Various SixTrack Checks in the HL-LHC Beam-beam context

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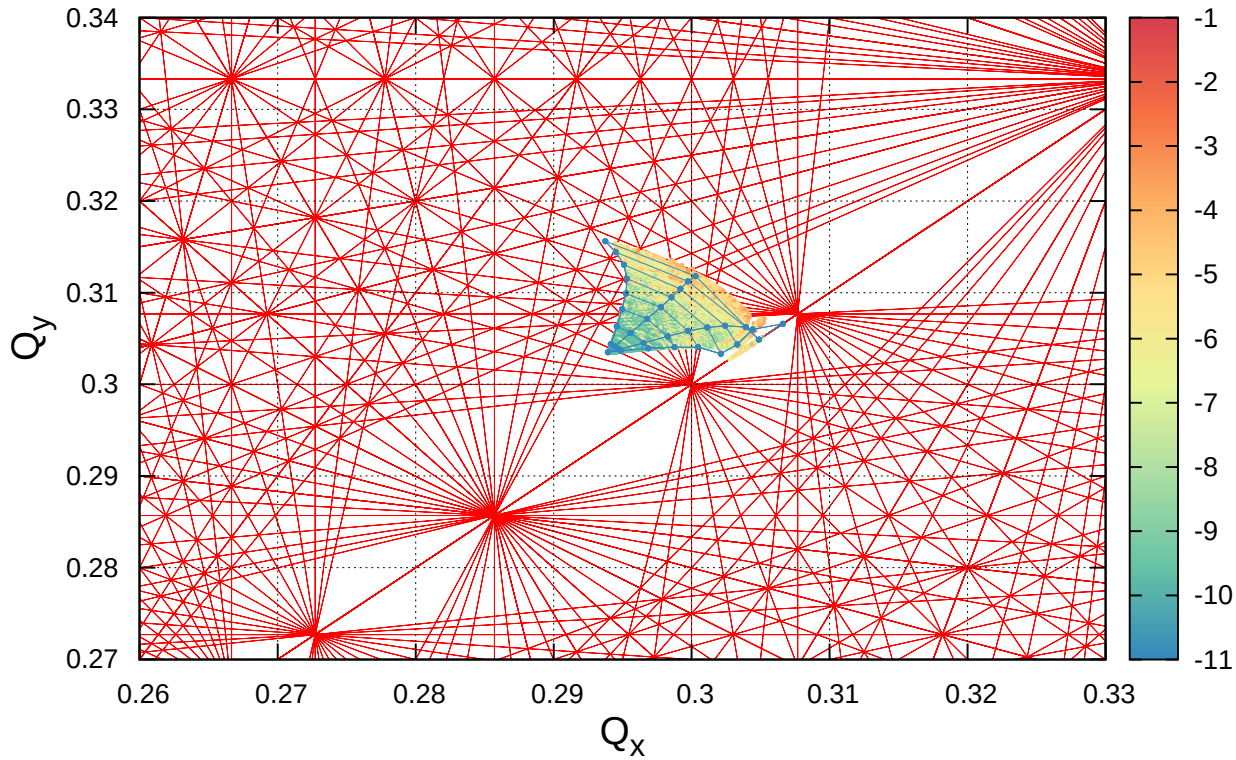
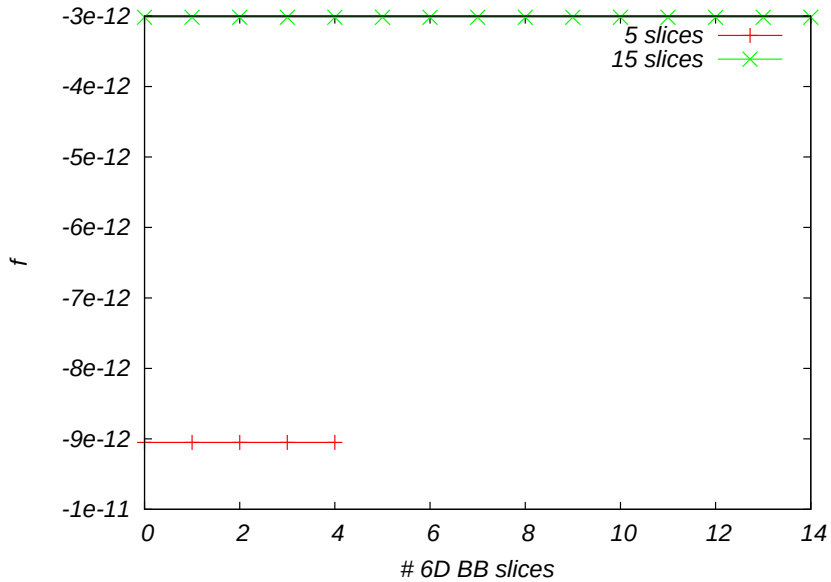
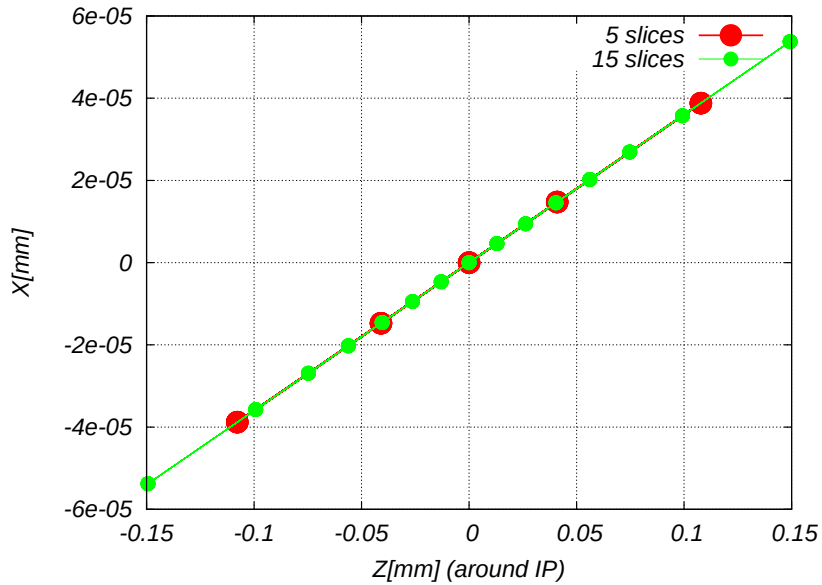
Footprint MADX vs SixTrack. 4D case



Beam 2 implementation in Sixtrack if wrong will impact both 4D + 6D.
On-going checks: footprint ok. 7.5/30 case.
Footprint at different moments of long term tracking.

6D BB a la Hirata in SixTrack



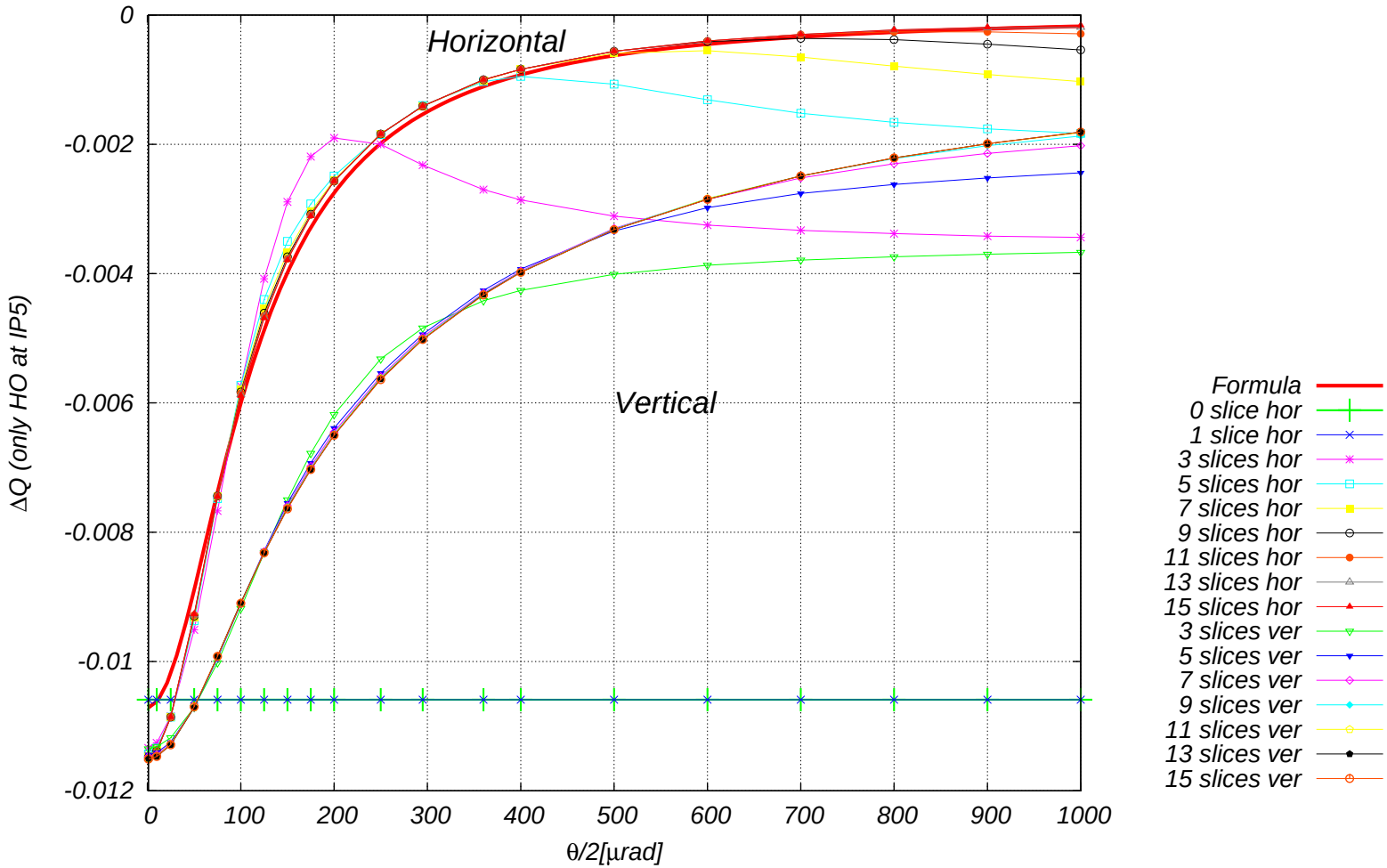


6D beam beam Hirata's implementation in SixTrack versus references and crab crossing implemented.
See previous talk in the beam-beam working group

`http://indico.cern.ch/getFile.py/access?contribId=1&resId=0&materialId=slides&confId=254901`

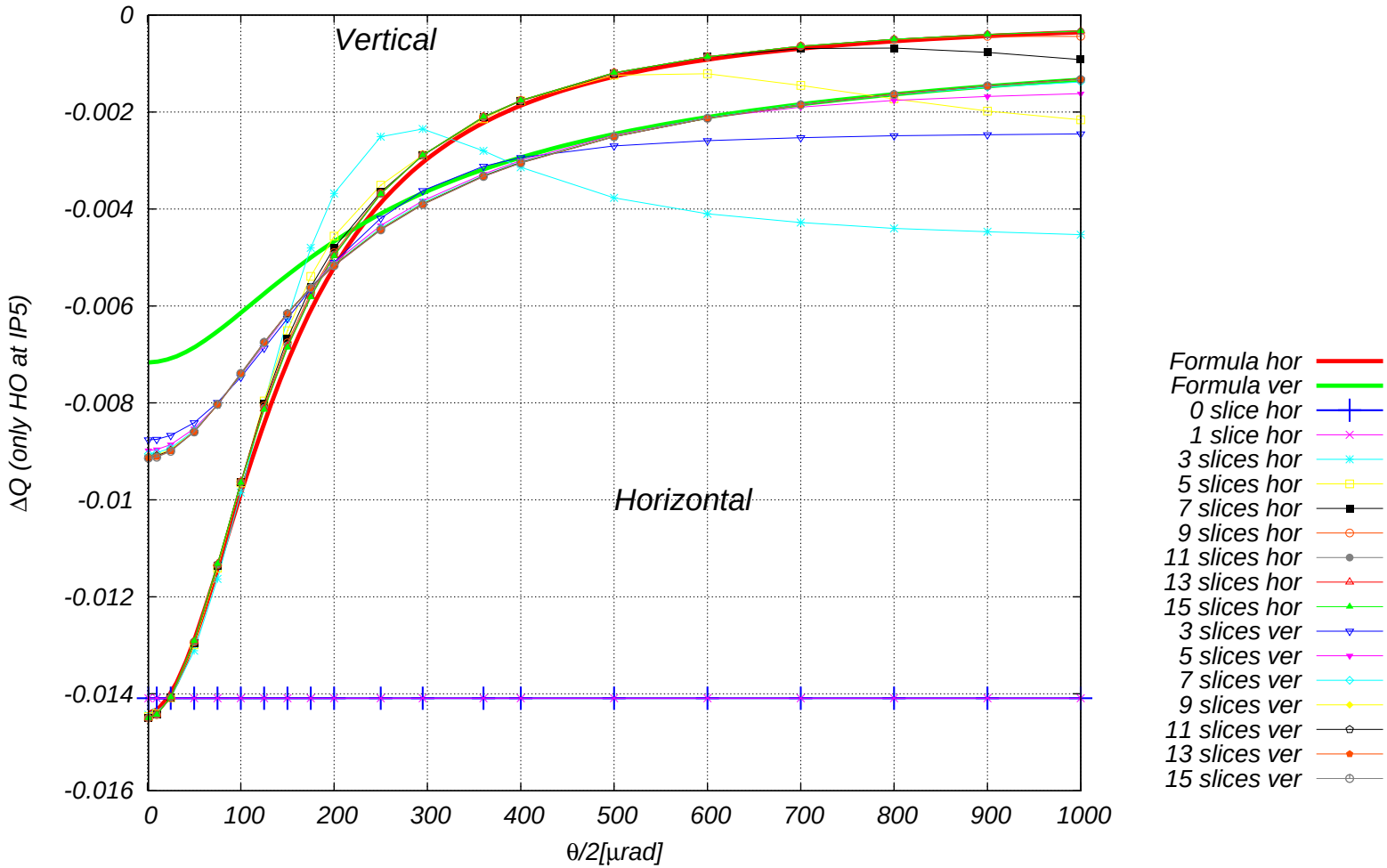
Tune Shift vs Number of slices

HL-LHC optics $\beta^*_{x,y} = 15$cm.



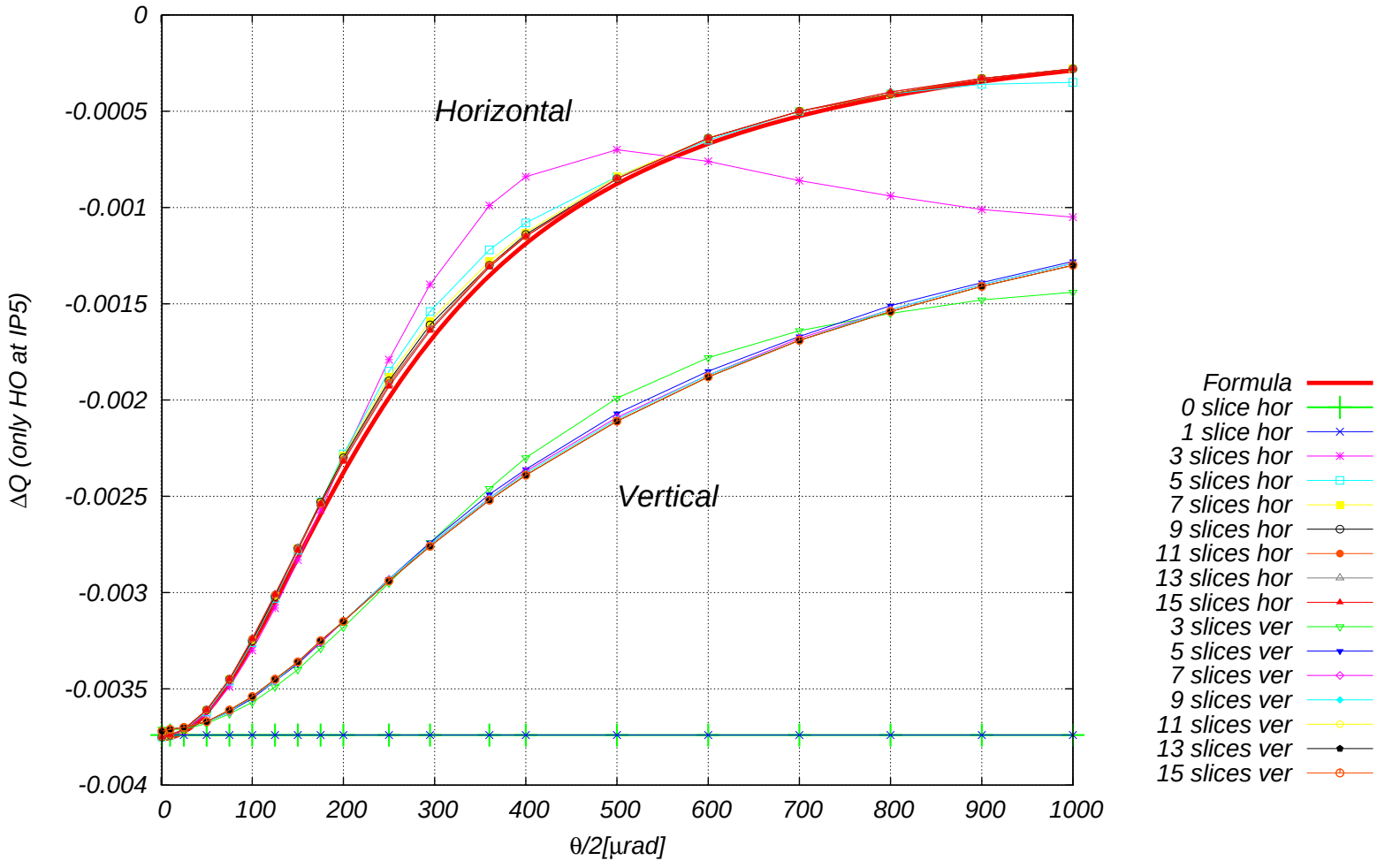
Tune Shift vs Number of slices

HL-LHC flat optics $\beta^*_{x,y} = 30/7.5$cm.



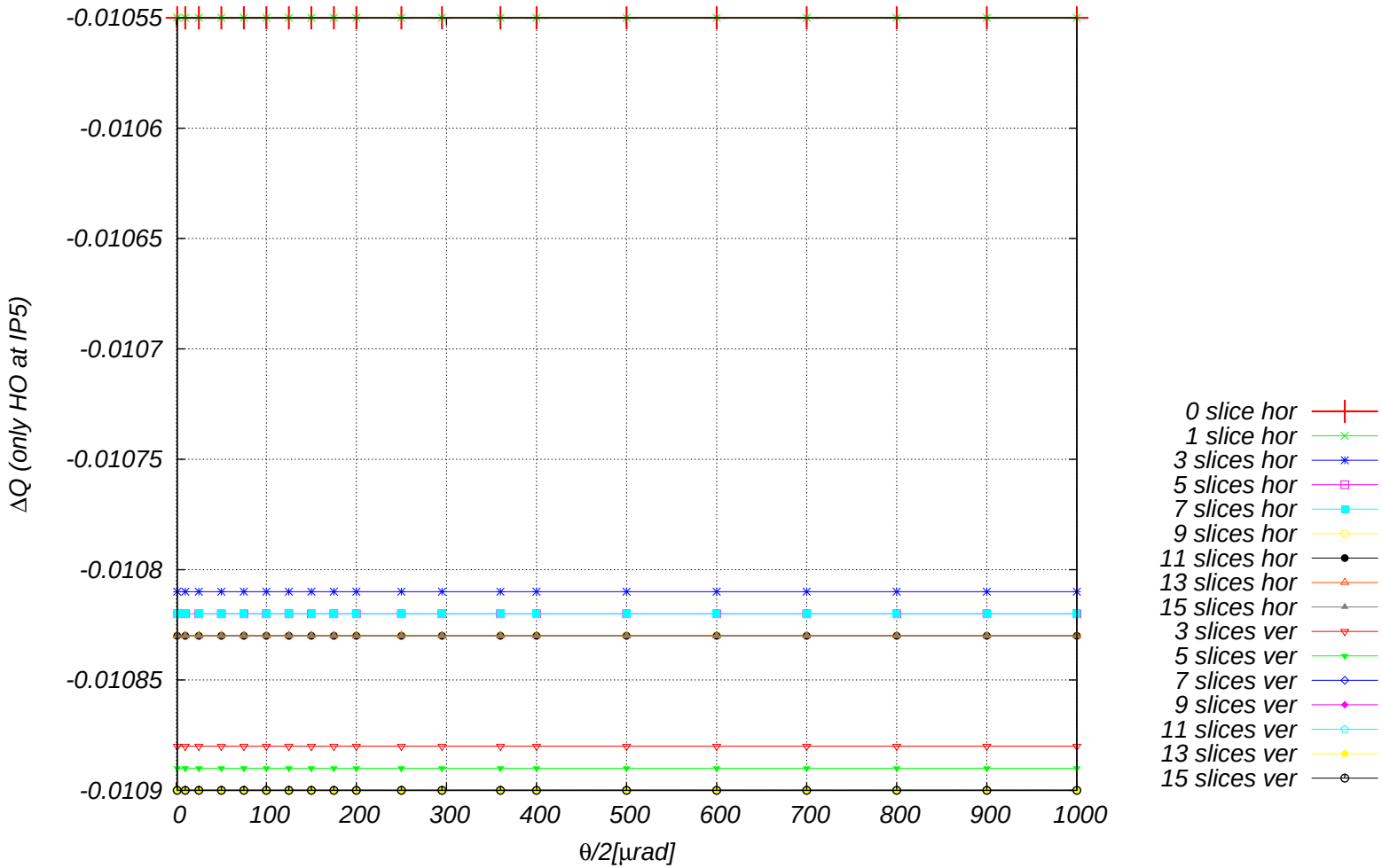
Tune Shift vs Number of slices

LHC optics $\beta^*_{x,y} = 55\text{cm}$



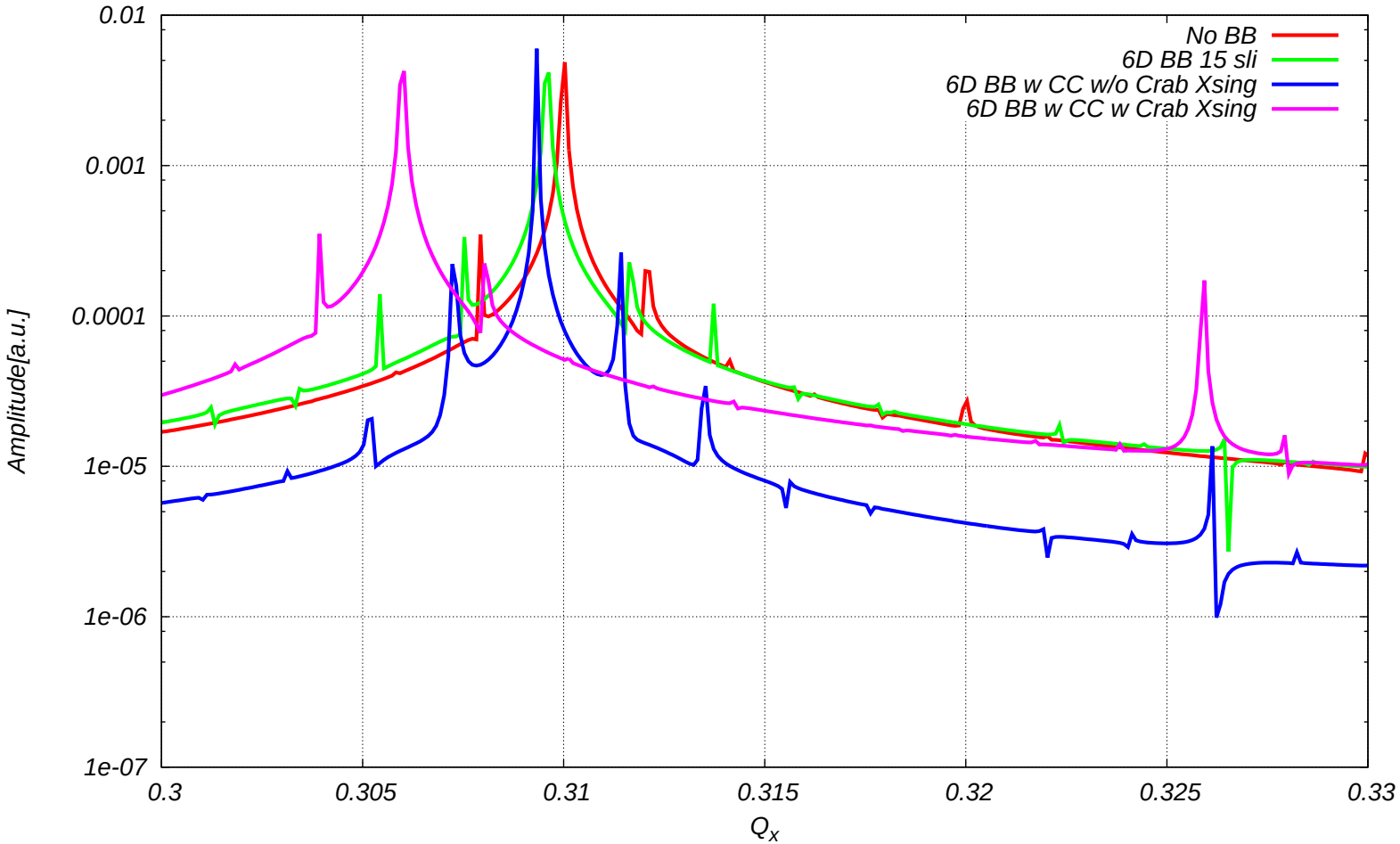
Tune shift for Crab Xsing case

HL-LHC optics $\beta^*_{x,y} = 10$cm with crab crossing.

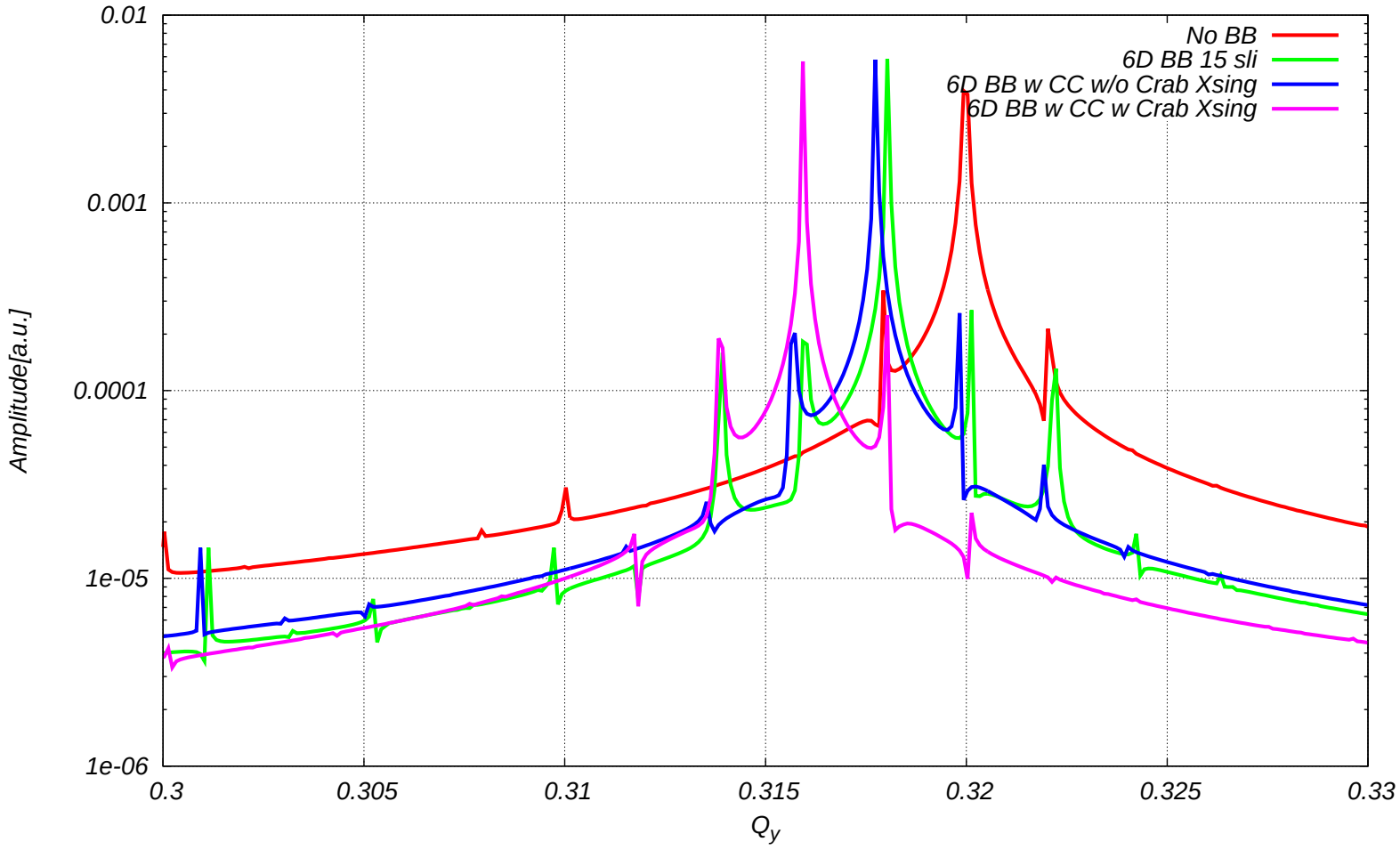


Crab Cavities available in SixTrack with general crab crossing in both H/V (possible use in crab kissing).

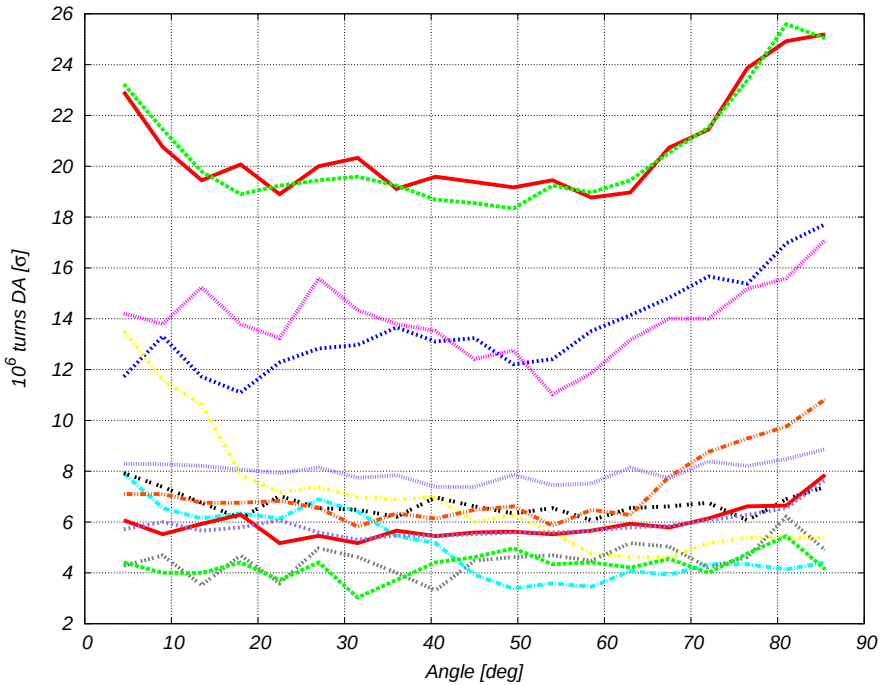
Synchrobetatron resonances

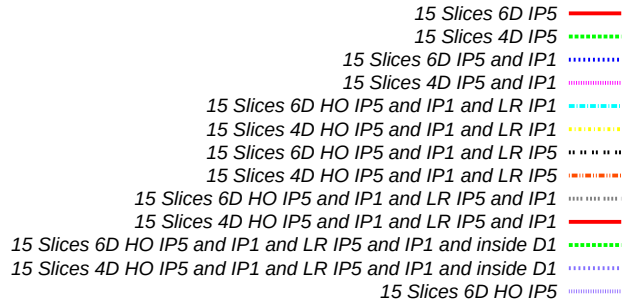


Synchrobetatron resonances



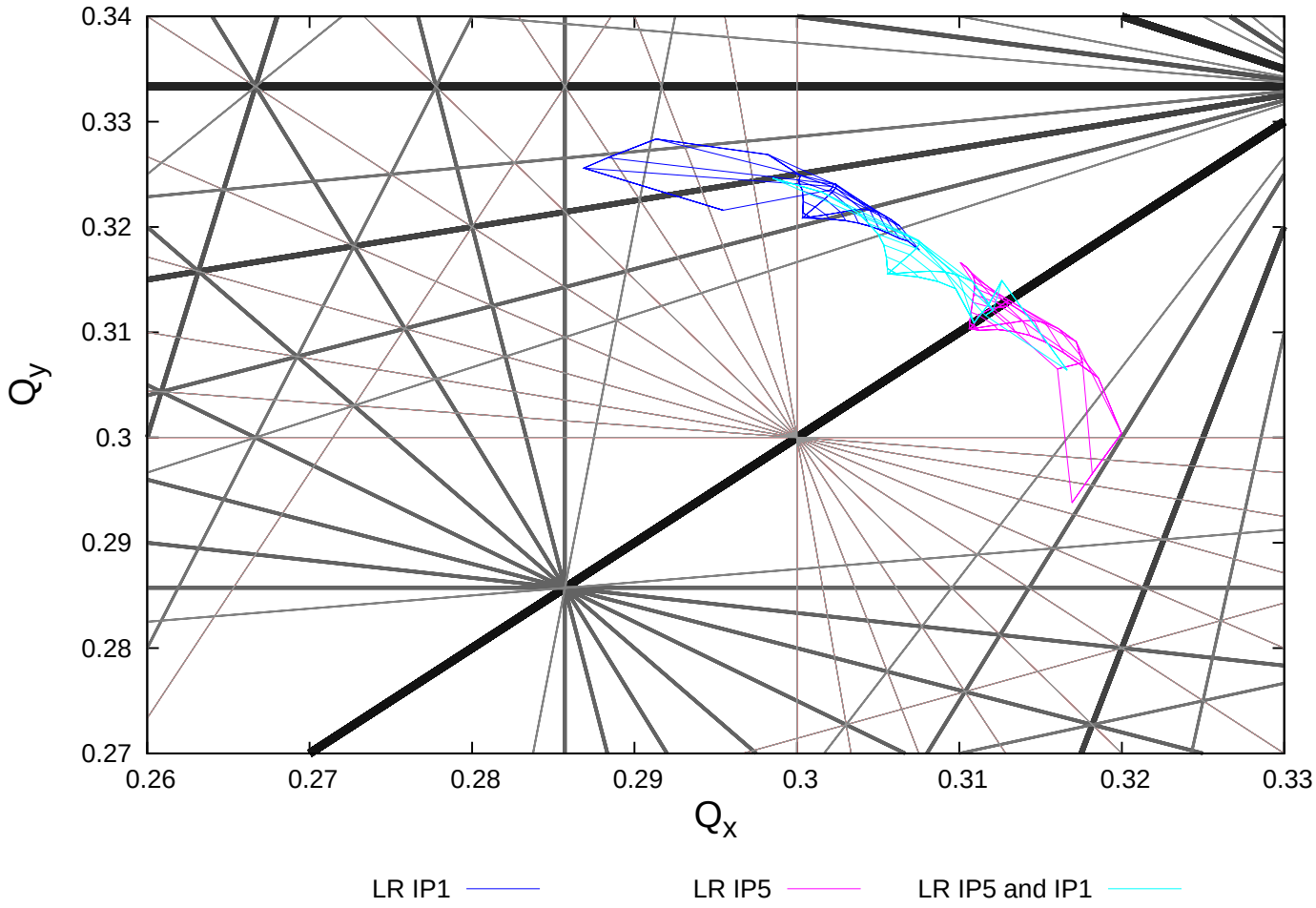
Where the difference comes from?





Differences 4D vs 6D (always referred to BB lenses) coming from adding second LR set. Optics used round 10/10 cm. Possible hints large amplitude more affected in 6D (growing tails), synchrobetatron resonances effect, simply numerical issues due to different implementation.

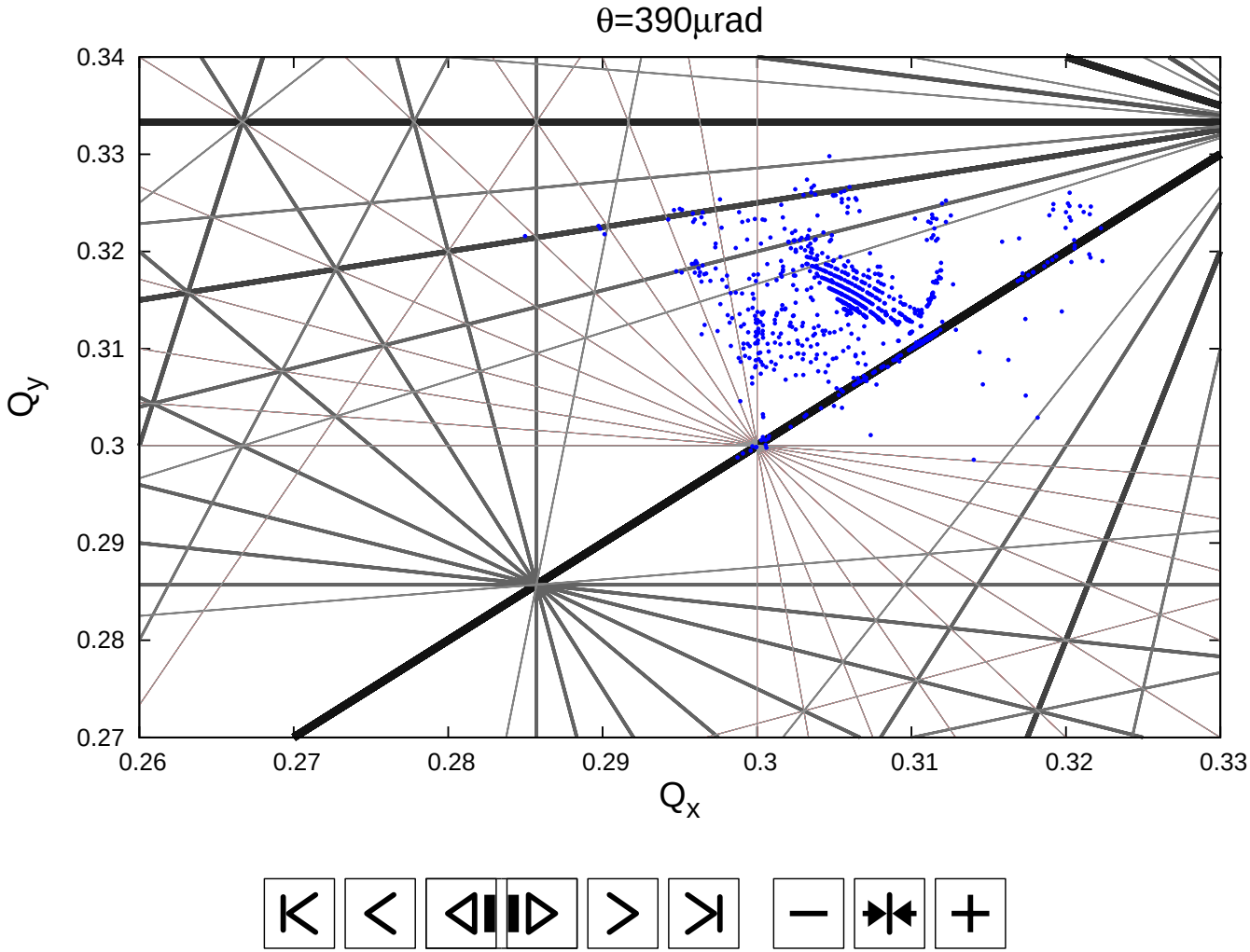
Where the difference comes from?



Of course any check will depend on the region of the tune diagram where we are. 6D effects in footprint could explain the differences simulated.

CC FMA xsing angle scan

Footprint evaluation for different crossing angles in case of round 15 cm optics with crab cavities.



Future work and possible checks in Lifetrack

- MADX to SixTrack beam 2 implementation.
- Crosschecks with FMA/footprints simplified cases (HO, HO+LR, etc.).
- Tune calculation with sliding window for 6D cases.
- Synchro-betatron resonances versus crossing angle and Q_s.
- Understand DA definition in SixTrack and LifetTrac.

Any suggestion/comment will be more than welcome!