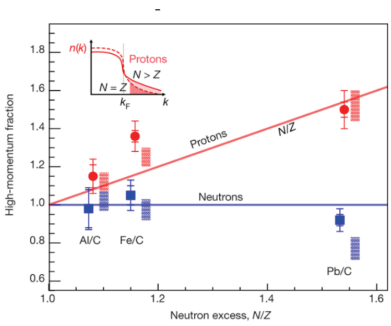
Jefferson Lab
Thomas Jefferson National Accelerator Facility
Exploring the Nature of Matter

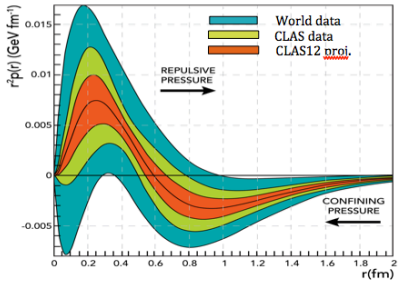
December 31, 2018

Dear Hall B collaborators

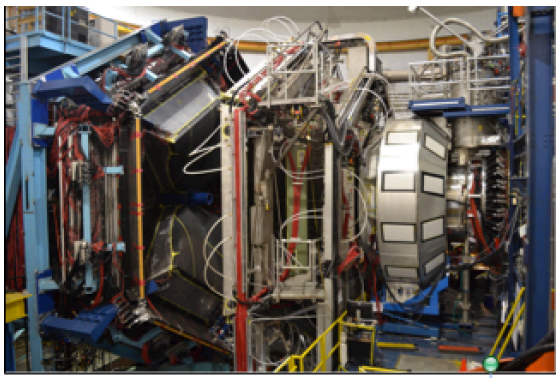
2018 has been a very successful year for Hall B. As we are about to enter a new year I like to take a look back at some of the highlights of 2018. Before I do this I like to welcome all new members who have recently joined one of the Hall B experiment collaborations (CLAS, HPS, PRad). Besides new individual members, also three new member institutions, Duke, MIT and Lamar have joint the CLAS collaboration.



Our reach in science continues to broaden with results from the 6 GeV era coming out unabated, several of them published in Journal Nature and other high-impact publications, e.g. the proton excess in p-n pairs at high momentum (top), and the pressure distribution inside the proton from CLAS DVCS data (right), which opened up a new direction in experimental nucleon structure research. The search for evidence of dark matter continued with a first publication, and the result of a precision measurements of the proton's charge radius were shown at the DNP/JPS meeting in Hawaii. Many new results were published, among others on meson photoproduction in the search for new excited proton and neutron states, on nucleon transition form factors, deep inelastic processes related to GPDs and TMDs, and studies of nucleon-nucleon correlations from the highly successful data mining initiative.

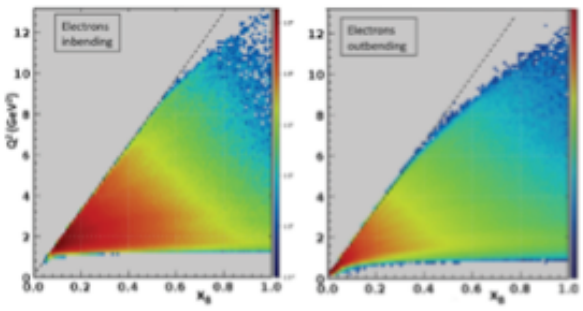


The 12 GeV science program

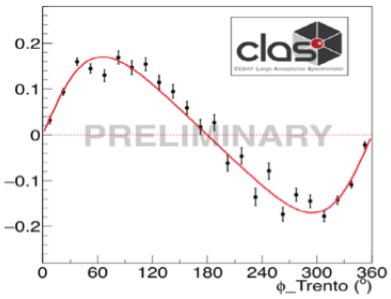


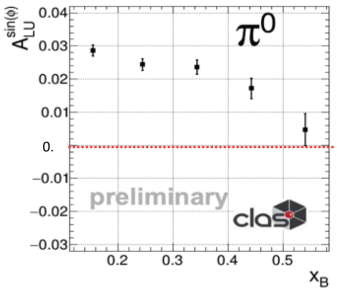
A new CLAS12 RG-M "Addressing critical neutrino-nuclear issues", that covers also short range correlations in nuclei with exclusive processes was approved by PAC46 with 45 beam days. It represents a significant broadening of the science program by extending the nuclear structure studies to exclusive processes and reaching out to the neutrino community. Another proposal on J/ψ production off deuterium was added RG-B. The year 2018 began with the commissioning of the many components of CLAS12 and of the combined detector system. Using beam energies at 2.2, 6.4, and 10.6 GeV, the main features of CLAS12 in terms of kinematic reach, detector alignments, and resolution could be mapped out. The CLAS12 run group proposals make use of simultaneous measurements of several reactions that cover different kinematic ranges in scattered electron angles, Q^2 and x_B.

The figure shows the electron kinematics at 10.6GeV beam energy, covering the range $1.2 \le Q^2 \le 13$ GeV^2 for elastic ep kinematics at $x_B = 1$, and the inelastic kinematics at $x_B \ge 0.1$ for electrons bending inwards (lhs). At reversed Torus magnet polarity, with electrons bending outward (rhs), the x_B reach is extended to smaller values at lower Q^2. The dashed line shows the limit from the beam energy.



An important result of this year has been the demonstration that CLAS12 in its design configuration can run on hydrogen target at the full luminosity of 10^{35}cm^{-2}s^{-1}. This has been demonstrated at the 11 GeV run during the spring and in the fall during the 6.5 GeV run for RG-K. Preliminary results of RG-A have let to a dozen presentations at the joint meeting of the American and the Japanese Physical Societies DNP/JPS in Hawaii. Two examples may suffice to demonstrate readiness of CLAS12 for science. One of the flagship programs is the 3D imaging of the protons quark structure processes in Euclidean space and in momentum space, employing the DVCS p(e,e'pγ) and SIDIS p(e,e'h)X processes. The graph to the left shows the DVCS-BH beam-spin asymmetry of a small fraction of the data collected in the spring run at 10.6 GeV, the graph on the right shows the beam-spin asymmetry for π^0 SIDIS events, where the small asymmetry is measured with precision.





None of the early results from the 2018 runs would have been possible without the tremendous dedication of the Hall B technical team, magnet group, and the support provided many individuals of the technical and detector support groups at JLab and abroad.

As we have left the year 2018 behind that saw great science emerging, including from the first data taken with CLAS12 at energies near 11 GeV, we are looking forward to the successful exploitation by the collaboration of the great potential provided by CLAS12 for discovery science. This is where the leadership, scientific curiosity, and energy of the collaboration members are needed to enter the new era of hadron and nuclear science towards addressing the intricate problems and challenges of strong interaction physics and confinement, and the science beyond.

I wish you all a very happy and successful Year 2019 !

Volker Burkert