

## Hydrocarbon measurement in the LVEA at LHO after 145 days of pumping

Kyle Ryan and R. Weiss September 27, 2013

The pressure of a set of hydrocarbons was measured by pumping speed modulation with the Pfeifer RGA mounted on HAM3. The pressure modulation was made by closing and opening GV2 thereby including and excluding the cryo trap CP2 from the measurement volume. The measurement volume consisted of HAM2, HAM3, BSC1, BSC2, BSC3, BSC7 and BSC8.

The RGA was operated in SEM mode with a SEM voltage of 1600 volts, The sensitivity of the RGA was established by calibration with an argon leak of  $2.2 \times 10^{-9}$  torr liters /sec at amu40 and a  $2.2 \times 10^{-9}$  torr liter/sec leak of krypton at amu 84. The RGA sensitivity at amu40 is  $2.2 \times 10^{-2}$  torr/amp and  $4.8 \times 10^{-2}$  torr/amp at amu 84. With no pumping in the RGA volume short of the pumping by the RGA itself (approximately 2 liters/sec), the pressure of hydrocarbons in the measurement volume when the system is being pumped by CP2 is given by

$$P_{\text{volume}} = \Delta P_{\text{RGA}} (\text{GV2}_{\text{closed}} - \text{open}) \frac{F_{\text{pumps}}}{F_{\text{CP2}}}$$

The estimates for the pumping speed of the ion pumps (IP1, IP2 and IP5) open to the measurement volume is  $F_{\text{pump}} = 4000$  liters/sec and the cryo pump CP2 and associated tabulation is  $F_{\text{CP2}} = 40000$  liters/sec. The hydrocarbon pressures when CP2 is opened to the system are listed in the table.

amu	pressure torr
41	$3.5 \times 10^{-13}$
<b>43</b>	$1.2 \times 10^{-13}$
<b>53</b>	$2.2 \times 10^{-14}$
<b>55</b>	$6.4 \times 10^{-14}$
<b>57</b>	$2.6 \times 10^{-14}$
<b>65</b>	$1.1 \times 10^{-14}$
<b>69</b>	$2.6 \times 10^{-14}$
<b>total</b>	$6.2 \times 10^{-13}$

Our goal is to keep the total pressure of hydrocarbons below  $10^{-13}$  torr when running the interferometer. There is a good chance that with both cryo traps open and additional pumping time we will get close to this value. To be sure, it would be useful to repeat the measurement at a convenient time several months from now.