LSC Scientific Committee
17th Meeting
November 5-4, 2015
Canfranc Estación, Spain

Summary, Conclusions and Recommendations

The LSC Scientific Committee met at the Canfranc laboratory 5-4 November, 2015 to assess progress and to make recommendations on the experimental program. This meeting marks the first since Aldo Ianni became the Director of the laboratory. The Committee is very pleased with the new initiatives taken, particularly in the areas of safety (safety training has become an important component of employee development) the work to increase the laboratory visibility internationally, the new projects that he is bringing to the laboratory and the overall level of ownership that he has taken with respect to the lab. He has already attracted to the lab two new scientific initiatives with substantial potential for discovery. The renewed energy that he brings to the laboratory is welcomed by all of the committee.

The committee welcomes Mario Martinez as an external member of the committee. Dr. Martinez brings a wealth of experience to the committee as well as his perspective from the Ministry.

Excellent progress has been made in the three flagship projects for the laboratory. The procurement of crystals for ANAIS is progressing well, ArDM has completed a major physics data taking run and NEXT is making good progress in the final construction of the NEW detector.

While the experiments are making good progress, the committee does have concerns regarding the level of support at the laboratory. It is difficult to deal with such problems at times of financial pressure but there are some measures that would help at very modest cost. The laboratory operates with a very small staff and any loss would have very serious consequences. The risk of critical people leaving could be ameliorated by two small changes. First, the role of the safety engineer is critical to the laboratory. There is a position for such a person in the laboratory complement but the laboratory is not permitted to fill it. Instead, an engineer has been engaged in a temporary position. This should be changed to give the engineer normal expectations of tenure. Another person is filling a technical position but is, in fact, a qualified and respected scientist. There is a real risk that this person will be attracted to a more suitable position elsewhere if his position is not made more commensurate with his qualifications. Another action which would be very beneficial is if the 'local' University at Zaragoza could be more involved in the experiments and exploit better this outstanding facility. In particular, the ANAIS experiment has great potential to be a very visible project but it is seriously understaffed. Increased participation in this project would be very beneficial.

The committee has decided to change the format of the next review meeting. It will conduct more in-depth reviews of ANAIS, NEXT and ArDM to give sufficient time to look in detail at all aspects of these projects and to allow presentations by several of the collaboration members. Also, as CUNA is approaching a major decision point it will look at this in detail. The committee expects short written progress reports from the other projects but oral reports will not be required. The date for the next meeting was set as 16, 17 May 2016.

Comments on the project are as follows:

EXP-05 NEXT

The committee congratulates the NEXT Collaboration for the continuous progresses and the impressive achievements on the detector, electronics and Infrastructures.
Among the excellent work produced, the points listed below were particularly appreciated:

- The aggressive New schedule and installation campaigns that will allow to have, by the end of 2015:
    - Integration and cabling of the front-end electronics, commissioning of DAQ, and consequent tests of the tracking plane sensors
    - An operative gas system
    - The Energy plane calibration tests in Ar
- The aggressive road-map to winter 2016 that will permit:
    - The installation of the gas system and commissioning of the slow control
    - The installation of the field cage
    - Commissioning of the detector by March 2016 and initial results by the end of the year
- The effort of presenting an updated TDR of NEXT-100 by November-2016 meeting. If so, the construction of major parts of NEXT-100 could start in 2017. In this framework it was appreciated that no changes are foreseen for the FEE and DAQ.
- The effort invested in improving the infrastructures that will be fully commissioned by end of the year (in order to reduce the background, the collaboration plan to construct a Cu shielding hub)
- Progresses of the NEW detector:
    - NEW vessel: it has been certified for operation with pressure and it is installed on its platform enclosed by a fully-functional lead castle.
    - Energy Plane (EP): is completed and was successfully tested up to 15 bar! Only one out of the 12 PMT broke and will be investigated in the incoming future
    - Tracking plane (TP): all 33 Dice Boards are tested and ready to go with all the necessary services (just 1 SiPM out of 2000 failed). Noticeable that all feed-through were tested and are qualified
- FE electronic: all ready and tested

- Read-out and DAQ electronic: all ready and tested
- Gas system: all parts are in hand, will be assembled, will undergo internal and external refereeing and will be certified by Cryvoc by February 2016. A risk analysis will be performed afterwards.
- Gas system safety and control protocol: A very detailed and complete protocol was presented; it will allow monitoring all relevant parameters that can jeopardize the good functioning of the system and will take immediate safety actions

Together with many achievements, some concerns emerged during the review. The reviewers solicit clarifications, or follow-up, on the items listed below:

- NEW requires the construction of a sealed containment around the NEW detector shield fed with radon reduced air. Details of this system need to be worked out with the Lab management.
- The gas Slow Control system needs to be finalized and commissioned
- The HVFT just arrived from Cryvac; it is not up to specifications and has to be returned to the company. A second piece will arrive next week but the break-down tests have still to be performed and the connector has still to be qualified. The field cage is expected to be operative in March
- Computing and infrastructure: the radio link of 32Mb/sec is insufficient to send data to IFIC and should be improved. This item might take time since it depends on the Jaca region and not only on LSC. A back-up solution needs to be put in place.

The scientific committee acknowledges the large efforts and huge progresses made by the NEXT Collaboration in the assembly of NEXT-NEW a flagship project of the laboratory.

The schedule for bringing this project into operation is aggressive and to be successful, it needs to be carefully coordinated with the laboratory. The committee urges the experiment to provide a detailed plan to the laboratory, including milestones at which the safety analyses will be available for the lab's review. Adequate time for such reviews must be included in the plan.

The committee would also like to see the criteria for filling with enriched xenon documented together with criteria for moving towards NEXT.

Infrastructure

In addition to the reports from the experimental projects, the committee received accounts from the lab staff on chemistry developments and the low-background gamma counting facilities. The main focus of the chemistry program has been the development of ultra-low background copper formed by local electrodeposition of copper from purified baths. This is a material in great demand for low background experiments especially if the copper is formed underground so the cosmogenically produced radioactivities are not present. There are also plans for a general purpose

assay facility based on an ICPMS device. The committee welcomed this as a very valuable tool for low background experiments but urged the Laboratory to consider carefully the general infrastructure required to do the sophisticated sample preparation to properly exploit such a device. The Lab has assembled an impressive array of germanium detectors for low background counting applications. The Committee was pleased to see the professional way this is being handled and in particular it was pleased to see improvements in the facilities for safe sample changing.