

ILC 3.2 km DR design based on FODO lattice (DMC3)

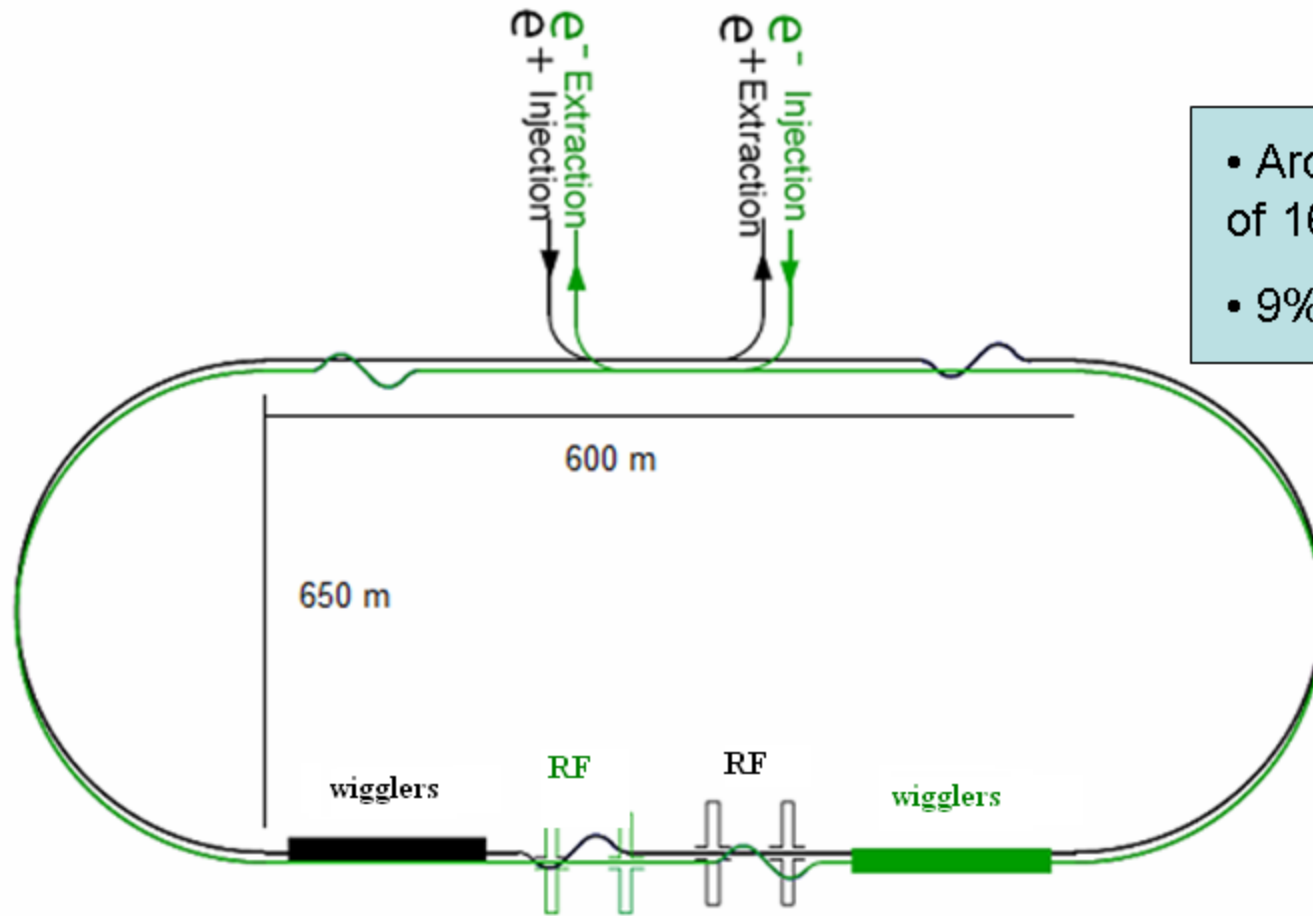
Dou Wang, Jie Gao, Gang Xu, Yiwei Wang
(IHEP)

ALCPG, Eugene, Oregon, USA
March 20, 2011

Main properties of DMC3

- 3.2 km circumference, 5 GeV, 5 Hz repetition
- Racetrack layout
- Use FODO cell for arc sections
- Flexibility in momentum compaction between $2.7 \cdot 10^{-4}$ and $6.2 \cdot 10^{-4}$
- Single tunnel for injection and extraction beam lines
- Locating the RF and wigglers near each other to minimise cryogenic transfer lines

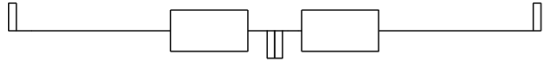
Layout



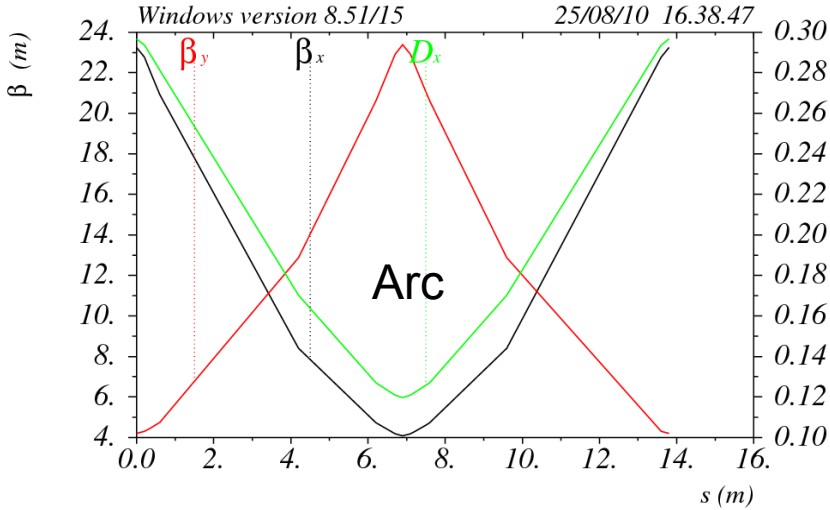
- Arcs consist of a total of 166 FODO cells
- 9% radiation in arcs

- Straights are similar to 6 km DCO4
- 91% radiation in straights

Lattice functions

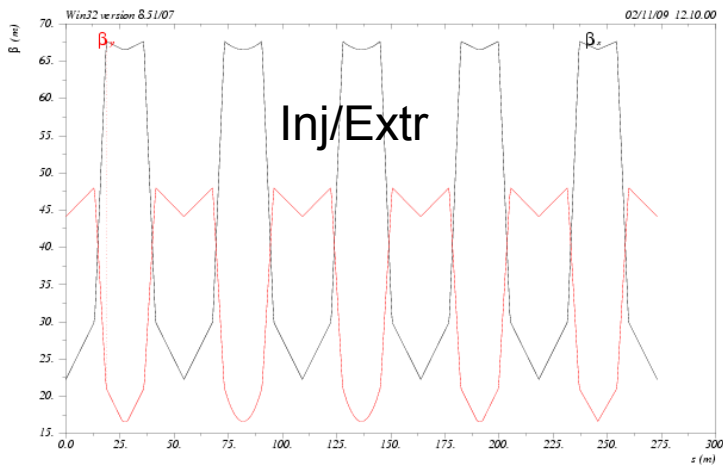
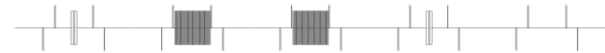


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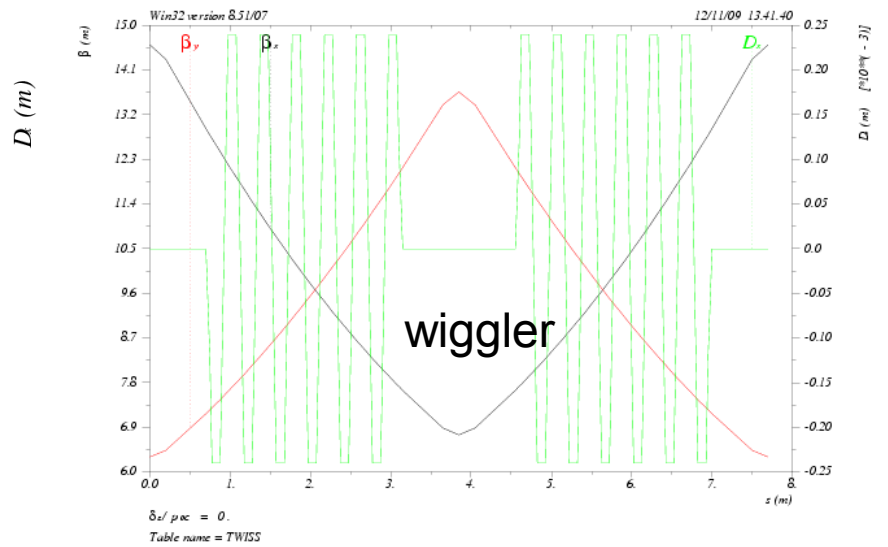


$\delta_E / p_{oc} = 0.00000$

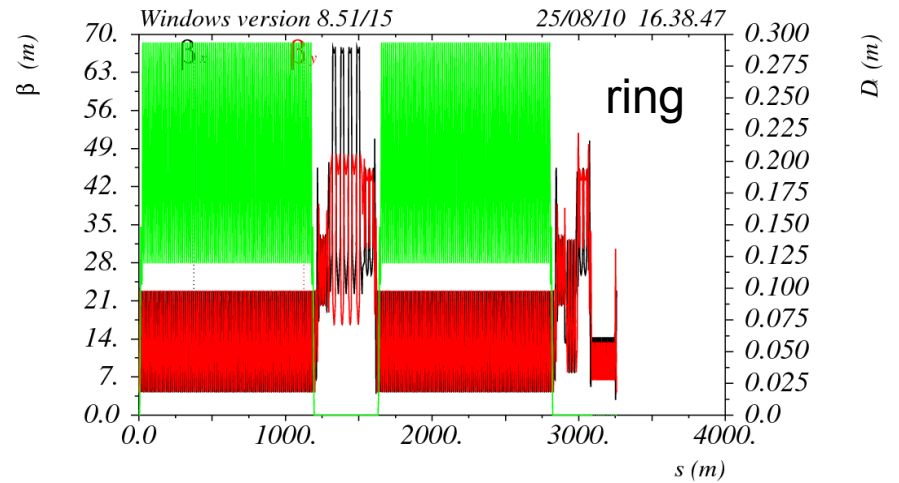
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$\delta_E / p_{oc} = 0.$
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$\delta_E / p_{oc} = 0.00000$

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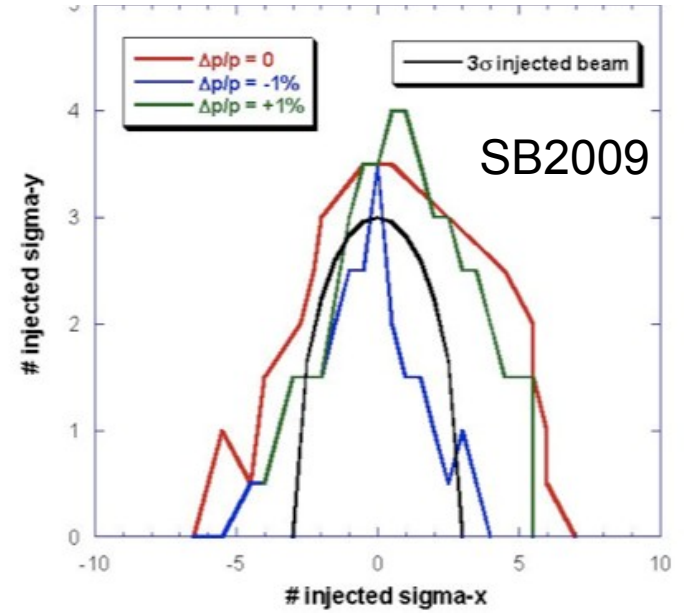
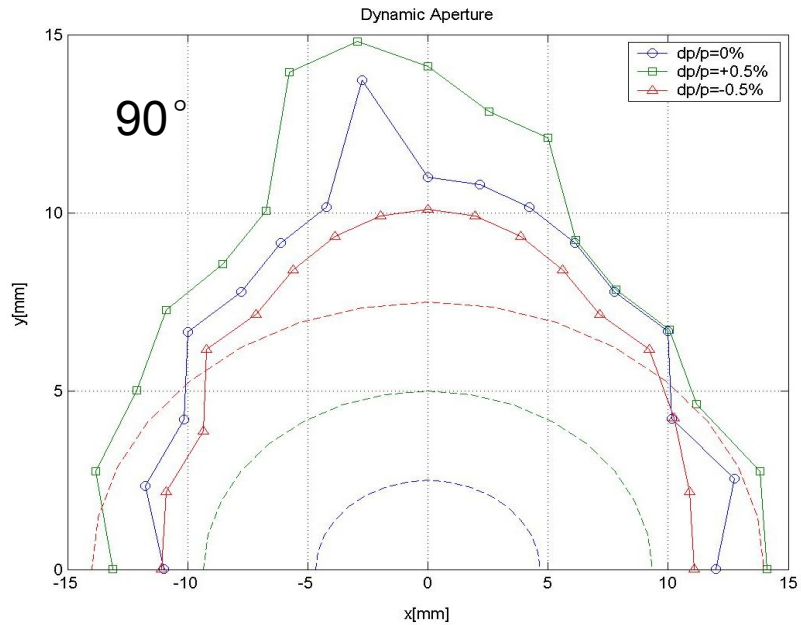
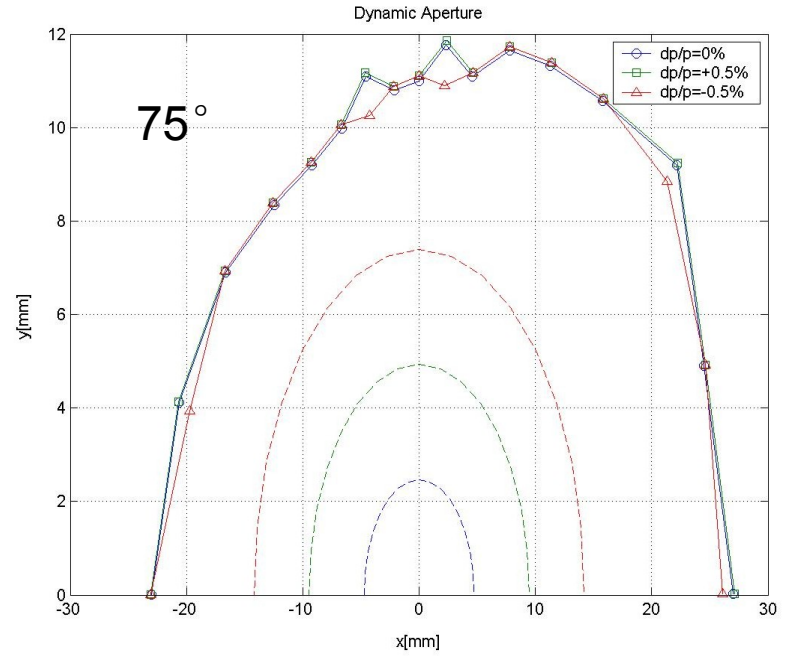
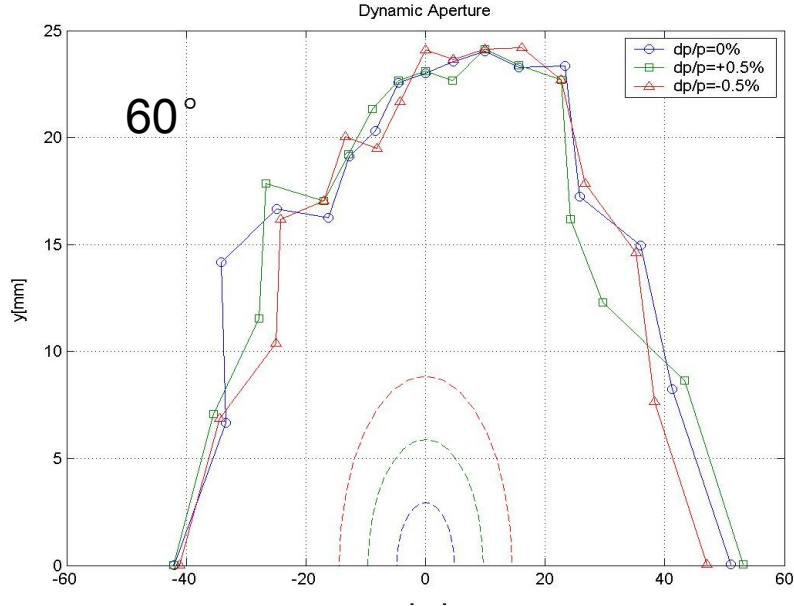
Major parameters of DMC3

	SB2009	DMC3		
Beam energy (GeV)	5.0	5.0		
Circumference (m)	3238	3258		
RF frequency (MHz)	650	650		
Transverse damping time (ms)	24	23		
Natural bunch length (mm)	6	6		
Natural energy spread	1.2×10^{-3}	1.26×10^{-3}		
Phase advance per FODO cell		60°	75°	90°
Momentum compaction factor	1.3×10^{-4}	6.19×10^{-4}	4.04×10^{-4}	2.77×10^{-4}
Nominalised natural emittance (um)	5.2	6.27	4.45	3.58
RF voltage (MV)	7.5	33.0	21.84	15.36
Natural chromaticity x/y	-102/-66 ?	-42.3/-41.5	-51.2/-49.9	-63.7/-61.7
Total wiggler length (m)	78	98		

Magnet parameters

	DMC3	SB2009
Arc dipole length	2.0 m	2.7 m
Arc dipole field	0.154 T	0.26/0.36T
Number of arc dipoles	344	128
Chicane dipole length	1.50 m	1.0 m
Chicane dipole field	0.1 T	0.27 T
Number of chicane dipoles	32	48
Quadrupole length	0.40 m	0.6/0.3 m
Total number of quadrupoles	474	590
Sextupole length	0.25 m	
Total number of sextupoles	332	

Dynamic aperture



summary

	DMC3	SB2009
Arc cell	FODO	SuperB
circumference	3.2 km	3.2 km
layout	Racetrack	Racetrack
Physical requirements	achieved	achieved
Flexibility of momentum compaction	Yes ($2.7 \cdot 10^{-4} \sim 6.2 \cdot 10^{-4}$)	no
momentum compaction	Larger ($2.7 \cdot 10^{-4} \sim 6.2 \cdot 10^{-4}$)	Smaller (1.3×10^{-4})
RF voltage	higher	lower
Dynamic aperture	larger	smaller