

## Minutes of the 11th "ILC-CLIC e+ studies" meeting

Date: February 18th, 17:30(JST) 9:30(CET), 2010

A part of Attendees (whom Omori was able to hear the voices):  
Louis(CERN), Vivoli(CERN), Eugene(NSC-KIPT), Peter(NSC-KIPT),  
Chehab(IPNL/LAL), Dadoun(LAL), Xu Chenghai(IHEP/LAL),  
Freddy Poirier(LAL), Irina Chaikovska(LAL), Sabine(DESY-Z),  
Andriy(DESY-Z), Stefan(DESY), Norbert(STFC), Takahashi(Hiroshima),  
Kuriki(Hirosima), Kamitani(KEK), Urakawa(KEK), Yokoya(KEK),  
and Omori(KEK)

### Agenda

1. Brief Report on Hybrid tgt exp. at KEK-LINAC: Takahashi-san
2. Preparation of Posipol 2010: Omori
3. Announcement: Louis-san:

### Presentations:

[http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20100218/20100218-Takahshi\\_HybridTest.pdf](http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20100218/20100218-Takahshi_HybridTest.pdf)

[http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20100218/20100218-Omori\\_POSIPOL2010.pdf](http://www-jlc.kek.jp/~omori/ILC-CLIC-e+Studies/20100218/20100218-Omori_POSIPOL2010.pdf)

1. Brief Report on Hybrid target experiment at the KEK-LINAC:

Takahashi-san presented a results and preliminary analysis of the hybrid target experiment at KEK-LINAC.

Please see "20100218-Takahshi\_HybridTest.pdf".

The experiment was done on January 10th-11th.

In the last phone meeting (Jan/14) just after the experiment, Takahashi-san made the first brief report. But at that time, almost no results was presented because there was too short time between the experiment and the meeting.

In this meeting, Takahashi-san presented the results of the experiments, the results of the preliminary analysis, and comparison with the simulations.

#### Hybrid configuration:

- 8 GeV e- beam on 1 mm crystal tungsten (on or off axis)
- All charged particles up to 8 GeV swept out
- Only gamma-rays on 8 mm amorphous tungsten

#### Conventional configuration:

- 8 GeV e- beam on amorphous tungsten (8 mm or 18 mm)

Measurement:

Number of positrons from the amorphous target.

(Momentum window 20 MeV and 10 MeV)

Temperature at the exit of the target by thermocouples

How the data look like:

- \* e+ detected in hybrid configuration  
on axis/off axis ~ 3.5
- \* hybrid on axis and conventional with 8 mm tungsten  
detected number of e+s are almost same
- \* temperature rise of amorphous targets
  - hybrid 32.1 degree C
  - conventional 24.7 degree C
- \* detected number of e+s at 20 MeV and 10MeV  
20MeV/10MeV ~ 3.9

Takahashi-san submitted the question "Can we understand the these?", and he tried to answer by himself.

He compared the GEANT4-based simulation and the experimental results. Gamma-rays generated in a thin crystal tungsten were simulated by Dadoun-san. Other parts of the simulation were done in Hiroshima Univ.

The biggest issue was that why temperature rise of the amorphous target (t = 8 mm) in the hybrid configuration was larger than that of the conventional (8 mm thick amorphous tungsten target) configuration.

According to the Takahshi-san's simulation study, the total energy deposit for the hybrid configuration (crystal 1 mm, amorphous 8 mm) is about twice larger than that of the conventional (8 mm thick amorphous tungsten target) configuration.

So, it was reasonable that the hybrid configuration had larger temperature rise in the experiment than that of the conventional (t = 8 mm) configuration.

According to the simulation the total number of the positrons was larger for the hybrid configuration too.

However the simulation showed that the positrons generated in the hybrid configuration had larger angular spread than those generated in the conventional configuration (t = 8 mm).

Since the detector system used in the experiment had acceptance at only very forward region, this qualitatively explained that detected number of positrons were almost same in the hybrid and in the conventional (t = 8 mm) configurations.

After Takahashi-san's presentation we made discussions.

Question by Yokoya-san:

It seemed that the results of the experiment didn't agree with our expectation. Our expectation was that energy deposit in the hybrid configuration was much smaller than that in the conventional configuration. Is the hybrid scheme effective?

Question by Louis-san:

We expected that energy deposit was reduced by gamma-ray injection.

Question by Chehab-san:

Did you sweep the 8 GeV beam?

Takahashi-san's answer to the Chehab-san's question.

Yes all charged particles up to 8 GeV were swept out.

Takahashi-san's answer to Yokoya-san and Louis-san.

The crystal generates more gamma-rays in low energy region with wider angular distribution.

So angular and energy distributions of positrons generated in the hybrid configuration are different from those in the conventional configuration.

To consider feasibility for positron sources, comparison of total number of positrons versus total energy deposit (which correspond to the temperature rise) is not enough (or may be rather miss-leading).

It is crucial to compare the number of accepted positrons versus the Peak Energy Deposit Density (PEDD).

In order to proceed these analyses, we need more data for temperature distribution in the targets as well as detail simulation. Thus, it is too soon to discuss feasibility of hybrid system for the positron sources from the experimental data.

Comments by Chehab-san:

Chehab-san agreed Takahashi-san.

Question by Chehab-san:

Did you measure temperature at the exit of the target?

Takahashi-san's answer :

Yes.

But the temperature rose very slowly.

So effectively we think the target had almost same temperature everywhere in the target.

Question by Louis-san:

Can you measure positrons at other momentum points?

Takahashi-san's answer:

We can measure at 5, 10, 15, 20, and 30 MeV.

But actually, measurement at 5 MeV is difficult because signal is low. Next time, we will make measurements at 10, 20, and 30 MeV

## 2. Preparation of Posipol 2010:

Please see "20100218-Omori\_POSIPOL2010.pdf".

Omori explained the status of preparation.

The place was decided: KEK.

The web-site will be ready by the end of February  
Registration will start when Web will be ready  
The poster will be ready begging of March

3. Announcement from Louis-san:

Louis-san informed the meeting that following the last ILC Executive Committee, the ILC-CLIC e+ studies working group is strongly encouraged to study the hybrid target configuration, as a possible option for the ILC e+ source taking advantage of the strong synergy with the CLIC corresponding configuration.

The date of the next phone meeting will be March 18th.

Reported by T. OMORI