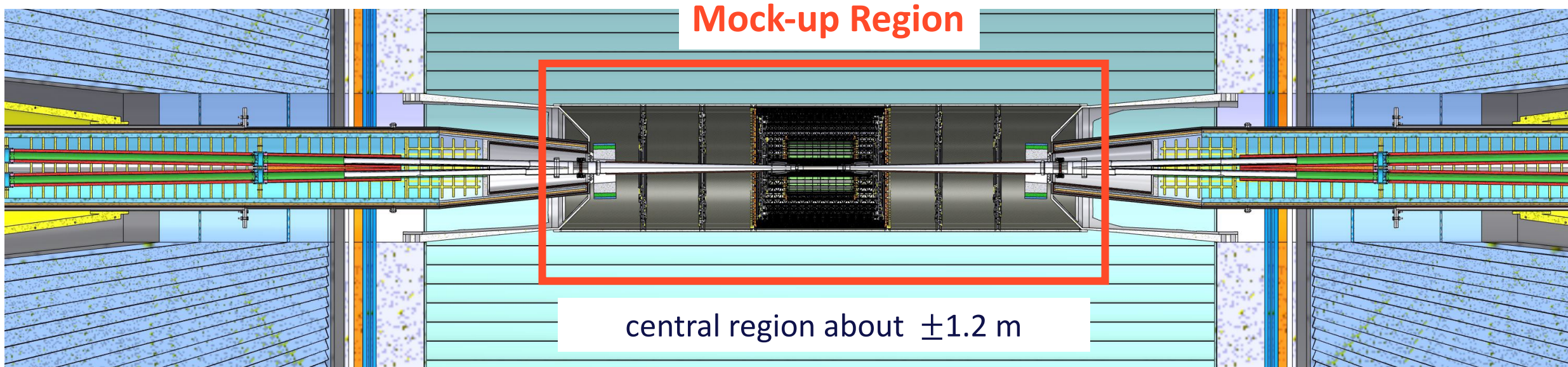




PIANO DI LAVORO MOCK-UP IR FCC-EE

Manuela Boscolo (INFN-LNF)

FCC-ee Interaction Region



IR based on the crab-waist scheme, compact and crowded with tight constraints and many technical challenges → mockup needed for R&D and prove state-of-the-art technological solutions and test its feasibility

Approved project, will be built in Frascati in joint venture CERN-INFN. Addendum CERN-INFN signed by CD 26.01.2024

Relevant dates:

Starting date	1.11.2023
Delivery to INFN-LNF of the central ALBeMet chamber	30.11.2024
End date	31.12.2025

Technological relevant deliverables

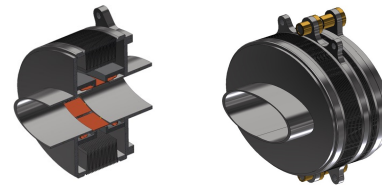
1. Prototype of the **Albemet162** central IP chamber including cooling system and flanges to test:

- the welding (EBW)
- the assembly procedure
- the cooling system



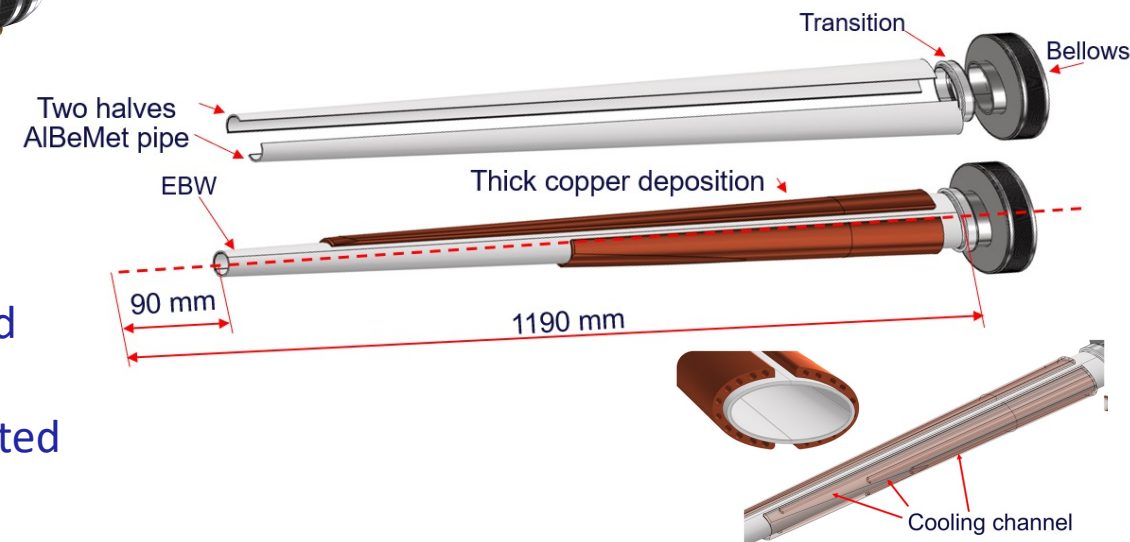
2. Prototype of the bellows to study:

- the fabrication, assembly procedure and electron beam welding over an elliptical geometry
- the thermal/electrical contact effectiveness
- the AlBeMet 162/stainless steel transition



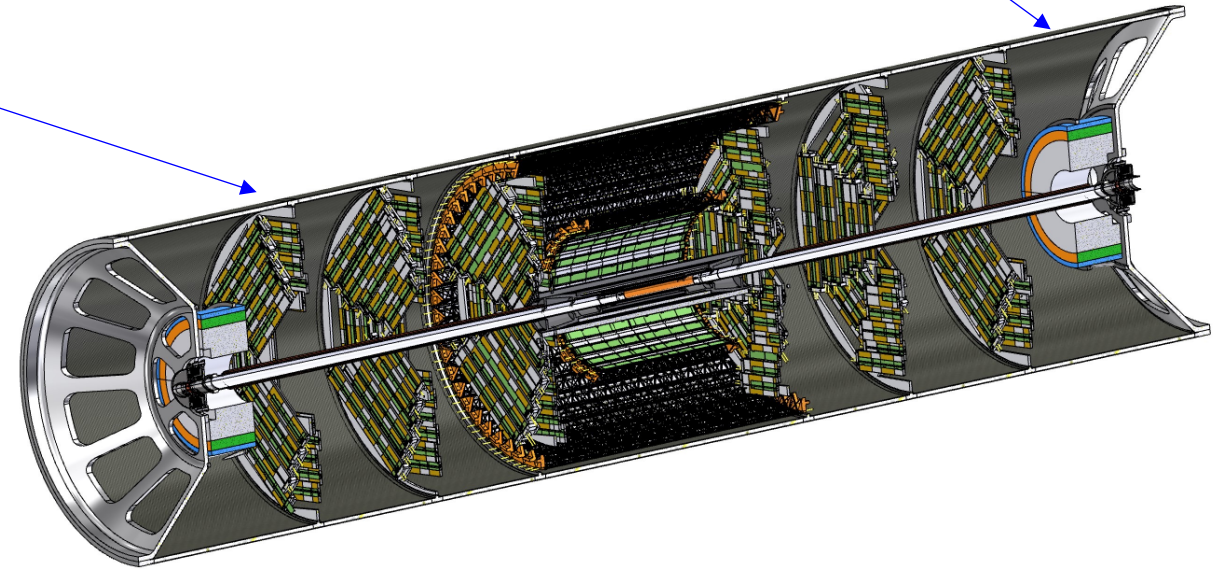
3. Prototype of the conical chamber with cooling system until the crotch, to study the:

- accuracy of the elliptical varying section shape
- thick copper deposition over an elliptical shape with embedded channels
- tightness of the channels and thermal contact between deposited copper and AlBeMet



Technological relevant deliverables

4. **Mock-up of the carbon-fibre cylinder structure with endcaps and its mechanical support**, to verify
 - the fiber carbon composite fabrication technology including the reinforcements for anchoring LumiCal and outer tracker
 - the shape accuracy and rigidity of the structure
5. **Mock-ups of the vertex mechanical structures**
 - Aluminium for the Outer Vertex part and the discs
 - Carbon fibre for the inner vertex detector
 - Study of services (cables and cooling pipes) routing
 - Validation of inner vertex air cooling
 - Needs a “cooling tunnel” to be developed in Pisa



Team attuale

LNF

- M. Boscolo (Principal Investigator)
- E. Di Pasquale
- F. Franesini
- S. Lauciani
- G. Sensolini

Pisa

- F. Palla
- F. Bosi

CERN contacts

- Andrea Gaddi
- Roberto Kersevan

+ international collaborators

Richieste Divisione Acceleratori

Servizio ingegneria meccanica

resp. servizio – E. Di Pasquale

1 tecnologo art. 36 – F. Fransesini

1 progettista – S. Lauciani

G. Sensolini – consulenza

supporto tecnico servizio

Attività':

Disegni esecutivi del mockup e dei suoi supporti

Ordini / gare

messa in funzione del laboratorio

assemblaggio

misure, test

controllo accettazione componenti (metrologia)

Servizio vuoto

Richiesto supporto tecnico

Attività':

- Consulenza
- Installazione impianto
- Test da vuoto (appena disponibili le camere da vuoto)

Previsione temporale:

- 5 giorni di 2 persone per allestimento e ricerca delle perdite sul mockup assemblato
- 3 giorni di 2 persone per allestimento e test di tenuta meccanica in vuoto per zona di interazione

Richieste Divisione Tecnica

Servizio impianti a fluido

Attività per impianto di raffreddamento con paraffina per misure sulla camera da vuoto

- progettazione – da ora
- messa in opera – subordinata a quando arriva la camera da vuoto (previsione: luglio)
- Sistema di sicurezza (connessione delle termocoppie, ecc.)

Step successivo da definire

- raffreddamento aria per test air-cooling del vertice
prima test a INFN-Pisa, poi allestimento ai LNF
simulazioni Ansys in corso INFN-Perugia & Univ. Perugia
- sensori per monitorare la portata di aria e le pressioni del fluido raffreddante

Allestimento Laboratorio Mockup

Soffitto

preventivo, pronto entro meta' marzo

Climatizzazione – fine marzo → servizi elettrotecnica e impianti a fluido

Acqua - esistente

Aria secca compressa

- esistente ma portate da verificare

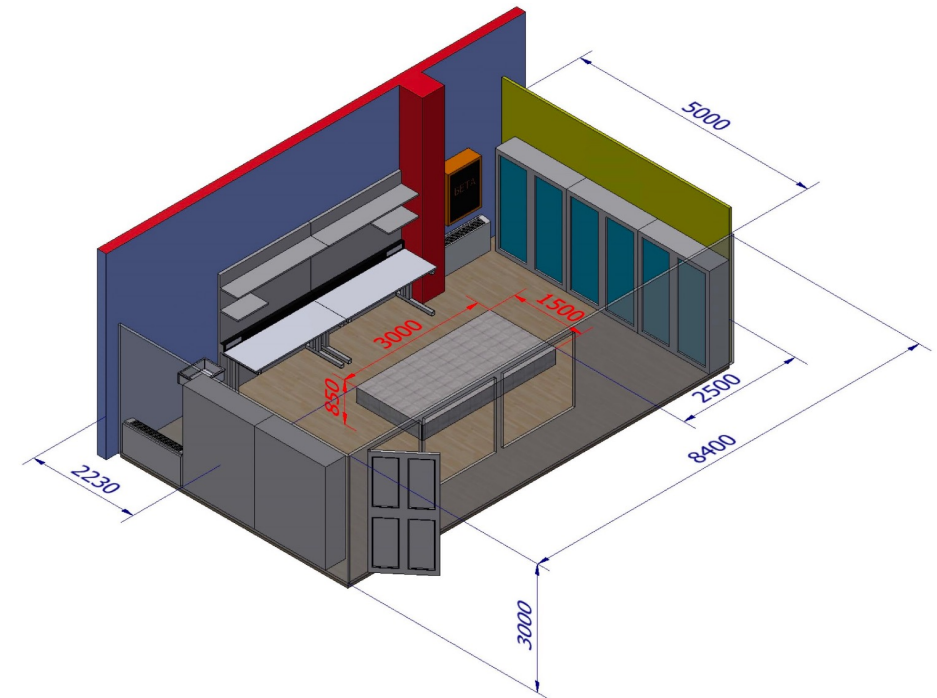


Fig.9) IR mockup hall layout

E. Di Pasquale

Summary

Scientific scope & motivation, technical details, project timeline discussed at:

FCC-ee MDI & IR Mock-up Workshop, 16-17 November 2023 Frascati <https://agenda.infn.it/event/37720/>

FCCIS 2023 Annual Workshop, 13-15 November 2023, Rome

[MDI Status & Plans, link](#)

<https://indico.cern.ch/event/1326738/>

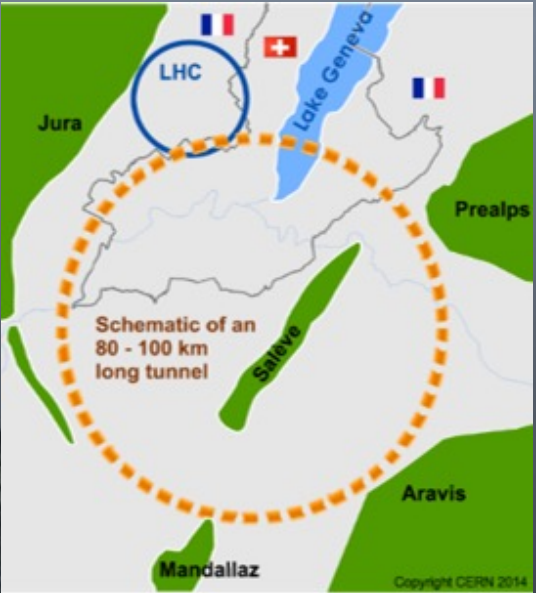
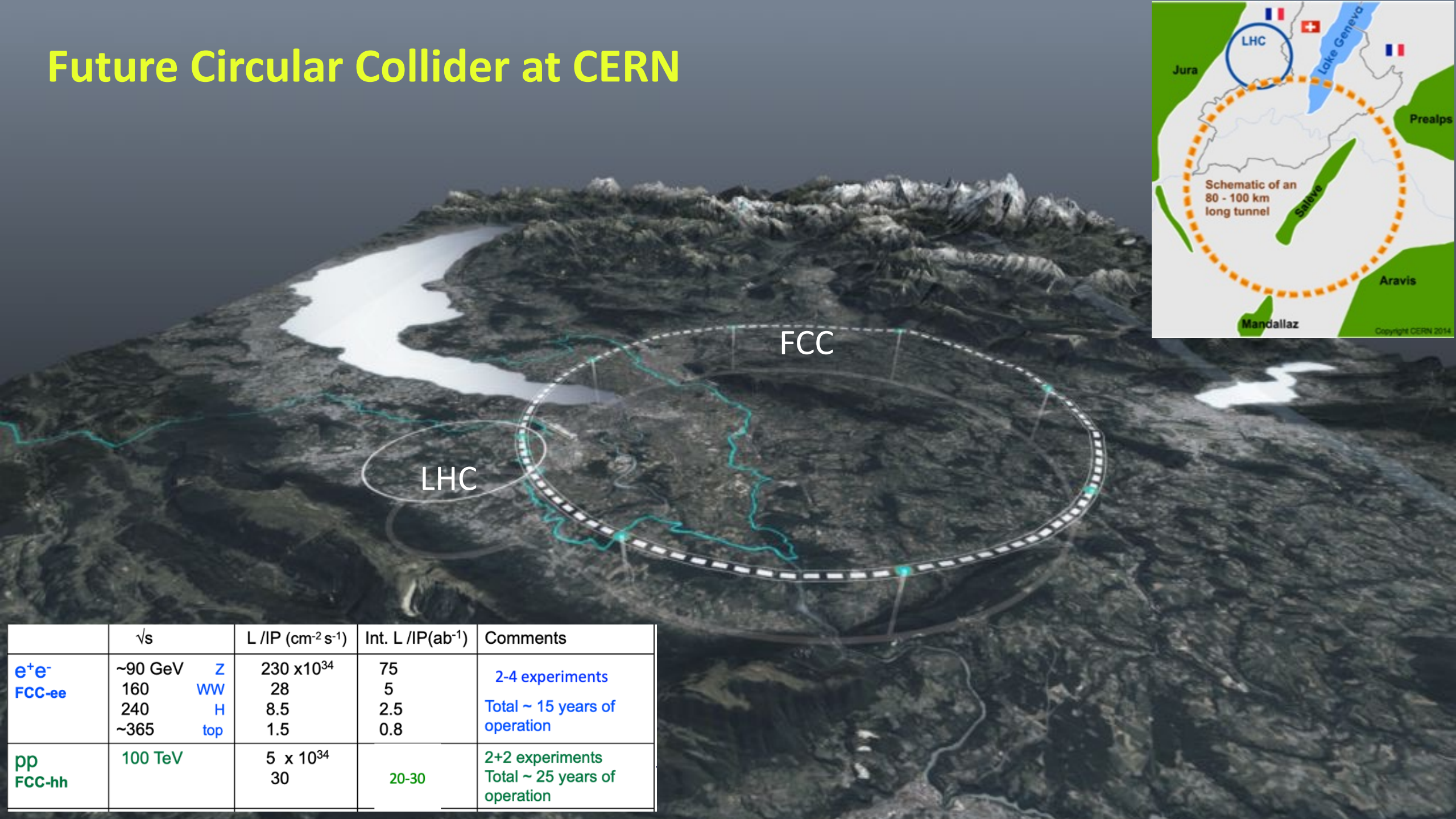
MDI monthly meetings: <https://indico.cern.ch/category/5665/>



<https://w3.lnf.infn.it/due-workshop-internazionali-sul-disegno-del-collisore-fcc-ee-a-roma-e-frascati/>

Additional material

Future Circular Collider at CERN



	$\sqrt{s}$	L / IP ($\text{cm}^{-2} \text{s}^{-1}$)	Int. L / IP (ab^{-1})	Comments
e^+e^- FCC-ee	~90 GeV 160 240 ~365 Z WW H top	230 x 10³⁴ 28 8.5 1.5	75 5 2.5 0.8	2-4 experiments Total ~ 15 years of operation
pp FCC-hh	100 TeV	5 x 10³⁴ 30	20-30	2+2 experiments Total ~ 25 years of operation

Wind tunnel for VTX air cooling

to be tested at Pisa next year, before the test at LNF

