Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Sayma: Agile RF for Coherent Quantum Control Using ARTIQ
JOSEPH W. BRITTON, Army Research Lab, University of Maryland, DAVID T. C. ALLCOCK, NIST, University of Colorado, University of Oregon, CHRIS BALLANCE, TOM P. HARTY, University of Oxford, ROBERT JORDENS, M-Labs Ltd, QuARTIQ GmbH, GREG KASPROWICZ, PAWEL KULIK, Warsaw University of Technology, DANIEL H. SLICHTER, NIST, WEIDA ZHANG, University of Oxford, SEBASTIEN BOURDEAUDUCQ, M-Labs Ltd, QuARTIQ GmbH — The Advanced Real-Time Infrastructure for Quantum physics (ARTIQ) [1] is a control system for quantum information experiments. It features a high-level programming language called ARTIQ Python, in which complex experiments can be expressed. Experiment code is compiled and executed on dedicated FPGA hardware with nanosecond timing resolution and microsecond branching latency. The system was designed to meet the requirements of complex, feedback-based algorithms including quantum error correction and networking. Sinara [2] is an open source suite of high performance FPGA-based hardware designed for trapped ion qubit systems using ARTIQ. This poster discusses the Sayma high performance DAC system, a Sinara component with high channel density, low phase noise, and phase-synchronous operation. The DACs provide a 16-bit output at data rates up to 1 GSPS, with digital interpolation enabling output clock rates up to 2.4 GHz. Output waveforms are defined parametrically, easing waveform storage requirements and enabling low-latency feedback for waveform frequencies and amplitudes. Clock synchronization follows a scheme similar to CERN's White Rabbit. [1] github.com/m-labs/artiq [2] sinara-hw.github.io

Joseph W. Britton
Army Research Lab, University of Maryland

Date submitted: 01 Feb 2019 Electronic form version 1.4