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Abstract:Terahertz-wave transmission loss measurement systems at 330-500GHz using single- and dual-channel superheterodyne receivers are described. It is shown that the phase noise effect in a single-channel system causes significant signal level fluctuation in the lock-in amplifier. The dual-channel system can eliminate the phase noise effect in synchronous detection and achieve a room-temperature noise floor of 170 dBm. The dynamic range of the dual-channel system is estimated to be 140-152dB. The measurement uncertainty of the system is analyzed. A 0-100dB WR-2.2 waveguide attenuator can be measured with expanded uncertainties of 0.078-0.24dB at 480GHz. The dual-channel system can serve as a national measurement standard for waveguide transmission measurement at 330-500GHz and provide traceability for measurements made using commercial instruments. © 2012 IOP Publishing Ltd.
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