

UseCase.0002 (1.0)

Performance Settings -Recommendations

Keywords: performance, time, memory, consuming, large data, parallelization, CPU, core, FFT algorithm, RAM, warning, sampling

Description

- This use case explains the configuration option on the **Performance** tab of the global options dialog.
- It also demonstrates how the performance settings shall be set for a specific PC configuration.
- The settings are mainly dependent on the amount of RAM which is given and the number of cores of the CPU that is used.

Performance Setting: View

Glob	al Optio	ons				×
Fields and Sampling Operations View Pa	arameters	Perform	ance	Other Settin	igs	
View Performance						
Disable Light View						
Use Standard Range for Complex A	Amplitude	View				
Maximum Number of Table Cells	for Data Ar	rays			100000	J
Array Size and Handling						
Default Precision of Arrays		C	Double	Precision	~	
Swap Large Field Data on Hard Di	sc					
Field Size Warnings						
✔ Warn Before Exceeding Specifie	d Limits					
Warning Levels						
Maximum Number of Sampling	Points pe	r Field		1E+(07	
Maximum Number of Fields Se	et Member	S		4(00	
Guaranteed Amount of Remain	ing Physic	cal Mem	ory		1 GB	
Multi Core Processing						
Use Multiple Cores	Number of	of Cores	To Use	•	2	
Use Multiple Cores for Parameter	Run Loop					
FFT Algorithm						
Intel Math Kernel Library FFT	⊖ Virtua	ILab FF	т			
Reset All 💕 🛃	C)k	Ca	ancel	Help	

- At the top part the user can define the default view parameter that influence the performance.
- In case you work with large fields it is recommended to disable the light view.
- With checked standard range option no min/max values are calculated, instead default scaling is used. On demand the auto or user defined scale can always be displayed.
- The maximum number of table cells limits how much data is automatically displayed. If also larger arrays should be displayed, this can always be triggered by a button click.

Performance Setting: Array Size and Handling

Global Options			×	
Fields and Sampling Operations View P	arameters Perfo	mance Other	Settings	
View Performance				11
Disable Light View				
Use Standard Range for Complex	Amplitude View			
Maximum Number of Table Cells	for Data Arrays		100000	ו
Array Size and Handling				
Default Precision of Arrays		Double Precisio	on v	
Swap Large Field Data on Hard Di	isc			
Field Size Warnings				
✓ Warn Before Exceeding Specifie	ed Limits			
Warning Levels				
Maximum Number of Sampling	g Points per Field		1E+07	
Maximum Number of Fields S	et Members		400	
Guaranteed Amount of Remain	ning Physical Me	mory	1 GB	
Multi Core Processing				
✓ Use Multiple Cores	Number of Core	s To Use	2	2
Use Multiple Cores for Parameter	Run Loop			
FFT Algorithm				
Intel Math Kernel Library FFT	◯ VirtualLab F	FT		
Reset All 💕 ⋥	Ok	Cancel	Help	

- The user can also select the default precision of arrays.
- If the simulation requires a very high accuracy (e.g. pulse simulation) it should be set to Double, otherwise Float can be used.
- Internally VirtualLab always calculates in Double precision, but the generation of the output fields can be scaled down by selecting Float precision here.

Performance Setting: Array Size and Handling

Global Options					
Fields and Sampling Operations View P	Parameters Perfor	mance Other Settings	i		
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		Float Precision	~		
Swap Large Field Data on Hard D	isc				
Field Size Warnings					
✓ Warn Before Exceeding Specifie	ed Limits				
Warning Levels					
Maximum Number of Samplin	g Points per Field	1E+07			
Maximum Number of Fields S	Maximum Number of Fields Set Members 400				
Guaranteed Amount of Remaining Physical Memory 1 GB					
Multi Core Processing					
✓ Use Multiple Cores	Number of Core	s To Use	6		
Use Multiple Cores for Parameter	Run Loop				
FFT Algorithm					
Intel Math Kernel Library FFT	O VirtualLab F	FT			
Reset All 💕 🛃	Ok	Cancel	Help		

- For different objects and algorithms within VirtualLab a mechanism to swap data to hard disc is implemented.
- This allows that not the complete data has to be stored in the RAM. On the other hand this option may slow down your simulation.
- Examples for such object are
 - Harmonic Fields Set
 - Parameter Run

Performance Setting: Array Size and Handling

Global Options
Telds 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
Waming Levels
✓ Maximum Number of Sampling Points per Field 1E+07
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 2
Use Multiple Cores for Parameter Run Loop
FFT Algorithm
Intel Math Kernel Library FFT O VirtualLab FFT
Reset All 😂 🛃 Ok Cancel Help

- The user can also define whether he like to be warned if some fields are too large or a harmonic fields set has too many members.
- This options are mostly evaluated within the source.
- In addition, the user can define a guaranteed amount of RAM which shall remain available for other programs.
- For most cases the initial defaults from VirtualLab are appropriate.

Performance Setting: Multi Core Processing

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 V
Swap Large Field Data on Hard Disc
Field Size Warnings
✔ Warn Before Exceeding Specified Limits
Waming Levels
✓ Maximum Number of Sampling Points per Field 1E+07
Maximum Number of Fields Set Members 400
Guaranteed Amount of Remaining Physical Memory
Multi Core Processing
✓ Use Multiple Cores Number of Cores To Use 2
Use Multiple Cores for Parameter Run Loop
FFT Algorithm
Intel Math Kernel Library FFT O VirtualLab FFT
Reset All 🚰 🛃 Ok Cancel Help

- VirtualLab is enabled to use parallel computing for divers computations and simulations.
- The user can specify how many CPU cores shall be used.
- A rule of thumb is to use here (Number of Cores - 1). So one core remains available for the operating system.
- It is also possible to specify whether the loops of the Parameter Run shall be run in parallel.

Performance Setting: FFT Algorithm

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
Waming Levels
✓ Maximum Number of Sampling Points per Field 1E+07
✓ Maximum Number of Fields Set Members 400
Guaranteed Amount of Remaining Physical Memory
Multi Core Processing
✓ Use Multiple Cores Number of Cores To Use 2
Use Multiple Cores for Parameter Run Loop
FFT Algorithm
Intel Math Kernel Library FFT O VirtualLab FFT
Reset All 🧭 🛃 Ok Cancel Help

- Due to the fact that the FFT algorithm is of central concern for solving diffraction equations, VirtualLab has two build in versions to perform a FFT.
- We recommend to use the Intel Math Kernel Library FFT as default.



- The setup of the performance settings for VirtualLab depends on the simulation task which should be realized as well as the computer configuration which is used to run VirtualLab.
- By a clever selection of the settings the user can define the best compromise between performance and memory consumption for his specific case.