World Academy of Science, Engineering and Technology
International Journal of Electronics and Communication Engineering
Vol:14, No:09, 2020

Experimental Demonstration of an Ultra-Low Power Vertical-Cavity Surface-Emitting Laser for Optical Power Generation

Authors : S. Nazhan, Hassan K. Al-Musawi, Khalid A. Humood

Abstract : This paper reports on an experimental investigation into the influence of current modulation on the properties of a vertical-cavity surface-emitting laser (VCSEL) with a direct square wave modulation. The optical output power response, as a function of the pumping current, modulation frequency, and amplitude, is measured for an 850 nm VCSEL. We demonstrate that modulation frequency and amplitude play important roles in reducing the VCSEL’s power consumption for optical generation. Indeed, even when the biasing current is below the static threshold, the VCSEL emits optical power under the square wave modulation. The power consumed by the device to generate light is significantly reduced to > 50%, which is below the threshold current, in response to both the modulation frequency and amplitude. An operating VCSEL device at low power is very desirable for less thermal effects, which are essential for a high-speed modulation bandwidth.

Keywords : vertical-cavity surface-emitting lasers, VCSELs, optical power generation, power consumption, square wave modulation
Conference Title : ICOEC 2020 : International Conference on OptoElectronics and Communications
Conference Location : Amsterdam, Netherlands
Conference Dates : September 17-18, 2020