

TOTEM un-squeeze to 90 m

Reminder and for ref.:

Reduction by π in phase advance in un-squeeze from low β^* to $\beta^* \gg L^*$

Need and methods for global tune adjust, [LHCC 19/04/2006](#)

Powering issue [LMC 15/04/2009](#) and [LCU 21/04/2009](#), ratio $0.5 < b1/b2 < 2.0$ constraint

LCU [16-06-2009](#) on TOTEM Optics and Aperture studies. 90m not limited around triplet

LMC [14-10-2009](#) TOTEM optics preferred solutions. Preferred is to add cables to remove the ratio constraint - on at least some quadrupoles to allow for the un-squeeze from physics rather than swapping the q4 polarity. To be done in the next longer shutdown.

For 2010 - 2011 run : **important to try the un-squeeze to 90 m with beam**

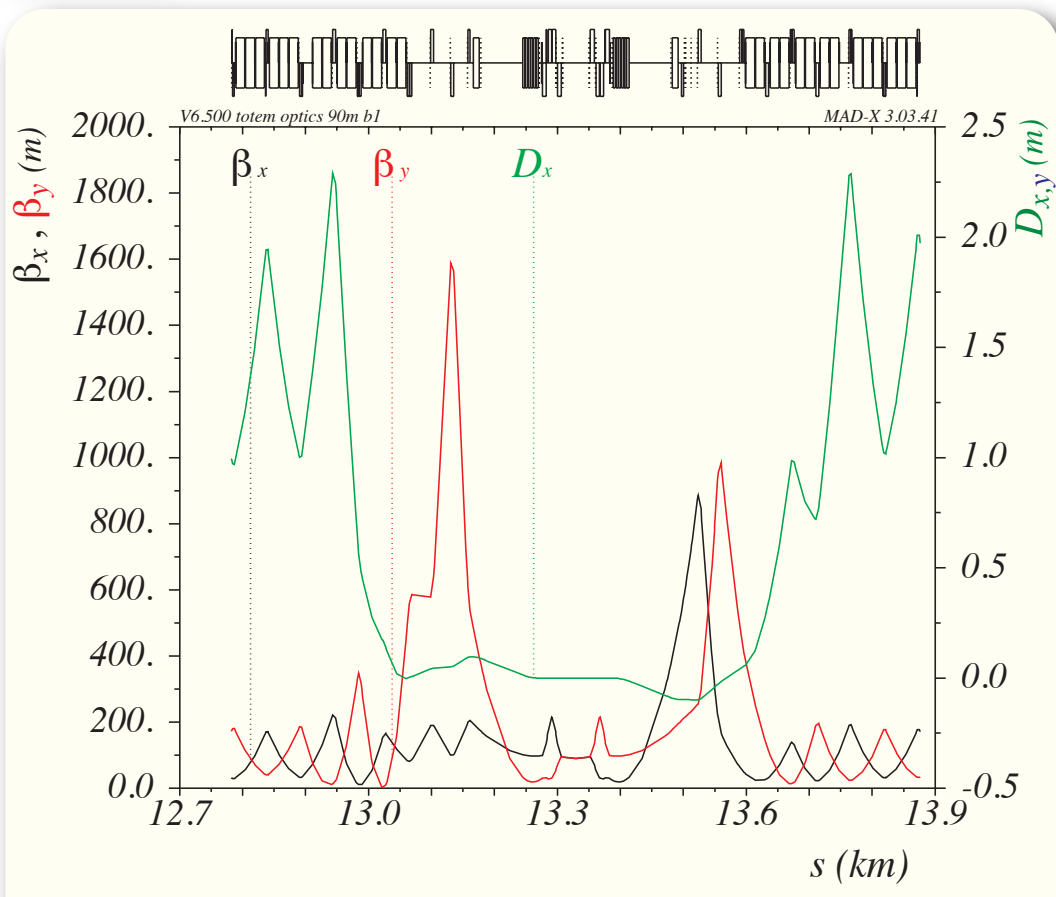
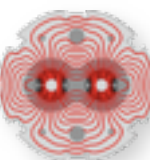
-- however still with the ratio constraint which makes the matching very difficult and tedious.

early **90 m** : by un-squeeze, π in x, $\pi/2$ in y ; diffractive Φ and first look at σ_{tot} , relevant for 1st LHC run

nominal **high- β** : not planned for 1st year of LHC operation. 7 TeV and reduced emittance ; $\pi/2$ in x and y presenting the current status, more tuning for b2 (if needed re-iteration b1/b2)

+ full re-verification of all constraints, aperture checks at 3.5 TeV

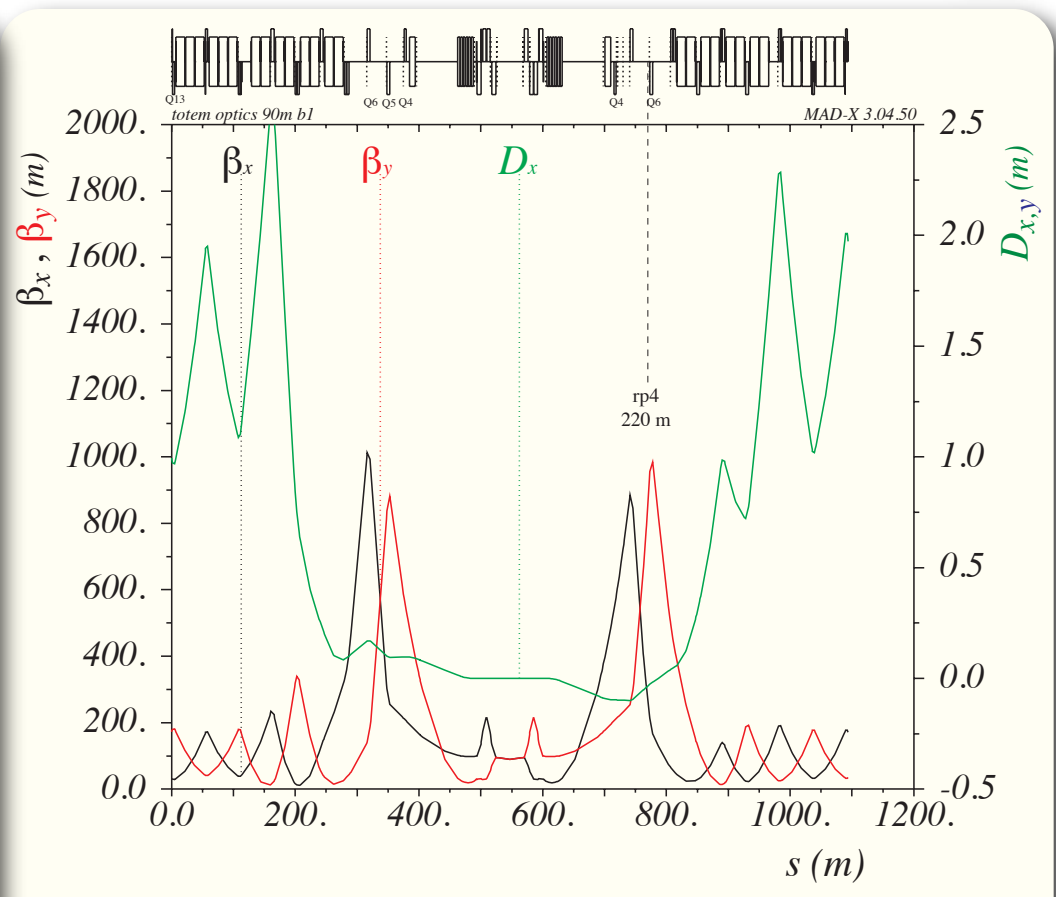
+ transfer to control system



2007 version

$\Delta Q_x = 0.10$ $\Delta Q_y = 0.03$

[/afs/cern.ch/eng/lhc/optics/V6.501/HiBeta/IP5_beta90.str](http://afs/cern.ch/eng/lhc/optics/V6.501/HiBeta/IP5_beta90.str)



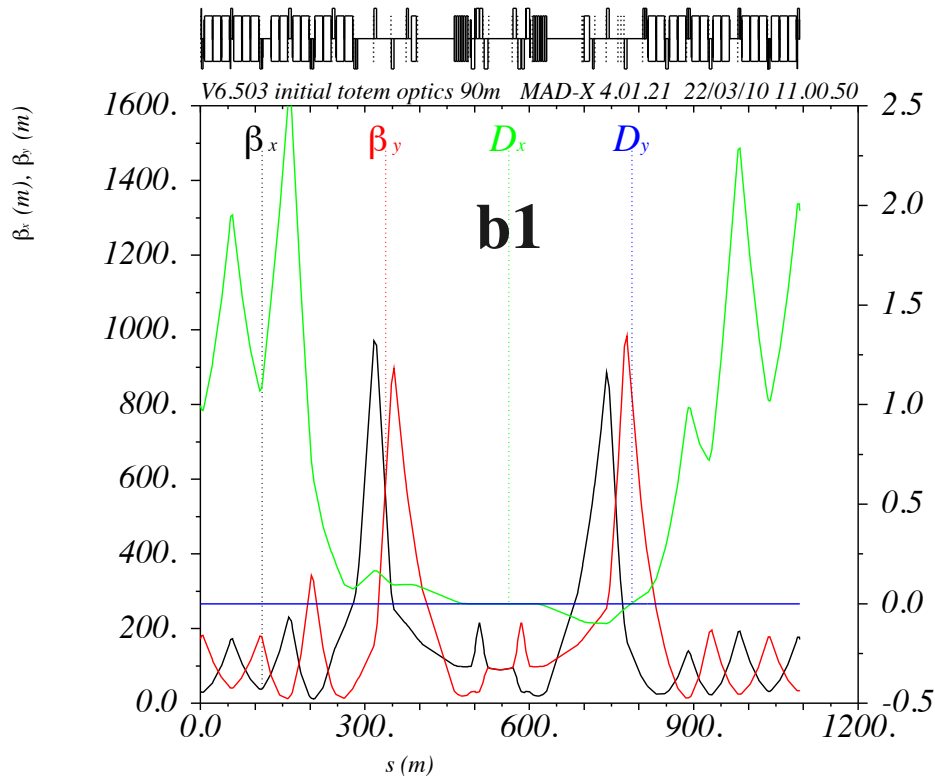
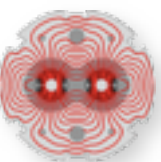
**90 m optics, 2009 version,
more anti-symmetric re-match**

$\Delta Q_x = 0.20$ $\Delta Q_y = 0.045$

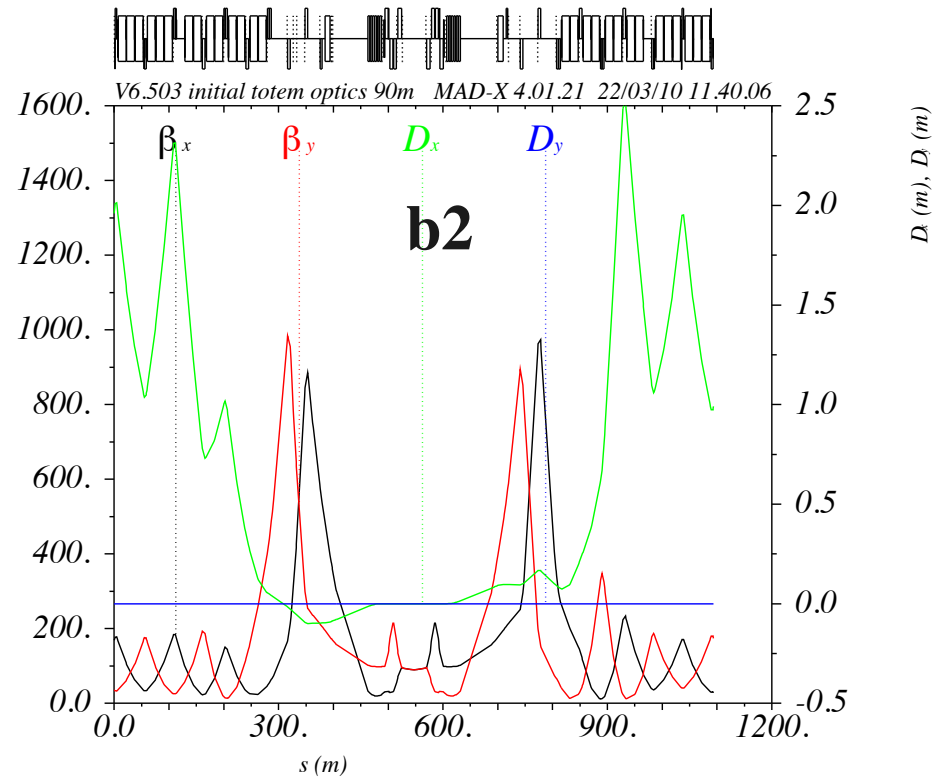
**still not quite enough margin for b2
for ratio constraint**



90 m, 2010 version



$\Delta Q_x = 0.222$ $\Delta Q_y = 0.055$



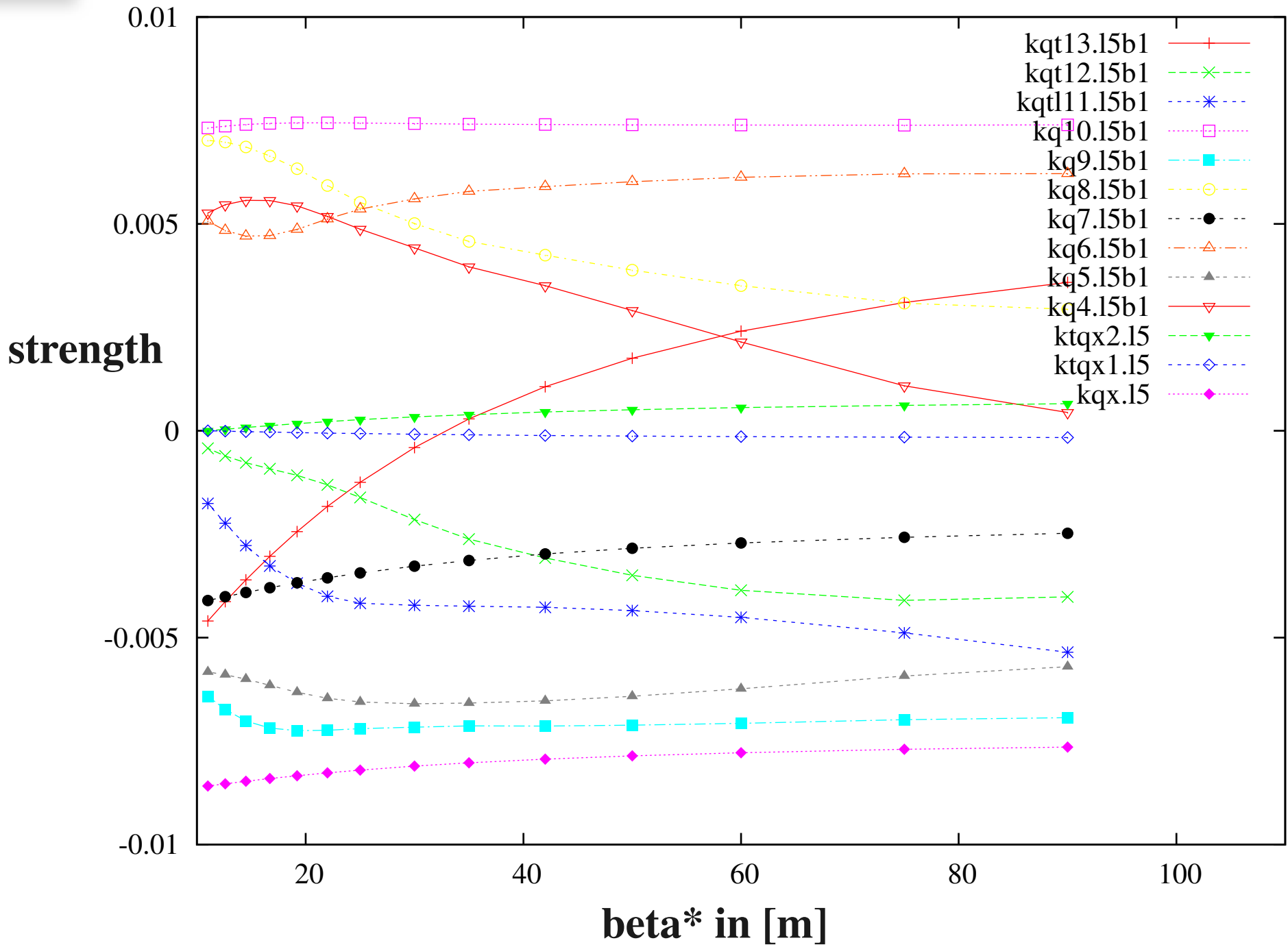
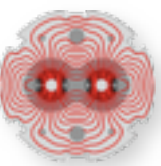
$\Delta Q_x = 0.220$ $\Delta Q_y = 0.053$

b1/b2 strength ratios	kq4.15b1/	kq4.15b2=	0.970945
	kq5.15b1/	kq5.15b2=	1.04019
	kq6.15b1/	kq6.15b2=	1.05394
	kq7.15b1/	kq7.15b2=	1.5816
	kq8.15b1/	kq8.15b2=	1.33077
	kq9.15b1/	kq9.15b2=	1.03071
	kq10.15b1/	kq10.15b2=	0.94919

kq4.r5b1/	kq4.r5b2=	1.10542
kq5.r5b1/	kq5.r5b2=	0.961367
kq6.r5b1/	kq6.r5b2=	0.938599
kq7.r5b1/	kq7.r5b2=	0.525421
kq8.r5b1/	kq8.r5b2=	0.571775
kq9.r5b1/	kq9.r5b2=	0.964224
kq10.r5b1/	kq10.r5b2=	1.05372

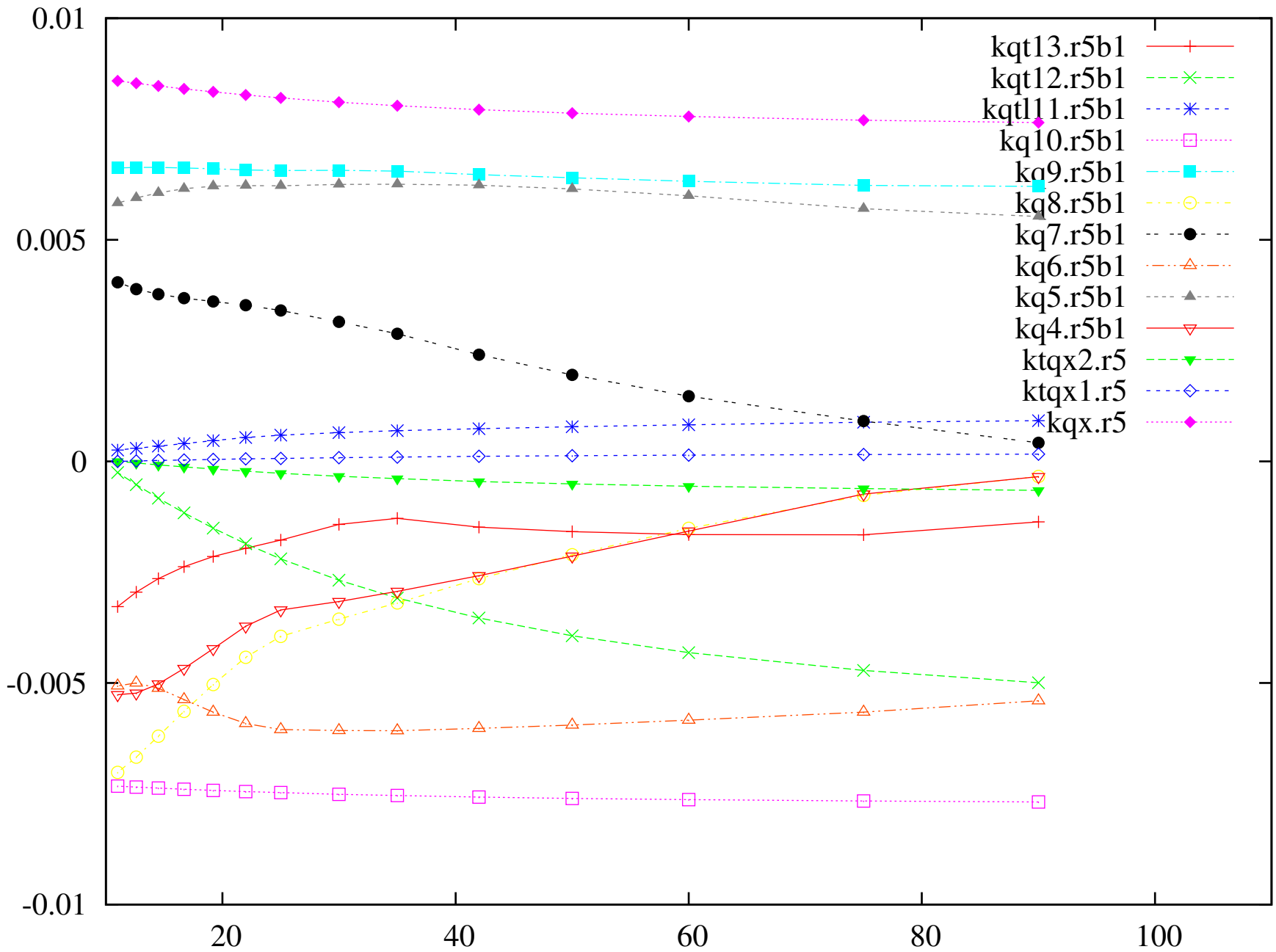
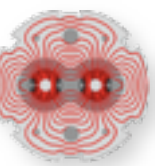


un-squeeze 90 m, b1, left



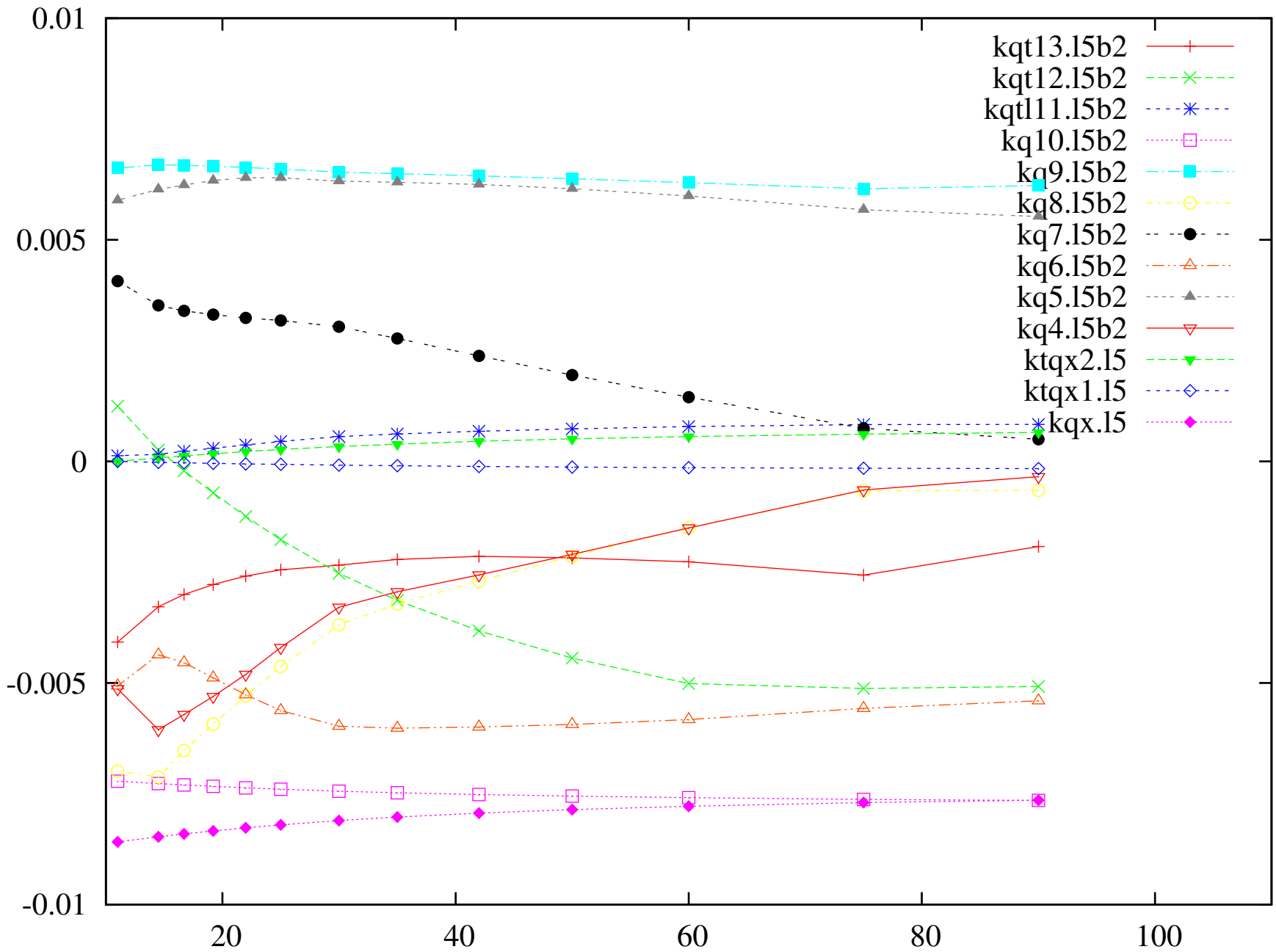
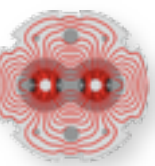


un-squeeze 90 m, b1, right



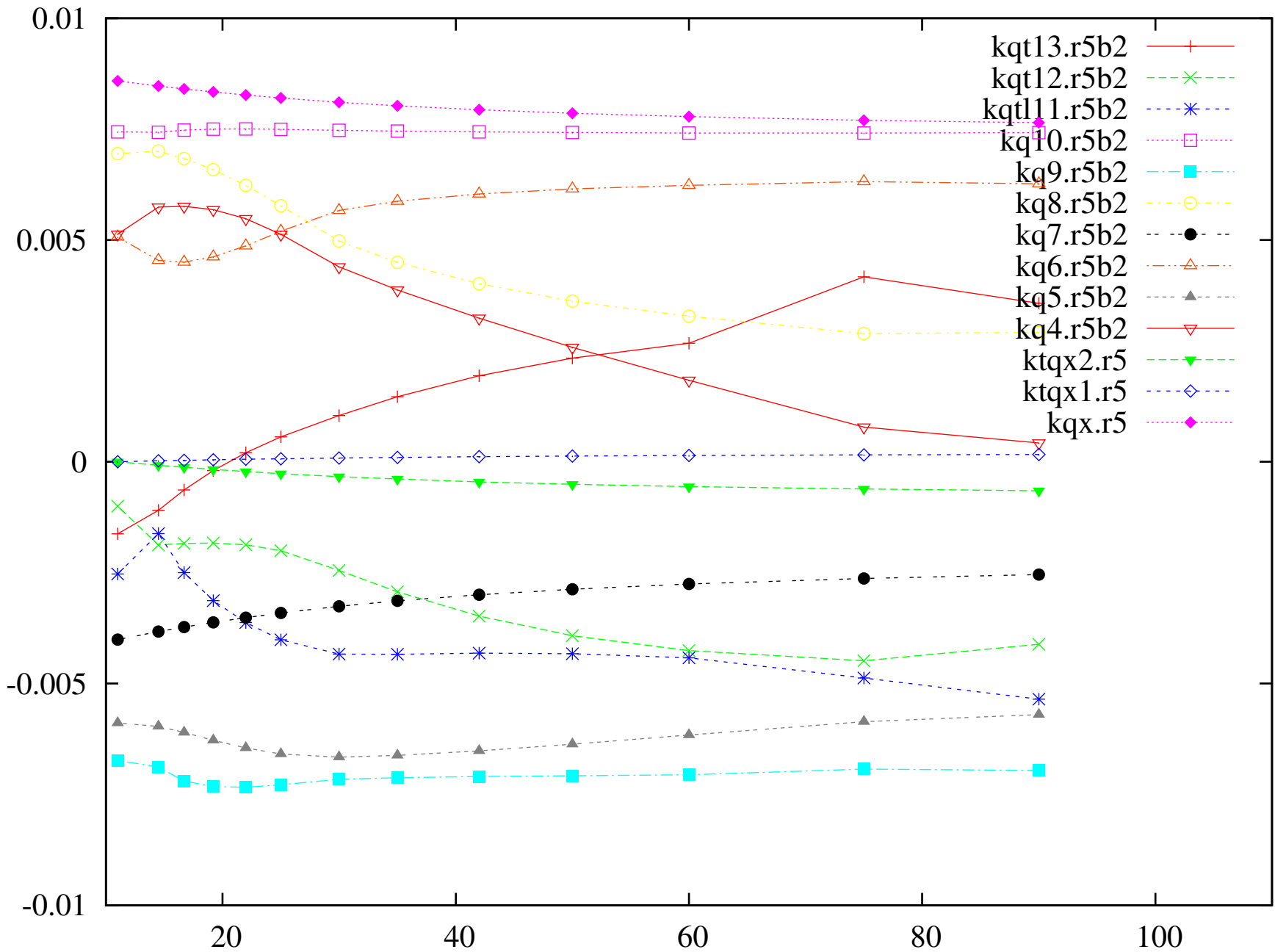
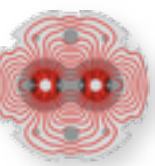


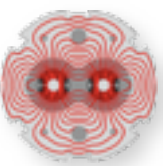
un-squeeze 90 m, b2, left





un-squeeze 90 m, b2, right

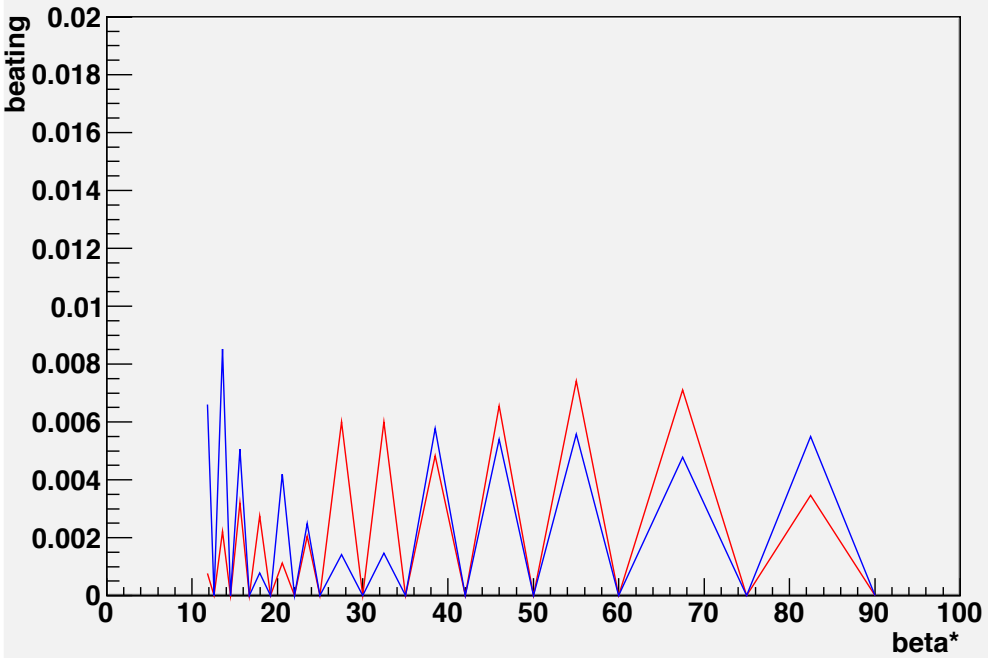




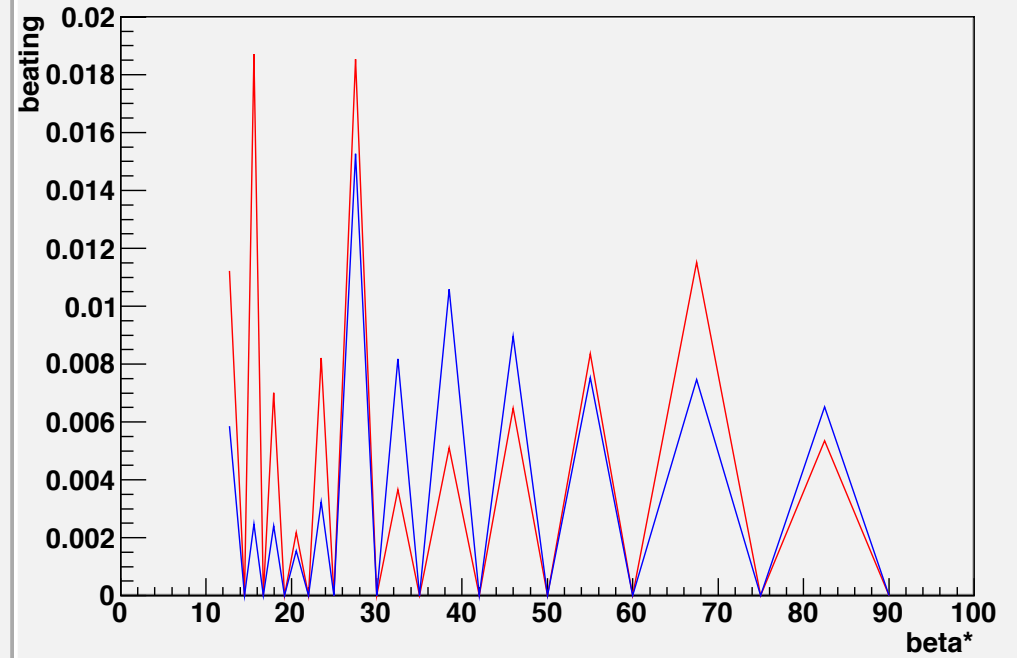
b1

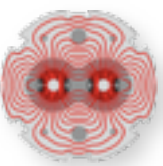
b2

beta beating during the un-squeeze



beta beating during the un-squeeze





$+\Delta Q_x = 0.222$ $+\Delta Q_y = 0.055$ required to compensate loss in tune in IR5
90 m operation should be compatible with all experiments, so IP2/IP8 not available
use IR4 soft dispersion constraint

