

Table 3-1. Electron beam operational parameters at SCRF linac end, including rms stability requirements.

Electron Beam Parameters	symbol	nominal	range	units
Final electron energy (operational)	E_f	4.0	2.0-4.14 ¹	GeV
Electron bunch charge (limited by beam power)	Q_b	0.10	0.01-0.3	nC
Max. bunch repetition rate <u>in linac</u> (CW) ²	f_b	0.62	0-0.93	MHz
Average electron current <u>in linac</u>	I_{av}	0.062	0.001-0.3 ³	mA
Average electron beam power at <u>linac end</u> (limit)	P_{av}	0.25	0-1.2 ⁴	MW
Norm. rms transverse slice emittance at undulator	$\gamma\epsilon_{L-s}$	0.45	0.2-0.7 ⁵	μm
Final peak current (at undulator)	I_{pk}	1000	500-1500	A
Final rms bunch length (at undulator)	σ_{z_f}	8.3	0.6-52	μm
Final estimated useable fraction of bunch duration	$\Delta\tau_f/\tau_f$	~50	-	%
Total magnetic compression (cathode to undulator)	C_T	85	25-150	-
Final slice energy spread (rms, with heater)	σ_{E_s}	500	125-1500	keV
<i>Estimated RMS Beam Stability Goals:</i>				
Relative rms electron energy stability (at und.)	$(\Delta E/E_f)_{rms}$	< 0.01	-	%
Relative rms peak current stability (at und.)	$(\Delta I/I_{pk})_{rms}$	< 5	-	%
Bunch arrival time stability (rms, at und.)	$(\Delta t_b)_{rms}$	< 20	-	fs
Transverse centroid stability (rms, at und., 100 pC)	$\Delta x_{rms}/\sigma_x$	< 10 ⁶	-	%