

News from FCC-France since May 2020 Workshop

R. Aleksan, J. Andrea, **G. Bernardi**, A. Besson, V. Boudry, L. Di Ciaccio, S. Gascon,
F. Malek, S. Monteil, N. Morange, S. Muanza, L. Poggioli, R. Salerno, J. Stark

IRFU Saclay, CPPM Marseille, IJCLab Orsay, IPHC Strasbourg
IP2I Lyon, LAPP Annecy, LPC Clermont, LLR Palaiseau
LPNHE Paris, LPSC Grenoble, L2IT Toulouse,

- **New session on Accelerator**

- **New session on Theory**

- **French activities in FCC-ee in Physics and Detectors**

New since Last Workshop (I)

Session on Accelerator :

→ Chair/organizers : Angeles Faus-Golfe (IFIC and LAL) , Pierre Vedrine (CEA)

14:00	Introduction to FCC project (FCCEe and R&D for FCChh) (15'+5') Orateur: Antoine Chance (CEA Irfu)
14:20	Optics studies for the FCCEe booster ring (15'+5') Orateur: Barbara Dalena (IRFU)
14:40	Optimized positron production in FCCEe (15'+5') Orateur: Iryna Chaikowska (IJCLab)
15:00	Stabilization and dynamic alignment issues in FCCEe (15'+5') Orateurs: Gael Balik (LAPP IN2p3/CNRS) , LAURENT BRUNETTI (LAPP)
15:20	H.F magnets R&D (15'+5') Orateur: Etienne Rochepault (CEA-Saclay)
15:40	Dynamics Vacuum for FCCEe (15'+5') Orateur: suheyla bilgen (LAL)

New since Last Workshop (II)

Session(s) on Theory :

→ Chair/organizers : Benjamin Fuks (LPTHE Paris), Giacomo Cacciapaglia (IPNLUniv. Lyon 1)

09:00

Introduction to the FCCee theory session (15'+5')

Orateur: Christophe Grojean (DESY (Hamburg) & Humboldt University (Berlin))

09:20

Light composite resonances at future circular colliders (15'+5')

Orateur: Lara Mason (UCBL (IP2I) / UJ)

09:40

Tera-Z phase of FCC-ee as a portal to composite dynamics (15'+5')

Orateur: Dr ABHISHEK IYER (IP2I Lyon)

10:00

Probing QFT bedrock principles and the inverse problem at the FCC-ee (15'+5')

Orateur: Benjamin Fuks (LPTHE Paris)

10:20

Composite Higgs revealed in di-Higgs photo-production at future e+e- colliders (15'+5')

Orateur: Giacomo Cacciapaglia (IPNL - Univ. Lyon 1)

ee

12:05

Introduction to the FCC-hh future studies (20'+5')

Orateur: michelangelo mangano (CERN)

12:30

Additional Gauge Bosons and their effects on ttbar cross-section @ FCC-hh (15'+5')

Orateur: Ingo Schienbein (LPSC)

12:50

Higgs boson pair at N3LO in QCD (15'+5')

Orateur: Hua-Sheng Shao (CERN)

hh

Preview of FCC Physics and Detector activities in the French Labs since May 2020 workshop

Work has been done on :

- R&D (sometimes related to ILC)
- Physics cases studies

It is difficult to start joint projects in this period.

IRFU CEA-Saclay (contact R. Aleksan)

Physicists involved : R.Aleksan (FCC), F. Couderc (CMS), E. Locci (CMS),
P. Schwemling (ATLAS), B. Tuchming (D0)

Physicists involved in other e+e- FC : P. Attie, M. Besancon, P. Colas, S. Ganjour, M. Titov

Physics interest :

- EW physics (W mass, Z coupling to ν_e)
- B Physics (CP violation)

R&D :

- TPC (readout and Ion Backflow)
- Wireless detector data transmission

Reports today

Fast Timing measurements with Micromegas (15'+5')

Orateur: Thomas Papaevangelou (CEA Saclay)

Ion Back Flow in TPC (15'+5')

Orateur: Paul Colas (CEA/DAPNIA Saclay)

The EW case for an extreme EM calorimeter resolution (15'+5')

Orateur: Roy Aleksan (CEA-Saclay)

Study of $B_s \rightarrow D_s K$ at FCC-ee and constraints on detector (15'+5') ¶

Orateur: Roy Aleksan (CEA-Saclay)

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)

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: Tonic 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)

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)

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)

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

LLR Palaiseau (contact R. Salerno)

Physicists involved : C. Ochando (CMS), R. Salerno (CMS), Y. Sirois (CMS)

Physicists involved in other e+e- FC : V. Boudry, J-C Brient, F. Jimenez Morales, H. Videau

Physics interest :

- Study the EWSB (Scalar sector, Higgs self-coupling, VBS)

Future R&D @ LLR ?

- high-granularity Si-based calorimeter (continuous operation, timing)

A Calice Calorimeter for FCC-ee ? (15'+5')

Orateur: Vincent Boudry (LLR - CNRS, École polytechnique/IPP Paris)

Report today

LPC Clermont (contact S. Monteil)

Physicists involved : S. Monteil (LHCb) + 2 TH. on the first study A.Teixeira, J. Orloff. .

Physicists involved in other e+e- FC : D. Boumediene

Physics interest :

- Heavy Flavor Physics

Future R& D on calorimetry

- LPC is involved in R&D detector on calorimeter in the CALICE project.

Flavour physics case studies (with related activities in Clermont) (15'+5')

Orateur: Stephane Monteil (Laboratoire de Physique de Clermont - UCA/IN2P3)

Report today

LPSC Grenoble (contact F. Malek)

Physicists involved : F. Malek (ATLAS), A. Lucotte (ATLAS)

Physics interest

- EW Observables precision measurement (@TeraZ physics)
- Discovery potential in direct searches of dark matter.

Future R& D on calorimetry

- Mechanics structures and materials, Cooling, Electronics

LPNHE Paris (contact L. Poggioli)

Physicists involved : G.Bernardi (ATLAS), A.Blondel (T2K), B.Malaescu (ATLAS),
G.Marchiori (ATLAS), L.Poggioli (ATLAS), Ang Li (ATLAS student)

Physicists involved in other e+e- FC : D. Lacour

Physics interest

- Electroweak (eg beam Energy calibration and polarization)
- Higgs couplings, Higgs: H to bb/cc/gg. HZ total cross section. Di-jet mass resolution
- QCD: α_s measurement at Z pole and below

Future R& D ?

- Potentially oriented towards Si sensors developments, for calorimetry and tracking

Perspectives for high-precision $\alpha_S(m_{ZZ})$ determinations at FCC-ee (15'+5')

Orateur: Bogdan MALAESCU (LPNHE, Paris, FRANCE)

HZ cross section measurement @ FCC-ee (15'+5')

Orateurs: Ang LI (LPNHE Paris) , Gregorio Bernardi (LPNHE Paris)

Reports today

L2IT Toulouse (contact J. Stark)

L2IT (Laboratoire des 2 Infinis de Toulouse) was founded on January 1st 2020.

It is a CNRS/IN2P3 and Université Toulouse III - Paul Sabatier Laboratory

Physicists involved : J. Stark (ATLAS) as L2IT contact (and director) for the time being

Many thanks for the talks from our foreign colleagues

- FCC general talks
- CEPC detectors
- IDEA drift chamber / IDEA Calorimeter
- B physics
- Higgs Physics
- Top Physics

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Conclusions

Some visible progress on paper, let's check it during the workshop

Physicists involved :

- About 22 permanent physicists are active in FCC-FR (and another ~14 on ILC)
- Large technical teams in all the labs will be freed once HL-LHC approach completion
- Numbers are significant, but % of involvement has to grow, taking into account HL-LHC.
(Reminder: Theory and Accelerator /personpower not covered in these numbers)

Wide Physics interest :

- Higgs, Electroweak, Top, Heavy Flavour, QCD, BSM

Future R&D ?

- Exploit current expertise on MicroVertex, Tracking (TPC), and Calorimetry (Lar, Calice)
- Explore possible collaborations on other R&D ?

FCC and ILC communities could/should work closer