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## MKID Readout Electronics for the BULLKID-DM Experiment

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The BULLKID-DM experiment aims to detect WIMP-like particles with masses below 1 GeV/c<sup>2</sup>, which are potential candidates for Dark Matter. Sensing these particles is difficult, as it requires nuclear recoil detectors with energy thresholds with hundreds or tens of eV, thus exceeding the capabilities of conventional semiconductor detectors. BULLKID-DM intends to tackle this challenge by using cryogenic microwave kinetic inductance detectors (MKIDs) with exceptional energy resolution to sense a target with a total mass of around 800g, divided into over 2000 silicon dice.

KIT joined the BULLKID collaboration and currently develops the room-temperature readout electronics needed to interface the frequency-multiplexed MKIDs. Since the readout requirements are similar to microwave-SQUID- multiplexed magnetic microcalorimeters (MMCs), the readout concept we originally proposed for the ECHo experiment has partially been reused. We ported the system to the ZCU216, a commercial evaluation card built around a Radio-Frequency System-on-Chip (RFSoc) with integrated high-speed data converters, and attached a custom analog front-end for signal conditioning. Recent efforts were aimed at generalizing our existing firmware modules to enable convenient adaptation to specific requirements of current and future experiments. In this contribution we will outline and evaluate the BULLKID-DM readout system design including the selected hardware components and the FPGA-firmware containing the real-time signal processing stages for tone generation, frequency demultiplexing and event triggering.

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