Design of the FCC-hh Muon Detector and Trigger System
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The FCC-hh project

- Concept for a future circular pp collider
  - 16 T dipole magnets in a tunnel of 100 km circumference.
  - ⇒ 100 TeV centre-of-mass energy.
  - Peak luminosity: 3·10^{35} cm^{-2}s^{-1}.
  - Integrated luminosity: 20 ab^{-1}.

- Proposal for the instrumentation of the muon system
  - Conceptual detector design
    - 4 T field in the inner detector.
    - Magnetic field integral up to the barrel muon system: 18 Tm.
    - Direction of flight into the muon system is a measure for the muon momentum.

Proposal for the instrumentation of the muon system

- Background rates in the muon system
  - Maximum nominal counting rate <10 kHz/cm^{2}.
  - Maximum rate including all safety factors: 25 kHz/cm^{2}.
  - ⇒ Small diameter muon drift-tube (sMDT) chambers can be operated at these rates.

- sMDT chambers for the muon system
  - 2x4 layers of 2.8 m long drift tubes (axial in barrel, radial in outer endcaps) with 1.5 m multilayer distance provide 40 µm spatial resolution, 70 µrad angular resolution, 100% tracking efficiency, 3.5 ns BCID resolution up to the maximum background rates.
  - 40 cm long tubes to be used in regions with 25 kHz/cm^{2} rates.
  - Monolithic sMDT construction, no optical alignment of multilayers needed. Chambers well accessible.

Simulation of the stand-alone muon momentum resolution

- Simulation framework
  - Simulation using Geant-4.10.04p01.
  - Calorimeters and solenoids simulated as homogeneous blocks with the correct average radiation and nuclear interaction lengths.
  - Latest FCC magnetic field map used.
  - Two simulation modes:
    - Muon chambers are two ideal detector layers at 1.5 m distance from each other or sMDT chambers.

- Momentum resolution as a function of η for p_{T}=100 GeV
  - Momentum resolution dominated by multiple scattering in the calorimeters and the shielding.
    - ⇒ ~5% in the barrel,
    - ~10% resolution in the outer end caps,
    - ~15% resolution in the inner end caps,
    - ~40% resolution in the forward system.
  - Error bars reflect the spread of the resolution in the given region.
  - Contribution of energy loss fluctuations to the resolution at p_{T}<10 GeV.
  - Resolution dominated by multiple scattering up to p_{T} ~ 1 TeV.
  - Resolution limited by the angular resolution of the chambers for p_{T} > 1 TeV.