

LSC Scientific Committee

18th Meeting

May 16,17 2016

Canfranc Estación, Spain

EXP-05 NEXT

The committee wants to congratulate the NEXT Collaboration as it has shown to be able to keep the extremely tight schedule concerning the detector construction and the Xe measurement preparation.

The committee appreciates the continuous progresses and the impressive achievements on the infrastructures, on long standing critical items of the detector, on calibration and data analysis and understanding the possible sources of backgrounds.

Among the excellent work produced, the points listed below are particularly relevant:

- The installation of airborne Radon suppression system as part of the LSC infrastructure
- Impressive progresses on the infrastructures and the excellent work performed to install and commission the gas evacuation plant.
- A very detailed tuning and commissioning of the control system, the starting, default and failure modes
- The careful and detailed safety and risk-assessment tests and analysis that were performed in synergy with the laboratory support
- The almost thorough completion of the NEW detector, including some promising innovations:
 - The implementation of line-base restores to improve for the energy plane signals
 - The improvement of the field cage design which is now enriched with safety grooves in the buffer region
 - The smart development of a home-made HVFT that was successfully tested up to 30 kV at high pressure
- The nice results obtained with the tracking plane SiPM
- The large effort and excellent organization of the DAQ, simulation and data analysis teams
- The convincing strategy adopted with Kr and other sources in order to calibrate the detector response and estimate the energy scale and the resolution

- The continuous effort and large campaign to screen materials, understanding the possible sources of backgrounds, the strategy and monitoring plans for the radon-induced background
- The development of a rich background model, based on GEANT4 and on the results of the screening campaign, which takes into account the sources relevant both for the zero- and two-neutrino channel. In this aspect, we invite the collaboration to deepen some aspects of the model and of the detector-response simulation that seem to predict the questionable existence of a double-escape line in a position where it is not expected

In this context, the prospect to run the NEW detector with Xe in a few weeks (from June 17th) is realistic, since only three elements are lacking but their implementation looks imminent:

- A cryo-bottle for gas recovering
- The method for the baseline restore of the PM signal, to be accomplished offline at the digital level
- The completion of a new version of the field cage with the aforementioned innovations

Beyond the NEW and NEXT100 program, the committee appreciates the very challenging R&D on barium daughter tag, based on the use of an organic molecule with a high specificity for Ba, that would lead to a complete background rejection in large-scale ultimate experiment.

On the organizational side it was strongly appreciated the sound organization of the Collaboration.

In particular, the committee appreciates the strategy to strengthen the American contribution, marked by the new position of David Nygren as co-spokesman of the collaboration. There are in fact the elements for an enlargement of the American component. There is a rising interest in the experiment by the US Universities and the opportunity to have access to R&D NSF/DOE funds that will be available this year to define the neutrinoless double beta decay search strategy in view of a technology down-selection foreseen in 2018/2019. NEXT has the means to compete successfully in this context, especially if the expected performance of the NEW detector in terms of energy resolution and tracking are achieved.

The committee did not identify any substantial problem and therefore encourage the NEXT Collaboration to concentrate on the incoming data taking-analysis period, to successfully measure the electron life-time and the stability of the system, the background rejection power, validate the Monte Carlo simulations and proceed full speed to update the NEXT-100 TDR by the end of 2016.

The committee however would appreciate the set-up of a clear list of milestones to be accomplished during the natural Xe operation of NEW before moving to the enriched Xe phase, involving both technical and scientific aspects (gas safety system, energy resolution, tracking performance).

Equally important will be to carefully evaluate the transition to the NEXT-100 era in term of efforts, funding, solving critical steps that might rise in running NEW and demonstrate the expected performances of NEXT-NEW. The committee acknowledges the intention of the collaboration to proceed, in parallel with the NEW operation, with the completion of the NEXT-100 apparatus within

2018, even in absence of fresh new funds. To assess the feasibility of this, the committee looks forward to receiving an updated TDR at its fall meeting together with a statement of available resources.