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Title:High-frequency microwave signal generation using multi-transverse mode VCSELs subject to two-frequency optical injection

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Abstract:In this paper we report a new method of photonic generation of microwave signals using a multi-transverse mode VCSEL subject to two-frequency optical injection. Numerical simulations show that double injection locking involving two transverse modes can be obtained in these systems. We show that the higher-order transverse mode is excited with a much larger amplitude than that of the fundamental transverse mode. The comparison with the case of a single-transverse mode VCSEL subject to similar two-frequency optical injection shows that multi-transverse mode operation of the VCSEL enhances the performance of the photonic microwave generation system. Broad tuning ranges, beyond the THz region, and narrow linewidths are demonstrated in our system. The maximum frequency of the generated microwave signals can be substantially increased if multimode VCSELs are used instead of single-mode VCSELs. ©2012 Optical Society of America.

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