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Booster Design for the ILSF

H.GHASEM[1,3], D. EINFELD[2], F. SAEIDI[3] and E. AHMADI[3]

[1]School of Particles and Accelerators, IPM, P.O. Box 11395-5531, Tehran, Iran

[2]CELLS-ALBA Synchrotron, Cerdanyola del Vallès

[3]Iranian Light Source Facility, IPM, P.O. Box 19395-5746, Tehran, Iran

➢ ABSTRACT

A full energy 3 GeV booster synchrotron has been designed to boost the electron beam to the target energy of 3 GeV for the proposed third generation synchrotron light source (ILSF) that will be constructed in Iran. The primary goal of the ILSF booster is to design a synchrotron which can deliver a small emittance while at the same time has a low cost in construction.

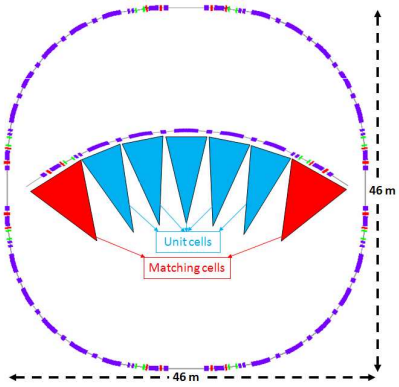
➢ INTRODUCTION

The main task for the injectors of the ILSF storage ring is to generate and accelerate the electrons to the target energy of 3 GeV. The ILSF injector consists of four main systems.

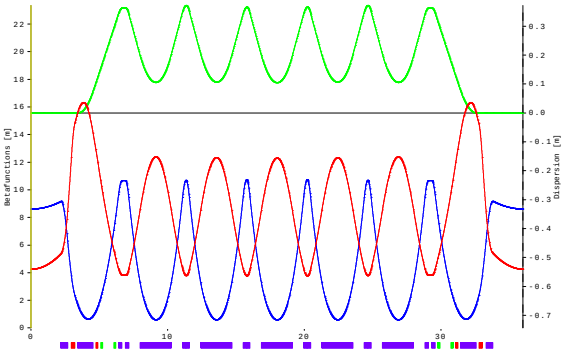
- Linac
- Transfer line from linac to booster (LTB)
- Booster synchrotron
- Transfer line from booster to storage ring (BTS)

➢ LATTICE CHOICES

o1st configuration



Dipole magnets	
Magnetic field at injection (T)	0.057
Magnetic field at extraction (T)	1.150
Length [Matching/Unit cell] (m)	1.390/2.278
Deflecting angle [Matching/Unit cell] (Deg.)	7.5/15
Bending radius (m)	8.701
Quadrupole component (m^{-2})	-0.275
Sextupole component (m^{-3})	-3.136



Parameter	Value
Energy at injection (GeV)	0.15
Energy at extraction (GeV)	3
Circumference (m)	144
No. of super-period	4
Maximum current (mA)	10
Emittance (nm-rad)	13.451
Harmonic number	240
RF frequency (MHz)	500
Tune [Q_x/Q_y]	11.227/3.288
Nat. energy spread	1.0248E-3
Nat. Chromaticity [ξ_x/ξ_y]	-19.91/-8.89
Momentum compaction	5.167E-4
Radiation loss per turn (KeV)	823.4
Damping times[$\tau_x/\tau_y/\tau_s$](ms)	2.25/3.50/2.42
Revolution frequency (MHz)	2.084

➢ LATTICE CHOICES

o2nd configuration

Parameter	Value
Energy (GeV)	3
Circumference (m)	297.6
No. of super-period	22
Current (mA)	400
Emittance (nm-rad)	1.96
Harmonic number	496
RF frequency (MHz)	500
Tune [Q_x/Q_y]	21.170/5.134
Nat. energy spread	1.0125E-3
Nat. Chromaticity [ξ_x/ξ_y]	-56.17/-35.37
Momentum compaction	5.5156E-4
Radiation loss per turn (MeV)	1.002