CHEF

Swiss Experimental Research for the FCC

FCC Process within CHIPP

- SCHWEPPS 2016 (Strategy workshop on high energy physics in Switzerland)
  - Session on future accelerators and detectors
  - Led to Summary paper -> Pillar 1 (High-energy physics) White paper
    - 2018: Chapter on “Potential future facilities as drivers for Pillar 1 research” including FCC-ee & FCC-hh
- 2016: Swiss groups found CHART (Swiss Accelerator Research and Technology)
  - Recognizing accelerator development is the limiting factor for future projects
  - “The mission of CHART is to support the future oriented accelerator project FCC …”
- 2018: Swiss input for European Strategy Update document
  - Following unanimous CHIPP board agreement: “the Swiss community considers the FCC to be the most promising project for the next high-energy frontier machine at CERN.”
  - “Full exploitation of the LHC should remain as the first priority for the European particle physics programme, in parallel with an intensified R&D and design effort to realise the next large project at CERN in the future, namely FCC. “

FCC Process within CHIPP (continued)

- 2020: European particle physics strategy update released with highest priority on future electron-positron Higgs factory, and advice to follow-up on feasibility of FCC-ee FCC-hh
- 2020-2021: Swiss input ECFA detector R&D roadmap document
  - ECFA now -> recommendations for implementation and working with funding agencies
- 2021: CHIPP roadmap for Research and Infrastructure 2025-2028
  - Recommendation 1b: CHIPP recommends the development of a national strategy towards the participation in CERN's programme for an FCC, starting with FCC-ee, which encompasses detector development, theoretical research, and data analysis and simulation.
- 2022: CERN and ECFA strategy implementation plans and FCC feasibility study
- **In Switzerland: Forming CHEF, a structure for organizing the Swiss FCC experimental research and interfacing to the international efforts**

CHEF framework

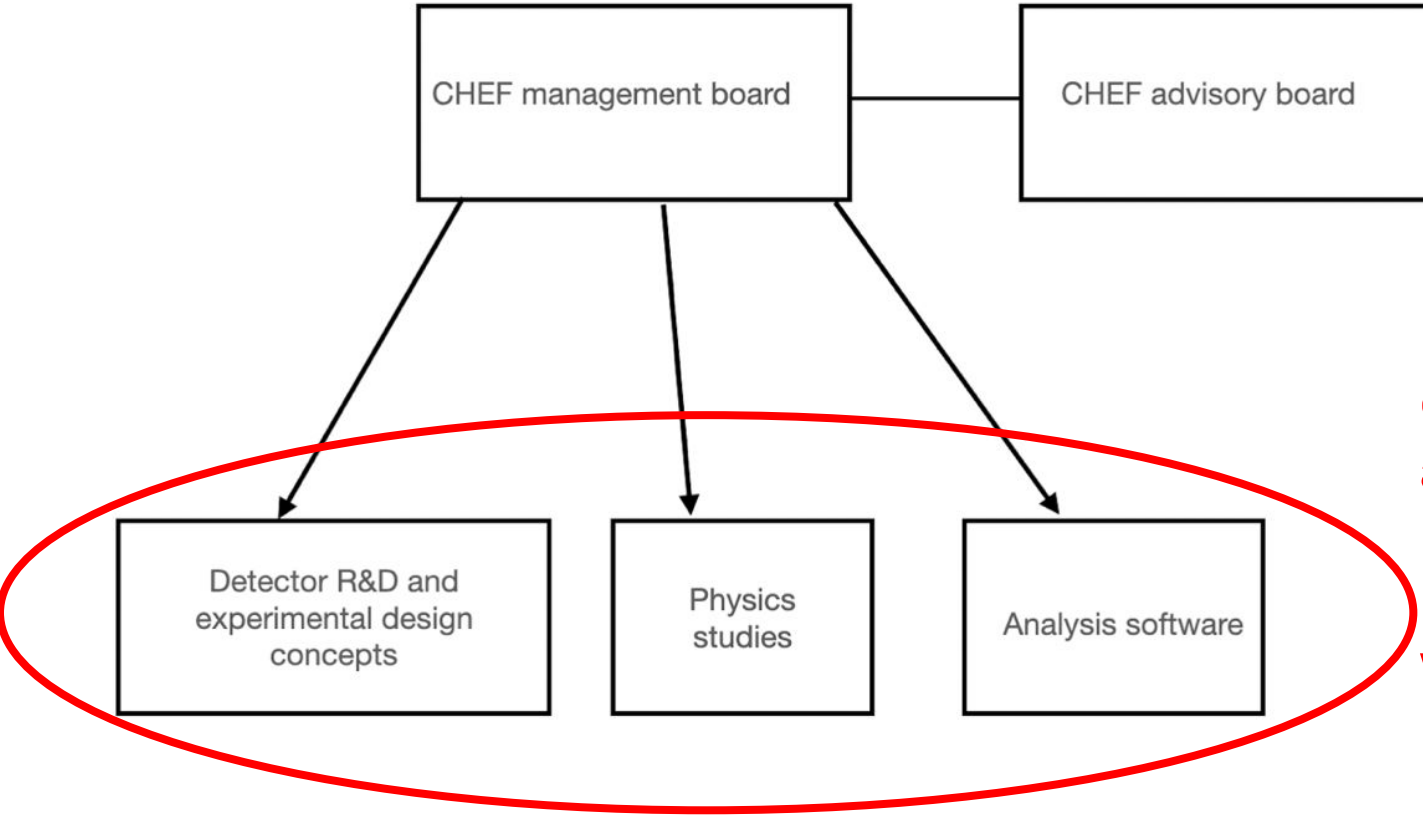
Following the successful implementation of CHART

CHEF goals:

- Provide a national (CH) structure for longer-term engagements in detector instrumentation work
- Establish a platform to take advantage of synergies in detector developments between Swiss institutions
- Promote applications to other fields
- serves as a center to enable a coherent strategy for defining the physics goals and deriving instrumentation requirements.
- acts as a collaborative link to CERN, ECFA, and efforts in other countries
- Act as a communication channel to the public

CHEF as direct continuation of the LHC and HL-LHC developments, to maintain strong and visible engagement of Switzerland

Preliminary CHEF structure



Goal of updating and defining a baseline of work packages at this workshop

CHEF general timeline

2022: This Workshop : Collect inputs to CHEF structure

2023: Define CHEF structure, develop contacts with Swiss institutions

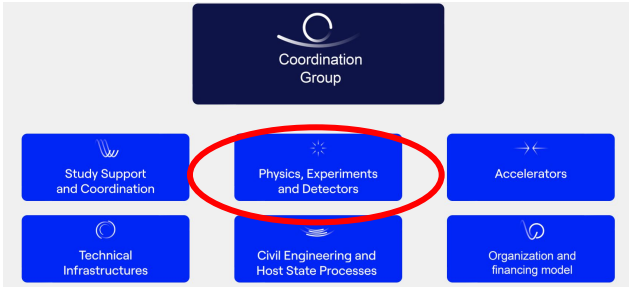
2024: Obtain agreements between funding sources

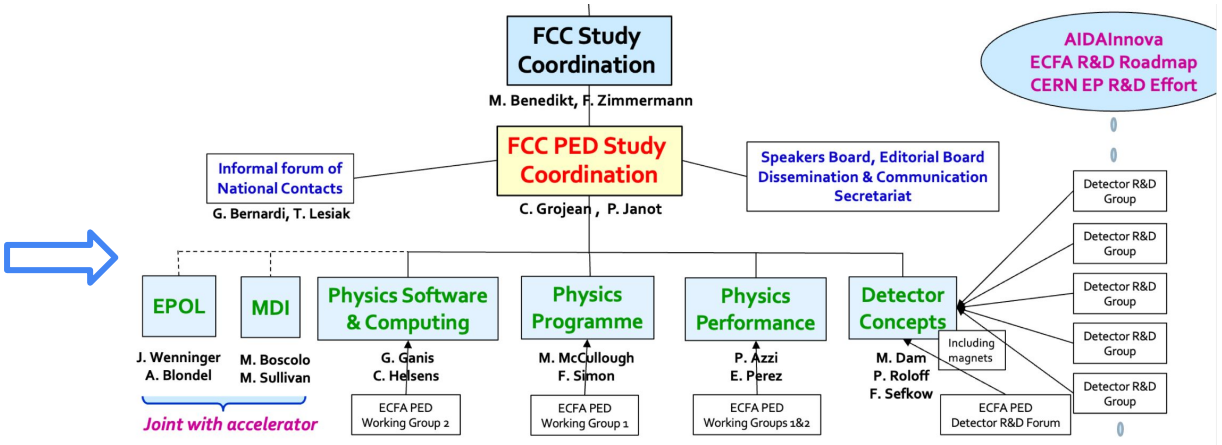
2024: Establish CHEF management board and advisory board

2025-2028: CHEF is fully operational

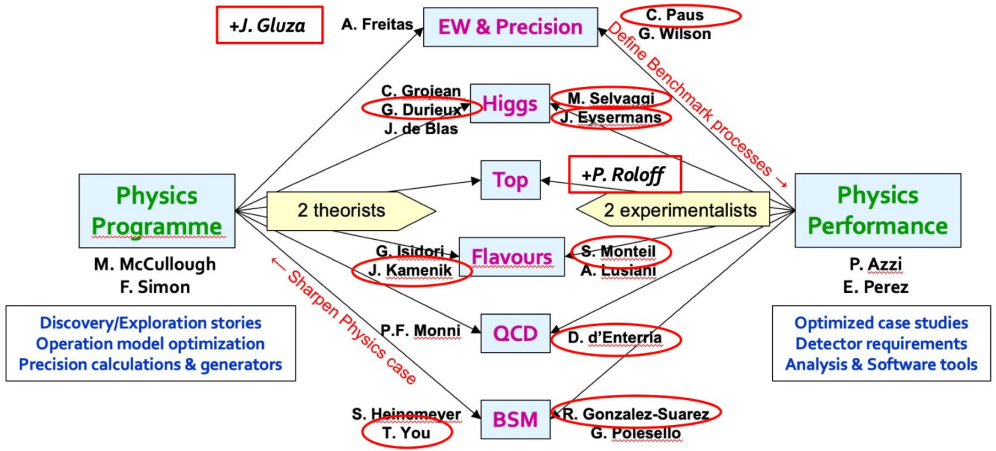
Matching CHEF to FCC structures

FCC organization



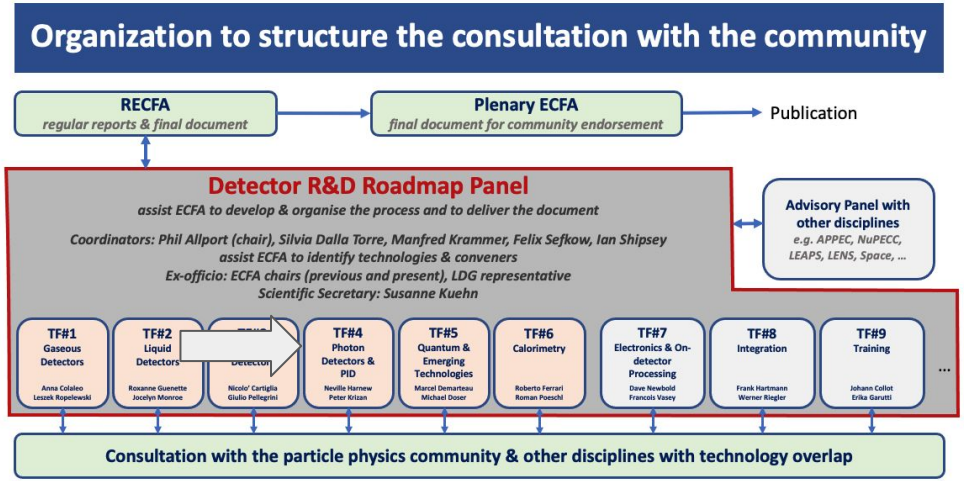


Physics program

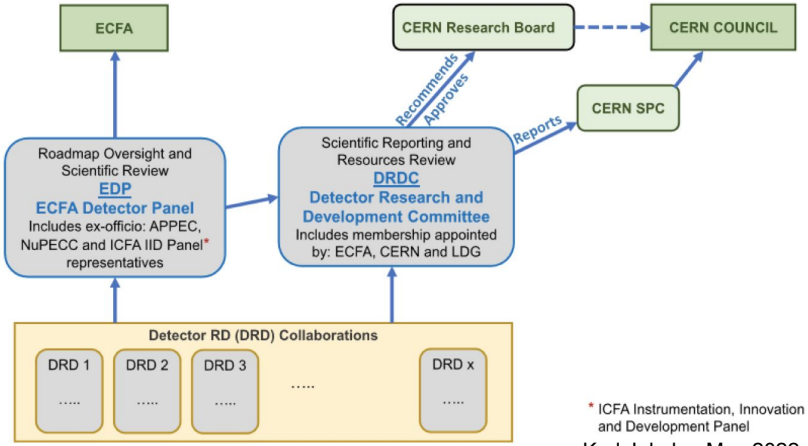


FCC Detector R&D

ECFA task forces to survey community



Implementation of ECFA recommendations



Swiss institutions' interests in FCC

(part 1)

(source 1st Swiss FCC workshop, Sept.`21)

ETHZ

- Physics interests :
  - **Higgs**/**BSM**/LLP Physics
  - B-tagging/**tracking**/**jet**/**met**
- Detector R&D
  - **Pixel**
  - **DMAPS**
  - **Passive CMOS**
  - 3D diamonds

PSI

- Physics interests :
  - **Higgs** / **B-phys**
  - **Tracking**/vertexing
- Detector R&D
  - **Pixel**
  - **DMAPS**
  - **Pixel** readout chips
  - Fast **silicon** readout

UZH

- Physics interests :
  - **BSM**/**Higgs**/SM
  - Tau/**jets**
- Detector R&D
  - **Pixel**
  - **LGAD** sensors
  - **Passive CMOS**
  - **HV-MAPS** (LHCb)
- FCCee SNF grant (Florencia)
  - **C/B-tagging**
  - Top-quark physics
  - **DMAPS**

In bold : multiple institutions interested

Swiss institutions' interests in FCC

(part 2)

(source 1st Swiss FCC workshop, Sept.`21)

Bern

- Physics interests :
  - **Tracking**/showers
- Detector R&D
  - **Pixel**
  - Trigger
  - **DAQ**

Geneva

- Physics interests :
  - Hadronic Physics/**BSM**
  - **Tracking/jet/met**
- Detector R&D
  - Heterogeneous computing & **DAQ**
  - Machine learning
  - **Silicon timing detectors**

EPFL

- Physics interests :
  - **B/C-physics**
  - **Tracking**
- Detector R&D
  - Scintillating fibers/SiPMs
  - **DAQ**

In bold : multiple institutions interested

Challenge

Map Swiss interests into subset of FCC working packages

This is the task for discussion this week

Intro to discussion

We aim at baseline work package definition. Want to add substance based on presentations. “Version 0”, to guide the discussion:

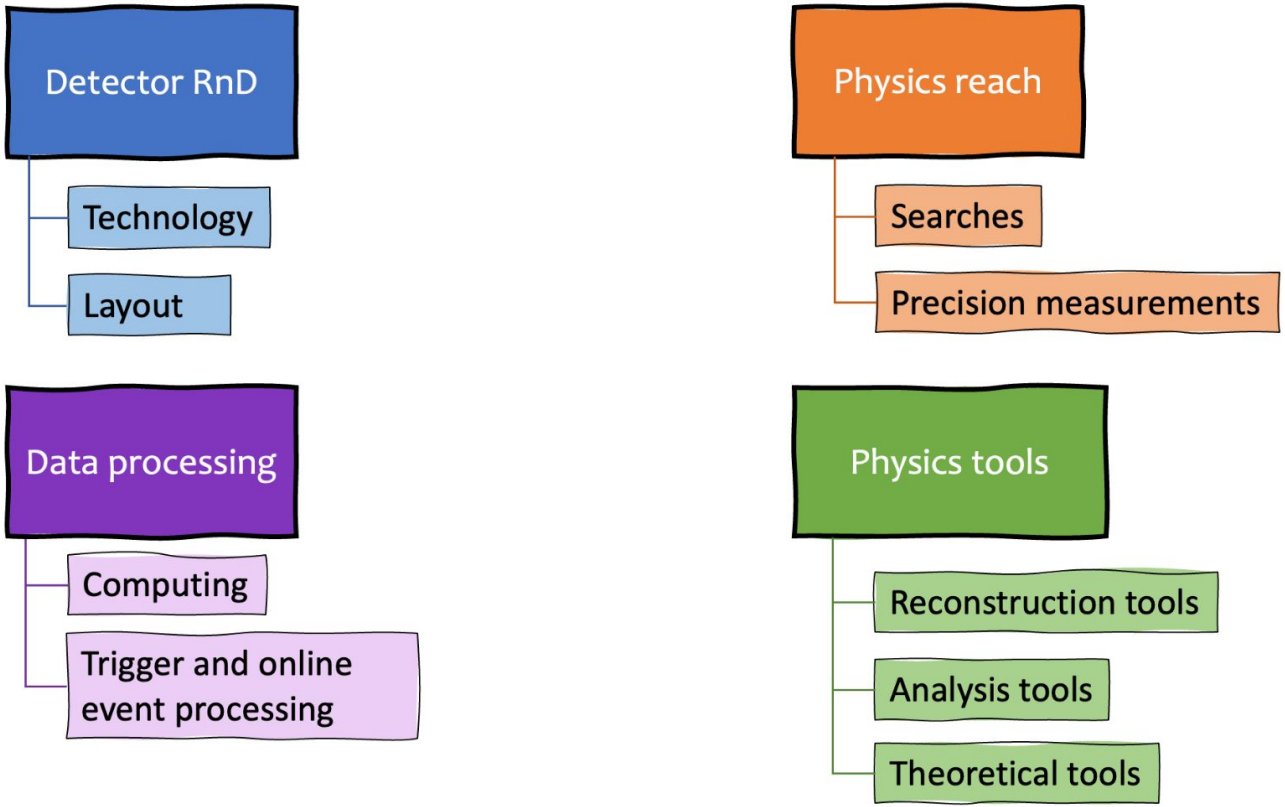
- Physics reach → More presentations and discussion tomorrow
  - Searches
  - Precision studies
- Tools (theory and analysis) → Interface between detector and physics
  - Reconstruction tools
  - Analysis methods
  - Theoretical methods
- Detector → Today
  - Technology
  - Layout
- Data processing
  - Computing
  - Trigger and online event processing

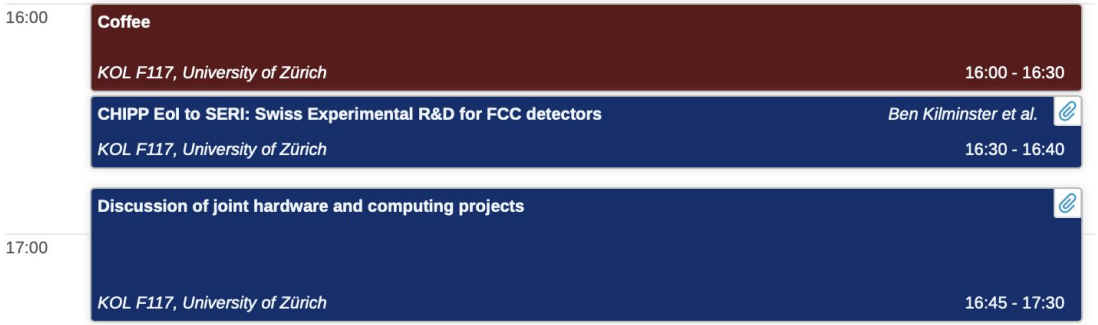
https://docs.google.com/document/d/1seR9n-dKf8uQVb0NtRJNnUVz43Jf6Gzvo4uLWIkqSa4/edit

Overview discussion today and focus on detector

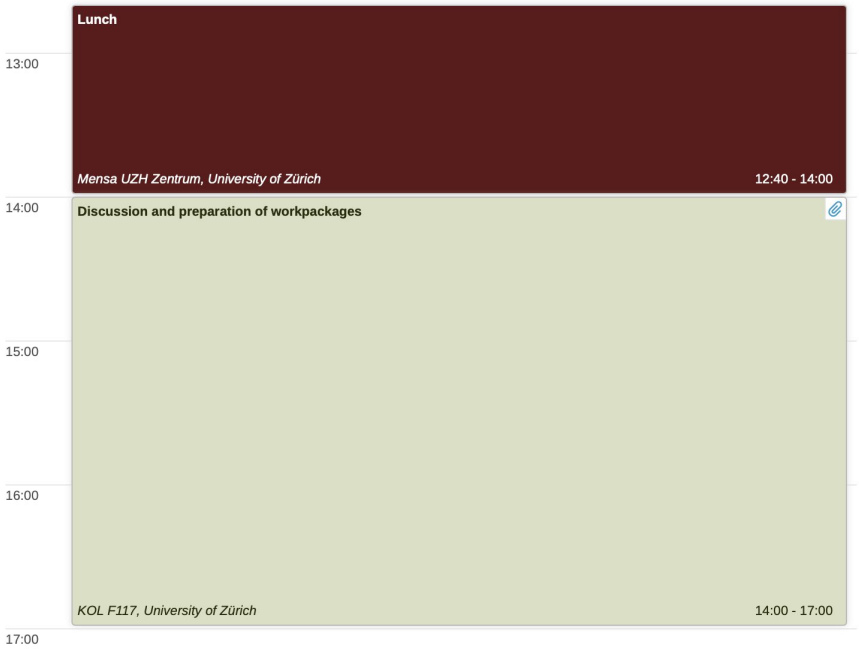
Content writing time tomorrow

CH FCC Interests – Preliminary Structure





Today



Tomorrow afternoon

Questions for the discussion

https://docs.google.com/document/d/1seR9n-dKf8uQVb0NtRJNnUVz43Jf6Gzvo4uLWIkqSa4/edit

Is the overall structure along the lines physics – tools – detector – computing reasonable?

Is there sufficient bottom-up interest for all aspects ?

Should we focus on less and then grow?

Do we need to formalize the interfaces to CERN/FCC DRD in the structure ?

Need separate “outreach” “education” “sustainability” “industrial applications”, or assume as implicit to each work package ? Same on transversal activities “electronics” “mechanics”

How much “space” should be given to blue-sky, vs. dedicated development ?

How much “space” for alternates to FCC (or “FCC agnostic”) ?

Join FCC detector concepts ?