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Title:A spectral analysis of an integrated photomixer/antenna in a homodyne terahertz photomixing system
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Abstract:An analysis has been carried out to estimate the spectral characteristics of an integrated photomixer/antenna in a homodyne photomixing system. The analysis adopts the impedance mismatch factor and Friis power transmission formula used in communication links based on the conventional analysis theory of a terahertz photomixer. The analysis and experimental results have proved that an impedance matching condition between the impedance of a photomixer and the input impedance of an antenna is directly related with photomixing terahertz wave generation. The Friis formula is introduced to calculate the propagation loss of the wave from a transmitter to a receiver in a homodyne photomixing system. A log-periodic antenna was used to ensure a high dynamic range in a broad frequency region. The dynamic range of the homodyne terahertz photomixing system was about 60 dB near 100 GHz and decreased with an increasing frequency from 10 GHz to 1000 GHz. The measured results agree well with the theoretically analyzed results and prove that the terahertz photomixing power is closely related to impedance mismatch factor and it could be estimated in the homodyne terahertz photomixing system without a terahertz power detector. 
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