Readiness for data analysis and publication of the Hall C commissioning experiment(s).

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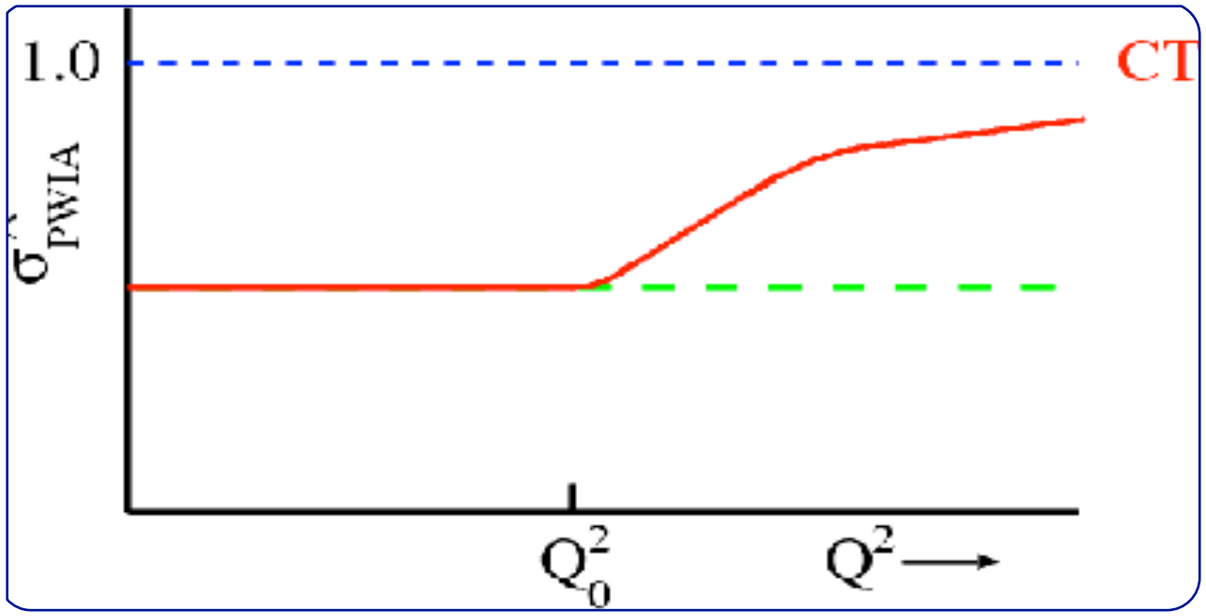
- The Commissioning Experiment
- Readiness of **hcana**
- Readiness of **SIMC**
- Beam - to - publication
- Summary

Hall C Software Review
Nov 10-11, 2016

Hadron Propagation and Color Transparency at 12 GeV

Experiment E12-06-107:Spokespersons - D. Dutta & R. Ent

Running only A(e,e'p) portion of experiment — 3.5 days @ 8.8 GeV & 6.5 days @ 11 GeV (total 10 days)

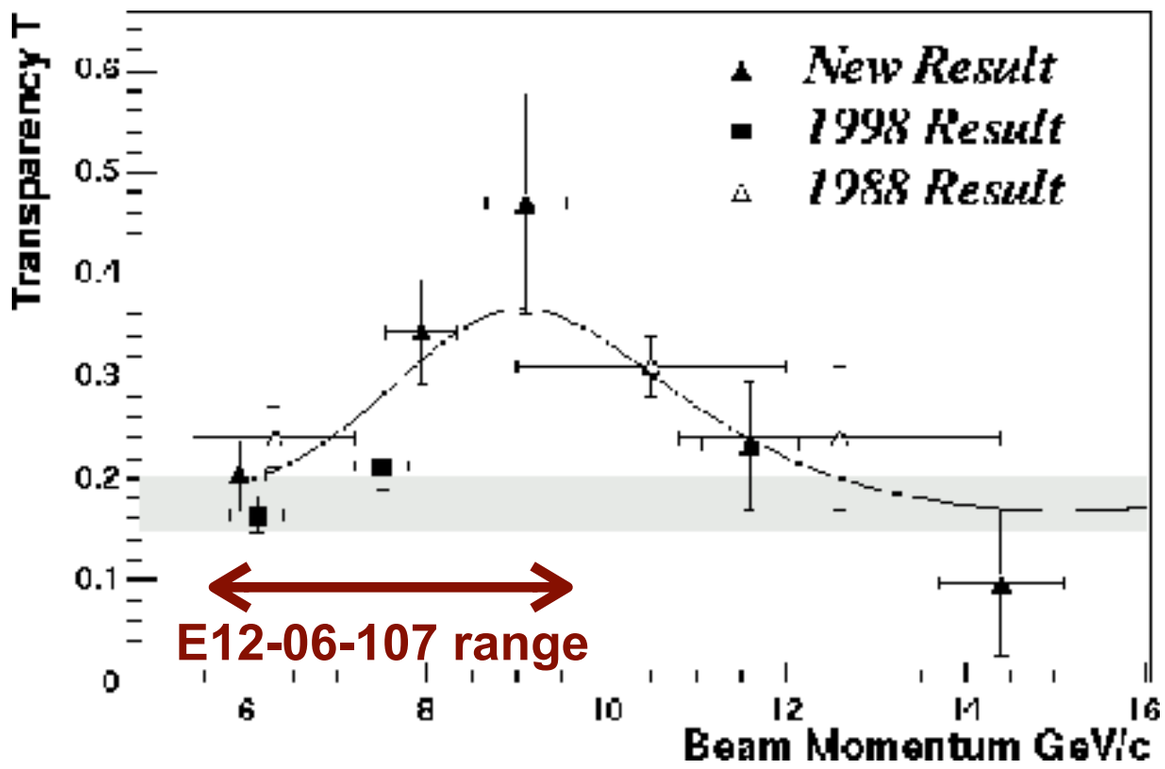


JLab Experiments have conclusively found the onset of CT in mesons, but so far there is no conclusive evidence for CT in baryons up to $Q^2 \sim 8$ GeV^2

CT searches at **BNL using A(p,2p)** reaction have observed a bump in the transparency. This experiment covers an energy range which overlaps with the BNL bump and will help interpret it.

CT leads to vanishing of the hadron-nucleon interaction for hadrons produced at high momentum transfers

CT is unexpected in a strongly interacting hadronic picture. But it is natural in a quark-gluon framework.



A(e,e'p) at 12 GeV JLab

Goal: measure the A(e,e'p) proton knockout cross sections to extract the proton nuclear transparency up to the highest Q^2 at the 12-GeV JLab

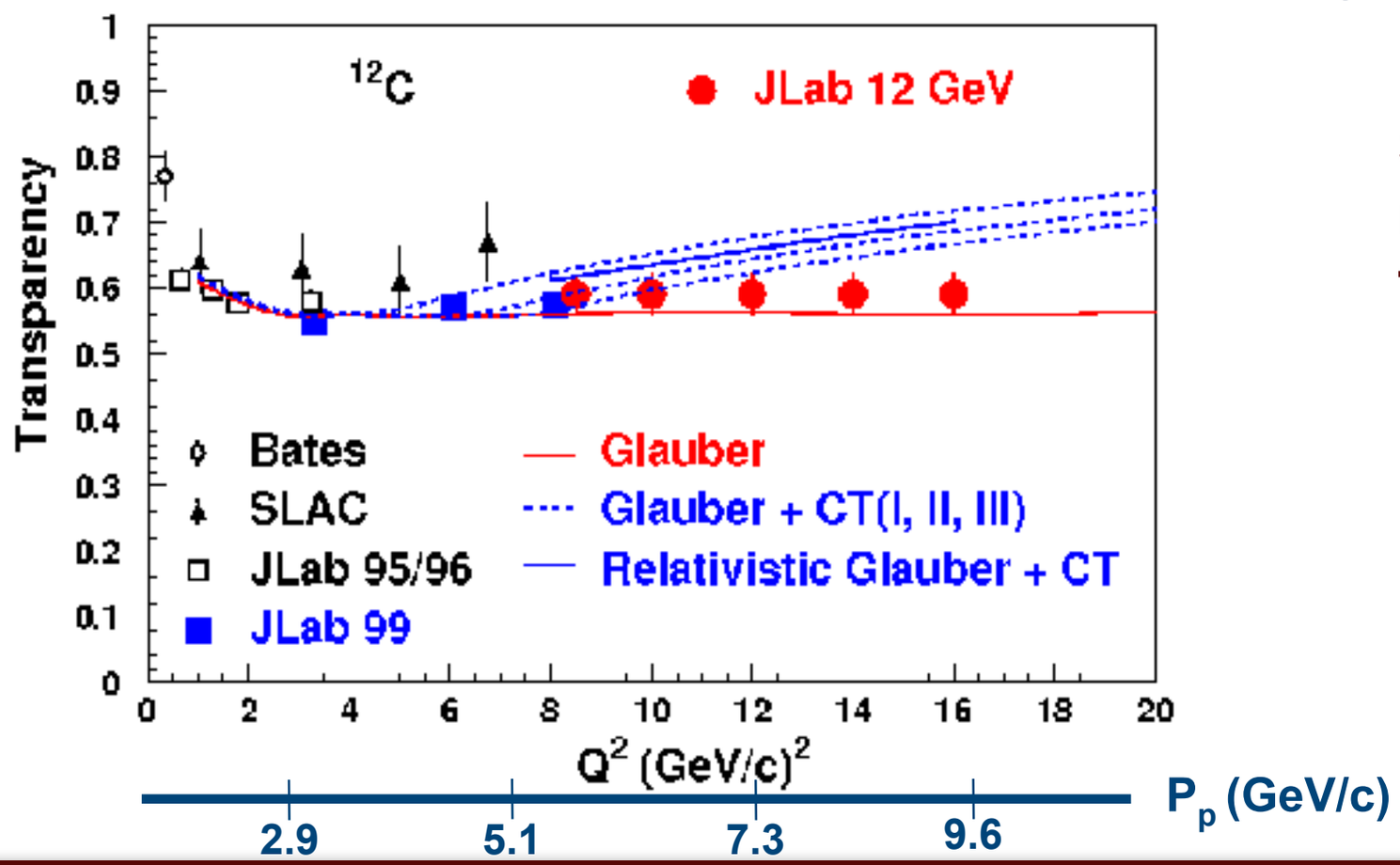
Can only be performed in Hall C with HMS+ SHMS

A(e,e'p) cross-section on ^1H and ^{12}C with 70uA of 8.8 & 11.0 GeV beam.

5 different Q^2 points (8,10, 12, 14 & 16.4 GeV^2)

HMS: electron arm
SHMS: hadron arm

PID: Base detector package
aerogel in SHMS (not required but can be inserted to commission)



Spectrometer and target requirements are middle of the road.

SHMS: p = 5.12 - 9.64 GeV/c
θ = 10 - 22.7 deg

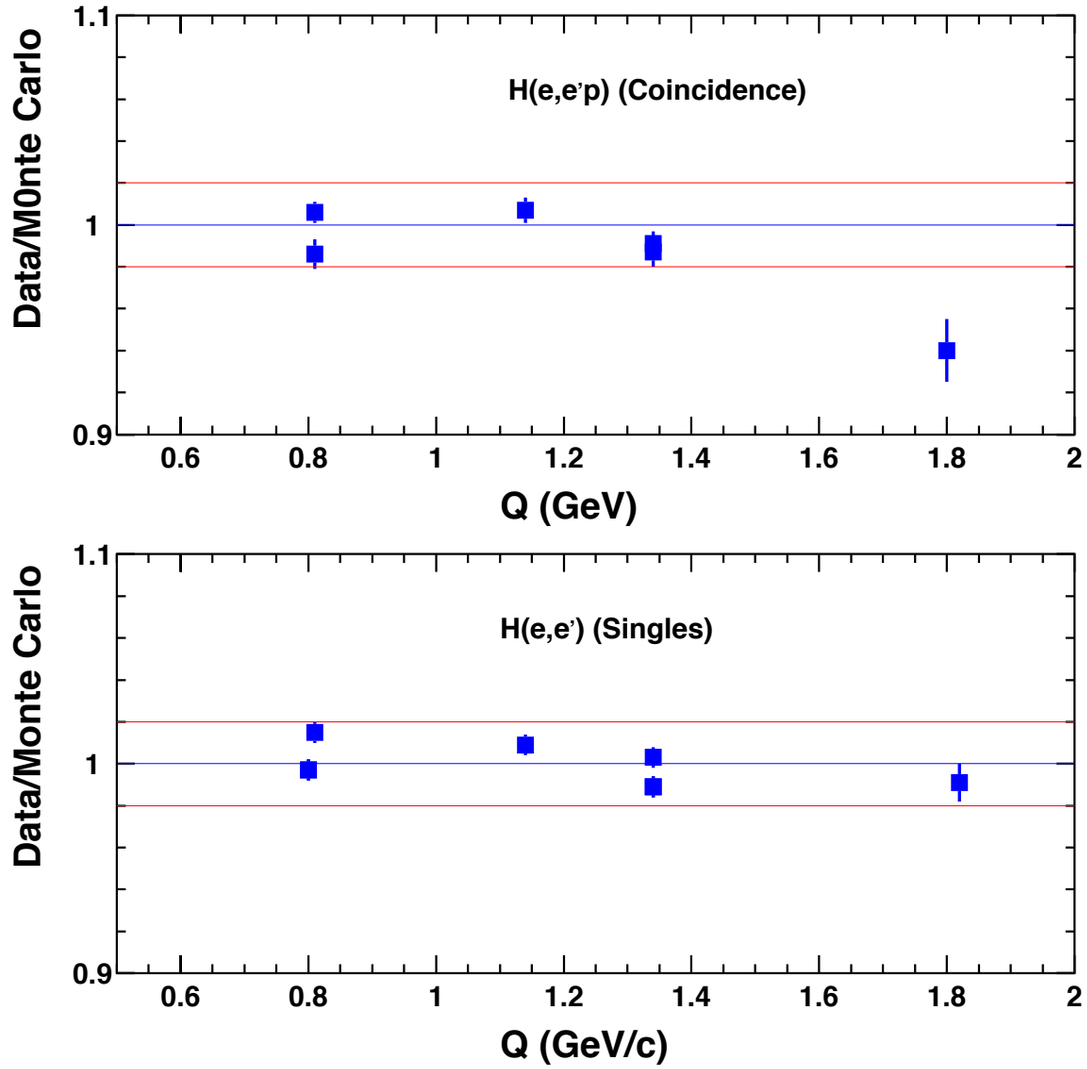
HMS: p = 2.25 - 4.53 GeV/c
θ = 25.9 - 48.1 deg

Targets: 10 cm LH_2 & empty thick and thin Carbon

A(e,e'p) is an ideal commissioning experiment.

- **H(e,e'p) process critical for SHMS commissioning is part of the experiment.**
- **The Hall C Monte Carlo simulation SIMC was built for the A(e,e'p) process.**
- **Analysis framework and simulation is tested and ready, online results can be used for diagnostics.**

H(e,e'p) results from Hall-C commissioning experiment E91-013



The 1994-95 version of simulations and analysis package was able to monitor rates online at the 10% level. We should be able to do much better now and provide a great diagnostic tool for commissioning.

Hall C Analysis Components

Image from G. Niculescu

hcana Refresher

hcana Readiness

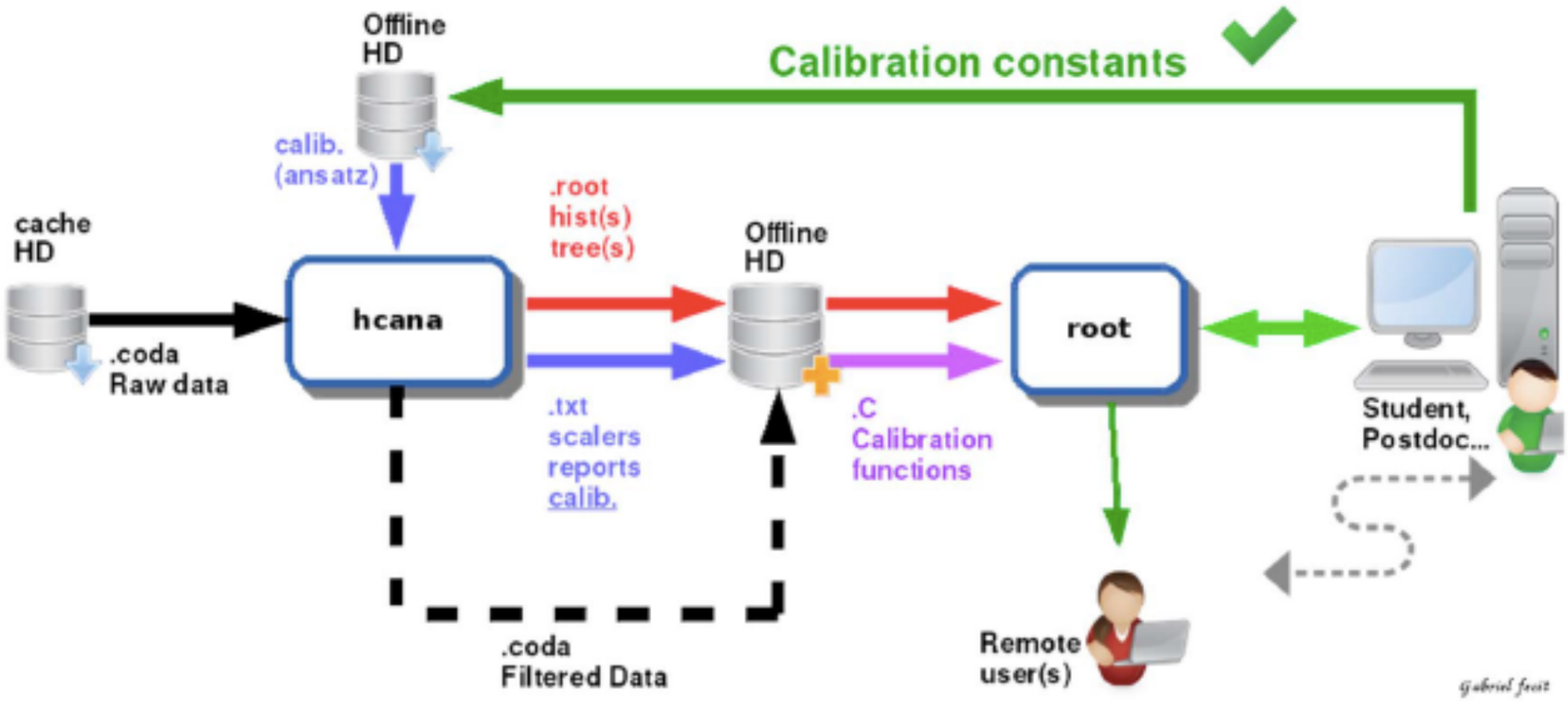


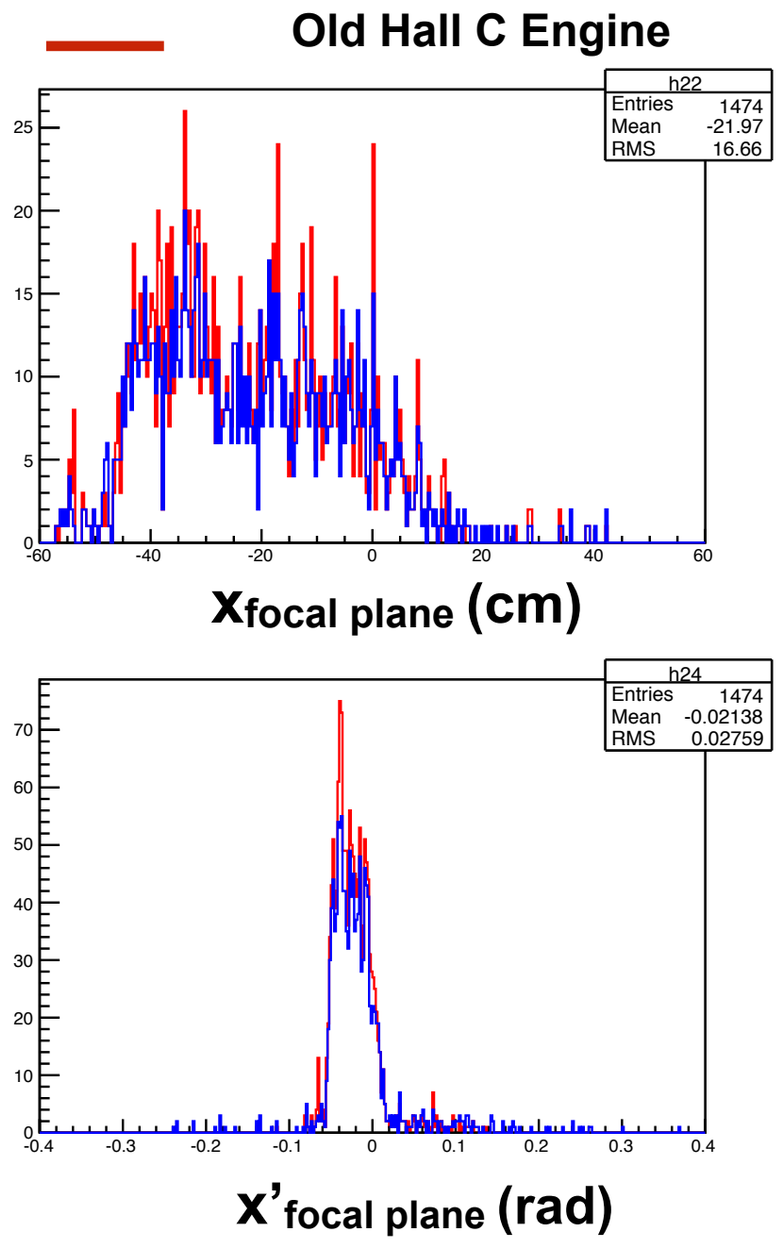
Image from G. Niculescu

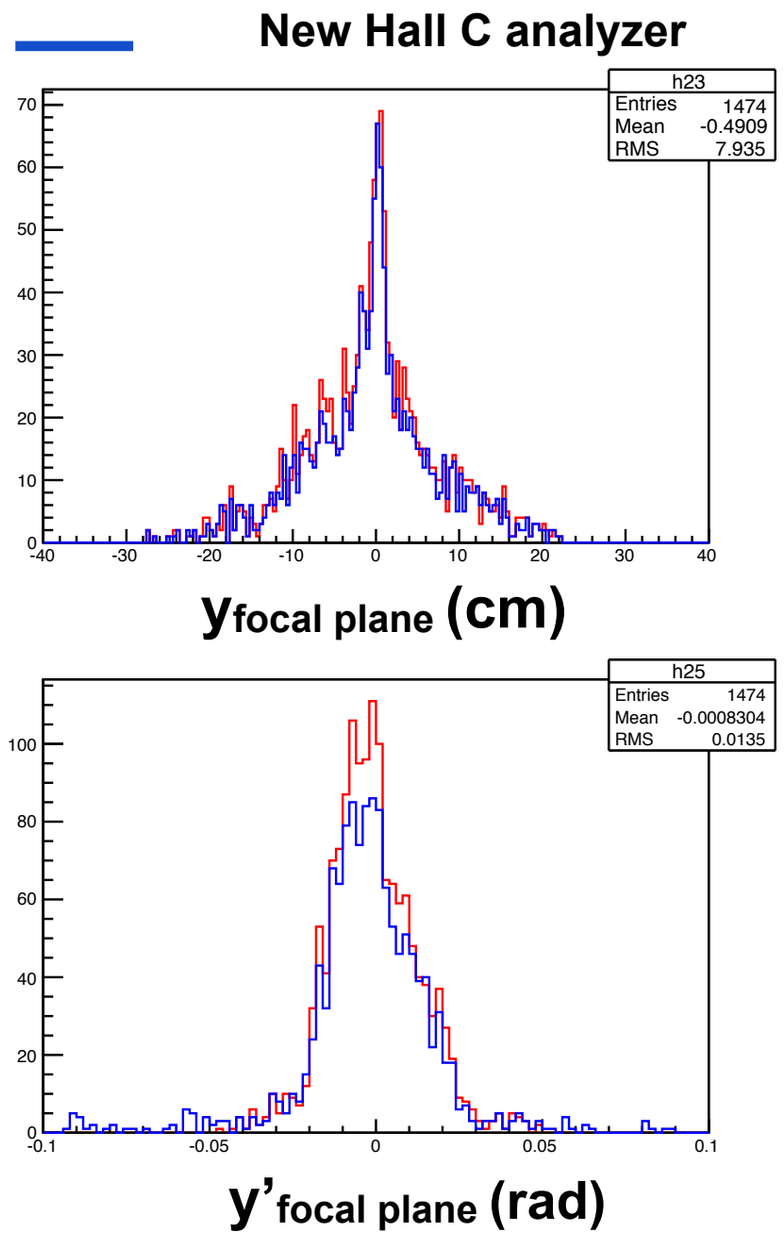
Validating hcana with E94-139 data

E94-139 measured C(e,e'p) at Q^2 = 8.1 GeV^2 this is same as the lowest Q^2 point for E12-06-107

We have used the data from E94-139 to test the new Hall-C analyzer against old ntuples from the experiment

HMS DC focal plane variables





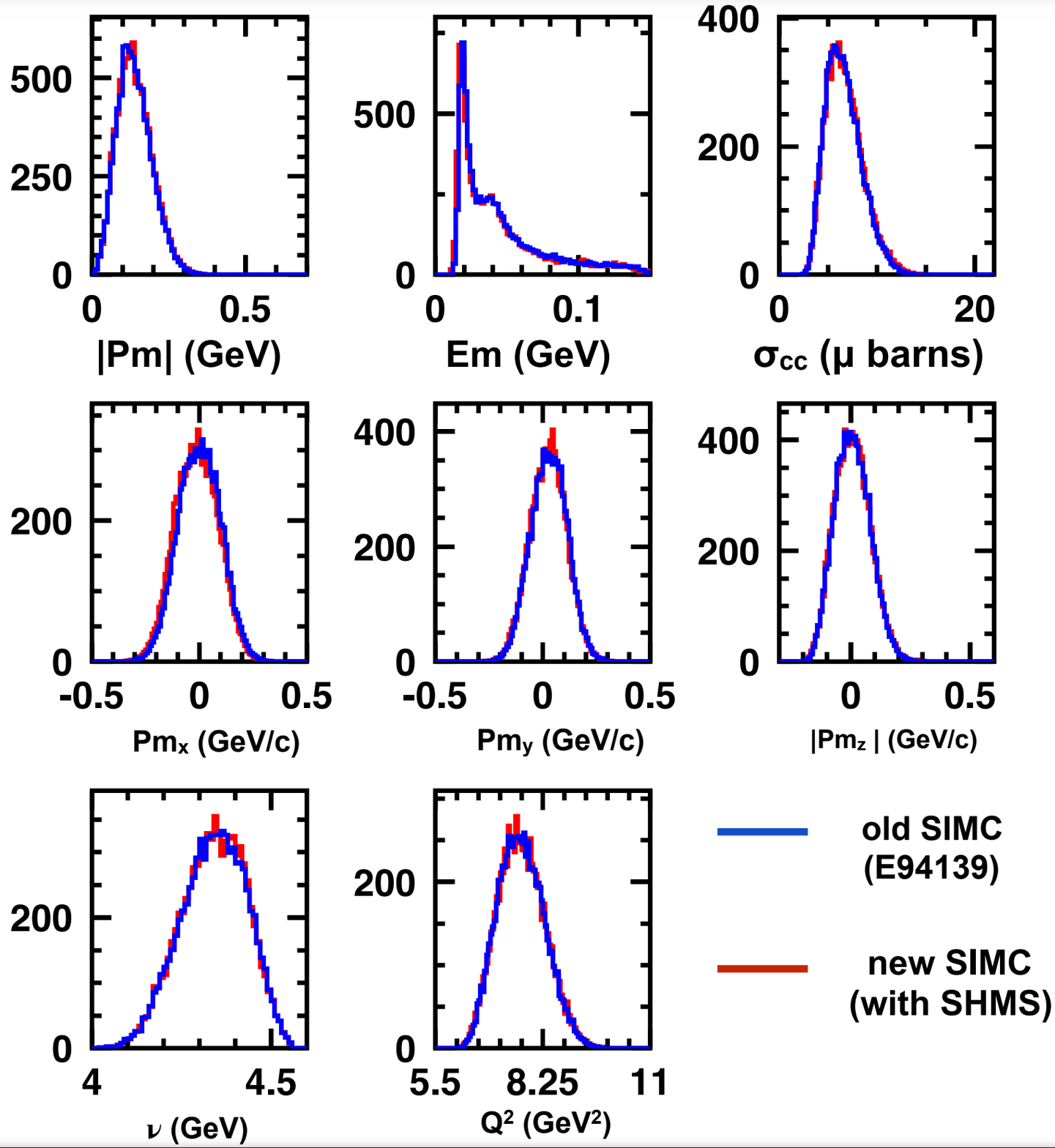
SIMC Refresher

SIMC with SHMS

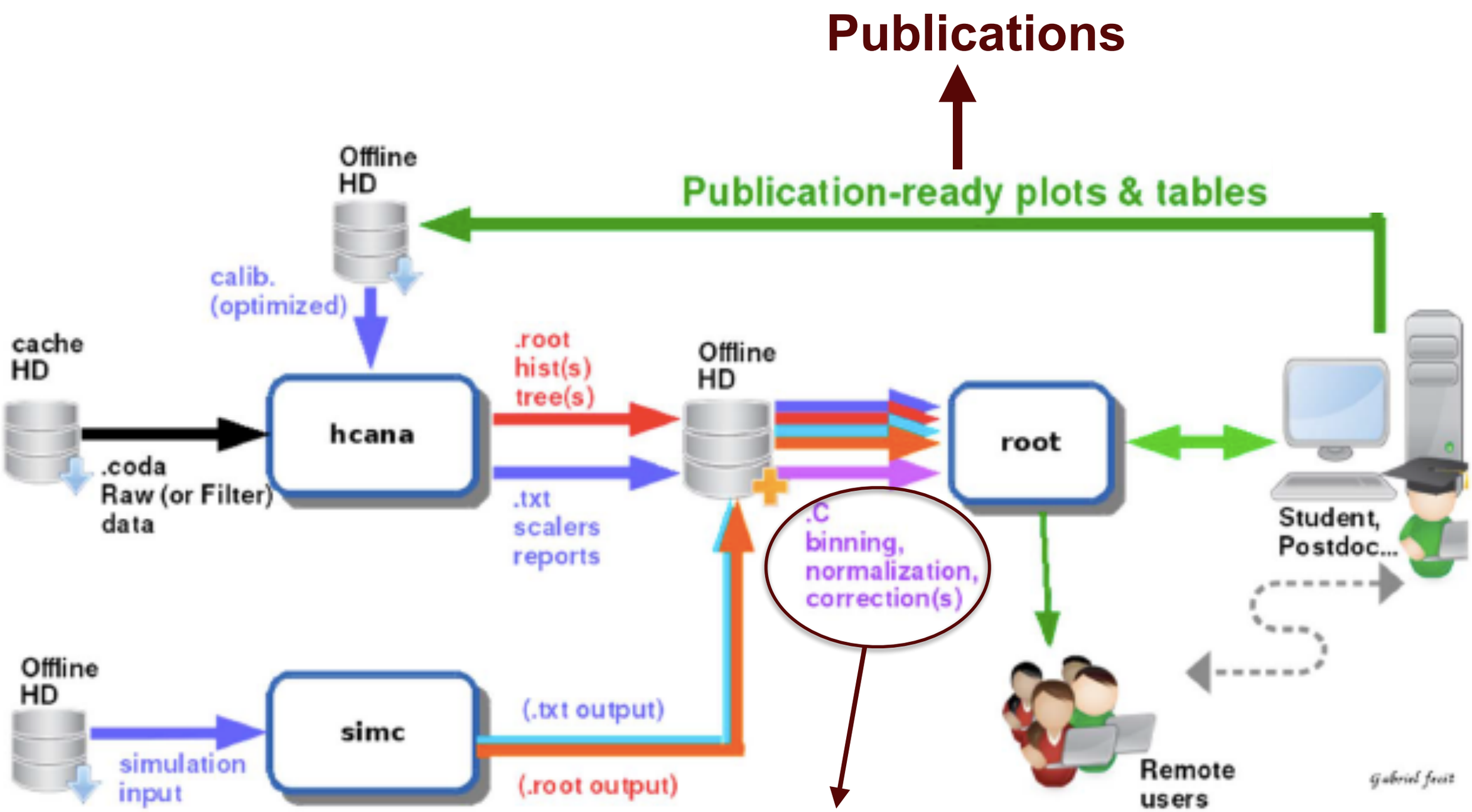
Validation of SIMC with SHMS

E94-139 measured C(e,e'p) at Q^2 = 8.1 GeV^2 this is same as the lowest Q^2 point for E12-06-107

We have used the SIMC ntuples from E94-139 to test the new SIMC with SHMS.



Beam to Publication



Exists from E91013 & E94139 but as PAW kumac and fortran

Image from G. Niculescu

Beam to Publication

The track record

E91-013
(Hall C Commissioning Expt.)
(e,e'p) on H, C, Fe and Au
$0.8 < Q^2 < 3.3$ GeV^2

Experiment completed: May 1996
First Conf. presentation: PANIC, May 96
First publication: sub. Nov. 97, pub. Jun. 98
(first JLab publication)
Total publications: 3 (cites 89, 16, 50)
PhD students, post-docs: 2,1

E94-139
(e,e'p) on H, D, C, and Fe
$3.2 < Q^2 < 8.1$ GeV^2

Experiment completed: Oct 1999
First publication: sub. Aug. 01, pub. Oct. 02
Total publications: 1 (cites 92)
PhD students, post-docs: 1,1

E12-06-107
(Hall C 12 GeV Commissioning Expt.)
(e,e'p) on H, C
$8.1 < Q^2 < 16$ GeV^2

Given the fewer targets and the maturity of SIMC it is reasonable to expect publication within 12-18 months after end of experiment

Software Workforce

E12-06-107 Collaboration

ANSL/Yerevan, Argonne, Catholic, Duke, Hampton, JLab, Mississippi State, Regina

collaborators have built several of the SHMS detectors including the GEM based active collimator to be used to commission the SHMS.

subset of collaboration commissioned Hall-C in 1994

Collaboration also carried out several nuclear transparency experiments E91-013 (1994-1995), E94-139 (1999) and E01-107 (2004) with strong publications record from these experiments (2 PRLs, 6 PRCs (1 as rapid comm)).

373 citations, 5 articles with over 50 citations each

Scheduled for 10 PAC days or ~ 60 shifts
over 25 collaborators => expect less than 5 shifts/person

1 thesis student - Deepak Bhetuwal (MSU)
1/2 post-doc (MSU) dedicated to this experiment
extensive support from JLab staff and post-docs in commissioning spectrometer and building/validating Software

Summary