# On DSSD set-up

Igor Denisenko
iden@jinr.ru

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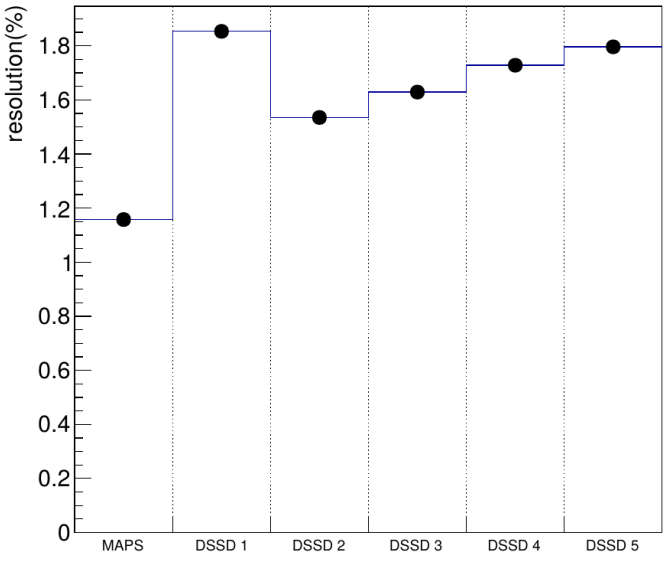
# Motivation

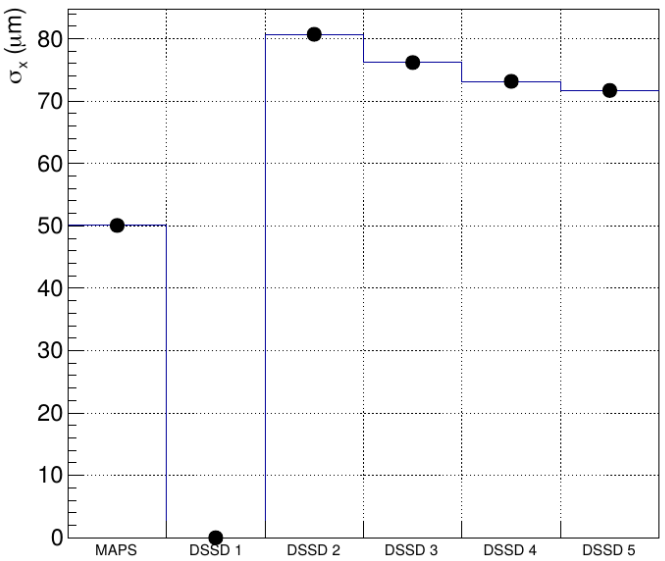
- The current DSSD set-up consists from 5 layers. Do we need all of them?
- The simulations with MCT showed the best *momentum resolution* is achieved with one layer.
- Here I show simplified studies of momentum and primary vertex resolution and refer to more realistic Amaresh's results on reconstruction of D-meson vertex.
- The layer thickness if 300 µm of silicon, resolution is taken from the current TDR. The default DSSD resolution in SpdRoot is 60, which is different from TDR/
- For the DSSD configurations with reduced number of layers the outer ones are removed, position of inner ones is not changed.

# Vertex detector performance

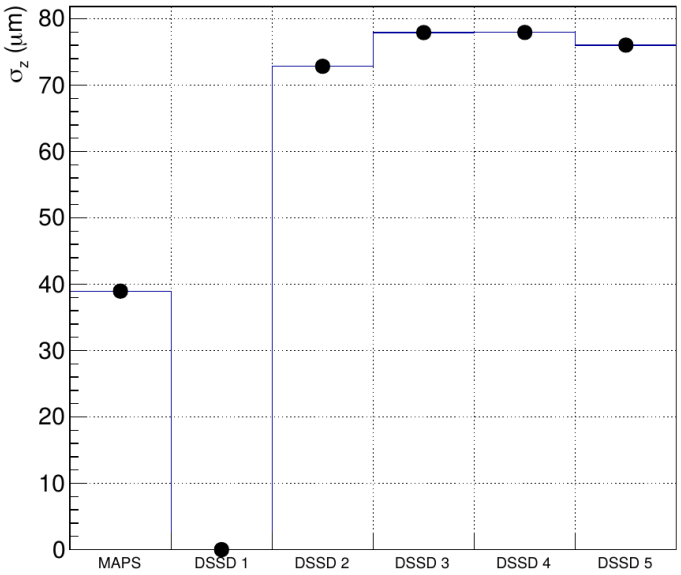
Momentum resolution (%)




Vertex resolution in the perp. plane



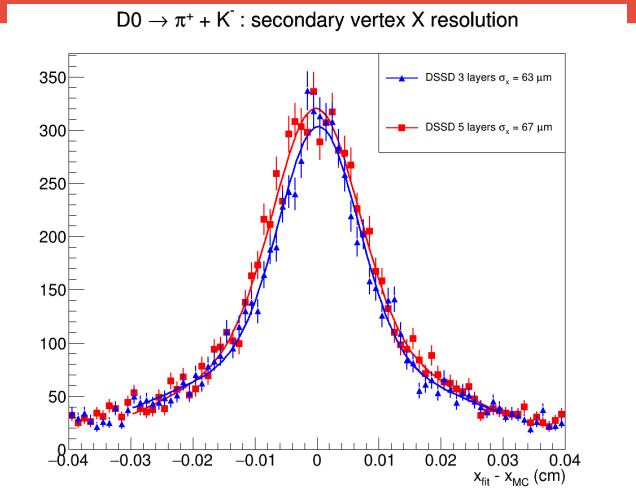

Vertex resolution along Z-axis

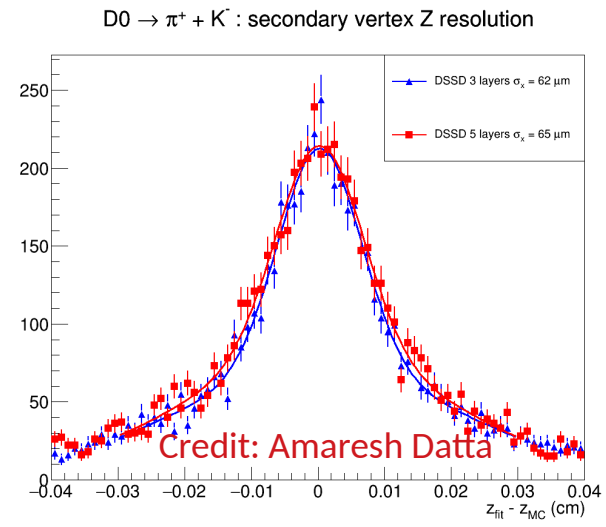



1.5 GeV mouns

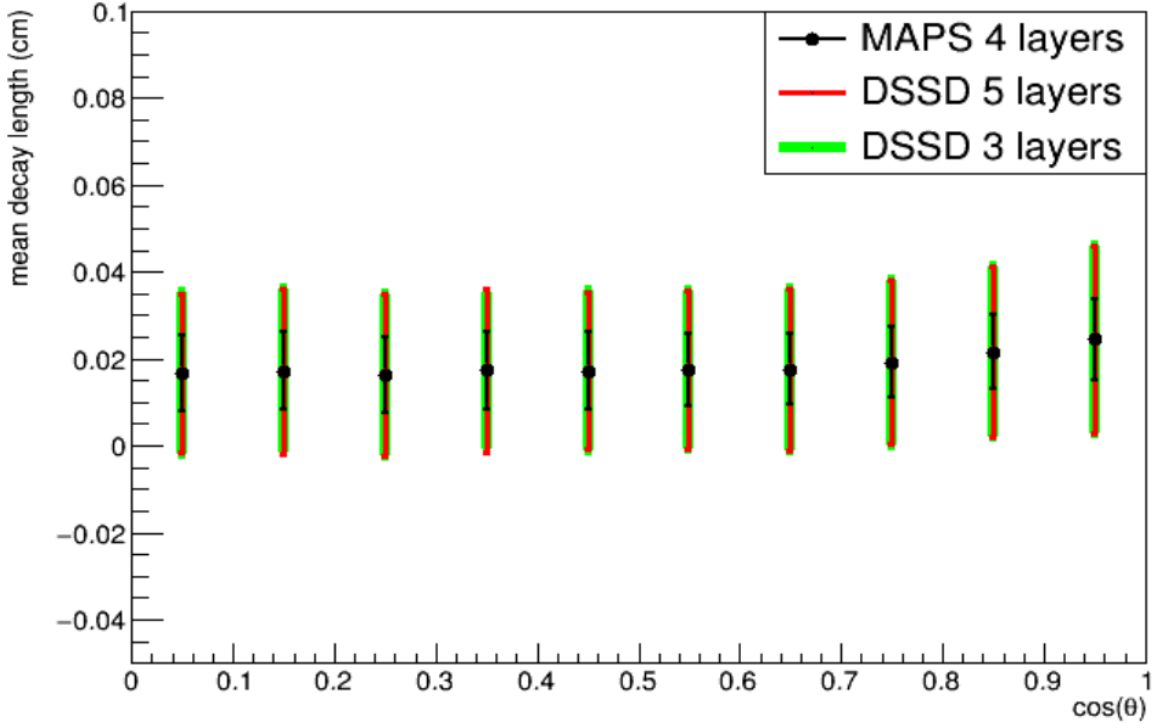
- a pair of 1.5 GeV muons
- fit with double gaussian
- only $\sigma_1$ is shown

# Secondary vertex reconstruction for D → Kπ




Credit: Amaresh Datta



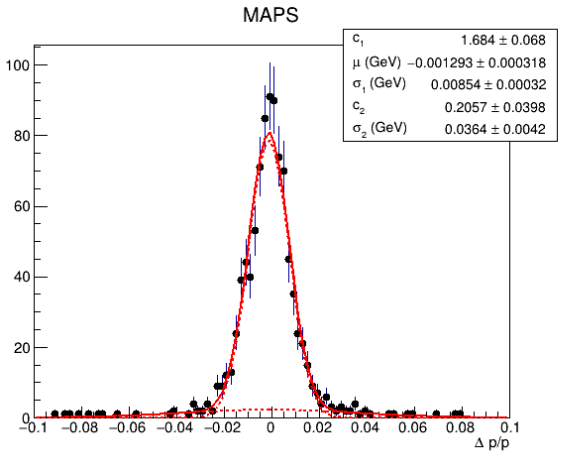

Credit: Amaresh Datta, Physics & MC Meeting 27.04.22

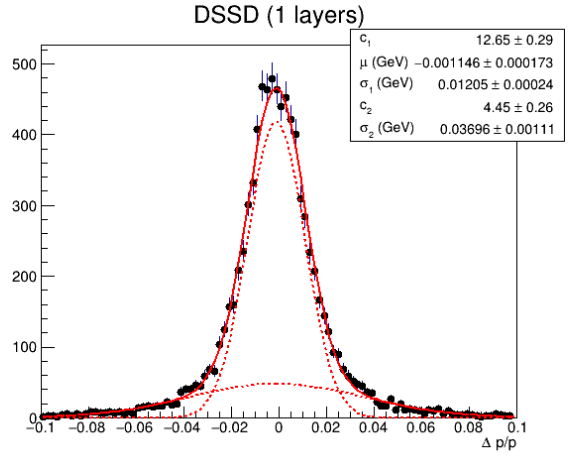
No substantial improvement for 5 layers as compared to 3 ones (layer $\sigma_z$ = 60 μm, which is a default value in SpdRoot).

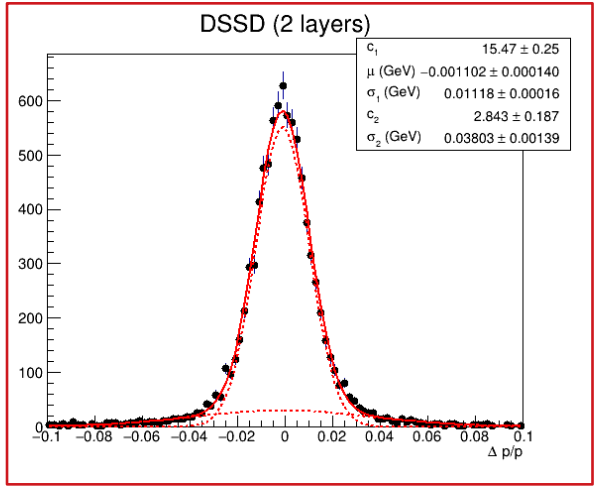
# Conclusion

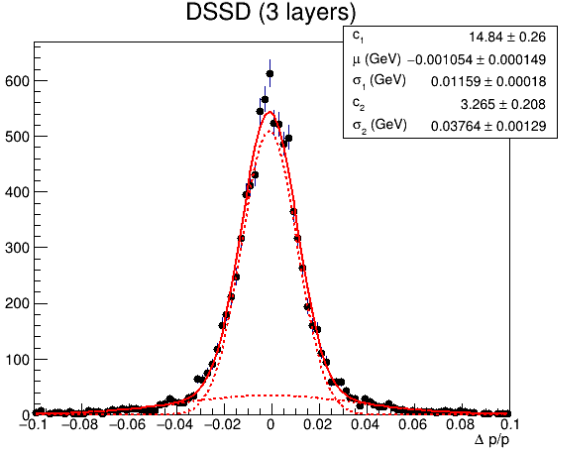
- With the tested DSSD set-up the best momentum resolution is achieved with with two layers.
- For the vertex resolution there is no notable improvement for 5 DSSD layers as compared to 3.
- The position of the second and the third layers are to be optimized.
- The same can be expected for the DSSD endcaps. The need for DSSD endcaps requires a dedicated study.

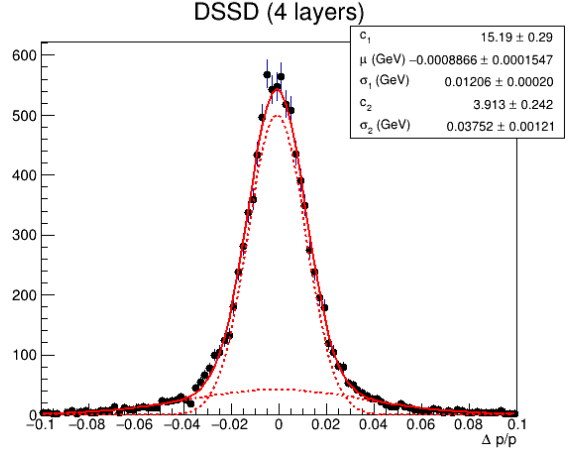
# Momentum resolution (1.5 GeV muons)

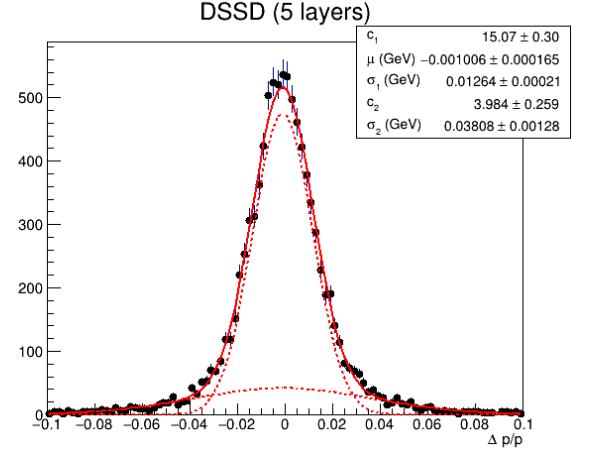


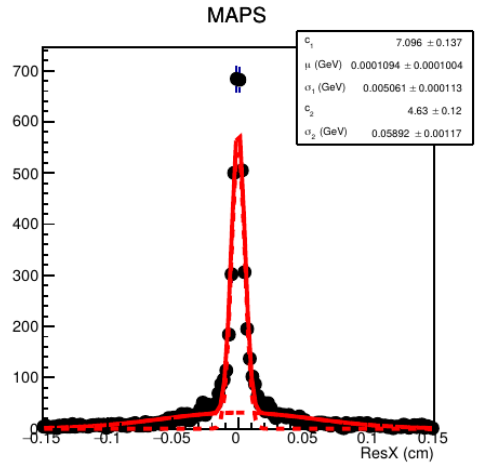



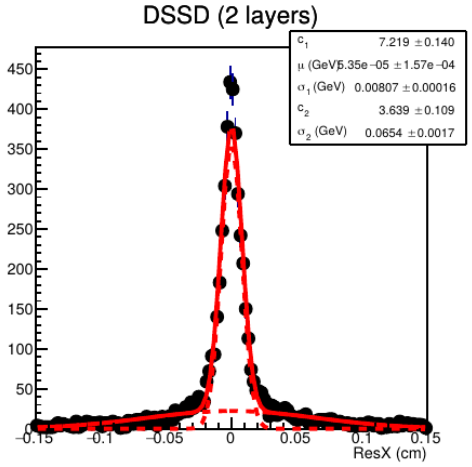



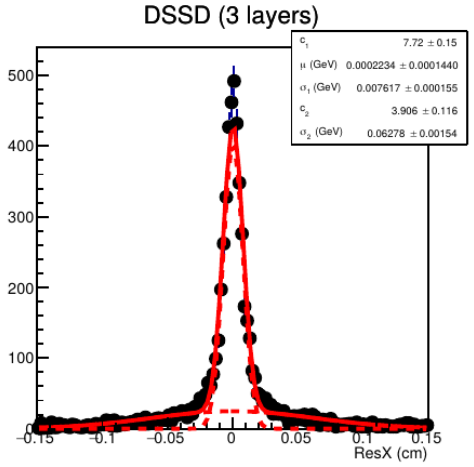



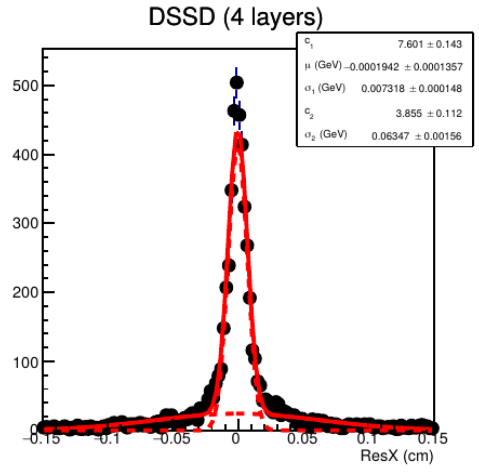



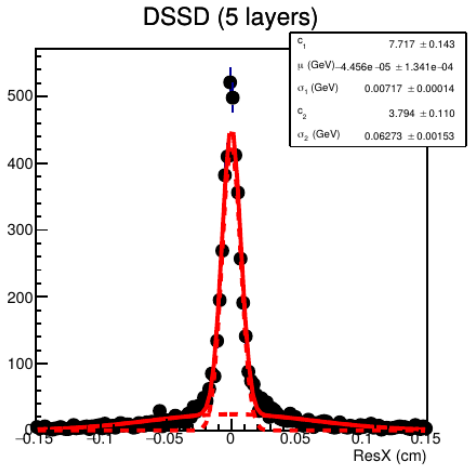
# Primary vertex resolution along X-axis (two 1.5 GeV muons)



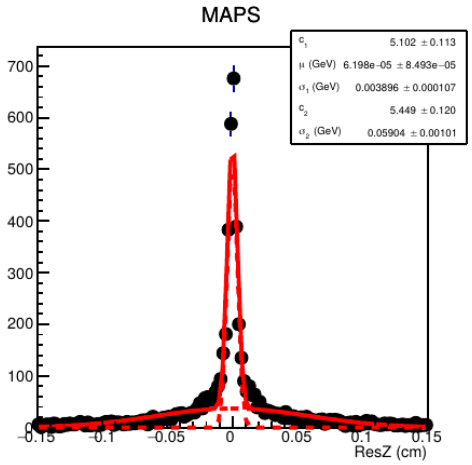



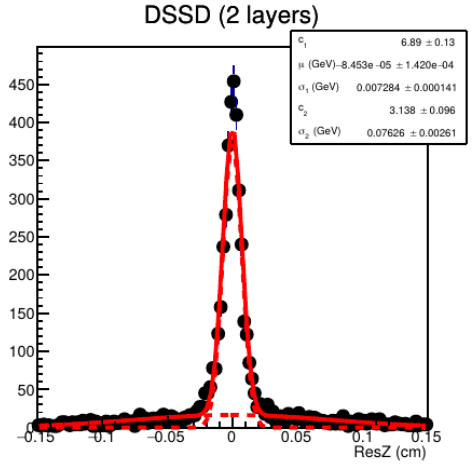



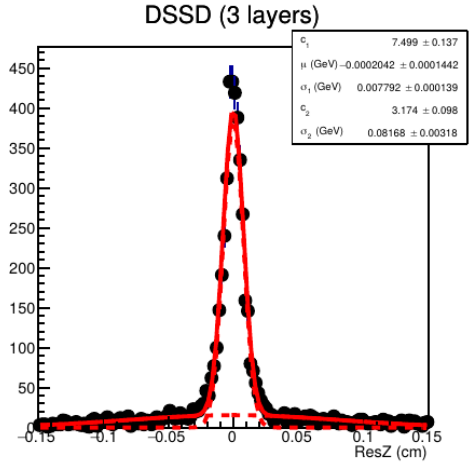



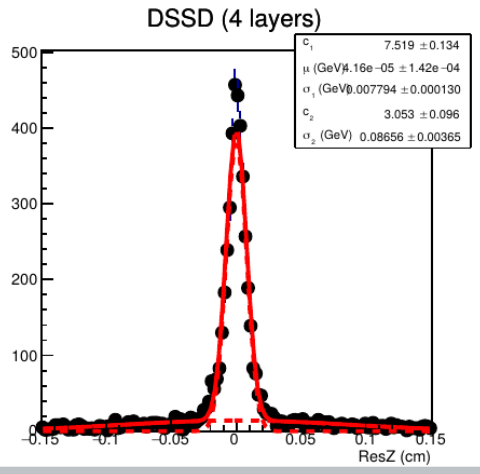

| Detector | σ1 (μm) |
|---|---|
| MAPS | 50 |
| DSSD (2) | 81 |
| DSSD (3) | 76 |
| DSSD (4) | 73 |
| DSSD (5) | 72 |

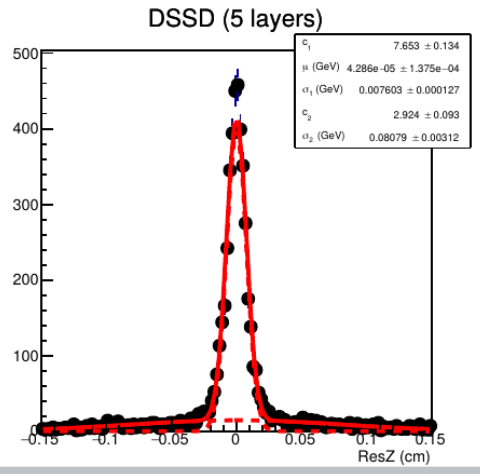
# Primary vertex resolution along Z-axis (two 1.5 GeV muons)




| Detector | σ1 (μm) |
|---|---|
| MAPS | 39 |
| DSSD (2) | 73 |
| DSSD (3) | 78 |
| DSSD (4) | 78 |
| DSSD (5) | 76 |