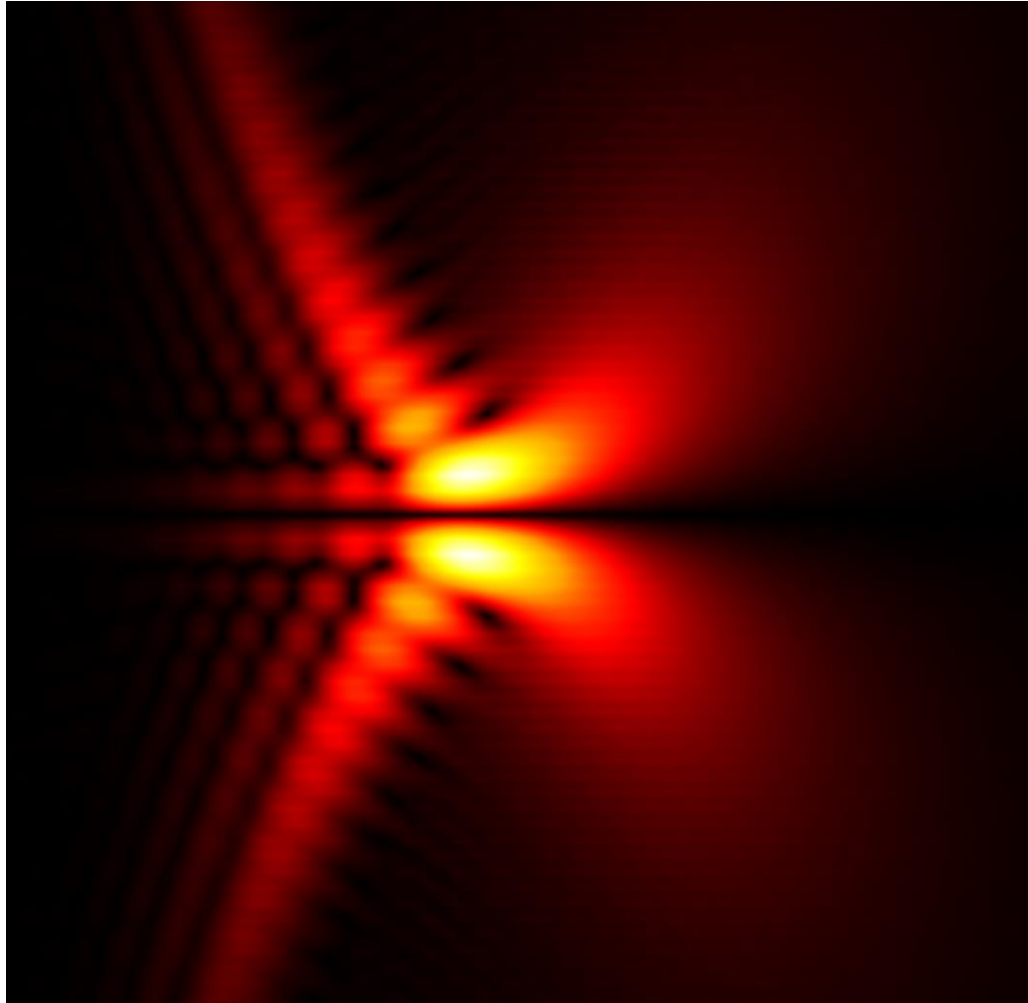


Pulse Focusing with High-Na Lens

Abstract



While for most other types of sources it is often accurate enough to labour under the stationary approximation, ultrashort pulses require a somewhat more nuanced approach, where the correlation between the different spectral modes is taken into account. We investigate here the effects of subjecting one such pulse to propagation through a lens with high numerical aperture, in terms of its spatial, as well as of its temporal, profile.

Scenario

laser pulse

- collimated gaussian profile
- diameter: 2.5 mm x 2.5 mm
- linearly polarized in x-direction
- Gaussian spectrum
- 800 nm central wavelength
- 5 fs pulse duration

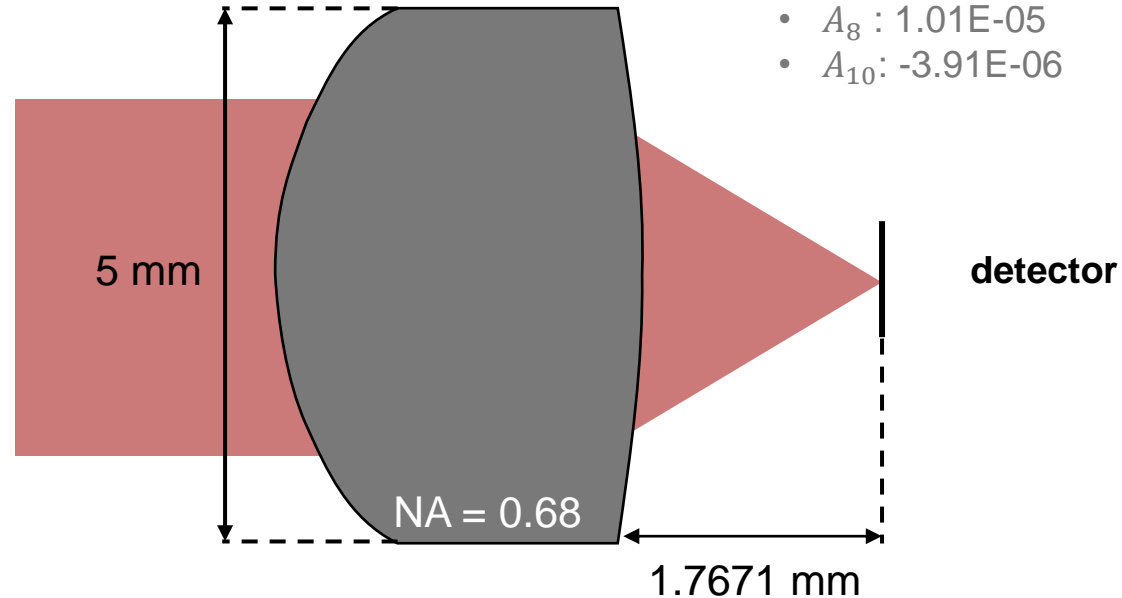
high NA aspheric doublet

asphere 1:

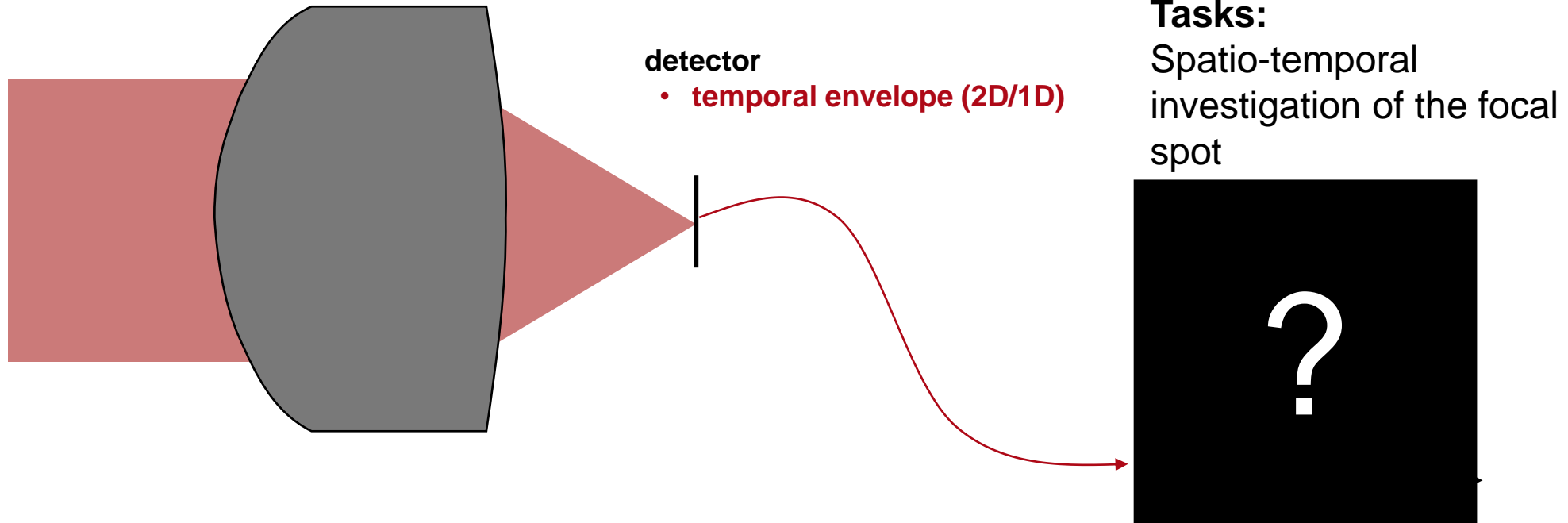
- radius of curvature: 2.75 mm
- conical constant: -0.61
- asphere coefficients:
 - A_4 : 0.000589
 - A_6 : -1.76E-05
 - A_8 : 1.01E-05
 - A_{10} : -3.91E-06

asphere 2:

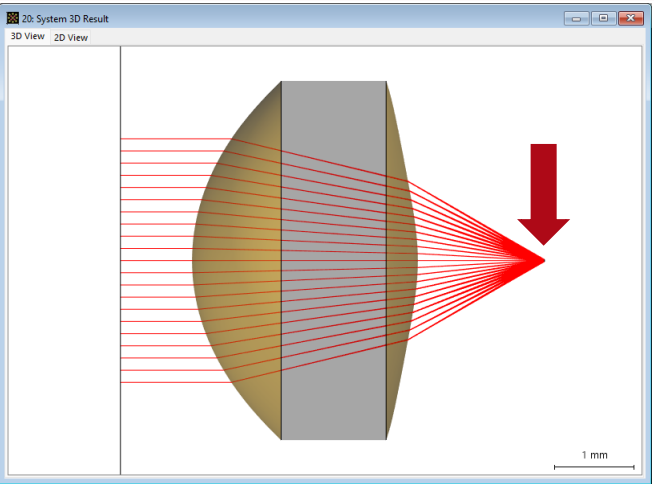
- radius of curvature: -3.19 mm
- conical constant: -12.7
- asphere coefficients:
 - A_4 : 0.0124
 - A_6 : -0.00371
 - A_8 : 0.000512
 - A_{10} : -3.11E-05



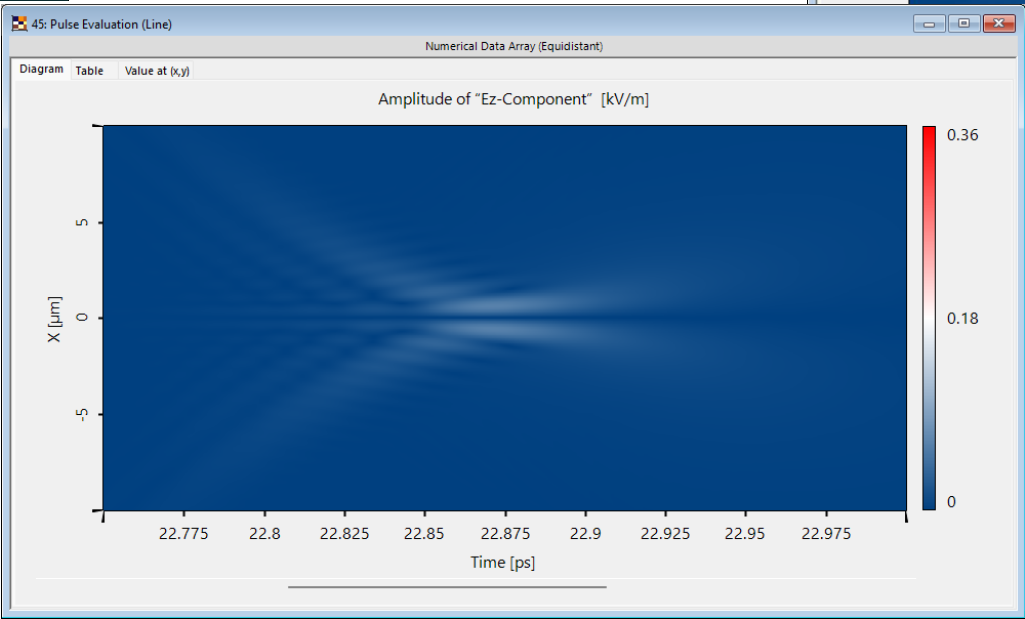
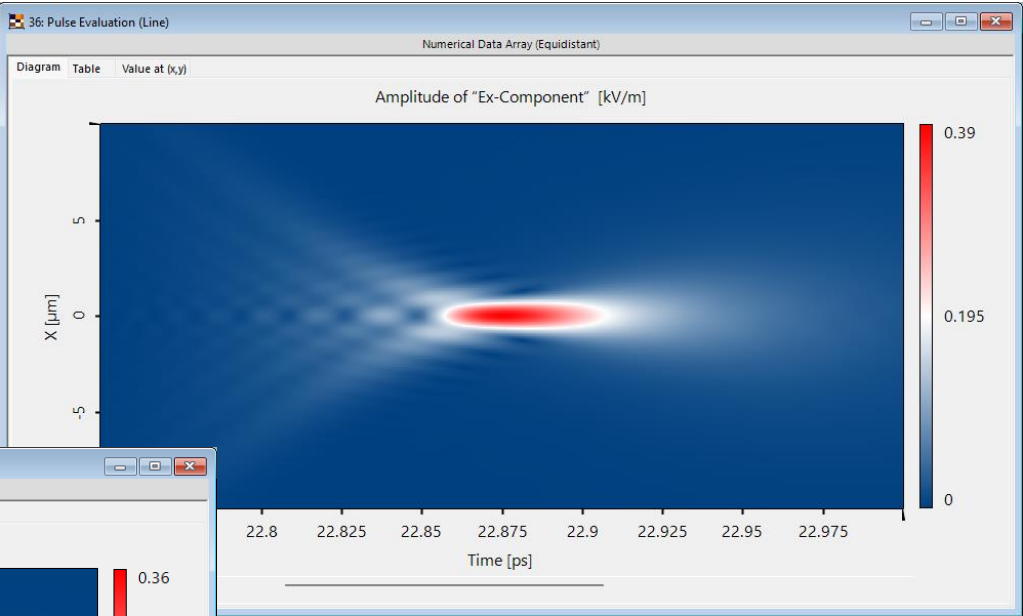
Modeling Task



Simulation Results

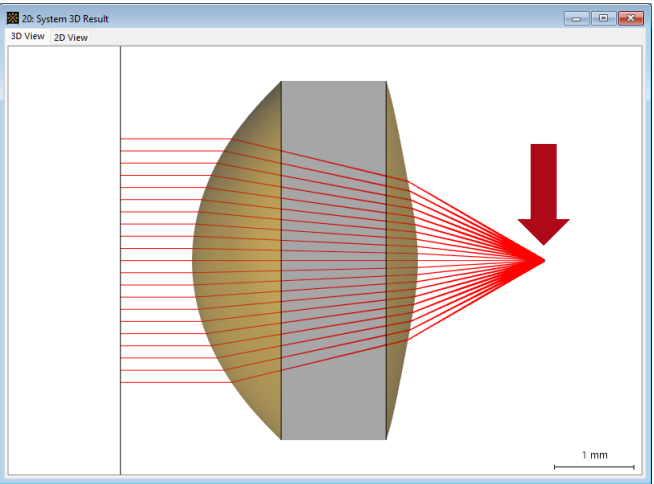


Ex-component

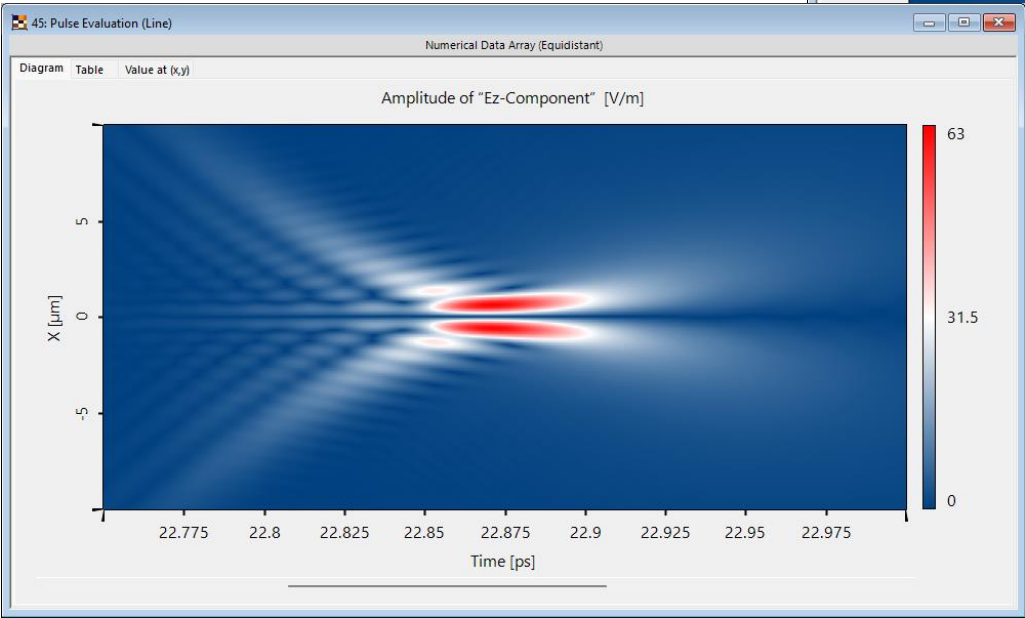
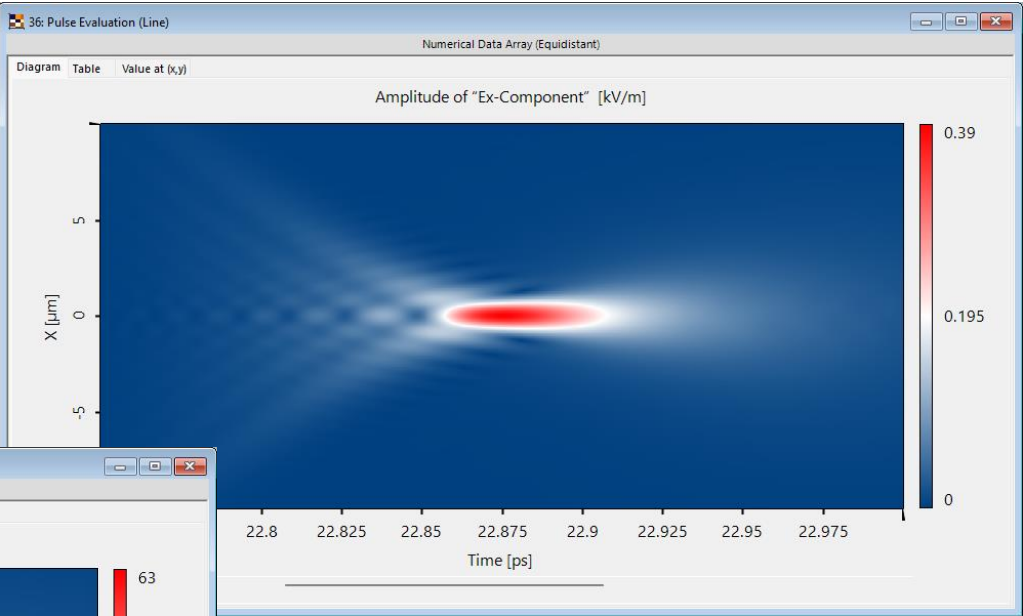


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Simulation Results

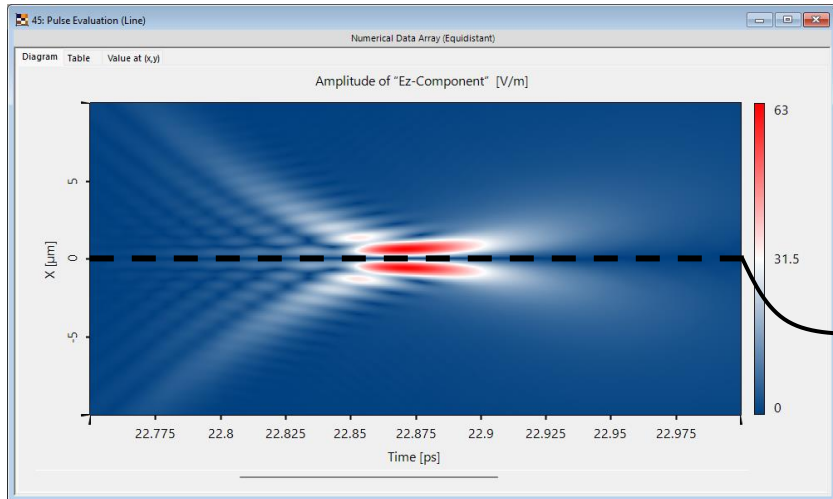
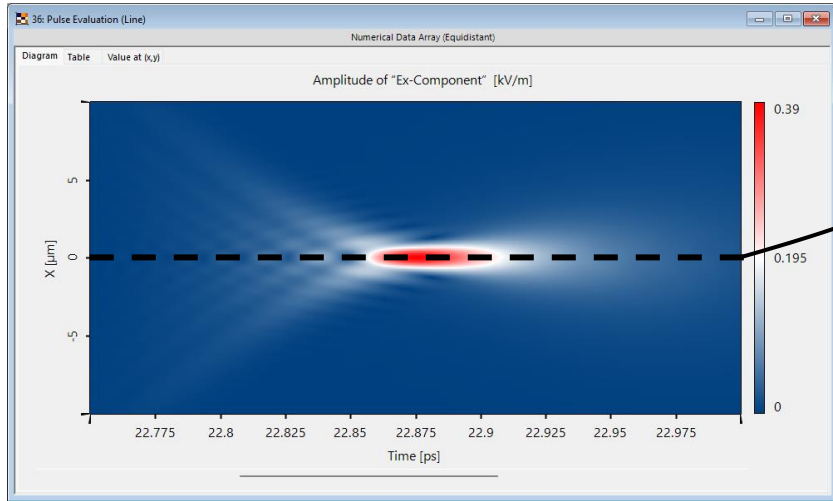


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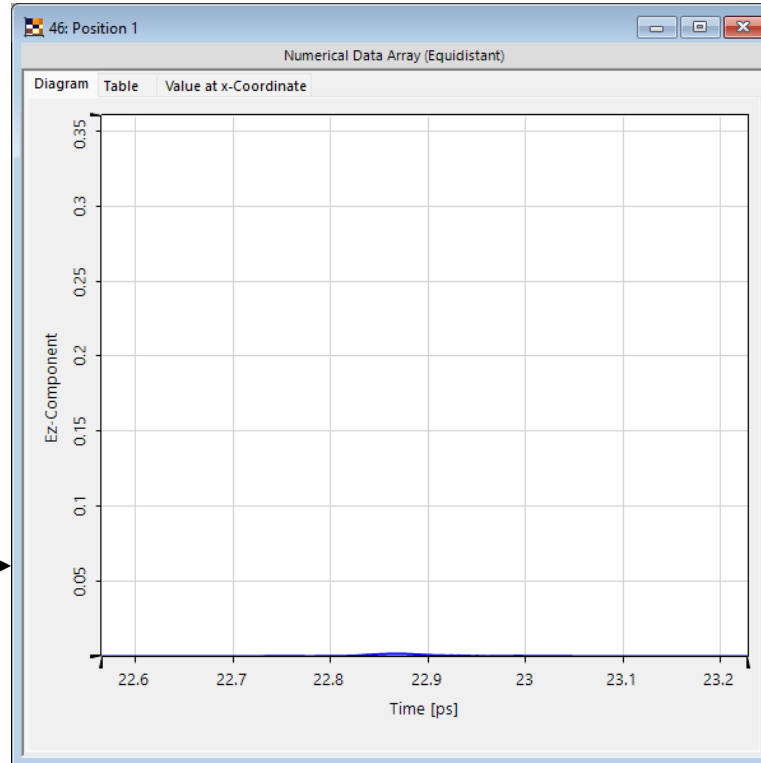
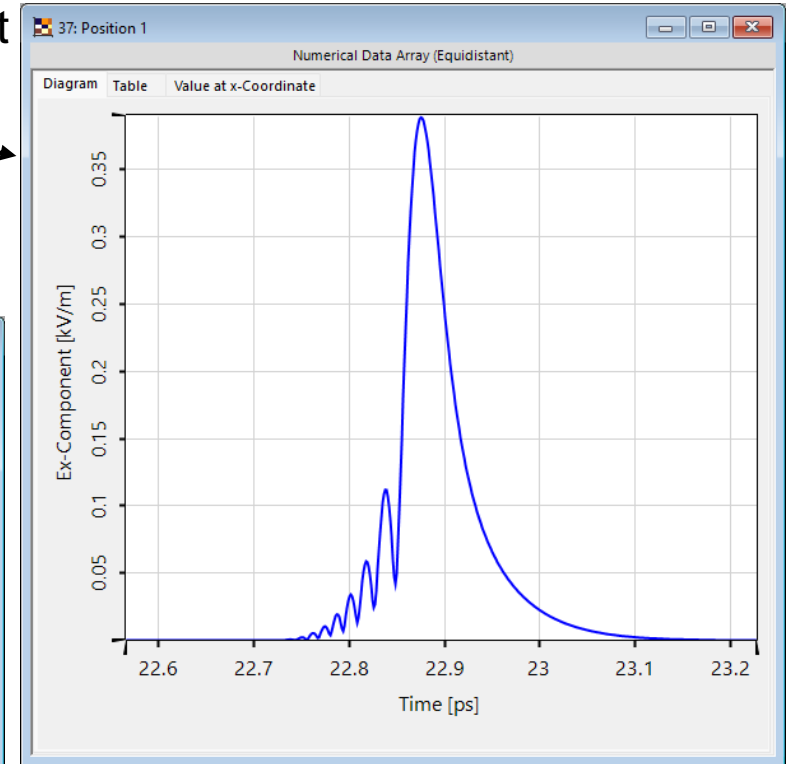


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Spatio-Temporal Investigation: On-Axis

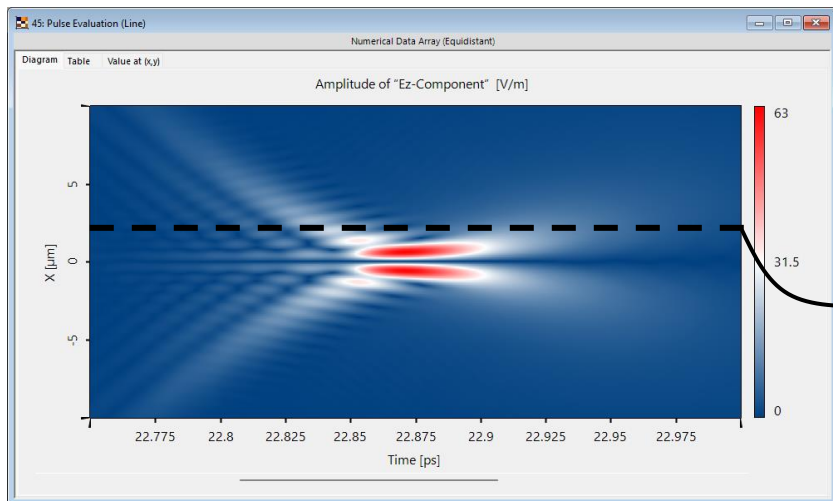
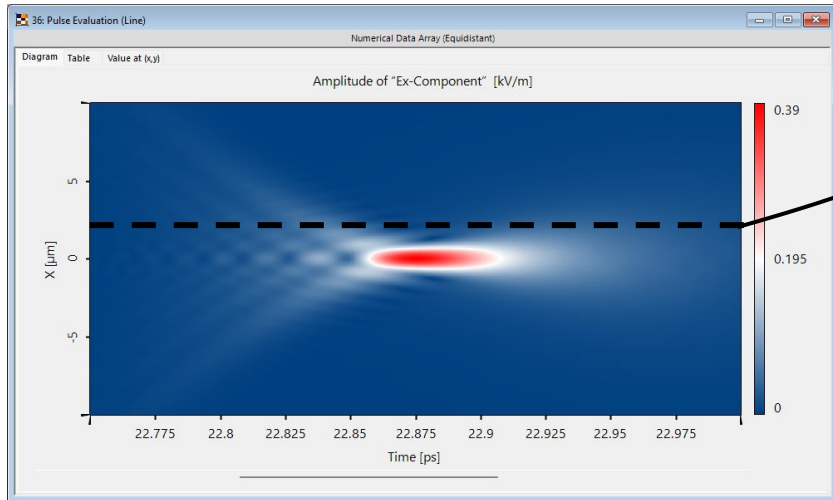


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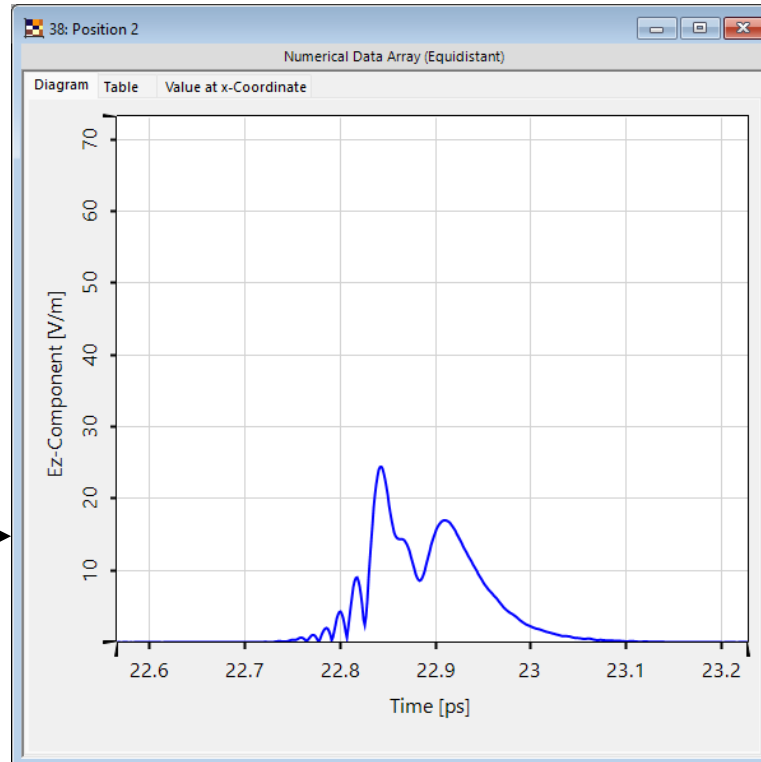
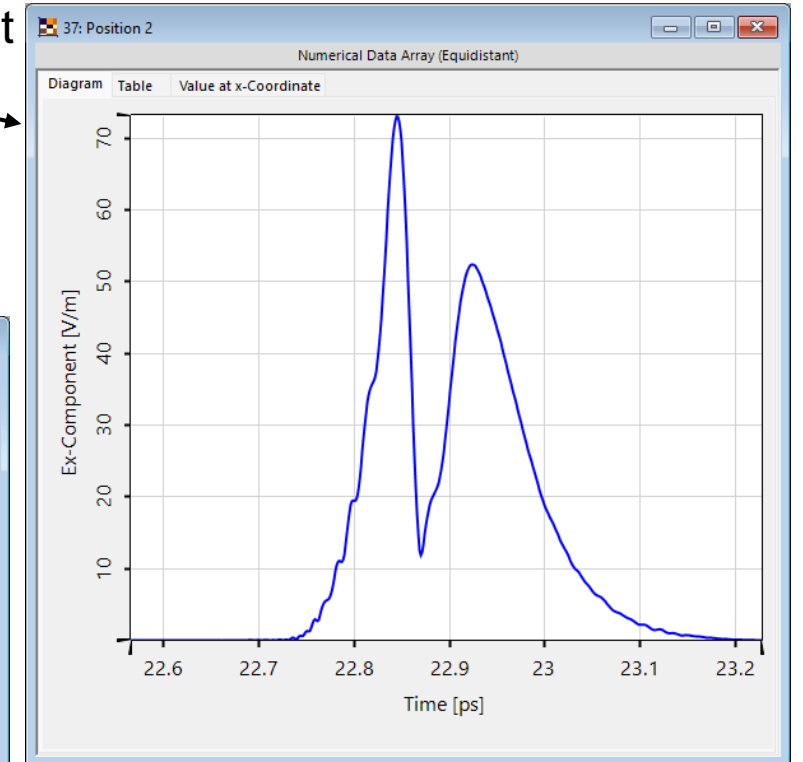


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Spatio-Temporal Investigation: Off-Axis

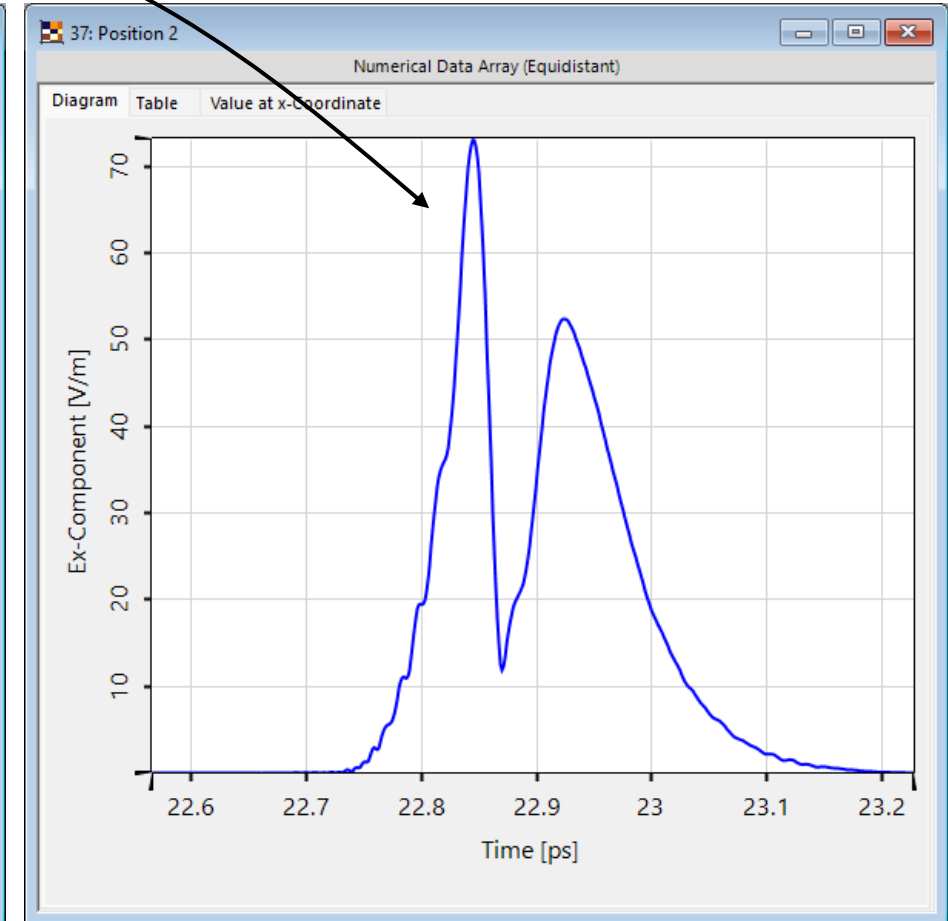
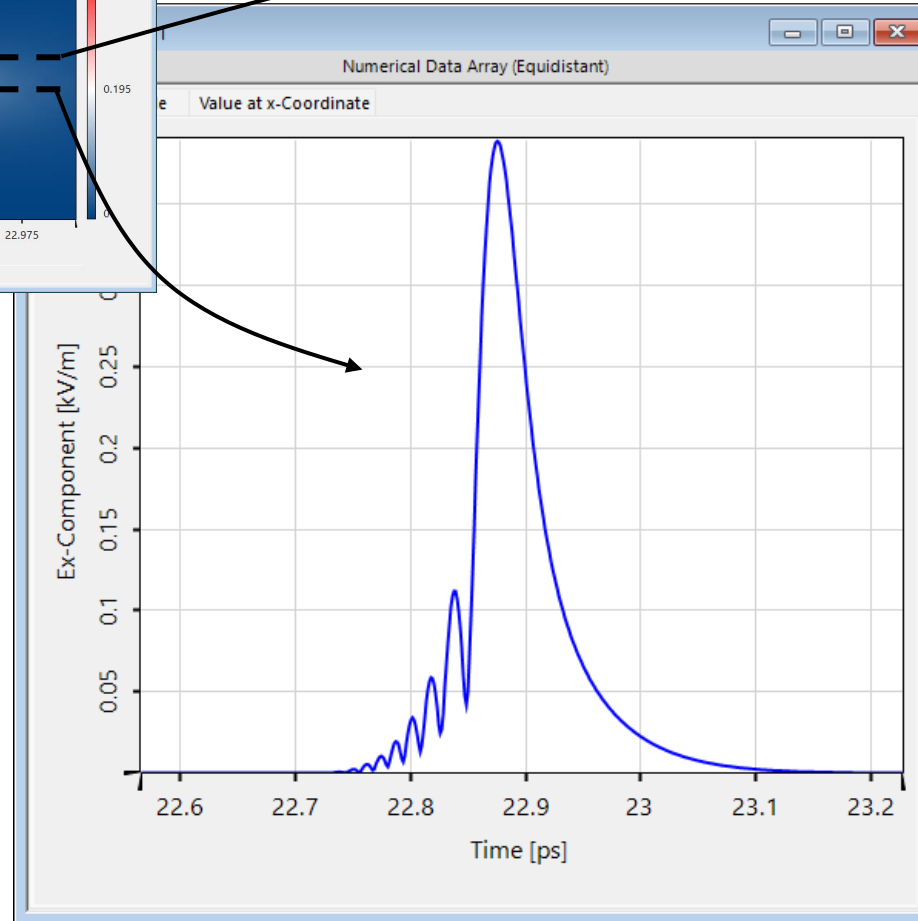
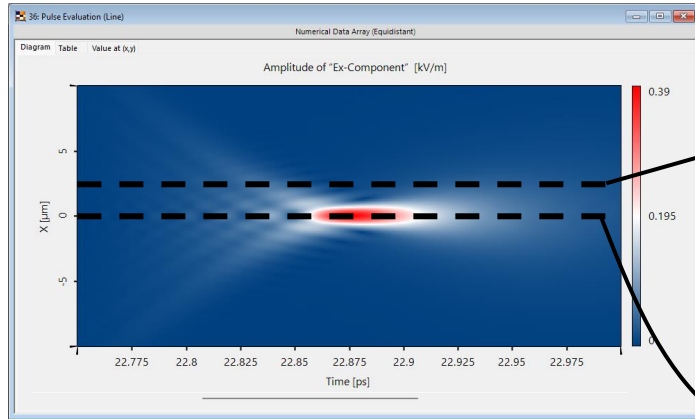


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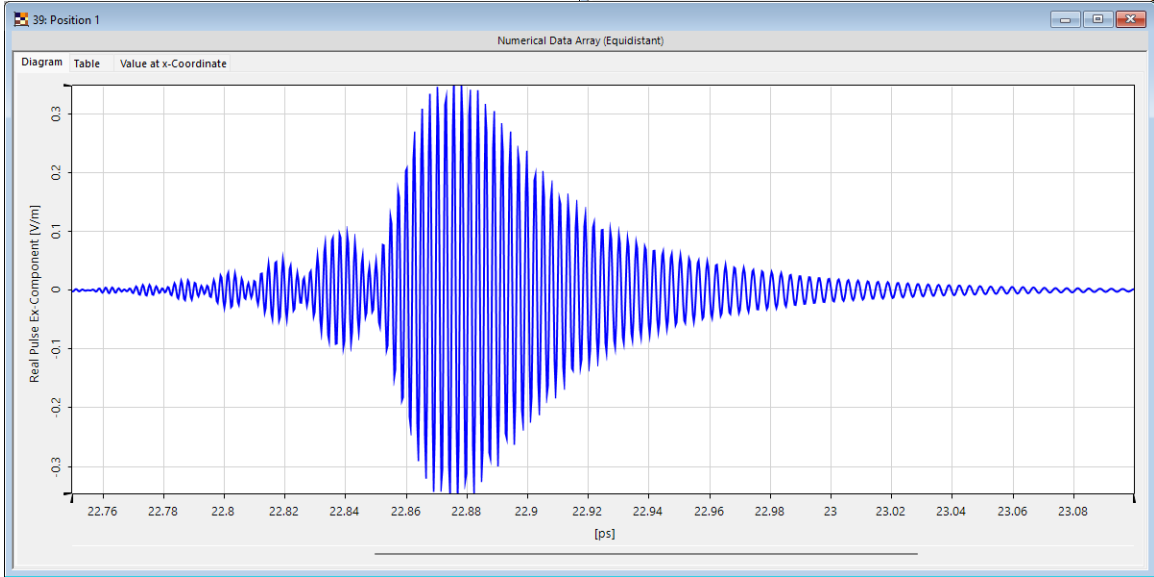
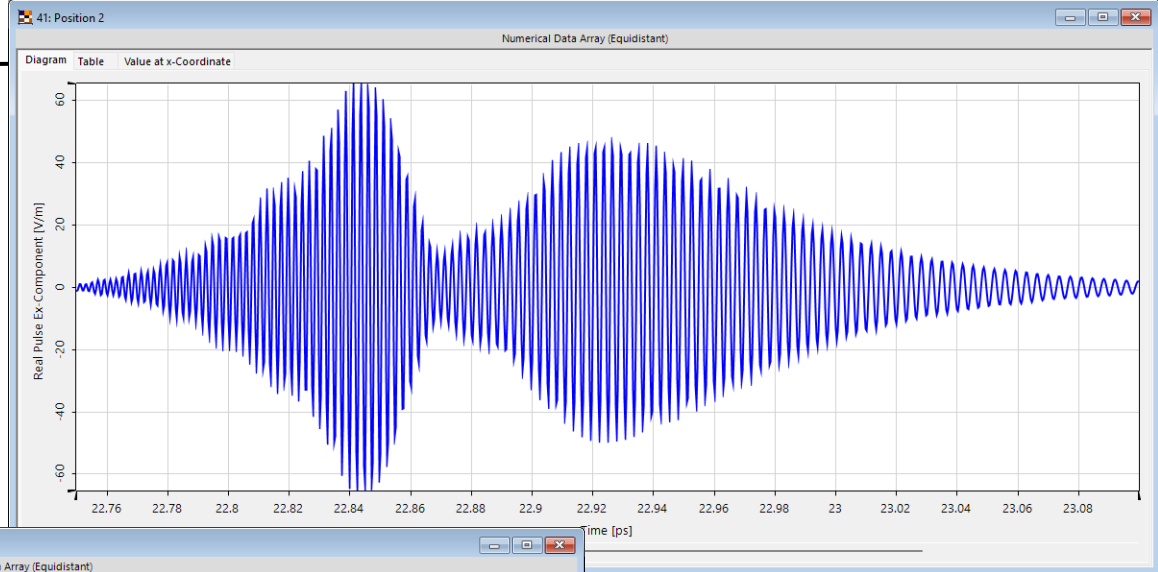
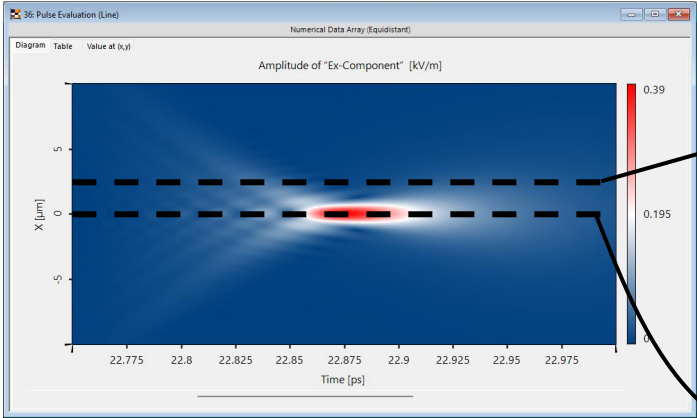


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Spatio-Temporal Investigation: Comparision



Spatio-Temporal Investigation: Real Pulse



Document Information

title	Pulse Focusing with High-NA Lens
document code	USP.0003
document version	1.0
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software version	2024.1(Build 1.134)
category	Application Use Case
further reading	<ul style="list-style-type: none">- <u>Femtosecond Pulse Propagation through Dispersive Seawater</u>- <u>Focusing of Femtosecond Pulse by Using a high-NA off-Axis Parabolic Mirror</u>