

Executive summary

European Strategy Plenary Session

Salamanca, 29-31 October 2018

Energy Frontier

■ **The LHC program**

- The LHC programme and its upgrade HL-LHC are the highest priority of our Spanish Community. Therefore we believe that the full LHC/HL-LHC operation and the exploitation of its physics programme should be the first priority of Europe for the next years.
- Many important open questions in the SM are related with Flavour Physics, B-physics should represent an important ingredient of the LHC and HL-LHC physics program. The b-physics Spanish scientific community prioritizes the participation in the LHCb experiment over other options.

■ **Beyond the LHC physics programme**

- The present ILC proposal, conceived as a Higgs factory at 250 GeV centre-of-mass energy with potential upgrades to higher energies, is positively seen by the community. The scientific program is sound and the project is realistic and feasible. In general the community prioritize an e^+e^- collider extendable in energy and capable to reach at least 550 GeV. At this level both e^+e^- proposals, ILC and CLIC, are supported with a preference for the ILC as a more mature technology and for its faster implementation.
- If the Japanese government supports to construct and to host the ILC250, the Spanish community is eager to participate in this new endeavour. A possible future contribution from Spain to ILC250 should be negotiated in close collaboration with the rest of interested European countries. The participation of the CERN lab to this possible European contribution in technology and science as well as logistics is considered essential.

▪ **Beyond the LHC physics programme (cont)**

- FCC-hh is the next ambitious CERN proposal. It is scientifically sound and technologically credible in reasonable time scales. A strong R&D programme to develop the needed technologies for the future CERN projects is mandatory and fully supported by the Spanish community. This includes detector and accelerator R&D. In Spain, the development of high-field superconducting magnets for either HE-LHC or FCC-hh is our main line of activity.
- The various FCC phases (e-e, h-h, e-h) currently in the program could be adjusted to the evolving international scientific panorama. Moreover, the similar China proposal on a circular collider could have a definitive impact. Effort should be paid to integrate Asia strategy in the global HEP vision.
- For the HE-LHC and FCC-hh proposals the Spanish community understands that at this stage both projects need to develop a common technology mainly for high-field magnets. For the period of the next 4-5 years no urgent need to prioritize is felt. The results from HL-LHC may also help finding the best balance between physics potential and available resources.
- R&D in novel acceleration techniques is considered a must for the future of the field. The AWAKE program should be completed and complemented with other initiatives (plasma wakefield acceleration, muon collider, etc.). A coordinated R&D program between CERN and the individual national initiatives should be consolidated in reasonable time scales.

Neutrinos in accelerators

- A solid neutrino oscillation physics program is being established at Fermilab for the construction and operation of the DUNE long-baseline neutrino experiment with a strong involvement of the European neutrino physics community, in which CERN plays a central role. The neutrino national community considers of high priority for the next years to support and enhance the Spanish participation in this program.

Beyond Colliders

Astroparticle physics, Multi-messengers, Cosmological Surveys

- The Spanish community is aligned with the update on long-term strategies put forward by the Astroparticle Physics European Consortium (APPEC) at the beginning of 2018. We endorse the societal, organizational and scientific recommendations issued for the period 2018-2026.
- In the multi-messengers era, astroparticles experiments and cosmological surveys are taking a leading role in the understanding of the universe. We strongly support a larger involvement of CERN in future Astroparticle Physics endeavors through a sharing of the technological know-how, infrastructures and human resources. We encourage the development of coordinated actions in areas of common interest like theory, R&D for new detector technologies, open data, education and outreach.
- We stress the importance of coordinating the efforts of the Spanish groups, and to guarantee a continuous and unconditional support to the big infrastructures installed in our country (i.e., Canfranc Underground Laboratory, Observatory of El Roque de los Muchachos).
- To secure the contribution of the Spanish community, we recommend to set a coherent program of funding such that our community can contribute to the construction of future large scale experiments. As well as to foster the rich program of measurements and detector R&D to study dark matter, axions and the nature of neutrino and its mass. We also support the active participation of Spanish groups in the current and forthcoming cosmological surveys (both satellite-based and ground-based)

Theoretical Physics

- To be completed ...

Nuclear Physics

- To be completed ...