Optical Amplifier Noise Factor

Overview

The noise factor is defined as the unitless ratio of the output noise power of a device to the portion thereof attributable to thermal noise in the input termination at standard noise temperature T0 (usually 290 K). These figures of merit are used to evaluate the performance of an amplifier or a radio receiver, with lower values indicating. The noise factor F of an (electronic or optical) amplifier is a measure of how much excess noise the amplifier adds to the signal. In-line amplifiers: Periodically amplify signal due to fiber attenuation, high G, high Psat. An illustration of the effective gainis given below. Note the presence of a gain peak around 1530nm and a semi-flat gain. Electrical noise figure (NF) is standardized since many decades. Problematic aspects, in conflict with electrical NF: Optical signals have in-phase and quadrature components, like. Noise figure is commonly used in commu-nications systems because it provides a simple method to determine the impact of system noise on sensitivity. Non-inverting noise analysis diagram like monolithic microwave integrated circuits (MMICs) and discrete transistors in communications.

Article Content

Lecture 9: Optical Amplifiers

EDFA Noise Figure The spontaneous emission factor is a function of Pp and therefore is a function of (z). We can average n sp over the amplifier length. Therefore the noise figure and gain (as seen

NOISE IN FIBER OPTIC COMMUNICATION LINKS Robert Dahlgren Bob.Dahlgren@ieee

The physics of noise in optical communication links is of great interest in the design of fiber optic communication systems. In this report the role of noise in optical communications, and how it can

Optimum noise performance of optical amplifiers

The concept of noise figure F and noise measure M applicable to radio frequency and microwave amplifiers is reviewed and extended to cover optical amplifiers. Two noise figures are defined in the

Tutorial Fiber Amplifiers, Part 9: Noise of Fiber

Tutorial on fiber amplifiers. The ninth part discusses excess noise generated by fiber amplifiers. This is a quantum-mechanical phenomenon, and it is made stronger

Lecture 8: Intro to Optical Amplifiers

The ASE noise is one of the factor that sets the ultimate limits of optically amplified systems The optical signal-to-noise ratio (OSNR) cannot go below agiven level to have acceptable BER at the receiver

OSA: Characterization of Optical Amplifier Gain and

The applicable models are equipped as standard with an optical amplifier analysis function (EDFA-NF) that automatically calculates the gain and noise figure (NF) of

Optical and Unified Noise Figure, and Homodyne Noise Figure

Noise figures presented here Fo, IQ = 1 G + ~ = the optical NF ≥1 derived, in full agreement with Fe definition, as SNR degradation factor in a linear system with 2 available RX quadratures FIQ = the

Calculating noise figure in op amps

Of the three basic op amp circuits, it is easiest to find the input-referred noise for the non-inverting op amp amplifier, so it will be discussed first. Figure 1 shows a noise analysis diagram for a non

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Optical Amplifier OSNR The signal at the output of an optical amplifier in response to a noise free signal at the input is Pin <Pout> = <GPin+mPN> The following formulation accounts for all noise terms that

Calculating noise figure in op amps

Recognizing the need to specify wide-band op amps in RF engineering termi-nology, some manufacturers do provide noise figure, but they seem to be the exception rather than the rule. Op

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Analog Devices is global leader in the design and manufacturing of analog, mixed signal, and DSP integrated circuits to help solve the toughest engineering

Theoretical Comparison of Noise Characteristics in Semiconductor and ...

Characteristics of the intensity noise, the phase noise, the frequency noise, and the spectral linewidth in the semiconductor optical amplifier (SOA) and the erbium doped fiber amplifier (EDFA) were

Theory of spontaneous emission factor and noise figure

Abstract This study develops a theory of noise in optical parametric amplifiers (OPAs) based on the quantum-mechanical Langevin equations.

Optical Noise

Similar to electronic amplifiers, an optical amplifier not only provides optical gain, but also introduces optical noise which degrades the optical signal-to-noise ratio (OSNR).

Chapter 11 OPTICAL AMPLIFIERS

Optical amplifier, as the name implies, is a device that amplifies an input optical signal. The amplification factor or gain can be higher than 1,000 (> 30 dB) in some devices. There are two principal types of

Optical Parametric Amplifiers

Optical parametric amplifiers use parametric nonlinear interactions (rather than laser amplification) for amplification, often of light pulses.

Noise Figure of Watt-Class Ultralow-Confinement Semiconductor Optical ...

THE noise figure (NF) of an optical amplifier is an important figure of merit used to characterize the ampli-fier''s potential for low-noise performance. Typically, low NF is needed for preamplifier and

Understanding Noise Figure in Amplifiers: Definition

Noise figure is an indispensable factor in amplifier design, affecting signal quality and performance. By understanding and managing noise figure,

Optical Amplifier (AMP)

The amount of noise added is determined by the "noise figure", which can also be specified in dB or as a ratio (in which case it is the noise factor). Please see the

Noise Figure

The noise figure is expressed in decibels (dB) and is derived from the noise factor, which is the ratio of the output noise power to the input noise power, adjusted for

Noise figure

Noise figure (NF) and noise factor (F) are figures of merit that indicate degradation of the signal-to-noise ratio (SNR) that is caused by components in a signal chain. These figures of merit are used to

Quantum Noise in Optical Amplifiers

This chapter describes quantum noise in optical amplifiers, including population-inversion–based amplifiers such as an Erbium-doped fiber amplifier

The Ultimate Guide to Optical Amplifier Noise

Optical amplifier noise is a critical factor in determining the performance of optical communication systems. Understanding the fundamentals of optical amplifier noise and employing

Optical and Unified Noise Figure, and Homodyne Noise Figure

Optical amplifier must be loaded with extra optical signal power at other times/frequencies/polarization in order to keep G, ~ constant. Usually there are p = 2 polarization modes. p = 1 requires inserted

Amplifier Noise – spontaneous emission, excess noise,

Part 9: Noise of Fiber Amplifiers Erbium-doped Fiber Amplifier for Multiple Signals noise figure spontaneous emission quantum noise amplified spontaneous

Theory of spontaneous emission factor and noise figure

We derive theoretical expressions for the spontaneous emission factor of OPAs for the first time. This enables analyzing the effect of internal loss on the

Noise Figure – noise factor, quantum noise, electronic or

The noise factor (F) indicates how much excess noise an amplifier adds. It is the factor by which the output noise power spectral density exceeds the amplified

Analysis of Noise Effects in Long Semiconductor Optical Amplifiers

Abstract: In this letter, we address one of the essential processes to consider in long Semiconductor Optical Amplifiers (SOAs) analysis, which is the noise. Particularly, we investigate the impact of noise

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