Contribution ID: **175** Type: **Oral**

The Data Acquisition System for the KOTO detector

Monday 2 June 2014 17:50 (20 minutes)

The goal of KOTO experiment at J-PARC is to discover and measure the rate of the rare decay KL -> pi0-nu-nubar, for which the Standard Model predicts a branching ratio of (2.4 +/- 0.4)x10E-11 . The experiment is a follow-up to E391 at KEK with a completely new readout electronics, trigger and data acquisition system.
The KOTO DAQ comprises a front-end 14-Bit, 125MHz ADC board and a two-level hardware trigger electronics. The ADC board injects the frontend detector signals into a low pass filter before digitization. The digitized pulses are stored inside a 4 μs deep pipeline while waiting for the first level trigger decision, based on a minimum energy deposition in the CsI calorimeter in anti-coincidence with signals in veto detectors. Data is then buffered inside a L2 trigger board, which calculates the center-of-energy of the event. Data accepted by the second level trigger board is read out via a front panel 1Gb Ethernet port into a computer cluster through a network switch using UDP protocol.
After several commissioning runs in 2011 and 2012, KOTO has taken the first physics run in May 2013. We will review the performance of the DAQ during this run as well as plans to upgrade the clock distribution system and the overall trigger hardware connectivity. Finally we present a redesign of the Level 2 trigger and readout electronics able to accommodate the increase in data rate expected in the next few years.

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Session Classification: III.b Trigger & DAQ

Track Classification: Data-processing: 3b) Trigger and Data Acquisition Systems