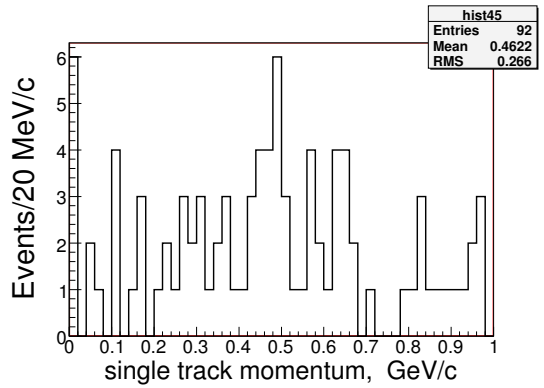
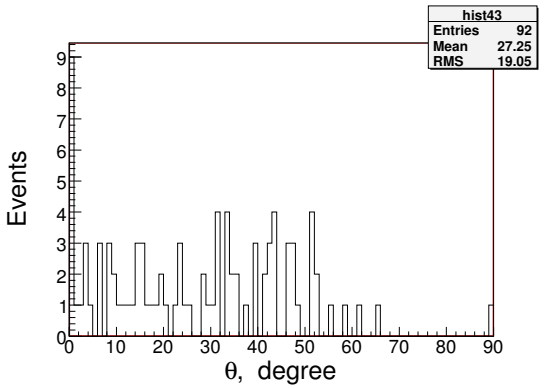
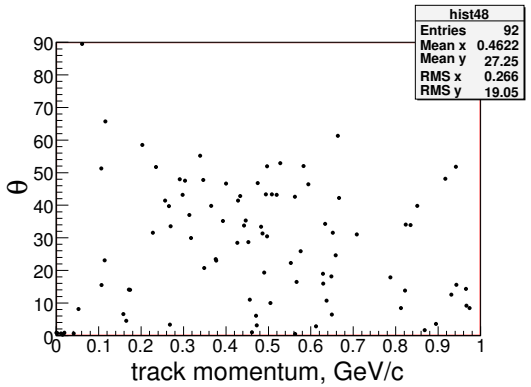
58 GeV/c hadrons: what is a highest recoil angle?







What is acceptance for the high angle tracks?

Data: 58 GeV/c hadrons on thin target data.

Trigger: beam and interaction triggers with $\pi^{\pm}$,K$^{\pm}$ and p/$\bar{p}$.

Selection: look for the events with soft single track vertices only

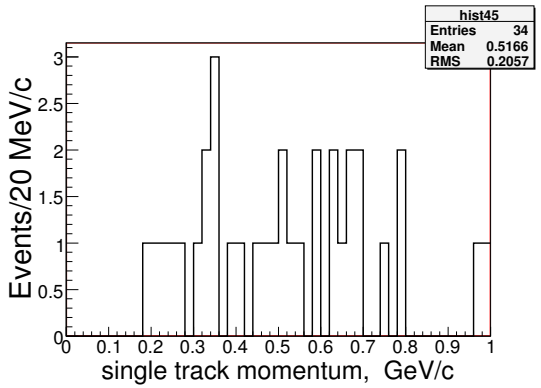
Top plot - the track momentum.

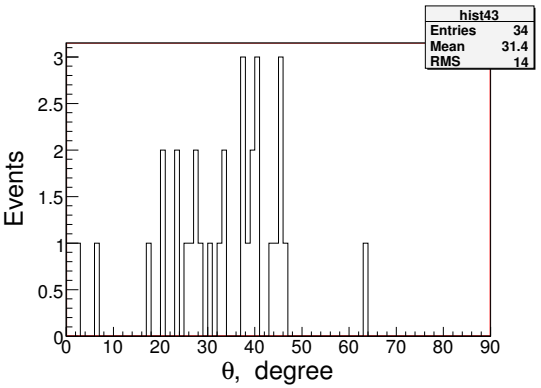
Middle - soft track outgoing angle, θ, where cosθ = p_z/p_{tot}.

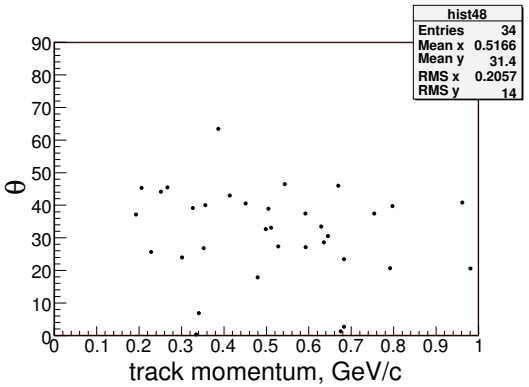
Bottom - soft track angle vs momentum scatter plot.

Answer: the recoil track angle might be up to $\theta_{max} \approx 65^o$.

20 GeV/c hadrons: what is a highest recoil angle?







Data: 20 GeV/c hadrons on thin target data.

Trigger: beam and interaction triggers with $\pi^{\pm}$,K$^{\pm}$ and p/$\bar{p}$.

Selection: look for the events with soft single track vertices only

Top plot - the track momentum.

Middle - soft track outgoing angle, θ, where cosθ = p_z/p_{tot}.

Bottom - soft track angle vs momentum scatter plot.

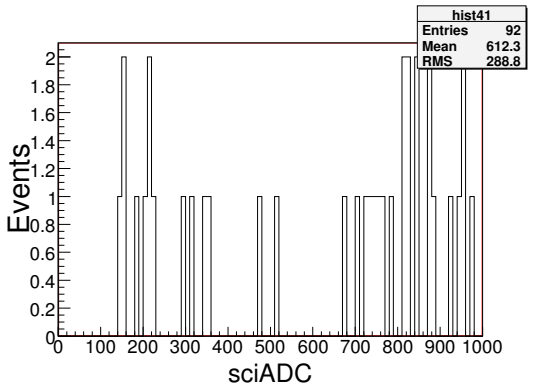
Answer: the recoil track angle might be up to $\theta_p < 65^o$.

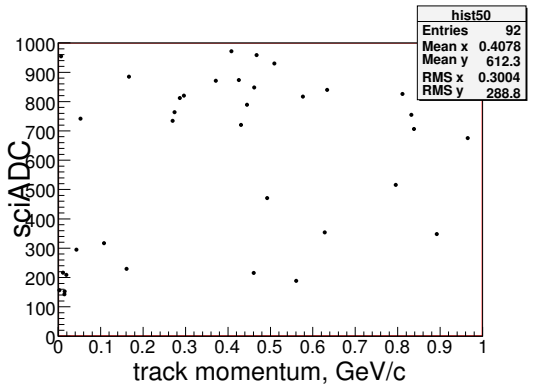
According to the kinematics at 20 GeV/c the neutron angle will be $\theta_n \geq 3^o$.

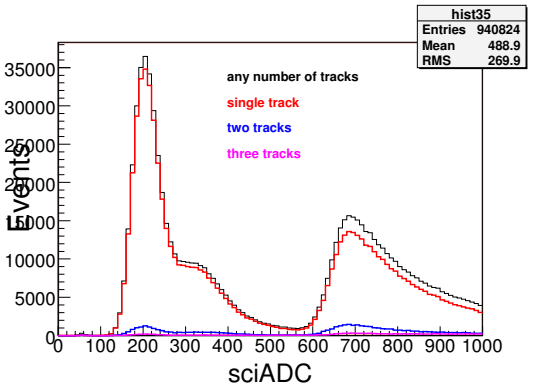
HCAL acceptance is $\approx 1^o$.

Conclusion: requiring the recoil track with $\theta_p < 65^o$ means that I will kill the neutrons at $0^o - 3^o$ angular region.

58 GeV/c hadrons: what is a pulse height of the scintillator?







What is a pulse height of the trigger scintillator?

Data: 58 GeV/c hadrons on thin target data.

Trigger: beam and interaction triggers with $\pi^{\pm}$,K$^{\pm}$ and p/$\bar{p}$.

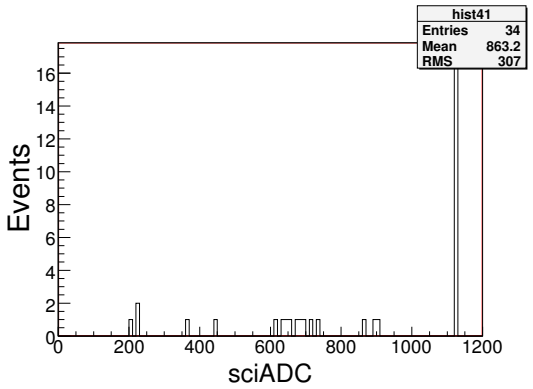
Selection: look for the events with soft single track vertices only

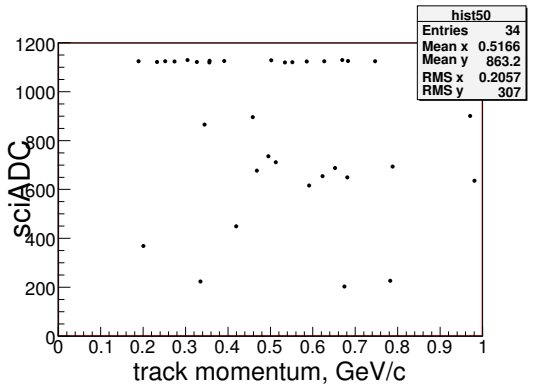
Top plot - the pulse height of the trigger scintillator for the soft tracks.

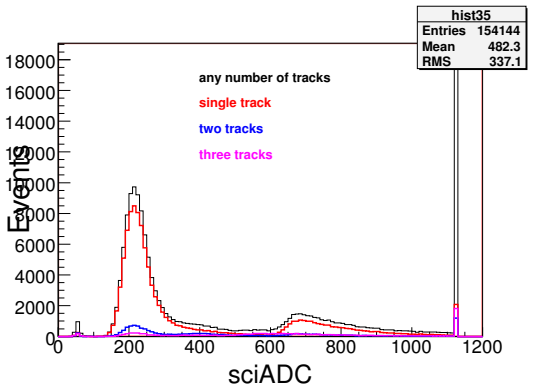
Middle - the pulse height vs the track momentum scatter plot.

Bottom - the pulse height for the 58 GeV/c tracks (for comparison).

20 GeV/c hadrons: what is a pulse height of the scintillator?







What is a pulse height of the trigger scintillator?

Data: 20 GeV/c hadrons on thin target data.

Trigger: beam and interaction triggers with $\pi^{\pm}$,K$^{\pm}$ and p/$\bar{p}$.

Selection: look for the events with soft single track vertices only

Top plot - the pulse height of the trigger scintillator for the soft tracks.

Middle - the pulse height vs the track momentum scatter plot.

Bottom - the pulse height for the 20 GeV/c tracks (for comparison).

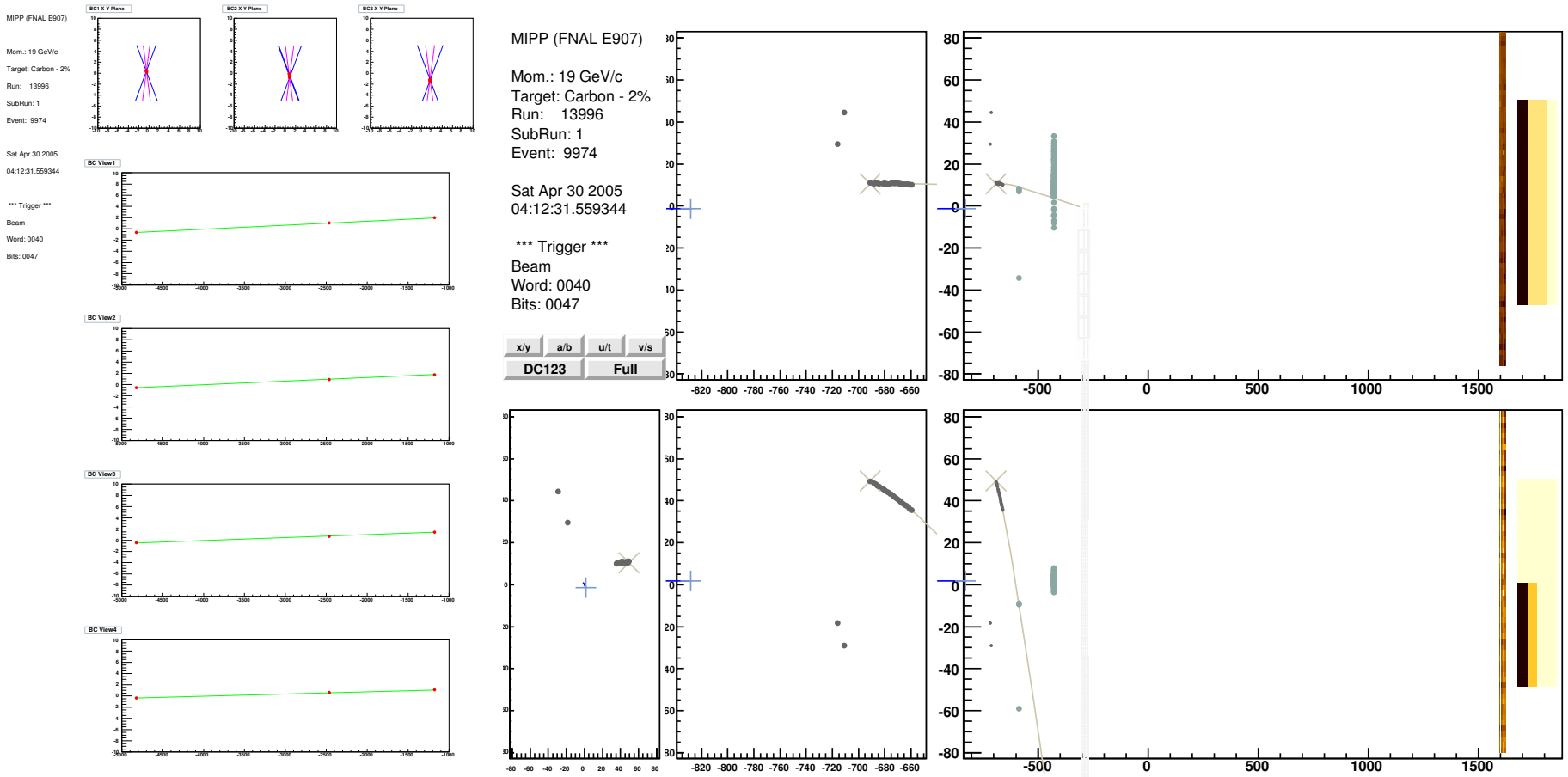
Events with sciADC$\approx$1125 counts are overflows.

What is the pulse height distribution tells? The pedestal is at $\approx$50 counts, the minimum ionizing deposition is at $\approx$220 counts and the region from 600 up to overflow counts is the deposition from soft tracks(?).

The trigger scintillator angular acceptance: about 52^o. It is 2.5 cm away from target in Z and 2.67 cm half-wide in X and 3.81 cm half-wide in Y.

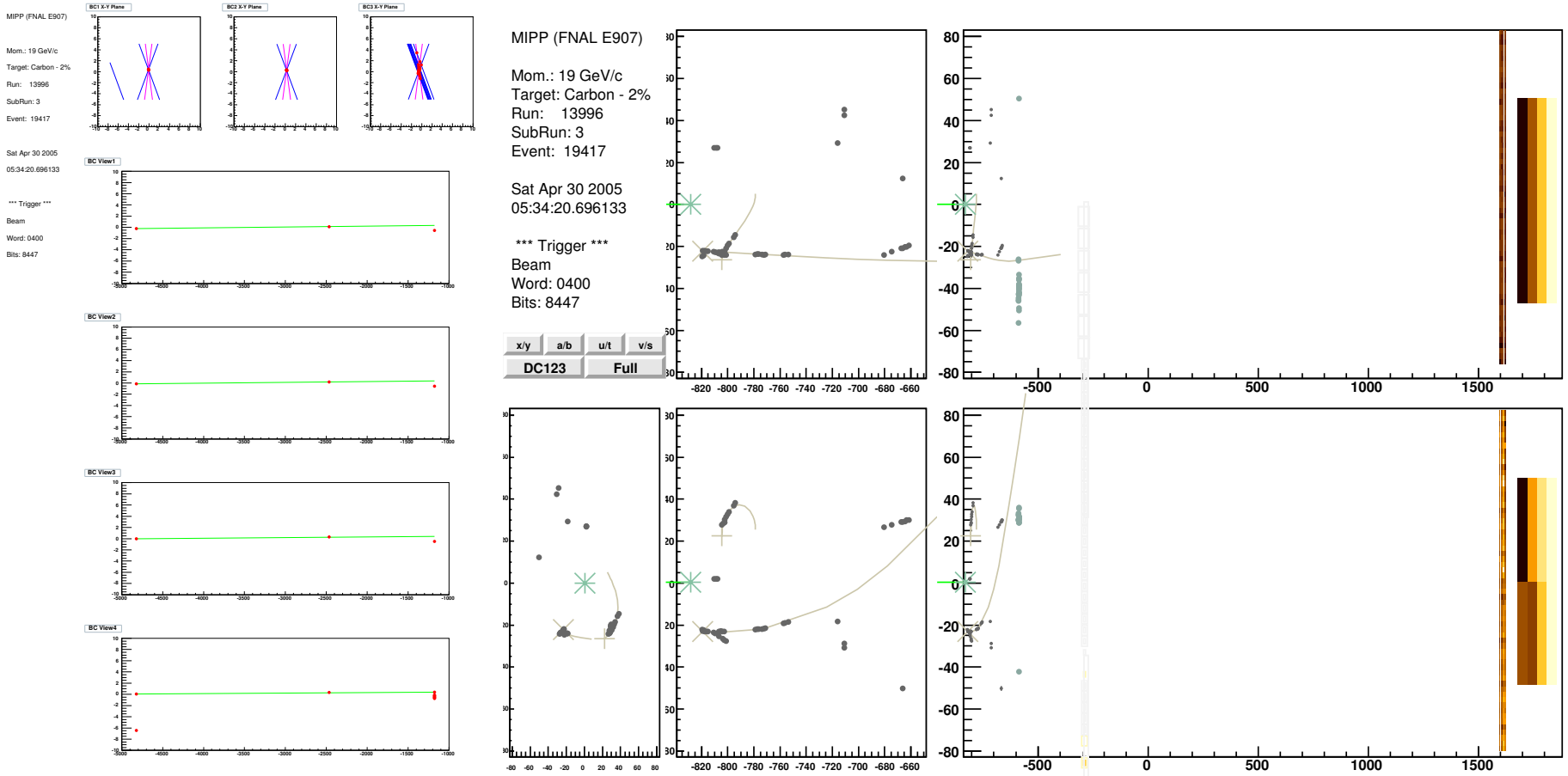
Suggestion: use the pulse height values as a veto for the soft and high energy charged tracks. If sciADC$<$100, it indicates that there is no any outgoing tracks within 0-65^o angular region. So, then we can assume that the recoil protons might be within 65-90^o region.

sciADC<100 cut: run 13996 event 9974



Trigger: proton beam. Single beam track - green line on left plot and blue short line on middle indicates where it enter into TPC. EMCAL=0, HCAL=12.4 GeV. This event also was in former Sample A. This event has weight 101 (prescaled).

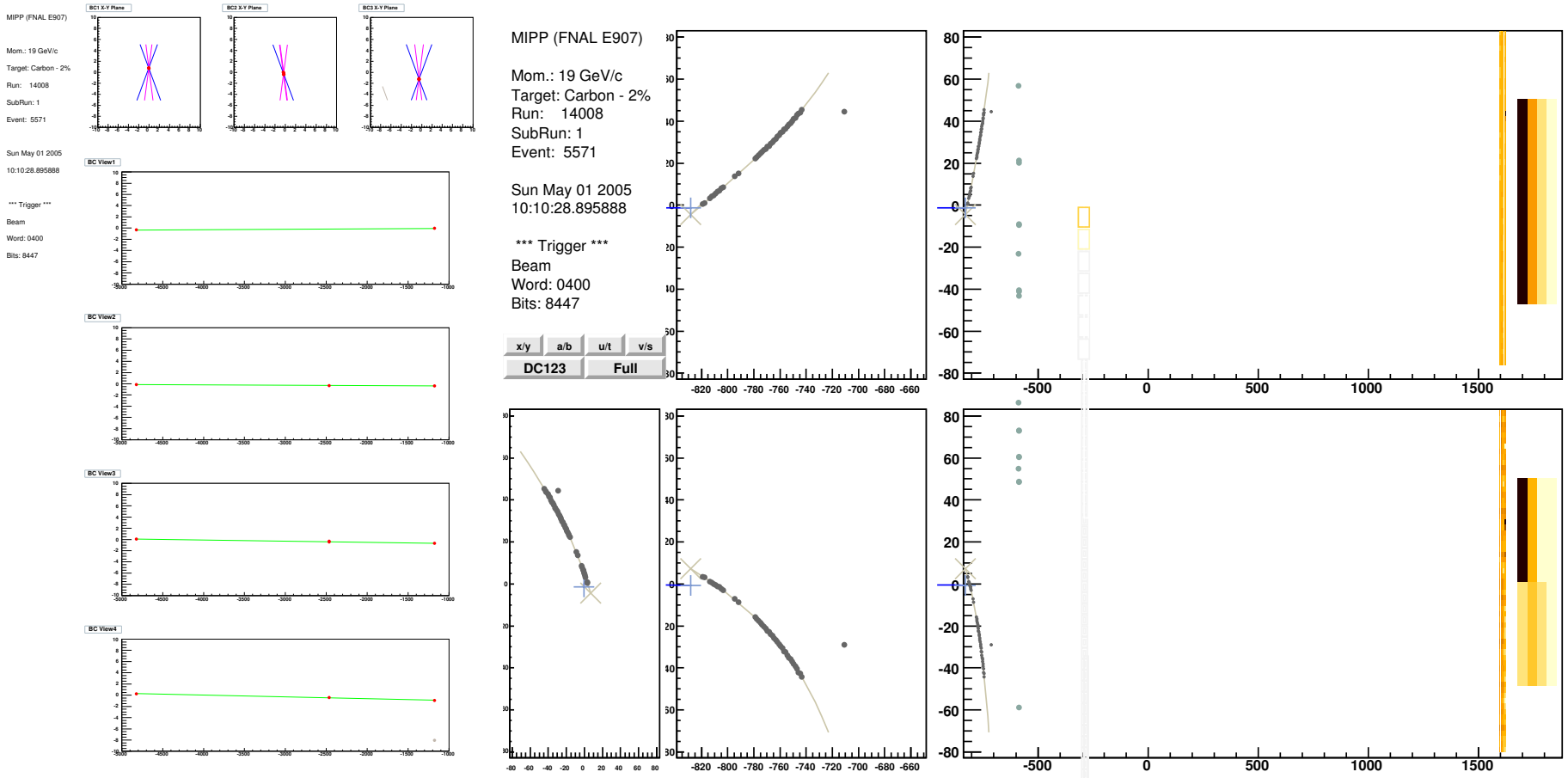
sciADC<100 cut: run 13996 event 19417



Trigger: proton interactions. What cause interaction? Probably that one of the tracks interact with scintillator and scatter.

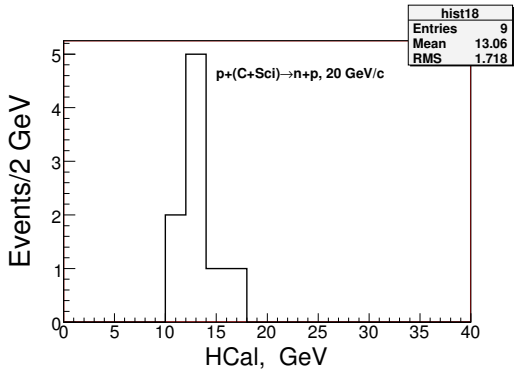
EMCAL=0, HCAL=14.7 GeV.

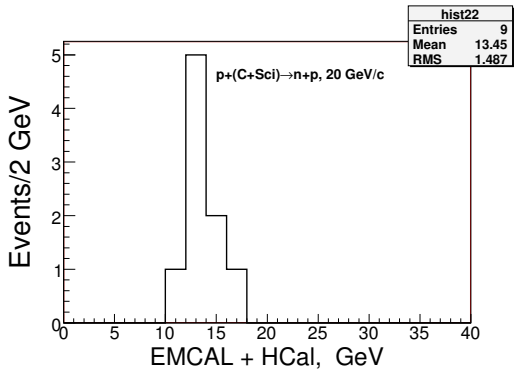
sciADC<100 cut: run 14008 event 5571

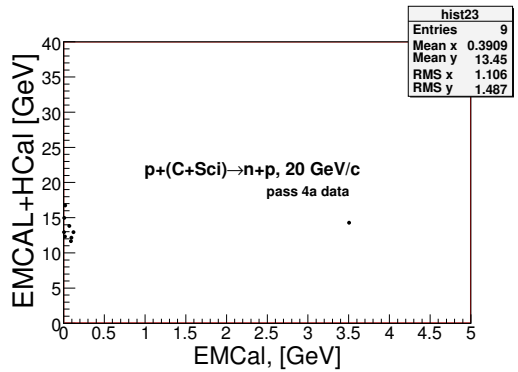


Trigger: proton interactions. Probably that the track interact with scintillator and scatter. Due to of that it mismatch with the incoming beam track. EMCAL=0, HCAL=12.84 GeV.

20 GeV/c protons: neutron candidates with C target







Data: 20 GeV/c protons on thin Carbon target.

Trigger: proton beam and proton interactions

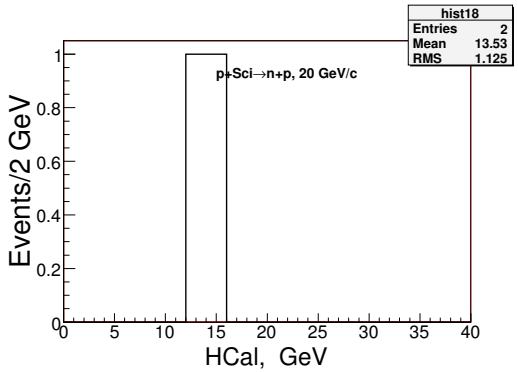
Selection: sciADC $<$ 100 and HCAL $>$ 10 GeV.

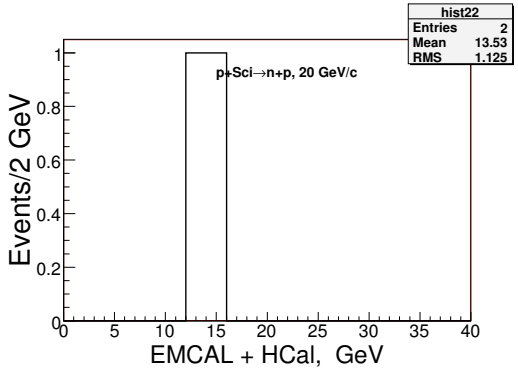
Top plot - HCAL distribution.

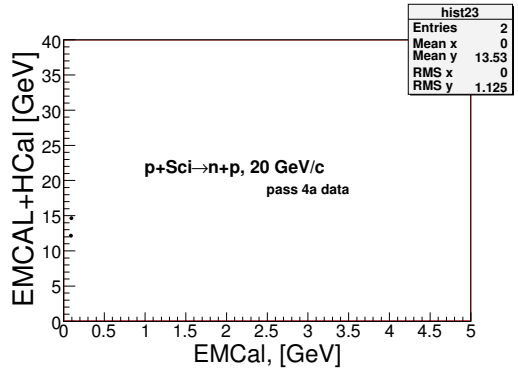
Middle - EMCAL + HCAL distribution.

Bottom - EMCAL+HCAL vs EMCAL scatter plot.

20 GeV/c protons: neutron candidates from target-OUT







Data: 20 GeV/c protons, target-OUT case.

Trigger: proton beam and proton interactions

Selection: sciADC $<$ 100 and HCAL $>$ 10 GeV.

Top plot - HCAL distribution.

Middle - EMCAL + HCAL distribution.

Bottom - EMCAL+HCAL vs EMCAL scatter plot.

summary of 20 GeV/c data

	Carbon + Sci	Sci
proton beam triggers	7116	3051
incident protons (scaled using prescale)	718716	233771
number of neutron candidates with proton beam	1*101	0
number of neutron candidates with proton interactions	8	2
total neutron candidates	109	2
neutrons per single incident proton (x 10^{-5})	15.2$\pm$10.1	0.85$\pm$0.60

Table 1: Summary of the neutron candidates with 20 GeV/c proton beam. I am not sure that considering the proton interactions is right thing to do.