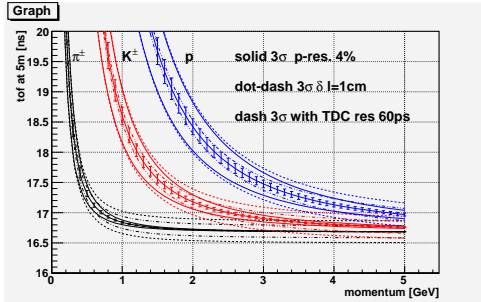


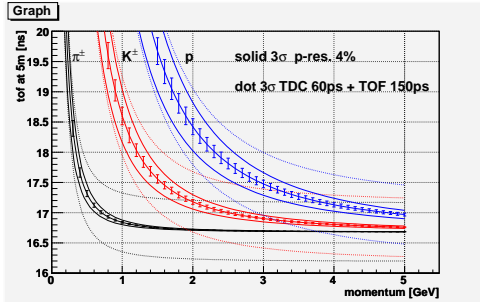
TOF Detector



TOF smearing

- TDC resolution (60 ps)
- Momentum resolution ($\sim 4\%$)
- path-length resolution (1 cm?)
- 6σ P2P separation

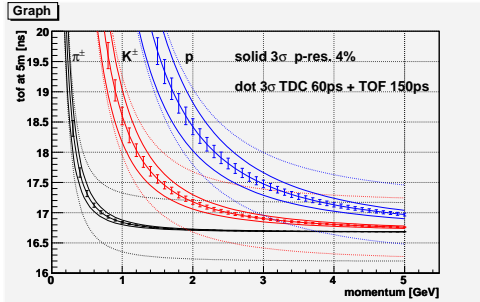
TOF Detector



TOF smearing

- TDC resolution (60 ps)
- Momentum resolution ($\sim 4\%$)
- path-length resolution (1 cm?)
- 6σ P2P separation
- TOF-Detector resolution (150 ps/plane)
scintillation rise-time,
decay time
light dispersion (geometry)
PMT TTS

TOF Detector

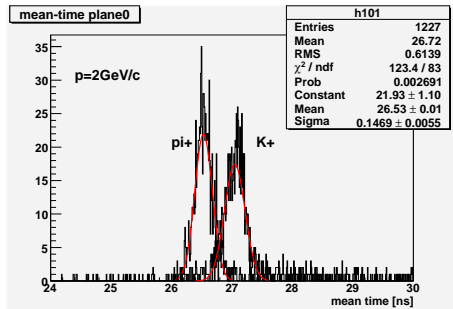


- optimize TOF-Detector resolution
- pion-kaon separation is most important

TOF smearing

- TDC resolution (60 ps)
- Momentum resolution ($\sim 4\%$)
- path-length resolution (1 cm?)
- 6σ P2P separation
- TOF-Detector resolution (150 ps/plane)
scintillation rise-time,
decay time
light dispersion (geometry)
PMT TTS

TOF pion-kaon separation



Particle Identification

- separate pions from kaons
- 3σ P2P separation not enough
- relative particle fluxes important (p-dependent)
- 6σ P2P 1.4 GeV/c ($\pi - K$ separation)

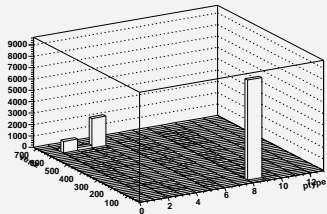
TOF Simulation

- two planes horizontal/vertical
- each paddle 252 cm x 6.0 cm x 2.54cm
- active material EJ-200 (Bicron 408)
- PMT XP2020
- TOF resolution 150 ps/plane
- digitization in JANA/DANA frame work
- TOF (mean-time), position (time-difference)
- geometrical hit-points
- assign points to tracks
- PID probability on TOF basis

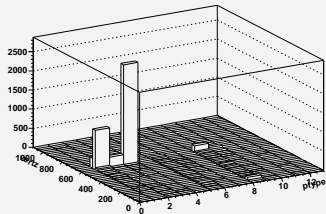
MC checks

Examples of using the MC simulation: 2 GeV π^+ at $\Theta = 5^\circ$

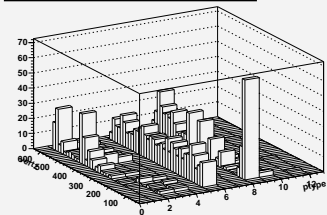
vertz:ptype {ptype<13&plane==0&vertz<700}



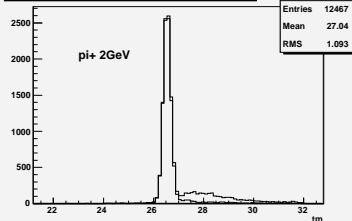
vertz:ptype {ptype<13&plane==0&vertz>70}



vertz:ptype {ptype<13&plane==0&vertz>70&vertz<600}

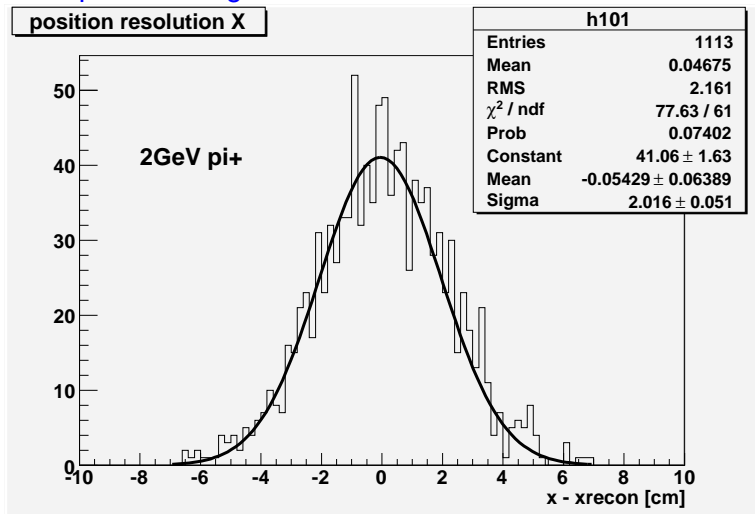


tm {abs(tm-27)<5&ptype<13&plane==0&vertz>50&vertz<700}



MC checks

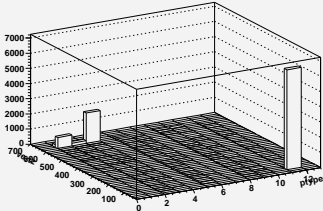
Examples of using the MC simulation: 2 GeV π^+ at $\Theta = 5^\circ$



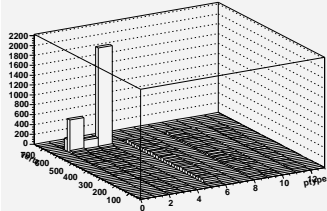
MC checks

Examples of using the MC simulation: 2 GeV K^+ at $\Theta = 5^\circ$

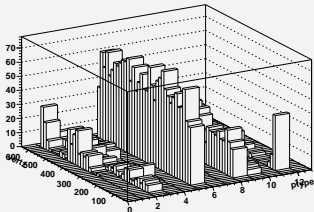
vertz:ptype {ptype<13&plane==0&vertz<700}



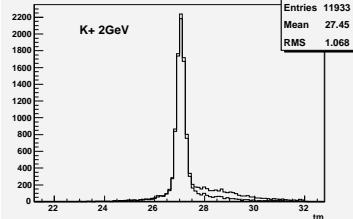
vertz:ptype {ptype<13&plane==0&vertz>70}



vertz:ptype {ptype<13&plane==0&vertz>70&vertz<600}

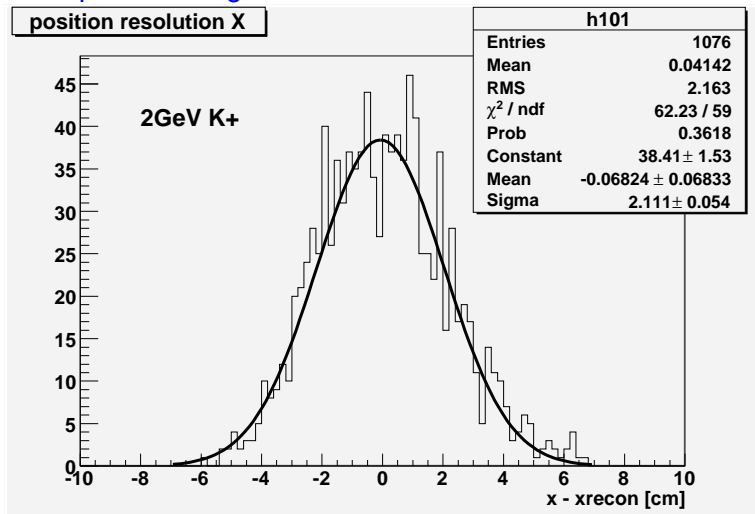


tm {abs(tm-27)<5&ptype<13&plane==0&vertz>50&vertz<700}



MC checks

Examples of using the MC simulation: 2 GeV K^+ at $\Theta = 5^\circ$



TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)

TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)
- photon statistics (*thick detector*)

TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)
- photon statistics (*thick detector*)
- light dispersion (*detector geometry small*)

TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)
- photon statistics (*thick detector*)
- light dispersion (detector geometry *small*)
- count rates (detector geometry *small*, PMT TT)

TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)
- photon statistics (*thick detector*)
- light dispersion (detector geometry *small*)
- count rates (detector geometry *small*, PMT TT)
- light detection efficiency (*PMT QE*)

TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)
- photon statistics (*thick detector*)
- light dispersion (detector geometry *small*)
- count rates (detector geometry *small*, PMT TT)
- light detection efficiency (*PMT QE*)
- PMT rise time (*PMT HV-divider*)

TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)
- photon statistics (*thick detector*)
- light dispersion (detector geometry *small*)
- count rates (detector geometry *small*, PMT TT)
- light detection efficiency (*PMT QE*)
- PMT rise time (*PMT HV-divider*)
- PMT dispersion (*PMT TTS*)

TOF Resolution

optimize TOF detector

- scintillator material (*rise time, decay time*)
- photon statistics (*thick detector*)
- light dispersion (detector geometry *small*)
- count rates (detector geometry *small*, PMT TT)
- light detection efficiency (*PMT QE*)
- PMT rise time (*PMT HV-divider*)
- PMT dispersion (*PMT TTS*)

1 paddle cross section 3.0 cm x 2.54 cm: cost!

2 faster PMT? micro-channel-plates?: cost!,rate!