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ANALYSIS OF GAIN-CLAMPED SEMICONDUCTOR LASER AMPLIFIERS

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Abstract

Amplification of multioptical signals by a semiconductor laser amplifier (SLA) may yield sever intermodulation distortion due to gain saturation. This distortion can be reduced by clamping the gain of the amplifier by operating the laser above threshold with wavelength selective feedback.

In this paper, we report on the static and small-signal dynamic of gain-clamped SLAs (GCSLAs). Analytical expressions are derived to relate the amplifier gain to input signal power. The simulation results demonstrate clearly the effect of gain clamping on reducing the gain saturation in these advanced amplifier structures.

تحليل أداء المضخمات الضوئية ذات الكسب الملزم

الخلاصة

ان عملية تضخيم عدة إشارات ضوئية باستخدام المضخم الضوئي يمكن ان ينتج تشوهات التداخل بسبب تشبع الكسب. يمكن تقليل هذا التشويه باستخدام مضخم ذو كسب ملزم, وذلك بتشغيل الليزر فوق قيمة القطع مع طول موجي مختار بالتغذية المرتدة.

في هذا البحث تم مناقشة المميزات المستقرة والحركية عند الإشارات الصغيرة لهذا النوع من المضخمات. تم اشتقاق صيغ رياضية تشير بوضوح إلى أن الكسب الملزم يقلل من تأثير تشبع الكسب في مثل هذه المضخمات المتطورة.

1-Introduction

Semiconductor laser amplifiers (SLAs) become essential elements in optical communication systems and optical networks to compensate for the optical fiber losses [1,2]. Recently, multisignals are frequently distributed through optical fiber because of its large transmission capacity with SLAs are employed to compensate for both fiber and distribution losses [3,4]. For example, microwave subcarriers multiplexed (SCM) fiber-optic systems have attracted extensive attention for their applications in broadband local access network and fiber radio systems. In simple SCM systems, many analog or digital base band signals are first modulated on electrical subcarriers at microwave frequencies and then the subcarrier signals are combined to modulate the semiconductor laser [5,6]. However these systems sever from intermodulation

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