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Resource-efficient FPGA implementation of a channelization stage for superconducting quantum detectors DAQ systems

Wednesday 12 June 2024 15:05 (20 minutes)

Modern experiments in particle physics and astrophysics rely on quantum detectors for superior energy resolutions. These detectors require specialized readout electronics employing frequency division multiplexing. Operational challenges include managing a high number of tones in the transmission lines, which further complicates the FPGA firmware. For instance, the ECHo experiment plans to operate ˜12,000 MMCs to study the upper limit of electron neutrino mass. Similarly, BULLKID-DM will employ ˜3,000 KIDs to search for dark matter. Room-temperature electronics handle digital synthesis of microwave tones and real-time data processing. A polyphase channelizer (PPC) and digital downconversion (DDC) facilitate sub-band separation and variable tone filtering. This FPGA-based channelization stage is adaptable to various experiments. Methods for modifying PPC and DDC for different detector parameters are also discussed, along with characterization techniques for assessing their performance.

Talk's Q&A

During the talk

Talk duration

20'+10'

Will you be able to present in person?

Yes

Authors: MUSCHEID, Timo; ARDILA-PEREZ, Luis (Institute for Data Processing and Electronics (IPE), Karlsruhe Institute of Technology (KIT)); SANDER, Oliver (KIT - Karlsruhe Institute of Technology (DE))

Presenter: MUSCHEID, Timo

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