

BELLE-II Review of Dec. 13, 2014 held at SLAC.

There were two general reviews. The first was on the KLM readout electronics and the second was on the commissioning detector called BEAST II which will be installed prior to the BELLE II roll-on.

KLM readout electronics

There are now two systems for the KLM; the RPC detectors which are the original detectors and new scintillator detectors in the inner 2 layers of the barrel KLM and in the End Caps. Both detector systems need new readout electronics for the new BELLE II data acquisition system.

In general, the KLM readout electronics is well developed and looks to meet the specifications of the new DAQ. There is the start of integrated tests of various pieces of the electronics and we highly encourage further work in this direction. We feel it is important to develop full systems tests as soon as is reasonable as this many times will uncover problems not seen with individual component testing or from separate communication tests. We were informed that there is a manpower shortage for this effort and highly encourage the team to address this problem as soon as possible so that full systems tests can commence.

KLM RPC electronics

- This system was presented as essentially complete and we agree. We feel this system should go directly to production. There were only very minor issues left and these looked easily correctable.

KLM Scintillator electronics

- The separate electronics modules are well developed and look close to ready for production. As was mentioned in the presentation, there is an issue of connector space on the RHIC board. The proposed solution looked awkward and difficult to maintain properly and we encourage more study to address this problem. We suggest putting together the entire barrel system as a first step as this will allow the study of the complete readout system.
- A question came up of what are possible choke points in the dataflow stream for the end cap detectors as they may have high rates from backgrounds and how might these problems be addressed. Can one raise the threshold of the detectors? This might be a serious problem in the low radius region near the beam lines and the detector design has a large fraction of the scintillators with one end of the detector in the small radius region.

Global trigger and readout

- We also had a presentation on the overall trigger and readout system and had a difficult time evaluating whether or not the Spartan6 FPGA had enough resources to support all of the needed chores it is supposed to do. In light of this, we recommend as soon as feasible a complete (or as complete as possible) system test of the overall readout dataflow.

BEAST II and commissioning

- In general, the plans and effort for the commissioning detectors look very good and the detectors look like they should be ready for the Phase I part of the schedule.
- One must remember that although there has been a good deal of beam pipe scrubbing prior to the BEAST installation there will still be above normal backgrounds due to continued scrubbing. With this in mind, we agree with the team that geometry simulation and background calculations will need to be made for the BEAST configuration during PHASE I, i.e. larger IR beam pipe, detector solenoid magnetic not present, no final focus magnets, etc.
- PIN diode system looks to be a nice, simple radiation detecting system. The temperature sensitivity of the PIN diodes was mentioned and we agree that this is an important point as it can significantly change the dark current value. PEP-II experience (Sullivan) was that temperature monitoring and correction was an essential part of the PIN diode system in BaBar even though the PIN diodes were mounted on a cooled beam pipe.
- The TPC neutron detectors look like a very nice system and should yield interesting results. There is some concern that other beam related backgrounds may swamp these detectors making it difficult to get clean neutron signals. We ask if it possible to test a detector with a known neutron source and another background source like a gamma source at the same time?

Other questions.

- It occurred to us that even after the electronics systems are complete there will need to be necessary maintenance to make sure the FPGA code and other firmware is working. Especially in the first year or two when the detector rolls on and beam conditions will be changing the most. But even after this initial time period the luminosity will be gradually increasing which may require adjustments to the firmware (especially in the trigger and global readout modules). We foresee some need for ongoing support for these systems.

Summary

- In conclusion, it looks like the electronics for the KLM readout and trigger are in good shape. The issues that are left are relatively minor. Again, we encourage completed systems tests with all modules as this should ferret out any remaining issues related to the overall system. It seems production procurement can get started while the overall system tests are being conducted. A shortage of manpower was identified in the presentation(s) and we see that as the most important issue to address as it also bears on the effort to complete full systems testing.
- For the BEAST II, the plan looks sound, the scope of work adequately planned and the manpower sufficient to complete the project on time.