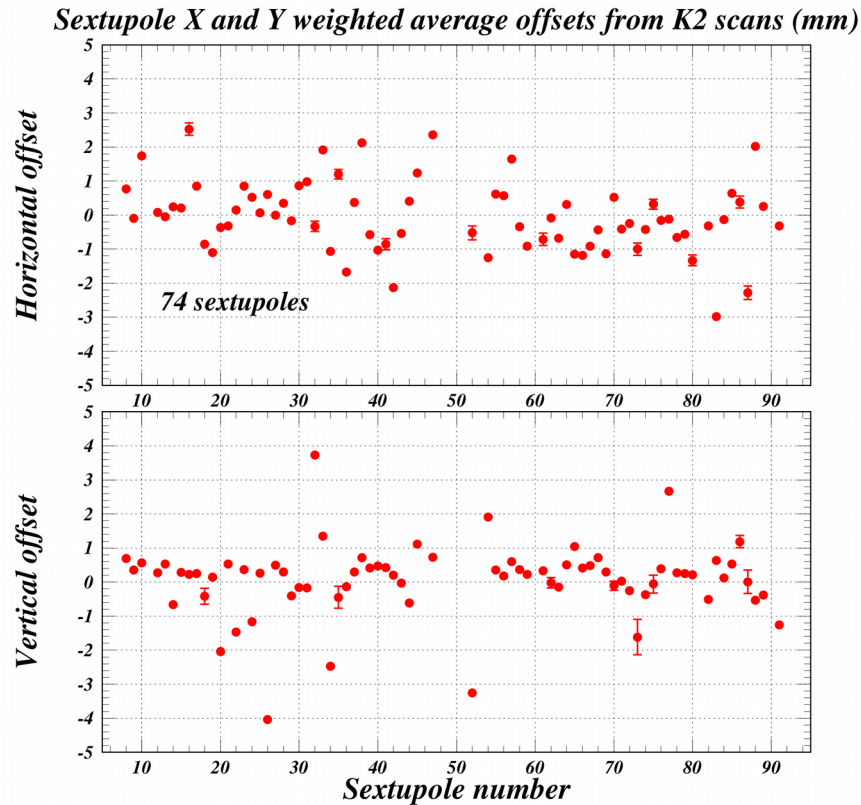




# Effects of Horizontal and Vertical Sextupole Misalignments



Jim Crittenden

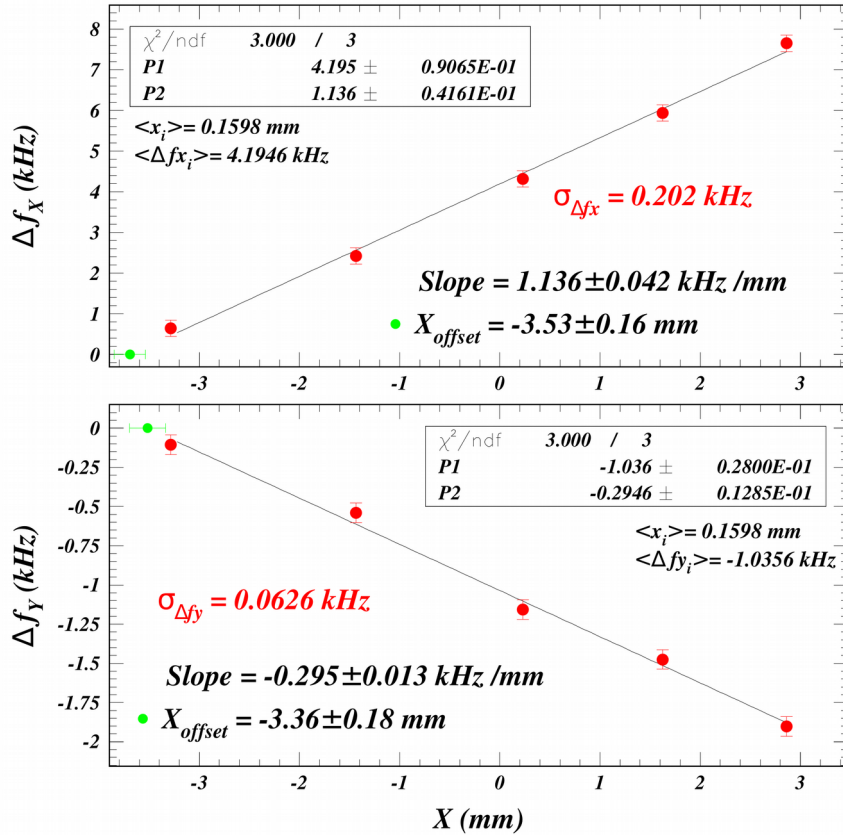
CESR Accelerator Group

15 February 2023



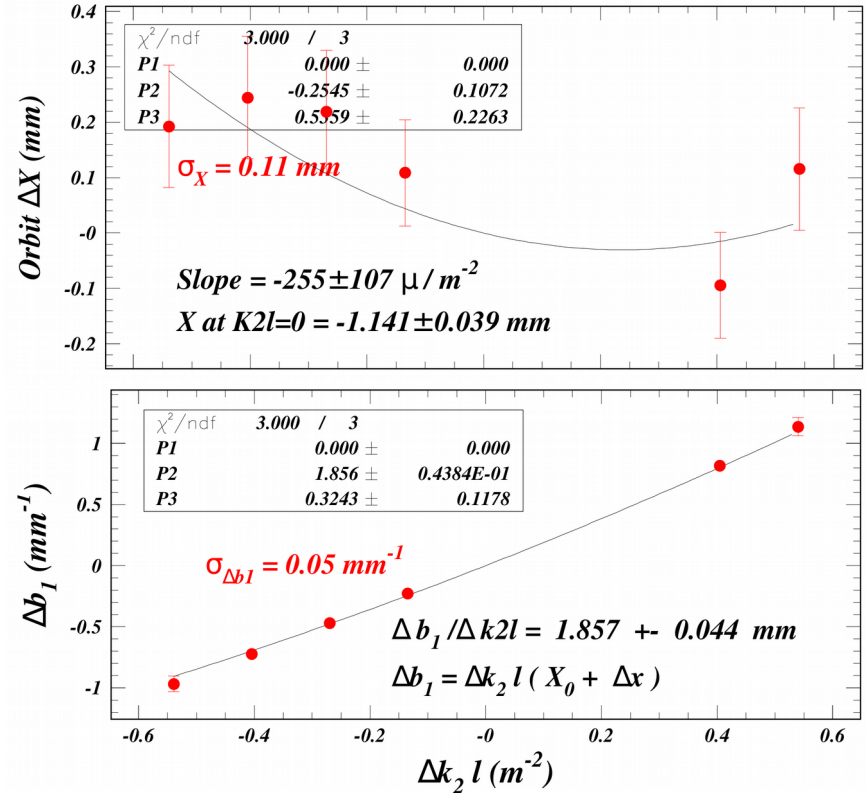
## Sextupole Calibration Data

March 19: Sextupole Calibration Fit for Sextupole Nr 83



**Xoffset = -3.46 +/- 0.12 mm**

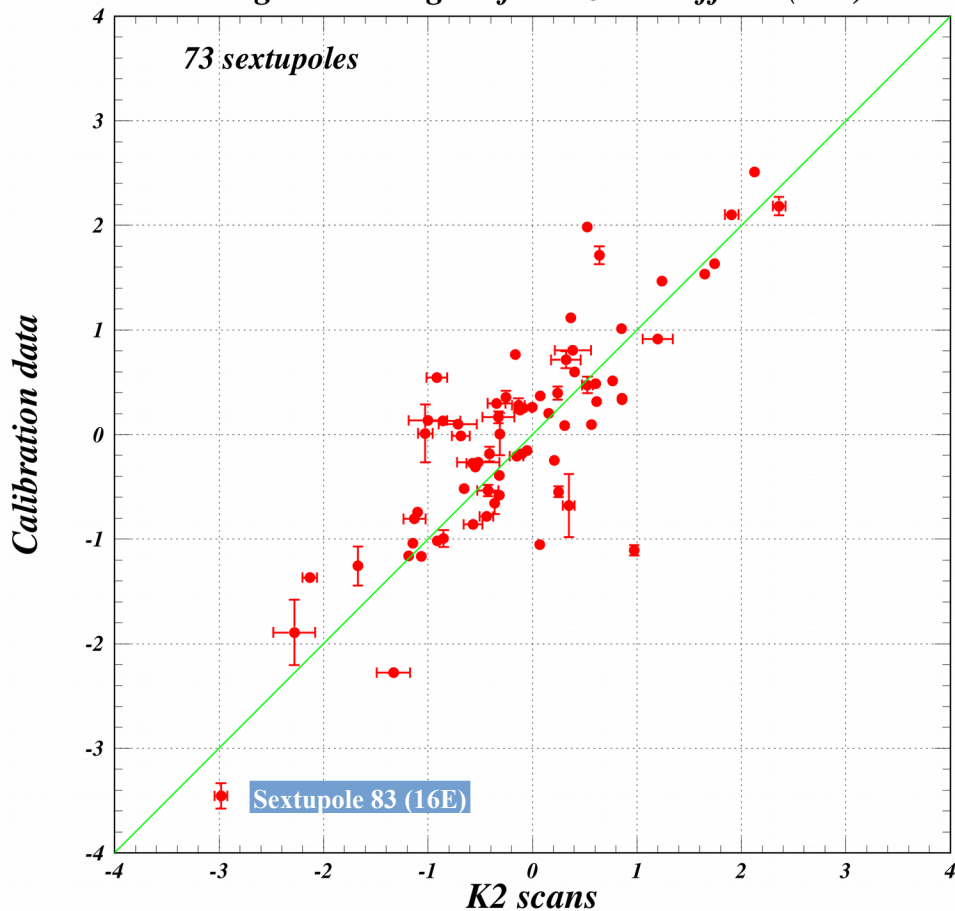
## K2 Scans



**Xoffset = -1.141 - 1.857 = -2.982 +/- 0.061 mm**

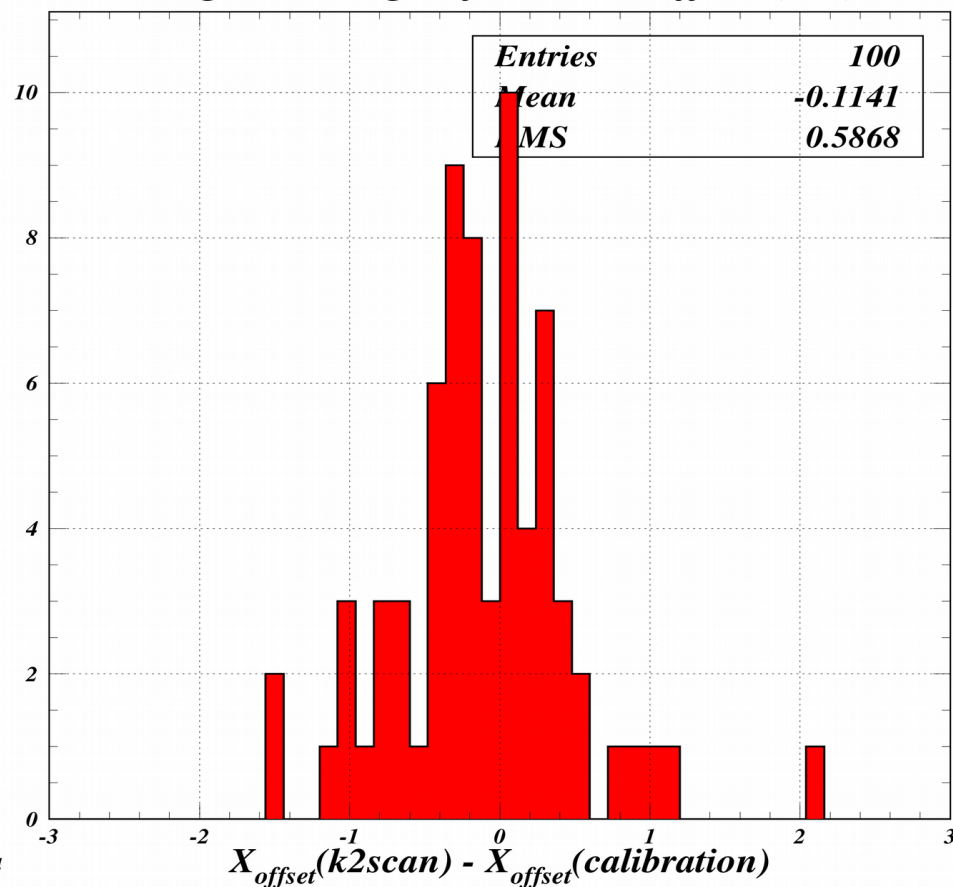
## Correlation

Weighted averages of horizontal offsets (mm)



## Difference

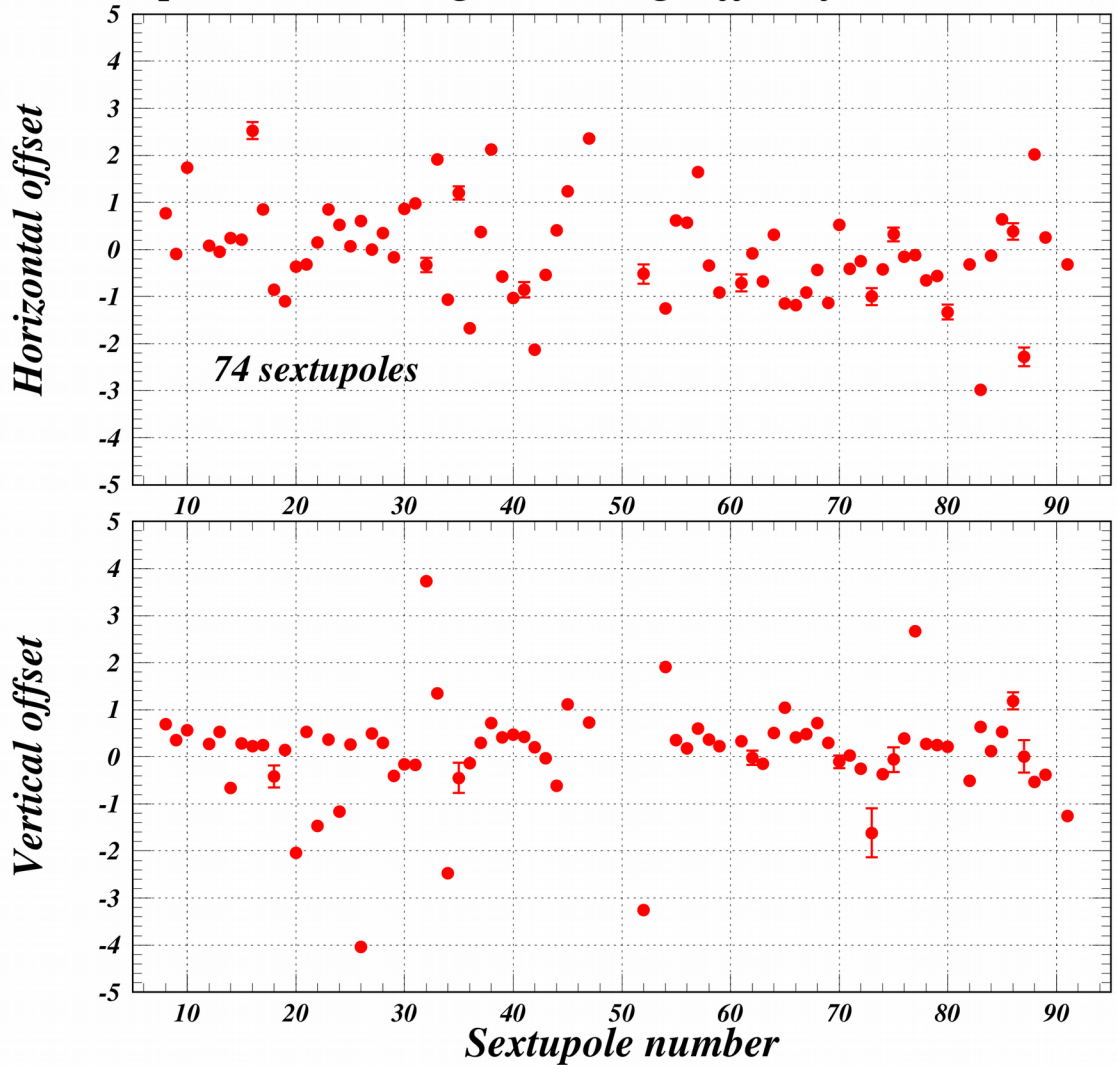
Weighted averages of horizontal offsets (mm)





# Horizontal and vertical misalignments from the K2 scans

*Sextupole X and Y weighted average offsets from K2 scans (mm)*





## Before modeling misalignments

	X		Y		
	Model	Design	Model	Design	
Q	16.55574	16.55574	12.63565	12.63565	! Tune
Chrom	0.99589	0.99589	1.01391	1.01391	! dQ/(dE/E)
J_damp	1.22134	1.22134	1.00000	1.00000	! Damping Partition #
Emittance	2.765E-08	2.765E-08	2.806E-14	2.806E-14	! Meters
Alpha_damp	2.142E-04	2.142E-04	1.754E-04	1.754E-04	! Damping per turn
I4	-2.553E-02	-2.553E-02	1.029E-37	1.029E-37	! Radiation Integral
I5	7.375E-05	7.375E-05	1.252E-39	1.252E-39	! Radiation Integral

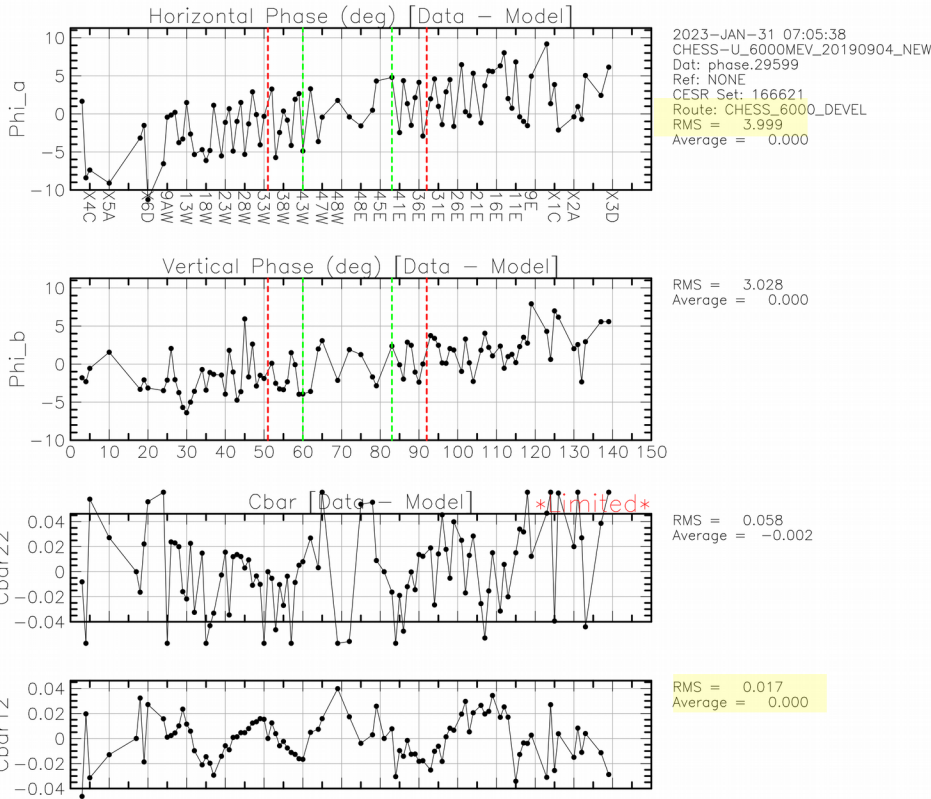
## After modeling misalignments

	X		Y		
	Model	Design	Model	Design	
Q	16.56685	16.55574	12.65322	12.63565	! Tune
Chrom	1.03693	0.99589	1.02351	1.01391	! dQ/(dE/E)
J_damp	1.22027	1.22134	1.00061	1.00000	! Damping Partition #
Emittance	2.761E-08	2.765E-08	3.089E-10	2.806E-14	! Meters
Alpha_damp	2.140E-04	2.142E-04	1.755E-04	1.754E-04	! Damping per turn
I4	-2.541E-02	-2.553E-02	-7.005E-05	1.029E-37	! Radiation Integral
I5	7.357E-05	7.375E-05	6.749E-07	1.252E-39	! Radiation Integral

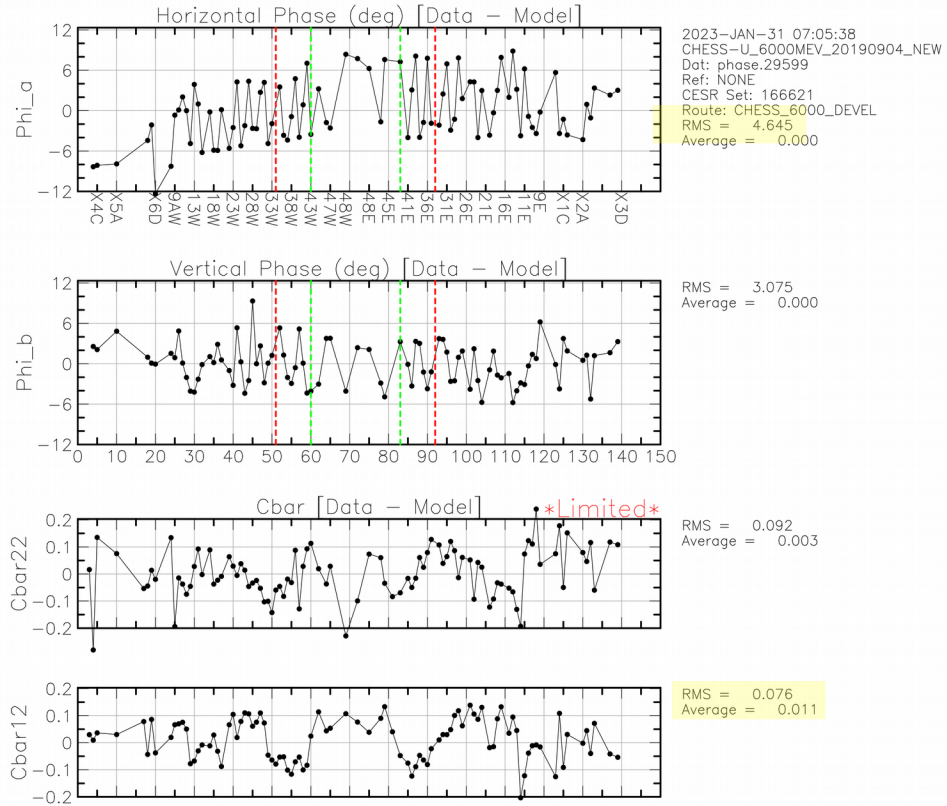


# Effects on phase and coupling

## Before modeling misalignments



## After introducing misalignments Tunes adjusted, but no phase or orbit correction

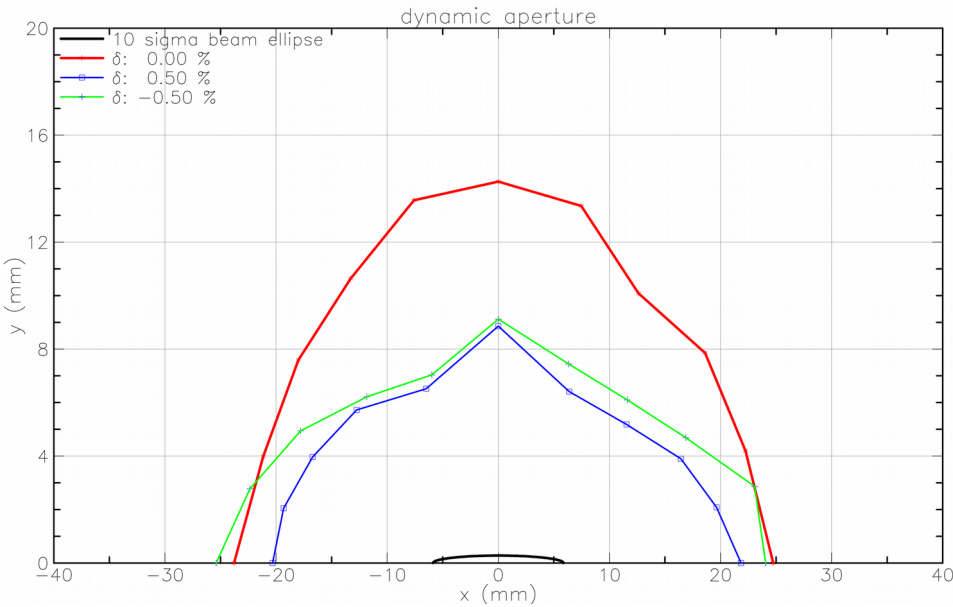


**The rms phase difference of the model to the measurement increases from 4.0 to 4.6 degrees.  
The coupling increases from 1.7 to 7.6 %.  
Verified that this error can be corrected with skew quads within their set limits.**

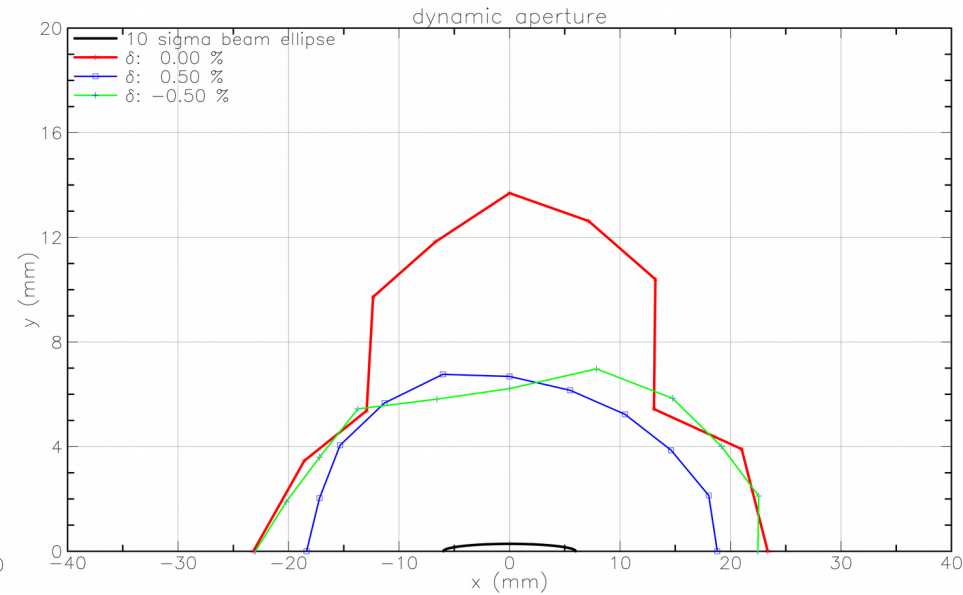


# Effects on dynamic aperture (Suntao's view da CesrV script)

**Before modeling misalignments**



**After modeling misalignments**



**No large effect on the dynamic aperture.**