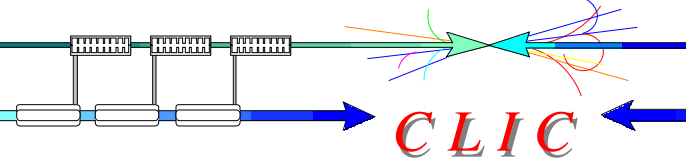


Update on CLIC/ILC common issues for the sources

J. Clarke and L. Rinolfi



"ILC/CLIC e^+ generation" working group

Officially set-up at University of Illinois Chicago - UIC
during ILC08 workshop: 15th - 20th November 2008

ILC convener: J. Clarke (Daresbury)



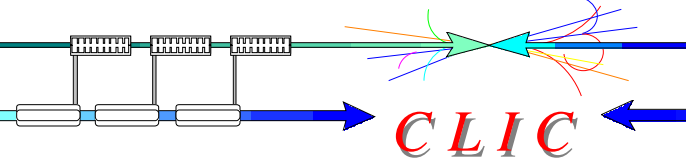
CLIC convener: L. Rinolfi (CERN)



Monthly regular Webex meetings, called "ILC/CLIC e^+ studies" managed by T. Omori / KEK

Distribution list: owner-ph-ilc-clic-positronsource@durham.ac.uk

Updated mandate of the working group

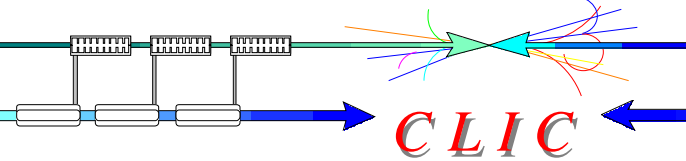


For **polarized electron** sources, ILC and CLIC studies are based on photo-injectors using a DC gun with different parameters.

For **polarized positron** sources, the ILC study considers the Undulator option as the base line while the Compton schemes are alternative options. The CLIC study considers the Compton schemes as the base line while the Undulator is an alternative option. Additionally, both projects are interested in the **development of conventional sources** (ILC as an alternative option and CLIC as the baseline for the CDR).

The working group should:

- Develop the synergy between the ILC and CLIC e^+ and e^- studies.
- Evaluate the common technical issues related to production of unpolarized and polarized positrons.
- Prioritize R&D.
- Review the existing tests facilities where further tests could be performed.
- Invite experts from different institutes to contribute to the studies.
- Evaluate where cost savings could be obtained.
- Promote common meetings and workshops.



CLIC/ILC work plan as defined in 2008



Short-term plan 2008 - mid-2009

a) Undulator-based source

Develop Geant4 model of collimator, target, capture optics, and capture RF assembly.
Optimise parameters wrt yield, polarisation and cost (Collaboration with ANL).
Consider timing constraints issues and upgrade paths.
Consider electron beam quality issues.

b) Compton source

Design of the Compton ring (Collaboration with NSC KIPT).
Optical stacking cavity (Collaboration with LAL and KEK).
High power lasers.
Stacking simulations.

c) Lithium lens capture optics

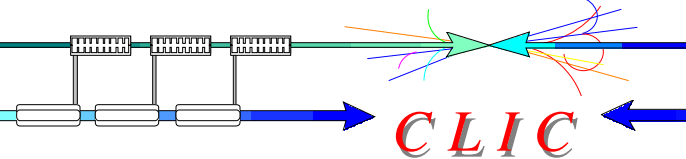
Evaluate suitability for Undulator and Compton schemes (Wide collaboration needed).

d) Conventional sources (Conventional targets and hybrid targets)

Simulations to optimize the unpolarized e^+ yield (Collaboration with LAL).
Evaluate the applicability of the Li lens.

e) Electron source

Set-up the CERN, CI, JLAB, SLAC collaboration for tracking studies.
Preliminary tests at HV for the DC gun.



CLIC/ILC work plan as defined in 2008



Long-term plan mid-2009 - mid-2010

Undulator-based source

Consider optimal target technology: thermal load, shock waves, activation (Collaboration with LLNL).

Compton source

Extend Geant4 model to Compton source (Collaboration with LAL)
Stacking simulations studied in 6D.

Lithium lens tests

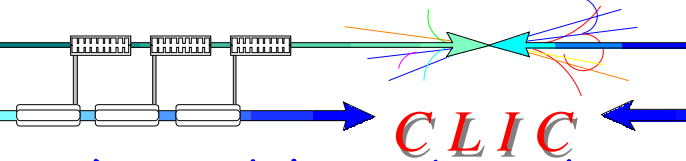
Participate to the BINP tests and CEsrTA tests.

Conventional sources

Channelling measurements on NA63 experiment at CERN
Perform experiments at KEKB positron source.

Electron source

Perform tracking studies (Collaboration with JLAB and SLAC).
Hardware tests at JLAB and SLAC for the DC gun at very HV.



a) Undulator-based source

Develop Geant4 model of collimator, target, capture optics, and capture RF assembly.

Studies performed by L. Zang for his phd for CLIC

Report by I. Bailey / Lancaster Uni. to this LCWS 2010 workshop

Comparison with ANL results remains to be done.

Optimise parameters wrt yield, polarisation and cost (Collaboration with ANL).

Simulations and optimization performed by ANL for ILC and CLIC.

Report by W. Gai to this LCWS 2010 workshop.

The cost has been evaluated but not yet officially available.

Consider timing constraints issues and upgrade paths.

No progress

Consider electron beam quality issues.

Report "Emittance change in the main ILC electron beam due to interaction with the positron source undulator: A review of the studies" by J. Clarke



b) Compton source

Design of the Compton ring (Collaboration with NSC KIPT).

Design advanced for a CLIC Compton Ring at 1.06 GeV and double chicane.

Report by E. Bulyak to this LCWS2010 workshop.

Optical stacking cavity (Collaboration with LAL and KEK).

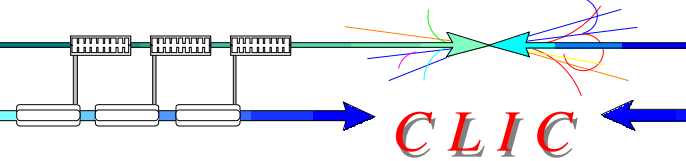
Cavity tested at KEK with 2 mirrors.

Cavity under development at LAL with 4 mirrors

High power lasers.

Important progress obtained by CELIA on a laser providing 200 W of average power with 178 MHz repetition frequency

Report by A. Variola to this LCWS2010 workshop



CLIC/ILC work plan as today (3)



b) Compton source

Stacking simulations.

Simulations performed for the longitudinal plane by F. Zimmermann.

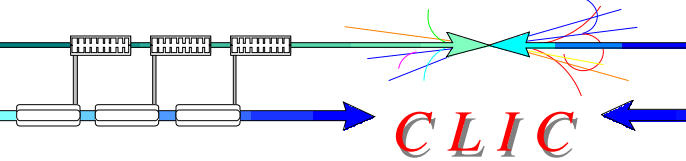
No progress for stacking in the transversal plane.

A new proposal for a CLIC scheme using 2 storage rings (T. Omori & L. Rinolfi)

Presented at POSIPOL 2009 workshop.

Report by M. Polyanskiy to this LCSW2010 workshop

Progress for Linac using Compton interactions.



CLIC/ILC work plan as today (4)



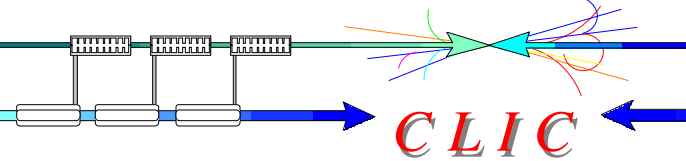
c) Lithium lens capture optics

Evaluate suitability for Undulator and Compton schemes (Wide collaboration needed).

*Report about capture efficiency by W. Gai /ANL for the undulator
and about feasibility of the lens by A. Mikhailichenko / Cornell at ALCPG09*

*Report by A. Mikhailichenko to this LCWS 2010 workshop
+ Publication “Lithium lens (II). Lithium flow magneto-hydrodynamics”*

No progress for Compton schemes.



CLIC/ILC work plan as today (5)



d) Conventional sources (Conventional targets and hybrid targets)

Simulations to optimize the unpolarized e^+ yield (Collaboration with LAL).
Evaluate the applicability of the Li lens.

Important progress made by LAL and CERN for the simulations.

A CLIC Note has been published:

"Study of an hybrid positron source using channeling for CLIC" , CERN CLIC Note 808

Simulations have been performed up to the CLIC Pre-Damping (2.8 GeV) by A. Vivoli.

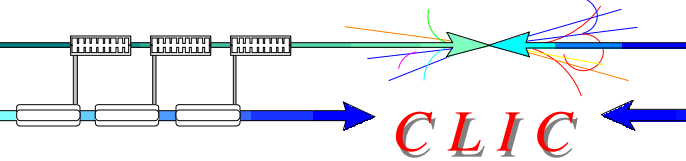
A CLIC Note is in preparation

Report on hybrid targets using channeling to this LCWS2010 workshop:

by R. Chehab for ILC

by L. Rinolfi for CLIC

No progress for applicability to the Li lens.



CLIC/ILC work plan as today (6)



e) Electron source

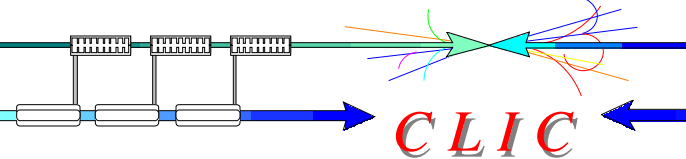
Set-up the CERN, CI, JLAB, SLAC collaboration for tracking studies.
Preliminary tests at HV for the DC gun.

JLAB performed HV tests at 100 kV for the "inverted" gun and work is in progress for the gun working at 500 kV

Polarized electrons have been produced, from a DC gun, by SLAC corresponding to CLIC parameters and results have been presented at CLIC 2009 workshop

Report by A. Brachmann to this LCWS2010 workshop

Report by M. Yamamoto to this LCWS2010 workshop



CLIC/ILC work plan as today (7)



Long-term plan mid-2009 - mid-2010

Undulator-based source

Consider optimal target technology: thermal load, shock waves, activation (Collaboration with LLNL).

Looking for a place to perform tests

Compton source

Extend Geant4 model to Compton source (Collaboration with LAL)
Stacking simulations studied in 6D.

Not yet started

Lithium lens tests

Participate to the BINP tests and CsrTA tests.

Still under discussion

Conventional sources

Channelling measurements on NA63 experiment at CERN => *Proposition has been discussed*
Perform experiments at KEKB positron source.

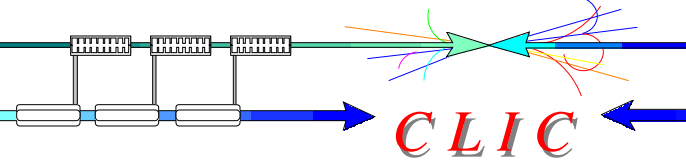
=> Important tests done at KEK: Report by T. Takahashi to this LCWS2010 workshop

Electron source

Perform tracking studies (Collaboration with JLAB and SLAC).
Hardware tests at JLAB and SLAC for the DC gun at very HV.

« Preliminary design of a bunching system for the CLIC polarized electron source » by F. Zhou et al. CLIC Note 813.

Hardware tests are ongoing at JLAB



- a) Most of milestones have been achieved for the short-term plan
- b) For the long-term plan, important results have been obtained regarding the hybrid targets using channelling and the DC gun for the electron sources.
- c) Some crucial milestones remain to be demonstrated for the undulator option (target tests, timing constraints,...) and for the Compton option (laser power, stacking process,...)