

# P42 Lattice Update

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# Introduction

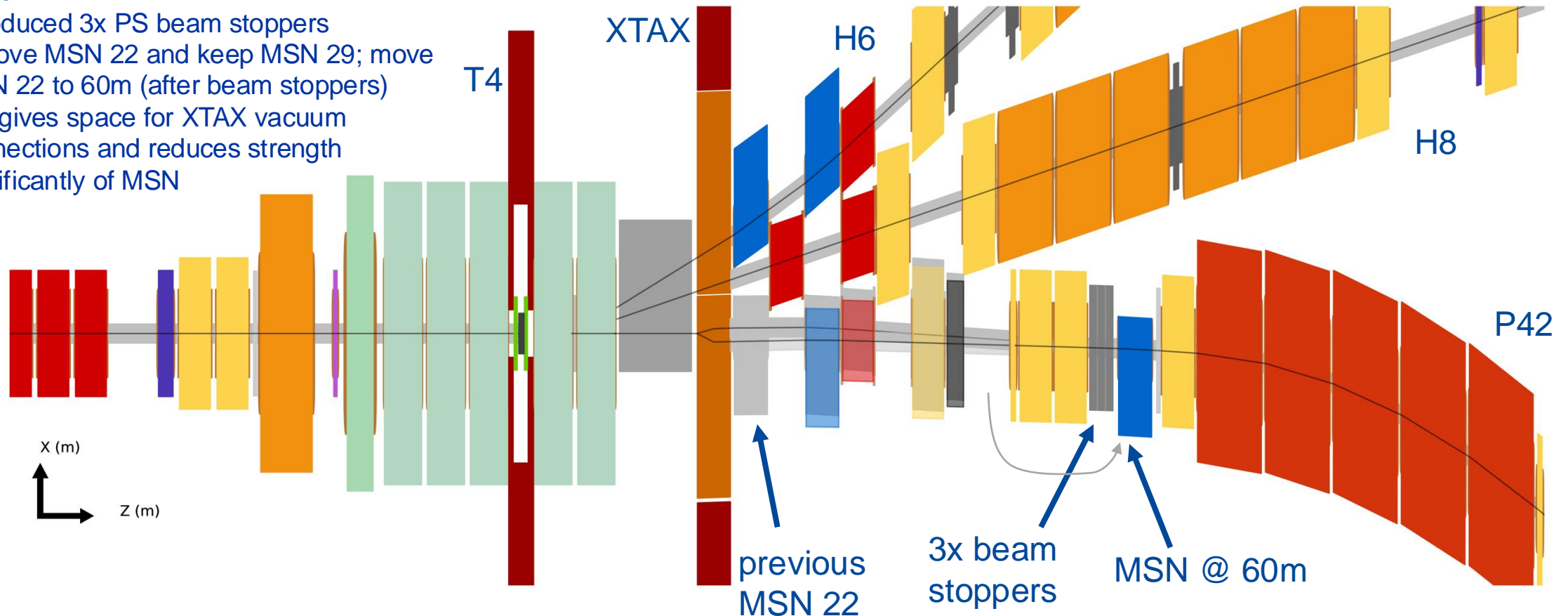
- P4 Updates to sequence in TCC2
- Correction of final angle in TCC8
- FODO transport
- Final focus (inc. shift of quads under bridge)
- Next Steps
- Comment on fire / sector door position

# Updates To P4 in TCC2

- Reminder: beam shifted to Salève side coming out of P4 XTAX now
  - move 1x MSN downstream to get back on track before tilted MBNs (bend4 & 5) inside TCC2

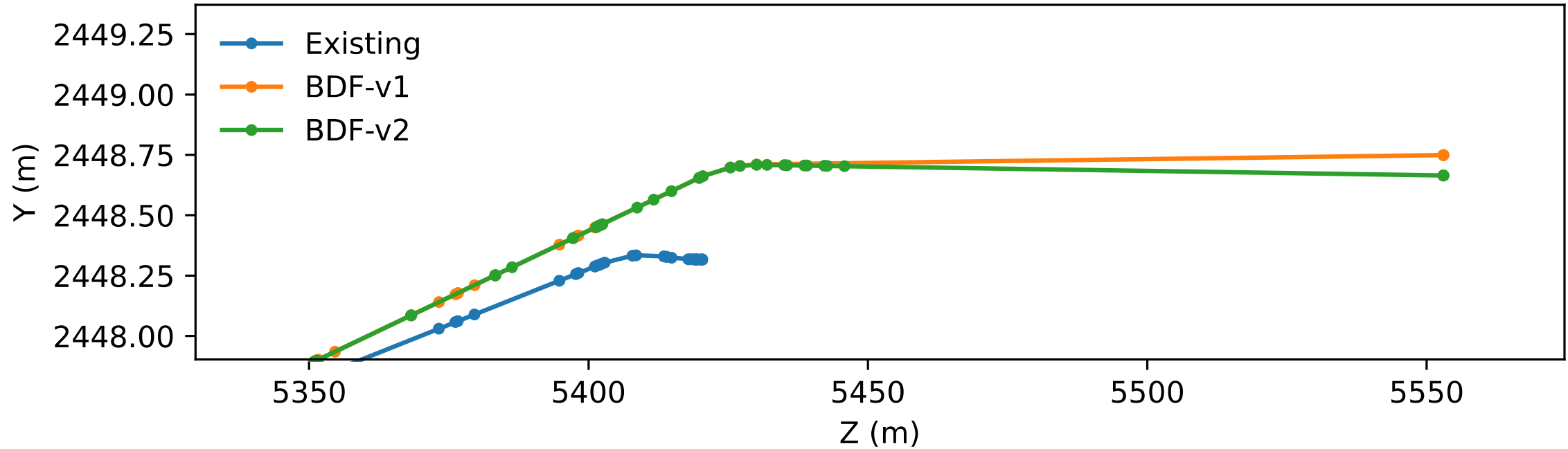
Changes:

- introduced 3x PS beam stoppers
- remove MSN 22 and keep MSN 29; move MSN 22 to 60m (after beam stoppers)
- this gives space for XTAX vacuum connections and reduces strength significantly of MSN



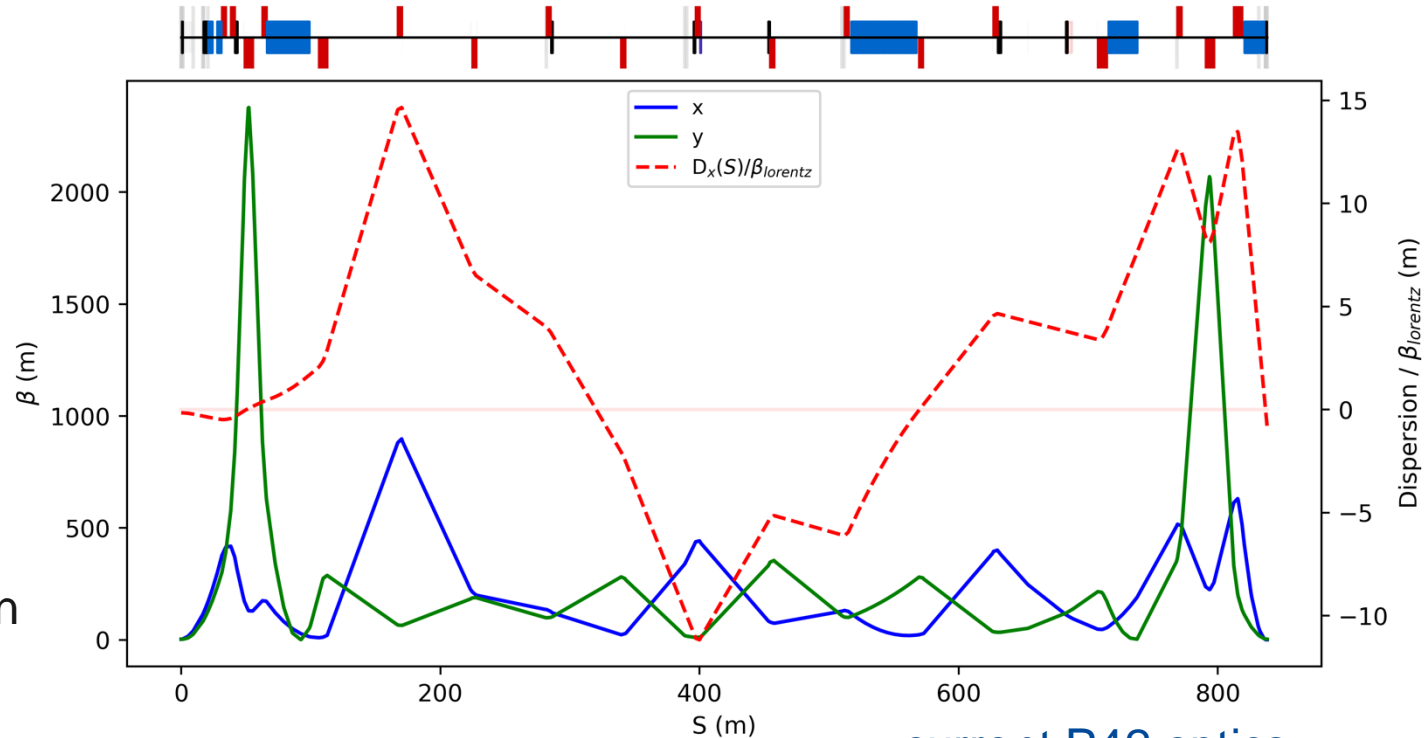
# TCC8 Final Angle Correction

- Adjusted final vertical bend to give zero angle (in CERN coordinate frame)
  - 0.3 mrad simple change



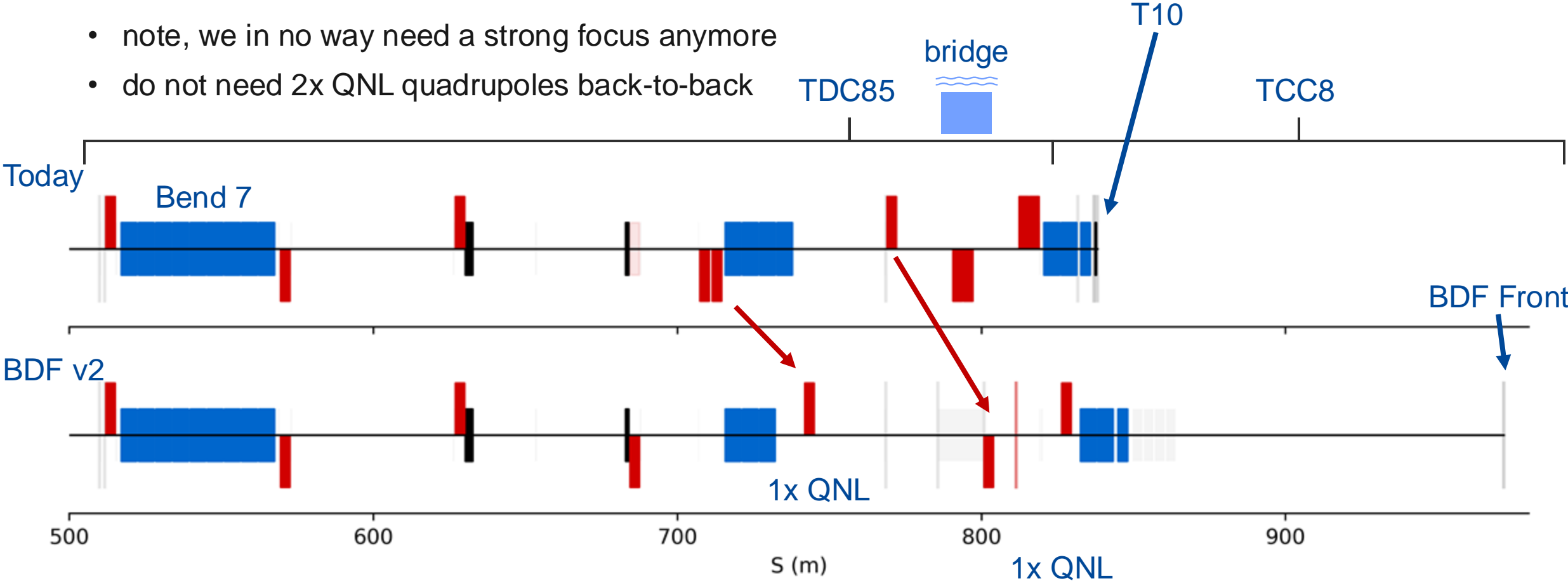
# Existing P42 / BDF Design

- Points that need revision:
  - shift longitudinally for quads under bridge
    - QNL.X0450792, QNL.X0450795
  - remove unnecessary magnets
  - rematch final focus
- Points to investigate:
  - can we better match into the FODO section
  - can we reduce dispersion overall
    - although note, power converters will ramp after LS3 across spill
    - relevant fractional momentum spread goes from  $\pm 1.5 \times 10^{-3} \rightarrow \pm 1 \times 10^{-4}$
  - can we reduce the peak  $\beta$  at  $\sim 70$  m after T4



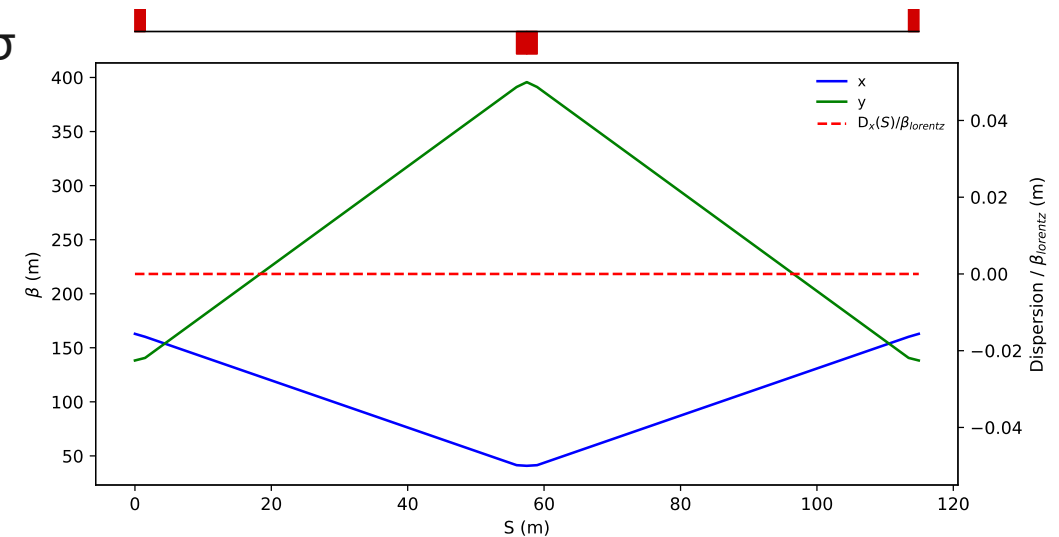
# FODO Rematching

- Propose to rearrange last few quadrupoles to better comply with existing regularly spaced FODO cells in P42
  - note, we in no way need a strong focus anymore
  - do not need 2x QNL quadrupoles back-to-back



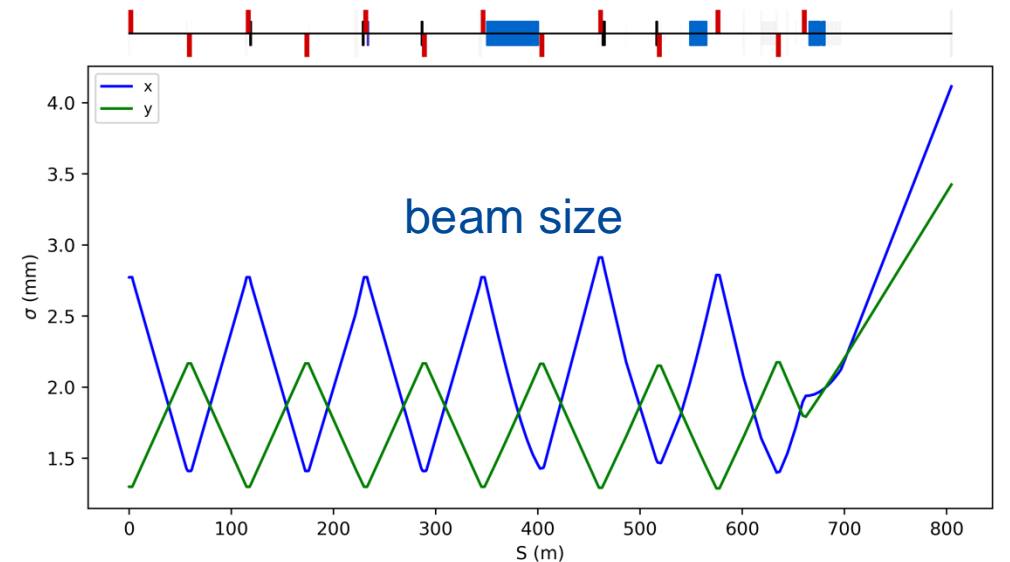
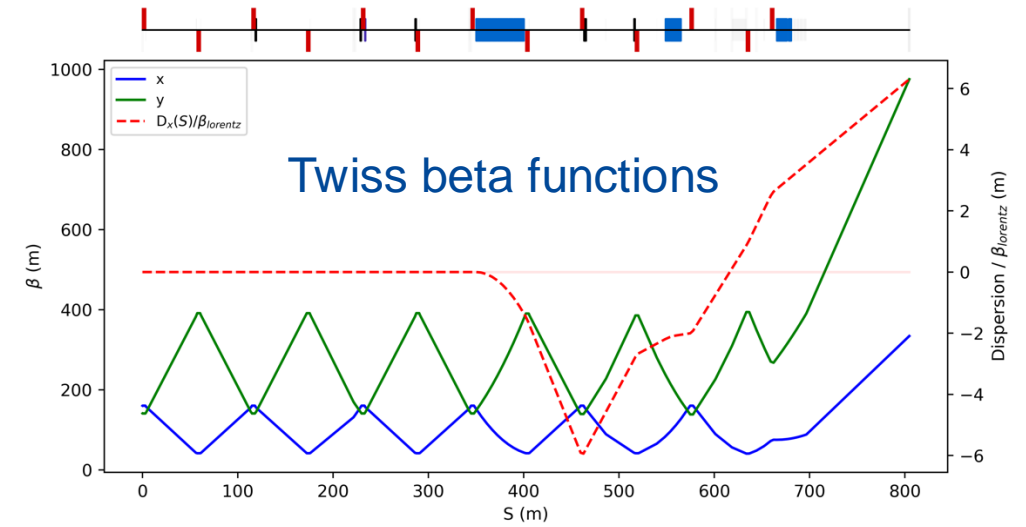
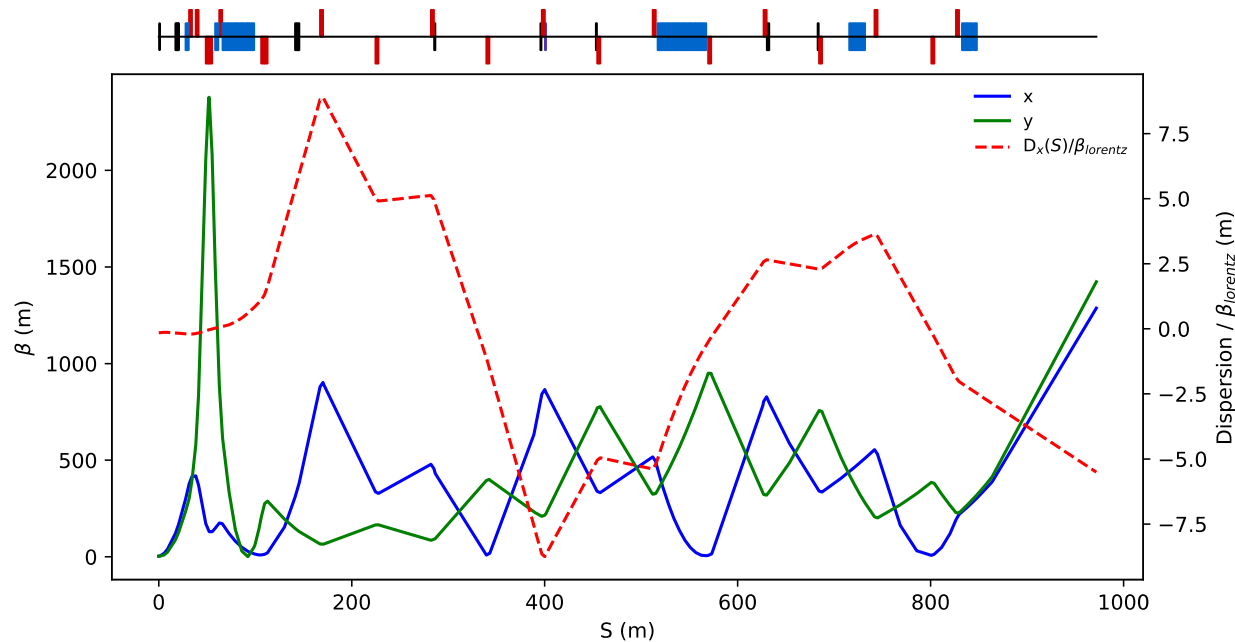
# FODO Rematching II

- Investigated different phase advance to minimise beam size in both dimensions
  - optimal  $90^\circ$  for symmetric betas or  $\sim 76^\circ$  considering only one plane
  - currently close to  $76^\circ$  but it is a fairly flat optimum
- Typical aperture (inside) is  $\sim 38$  mm radius at QNL quadrupoles (diamond shape)
- Emittances given  $\epsilon_x = 4.75 \times 10^{-8}$ ,  $\epsilon_y = 1.186 \times 10^{-8}$  m·rad (thanks Alex) for dedicated beam
  - implies a limit in beta of  $\sim 300$  m to respect aperture at  $10 \sigma$
- Chose  $72^\circ$  and slightly asymmetric beta functions to give a more circular beam



# Current Status of P42 BDF v2

- FODO chosen and marginally different from today's operation settings
- Settings of final focus nearly there
- Match upstream being (quickly) investigated



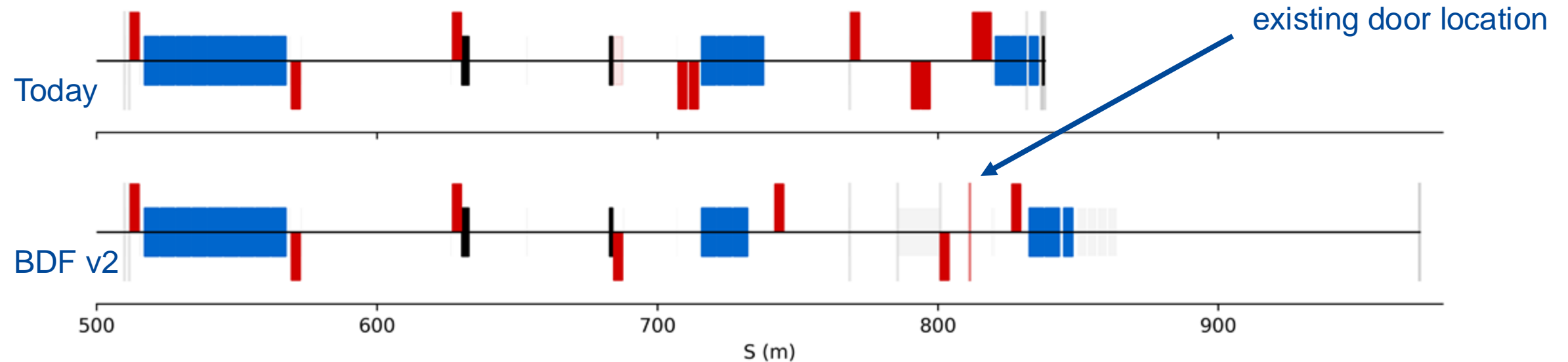


# Next (Quick) Steps

- Finalising whether doublet or triplet is needed at the end as well as match final values on target
  - check dispersion matching
- Check aperture of dilution system
  - check intermediate (soft) focus of beam there to reduce aperture constraint
- Rematch from T4 to start of FODO section in TT83
  - possibly shift QNL 108/111 by ~5 m
- Expect to circulate survey file next week

# Fire / Sector Door Location

- Exact position of quadrupoles will shortly be confirmed
- But this should not conflict with the proposal to move the fire / sector door
- A further shift of 0.5m to Jura of the BDF line would cause a 0.41m shift of the hole in the fire door at the existing position.
  - It would imply the need for an extra MBN at ~720m





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