

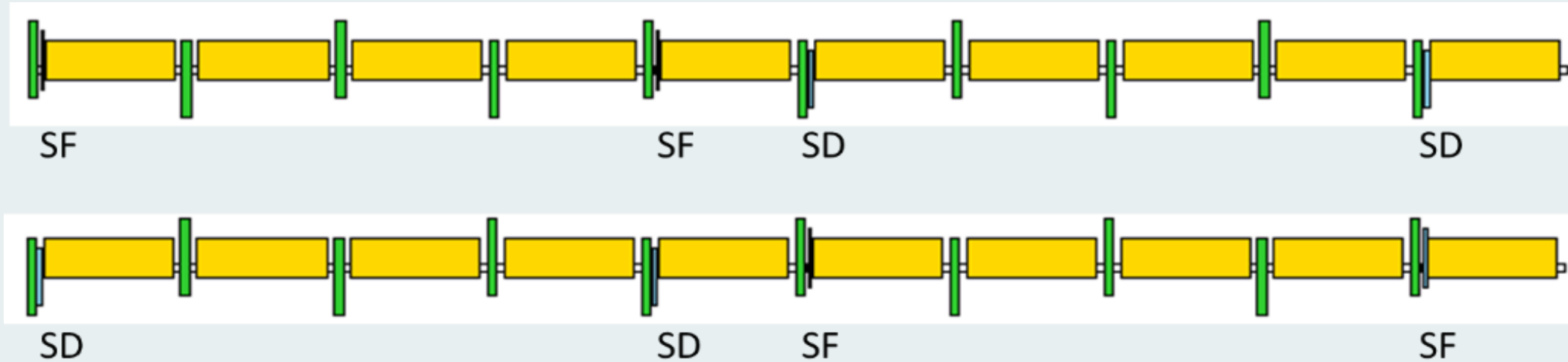
# The CEPC lattice design with combined dipole magnet\*

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## 1. INTRODUCTION

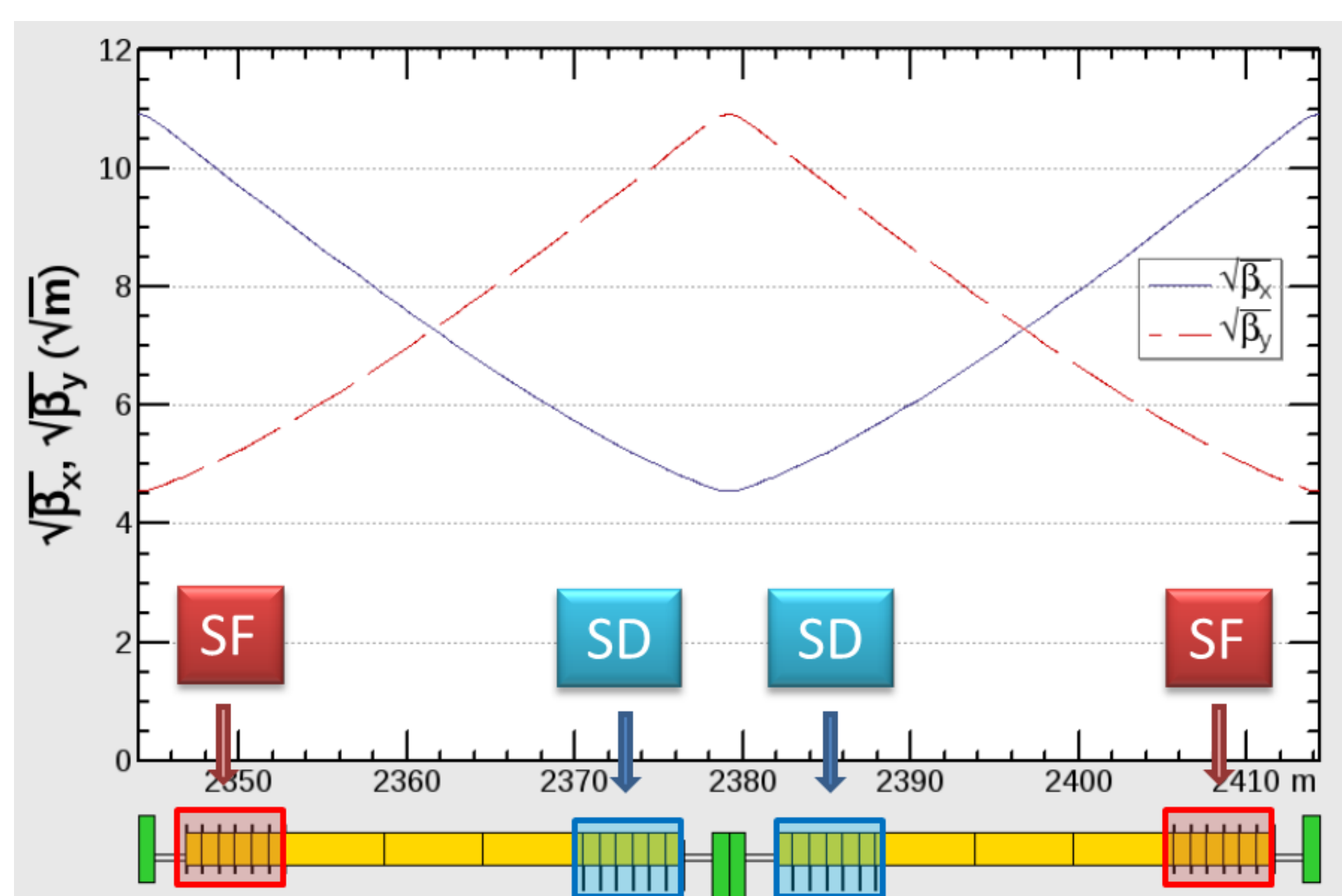
- FODO cell, 90°/90°, non-interleaved sextupole



- The power consumption of the arc sextupoles are too high.
  - Sextupole : 16.7 MW (copper coils)
  - Dipole: 6.5 MW (Al coils)
- Reducing the strength of the stand-alone sextupoles can make help.
- Combined function magnet: dipole + sextupole
  - Combined sextupoles: correct part (all) of the linear chromaticity
  - Stand-alone sextupoles: correct higher order chromaticity

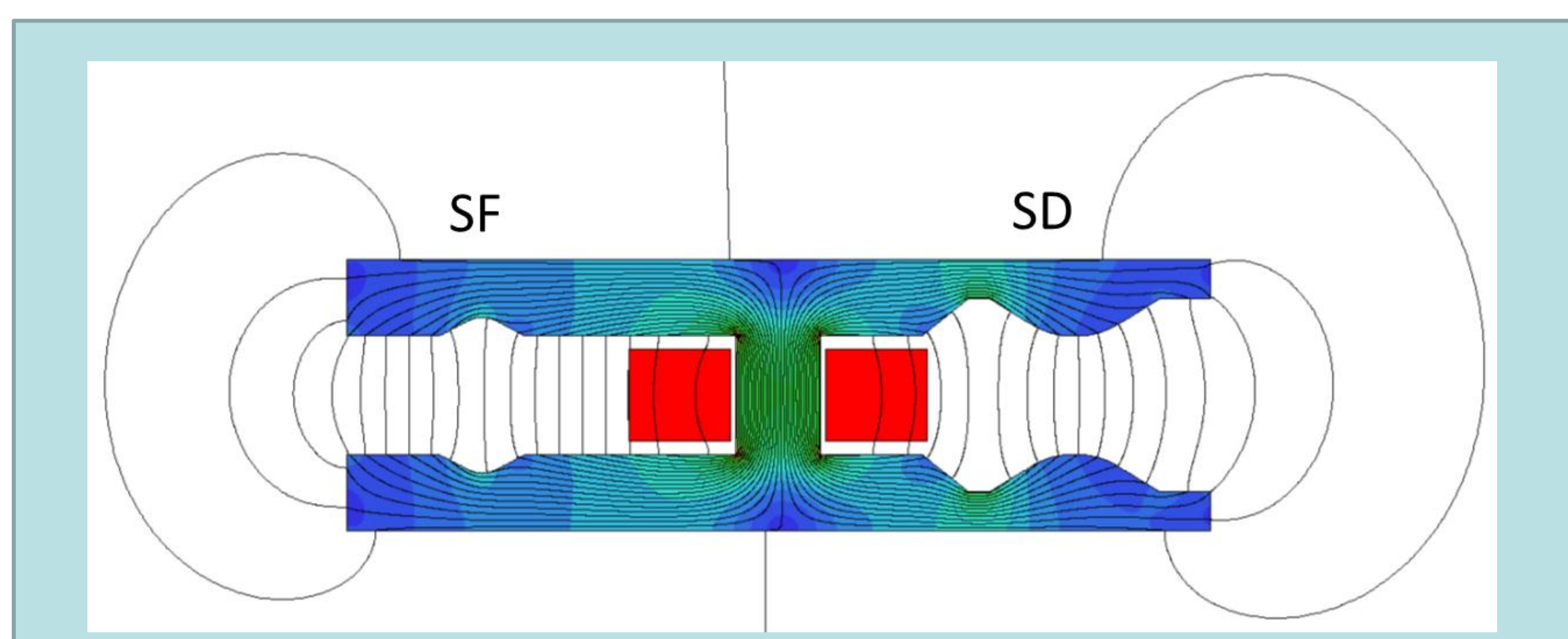
## 2. LATTICE WITH COMBINED D+S

- Five dipoles between two quadrupoles in the arc
- Combined sextupoles are on the first and fifth dipoles ( $\beta_{x,y} \gg \beta_{y,x}$ )
  - one dipole is cut into 6 slices
  - 7 thin sextupoles are insert in one dipole
  - 50% K2 reduction
- No additional power sources for SF and SD



- Dipole magnet design

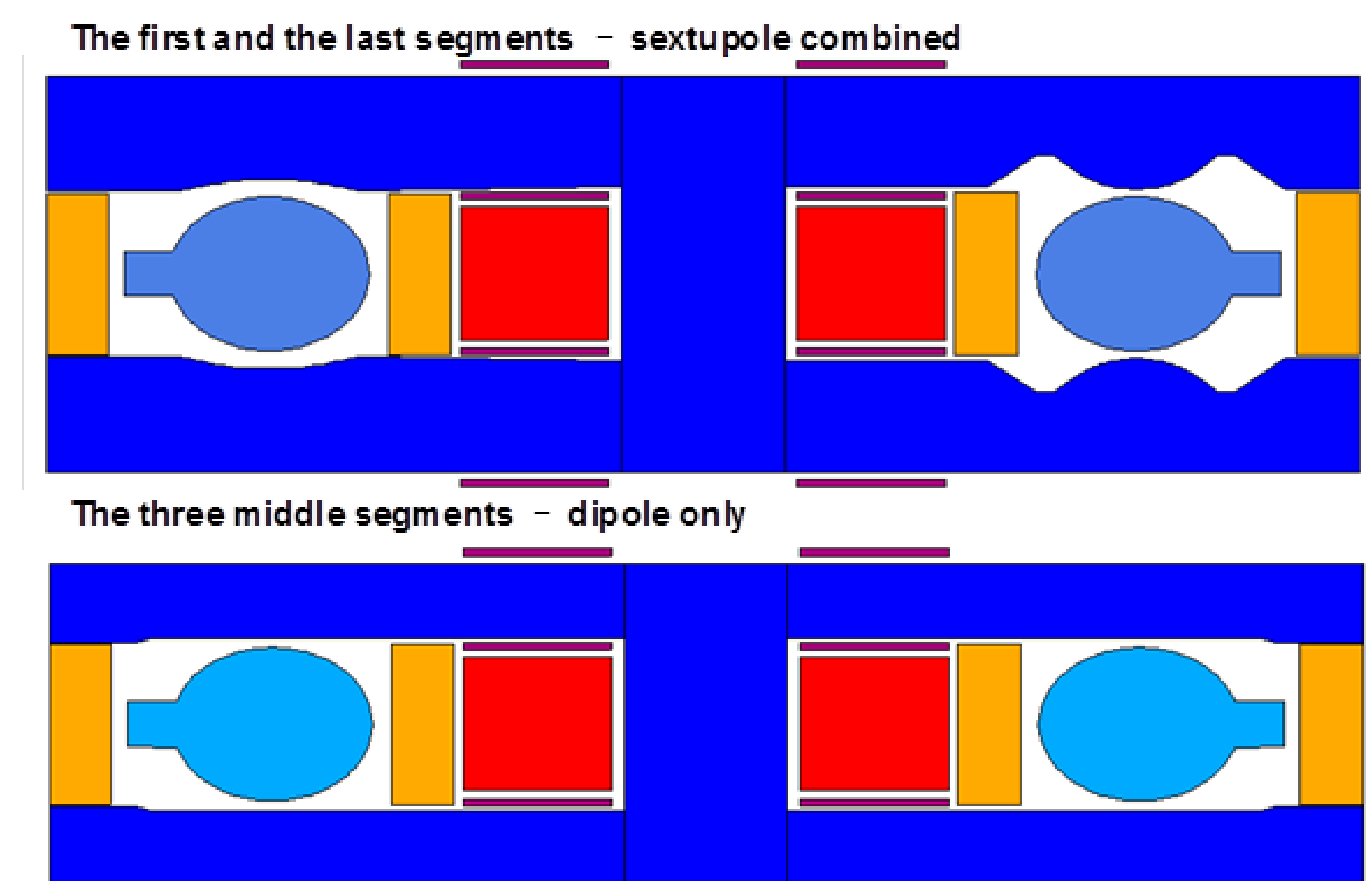
-- sextupole power: 75% reduction (16.7 → 4.43 MW)



## ACKNOWLEDGMENTS

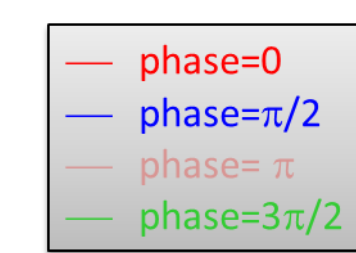
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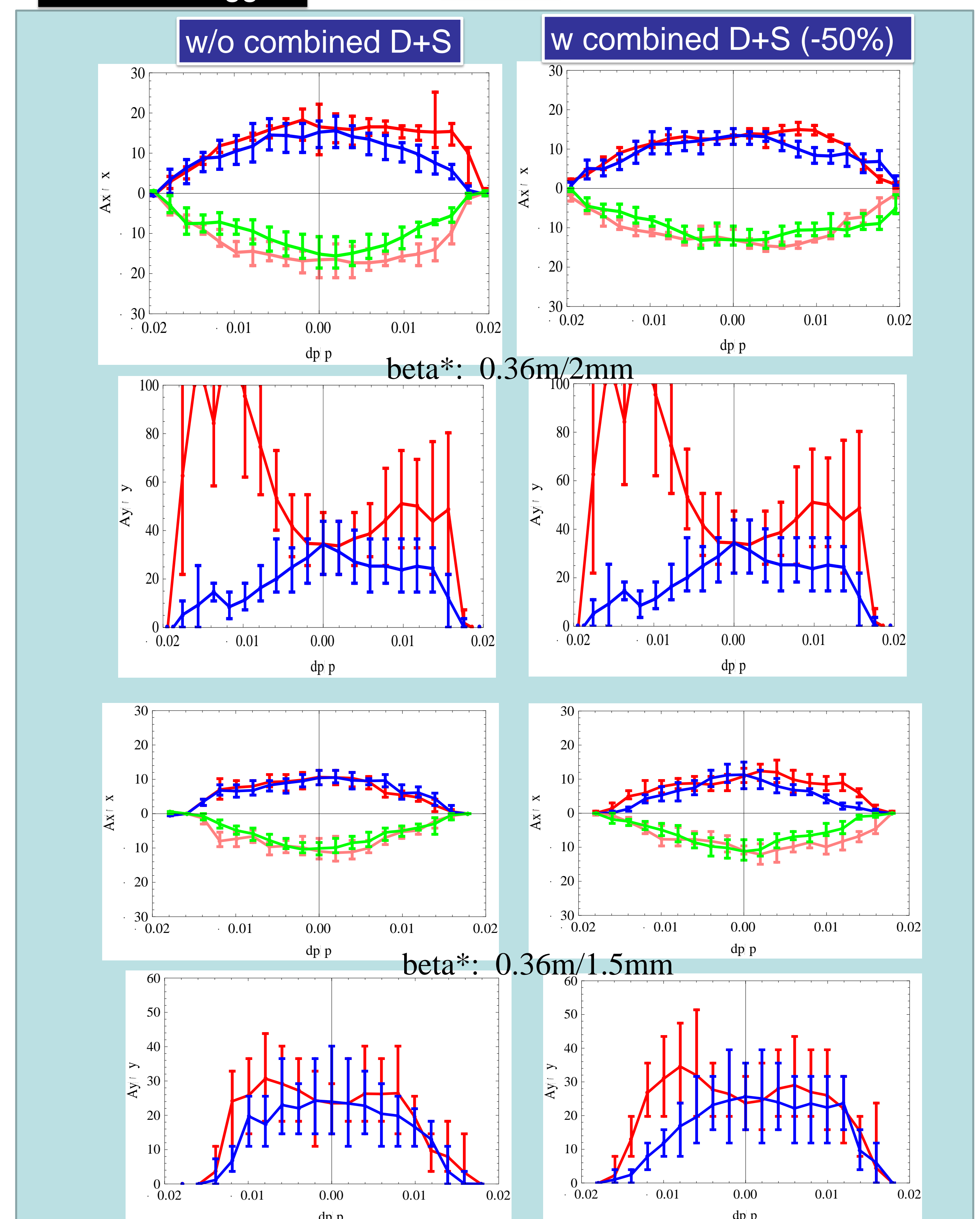


## 3. DYNAMIC APERTURE

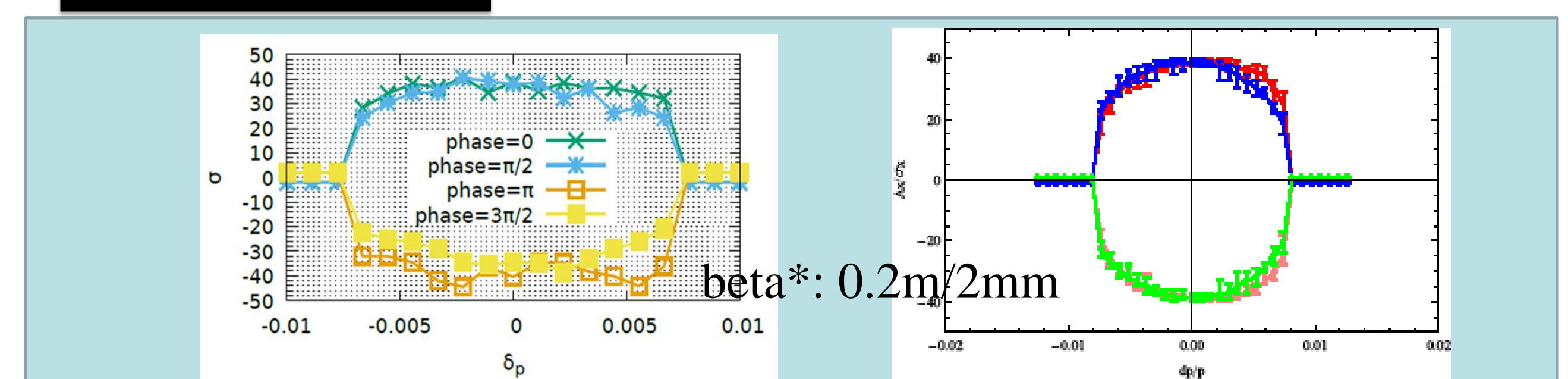
- Multi-sextupole optimization with downhill method
- 200 turns @Higgs, 3000 @Z
- 50 seeds
- Crab: full strength
- DA @ Higgs



- Synchrotron oscillation
- SR Damping
- Sawtooth + tampering
- Quantum fluctuation



- DA @ Z



- Strength of sextupoles reduced by a half
- power of sextupoles reduced by 75%
- DA same as the one without combined dipole magnets