**Report on HALHF Workshop, Ettore Majorana Centre, Erice, Sicily, October 4-7, 2024**

The workshop was attended by 24 scientists, all but two of whom stayed for the full period. The workshop began with a series of plenary presentations, which set the scene for the discussion to follow. After an introduction, talks were given on the following subjects:

1) Physics expected from a Higgs Factory, and the special constraints it placed on detectors;

2) The global collaboration towards a plasma-based linear collider, both as a Higgs factory and at much higher energies, wth emphasis on the US situation;

3) An overview of the global facilities in which HALHF-related R&D could be carried out;

4) A new baseline proposal for the HALHF project. This was the key talk that set out the programme for the rest of the workshop. Several changes were proposed, some of which were agreed by the end of the workshop. Others caused lively discussion, as detailed below;

5) The status of the SPARTA project, an ERC-funded project with aims which match closely with those of HALHF, was described;

6) Possible application to HALHF of structured wakefields using dielectrics was described;

7) Synergies between HALHF and the XCC project, to build a gamma-gamma collider using X-ray Free Electron Lasers Compton scattering from electron bunches, were discussed.

The questions to be covered in the workshop were outlined and working methods agreed.

The questions were:

1**)**RF linac designs: constraints and costs of drive-beam linac and positron linac;

2) Beam-driven RF/SWFA as cost-effective alternative for the positron linac;

3) BDS: shorten, collimation, include positron source;

4) The upgrade ladder: demonstrators, default energy, XCC, path to 10 TeV;

5) Plasma-linac design: staging, driver distribution;

6) Plasma-linac design: polarisation, beam-quality preservation, tolerances;

7) Plasma generation, heating, cooling and power flow, efficiency;

8)Physics/detector constraints, including coherent pairs.

Each question was addressed twice in parallel sessions, with two sessions running in parallel. At plenary meetings at the end of the morning and afternoon sessions, progress and important points were picked up and discussed. Each morning and afternoon session began with a plenary with selected topical issues were presented and discussed. After a final parallel session, the last day was held in plenary, in which reports on each of the discussion questions were presented, next steps were discussed and an outline of the paper to be submitted to the European Particle Physics Strategy Update process was discussed.

Some changes to the baseline, including separation of drive-beam and positron linacs and reduction in the plasma density, were agreed. Other important realisations were that the design of a plasma cell that is capable of dealing with the heat generated by the necessary beam power is a difficult problem that must be addressed urgently. Other subjects, such as the development of a Monte Carlo suite capable of simulating the asymmetric detector required for HALHF and many aspects of the electron plasma accelerator arm, are making good progress. A great deal remains to be done but all agreed that the workshop had been tremendously productive. All the participants extend their sincere thanks to the Ettore Majorana Centre for their hospitality and providing excellent facilities, which catalysed and facilitated the intense discussions that took place throughout the workshop, in which every participant was deeply engaged.