

Minutes of the 3rd "ILC-CLIC e+ studies" meeting (corrected)

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

A part of Attendees (whom Omori was able to hear the voices):
Louis(CERN), Frank(CERN), Vivoli(CERN), Variola (LAL),
Olivier Dadoun(LAL), Chehab(IPNL/LAL), Eugene(NSC-KIPT),
Andreas(DESY), Ralph Dollan(DESY), Peter Schuler(DESY),
Clarke(CI), Ian(CI), Andy(CI), Gudi(Durham), Takahashi(Hiroshima),
Kuriki(Hiroshima), Kamitani(KEK), Urakawa(KEK), and Omori(KEK)

Agenda:

1. Upcoming meetings : Omori
2. Draft agenda of the e+ session in TILC09 : Clarke-san
3. e+ source modeling activities at DESY Zeuthen : Andreas-san
4. LHeC parameter options and first ideas : Frank-san
5. Crab crossing in Compton sources; First results : Eugene-san
6. Possible tests in KEK facilities for LC e+ generation : Kuriki-san

Presentations:

<http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20090409/20090409-UpcomingMeetings.pdf>

http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20090409/20090409-Clarke_SourcesSession.pdf

http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20090409/20090409-Andreas_pps-sim.pdf

http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20090409/20090409-Frank_LHeC_e+source.pdf

http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20090409/20090409-Eugene_CrabCross.pdf

http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20090409/20090409_Kuriki.pdf

1. Upcoming meetings

Here is the list of the upcoming meetings.

- (1) GDE meeting (TILC09) 17th -21st April at Tsukuba
Sources session: Saturday, 18 April 2009 (9:00 – 16:00)
WebEx available
Please see "2. Draft agenda of the e+ session in TILC09".
- (2) FJPPL meeting 20th-22nd May 2009 at KEK

(3) POSIPOL workshop 23rd - 26th June 2009 at Lyon
Be careful, the date was slightly changed.

(4) CLIC workshop 12th-16th October 2009 at CERN

Please see "20090409-UpcomingMeetings.pdf" for the details.

2. Draft agenda of the e+ session in TILC09

Clarke-san introduced the draft agenda of the sources session in TILC09. Please see "20090409-Clarke_SourcesSession.pdf".

Here is the proposed agenda.

Saturday 18th April 9:00 - 16:00

Minimum Machine Simulations	Wei/Wanming?	(20)(By Webex)
Linac based compton source	Vitaly Yakimenko	(20)(By Webex)
Compton experiment on ATF	Takahashi?	(20)
Discussion		(30)

Coffee Break (10:30 - 11:00)

Electron Source Update	Axel?	(30)
Conventional source studies	Omori?	(30)
Beam test plans at KEK (window, liq. Pb, hybrid, UND?)	Urakawa?	(30)

Lunch (12:30 - 14:00)

Source Integration Update	Norbert	(20)
Target Experiment Report	Ian Bailey	(30)(By Webex)
Target Shock Wave study	Stefan?	(20)(By Webex)
Undulator Status Report	Jim Rochford	(20)(By Webex)
Discussion		(30)

If there is "?" after the name, the speaker was not confirmed yet at the time of the "ILC-CLIC e+ studies" meeting.

We made discussions about the agenda.

Omori asked to add the Kubo-san's talk (emittance preservation in undulators) and Jeff-san's talk (1 m sec flux concentrator).

Clarke-san agreed to add Kubo-san's short talk (maybe 15 min). Clarke-san pointed out that Jeff-san may not have new information to be reported, because he's situation is just after getting the budget. Maybe he can make a very short report (5 min?) about the status of the budget and his R/D plan.

3. e+ source modeling activities at DESY Zeuthen:

Andreas-san reported the recent activities on the e+ source modeling at DESY Zeuthen.

Please see "20090409-Andreas_pps-sim.pdf".

The code PPS-Sim (Polarized Positron Source Simulation) is developed for the e+ source modeling. PPS-Sim is developed based on the GEANT4 toolkit. It can treat polarisation transfer in physics processes and spin tracking in electromagnetic fields.

PPS_Sim has good GUI, thus to use PPS-Sim is easy even for non expert users. PPS-Sim also has a batch mode, thus it is convenient to generate high statistics data for expert users. PPS-Sim uses ROOT for data analysis.

Many parameters can be set from GUI, for example the length and the pitch of the undulator, energy of the electron beam, etc.

Andreas-san made a wonderful demonstration of the PPS-Sim with GUI mode.

After Andreas-san's presentation, several people asked that PPS-Sim runs on which operating systems. In the demonstration, Andreas-san's used Mac OS 10.5. Andreas-san answered that currently the PPS-Sim runs on Mac and Linux. There is no Windows version right now. However, in principle, we can make PPS-Sim windows-compatible.

Eugene-san asked about spin tracking in materials and in magnetic field, but Omori could not quite follow the discussion of Eugene-san and Andreas-san.

4. LHeC parameter options and first ideas:

Frank-san introduced the LHeC option of the LHC upgrade and e+ source ideas for the LHeC.

Please see "20090409-Frank_LHeC_e+source.pdf".

LHC has the option which will realize the very high energy collision of an electron (or positron) beam and a proton beam.

In some physics study requires (or prefers) a positron beam instead of an electron beam.

Frank-san presented the table of beam parameters of CLIC, ILC, LCEC, and some other projects. He also introduced the some of first trials to make conceptual design of the e+ source of the LCEC based on ERL-Compton and Linac-Compton schemes.

He also suggested to consider a undulator scheme for LHeC e+ source.

After Frank-san's presentation, we made discussions.

Question by Chehab-san:

What is the photon beam size in the Compton option?

Answer by Vivoli-san:

About 1 cm.

Question by Chehab-san:

Is polarization of electrons/positrons important?

Answer by Frank-san:

Physicists said it was not important.

Omori's comment:

If beam size at IP is not small and disruption of the electron/positron beam is negligibly small, we can use a storage ring.

5. Crab crossing in Compton sources; First results:

Eugene-san reported the effectiveness of the crab crossing in the Compton sources.

Please see "20090409-Eugene_CrabCross.pdf".

At first, Eugene-san very shortly summarized the history of the crab crossing in e- e+ colliders. In e- e+ colliders the typical crossing angle is rather small (around 1.3 degrees).

Then he introduced the Variola-san's proposal of the crab crossing in the Compton scheme. In Compton scheme typical crossing angle is large, around 8 degrees. The crab angle is half of the crossing angle, but still large.

Eugene-san presented the theoretical (analytical) model of the crab crossing in the Compton scheme and the results.

The calculation showed that the the crab crossing was very effective when the electron bunch length was not short.

After Eugene-san's presentation, we made discussions.

Comment by Peter-san:

Crab crossing is effective only when the crossing angle is large, and the crossing angle in the Compton schemes seems rather large. Can you make the crossing angle much small?

Answer by Variola-san:

The crossing angle of 8 - 10 degrees is the typical value of the current design of the laser stacking cavities. If we design a much longer cavity, we can make the crossing angle much small. However this makes the repetition rate small.

Comment by Omori:

We can keep high repetition rate with a long cavity if we put multi pulses in a cavity.

Comment by Variola-san:

If we put multi pulses in a cavity, average power in a cavity will be too high.

Comment by Eugene-san:

We have to consider the beam dynamics issues which were not considered in today's talk. The large crab angle may cause difficult issues.

6. Possible tests in KEK facilities for LC e⁺ generation:

Kuriki-san presented a theory of the damage of the e⁺ production targets and the possible tests in KEK facilities. In this time his talk was concentrated on the electron-beam driven sources.

Please see "20090409_Kuriki.pdf".

Kuriki-san discussed the cause of the target damage in two viewpoints; acoustic shock and temperature rise.

The shock wave is "accumulated" on a spot over a several 100ns. On the other hand, the time constant of the processes of the temperature rise is in order of 1 ms - 10 ms.

Therefore, it is very important to take the timing structure of the beam into account in the evaluation of the possible target damage. Counting only single bunch effect and average effect is not sufficient enough.

For the effect of the acoustic shock, Kuriki-san suggested to use the peak beam energy density which is summed up in several 100ns window. The limit can be 320 J/mm² for W(75)Re(25) alloy.

For the effect of the temperature rise, he suggested to use "effective beam energy density"

Kuriki-san evaluated the "peak beam energy density" and the "effective beam energy density" of the several conventional sources proposed for ILC. He also evaluated possible "peak beam energy density" and "effective beam energy density" which can be produced in the KEK beam facilities.

He concluded that the target vitality can be examined at KEKB beam dump or ATF Linac. By considering availability and duty cycle, ATF Linac is more feasible than KEKB beam dump.

After Kuriki-san's presentation, we made discussions.

Question by Frank-san:

How about the evaluation of the target damages in the photon-beam driven e⁺ sources?

Comment by Eugege-san:

Target damages are small in the photon-beam driven e+ sources.

Comment by Peter-san:

It depends on the target thickness. If we use thick target, the situation is similar to the electron-beam driven sources.

Comment by Kuriki-san:

Anyway, today's presentation treated only the electron-beam driven e+ sources.

The date of the next meeting will be May 14th.

Reported by T. OMORI

Note : Old minutes:

You can get the materials of the old "Euro-Japan meeting" from the address shown below.

<http://www-jlc.kek.jp/~omori/EuroJapanMeeting/>
