

RHIC p-Carbon polarimeters: Run15

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for the polarimetry group

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Previous run(s) problems → fixes

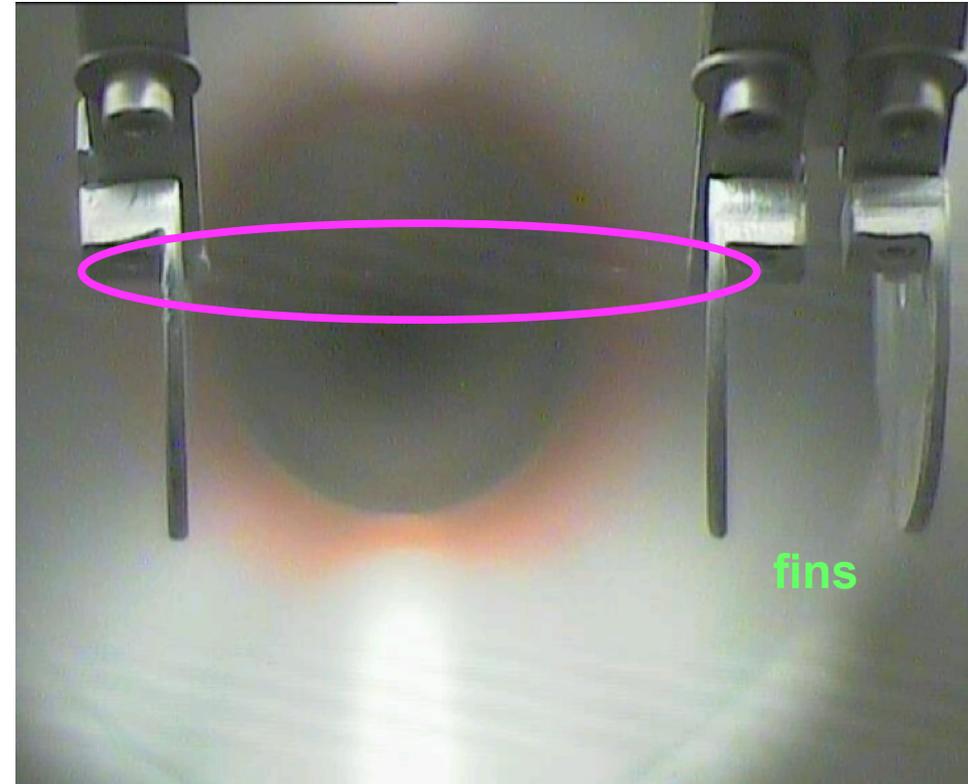
- Limited carbon target lifetime:
modified target holder, reduce EM fields
- Fine pitch Si detector gain instabilities:
mix older (stable) & new (fine pitch) detector designs

Startup & status

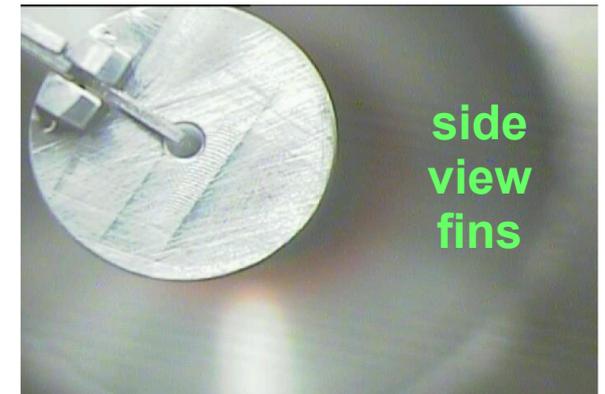
- So far so good...

Carbon target mortality

- Over years increasing $I_{\text{beam}} \Rightarrow$ reduced target lifetime
last two pp runs required two replacements all targets, big disruption

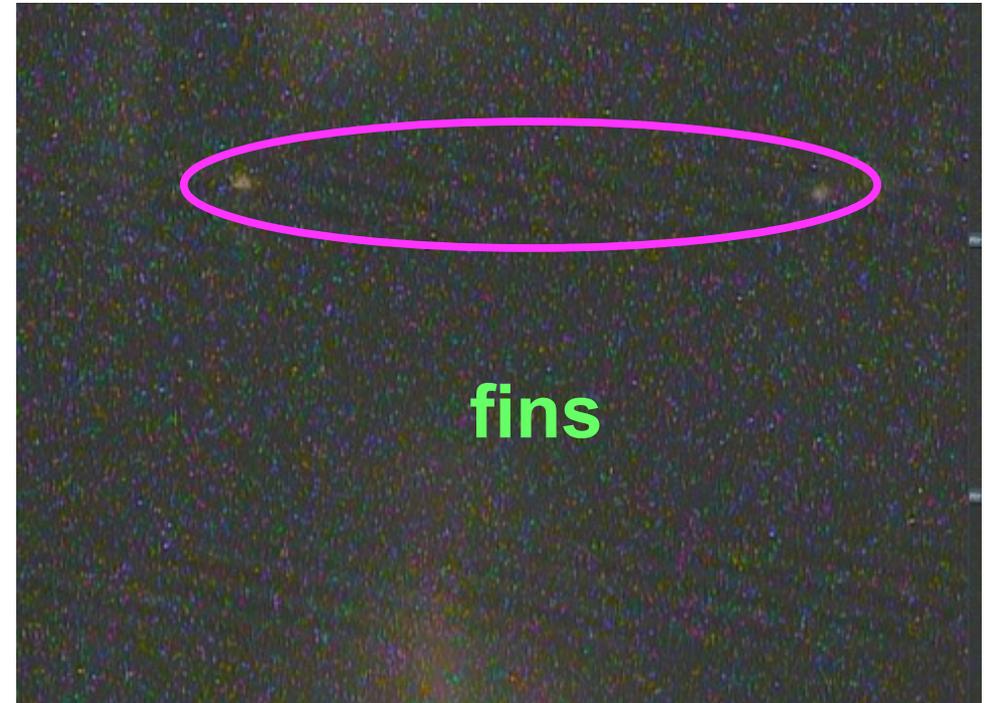


- EM simulation (J. Kewisch) showed beam charge induced high EM fields at target \rightarrow frame attachment (lightning rod)
- high fields \Rightarrow high current in target \Rightarrow heating
- Fix: install 'fins' (flat disks) at attachment point spread field lines, reduce fields



Carbon target mortality

- Spring 2014: tested, move target *near* (not in) Au beam:

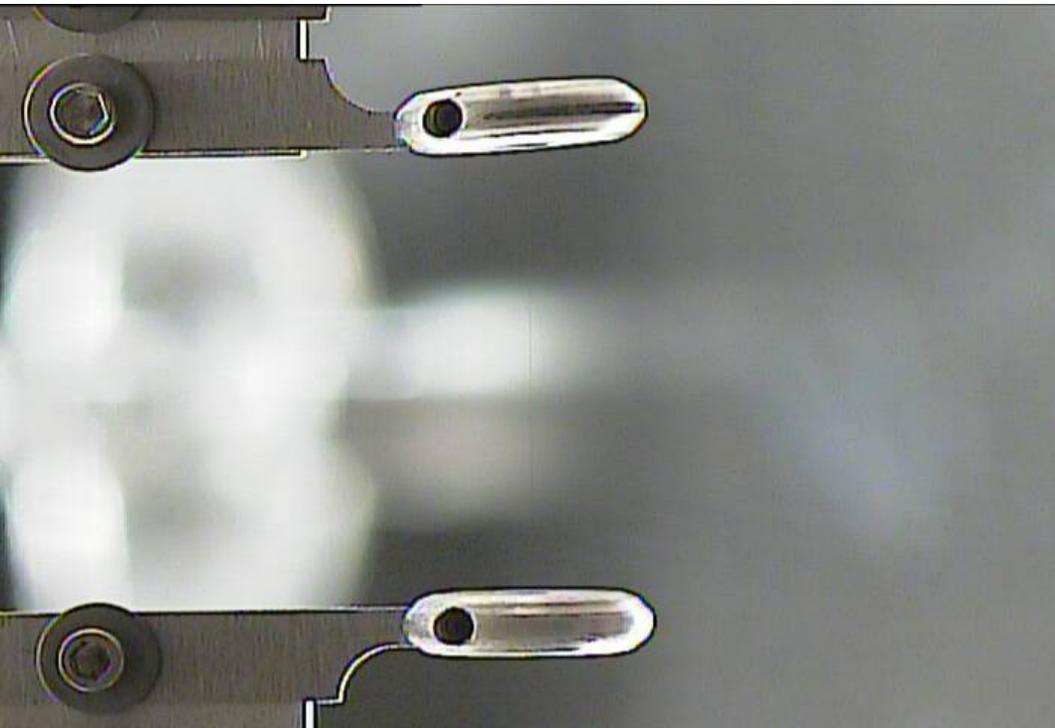


- Clear reduction in glowing (ohmic heating) at attachment point
- Also tested *in* He beam, also reduced glowing at ends

Carbon target mortality

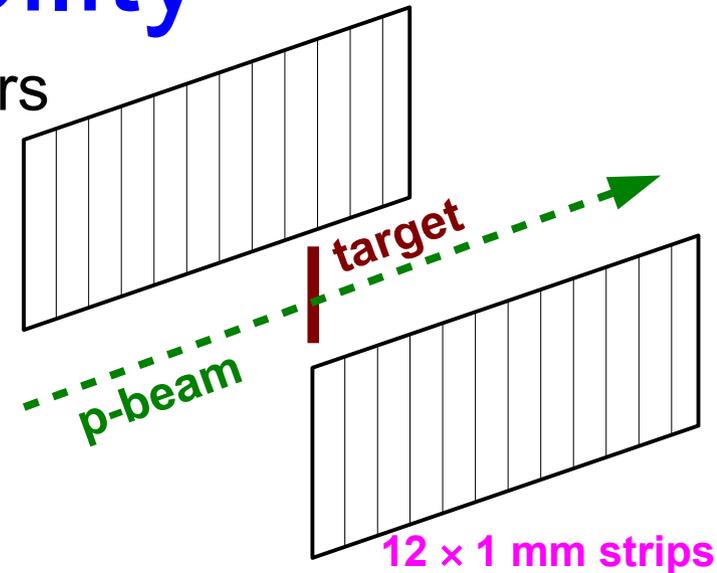
Run15:

- Such fins installed for 32 of 48 targets in 4 pC polarimeters (no room for fins other targets, hit chamber wall)
- Fin size reduced from prototype (don't shadow detectors)



Si detector stability

- Run13 used newer fine pitch (1 mm) Si detectors
- Each polarim. one pair detectors
longitudinally segmented:
- Useful info on target looseness,
material along target → detector path (E loss)
- But: 1 mm detectors showed large
gain instabilities, correlated w/ beam operations
- Were able to correct: gain ↔ I_{bias} correlation,
frequent α gain calibrations (end of fills)
- But this is not nice, extra uncertainties introduced



Run15:

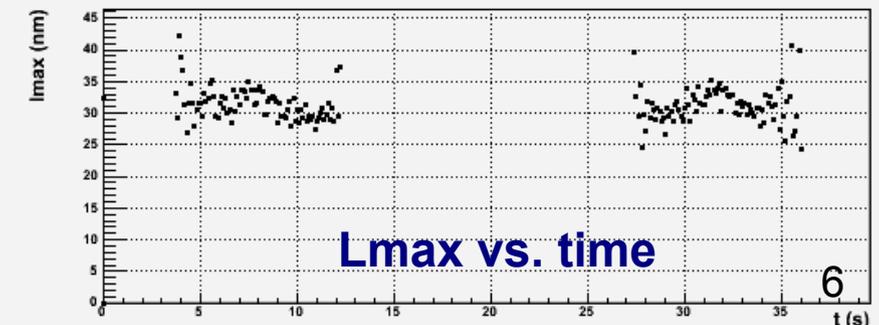
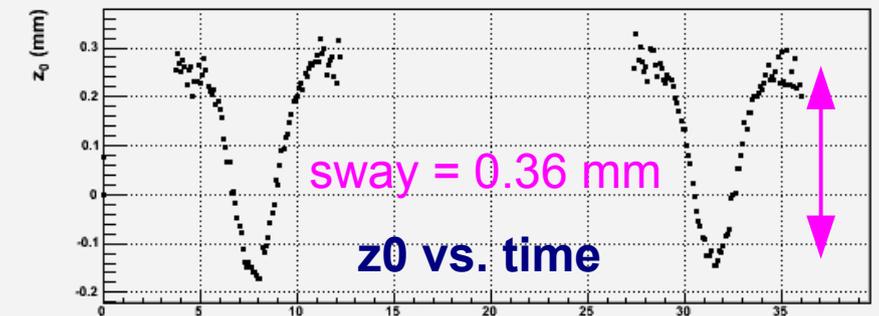
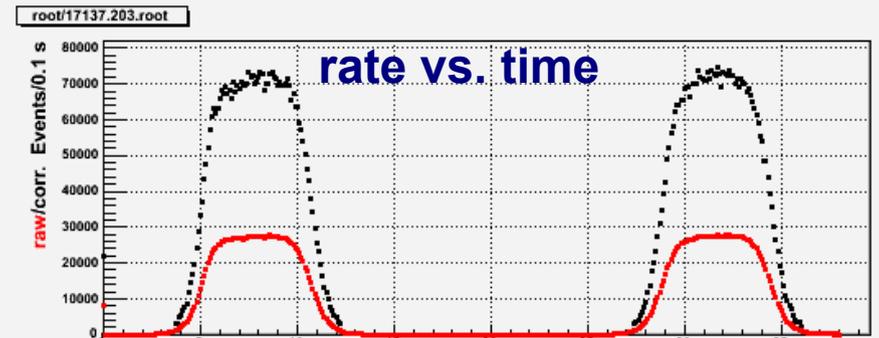
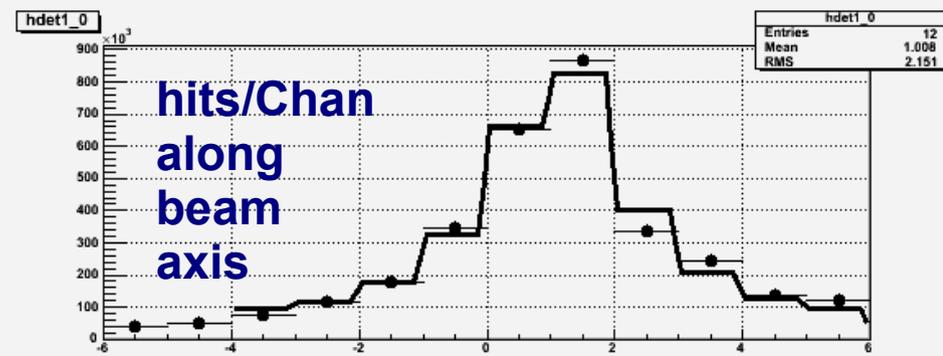
- Keep less stable pair 1 mm detectors, longitudinally segmented
- Use older 2 mm pitch detectors for other 4 detectors each polarim.
 - pitch too coarse for target looseness etc. measurement
 - but over years experience 2 mm detectors have stable gains

Long. detector fits

- Fits to detector hit distribution:
 - centroid $\Rightarrow z_0$:
target position along beam
 - RMS from mult. scat. in target
 $\Rightarrow L_{\max}$: thickness target \rightarrow det.
- Do fits in 0.1 sec. bins

- Targets move along beam (*upstream*)
- Observe 'sway' of target
- Rough measure of target looseness
- Track 'sway' vs. measurement

- $L_{\max} \sim$ constant, 30-80 nm
(nominal target thickness 50 nm)
- Track mean L_{\max} vs. measurement
- $L_{\max} \propto dE/dx$ energy loss of carbons exiting target, correction?



Startup & status

- System was off & cold > 1 ½ years, predictably some electronic & mechanical decay:
 - numerous electronics replacements, repairs
 - 3 leaking flanges (feedthroughs) replaced
 - hardware now in good shape, **zero** bad channels (observing few intermittent bad chan., problem identified, will fix)
- First polarim. in beam Jan. 27:
 - All looks normal, close to nominal, awaiting stable RHIC beams to adjust final timing, calibrations
 - All targets in Blue, ~¼ Yellow targets observed OK so far, then condition targets (annealing) with beams
- Results:
 - restarted software analysis chain
 - PC serving results web page died on weekend, replacing...
- Ready for Run15 PHYSICS