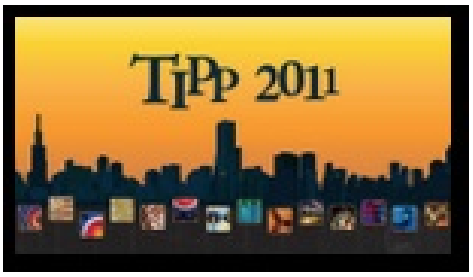

Contribution ID: **136** Type: **Oral Presentation**

Introduction of PANDA Data Acquisition System

Saturday 11 June 2011 17:00 (30 minutes)

PANDA is a general purpose hadron spectrum to be installed in the high energy storage ring of the Future Anti-proton and Ion Research facility-FAIR, in Germany. It employs the high quality cooled anti-proton beam to hit fixed target to do research on strong interaction, weak interaction, exotic states of matter, hadron structure and so on. Due to the rich physics studies with different event selection criteria and very high interaction rate of 2x10^7 /s and data rates of 200 GB/s and more, a hardware-trigger-less data acquisition system with high performance has been proposed.

The data from various sub-detector systems are tagged by a very precise timestamp in Front-end electronics. Event selection based on real time feature extraction, filtering and high level correlations will be executed on ATCA compliant FPGA-based Compute Nodes (CN) in two stages: At the first stage, the dedicated sub-detector information will be processed in the sub module. Some online feature extraction algorithms will be employed to extract particle information like energy, position, momentum and so on. Some kind of particle identification will be done for charged particles. The results from the first stage will be combined together in the second stage to make a preliminary reconstruction for physics events. Then the event selection will be done based on the research topics of PANDA experiment and the result will be sent to the offline PC farm for further processing.

Each CN features 5 Xilinx Virtex-4 FX60 FPGA chips and up to 10 GBytes DDR2 memory. 3Gbps bandwidth per channel and total of 50Gbps connectivity is provided by 8 front panel optical and 13 backplane electrical links using RocketIO ports. Five Gbit Ethernet links are provided for output transmission.

A prototype system on EMC online shower reconstruction has been designed. Some test results from this prototype system will be reported.

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Session Classification: Trigger and DAQ Systems

Track Classification: Trigger and Data Acquisition Systems