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Remote sensing of the radiation induced zero-resistance state in the high mobility GaAs/AlGaAs system RAMESH MANI, Harvard University — The possibility of inducing novel zero-resistance states by photo-exciting a high mobility GaAs/AlGaAs device, with radiation from the microwave and Terahertz parts of the electromagnetic wave spectrum, has recently motivated a broad theoretical examination of the photoexcited steady states of the low dimensional electron system. Present theory suggests that radiation- induced resistance oscillations originate from a field dependent scattering at impurities and/or a steady state change in the electronic distribution function. In these theoretical scenarios, the amplitude of the magnetoresistance oscillations increases with the radiation intensity such that the resistivity/conductivity is able to take on negative values at the minima of the oscillatory magnetoresistivity (or magnetoconductivity) for sufficiently large radiation intensities. The negative resistivity/conductivity state is believed to give way, however, to a zero-resistance state as a result of domain formation, providing for the experimentally observed phenomenon. Here, we report the results of experiments which sought to find signatures of the radiation-induced zero-resistance states in microwave transmission and reflection measurements of the high mobility 2DES. Remarkable changes are observed in the remotely observed photoresponse as a function of both the frequency and intensity. From the results, we deduce that the remote sensing of the radiation-induced zero-resistance state lies within the realm of possibility.

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