Status of the SPD offline

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Contents:

- *Alignment*
- *Geometry (A. Pulvirenti)*
- *Other issues*

Calibration: see talk by H. Tydesjo

Alignment

- Alignment and survey data:
  - several discussions with people involved
  - dedicated SPD meeting in July (A. Pepato et al.)
  - basic outcome:
    - no internal survey available (just typical deviations wrt nominal)
    - SPD (as the whole ITS) coaxial with the beam pipe
    - ITS + beam pipe not centered wrt TPC rails
    - measurements at level of sectors and half-barrels during the installation phase providing typical expected precisions
  - input for the realistic misalignment simulation:
    - $\sigma_{x,y,z}$ for module/sector/half-barrel positioning included in `MakeITSRealisticMisAlignment.C` (A. Dainese et al.)

Geometry

- "Old" geometry (`AliITSv11PPRasymmFMD`):
  - problem with holes at sector boundary:
    - due to use of "MANY" option when positioning volumes
    - checked to affect PDC06 (not PDC05)
    - fixed using assemblies (Bjorn, Ludovic)
    - class revision 1.56 on CVS since July

Geometry

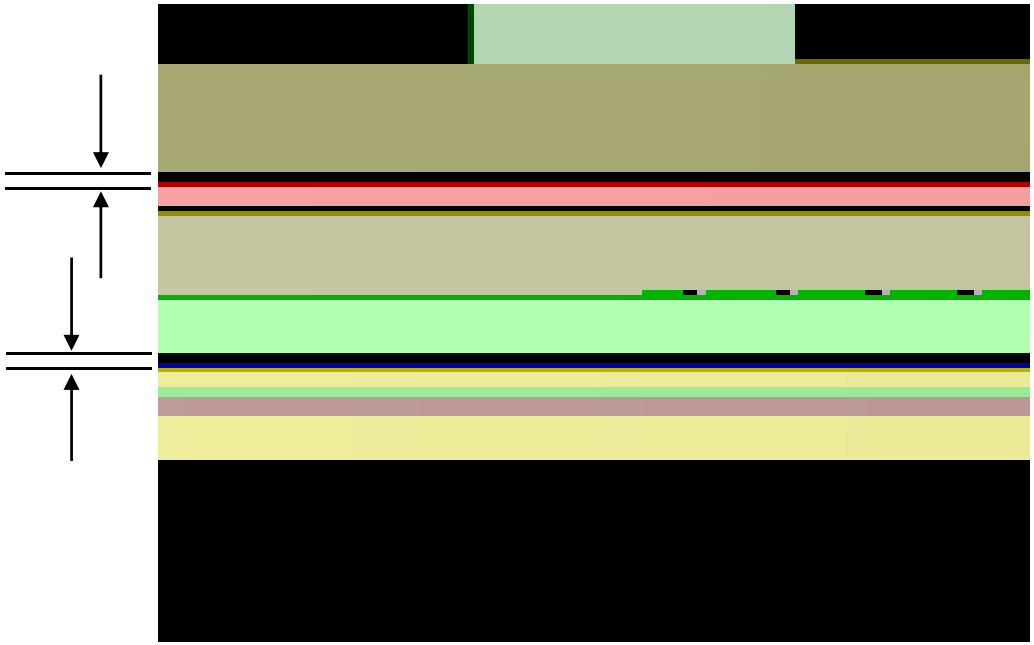
- Coding of the new SPD geometry:
  - barrel part almost completed (see nex slides from Alberto):
    - glue layers between several parts of the half-stave
    - half-stave volume as alignable one besides ladder (also Ludovic)
    - SMD components on pixel bus, thermal grease, bump-bonding
  - new `AliITSv11GeometrySPD` version recently committed
  - integration in `AliITSv11Hybrid` :
    - much work done by Ludovic before leaving (august)
    - some tests already done, to be extensively continued
  - cables and services:
    - relevant infos gathered, going to be implemented
  - further checks: materials, numbering/indexing issues

Details added to the SPD geometry implementation:

- grounding foil:
  - glue layers
  - thermal grease in the holes
- pixel bus:
  - (big) resistors, capacitors & pt1000
    - the small ones have been skipped
- ladder:
  - bump bonds between sensor and chips in ladders
- definition of half-stave volume
  - will be another alignable volume

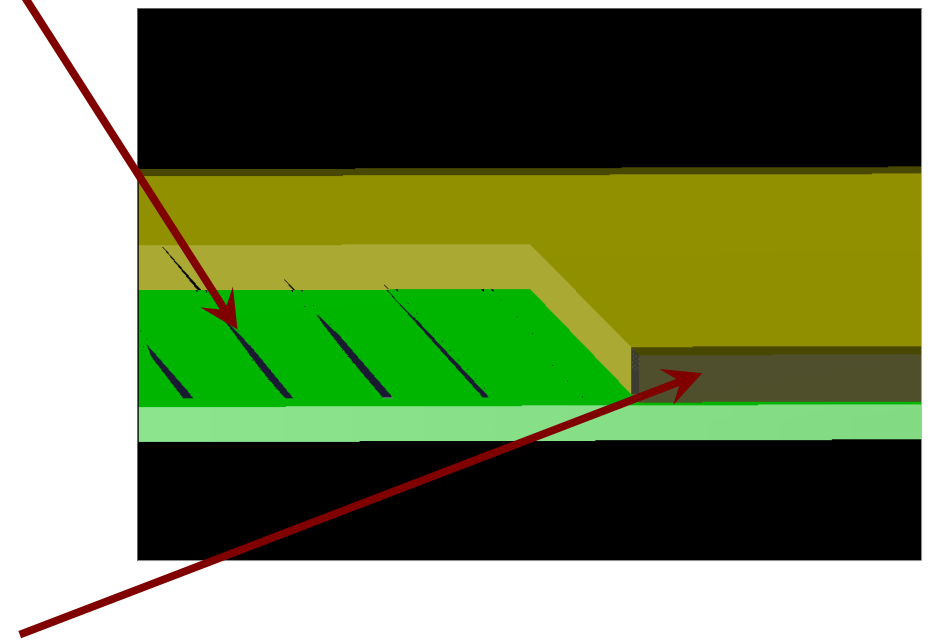
Glue layers

- Variable thickness layers
  - leave some free space around the ladder
  - prepared for ladder movement (alignment)
- Parameter initialized in constructor
  - AliITSv11GeometrySPD(Double_t gap)



Bump bondings

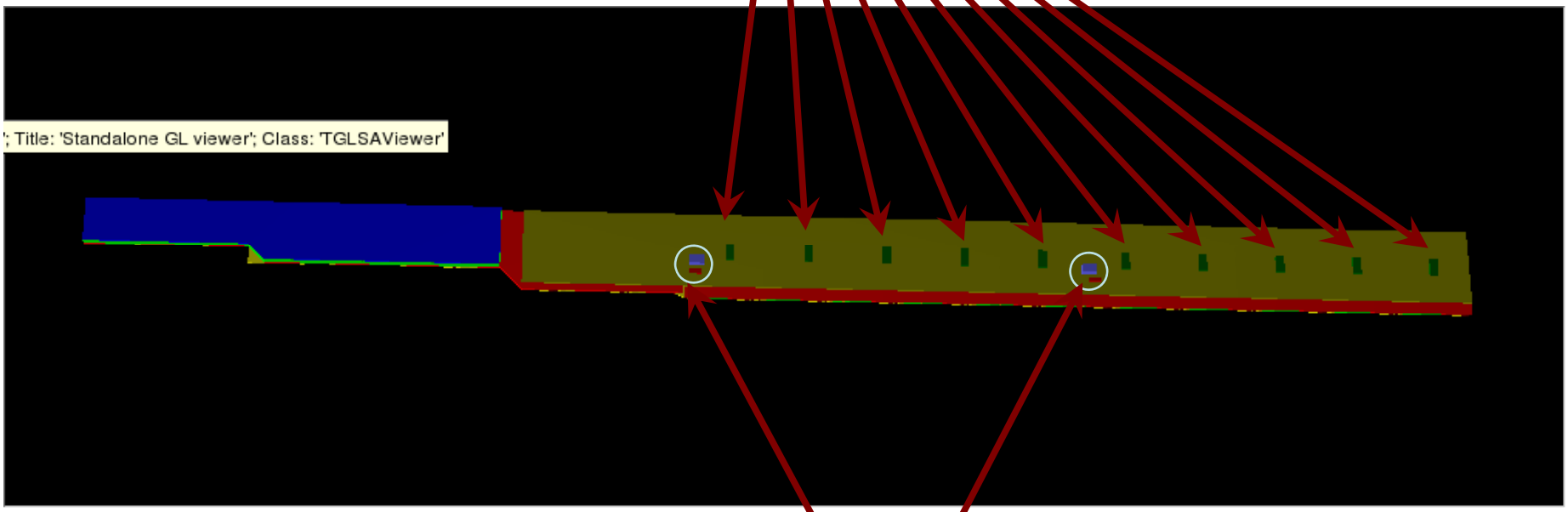
- Bumps are not implemented one by one in order not to slow down the geometry builder
- bump bond “stripes” (one per column)



- Added guard ring around the sensor

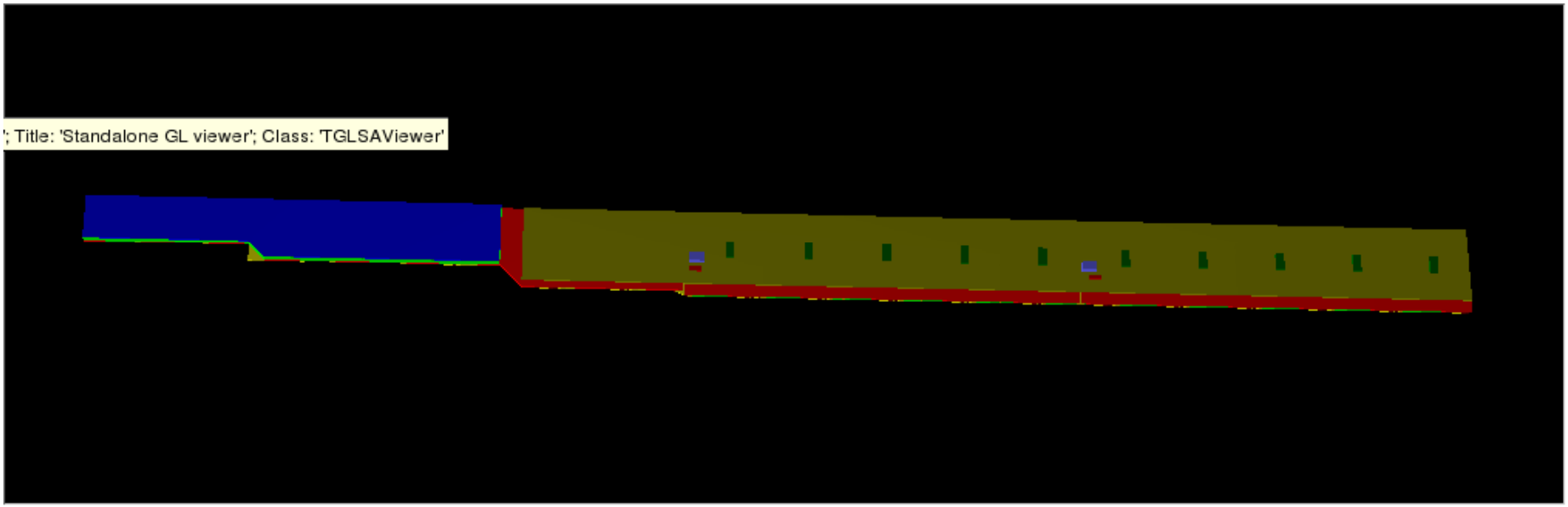
Pixel bus components

Pt1000's (one per chip)



Big resistors and capacitors in correspondence of the end of each ladder

Half-stave assembly



Half-stave assembly

- Defined the “half-stave level” in the geometry assembly
- A “stave” will be the assembly of two half-staves of different orientation

- GOAL:
  - define the half-stave as **alignable volume** in the ITS-SPD, since it is possible that the alignment of two HS in the same stave are done independently.

Conclusions and outlook

- "Central barrel" almost complete
  - defined 2 levels of alignable volumes (ladder, half-stave)
  - to be added: clips on outer layer staves (where necessary)
- End cones and services
  - actually not present
  - relevant information gathered from drawings/people
    - …not trivial to organize this into a simple structure (coming soon)
- Materials
  - materials implemented as in the old version
  - consistency checks to be done
- Integration tests possible (simulations/checks with the new geometry already present

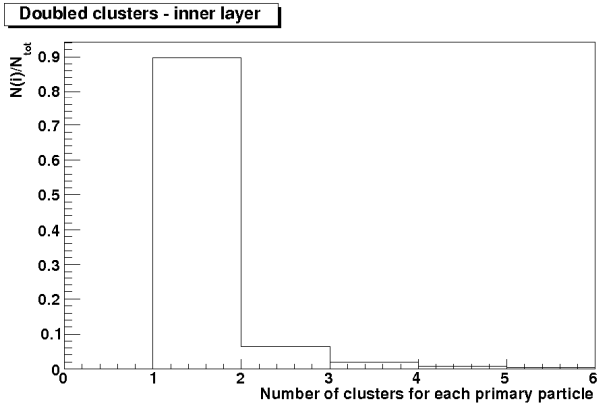
Other issues

- Changes in reconstructor classes (Cvetan):
  - tested as required:
    - same cluster number and coordinates as for old reco

- Cluster duplication:
  - problem spotted within the tracklet analysis (M. Nicassio):
    - some fraction of SPD clusters are duplicated (≈ 10%)
    - possibly due to cluster unfolding or other (unwanted) features
    - quantitatively studied (see next slides)
    - still under investigation, other experts involved

Other issues

Number of clusters per layer, associated (by label) to a primary track

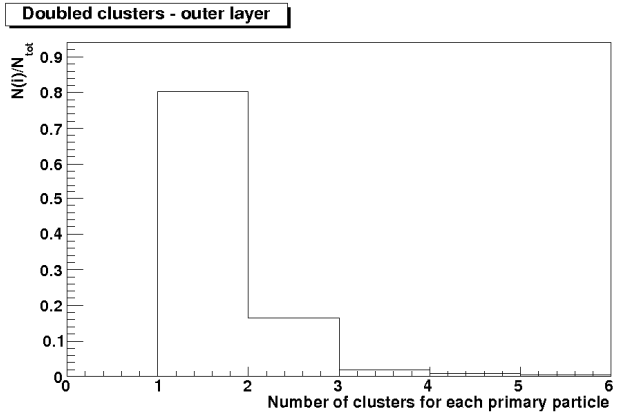


Inner SPD layer

90% of primaries with 1 cluster

10% of primaries with ≥ 2 clusters

i.e. 7% with 2 clusters
2% with 3 clusters
1% with > 3 clusters



Outer SPD layer

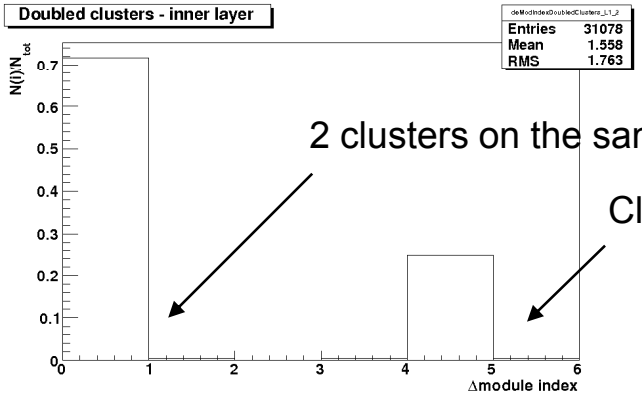
80% of primaries with 1 cluster

20% of primaries with ≥ 2 clusters

i.e. 16% with 2 clusters
2% with 3 clusters
2% with > 3 clusters

Other issues

Difference between indices of each of the two clusters in a duplicate

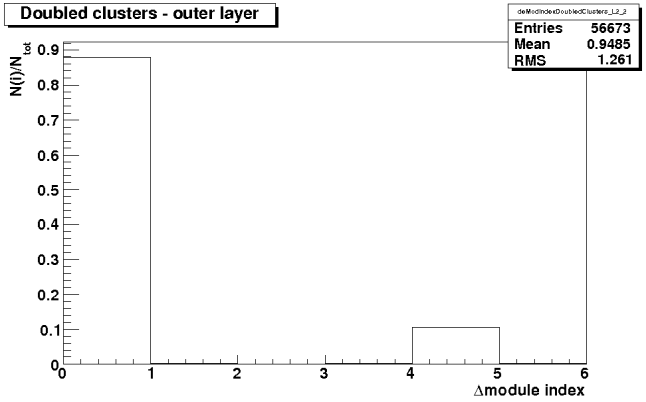


2 clusters on the same module (not ok)

Clusters on two adiacent modules (ok, due to geometrical overlap!)

Inner SPD layer

Duplicates on the same module:
≈ 5% of the total number of primaries



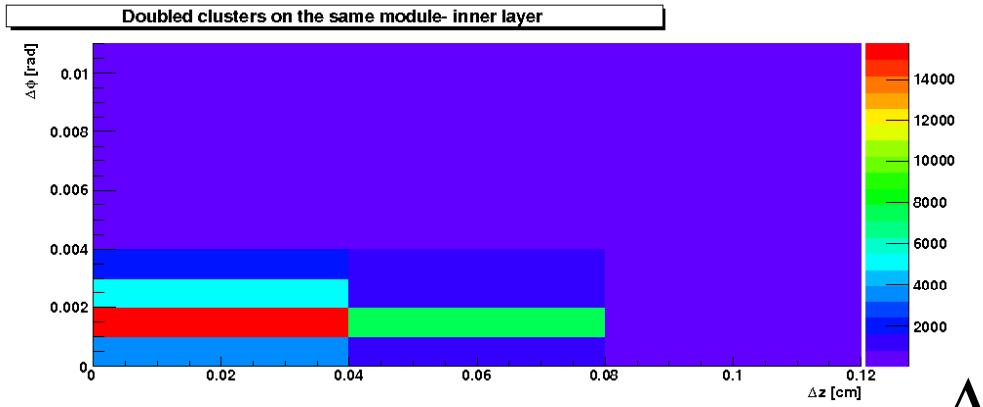
Outer SPD layer

Duplicates on the same module:
≈ 15% of the total number of primaries

Other issues

Difference (in units of pixels) between the two cluster centres

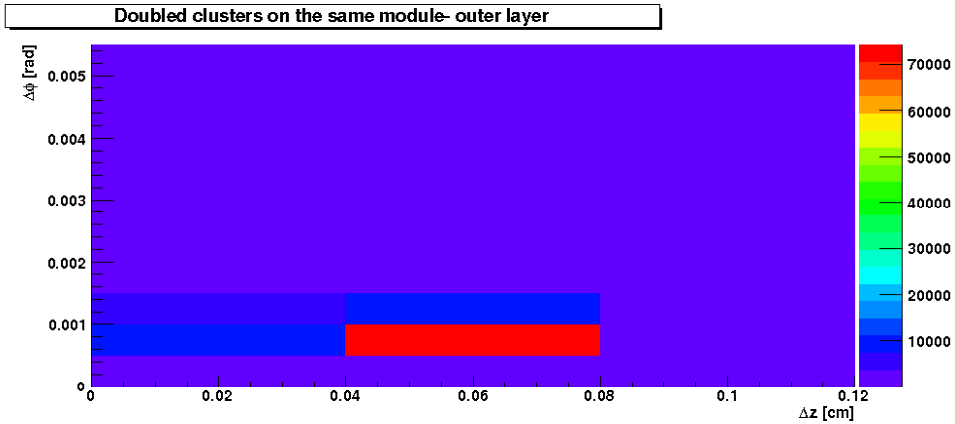
Δφ



Δz

Inner SPD layer

Δφ

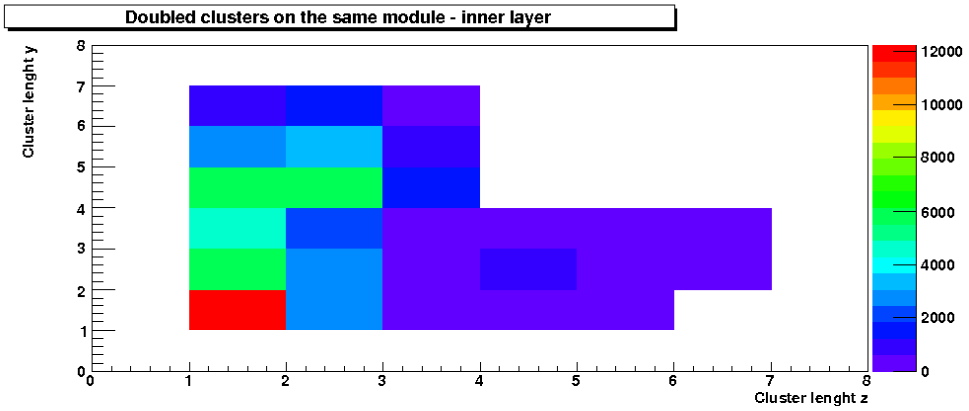


Δz

Outer SPD layer

Other issues

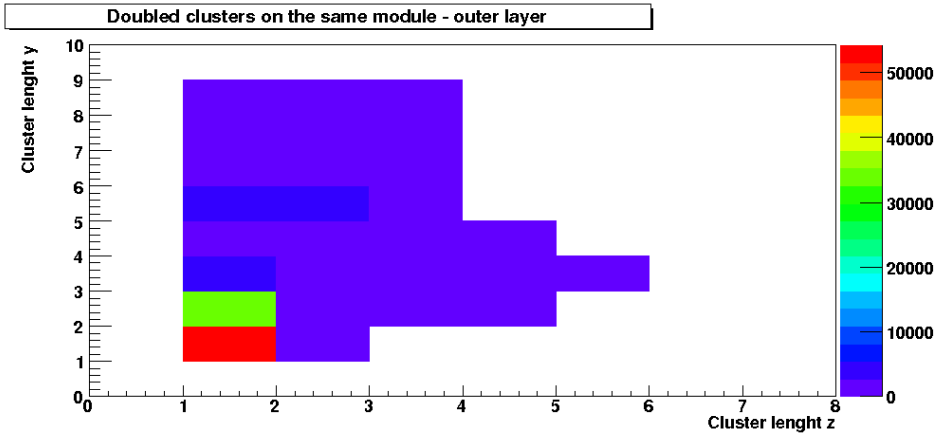
Length of the clusters involved in a duplication



Y

Z

Inner SPD layer



Y

Z

Outer SPD layer