

Memorandum

To: NSTX team

From: Rajesh Maingi

Subject: Calibration of center stack midplane valves

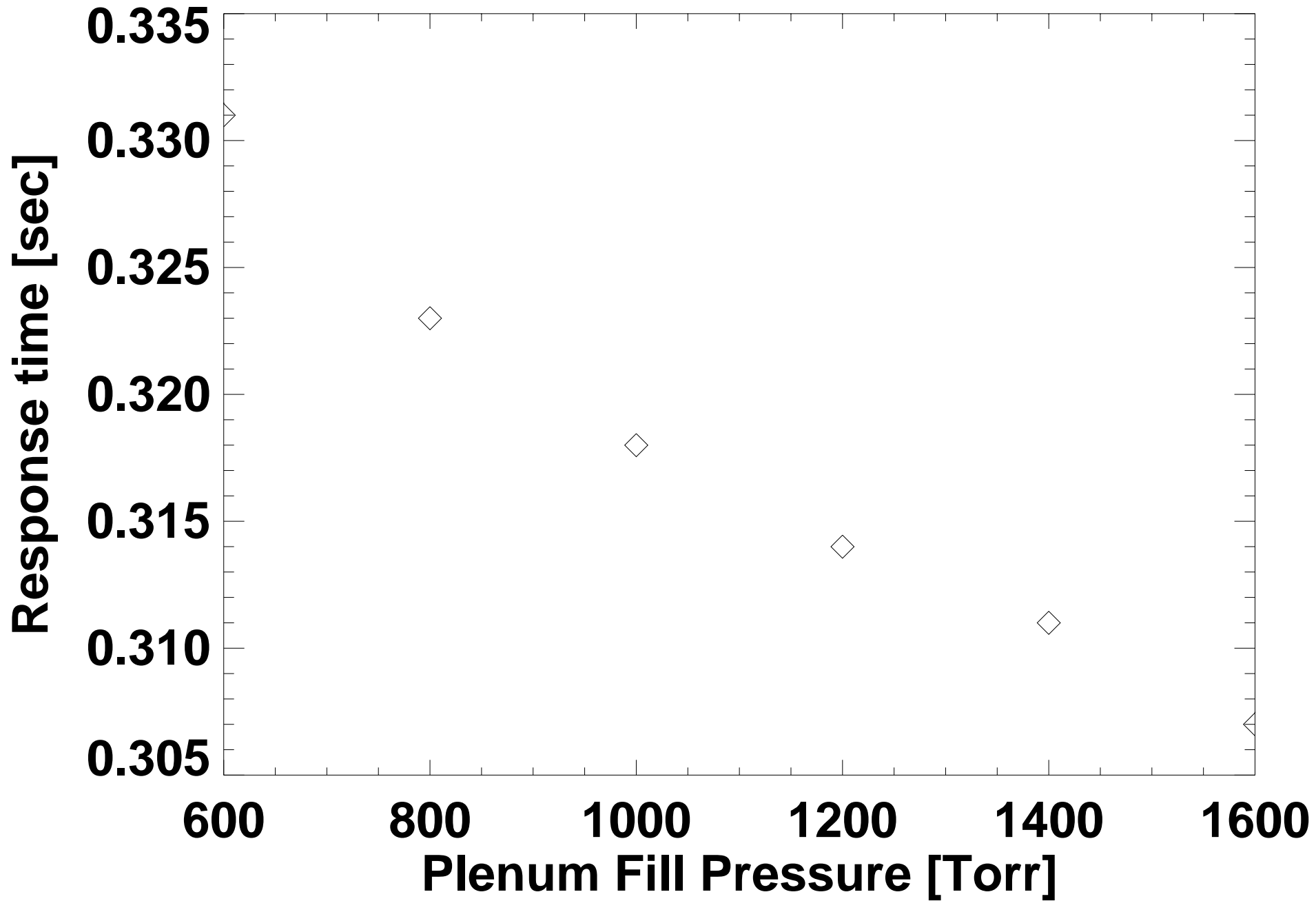
Date: April 8, 2004

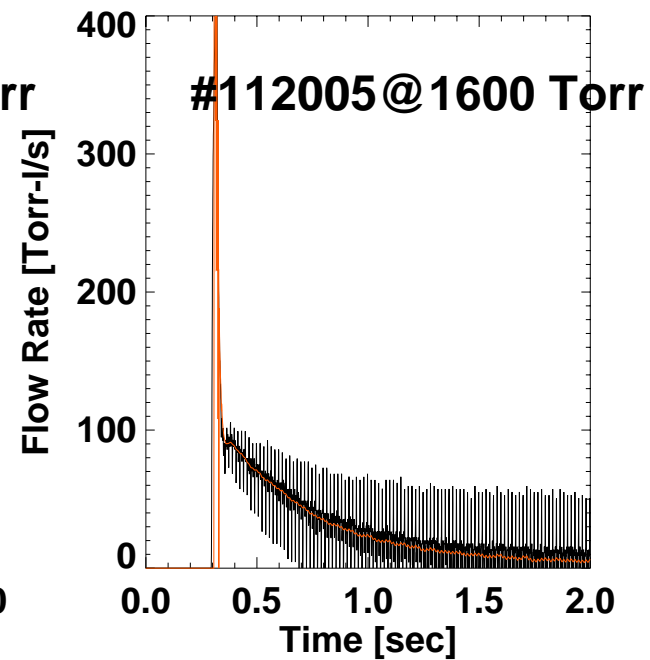
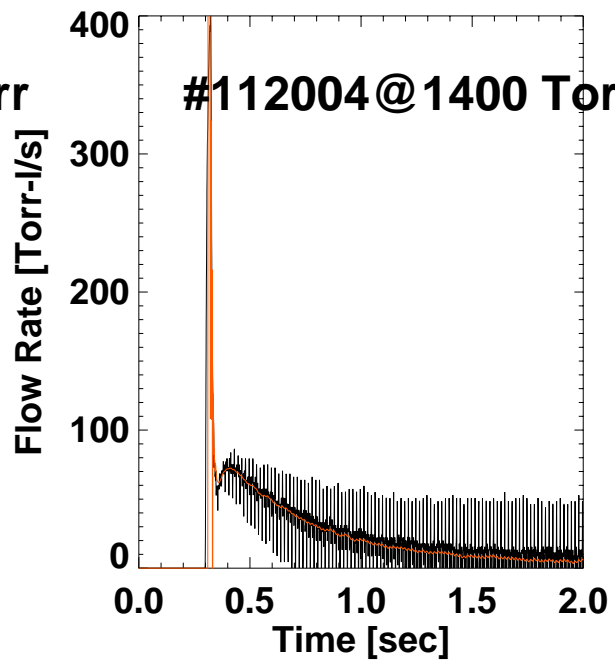
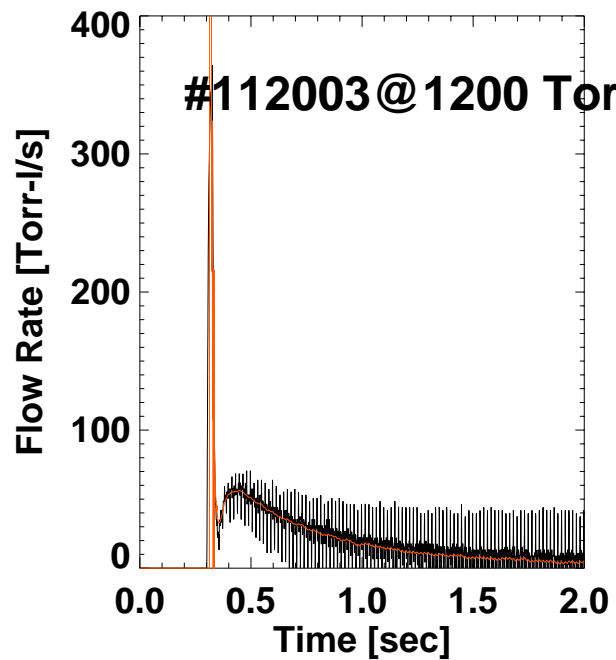
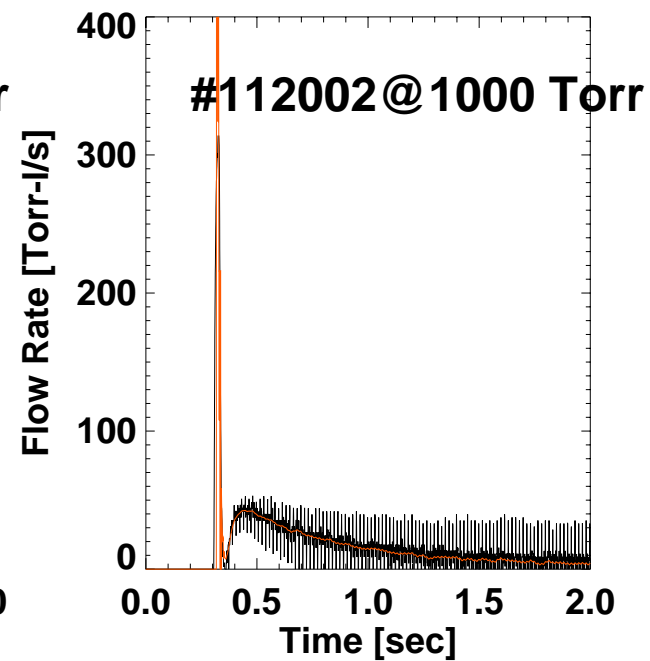
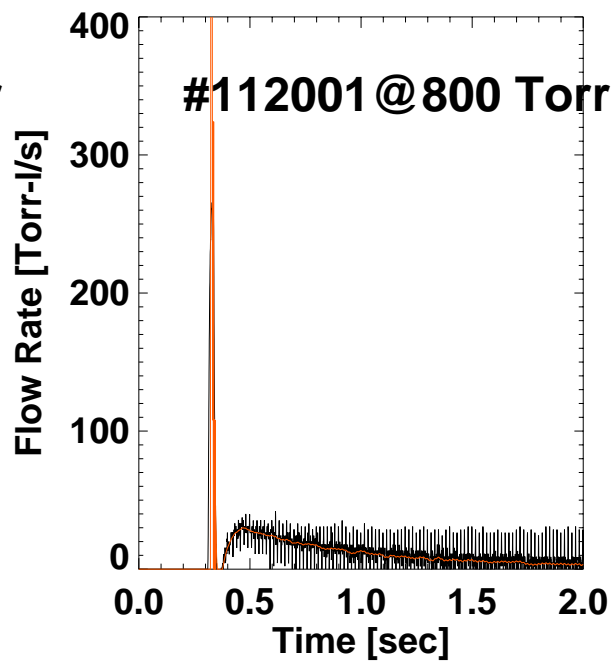
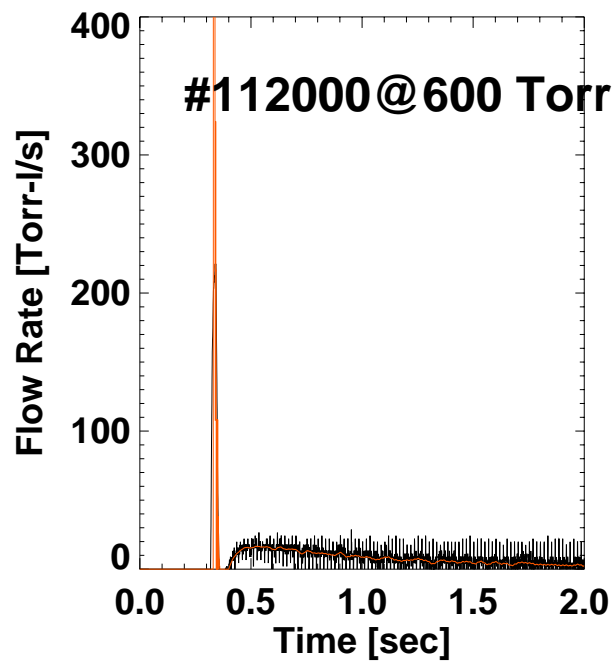
This memo documents the techniques I use for calibration of the “lock and load” type gas injector on NSTX, which include the center stack midplane, shoulder, and lower dome.

1. Turbo—pumps are turned off before the calibration shot
2. The gas injector is programmed to turn on at $t=0$ with a prescribed plenum pressure
3. The time that the pressure increases on the micro-ion BayE gauge is taken as the gas flow delay time (done manually at the moment)
4. The injector flow rate is computed as $d/dt (P_gauge * V_NSTX)$, where P_gauge is the calibrated pressure (maintained by R. Raman), and V_NSTX is the volume of NSTX (29 m^3 from B. Blanchard)
5. Different smoothing techniques have been tried to obtain smooth calibration curves; I presently smooth the data once before and once after taking the derivative (IDL smooth function for 49 data points, which equates to a ± 1.25 msec smoothing interval with present d/a rate)
6. The time dependent wave form of the calibration shot # is stored in my area

For an NSTX plasma shot, another code computes when the injector is programmed to initiate, reads the stored plenum pressure, and selects the best shot to recall the waveform. Note at present this code finds the closest calibration pressure; if the discharge pressure is different from my calibrated pressures, the code picks the closest pressure and does not interpolate between two calibration shots. Note also that this code has multiple calibrations, one or more per year over the last several years, and selects the right set of calibration curves based on shot number.

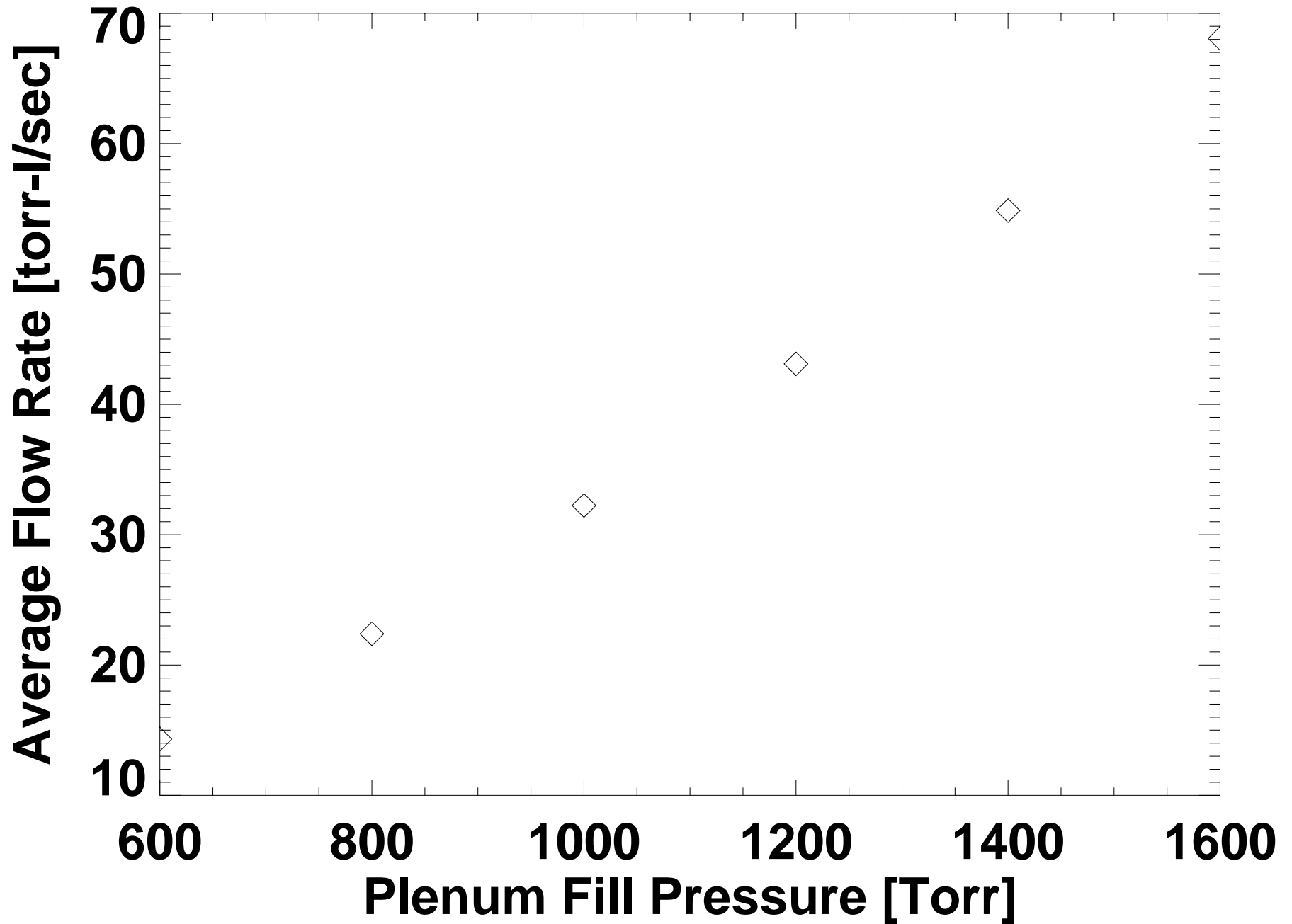
An example of a calibration curve from my April 8, 2004 is attached for your usage.





HFS Gas injector calibration

Average flow rate for 500ms after pop-up



Thu Apr 8 12:14:44 2004

cal_hfs_flow

rmaingi - idl.ps