



# **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/(**KAS**) and CLIC as the baseline for the CDR).
- **The working group should:**
  - **Develop the synergy between the ILC and CLIC  $e^+$  and  $e^-$  studies. (Such as CDR for CLIC and TDR for ILC)**
  - **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.**

# Current status

The ILC/CLIC work plan has been reviewed  
at POSIPOL 2010 (KEK) and  
at IWLC 2010 (CERN).

One conclusion was that major milestones have been  
achieved for the work plan 2008 - mid 2010.

## Commonality on 1 TeV ILC option and CLIC scheme

According to the available resources from the different  
institutes around the world, the possible contributions  
are presented for the work plan mid 2010 - 2011.

# 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-cathodes ( $e^-$ )
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

# 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)
3. Study 1 TeV option for ILC and its implication on CLIC

## 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  $\sim 10$  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) An updated work plan, for 2010 - 2011 is presented where many milestones have been already achieved from the different laboratories.
- b) The main issues are the lack of experimental facilities.
- c) The next review will be presented at POSIPOL 2011 in Beijing.