

Lecture 8: Nonlinear Optical Loop Mirror



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Nonlinear Optical Loop Mirror

The loop shall be a single nonlinear element without dispersion.

Save this element as

NOLM element only nonlinear.ppfx

Propagation parameter ▾ 🔍 ✕

Load ▾ Save ▾

standard propagation ▾ Setup >

general

define free parameters

☐ measure and parse 100 >

☐ write file

waveguide

loss 0.0 ▾ 1/m

gain 0 ▾ dB/m

mode diameter 20.0 ▾ μm

gamma 0.000603773 ▾ 1/(W m)

effects

☐ dispersion

☒ SPM / TPA

☐ Raman

☐ self-steepening

self phase modulation / two photon absorption term

$$\frac{\partial A}{\partial z} = \dots + i\gamma(1 - f_R)|A(T)|^2 A(T)$$
$$\gamma = \frac{\omega_0}{c} \frac{n_2}{A_{\text{eff}}} \text{ and } A_{\text{eff}} = \frac{\pi}{4} MFD^2$$

n2 3.2e-20 ▾ m²/W

f R 0 ▾

TPA 0.0 ▾ m/W

TPA is experimental so far ...

☐ saturate SPM

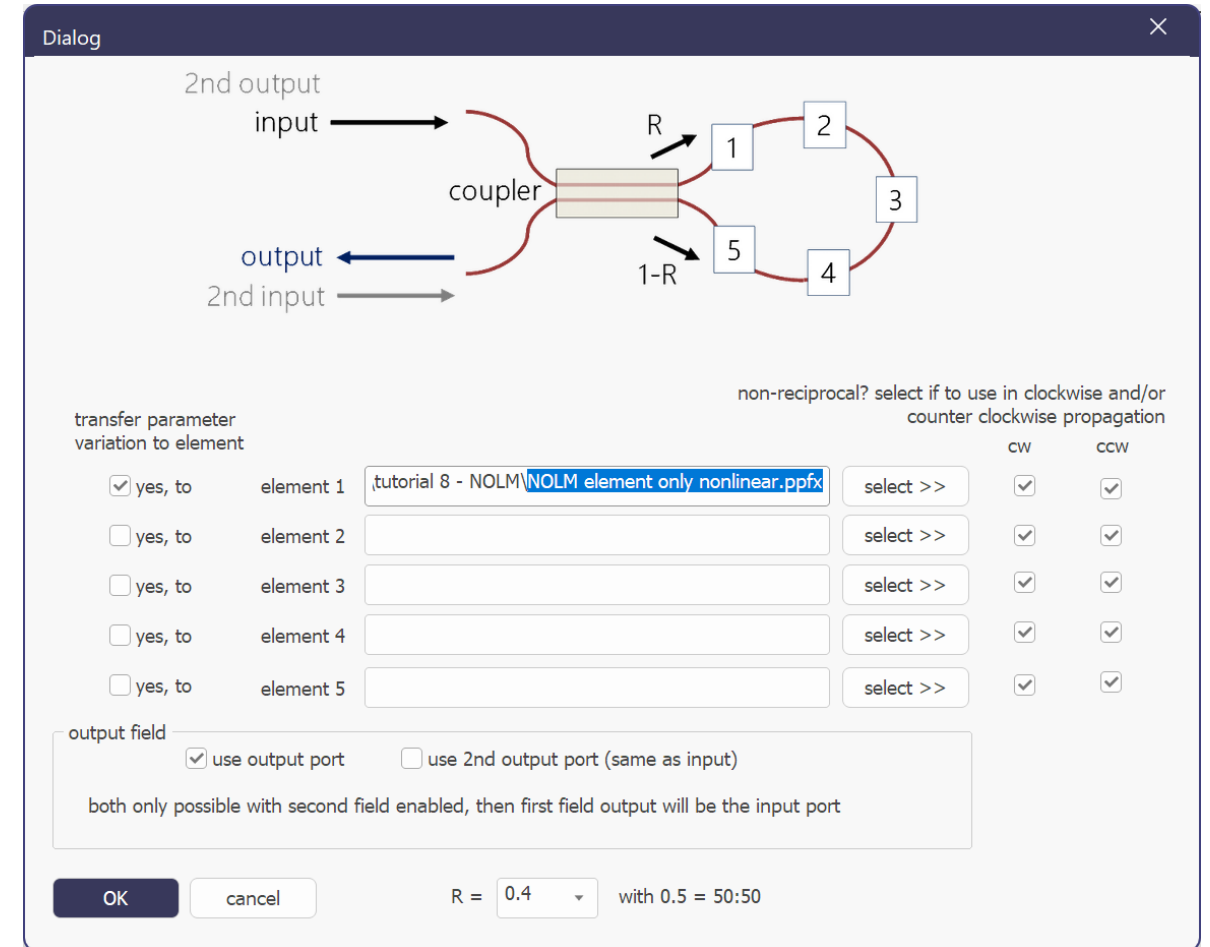
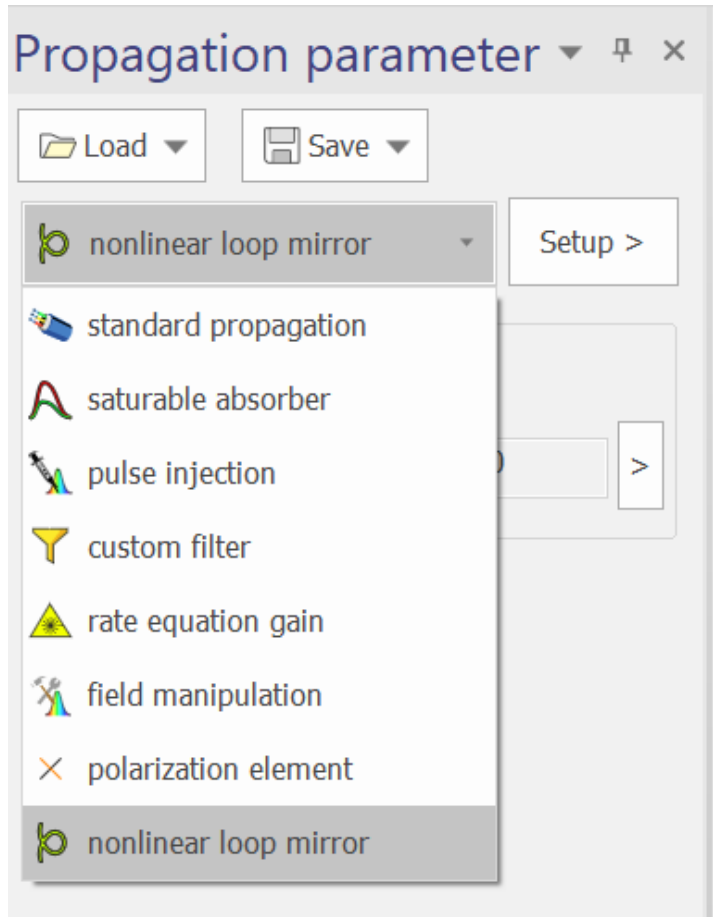
saturation power 1.0 ▾ GW/cm²

☒ use SPM and TPA

☐ exclude SPM

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Choose the NOLM element and start the setup dialog



Select the previously saved file for the first element. The output will be the result.

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In order to see the effect of the nonlinearity in the loop, please define a new pulse as „cw“ according to the settings here.

Pulse Profile and Data Array

data array setup

Size **1k (2¹⁰)**

array center wavelength **1060** nm

half interval **8** ps

vacuum length (full interval) **0.004796679328** m

fit all parameters to the closest value of the array ☒

Type **Gauss**

pulse duration (FWHM) **1e6** ps (sets spectral width)

TempShift **0** ps

phase **0** rad

wavelength **1060** nm ☒ same as array

2nd order spectral phase **0** fs²

3rd order **0** fs³

energy ☐ **1.6e-12** J

average power ☒ **0.1** W

repetition rate **6.25e+10** Hz ☒ **cw**

☐ scramble spectral phase (random phase)

☐ phase diffusion modell with given linewidth

☐ add quantum noise (one photon per spectral node)

double pulsing

separation **0** ps relative magnitude **0**

☒ create field in data array 1 ☐ create field in data array 2

☐ add field to data array 1 ☐ add field to data array 2

OK Apply Cancel reset

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Now the power is varied in the parameter variation dialog as well as the splitting ratio. The displayed results is the output power over the input power.

Parameter Variation

Initial Conditions

1st Parameter

2nd Parameter

Plot Content

Appearance

☒ always create new field

Parameter Variation

Initial Conditions

1st Parameter

2nd Parameter

Plot Content

Appearance

Px93 - Pulse_Creation.ε

=

x

W

from

to

datapoints

log steps

, with x

1

100000

50

☐

Parameter Variation

Initial Conditions

1st Parameter

2nd Parameter

Plot Content

Appearance

☒ use 2nd parameter

Px33 - NOLM.splitting_r

=

y

from

to

datapoints

log steps

, with y

0.1

0.4

2

☐

