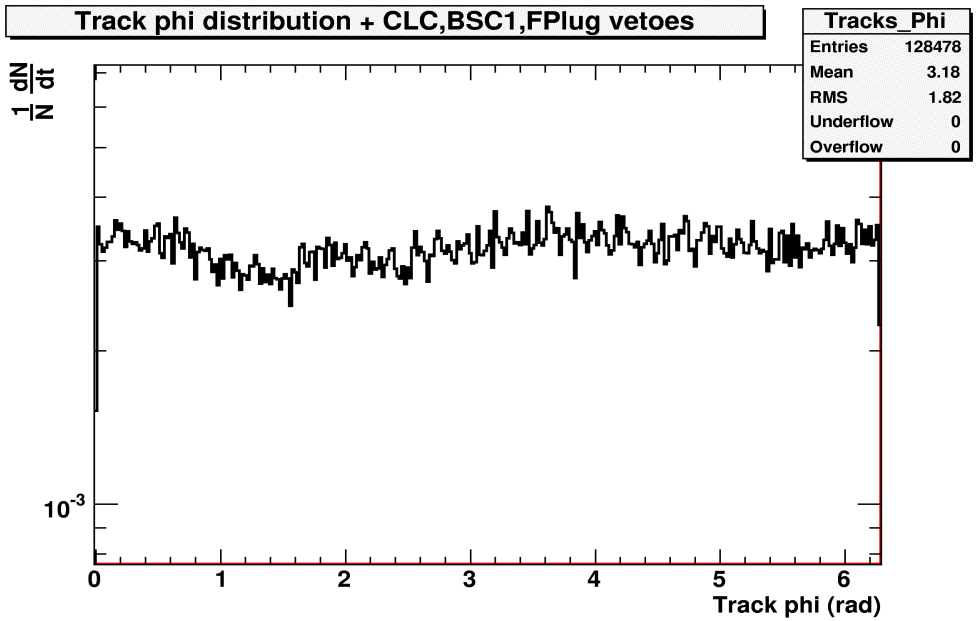
Gap-X-Gap update

1) Dominik Wrana:
    1) General tracks properties
    2) Particles charge
    3) High Pt tracks
2) Maria Żurek
    1) Particle Identification
3) Artur Święch
    1) Mass from dE/dx
    2) Beam halo cuts
    3) Middle gap

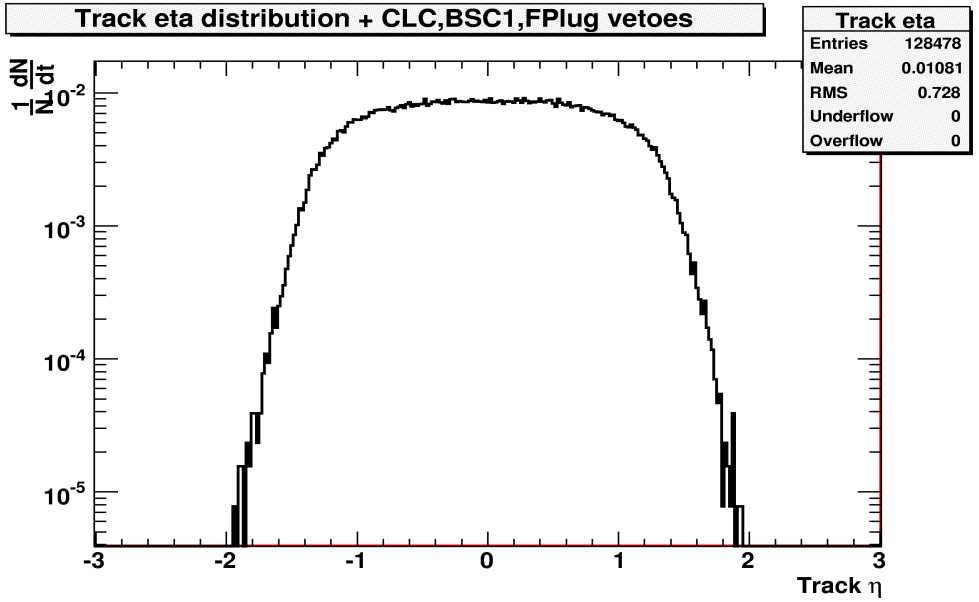
Tracks analysis

Dominik Wrana

General tracks properities

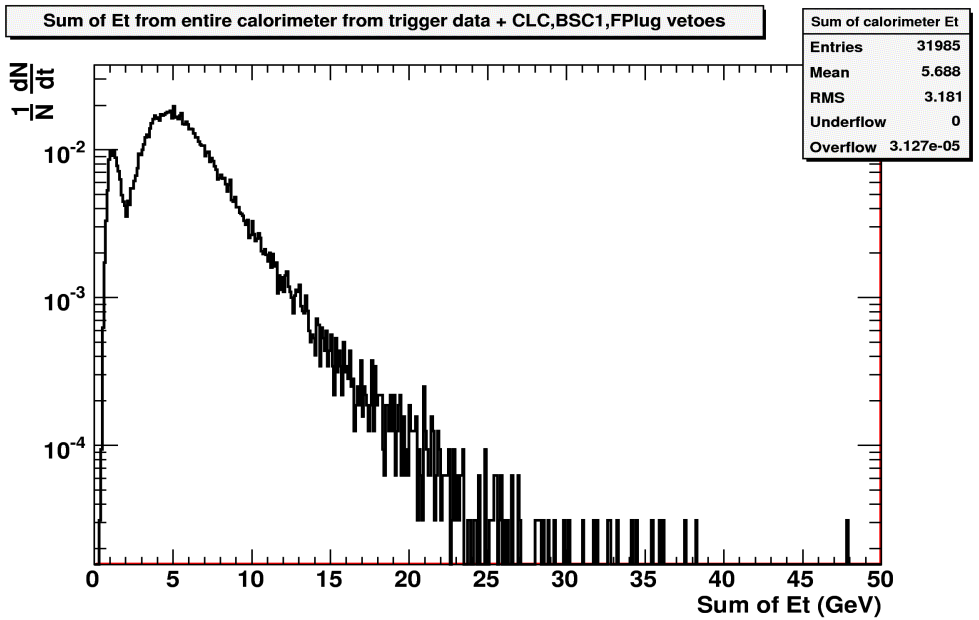


Tracks phi distribution
- trigger data
- rather flat distribution

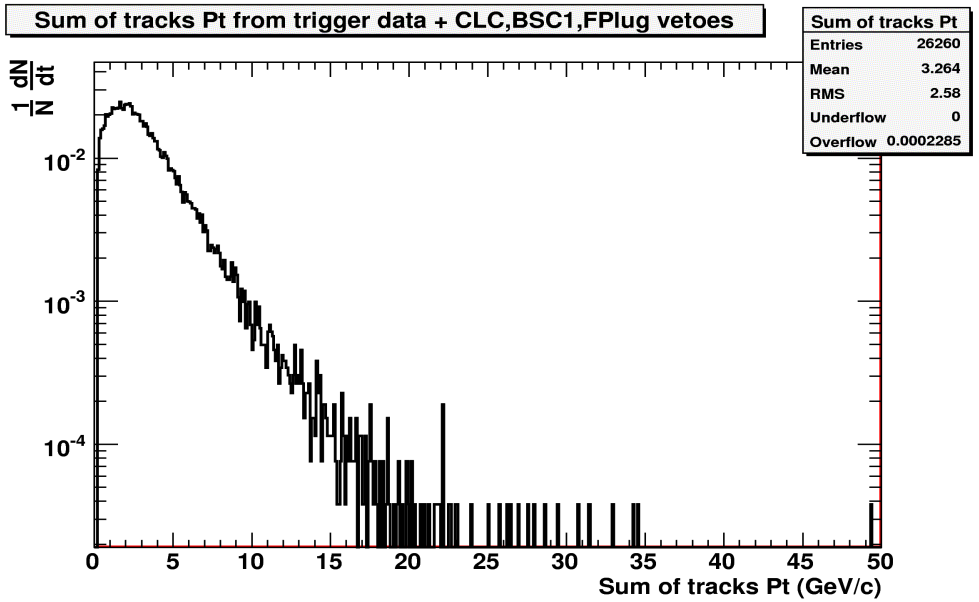


Tracks η distribution
- trigger data
- COT: |η| < 2
- silicon off

General tracks properities

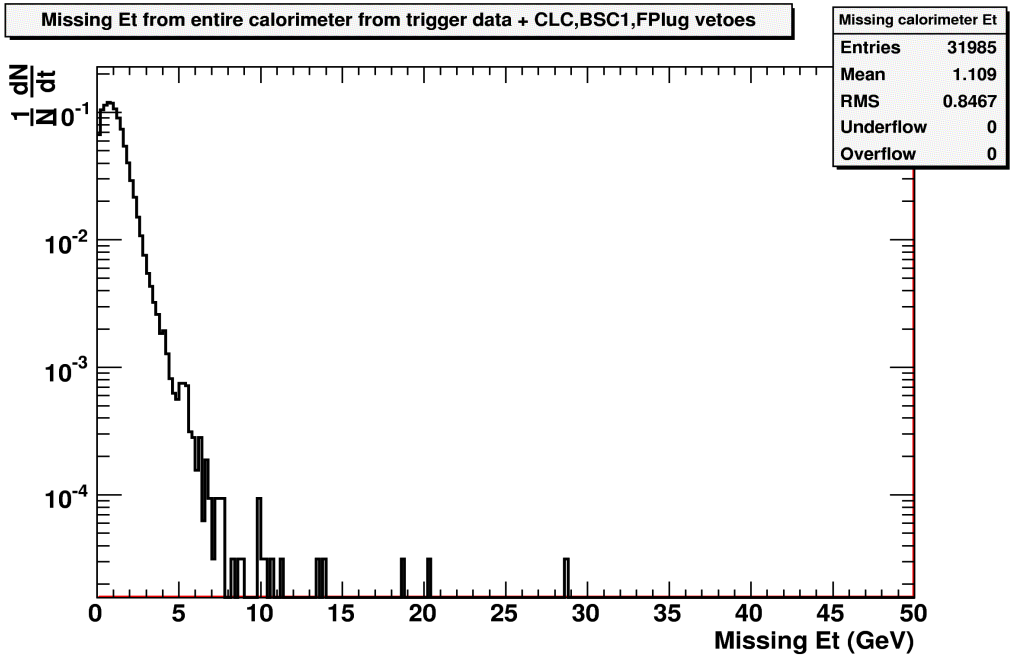


Sum of calorimeter Et
- trigger data
- peaks due to triggers

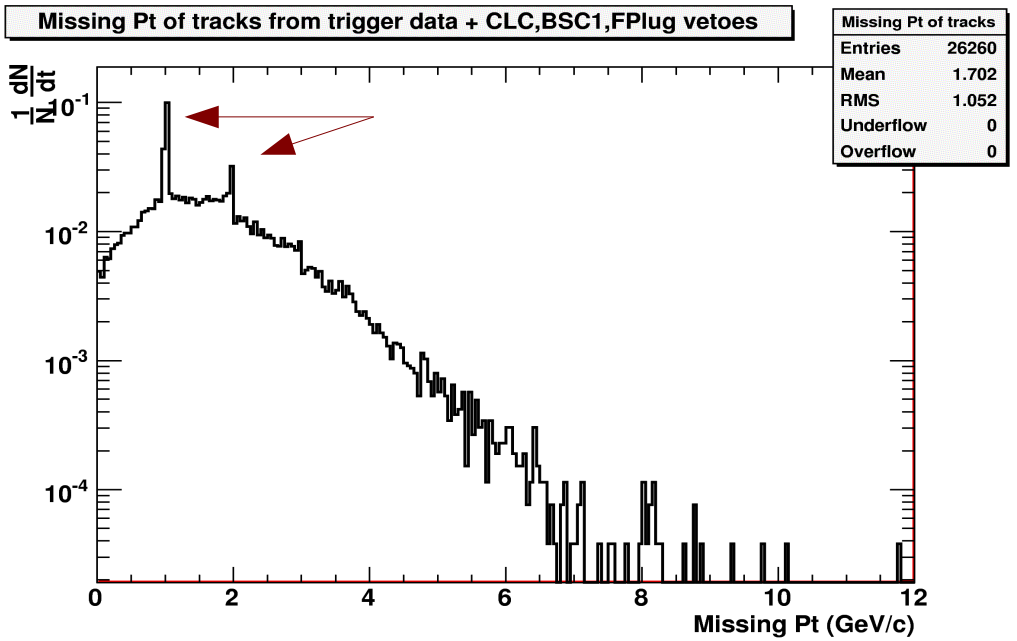


Sum of tracks Pt
- trigger data

General tracks properities

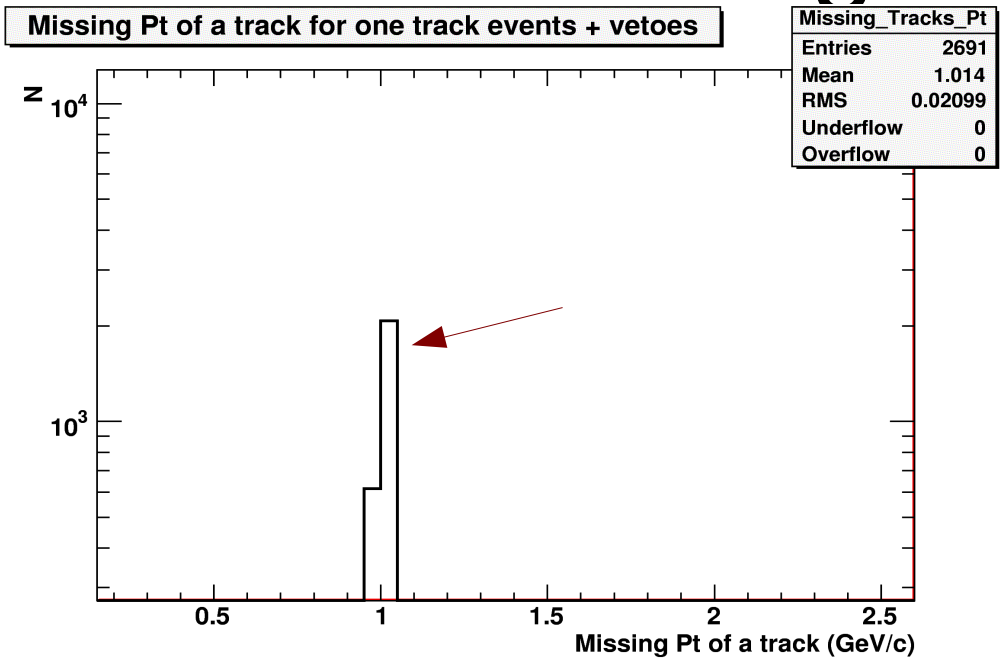


Missing calorimeter Et
- trigger data

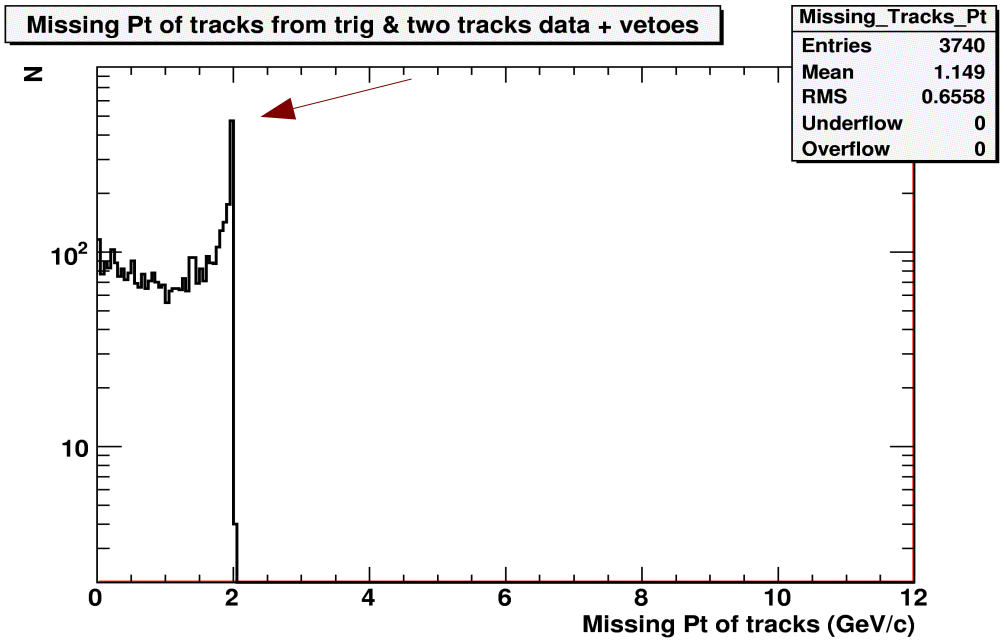


Missing tracks Pt
- trigger data
- peaks on 1, 2 GeV/c

Missing Pt of tracks

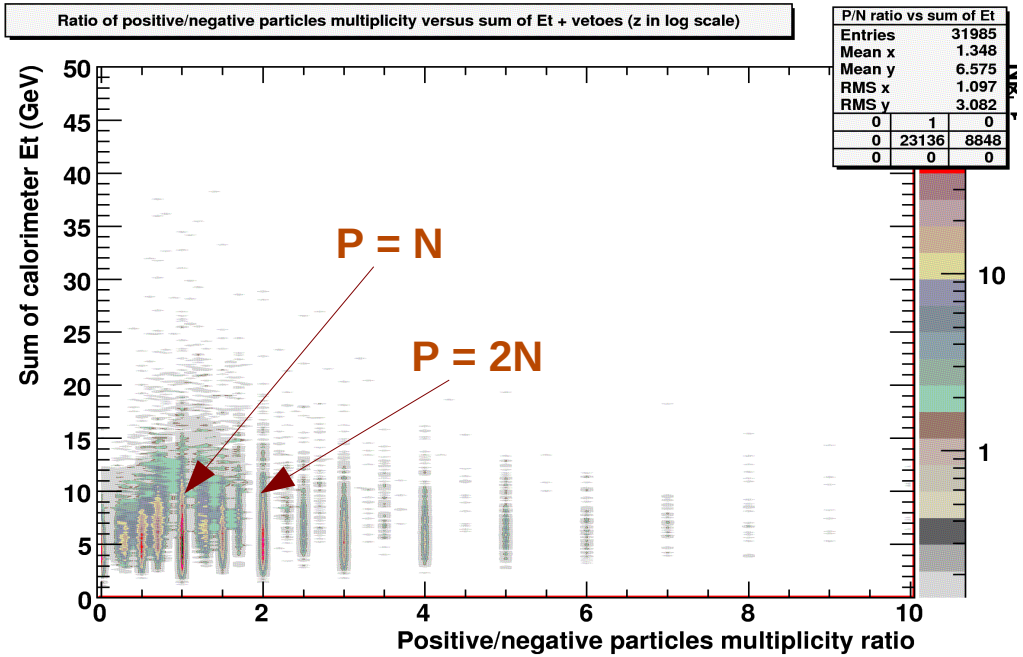


Missing tracks Pt
- trigger data
- one track events
- peak on 1 GeV/c !
- the same amount

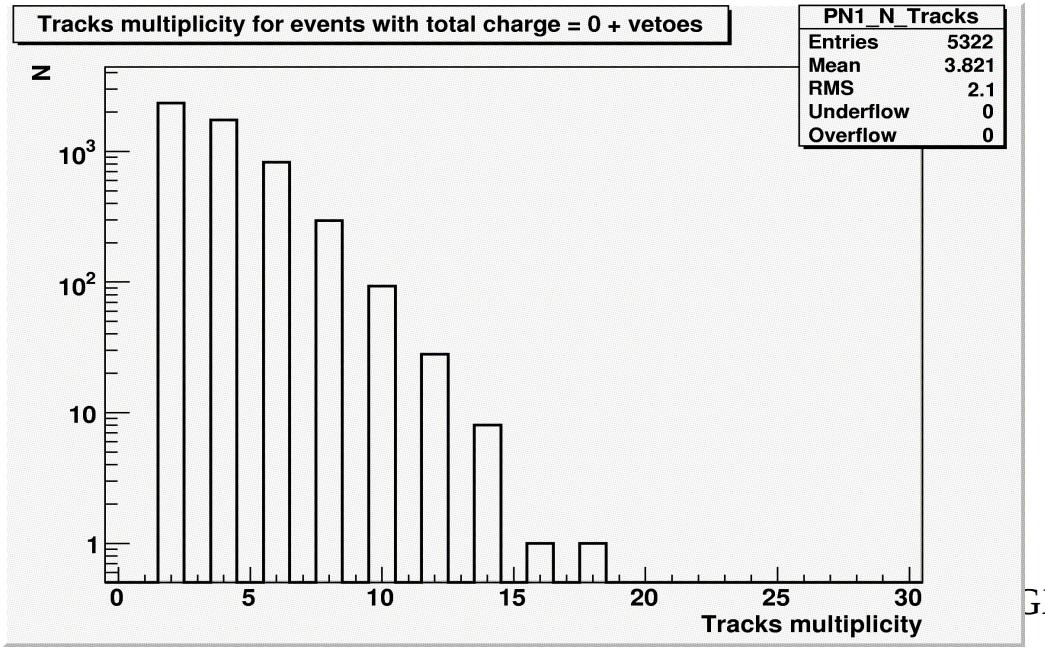


Missing tracks Pt
- trigger data
- two tracks events
- peak on 2 GeV/c !

Particles charge

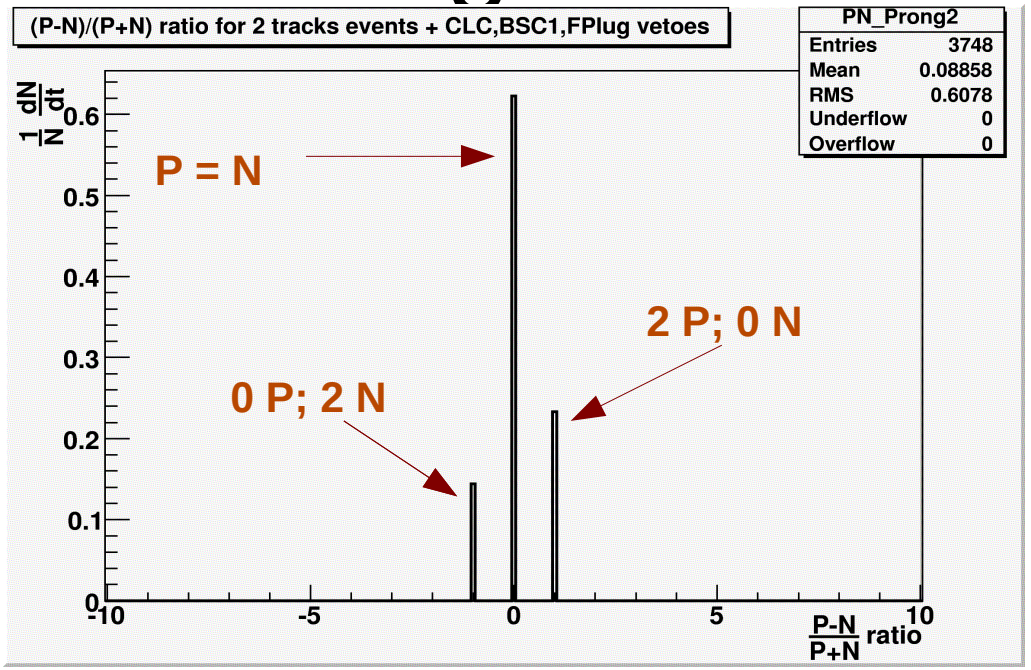


Positives/negatives ratio vs sum of cal Et
- trigger data
- more positives
- mean value ~ 1.3

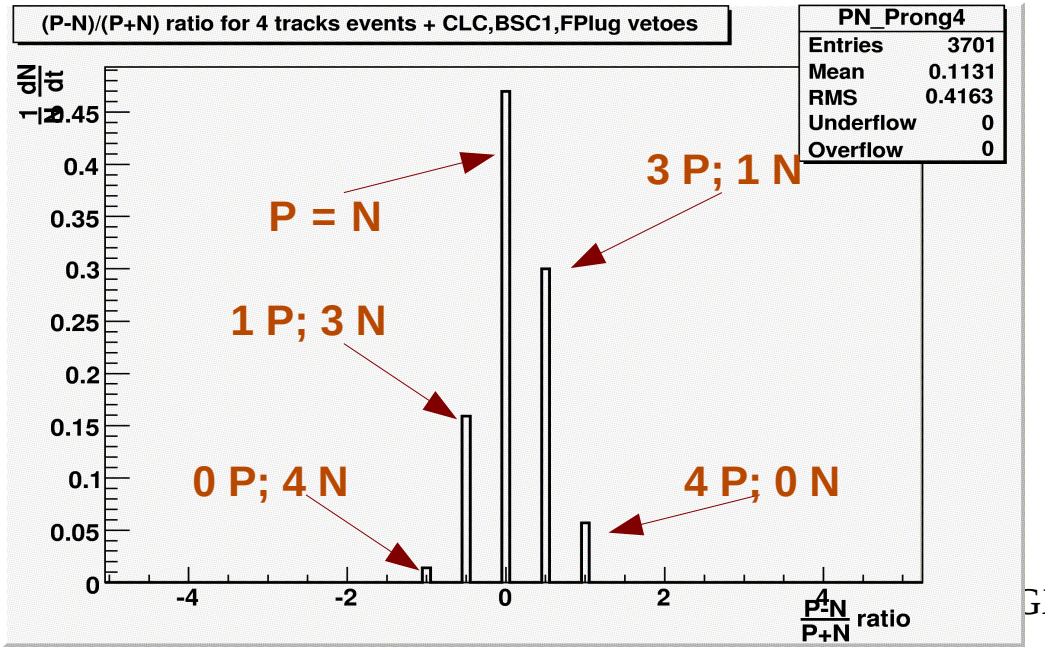


Tracks multiplicity for P/N =1
- trigger data
- ~ 2300 ev with 2 tracks
- ~ 1800 ev with 4 tracks

Charge - 2 and 4 tracks events

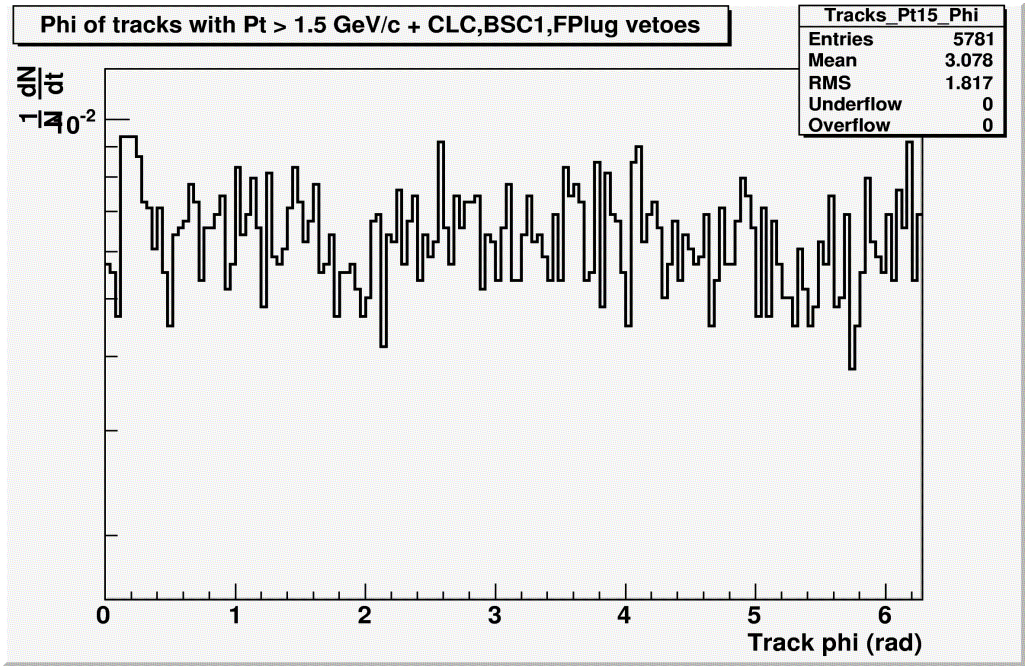


Ratio (P-N)/(P+N) for 2 tracks events
- trigger data
- more positives

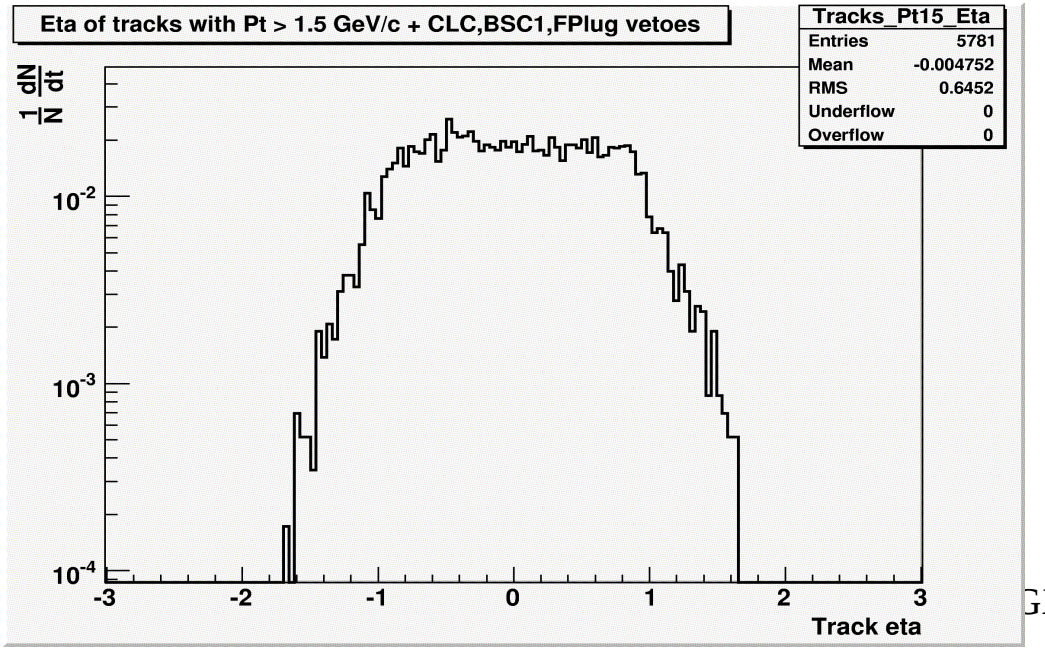


Ratio (P-N)/(P+N) for 4 tracks events
- trigger data
- still more positives

Tracks with Pt > 1.5 GeV/c

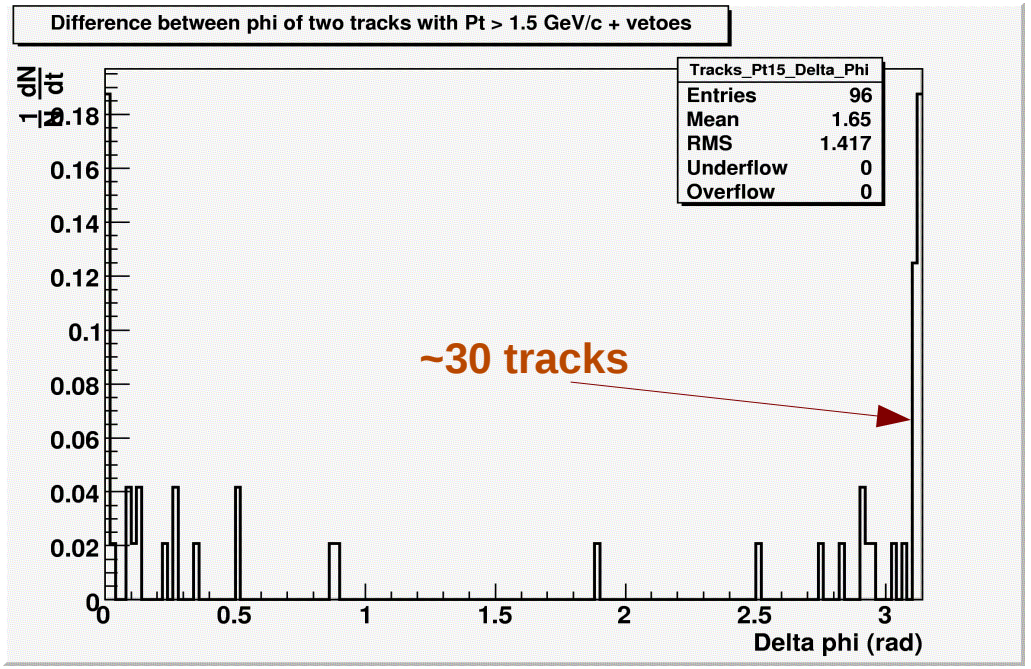


Tracks phi
- trigger data
- flat distribution

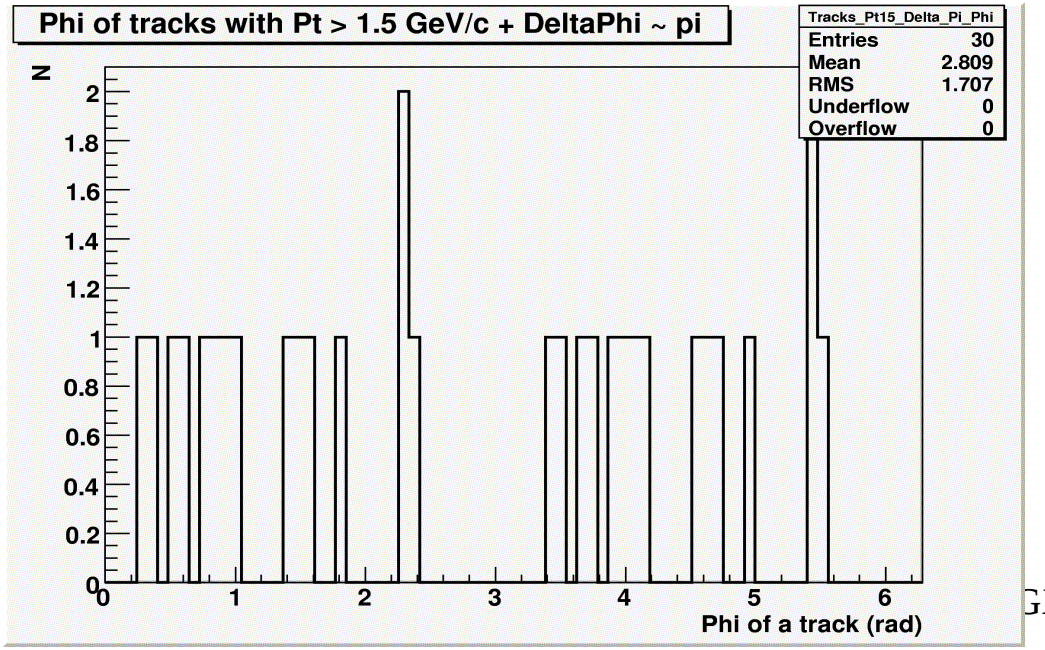


Tracks η
- trigger data

Tracks with Pt > 1.5 GeV/c

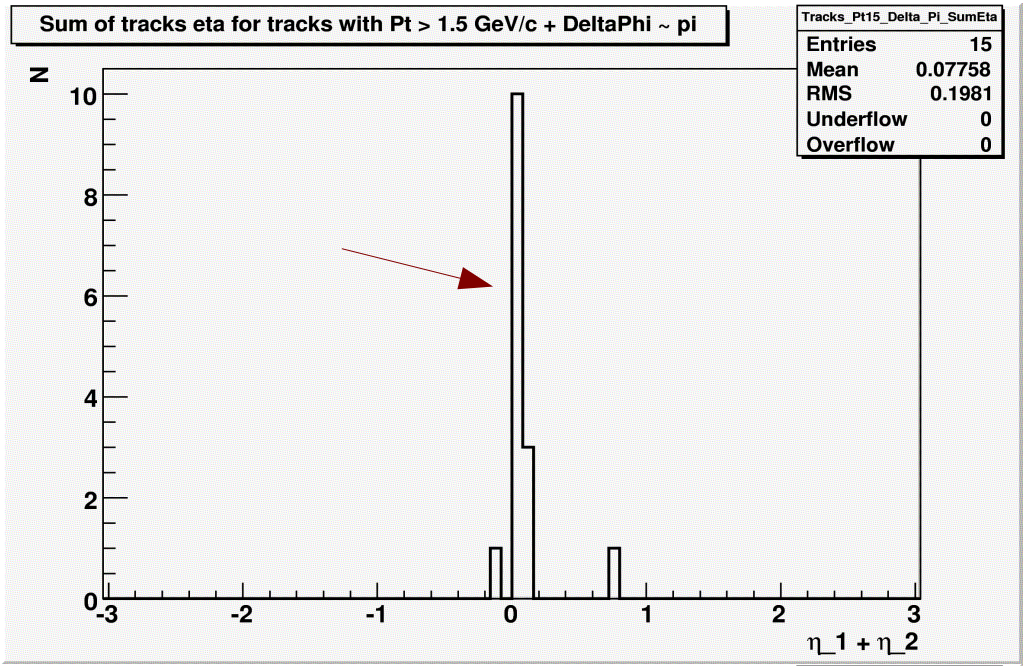


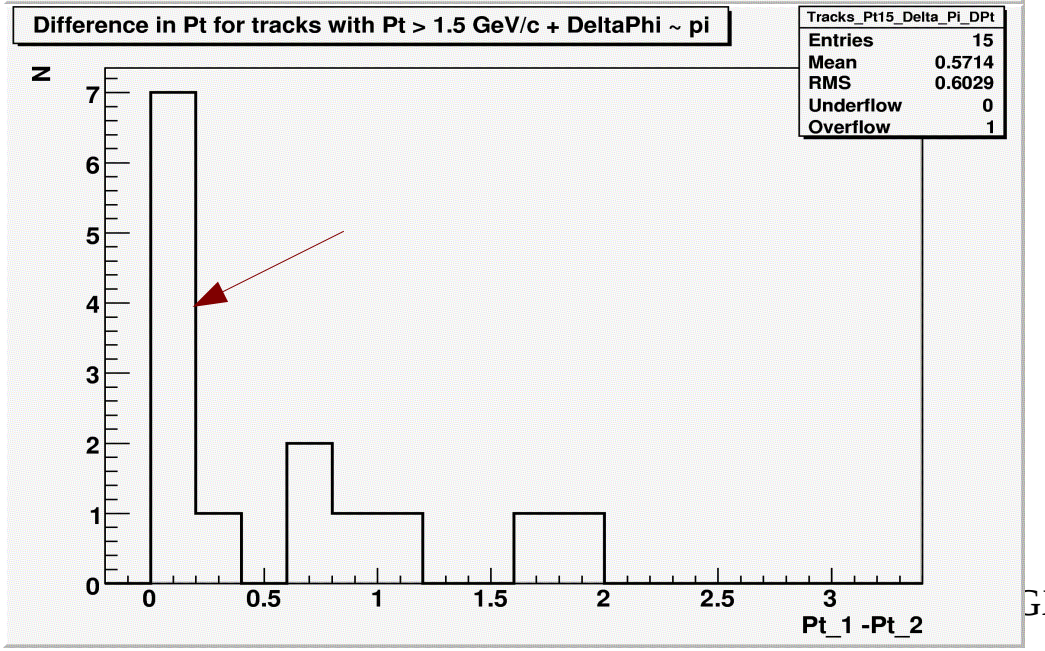
Delta phi of tracks
- trigger data
- 15 events with back to back tracks

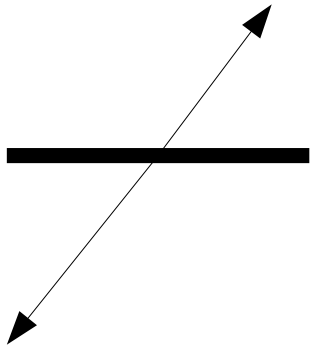


Phi of back to back tracks
- trigger data

Tracks with Pt > 1.5 GeV/c



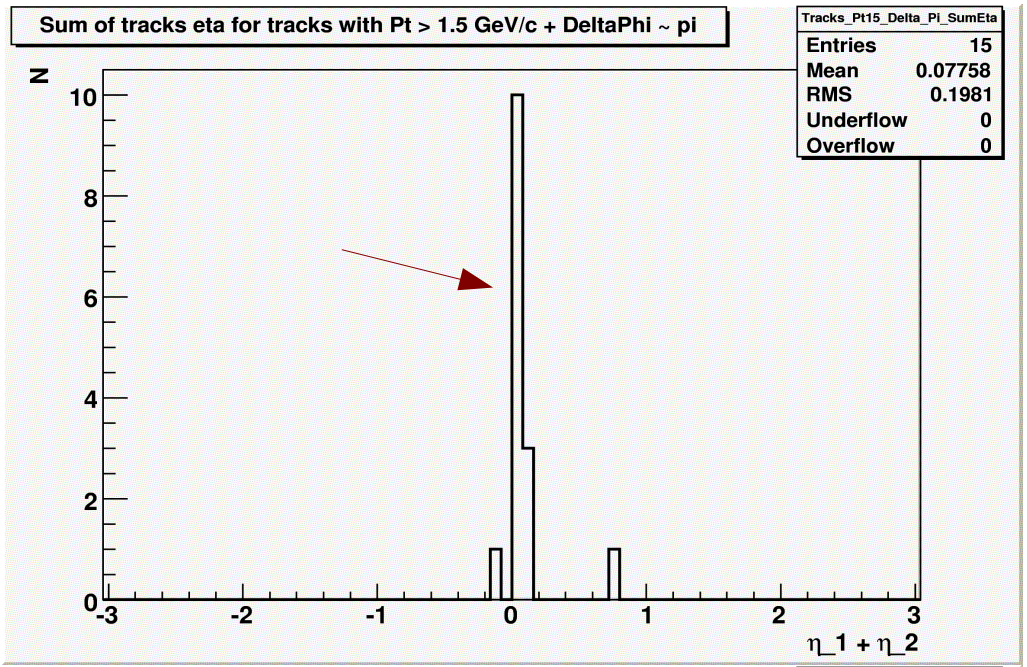


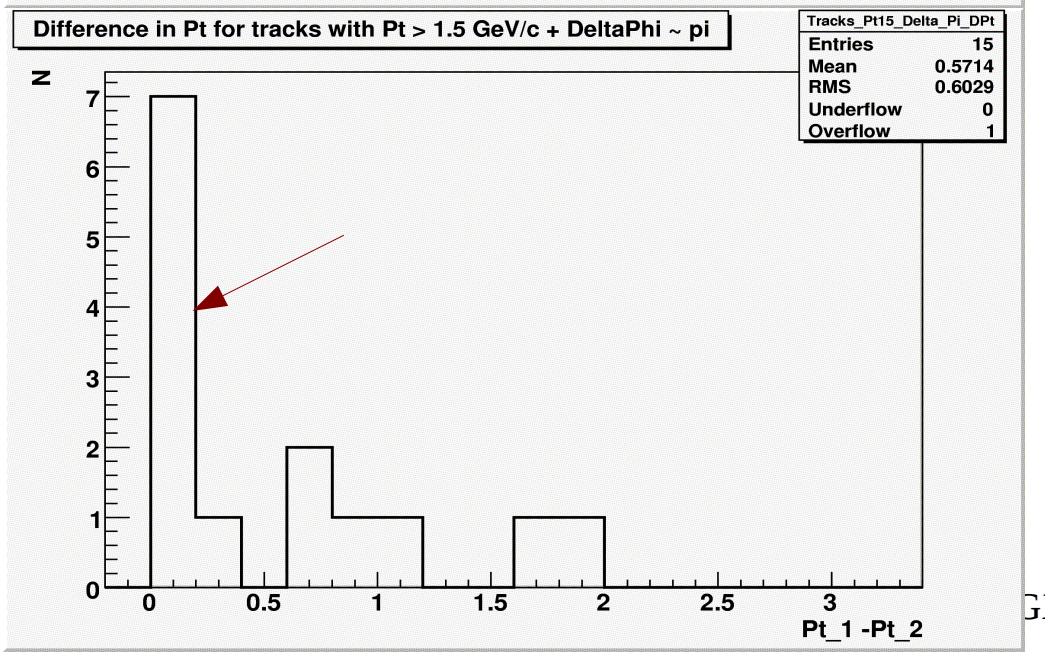


Sum of tracks η
- trigger data
- ~ 10 events:
(back to back in eta & phi)

Difference in Pt
- trigger data
-~ 8 events with equal Pt

Tracks with Pt > 1.5 GeV/c





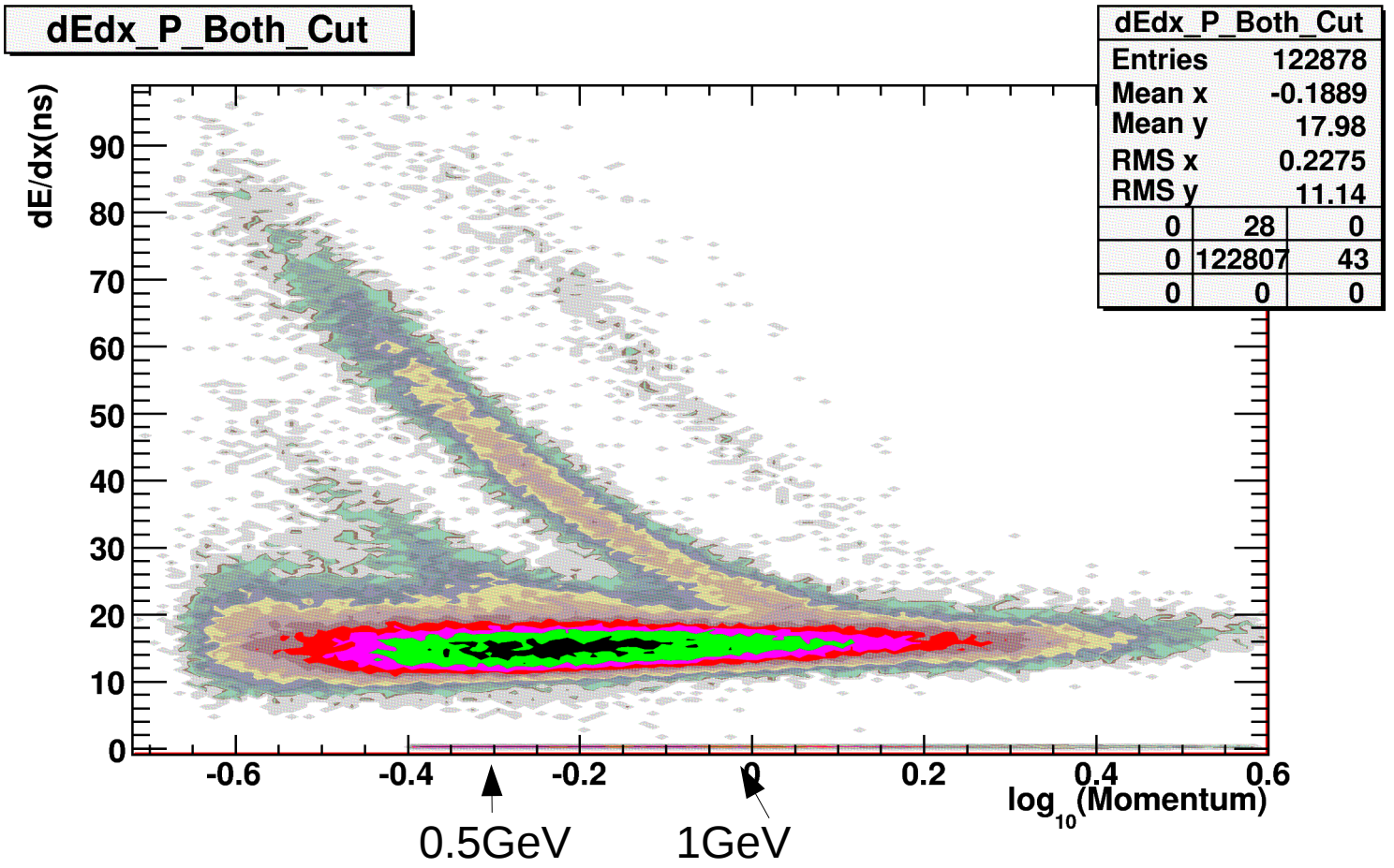
Need to do further analysis:
- muons?
- particle identification:
  - mass
  - pairs: π+π- , K+K- etc.
- event display
- differences in charge?

Looking for exclusive events:
- clean calorimeter
- forward rapidity gaps
- exclude muons
- high Pt tracks
- total charge 0

Particle Identification

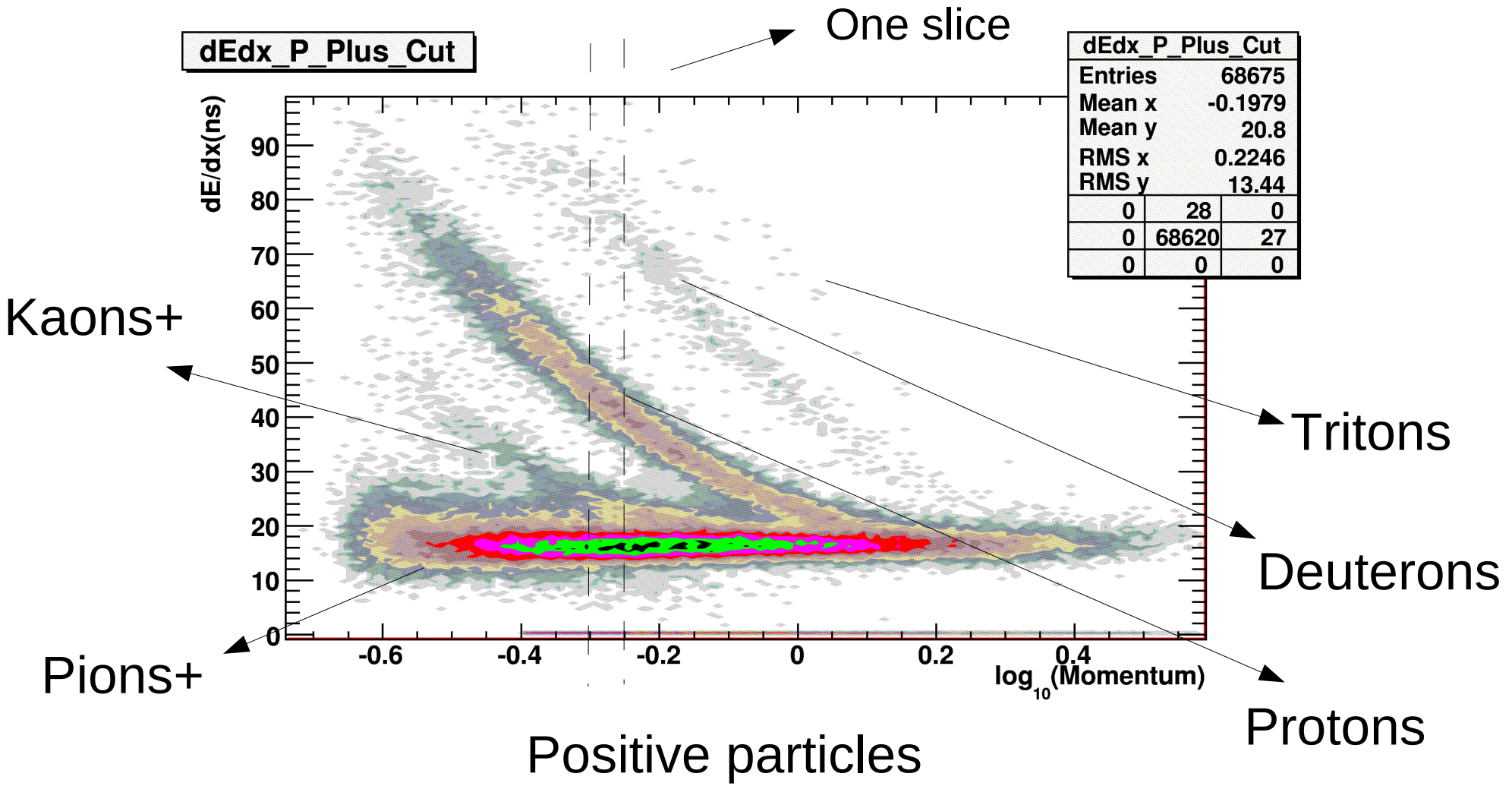
Maria Żurek

dE/dx and Momentum 2D Histogram



Both positive and negative particles

dE/dx and Momentum 2D Histogram

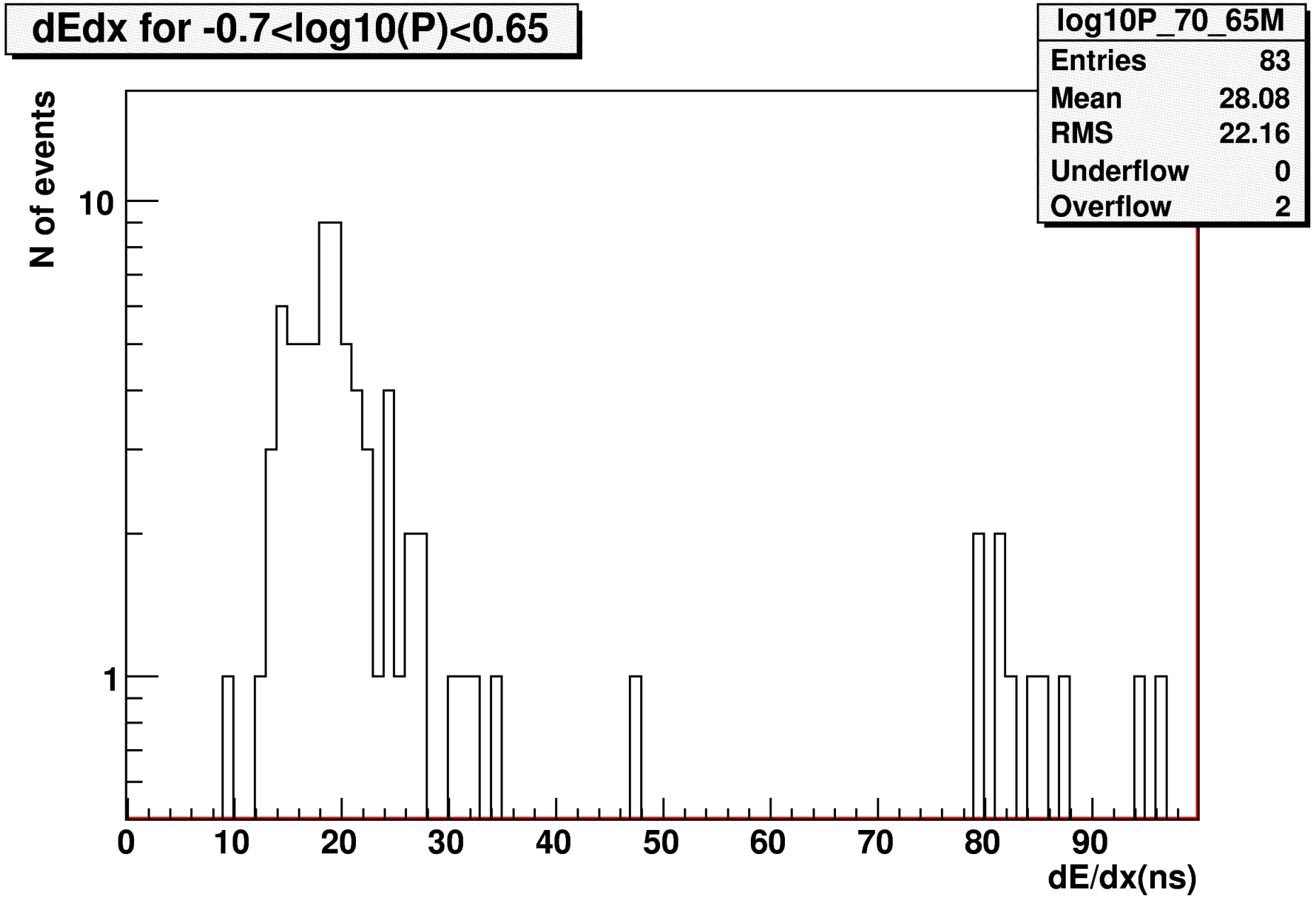


dE/dx - 1D Histograms

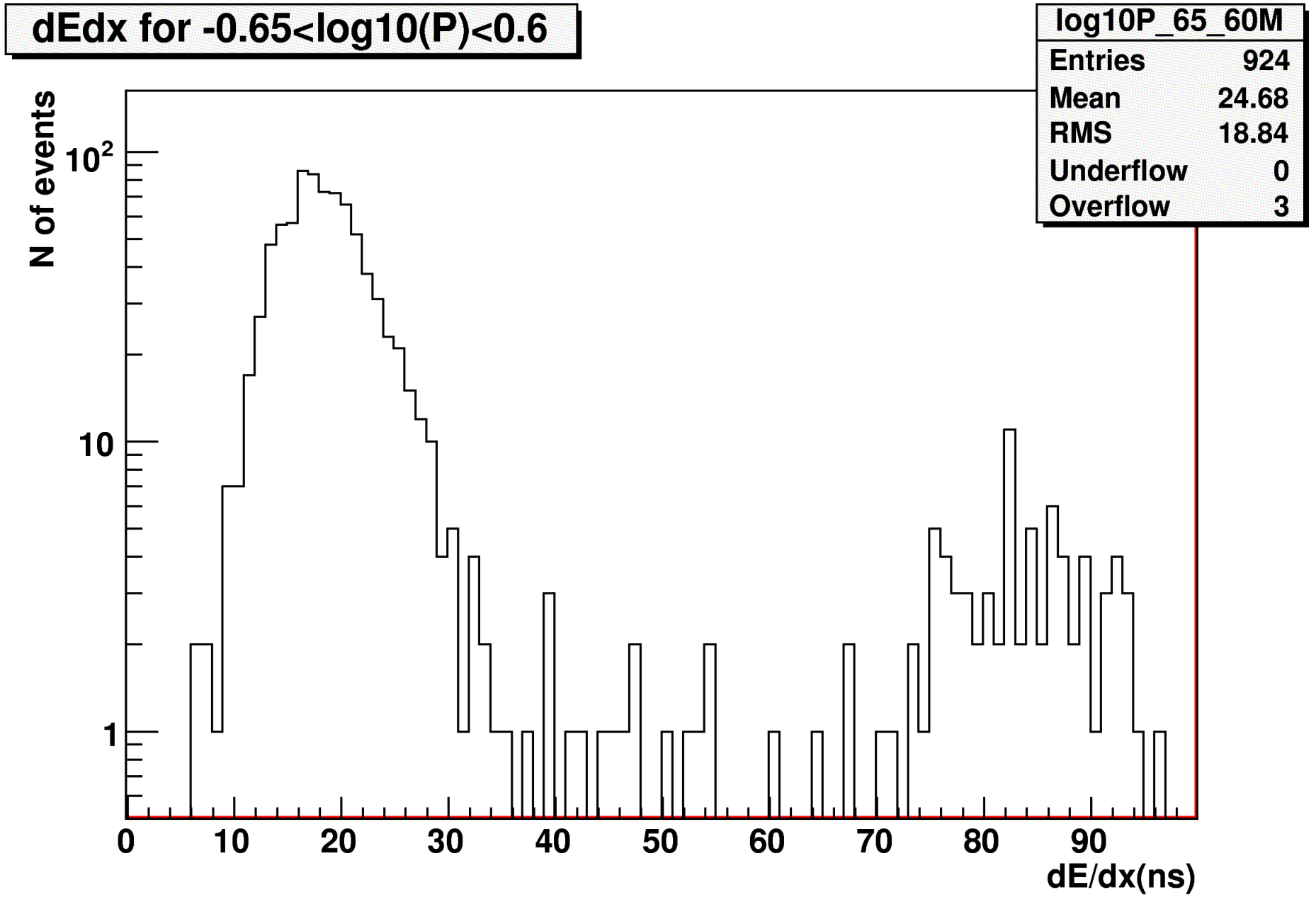
dE/dx distribution in different ranges of P

Positive particles

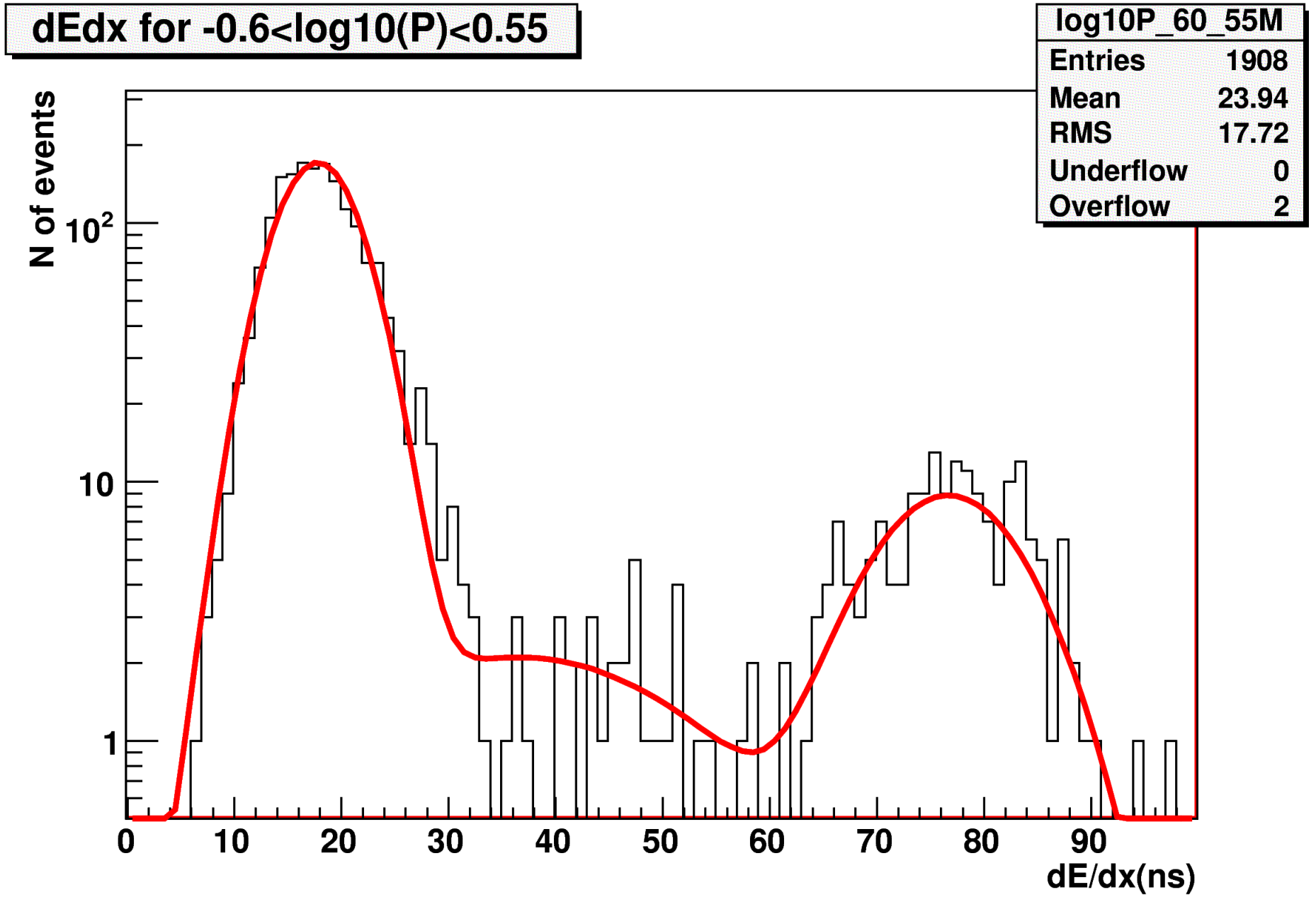
Positive particles



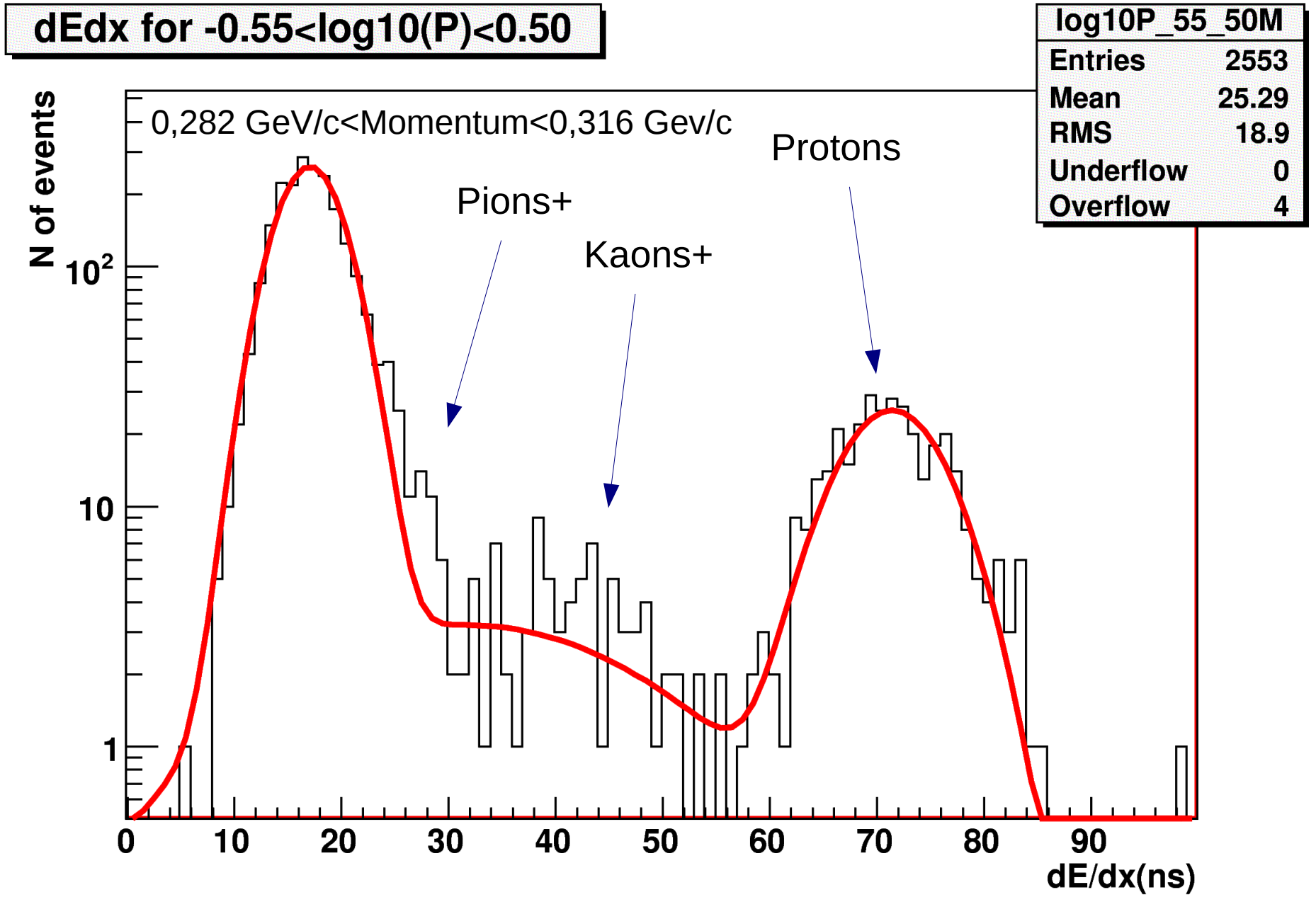
Positive particles



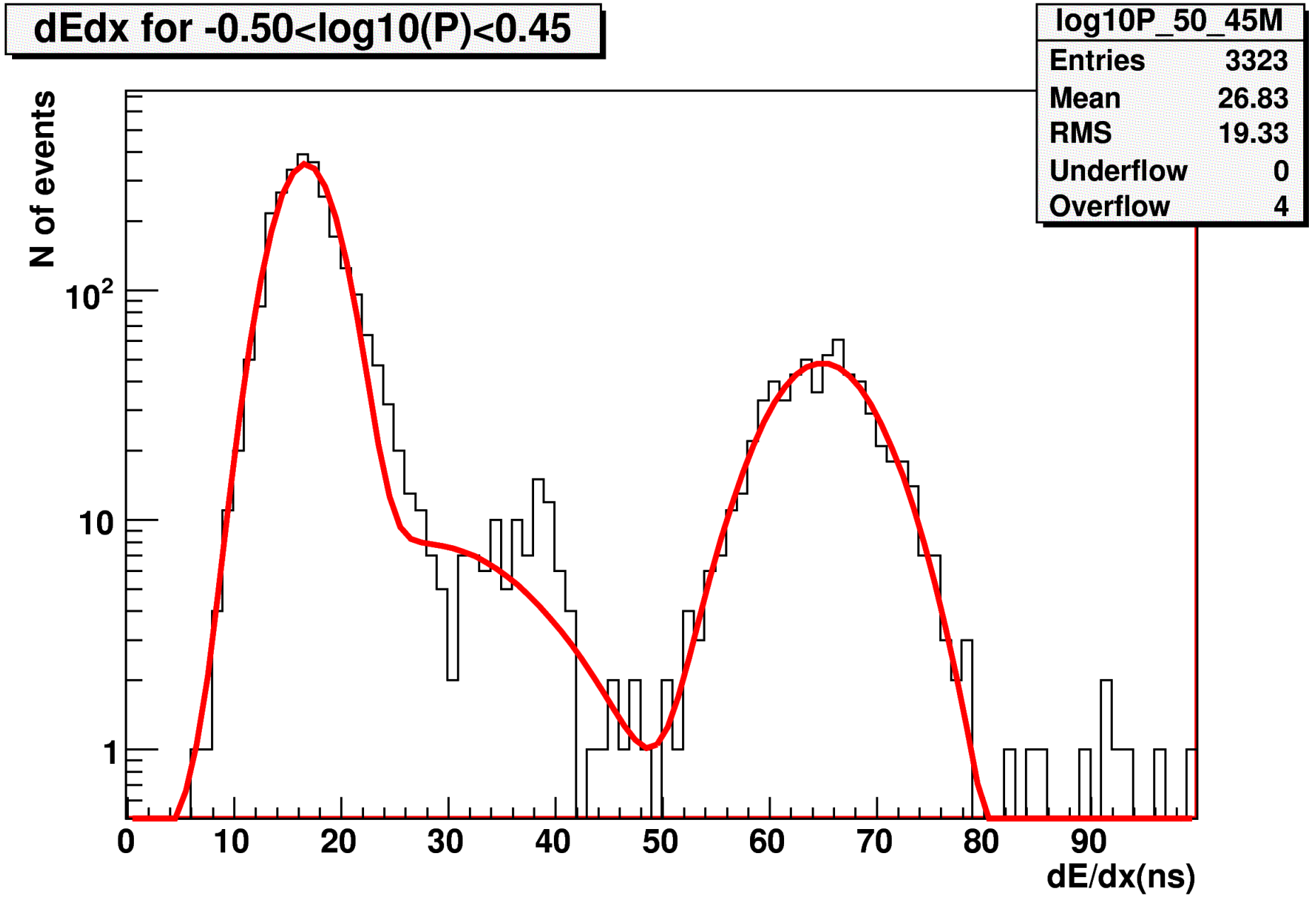
Positive particles



Positive particles



Positive particles



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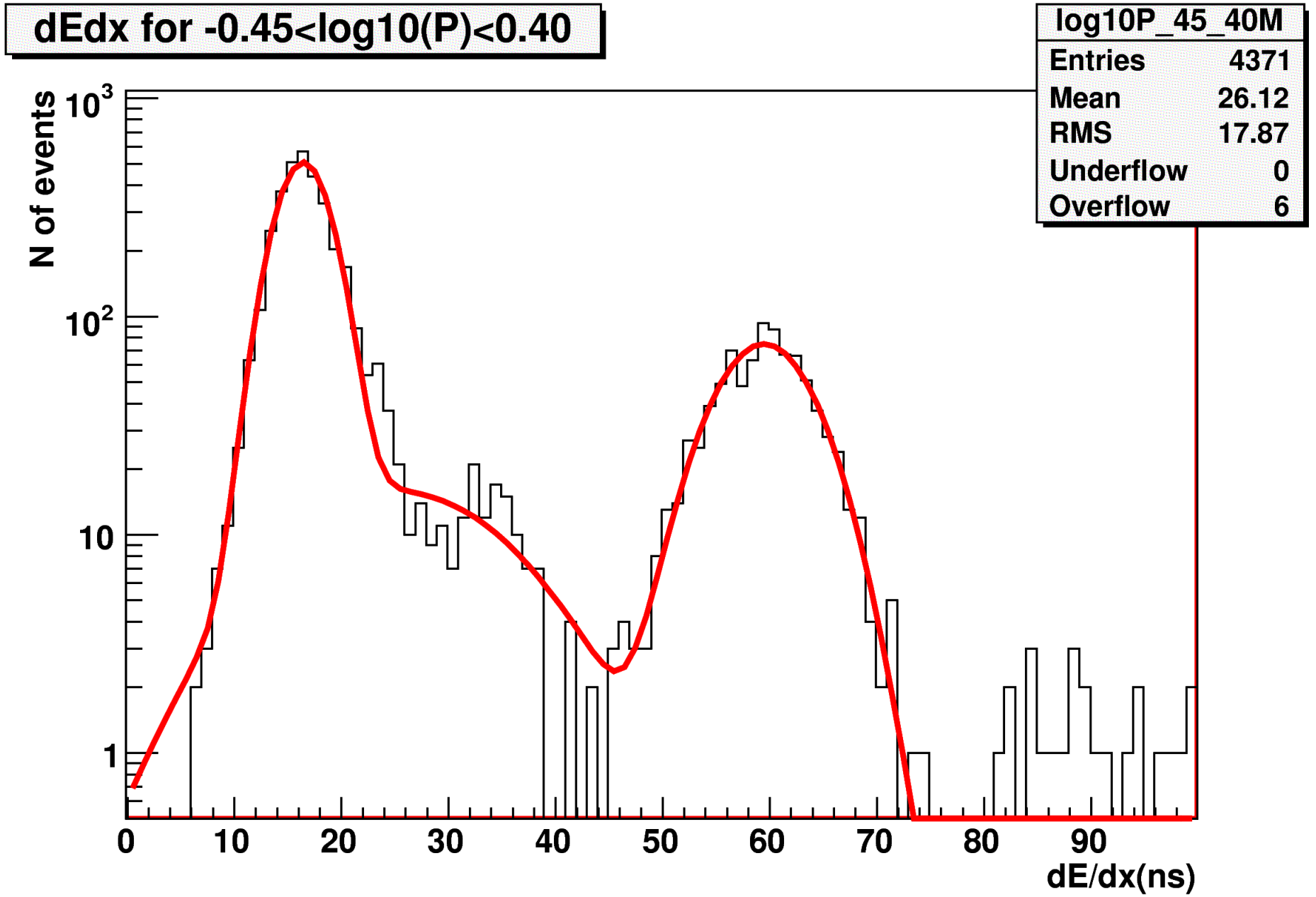

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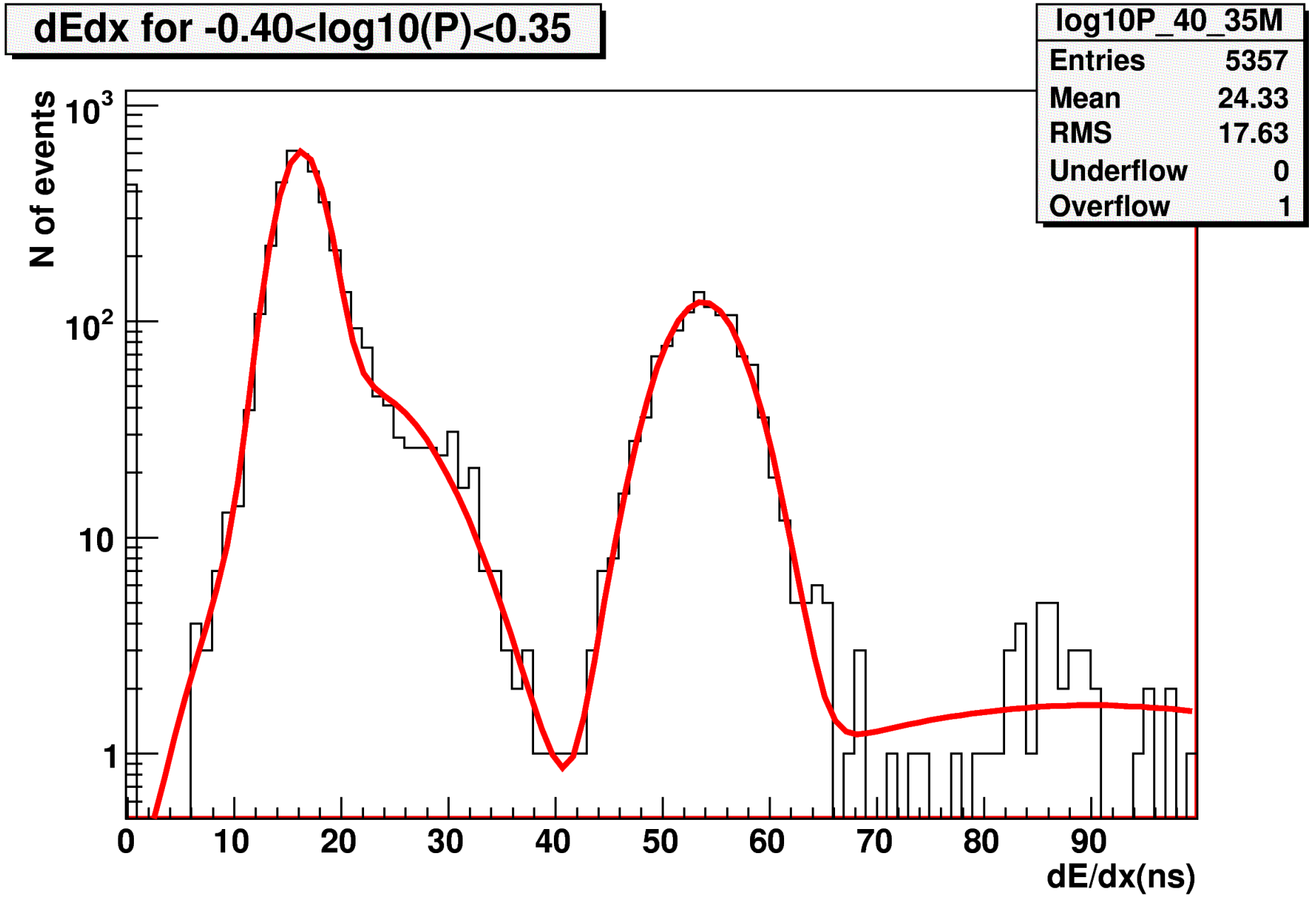
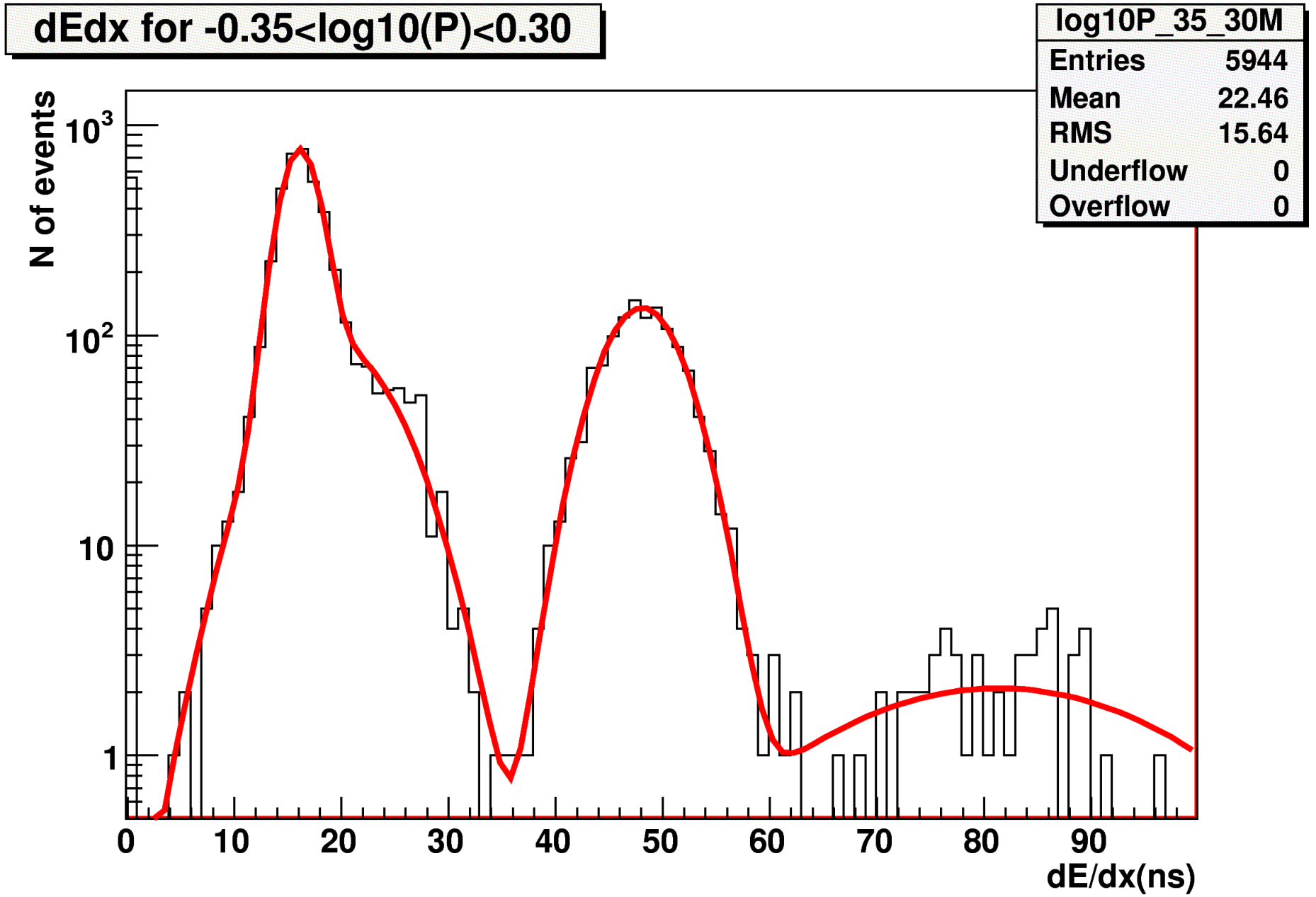
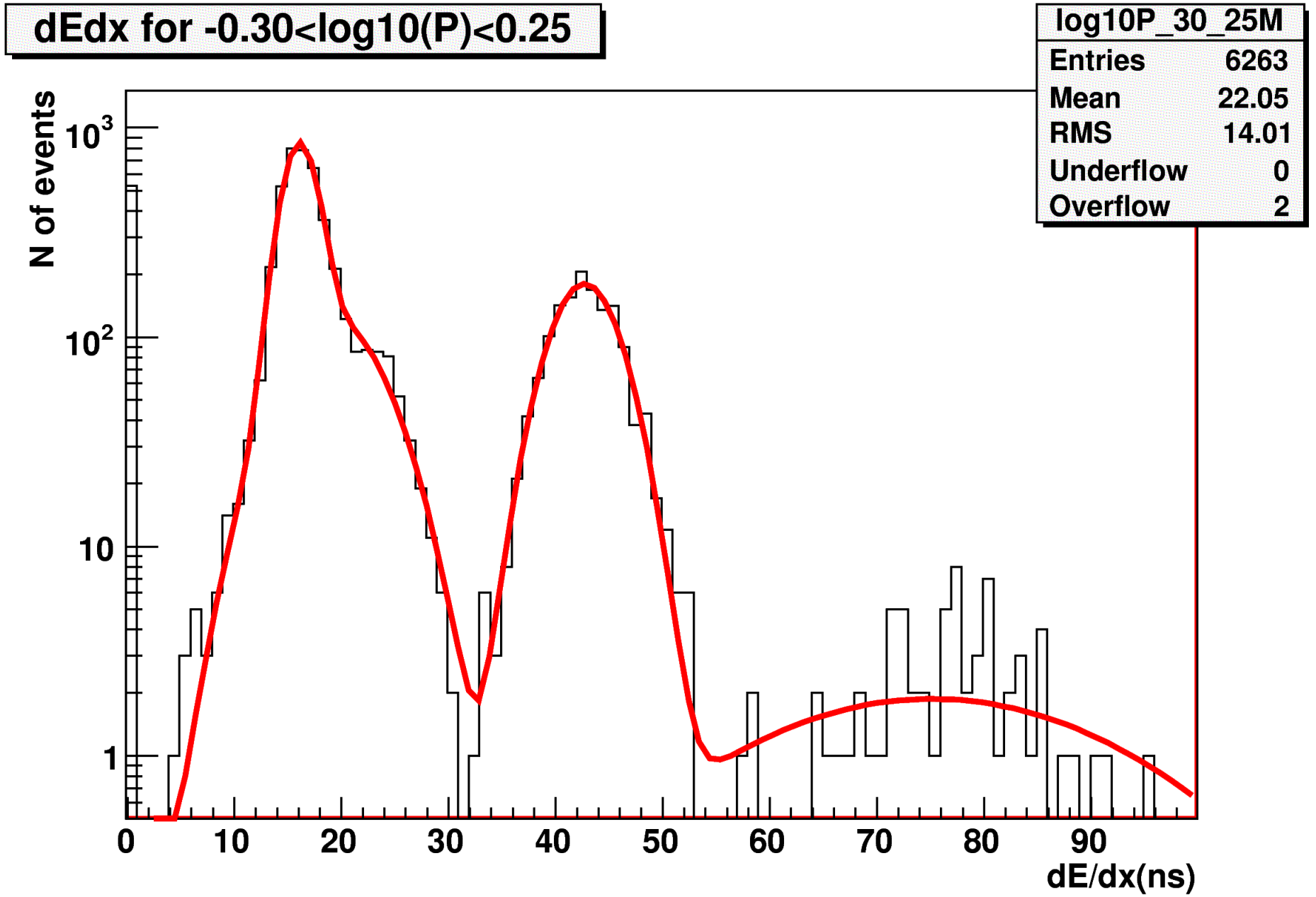


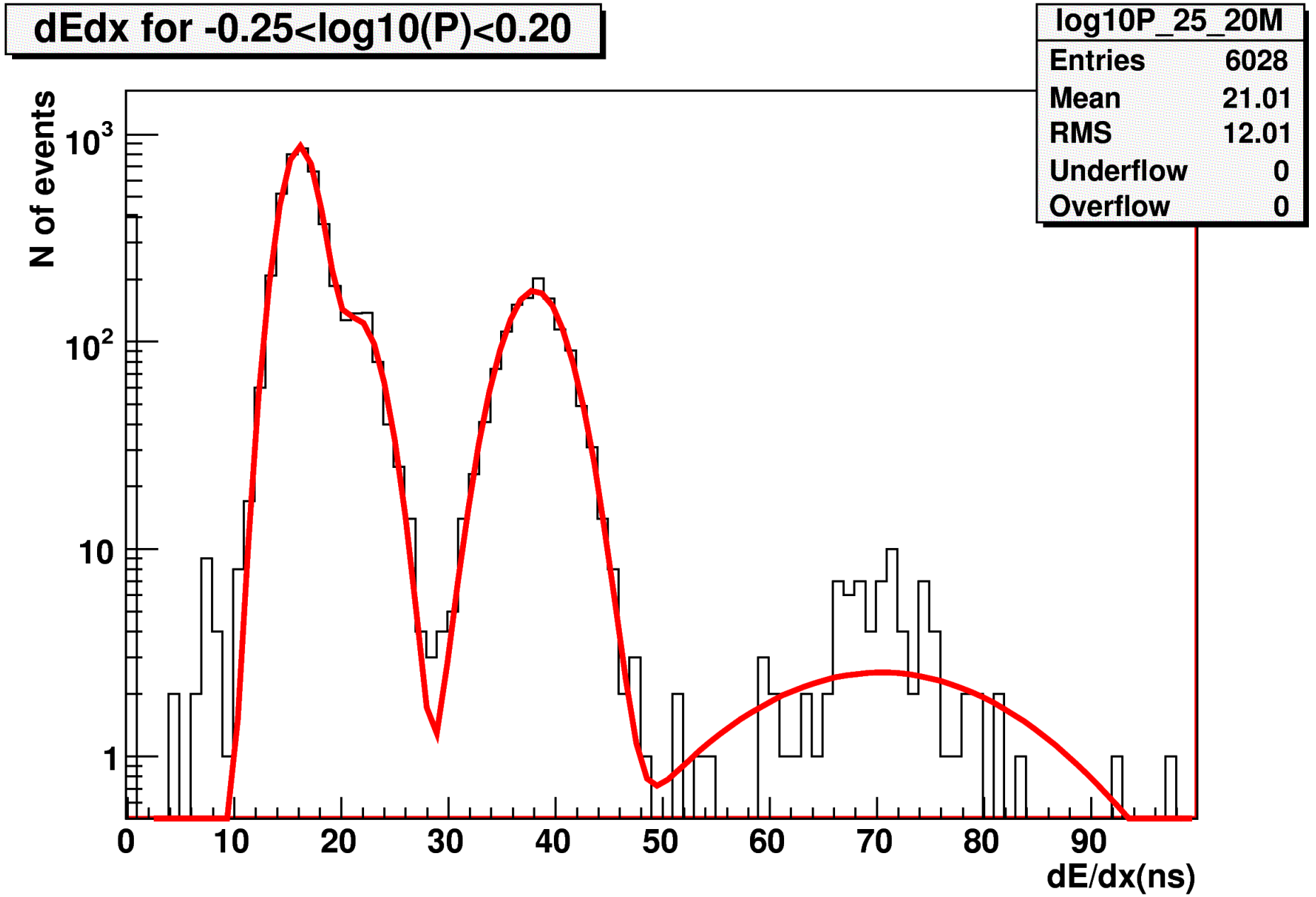
Positive particles



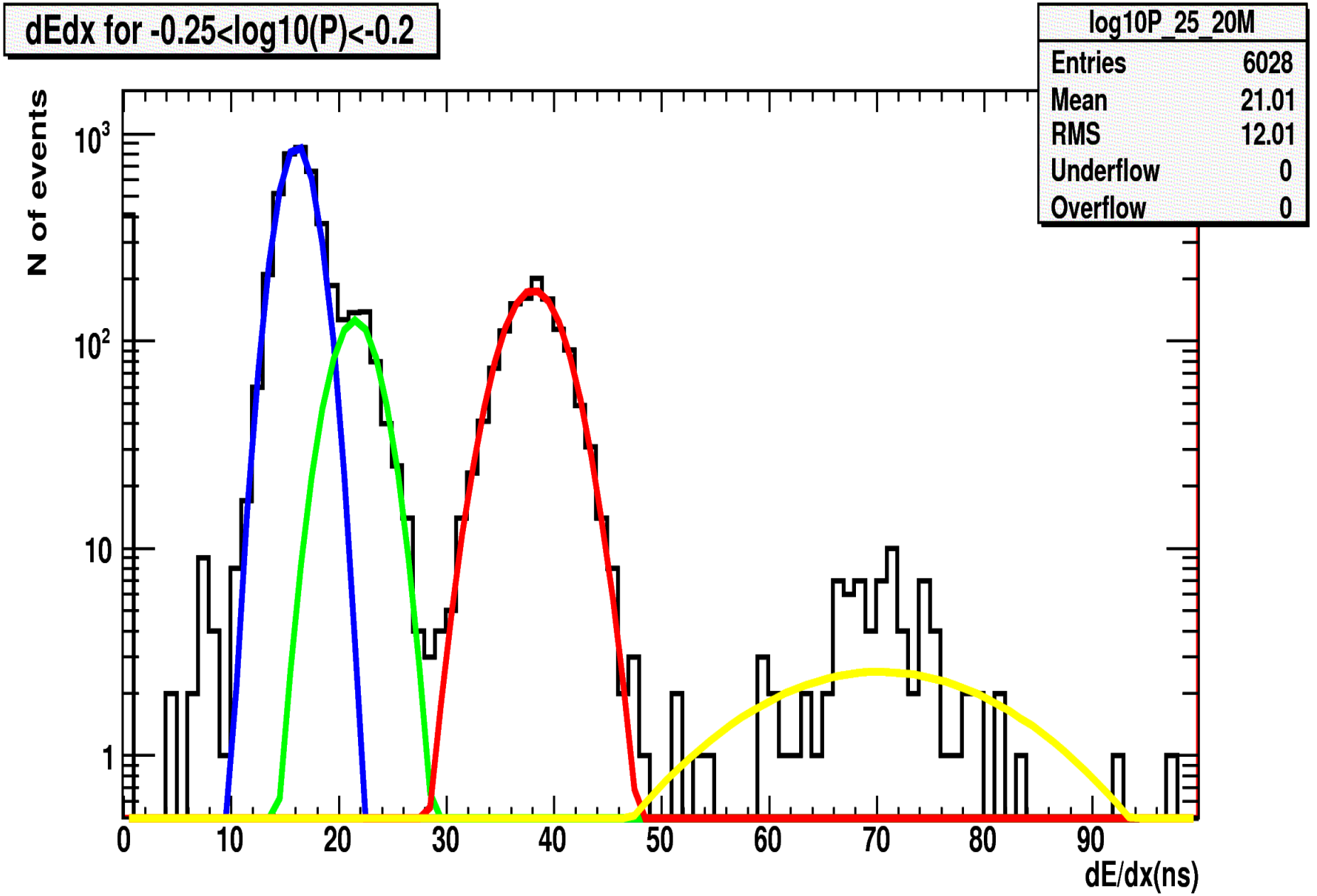
Positive particles



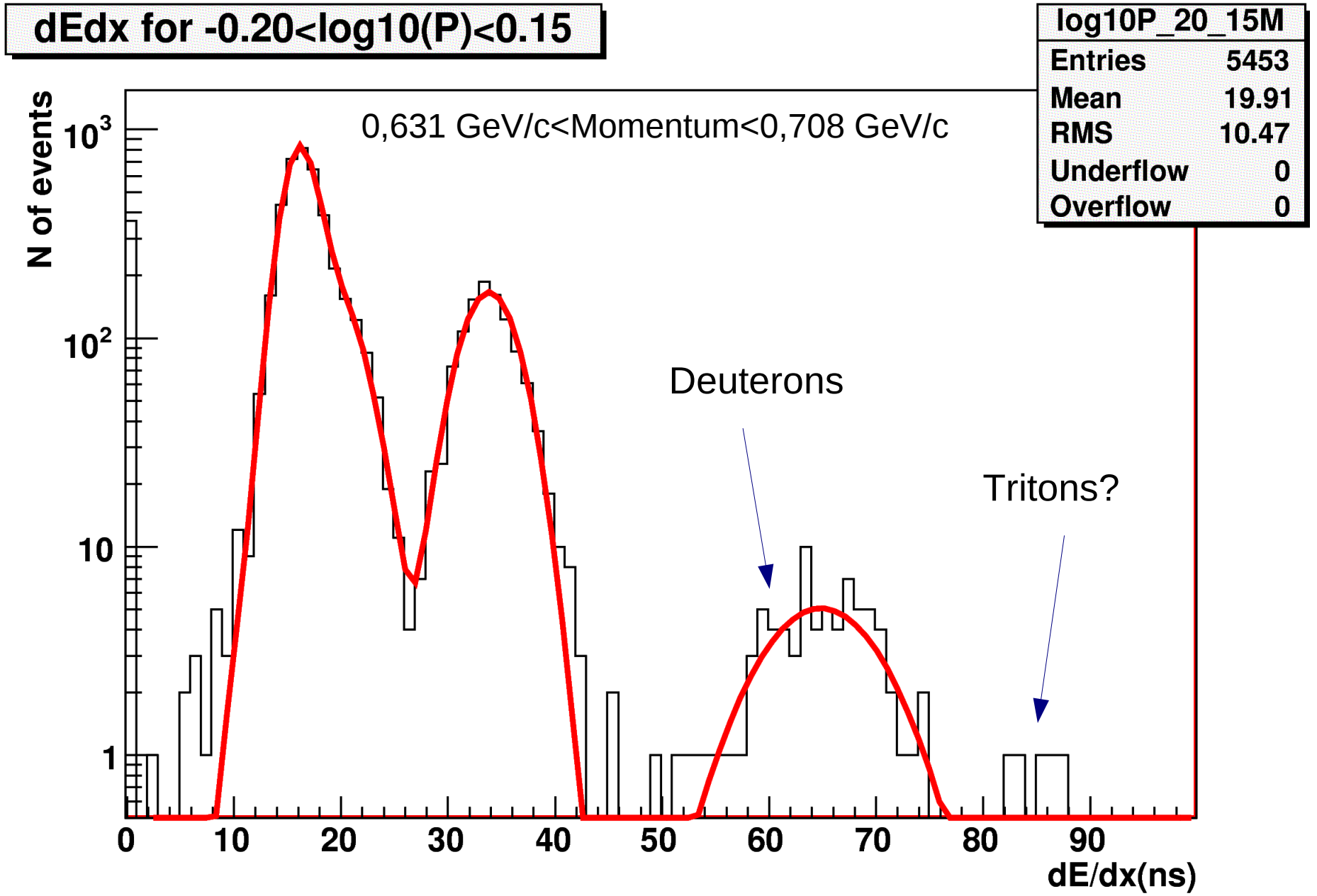
Positive particles



Positive particles



Positive particles



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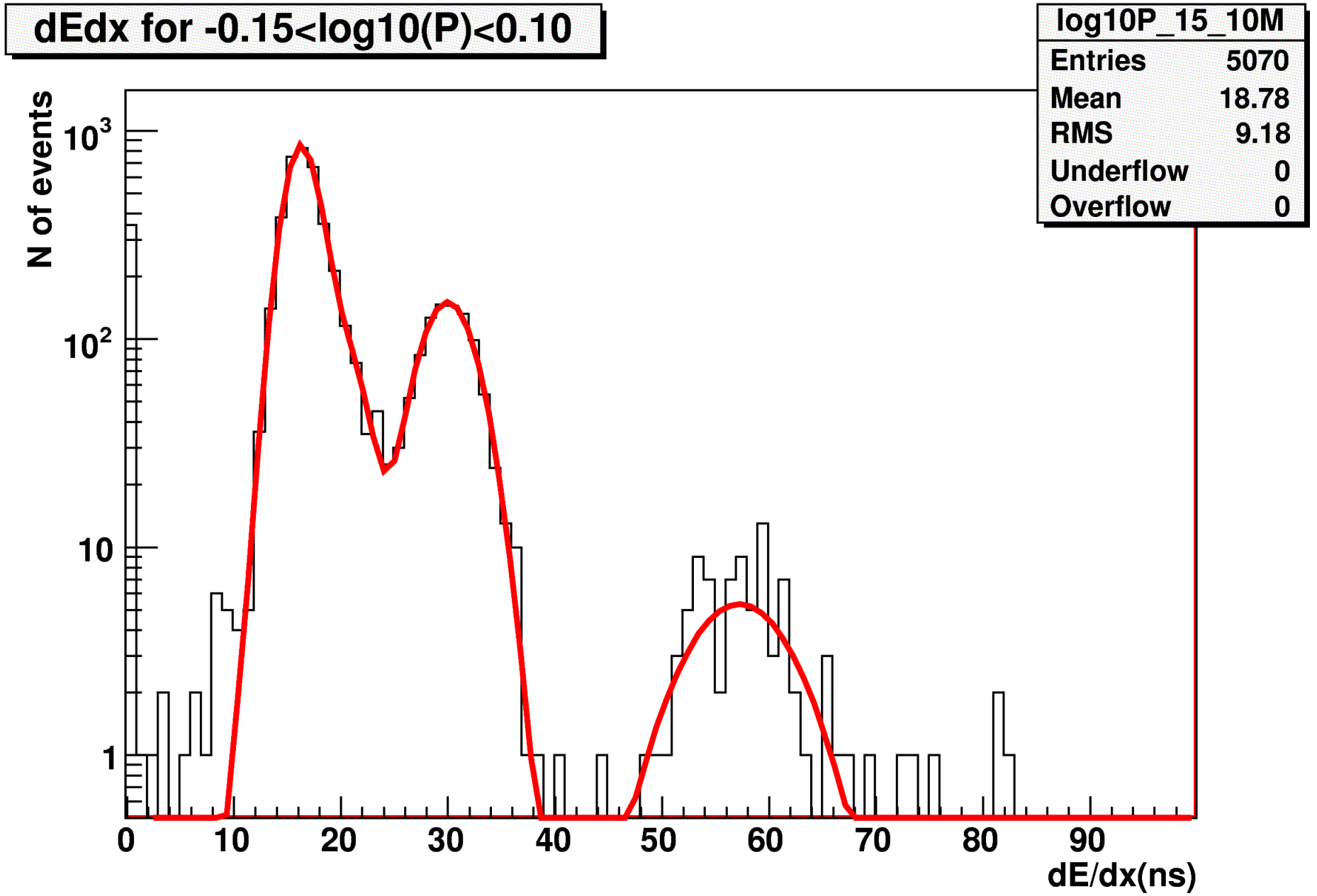

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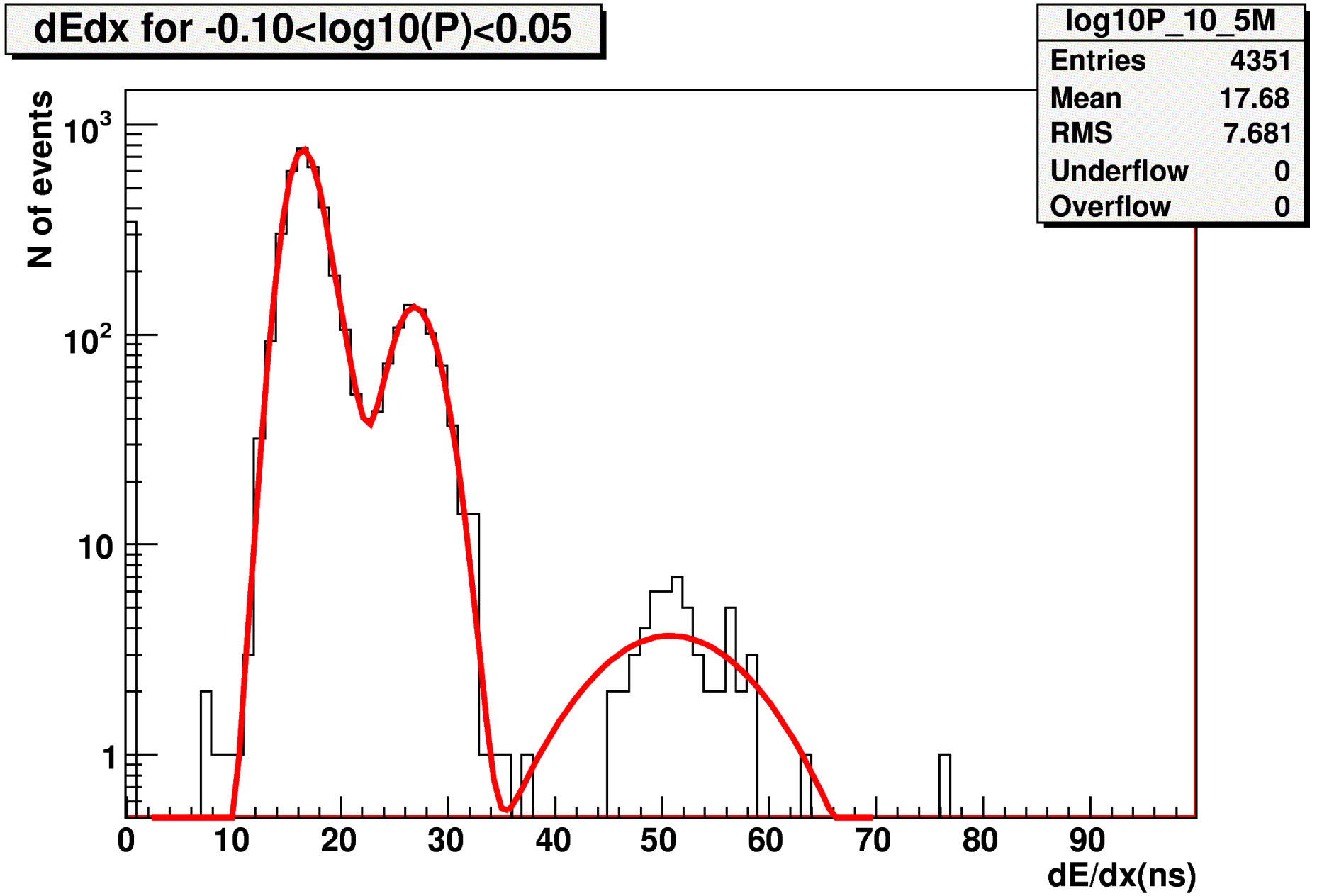

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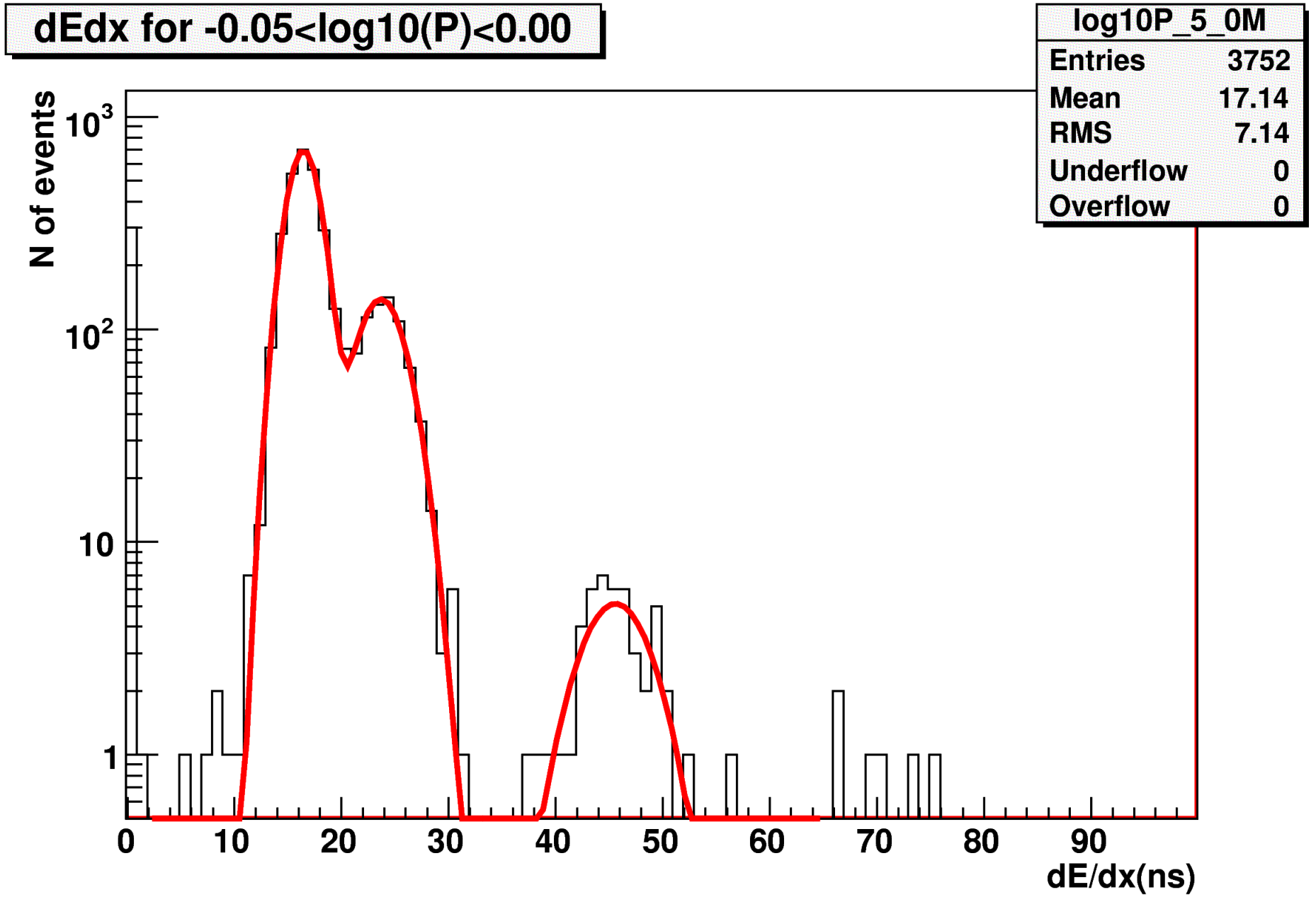

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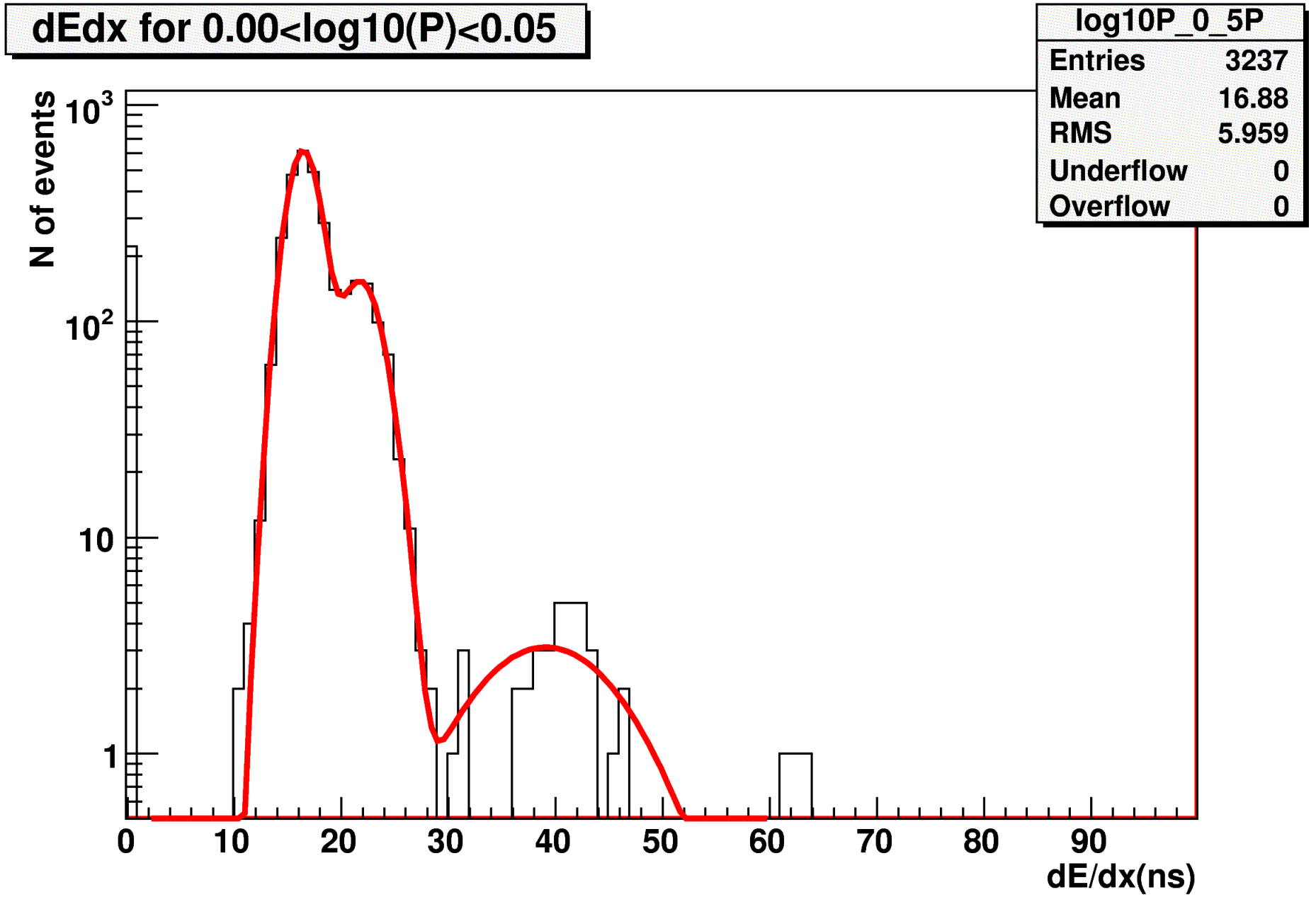
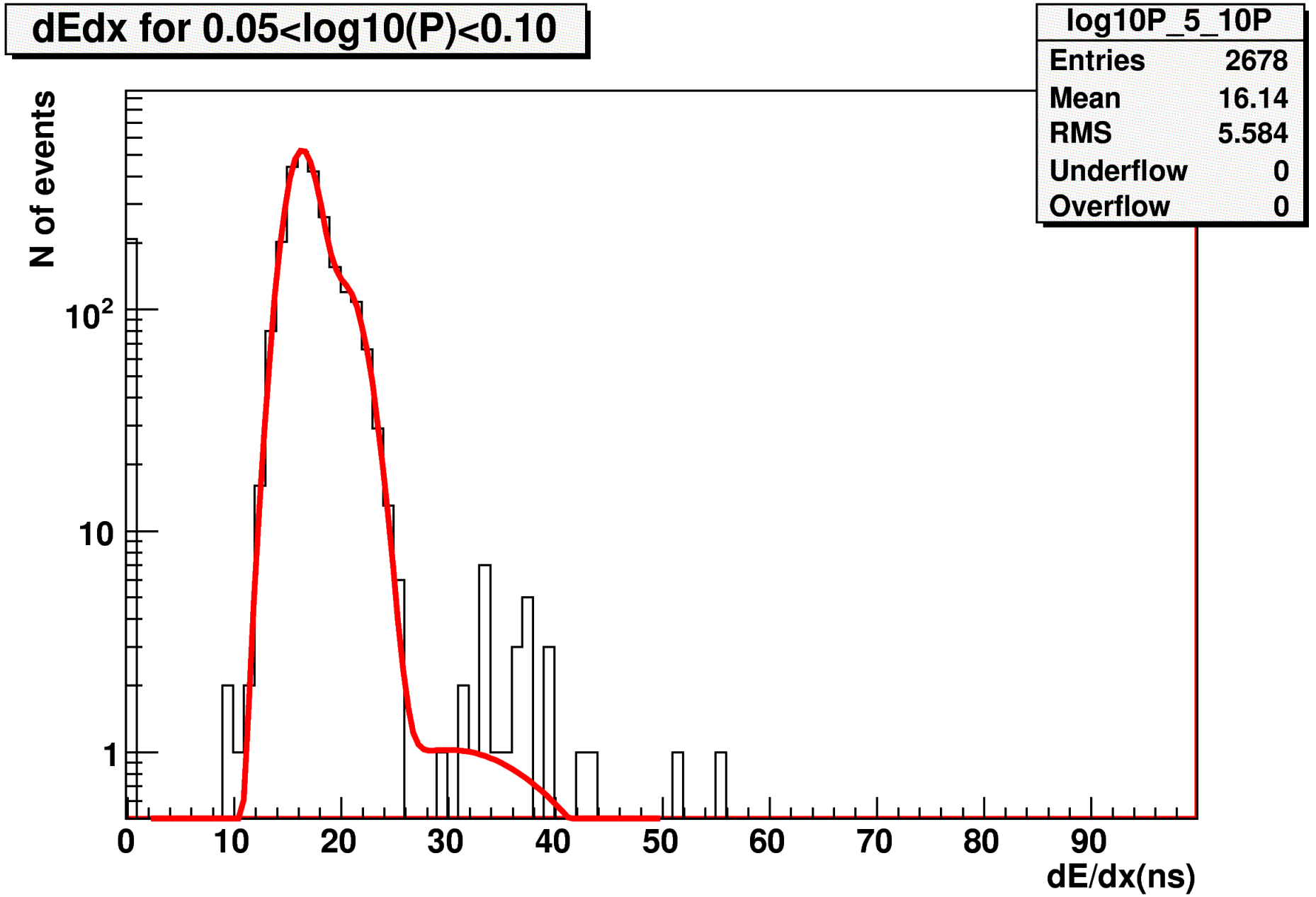
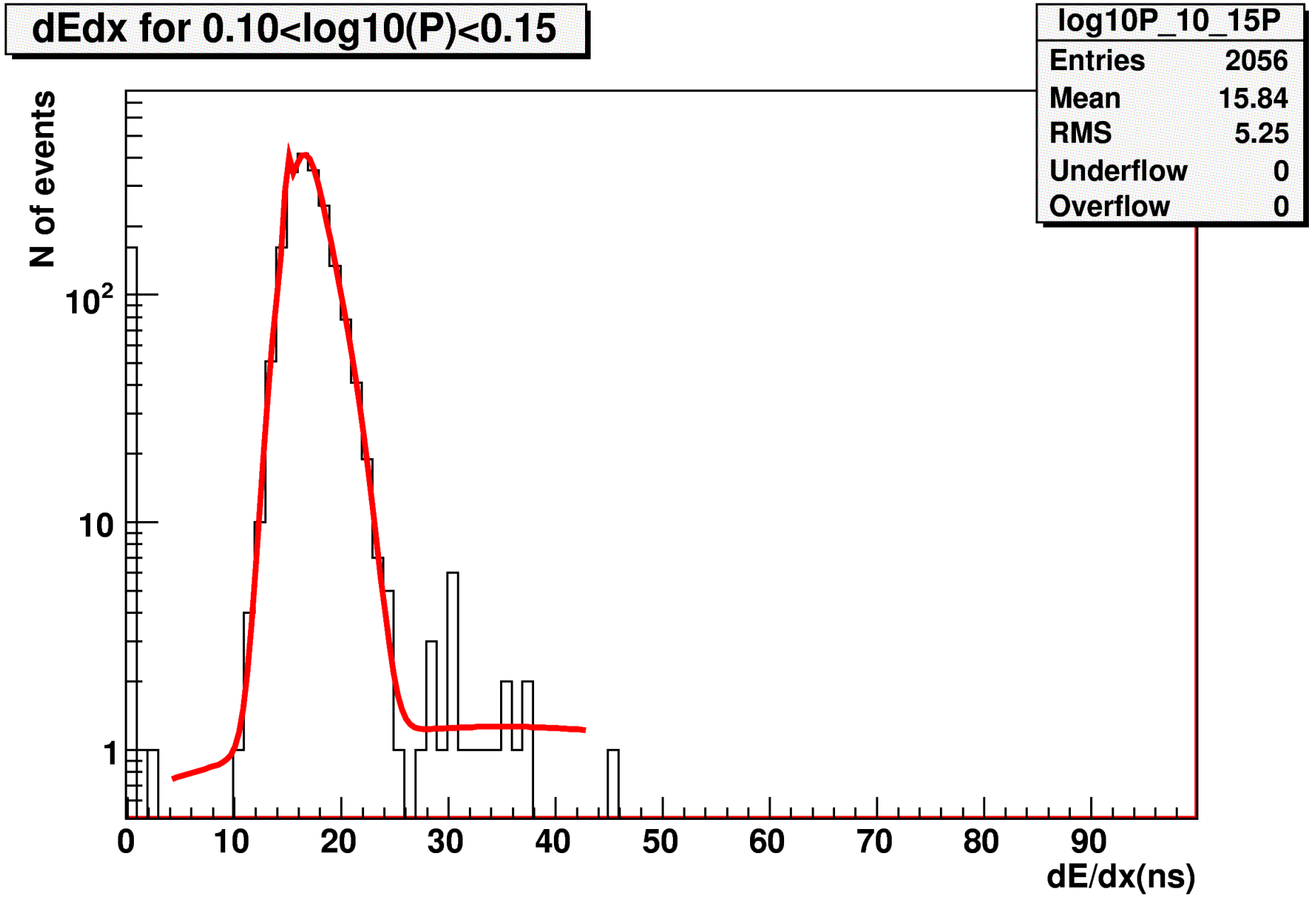


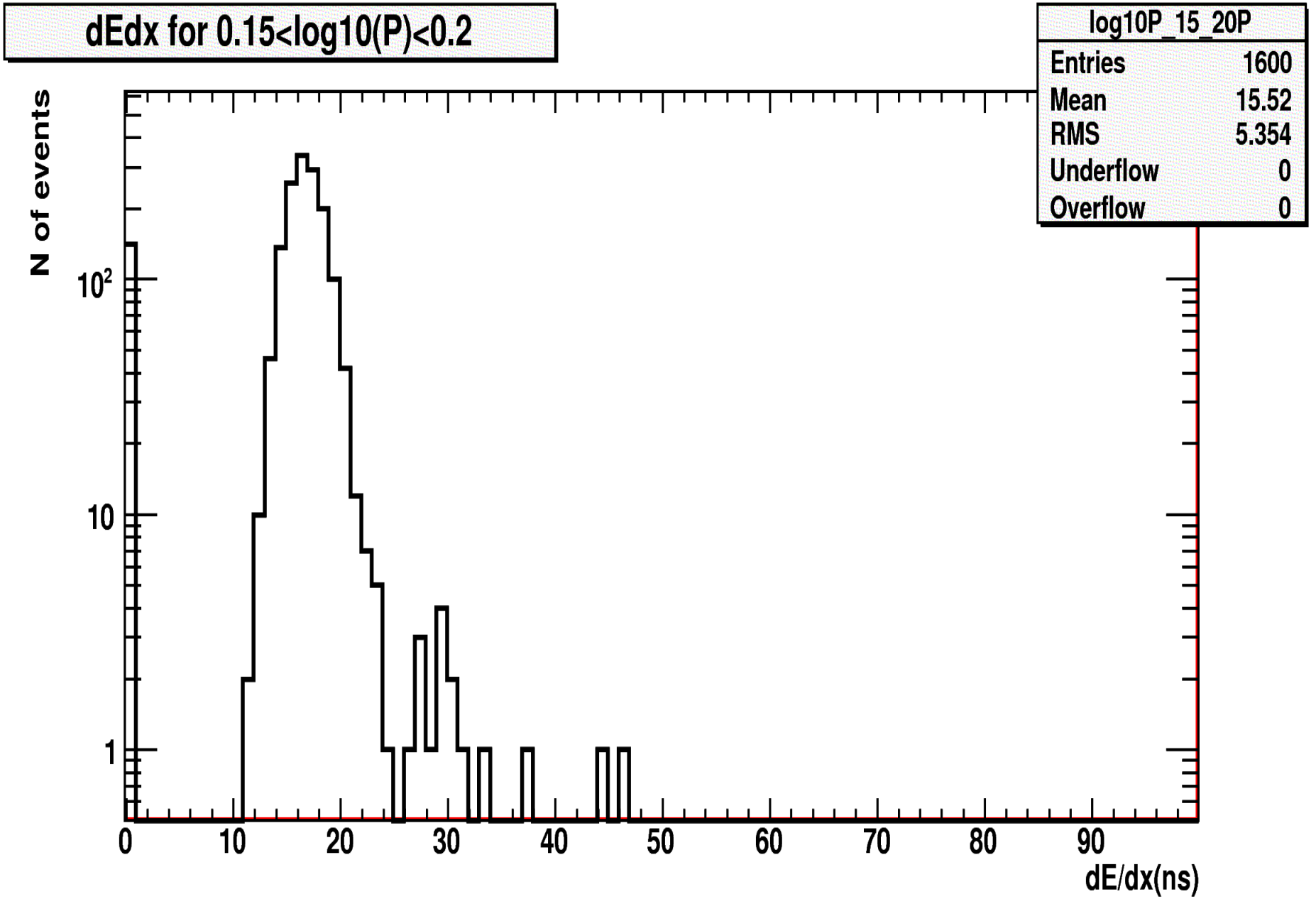
Positive particles



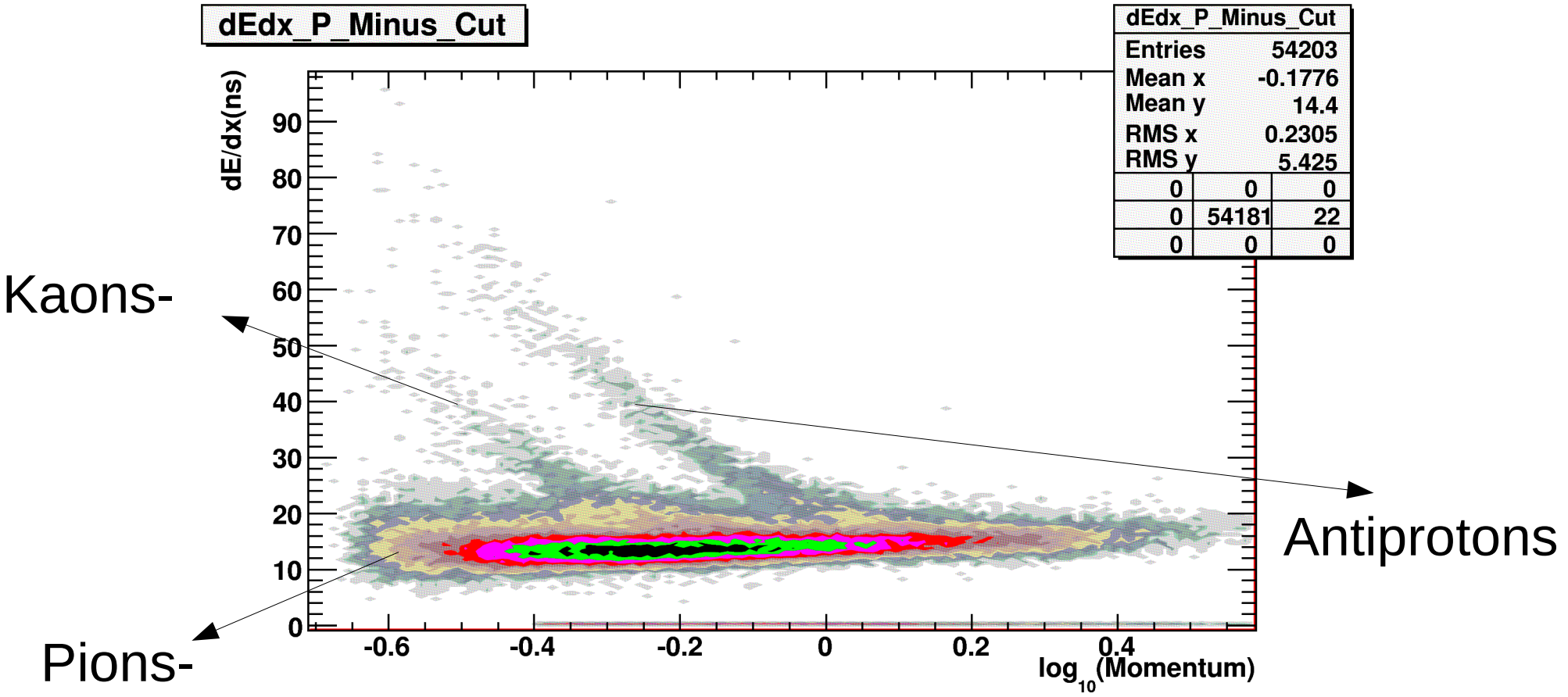
Positive particles



Positive particles



dE/dx and Momentum 2D Histogram



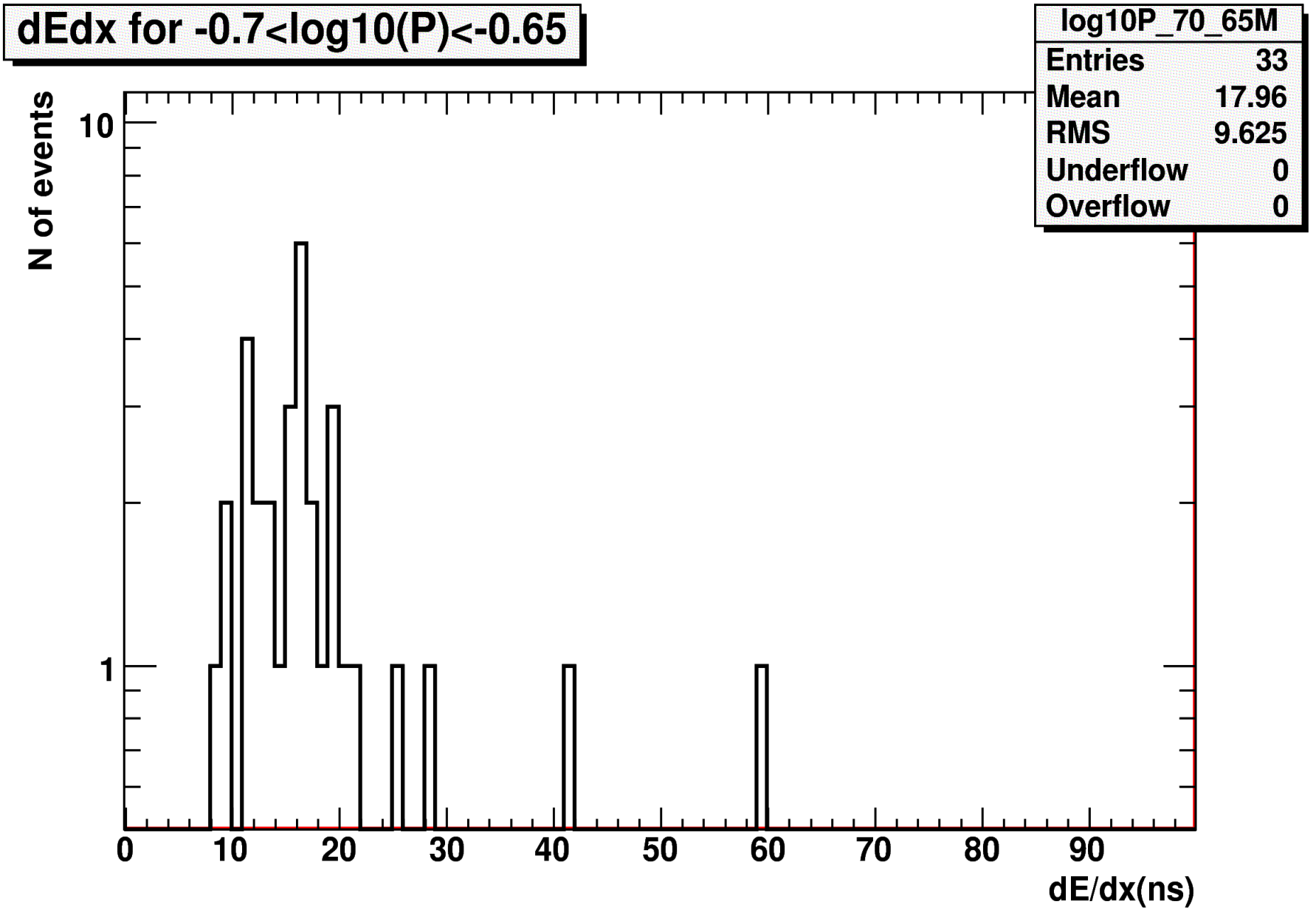
Negative particles

dE/dx - 1D Histograms

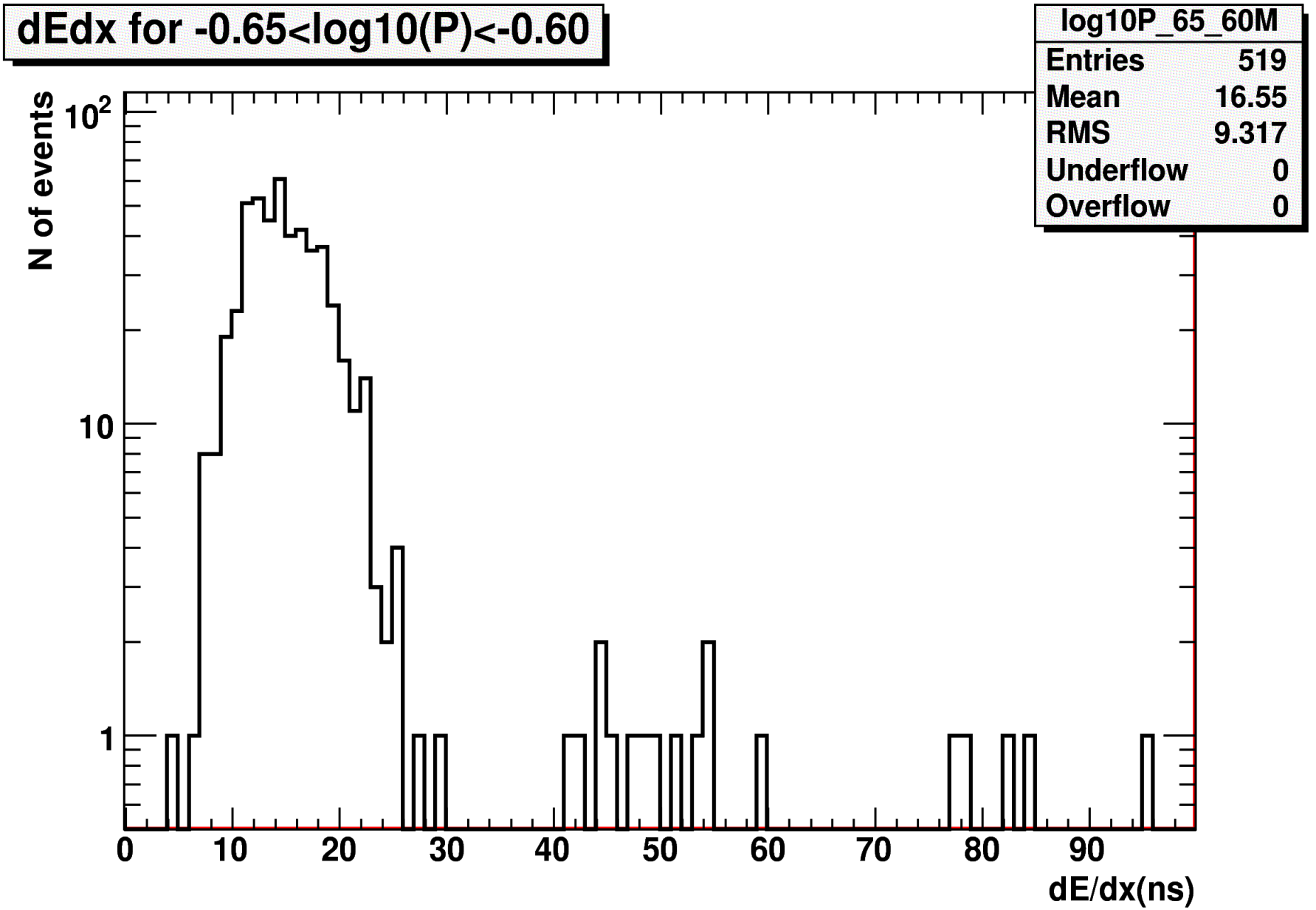
dE/dx distribution in different ranges of P

Negative particles

Negative particles



Negative particles



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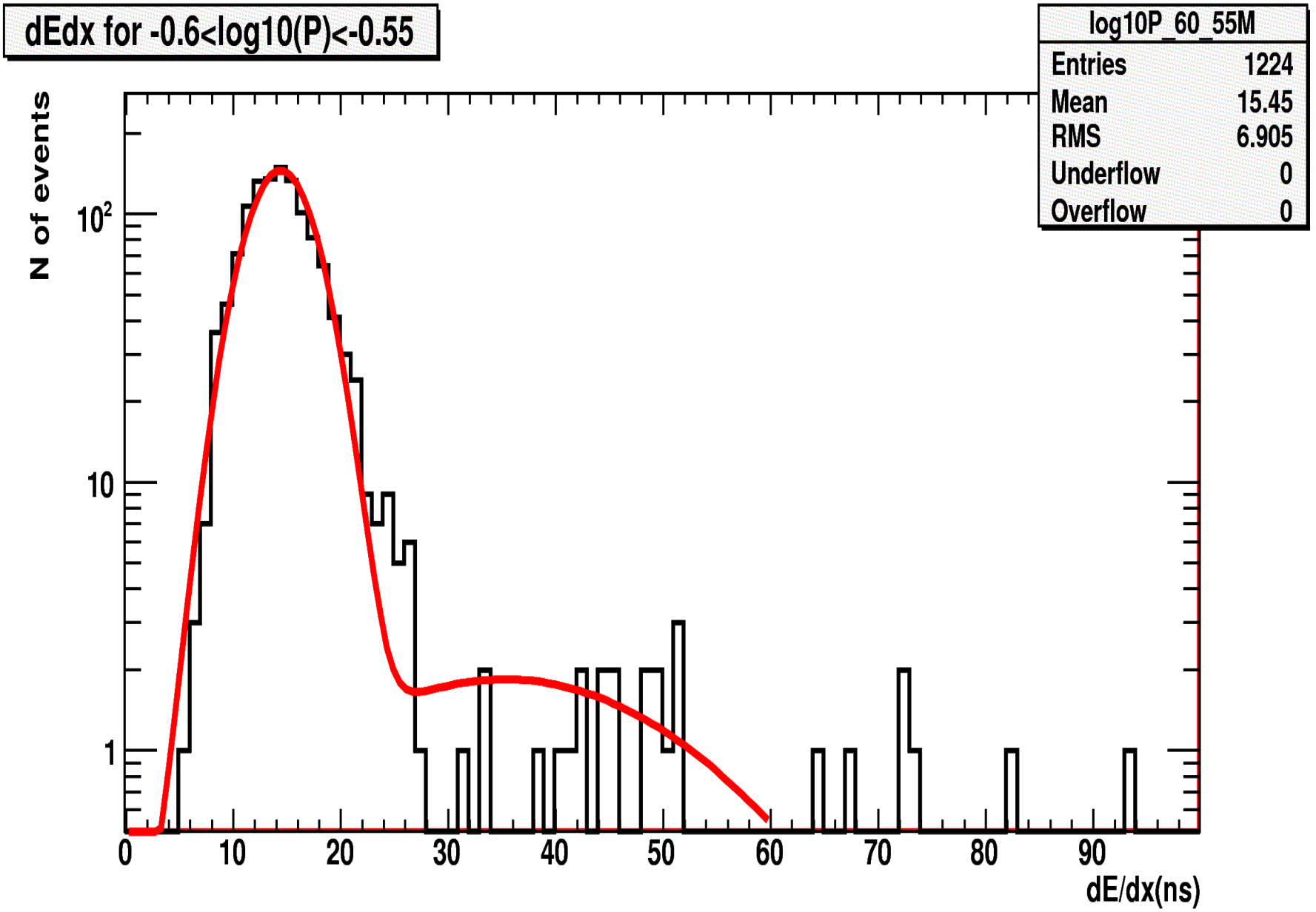

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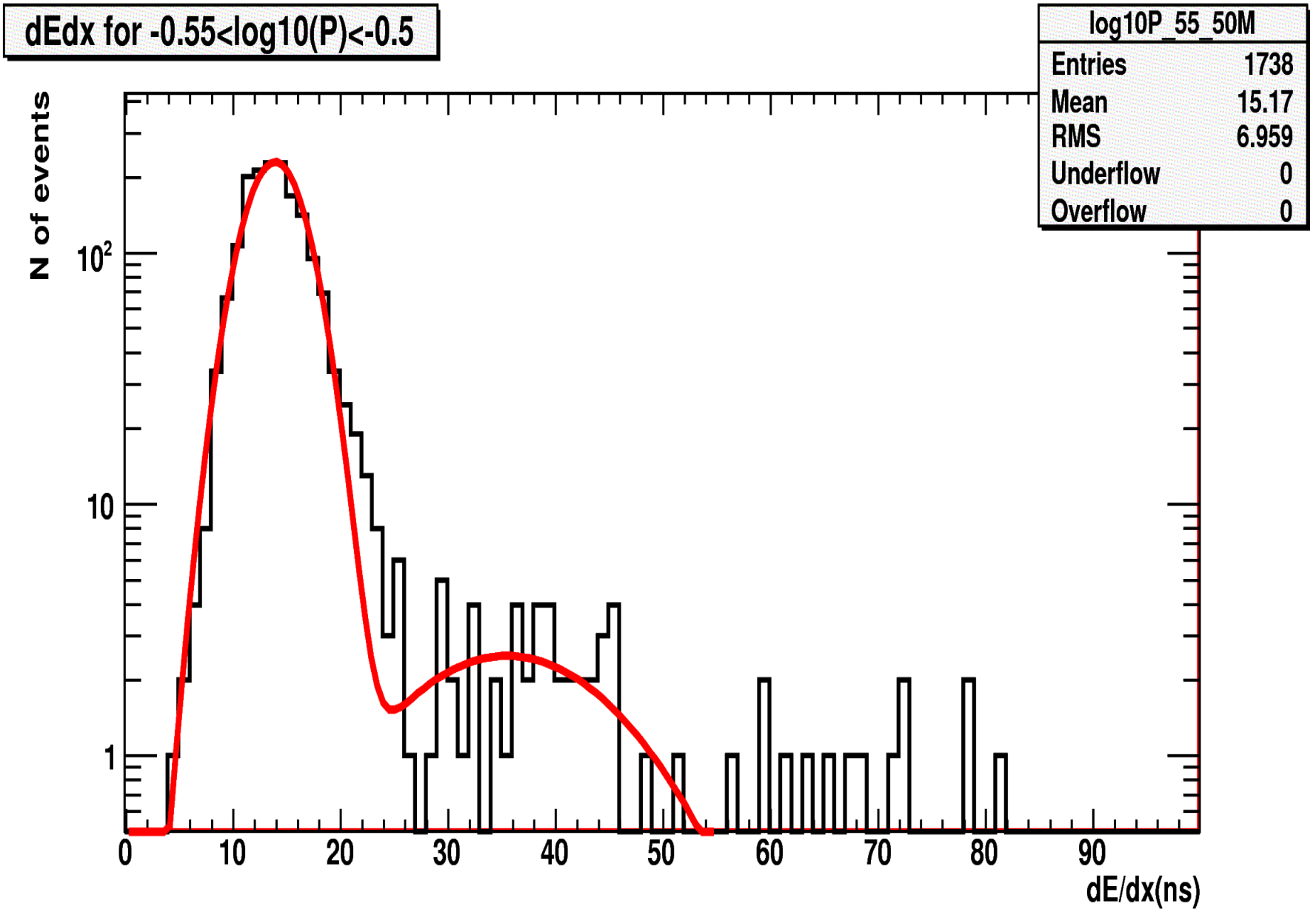

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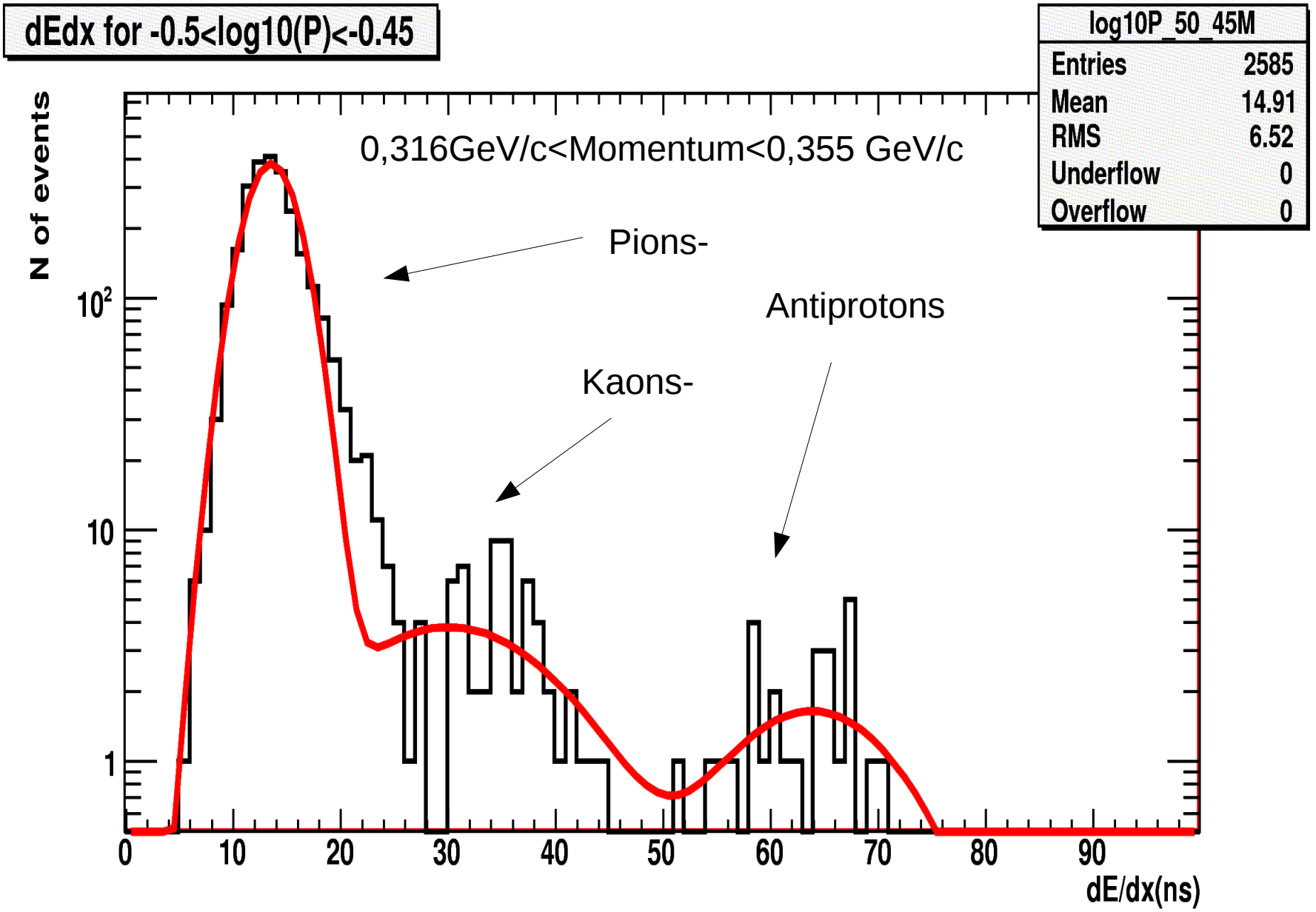

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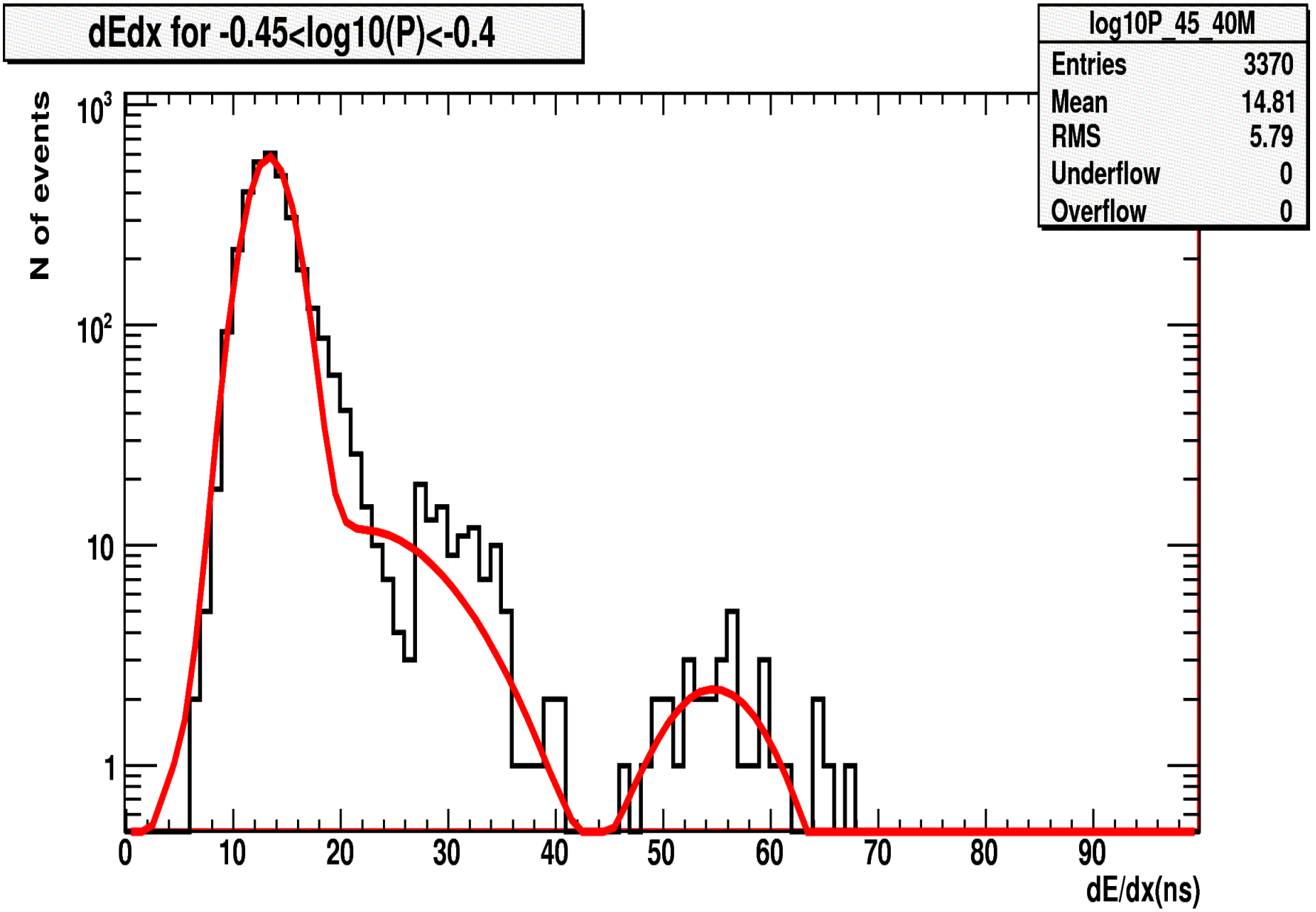

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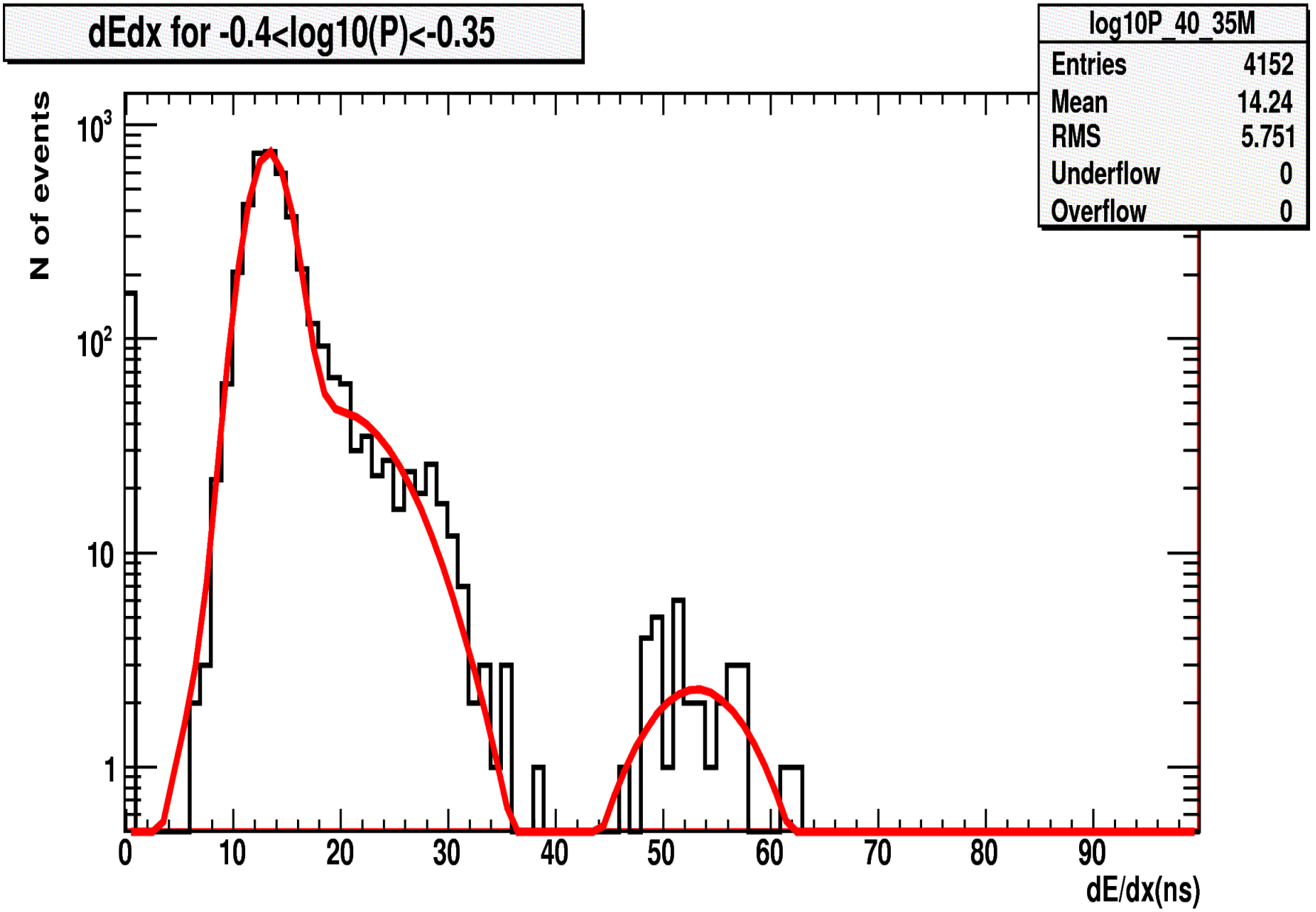

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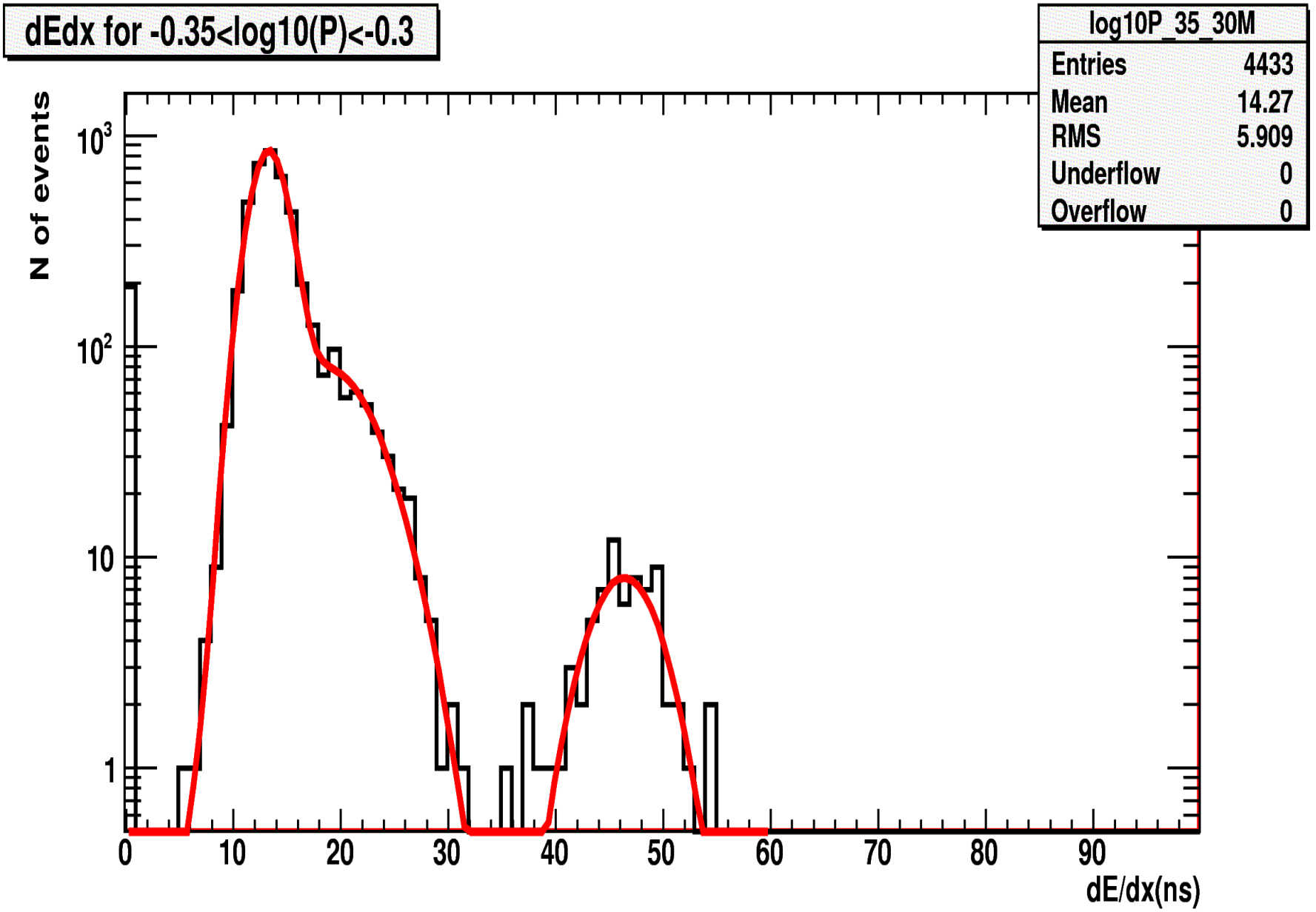

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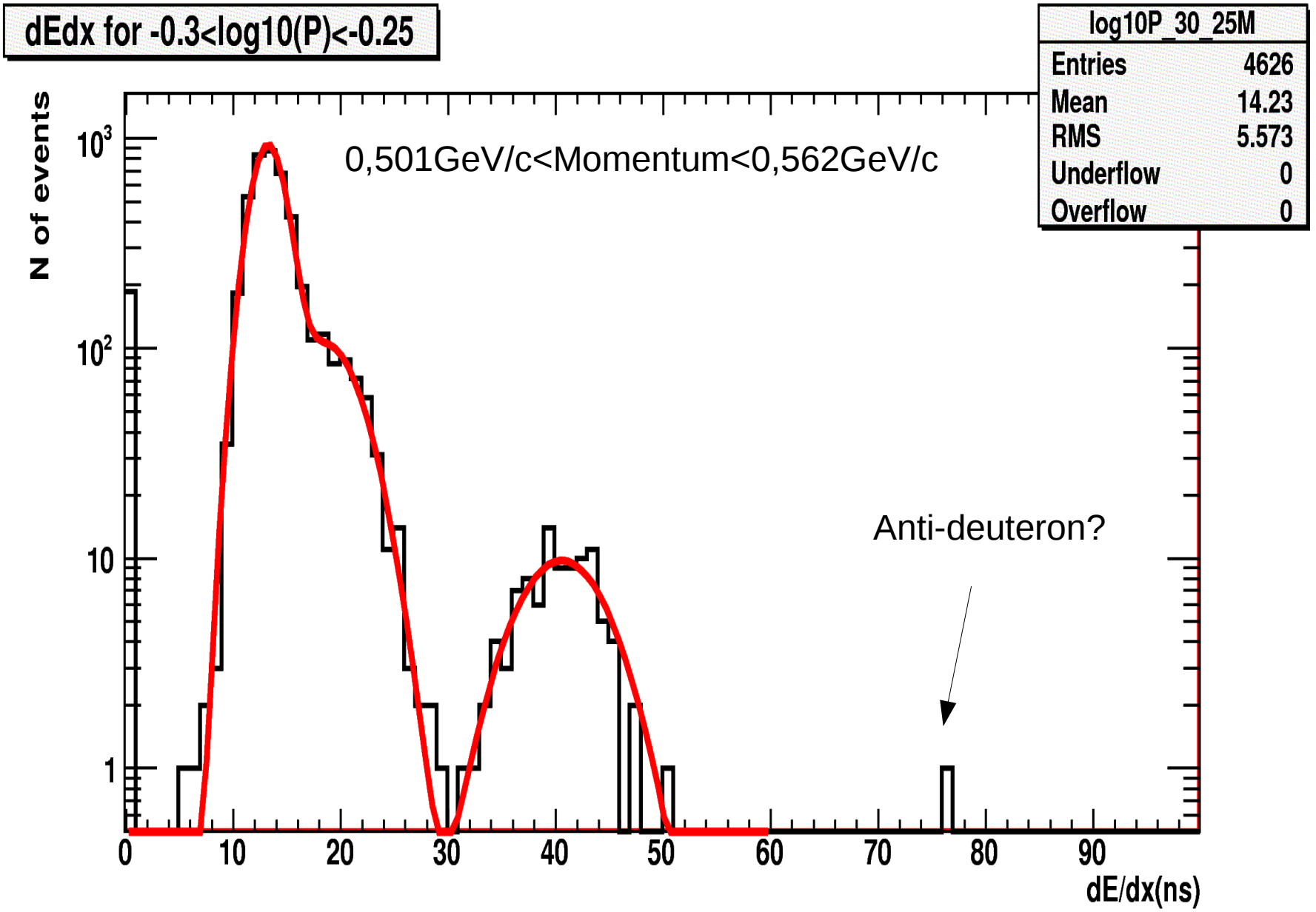
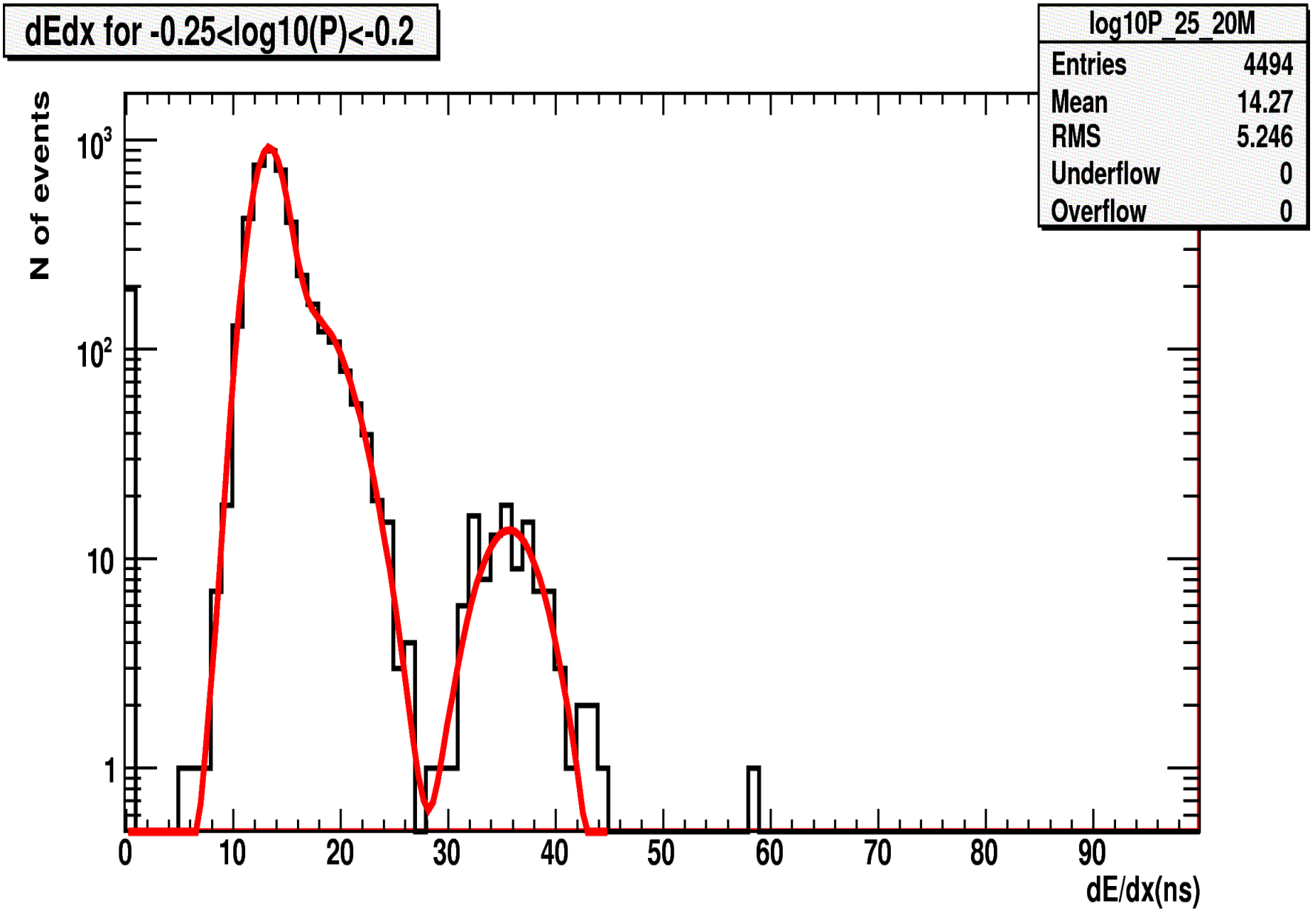


Negative particles



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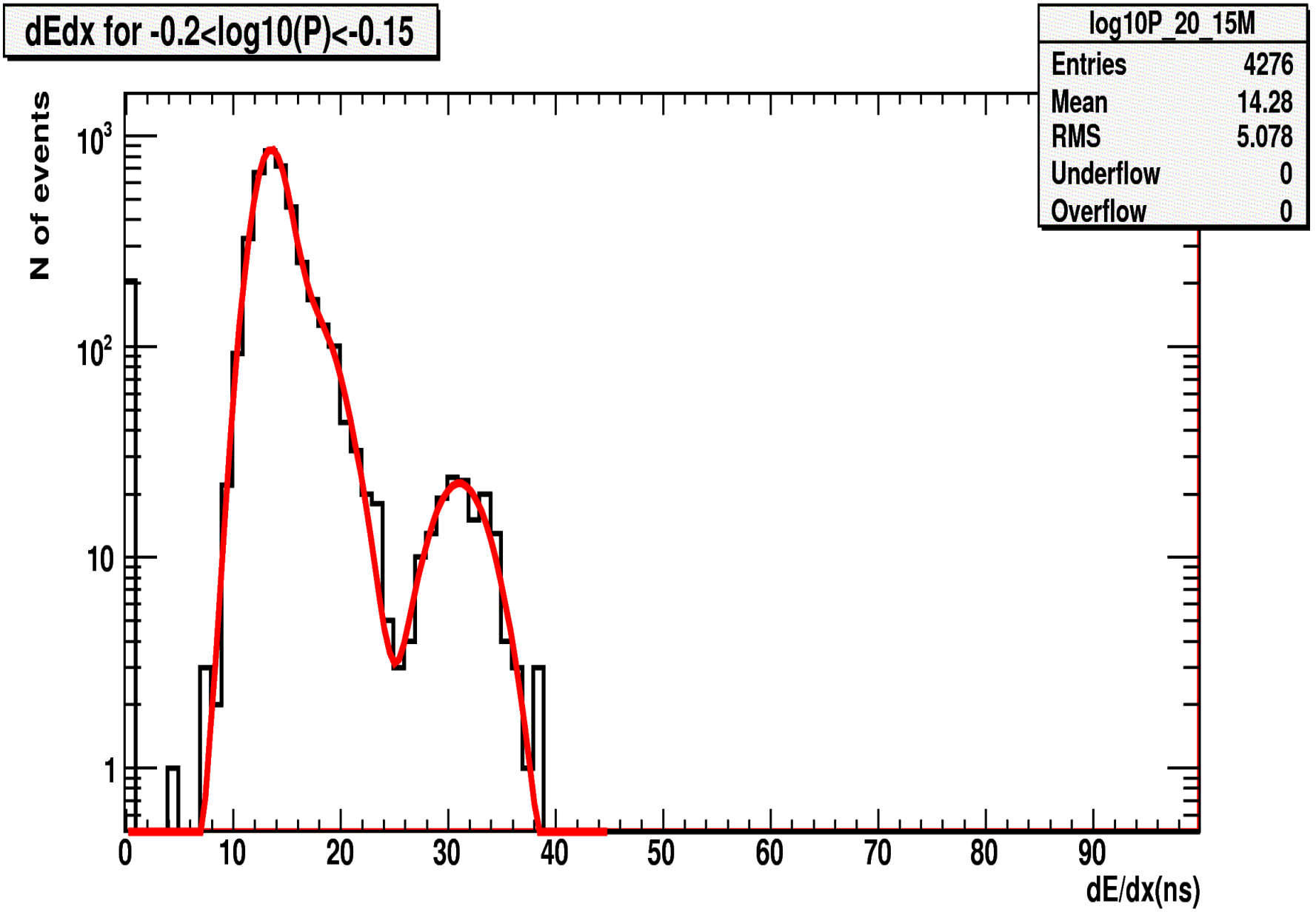
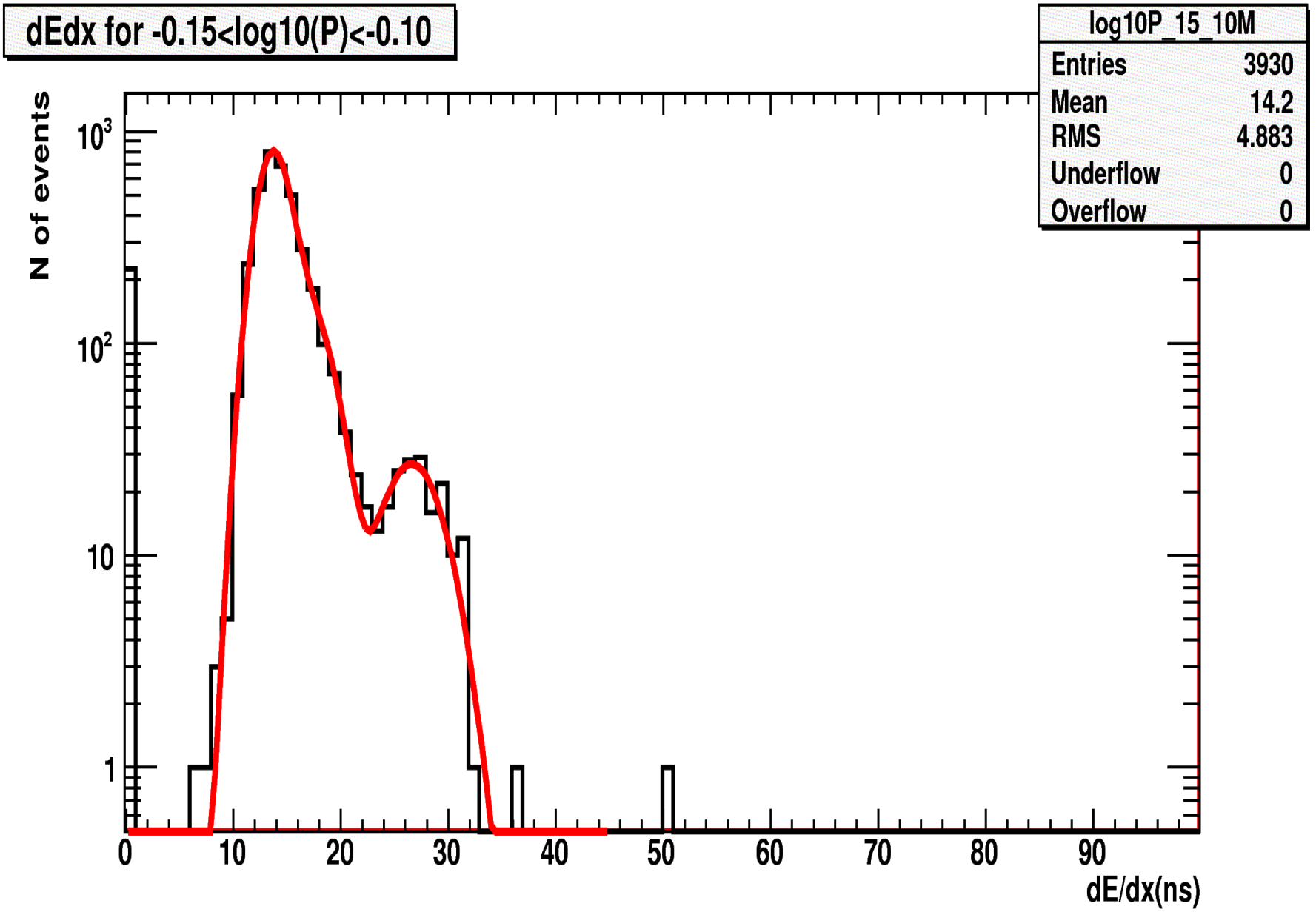
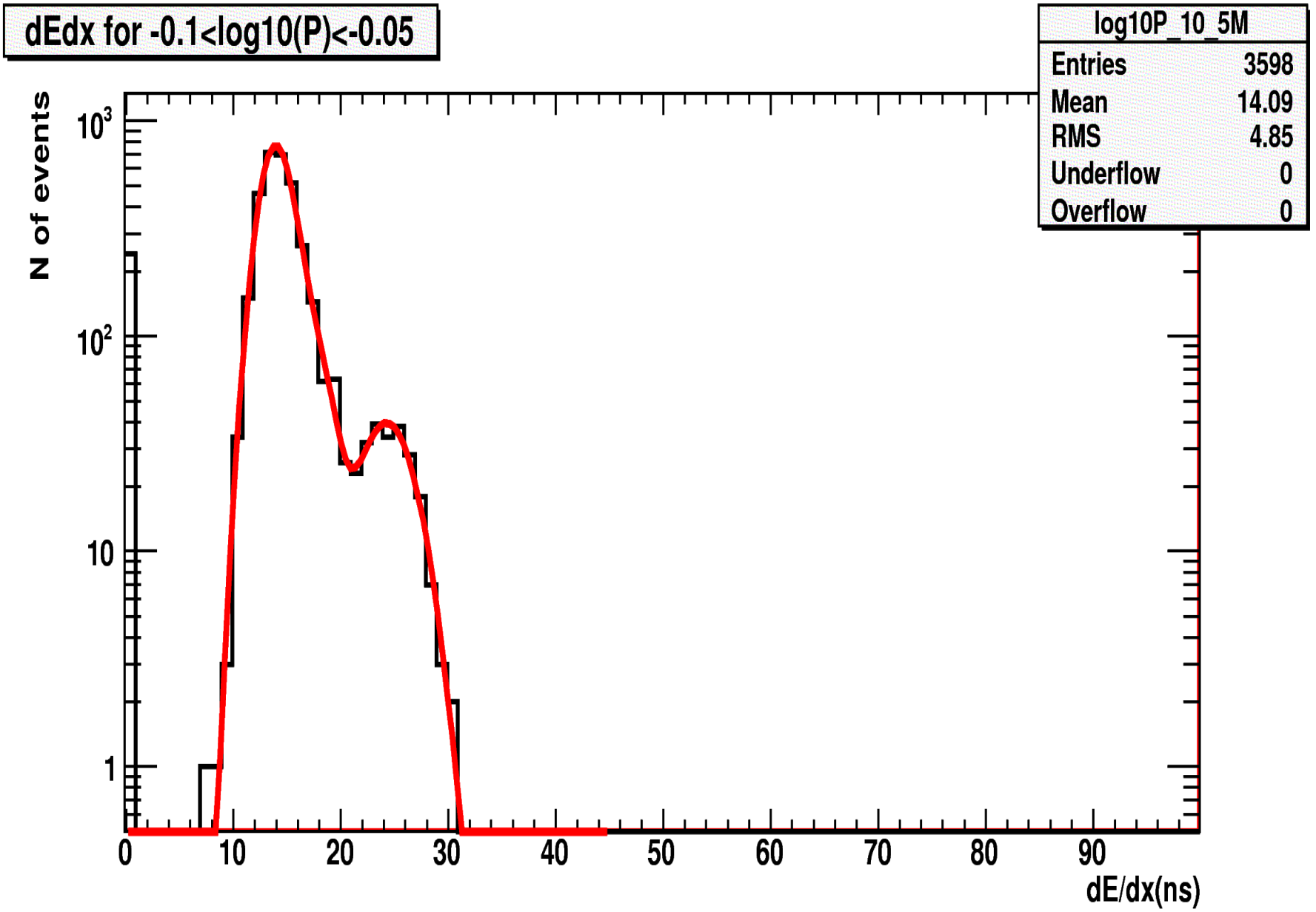


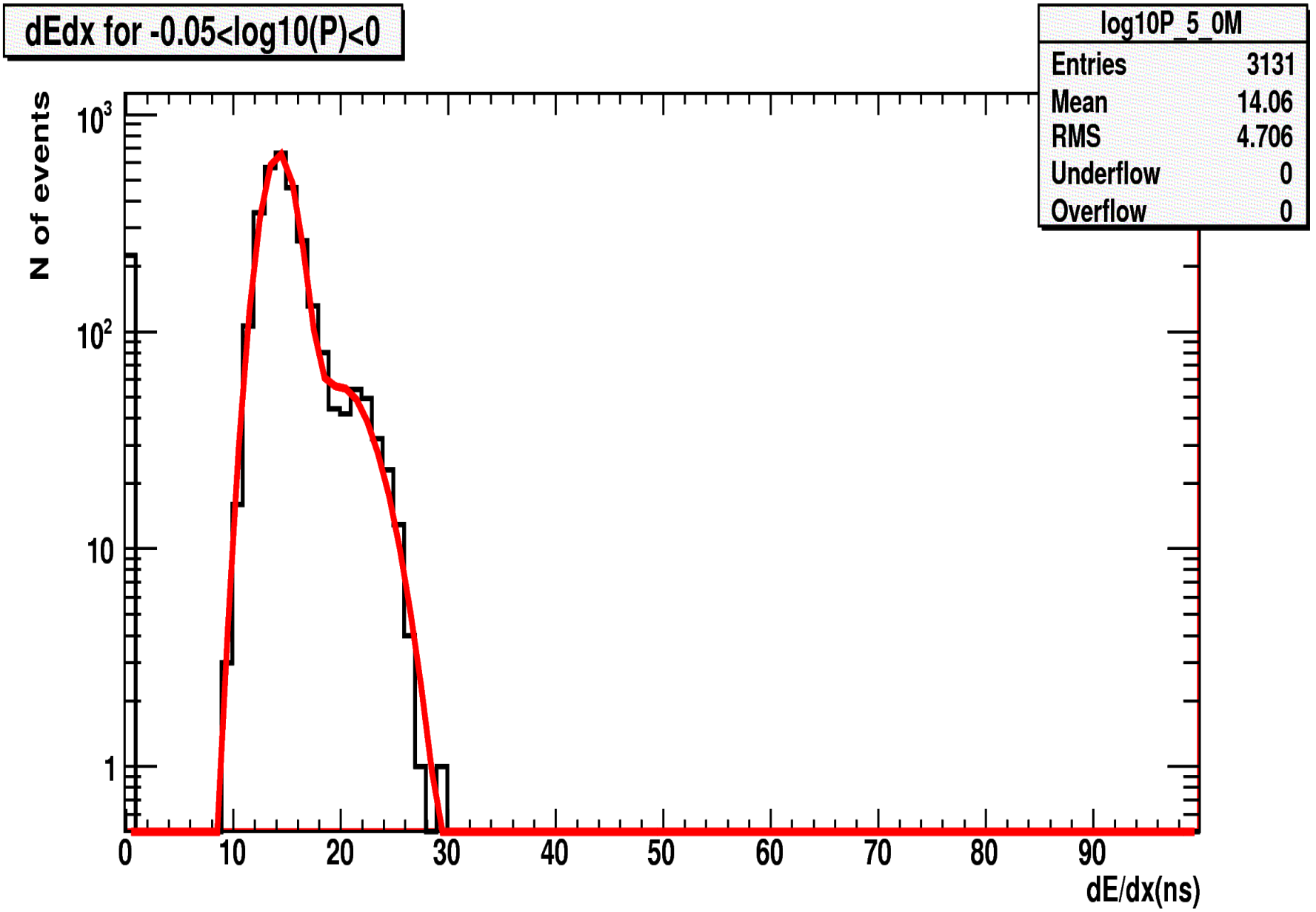
Negative particles



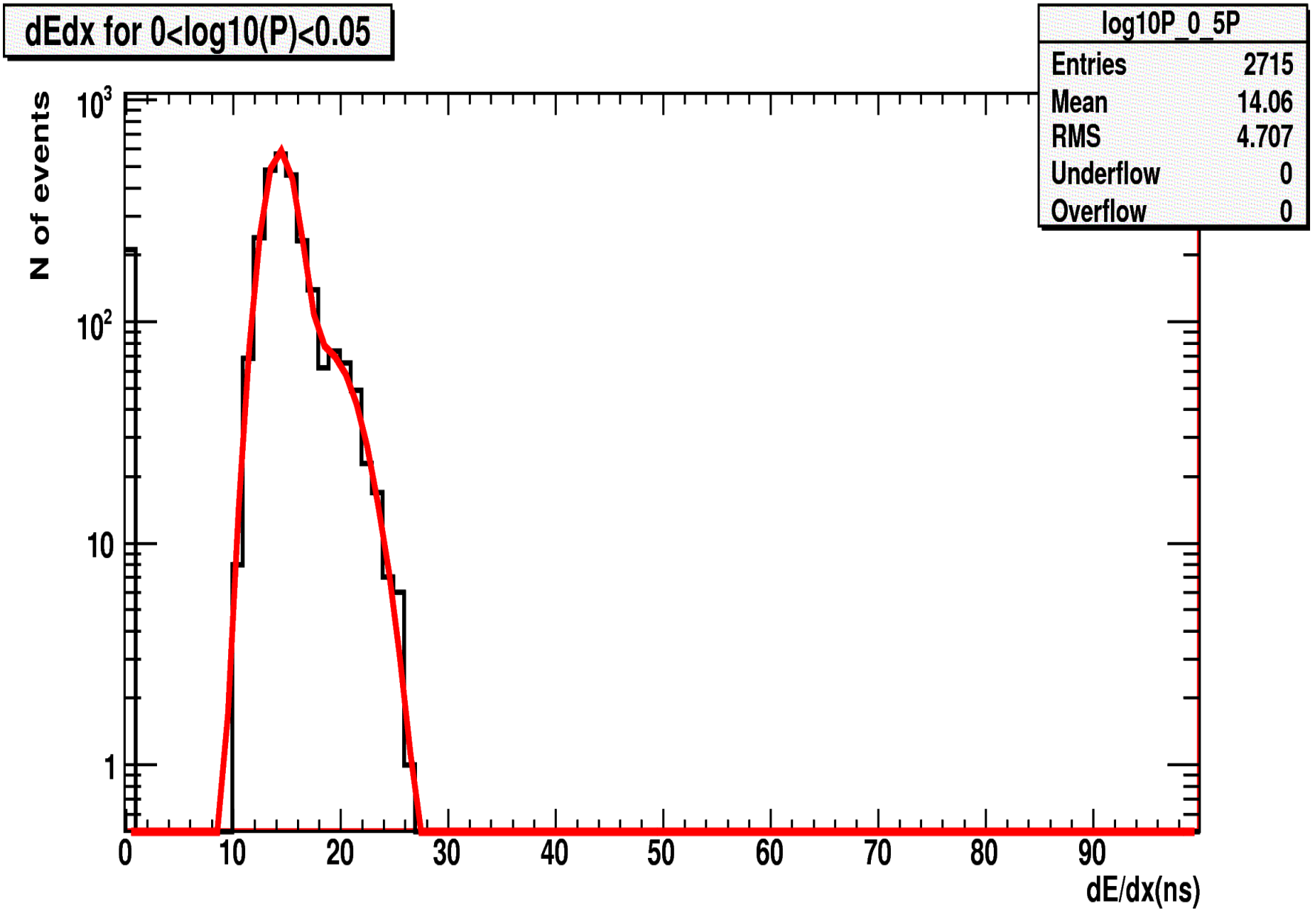
Negative particles



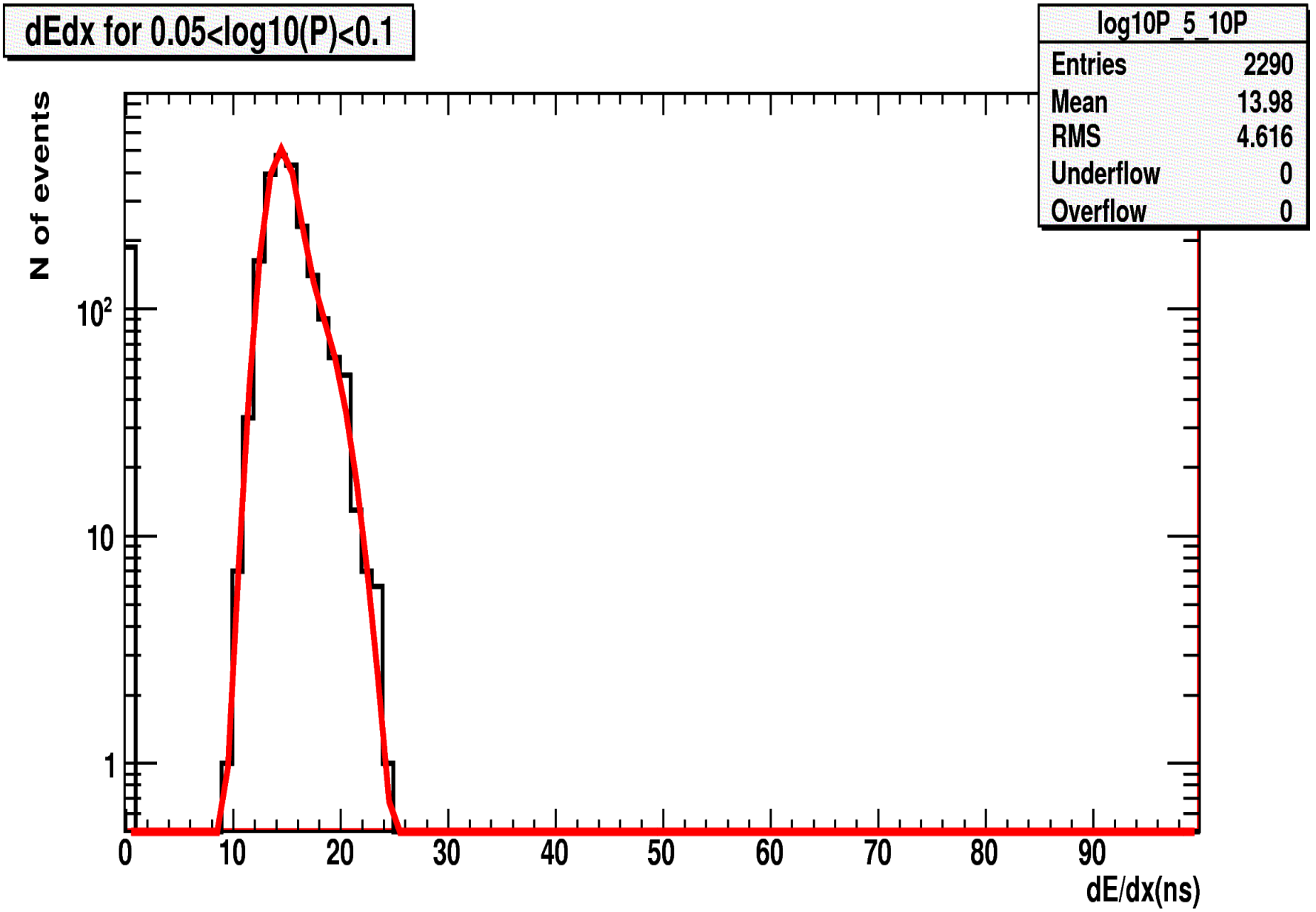
Negative particles



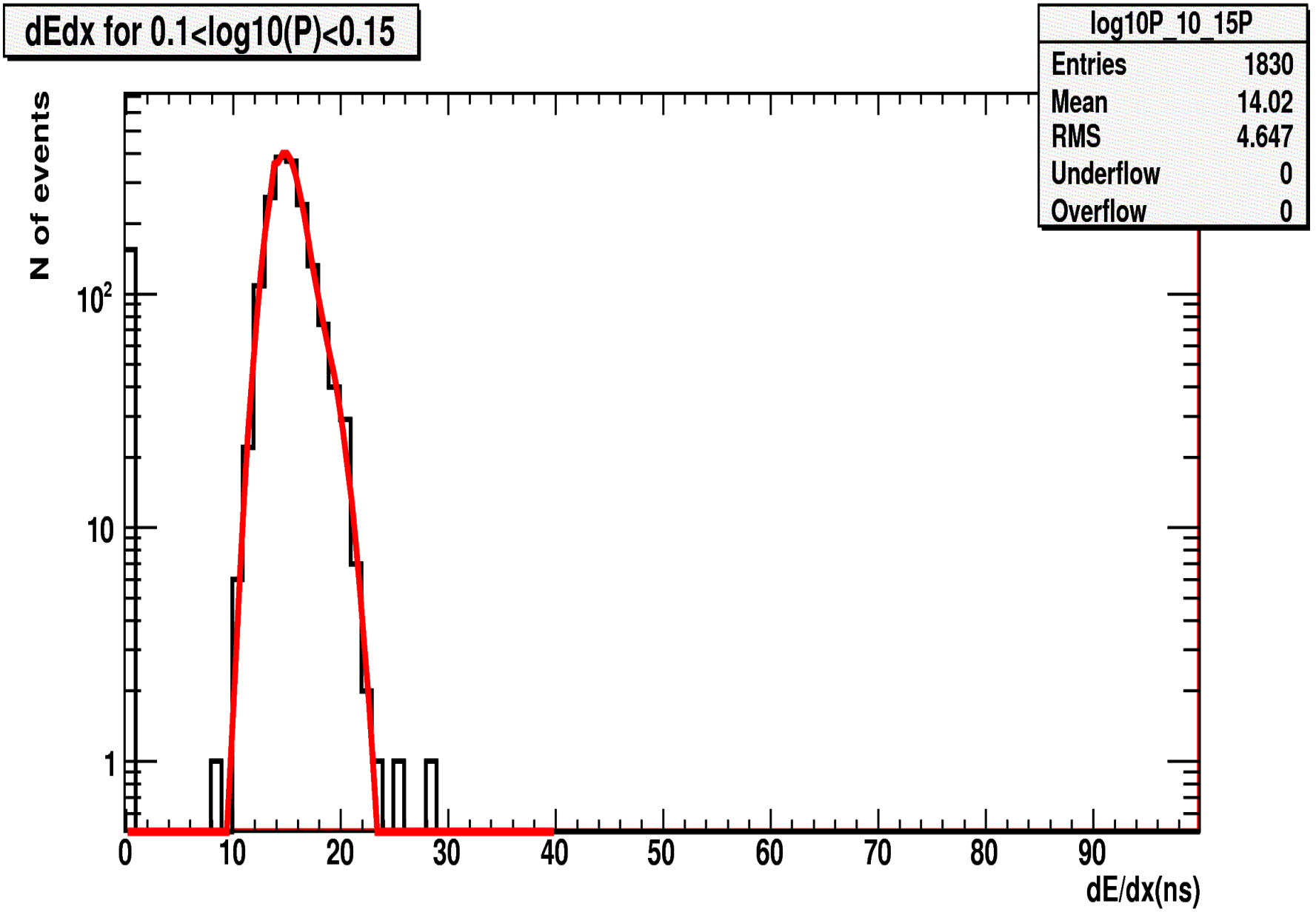
Negative particles



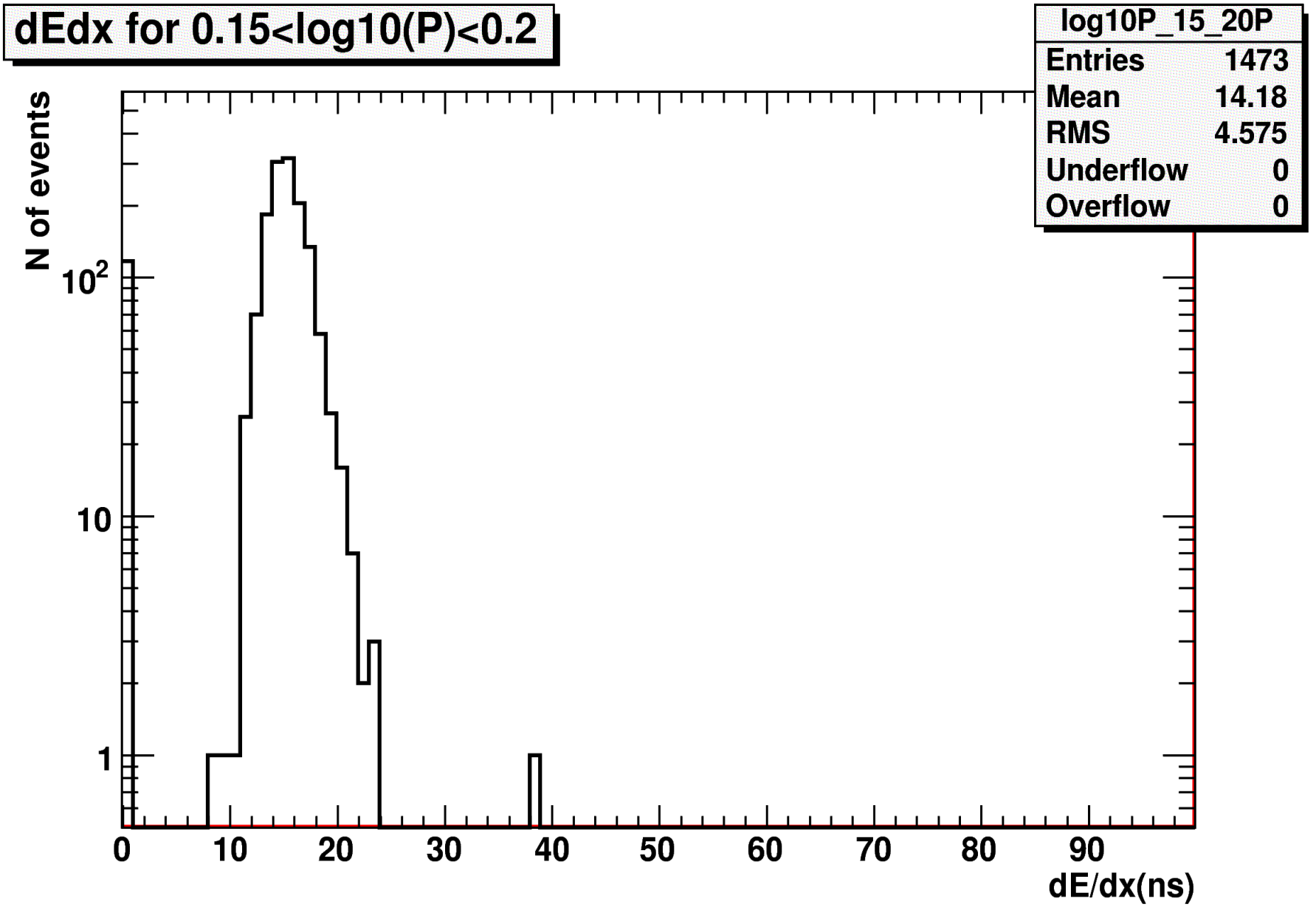
Negative particles



Negative particles



Negative particles



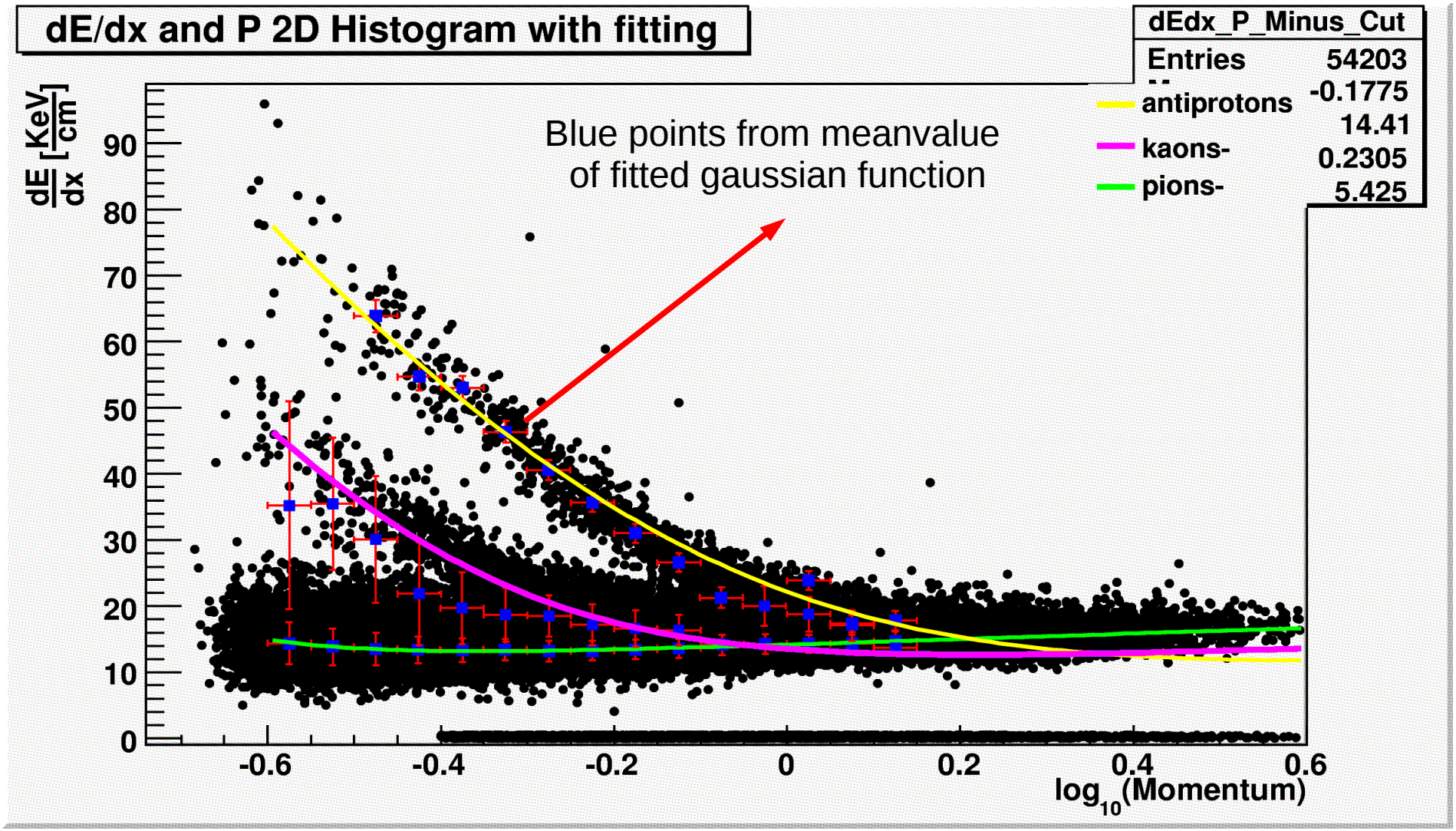
Fitting - universal curve parameterizations

CDF parametrization:

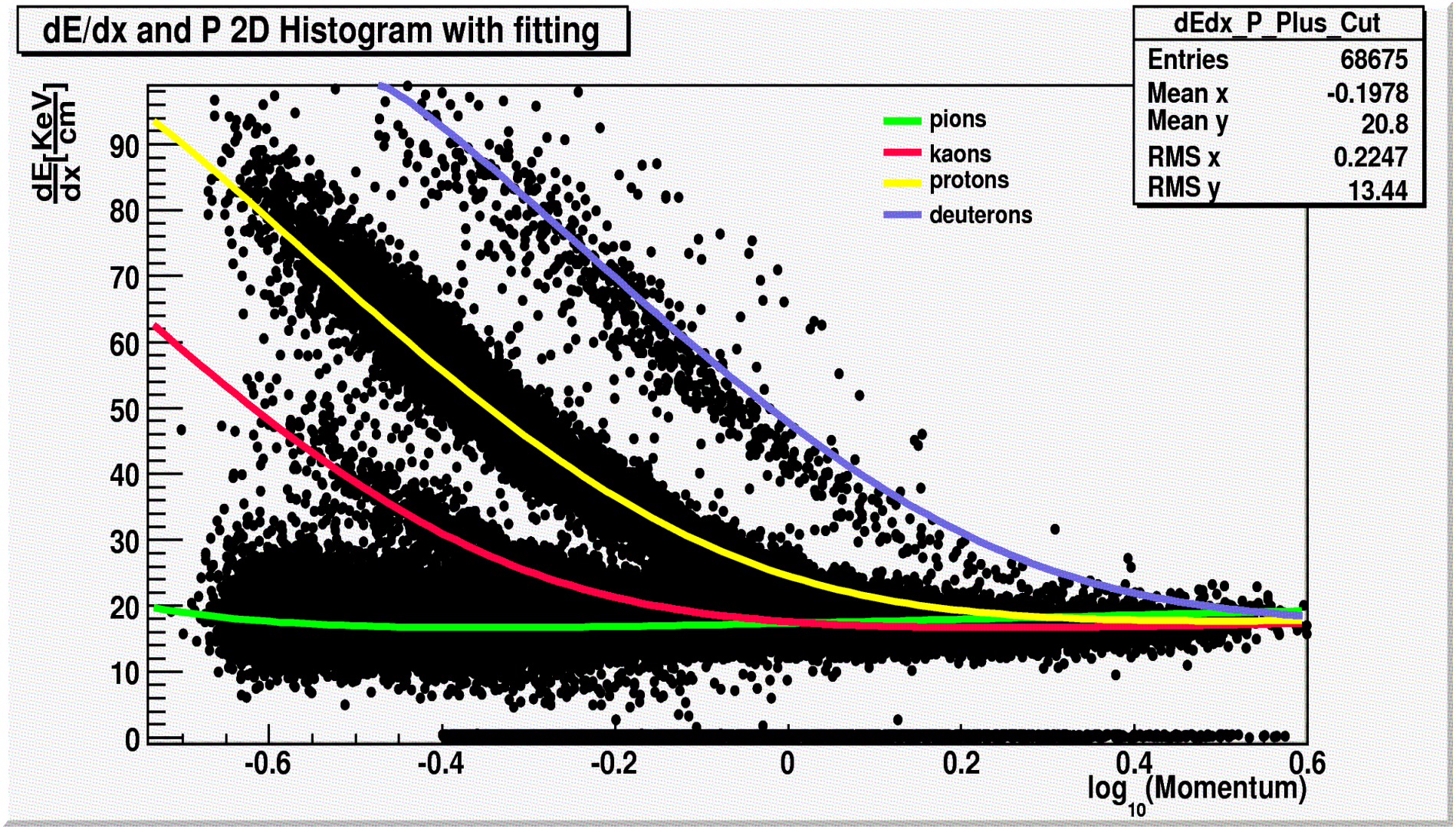
$$(c1*\log(x/(x+b)) + c0)/(t*t) + a1*(t-1) + a2*(t-1)*(t-1) + c$$

t – beta
x = momentum/mass

Negative particles



Positive particles

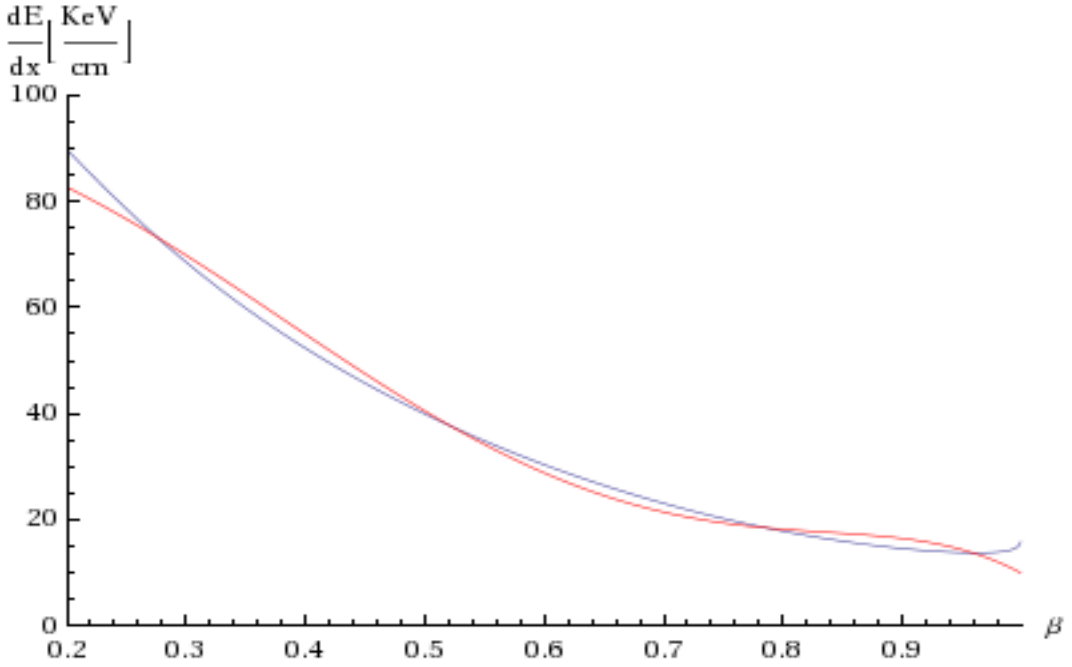


Miscellaneous

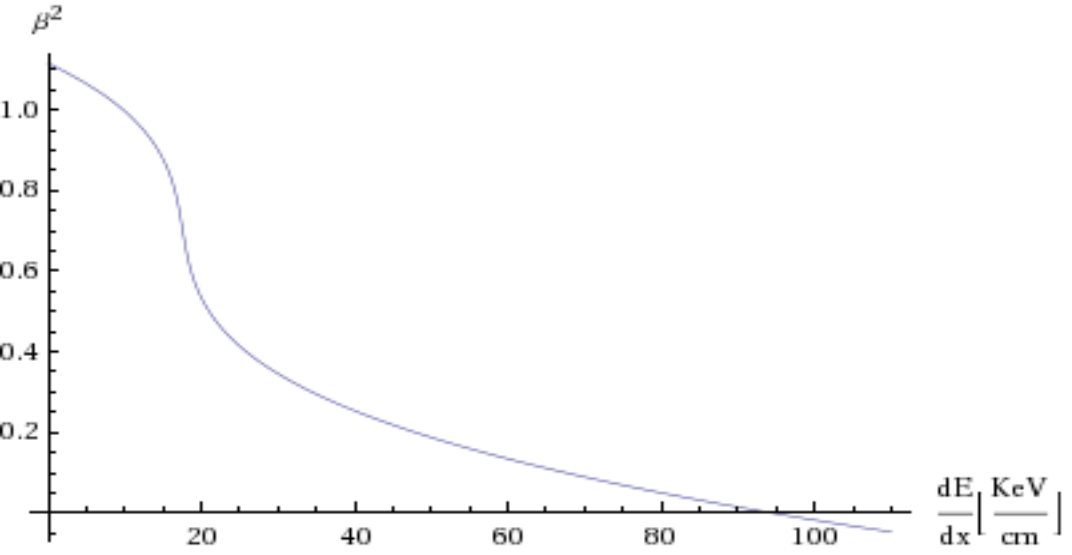
Artur Święch

Mass from dE/dx, derivation:

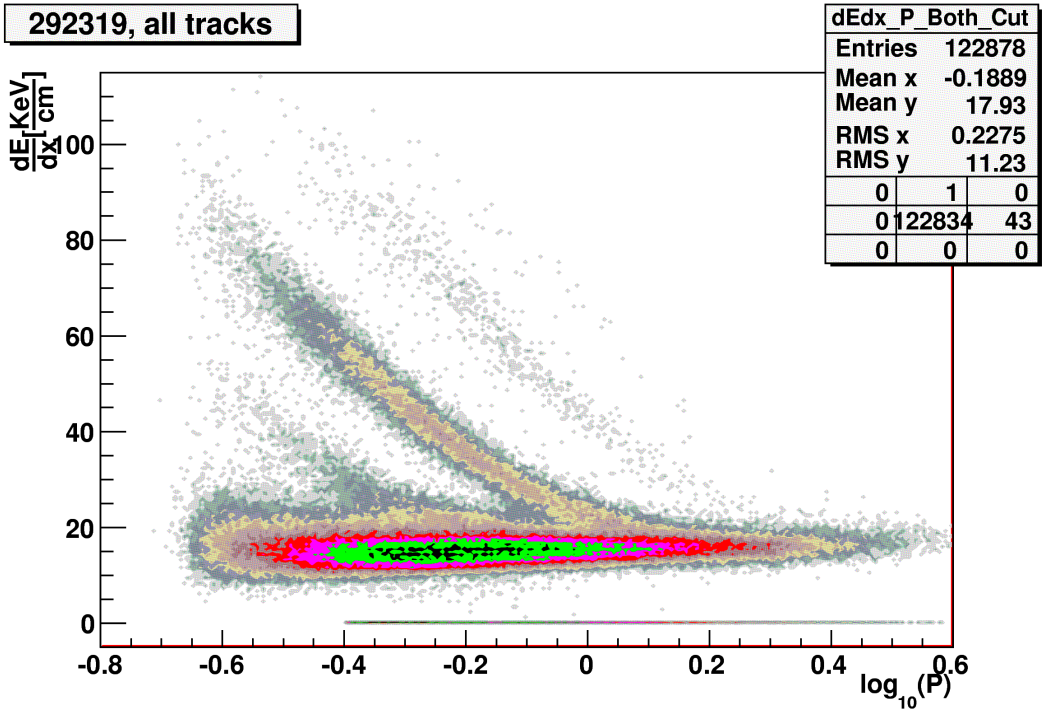
- „CDF” parametrization
  - dE/dx=(c1*log(x/(x+b))+c0)/(t*t) +a1*(t-1)+a2*(t-1)*(t-1)+c
    - x = beta*gamma, t = beta
- Aproximation (polynomial):
  - dE/dx=d0+d1*t^2+d2*t^4+d3*t^6
- Invert, and use to calculate mass:
  - m=sqrt((1-t^2)/t^2)*P



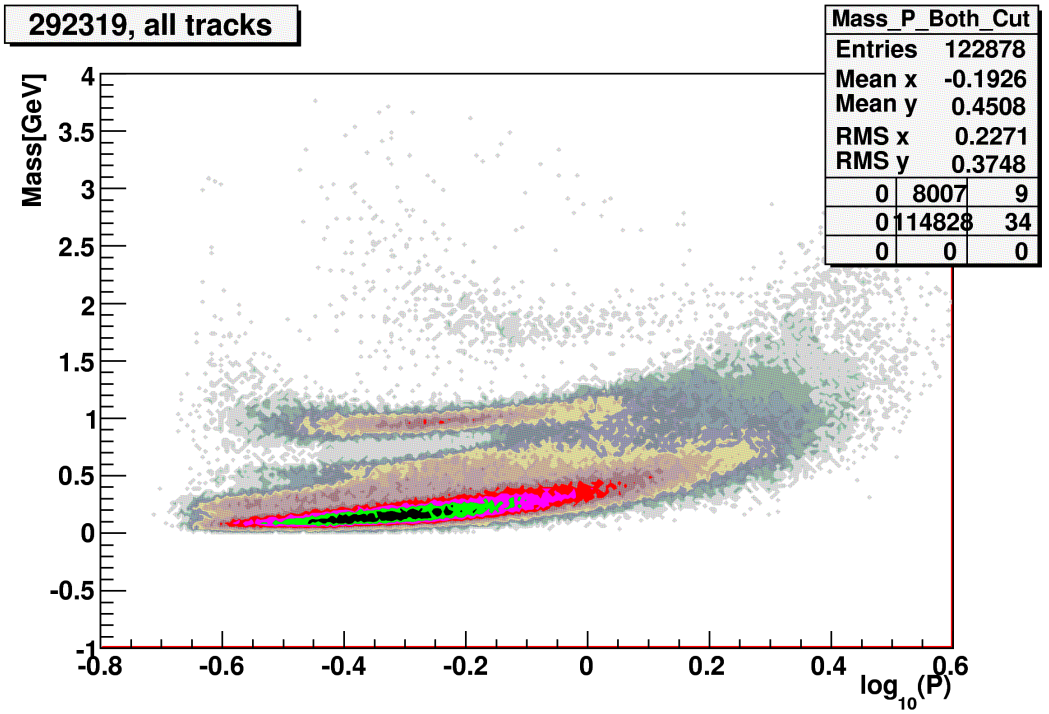
- Blue – CDF parametrization
- Red – Pol3 fit with respect to beta^2



- Result of inverting.
- Problems:
  - Beta>1
  - Beta<0



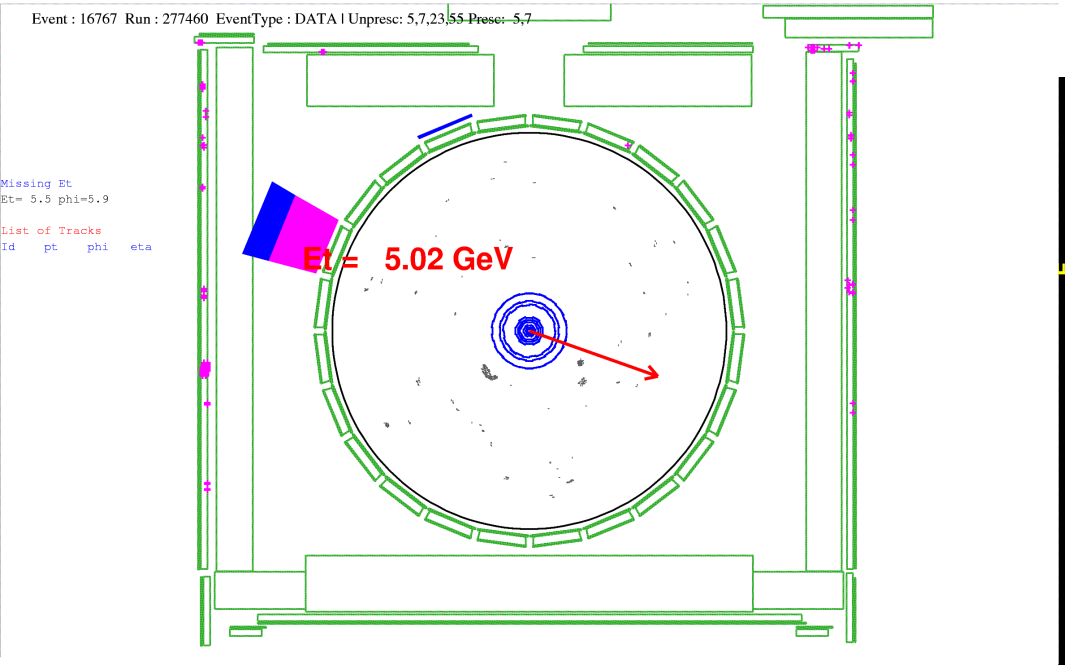
- dE/dx:
  - good looking
  - hard to parametrize

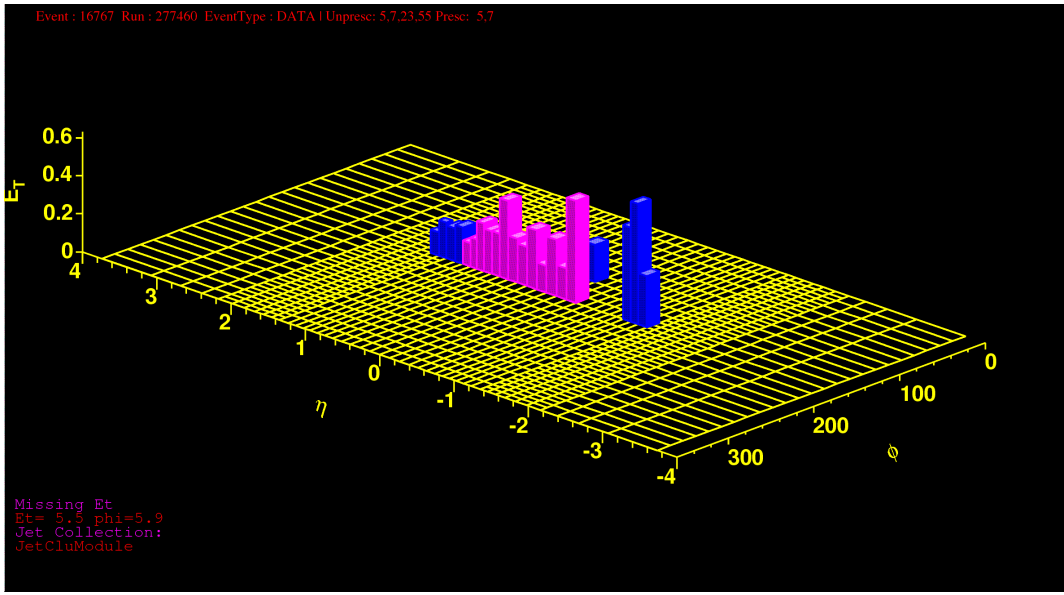


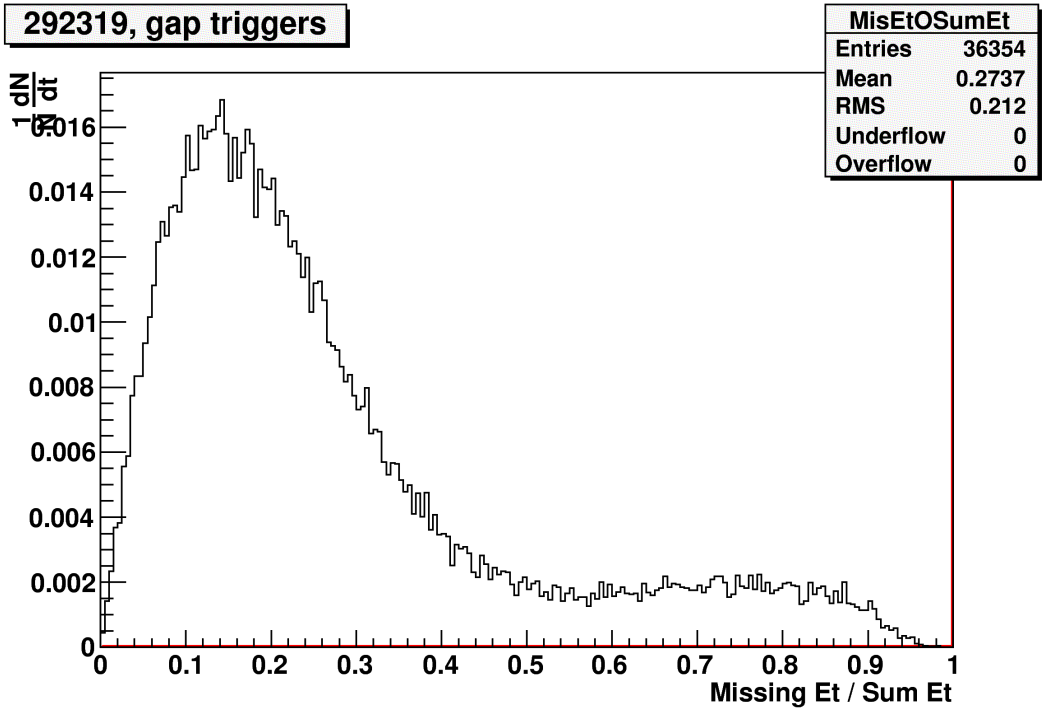
- Mass:
  - better to make slices
  - only aproximate can be obtained

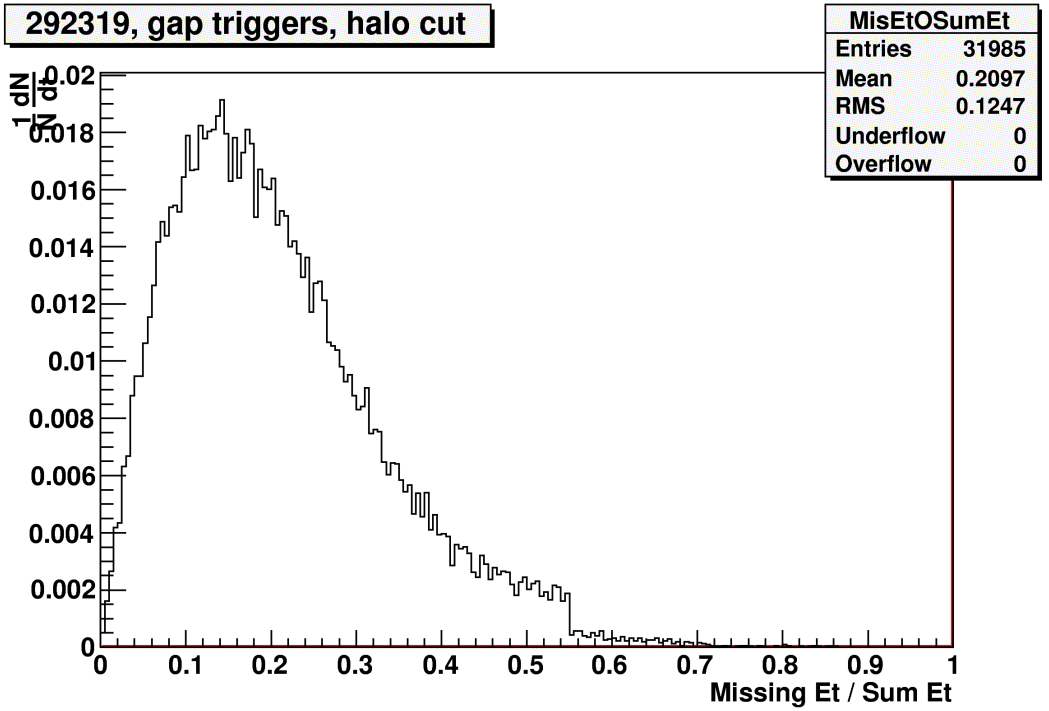
Beam halo cut

- Typical Beam Halo Event: (run 277460, 06/12/2009)
  - Big Missing Et
  - 0 tracks





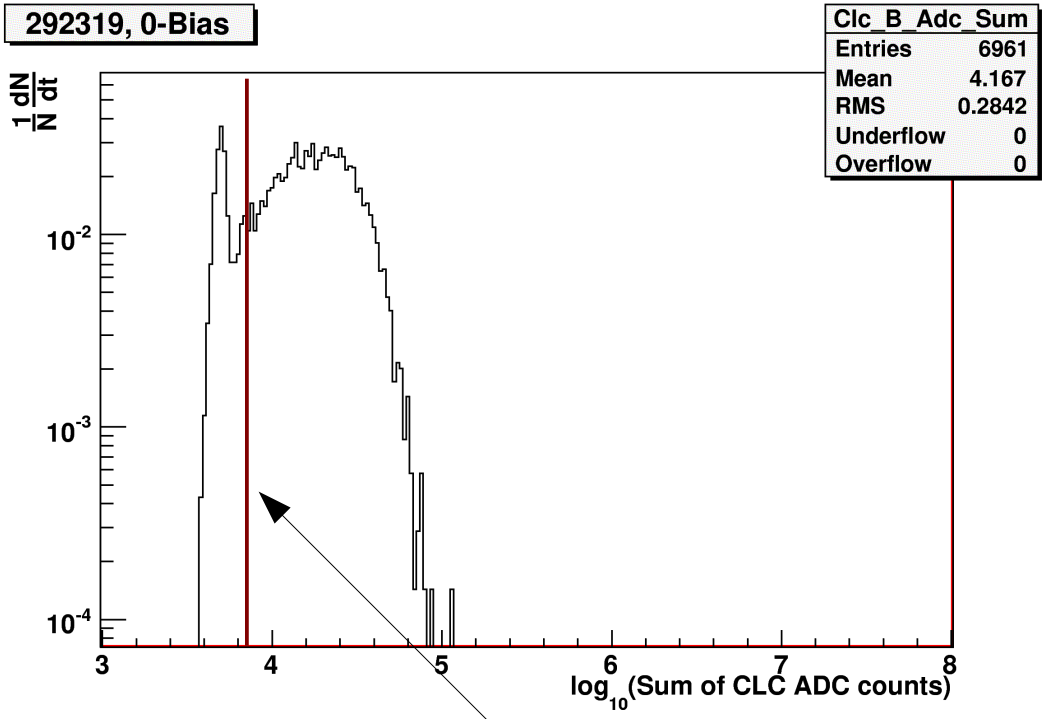


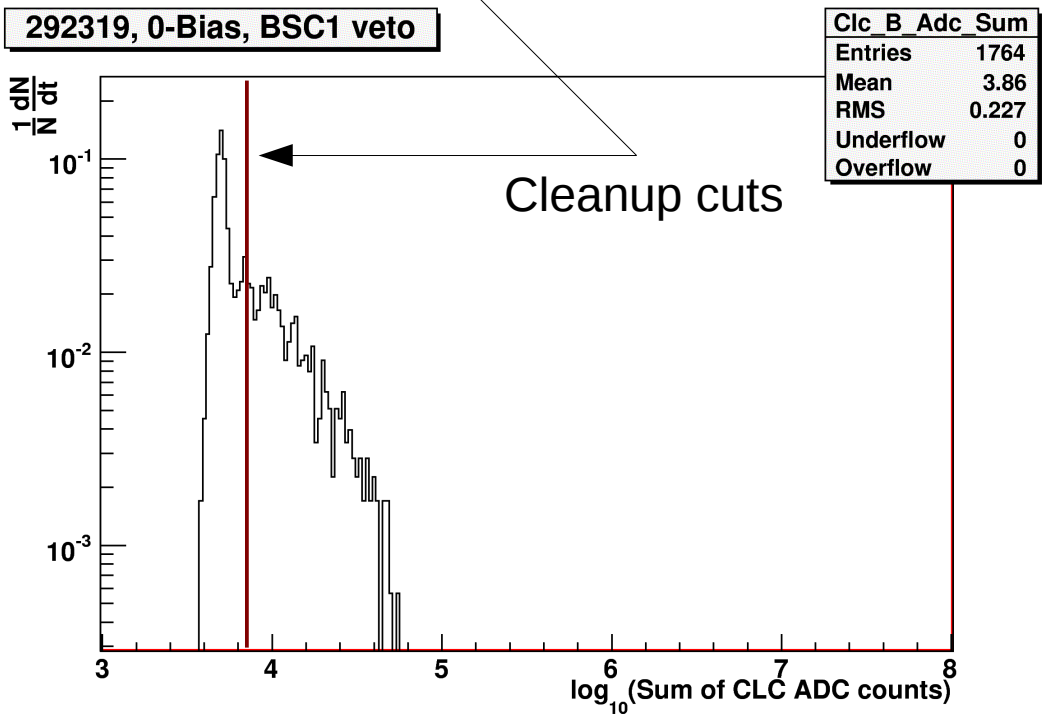


- Missing Et / Sum Et from whole calorimeter
- Proposed cut:
  - >0.55Missing/Sum Et AND
  - No Tracks
- ~12% of events

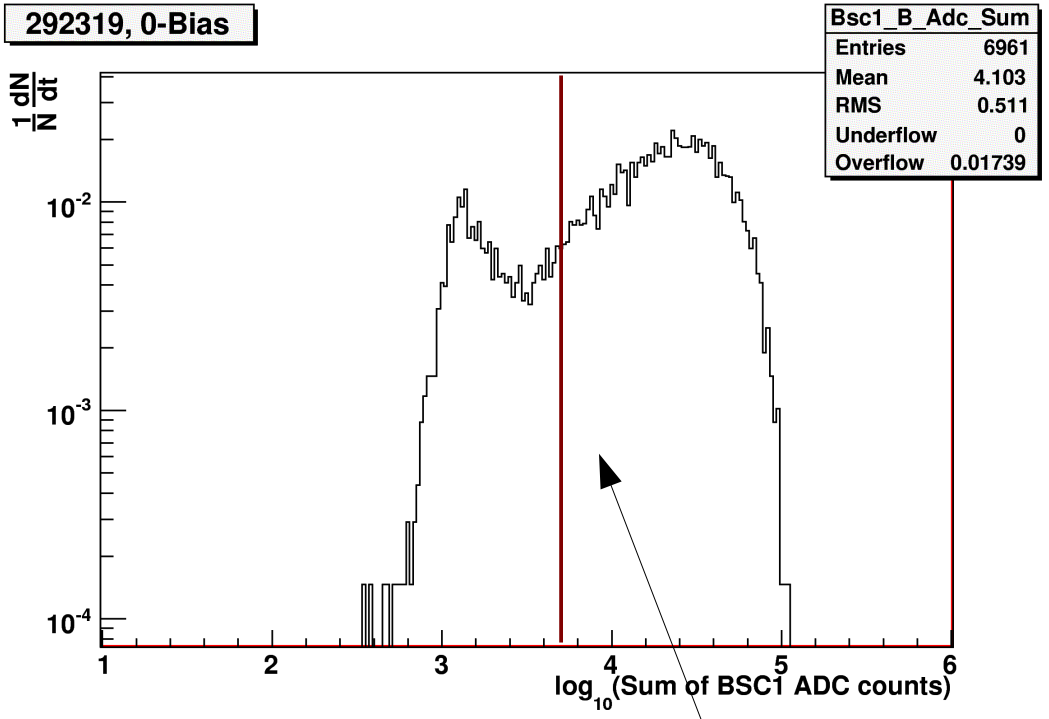
Middle gap

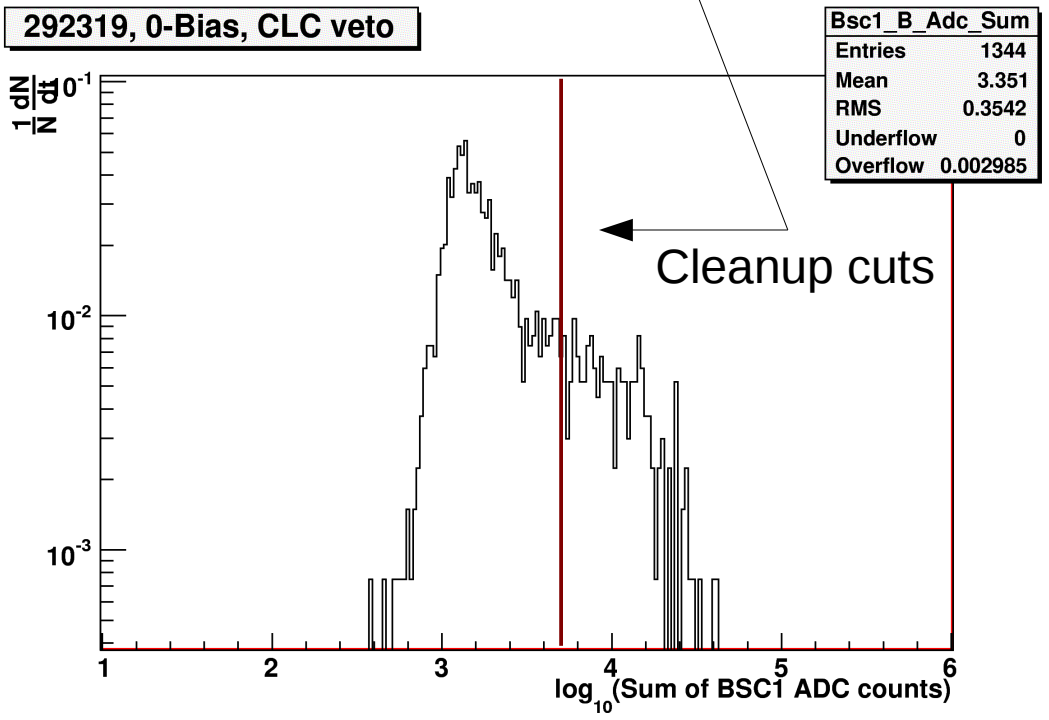
- BSC1 coverage:
  - 5.4<|eta|<5.9
- CLC coverage:
  - 3.7<|eta|<4.7
- Middle gap – uncovered region ~ 0.7 in eta
- Solutions:
  - Separate analysis of 0-bias X between 2 Gaps.
  - Additional detector for future (?)





- 0-Bias analysis
- Sum of CLC counts No cuts
- Sum of CLC counts with gap in BSC1





- Sum of BSC1 counts No cuts
- Sum of BSC1 counts with gap in CLC
- Region between should be quite empty (?)