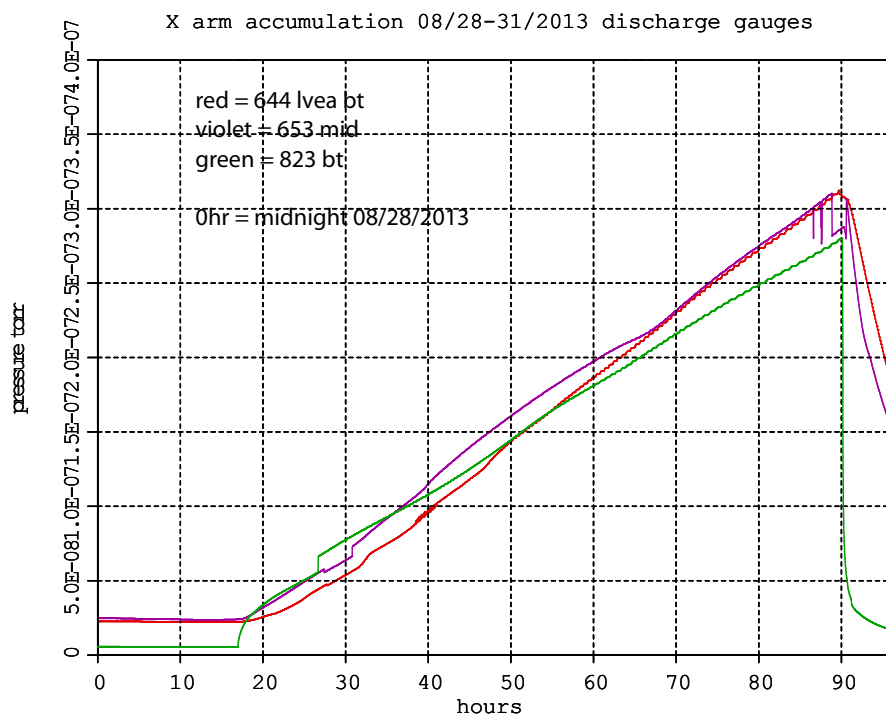


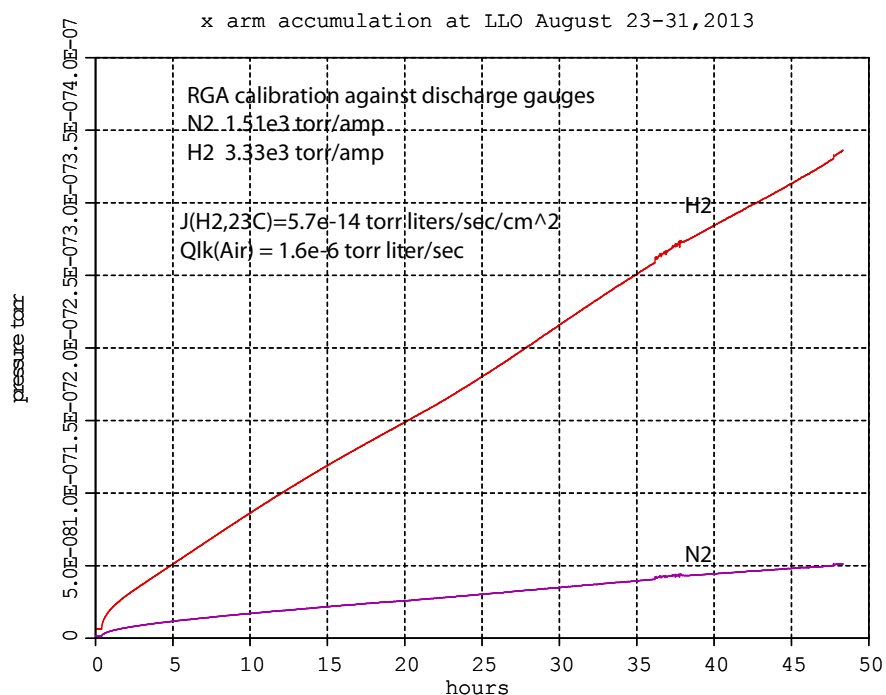
## **Accumulation measurement on the x arm at LLO August 28 -31, 2013**

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**Summary** We made an accumulation of the gas evolved in the x arm at LLO by closing off valves at ion pumps in the test mass chamber at the x end and on the x manifold in the LVEA. The accumulation was measured on cold cathode gauges at the LVEA (PT644), in the mid building (PT653) and at the xend (PT823). An RGA in Faraday mode placed in the x end test mass chamber was used to separate hydrogen from nitrogen. The cryotrap at both ends were included in the accumulation volume. The x end test mass chamber was empty and had been pumping for 35 days before the accumulation. The results gave an accumulation of molecular Hydrogen of  $8.9 \times 10^{-6}$  torr liters/sec corresponding to an average outgassing rate of hydrogen of  $5.7 \times 10^{-14}$  torr liters/sec/cm<sup>2</sup> at 23C. The average hydrogen outgassing rate at 23C measured after the beamtube bakeout in 2000 was  $5.4 \times 10^{-14}$ . The accumulation of nitrogen was  $1.2 \times 10^{-6}$  torr liters/sec which corresponds to an air leak of  $1.6 \times 10^{-6}$  torr liters/sec. It is unlikely that the air leak is due to outgassing by the VITON "O" rings in the gate valve at the x end test mass chamber. The outgassing rate after 35 days of pumping following an exposure to full atmospheric pressure is expected to be between 1/5 to 1/10 of the air leak being measured. The calibration of the RGA was done by using the average of the cold cathode gauges for the air sensitivity. The literature value for the ratio of the sensitivity  $H_2/N_2 = 1/2.2$  used for both the cold cathode gauges and the RGA.



**Figure 1** The uncorrected output of the three cold cathode gauges on the y arm. The temperature dependence of the hydrogen outgassing is the primary source of the deviations from a linear dependence of the pressure with time.



**Figure 2** The accumulation of hydrogen (amu 2) and nitrogen (amu28) measured on the RGA at the x end test mass chamber. The data has been corrected for offset drifts by subtracting the signal at amu5. The data has not been corrected for temperature changes.