ITS upgrade meeting

"Improvements to chapter 3 of CDR within the next 3 weeks"

G.E. Bruno

Outline:

- remind of the time-line
- possible improvements

Timescale

- **CDR v1.0** to ITS Collaboration and IRC: ITS Upgrade Plenary Meeting on 14th November (**today**)
- **CDR v2.0** + executive summary (including comments from IRC and ITS) to ALICE**: 5th December**
- presentation of upgrade projects to ALICE: during the 12th December mini-week (joint session of TB/PB)

- we have 3 weeks to improve the CDR from present **v1.0** to v2.0:
  - obviously, comments from you and IRC
  - are there substantial modifications that can be done in the timescale of the next 3 weeks ?

Possible improvements to chapter 3

1. Remove upgrade scenario 1 (NEW-SPD)
2. PID reviewed against realistic technical implementations
3. Performance of combined tracking ITS +TRD
4. Requirements for single track time resolution
5. Include a detector performance study for layer0 with 0.1% radiation length

1. Remove upgrade scenario 1 (NEW-SPD)

- Reasons:
  1. life-time of new detector should span over several years
  2. running scenario being defined now within the ALICE Upgrade Task Force:
     - interaction rate:
       - **Pb-Pb at 50 KHz**
       - Ar-Ar at 140 KHz
       - pp at 2MHz

2. PID reviewed against realistic technical implementations

- Reasons:
  - development of PID study done in parallel with the study and definition of the "best" layouts for tracking performance
  - few configurations discussed in sec. 3.7, one is ideal (w.r.t. the technical implementation), none of them corresponds to those defined from the tracking study (SPD-New and ALL-New)
- Actions:
  - define 1 or 2 different configurations (Vito & Luciano) and repeat the study for that (Francesco, Stefano, Stefania)
- dead-line: 2 weeks

- General comments: no strong links to the physics performance
  - difficult to improve within 3 weeks

3. Performance of combined tracking ITS+TRD

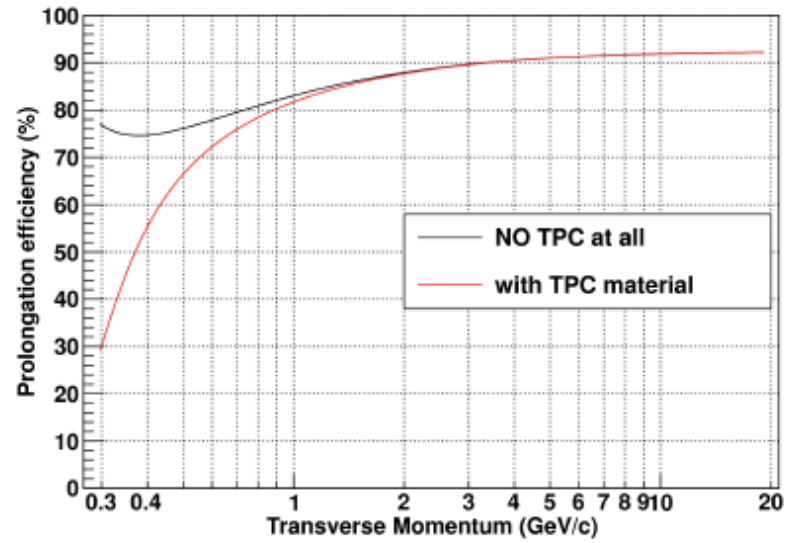
- Reasons: exploit the Pb-Pb 50 KHz running scenario
  - ITS+TRD tracking → TOF (for PID)
- Actions: Stefan is studying it

First glance of the "matching probability" in outward direction …

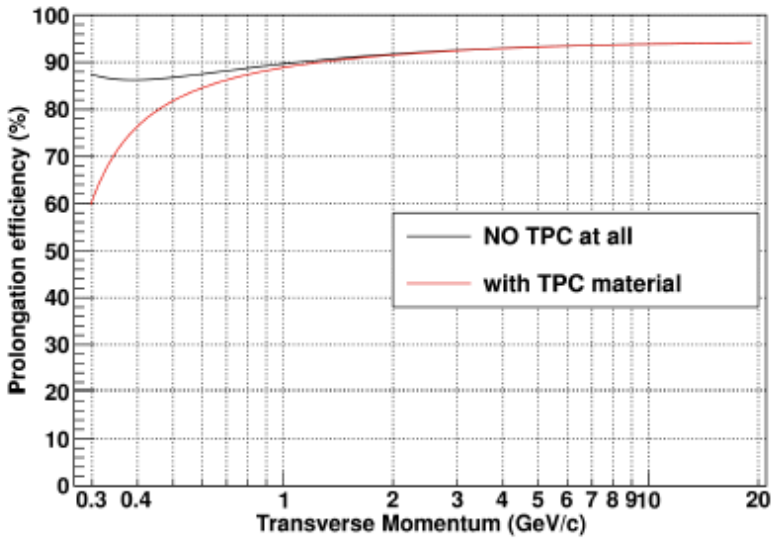
(obtained with Fast-Tool, central PbPb)

Stefan

Current ITS configuration



All-New configuration



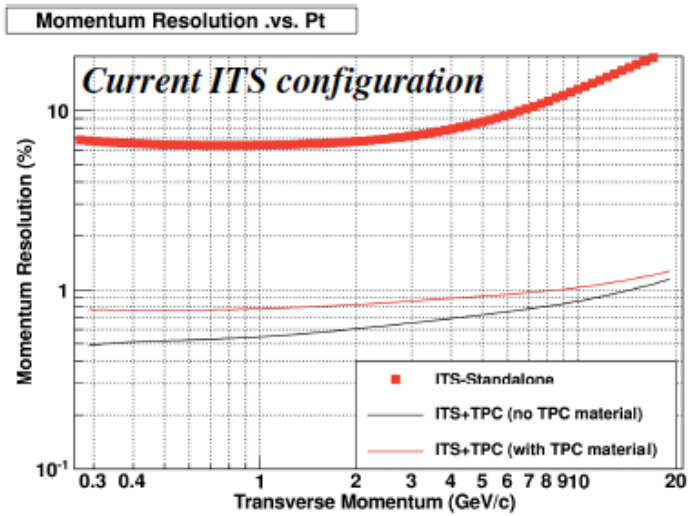
Lower pt limit around 300 MeV (outermost TRD layer at r~360cm)

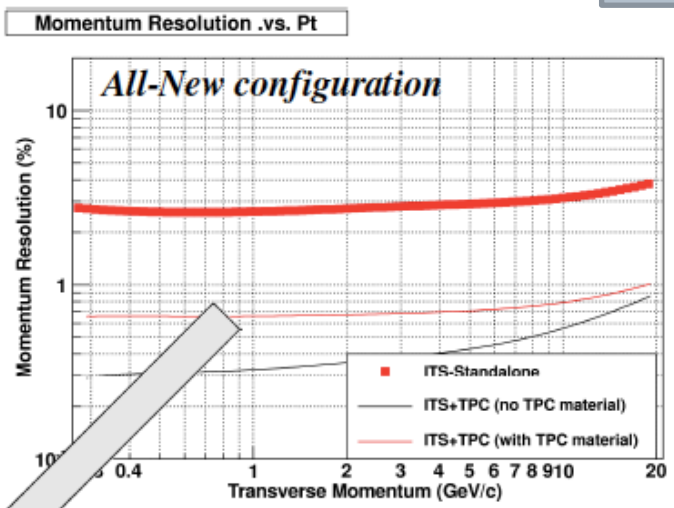
3. Performance of combined tracking ITS+TRD

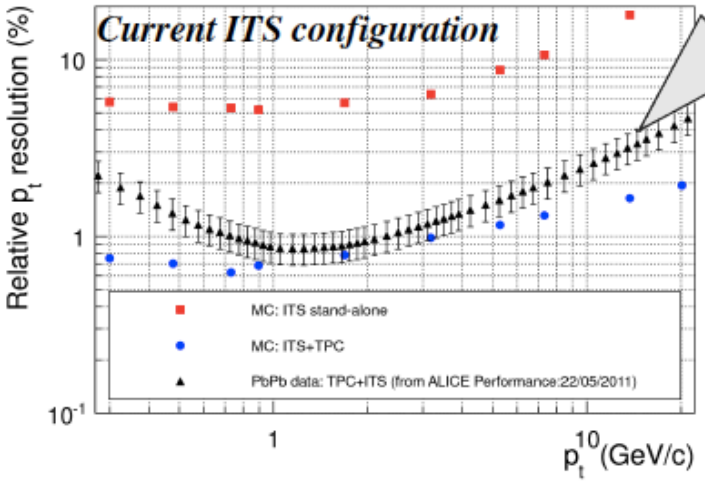
2) Combined ITS plus TRD tracking

Stefan

First glance of the "improved pt resolution" (with "ideal TRD") …







Assuming that the "matching" works sufficiently well …

→ **ITS+TRD pt resolution might be better than current ITS+TPC performance due to the longer lever arm**

→ **This of course assumes an "ideal TRD (and ITS)"**

4. Requirements for single track time resolution

Ruben

3) Single track time-resolution

(thanks to discussions with Magnus)

- Depends of course on the "expected" IR and and the integration time

Probability for PileUp?

$P = 1 - Exp(-\lambda\tau)$

λ = IR; τ= integration time

λ/τ	0.1µs	1µs	20µs	50µs
8kHz	0.08%	0.8%	14.8%	33.0%
50kHz	0.5%	4.9%	63.2%	91.8%

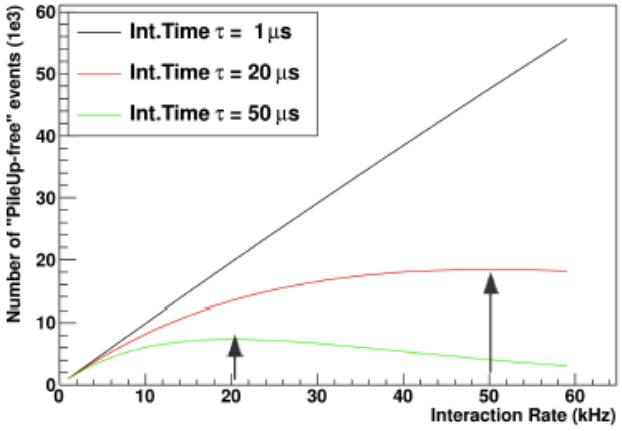
Mean number of Piled-Up event

$N = \lambda\tau$

λ/τ	0.1µs	1µs	20µs	50µs
8kHz	< 0.1	<0 .1	0.16	0.4
50kHz	< 0.1	< 0.1	1	2.5

- **Optimum on "recorded events" (PileUp free),** "read-out" time is not considered

→ **less than 1 µs is a "save choice"**



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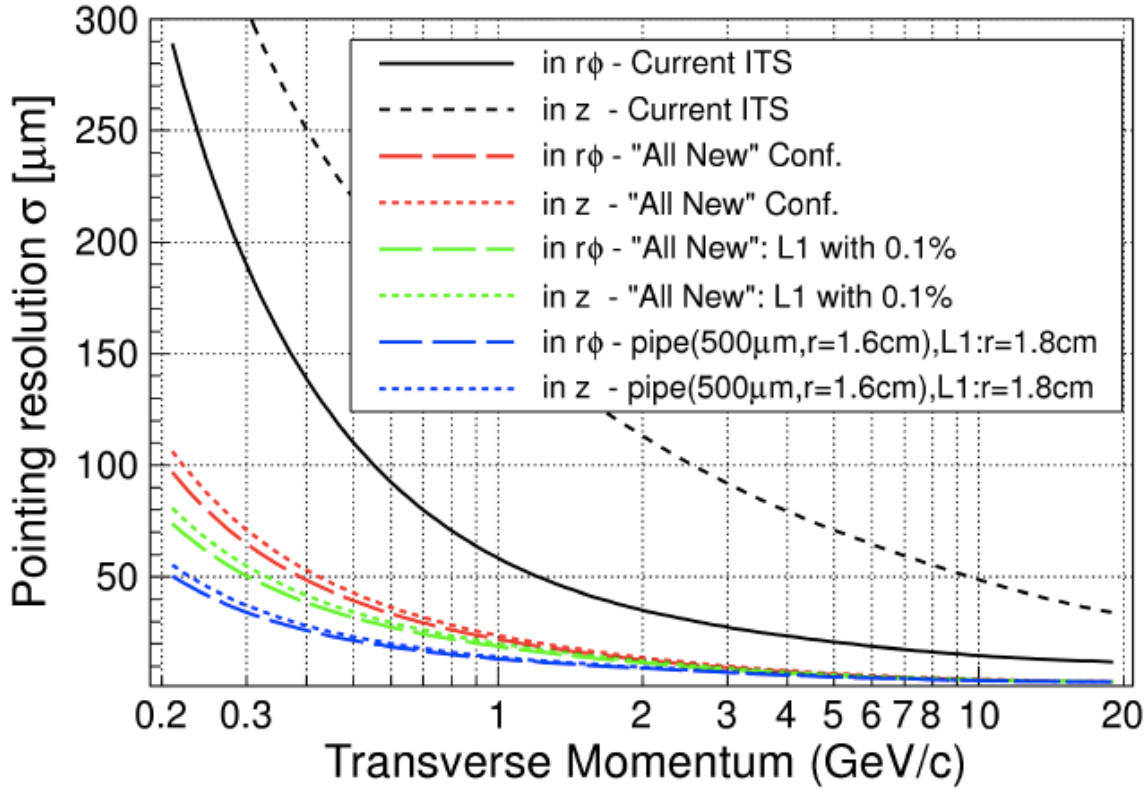
5. Include a study for layer0 with 0.1% radiation length

1) Further improvement of the Impact-Parameter Resolution

To reach **another factor 2** in comparison to the "ALL-NEW" setup, we not only have **improve the properties** of the **first Layer**, but also of the **beam-pipe** …

→ This is an other unpresented challenge … ;-)



Add. factor 2 means:

L1:

X0: 0.3% → 0.1%

R = 2.2 cm → 1.8 cm

Beam-pipe:

Width: 800 → 500 µm

R = 2.0 cm → 1.6 cm

Λ_c studies will show if we need the additional Factor 2?

Conclusion

- we would appreciate your feedback to improve the document

Extras

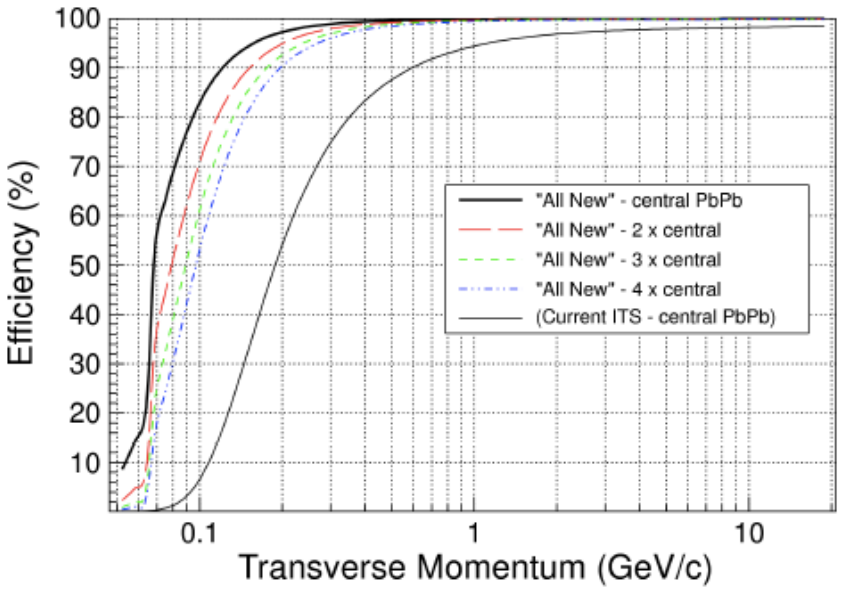
4. Requirements for single track time resolution

3) Single track time-resolution

Ruben

BUT, the problem is two-fold:

a) At least two (inner) layers should be able to distinguish between two events (including trigger-information?)

→ Integration time < 1μs ?

b) As long as the other layers do not pile-up too many events, the reconstruction efficiency should not suffer too much?