Hybrid Synchrotron Arc: 2 Dipoles per Half Cell, Warm at F

J. Scott Berg

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Basic Arc Cell: Dipole Arrangement

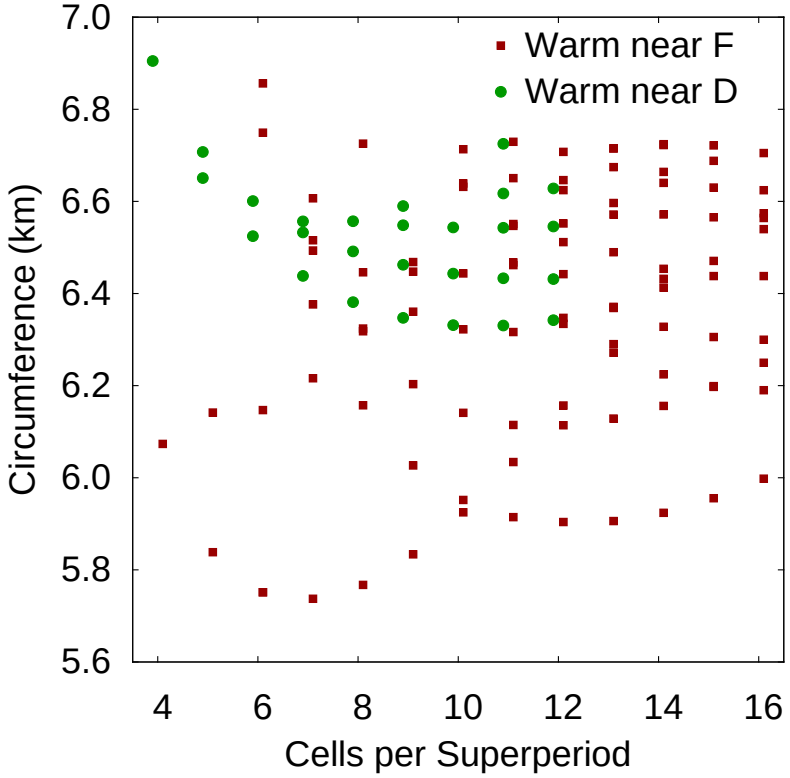
Optimization Process

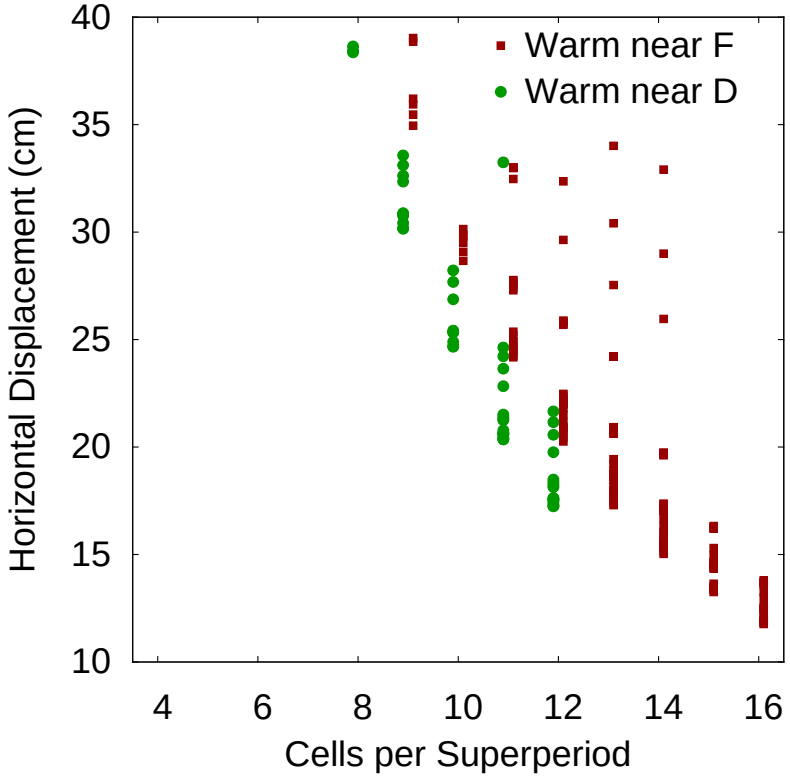
- Find closed orbit at 375 GeV with warm dipoles at −1.8 T, 750 GeV with warm dioples at +1.8 T
- Set tunes to desired values, times of flight equal using quad fields and warm dipole length
- Minimize excursion with cold dipole length
- Adjust quadrupole lengths so pole tip fields low enough

Results and Analysis

- Warm near F overall better than warm near D
  - Larger excursion for given number of cells, but
  - Lower circumference for given number of cells
  - Lower excursion for given circumference
- Warm near F: F is combined-function bend
  - D acts in wrong direction with warm near D

Comparison: Warm near D or F





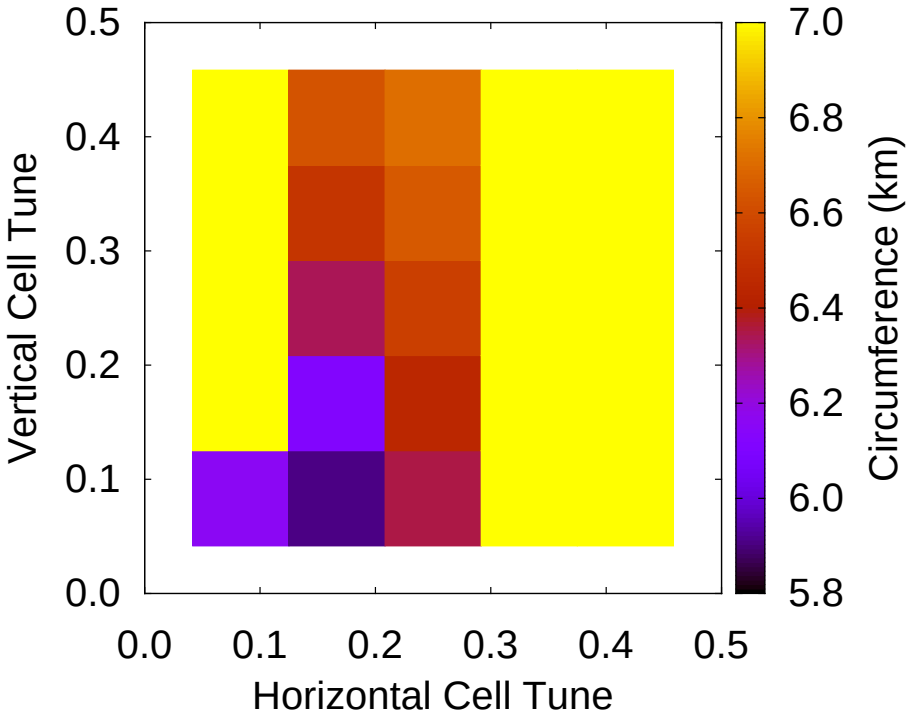
Results and Analysis

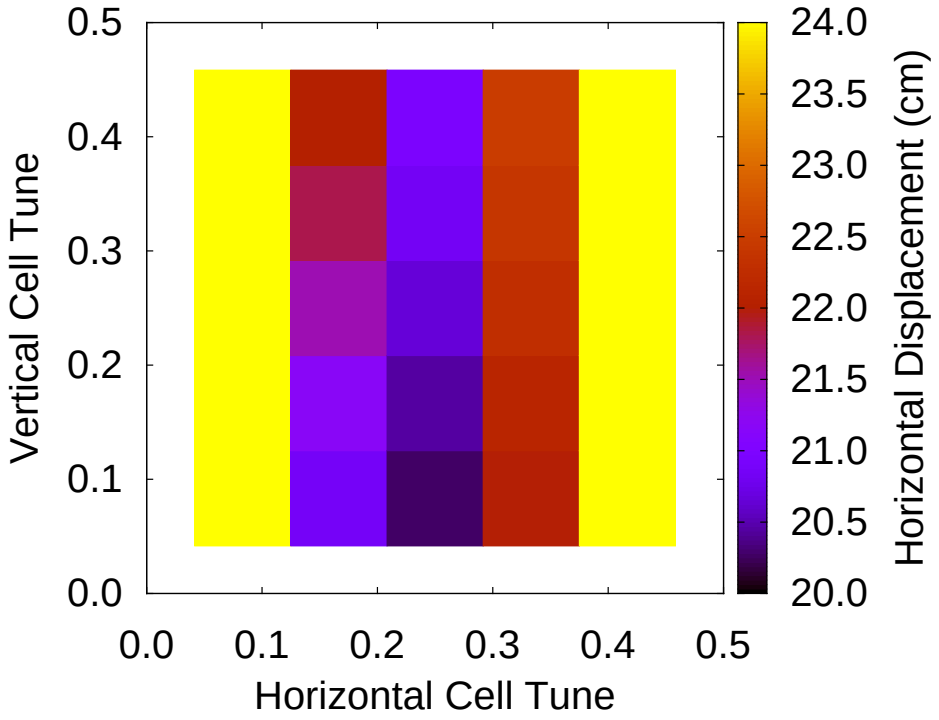
- Tune range for optimal circumference different for low and high number of cells
  - Low number of cells: lowest tune, both planes
  - Higher number of cells: second lowest tune horizontal, lowest vertical
  - Low tune: less quad length to get focusing
    - Higher tunes help keep excursion down
- Similar behavior for warm near D, but doesn't appear in our range

Results and Analysis

- Optimal tunes: low vertical helps everything
- Displacement likes horizontal tune near 0.25
- Circumference likes horizontal tune just below 0.25
- Probably prefer horizontal tune just below 0.25: small penalty to displacement

Warm Near F: Tune Dependence

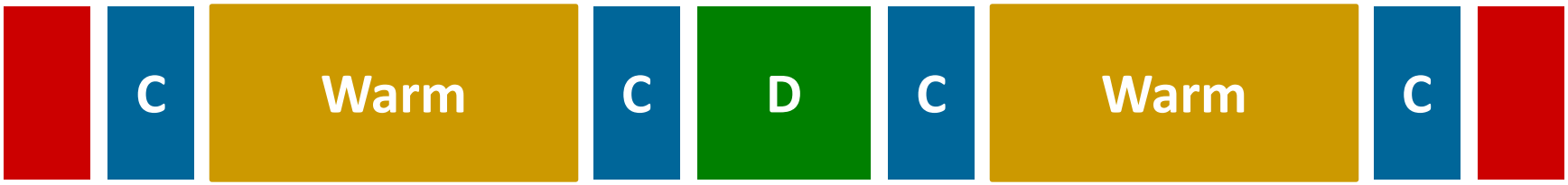




Conclusions, Next Steps

- 2 dipoles per cell, warm near F best arrangement
- Displacements still high, but haven't found minimum
- Next step is to try three dipoles per cell, looking at two possible arrangements
  - Expect warm in center reduces excursion in quadrupoles

Arrangement of Dipoles



vs.