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Pulsed Electrically Detected Magnetic Resonance of 2D Electrons in a Si/SiGe Quantum Well ALEXEI TYRYSHKIN, Princeton University, STEPHEN LYON, Princeton University, WOLFGANG JANTSCH, Universitat Linz, FRIEDRICH SCHAFFLER, Universitat Linz — We have developed a new method of pulsed EDMR (Electrically Detected Magnetic Resonance) and applied it to measure spin relaxation times of 2D electrons in a Si/SiGe quantum well. The method is based on spin-dependent transport in the 2D channel: Conduction electrons scatter off each other, and their scattering cross section depends on the relative orientation of their spins [1]. The initial, thermal polarization of 2D electron spins (at H=350 mT and T=4 K) is altered by applying the resonant 10 GHz microwave pulses. A change in the spin polarization results in a variation of the device conductivity ($\sim 10^{-4}$), and its recovery back to the thermal equilibrium is measured after the microwave pulse. The recovery time measures the spin relaxation, and we find $T_1 = 1.4$ μs for 2D electrons in a modulation-doped Si quantum well, the same time as we measure with conventional pulsed spin resonance. This new pulsed EDMR method will allow the measurement of T_1 and T_2 on small semiconductor structures with sensitivity down to a few spins, possibly a single spin. [1] Ghosh and Silsbee, Phys. Rev. B 42, 12508(1992).

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