

# Database and Simulation Codes

**Simple thoughts  
Around Information Repository  
and Around Simulation Codes**

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# Information Repository

## ◆ Information is Valuable

- ❖ However, easily Lost (if Lifespan > 10years)  
and repeatedly Re-produced

## ◆ Central Repository is Necessary

### ❖ Project-wide

Lifespan from Design to Maintenance Phase

- ❖ Preferably any Kinds of Data at Center  
At least Pointers to Real Data

### ✧ Central (as Much as Possible)

- ◆ Different versions of Beamline Geometry, Component Design, Electronics, Scheduling, Simulation Codes

### ✧ Distributed (Possibly)

- ◆ Drawings, Budget, Purchase History, Personnel



# Repository; Features

## ◆ Easy Access

### ❖ Otherwise, not Stored and Lost

- ◆ Becomes a Dead Resource

### ❖ Requires Web based Human Interface

- ◆ Easily Accessible by Anyone

### ❖ As well as API for Simulation Codes, etc

- ◆ Multiple Language API to Repository
- ◆ Such as Oracle, Postgres or MySQL, etc

### ❖ Should be easily tested

- ◆ Open Source Solution is Preferable for wide acceptance
- ◆ There are many projects successful with Open Source DB

## ◆ Some extent of Security Level

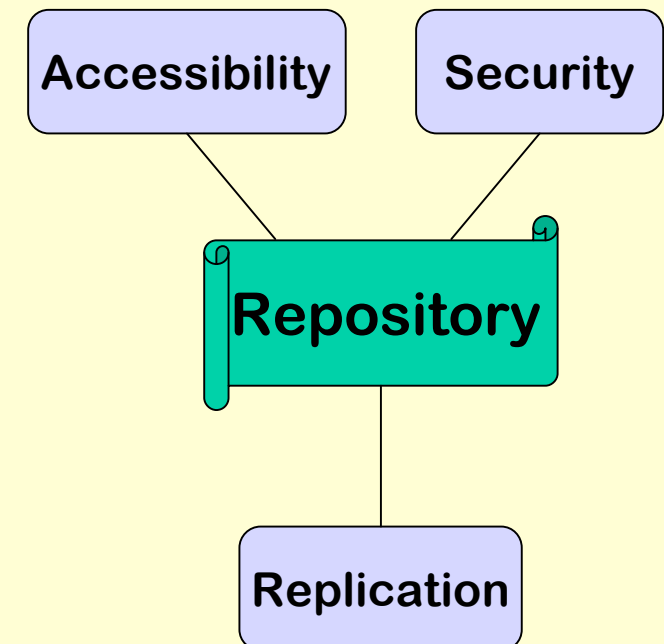
### ❖ Automatic e-Mail based Account

- ✧ We cannot manage all the Accounts Manually

## ◆ Replication between Continents

### ❖ In case of Network Trouble

- ✧ But the Technology is not Mature yet...



# Repository; Internal

## ◆ Relational Database Construction

- ❖ If one group of Information is small; no problem
- ❖ If Large; Relational Information Management is indispensable
  - ✧ However, if it is Complicated No one would update

## ◆ Realization

- ❖ Large Labs utilize Information Infrastructure with Oracle
- ❖ Many Projects Start to Utilizing Open Source Solutions
  - ✧ Postgres or MySQL + Java or Python
  - ✧ Anyone Can Test the Resource Usage Easily



# Document Repository

## ◆ Document Repository is another Important Issue

### ❖ For example,

✧ Hi, in the video conference tomorrow, we use the material, “Nov15/DR-Kicker.pdf”, which refers to “John/Schematics.pdf”.

❖ The same Document should be referred by Date, Author, Category

❖ Version Tracking Capability

## ◆ Services like CERN Document Server (CDS) or e-Print/arXiv may be utilized

✧ Self-archiving

✧ Open Archives Initiative (OAI) Compliant

✧ Possibly Available as Freeware

❖ May start with a Front-end server to These Services

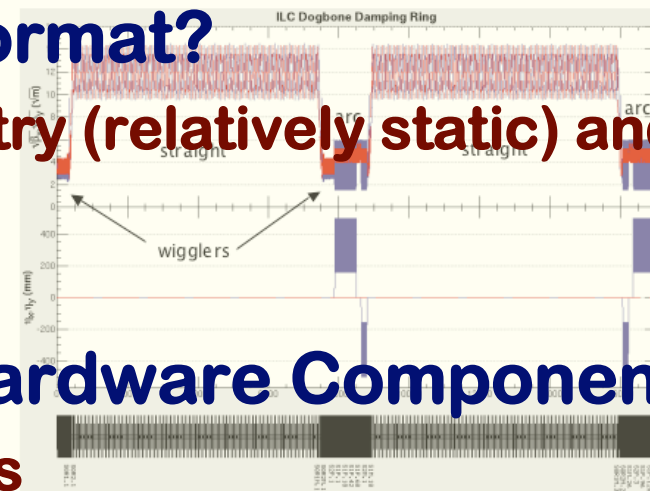
❖ or Employ the Server Software  
and Establish our own Server



# Beam Optics Database

- ◆ Repository of Inputs to Simulation Codes?
- ◆ XSIF Extended Standard Input Format
  - ❖ Many Simulation Codes utilize it
  - ❖ SAD does not
  - ❖ Currently a Conversion Tool is Used to for These Input Formats
  - ❖ XSIF (LIBXSIF) inclusion in SAD?
- ◆ Yet another Generalized Input Format?
  - ❖ Separation between Beamline Geometry (relatively static) and Beam Optics (more varying)
  - ❖ Could be structured into XML
- ◆ Relational information to each Hardware Components
  - ❖ We do not prefer complicated relations

The Dogbone lattice was reproduced on SAD successfully.



- MAD to SAD conversion by [Koiso](#).
- Class library: [acsad0.kek.jp/users/oide/ILC/DR/DB.n](http://acsad0.kek.jp/users/oide/ILC/DR/DB.n)
- CVS repository by [Ohnishi](#).

by Oide



# Simulation Codes

## ◆ Simulation for

- ❖ 6D Optics Matching, Tracking, Space Charge, Coherent Radiation, Beam Slices, Polarization, eClouds, etc.

## ◆ Cross-check

- ❖ Between Codes is always Important

## ◆ Scripting is preferable

- ❖ Conditional behavior descriptions
- ❖ Scanning for Parameter Optimization

## ◆ Data manipulations

- ❖ All-in-one like SAD
  - ✧ FFT, Non-linear Fitting, Plots, etc
    - ◆ Code that does everything except dig the tunnel (from SLAC/NLC web)

- ❖ Combined with Tools like Matlab

## ◆ Graphical User Interface

- ❖ Interactive Design Development



# Virtual Accelerator

## ◆ Full-simulation

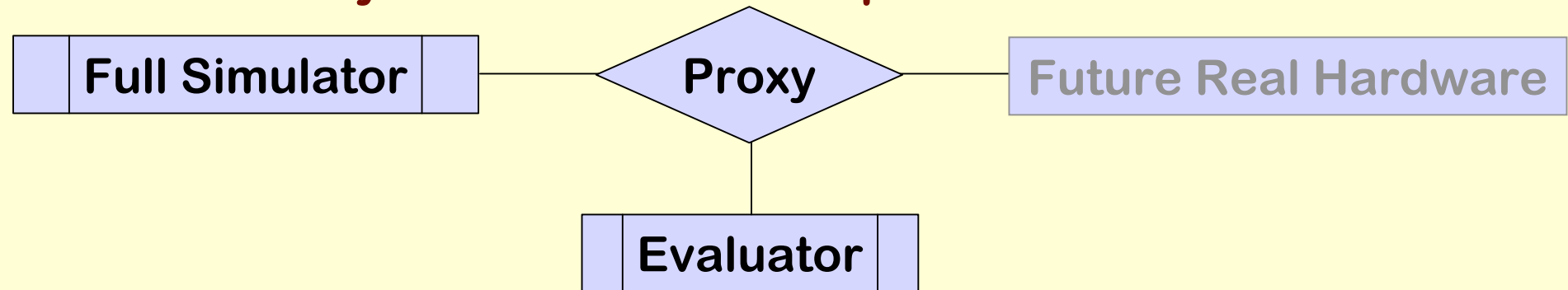
- ❖ Is Preferable from B.C to IP, or from Gun to Dump after IP

## ◆ For Easy Access

- ❖ Simulator and Evaluator Separation

## ◆ Virtual Accelerator Realization

- ❖ Some kind of Proxy in front of Simulator Input



- ❖ SAD can do both Simulator and Evaluator

## ◆ Proxy

- ❖ EPICS has such stub and Some Projects utilize it

## ◆ Field Value Exchanges

- ❖ Link with rf-Cavity/Magnet Simulation Codes is also Preferable



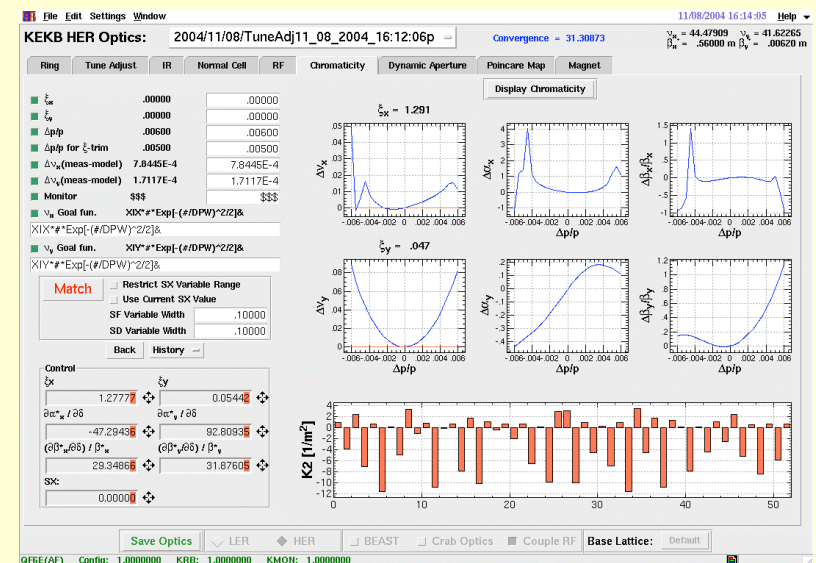
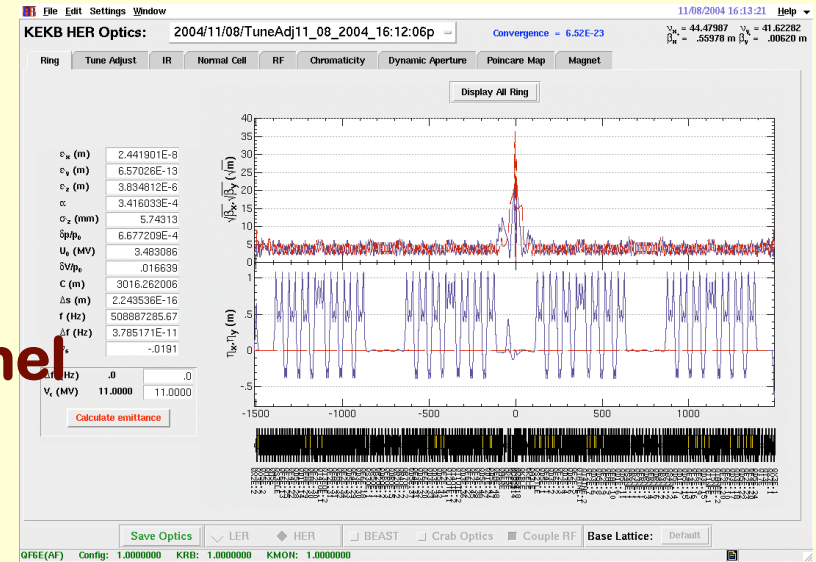
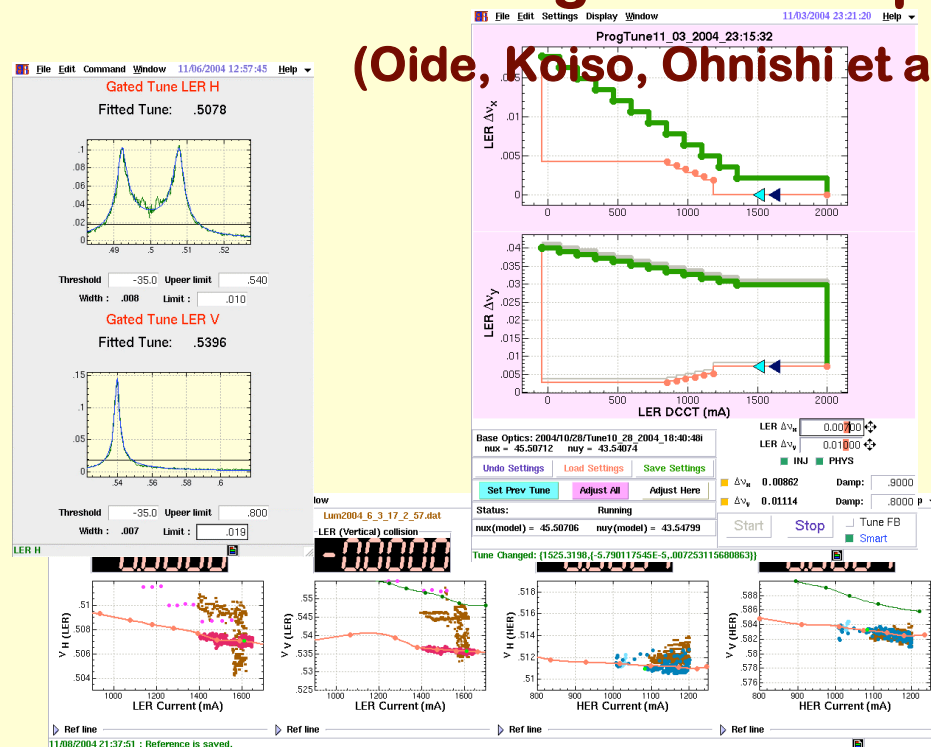


# V.A. in KEKB

## ◆ For Example in KEKB

- ❖ most Beam Optics Condition is maintained in the Optics Panel
- ❖ Other Panels Manipulate Parameters Communicating with the Optics Panel

(Oide, Koiso, Ohnishi et al)



Tune Measurement/Changer

Optics Panel

# Summary

## ◆ Common Database

- ❖ We are in the Process of merging distributed Ideas on the Linear Collider to form ILC
- ❖ Eventually we Need Common Repository to Accelerate Research and Development
- ❖ The Repository should Cover the wide range of Materials and May be Utilized in the Real Machine

## ◆ Simulation Code

- ❖ We should share Codes, Beam Optics, Ideas, etc to Optimize the ILC design process
- ❖ Virtual Accelerator Construction may Help accelerating the process  
may Enhance the Global Accelerator Network Idea

