OptiSystem 16.0 Release Notes

IMPORTANT - PLEASE READ ME

Installation Notes:

- If you have an earlier version of OptiSystem on your computer, OptiSystem 16.0 will be automatically installed in a separate directory.

- OptiSystem 16.0 includes the option to install OptiSystem samples during (or any time after) installation. The installation location for the samples folder can be defined (by default the samples folder will be installed in "C:\Users\username\Documents\OptiSystem 16.0 Samples"). If you have saved any projects to the target installation location it is highly recommended to save this folder to a backup folder).

Minimum hardware and software requirements

OptiSystem requires the following minimum/recommended system configuration:

- <u>Minimum PC configuration</u>: PC with Pentium processor (E6, G Series) or equivalent.

- 8GB RAM.

- <u>Recommended PC configuration</u>: PC with a clock speed > 2 GHz with 2-4 cores (e.g. Intel i5, i7, i9 or equivalent AMD) and 16GB RAM or more.

- <u>Operating Systems</u>: Microsoft Windows 7/8.1/10 (**64-bit only!**)

- 1.5 GB free hard disk space

- 1280 x 1024 graphic resolution

Application execution

- Administrators: when installing OptiSystem for users with Restricted User Profile, install the sample files in a folder where these users have Read/Write access. By default, the sample files are installed in the current user's Document folder. OptiSystem requires the read/write file access and will not work with read-only files.

- There are some MATLAB files (xxxxx.m) included that are necessary to make the samples work properly. Another important point - the path in the MATLAB search path (Main tab of the MATLAB component) has to be updated with the path to the MATLAB files, otherwise the samples will not work.

- The path to the Scilab/bin folder has to be added to Scilab component (a parameter field has been created for this purpose), otherwise the Scilab component library will not work.

- For the OptiSystem Help feature to function properly, Adobe Acrobat Reader must be installed. To get the latest version please visit the Adobe website at http://www.adobe.com/.

- Some computers are configured in power saving mode to go to Hibernation or Sleep mode when they are not in use. It is recommended to disable this feature, especially when running unattended lengthy simulations. Typically, after the simulation is complete, the computer idles and eventually goes to Hibernation. This causes the licensing platform drivers to invalidate the license. When the computer wakes up and resume its execution, OptiSystem software will issue a message that the license is

not available and terminate, losing the simulation results in the process. Please disable the computer hibernation feature to avoid this problem.

OptiSystem Version 16.0 list of updates

Components

Component(s)	Library	Changes/Updates
Compliance Test Patterns	Default/Transmitters/ Coders/	This component is used to create standard compliance jitter patterns for testing tolerances of different photonic devices. These patterns are the CJTPAT, CRPAT, and CSPAT. The component allows users to edit these patterns by adding bytes and the number of times each sequence is repeated. Users also have the ability to load their own patterns.
FBG Sensor	Default/Sensors	The component allows users to design the FBG according to the actual physical parameters of the grating to perform temperature, stress and strain sensing.
Phi-OTDR	Default/Sensors	This component is used to sense vibration in the optical fiber. The user can setup the number of vibrations, vibration frequency of each vibration and its location.
Phi-OTDR Interrogator	Default/Sensors	This component can be used as a visualizer connected to the "Phi-OTDR" component. External data can also be loaded into the component via its component property settings. This feature will allow the user to analyze experimental measurements.

Other features and improvements

Other features	Changes/Updates
User defined IQ-map	OptiSystem 16.0 allows users to enter a user defined IQ-map for the QAM Sequence Generator, QAM Sequence Decoder, and the Decision components.
EVM accuracy	A new parameter is added to the Decision component called "Decision Error Accuracy", which controls the EVM value.
Guided modes Number	An approximate number of guided modes is added to the results of the "Parabolic-Index Multimode fiber" and "Measured-Index Multimode Fiber" components
Rayleigh backscattering	A time domain representation of the Rayleigh backscattering (RBS) in OptiSystem 16.0 is added. The randomly produced RBS noise power level is measured accurately at the input port of the fiber. The RBS is also represented as parametric signal in the frequency domain.
Visualizers relocation	A new subdirectory called "M-ary" is created in the "Visualizer Library" and the location of the components in the "Visualizer Library" are reorganized to better display them. Also, "Compare" subdirectories are created in the Optical, Electrical, Binary and M-ary directories, where the relevant compare visualizers are moved to them.
View Signal Visualizer data download	A new tab is added to the "View Signal Visualizer" component to allow exporting of all samples/iterations when either the "Convert To Optical individual Samples" component or sweeping feature is used. Typically, one sample is displayed and can be exported as xxxxx.txt or Excel file. The new tab is called "Export All Signal Indices to xxxxx.txt or excel file.
Modulators absorption and phase data file	A data file that represents the used data in the absorption and phase profiles of "Single Drive MZ Modulator Absorption-Phase" and "Dual Drive MZ Absorption-Phase" components is added to the Example Library to allow users load/edit it

Documentation

Document	Changes
OptiSystem Component Library	-New data sheets are created for the Compliance Test Patterns, Phi-OTDR, Phi-OTDR Interrogator, and FBG Sensor components.
	-The following data-sheets are edited or corrected:
	a. The equation that describes the operation of the "Optical Hard Limiter" Component is corrected.
	b. The data sheet of saturable absorber is edited to fix the unit of saturation power. A new reference by H. A. Haus, "Theory of mode locking with a fast-saturable absorber", Journal of Applied Physics, Vol. 46, No. 7, July 1975 is added to the data sheet.
	c. New equations describing Fried parameter are added to the data sheet of the "FSO Channel" component. Also, a new reference is added to the list of references.
	d. The data sheet of the "Optical DP-QPSK Transmitter" component is edited to describe the process that allows using external laser and external PRBS for the component.
	e. The data sheets of the "Single Drive MZ modulator Absorption-Phase", "Dual Drive MZ Absorption-Phase" and "Dual Port Dual Drive MZ Absorption-Phase" components are edited to show the structure of the absorption and phase data file. Thus, users can load/edit their own data files.
	f. The data sheet of the "Parabolic-Index Multimode Fiber" component is modified to show the method used to approximately calculate the number of modes propagating in the fiber.
	g. The FBG length unit is fixed in the data sheets for the "Uniform FBG Sensor", "Fiber Bragg Grating (FBG)", "Empirical Laser Measured" and "Saturable Absorber" by changing it from nm to mm.
OptiSystem Global Parameters	The Global Parameters Reference Guide document is edited to better explain some of the "Global Parameters" especially the reference wavelength.

OptiSystem Version 16.0 Improvements & Fixes

Additional release notes issues

    a.   A user-defined IQ map and user defined threshold set parameters are added to the "Decision" component to enable dynamic detection.

    b.   A new parameter is added to the "Decision" component to control the accuracy of calculating symbol EVM. It is called "Decision Error Accuracy".

    c.   An approximate number of guided modes is added to the component results of the "Parabolic-Index Multimode Fiber" and "Measured-Index Multimode Fiber" components. This number does not represents the number of LP modes.

d. A time domain representation of the Rayleigh backscattering (RBS) signal is introduced in OptiSystem 16 in addition to the existing parametric signal representation. An accurate power level of the randomly produced RBS signal can be measured at the input port of fiber.

e. The location of the visualizers in the "Visualizer Library" are reorganized to better display them. A new subdirectory called "M-ary" is created in the "Visualizer Library". Also, "Compare" subdirectories are created in the Optical, Electrical, Binary and M-ary directories.

f. A new tab is added to the "View Signal Visualizer" component to allow exporting all samples/ iterations at once when the "Convert To Optical individual Samples" component or the sweeping feature are used. Typically, one sample is displayed in the visualizer and can be exported as xxxxx.txt or Excel file. The new tab is called "Export All Signal Indices" to xxxxx.txt or excel file.

g. A data file representing the used data in the absorption and phase profiles of the "Single Drive MZ Modulator Absorption-Phase" and "Dual Drive MZ Absorption-Phase" components is added to the Example Library to allow users edit/load this file separately. The file is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Component sample files\Transmitters Library\Modulators\Optical

Example Library

a. New example is added to explain the operation of the "Compliance test Patterns" component. The "Compliance Test Patterns for pin jitter testing.osd" example is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Optical receiver design and analysis\Jitter analysis\

b. The original example "8B 10B sequence Generator.osd" is improved by adding new visualizers to enable better understanding the results. A "View Signal Visualizer" and "Dual Port Binary Sequence Visualizer" are added to allow viewing the input and output bit sequences and their relevant pulses. The modified example is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Component sample files\Transmitters Library\Coders\

c. New example showing the transmission of 8B/10B encoded signal is added. The file name is "8B10B Sequence Generator-Decoder.osd". The new example is located at C:\Users\xUSERNAME\Documents\OptiSystem 16.0 Samples\Component sample files\Transmitters Library\Coders\

d. Three examples for DP-256QAM modulated signal at 160gbps are added to OptiSystem 16. The transmitted signal is evaluated for back-to-back, amplified and transmitted over 160km of SMF fiber cases. The new examples are located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Advanced modulation systems\QAM systems\256 QAM\. Note that the sequence length and the number of samples per bit affects the accuracy of the calculation.

e. A new example using OFDM 256-QAM modulated signal RoF transmission is added to OptiSystem 16 Example Library. The new example is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Advanced modulation systems\OFDM systems\

f. A new example on 16APSK "120 Gbps Nyquist DP-16APSK circular (1 2) 100km no-repeater system.osd" is added at the following location.

C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Advanced modulation systems\

g. An example on active mode-locked laser using intensity modulator inside a ring cavity is added to OptiSystem 16. The example "Active Mode Locked Fiber Laser with IM.osd" is located at the location C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Optical amplifiers\Fiber lasers and amplifiers. The laser generated pulses are compressed from $0.5\mu s$ to 11ns.

h. New example describing the operation of the "Optical Hard Limiter" component is added to the Example Library. The example "Optical Hard Limiter_Cascaded.osd" uses cascaded hard limiter components. It is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Component sample files\Signal Processing Library\Arithmetic\Optical

i. The example "Spatial-Mode-Demultiplexing-Amplification.osd" is renamed to "Spatial Division Multiplexing (two modes) Amplified Transmission.osd" to reflect its application.

j. An example on the newly introduced FBG sensor component is added to OptiSystem 16. The example "FBG Sensor.osd" is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Sensor systems\FBG Sensor

k. A new set of examples on the "Phi-OTDR" and "Phi-OTDR Interrogator" components are added to the Example Library. Four examples to sense single, two, three and four vibrations are included. Also, one example showing the capability of loading an external experimentally measured vibration file is added. This feature can be used to analyze experimentally measured data. The location of these examples are at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Sensor systems\Phi-OTDR\

l. New example "112Gbps DP-16QAM_OSNR Control_ Transmission System with DSP.osd" is added to 16QAM example library located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Advanced modulation systems\QAM systems\16 QAM

m. The example "Optical Frequency Comb Generation Using Stimulated Brillouin Scattering Recycling.osd" is used for generating comb laser using SBS nonlinear effect. The example is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Fiber analysis and design\Optical Fiber Nonlinearity\SBS

n. A new example "Rayleigh Backscattering-Time Domain Representation.osd" is added to OptiSystem 16.0 showing the time representation of Rayleigh scattering signal. The example is located at C:\Users\USERNAME\Documents\OptiSystem 16.0 Samples\Fiber analysis and design\RayleighScattering\

o. A new example "OptiGrating component.osd" allowing users to edit and load FBG transmission and reflection data file (FBG.txt) is added to the Example Library. The example is located at C:\Users\USERNAMEDocuments\OptiSystem 16.0 Samples\Software interworking\OptiGrating \