

UseCase.0051 (1.0)

Pulse Simulation – Generation

Keywords: pulse, visualization, generator, Gaussian

Description

- The use case shall discuss the possibilities to define a pulse in VirtualLab.
- Different options of definition will be explained.
- Further usage of the generated pulse document to define the spectral distribution of a light source will be illustrated.

Important Reminder!

Global Options ×			
Fields and Sampling Operations View Parameters Performance Other Settings			
View Performance			
✓ Disable Light View			
Use Standard Range for Complex Amplitude View			
Maximum Number of Table Cells for Data Arrays 100000			
Array Size and Handling			
Default Precision of Arrays Double Precision			
Swap Large Field Data on Hard Disc			
Field Size Warnings			
✓ Warn Before Exceeding Specified Limits			
Warning Levels			
✓ Maximum Number of Sampling Points per Field 1E+09			
Maximum Number of Fields Set Members 400			
Guaranteed Amount of Remaining Physical Memory 1 GB			
Multi Core Processing			
✓ Use Multiple Cores Number of Cores To Use			
Use Multiple Cores for Parameter Run Loop			
FFT Algorithm			
Intel Math Kernel Library FFT O VirtualLab FFT			
Reset All 🚰 🛃 Ok Cancel Help			

- Make sure, that for pulse modeling you have chosen Double Precision BEFORE pulse specification!
- The global options can be edited by the menu item "Global Options" in the file menu.

Pulse Generation – Generators



- The source ribbon of VirtualLab allow the usage of the pulse spectra generators.
- The following generators are available
 - Gaussian Pulse Spectrum
 - Databased Pulse Spectrum
 - Programmable Pulse Spectrum

Gaussian Pulse Generator

Gaussian Pulse Spectrum			
Pulse Specification			
Definition by FWHM O Definition	ition by 1/e Diamete	r	
Pulse Duration	10 fs		
Carrier Wavelength	800 nn		
Carrier Frequency	374.74 TH	z	
Estimated Increase of Time Window		5	
Numerical Settings			
Squared Amplitude Truncation (Frequency Domain)	0.01 %	6	
Resulting Size of Angular Frequency Window	1.0107 PH	z	
Squared Amplitude Truncation (Time Domain) 0.			
Resulting Size of Time Window	182.26 f	s	
Resulting Samples	2	9	
OK Cancel	Help		

- The Gaussian pulse spectrum generator generates a pulse of Gaussian shape in the time domain.
- The user can enter the pulse duration, the carrier wavelength of the pulse and several numerical parameters (explained in detail in the manual).

Databased Pulse Generator

Specification in Time Domain Specification In Frequency Domain			equency Domain
Carrier Wavelength 500 pm		Carrier Frequency	599.58 THz
lse Shape			
	Analituda	Phase	
Datapoint #1	Amplitude 1.V/m	Orad	^
Datapoint #1	2 V/m	0 rad	
Datapoint #3	2 1 V/m	0 rad	
Datapoint #4	2.15 V/m	0 rad	
Datapoint #5	2.7.V/m	0 rad	
Datapoint #6	3 V/m	0 rad	
Datapoint #7	3.01 V/m	0 rad	
Datapoint #8	2.5 V/m	0 rad	
Datapoint #9	2 V/m	0 rad	
Datapoint #10	1.8 V/m	0 rad	
Datapoint #11	2 V/m	0 rad	
Datapoint #12	2.7 V/m	0 rad	
Datapoint #13	1 V/m	0 rad	×
Data Table Tools 🗸			
imerical Settings			
Size of Time Window	50 fs	Number Datapoints	14 🜲
Sampling Distance	2.5714 fo		

- Within the database pulse spectrum generator the user can enter data points in frequency or time domain.
- The user can specify the central wavelength and the sampling (size or distance) within the target domain.
- The data will be interpreted with linear interpolation.

Programmable Pulse Generator

Edit Programmable Pulse Spectrum Generator				
Pulse Specfication				
Specification in Time Domain	O Specification In Frequency Domain			
Carrier Wavelength 500 nm	Carrier Frequency 599.58 THz			
Pulse Shape				
Definition	Validity: 🗸			
Numerical Settings				
Size of Time Window 50 fs	Number Datapoints 50			
O Sampling Distance 1 fs				
0	K Cancel Help			

- Within the programmable pulse spectrum generator the user can enter a formula of the desired function in frequency or time domain.
- The user has to specify the central wavelength and the sampling (size or distance and number of data points) within the target domain.

Pulse Document 1D



- The output of the pulse generator is a pulse component at one point.
- The pulse component is shown in wavelength domain (see x-axis).
- The pulse component in wavelength domain can be used to specify a spectrum of light source that shall be used for simulation.

Specification of Spectral Distribution in Source

Edit Plane Wave				
Spatial Para	ameters Po	larization Mode Sou	Selection Sampling	
Bas	T Tarameters	- Spr		
Power Spectr	um lype	List o	f Wavelengths 🗸 🗸	
- Spectral Va				
Index	Wavelength	Electric H (Amplitude)	(Phase)	
1	532 nm	1 V/m	n O rad	
Load Fr	rom File		Add Datapoint Load From Diagram	
Save	I o File		Show Diagram	
<u>D</u> efault Parar	neter	<u>O</u> k	Cancel <u>H</u> elp	

Get Diag	ram ×
30: Gaussian Pulse Spectrum	
	Ok Cancel



- VirtualLab allows to specify a pulse in time or frequency domain.
- The specification can be done by
 - Pre-defined definition (Gaussian shape)
 - Database definition
 - User-defined definition (Programmable)
- The defined pulse will be generated in the wavelength domain and can be used to specify the spectral distribution within a light source of VirtualLab.