Hybrid Synchrotron Lattice Design

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MAP Friday Meeting

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Outline

- Basic design outline
- First-pass lattice design (Garren)
- Lattice design studies (Berg)
- Next steps

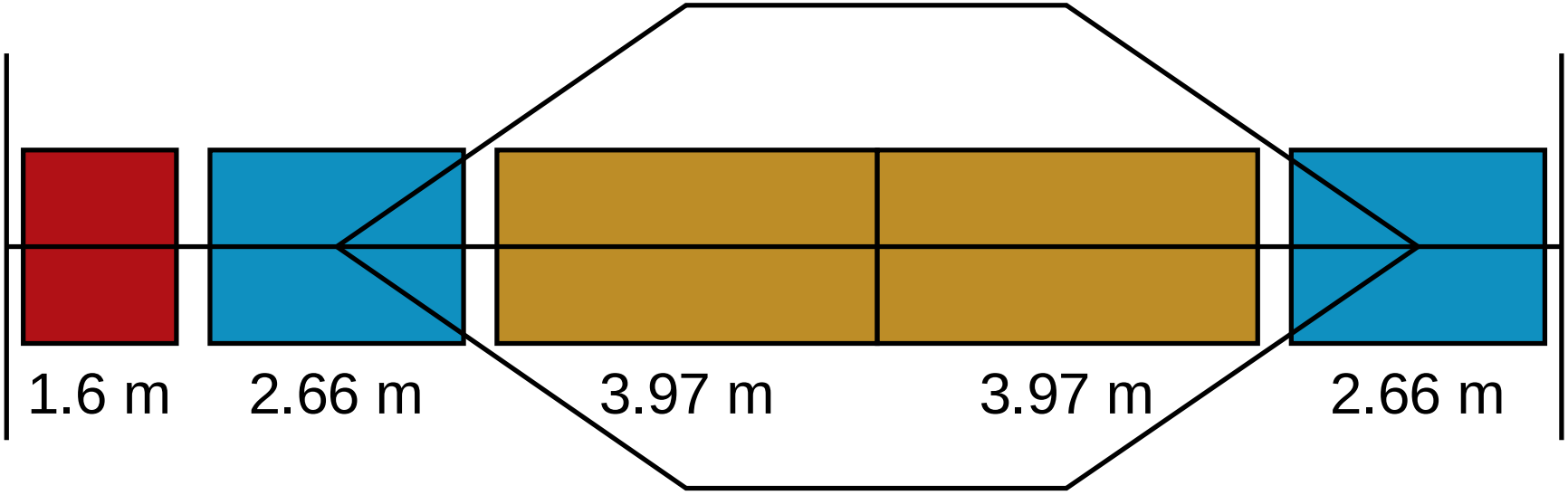
Lattice Design Parameters

- Discussed at April MAP acceleration meeting
- Accelerate from 375 GeV/*c* to 750 GeV/*c*
- FODO lattice cell structure
- 8 superperiods, 3-cell straight sections
- Suppress closed orbit shift and dispersion in straights
- Chromaticity correction
- 8 T cold, 1.8 T warm dipole, 1.3 T warm quad

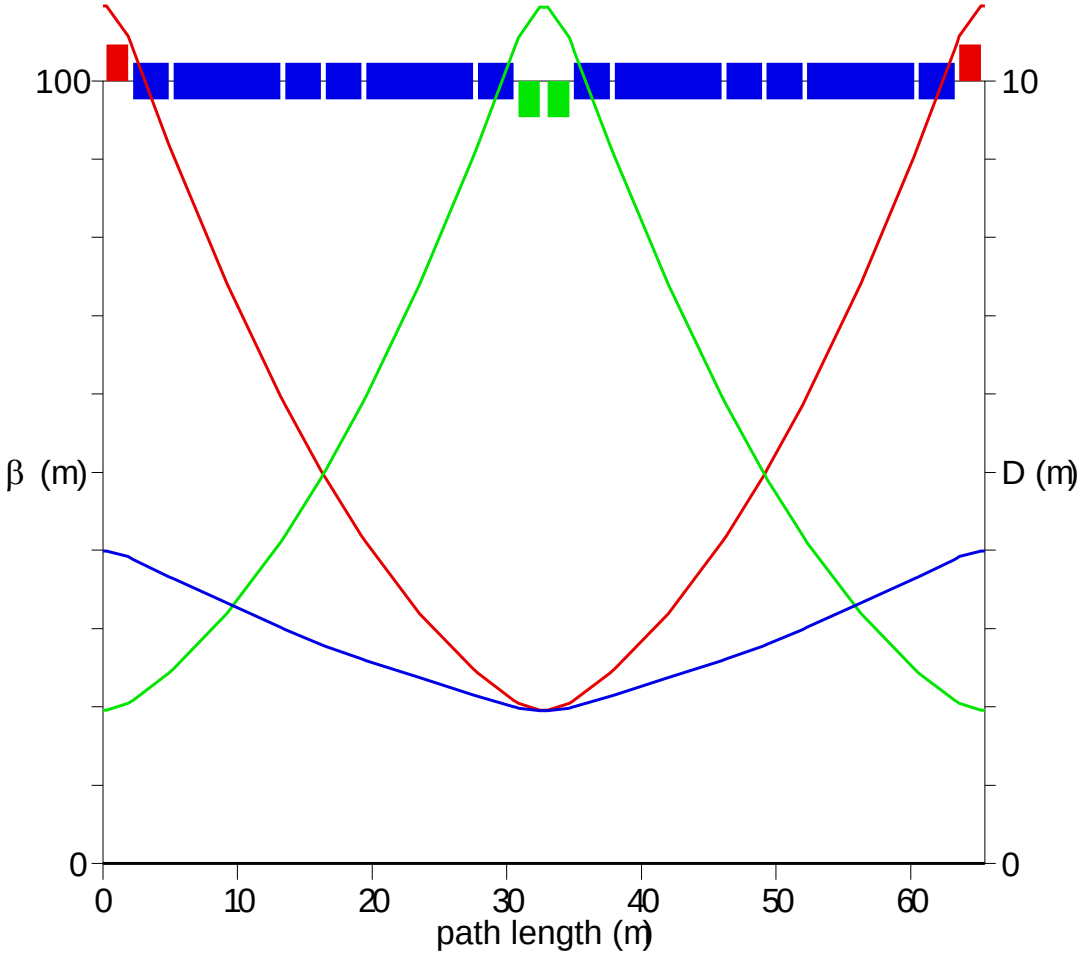
First-Pass Design (Garren)

- 13-cell superperiod: 6 arc cells, 3 straight, 4 dispersion suppression
- 90° phase advance per cell
- 6288 m circumference
- Arc and straight cells same length, dispersion suppression cells shorter
- 5 dipoles per half-cell: CWCWC

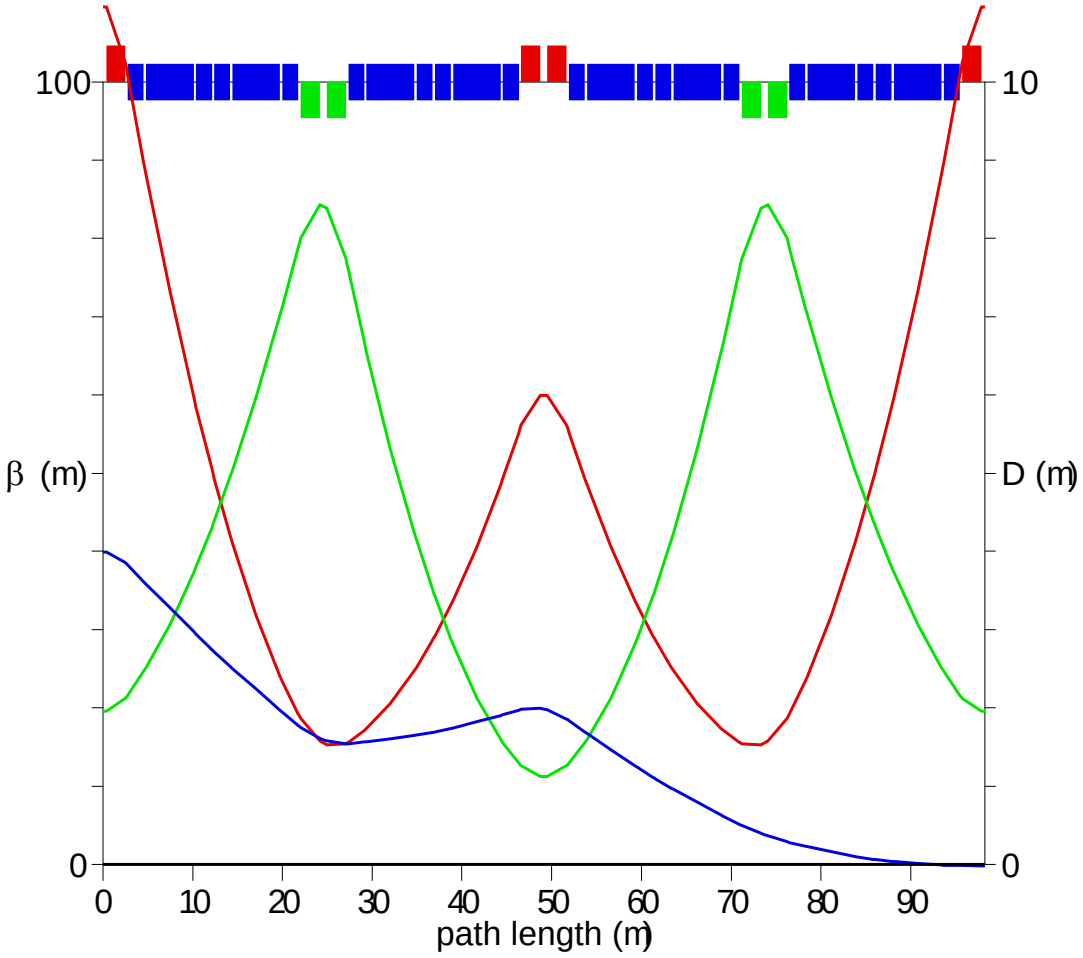
Closed Orbit in Quarter Cell



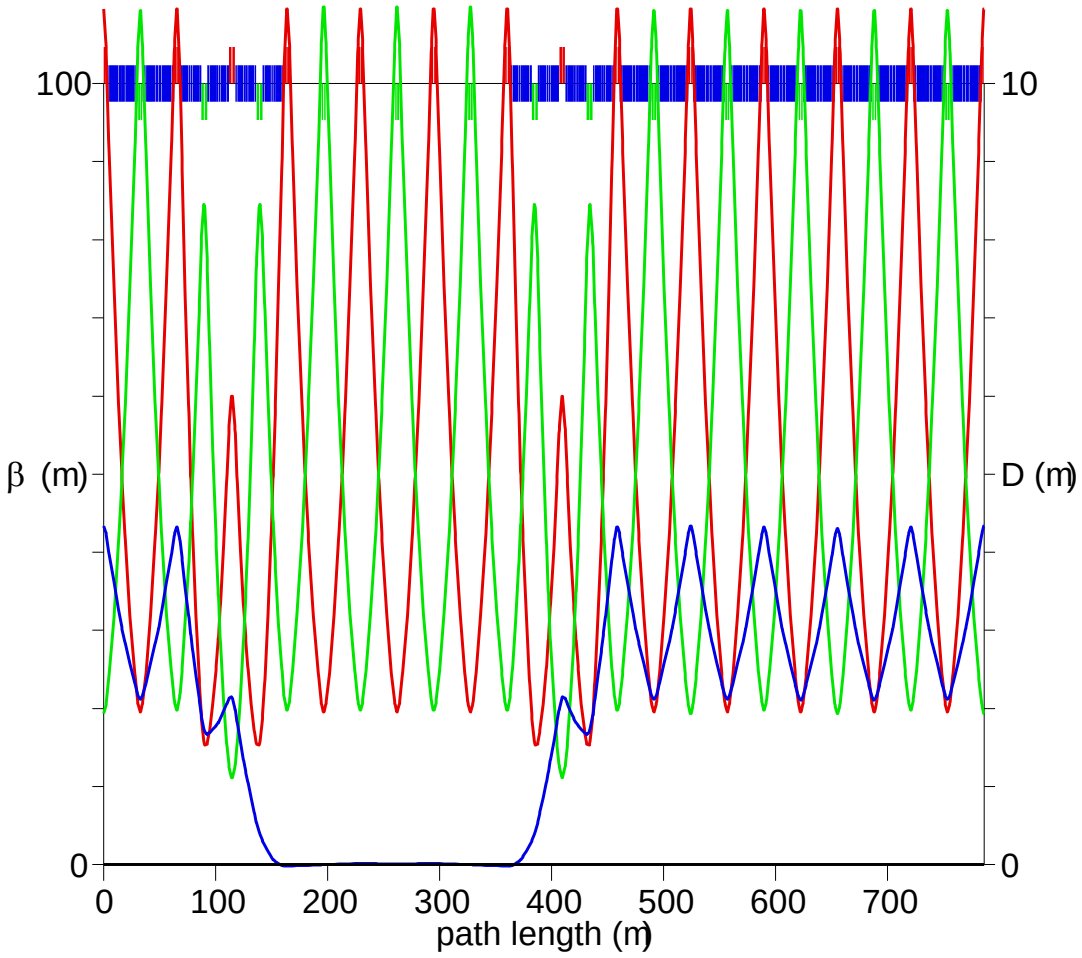
Arc Cell Lattice Functions



Dispersion Suppressor



Full Superperiod



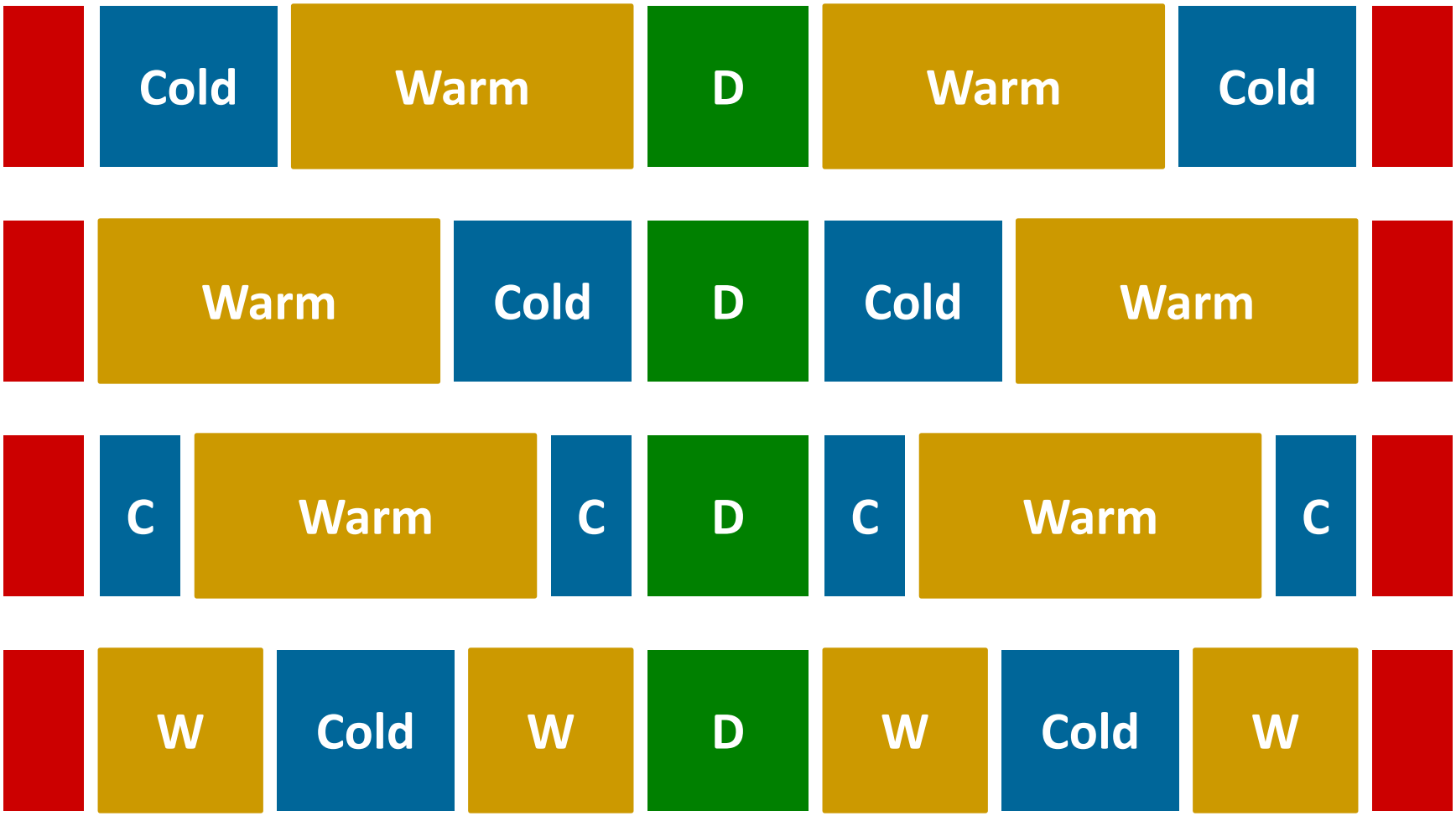
Missing Pieces, Next Steps

- Design has time of flight variation with energy
  - Add chicanes to correct, or
  - Allow motion in quadrupoles to correct
- Add chromaticity correction
- Ring tune is an integer: decide how to tune phase advance
- Check closed orbit, time of flight
- MAP note on this design almost finished

Optimal Hybrid Lattice Structure

- Study dipole arrangements in arc cells
  - Number of dipoles per half cells
  - Arrangement of warm and cold dipoles
- Arc cell corrects time of flight variation
- First studies with two dipoles per half cell
  - Not optimal, but progressing from few to more

Different Dipole Arrangements



Status and Next Steps

- Warm near F preferred
  - Beam swings more near ramped warm magnet
  - F bends more when beam moves out
- Orbit excursions too large with only 2 dipoles
- Moving on to add more dipoles
  - Quit when more dipoles per half cell gives no discernable benefit