

OptiGrating component

Using an OptiGrating Design in OptiSystem – Uniform FBG

OptiSystem Application Note



OptiGrating component – Using an OptiGrating Design in OptiSystem

Uniform Fiber Bragg Grating

Introduction

In this application note, we demonstrate how to export a design in OptiGrating to Optisystem and use it as a component through 'OptiGrating component'. Here first we design a Uniform FBG in OptiGrating and then use it in OptiSystem in a 3-user Optical CDMA system. The OptiGrating component is located in the 'Optiwave Software Tools' library.

1. Design of Uniform FBG in OptiGrating

We have used the 'fbguniform' sample in the OptiGrating software to design the gratings. Two changes are made to this design: 1) the average index is set to uniform and 2) the modulation index is set to 0.00023 to get the desired bandwidth. In this example, we design four uniform FBGs with 0.3 nm of bandwidth and center wavelength of 1) 1548.5 nm, 2) 1550.1 nm, 3) 1550.9 nm, and 4) 1552.5 nm. The center wavelength is set by the period length of the grating. Following table shows the period length for each FBG.

Wavelength	Period
1548.5 nm	0.533296 um
1550.1 nm	0.53385 um
1550.9 nm	0.534127 um
1552.5 nm	0.534680 um

Figure 1 shows the setting for the Uniform FBG design and Figure 2 shows the spectrum of the grating.

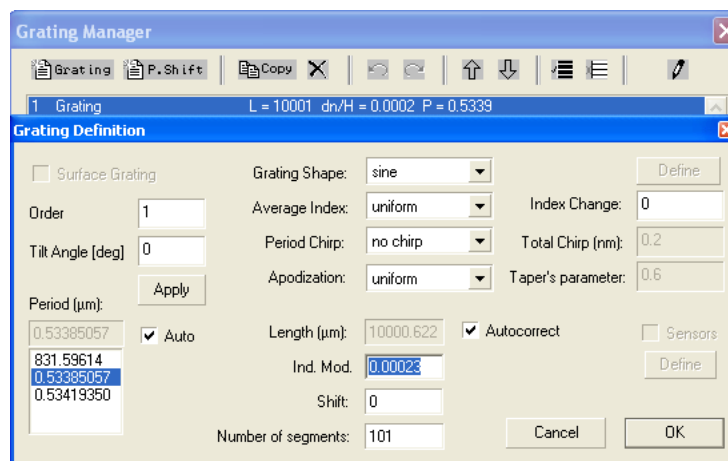


Fig. 1: Grating definition for uniform FBG

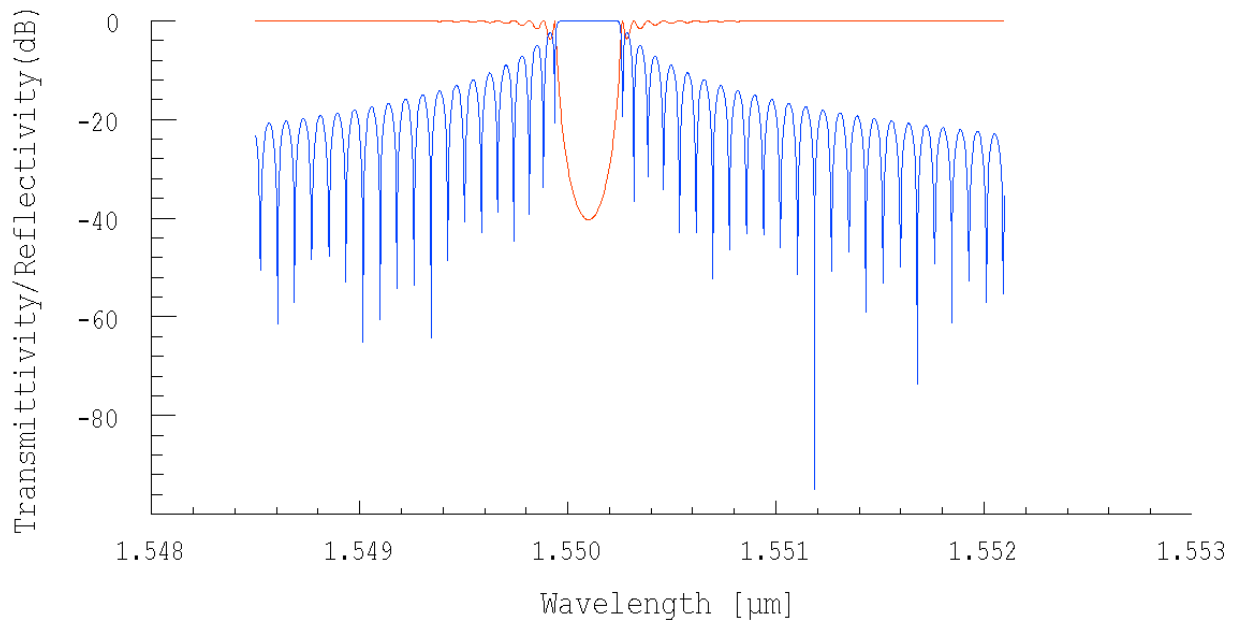


Fig. 2: Spectrum of uniform FBG at 1550.1 nm with 0.3 nm bandwidth

It is also possible to have multiple gratings in one design. As an example we design a grating with 2 uniform FBGs centered at 1548.5 nm and 1550.1 nm, both have the bandwidth of 0.3 nm. Following is the grating setup, and Figure 4 is the Spectrum.

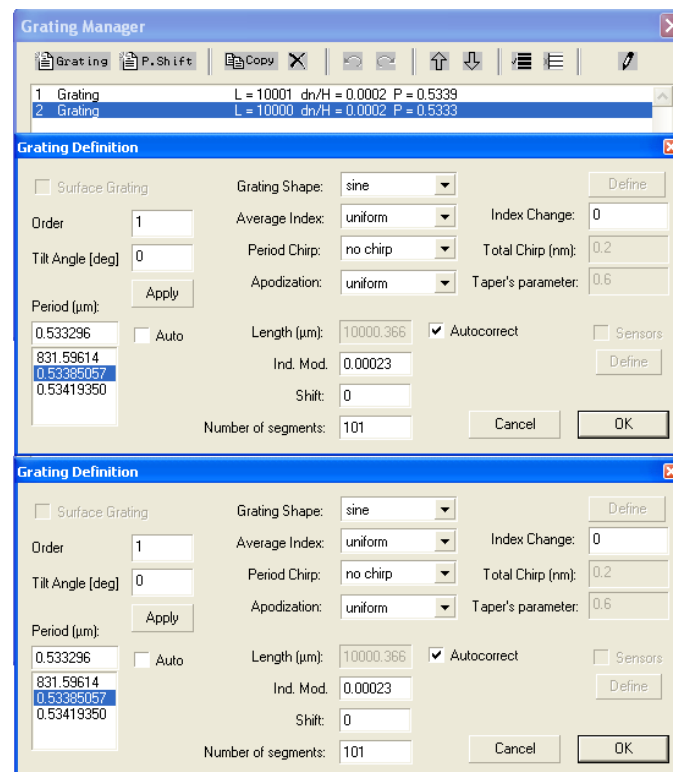


Fig. 3: Grating definition for two uniform FBGs

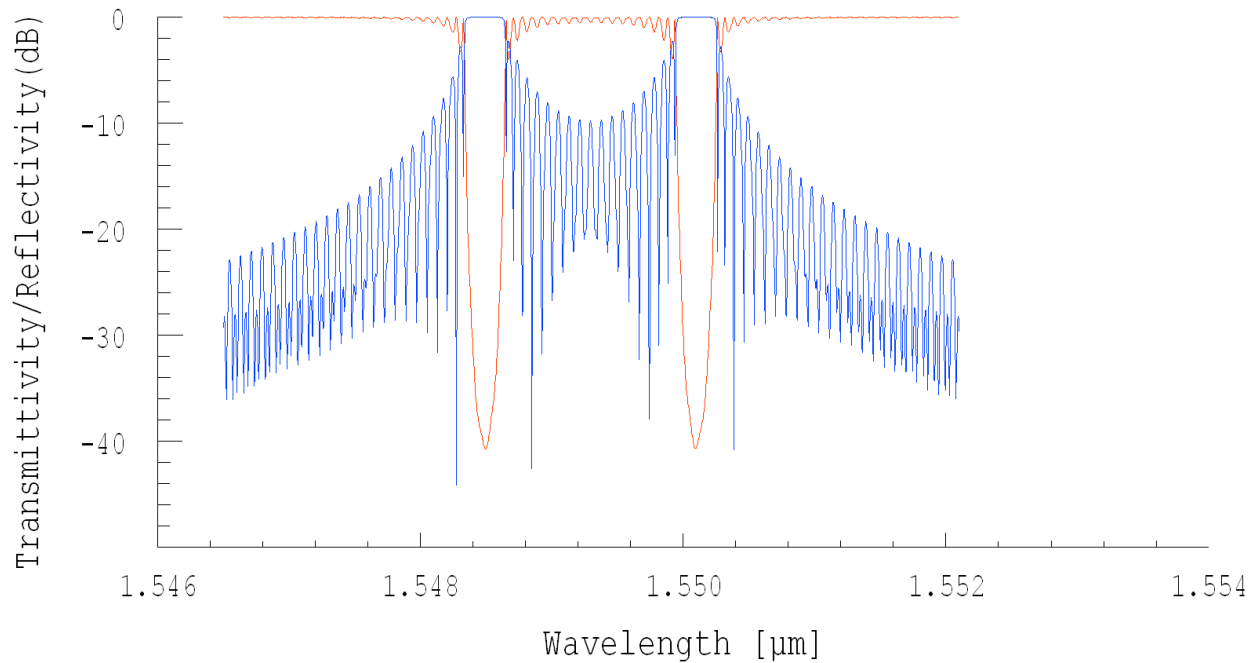


Fig. 4: Spectrum of 2 uniform FBGs at 1548.5 nm and 1550.1 nm and with 0.3 nm bandwidth

In order to export the designed FBGs to Optisystem, we need to save the complex spectrum of both transmission and reflection. That can be easily done using the tools menu and choosing Export Complex Spectrum. Then in export format choose OptiSys format and choose the file name.

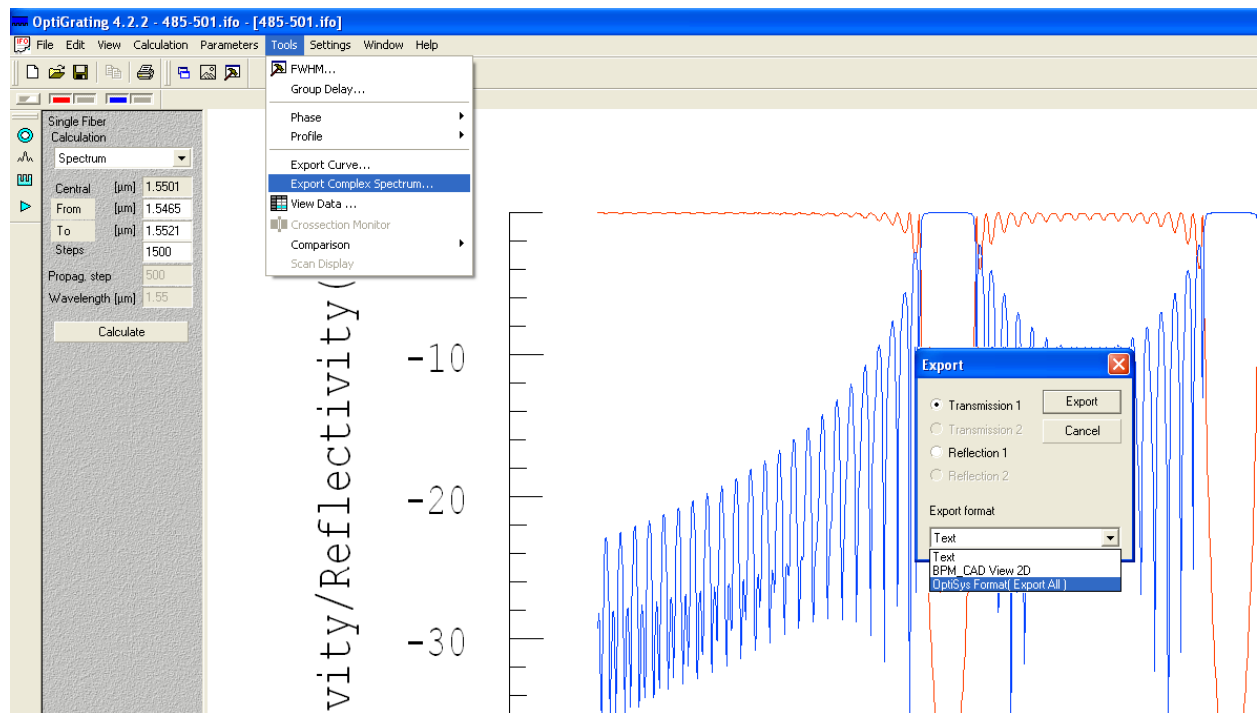


Fig. 5: Exporting OptiGrating to OptiSystem

2. Exporting the Uniform FBG to OptiGrating component in OptiSystem

In order to call the design in OptiSystem, simply drag an 'OptiGrating' component in the layout and choose the generated '*.txt' file as the Filename in the properties (Figure 6). This will automatically export the transfer function of the FBG designed in OptiGrating to the 'OptiGrating component'. In this application note, we use the designed FBGs in an Optical CDMA network.

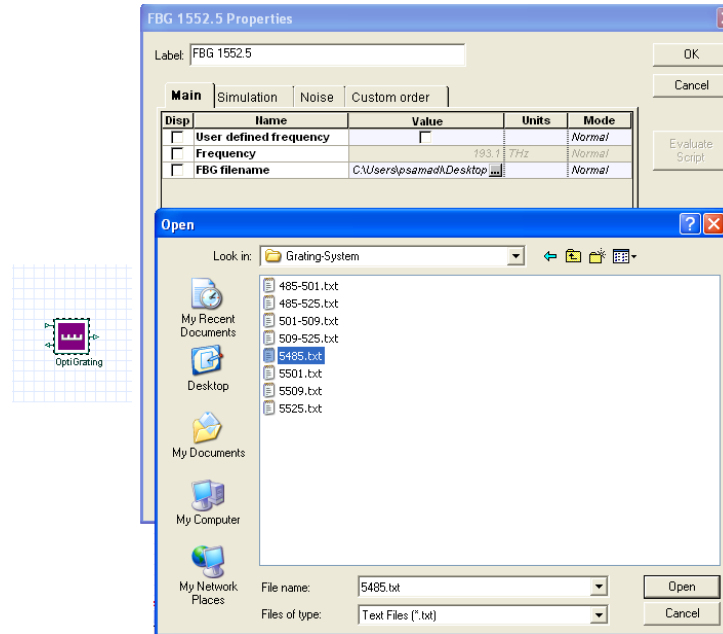


Fig. 6: OptiGrating Component

Figure below shows the layout of the Optical CDMA system in OptiSystem. We have simulated a 3-user fiber Bragg grating (FBG) based OCDMA network at 200 Mbit/s. Uniform FBGs are used to implement the Modified Quadratic Congruence (MQC) codes by spectral amplitude encoding.

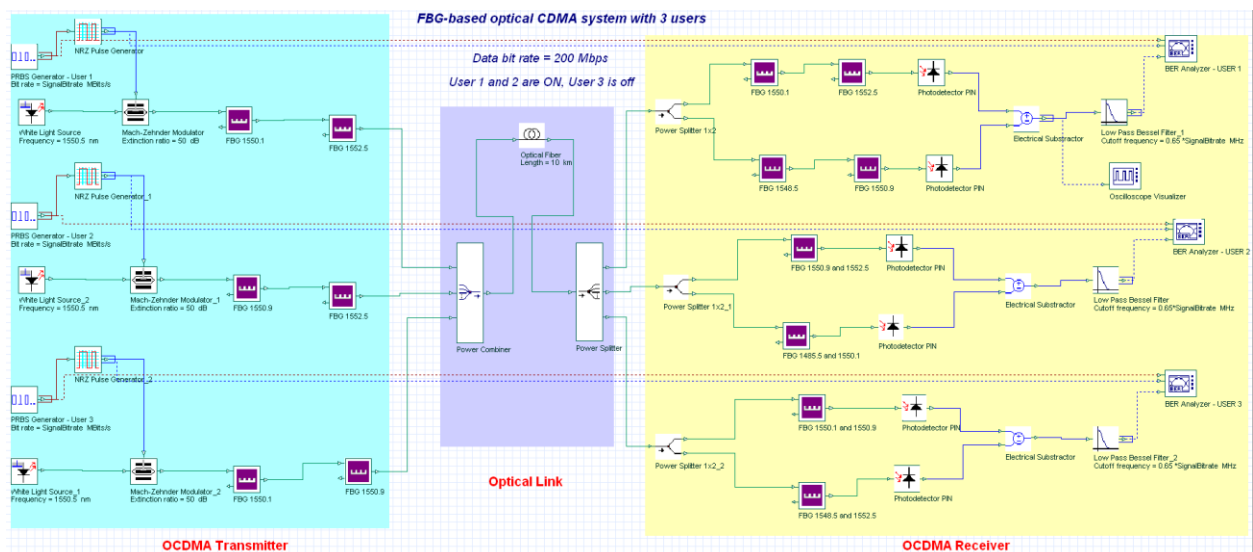


Fig. 7: Layout of DPSK System

The signal is generated using an incoherent source modulated with a NRZ PRBS data using a Mach-Zehnder Modulator. The optical link is 10 km of single mode fiber. The receiver comprises two spectral filters and two photodetectors connected in a balanced configuration which perform the decoding with a low-pass filter and a BER analyzer. In this experiment user 1 and 2 are ON and user 3 is OFF. Next two figures demonstrate the spectra of the encoded data for user 1 and user 2.

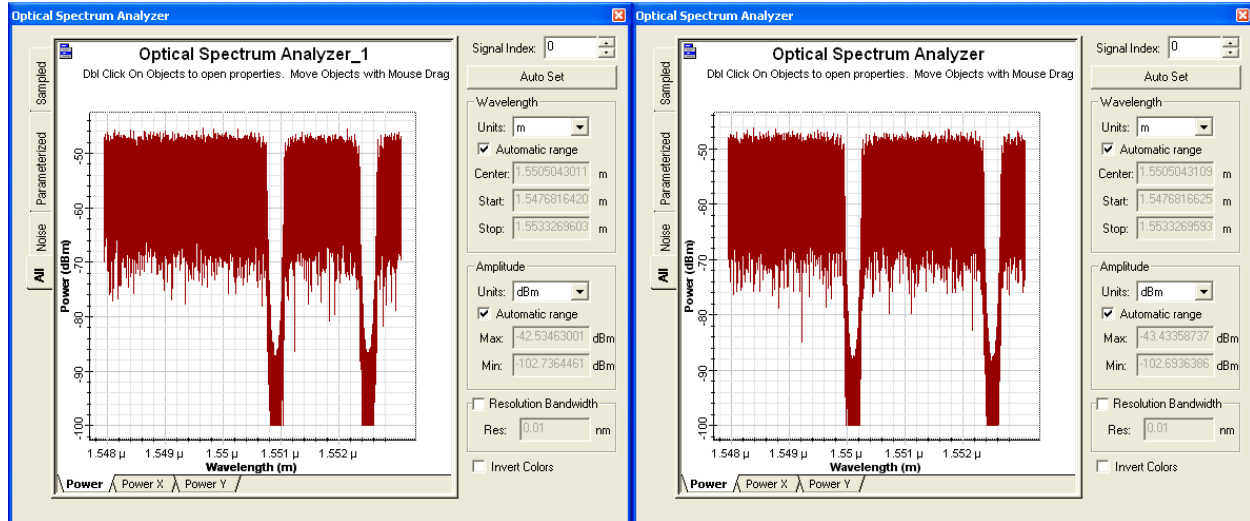


Fig. 8: Spectra of the encoded data for user 1 and 2

Following are the eye diagrams for user 1 and 2. Using OptiSystem you can analyze the performance of this system by adding more users, using different OCDMA coding schemes, modulation format, or increasing the propagation length.

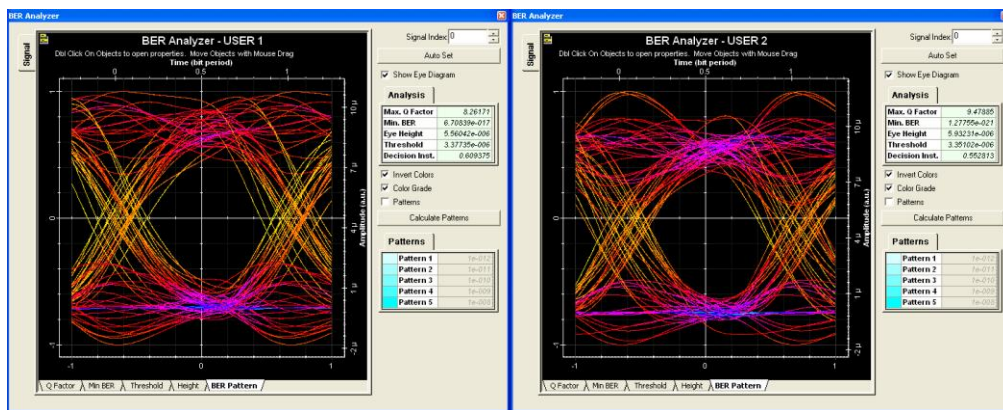


Fig. 9: Eye diagram after 10 km propagation for user 1 and user 2



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