SYNOPSYS®
Silicon to Software™

From Idea to Photonic Chip: The OptSim Circuit Interface With IPKISS

Photonic Chip Design

Advances in monolithic integration technology are enabling photonic integrated circuits (PICs) of increasing complexity. Silicon photonics is particularly well-positioned as a disruptive technology that will make the photonic chip ubiquitous by leveraging the maturity and scale of CMOS technology.

Photonic design tools play a fundamental role in providing the designer with powerful features and ease of use. The design process is divided into different levels. Each level exposes to the user functionalities of increasing abstraction while hiding the inner workings of the level underneath. The first level corresponds to the physical layout. Here the geometry and the material properties are controlled in order to create structures that define components and connections. The level above is the circuit level, where the signal behavior is defined by connecting individual components into circuits.

The designer's ideas are naturally expressed at the circuit level, where the signal behavior is modeled and can be simulated. Once the desired functionality is achieved, it can be translated into a layout representation by leveraging process design kit (PDK) libraries that have both circuit and layout representations.

OptSim Circuit Interface With IPKISS

RSoft OptSim™ Circuit is a circuit-level photonic design tool from Synopsys. In OptSim Circuit, the designer can drag and drop the photonic components into the drawing area, connect them to form a photonic circuit, and simulate them to assess performance and behavior at the signal level.

IPKISS™ from Luceda Photonics is a photonic design environment with physical layout capability. In IPKISS, the designer can define the photonic component geometry, materials, placement and routing. Once the layout is satisfactory, it can be exported to the foundry in order to create a mask.

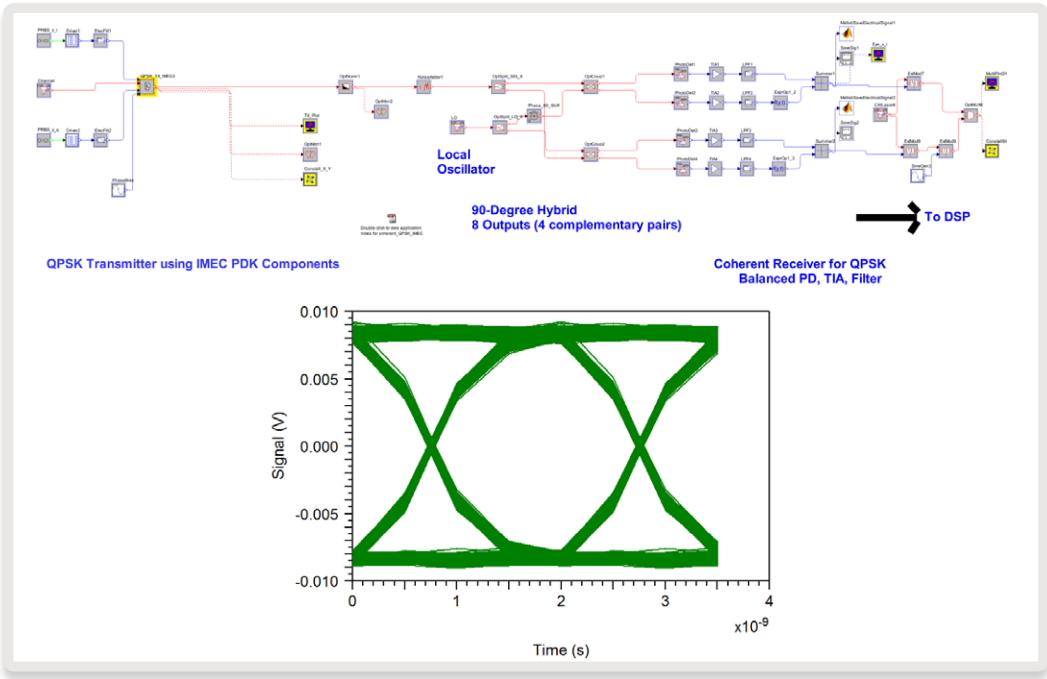

Figure 1. OptSim QPSK system schematic and eye diagram simulation

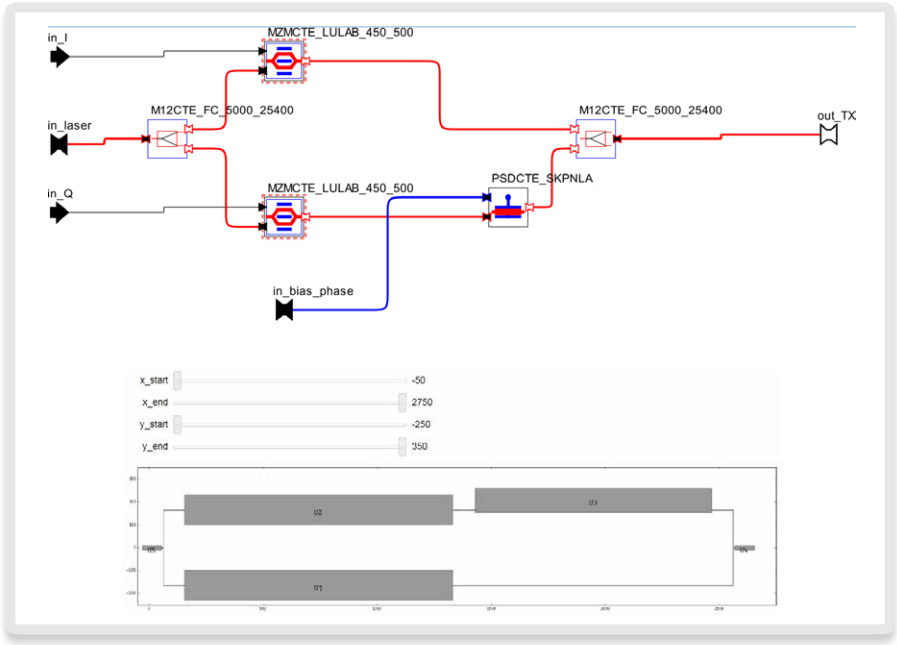

Figure 2. OptSim schematic (top) and IPKISS layout (bottom) of QPSK transmitter

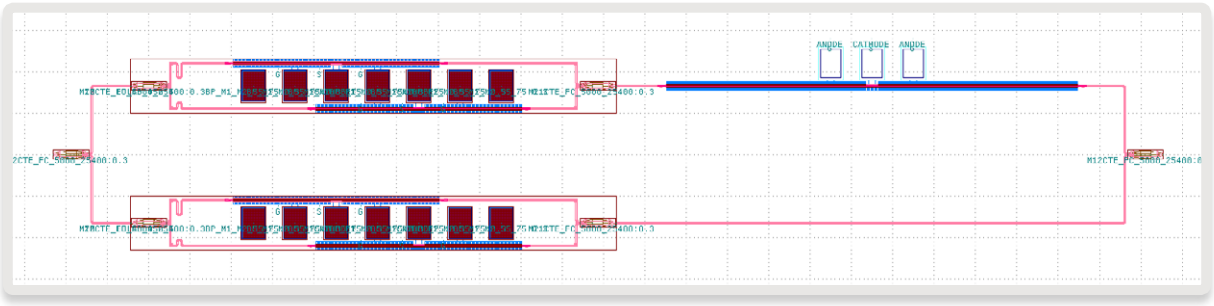

Figure 3. Rendering of GDSII file representing the mask created by IPKISS

The interface between OptSim Circuit and IPKISS provides users with a seamless path from idea to realization, from function to mask. Figure 1 shows the OptSim Circuit schematic and eye diagram simulation of a QPSK system. Figure 2 shows the QPSK transmitter representation using the IMEC iSiPP25G PDK in OptSim and in IPKISS. Figure 3 shows the rendering of the GDSII file representing the mask created by IPKISS.

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