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Subject: photon collider at ILC

Dear Barry, Brian, Gerry, Fumihiko,

please accept my congratulation on the completion of the formation of the core of the ILC general staff!

On behalf of large group of colleagues and personally I would like to pay your attention to one strategic ILC direction before any irreversible decisions are taken. The matter concerns the photon collider.

My task is facilitated by the fact that you are not presidents of the USA, UK, Japan, but are very experienced experimental physicists and as colleagues we can understand each other without extra words. Nevertheless, as a godfather of this proposal I would like to explain shortly what is a basis of my strong belief in this venture.

1. Motivation.

At linear colliders electron beams are used only once, this makes possible to convert (by laser) electrons to high energy photons and study gg , ge collisions with energies and luminosities similar to e^+e^- . The number of interesting events (like any heavy charged pairs), $L \cdot \sigma$, is similar (or even higher) than in e^+e^- . One can study the same physics, but in different reactions. In some cases the photon collider provides the excess to higher masses (C-even resonances in gg , like H,A; like a pair of heavy charged SUSY and light neutralino in ge).

There is no principle reasons to consider e^+e^- much better than gg , if energies and luminosities are similar.

Due to additional types of collisions the LC physics program almost doubles, and this needs very small (relative) additional cost, may be 2-3% (if the same detector and IP). It is clear to any sensible person, that if it technically possible, it should be included to a basic ILC design without doubts!

2. Technical feasibility.

A critical element is the laser system. Fortunately, due to a large distance between bunches at the ILC, one can use an external

optical cavity which saves the laser power by a factor of 100. All technologies exist, though it will be a state-of-art laser system which needs intellectual efforts, money and time (still sufficient).

There is some risk, but small, because the detector can continue work in e^+e^- or $e-e^-$ modes (LIGO was more risky!). We should accept some risks in order to make progress and reach success, otherwise life will be not interesting.

Most comprehensive description of the photon collider is the chapter in TESLA TDR, The Photon collider at TESLA, hep-ex/0108012, Intern.Journ.of Mod.Phys.A 19(2004)5097-5186 (ed.V.Telnov), can be read out from the photon collider home page <http://www.desy.de/~telnov/ggtesla>

3. Physics community.

All LC, LCWS and regional workshops had gg-sessions, there were three International workshops on photon colliders. The number of publications (mostly theoretical) is > 1000 , citation of the basic paper >500 . In 1999 we created the International collaboration on photon colliders, about 150 signed. The number of authors of TESLA TDR chapter is about 100 people from 44 institutes. There is no doubts that sufficient number of people will join to this project when it will be officially supported (by now only real enthusiasts).

4. Further steps.

In July 2004, the photon collider conveners sent the letter to ISCLC and WWS OC with our view on a place of the photon collider in the LC project:

(<http://www.desy.de/~telnov/ggtesla/letter/ggletter.pdf>)

Please, read it (only 1.5 pages), very important for nearest steps on ILC.

There we enumerated special requirements to the LC systems (damping ring, crossing angle, final focus, detector, beam dump, space for laser etc) which should be included to the basic LC project from the very beginning, and how we see further work on the photon collider in the frame of ILC.

This work assumes a tight collaboration of the photon collider group with LC designers and one of the detectors (one of experiments after 3-4 years of e^+e^- runs is modified for work in gg,ge modes).

Let me note that may be due to many events on the ILC during the last year the photon collider at present is not mentioned in the organization structure of the ILC. I guest it should be corrected, and photon collider should be presented at GDE level as important part of the project interfering

with many other systems.

These days I am working in contact with MDI group on ILC layout (crossing angle, beam dump which are special for the photon collider) and basic parameters. With gg-conveners we agreed to prepare some not long document on the photon collider for Snowmass (I am a chief editor) which include questions connected with ILC layout and parameters .

But it is clear that further steps are not possible without political and organization decisions on this subject and we hope on your wise decisions and support.

From my side, I can provide any additional information on the photon collider and will be happy to continue the work photon colliders (since 1980) on organization and expert levels.

Wish you success!

Best regards

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