

Minutes of the 16th Euro-Japan Compton capture&stacking meeting

Date: October 23th 17:00(JST) 10:00 (CET), 2008

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

Agenda:

1. Report from the "Inj. and DRs WG of CLIC08 WS" : Louis-san
2. Discussion, Towards GDE/LCWS at Chicago

Presentations:

L. Rinolfi: Report from the "Inj. and DRs WG of CLIC08 WS"
[http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20081023/
20081023-Rinolfi_CLIC_Summary.pdf](http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20081023/20081023-Rinolfi_CLIC_Summary.pdf)

Summary of the discussions:

1. Report from the "Inj. and DRs WG of CLIC08 WS":

Louis-san reported the summary of the "injector and damping ring WG" of CLIC08 workshop.

Please see "20081023-Rinolfi_CLIC_Summary.pdf".

His report was focused on e+ sources.

General overview of the WG:

term: 2 days

talks: 26

attendance: 25 to 30 persons for each session

laboratories and universities:

ANKA (D), ANL, BINP, CERN, Cockcroft Institute,
FNAL, IPNL (Lyon), KEK, PSI, Lancaster University,
LNF (Frascati)

Overview of CLIC e+ source studies:

3 configurations are considered.

- 1) Base Line configuration:
based on 3 TeV (c.m.e.).
unpolarized e+ source (Hybrid target).
- 2) Compton configuration:
based on 3 TeV (c.m.e.) .
polarized e+ source (Compton).
The undulator option is an alternative.
- 3) Low energy configuration:
based on 500 GeV (c.m.e.).
relaxed beam parameters for the Damping Rings.
a double charge per bunch.

Questions/Comments/Discussions related to Louis-san's report

(a) Why 0.5 ns:

CLIC choose 0.5 ns bunch spacing. This requires 2 Ghz power source in DR/pre-DR. It is an unusual source.

Omori asked why CLIC chose 0.5 ns.

Louis-san answered that the frequency of the CLIC main linac was 12 Ghz. Luminosity optimization study chose 0.5 ns.

(b) How many trains in DR and pre-DR:

Omori asked how many trains were stored in the DR/pre-DR.

Louis-san answered one. DR/pre-DR stored only one train.

One train contains 312 bunches.

(c) undulator location:

Undulator option for "3 TeV CLIC" chose the location of the undulator at the 250-GeV-point.

Omori mentioned that if we will construct "3 TeV CLIC" after "500-1000 GeV ILC", the 250-GeV-point will be OK.

Because we will not perform low energy operation in "3 TeV CLIC". However if we will build "500 GeV CLIC" (this scenario implicitly assume no ILC), we will need low energy operation ($E_{cm} = 240$ GeV, for example).

Therefore a 250-GeV-point will be problem in "500 GeV CLIC".

(d) Ng/Ne/turn in Compton ring:

Louis-san pointed out that Frank-san and Eugene-san assumed very different number in Ng/Ne/turn.

Frank-san : Ng/Ne/turn = 0.2 (laser 650 mJ x 1)

Eugene-san : Ng/Ne/turn = 0.034 (=85/2500)

Eugene-san and Omori answered the question.

Ng/Ne/turn is a big issue in Compton ring scheme.

Actually, Ng/Ne/cycle is the issue.

Here, the cycle is a "single generation cycle" which consists of multiple turns and gamma-ray generation continues in those turns.

The beam energy spread increases in a cycle due to gamma generation. If Ng/Ne/cycle is too large, energy spread becomes too large, so we can not maintain the beam in the Compton ring.

In CLIC, we expect that Ng/Ne/cycle is small, because CLIC requires much smaller number of e+ in a train than that of ILC. In ILC, this is problem. A solution will be large Compton ring.

Compton ERL scheme has no problem of Ng/Ne, because ERL is a single-turn ring.

2. Discussion, Towards GDE/LCWS at Chicago:

People who will go to Chicago from our collaboration:

Louis-san, Urakawa-san, Kuriki-san, Takahashi-san, Vitary-san, and Omori

Main subject in the Chicago meeting:
Minimum Machine

Comments from Urakawa-san:

- (a) In the PAC meeting at Paris, Urakawa-san made a chat with a person from DOE. The person said that the American team needed the Minimum Machine (MM) study.
Below is the Q&A by Omori(Q) and Urakawa-san(A).
Q: Why the American team need MM?
A: To continue ILC.
If ILC cost stay high, US government will stop ILC.
Q: Stop to host ILC?
A: Stop ILC R/D.
If ILC is too expensive, US will consider to make muon collider.
Q: Does Fermilab people think that a muon collider is cheaper than ILC?
A: I don't know.
- (b) What will be considered in MM:
(i) Half number of bunches --> Half DR length --> New parameter to compensate luminosity drop.
(ii) A undulator located at the end of the e-linac, at the 250-GeV-point. This will make a gamma-spot on the target small. We have to re-evaluate target heat issue.

Comments from Omori:

- (a) Current RDR baseline e+ design has a problem in the design of the shielded flux concentrator (zero B-filed on the target), in order to avoid heat problem of the target. However, the shielded flux concentrator requires very large R/D. Quarter wave transformer (QWT) is a only feasible solution in this moment.
Capture efficiency of a QWT is significantly lower than that of the flux concentrator. If we employ a QWT, we have to employ a much longer undulator length, L_{und} , in order to compensate low efficiency. Now L_{und} is about 170 m in RDR, with assuming the flux concentrator. If we employ QWT, L_{und} will become about 300 m.
Also we have to extend linac.
The baseline undulator makes 3 GeV drop of the beam energy. If we make L_{und} about twice, it makes 6 GeV drop of the beam energy. So we need additional 6 GeV main linac.
I think that GDE need to share the concern about the matching device and the target.
Also, In my opinion, we need to change RDR baseline design to QWT-based capture system, because a baseline should be as ready-to-constluct as possible.
- (b) I think that a undulator located at the end of the e-main linac, at the 250-GeV-point, is not a good idea. If Higgs mass is low, we need low energy operation, for example $E_{cm} = 240$ GeV. In order to meet low energy operation, we need a long undulator even we put it at the end of the e- main linac.
- (c) I think that we need to consider advanced conventional e+ sources, with a hybrid target and/or a liquid lead

target, also as candidates of the MM e+ source.
Because those advanced conventional e+ sources are
maybe the most ready-to-construct in this moment.

The date of the next meeting will be either
November 7th, or November 12th, or November 14th.
We will decide later.

Reported by T. OMORI