AWG1 (Injector) Summary

Steffen Döbert, Wei Gai, Masao Kuriki

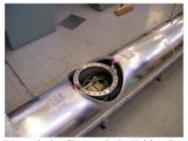
Working Group Summary

- 3 presentations for electron source
- 13 presentations for positron source
- 1 presentation for polarization in physics
- Posipol 2014 (ILC-CLIC e+ study group) meeting will be held in Morioka.

Undulator e+ source (baseline) — W. Gai

Flux concentrator R&D — J. Gronberg

4-m module fabrication and cryogenic tests

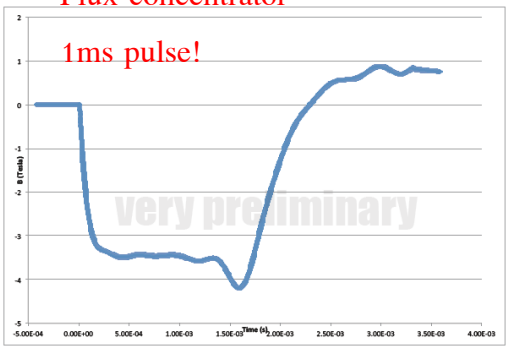


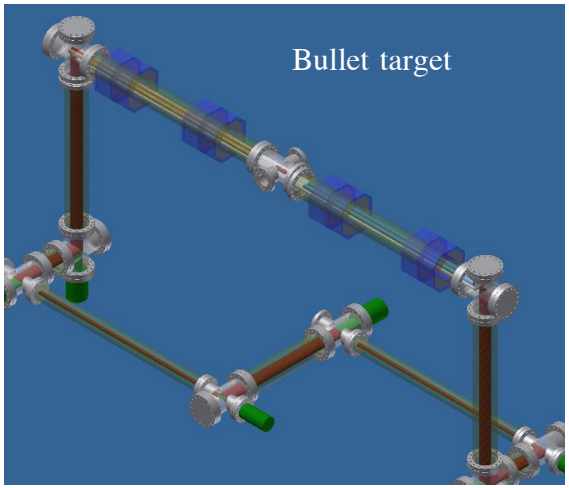
Y. Ivanyushenkov, "Superconducting Undulator Status", POSIPOL2013, ANL, September 4, 2013

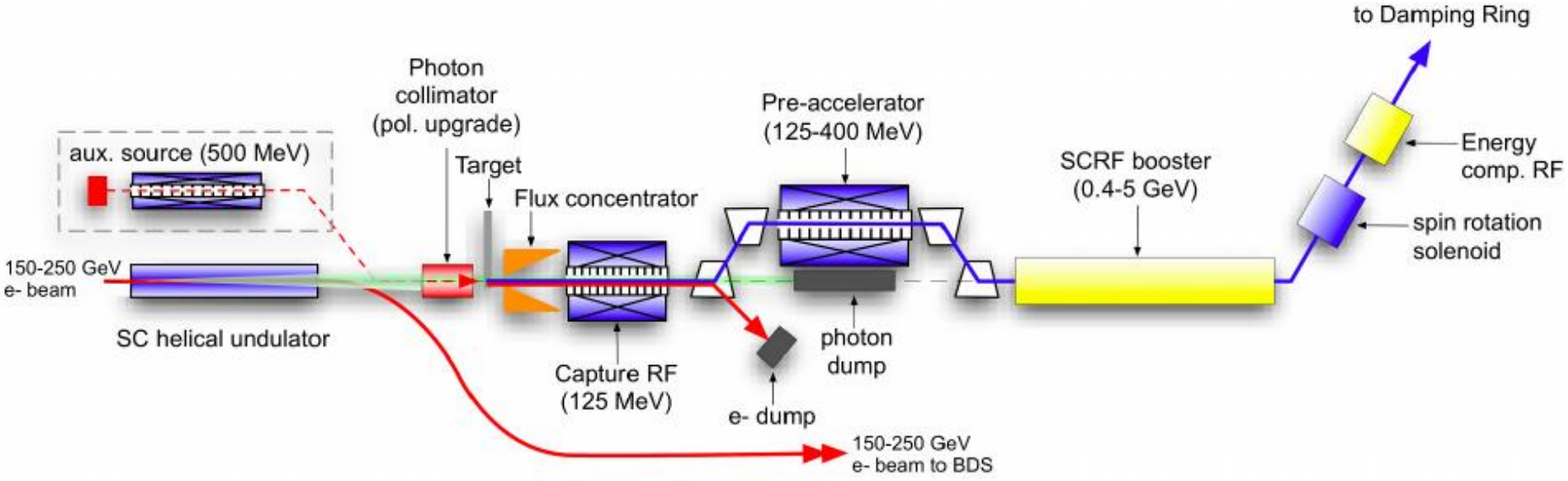
8

Flux concentrator

1ms pulse!





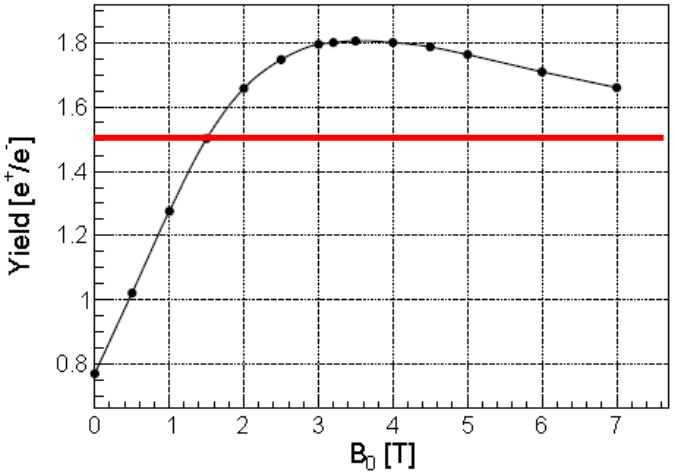


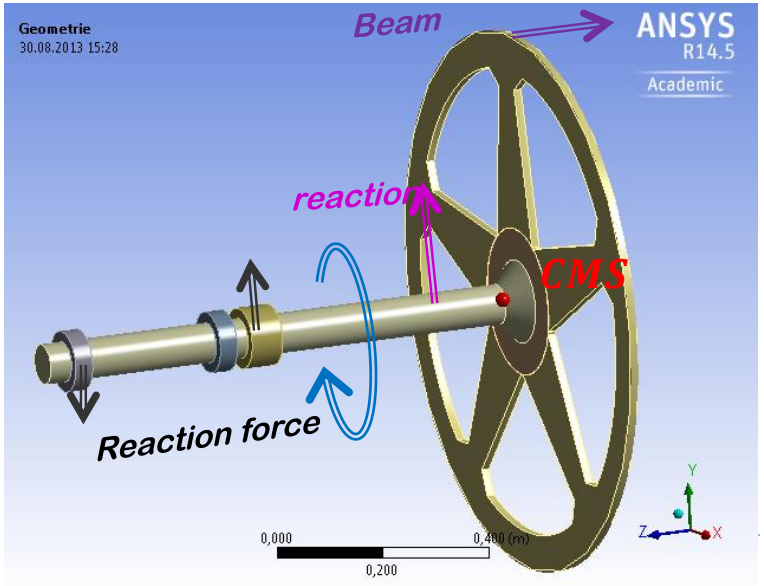
Undulator Source at ILC1 (120GeV)

A. Ushakov

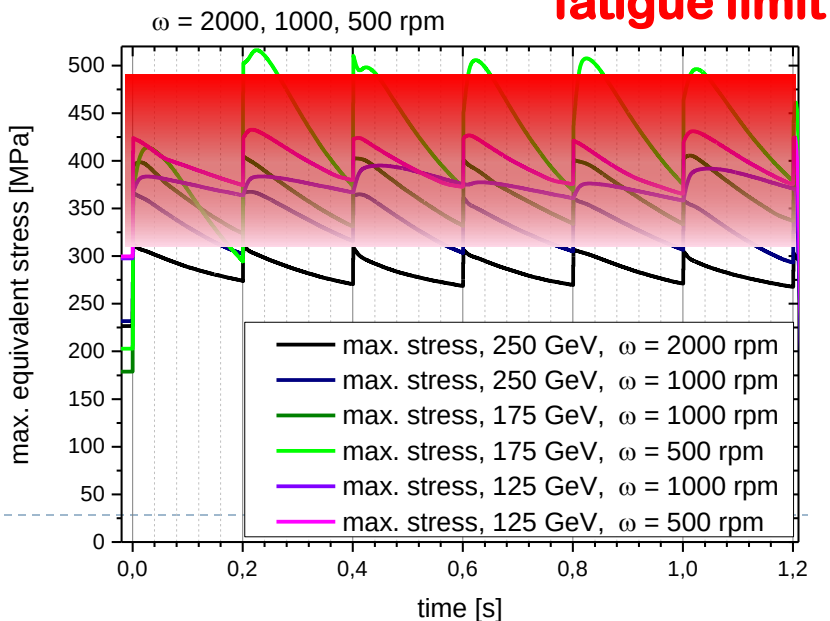
Heat load, stress and reaction force studies of target **F. Staufenbiel**

- Less yield at ILC1 can be recovered by
  - 147 - > 231m undulator
  - Optimze capture parameters.
- No 10 Hz operation is needed.





fatigue limit



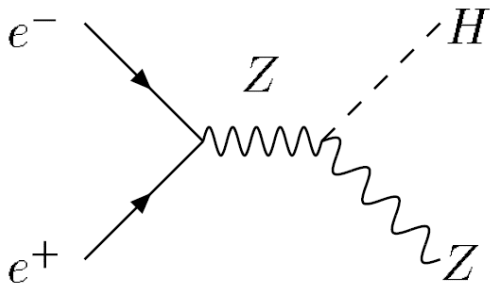
Polarized positrons at low energies S. Riemann

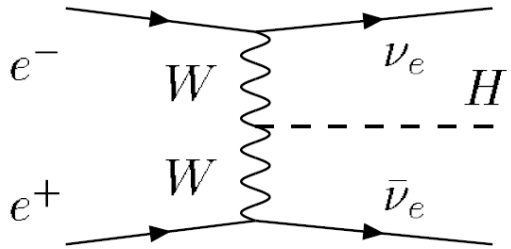
$e^+_R\, e^-_L \rightarrow ZH$

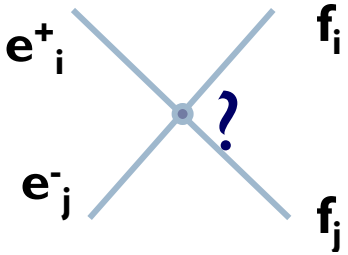
$e^+_L\, e^-_R \rightarrow ZH$

~~$e^+_L\, e^-_L \rightarrow ZH$~~

~~$e^+_R\, e^-_R \rightarrow ZH$~~



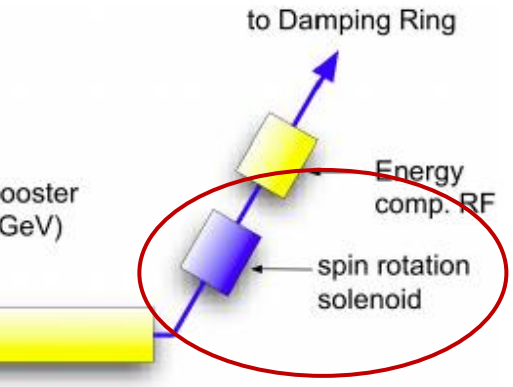


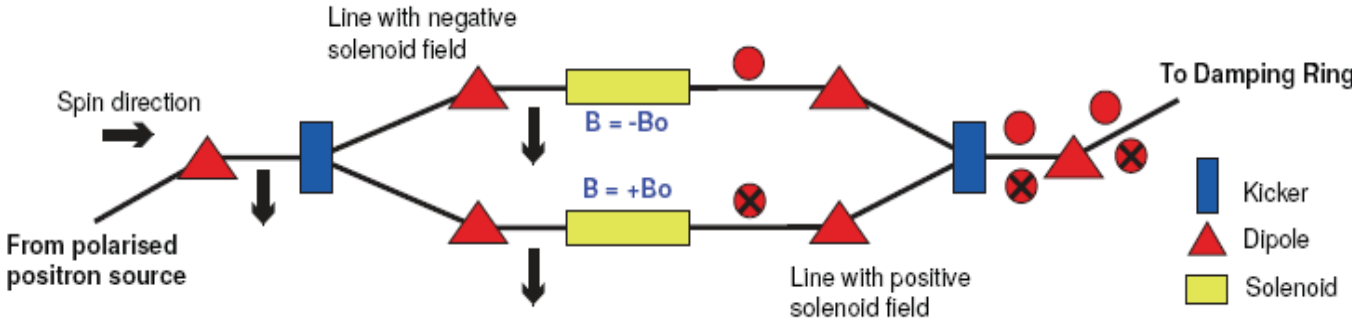


$$\sim \frac{\eta_{ij} \cdot E_{cm}^2}{\Lambda^2}$$

i,j = L,R

Best flexibility with polarized e+ and polarized e- beam





300Hz Conventional e+ Source: Flux Concentrator for Super-KEKB

T. Omori
T. Kamitani

e+ creation
20 triplets, 300Hz in 60ms

go to main linac
1ms pulse, 5Hz

Drive Linac
6 GeV NC

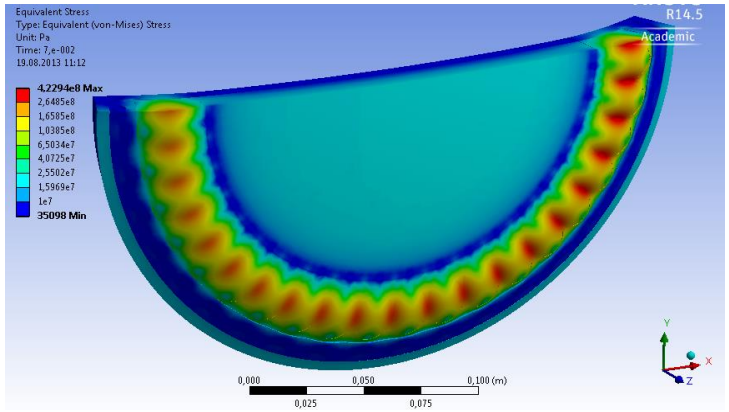
Booster Linac
5 GeV NC

DR

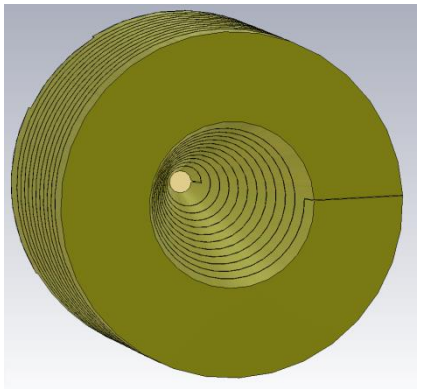
$T_{b\_to\_b}$ = 6.15 n sec

2640 bunches
60 mini-trains

5m/s W Target



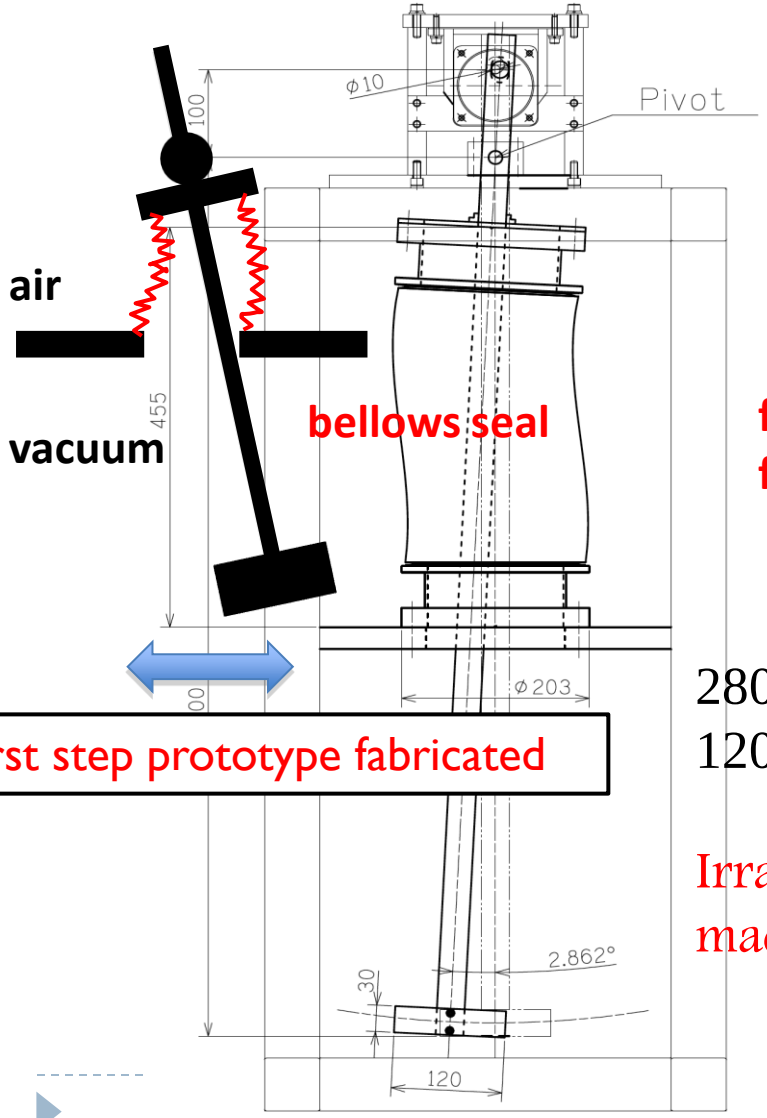
Super-B AMD

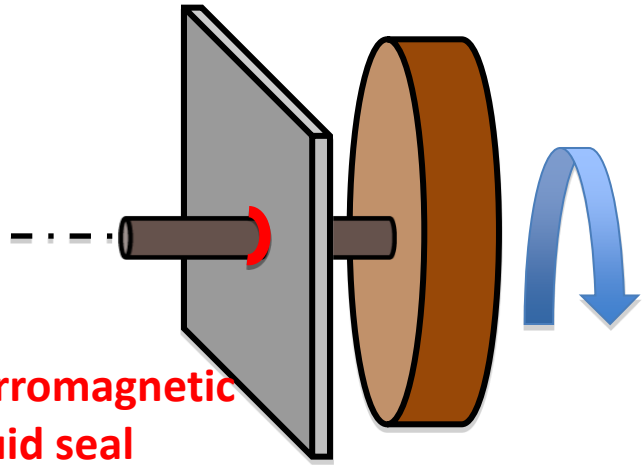


Applicable to ILC

Target R&D
Rad. Dose at Fluid seal

T. Omori
T. Takahashi



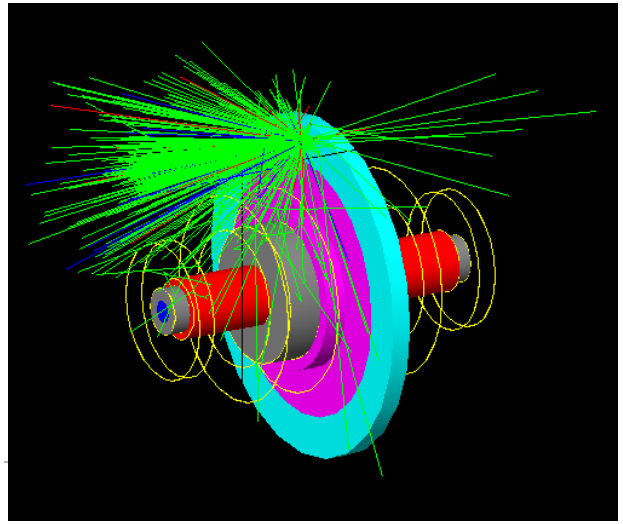


Prototype will be delivered soon.

First step prototype fabricated

280MGy/year at peak
120MGy/year average

Irradiation test will be made at JAEA Takasaki.

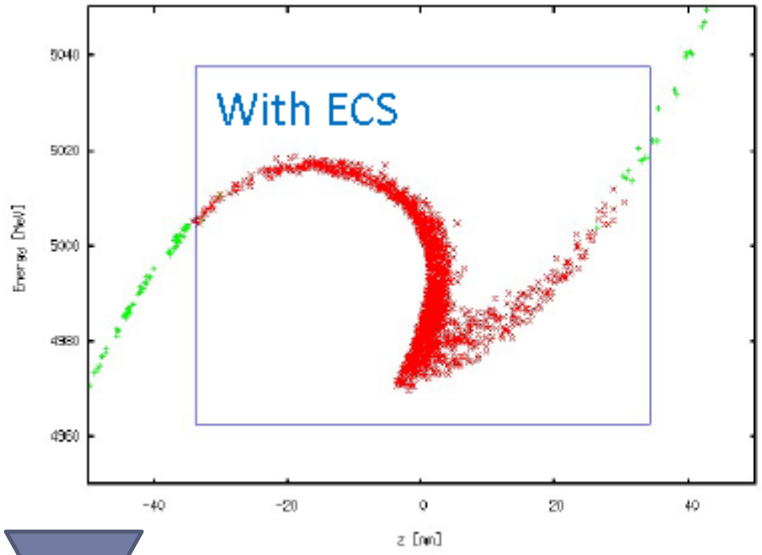


E+ Capture Optimization
Beam loading comp. for 300Hz e+ gen.

T. Okugi
J. Urakawa

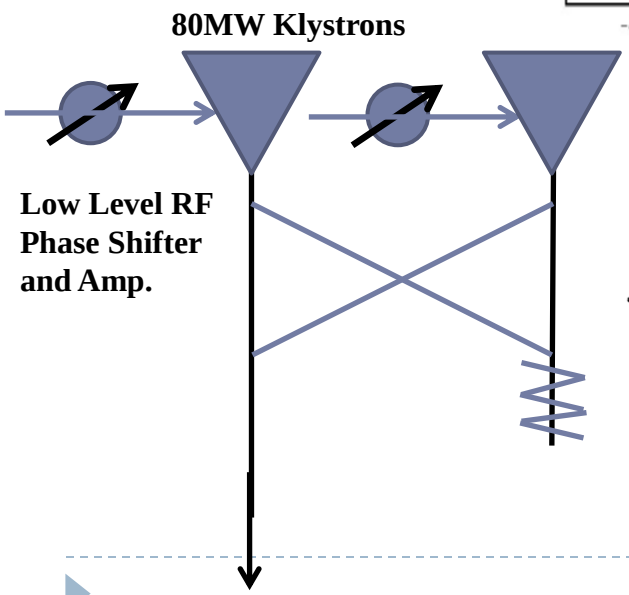
- 40MV/m Acc.
- 2.0T Solenoid

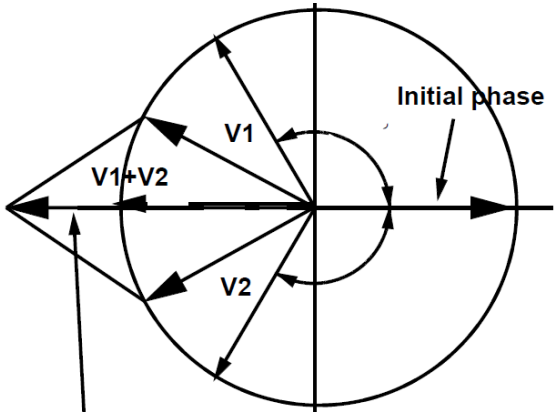
Reproduce a similar result with more conventional parameters is desirable.

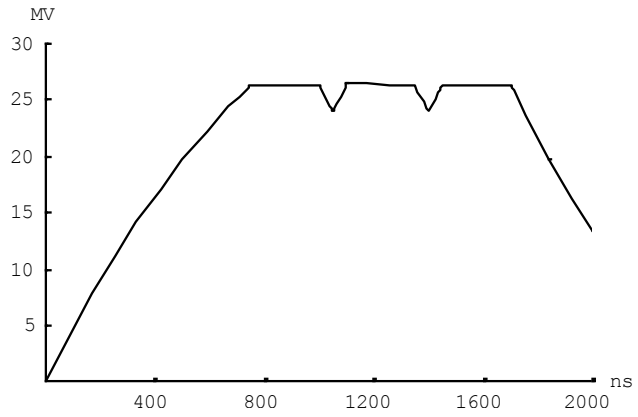


e+/e− > 1.5

Location	Efficiency
Injection	2.842
After Booster	1.914
After ECS	1.673
Long. Cut	1.672
Long. & Trans. Cut	1.641





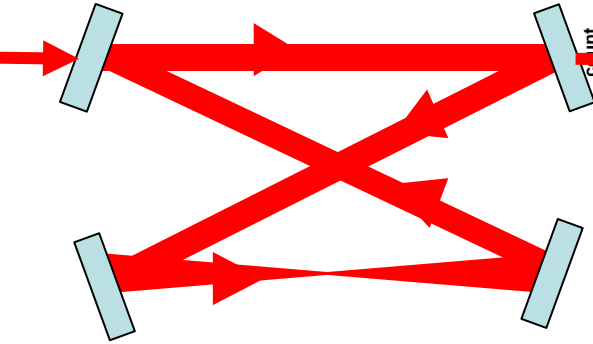


Laser Compton Exp. At ATF

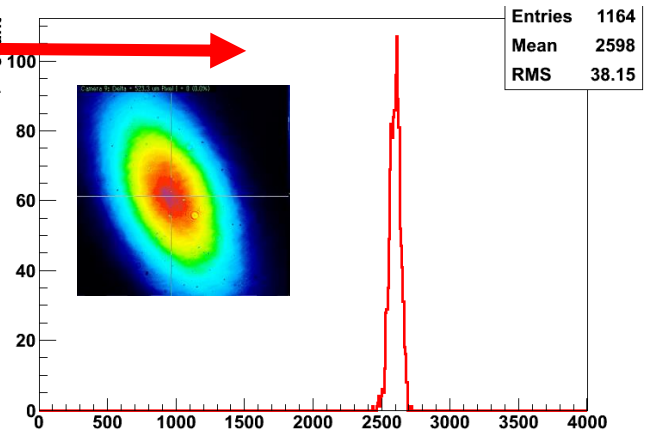
New Quantum Beam project

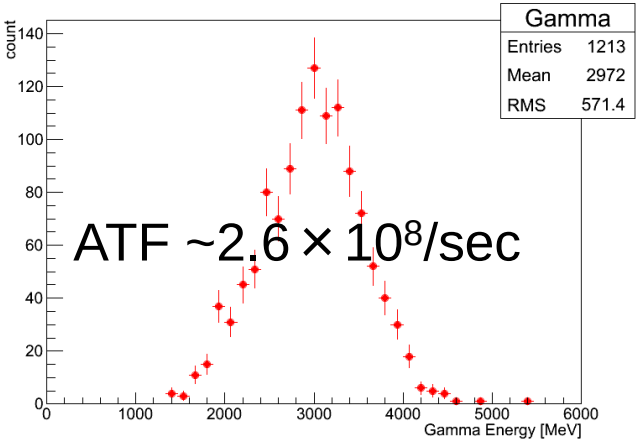
T. Takahashi

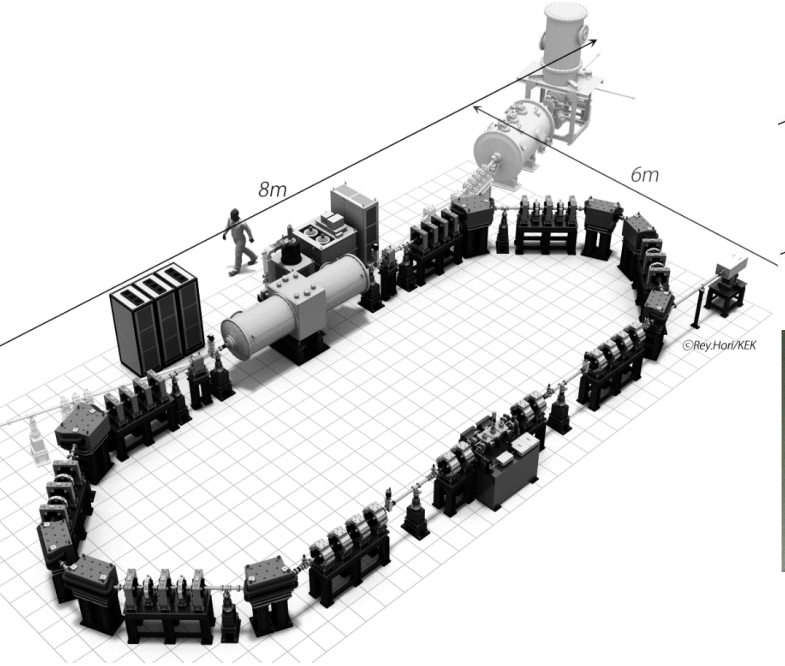
J. Urakawa

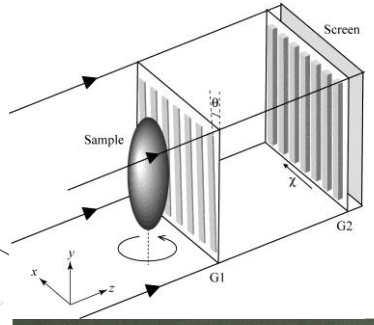


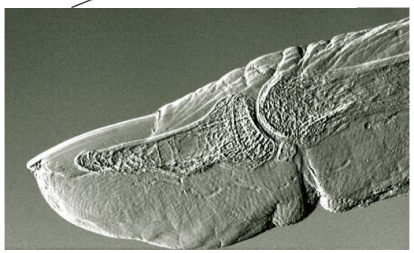
Achieved ΔL<<8pm







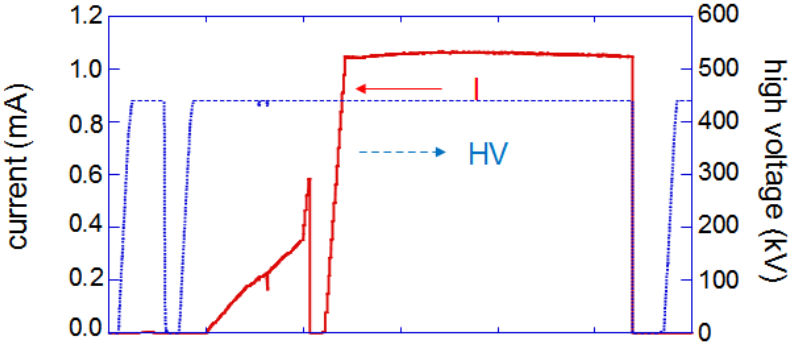


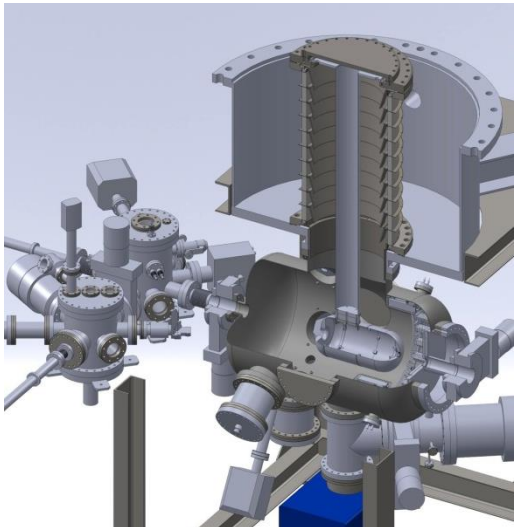


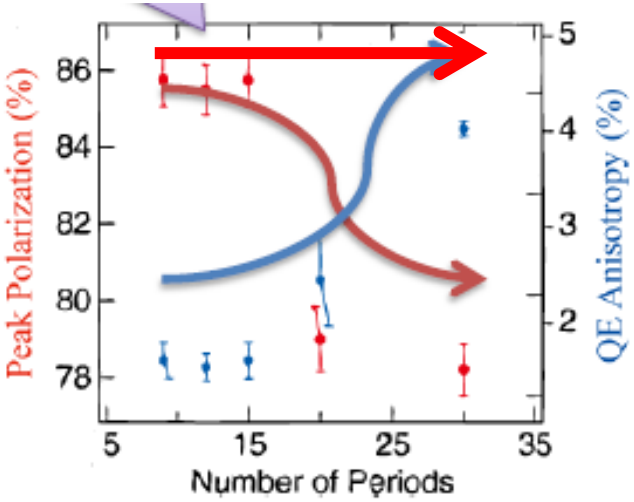
500kV DC gun for ILC M. Kuriki

Strain Compensated Super-lattice GaAs cathode N. Yamamoto

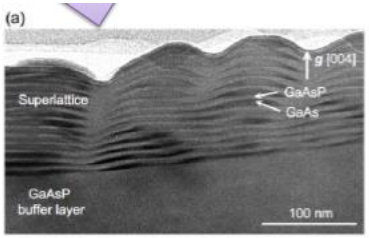
Demonstration
500kV, 10mA
Cathode emission current should be improved.







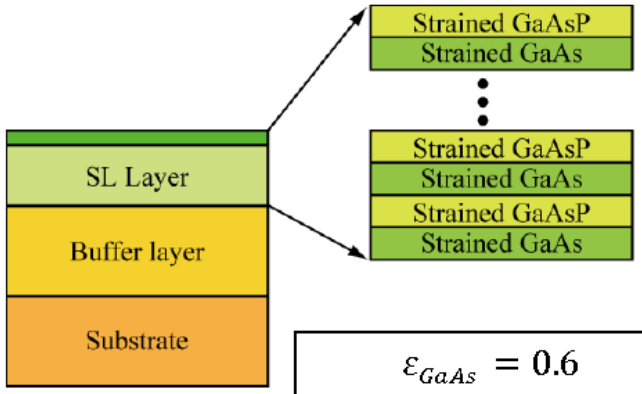
Ref. T. Maruyama, et al., APL (2004)



Ref. X.G.Kim, et al., JAP (2010)

By controlling zero net strain, high QE and High polarization is possible!

Strain-compensated SL

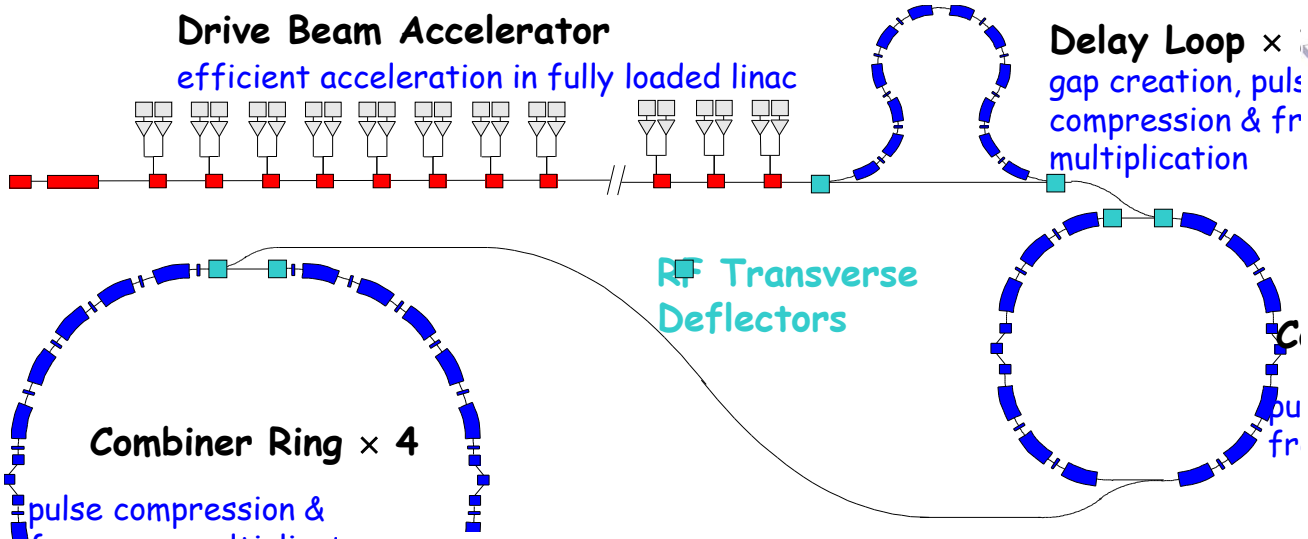


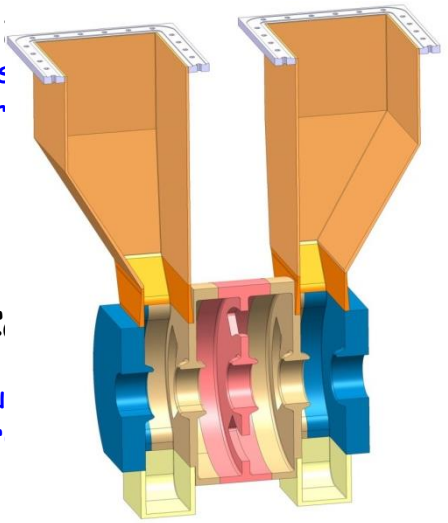
$\varepsilon_{GaAs} = 0.6$
$\varepsilon_{GaAsP} = -0.6$
$L_{GaAs} \cong L_{GaAsP} = 4nm$

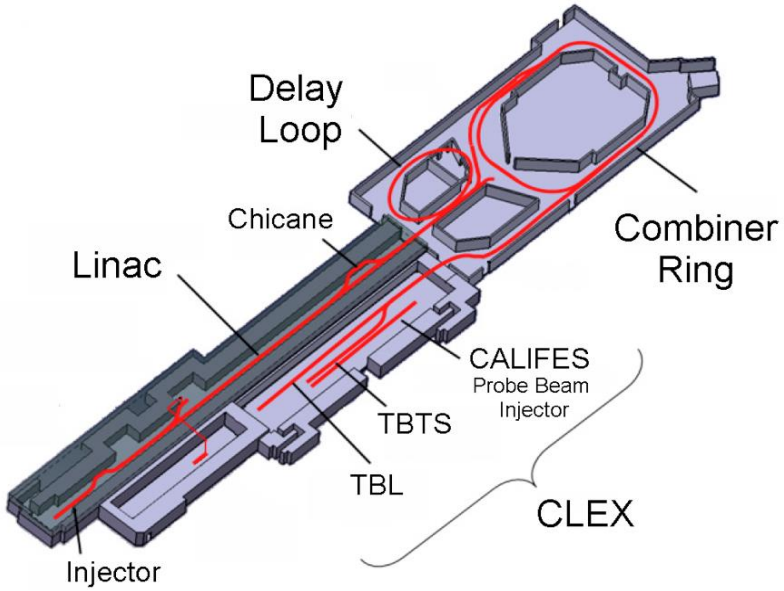
Net strain $\cong$ 0

Drive Beam injector developments

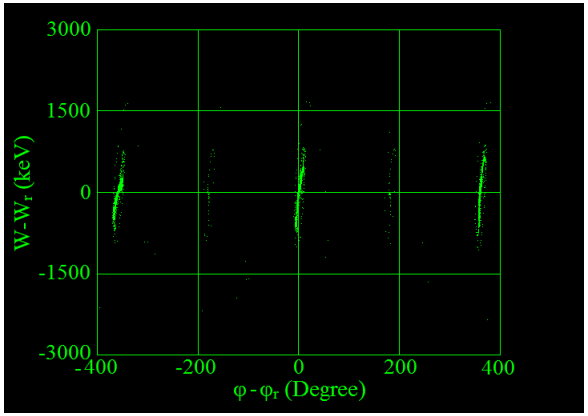
S. Döbert







SOURCE LAYOUT



Discussion

- Electron source
  - The gun system development is desirable.
- Undulator :
  - Technical demonstration of e+ production target with an enough level is mandate.
  - Mechanical engineering design of the undulator should be made.
- 300Hz e- driven:
  - Target prototype will be made soon.
  - Irradiation test of magnetic fluid seal will be made.
  - Super-B AMD is applicable for ILC.
  - An integrated simulation for e+ capture is urgent.

Strategy

- Undulator is our baseline. At least, the critical devices should be well established prior to the ground breaking.
- An integrated design of 300Hz conventional scheme should be completed urgently.
- These two schemes have to be compatible from the CFS point of view. The foot prints should be same.
- At some point, we will asses these schemes from the project point of view.
- After that, we will concentrate on a single scheme.

No positron , No collision!

We expect a good management to realize the collision.