A Large Ion Collider Experiment

News from the ITS

Run 2 …
Run 3 …

ITS in Run 2
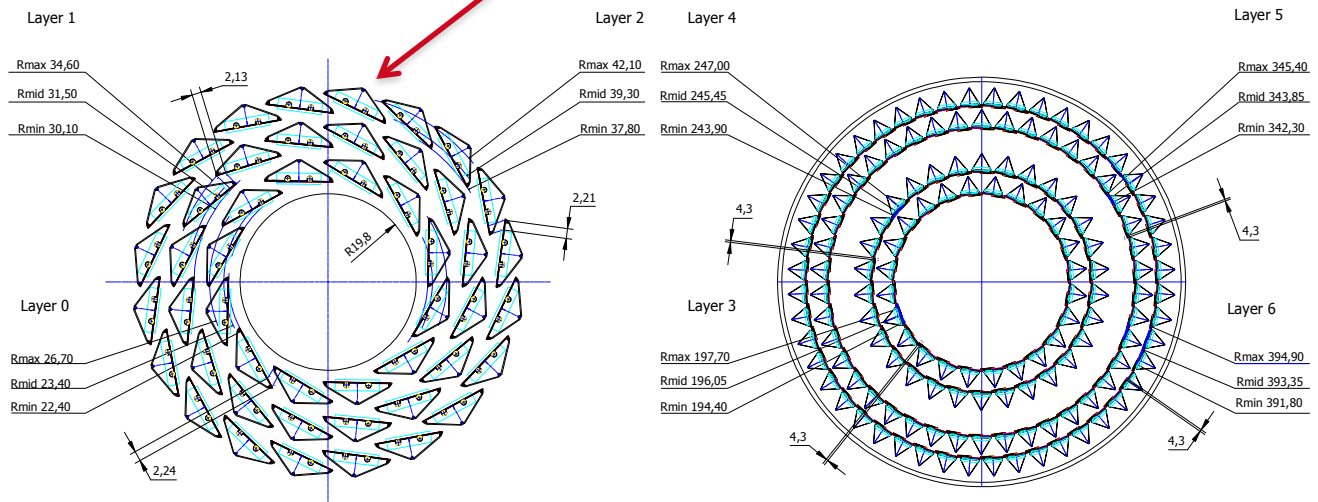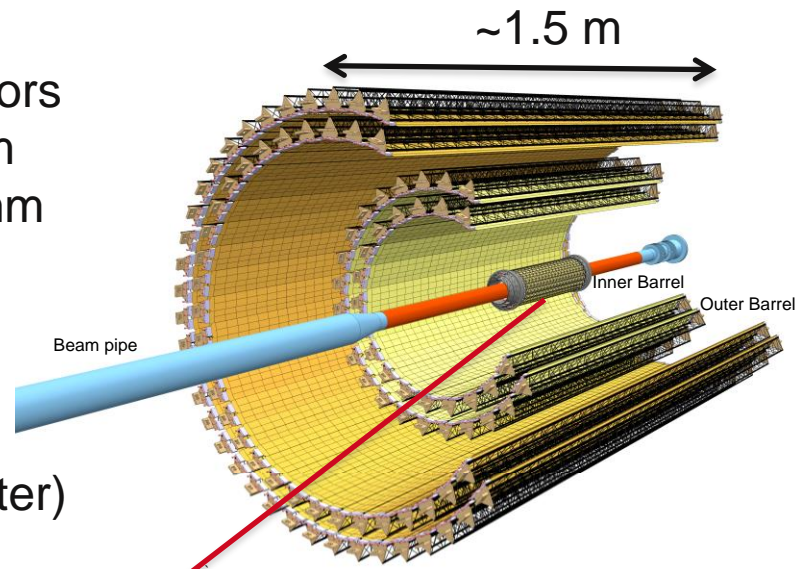## It is still the same detector

◆ Not much new from the offline point of view…

◆ Re-doing the alignment

◆ Some QA tasks need to be automatized

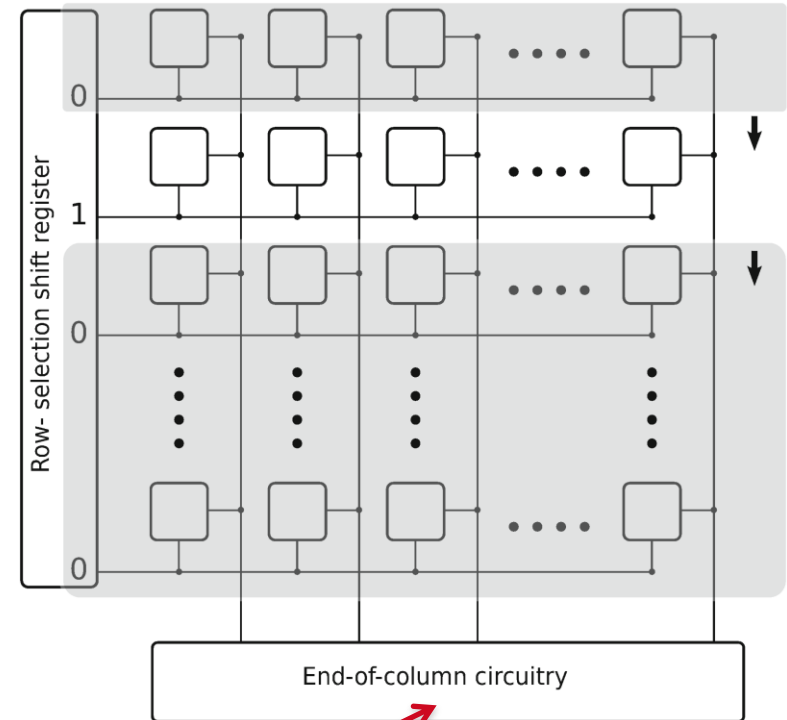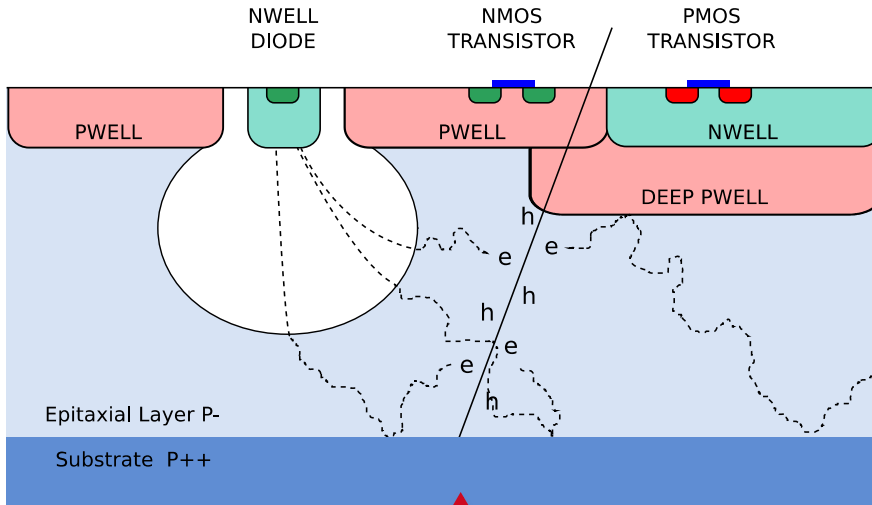◆ Investigation of the possibilities to run the local SDD reconstruction on the HLT (manpower needed)

ITS IN RUN 3

This will be a completely different new detector

~1.5 m

- 7 layers of monolithic pixel sensors
- R of the innermost layer ~22 mm
- R of the outermost layer ~400 mm

- ~23k pixel sensors
- ~500k pixels per (inner) sensor

- Material: 0.3% (inner), 0.8% (outer)
- Precision ~4 μm (inner)

Inner Barrel

Outer Barrel

Beam pipe

Layer 1

Rmax 34,60
Rmid 31,50
Rmin 30,10

2,13

Layer 2

Rmax 42,10
Rmid 39,30
Rmin 37,80

Layer 4

Rmax 247,00
Rmid 245,45
Rmin 243,90

Layer 5

Rmax 345,40
Rmid 343,85
Rmin 342,30

R19,8

2,21

4,3

4,3

Layer 0

Rmax 26,70
Rmid 23,40
Rmin 22,40

Layer 3

Rmax 197,70
Rmid 196,05
Rmin 194,40

Layer 6

Rmax 394,90
Rmid 393,35
Rmin 391,80

2,24

4,3

4,3

A readout «unit» : Pixel Chip

NWELL
DIODE

NMOS
TRANSISTOR

PMOS
TRANSISTOR

PWELL

PWELL

NWELL

DEEP PWELL

h

e   e

h   h

e

e

h

Epitaxial Layer P-

Substrate P++

Row- selection shift register

0

1

0

End-of-column circuitry
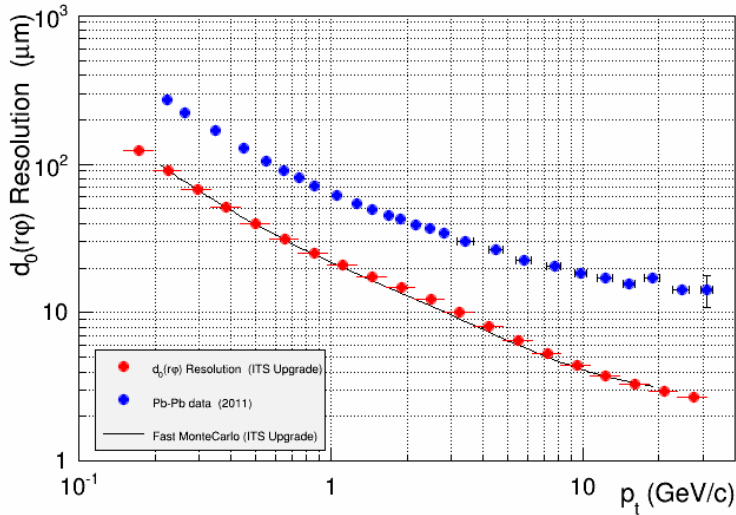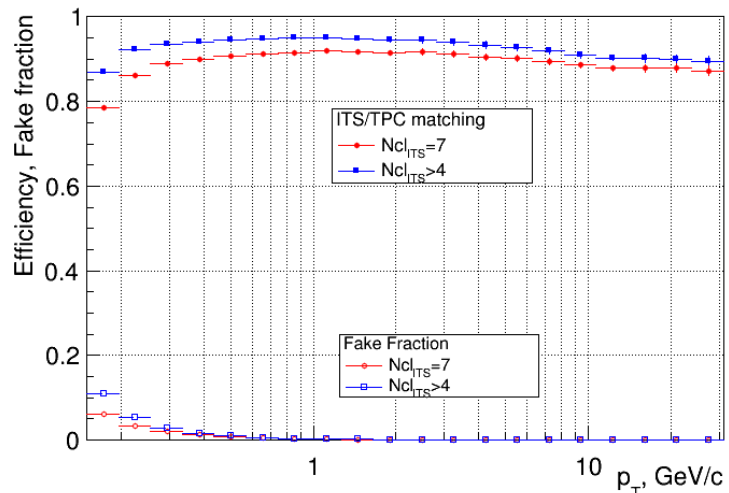
◆ Monolithic Active Pixel Sensors (MAPS) :
integrate both the sensor and the readout

◆ Read out sequentially column-by-column,
with a total "integration time" ~20 – 30 µs
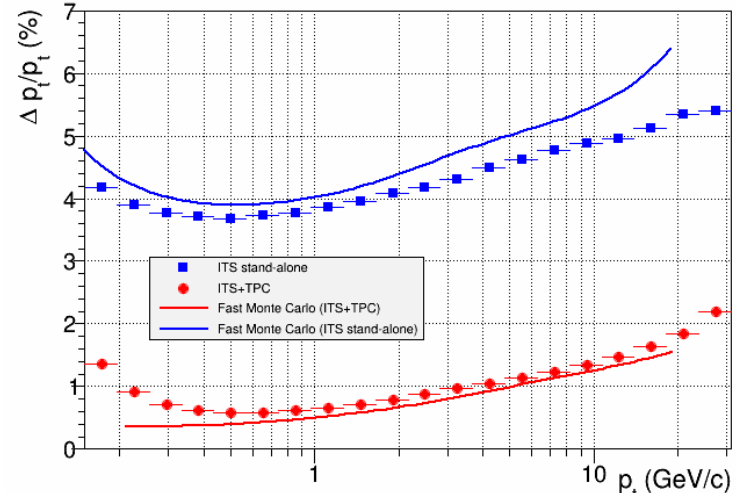
Performance of the ITS in Run 3
"In principal", evaluated with the current AliROOT (see ITSU TDR)
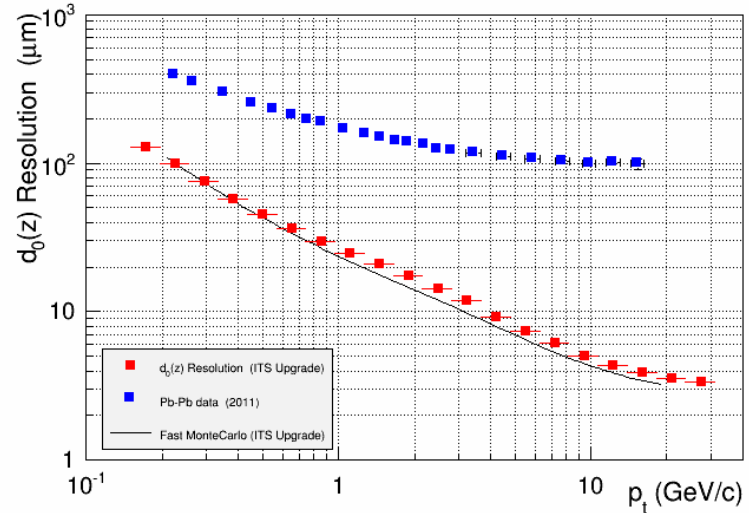
Impact parameter resolution in the bending plane (left) and longitudinal direction (right)

TPC-ITS track matching efficiency

Transverse momentum resolution

5

ITS SOFTWARE REQUIREMENTS IN RUN 3
(A few points are common with other ALICE detectors ?)

◆ **<u>Monte Carlo (always the slowest part !):</u>**

With the number of events x100 of the current, some "fast" MC is desperately needed

◆ Calibration: Dead/noisy pixels only (~10^{-5} of the total number of pixels)

◆ Alignment: Down to ~4 μm, with an expected outer layer sagging up to ~100 μm

Can the sagging be reliably modelled ?

◆ Reconstruction:

- Amount of processing: a need for a migration on-line (cluster finder, PV finder, …)
- Challenges with the TPC: a need for a powerful stand-alone ITS tracking
- 50 kHz rate + 30 μs readout: a need for a reliable pileup tagging
(time stamps for the hits, an improved (separation <1 cm) multiple PV reconstruction)