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Ferromagnetic single-electron transistors fabricated by atomic force microscopy[1] RUISHENG LIU, HAKAN PETTERSSON, Center for Applied Matematics and Physics, Halmstad University, Sweden, LUKASZ MICHALAK, CARLO CANALI, Div. of Physics Dept of Chemistry and Bimedical Sciences, Kalmar University, Sweden, LARS SAMUELSON, Solid State Physics/Nanometer Consortium, Lund University, Sweden — We report on the fabrication and magneto-transport measurements of Ni/Au/Ni ferromagnetic single-electron transistors (F-SETs), fabricated by atomic force microscopy. By positioning a single Au disc (30 nm in diameter) into the gap between the Ni drain and source electrodes (of width 220 nm and 80 nm, respectively) step-by-step with Angstrom precision, and using plasma-processed NiO_x as tunneling barriers, we can successfully fabricate F-SETs of high quality and substantial stability. The characteristic time interval of the device between two successive tunneling events is $\sim$10ps. The absence of any clear features in the transport related to the applied external magnetic field indicates that no spin-accumulation is maintained in the central Au disc. This interesting result indicates that the spin-relaxation time inside the central island should be shorter than 10ps. Based on these findings, we will discuss possible mechanisms of spin-relaxation in metal nano-structures triggered by spin-orbit interaction.

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