Future Colliders and European/Spanish Strategy thoughts

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Things we can agree on

- **Completion of the HL-LHC program:**
  - Discovery of new physics around the GeV, ~100 GeV, few hundreds of GeV or couple of TeVs can totally change the focus of the "best" new facility to built
- **We need to increase our commitment/participation in Future Collider activities**
- **In terms of European strategy, we want to maintain the current leading role ot CERN in HEP. Assuming no new physics at HL-LHC:**
  - We support the construction and exploitation of a Higgs/EW/Top factory at CERN
- **We have invested large efforts until now in ILC/CLIC studies and related detectors/accelerators technologies:**
  - Should a linear collider facility be made somewhere in the world, the Spanish community would like to participate according to personpower financial possibilities

Then, my views...

- **We need to separate several aspects in the discussion:**
  - Physics, timing, cost, maintenance of community, technology
  - But we should not design a strategic “physics” plan using pure technology targets or our past involvement/activities/inertia

- **PHYSICS: the accelerator I would have more fun with is CLIC. However I believe that the best option from the physics point of view is FCC:**
  - The key reason is that FCC provides the most comprehensive indirect+direct exploration of the 10 TeV scale under the assumption that HL-LHC has (almost) excluded any kind of physics up to the ≈ 3 TeV scale.
  - This considers the FCC-ee + FCC-hh as a whole, not just a Higgs factory step. A simple Higgs factory step (including CLIC) will not be enough. We can not decouple the lepton collider step from further exploration via a hadron collider.

Then, my views...

- **PHYSICS (cont.):**
  - In the absence of any new physics from HL-LHC, the FCC-ee step will provide the best:
    - measurement of Higgs from 240+365 GeV running
    - ultimate measurements of SM parameters (masses, couplings, sin2theta)
    - coverage of universal tree-level deviations from the SM at the 10 TeV scale
    - factory for heavy flavour, tau and very rare decays
- **Maintenance of HEP community:**
  - Obviously the FCC is the best choice: 4 experiments at FCC-ee, 2+X for FCC-hh, long-term program for 20xx century.
  - The challenge is to maintain the program “exciting” in time, but this is also a challenge for other accelerator options, which should envisage a continuation of the physics program beyond a Higgs factory.

Then, my views...

- **Timing:**
  - I feel that the FCC-hh step arrives too late in time (assuming no new physics found before). But getting it earlier implies cutting other steps (HL-LHC, Higgs factory) and involves more resources

- **Cost:**
  - First, should we really enter this discussion ? Is it our job ?
  - Too early to judge on a financial model for the FCC, which will only be ready in March 2025. We can only discuss our positions “assuming” that the project is financially feasible
  - We can not compare pears and apples, i.e. a Higgs factory-only program with the complete FCC (ee+hh) program. A comparison of ILC/CLIC with FCC-ee only does not make sense (not even from the physics point of view).