Minutes of the 18th Euro-Japan Compton capture&stacking meeting

Date: November 27th 17:00(JST) 9:00 (CET), 2008

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

Agenda:

1. Report from the GDE/LCWS at Chicago: Omori
2. ILC/CLIC "e+ generation" working group: Louis-san
3. New e- driven e+ source for MM: Kuriki-san
   (presented by Omori)

Presentations:

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20081127/
20081127-Omori_ReportGDE_Meeting_Chicago.pdf

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20081127/
20081127-Louis_ILC_CLIC_e+.pdf

http://www-jlc.kek.jp/~omori/EuroJapanMeeting/20081127/
081119_MM_v03.pdf

Summary of the discussions:

1. Reports from GDE/LCWS at Chicago:

   Omori made a report from the GDE/LCWS at Chicago (26-20 Dec).

   Please see "20081127-Omori_ReportGDE_Meeting_Chicago.pdf".

   (a) List of talks in the GDE source session:

       (1) Positron source update
           Jim CLARKE

       (2) Undulator Manufacture and Measurement
           James ROCHFORD

       (3) Positron Source integration update
           Norbert COLLOMB

       (4) Compton source Ring/ERL design & cavity experiment at ATF
           Tsunehiko OMORI

(5) Hybrid targets
Robert CHEHAB

(6) 300Hz positron generation scheme
Tsunehiko OMORI

(7) Compton stacking ring update
Frank ZIMMERMANN (presented by Masao KURIKI)

(8) Linac-based Compton source
Vitaly YAKIMENKO

(9) Fast or slow positron spin flipping
Sabine RIEMANN

(10) Positron Spin Rotation at lower energy than the damping ring
Kenneth MOFFEIT

(11) CLIC-ILC Common source activities
Louis RINOLFI

(12) Auxiliary positron source update
Masao KURIKI

(13) Lithium lens and window tests
Junji URAKAWA

(14) Electron Source Update
Axel BRACHMANN

(15) Polarized Cathode R&D update and PESP2008 summary
Feng ZHOU

(16) 200 keV gun development for ILC
Masao KURIKI

(17) Updates on Cornell Positron Conversion Code KONN
Alexander MIKHAILICHENKO

(b) List of e+ related talks in Other sessions:

(i) LCWS gg/GDE BDS joint session
Optical Cavity R&D around KEK-ATF
Tohru TAKAHASHI

(ii) GDE summary session
Sources Session Summary
Axel BRACHMANN / Jim CLARKE

(c) Other activities related to e+ source:

In Chicago, Kuriki-san made a proposal of a conventional

e+ source for MM. This source is driven by a 700 MeV e- beam. Unfortunatly, there was no opportunity to present this proposal in the sessions, because Kuriki-san made this proposal after the day of e+ session. However, this proposal was explained/presented to Clarke-san and PMs. This proposal will be a part of MM study.

Please see "3. New e- driven e+ source for MM" for details of the proposal.

In the GDE EC (Executive Committee) meeting in Chicago, Yokoya-san (GDE Asia Director) explained his concern about the undulator source and the necessity of the R/D of conventional sources. His arguments included "700 MeV e- driven source", "Liquid Lead Target", "Hybrid Target", and "300 Hz generation".

2. ILC/CLIC "e+ generation" working group:

Louis-san explained "ILC/CLIC e+ generation working group".

Please see "20081127-Louis_ILC_CLIC_e+.pdf"

(a) Mandate of the working group:

The ILC study considers the Undulator option as the base line while the Compton ring is an alternative option. The CLIC study considers the Compton ring as the base line while the Undulator is an alternative option.

The working group should:

* Develop the synergy between the ILC and CLIC e^+ studies.

* Evaluate the common technical issues related to both options for the production of polarized positrons.

* Prioritize R&D.

* Consider other alternatives such as ERL, Linac-Compton and conventional sources.

* Review the existing technical and tests facilities where further tests could be performed.

* Evaluate where cost savings could be obtained.

* Promote common meetings and workshops.

(b) Common ILC/CLIC subjects:
    (1) Production of polarized photons
    (2) Undulator magnet
    (3) Laser system
    (4) Compton schemes (Ring, ERL, Linac)
    (5) Targets issues
    (6) Optical Matching Device
    (7) Capture and acceleration sections
    (8) Transport and collimation of large emittances
    (9) Optimization for a maximum e^+ yield
    (10) Stacking
    (11) Polarization issues
    (12) Codes development and sharing decks
    (13) Integration issues for the target station
    (14) Radioactivity issues

(c) Test facilities:

* Positron target tests (CI) at Daresbury
* ATF at KEK
* Li lens, window tests, liquid Li and Pb targets at BINP
* Li lens for e^+ beam at CesrTA
* Optical cavity at LAL
* NA63 experiment at CERN

3. New e- driven e+ source for MM:

Omori explained Kuriki-san's proposal:
  New e- driven e+ source = "700 MeV e- driven source"

  (MM = Minimum Machine)

Please see "081119_MM_v03.pdf".

Following (a) - (g) is a summary of Kuriki-san's proposal.

(a) Why new e- driven e+ source for MM:

    e- driven conventional e+ source is the only
    one method, which ever been operated, but
    some risk on the conversion target.

    If this cost is cheaper than undulator, it is very
    suitable for MM study.

    The risk is concentrated on the conversion and
    capture devices, which can be controlled by
    appropriate R&D.

(b) Choice of drive beam energy and target thickness:

    Drive beam :
       700MeV, 160 % intensity electron (5.12nC).

(100 % = 2 x 10^{10} particles/bunch)

Target :
3X0 tungsten

Matching device and positron yield:
if "Flux concentrator" --> e+ intensity = 51 %
if "Liquid Lithium lens" --> e+ intensity = 102 %

(c) Configuration of the new e- driven e+ source

L-band RF gun (FLASH type) generates ILC format (1300 bunches in 1 m sec) beam with 5.1nC bunch intensity.

One RF section (2 klystron for high beam power drives 3 cryomodules, 24 cavities) accelerate it up to 700MeV.

Liquid lead target + Liquid Lithium lens for high capture efficiency.

(d) Cost reduction"

"167 m undulator at end-of-linac"
--> "700 MeV e- driven source"

Cost reduction = 48.8 MILC

(e) Comparison: "700 MeV e- driven source" and "undulator"

"700 MeV e- driven source"
* significant cost reduction.
* It has a potential risk, but it can be controlled.

"undulator"
Not suitable for MM because it leads a definite change on our scope.
* The cost minimum solution (undulator at the end of linac, constant undulator length) results luminosity loss in any case for lower energy operation.
* To fulfill the required luminosity, the undulator length becomes incredibly long.

(f) Sub effects (when we employ "700 MeV e- driven source"):

(1) The emittance of the generated positron beam is larger. DR acceptance should be confirmed.

(2) The degree of freedom of the layout and operation is much increased. Further optimization for better availability, operability, cost saving, etc. are possible;
* No need for adjustment on the round trip path to be an integer of DR circumference.

700MeV, 100 % intensity electron (5.12nC).

* No operational dependence to other subsystems.
* The system do not have to be stuck in BDS. Construction and commissioning scenario becomes much simpler.

(g) Kuriki-san's proposal:
We keep the undulator as our baseline and the "700 MeV e- driven e+ source" for MM study working assumption.

In Chicago, this proposal was presented to 3 PMs. Nick-san agreed to include this proposal as a part of MM study. Nick-san also stressed that the undulator must be studied in MM. So we will study both in MM.

Discussions in the phone meeting:

Question by Chehab-san:
What is the beam current of the drive beam?
Answer by Omori:
"5.1 nC/bunch x 1300 bunches" in 1 m sec. In order to accelerate this high current beam, Kuriki-san put 2 klystrons to 3 cryomodules. The number of klystron/cryomodule is double of the main linac.

Question by Chehab-san:
Who will study a liquid-target.
Answer by Urakawa-san:
We expect a liquid-target will be studied by BINP people. Actually, they already made a prototype. A beam test will be done in KEK.

Question by Chehab-san:
Who will study a Li-lens.
Answer by Urakawa-san:
Mihailchenko-san already made a conceptual design. BINP already made a prototype liquid Li-lens for a proton beam. We expect that we can combine those two effects. A beam test will be done in KEK.
Comment by Omori:
CESR people also have a plan of liquid Li-lens study.

Comment by Louis-san:
Louis-san stressed the difficulty of the construction and commissioning scenario when we put the undulator in the BDS tunnel.

The date of the next meeting will be on either December 12th or 19th. Or it will be at the begging of the next year. We will decide later.

Reported by T. OMORI

of the next year. We will decide later.