



Pion-LT Meeting

Mr. Muhammad Junaid
Ph.D. Student
Department of Physics,
University of Regina, Canada

HEEP Study

PionLT Experiment

Beam Energy (GeV)	Setting (HeePCoin - 9)	Run Numbers
5.986	HMS_p = -3.271, HMS_theta = 29.170, SHMS_p = 3.493, SHMS_theta = 27.495	13058 – 13062, 13128
6.395 (s1)	HMS_p = -4.752, HMS_theta = 18.595, SHMS_p = 2.412, SHMS_theta = 37.970	16277 – 16279
6.395 (s2)	HMS_p = -4.391, HMS_theta = 21.095, SHMS_p = 2.792, SHMS_theta = 34.470	16280 – 16282
6.395 (s3)	HMS_p = -3.014, HMS_theta = 33.350, SHMS_p = 4.220, SHMS_theta = 23.115	16512 - 16517
7.937	HMS_p = -3.280, HMS_theta = 33.645, SHMS_p = 5.512, SHMS_theta = 19.265	14589 - 14600
8.479	HMS_p = -5.587, HMS_theta = 19.560, SHMS_p = 3.731, SHMS_theta = 30.020	16162 – 16165
9.177	HMS_p = -3.738, HMS_theta = 31.645, SHMS_p = 6.265, SHMS_theta = 18.125	11846 - 11879
9.876	HMS_p = -5.366, HMS_theta = 23.050, SHMS_p = 5.422, SHMS_theta = 23.050	13164 - 13169
10.549	HMS_p = -5.878, HMS_theta = 21.670, SHMS_p = 5.539, SHMS_theta = 23.110	14986 - 14993

- Cuts for HeeP data.

HMS Cuts (Electrons)

$$-8 < H_gtr_dp < 8$$

$$-0.08 < H_gtr_th < 0.08$$

$$-0.045 < H_gtr_ph < 0.045$$

$$HMS_Cal_etottracknorm > 0.7$$

$$H_Cer_npeSum > 1.5$$

SHMS Cuts (Protons)

$$-10 < P_gtr_dp < 20$$

$$-0.06 < P_gtr_th < 0.06$$

$$-0.04 < P_gtr_ph < 0.04$$

Ctime_epCoinTime_ROC1 – Prompt Peak

- Cuts for HeeP SIMC.

HMS Cuts (Electrons)

$$-8 < hsdelta < 8$$

$$-0.08 < hsxpfp < 0.08$$

$$-0.045 < hsyfp < 0.045$$

SHMS Cuts (Protons)

$$-10 < ssdelta < 20$$

$$-0.06 < ssxpfp < 0.06$$

$$-0.04 < ssypfp < 0.04$$

- Global In-Plane Offset from Garth:

Global In-Plane Offsets – Momentum and Energy offsets in 0.1% unit, Angle offset in mrad unit

dthe	1.2000	dpe	-0.1000	dthp	1.7000	dpp	-0.2000		
BE	5984.8	6394.7s1	6394.7s2	6394.7s3	7937.6	8478.6	9171.3	9876.9	10546.8
dE	-0.6000	-0.6000	-0.6000	-0.6000	-0.5000	-0.5000	-0.6000	-0.7000	-0.0000

- Implemented energy, momentum and angle offset with positive sign on both DATA and SIMC.
- Implemented Out-of-plane offsets to DATA (**HMS = +0.0019rad** and **SHMS = -0.00005rad**).

- Made HeePCoin comparison plots and calculated Data/SIMC Ratio.
- Calculated errors in ratios properly.
- SIMC and Data is normalized.

$$\text{Effective charge} = \text{Charge} \times \text{Tracking Eff} \times \text{Detector Eff} \times \text{Hodo} \frac{3}{4} \text{Eff} \times \text{EDTM Live Time} \times \text{Boiling Corr}$$

- In data normalization, Following quantities are included:
 - **Charge (run-by-run)**
 - **Tracking Efficiencies (HMS and SHMS run-by-run)**
 - **Detector Efficiencies (HMS Cer and HMS Cal run-by-run)**
 - **Hodo $\frac{3}{4}$ Efficiencies (HMS and SHMS run-by-run)**
 - **EDTM Live Time (run-by-run)**
 - **Dummy Target Thickness Correction Applied – (3.527 +/- 0.227 - PionLT)**
 - **Richard's Boiling Correction Applied (-0.0007899) - From Richard**

In progress:

- Working on error determination of some of the variables (Hodo eff, Charge, Current etc).
- Will do SIMC Model testing with Nacer. (10.6 GeV)
- Working on Proton absorption correction.

Beam Energy (GeV)	Run Numbers	Data/SIMC Ratio	Issues
5.986	13058 – 13062, 13128	1.054 +/- 0.085	
6.395 (s1)	16277 – 16279	1.083 +/- 0.078	
6.395 (s2)	16280 – 16282	0.941 +/- 0.074	
6.395 (s3)	16512 - 16517	1.094 +/- 0.011	Dummy run issue Its not HCANA issue
7.937	14589 - 14600	1.116 +/- 0.330	
8.479	16162 – 16165	1.144 +/- 0.100	
9.177	11846 - 11879	1.259 +/- 0.348	
9.876	13164 - 13169	1.153 +/- 0.136	
10.549	14986 - 14993	1.228 +/- 0.179	

- Working on do **Full_Replay_Pass2** replays.
- Getting error related to crate map during replays.

```
Starting analysis
Info in <THaCrateMap::init(tloc)>: Opened database file MAPS/db_cratemap.dat
THaCrateMap: WARNING: Did not find TSROC. Using default 21
  If this is incorrect, TS info (trigger bits etc.) will be unavailable.
Caen1190Module::LoadBank: slot/crate 18/2: FATAL ERROR: No global header found in bank. Call expert.
Banks found (event 1):
roc bank  pos   len
1   4    11    8
1 1190   21   40
1  250   63  1000
1 9250  1065  238
1 9001  1305   1
1  20   1308   5
2   4    1317   8
2 1190  1327   56
2  250  1385  2092
2 9250  3479  170
2 9001  3651   13
2  20   3666   5
3   4    3675   6
3 1190  3683  120
3  20   3805   1
4   4    3810   8
4  250  3820  124
4 9250  3946  272
4  20   4220   5
5   4    4229   8
5 3801  4239  231
5 9801  4472   33
5  20   4507   5
6   4    4516   6
6 1190  4524  132
6  20   4658   1
8   4    4663   8
8 3801  4673  264
8 9801  4939   33
8  20   4974   5
Sum                4898
Caen1190Module::LoadBank: slot/crate 18/2: FATAL ERROR: No global header found in bank. Call expert.
Caen1190Module::LoadBank: slot/crate 18/2: FATAL ERROR: No global header found in bank. Call expert.
Caen1190Module::LoadBank: slot/crate 18/2: FATAL ERROR: No global header found in bank. Call expert.
Caen1190Module::LoadBank: slot/crate 18/2: FATAL ERROR: No global header found in bank. Call expert.
```

- Updated Hcana and Analyzer(podd) version to latest.
- Getting warnings related to crate map during some of replays.

```
Starting analysis
Info in <THaCrateMap::init(tloc)>: Opened database file MAPS/db_cratemap.dat
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Banks found (event 1):
roc  bank  pos  len
1    4      11   8
1   1190   21  36
1   250    59 1000
1   9250  1061 238
1   9001  1301   1
1    20   1304   5
2    4     1313   8
2   1190  1323   60
2    250  1385  2196
2   9250  3583  170
2   9001  3755   13
2    20   3770   5
3    4     3779   6
3   1190  3787  120
3    20   3909   1
4    4     3914   8
4   250   3924  124
4   9250  4050  272
4    20   4324   5
5    4     4333   8
5   3801  4343  231
5    20   4576   5
6    4     4585   6
6   1190  4593  136
6    20   4731   1
8    4     4736   8
8   3801  4746  264
8    20   5012   5
Sum                4940
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 13, expected 15
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
Caen1190Module::LoadBank: slot/crate 7/3: Warning: global trailer word count mismatch, got 9, expected 11
```