



Electron Model for Proton FFAG

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Proton FFAG Issues

Space-Charge at Injection -- $\Delta v \sim 0.3 - 0.5$

High Intensity $\sim 10^{13} - 10^{14}$ p/p

Emittance 100π mm-mrad

$\gamma \ll \gamma_T$ Isochronism (may) not be required

Large β variation 0.5 - 1.0

Acceleration: Frequency Modulation

Ferrite (how fast?)

Harmonic Number Jump

CW mode of Operation

Multiple Resonance Crossing

Electron Model for Proton FFAG Accelerator



Table 1. Lattice Parameters of Electron Model

Circumference	9.05484 m
Period Length	0.377286 m
No. of Periods	24
F: Length	4.375 cm
Field	-38.717 G
Gradient	3,739 G/m
D: Length	8.75 cm
Field	90.586 G
Gradient	-3,275 G/m
Drifts: S (half), cm	8.239
g (full), cm	1.875
Phase Advance, H/V	0.32589 / 0.28593
Betatron Tune, H/V	7.82122 / 6.86230
Transition Energy, γ_T	16.914 i
Chromaticity, H/V	-0.8274 / -1.8493

Table 2. Acceleration Parameters of Electron Model

	<u>Injection</u>	<u>Extraction</u>
Kinetic Energy, keV	217.85	816.93
Momentum, keV/c	519.73	1,225.66
β	0.71306	0.92300
Revol. Freq., MHz	2.3618	3.0552
Revol. Period, μ s	0.4234	0.3273
Harmonic Number		3
RF Frequency, MHz	7.085	9.166
Bunch Area (full), eV-s		0.40
Peak RF Voltage, kV		5.824
Energy Gain, keV/turn		2.427
No. of Cavities		1
No. Electrons / Cycle		5.446×10^{10}
Circul. Current, mA	20.59	26.659
Beam RF Power, W	50.04	65.13
Space-Charge Δv	0.50	0.16
Full Emittance, norm.	100 π mm-mrad	
Repetition Rate, Hz	2.5	
Injection Period	0.1122 ms (255 turns)	
Acceleration Period	0.7854 ms (2,200 turns)	
Total Period	0.8976 ms	

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