

# J-PARC status

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**J-PARC Center**

**JAEA  
KEK**

# J-PARC

Jointly promoted and operated by JAEA and KEK (Construction: 2001~2009, operation: 2009~)

3 Accelerators  
3 User facilities

## International User Facility

3 GeV synchrotron  
RCS (25 Hz, **1MW**)

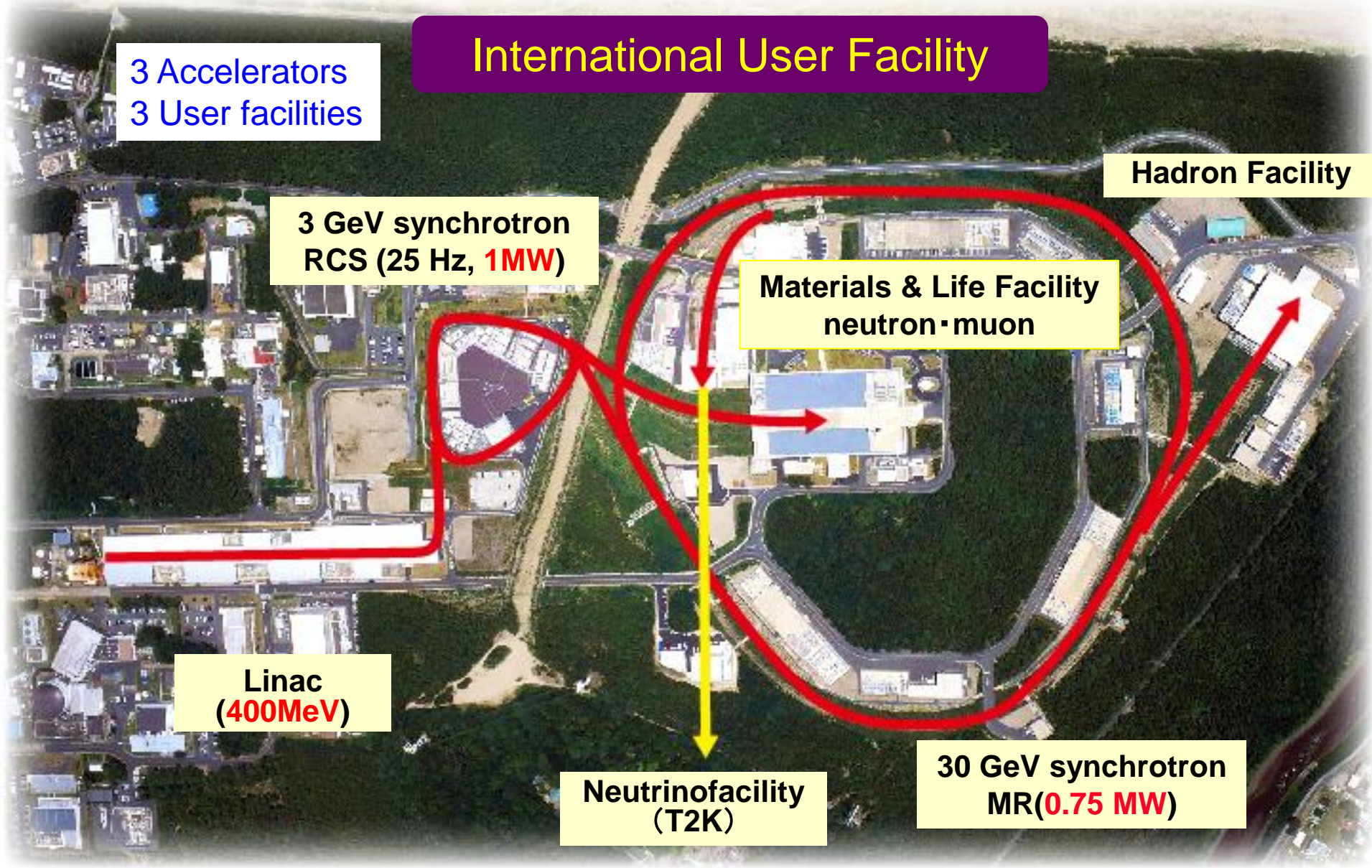
Hadron Facility

Materials & Life Facility  
neutron • muon

Linac  
(**400MeV**)

Neutrino facility  
(T2K)

30 GeV synchrotron  
MR(**0.75 MW**)



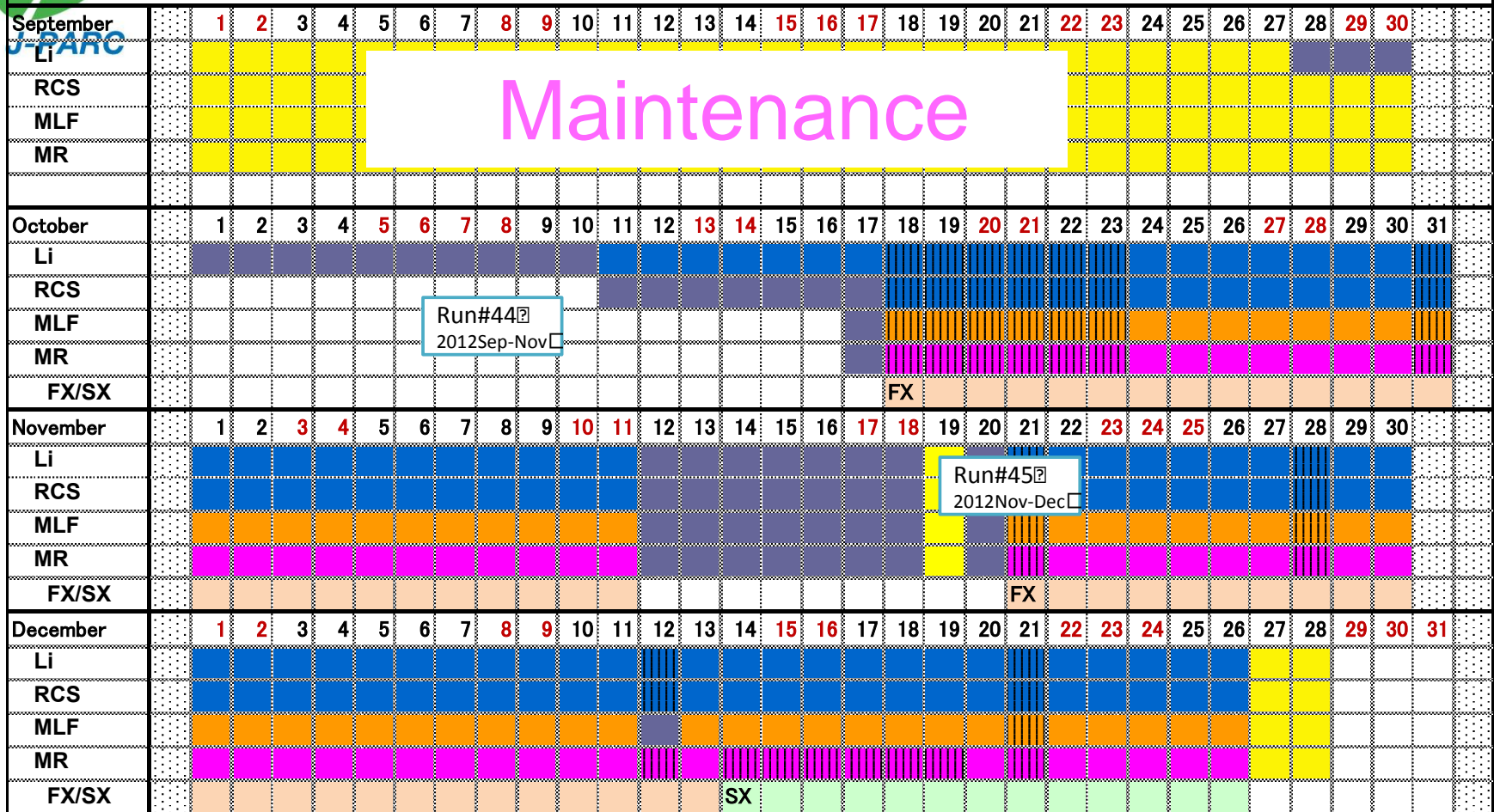
# **Accelerators and experimental facilities**

***Major progresses in last 6 months***



# Operation summary in JFY2012 (Sep - Dec, 2012)

2012: Accelerator maintenance & User operation plan



Sep. 28 - Oct. 17 : Accelerator study.

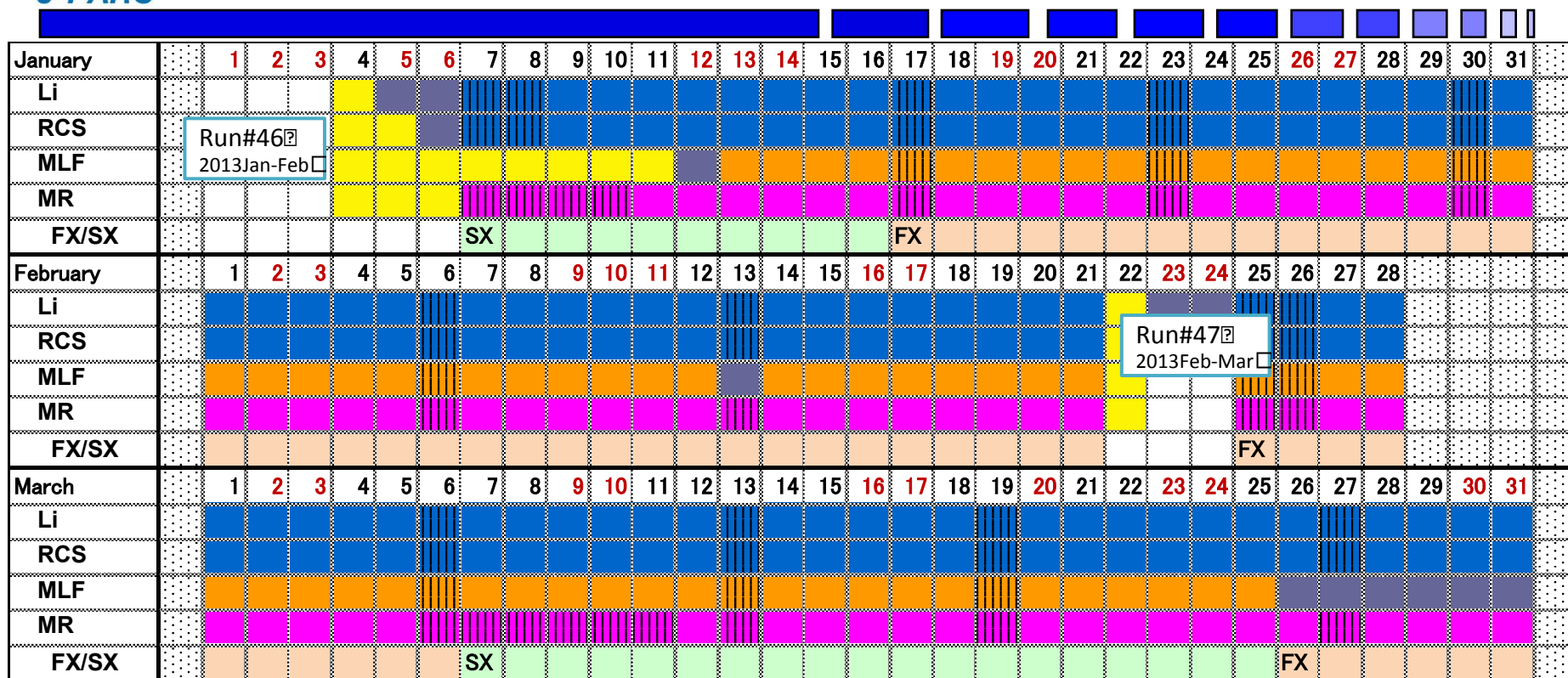
Oct. 18 : Beam delivery to the MLF and NU for user operation restarted.

Nov. 12 - 20 : RCS high power study.

Dec. 14 : Operation mode of the MR switched from FX to SX.



# Schedule in JFY 2012 (Jan. – March , 2013)



Additional MR study will be negotiated with users.

Jan. 7 -17 : MR mode is SX. Beam of 10-20 kW for study and 10-15 kW for users.

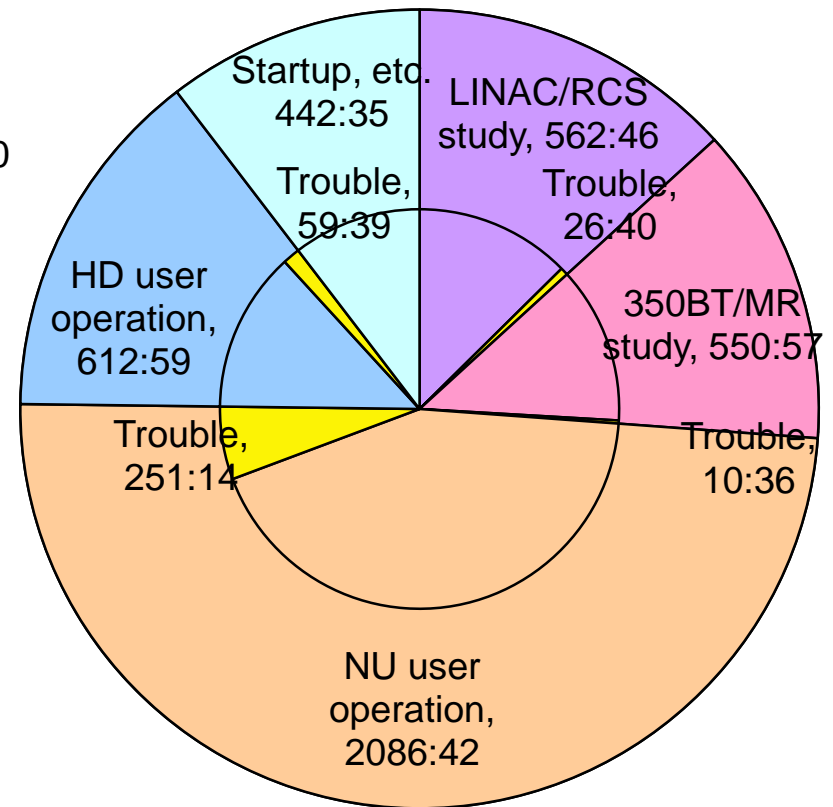
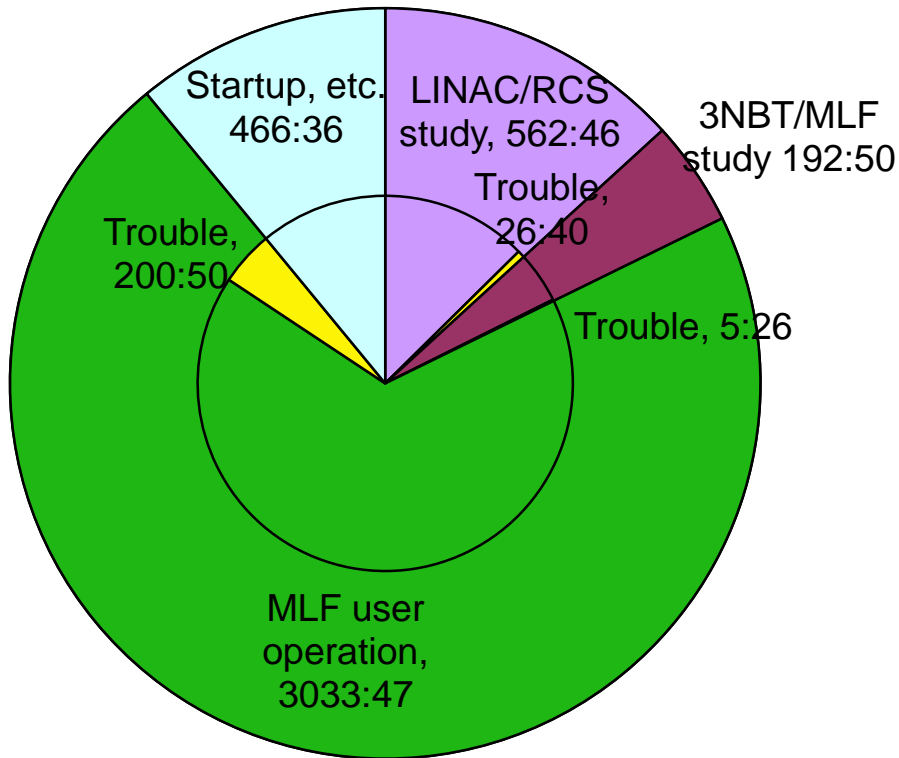
Jan. 17-March 6 : MR mode is FX. Beam of 200-220 kW for the T2K experiment.

March 7-25 : MR mode is SX. Beam of > 20 kW for study and 15-20 kW for users.

March 26-April 11 : MR mode is FX. Beam of 200-220 kW for the T2K experiment.



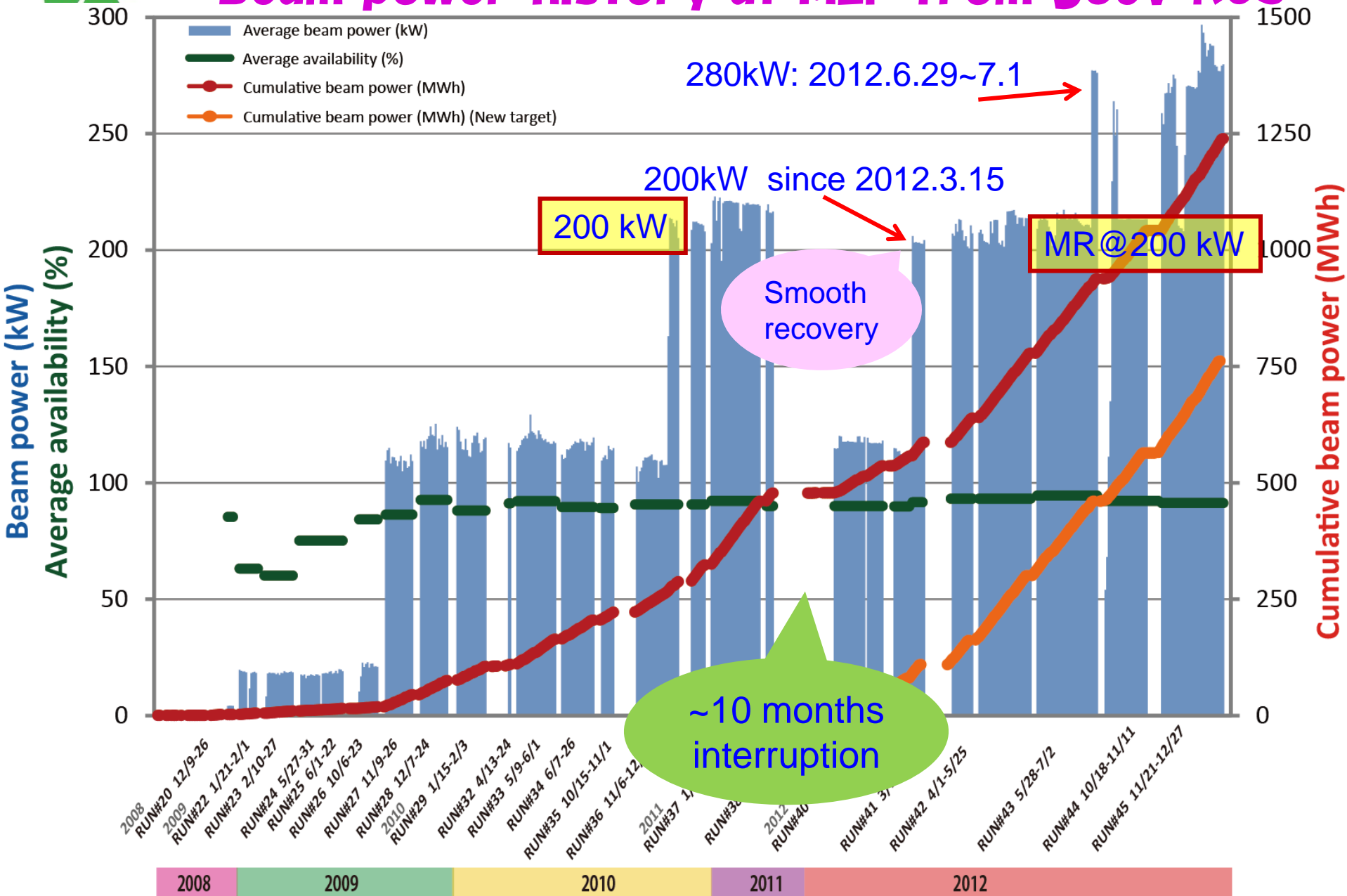
# Operation Statistics in JFY 2012 - RUN#42-45 (April 5<sup>th</sup> to Dec 27<sup>th</sup>) -



Availability (including beam stops due to troubles in the experimental facilities) :  
93.4 % for the MLF users, 88.0 % for the T2K experiment, 90.2 % for the HD users

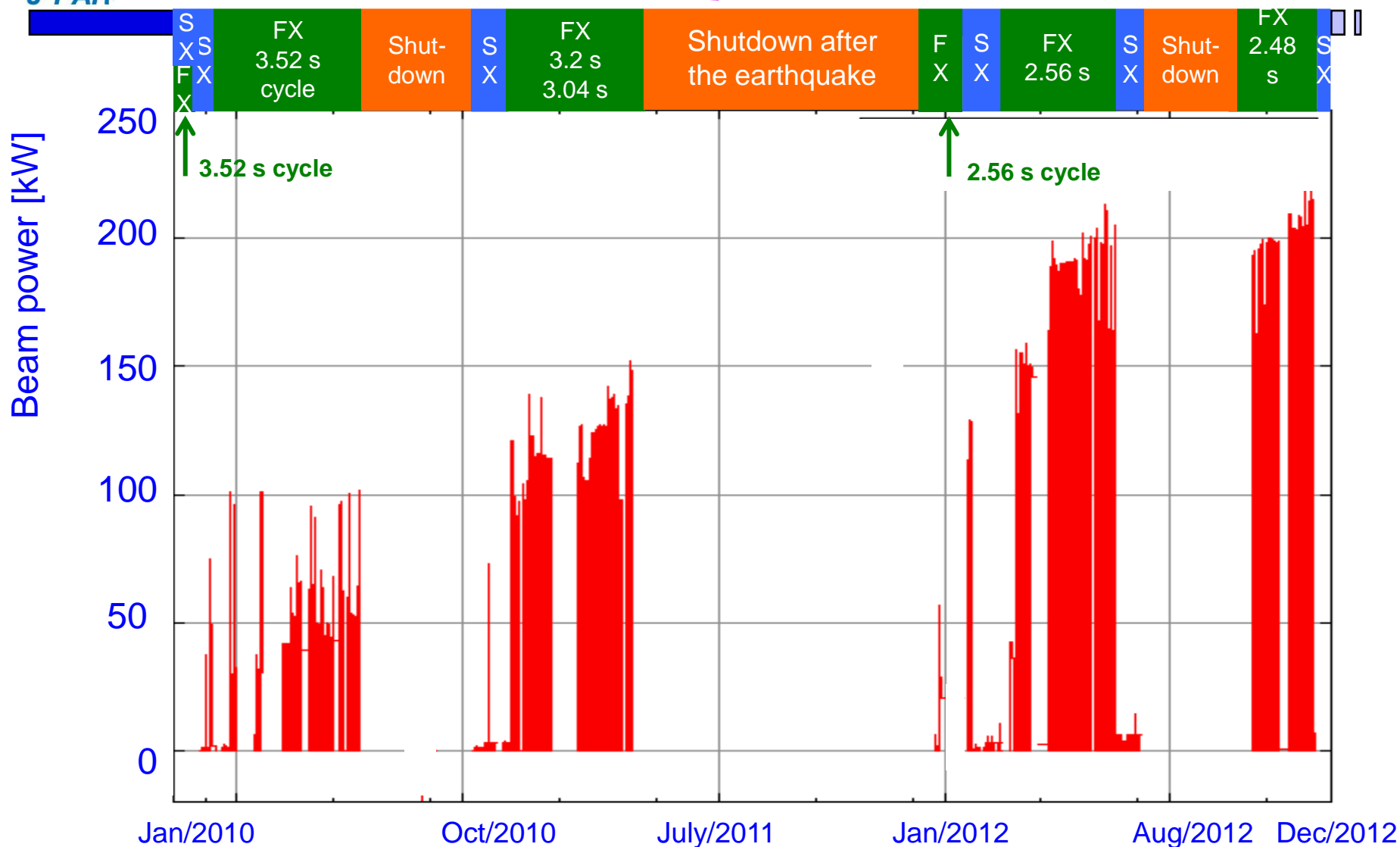


# Beam power history at MLF from 3GeV RCS



# MR operation history

(from January 2010 to Dec. 2012)



Delivered beam power to the T2K experiment is 217 kW in max.



# Pressure waves mitigated by microbubbles

J-PARC

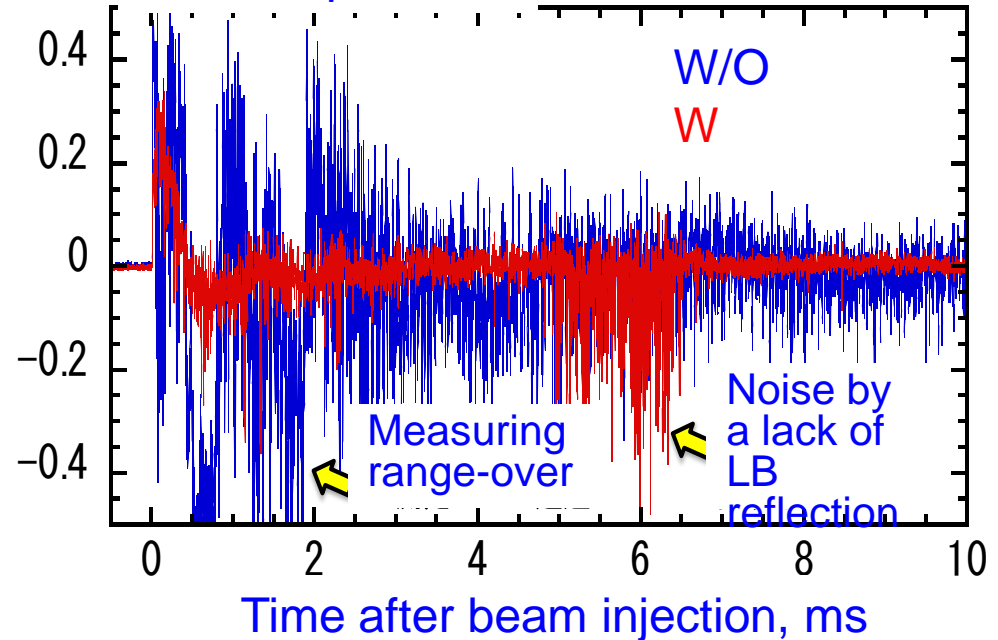
Bubbler

Target vessel

Displacement velocity, m/s

## Vibration at the target vessel

530kW operation



Bubble distribution

Mercury target

Target trolley

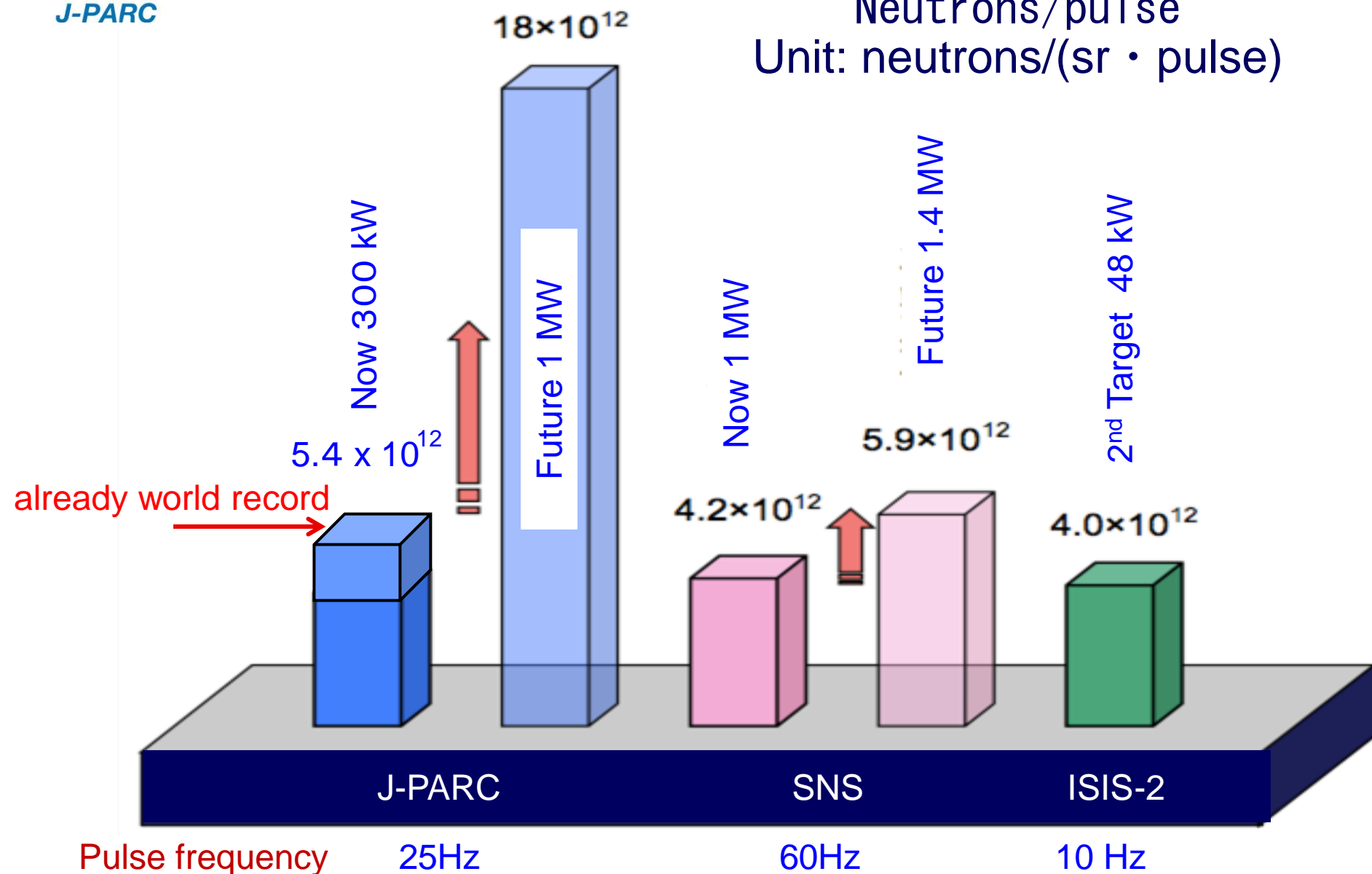
Gas-supplying system

Displacement & Vibrational time were reduced by microbubbles

Microbubble mitigation effect on pressure waves was verified

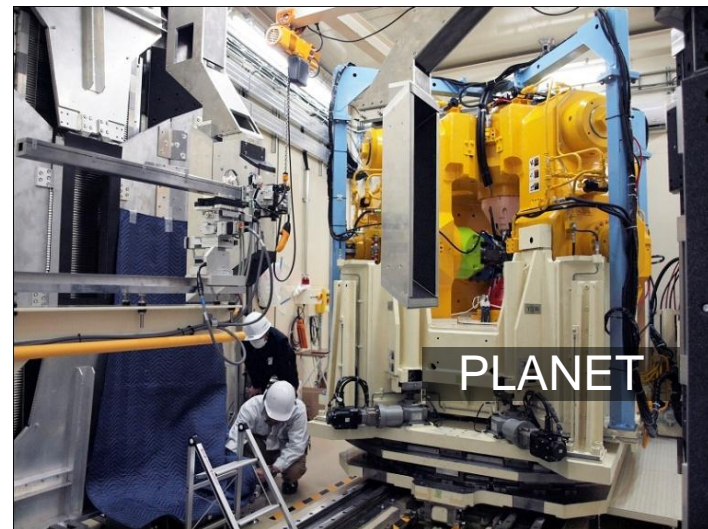
# J-PARC leads pulse neutrons performance

Neutrons/pulse  
Unit: neutrons/(sr · pulse)



# MLF Instrumentation (Neutron, Muon)

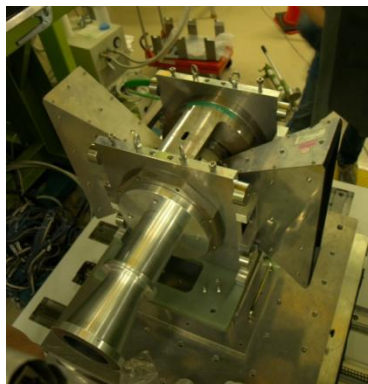
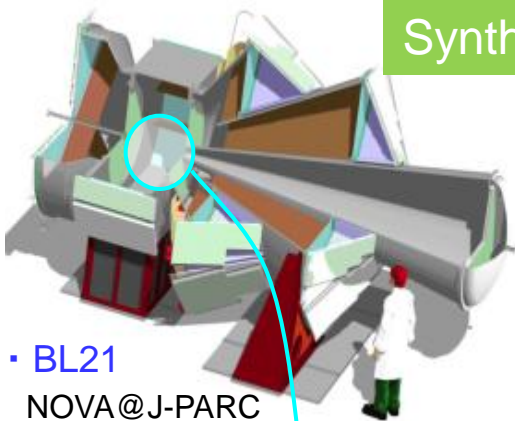
- Diffractometer for advanced battery development 「SPICA」  
Ceremony (September 4)
- Diffractometer for high pressure science 「PLANET」 Ceremony (September 27)



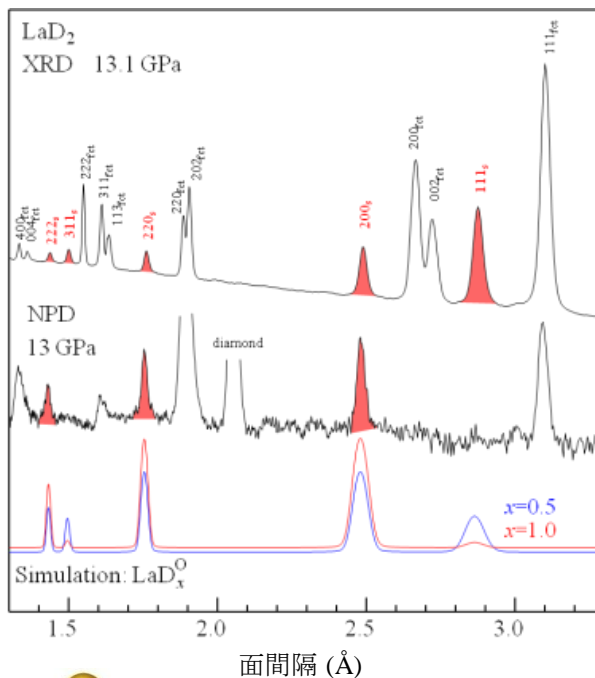
# Two sites of rare earth hydride under high pressure

JAEA (SPring-8)、J-PARC、Kyoto U.、Fukuoka U.、  
Yamagata U.、Niigata U.、Kyushu U.

Synthetic observation of metal-hydride by X-rays and neutrons

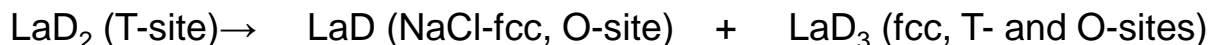
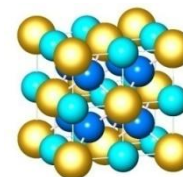
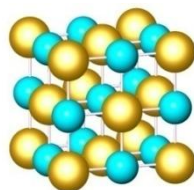
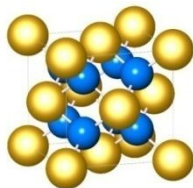


Paris-Edinburgh  
Type High Pressure Vessel



It was observed that two different sites of rare earth hydride under high pressure more than 13 (Lanthan hydride)

Important finding for stable and high hydrogen density materials development.

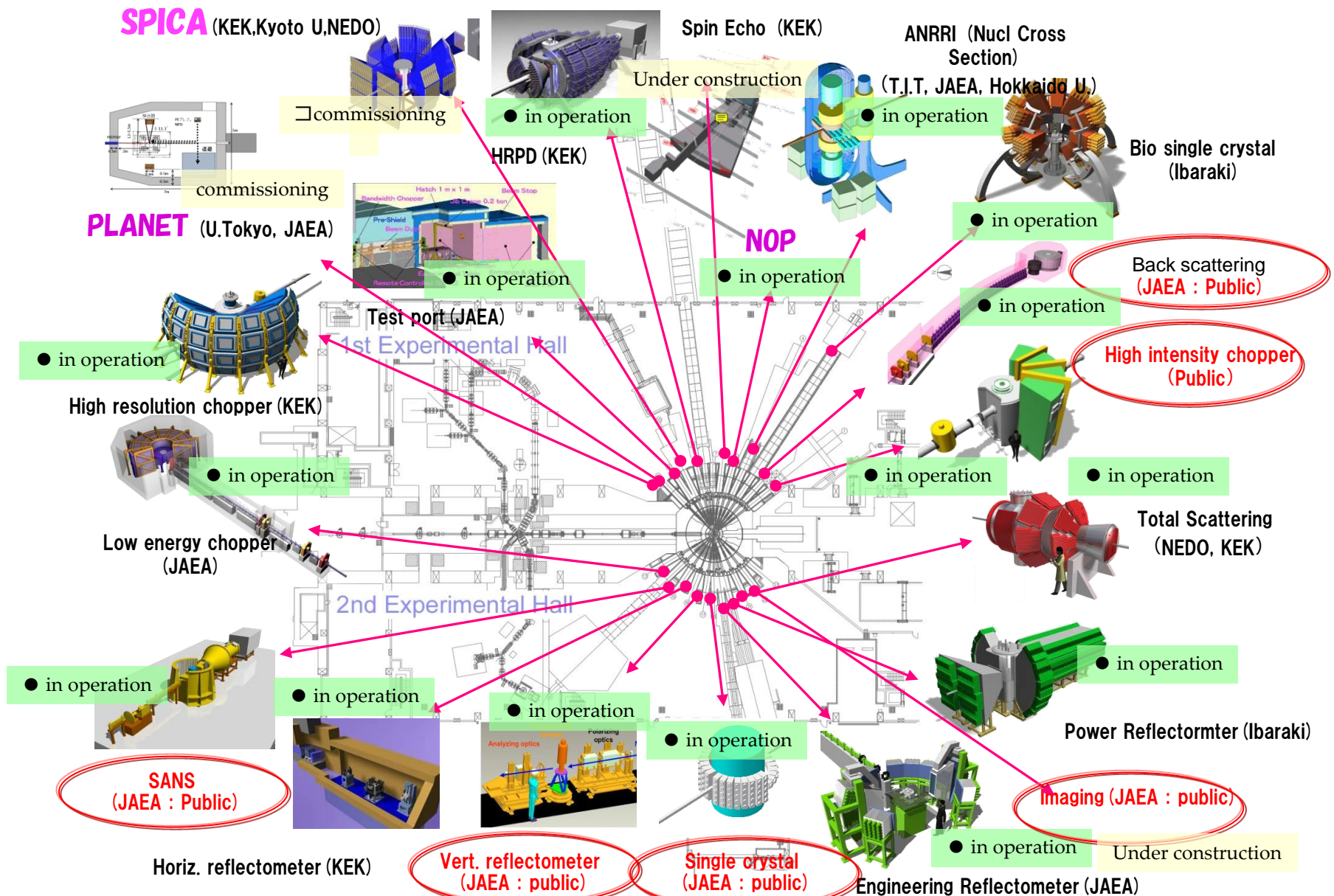


Received  
by PRL

NEDO Project (2007~2011)



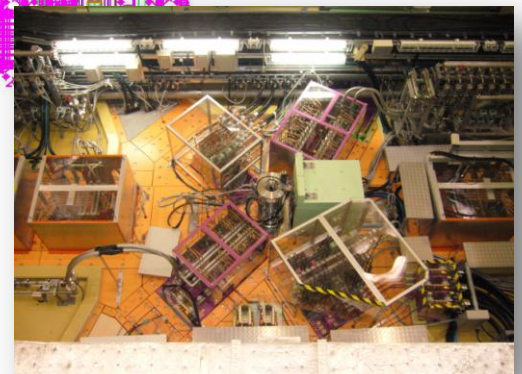
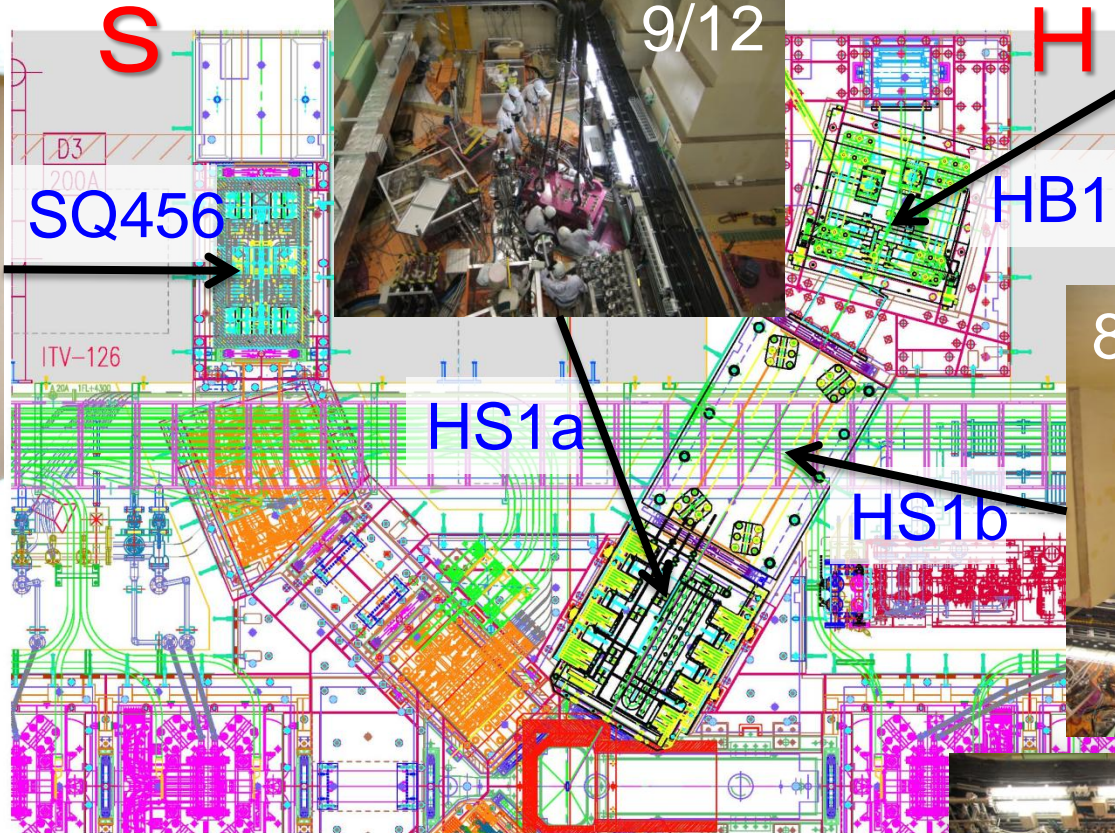
# Neutron Instrument status



16 In operation • 2 commissioning, 2 under construction : 20 instruments (out of 23)



# Muon S- H- Front end Installation



4 Electric Magnets and associated apparatus were placed in M2 tunnel area during 2012 Summer Shutdown Time

# World highest pulse muon production was recorded at U-Line

Muon/pulse  
30,000 (160kW)  
RIKEN RAL(UK)

Proton Beam

Carbon Target

J-PARC/MLF  
@D line  
First muon production  
(2008/9/26)

Muon/pulse  
(D line)  
72,000 (120kW)  
(2009/12/10)



U-line

**World record !**

Muon/pulse (@U line)  
**25,000,000 (212kW)**  
(2012/11/7)

2008

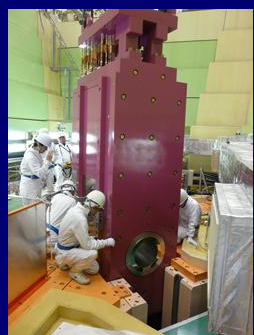
2009

2010

2011

2012

U Line



Capture solenoid electric magnet  
(2009/3/11)



SC solenoid electric magnet  
(2012/7/5)



SC axial Focusing Device  
(H24/9/25)

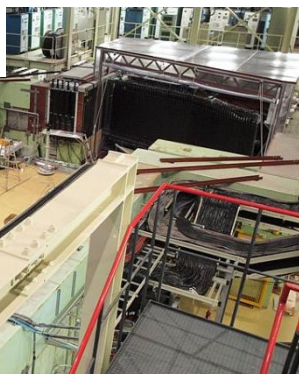




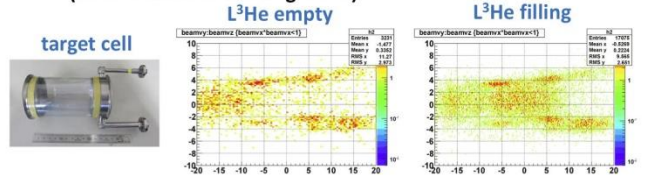
# Experiments at HD hall in Run45

December 14 ~ 27, 2012

E15: Search for deeply-bound kaonic nuclear states



● vertex images reconstructed by the CDS  
(cross-section of the target cell)

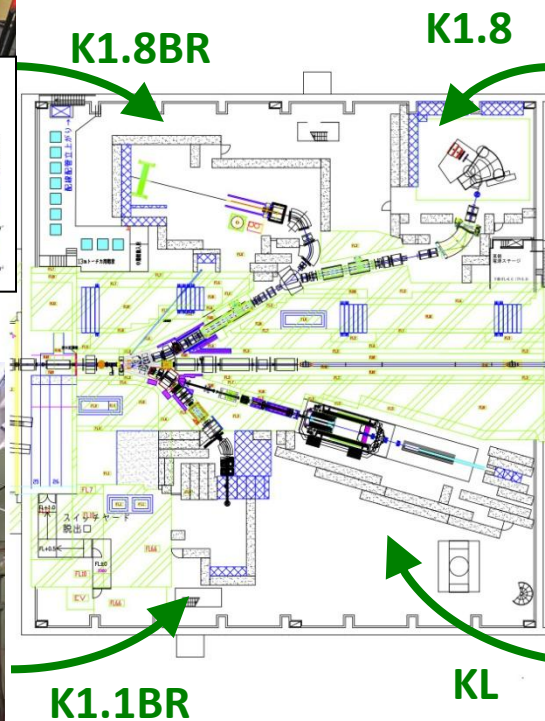


E15: shakedown with 3He target



Beam tuning & two test experiments (T47 & T48)

Four existing beam lines are all busy for physics experiments.



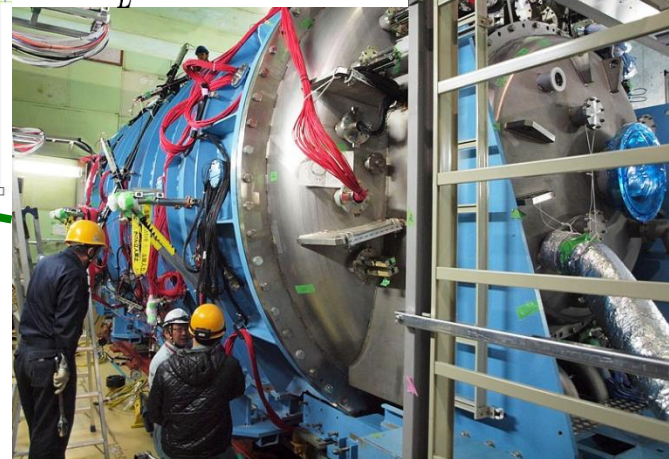
Among them, E10 at K1.8 started data acquisition!

E10: Study on Lambda-Hypernuclei with the Charge-Exchange Reactions



E10 : data acquisition

E14:  $K_L^0 \rightarrow \pi^0 \nu \bar{\nu}$  Experiment



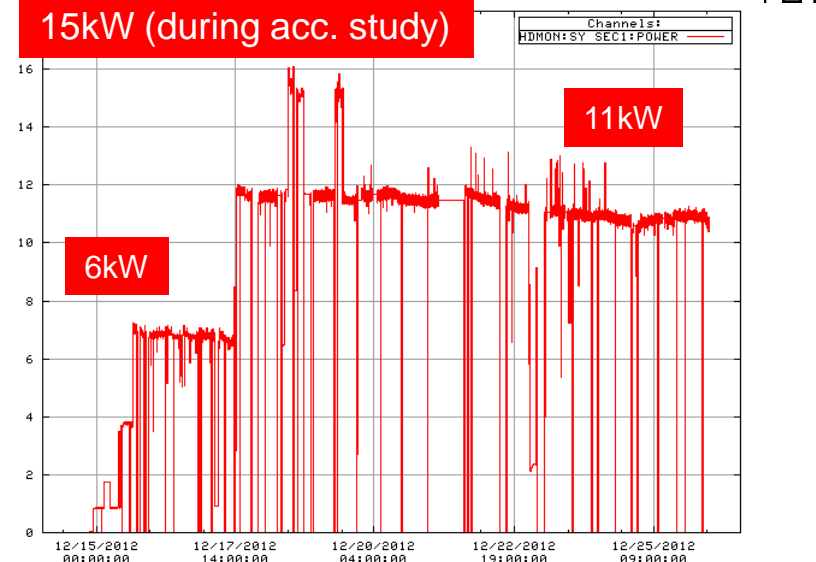
E14 shakedown with full detector system 16



# Status of Hadron Experimental Facility at Run#45 (Dec. 14~27)

Run number	45
Shot number	637940
Last shot time	12/12/20 13:48:53
MR Power	11.1 kW
MR Intensity	$1.4 \times 10^{13}$ PPP
SX Duty	38.45 %
SX spill length	1.95 sec
SX extraction efficiency	99.24 %

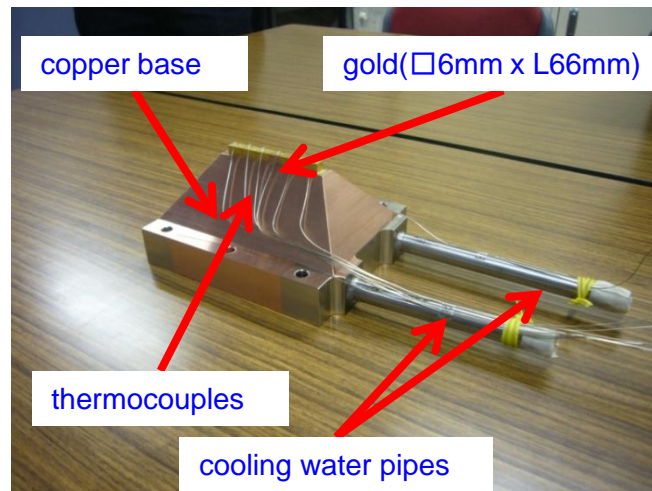
Typical operation status in Run45 (12/14-27)



Beam power trend in Run45 (12/14-27). Over 10kW becomes usual

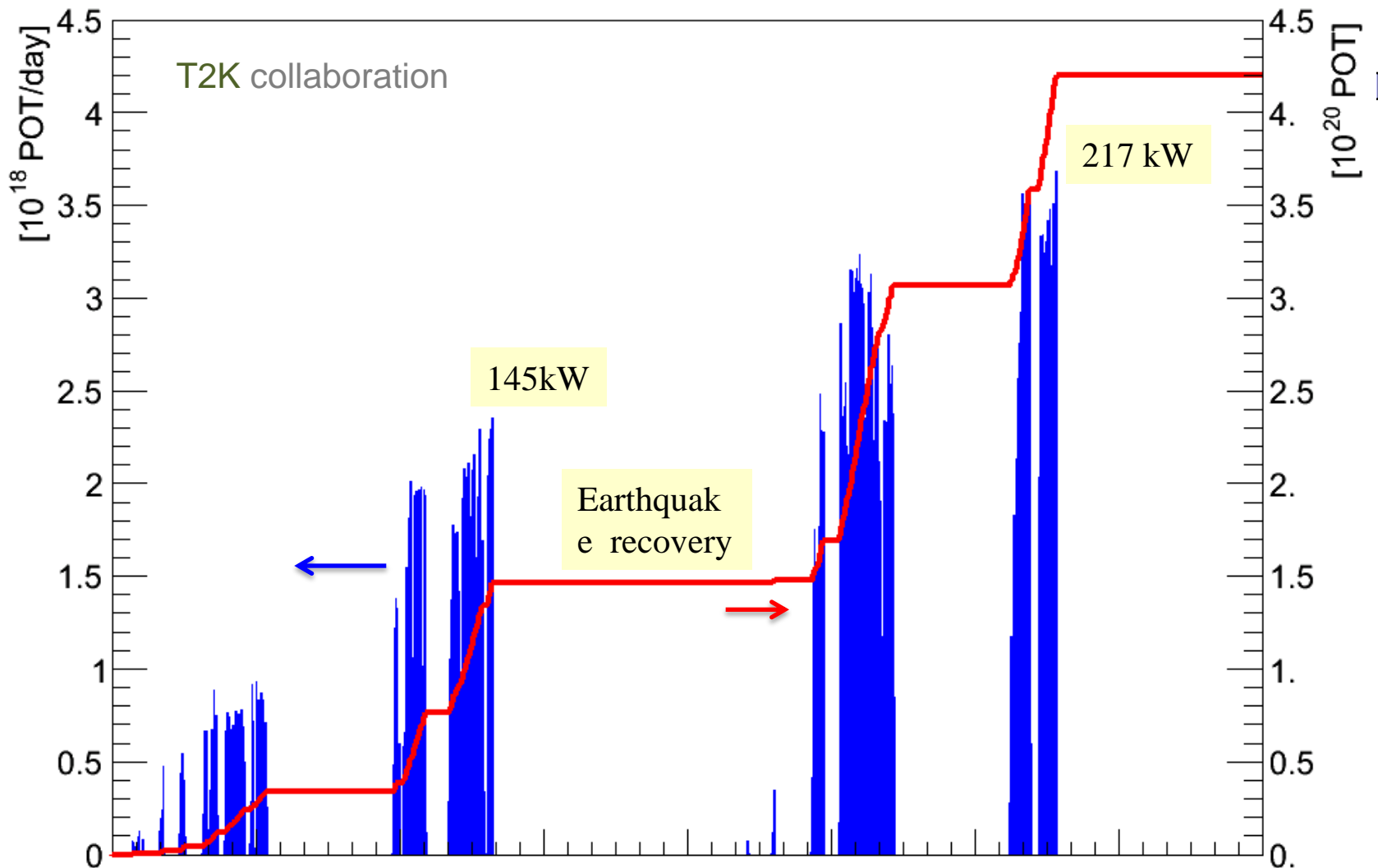


Ceiling concrete in KL experimental area has been completed for high intensity run!



The new gold target for high intensity beam is ready!

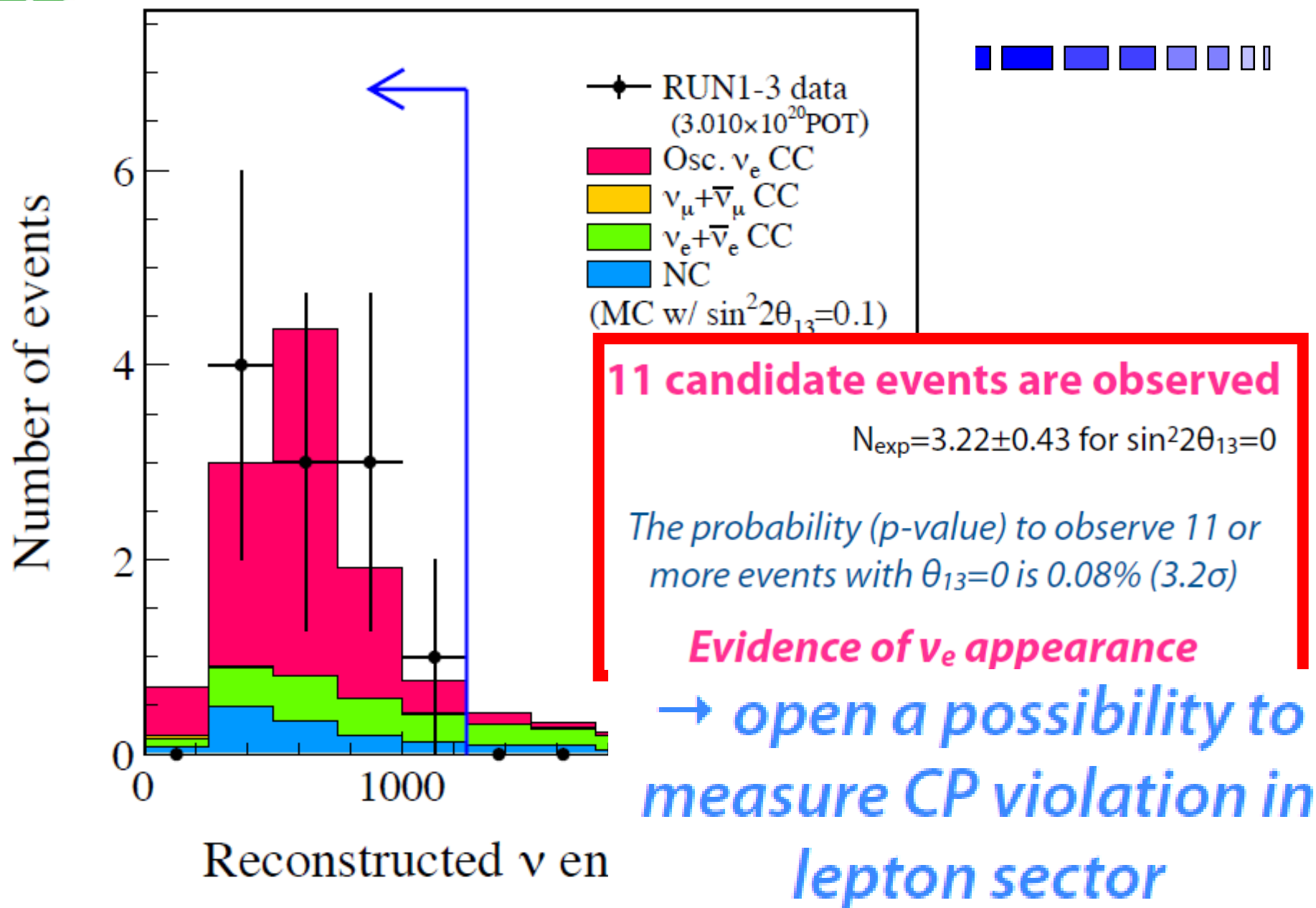
# History of delivered beam to the T2K experiment



Beam delivery to the T2K experiment in 2012 finished on Dec. 14.  
Accumulated number of proton  $\sim 4.2 \times 10^{20}$  POT.

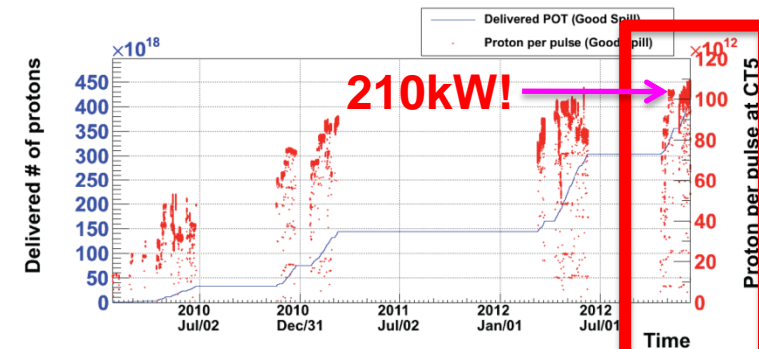
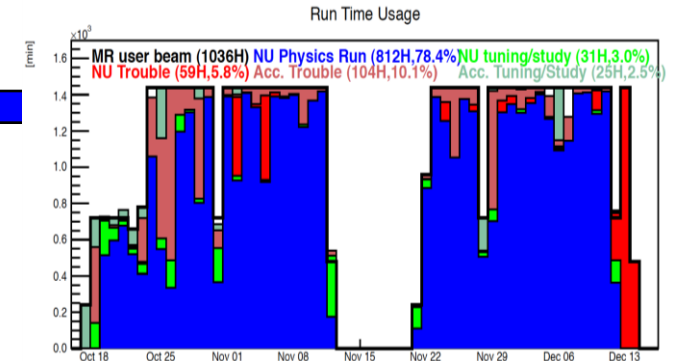
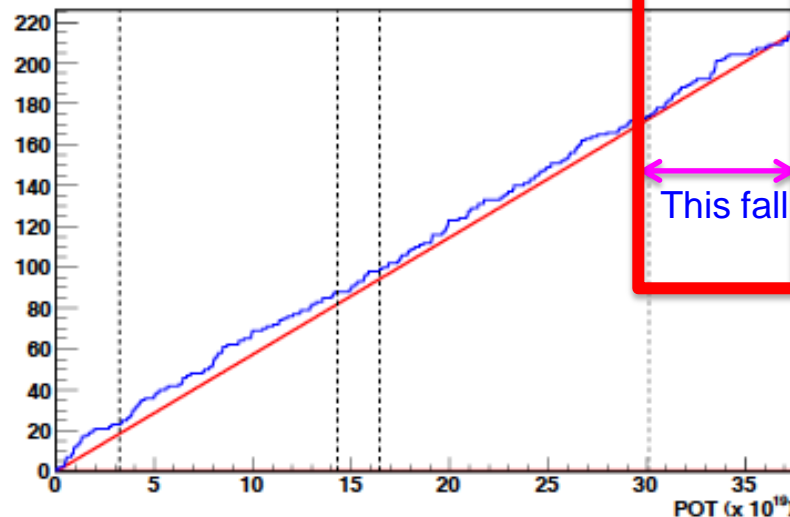


## T2K: 11 candidate events



- T2K took data from Oct. 2012
- Physics runtime fraction was 78.4 % = 812h(took data)/1036h(allocated).
- Stable **210kW** operation achieved
- Added  **$1.1 \times 10^{20}$  POT** after this Summer & reached total POT of  **$4.2 \times 10^{20}$**
- Super-Kamiokande is increasing neutrino events from J-PARC as expected

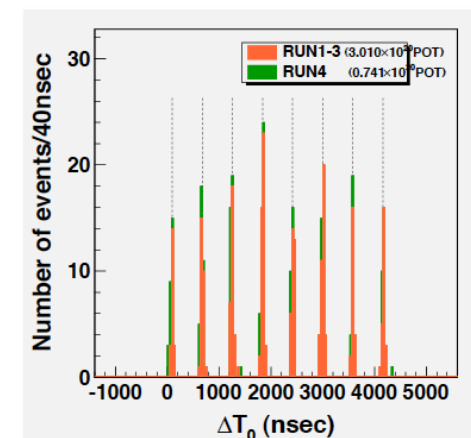
FCFV Events RUN1+RUN2+RUN3+RUN4



Run#440194~#440235 (End of Run44) : CT4 is used for PC

This fall

Integrated POT (Run29-45) :  **$4.148 \times 10^{20}$**





## ■ J-PARC Open house

July 29, 2012、 ~2,100 people  
MR, MLF, Neutrino, Hadron facilities



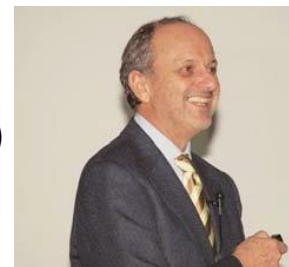
## ■ 4<sup>th</sup> J-PARC/MLF Symposium

October 10、 @National Museum of Emerging Science and Innovation(MIRAIKAN)  
~200 participants



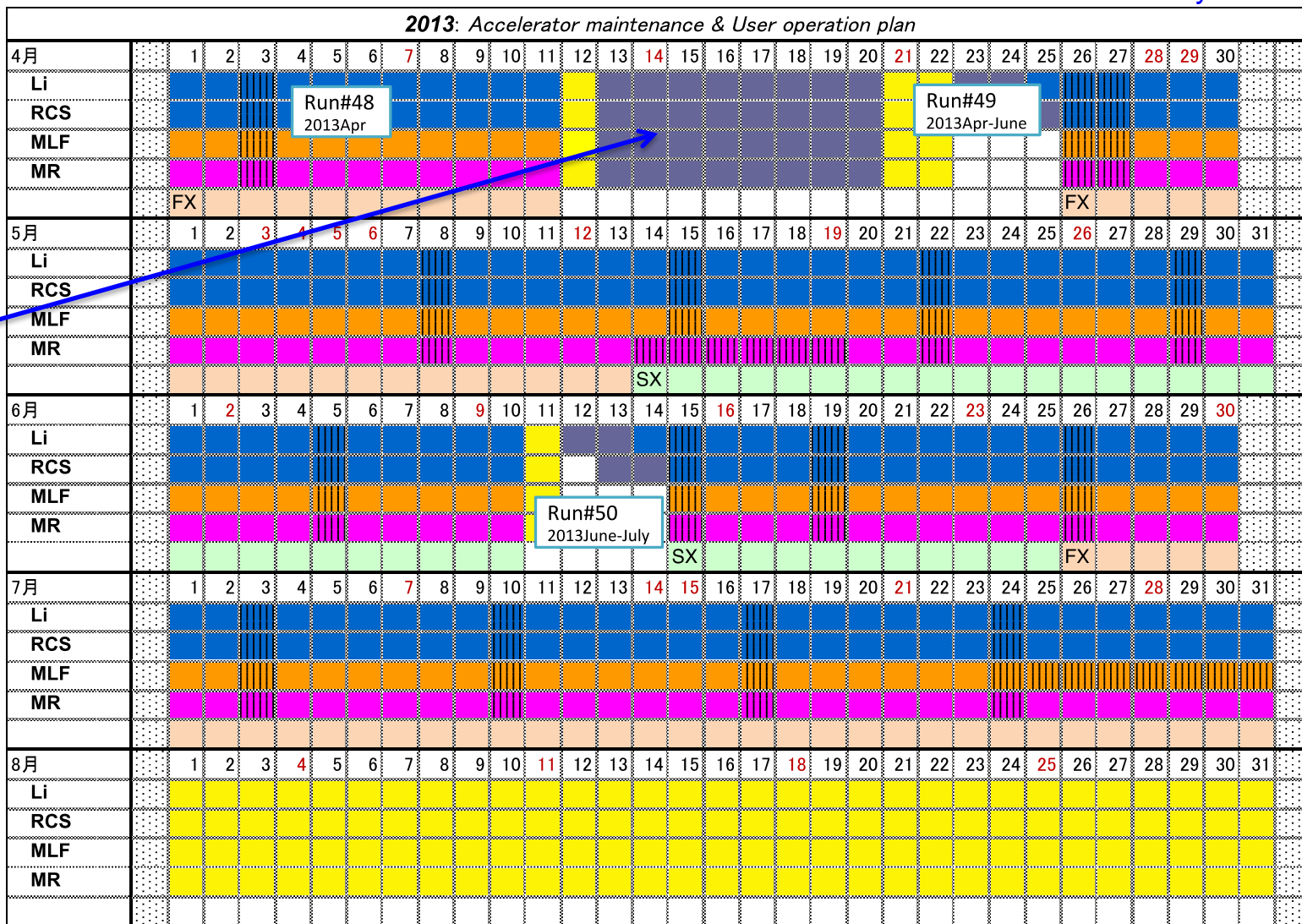
## ■ 1<sup>st</sup> J-PARC Colloquium

November 20、 IQBRC  
Lecturer : **Prof. Guido Tonelli** (Pisa Univ.)  
CERN LHC CMS former leader  
Topic : Origin of Mass in the era of LHC  
– quest for the Higgs boson –



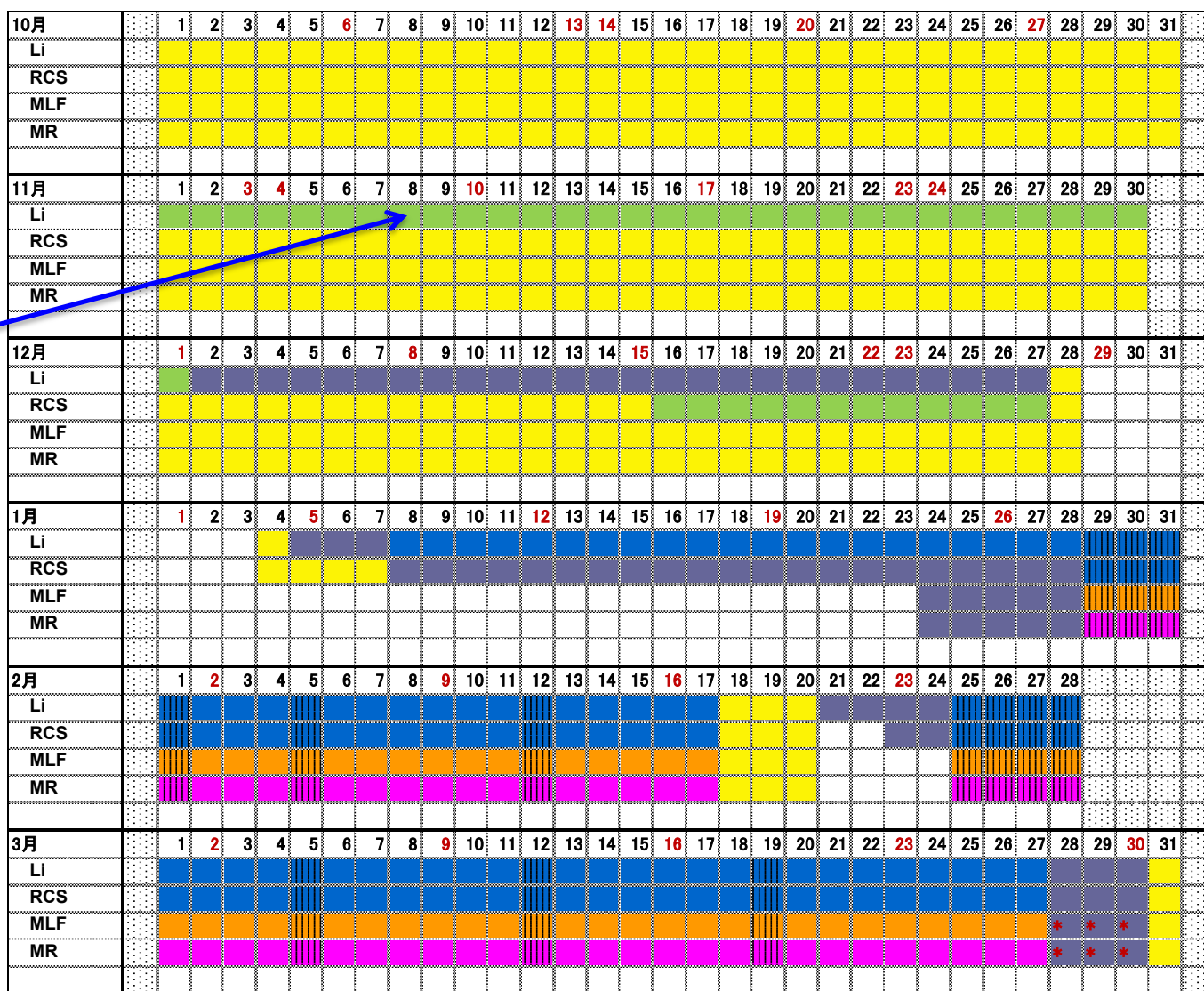
# Schedule in JFY2013(the first half)

The details have not been officially fixed.



# Schedule in JFY2013(the latter half)

RF conditioning of newly installed cavities.

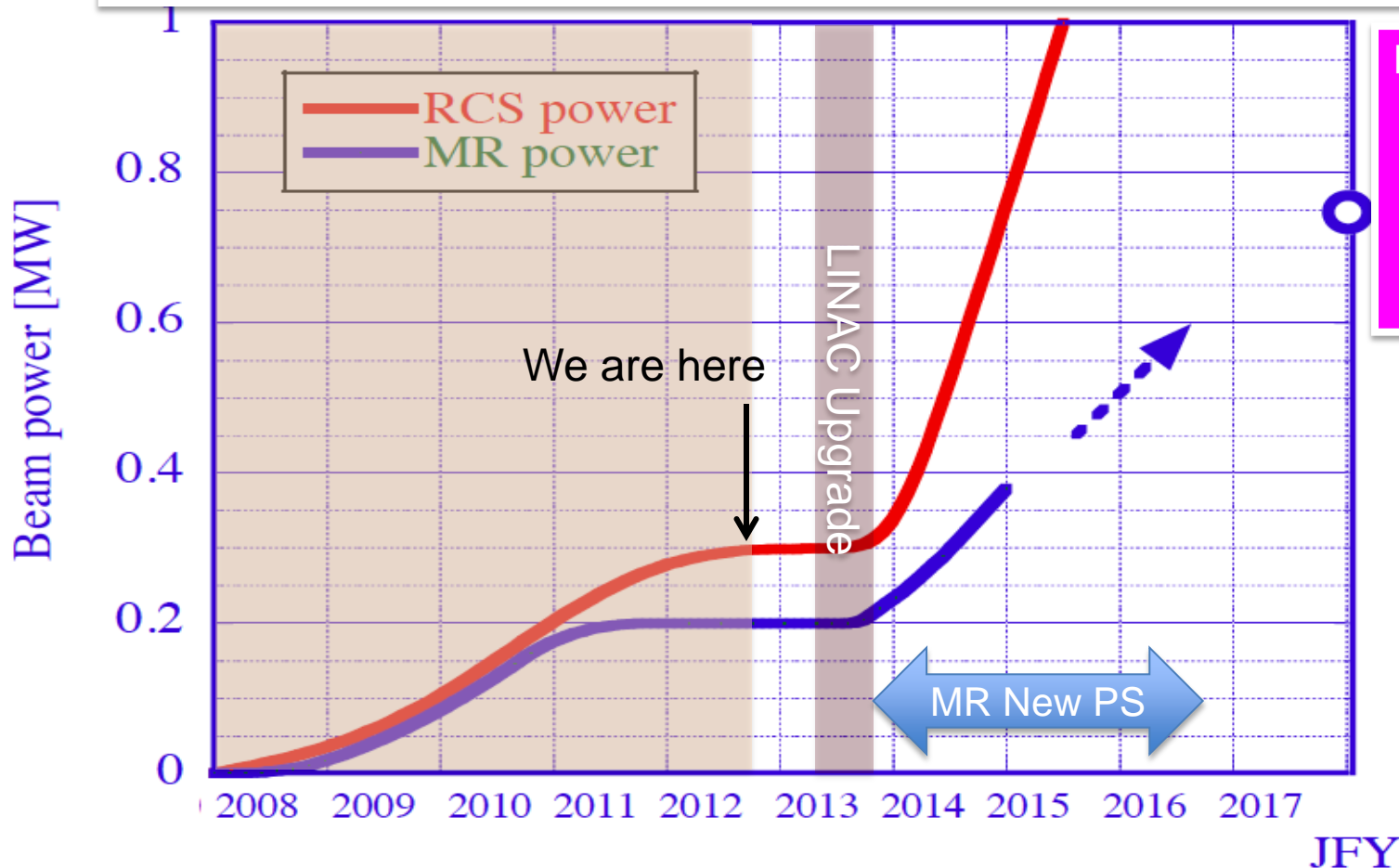


The linac will start beam commissioning in Decmber 2013, and the RCS start in January 2014. User operation will resume in the end of January 2014.

# Schedule for MR power upgrade

FY2013: Linac 400MeV, FY2015: RCS MW

Development of PS, FY2018: MR 0.75 MW



Issues for MR

- PS
- High gradient Cavity
- High repetition
- Shielding

# “Master Plan 2013” of Science Council of Japan

## -- Large Facility Plans for Researches --

- Proposal is due in March, 2013.
  - Selection of 200 proposals in June 2013
  - Selection of 25-30 proposals in December 2013
  - To be finalized in April 2014
  - Will affect funding from JFY2015
- “Master Plan 2010” resulted in
  - Super KEKB
- J-PARC related proposals in preparation
  - Neutrino Program:
  - Hadron and Muon Fundamental Physics: “Origin of Matter”
  - MLF Program (Neutron and Muon Science) : N-, M- microscope for slow dynamics
  - ADS : R&D of target and sub-critical physics with spallation neutron.





# Budget proposal for FY2013

- Budget proposal for FY2013 suspended due to the national election and administration change.
- Almost same budget profiles are kept as it was 6 month before.
- It will be settled by the end of January at the funding agency level.
- As emphasis is place on breaking away from deflation economy by the new administration, a large size supplemental budget will be possibly delivered.

# FY2013 J-PARC Center budget request (rev.)

## 1.Operation fee (Electricity, Operators, consumables, spares)

JAEA	83 Oku-yen
KEK	85 Oku-yen

6 cycles user operation  
maintenance, improvement

## 2.J-PARC experimental facility and equipments

▪ Muon beam line	KEK	<del>4.6</del> Oku-yen (1/5) <b>Supple.?</b>
▪ High momentum beam line and COMET	KEK	7.7 Oku-yen (1/3) <b>new</b>
▪ Neutron Imaging BL	JAEA	8.0 Oku-yen (2/3)
▪ Polarized neutron BL	KEK	2.9 Oku-yen(1/3) <b>Supple.?</b>

## 3. Improvement of user environment

▪ User main building	JAEA	<del>6.5</del> <b>15.0</b> Oku-yen(1/3) <b>Supple.?</b>
▪ Access road	JAEA	0.2 Oku-yen

## 4. ADS Development

▪ ADS Target test facility → R&D	JAEA	<del>5.2 Oku-yen(1/4)</del> <b>new 1.5 Okuyen</b>
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# Summary

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- Under a slogan of full recovery from the damage due to the earthquake
  - User programs in progress extensively with powerful beam.
    - Finally, Hadron receive SX beams with 11 kW.
    - Neutrino has steadily accumulated events toward  $5\sigma$ .
    - Neutron and Muon appreciates stable beam operation with 300 kW.
  - He bubble injection technique demonstrates effective PW mitigation.
- Next FY 2013
  - Linac: 400MeV energy upgrade, installation of Ion source, RFQ for 1MW
  - 6 cycles in user operation
  - Main building of user
  - Preparatory work for MW regime