242. Title: Microwave based nanogenerator using the ratchet effect in Si/SiGe heterostructures

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Abstract: Ratchet based microwave current generators and detectors were developed in Si/SiGe heterostructures for wireless communication with the possibility of extending the detection limit to the terahertz range. A microwave induced ratchet current was generated in the two-dimensional electron gas by patterning an array of semicircular antidots in hexagonal geometry. The spatial asymmetry created by the semicircular antidots forces the electrons under the influence of the microwave electric field to move preferentially towards the direction of the semidisc axis. A photovoltage of the order of few millivolts was observed. Such a photovoltage was completely absent in a symmetric system consisting of circular antidots. The induced photovoltage increased monotonically with microwave power and was found to be independent of the microwave polarization. This device opens the possibility of employing silicon based heterostructures for nanogenerators and other wireless communication devices using microwaves.