Commissioning and first performance results of the new ALICE upgraded Inner Tracking System

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**Incoming Detector System Upgrade for LHC Run 3**

- Heavy-flavour mesons and baryons (down to very low p_T)
- ChARMIon states
- Di-leptons from QGP radiation and low-mass vector mesons
- High-precision measurement of light and hyper-nuclei
- Largest possible data samples: Run 3+Run 4: 10^{11} events ~ 13 nb^{-1} in Pb-Pb

**ITS Upgrade Design Goals**

- Minimum bias (no trigger) readout at 100 kHz for Pb-Pb interactions (3kHz during RUNs 1 and RUN2)
- Improvement of impact parameter resolution by a factor 3 in particular for very low p_T
- Improvement of standalone tracking efficiency and p_T resolution

**New ITS Layout**

- 6 - 7 layers (3 inner, 4 outer layers)
- Distance to IP of innermost layer reduced from 10 mm → 22 mm, radial coverage 22 – 406 mm
- Higher tracking granularity through reduced pixel size (50x425 µm^2 → 27x29 µm^2), based on Monolithic Active Pixel Sensors (MAPS)

**Commissioning and Operation**

- Installation in the cavern
  - precise positioning of half barrels in the TPC at the level of about 0.1 mm using six cameras to monitor the positions of the key detector components and compare them to 3D CAD models

**IT52 Detector Control System fully operational and integrated in ALICE DCS**

- Pixels, staves, readout electronics and infrastructure fully controlled and configured
- Full detector functionality implemented as C++ library, can be run in standalone mode (testing) and also with the ALICE FRED framework (operation)
- GLI, alarms, FSM implemented in WinCC
- the full system has been routinely used during commissioning

**Calibration**

- Online Calibration of 12.5 billion pixels (~50TB of data for the full detector)
- Several scans running sequentially:
  - threshold tuning (adjustment)
  - threshold scan (actual thresholds)
- Scans performed by DCS (configuring and triggering test injections)
- All tests of a stave in parallel
- Distributed analysis on event processing nodes

**LHC Pilot Beam**

- First tracks of p+p-collisions in pilot beam tests in October 2021
- Data shown before alignment

**Current activities and next steps**

- Comprehensive commissioning, detector tuning and error correction both in standalone mode and with ECS
- Identify potential issues in hardware and software
- Maximizing operational experience