

Compton Analysis Progress

for the d_2^n analysis meeting

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- 1 Special Runs During d_2^n
 - Beamline Calibration
 - Detector Calibration
- 2 Compton Analysis: Return of the Trigger Rate Cuts
 - Cavity State Identification
 - The Tail for Cavity-Off Events
- 3 The Next Steps

Fully detailed on d_2^n wiki page

[https://hallaweb.jlab.org/wiki/index.php/List_of_special_runs_\(d2n\)](https://hallaweb.jlab.org/wiki/index.php/List_of_special_runs_(d2n)) ...

- Beam Current Calibration

- Calibration runs (including Faraday cup) taken February 17 (5.9 GeV)
- Five minutes each at 5-30 μA (in 5 μA increments)
- Preliminary calibrations done by Kalyan at the end of February

- Beam Position Calibration

- Calibration runs taken February 7 (5.9 GeV)
- Each corner of a 4x4 square, plus the center (origin)
- Vince noticed some harp problems during Transversity, which were not fixed

Fully detailed on d_2^n wiki page

[https://hallaweb.jlab.org/wiki/index.php/List_of_special_runs_\(d2n\)](https://hallaweb.jlab.org/wiki/index.php/List_of_special_runs_(d2n)) ...

- BigBite Optics

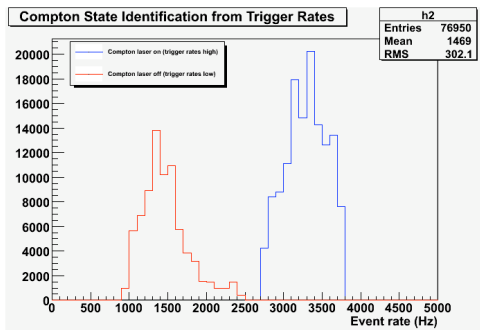
- Runs taken February 10-11 (5.9 GeV) by Xin
- BeO and H₂ targets
- Various raster sizes (including raster off)
- BigBite magnet on/off
- BB Cerenkov LED runs February 26 (beam off)

- LHRS Optics

- LHRS calibration runs taken during Transversity
- No major configuration changes between Transversity and d_2^n
- Documented on Transversity wiki
https://hallaweb.jlab.org/wiki/index.php/Optics_transversity

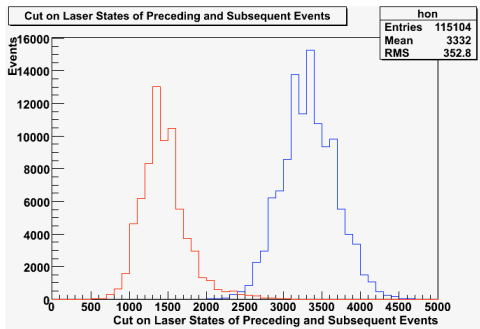
Cavity State Identification

- At the last meeting, we discussed some problems with making an accurate determination as to whether the laser cavity is on or off
- The unreliability of the real-time cavity power logic signal makes this more difficult
- When the tune through the Compton chicane is good, there is a clear separation in photon rates for cavity ON versus cavity OFF
- We left off with a cut based on those trigger rates



Can We Trust These Cuts?

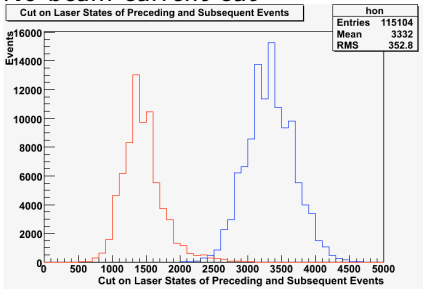
- At least 30 seconds are supposed to pass before the cavity state changes
- Suppose we require the preceding and subsequent MPSes to have the same laser state as the current one
- We can thus avoid cutting on the same variable we're trying to measure



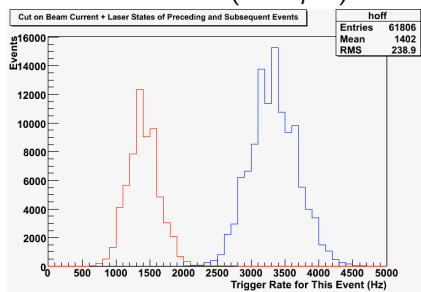
The Cavity-Off Tail

Why do the cavity-off events have such a long tail at high rates?

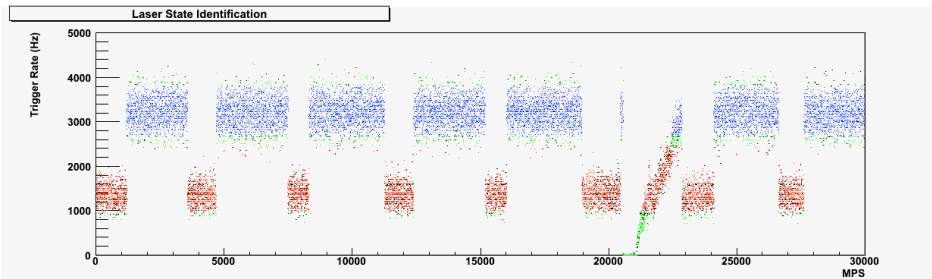
No beam-current cut



Beam-current cut ($> 10\mu\text{A}$)



Explanation of the Cavity-Off Tail



- When the cavity is on, rates are high – until the beam trips
- As the beam comes back up, the Compton rates rise with the beam current
- At low beam currents, the Compton rate is artificially low for cavity ON
- The event ends up erroneously flagged as a high-rate cavity OFF event

- Compton calibrations
 - Tweak cavity OFF trigger cut range
 - Asymmetry histories for each configuration and each DAQ

- Beamline calibrations
 - Beam current monitors
 - Beam position monitors