Status of J-PARC Construction

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J-PARC Center at KEK/JAEA

J-PARC Facility

Joint Project between KEK and JAEA
Phase 1 and Phase 2

- Phase 1 + Phase 2 = 1,890 Oku Yen (= $1.89 billions if $1 = 100 Yen).
- Phase 1 = 1,527 Oku Yen (= $1.5 billions) for ~8 years.
- JAEA: 860 Oku Yen (56%), KEK: 667 Oku Yen (44%).

Construction Budget

Budget Profile (Construction)

- Construction Started
- Fiscal Year
- Now
- Completion of Phase-1
Plan for JFY2008

Injection to MR in May

Open for Users by the end of CY2008
(2 cycles in JFY2008)

Beams to the Hadron Hall by the end of CY2008

Neutrino beams from the beginning of JFY2009
Linac Area
First beam on 1/24/07
Very stable beams
Linac $\rightarrow$ 3 GeV Injection area

3 GeV Magnets

RF for 3 GeV (New material)

To Exp. hall
To 50 GeV To the ring

3 GeV Synchrotron Area

First beam on 10/31/07
50 kW in late Feb., 2008 (equivalent to 130kW)
MR Circulation, RF Capture & Extraction

Signal for 1000 turns around the ring

Movement of Beam Bunch
Neutron Experimental Hall #1

Production of Neutrons on 5/30/2008
Open to Users from December of 2008
First Production and Detection of Neutrons

4500 neutrons were detected using $^6\text{Li}(n,\alpha)$ reactions.

Time-of-flight for neutrons (s)

Test Experiment with Neutrons (BL08)

钢材料供給装置 (新技術)

Steel Materials
Provided by Prof. Tomoda at Ibaraki U.

Measurement of Time-of-flight
5/31/2008  500 pulses

Measurement of Neutron Intensity
5/31/2008  500 pulses

Proton Power
about 0.07 kW

About 1000 times power is expected on Day-1
Hadron Experimental Hall

Plan at the Hadron Exp. Hall

K1.1 = 1.1 GeV/c for Kaon

Hadron Hall Beamlines

Now

Summer of 2007

Hadron Area
Beams within JFY2008
Fast Extraction Line for Neutrinos

Near Detector Area

Neutrino Area
Beams from JFY2009
Recent Major Events

2007
- 10
  Beam extraction from 3 GeV (10/31)
- 11
- 12

2008
- 1
  Beam power of 5 kW/pulse (130 kW equiv.), 50 kW extracted at 3 GeV
- 2
- 3
- 4
- 5
  Injection, RF capture and extraction with 3 GeV beams at MR (5/22)
  Production of neutrons (5/30)
- 6

Government Review Committees

- The Review Committee appointed by the Government was held from December of 2006 through June of 2007.
  - Linac Energy Recovery
  - Organizational Structure at the Operational Stage (J-PARC Center)
  - PAC for Neutrons and Muons + Beam-Time Fee
  - Usage of Neutron Beam Lines by Industries
  - Phase 2 Projects
  - Internationalization of the J-PARC
  - Operational Cost
  - Etc., Etc.
① Linac Energy Recovery

The Review Committee recommended strongly to start the energy recovery immediately after the completion of Phase 1.

Entire cost goes to JAEA.
JFY2008: 1.5 Oku Yen for “Linac Recovery #1” approved.
JFY2009 budget request for “Linac Energy Recovery #2 for 4 years” is planned.

② J-PARC Center & Two Organizations

J-PARC Center is ranked to the same level of other institutions.
J-PARC Center is one of 11 Major Units (At Tokai, One of Two Units)

Reorganization at KEK is in progress.
③ Operational Budget

Operational Cost of J-PARC

200 day data taking

The Review Committee understood the reason why this budget is needed. However, an effort to reduce the cost was also recommended.

Total: 187 Oku Yen (Other personnel's: About 30 Oku Yen)
How to Grow Operational Budget?

JAEA
- JAEA is not an organization to provide an open access/service fully to public (JAEA is not a user-based institution).
- MEXT proposes to introduce a new scheme (which has been adopted by the SPring-8) so that the Government takes a responsibility to open the facility 100% to users (broader than the usage which is related to nuclear energy mission alone).
- In this case, the JAEA will take a responsibility for the operation of the facility, whereas a “contractor” must be assigned to promote scientific programs (e.g., management for selection of experimental proposal) on behalf of the Government.

KEK
- KEK is an organization to provide an open access/service to university and other academic institutions.
- MEXT is discussing possible mechanisms of how to provide a growing J-PARC operational budget, since the total KEK operational fund cannot grow too much.

Major Upgrades under Discussions

Neutrons and Muons
- Neutron equipments: How to fill the 23 beamlines (so far about ten were funded).
- Muon equipments: Among four beamlines, only one will be in operation in 2008. Others have to be funded.

Hadrons
- Must construct several kaon beamlines plus a primary beamline.
- Hadron hall expansion (Phase 2: 60m in length to 100m): Necessary to accommodate many user groups (Many requests on this at the Int. Workshop (NP08) held on 5-7 March of 2008).

Neutrinos
- Power upgrade.
- The third detector (at 2 km from J-PARC or at Okinoshima/Korea).

Nuclear Transmutation
- The major item for Phase 2 … Main Goal for JAEA.

Others
- Energy upgrade to 50 GeV.
- Third extraction line or Fast Extraction at Hadron Hall?
- Polarized protons, heavy-ions, ….
New members were elected in November of 2007.
Representatives from four communities are included.
Roadmap of the future J-PARC will be discussed at this committee.
- Discussion items by this committee were re-identified.
- The committee will start intense discussions from March 17th about future plans of the J-PARC.

Upgrades including Phase 2 will be discussed at this Committee

5 World Centers

- Materials and Life Science: One of three world neutron centers.
- Nuclear and Particle Physics: World unique Kaon Factory. One of three world neutrino centers. For antiprotons, GSI will form a center.
- For transmutation, a world unique center.

Center for neutrons

Center for neutrinos

Hadron (Kaon)

Hadron (Anti-p)

Intenationalization is still a big issue for J-PARC!
Early March

The First International Symposium
on Science at J-PARC on 5-7 March

IAC Meeting on 3-4 March

Coordination and Competition

GSI (H. Gutbrod):
- GSI (FAIR): Anti-protons + Heavy-ions
- J-PARC: Kaon + Polarized protons

BNL (P. Pile) + FNAL (Y.-K Kim):
- Strangeness Nuclear Physics Experiments
  - BNL → J-PARC
- Nuclear/Hadron Physics Experiments
  - Kaon Rare Decay Experiments
  - Muon Decay Experiments (LFV, g-2, etc.)
    - Good coordination is needed to the above three areas.
- Neutrino Experiments and Proton Decay Experiments
  - Competition with FNAL, or, eventually coordination???
- Neutron Experiments

From my summary slide on 3/7/08 in NP08
Summary

- **Uniqueness of the J-PARC Project - Multipurpose Facility**
  - Variety of secondary beams → Variety of frontier sciences (Materials, Life, Particle and Nuclear, Nuclear Engineering, etc).
  - From “basic science” to “industrial usage”.

- **News during the Past Half a Year**
  - Construction for both equipments and facilities: On schedule.
    - 3 GeV acceleration and extraction succeeded. Higher power than scheduled was achieved.
    - Main Ring injection and extraction with RF capture succeeded.
    - Production of neutron was successful.
  - A new “Users Steering Committee” started.
  - The Users Office started its operation.
  - Operational fund for JFY2008 allows 2 cycle operation for MLF users and an experimental run for K1.8BR.
  - Will deliver beams within JFY2008 for both Materials and Life Experimental Hall and the Hadron Hall. Beams for neutrinos will start from April of 2009.

- **Issues**
  - Linac energy recovery.
  - Organizational structure at the operational stage (J-PARC Center)
  - Operational budget ... We are setting the highest priority here.
  - PAC (location), Budget for experimental facilities, Beamtime Fee, etc.
  - Future Upgrade including Phase 2.
  - Internationalization of the J-PARC Project. ... Urgent but not yet attained.