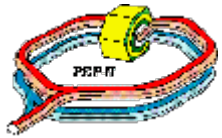


AC Power for a Super-B Factory

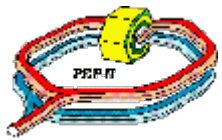
John T. Seeman

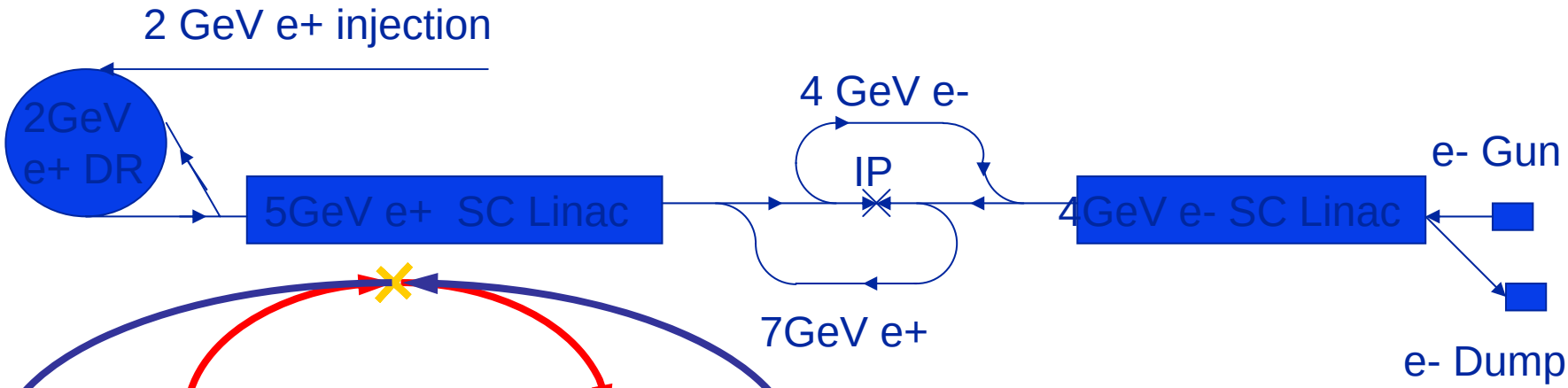
SBF Workshop

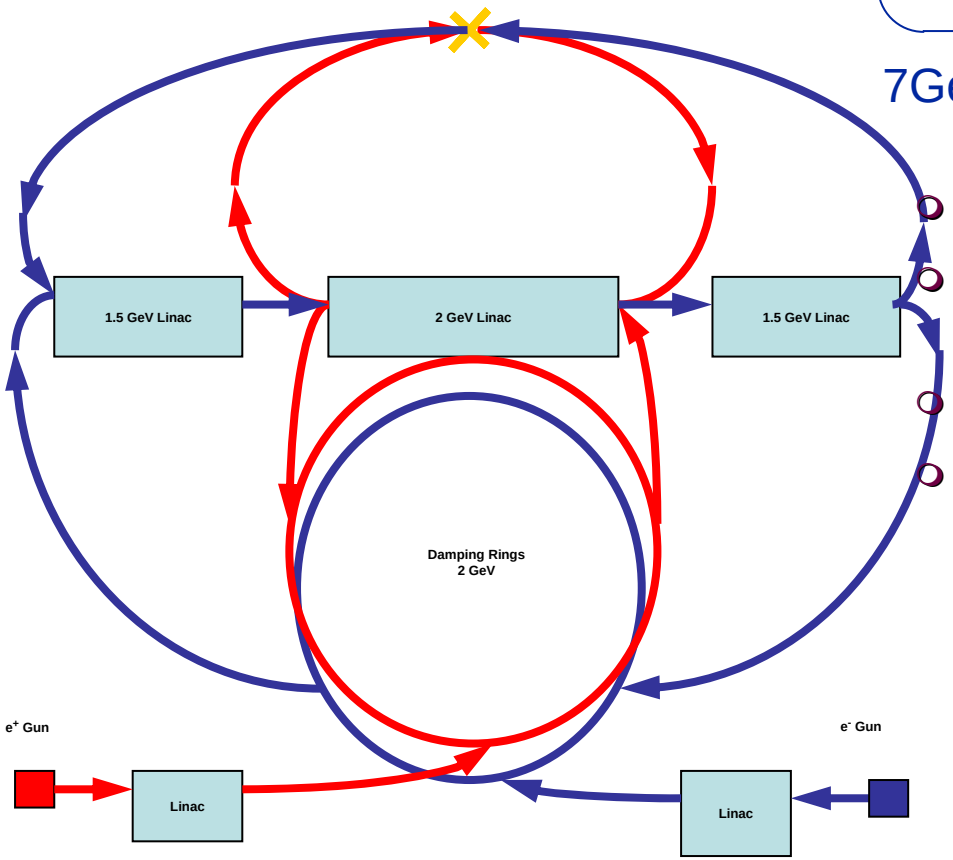
SLAC

June 15, 2006

Linear Super B schemes with acceleration and energy recovery, to reduce power

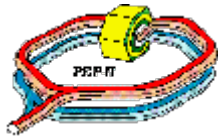






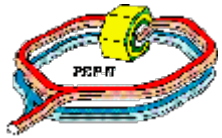
- **Use SC linacs to recover energy**
- **Use lower energy damping rings to reduce synchrotron radiation**
- **No electron damping ring**
- **Make electrons fresh every cycle**
  - **Damping time means time to radiate all energy**
  - **Why not make a fresh beam if storage time is greater than 1 damping time**

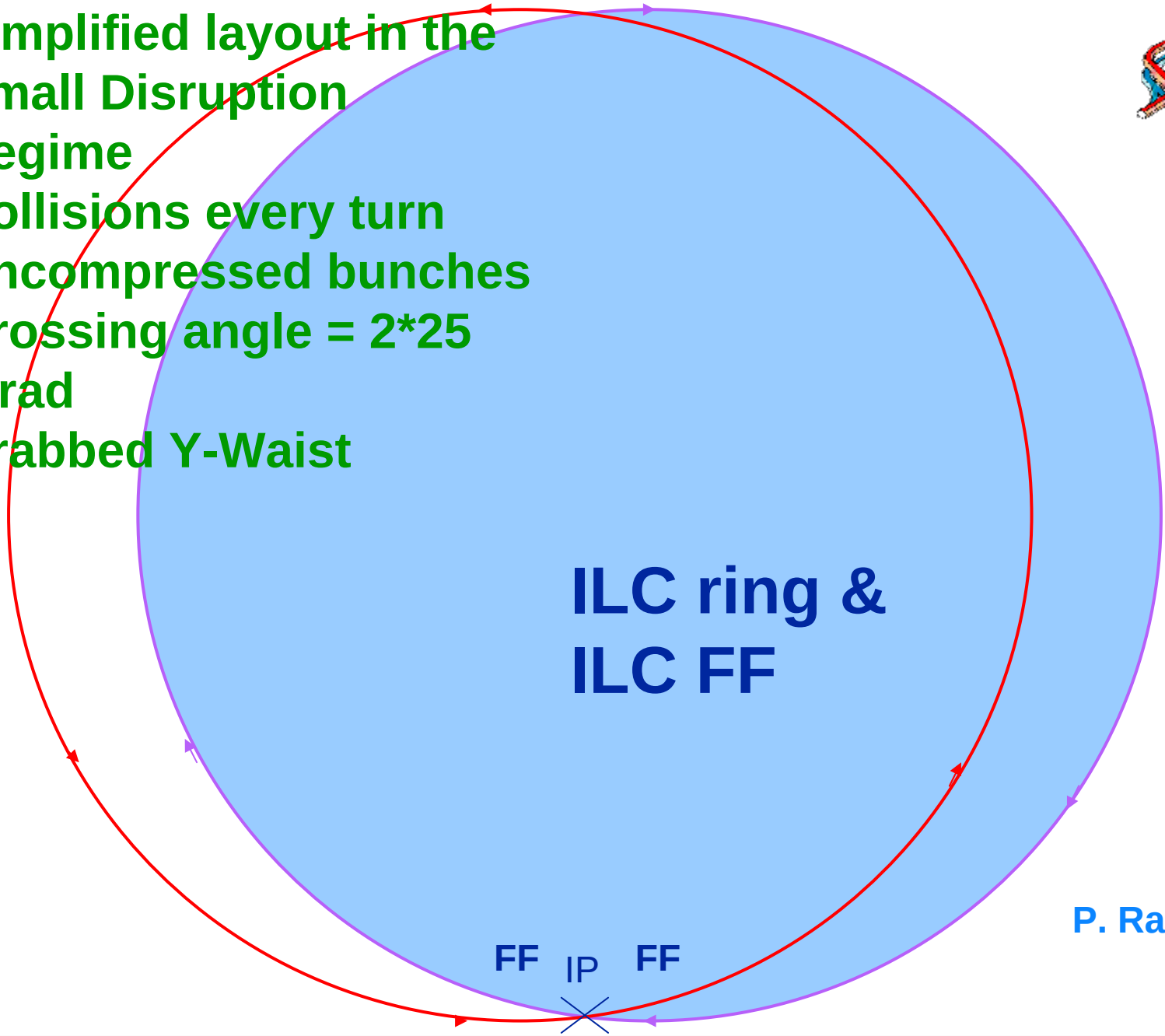
Use SC RF for ERL



- Power for cryogenics.
- Little power for beam.
- Cryo-power is likely (much?) less than saved RF power.

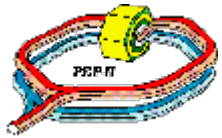
Simplified layout in the Small Disruption Regime
Collisions every turn
Uncompressed bunches
Crossing angle = 2*25 mrad
Crabbed Y-Waist





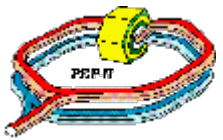
P. Raimondi

PEP-II Power



- SLAC campus = 15 MW
- Linac running at 30 Hz = 8 MW
- PEP-II magnets = 6 MW
- PEP-II RF (9 x 3.1 GeV) (2.7 A x 1.7 A) = 15 MW
- SPEAR = 5 MW
- Total = 49 MW

M. Biagini April 2006



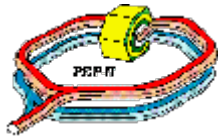
	SBF 4 GeV	SBF 7 GeV
C (m)	3006.	3006.
B_w (T)	1.6	1.6
L_{bend}(m)	5.6	11.2
B_{bend} (T)	0.078	0.136
Uo (MeV/turn)	4.6	7.8
N. wigg. cells	8	4
τ_x (ms)	17.5	18.
τ_ε (ms)	8.8	9.
ε_x (nm)	0.54	0.54
σ_E	1.1×10^{-3}	1.45×10^{-3}
I_{beam} (A)	2.5	1.4
P_{beam}(MW)	11.5	10.9

cm $\sigma_E = 0.9 \times 10^{-3}$

Total Wall Power (66% transfer eff.): 34 MW

AC efficiency = 50% ?
=(65% klystron+90% power supply + 15% off klystron peak for stability)

Approximate SBF Site Power (3 km ring)



- Campus +detector = 5 MW
- Linac and e+ at 30 Hz = 10 MW
- Magnets (~1.5 x PEP-II) = 10 MW
- RF (4 x 7 GeV) (2.5 A x 1.4 A) = 22.4 x 2=45 MW
- Total = ~70 MW