

ITS Upgrade Studies - Working Group 2

Detector Specifications and Performance Studies

ITS Upgrade Meeting, 29th November 2010

L. Musa

- ◉ Tasks
- ◉ Structure
- ◉ Discussion

Define the detector specifications from physics requirements (WG2 \leftrightarrow WG1)

Simulate the detector performance based on the detector design and implementation studies (WG1 \leftrightarrow WG3-5)

- Study particle density and radiation load for the innermost layer
- Define detector specifications at mid rapidity
 - Number of layers and their geometry
 - Hermeticity, segmentation and alignment
 - Material budget
 - Detector efficiency, signal dynamic range and linearity
 - Event time resolution
 - Event readout time (Integration time for MIMOSA)
 - Definition of trigger algorithms and primitives

- Study the possibility of extending the tracking at large rapidity (forward/backward) (in collaboration with muon-spectrometer upgrade group)
 - vertexing and tracking
 - PID
 - timing and triggering
- Simulate detector response and performance
- Several design options should be studied
 - A. present ITS + Pixel Layer0
 - B. Pixel Layer0 + replace SDD with a combination of Strip and Pixel layers
 - C. Replace entire ITS with a combination of Pixel and Strip detectors
 - D. C + extend acceptance to large rapidity
- Prepare the “Detector specifications and performance” chapter of the Technical Proposal

Members (21)

Bari: V. Altini, G. Bruno, C. Digiglio, C. Terrevoli

CERN: A. Mastroserio, S. Rossegger, R. Shaoyan

Lyon: J-Y Grossiord, Laure Massacrier

Padua: A. Dainese, R. Turrisi

St. Petersburg: Feofilov, Konradiev, Kolozhavri, Vinogradov

Strasbourg: Y. Belikov

Torino: M. Maserà, F. Prino, M. Poghosyan, M. Sitta

Trieste: S. Piano

Conveners: G. Bruno, M. Sitta

We warmly invite other members of the collaboration to join the ITS Upgrade WG2 to

- work on one or more tasks or
- simply participate to the meetings and contribute to the discussions

Particle densities

- $dN_{ch}/d\eta$ is known
- particle density scale approximately as $1/r^2$
- number of hits associated to tracks $\sim 50\%$

Radiation load

- known (ionising) for $r \geq 4\text{cm}$
- extrapolate to smaller radii down to 2cm

Detector response and performance

- Pointing resolution
 - radial position of first two layers
 - radiation length of beam pipe and first layer
 - spatial resolution (for high pt)

Detector response and performance

- Tracking efficiency
 - nr. of layers and geometry
 - segmentation (occupancy)
 - spatial resolution and **alignment**
 - hit efficiency
 - integration time (for MIMOSA)
- PID: resolution and separation power (signal resolution, dynamic range, linearity)
- Timing information
 - bunch crossing time stamping (how to do with MIMOSA)
 - can we provide an accurate t_0 ?
- Trigger information
 - OR, SUM
 - event topology \Rightarrow pipeline readout

Simulations tools

- Giuseppe-Cristina
- Rosario
- Jim(STAR) - Stefan

Meetings

- frequency
- audioconference or videoconference
- indico: ALICE ITS upgrade (<http://indico.cern.ch/categoryDisplay.py?categId=3211>)