

Plasmonic Heterodyne Terahertz Receivers with Quantum-Level, Sensitivity at Room Temperature

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Abstract

We introduce a terahertz receiver that uses plasmonic photomixing for frequency downconversion to offer quantum-level sensitivities at room temperature for the first time. Frequency downconversion is achieved by mixing terahertz radiation and a heterodyning optical beam with a terahertz beat frequency in a plasmonics-enhanced semiconductor active region. With a versatile design capable of broadband spectrometry, over a 0.1-5 THz bandwidth, we demonstrate receiver sensitivities down to 3 times the quantum-limit at room temperature.