

# Run 20 RHIC Machine/Experiments Meeting

*February 11, 2020*

## Agenda:

- General discussion of Run 20 & Scenario for discussion - W. Christie
- Collider Update - C. Liu
- LEReC Update - A. Fedotov
- STAR Status/update - J.H. Lee
- All Other Business (AOB)

## BLUEJEANS CONNECTION INFO:

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

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

Meeting ID: 273 705 843

# RHIC Run FY20 Run Schedule

(Revision date: 12/10/19)

Program Element	Calendar 2019				Calendar 2020						
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July
RHIC Cryo warm scrub starts October 7 <sup>th</sup>											
RHIC Cryo 45 K cool down (Nov 4 <sup>th</sup> – Dec 1 <sup>st</sup> )											
RHIC Cryo 4.5 K cool down starts December 2 <sup>nd</sup>											
RHIC Cryo off June 17 <sup>th</sup>											
EBIS Startup Sept 3 <sup>rd</sup> , Booster Startup Sept 16 <sup>th</sup> , AGS Startup Nov 11 <sup>th</sup>											
LEReC ready on Feb 29 <sup>th</sup> , 4 wks 7.7 GeV/n TBD											
RHIC setup/commissioning (12/5 – 12/10)											
RHIC physics $v_s = 11.5$ GeV/n AuAu (12/10 – 2/23, no LEReC, 2 days 3.5 GeV FXT on TBD)											
RHIC physics $v_s = 9.2$ GeV/n AuAu (2/29 – 5/31, LEReC, 3.2 GeV FXT done in Run-19)											
RHIC physics for five more FXT energies AuAu and one week CeC (6/1 – 6/15)											
NSRL Operations (Sept 23 <sup>rd</sup> – June 15 <sup>th</sup> )											
LINAC (Setup Dec 19 <sup>th</sup> , Beam Dec 26 <sup>th</sup> )											
BLIP Isotopes (Dec 26 <sup>th</sup> – June 15 <sup>th</sup> )											
Tandem Operations (Sept 23 <sup>rd</sup> – Feb 23 <sup>rd</sup> )											

**N.B. The Schedule above assumes that RHIC Run 2020 will be 28 Cryo weeks long.**

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

# 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 effectively 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 (Run 20) 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
1/14 – 1/20:	~ 33 hrs LEReC
1/21 – 1/27:	~ 32 hrs LEReC
1/28 – 2/3:	~ 28 hrs LEReC

*Total LEReC ~ 196 hrs (~ 8.2 days) Done*

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	582M
	7.3	14.5	260	5.5 weeks	300M	324M
Run20	5.75	11.5	315	9.5 weeks	230M	~ 132 Mevts at present
	4.55	9.1	370	9.5 weeks	160M	~ 7 Mevts at present
	3.85	7.7	420	12 weeks	100M	
Run20	31.2	7.7 (FXT)	420	2 days	100M	Done
	19.5	6.2 (FXT)	487	2 days	100M	Done
	13.5	5.2 (FXT)	541	2 days	100M	Done
	9.8	4.5 (FXT)	589	2 days	100M	Done
	7.3	3.9 (FXT)	633	2 days	100M	Done
	5.75	3.5 (FXT)	666	2 days	100M	
	4.55	3.2 (FXT)	699	2 days	100M	201M
	3.85	3.0 (FXT)	721	2 days	100M	3.7M+300M (run18)

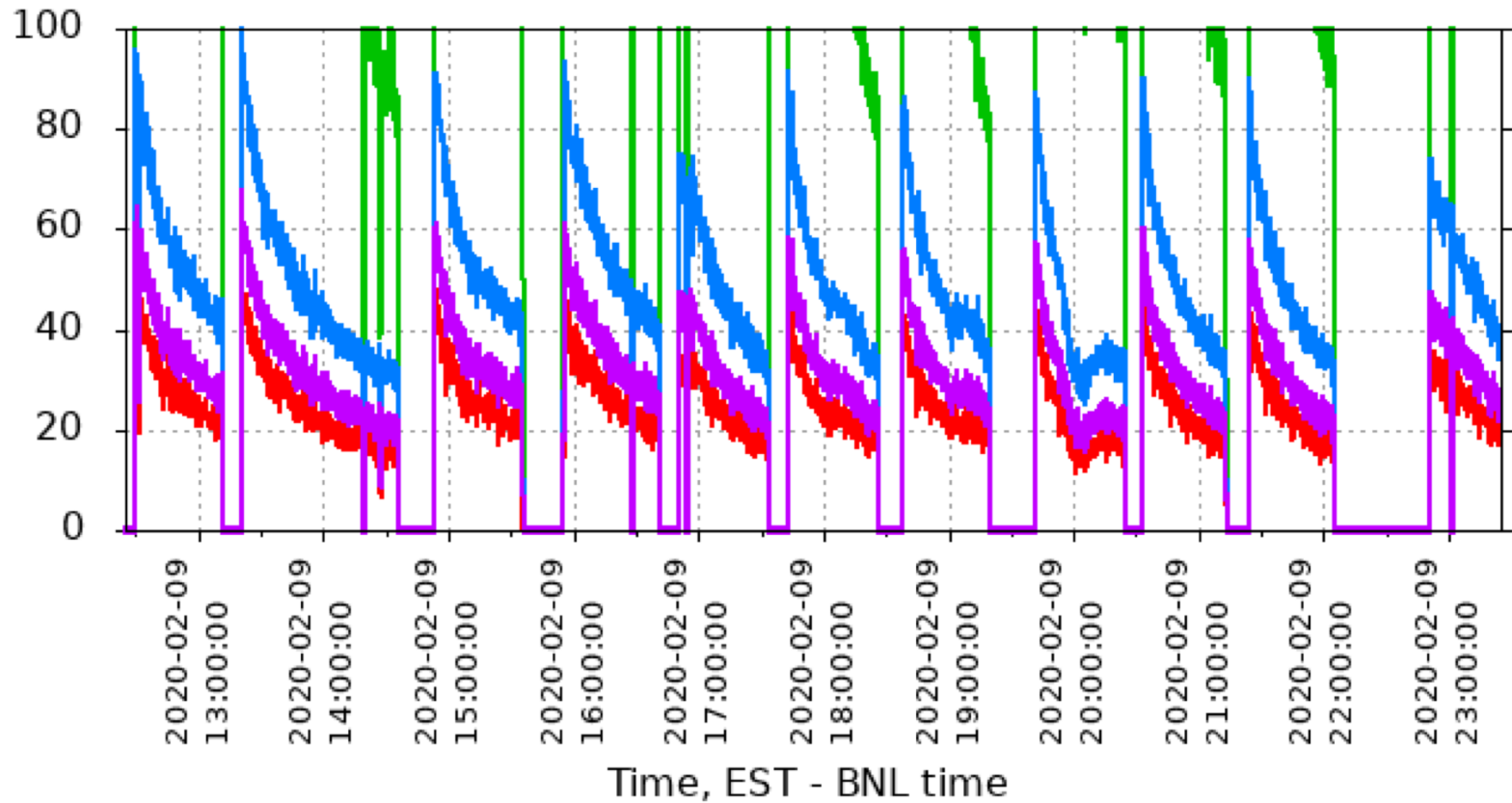
- Top priority for Run20 is measuring next two energies in BES-II at  $\sqrt{s_{NN}} = 11.5$  GeV and 9.2 GeV
- Finishing **fixed target** measurements at  $\sqrt{s_{NN}} = 3.5, 3.9, 4.5, 5.2, 6.2, 7.7$  GeV

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 ~ 16.5 hrs.

- assumes average HLT good rate of 1700 Hz
- Only one fixed target data set left (5.75 GeV, sched. To start 2/13)

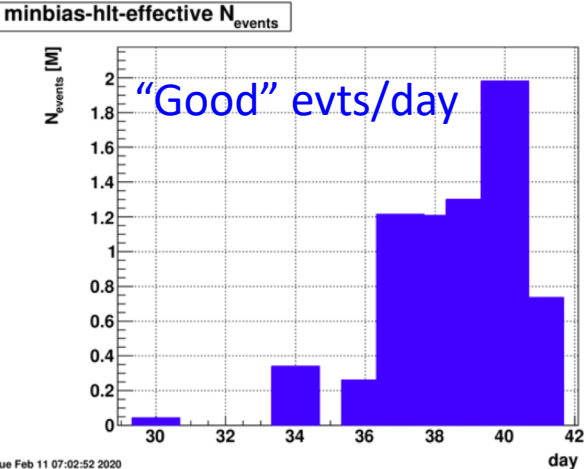
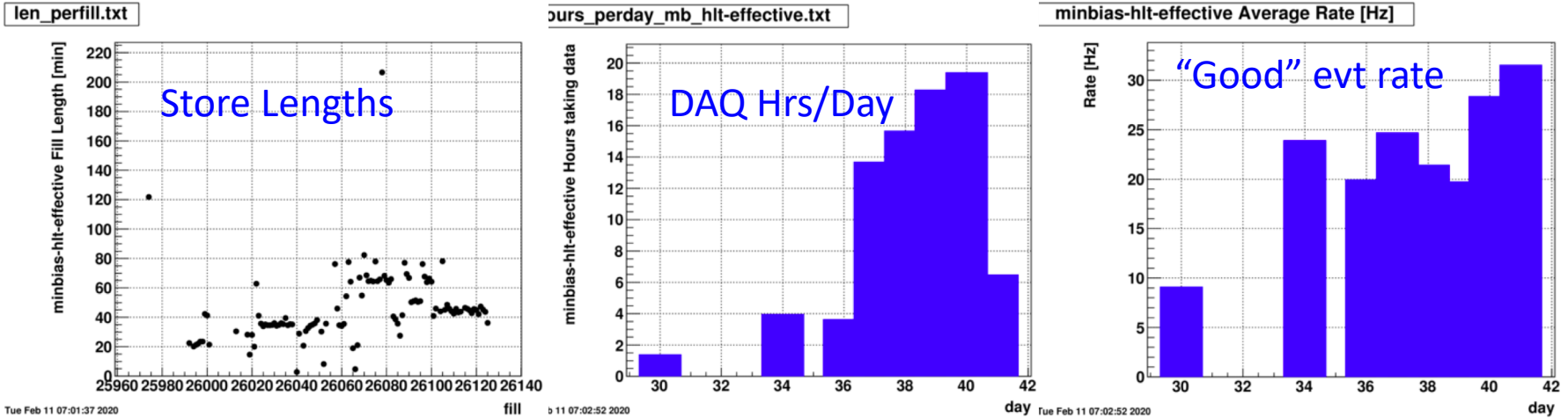
# Some STAR Trigger rates with 9.2 GeV LReC Cooled Collisions

Rates seen on Sunday, February 9, 2020.



- HLT good (70cm vtx) — red line
- MB taken — green line
- HLT good (150cm vtx) — blue line
- "Good" evts — purple line

# Updated estimates for how long it would take to collect the 9.2 GeV data set



Estimates based on *observed* performance:

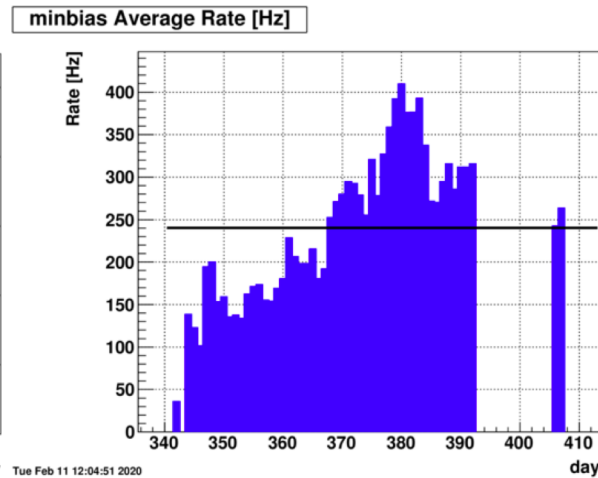
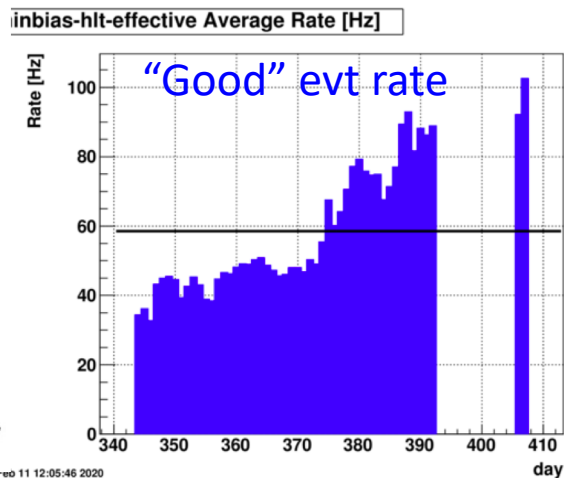
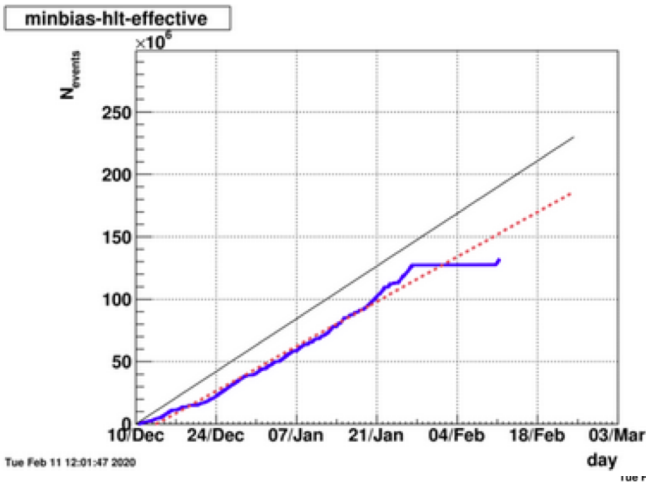
If one assumes 15 Hrs/day of DAQ running, at an average rate of 3 Hz:

- $15 \text{ hrs/day} \times 3600 \text{ sec/hr} \times 33 \text{ evts/sec} = 1.8 \text{ Mevts/day}$
- Data set goal is 160 M "good" evts (Currently have 7 Mevts)
- $153 \text{ Mevts} / 1.8 \text{ Mevts/day} = 85 \text{ days} = 12.4 \text{ wks}$

***Reasons to believe that the estimate above is realistic:***

- On Sunday, after only a few days of optimization, 2 M "good" evts were recorded
- There was a store that had an average "good" event rate of 38 Hz
- Historically, the RHIC luminosity takes weeks of running to reach luminosity plateau

# An extremely successful return to collisions at 11.5 GeV



“Good” evt rate increased, and the input min-bias trigger rate decreased! Cleaner data at a higher rate!

Estimate for how long it might take to complete the 11.5 GeV data set:

- 131 M “good” evts in hand
- Goal is 230 M “good” evts (~ 100 Mevts to go)
- 9.2 GeV LEReC interleaved commissioning is done.
- Use assumptions of 15 hrs/day of DAQ running, and store averaged “good” evt rates of 90 Hz
- $15 \text{ hrs/day} \times 3600 \text{ sec/hr} \times 90 \text{ evts/sec} = 4.9 \text{ Mevts/day}$
- $100 \text{ Mevts} / 4.9 \text{ Mevts/day} = 20.4 \text{ days}$
- There are 20 days between today and Monday March 2<sup>nd</sup>
- I judge the estimate above as somewhere between realistic and conservative

## A possible Scenario for how the rest of Run 2020 might proceed

January						
Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

February						
Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

March						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April						
Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

We went back to 11.5 GeV Physics running on Monday February 10<sup>th</sup>, estimate is that we'll complete 230 Mevts goal by Monday, March 2nd.

If 9.2 GeV Physics running is from March 2, to May 25, this is 12 wks. With **observed** rates for 9.2 GeV collisions this should be sufficient time to reach full 130 Mevts goal.

2 weeks of 7.7 GeV LEReC commissioning gets one to June 8<sup>th</sup>. This may be an overestimate of the LEReC time needed.

8 days of CeC then gets one to June 15<sup>th</sup>, the end of a 28 Cryo week run (N.B. assumption of 28 Cryo week run.

*N.B. The 9.2 GeV Physics running, 7.7 GeV LEReC commissioning, and CEC time may well be run in an interleaved mode from March 2 to the end of the run.*



## All Other Business (AOB)