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Title:Enhanced performance of resonant sub-terahertz detection in a plasmonic cavity
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Abstract:A multi-gate high electron mobility transistor coupled to a log-periodic antenna was engineered to detect sub-terahertz radiation through resonant excitation of plasmon modes in the channel. The device was integrated with a silicon hyper-hemispherical lens in order to enhance radiation collection and eliminate parasitic substrate modes. The continuous detector response spectrum from 185 GHz to 380 GHz indicates the presence of distinct collective plasmonic cavity modes resulting from the quantization of the plasmon wavevector. In a bolometric detection mode, a noise equivalent power of less than 50 pW/Hz^{1/2} and a responsivity exceeding 100 kV/W have been measured at 11.5 K.
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Inspec controlled terms:elemental semiconductors - high electron mobility transistors - lens antennas - microwave detectors - plasmonics - silicon - surface plasmon resonance
Uncontrolled terms:resonant subterahertz detection - multigate high electron mobility transistor - log-periodic antenna - resonant excitation - silicon hyperhemispherical lens - radiation collection - parasitic substrate modes - continuous detector response - collective plasmonic cavity modes - plasmon wavevector quantization - bolometric detection mode - noise equivalent power - frequency 185 GHz to 380 GHz - temperature 11.5 K - Si
Inspec classification codes:B2560S Other field effect devices - B7230 Sensing devices and transducers - B5270B Single antennas - B1350F Solid-state microwave circuits and devices
Numerical data indexing:frequency 1.85E+11 3.8E+11 Hz;temperature 1.15E+01 K
Chemical indexing:Si/int Si/el
Treatment:Practical (PRA); Experimental (EXP)

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