



LINEAR COLLIDER COLLABORATION

Designing the world's next great particle accelerator

**LCC Technical Board Meeting, 5 August 2014**

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# R&D criteria

- ILC is a huge project on the fundamental Science.
- We have no future if we fail.
- It is desirable to demonstrate the system prior to the project approving, but it is sometimes practically difficult.
- At least, any critical components have to be confirmed in the same level with the real component.



# Super-conducting Case

- The target gradient is confirmed in laboratory level more than 10 years ago, but it is not sufficient.
- Cryo-module system test: S1 global. TTF, STF-Phase I, NML-FNAL,...
- Linac system test : TTF, FLASH/XFEL, STF Q-beam, STF-Phase II,
- Study for industrialization: Yield study, cost effective fabrication, fabrication pilot plant, ...

**Why do not we need  
the same things for positron?**



# Undulator Positron

- Undulator prototype: OK at this moment.
- Undulator system test: ?
  - E166 is for principal demonstration and far from the real system.
  - It is practically difficult.
  - We need a realistic commissioning scenario of the positron source. Otherwise, it could be time consuming.
- Flux concentrator : OK, but need a vital test.
- Target: This is our main issue in this meeting.
- Capture RF : SLAC design is enough.



# Criteria for Target R&D

- Target is the most critical device among sub-components of the positron system.
  - Possible issues are
    - Target damage by heat load, shock-wave, fatigue, etc.
    - Mechanical vibration,
    - Vacuum seal,
    - Water cooling,
  - The target system test is possible. We have to do it.
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# Undulator Target

- 100 m/s in vacuum is not established technology. We have to do the system test.
  - LLNL : Rim rotating target with the ferromagnetic fluid seal.
    - Vacuum spike problem should be understood.
    - Need some collaboration with company is desirable. RIGAKU, Ferrotech,..
    - The target has the same weight, but size is smaller (i.e. moment is smaller). The same target test is desirable.
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# Comments on the differential Pumping Concept

- Differential pumping is a well known technique to achieve UHV with some massive out gas environment.
  - Conductance of a seal strongly depends on the clearance between the rotating rod and seal wall. The required clearance depends on anomalous vibration of the rotating rod which is usually difficult to expect.
  - A target system with a real geometry and weight is required to engineer the seal geometry.
  - This experimental data will be obtained from FFNL test by replacing the ferro-M-seal to the labyrinth seal.
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## E-driven 300Hz target

- 5 m/s in vacuum is established technology according to RIGAKU Co for commercial X-ray source.
  - Radiation damage on the seal material is issue. An irradiation test will be carried out in this year at JAEA Takasaki Co facility.
  - A prototype with a realistic geometry target will be designed in this fiscal year. The fabrication is in the next fiscal year (2015). The system test including an endurance test will be made.
  - Another concept, pendulum target prototype is considered. An endurance test for the vacuum bellows (Medium Vacuum) is carried out in this year.
  - Flux concentrator: A design will be made based on Super-KEKB Flux concentrator, because the pulse structure is similar to that of S-KEKB, 7T, 5 $\mu$ s, instead of 1ms for the undulator.
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