

Recent ILC Activities in Japan

R&D for Cost Reduction
Response to NRI Report

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2016.10.24 ILC-CLIC Positron

Effort for Cost reduction

- MEXT ask for possibility of cost reduction
- Mainly in SCRF technology
 - ILC budget completely cut off in US but there is still some budget for SCRF
- Possible items: improvement of cavity
 - High Q and High G by nitrogen doping
 - Niobium material (large grain, low RRR)
 - Coupler improvement
- Cannot expect significant cost reduction in other fields

Response to NRI Report

- NRI (Nomura Research Institute) Report on ILC Technology
 - “ILC計画に関する技術的実現可能性等調査分析報告書” (in Japanese only)
 - http://www.mext.go.jp/b_menu/shingi/chousa/shinkou/038/gaiyou/1374357.htm
 - ~240 pages in 3 volumes.
 - The report assigns 4-level ranks for ~30 items of ILC technology
 - ◎ : Double circle: prototype and test done, improvement by small scale R&D
 - ○ : Single circle: prototype and test done, some more R&D needed for mass production
 - △ : Triangle : no prototype, no validation, break through needed
 - × : Cross : basic technology premature

Triangle Items

- There is no “cross” item but there are several “triangles”
- Marx modulator
- **Undulator source**
 - Target (water cooling failed, no prototype for others)
 - Undulator (field accuracy, no beam test)
- **e-Driven source**
 - No target prototype
 - Detailed design of AMD & booster linac
- Feedback system in Damping Ring (high ADC bits)
- Main beam dump (14MW)
 - No prototype
 - Window
 - Safety
- Crab cavity
 - No prototype of 9-cell cavity
 - HOM coupler
 - Cryostat design

Budgets

- JFY2016,2017: Regular year budget only. No specific budgets for R&D
 - Will stop STF operation and reduce the operation time for ATF2
- May expect additional budget in JFY2018, 2019.

e-Driven Source (1)

- Target
 - Had a meeting at KEK with Rigaku and non-positron people
 - Key technology is the magnetic fluid in high vacuum (evaporation)
 - Equilibrium vapor pressure is a strong function of temperature: $\log P$ proportional to $-1/T$
 - P around 10^{-7} Pa for temperature at 50 deg C for material of good endurance under radiation (though the data is still poor)
 - The rotation speed less important
 - Hence, this study will also help water cooling of undulator source target
 - Conclusion:
 - Continue present prototype construction with Rigaku (~\$50k in JFY2016, and hopefully, plus ~\$50k in 2017)
 - With a bit different emphasis
 - → Add differential pumping for testing high vacuum
 - → Cannot be done in JFY2016. Design only.

e-Driven Source (2)

- NC SW cavities right after FC
 - 3 problems:
 - Radiation effects (discharge)
 - Temperature change by heating
 - Beam-loading
 - Detailed design study in JFY2016+2017
- Detailed system design
 - Radiation shield
 - Good info from undulator source study
 - Cost estimation
 - Presumably more costly than undulator source but how much?
 - Tend to focus on 1312 bunches

Undulator Positron

- Reconfirm that the baseline is the undulator source
 - Japanese involvement has been limited up to now
 - Should contribute more
- Undulator: we claim
 - Accurate field can be obtained by careful winding
 - Beam test not needed
 - So, no new R&D being planned
- Target
 - R&D for water cooling of e-driven source will also help the undulator source
 - Can we contribute something for radiation cooling?