Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

High performance MoS_2 Field-Effect Transitors in a simple design[1] S. VELEZ, O. TXOPERENA, L. PIETROBON, CIC nanoGUNE, 20018 Donostia-San Sebastian, Basque Country, Spain, F. CASANOVA, L.E. HUESO, CIC nanoGUNE, 20018 Donostia-San Sebastian, Basque Country, Spain and IKERBASQUE, Basque Foundation for Science, 48011 Bilbao, Basque Country, Spain — The discovery of graphene, with its rich and fascinating physical properties, has opened up a new world where 2D-layered materials is the platform for developing powerful devices. Molybdenum disulfide (MoS_2), a 2D material belonging to the family of transition metal dichalcogenides, has an intrinsic band-gap and strong spin-orbit coupling which would complement those applications pristine graphene cannot cover. In particular, MoS_2 has been shown to work well as a field-effect transistor (FET), to exhibit superconductivity and valley polarization, demonstrating its potential in spintronics, valleytronics, or for designing other novel devices. Here we will show high performance of FETs based on monolayer and a few layer MoS_2 working with a simple design (Si/SiO2 back gate and two terminal configuration). The FETs show room temperature ON/OFF ratios exceeding 10^7 and with mobilities higher than 10 $cm^2V^{-1}s^{-1}$. These values are among the best previously reported ones in similar designs and support the viability of building up simpler but still powerful devices which would allow large scale fabrication suitable for nanoelectronics. Further investigations exploiting both spintronics and valleytronics of layered MoS_2 are the final goal of this work.

[1]This work is supported by the European Research Council Grant 257654-SPINTROS

Saul Velez
CIC nanoGUNE, 20018 Donostia-San Sebastian, Basque Country, Spain

Date submitted: 15 Nov 2013 Electronic form version 1.4