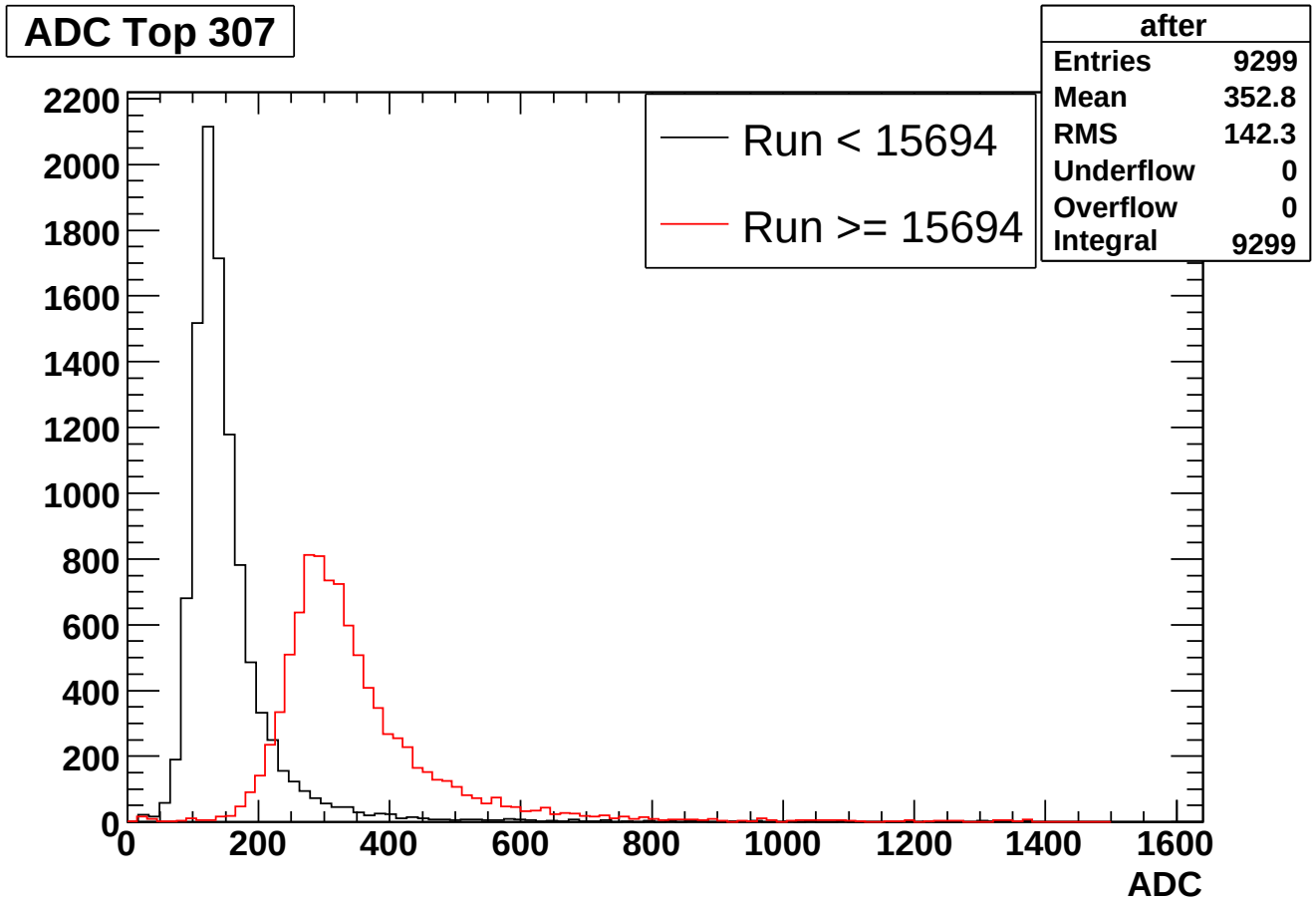
TOF Update

- Redo attenuation length calculation after reducing distortions due to background
- Recalculate slewing coefficient
- Restrict hit position in bars to $\pm 100cm$
- Compare resolutions for a)thin vs NuMI, b) before and after HV change
- combine data from several bars with $\sigma < 0.4ns$.

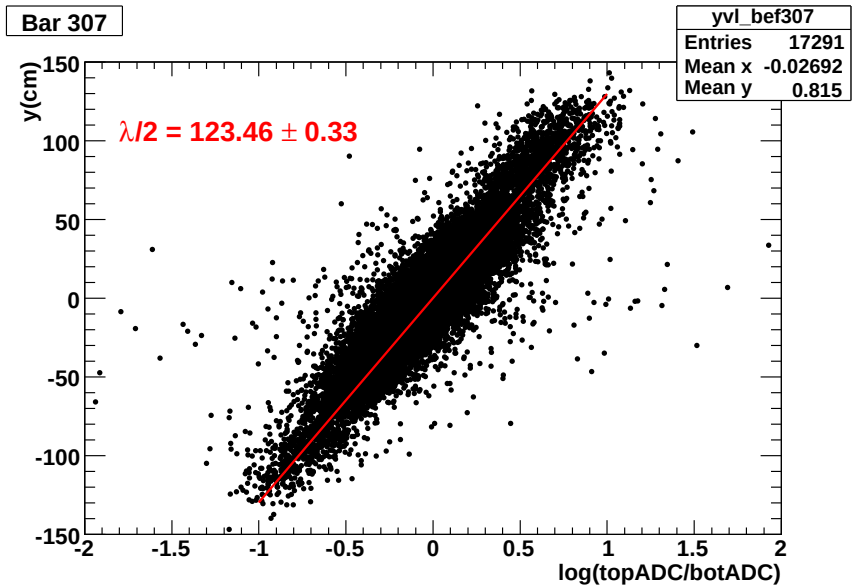
HV Change

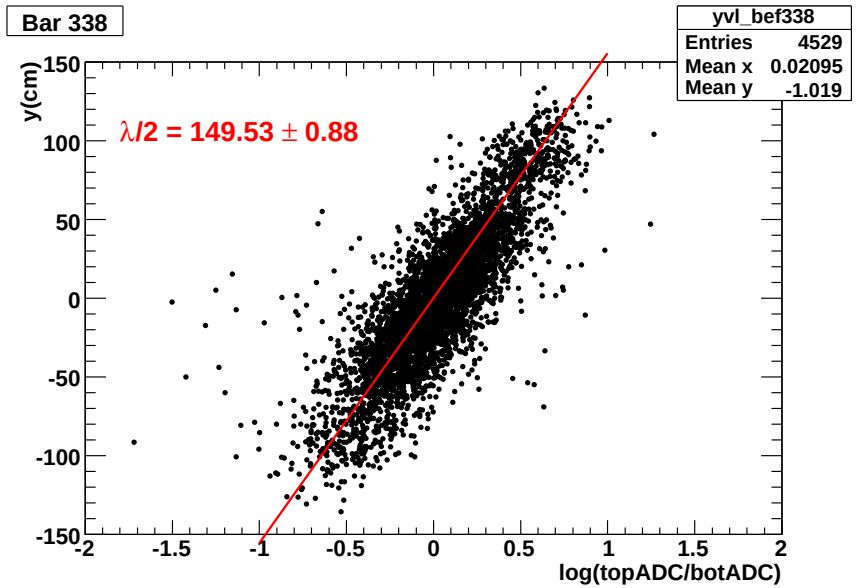


The gain change is due to a change in the HV.

HV was changed to -880V (from -800V) beginning run 13694. Aug 26, 2005, Logbook Entry 20450. To better understand any possible effects, we separate the data at this boundary.

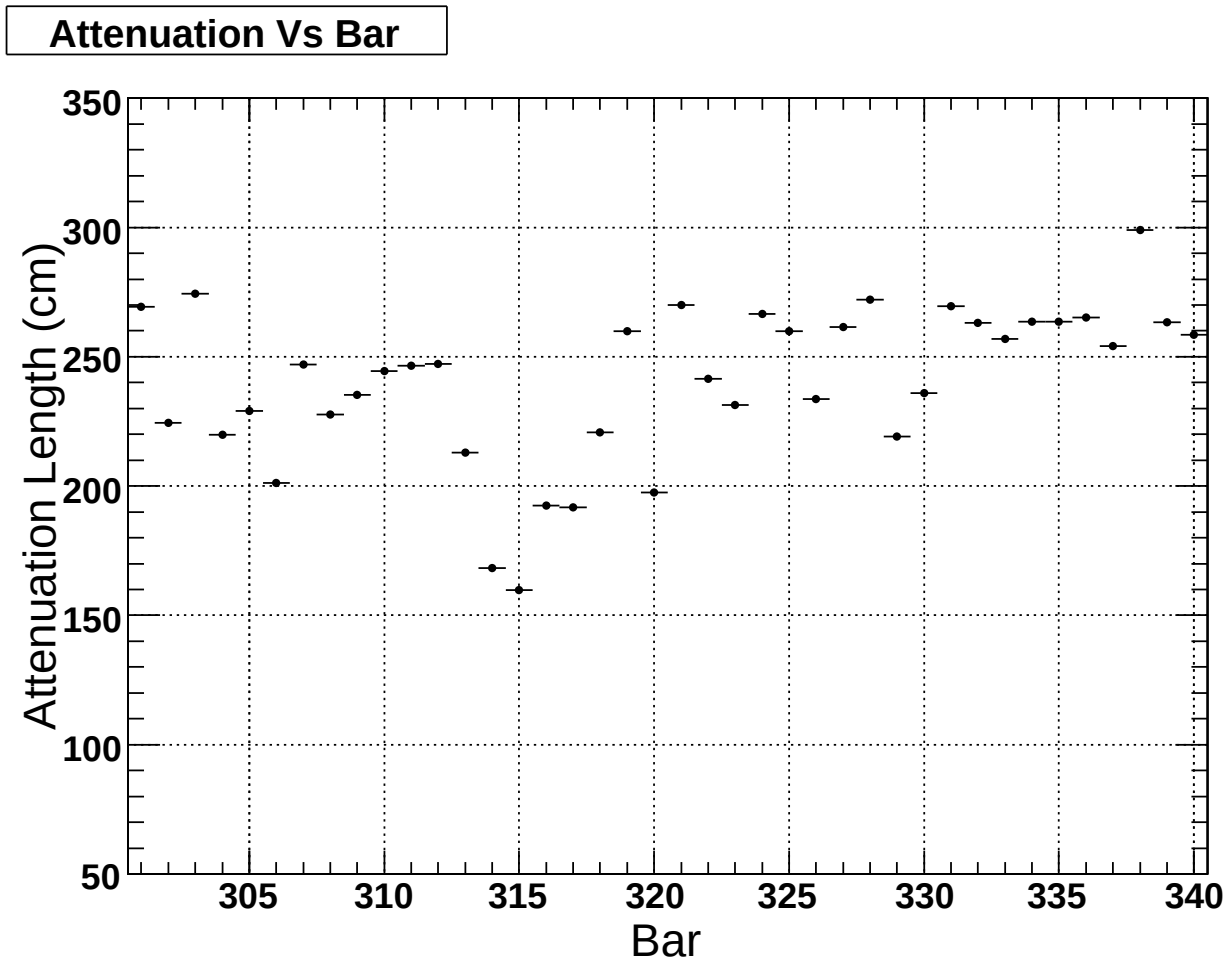
Attenuation Length





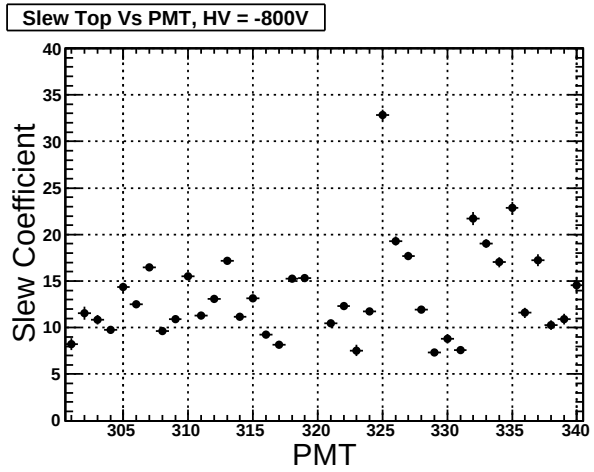
The attenuation half-length calculation for bars 307 and 338. Red line in plots is the likelihood fit. Slope = half attenuation length. Maybe some finer correction ”by hand” is possible to remove background distortion especially for bars with broad smearing.

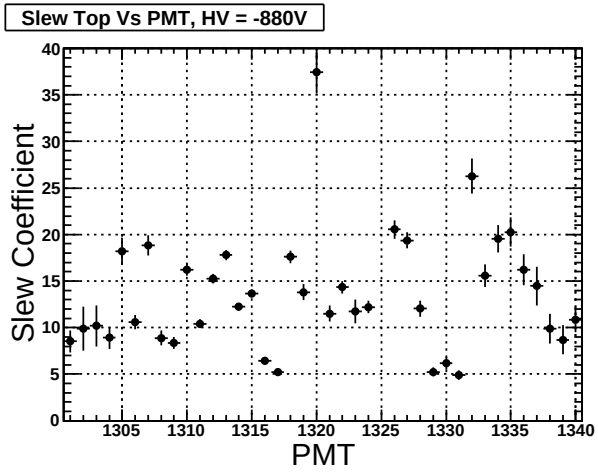
Attenuation Length (contd)

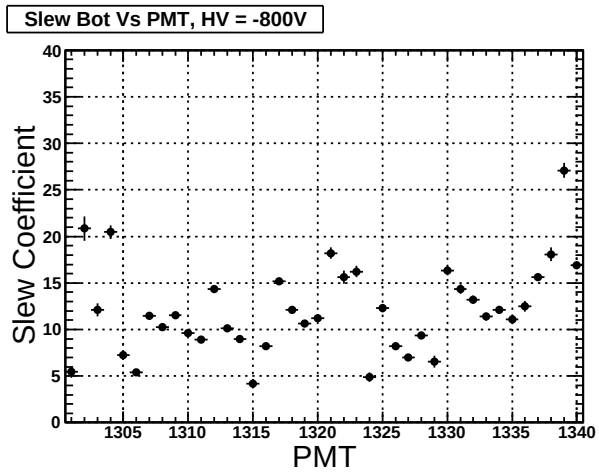


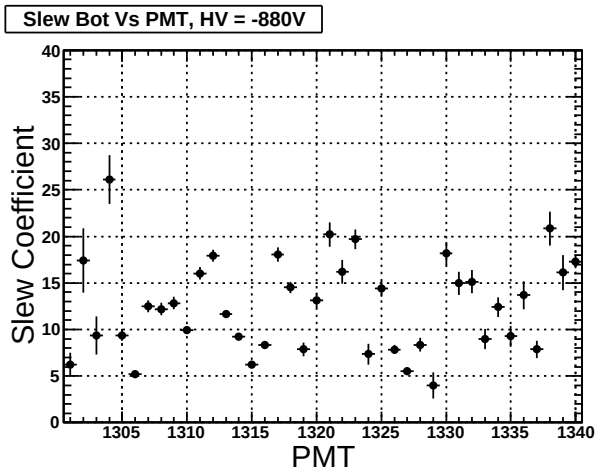
Attenuation length vs Bar number for Runs $<$ 15694. Attenuation length does not change much after HV increase. For eg. bar 307, $\lambda/2 = 123.46$ before and $= 126.4$ after.

Slewing Correction





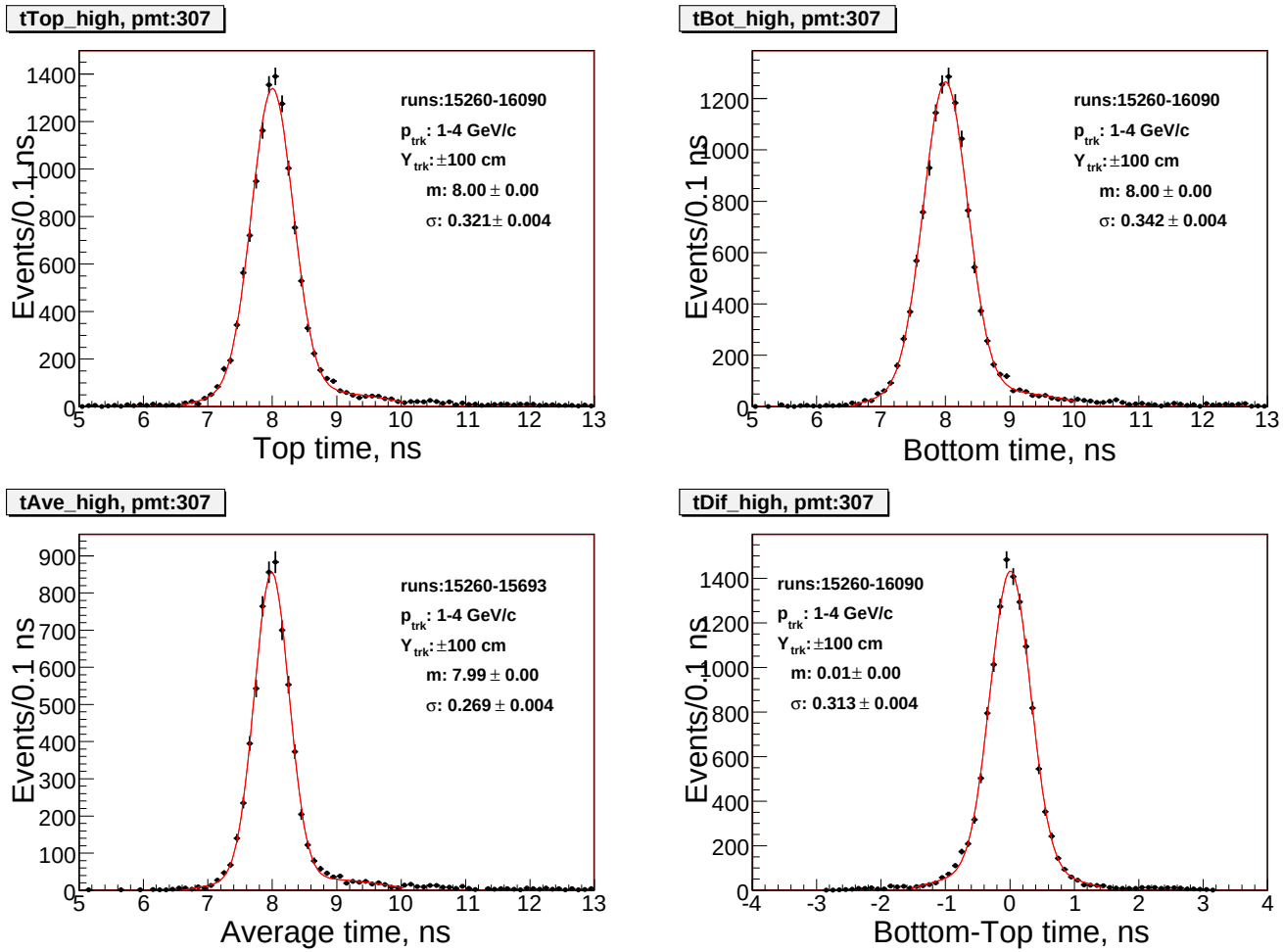




Slewing coefficients calculated after correcting ADCs for attenuation.

Left: HV = -800V, Right: HV = -880V

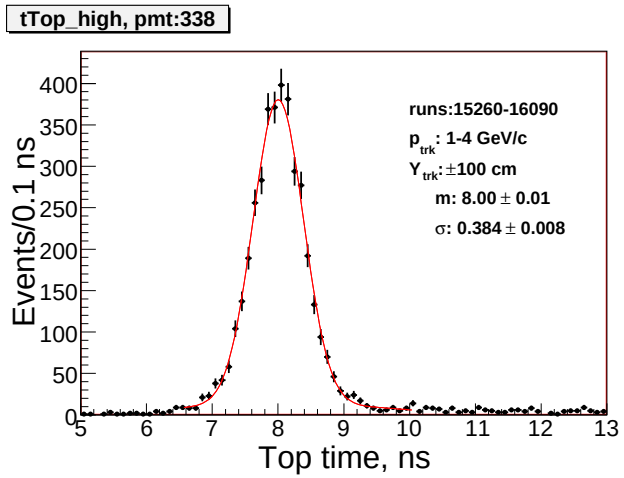
bar 307, thin targets, 120 GeV/c

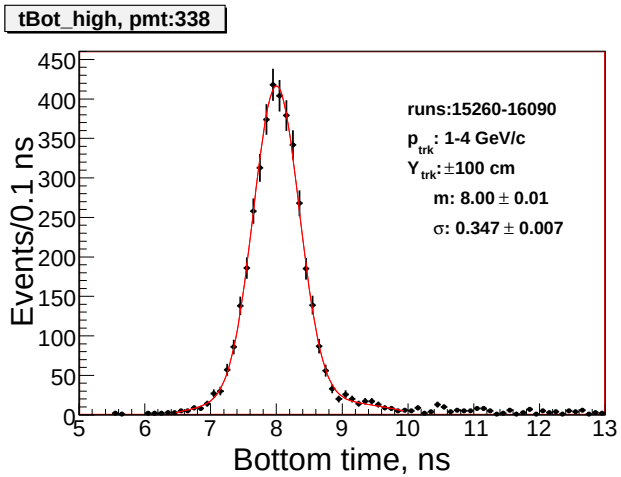


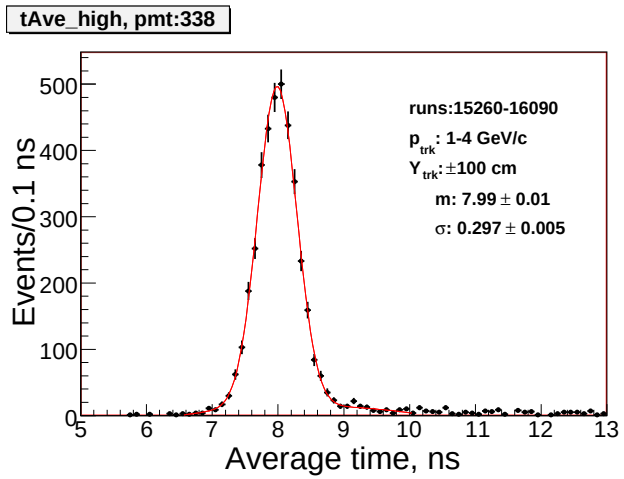
ToF bar with best time resolution on East side. 120 GeV/c thin-targets.

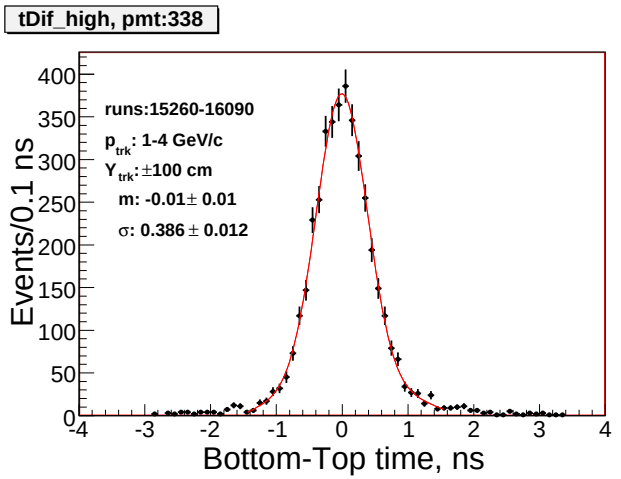
Before HV change $\sigma = 269$ps (see plot). For combined thin-targets $\sigma = 284$ps.

bar 338, thin targets, 120 GeV/c



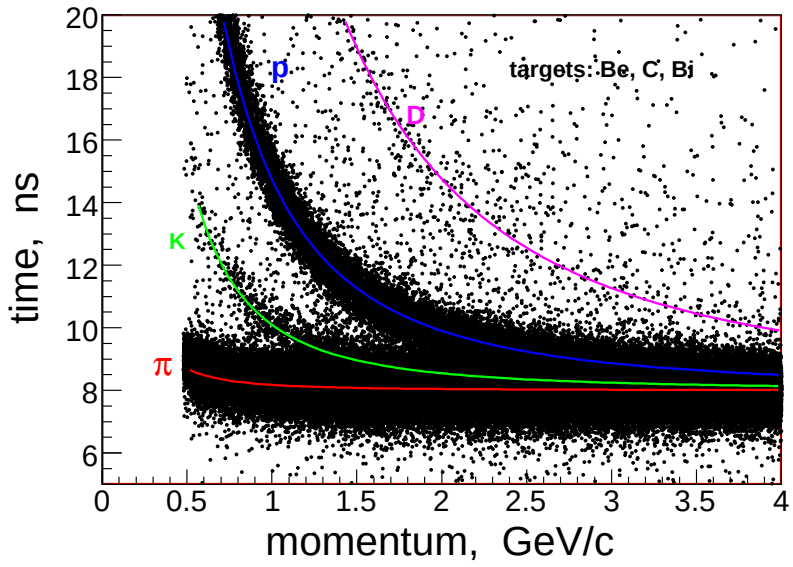


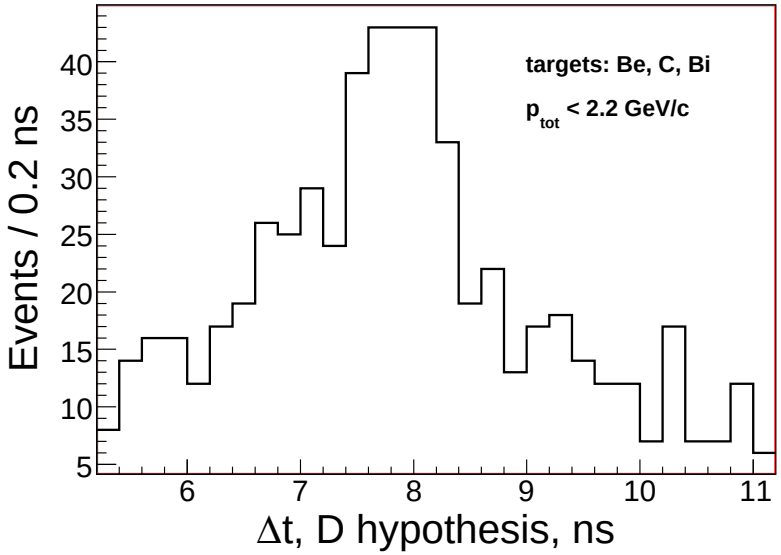




Bar with best resolution on the West side. 120 GeV/c thin-targets.

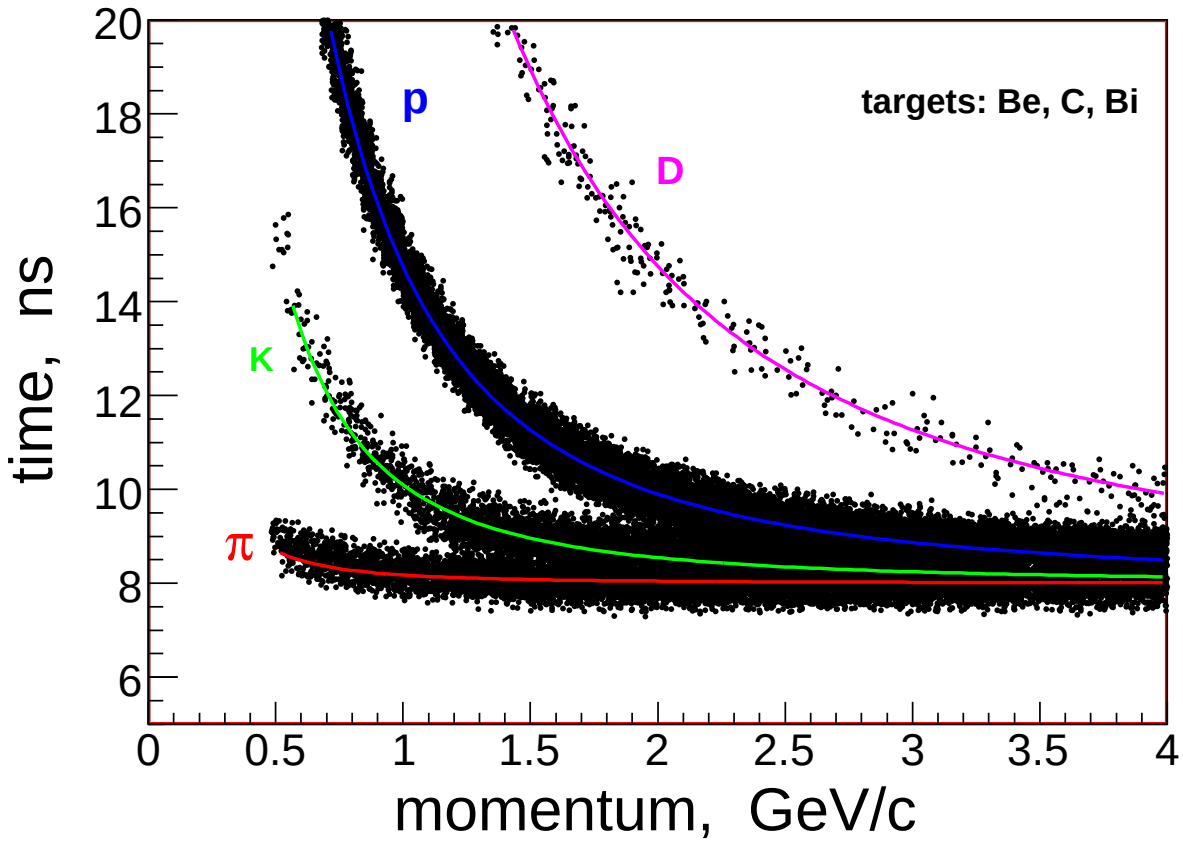
thin targets, 120 GeV/c, time vs momentum





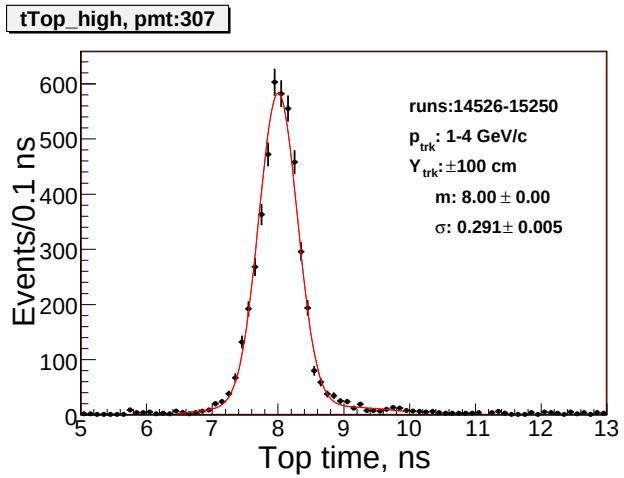
Left: ToF time vs track momentum. Targets: Carbon, Bismuth, Beryllium. Momentum: 120 GeV/c. Colored curves are predicted values for π, K, p, D hypotheses. Right: TOF Time with deuteron hypothesis requiring $p_{tot} < 2.2$ GeV/c to avoid proton tail. The ”peak” indicates possible presence of deuterons.

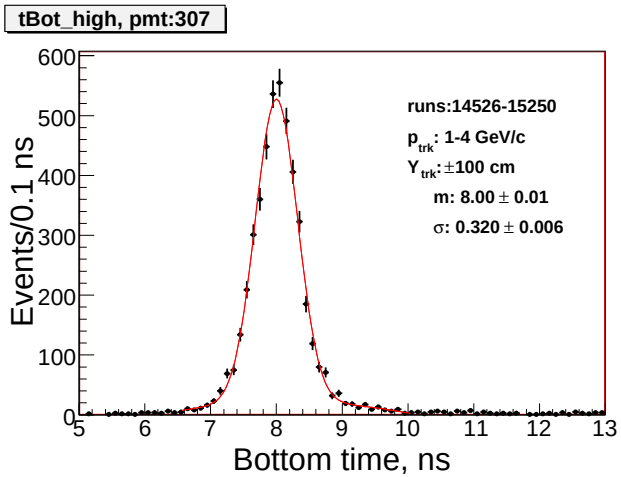
thin targets, 120 GeV/c, time vs momentum

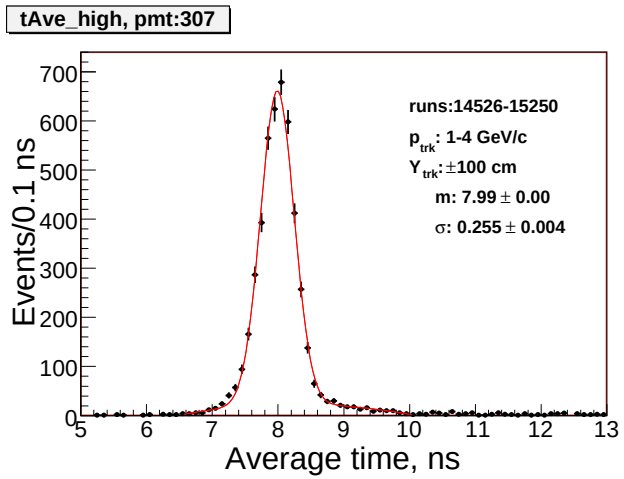


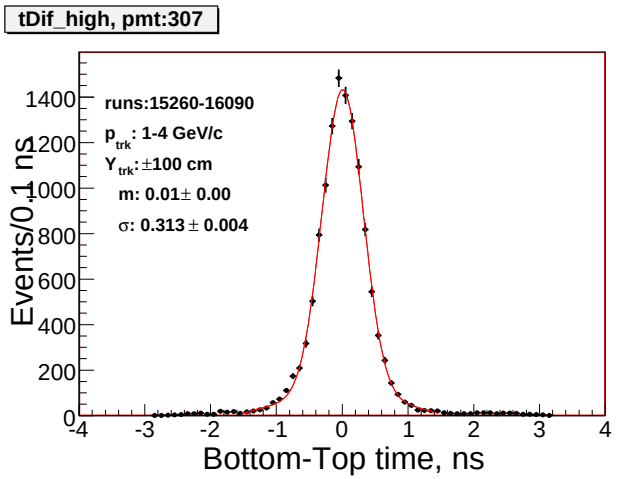
ToF time vs momentum. Targets: C, Bi, Be. Momentum: 120 GeV/c. Red curve - pions, green - kaons, blue - protons. For each species, require that ToF time be consistent with predicted value within $\pm 2.5\sigma$. Select only events satisfying one of the hypotheses.

bar 307, NuMI target, 120 GeV/c



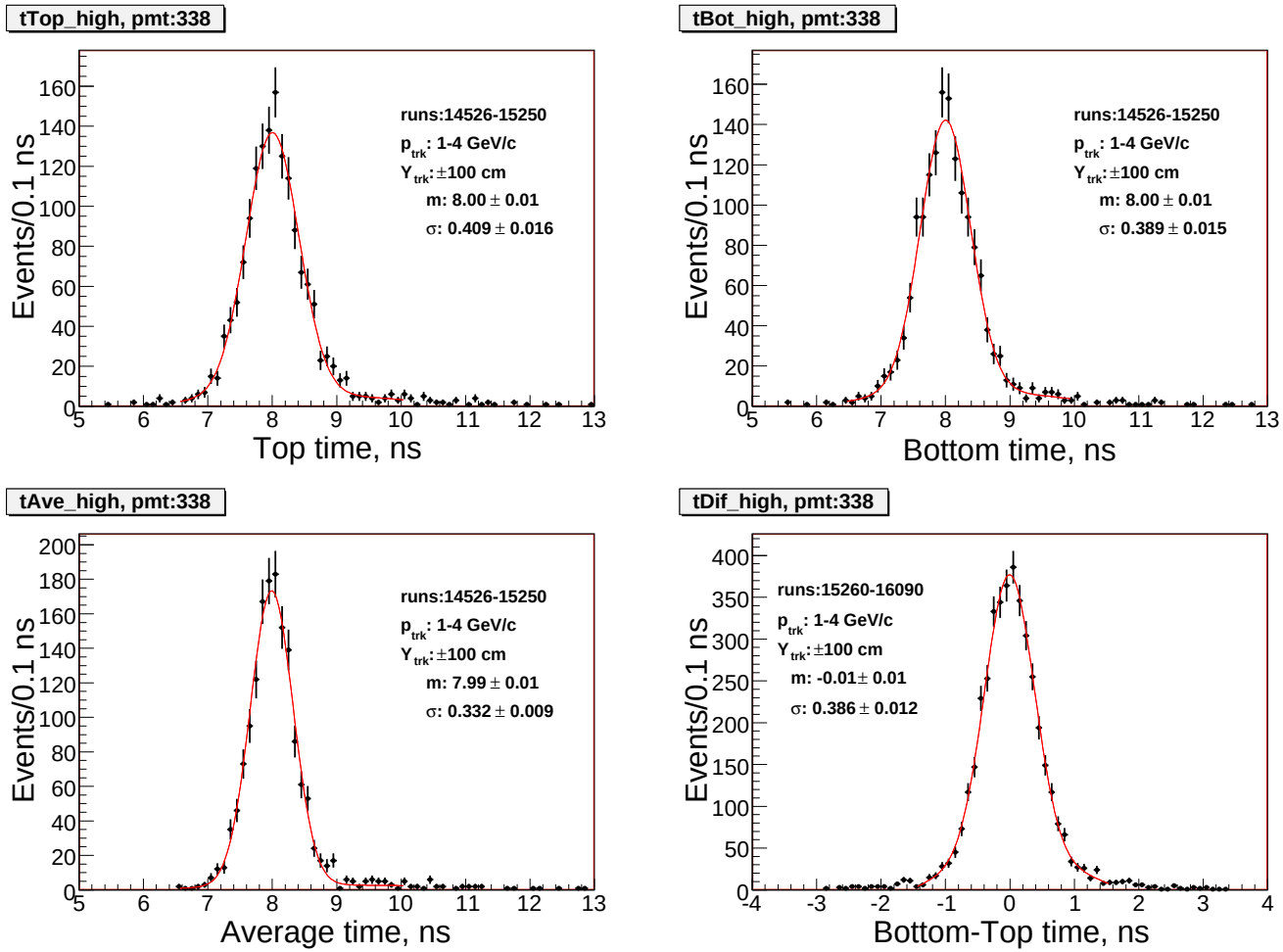






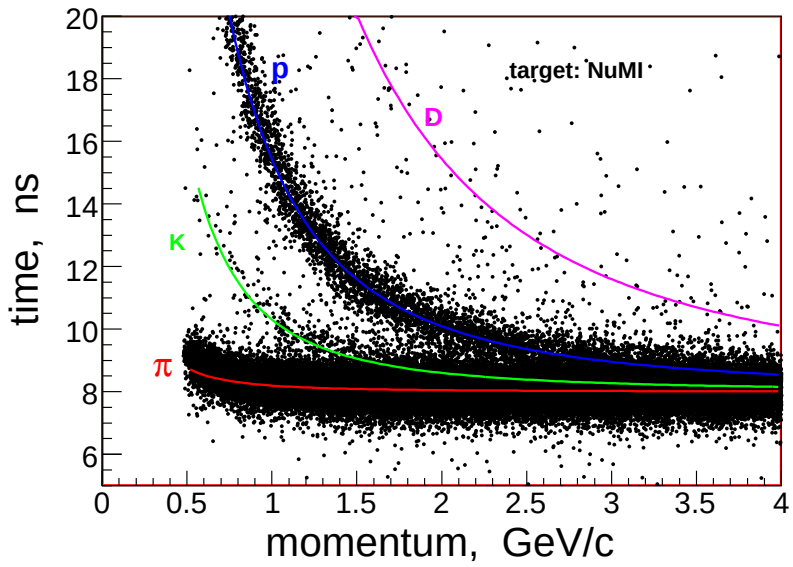
ToF bar with best time resolution from East side. Target: NuMI. Momentum: 120 GeV/c

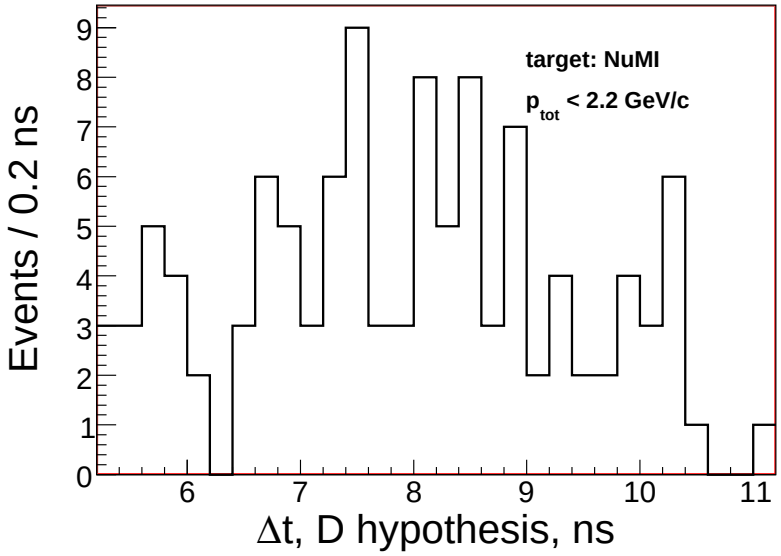
bar 338, NuMI target, 120 GeV/c



ToF bar with best time resolution from West side. Target: NuMI. Momentum: 120 GeV/c

NuMI target, 120 GeV/c, time vs momentum

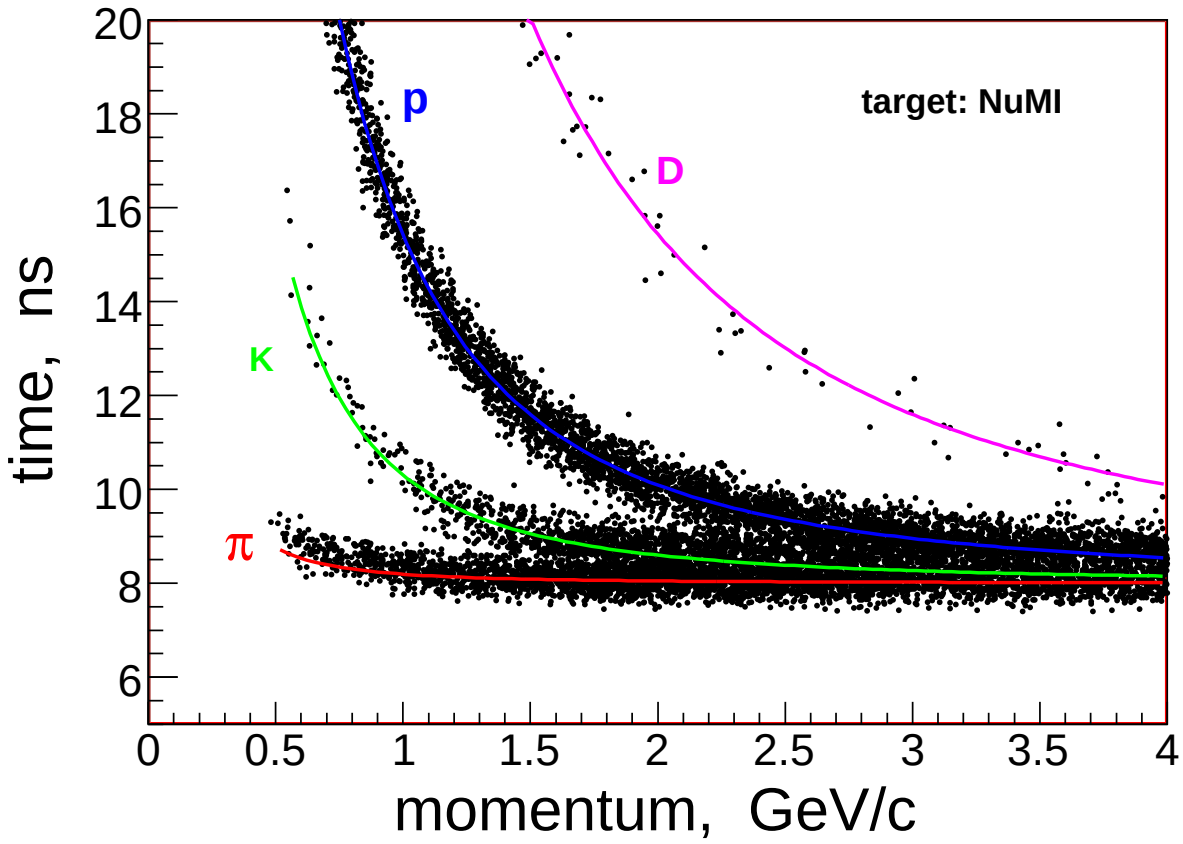




Left: ToF time vs track momentum. Target: NuMI. Momentum: 120 GeV/c. Colored curves are predicted values for π, K, p, D hypotheses.

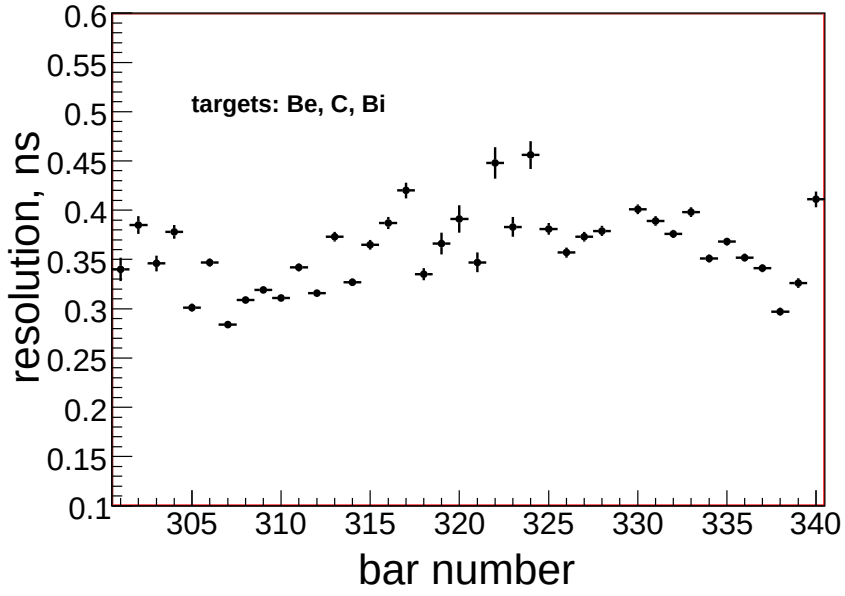
Right: Are there any deuterons? TOF Time with deuteron hypothesis.

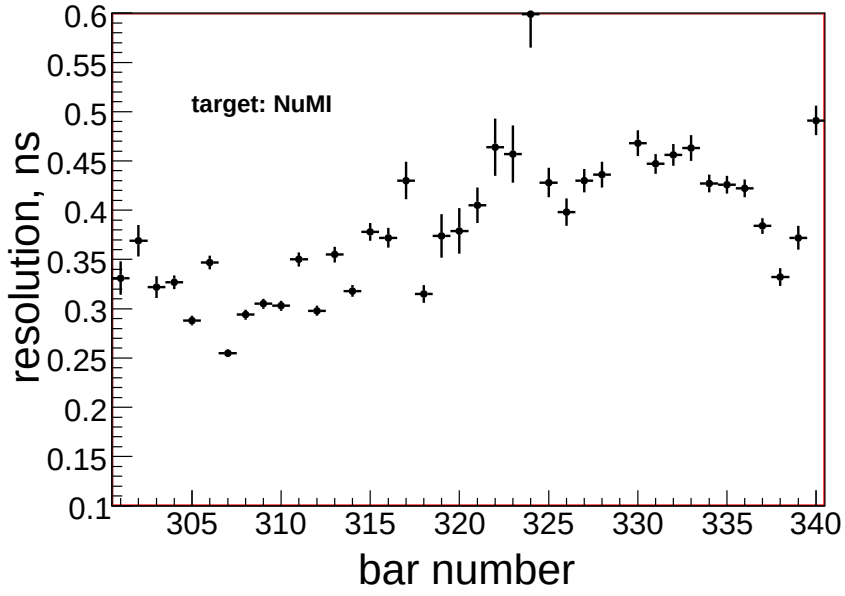
NuMI Target, 120 GeV/c, time vs momentum



ToF time vs track momentum. Target: NuMI. Momentum: 120 GeV/c. Red curve represents pions, green - kaons, blue - protons. For each species, require that ToF time be consistent with predicted value within $\pm 2.5\sigma$. Select only events satisfying one of the hypotheses.

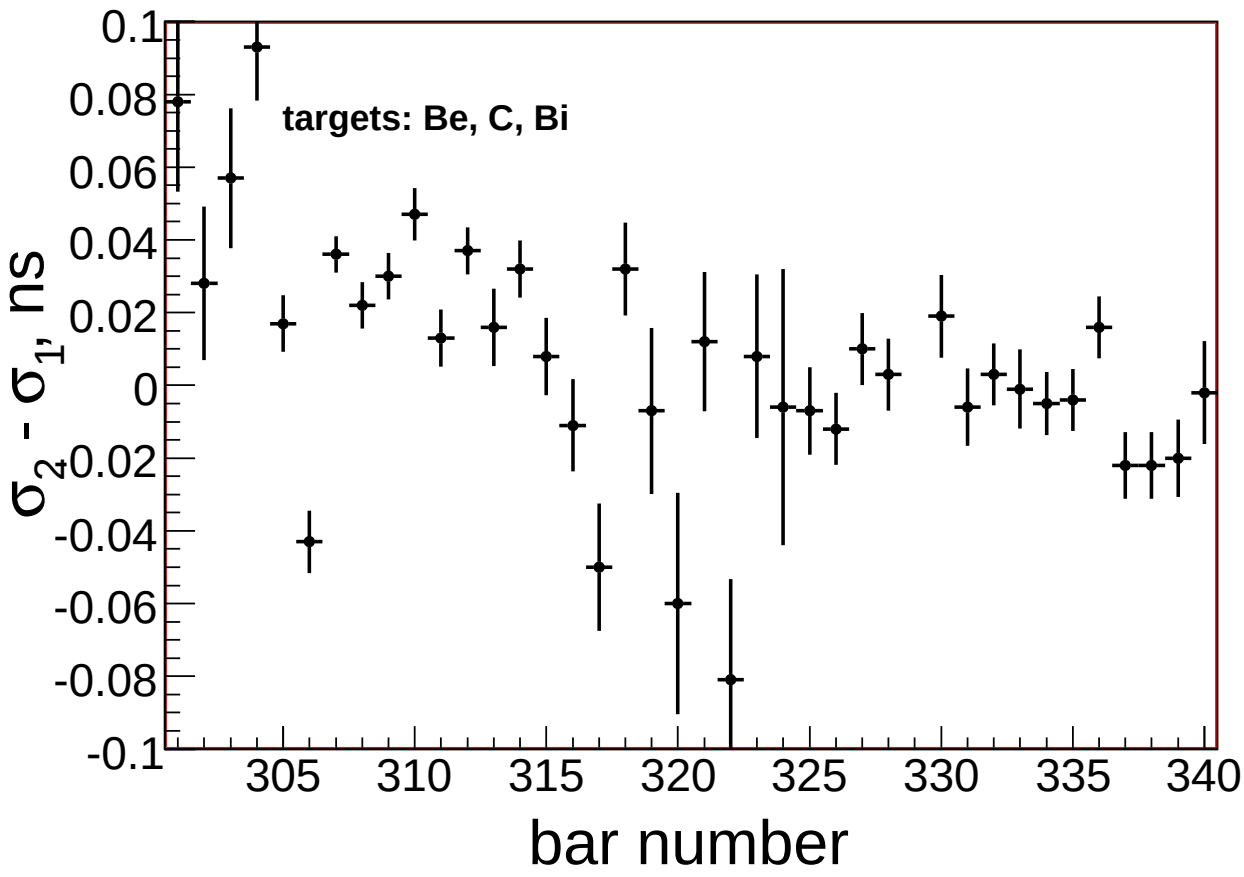
time resolution vs bar number





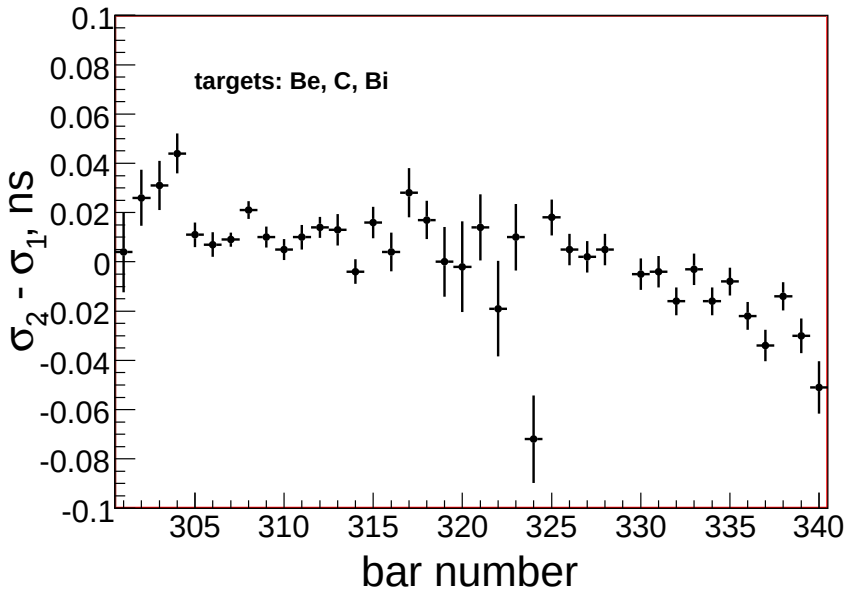
Left: Thin Targets. Right: NuMI

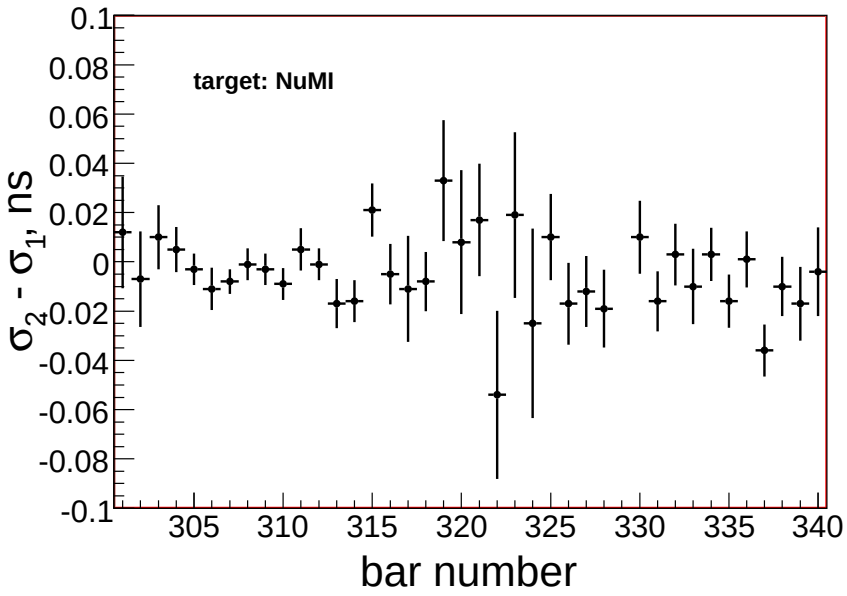
HV effect on Time Resolution



$\sigma 1$ = before HV change. $\sigma 2$ = after HV change

time resolution difference





$\sigma 2$ = latest, $\sigma 1$ = previous (Nov 15). Changes since then are attenuation, slewing, restriction on hit position. Left: Thin Targets. Right: NuMI