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Development of a Reconfigurable Readout for Superconducting Arrays

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New fully integrated digital signal processing technology called Radio Frequency System on a Chip (RFSoc) developed for communications and defense applications will set the standard for future astronomical instruments which utilize superconducting arrays of kinetic inductance detectors (KID), Transition edge sensors (TES), and nanowire single photon detectors (SNSPD). The RFSoc combines a fabric of reconfigurable logic, high speed input/output digitizers, and a microprocessor all onto a single integrated chip. This dramatically reduces the size, weight, and power of the system while simultaneously increasing the instantaneous bandwidth. In parallel the open source community has developed a Python interface for high performance SoCs which allows for rapid software development. Taking advantage of this product of Moore's law and leveraging previous work we have begun firmware development on the ZCU111 RFSoc evaluation board. We report on the algorithms, firmware, and software implementation as well as preliminary measurements with superconducting arrays. We will also discuss the potential for RFSoc-based readouts as a platform for balloon-borne and space based telescopes.

Less than 5 years of experience since completion of Ph.D

Y

Student (Ph.D., M.Sc. or B.Sc.)

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