

LSC Scientific Committee

23rd Meeting

12, 13 December 2018

Canfranc Estación

Summary, Conclusions and Recommendations

Introduction

The 23rd meeting of the LSC Scientific Committee was held at Canfranc 12, 13 December 2018. The focus of the oral presentations was on the larger projects so that adequate time could be spent reviewing these. Project making presentations were ArDM, TRES-DM, ANAIS and NEXT. In addition, presentations were made by 3 groups submitting Expressions of Interest. The topics were DART (an extension of the ArDM program), DAMIC (a dark matter search using CCD's) and a new low background materials screening proposal. In addition, written reports were received from SuperKGd, CROSS, ETSEC and GEODYN.

The committee was very pleased with the overall level of progress being made by the major projects and no serious concerns arose in the course of the review.

This meeting was the first for which the laboratory was under the Directorship of Carlos Peña Garay. The committee is very pleased to learn that Dr. Peña Garay is resident at the lab. It is a little early to tell whether the good progress observed is correlated with the increased presence on site, but the committee feels strongly that this will be of great benefit.

The next meeting of the committee was set for 12, 13 June 2019.

NEXT EXP-05-2008

The Committee was very pleased to see the solid progress made by the NEXT collaboration in resolving all the technical problems with the detector. The detector is now producing data of high quality using the depleted xenon. It is very gratifying to see the effect of using radon free air around the detector. This reduced the background rate by a factor of two. Additional lead shielding also gave about a factor of 2 reduction. The committee is satisfied that all of the conditions set for introducing the enriched xenon have been met. Specific criteria were as follows:

- 1) A demonstration that 2.614 MeV gammas can be detected with an energy resolution compatible with the predicted resolution at Q_{th} . The data display a clear peak at 2.614 MeV with a resolution of about 1% FWHM. This is a world leading resolution for xenon and very close to the anticipated resolution for the project.

2) A background spectrum that is understood by comparison with a background model. This has been achieved for the high energy part of the spectrum. At the lower energies there is clear evidence for more ^{60}Co than expected from the radioactivity measurements. This does not impact the search for neutrinoless double beta decay but is being investigated further.

3) The background spectrum filtered with a 2-electron criterion. This should very selectively pick out the 1.59 double escape peak. This has been demonstrated. The selectivity is not as good as the earlier Gotthard tunnel data but in that experiment additives were used in the xenon to reduce diffusion but these kill the scintillation light so are not acceptable in a detector such as NEXT.

4) A comparison between the spectrum obtained for the background and that expected for the double beta signal. This has been provided in the presentation. The signal does not dominate at any energy but a comparison between the run with depleted xenon and enriched xenon should provide a measure of the 2 neutrino double beta decay rate with reasonable precision.

The committee were satisfied that the project met the conditions and should be allowed to use the enriched xenon.