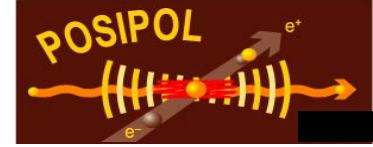


# ILC/CLIC $e^+$ generation working group

Wei Gai, ANL  
Louis Rinolfi, CERN

Thanks to Omori-san for the coordination of the Webex meetings

# Brief history



November 2008: creation of the “ILC/CLIC e+ generation” working group by the management of ILC and CLIC:

Convener ILC: Jim Clarke / STFC

Convener CLIC: Louis Rinolfi /CERN

February 2009: Start-up of Webex regular meetings by Omori-san / KEK called “ILC/CLIC e+ studies”

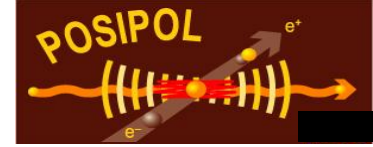
January 2011: Change of ILC convener

Convener ILC: Wei Gai / ANL

Convener CLIC: Louis Rinolfi / CERN

February 2012: Retirement of CLIC convener

# First Webex meeting: February 2009



Organized and coordinated by Omori-san / KEK  
and the regular meetings continue up to now

Minutes of the 1st "ILC-CLIC e+ studies" meeting

Date: February 5th 17:00(JST) 9:00 (CET), 2009

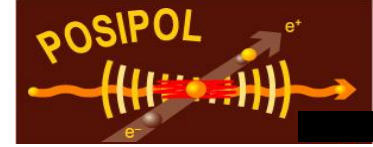
A part of Attendees (whom Omori was able to hear the voices):

Louis(CERN), Vivoli(CERN), Variola (LAL), Dadoun(LAL), Eugene(NSC-KIPT),  
Andreas(DESY), Sabine(DESY), Andy(CI), Andriy(), Gudi(Durham), Clarke(CI), Stefan(),  
Kuriki(Hiroshima), Takahashi(Hiroshima), Kamitani(KEK), Urakawa(KEK), and Omori(KEK)

Agenda:

1. ILC-CLIC e+ studies : Louis-san
2. Update of Low E e- driven source : Kuriki-san
3. Optimal Compton Ring : Eugene-san

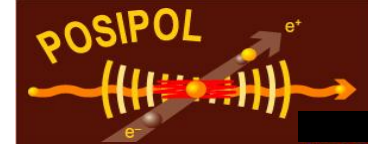
# Mandate



- 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<sup>+</sup> and e<sup>-</sup> 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.**

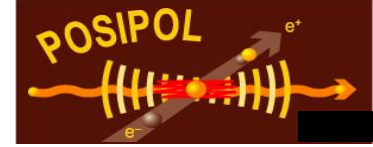


# Membership of the “ILC/CLIC $e^+$ generation” working group in 2010

- Membership of the joint WG (names, affiliations):
  - Ian Bailey (CI), A. Brachmann (SLAC), Eugene Bulyak (NSC-KIPT/Karkhov), Iryna Chaikovska (LAL), Robert Chehab (IPNL/Lyon), Jim Clarke (CI), N. Collomb (CI), O. Dadoun (LAL), E. Eroglu (Uludag University), Wei Gai (ANL), P. Gladkikh (NSC-KIPT/Karkhov), Jeff Gronberg (LLNL), Stephan Hesselbach (Durham University), Takuya Kamitani (KEK), Masao Kuriki (Hiroshima University), Wanming Liu (ANL), Alexander Mikhailichenko (Cornell), Gudi Moortgat-Pick (Desy), Tsunehiko Omori (KEK), Freddy Poirier (LAL), Matt Poelker (JLAB), Igor Pogorelski (BNL), Sabine Riemann (Desy), Louis Rinolfi (CERN), Andreas Schaelicke (Desy), Daniel Schulte (CERN), John Sheppard (SLAC), V.M.Strakhovenko (BINP), Tohru Takahashi (Hiroshima University), Junji Urakawa (KEK), Andriy Ushakov (Desy), Alessandro Variola (LAL), Alessandro Vivoli (CERN), Vitaly Yakimenko (BNL), Lei Zang (CI), Feng Zhou (SALC), Frank Zimmermann (CERN), Fabian Zomer (LAL)

Not yet updated for POSIPOL 2012

# Status



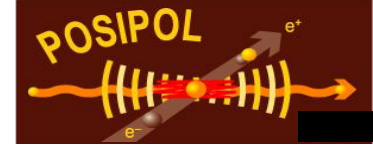
The work plan of "ILC/CLIC  $e^+$  generation" working group has been reviewed at POSIPOL 2010 (KEK) and at IWLC 2010 (CERN).

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

According to the available resources from the different institutes around the world, the possible contributions were presented for the work plan 2011 at IWLC 2010

No specific review was done in 2011

# Proposal



Review the plan foreseen for 2011

Discuss the plan for the future

Color code for next slides:

Green = work done

Orange = work ongoing

Red = work not done and stopped

Black = status unknown

# Plan 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 for Polarized  $e^+$  source (collaboration with Hiroshima University)
5. L-band RF Gun for Superconducting Test Facility ( $e^-$ )
6. 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 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)

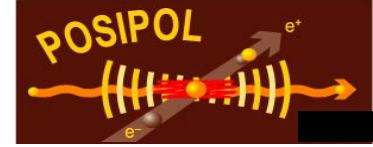
Photo-cathode Laser R&D ( $e^-$ )

## IHEP

Hybrid targets simulation at LAL (PhD student from IHEP at LAL)

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

# Plan 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

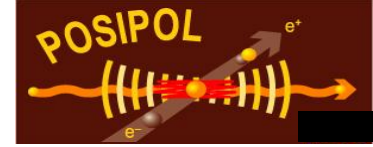
## Cornell

1. Design Li lens
2. Design collimator

## LLNL

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

# Plan for American labs



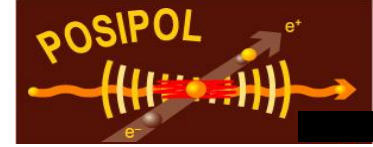
## JLAB

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

1. Polarized electron source
2. RF Undulator

# Plan for European labs



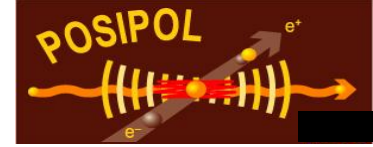
## CERN

1. Beam dynamics studies for  $e^+$  source based on hybrid targets
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. Studies granular positron target

## LAL

1. Unpolarized  $e^+$   
Simulations of the crystal targets with channelling processes (collaboration IHEP/CERN).
2. Polarized  $e^+$   
Simulations of Compton process (CAIN simulations) (see Iryna's thesis)  
Development of optical cavity and laser system for the Compton process (collaboration with KEK)
3. GEANT4 simulations for targets and capture sections.
4. PARMELA and ASTRA simulations from the target to the pre-injector exit

# Plan for European labs



## DESY

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

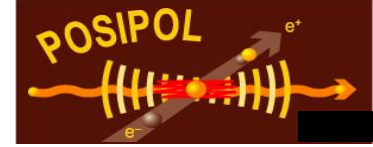
## STFC

1. Undulator studies
2. New Undulator (within EuCard)
3. 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 (waiting  $\gamma$ -spectrum for CLIC)

# Plan for European labs



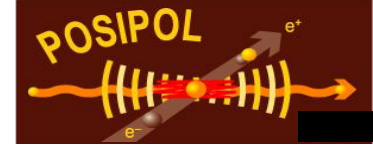
## Kharkov Institute of Physics and Technology (NSC-KIPT)

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
3. Studies of rod conversion targets

## BINP

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

# Summary



a) Many milestones have been achieved from the different laboratories.

b) It would be necessary to review the status of experimental facilities

c) The CLIC convener is now retired from CERN.  
We are looking for a replacement.

If not found, do we want to continue with a single ILC convener to coordinate the "ILC/CLIC  $e^+$  generation" working group activities ?

Discussion at POSIPOL 2012 would help to clarify the status and the future of this ILC/CLIC common working group