

Experiments with the RHIC Collimation System

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RHIC Retreat 2000
SUNY at Stony Brook

Outline

- Reasons to Collimate
- Current Collimator setup
- Beam Cleaning
- Diffusion Experiments
- Future Plans/Upgrades

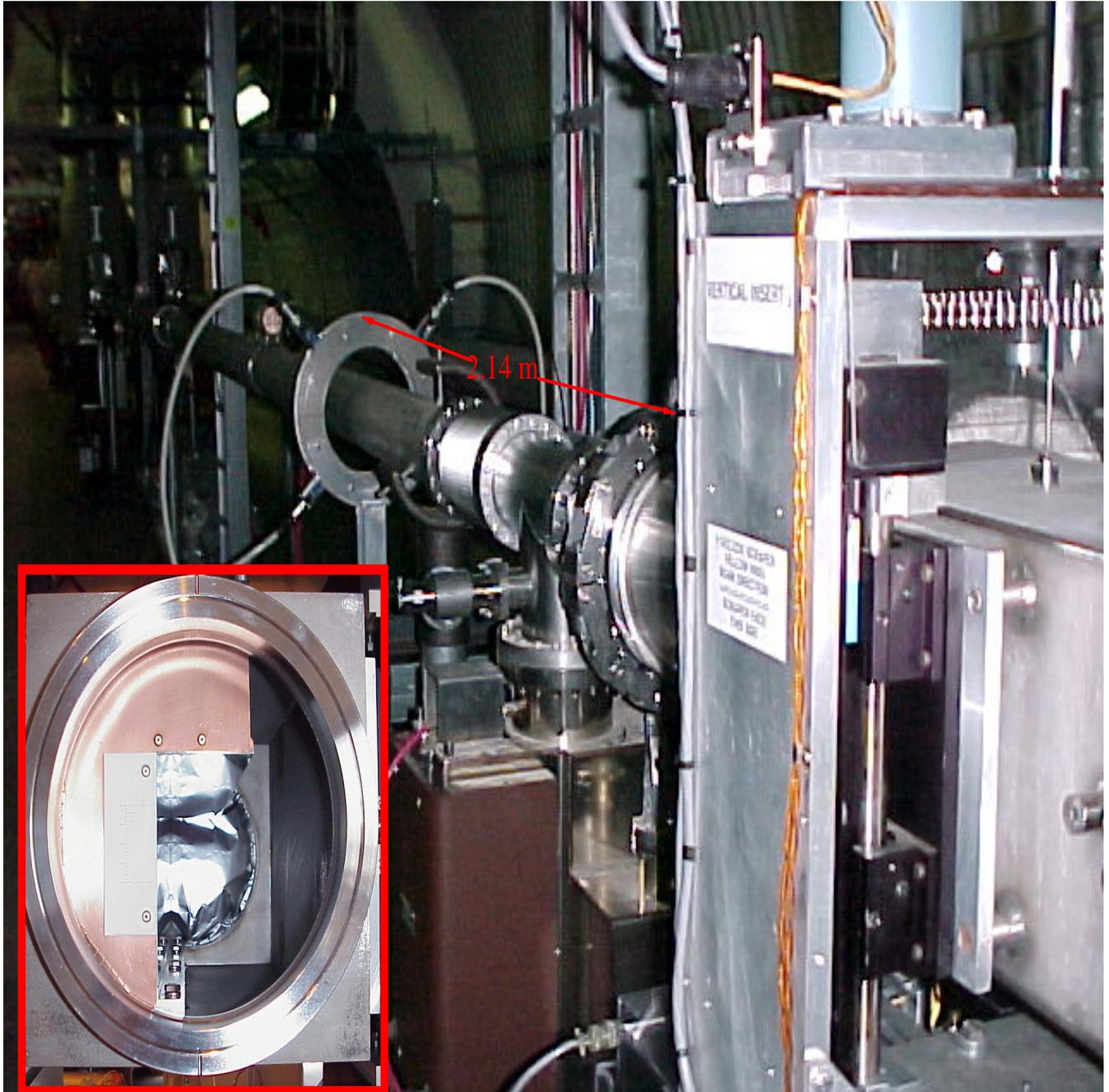
Why Collimate??

Various processes cause particles to enter into unstable orbits, causing a beam halo. These particles then are lost as they hit various apertures.

- Intra Beam Scattering
- Beam – Beam Scattering
- Power supply ripple
- Magnet Errors
- ...

Purpose of collimation system is to remove these particles, and localize the losses, thus making life easier for the experiments and various accelerator components.

Setup Yellow Ring

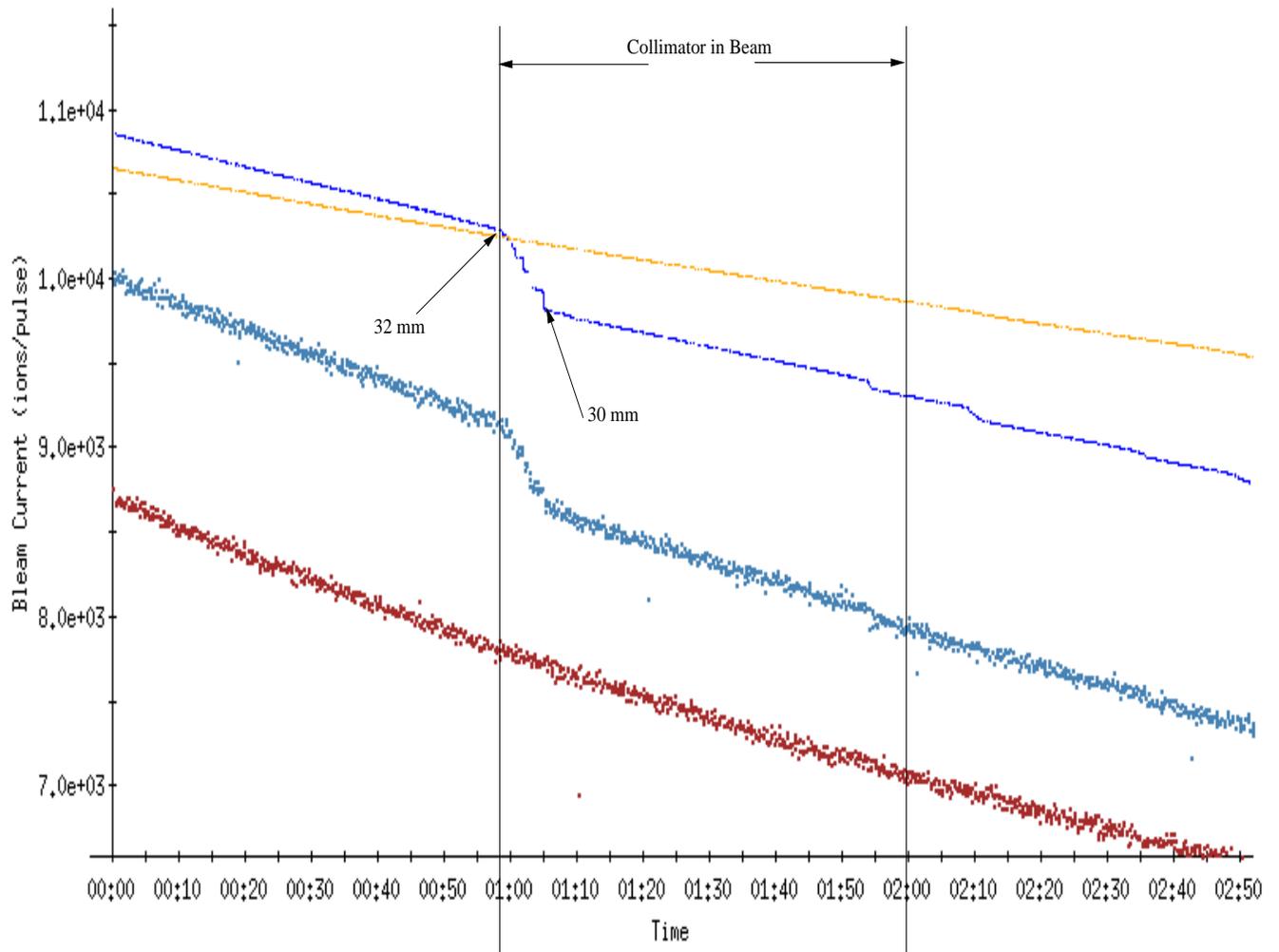


List of Runs

Date	Time	Ring	Purpose
8/24	00:30–01:57	Blue	Commissioning
8/24	11:23	Yellow	Commissioning
8/29	20:38–21:20	Yellow	Diffusion Study
9/3	22:00–22:30	Yellow	Beam Size Experiment
9/3	23:48–00:17	Yellow	Diffusion Study Beam Cogged
9/4	00:24–00:37	Yellow	Diffusion Study Beam Uncogged

Beam Current response

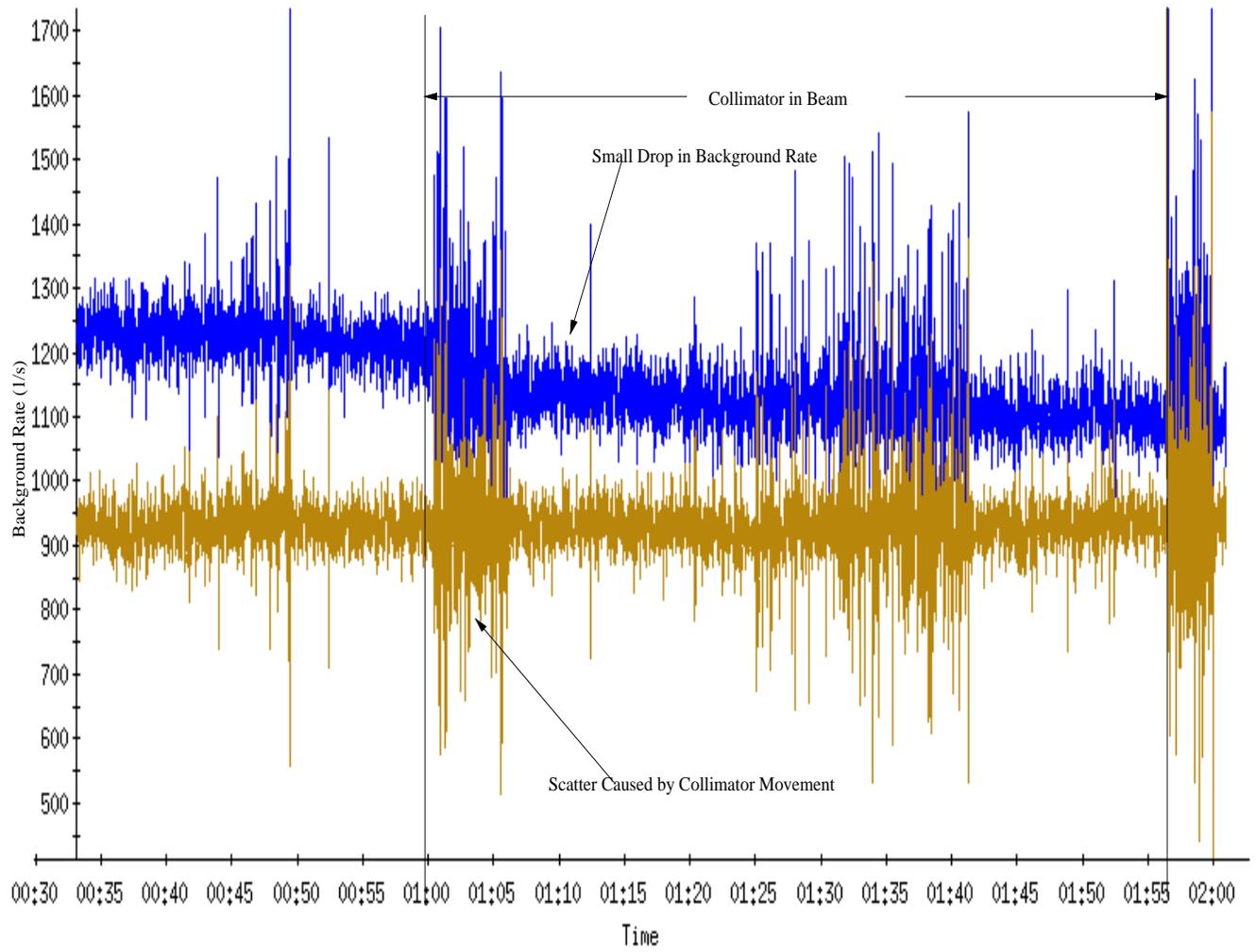
Blue Ring Commissioning



— blueDCCTtotal — ye1DCCTtotal — bluWCMbunched — ye1WCMbunched

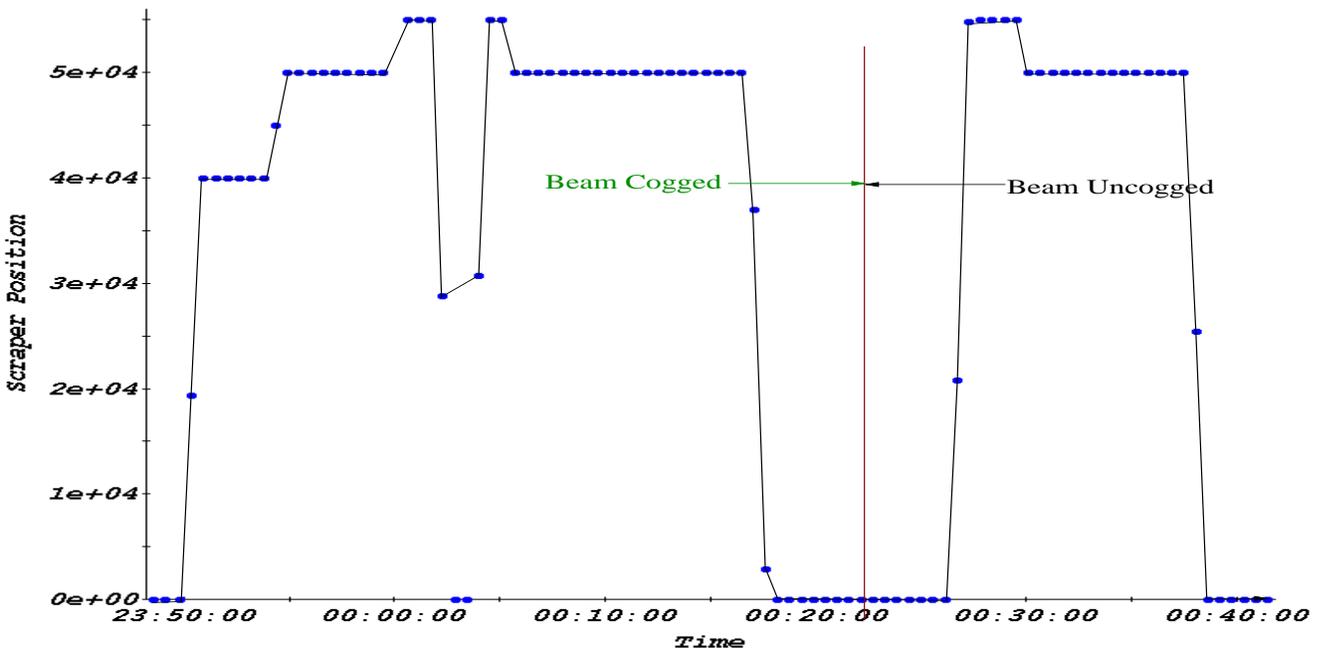
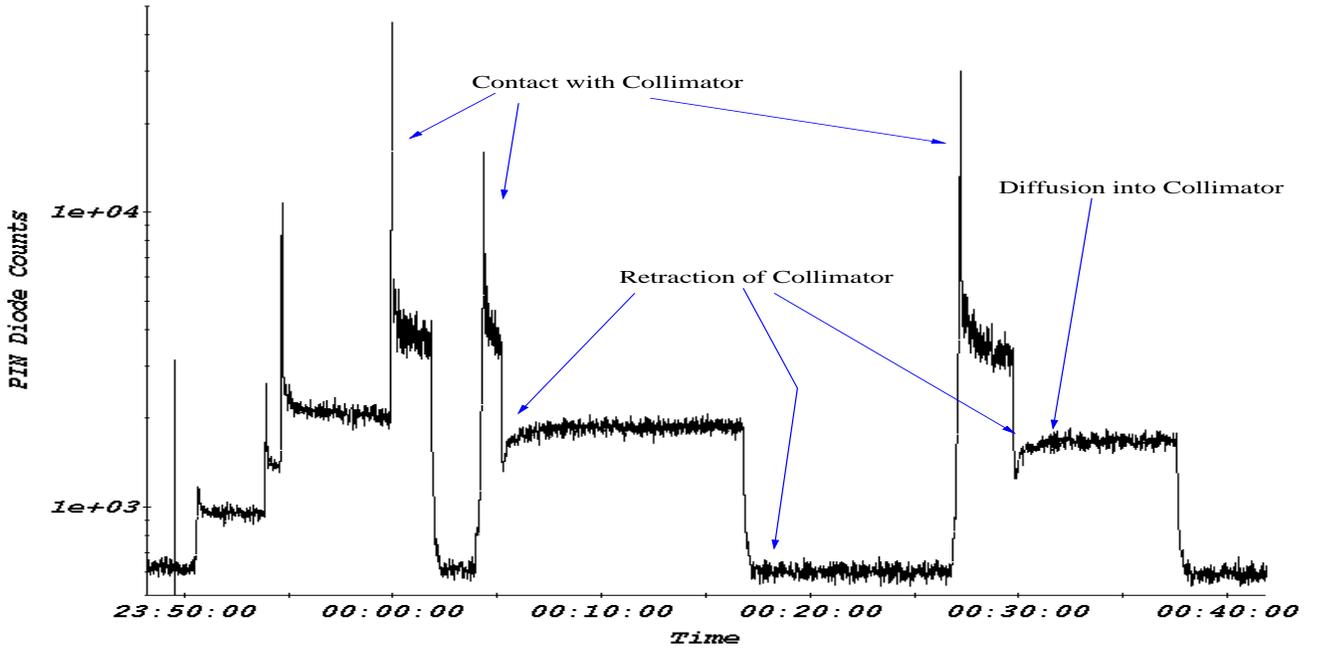
Brahms Background Rate

Blue Ring Commissioning



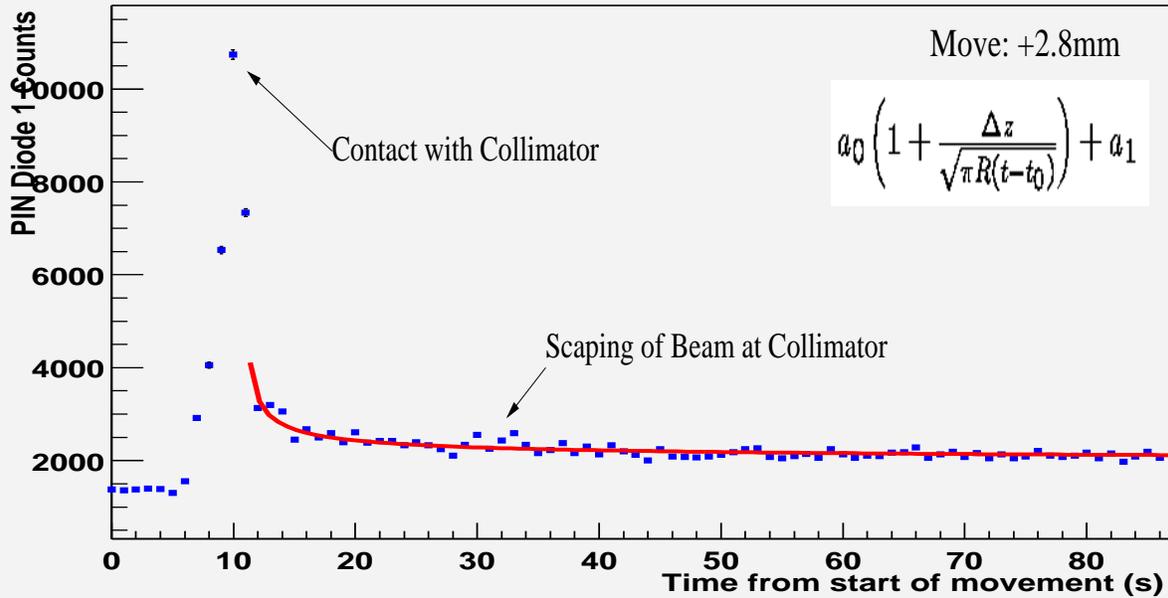
— Blue Facing ZDC — Yellow Facing ZDC

Diffusion Experiment

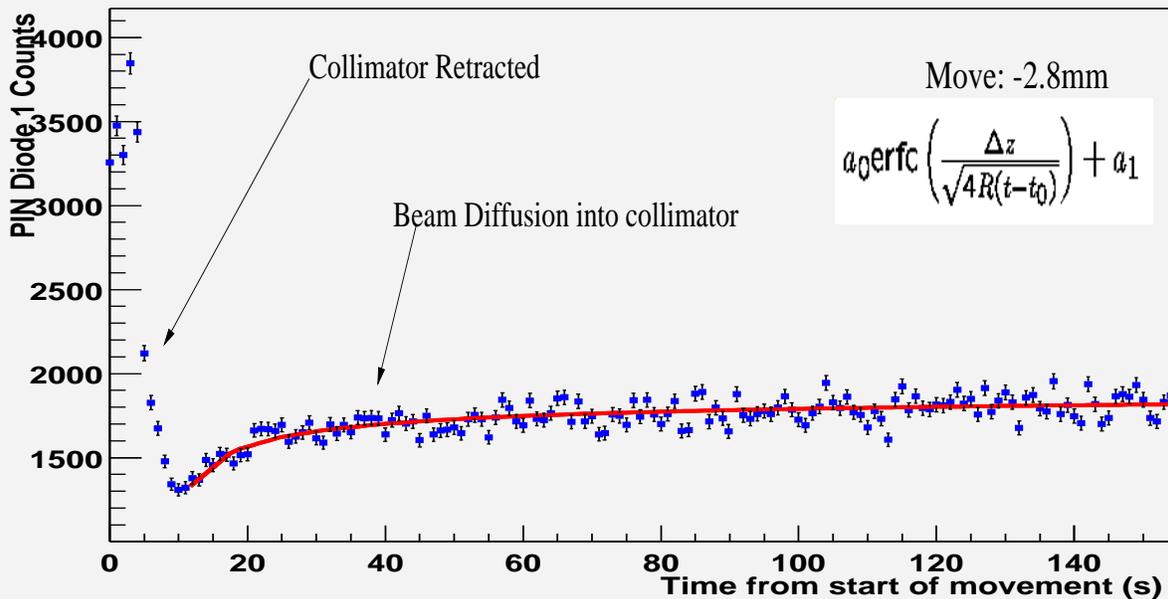


Analysis

PIN Diode 1 Counts vs. Time



PIN Diode 1 Counts vs. Time



Δz – Normalized Movement

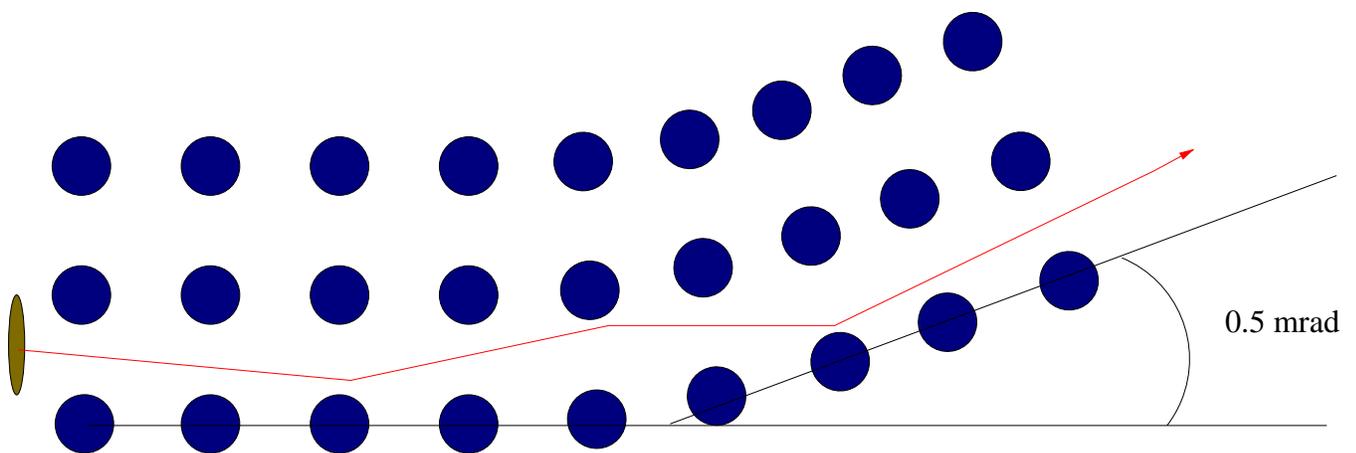
R – Diffusion Rate

Future Plans/Upgrades

- Experiments
 - Repeat experiments w/Protons and Au with 2001 lattice
 - Vary intensity, Beam sizes, ...
 - Look for losses around the ring while collimator is in beam.
- Upgrades
 - Next run Yellow gets a bent crystal collimator.
 - Shortly thereafter Blue gets one (assuming Yellow is successful!)

Crystal Channeling

If ions enter a crystal at an appropriate angle, the scattering events are correlated, and the ion is channeled through the crystal planes.



Advantage: The angle of escape from the crystal is known, intercepting the ions now is easy!

Summary

- The collimator does scrape away the halo.
- Background in the ZDCs is not caused by halo, likely Beam–Gas or off momentum particles.
- Crystal collimator is “in the oven”
- Run FY01 awaits