Choosing the Right Photonic System Design Software

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Introduction

Enhanced productivity and reduced time to market contribute to healthy corporate balance sheets. In the photonics industry, the right design software can help achieve both. Due diligence during the software selection process is an exercise technology companies can't afford to take lightly. Sometimes, the number of available solutions and marketing messages from different software vendors can obscure technical realities of their offerings, making the selection process confusing, if not overly daunting. This document highlights key expectations we recommend you keep in mind when choosing photonic system design software, and how the offerings from the Synopsys Photonic Solutions portfolio can help you maximize engineering efficiency and produce the best competitive product.

Basic Expectations of Photonic System Design Software

There are three basic expectations of any photonic system design software:

- Accuracy
  - Are there any modeling assumptions that can potentially compromise accuracy of the results? Do the simulation setup and model parameters reflect real-life settings?
- Speed and efficiency
  - What are the tradeoffs between speed and efficiency versus accuracy? How demanding is the software on computational resources (hardware and simulation time)?
- Flexibility
  - How does the software scale with the complexity of the problem? Can I use the lab measurements or must I know the physical parameters? How easy is it to import and export results and work with other software tools?

Synopsys Photonic System Tools Overview

The Synopsys Photonic Systems Tools include OptSim™ and ModeSYS™. OptSim models single-mode fiber-based systems at the signal propagation level. ModeSYS is a design and simulation tool for multimode fiber based systems where both the temporal and spatial attributes of the optical signal propagation are taken into account. While the products share the same graphical user interface (Figure 1) and work under a common platform, each can also function as a standalone product, providing a cost-effective, needs-based modular solution.

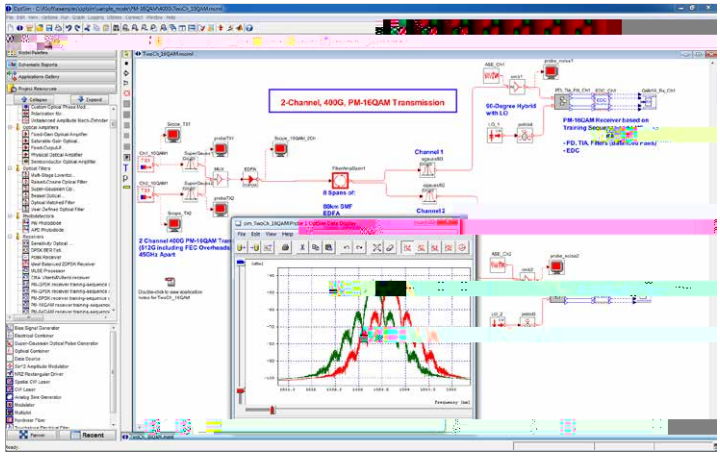

Figure 1: The graphical user interface (GUI) of the Photonic System Tools

Simulation Engines and Technology

A one-size-fits-all approach to choosing photonic system design software does not work efficiently for the ever-evolving nature of the applications and modeling problems. At the same time, too many software choices can be confusing. The Synopsys Photonic System Tools strike the optimal balance between the two. While ModeSYS users benefit from the frequency-domain split-step (FDSS) approach, OptSim users can choose to work either with the time-domain split-step (TDSS) simulation engine or with the FDSS simulation engine. The circular-convolution-based FDSS method has been widely used for decades in a variety of modeling problems. OptSim's linear-convolution-based TDSS is especially helpful for modeling problems where periodicity assumptions don't reflect reality, in mixed bitrate situations, and in cases when transmission of a large number of bits is required without creating exorbitant computational requirements.

Multimode system modeling and simulation is inherently difficult because detailed spatial attributes of the optical signal are difficult to analyze at the system level. ModeSYS, the first commercial modeling tool for multimode systems, offers an excellent balance between device-level simulation accuracy and system-level modeling efficiency.

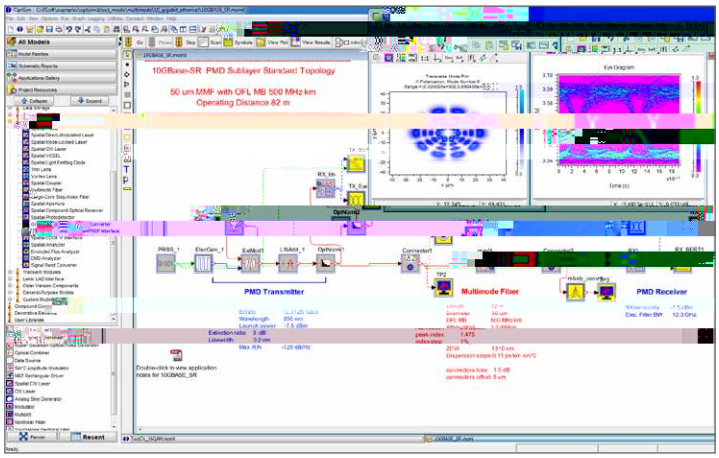

Figure 2: ModeSYS layout of an OM4 multimode-fiber-based 10Gbps Ethernet link

For ModeSYS users, important modeling challenges include inter-component coupling, large core multimode fibers, mode coupling due to microbends, effects of refractive index variations and manufacturing imperfections on the system performance, measurement