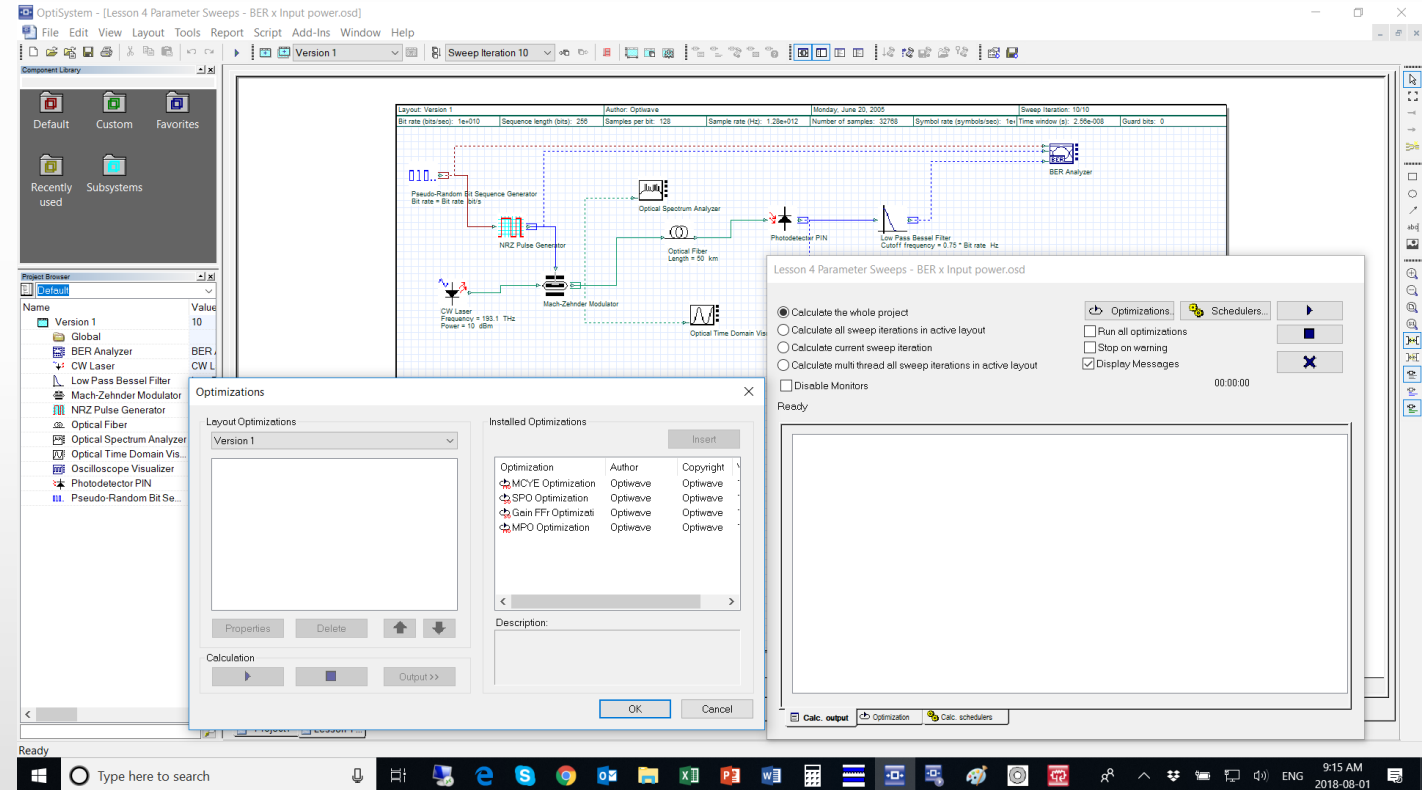




Parameters Optimization

Creating Optimization Process

- After creating the project, select “Calculate” then choose “Optimizations..”
- There are four kinds of Optimization
 - Monte-Carlo Yield Estimation
 - Single parameter single result optimization
 - Gain FFr Optimization
 - Multi-parameter multi-result optimization
- Double click on required optimization type or highlight it and select “Insert”



Main tab

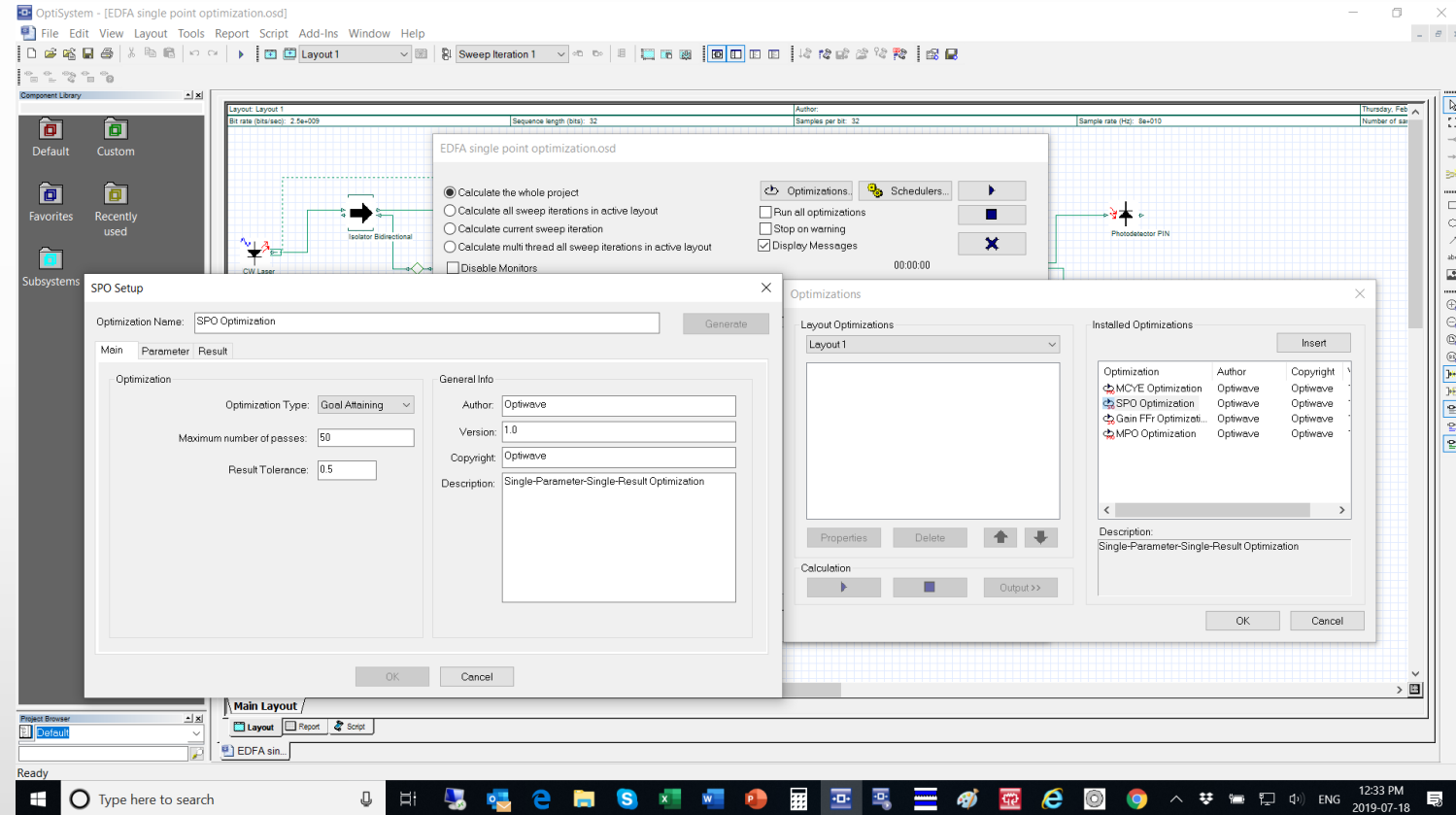
- Choose Optimization type:

Minimize

Maximize

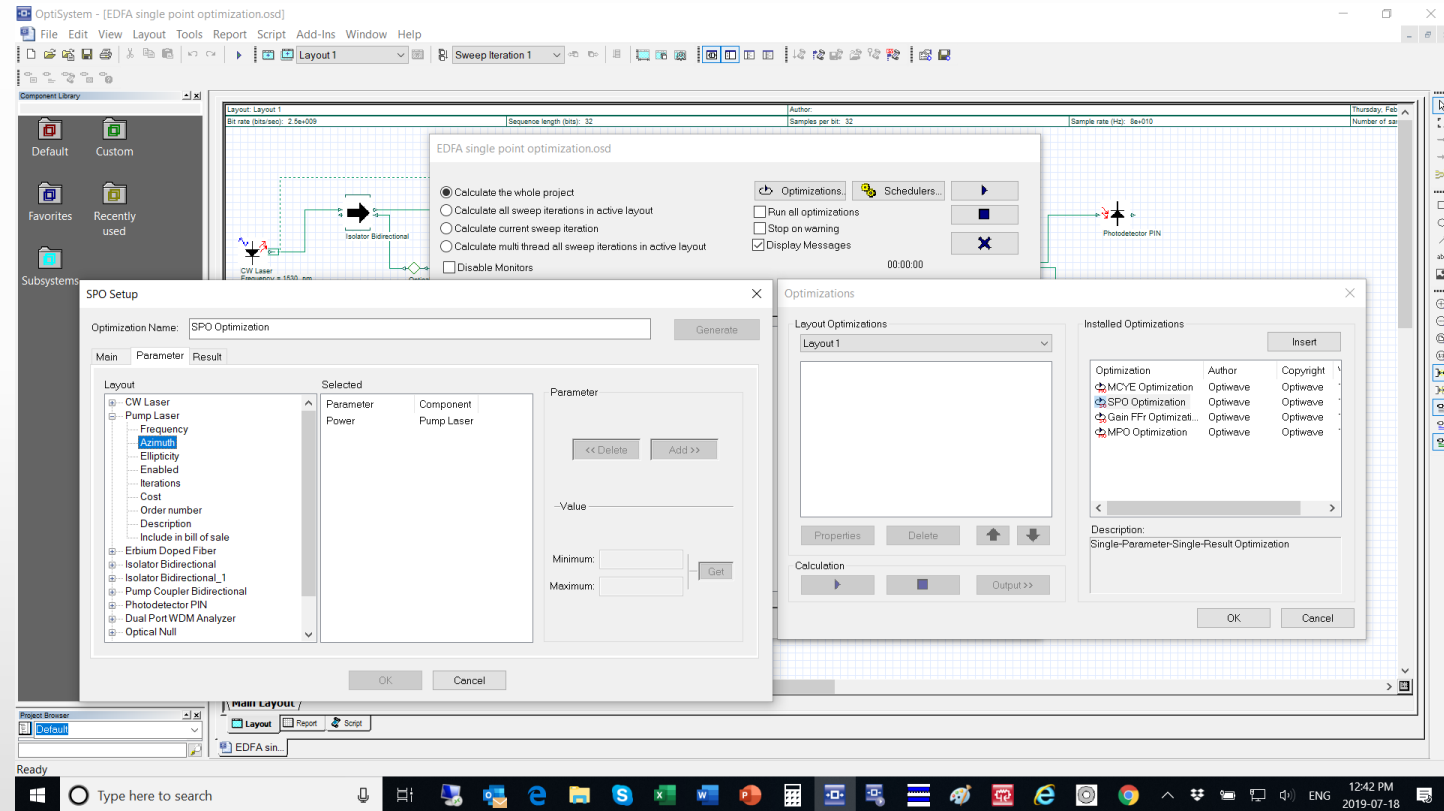
Goal Attaining

- Choose the Maximum number of passes
- Choose Result Tolerance



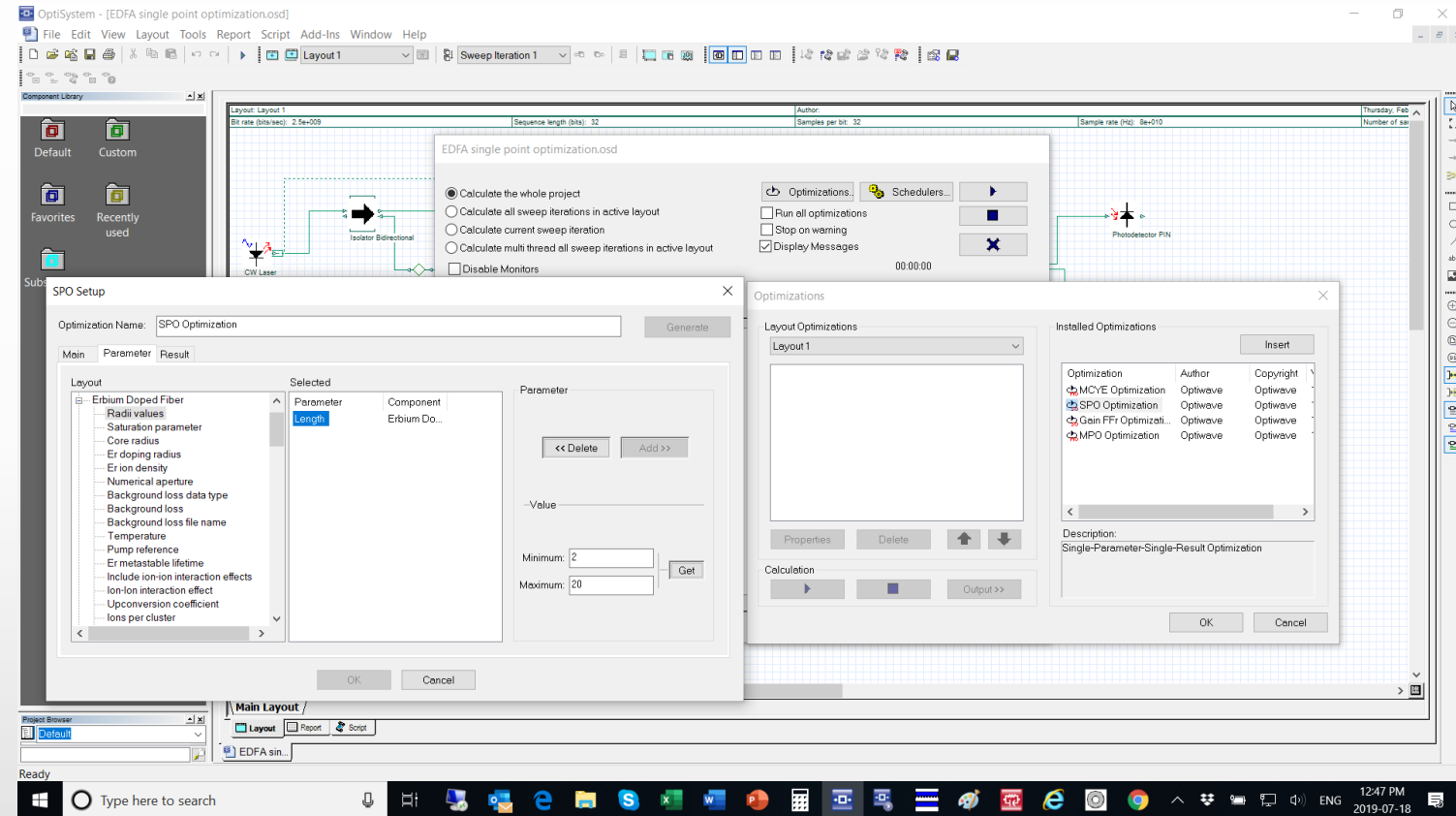
Parameter tab

- All components in the Project Layout are listed
- Use [+] and [-] to maximize or minimize the list of parameters of each component in the layout
- Select the parameter(s) to optimize by double click on it or highlighted then choose Add>> to add it to the “Selected” list. An added parameter will be taken out from the “Layout” side



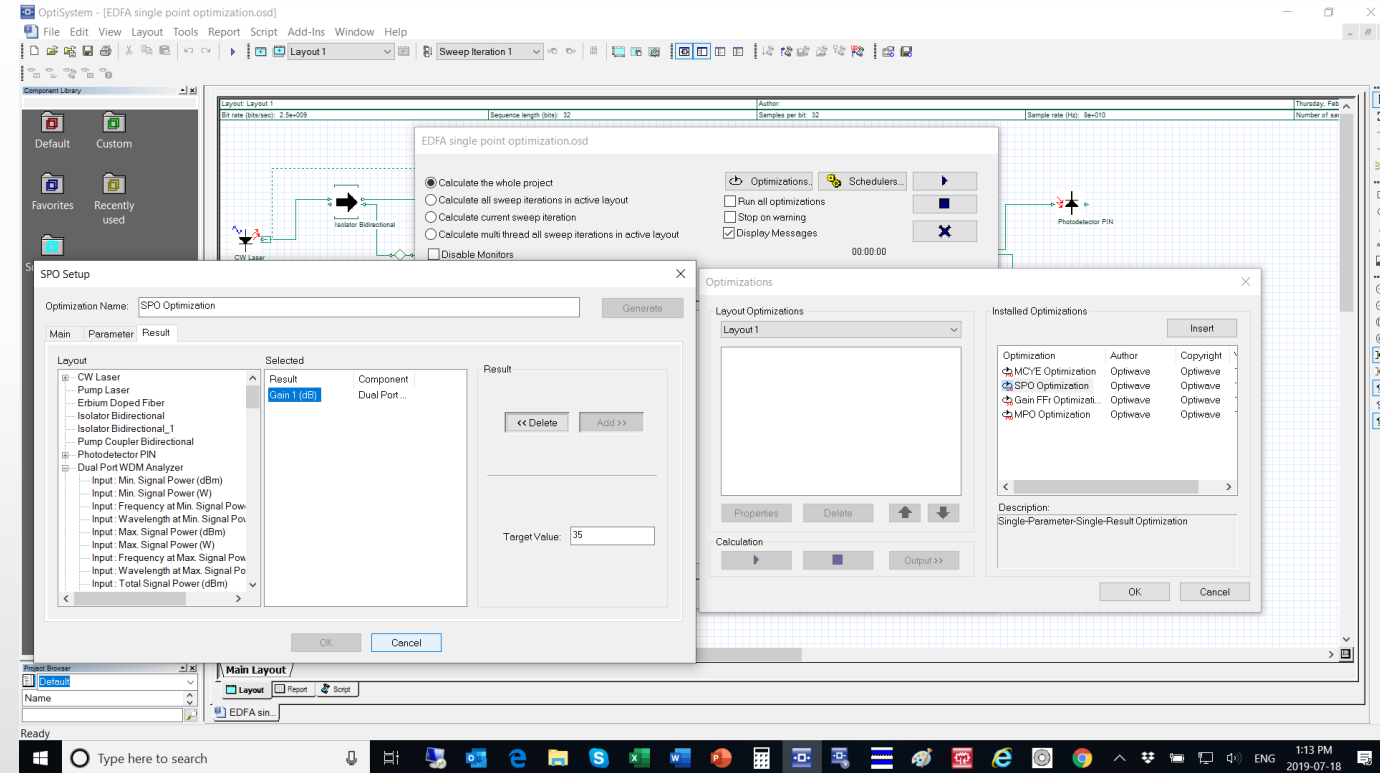
Parameter tab

- Highlighting a parameter selected for optimization to enter the Minimum and Maximum value of the optimization range



Result tab

- OptiSystem components designed to have results after calculation will have [+] symbol to show the list of available results
- Select the desired result(s) for the optimization process by double clicking on it or highlight it then choose Add>>
- Highlight the selected result to enter the “Target Value:” when the “Optimization Type:” is “Goal Attaining”.



Optimized Parameter(s)

- Optimized parameter(s) name appears green in the Component Properties popup window
- The parameter “Mode” become “Optimize”
- Parameter value is the minimum value of the optimization range

OptiSystem - [Lesson 4 Parameter Sweeps - BER x Input power.osd]

File Edit View Layout Tools Report Script Add-Ins Window Help

Version 1 Sweep Iteration 1

Component Library: Default, Custom, Favorites, Recently used, Subsystems used

Project Browser: Default, Version 1 (Global, BER Analyzer, CW Laser, Low Pass Bessel Filter, Mach-Zehnder Modulator, NRZ Pulse Generator, Optical Fiber, Optical Spectrum Analyzer, Optical Time Domain Vis..., Oscilloscope Visualizer, Photodetector PIN, Pseudo-Random Bit Se...)


Layout: Version 1
 Bit rate (bits/sec): 1e+10 | Sequence length (bits): 256 | Samples per bit: 128 | Sample rate (Hz): 1.28e+12 | Number of samples: 32768 | Symbol rate (symbols/sec): 1e10 | Time window (s): 2.56e-008 | Guard bits: 0

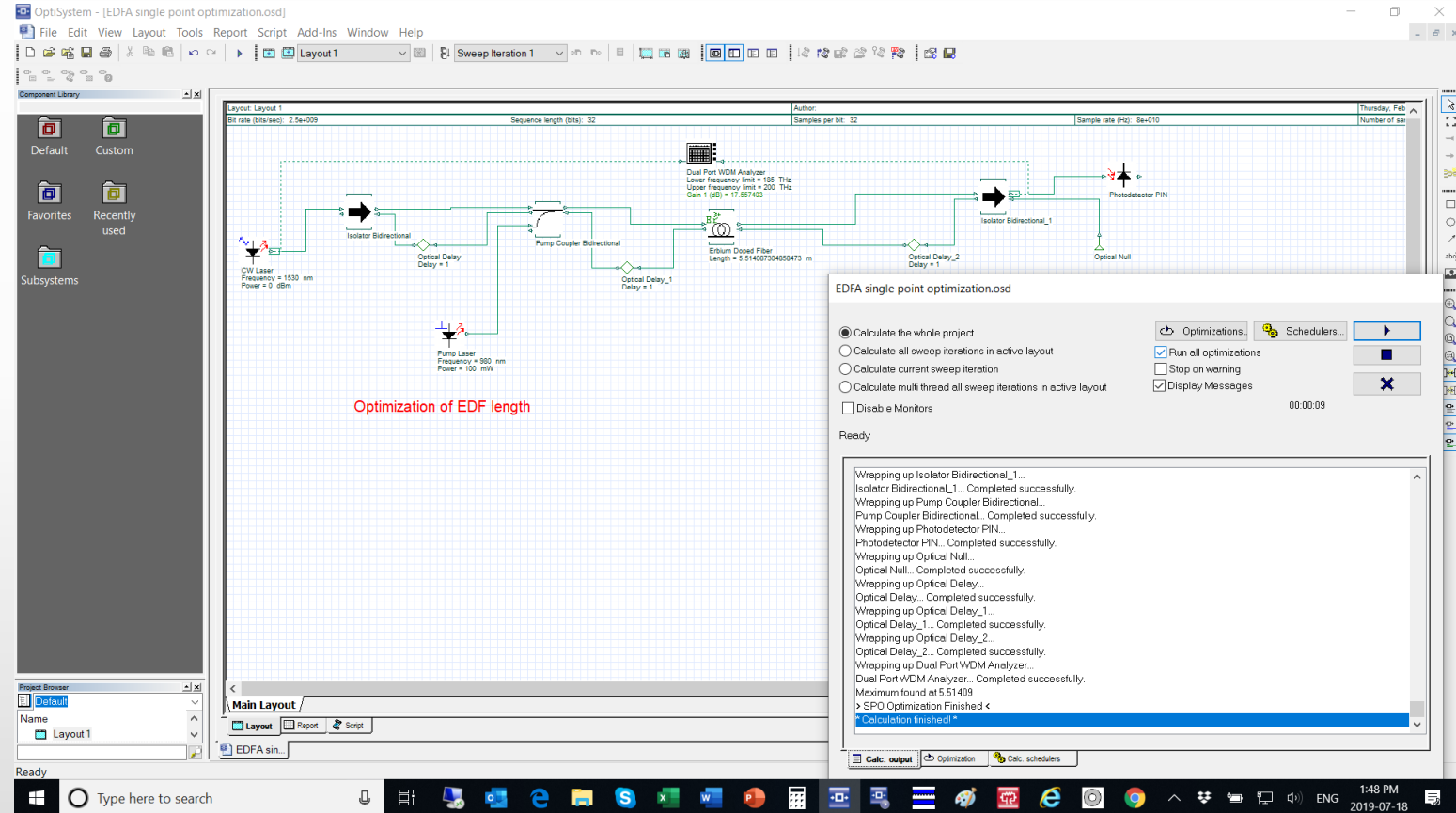
Photodetector PIN Properties

Disp	Name	Value	Units	Mode
<input type="checkbox"/>	Dark current		10 nA	Normal
<input type="checkbox"/>	Noise calculation type	Numerical		Normal
<input type="checkbox"/>	Noise bandwidth source	Use sample rate		Normal
<input type="checkbox"/>	Add signal-ASE noise	<input checked="" type="checkbox"/>		Normal
<input type="checkbox"/>	Add ASE-ASE noise	<input checked="" type="checkbox"/>		Normal
Thermal noise				
<input type="checkbox"/>	Add thermal noise	<input checked="" type="checkbox"/>		Optimize
<input type="checkbox"/>	Bandwidth (Thermal)	Bit rate	Hz	Script
<input type="checkbox"/>	Thermal noise calculation	Defined		Normal
<input type="checkbox"/>	Thermal power density	0.999999999999965e-021	W/Hz	Optimize
<input type="checkbox"/>	Absolute temperature	298	K	Normal
<input type="checkbox"/>	Load resistance	50	Ohm	Normal
Shot noise				
<input type="checkbox"/>	Add shot noise	<input checked="" type="checkbox"/>		Normal
<input type="checkbox"/>	Bandwidth (Shot)	Bit rate	Hz	Script
<input type="checkbox"/>	Shot noise distribution	Gaussian		Normal
<input type="checkbox"/>	Time interval points	None		Normal

Parameter is Optimized

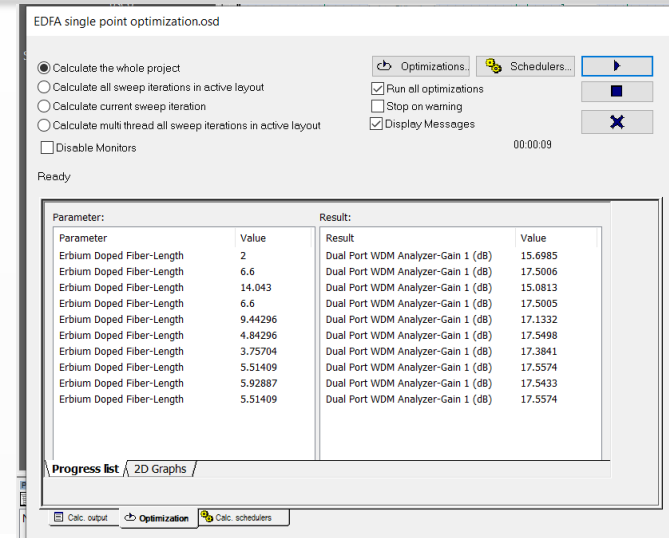
OS Taskbar: Type here to search, ENG 20

- Select Calculate in OptiSystem GUI
- Select “Run all optimization”
- Select “Calculate the whole project”
- Select Run symbol 

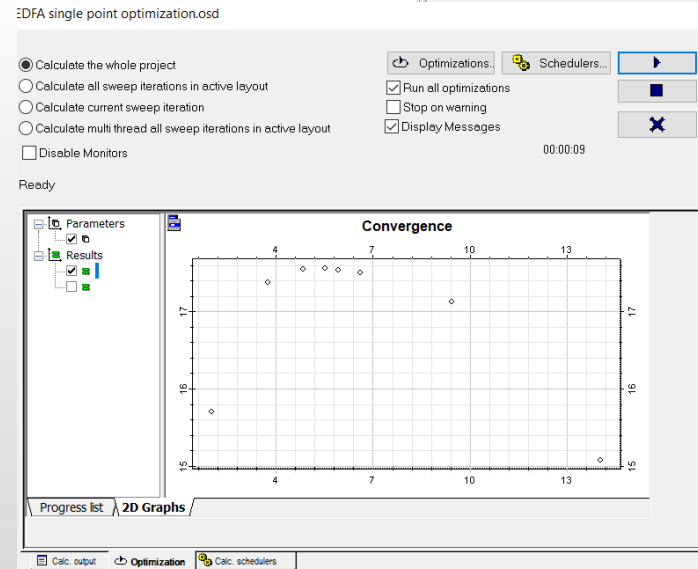


Monitoring Optimization Process

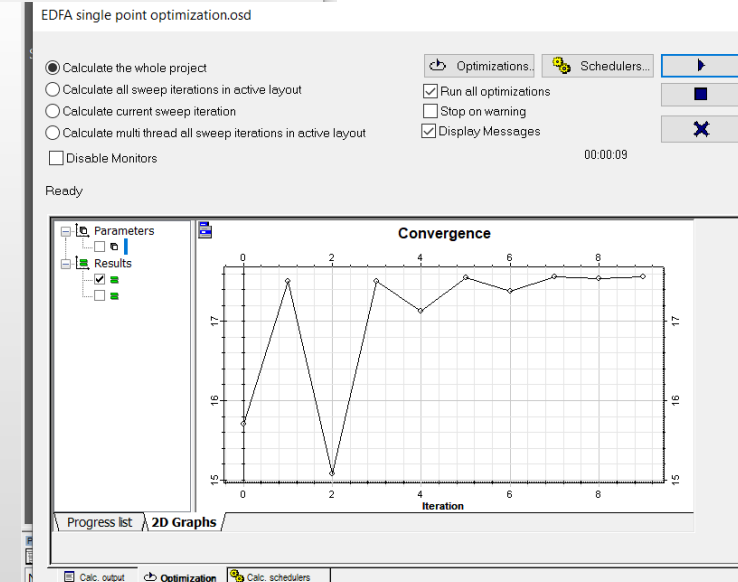
- Users can view optimization progress by selecting “Optimization” tab at the bottom of the calculation window
- Select “Progress list” to view the progress of “Parameter” Value and the “Result:” Value during the calculation
- Select “2D Graphs” to view different displays of the Parameter(s) and Results of the optimization process



Convergence
in 10
iterations



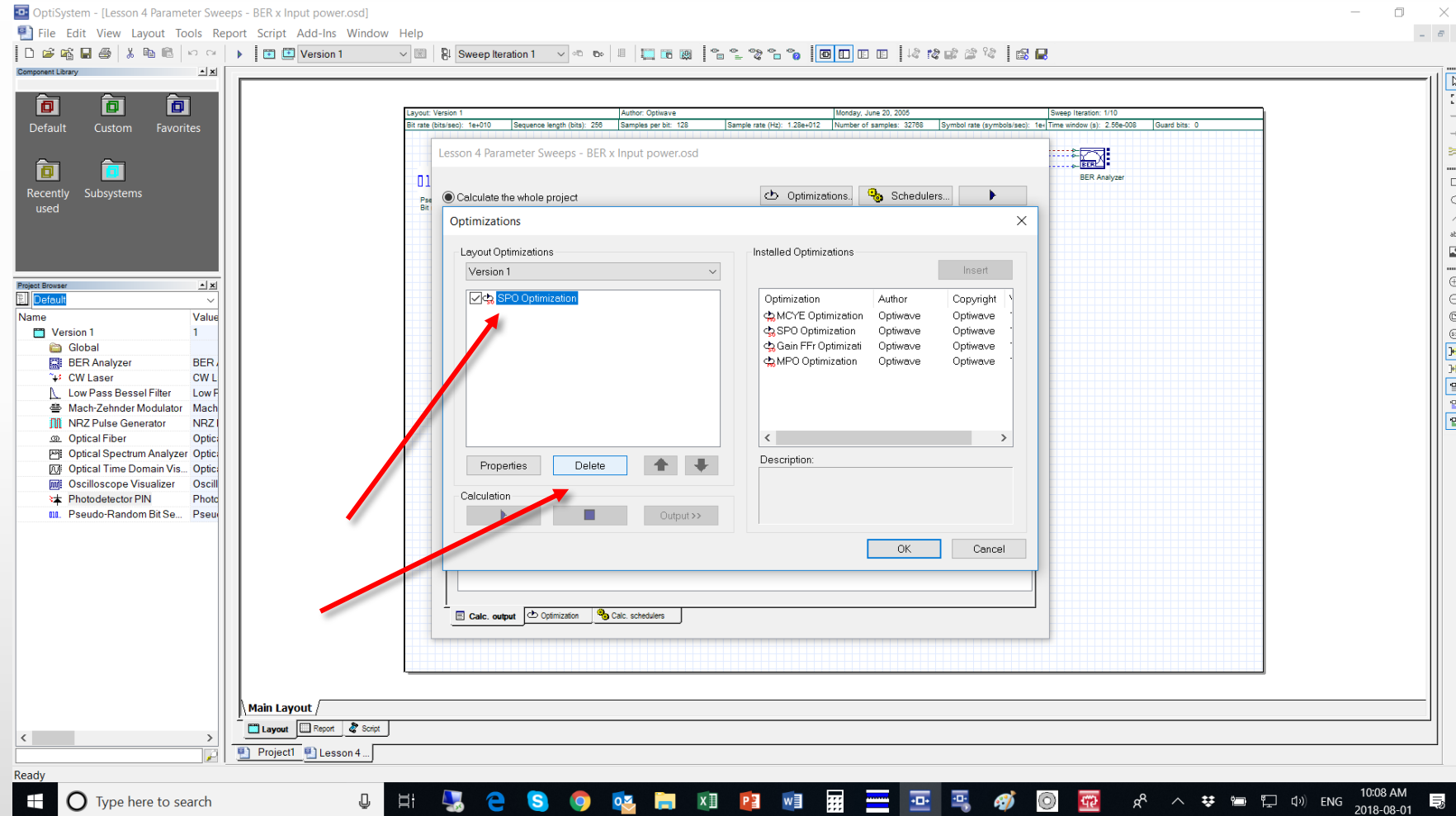
Results versus Parameter



Results versus Iteration

Delete Project Optimization

- Select Calculate and select Optimization, then select the optimization process and delete it
- Parameter is no more optimize in Component Properties (it is Normal)



Multi-Parameter Optimization

OptiSystem - [EDFA multiparameters optimization.osd]

File Edit View Layout Tools Report Script Add-Ins Window Help

EDFA Gain Sweep Iteration 1

Component Library

Default Custom Favorites Recently used Subsystems used

Layout: EDFA Gain
Bit rate (bits/sec): 2.5e+009

EDFA multiparameters optimization.osd

Calculate the whole project
 Calculate all sweep iterations in active layout
 Calculate current sweep iteration
 Calculate multi thread all sweep iterations in active layout
 Disable Monitors

Run all optimizations
 Stop on warning
 Display Messages
 00:01:52

MPO Setup

Optimization Name: MPO Optimization

Main Parameters Results

Optimization

Maximum number of passes: 200

Advanced

Scaling factor: 1e-009

Error termination tolerance: 1e-015

Gradient error termination tolerance: 1e-020

Minimum change for calculation step: 1e-015

Minimum change for finite differencing: 1e-006

General Info

Author: Optiwave Corporation

Version: 1.0

Copyright: Optiwave Corporation

Description: Multi-Parameter-Multi-Result Optimization

Optimizations

Layout Optimizations

EDFA Gain

MPO Optimization

Calculation

Installed Optimizations

Optimization	Author	Copyright
MCYE Optimization	Optiwave	Optiwave
SPO Optimization	Optiwave	Optiwave
Gain FFR Optimizati...	Optiwave	Optiwave
MPO Optimization	Optiwave	Optiwave

Description:

Project Browser

Default

Name Value

Layout Report Script

EDFA mul...

Ready

Type here to search

6:26 AM 2019-07-19

Main

Name/Description	Default value	Value range
Maximum number of passes Maximum number of iterations allowed.	50	[1, INF]
Scaling factor Scale that minimizes the error estimate.	1e-009	[0, INF]
Error termination tolerance Termination tolerance on the result values.	1e-015	[0, INF]
Gradient error termination tolerance Termination tolerance on the conjugate gradient iteration.	1e-020	[0, INF]
Minimum change for calculation step Minimum change in variables for calculation.	1e-015	[0, INF]
Minimum change for finite differencing Minimum change in variables for finite differencing.	1e-006	[0, INF]

Optimized Parameters

The screenshot shows the OptiSystem interface with the MPO Setup dialog box open. The dialog has three tabs: Main, Parameters, and Results. The Parameters tab is active, showing a list of components in the 'Layout' section. The 'Selected' section lists 'Power' and 'Length' parameters for the 'Pump' and 'EDF' components. The 'Parameter' section shows input fields for Minimum (0), Maximum (160), and Starting (100) values, along with 'Get' buttons and a checkbox for 'Get current value as starting'.

Below the dialog, the 'Optimizations' panel is visible, showing 'EDFA Gain' as the selected layout optimization. The 'Installed Optimizations' list includes:

Optimization	Author	Copyright
MCVE Optimization	Optiwave	Optiwave
SPO Optimization	Optiwave	Optiwave
Gain FFI Optimizati...	Optiwave	Optiwave
MPO Optimization	Optiwave	Optiwave

This screenshot shows the same OptiSystem interface but with a different configuration in the MPO Setup dialog. The 'Parameter' section shows Minimum (0), Maximum (160), and Starting (100) values. The 'Optimizations' panel shows 'EDFA Gain' as the selected layout optimization. The 'Installed Optimizations' list is identical to the previous screenshot.

Optimization Result

OptiSystem - [EDFA multiparameters optimization.osd]

File Edit View Layout Tools Report Script Add-Ins Window Help

EDFA Gain Sweep Iteration 1

Component Library: Default, Custom, Favorites, Recently used, Subsystems used

Layout: EDFA Gain
Bit rate (bits/sec): 2.5e+009
Sequence length (bits): 1

EDFA multiparameters optimization.osd

- Calculate the whole project
- Calculate all sweep iterations in active layout
- Calculate current sweep iteration
- Calculate multi thread all sweep iterations in active layout
- Disable Monitors

Optimizations... Schedulers... [Run] [Stop] [Close]

Run all optimizations
Stop on warning
Display Messages

00:01:52

MPO Setup

Optimization Name: MPO Optimization [Generate]

Main Parameters Results

Layout: EDF, Pump, WDM Transmitter, Ideal Mux, Optical Spectrum Analyzer, Dual Port WDM Analyzer, Optical Spectrum Analyzer_1, Optical Power Meter Visualizer

Selected:

Result	Component
Gain 1 (dB)	Dual Port WDM Analyzer
Gain 10 (dB)	Dual Port WDM Analyzer
Gain 11 (dB)	Dual Port WDM Analyzer
Gain 12 (dB)	Dual Port WDM Analyzer
Gain 13 (dB)	Dual Port WDM Analyzer
Gain 14 (dB)	Dual Port WDM Analyzer
Gain 15 (dB)	Dual Port WDM Analyzer
Gain 16 (dB)	Dual Port WDM Analyzer
Gain 2 (dB)	Dual Port WDM Analyzer
Gain 3 (dB)	Dual Port WDM Analyzer
Gain 4 (dB)	Dual Port WDM Analyzer
Gain 5 (dB)	Dual Port WDM Analyzer
Gain 6 (dB)	Dual Port WDM Analyzer
Gain 7 (dB)	Dual Port WDM Analyzer

Result: << Delete Add >>

Target Value: 23
Tolerance: 0.1

Number of Goals to Achieve Exactly: 16

Optimizations

Layout Optimizations: EDFA Gain

MPO Optimization

Properties Delete [Up] [Down]

Calculation: [Run] [Stop] [Output >>]

Installed Optimizations

Optimization	Author	Copyright
MCYE Optimization	Optiwave	Optiwave
SPO Optimization	Optiwave	Optiwave
Gain FFR Optimizati...	Optiwave	Optiwave
MPO Optimization	Optiwave	Optiwave

Description:

OK Cancel

Project Browser: Default

Name Value

EDFA mul...

Ready

Type here to search

6:28 AM 2019-07-19

MPO Optimization Progress

OptiSystem - [EDFA multiparameters optimization.osd]

File Edit View Layout Tools Report Script Add-Ins Window Help

EDFA Gain Sweep Iteration 1

Component Library

Default Custom Favorites Recently used Subsystems used

Layout: EDFA Gain
Bit rate (bits/sec): 2.5e+009
Sequence length (bits): 1

EDFA multiparameters optimization.osd

Calculate the whole project
 Calculate all sweep iterations in active layout
 Calculate current sweep iteration
 Calculate multi thread all sweep iterations in active layout
 Disable Monitors

Run all optimizations
 Stop on warning
 Display Messages

00:01:52

Ready

Parameter:	Value	Result:	Value
Pump-Power	24.6586	Dual Port WDM Analyzer-Gain 13 (dB)	23.0068
EDF-Length	4.75494	Dual Port WDM Analyzer-Gain 14 (dB)	22.9917
Pump-Power	24.6586	Dual Port WDM Analyzer-Gain 15 (dB)	22.9516
EDF-Length	4.75494	Dual Port WDM Analyzer-Gain 16 (dB)	22.8316
Pump-Power	24.6586	Dual Port WDM Analyzer-Gain 2 (dB)	22.9299
EDF-Length	4.75494	Dual Port WDM Analyzer-Gain 3 (dB)	22.9668
Pump-Power	24.6586	Dual Port WDM Analyzer-Gain 4 (dB)	23.0051
EDF-Length	4.75494	Dual Port WDM Analyzer-Gain 5 (dB)	23.0538
Pump-Power	24.6586	Dual Port WDM Analyzer-Gain 6 (dB)	23.083
EDF-Length	4.75494	Dual Port WDM Analyzer-Gain 7 (dB)	23.0414
Pump-Power	24.6586	Dual Port WDM Analyzer-Gain 8 (dB)	23.0522
EDF-Length	4.75494	Dual Port WDM Analyzer-Gain 9 (dB)	23.0885

gain of EDFA

Project Browser

Name Value

Ready

Windows taskbar: Type here to search, 6:18 AM, 2019-07-19

Pump Power Optimization Convergence

Pump power is optimized to achieve specific gain

OptiSystem - [EDFA multiparameters optimization.osd]

File Edit View Layout Tools Report Script Add-Ins Window Help

EDFA Gain Sweep Iteration 1

Component Library

Default Custom Favorites Recently used Subsystems used

Layout: EDFA Gain
Bit rate (bits/sec): 2.5e+009

EDFA multiparameters optimization.osd

Calculate the whole project
Calculate all sweep iterations in active layout
Calculate current sweep iteration
Calculate multi thread all sweep iterations in active layout
Disable Monitors

Optimizations... Schedulers... [Run] [Stop] [Close]

Run all optimizations
Stop on warning
Display Messages

00:01:52

Ready

Parameters
Power
Length

Results
Gain 1 (dB)
Gain 10 (dB)
Gain 11 (dB)
Gain 12 (dB)
Gain 13 (dB)
Gain 14 (dB)
Gain 15 (dB)
Gain 16 (dB)
Gain 2 (dB)
Gain 3 (dB)
Gain 4 (dB)
Gain 5 (dB)
Gain 6 (dB)
Gain 7 (dB)

Convergence

Gain 1 (dB)

Power

gain of EDFA

Progress list 2D Graphs

Calc. output Optimization Calc. schedulers

Project Browser

Default

Name Value

EDFA mul...

Ready

Type here to search

6:24 AM
2019-07-19

EDF Length Optimization Convergence

The screenshot displays the OptiSystem interface for an EDF Length optimization. The main window shows a 'Convergence' plot with 'Gain 1 (dB)' on the y-axis (ranging from -30 to 30) and 'Length' on the x-axis (ranging from 4 to 4.6). A red horizontal line is drawn at approximately 20 dB, indicating the target gain. The plot shows data points that converge to this target gain as the length increases. The 'EDFA Gain' parameter is set to 'Sweep Iteration 1'. The 'Results' tree on the left shows 'Gain 1 (dB)' selected. The 'Optimization' tab is active, and the 'Calc. output' button is visible.

Length	Gain 1 (dB)
4.0	20
4.1	20
4.2	20
4.3	20
4.4	20
4.5	20
4.6	20

EDF Length is optimized to achieve specific gain

No. of Passes Effect on Optimization Convergence

OptiSystem - [EDFA multiparameters optimization.osd]

File Edit View Layout Tools Report Script Add-Ins Window Help

EDFA Gain Sweep Iteration 1

Component Library

Default Custom Favorites Recently used Subsystems used

Layout: EDFA Gain
Bit rate (bits/sec): 2.5e+009
Sequence length (bits): 1

Dual Port WDM Analyzer
Lower frequency limit = 185 THz
Upper frequency limit = 200 THz

Optical Power Meter Visualizer

Optical Spectrum Analyzer_1

EDFA
Length = 4.754933344713096 m

Pump
Frequency = 980 nm
Power = 21.72254331714048 mW

Optical Spectrum Analyzer

EDFA multiparameters optimization.osd

Calculate the whole project
 Calculate all sweep iterations in active layout
 Calculate current sweep iteration
 Calculate multi thread all sweep iterations in active layout
 Disable Monitors

Optimizations Schedulers...

Run all optimizations
 Stop on warning
 Display Messages

00:01:52

Ready

Parameters
Power
Length

Results
Gain 1 (dB)
Gain 10 (dB)
Gain 11 (dB)
Gain 12 (dB)
Gain 13 (dB)
Gain 14 (dB)
Gain 15 (dB)
Gain 16 (dB)
Gain 2 (dB)
Gain 3 (dB)
Gain 4 (dB)
Gain 5 (dB)
Gain 6 (dB)
Gain 7 (dB)

Convergence

Gain 1 (dB)

Iteration

Progress list 2D Graphs

Calc. output Optimization Calc. schedulers

The EDF length and pump power are optimized to get maximum gain of EDFA

Questions

support@optiwave.com

Reference

[OptiSystem_User_Reference.pdf](#)

