

Summary on the ILC undulator source discussion at LCWS 2013, Tokyo and proposed work plan

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In the last decade, many technical issues for the undulator based positron source have been resolved:

- End to end beam dynamic simulations, including spin tracking by several institutes.
- Constructed and tested a prototype superconducting undulator, total 4 meter long, to the specified field ($K=0.92$) period ($l=1.15$ cm). No show stopper identified.
- Calculation on the target heating and shocks from incoming gamma beam shows no major issues identified from the studies.
- A fast spinning target wheel constructed and tested (2000 rpm) at UK with no show stoppers identified.
- Major components such as OMD, normal conducting pre-accelerator are tested to satisfactory.
- A much simplified layout of the remote handling system has been developed, and with much cost reduction from the early design.
- Interfacing with damping ring studied and no issues arisen.

A few risk issues identified with the current target design, a detailed (but limited) experimental study on rotating target vacuum Ferro fluidic seal at LLNL showed:

- Limited life time of a vacuum seal (short time survival, but long term > a few weeks with vacuum spikes) and no further experiments on other type of seal for improved study due to lack of funding.
- No radiation damaging testing yet and cooling water impact on wheel dynamics.

There is plan for a rotating seal leak test at KEK planned, but at much lower rotation speed.

Suggested work plan in the near term:

- Further study on spinning target tests, including: a new type of sealing material, better cooling, and incorporate differential pumping, as suggested by many attendees.
- **The further study on the vacuum of the spinning target should include a real size wheel and cooling water flow in the wheel.**
- Pursue an alternative plan, such as a self-contained bullet type target system, as proposed by Wei Gai or other ideas. Any new target scheme should only be limited to the current target floor space and not cause any civil engineering difficulties.
- A back up plan of conventional source should be examined. Current favorite version is the 300 Hz option, as proposed by the collaboration of ANL, IHEP, Hiroshima U., U. of Tokyo, KEK, DESY, and U. of Hamburg . Key issues to be resolved for the scheme:
 - Target: Shocks, stresses, and cooling. There are some existing design/working models to follow. Need some engineering studies, require 5 m/s.
 - Due to the bunch timing structure, the following new issues to be considered:

- § Beam capturing Linac, 300 Hz linac (hybrid L and S?); Un-even beam loading, and energy compensation; RF gymnastics (solution exists, although may not be optimized); Interface between L-band and S-band (bunch compressor?)
- § Start to end beam dynamics simulation is required.
- § Interface with damping ring simulation.
- Develop a floor plan that the whole system can be fit into the baseline configuration. (undulator scheme)
- Costing according to ILC methodology.

During the discussion, the attendees agreed that although above tasks can be challenging, but given enough R&D resources, they all are solvable. If funding provided, we should be able to find a working solution for the ILC e+ source, and make sure that sources are not a technical bottle neck for the ILC construction in Japan.