DR 3.2 km Lattice

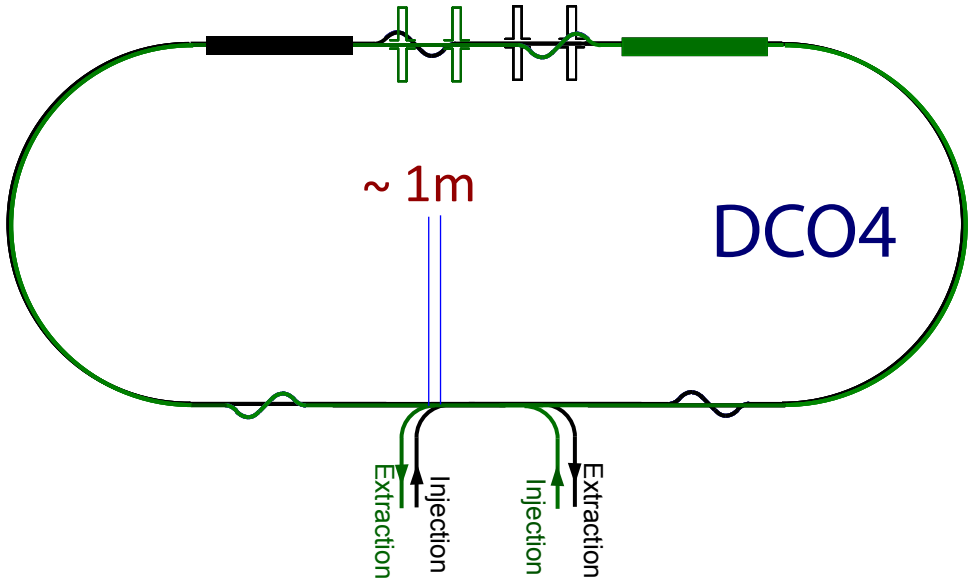
Webex meeting

24 May 2011

D. Rubin

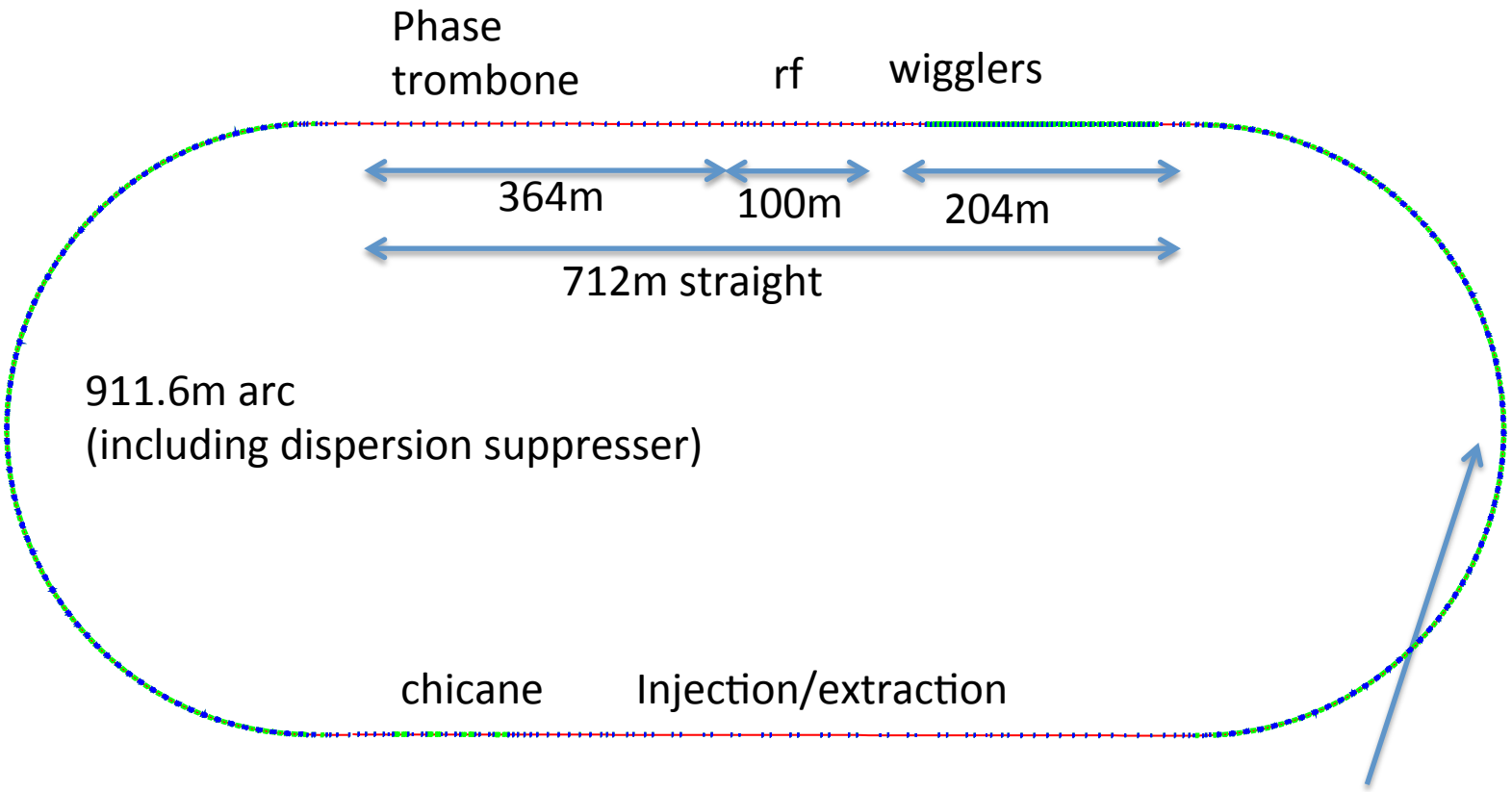
Modification with respect to DCO4

Start with DCO4 with
6.4m circumference



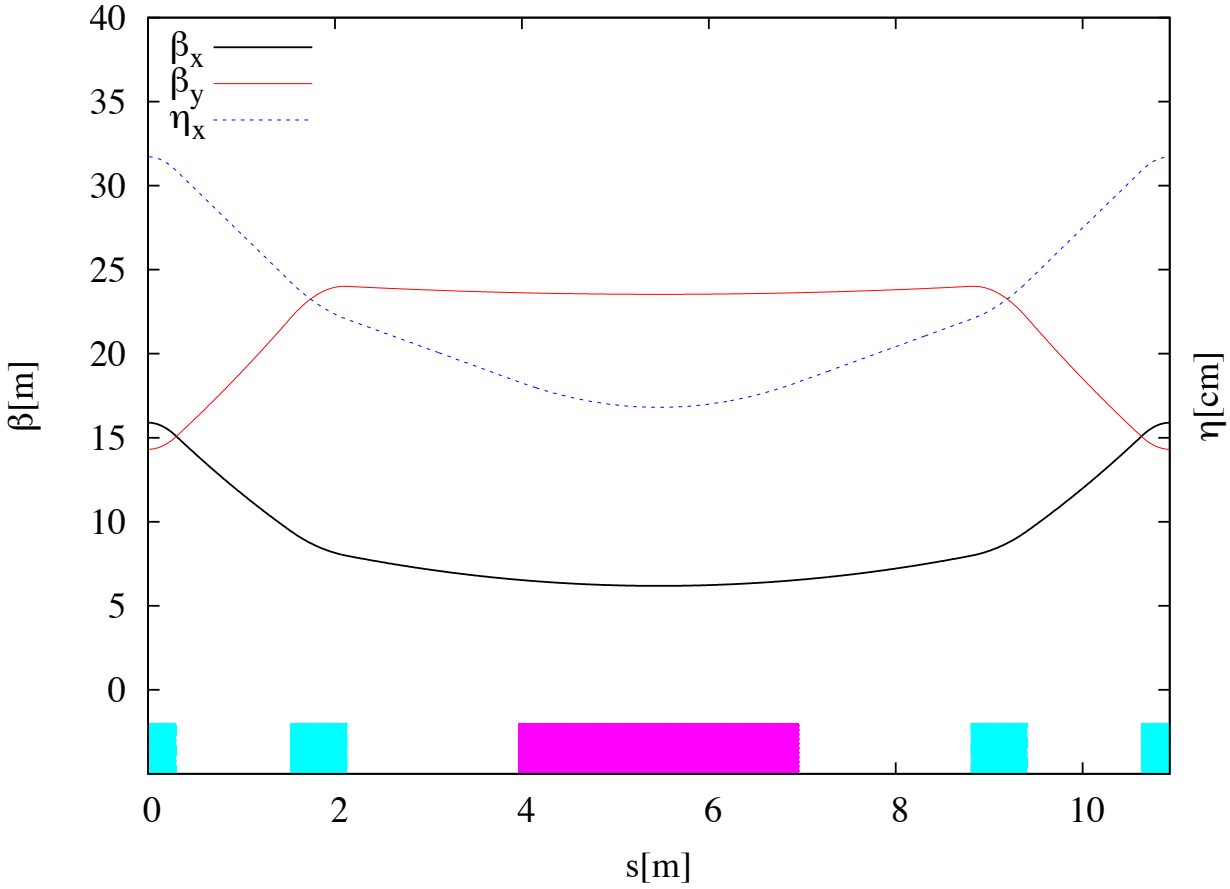
1. Eliminate one of two circumference changing chicanes
2. Eliminate 5 of 12 phase trombone cells
3. Reduce number of wiggler cells from 44 to 27 ,
   wiggler period -> 32cm (vs 40cm), 12 poles
4. Modify RF straight so that cryostats for two positron rings are interleaved
   (12 cavities are required. There is space for 16)
5. Eliminate 4 of 7 FODO cells in injection straight
6. Circumference =3.2km, straight = 712m, arc= 911m

3.2485km circumference

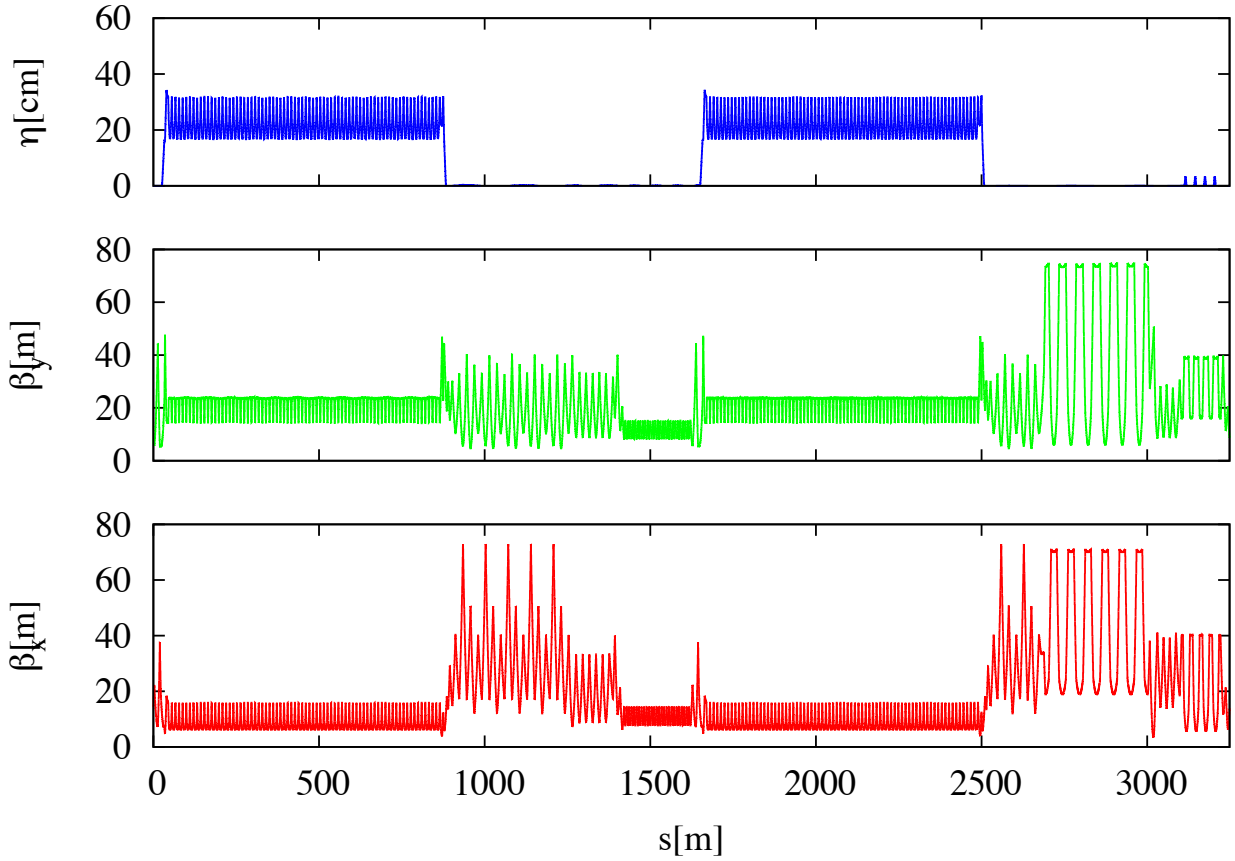


The arc is assembled from 75 FDBDF (focus/defocus/bend/defocus/focus) "TME variant" arc cells.
Cell length = 10.931m
Bend length = 3m

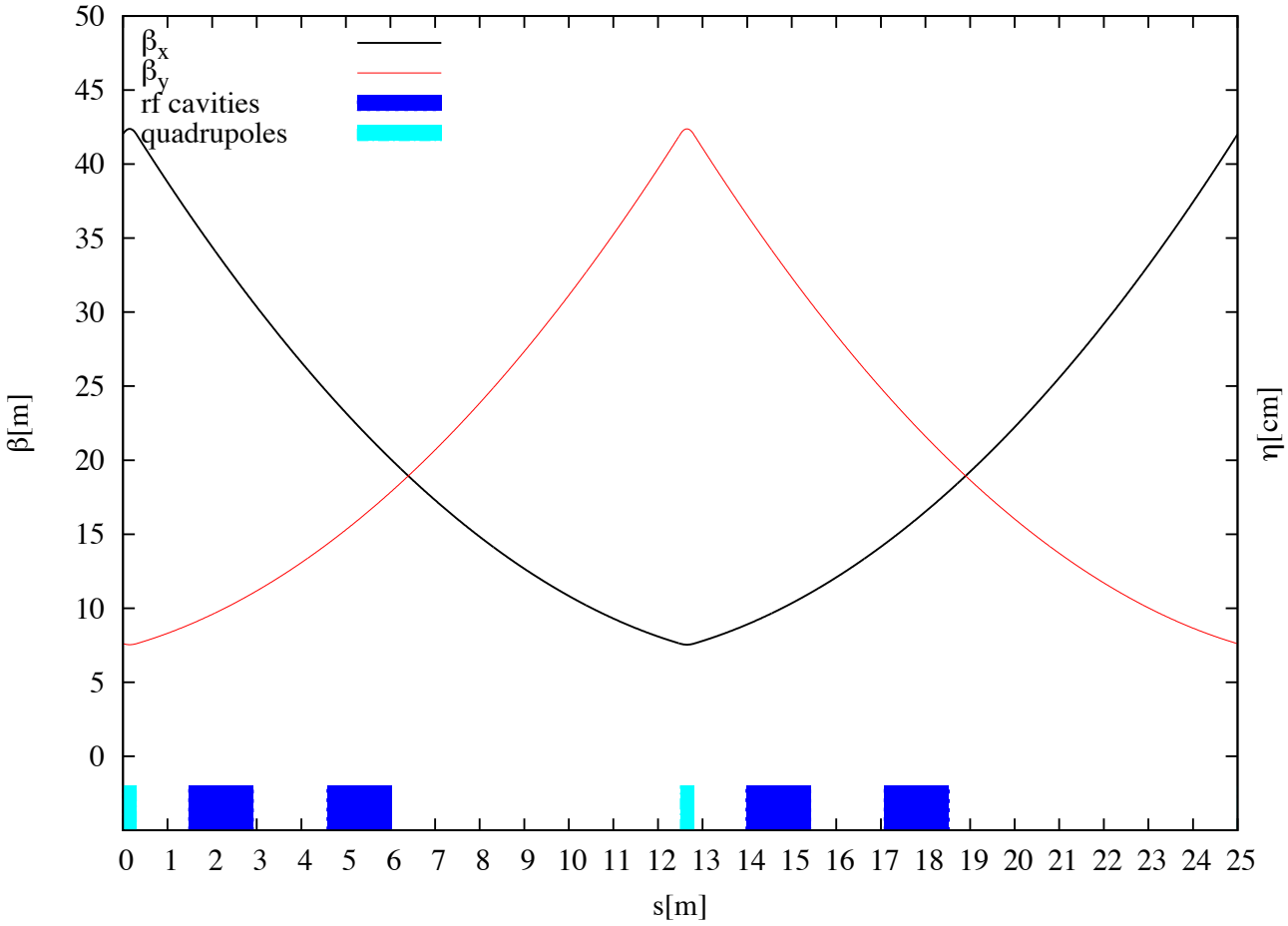
Arc cell - FDBDF



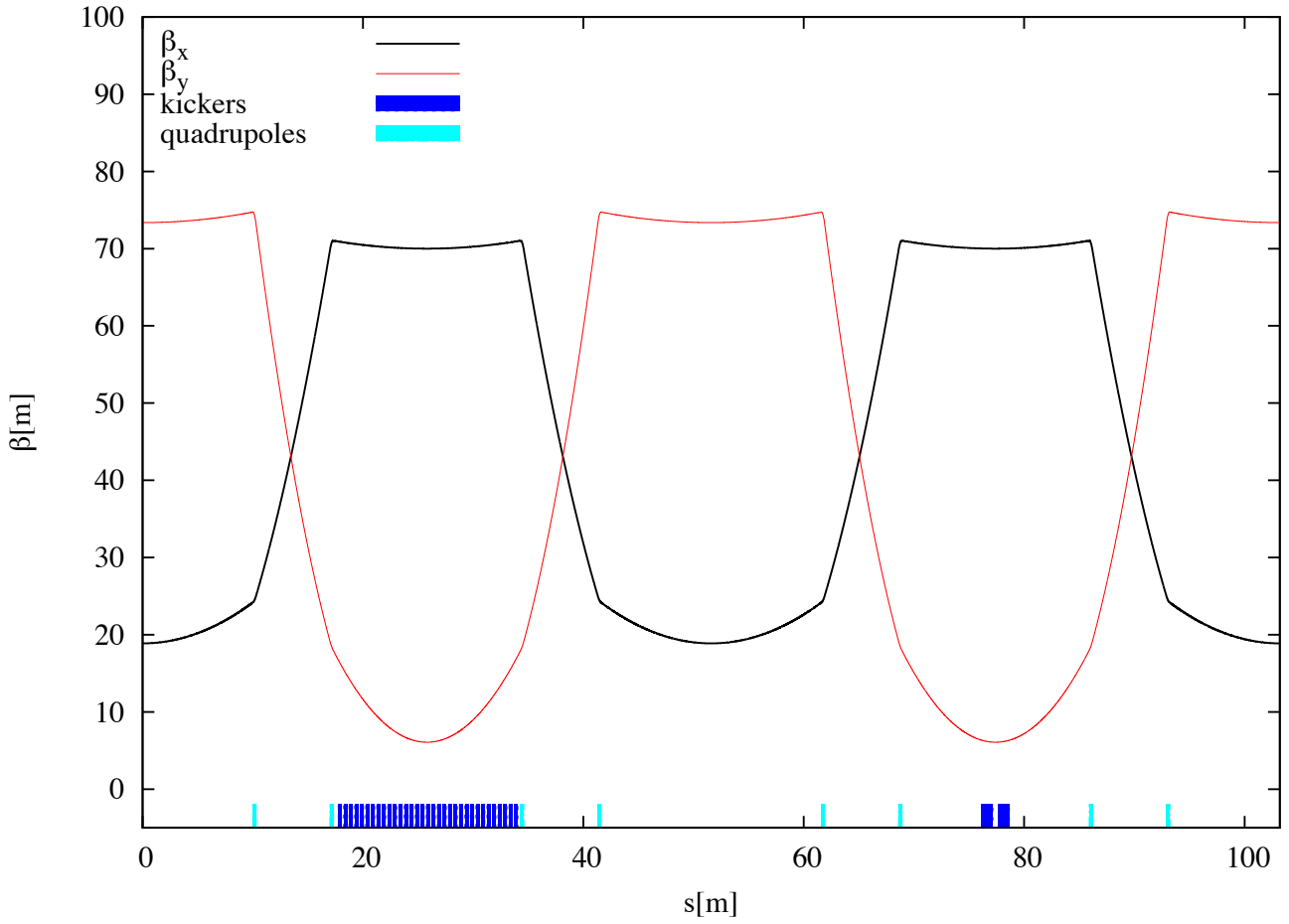
Bmad_7-27wig. – 712m straight



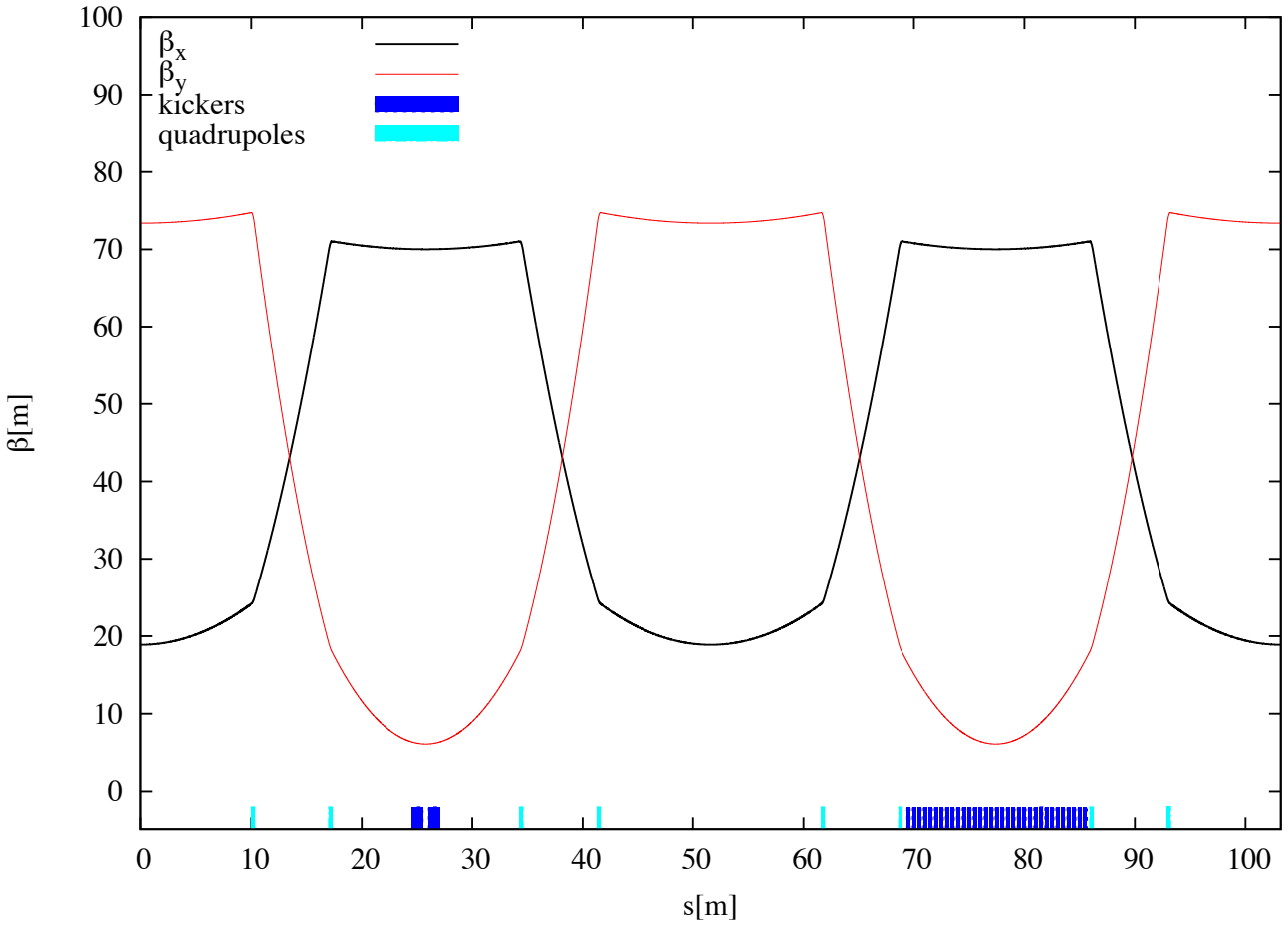
RF cells


β_x
β_y
rf cavities
quadrupoles
β[m]
η[cm]
s[m]
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
0 5 10 15 20 25 30 35 40 45 50

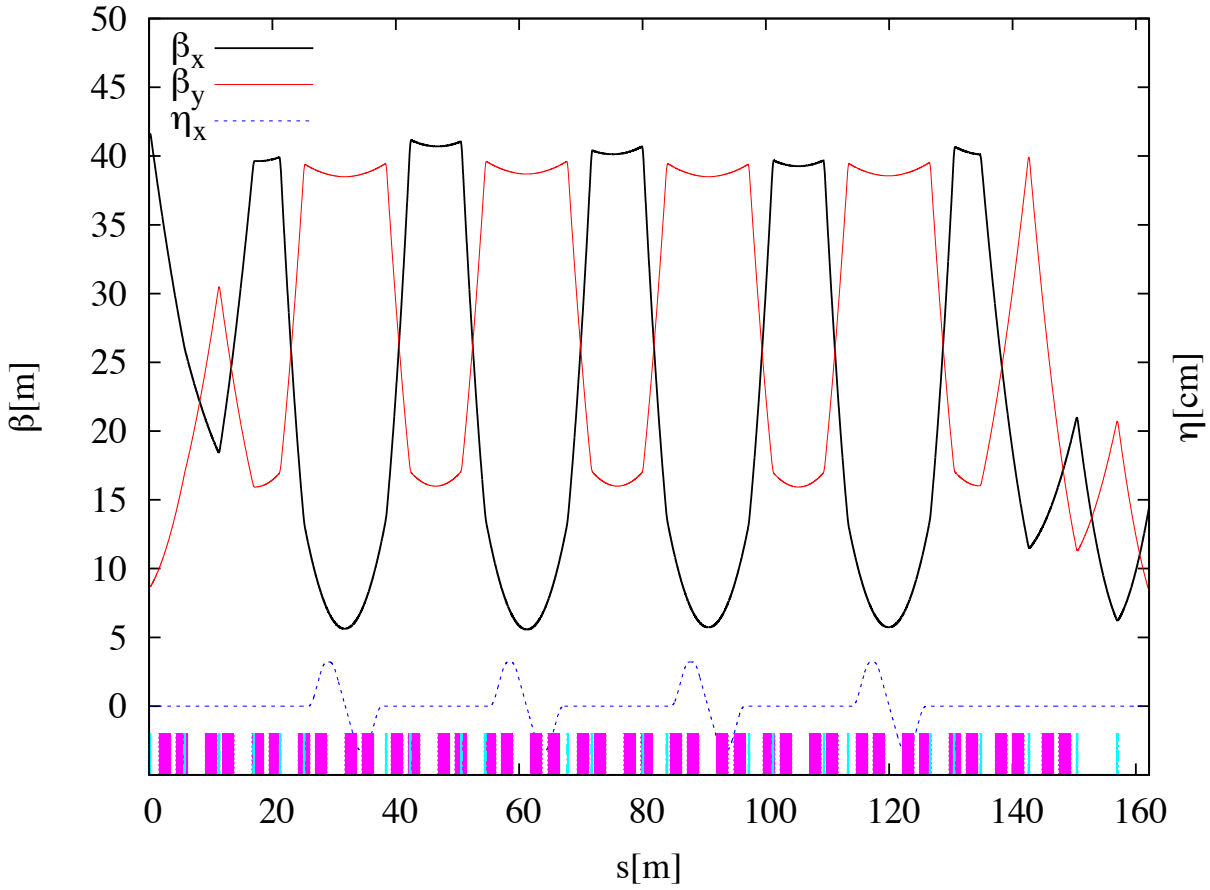
Extraction straight



Injection straight



Circumference changing chicane

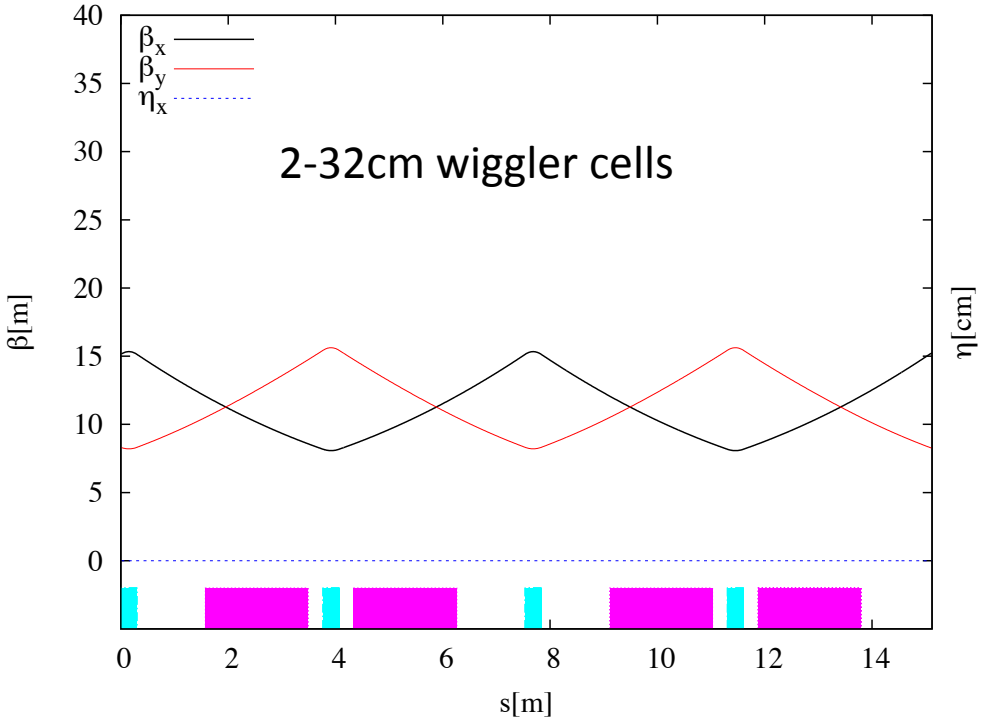


wiggler

32cm wiggler params

12 poles
32cm period
Wiggler length = 3.84
Cell length = 7.56 m

27 wiggler cells



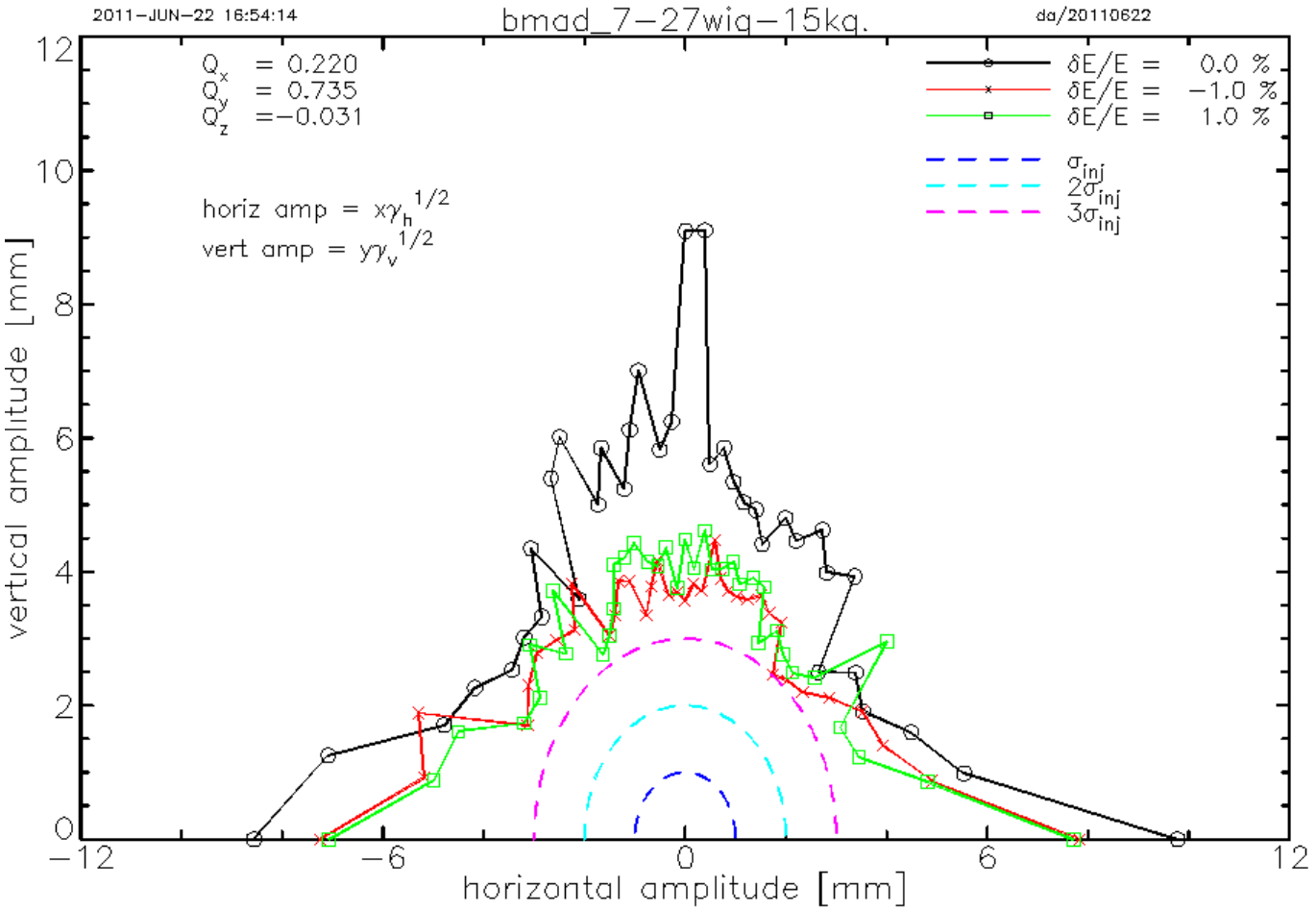
3.248km ring with FDBDF arc cells and 712m straight

Parameter	10 Hz(Low)	5 Hz (Low)	5 Hz (High)
Circumference	3.248 km	3.248 km	3.248 km
RF frequency	650 MHz	650MHz	650 MHz
τ_x/τ_y [ms]	13.5	24.1	24.1
σ_s [mm]	6	6	6
σ_δ	0.134%	0.11%	0.11%
α_p	3.3×10^{-4}	3.3×10^{-4}	3.3×10^{-4}
$\gamma\varepsilon_x$ [μm]	2.7	4.4	4.4
RF [MV] (12 cavities) Total/Per cav	19.7/1.64	14 /1.7	14/1.7
ξ_x/ξ_y	-51.5/-44.6	-51.5/-43.9	-51.5/-43.9
Wigglers- N_{cells}@B[T]	27@2.1	27@1.5	27@1.5
Energy loss/turn [MeV]	8.0	4.5	4.5
sextupoles	3.41/-4.34	3.41/-4.34	3.41/-4.34
Power/RF coupler @400mA [kW]	267	150	300

RF

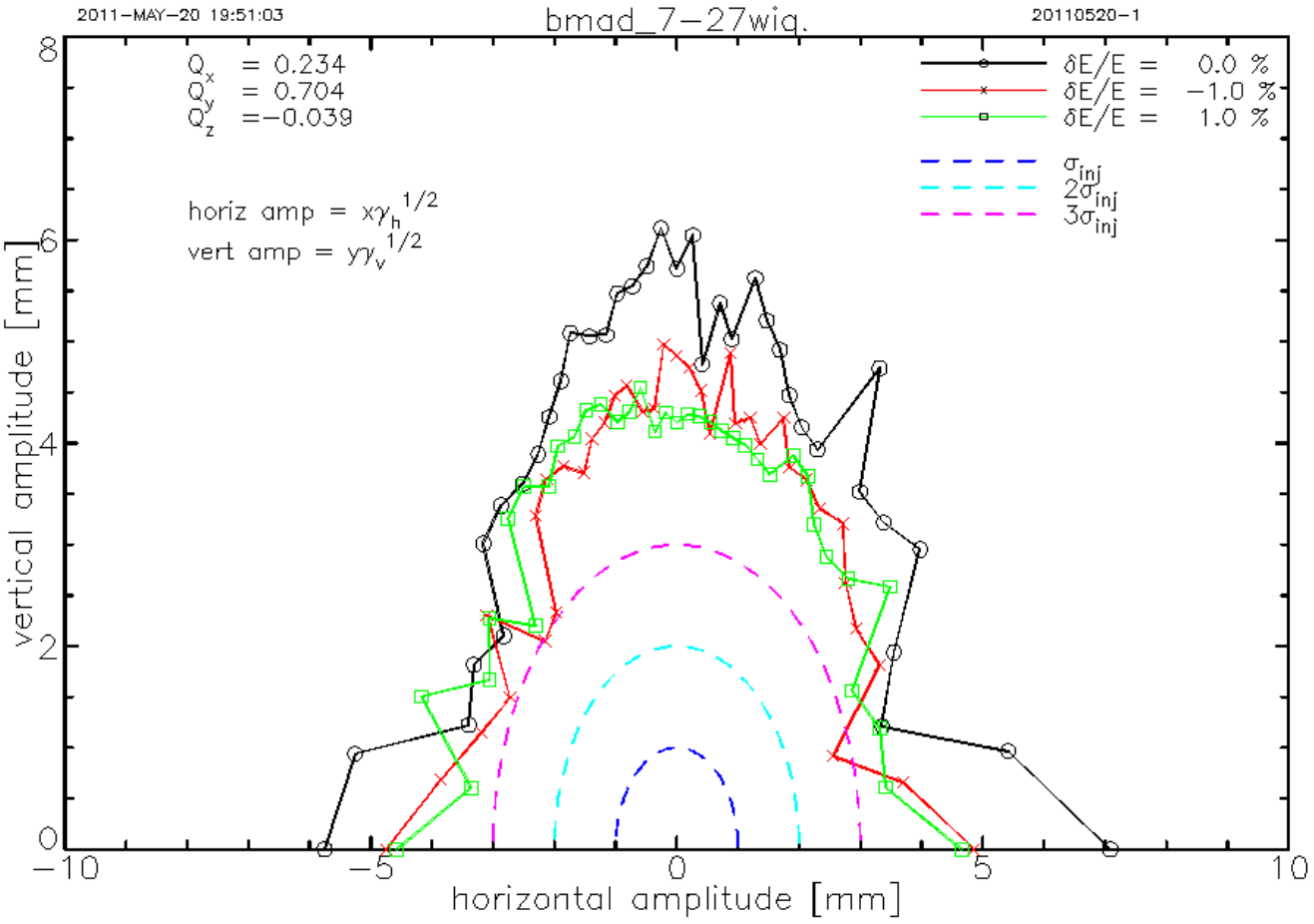
The lattice can accommodate 16 RF cavities
If we assume 12 then
- Voltage/ cavity in 10Hz mode is 1.64
- Power/coupler in 5Hz, high power mode is 300kW

Dynamic aperture
5 Hz



Periodic type wiggler model, includes vertical focusing and cubic nonlinearity

Dynamic aperture
10 Hz



Periodic type wiggler model, includes vertical focusing and cubic nonlinearity