

RHIC Polarimetry

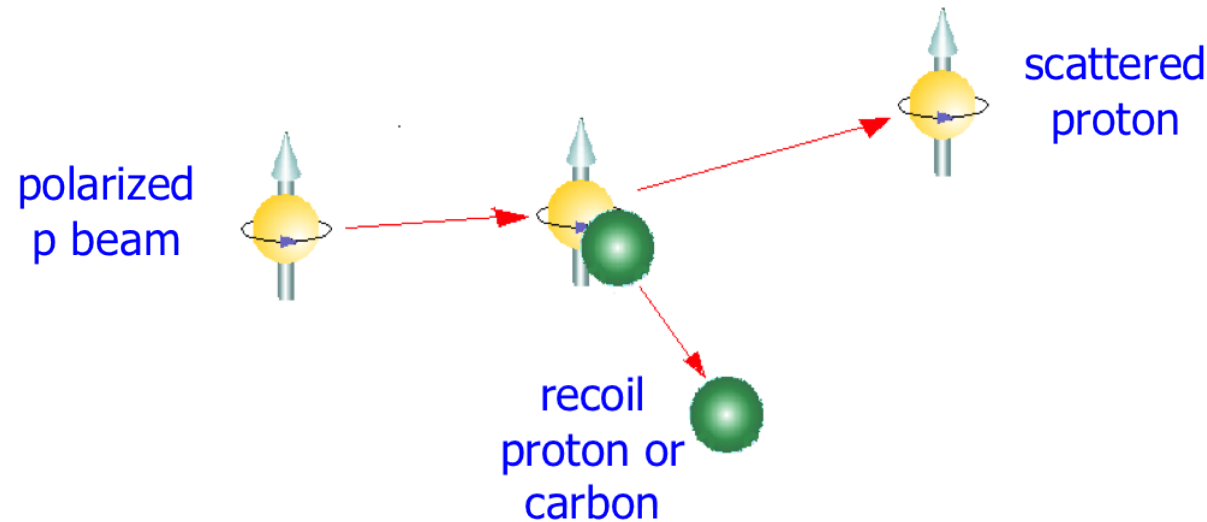
Status

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January 14, 2011

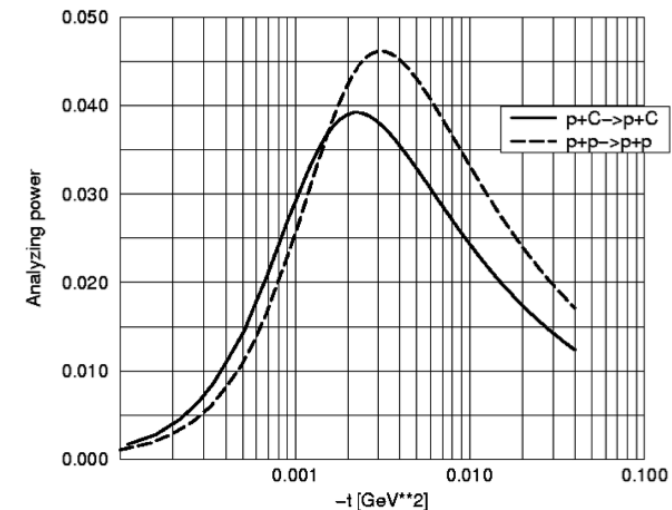
- The mission:
 - Support H-Jet and p-Carbon polarimeters
 - Provide a reliable polarization measurement at a wide range of beam energies 24 to 250 GeV
 - Achieve precision for polarization measurement of $< 5\%$
 - Measure beam polarization profiles
 - Polarization lifetime or decay during a store
 - Bunch emittance measurement
- Active members:
 - Igor Alekseev
 - Elke Aschenauer
 - Grigor Atoian
 - Sasha Bazilevsky
 - Alan Dion
 - Haixin Huang
 - Yousef Makdisi
 - Andrei Poblaguev
 - Bill Schmidke
 - Dmitri Smirnov
 - Dima Svirida
 - Kin Yip
 - Anatoli Zelenski

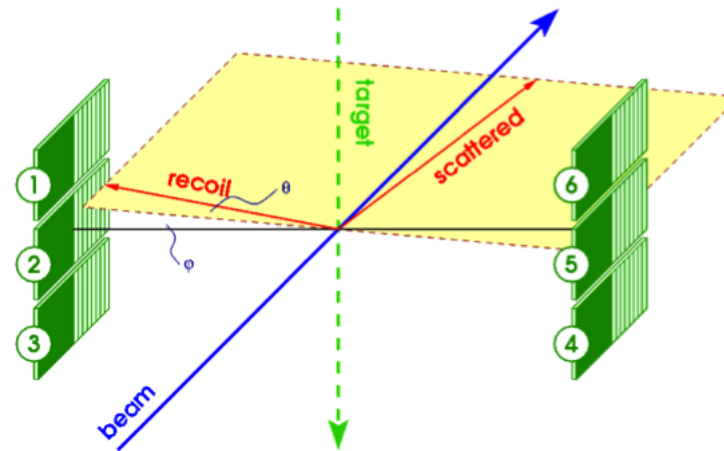
- The kinematics of elastic scattering is fully defined by the recoil products



- Analyzing power is calculable for the Coulomb-Nuclear Interference (CNI)
 $0.001 < |t| < 0.02 \text{ (GeV/c)}^2$
- In the experiment we measure asymmetry ε

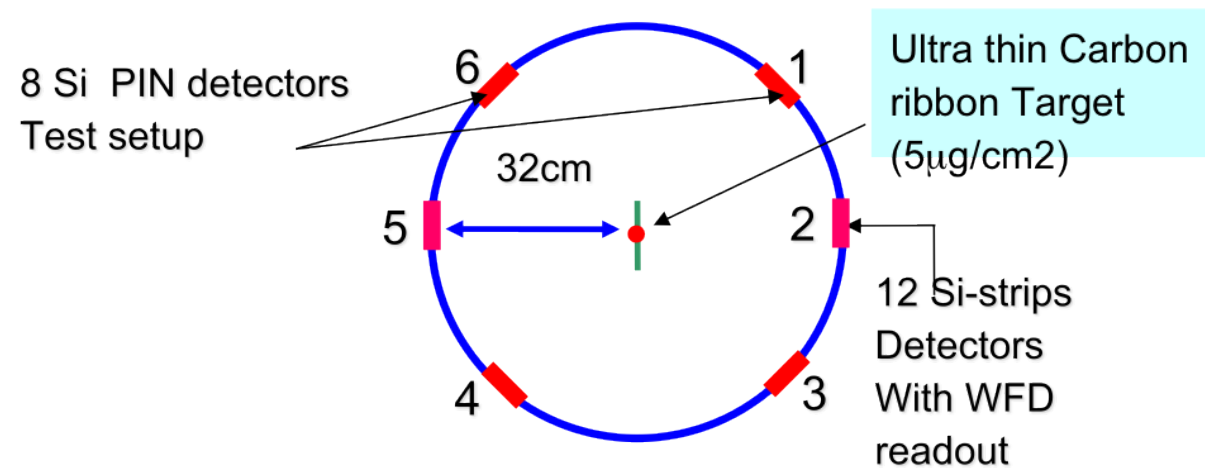
$$A_N = \frac{\varepsilon}{P} = \frac{1}{P} \times \frac{N_L - N_R}{N_L + N_R}$$





- One dead silicon detector was replaced
- A week ago cleaned the dissociator nozzle and fixed the hydrogen generator
- The jet was cooled and continuously ran for three days with stable target polarization of 96%
- The hydrogen generator failed on January 7 damaging the dissociator
- Reinstalled the generator and the dissociator and applied additional thresholds to shut down the system and prevent damage
- The generator is currently running without cooling to gain confidence in the fixes

p-Carbon Polarimeters



- Two polarimeters (upstream and downstream) in each ring
- Each polarimeter has six vertical and six horizontal carbon targets
- Polarization measurements performed by moving vertical or horizontal targets through the beam
- Measurements every 2-3 hours during a store

All detectors:

replaced preamps
Q→I sensitive, faster
10's nS → ~ 10 nS
reduced pileup

4 BNL det. @ 45°
new ceramic, improved grounding
2 Hamamatsu det. @ 90°

Y1D

Y2U

6 usual BNL det.
presently one det. no signal,
bias problem?

B1U

B2D

6 usual BNL det.

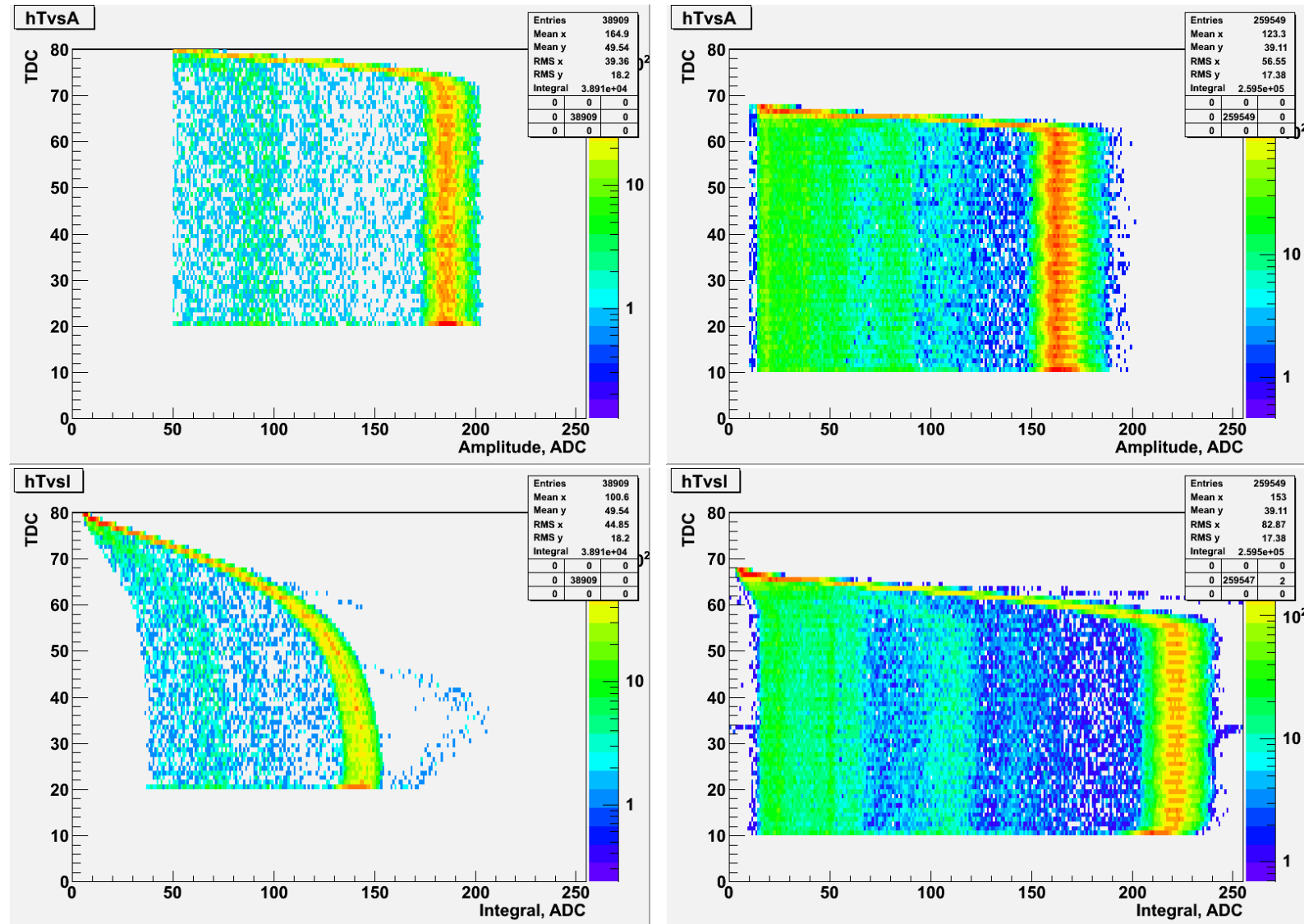
4 BNL det. new ceramic
2 Hamamatsu det.

shapers
counting room
DAQ

no shapers
tunnel
DAQ

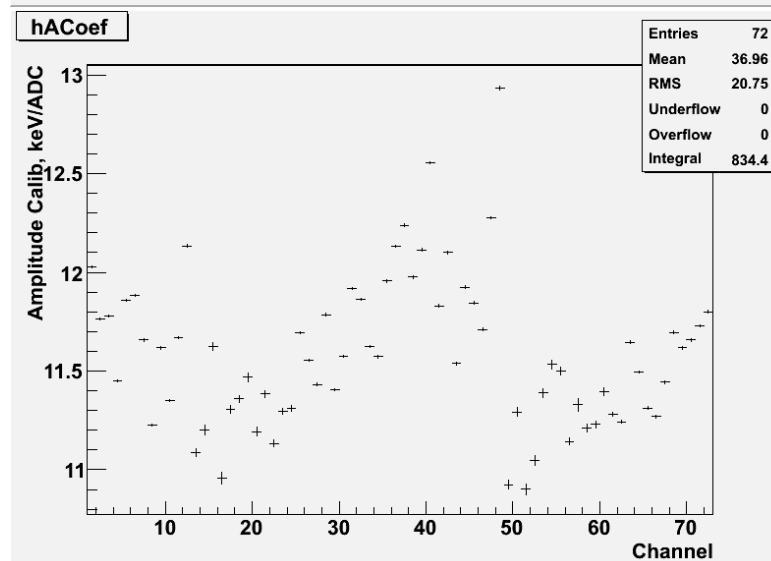
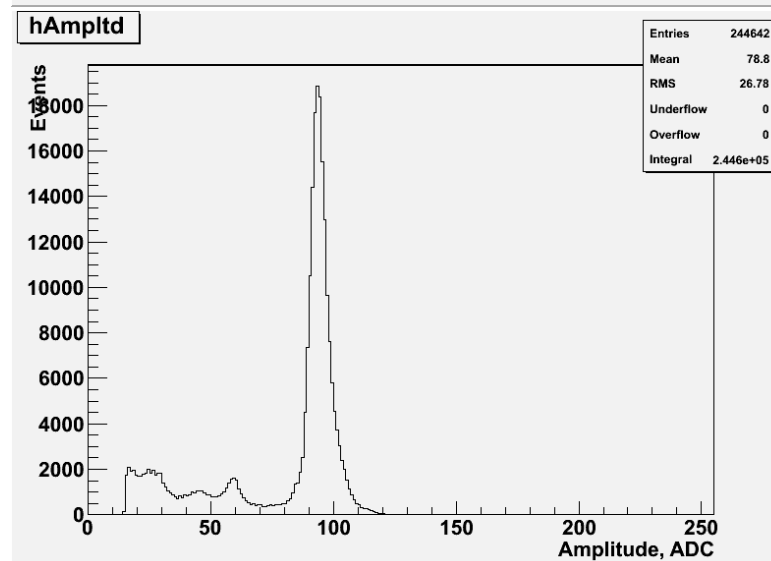
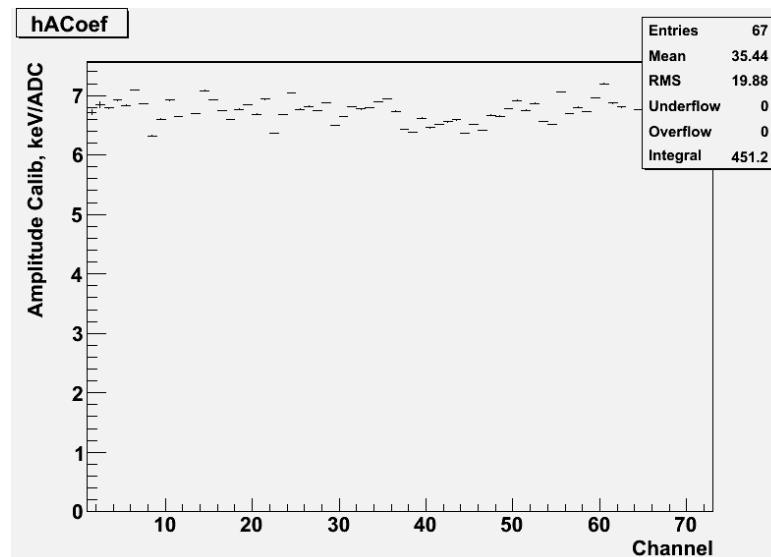
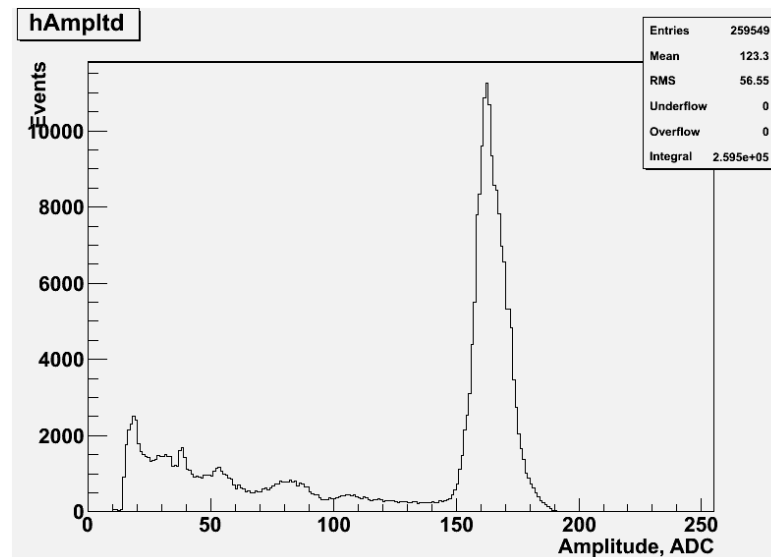
- Upstream polys. only new preamps
- Downstream: new det./ceramics,
shorter cable to DAQ, no shapers
⇒ reduced pulse degradation

- Left: 2009, Right: 2010
- We have shorter signal in 2011



Alpha Calibration of p-Carbon Polarimeters

- Blue upstream (top) and blue downstream (bottom)
- Channel calibration is stable across the channels

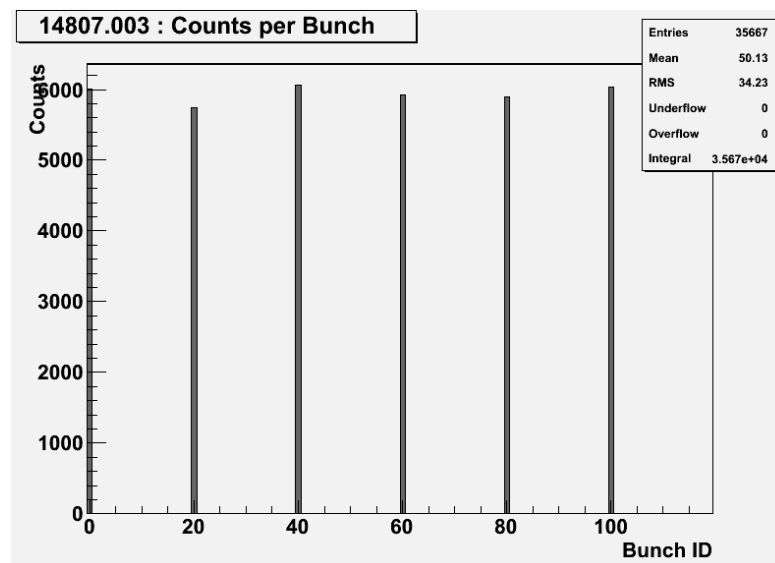
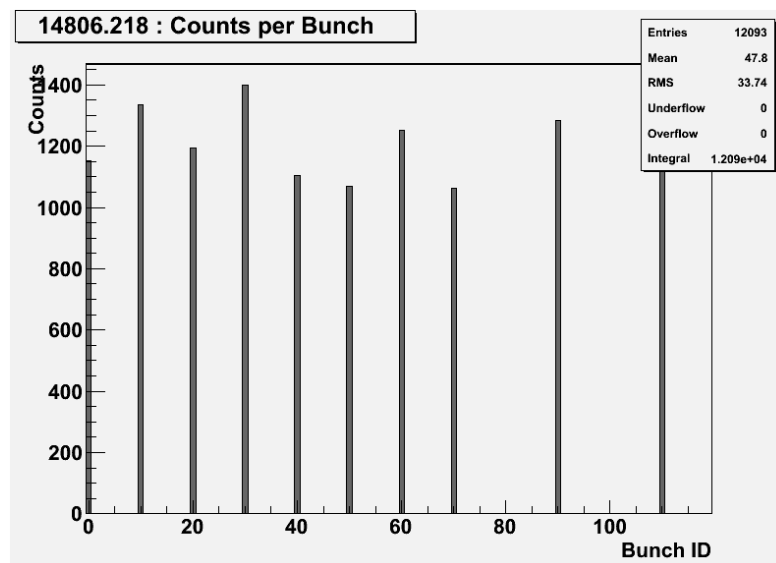


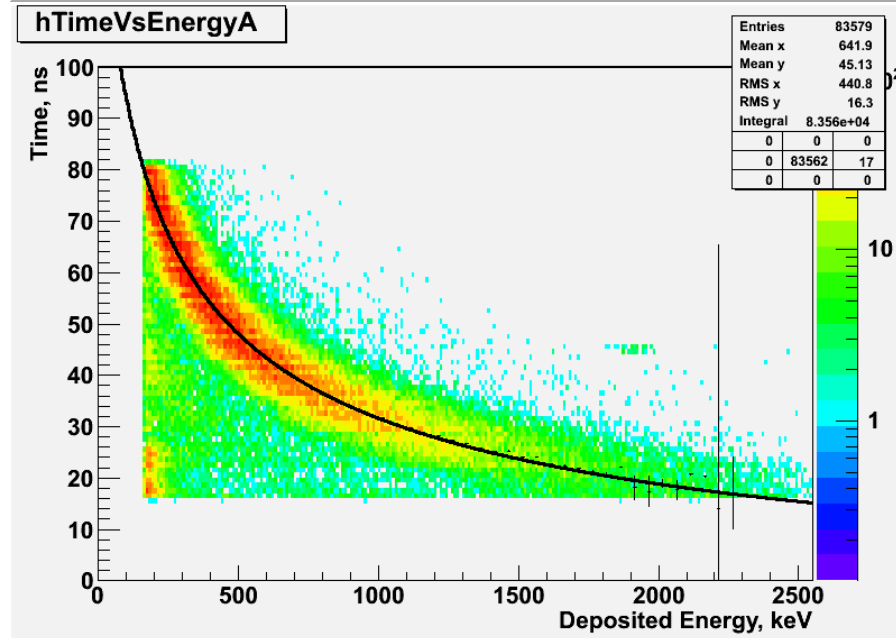
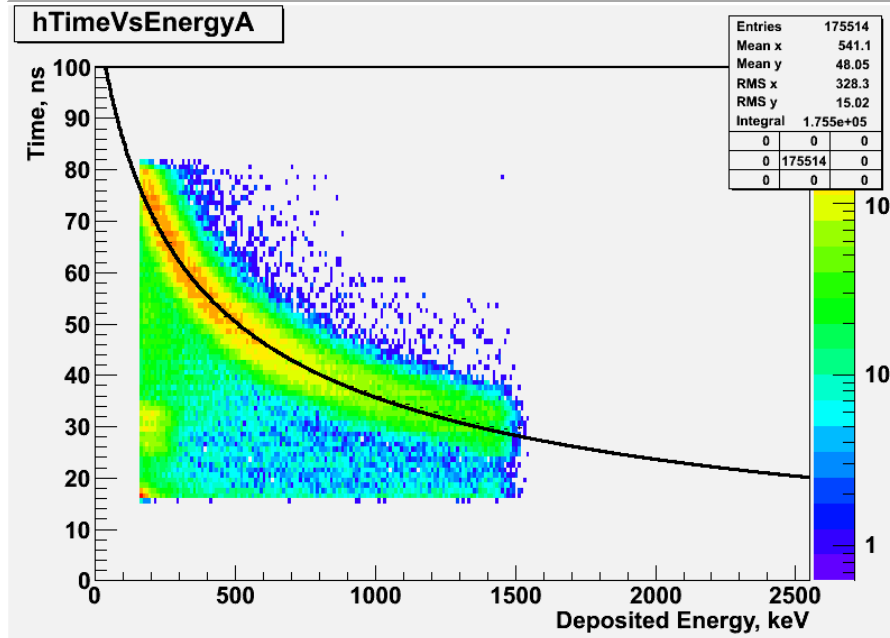
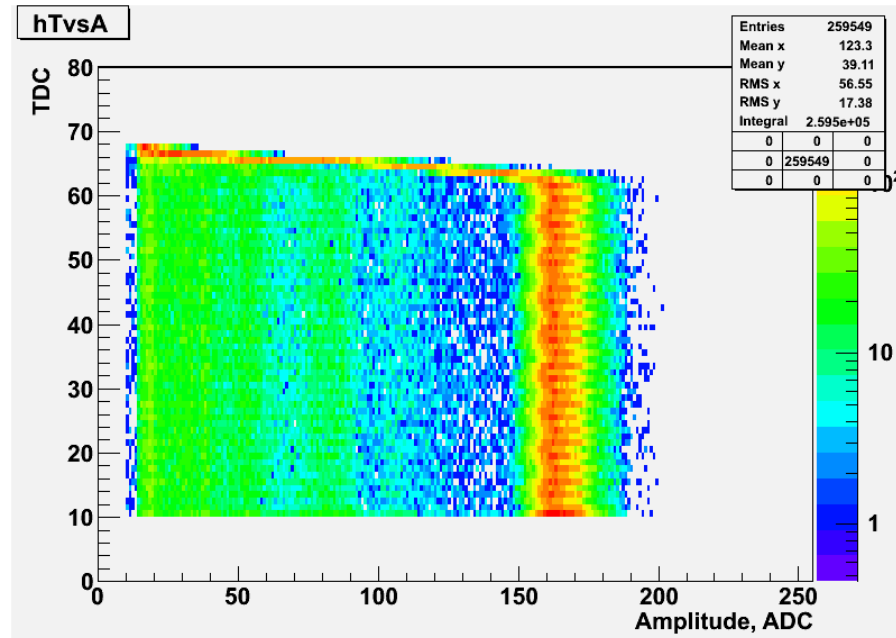
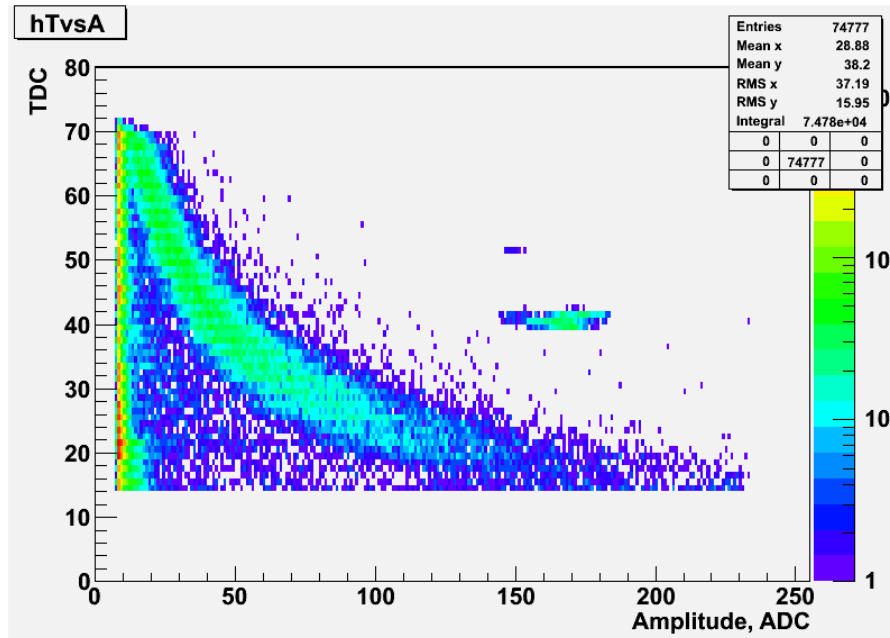
- Blue-2

- Run 14806.218
- Horizontal target 1
- 10 bunches
- Low energy threshold

- Blue-1

- Run 14807.003
- Vertical target 1
- 6 bunches
- Increased energy threshold





- Upstream and downstream have different dynamic ranges

- All p-Carbon and H-Jet detectors have been installed
- An effort is made to organize and improve the existing software, both online and offline
- p-Carbon polarimeters:
 - New targets are in place
 - All channels calibrated with alphas
 - Data from test runs is available for blue polarimeters
 - **We see the bananas!**
 - Can calibrate for t_0 and the dead layer
 - Configure the yellow polarimeters
- H-jet polarimeter:
 - Take alpha calibration vs silicon bias voltage and balance the individual channel gains
 - Scan the jet horizontally to determine the jet beam width, background, and center on the beam
 - Take data to start offline analysis and determine the dead layer