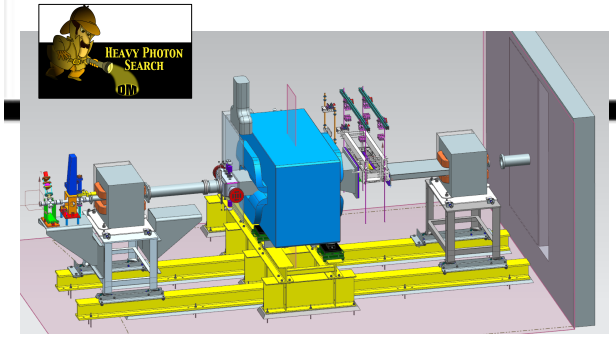
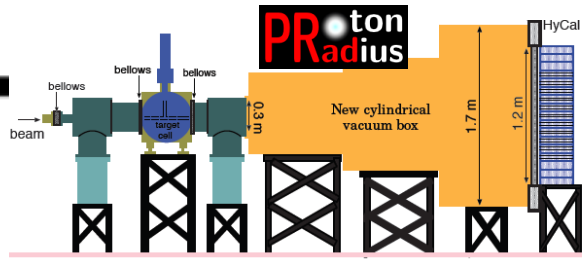
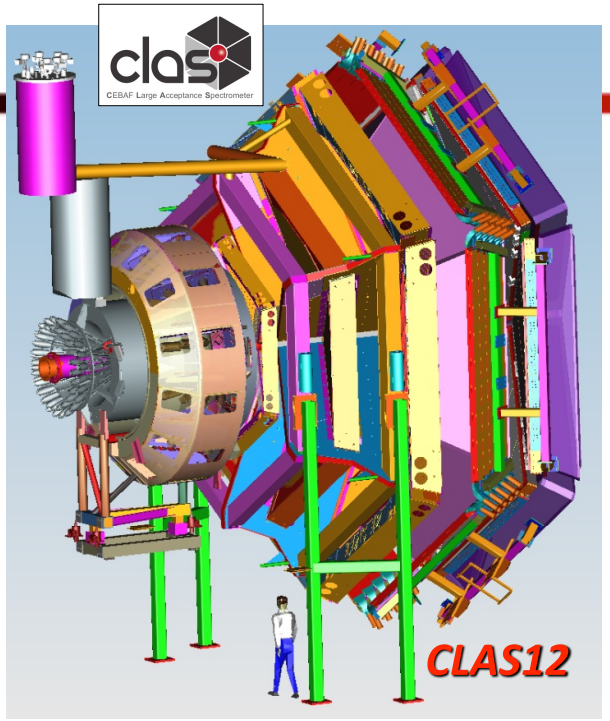






Status of Hall B

Volker D. Burkert

PAC45 Meeting
July 10, 2017

- CLAS12 equipment
- Physics highlights
- HPS & PRad update
- Proposals & RG-A
- Summary

Jefferson Lab
Exploring the Nature of Matter

Equipment

Forward Detector (FD)

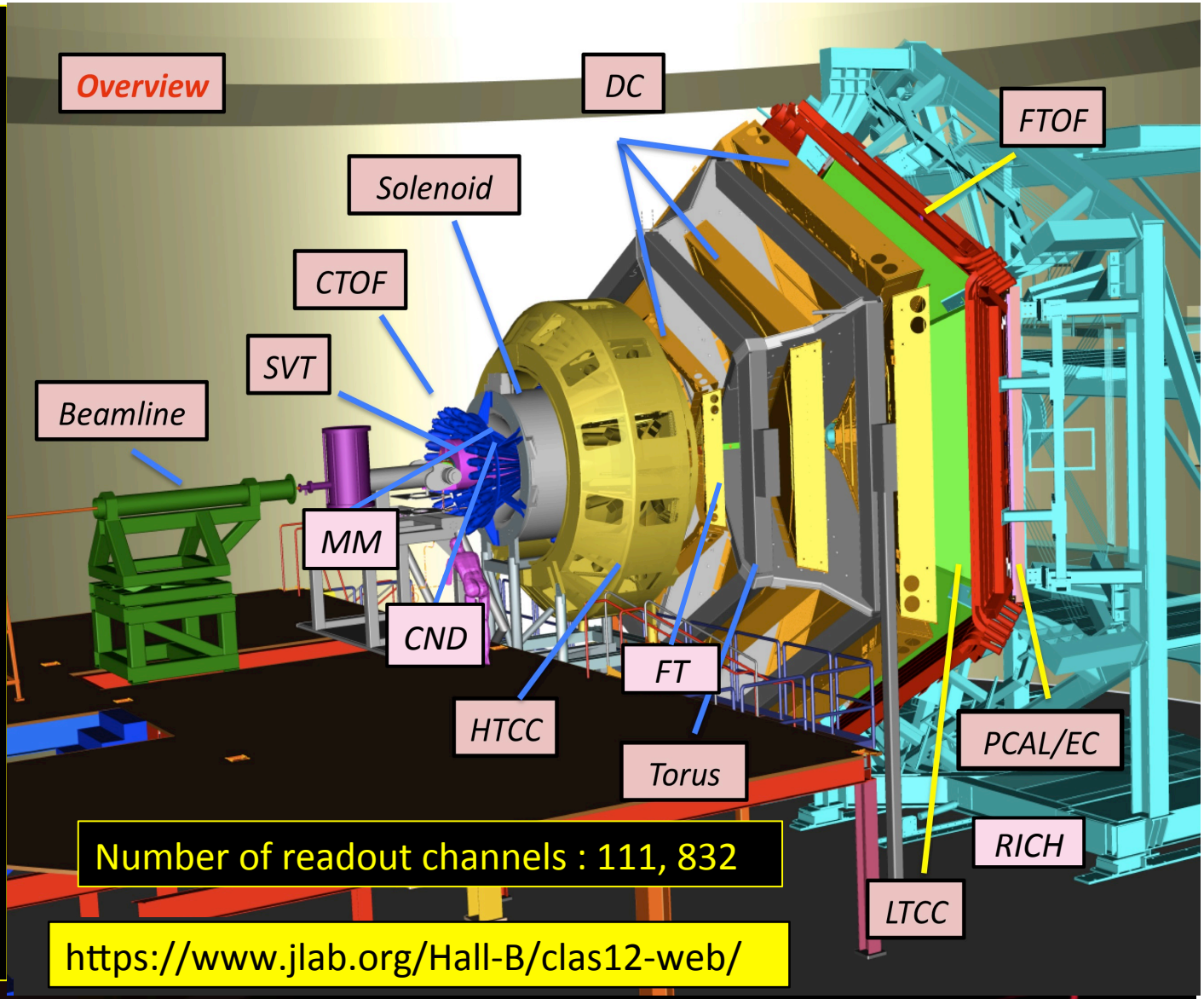
- TORUS magnet
- HT Cherenkov Counter
- Drift chamber system
- LT Cherenkov Counter
- Forward ToF System
- Pre-shower calorimeter
- E.M. calorimeter
- Forward Tagger
- RICH detector

Central Detector (CD)

- Solenoid magnet
- Silicon Vertex Tracker
- Central Time-of-Flight
- Central Neutron Detector
- MicroMegas

Beamline

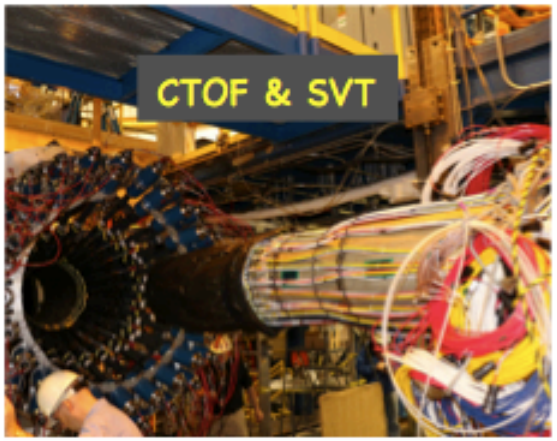
- Photon Tagger
- Shielding
- Targets
- Polarimeter

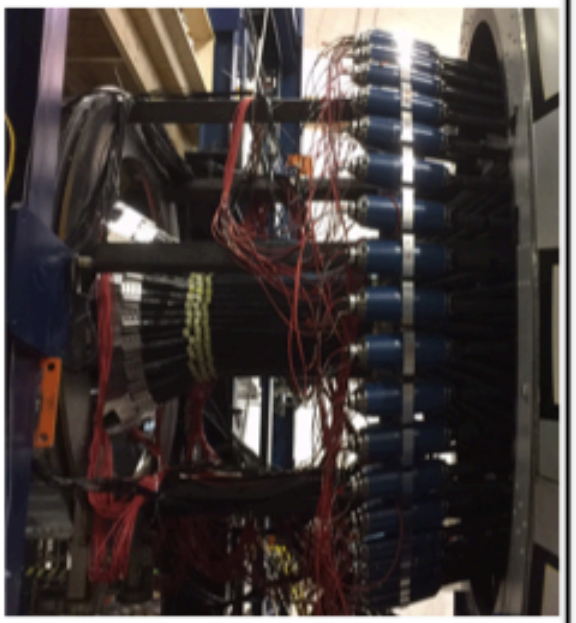


Number of readout channels : 111, 832

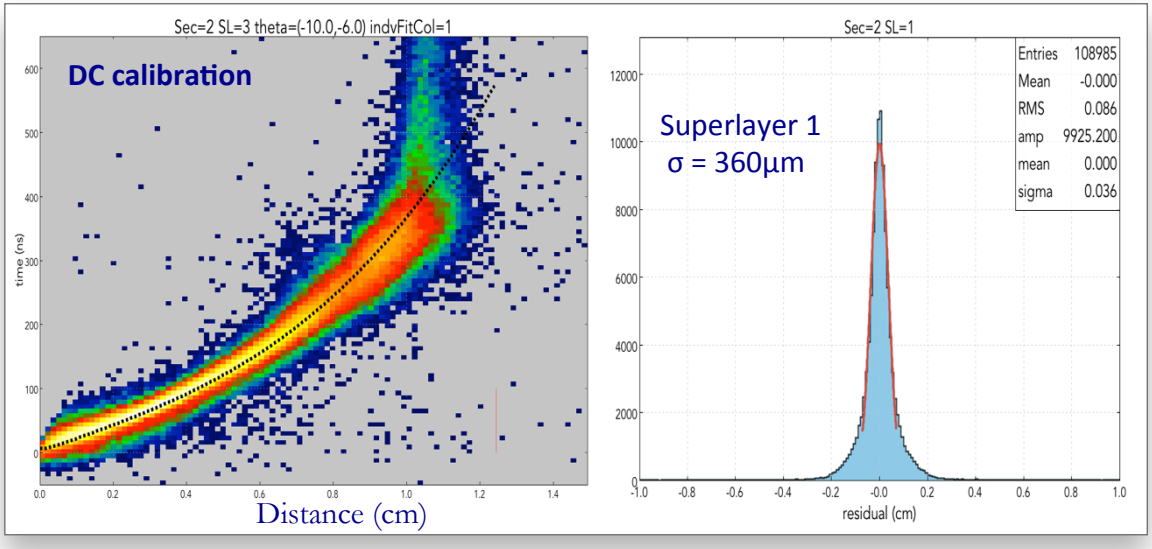
https://www.jlab.org/Hall-B/clas12-web/

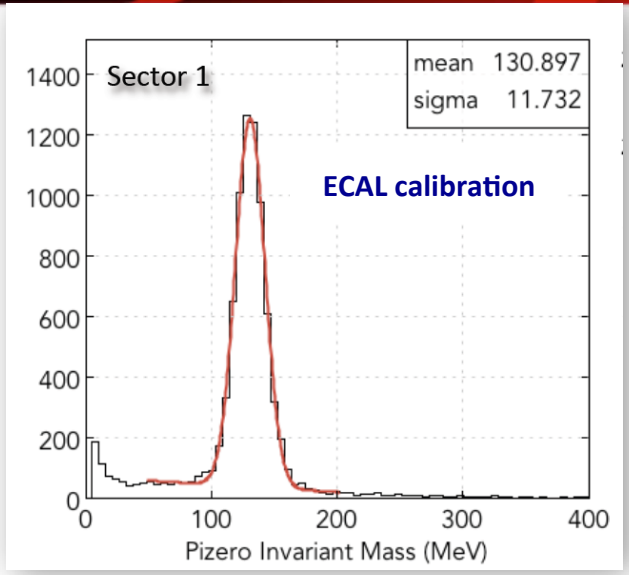
KPP-Equipment



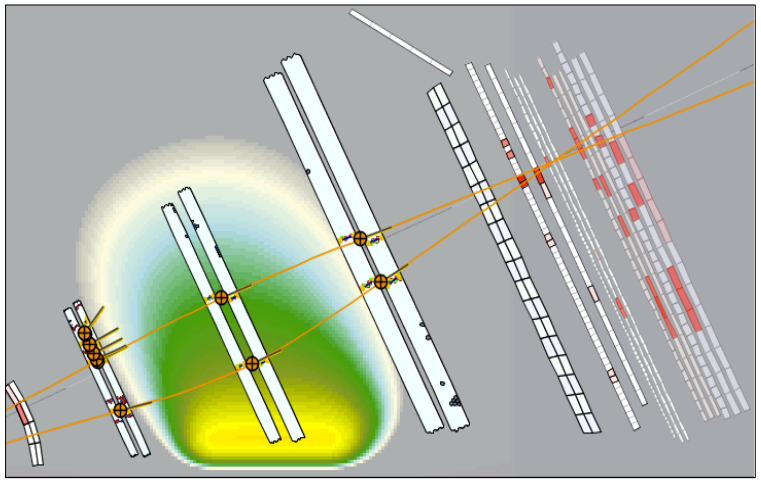


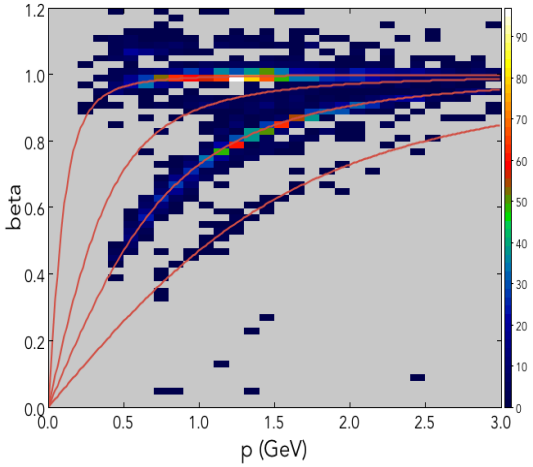
CLAS12 Calibration with KPP Data

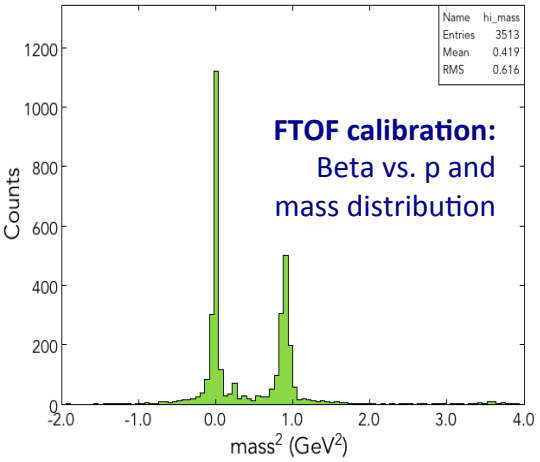




KPP Run 2/3-2/6 – DOE approval 2/7

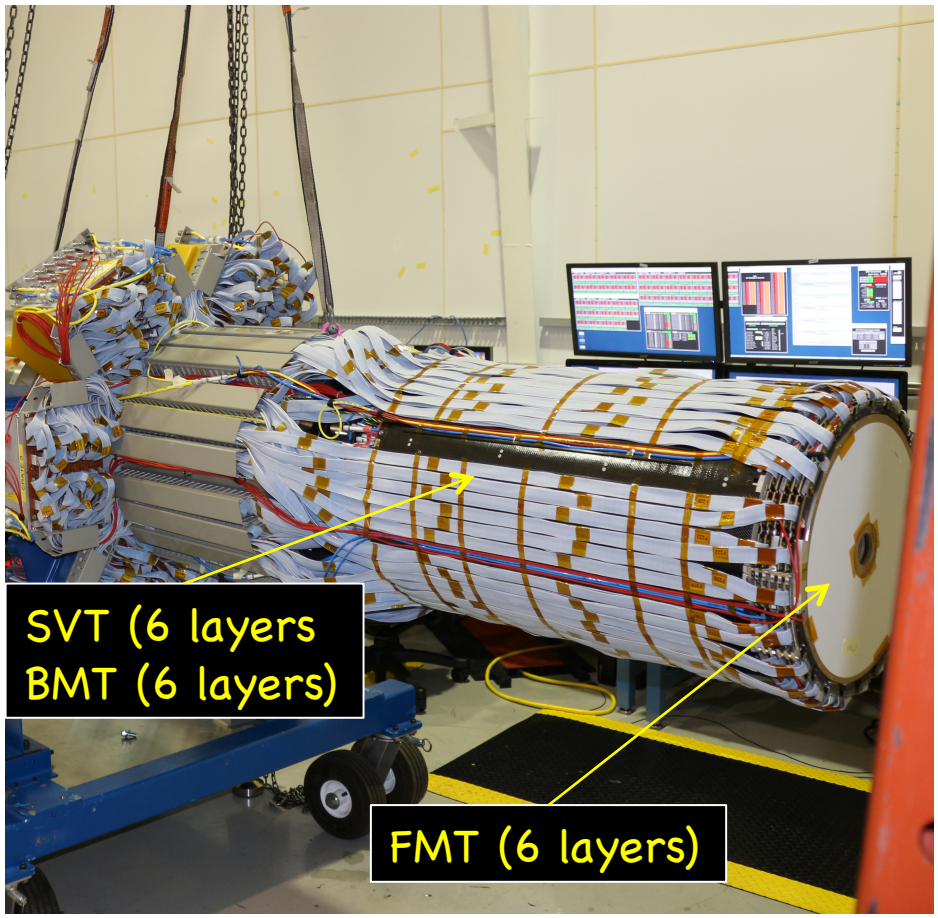




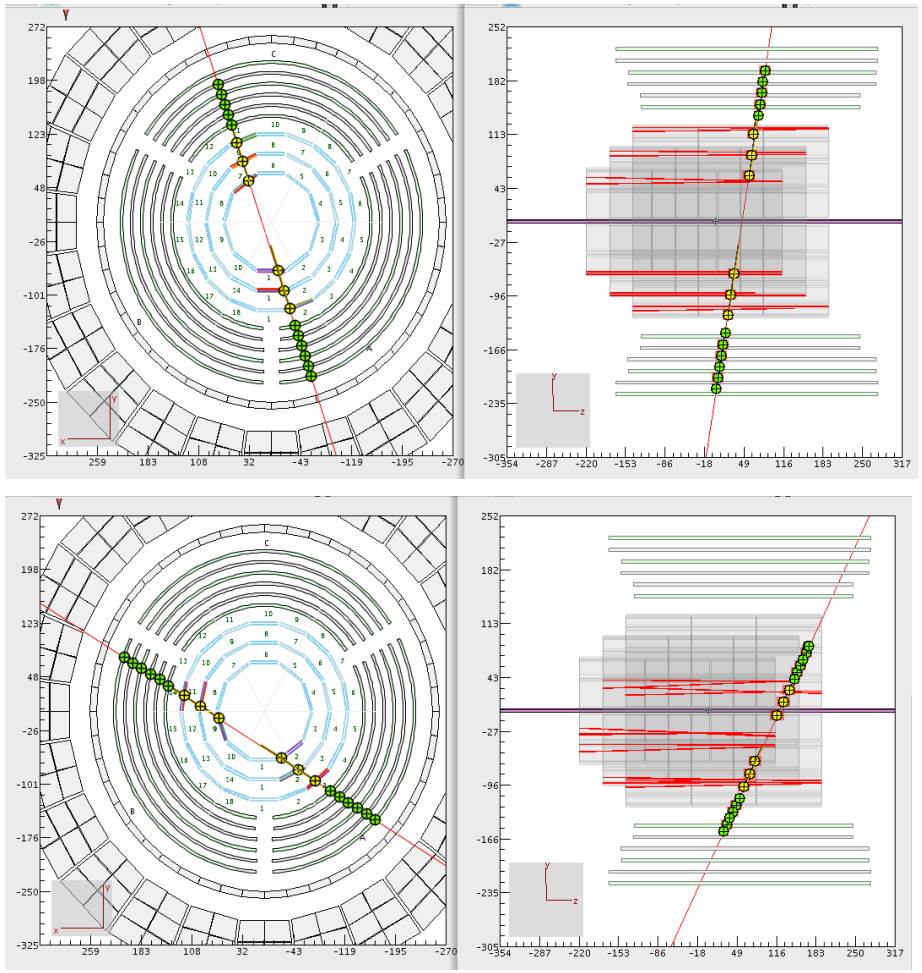


Central Vertex Tracker

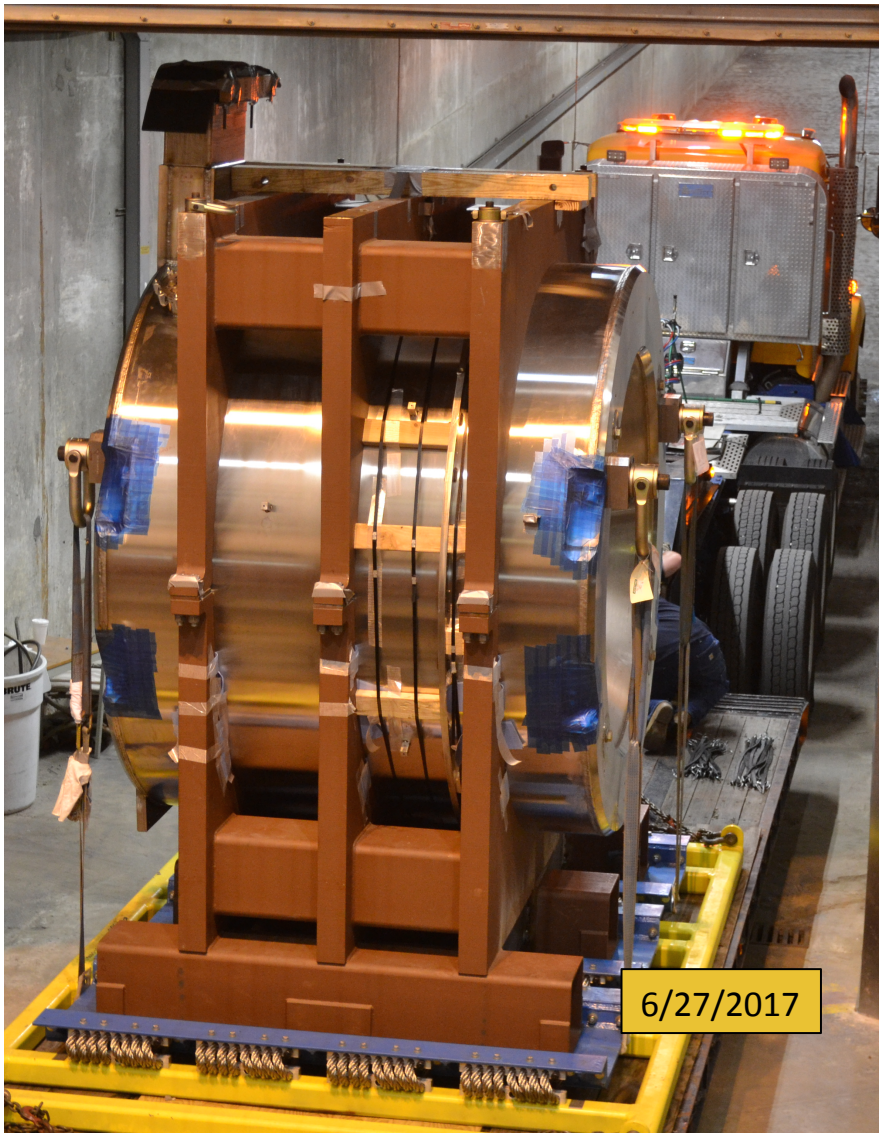
Silicon-VT + Barrel-MT + Forward-MT

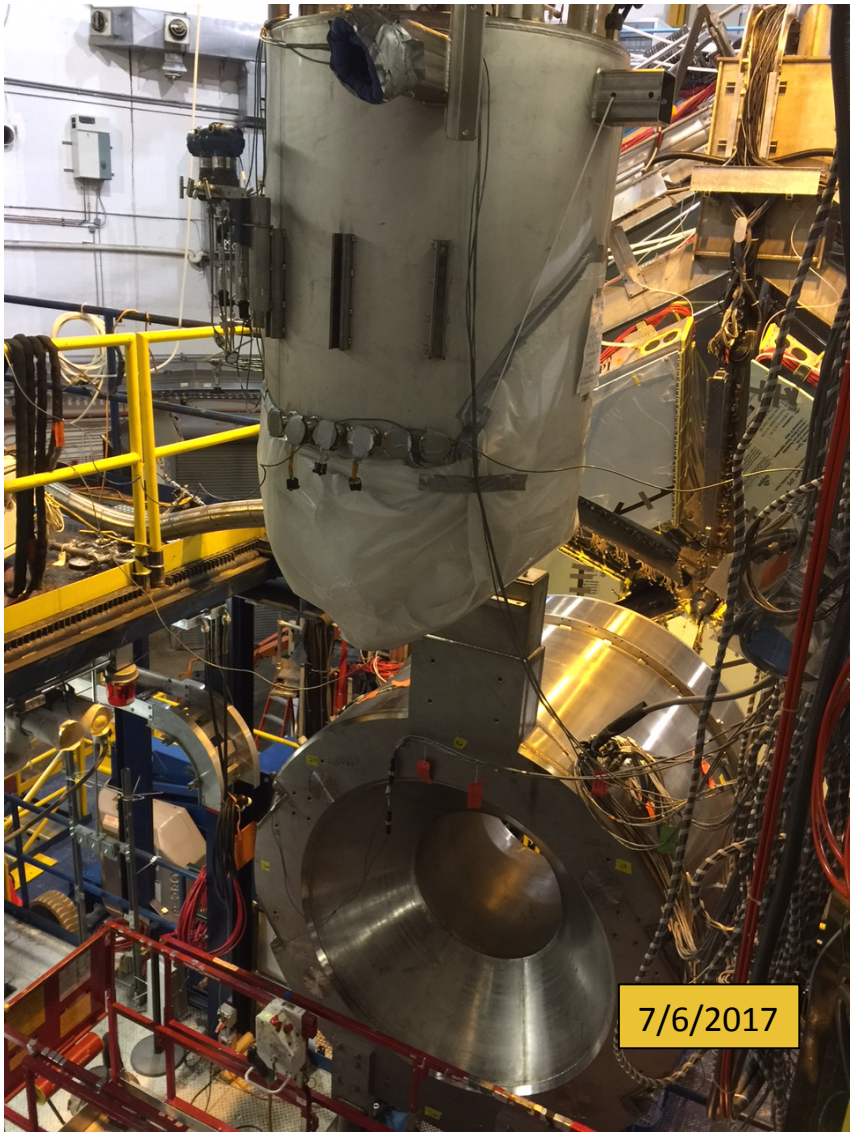


Cosmic ray tracks in CVT

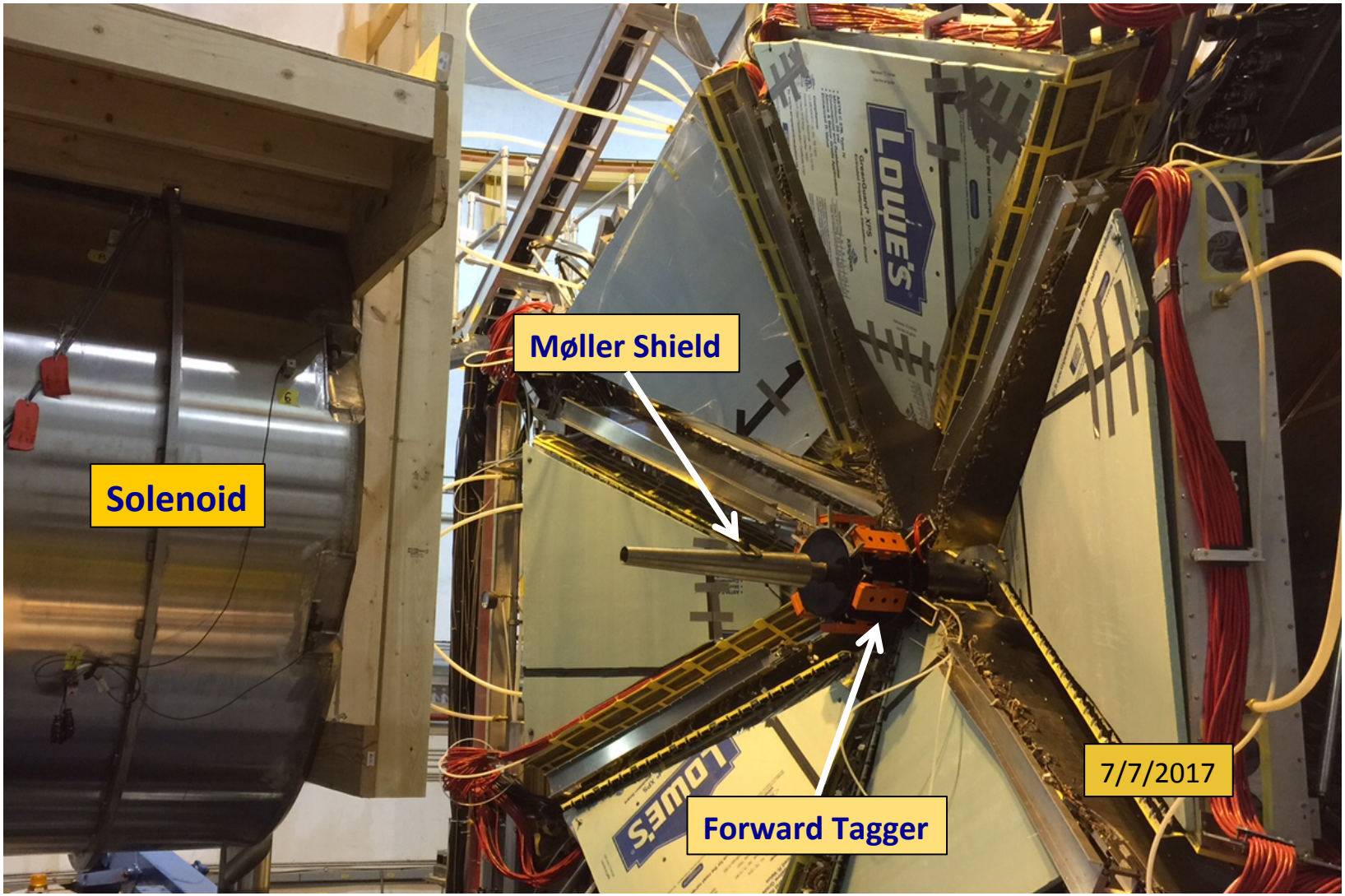


5T Solenoid Magnet



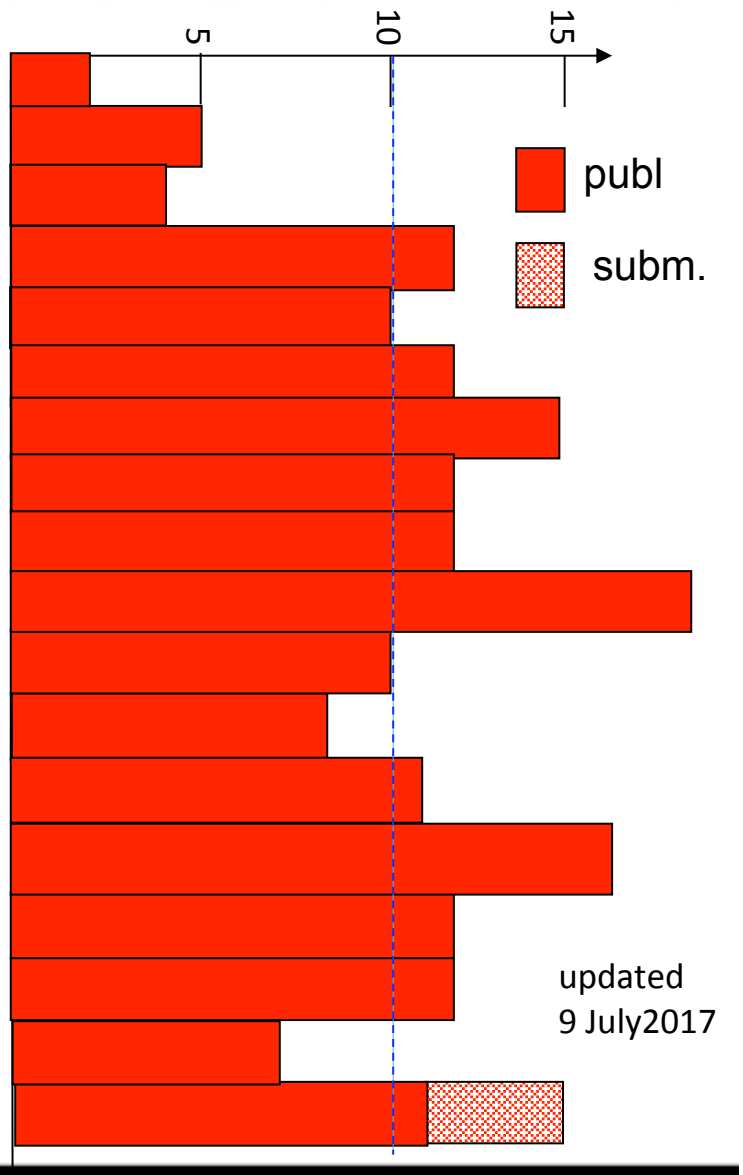


CLAS12 Solenoid & Forward Tagger

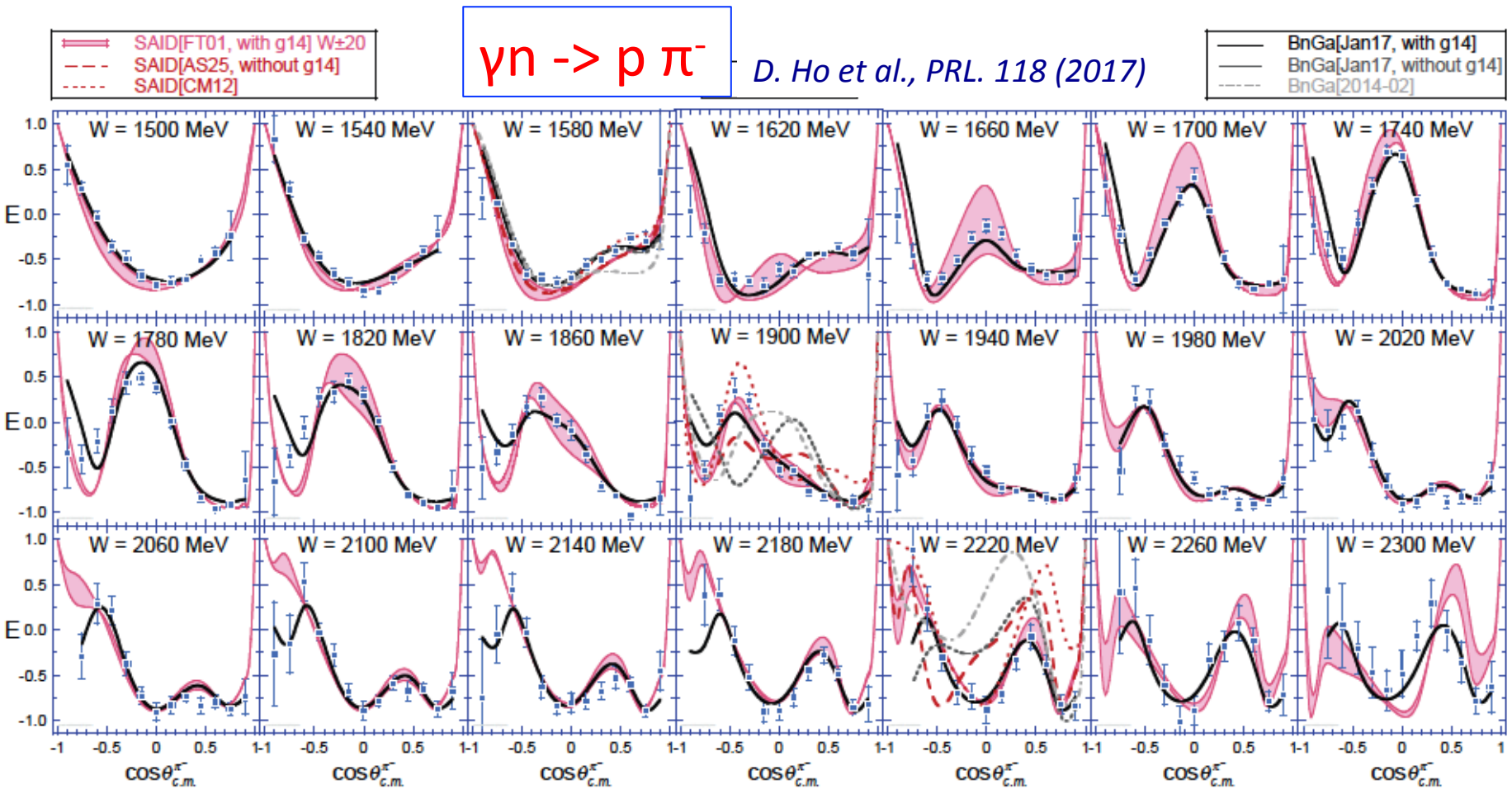


Hall B - Physics Publications in refereed Journals

	Spectroscopy	Deep Inel. Scatt.	Nuclear Physics	ALL
2000	-	1	1	2
2001	2	3	-	5
2002	3	-	1	4
2003	7	4	1	12
2004	3	3	4	10
2005	7	3	2	12
2006	8	4	3	15
2007	7	2	3	12
2008	4	6	2	12
2009	8	7	4	19
2010	4	2	4	10
2011	3	1	4	8
2012	6	3	2	11
2013	8	6	2	16
2014	5	6	1	12
2015	4	5	3	12
2016	7	-	-	7
2017	5+2	6+2		11+4
SUM	91 +2	62 +2	37	190+4



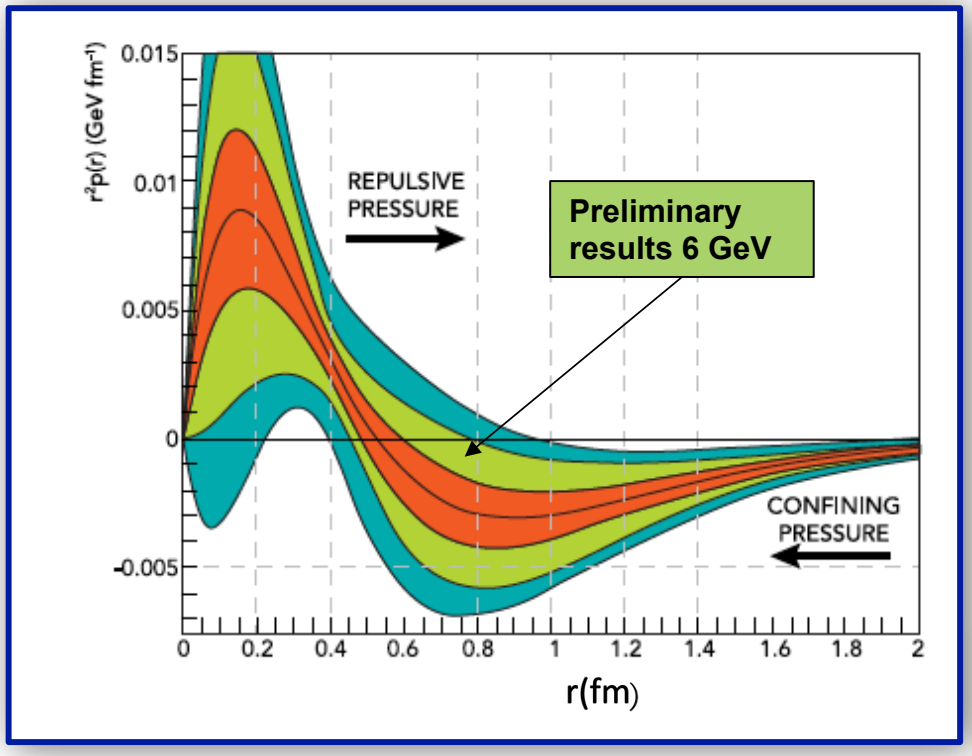
First E asymmetry on neutrons

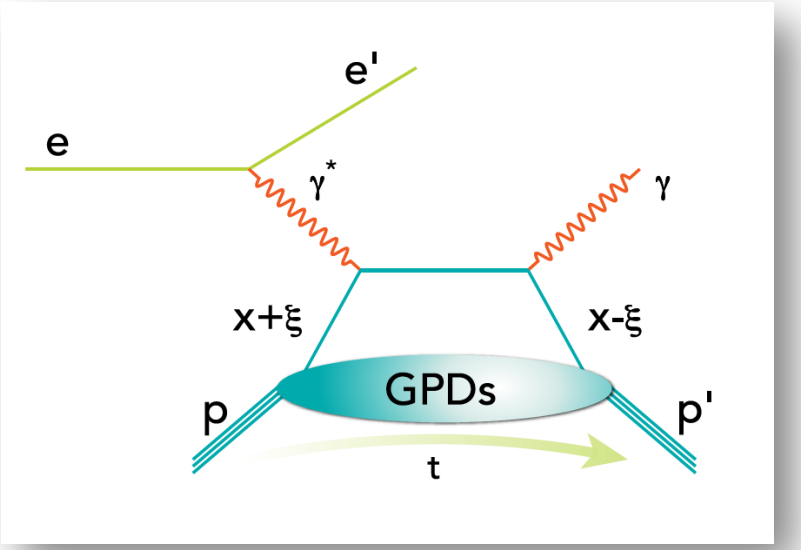


Neutron asymmetry data lead to revision of resonance photocoupling amplitudes, and strong evidence of a nucleon state N(2040)3/2⁺.

Unraveling Confinement in the Proton

Pressure distribution in the proton





E12-016-019B

Extract the confinement form factor $d_1(t)$ and through a Fourier transform the radial shear force and pressure distribution.

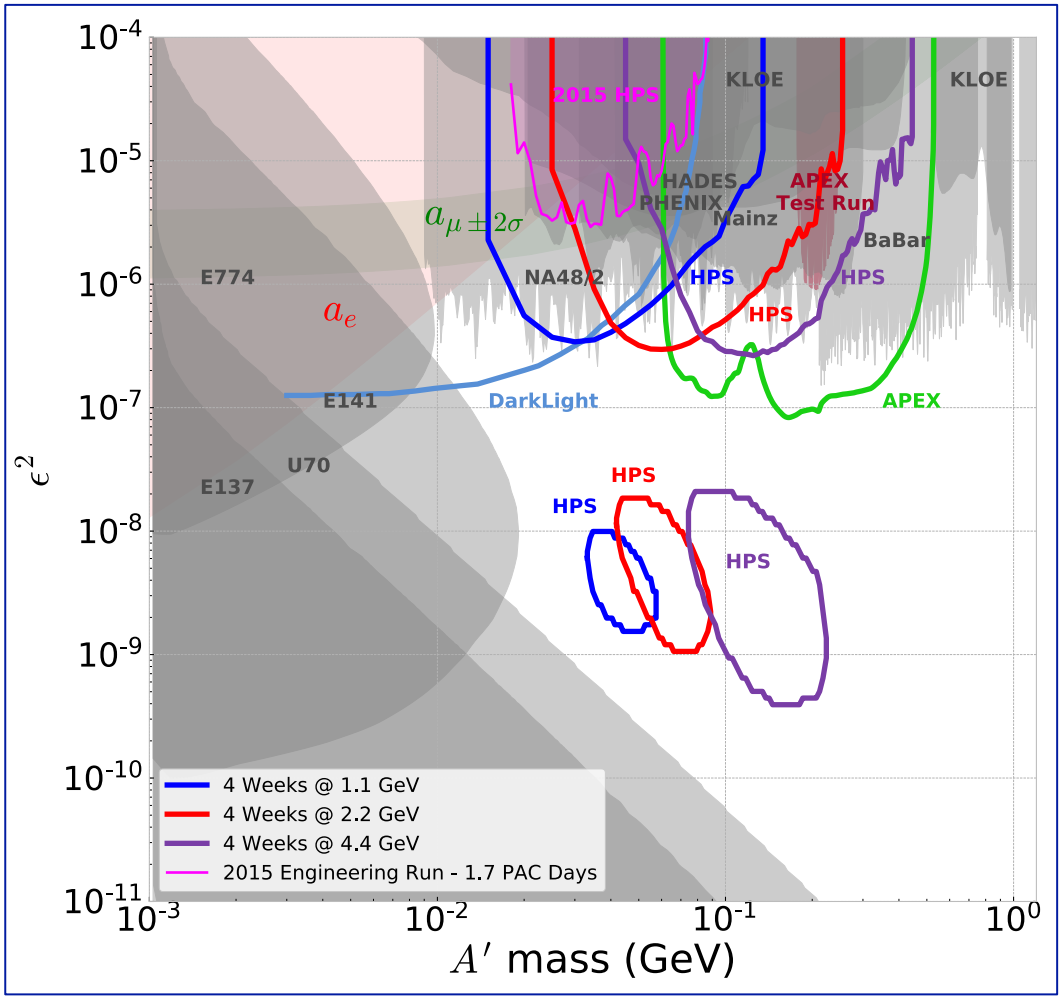
DVCS with CLAS12 will address one of the most fundamental unresolved problems in physics: How is confinement and the stability of visible matter in the universe realized?

Like to address this by direct measurement of the confinement forces.

Heavy Photon Search

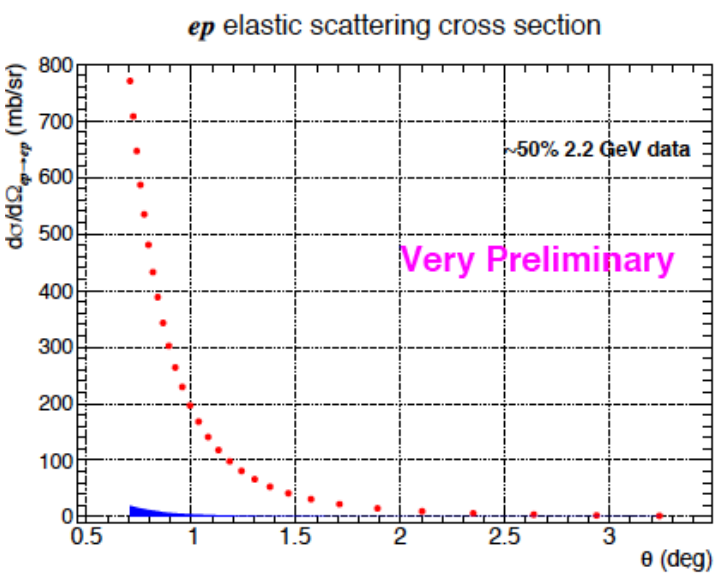
HALL B

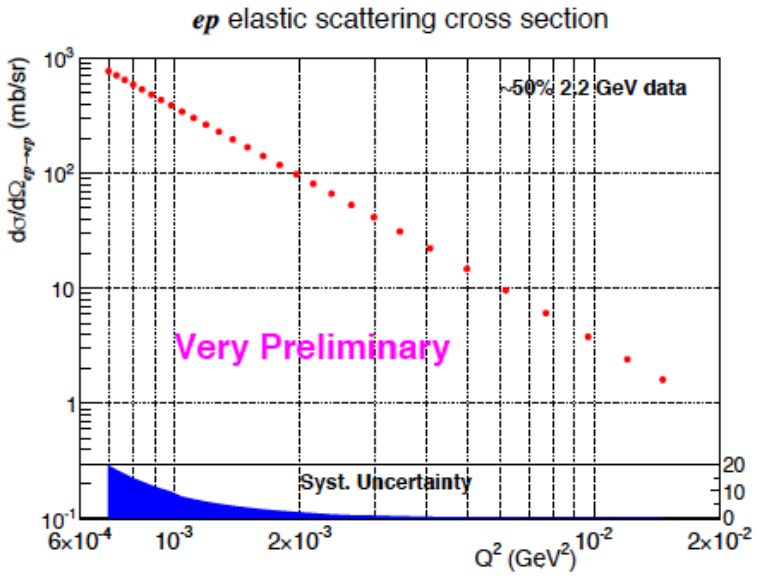
- HPS engineering runs were run at 1.05 GeV and 2.3 GeV.
- A new reach estimate includes *upgraded SVT* and the trigger setup with the *new hodoscope.*
- For the next run the plan is to use 4.4 GeV beam.
- With minor changes to the beamline and a new energy regime HPS will increase reach especially with vertex reconstruction.



Total of 40 PAC days at 4.4 GeV will be requested for the next run in 2018

- About half of 2.2 GeV beam energy data have been analyzed:
  - ✓ Preliminary differential cross sections for the elastic ep ➔ ep scattering have been extracted for the forward angles;
  - ✓ statistical errors are on the level of ~0.2% at this analysis stage;
  - ✓ systematic errors are conservatively estimated to be on the level of ~2% at this analysis stage and differ for angular range.
- Physics analysis in progress.





PAC45 – Hall B Proposed Experiments

Proposals	Physics Topic	Contact	Days
PR12-17-006	Critical Neutrino-Nucleus Issues	Hen	**41**
PR12-17-009	Deuteron Charge Radius with Elastic eD Scattering	Gasparian	**39**
New RG Proposal RG-L			
PR12-17-012	Partonic Structure of Light Nuclei	Meziani	
PR12-17-012A	Tagged EMC measurements on Light Nuclei	Dupre	
PR12-17-012B	Spectator-Tagged DVCS on Light Nuclei	Armstrong	
PR12-17-012C	Other Physics Opportunities w/ ALERT	Hafidi	
Beam Time Requested			**55**
RG Experiment RG-A			
E12-12-001A	**Near threshold J/ψ production – LHCb pentaquark**	**Stepanyan**	
Letters of Intent			
LOI12-17-001	Study of J/ψ Photoproduction off Deuteron	Ilieva	
LOI12-17-002	Search for a ϕN bound state at Hall B	Gao	
New beam time request for Hall B Proposals:			**135**

Summary

- Successful KPP run in February – data currently employed for detector calibration & event reconstruction
- Analysis preparations for the fall run are in high gear
- CLAS data continue to deliver important science in many areas – first results from polarized HD target run published in PRL
- First HPS results of 2015 run presented - upgrade planned for next 4.4 GeV run with enlarged reach
- PRad presents preliminary cross section data of 2.2 GeV data
- New proposals cover new research areas

Additional slide

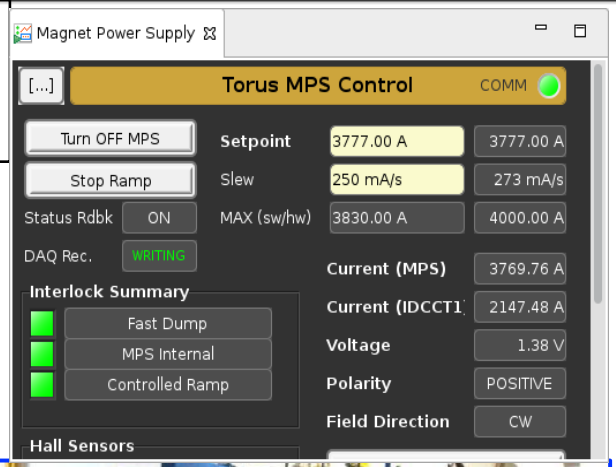
Torus Construction & Commissioning COMPLETE

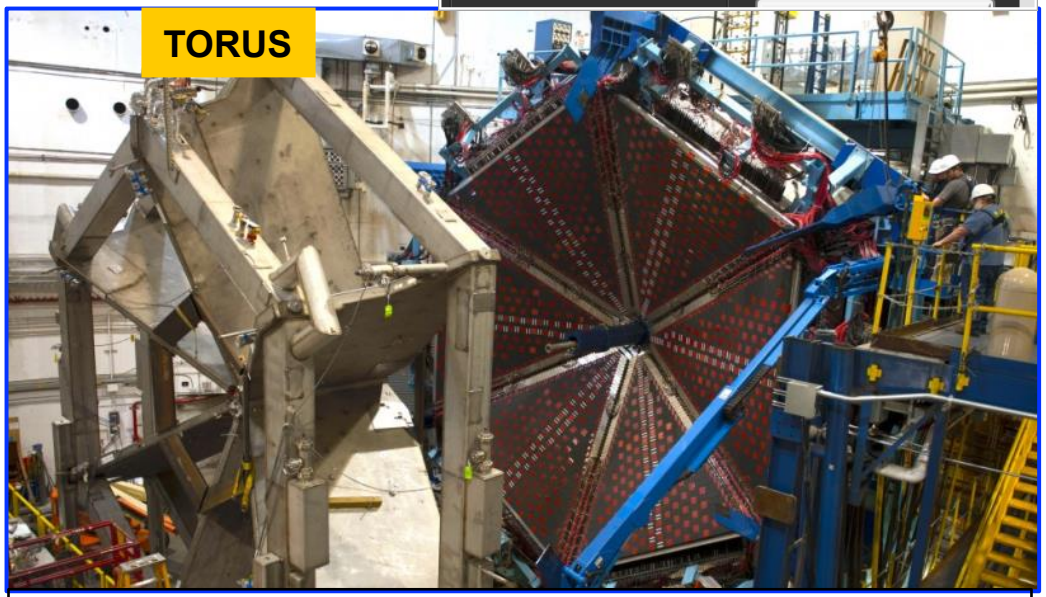
Installation completed May 2016

High Power Tests COMPLETE

Nov 4, 2016

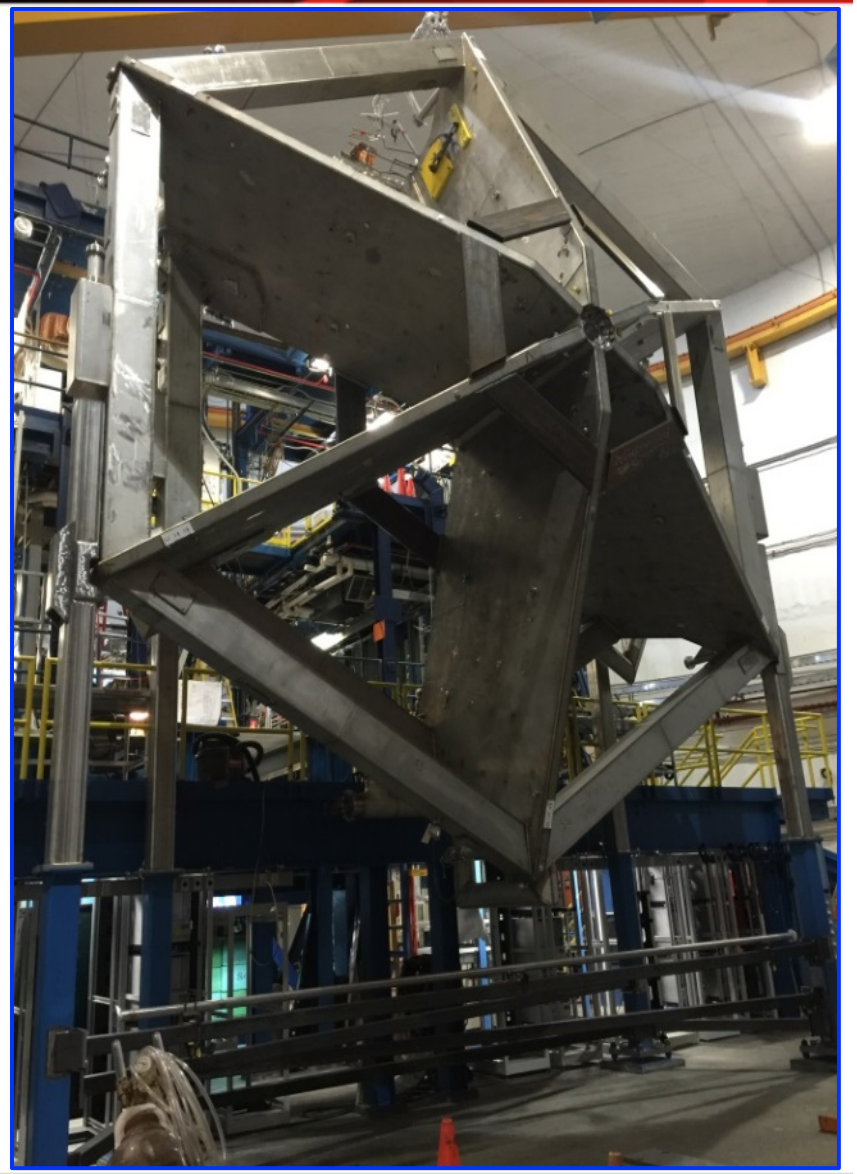
at 13:55





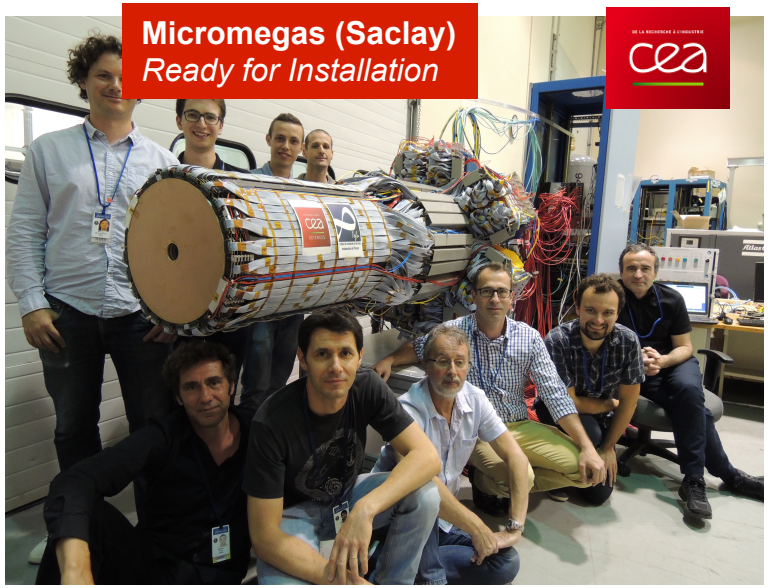
Used Successfully in KPP Beam Run

Feb 2017

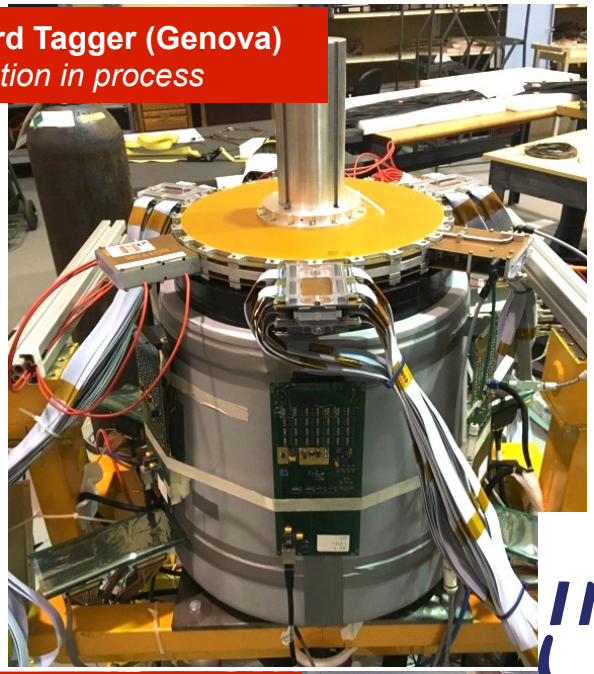


Detector Upgrades

Micromegas (Saclay)
Ready for Installation



Forward Tagger (Genova)
Installation in process



Neutron Detector (Orsay)
Ready for installation

RICH Detector (Frascati)
Being assembled