Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Silicon based cryogenic platform for the integration of qubit and classical control chips T. LEONHARDT, A. HOLLMANN, D. JIROVEC, R. NEUMANN, B. KLEMT, S. KINDEL, JARA-Institute for Quantum Information, RWTH Aachen University, M. KUCHARSKI, G. FISCHER, Innovations for High Performance Microelectronics, Frankfurt (Oder), D. BOUGEARD, Institut fr Experimentelle und Angewandte Physik, Universitaet Regensburg, H. BLUHM, L. R. SCHREIBER, JARA-Institute for Quantum Information, RWTH Aachen University — Electrostatically confined electron-spin-qubits proved viable for quantum information processing [1-3]. Yet their up-scaling not only demands improvement of physical qubits, but also the development and cryogenic integration of classical control hardware. Therefore, we created a platform to integrate quantum chips and classical electronics. These multilayer interposer chips incorporate passive circuit elements, high bandwidth coplanar wave guides and interconnects for electron spin resonant qubit control as well as low impedance DC microstrips reducing EM-crosstalk from AC to DC lines. We used the interposer for measurements of a Si/SiGe quantum dot at 30 mK. We also characterized a commercial voltage controlled oszillator (VCO) based on hetero-bipolar transistors [4]. Tunable about 30 GHz it is ideal for electron spin resonant qubit control. Cooled from 300 to 4 K it exhibits a slightly increased output power and frequency, while the phase noise level is constant. The device remains functional up to magnetic fields of 6 T. [1] M.Veldhorst et al. Nature 526(2015) [2] E.Kawakami et al. PNAS 113(2016) [3] K.Takeda et al. Sci.Adv. 2(2016) [4] M.Kucharski et al. Proc. EuMIC (2016)

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Date submitted: 11 Nov 2016 Electronic form version 1.4