



ILC/CLIC e^+ generation working group

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Mandate

- 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.**



Original CLIC/ILC work plan (to mid 2010)

Undulator-based source

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

Optimise parameters wrt yield, polarisation and cost

Consider timing constraints issues and upgrade paths.

Consider electron beam quality issues.

Consider optimal target technology: thermal load, shock waves, activation

Compton source

Design of the Compton ring

Optical stacking cavity

High power lasers

Stacking simulations

Extend Geant4 model to Compton source

Stacking simulations studied in 6D



Original CLIC/ILC work plan (to mid 2010)

Lithium lens capture optics

Evaluate suitability for Undulator and Compton schemes

Participate to the BINP tests and CsrTA tests.

Conventional sources (Conventional targets and hybrid targets)

Simulations to optimize the unpolarized e^+ yield

Evaluate the applicability of the Li lens.

Perform experiments at KEKB

Channelling measurements on NA63 experiment at CERN

Electron source

Set-up the CERN, CI, JLAB, SLAC collaboration for tracking studies.

Preliminary tests at HV for the DC gun

Perform tracking studies

Hardware tests at JLAB and SLAC for the DC gun at very HV



Current status

Important reduction of resources have registered in several institutes.

Therefore the ILC/CLIC work plan has been revised according to the available resources from the different institutes around the world and the possible contributions are presented.



Plan 2010 - 2011 for Asian labs

KEK

1. Tests with hybrid targets at KEKB Linac
2. Tests of BN windows at KEKB storage ring beam dump for liquid Pb target
3. Tests of liquid Pb target system at ATF (collaboration with BINP)
4. Laser Compton Experiment (Polarized e^+ source)
5. Laser Cavity R&D (collaboration with Hiroshima University)
6. L-band RF Gun for Superconducting Test Facility (e^-)
7. HV DC gun (200kV and 500kV) (polarized e^- with Superlattice photo cathode).

Hiroshima University

1. Tests Photo - cathode s (e^-)
2. Ultra High Vacuum R&D (e^-)
3. L-band RF Gun (e^-)
4. Laser Cavity R&D (collaboration with KEK)
5. Laser Compton Experiment (Polarized e^+ source)
6. Tests with hybrid targets at KEKB Linac.



Plan 2010 - 2011 for Asian labs

Nagoya University

Photocathodes developments (polarized e-) and high voltage DC gun (200 kV).

Institute for Solid State Physics (ISSP)/Advanced Industrial Science and Technology (AIST)

Photo-cathode Laser R&D (e-)

IHEP

Hybrid targets related physical processes simulation at LAL (PhD student from IHEP at LAL)

High voltage DC gun (500 kV) (collaboration with KEK/JAEA possible in near future)

RIKEN/Spring8

Yamaguchi University



Plan mid-2010 - 2011 for American labs

ANL

1. Simulations for e^+ sources Undulator based
2. Studies of energy deposition in various targets (W, Ti, liquid Pb)

BNL

1. Studies of Compton Linac for polarized e^+
2. Development of CO_2 lasers
3. Studies for Superconducting photo-injectors

Cornell

1. Design Li lens
2. Design collimator

LLNL

1. Target tests related to beam energy deposition
2. Design of Flux Concentrator
3. Rotating seal vacuum tests



Plan mid-2010 - 2011 for American labs

JLAB

1. **Polarized electron source**
2. Build a dedicated beam line & low-power e^+ conversion target at 10 MeV (CEBAF injector)
3. Integrate E-166 e^+ collection & Compton transmission polarimeter + system upgrades
4. Commission experimental apparatus with polarized electron beam
5. Perform experiment to characterize transfer of ~ 10 MeV polarized electrons to positrons

SLAC

Polarized electron source



Plan 2010 - 2011 for European labs

CERN

1. Beam dynamics studies for e^+ source based on hybrid targets (collaboration with LAL/IPNL)
2. Studies for polarized positrons (Compton ring, Compton linac, ERL, Undulator)
3. FLUKA simulations for different type of targets (collaboration with Uludag university)
4. Stacking simulations in Compton and ERL rings
5. Polarization studies (collaboration with DESY).

LAL / IPNL / BINP

1. Unpolarized e^+
Simulations of the crystal targets with channelling processes (collaboration IHEP/CERN).
2. Polarized e^+
Simulations of Compton process (CAIN simulations)
Development of optical cavity and laser system for the Compton process
(collaboration with KEK)

GEANT4 simulations for targets and capture sections

PARMELA and ASTRA simulations from the target to the pre-injector exit

Studies on the source layout



Plan 2010 - 2011 for European labs

DESY

1. Source modeling including spin tracking (PPS-Sim, GEANT4)
2. Shock wave simulation studies
3. Radiation aspects at target and source area
4. Polarization studies and depolarization effects (collaboration with CERN)

STFC

1. Undulator studies
2. Central integration

Lancaster University

1. Complete work on target prototype (eddy currents and mechanical characteristics)
2. Investigate the effect of less-idealised photon distribution from undulator
3. Study of depolarization effects at IP (collaboration with Desy)
4. Hydrodynamic shockwave simulations (collaboration with Durham)
5. Study of ILC/CLIC Compton source with PPS-Sim code.



Plan 2010 - 2011 for European labs

Kharkov University

1. Beam dynamics simulations for e^+ source based on Compton ring
2. Evaluation and simulation of parameters of the polarized gamma-ray beams for production of polarized positrons.

BINP

1. Li lens tests
2. Flux concentrator studies
3. Development of liquid targets.



Summary

a) Major milestones have been achieved for the work plan: 2008 - mid 2010

b) An updated plan is presented with realistic contribution from the different laboratories.

c) The milestones are due to be updated at this workshop

