RHIC Polarimetery: p-Carbon

Status

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p-Carbon Polarimeters in Run 11

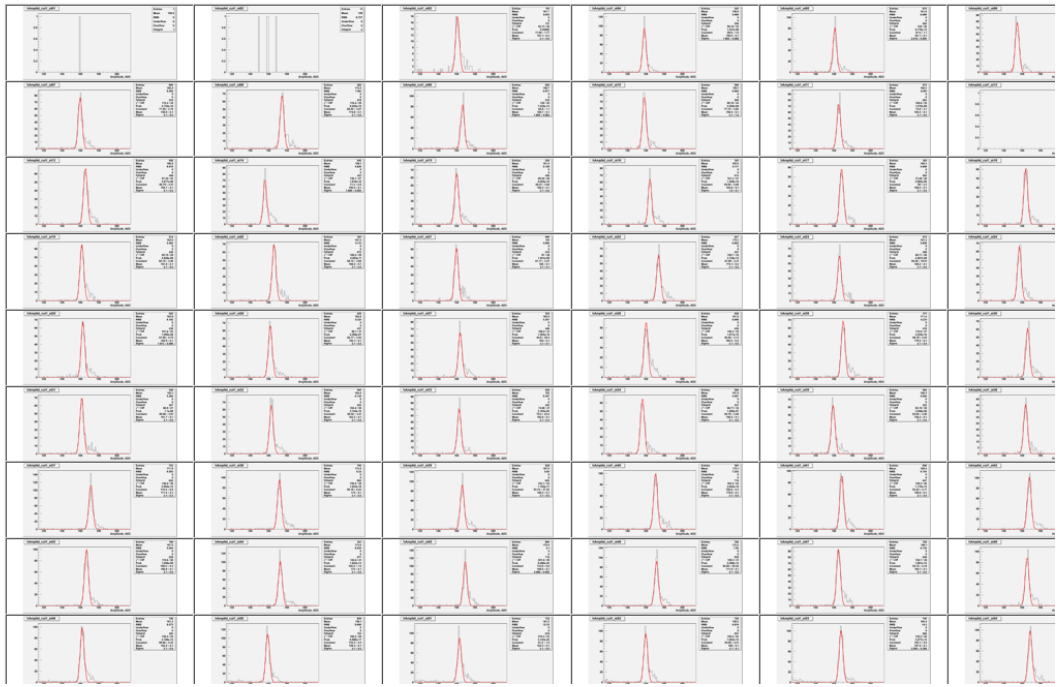
- Main problem of Run 9 was rate dependence coming from amplifier saturation
- To reduce the pile-up in Run 11 used faster current-sensitive preamplifiers
- **Upstream polarimeters** had 6 BNL silicon detectors
  - Improved grounding
  - New ceramic base
- **Downstream polarimeters** had Hamamatsu detectors at 90°

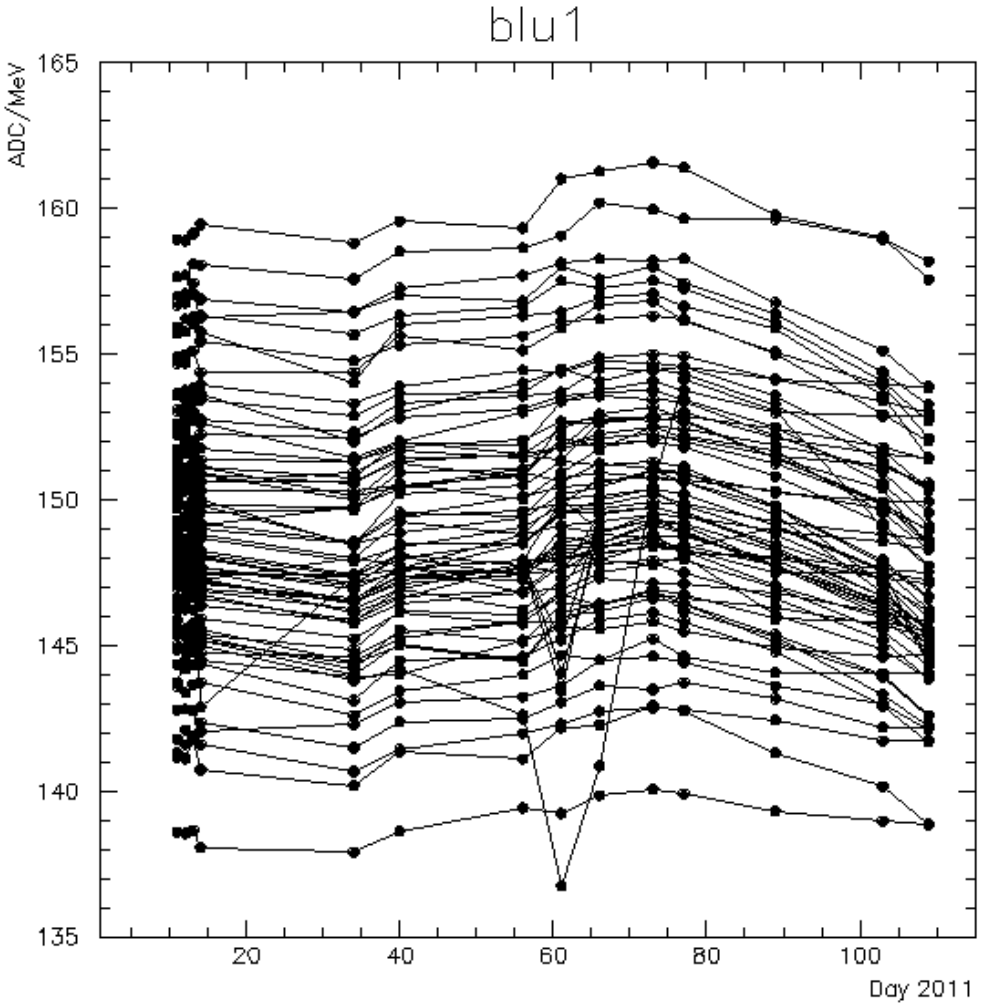
Run 11 Timeline

- Feb 11: Physics run started (Fill 15154)
- Feb 19-22: Both downstream polarimeters read out in the counting room
- Feb 25: Online polarization values scaled down by $\sim 18\%$
- Mar 7: Adjusted timing parameters in Y1D
- Apr 18: H-jet calibration at 24 GeV
- More detailed Run 11 timeline is available at https://wiki.bnl.gov/rhicspin/Run_11_timeline

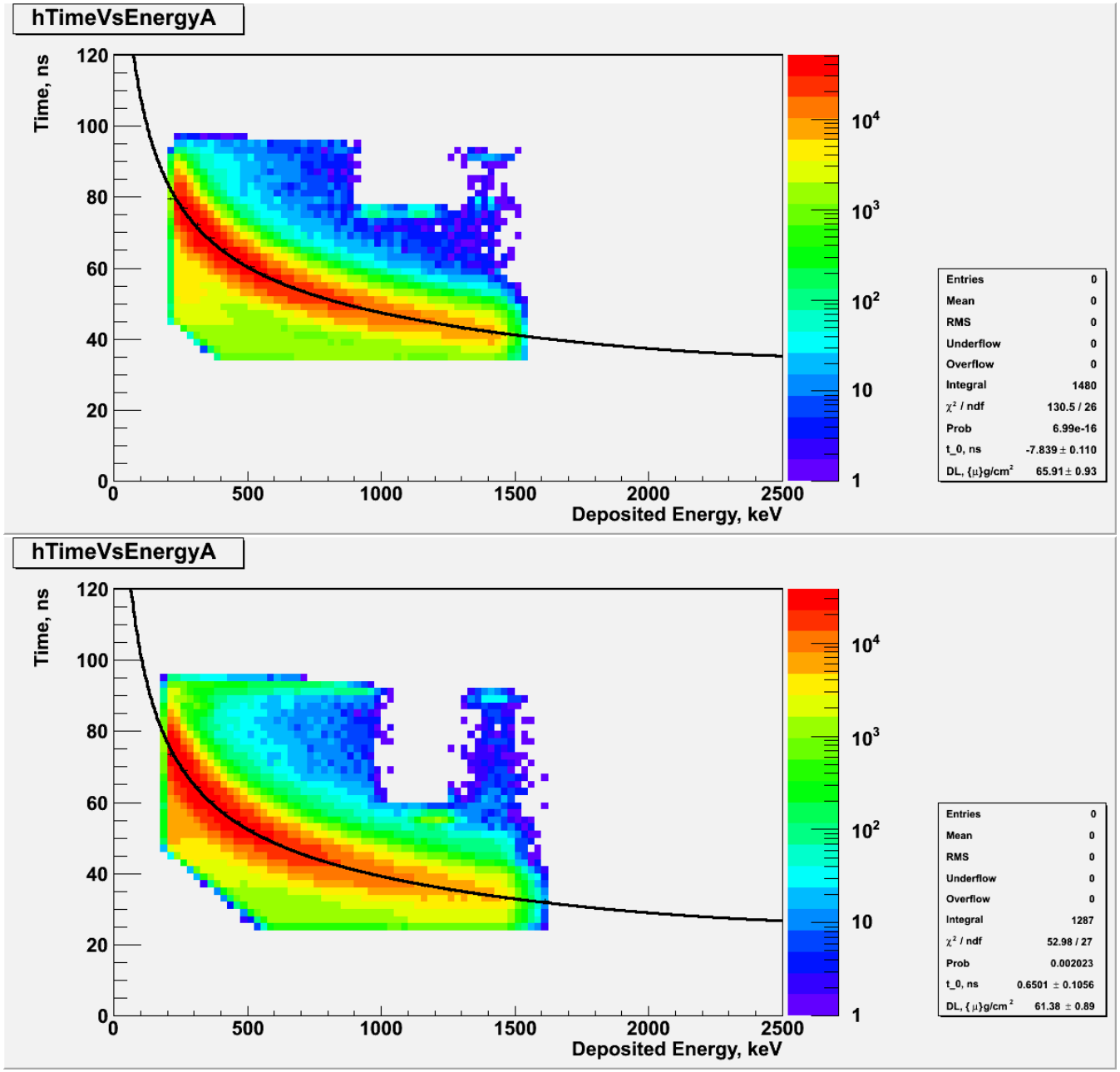
α Calibration

- Regularly took α runs during longer RHIC breaks
- Gains are extracted from Gaussian fit to peaks





p-Carbon Data



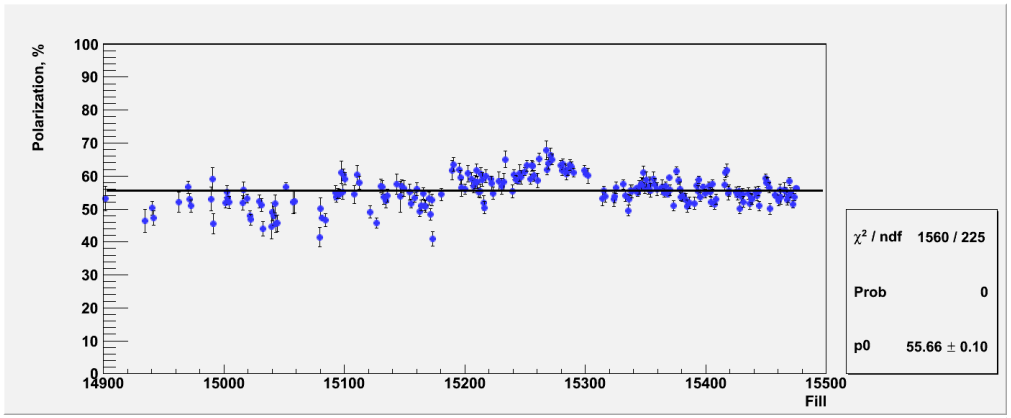
Offline Measurement

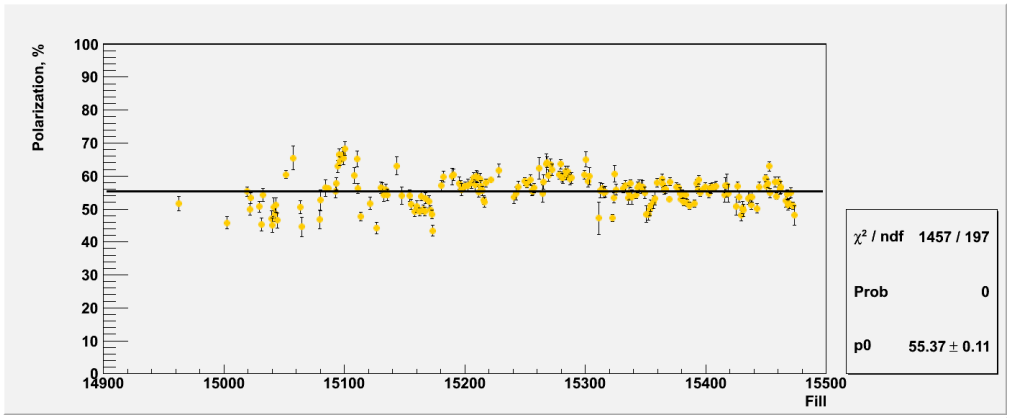
- To fit data use the same model as in Run 9

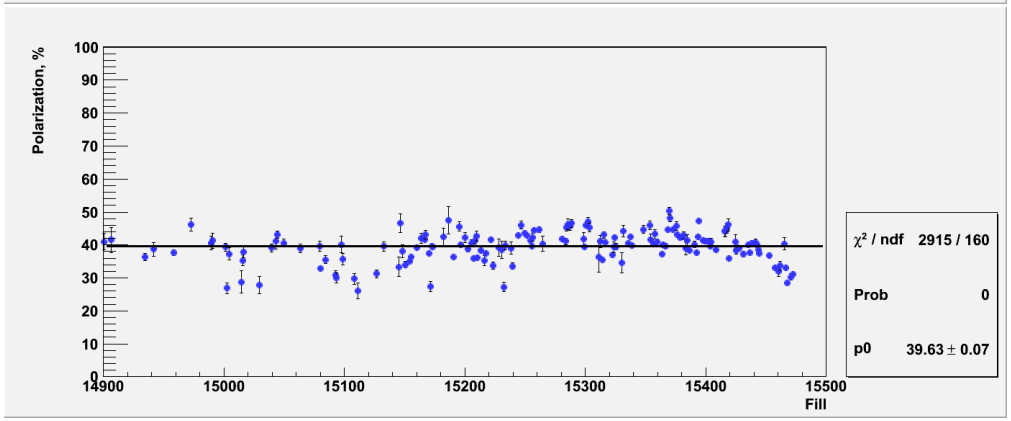
$$E_{\text{meas}} + E_{\text{loss}} = \frac{M_C}{2} \times \frac{L^2}{(t_{\text{meas}} + t_0)^2}$$

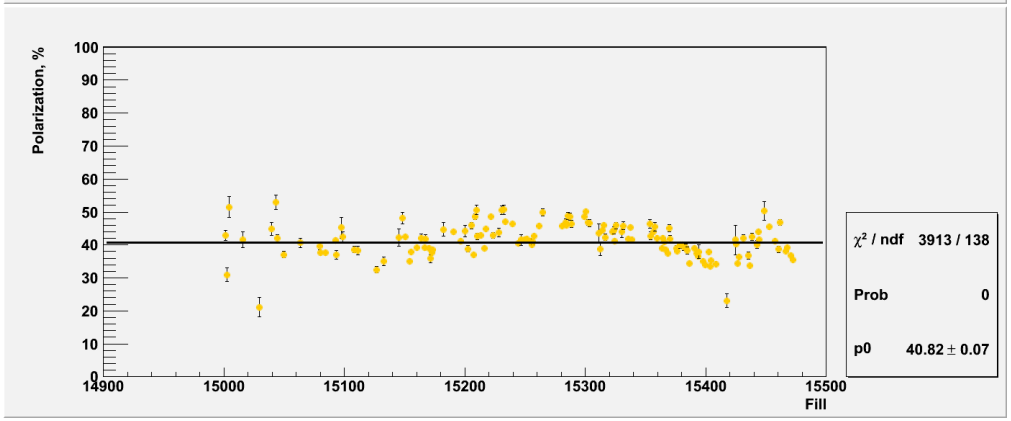
  - where $E_{\text{loss}} = E_{\text{loss}}(E_{\text{meas}}, x_{\text{DL}})$
- The extracted parameters are highly correlated
- One should be careful interpretating the "t_0" and "dead layer" parameters

Blue and Yellow Polarization in Run 11
Injection (left) and Flattop (right)



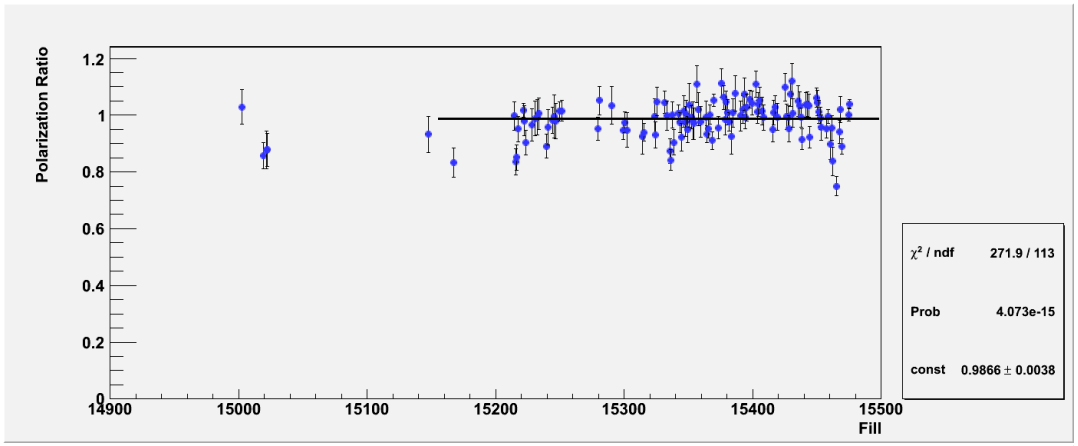


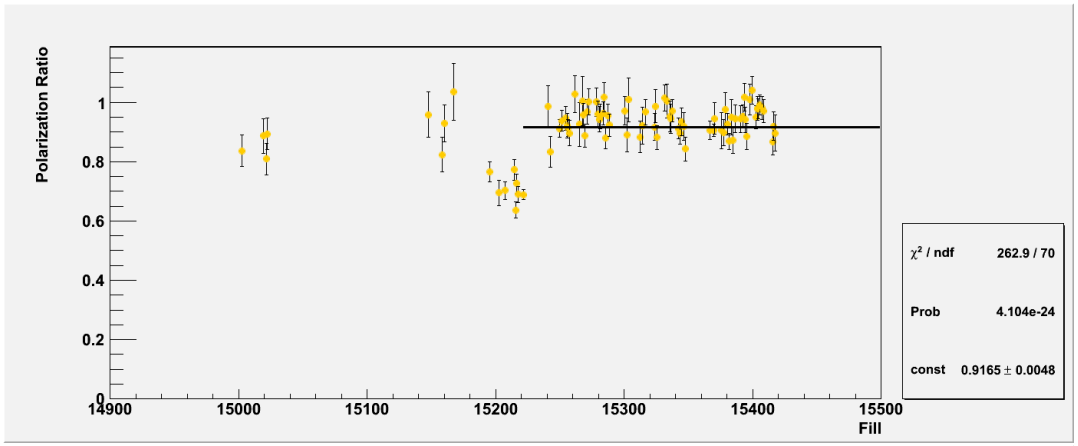


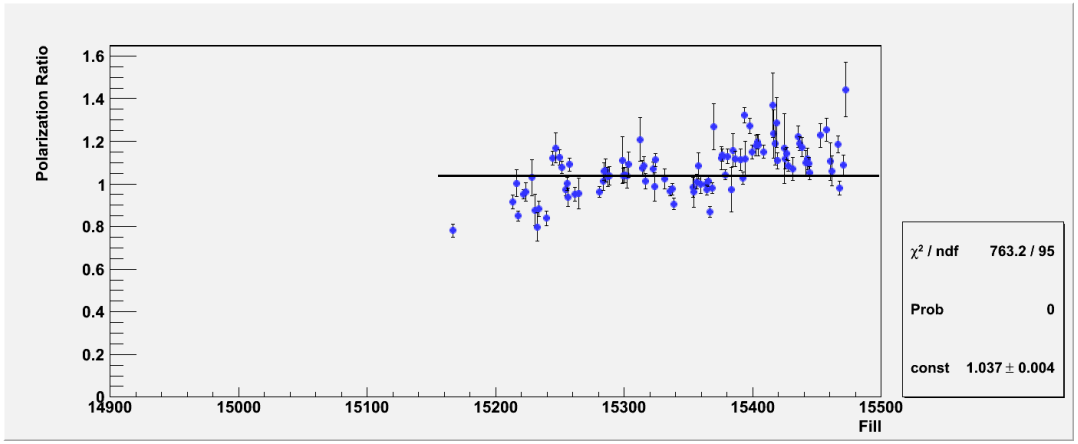


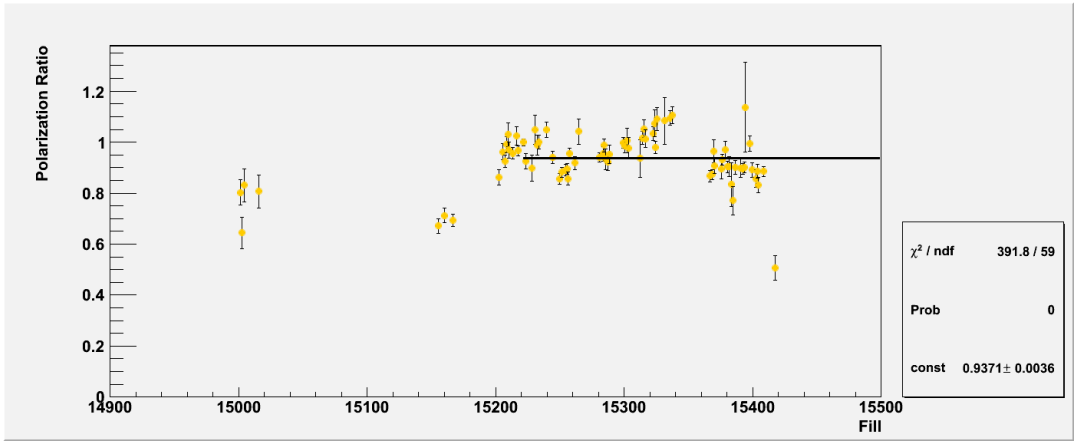
- Currently used analyzing power is ~ 0.014 as in online after scaling
- Polarization per fill is weighted average of few measurements

Upstream vs Downstream at Injection and Flattop



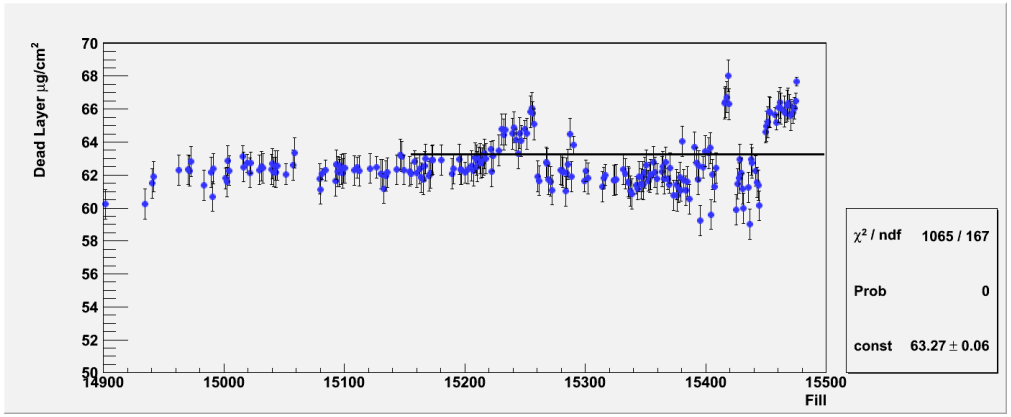


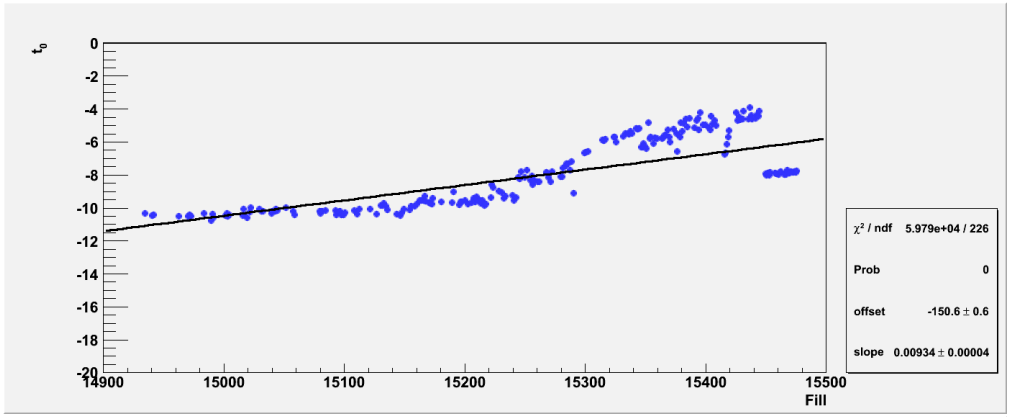


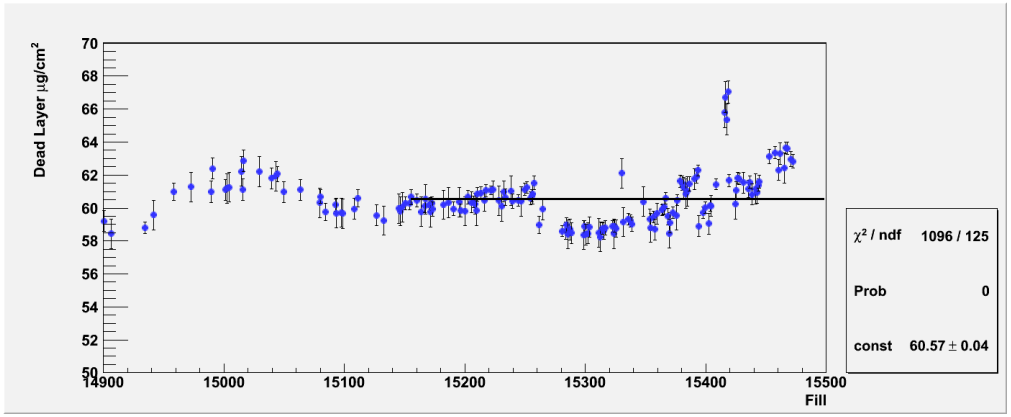


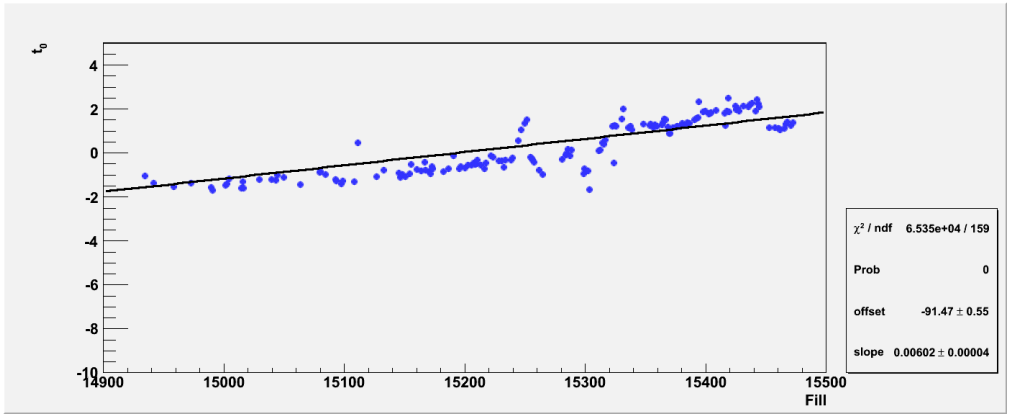
	24 GeV	250 GeV
Blue Up/Down	0.99	1.04
Yellow Up/Down	0.92	0.94

Blue-1: Dead Layer and t_0



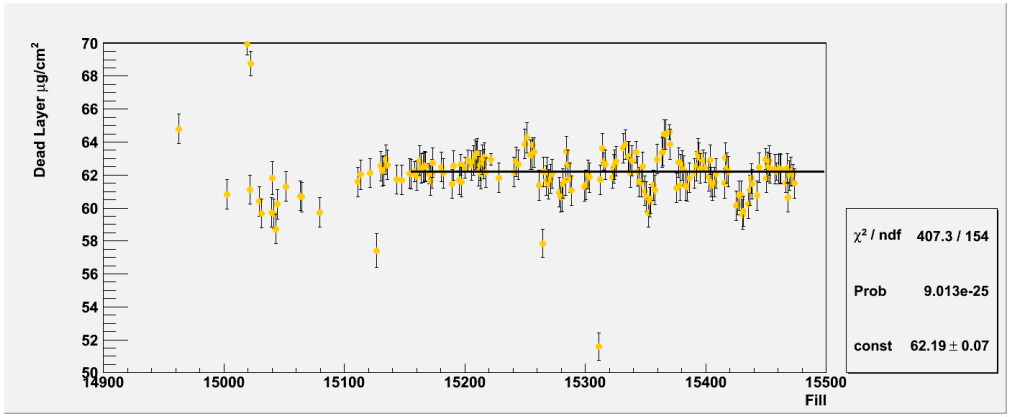


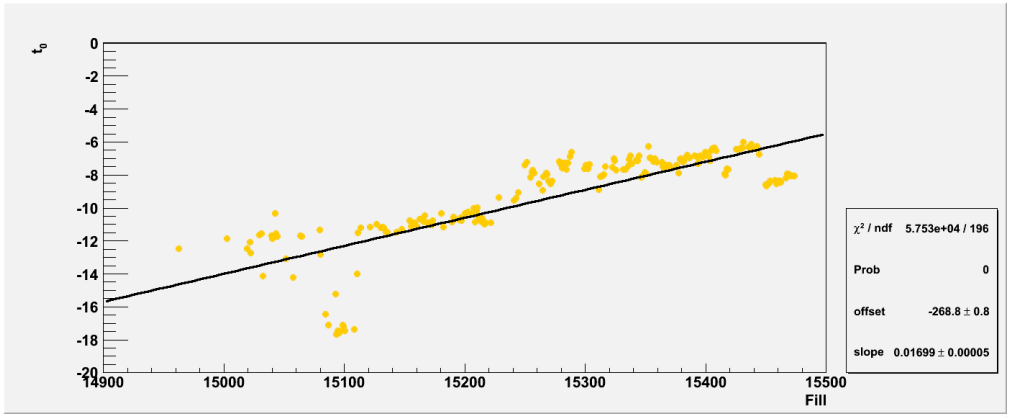


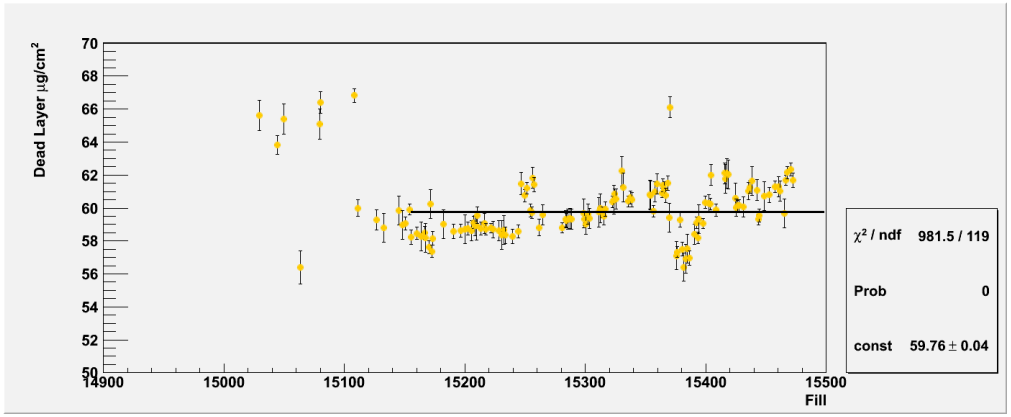


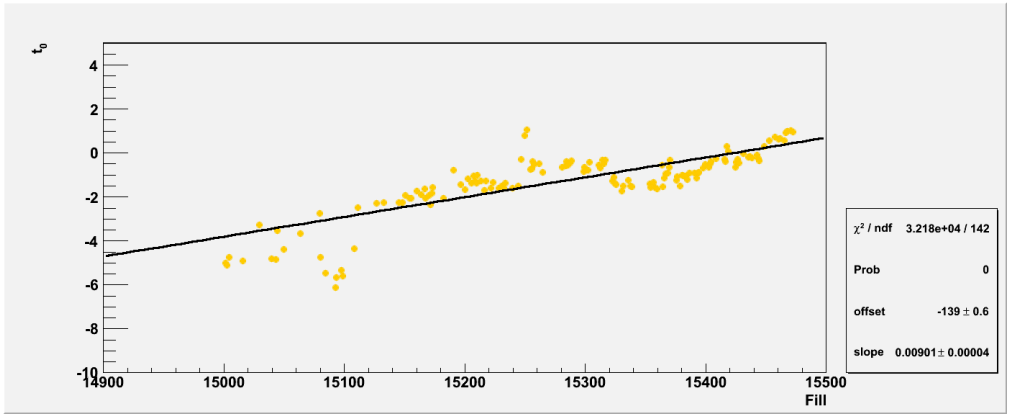
- Sudden changes in t_0 can be correlated with change in the machine status

Yellow-2: Dead Layer and t_0

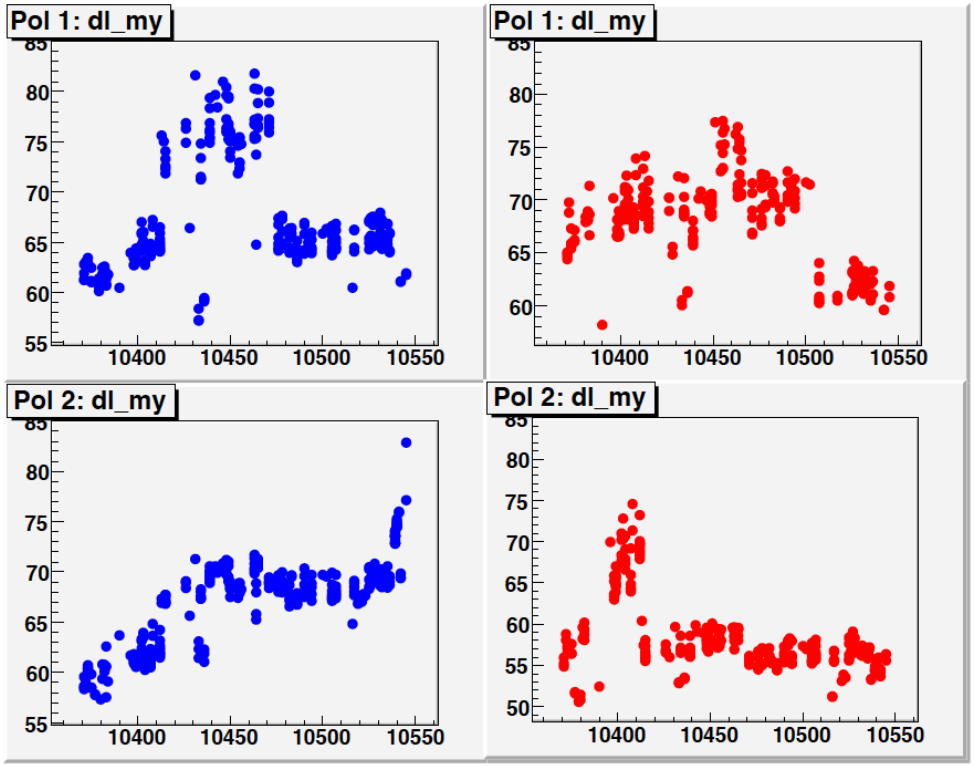


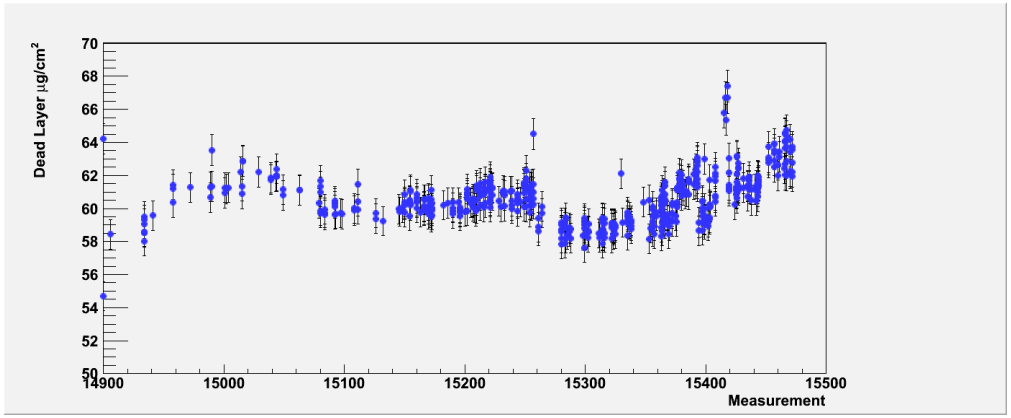


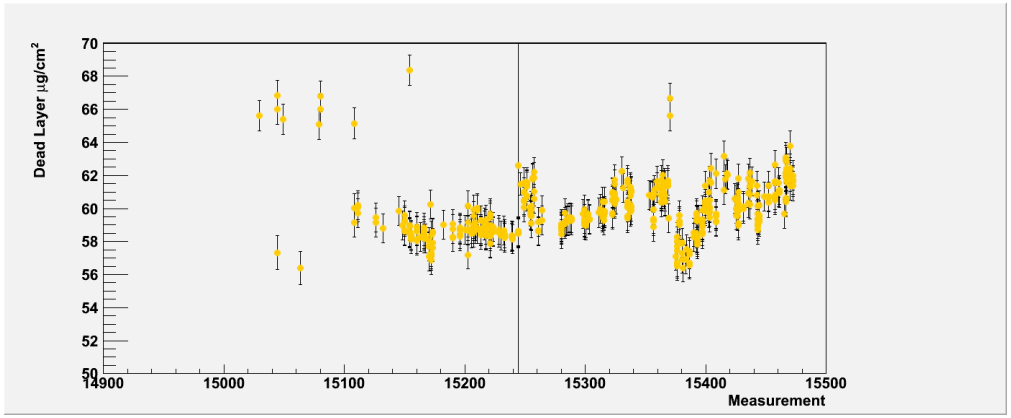




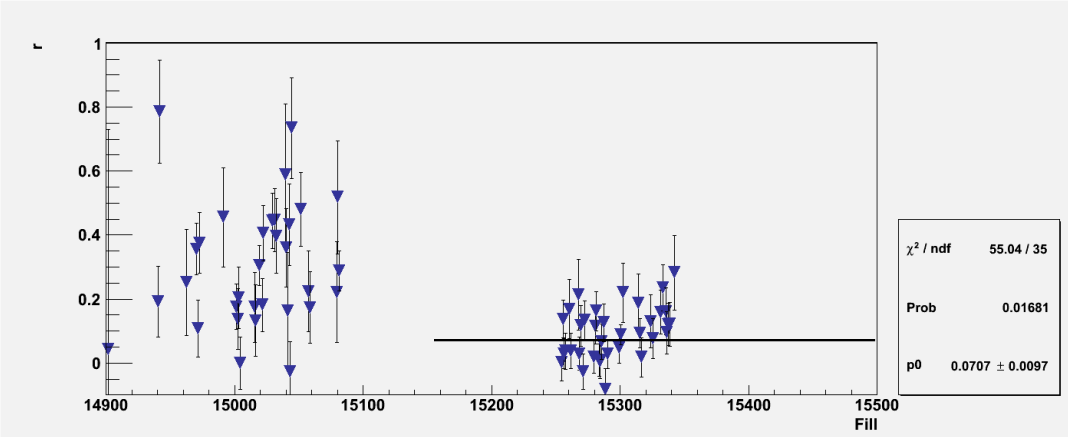
Dead Layer in Run 11 vs Run 9

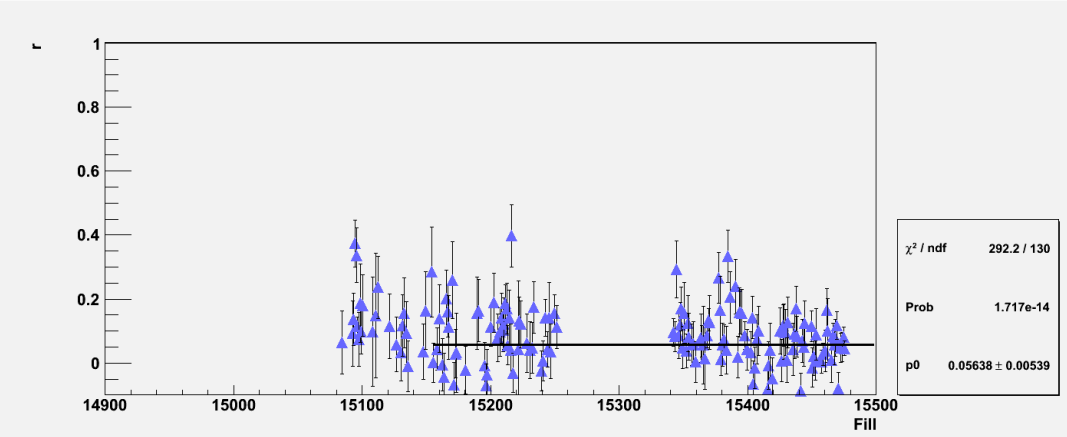


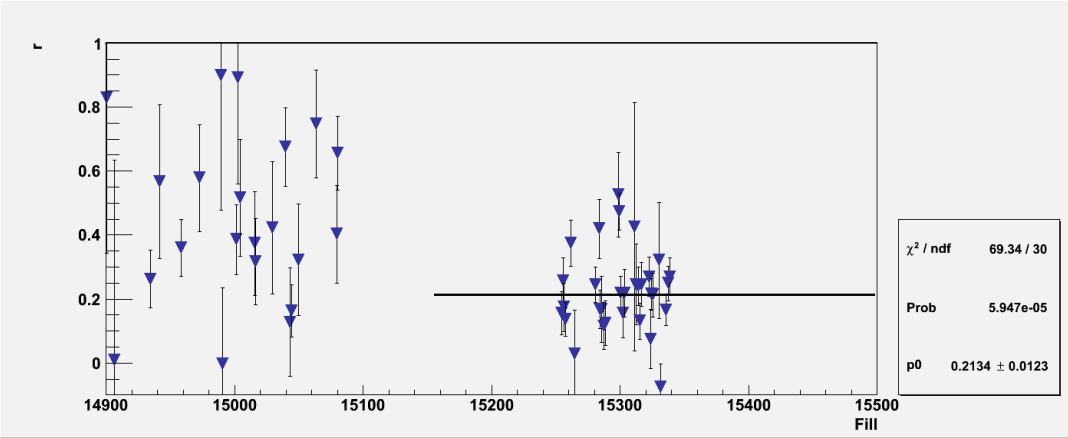


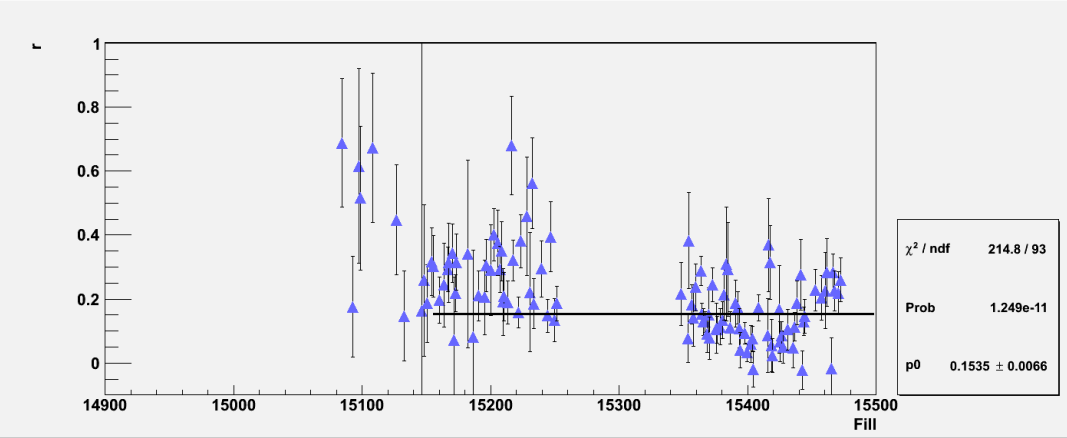


Blue-1 Upstream: Horizontal and Vertical Profiles

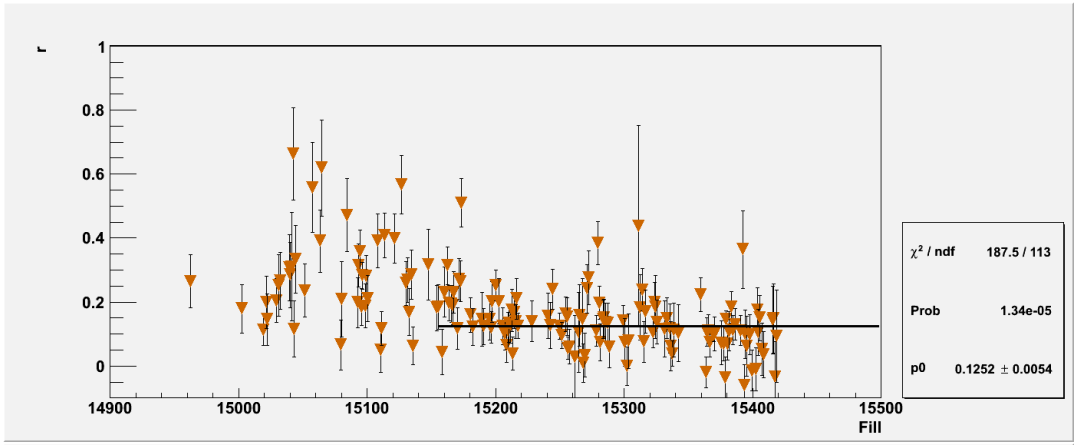


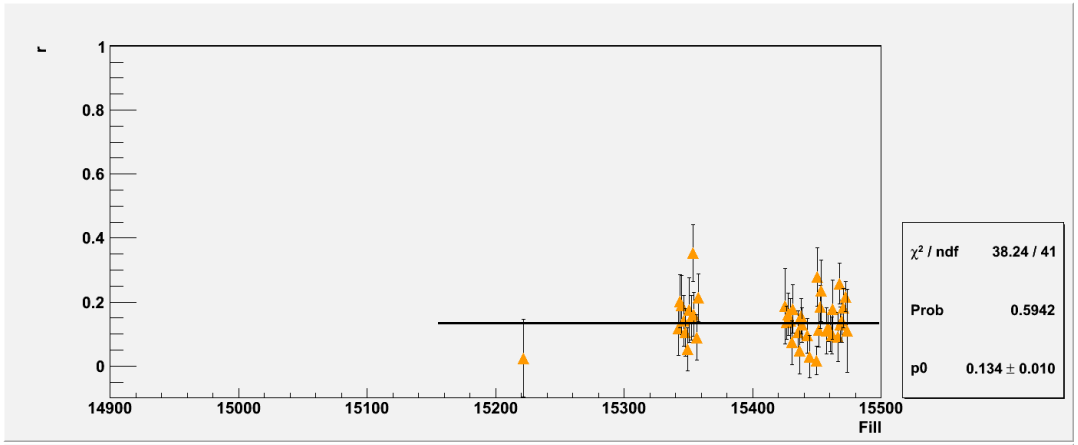


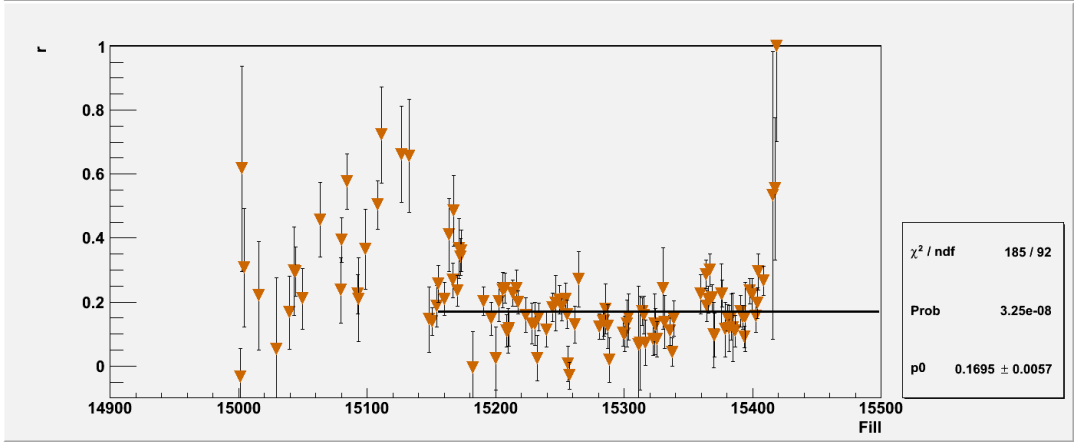


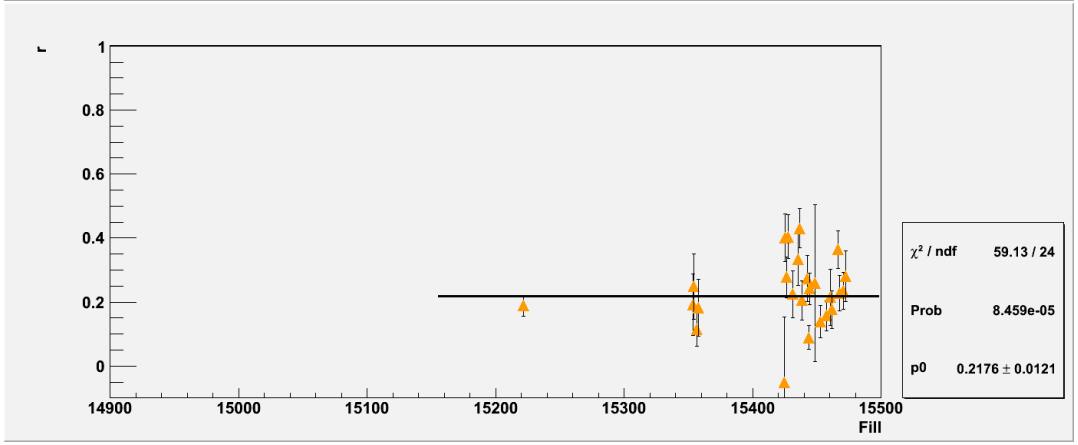


Blue-1 Upstream: Horizontal and Vertical Profiles





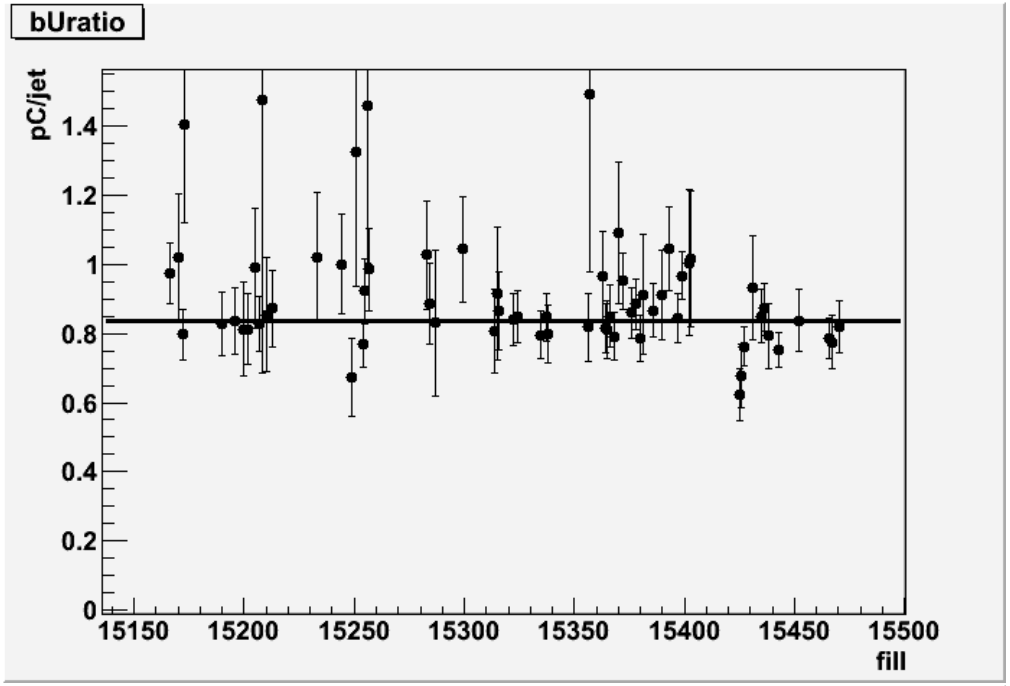


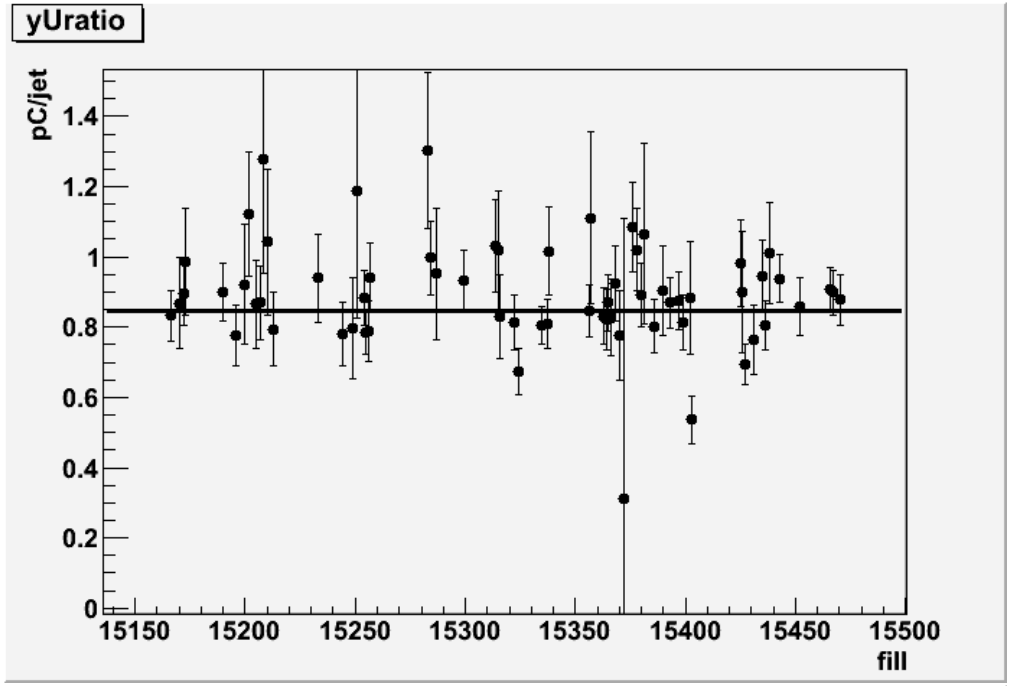


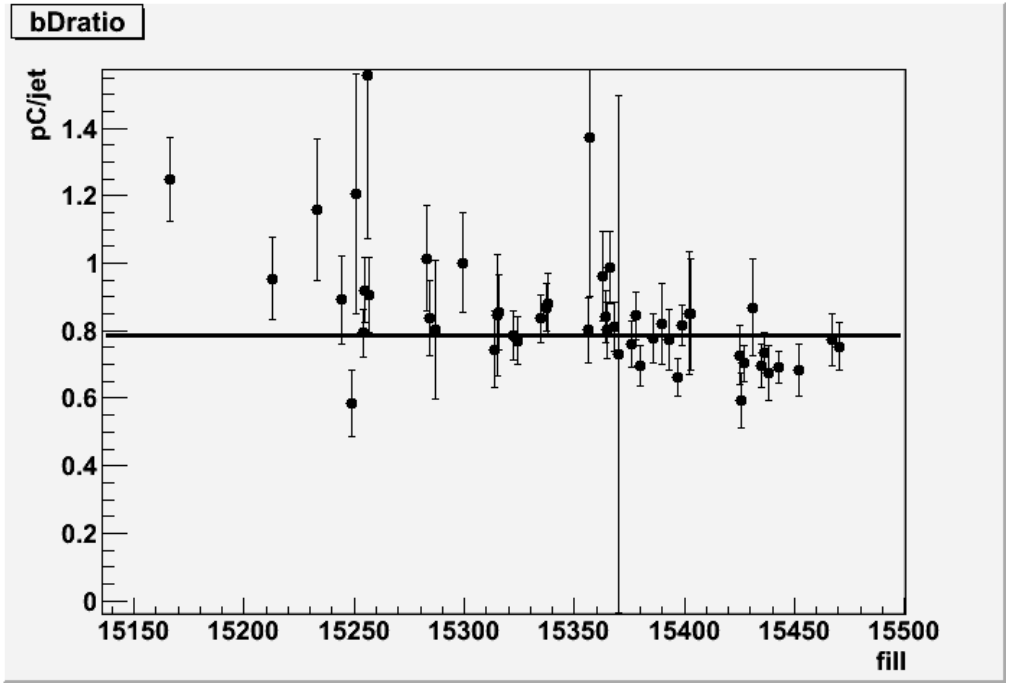
Horizontal and Vertical Profile r

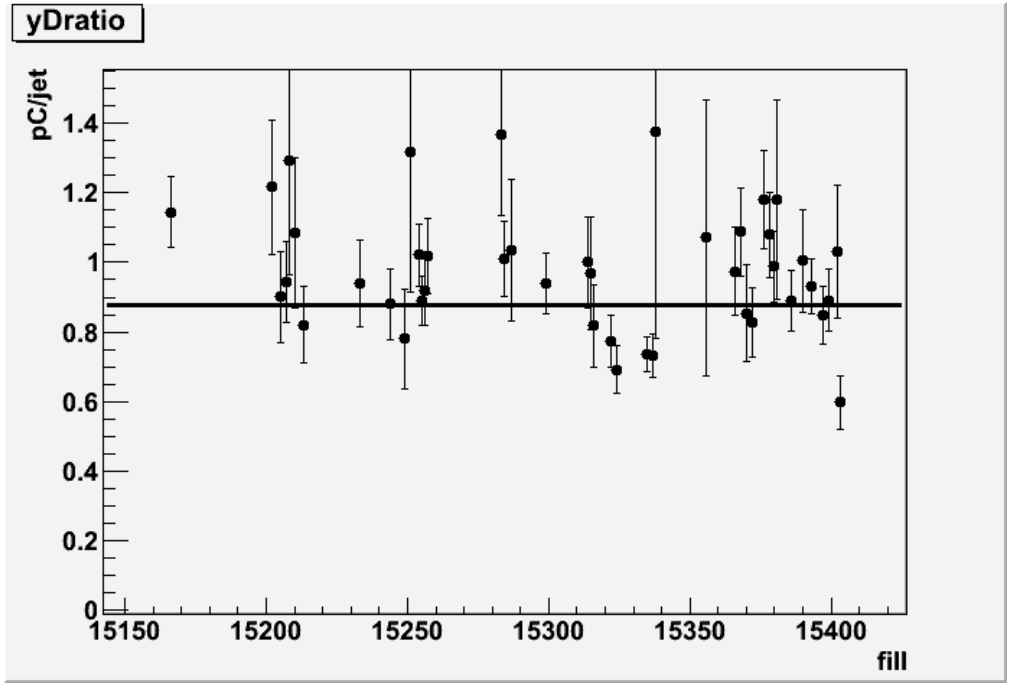
	H-Profile	V-Profile	H-Profile	V-Profile
Blue-1 Upstream	0.07	0.06	0.21	0.15
Yellow-1 Downstream	0.09	0.07	–	0.18
Blue-2 Downstream	0.05	0.09	0.20	0.19
Yellow-2 Upstream	0.13	0.13	0.17	0.22

p-Carbon and H-jet Polarization Ratio: Blue and Yellow









Summary

- There is **no strong indication** for rate dependence in Run 11
- The "dead layer" and t_0 parameters look more stable than in Run 9
- **Still to do:**
  - Data quality checks
    - Investigate non-statistical differences in basic parameters
    - Exclude detector 4 in Blue-2
  - Use t_0 from the scintilators
  - Recalculate polarization with new analyzing power scaled by H-jet
  - Calculate profile-corrected polarization for the experiments
  - Polarization decay during fill
  - Performance of Hamammatsu detectors
- For latest results and progress visit
  https://wiki.bnl.gov/rhicspin/Results
  http://yellowpc.rhic.bnl.gov/rundb/