Run 17 Report

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For the STAR Collaboration

June 22, 2017

Outline

- BUR and Physics goals
- Detector upgrades for Run 17
- Running performance and datasets
- Summary

Beam Use Request

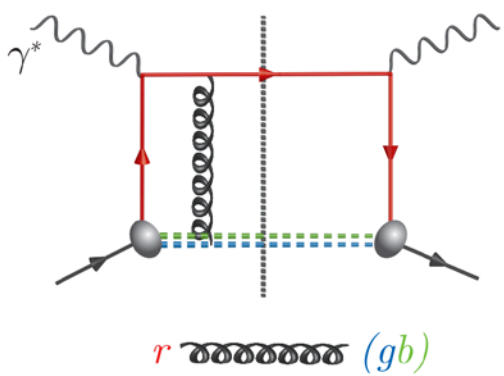
Run	Energy	Duration	System	Goals	priority	Sequence
17	$\sqrt{s_{NN}}$=510 GeV	13-wk	Transverse p+p	A_N of $W^{\pm}$, γ, Drell-Yan, L=400 pb^{-1}, 55% pol	1	1
		1-wk	p+p	RHICf		2
		2-wk	CeC			
	$\sqrt{s_{NN}}$=62.4 GeV	4-wk	Au+Au	Jets, dileptons, NPE 1.5B MB	3	3
18	$\sqrt{s_{NN}}$ =200 GeV	3.5-wk	Ru+Ru	1.2B MB	2	4
	$\sqrt{s_{NN}}$=200 GeV	3.5-wk	Zr+Zr	1.2B MB	2	5
	$\sqrt{s_{NN}}$=27 GeV	2-wk	Au+Au	>500M MB	3	6

- Highest priority: 13-week transverse pp510 (successful)
- 3-week AuAu54.4 + CeC (successful)
- 4-day RHICf (in progress)

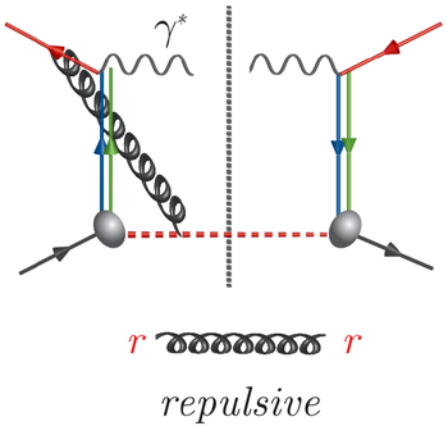
Transverse p+p at 510 GeV

- HP13 (2015): Test unique QCD predictions for relations between single-transverse spin phenomena in p-p scattering and those observed in deep-inelastic lepton scattering
- Simultaneously measure A_N of **W±/Z**, **Drell-Yan**, **direct-γ**, which are all sensitive to **<u>Sivers function sign change</u>**.
- Access TMD evolution at different Q^2 and unknown sea quark Sivers function.

DIS



Drell-Yan



Au+Au at 54.4 GeV

- Theoretical calculations suggest that the partonic coupling to the medium is stronger when temperatures are close to the critical value.
- We aim to measure:
  - Non-photonic electron v2 -- confirm that this enhanced coupling results in the partial thermalization of charmed quarks even at this low energy
  - Semi-inclusive recoil jet -- probe possible differences in the jet energy redistribution
  - Direct (virtual) photon -- improve our understanding of thermal photon production and their medium coupling
  - Using the FMS to constrain the longitudinal structure of the initial stages of HICs

RHICf

- Low luminosity radially polarized p+p collisions at 510 GeV
- Measure cross sections of forward particle production for Cosmic Ray physics
- Radial polarization to measure Single-Spin Asymmetry of forward particles

See Takashi Sako's talk on June 21, Wednesday.

STAR Detector Upgrades for Run 17

- Forward Meson Spectrometer (FMS) Post Shower
- FMS Ultra-Violet Curing System
- RHICf
- Event Plane Detector (EPD) quadrant
- Endcap Time of Flight detector (eTOF) prototype

* iTPC prototype Readout and FEE
* Test prototype calorimeters for fSTAR and EIC

FMS Preshower and Postshower

Preshower
scintillator
hodoscope

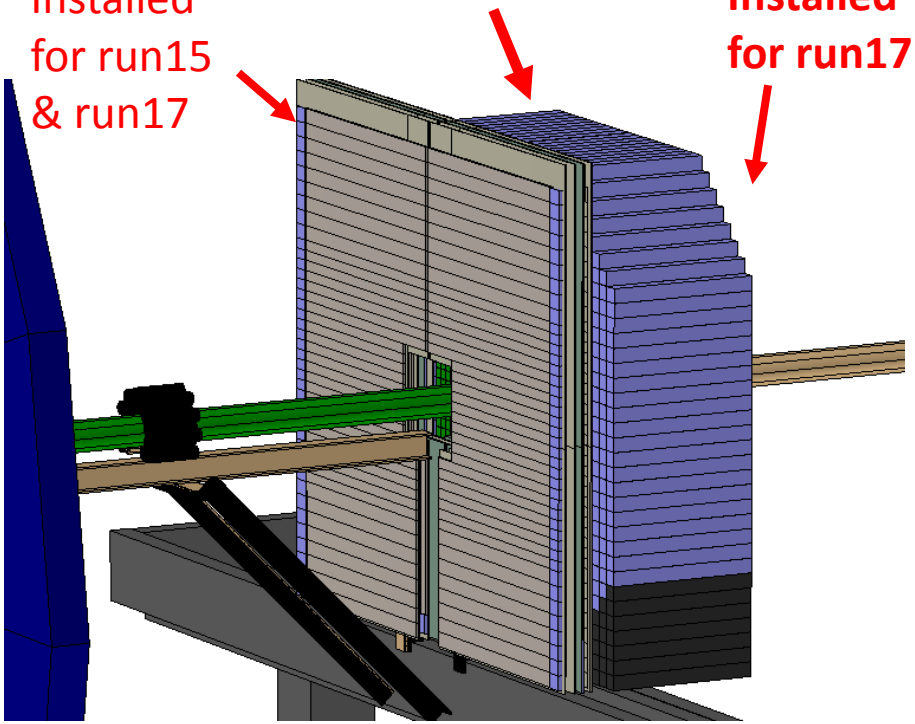
Installed
for run15
& run17

Forward Meson Spectrometer

476+788 PbGl towers

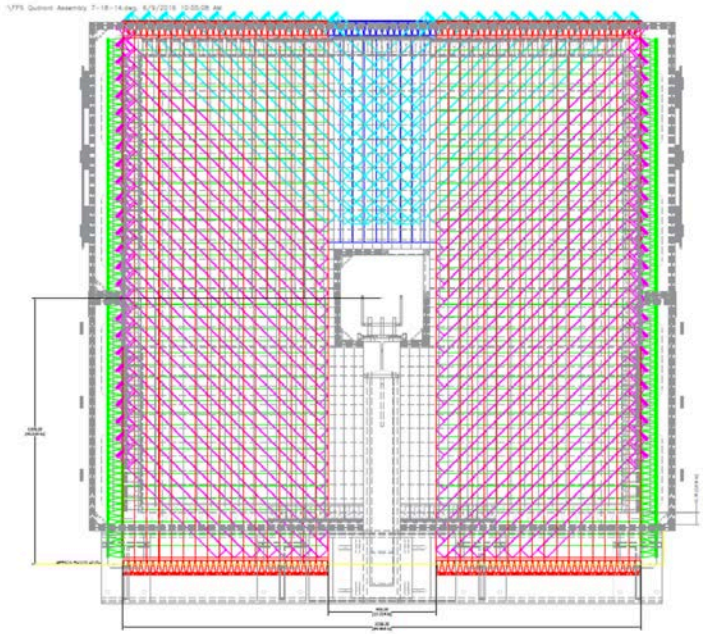
Postshower
scintillator
hodoscope

Installed for run17



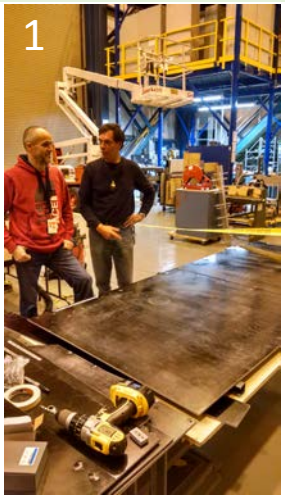
downstream from nominal interaction point

- Aim to provide electron/hadron discrimination



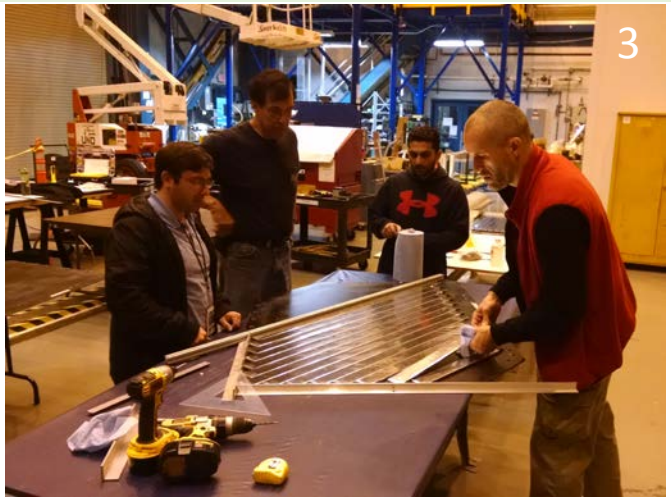
Front View of Postshower

FMS Post-shower Installation



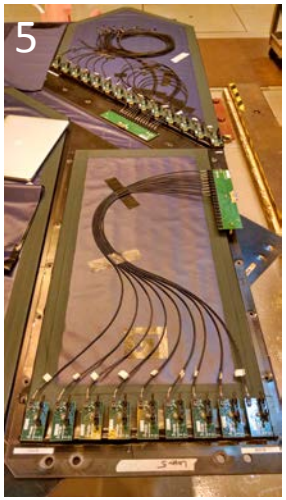
Start with pre-cut panels

Drill and tap for joining



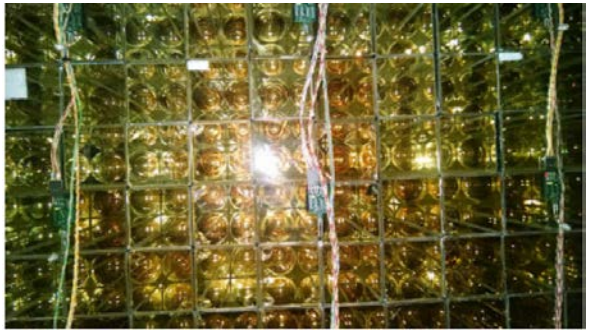
Glue on wrapped scintillators with light guides

Attach SiPMT boards

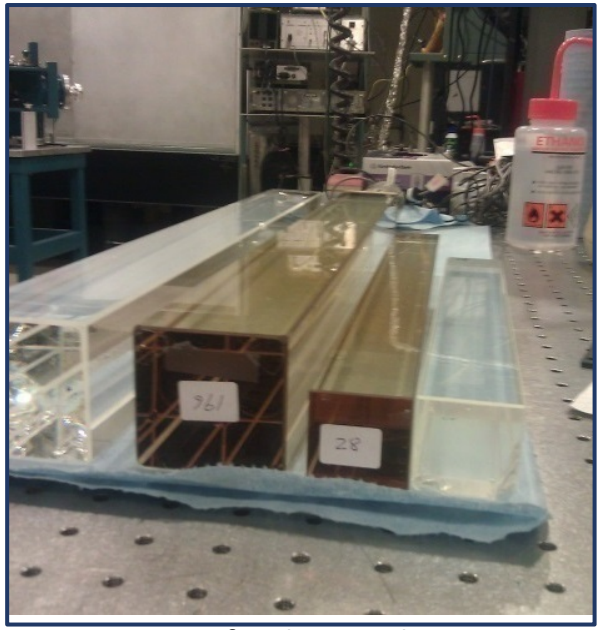


Install FEE boards & cables

FMS UV Curing System

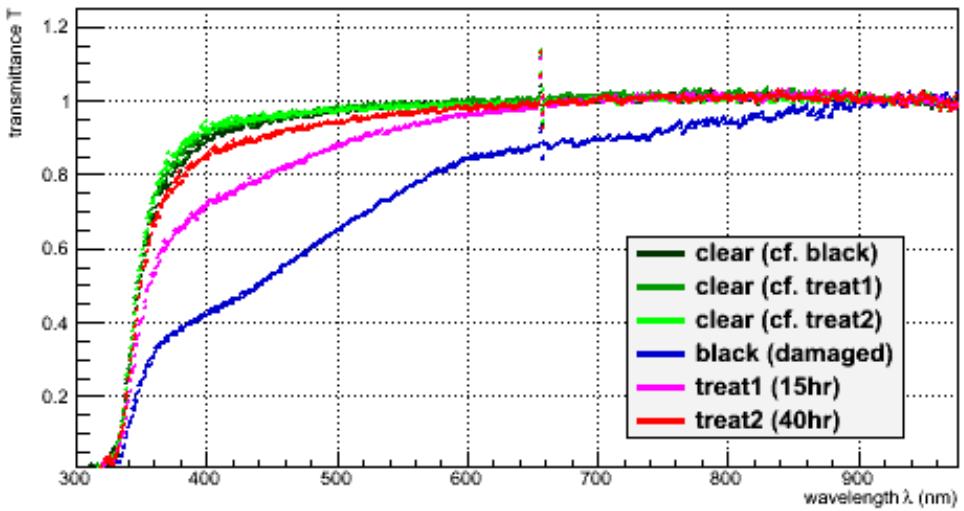


UV curing system



Curing of radiation damage

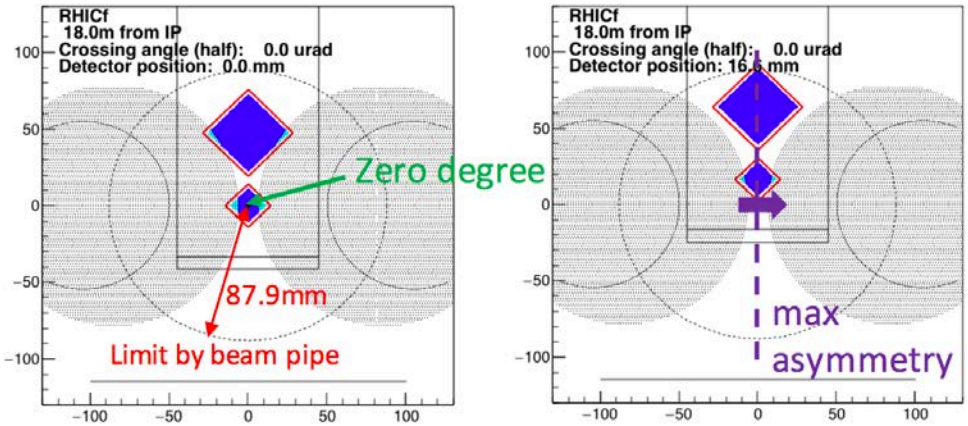
PbGl transparency after UV curing



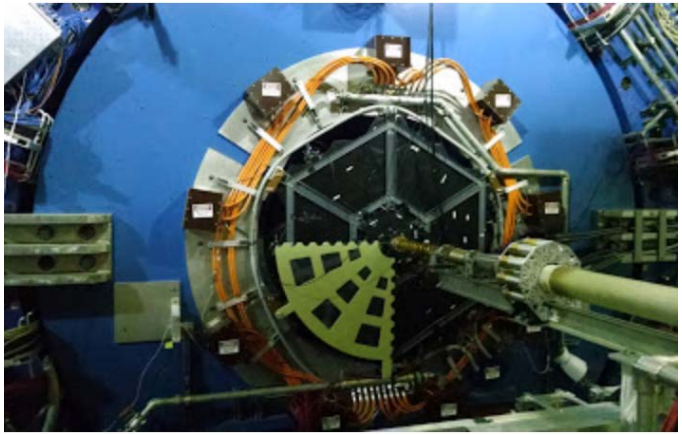
- Pb-glass annealed in sunlight before.
- New system to daily anneal in place with UV

RHICf

- The RHICf setup is a position sensitive calorimeter system to be positioned just in front of the ZDCs on the West side of STAR
- Detector installation and final check later today

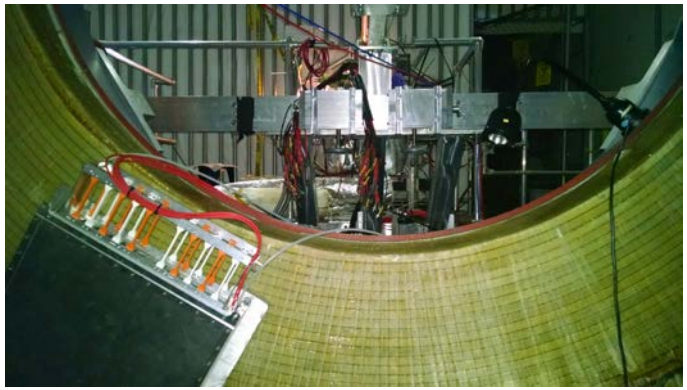


EPD and eTOF



EPD installed behind BBC on East side

- **E**vent **P**lane **D**etector
  - 1/8 installed for Run 17, working well
  - Construction of full EPD underway



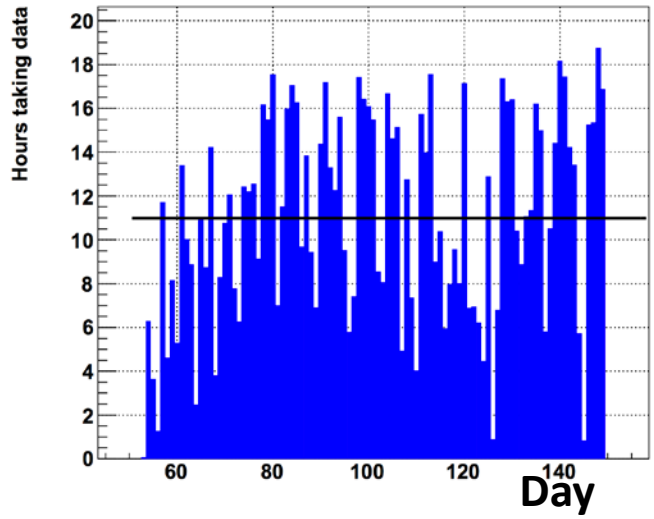
eTOF installed on inside surface of East Poletip

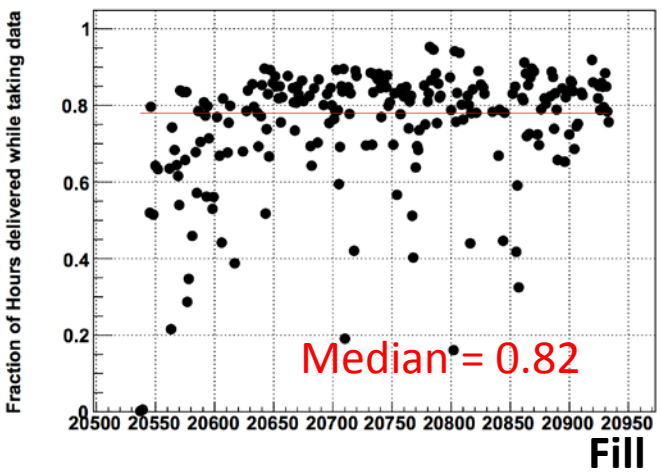
- **E**ndcap **TOF**
  - FAIR Phase 0: joint project between CBM and STAR
  - Prototype installed for Run 17 and successfully commissioned DAQ interface
  - Aim to populate on TPC sector (3 modules) for Run 18

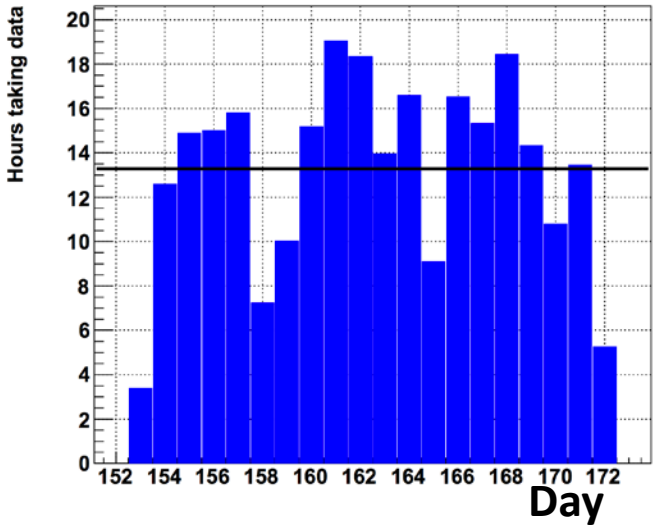
See Prashanth Shanmuganathan's talk on June 23, Friday.

STAR Running Efficiency in Run 17

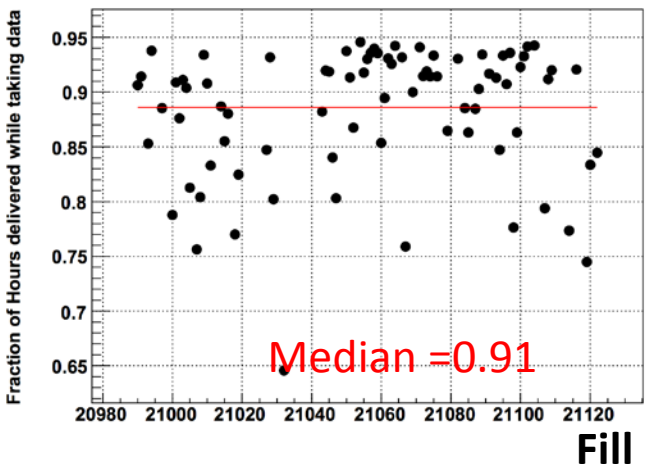
PP510







AuAu54.4



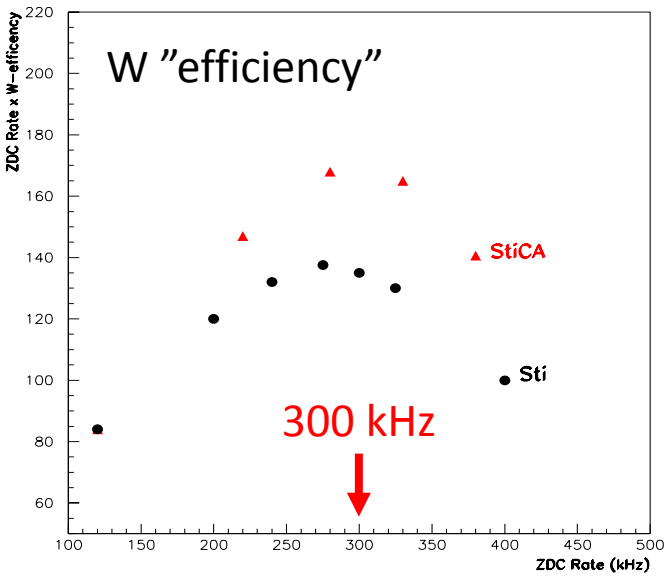
✓ High efficiency running with over 80% data taking time

PP510 Operation Mode for W-boson

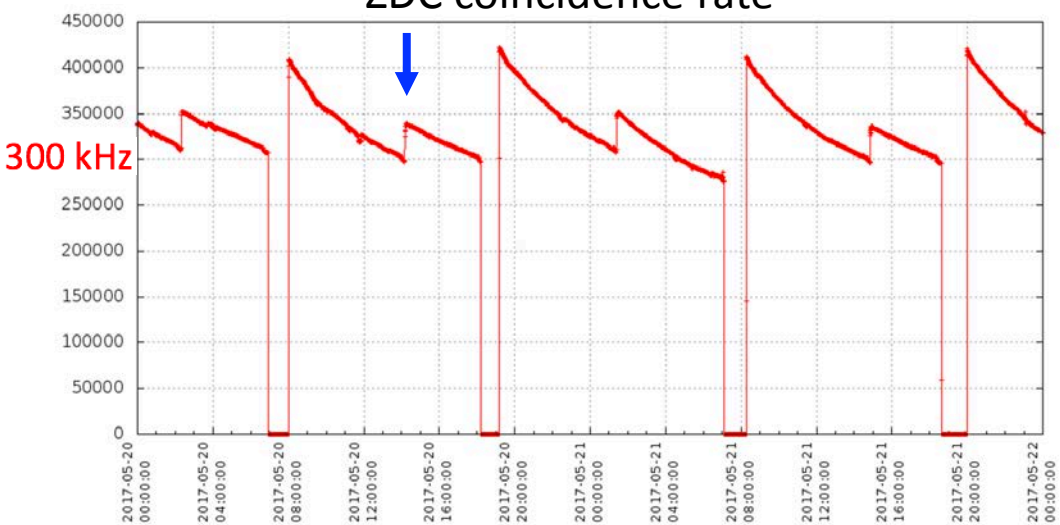
The W-boson reconstruction efficiency was obtained from the data measured in 2011 to 2013 and with improved Tracking Algorithm.

The highest FoM is reached at a ZDC rate of 315 kHz corresponding to a luminosity of 1.3 x 10^{32} $cm^{-2}s^{-1}$.

Optimization of delivered luminosity with dynamic **beta* squeeze**.



ZDC coincidence rate



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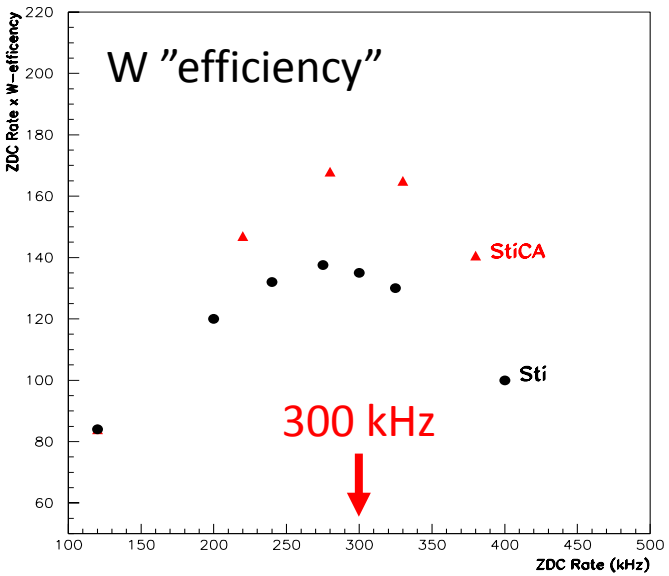

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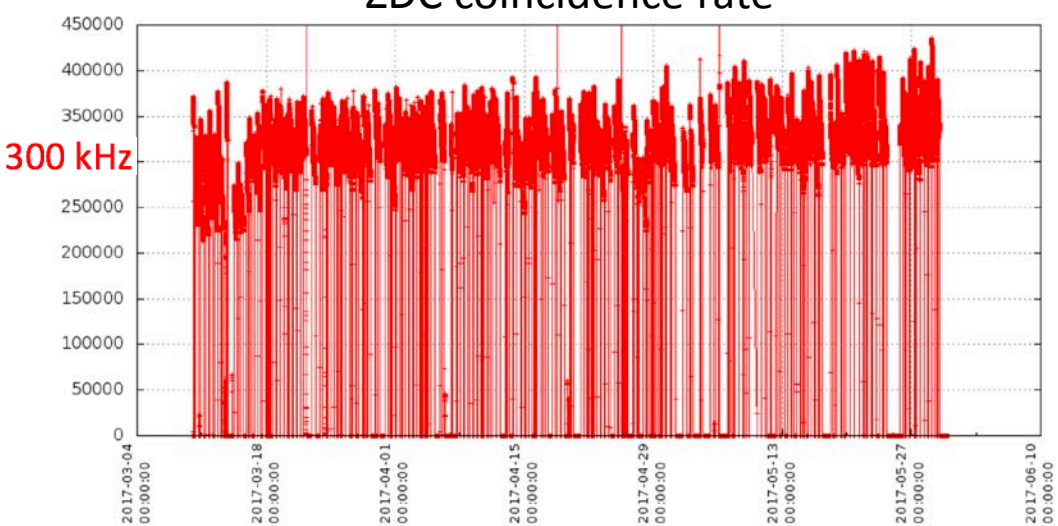
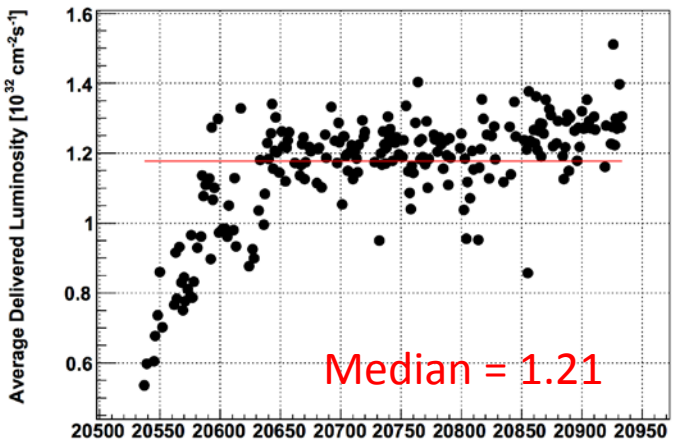
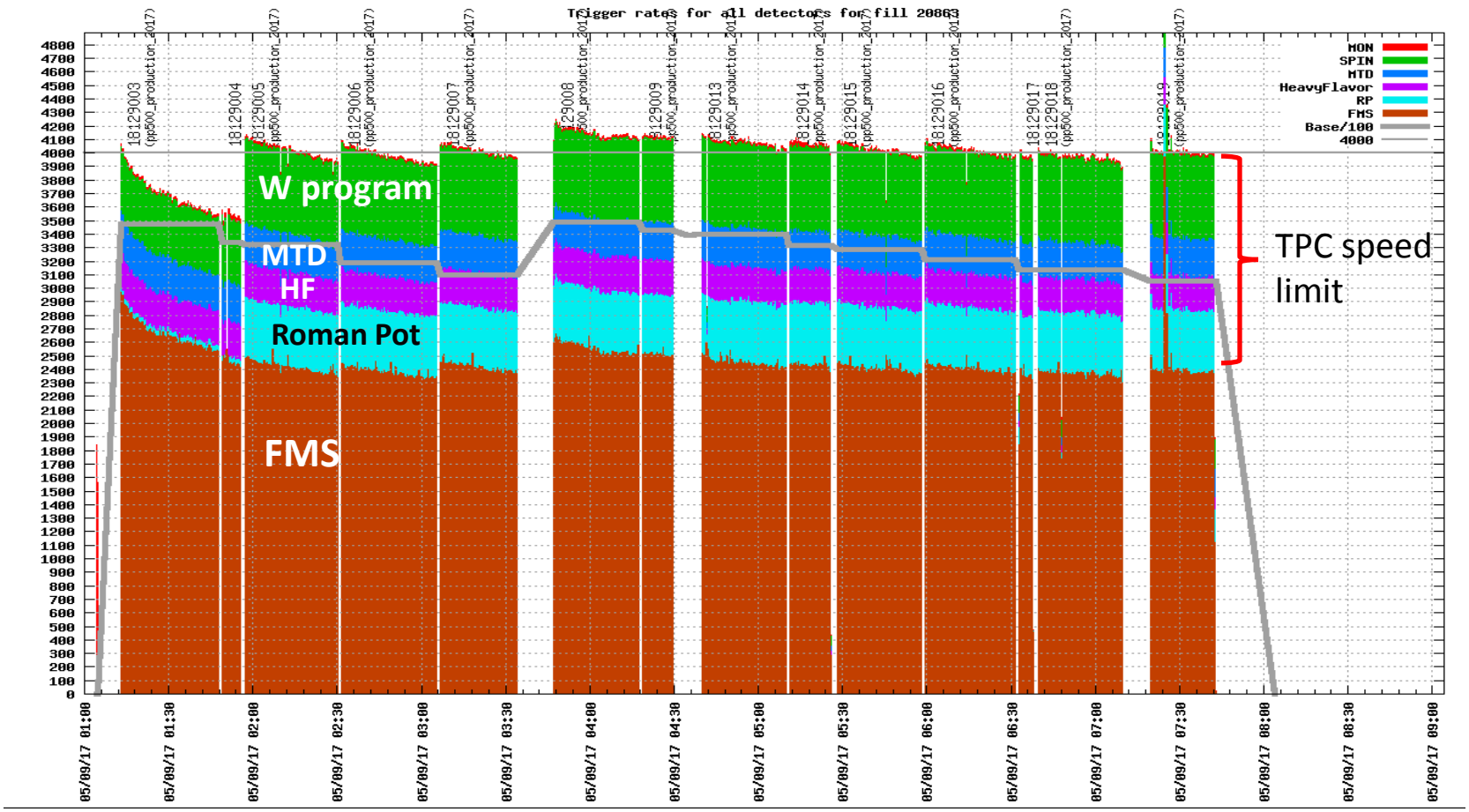


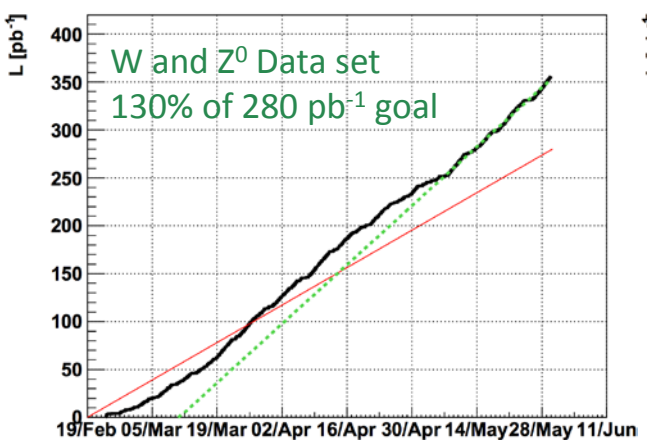


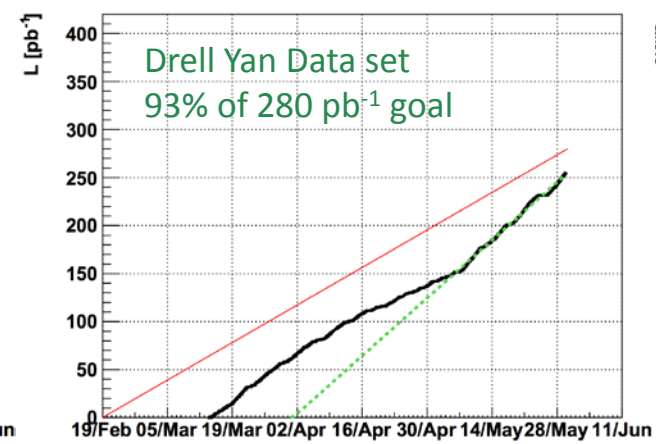
PP510 Bandwidth Allocation (store from May 9th)

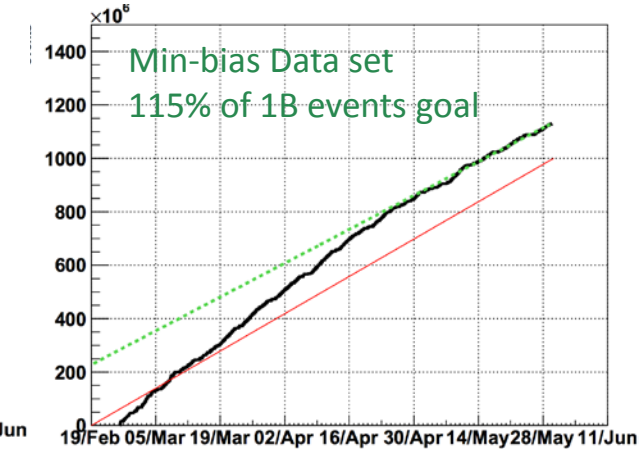


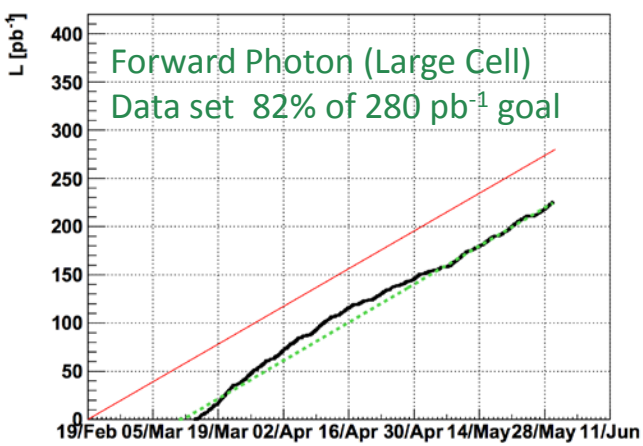
- **41 Triggers Running at a total of about 4200 Hz, accumulating ~ 1.7 GB/sec!**

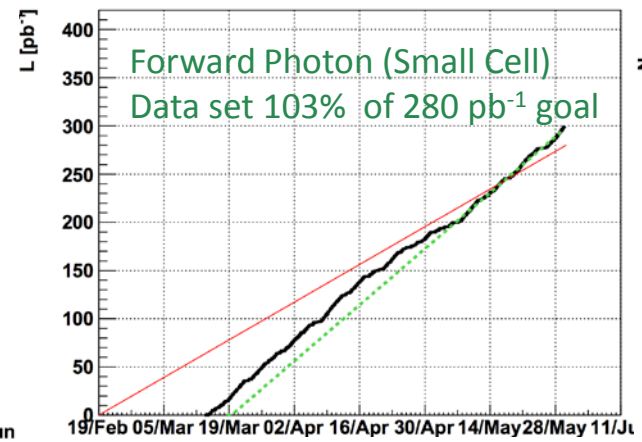
Run 17 PP510 Datasets

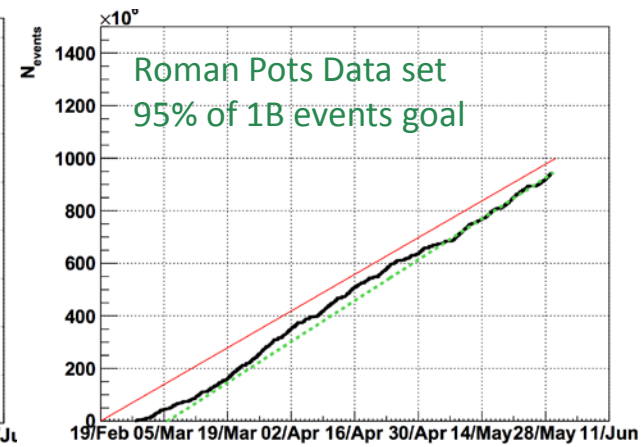








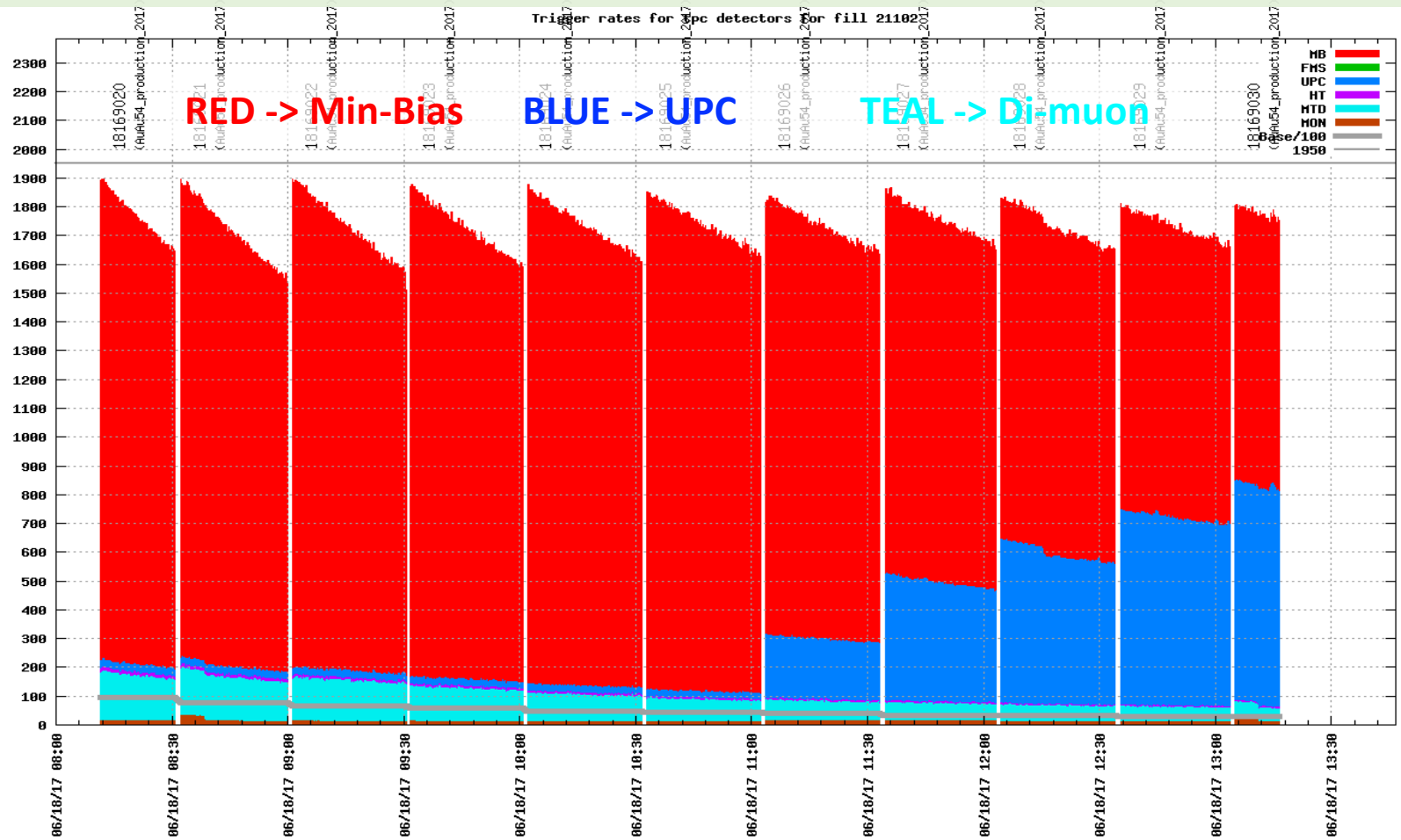




Key: = Goal = Data to date = Projection

* The beam polarization was spot on to the projected value, ~55%.

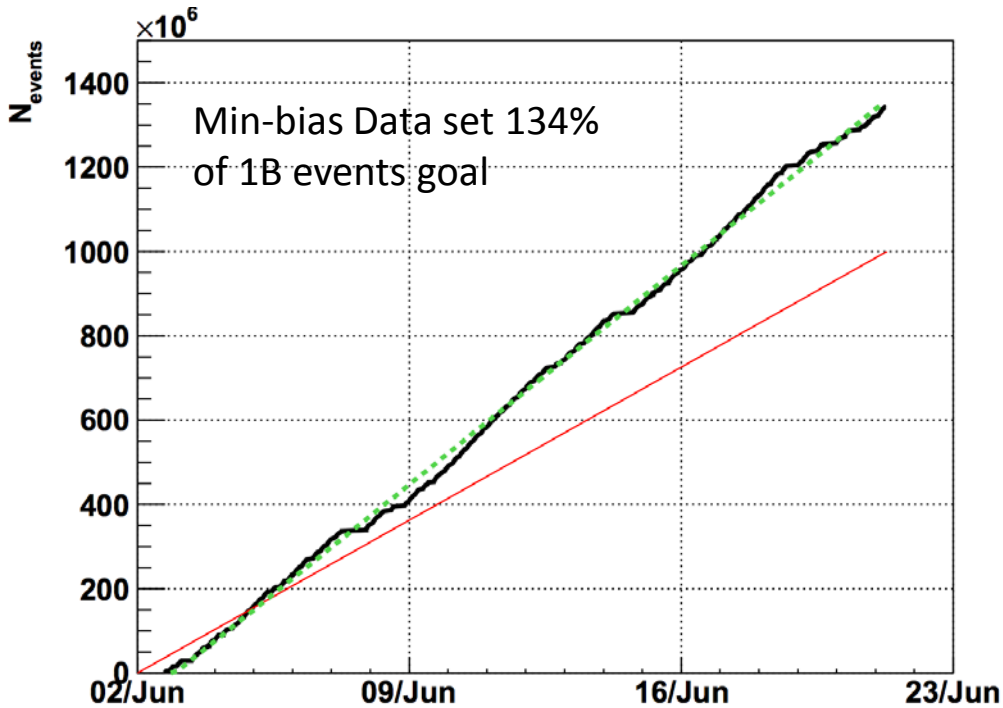
AuAu54.4 Bandwidth Allocation (store from June 18th)



TPC speed limit

- **22 Triggers Running at a total of about 1900 Hz, accumulating ~ 0.6 GB/sec!**

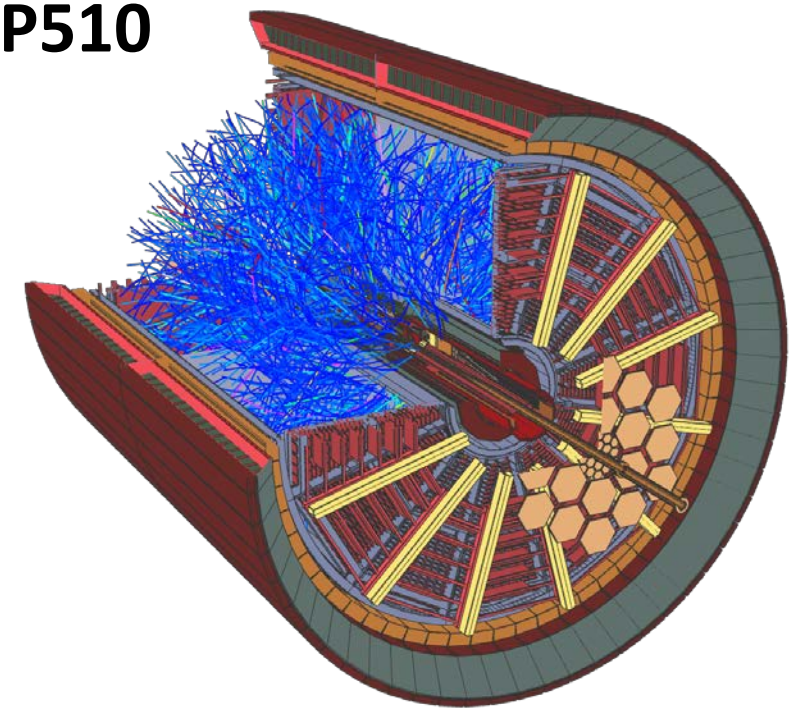
Run 17 AuAu54.4 Datasets



Key: = Goal = Data to date = Projection

Event Display

PP510



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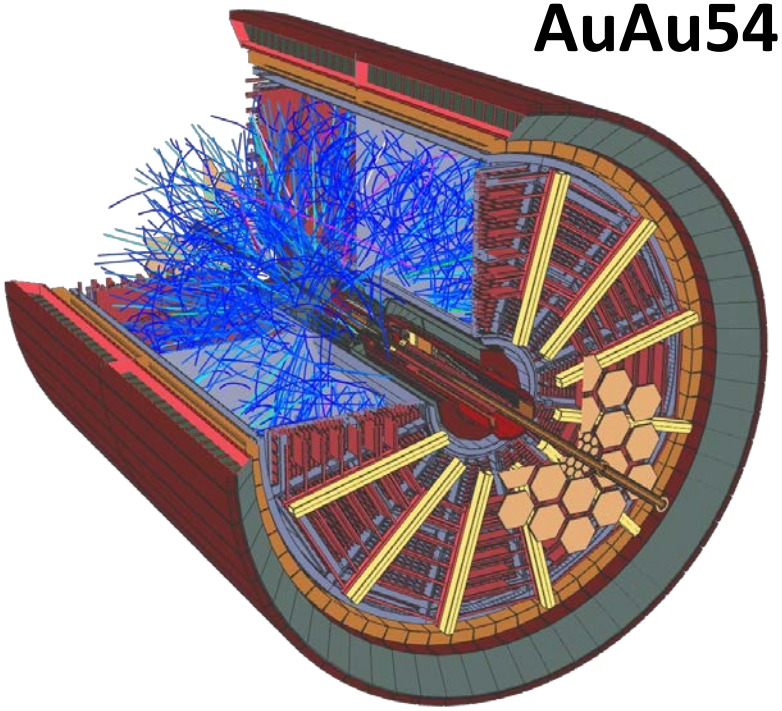

* Evidence of pile-up in pp collision.

Summary

- ✓ Wonderful datasets for transverse pp510 and AuAu54.4
- ✓ Several new subsystems installed, commissioned, and have been running well.
- ✓ **Very successful operation in Run 2017 !**

Thanks to C-AD!