

RHIC Run17 Availability/Reliability

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RHIC Retreat
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U.S. DEPARTMENT OF
ENERGY

Office of
Science

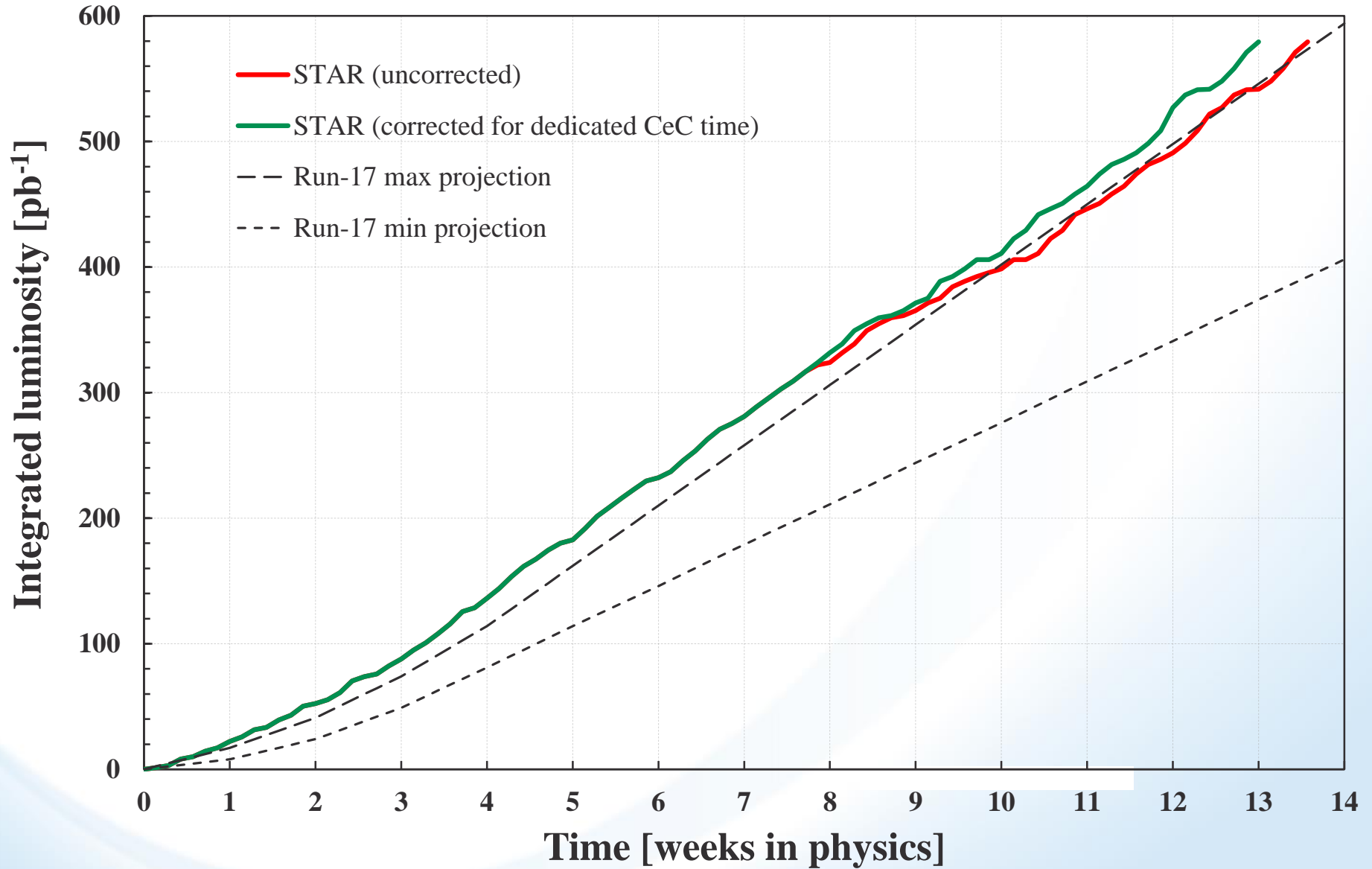
This Presentation

- Charts, Charts, and more boring charts.
 - Delivered Luminosity
 - Availability
 - Failures
 - “Witch Hunt”

The Bottom Line

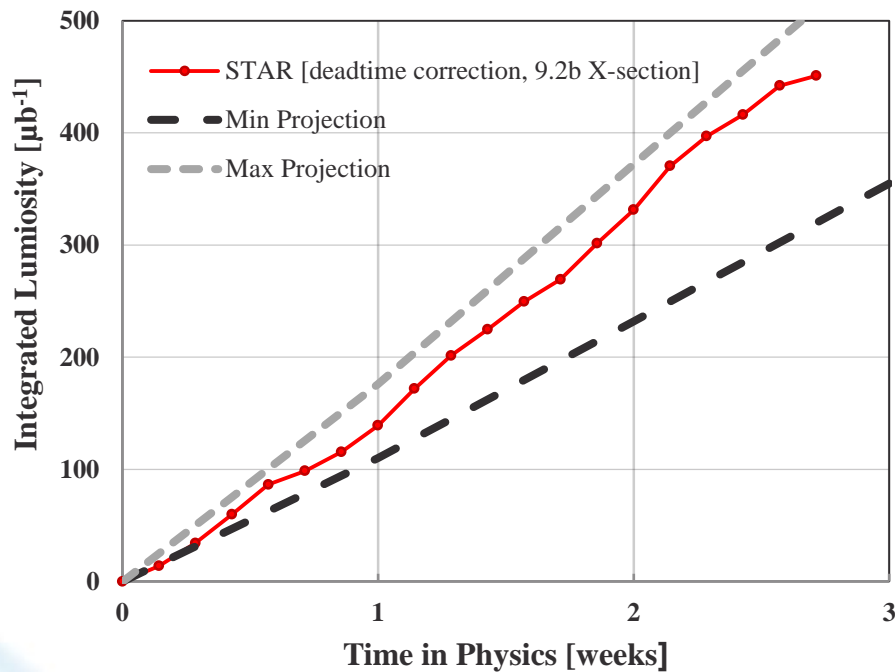
- Delivered Luminosity for
 - **p↑+p↑ at $\sqrt{s} = 510$ GeV**
 - **Au + Au at $\sqrt{s} = 54.4$ GeV**
 - **RHICf at $\sqrt{s} = 510$ GeV**

RHIC Run-17 delivered luminosity, $p\uparrow+p\uparrow$ at $\sqrt{s} = 510$ GeV

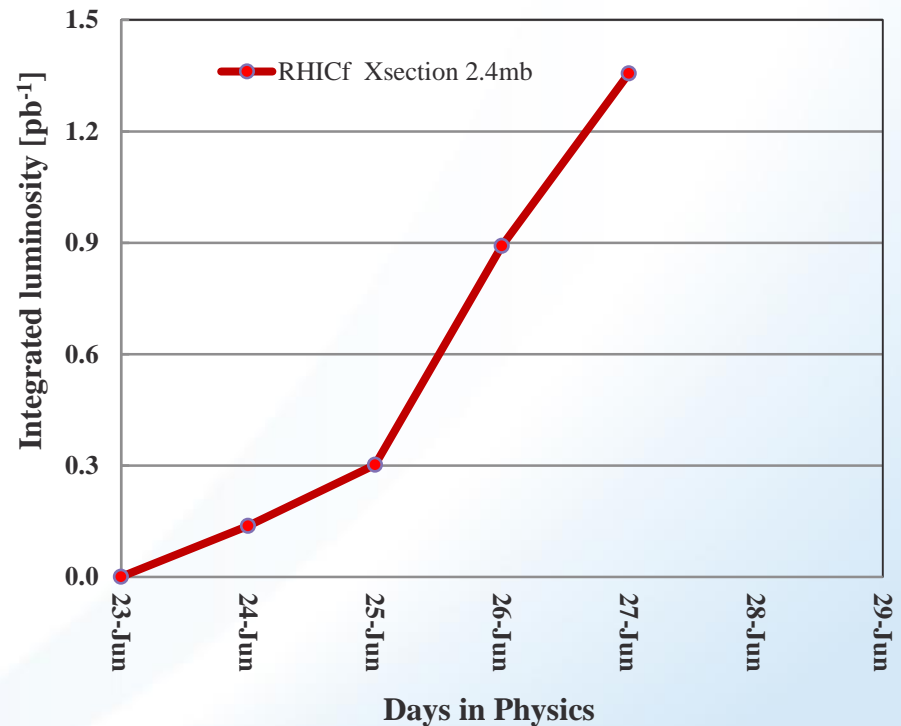


Run17 Gold Operations & RHICf

Integrated Luminosity
Run17 27.2Gev Au x 27.2 GeV Au



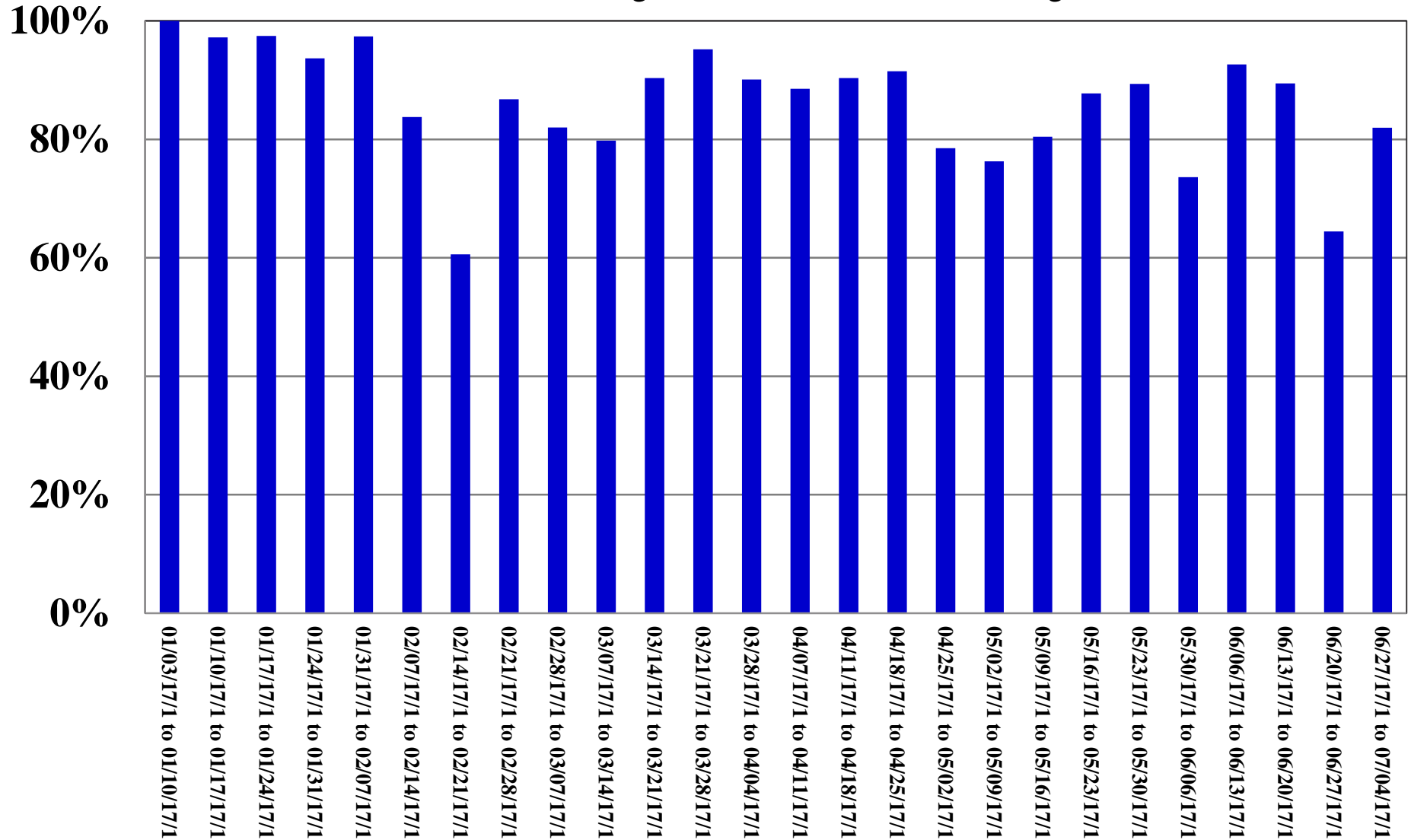
RHIC Run-17 RHICf delivered luminosity, $p\uparrow+p\uparrow$ at $\sqrt{s} = 510$ GeV



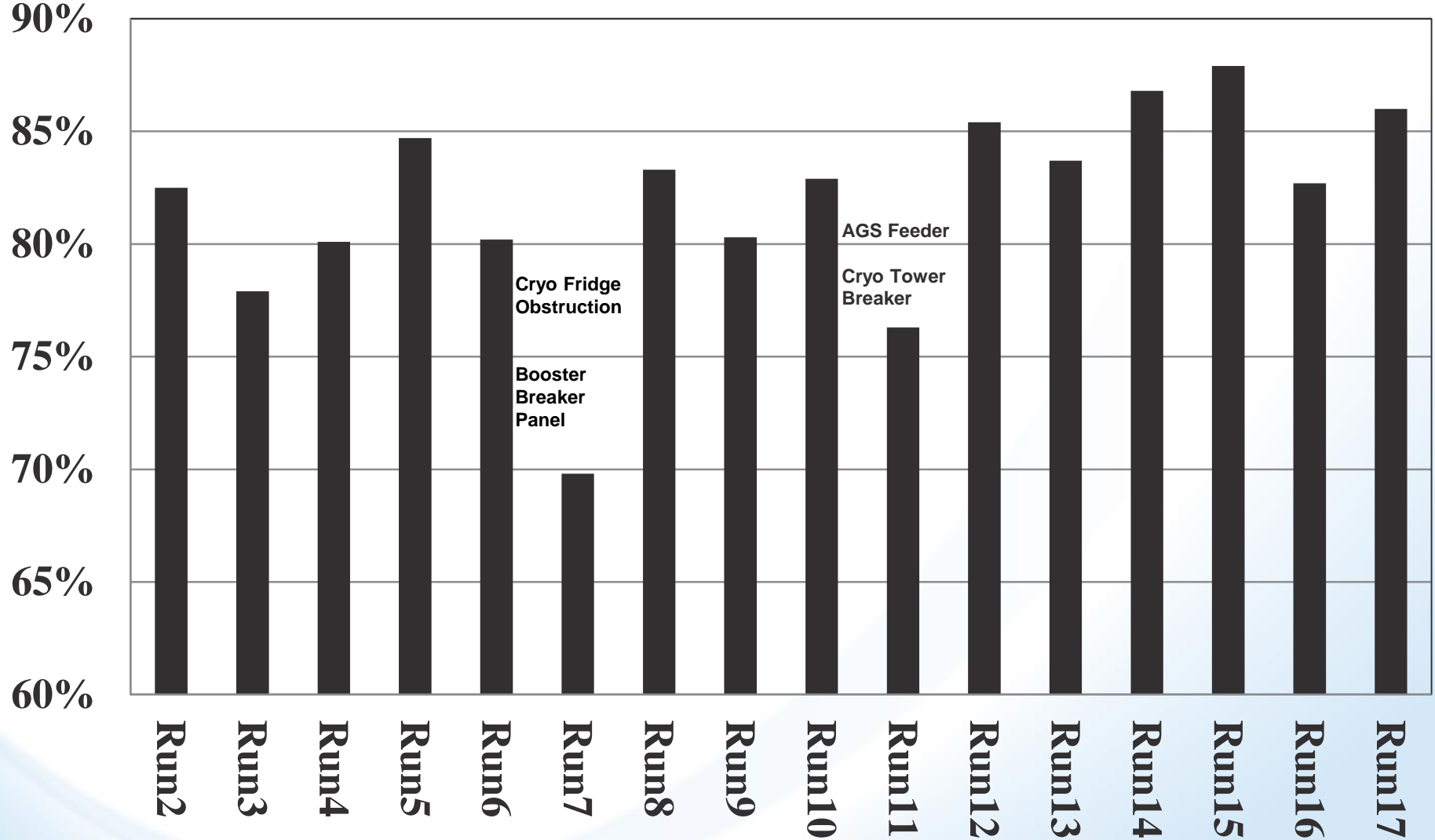
Availability

- Run17 Availability by week
- RHIC Availability by Run
- RHIC Availability comparison
 - p⁺ \sqrt{s} =~250 GeV Runs
 - p⁺ \sqrt{s} =100 GeV Runs
 - Au \sqrt{s} =100 GeV Runs

Run17 Weekly Availability 86%

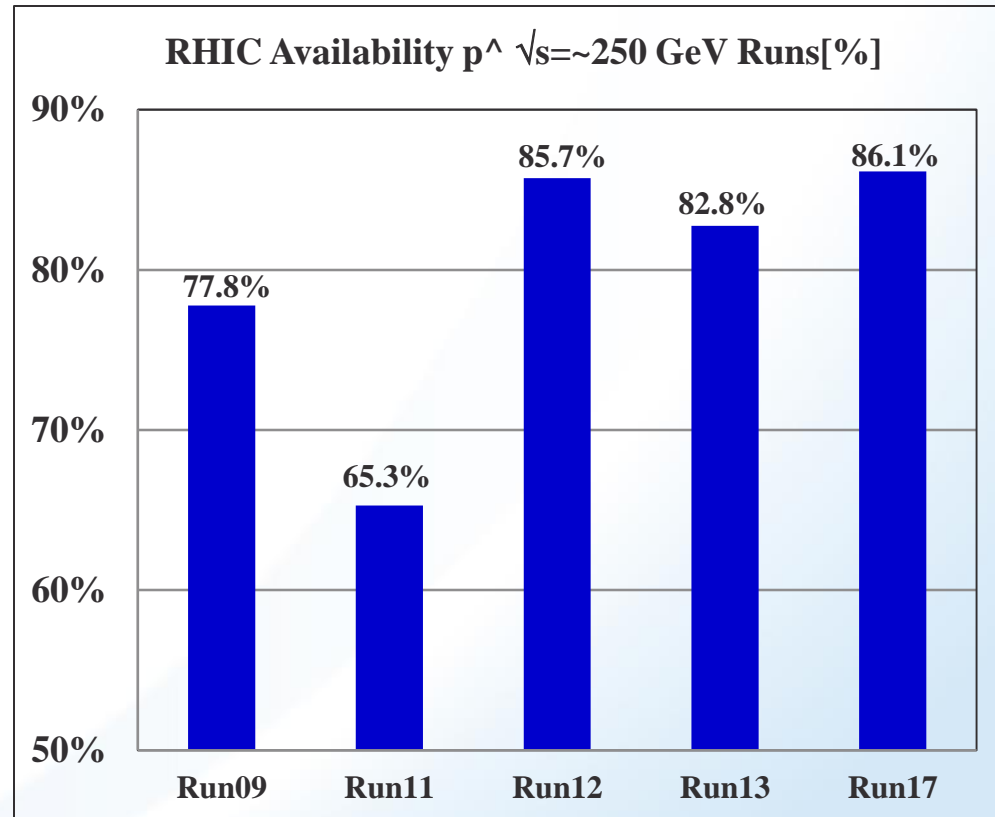


RHIC Availability by Run [%]



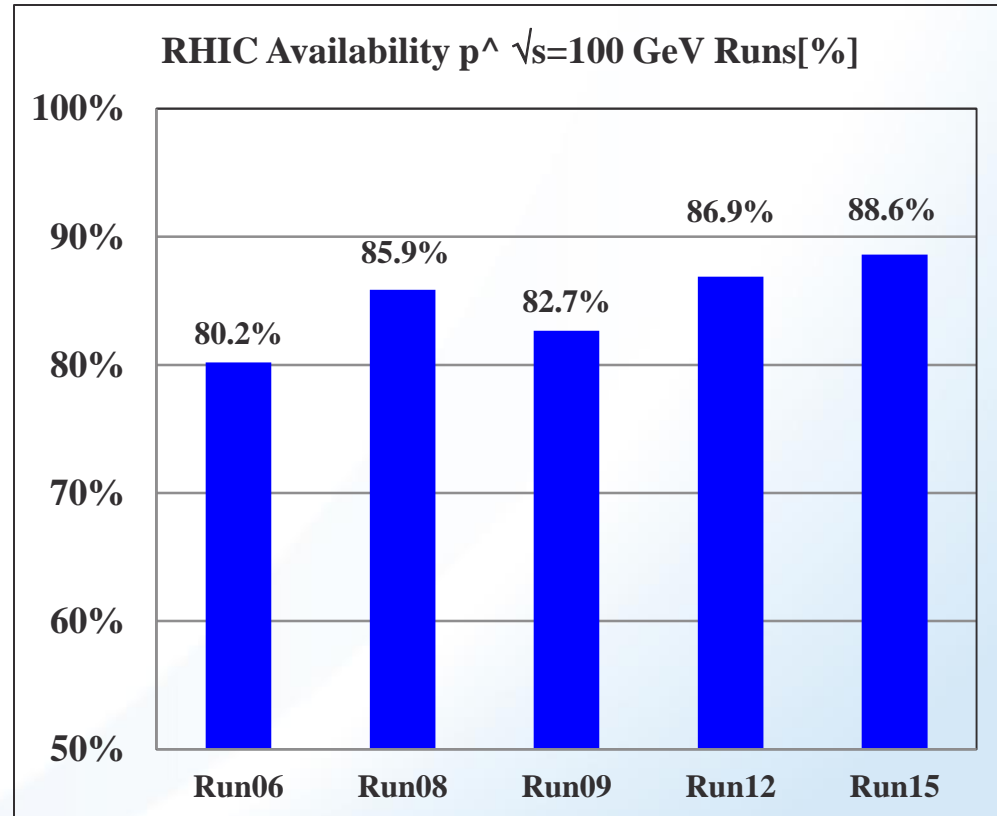
RHIC Availability $p^{\wedge} \sqrt{s} \sim 250$ GeV Runs[%]

Run#	Physics dates	Availability
Run09	03/06/09 - 04/13/09	77.8%
Run11	02/11/11 - 04/17/11	65.3%
Run12	03/16/12 - 04/18/12	85.7%
Run13	03/10/13 - 06/10/13	82.8%
Run17	2/24/17 - 05/29/17	86.1%
	average	79.5%



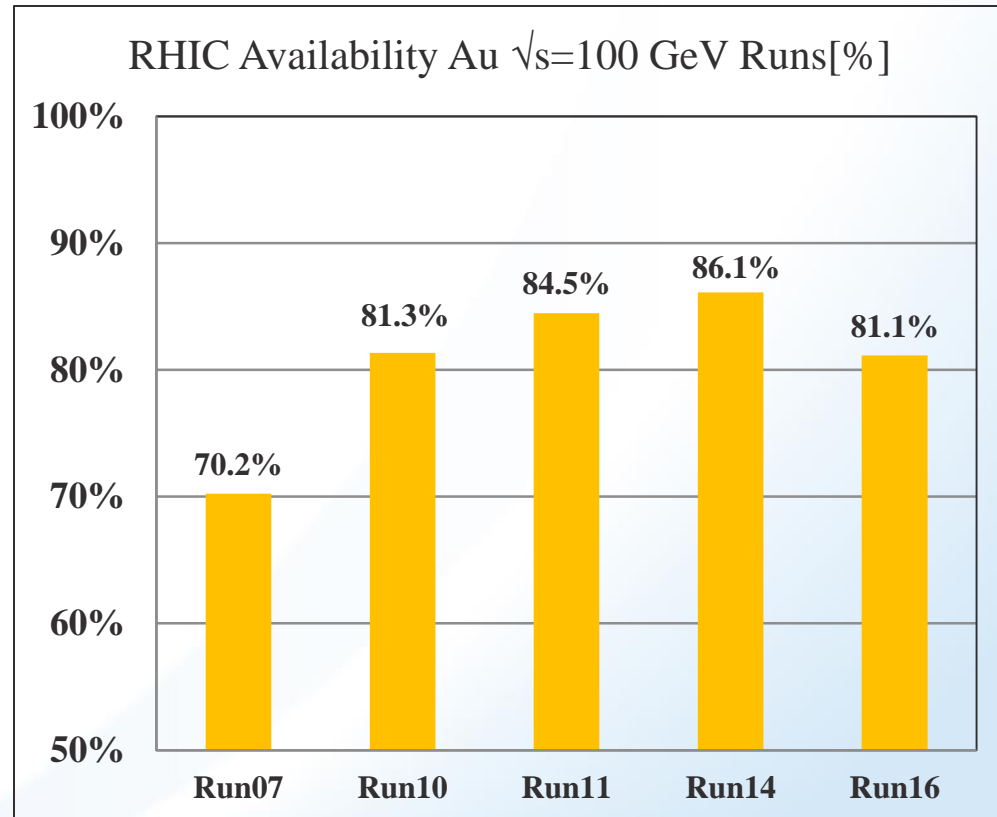
RHIC Availability $p^{\wedge} \sqrt{s}=100$ GeV Runs[%]

Run#	Physics dates	Availability
Run06	02/23/06 - 06/05/06	80.2%
Run08	02/15/08 - 03/11/08	85.9%
Run09	04/20/09 - 07/04/09	82.7%
Run12	02/10/12 - 03/12/12	86.9%
Run15	02/10/15 - 04/27/15	88.6%
	average	84.8%



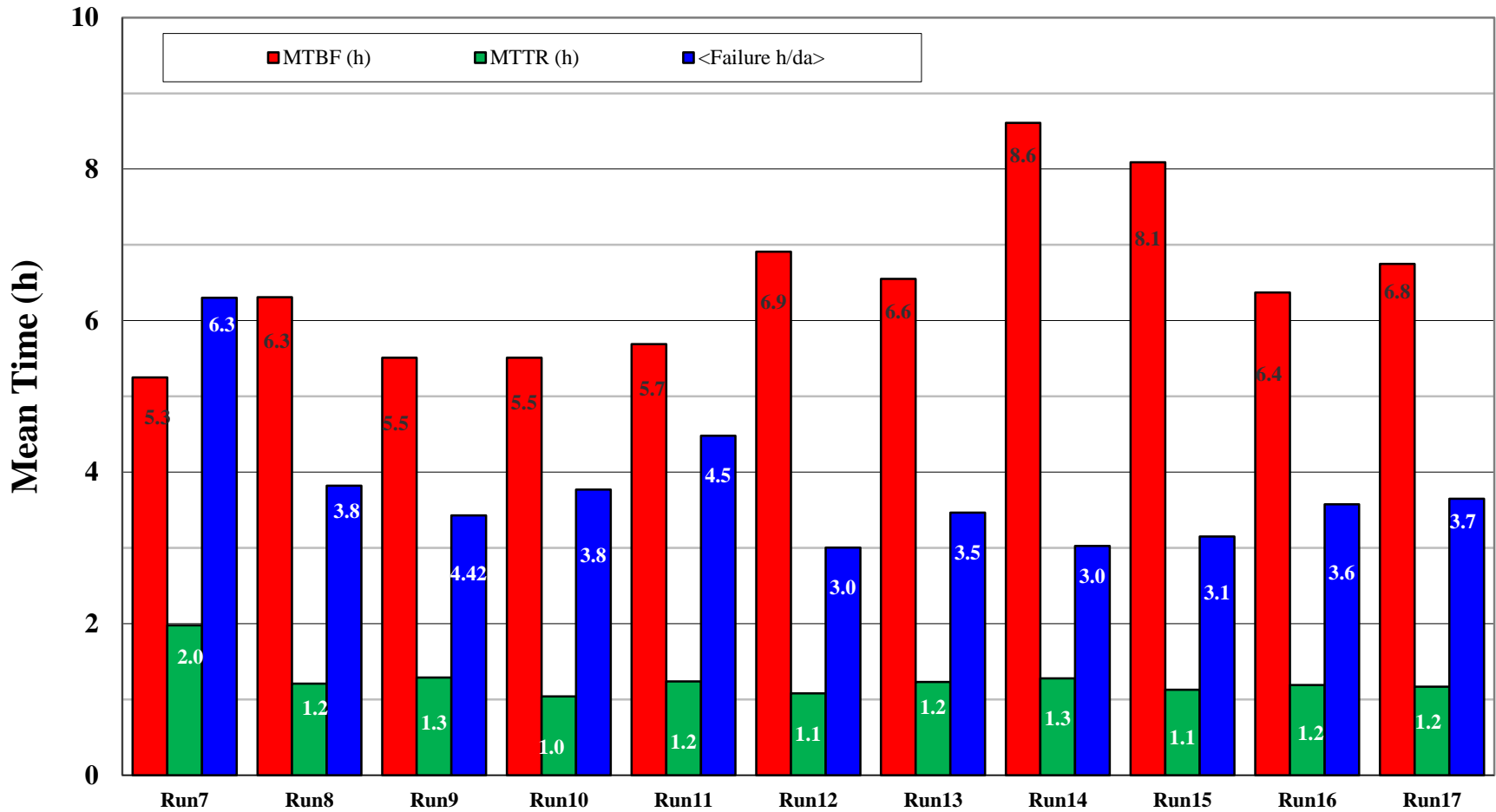
RHIC Availability Au $\sqrt{s}=100$ GeV Runs[%]

Run#	Physics dates	Availability
Run07	03/26/07 - 06/27/07	70.2%
Run10	12/31/09 - 03/19/10	81.3%
Run11	05/06/11 - 06/20/11	84.5%
Run14	03/15/14 - 06/16/14	86.1%
Run16	02/07/16 - 05/10/16 06/17/16 - 06/28/16	81.1%
	average	80.7%



RHIC + Injectors

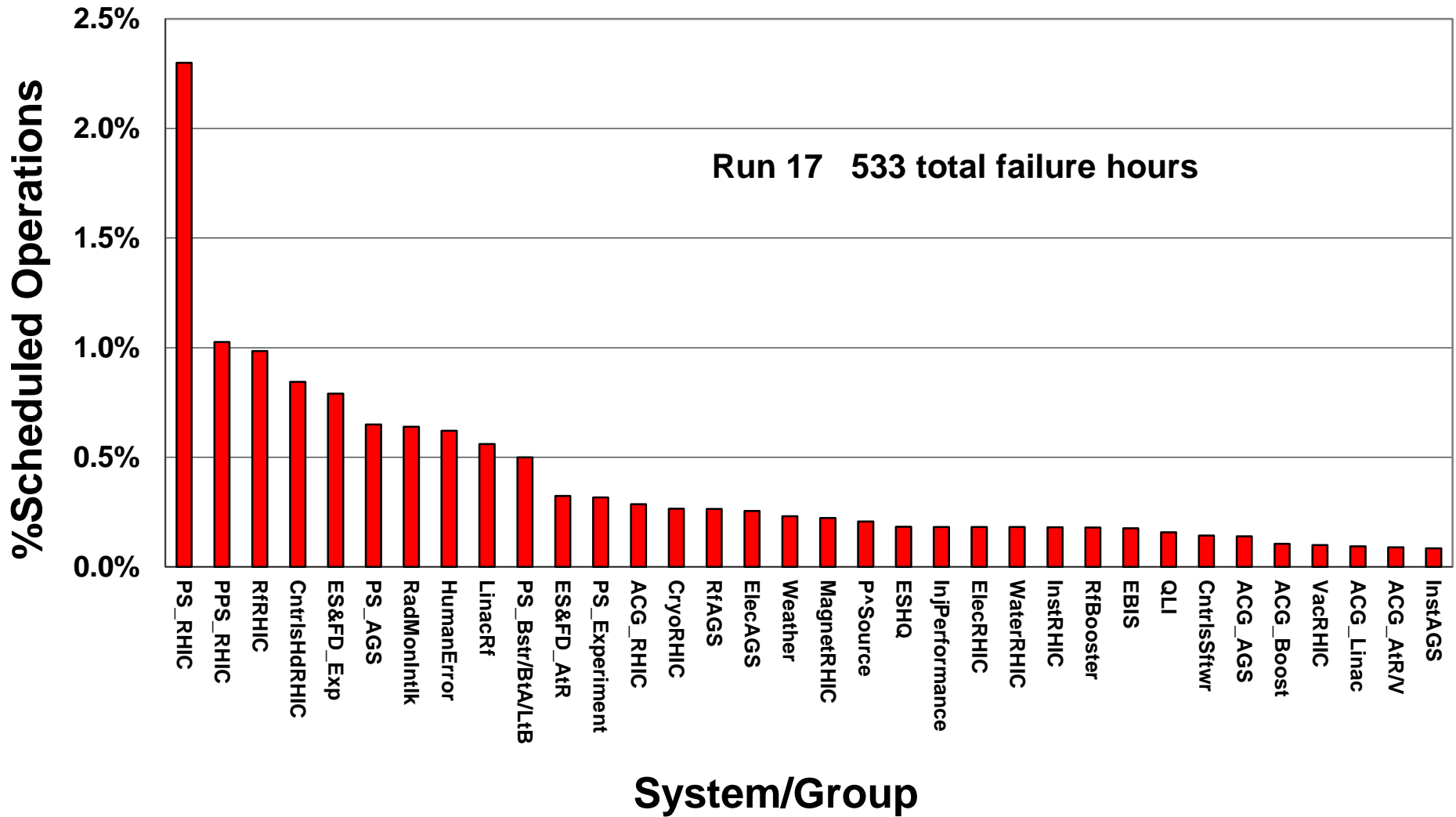
MTBF, MTTR, <Failure hours/da>



Failures

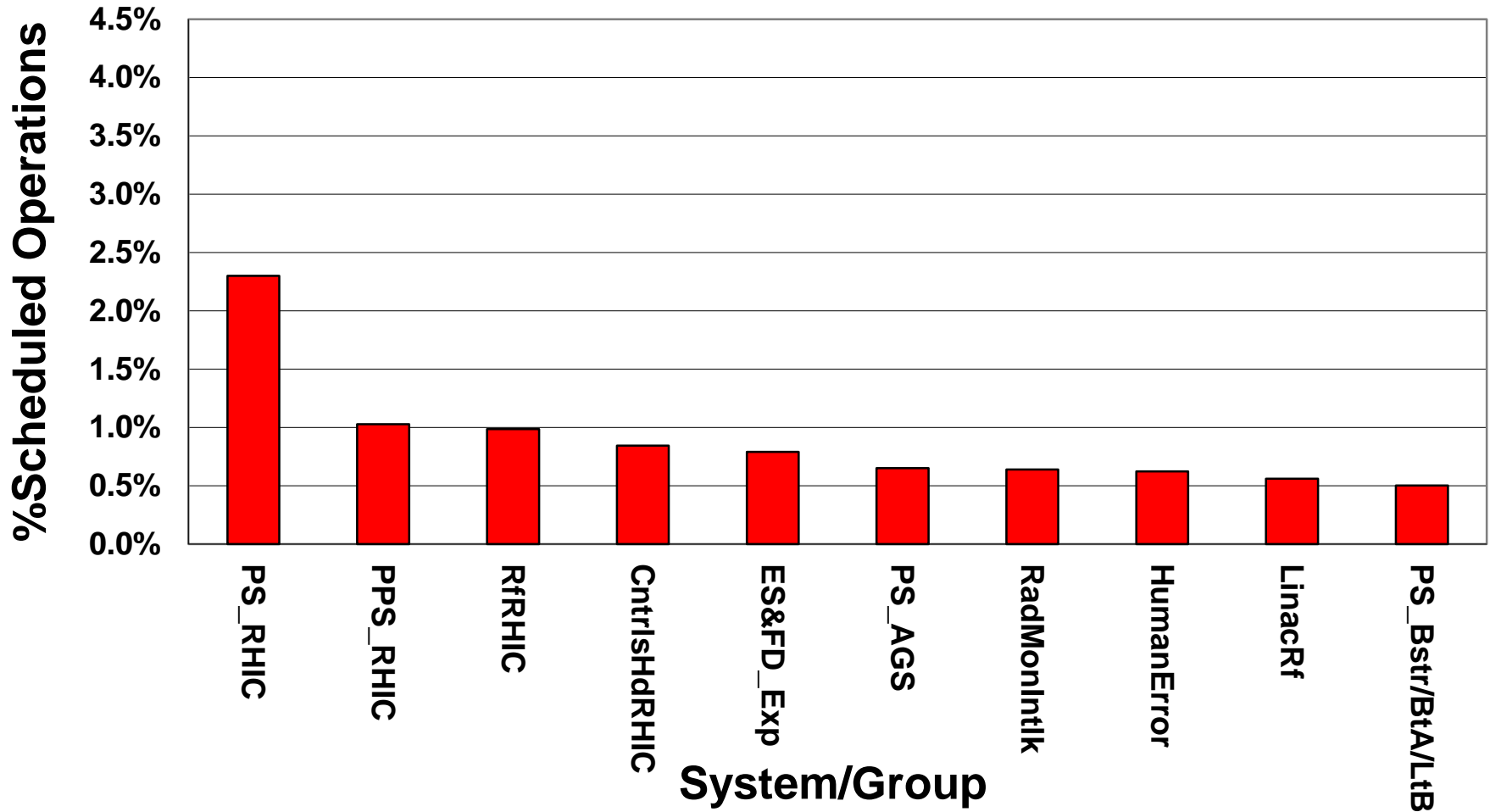
- Run17 System Failures
- Run17 “Top Ten (failure)” list
- Recurring system failures for $p^{\wedge} \sqrt{s}=250$ GeV Operations

Run17 Failures by Group/System



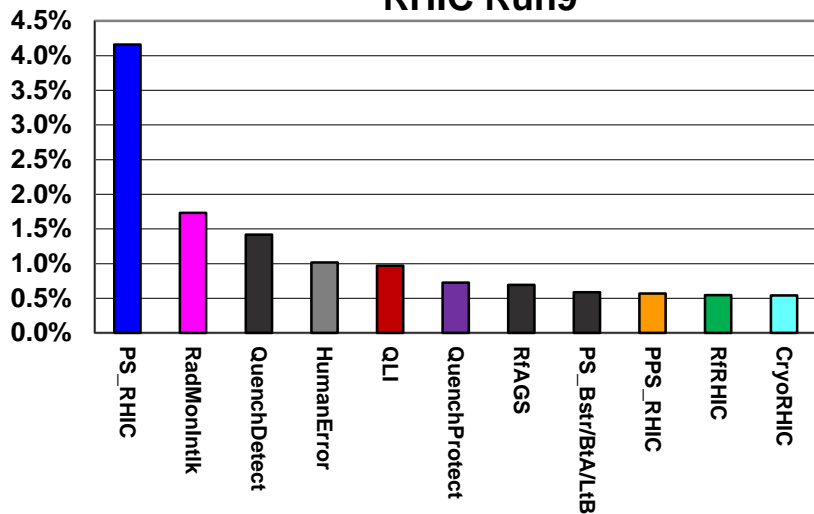
Run17 Top 10 Failures by Group/System

RHIC Run17 Failure Hours (> 1 hr.) by System/Group

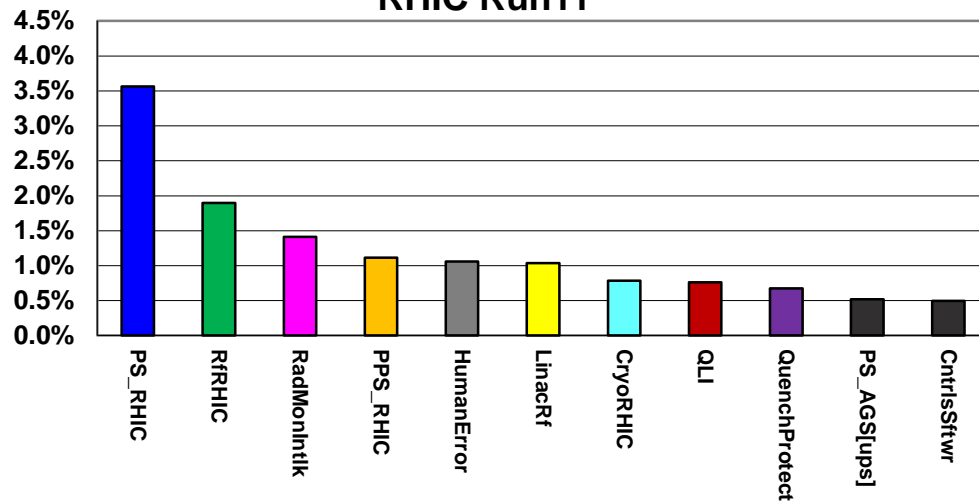


Top ELEVEN Failures $p^{\sqrt{s}}=250$ GeV Operation

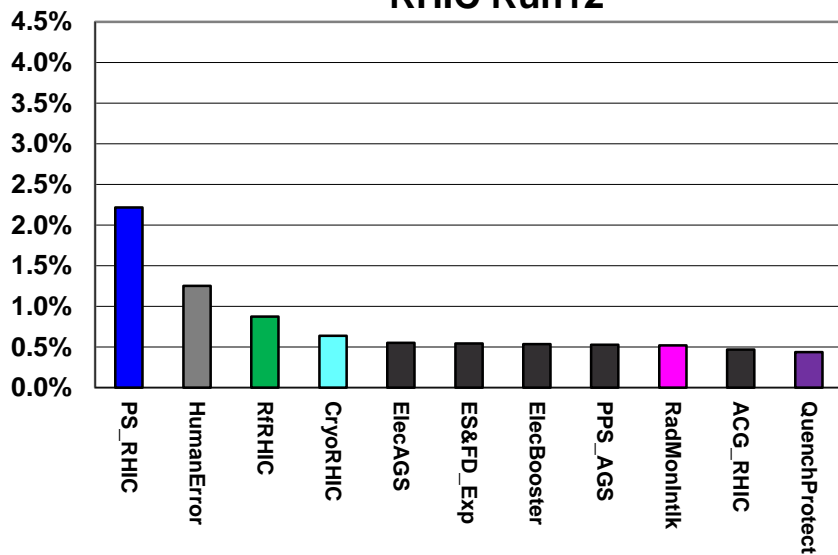
RHIC Run9



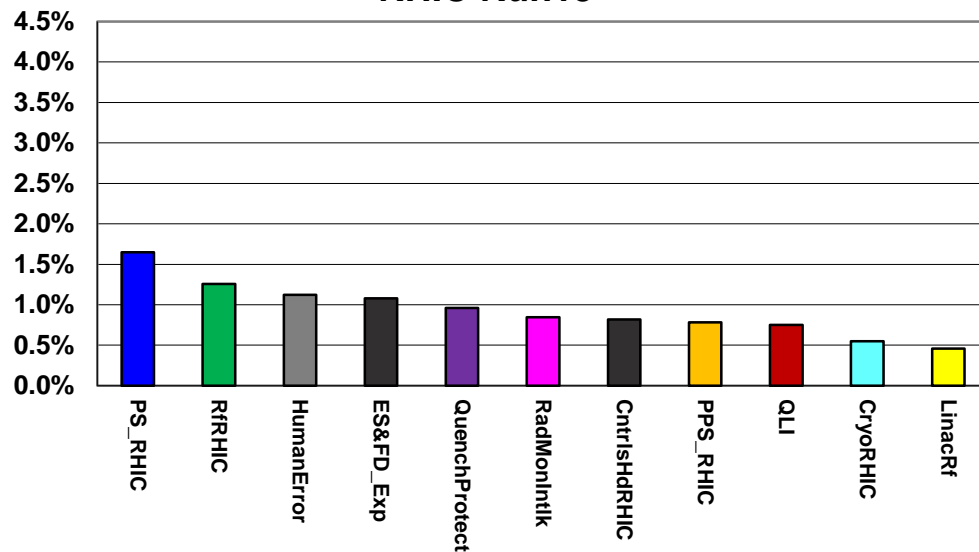
RHIC Run11



RHIC Run12



RHIC Run13



Recurring (failure) themes ($\sqrt{s}=250$ GeV p⁺ operation)

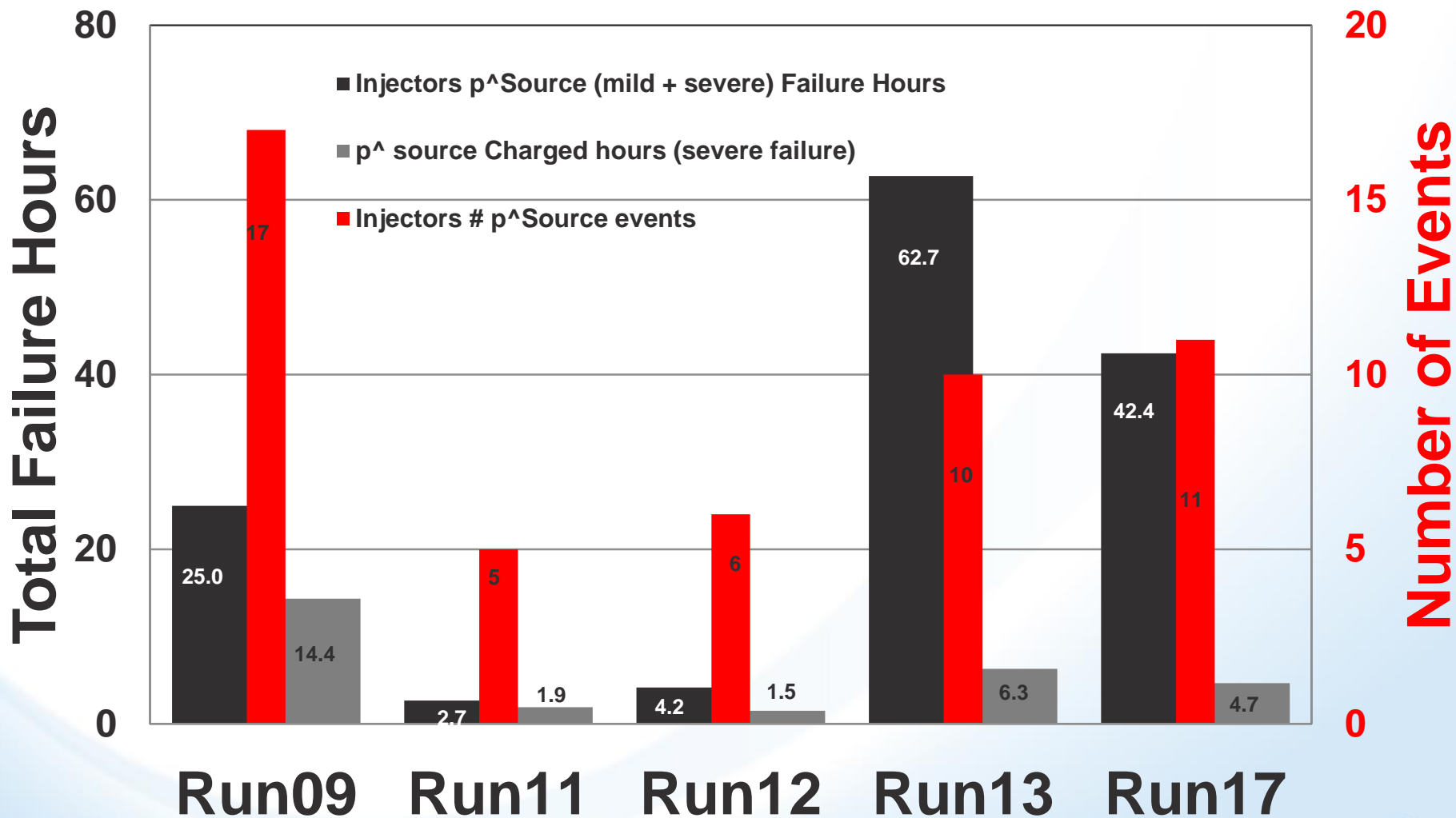
		Ranking in "TOP TEN LIST"				
System		Run17	Run13	Run12	Run11	Run09
PS_RHIC	(5/5)	1	1	1	1	1
RF_RHIC	(5/5)	3	2	3	2	10
Human Error	(5/5)	8	3	2	5	4
Rad Mon Permit Pulls	(5/5)	7	6	9	3	2
PPS_RHIC	(4/5)	2	8		4	9
Quench Protect	(4/5)		5	11	9	6
Cryo RHIC	(4/5)		10	4	7	11
Linac Rf	(3/5)	9	11		6	
QLI	(3/5)		9		8	5

Witch Hunt

- An attempt to determine the (failure) impact of some systems on the ability of the injector physics group to perform machine development behind RHIC stores.
- Systems looked at (mild + severe failures vs severe failures) for $p^{\wedge} \sqrt{s}=250$ GeV Operations
 - p^{\wedge} source
 - AGS Power Supplies
 - LINAC
 - Access Controls
 - Air Conditioning

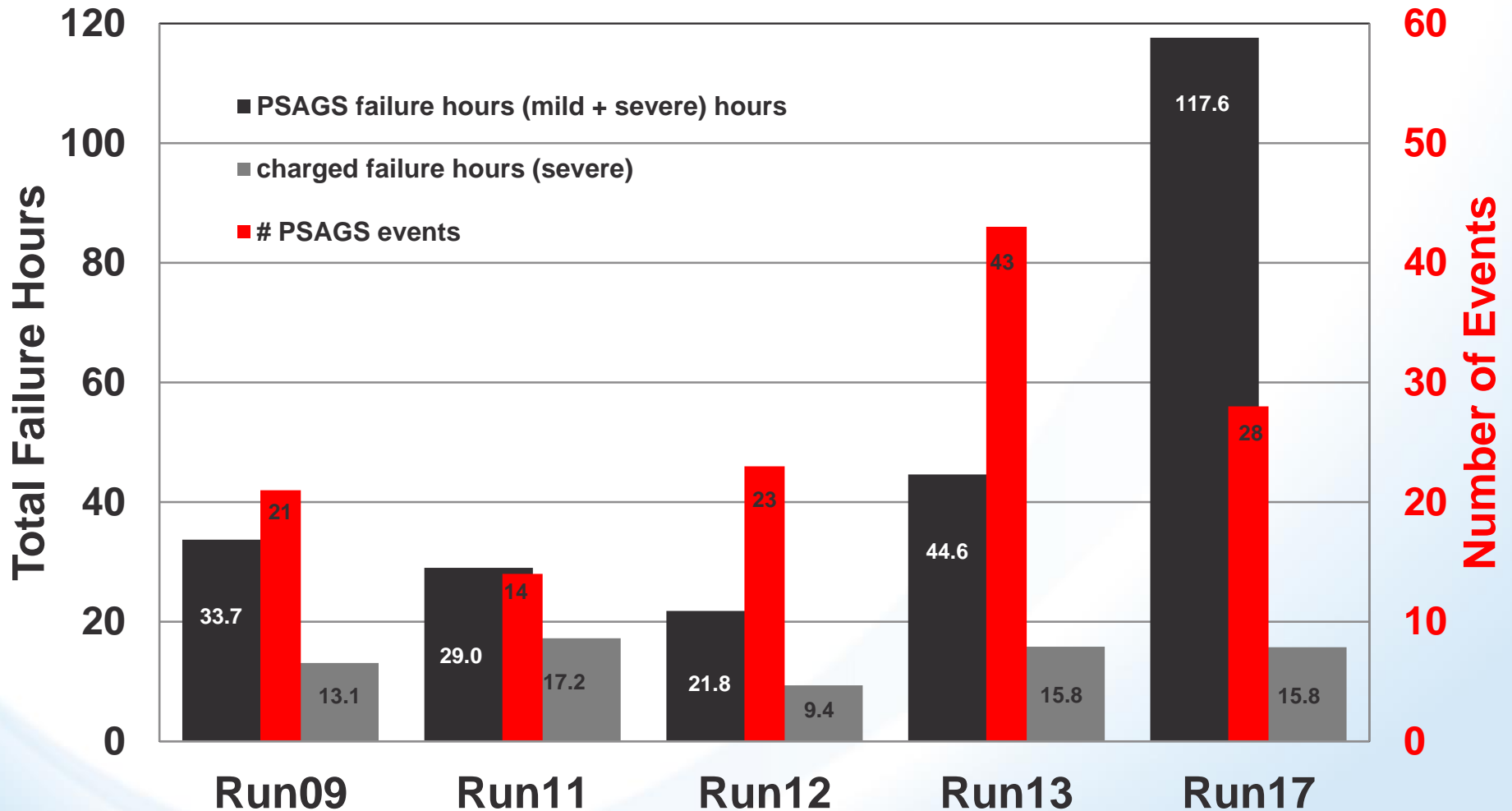
p^ Source

Total p^ Source failure hours by p^ $\sqrt{s}=510$ Runs



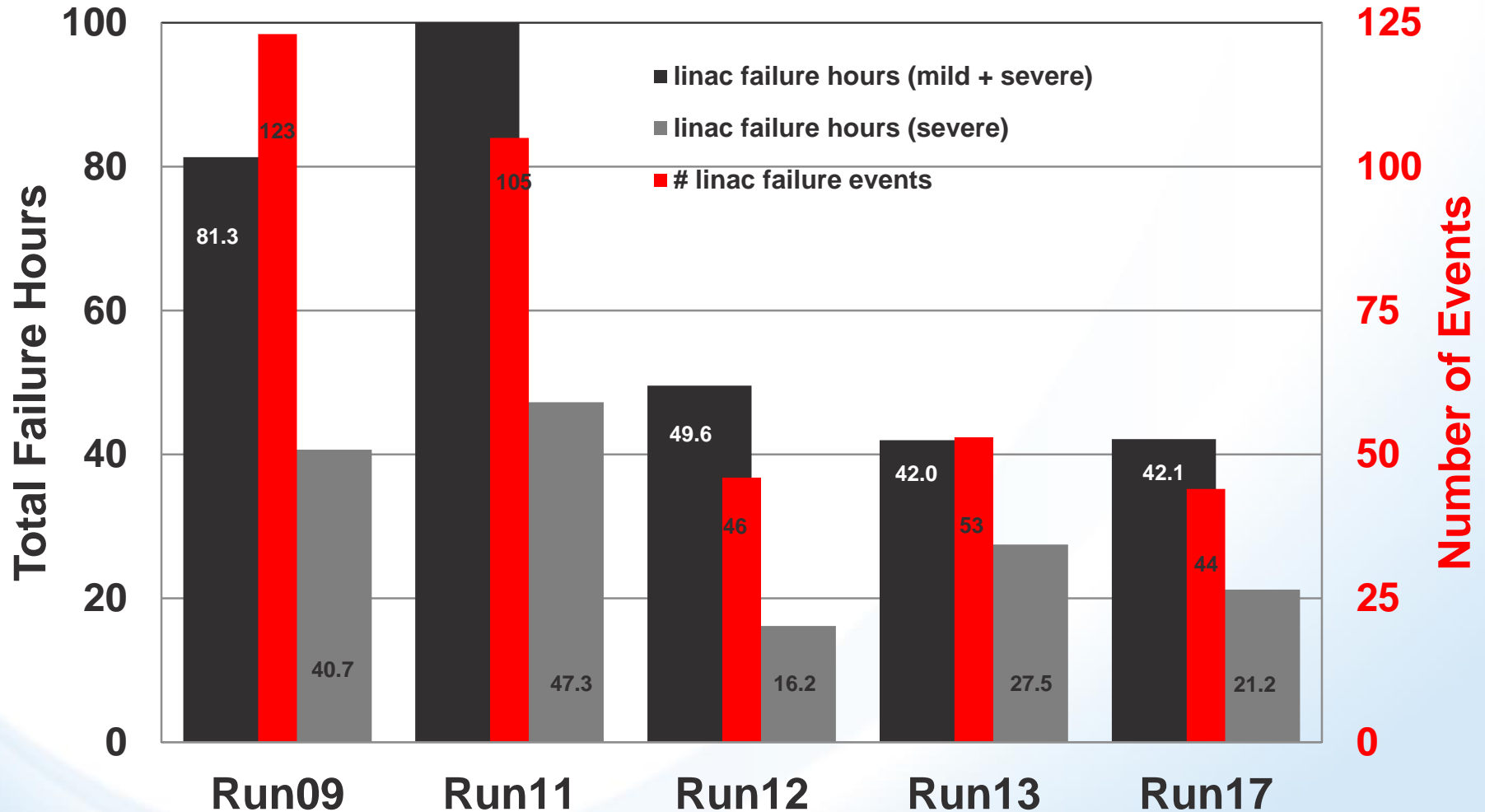
AGS Power Supplies

Total PS AGS failure hours by p[√]s=510 Runs



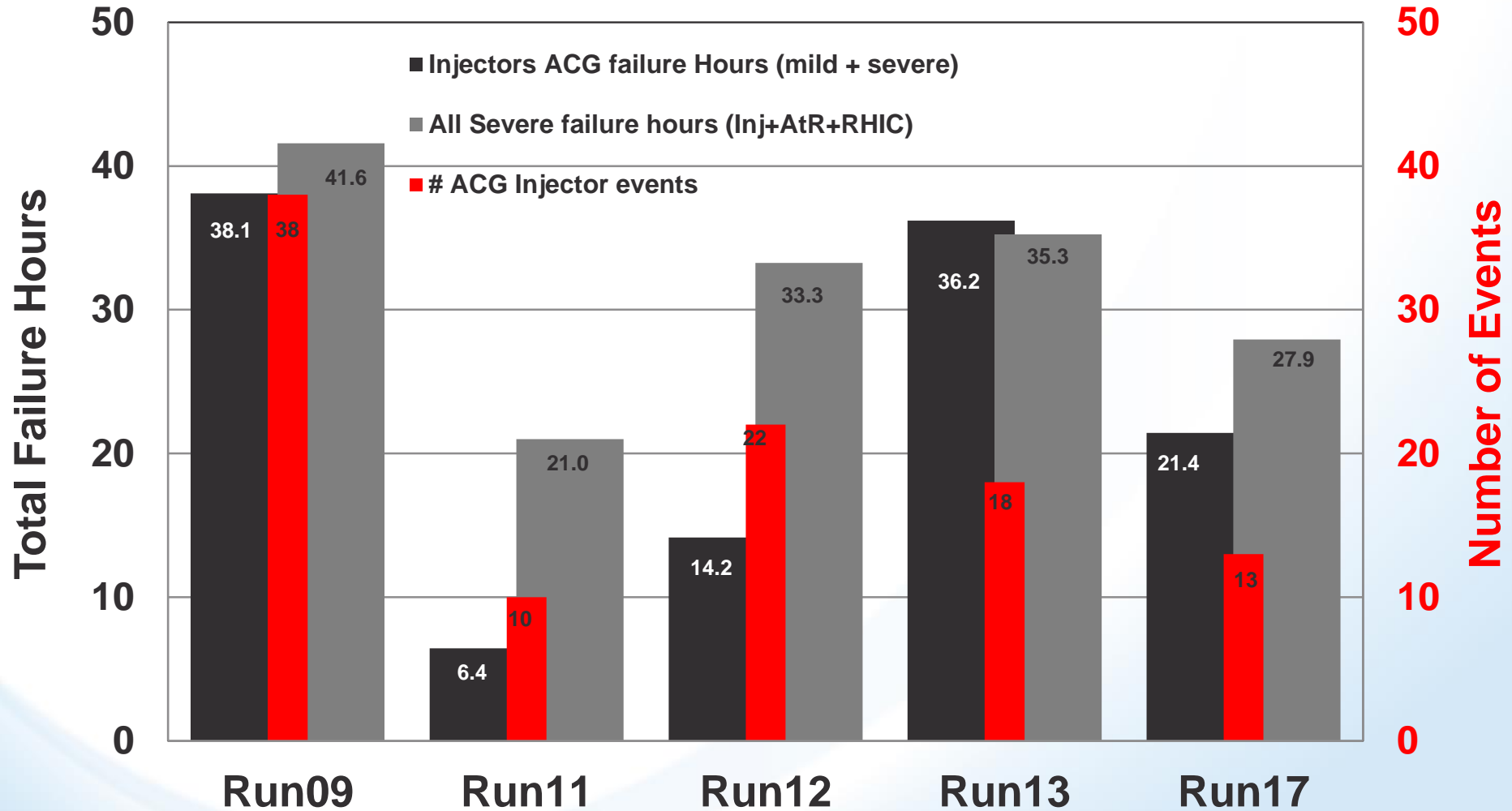
LINAC (BLIP not included)

Total LINAC failure hours by $p^{\sqrt{s}}=510$ Runs



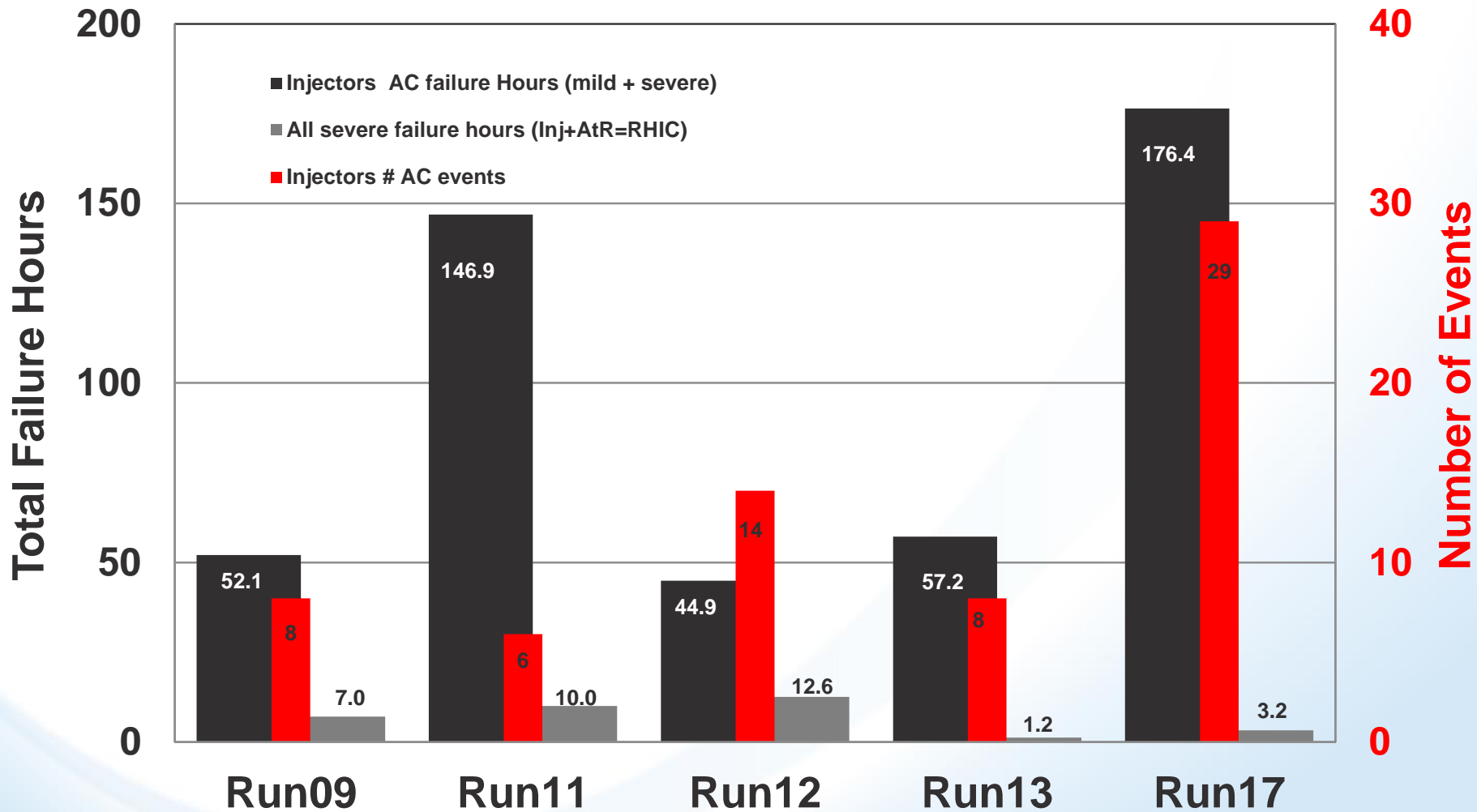
Access Controls

Total Injector Access Controls failure hours by p[√]s=510 Runs



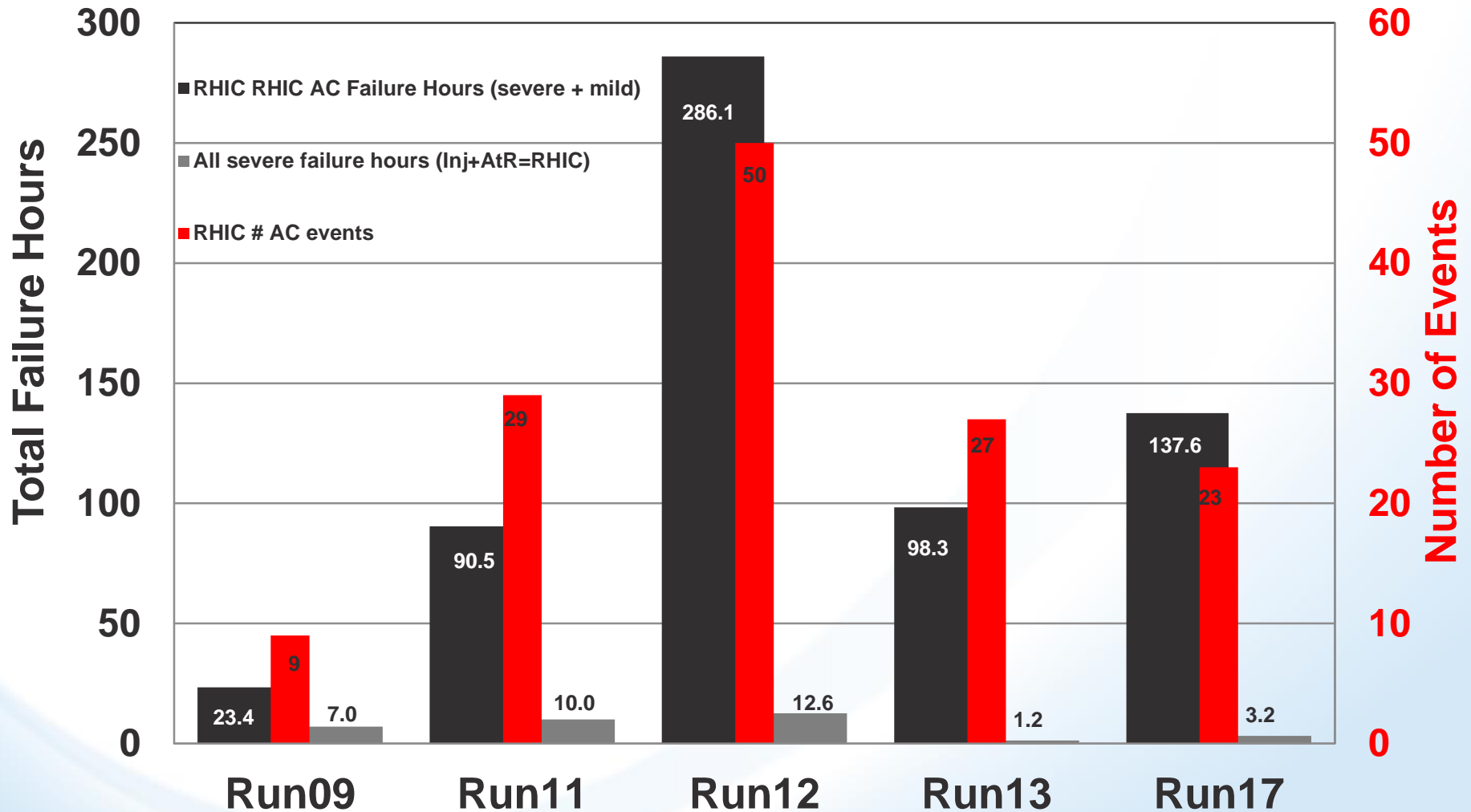
Air Conditioning

Total Injector AC failure hours by p[√]s=510 Runs



Air Conditioning – Bonus

Total RHIC AC failure hours by $p^{\sqrt{s}}=510$ Runs



Conclusions

- Run 17 Availability for p^{\wedge} at $\sqrt{s} = 500$ GeV was the best recorded.
 - We do better at p^{\wedge} $\sqrt{s} = 200$ GeV
- Magnitude of “Mild” failure hours for some systems may come as a surprise – still – P. Sampson and support groups do a fine job of minimizing downtime.
- Haixin’s complaints about AGS p^{\wedge} Machine Development time lost to failures are real.
 - LINAC is not a suspect.
- Air Conditioning remains an issue at C-AD