Atomic Scale Devices in Silicon Fabricated using Scanning Tunneling Microscopy

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Atomic scale devices consisting of phosphorous monolayers fabricated using scanning tunneling microscopy open possibilities of making novel quantum devices that allow manipulation of electron spins in single or few-dopant atom quantum dots for quantum computation. The process relies on STM patterning on silicon with a hydrogen monolayer as a mask. This technique allows patterning devices at the atomic scale enabling fabrication of a variety of quantum structures. Our primary research focus is on making single electron transistors (SET) and few donor/dot devices for applications in spin-to-charge readout and coherent spin manipulation using electron spin resonance (ESR). We are in the process of implementing high frequency oscillating magnetic fields to manipulate an isolated electron on a quantum dot. This poster presentation will include the fabrication of devices, examples of transport measurements using SETs and quantum dots and our efforts so far in integrating on-chip microwave transmission lines for on-chip oersted lines with the objective of observing spin rotations using magnetic resonance.