

Application of Strong Optical Feedback to Enhance the Modulation Bandwidth of Semiconductor Lasers to the Millimeter-Wave Band

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Abstract : We report on the use of strong external optical feedback to enhance the modulation response of semiconductor lasers over a frequency passband around modulation frequencies higher than 60 GHz. We show that this modulation enhancement is a type of photon-photon resonance (PPR) of oscillating modes in the external cavity formed between the laser and the external reflector. The study is based on a time-delay rate equation model that takes into account both the strong feedback and multiple reflections in the external cavity. We examine the harmonic and intermodulation distortions associated with single and two-tone modulations in the mm-wave band of the resonant modulation. We show that compared with solitary lasers modulated around the carrier-photon resonance frequency, the present mm-wave modulated signal has lower distortions.

Keywords : semiconductor laser, optical feedback, modulation, harmonic distortion

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