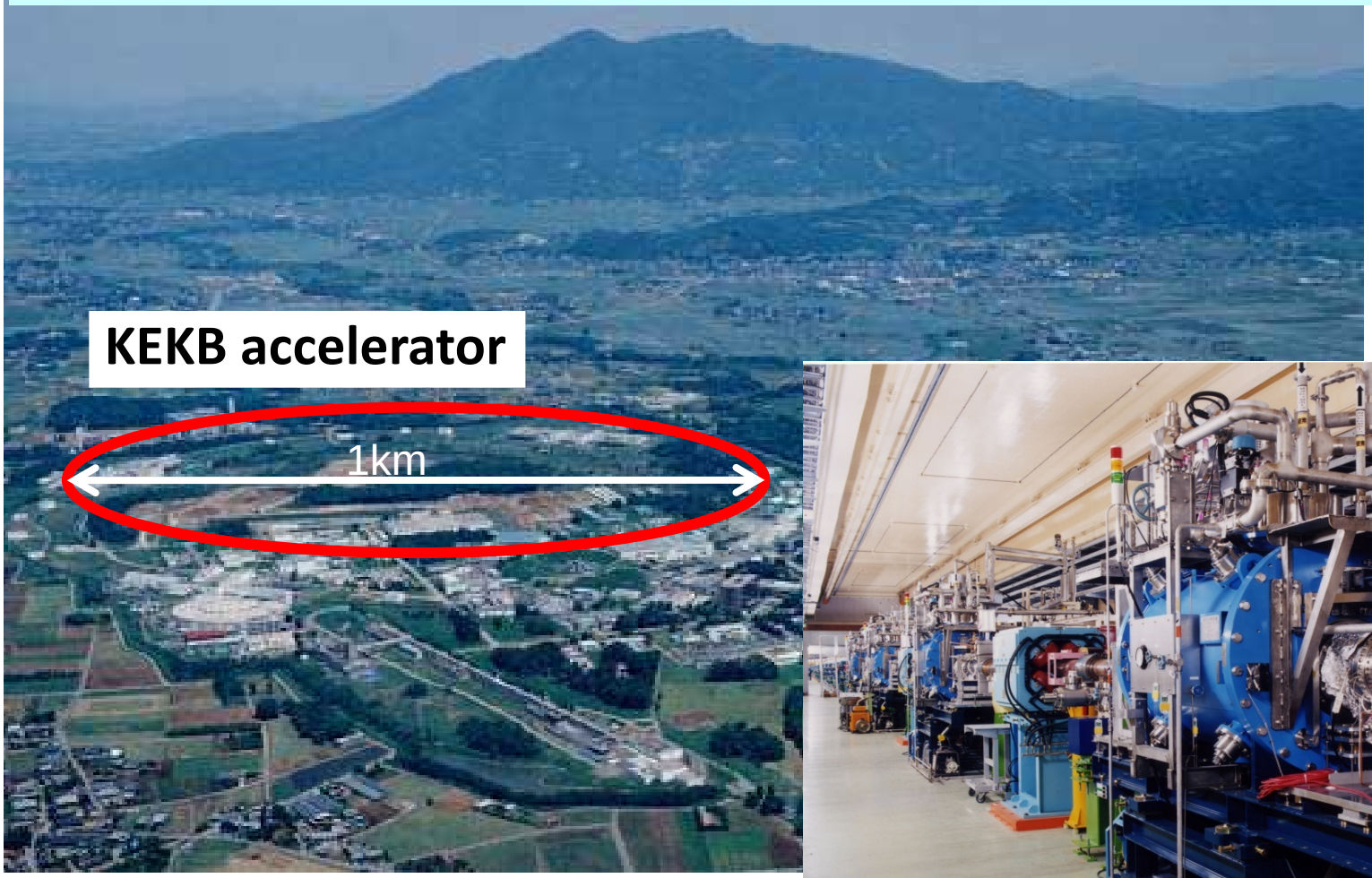
# Design and Status of the SuperKEKB Accelerator Control System

*M. Iwasaki (KEK)*

*for the SuperKEKB accelerator control group*

# SuperKEKB project

**SuperKEKB → Upgrade of the KEKB B-factory experiment in Japan**



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***The KEKB B-factory in Japan***

More than1ab$^{-1}$ data / 11 years

The world highest luminosity

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***The KEKB B-factory in Japan***

More than $1ab^{-1}$ data / 11 years

The world highest luminosity

→***Will be upgraded to <u>SuperKEKB</u>***

***<u>X40 higher luminosity</u>***

# KEKB to SuperKEKB

- KEKB operation finished in 2010 June.
- SuperKEKB operation will start from 2015 Jan.

**Currently under construction**

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# SuperKEKB Control System

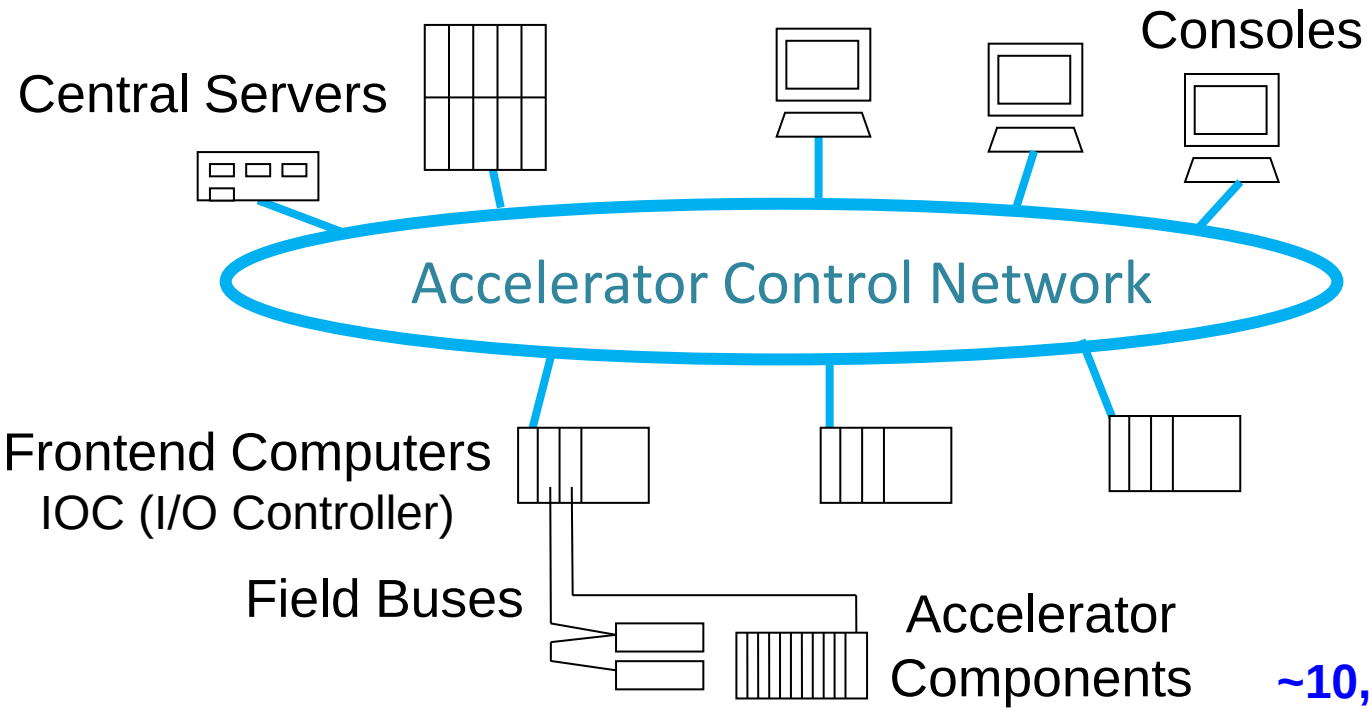
- **EPICS is used as the main software to control the accelerator**

  2 layer model

  - **OPI (Operation Interface)** --- operation programs on central servers
  - **IOC (I/O Controller)** --- equipment controls on frontend computers

- **Scripting Languages are used for the operation programs**

  **SAD Script/Tk Python/Tk Tcl/Tk**




**~10,000 components**

**# signals to control → ~200,000**

# IOC (I/O Controller) for SuperKEKB

- **VME/VxWorks IOC**
- **PLC/Linux IOC**
  - Yokogawa FAM3 series
  - Linux running on the CPU module(F3RP61)
  - Install EPICS into the CPU module


CPU Module
F3RP61

I/O Modules

Control the vacuum system, LLRF, beam collimators, etc.

**J. Odagiri et al., MOCOBAB02**

- **PC/Linux IOC**

# Field Buses

**Many kinds of fieldbus in SuperKEKB**

Ethernet, GP-IB, serial, VXI/MXI (for BPM), ARCNET (for magnet power supply) …

**We have developed the magnet power supply interface controller module (PSICM)**

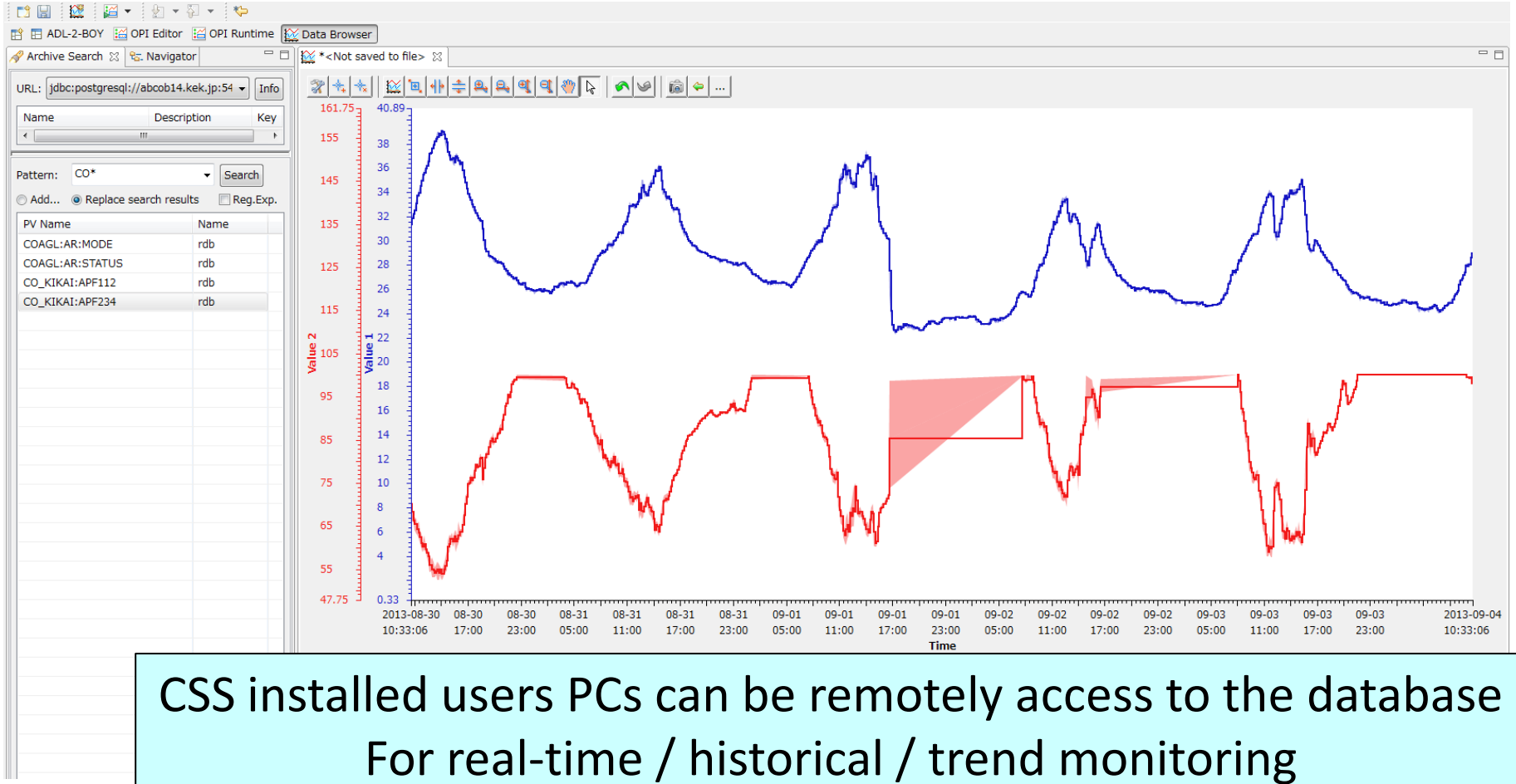
**We upgrade PSICM for SuperKEKB**

- Faster data transfer rate
- Support 24, 20, 18-bit DAC
- Redundant timing signal input


T. T. Nakamura et al., TUPPC089

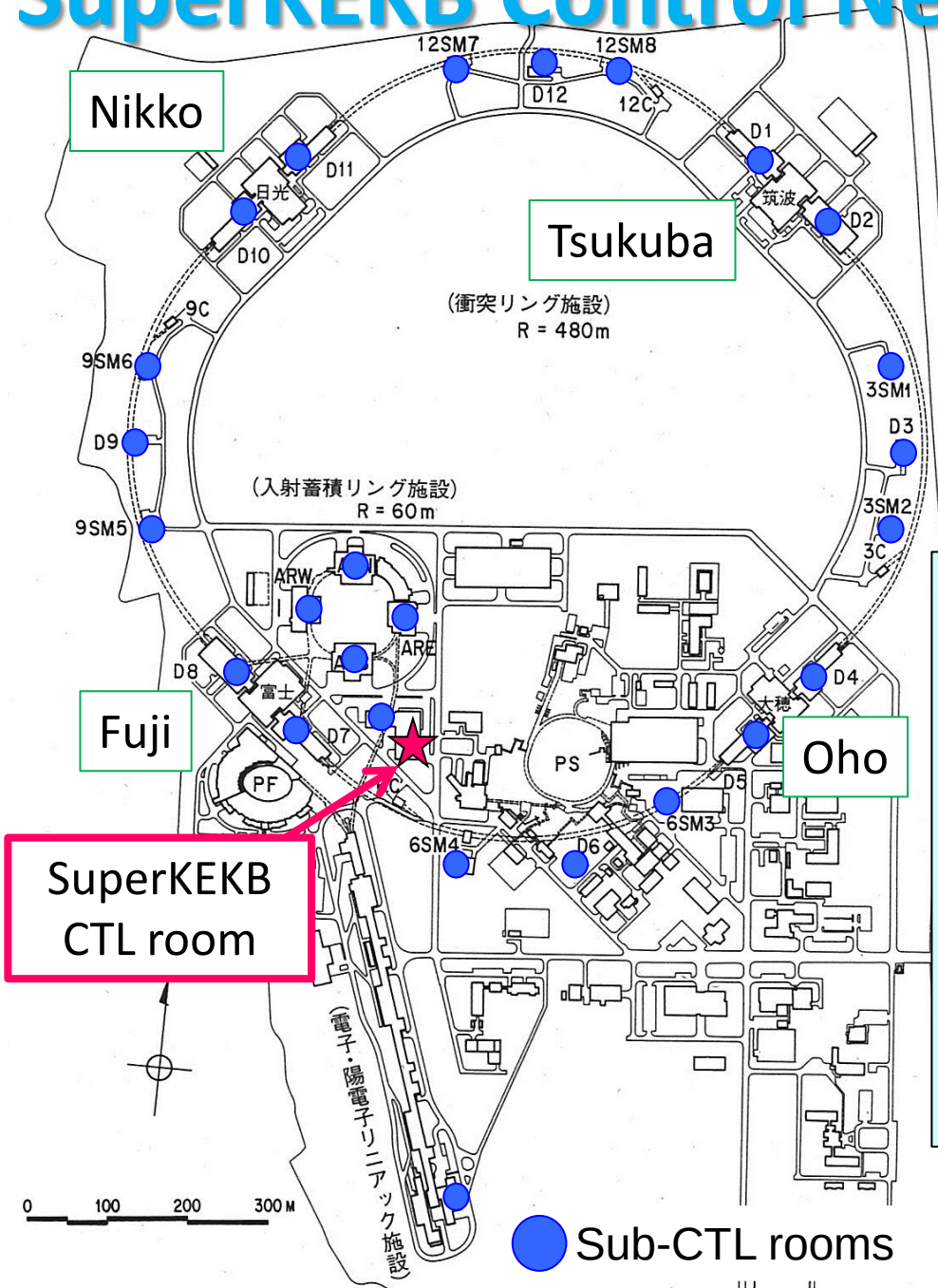
# Data Archiving System

- **KEKBLog as a primary data archiving system** (file based logging system)
- **CSS(Control System Studio)-based Archiver + PostgreSQL**
  **as the 2nd option data archiving system**




CSS installed users PCs can be remotely access to the database
For real-time / historical / trend monitoring

# SuperKEKB Control Network System




## Star network topology

Main network switch is located at the SuperKEKB CTL room

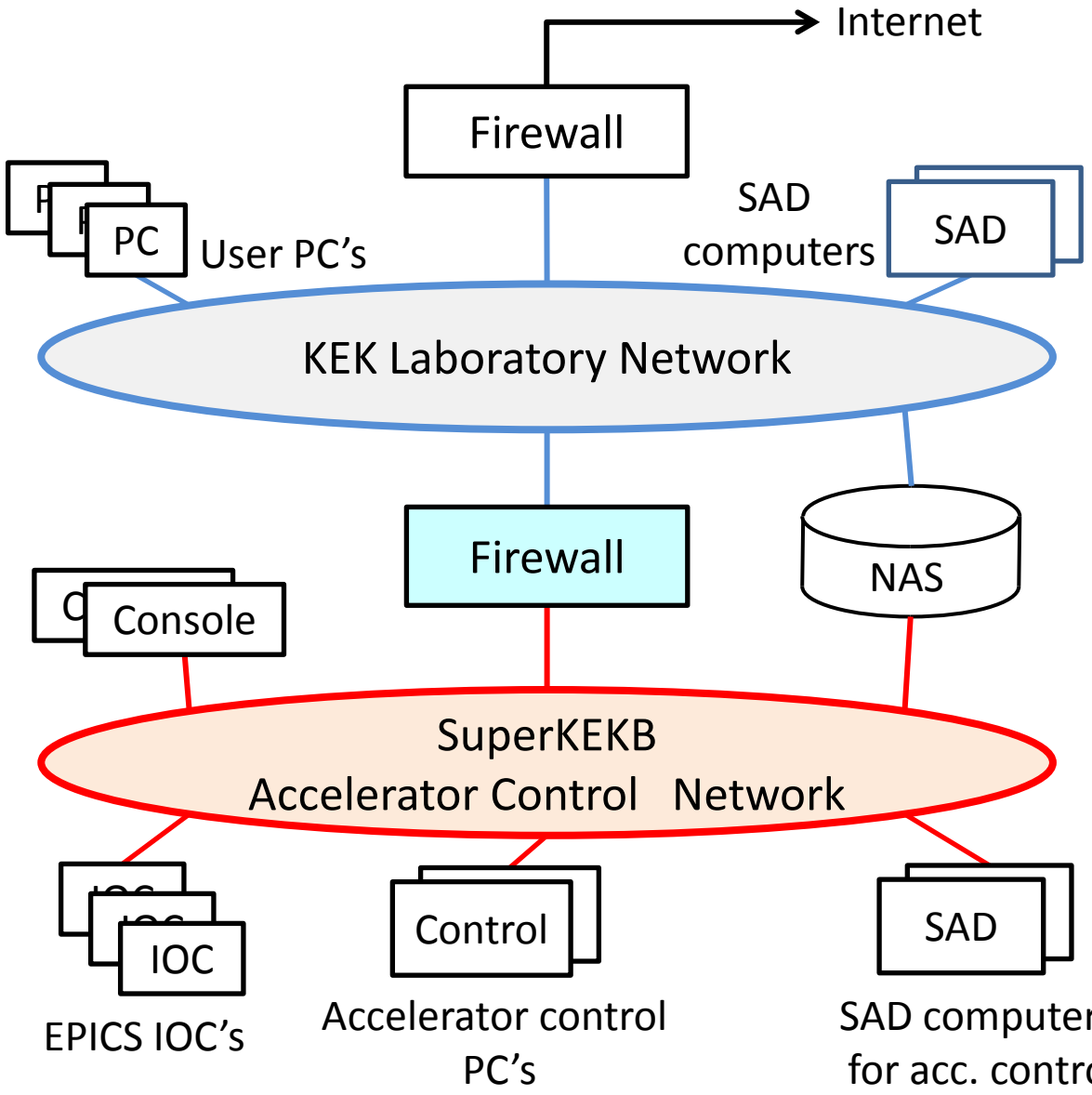
Connecting the SuperKEKB CTL room and 26 sub CTL rooms, where network switches are located.

## Upgrade in Progress

- 10GbE/1GbE switches
- Additional optical cables for the redundant network configuration
- New network configuration
- Wireless LAN installation into the whole SuperKEKB accelerator area

M. Iwasaki et al., THPPC009

# New Network Configuration




**New configuration from this summer**

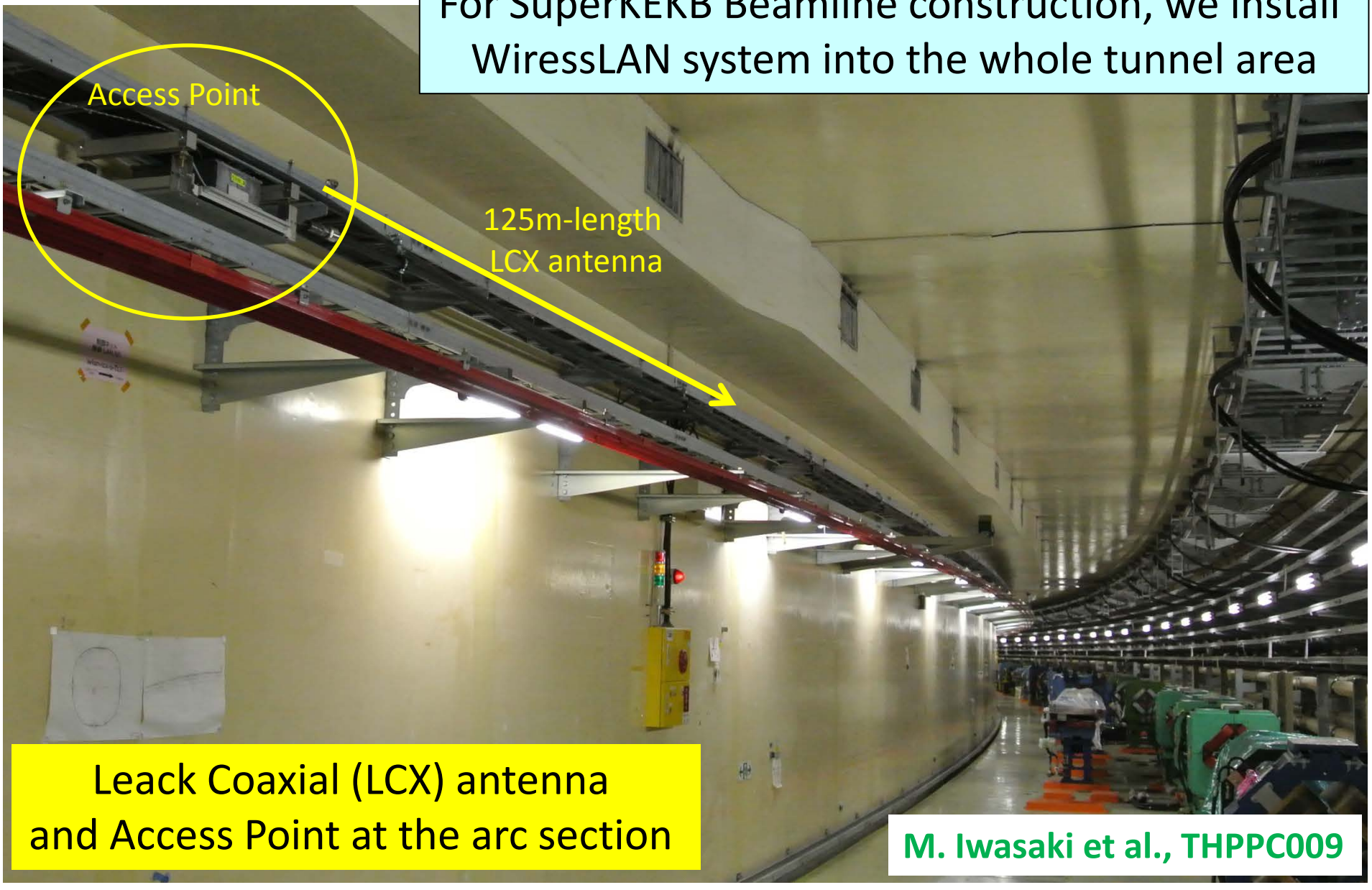
All computers in the acc. control network don't directly connect to the KEK laboratory network

→ **Enhance the security**

M. Iwasaki et al., THPPC009

# Wireless LAN system into the beamline

For SuperKEKB Beamline construction, we install WiressLAN system into the whole tunnel area




Leack Coaxial (LCX) antenna
and Access Point at the arc section

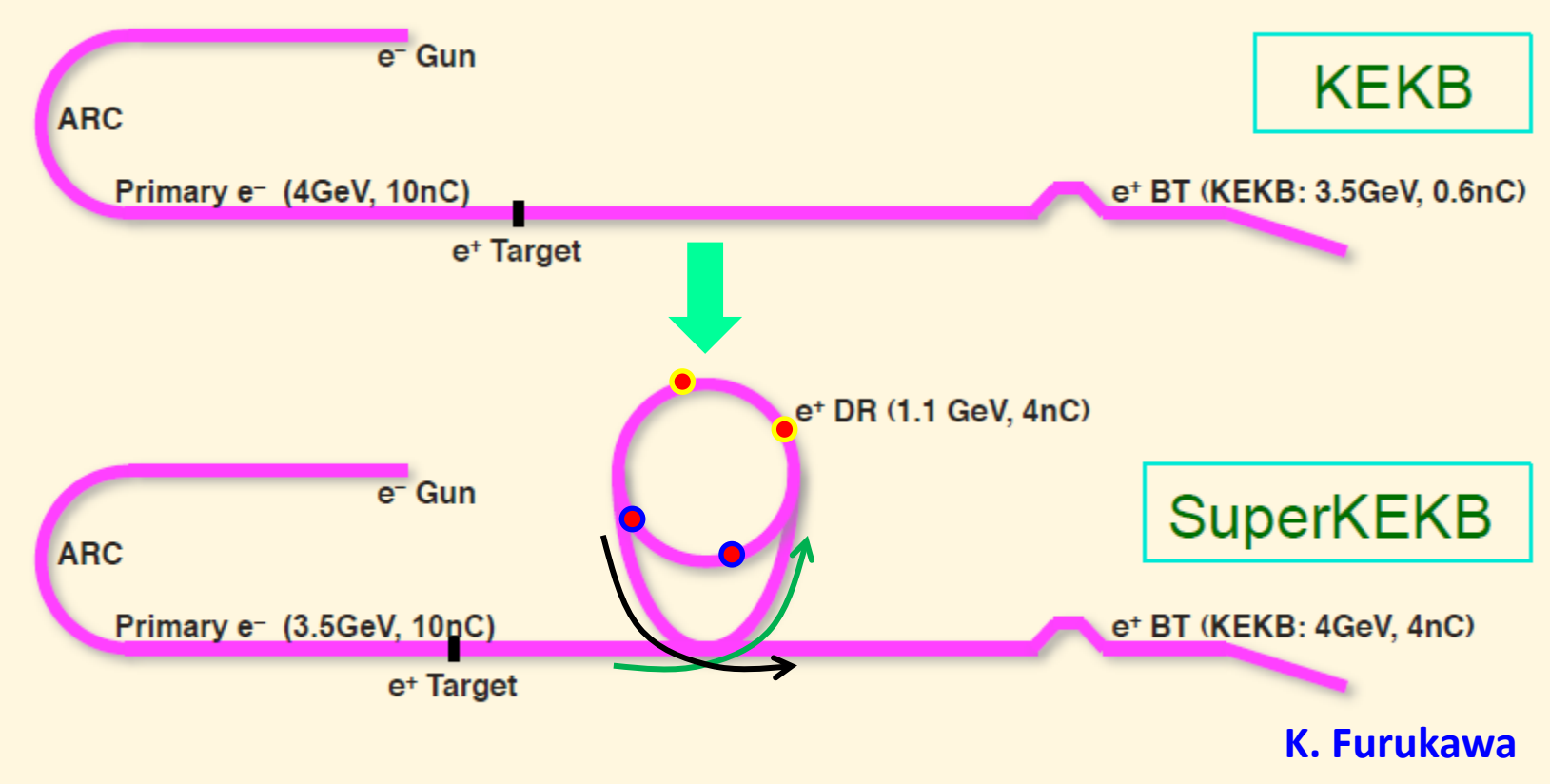
M. Iwasaki et al., THPPC009

# Timing System for positron injection

In SuperKEKB, we construct **the positron Damping Ring**

→ Positron injection timing scheme become complicated

**To account for DR, new timing system for $e^+$ injection is required**




H. Kaji et al., THCOCA04

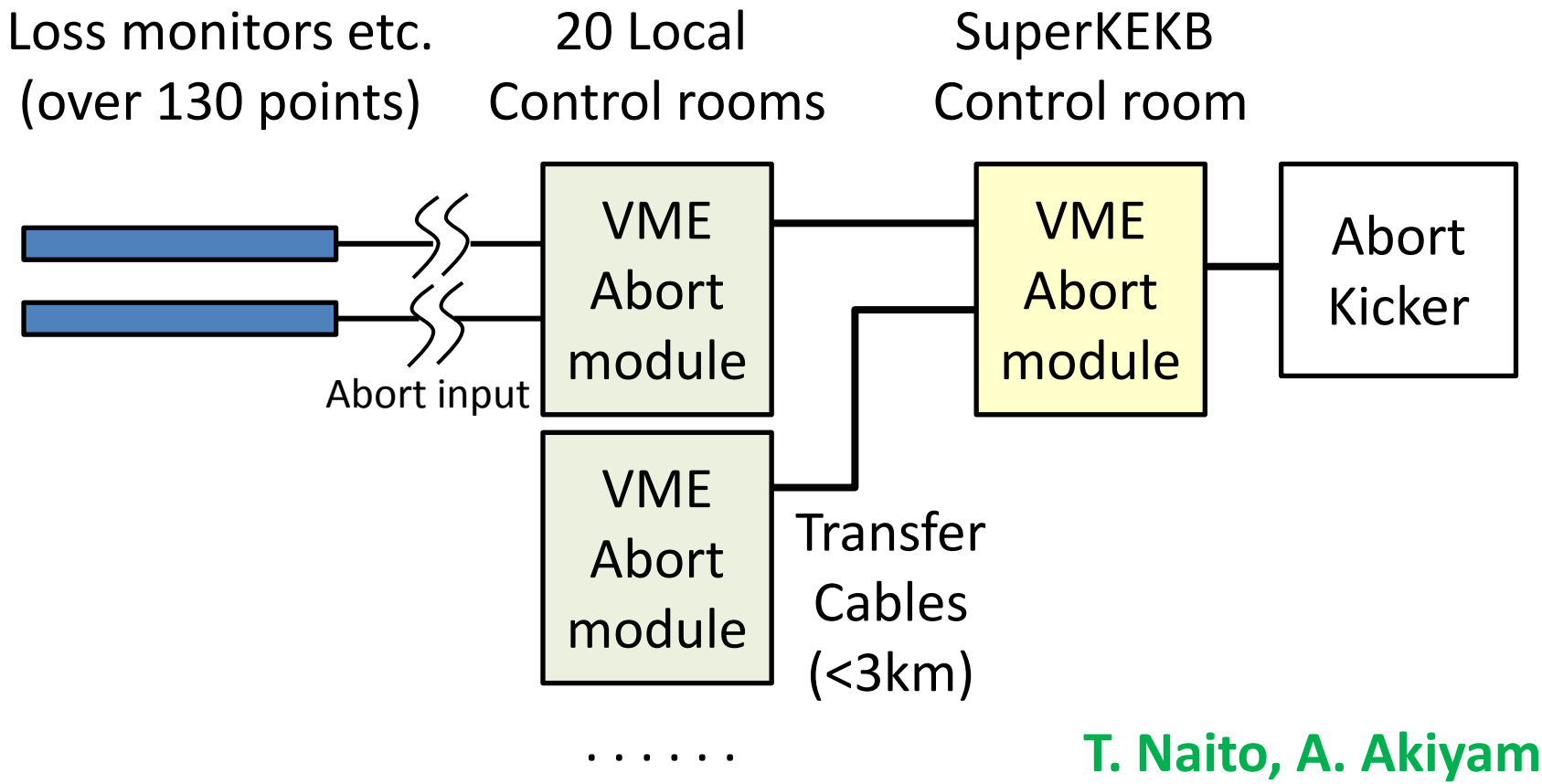
K.Furukawa et al., FRCOBAB04

# Beam Abort System

**We have developed the faster response Beam Abort System for SuperKEKB**

E/O conversion, optical cable to transfer the signal, remove low-pass filters

→ **Response time improved from 100μs to 20μs**




T. Naito, A. Akiyama

# Renovation of the computing room

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This summer, we removed old server racks,
old panel board cabinets, power and signal cables.

# Renovation of the computing room

Now under installation of the server racks

# Summary

**Upgrade of the accelerator control system for SuperKEKB is in progress**

***Currently preparing for the 1st SuperKEKB operation in 2015 January***

**Please also see the details of the accelerator control system upgrade in the following presentations/posters**

J. Odagiri et al., MOCOBAB02,
"Integration of PLC with EPICS IOC for SuperKEKB Control System"
T. T. Nakamura et al., TUPPC089,
"Upgrade of the Power Supply Interface Controller Module for SuperKEKB"
H. Kaji et al., THCOCA04,
"Upgrade of Event Timing System at SuperKEKB"
M. Iwasaki et al., THPPC009,
"Design and Status of the SuperKEKB Accelerator Control Network System"
K. Furukawa et al., FRCOBAB04
"Beam Feedback System Challenges at SuperKEKB Injector Linac"