Open Optical Networks - The Fiber

Exercise 1

Instantiate and use a Fiber span.

1. download from the web portal the following files:
   - eqpt.json
   - default_edfa_config.json
   - utilities.py
2. create a json file with the parameters of your Fiber. This json file has the following parameters:
   - "uid": a string used as unique identifier. You can use the name you want.
   - "params": a structure containing the following parameters:
     - "length": 80 km (length of the fiber)
     - "loss_coef": 0.2 dB/km (attenuation coefficient)
     - "length_units": "km" (this parameter automatically scales the length and the loss coefficient)
     - "att_in": 0 dB (attenuation before the fiber)
     - "con_in": 0.5 dB (loss of the connector at the input of the fiber)
     - "con_out": 0.5 dB (loss of the connector at the output of the fiber)
     - "type_variety": "SSMF"
     - "dispersion": 1.67e-05 s/m^2 (dispersion coefficient)
     - 'gamma': 0.00127 W/m (non-linear coefficient)
3. Instantiate the fiber from the JSON file.
   Hint: use the kwargs to pass the dictionary to the constructor function. To pass a dictionary as kwargs to a function do as follows:
   output = function(dictionary_with_input_parameters)
4. instantiate a noiseless WDM comb according to the parameters described in eqpt.json file
5. propagate the WDM comb through the Fiber.
   Hint: As Fiber has the method __call__(self, spectral_info), an object Fiber can be used as function. So, the command fiber(spectral_information) will return the spectral information propagated through the fiber.
6. plot the signal before and after the propagation and the NLI noise power after the propagation.
7. plot the signal-to-NLI noise ratio (the SNR_{NL}) after the Fiber.

Exercise 2

Fiber and Amplifier cascade

1. instantiate a fiber as described in the previous exercise and an EDFA with the parameters described in the exercise # 1 of the previous set but with an amplifier gain=17 dB.
2. instantiate the spectral information as well.
3. propagate the spectral information through the fiber and then trhough the EDFA.
4. plot the Signal power, NLI power and ASE power before and after each network element.
5. plot the GSNR, SNR_{NL} and OSNR after the EDFA and after the Fiber.