OptiSystem 20.0 Release Notes

IMPORTANT - PLEASE READ ME

Installation Notes:

- If you have an earlier major version of OptiSystem on your computer, OptiSystem 20.0 will be automatically installed in a separate directory.
- OptiSystem 20.0 includes the option to install OptiSystem samples during (or at any time after) installation. The samples are installed by default in the folder "C:\Users\USER NAME\Documents\OptiSystem 20.0 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:

- Minimum PC configuration: PC with Pentium processor (E6, G Series) or equivalent.
- 8GB RAM.
- Recommended PC configuration: 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.
- Operating Systems: Microsoft Windows 10 and Windows 11 (**64-bit only!**)
- **Microsoft has shelved Windows 7**, we are dropping Windows 7 support starting this release. However, the software might run under Windows 7, but we do not guarantee it and we will not be able to provide technical support for bugs/crashes.
- 2 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 20.0 list of updates

Components

Table 1: New Components

Component	Library	Changes/Update
FSO Weather Condition	Default/Free Space Optics/	The new component is used to calculate the attenuation of the FSO channel at any wavelength under different weather conditions (clear, Haze, Fog, Rain, Snow) and for different cloud types.
User Defined M-ary Sequence Generator	Default/Transmitters Library/M-ary Sequence Generators/	This component allows loading standard M-ary sequences that are used in the TDECQ Analyzer visualizer. This visualizer is used to quantify the performance of PAM4 systems through their PAM4 eye diagram.
TDECQ Analyzer	Default/Visualizer Library/Electrical/	The transmitter dispersion eye closure quaternary (TDECQ) analyzer visualizer is used to analyze the eye diagram for PAM4 transmission systems.
Optical to Electrical Signal Converter	Default/Receivers Library/Photodetectors/	This components is used to convert the Optical sampled field directly to an electrical sampled signal in one of the following formats (complex, magnitude, argument, power)
Electrical Clipper	Default/Signal Processing Library/Arithmetic/Electrical/	This component clips the electrical signal above and below user-defined levels.
Electrical Transfer Function Visualizer	Default/Visualizer Library/Test Sets/ Electrical/	The visualizer allows users to calculate and display the system transfer function H(f) between two ports with electrical signals.

Other features and improvements

Features	Changes/Updates
Cuda GPU	OptiSystem 20.0 supports Cuda version 11.6.
Optical Fiber Component Parameters at Reference wavelength	The message “The parameter (**attenuation, dispersion, effective area or n_2**) will be calculated at the **Reference wavelength**. If the Reference wavelength is not in the loaded file, interpolation will be used to get the desired value at the Reference wavelength” pops up when a user chooses to load a file for the desired parameter in the unidirectional **Optical Fiber** component.
Visual Studio (VS22)	The CPP component support VS22.

Set OSNR Component	Add a field “Random numbers” in the component properties window to enable/disable the Randomness feature. The original component, which is a compound component doesn’t have this option
Parameter Groups	Add Randomness seed feature to the Parameter Groups that can be accessed from Layout field in the tool-bar of OptiSystem GUI. A total of 131 components have been affected.
Input files for parameters	Allow executing OptiSystem projects that have components which use input file(s) without the need to use a path for the input file(s) as long as the file(s) is located in the same directory of OptiSystem project. There are 11 components affected by this change.
2D and 3D graphs	Remove the 3D graphs in the BERT Test Set component view shown in Project Browser or component view feature when there is no nesting of two parameters in the project which is a requirement for creating 3D graphs, However, 2D graphs are created when only one parameter is swept. If two parameters are swept, there will be no 2D graphs generated for BER versus that parameter. The example (BERT Graphs_112Gbps DP-16QAM_B2B_subsystem with DSP.osd) demo that.
OptiInstrument Comm and Control Component	Add new controls to the OptiInstrument Comm and Control component to allow choosing the interpolation scheme (Linear or Cubic) and loading power & phase data, Real & Imaginary or just power data for signals.
Sweep parameters loaded from a file	Allow users to load from file any swept parameter for all components. A new choice “From file...” is added to the Parameter Sweeps popup window. This feature addresses QKD needs.
Switching control using stream of bits	Enable users to control the operation of different switches using a sequence of bits instead of a single bit in older versions of OptiSystem. This feature addresses QKD needs.
Creation of Frames for plots	Allow users to create frames for different graphs when sweeping feature is used. This would enable machine learning applications.
Animation	Allow animation (file-to-file and progress bar) when movies and frames are created from plots.
Raised-cosine M-ary Pulse Generator	Allow a non-power of 2 number of samples feature for raised-cosine M-ary pulse generator. This feature is enabled in the global parameters popup window.

Documentation

Document	Changes
Fiber Bragg Grating (FBG)	Update the datasheet of the Fiber Bragg Grating (FBG) component by adding definitions to the chirp and apodization features in the technical background and add couple of equations to explain the Modulation AC and Modulation DC parameters.
Analog to Digital	The datasheet of the ADC component is updated by defining the dynamic range, step-size and number of levels. Also, a statement is added that A rectangular lowpass filter is used in the code of the ADC component to prevent aliasing.
2X1 Combiner and NX1 Combiner	The datasheets of these components are edited by correcting the input ports and fix equation (1) for the 2X1 combiner by removing the term N.
Universal Electrical Sampler and Universal Optical Sampler Components	The datasheets for these components are edited by adding more information on the operation of the components int he Technical Background.

BERT and Multiple BERT	Edit the datasheets to explain the process of display 2D and 3D graphs of the BERT components using the project browser or component view. The display of the 2D and 3D graphs depends on the process of sweeping parameters in the project. When single parameter is swept, only 2D plots of BER versus that parameter will be available (the list of 3D graphs will not exist). However, when two parameters are swept and nested, only 3D plots of BER versus these two parameters will be available (the list of 2D graphs will not exist). When two parameters are swept but not nested, then neither 3D or 2D plots will be available.
Optical Switch	The datasheet is edited to explain that the switch is made from MZM interferometer with a phase element placed at the top arm.
Optical Filter Analyzer and Electrical Filter Analyzer	Fix the equation for the frequency response H(f) for Optical and Electrical Filter Analyzer to show H(f) = O(f)/I(f).
Switch	Edit the data sheet to show four output ports
Ideal Y Select Nx1, Ideal Y Select 8x1, Ideal Y Select 4x1, Ideal Y Select, Ideal Y Switch 1XN, Ideal Y Switch 1X8, Ideal Y Switch 1X4, Ideal Y Switch 1X2	The statement “The component can be controlled by a sequence of bits, where the selected input/output port is identified based on the current sequence of bits equivalent to the number of that port” is added to the datasheets. Also, mention that when the last bits in a control sequence are not enough to identify a port (input for select and output for switch components) they will be ignored.
FSO Channel	Edit equation (1) of the FSO Channel component to include the transmitter and receiver loss terms as well as additional Loss. Also describe the Geometric loss calculation.
FSO Weather Condition, User Defined M-ary Sequence Generator, TDECQ Analyzer, Optical to Electrical Signal Converter, Electrical Clipper, Electrical Transfer Function Visualizer.	create new datasheets for these components.
Photodiode PIN and APD	Add electronic diagram to the datasheets to show where the current is collected.

OptiSystem Version 20.0 Improvements & Fixes

Additional release notes issues

a. Fixing crashing of OptiSystem when choosing SPM in the TDF.
b. Fixing a crash issue of OptiSystem caused in earlier versions when a plot present in the report page uses data from a component that is deleted before saving the project. The application crashes when launching the project and try to open the report page.
c. Fixing a crash due to BER Test Set or BER Test Multiple components when the number of sweeps over 1000 or when two or more parameters are swept.
d. Allow the cases when the Delta = Maximum-Minimum for the Select and Switch components specially when the user sets Selection to sweep and try to fill all sweeps selection with values using Discrete tab and choose Minimum to 1, Maximum to 2 and Delta 1 for the Select or Switch components.
e. The RF-Spectrum analyzer and Dual-Port RF Spectrum analyzer has 3-dB power level higher for positive frequencies when displaying negative frequencies is disabled. This

issue has been fixed such that the power level is not doubled when displaying positive frequencies only.

f. Fix the issue of updating the graphs in the project browser when the relevant visualizer is updated after been disabled during the calculation of the project.
g. Fix an issue in the Directly Detected Eye Analyzer Visualizer (The visualizer is a compound component made of a pin detector and a null components). It causes emptying the buffer at the output port of the component it is connected to it. That causes an error messages to appear for visualizers connected at same port and prevent calculating them.
h. Make the maximum number for parameters' sweep iteration to 20,000 to enable Machine Learning projects.

Examples Library

1. The example (PAM4-OAM_MMF.osd) is added to OptiSystem Example Library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Multimode systems\Orbital Angular Momentum-OAM.
2. The example (50Gpbs PAM4_OAM_FSO Channel.osd) is added to OptiSystem Example Library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Multimode systems\Orbital Angular Momentum-OAM.
3. The example (Optical-Electrical PSK Modulator and Demodulation.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Advanced modulation systems\PSK systems.
4. The example (16-QAM with M-ary Threshold.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Advanced modulation systems\QAM systems\16 QAM.
5. The example (18Tupling System.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Microwave and RoF optical systems.
6. The example (TDFL.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Optical amplifiers\Fiber lasers and amplifiers.
7. The example (Autocorrelation feature.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Visualizer Library.
8. The example (EDFA_FWM.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Optical amplifiers.
9. The example (SBS FWM comb setup.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Fiber analysis and design\Optical Fiber Nonlinearity.
10. The example (Saturable Absorber component.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Passives Library\Optical\Reflectors.

11. The example (LPF frequency response characterization.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Visualizer Library\Electrical.
12. The example (LG Modes transmission over fiber.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Multimode systems\Orbital Angular Momentum.
13. The example (LG Modes transmission over FSO Channel.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Multimode systems\Orbital Angular Momentum.
14. The example (VCSEL spatial mode under miscoupling.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Multimode systems.
15. The example (VCSEL spatial mode under differrent scintillation.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Multimode systems.
16. The example (RoF with splitter instead of interleaver.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Microwave and RoF optical systems.
17. The example (16 QAM FSO_Using M-ary Threshold Detector.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Advanced modulation systems\QAM systems\16 QAM.
18. The example (112Gbps DWDM Coherent DP-QPSK_Trans system with DSP.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Advanced modulation systems\PSK systems\QPSK.
19. The example (Single_balanced 5G fronthaul.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Microwave and RoF optical systems.
20. The example (FSO Weather Condition_Dry Weather with different Visibilities.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Optical wireless\FSO Weather Condition.
21. The example (FSO Weather Condition_Different cloud types.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Optical wireless\FSO Weather Condition.
22. The example (Direct Detection OFDM 4 QAM over FSO.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Advanced modulation systems\OFDM systems.
23. The example (Direct Detection OFDM 4 QAM over FSO with LDPC.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Advanced modulation systems\Error coding techniques\LDPC.
24. The example (Universal optical sampler.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Signal Processing Library\Tools\Optical.

25. The example (Universal electrical sampler.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Signal Processing Library\Tools\Electrical.
26. The example (OptiSystem Optical Signal Example.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Instrumentation.
27. The example (OptiSystem Electrical Signal Example.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Instrumentation.
28. The example (Subsystem_transfer_function.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Visualizer Library\Electrical.
29. The example (BERT Graphs_112Gbps DP-16QAM_B2B_subsystem with DSP.osd) is added to the example library at the location. C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Test Sets\Binary
30. The example (TDECQ_example.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Visualizer Library\Electrical
31. The following examples are added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Component sample files\Optical Switches.
    a. Ideal Optical Select 8x1.osd
    b. Ideal Optical Select Nx1.osd
    c. Ideal Optical Select 2x1.osd
    d. Ideal Optical Switch 1xN.osd
    e. Ideal Optical Switch 1x8.osd
    f. Ideal Optical Select 4x1.osd
    g. Ideal Optical Switch 1x4.osd
    h. Ideal Optical Switch 1x2.osd
    i. Ideal Optical Switch.osd
    j. MZ Optical switch with electrical control.osd)
    k. The example (OptiSystem Optical Signal Example.osd) is added to the example library at the location C:\Users\USER NAME\Documents\OptiSystem 20.0 Samples\Instrumentation.