Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Effect of doping density concentration in modulation-doped GaAs/AlGaAs heterostructures on charge noise in quantum point contacts SAEED FALLAHI, JAMES NAKAMURA, Department of Physics and Birck Nanotechnology Center, Purdue University, MICHAEL YANNELL, Schools of Electrical and Computer Engineering, Purdue University, MICHAEL MANFRA, Department of Physics, Birck Nanotechnology Center, Schools of Electrical and Computer Engineering and Materials Engineering, Purdue University — Low frequency charge noise is an important consideration for semiconductor spin qubits that may limit coherence times. We present measurements of low frequency charge noise in modulation doped GaAs/AlGaAs heterostructures grown by molecular beam epitaxy in which the silicon doping density has been varied from 2.4E18 cm-3 (critically doped) to 6.0E18 cm-3 (overdoped) within a fixed thickness.. We have fabricated quantum point contacts (QPCs) on these heterostructures with different QPC widths ranging from 300nm to 500nm. We measured current noise through quantum point contact (QPC) on the riser of the first quantized conductance plateau. These QPCs provide a sensitive probe of charge noise in the heterostructure. We present data demonstrating the relationship between low frequency noise and density and placement of silicon donors. We have also investigated influence of dimeric (As2) vs tetrameric (As4) arsenic vapor species during MBE growth on charge noise and its relation to the formation of electron trapping centers.

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Date submitted: 09 Nov 2016 Electronic form version 1.4