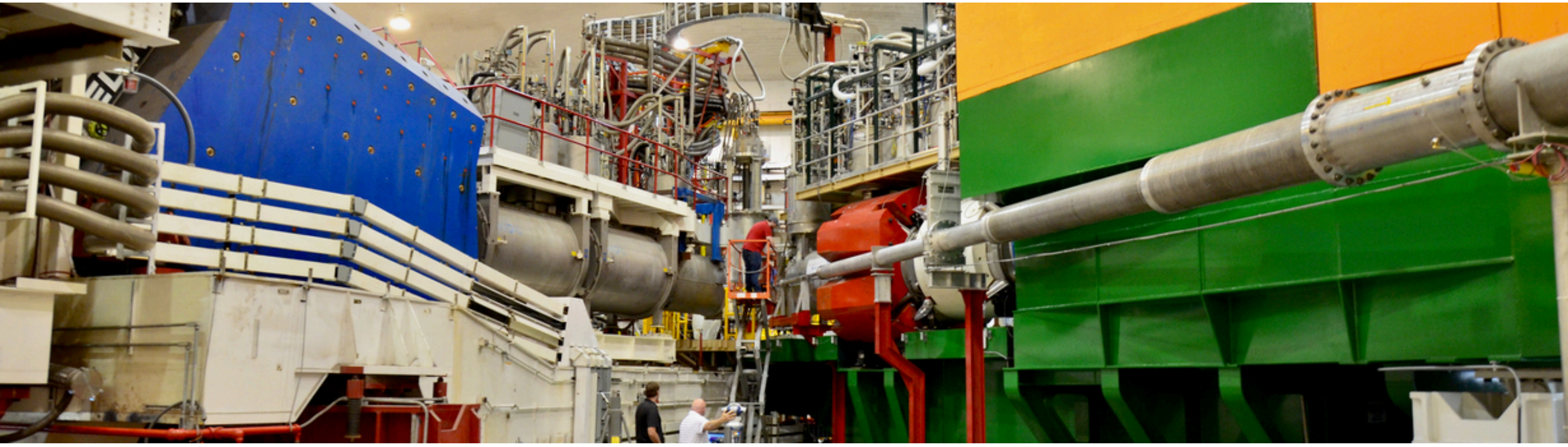


Deuteron Electro-Disintegration Experiment (E12-10-003)

Carlos Yero

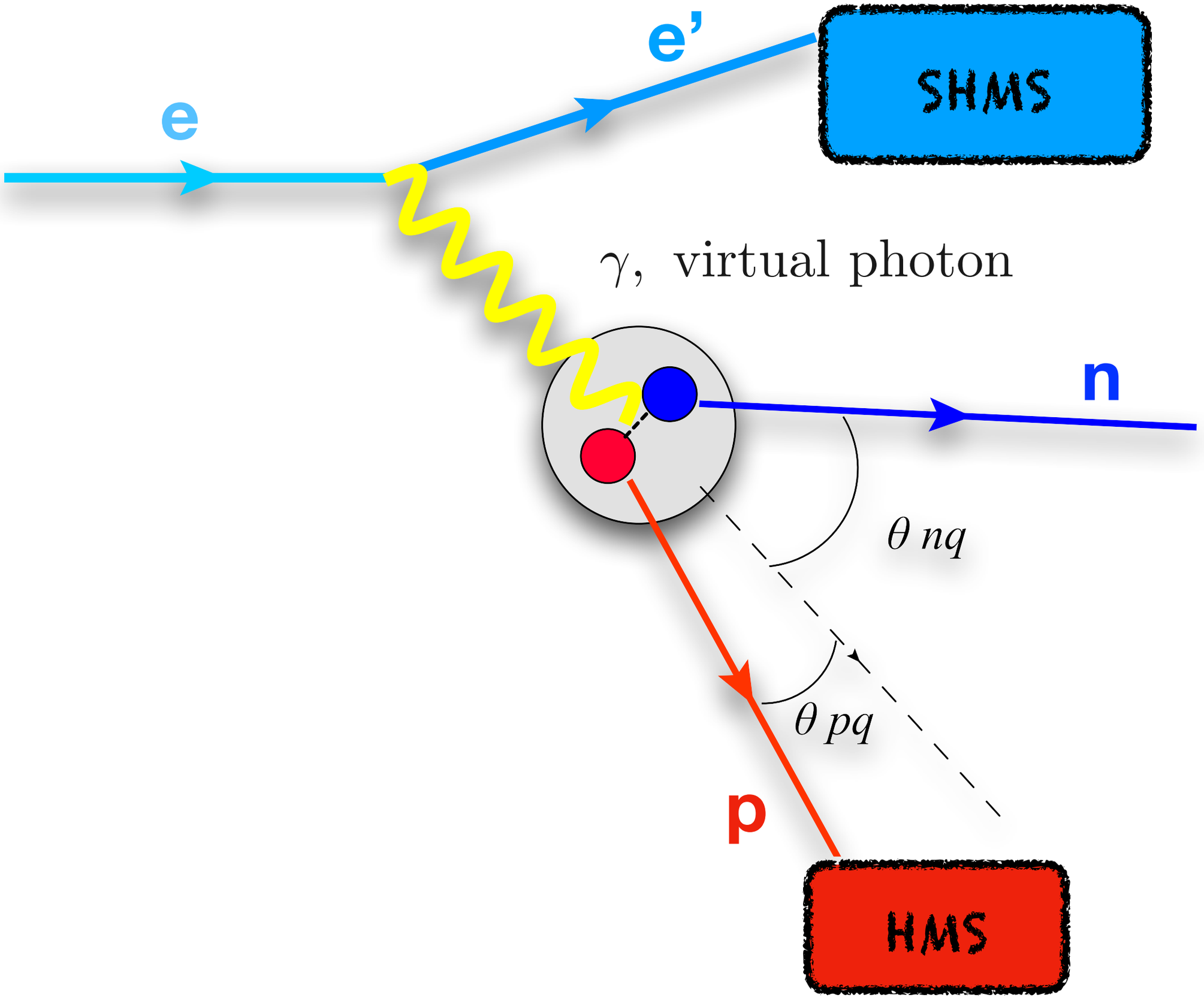
April 2018

Jefferson Lab
Exploring the Nature of Matter

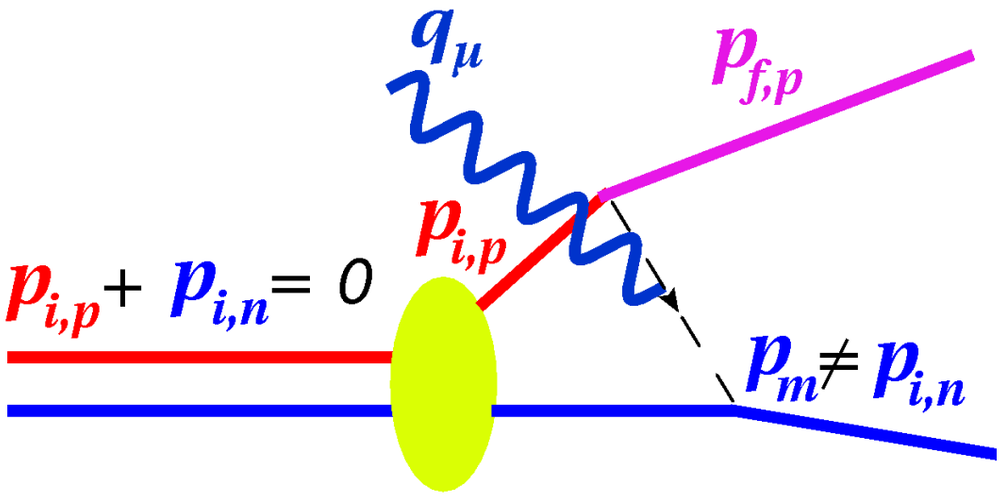
FIU

Hall C

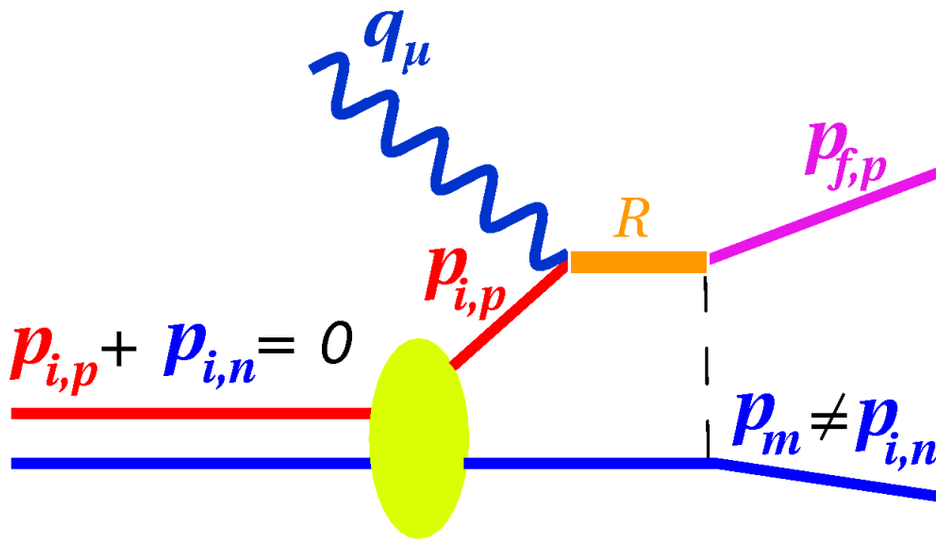
D(e,e'p)n Reaction Kinematics



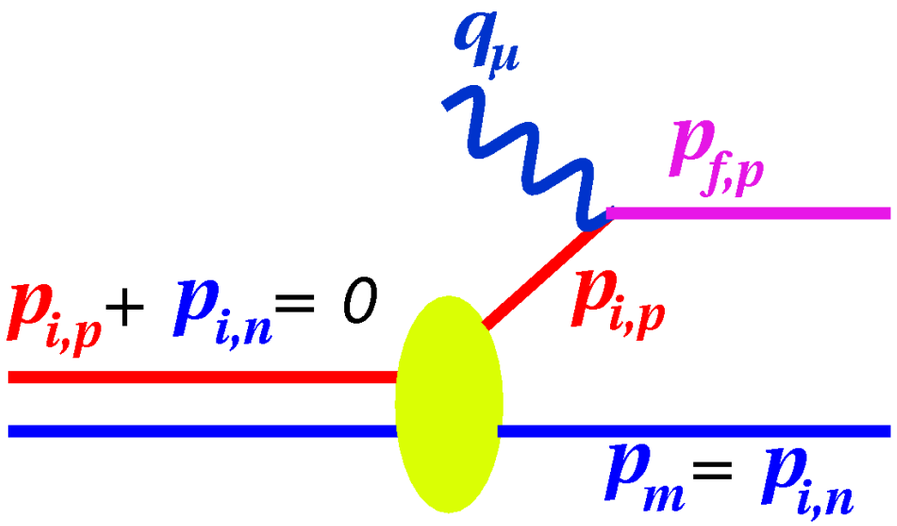
D(e,e'p)n Interactions



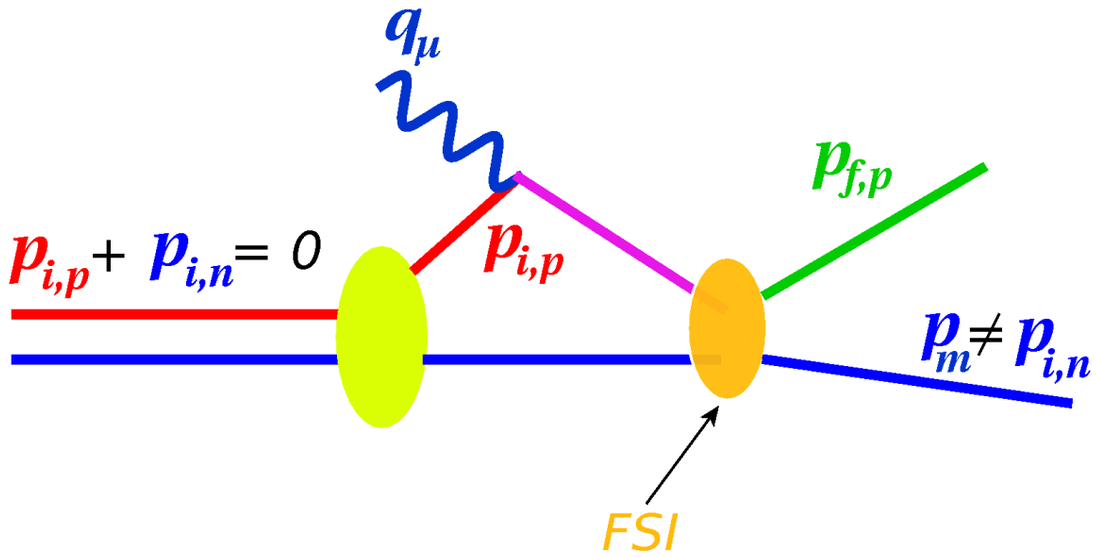
Meson-Exchange Currents (MEC)



Isobar Configurations (IC)



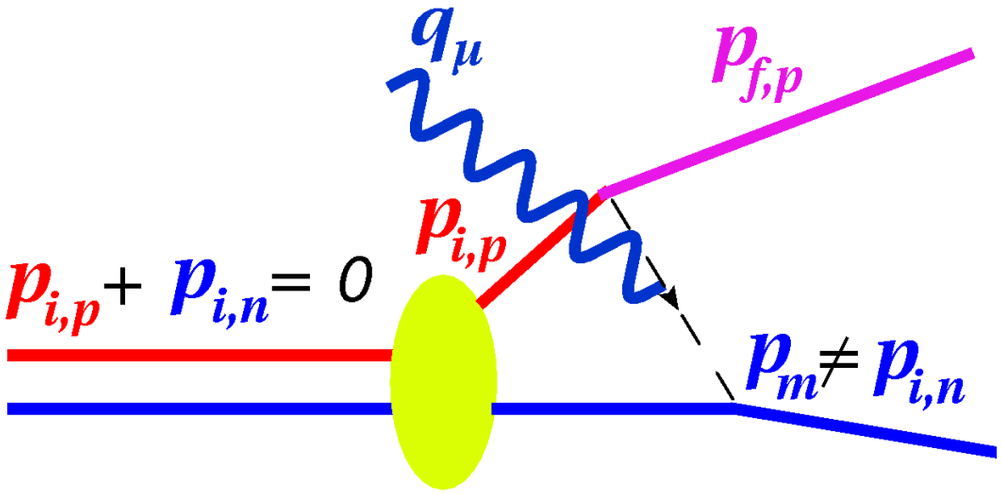
Plane Wave Impulse Approximation (PWIA)



Final State Interactions (FSI)

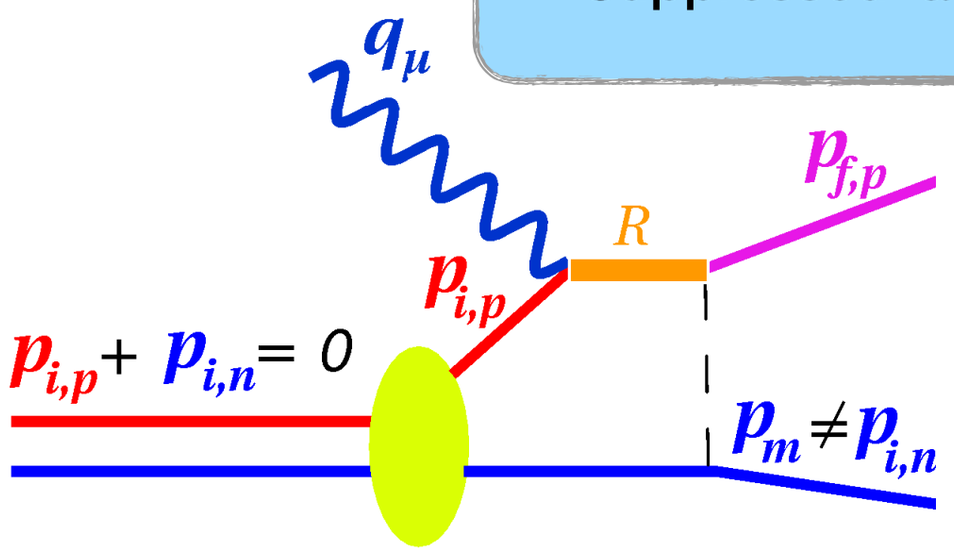
D(e,e'p)n Interactions

Suppressed at Q2>1

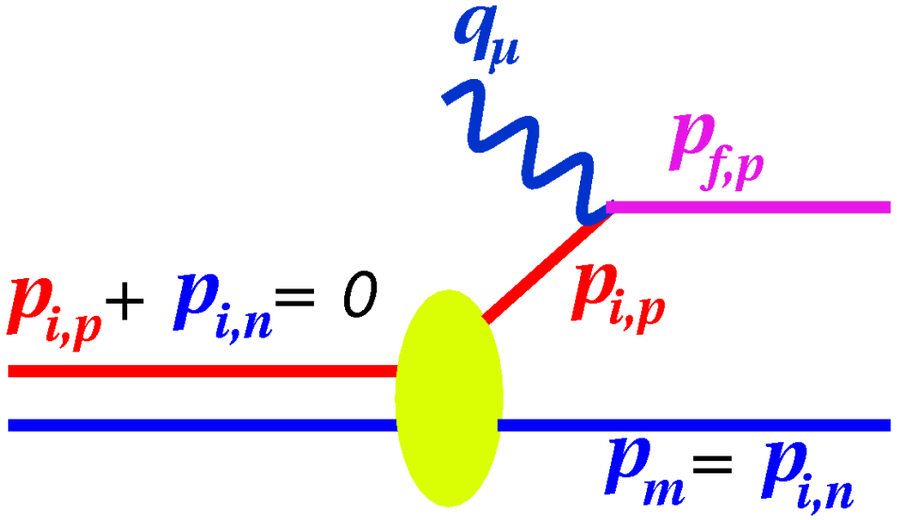


Meson-Exchange Currents (MEC)

Suppressed at x>1

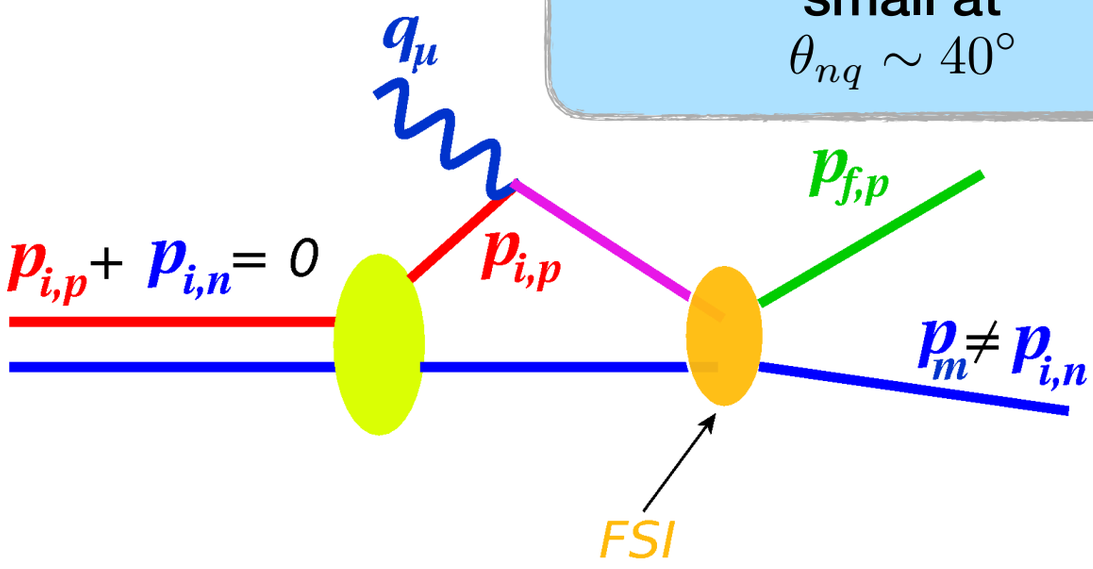


Isobar Configurations (IC)



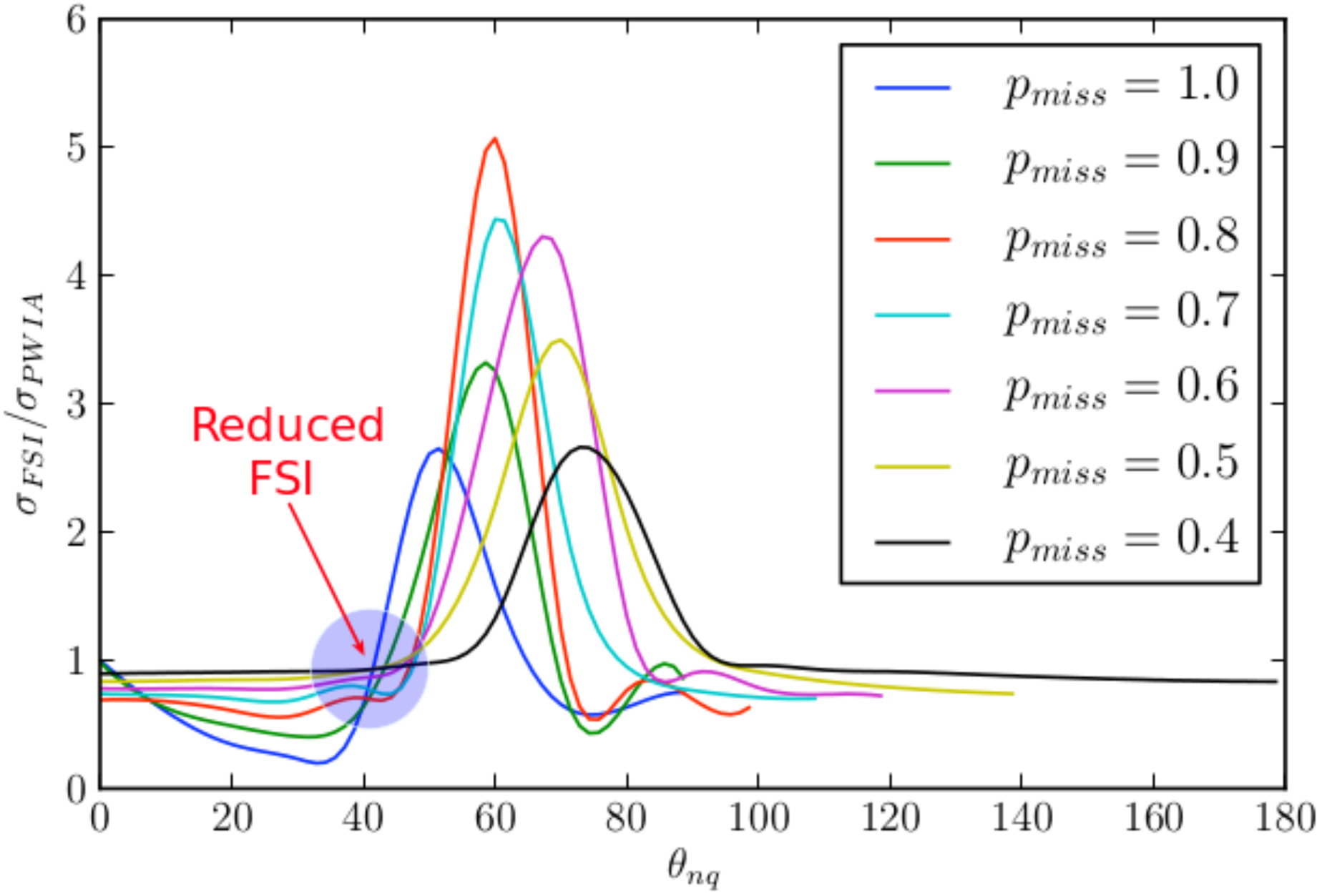
Plane Wave Impulse Approximation (PWIA)

FSI expected to be small at $\theta_{nq} \sim 40^\circ$



Final State Interactions (FSI)

D(e,e'p)n (E12-10-003) Theoretical Background



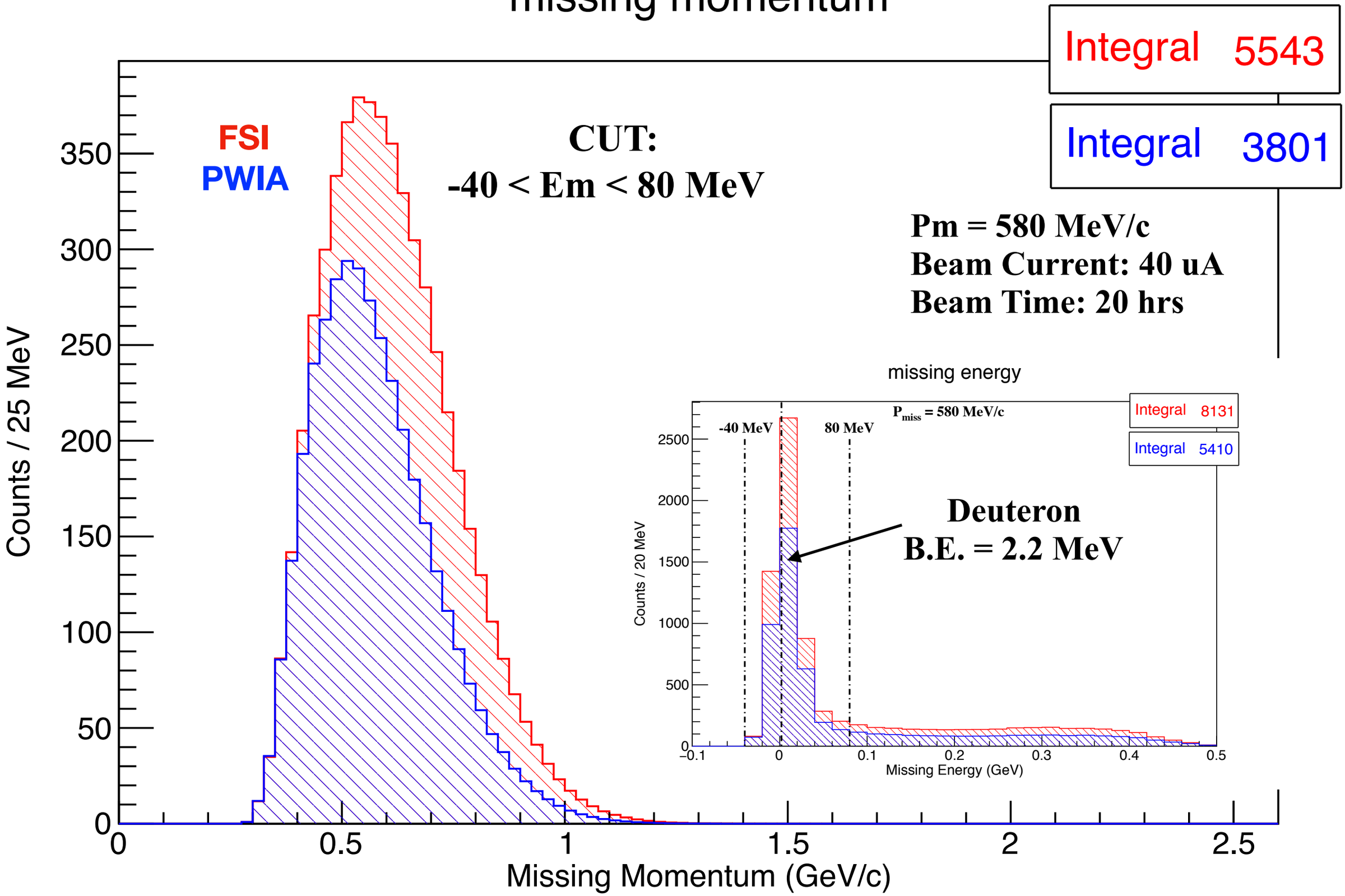
Theoretical Calculation by:
Dr. Misak Sargsian

E12-10-003
Simulation Results
for
Missing Momentum Setting: 580 MeV/c

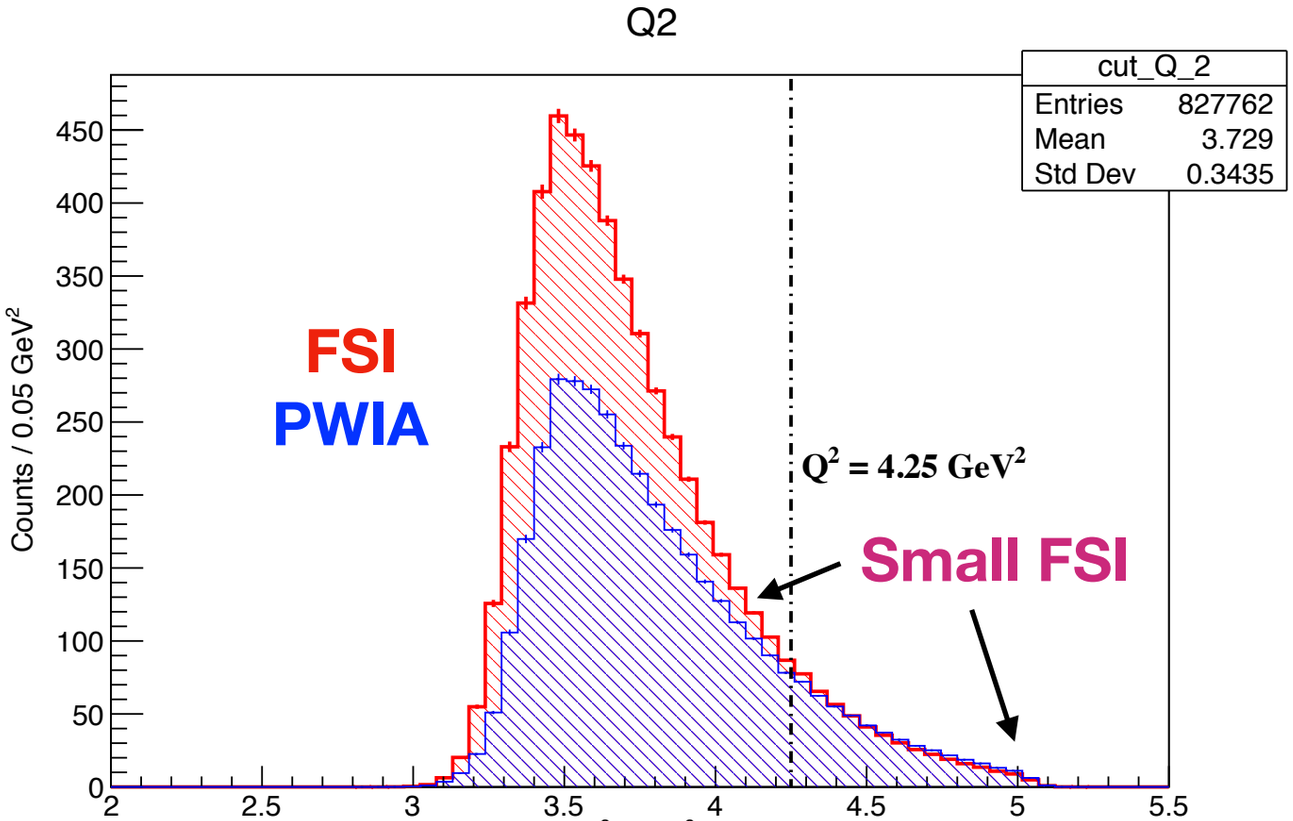
For detailed simulation results of this and other settings measured,
See BackUp Slides

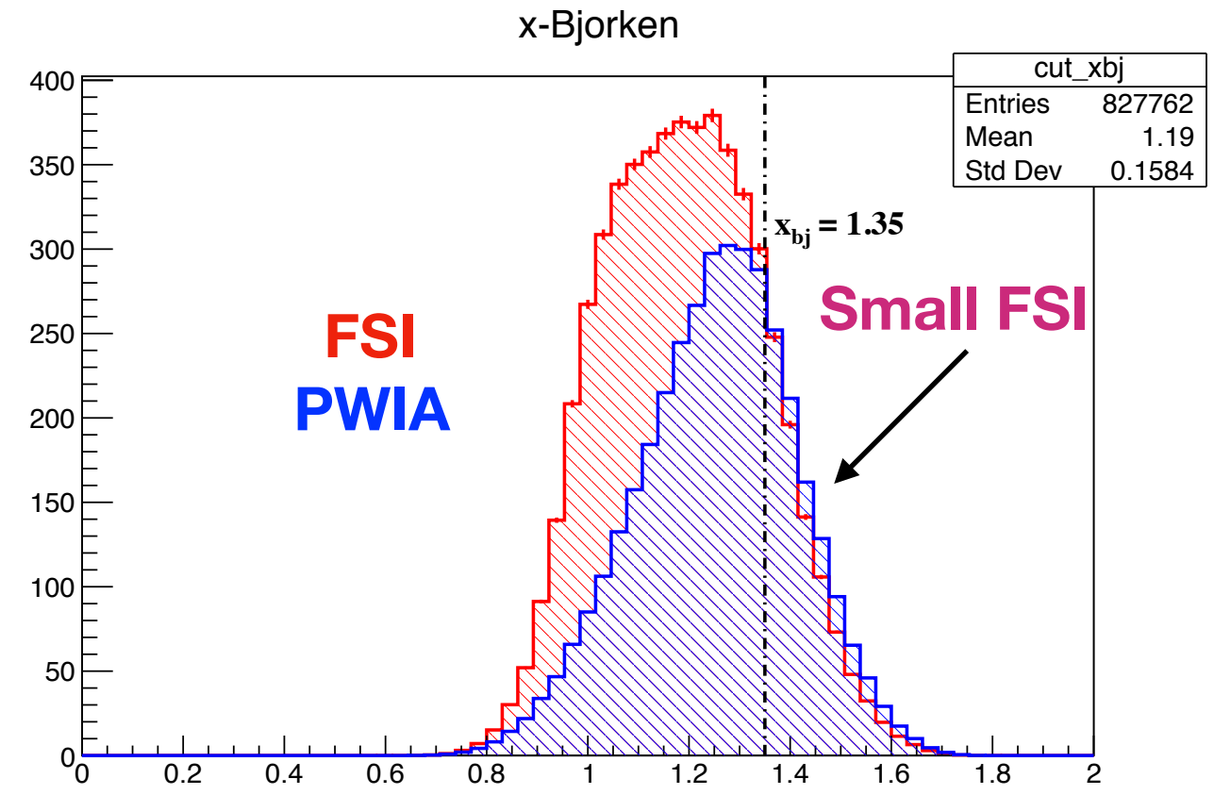
E12-10-003: Simulation Results

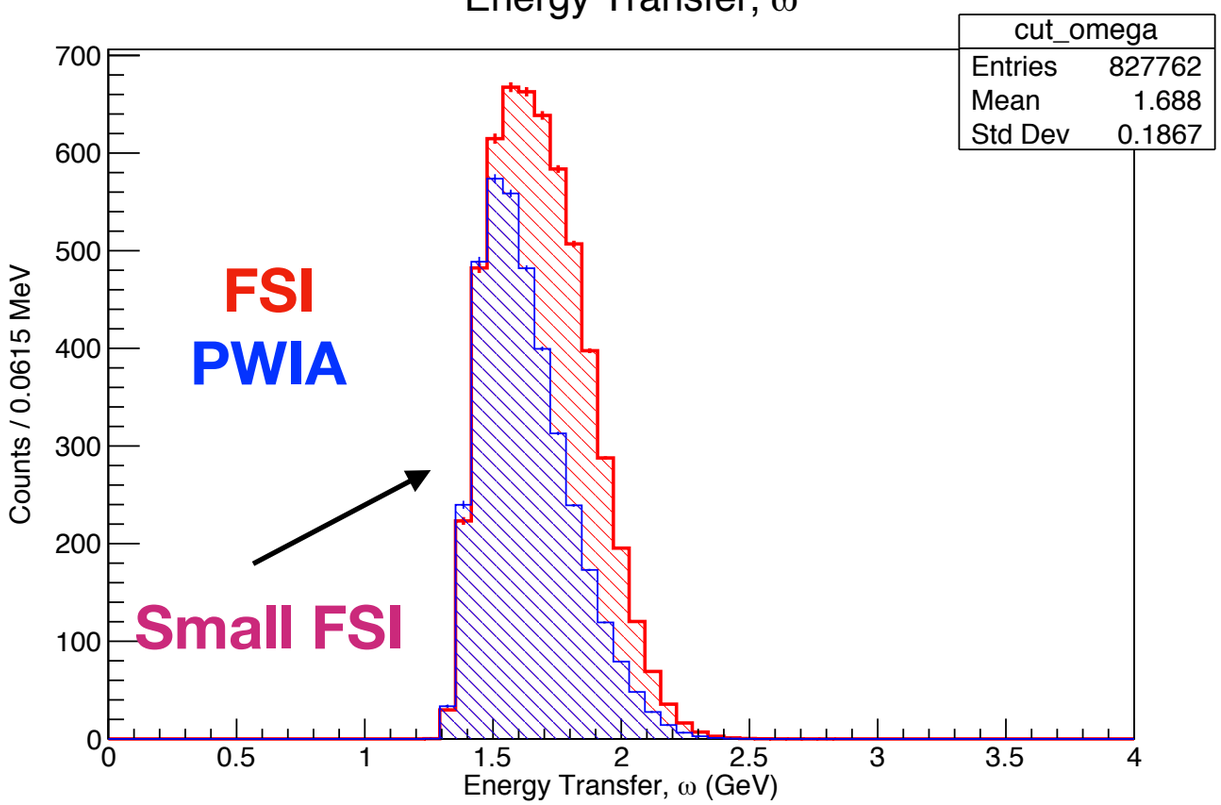
missing momentum

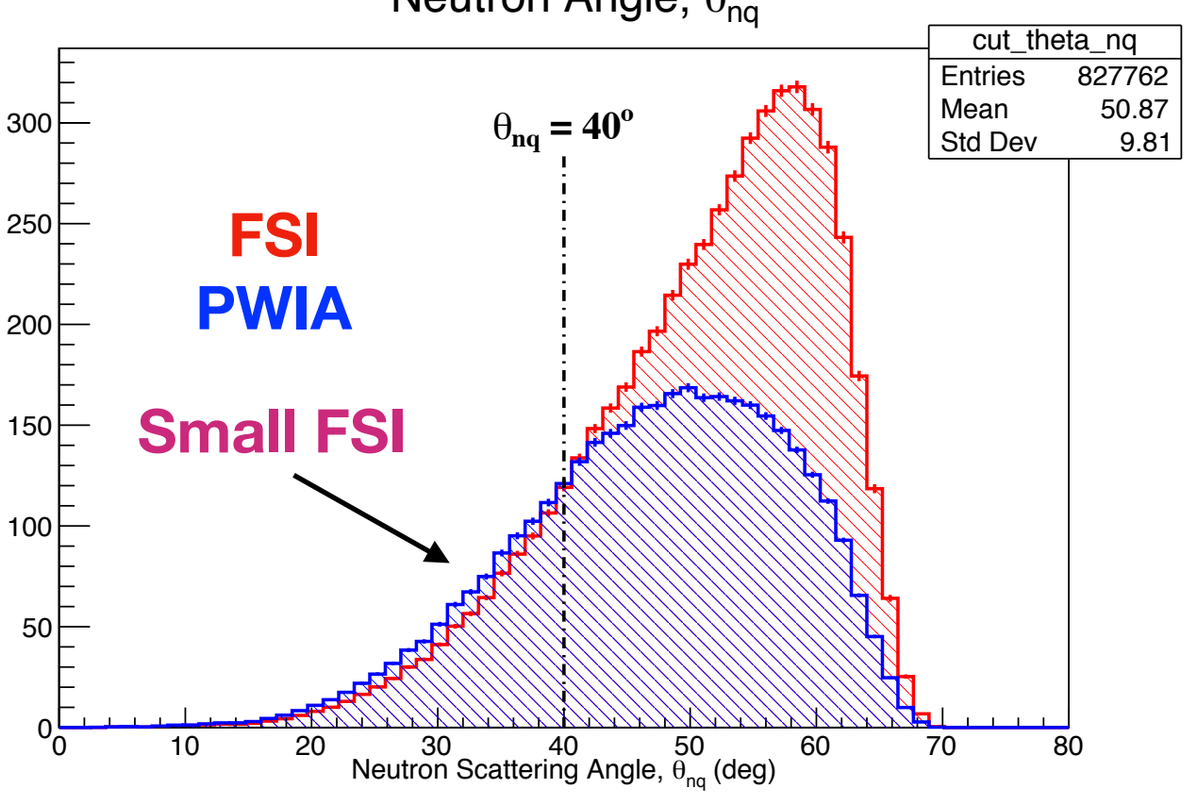


Missing Momentum = 580 MeV/c
CUT: -40 < Em < 80 MeV

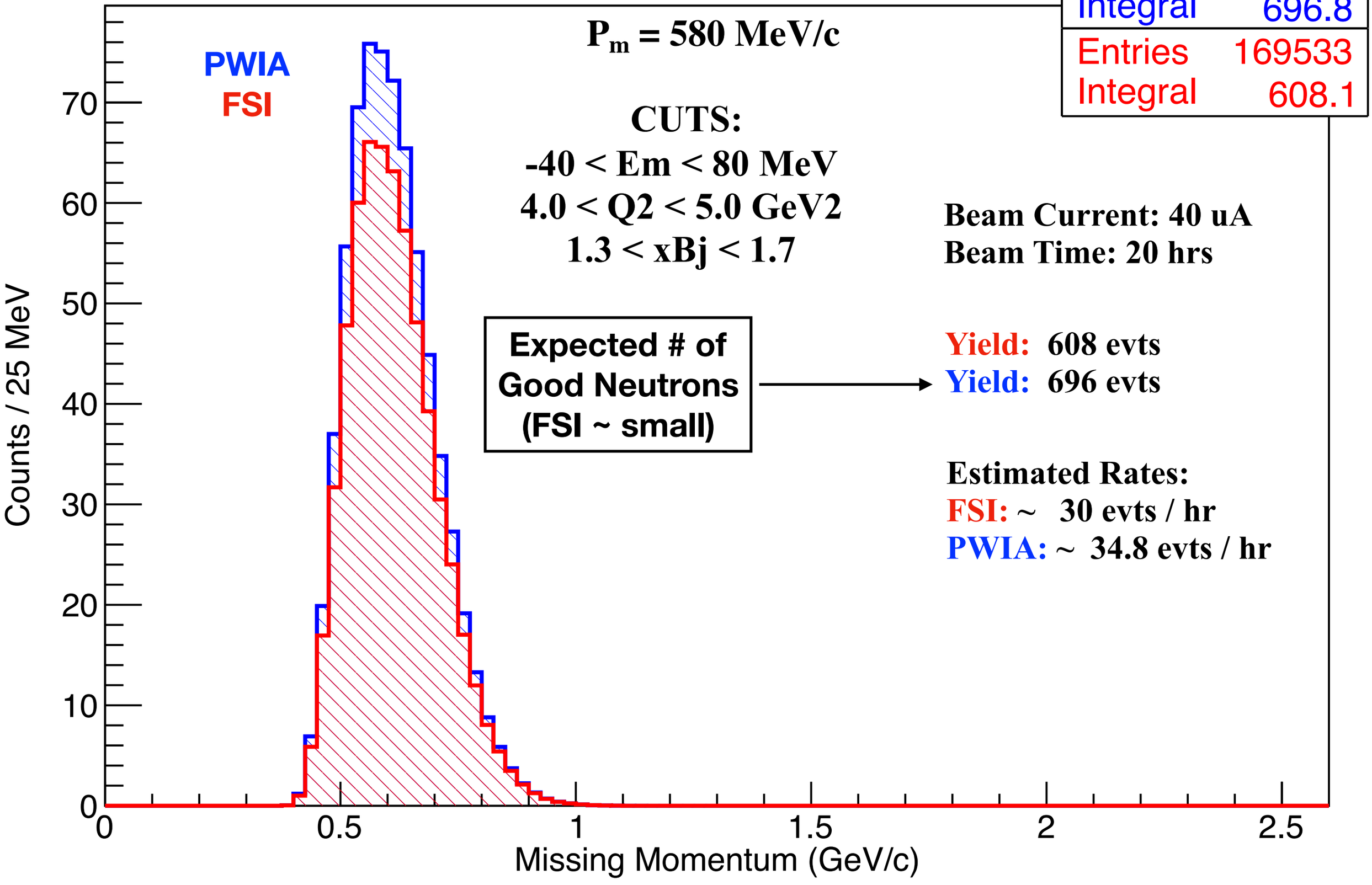








missing momentum



E12-10-003:

First Look at Experimental Results

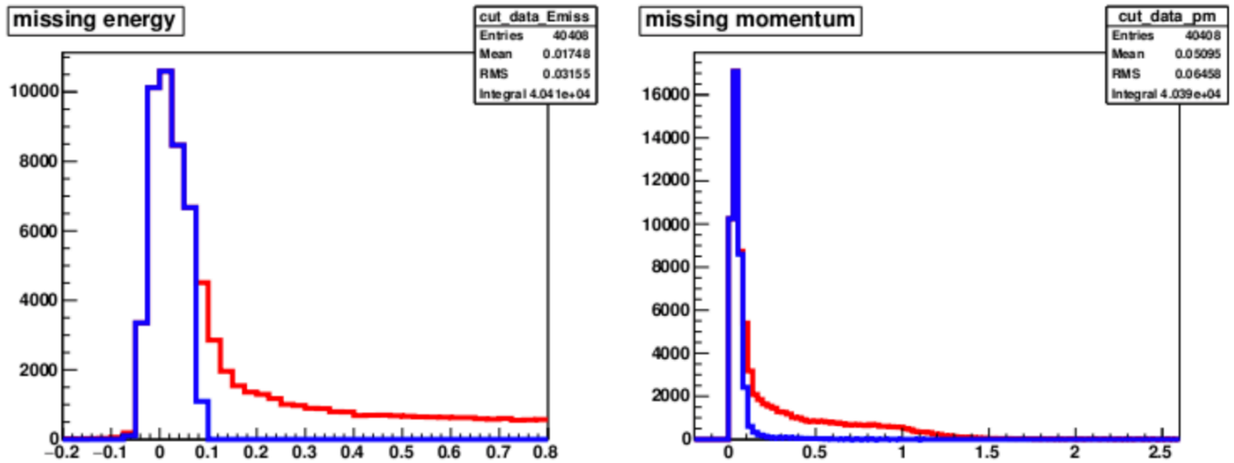
For detailed first data results of this and other settings measured,
See BackUp Slides

Overview of the Experiment Data-Taking Stage

☑ **Run Period: April 3 to April 10, 2018**

☑ **Data was monitored online for quality check.**

Example of Online Monitoring plots
For a H(e,e'p) run.



Overview of the Experiment Data-Taking Stage

- ☑ **Run Period: April 3 to April 10, 2018**
- ☑ **Data was monitored online for quality check.**
- ☑ **A standard kinematics file was constantly kept up to date, with the spectrometer settings, Beam and target information, before data replay.**

Snippet of standard kinematics datafile

```
#D2 Electro-Disintegration (E12-10-003) - April 4, 2018

#Al Dummy Run (for H(e,e'p))
3252-3258
gpbeam = 10.600
gtargmass_amu = 26.98
htheta_lab = -37.2900
ptheta_lab = 12.200
hpcentral = 2.93814
ppcentral = 8.700*0.985
ppartmass = 0.0005109
hpartmass = 0.93827231

#Proton Absorption Measurements
3259-3263
gpbeam = 10.600
gtargmass_amu = 1.00794
htheta_lab = -37.2900
ptheta_lab = 12.200
hpcentral = 2.93814
ppcentral = 8.700*0.985
ppartmass = 0.0005109
hpartmass = 0.93827231

#D2 - Low Missing Momentum Setting = 80 MeV
3264-3268
gpbeam = 10.600
gtargmass_amu=2.014101
htheta_lab = -38.89
ptheta_lab = 12.200
hpcentral = 2.844
ppcentral = 8.7*0.985
ppartmass = 0.0005109
hpartmass = 0.93827231

#D2 - High Missing Momentum Setting = 580 MeV
3269-3282
gpbeam = 10.600
gtargmass_amu=2.014101
htheta_lab = -54.96
ptheta_lab = 12.200
hpcentral = 2.194
ppcentral = 8.700*0.985
ppartmass = 0.0005109
hpartmass = 0.93827231

# optics scan for SHMS Q3 and HB with optics #1 and sieve
3283-3287
gpbeam = 10.600
gtargmass_amu = 12.0107
htheta_lab = -54.96
ptheta_lab = 8.915
hpcentral = 2.194
ppcentral = 8.700*0.985
ppartmass = 0.0005109
```

Overview of the Experiment Data-Taking Stage

- ☑ **Run Period: April 3 to April 10, 2018**
- ☑ **Data was monitored online for quality check.**
- ☑ **A standard kinematics file was constantly kept up to date, with the spectrometer settings, Beam and target information, before data replay.**
- ☑ **Runs were recorded by hand and later to GoogleDocs, where more additional Run information was added, and easier to keep track of.**

Runs Recorded by hand, and then written to GoogleDocs

Goal is 5040 mC

Run#	BCM4A (mC)	~~BCM4B~~ Running Total (mC)	Computer Live Time	SHMS trkEff	HMS trkEff	Yield/ Charge
3269	69.5	69.5	99.9	.92	.99	1.2/mC
3270	38.5	108.0	99.9	.89	1.0	1.0/mC
3271	146.767	254.7	99.9	0.9	1.0	1.27/mC
3272	155.599	410.2	99.9	0.92	1.0	1.29/mC
3273	140.186	550.3	99.9	0.89	1.0	1.4/mC
3274	105.75	656.0	99.9	0.89	0.99	1.29/mC
3275	30.278	686.2	99.9	0.89	1.0	1.28/mC

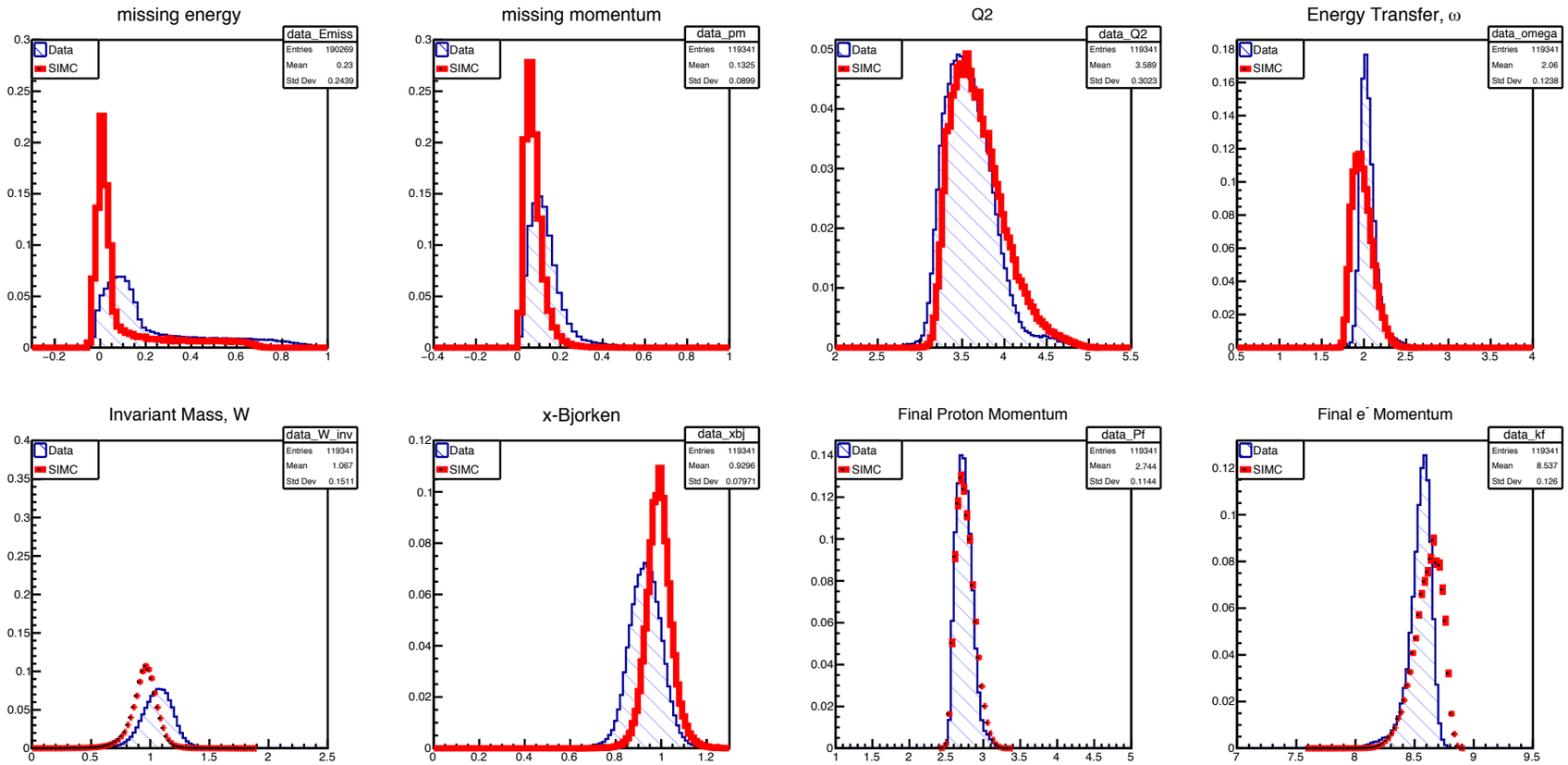
E_RunSheet

File Edit View Insert Format Data Tools Add-ons Help Last edit was 12 days ago

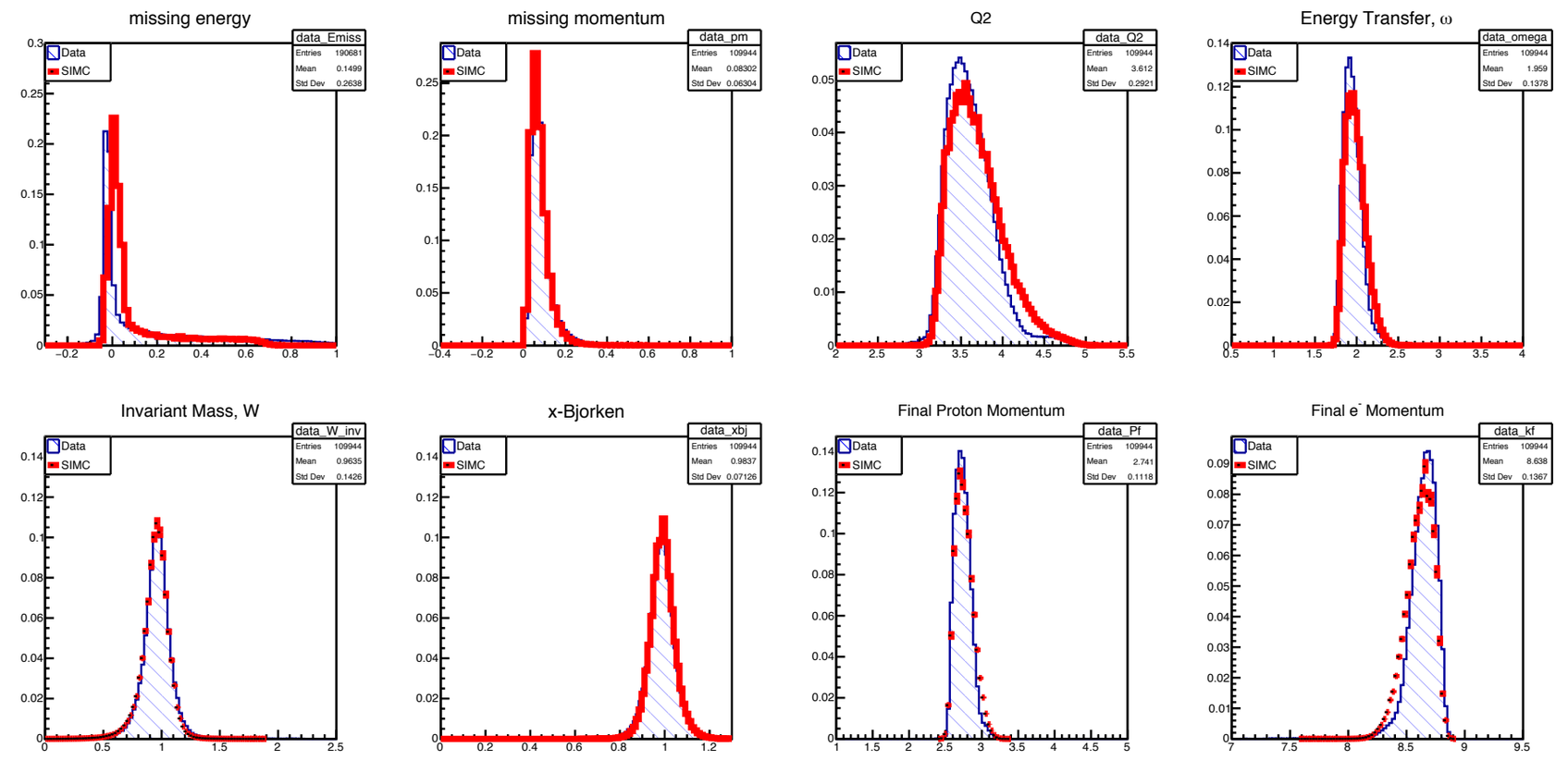
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Min Charge Goal: 144 mC												
2	Missing Momentum: 80 MeV												
3	Run			Charge (mC)			CPU Live T	SHMS trk Eff	HMS trk Eff	Yield / Charge (counts/mC)			
4	3264			37			98.2	0.945	0.998	1032			
5	3266			6.4			97.9	0.943	0.998	999			
6	3267			120.6			97.8	0.939	0.998	996			
7	3268			108.5			98.1	0.942	0.998	1015			
8	3289			136.6			97.9	0.941	0.997	1165	this was taken after removing saturation corr. for SHM		
9				409.1									
10													
11													
12													
13	Missing Momentum: 580 MeV												
14	Min. Charge Goal:			2880			(Assuming 20 hrs at 40 uA)						
15	Max Charge Goal			5040			(Assuming 20 hrs at 70 uA)						
16	Start time	4/4/2018 14:12:00											
17	Run	Run end time	Total Time	Charge (mC)	Expected charge at 40uA	Machine efficiency	Running Sum (mC)	% of Min Charge Goal	% of Max Charge Goal	CPU Live Time	SHMS trk Eff	HMS trk Eff	Yield / Charge (counts/mC)
18	3269	4/4/2018 15:04:00	0.87	69.5	124.8	0.56	69.5	2.41	1.38	99.9	0.92	0.99	1.2
19	3270	4/4/2018 16:02:00	1.83	38.5	264	0.41	108	3.75	2.14	99.9	0.89	1	1
20	3271	4/4/2018 19:34	5.37	146.767	772.8	0.33	254.767	8.85	5.05	99.9	0.9	1	1.27
21	3272	4/4/2018 20:36	6.40	155.599	921.6	0.45	410.366	14.25	8.14	99.9	0.92	1	1.29
22	3273	4/4/2018 21:45	7.55	140.186	1087.2	0.51	550.552	19.12	10.92	99.9	0.89	1	1.4
23	3274	4/4/2018 22:56	8.73	105.75	1257.6	0.52	656.302	22.79	13.02	99.9	0.89	0.99	1.29
24	3275	4/4/2018 23:13	9.02	30.278	1298.4	0.53	686.58	23.84	13.62	99.9	0.89	1	1.28
25	3276	4/5/2018 3:38	13.43	61.2	1934.4	0.39	747.78	25.96	14.84	99.9	0.88	0.99	1.4
26	3277	4/5/2018 5:01	14.82	114.2	2133.6	0.40	861.98	29.93	17.10	99.89	0.92	1	1.2
27	3278	4/5/2018 6:01	15.82	143.089	2277.6	0.44	1005.069	34.90	19.94	99.82	0.89	0.99	1.26
28	3279	4/5/2018 7:09	16.95	92.8	2440.8	0.45	1097.869	38.12	21.78	99.89	0.9	1	1.47
29	3281	4/5/2018 13:03	22.85	141	3290.4	0.38	1238.869	43.02	24.58	99.9	0.91	0.99	1.54
30	3282	4/5/2018 13:29	23.28	43	3352.8	0.38	1281.869	44.51	25.43	99.88	0.923	99	1.34
31	3291	4/5/2018 20:28	30.27	141	4358.4	0.33	1422.869	49.41	28.23	99.86	0.9	0.996	1.188
32	3292	4/5/2018 21:29	31.28	145	4504.8	0.35	1567.869	54.44	31.11	99.88	0.88	0.99	1.39
33	3293	4/5/2018 22:33	32.35	128	4658.4	0.36	1695.869	58.88	33.65	99.88	0.91	1	1.27
34	3294	4/5/2018 23:33	33.35	141	4802.4	0.38	1836.869	63.78	36.45	99.88	0.89	1	1.27
35	3295	4/6/2018 0:50	34.63	168.86	4987.2	0.40	2005.729	69.64	39.80	99.91	0.901	0.998	1.38
36	3296	4/6/2018 1:52	35.67	139.682	5136	0.42	2145.411	74.49	42.57	99.86	0.902	0.9981	1.27

Kinematic Setting: 80 MeV Missing Momentum
Comparison between old/new SHMS delta matrix

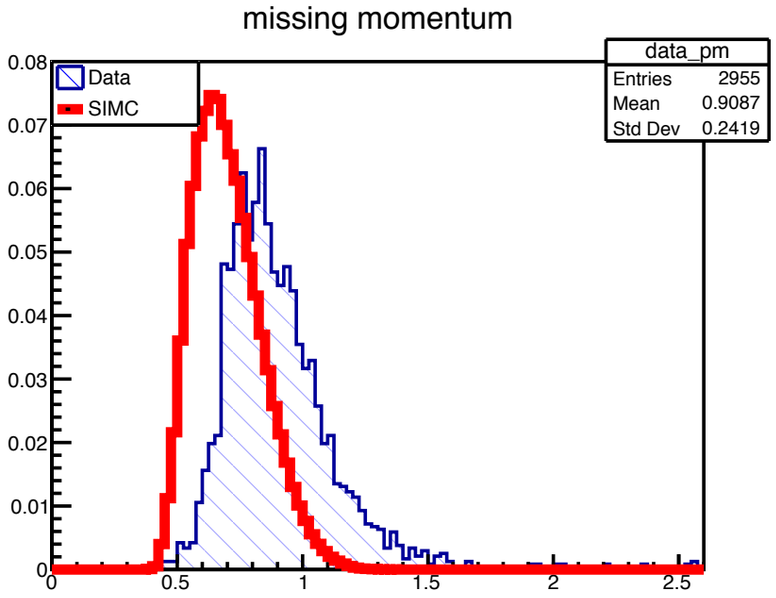
Old SHMS reconstruction delta-matrix

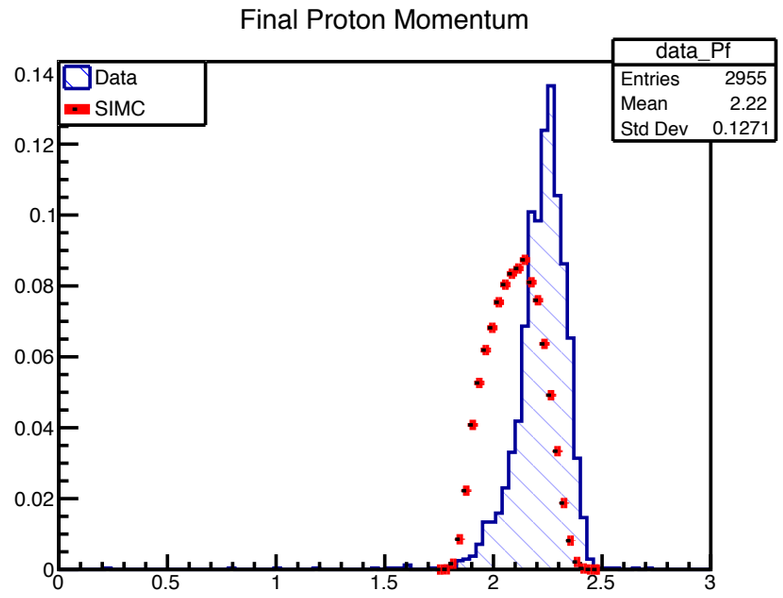


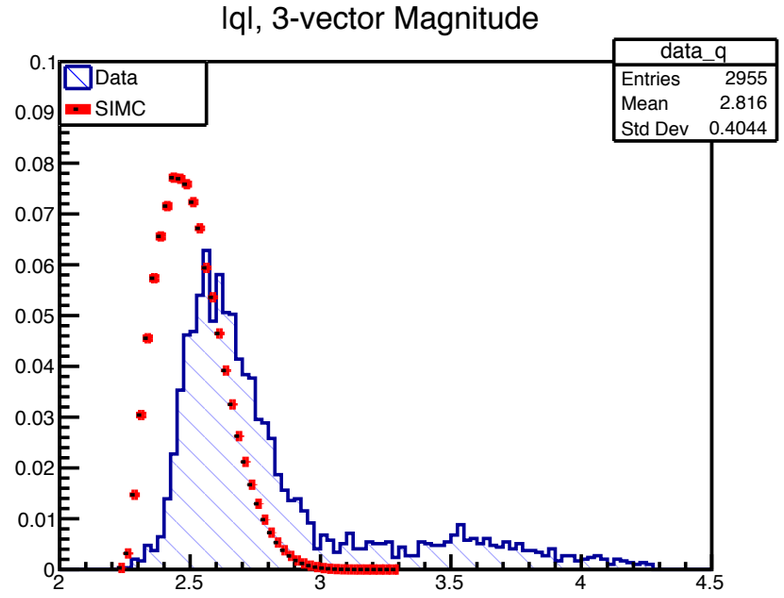
Optimized SHMS reconstruction delta-matrix

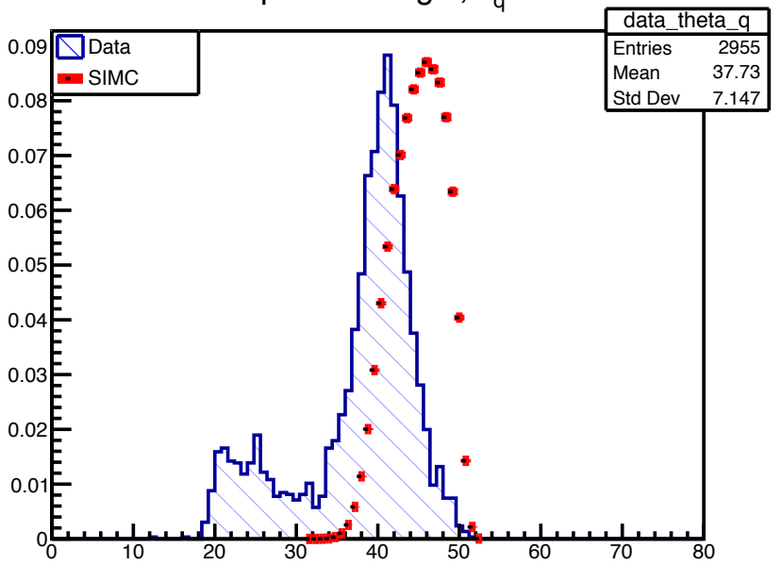


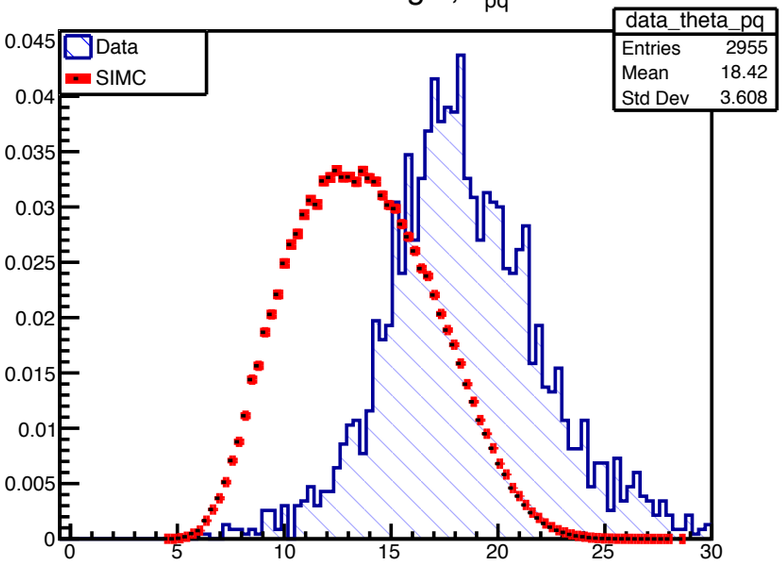
Kinematic Setting: 750 MeV Missing Momentum

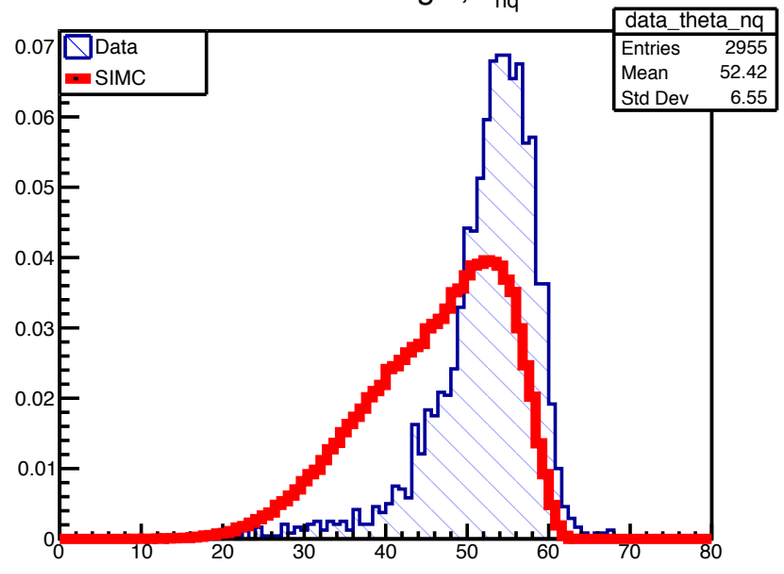












Still, a lot of work need to be done before analysis . . .

*** Observed offsets need to be corrected**

*** Detector calibrations need to be done**

*** H(e,e'p) runs taken must be used to fine tune SHMS**

BackUp Slides

For detailed SIMC/Data comparison of E12-10-003, follow this link:

https://hallcweb.jlab.org/wiki/images/7/70/FirstLook_DataSIMC_Deut.pdf

For detailed Simulation Results of E12-10-003, follow this link:

https://hallcweb.jlab.org/wiki/images/6/64/Updated_Yield_Estimates_PDF.pdf

Thank You!

Questions?