

Protecting STAR from Pre-fires

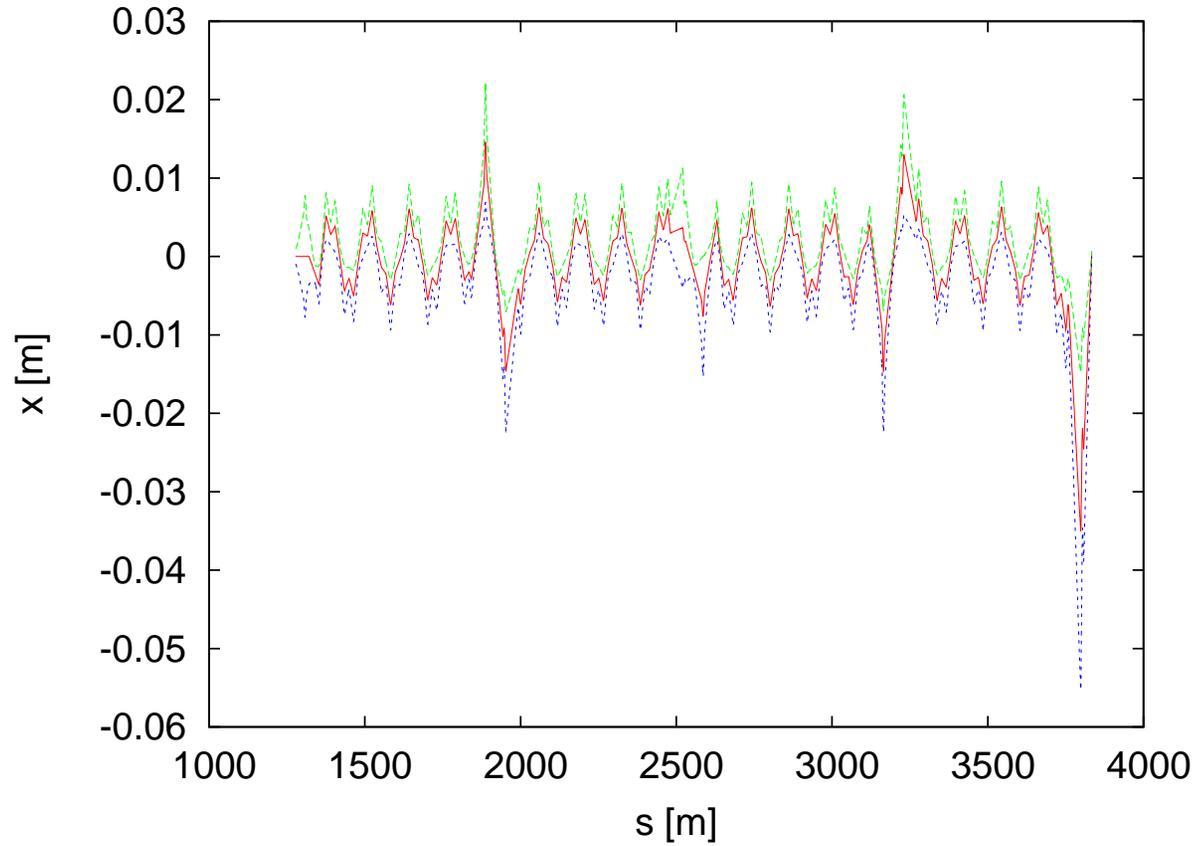
C. Montag

with input from A. Drees, M. Blaskiewicz, G.
Robert-Demolaize, Y. Luo, T. Roser, ...

Pre-fires and STAR

- We have learned recently that for several years, the **first Blue pre-fire in each run** took out the STAR electronics for some of their detector components
- For Run-14, STAR has installed a new **\$3 million** silicon detector
- This new detector component is the central part of their physics goal for this run
- **We have to protect STAR** from these (unavoidable) pre-fires

Orbit and 3σ envelope from 0.115 mrad abort kick



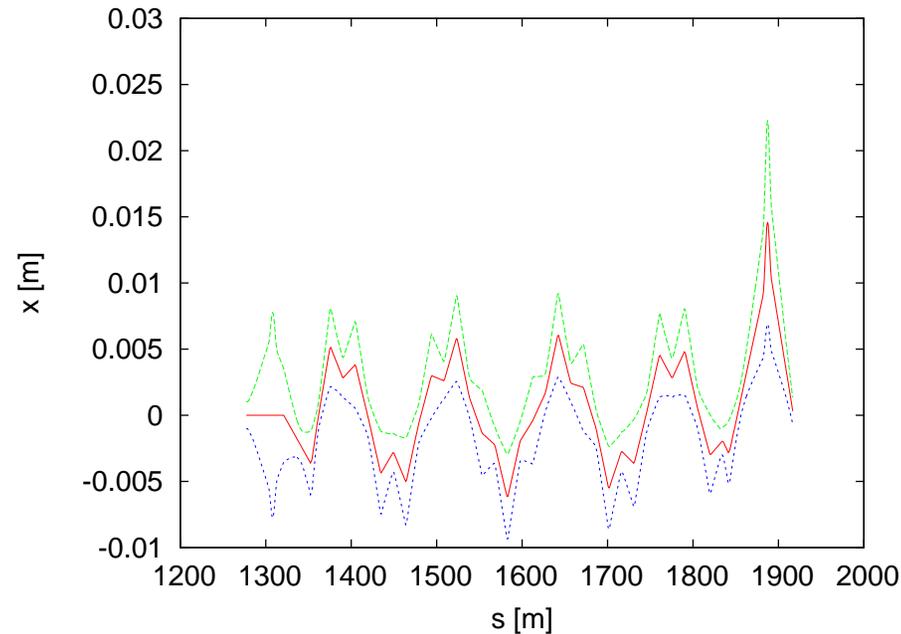
3σ envelope just scrapes triplet upstream of STAR

Initial approach

- Apply a 2.3 mrad crossing angle in IR12, using DX-D0 bump
- This bump brings the orbit within 5 mm of the DX aperture
- Abort kicker pre-fire will provide the necessary kick to slam the beam into the DX

DX magnets are the weakest type of magnet in RHIC; idea had to be abandoned

Beam in arc between IR10 and IR12

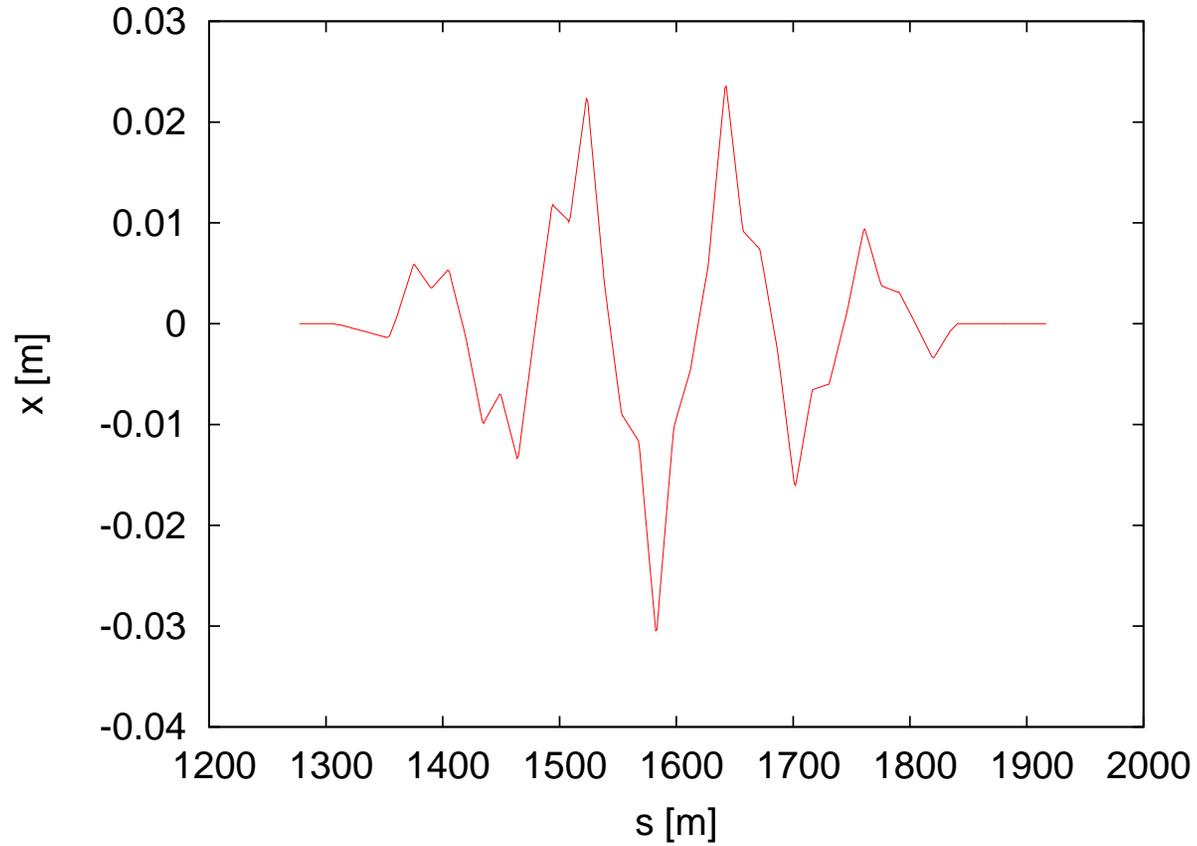


Orbit shifts by -5 mm at $s=1584$ m

With an aperture radius of 34.5 mm, we need a **-29.5 mm orbit bump** to slam the beam into the wall in the event of a pre-fire

RMS beam size for 15π beam is 1mm; 5σ aperture should be sufficient

Bump over entire arc between IR10 and IR12



−29.5 mm bump at $s=1583$ m

Orbit bump parameters

- Using all horizontal correctors in the entire arc
- Maximum corrector strength at store energy: $320 \mu\text{rad}$
- Maximum corrector strength used in the bump: $128 \mu\text{rad}$
- Path length change due to this bump: $\Delta_s = -0.5 \text{ mm}$

Summary

- Blue pre-fires **always** damage STAR
- We need to protect the new \$3 million detector
- This can be accomplished by a -29.5 mm orbit bump in the arc between IRs 10 and 12
- Should implement a similar solution in Yellow between IRs 8 and 10 to protect PHENIX, though they were less vulnerable in the past