IR8 optics for pre-squeeze and squeeze crossing scheme and aperture

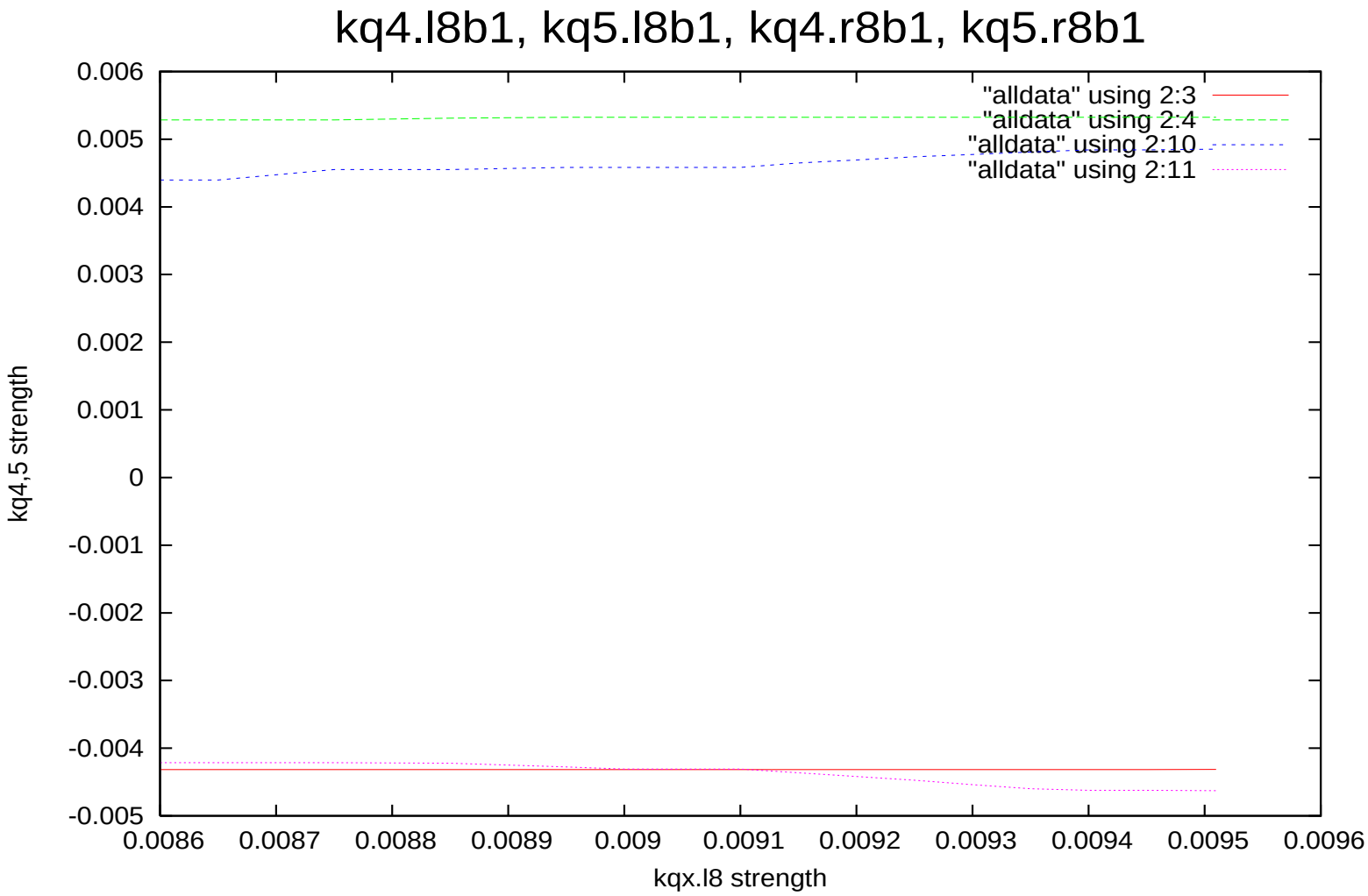
M. Meddahi

Thanks to: M. Giovannozzi, W. Herr, Y. Papaphilippou, T. Risselada

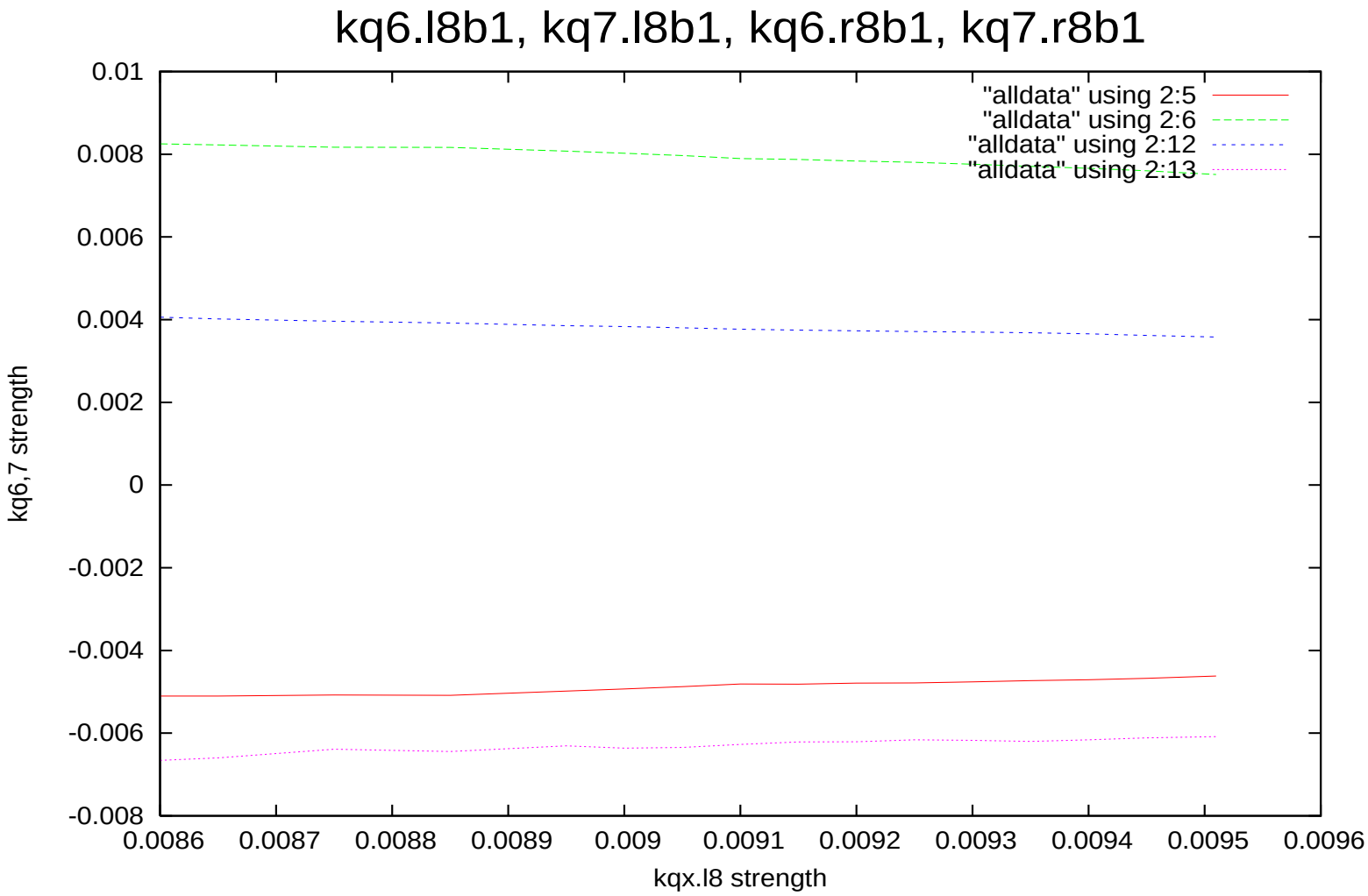
Generalities

- /afs/cern.ch/eng/lhc/optics/V6.500/V6.5.seq
- /afs/cern.ch/eng/lhc/optics/V6.500/V6.5.inj.new-nominal.str
- pre-squeeze is done at 7 TeV and followed by squeeeze
- pre-squeeze: reduce kqx from about 222 T/m to about 200 T/m
- squeeze: reduce β^* from 10 m to 2m
- keep $\beta^* = 10$ m during the pre-squeeze (both planes)
- avoid up and down in the powering of quads, in particular kq4 and kq5
- calculate crossing scheme and check aperture

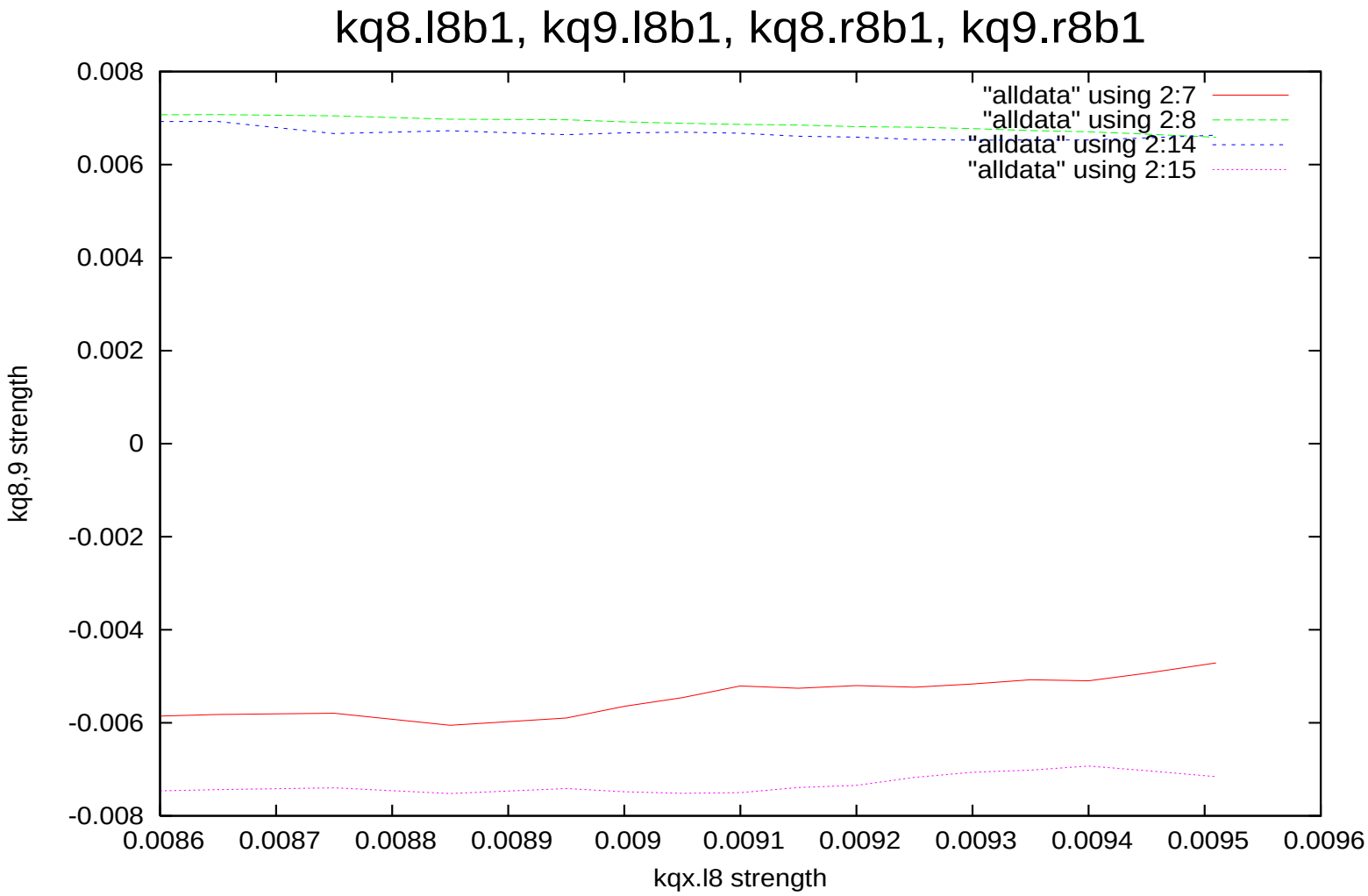
Pre-squeeze optics, beam 1



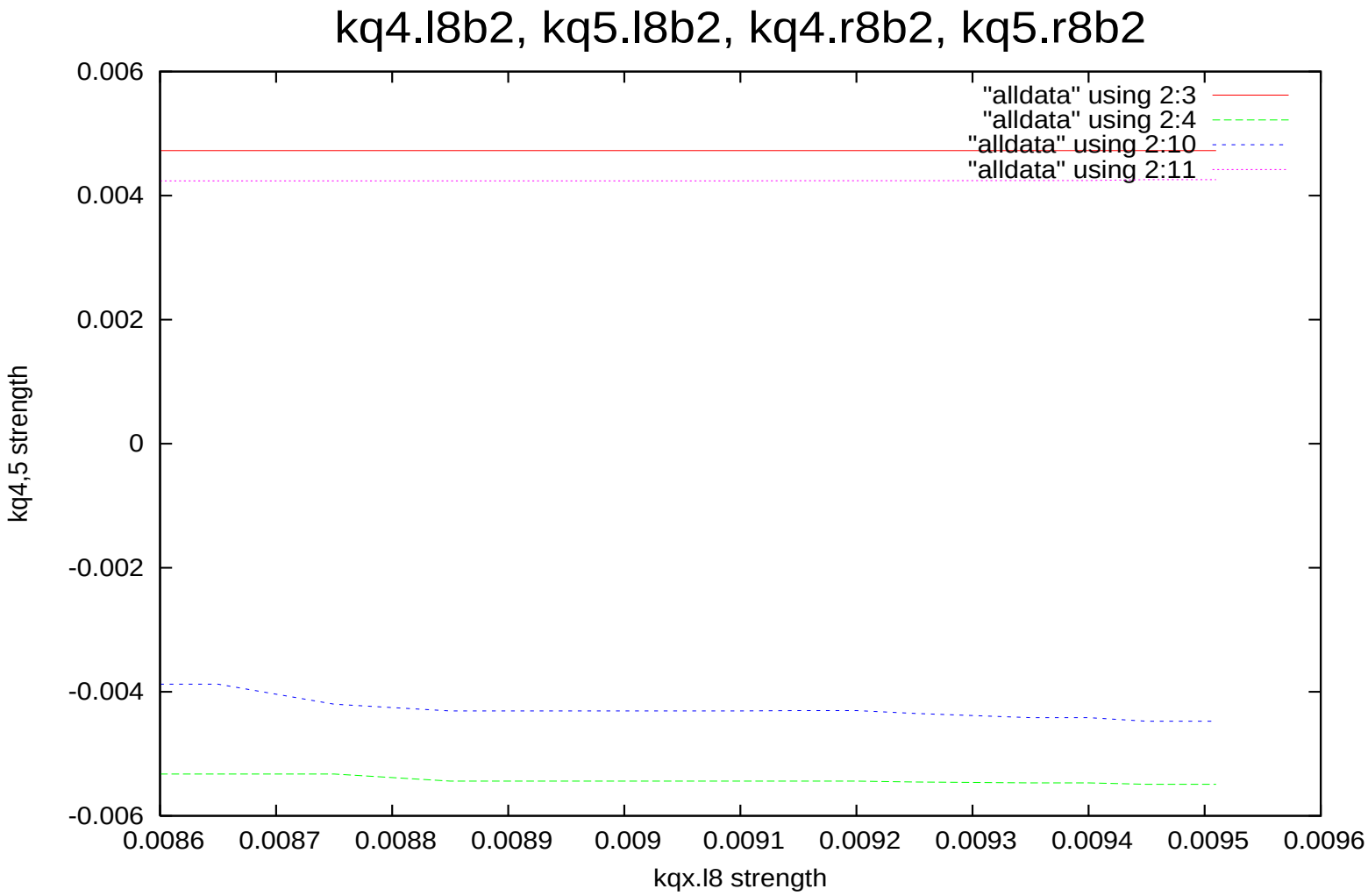
Pre-squeeze optics, beam 1



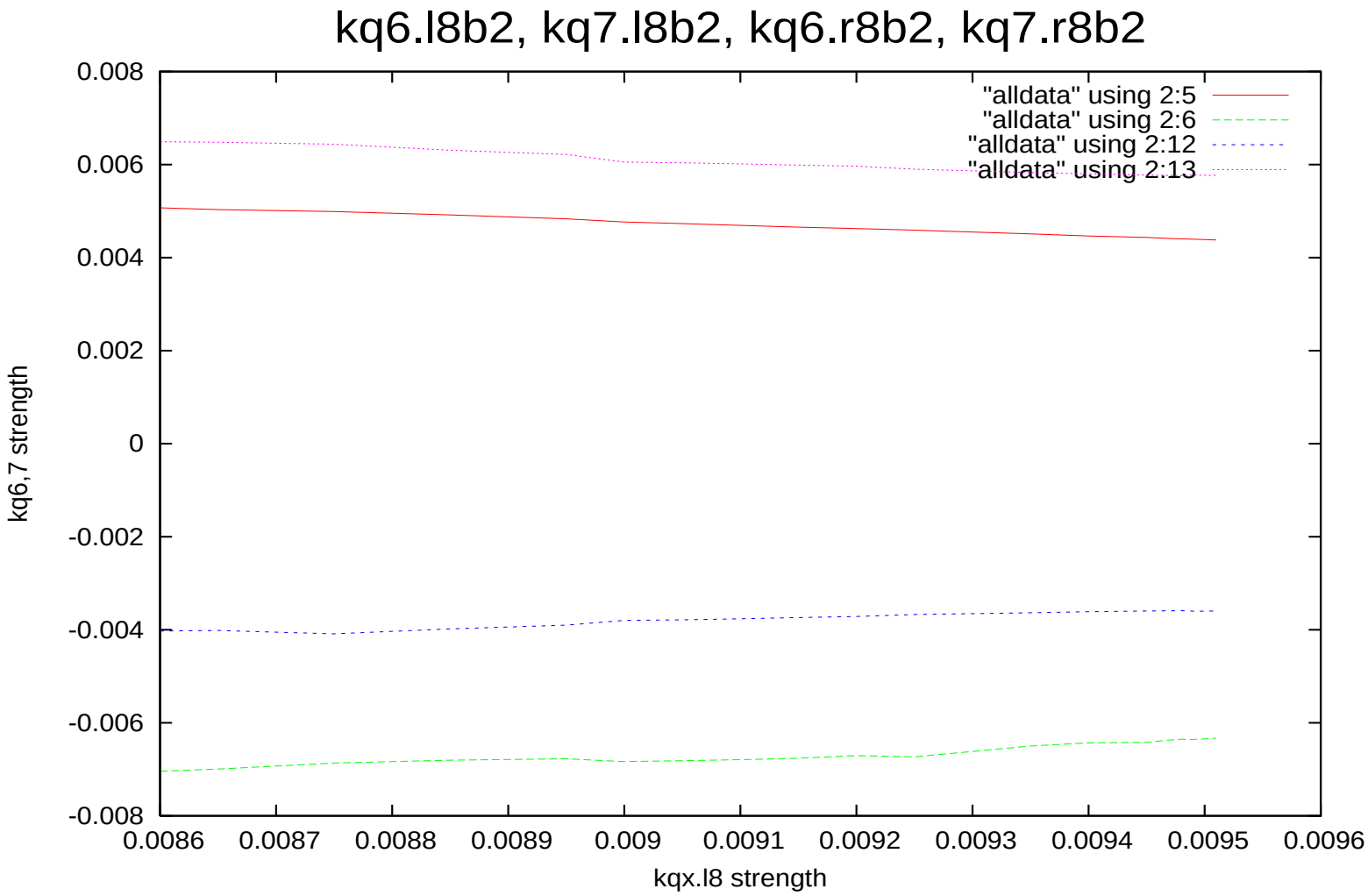
Pre-squeeze optics, beam 1



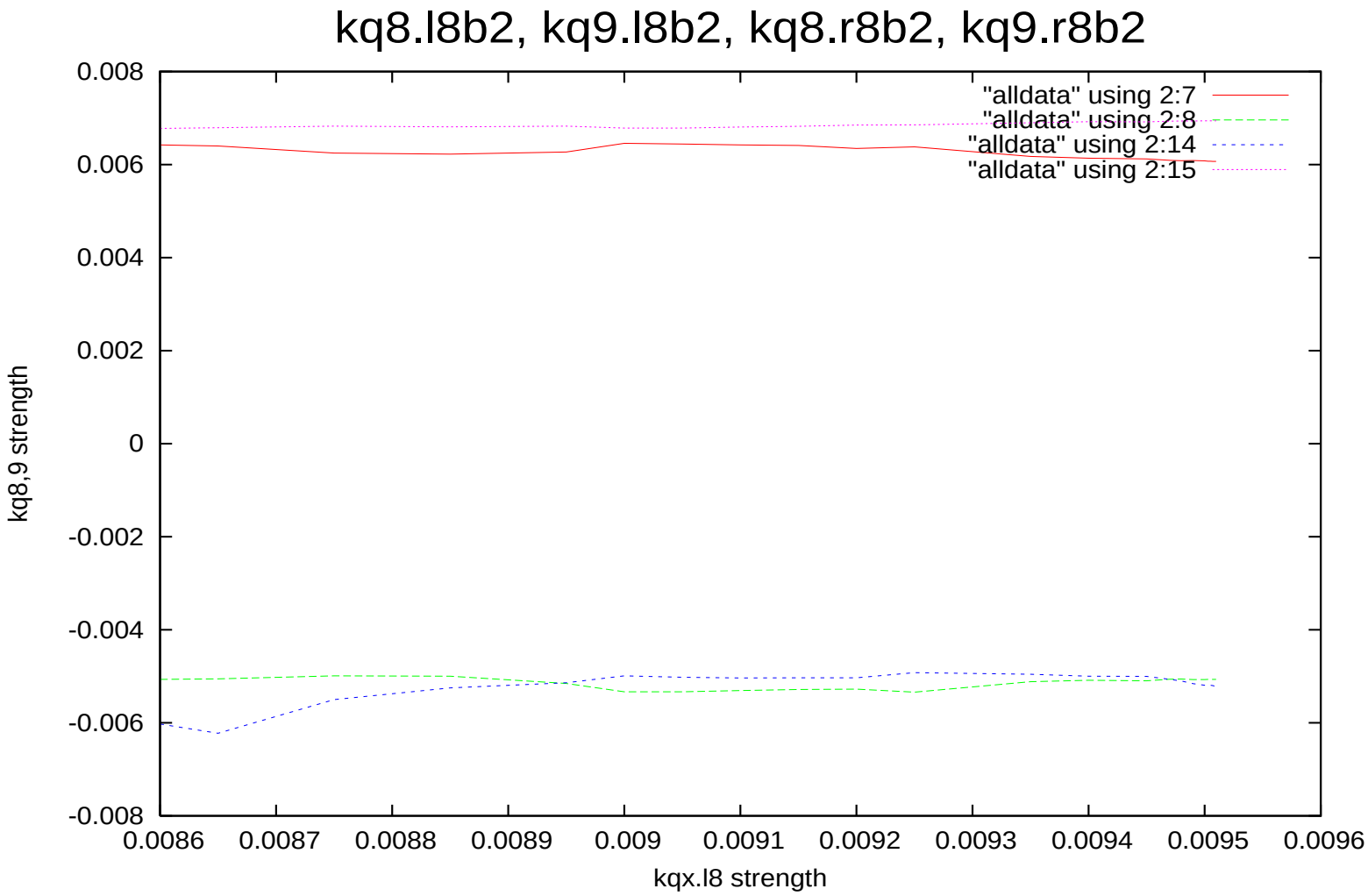
Pre-squeeze optics, beam 2



Pre-squeeze optics, beam 2



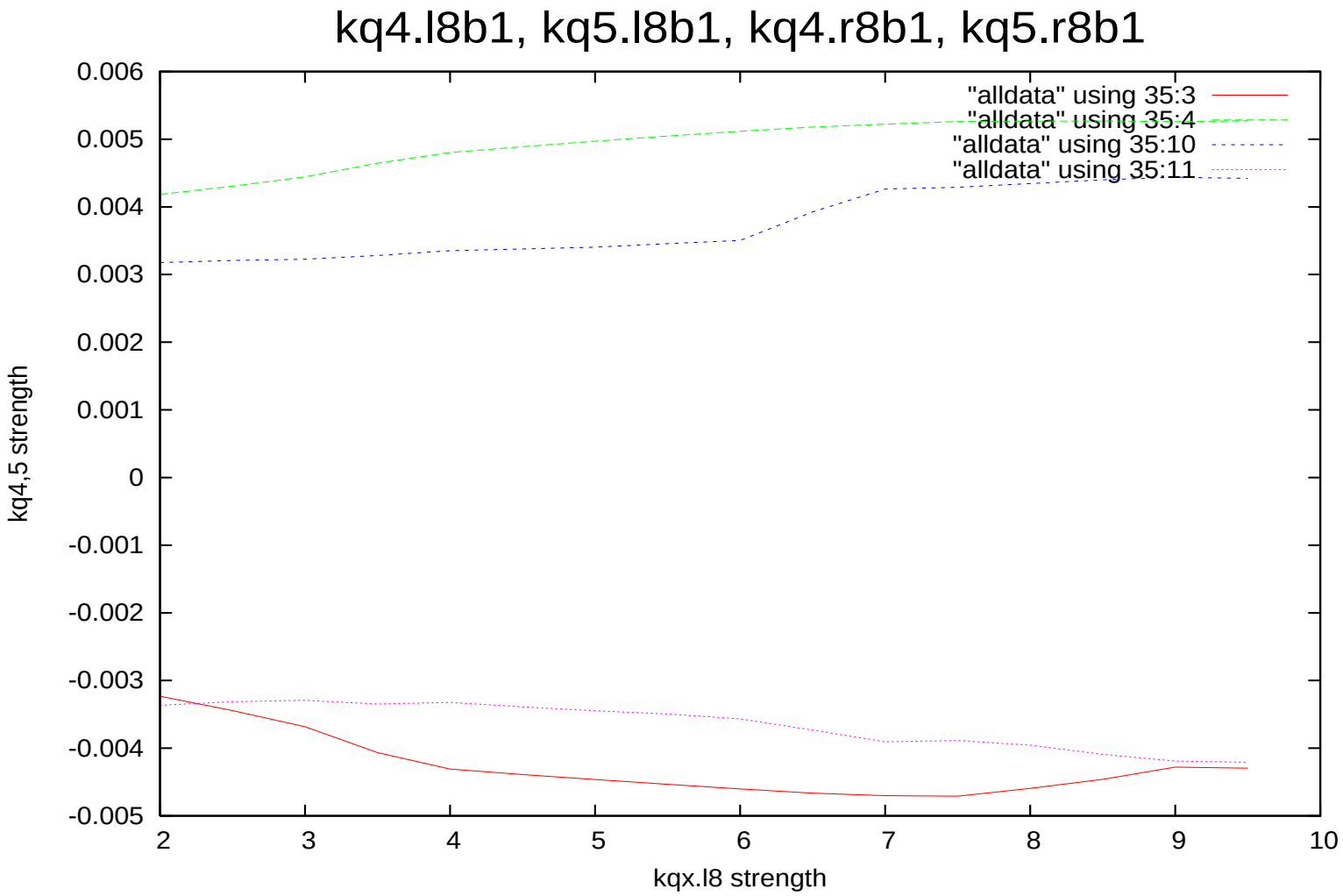
Pre-squeeze optics, beam 2



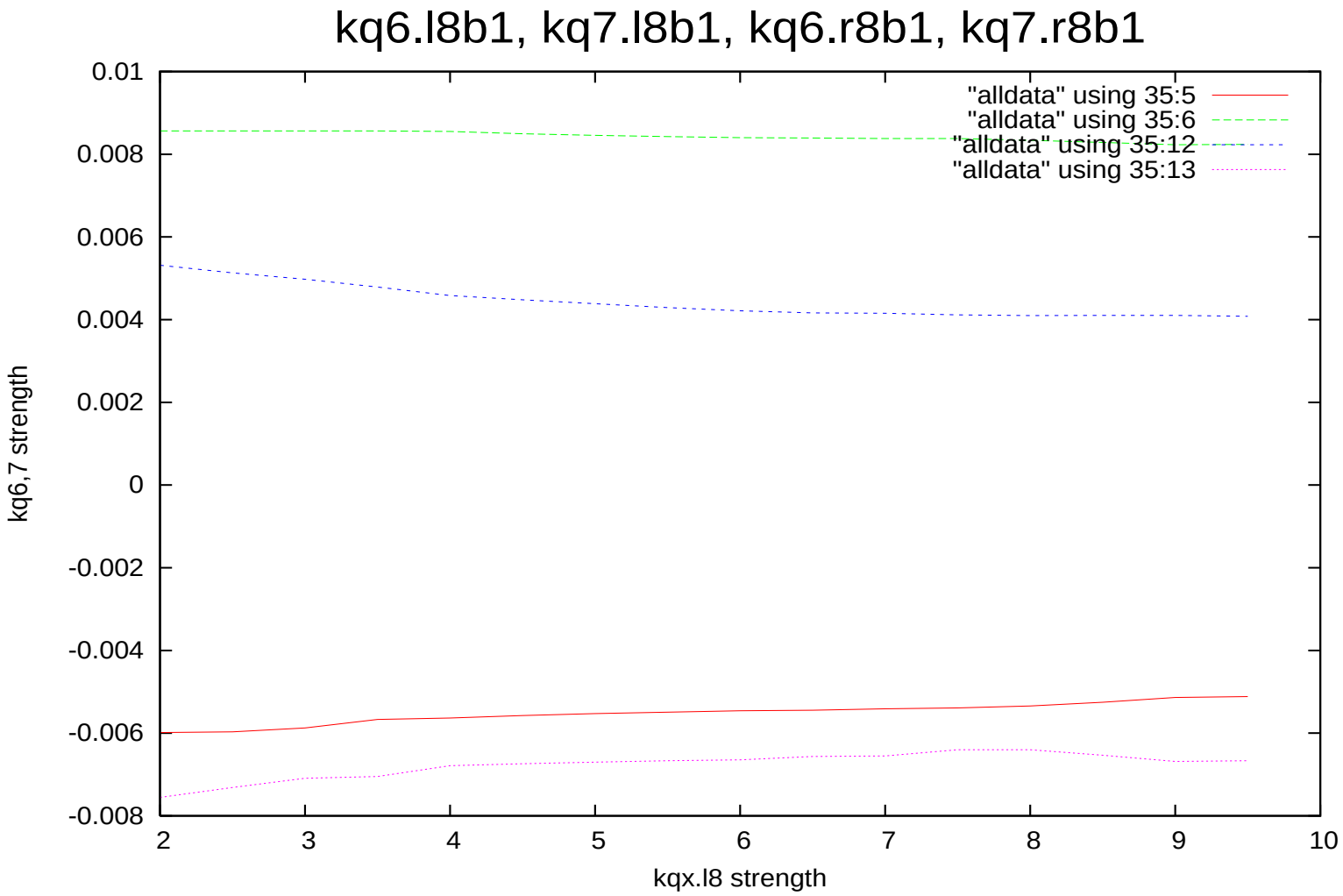
Additional info

- reduce the number of optics files during the pre-squeeze from about 30 to 15
- futher checks of powering of magnets (min. value - time of squeeze)

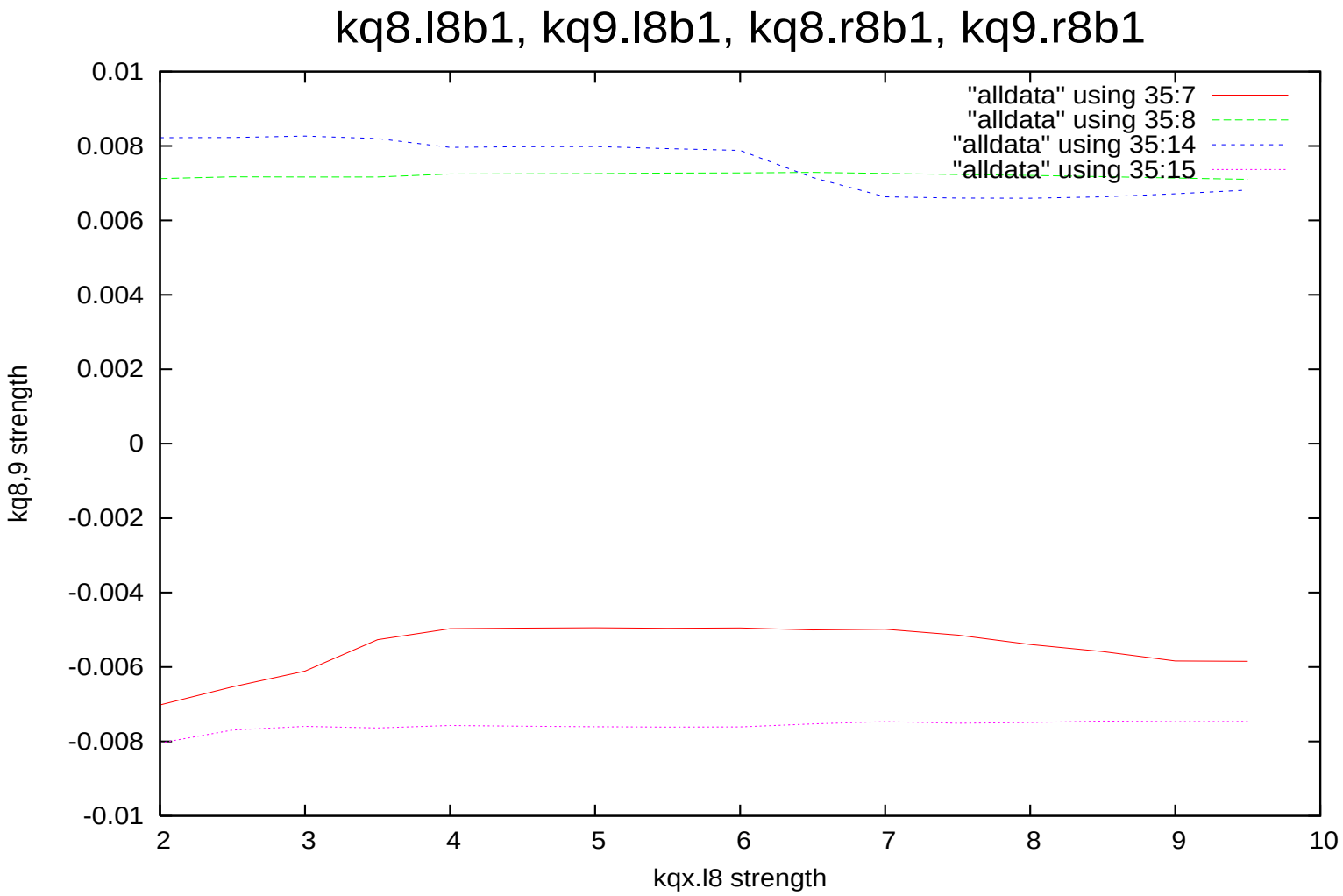
Squeeze optics, beam 1



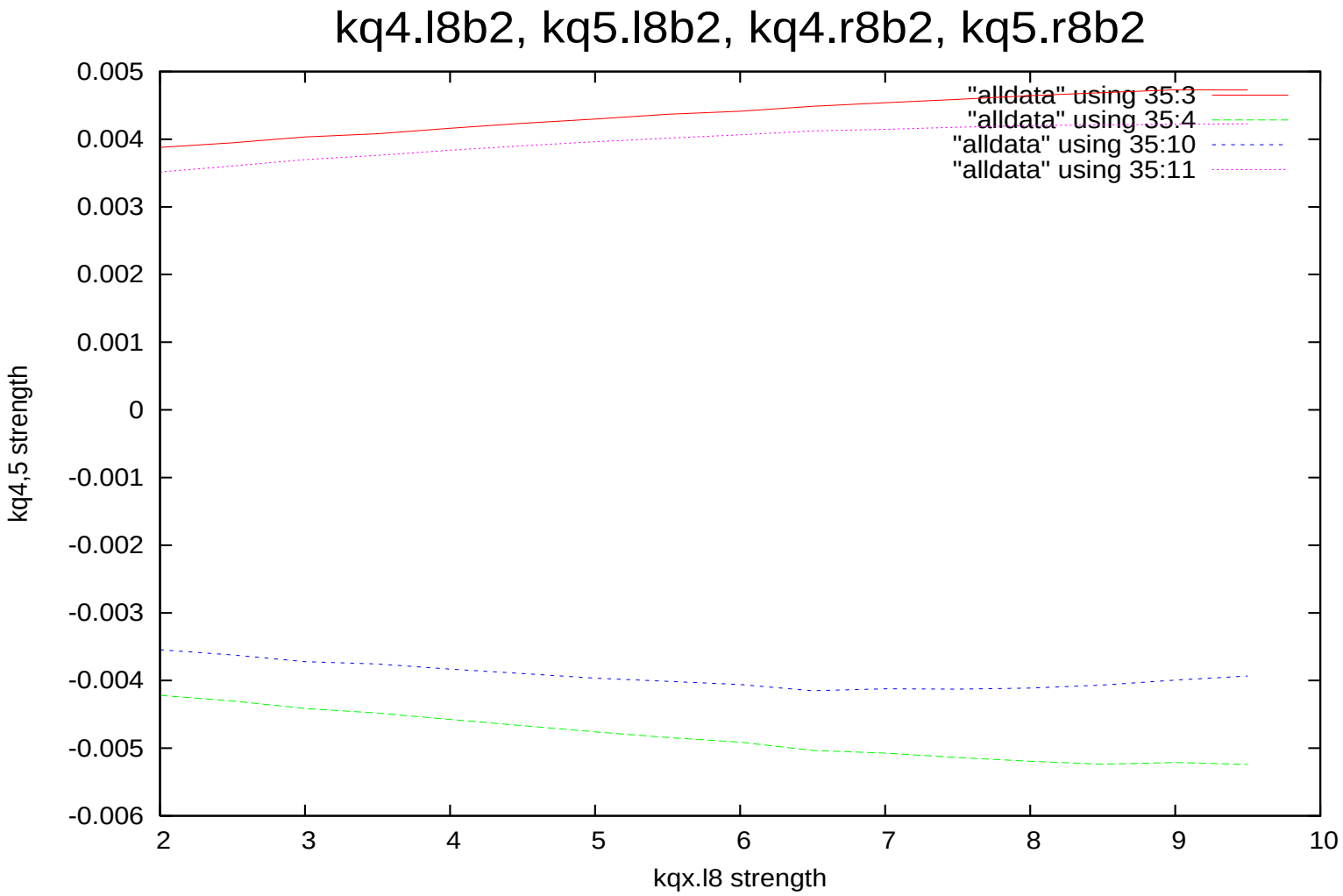
Squeeze optics, beam 1



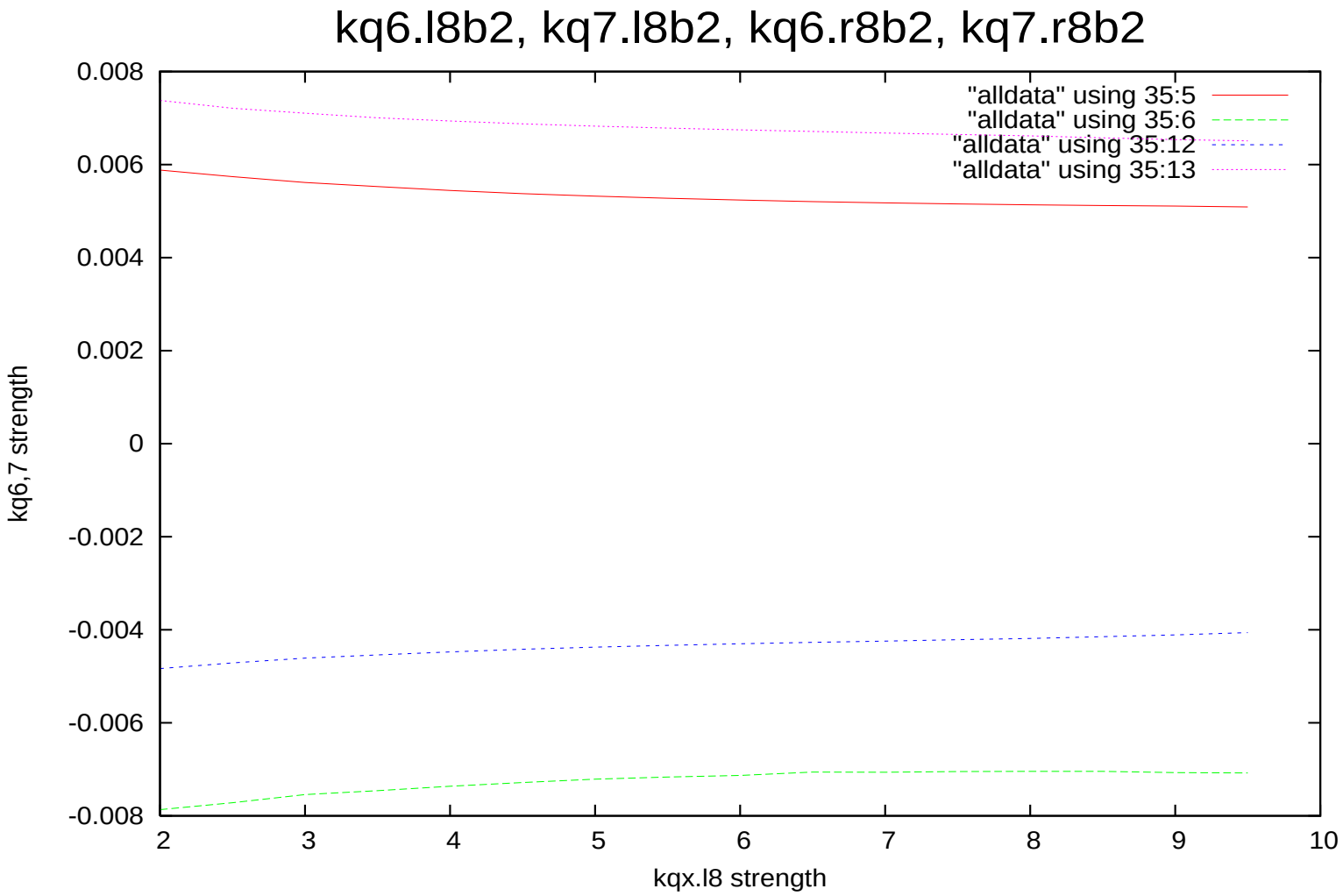
Squeeze optics, beam 1



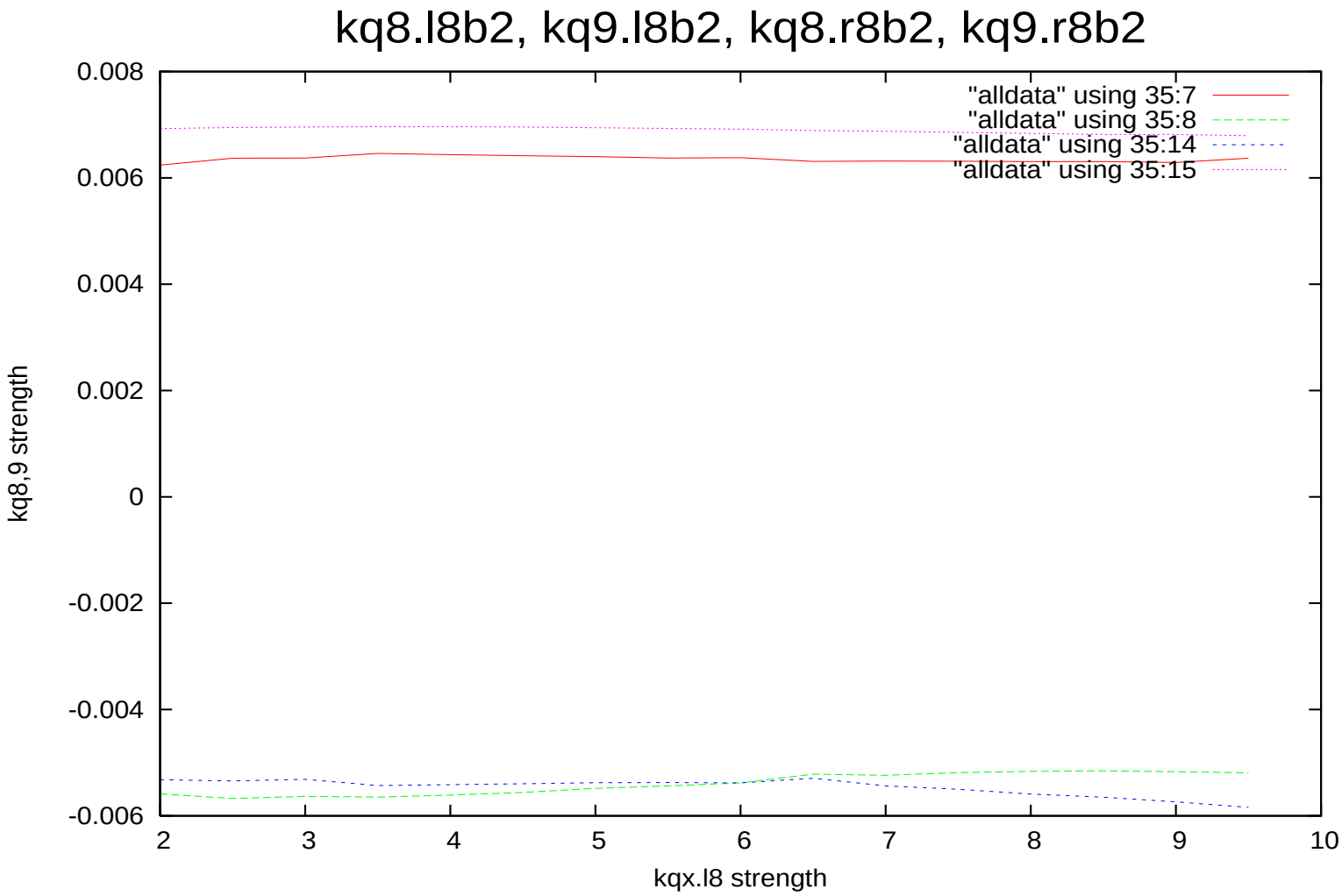
Squeeze optics, beam 2



Squeeze optics, beam 2



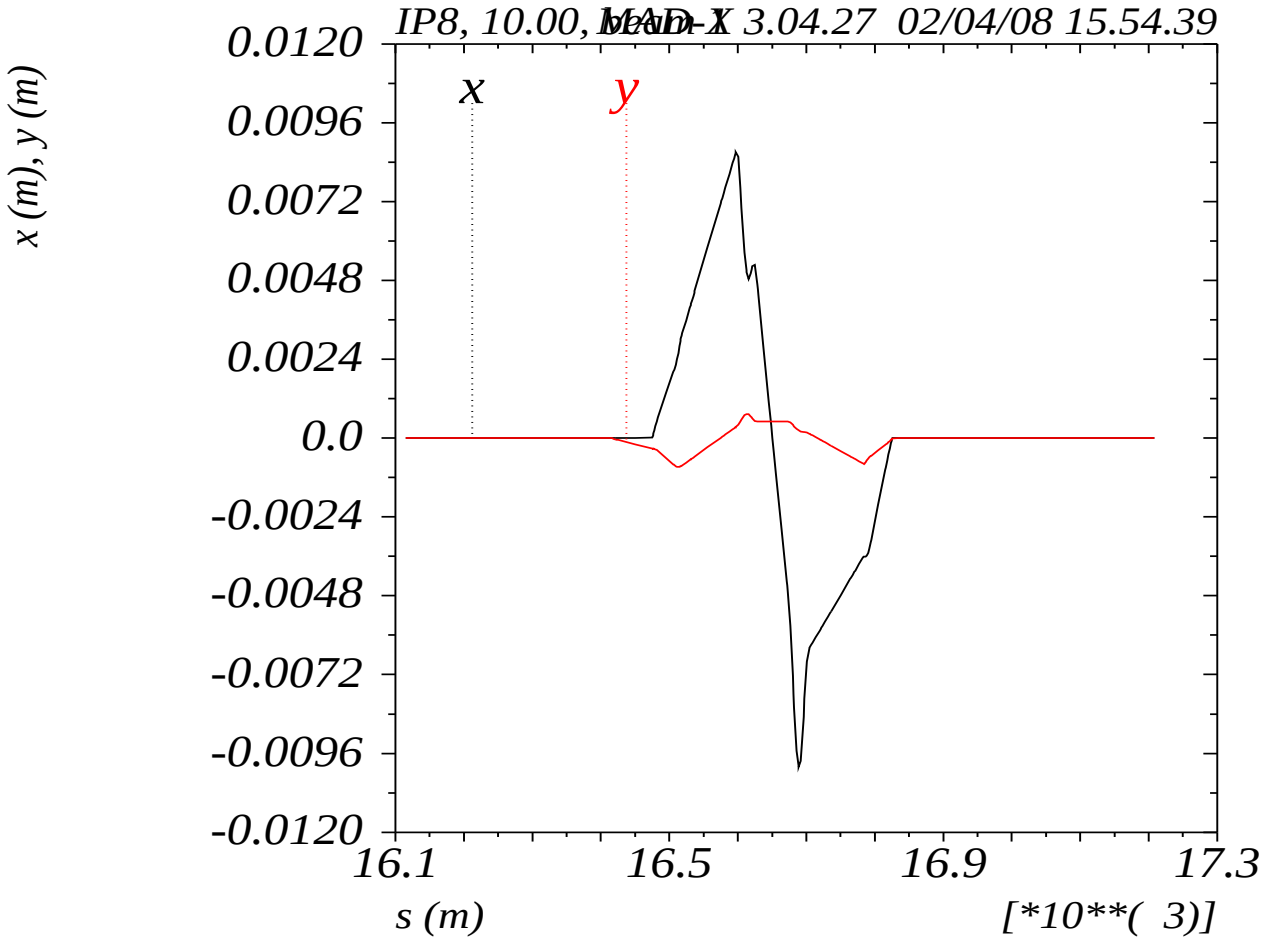
Squeeze optics, beam 2



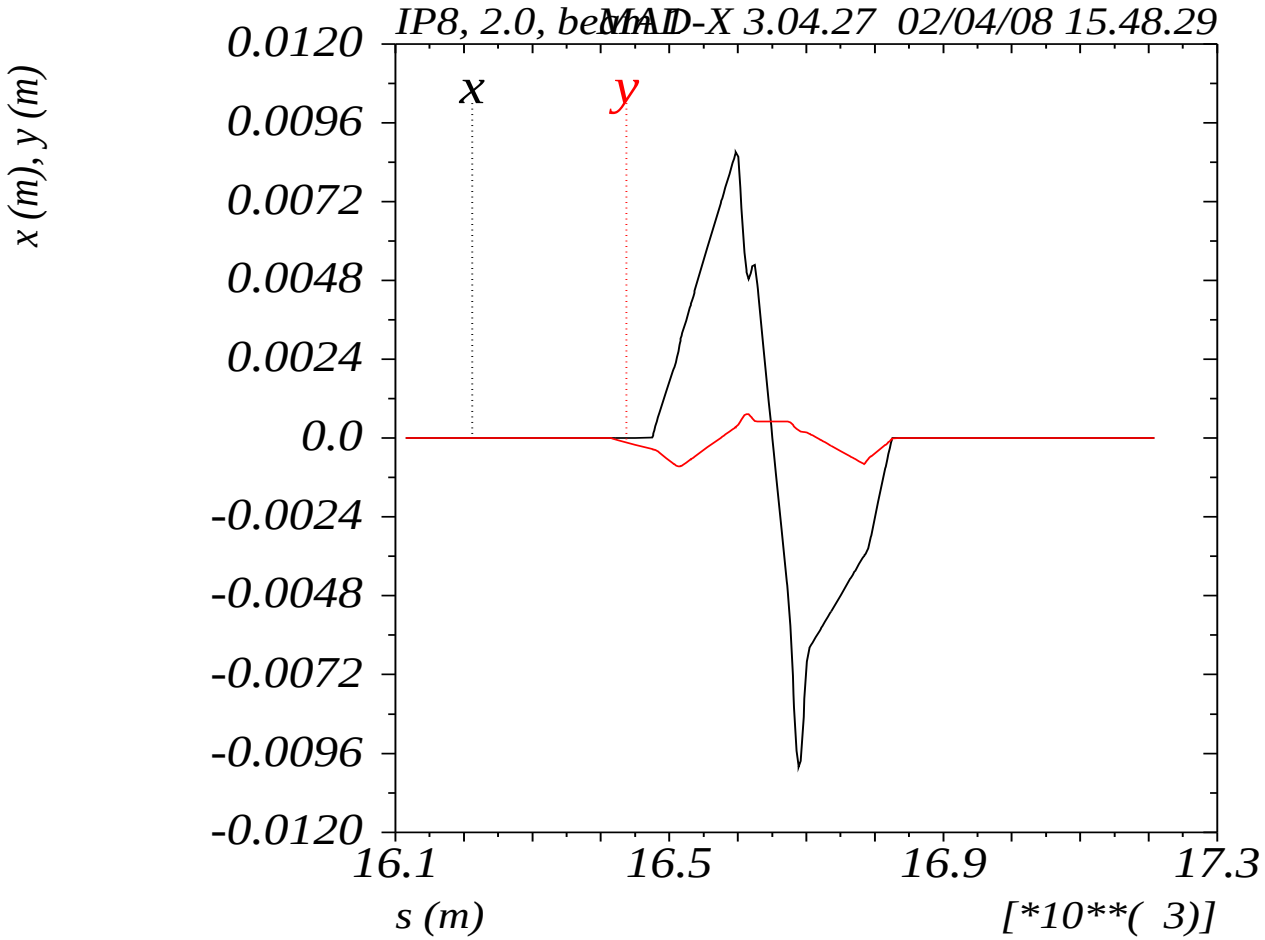
IP8 crossing scheme

- **matched for external angle of $\mp$ 210 μrad**
- **mcbx1 = -35 μrad for all squeeze optics**
- **mcbx1 = -35 down to 7 μrad during the pre-squeeze**
- **during pre-squeeze and squeeze, all other crossing scheme correctors at max 70%**

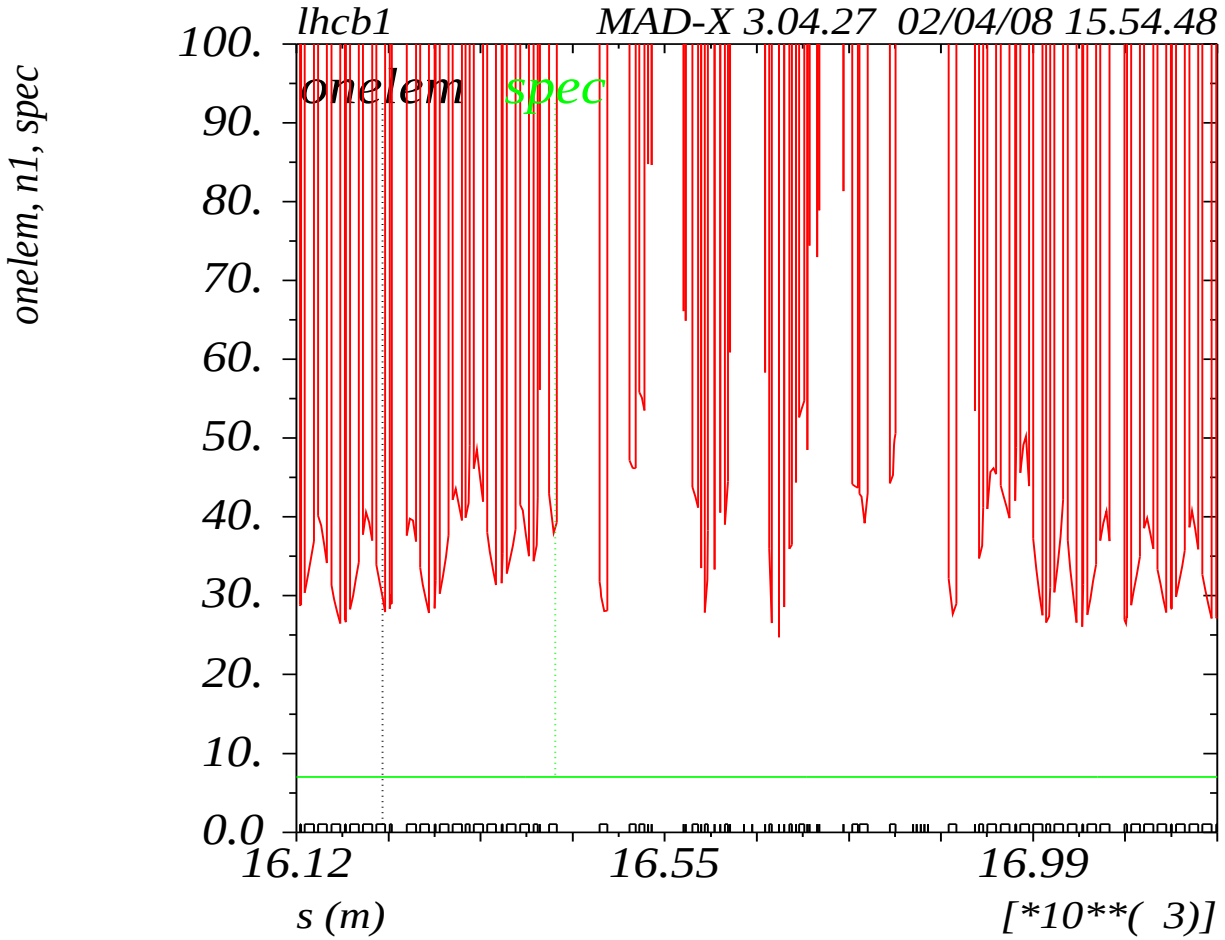
crossing angle at IP8, start of squeeze, 10m optics



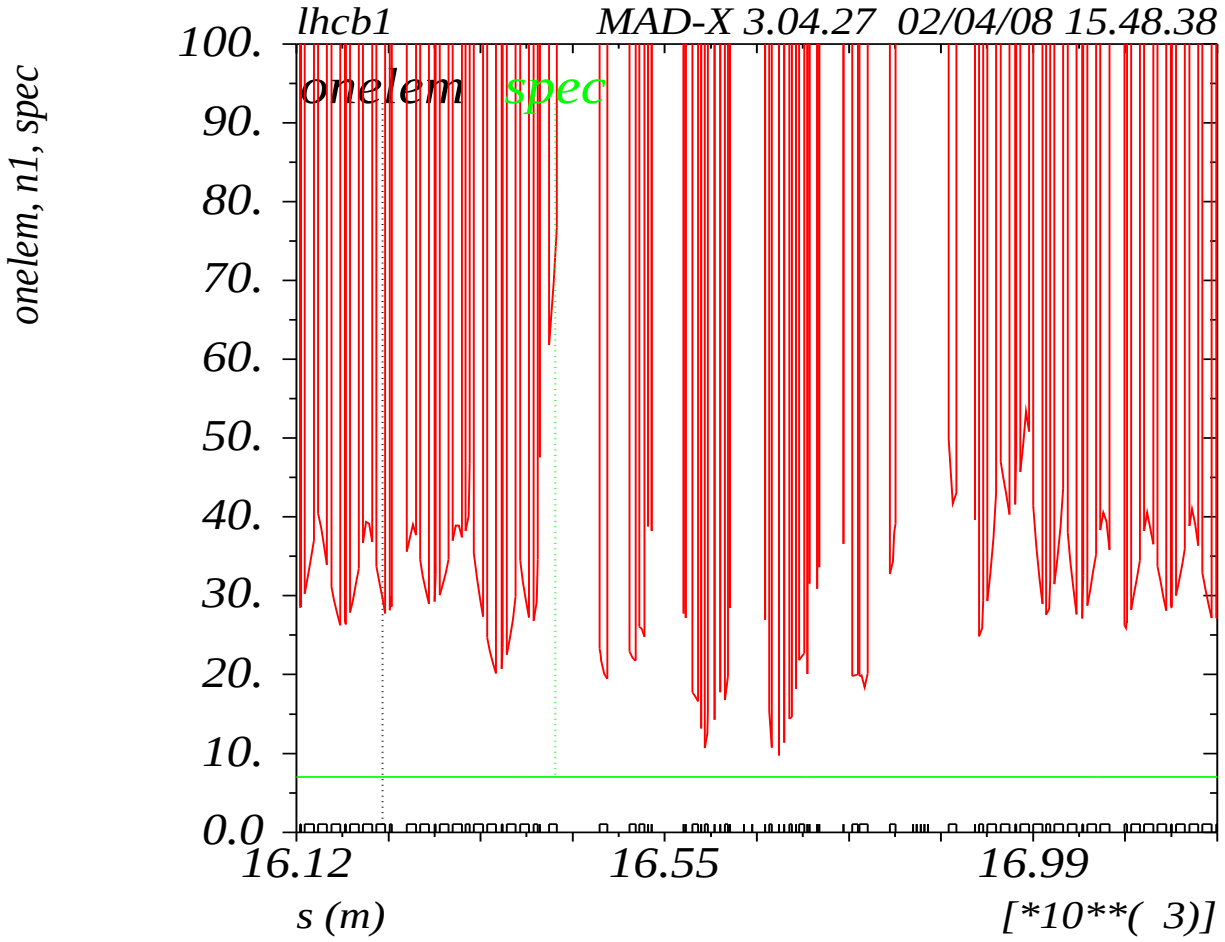
crossing angle at IP8, end of squeeze, 2m optics



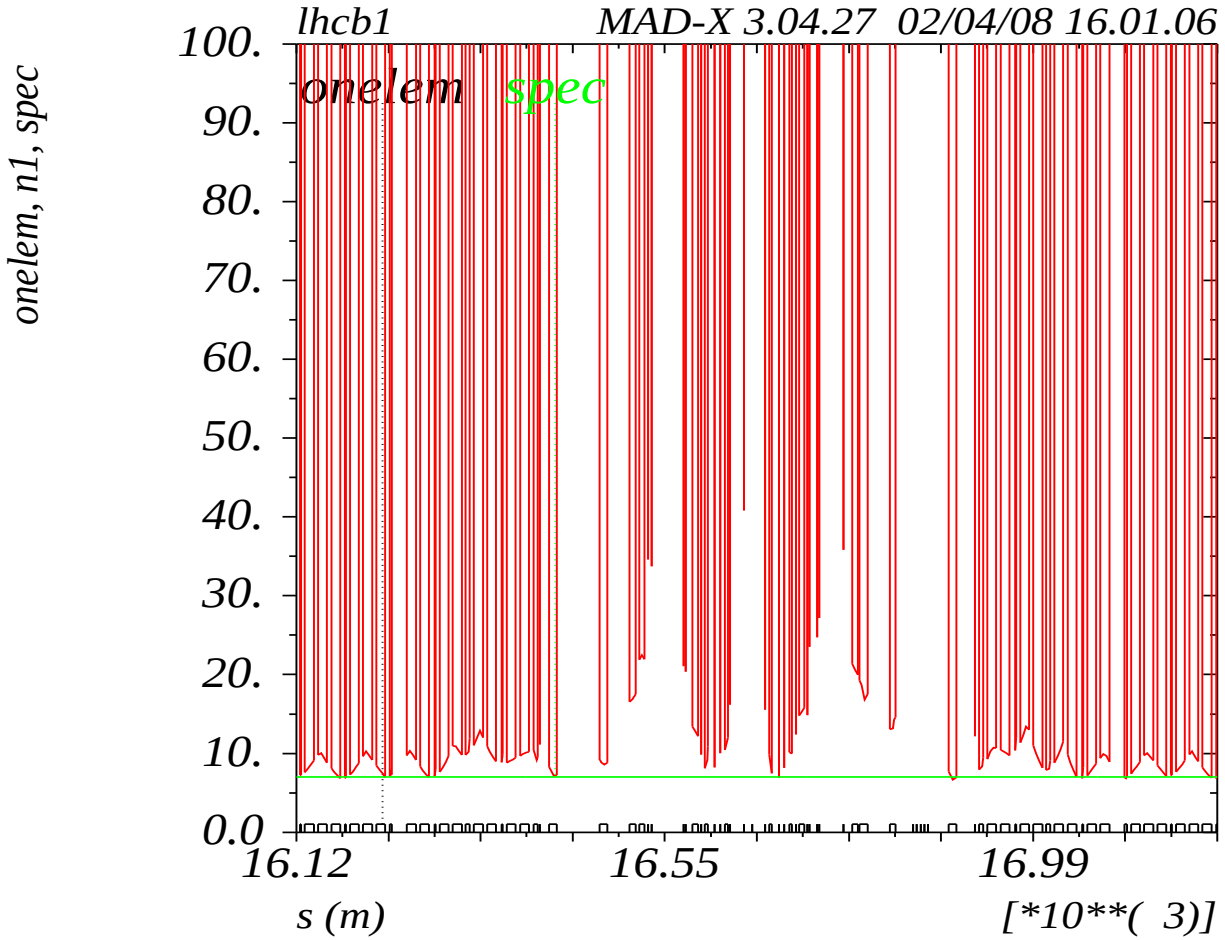
Aperture checks - start of squeeze, 7 TeV, 10m



Aperture checks - end of squeeze, 7 TeV, 2m



Aperture checks - Injection optics, 450 GeV, 10m, $\mp 170\mu$rad



Aperture, 7 TeV

Optics	β^* m	n1 B1 σ	n1 B2 σ	location
start pre.sq.	10	23	23	mqxb.b2.r(l)8
end pre.sq.	10	23	23	mqxb.b2.r(l)8
squeeze	5	17	17	mqxb.b2.r(l)8
squeeze	4	15	15	mqxb.b2.r(l)8
squeeze	3	12	12	mqxb.b2.r(l)8
squeeze	2	9.6	9.6	mqxb.b2.r(l)8

Conclusion

- pre-squeeze and squeeze optics matched with β^* of 10 m, both planes
- check with PO to be done
- crossing scheme implemented
- aperture checked