E/p v.s. time

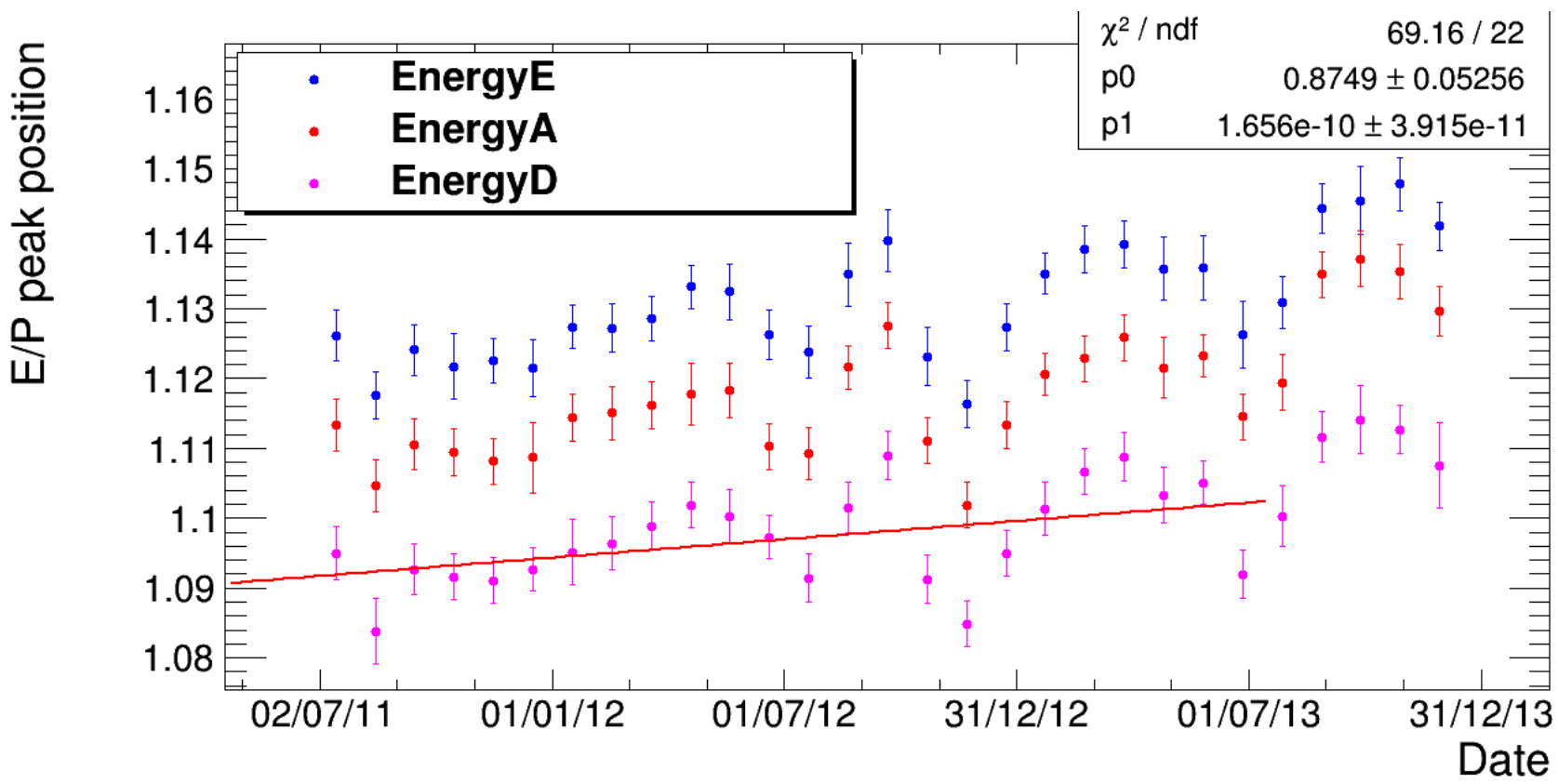
Does ECAL change?

Jie Feng

selection

- Sample: 20~80 GeV electron, proton and helium
- Period: 07.11 – 11.13 (29 months)
- Reconstructed energy: EnergyE, EnergyA, EnergyD

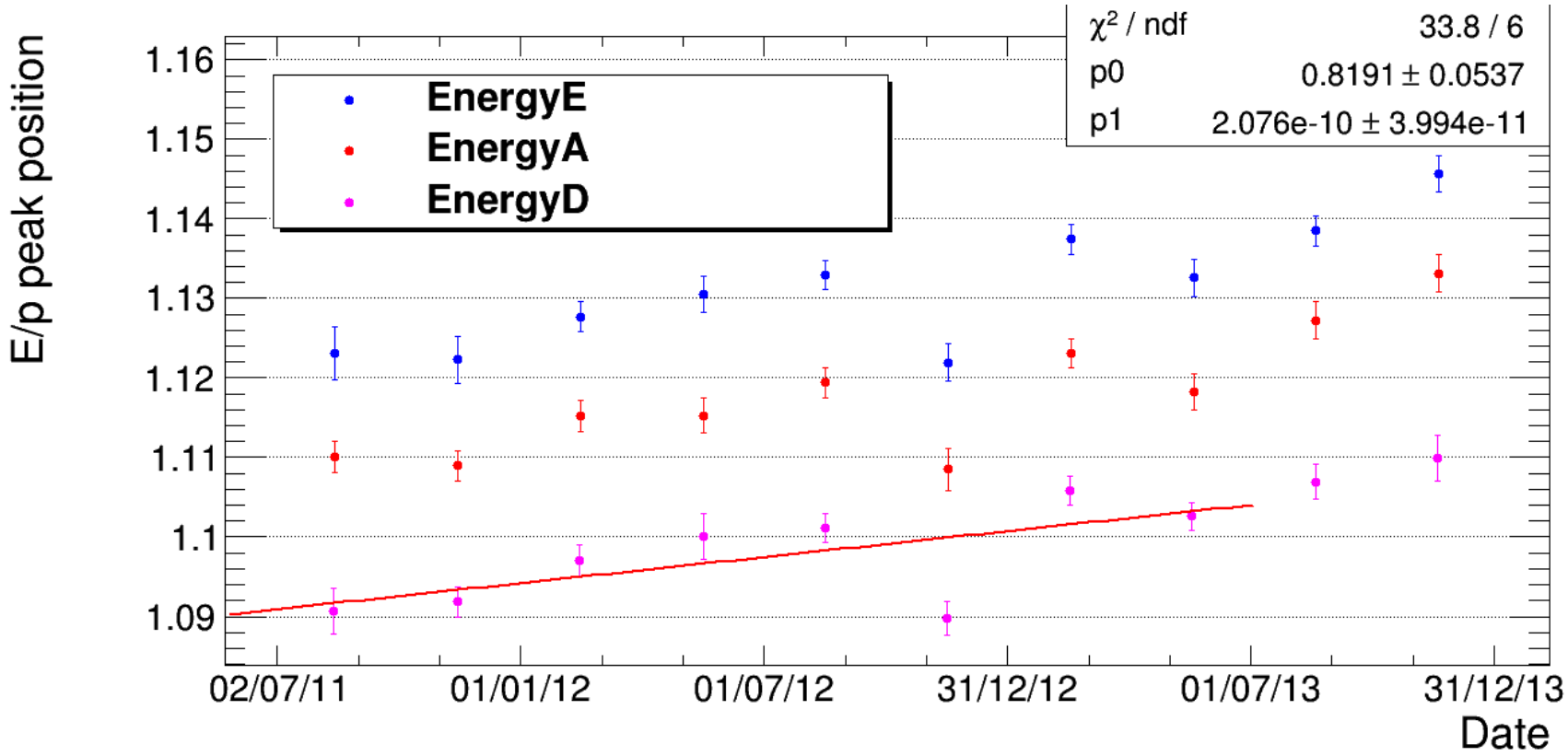
Electron E/p position



2% increase of E/p peak position during this two years is observed for all kinds of reconstructed energy.

Something has changed after 07.13.

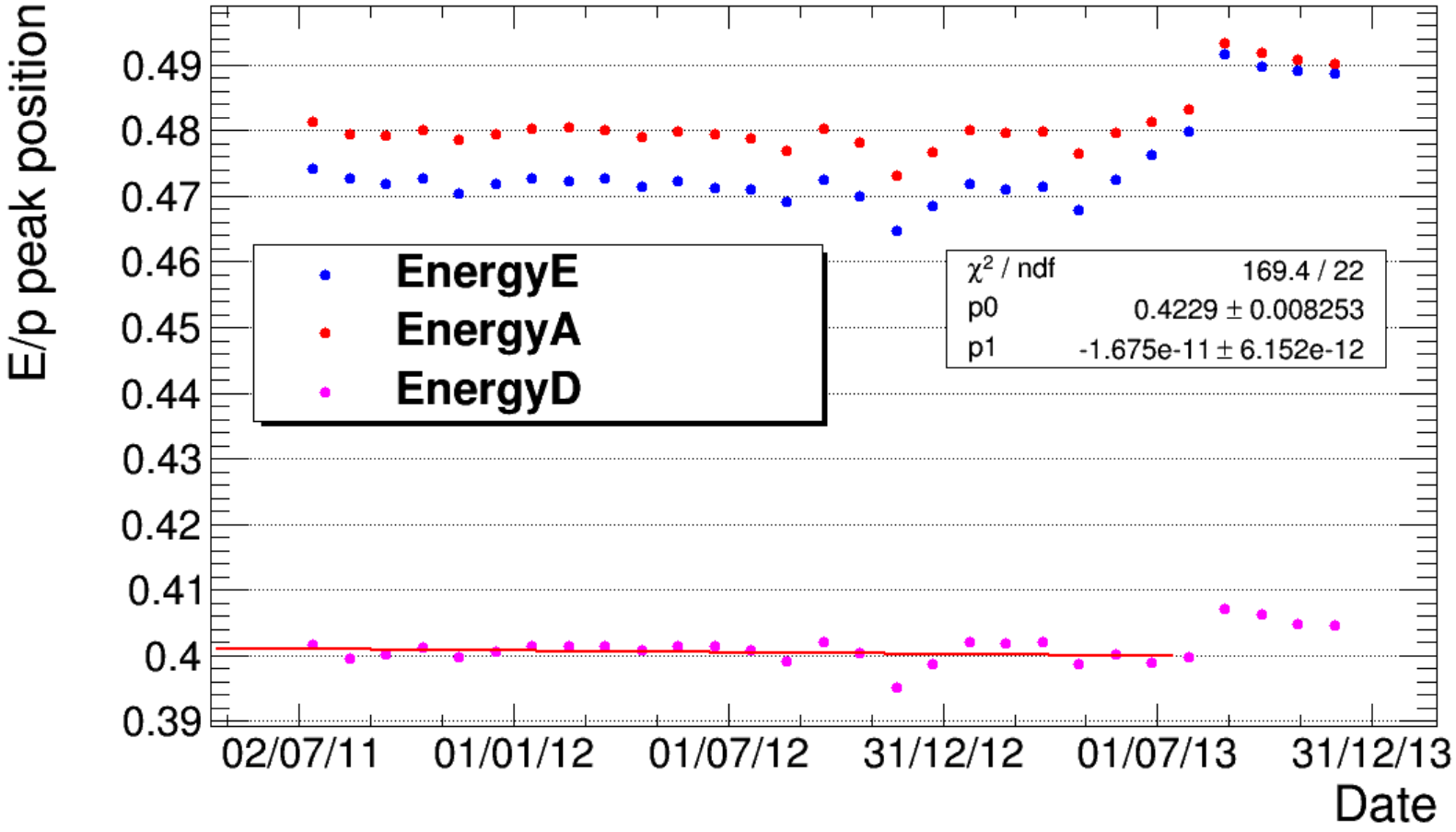
Electron E/p position – 3 months / point



2% increase of E/p peak position during this two years is observed for all kinds of reconstructed energy.

The change after 07.13 is smoothed.

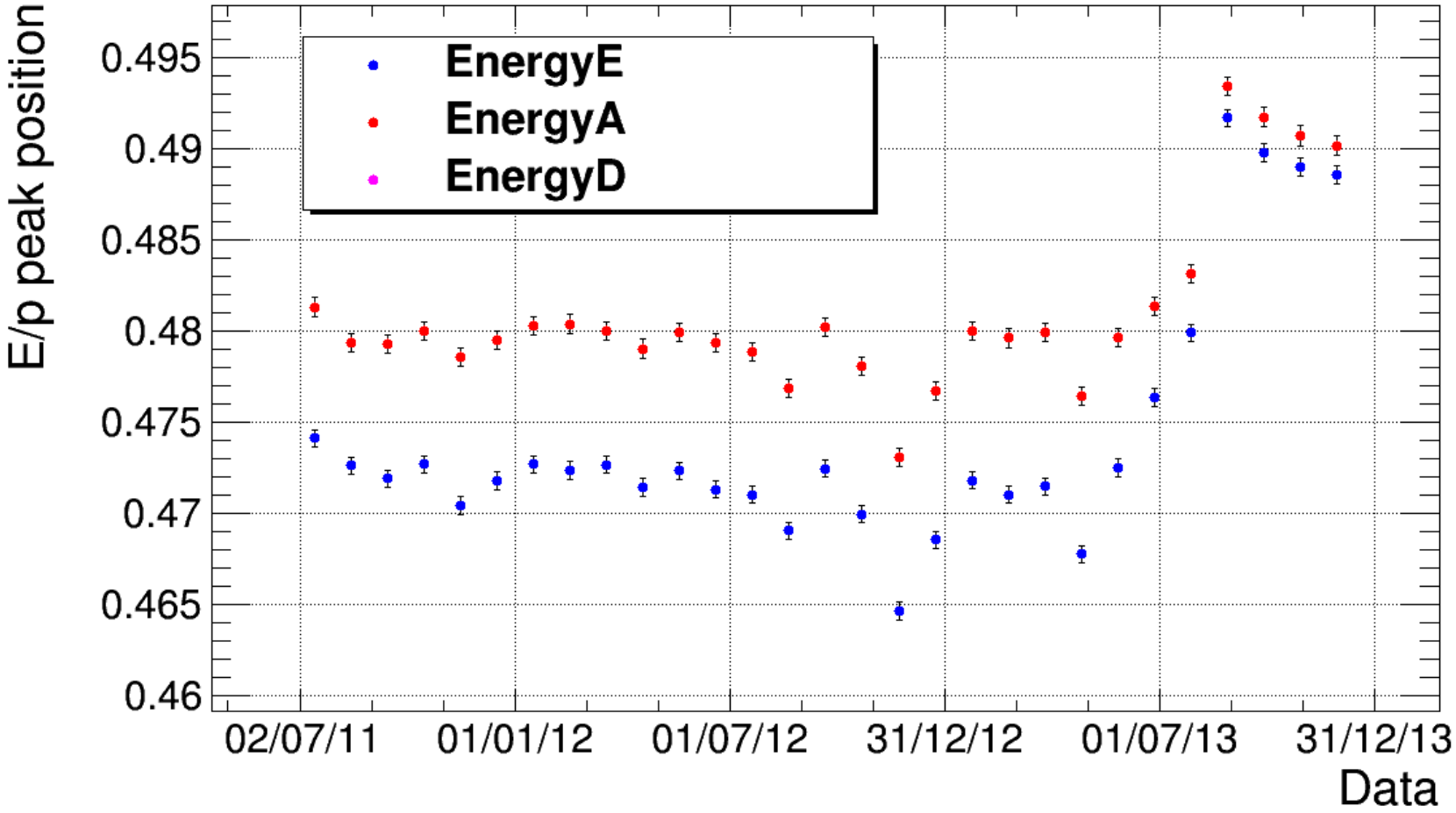
Proton E/p position – (1)



Proton E/p peak position is quite stable with time, especially for EnergyD

The step around 07.13 may be due to the update of Ecal calibration.

Proton E/p position – (2)



Proton E/p peak position is quite stable with time.

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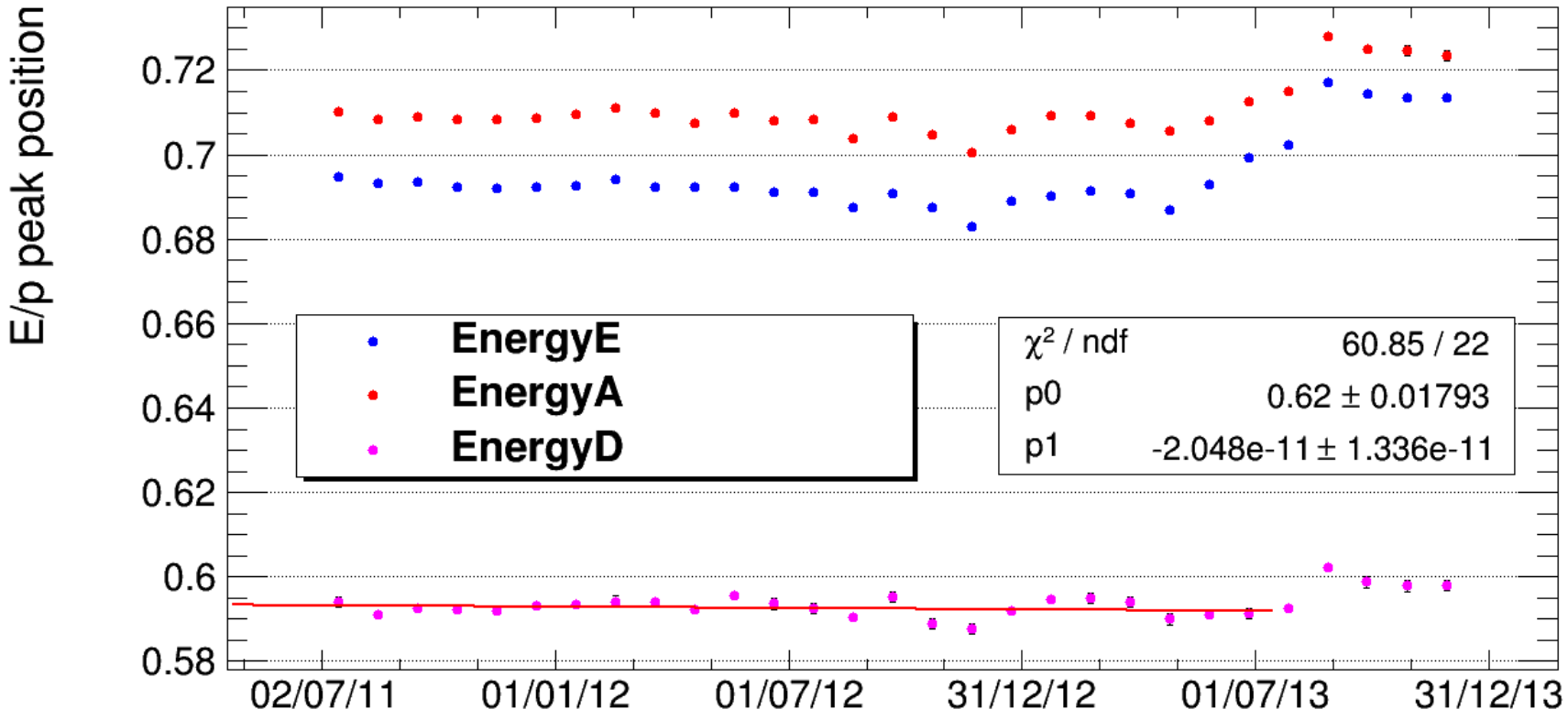
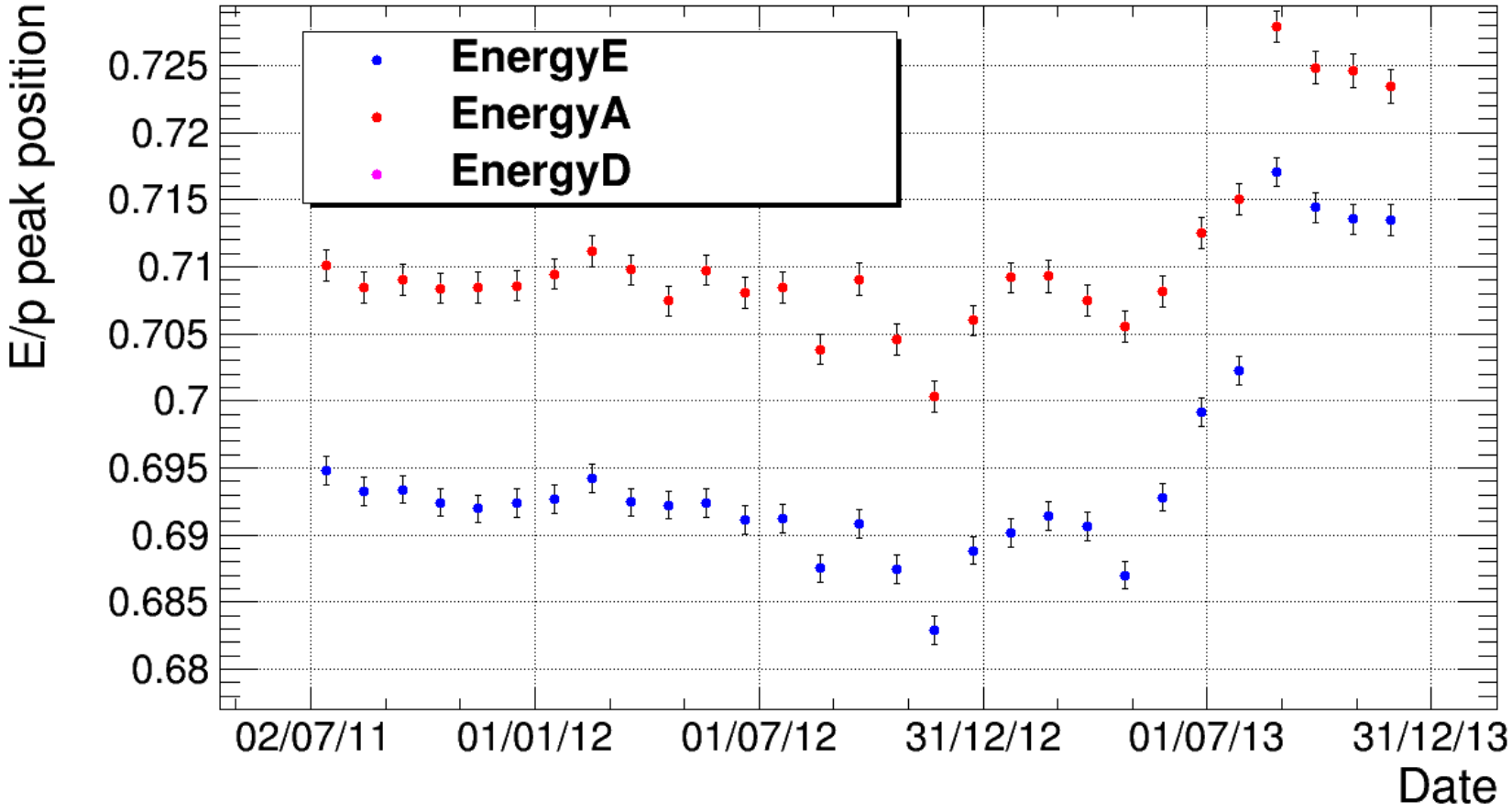
Helium E/p position – (1)



Helium E/p peak position is quite stable with time, especially for EnergyD

The step around 07.13 may be due to the update of Ecal calibration.

Helium E/p position – (2)



Helium E/p peak position is quite stable with time.

The step around 07.13 may be due to the update of Ecal calibration.

Summary

- Before 07.13：
- E/p of electron increases with time.
- E/p of hadron does not increase with time.

Potential Reasons

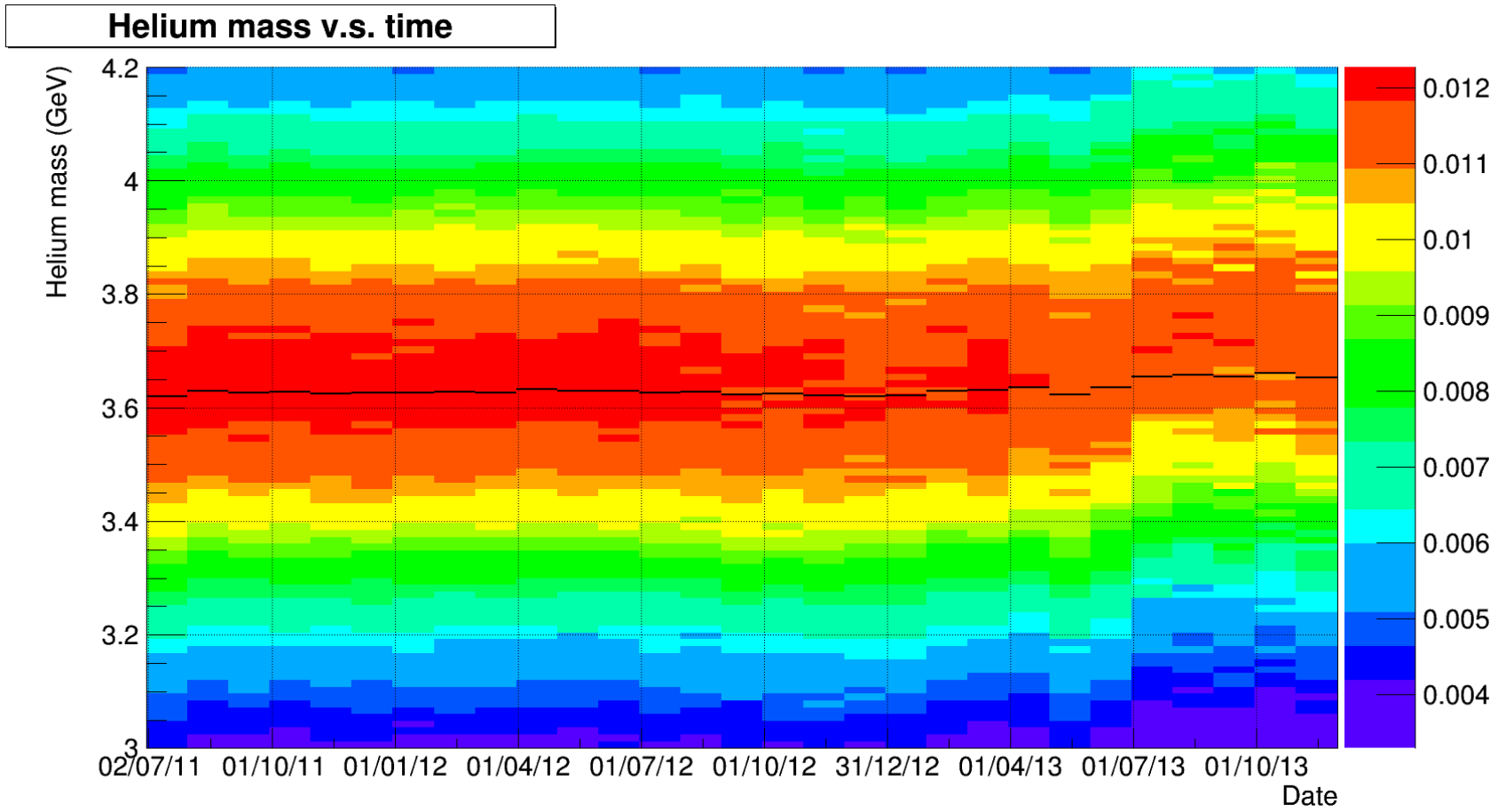
- Ecal performance difference between EM showers and hadronic showers.
- Reconstructed rigidity difference between that of electron and that of hadron.
- The largest difference between electron and helium is the mass.
- Synchrotron radiation?

To do

- Check the mass of Helium v.s. time to check rigidity.

- Rig_L1/Rig_L9 v.s. time to see electron radiation.

Helium mass with time



$$m = \frac{rigidity * Z}{\beta * \gamma}$$

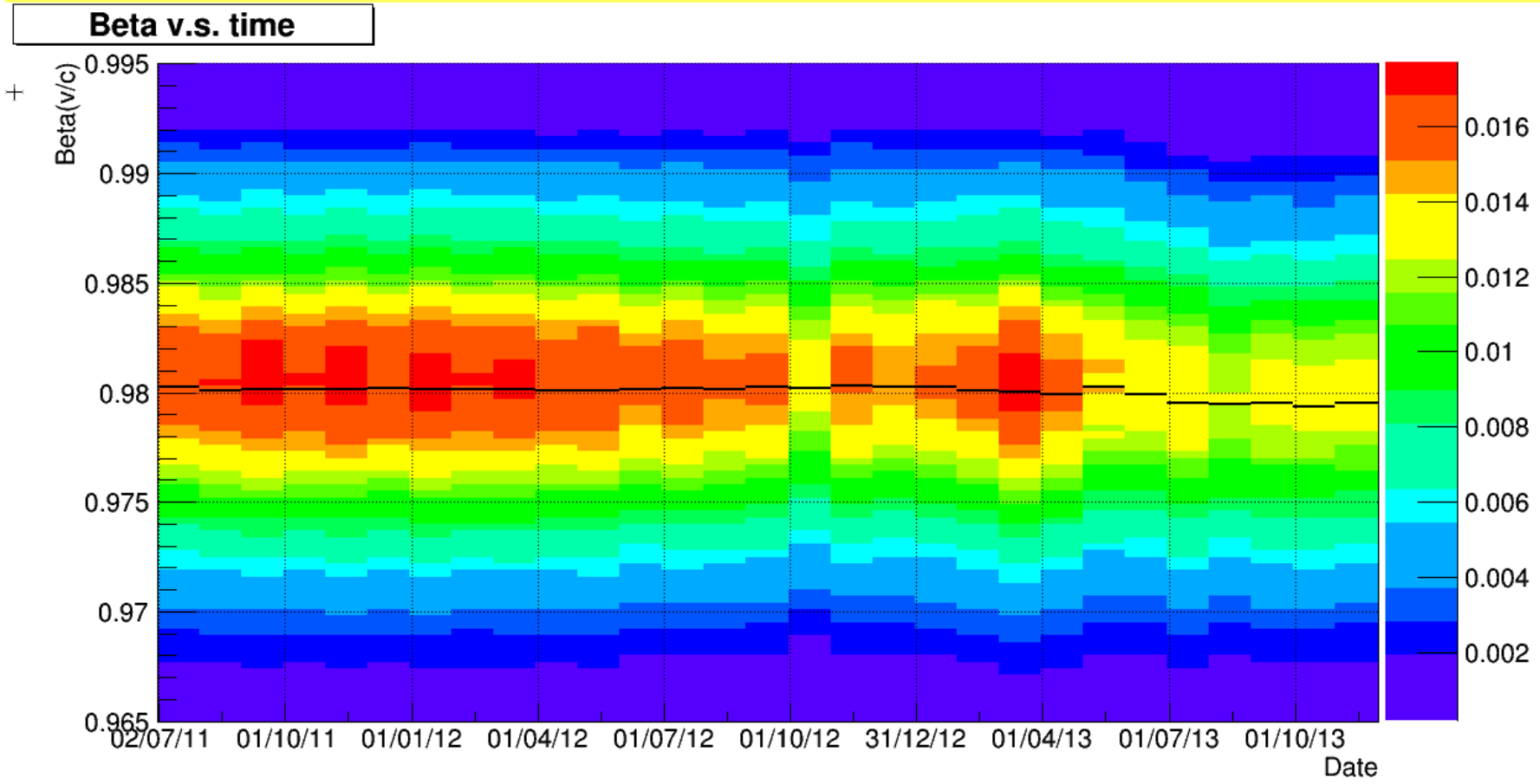
8~10 GV Helium are selected.

Beta is measured by RICH.

Mass is stable before 07.13. Something has changed since 07.13.

The peak shifts by 3% at around 07.13.

Beta with time



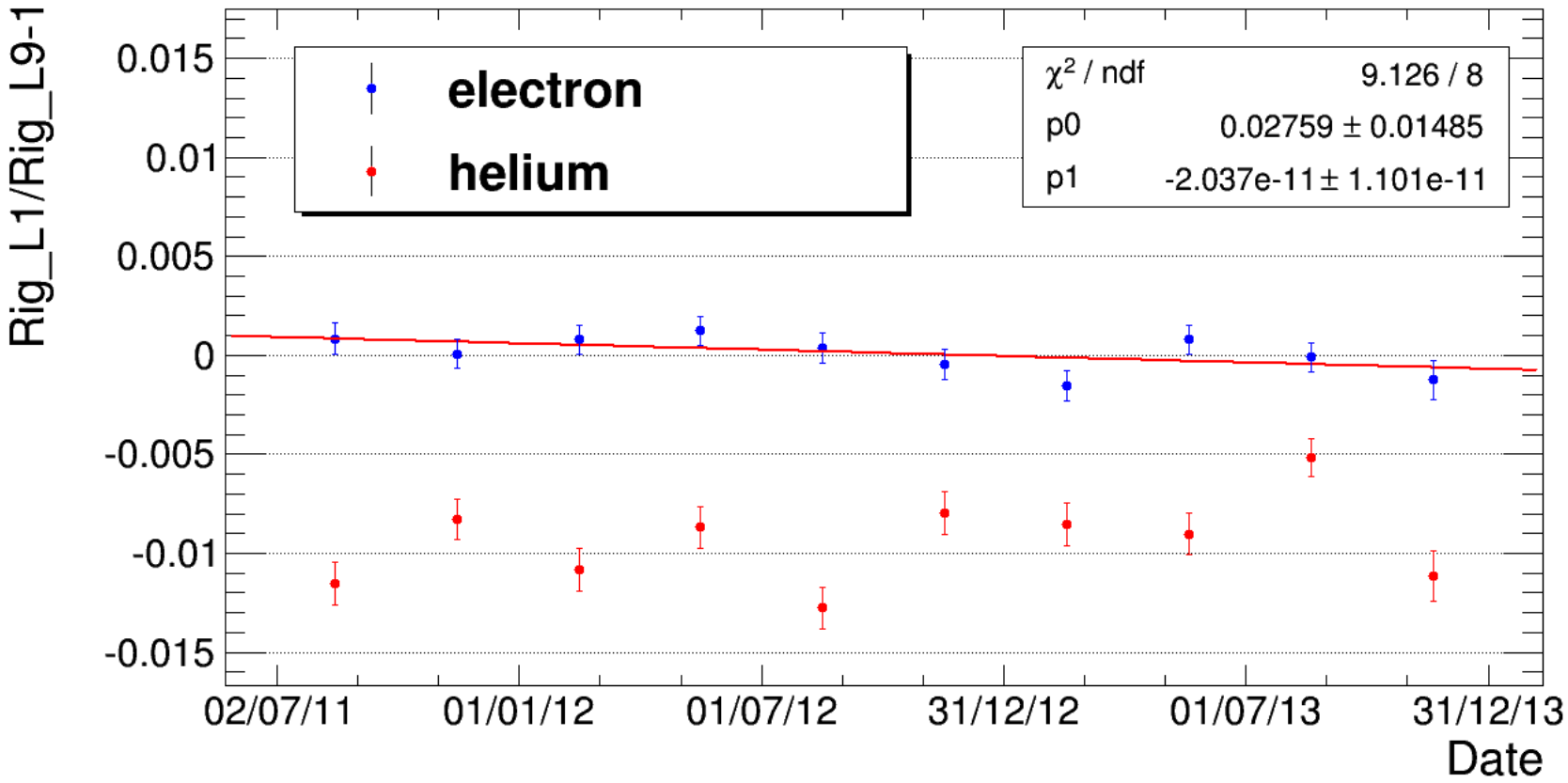
8~10 GV/c Helium are selected.

Beta is measured by RICH.

β shifts by ~-0.05%, β γ by ~-6% and mass by 3%.

For the same rigidity, this demonstrates that we observes some problem for rigidity or rich.

Synchrotron radiation?



Rigidity_L1/Rigidity_L9-1 does not describe the increase of the synchrotron radiation. 🙁

Conclusion

- Before 07/13:
- Helium mass → rigidity stable with time
- EnergyD/p of helium

→ ECAL is stable with time

- After 07/13:
- Something unknown has happened:
- 1) ECAL equalization change?
- 2) Tracker or RICH change?

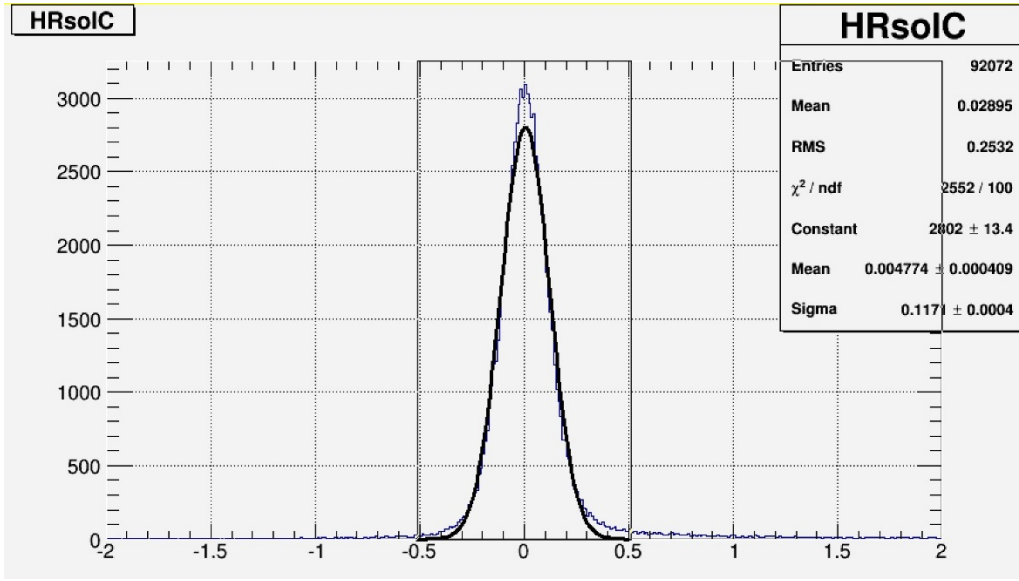
Back up slides

Possibility to measure the rigidity performance with Helium mass.
-Discussion with F.Barao

- $\left(\frac{\sigma_m}{m}\right)^2 = \left(\frac{\sigma_p}{p}\right)^2 + \left(\gamma^2 \frac{\sigma_\beta}{\beta}\right)^2$

- P=8GV/c, γ^2~30, $\left(\frac{\sigma_p}{p}\right)$ $\sim 12\%$, $\frac{\sigma_\beta}{\beta} \sim 0.1\%$
- $\frac{\sigma_m}{m}$~12%➔σ_m~48%

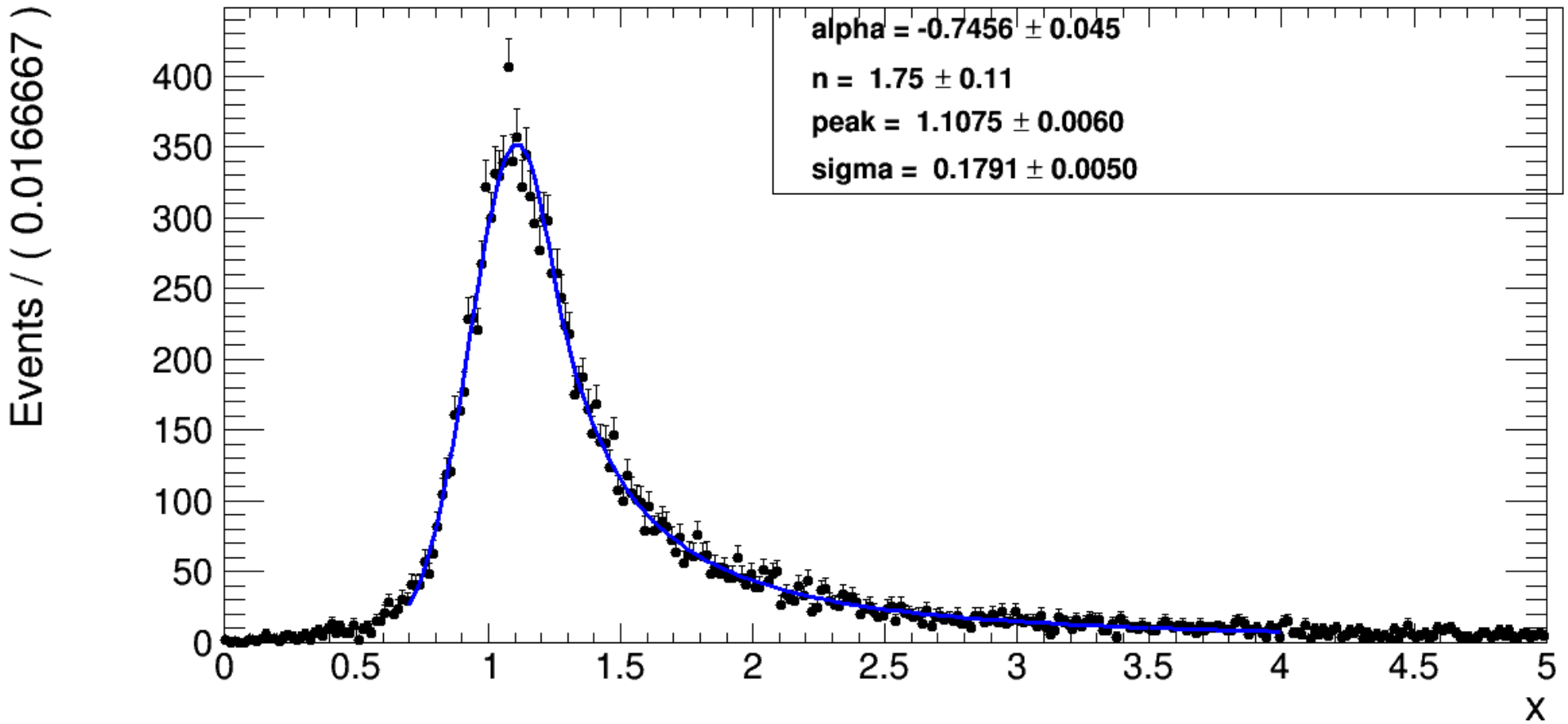
- $\sigma_{<m>} = \frac{\sigma_m}{\sqrt{N}} \overset{N=10\text{^}6}{\Longrightarrow} 0.048\%$
- $\frac{\sigma_{<m>}}{<m>} = \frac{0.048\%}{3.6}$~0.013%



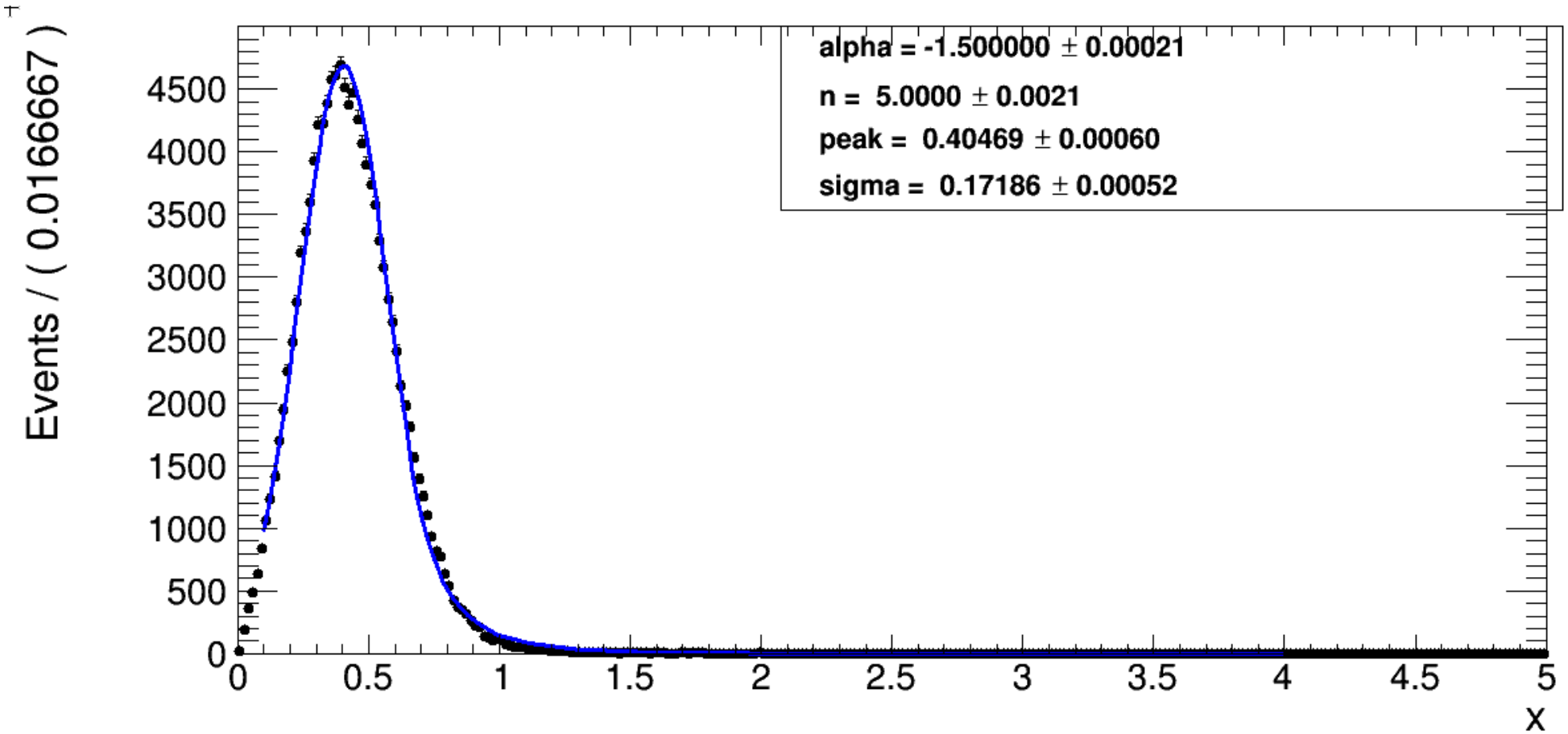
8GV/c rigidity resolution is 12%.
Drawn by H.Chou(Taiwan).

selection

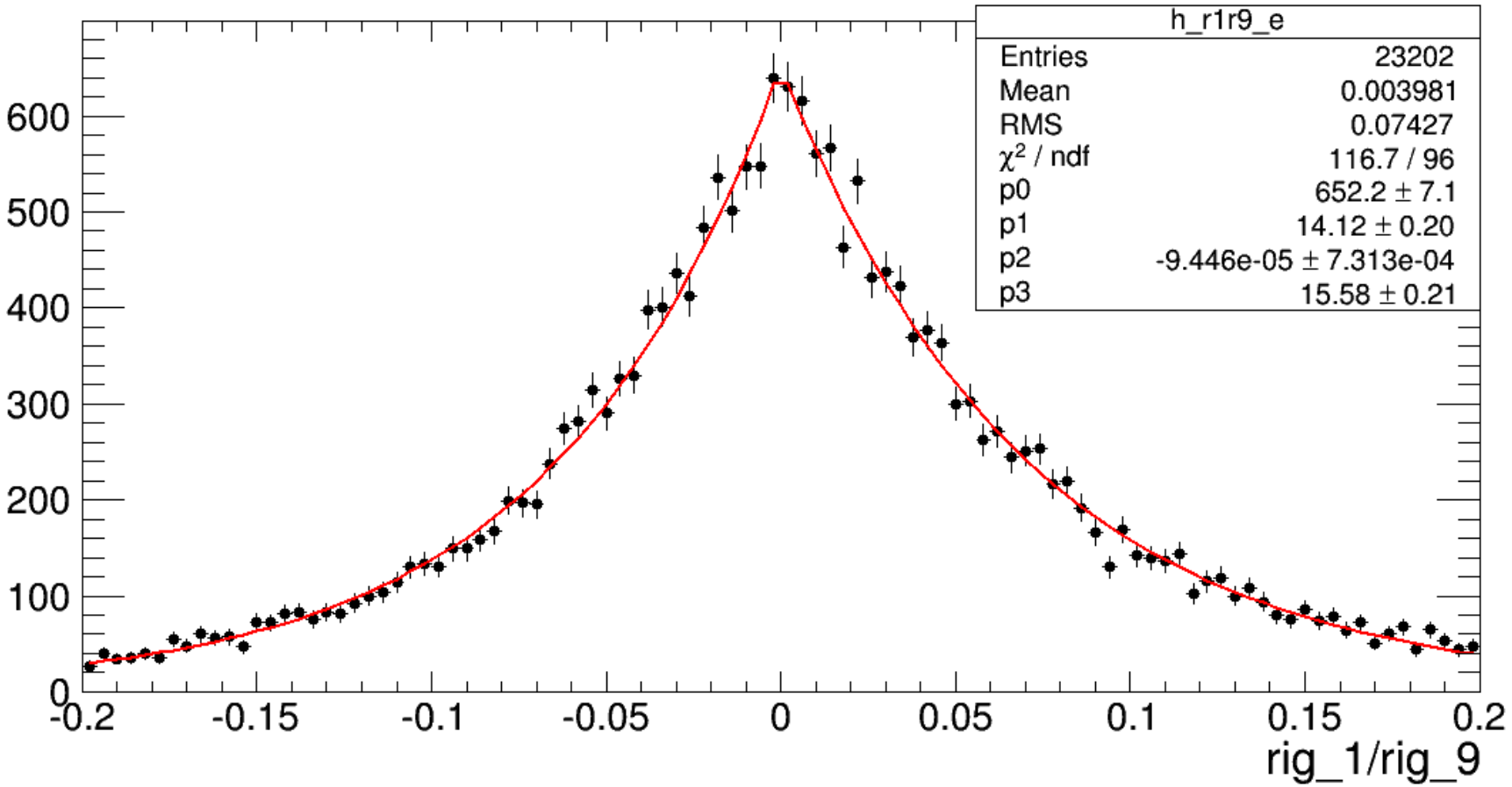
Electron EnegyD fit



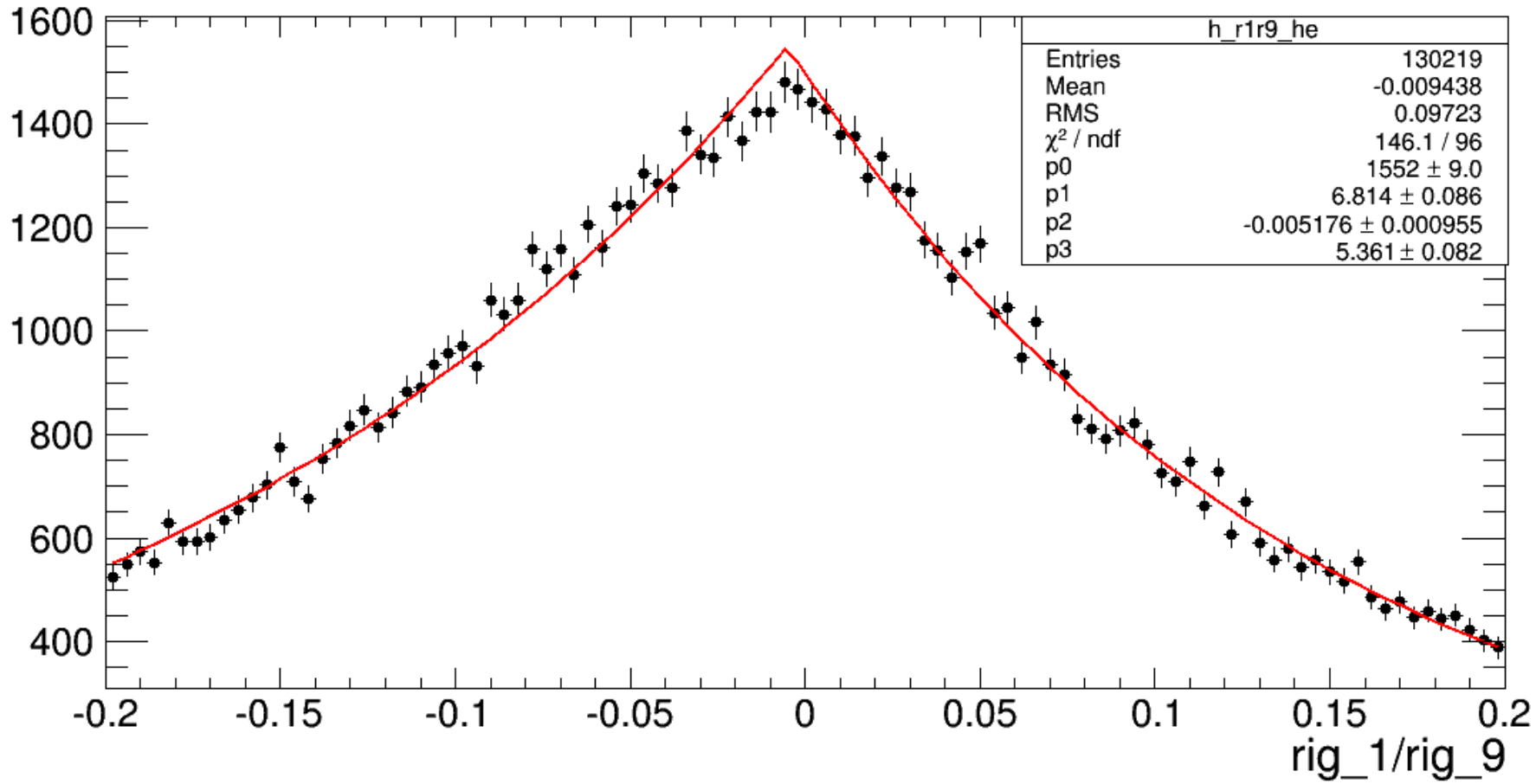
Proton EnegyD fit



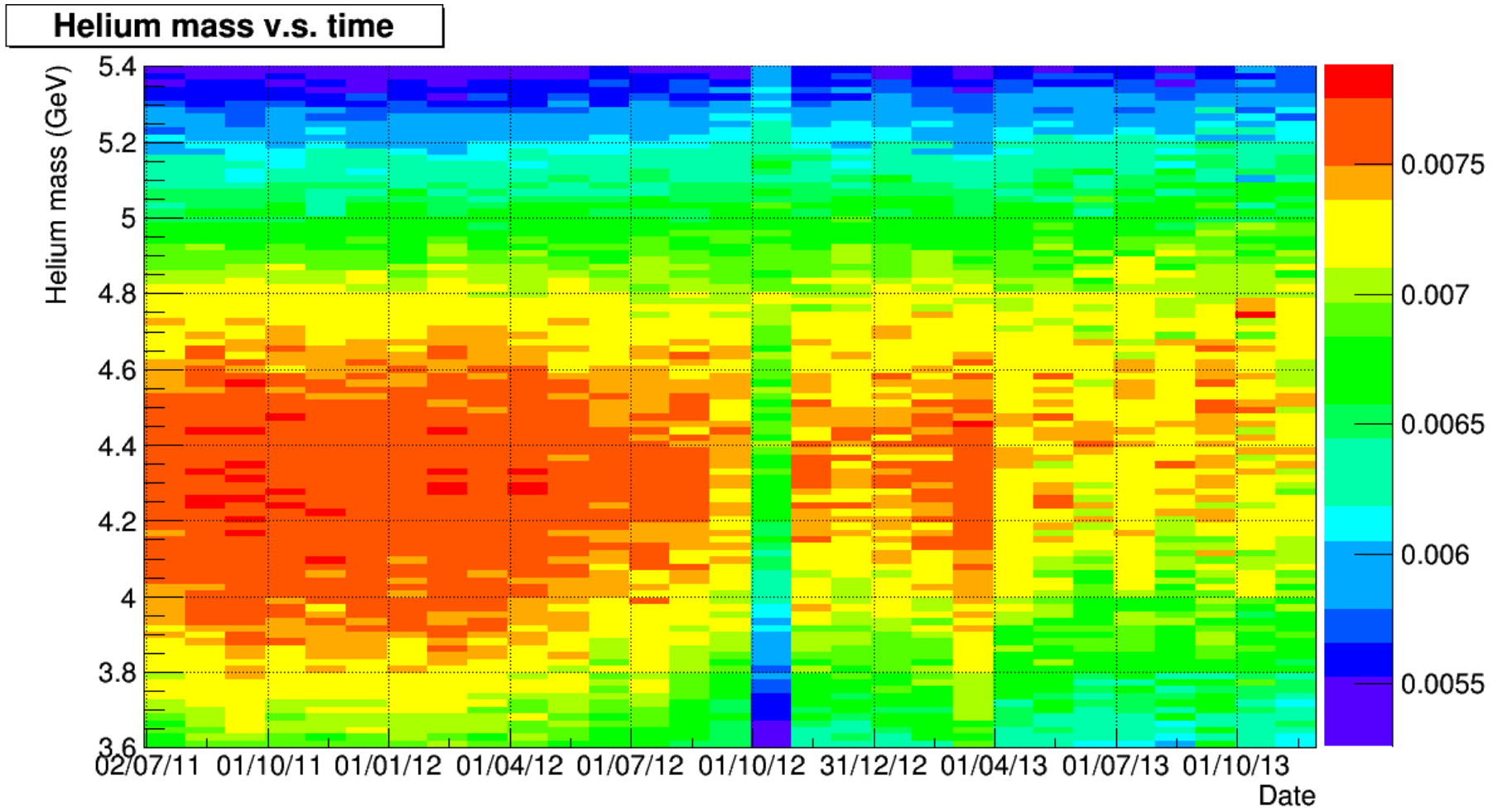
Rig_1/rig_9 for electron



Rig_1/rig_9 for helium



Helium mass measured by TOF



Hard to tell if there is a break at 07.13.