LOGO Implementation

1) To define your weighted paths, use the probe method (using the default launch power of 1mW)

2) When you call network.propagate method:
you will call, inside the propagate method, the optimized launch power method, in a way like:
optimal_power = line.optimized_launch_power(lightpath)

⇓

. This method has to be structured as it follows:

(I) Retrieve ASE noise and η_{NLI} using the correct formulas:

a) $$ASE = N_{amps} \cdot h \cdot f_0 \cdot B_n \cdot NF \cdot |G - 1|$$ (all linear units)

[pay attention to retrieve Namps correctly considering the n_{spans}]

(II) Retrieve the spans as: $$n_{spans} = N_{amps} - 1$$

(III) Convert α in linear units: $$\alpha_{lin} = \frac{\alpha_{dB}}{20 \log_{10}(e)}$$

(IV) Retrieve other values from line, as: β_2, γ, R_s, df, η_{NLI}, where:

b) $$\eta_{NLI} \cong \frac{16}{27\pi} \cdot \log\left\{\frac{\pi^2}{2} \cdot \frac{|\beta_2| \cdot R_s^2}{\alpha_{lin}} \cdot N_{ch}^{2\frac{R_s}{df}}\right\} \cdot \frac{\alpha_{lin}}{|\beta_2|} \cdot \frac{\gamma^2 \cdot L_{eff}^2}{R_s^3}$$

where: $$L_{eff} = \frac{1}{2 \cdot \alpha_{lin}}$$

(V) Retrieve and return the optimal power as:

x) $$P_{opt} = \sqrt[3]{\frac{ASE}{2 \cdot \eta_{NLI} \cdot N_{span} \cdot B_n}}$$

③ Update the signal power in the Lightpath with the optimized one:

c) $\boxed{\text{lightpath.signal\_power} = \text{optimal\_power}}$

• Tip: Points ②, ③ should be performed in propagate method of Node

④ In propagate method of Line:

(I) For loloring: as it was.

(II) For noise_generation:

evaluate ASE and NLI as seen before, where:

d) $\boxed{NLI = P_{ch}^3 \cdot \eta_{NLI} \cdot N_{span} \cdot B_n}$,

and consider that, here, P_{ch} is the lightpath.signal_power, as it is already the optimized launch power.

And then:

e) $\boxed{Noise = ASE + NLI}$

(III) Then, update noise in Lightpath and occupy the Channel state

(IV) Compute ISNR: as:

f) $\boxed{ISNR = \frac{1}{GSNR^{(*)}(lightpath)}}$,

where (*): here call a compute_gsnr method: Just as:

g) $\boxed{GSNR(lightpath) = \frac{Signal(lightpath)}{Noise(lightpath)}}$ ^

↳ NB: this is linear! and so ISNR is linear too!

where Signal(lightpath) is equation e), given by x), and Noise(lightpath) is equation e).

⑤ Then call a method update_snr of class Lightpath, that Just update the values of ISNR as:

$\boxed{snr \mathrel{+}= snr}$ in order to obtain:

$\boxed{ISNR = \sum_{\hat{n}} ISNR_{\hat{n}}}$ (**)

(**) Notice that all $ISNR_z$ must be in linear units (check all the formulas before too!)

(6) Finally you get your GSNR from the LOGO optimization strategy as:

$$GSNR = 10 \log_{10}\left(\frac{1}{signal\_information \cdot ISNR}\right) \quad (\text{in } dB)$$