

## Press Information

Berlin, March 1, 2019

# VPIphotonics Design Suite - Version 10.0

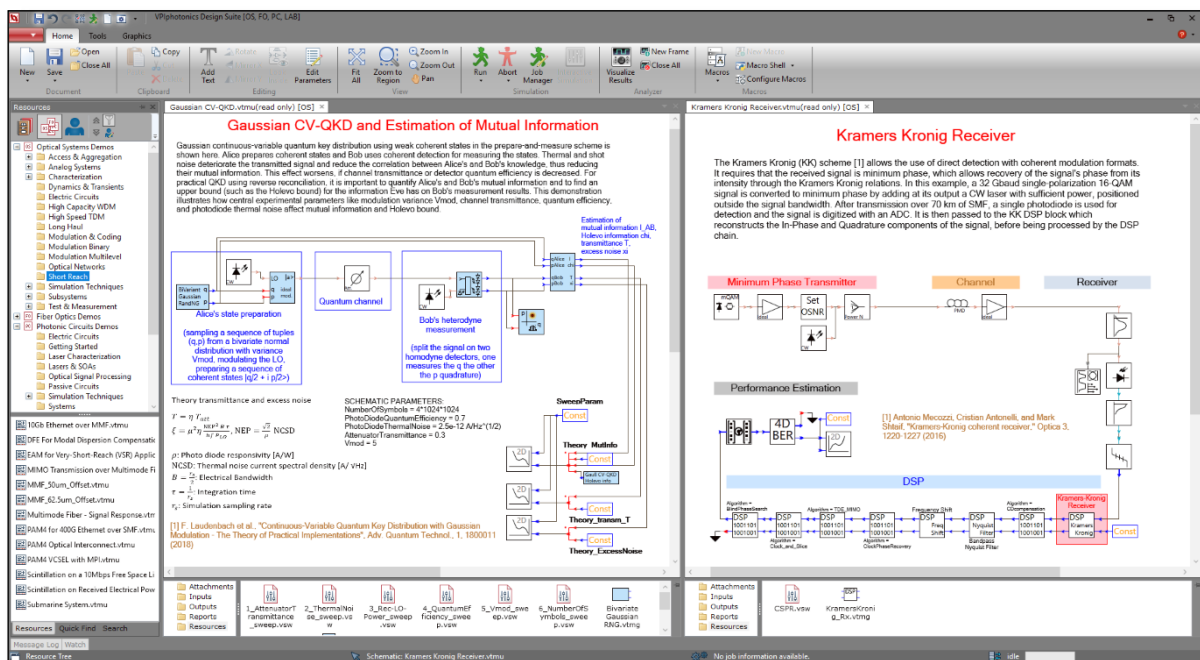
## New release of market-leading optical transmission system and component design software – on show at OFC 2019

VPIphotonics Design Suite Version 10.0 provides access to professional application-specific simulation tools and several pluggable toolkit extensions with common usability, design process and data analysis capabilities.

Version 10.0 offers enhancements of the user interface and tools operation and many advances in simulation capabilities, including new functionalities and analysis tools for coherent mQAM, direct-detection PAM-M, multimode transmission systems, DSP and coding, and much more.

VPIphotonics' software solutions are leveraged by numerous commercial companies and educational institutions around the world, to boost product development and successfully perform a diversity of research and design projects. With the improved capabilities provided in Version 10.0, VPIphotonics Design Suite not only offers enhanced support for its existing applications and markets, but even addresses new ones.

Our team will demonstrate the capabilities provided by VPIphotonics Design Suite Version 10.0 at OFC 2019, booth 3639.



Photonic Design Environment (PDE) of Version 10.0

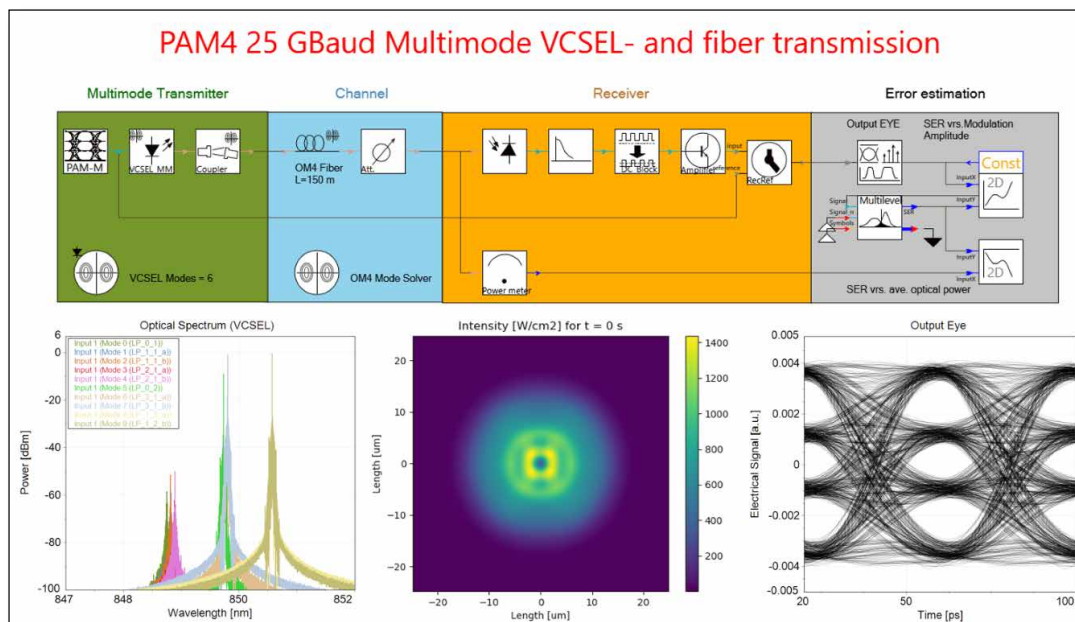
## Short list of key features in Version 10.0

- **Probabilistically-shaped (PS) QAM with FEC** – New module allows combining LDPC codes with PS square M-QAM to design capacity-approaching transmission systems.
  - **Arbitrary geometric & probabilistic shaping** – New module to generate arbitrary QAM formats with user-defined PDFs applied on the constellation amplitudes.
  - **(Generalized) Mutual Information** – The performance of coherent formats can now be estimated in terms of the (G)MI.
  - **Digital subcarrier multiplexing** – New DSCM Tx with any number of subcarriers and variable bit-loading; illustration of 200G DSCM transmission over 750 km.
  - **Enhanced Gaussian Noise (EGN) model** – New module that calculates the nonlinear interference noise power according to the EGN model.
  - **Quantum Communications** – Illustration of Gaussian continuous-variable quantum key distribution (CV-QKD) using weak coherent states in the prepare-and-measure scheme.
  - **Kramers-Kronig receiver** – New example showcasing the Kramers-Kronig scheme and detection of coherent formats with a single photodiode.
  - **Performance of PAM signals** – Improved module to output sampled Rx PAM signal, optimum decision thresholds, detected levels, symbols and bits.
  - **Digital Back Propagation** – New applications showing how DBP can be applied in long-haul transmission systems to compensate for fiber nonlinearity.
  - **Stokes space polarization demux** – New DSP algorithm for polarization alignment of dual-polarization QAM signals; can also display DP signals in 3D Stokes space.
  - **Realistic OM3 and OM4 profiles** – Hundreds of refractive index profiles with various defects; illustration of statistical simulations of realistic OM3 and OM4 fibers in short-reach applications.
  - **Multimode fiber characterization** – Illustration of testing methods of the DMD, effective modal and overfilled bandwidth (IEC 60793-1-41/49 specs).
  - **Multimode VCSEL** – Several enhancements: arbitrary radial and angular current injection profiles; simple basic equivalent electrical circuit; intermodal gain compression in the nonlinear gain model.
  - **Encircled flux measurement** – New module and illustration of how to measure the Encircled Flux of a Tx (IEC 61280 -1-4 specs), and test its standard-compliance.
  - **Free space multimode coupling** – New free space coupling between multimode components (e.g., VCSEL, fiber) with lateral offset and angular misalignment; access to total and modal intensities in the near and far field.
  - **25Gbd PAM4 with multimode VCSEL** – Illustration of short-reach 25Gbd PAM4 transmission via multimode VCSEL, free-space coupler, and OM4 fiber with defects.
  - **Measured SOA model** – New SOA model that can be characterized using experimentally measured gain spectra for various injection currents.
  - **Directional coupler** – Enhanced directional coupler model accounting for the wavelength-dependence of the coupling coefficient.
  - **Multidimensional optimizations** – Interactive Simulation Control provides two global and seven local optimization algorithms.
  - **Spectrogram** – New module for visualizing time-varying signal spectra; also illustrates how custom Matplotlib-based visualization modules can be created.
- Many new demo examples have been added and existing ones modified to illustrate new functions and applications. Version 10.0 provides access to over 870 ready-to-run demo setups now.

## Design Example – 25G PAM4 via MM-VCSEL over OM4 fiber with defects

25G VCSELS generating PAM4 signals have been accepted by the 400GBASE-SR4.2 standard as new means of increasing the capacity for short reach multimode transmission systems. These links use two different wavelengths for transmission: 850 nm for uplink and 910 nm for downlink.

This setup demonstrates simulation of the uplink using a multimode VCSEL model taking into account mode competition, modal noise, and other physical effects. Using a model for imperfect free-space coupling, its output is coupled into the graded-index multimode fiber with lateral offset and tilt. Then, transmission over 150 m OM4 fiber with realistic defects of the transversal index profile is simulated, leading to limitations of the effective modal bandwidth. The impact on the Symbol Error Rate (SER) can be investigated, as a function of varying design parameters.



Setup and results for 25G PAM4 via MM-VCSEL over 150 m OM4 fiber

## About VPIphotonics

VPIphotonics™ sets the industry standard for end-to-end photonic design automation comprising design, analysis and optimization of components, systems and networks. We provide professional simulation software supporting requirements of optoelectronics, integrated photonics and fiber optics applications, optical transmission system and network applications, as well as cost-optimized equipment configuration. Our team of experts provides professional consulting services addressing customer-specific design, analysis and optimization requirements, and delivers training courses on adequate modeling techniques and advanced software capabilities.

VPIphotonics' award-winning off-the-shelf and customized solutions are used extensively in research and development, and by product design and marketing teams at hundreds of corporations worldwide for 20+ years. Over 160 academic institutions joined our University Program enabling students, educators and researchers an easy access to VPIphotonics' latest modeling and design innovations.

For further information, please visit us at [www.VPIphotonics.com](http://www.VPIphotonics.com).