

Physics Performance meeting

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Report(s)

Final Feasibility Study Report

- First draft to be ready by the end of the year (for the SPC)
 - Draft v0 for internal PED review by 30th of September!
 - analysis note drafts ready by early September

The Final Report will be an official document, public and submitted to the Strategy

The advancement of the strategy is such that several of you are likely involved also in National reports, White papers, and some of the ECFA topics. It is essential to streamline and optimize the work to guarantee the best and coherent information for FCC-ee to be submitted.

Physics Performance work for the Final Study Report

- **Answer specific questions requested by the Scientific Advisory Committee (SAC)**
 - **at least one analysis with full simulation:**
 - Higgs recoil analysis (J. Eysermans)
 - HF-Tagging/PFlow and $H \rightarrow bb/cc/ss$ final states (S. Aumiller, D. Garcia)
 - **study of Tau polarization measurement:**
 - expert group in place, full studies ongoing (M. Cepeda/D. Garcia -- shown today)
 - **expand requirements on Muon Detectors:**
 - some studies started with Delphes (M. Ali, F. Bedeschi).
 - Backgrounds studies? \rightarrow need resources
 - **case studies and requirements from the Z pole**
 - Z width (E. Perez), tau polarisation (see above), Rb exclusive, Rc (Lars/Michele)

Physics Performance work for the Final Study Report

- **A new and complete summary table for detector requirements:**
 - to be filled for each sub-detector components
 - In some cases even with detailed information

Table 1: List of detector requirements

	Aggressive	Conservative	Comments
Beam-pipe	$\frac{\chi}{X_0} < 2\%$	-	$B \rightarrow K^* \tau \tau$
Vertex	$\sigma(d_0) = 2 \oplus \frac{20}{\sqrt{\min^{1/2} s_{\text{IP}}}} \mu\text{m}$	-	-
Tracking	$\frac{\sigma_p}{p} < 0.1(0.2)\%$ at $\sqrt{s} = 90$ (240) GeV	-	$\delta M_H = 4$ MeV $\delta \Gamma_Z = X$ keV
	$\sigma_\theta < 0.1$ mrad	-	$\delta_{\text{BES}} < 0.2\%$ for $\delta \Gamma_Z = 40$ keV
ECAL	$\frac{\sigma_E}{E} = \frac{3\%}{\sqrt{E}}$	$\frac{\sigma_E}{E} = \frac{10\%}{\sqrt{E}}$	$Z \rightarrow \nu_e \nu_e \gamma$ τ polarisation boosted π^0 decays bremsstrahlung recovery
	$\Delta x \times \Delta y = 2 \times 2$ mm ²	$\Delta x \times \Delta y = 5 \times 5$ mm ²	
	$\delta z = 100 \mu\text{m}$, $\delta R_{\text{min}} = 10 \mu\text{m}$ (at 20°)	-	alignment tolerance for $\delta \mathcal{L} = 10^{-4}$ with $\gamma\gamma$ events
HCAL	$\frac{\sigma_E}{E} = \frac{30\%}{\sqrt{E}}$	$\frac{\sigma_E}{E} = \frac{50\%}{\sqrt{E}}$	$H \rightarrow s\bar{s}$, $c\bar{c}$, gg , invisible HNLS
	$\Delta x \times \Delta y = 2 \times 2$ mm ²	$\Delta x \times \Delta y = 30 \times 30$ mm ²	$H \rightarrow s\bar{s}$, $c\bar{c}$, gg
Muons	low momentum ($p < 1$ GeV) ID	-	$B_s \rightarrow \nu \bar{\nu}$
Particle ID	$3\text{-}\sigma$ K/π separation up to $p = 30$ GeV	-	$H \rightarrow s\bar{s}$ $b \rightarrow s \nu \bar{\nu} \dots$
LumiCal	$\delta z = 100 \mu\text{m}$, $\delta R_{\text{min}} = 1 \mu\text{m}$	-	tolerance required to reach $\delta \mathcal{L} = 10^{-4}$ target (Bhabha)
hermeticity	-	-	$\nu \bar{\nu} H$, $H \rightarrow$ invisible

Table 1: List of vertex detector requirements

	Aggressive	Conservative	Comments
Beam-pipe	$\frac{\chi}{X_0} < 2\%$	-	$B \rightarrow K^* \tau \tau$
Vertex	$\sigma(d_0) = 2 \oplus \frac{20}{\sqrt{\min^{1/2} s_{\text{IP}}}} \mu\text{m}$	-	-
Material budget	-	-	-
Radius Innermost layer	-	-	-
Single point resolution	-	-	-
Hit efficiency	-	-	-
Occupancy	-	-	-
Acceptance	-	-	-



Physics Performance work for the Final Study Report

- **MONEY PLOTS:** these are connected to the requirement table.
 - We need to show for which values of the detector performance we cannot achieve the desired measurement.
 - Will setup focus meetings to brainstorm and define them for the various groups (BSM, Flavor, EWK, QCD)

Welcome!

- Juliette Alimena (DESY), as BSM convener to join Rebeca Gonzales Suarez and Giacomo Polesello
- Lata Panwar (LPNHE), as MC contact for SM & QCD, to join Louis Portales (Higgs & Top), Xunwu Zuo (Flavours) and Sarah Williams (BSM)

Common sense policy on Notes and Talks



- **“Common Sense” Policy on publication of FCC related results:**
 - If it includes MC data and tools and statistics from the FCC-ee. And it has FCC-ee in the title (!)
 - Have a detailed FCC Note posted as well as the draft paper version in CDS, and a presentation (or more) at the Physics Performance meeting.
 - We will define a reviewers for a speedy decision on submission.
 - Several Notes still hanging there since a few months...would like to get them published.
- **Talks and Speaker Burö, Intense period of talks and presentations:**
 - Contact the Speaker Buro when you are assigned/invited for a talk
 - Share your slides a week in advance (we do not have automatic system yet like Cinco) for approval. Since things move fast, this is important in order to make sure the latest approved numbers and plots are presented.

Upcoming working meetings

Higgs/Top FCC meeting, July 16 2PM (tomorrow)

- <https://indico.cern.ch/event/1430125/>

ICHEP, 18-24 July, Prague

- <https://indico.cern.ch/event/1291157/>
- Many talks and posters:
 - Flavor and tau physics @FCC (Aidan Wiederhold)
 - Higgs physics opportunities at the FCC (Giovanni Marchiori)
 - High precision QCD and Physics at the FCC
 - BSM Physics and HNL at the FCC (Nicolo Valle)
 - Electroweak Precision Physics at the FCC
 - Poster on Higgs mass/ZH cross-section of 240+365 GeV (Gregorio B, Ang. L, Kevin D, Jan E.)
 - Poster on Leptophilic Z' bosons at the FCC

ECFA workshop on EWK factories, 9-11 October, Paris

- <https://indico.cern.ch/event/1399276/>

2nd FCC Italy-France Workshop, 4-6 November, Venice

- <https://agenda.infn.it/event/37960/>

Open call for speakers



- [ICNFP 2024](#) (Crete) August:
 - FCC talks(s) on physics/detectors
- For Higgs-Hunting'24 (Paris), we have 1 talk with Young postdoc speaker requested
- For Higgs'24 (Uppsala), we have 3 talks:
 - Higgs physics at the FCC-hh
 - Higgs couplings and detector requirements at the FCC-ee
 - Higgs properties (mass/width/CP) and detector requirements at the FCC-ee

Agenda for today



15:00 → 15:10 **News**

Speakers: Emmanuel Francois Perez (CERN), Michele Selvaggi (CERN), Patrizia Azzi (INFN Padova (IT))

🕒 10m

15:10 → 15:30 **Flavour tagging and PID**

Speaker: Dr Andrea Sciandra (Brookhaven National Laboratory (US))

🕒 20m

15:30 → 15:50 **HNL searches**

Speakers: Matteo Presilla (KIT - Karlsruhe Institute of Technology (DE)), Sofia Giappichini (KIT - Karlsruhe Institute of Technology (DE))

🕒 20m

15:50 → 16:10 **Z width and point-to-point energy calibration**

Speaker: Emmanuel Francois Perez (CERN)

🕒 20m

16:10 → 16:30 **Tau polarisation update**

Speakers: Dolores Garcia (CERN), Maria Cepeda (CIEMAT)

🕒 20m