Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**Spin blockade in a triple silicon quantum dot in CMOS technology**[1] E. PRATI, G. PETRETTO, M. BELLI, Laboratorio MDM, CNR-IMM, G. MAZZEO, Laboratorio MDM, CNR-IMM and Università Milano Bicocca, S. COCCO, M. DE MICHIELIS, Laboratorio MDM, CNR-IMM, M. FANCIULLI, Laboratorio MDM, CNR-IMM and Università Milano Bicocca, F. GUAGLIARDO, Politecnico di Milano, M. VINET, LETI-Minatec, CEA, R. WACQUEZ, CEA Grenoble and Universite Joseph Fourier — We study the spin blockade (SB) phenomenon by quantum transport in a triple quantum dot made of two single electron transistors (SET) on a CMOS platform separated by an implanted multiple donor quantum dot [1]. Spin blockade condition [2] has been used in the past to realize single spin localization and manipulation in GaAs quantum dots [3]. Here, we reproduce the same physics in a CMOS preindustrial silicon quantum device. Single electron quantum dots are connected via an implanted quantum dot and exhibit SB in one current direction. We break the spin blockade by applying a magnetic field of few tesla. Our experimental results are explained by a theoretical microscopic scheme supported by simulations in which only some of the possible processes through the triple quantum dot are spin blocked, according to the asymmetry of the coupling capacitances with the control gates and the central dot. Depending on the spin state, the SB may be both lifted and induced. Spin control in CMOS quantum dots is a necessary condition to realize large fabrication of spin qubits in some solid state silicon quantum device architectures.

[1] Pierre et al., Appl. Phys. Lett., 95, 24, 242107 (2009); [2] Liu et al., Phys. Rev. B 77, 073310 (2008); [3] Koppens et al., Nature 442, 766-771 (2006)

Enrico Prati
Laboratorio MDM, CNR-IMM

Date submitted: 05 Dec 2011 Electronic form version 1.4

[1]Work funded by the FPVII AFSID Project