Compensation of PSB injection chicane perturbation - studies

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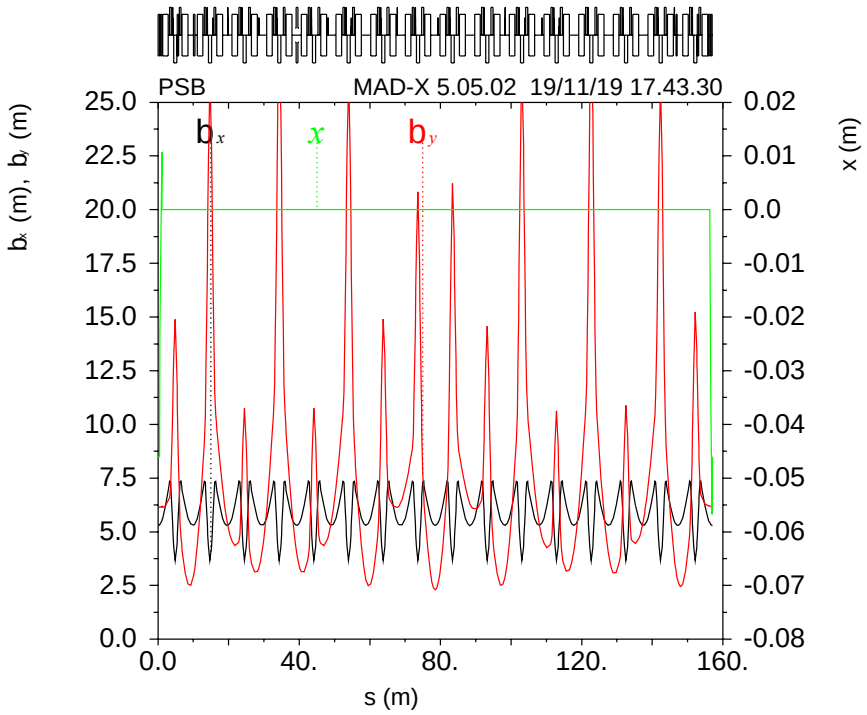
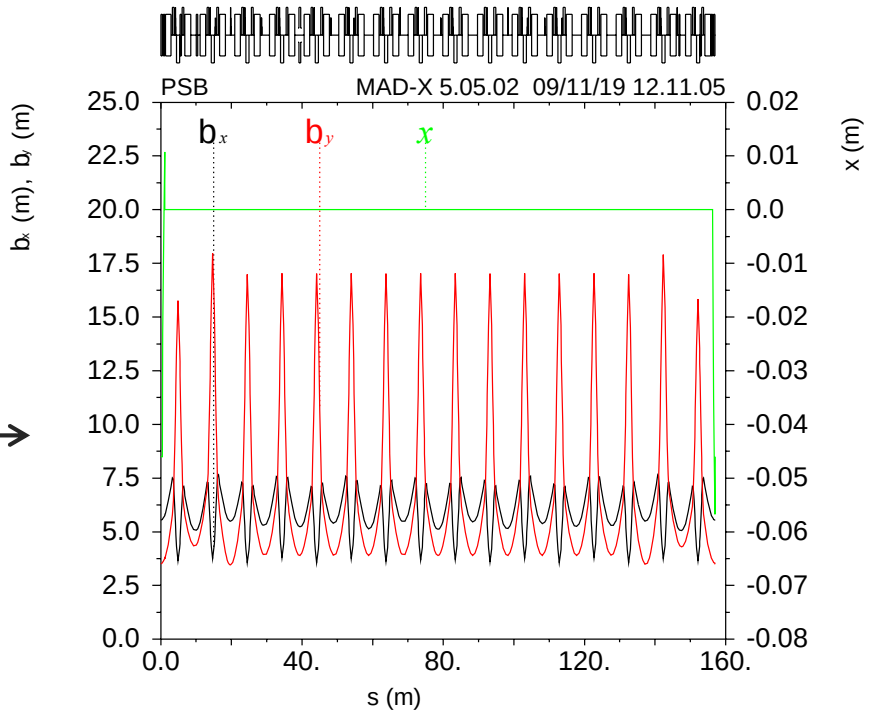
Introduction

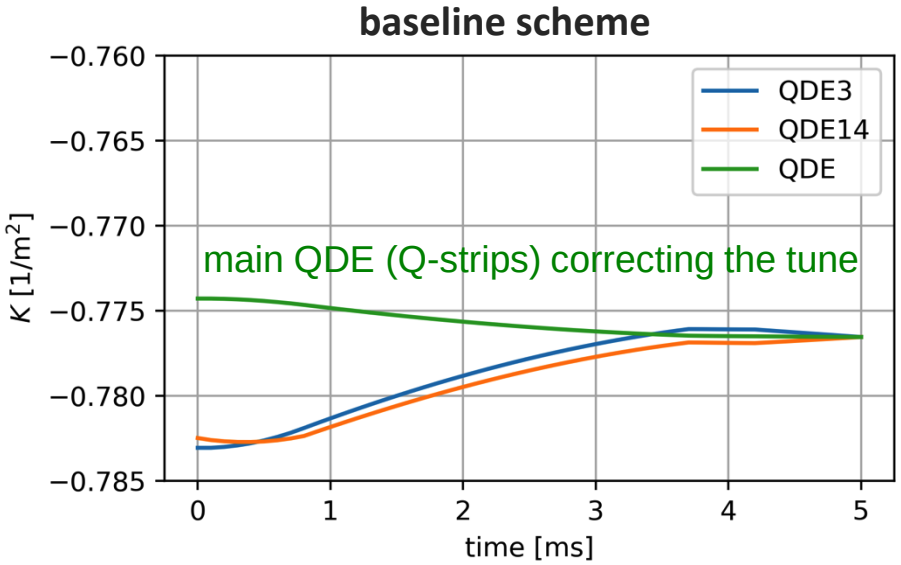
- The strong edge focusing of the new H- injection chicane induces beta-beating in the vertical plane
- Two individually powered quadrupole Q-strips can compensate the beta beating (fast dynamic correction during 5 ms fall of injection chicane)

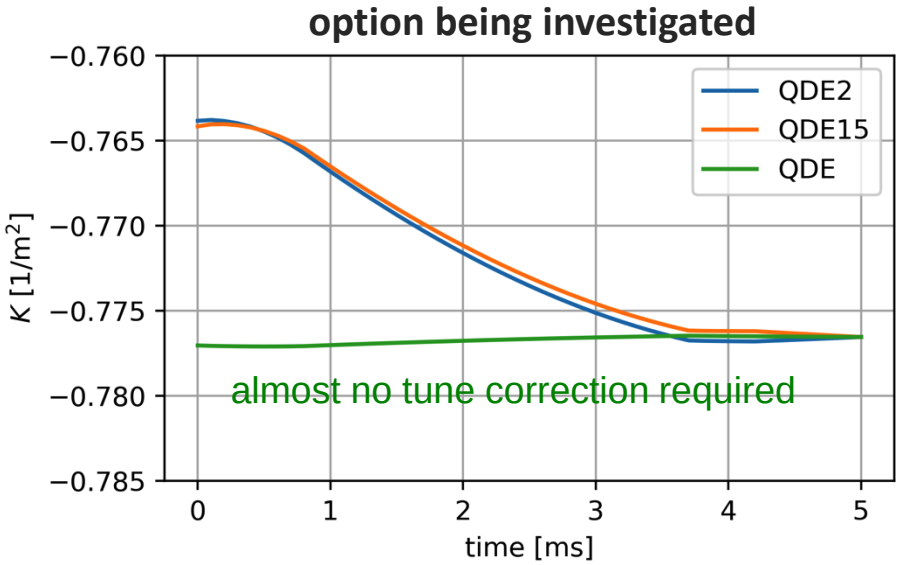




Studies on correction scheme

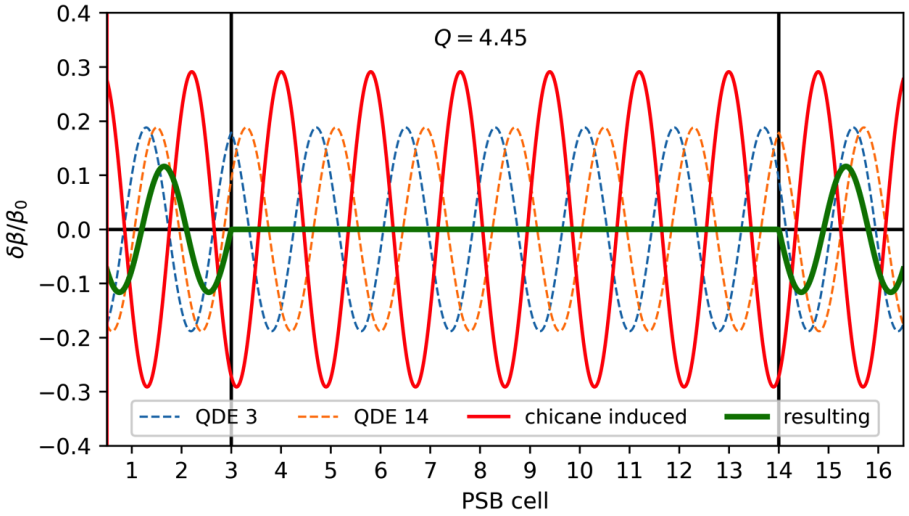
- **The baseline correction scheme is based on using QDE3 & QDE14**
  - **Optimized for $Q_y > 4.5$**, which was the baseline for operation post LS2
- **Alternative option using QDE2 & QDE15**
  - **Advantages when operating with $Q_y < 4.5$**, as will be the case for some period after LS2 (maybe always?)
    - correction of beta-beating also (almost) corrects the tune at the same time

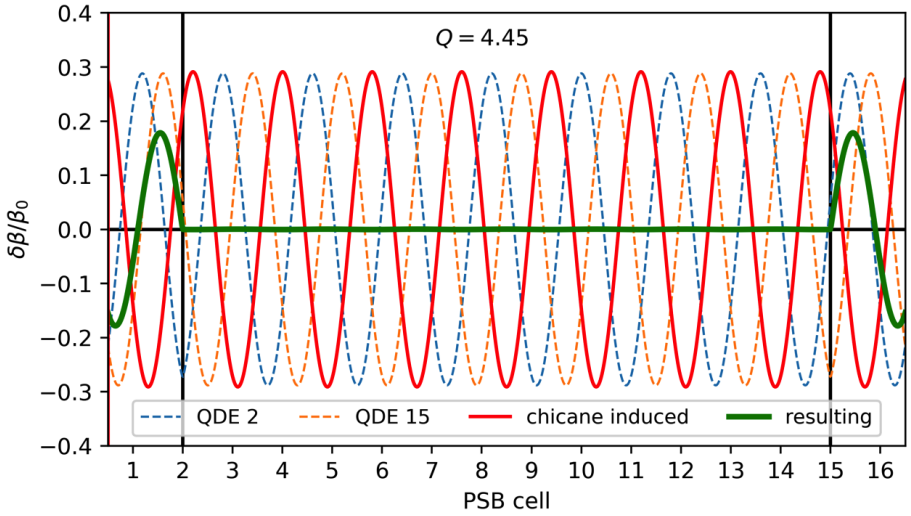




Induced beta waves

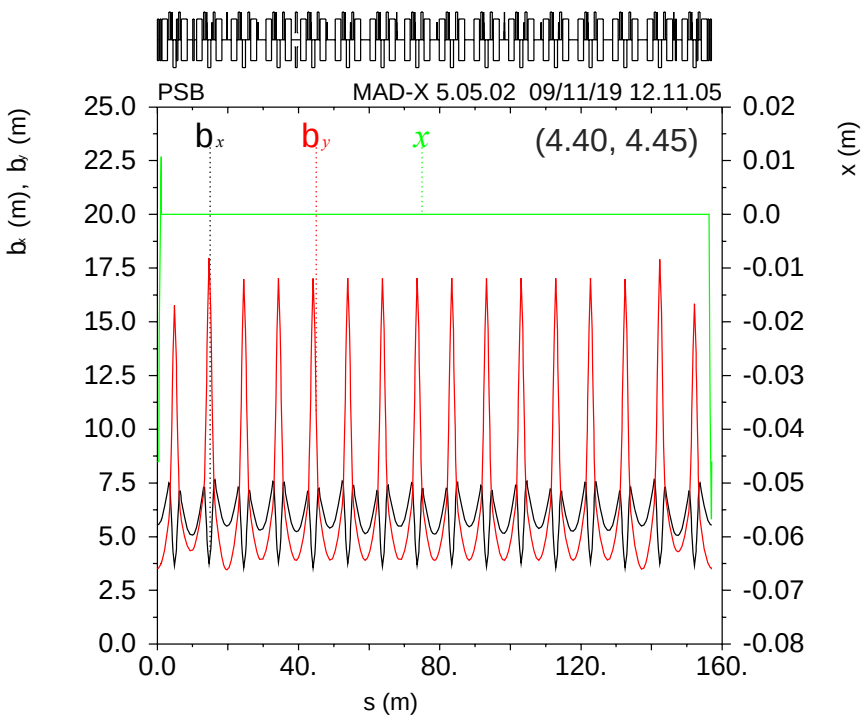
- **Injection chicane and individual QDE strips induce beta beating waves**
  - Final beta beating is the result of all contributions
  - Aim is to confine beta distortion around the injection chicane
- **At future "nominal" vertical tune of 4.45**
  - QDE3 induces change of beta function at QDE3 and QDE14 (and vice versa)
  - QDE2 practically does not affect beta function at QDE14 (and vice versa), some advantage for beta beat correction in the machine



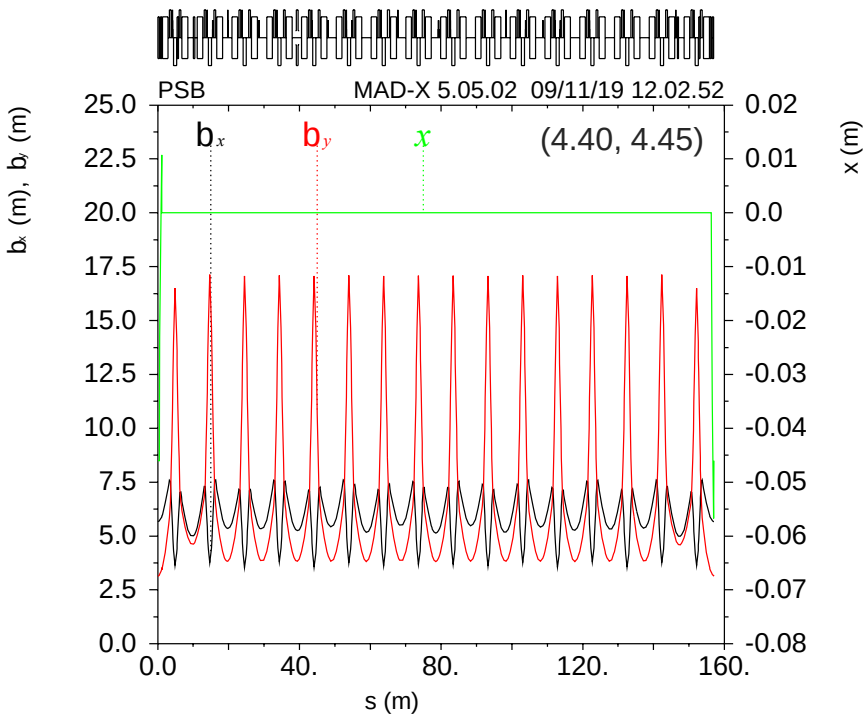


Comparison of achievable corrections

baseline scheme (QDE3 & QDE14)



option (QDE2 & QDE 15)



Summary and outlook

- **The two configurations have their advantages depending on the operational working point in the PSB**
  - Using QDE3-14 is probably better for working points Q_y>4.5
  - The newly proposed configuration of QDE2-15 probably be better for Q_y<4.5
  - **Comparison of the two schemes to be studies in space charge simulations**

- **Ideally we would like to have the possibility to switch between the two configurations (QDE3 & QDE14 ←→ QDE2 & QDE15) to maintain full flexibility depending on operational needs**
  - From discussion with EN-EPC and EN-EL it seems that installing a patch panel for "quick" change of configuration seems not feasible
  - The configuration can be changed in the tunnel by installing short additional cables – requires longer intervention with sufficient cool-down before the works and therefore can be done only before startup or during YETS → **need to decide until February which configuration to use after LS2**

Thank you for your attention