Horn Shift Study

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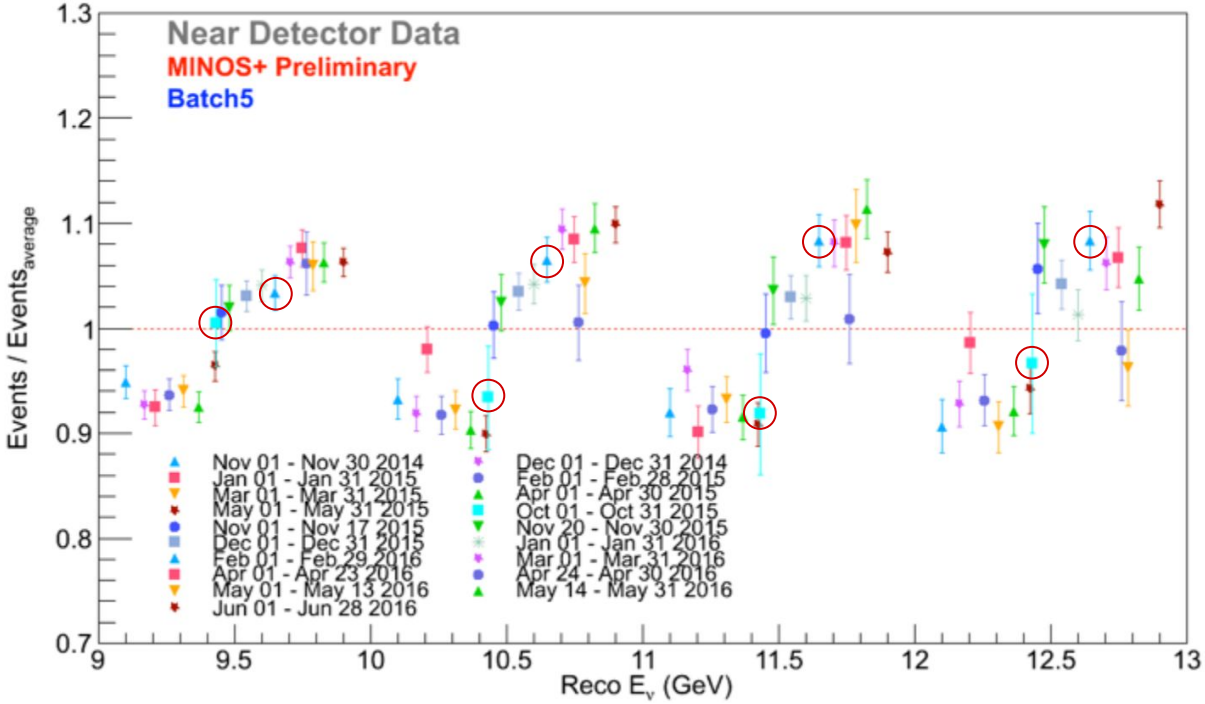
Introduction

- It is found out that the horn was shifted during some period of Run 13.
- Study the effect of the shift.

Dataset

Ray's DQM plot is a hint of when the shift happened. NuMI-X DocDB #127, page 8.

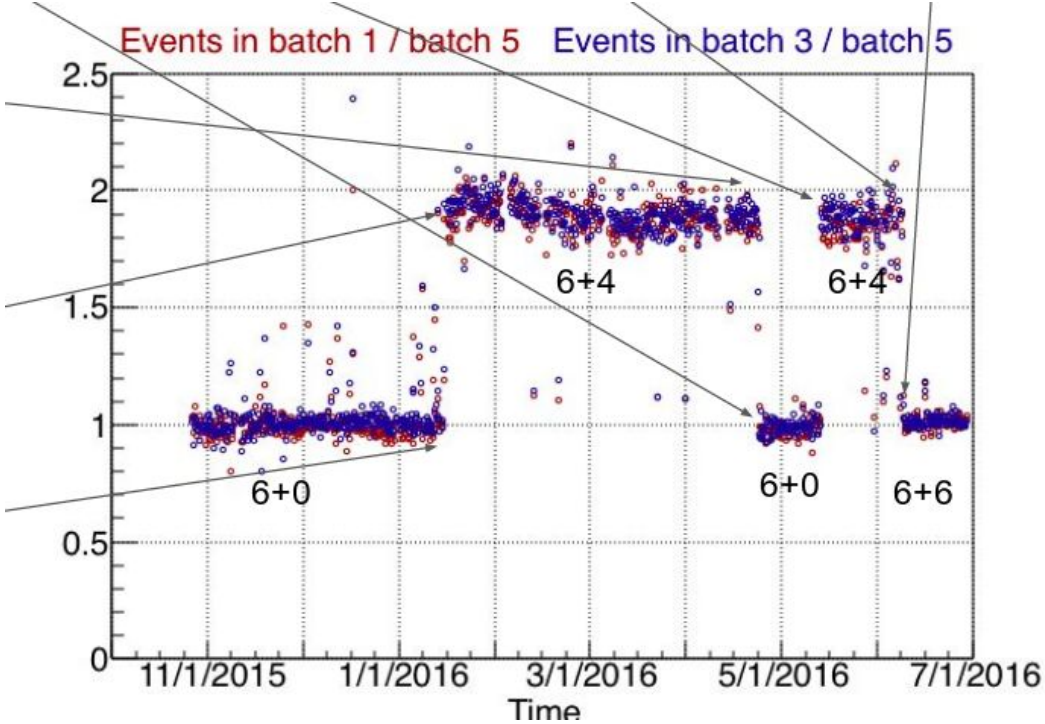


Code

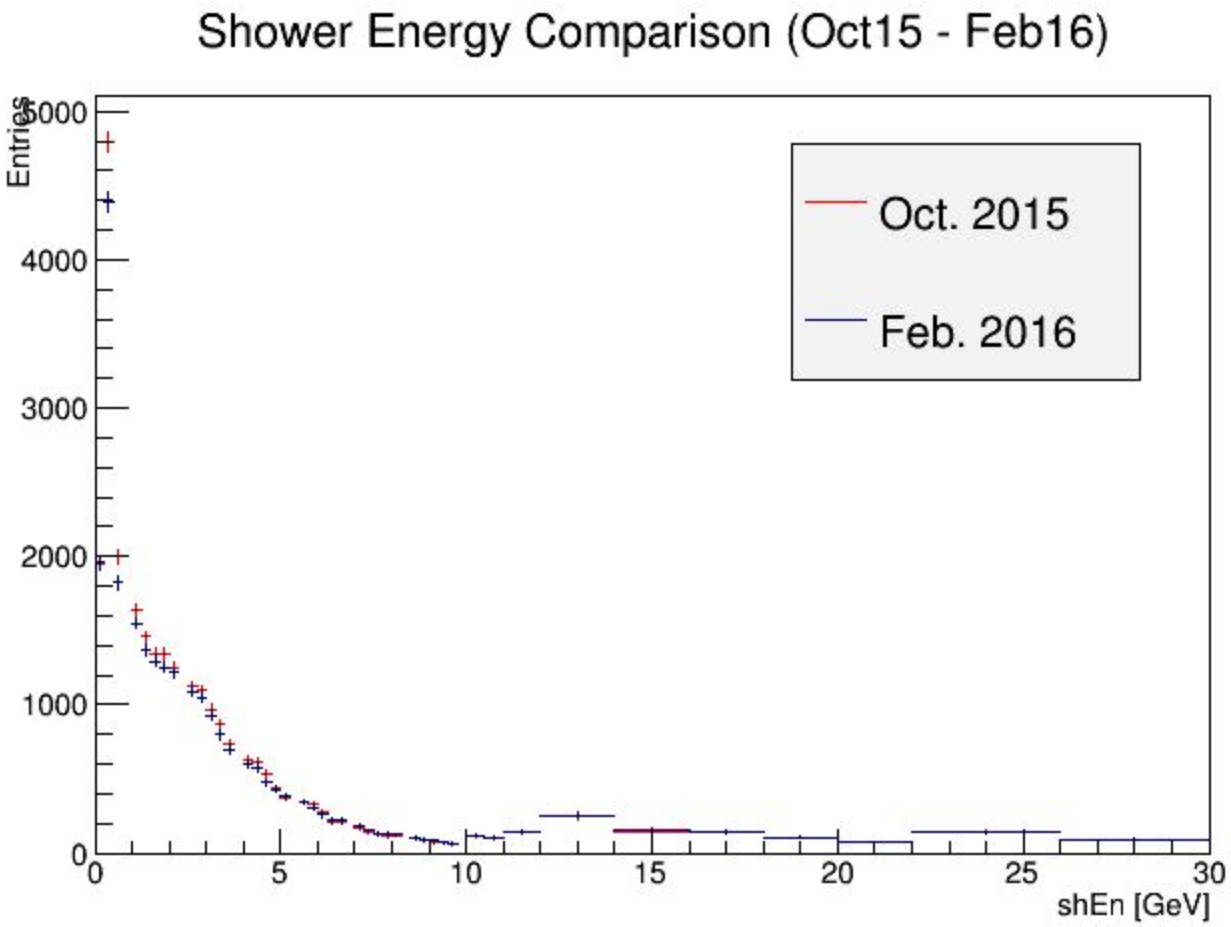
- Code in **/minos/app/dphan/HornShiftStudy/HornShiftEnergyVariablesND.C**
- Simply taking the 4 variables **trkEn**, **shwEnkNN**, **energyCC** and **energyNC** in **timeTree** tree from two time periods and plotting their ratios to see if there are any big discrepancy.
- Each energy variable is normalized by its corresponding POT.

Dataset

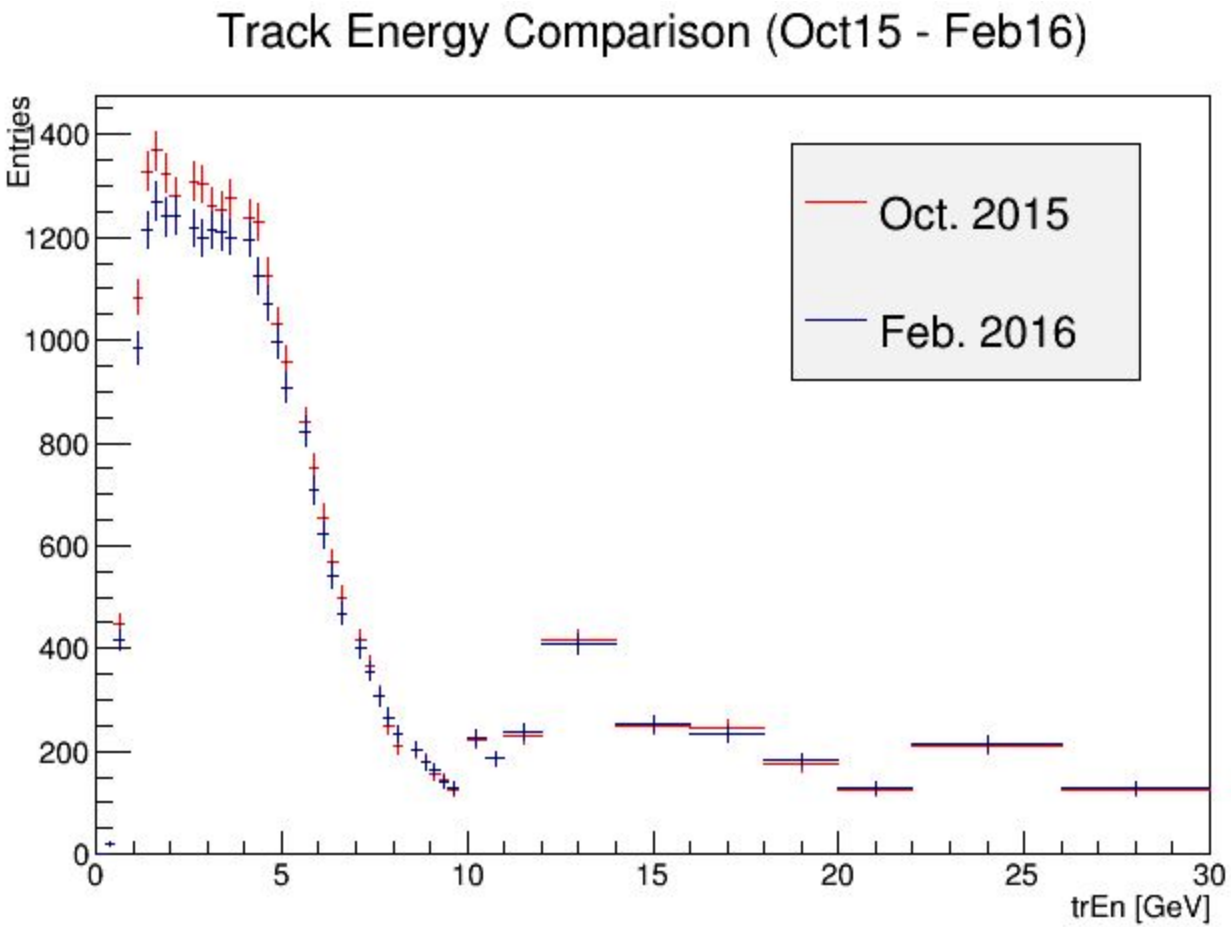
- Comparing **late Oct. 2015 - early Nov. 2015** (early weeks of Run 13) to **Feb. 2016**.
- Batch structure (see MINOS DocDB 11627, page 6). Plot on the right.



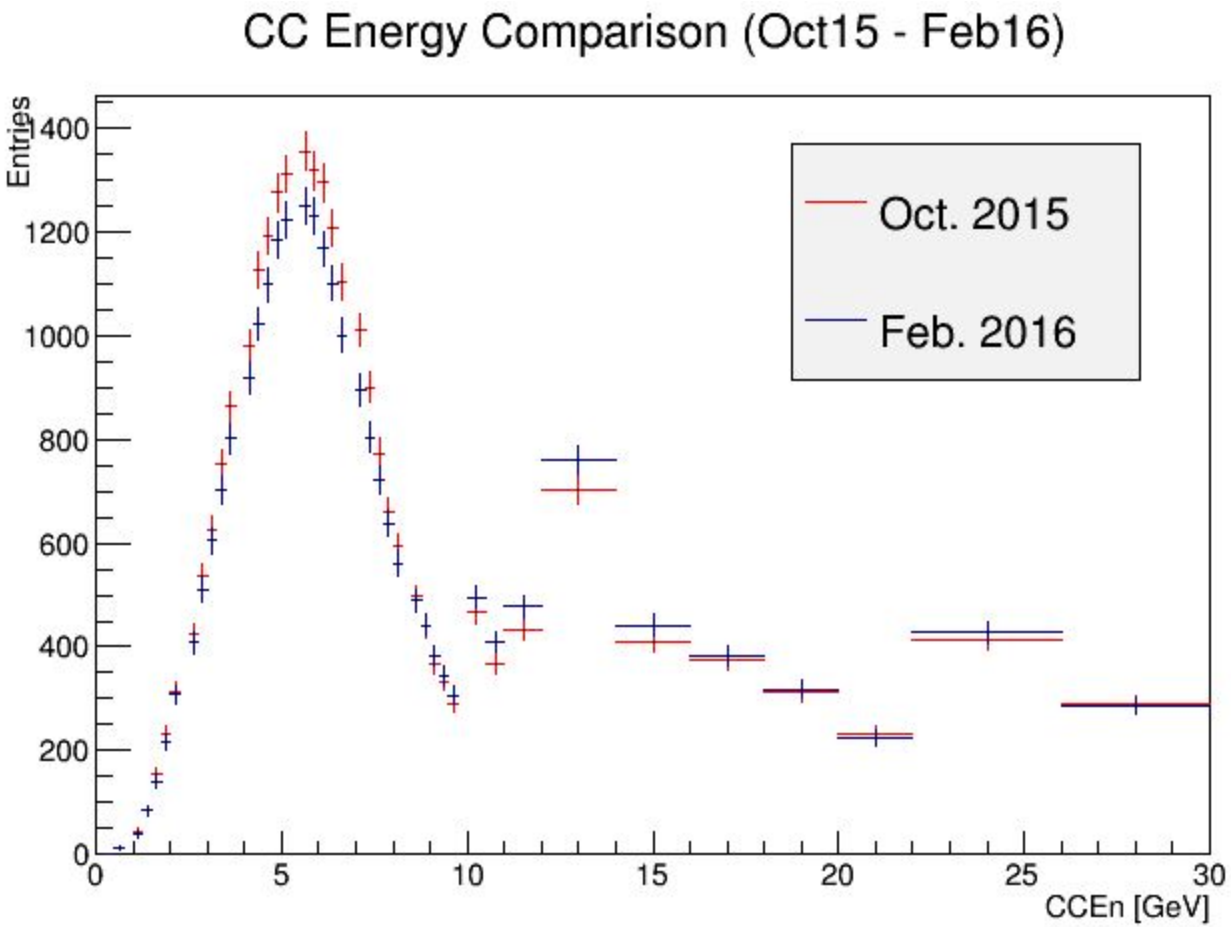
Shower Energy



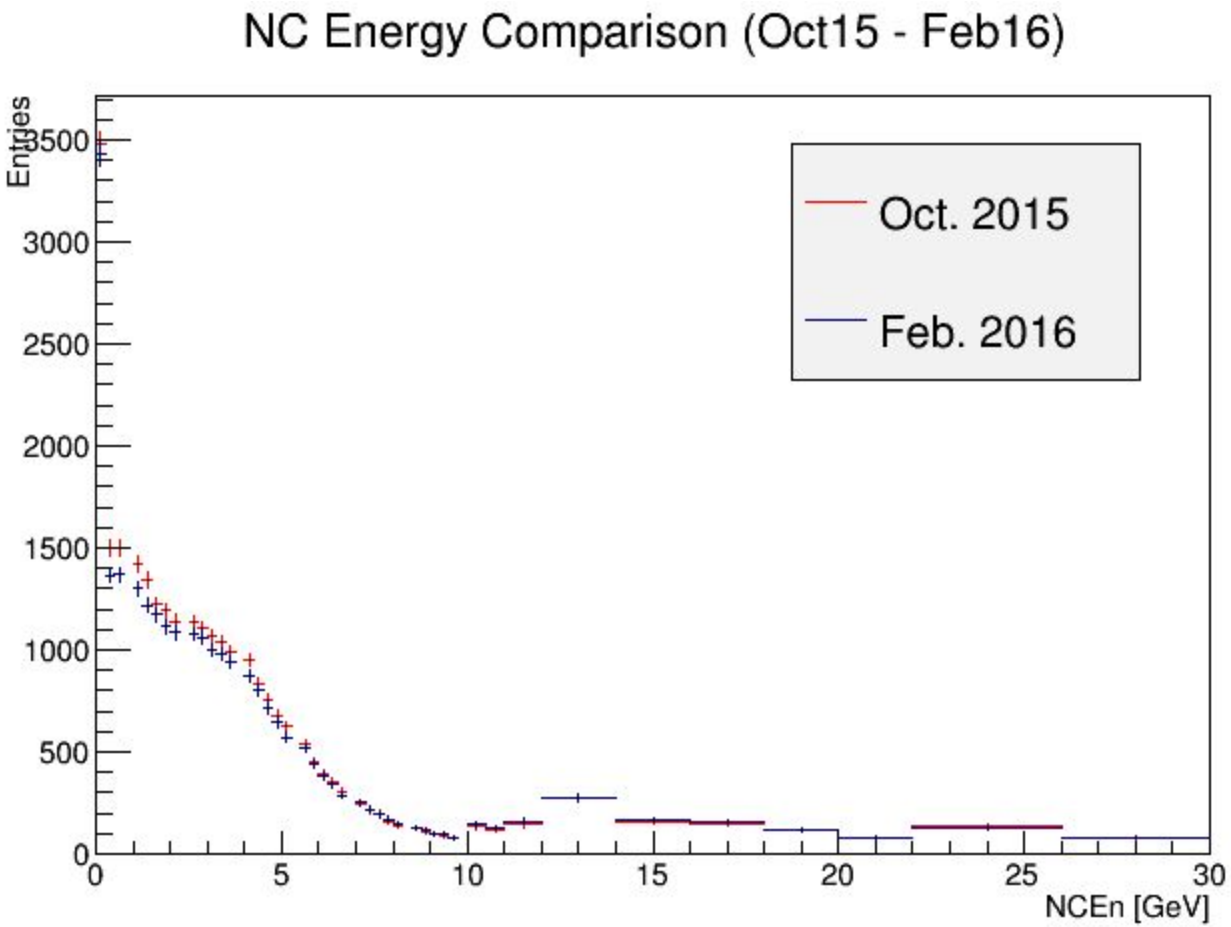
Track Energy



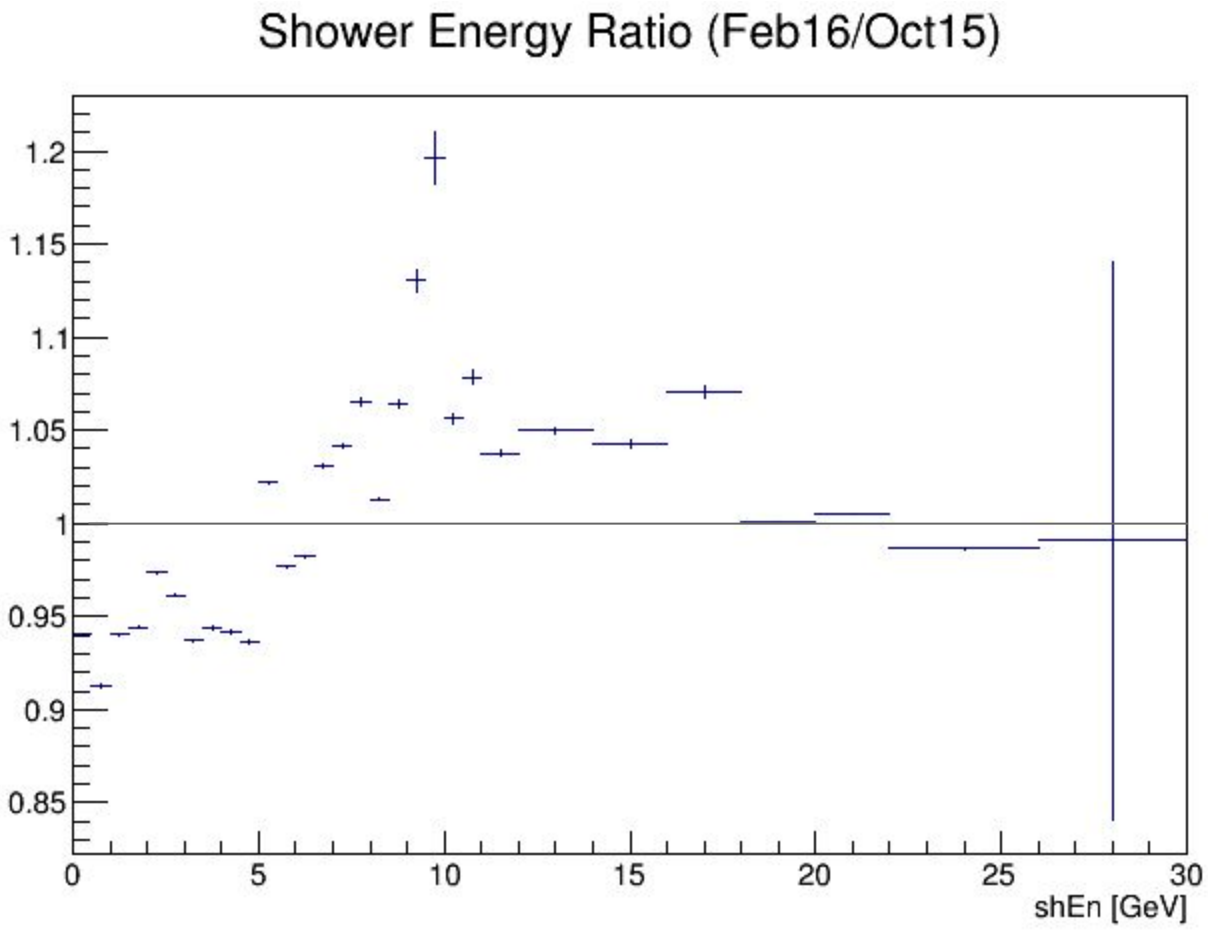
CC Energy


CC Energy Comparison (Oct15 - Feb16)
Entries
1400
1200
1000
800
600
400
200
0
0
5
10
15
20
25
30
CCEn [GeV]
Oct. 2015
Feb. 2016

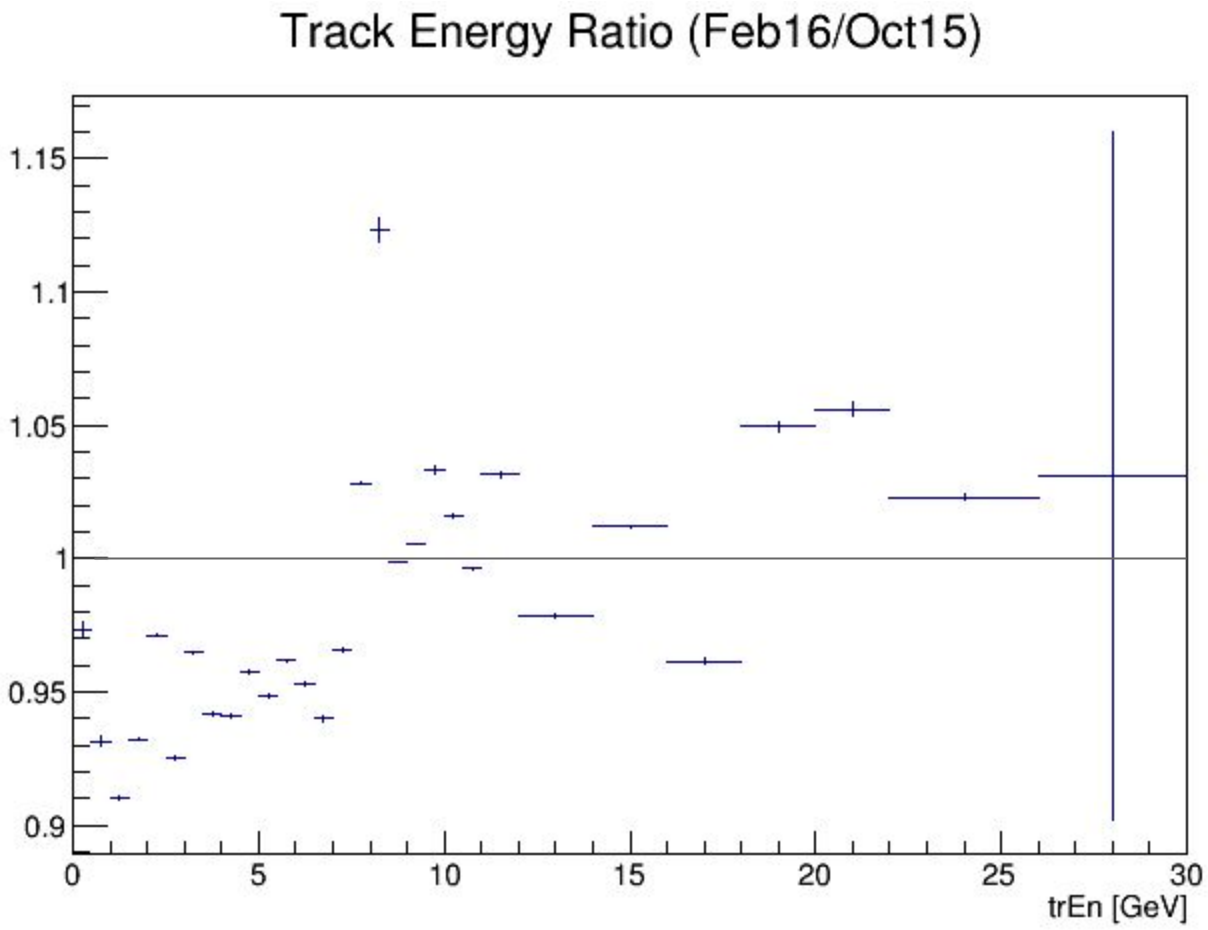
NC Energy


NC Energy Comparison (Oct15 - Feb16)
Entries
3500
3000
2500
2000
1500
1000
500
0
0
5
10
15
20
25
30
NCEn [GeV]
Oct. 2015
Feb. 2016

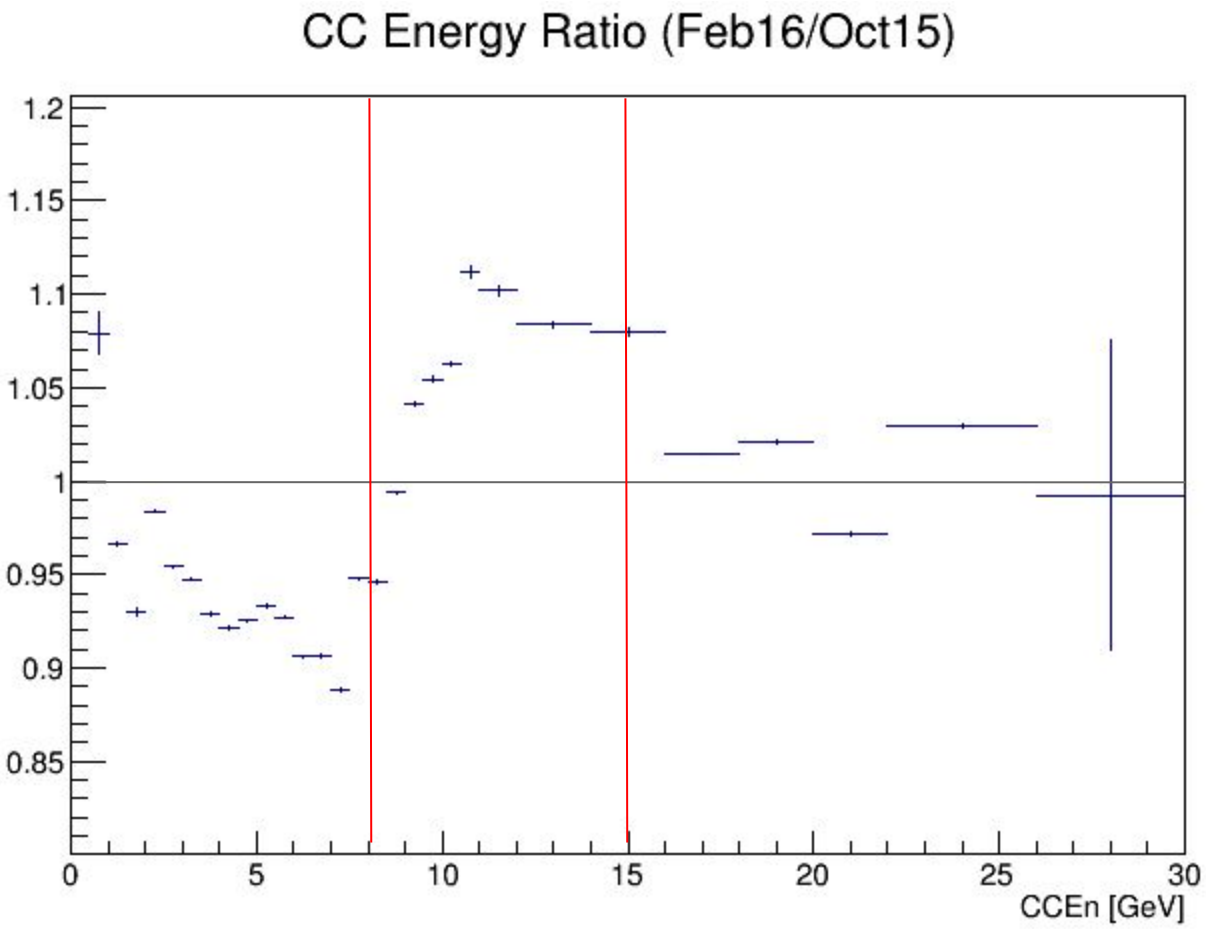
Shower Energy Ratio



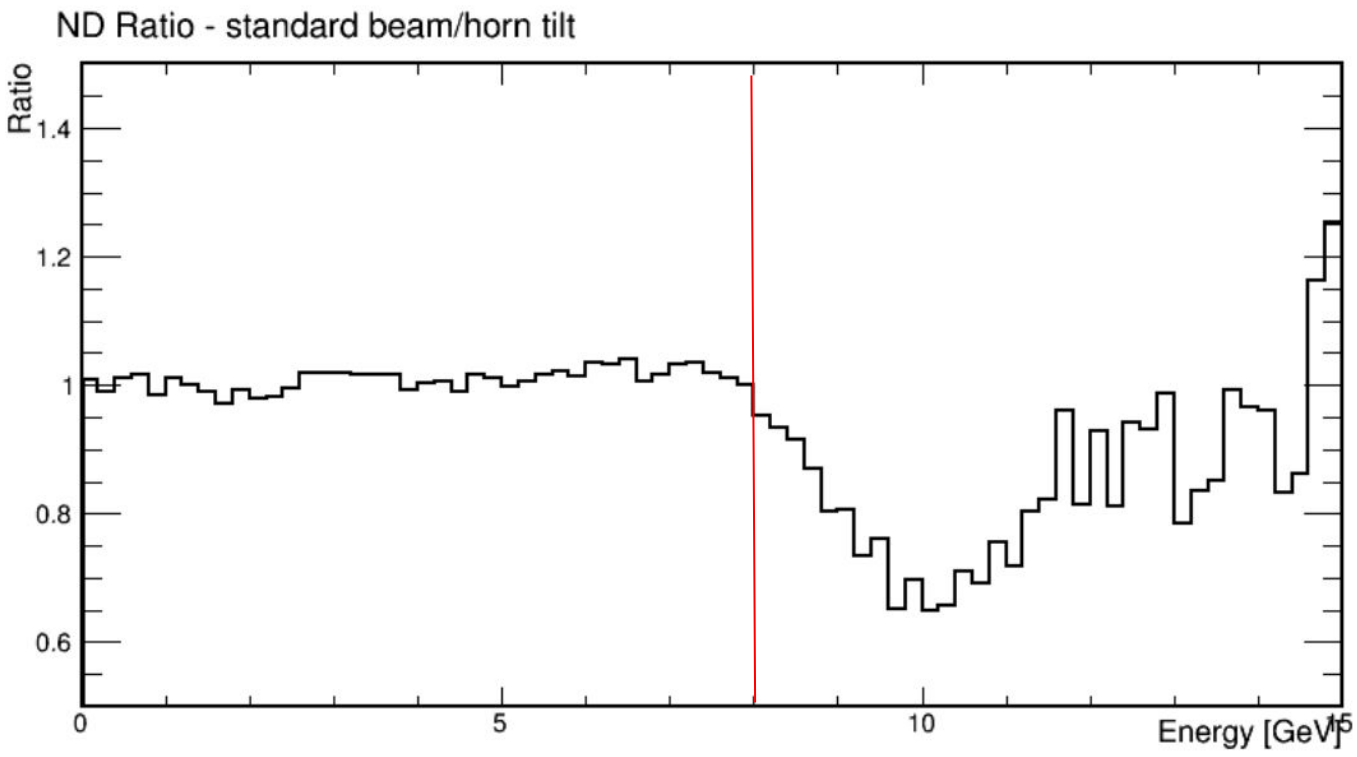
Track Energy Ratio



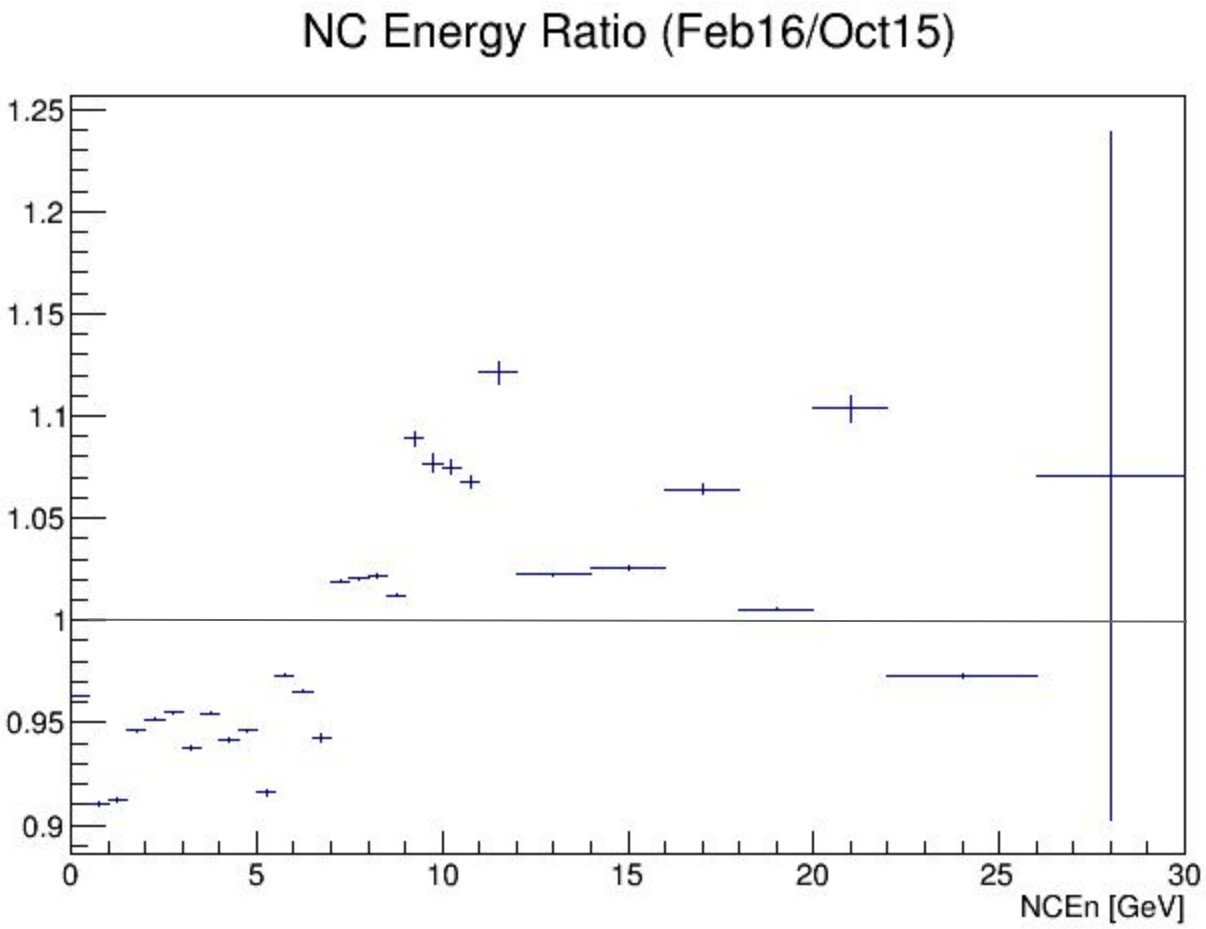
CC Energy Ratio



Giulia's Flux



NC Energy Ratio



Backup

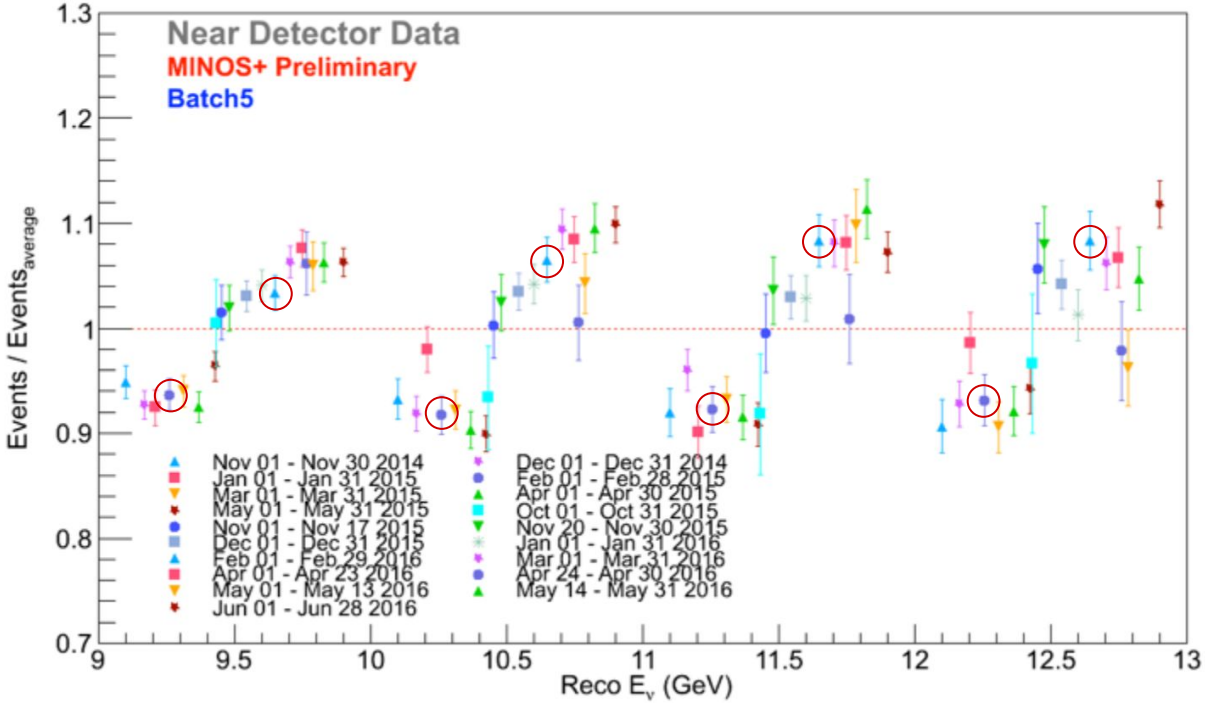
Run 12 vs. Run 13

- Code in **/minos/app/dphan/HornShiftStudy/HornShiftEnergyVariablesND.C**
- Simply taking the 4 variables **trkEn**, **shwEnkNN**, **energyCC** and **energyNC** in **timeTree** tree from two run periods and plotting their ratios to see if there are any big discrepancy.
- Each energy variable is normalized by its corresponding POT.

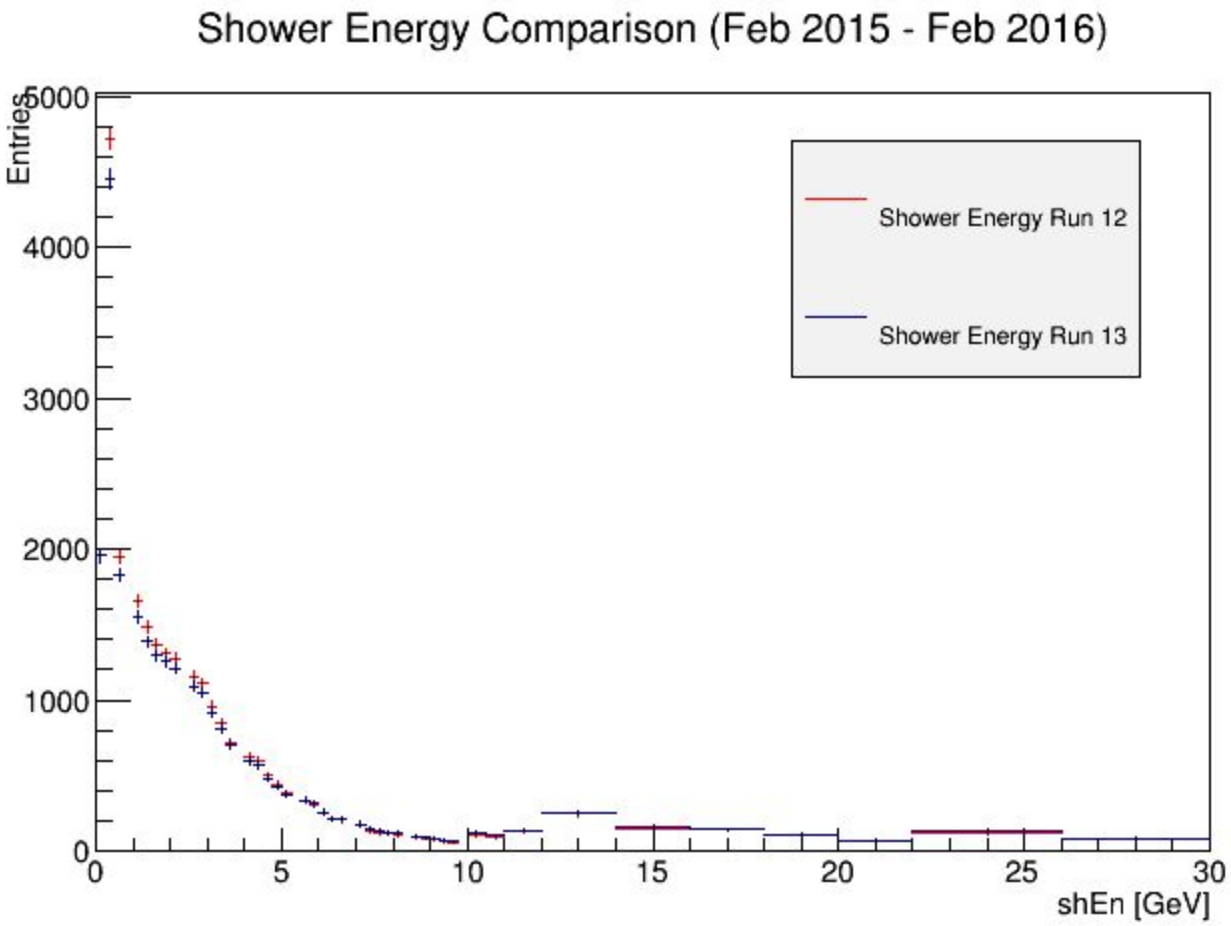
```
POT Run 12 (Feb. 2015): 1.97685e+18
POT Run 13 (Feb. 2016): 2.09055e+18
Run 12 (Feb. 2015) number of selected events: 613881
Run 13 (Feb. 2016) number of selected events: 649129
```

Dataset

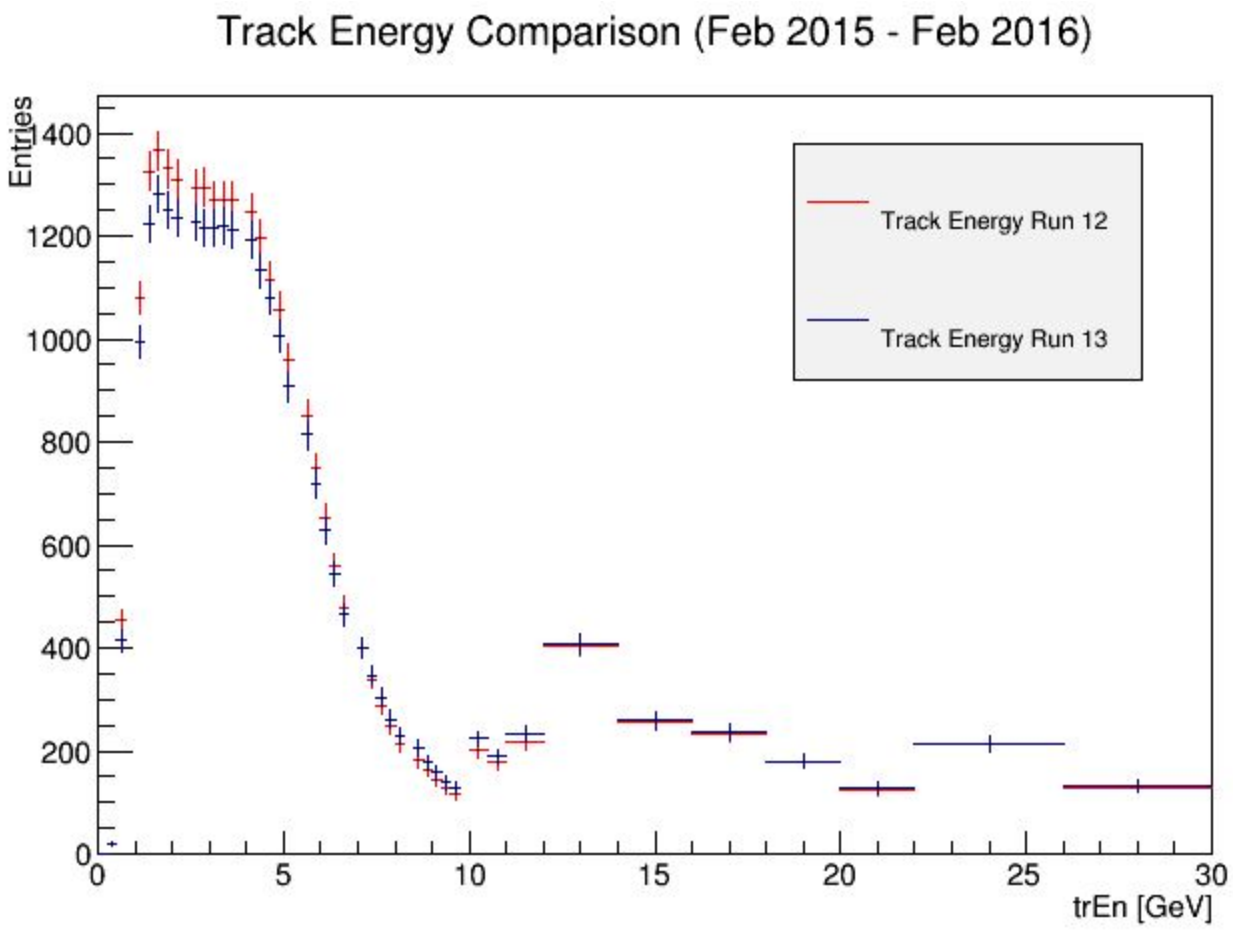
Ray's DQM plot is a hint of when the shift happened. NuMI-X DocDB #127, page 8.



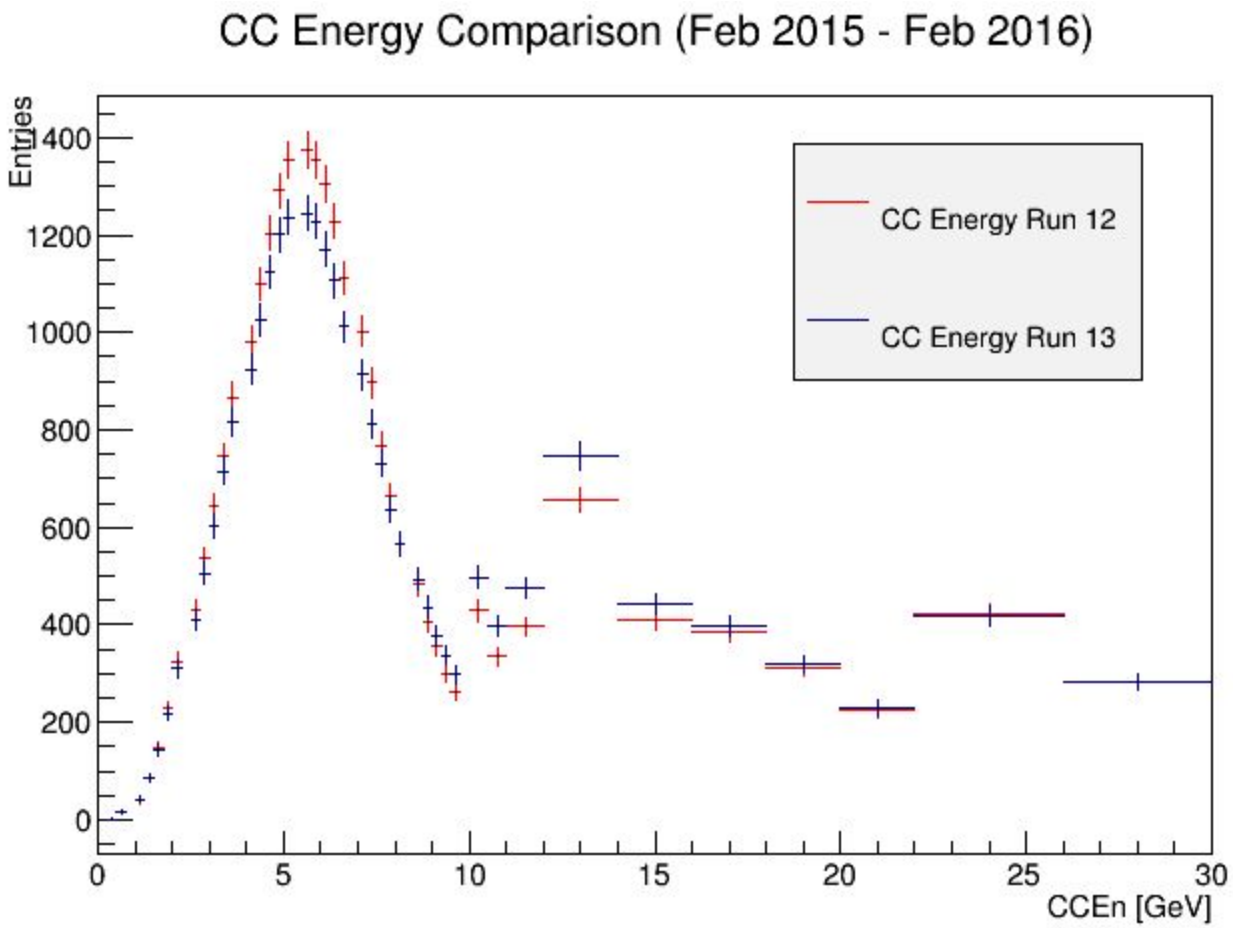
Shower Energy



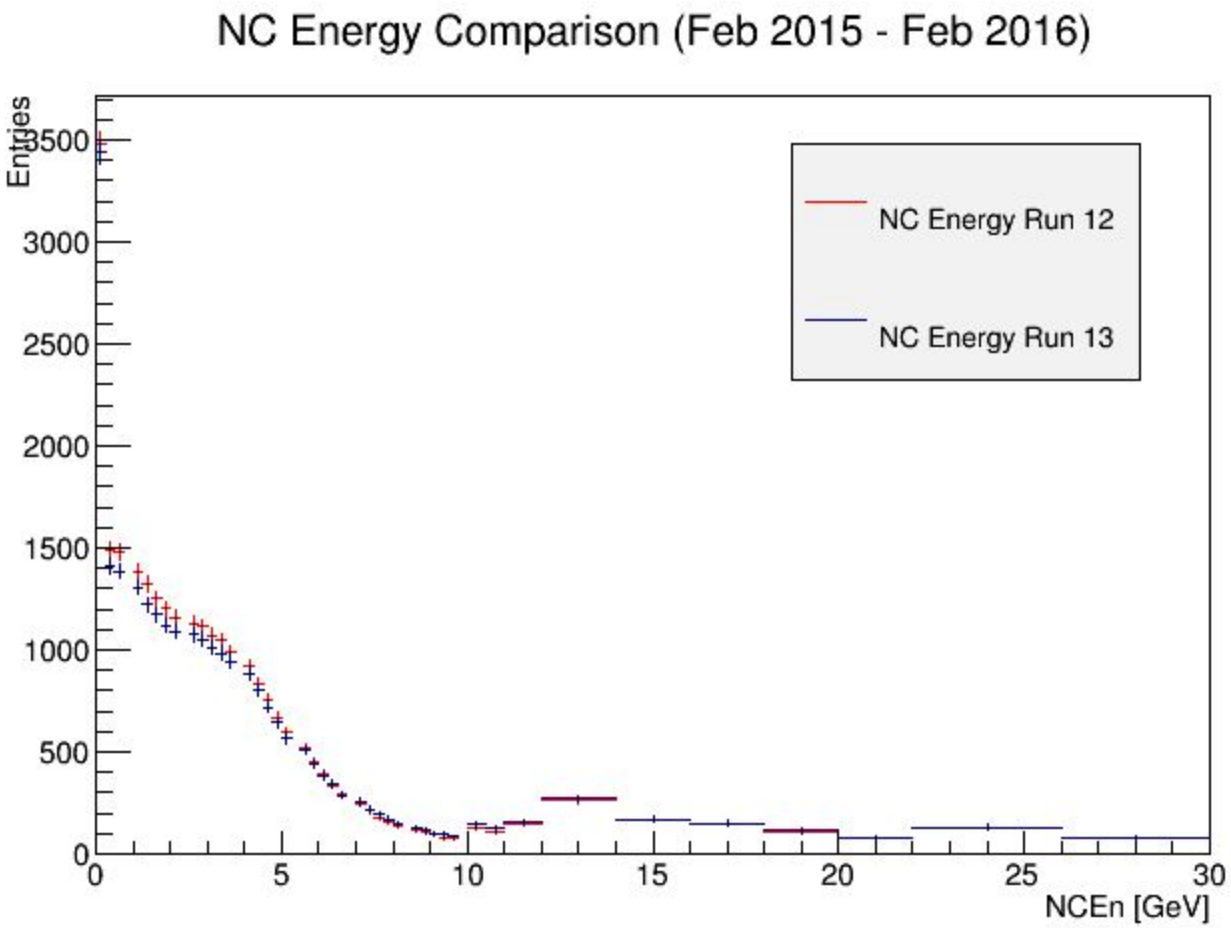
Track Energy



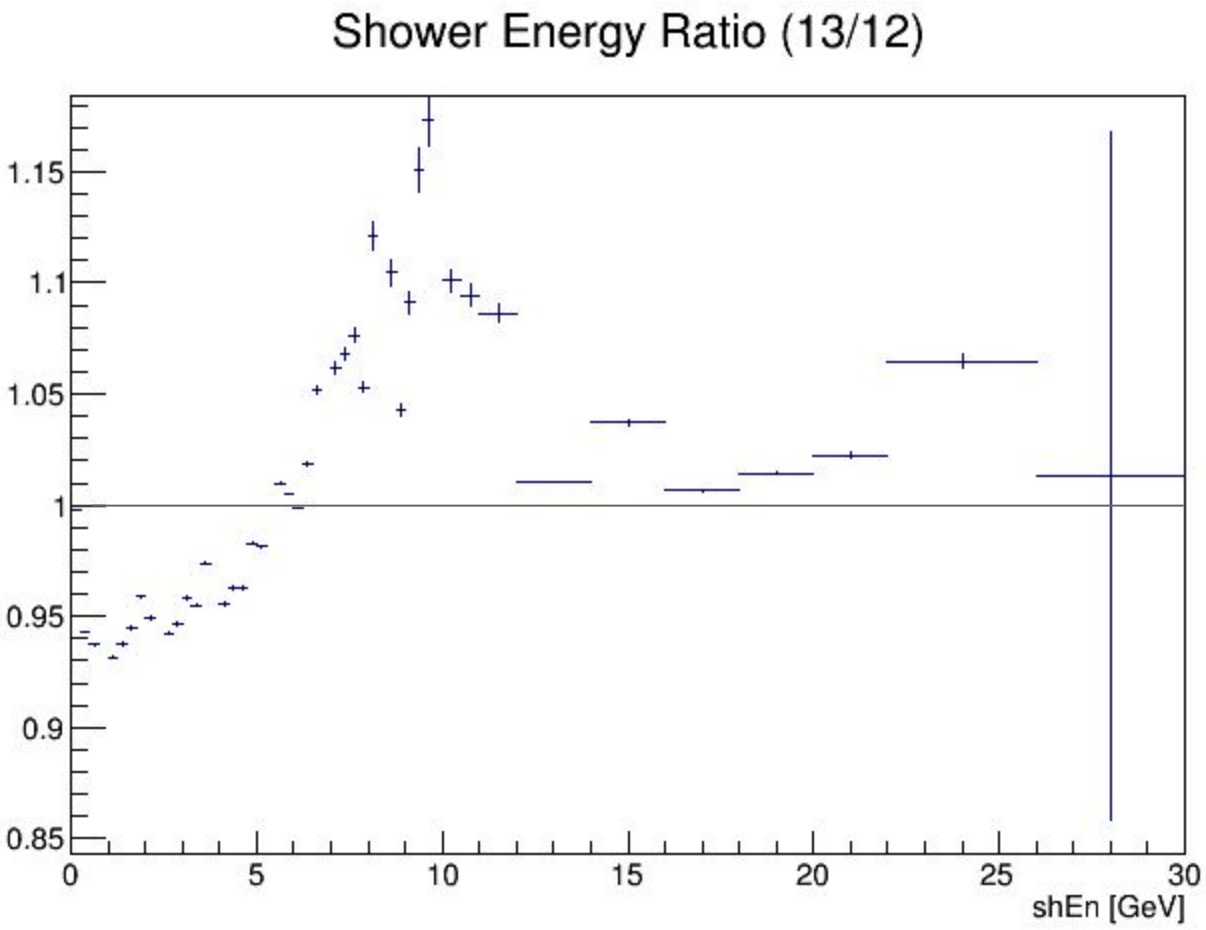
CC Energy


CC Energy Comparison (Feb 2015 - Feb 2016)
Entries
1400
1200
1000
800
600
400
200
0
0
5
10
15
20
25
30
CCEn [GeV]
CC Energy Run 12
CC Energy Run 13

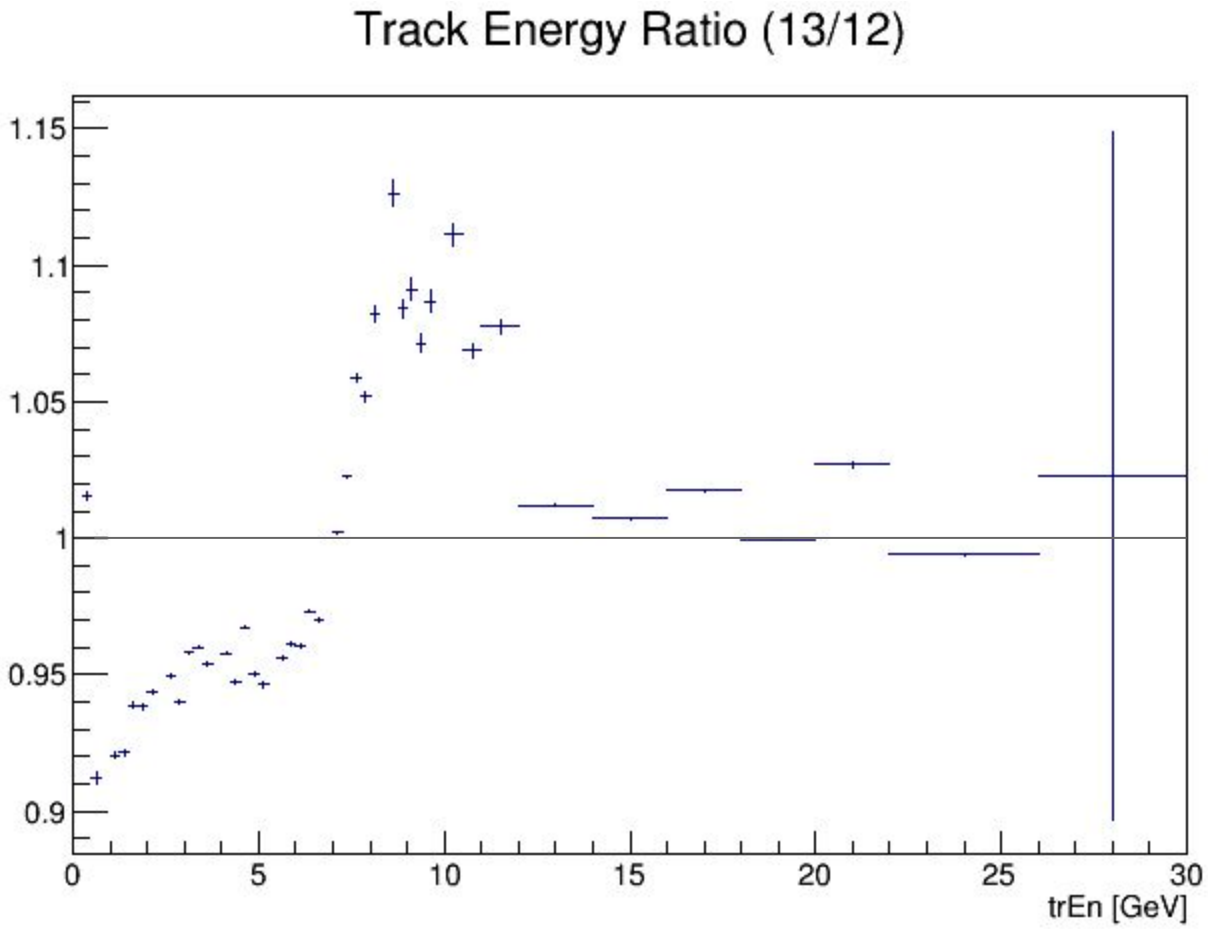
NC Energy


NC Energy Comparison (Feb 2015 - Feb 2016)
Entries
3500
3000
2500
2000
1500
1000
500
0
0
5
10
15
20
25
30
NCEn [GeV]
NC Energy Run 12
NC Energy Run 13

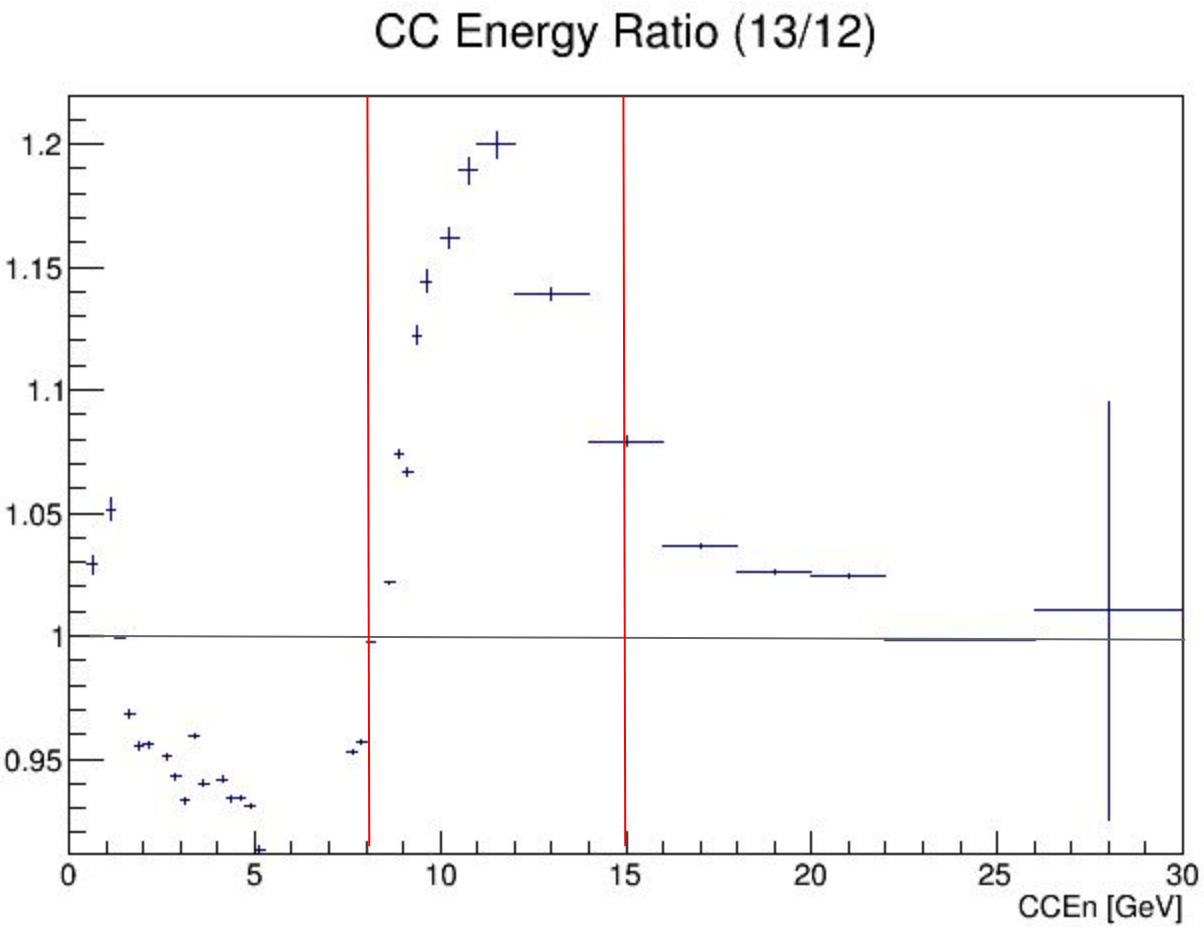
Shower Energy Ratio



Track Energy Ratio



CC Energy Ratio



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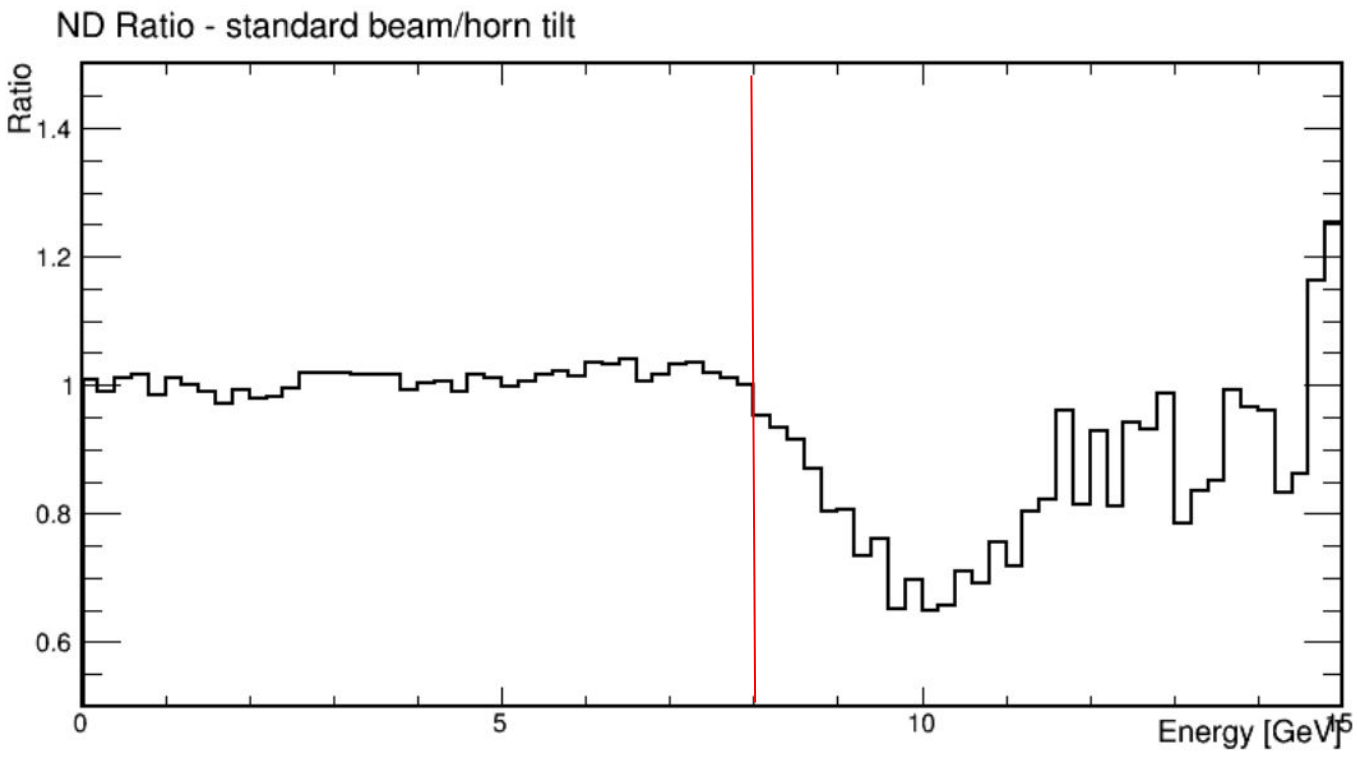
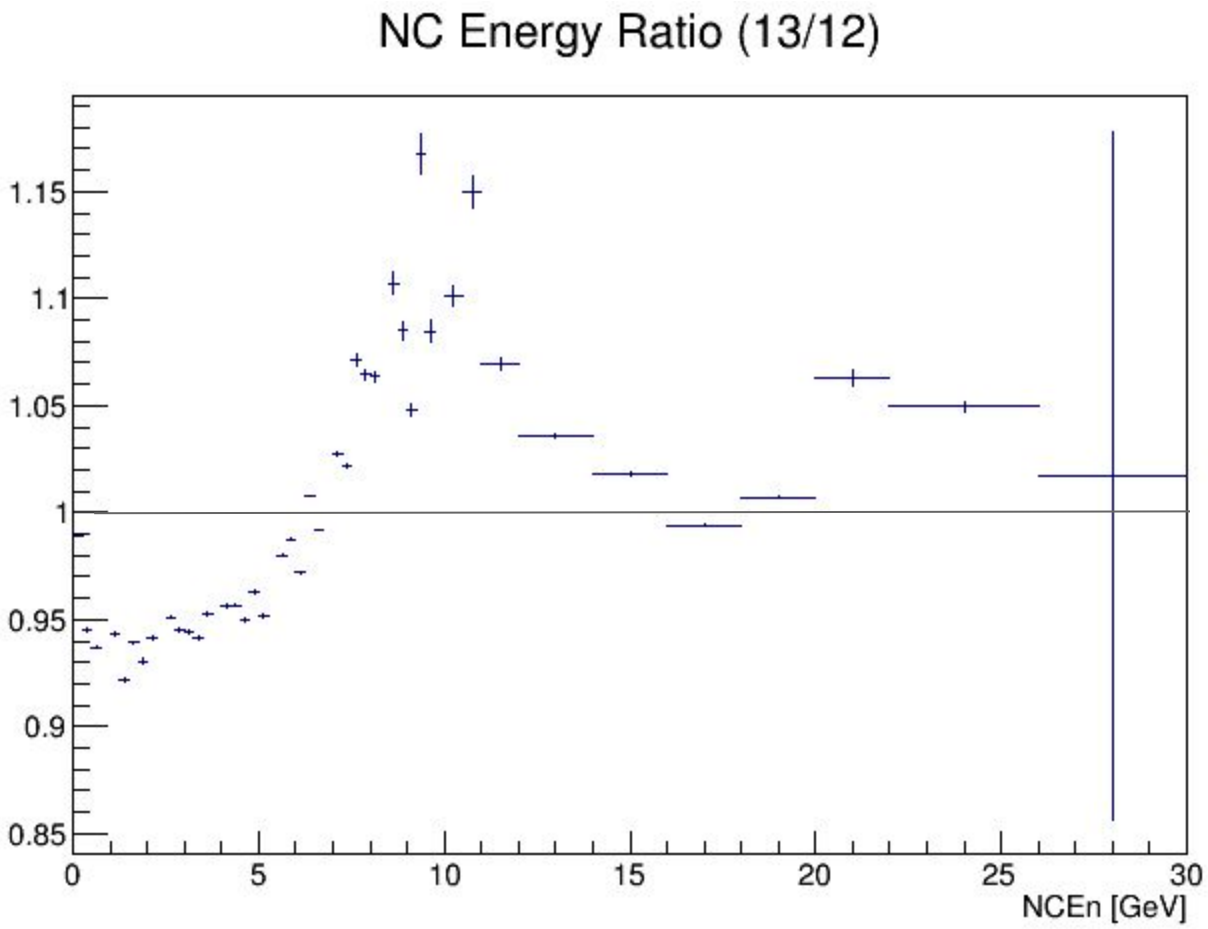
NC Energy Ratio