

# FCC-LPNHE monthly meeting

Luc

- |                                   |                  |
|-----------------------------------|------------------|
| • Conseil scientifique 19/11/2020 | Luc, All         |
| • Feedback general                | Luc              |
| • FCC_France news                 | Greg             |
| • Snowmass feedback               | All              |
| • Ongoing activities              | Bogdan, Giovanni |
| • Budget                          | Luc              |
| • AOB                             |                  |

NB: Alain not available for this meeting

# Latest news: ESG strategy

P. Janot [indico.cern.ch/event/954922/](https://indico.cern.ch/event/954922/)

## □ ESU 2020, CERN-ESU-013, High-priority future initiatives

- ◆ An electron-positron Higgs factory is the highest-priority next collider. For the longer term, the European particle physics community has the ambition to operate a proton-proton collider at the highest achievable energy.
- ◆ Europe, together with its international partners, should investigate the technical and financial feasibility of a future hadron collider at CERN with a centre-of-mass energy of at least 100 TeV and with an  $e^+e^-$  Higgs and EW factory as a possible first stage. Such a feasibility study of the colliders and related infrastructure should be established as a global endeavour and completed on the timescale of the next Strategy update.

## □ ESU 2020, CERN-ESU-014

- ◆ It is important to launch a feasibility study for such a collider to be completed in time for the next Strategy update, so that a decision as to whether this project can be implemented can be taken on that timescale. The feasibility study should involve the following aspects: the possibility of construction such a large infrastructure in the vicinity of CERN, the financial plan to complete and operate a project of this scale with international partners, its governance, and the handling of the energy consumption.
- FCC integrated programme prepares for both:  $e^+e^-$  Higgs and EW factory as a possible first stage, and highest energy hadron collider at ultimate goal.

# FCC project milestones

P. Janot [indico.cern.ch/event/954922/](https://indico.cern.ch/event/954922/)

## □ Infrastructure and Machine

## Physics, Experiments, Detectors

(exact dates to be discussed in the coming months)

Milestone / activity	Target date	Possible timeline
First $e^+e^-$ collisions in FCC-ee	2040	FCC-ee detector commissioning
Start machine installation	2037	Start FCC-ee detector installation
Tunnel completion	2035/36	
Start tunnel construction	2030	Start FCC-ee detector construction
Project approval	2028	FCC-ee Detector TDR's and approvals
Next ESPPU	2026/27	
Key prototypes (feasibility proof)	2025/26	FCC-ee Proto-collaborations and Lol's
CDR++/TDR (feasibility proof)	End 2025	CDR++ (Common work) Physics, Software, Technologies, R&D

CERN **MTP** (Mid Term Plan) financing for **2021-2025** (5years)

- 163MCH for future colliders (**120 FCC** 33 CLIC 10 muonC)
- **154MCH** for R&D **machine** (eg High Field magnets for hh), incl. 50 for FCC-ee
- **53MCHF** for **Detectors** R&D

# Conseil Scientifique

- 19/11/2020
- External Rapporteur : Isabelle Wingerter-Seez
- Timescale
  - Agree today on structure document
  - Draft distributed among us for comments 12/10
  - Goal: ~10 pages document to Isabelle 19/10 (3 weeks from now)

# Document structure for CS (1)

## Executive summary

### 1.General framework

- Situation at the end of HL-LHC
- ESG recommendation
- Future colliders projects

SM/BSM

Context/Precision/Reach

ILC/CepC/FCC/wrt ESG

### 2.FCC project

- Machine
- Physics potential
- Detectors
- Timescale & Organization

Presentation/ee/hh/eh

ee/hh/eh

Baseline for ee/for hh

Overall timescale/Next 6yrs

### 3.FCC in France

- Organization
- Interests
- Activities

# Document structure for CS (2)

## 4. FCC at LPNHE

- Motivations
- People, Implications & responsibilities
- Physics & performance involvement
- R&D prospects

Why FCC/Why now

Lols Snowmass/Other

Timescale/Directions

## 5. Requests

- Now
- In 2 years

## 6. Conclusion

## 7. References

CDR, Lols,...

# MC/Simulation tutorials

- FCC-ee/hh
  - Organized by C.Helsens & G.Ganis
  - day 1: Sept 22nd at 16:00 CERN  
<https://indico.cern.ch/event/945608/>
  - day 2: Sept 23rd at 17:00 CER-  
<https://indico.cern.ch/event/945608/>
  - day 3: Sept 29th at 16:00  
CERN <https://indico.cern.ch/event/949950/>
  - All recorded

# Snowmass2021

- Submitted LoIs available at <https://indico.cern.ch/event/951830/>
- Implication in 5 Accelerator frontier LoIs (AB), 11 in Energy frontier, eg
  - Perspectives for high-precision  $\alpha_s(m_Z^2)$  determinations from  $e^+e^-$  measurements at FCC-ee (BM,AB)
  - High-precision  $\alpha_s(m_Z^2)$  determinations from FCC-ee  $e^+e^- \rightarrow$  hadrons data below Z peak (BM,AB)
  - Higgs boson coupling measurements to charm quarks at FCC-ee (GB, GM, AB)



# Ongoing activities

- Ongoing activities
  - H to cc/bb/gg
  - $\alpha_s$  measurement at Z pole
- Interest?
  - Precise granularity & energy resolution needs for EM calorimeter
    - Mostly done for CDR at ZH
    - At Z pole, does it change? (eg B physics, tau physics)
- Question
  - Is there for FCC-hh the equivalent as for FCC-ee (Physics cases, benchmarks,...)?

# Budget

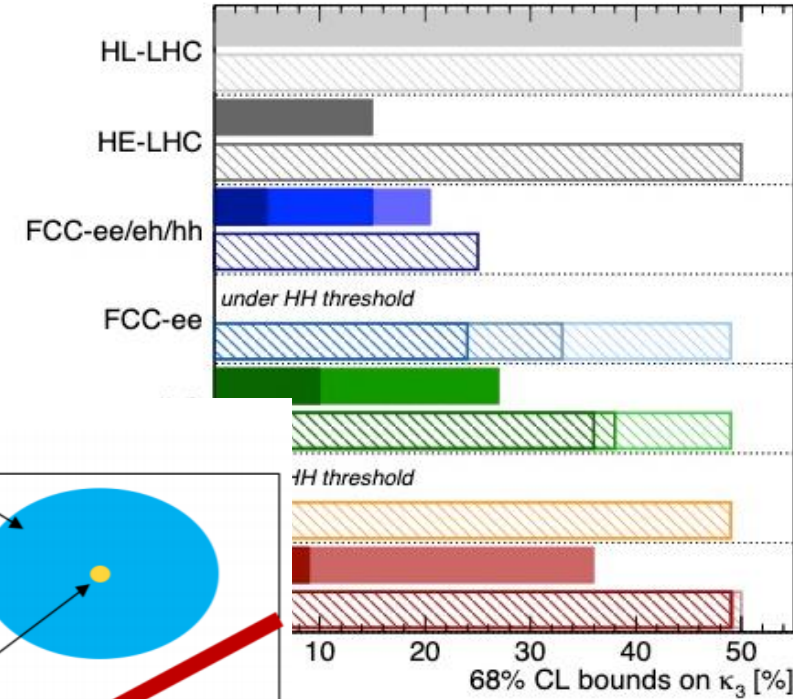
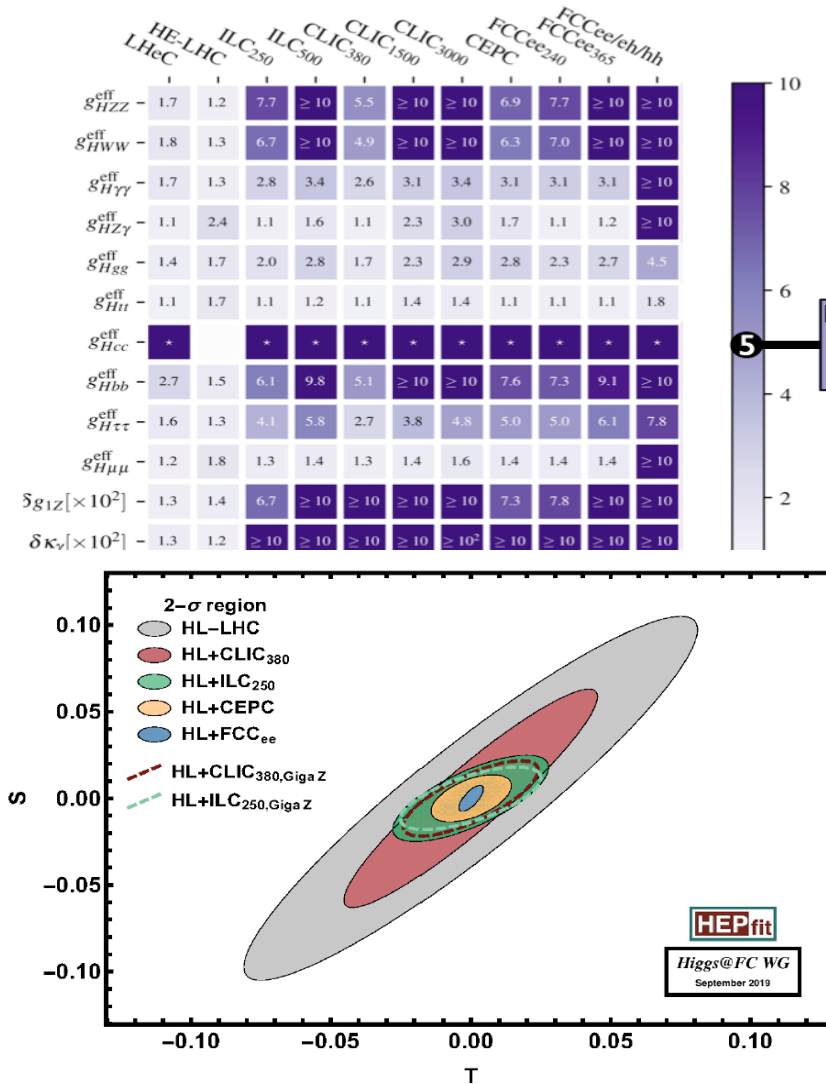
- Submitted to DIALOG for 2021
  - 7k€ missions      2k€ functioning
- Breakdown for wkshops (3 in 2021, 1 at CERN, 2 in France)
  - CERN cost: 5 nights x 130 (hotel) + 120 (train)      770€
  - FR cost: 3 nights x 100 (hotel) + 120 (train)      420€
- Breakdown for discussions/meetings at CERN
  - 2 nights x 130 (hotel) + 120 (train)      380€
- Total
  - 2 persons x 3 wkshops 3220 + 10 x visits CERN 3800      7k€
    - Visits can absorb 1/2 stage M2 4 months 1k€
  - Functioning (abonnements train, laptop)      2k€

# Other points

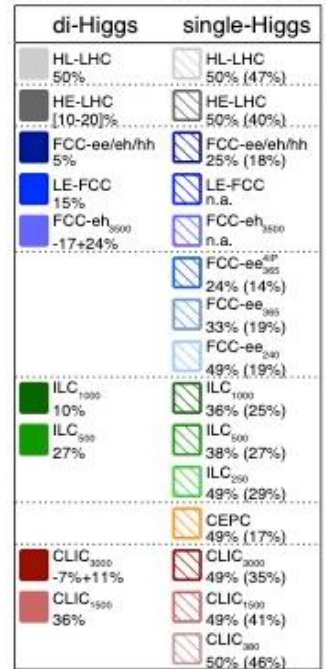
- Informal presentation of FCC status after ESG outcome?
  - Useful. Could help in attracting more people
  - Which format? Réunion du vendredi,...
  - Wait after CS?
- Manpower
  - PhD in 2020 (Greg): Ang
  - Need to get PhD in 2021 (ATLAS/FCC)
  - Other?
- Next
  - FCC-IS kickoff & FCC physics workshop 9-13 November
  - FCC-France next workshop. Most likely January (at LAPP)

# Figures for CS (1)

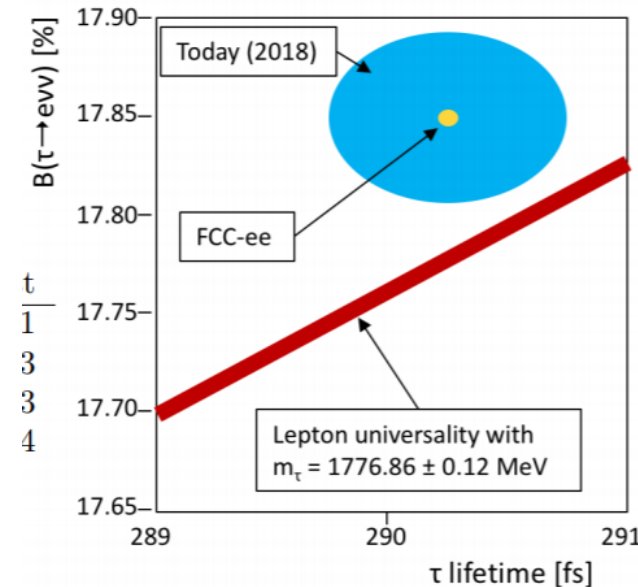
M. Cepeda for Higgs@FC WG



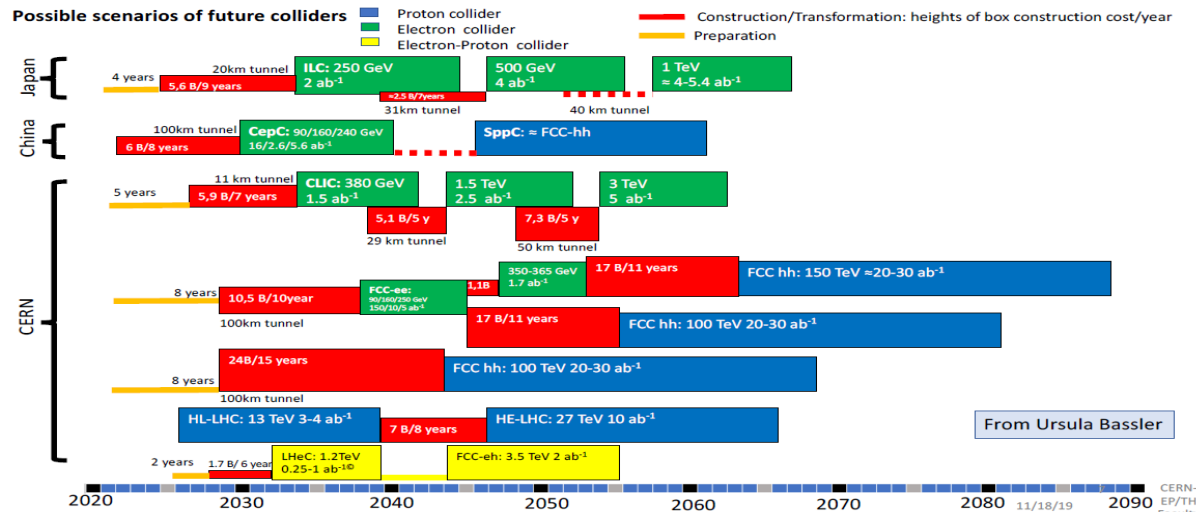
Higgs@FC WG November 2019



All future colliders combined with HL-LHC

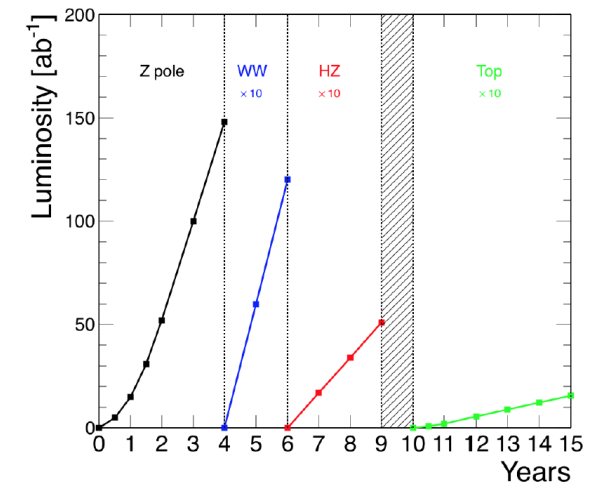
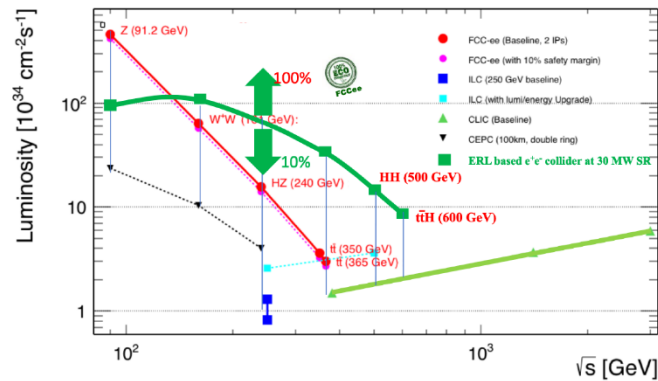
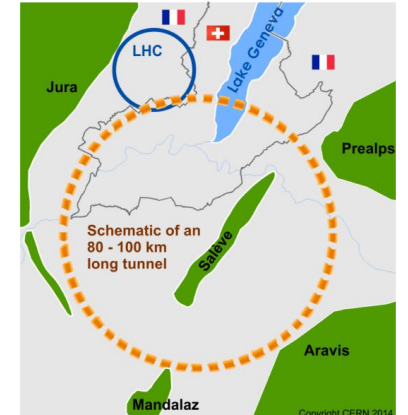
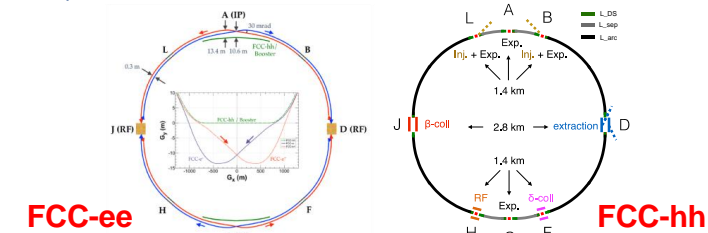


# Figures for CS (2)



**Stage 2: FCC-hh (~100 TeV) as natural continuation at energy frontier, with ion and eh options.**

Complementary physics  
Integrating an ambitious high-field magnet R&D program  
Common civil engineering and technical infrastructures  
Building on and reusing CERN's existing infrastructure.  
FCC integrated project plan is fully integrated with HL-LHC exploitation and provides for seamless continuation of HEP.





# Figures for CS (3)

