CDR on Silicon Tracker

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Outlines

- Introduction
  - Main task: Improving tracking efficiency and precision
  - Additional functionalities: field distortion, detector alignment, time-stamping, dE/dx
  - Material budget control ($\sigma_{1/Pt}$ equation)

$$\sigma_{1/p_T} = a \oplus \frac{b}{p \sin\theta} \quad [\mathrm{GeV}^{-1}]$$

- Baseline design
  - Detector layout (2 SIT + TPC + 1 SET, 5 FTD ETD?)
  - fast simulation (LDT toy MC) & full simulation (tracking performance section)

Outlines

- Sensor tech. & Front-End electronics
  - silicon microstrip sensor
    - 10x10 cm^2, pitch 50 μm σ_{sp} < 7 μm, thickness ~ 200 μm
    - Front end electronics board (amplifying,shaping,ADC, zero suppression, sparcification..)
  - silicon pixel sensors
    - e.g., CMOS pixel sensors (CPS), σ_{sp} < 7 μm, thickness ~ 50 μm
    - Front end electronics on sensor

Outlines

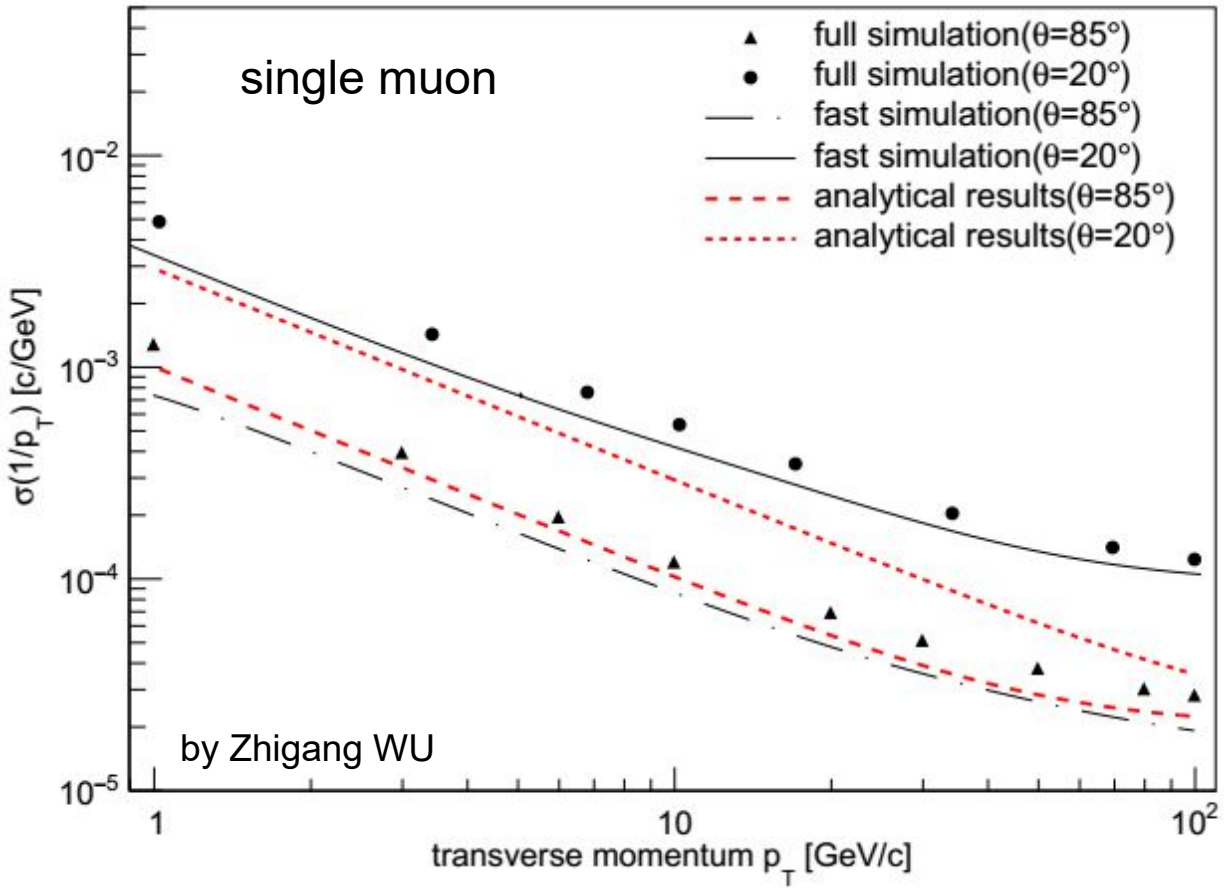
- Powering and cooling
  - powering: DC-DC converters
  - cooling: silicon micro-channel

- Mechanics and integration
  - Carbon-fibre Reinforced Plastic material
  - laser monitoring systems for pre-alignment

  Liverpool Univ.(GAO yanyan) will cooperate on this part

Outlines

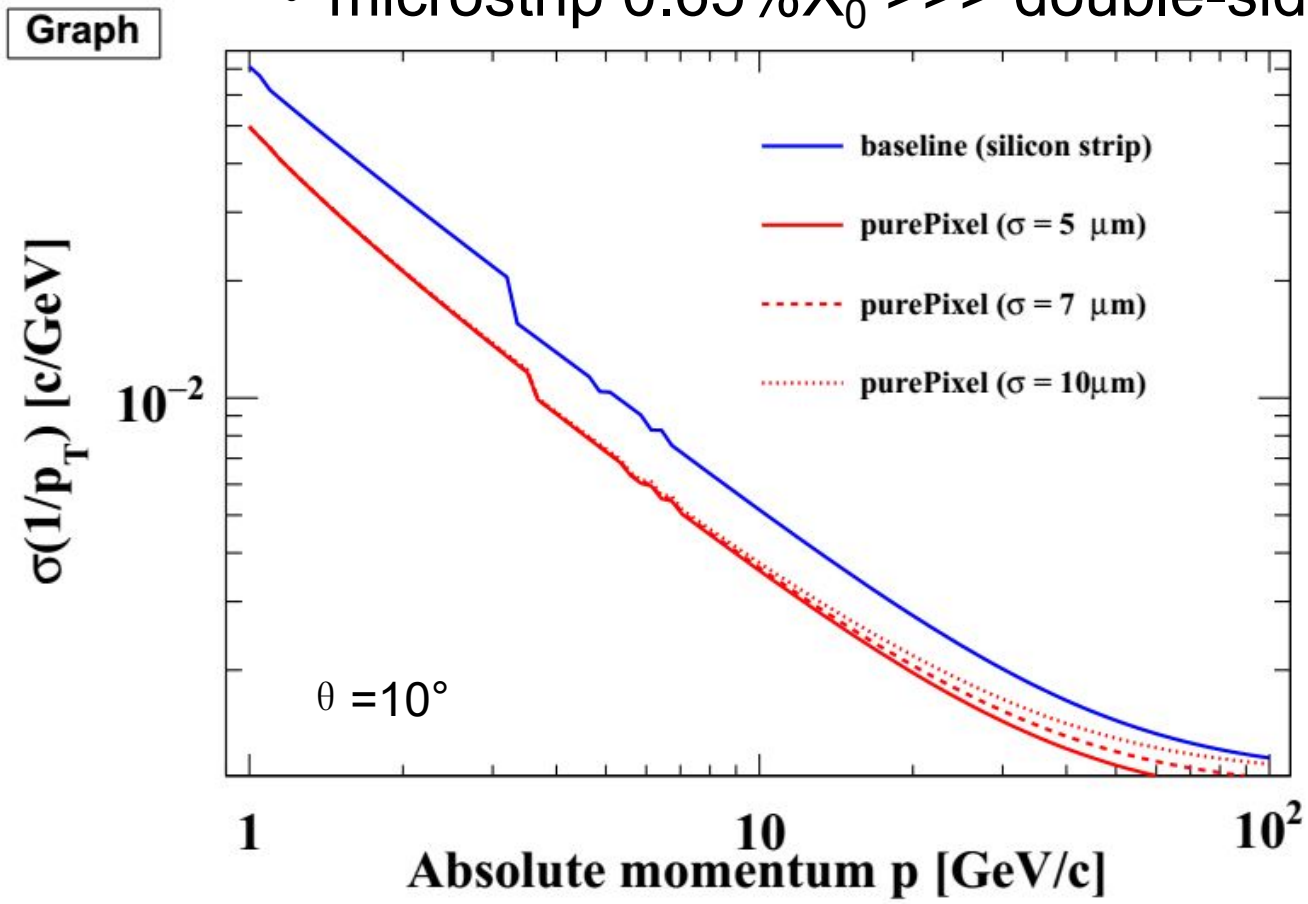
- Tracking performance (baseline design)



- Fast MC works well
- $\sigma_{1/Pt}$ equation only uses barrel detectors

Outlines

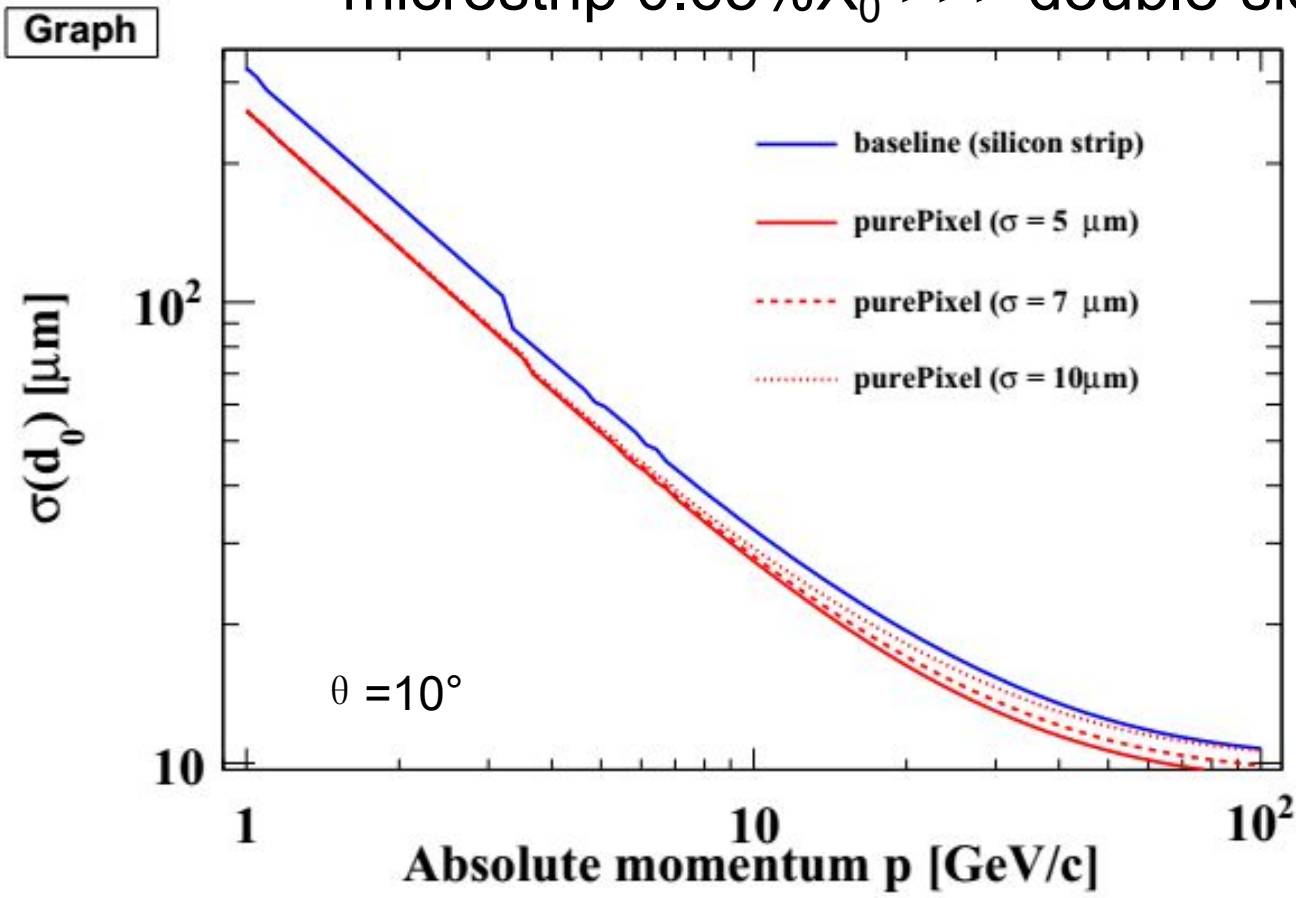
- Tracking performance (baseline vs pure pixel)
  - microstrip 0.65%X_0 >>> double-sided pixel 0.3%X_0



- Significant improvement
- When **p < 10 GeV**, no obvious difference for chosen spatial resolutions of pixel detectors

Outlines

- Tracking performance (baseline vs pure pixel)
  - microstrip 0.65%X_0 >>> double-sided pixel 0.3%X_0



- Similar behaviour for σ (d_0)
-
- More optimisations....

Outlines

- Critial R&D
  - pixelated strip sensors using CMOS tech.
  - p^+-on-n silicon microstrip sensors (slim-edge)
  - Front-end electronics (low power consumption, low noise, ...)
  - Efficient powering and CO2 cooling (low material budget)
  - light but stiff mechanics
  - Detector layout optimisation

Thank you