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Kenneth Barish <barish@ucr.edu>

Updated Luminosity and Polarization Projections for STAR's BUR

Fischer, Wolfram <wfischer@bnl.gov> Mon, Jul 13, 2020 at 10:46 AM
To: "Kenneth N. Barish" <Kenneth.Barish@ucr.edu>
Cc: Helen Caines <helen.caines@yale.edu>, "Ruan, Lijuan" <ruan@bnl.gov>, "Roser, Thomas" <roser@bnl.gov>, "Minty, Michiko" <minty@bnl.gov>, "Liu, Chuyu" <cliu1@bnl.gov>, "Huang, Haixin" <huanghai@bnl.gov>, "Fedotov, Alexei" <fedotov@bnl.gov>, "Christie, William" <christie@bnl.gov>

Hi Ken,

here are the answers (in blue), and a few questions (in red).

Please let me know if you have any other question.

Wolfram

Run 21

- Any updated projections for Au+Au at 17.1 GeV and O+O at 200 GeV?
  Au+Au at COM = 17.1 GeV: 18M HLT good events per day (interpolated) or 2 weeks for 250M events without any other activity.
  O+O at COM = 200 GeV: Lpeak = 34e28 cm^-2s^-1, Lavg = 20e28 cm^-2s^-1 (without stochastic cooling)
  It was previously stated that Lavg = 2e28 cm^-2s^-1 is sufficient. Q1: Is that still the case?
  Setup to physics is ~1/2 week, full performance probably within 1 week after that. Q2: How long do you plan to run?
- Update for luminosity projections, with electron cooling, for the Au+Au 7.7 GeV Collider Energy. Based on previous experience and 9.2 GeV performance.
  We have no new information yet since the test this year is still outstanding.
  Assuming 30% more events from an increased vertex region (Q3: Is that a correct assumption), and up to 30% more luminosity (primarily from the new 1.4 GHz LEReC cavity), we would get 0.5M/day or 28 weeks for 100M events without any other activity.
  This clearly is an issue with the time available. Chuyu is more optimistic with respect to the 1.4 GHz cavity, and that may turn out to be
  correct, I would just not plan with that.
- Luminosity projections and setup-times for fixed target AuAu Single Beam Energies 100GeV, 70GeV, 44.5GeV, 3.85GeV, 3.15GeV, 2.5GeV (and should any of these energies be adjusted?).
  As demonstrated this 2 days per energy for 100M events (setup + physics) is a good estimated. It is not clear that 3.15 GeV and 2.5 GeV are easily possible. The Yellow beam lifetime at 2.5 GeV in Run-12 was 5 min. If this request holds we would like to test the beam lifetime this year since the new magnetic cycle (wiggle ramp) may give better lifetime. Q4: Should we schedule a test?
- Additional information: I expect that CeC will request ~1 week of dedicated time in each of the next few runs.

Run 22 (250GeV+250GeV polarized protons)

- Expected ramp-up time (since it has been a few years).
  2 weeks of setup to beginning of physics, from beginning of physics to full performance up to 4 weeks.
- Luminosity projections.
  In 2017 we had Lpeak = 154e30 cm^-2s^-1 and Lavg = 127e30 cm^-2s^-1. Lpeak was limited by STAR.
  I think we can get to Lpeak = 450e30 cm^-2s^-1 and Lavg = 270e30 cm^-2s^-1 (same bunch intensity as in Run-15

at 100 GeV).
Q5: Is the Lpeak limit from Run-17 still valid? If not, is there another limit?

- Estimation for the average polarization to expect.
  Same as Run-17, 55% (as measured by H-jet and averaged over store time and both rings).

Run 24

- With the extended request for the BUR, we also need luminosity projections for 100 GeV pp and pAu as well as what polarization we can expect
  Please see Tables 4 and 6 in the latest published projections document (7 January 2019, attached) **for 2022E**. (since we have not been developing the performance it would be too optimistic to jump to the 2024E values). These are still fairly optimistic luminosity numbers.
  Q6: Are there any limits on the Lpeak in 2024?
  If we have a better idea of the Run-21 plan, it would be good to update the projections document.

From: "Kenneth N. Barish" <Kenneth.Barish@ucr.edu>
Date: Wednesday, July 8, 2020 at 8:36 PM
To: "Fischer, Wolfram" <wfischer@bnl.gov>
Cc: Helen Caines <helen.caines@yale.edu>, "Ruan, Lijuan" <ruan@bnl.gov>
Subject: Re: Updated Luminosity and Polarization Projections for STAR's BUR

Dear Wolfram,

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