Contribution ID: **1**   Type: **not specified**

Design of a data acquisition system for the EURECA experiment

Tuesday, 3 June 2014 10:00 (20 minutes)

The EURECA direct dark matter search experiment, as outlined in its Conceptual Design Report (http://www.sciencedirect.com/science/art will consist of up to 1 ton of cryogenic (T~15mK) detector mass. The detectors will be Ge-Bolometers of EDEL-WEISS type and CaWO4 detectors of CRESST type. Each individual detector with a mass of ~1kg brings 4 to 6 channels which have to be read out simultaneously. The cryostat with the detectors will be within a water tank, acting as an active muon veto system, using the Cherenkov effect. The digitized data of the photomultipliers will be integrated in the DAQ as well. A highly integrated and scalable FPGA based DAQ system on the µTCA platform is projected as the central DAQ and the event building trigger unit.

A smaller but similar DAQ concept developed at KIT is used in the present EDELWEISS-III phase. It processes the data of 240 digital channels, each with 1.6 Mbit/s data rate. Two simultaneous read out modes are supplied. One branch delivers a continuous raw data stream to 3 acquisition PCs while the other branch uses the FPGAs for trigger and event building. In the event mode, a time resolved ionization channel with 40 MHz and 16 bit sampling is available for additional localization of events within the Ge crystal and to detect multiple scattering events.

We present the architecture of the DAQ system, its current operation within the EDELWEISS experiment and an outlook towards a potential EURECA DAQ system.

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Session Classification: Session 3