ELI - Nuclear Physics Executive Committee Meeting
IFIN-HH, Bucharest - Magurele
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Summary

Prof. Adrian Curaj, the president of the National Authority for Scientific Research, expressed the support of the Romanian Authorities for the ELI project and their will to submit the Romanian proposal to the European Commission this year, together with the other two proposed ELI pillars in the Czech Republic and Hungary.

Prof. G. Mourou and G. Korn presented the latest news concerning the ELI Preparatory Phase FP7 Project: at the recent Meeting in Berlin, the main structure of the final report (ELI White Paper) has been defined and editors nominated. It has to be, to the largest possible extend, a *site non-specific* TDR (Technical Design Report) - CDR (Conceptual Design Report), having the role to demonstrate that the 3 national proposals are part of the same infrastructure.

J.P. Chambaret and G. Korn presented the technological options available and the bottlenecks to be overcome for the construction of the '10 PW Ti-Sapphire-based' Lasers for the Romanian ELI-NP Pillar. As a conclusion, the construction of a prototype of 5–7 PW is possible before the end of 2013, but however huge R&D effort has to be launched very soon in order to make possible the construction of reliable 10 PW units before 2015.

The Scientific Case of ELI-NP, a draft version of almost 90 pages, was distributed in print form to the participants and summarized in the presentation of D. Habs, Chair of the Experiment Working Group. The report was prepared with the contribution of many people from various laboratories throughout the world, demonstrating that the ELI-NP can count on a large international user community. The proposed experiments, separated in 3 categories – i) experiments with high intensity lasers and accelerated particles ii) experiments with gamma beams and iii) experiments using both systems – cover a broad range of science including new nuclear physics, astrophysics, fundamental high field physics as well as applications in radioactive waste management, material science and life sciences. A staged development of ELI-NP and its experimental instrumentation was proposed, as well as a flexible design of the facility allowing for future extensions.

The report of the Gamma Source Working Group was presented by G. Wormser. High-flux, high-brilliance, low bandwidth gamma beams will be obtained through Compton backscattering of optical photons on relativistic electron bunches. Two main options were compared: electron bunches produced by a warm LINAC, circulated in a storage ring and periodically refreshed versus superconducting ERL (Energy Recovery Linac) which accelerates continuously fresh bunches and sends them in a loop while decelerating and recovering the energy of previously accelerated bunches. Both solutions were intensively debated, emphasizing the characteristics they can offer with reference to the proposed

experiment requirements. The later allows for higher brilliance and narrower gamma energy dispersion but has associated higher price and higher risks, since ERLs of desired beam energies and intensities are still in R&D stage around the world. R. Hajima presented the ongoing construction of JAEA 17 MeV-ERL and gave a price estimate for a 2-loop 1 GeV ERL, a large part of the costs representing the cryogenic system. The absence of local expertise in this technology was considered by some participants a factor increasing the cost, as it implies either to built and train a team or to adopt a more expensive 'turn key' system. The strict deadline for funding availability (2015) was another argument in favour of a lower risk solution than the ERL solution which is still in the R&D stage. During the debates, it was underlined that the ELI-NP pillar may be a worldwide unique facility just because it will allow combined experiments both with 10 PW lasers and with brilliant gamma beams. In this respect, the solution applied by C. Barty at LLNL, using a low pulse repetition rate warm LINAC without storage ring to produce high peak brilliance gamma beams could be easily scaled for larger energies and was considered an attractive solution for ELI-NP.

The report of the Civil Engineering Working Group was presented by M. Gross. The proposed layout of the facility was discussed together with the key points having significant impact on design and/or costs, emphasizing that this layout needs to be addressed by the other working groups as well. Even supposing that the local building costs were lower, they would still represent a large part of the total costs and would call for reduction and optimization of areas. Costs for control systems, licensing and overheads will have to be included.

Conclusions

- The ELI-NP proposal has to be ready this year.
- Two arms of 10 PW Ti-Sapphire-based APOLLON laser is a minimum request of experiments, with a possibility for a future upgrade to 4 arms in the second stage.
- All the 3 options for electron accelerators are opening extraordinary possibilities to the ELI-NP pillar. All of them are within the goals of the pillar, but the ERL solution which is still in the R&D stage could be risky due to the strict deadline 2015 for finishing the ELI-NP facility. Further comparison is needed to decide upon the best solution considering the various aspects discussed during the meeting related to the characteristics required by the experiments and the feasibility of complying with the deadline of the construction till 2015.
  The conclusion drawn in the subsequent discussions was that the best choice for the ELI-NP gamma source is a warm LINAC accelerator of 600 MeV in the first stage (2011-2015) and, afterwards, in the second stage (after 2015), an upgrade in energy and intensity, with a very good bandwidth, using the best solution available at that moment.