

# ***Brief summary of DR/BDS/DUMP group meeting (05/25)***

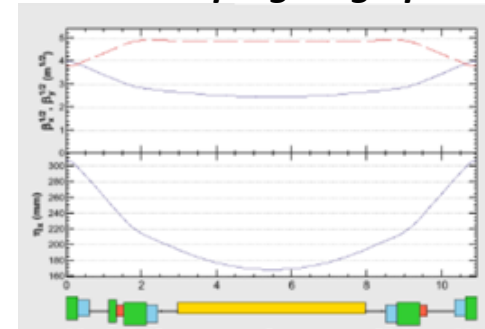
Attendees :, Philip Burrows, Angeles Faus-Golfe, Thomas Markiewicz, Toshiyuki Okugi, Brett Parker, Ben Shepherd, Nobuhiro Terunuma, Glen White, Kaoru Yokoya, Mikhail Zobov

2022/05/31  
Toshiyuki OKUGI, KEK  
IDT WG2 meeting

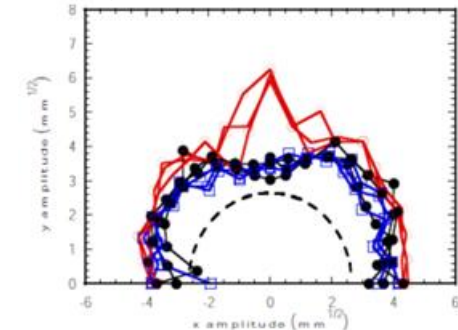
# WP-prime-12: System design of ILC DR

- ◆ The present design of the ILC damping ring (DR) is a simple design using hard edge magnet model with zero spacing between the magnets.
- ◆ It is pointed out that the dynamic aperture of the circular accelerator decreases when the fringe field of the magnet is taken into account.
- ◆ By quantitatively evaluating the effect of fringe field on the dynamic aperture of magnets in ILC DR, the method for evaluating fringe field in accelerator design will be established and the design of ILC DR will be optimized.

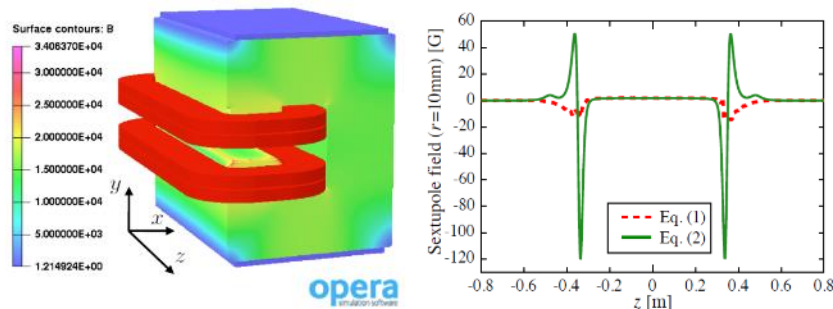
## ILC damping ring optics



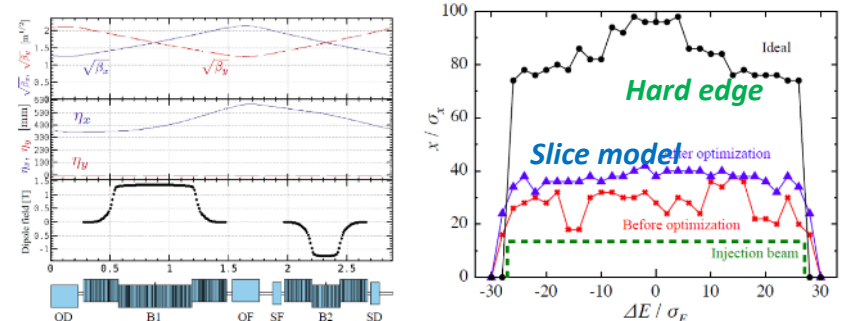
## Dynamic aperture for ILC DR (hard edge)



## Modeling of the fringe field for SuperKEKB DR



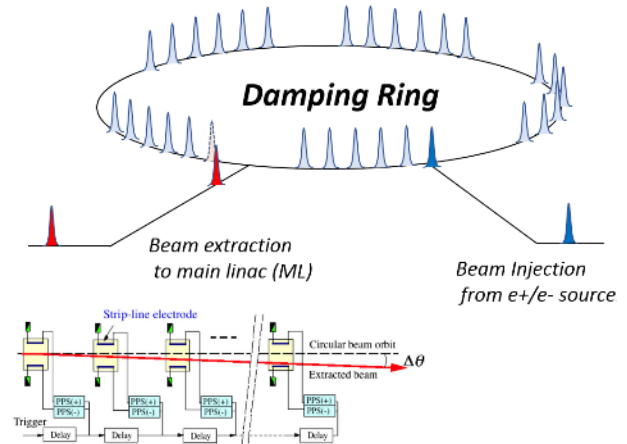
## Dynamic aperture evaluation with fringe effect ( SuperKEKB DR )



# WP-prime-14: System design of ILC DR injection/extraction kickers

- ◆ A fast kicker system using a semiconductor pulse power supply with nanosecond response was confirmed as proof of principle at KEK's ATF about 10 years ago.
- ◆ Semiconductor technology has been evolving, and it is now possible to advance nanosecond response beam injection/excitation systems using the recent semiconductor technology.
- ◆ The technical evaluation of the fast kicker power supply using the recent semiconductor technologies.
- ◆ The evaluation of fast pulsed power supply technology will contribute not only to the fast kicker system but also to the performance and reliability of nanosecond-scale beam control technology and its application to a wide range of accelerator systems.

## ILC fast injection/extraction system

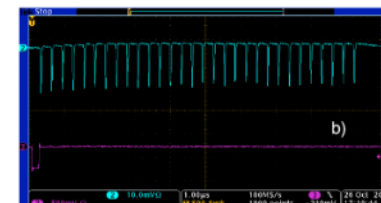


## Beam extraction test at KEK ATF

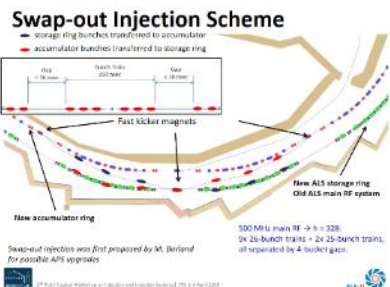
Stored beam in DR



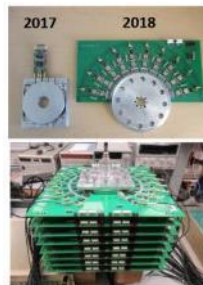
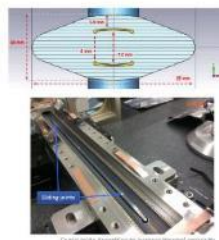
Extracted beam from DR



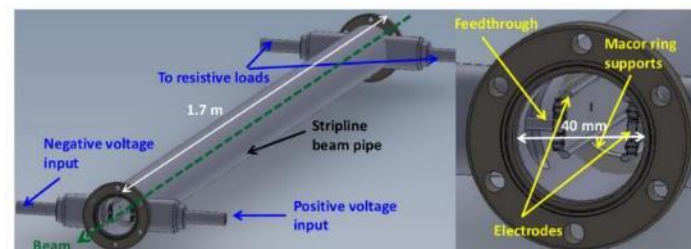
## Swap-out injection system planned at LBNL



ALS-U Test Kicker



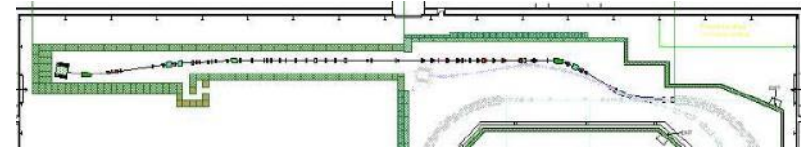
## Beam injection/extraction system for CLIC damping ring



# WP-prime-15: System design of ILC FFS

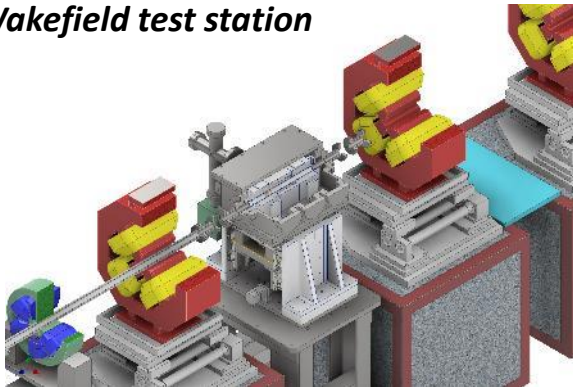
- ◆ ATF2 beamline is the only existing test accelerator in the world to test the final focus system (FFS) of linear colliders.
- ◆ The following 3 research topics are important topics to be pursued at the ATF.
  - ◆ wakefield mitigation
  - ◆ correction of higher-order aberration
  - ◆ training for ILC beam tuning
- ◆ The technical research at ATF2 beamline has proceeded, and should continue to be based on the ATF international collaboration, or its extension (welcome to new collaborators).

**ATF2 beamline**

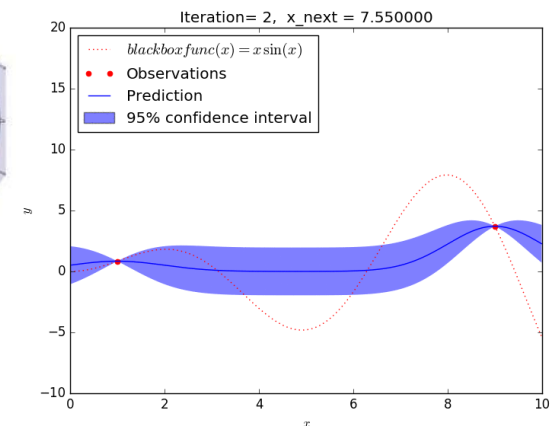
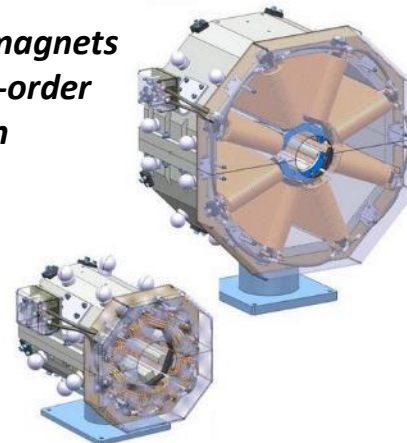


**Maximum search algorithms  
to be applied to beam tuning  
( Machine Learning )**

**Wakefield test station**



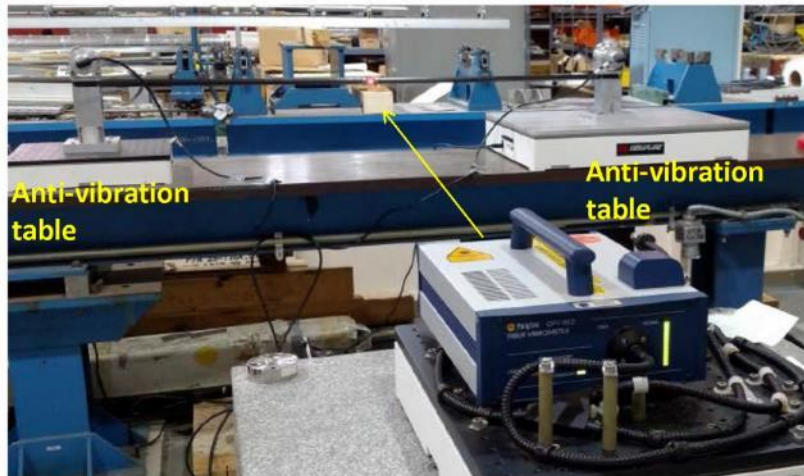
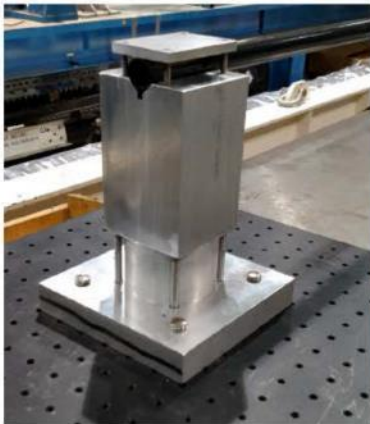
**Octupole magnets  
for higher-order  
aberration**



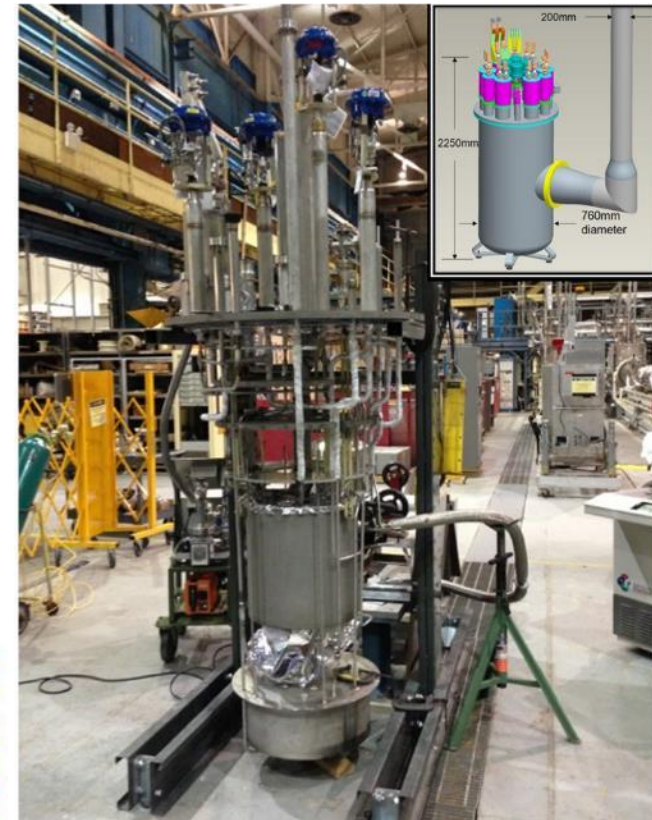
# WP-prime-16: Final doublet design optimization

- ◆ Cooling of the superconducting ILC final focus magnets will be performed using 2K superfluid helium to realize superconducting magnets with high oscillation stability.
- ◆ Quantitative evaluation of the vibration generated by the 2K cooling system located on the side of the final focus magnets has not been completed.
- ◆ We will measure and evaluate the vibration generated by the 2K cooling system by using the prototype.

***Vibration measurement system  
for SuperKEKB final focus magnet (KEK)***



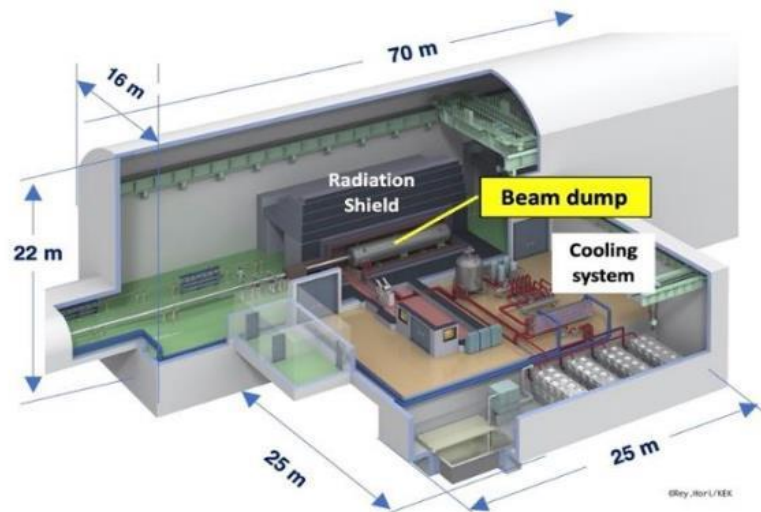
***Prototype of ILC service cryostat  
( 2K cooling system ; BNL )***



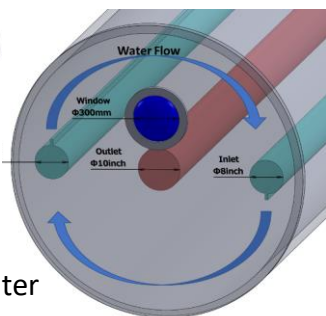
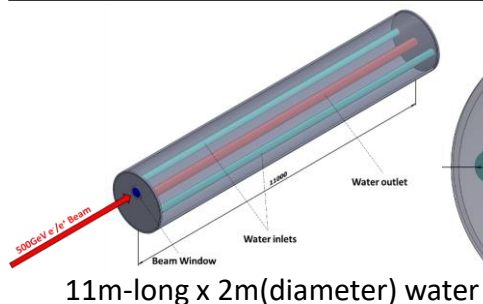
# WP-prime 17: Beam Dump

◆ Finalize the engineering design of the main beam dump system

- Vortex water flow in the dump vessel
- Cooling water circulation and heat exchange
- Remote exchange of the beam window
- Countermeasure for failures / safety system



Imaginary view of the main dump section



## Vortex water flow

- 17 MW at 500 GeV beam
- 1 MPa to prevent boiling

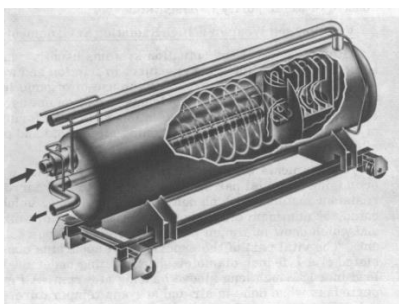
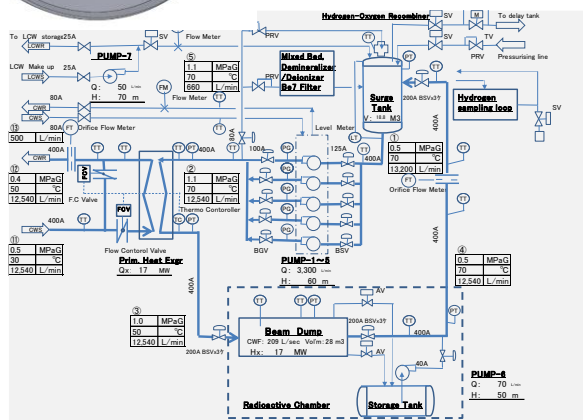
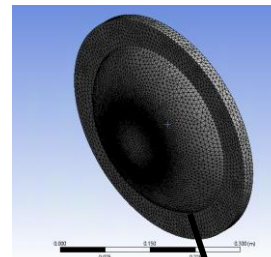


Fig. 1. Artist's Conception of 2.2 MW Beam Dump.

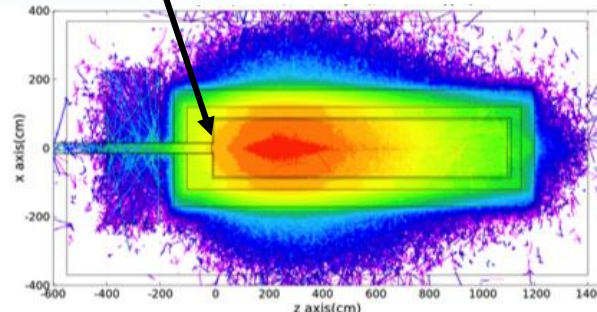


Primary design of the beam dump water circulation and heat exchange



## Beam window

- Ti-alloy
- 30 cm diameter
- Exchange every a few years



Remote exchange of the beam window under high radiation dose

SLAC 2.2MW water dump (precedent)