Design and Status of the SuperKEKB Accelerator Control Network

M. Iwasaki, K. Furukawa, H. Kaji, K. Mikawa, T. T. Nakamura, T. Obina, M. Satoh (KEK, Ibaraki, Japan) T. Aoyama, M. Fujita, S. Kusano, T. Nakamura, N. Tanaka, K. Yoshii (Mitsubishi Electric System & Service Co. Ltd, Japan)

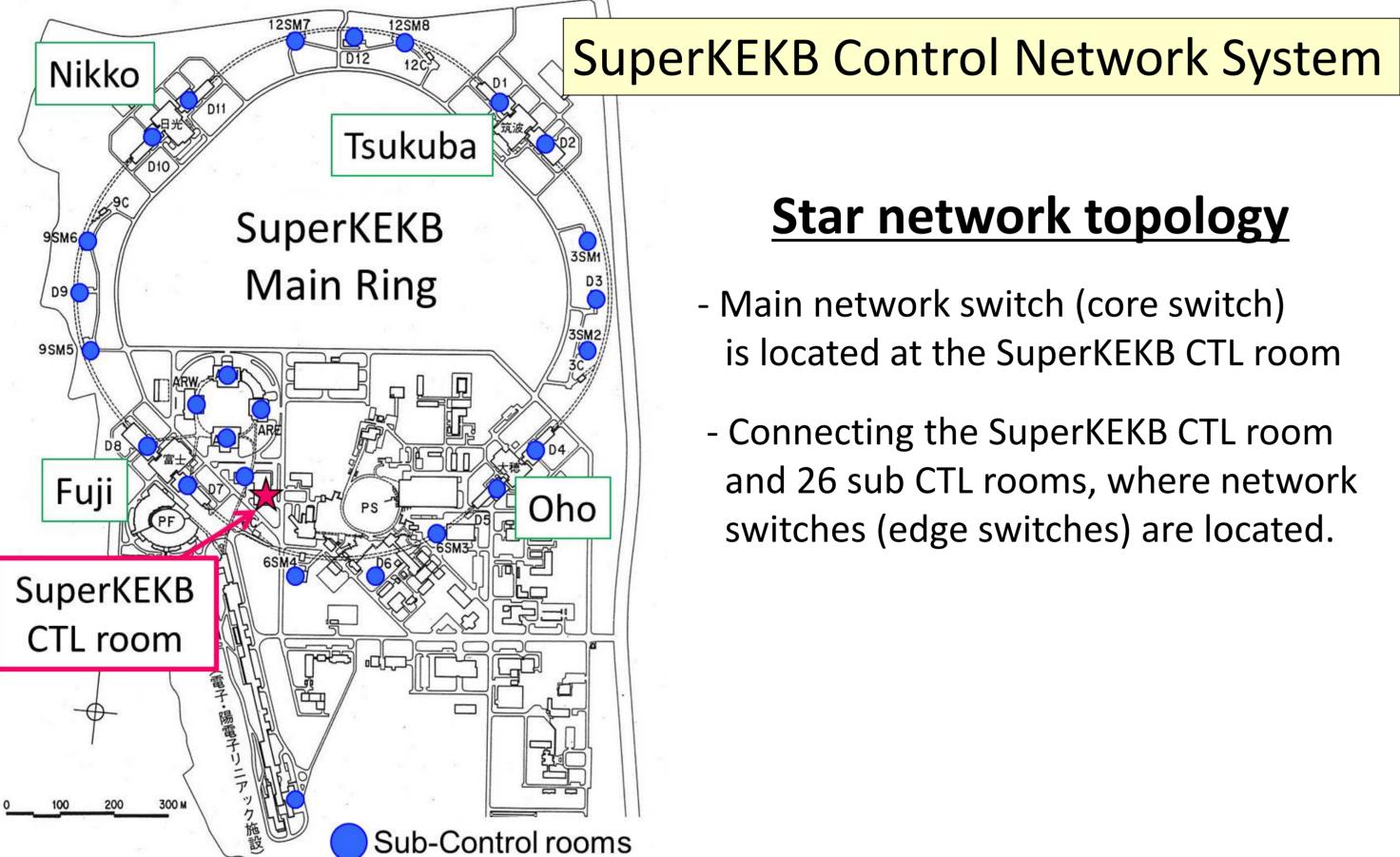
1. SuperKEKB project

SuperKEKB: Upgrade plan of the KEKB B-factory project

- Target luminosity $8x10^{35}$ cm⁻²s⁻¹ **x40 of KEKB**
- KEKB operation finished in 2010 June.
- SuperKEKB operation starts from 2015 Jan. **Currently under construction**

We have upgraded the accelerator control network system for SuperKEKB

2. SuperKEKB Control Network Design

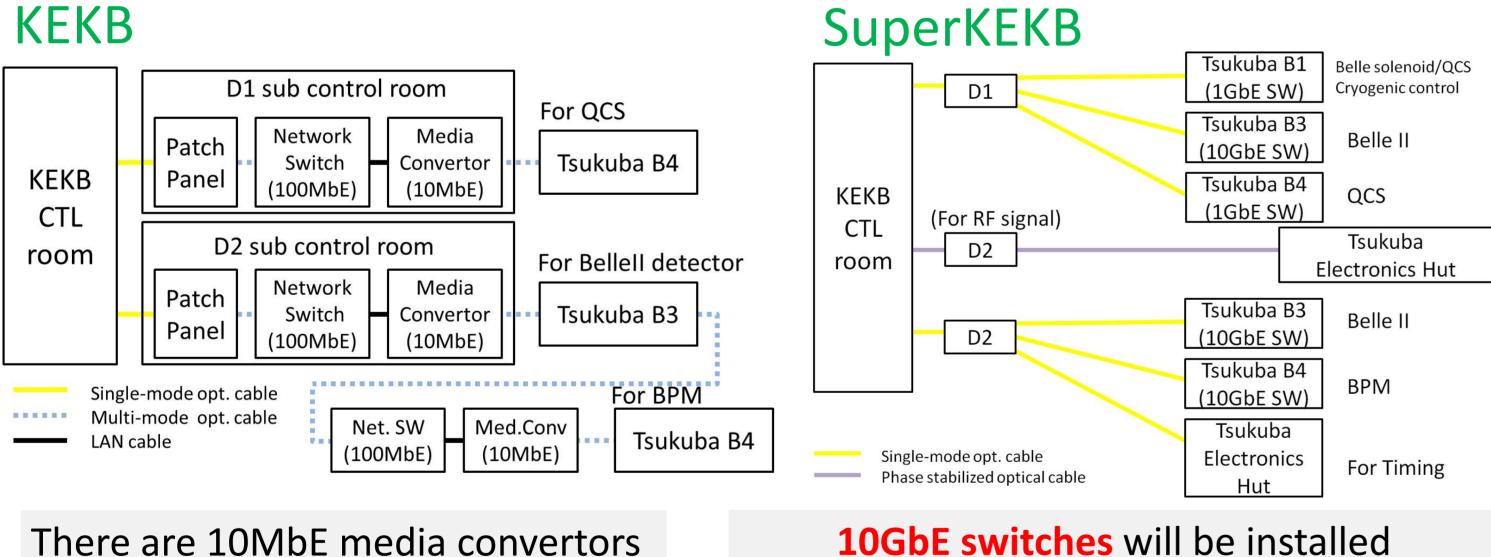


Star network topology

- Main network switch (core switch) is located at the SuperKEKB CTL room
- Connecting the SuperKEKB CTL room and 26 sub CTL rooms, where network switches (edge switches) are located.

Network connections and Network bandwidth

Network connection btw KEKB and Tsukuba



in the network line

10GbE switches will be installed **Redundant configuration** (Active-Standby)

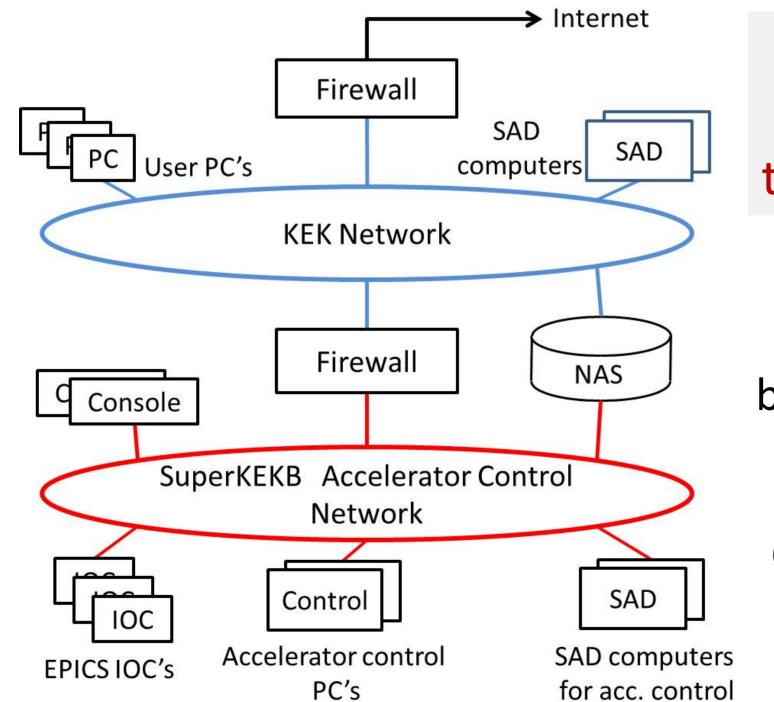
VLAN segmentation for the SuperKEKB Control Network

EPICS: Main software tools to control SuperKEKB

EPICS uses UDP broadcast \rightarrow Many UDP broadcast packets in the network. Accelerator components with Ethernet interface also receive these.

We prepare VLANs for the accelerator components.

Network reconfiguration to connect with the KEK network



We changed the network configuration this summer, to enhance the network security

KEKB: Many computers connect to both KEK and KEKB control networks

Computers in acc. control network don't connect to KEK network

3. WiressLAN installation into the beamline

For SuperKEKB beamline construction, we install the Wiress LAN system into the whole tunnel area

Measured network speed with a Leaky Coaxial (LCX) cable antenna

LCX cable parameters

200m length, 20D type, Coupling loss 70dB, Transmission loss 7(dB/100m)

Access Point B Access Point A LCX Effective transmission rate (Mbps) LCX Effective transmission rate (Mbps) — Control network (up) --- Control network - - - Local network (down) --- Local network (down Distance from the Distance from the 100m access point (m) 150m 200m access point (m)

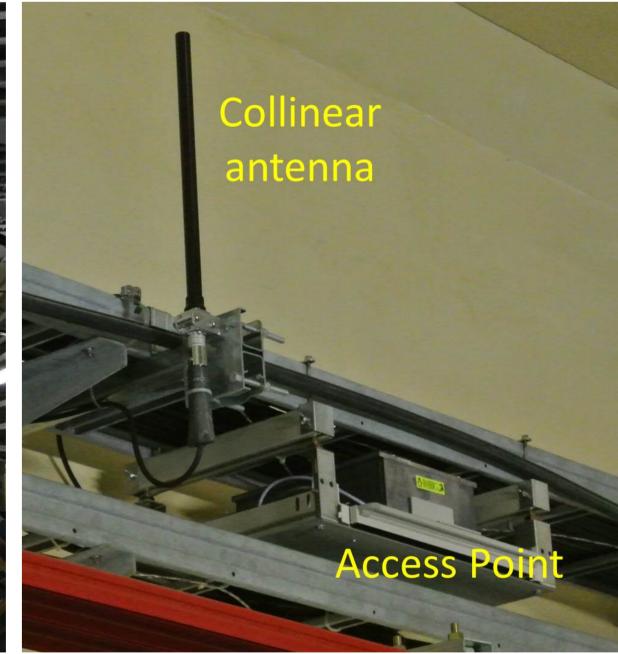
Based on this measurement, we chose access point B

Layout of the installed wireless LAN components in SuperKEKB Tsukuba

- 125m x 4 20D type LCX antenna power equipment for the one arc section building - 4 collinear antenna for the one straight section Power supply for the APs at the middle of arc sections is from the PoE modems at power equipment buildings LCX antenna Coupling loss 65dB LCX antenna Transmission loss 9(dB/100m) Access Point for LCX Nikko **Collinear antenna** Gain 6dBi Collinear antenna

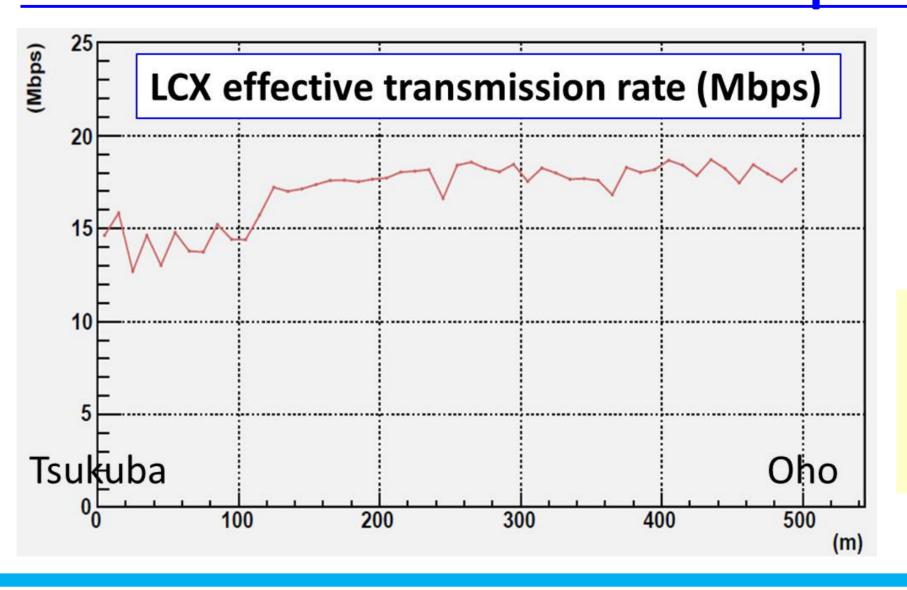
Installed LCX and Collinear antenna in SuperKEKB





We select LCX and Collinear antennas with good radiation hardness >1MGy. The all AP and PoE in the tunnel are installed within lead boxes.

Measured WiressLAN Network Speed at SuperKEKB tunnnel



Good network speed performance of ~18Mbps in the whole tunnel area

4. Summary

We have upgraded the accelerator control network system for SuperKEKB.

The designed network system has the higher performance: the wider bandwidth data transfer and redundant configuration. We have installed the new wireless network system into the 3 km circumference accelerator tunnel.