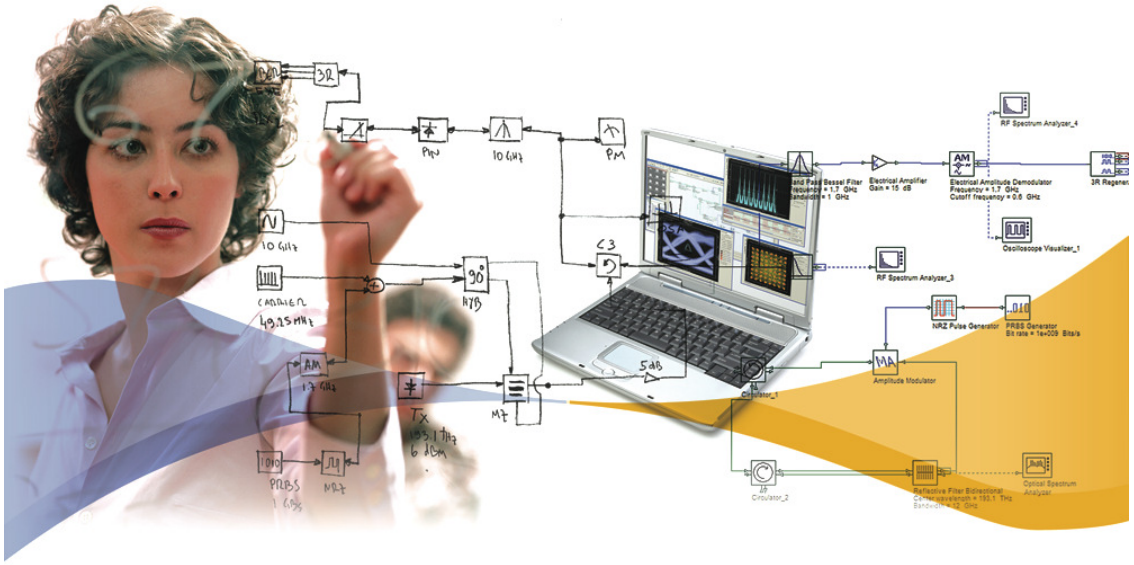

OptiSystem 12.2

Release overview (30 Oct 13)

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OptiSystem 12.2 key features

Available in Dec 2013!

- **Enhanced digital signal processing (DSP) library**
  - New capabilities have been added to the *DSP for 16-QAM* component (formally known as *DSP for DP-16-QAM*) and *DSP for QPSK* component (formally known as *DSP for DP-QPSK*) including DC blocking, normalization, resampling, quadrature imbalance compensation, timing recovery & frequency offset estimation.
  - Enhancements have also been made to the chromatic dispersion compensation, adaptive equalization, and carrier phase estimation algorithms
- **Improved transmitter & receiver capabilities**
  - A new *Decision* component has been added to the Receivers/Demodulators library to allow for the automated setting and optimized decision settings for QPSK and 16-QAM signal formats
  - ***Differential encoding*** has been added to the QPSK and QAM sequence generators and decoders (to provide improved distance performance for QAM and QPSK-based coherent systems)
- **Other release improvements**
  - The *BER Test Set* component has been enhanced to allow for the separate calculation of BER for dual polarization systems
  - The *WDM Analyzer* component has been updated to allow for either the calculation of SNR or OSNR depending on the user's test configuration requirements
  - New "Symbol rate" and "Guard Bits" parameters have been added to the global parameters panel to better align system settings for higher modulation systems

DSP for QAM component

- **Pre-processing**
  - Noise (from noise bins) is now automatically added to the sampled signal data
  - ***DC blocking*** is now performed to deal with imperfectly biased voltage settings in modulators
  - ***Normalization*** is now automatically performed to set the received symbols to the [-3, -1, 1, 3] 16-QAM constellation grid
- **DSP algorithms**
  - A ***Bessel filter*** has been integrated into the *DSP for 16-QAM* component (users had to previously add an external filter)
  - ***Quadrature Imbalance (QI)*** compensation is now performed to mitigate the amplitude and phase imbalances of the in-phase and quadrature signals
  - The ***chromatic dispersion (CD)*** compensation algorithm has been enhanced to include a frequency domain transfer function (complementing the existing time-domain FIR filter)
  - ***Timing recovery*** is now performed to ensure that received symbols are synchronized
  - The ***Adaptive Equalizer (AE)*** algorithm has been improved and now uses the two stage constant modulus and radius-directed (CMA-RD) method
  - ***Frequency Offset Estimation (FOE)*** is now performed to deal with frequency and phase mismatching between the received carrier and local oscillator
  - The ***Carrier Phase Estimation (CPE)*** algorithm has been improved and now uses the blind phase search method
- **Component flexibility**
  - All stages of the DSP algorithms can be separately activated or deactivated thus allowing for DSP component cascading. Users can also introduce custom design or external DSP algorithms within the DSP cascade through the new per stage ***down-sampling*** and ***up-sampling*** feature.
  - The *DSP for 16-QAM* component can be optionally setup to support single or dual polarization system configurations (16-QAM, DP-16-QAM)

DSP for QPSK component

- **Pre-processing**
  - Noise (from noise bins) is now automatically added to the sampled signal data
  - ***DC blocking*** is now performed to deal with imperfectly biased voltage settings in modulators
  - ***Normalization*** is now automatically performed to set the received symbols to the [-1, 1] QPSK constellation grid
- **DSP algorithms**
  - A ***Bessel filter*** has been integrated into the *DSP for QPSK* component (users had to previously add an external filter)
  - ***Quadrature Imbalance (QI)*** compensation is now performed to mitigate the amplitude and phase imbalances of the in-phase and quadrature signals
  - The ***chromatic dispersion (CD)*** compensation algorithm has been enhanced to include a frequency domain transfer function (complementing the existing time-domain FIR filter)
  - ***Timing recovery*** is now performed to ensure that received symbols are synchronized
  - The functionality of the existing ***CMA*** algorithm (within the ***Adaptive Equalizer (AE)*** algorithm) has been improved for more accuracy and robustness
  - ***Frequency Offset Estimation (FOE)*** is now performed to deal with frequency and phase mismatching between the received carrier and local oscillator
  - The functionality of the existing ***4^{th} power*** method (within the ***Carrier Phase Estimation (CPE)*** algorithm) has been improved for more accuracy and robustness
- **Component flexibility**
  - All stages of the DSP algorithms can be separately activated or deactivated thus allowing for DSP component cascading. Users can also introduce custom design or external DSP algorithms within the DSP cascade through the new per stage ***down-sampling*** and ***up-sampling*** feature.
  - The DSP for QPSK component can be optionally setup to support single or dual polarization system configurations (QPSK, DP-QPSK)

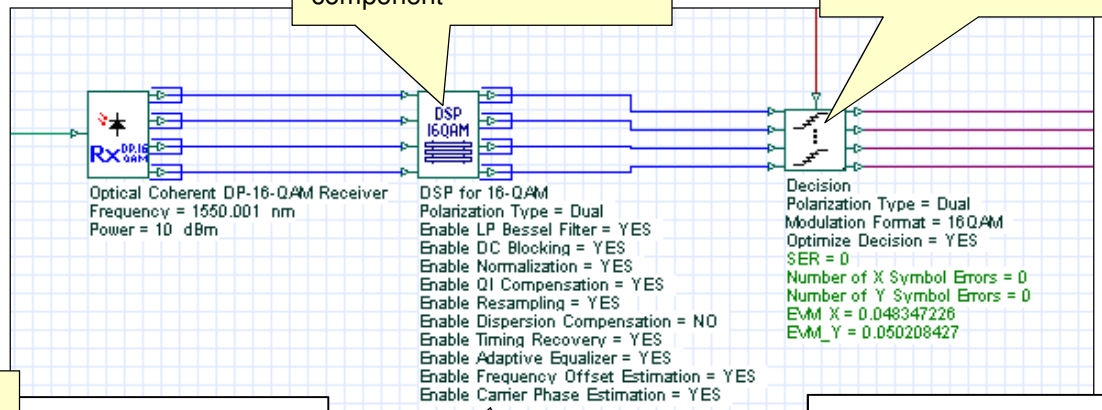
Decision component

- **DC blocking option**
  - If the DSP component (QAM or QPSK) is not used before the *Decision* component then ***DC blocking*** can be enabled to deal with imperfectly biased voltage settings in modulators
- **Normalization**
  - ***Normalization*** is used to set the received symbols to the [-3, -1, 1, 3] 16-QAM or [1, -1] QPSK constellation grids
- **Decision logic**
  - The user has the option to enable or disable the “optimize decision” process
  - When disabled the decision thresholds are set to 0 (QPSK) or ± 2 (16-QAM)
  - When enabled the signal constellation is rotated (if required), received symbols are aligned, and polarization rotation is performed (if required) to ensure the correct alignment of all received symbols (and polarization channels) with the transmitted symbol stream
- **Performance metrics**
  - The error vector magnitude (EVM) is calculated for the received symbols (for both X and Y polarization channels)
  - The received signals are compared with the original transmitted signals to determine the total count of symbols errors (for X and/or Y polarization channels) and thus symbol error rate (SER)

Example configuration DP-16-QAM

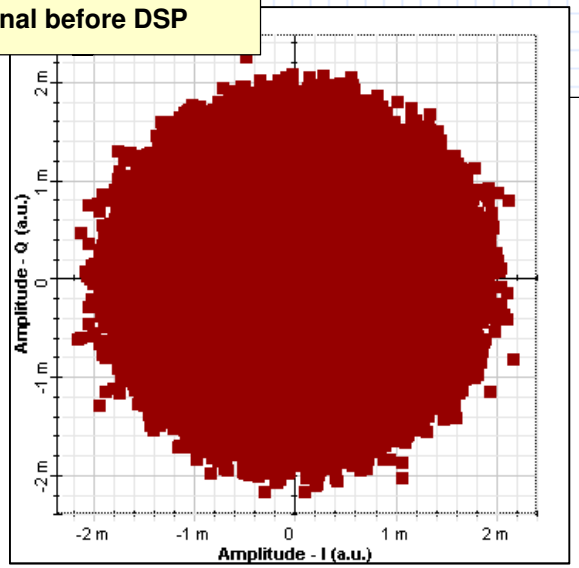
Updated *DSP for 16-QAM* component

New *Decision* component



112 Gb/s back-to-back system
OSNR = 18 dB
Laser linewidth = 100 kHz
Osc. freq offset of 125 MHz

Signal before DSP



Each algorithm stage has an **up-sampling** and **down-sampling** capability and can be independently enabled or disabled.
This allows for cascading of DSP components and the insertion of external DSP algorithms (such as with the MATLAB component)

Signal after DSP