Vladislav Balagura, LLR 14 Apr 2016

(Landau convolved with the resolution) X S-curve from trigger does not fit data very well. Try to extract exact shape from MC.

Inspired by excellent Geant4 description from Andreas, I used the same Geant4 example (N3 in Geant9, B4d in Geant10). Started from the very basic simulation of only Si pixel of 5.5x5.5x0.325 mm3, with 0.3 mm active thickness (100% efficient, no noises).



10 000 muon (E=100 GeV) events, accumulated

Generated 500 K muons with E=100 GeV and 50 K samples at various other energies. It takes O(minute) at my desktop.

Landau fit is not perfect, as expected



Approximated the distribution with the spline – much better description.



Comparison of Landau and spline, zoomed.



Muons at SPS are not monochromatic: they pass thick beam dump (considerable dE/dx losses with fluctuations) and to obtain high muon rates we opened collimators (momentum spread)

Position of maximum (Most Probable Value) in distributions at various energies. Nice demonstration of Bethe-Bloch dF/dx formula.

Good thing: plateau at high energies instead of relativistic rise because delta electrons escape active Si volume.



Geant4: muon shoots at 5.5x5.5x0.325 mm3 Si, 0.3 mm active thickness

Not only MPV, but the distributions themselves (smoothed here by splines) are similar at E>=20 GeV. So, no extra broadening of the fitting curve due to variations of muon momenta. Different top at E=100 GeV is probably due to 10 times higher statistics which influences spline fit.



Same for all generated energies



Plan is to fit data with the obtained spline curve.

Better description and only one calibration factor instead of (MPV + scale) in standard Landau fit. Convolution with Gaussian determined from pedestal width, times S-curve with varying mean, sigma.



E(muon) = 100 GeV, spline fit