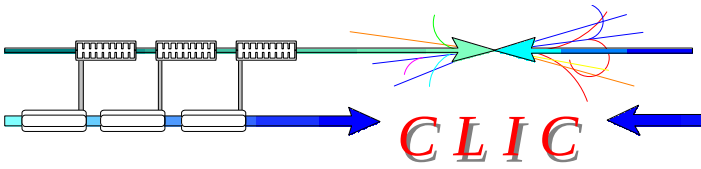


Injectors and Damping Rings working group summary

No time to discuss the damping rings in this talk.

Y. Papaphilippou (replacing S. Guiducci), L. Rinolfi

Shortened and modified by I. Bailey

ILC Positron Source Collaboration Meeting

A brief overview of the 2 days:

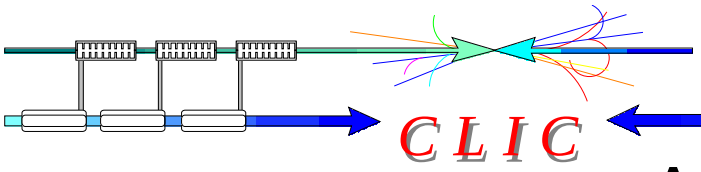
Number of talks: 26

A common session of 3 talks with "Instrumentation" and "Tests Facilities" working groups

Attendance: ≈ 25 to 30 persons in general for each session

26 speakers coming from 11 laboratories and universities:
ANKA (D), ANL, BINP, CERN, Cockcroft Institute, FNAL, IPNL (Lyon), KEK, PSI, Lancaster University, LNF (Frascati),

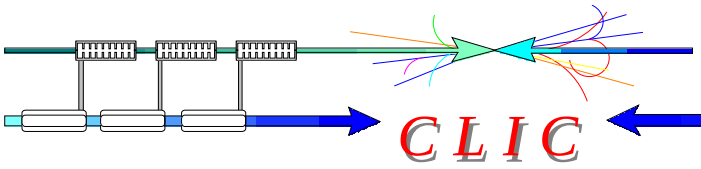
institutes also working on ILC positron source



CLIC Main beam parameters

At the entrance of the Main Linac for e^- and e^+

		NLC (1 TeV)	CLIC 2008 (0.5 TeV)	CLIC 2008 (3 TeV)	ILC (0.5 TeV)
E	GeV	8	9	9	15
N	10^9	7.5	7	3.72 - 4	20
n_b	-	190	312	312	2625
Δt_b	ns	1.4	0.5	0.5 (6 RF periods)	369
t_{pulse}	ns	266	156	156	968925
$\varepsilon_{x,y}$	nm, nm	3300, 30	2400, 10	600, 10	8400, 24
σ_z	μm	90-140	72	43 - 45	300
σ_E	%	0.68 (3.2 % FW)	2	1.5 - 2	1.5
f_{rep}	Hz	120	50	50	5
P	kW	219	180	90	630



Preliminary overview

The CLIC Main Beams Injector Complex has 3 studies corresponding to 3 configurations:

1) Base Line configuration:

The study is based on 3 TeV (c.m.) with unpolarized e^+ source and with ultra low emittances for the Damping Rings.

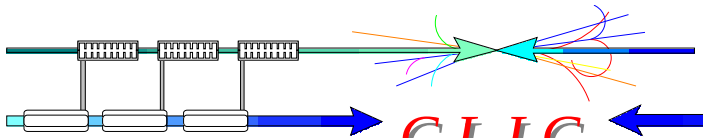
2) Compton configuration:

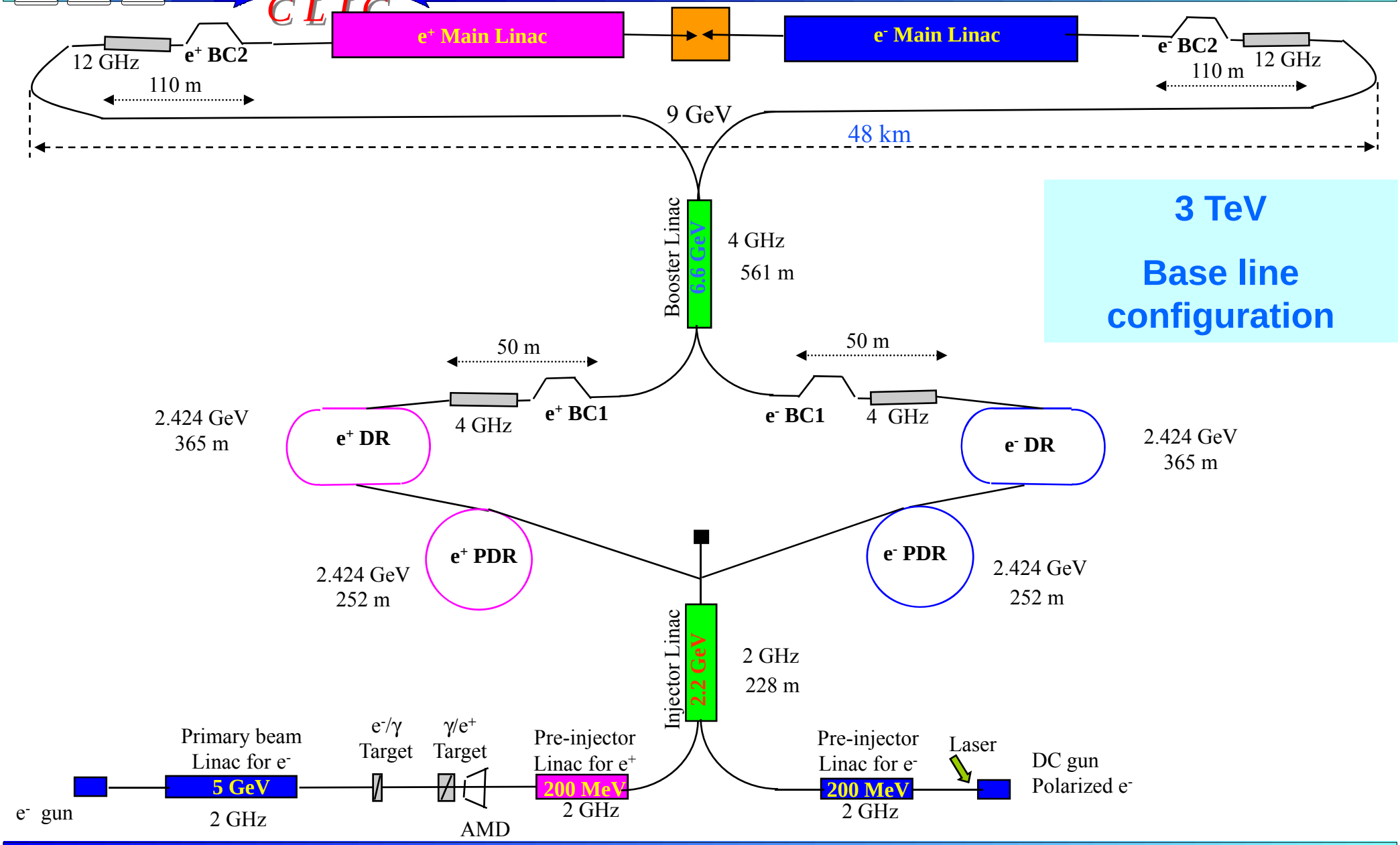
The study is based on 3 TeV (c.m.) with polarized e^+ source. The undulator option is considered as an alternative.

3) Low energy configuration:

The study is based on 500 GeV (c.m.) with relaxed beam parameters for the Damping Rings but with a double charge per bunch for the lepton sources.

The CLIC Injector complex in 2008





3 TeV

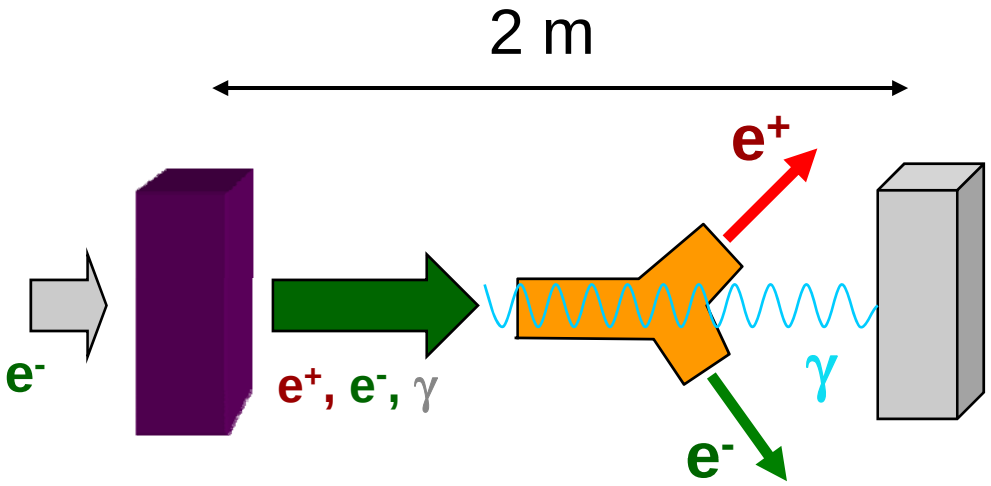
Base line configuration

Unpolarized e^+ source from channeling

R. Chehab / IPNL Lyon

PRELIMINARY CONCLUSIONS for 3 TeV

- The hybrid positron source provides the needed yield for CLIC.
A yield >1 e^+/e^- is reachable using only photons coming from the crystal
- The Peak Energy Density Deposition remains under the critical value of 35 J/g (for W) both for the thin crystal and the thick amorphous target.

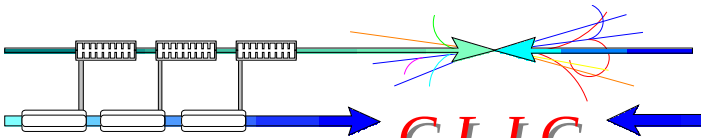


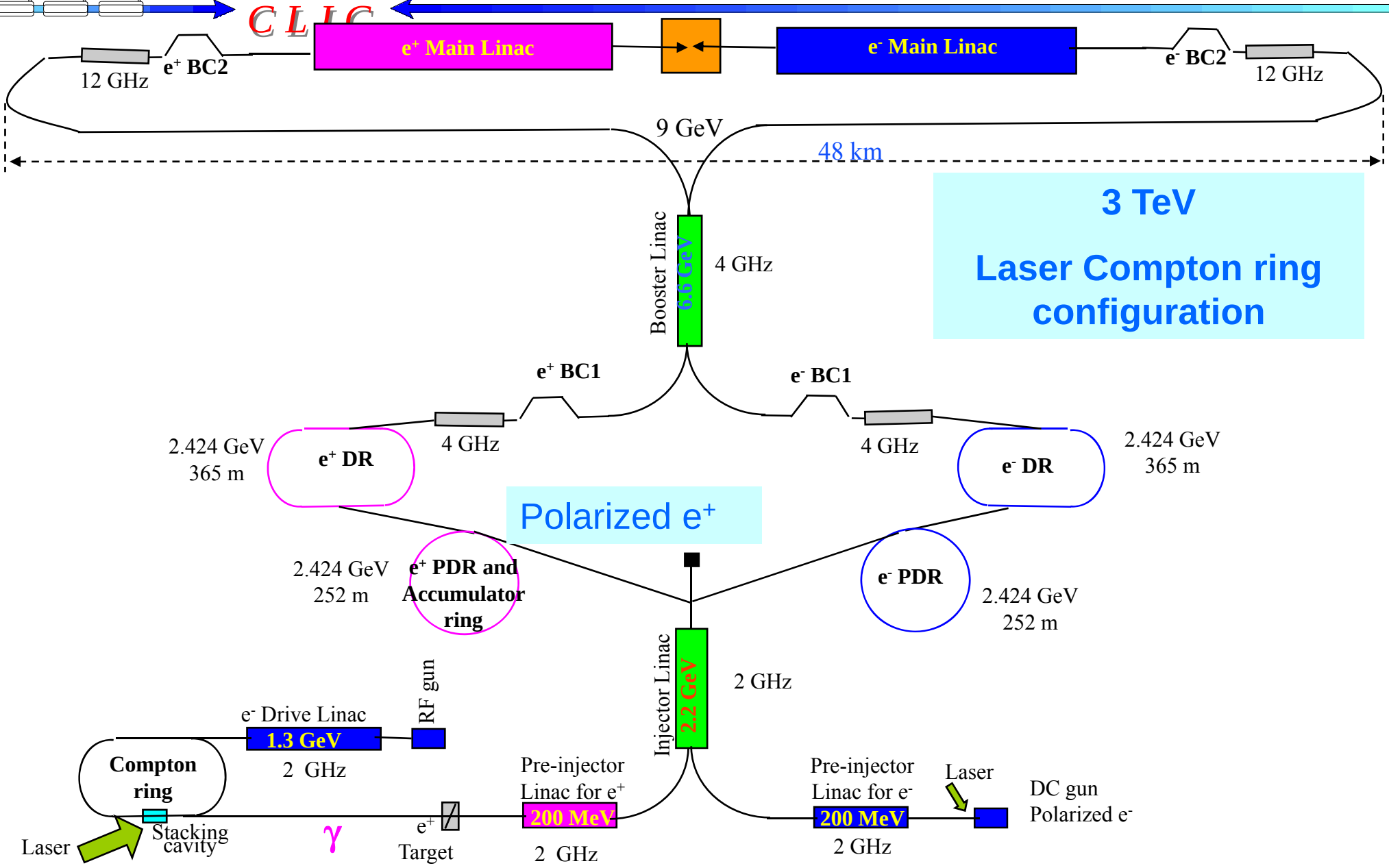
PEDD calculated
= 15.5 J/g

See talk by I. Bailey tomorrow.

At 500 GeV, charge is doubled => Study if a double target stations could be avoided ??

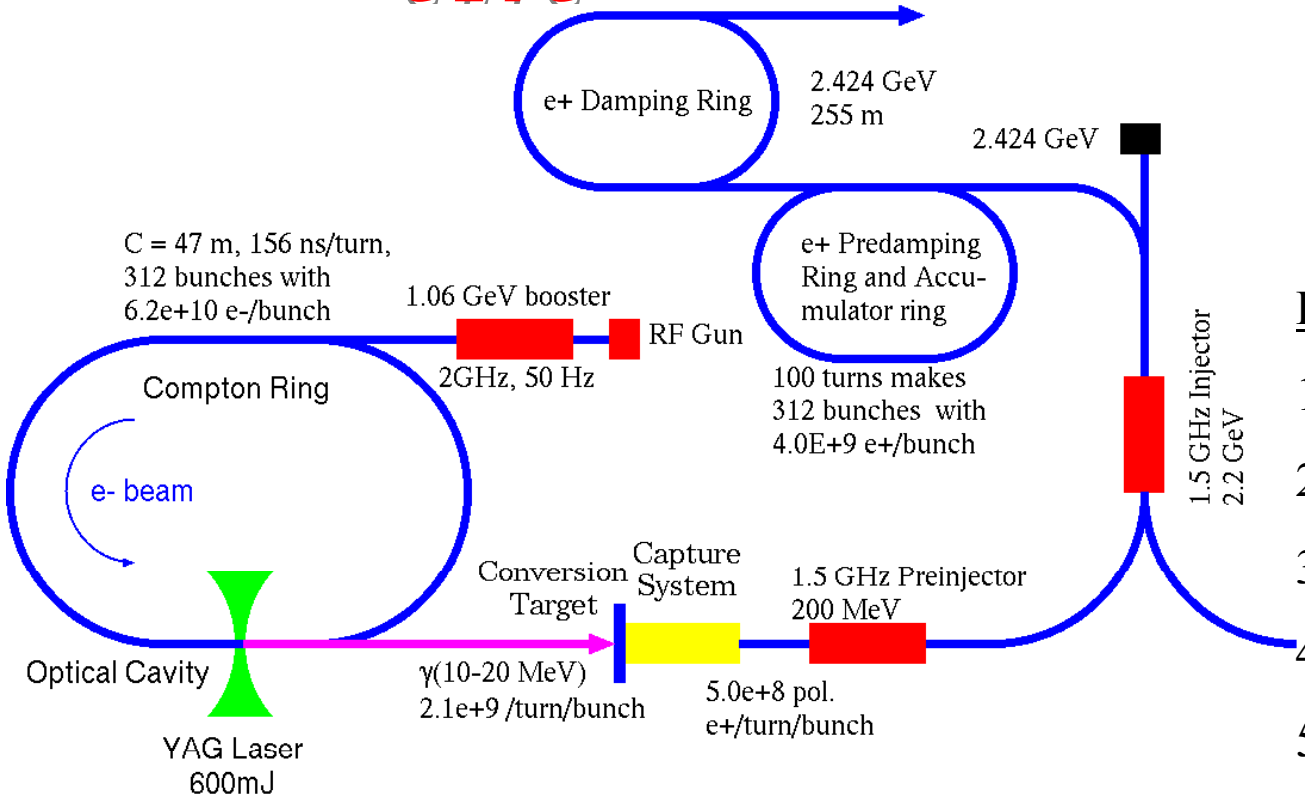
The CLIC Injector complex (Compton ring)





CLIC Compton Scheme

J. Urukawa / KEK



ILC/CLIC common issues on Compton:

1) Number of e^- (beam stability)

2) Optical cavity

3) High quality and high power laser

4) Choice of ERL parameters

5) Energy compression before (P)DR

6) Short Damping Time for (P)DR

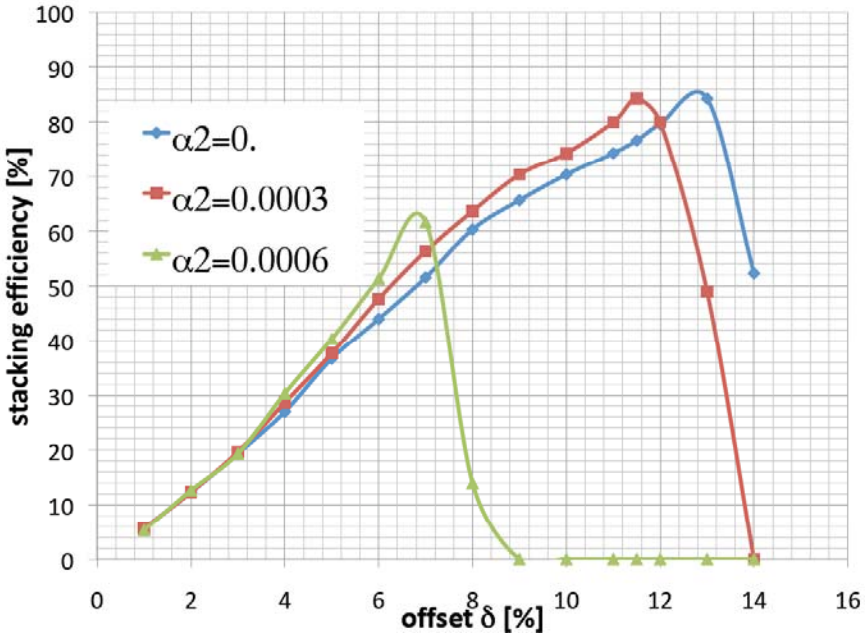
7) e^+ stacking

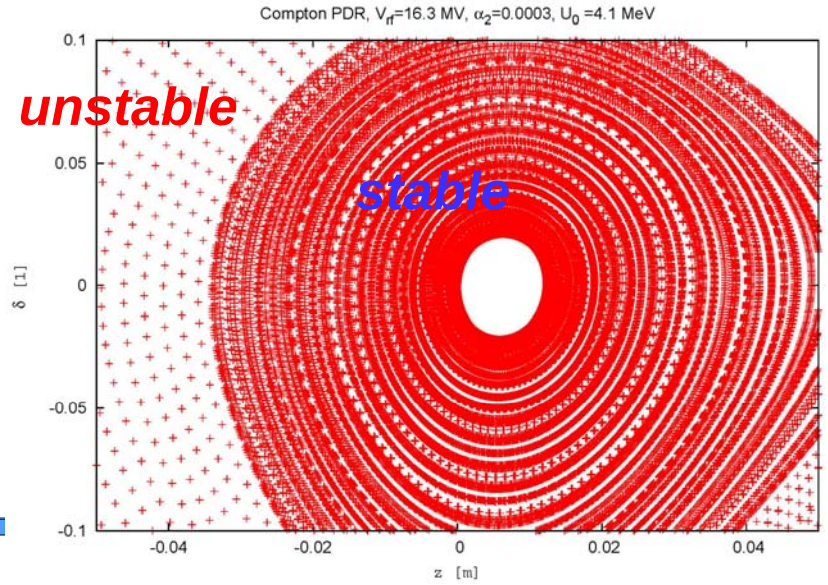
Collaboration on Positron Generation strongly supported by CLIC and ILC managements (J.P. Delahaye@PosiPol08)

Stacking of polarized e+ into the PDR

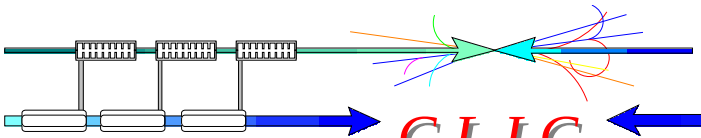
F. Zimmermann / CERN

- CLIC Compton source using ERL or CR
- e+ emittance preservation after capture
- CLIC PDR parameters should have a **low** a_2 (4×10^{-4}) and **high** V_{RF} (~16MV)
- 95% efficiency can be achieved with off-momentum off-phase injection
- Needs **10% of momentum acceptance** in PDR (off momentum DA)
- quite some flexibility (# optical cavities vs. e- bunch charge) but a few **challenges** for PDR design





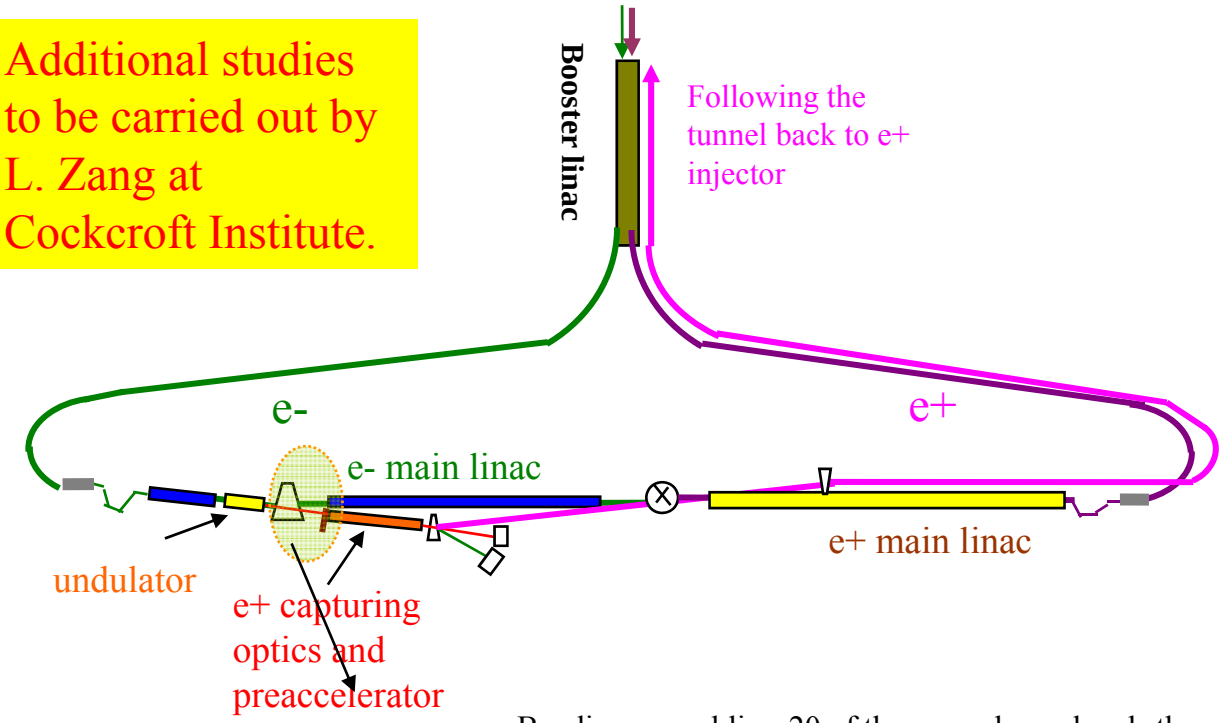
The CLIC Injector complex (Undulator)

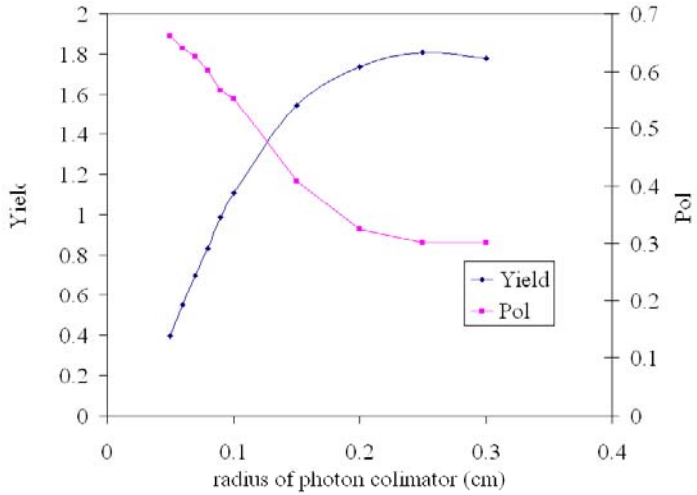


A ~~possible~~ CLIC layout with undulator based e+ source

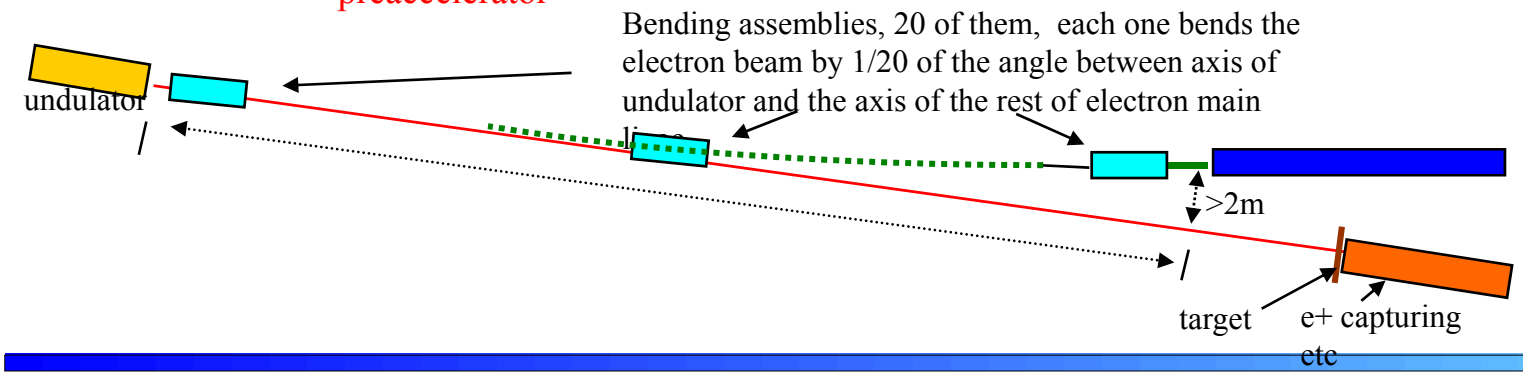
W. Gai / ANL

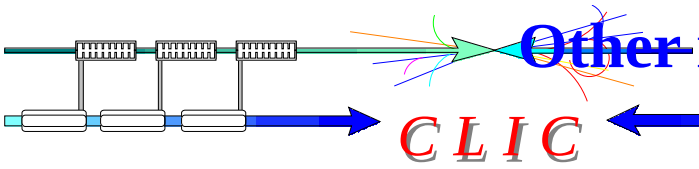
Additional studies to be carried out by L. Zang at Cockcroft Institute.





Simulations shows that the undulator will not dilute the emittance of the e- beam.





Other relevant issues (I. Bailey subjective choice)

Polarized e- source

➢ For 500 GeV CLIC option, the gun could be a critical issue if the charge is doubled.

Booster Linac

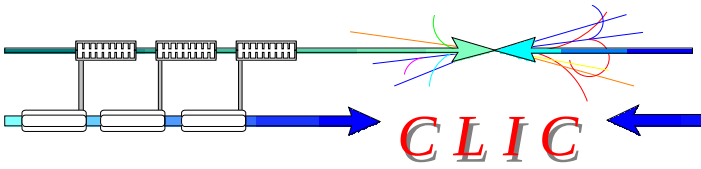
➢Effects of long range wake fields remains to be studied.

Damping Rings

➢Intra-beam scattering in damping rings is a concern. Relationship with polarisation needs to be understood. (Role for ILC spin trackers?)

Spin Transport

➢Need for complete start-to-end simulation recognised.

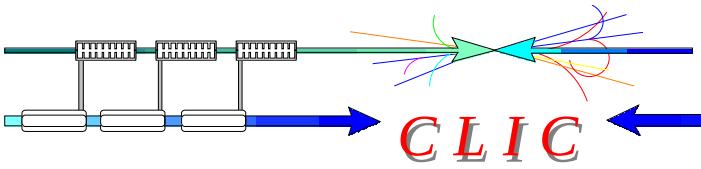


CLIC/ILC DR common issues

S. Guiducci / LNF

- Intense interaction between ILC/CLIC in the community working on the DR crucial issues: ultra low emittance and e-cloud mitigation.
- Common WEBX collaboration meetings already organized for CESRTA, ILC and CLIC DR (inscribe yourself in the mailing list)
- It is very important to strengthen the collaboration and include also other beam dynamics and technical aspects.

	ILC	CLIC
Energy (GeV)	5	2.4
Circumference (m)	6476	365
Bunch number	2700 - 5400	312
N particles/bunch	2×10^{10}	3.7×10^{9}
Damping time τ_x (ms)	21	1.5
Emittance $\gamma\varepsilon_x$ (nm)	4200	381
Emittance $\gamma\varepsilon_x$ (nm)	20	4.1
Momentum compaction	$(1.3 - 2.8)\times10^{-4}$	0.80^{-4}
Energy loss/turn (MeV)	8.7	3.9
Energy spread	1.3×10^{-3}	1.4×10^{-3}
Bunch length (mm)	9.0 - 6.0	1.53
RF Voltage (MV)	17 - 32	4.1
RF frequency (MHz)	650	2000



Conclusion

1) Enormous progress have been made for the CLIC Main Beam Injector Complex since the last CLIC workshop (CDR in 2010)

2) Two new ILC/CLIC working groups are in place for:

i) Damping Rings

ii) e^+ sources

3) The CLIC Main Beam Injector Complex is considered as a classical ensemble based on conventional technology which should provide the requested beam parameters at the entrance of the Main Linacs (easily):

BUT

a) For the Base Line configuration, crucial studies remain to be performed.

b) For polarized e^+, an intense R&D is necessary.

c) For the 500 GeV option, requesting a double charge per bunch, intense studies are necessary to confirm the feasibility (at lower cost).