**RSoft Application: Broadband Fiber-Optic Parametric Amplifier**

Extending Reach Without Using Discrete Optical Amplifiers

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**Overview**

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

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**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.

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**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.

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*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 amplification\(^1\) can be obtained without using external, doped-fiber amplifiers, resulting in potential cost savings.

\[\text{Figure 2. FOPA gain spectra as a function of signal wavelength offset from the pump wavelengths}\]


For more information, please contact Synopsys' Optical Solutions Group at (626) 795-9101, visit http://optics.synopsys.com/rsoft/, or send an e-mail to rsoft_sales@synopsys.com.