

POSIPOL 2006
impressions & ideas

Frank Zimmermann



A. Variola

Compton ring

yield with realistic lattice, energy spread, rf power,
Touschek lifetime, instabilities, optical cavities near
heat-load limit ...

(P. Gladkikh, S. Guiducci, E. Bressi, J. Urakawa...)

crab crossing (A. Variola)

compression at Compton IP (J. Urakawa)

maximum no. γ / e- / collision

$$P = Z_R \frac{8\pi}{3} \alpha \frac{\xi^2(0)}{\lambda} \arctan\left(\frac{l_{\text{int}}}{2Z_R}\right) \frac{\sigma}{\sigma_T}$$

$$\frac{\sigma}{\sigma_T} \approx 2.6$$

$P \sim 1$, with $Z_R \sim 300 \mu\text{m}$, $l_{\text{int}} \sim 10 Z_R$, $\lambda = 1 \mu\text{m}$, $\xi^2 \sim 0.1$

undulator & Compton γ 's

in principle equivalent, but not quite

(V. Strakhovenko)

photon spectrum

mean photon energy

angular photon distribution

power on conversion target

collimation efficiency

cost

lasers

- great progress (all talks)
- fiber lasers and TB products both promising (Y. Zaouter, T. Ruchti)
- parameters close to what we need

better integration into design

ILC:

use e- DR as Compton ring (A. Variola)

CLIC:

perhaps avoid Compton ring →

head-on collisions (V. Yakimenko),

use CLIC drive beam (T. Levefre);

laser pulse can still be stacked in optical cavity;

head-on collisions; higher-energy photons

50-100 MeV (T. Omori);

do we throw away the Compton collided part of
drive beam?

CLIC drive beam parameters

parameter	symbol	value
energy	E	1.2 GeV
emittance	$\gamma\epsilon$	150 μm
beam size @ $\beta=0.1$ m	$\sigma_{x,y}$	80 μm
bunch length	σ_z	400 μm
bunch population	N_b	10^{11}
repetition rate	f_{rep}	150 Hz
bunch spacing	L_{dist}	0.067 ns
bunches/train	n_b	1952

estimate $\sim 10^7$ e+ / Compton IP; still needs ~ 300 collisions / e+ bunch

R & D

test Compton collision with CTF-3 drive beam?! (T. Lefevre)

possibility to install optical cavity from LAL??
(F. Zomer)

test (e-) accumulation @ ATF or “ATF-3”
(ATF/ATF-3 talks by H. Sato, K. Sakaue,
and J. Urakawa)

CTF-3 parameters

parameter	symbol	value
energy	E	200-400 MeV
emittance	$\gamma\varepsilon$	1-4 μm
beam size at $\beta=1$ m	$\sigma_{x,y}$	35-100 μm
bunch length	σ_z	300 μm
bunch population	N_b	6-30x10 ⁹
repetition rate	f_{rep}	5 Hz
bunch spacing	L_{dist}	0.067-0.67 ns
bunches/pulse	n_b	1-2100

assuming beam is generated by rf gun