

These measurements of the ETMX charge were done manually using awggui for excitation and diaggui for data processing. The data taken took place between UTC (2014-08-26 20:10:00) and UTC (2014-08-26 22:00:00). This is the 4th measurement after the ion pump gate valve has been opened this took place about UTC 2014-08-22 20:40:00.

I drove a sinusoidal excitation at 4Hz and amplitude 30000 counts which is equivalent to 91.5 Volts on the ESD ( $30000 \cdot 20 \cdot 40 / 2^{18}$ , as the DACs drive  $\pm 10V$  and they are 18 bits and then we have an amplifier of Gain 40). Notice that this actuation signal amplitude is divided to the deflection measurements in the tables below to get the standardised plots at the end of this document.

Then we monitor the deflection of the ETMX mass both in Pitch and Yaw looking at the *oplev*. The *oplev* has been carefully centred to the QPD before the measurements.

The magnitudes of the deflection given below are in *urad* and are obtained through a power spectrum plot of the *oplev* pitch and yaw signals. This power spectrum was measured with a **BW = 0.02Hz** (actual value is **0.0234375**) on the range between 1 – 5 Hz and averaged **3** times.

During the measurements the coherence between excitation and Pitch and Yaw was monitored to be sure that the excitation was observed. I also measured the phase (in degrees) of the transfer function between excitation and *oplev* pitch and yaw (the phase was measured to confirm it is 180 degrees different for the deflections with + and - BIAS). The same excitation was applied to the 4 quadrants of the ESD.

The ETMX pressure at PT-510 is  $2.96e-7$  good enough for these measurements. ISI Watchdog ST1 and ST2 green so no much drift of the *oplev*. Next I show the results:

**Driving UR quadrant: low coherence +195V in yaw**

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	4.968e-3	179	5.365e-3	-1
+195.3	1.8475e-3 (low coherence 0.985)	173	2.4037e-3 (low coherence 0.98)	15
-195.3	3.0369e-3	-2	3.6567e-3	180
-390.5	5.7834e-3	-2	5.9531e-3	-177

**Driving UL quadrant:**

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	4.467e-3	180	5.135e-3	179
+195.3	1.7829e-3	174	1.8954e-3 (low coherence 0.98)	-177
-195.3	3.299e-3	-1	4.042e-3 (low	-4

			coherence 0.98)	
-390.5	5.888e-3	0	6.915e-3	2

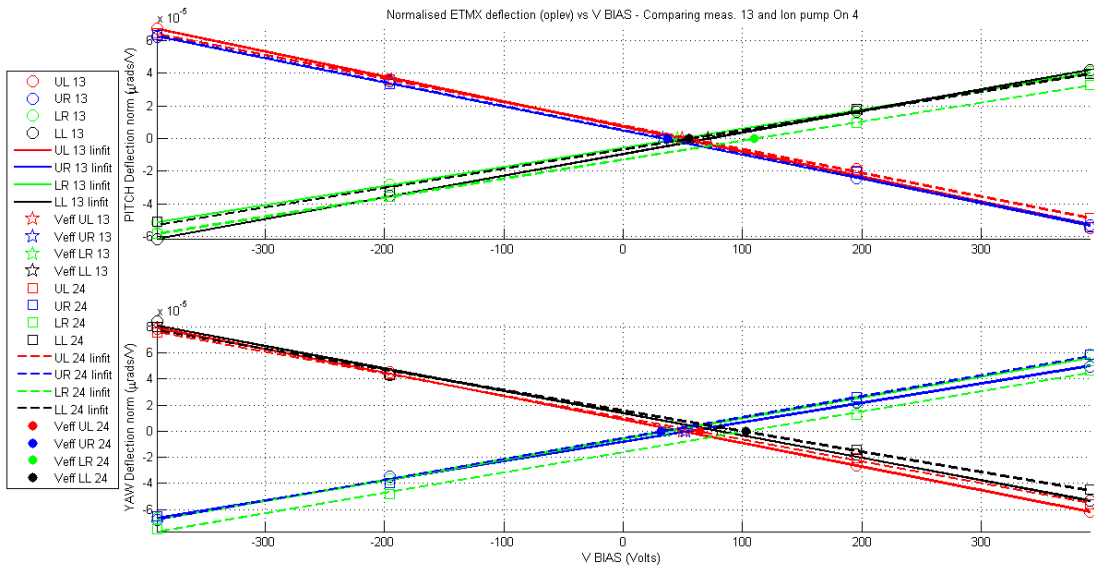
Driving LL quadrant: **low coherence +195V in yaw**

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	3.6073e-3	0	4.0738e-3	179
+195.3	1.648e-3	-5	1.3317e-3 (low coherence 0.96)	-178
-195.3	2.96e-3 (low coherence 0.98)	-179	3.979e-3	0
-390.5	4.664e-3	180	7.341e-3	-4

Driving LR quadrant: **low coherence +195V**

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	2.9933e-3	0	4.29e-3	-4
+195.3	0.9067e-3	-13	1.1349e-3 (low coherence 0.96)	10
-195.3	3.269e-3	179	4.4018e-3	179
-390.5	5.307e-3	178	6.8783e-3	174

Plotting the above results in the standard way “Normalised deflection [ $\mu\text{rad}/\text{V}$ ] vs V BIAS”, the normalisation of the deflection is by the amplitude of the excitation = 91.5Volt. Comparison between measurement 21, 22 and current (measurement 24):



	UL - 21	UL - 22	UL - 24	UR - 21	UR - 22	UR - 24	LR - 21	LR - 22	LR - 24	LL - 21	LL - 22	LL - 24
Veff PITCH [V]	53	34	56	37.5	29	37	62	116	110	66	87	55
PITCH slope [ $10^{-7}$ µrad/V]	-1.478	-1.4889	-1.4424	-1.4403	-1.4715	-1.4757	1.1073	1.0992	1.1619	1.2048	1.1582	1.1828
Veff YAW [V]	47	34	64	39	34	31	67	98	103	42	104	103
YAW slope [ $10^{-7}$ µrad/V]	-1.7636	-1.7234	-1.6798	1.5308	1.5451	1.6048	1.5125	1.5742	1.5588	-	1.6419	-1.5737