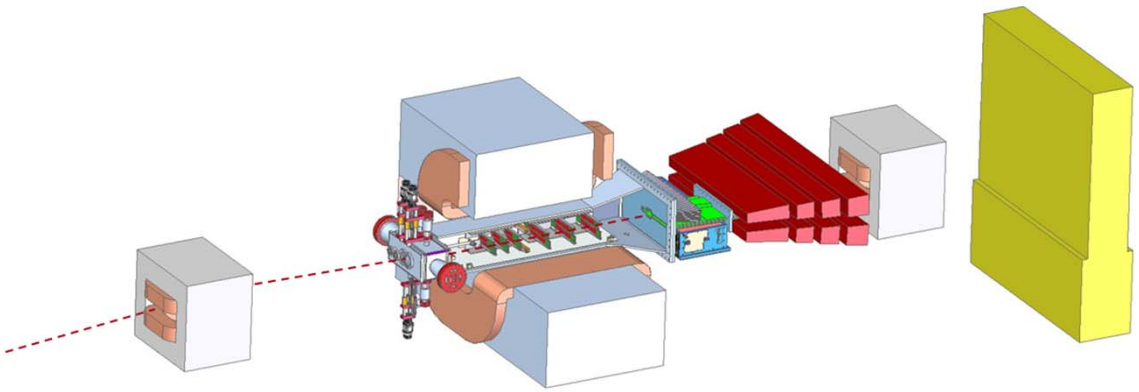

HPS ECAL review

Final Report

October 29, 2013

U.S. DEPARTMENT OF ENERGY
Office of Science

SLAC NATIONAL ACCELERATOR LABORATORY

Review Panel

Marco Oriunno	SLAC	Chair
John Jaros	SLAC	Co-Chair
Stepan Stepanian	JLAB	Co-Chair
Raphael Dupre	IPNO Orsay	Link person to the ECAL project
Michel Garcon	CEA-Saclay	External Reviewer
Elton Smith	JLAB	External Reviewer

Link to the Web Page of the Review with the agenda and the documents submitted to the Review Panel:

https://confluence.slac.stanford.edu/display/hpsg/ECAL+Review+Oct.17%2C+2013

Charge

SLAC

Thank you for agreeing to review ECAL Project of Heavy Photon Search (HPS) experiment. It is expected that electron beams for HPS engineering run in Hall-B will be available early October-November of 2014. The HPS collaboration aims to have detectors installed and ready for commissioning with beam in October of 2014. In your review, please evaluate how ready the ECal Project is to move forward to the construction phase, and towards the installation at JLAB by September'14. In particular, what would be the impact on the schedule implementation of a new large area APDs.

General Remarks

The Review panel congratulates the project for the quality of the talks presented, which addressed all the points in the Charge.

The ECAL detector is key for the success of the HPS experiment and clearly the number and the geographical distribution of participating institutes, all involved already in the Hall B, is one of the strength of the project.

The new APDs will indeed boost the physics performances and the project should go full ahead with such upgrade, implementing all the required measures to be ready for the installation in September'14.

1. Are the detector specifications clearly defined and reflect the physics requirements?
2. Does the detector design meet the required specifications?

SLAC

Findings:

The Project is an upgrade of an existing detector, with clear physics requirements, tested in the field during the Test Run, which corrects problems noted and extends capability. The proposed enhancements, Mother Boards, Light Monitoring System and New APDs, have low technological risks compared to the benefit of increased performances.

Comments:

1. Cross Talk simulations to complete the Mother Board design were not shown.
2. The space available and the constraints for the integration of LEDs on the crystals need to be checked soon. This geometrical issue should be looked at a little more closely in connection with the tolerances and position required for gluing the APD onto the crystals.
3. On some crystals the APD pin may be too close to the frame structure. The APD off-centering on the back of the crystal has to be clearly defined.
4. A cosmic trigger is planned to monitor and balance outputs from all the crystals, but a full design, including trigger and data acquisition requirements, was not discussed. The responsible collaborators have not yet been identified.
5. Tables for each subsystem, which state quantitative design goals for their major characteristics, as for example the LED wavelength, minimum and maximum input signals of the LMS, were not shown.

Recommendations: None

3. Are the interfaces with the other sub-system sufficiently understood, e.g. Beamline, Slow Control, TDAQ.

SLAC

Findings:

The Light Monitoring System is critical for the fast debugging and calibration of the individual channels.

Comments:

1. The LMS has interfaces with the Slow Control, the DAQ and the Software system, which were not shown.
2. No plan has been shown for what needs to be done for Ecal monitoring or trigger monitoring.

Recommendations:

A plan needs to be coordinated with the Software and TDAQ groups, responsibilities defined, and schedule generated.

4. Does the team have a schedule for the project that allows the installation of the calorimeter in September'14?

Findings:

The schedule is detailed and resource loaded, showing the readiness for installation by end of August'14, just one month before the expect delivery of the first beam.

Comments:

1. The procurement has been estimated to be four months long, with two weeks of tendering, pushing the start of work on the new APDs only in May. Some of the task need to run in parallel to achieve the installation goal by September'14, which need an high level of coordination. Working with the supplier on a staged delivery of the APDs and maximizing the possible preparation work before the first batch is available must be definitely pursued.

2. Leveling of the manpower at participating institutes, insuring that there are not overlapping commitments within ECAL and with other high priority projects at the local institutions, was not shown.

Recommendations: None

5. Is planning underway for initial "rough" calibration, final calibration, and commissioning? Who will have responsibility for these areas?

SLAC

Findings:

Only the most general overview of calibration and commissioning was presented. This area must receive additional planning, and realistic plans and manpower assignments will be needed in the future.

Comments:

1. A schedule of the Calibration and Commissioning off-beam has not been presented, which is key to the readiness of the detector by September'14
2. Details about the need of a Secondary Target for calibration purpose were not shown
3. Manpower to be responsible for rough calibration and final calibration has not yet been identified.

5. Is planning underway for initial "rough" calibration, final calibration, and commissioning? Who will have responsibility for these areas?

SLAC

Recommendations:

1. Establish whether there is need for a secondary target and define the integration details with the Beamline and the SVT project.
2. Develop definite plans for final calibration, including identifying people responsible for the calibration code and procedures, and plans to test these codes on Monte Carlo data.

6. Are there remaining issues in the project that require additional R&D and/or design changes?

Findings: None

Comments:

1. The Light Yield value used for the design with large APDs (10x10) is 25 p.e./MeV, which comes from past measurements and analyses of the cosmic ray peaks. This number may look inconsistent with other measurements done for other crystals like CLAS/DVCS
2. The dynamic range of the APD/amplifier combination would ideally allow running and calibrating at energies of 1.1, 2.2, and 6.6 GeV.
   Is this possible or must the dynamic range be set to accommodate 2.2 GeV running?
3. The LEDs can be sensitive to hadronic radiation. A 60Co source produces less than 1.5 MeV photons and is not effective at hadron production. Therefore, it is worth investigating at least in the literature the effect of neutron damage on these devices.

Recommendations:

The LY measurements must be repeated as soon as possible to define the right values to be used and remove the discrepancies.

7. Can the project adequately justify the cost and are the necessary funds secured?

SLAC

Findings:

The additional funding from INFN, which will lead to the possibility to upgrade the APDs, is acknowledged as a very positive step. The Costs are well detailed. Close cooperation between INFN and Orsay has been essential for funding the APD purchase expeditiously.

Comments:

Although many of the cost estimations are based on quotes, the contingency looks to be on the low side on the INFN funds. Contingency funds are available only at IPNO.

Recommendations:

Implement procedures to track carefully the schedule and the budget through the construction integrating efforts at both Orsay and INFN. Define local budget holders at the participating institutions.

8. Has a quality assurance plan be developed and put in place?

SLAC

Findings:

While not identified specifically as QA, detailed plans were discussed for measuring the performance of the APDs, crystal modules, and LMS.

Comments:

Additional QA procedures for any other aspects of the Ecal construction should be incorporated into the schedule and planning.

Recommendations:

None.

9. How will INFN and Orsay coordinate overall project management, budget shortfalls, manpower shortages, or schedule overruns?

SLAC

Findings:

The schedule with the new APDs is tight with many activities in parallel and different institutes involved, and will require an higher level of coordination.

Comments:

1. A project coordination group is in place, with plans for regular meetings to discuss issues which arise. Within INFN, additional coordination among the various participating institutions is planned to help divide the work load and monitor progress, and this coordination should be monitored and augmented as needed in the future.
2. The eventual reallocation of the regional budget and manpower, according the project needs during the construction phase is key, because of the tightness of the schedule.

Recommendations:

The PL should nominate regional coordinators at each participating institute, ORSAY, INFN, JLAB,