HIGH-ENERGY COLLIDER PARAMETERS: e^+e^- Colliders (III)

Proposed e^+e^- colliders. The numbers here were received from representatives of the colliders in 1993 or early 1994. Numbers are subject to change and many are only estimates; those in parentheses are for later upgrades. Quantities are, where appropriate, r.m.s. H and V indicate horizontal and vertical directions.

	KEKB (KEK)	PEP-II (SLAC)	VLEPP, INP (Serpukhov)
Physics start date	1998	1999	?
Maximum beam energy (GeV)	8×3.5	$e^- \times e^+$: 9×3.1 (6.5 GeV c.m. max)	250
Luminosity (10^{30}cm^{-2}s^{-1})	2000 (→10000)	3000	3000
Time between collisions (μs)	0.01 (→0.002)	0.0042	—
Crossing angle (μ rad)	± 2800 ($\rightarrow \pm 10,000$)	0	?
Energy spread (units 10^{-3})	0.7	e^-/e^+: 0.61/0.81	5–100
Bunch length (cm)	0.5	1.0	0.075
Beam radius (10^{-6} m)	H: 140 V: 1.4	H: 155 V: 6.2	H: 1 V: 0.007
Free space at interaction point (m), angular spread	± 0.2, $(+300/-500)$ mrad cone	± 0.2, ± 300 mrad cone	± 1.2
Luminosity lifetime (hr)	3	2	—
Filling time (min)	6 (→13) topping up	3 (topping up)	—
Acceleration period (s)	—	—	0.0033
Injection energy (GeV)	8/3.5	2.8–12	3.5
Transverse emittance ($10^{-9}\pi$ rad-m)	H: 19 V: 0.19	e^-: 48 (H), 1.9 (V) e^+: 64 (H), 2.6 (V)	H: 0.2 V: 3×10^{-4}
β^*, amplitude function at interaction point (m)	H: 1.0 V: 0.01	e^-: 0.50 (H), 0.02 (V) e^+: 0.375 (H), 0.015 (V)	H: 5×10^{-3} V: 10^{-4}
Beam-beam tune shift per crossing (units 10^{-4})	500	300	—
RF frequency (MHz)	508	476	1.4×10^4
Particles per bunch (units 10^{10})	1.3/3.2	e^-/e^+: 2.7/5.9	10–20
Bunches per ring per species	1024 (→5120)	1658	1
Average beam current per species (mA)	220/520 (→1100/2600)	e^-/e^+: 990/2140	0.003
Circumference or length (km)	3.02	2.2	2×3
Interaction regions	1	1 (2 possible)	1
Utility insertions	3	5	—
Magnetic length of dipole (m)	2.56/0.42	e^-/e^+: 5.4/0.45	—
Length of standard cell (m)	19	15.2	1.2
Phase advance per cell (deg)	90	e^-/e^+: 60/90	20–90
Dipoles in ring	224	e^-/e^+: 192/192	—
Quadrupoles in ring	343/341	e^-/e^+: 282/282	20,000
Peak magnetic field (T)	0.3/0.85	e^-/e^+: 0.18/0.75	—