J-PARC Status

<progress in the last 1 year>

N. Kamikubota, **KEK**

and J-PARC Control members

EPICS at DESY in April.2007, n.kami, KEK
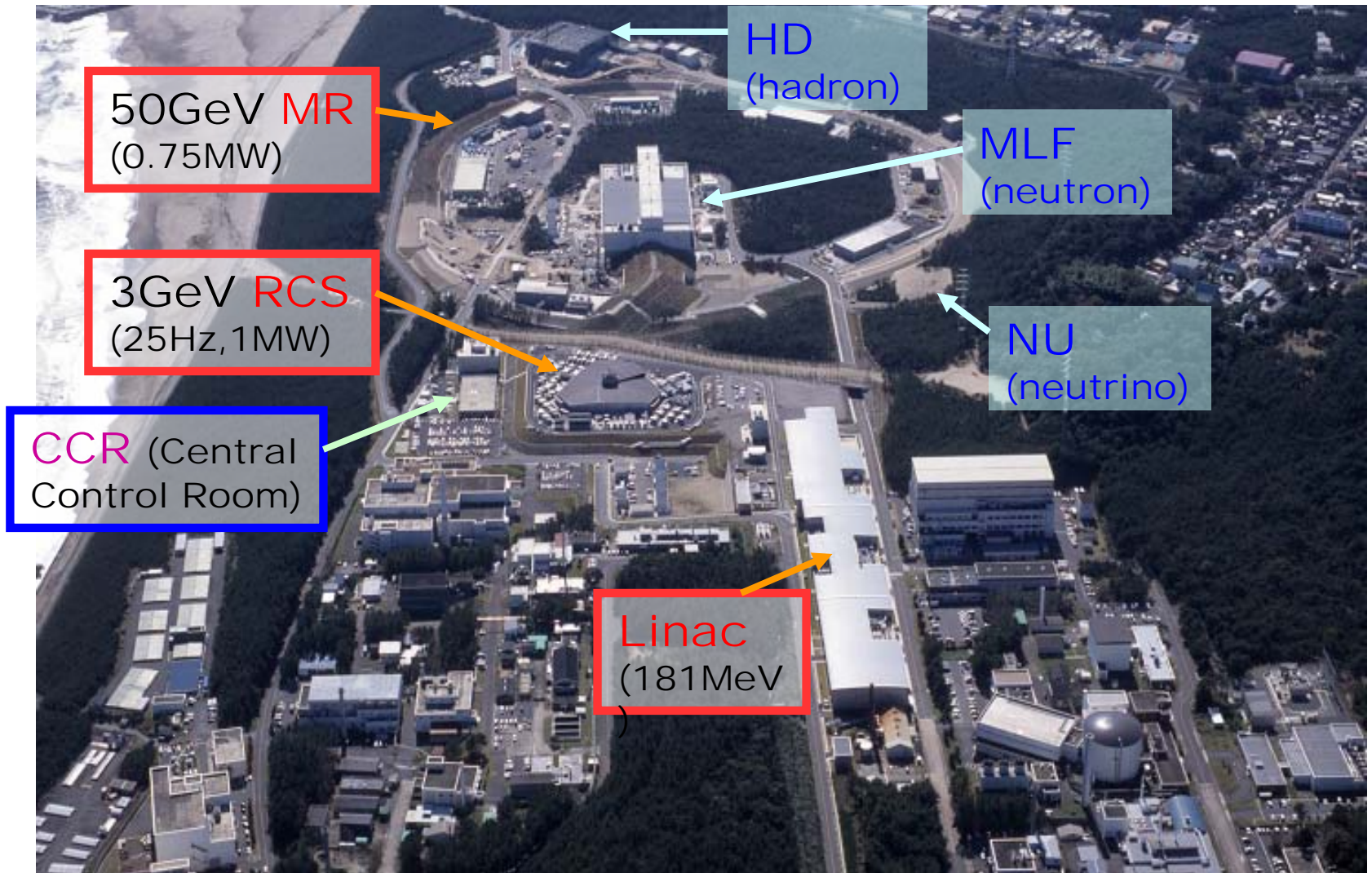
J-PARC

- **Japan Proton Accelerator Research Complex**

- **A joint project between JAEA* and KEK**

  *JAEA – Japan Atomic Energy Agency, formerly JAERI

- **Construction site is in JAEA in Tokai#, Ibaraki, Japan**

  #Tokai is 60km NE of KEK-Tsukuba, 130km NE of Tokyo
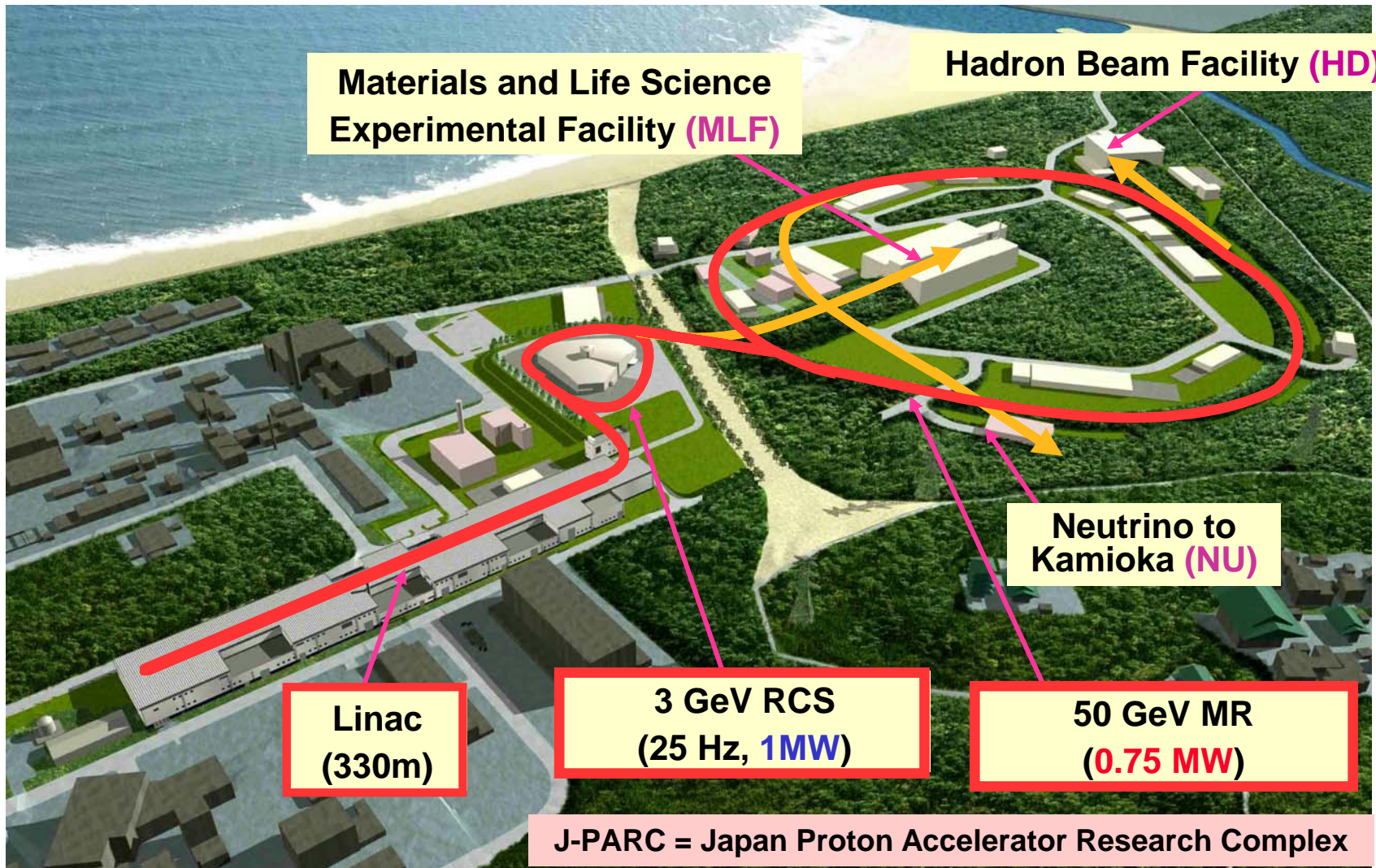
J-PARC (Site)
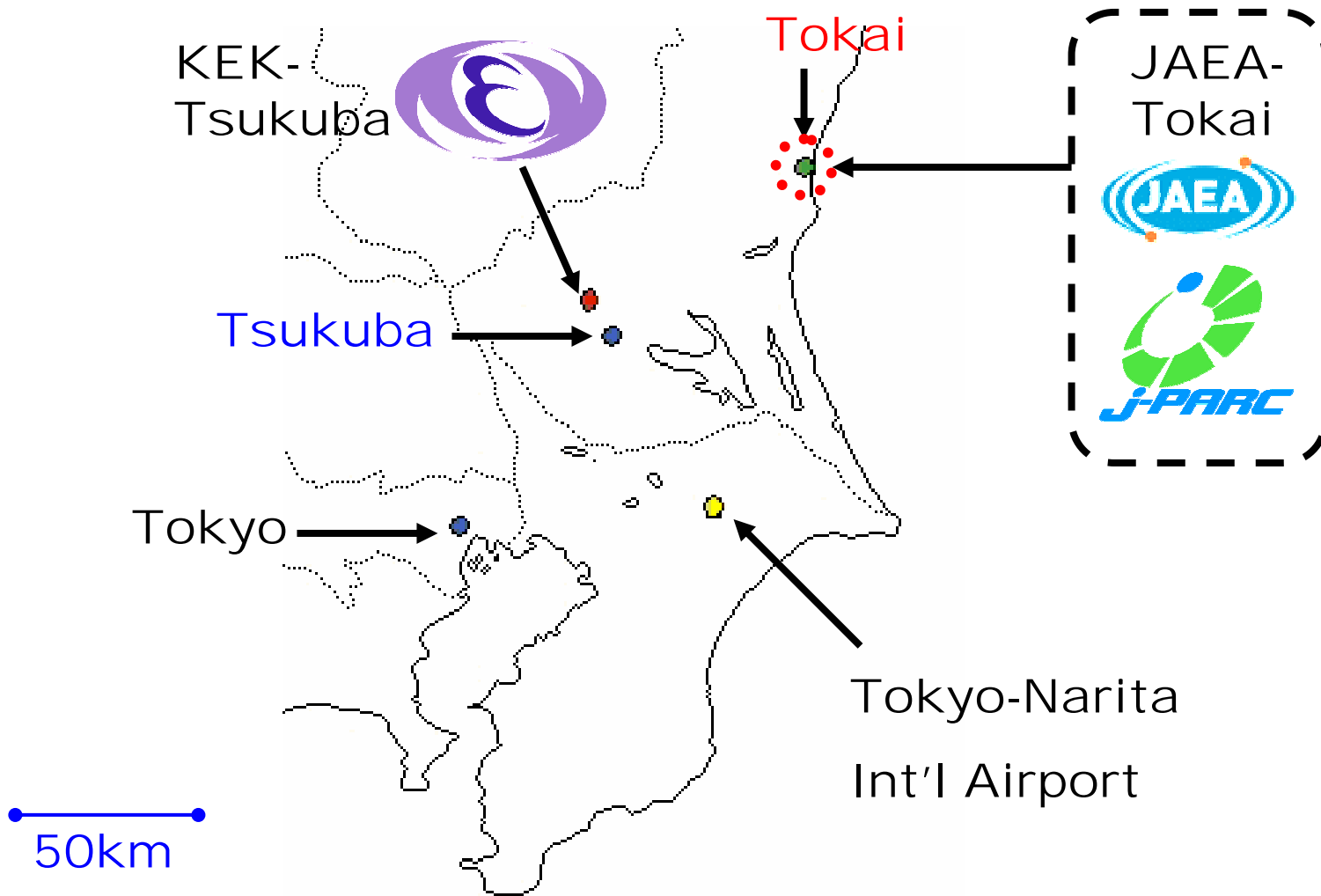
KEK-Tsukuba

Tokai

JAEA-Tokai

Tsukuba

Tokyo

Tokyo-Narita Int'l Airport

50km

J-PARC Facility (Nov.2006)

HD (hadron)

50GeV MR (0.75MW)

MLF (neutron)

3GeV RCS (25Hz,1MW)

NU (neutrino)

CCR (Central Control Room)

Linac (181MeV)

J-PARC Facility

Materials and Life Science Experimental Facility (MLF)

Hadron Beam Facility (HD)

Neutrino to Kamioka (NU)

Linac (330m)

3 GeV RCS (25 Hz, 1MW)

50 GeV MR (0.75 MW)

J-PARC = Japan Proton Accelerator Research Complex

EPICS at DESY in April.2007, n.kami, KEK

J-PARC Schedule

- **2002 - Construction started in JAEA-Tokai**

  ....

- **Nov.2006**

  Linac – Beam commissioning started

- **Jan.2007**

  Linac - Beam accelerated to 181MeV

  ....

- **Oct.2007**

  3GeV RCS – Beam Commissioning will start

- **May.2008**

  50GeV MR – Beam Commissioning will start

EPICS at DESY in April.2007, n.kami, KEK

Accelerator

Progress in the Recent 1-year

- **Linac**
  - **Proton beam (H-) was accelerated successfully to the design value of the Phase-I, 181 MeV, on January 24,2007**

I am here ..

- **{5mA, 20us, 2.5Hz} very low-power was used as a initial test to avoid possible damage**

EPICS at DESY in April.2007, n.kami, KEK

Progress in the Recent 1-year (Continued)

- **3GeV RCS**
  - H/W **installation is in the final phase**
  - **Loose bolt problem** in quadrupole magnets made abnormal vibration: torque was not controlled properly
  - **Still on schedule**, but no margin

- **50GeV MR**
  - [Tunnel] H/W **installation is still going on**
  - [Ground] H/W **installation and cabling started**
  - On schedule, in general

50GeV MR – Magnet Installation

- Started in Nov. 2005
- Almost finished

EPICS at DESY in April.2007, n.kami, KEK

Control System

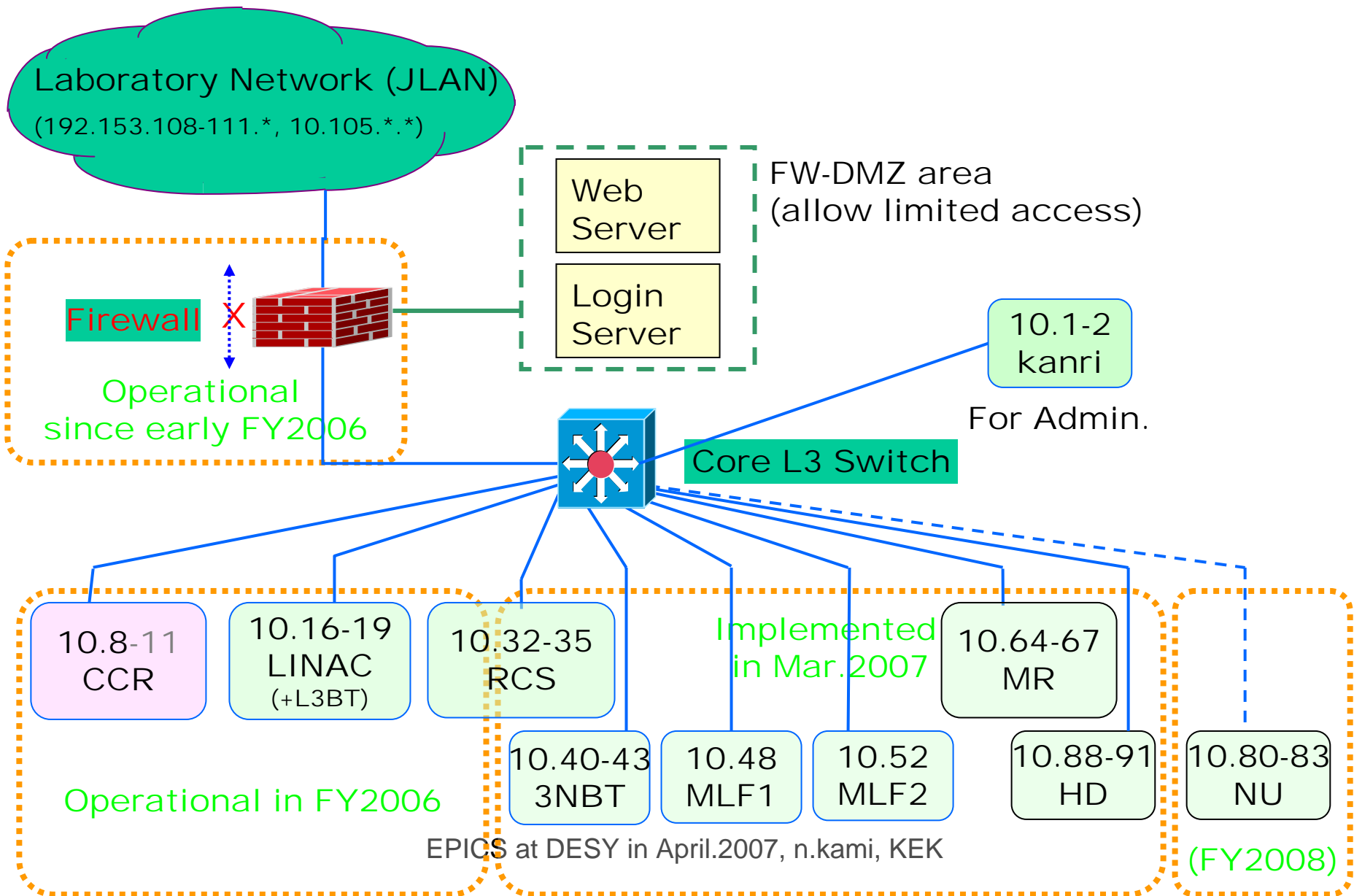# Control Infrastructures

- **CCR (Central Control Room)**
  - **Arranged for LINAC commissioning in 2006**
- **Network**
  - **Linac : operational since FY2006**
  - **RCS&MR : implemented in March.2007**
  - **Firewall to Laboratory network : started in FY2006**
- **Computers**
  - **Servers : replace one by one with new machines**
    Web server, RDB server – replaced in 2006
    File server, CPU server – will be replaced in 2007
    # Blade-type server was introduced in 2006
  - **Consoles (Linux PCs, Thin-client terminals) :**
    introduced and operational since FY2006
- **More**
  - **PPS (Personal Protection System) and MPS (Machine Protection System) : Operational since Oct.2006**
  - **E-log : started in Nov.2006 for Linac commissioning**
    # ZLOG was introduced from KEKB and modified for J-PARC

Control Infrastructure - CCR

LINAC/RCS

PPS Displays

MAIN operation consoles

Shift Leader

Workspace

EPICS at DESY in April.2007, n.kami, KEK

Feb.2007

Control Infrastructure - Network

Laboratory Network (JLAN)

(192.153.108-111.*, 10.105.*.*)

FW-DMZ area
(allow limited access)

Web
Server

Login
Server

Firewall ✗

**Operational
since early FY2006**

10.1-2
kanri

For Admin.

Core L3 Switch

10.8-11
CCR

10.16-19
LINAC
(+L3BT)

10.32-35
RCS

**Implemented
in Mar.2007**

10.64-67
MR

10.40-43
3NBT

10.48
MLF1

10.52
MLF2

10.88-91
HD

10.80-83
NU

Operational in FY2006

EPICS at DESY in April.2007, n.kami, KEK

(FY2008)

Control Infrastructure - Computers

Firewall	Web Server / LoginServer — **Blade system (Introduced in FY2006)** — FW-DMZ area	
RDB/Config	RDB/Config. — RDB/Config.	
Development/HLA	Server #2 / Server #1 — **Thin client system (Introduced in FY2006)** — PC (Linux)	PC (Linux) — Server #3
Operation	ThinClient — ThinClient — PC (Linux)	PC (Linux) — ThinClient
Network	ccr.jkcont (10.8-11) — li.jkcont (10.16-19)	RCS (10.32-35) — MR (10.64-67)
Data-archive	Ch.Archiver — RDB/Archive	**(FY2007-2008)**
File Server	FileServer #1 (KEK) — FileServer #2 (JAEA)	
IOC	IOC LINAC — **Operational in FY2006**	IOC RCS — IOC MR

Server plan (FY2007) — **CPU Server (FY2007)** — **File Server (FY2007)**

EPICS at DESY in April.2007, n.kami, KEK

HLA = High Level Application

Control Infrastructure – PPS/LINAC
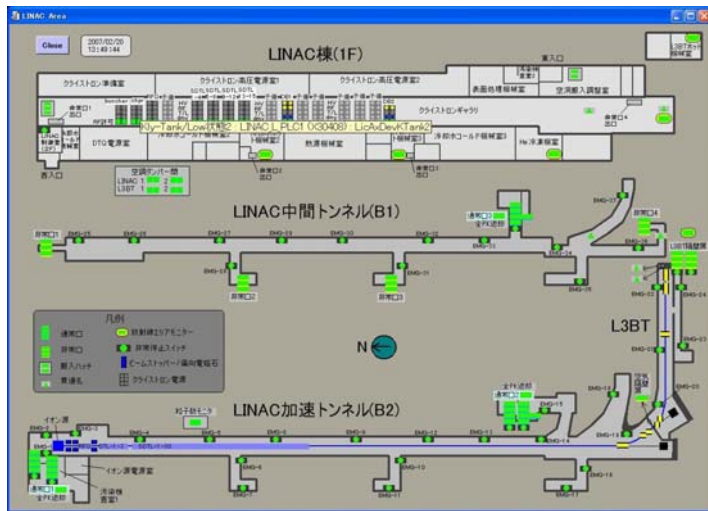
PPS Status Monitor

PPS Operator Console

Access Control Table

TV Monitors of an Access Point

EPICS at DESY in April.2007, n.kami, KEK

Control Infrastructure – MPS/LINAC GUI

MPS detailed screen

Loss by correction-magnet adjusting

181MeV 5.3mA 50usec
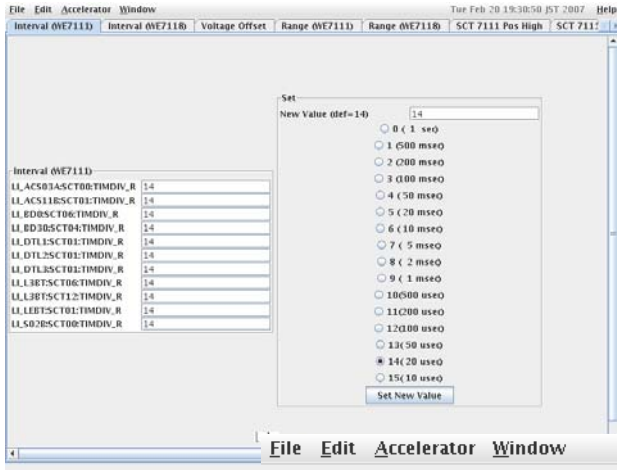
J-PARC Control

- **Divide Project between JAEA & KEK**
  - **LINAC: JAEA is in charge of LINAC control**
  - **RCS : JAEA asked RCS controls to a company**
  - **MR: KEK is in charge of MR control**
- **Software Development (Basic Policy)**
  - **JAEA: use Java extensively for OPI, VxWorks for IOC**
  - **KEK: use OPI tools of KEKB, Linux for IOC**

Accelerator	OPI Application Basic	High-Lvl.	IOC/VME OS,H/W	Drivers (works before 2005)
Linac and 3GeV RCS	**Java**	**XAL /JCE**	**VxWorks PowerPC Adv7501**	**- VME I/O Modules mainly by Advanet - TeraDev for PLC**
50GeV MR	**MEDM (or EDM)**	**SAD Python**	**Linux Intel-based VMIC7807 VMIC7700**	**(Network devices) -NetDev for PLC, BPMC, EMB-LAN -WE7000 drivers**

EPICS at DESY in April.2007, n.kami, KEK

J-PARC Control - LINAC

- **During Dec.2006-Apr.2007**
  - **The control system has been developed and used successfully** for the beam commissioning
    - **All devices are monitored** through the control system
    - **Most of devices are controllable, but partly not**

  - **Variety of OPI applications** have been developed
    - **Java** for basic control panels, **XAL/JCE** for high-level applications for beam commissioning studies
      - JCE (J-PARC Commissioning Environment), Java-based SAD script interpreter
    - **a few EDM/MEDM are also developed**

J-PARC Control – LINAC (Cont.)

JCE script example

- **Digitizer configuration panel (left)**
- **BPM display panel (below)**

EPICS at DESY in April.2007, n.kami, KEK
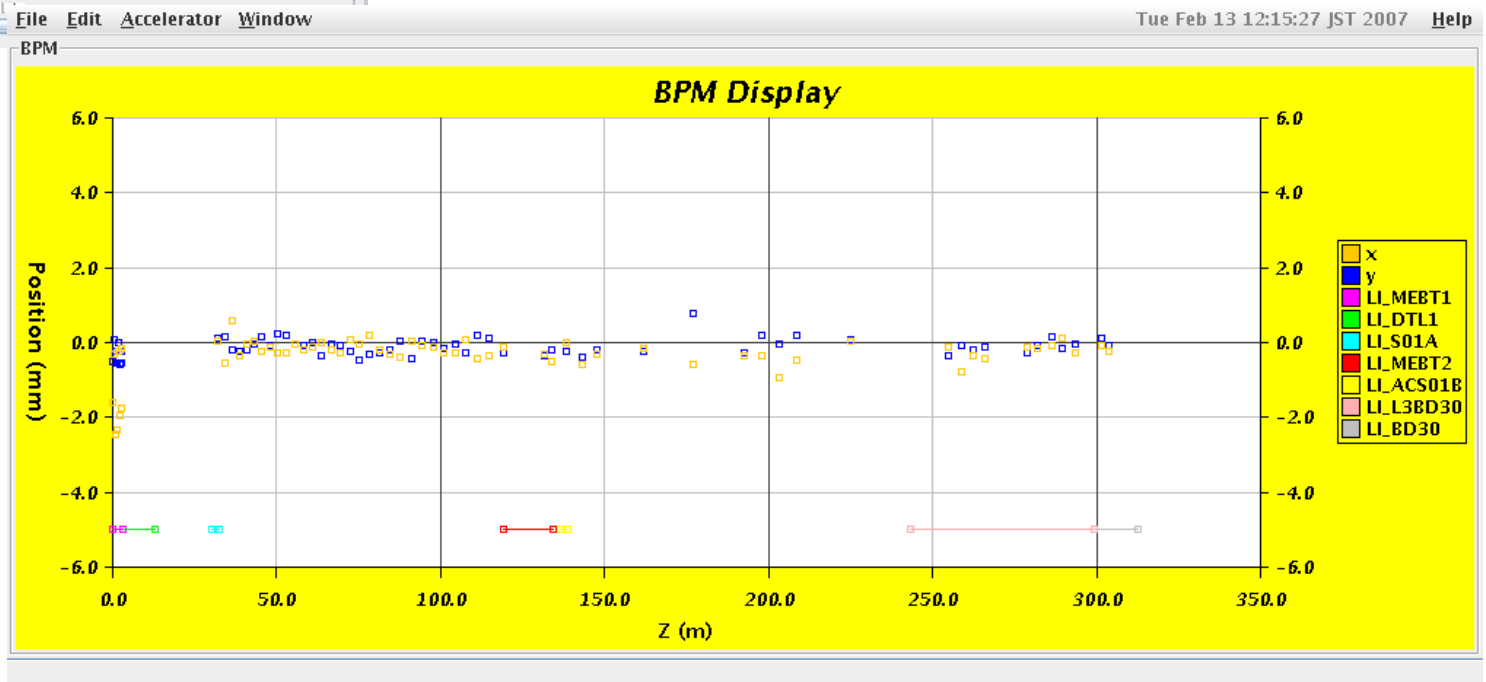
J-PARC Control – LINAC (Cont.)

Orbit Correction of A0BT line (XAL based)
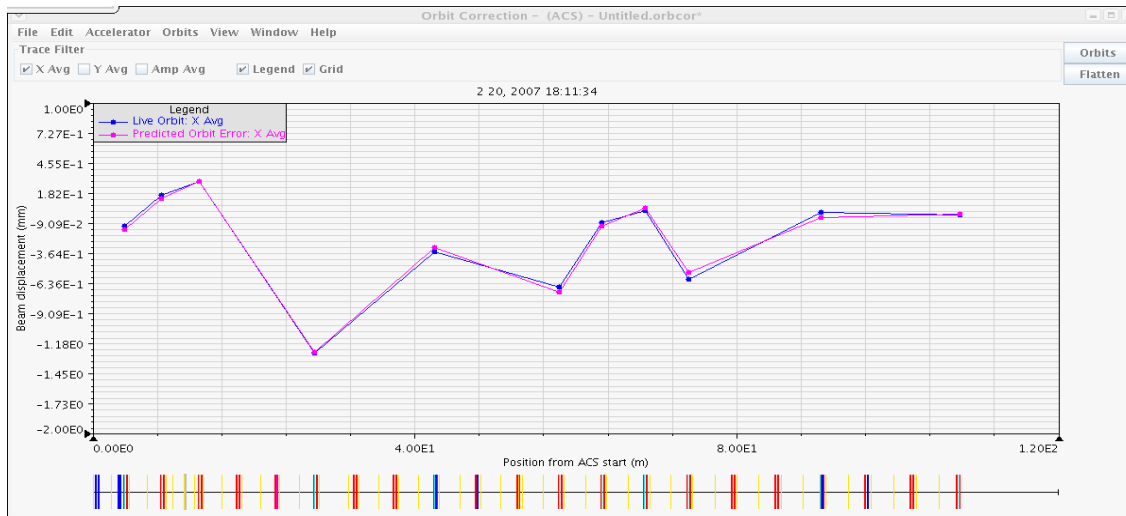
- **Prediction is given (upper)**
- **After correction (lower)**

EPICS at DESY in April.2007, n.kami, KEK

J-PARC Control – LINAC/HLA

- **JCE (J-PARC Commissioning Environment)**
  - **Java based SAD script interpreter developed at JAEA**
  - **Quick development and test of control / calibration sequences**
    - **Magnet field setting**
    - **BPM/SCT monitor display**
    - **FCT energy calculation**

- **Java applications (utilizing XAL library)**
  - **Online model**
  - **Beam based calibration**
  - **Orbit correction**
  - **SCORE (Save and Restore setting DB interface)**
  - **RF phase scan**
  - **WSM profile analysis**

J-PARC Control – LINAC (Cont.)

- **During Dec.2006-Apr.2007**
  - **Commissioning started at Klystron Gallery (not at CCR), since RF is not remote-controllable through the control system**
    - **→ updating the RF control system is underway**

  - **ill-behaved device caused multi-cast storm and eat up network bandwidth.**
    - **→ device identified and removed (Mar.2007)**
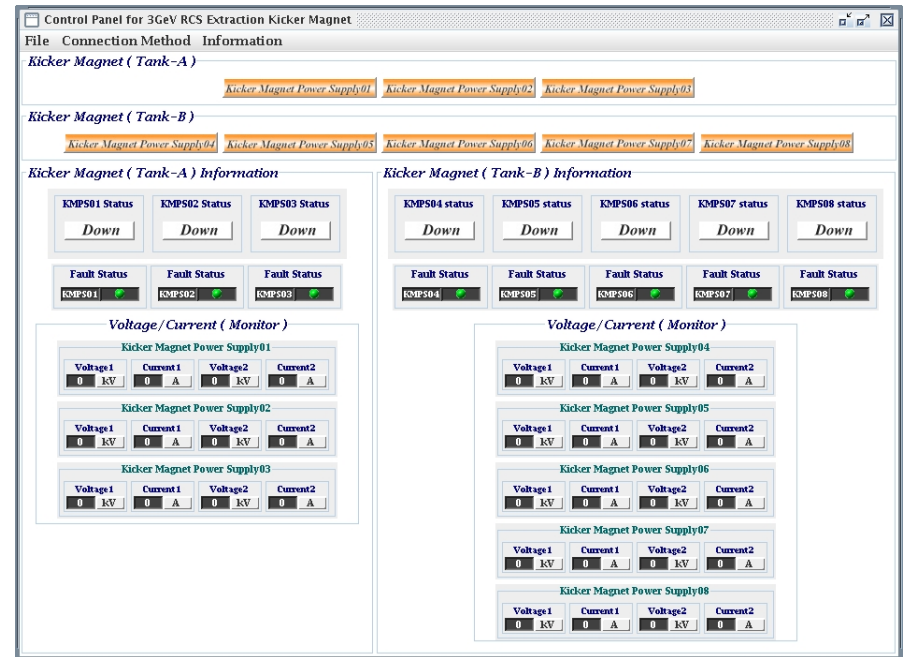
J-PARC Control - RCS

- ## RCS – by Sept.2007
  - ### Following Installations were completed
    - IOC(VME), NIM(Timing modules), Network, MPS
    - PC/Linux for console in the RCS local control room

  - ### OPI development
    - Basic OPI will be developed by H/W companies
    - High-level application will be developed by commissioning group
    - Re-use LINAC's OPI if possible

OPI for Kicker magnet Power-supplies

J-PARC Control - MR

- **MR – by May.2008**
  - **Installations**
    - **CPU for IOC(VME), NIM(Timing modules) and Network switches will be introduced by the summer of 2007**
    - **Cabling will be made by the autumn of 2007**
  - **OPI development**
    - **Basic OPI will be created under negotiation with device groups.**
    - **High-level application will be developed by the commissioning group**
    - **Development environment for OPI (EDM,SAD, etc.) is ready**

J-PARC Control - Summary

- **Linac** control by JAEA Team
  - Started in Nov.2006
  - **Succeeded** to contribute to the beam commissioning
  - Part of Linac (RF) is not remote-controllable yet
  - High-level applications (XAL/JCE) are developed

- **RCS** control by a company/JAEA
  - Will be started in Sept.2007
  - Hardware components were installed already
  - Software is under development

- **MR** control by KEK Team
  - Will be started in May 2008
  - Hardware installation is underway
  - Negotiating with device groups for software development

EPICS at DESY in April.2007, n.kami, KEK

Control-Related Issues

EPICS at DESY in April.2007, n.kami, KEK

EPICS Lecture for J-PARC Staff

- **EPICS lecture on request for J-PARC staff**

  – **Roughly once per 1 month since 2006**

EPICS at DESY in April.2007, n.kami, KEK

Man-power of KEK Team

- **Man-power of KEK team**
  - **FY2005: J.Odagiri and N.Yamamoto moved from KEKB to J-PARC**

  - **Mar.2007: T.Katoh retired**

    But keep working with us

    as a scientific adviser,

    2 days per week

  - **Apr.2007:**
    - **N.Yamamoto becomes a new group leader**

    - **a new member, T.Matsumoto, joins us (previously he worked for HERA@DESY)**

Thank you for your attention

(^_^)