

FCC-LPNHE informal meeting

Luc

- Goal of the meeting
- Future colliders: Projects & Timescale
- FCC coming events
- LPNHE
 - Persons involved/interested
 - Potential implications
 - Tentative budget
- Next
- AOB

Goal of the meeting

- At Réunion de coordination, 18/10
 - LP to take in charge scientific animation of FCC activities at labo
 - Meeting with interested persons
 - Feedback from CERN and other labs activities
 - Link with other French groups
 - It is NOT a new group today, more a prospective activity
- Since decisions/directions for future collider(s) in HEP should converge in 2020
 - Keep an eye and stay open to future chosen collider(s)
- Physics at colliders is one of the major lab activity
 - Timescale is not that far away!

European Strategy (EPPSU2020 Timeline)



Granada Symposium

Physics Briefing Book

Recommendation Early 2020

Different projects

- e^+e^-

- **ILC** (Japan): Linear 250GeV (ZH), 500 (tt), 1TeV
- **CLIC** (CERN): Linear 380GeV (tt), 1.5TeV, 3TeV
- **CepC** (China): Circular 90 (Z), 160 (WW), 240GeV
- **FCC-ee** (CERN): Circular 100km $s^{1/2}$: Z, WW, ZH, tt

FCC-ee	H	Z	W	t	$\tau(\leftarrow Z)$	$b(\leftarrow Z)$	$c(\leftarrow Z)$
	10^6	$5 \cdot 10^{12}$	10^8	10^6	$3 \cdot 10^{11}$	$1.5 \cdot 10^{12}$	10^{12}

- hh

- **SppC** (China) same tunnel as CepC 75-100 TeV
- **HE-LHC** (CERN) new 16T magnets in LHC 27 TeV
- **LE-FCC** (CERN) 100km tunnel, 8T magnets 47 TeV
- **FCC-hh** (CERN) same tunnel as FCC-ee 100 TeV

#events

FCC-hh	H	b	t	$W(\leftarrow t)$	$\tau(\leftarrow W \leftarrow t)$
	$2.5 \cdot 10^{10}$	10^{17}	10^{12}	10^{12}	10^{11}

#events

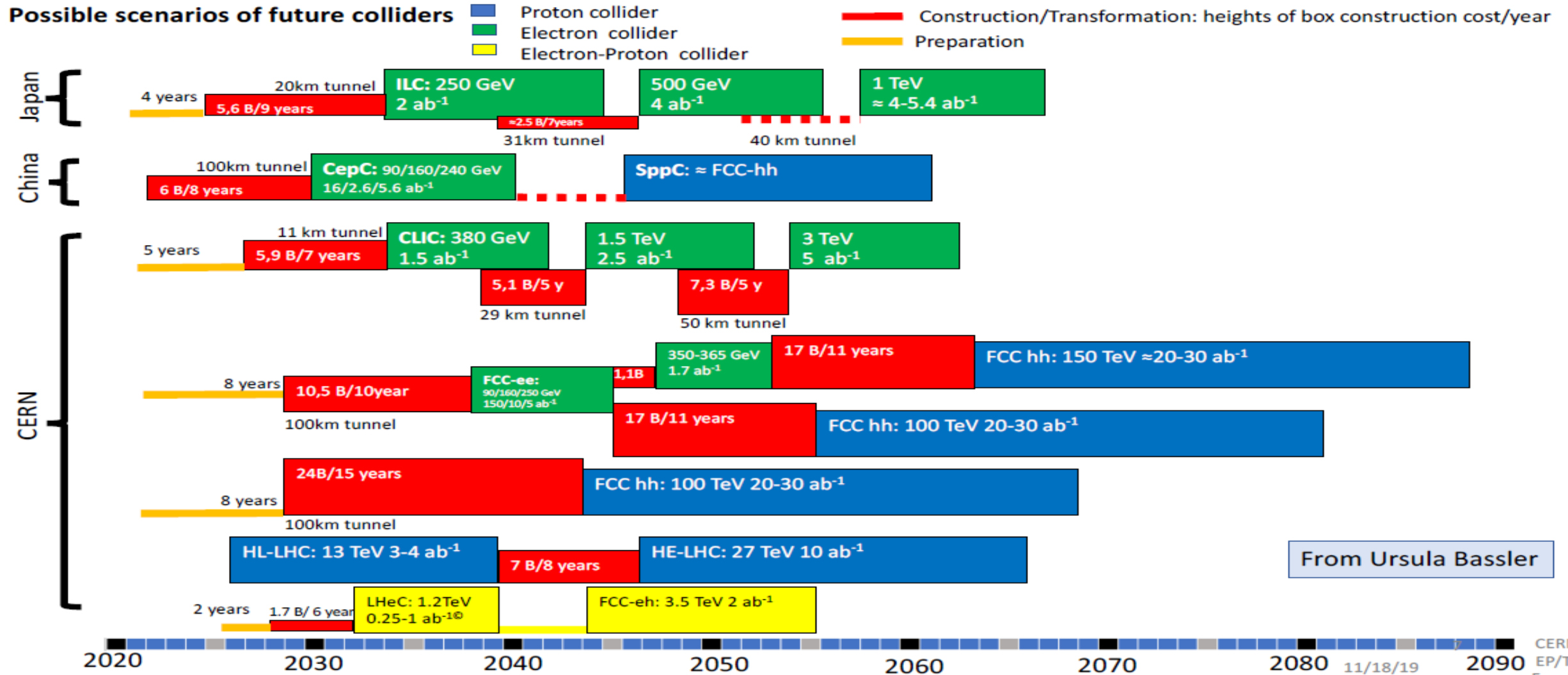
- Also

- **LHC-eC** eh collisions

FCC-eh	H	t
	$2.5 \cdot 10^6$	$2 \cdot 10^7$

#events

Different projects timescale

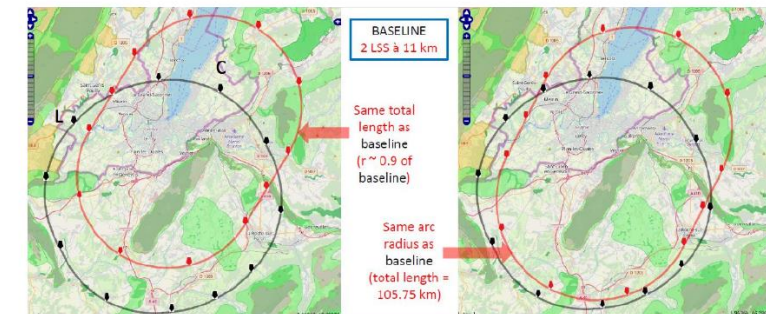


Post-Granada scenarii

H. Abramovicz
CERN Faculty, 11/2019

	2020-2040	2040-2060	2060-2080
		1st gen technology	2nd gen technology
CLIC-all	HL-LHC	CLIC380-1500	CLIC3000 / other tech
CLIC-FCC	HL-LHC	CLIC380	FCC-h/e/A (Adv HF magnets) / other tech
FCC-all	HL-LHC	FCC-ee (90-365)	FCC-h/e/A (Adv HF magnets) / other tech
LE-to-HE-FCC-h/e/A	HL-LHC	LE-FCC-h/e/A (low-field magnets)	FCC-h/e/A (Adv HF magnets) / other tech
LHeC-FCC-h/e/A	HL-LHC + LHeC	LHeC	FCC-h/e/A (Adv HF magnets) / other tech

- 4 & 5 assume e^+e^- machine in Asia (Japan, China)
 - 4 is hh in 2 steps LE (8T magnets) then HE (16T)
 - 5 is eh intermediate then full hh @100 TeV
- 1 is full CLIC (380 GeV \rightarrow 3TeV)
- 2 is CLIC @ 380 GeV + FCC-hh
 - 100 km machine with 11km straight sections? (racetrack)
- 3 is full FCC (ee: 90-365, hh 100 TeV)



EPPSU2020 priorities

H. Abramowicz
CERN Faculty, 11/2019

- Should not commit to a detailed roadmap beyond 2060
- Next facility after LHC should be an ee collider (Higgs factory - precision frontier)
 - ❖ 30 to 40% prefer a facility in Europe (and then mostly FCCee)
- Europe should lead the energy frontier (pretty much unanimous)
 - ❖ Japan and US voiced support
 - ❖ If ee collider in Asia, next facility for Europe FCChh
 - ❖ Some would even like to see LE-FCC followed by HE-FCC (if magnets not ready); ep and heavy ions programme included
 - ❖ HE-LHC has no traction
- Strong support for R&D in new accelerator technologies (plasma wakefield, HTS) and projects (muon collider)
- High priority to "diversity" programme with no explicit ranking (may need to discuss some costly projects)

CERN: EPPSU to decide if next collider in Europe is linear or circular (CLIC or FCC)
Europe should decide on its priority and not wait for other regions to choose (Fabiola)

FCC coming events

- Workshop: FCC week 1/year
 - [3rd FCC physics & Expts Workshop](#) Jan 13-17 2020, CERN
 - Please register!
- [Regular meetings](#)
 - Physics ee, WG11 (Detector ee), software, ...
 - Please subscribe to mailing lists!
- Some documents
 - FCC Conceptual Design Report (March 2019)
 - <https://fcc-cdr.web.cern.ch/>
 - [Presentation at CERN](#)
 - [FCC-ee: Your questions answered](#) June 2019

Potential persons interested

- Already involved
 - Alain, Greg, Giovanni M., LP
- Interests expressed
 - Bogdan
- Started to discuss with people
 - In the beginning essentially from ATLAS & LHCb
 - Vava, Francesco contacted
 - To be continued and possibly extended to other groups
- Young persons
 - PhD? Not full FCC, for physics studies. A priori, too late for 2020
 - Potential ITN Marie-Curie for FCC-ee Physics Tools (b-tagging)

Possible activities

- Short Term
 - Get involved in the Software: To be able to run it, and start doing first performance/physics studies
 - Critical and point of interest: b-tagging
- Longer term
 - One has to be present at detector level (entrance fee!)
 - No expertise in machine itself (Cf. CEA, LAL)
 - At Lab, Big expertise both in Calorimetry & Tracking
 - In particular with Silicon
 - CALICE for ILD & ATLAS Tracker upgrade for ATLAS
 - A natural and efficient direction would be Si based detector R&D
 - Si/W fine grained calorimeter / Si Tracker/Vertex detector

Tentative budget for 2020

INPUTS

1) FCC yearly Workshop at CERN: Total 800€

- 5 nights: 5x130€ / Train: 120€

2) FCC yearly Week (This year in Paris, November): Total 500€

- Only Fees 500€ (based on last week fees in Brussels)

3) Typical 3 days discussion/meeting at CERN: Total 380€

- 2 nights: 2x130€ / Train: 120€

NEEDS

- Workshop x2 persons

- Week x3 persons

- Discussion x10 (1 person/month excl. Jan and Nov)

TOTAL 7000€

Next

- 1 day meeting in January (most likely 13th)
 - To shape FR attitude wrt FCC project
 - Compared to FCC-FR workshop, more a strategic meeting
 - Organized around FCC-FR organizing Committee
- FCC workshop at CERN 13-17 January
- FCC-FR workshop summary at Réunion du Vendredi 20/12
- Continue discussion with people at Lab to trigger new interests/involvements
- Next meeting after Workshop at CERN
 - Try to establish monthly basis meetings?
 - Open it to wider audience?

Some final points after the Workshop

- FCC-FR workshop in November very successful
 - Quoted as example to other countries by H. Abramowicz (November Faculty)
 - Many French labs already involved in physics studies and/or detector R&D
 - eg CALICE R&D, but LAr calorimetry R&D showing up (LAPP, LAL)
- Critical: How to sell the project?
 - Up to 2013: hh presented as core of the project
 - Since then, balance with emphasis on ee
 - Time has come to rebalance ee and hh altogether, seen as a whole
- Essential now: Present FCC-ee & FCC-hh as real synergy
 - Because this is the case! LEP/LHC sharing tunnel has shown its success
- Potential danger
 - Present the project as « easy » esp. for FCC-ee). It is not the case
 - Be too shy: This project is really well thought and founded