

RSoft Application: Broadband Fiber-Optic Parametric Amplifier

Extending Reach Without Using Discrete Optical Amplifiers

Overview

A system designer at a government research lab wanted to explore ways to extend transmission distance without using discrete amplifiers.

The Challenge

In fiber-optic communication systems, power loss due to fiber attenuation limits reach. Doped fiber amplifiers can help, but they are expensive. Accurate modeling of fiber's nonlinear transmission impairments is required.

The Solution

RSoft™ OptSim™ tool provides fiber models that take into account linear, nonlinear and polarization-related transmission impairments and their interplay. Broadband fiber-optic parametric amplification (FOPA) exploits third-order nonlinearity of the transmission fiber rather than requiring any external doping or specialty fibers.

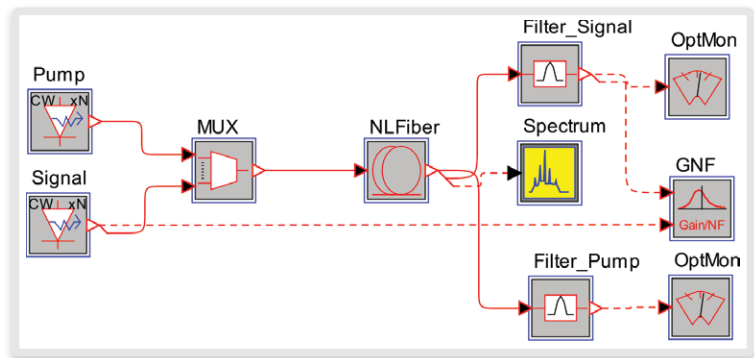


Figure 1. OptSim topology for the broadband FOPA layout

The Result

FOPA bandwidth depends on pump signal power, fiber dispersion and nonlinearities. Broad, flat gain is achieved when the pump signal is at 0.55nm offset from fiber's zero dispersion wavelength. Tailored gain profiles and regions of amplification¹ can be obtained without using external, doped-fiber amplifiers, resulting in potential cost savings.

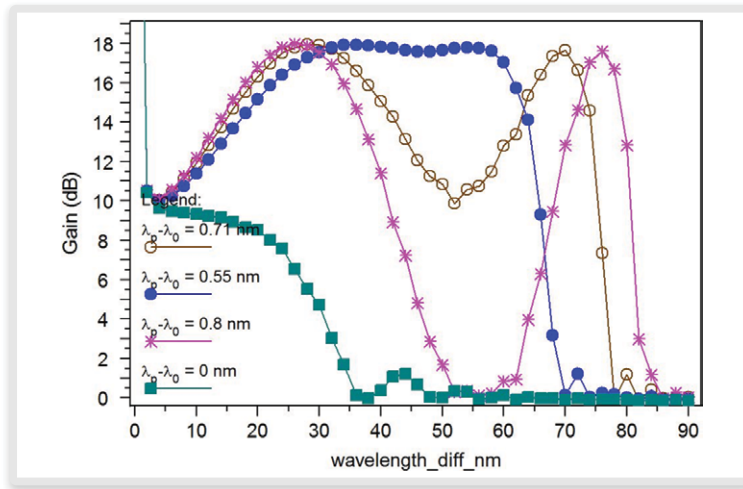


Figure 2. FOPA gain spectra as a function of signal wavelength offset from the pump wavelengths

¹M. Marhic, et al., "Broadband fiber optical parametric amplifiers", Optics Letters, Vol. 21, No. 8, pp. 573-575, Apr. 1996

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