FCCee MP kick-off

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Organisation of the Task Force

- Chair:
  - Jan Uythoven - MPE
- Scientific secretaries:
  - Christoph Wiesner – MPE
  - Anton Lechner – STI
- Core team members
  - Roderik Bruce – ABP (collimation)
  - Chiara Bracco – ABT
  - Belen Maria Salvachua Ferando – BI
  - Andy Butterworth – RF
  - Brennan – SY
- Total of 8 people in core team
- Larger group of ‘contact persons’ →

Contact Persons - confirmed

- ABP
  - Optics: Jacqueline Keintzel
  - Impedance/e-cloud/beam-beam and instabilities: Carlo/Lotta/Xavier
- Magnets
  - Warm: Daniel Schörling
  - Cold: Attilio Milanese
- Survey/Alignment: Hélène Mainaud Durant
- OP: Daniele Mirarchi (wider interest)

Contact Persons - tbc

- Power converters - ? Ask Valerie
- Vacuum - ? Ask Paolo
- Booster: Antoine Chancé (Saclay)
- Experiments: Manuela Boscolo (INFN)

- Missing or other names?
  - Not for now: EN, CRG

Context

- Why a task force?
  - Future accelerators is actually part of the mandate of the Machine Protection Panel. FCCee will need a boost now, during LS3 it could be integrated in the existing MPP structure
  - Limited time – shorter than a working group
- FCC context
  - FCCee (to be) organised by 4 pillars
    - One is the recently started Accelertor Technical Design Coordination Committee
    - MP reporting to ‘new’ optics meetings – changing name to Accelerator Design Meeting – which should also cover operations. Chaired by Frank and Jorg
    - Structure needs to be clarified; reporting lines etc.
- Indico to move to move to FCCee pages: https://indico.cern.ch/category/5264/

  Following this first meeting

Objectives, deliverables

- Feasibility report due in March 2025 – very limited time, start writing end of this year
- End 2027 need all information relevant for integration and civil engineering
- End 2027 Technical pre-design of systems
- 2031 Technical Design Report

Strategy short term

- Collection of topics: damage potential and then failure modes
  - beam losses (incl. failure modes, beam-beam etc.)
  - synchrotron radiation
  - Beam induced heating – is this part of the task force?
  - ...
- Get a first idea of all relevant protection systems, with the ultimate goal to develop a coherent machine protection architecture in the next years
- Obtain a first understanding of the possible reaction time required by beam interlock and extraction system (based on first principles)

Mid term objectives

- input for technical pre-design of systems, in particular if they have an impact on integration and civil engineering)

- Define a coherent set of design scenarios and derive specifications for protection-relevant systems (BLMs, collimation, interlocks, absorbers, beam dump system etc.)

Mandate

- Proposal from meeting -1, coming from SY
  - https://indico.cern.ch/event/1398008/
  - →

Define concepts of accidental scenarios for the collider and booster ring relevant for machine operation and hardware protection.
Take a global view on beam losses and beam-induced impedance heating and their effects in the collider and booster rings. Assure a coordinated design of machine safety-relevant accelerator systems, combining different areas of expertise, such as machine protection, beam transfer, beam abort and disposal, collimation, beam loss detection, interlocks, beam-coup-ling impedance, beam-matter interactions, as well as beam-intercepting devices.
Progress on the understanding and modelling of beam loss mechanisms, from dust-induced losses and instabilities to accidental losses caused by the malfunction of equipment (e.g. injection or extraction failures); establish a catalogue of possible beam loss scenarios and their likelihood; define design scenarios for systems vs “beyond design” scenarios. Incorporate the experience from other machines (e.g. SuperKEKB).
Discuss aspects related to high-energy density of the stored lepton beams (due to the small emittance), which poses a severe challenge for beam-intercepting devices. Develop ideas for reducing the risk of losing bunch trains on a single spot.
Develop a coherent set of system requirements and specifications for protection-related systems such as the beam loss monitor (BLM) system, beam interlock system, passive protection absorbers, collimation system, and beam abort system. Define key numbers such as the required time resolution and response time of BLMs, the reaction time of the beam abort system, etc. Evaluate the need for local protection absorbers, which complement the collimation system.
Trigger and steer the required simulation studies, including particle tracking, shower simulations and thermo-mechanical studies.

Add RF failure modes, powering failure modes

‘fire ball’

Overall reaction time BLM – BIS - Dump

Meeting Format, recurrence and time slot

- Every two weeks?
  - Day and time?
- Core team and other people on invitation, depending on the topic

Agenda of next meeting(s)

www.cern.ch