Second FCC France Workshop

S. Muanza: CPPM Marseille, CNRS-IN2P3 & AMU

FC-CPPM Monthly Meeting

January 26, 2021

Outline

Introduction

- Held on-line, 20-21 Jan. 2021, Link
- Attendance: 149 persons
  - 10 from Marseille (9 CPPM, 1 CPT), +1 IN2P3 Deputy Dir. for HEP
- Including sessions on accelerators, FCC-hh, B-Physics, Theory

Activities in FCC-France Labs

- Related to FC-CPPM interests

IJCLab Orsay (contact N. Morange)

Physicists involved : N. Morange (ATLAS), M-H Schune (LHCb), J. Lefrançois (LHCb) + intern
Physicists involved in other e+e- FC : R. Pöschl , D. Zerwas, M. Winter

Physics interest :

- B physics
- Higgs and EW physics

Future R& D :

- High-granularity LAr calorimeter
- Powder-O calo concept

Reports today

design de PCB/electrodes pour un calorimètre LAr (15'+5')
Orateur: ronic chiche (LAL - IN2P3 - CNRS)

Introduction to the Heavy-Flavor/QCD session (15'+5')
Orateur: Marie-Hélène Schune (LAL)

First look at Bc--> tau nu @ FCC-ee (15+5')
Orateur: Yasmine Amhis (IJCLab)

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IPHC Strasbourg (contact J. Andrea)

Physicists involved : J. Andrea (CMS), A. Besson (ILC), Z. Elbitar (ILC)
Physicists interested : J. Baudot, G. Dujany

Physics Analysis interest

- B-physics,
- Precise top-quark measurements and EFT interpretation.

Future R&D at IPHC

- focused on pixelated detection layers: sensors & integration,
- short term: involvement in ongoing R&D projects having specs of interest to FCC

Reports « today »

CMOS project status report (15'+5')
Orateur: auguste besson (Institut Pluridisciplinaire Hubert Curien)

DICE project status report (15'+5')

Status of whizard for top and other particles generation (15'+5')
Orateur: jeremy andrea (IPHC)

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IP2I Lyon (contact S. Gascon-Shotkin)

Physicists involved : G. Boudoul (CMS), D. Contardo (CMS), S. Gascon (CMS)
Physicists involved in other e+e- FC: G. Grenier, I. Laktineh, L. Mirabito
+ Theory group (4 talks)

Physics interest:

- Higgs boson physics (SM + BSM)

Current and Future R&D

- Semi-digital HCAL (sub-ns time measurement), GRPC developments
- Monolithic Active Pixel sensor (MAPs) for tracker/high-granularity calorimeters in 65nm technology

Reports today

Conceptual design studies for FCC-ee experiments, from a detector performance perspective (20'+5')
Orateur: Didier Contardo (IN2P3/CNRS)

DICE project status report (15'+5')

A new read-out technique for muon detection for FCCee (15'+5')
Orateur: Imad LAKTINEH ({UNIV CLAUDE BERNARD}UMR5822)

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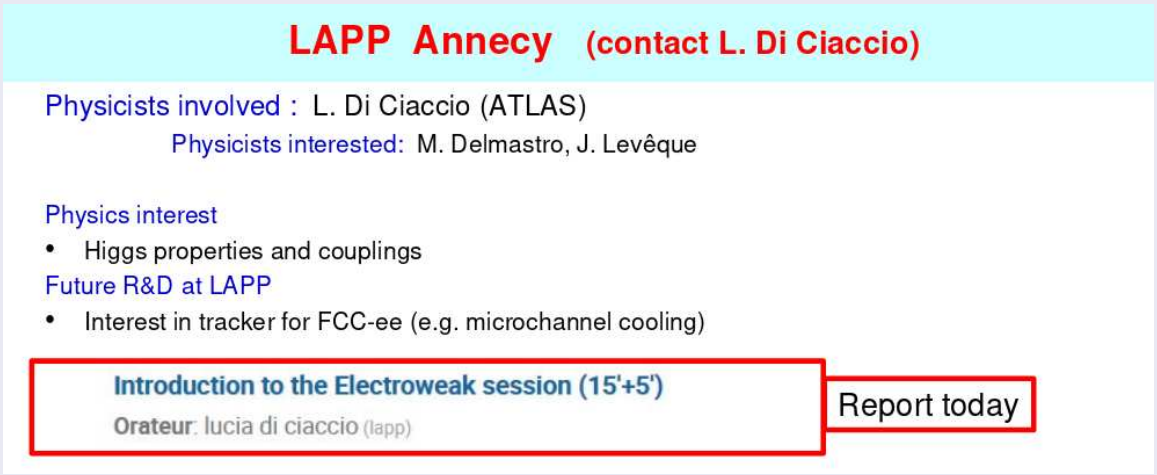

LAPP Annecy (contact L. Di Ciaccio)

Physicists involved : L. Di Ciaccio (ATLAS)

Physicists interested: M. Delmastro, J. Levêque

Physics interest

- Higgs properties and couplings

Future R&D at LAPP

- Interest in tracker for FCC-ee (e.g. microchannel cooling)

Introduction to the Electroweak session (15'+5')

Orateur: lucia di ciaccio (lapp)

Report today

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CPPM Marseille (contact S. Muanza)

Physicists involved : S. Muanza (ATLAS), M. Barbero (ATLAS), M. Hilali (student)

Physics interest,

- MC Generators
- Physics Beyond the Standard Model

Future R&D at CPPM

- R&D on Depleted CMOS sensors for FCC-ee (in collaboration with IPHC and IP2I)

Reports today

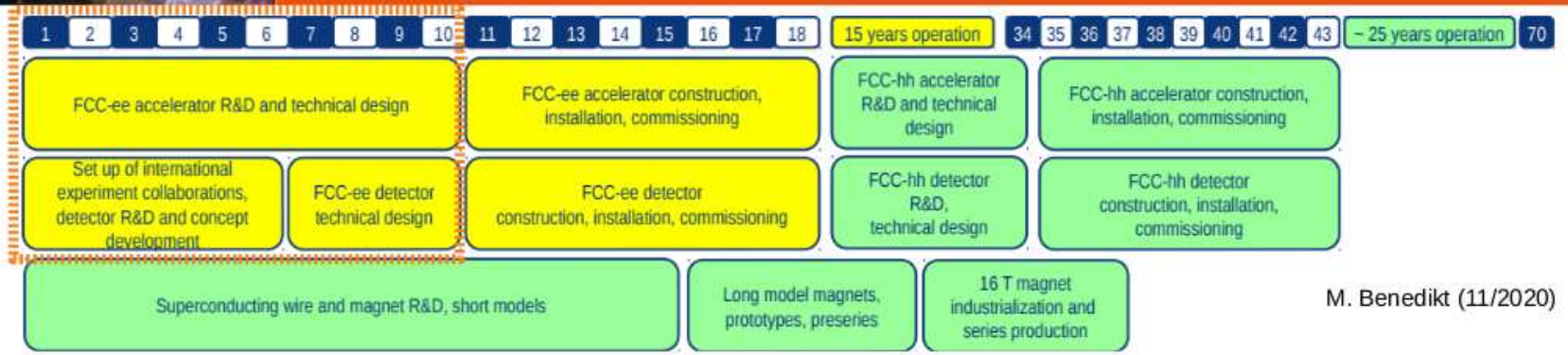
Searches for Charged Higgs bosons @ FCC-ee (15'+5')

Orateur: Dr Steve Muanza (CPPM, CNRS-IN2P3)

DICE project status report (15'+5') ¶

Orateur: Marlon Barbero (CPPM)

Timeline for FR effort on FCC-ee Detectors



M. Benedikt (11/2020)

Exploration phase: ~]2019-2021]

- mostly simulation work: further refine the detector requirements
- conceptual development of detectors, along the CLD & IDEA models but also beyond
- build on acquired expertises, transform ILC R&D, to develop a few strong lines of R&D
- but also still hopefully some room for generic R&D and new bright and bold ideas

Focus & Consolidation phases: [2022-2023] & [2022-2026]

- focus on only a few options to get a strong FR contribution
- foreseeable target scale (HR, €) for the effort: O(LHC) at most
- shape the French contributions: how many detectors, which sub-detectors, etc
- move forward at full speed on the R&D for selected options
- after next round of Strategy, prepare financial means to support end of R&D & construction

TDR Preparation: [2027-2032]

- French interests and contributions well-defined

Physics & Det.R&D organization @ IN2P3

FCC-Phys Master-Project:

- physics studies and detector developments for FCC *[G. Bernardi, LPNHE, + 10 of our labs]*
- started in January 2019, new project in the SMPP scientific program at IN2P3
- for the exploration phase: mostly support for workshops, travels, etc
- budget x3 in 2021

Specific Master-Projects on Detector R&D:

- CALICE (ILC): ultra-granular EM & HAD calorimetry *[JC. Brient, LLR, IJCLab, IP2I, LPC, LPNHE, Ω]*
- CMOS (ILC): thin & granular pixel detectors *[M. Winter, IPHC/IJCLab]*
- DICE: hybrid pixels & DepMAPS *[M. Barbero, CPPM, IPHC]* NEW
- 1 new project, +45% budget increase in 2021

Transverse R&D projects of interest:

- PICMIC: new MicroPlateChannel detectors w/ sub-µm & ps resolution *[I. Laktineh, IP2I, CPPM, IPHC, Ω]*
- FASTIME: timing ASIC 130nm with ps resolution *[M. Dahoumane, IP2I, IJCLab, IPHC, LPC]* NEW
- QUARTET: 4D-tracking with MAPS Si pixels *[F. Morel, IPHC, CPPM, Ω]*
- DAQGEN: reconfigurable DAQ card in MTCA4.0 *[JP. Cachemiche, CPPM, CENBG, IJCLab, LPCC, LPSC]*
- THINK: machine learning in real-time DAQ *[JP. Cachemiche, CPPM, CENBG, LAPP, LPCC, LPNHE]*
- 1 new project, +30% budget increase in 2021

Evolving organization, 2021 a key-year:

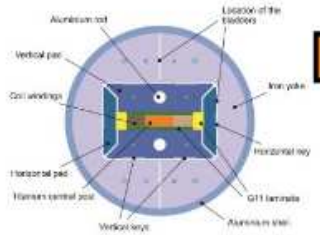
- organization in Europe taking shape, in particular with ECFA Detectors R&D Panel *[FR: D. Contardo, IP2I]*
- our current organization can be improved, e.g. to better address the ILC/FCC duality/commonality on RD
  - good will is there, go further to maximize spread of knowledge and return on investment ? (common workshop ?)
  - activities around physics at the Higgs Factory: natural & easier place to start with, strong involvement of theorists

CEA/CERN Dipole Magnet Strategy

SMC Short Model

2021

Flat coils, **12 T**

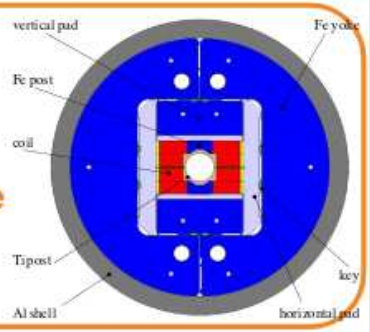


FRESCA2

2019

+Flared-ends + aperture

Current record of **14.6 T**



Flared-end coils

FRESCA2 = Facility for REception of Superconducting CAbles

- CEA/CERN collaboration:
- Design and winding at CEA
- Fabrication, Assembly and tests at CERN
- **Achieved world record of 14.6 T**

CEA/CERN Dipole Magnet Strategy

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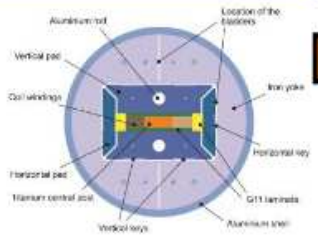

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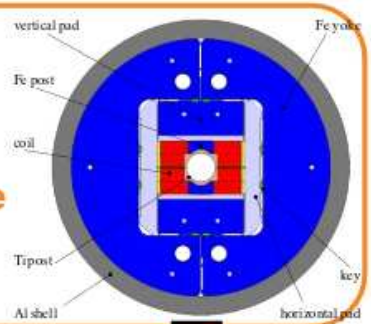
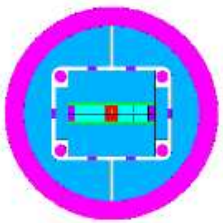
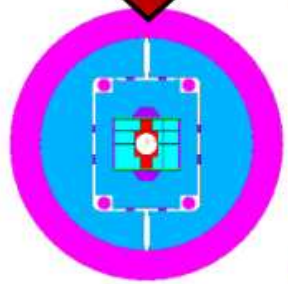


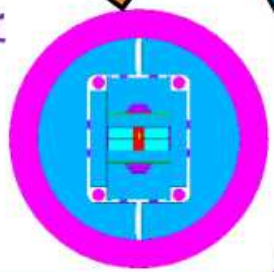
R2D2 Demonstrator
2023
Demonstrate **Grading**
→ **12 T**



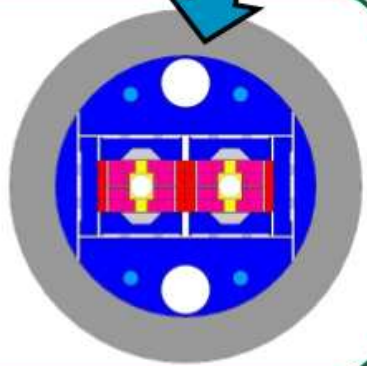
F2D2 Demonstrator
Future agreement
+Grading + Flared-ends
+ **Aperture → 16 T**



FD 'Reduced' demonstrator
Future agreement
+Grading + **Flared-ends**
→ **14 T**



FCC Model
Far future
Double aperture
→ **16 T**



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