FCC-contacts – December 4th

- News
- Les projets CMOS et DICE
- Programme du Workshop de Janvier
- Tour de Table
- AOB

Brief news of relevance (A. Blondel/P. Janot)

MTP (as discussed in June) has been approved.

→ Budget for High Field Magnet

→ budget for CLIC reduced to accelerator part only

→ **FCC-ee Physics and Experiment studies will be supported**

+ detector R&D in CERN-EP + ECFA panel on detector R&D

(not FCC exclusive, of course)

The role of ECFA in the context of the Strategy

- **Detector, Experiment and Physics studies towards a Higgs Factory**

  (aligned with the ECFA initiative to map the potential of Higgs physics at future colliders)

- **Organize the development of a Detector R&D Roadmap**

  (additional to the ECFA Detector R&D Panel)

- **Synergy efforts with astroparticle and nuclear physics**

  (aligned with our JENAS initiatives, Joint APPEC-ECFA-NuPECC Seminar)

- **Societal efforts on recognition, diversity and career aspects**

  (aligned with our working groups on the topic and the ECFA initiative to organize a Strategy debate among early-career researchers)

Physics, Experiment & Detector studies towards a Higgs Factory

Support for and Acknowledgement of a series of PED@HF workshops

PED@HF – Physics, Experiments and Detector studies at Higgs Factories

ECFA acknowledges the need for the experimental and theoretical communities involved in Physics studies, Experiment designs and Detector technologies at future Higgs Factories to gather. ECFA supports a series of workshops with the aim to share challenges and expertise, to explore synergies in their efforts and to respond coherently to this priority in the European strategy for particle physics.

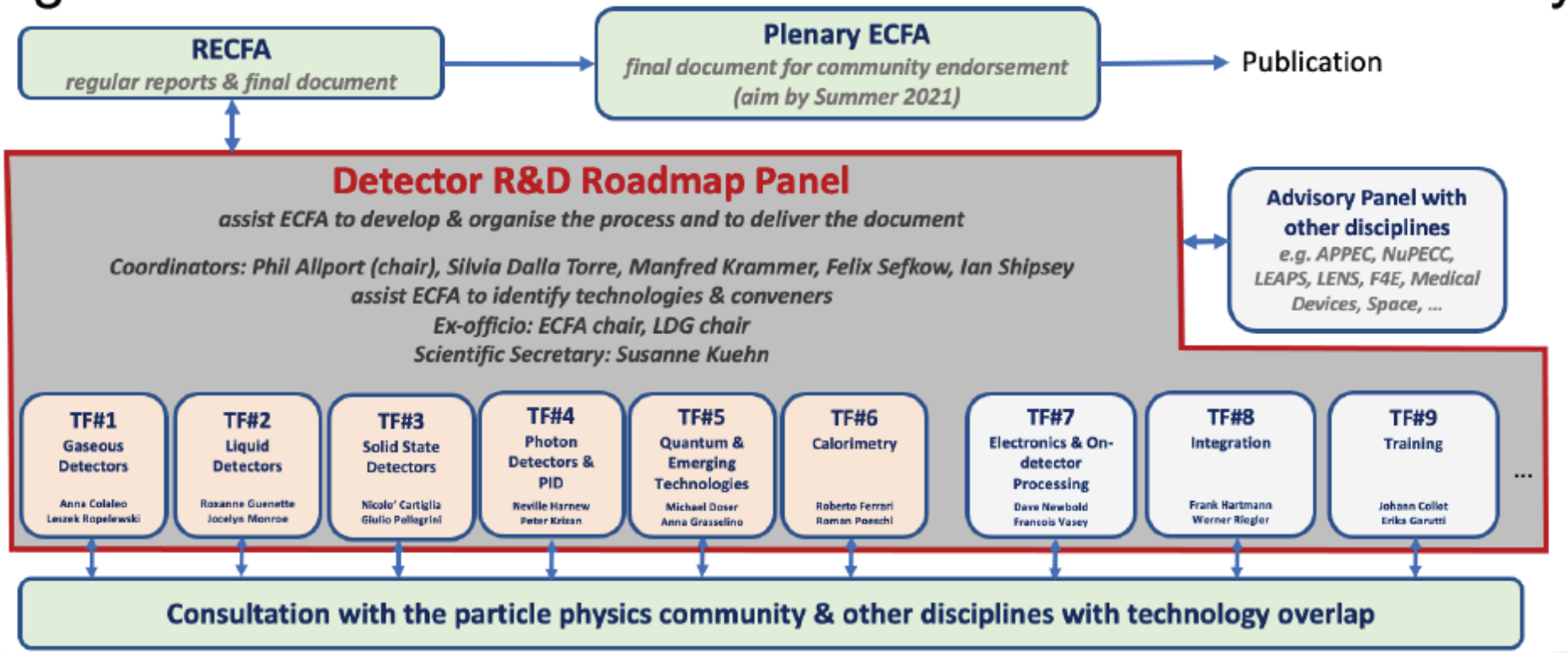
Such *Aix-les-Bains-type* workshops would focus on PED studies for a Higgs Factory which would match a previous ECFA initiative mapping the potential of Higgs studies at future colliders. Setting up an International Advisory Committee (IAC) would be the next step, involving some RECFA members and European leaders of the most relevant colliders (e.g. CLIC, FCC, ILC, CEPC, LHeC, muon collider) with a mandate to setup a Program Committee (PC) that would develop an agenda in consultation with the IAC, and embracing the global nature of these projects.

Next ECFA meeting 19-20 November 2020

Detector R&D roadmap

Organised by ECFA, a roadmap should be developed by the community to balance the detector R&D efforts in Europe, taking into account progress with emerging technologies in adjacent fields. The roadmap should identify and describe a diversified detector R&D portfolio that has the largest potential to enhance the performance of the particle physics programme in the near and long term. This community roadmap could, for example, identify the grand challenges that will guide the R&D process on the medium- and long-term timescales, and define technology nodes broad enough to be used as the basis for creating R&D platforms. This will allow concerted and efficient actions on the international scale addressing the technological challenges of future experiments while fostering an environment that stimulates innovation and collaboration with industry.

Organization to structure the consultation with the community



Focus on the technical aspects given the EPPSU process as input.

Development of a matrix, where for each Task Force the identified future science programmes that they will need to address in terms of the technology challenges to be met and estimate the lead-time over which the required detector R&D programmes may be expected to extend.

Create a time-ordered R&D requirements roadmap in terms of key capabilities not currently achievable.

Organization to structure the consultation with the community

RECFA
regular reports & final document

→

Plenary ECFA
final document for community endorsement
(aim by Summer 2021)

→ Publication

FCC

See presentation by Susanne Kuehn at FCC workshop

Coordinators: Phil Allport (chair), Silvia Dalla Torre, Manfred Krammer, Felix Sefkow, Ian Shipsey
assist ECFA to identify technologies & conveners
Ex-officio: ECFA chair, LDG chair
Scientific Secretary: Susanne Kuehn

FCC IS CONCERNED BY ALL WP'S!

example Task Forces at this stage

TF#1	TF#2	TF#3	TF#4	TF#5	TF#6
Gaseous Detectors	Liquid Detectors	Solid State Detectors	Photon Detectors & PID	Quantum & Emerging Technologies	Calorimetry
Anna Colaleo Leszek Ropelewski	Roxanne Guenette Jocelyn Monroe	Nicolo' Cartiglia Giulio Pellegrini	Neville Harnew Peter Krizan	Michael Doser Anna Grasselino	Roberto Ferrari Roman Poeschl

TF#7	TF#8	TF#9
Electronics & On-detector Processing	Integration	Training
Dave Newbold Francois Vasey	Frank Hartmann Werner Riegler	Johann Collot Erika Garutti

- Focus on the te
- Development of
  technology chal
  Create a time-o

terms of the main
cted to extend.

Input and timeline of the process

- The Panel is finalising the scope of each Task Force.
- Next, several Task Force experts will be assigned in consultation with the conveners with a role to preparing the respective Task Force symposia, in general one symposia for each Task Force and scheduled for March-April 2021, and potentially to become speakers at the symposia.
- The presentations and discussions at the open symposia aim to inform the discussion and consultation with the community, and therefore they require dedicated preparation by conveners and experts.
- Each Task Force will itself connect to industry where relevant within its scope.
- The role of the Advisory Panel is thought to be helpful to connect, where relevant, Task Force members with experts in adjacent fields to work together towards the roadmap and during the symposia.
- Task Force members are to connect to the community; RECFA members will have an opportunity to provide national input to conveners and experts, or to name an expert delegate for this.
- A communication line will be established with future projects with a view to collect information.
- A multi-day drafting session, in or around May 2021, will bring together the coordinators and conveners to draft the roadmap. Report at the RECFA meeting, at this stage foreseen on 28 May 2021 with a further opportunity for community feedback.
- Consultation with CERN Council in June 2021, and a final community contact prior to the publication at the EPS-HEPP conference in July 2021.

AB -- This is a very short time scale. It is an important process since people will refer to it in e.g. grant proposals.

-- The Z factory (5.10^{12} Z) challenge will be written explicitly in the scope description

-- We had discussions with Allport and Kuehn;

→ **our problems are often new and require tapping all task forces. We would like to actively address all of t**

FCC

From the workshop

Africa	3
Asia	84
Europe	733
North America	82
Oceania	1
South America	7
Grand Total	**910**

Julie Hadre

502 registered participants to the physics workshop (**910** for the whole November workshop)

Tremendous talks across the board in all sessions

➔ Congratulations to all conveners and speakers!

si-VTX module is not necessarily square or flat

Laci Andricek DEPFET (Belle II and Beyond)

towards a first layer of 11mm radius?

First results from the Physics Performance effort

➔ Congratulations to Emmanuel and Patrizia and contributors!

many new faces!

From the round table

please send around your take-aways from the round table!
→ beate.heinemann@desy.de milstead@fysik.su.se

Why do we need a new accelerator after the LHC?

Challenge brought about by J. Mnich, and repeated several time
Various wordings around the fact that the discovery of the Higgs is a big jump into the unknown
because many open questions remain

➔ it would be great to organize a **short** argument that summarizes the point.
Within our field and nearby science (astro-particles, cosmologists etc..)
For more general scientific community
For the public

➔ Important to be very clear on the **cost vs time profile**
(10+1+17)BCHF over 40-50 years is not the same as "30BCHF"!

How do we attract the young generation of experimenters for FCC-ee studies?

understanding of how to collaborate with the big LHC experiments to somehow find a way that youngsters can do e.g. R&D on FCC and operations+analysis on CMS or ATLAS is important.
Probably difficult until HL-LHC upgrade is done but it is important to think about it for the experimentalists.
Guenther: need to discuss with LHC experiments ..

-- chat room:

Future accelerator studies are a great opportunity to explore uncharted territory, discover/invent new things and to publish 'few authors' original material.
Also an opportunity to broaden one's vision of the physics, contact theorists and acc. physicists, etc...

Questions to the round table

How do you deal with a sceptic who says the SM is complete and there is no need to go further with the FCC ?
What is the most compelling reason to do the FCC (in particular to also convince the funding agency)?

What are the biggest technical challenges about the FCC-ee to achieve the measurement precision required?
Should the FCC-ee analysis and detector aspects be discussed in close collaboration with ILC, maybe jointly discussing explicitly what aspects are different and which are the same to leverage the manpower best?

Is it a good idea for early career experimentalists to spend significant time on FCC? What sort of fractions is useful?
Should the organisational model follow those of the LHC experiments, e.g. regarding how tasks are shared and how authorship is granted?
Should students and postdocs try to spend some time on the FCC now, and how can they prioritise this w.r.t. LHC operation and data analysis?

How can we engage the theoretical community sufficiently to achieve the extraordinary precision required to fully capitalize on the FCC data?

Can early career researchers or scientists at universities help with the R&D on superconducting magnets?
Or, are there other very important technical areas led by CERN where universities could contribute?

In view of the detector developments required, how can we make sure this receives the attention and funding required to ensure the technology is ready when we need it?
What are the key technology advancements required for FCC-ee / FCC-hh? Are there any revolutions needed?

Will analysis in the 2050s actually be done by humans or will it all be automated by AI?

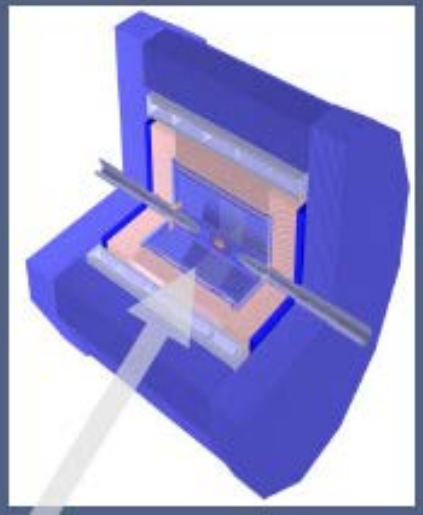
How many experiments and access points there will be at the FCC? Will there be specialised experiments like lhcb and ALICE or general purpose like atlas and CMS?

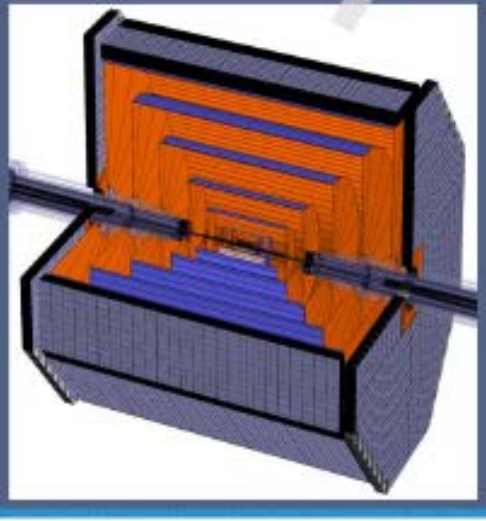
The LHC ring will provide protons to the FCC. But since filling doesn't happen at all times, what will the LHC ring be used for in the meantime? Will there be an equivalent or the current North Area with more experiments?

CEPC Detector Concepts Studied

Particle Flow Approach

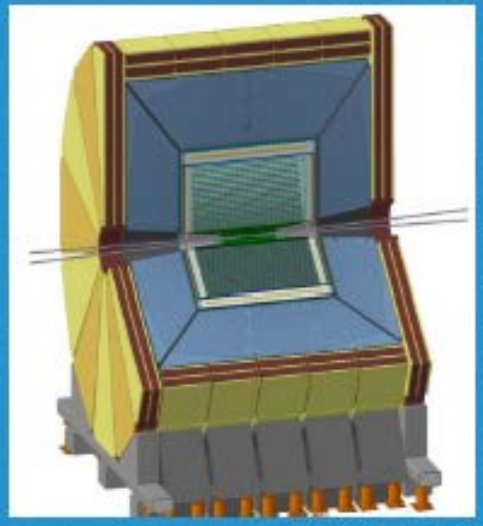
High magnetic field concept (3 Tesla)





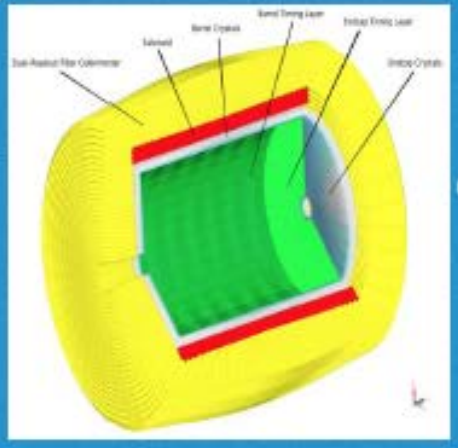
Full silicon tracker concept

Low magnetic field concept (2 Tesla)



IDEA Concept

also proposed for FCC-ee



"Fourth concept": Crystal Calorimeter based detector (2-3 Tesla)

Final two detectors WILL be a mix and match of different options

FCC

Very briefly

DG at FCC-IS: "CERN will put in place dedicated effort in experimental and theoretical physics"
Discussion has taken place in EP + Th departments. → **Patrick** (Michelangelo)

Mandate and organization for the whole FCC for 2021-25
(aim) to be made public in March 2021
Until then we operate with 2013 mandate.

ECFA is putting together
-- Higgs (and Electroweak) Factory "physics experiments and detectors" workshops *)
-- a detector R&D road map panel
Great opportunities not to be missed!

*)see news of March and April 2020 for genesis.

FC: Organisation et projets

Futur collisionneur, physique prospective et R&T détecteurs:

- priorités ESPPU: usine à Higgs, collisionneur pp d'au moins 100 TeV
- choix de l'usine à Higgs non-tranché: ILC, FCC-ee, ...
- organisation se met en place (CERN, ECFA, nous) pour cela
  - prospectives nationales et déclinaison institut
  - R&T machines (cf. Jean-Luc)
  - prospectives physique/optimisation détecteurs, R&T détecteurs
- schéma global (présenté aux journées FCC-France), à affiner:
  - poursuite de la R&T ciblant ILC (CALICE/CMOS), synergie autres machines à encourager
  - propositions de R&T génériques (agnostique % machine) encouragées
  - pas de soutien à de la R&T ciblant FCC avant 2 ans (phase Exploratoire avant Focus&Consolidation)
  - nouveau MP FCC-Phys pour prospective physique & animation ciblant FCC et au-delà

Projets R&T détecteurs:

- CALICE (IJCLab, IP2I, LLR, LPC, LPNHE, Omega): calorimétrie ultra-granulaire
- CMOS (IPHC/IJCLab): capteurs pixels minces et granulaires
- NEW: DICE (CPPM, IPHC): pixels haut taux de comptages: hybrides (ASIC 65nm) et DepMAPS

Futurs collisionneurs:

SIMP, (CPVQ): physique prospective

FCC-Phys:	3 ETP CH [# {8 ch, 0 doc, 0 pdoc}]	G. Bernardi (LPNHE)

Budget indicatif 2021 FCC-Phys: 34 k€

INDE: les détecteurs innovants

CALICE:	7 ETP CH [# {10 ch, 1 doc, 1 pdoc}]	6 ETP IT [# {19}]	J-C. Brient (LLR)
CMOS:	2 ETP CH [# {4 ch, 1 doc, 0 pdoc}]	10 ETP IT [# {15}]	M. Winter (IJCLab)
DICE:	nouveau projet (CPPM+IPHC)		M. Barbero (CPPM)

Budget indicatif 2021 CALICE: 220 k€

Budget indicatif 2021 CMOS: 124 k€

Budget indicatif 2021 DICE: 93 k€

Obtenus 34 kE sur 55 demandés. Négociation en cours,
Prévoir de recevoir environ 2/3 de la somme demandée.