

OptiBPM component

Using an OptiBPM Design in OptiSystem – MMI Coupler

OptiSystem Application Note



OptiBPM component – Using an OptiBPM Design in OptiSystem – MMI Coupler

Introduction

In this application note, we demonstrate how to export a design in OptiMPB to Optisystem and use it as a component through 'OptiBPM component NxM'. Here first we design a MMI coupler in OptiBPM and then use it in OptiSystem to build a DPSK demodulator and a 90° hybrid for QPSK demodulation. The OptiBPM component is located in the 'Optiwave Software Tools' library.

1. Design of MMI coupler in OptiBPM

The MMI coupler is designed in OptiBPM using silica Material system. The refractive index of the core and cladding are 1.47 and 1.4456 respectively. For these refractive indices, the waveguide width of 3.5 μm results in a single mode operation. The layout of the MMI coupler is shown in figure below.

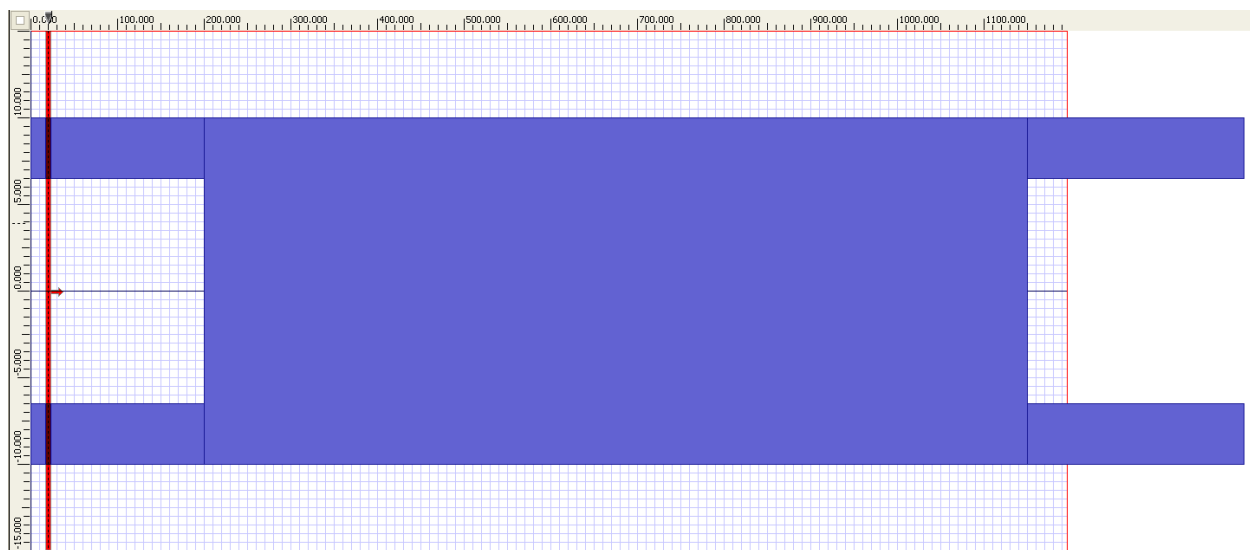


Fig. 1: Layout of MMI coupler

The Input waveguides are 200 μm long and the coupler is 20 x 960 μm . The size is calculated based on 3-dB coupling ratio between the two inputs. In order to export this design to Optisystem, we need to generate the scattering data (*.s) file. This can be easily done by the scattering data script. By clicking on the scattering data script button, the software generates the script. In the menu choose the Input plane, the wavelength range and number of steps. In this example the wavelength range is from 1545 to 1555 μm (Figure 2). By clicking OK, software generates the script required to build the scattering data file.

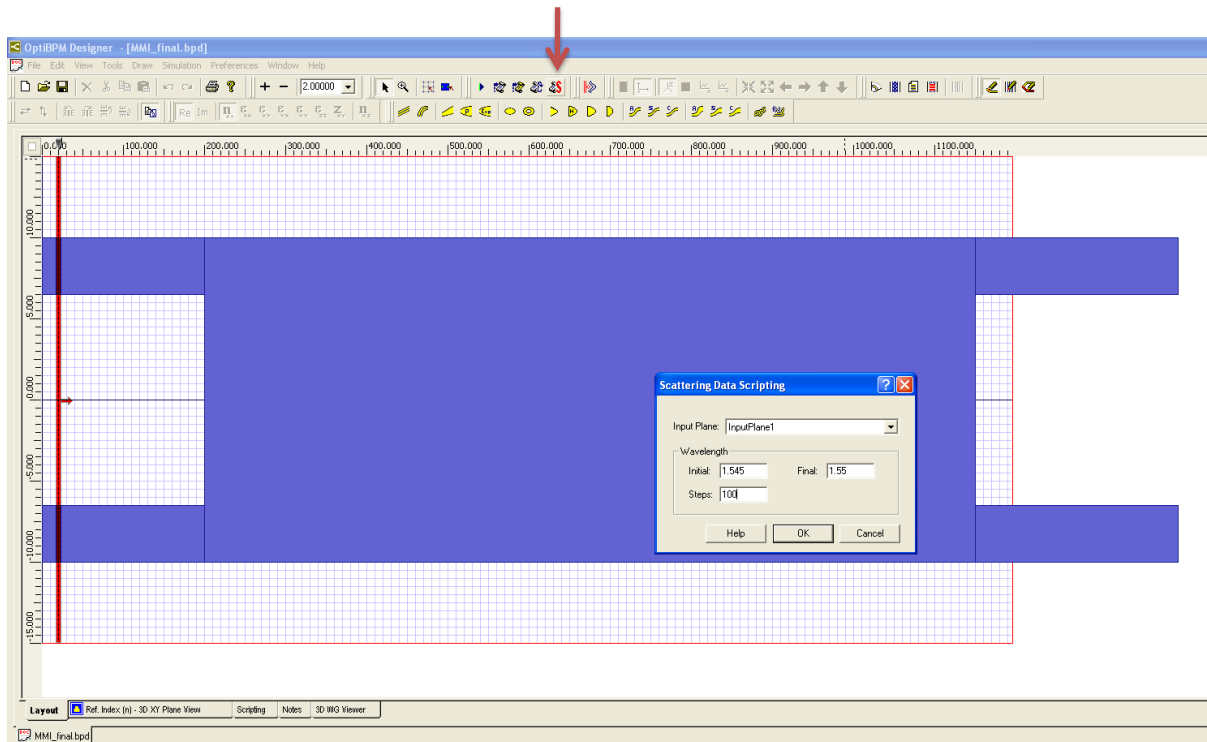


Fig. 2: Generating Scattering Data Script

In order to start the simulation, in the simulation parameter window, choose 'Simulate using script' and check the 'Simulation generates scattering data information' box, and click on 'Run'.

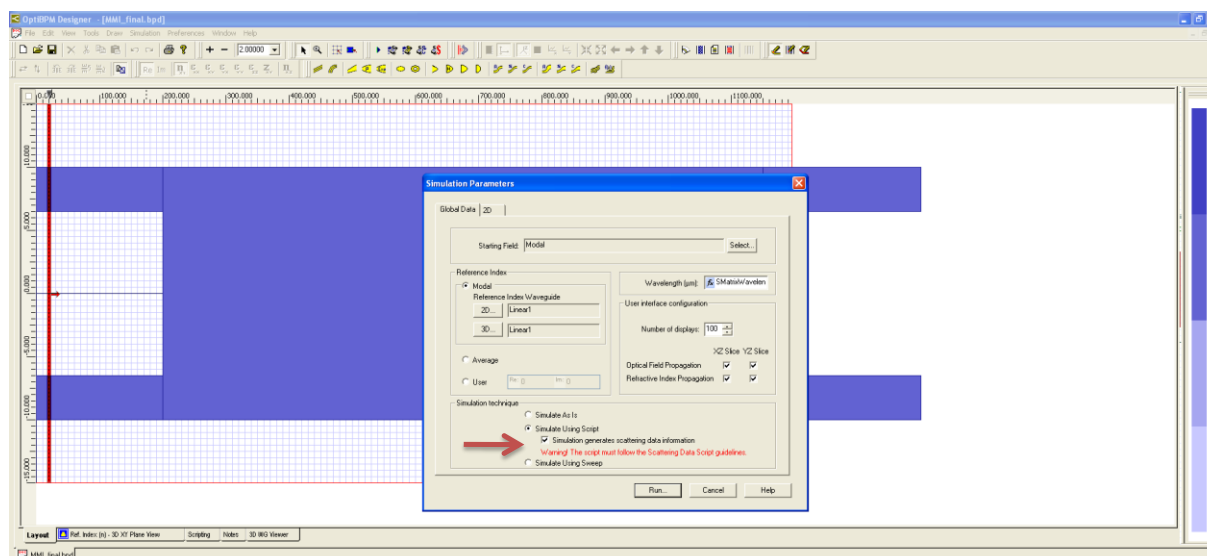


Fig. 3: Generating Scattering Data Script

When the simulation is finished, view the results on OptiBPM Analyzer. In the window, on the 'Export' tab, click on 'Scattering data in Cartesian Coordinates', and save the '*.s' file.

2. Exporting the MMI coupler to OptiBPM component in OptiSystem

In order to export the design to OptiSystem, simply drag an 'OptiBPM component NxM' in the layout, and choose the generated '*.s' file as the Filename in the properties (Figure 4). This will automatically export the transfer function of the MMI coupler designed in OptiBPM to the 'OptiBPM component' with 2 inputs and outputs. In this application note, we use the MMI coupler to build 1) DPSK demodulator, 2) 90° hybrid.

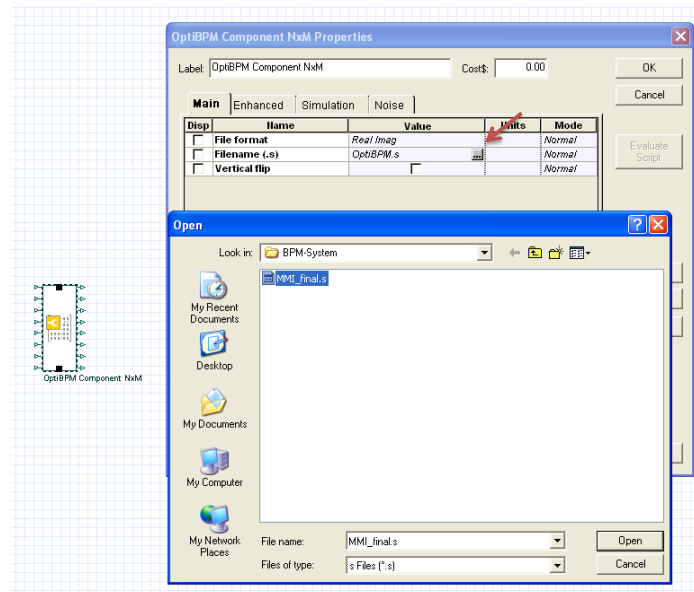


Fig. 4: OptiBPM Component NxM

Figure below shows the layout of the DPSK system in OptiSystem. It consists of three parts, which are DPSK transmitter, Propagation loop and DPSK demodulator. The demodulator is basically an interferometer with the length difference of 1-bit. We built that using two OptiBPM designed MMI coupler and an optical time delay.

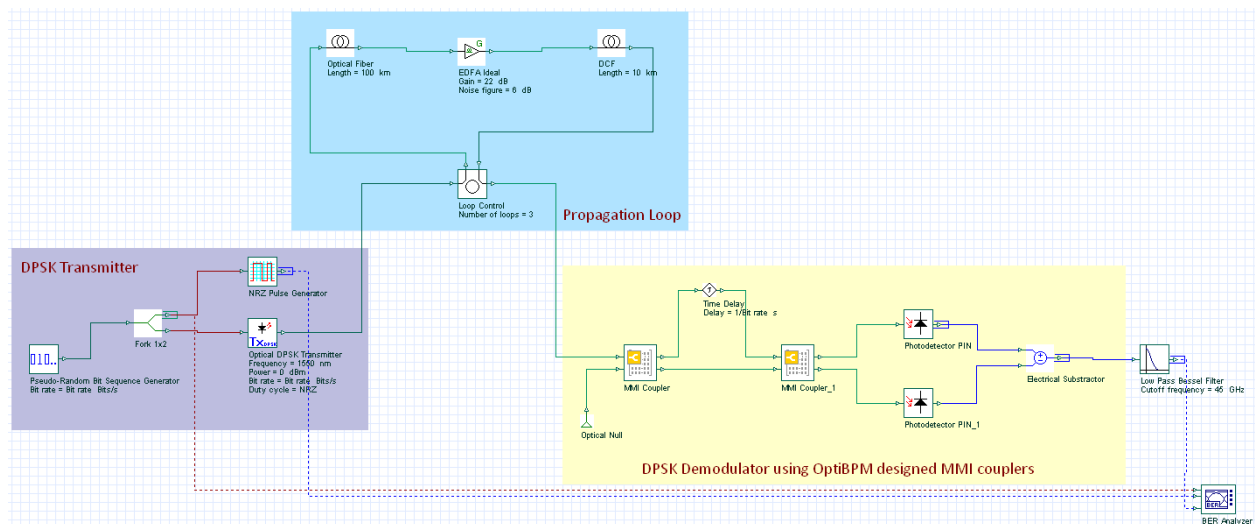


Fig. 4: Layout of DPSK System

Figure 6 shows the eye diagram after 300 km of propagation at 40 Gb/s with dispersion compensating fiber.

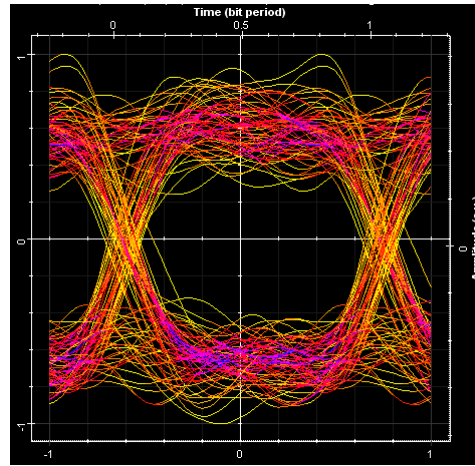


Fig. 6: Eye diagram after 300 km propagation

The second example is using the MMI coupler designed in OptiBPM to build a 90° optical hybrid for coherent QPSK demodulation. Figure 7 demonstrates the layout of this system. It consists of Optical QPSK transmitter, length of single mode fiber (SMF) with an EDFA, Coherent QPSK receiver, and the BER test set. The coherent receiver is built by a 90° degree optical hybrid which made of 4 MMI couplers designed in OptiBPM, 2 balanced photo-detectors and electrical subtractors, amplifiers, filters and the decoder.

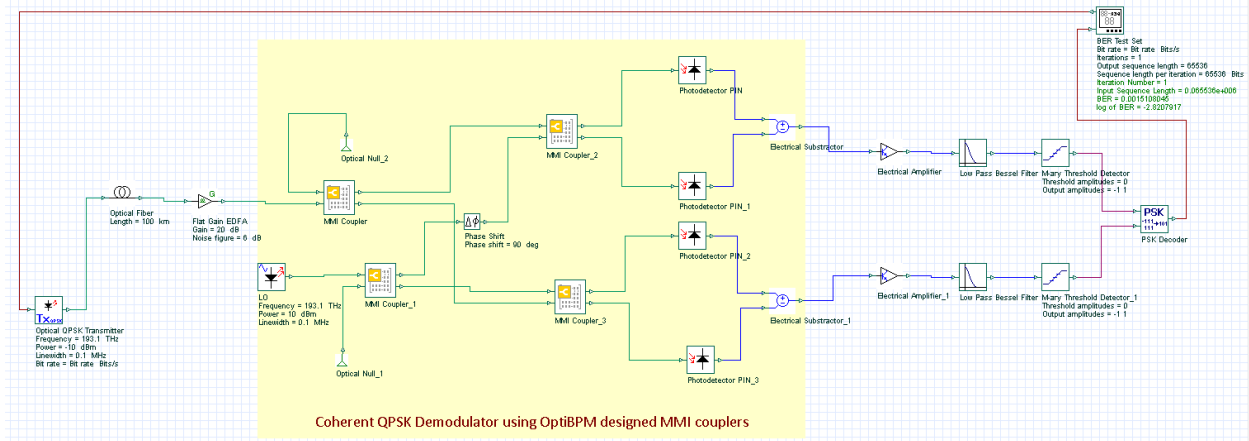


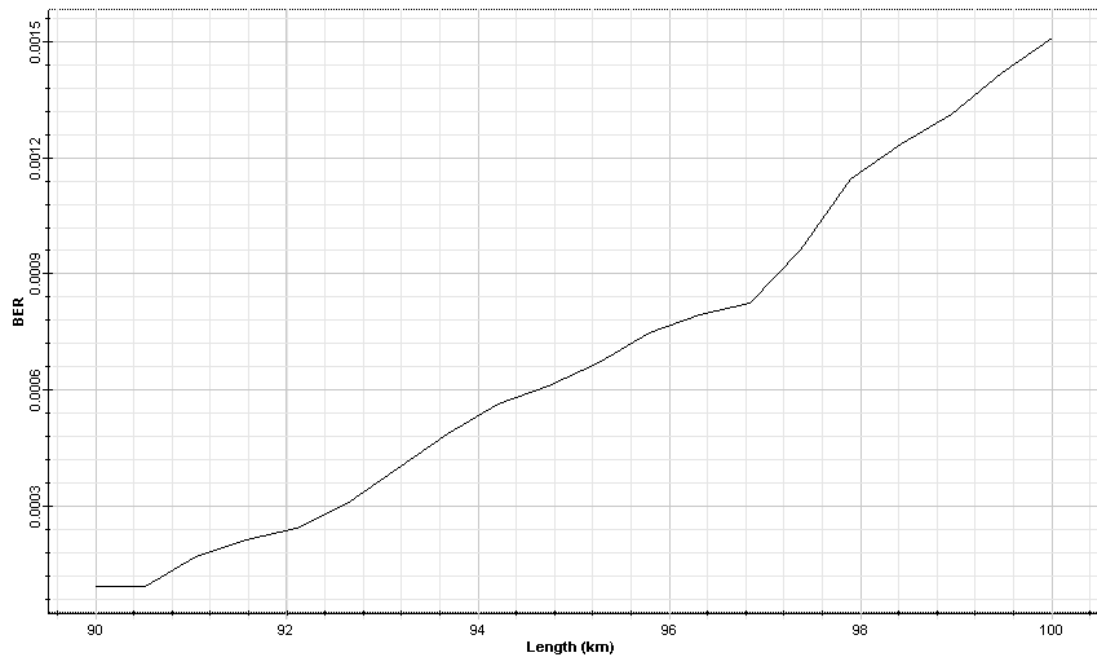
Fig. 7: Layout of optical QPSK System

In order to examine the performance of this system, we measured the BER vs. the propagation length. Following diagram shows the result. The BER is measured for 65536 bits at 10 Gb/s.



BER (Length (km))

Do! Click On Objects to open properties. Move Objects with Mouse Drag





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