LG 07/18/2006

HFT September Test Description

Our goal is to test functionality of a prototype MIMOSTAR2 detector in the environment at STAR in the September 2006 run at STAR. We anticipate gathering information on:

- Charged particle environment near the interaction region in STAR.
- Performance of our cluster finding algorithm.
- Performance of the MIMOSTAR2 sensors.
- Functionality of our tested interfaces to the other STAR subsystems.
- Performance of our hardware / firmware as a system.
- The noise environment in the area in which we expect to put the final HFT.

Hardware and firmware testing:

We have constructed a test readout system that exercises most of the interfaces that we intend to use for the final detector at STAR. We will also test the cluster finding and data sparsification system described in the readout section of our proposal which can be found at http://www.lbnl.leog.org/RDO_section_HFT_proposal.pdf . A schematic of the system and list of the hardware, firmware and software that we are producing can be found at http://www.lbnl.leog.org/Sept_2006_system.doc. We are producing a detector system that consists of 3 separate MIMOSTAR2 chips on individual mounts in a telescope configuration. This detector will be inserted into the STAR detector via a guide tube that places the telescope with the active areas of the sensors perpendicular to the beamline direction and located below the existing beam pipe. This telescope will be read out via a motherboard / daughter card configuration that we have constructed. The readout system will allow us to run either as a stand alone detector or as a integrated detector with our data read out into the star DAQ system and built into the STAR events. Attached is a diagram that shows schematically the connections that we envision to the rest of the STAR detector.

Interfaces:

Trigger – We intend to use one of the existing TCD cables that feeds the TPC front ends to supply our clock and triggers. The TCD cables are multi-drop PECL and we have spoken to Fred Bieser about adding an extension to one of the existing cables. He believes this is a good way to have access to the trigger information without disturbing the working system and approved a design for the extension cable. We are passive in the sense that we do not have drivers and will not assert a busy nor a detector status. We intend to take triggers when the TPC takes triggers and any internal busy states that we have will result in us delivering a dummy (empty busy) event to be read out. We hope that this results in a clean and passive interface to the trigger without creating any additional required infrastructure.

DAQ – We have several redundant readout schemes. Our primary readout scheme is to use the CERN SIU and readout to a PC running LINUX containing a RORC in the DAQ room using optical fibers. The idea is to use the same readout path as the test patch of the

DAQ1000. We have been in contact with Tonko who will take care of the back end which is the reading of the RORC and building of our data into the STAR event. We also will be running a NFS file share on the hard drive in our control PC located on the platform from an embedded LINUX kernel running in the NIOS II processor in our Altera FPGS on the motherboard. This will allow us to write data over Ethernet. In addition, we will have a serial connection to our control PC which will also allow (though at a much reduced data rate) us to save data to our control PC.

Run Control and Slow Controls – It is anticipated that we will control our system through the control PC on the platform via remote desktop software from the counting house. Since we are doing development work we will be running tests on our system whilst STAR is taking data. We are hoping that our inclusion in the STAR event can be handled at the DAQ receiver end through Tonko with an extremely simple interface such as writing empty events into our part of the data structure if no data is present. This would keep us from needing to stop and start runs based on our testing activity.

Cables, AC, Fibers, Power Supplies, Ethernet, etc.:

Based on the attached diagram.
AC – we need AC power on the platform and in the DAQ room. The AC power on the platform needs to be remotely controllable to allow for the (unlikely) reset of the control PC The AC power in the DAQ room is for the RDO PC.

Fibers – We need a dual fiber connection from the motherboard in the STAR magnet to the DAQ room. Howard Wieman and Danny Padrazo are looking into this. It is our understanding that there are dual fiber links from the platform to the DAQ room for DAQ1000 testing and that a pair could be made available to us. Also, HW and DP are looking into the jumpers to connect from the motherboard to the platform and from the patch panel in the DAQ rom to the RDO PC.

Ethernet – We will need 4 ethernet connections. The motherboard, the control PC, the RDO PC and the AC control box on the platform. These would all need to be on the same or a mutually accessible subnets. We will investigate obtaining these connections.

Power – The motherboard and Stratix Board run from >/= 6V DC. We are planning on using the MWPC supplies to provide power. DP will make the cables for running the motherboard and STRATIX boards from the MWPC power supplies with appropriate connectors.

Cables – The TCD cable connection is described above. We also make a serial cable running from the MB to the platform. In addition, We have a remote monitoring system looking for latch up on the MB regulated power. This will be combined with the remote prom reload into a single twisted pair cable that runs from the MB to the control PC. We will make this cable. Two JTAG cables are required for configuration updates to the system. These will run from the control PC to the MB. We will make these cables.

Space – We will need some space on the platform for our control PC and some space in the DAQ room for the RDO PC. Our understanding is that there is a spare DAQ RDO PC that may be available for our use. If not, we can bring one from LBL.

Testing Sequence

During the August shutdown, we will install our insertion tube and required cabling into the STAR detector. After that point, we can install our hardware into the STAR detector during a scheduled acess during the run. Our intention is to get our system working on the bench at LBL. After initial functional testing we will take our system to the ALS for testing in the 2 GeV electron beam and calibrating the detector response and tweaking the cluster finding algorithms. At this point we will ship the detector to BNL and hook everything up outside the magnet to test the function at STAR. After that we will insert the detector into STAR and begin data taking.

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Cable Diagram
LG 07/17/2006