



University  
of Regina

# $H(e, e')p$ Study

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Kaon LT Meeting, 08/07/2024

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# Event Selection

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$(H\_gtr\_dp > -8) \& (H\_gtr\_dp < 8)$

$(P\_gtr\_dp > -10) \& (P\_gtr\_dp < 20)$

$(H\_gtr\_xp > -0.08) \& (H\_gtr\_xp < 0.08)$

$(H\_gtr\_yp > -0.045) \& (H\_gtr\_yp < 0.045)$

$(P\_gtr\_xp > -0.06) \& (P\_gtr\_xp < 0.06)$

$(P\_gtr\_yp > -0.04) \& (P\_gtr\_yp < 0.04)$

$(CTime\_epCoinTime\_ROC1 > ((0) - ((4.008)/2.0) - (0.25))) \&$   
 $(CTime\_epCoinTime\_ROC1 < ((0) + ((4.008)/2.0) + (0.25)))$

$(abs(H\_gtr\_beta - 1)) < 0.3)$

$(H\_cer\_npeSum > 2.0)$

$(H\_cal\_etottracknorm > 0.7)$

# Data and MC Yields Calculation

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total\_data\_effective\_charge = BCM1\_Charge x HMS\_Elec\_SING\_TRACK\_EFF x  
SHMS\_Prot\_SING\_TRACK\_EFF x HMS\_cer\_eff x HMS\_cal\_eff x  
SHMS\_Hodo\_3\_of\_4\_EFF x HMS\_Hodo\_3\_of\_4\_EFF x Non\_Scaler\_EDTM\_Live\_Time x  
data\_Boiling\_factor

data\_Boiling\_factor = 1 + (-0.0007899 \* data\_BCM1\_Beam\_Cut\_Current)

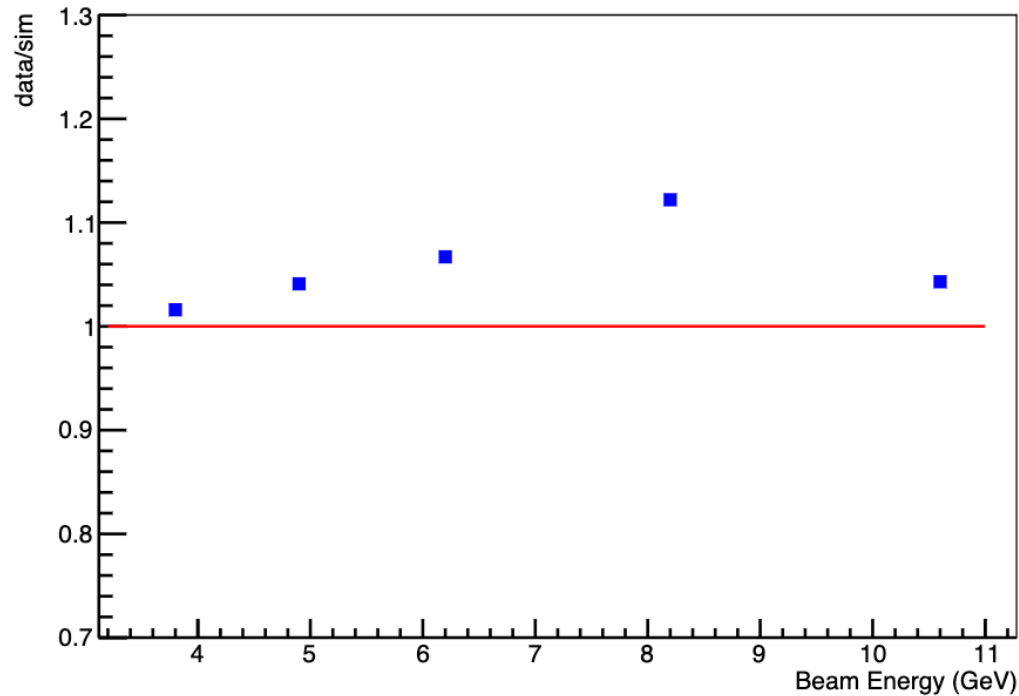
normfac\_data = 1.0/(total\_data\_effective\_charge)

dummy\_target\_corr = 4.8579

normfac\_dummy = 1.0/(total\_dummy\_effective\_charge\*dummy\_target\_corr)

normfac\_simc = (simc\_normfactor)/(simc\_nevents)

# Data and MC Yields for different Beam Energy



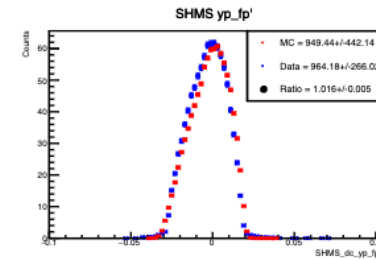
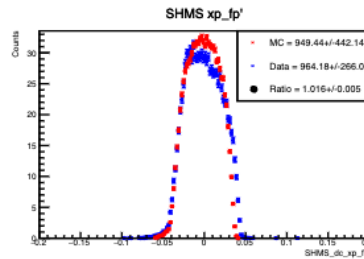
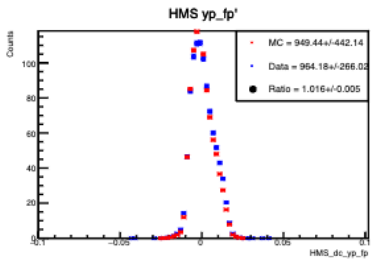
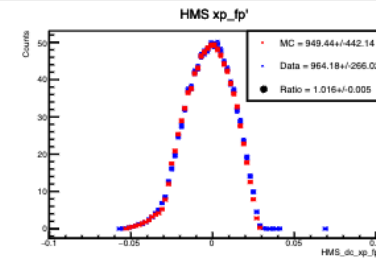
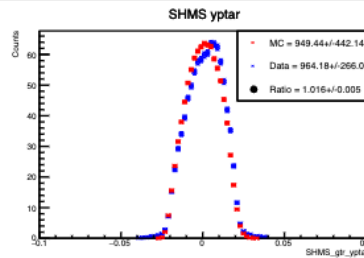
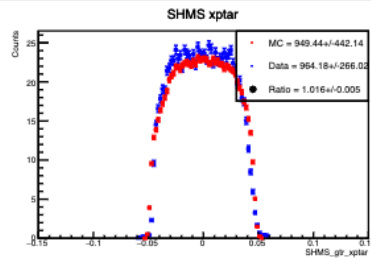
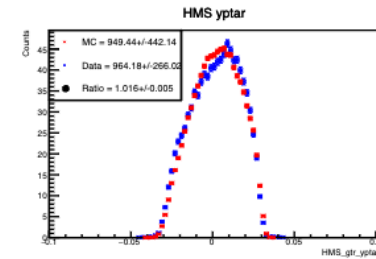
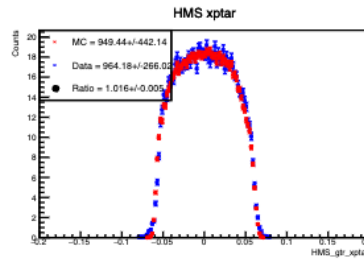
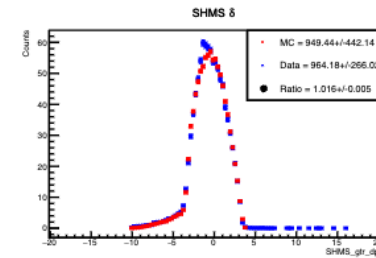
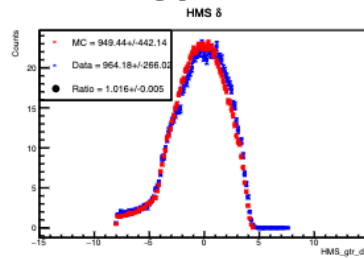
Energy	Bosted	Arrington	AMT	Brash
3.8	1.016 +/- 0.005	1.027 +/- 0.005	1.022 +/- 0.005	1.023 +/- 0.005
4.9	1.041 +/- 0.004	1.057 +/- 0.005	1.050 +/- 0.005	1.061 +/- 0.005
6.2	1.067 +/- 0.004	1.060 +/- 0.004	1.057 +/- 0.004	1.086 +/- 0.004
8.2	1.122 +/- 0.006	1.147 +/- 0.006	1.115 +/- 0.006	1.143 +/- 0.006
10.6	1.043 +/- 0.005	1.091 +/- 0.005	1.043 +/- 0.005	1.067 +/- 0.005

# Data and MC Yields Calculation

Beram Energy: 3.8 GeV

HeePCoin Setting  
Beam Energy = 3.834  
HMS\_p = 2.026  
HMS\_theta = 38.600  
SHMS\_p = 2.583  
SHMS\_theta = 29.305  
Red = SIMC  
Blue = DATA

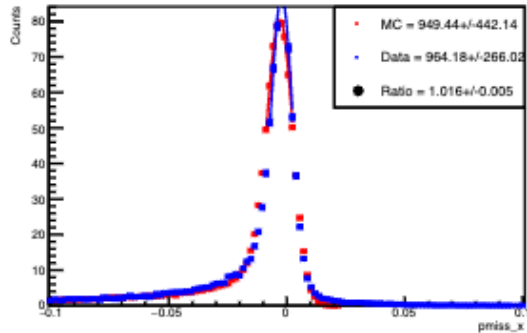
Data/SIMC Ratio = 1.016 +/- 0.005



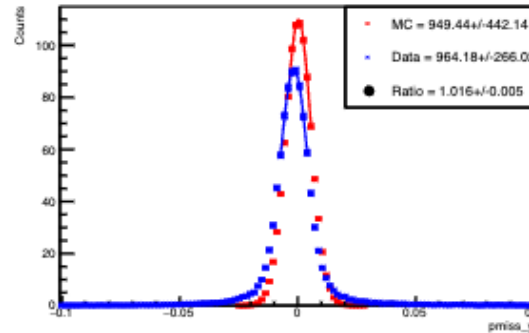
# Data and MC Yields Calculation

Beram Energy: 3.8 GeV

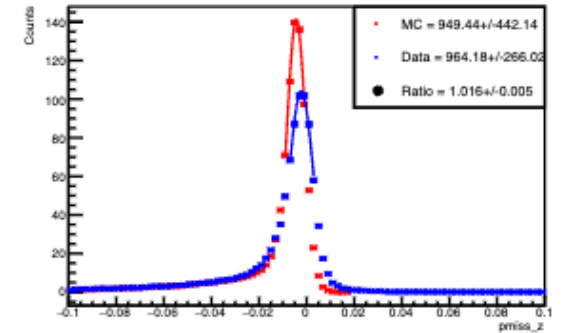
Momentum\_x Distribution



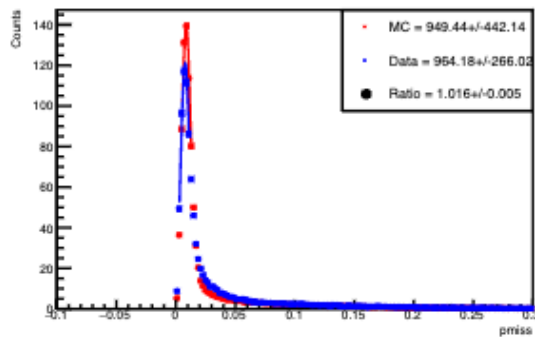
Momentum\_y Distribution



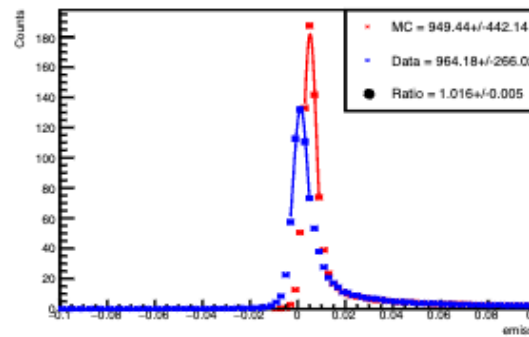
Momentum\_z Distribution



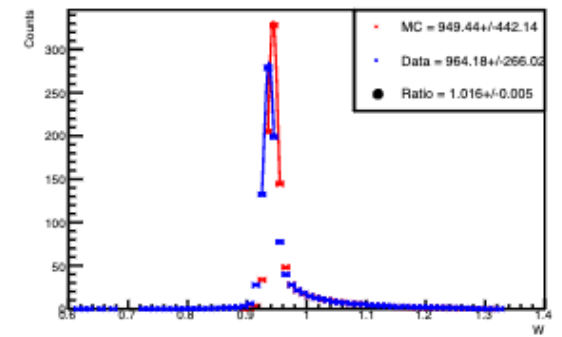
Momentum Distribution



Energy Distribution



W Distribution



# Data and MC Yields Calculation

**Beram Energy: 3.8 GeV**

Run_Number	6634.0	6635.0	6637.0
charge	44.478	35.168	28.34
charge_error	0.0	0.0	0.0
HMS_Tracking_Eff	0.998	0.9978	0.9979
HMS_Tracking_Eff_error	0.0003	0.0003	0.0005
SHMS_Tracking_Eff	0.9974	0.9974	0.9973
SHMS_Tracking_Eff_error	0.0002	0.0002	0.0002
HMS_Cer_Detector_Eff	0.973	0.973	0.973
HMS_Cer_Detector_Eff_error	0.0006	0.0006	0.0006
HMS_Cal_Detector_Eff	0.9961	0.9961	0.9961
HMS_Cal_Detector_Eff_error	0.0005	0.0005	0.0005
HMS_Hodo_3_4_Eff	0.999911	0.999906	0.999895
HMS_Hodo_3_4_Eff_error	0.0003	0.0003	0.0005
SHMS_Hodo_3_4_Eff	0.992261	0.992308	0.993134
SHMS_Hodo_3_4_Eff_error	0.0002	0.0002	0.0002
EDTM_Live_Time	1.0003	1.0006	1.0001
EDTM_Live_Time_error	0.0	0.0	0.0
Boiling_factor	0.959865181	0.9596550676	NA
Boiling_factor_error	0.0	0.0	NA
effective_charge	40.87791262165573	32.318979657034426	27.147768813672737
effective_charge_error	0.03863839507373716	0.030548936617074744	0.02991304488024401
target_corr	NA	NA	4.8579
target_corr_error	NA	NA	0.01

# Data and MC Yields Calculation

**Beram Energy: 3.8 GeV**

total_data_effective_charge	73.19689227869016	0.049256097107954526
total_dummy_effective_charge	131.88114611994078	0.029983790406612847
N_data	70764.0	266.01503716895405
N_dummy	341.0	18.466185312619388
N_simc	195485.0	442.13685664056555
normfac_data	0.013661782199613007	NA
normfac_dummy	0.007582584997331907	NA
normfac_simc	60.2665	NA
N_data_norm	966.7623555734149	3.6920081967637723
N_dummy_norm	2.5856614840901804	0.14002265373620737
N_simc_norm	949.4350993311389	2.1473783175307206
N_data_W	964.1766940893247	3.6369358997109447
N_simc_W	949.4350993311392	2.1809031765006264
dataSimcRatio_W	1.0155267008440816	0.004518718212857112

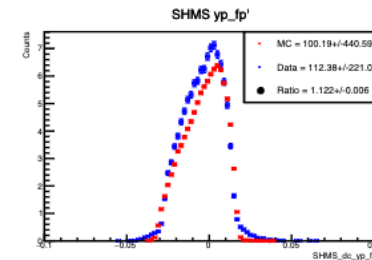
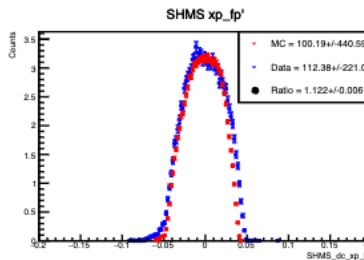
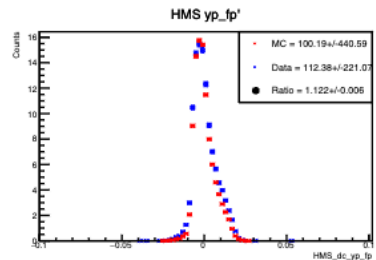
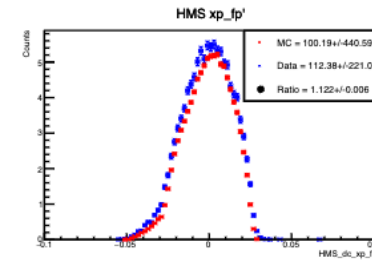
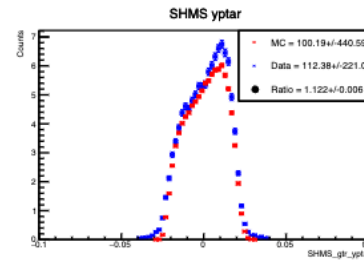
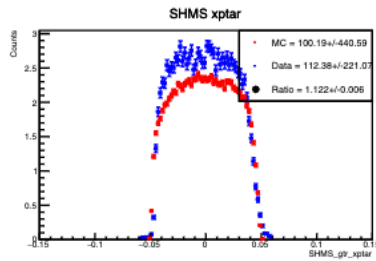
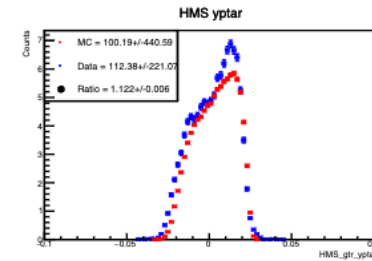
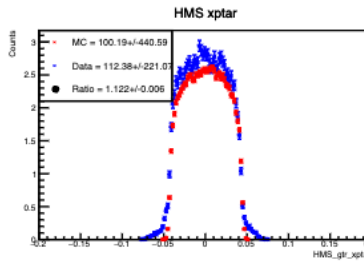
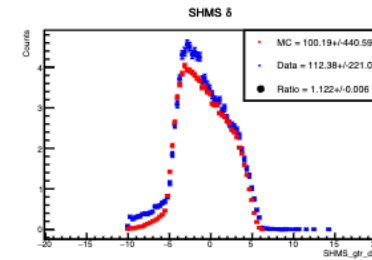
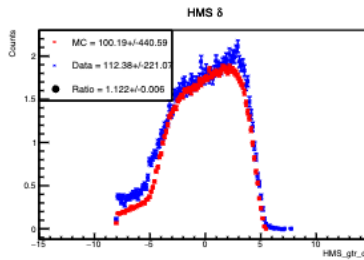


# Data and MC Yields Calculation

Berem Energy: 8.2 GeV

HeePCoin Setting  
Beam Energy = 8.213  
HMS\_p = 4.672  
HMS\_theta = 24.000  
SHMS\_p = 4.371  
SHMS\_theta = 25.775  
Red = SIMC  
Blue = DATA

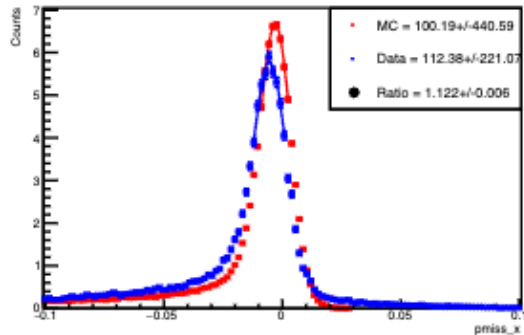
Data/SIMC Ratio = 1.122 +/- 0.006



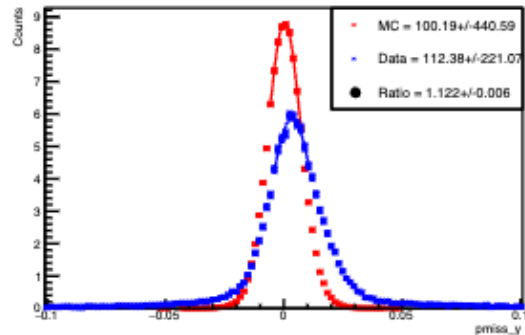
# Data and MC Yields Calculation

Beram Energy: 8.2 GeV

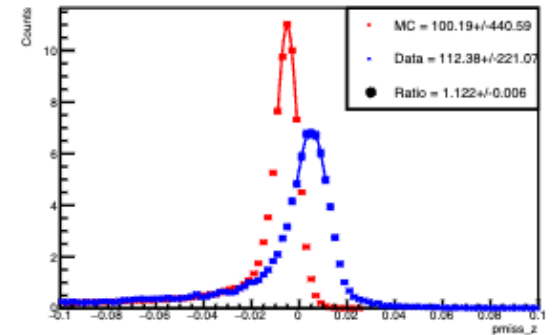
Momentum\_x Distribution



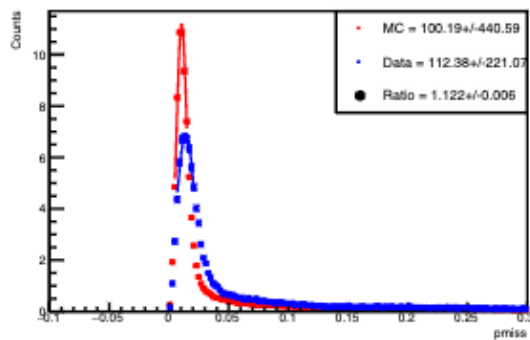
Momentum\_y Distribution



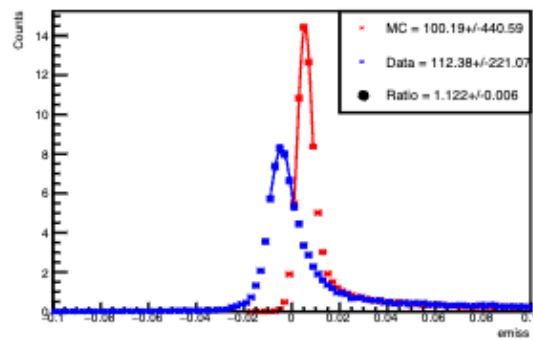
Momentum\_z Distribution



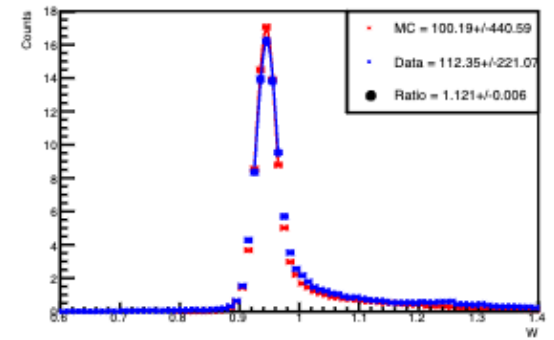
Momentum Distribution



Energy Distribution



W Distribution



# Data and MC Yields Calculation

Beram Energy: 8.2 GeV

Run_Number	7974.0	7975.0	7976.0	7977.0
charge	113.204	217.584	211.754	42.133
charge_error	0.0	0.0	0.0	0.0
HMS_Tracking_Eff	0.9974	0.9974	0.9972	0.9974
HMS_Tracking_Eff_error	0.0002	0.0002	0.0002	0.0005
SHMS_Tracking_Eff	0.9925	0.9931	0.9929	0.996
SHMS_Tracking_Eff_error	0.0003	0.0002	0.0002	0.0003
HMS_Cer_Detector_Eff	0.973	0.973	0.973	0.973
HMS_Cer_Detector_Eff_error	0.0006	0.0006	0.0006	0.0006
HMS_Cal_Detector_Eff	0.9961	0.9961	0.9961	0.9961
HMS_Cal_Detector_Eff_error	0.0005	0.0005	0.0005	0.0005
HMS_Hodo_3_4_Eff	0.999677	0.999673	0.999666	0.999692
HMS_Hodo_3_4_Eff_error	0.0002	0.0002	0.0002	0.0005
SHMS_Hodo_3_4_Eff	0.972946	0.973222	0.973266	0.966059
SHMS_Hodo_3_4_Eff_error	0.0003	0.0002	0.0002	0.0003
EDTM_Live_Time	0.897	0.9011	0.9019	1.0005
EDTM_Live_Time_error	0.0011	0.0015	0.0015	0.0
Boiling_factor	0.945062455	0.9464155537	0.9456604093	NA
Boiling_factor_error	0.0	0.0	0.0	NA
effective_charge	89.5527285217324	173.3124738909242	168.6223942433079	39.1970900371934
effective_charge_error	0.13881334055646652	0.32729189626979527	0.31821677202937265	0.04504829894769587
target_corr	NA	NA	NA	4.8579
target_corr_error	NA	NA	NA	0.01

# Data and MC Yields Calculation

**Beram Energy: 8.2 GeV**

total_data_effective_charge	431.48759665596447	0.4771279103983728
total_dummy_effective_charge	190.4155436916818	0.045095306532067975
N_data	48870.0	221.06560112328648
N_dummy	167.0	12.922847983320086
N_simc	194121.0	440.5916476738977
normfac_data	0.0023175637208346553	NA
normfac_dummy	0.005251672109390325	NA
normfac_simc	41.6184	NA
N_data_norm	113.2593390371896	0.5274188184306069
N_dummy_norm	0.8770292422681842	0.06786687816104113
N_simc_norm	100.18876343603007	0.22739596623080885
N_data_W	112.34522877538811	0.5167259114689724
N_simc_W	100.18876343603006	0.23449981284173105
dataSimcRatio_W	1.1213356161154726	0.005886666696810623