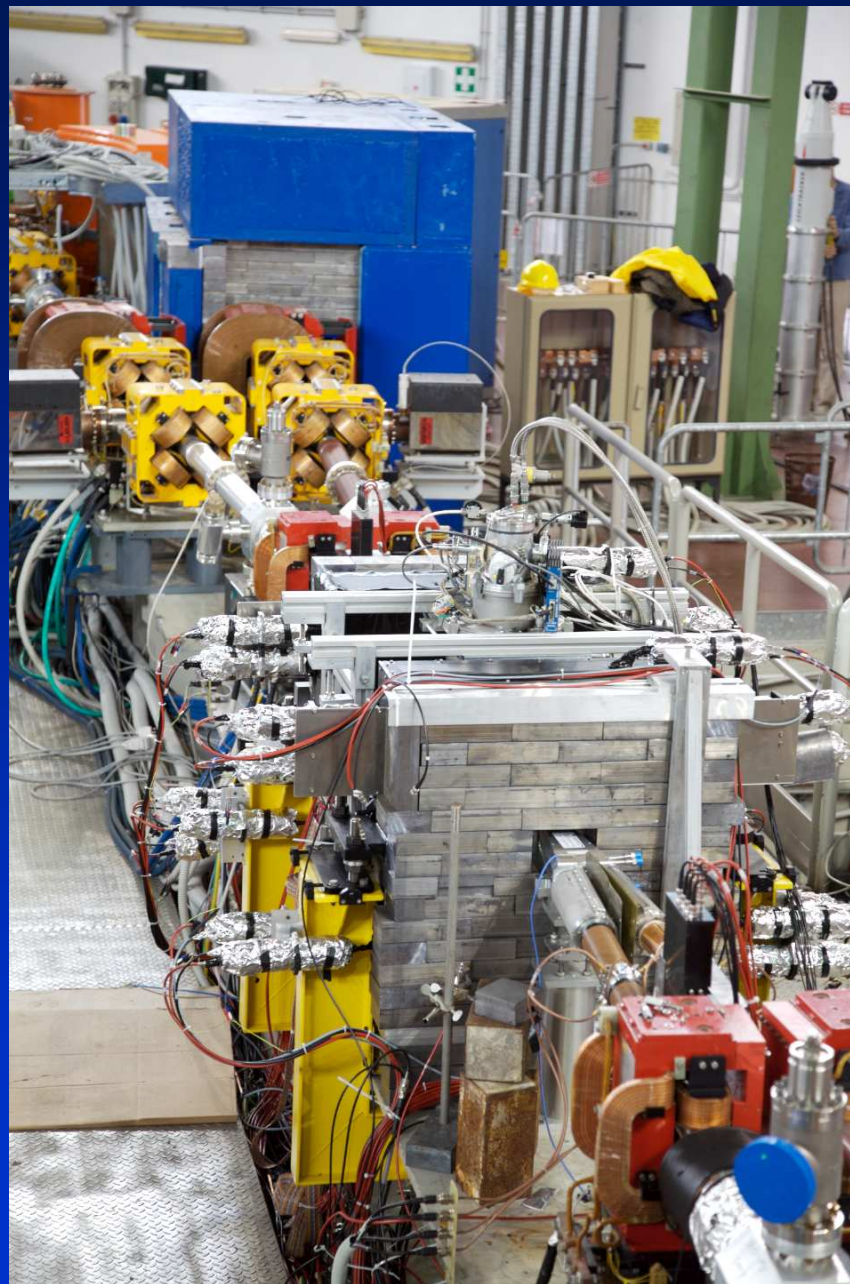# SuperB Lattice evolution

P. Raimondi for SuperB Team

LNF April-23,2009

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SuperB CDR Collaboration Team

Dafne Collaboration Team

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SuperB Lattice Evolution

- 2 rings (4x7 GeV) design
- Low emittance optics: ILC
- Long damping time: Pep
- Beam currents: comparable to present Factories
- Recycle Pep Hardware

SuperB ARC Lattice Evolution

- Initial lattice based on ILC-DR Tme Cell, mux=0.37:
  Ring 6.6Km Long + Wigglers
- Readjusted with Pep hardware and matched for SuperB parameters:
  Ring 3.5Km Long + Wigglers
- Paired two bends in the Tme Cell and added a Qf in between, set Mux=0.5 Muy=0.2

  Very large ARC Dynamic aperture because the

  -I between the Horizontal Sextupoles

  Ring 2.3Km Long Wigglers not needed

  CDR design based on this cell

SuperB ARC Lattice Evolution

- Equilibrium emittance for this cell decreases fast with mux

- Alternating two cell in the arc:

  one with mux=0.5 and one with mux=0.75 the

  intrinsic emittance decreses and the number of cells can be reduced

  Even larger ARC Dynamic aperture because the

  -I between the Horizontal Sextupoles and Arc sextupoles correct all chromaticity phases
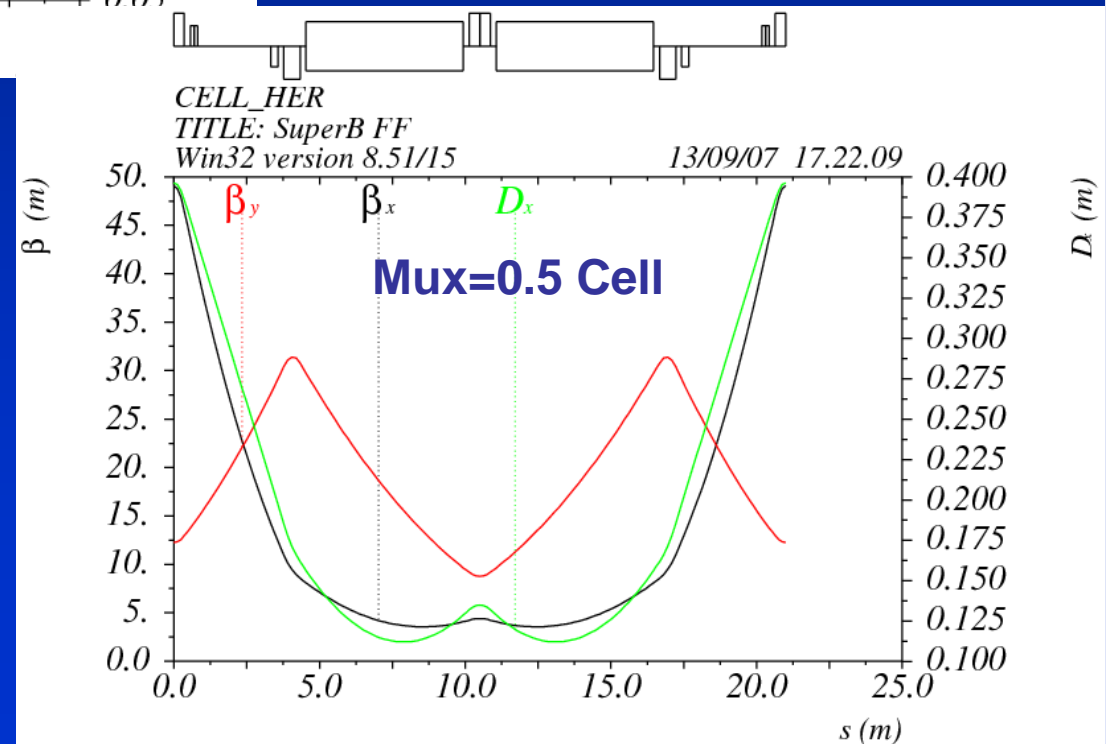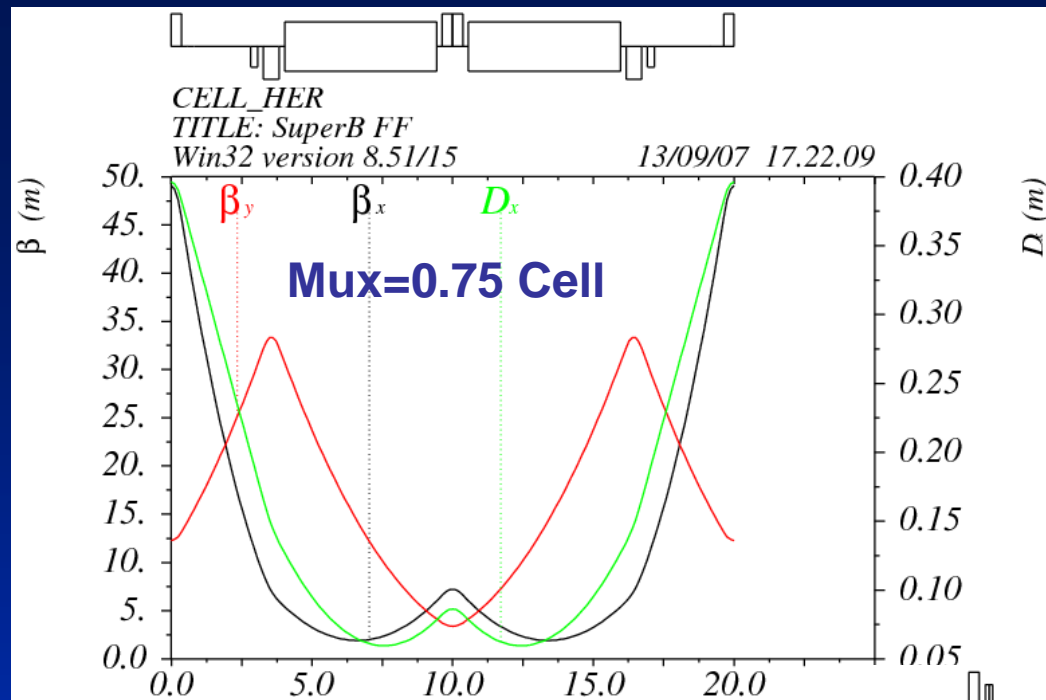
  1.65Km Long Wigglers not needed

   June 2008 design based on this lattice

M. Biagini

Arc cells layout
Alternating Sequence
of these cells

SuperB ARC Lattice Evolution

- Optimized Arc lattice and DA with all mux=0.75, muy=0.25 Arc Cells
- Just two Arcs left with 21 Cells each (from 4 Arcs*14cells)
- 30% Fewer sexts: sext-nosext-sext-sext-nosext-sext etc…
- Arc Dynamic aperture further increased since all sextupoles are at –I in both planes (although x and y sextupoles are nested)
- Emittance smaller and adjustable by varying the betas and etas in the Arc
- Adjusted the magnet spacing according with the Pep hardware (6% lengthening)
- Damping time 5% shorter than the old design
  Ring< 1.40Km Long Wigglers not needed
  Possible to consider a different site for this Layout

SuperB ARC Lattice Evolution

- Integrated CDR FF (the shortest) with the shortest lattice
- Ring 1.2Km long
- Emittance 20% higher than desing
- HER Power 20% higher than desing
- With reduced HER Energy, Emittance and Power back down by 20%
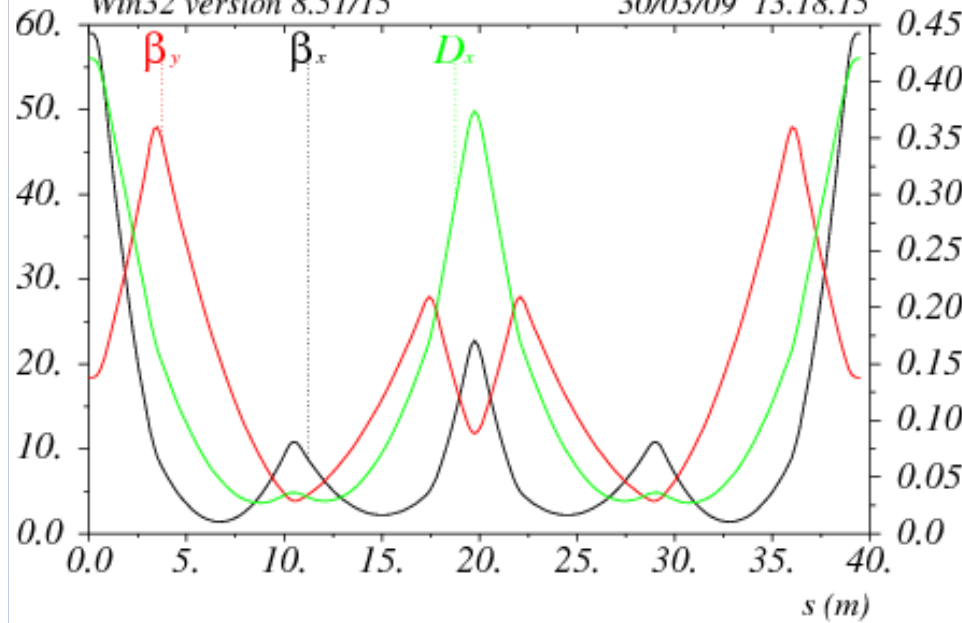- Adding Spin rotators on LER makes Rings about 1.32Km Long

Arc Cells
Alternating sequence
of these cells

Distances between magnets
compatible with PEP hardware
All K-values in range

Ring with FF
TITLE: SuperB FF
Win32 version 8.51/15   10/06/09 17.00.46
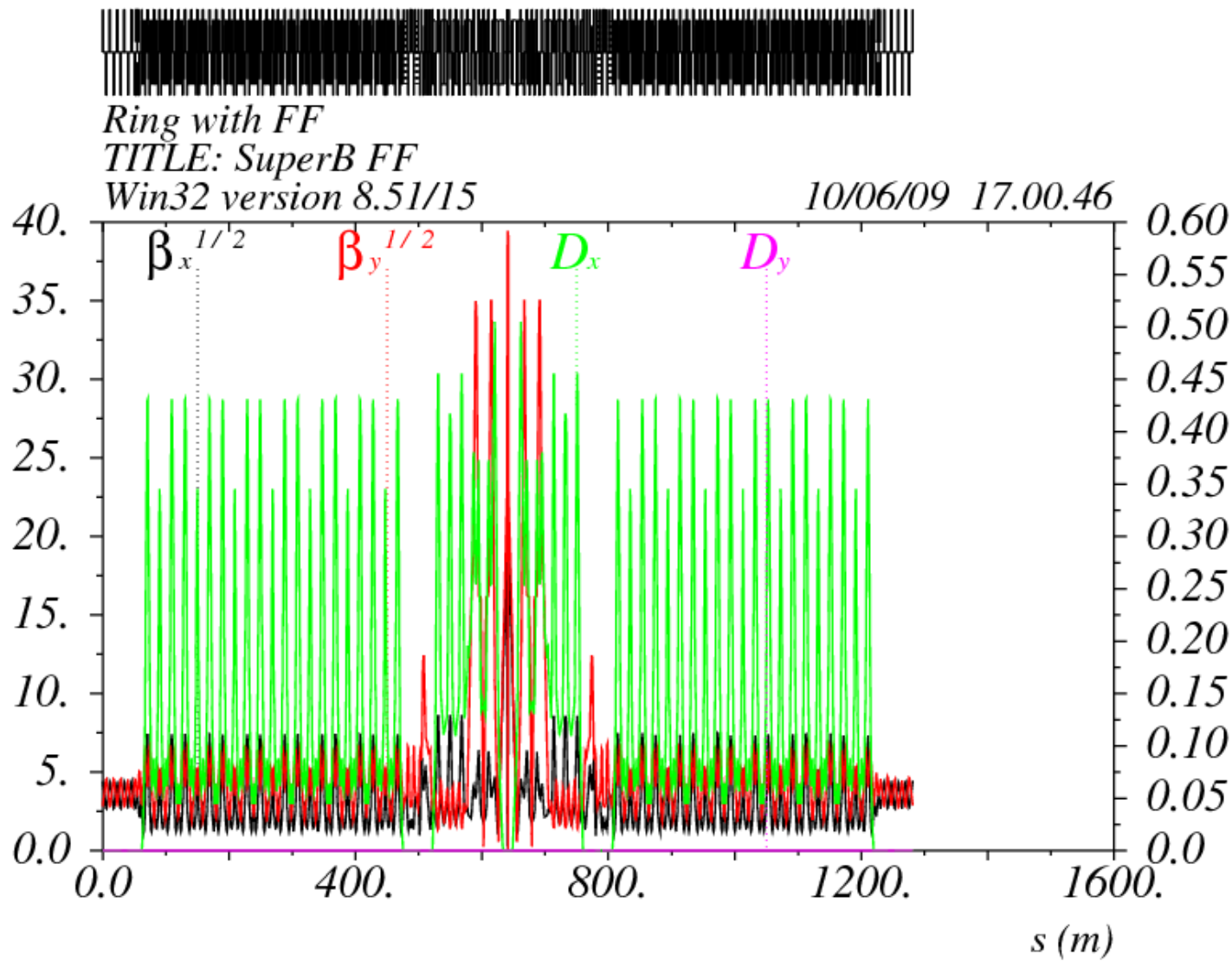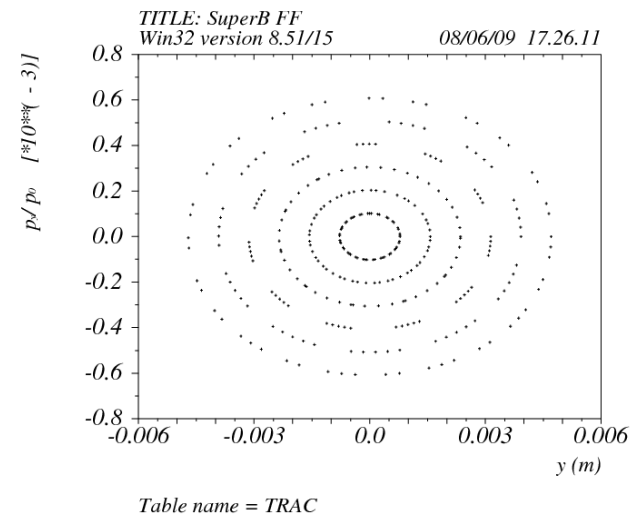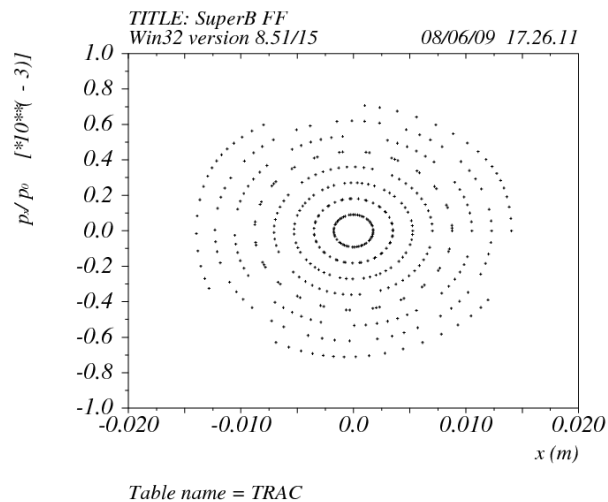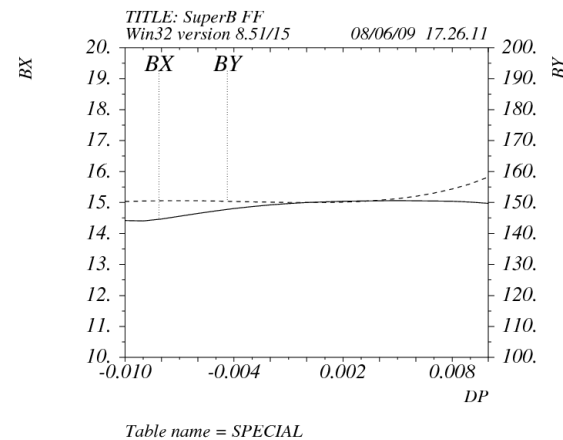
Arcs + FF

Straights in the middle of the Arcs are missing
This solution does not requires them for optic properties, but can be
added if needed (for RF, Injection etc…)
FF readjusted to match the bending required for polarization
SPIN Rotators are included just outside the CRAB Sextupoles

Arcs Dynamic Aperture

15sigmas contour rings in X 5sigmas full coupled contour rings in y
FF properties similar to previous versions:
X>50sigmas, Y>30sigams dE/E about +/-1%

Conclusions

Short lattice possible, reduces the complexity in finding solutions for the dig.

Performaces in luminosity reduced by about 30% for a given power w.r.t. a longer ring

With lower HER energy, luminosity power cost equal to the CDR one

Polarization solution under analysis and optimization in terms of polarization and impact on the machine performances