

RHIC polarimetry Run13

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on behalf of the polarimetry group

Time Meeting 05.02.12

Reminder: Run12 pC polarimeter difficulties:

- RF pickup in detectors: noise swamped signal survived by excluding (many) noisy channels
- Carbon target lifetime: high mortality rate replaced entirely in two lengthy maint. days

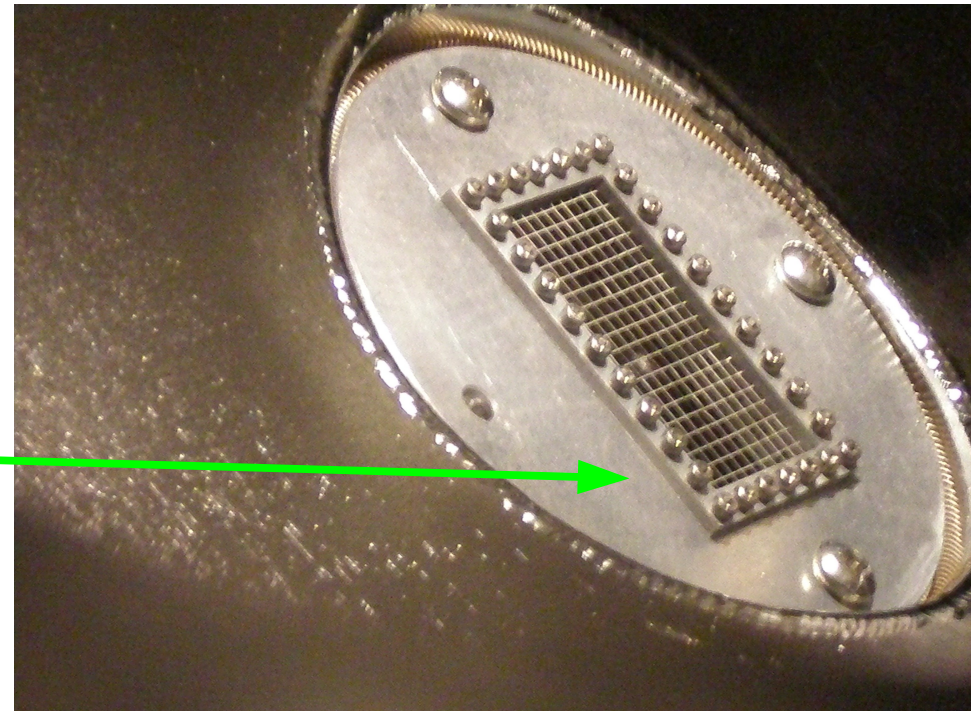
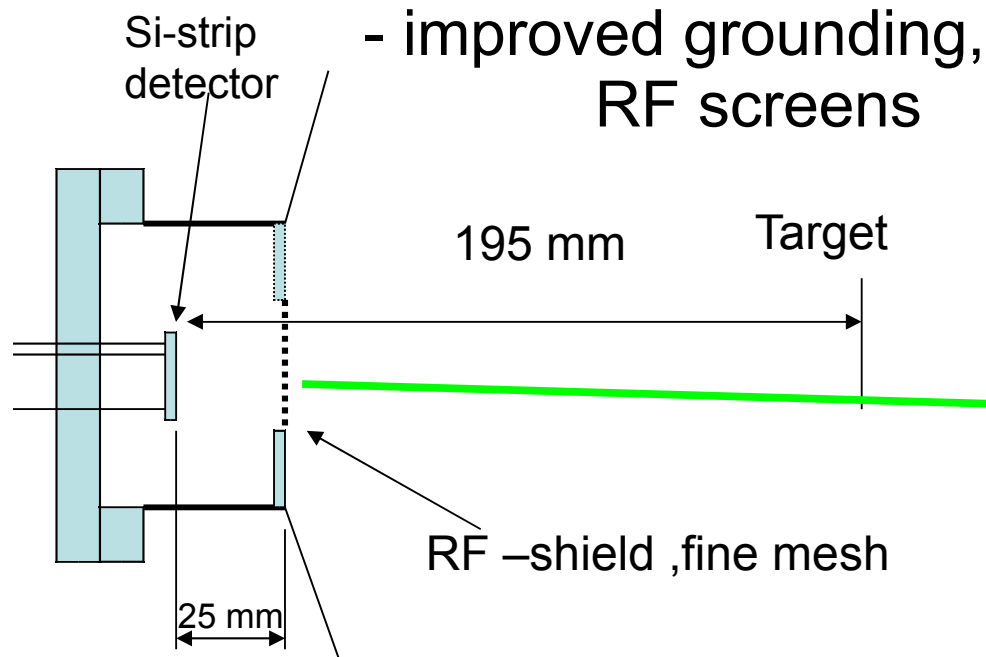
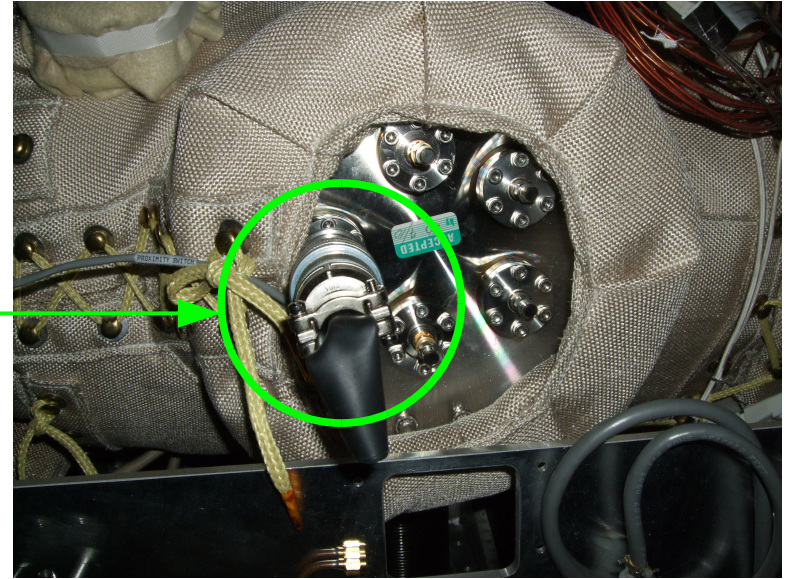
Steps to mitigate, new pC features for Run13:

- Shielding against RF
- Target selection & monitoring

Status: pC & H-jet

Run13: RF pickup reduction

- Run12 big problems with RF pickup noise in pC detectors
- Major external source:
 - YEL stochastic cooling pickup
- Steps to reduce:
 - terminate feedthroughs on stochastic cooling pickup
 - upgraded grounding/shielding pC preamp boxes on chamber
- Reduce internal RF from in chamber:



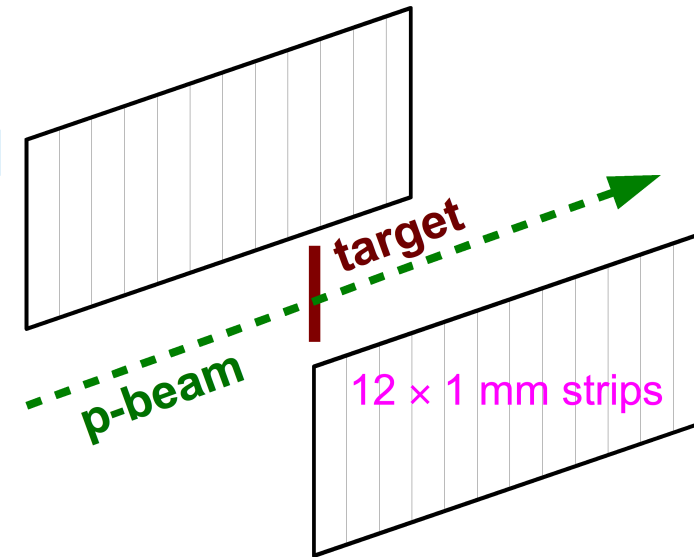
Run13: target lifetime improvement

- Run12 had high rate target mortality:
 - entire target set replaced twice, entire maintenance days
- Run12 used thinnest possible **25 nm thick** carbon targets
- Run13 will use **50 nm thick** carbon targets, more robust
 - monitor rates closely, avoid DAQ buffer overflows (target speed)
- Observation: targets are non-conducting before use;
 - targets that survive beam exposure are conducting
- Hypothesis: heating in beam changes structure (& conductivity)
- Installed some targets treated to become conductive:
 - treated with intense flash lamp
- Early RHIC operations:
 - expose all targets to low current beam, anneal
- Installing video system to monitor all targets behavior, viability



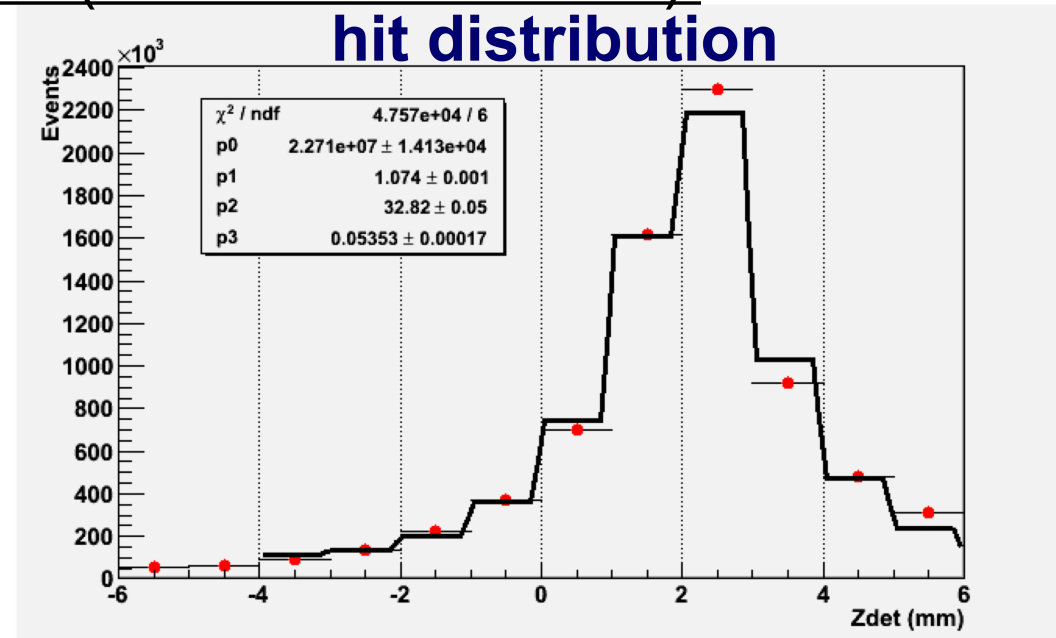
Run13: long. segmented det.

- pC detectors usually segmented azimuthally
- Run13: each polar. pair of detectors segmented longitudinally (along beam):
- One such pair tested in Run12, promising results



Distribution of hits in strips gives info (fit to MC distribution):

- Centroid \Rightarrow
 - target position along beam
 - varying position \Rightarrow loose target
- Width (from multiple scattering) \Rightarrow
 - target material traversed
 - pC scattering \rightarrow detector
 - effect on P measurement (shifted carbon energies)



**\Rightarrow monitor parameters through sweep measurements,
check of target status (see broken target quickly)**

Status

pC:

- Preamps improvements, RF screen/grounding implemented
- Video system installed (one camera each polar., above beam plane)
- All detectors, RF shields, alpha sources, targets installed
 - two longitudinally segmented detectors each pC polarimeter (top two 45° detectors)
- Preamps in Blue polars.: checkouts all OK
- Yellow pumpdown, preamp installation today/tomorrow
- Yellow stochastic pickup feedthrough not yet terminated:
⇒ **stochastic cooling group please do this soon**

H-jet:

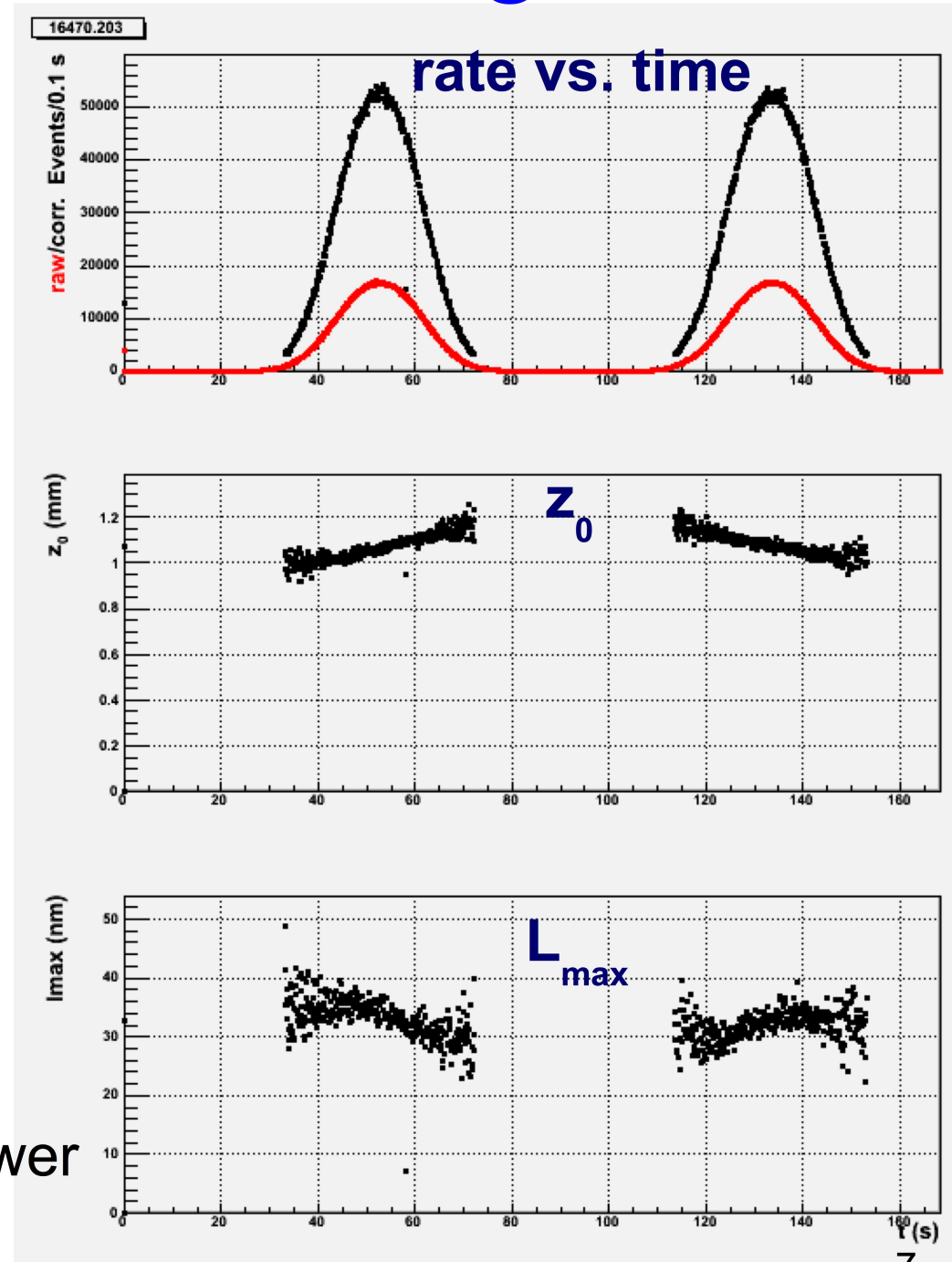
- Performance in Run12 was fine, no changes for Run13
- Readout checkout started, debugging
- Jet target turn on this week

RHIC polarimeters will be ready for beam

Extras

Run profile: taut target

- Fits performed for 0.1 sec. bins
- Rate \sim position across beam
 \sim gaussian beam intensity:
- z_0 varies \sim linearly in time
- Target sweep direction not perpendicular to beam axis, crosses beam at an angle
- L_{\max} \sim constant
- L_{\max} affects P measurement:
 - dE/dx shifts measured E_{carbon}
 - shift $E_{\text{carbon}} \Rightarrow$ shift analyzing power
 - can monitor, correct for effect



t in sec.; 10 points / sec.

Run profile: loose target

- Loose target, ~ 1.3 mm sway
- Attracted radially toward beam
- As it reaches radial center of beam it stays there, rate flat tops
- While at radial center of beam, other forces attract it toward $-z$, it moves ~ 1.3 mm along beam
- Reverse process as target drawn out other side of beam

Long term target monitoring:

- The long. segmented detectors provide useful info on target looseness, viability...
- Also spectacular indication when a target breaks

