

The RHIC Beam Abort Kicker Instability Issues

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RHIC BEAM ABORT KICKER



THYRATRON e2v

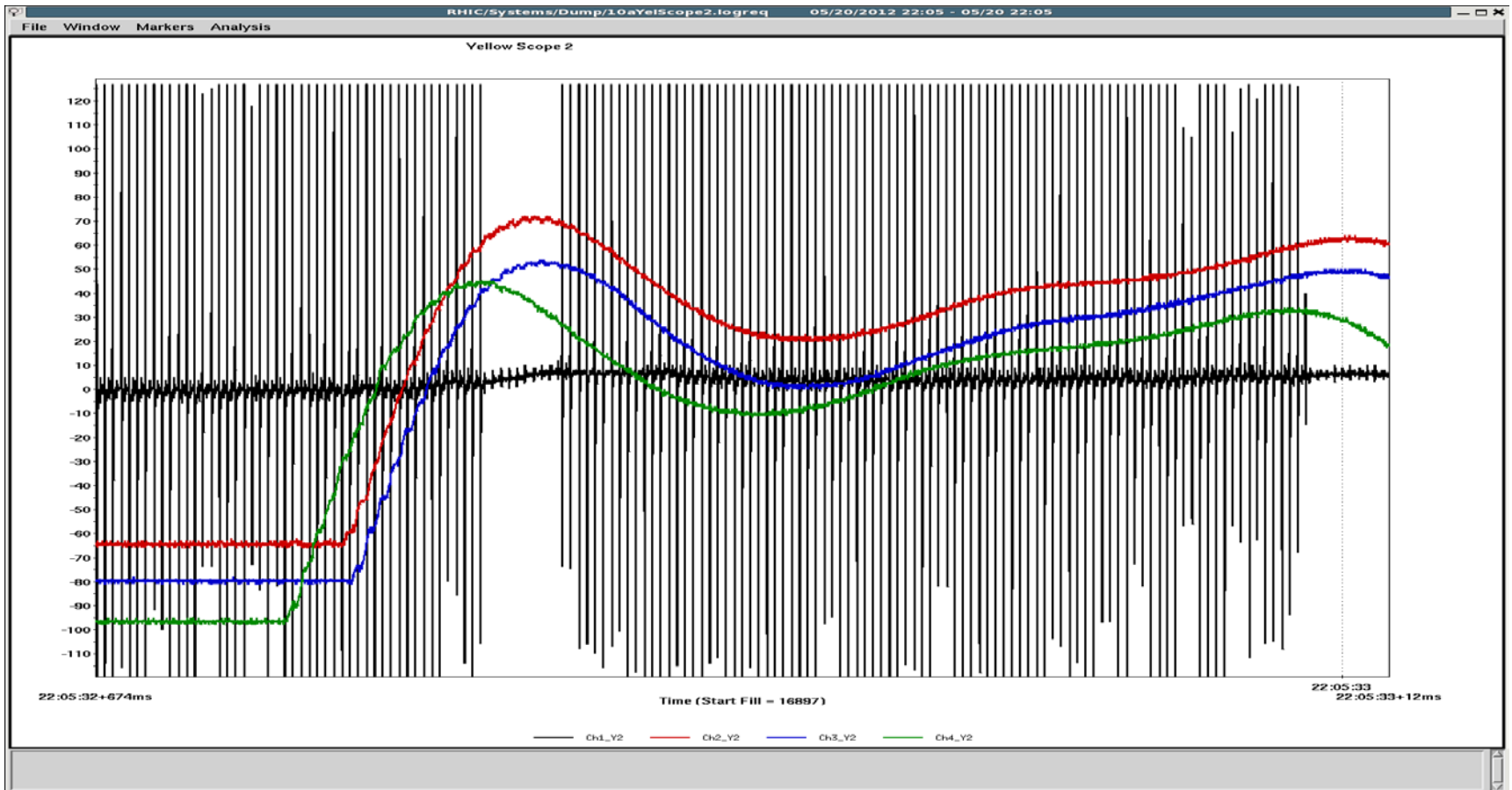
CX3575C

Adjustable Reservoir, Filament & DC Prime Grid
Control Grid

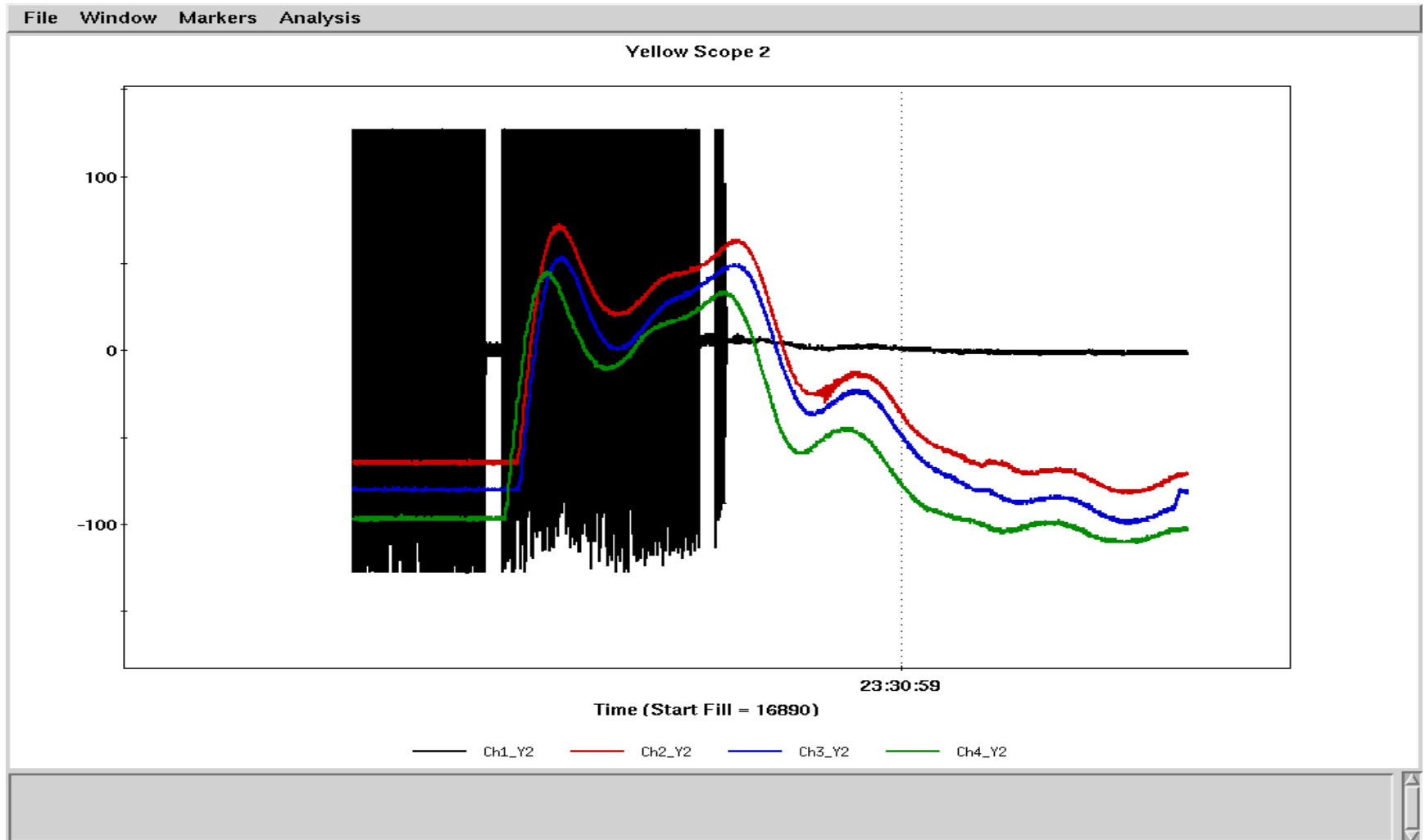
Peak forward anode voltage	60 kVmax
Peak forward anode current:	
modulator service	10 kAmax
crowbar service	50 kAmax
Peak reverse anode current:	
modulator service	5 kAmax
crowbar service	25 kAmax
Average anode current	3.0 Amax
Rate of rise of current	100 kA/us



Typical Kicker Pre-fire Scope Log



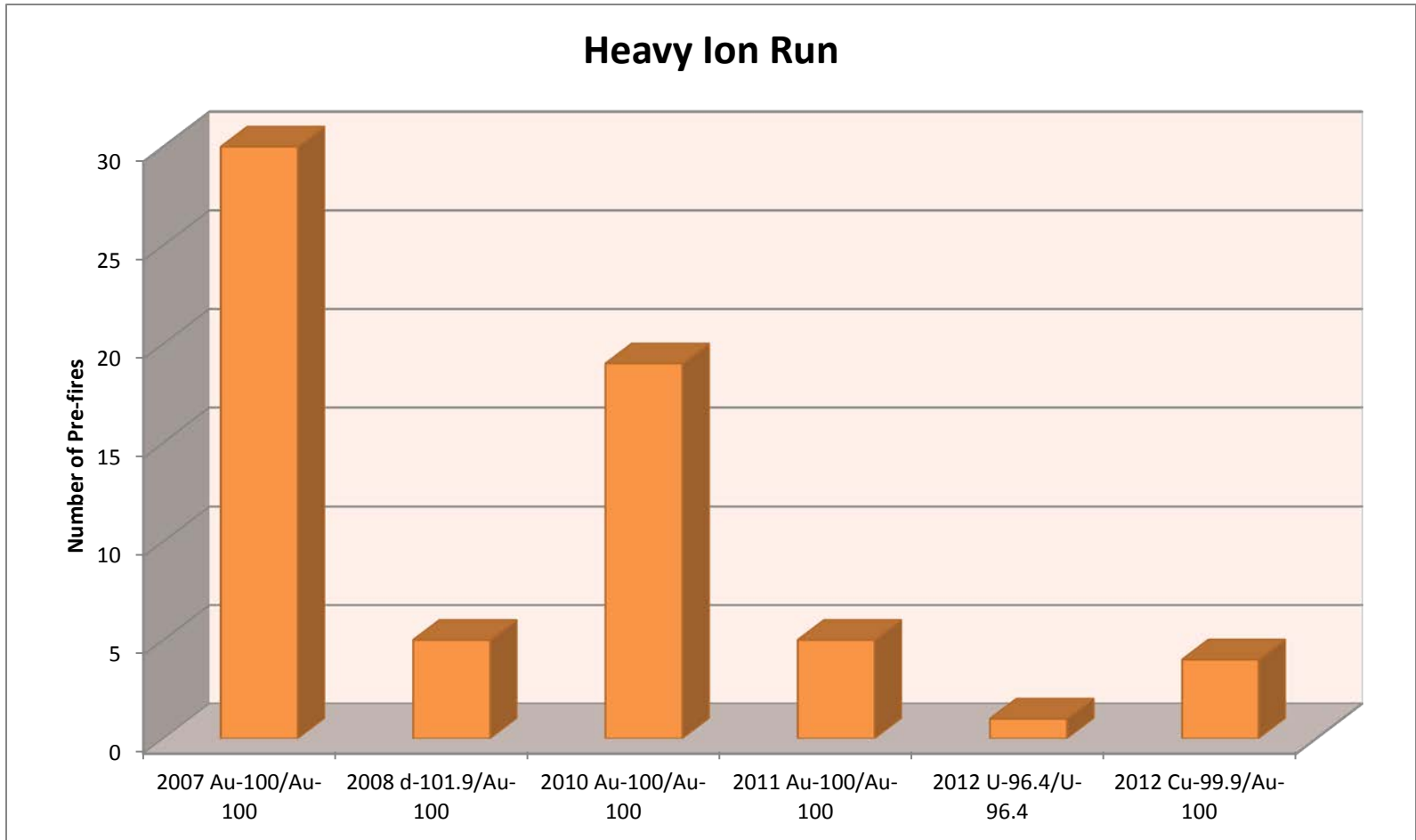
May 18 Pre-Fire Scope Picture



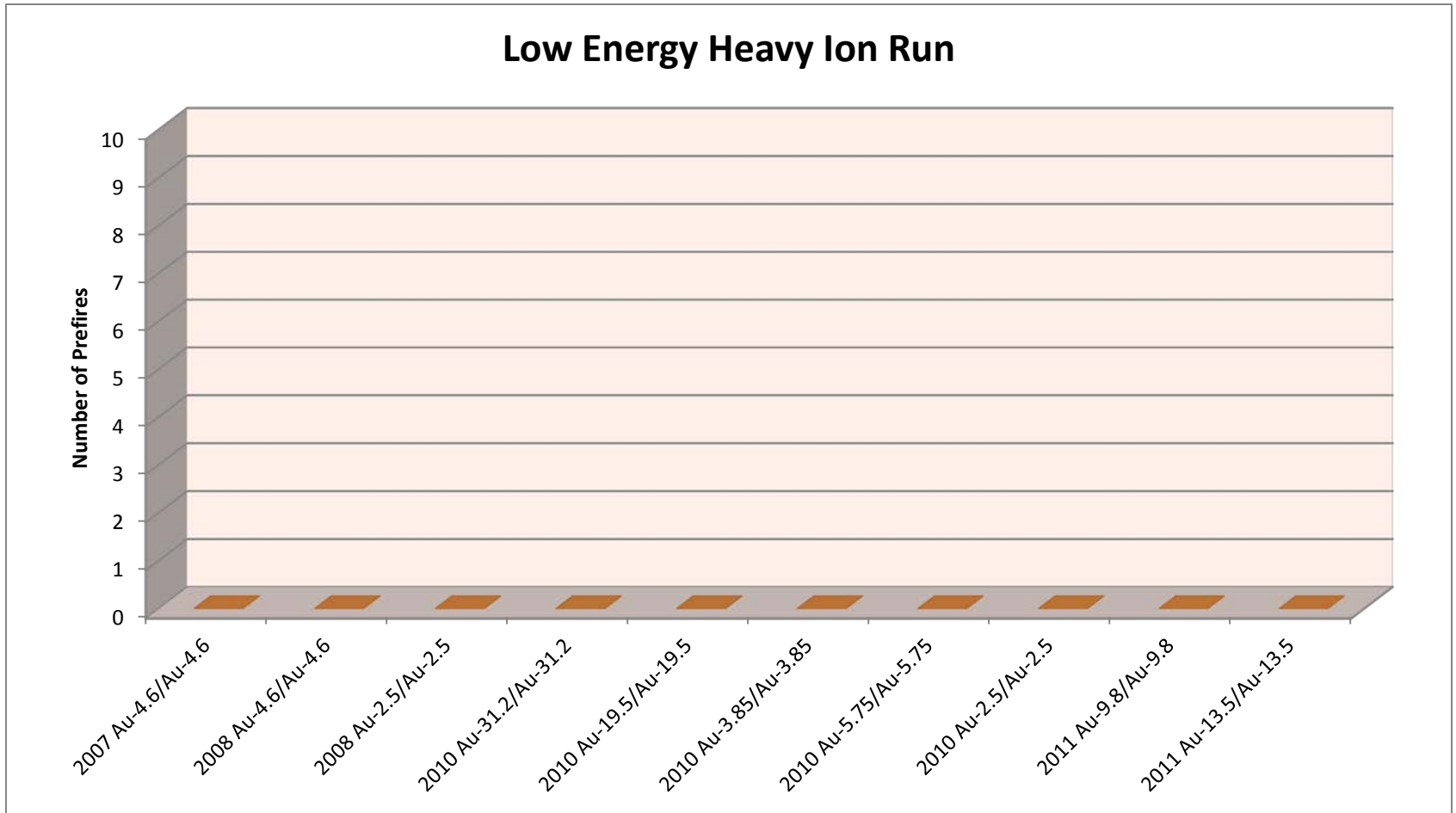
2007 - 2012 Pre-fire Summary

Run	Mode	Beam		Energy			Length Day	Prefire
		Blue	Yellow	Blue	Yellow			
RUN 2007	1A	Au	Au	100	100 GeV/u		125	30
	1B	Au	Au	4.6	4.6 GeV/u		1	0
RUN 2008	1	d	Au	101.9	100 GeV/u		80	5
	2	pp	pp	100	100 GeV		41	0
	3A	Au	Au	4.6	4.6 GeV/u		1.29	0
	3B	au	Au	2.5	2.5 GeV/u		0.625	0
RUN 2009	1A	pp	pp	250	250 GeV		67	10
	1B	pp	pp	100	100 GeV		74	1
	1C	pp	pp	100	100 GeV		5	0
RUN 2010	1A	Au	Au	100	100 GeV/u		101	19
	1B	Au	Au	31.2	31.2 GeV/u		21	0
	1C	Au	Au	19.5	19.5 GeV/u		14	0
	1D	Au	Au	3.85	3.85 GeV/u		34	0
	1E	Au	Au	5.75	5.75 GeV/u		9	0
	1F	Au	Au	2.5	2.5 GeV/u		1.21	0
RUN 2011	1	pp	pp	249.9	249.9 GeV/u		109	13
	2A	Au	Au	9.8	9.8 GeV/u		13	0
	2B	Au	Au	100	100 GeV/u		49	5
	2C	Au	Au	13.5	13.5 GeV/u		9	0
RUN 2012	1A	pp	pp	100.2	100.2 GeV/u		51	0
	1B	pp	pp	254.9	254.9 GeV/u		38	0
	2A	U	U	96.4	96.4 GeV/u		26	1
	2C	Cu	Au	99.9	100 GeV/u			4

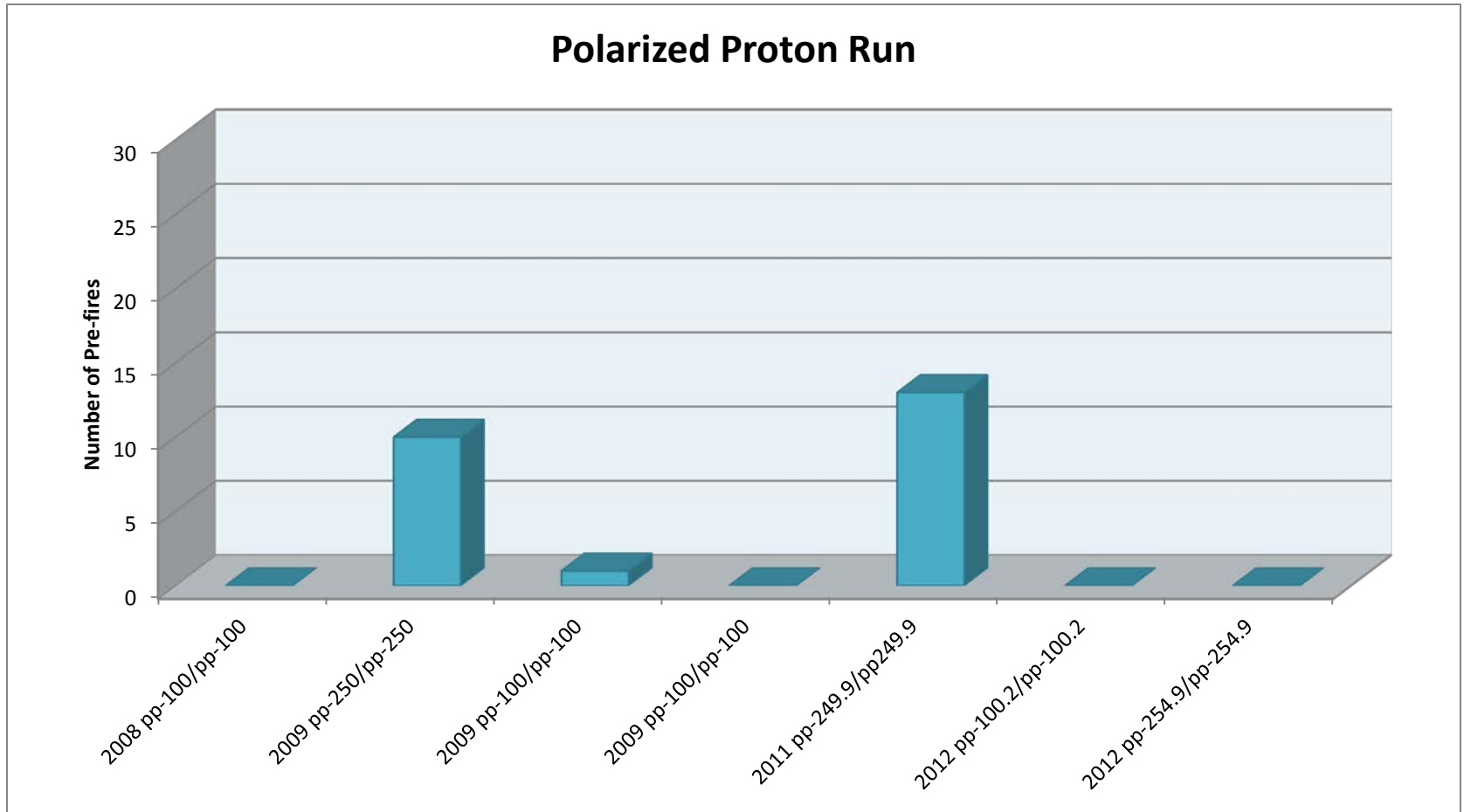
Heavy Ion Run



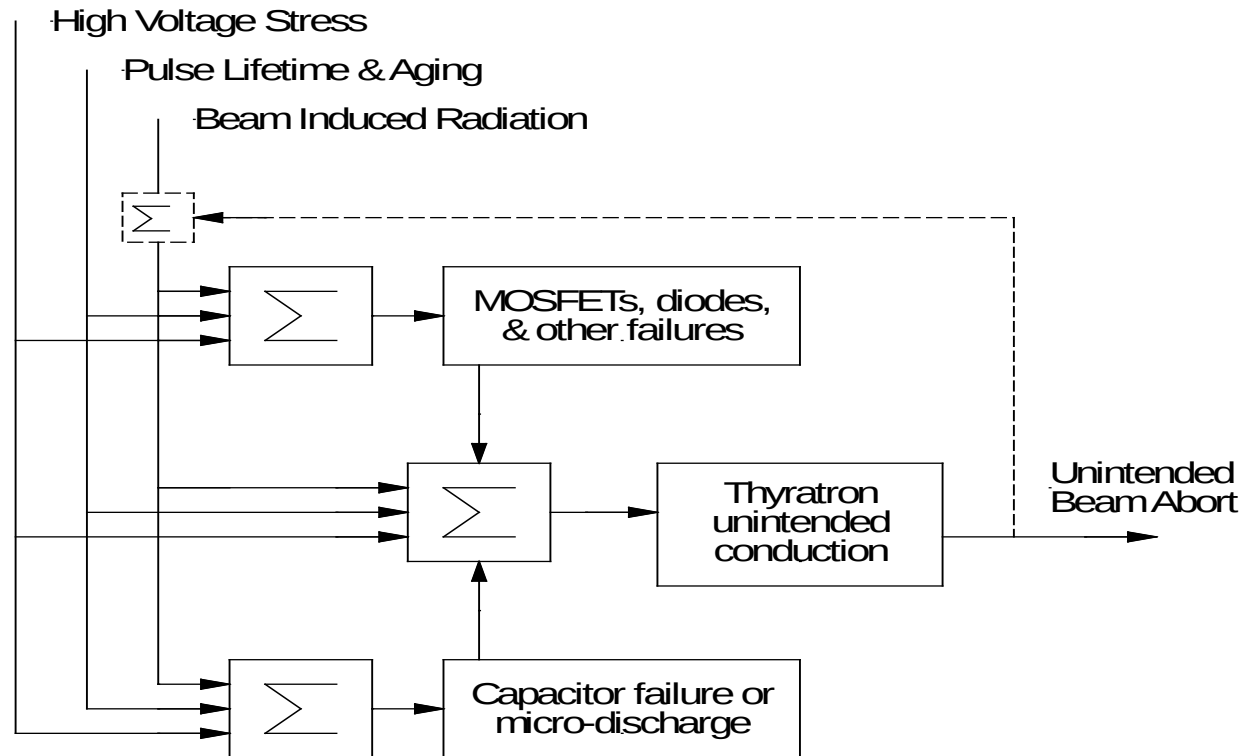
Low Energy Heavy Ion Run



Polarized Proton Run



Main Contributing Factors



Response Actions

- Reduce reservoir voltage slightly (0.1 to 0.2 V) to lower thyatron sensitivity to beam
 - Penalty: longer delay, slower current rise time, more beam loss if other unit pre-fired
 - Penalty: more difficult to conduct at injection energy
- Reduce charging voltage to lower high voltage stress on thyatron and capacitors
 - Penalty: lower deflection angle

Response Actions

- High voltage reconditioning of modulators
- Thyatron reconditioning
- Thyatron auxiliary checking and adjustments
- Replace damaged thyratrons in early 2000s
- Replace and upgrade high voltage trigger units
- Check and adjust thyatron timing alignment
- Surface Cleaning

Response Actions

- Replace damaged capacitors
 - A total of 78 capacitors have been changed, including 11 large metal enclosed ones and 67 thermal plastic case capacitors.
- Replace other damaged components
- Attempt to reduce beam loss at kicker locations