HEEP Studies

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HEEP Study

Beam Energy (GeV)	Setting (HeePCoin - 9)	Run Numbers
9.177	HMS_p = -3.738, HMS_theta = 31.645, SHMS_p = 6.265, SHMS_theta = 18.125	11846 - 11879
5.986	HMS_p = -3.271, HMS_theta = 29.170, SHMS_p = 3.493, SHMS_theta = 27.495	13058 – 13062, 13128
9.876	HMS_p = -5.366, HMS_theta = 23.050, SHMS_p = 5.422, SHMS_theta = 23.050	13164 - 13169
7.937	HMS_p = -3.280, HMS_theta = 33.645, SHMS_p = 5.512, SHMS_theta = 19.265	14589 - 14600
10.549	HMS_p = -5.878, HMS_theta = 21.670, SHMS_p = 5.539, SHMS_theta = 23.110	14986 - 14993
8.479	HMS_p = -5.587, HMS_theta = 19.560, SHMS_p = 3.731, SHMS_theta = 30.020	16162 – 16165
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

HEEP Study

- 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 < hsypfp< 0.045

SHMS Cuts (Protons)
-10 < ssdelta< 20
-0.06 < ssxpfp< 0.06
-0.04 < ssypfp< 0.04

HEEP Study

- **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 to both DATA and SIMC.

- Implemented Out-of-plane offsets to DATA (**HMS = +0.0019rad and SHMS = -0.00005rad**).
- Tested Out-of-plane offsets with opposite but distributions moved to opposite direction.
- Used Out-of-plane offsets with same signs got from fitting results.

HEEP Study

- In first study, applied In-plane momentum and In-plane energy offsets in four different combinations.

Combinations	In-Plane Energy Offset	In-Plane Momentum Offset	In-Plane Angle Offset (kept fixed)
1st	**-ve sign**	**-ve sign**	+ve sign
2nd	**-ve sign**	**+ve sign**	+ve sign
3rd	**+ve sign**	**-ve sign**	+ve sign
4th	**+ve sign**	**+ve sign**	+ve sign

- In second study, applied in-plane angles offsets in two different combinations.

Combinations	In-Plane Energy Offset	In-Plane Momentum Offset	In-Plane Angle Offset
1st	+ve sign	+ve sign	**+ve sign**
2nd	+ve sign	+ve sign	**-ve sign**

HEEP Study

- In first study, applied Out-of-plane Offsets with existing signs – **Its working fine**

Out-of-plane HMS Offset	Out-of-plane SHMS Offset
+ve sign	-ve sign

- In Second study, applied Out-of-plane Offsets with flipped signs.

Out-of-plane HMS Offset	Out-of-plane SHMS Offset
-ve sign	+ve sign

HEEP Study

- Made HeeP comparison plots of other variables (delta, target, focal plane)
- SIMC is normalized.
- Data is normalized (BCM calibrations are not correct)

$$Effective\ charge = \frac{1}{Charge \times Tracking\ Eff \times Detector\ Eff \times Hodo\frac{3}{4}Eff \times EDTM\ Live\ Time \times Boiling\ Corr.}$$

- 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 ¾ Efficiencies (HMS and SHMS run-by-run)**
- **Conclusion**
  - **momentum and energy offsets in positive sign gives good results.**
  - **Out-of-plane Offsets with existing signs gives good result.**

In progress:

- Working on HeeP Coin Study.