

# Run 19 RHIC Machine/Experiments Meeting

*January 7, 2020*

## Agenda:

- General discussion of Run 20 - W. Christie
- Discussion of Fixed Target Running - C. Liu
- STAR Status/update - J.H. Lee
- LEReC - A. Fedotov
- All Other Business (AOB)

## BLUEJEANS CONNECTION INFO:

To join the meeting on a computer or mobile phone: <https://bluejeans.com/273705843/1875?src=calendarLink>

Phone Dial-in +1.408.740.7256 (US (San Jose))

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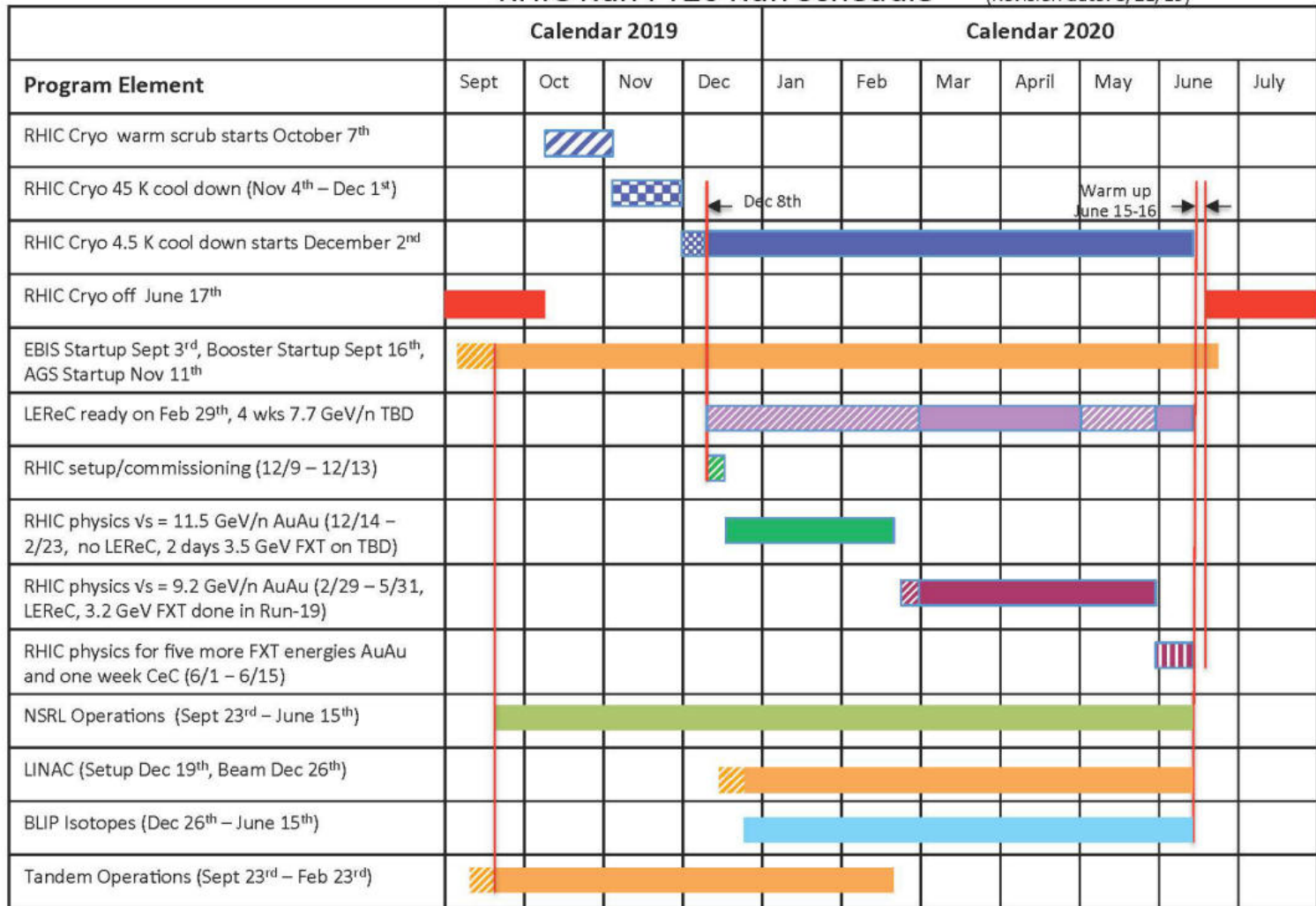
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Global Numbers: <http://bluejeans.com/numbers>

Meeting ID: 273 705 843

# RHIC Run FY20 Run Schedule

(Revision date: 8/21/19)



**N.B. This schedule assumes that we end up with a budget that allows for a 28 Cryo week run.**

The actual transition date between 11.5 and 9.2 GeV Physics running will be a matter of discussion as the run progresses.

It is likely that STAR will request to start/run the Fixed target sometime in mid to late January.

# Summary of interleaving LEReC Commissioning with the STAR Physics running

Meeting held on December 17, 2018 to discuss Strategy/plan:

- Once collisions available, Spend the first about week getting STAR tuned up and the Physics running going.
- After this first week of running, start interleaving LEReC commissioning
  - Idea discussed to schedule for 12 hours every other day (e.g. M, W, F)
  - Keep schedule “flexible” so that if for any reason LEReC can’t effective use the time it switched back to Physics running.
  - Also so that if LEReC is making good progress, and more time is desirable, the allotted time can be extended.

This is a Strategy/plan to get started on this sharing of the Collider time. Expectation is that once we see how this works we’ll discuss if we need any modifications.

## Rough accounting of LEReC hours per week and planned for this week:

12/10 - 12/16:	~20 hrs LEReC
12/17 - 12/23:	28 hrs LEReC
12/24 - 12/30:	0 hrs LEReC
12/31 – 1/6:	~24 hrs LEReC
1/7 - 1/13	~ 31 hrs LEReC

*Total LEReC ~ 103 hrs (~ 4.3 days)*

Key:

Blue = as run

Red = planned

# STAR Beam Use Request for Run20

	Beam Energy (GeV/nucleon)	$\sqrt{s_{NN}}$ (GeV)	$\mu_B$ (MeV)	Run Time	Number Events requested / collected
	9.8	19.6	205	4.5 weeks	400M <b>582M</b>
	7.3	14.5	260	5.5 weeks	300M <b>324M</b>
Run20	5.75	11.5	315	9.5 weeks	230M
	4.55	9.1	370	9.5 weeks	160M
	3.85	7.7	420	12 weeks	100M
Run20	31.2	7.7 (FXT)	420	2 days	100M <b>51M</b>
	19.5	6.2 (FXT)	487	2 days	100M
	13.5	5.2 (FXT)	541	2 days	100M
	9.8	4.5 ( FXT)	589	2 days	100M
	7.3	3.9 (FXT)	633	2 days	100M <b>53M</b>
	5.75	3.5 (FXT)	666	2 days	100M
	4.55	3.2 (FXT)	699	2 days	100M <b>201M</b>
	3.85	3.0 (FXT)	721	2 days	100M <b>3.7M+300M (run18)</b>

- Top priority for Run20 is measuring next two energies in BES-II at  $\sqrt{s_{NN}} = 11.5$  GeV and 9.2 GeV
- Finishing **fixed target** measurements at  $\sqrt{s_{NN}} = 3.5, 3.9, 4.5, 5.2, 6.2, 7.7$  GeV

STAR's plan is to accumulate 100 Mevts this year for each of the 6 FXT energies.

Rough estimate of STAR running time needed per Energy is  $\sim 16.5$  hrs.

- assumes average HLT good rate of 1700 Hz

# Prelim. fit results 2020, beta\* 10

scan	Xsec <sup>m</sup> WCM	Lumi WCM	Xsec DCCT	Lumi DCCT	sigma_ x	sigma_ y	emit_x	emit_y
	barn	10 <sup>24</sup>	barn	10 <sup>24</sup>	mm	mm	mmmrad	mmmrad
1	7.8	7.1	6.1	8.3	2.2	1.9	3.1	2.3
2	8.1	5.2	5.9	6.8	2.0	2.1	2.5	2.6
3	9.3	3.2	6.1	4.8	2.3	2.1	3.3	2.6

- Beam size is flat during the store – consistent with IPM
- Emittance from scans 30-50% larger than IPM
- Cross section used in 2010 was 6 barn (need to find out which signal was used)
- Xsec based on total beam intensity indicates that VPD sees collision from every crossing (including satellites), sort-of confirmed by Hank
- Need to add STAR HLT rate to analysis

thanks! Here are the prelim. HLT results from the 3 scans and the comparison with the IPM scan by scan:

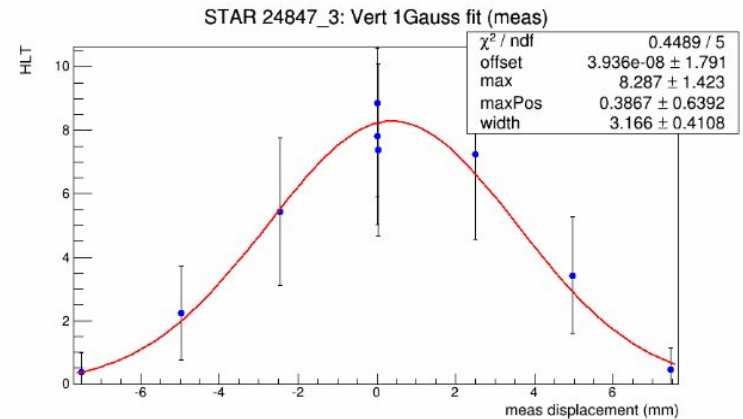
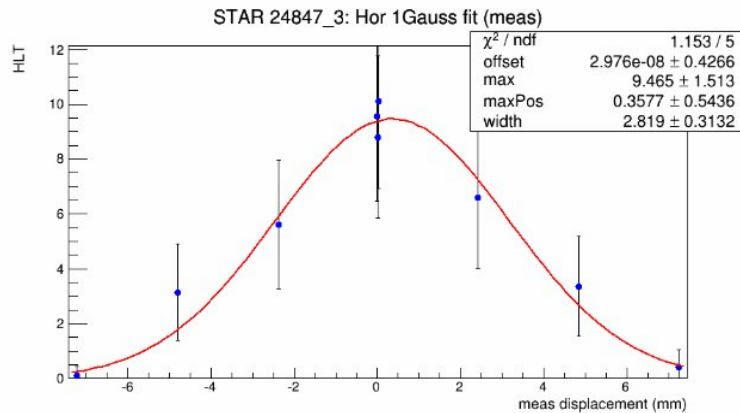
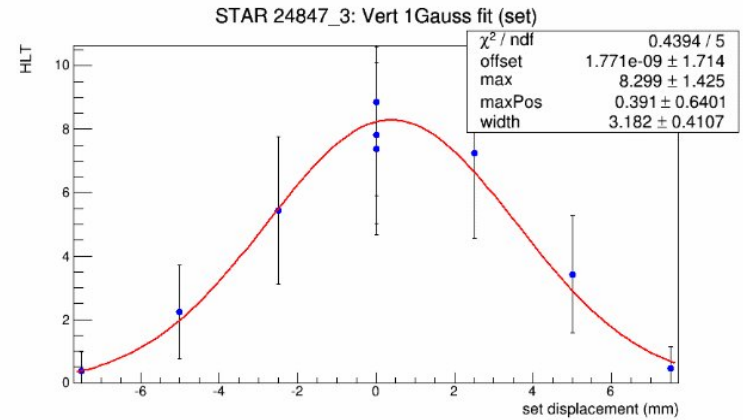
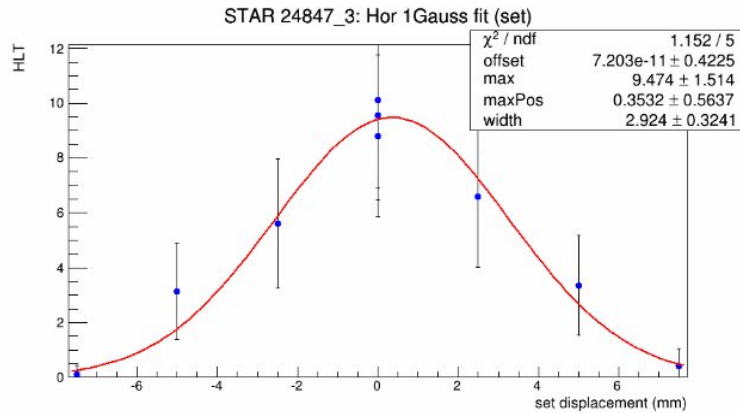
scan	xsec-WCM barn	Lumi-WCM 10 <sup>24</sup>	xsec-DCCT barn	Lumi-DCCT 10 <sup>24</sup>	sigma_x mm	sigma_y mm	emit_h	emit_v	IPM_h	IPM_v
1	3.0	7.2	2.5	7.8	2.1	2.1	3.1	2.3	1.9	1.8
2	3.2	4.3	2.4	5.6	2.5	2.0	2.5	2.6	1.9	1.8
3	2.9	3.1	1.8	4.8	2.1	2.3	3.3	2.6	2.0	2.0

sigma<sub>x,y</sub> is the beam-size (not overlap size), and here from the HLT - not the VPD, the two disagree about the horizontal plane in the 2nd scan, don't know why (yet). The agreement with the IPM is between 30-65% in the horizontal plane and 30-45% in the vertical plane.

My numbers and yours for HLT xsec(WCM) agree reasonably well (given that error bars are a bit larger with LE).

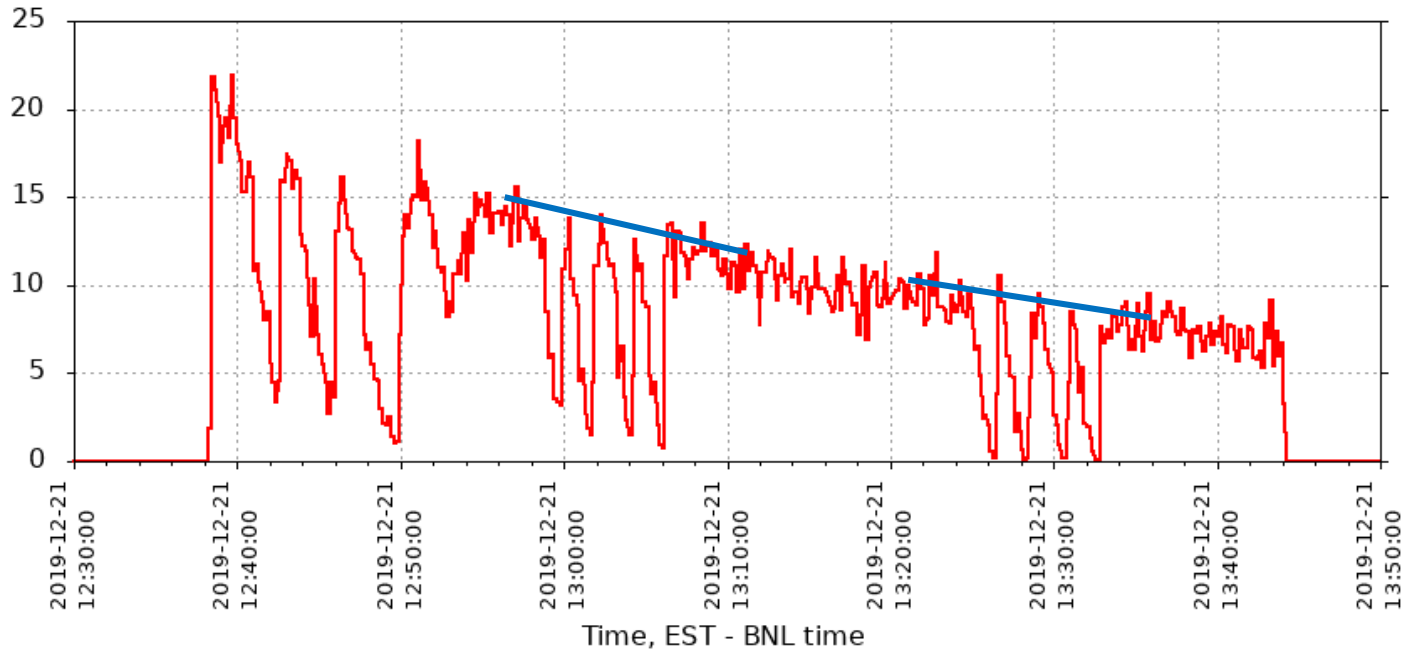
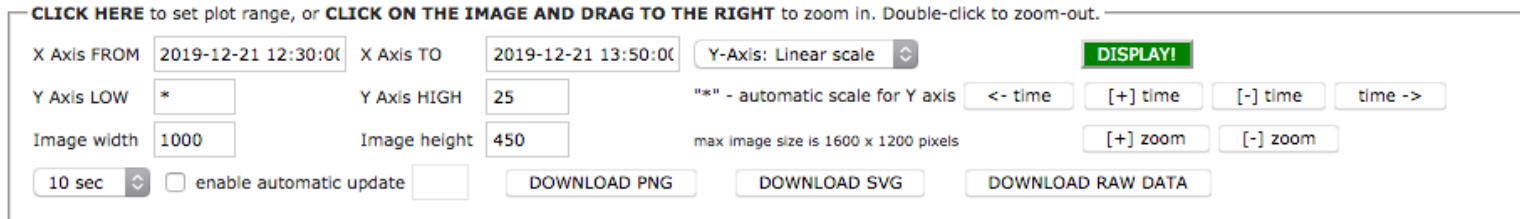
Angelika

For Comparison: 3<sup>rd</sup> scan from Dec. 21 2019 using the HLT signal



Note: no background – levels drop down to zero for full displacement

# Cross sections calculated using the HLT extracted luminosity values



starEventTrigger.rate - HLT good (70cm vtx), before 2019-06-18 was HLT good —

For Scan #2, mean rate for HLT good (70 cm) ~ 14 Hz

$$\text{Rate} = L \cdot \sigma \rightarrow \sigma = \text{Rate} / L = 14 \text{ Hz} / 4.3 \times 10^{24} \text{ s}^{-2} \text{ cm}^{-2} = 3.2 \times 10^{-24} \text{ cm}^2 = 3.2 \text{ b}$$

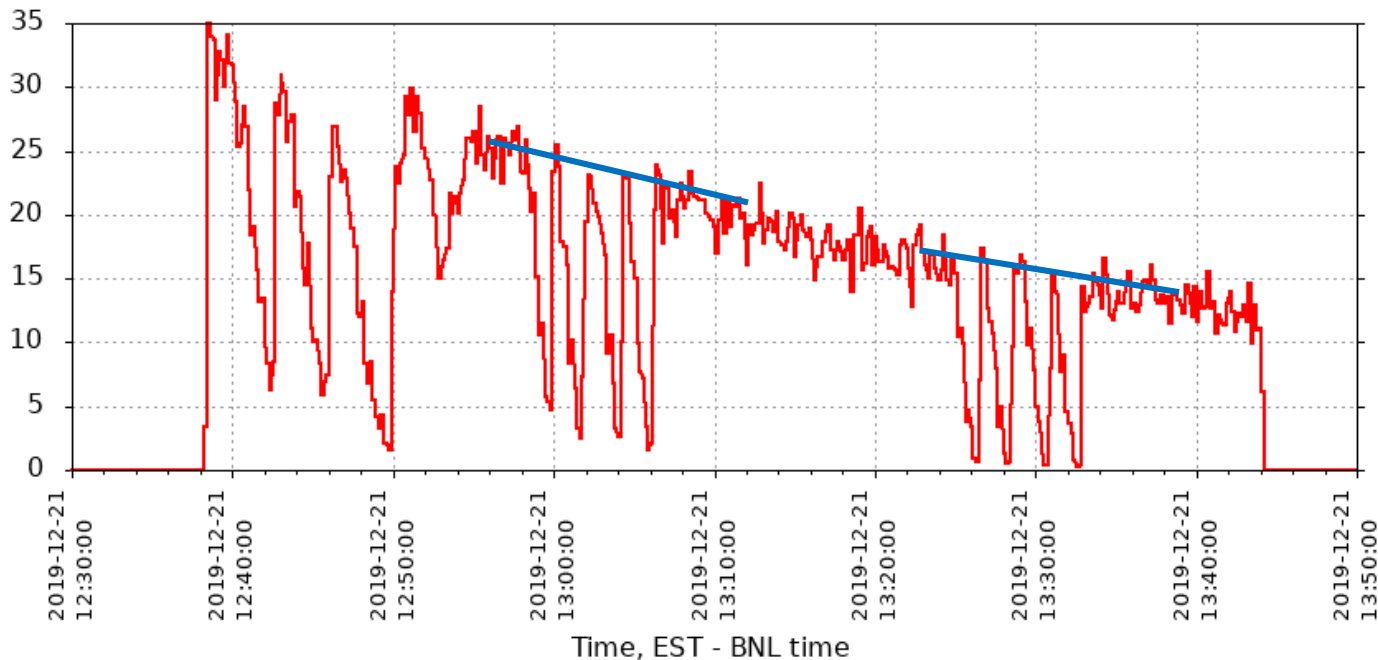
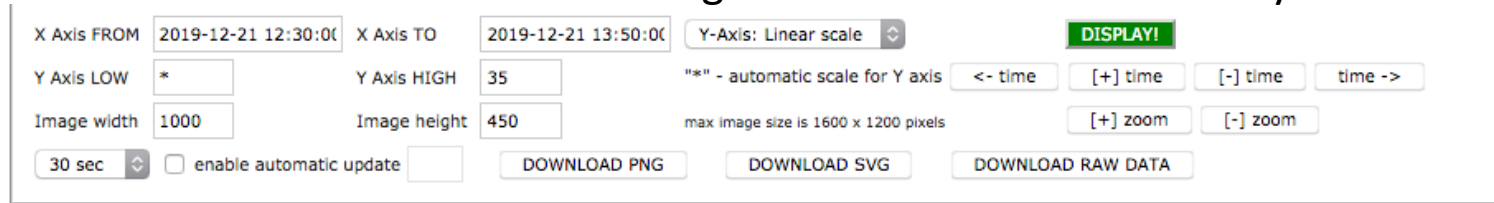
For Scan #3, mean rate ~ 9 Hz

$$\sigma = \text{Rate} / L = 9 \text{ Hz} / 3.1 \times 10^{24} \text{ s}^{-2} \text{ cm}^{-2} = 2.8 \times 10^{-24} \text{ cm}^2 = 2.9 \text{ b}$$

Mean sigma 3.0 b, taking an unc. of ~ 1 Hz in each rate gives an unc. of ~.2, Sigma = 3.0 +/- .2 b

Compares well with Angelika's average cross section of 3.0 b (ave. over the three scans)

# Cross sections calculated using the HLT extracted luminosity values



150  
 starEventTrigger2.rate - HLT good (200 cm vtx), before 2019-06-18 was: MB in abort gap —

For Scan #2, mean rate for **HLT 150 cm vtx**  $\sim 24$  Hz

$$\text{Rate} = L * \sigma \rightarrow \sigma = \text{Rate} / L = 24 \text{ Hz} / 4.3 \times 10^{24} \text{ s}^{-2} \text{ cm}^{-2} = 5.6 \times 10^{-24} \text{ cm}^2 = 5.6 \text{ b}$$

For Scan #3, mean rate  $\sim 16$  Hz

$$\sigma = \text{Rate} / L = 16 \text{ Hz} / 3.1 \times 10^{24} \text{ s}^{-2} \text{ cm}^{-2} = 5.2 \times 10^{-24} \text{ cm}^2 = 5.2 \text{ b}$$

Mean sigma 5.4 b, taking an unc. of  $\sim 1$  Hz in each rate gives an unc. of  $\sim .2$ , Sigma = 5.4  $\pm$  .2 b

Considering the missing peripheral fraction of the cross section (HLT req. of 5 or more tracks), and portion of interaction diamond beyond  $\pm 150$  cm, this looks reasonable.



## Some anticipated Issues that we'll be discussing through out RHIC Run 20

- The length of the run (24 vs 26 or 28 Cryo weeks, awaits final FY20 budget)
- Going into the run, it looks like a significant challenge, that we may not be able to overcome, to fully meet the stated STAR data set (statistics) goals.
- A key decision will be deciding when to switch from the 11.5 to the 9.2 GeV Physics running. The timescale for this decision is likely sometime in February.
- When to run the STAR Fixed target program, as well as whether to run it all in the same time period. Likely timescale for this decision is mid January or so.
- We need to accommodate collider time for the 9.2 and 7.7 LEReC commissioning, as well as the CeC program.
- What is clear now is that we have to be very careful and deliberate in scheduling and efficiently utilizing every day of RHIC Run 2020.

These are what I anticipate as being the key issues we'll be dealing with during the run. Any additional issues that people would like to add to the list?

All Other Business (AOB)