Inner Tracker Resolution for Secondary Vertex Reconstruction

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Secondary Vertex Resolution : Vertex Detector Dependency

- First stage : MicroMegas, Second stage : DSSD or MAPS?
- D-meson measurements are an important focus at the later stage SPD, seondary vertex resolution within a hundred micrometers are important (roughly the decay length of D^0)
- To test performance, daughter tracks from the secondary vertices are fitted and the difference between reconstructed and true (MC) vertices are plotted separately in X (perp. to beam dir.) and Z (along beam dir.)

Dependence on Vertex Detector

- To study performance of possible Inner Trackers, considered :
- 1 layer of DSSD ($300\mu m$ thickness)
- 3 layers of DSSD ($300\mu m$ thickness)
- 5 layers of DSSD (default in SPDRoot, $300\mu m$ thickness)
- 4 layers of MAPS
- Default MicroMegas (3 layers) in SpdRoot
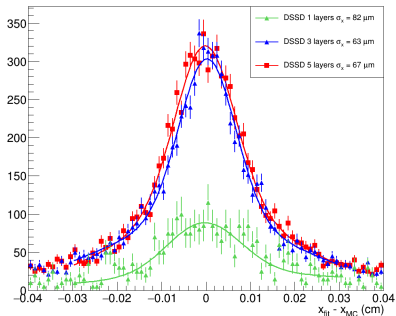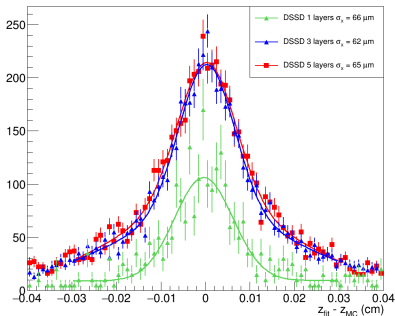- Only signals were considered ($D^0 \rightarrow \pi^+ K^-$)
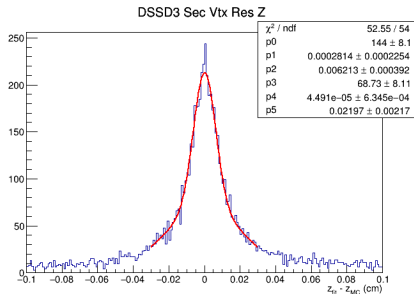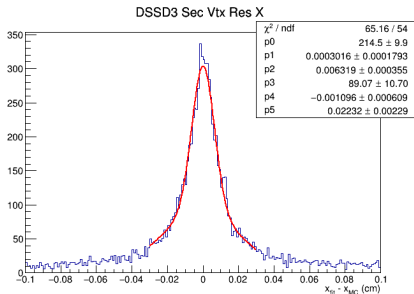
Sample fit of the difference between reconstructed and Monte Carlo secondary vertex positions with two Gaussians.

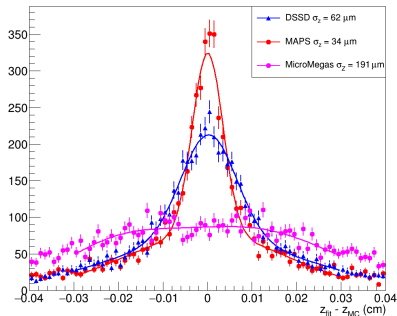σ of the narrow Gaussian is used as resolution.

Comparison of performance of DSSD 1 layer, 3 layers and 5 layers.
One layer performs worse. Three and five are close but more layers
cause 5-6% worse resolution.

Comparison of performance of three different Inner Trackers.
MicroMegas - decided the worst. MAPS clearly performs better -
35-45% depending on direction.

Conclusions

- Micromegas is really not helpful in D meson secondary vertex determinations
- MAPS significantly outperforms DSSD
- Five layers of DSSD performs slightly worse than three - possibly becuase of the multiple scattering in material in the higher number of layers
- Probably 3 layers of DSSD is a decent compromize if we can not have MAPS
- I'll take a look if the resolutions are significantly different for three particle decays of the charged D mesons

Thank You