

# Towards an Attempt of a Summary

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FC@CERN German Community Event  
Bonn, 24.5. 2024



# Procedure to obtain a short summary document

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This morning: three discussion sessions:

- Community engagement in R&D for FC@CERN (Frank Simon)
- Path towards the ESPP update (Heiko Lacker)
- Scenarios for FC@CERN (Klaus Desch)

Now: try to summarize outcome of discussions in a few keywords

- use key questions or statements from three previous presentations
- add further items in case needed and agreement is reached
- try to identify majority / consensus opinion, but also respect minority opinions

Provide a draft of full text in the next month

Iterate text within KET and with participants of the workshop

Approval of final text by KET and „publication“ as minutes on agenda page in summer

It has no the status of “KET Stellungnahme”. But it can of course be accessed by BMBF, PT-DESY, ...

# Other items:

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Who is addressee?

Approval of final text by KET and „publication“ as minutes on agenda page in summer

It has no the status of “KET Stellungnahme”. But it can of course be accessed by BMBF, PT-DESY, ...

No contradiction from audience

From Lutz’s introduction slides:

**The community wants to discuss the opportunities of a potential FCC-ee collider at CERN  
This is the scope and goal of this workshop!**

**There are several Higgs factory projects on the table: the focus of this workshop does not represent a pre-commitment of the community to this project**

My personal opinion: should go to “preamble” of summary document

Full support from audience

# Path towards the ESPP update

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## Q1: Proposed timeline?

Three workshops:

- „Non-collider“ (22.-24. Nov., Bad Honnef)
- „Collider“ (27.-29. Nov., DESY)
- „Concluding Workshop“ (19.(evening)-22.(afternoon) Jan., Bad Honnef)

Preparation of input to ESPP update: Iterate text in February and submit bevor 31. March

## Q2: Workshops: numbers, dates, content, organisation ... ?

Number and dates see above

Proposed preliminary content see Heiko's slides

Organisation: organisation committees in „creation process“, other committees (KAT KfB, KHuK) involved

## Q3: Anything else?

My conclusion from discussion: timeline and number of workshop signed-off by majority of the audience.

MPI proposed to host the collider workshop. KET will decide on final dates and locations.

Details of agendas to be clarified in/with organizing committees.

Focusing on most pressing topics shall be considered taking also into account guidelines by ECFA.

# Community engagement in R&D for FC@CERN

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Q1: Steps towards the next projects: FCC feasibility study (FS), study in FCC pre-TDR phase, concrete projects/det.:

How do we engage in this process as a community?

- the community should visibly engage in FCC FS and pre-TDR studies in all areas

Q2: FCC detector R&D / physics studies / computing & software

Where and how should we engage as a community? What about visibility on the coordination level?

- participate in documentation and spreading of compelling physics case at various levels (get prof. help?)
- engage in Focus topics for the ECFA study on Higgs/ Top/EW factories <https://arxiv.org/abs/2401.07564> at tt-threshold
- lower threshold to get involved with MSc students ... (online / in person tutorials)
- provide documentation for new comers interactively and online
- provide technical infrastructure to perform physics /detector optimization studies
- provide set of fully simulated event samples for one / several detector concepts (see C&S)
- get engaged in KEY4HEP development
- get engaged in Detector R&D in BMBF research compounds and DRDx collaborations
- coordination roles (visibility) will emerge automatically once activities are ramped up

Q3: Detector concepts – path to collaborations:

Which detector concepts do we engage in? Where do we lead?

- no commitments to specific detector concept now
- remark: CLD/ILD has the most advanced technical infrastructure

# Community engagement in R&D for FC@CERN (2)

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Q4: Detector R&D - Subsystems and overarching themes:

Does our „concept interest“ match our technology expertise and preference?

Can we engage in overarching themes with high relevance on overall system design?

Q5: Detector R&D funding and organisation in D: three compounds are funded by BMBF in 2024 – 2027

Shall an overarching coordination of De-FC(C) activities in detector R&D be established?

- common meetings attached to Terascale Alliance Detector Workshop and Annual Meeting

Q6: Computing and software R&D: (currently no funding)

How do organize to achieve maximum impact ? Shall a similar structure for computing&software be established

- organize knowledge transfer / workshops + tutorial

- check whether and how developments in FIDIUM and PUNCH can be used

Q7: Should the community join one detector concept for studies in coordination w/ detector R&D activities ?

- see above

Q5+6: KET is charged to provide a proposal of a concept how activities in Germany shall and can be coordinated

The Helmholtz Alliance Physics at the Terascale might be an good environment for such a structure

# Scenarios for FC@CERN (1)

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## Statement 1:

There are fundamental questions about our Universe and its microscopic constituents, which can only be answered at high energy

→ without a new collider, many of these questions will for sure remain unanswered.

Colliders are expensive – should be requested responsibly from society.

CERN is the world-leading lab for particle physics. Maintaining this leadership is clearly desirable.

A collider flagship project at CERN soon after HL-LHC is needed and well-motivated.

In addition to a superb physics case, the project has to; address ambitious sustainability goals, strongly involve the (now) young generation, attract (positive) public interest, be attractive for (German) industry. be affordable and feasible, **drive cutting edge technologies, communication of compelling physics case**

## Comments/observations:

- add: “drive cutting edge technologies” to list, add “collider” to underlined statement
- exact final phrasing to be determined carefully in full text → open for comments by all participants (e.g. “clearly desirable” → “absolutely mandatory and our ambition”, not endangering HL-LHC programme)
- My impression: no major contradictions observed.

Such a general statement is welcomed by overwhelming majority.

# Scenarios for FC@CERN (2)

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Statement 2:

An  $e^+e^-$  Higgs factory is the highest priority goal of the world-wide community and has a rich physics programme.

CERN has launched a feasibility study (is) proposing the FCC-ee as a Higgs factory.

The FCC-ee offers excellent opportunities to study the nature of the Higgs boson and its connections to many of the open questions in particle physics and further exciting physics opportunities.

Germany should embark on this project more strongly.

We want to increase efforts to:

communicate our excitement about the physics potential; contribute to theory challenges to achieve the required (beyond-state-of-the-art) precision, prepare to play a major role in proposing and developing detectors, software, computing “and work out physics case”, increase involvement in the accelerator (labs + industry)

Comments: general message approved by strong majority

- exact final phrasing to be determined carefully in full text → open for comments by all participants
- add “has launched a feasibility study” in 2<sup>nd</sup> line - add “work out physics case” to list
- stress more explicitly broad compelling physics programme
- replace “more strongly” by “strongly” ? (no majority support)
- does “increase efforts to” not also apply to the collider studies? -move ”communication” also to “statement 1”



# Scenarios for FC@CERN (3)

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Statement 3:

There are uncertainties with financial feasibility and global context

- What if FCC-ee is not feasible and/or not affordable? → “other Higgs factory”
- What if China decides to build the CEPC? → “other collider”

Possible implications:

- accelerate magnet development and move ”directly” to FCC-hh ?
- high-energy (>500 GeV) linear collider collider (ILC-like, CLIC-like, ...) ?
- muon collider ??
- ...

If FCC-ee is not affordable or not advisable ...”

In the context of EPPSU, a competitive, feasible, and affordable (Plan B) alternative colliders (at CERN ?) need (also) to be (developed) identified to address the open fundamental questions

Comments: My observation “re-work statement to large extent” → see above for final agreed on text in green

Remaining comments/observations in lines below obsolete by now

- if e+e Higgs factory is highest priority: ILC/CLIC-like should not be treated at the same level as FCC-hh,  $\mu$ -CL-
- should mention different status of maturity /feasibility of three projects
- replace “plan B” by alternative - replace “developed” “identified”
- underlined sentence should be phrased more carefully