Contribution ID: **236** Type: **poster**

Control and monitoring of alignment data for the ATLAS endcap Muon Spectrometer at the LHC

Monday, September 3, 2007 8:00 AM (20 minutes)

The ATLAS Muon Spectrometer is constructed out of 1200 drift tube chambers with a total area of nearly 7000 square meters. It must determine muon track positions
to a very high precision despite its large size necessitating complex real-time alignment measurements.
Each chamber, as well as approximately 50 alignment reference bars in the endcap region,
are equipped with CCD cameras, laser sources, and LED-illuminated masks which optically link chambers and bars in a three dimensional grid. This permits micron–level determination of chamber-to-chamber positions and chamber distortions.
This information is used to correct drift tube positions and shape for muon track reconstruction.
The endcap optical system produces about 8000 83 kB images during each 20 minute readout cycle.
The optical data acquisition and image analysis are performed by a hardware/software system
(LWDAQ) developed at Brandeis University. The system is segmented so that six processes running
on several computers perform the optical readout and image analysis in parallel.

We describe the architecture and implementation of the control system;
monitoring of the optical readout processes;
evaluation of the validity of images; display of results, validity parameters, and error conditions;
and storage of analysis results and quality in an Oracle database. The distributed control architecture includes a
Linux-based control and communication process and a PVSS SCADA system for the user interface,
display functions, and database storage.
Details of the architecture, communications, and performance will be presented.

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Session Classification: Poster 1

Track Classification: Software components, tools and databases