Focusing of Femtosecond Pulse by Using a High-NA Off-Axis Parabolic Mirror
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 also the possible coupling between the above. As an example, the focusing process of a 10fs pulse by using a high-NA parabolic mirror is modeled in VirtualLab, 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?
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

Output plane

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

$|E_y|^2 = 3\%$

$|E_z|^2 = 4\%$
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