

Task 2.5 Status

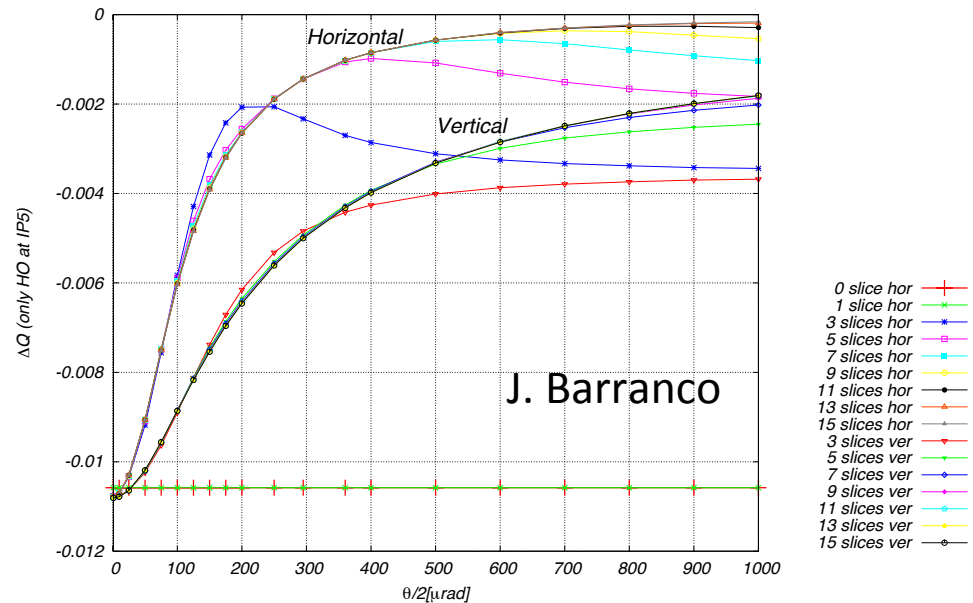
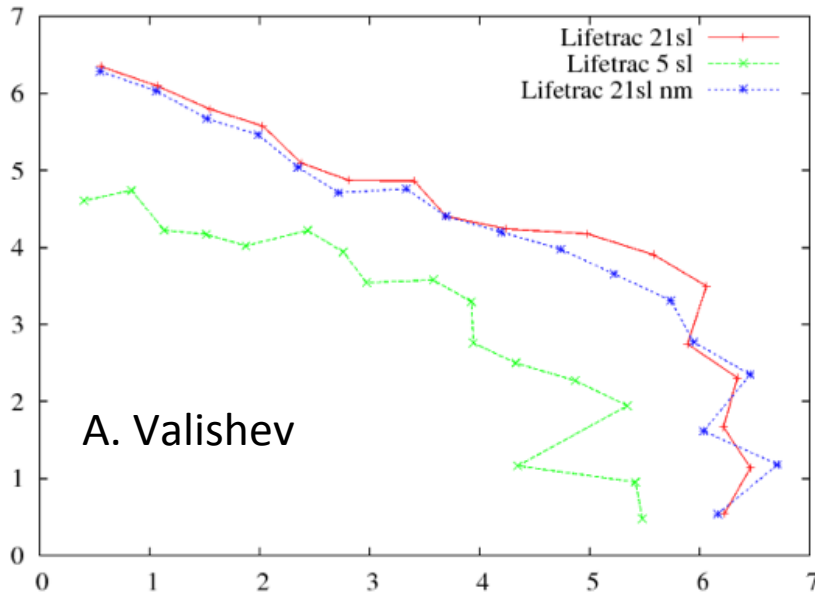
D. Banfi, J. Barranco, M. Crouch, K. Ohmi,
T. Pieloni, J. Qiang, A. Valishev

- Sixtrack versus Lifetrac
- DA preliminary studies
- Strong-strong studies

Lifetrac vs Sixtrack

From BB meeting 11th December 2013

- Strong impact of number of slices shown by Lifetrac not seen in Sixtrack
- Different tune shifts for small crossing angles, more important for small beta* values

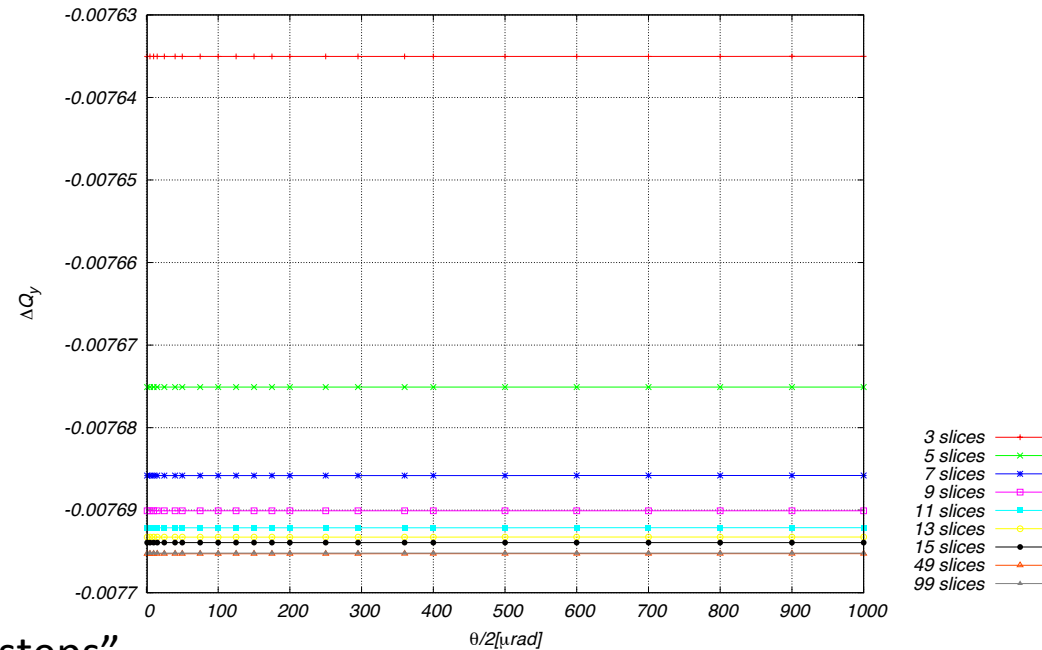
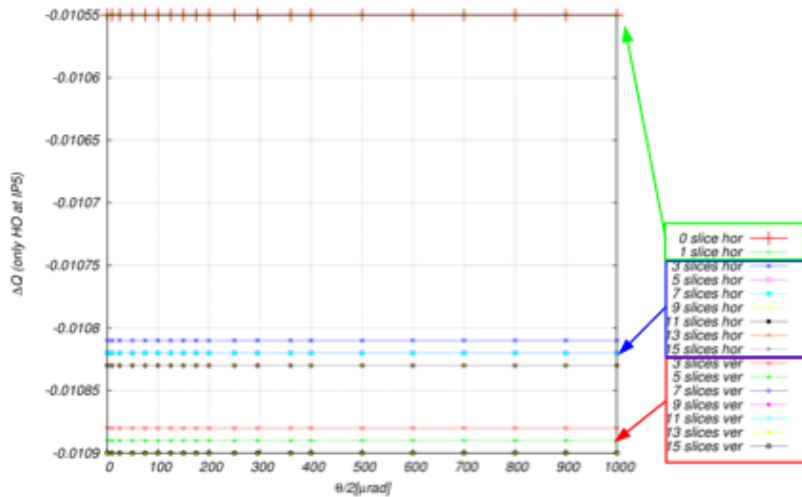


Found hard-coded maximum number of slices for 6D head-on (...if larger than 15 then reset to 15...)

Corrected! Now free parameter...

Crab Crossing convergence

Problem: why steps are finite and not reducing while slices increase?



2 ISSUES:

- Sixtrack Tune resolution defines the “steps”
- Slices number above 15 was constant and equal to 15

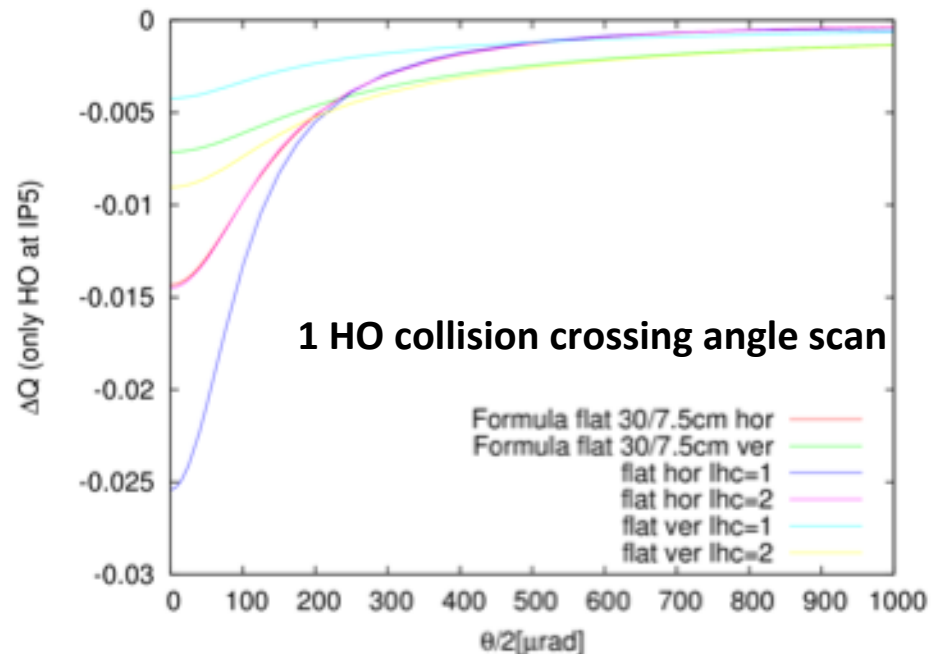
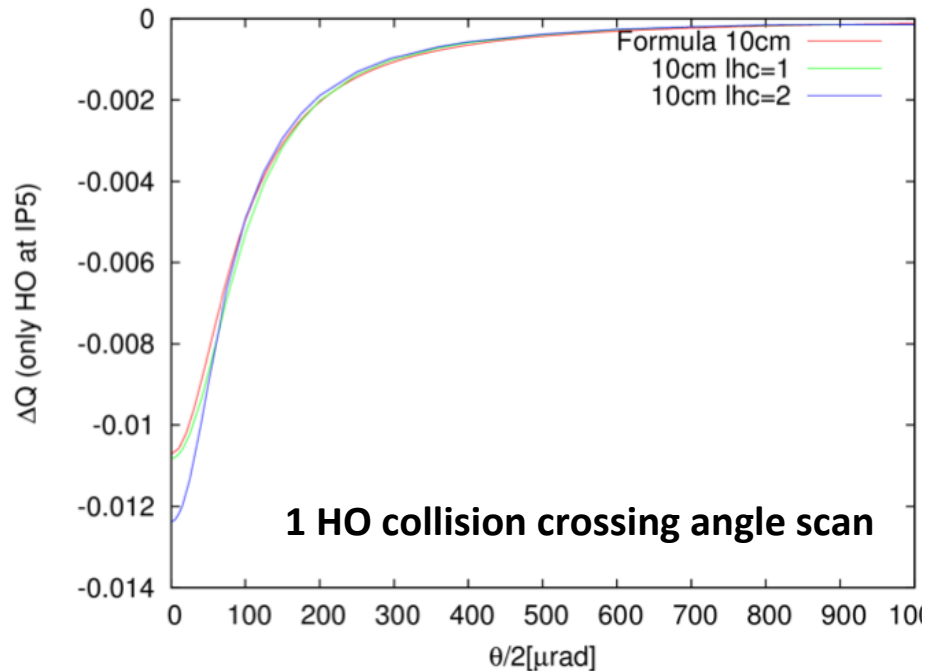
Found hard-coded maximum number of slices for 6D head-on (...if larger than 15 then reset to 15...)

Corrected! Now free parameter...

Sixtrack lhc=0,1,2 options

6D lens is built internally in Sixtrack

lhc option is meant for LR: lhc=0 sym optic, lhc=1 anti-sym, lhc=2 read from MADX file



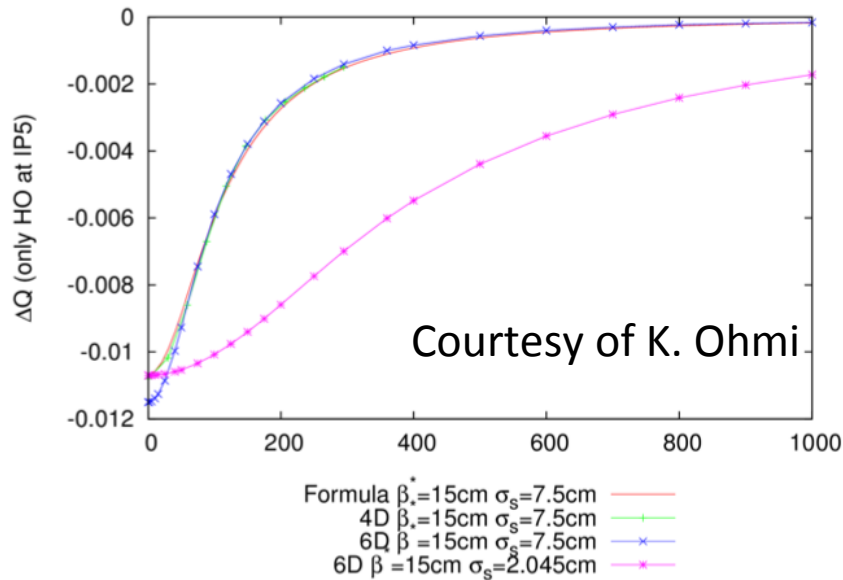
lhc=2 should not affect Head-on collision: 6D beam-beam lens is built inside Sixtrack and parameters are not read-in from MADX files!

This was not true!

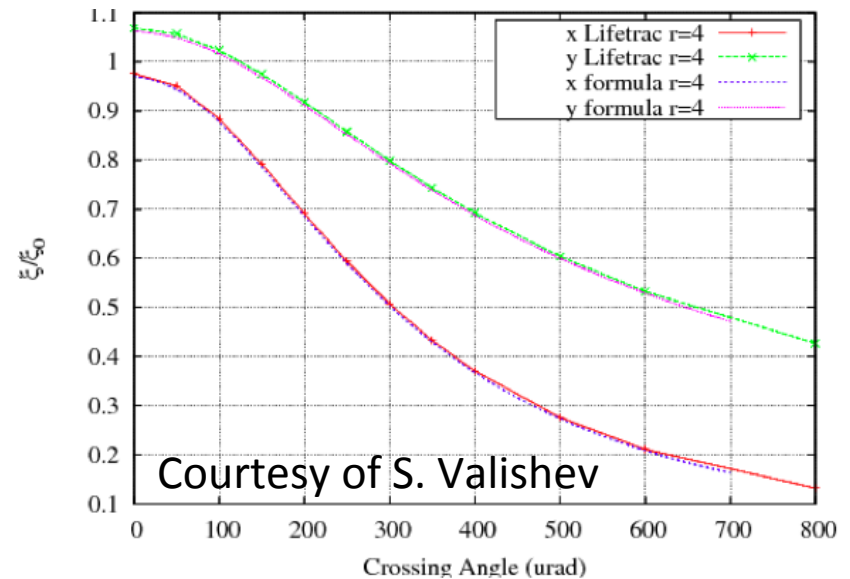
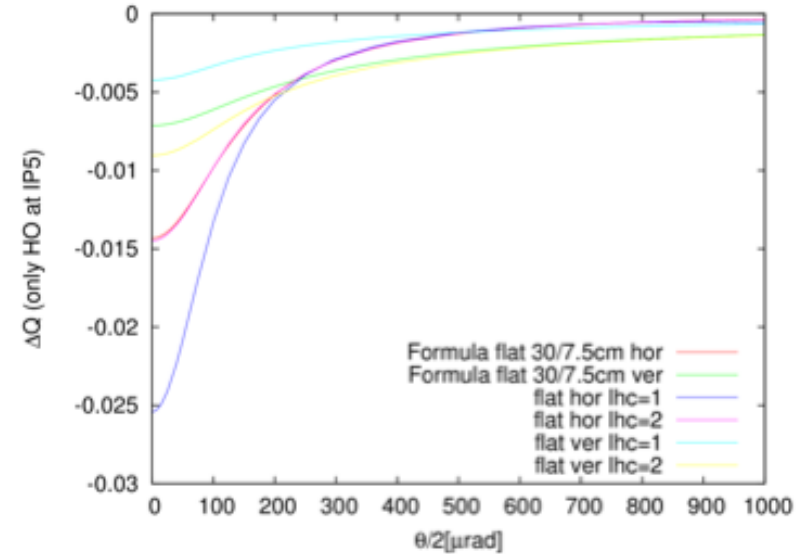
lhc=2 overwrites the 6D head-on beam-beam lens !

Lifetrack versus Sixtrack inconsistency and Ohmi

4D vs 6D tune shift

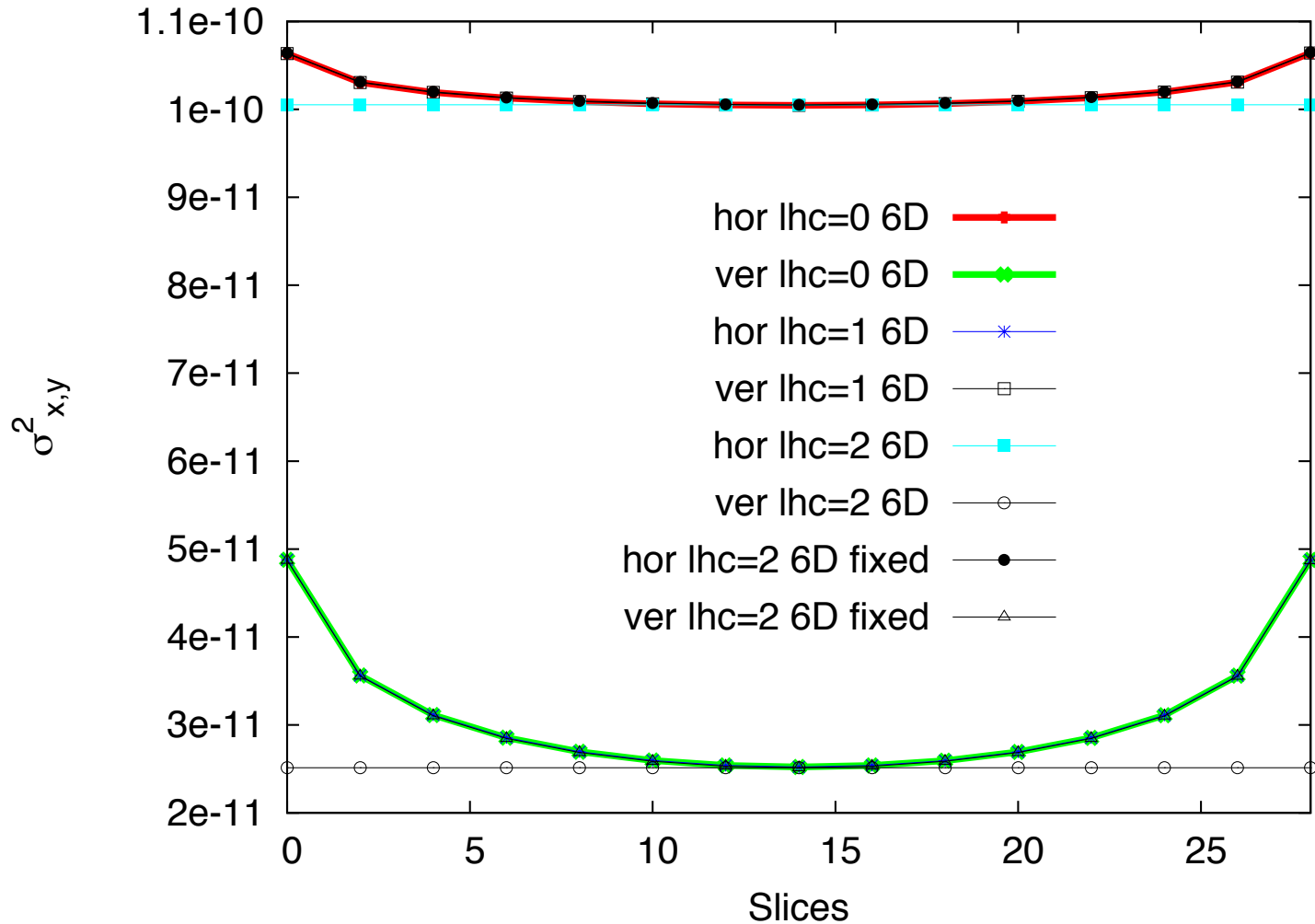


Sixtrack tune shifts for head-on larger than expected for small crossing angles



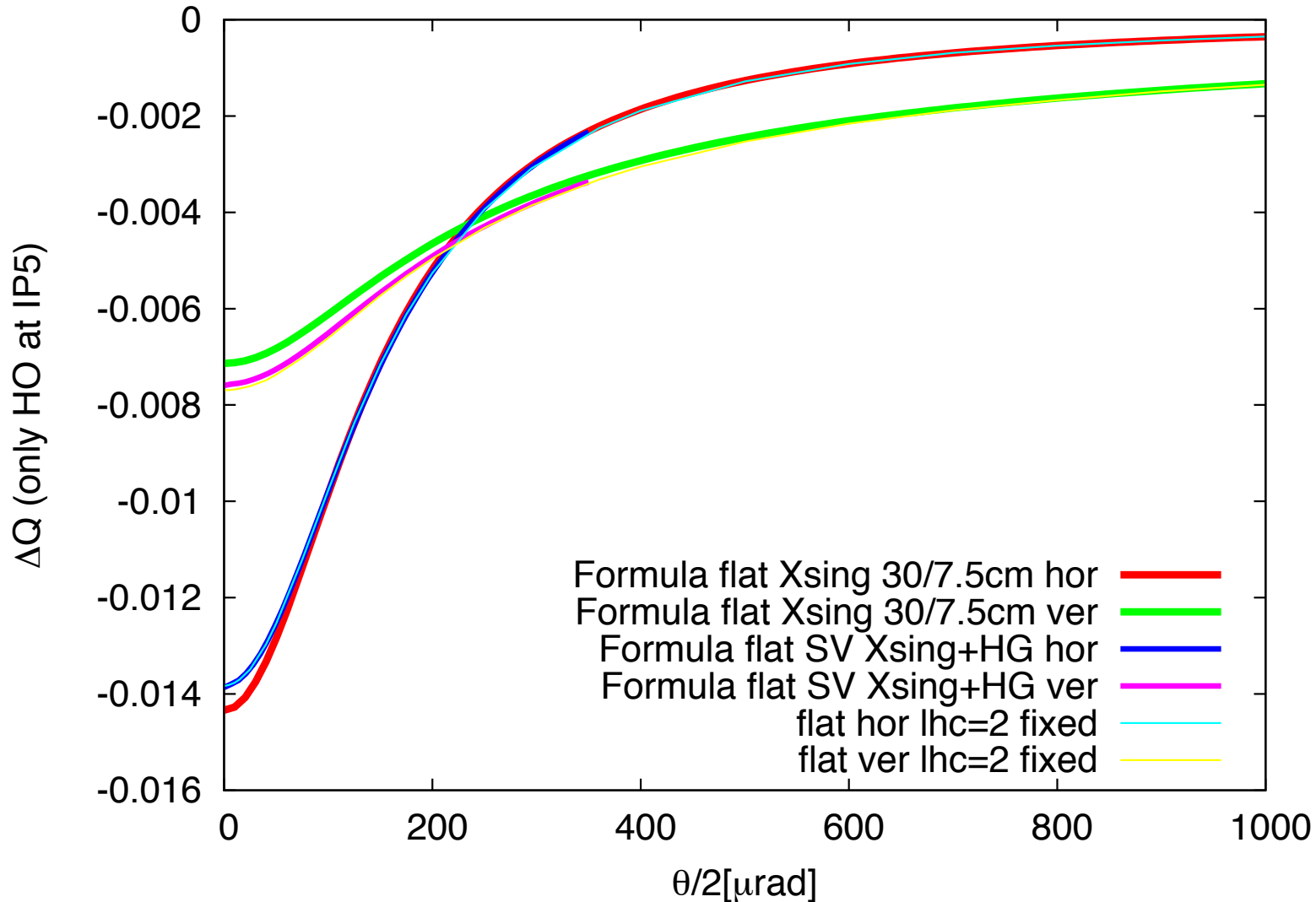
Flat optics is different

- 6D beam-beam lens construction correct
- lhc=2 option was overwriting the head-on beam-beam slices properties (σ^2)



Problem fixed!

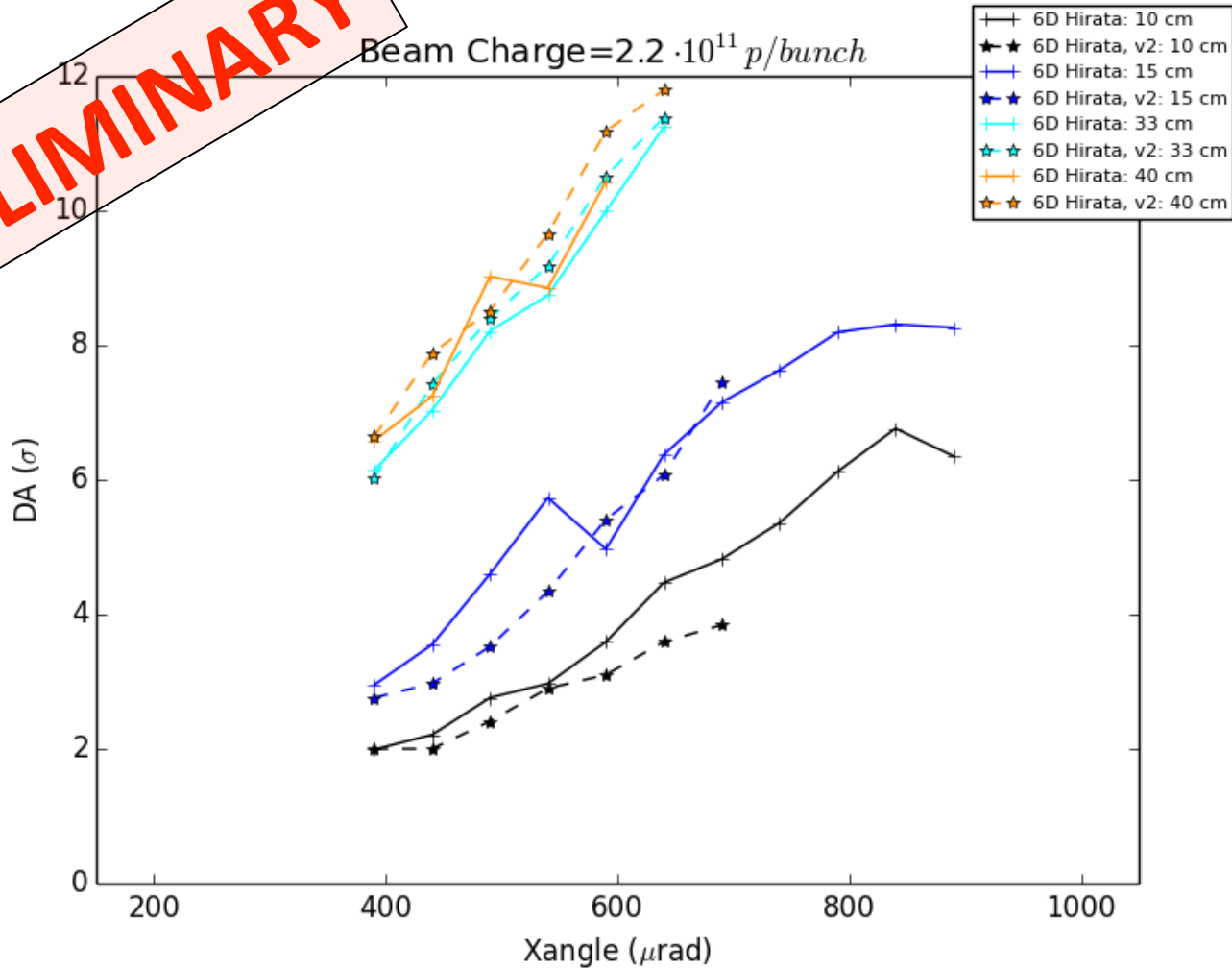
lhc=2 option corrected



Correction effect removes differences from Lifetrack/formula calculations for flat Round optics case correct with lhc=1 option, no need for modification!

Impact of bugs on DA results: round

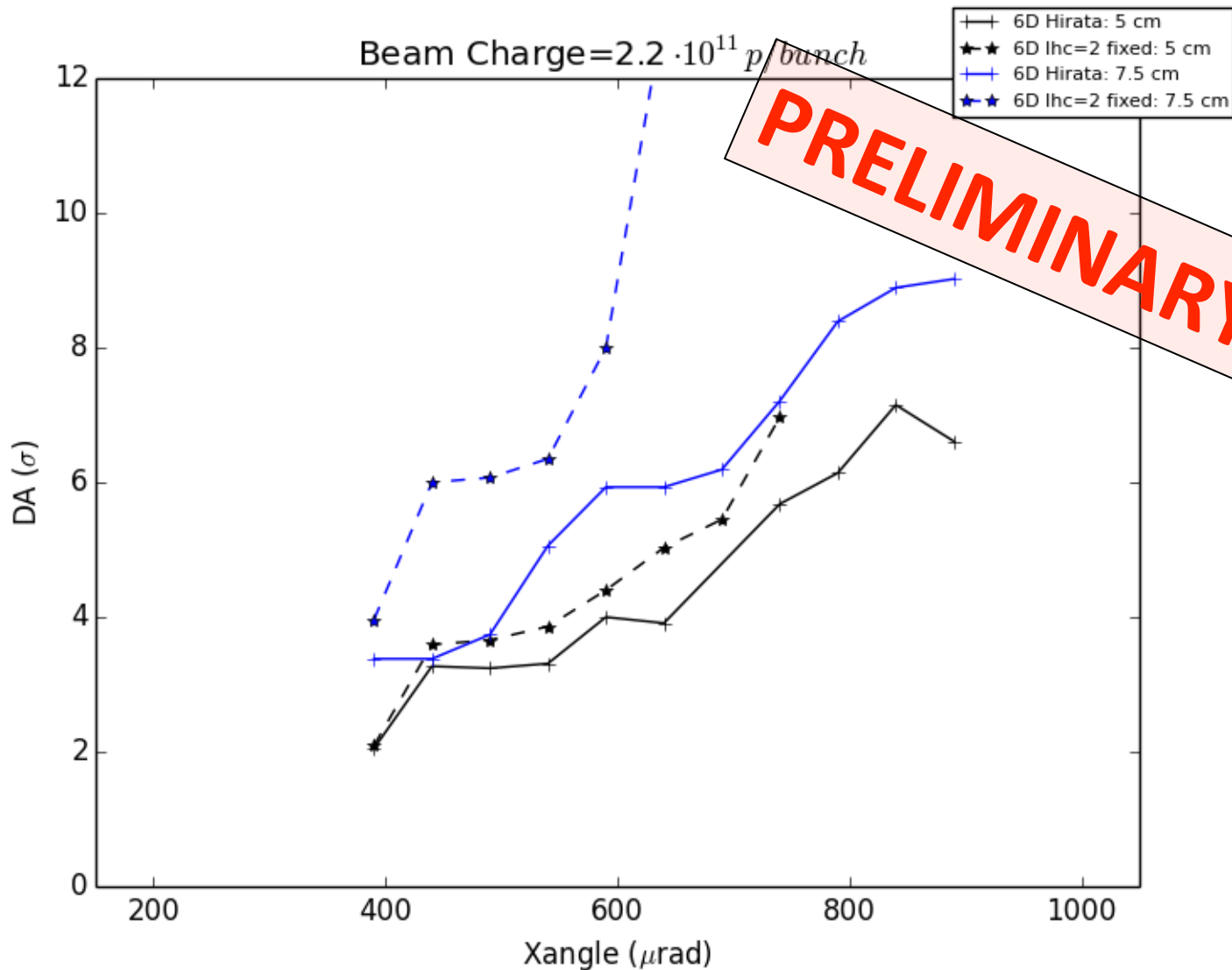
PRELIMINARY



Very little/negligible impact of lhc option!

Slices number should be important: under study!

Impact of bugs on DA results: flat beams

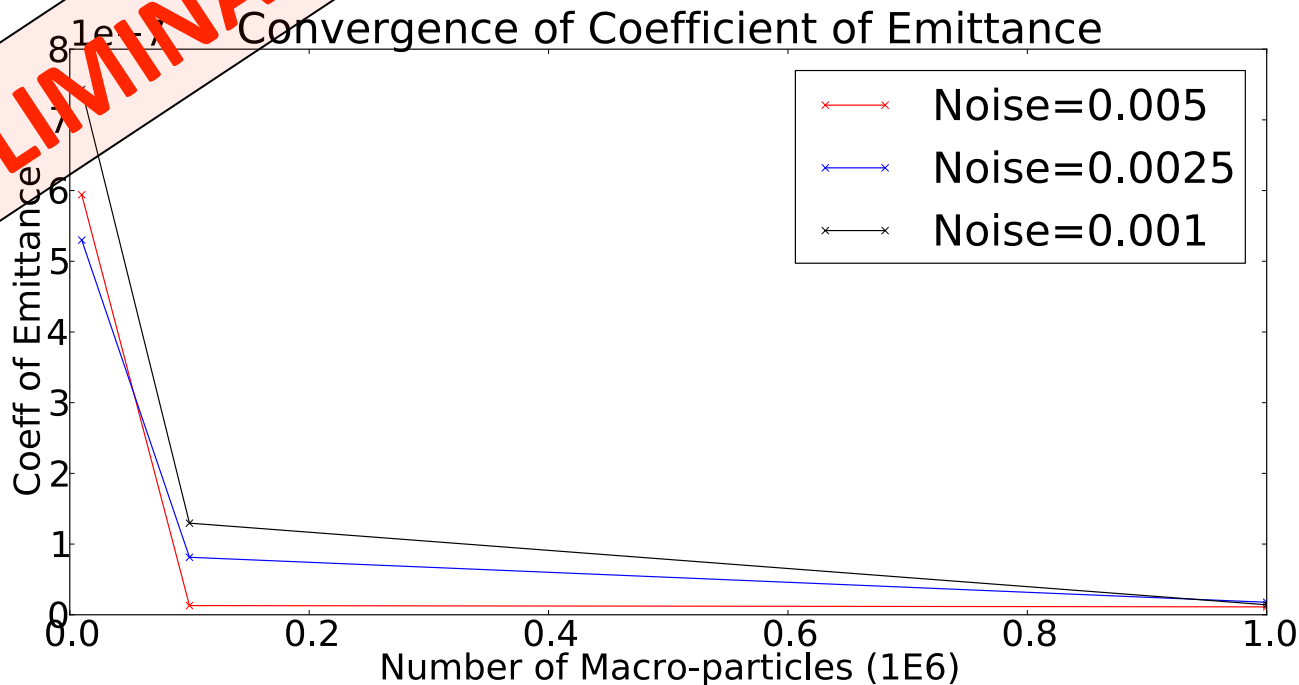


Impact of lhc=2 option not always important!

Slices number is more important: under study!

Strong-strong studies

- 6 D head-on implementation in COMBI on-going benchmark with Beam-beam 3D
- J. Qiang and K. Ohmi reproducing LHC observables to define octupole/chroma values for colliding beams
- Noise studies M. Crouch Manchester University , convergence studies and parameter scans White, colored, Gaussian noise. Benchmark versus Ohmi & Ji studies!
- Studying COMBI transverse feedback impact on beams: parameter scan



Summary:

- Weak-strong studies:
 - Lifetrac versus Sixtrack benchmark: very useful, we should keep going like this for more complex cases!
 - 2 Bugs found in Sixtrack and corrected!
 - lhc=2 implementation not compatible with 6D bb lens
 - 6D BB lens slices number fixed to maximum 15
 - First results of DA show impact of bugs on results
 - LHC 2012 long range experiments simulations under analysis
 - DA simulations campaign launched on lhc@home for HL-LHC scenarios
- Strong-strong:
 - Collaboration with Daresbury/Manchester very positive:
 - Manchester scan large parameter range for noise studies in general
 - Daresbury cluster to scan transverse feedback impact on beams
 - LBNL & KEK characterizing LHC emittance blow up in collision
 - 6D beam beam lens for head-on in COMBI benchmark with BB3D (LBNL)