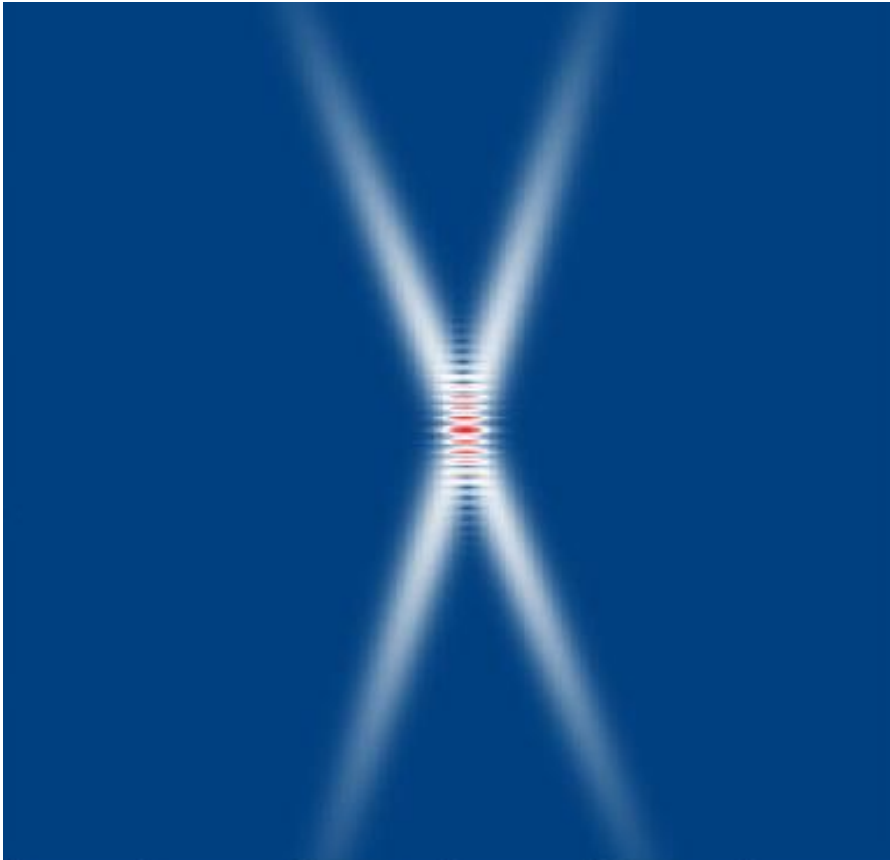


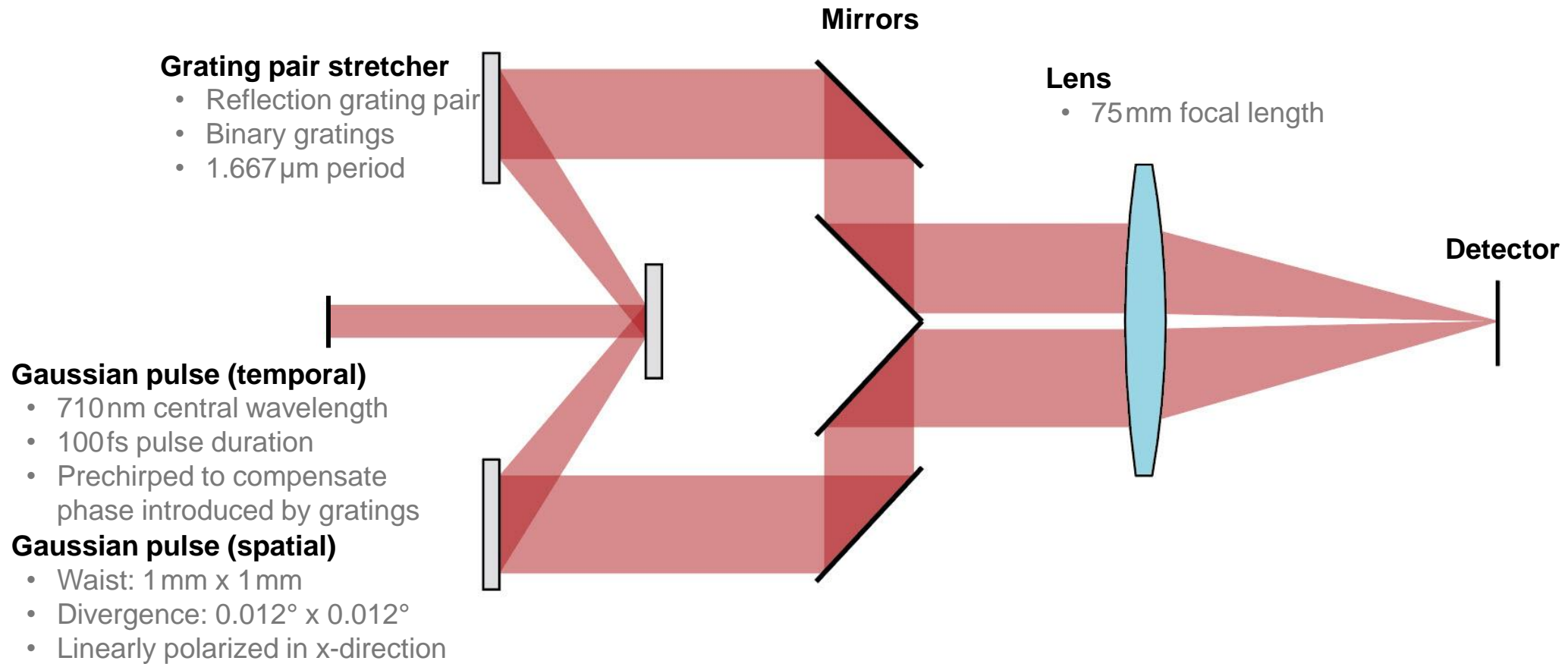
Interference Effects for Symmetric SSTF-Setups

Abstract

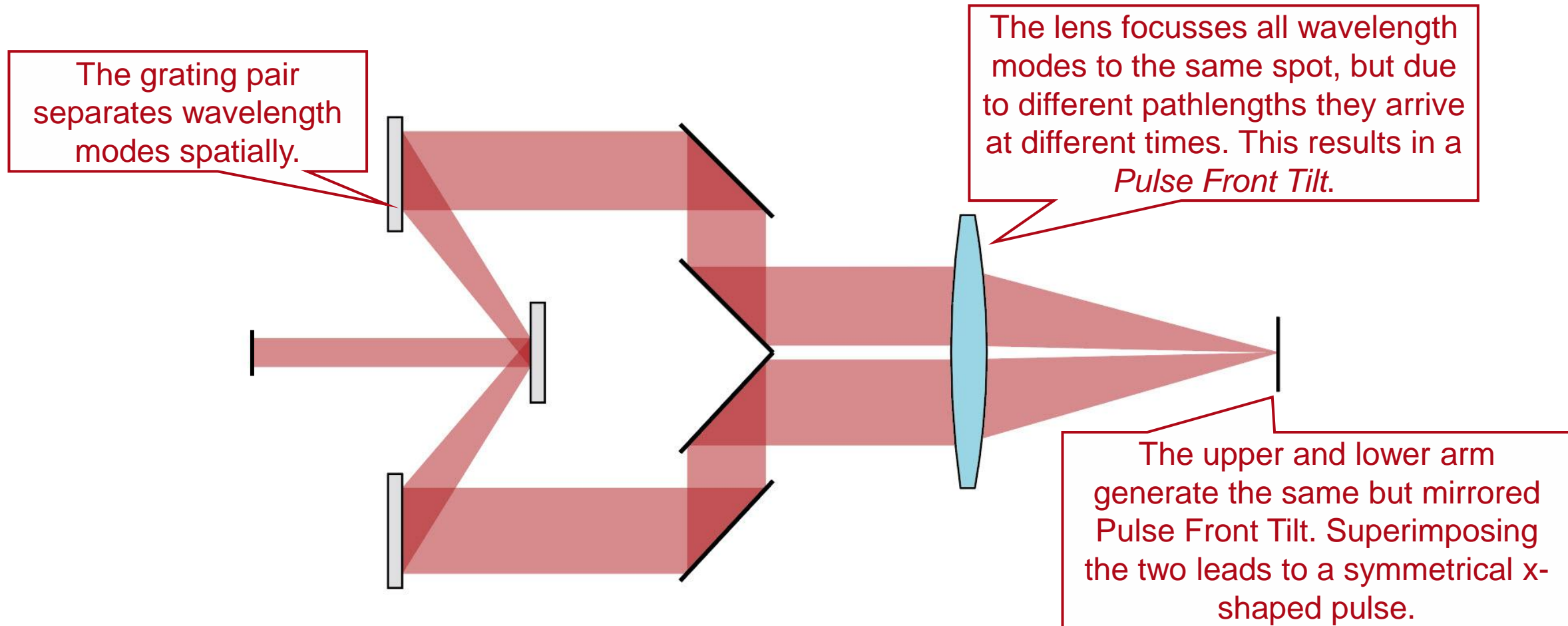


“Simultaneous spatial and temporal focusing” (SSTF) is a well known approach where light is spectrally widened with a stretcher setup and is then focused with a lens to get a focal spot that has a minimal size in space and time domain. This approach however, leads to a tilt of the pulse front, creating an asymmetric field distribution in the focus. To correct this behavior a symmetrized approach is shown, utilizing two mirrored paths and the resulting interference effects are analyzed.

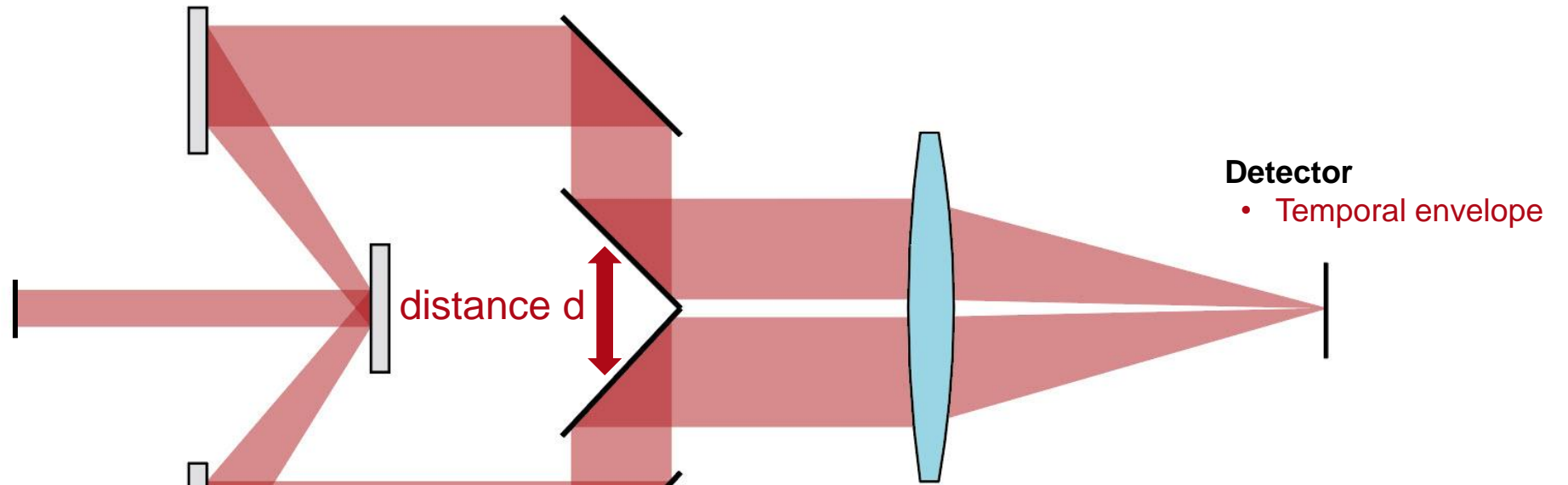
Application Scenario: System



Application Scenario: System



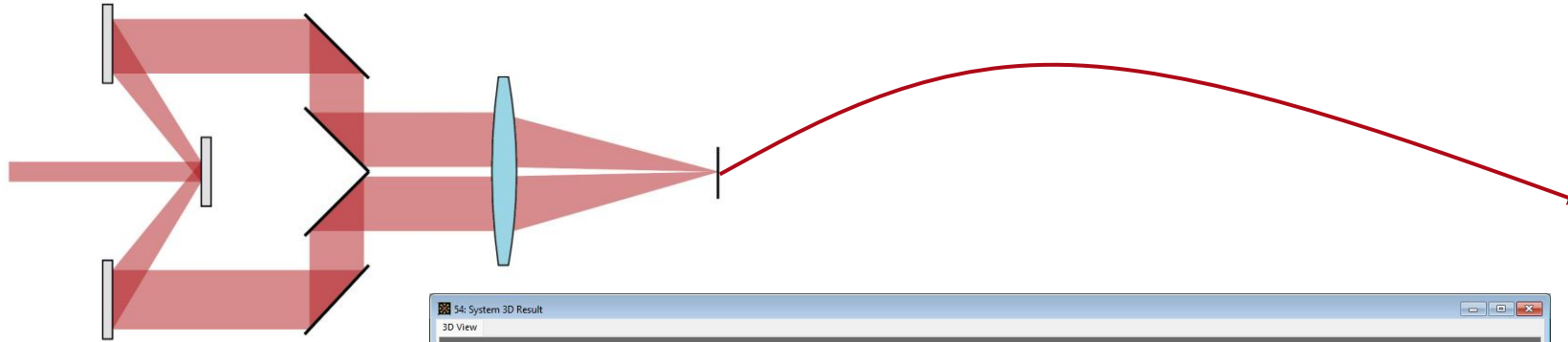
Application Scenario: Task



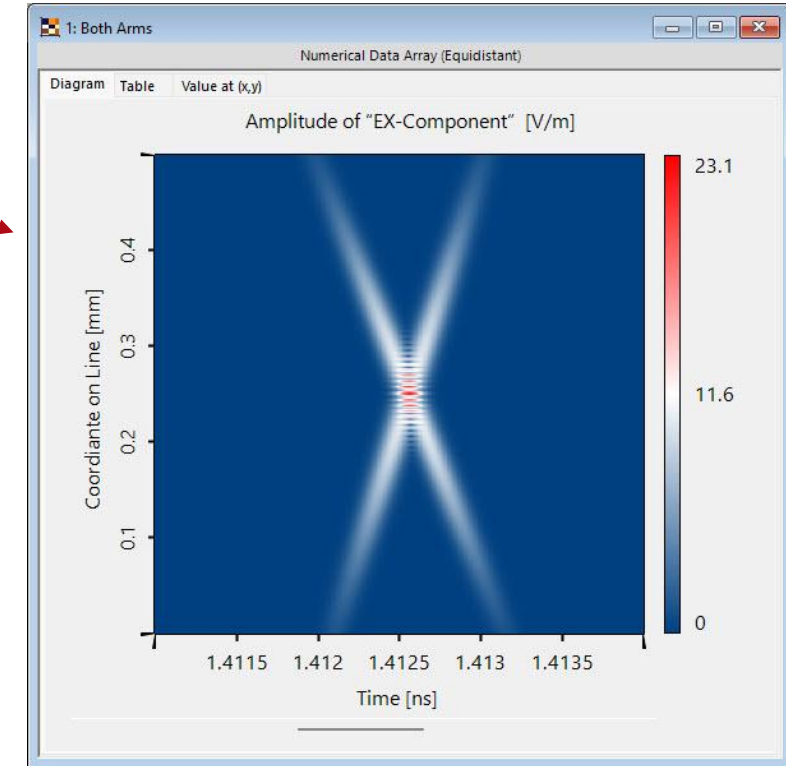
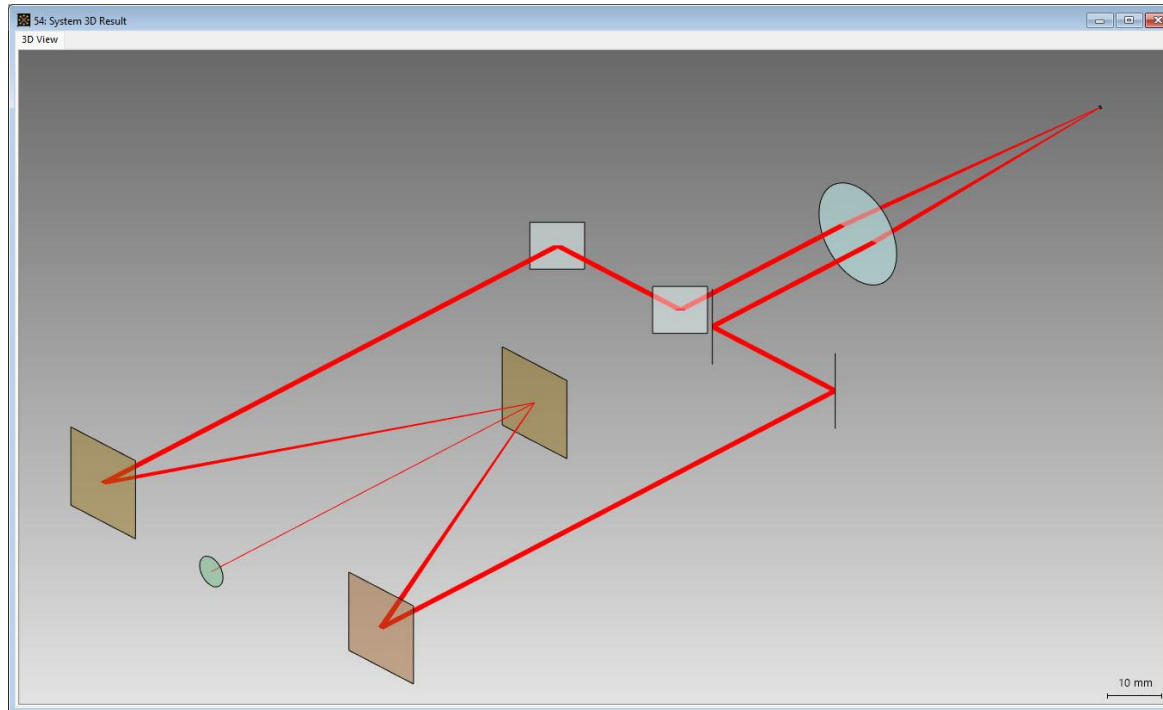
Task: Detect temporal envelope at focal spot for various distances d .

Simulation Results

System Impressions

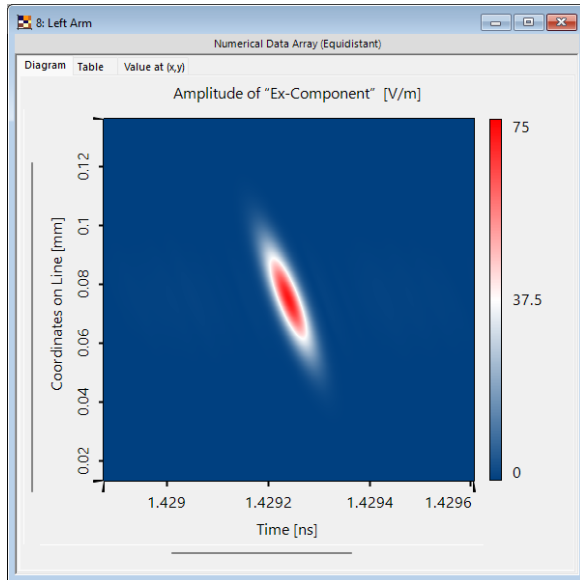
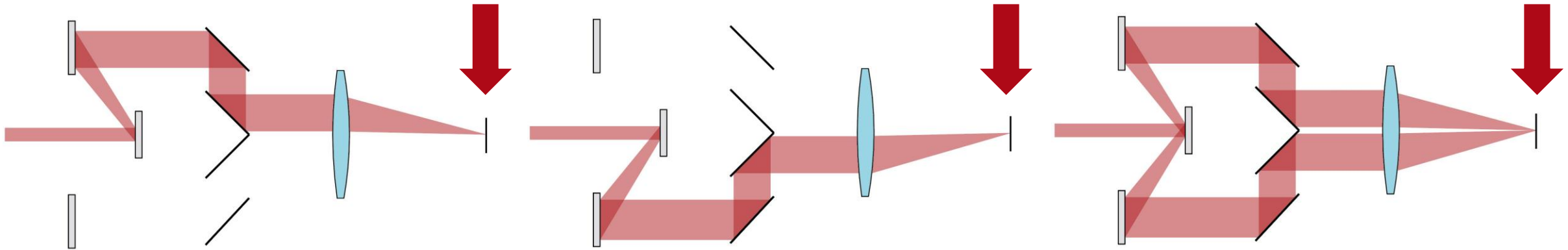


System 3D view
(only center ray of
central wavelength
is shown for better
visibility)

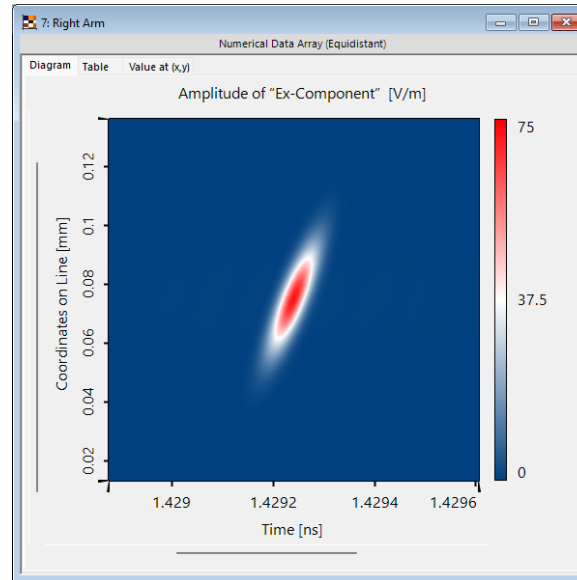


Temporal envelope at detector

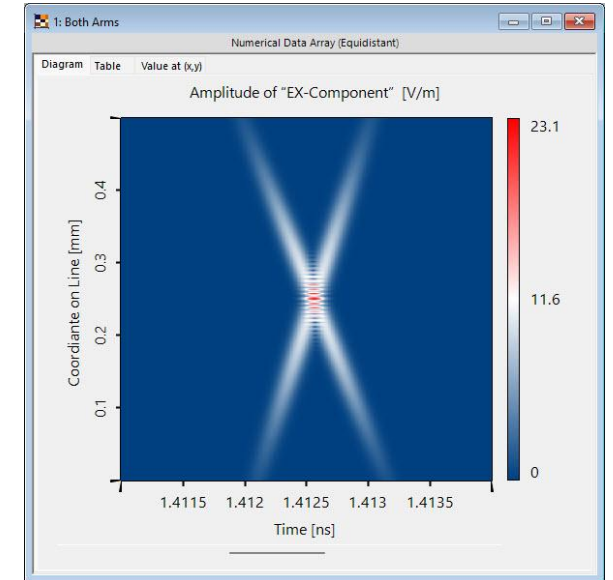
Creation of a Cross-Pulse



Temporal envelope over time for
upper arm



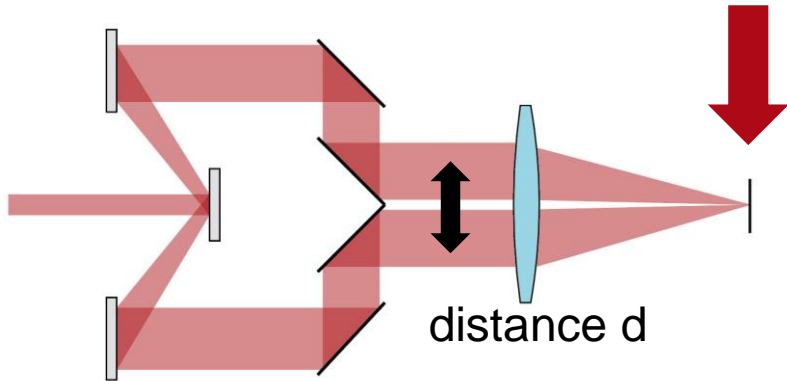
Temporal envelope over time for
lower arm



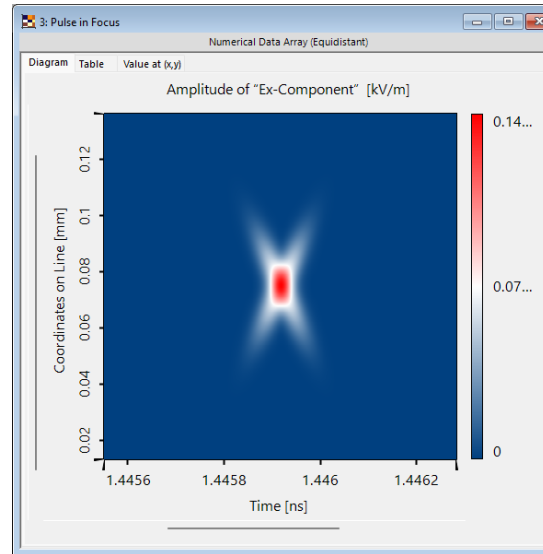
Temporal envelope over time for
both arms

Interference in the Focal Region

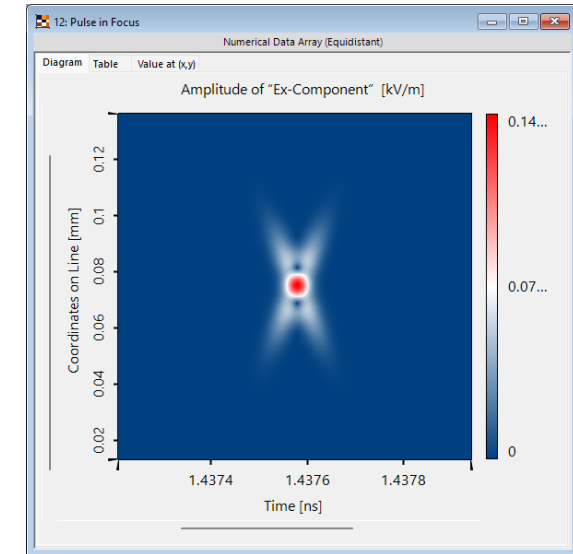
When the two orders are combined again, interference effects appear. The period of the lines along x-axis is directly proportional to the angle in which the two beams are focused and hence the distance of the two beams before they hit the focusing lens.



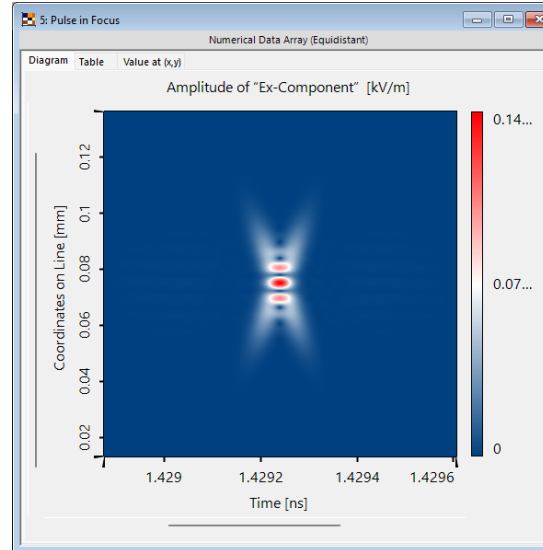
d = 0mm



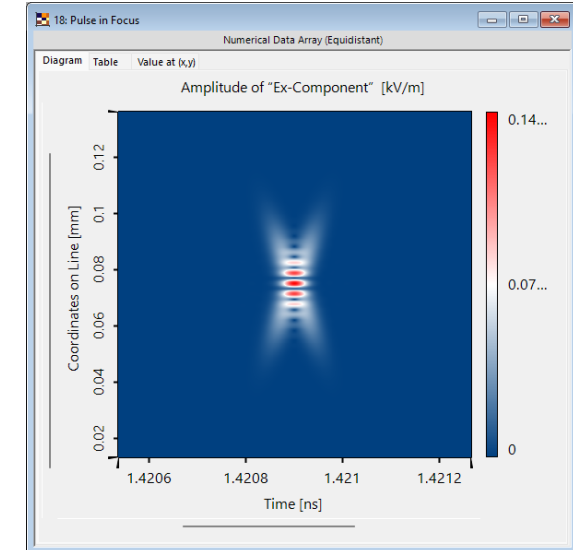
d = 5mm



d = 10mm



d = 15mm



Workflow Steps

Basic Workflow Steps

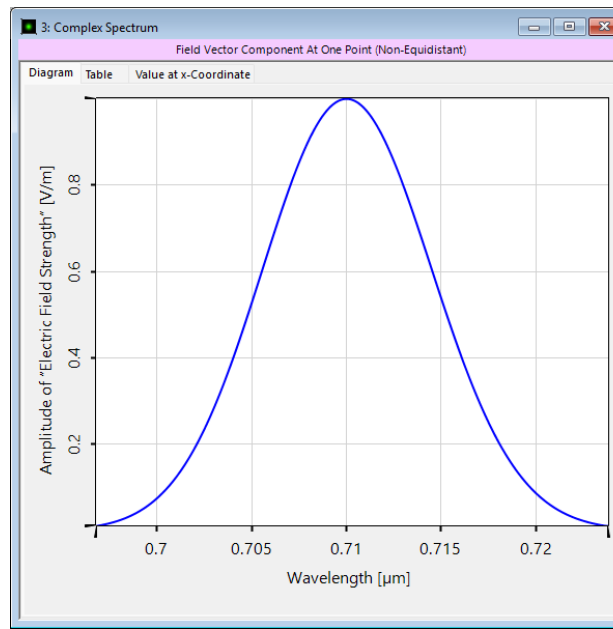
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

- Gaussian Wave
- Inclusion of spectra to source



Spectrum

Edit Gaussian Puls Source

Spatial Parameters Polarization Mode Selection Sampling

Basic Parameters Spectral Parameters

Power Spectrum Type List of Wavelengths

Spectral Values

Ind	Wavelength	Electric Field Strength (Amplitude)	Electric Field Strength (Phase)
1	696.8065943 nm	10.56200999 mV/m	
2	696.933561 nm	11.54268091 mV/m	
3	697.060574 nm	12.6033763 mV/m	
4	697.1876333 nm	13.74950976 mV/m	
5	697.3147388 nm	14.98675549 mV/m	
6	697.4418908 nm	16.3210512 mV/m	
7	697.5690891 nm	17.75860019 mV/m	
8	697.6963339 nm	19.30587234 mV/m	
9	697.823625 nm	20.96960393 mV/m	
10	697.9509626 nm	22.75679632 mV/m	

Source settings

Basic Workflow Steps

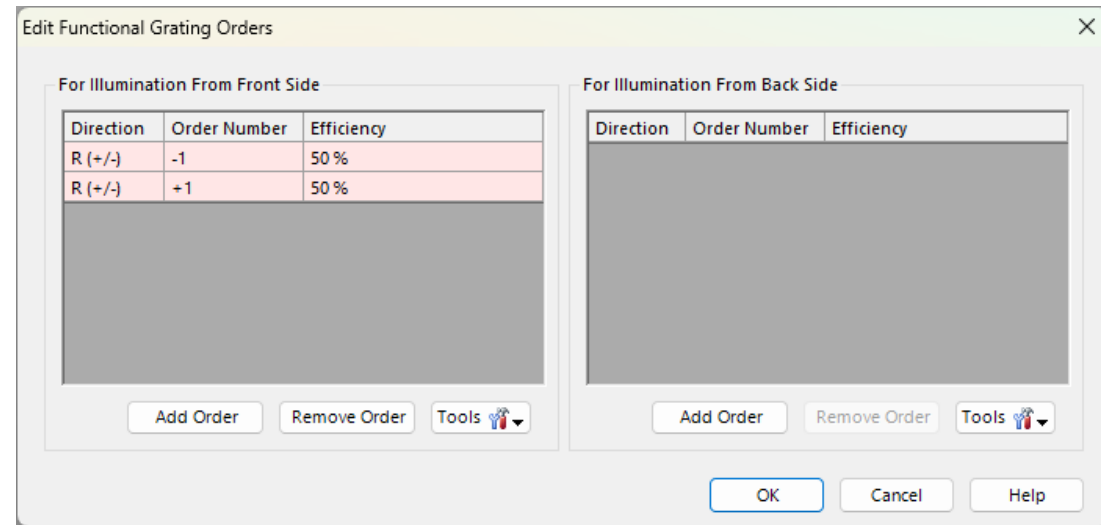
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

- Functional Grating component
- Position and orientation of elements in the optical setup
- Channel configuration for surfaces and grating regions



Grating
Channels

Basic Workflow Steps

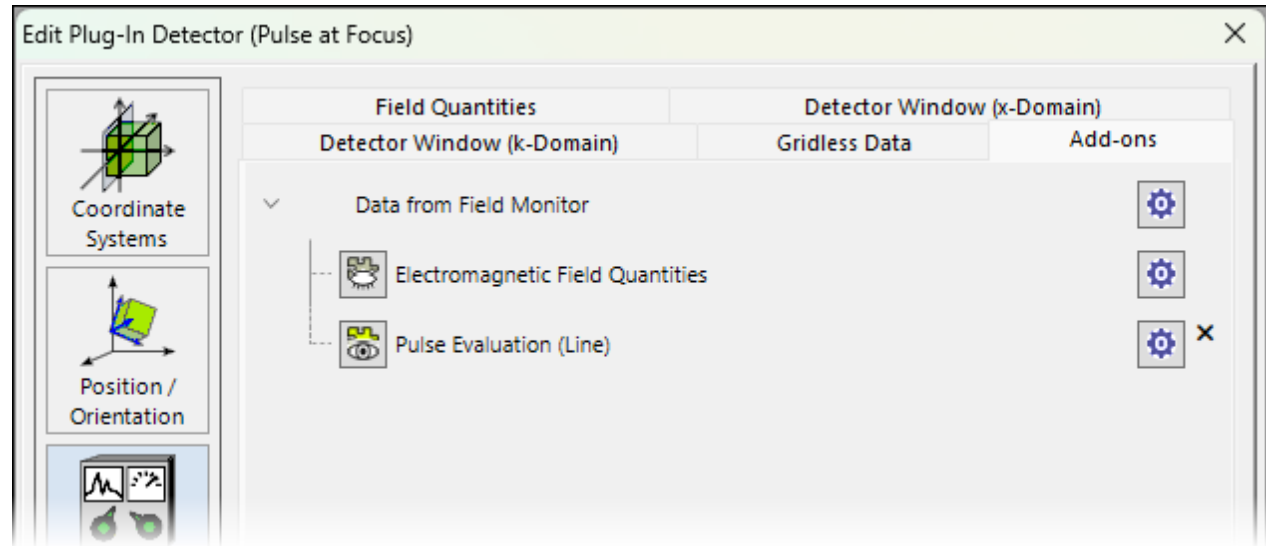
Source selection

System setup

Detector selection

Getting it done in VirtualLab Fusion:

➤ Plug-in Detector



Detector
add-on
selection

Document Information

Title	Interference Effects for Symmetric SSTF-Setups
Document code	USC.0441
Publication date	08.07.2025
Required packages	-
Software version	2025.1 (Build 1.172)*
Category	Use Case
Further reading	<ul style="list-style-type: none">- Grating Stretcher for Ultrashort Pulses- Pulse Focusing with High-NA Lens

* The files attached to this document require the specific version or later.