

Notes on Annual LARP/CERN Meeting 2011

Eric Prebys, 08-FEB-2011 (*updated, 08-MAR-2011*)

Annual LARP/CERN meeting was held on February 4, 2011 at CERN. The goal was to brief CERN on LARP activities and get feedback regarding the most effective use of LARP resources. Because of the time, it was also an opportunity to discuss the impact of any of the recommendations at Chamonix.

There were two presentations, which can be found here: <http://indico.cern.ch/conferenceDisplay.py?confid=126247>

The first talk covered accelerator related activities and personnel programs, while the second concentrated on the magnet program.

We discussed the Chamonix meeting, and whether any of the presentations and proposals made there have any relevance to LARP. We agreed that although the energy proposal was the most anticipated, it has little direct bearing on our activities.

The decision to delay the joint consolidation shutdown until 2013, and its implications on longer term plans will affect a number LARP activities. Most immediately, the delayed shutdown should allow time to test the rotatable collimators, in spite of the delays experienced by that project.

Based on the observed performance of the LHC so far, revised luminosity estimates put the potential peak luminosity at $2-3 \times 10^{34}$ Hz/cm², which raised the questions whether the luminosity goals of HL-LHC can be met without major changes to the current machine. However, under any scenario the existing triplets would reach their radiation limit and simply replacing them would not be practical as the new lifetime would be much shorter. The base line plan is still to use new triplets based on Nb₃Sn with larger gradient/aperture and significantly higher radiation lifetime, which should be ready for installation by 2020.

Of other interest at Chamonix was the presentation of possible alternatives to the crab cavities, however, it was strongly confirmed at our meeting that crab cavities remain the base line approach to high luminosity.

In our discussion of the LARP personnel programs (LTV and Toohig), everyone agreed that by and large, LARP personnel had been very effective and were greatly appreciated by CERN, and also that the visitors had received excellent support from CERN. It was suggested and agreed that it would be useful for Steve Myers and Rolf Heuer to draft a letter to this effect to be sent to the Office of HEP.

Generally, it was felt that all LARP instrumentation was delivered and working well, and that the hand offs to CERN were either complete or proceeding smoothly.

One issue that was discussed at some length was the relative importance of the high bandwidth feedback system proposed for the SPS. This is an area that has generated a lot of interest and was mentioned specifically at Chamonix; however, it would also potentially require fairly significant resources, so it's important to get some idea how likely it is that such a system would be implemented. It was agreed that we did not have enough information to answer this question on the spot, but that we would try to resolve it in the near future.

The current status of the rotatable collimator effort was presented. There have been some delays related primarily to the bearing system, and now the delivery to CERN is anticipated for March. In this sense, the delay of the joint consolidation shutdown is very fortuitous. In general, it is felt that the unexpectedly low loss rates in the LHC may reduce the overall scope of the collimation system, but it is still believed that if the rotatable collimators pass the proposed tests, they will likely replace the Tungsten collimators near the experimental regions.

The future of the crystal collimation effort was discussed, and it was agreed that it was good physics for a rather small investment, and that it was particularly interesting for the high intensity ion program.

CERN considers the study of hollow electron beams an interesting R&D activity for the beam halo removal in hadron colliders with potentially important applications for the LHC. The proposed technique is still at an early stage of development and it is therefore too early to speculate at this stage on the likelihood of installation into the LHC. CERN therefore fully supports a continuation of the related studies within the USLARP Framework.

Renewed interest has arisen in wire compensation. LARP established several years ago that this was a promising technology, but that the next step was a mechanical design, so there has been no activity in this area for some time. Therefore, we did not have enough information to decide whether we would be interested in or have the resources to pursue further work in that area.

We reported that LARP had made good on its commitments to the PS2 white paper and some of the effort in coherent effects had been redirected toward the PSB. There was some discussion of the future of this effort in the light of the recent interest in a rapid cycling synchrotron, but no clear decision was reached.

There was some lively discussion about the near term future of the crab cavity program. Of particular interest was the time scale for a down select, and the issue of whether any proposed solution should be capable of working in either plane. It was noted that while the Lancaster design and the JLab design are supported by separate funding, the SLAC design had been supported largely out of SLAC general accelerator R&D funds, which would likely be reduced in the future. Formulating a plan in this area is an important action item.

The magnet presentation and discussion stressed the integration of the LARP magnet R&D activities into the overall plans for the HL-LHC upgrade. Successes in 2010 included the 4 m long, 90 mm LQ reaching 220 T/m, and the first tests of the 1 m long 120 mm HQ, which achieved more than 155 T/m at 4.5K, surpassing the intrinsic limits of NbTi at 1.9K.

The general plans are to complete the LQ program, correct the performance limitations observed in the 1 m HQ, and then demonstrate the capability to scale-up this design to 4 m length (LHQ). . The next logical step after that would be an actual prototype of a magnet with the final aperture. For that reason it was stressed that the aperture of the focusing quads in the HL-LHC should be determined by the end of 2012.

It was also stressed that although knock on effects from the delay of the joint consolidation shutdown would almost certainly delay the HL-LHC upgrade, the schedule for the development of Nb₃Sn quads remains tight. The key milestones and contributions by both USLARP and CERN required for completion of the R&D, infrastructure, prototyping and production were presented at the meeting. This magnet plan has been formulated in close collaboration with CERN, and the discussion confirmed the general approval.