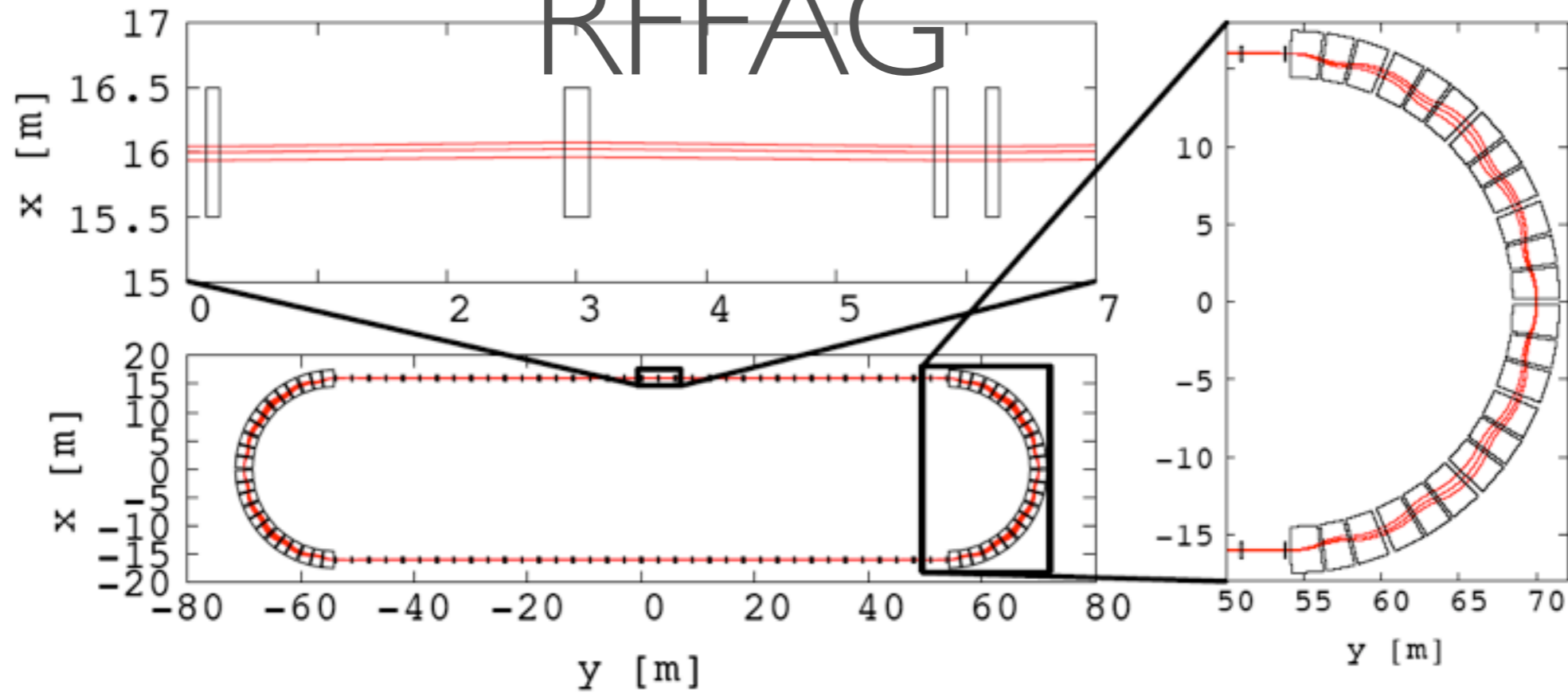


RFFAG RING COSTING

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RFFAG



arc section

straight section

Cell type	FDF triplet	
Number of cells in the ring	16	
Cell opening angle	22.5 deg	
r_0	16 m	
k-value	10.85	
Packing factor	0.9	
Collimators ($r_{min}, r_{max}, z_{max}$)	(14.5 m, 17.5 m, 0.3 m)	
Periodic cell dispersion	1.35 m (at 2 GeV)	
Horizontal phase advance	90. deg.	
Vertical phase advance	22.5 deg.	
F_1 magnet parameters		
Magnet center	4.1 deg	
Magnet length	6.8 deg	
Fringe field fall off	Linear (Length: 0.1 deg)	
$B_0(r_0 = 16 m)$	-1.430895 T	
D magnet parameters		
Magnet center	11.25 deg	
Magnet length	6.0 deg	
Fringe field fall off	Linear (Length: 0.1 deg)	
$B_0(r_0 = 16 m)$	1.866669 T	
F_2 magnet parameters		
Magnet center	18.4 deg	
Magnet length	6.8 deg	
Fringe field fall off	Linear (Length: 0.1 deg)	
$B_0(r_0 = 16 m)$	-1.430895 T	

Cell type	DFD triplet	
Number of cells in the ring	36	
Cell length	6 m	
x_0	16 m	
m-value	$3.9 m^{-1}$	
Packing factor	0.07	
Collimators ($x_{min}, x_{max}, z_{max}$)	(15.5 m, 16.5 m, 0.3 m)	
Periodic cell dispersion	0.26 m	
Horizontal phase advance	13.0 deg.	
Vertical phase advance	15.2 deg.	
D_1 magnet parameters		
Magnet center	0.2 m	
Magnet length	0.1 m	
Fringe field fall off	Linear (Length: 0.04 m)	
$B_0(x_0 = 16 m)$	0.712225 T	
F magnet parameters		
Magnet center	3 m	
Magnet length	0.2 m	
Fringe field fall off	Linear (Length: 0.04 m)	
$B_0(x_0 = 16 m)$	-0.639761 T	
D_2 magnet parameters		
Magnet center	5.8 m	
Magnet length	0.1 m	
Fringe field fall off	Linear (Length: 0.04 m)	
$B_0(x_0 = 16 m)$	0.712225 T	

COST EVALUATION

- Environment in cost estimation
 - Magnet : two cases (1)NC, (2)SC (superferric)
 - Injection system ; not included.
 - No infrastructure (water, power line etc.)

CASE (I) NC MAGNET

	cost (BYen)
magnet	4.5
PS	2.2
vacuum	0.5
control etc.	0.3
TOTAL	7.5

100Yen = 1US\$

- Magnet
 - Arc section
 - No. of magnets (FDF x 8 x 2) 48
 - Weight/magnet ~76 ton/piece, total --> 3648ton
 - Straight section
 - No. of magnets (DFD x 16 x 2) 96
 - Weight/ magnet D: ~0.8 ton. F:~1.6ton, total 102.4 ton
- Power supply
 - Arc section 510kW/magnet, total --> 25 MW
 - Straight section 120kW/magnet total 11.5MW
- Vacuum
 - $<10^{-5}\text{Pa}$

CASE (2) SC(SUPER-FERRIC) MAGNET

	cost (BYen)
magnet	7
PS	0.2
vacuum	0.5
control etc.	0.3
TOTAL	8*

*without refrigerator

- Magnet
 - Arc srciton
 - No. of magnets (FDF x 8 x2) 48
 - SC coil(NbTi) length 10m x 100T = 1000m/
magnet total -->48km
 - Straight section
 - No. of magnets (DFD x 16 x 2) 96
 - SC coil(NbTi) length 2m x 54T = 108m/
magnet total -->10.4km