



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

# CHESSUTTOSC, 5.3 mm delay, Match 1

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# Matching Techniques

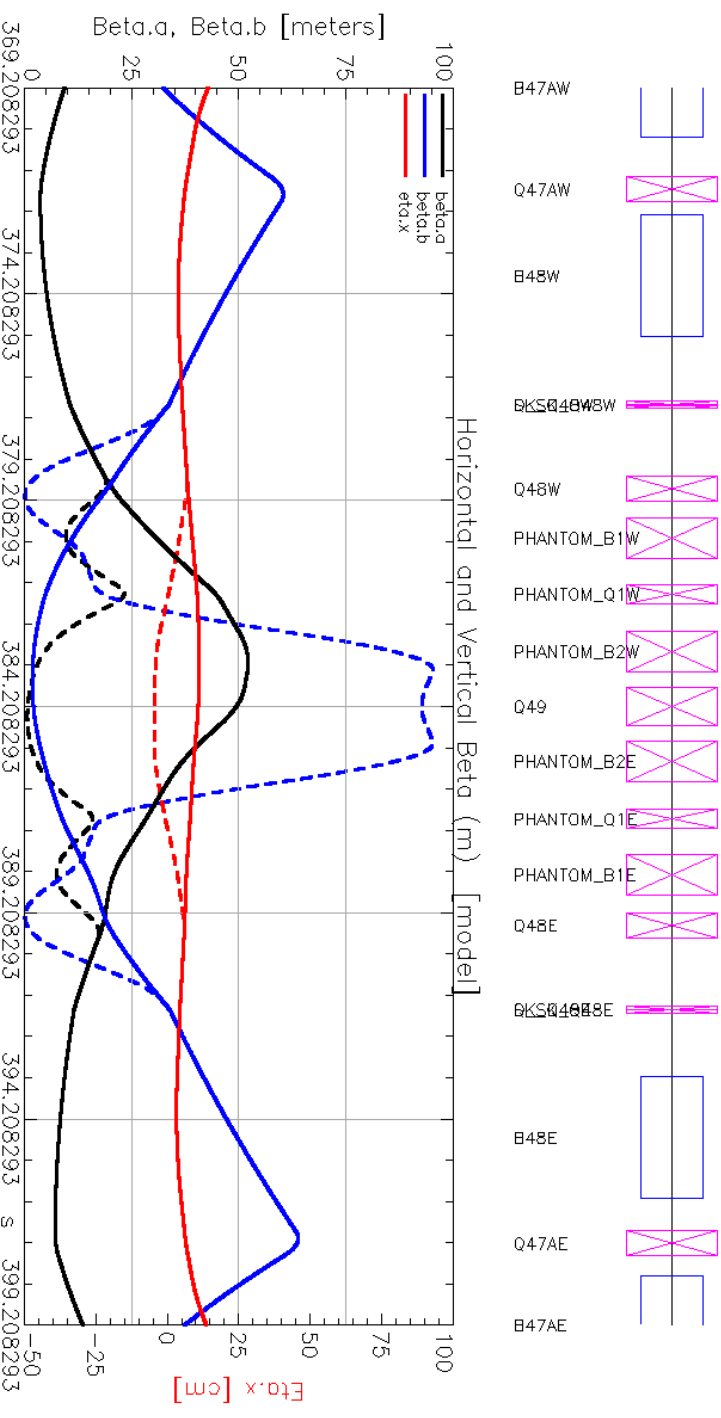
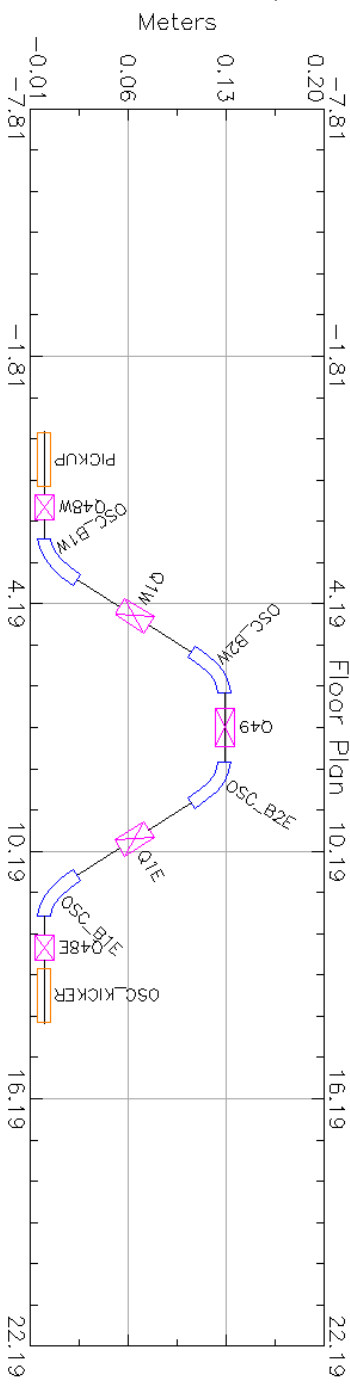
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- 1) “Throw it in and kneed the dough”
  - i. It is nice if this results in a stable lattice, initially.
  - ii. Replace old line with new line, hope for stability, then work towards good solution.
  - iii. Resulting ring may be substantially different from original ring.
- 2) Convert ring into linac, optimize beginning and end Twiss parameters.
  - i. Requires restructuring of lattice files and optics program.
  - ii. Ring parameters lost, requires interpretation of emittance, compaction, etc.



# Phantom elements for matching

- Difficulty matching CESR to bypass was lack of flexibility between Q48E and Q48W, not in the remainder of the ring.
- Solution:
  - Superimpose many, initially  $K_2=0$ , quads Between Q48E and Q48W.
  - Use optimizer to obtain desired optics a cleavage locations.
- Also: OSC is optimized simultaneously with CESR.
  - Accommodates CESR's slight asymmetry.

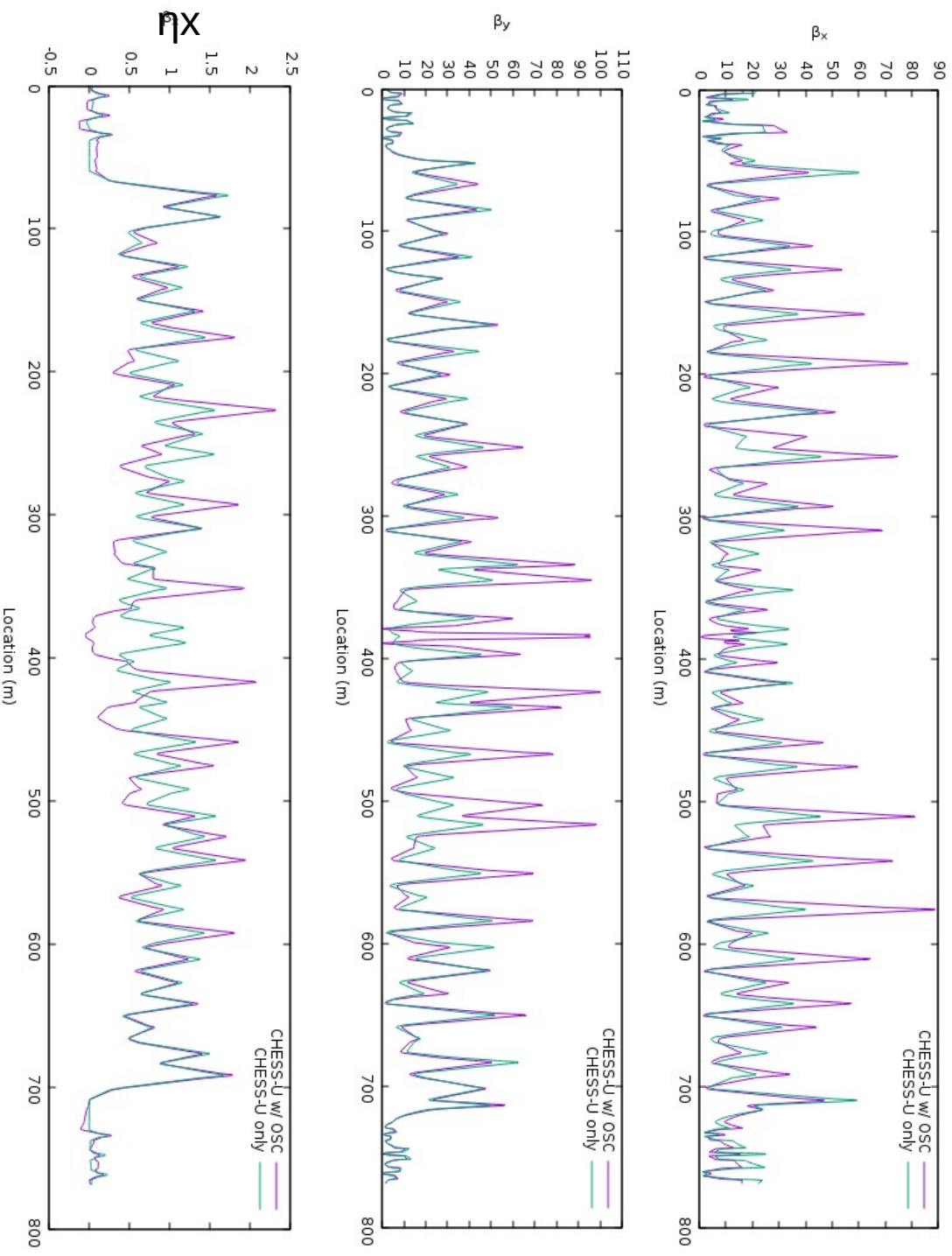




# Modifications to CESR

- 500 MeV
- Employ SK\_Q48W and SK\_Q48E as ordinary quadrupoles.
  - Good matching required focusing before OSC undulators.
- Shift SK\_Q48E 30 cm away from Q49.
  - Kicker undulator had been overlapping Q49.

	without OSC	with OSC
$\epsilon_x$ (pm)	14.1	139.2
$\sigma_p$	$3.3 \cdot 10^{-4}$	$2.9 \cdot 10^{-4}$
$Q_x$	16.623	16.162
$Q_y$	14.095	13.175





# Features of Bypass

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- $\pi$ -phase advance from pickup middle to kicker middle
- 5.3 mm path length  $\Delta$
- 12.9 cm depth
- 2.6834° bends
- Removed strict symmetry requirements. Bypass is “CESR symmetric”.

	Matched Bypass	Free-standing sym Bypass
$\tilde{J}$	$9.8 \cdot 10^{-4}$	$2.1 \cdot 10^{-4}$
$\tilde{M}_{56}$	$7.2 \cdot 10^{-3}$	$5.5 \cdot 10^{-6}$

Could be an issue. Still investigating.



# Variables

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- Element positions
- Consumable space in L3
- Rad-int emittance
  - Requires further IBS studies.
  - Some discussion of coupling schemes.
- Peak Beta in bypass
- Tunes
- Optimize for IBS Growth
  - IBS: Make dispersion small where beam is small.
  - SR: Make dispersion small in bends.