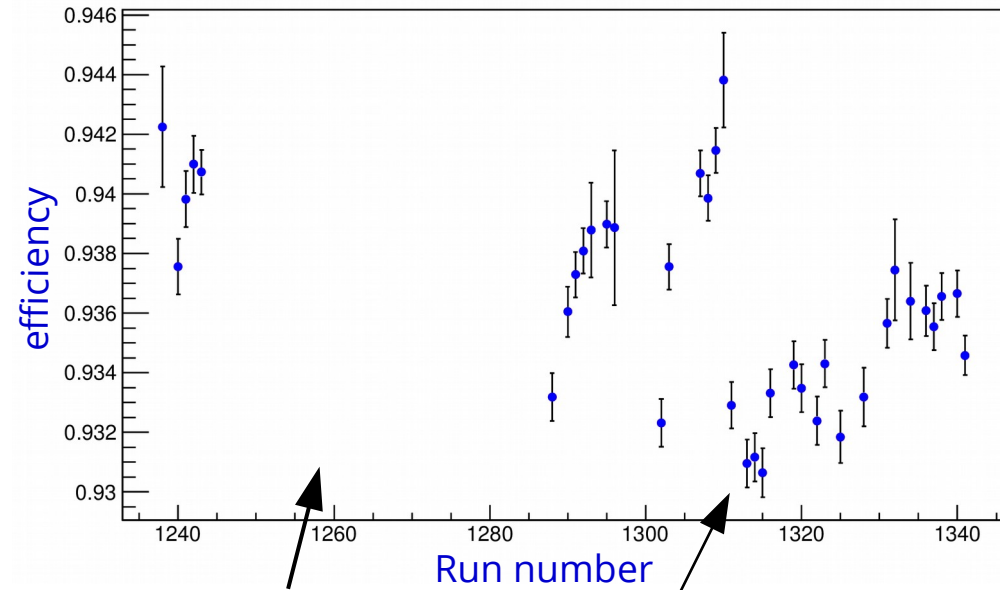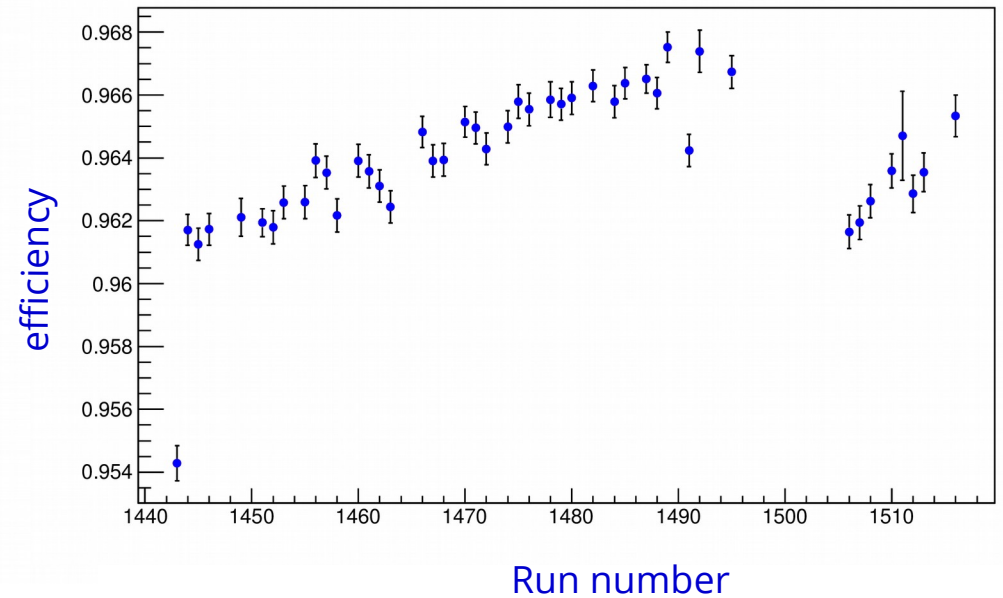# ee2 efficiency time stability

1GeV

2GeV

HyCal ADC board charge, this area filled with junk runs

- Time correlation more apparent with 2GeV beam

GEM gas change:

- Run 990,　bottle change 05/31/2016 – 07:48.
- Run 1059, bottle change 06/04/2016 – 09:37.
- Run 1131, bottle change 06/11/2016 – 18:47.
- Run 1404, bottle change　06/17/2016 – 19:00.
- Gas changed every 6~7 days
- ~3 gas changes during HyCal gain equalization and calibration, only 1 change in production
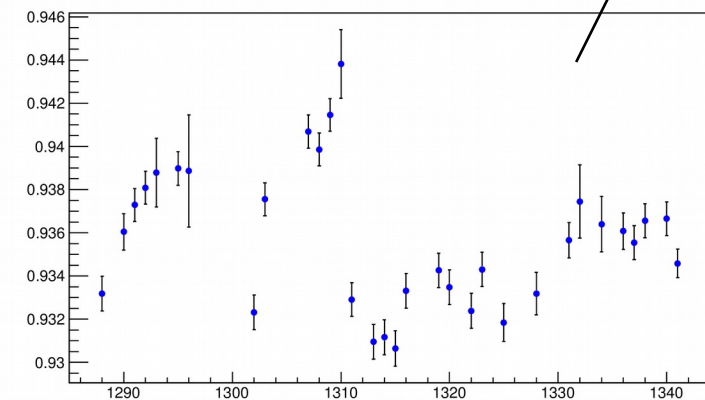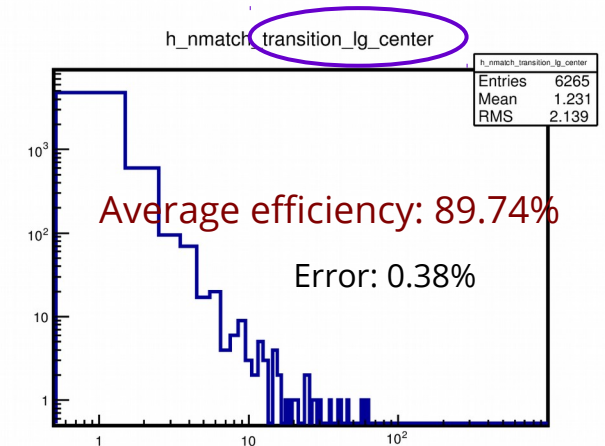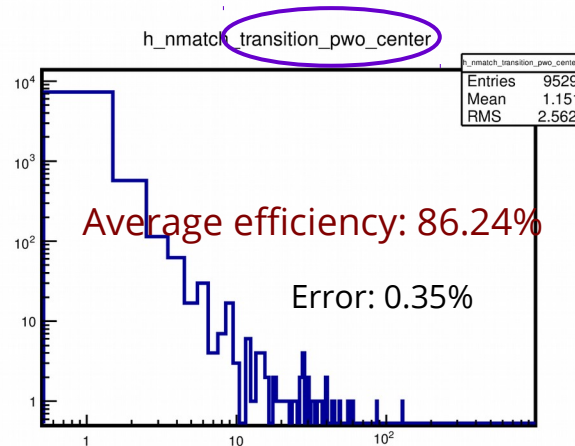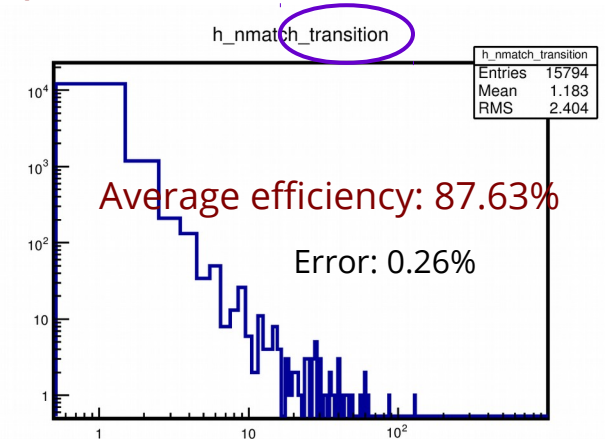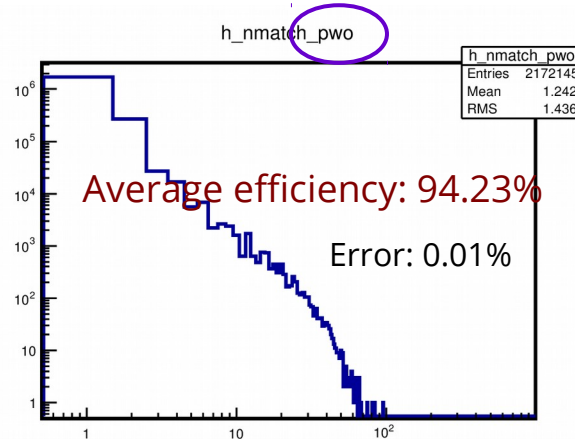
2 GeV ep events

ep cuts:

- 1 sigma cut around beam energy
- HyCal cluster size cut
- Polar angle > 0.8
- Matching radius: 6 sigma

ee2 cuts:

- 1 sigma cut around theoretical energy
- Require 2 hycal clusters at the same time
- HyCal cluster size cut
- Polar angle > 0.8
- Matching radius: 6 sigma

ee1 cuts:

- 1 sigma cut around theoretical energy
- HyCal cluster size cut
- Polar angle > 0.8
- Matching radius: 6 sigma

h_nmatch_pwo

h_nmatch_pwo	
Entries	2172145
Mean	1.242
RMS	1.436

Average efficiency: 94.23%

Error: 0.01%

h_nmatch_transition

h_nmatch_transition	
Entries	15794
Mean	1.183
RMS	2.404

Average efficiency: 87.63%

Error: 0.26%

h_nmatch_transition_pwo_center

h_nmatch_transition_pwo_center	
Entries	9529
Mean	1.151
RMS	2.562

Average efficiency: 86.24%

Error: 0.35%

h_nmatch_transition_lg_center

h_nmatch_transition_lg_center	
Entries	6265
Mean	1.231
RMS	2.139

Average efficiency: 89.74%

Error: 0.38%

- X axis: how many matching GEM clusters within searching radius for one HyCal cluster
- Y axis: counts
- Transition area, especially transition clusters centered in crystal region has low efficiency
- algorithm to improve transition area match, not finished.
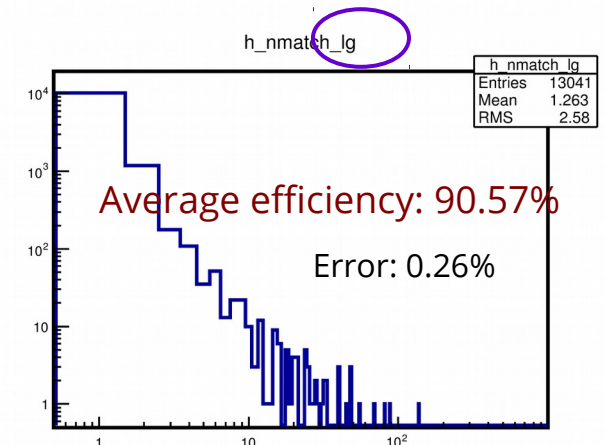
h_nmatch_lg

h_nmatch_lg	
Entries	13041
Mean	1.263
RMS	2.58

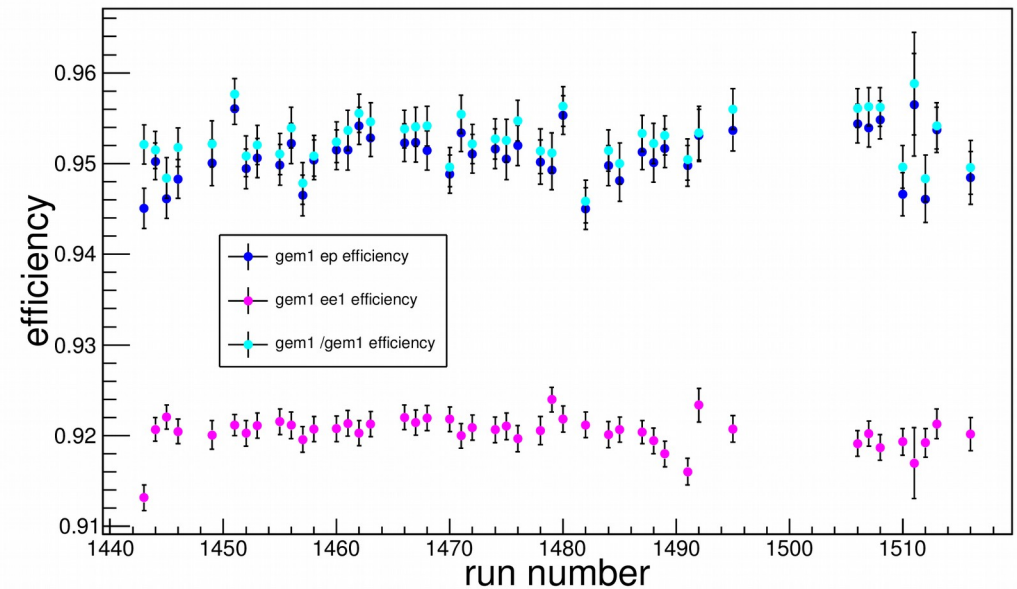Average efficiency: 90.57%

Error: 0.26%

efficiency in overlapping area

- Use one GEM chamber to check efficiency for the other chamber
- Every time find a cluster on GEM1, check if GEM2 sees that cluster, and vice versa
- This way has a cleaner data source than directly using HyCal, difference ~ 0.2% higher
- GEM1 efficiency ~1% higher than GEM2

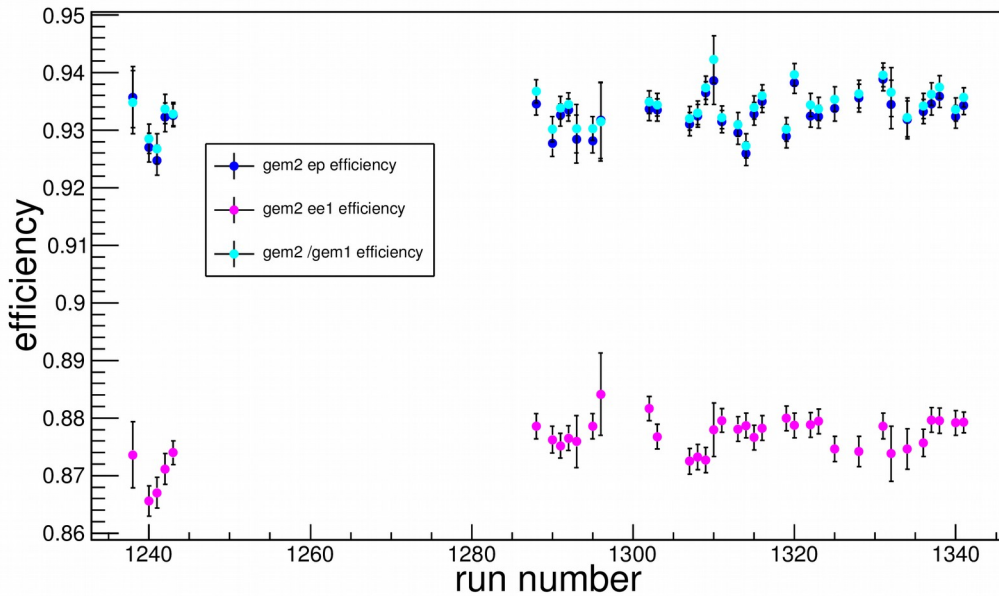2GeV with spacer overlap area gem2 efficiency
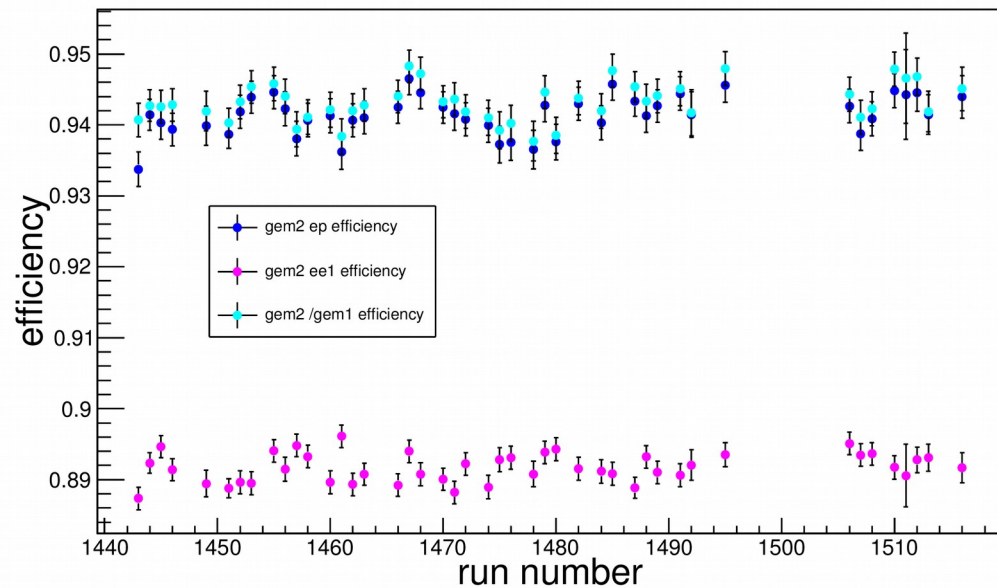
2GeV with spacer overlap area gem efficiency

efficiency in overlapping area

- Use one GEM chamber to check efficiency for the other chamber
- Every time find a cluster on GEM1, check if GEM2 sees that cluster, and vice versa
- This way has a cleaner data source than directly using HyCal, difference ~ 0.2% higher
- GEM1 efficiency ~1% higher than GEM2

1GeV with spacer overlap area gem2 efficiency

1GeV with spacer overlap area gem1 efficiency