



Institut national de physique nucléaire et de physique des particules

www.in2p3.fr

A composite image featuring particle tracks on the left and a colorful nebula on the right. The particle tracks are thin lines of various colors (yellow, orange, red, blue) with small dots at their ends, radiating from a central point. The nebula is a large, colorful cloud of gas and dust in shades of purple, pink, and blue, set against a dark background with stars.

Sonder les infinis : des particules au cosmos

FCC-France Workshop:
Introduction

IN2P3

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14/05/2020

IN2P3

Welcome and goals

Follow-up of the 1st FCC-France Days:

- assess the state of the project
 - physics potential
 - R&D & challenges for accelerators, detectors, software
- gauge the interest of the community
- discuss the various interests in France
- foster nation-wide collaboration & synergy
- discuss organizational aspects
- extremely successful !!

Focus of this workshop:

- go a bit deeper
- physics studies
- detector requirements & studies
- focus on FCC-ee

Next workshop:

- tentatively planned for December 2020 or January 2021 in Annecy (LAPP)
- focus on accelerators R&D
- more discussions on FCC-hh



<https://indico.in2p3.fr/event/19693/>



Global context

Covid-19:

- hope that you and your relatives are doing well
- our work largely frozen, slowly adapting & recovering, great contributions of community
- next months are a bit uncertain, maybe legitimate reasons to worry
- plenty of reasons to hope as well: role of basic science, CERN as a model for cooperation,...
- this workshop is a great answer, to further build the case for our ambitious scientific goals

ESPP:

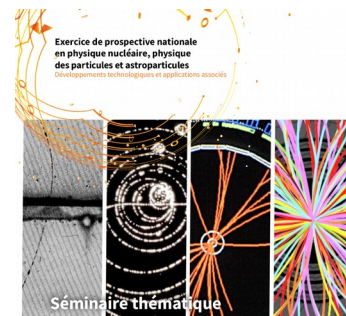
- key-year for the definition of the next European Strategy
- proposed French position for Bad-Honnef discussed in January
- FCC has a significant place in that proposal
- consensus to be reached, a priori news at the June CERN Council

<https://indico.in2p3.fr/event/20221/>

Prospectives:

- on-going work on perspectives at the national/IN2P3 level
- working groups of special interest: GT01, GT07, GT08, GT09
- outcome this fall

<https://prospectives2020.in2p3.fr/>



**Physique
des particules**

IP2I, Lyon
12-13 Mars 2020

Pour consulter l'agenda et obtenir plus d'informations
sur l'exercice de prospective nationale:
<https://prospectives2020.in2p3.fr>

Status:

- impressive amount of studies already conducted for CDR !
- main physics cases well-studied
- still plenty of fun studies ahead !

Interests in France:

- pretty much everything !
- precision EW physics, QCD
- Higgs couplings
- searches for new physics
- top quark physics
- heavy flavours: B-physics, tau-physics
- strong theory community
- object measurements/performance
 - tracking/calorimeter reconstruction
 - b-tagging, jets, e/γ , PID
 - particle-flow
- software, software, software !!(?)
 - simulation
 - reconstruction
 - core software
- computing !!



Detectors

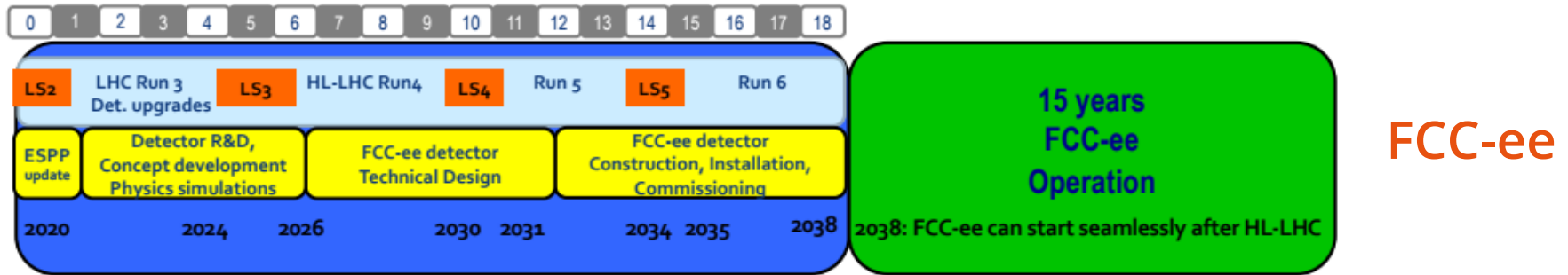
Towards the definition of the detectors for FCC-ee

- a lot of work done already, much more ahead of us
- two complementary detector concepts for feasibility studies: CLD & IDEA
- need for further studies and refining the requirements
- room for new concepts for detectors and sub-detectors
- many FR expertises opening avenues for major contributions & leadership

Main expertises in France and opportunities:

- calorimetry: ultra-granular calorimetry à la CALICE, LAr calorimetry, crystal-based, hadronic
- tracking: silicon detectors (pixels, CMOS,...), gaseous detectors (RPC, micro-pattern, TPC,...)
- particle-ID: specific challenges (RICH, ToF)
- trigger and readout: change of paradigm with full readout and RTA (LHCb), embedded IA ?
- electronics & micro-electronics (ASICs)
- mechanics & system integration: cooling, cables (removal?), power distribution, data links
- coils & magnets
- cost effectiveness is fun !
- build on well-advanced R&D pursued for ILC (*round-table*), towards machine-agnostic R&D
- build on heritage but also allow to step back and think out of the box

Timeline for FR effort on Detectors



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 for the effort: O(LHC)
- 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



Organization (IN2P3)

FCC-Phys Master-Project:

- physics studies and detector developments for FCC
- started in January, new project in the SMPP scientific program at IN2P3
- scientific coordinator: Gregorio Bernardi (LPNHE)
- for the exploration phase: mostly support for workshops, travels, etc
- will hold most of the FCC Detector R&D projects in the future

FCC-NPC Master-Project:

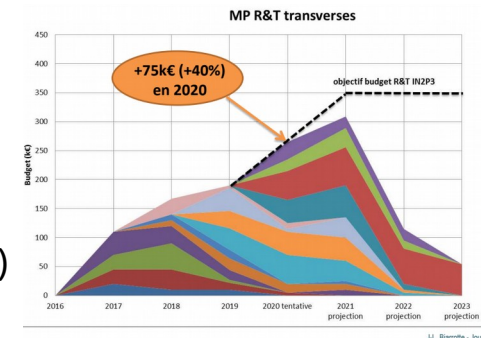
- R&D on accelerators, defined by Jean-Luc Biarrotte (DAS Accelerators&Technologies)
- scientific coordinator: Angeles Faus-Golfe (IJCLab)
- 4 project lines: FCC-hh dynamic pressure, FCC-ee positron, FCC-ee stabilisation, R&D lumi e+e-

Activities on Detectors:

- natural interplay with the prospective work conducted in GT08 (and GT07)
- effort starting at the institute to define a “federation” for detector-related work

R&T Support:

- goal of increasing our support for transverse/generic R&T
- applications for generic R&T projects (w/ possible use at FCC) encouraged, through usual mechanism (contact: Jean-Luc, Rodolphe, me)
- in parallel, build also/redefine ILC R&D (MP CALICE&CMOS, ~200k€/y)





Conclusion

- building on the success of the 1st FCC-France Days last fall
- first instance of a long serie of workshops dedicated to FCC program !
- joint organization by IN2P3 & IRFU to foster nation-wide collaboration
- should obviously translate in strong participation & leadership at the project level
- in the meantime interest in the FR community has grown
- many areas of interest will be discussed today and tomorrow
- a lot of fun & exciting science to do to prepare the physics and the detectors
- we are starting to put in place the organization to help shaping this major long-term effort !

Enjoy the workshop !

Many thanks to:

- Gregorio Bernardi for MP FCC-Phys, Roy Aleksan for IRFU and the organizing committee: Roy Aleksan, Jeremy Andrea, Gregorio Bernardi, Auguste Besson, Vincent Boudry, Suzanne Gascon, Thibault Guillemin, Fairouz Malek, Stephane Monteil, Nicolas Morange, Steve Muanza, Luc Poggioli, Roberto Salerno, Jan Stark
- the FCC management (Michael Benedikt) and ECFA (Jorgen d'Hondt)
- all our other distinguished guests
- all of you for your participation & involvement