

dAu Intensity Issues in RHIC

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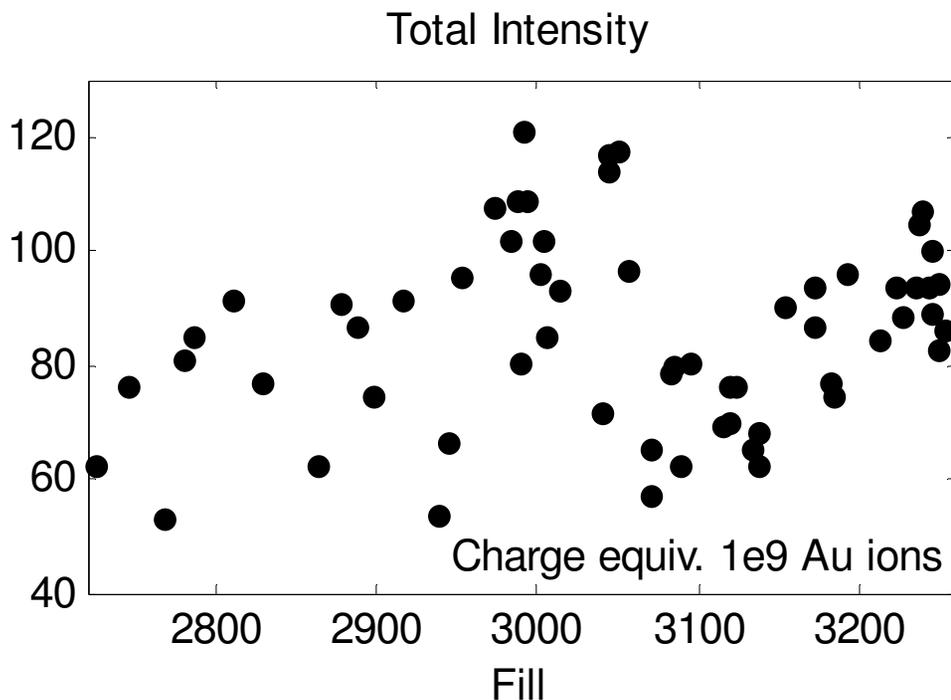
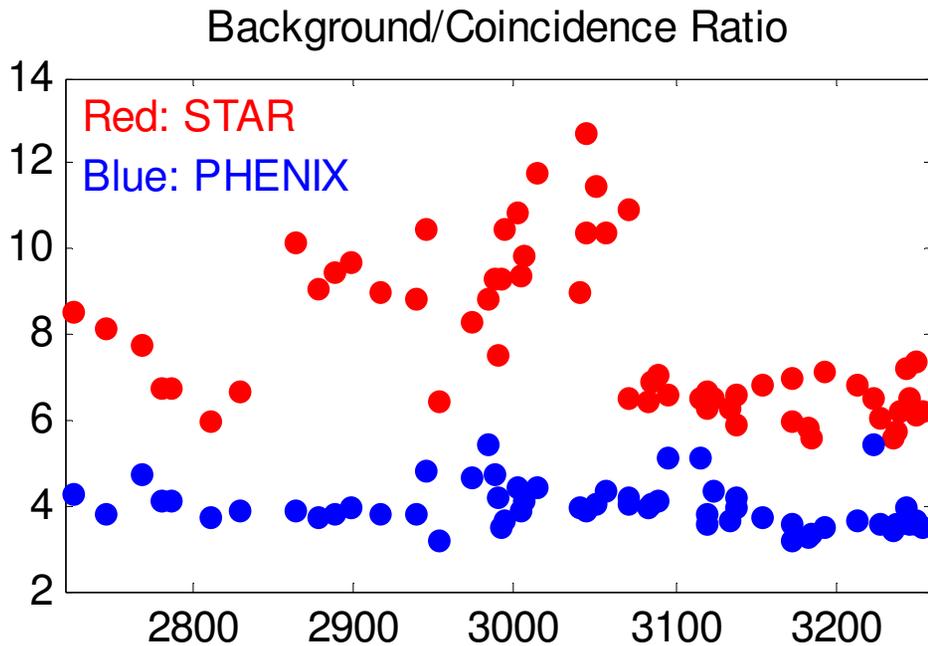
I. STAR Background

STAR background problem was marginal in dAu03, Au04, and Au07. Will it become a problem in dAu08?

II. IR Dynamic Pressure Rise

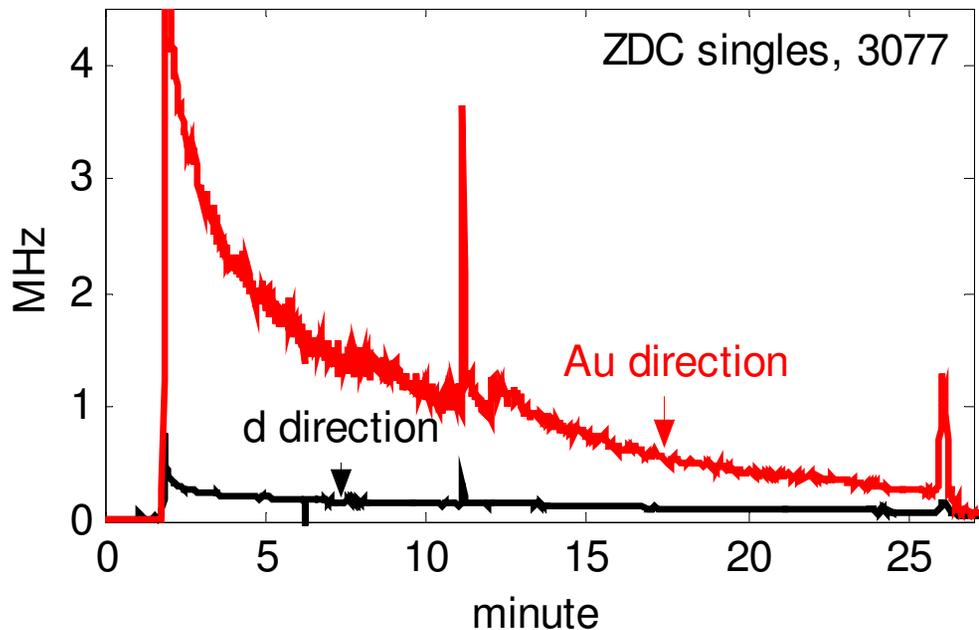
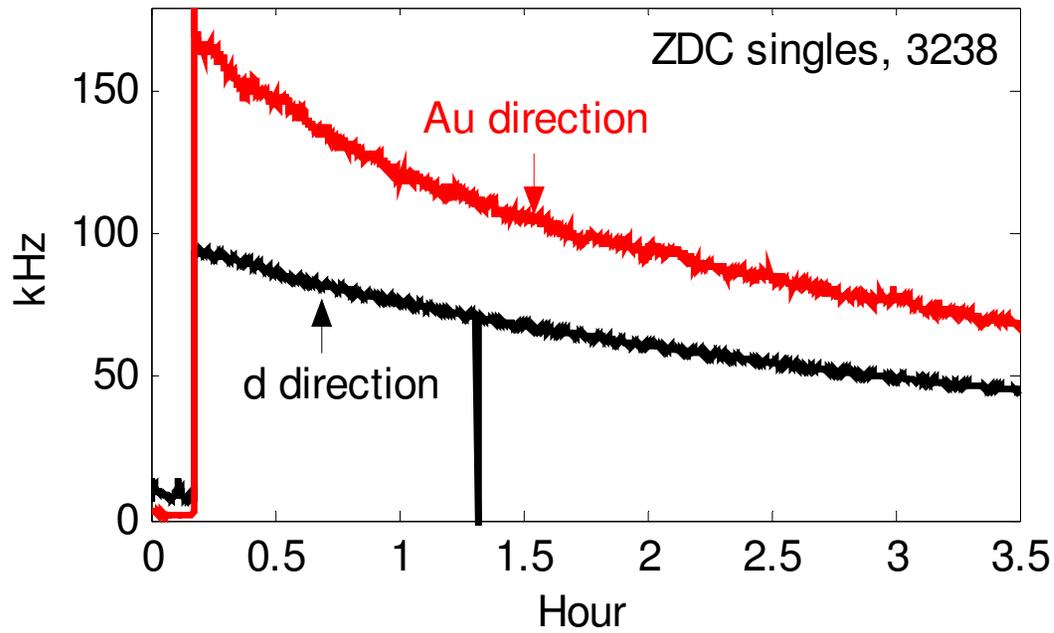
Because of the deuteron beam, the IR pressure rise in dAu08 could be higher than Au07, but by how much?

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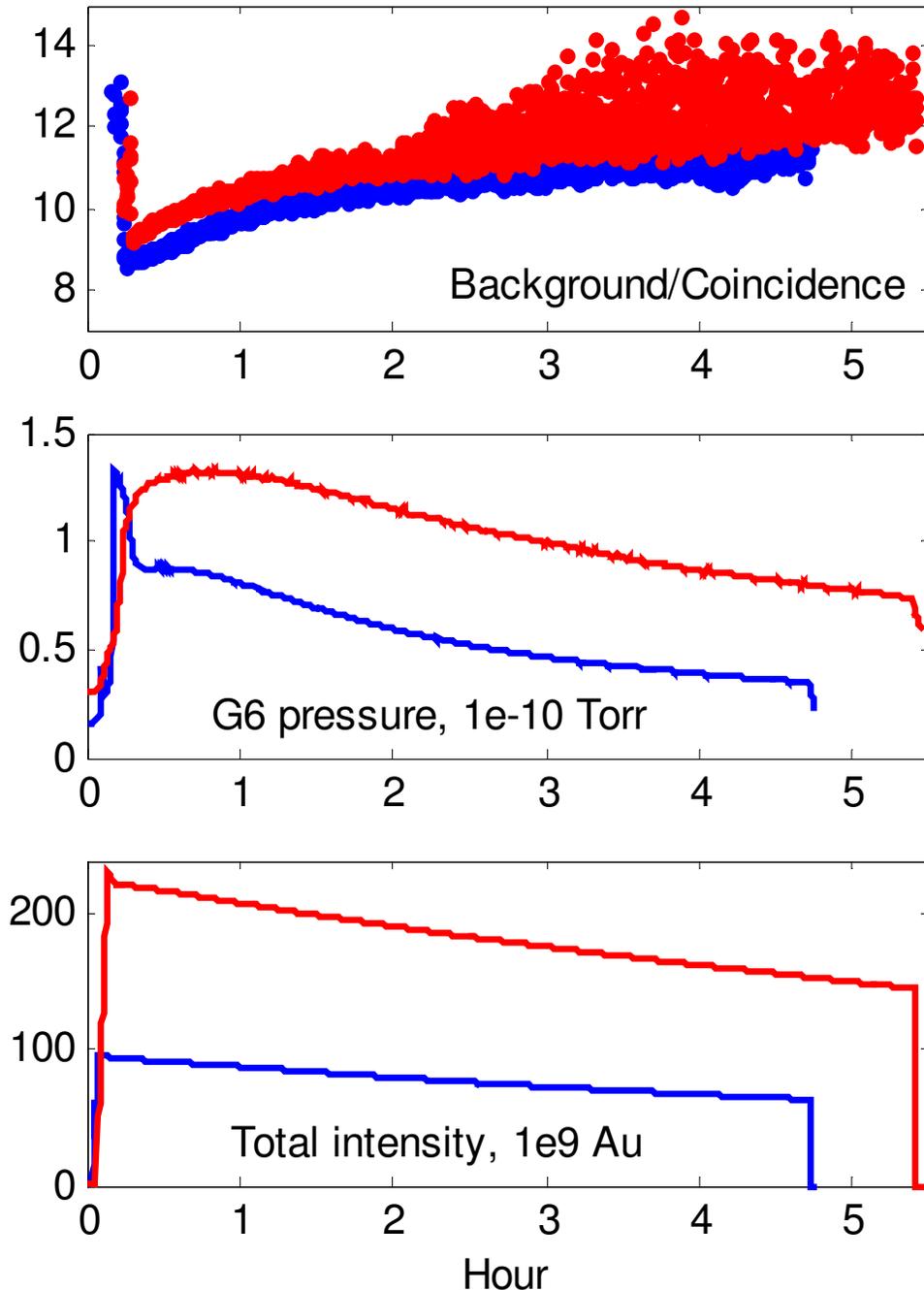
I. STAR background

- In dAu03, the PHOBOS background was a limiting factor. However, largest STAR ZDC background/coincidence ratio was about 13 (at 0.5 hour after transition). The STAR is different from the PHENIX.
- STAR background was not correlated with pressure rise, neither with the emittance: Fills 3049, 3055 had small emittance, but high background.
- The sudden drop of STAR ZDC background/coincidence ratio happened as 110-bunch switched to 55-bunch, and the total intensity reduced by a half. The mechanism is, however, not understood.



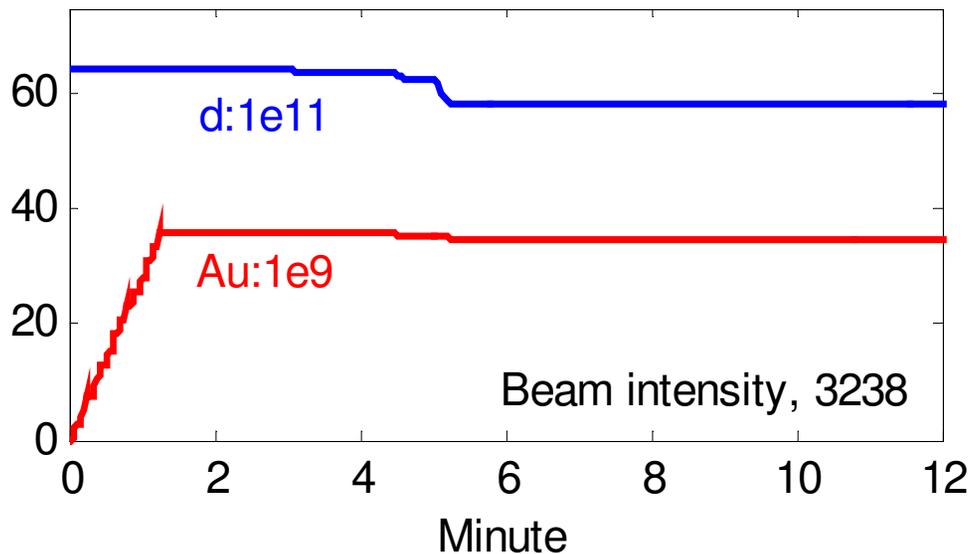
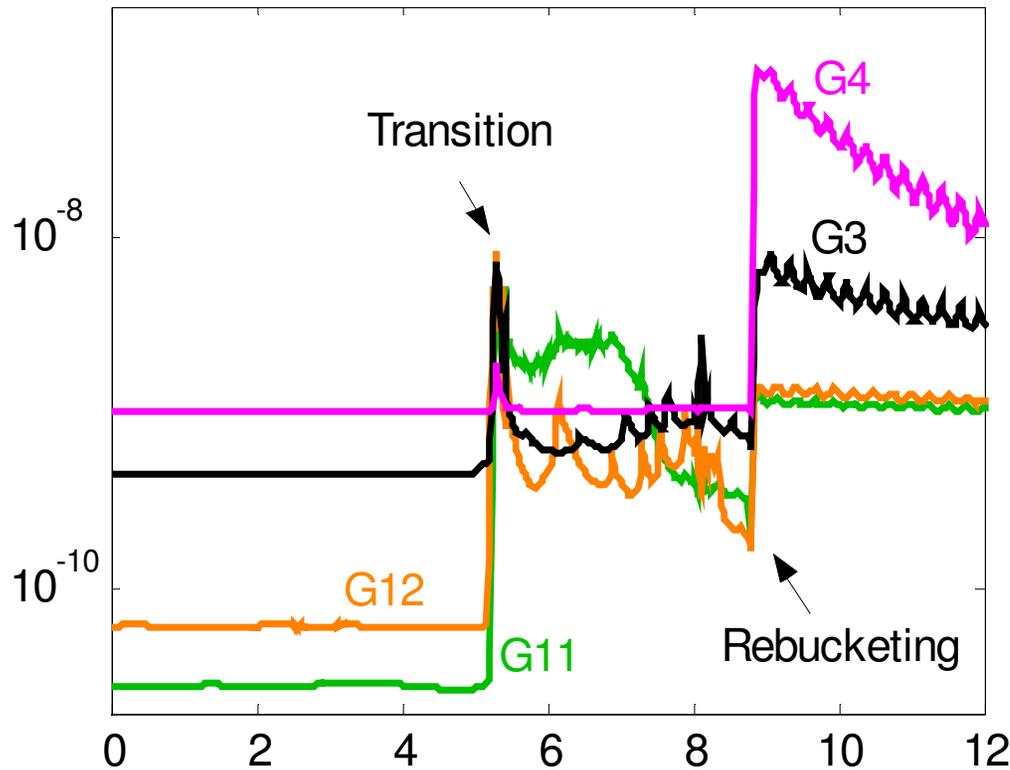
- ZDC background is the average of the singles in Au and d directions in dAu run.
- For Au direction, hadronic cross section is 2.21 b. For d direction, it is 18% of that (PRL, 072304, 2003). With the single Coulomb dissociation 1.25 b (it is negligible in Au direction), the total is 1.65 b in d direction. This is in general observed, but not very consistent.
- Large ZDC singles can often be traced to beam losses. Another factor is: the large Au direction singles in 3077 (no Au beam) was explained by the back-side entry of the ZDC detector.

Blue: 4832, Run4 Red: 8975, Run7



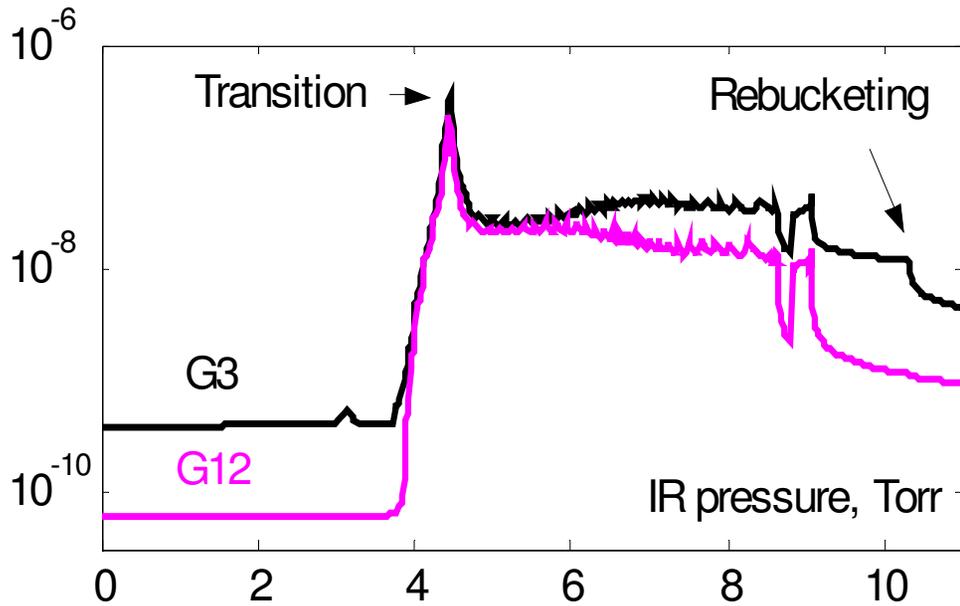
- In dAu03, the dynamic pressure rise at IR6 was not high, and beam-gas was not an important factor in STAR background. In dAu08, the beam intensity will be much higher, the IR6 dynamic pressure rise might become relevant.
- The IR6 dynamic pressure rise in Au04 and Au07, typically at $1e-10$ Torr, had marginally affected the STAR background.
- In Au04, IR6 static pressure rise caused higher dynamic pressure rise, to $5e-10$ Torr. In Au07, similar problem was mitigated by vacuum sublimations.

IR pressure, Torr

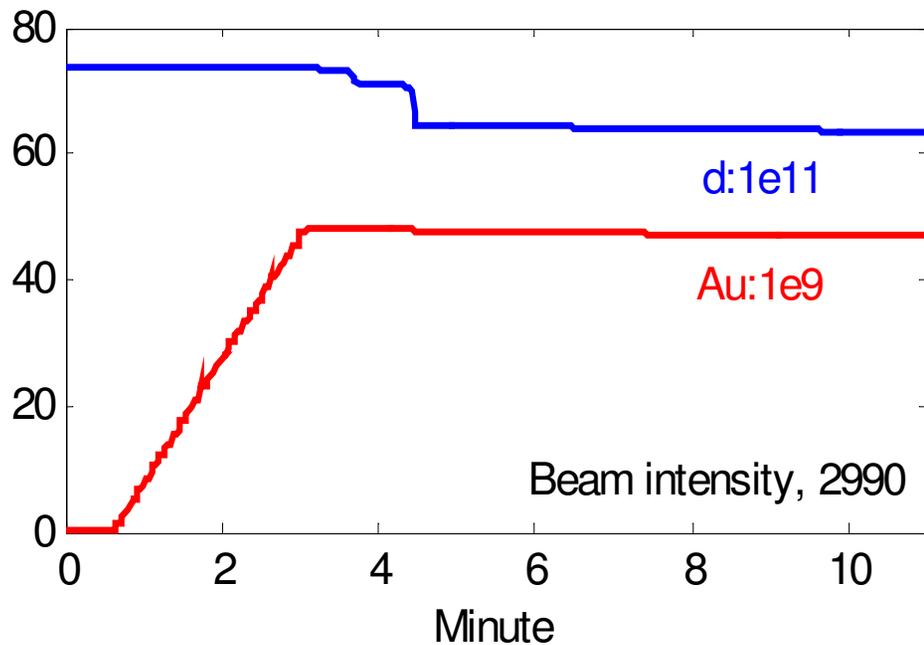


II. IR Pressure Rise

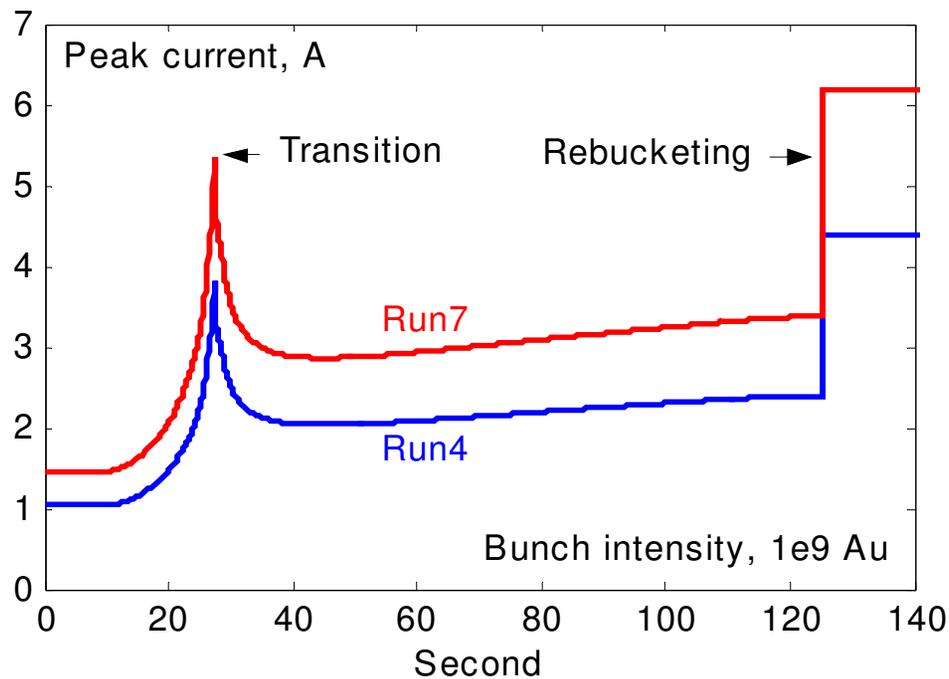
- In Au07, for 110-bunch beams with the bunch intensity of $1.2e9$, the highest IR pressure rise only reached $2e-8$ Torr. So high intensity Au beam alone may not be a problem in dAu08.
- In dAu03, 110-bunch deuteron beam with the bunch intensity of $0.7e11$ (3077) had caused pressure rise of $2e-8$ Torr at IR.
- Transition and rebucketing pressure rise at IR4 and IR12 for the golden fill in dAu03, Fill 3238: 55-bunch, with the deuteron bunch intensity of $1.1e11$, and $0.62e9$ for Au.



- Another example in dAu03. The highest pressure rise at IR4 and IR12 was from Fill 2990: 110-bunch, with the deuteron bunch intensity of $0.54e11$, and $0.42e9$ for Au. Transition pressure rise at G3 and G12 both reached 4e-7 Torr. Note that at the rebucketing, the pressure is reduced.



- In dAu08, the Q3-Q4 straight sections and IR2, IR10 pressure rise will not be high, because of the NEG pipes. The chamber condition at IR4 and IR12 will not change much, the pressure rise there might be the highest at IRs.



- With smaller Au beam longitudinal emittance, the peak current is higher for the same bunch intensity.
- In dAu08, the large longitudinal emittance of the deuteron beam and the high Au beam peak current might create problem at IRs.
- Benchmark CSEC (thanks to Mike and Wolfram) for IR pressure rise shows an electron line density of 0.2 nC/m. Using the electron desorption rate of 0.005, and pumping speed of 17 l/s.m, this gives rise to the pressure rise of 1e-7 Torr.

