stacking simulations for e+ Compton source - update 4

Frank Zimmermann

Thanks to: Alessandro Vivoli, Tsunehiko Omori, Robert Chehab, Louis Rinolfi, Alessandro Variola, Vitaly Yakimenko

12 May2008

continuous stacking (ERL option), 20 MHz (Omori san, Variola san) **650 injections** over 5100 turns (inject every 6th turn), followed by 5155 turns (~100 ms) damping; damping time 6.4 ms;

inject with constant offset δ=1.2%

σ_z=9 mm, **$\sigma_{\delta 0}$=1x10^{-4}** (small!) **63.7% loss**

Omori san asked about "unstable point" injection

offset **δ=1.2% or 0.4%, z=0.1 m**: **99.8% loss**

offset δ=0.2%, z=-0.1 m: 99.9% loss

offset δ=0.5%, z=0.01 m: 72.8% loss

offset δ=0.7%, z=0.01 m: 50% loss!! Method works!?

offset δ=0.8%, z=0.01 m: 41.8% loss!

offset **δ=0.9%, z=0.01 m**: **36.7% loss!**

last time ~80% loss for continuous inj., now <37%

CLIC beam parameters (updated by Louis Rinolfi):
at IP: 3.72×10^9 ppb, 312 bunches, 0.5 ns spacing,
156 ns (=) train length, 50 Hz repetition rate
request 6×10^9 ppb e+ to account for downstream loss
6.2×10^{10} e-/bunch in 1.3 GeV Compton ring
→ ~7×10^8 photons → 1.4×10^7 e+ injected into pre-DR
accumulation over 460 turns yields target e+ number;
could split this into 20x23 injections e.g.
minimum pre-DR circumference: 47 m
Q_s is ~variable pre-DR parameter;
at exit of 2.2 GeV linac: **σ_δ=2.6%??, σ_z=5mm** (A.Latina)
CLIC damping ring circumference: 365.2 m
7 full trains fit into DR (7x more time for stacking;
total available time 7x20 ms=140 ms!)

further ideas:

- optimize injection offsets for minimum loss (ILC)
- energy precompressor after linac for both ILC & CLIC
- determine “optimum” pre-DR parameters
- several stacked pre-damping rings for CLIC if needed