These measurements of the ESD Charge were done manually using diaggui. 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 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 = 0.01Hz on the range between 1 – 5 Hz and averaged 2 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. Next I show the results:

Driving UR quadrant:

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+389.5	$4.63\cdot10^{-3}$	-16.57	$5.42\cdot10^{-3}$	-13.6
+194	$3.93\cdot10^{-3}$	-11.67	$2.73\cdot10^{-3}$	-16.89
-196.5	$3.8\cdot10^{-3}$	169.33	$5.94\cdot10^{-3}$	165.02
-392	$8.44\cdot10^{-3}$	164.87	$11.2\cdot10^{-3}$	166.87

Driving UL quadrant:

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+389.5	$6.57\cdot10^{-3}$		$5.43\cdot10^{-3}$	
+194	$1.97\cdot10^{-3}$		$1.25\cdot10^{-3}$	
-196.5	$7.36\cdot10^{-3}$		$6.38\cdot10^{-3}$	
-392	$11.89\cdot10^{-3}$		$10.53\cdot10^{-3}$	

This measurement was done several times to see repeatability with intervals of tends of minutes to more than 1 hour.

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+389.5	$6.38\cdot10^{-3}$		$5.36\cdot10^{-3}$	
+194	$1.82\cdot10^{-3}$		$1.07\cdot10^{-3}$	
-196.5	$7.42\cdot10^{-3}$		$6.96\cdot10^{-3}$	
-392	$12.12\cdot10^{-3}$		$10.77\cdot10^{-3}$	

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+389.5	$5.83 \cdot 10^{-3}$		$4.88 \cdot 10^{-3}$	
+194	$1.41 \cdot 10^{-3}$		$0.7 \cdot 10^{-3}$	
-196.5	$7.78 \cdot 10^{-3}$		$7.49 \cdot 10^{-3}$	
-392	$12.58 \cdot 10^{-3}$		$11.29 \cdot 10^{-3}$	

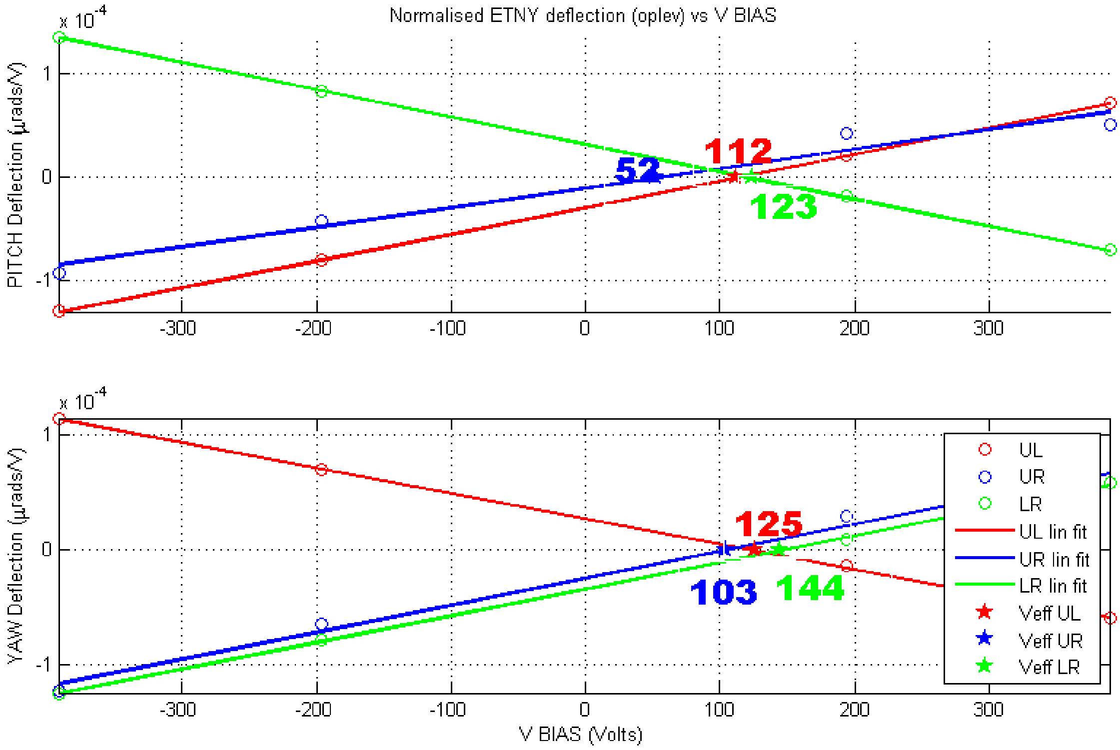
Driving LL quadrant: This quadrant had a very low excitation SNR, I gave the coherence values in brackets. While the SNR of the injections from the other quadrants was between 4 and 15 depending on the V BIAS, the injection from this quadrant only showed noise. This explains the random values for the deflection magnitude and for the phase.

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+389.5	$0.54 \cdot 10^{-3}$ (0.8)	-165.84	$0.47 \cdot 10^{-3}$	96.85
+194	$0.33 \cdot 10^{-3}$ (0.85)	95.31	$0.28 \cdot 10^{-3}$ (0.65)	-115.33
-196.5	$0.395 \cdot 10^{-3}$ (0.65)	10.33	$0.43 \cdot 10^{-3}$ (0.55)	-152.06
-392	$0.59 \cdot 10^{-3}$ (0.95)	37.71	$0.45 \cdot 10^{-3}$ (0.75)	-131.65

Driving LR quadrant:

V BIAS (Volts)	Pitch		Yaw	
	Mag (urad)	Phase (deg)	Mag (urad)	Phase (deg)
+389.5	$6.48 \cdot 10^{-3}$	167.271	$5.34 \cdot 10^{-3}$	-12.16
+194	$1.69 \cdot 10^{-3}$	170	$0.87 \cdot 10^{-3}$	-15.3
-196.5	$7.71 \cdot 10^{-3}$	-12.98	$7.17 \cdot 10^{-3}$	167.66
-392	$12.5 \cdot 10^{-3}$	-12.67	$11.4 \cdot 10^{-3}$	168.5

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.



	UL	UR	LR
Veff PITCH [V]	122	52	123
PITCH slope [µrad]	$2.6 \cdot 10^{-7}$	$1.9 \cdot 10^{-7}$	$-2.65 \cdot 10^{-7}$
Veff YAW [V]	125	103	144
YAW slope [µrad]	$-2.2 \cdot 10^{-7}$	$2.34 \cdot 10^{-7}$	$2.3 \cdot 10^{-7}$