E over P study

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E over P study

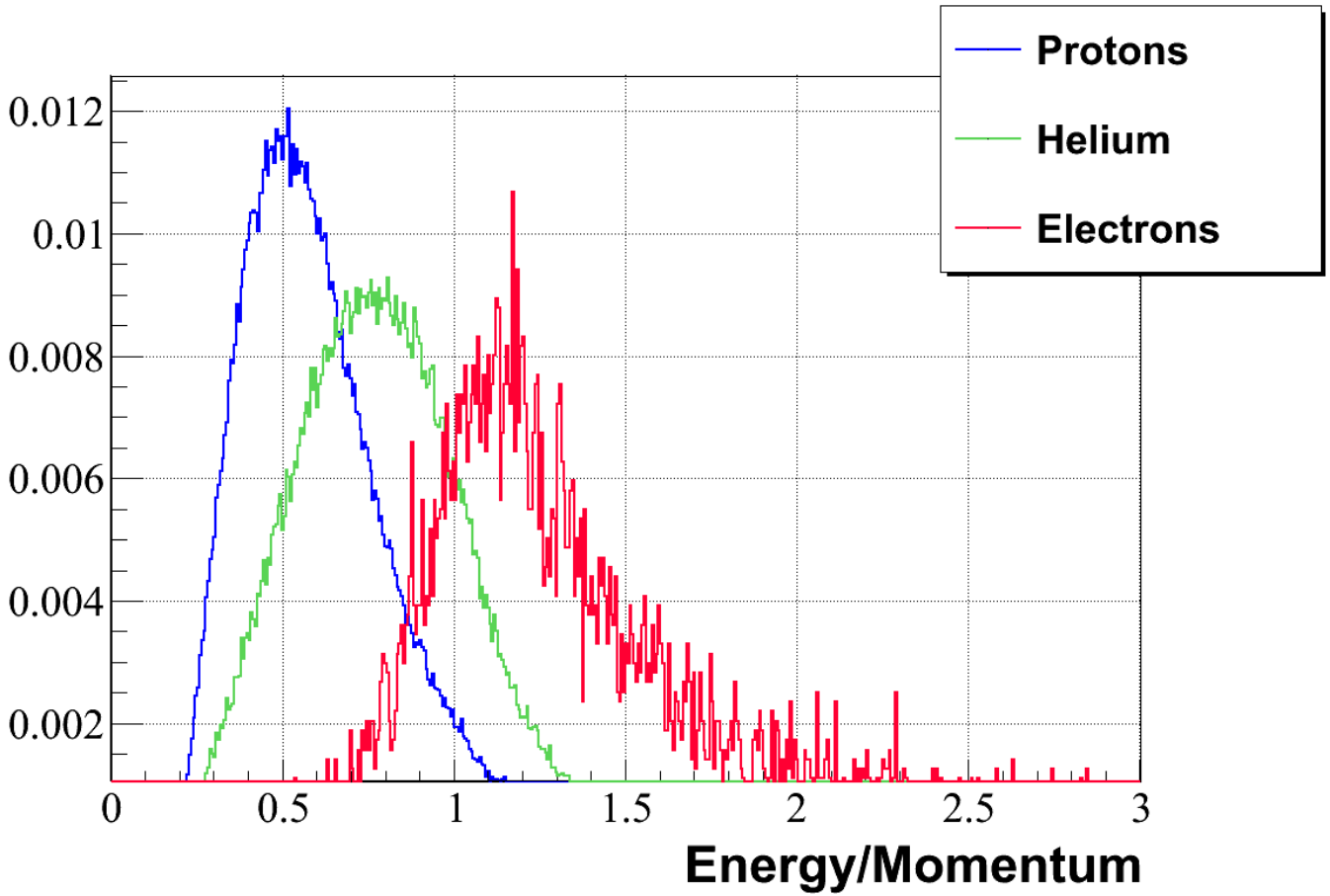
Study the energy-momentum match as function of time and energy (rigidity) for:

- Electrons
- Protons
- Helium

Data set: pass4 from 19/5/2011 to 26/11/2013
Independent study made by J. Feng.

Energy-momentum match

Example distribution for p, He, e^-. Energy between 20 and 80 GeV



Energy estimators

For this study: energy between 20 and 80 GeV.
Three energy estimators compared:

- EnergyE, aka getCorrectedEnergy(2,2)
- EnergyP, aka getCorrectedEnergy(2,0)
- EnergyA, aka getCorrectedEnergy(2,1)

For hadrons, also energy deposited is studied.

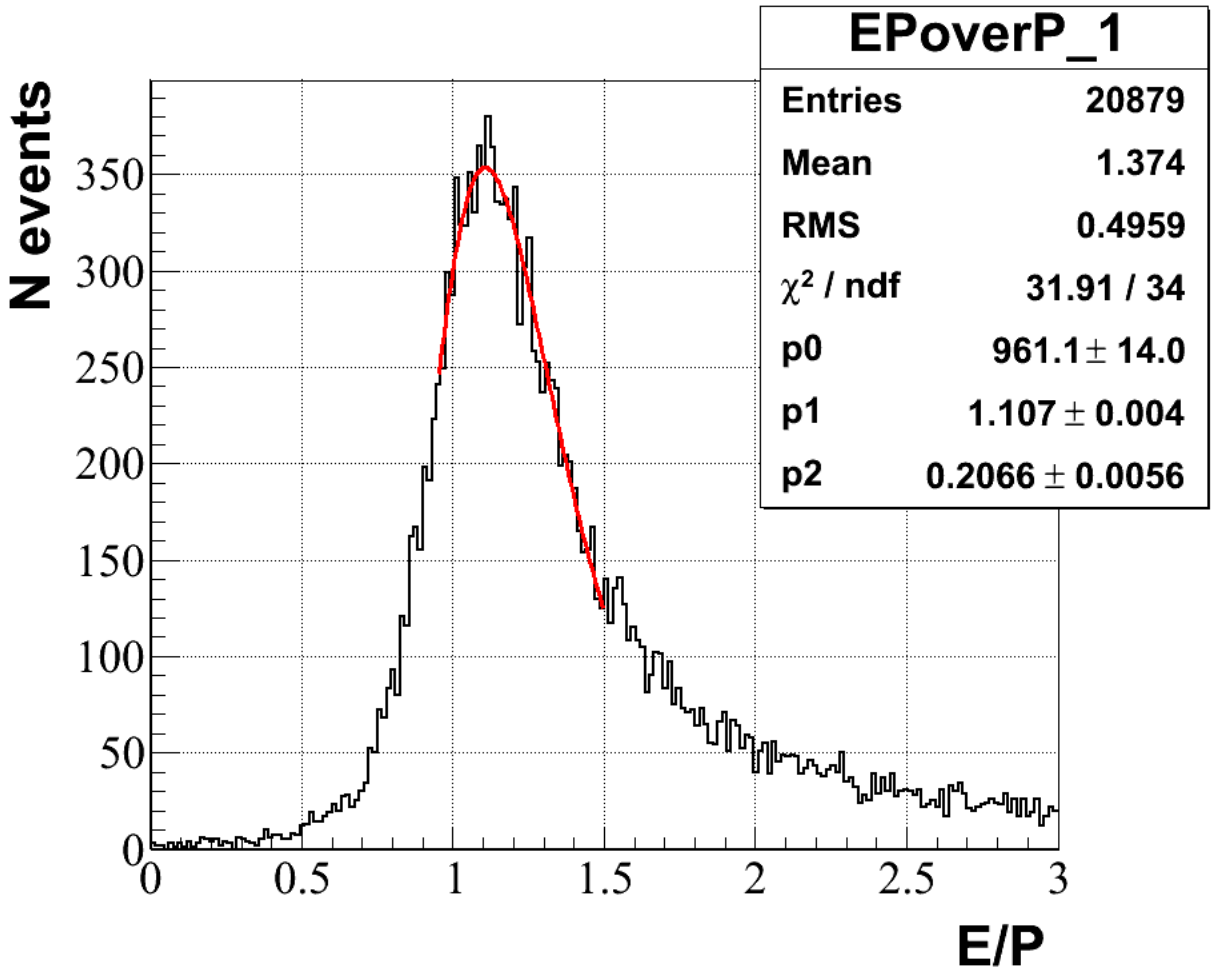
Electrons: event selection

- TOF: $beta > 0.5 || betaH > 0.5$
- Tracker: $N_{TRK} == 1$,Q_{TRK} <1.5, Negative rigidity (max span), $\chi^2(x, y) < 30$
- ECAL: no catastrophic leakage, BDT>0.
- TRD: Likelihood ratio(e,p) < 0.7, Likelihood ratio(e,He) < 0.7, Nhits> 8, $N_{Tracks} == 1$
- ECAL-TRD match: $\Delta x < 5$ cm, $\Delta y < 10$ cm
- Extrapolated ECAL shower within 30 cm from TRD center
- ECAL-TRK match: $\Delta x < 5$ cm, $\Delta y < 10$ cm

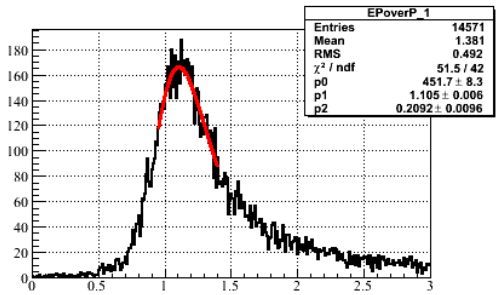
Electrons: Energy-momentum match

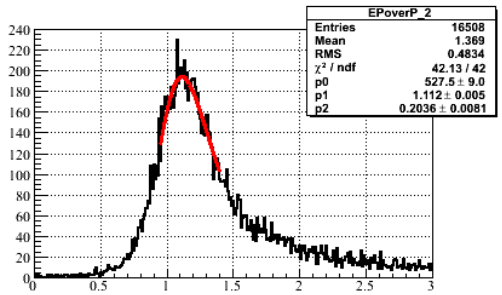
Formula used to fit the E/P distribution

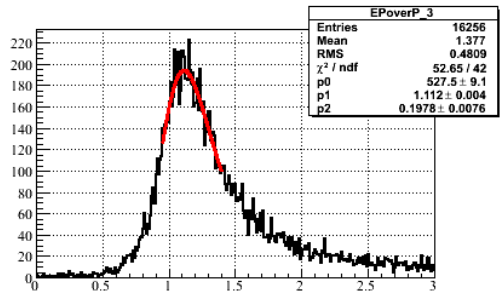
$[0] * exp(([1] - x)/[2] - exp(([1] - x)/[2]))$"

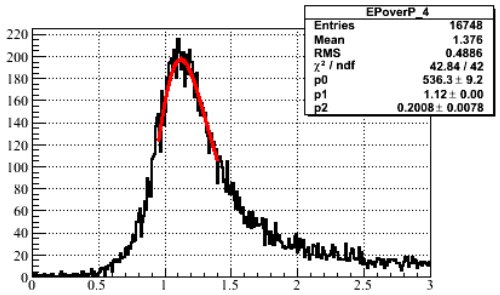


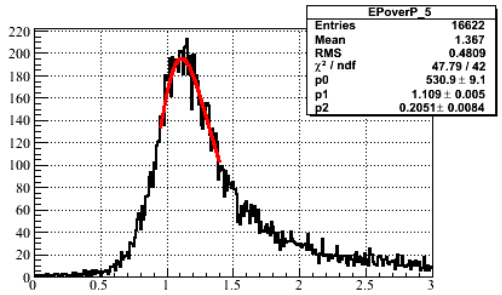
Electrons: E/P distribution for different periods

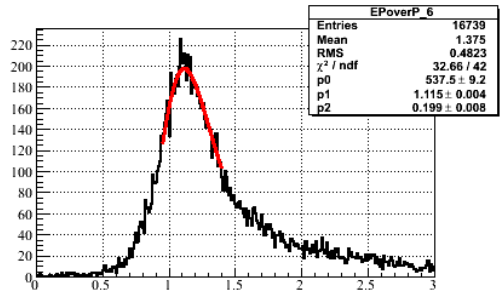


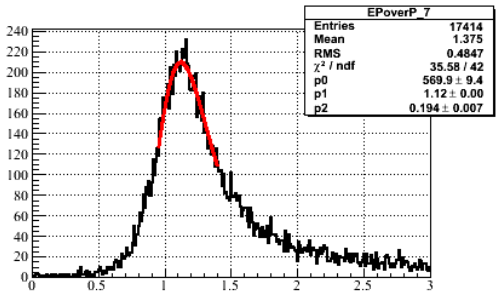


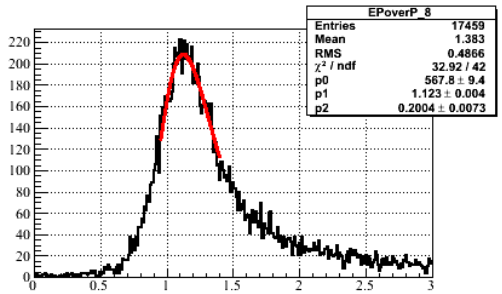


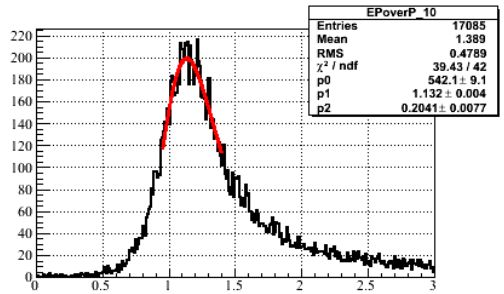






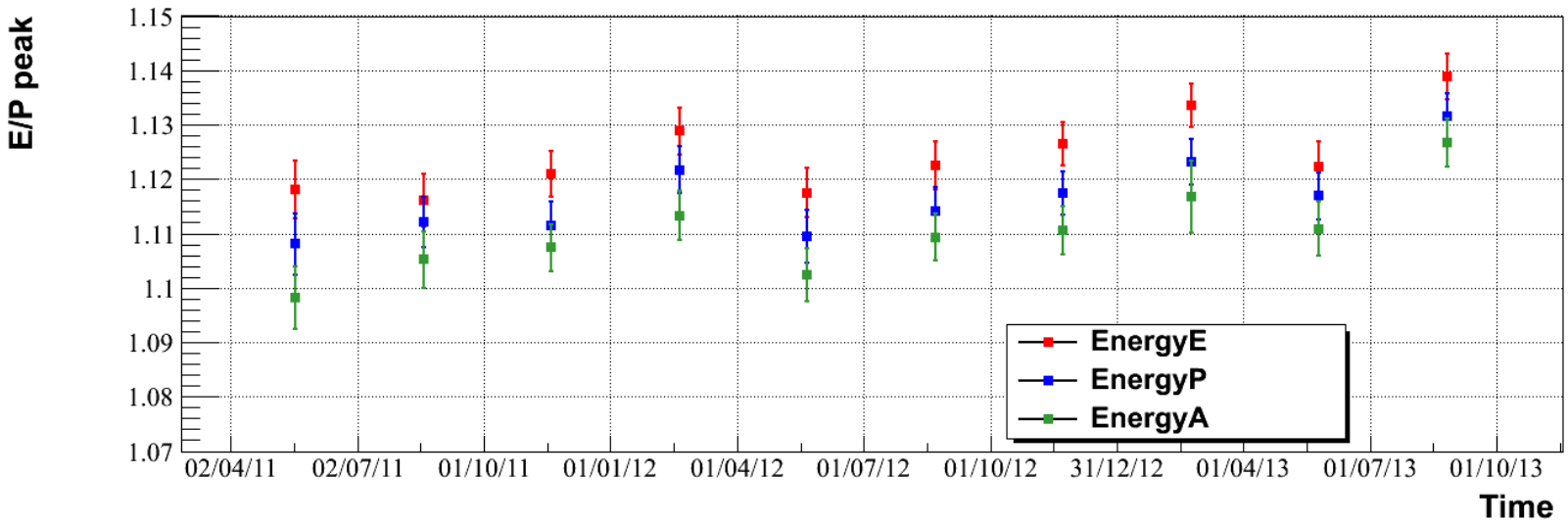




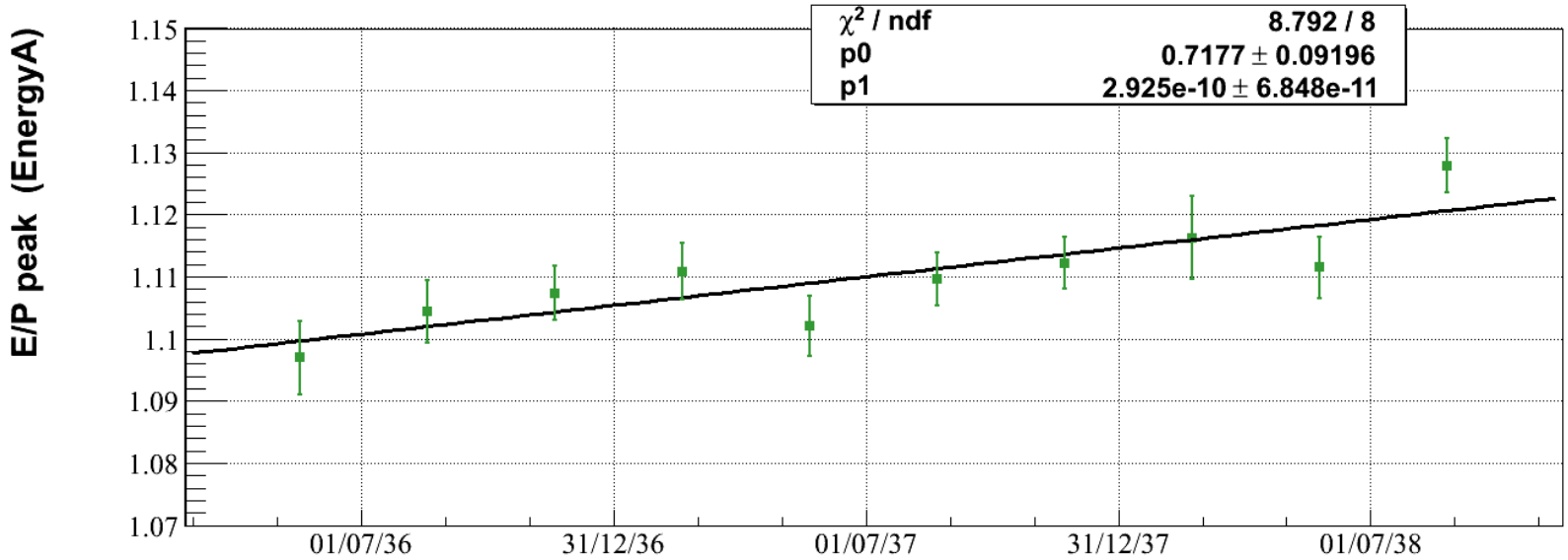


Electrons: Energy-momentum match peak vs time

1 bin every 3 months.



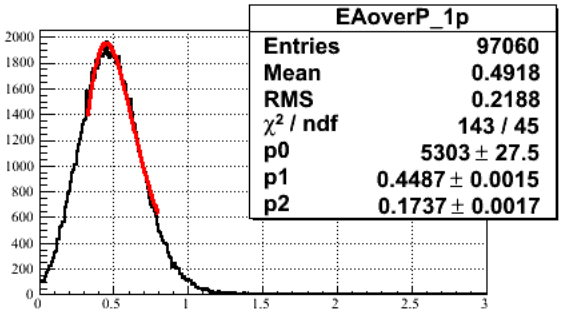
Energy-momentum match peak vs time (fit to a pol1)

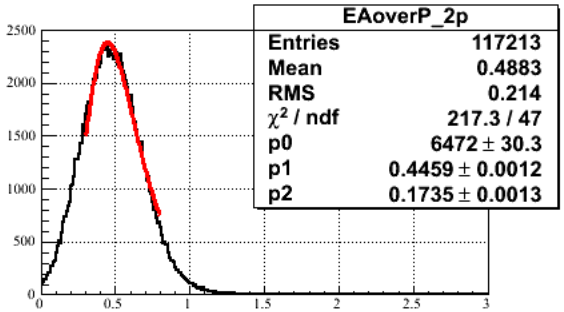


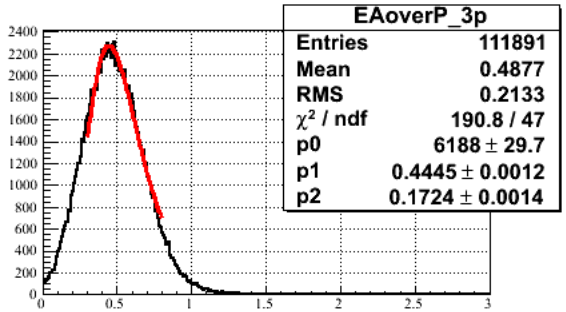
Protons: events selection

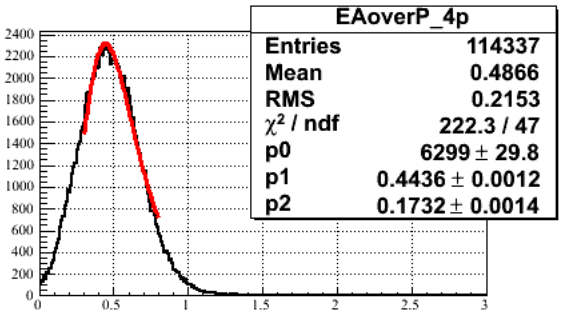
- TOF: $beta > 0.5 || betaH > 0.5$
- Tracker: $N_{TRK} == 1$,$Q_{TRK} < 1.5$, Positive rigidity (max span) L2, $\chi^2(x, y) < 30$
- ECAL: no catastrophic leakage
- TRD: Likelihood ratio(e,p) > 0.8, Nhits> 8, $N_{Tracks} == 1$

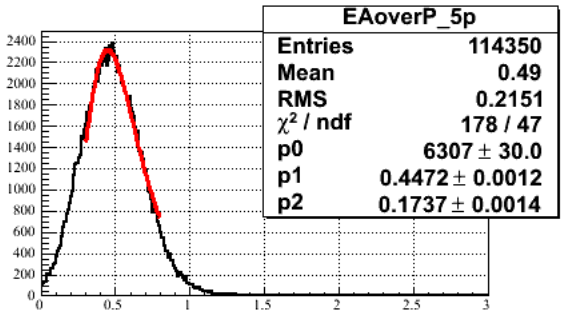
Protons: Energy-momentum peak vs time

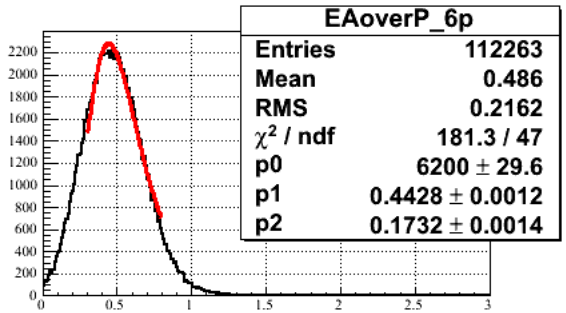


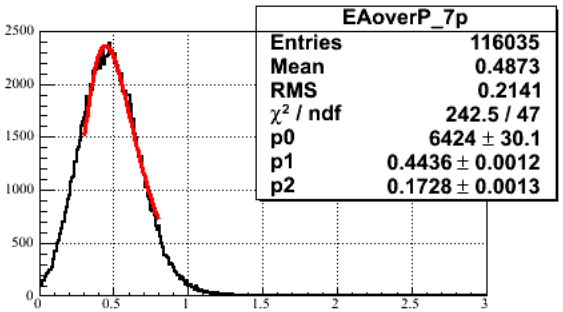


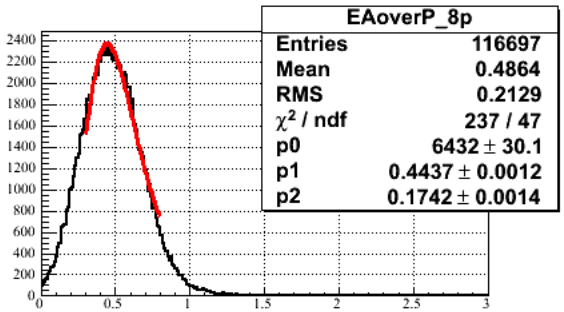


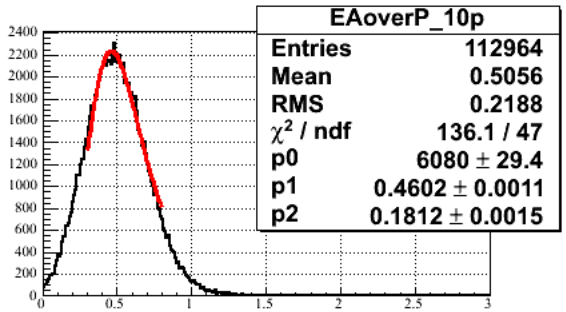






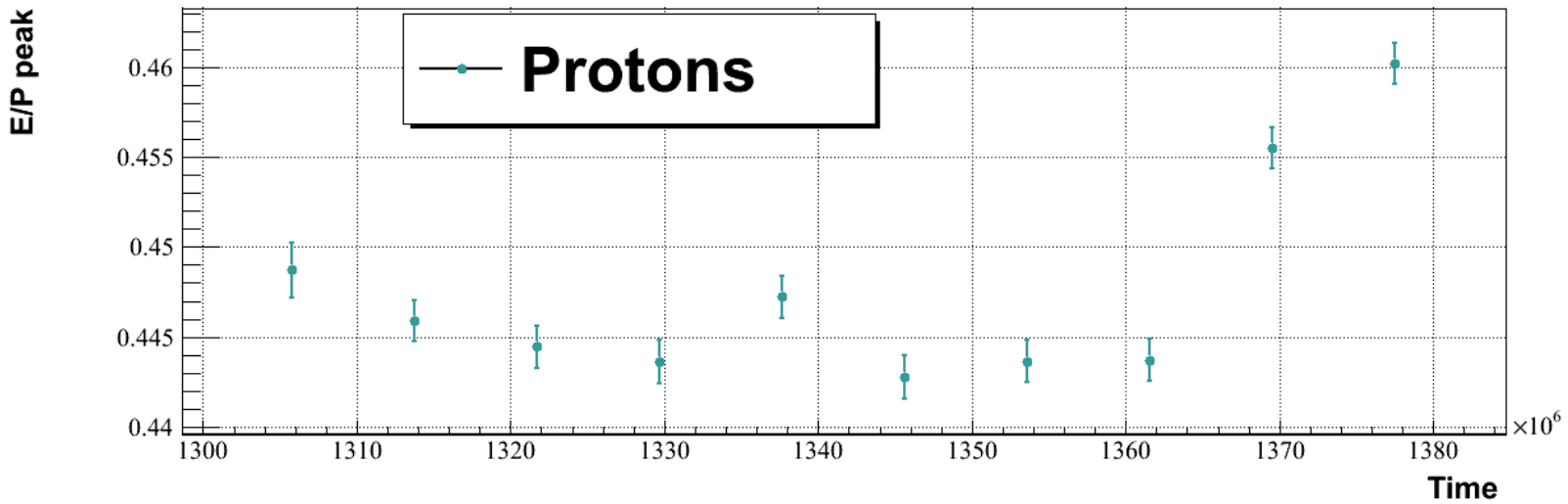






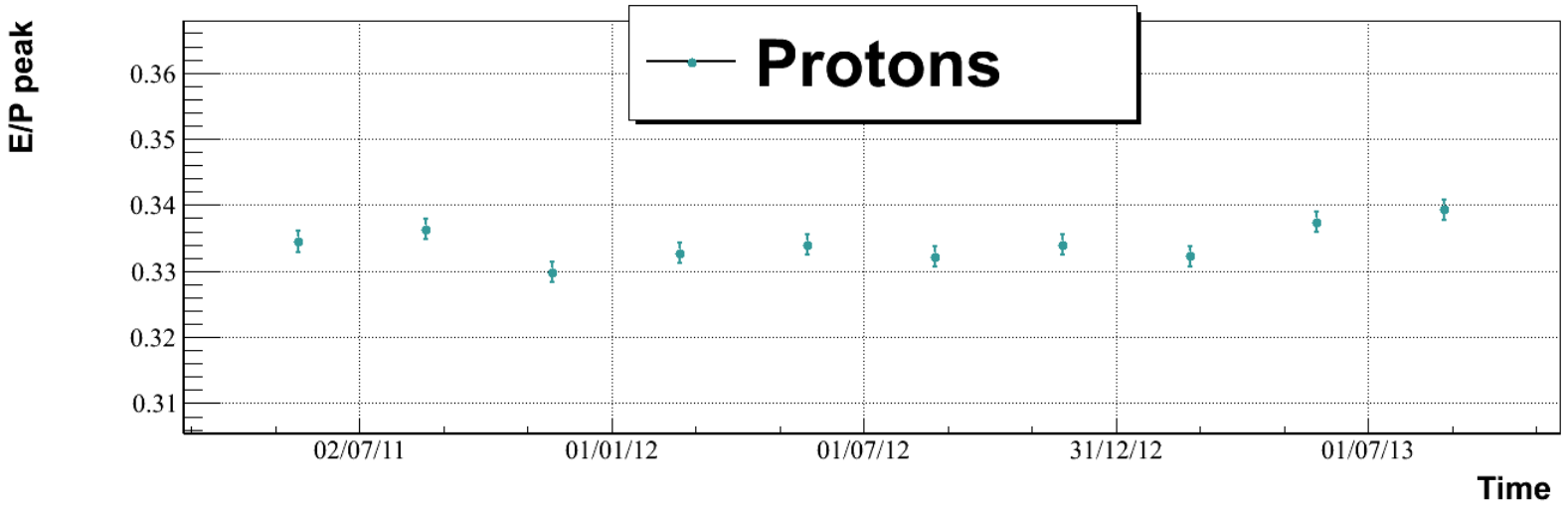
Protons: E/P peak vs time

Energy reconstructed (Energy A)



Protons: E/P peak vs time

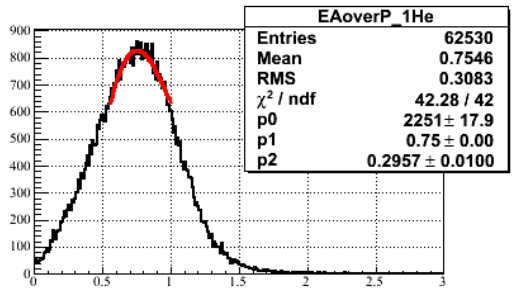
Energy deposited

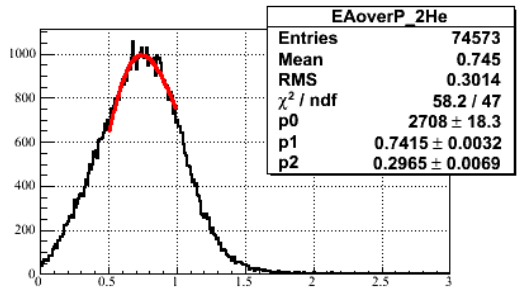


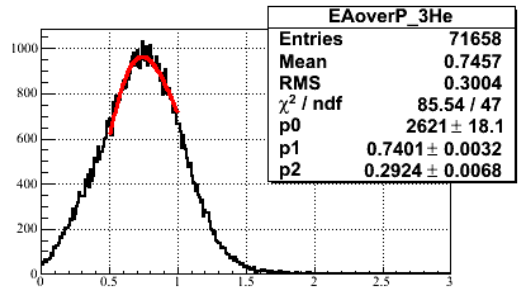
Helium: events selection

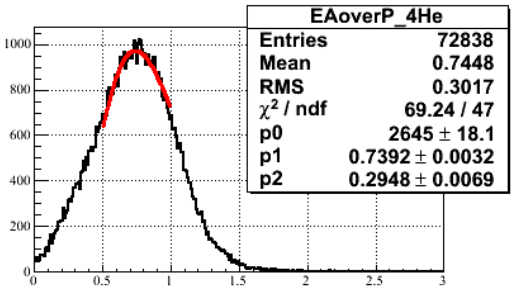
- TOF: $beta > 0.5 || betaH > 0.5$, $Q_{L0} > 1.8$ $||Q_{L1} > 1.8$, $Q_{L0} < 2.5$ $||Q_{L1} < 2.5$
- Tracker: $N_{TRK} == 1$,$1.8 < Q_{TRK} < 2.5$, Positive rigidity (max span) L1||L2||L9, $\chi^2(x, y) < 30$
- ECAL: no catastrophic leakage, ESE<-0.2

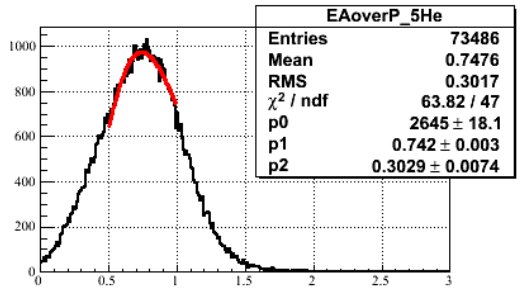
Helium: E/P distribution for different periods

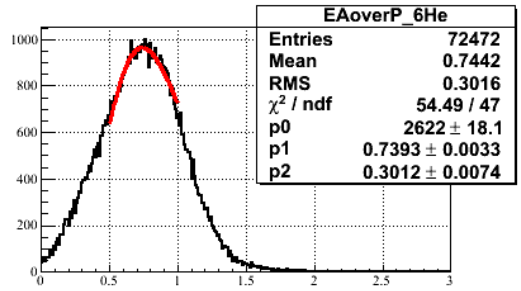


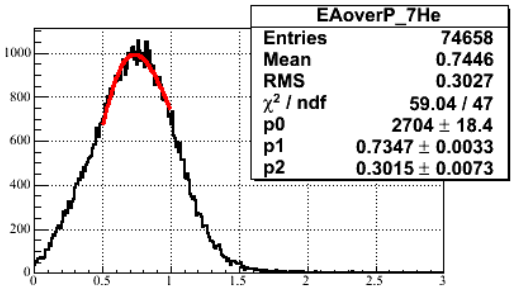


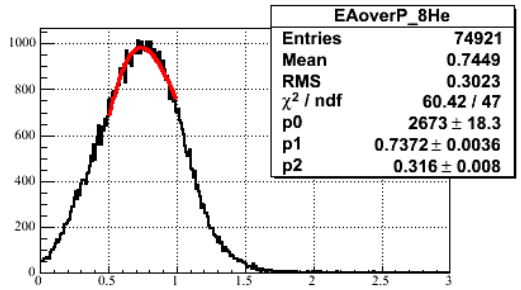


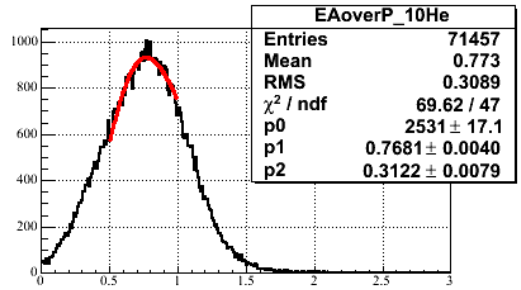






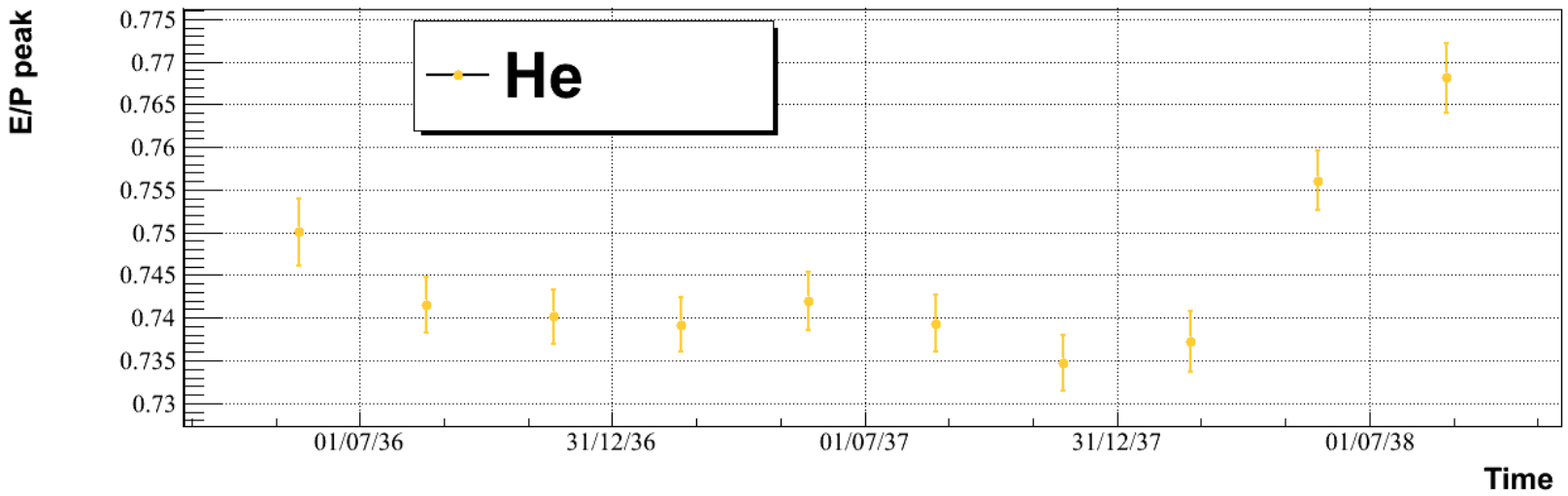






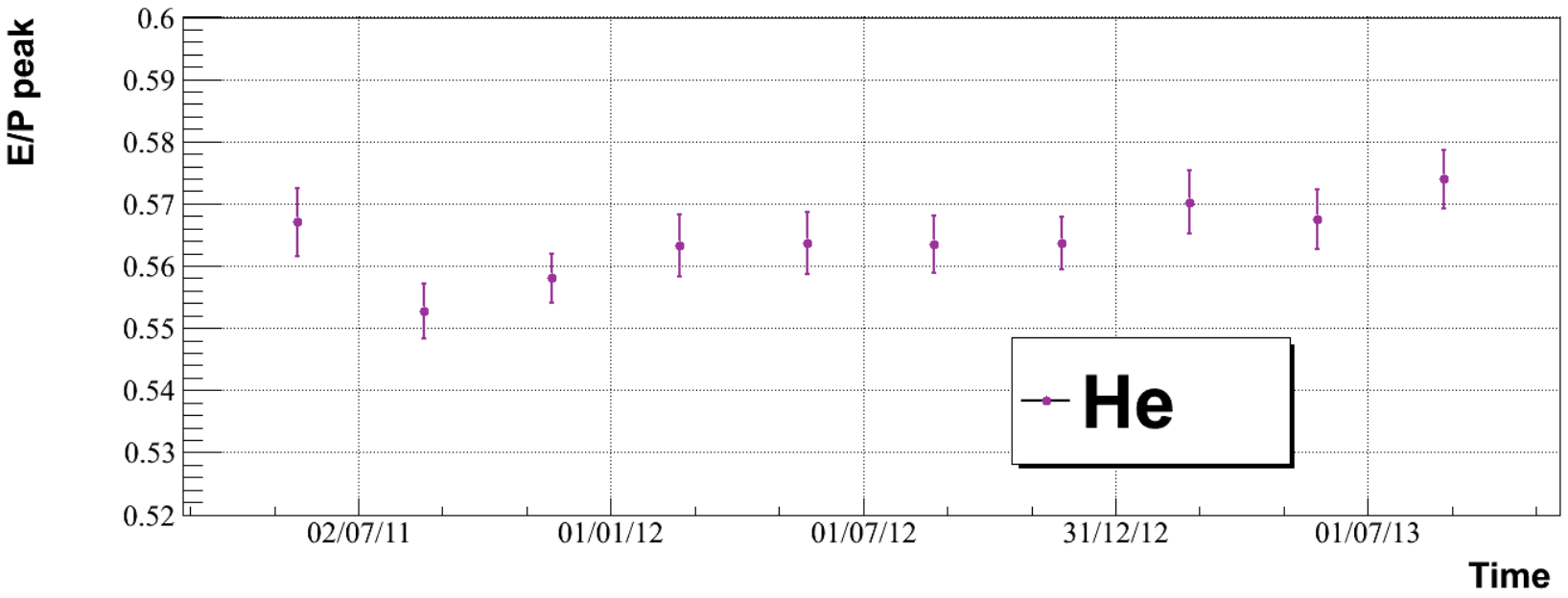
Helium: E/P peak vs time

Energy reconstructed (EnergyA)



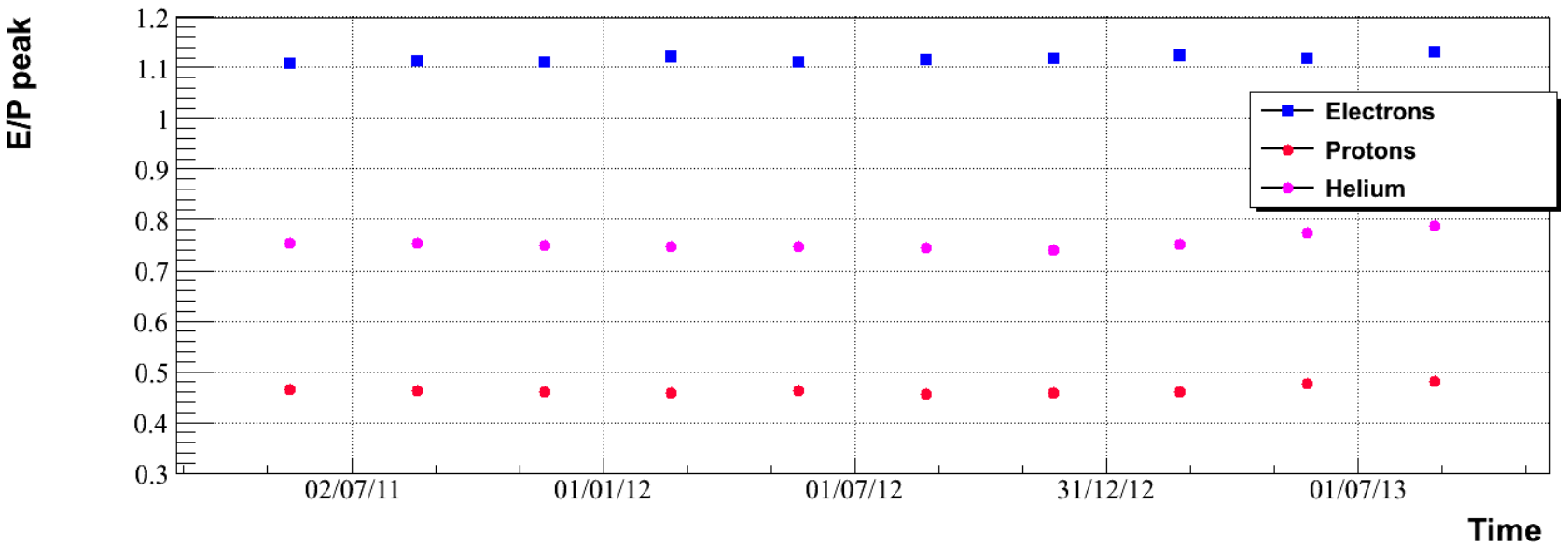
Helium: E/P peak vs time

Energy deposited



Comparison plot: E/P peak vs time for different particles

Energy reconstructed (EnergyP)

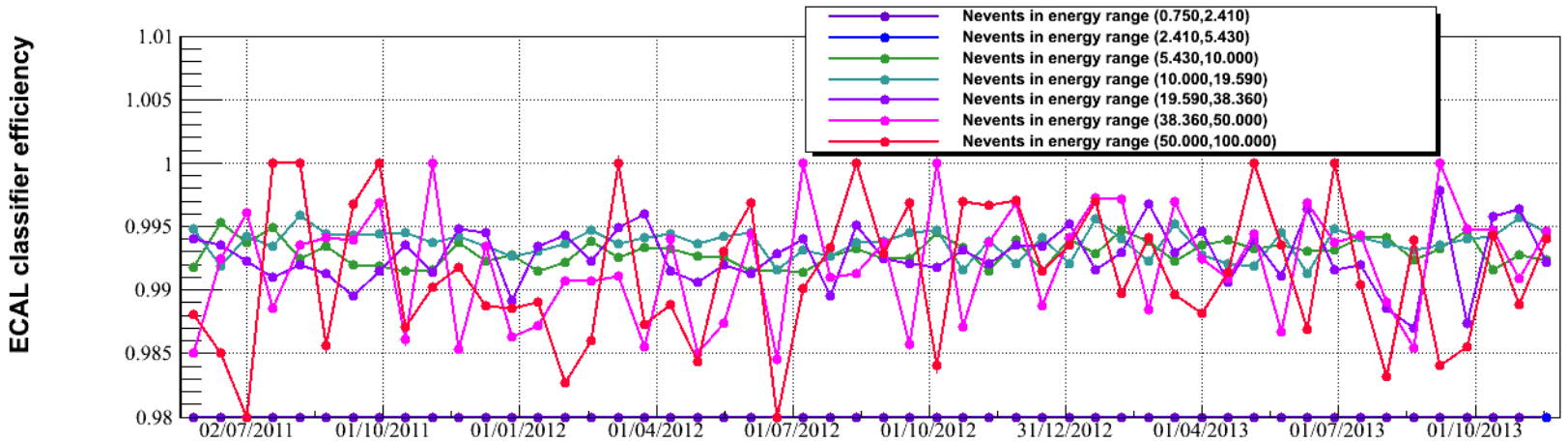


Some efficiency plots

in the following ...

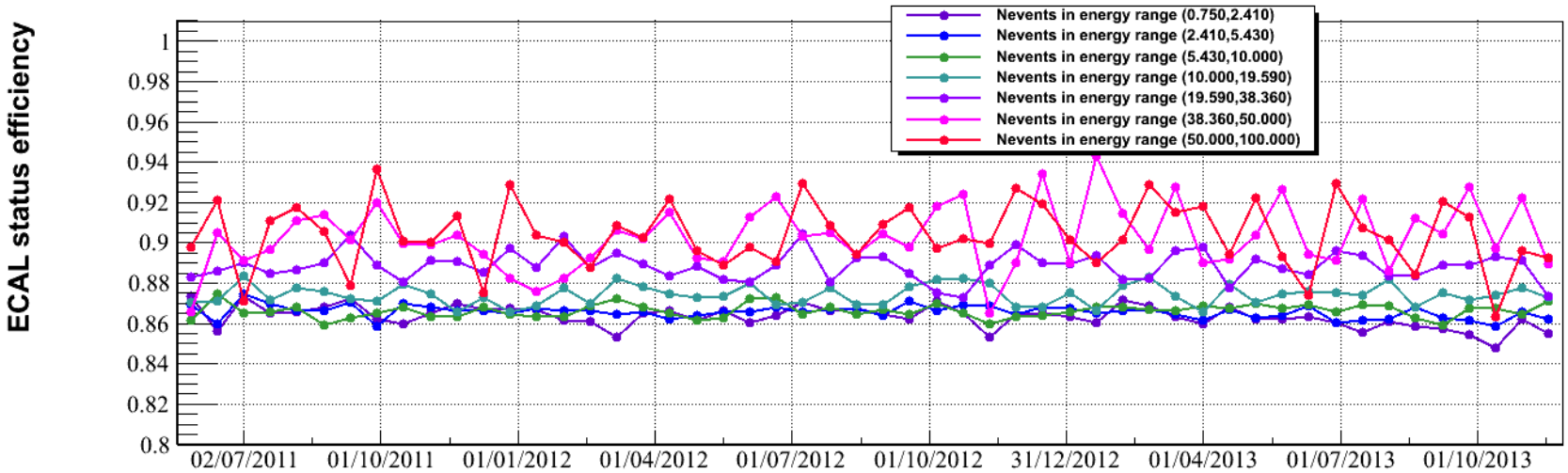
ECAL classifier efficiency vs time

Last cut: over a sample of electrons selected with TRD and $R_{maxspan} < 0$



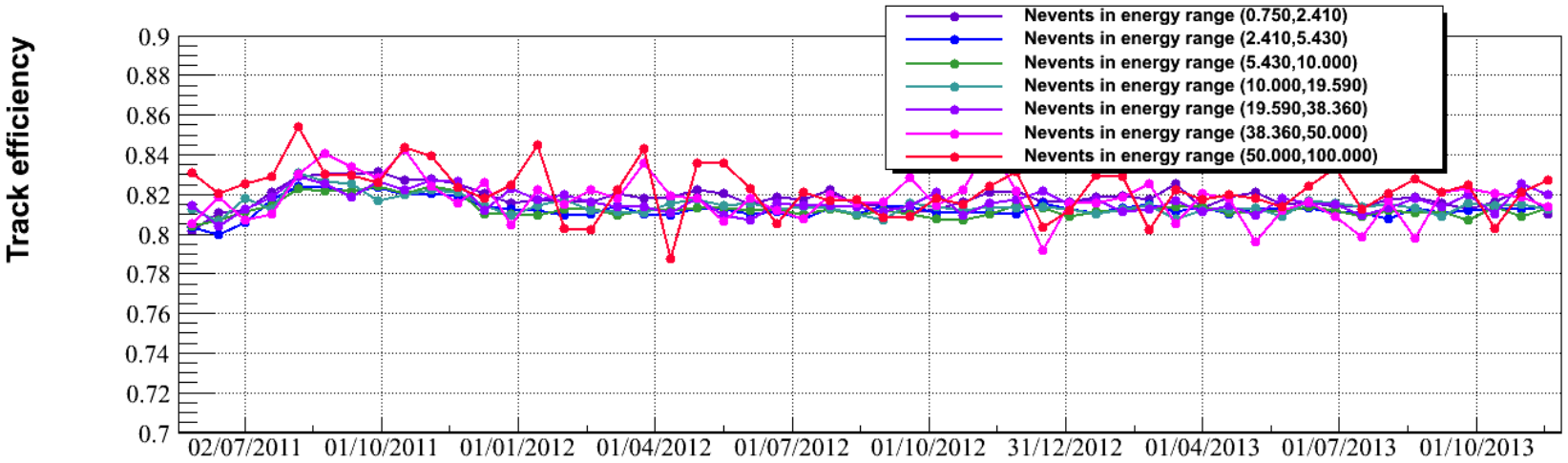
ECAL status vs time

This cut is used to reject events with catastrofic leakage.
Last cut: over a sample of electrons selected with TRD and $R_{maxspan} < 0$



Tracker reconstruction efficiency vs time

Events with at least one track over a sample of electrons selected with TRD and ECAL.

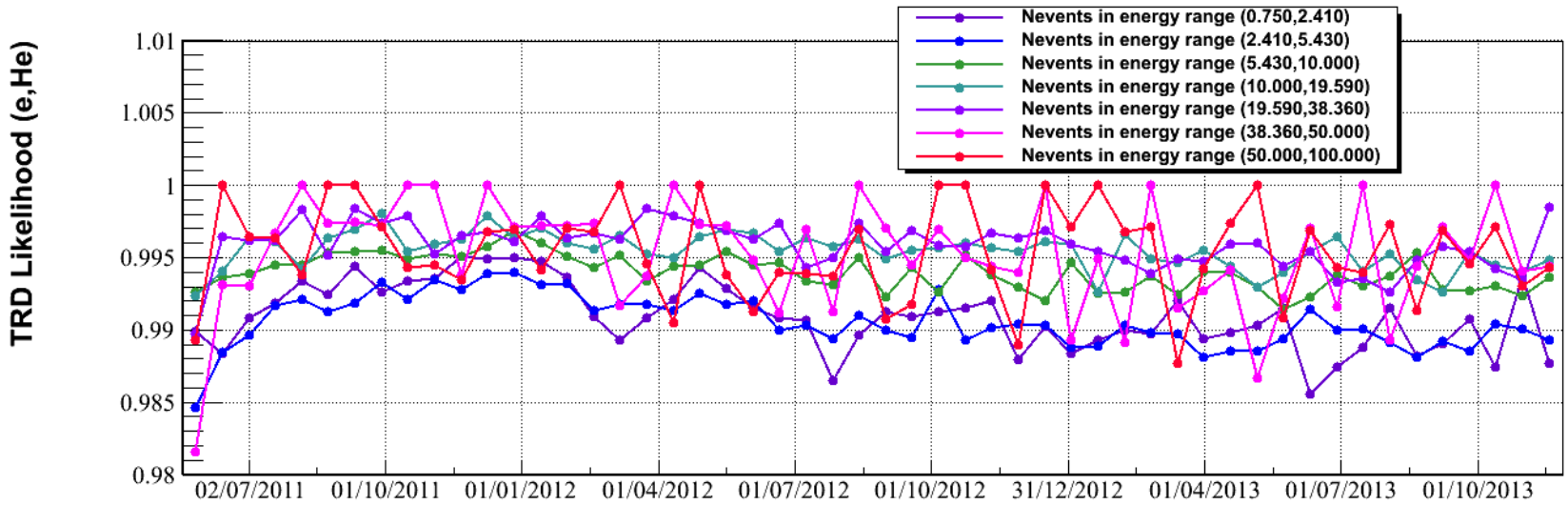


Known features at the beginning:

- threshold changed
- 6 ladders lost.

TRD Likelihood (e,He) efficiency vs time

Last cut: Events with L<0.7 over a sample of electrons selected with ECAL and $R_{maxspan}$ <0



Variations with time are related to gas pressure, as shown in october general meeting.