

PEP-II Planning for 2003-2009

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For the PEP-II Team

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PEP-II and KEKB Possible Luminosity Gains

(estimated by J. Seeman June 2003)

Effect	PEP-II	PEP-II Gain	KEKB	KEKB Gain
Lower β_y^*	12 \rightarrow 7 mm	1.5	6 \rightarrow 6 mm	1.0
Move x tune to 0.52	In progress	1.0	Done	1.0
Move x tune to 0.505	Later	1.2	In progress	1.1
Increase currents	In progress	2.0	In progress	1.3
Stronger LER solenoids	In progress	1.4	In progress	1.2
X-angle or Crab cavities	Not needed	1.0 (1.1)	2005-2006	1.5 (2.0)
Increased injection rate	30 \rightarrow 60/120	1.1	Done (50 Hz)	1.0
Or Continuous injection	Needs study	1.1 (1.2)	Needs study	1.05
Or two bunch injection	Needs study	1.1	Done	1.0
Total factor	75% of gain	4.2 (5.0)	75% of gain	2.0 (2.7)

PEP-II Integrated Luminosity Goals

Date	PEP-II delivered goal	Loss to other programs	Net delivered	BaBar losses	Net recorded	Total recorded
	(fb-1)	(fb-1)	(fb-1)	(fb-1)	(fb-1)	(fb-1)
July 2003	--	--	140	8	132	132
July 2004	116	12	104	6	98	230
July 2006	343	35	308	20	288	518

Beam Parameters

- June 2003: 1.45A x 1.1 A $\beta_y^*=12$ mm 939 bunches L=6.6E33
- July 2004: 2.7A x 1.6 A $\beta_y^*=9$ mm 1450 bunches L=12.1E33
- June 2005: 3.6A x 1.8 A $\beta_y^*=8.5$ mm 1500 bunches L=18.2E33
- July 2006: 3.6A x 2.0 A $\beta_y^*=6.5$ mm 1700 bunches L=23.0E33
- July 2007: 4.5A x 2.2 A $\beta_y^*=6$ mm 1700 bunches L=33.E33

Major Goals for Evaluation Focus Groups

- Parameters:
 - Check for consistent parameter sets.
 - Can we get the luminosity in other ways? (Low emittance gets 1×10^{33} .)
 - Check for instability thresholds with 1700 bunches.
 - How bad are the parasitic collisions?
 - Check beam-beam effect at low β_y^* and short bunches?
 - ECI in by-2 bunch pattern?
 - Do we need an IP crossing angle in 2006?

Major Goals for Focus Groups

- Lattice/Model:
 - Fix all beta-beats
 - Lower β_y^* in both rings from 12 mm to 6.5 mm.
 - Raise LER ν_x from 38.5 to 48.5 to reduce α . More sextupoles?
 - Raise HER ν_x from 24.5 to 34.5 to reduce α . More sextupoles?
 - Can we get low β_y 's without changing the IR (like KEKB)?
 - Would a super-conducting IR be better to low betay?

Group goals (Cont.)

- RF system:
 - Install HER-8 station in 2003
 - Install LER-4 station in 2004
 - Install HER-9 station in 2004
 - Install HER-10 station in 2005.
 - Total LER current = 3600 mA.
 - Total HER current = 2000 mA.
 - Reduce RF aborts from 10 per day to 0.5 per day.
- Feedback systems:
 - Make LLRF feedback capable of 3.6 x 2 A.
 - Make LFB system capable for 3.6 x 2 A with 1700 bunches.
 - Make TFB system capable for 3.6 x 2 A with 1700 bunches.

Group goals (cont.)

- Diagnostics:
 - Make all BPMs with x-y readout
 - Improve LER synchrotron light monitor.
- Vacuum systems:
 - New Q5 chambers
 - New Q4 chambers
 - New Abort windows
 - New Q1 chambers
 - New B1 chambers
 - New LER bellows
 - New LER transition chambers
 - New IR radial ion pumps
 - New HER Luminosity chamber

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Group goals (cont.)

- **Reliability/Uptime:**
 - Increase peak to average luminosity from 45% to 60%.
 - Reduce aborts from 10 per day to 1 per day.
 - Reduce chronic event failures.
 - Reduce single event failures.
- **Injection:**
 - Increase injection rate by trickling, 60 Hz, or multi-bunches per shot.
 - Reduce injection losses.
 - Reduce BaBar backgrounds from injection.

Group goals (cont.)

- Machine/Detector Interface:
 - HER current increases by 2x.
 - LER current increases by 2.5x.
 - Luminosity increases by 4x.
 - Is the new IR design acceptable?
- New IR Design:
 - Lower β_y^* to 8.5 mm in 2005.
 - Lower β_y^* to 6.5 mm in 2006.
 - Add IP crossing angle of 4 mrad in 2006? (Beam-beam says no!)
 - Beam stay clear issues?
 - Permanent magnets or Superconducting?