

Missing MQTs and including dipole b2 errors in the design model.

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Universität Hamburg

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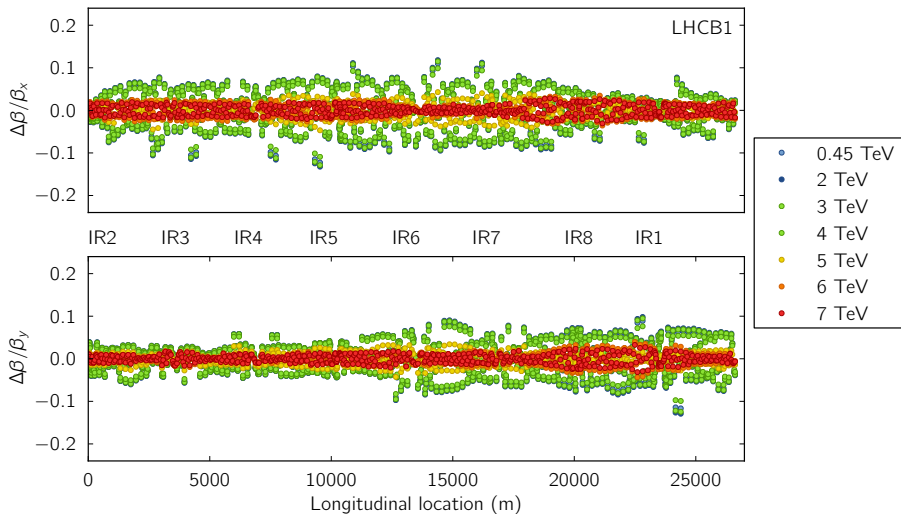


Dipole gradient b2 errors.

- Systematic part
 - Available for energies from Injection to 7 TeV in 0.5 TeV steps
 - Up-to-date values
- Random part
 - Uncertainty from warm to cold measurement
 - 60 seeds with random values in range of the uncertainty are available
 - !!! Not up-to-date
 - Current values are based on extrapolation of 2 currents (\approx Injection and \approx 7 TeV)
 - Also MB currents for 7 TeV were not precisely known when the seeds were created
 - New seeds are needed

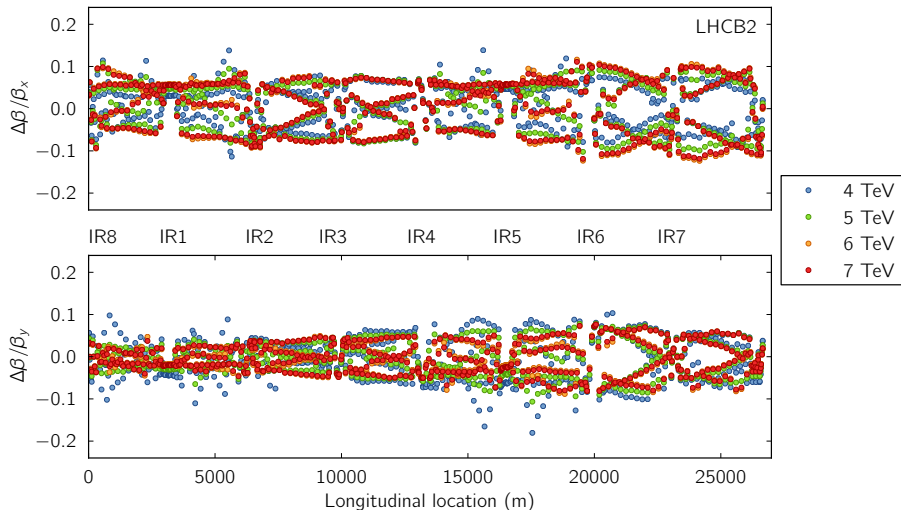
Dipole b2 errors for injection optics.

Ideal Model vs. Model + b2 errors

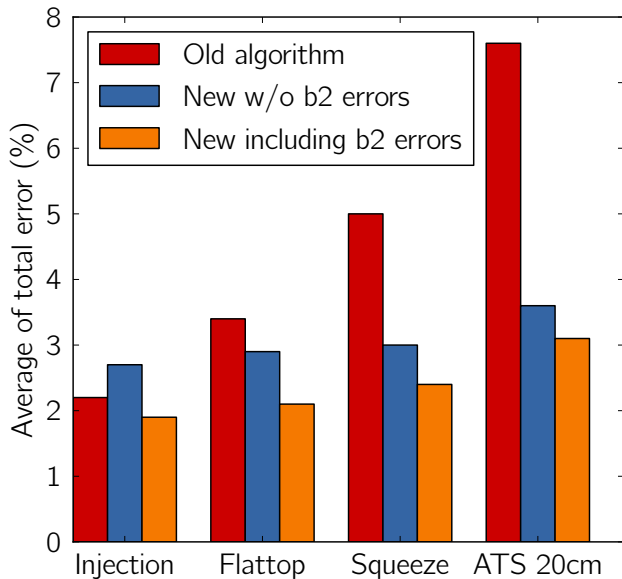


Dipole b2 errors for ATS 0.2 m optics.

Ideal Model vs. Model + b2 errors



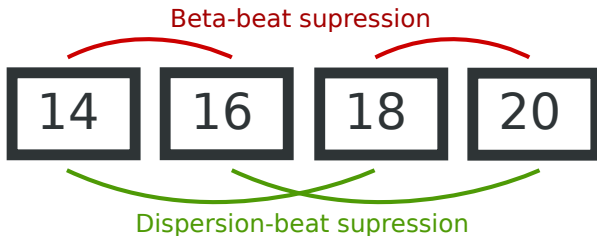
Errors bars of measured betas (experimental data).



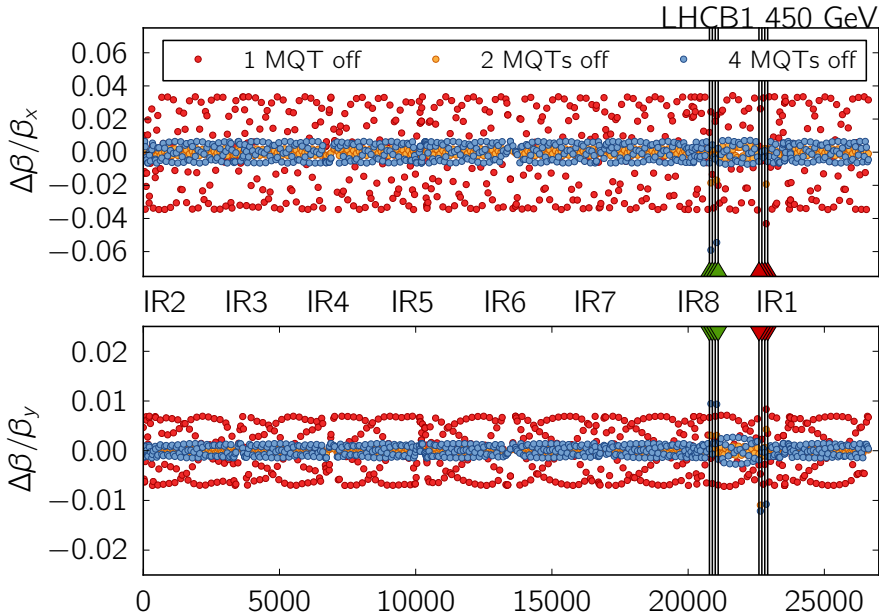
- Averaged $\Delta\beta$
- Errors larger than 200% were removed
- b2 dipole errors increase precision of the measurement

Missing MQT magnet.

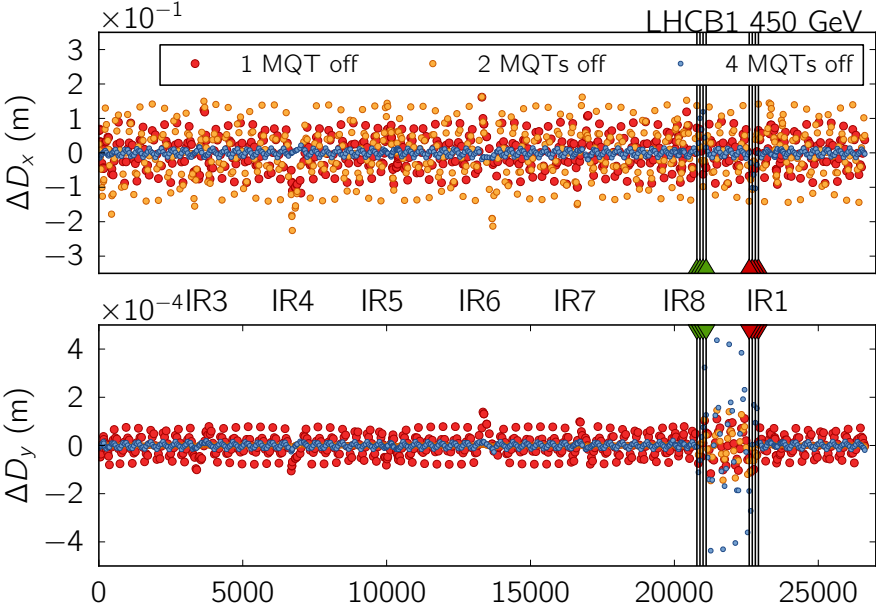
- MQT 18.L1 might not be working
- Impact on beta-beat correction was checked
- 8 MQTs are available in the arc81
- The disabled magnet is compensated by increasing the strength of the other MQTs in this arc
- Additionally the cases of switching off 2 or 4 MQTs is investigated



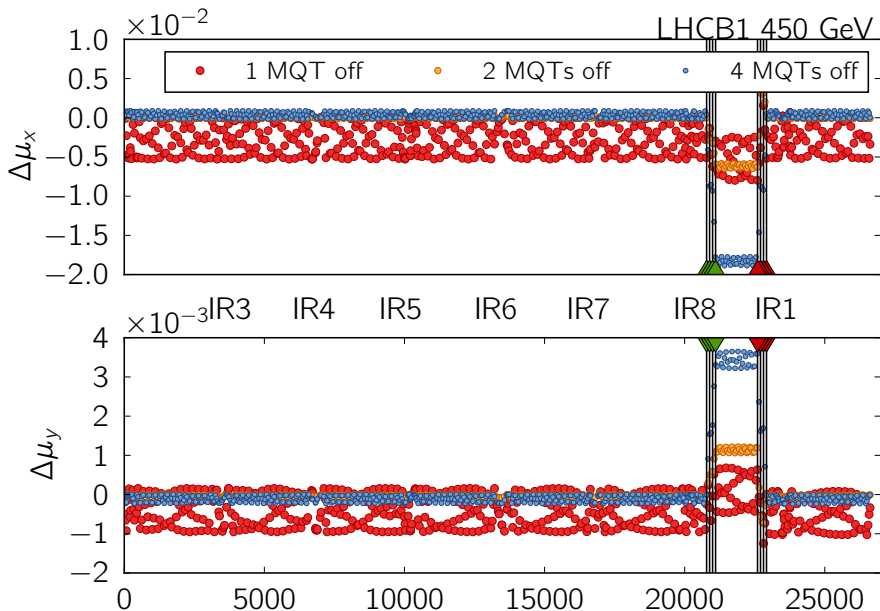
Impact on beta-beat after b2 correction.



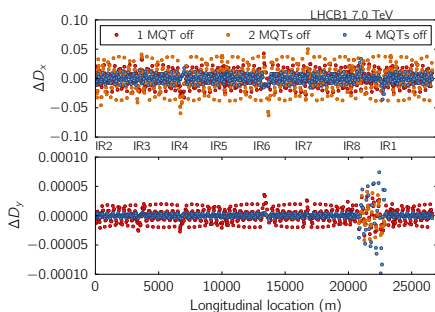
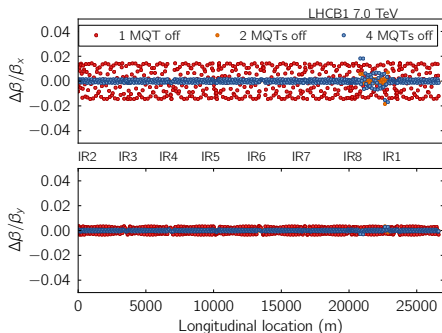
Impact on dispersion after b2 correction.



Impact on phase after b2 correction.

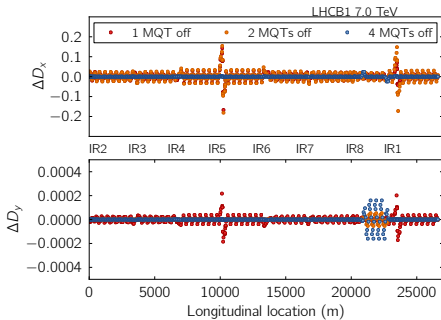
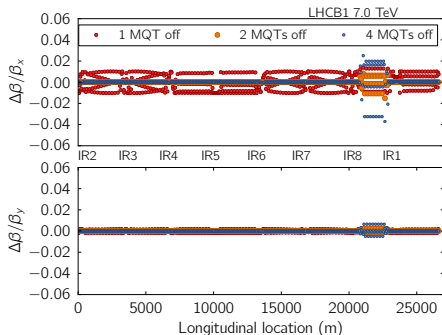


Missing MQT in injection optics at 7TeV.



- Tune shift of 0.08 in both planes
- Disabling 1,2,4 MQTs and compensating with the strength of the remaining MQTs in this arc

Missing MQT in ATS optics at 7TeV.



- Tune shift of 0.08 in both planes
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Conclusions.

- With the current performance of the LHC the b2 errors are in no case negligible
 - b2 errors are very well known (experimentally verified)
 - Optics measurements benefit from b2 errors in the model
- Include b2 errors +corr. in design model
- Missing MQT has an impact on the beta-beating
 - Switching off at least 2 MQTs is favored for the beta-beating
 - Switching off 4 MQTs is favored for the dispersion
 - Missing MQTs enhance the need for b2 errors + corr. + missing MQT in the design model