Abstracts

Optical heterodyne millimeter-wave generation using 1.55-/spl mu/m traveling-wave photodetectors

A. Stohr, R. Heinzelmann, A. Malcoci and D. Jager. "Optical heterodyne millimeter-wave generation using 1.55-/spl mu/m traveling-wave photodetectors." 2001 Transactions on Microwave Theory and Techniques 49.10 (Oct. 2001, Part II [T-MTT] (Special Issue on Microwave and Millimeter-Wave Photonics)): 1926-1933.

Optical heterodyne millimeter-wave generation using traveling-wave photodetectors (TW-PDs) is examined both experimentally and theoretically. Ultrahigh-frequency InP-based 1.55-/spl mu/m TW-PDs were fabricated and employed in an experimental setup for optical heterodyning. For the first time, optical heterodyne millimeter-wave generation in excess of 160 GHz is experimentally demonstrated in the frequency domain. The maximum electrical power delivered by the TW-PD to a 5052 impedance is -11.5 dBm at 110 GHz with a polarization penalty of only 1.3 dB. Furthermore, a theoretical analysis in frequency domain is presented describing the frequency response of TW-PD including effects of the photogenerated carrier dynamics as well as optical and electrical wave propagation phenomena. A broadband and flat frequency response is found indicating a total rolloff of about 13.1 dB for a frequency span from 25 GHz to 200 GHz. Finally, the detectors responsivity is theoretically investigated to differentiate between the physical phenomena associated with high-frequency limitations.

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