

Minutes of the 9th Euro-Japan Compton capture&stacking meeting

Date: April 21st 17:00(JST) 10:00 (CET), 2008

A part of Attendees (whom Omori was able to hear the voices):
Vivoli(LAL), Eugene(NSC-KIPT), Louis(CERN), Frank(CERN),
Takahashi(Hiroshima), Kuriki(Hiroshima), Kamitani(KEK),
Urakawa(KEK), and Omori(KEK)

Agenda:

1. Report from DESY Zeuthen ILC e+ meeting : Urakawa-san & Omori
2. Discussion, Upcoming Meetings
3. Capture simulation update : Vivoli-san
4. Stacking simulation update : Frank-san
5. Rod target update : Eugene-san
6. General Discussions

Presentations and materials:

Presentation from DESY Zeuthen ILC e+ Meeting:

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20080421/e+_workshop_PM_intro.pdf
[Meeting_Summary.pdf](#)

Upcoming Meetings:

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20080421/20080421-Discussion_UpcomingMeetings.pdf

A. Vivoli: Capture Simulation Update

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20080421/20080421-Vivoli_Table.pdf

F. Zimmermann: Staking Simulation Update

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20080421/20080421-Frank_StackingSimulationsUpdate3.pdf

E. Bulyak, Rod target update:

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20080421/20080421-Eugene_CT-pres21.pdf

Summary of the discussions:

1. Report from DESY Zeuthen ILC e+ meeting :

(a) Urakawa's report

Urakawa-san reported Clarke-san's summary talk of the e+ meeting.

Please see Meeting_Summary.pdf.

Now, Compton studies and target studies are listed in the high priority R/Ds.

Many attendees of the e+ meeting were interested in the Li lens and the liquid target, because both of them have a big potential to ease an e+ source design in any scheme.

(b) Omori's report

Omori reported the Marc-san's introduction talk of the e+ meeting.

Please see e+_workshop_PM_intro.pdf.

In the TDP1 (technical design phase 1), all alternative solutions will be studied and reviewed. Both conventional and Compton sources are alternative solutions of the e+ source.

2. Towards Upcoming Meetings:

Please see "20080421-Discussion_UpcomingMeetings.pdf"

(a) FJPPL at Paris (May 14-16)

Fabian-san will attend the meeting.
Kuriki-san considers the possibility to attend the WS.

(b) Nano-Beam WS at BINP (24-29/May)

The Nano-Beam WS at BINP will include advanced accelerator technologies, such as beam handling by crystals, advanced positron generation methods, gamma-gamma colliders.

Chhab-san, Urakawa-san, Takahashi-san, Kamitani-san and Omori will attend the WS.

In this occasion we will have the meeting with BINP people to discuss positron generation R/Ds.
The date of the meeting will be afternoon of 24th and/or 25th.

(c) GDE meeting at Dubna (4-6/June)

Kuriki-san will attend the GDE meeting.
Positron source will be discussed in the meeting in the view point of the cost reduction.

3. Capture simulation update

Please see "20080421-Vivoli_Table.pdf"

So far Vivoli-san's old simulation was up to 182 MeV (184 MeV). Vivoli-san showed the first result of the simulation up to 5 GeV.

He made two simulations up to 182 MeV (184 MeV). One aimed small σ_Z , but large σ_E (upper line), the other aimed large σ_Z , but small σ_E (lower line).

Vivoli-san extend the lower line result up to 5 GeV (the last line). In the course from 184 MeV to 5 GeV, about 10 % of positrons were lost. This will be fixed soon.

At the 5 GeV point, σ_Z was 5 mm and σ_E was 64 MeV.

4. Stacking simulation update

Please see "20080421-Frank_StackingSimulationsUpdate3.pdf"

Frank-san reported the first result of the continuous injection.

He assumed extremely small σ_E (1 MeV and 0.5 MeV).

He tried two frequencies, (a) 80 MHz and (b) 20 MHz.

(a) 80 MHz injection:
2550 injections over 5100 turns (every 2nd turn),
followed by 5155 turns (~100 ms) damping;
damping time 6.4 ms;

(b) 20 MHz injection:
inject every 6th turn

In both (a) and (b), he tested $\sigma_E = 1 \text{ MeV} \ \& \ 0.5 \text{ MeV}$,
and $\sigma_Z = 9 \text{ mm} \ \& \ 4.5 \text{ mm}$.

In any combination of above conditions, the stacking loss was very large. The loss was about 80 % in every condition.

Omori asked possibility of unstable point injection in which positron bunches injected slightly unstable point of the RF phase. Frank-san will try the simulation of the unstable point injection.

Vivoli-san will estimate number of positrons per bunch when we cut positrons and make σ_E to be 1 MeV (0.5 MeV).

5. Rod target update:

Please see "20080421-Eugene_CT-pres21.pdf"

Eugene-san made estimation of the total efficiency from the generated gamma-rays to the captured positrons.

About half of generated gamma-rays pass through the gamma collimator. ($\text{eff}_1 = 0.5$)

Typically, about 0.4 positrons comes out from the sliced rod target per one incident gamma-ray ($\text{eff}_2 = 0.4$).

He assumed that about 30 % of the positrons can be captured ($\text{eff}_3 = 0.3$).

Caution:

eff_1 , eff_2 , eff_3 are Omori's notation.

Total efficiency was about 0.04.

Therefore we can make 2×10^{10} positrons from 5×10^{11} gamma-rays.

This value is significantly better than the typical values. Typically, the total efficiency of a Compton scheme is 0.005 - 0.015.

Caution:

If we calculate the total efficiency from " $\text{eff}_1 \times \text{eff}_2 \times \text{eff}_3$ ", total efficiency is 0.06.

This value is slightly different from the value in the Eugene-san's slide, but it does not matter.

The date of the next meeting is 13th May,
17:00 JST (10:00 CET).

Reported by T. OMORI