SANE HMS Asymmetries

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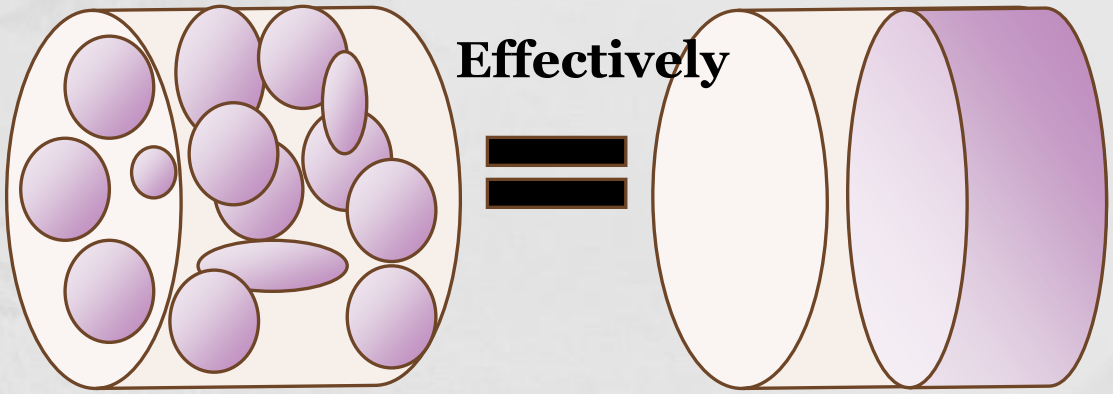
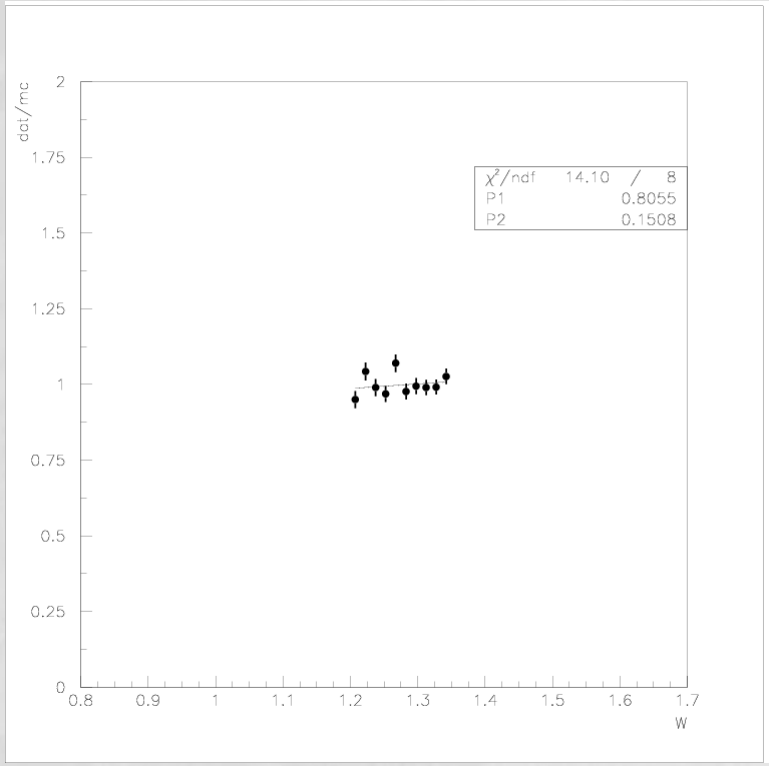
Packing fraction

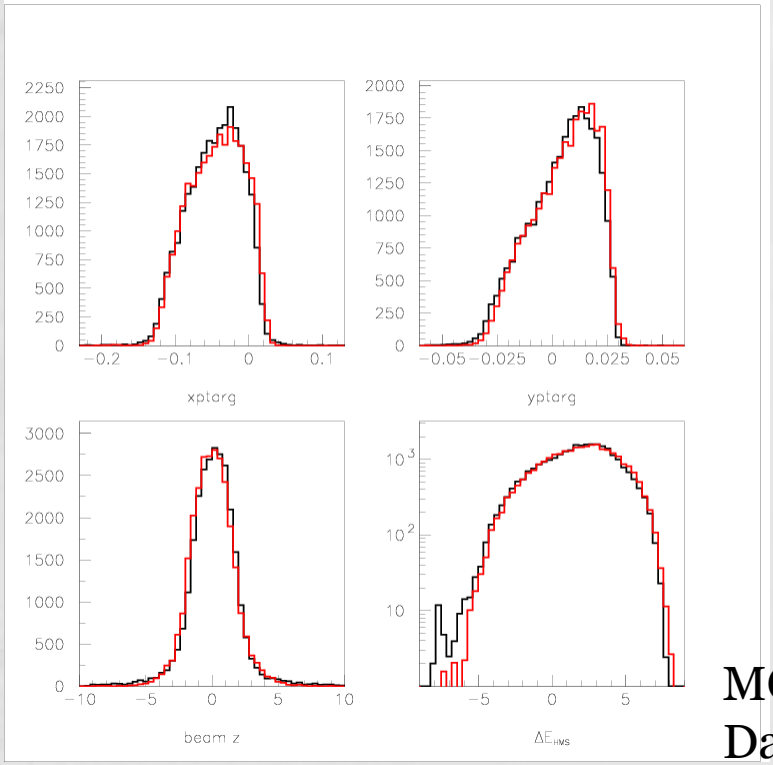
- Packing fraction is the relative volume ratio of ammonia to the target cell.
- HMS C or C+He runs(reference) and NH_3 runs of each target material are necessary to get PF.



Packing fraction

- Monte Carlo result of pol_hms_single and HMS data matches well for most of runs.

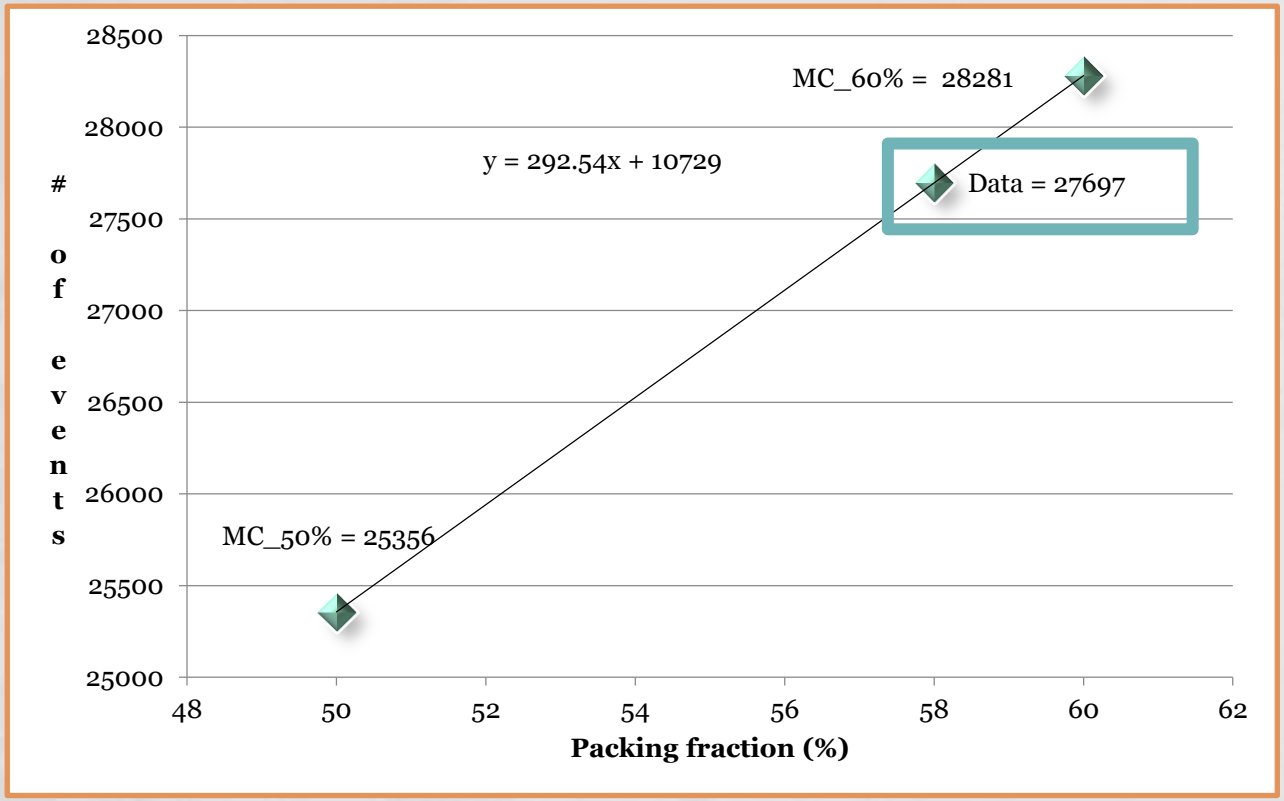




MC red
Data black

Run # 72790, Perp., 5.9 GeV beam, momentum=4.4 GeV/c, angle=15.4°

Packing fraction



PF(58.0%) of run # 72790, #8 & #5 6/29/07 NIST irrad 14NH3

Packing fraction table

Run#	targ_z_offset(cm)	raster_radius(cm)	C_run	dat/mc	Kinematics (B,Ei,Ef,θ)	Wmin	Wmax	PF(%)	error(%)	Insert
72213	-0.6	1.0	72377	0.867600	Perp,4.7,2.2,16	2.120	2.225	76.4	5.03	B,#2
72247	0.6	1.0	72377	0.867600	Perp,4.7,2.2,16	2.120	2.225	72.4	5.40	B,#13
72278	0.2	1.0	72290	0.915819	Perp,4.7,2.7,16	1.800	1.950	62.0	5.01	B,#2
72281	0.3	1.0	72290	0.915819	Perp,4.7,2.7,16	1.800	1.950	60.0	4.37	B,#13
72658	-0.1	0.7	n/a	1	Perp,5.9,3.1,15.4	2.100	2.250	56.7	4.30	B,#8&5
72672	0.0	0.7	n/a	1	Perp,5.9,3.1,15.4	2.100	2.250	54.9	4.21	B,#5&6
72790	-0.1	0.7	72782	0.933040	Perp,5.9,4.4,15.4	1.200	1.350	58.0	4.73	B,#8&5
72795	-0.1	0.7	72782	0.933040	Perp,5.9,4.4,15.4	1.200	1.350	56.0	5.60	B,#5&6
72828	1.8	0.7	72377	0.867600	Perp,4.7,2.2,16	2.120	2.225	63.4	4.89	C,#3
72957	-0.4	1.4	72940	1.01924	Para,5.9,3.1,15.4	2.050	2.125	60.9	5.00	C,#3
72959	-0.1	1.4	72940	1.01924	Para,5.9,3.1,15.4	2.050	2.125	62.6	5.72	C,#2
72984	0.1	1.0	72971	0.994550	Para,4.7,2.2,1.6	2.150	2.270	68.0	4.17	B,#9
72991	0.0	1.0	72971	0.994550	Para,4.7,2.2,1.6	2.150	2.270	65.7	4.21	B,#10
73014	0.1	1.0	73027	1.04163	Para,4.7,3.2,20.2	1.250	1.400	58.5	4.52	B,#10
73019	0.2	1.0	73027	1.04163	Para,4.7,3.2,20.2	1.250	1.400	61.4	4.76	B,#9

https://hallcweb.jlab.org/experiments/sane/wiki/index.php/Packing_Fractions_Tables

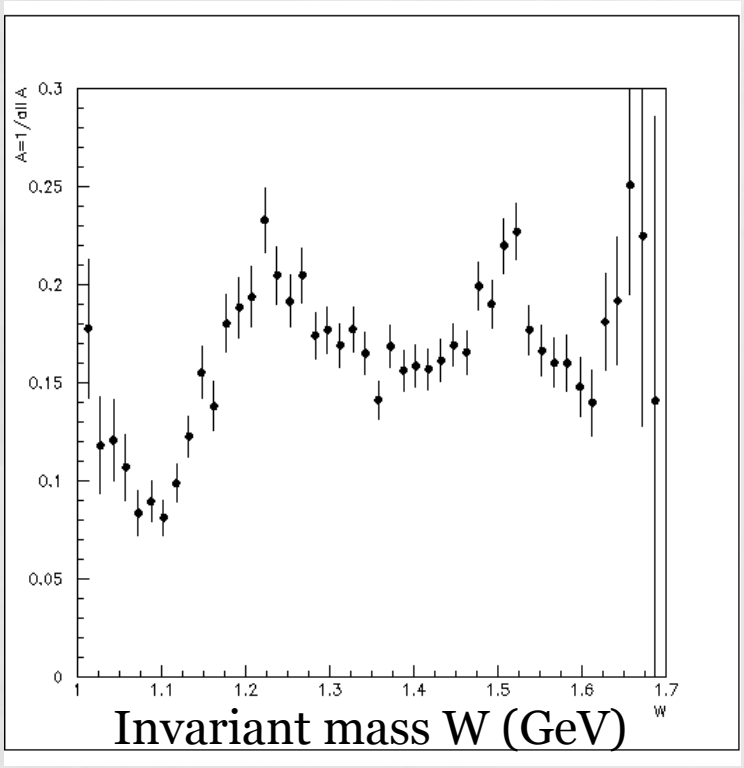
Packing fraction issues

- Perp, 5.9 GeV beam, HMS setting of 3.1 GeV/c and 15.4° kinematic range has no good carbon run.
  - Run # 72442 and 72505 should be reference carbon(or +He) runs for this kinematic regions. But they have big discrepancies, compared to MC results.
  - The data/MC ratio of 72505 is close to one when 8.8 cm vertical slit offset is assumed. Hclog says they could not find HMS slit position due to communication problem.
- Relatively low data/MC ratio of Perp, 4.7 GeV beam, HMS setting of 2.2 GeV/c and 16° causes big correction to PF of this kinematics.
  - Especially, run # 72213 even produces 76.4% PF. It was 63.2% before carbon correction. The same material has 58.3% PF, according to run #72278, which has 2.7 GeV/c HMS momentum.

Dilution factor

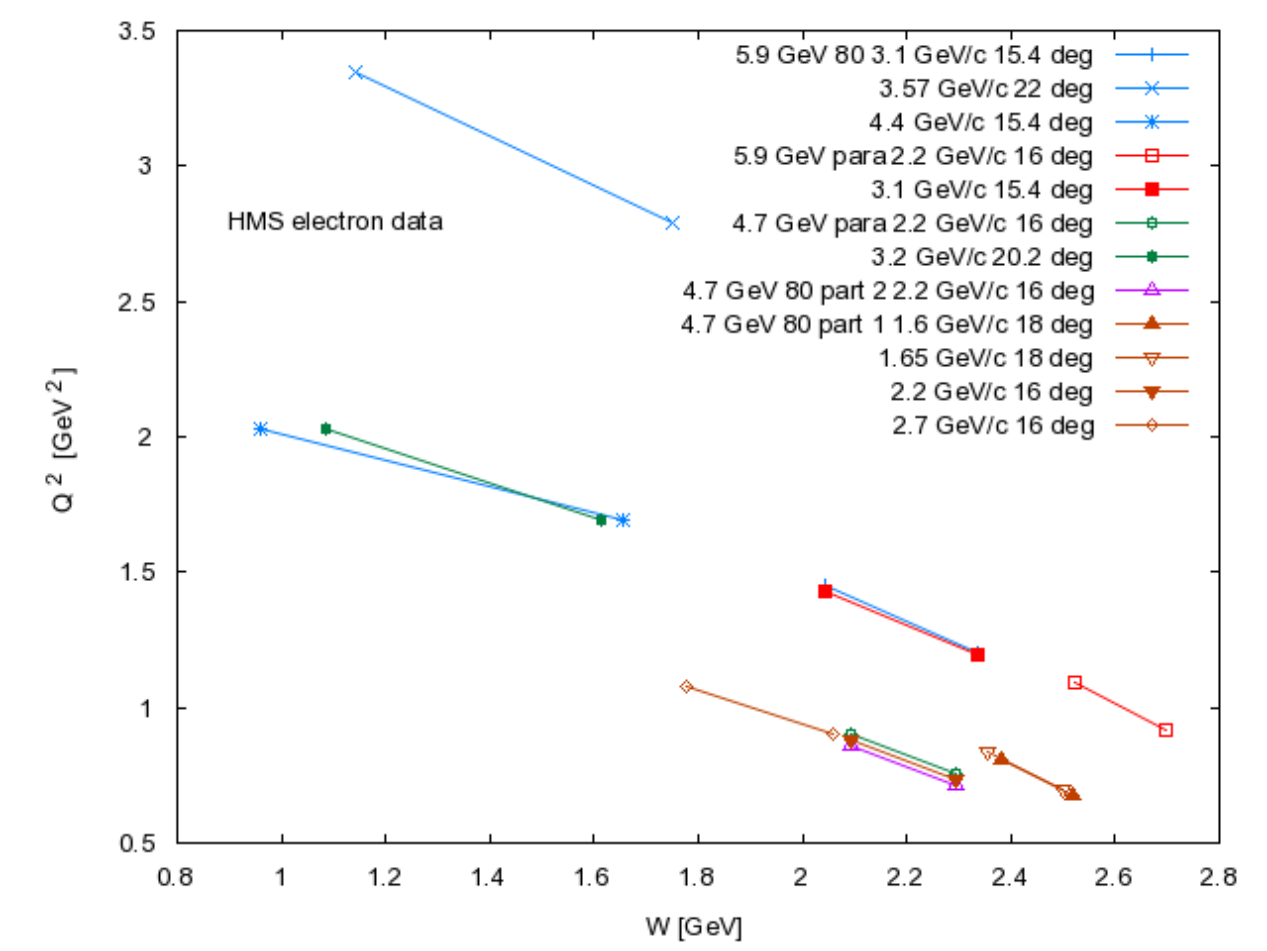
- Dilution factor f is the ratio of free polarizable nucleons to the total amount of nucleons in the sample.

$$f = \frac{N_H \sigma_H}{N_H \sigma_H + N_N \sigma_N + \sum N_A \sigma_A}$$



Dilution factor assuming 59% PF

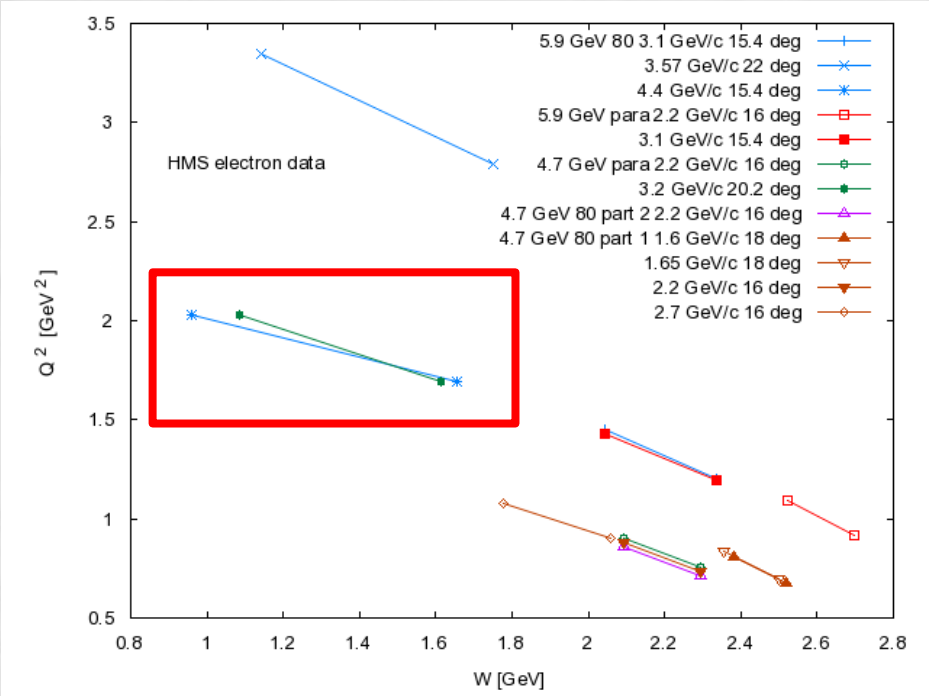
HMS kinematic regions



O. Rondon

HMS asymmetries

- PFs of material(so dilution factors too), beam and target polarization, lifetime correction, and charge normalization makes it possible to get preliminary HMS asymmetries.
  - Perp, 5.9,4.4,15.4



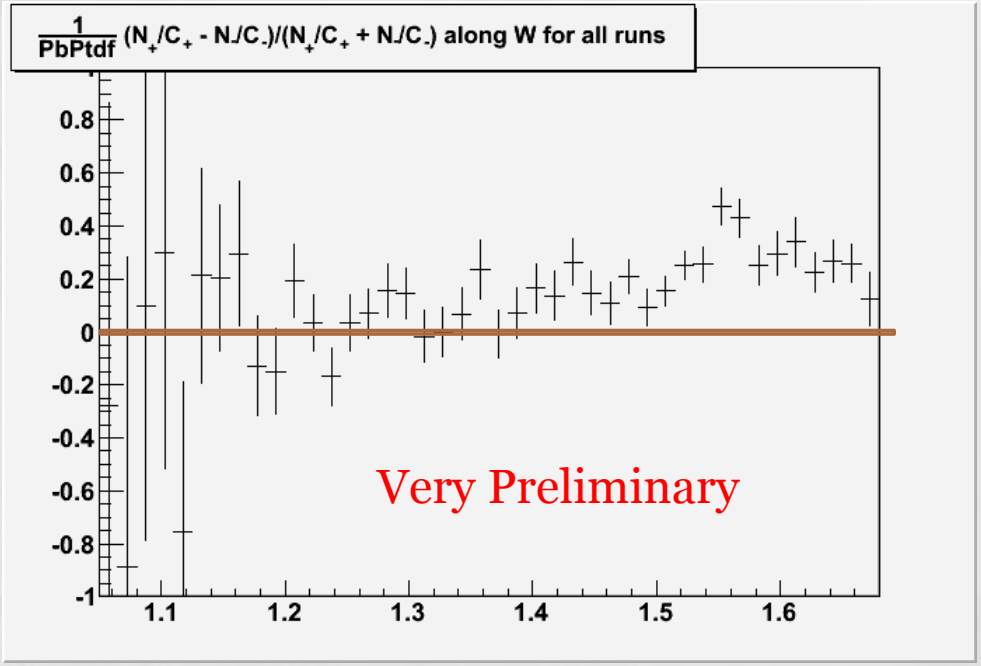
HMS asymmetries Apara

- Run # 73013-73018, 6 runs out of 45 runs in the same setting
- A_{para}, 4.7 GeV beam, HMS 3.2 GeV/c and 20.2°

$Q^2 \sim 1.862\ GeV^2$

1.087 GeV < W < 1.612 GeV

No radiative correction



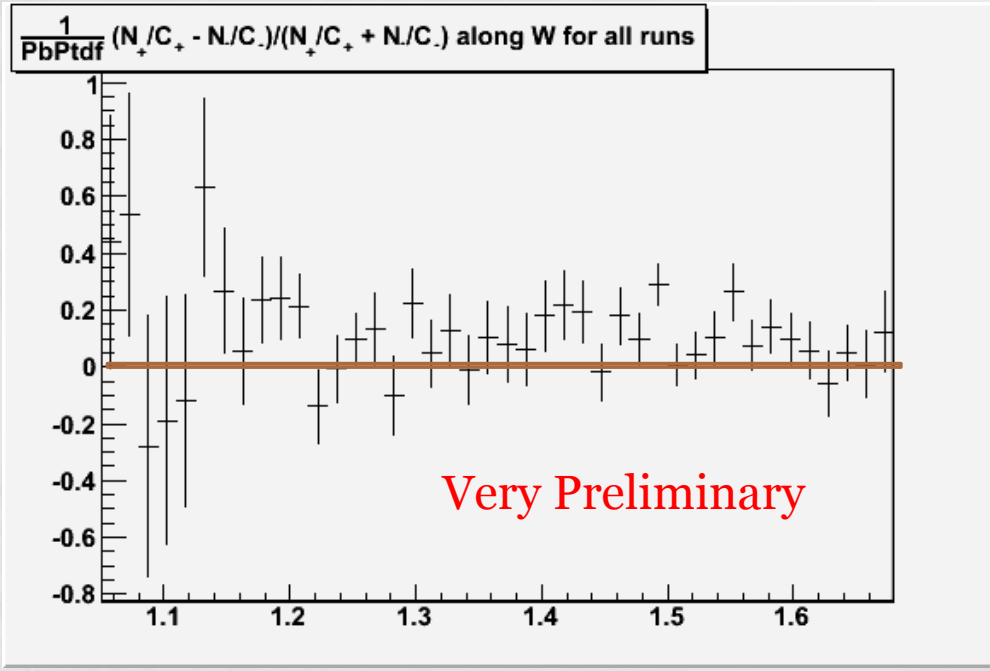
HMS asymmetries Aperp

- Run # 72783-72792, 6 runs out of 16 runs in the same setting
- A_{80° , 5.9 GeV beam, HMS 4.4 GeV/c and 15.4°

$Q^2 \sim 1.864\ GeV^2$

0.959 GeV < W < 1.656 GeV

No radiative correction

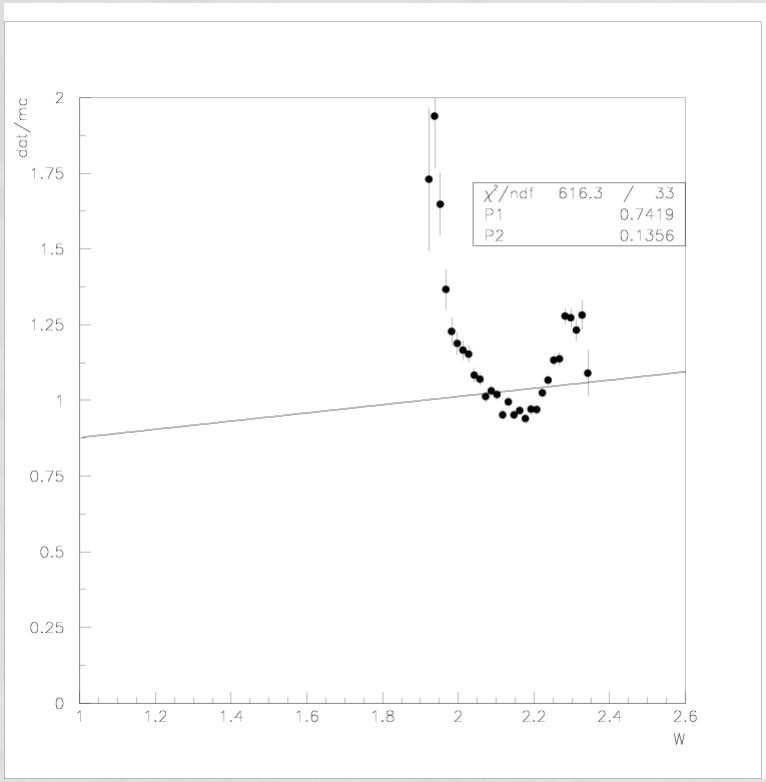


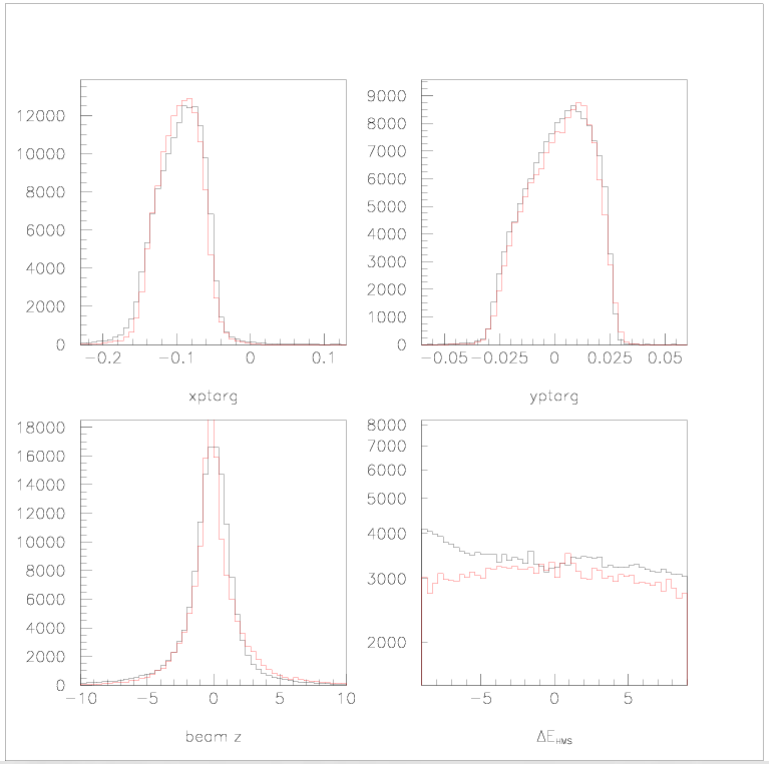
Conclusion

- Packing fraction using HMS data is near to complete.
- The problems of missing C run due to possible slit problem and too high PFs of some runs are under investigation.
- Preliminary HMS asymmetries are produced and ready to include all runs.

Backup slides

Slit offset in MC for run 72505



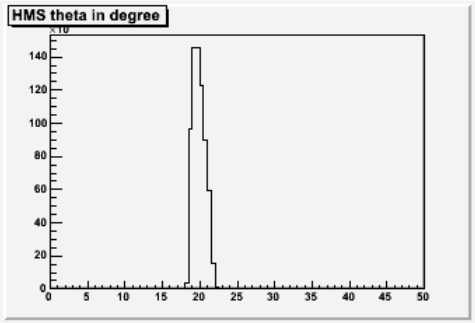


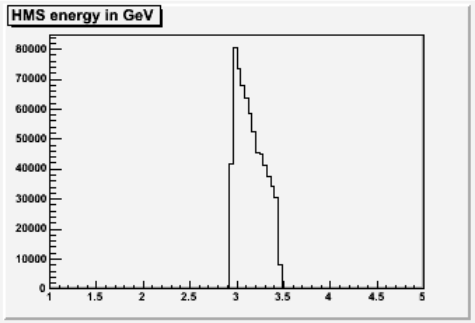
Comparing PF ratio with yield

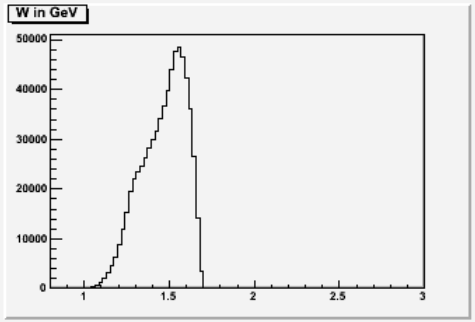
Run #	HMS Recorded	Life Time	Charge(uC)	Yield(/uC)	PF(%)	PF error(%)
72213	314540	0.57744	237.129	2297.12	76.4	5.03
72213	584775	0.8412	348.353	1995.58	63.6	4.9

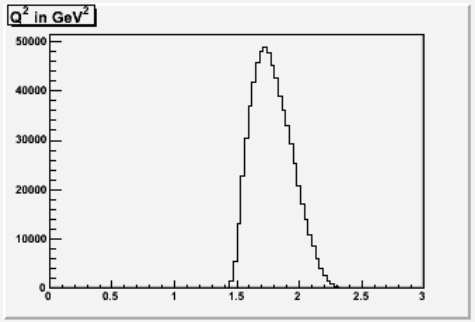
Because of suspicious high PF of run # 72213, it is compared with run # 72828 which has the same kinematics. The ratio of their yield should be close to the ratio of the PF's, if we do not consider Helium contribution.
The ratio of yield of run 72213 of 72828 is 1.1511 and the ratio of PF's is 1.2013 +- 0.12174

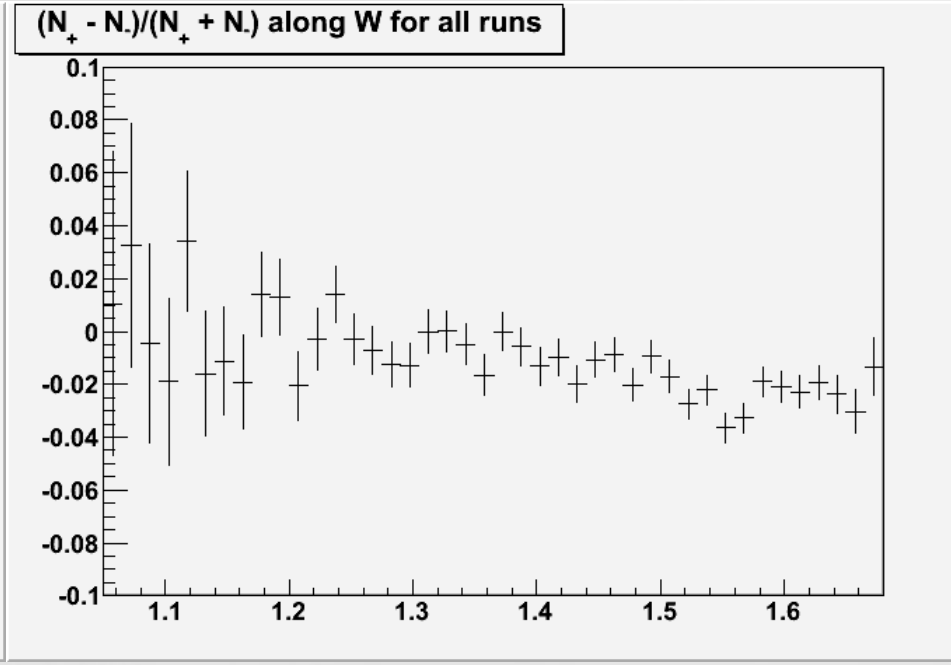
Apara details



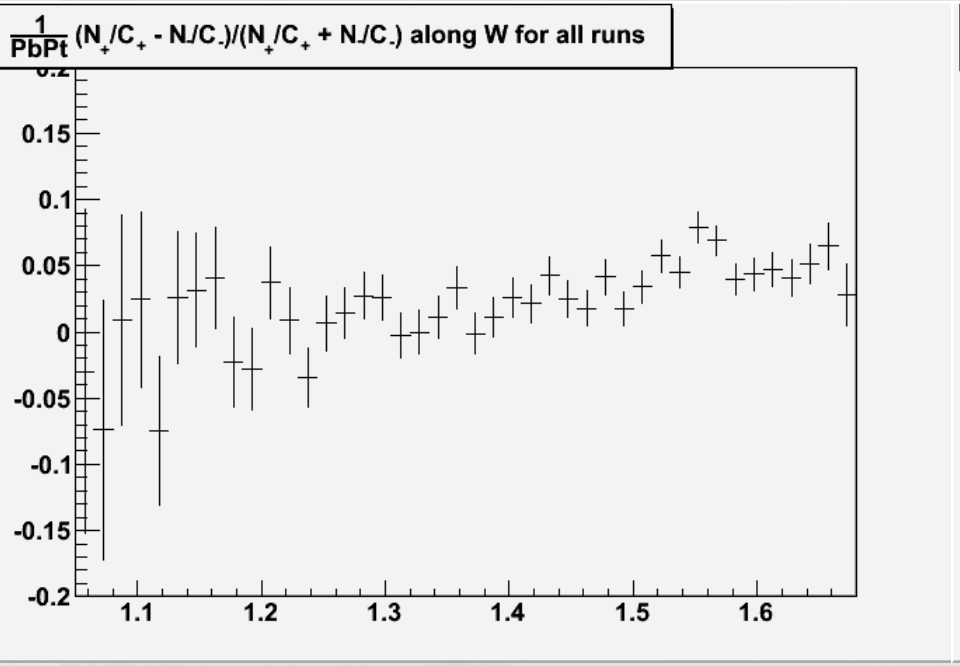


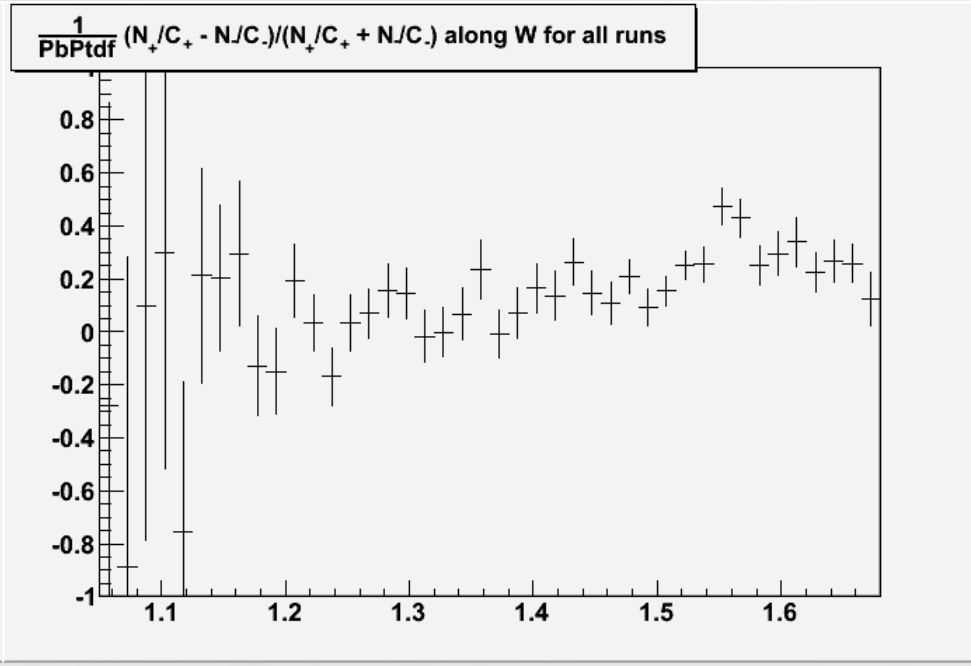




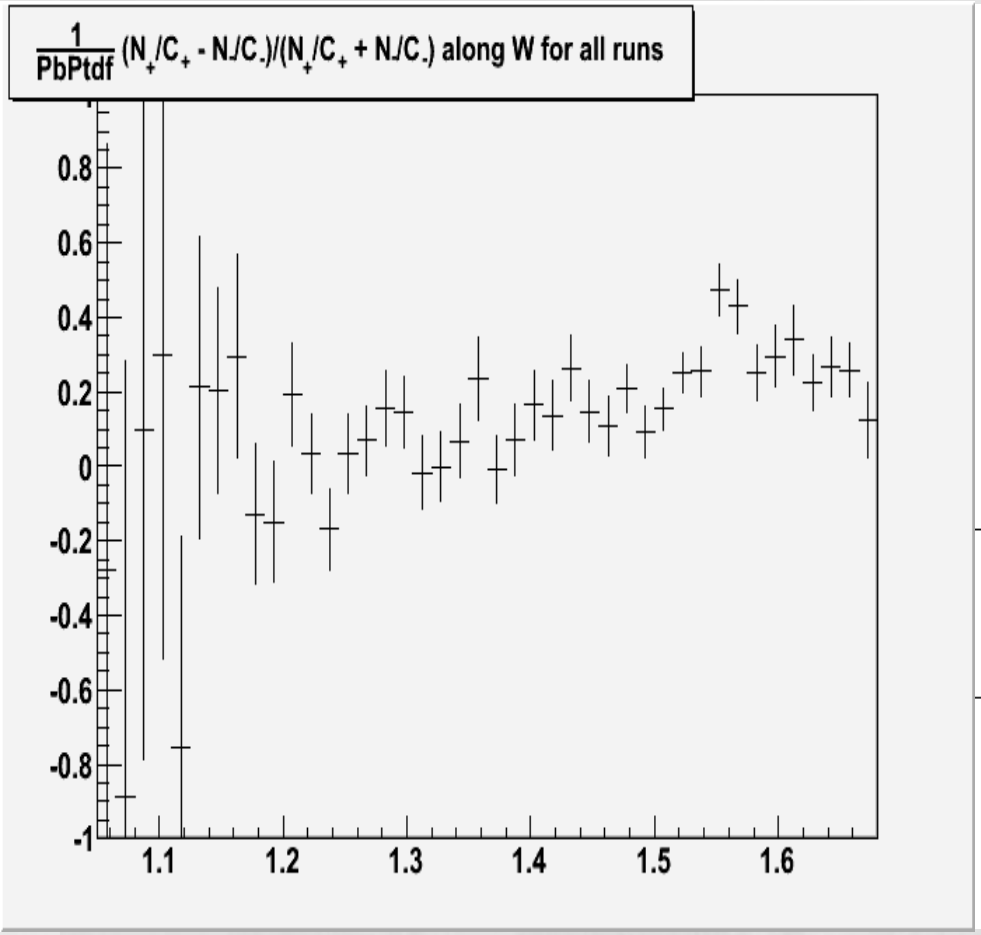


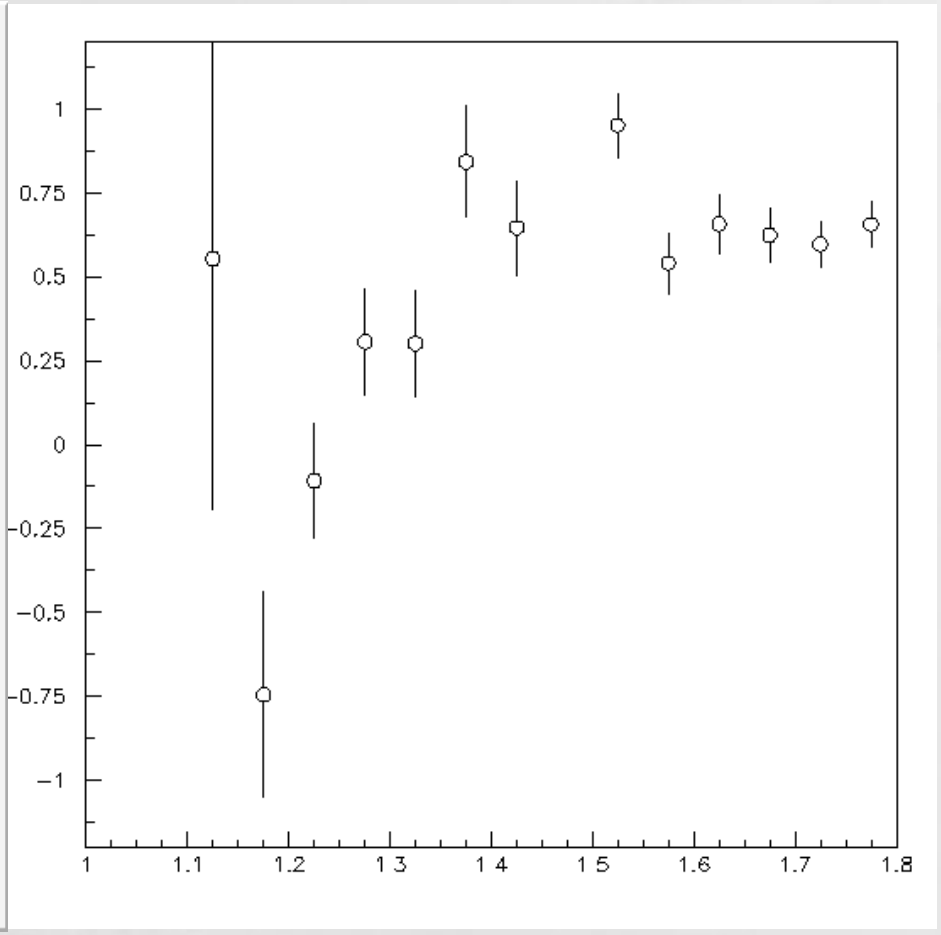
Apara details





Apara and A1 of CLAS





Q^2 = 1.862 GeV^2

CLAS EG1b A_1 Q^2 = 1.71 GeV^2

For $A_1 \sim 0$, $A_{\parallel} \sim D A_1$ where D is a kinematic factor