

RHIC status

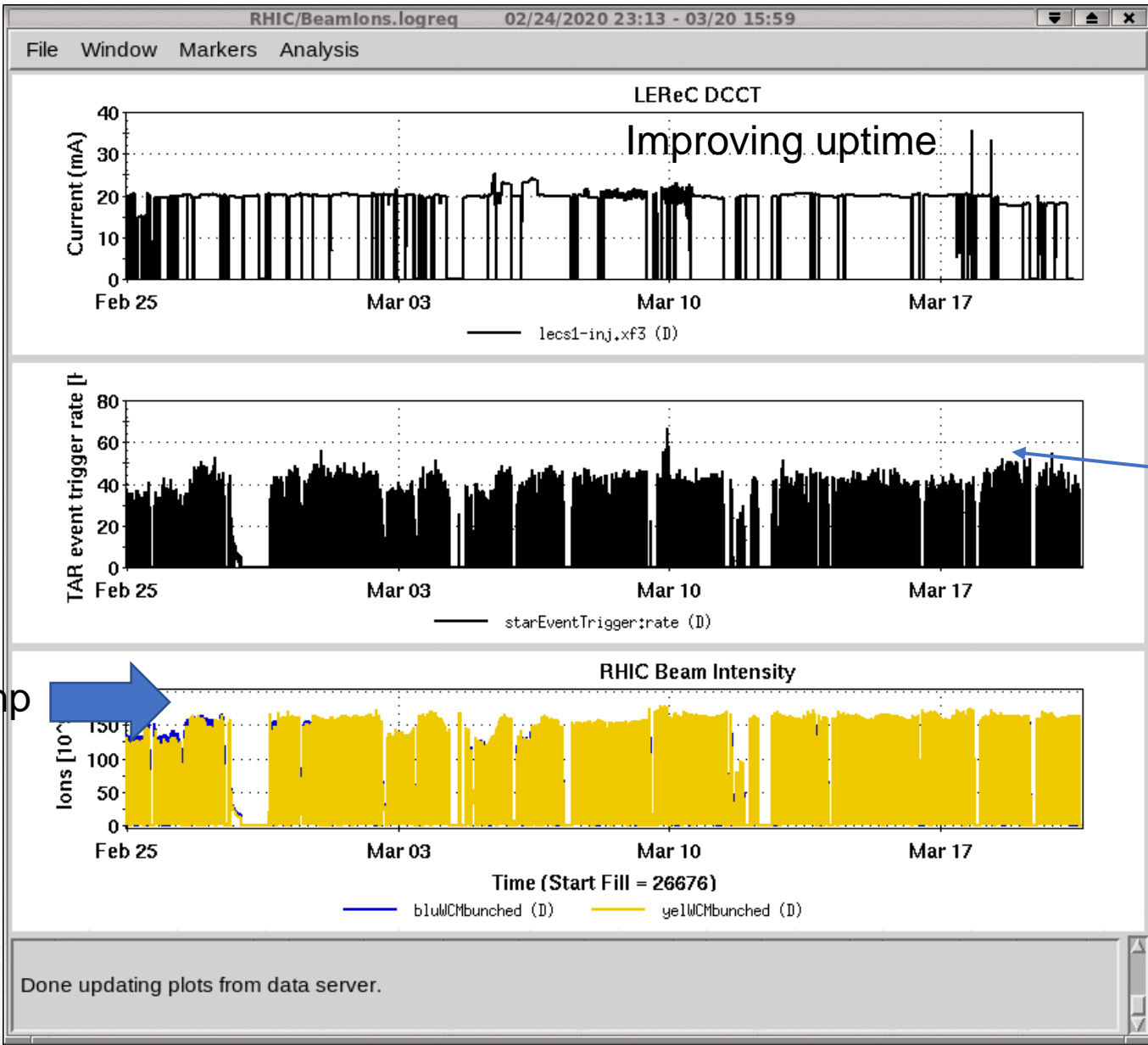
Chuyu Liu

Time meeting

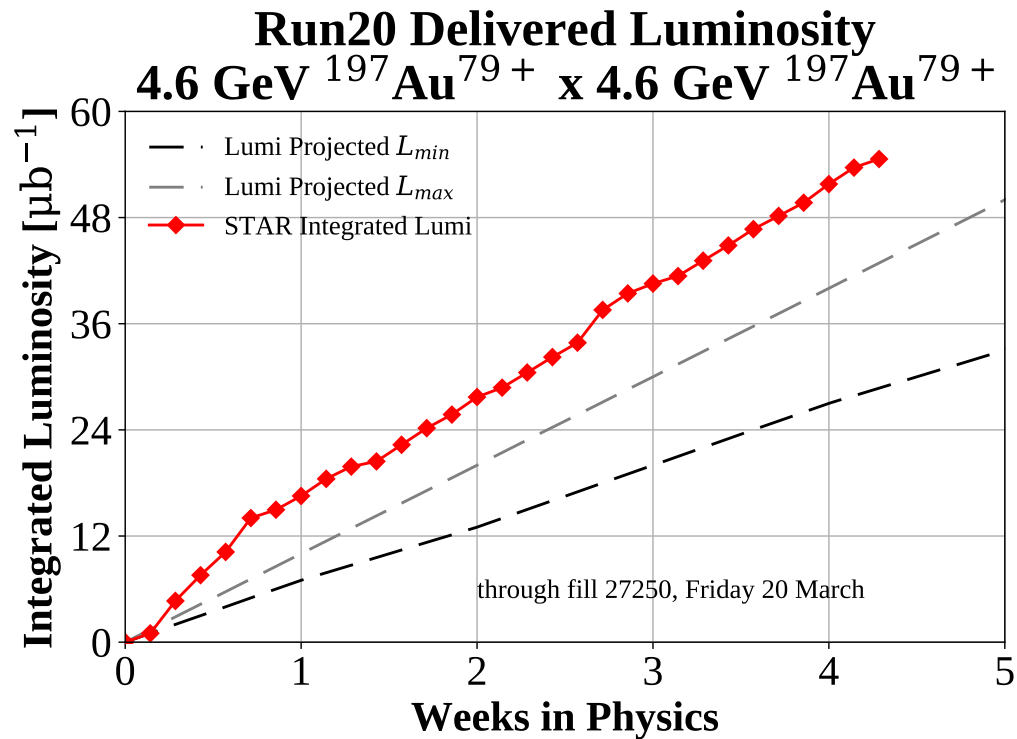
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 U.S. DEPARTMENT OF
ENERGY



RHIC performance overview



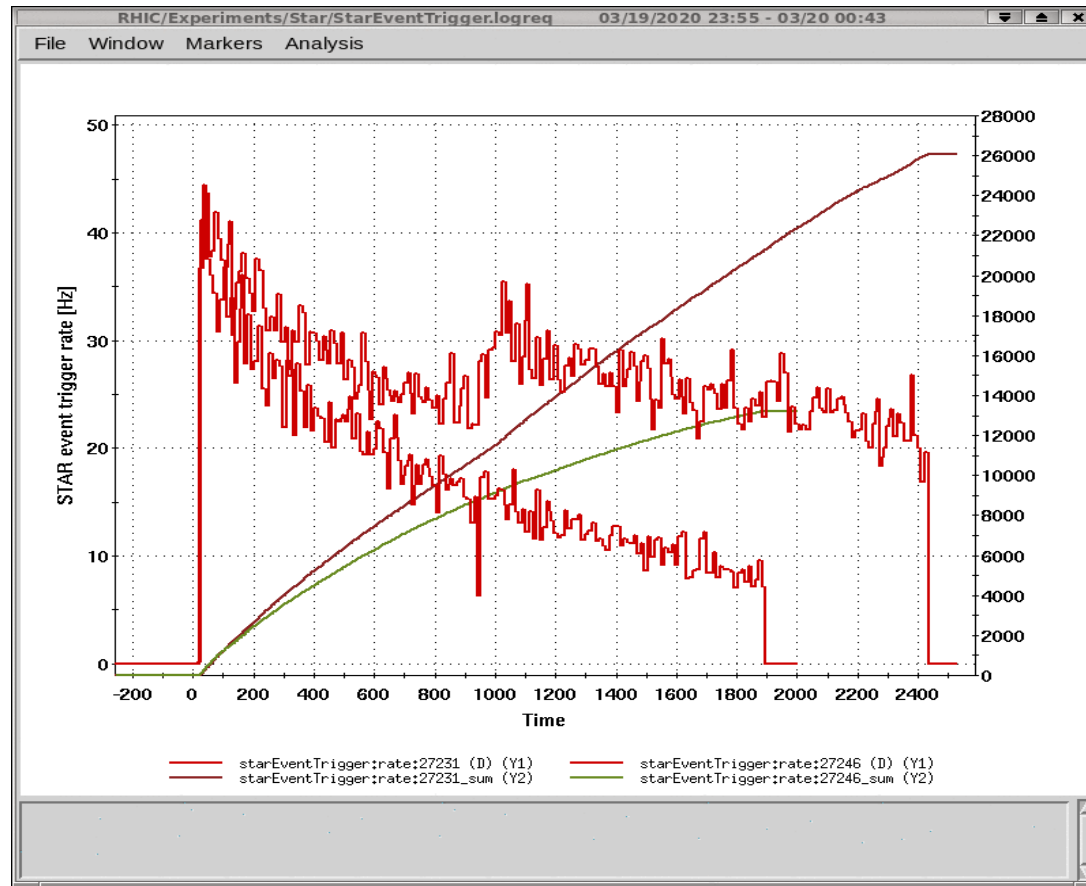
RHIC configurations for 4.59 GeV

- EBIS is the ion source. Bunch merge scheme $4 \rightarrow 1$ in AGS. Beam intensity in RHIC with EBIS was $150E9$ ions per ring.
- LEReC average current was ~ 20 mA.
- Harmonic $h=120$ was used with 9 MHz cavity so there is no longitudinal offset between electron and ion bunches.
- Store length was 30 minutes without cooling, 40 minutes with cooling.
- Betatron tunes were sitting ~ 0.23 .

More details

- If you inject more intensity so that it's higher at lumi-on event, you win.
- The best performance was achieved with LEReC current at 18 mA and high intensity in both rings. It was planned to explore even lower LEReC current.
- LEReC works better with $h=120$ instead of 122 at this energy (4.59 GeV). Longitudinal offset of electron and ion bunch are much smaller at 3.85 GeV.
- Tunes at 0.12 was tested, the performance without cooling was much better.
- There were many efforts to reduce the fill time, like reducing super-cycle time and speed up setup for collision in tape sequence.

Improvement of rates with LEReC



- A factor of 2 improvement comparing a 40-minute cooled store with a 30-minute uncooled store.
- A 62% improvement comparing the integrated rate in 30 minutes.

Summary

- We were on track to achieve the ambitious goal of 160 M in 12 weeks!
- LEReC cooling is critical for RHIC operation at beam energy 4.59 GeV, with the first beta squeeze at 15 minutes, and the second beta squeeze at 30 minutes into stores.
- We went a long way to improve bunch intensity in RHIC, ensuring stable EBIS input, maintain high stripping efficiency, going from 2-1 merge, to 3-1 and eventually 4-1 merge, maintain high injection efficiency.
- With space charge tune shift ~ 0.1 , the 0.12 has been proven to work better at 5.75 and 4.59 GeV. It is worthwhile to explore this working point further.