



Forschungszentrum Jülich
in der Helmholtz-Gemeinschaft



TAG Tracking: MVD questions to the simulations

Outline

- benchmark channels
- performance evaluations of the MVD
- Any other business

TAG Tracking

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Benchmark channels

4 tracking benchmark channels identified:

- $\bar{p}p \rightarrow D^{*+}D^{*-}$ with $D^{*\pm} \rightarrow D^0\pi^\pm$ and $D^0 \rightarrow K^-\pi^+$, $D^0 \rightarrow K^-\pi^+\pi^-\pi^+$ or $D^0 \rightarrow \bar{K}^0\pi^+\pi^-$, all single sided under special consideration of the slow π coming from the D^* decays.
 - important for MVD but also for CT \rightarrow K, π tracking and momentum measurement
- $\bar{p}p \rightarrow \Lambda\Lambda \rightarrow p\pi p\pi$
 - proposal to change to $pp \rightarrow \Xi\Xi$ channel to incorporate also cascade decays
 - Λ reconstruction, partly only with CT ($\sim 15\%$) \rightarrow tests vertexing capabilities of CT
- $\bar{p}A \rightarrow J/\Psi X \rightarrow l\bar{l}X$
 - high p_T lepton tracks in multi-track environment \rightarrow CT important for momentum measurement and tracking
- $\bar{p}p \rightarrow \bar{p}p$ elastic scattering
 - important for FT, nearly irrelevant for CT and MVD

This doesn't mean that only these channels should be considered but for detector optimization work we don't need full physical picture



Simulation question to the MVD

What do we need?

- studies of different reconstruction approaches esp. the (fast) reconstruction of close displaced vertices for D-mesons ('c-tagging' vs. 'c-trigger')
- full simulations of the benchmark channels to evaluate the tracking performance of the MVD layout with enough statistics (background and signal processes) and realistic detector descriptions
- comprehensive comparison of the obtained results between different layout options for detector optimization



Simulation questions to the MVD

- $\bar{p}p \rightarrow D^*D^*$ with $D^* \rightarrow K^\pm \pi \pi$ or $D^* \rightarrow K^0 \pi \pi$ or $D^* \rightarrow \text{slow } \pi$, all single sided
 - single track resolutions esp. for kaons in dependency from acceptance and particle momentum for different beam energies
 - vertex resolutions for decaying D-mesons
 - c-tagging capabilities
 - tracklets inside MVD only
- absolute and relative momentum resolutions
- track reconstruction efficiency
- PID separation power
- efficiency and purity of K^\pm reconstruction



Simulation questions to the MVD

Performance questions to be answered $\bar{p}p \rightarrow \Lambda\Lambda \rightarrow p\pi p\pi$

- single track resolutions in dependency from acceptance and particle momentum for different beam energies
- absolute and relative momentum resolutions
 - vertex resolutions for Λ decaying inside and outside the MVD volume
- reconstructed Λ mass resolutions
- track reconstruction efficiency
- efficiency and purity of Λ reconstruction
- PID separation power



Simulation questions to the MVD

- $\bar{p}A \rightarrow J/\Psi X \rightarrow \ell\ell X$
 - single track resolutions in dependency from acceptance and particle momentum for different beam energies and target nuclei
 - rate capabilities and multi-hit environment
- absolute and relative momentum resolutions
- reconstructed J/Ψ mass resolutions
- track reconstruction efficiency
- efficiency and purity of J/Ψ reconstruction
- PID separation power



Simulation questions to the MVD

Other related topics:

- data rate considerations
 - track finding and reconstruction efficiency due to event convolution in dependency of peak luminosity (DPM, UrQMD)
- material considerations
 - impact of reasonable (!) material distributions on the main performance properties
- performance degradation considerations
 - impact of different efficiency losses
 - impact of radiation effects during lifetime
 - impact of single event upsets (SEU)
 - impact of non-uniform magnetic field regions
- special things
 - impact of beam and target pipe design and thickness
 - etc.



Timeframe discussion

- For MVD we plan to finish the R&D phase in 2 – 3 years
 - dedicated MVD meeting scheduled for end of October → can be more precise then
- For CT the situation is more complex (i.e. political)
 - STT group started to converge their efforts coming up with an elaborated option by end of 2008
 - TPC option roughly on the same time scale
- For the FT I don't have any solid information

Any other business

- need more dedicated input from the other detector parts, i.e. CT and FT.
 - P. Hawranek nominated for the FT
 - No candidate for the CT up to now
- use the Wiki and/or GSI forum for distributing information among us.
- In Dec. Panda meeting we have to finalize our work
- Next meeting via VRVS on 18th or 19th of October

