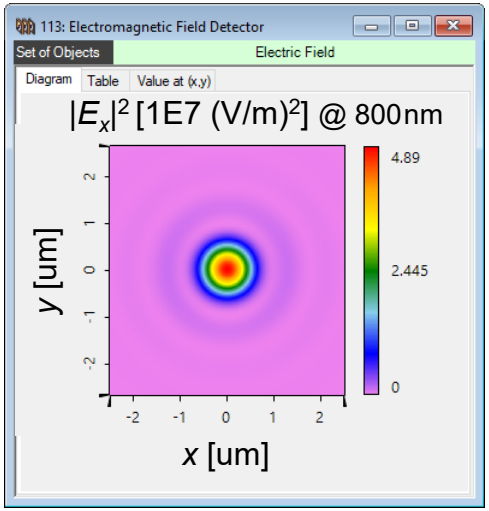




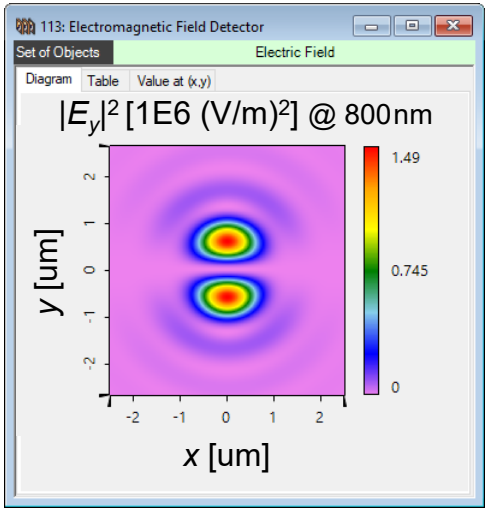
Results



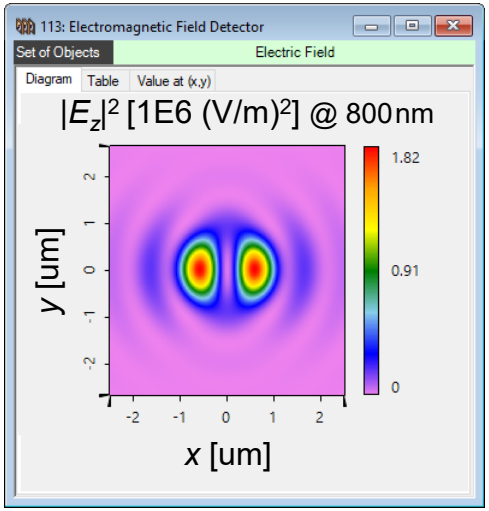
$|E_x|^2 \stackrel{\text{def}}{=} 100\%$



$|E_y|^2 = 3\%$



$|E_z|^2 = 4\%$



Document Information

title	Focusing of Femtosecond Pulse by Using a High-NA Off-Axis Parabolic Mirror
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