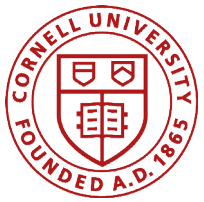

Cornell Laboratory for
Accelerator-Based Sciences
and Education (CLASSE)

Minimalist TTOSC Lattice with Matching Elements

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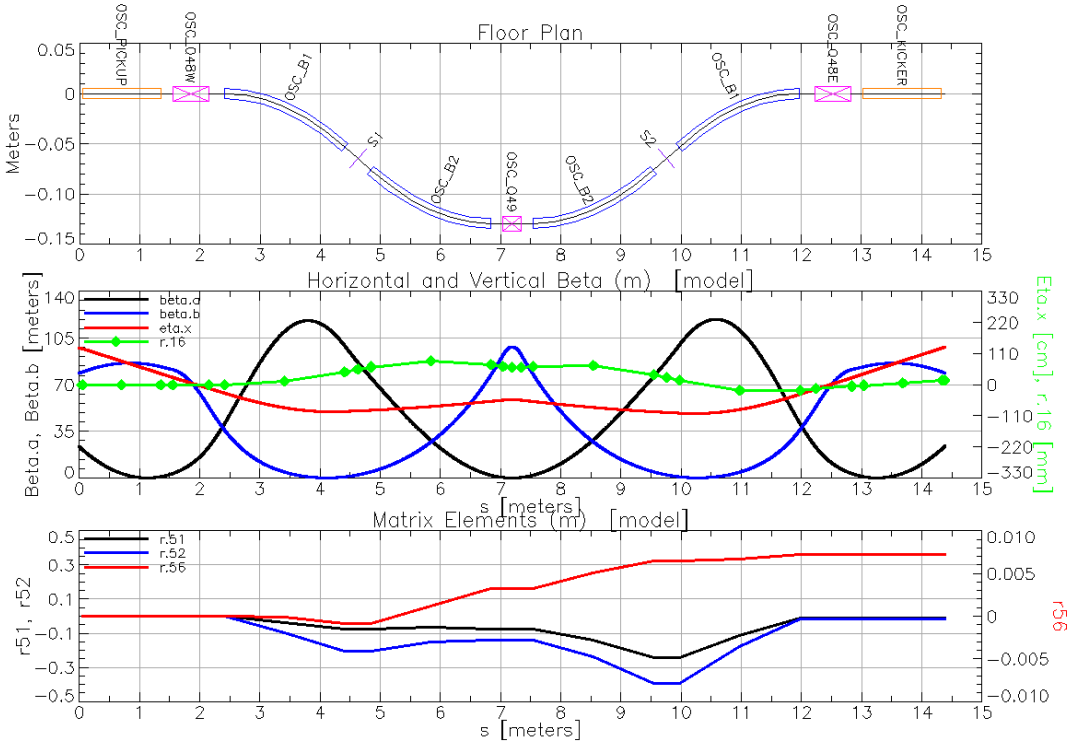
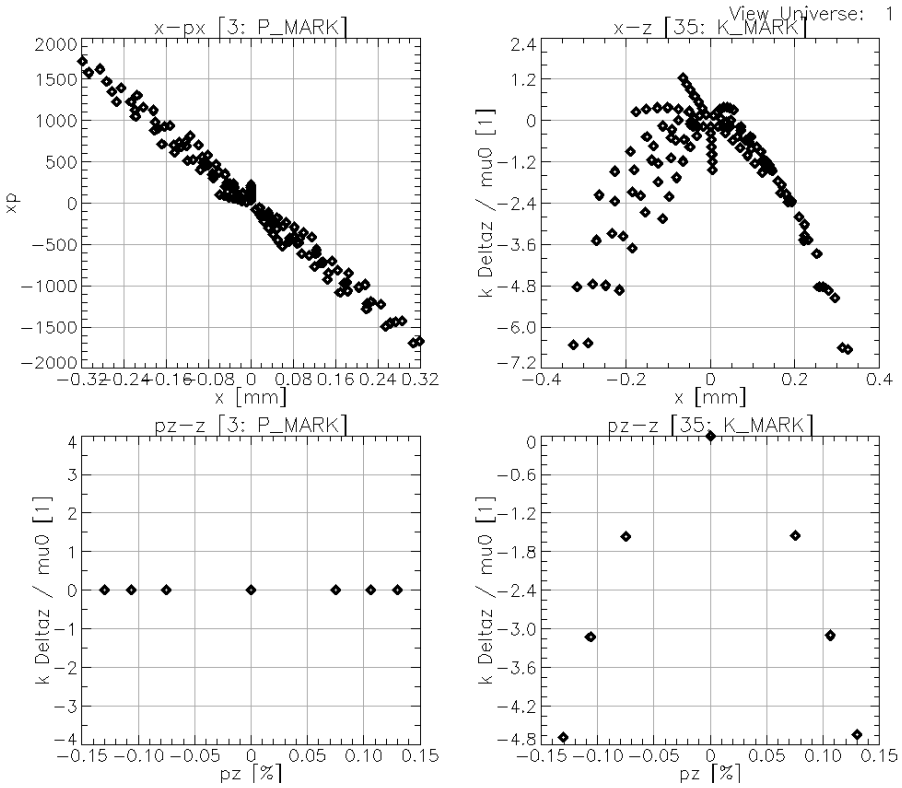
Introduction

- Last week we showed a 20 cm BQQBQBQQB bypass which looked OK but had unacceptable DA.

- Decision made to assemble an IOTA-like shallow (Δs = 5 mm) bypass in CESR, to allow for progress on overall TTOSC simulation development.

Layout & Optics w/o K_2

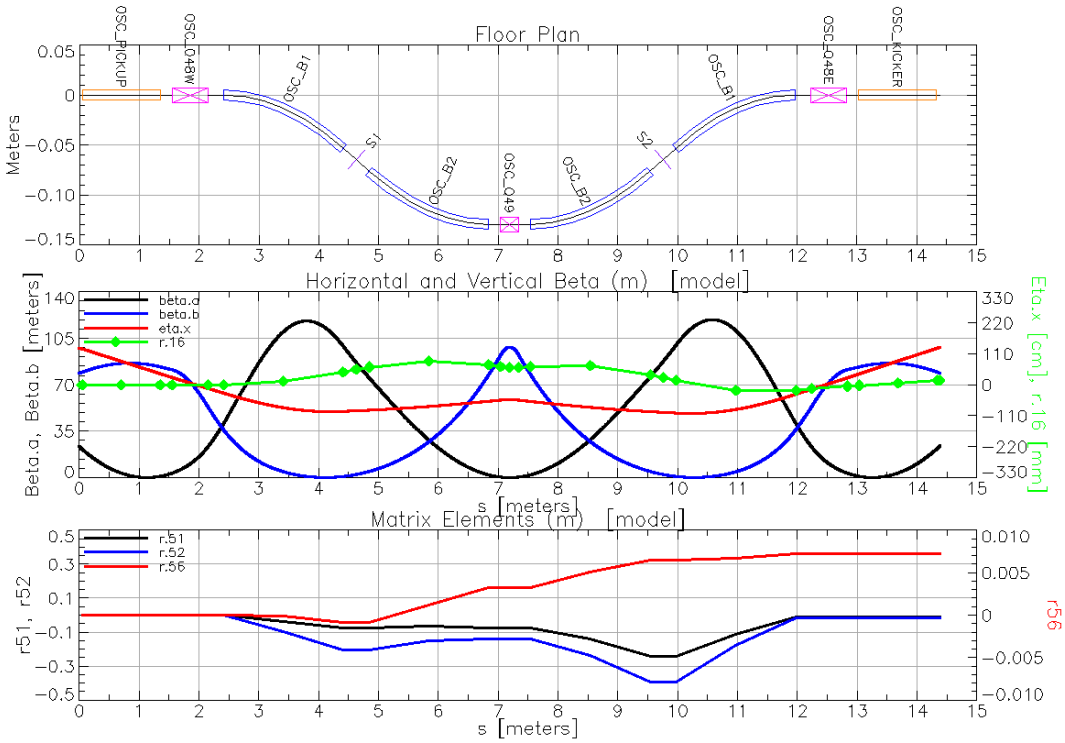


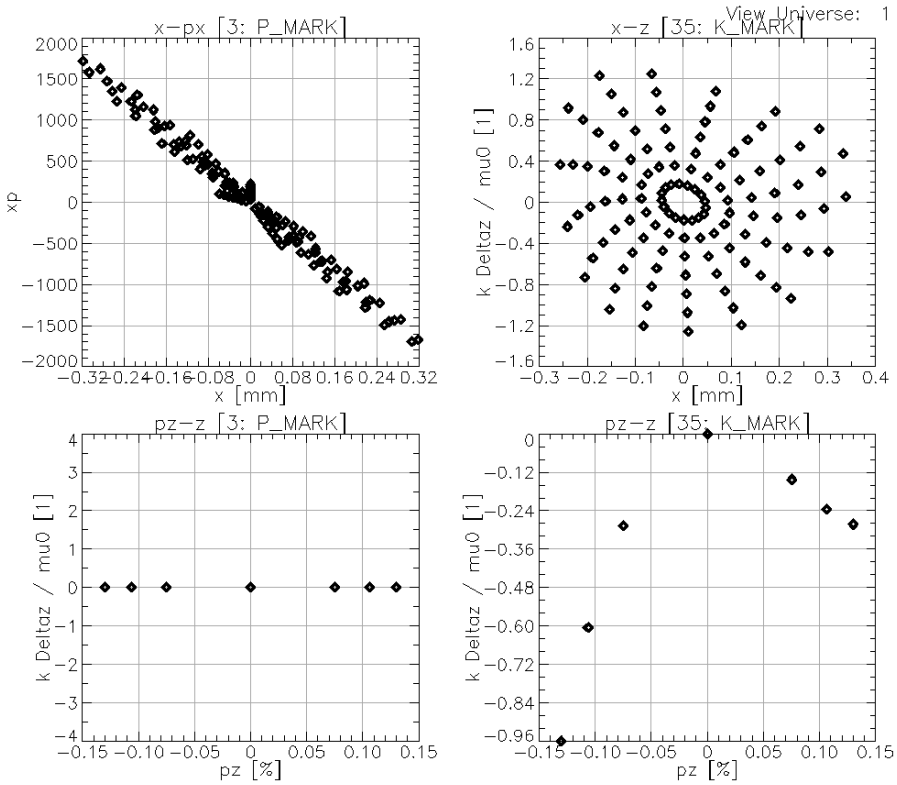


- $\tilde{\tilde{J}} = 9.7\ 10^{-6}$ ($\varepsilon_{max} = 15$ nm)
- $\tilde{\tilde{M}}_{56} = 9.4\ 10^{-6}$ ($\delta_p = 4\%$)
- $M_{56} = 7.3\ 10^{-3}$

Q49[k1] = -2.7 m^{-1}
B1[k1] = -0.459 m^{-1}
B2[k1] = 0.11 m^{-1}
Q48[k1] = -0.87 m^{-1}

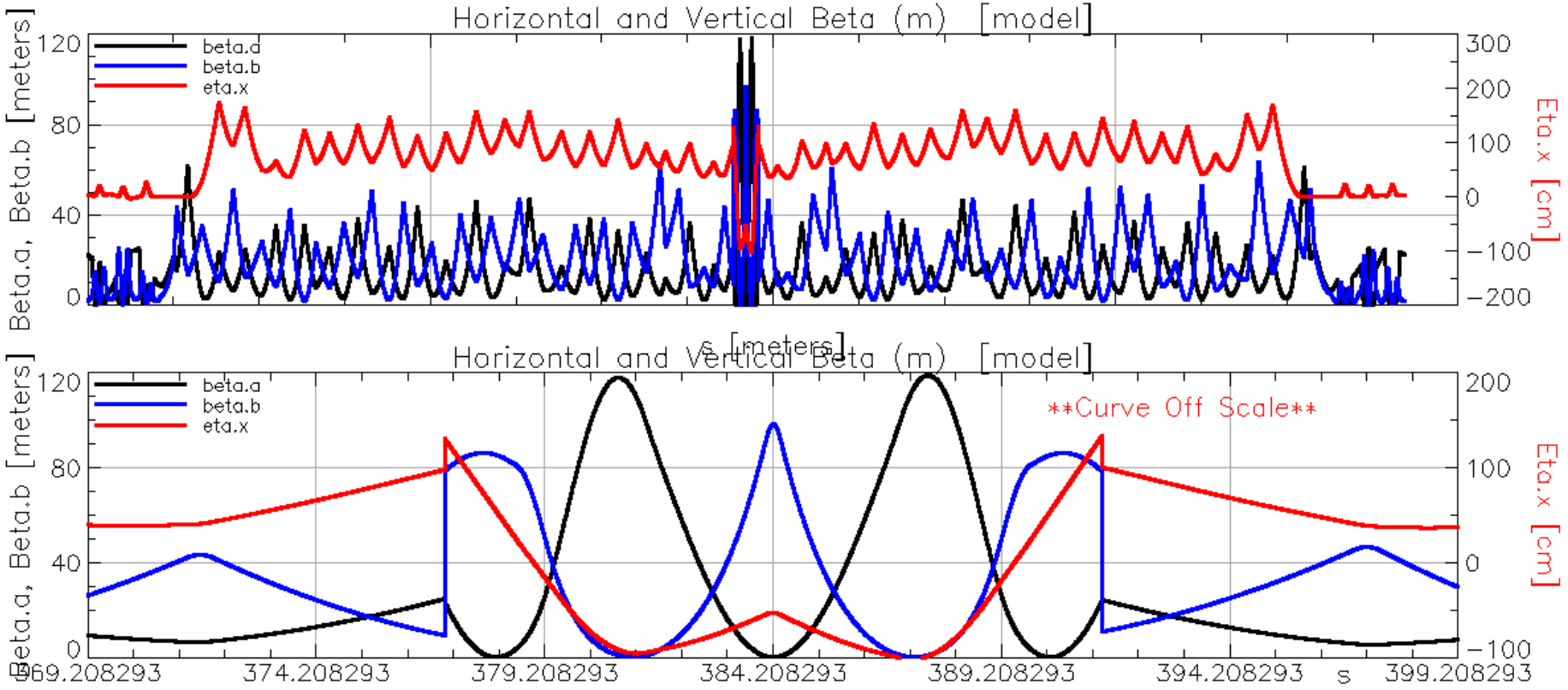
With Sextupoles





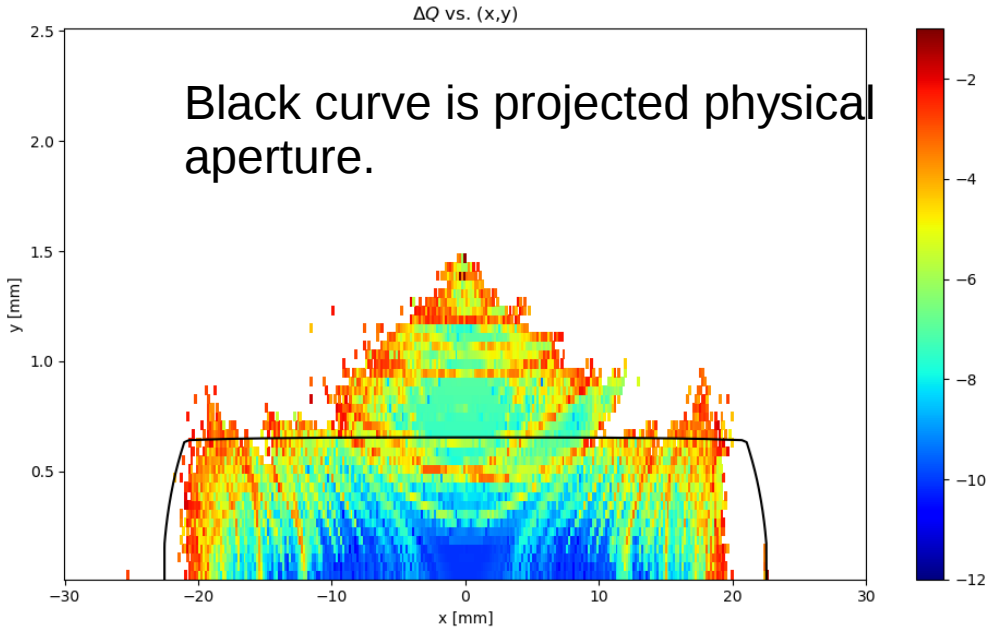
- One pair of sextupoles with same strength separated by Δυ~π cancels RDT contribution.
- S1[k2l] = S2[k2l] = 28 m^{-2}
- Monte Carlo: 60% of bunch in damping envelope.

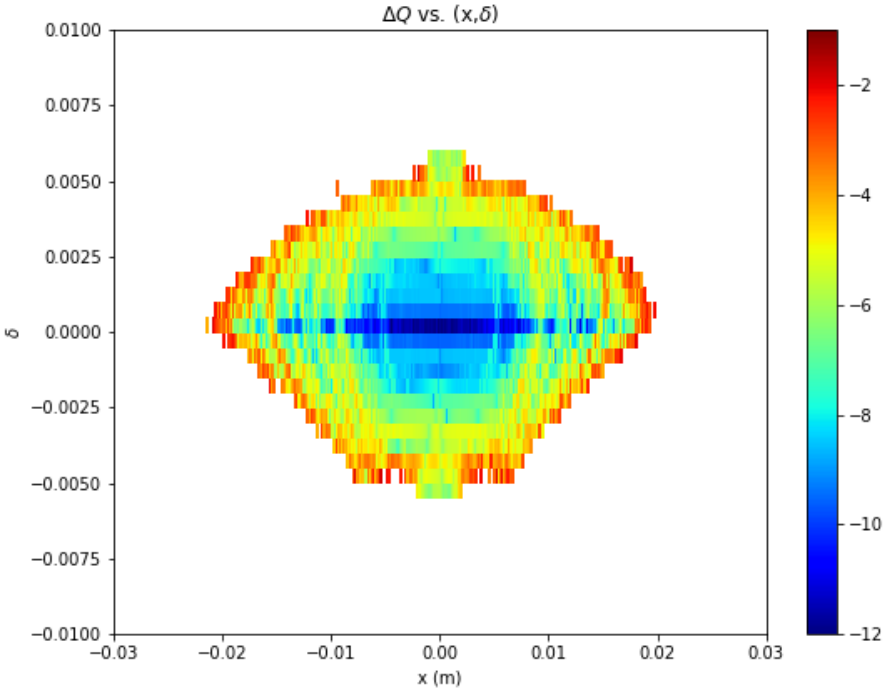
Ring Properties



- Matching with match elements
  - Bottom plot discontinuity shows the problem.
- Problem: Huge emittance production in bypass.
  - Minimizing curly-H, along with TTOSC parameters difficult with so few variables.
- $\varepsilon_{x,\text{chessu},500\ \text{MeV}} = 0.014$ pm
- $\varepsilon_{x,\text{chessu-OSC},500\ \text{MeV}} = 95$ nm

Dynamic Aperture





- This result from different bypass, but with similar sextupole properties. Expect similar result for the current bypass.
- εx = 5 nm => σx1 = 0.3 mm
- εx = 5 nm => σy1 = 0.09 mm

Conclusions

- Minimalist bypass (similar to IOTA), but with 5 mm delay produced with good TTOSC properties.
- Difficult (impossible) to match into CESR without significantly impacting TTOSC properties.
  - Matched with match elements.
- Very large emittance generation in bypass bends.
- Nonetheless: If we ignore emittance generation in bends, this CHESS-u + OSC can be used to investigate OSC process.