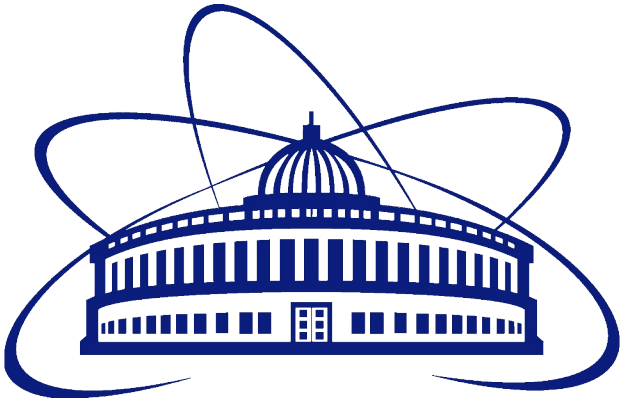

Status of MAPS/DSSD separation in SPDroot source code

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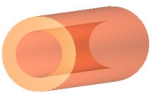
"Problems" with SVD geometry

- Dependence of the tracking results on the dimensions of the auxiliary geometry levels (layers);

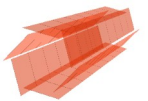
  Volume boundaries limit the step size when simulating the passage of a particle through a detector, which leads to a shift in the sequence of pseudo-random numbers.

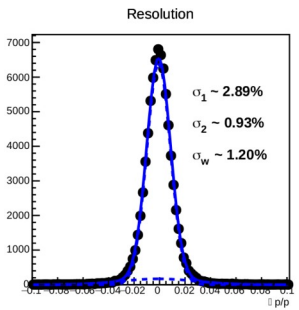
Level1 (layer)
Medium: air



Level2 (ladder)
Medium: silicon

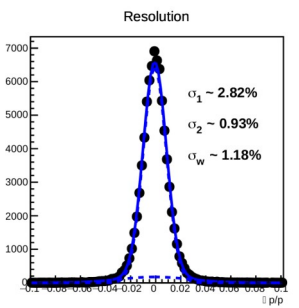
Level3 (chip)
Medium: silicon





Default:

#sigma_{1} (GeV)
2.88635e-02 ± 4.50443e-04
#sigma_{2} (GeV)
9.30730e-03 ± 3.84360e-05



Changed R_{min} of layers:

#sigma_{1} (GeV)
2.82122e-02 ± 4.36770e-04
#sigma_{2} (GeV)
9.25279e-03 ± 3.83027e-05

- There have been cases of hits disappearing in one of the layers for the MAPS option;

The details of the mentioned problems were presented at the last meeting:
https://indico.jinr.ru/event/4702/#2-status-of-svd-description-in

Second problem

<SPDroot>/macro/performance-tests/track-fitting

«*Examples demonstrate the track fitting performance for 1.5 GeV muons for MAPS+Straw, DSSD+straw and ITS+straw tracker variants. Ideal track finding is used.*»

SpdItsGeoMapperX::Instance()->SetGeometryPars(1, 1); // **MAPS option**
SpdItsGeoMapperX::Instance()→EnableEndcaps(0);

primGen->SetTarget(0., 30.); // Z- position, 2*delta or sigma [cm]
primGen→SmearGausVertexZ(kTRUE);

10000 events

Hits in layer 1:
7266
Hits in layer 2:
7629
Hits in layer 3:
7811
Hits in layer 4:
8141

Example of event without hit in 2d layer:

```
SpdIts::ProcessHits:   Event number:          9975
SpdIts::ProcessHits:   Vol Path:       /cave_1/ItsLayer1_1/ItsLadder1_6/ItsChip1_29
SpdIts::ProcessHits:   Track PiD:      13
z-position:      4.6
SpdIts::ProcessHits:   Event number:          9975
SpdIts::ProcessHits:   Vol Path:       /cave_1/ItsLayer3_1/ItsLadder3_20/ItsChip1_225
SpdIts::ProcessHits:   Track PiD:      13
z-position:      -3.3
SpdIts::ProcessHits:   Event number:          9975
SpdIts::ProcessHits:   Vol Path:       /cave_1/ItsLayer4_1/ItsLadder4_28/ItsChip1_88
SpdIts::ProcessHits:   Track PiD:      13
z-position:      -7.3
```

Second problem (solution)

Possible reasons:

- Gaps between chips;

  Chip phi-size: 14.336 mm → 15 mm
  Gap size between chips along z-axis: 0.664 mm → 0 mm

- Smearing of muon production vertex z-coordinate; (primGen->SetTarget(0., 30.); → primGen->SetTarget(0., 0.);)

Result:

10000 events

Hits in layer 1:
9942
Hits in layer 2:
9776
Hits in layer 3:
9563
Hits in layer 4:
9469

Hits disappearing in one of the layers for the MAPS option occurred as a result of a non-zero distance between the chips;

Conclusion

- The sources of the «problems» have been discovered:
  - *Volume boundaries limit the step size when simulating the passage of a particle through a detector, which leads to a shift in the sequence of pseudo-random numbers;*
  - *Hits disappearing in one of the layers for the MAPS option occurred as a result of a non-zero distance between the chips;*
- Performance tests for versions of source code with default SVD geometry and with separated MAPS and DSSD options show the same result. => ready for merge request
- End-cap option with internal structure ongoing