These measurements of the ETMY charge were done manually using awggui for excitation and diaggui for data processing. The data taken took place between UTC (2014-08-15 21:00:00) and UTC (2014-08-15 23:00:00). From the measurements on the 13th August we have confirmed that the ESD LL cabling does not seem to have any effect on the procedure, however what has made LR change charge sign? I need more data on this, I need to confirm that this method is consistent and I need to compare cable swapping within 1 hour of each other to really take it out of the equation. That is what I will be measuring today in this report;

1) Measure again as it is with the wrong LL cable configuration.
2) Swap ESD LL cable to the right configuration and compare.
3) ETMX oplev may come live today so we can start charge measurements in this mass, before the ion pump is turned on, also there are no illuminators there we only have the cold cathode (maybe not even that), so it will be good to monitor charge changes in that mass.

NOTE: I will increase by a factor of 2 the BW of the *oplev* spectrum measurements to reduce the measurement time interval otherwise taking data for 1.5 hours for each measurement is becoming unpractical. Also there is no evidence (from the standard deviation results I got during the test of changing BW value) that increasing BW to 0.02Hz would affect too much the measurement results.

I drove a sinusoidal excitation at 4Hz and amplitude 30000 counts which is equivalent to 91.5 Volts on the ESD ($30000*20*40/2^{18}$, as the DACs drive +-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 ETMY 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 ETMY pressure at PT-410 is 3.8e-8 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: Very low SNR and coherence at VBIAS -195Volt.

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	8.4170e-3	-9	6.9169e-3	-14
+195.3	5.4341e-3	-17	4.4056e-3	-12
-195.3	0.314e-3 (low coherence	-130	1.9109e-3 (low coherence	171

	0.4)		0.97)	
-390.5	2.8574e-3 (low coherence 0.99)	161	5.0e-3	167

Driving UL quadrant:

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	2.8549e-3 (low coherence 0.98)	177	0.948e-3 (low coherence 0.8)	155
+195.3	0.395e-3 (low coherence 0.8)	5	1.6705e-3 (low coherence of 0.98)	-13
-195.3	7.0079e-3	-13	7.4075e-3	-13
-390.5	10.0504e-3	-13	10.0787e-3	-15

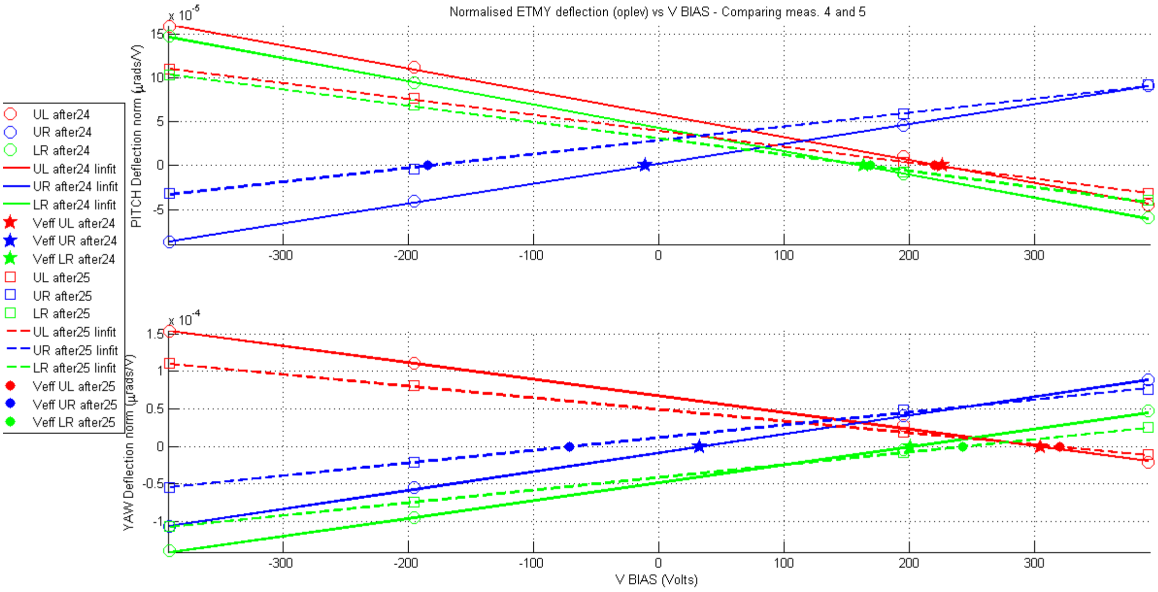
Driving LL quadrant: This quadrant is not being driven again because we brought the LL driving cable through the ESD LP box as per the previous measurements.

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	-	-	-	-
+195.3	-	-	-	-
-195.3	-	-	-	-
-390.5	-	-	-	-

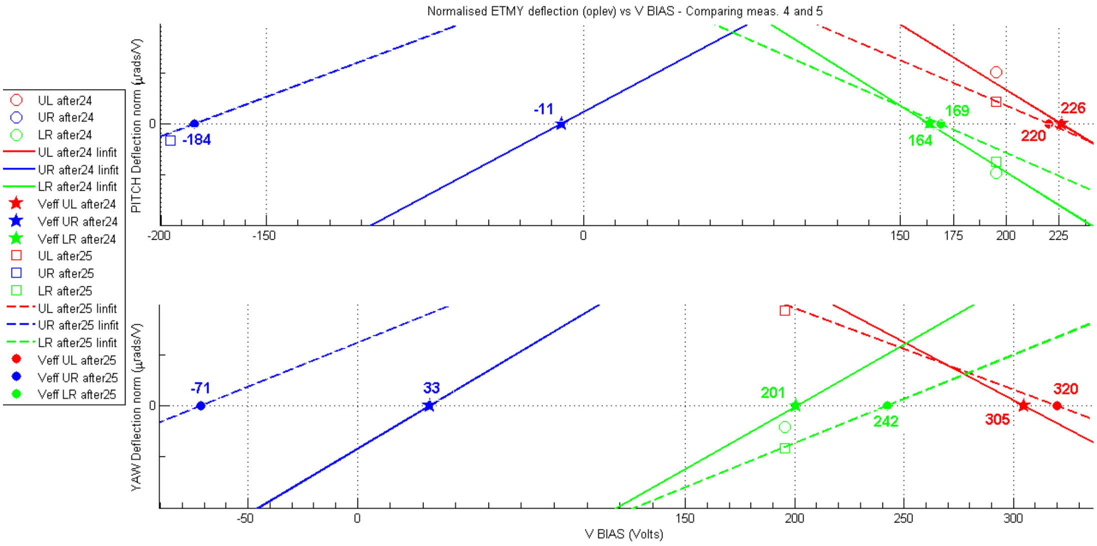
Driving LR quadrant: Very low SNR and coherence at VBIAS +195Volt.

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+390.5	3.6181e-3	168	2.3034e-3	-12
+195.3	0.701e-3 (low coherence 0.9)	144	0.749e-3 (low coherence 0.9)	180
-195.3	6.330e-3	-12	6.7395e-3	166
-390.5	9.4852e-3	-13	9.807e-3	167

Plotting the above results in the standard way "Normalised deflection [µrad/V] vs V BIAS", the normalisation of the deflection is by the amplitude of the excitation = 91.5Volt. We compare it with the previous measurements (labelled suffix 24, while the current ones is suffix 25):



And next we zoom on the zero crossing:



The results of these measurements are again interesting. We noticed that the common sign charge quadrants report a consistent charge within a few percent, however the other quadrant (UR) with opposite sign charge it did suffer again a considerable increase of that charge while in the previous measurement comparison (suffix 23 respect suffix 24) we saw the opposite effect, at that time the only different between the compared measurements was swapping the ESD LL quadrant cable with the BIAS cable going through the ESD LP filter box and they were 1 day apart. In the current comparison the ESD LL cable configuration has been maintain, the measurements are 1 day apart and the only difference is that I used half the spectrum bin resolution (BW = 0.02 instead of 0.01 Hz).

I notice that the current results are closer to those measured 2 days ago (measurement with suffix 23) so let's compare them next:

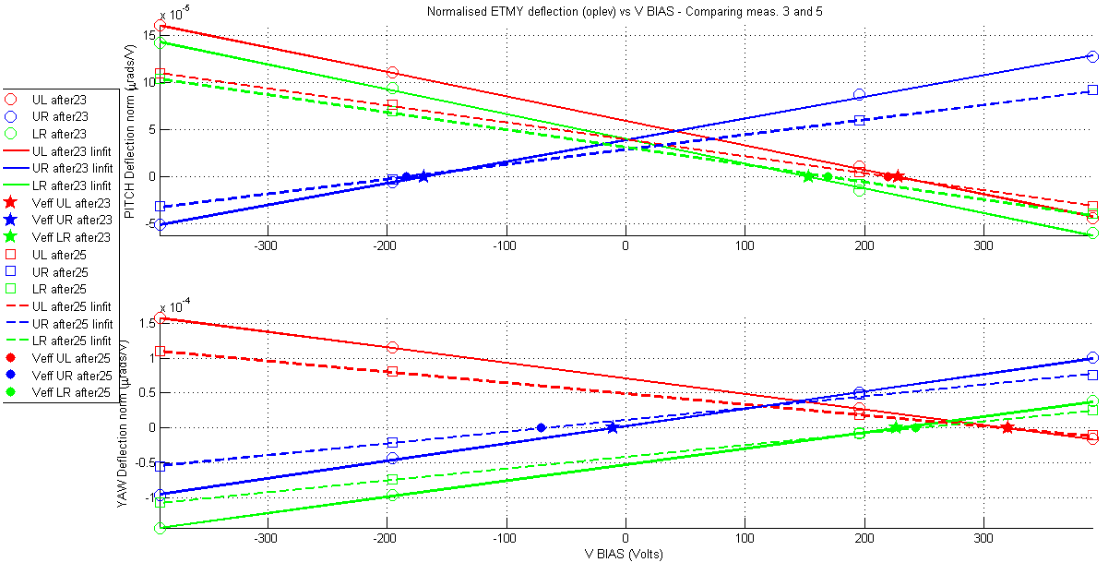


Table summary of Veff and slopes for the 3 sets of measurements (notice that the measurement with suffix 23 is in red, the one with suffix 24 is blue and the current one is in green):

	UL - 23	UL - 24	UL - 25	UR -23	UR - 24	UR - 25	LR -23	LR - 24	LR - 25
Veff PITCH [V]	228	226	220	-169	-11	-184	153	164	169
PITCH slope [10^{-7} µrad/V]	-2.6059	-2.6014	-1.8133	2.3050	2.2564	1.5825	-2.6351	-2.6454	-1.8588
Veff YAW [V]	320	305	320	-11	33	-71	227	201	242
YAW slope [10^{-7} µrad/V]	-2.2264	-2.2153	-1.5542	2.48879	2.4904	1.6861	2.3077	2.3825	1.6895

It is very interesting to notice that the slope of the charge measurements between “after25” and the others changes, this has not been the case until now. This slope is related to the dielectric constant and relative dielectric constant of the test mass, the spacing between test mass and electrodes, and geometry of the electrode pattern, the mass of the test mass and the injection frequency. Certainly none of these parameters should have changed, with maybe the exception of the spacing between the electrodes and the test mass.