Consistency Check

1.8 GeV ERL Scheme

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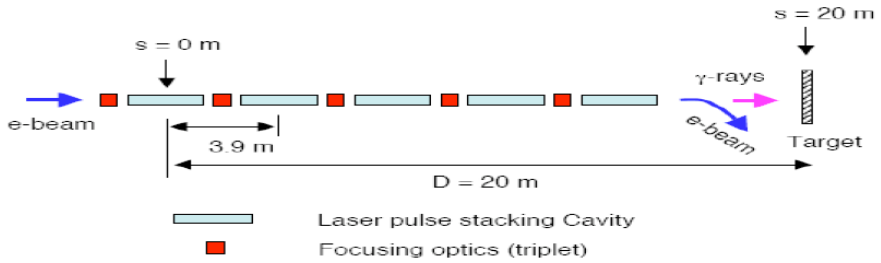
Gamma-ray Generation (CAIN simulation by T. Omori)



Electron beam

- E_beam = 1.8 GeV
- Ne/bunch = 1x10^{10}
- beta_horizontal = 0.16 m
- beta_vertical = 0.16 m
- emittance_horizontal = 4.51x10^{-10}
- emittance_vertical = 4.51x10^{-10}
- sigma_horizontal = 8.4 micron (in the first collision point)
- sigma_vertical = 8.4 micron (in the first collision point)
- sigma_longitudinal = 0.2 mm (0.7 psec)

Laser beam (for each collision point)

- Energy in a pulse = 0.6 J
- sigma_rateral = 5 micron
- sigma_longitudinal = 0.24 mm (0.8 psec)

Laser Electron Crossing Angle

0.087 rad (5 degree)

N_gamma = 0.75x10^{10} (1.8 GeV & 5 CPs)

Capture Simulation (by Vivoli-san 20080218)

Type	N. γ	Yield e^+/γ %	N. e^+	ε_z π cm MeV	N. e^+ / 4 π ε_z e^+ / (cm MeV)
1.8 / 5	0.75 10^{10}	0.88	6.65 10^7	2.15	2.19 10^6
1.8 / 5 B. C. 1	0.75 10^{10}	0.90	6.78 10^7	3.89	1.23 10^6
1.8 / 5 B. C. 2	0.75 10^{10}	0.81	6.08 10^7	2.51	1.73 10^6

Ne+(Captured)/N_gamma ~ 1 %

Stacking Simulation (by Frank-san 20080218 and 20080310)

proposed injection scheme

- ILC 2008: inject every second turn (80 MHz ERL) into the same bucket - 30 times; then wait 10 ms (~450 turns, ~1 damping time) and repeat 9 times; total injections/bucket: 300; synchrotron phase advance between two injections: 0.134

I am now trying
- ✓ energy pre-compression [x3] (R. Chehab)
- ✓ additional DR wigglers for faster damping [x2]
- ✓ larger rf voltage [x 1.5]

only 10.6% of injected e+ are lost!
loss fraction for single cycle similar

Ne+/bunch after stacking?

(a) N_gamma/buch = 0.75x10^{10} (1.8 GeV & 5 CPs)

(b) Ne+(Captured)/N_gamma ~ 1 %

(c) N_stack = 300

(a) x (b) x (c) --> Ne+/bunch = 2 x 10^{10}

It seems OK,,,,,,

However ----> Next page

Difficulties in ERL

Electron beam (ERL)

Ne/bunch = 1x10^{10} -> 1.6 nC difficult

1x10^{10} x 80 MHz --> 130 mA difficult

(80 MHz <--> inject every second turn)

wait 10 m sec for damping in DR not preferable

Other Solutions ?

(1) inject every 20th turn & avoid waiting

8 MHz ERL

Ne/bunch = 1x10^{10} -> 1.6 nC difficult

1x10^{10} x 8 MHz --> 13 mA moderate

Is stacking OK?

(2) Use storage ring instead of ERL

bunch length 0.7 p sec difficult

very small momentum compaction?

crab crossing?