KEK/J-PARC-PAC 2009-9
19 July 2009

J-PARC Program Advisory Committee

for the

Nuclear and Particle Physics Experiments at the J-PARC 50 GeV Proton Synchrotron

Minutes of the 8th meeting held on
Friday, Saturday and Sunday, 17-19 July 2009

OPEN SESSION (17,18-July-2009):

1. J-PARC Status: S. Nagamiya (J-PARC)

2. J-PARC Accelerator Status and Commissioning Plan: M. Yoshioka (KEK)

3. Physics plan of IPNS, Experimental Coordination, Mandate of this meeting: K. Nishikawa (KEK)

4. P27 Presentation (Search for a nuclear $\overline{K}$ bound state K^-pp in the $d(\pi^+, K^+)$ reaction): T. Nagae (Kyoto)

5. P28 Presentation (Study of isospin dependence of kaon-nucleus interaction by in-flight $^3He(K^-, n/p)$ reactions): H. Fujioka (Kyoto)

6. P29 Presentation (Study of in medium mass modification for ϕ meson using ϕ meson bound state in nucleus): H. Ohnishi (RIKEN)

7. E14 Report: T. Yamanaka (Osaka)

8. P30 Presentation (The investigation of $\Lambda(1405)$ state via the $d(K^-_{\text{stopped}}, n)$ $(\Sigma\pi)^0$ reaction) : T. Suzuki (Tokyo)

9. P31 Presentation (Spectroscopic study of hyperon resonances below $\overline{K}N$ threshold via the (K^-, n) reaction on Deuteron) : M. Noumi (Osaka)

10. E11 Report : Beam Line and Neutrino Facility: T. Nakadaira(KEK)

11. E11 Report : Near Detector Status: D. Karlen(Victoria)

12. Report from Muon Task Force: S.Mihara (KEK)

13. P21 CDR presentation (An experimental Search for Lepton Flavour Violating $\mu^- - e^-$ conversion): Y. Kuno, M. Yoshida, A. Sato, M. Aoki (Osaka)

CLOSED SESSION(17,18,19-July-2009):

Present: H.En'yo, A.Gal, K.Hagiwara, J.Imazato (Secretary), T.Kobayashi (Secretary), S.Kumano, T.Mori, Y.Nagai*, S.Nagamiya (J-PARC Center Director)*, S.N.Nakamura, T.Nakano, K.Nishikawa (IPNS Director), N.Saito (Secretary), M.Shaevitz, S.Shimoura, R.Tschirhart, K.Tokushuku (Chairperson), H.Yamamoto, M.Yoshioka(J-PARC)*

*) Part of the time

1. PROCEDURE

The minutes of the seventh J-PARC-PAC meeting (KEK/J-PARC-PAC 2008-15) were approved.

2. REPORT FROM THE J-PARC PROJECT DIRECTOR

The J-PARC Center Director S. Nagamiya presented the status of J-PARC. Significant progress has been achieved since the previous meeting. Charged kaons were indentified at the K1.8BR beamline during the commissioning of the slow extraction. On April 23rd, the first beam was successfully transported to the neutrino target and muons from pion decay were observed in the beam monitor. On May 28th, a government inspection for radiation safety was successfully passed. All four different types of beam facilities (neutron, muon, hadron and neutrino) have now been commissioned on schedule and an inauguration ceremony was held in Tokyo on July 6th.

The budget request for JFY2010 was recently submitted, which included operation funds for 155 days and new construction funds for the high-p beam line in the hadron facilities and for the intensity upgrade for the main ring (MR). In addition, the supplemental budgets from JFY2008 and JFY2009 will be used for the 400MeV Linac construction, for the completion of the K1.1BR beamline and for neutrino-related accelerator components.

The prospects for the J-PARC program over the next 5 to 10 years were discussed in the J-PARC users committee, which consists of the representatives from the various research fields covered by J-PARC, including the chairpersons of the high energy and nuclear physics committees. A written Japanese document was submitted in February.

The PAC congratulates the J-PARC center for the successful start-up of the facilities.

3. REPORT ON THE J-PARC ACCELERATORS

M. Yoshioka reported the milestones and basic plan for the J-PARC accelerators to move towards the design intensity. The relation between the beam power of the MR (P_{MR}) and that of the rapid cycle synchrotron (P_{RCS}) is expressed in a simple formula $P_{MR} = 0.16R_E\ P_{RCS}/T_{MR}$, where R_E is the energy ratio between the MR and RCS and T_{MR} is the machine cycle of the MR. R_E is 10 with 30 GeV operation. It is known that the increase of the MR energy is not a cost-effective method to increase the power since the magnets start saturating above 30 GeV operation. P_{RCS} will reach the design value of 1 MW when the 400 MeV Linac becomes operational, the 400 MeV beam injection to the RCS is realized, and the effect of the space charge effect is understood and mitigated. T_{MR} is currently 6 seconds and will be shortened by improving the magnet power supplies and adding more RF cavities for acceleration. A mid-term goal is to achieve P_{RCS} = 600 kW and T_{MR} = 2.5 seconds by 2011 followed by the goal of P_{RCS}=1 MW and T_{MR}=2.2 seconds by 2014. Work plans for these milestones are being drafted.

As reported in the previous meeting, there are two major problems which currently prevent stable operation; ripples in the MR magnet power supplies and discharges in the RFQ. In addition, damage to the finemet cores in the RF cavities of the RCS was reported and a new method for fabricating the cores needs to be developed.

In spite of these problems, much progress has been made in the commissioning runs in April-June. Multi 6-bunch operation was successfully tested as a single shot. The total protons in the ring was 4.4×10^{12}, which corresponds to 3.5 kW beam power with continuous operation at T_{MR} = 6 seconds. The injection timing to the MR was tuned and the beam loss at the injection was greatly improved. The ripples in the MR magnet were reduced to the 10^{-4} level by applying a symmetric configuration of the cabling. Further improvements are anticipated in the autumn for the stability of the slow extraction due to an active feedback system for extraction quadrupoles and a ripple cancellation system using trim coils.

In the October to December 2009 MR operation, the top priority will be machine studies for improving the beam power. A goal is to have $8x10^{13}$ protons in the ring (one shot), which is a milestone for the 100kW run in 2010. Studies of the fast and slow extraction will also be made. The progress will be reported to the PAC at January 2010 meeting.

The PAC strongly endorses the work plan for moving towards the design intensity and looks forward to the expected progress over the next six months.

4. REPORT FROM THE IPNS DIRECTOR

The IPNS Director, K. Nishikawa reported the roadmap for KEK and issues related to the J-PARC.

The future plan for KEK is based on the roadmap document made in 2008. The time lines of the KEK projects (J-PARC, KEKB, and the Photon Factory) as well as the international projects such as LHC and ILC were shown. KEKB has reached twice the design luminosity this year. A baseline design of the SuperKEKB with a nano-beam option has been developed and KEK has recently submitted a budget request for the KEKB upgrade. As for J-PARC, the beam commissioning has been on time but done with a low intensity. In order to achieve the original design performance and to move towards the intensity frontier, major investments will still be required.

The plan to complete the beamlines in the hadron facility was shown. The K1.8/K1.8BR and KL lines will be completed in 2009. By utilizing the supplemental budget funding, the K1.1BR and the test beam lines will be completed in 2010. As mentioned by the J-PARC Center director, the request for the high-p beam line has been submitted by KEK for the JFY2010 budget. If successful, all planned beamlines will become operational. Considering the expected low intensity for initial accelerator operation and to save funds and manpower, the director proposes to use the K1.1BR line as the initial test beam line until the proposed experiments for that line are approved and ready for installation. The particle yield of the K1.1BR beamline is much higher than the planned test beam and particle species are selectable with the electrostatic separator.

There is a conflict for floor space between the K1.1 and high-p lines. A solution was proposed where the downstream part of the high-p line is made removable and the experimental setup in the K1.1BR line is on a movable platform. With this

configuration the time to change the beamline is expected to be less than one month. If the COMET experiment takes place using the current primary hadron beam line, a possible option is to use a part of the high-p line and have the COMET detector setup in a structure partially outside the current Hadron Hall. For this option, the K1.1BR line will not be usable.

The PAC is glad to hear that the all planned beamlines in the hadron facility are in the process of completion. This makes the facility more versatile and widens the physics scope of J-PARC. The PAC also supports the proposal to use the K1.1BR line as an initial test beam facilities.

The PAC has a concern on the space limitation and conflict in the simultaneous operation of the beamlines. If COMET is placed as in the current plan, experiments which use the K1.1BR line need to be finished beforehand. Since the power upgrade timeline is not yet certain, a conservative estimation should be taken on the data taking time of the various experiments. If possible, it would be best to develop a plan where the space conflicts between future experiments was resolved.

The director also informed the PAC that a coordination committee for the J-PARC physics program has been formed which is called the "J-PARC Particle and Nuclear Physics Coordination Committee" (JPNC). The JPNC, chaired by M. Yoshioka, consists of 6 KEK staff who are leading members of the J-PARC experiments. The IPNS director and the PAC chairperson attend the meeting as observers. The JPNC makes decisions on the short term schedule of beam time and coordination between the experiments, as well as develop long term plans associated with the beamline arrangements and resources. The JPNC has proposed a run plan for the first beam. As shown in the previous PAC meeting by T. Takahashi, the beam intensity is expected to be too low to run experiments which require a kaon beam. It is, therefore, proposed to carry out the E19 (Pentaquark search) in the K1.8 line and the E17 ($K^- {}^3He$ *3d-2p* x-ray spectroscopy) in the K1.8BR line during the initial running. The commissioning of the KL beamline will also be done by the KOTO group in parallel with these experiments.

The PAC is pleased to hear that the JPNC committee has been set up for short term decision making and coordination with respect to the run plan. It expects a report from the JPNC at every PAC meeting. The PAC also supports the proposed initial fixed target run plan for initial beam.

5. PROPOSAL EVALUATION

1. **P27:** (Search for a nuclear $\overline{K}$ bound state K^-pp in the $d(\pi^+, K^+)$ reaction)

   The experiment aims to produce the K^-pp bound state, a topic of considerable interest, via the $d(\pi^+,K^+)$ reaction. The (π^+,K^+) reaction is well-established method of studying Λ hypernuclei, and the reaction with the increased π^+ momentum of 1.5 GeV/c is expected to produce the $\Lambda(1405)$ which serves as a doorway to the $\overline{K}$ bound system. For this experiment, the background events originating from quasi-free hyperon production can be highly suppressed by the proposed two-proton tagging technique.

   The PAC is concerned that the yield estimation might be optimistic because of the following considerations:

   (i) It was assumed that 1% of the produced $\Lambda(1405)$ are trapped to produce a K^-pp system, but this was deduced based on a specific model with an assumption on the binding energy and size parameter. This rate may be lower.

   (ii) The assumption that 20% of the decays are to the non-mesonic decay branch looks too large for a light nuclear system such as K^-pp. It could be several times smaller.

   In spite of this, the PAC considers that the experiment has the potential to show clear evidence of a K^-pp bound state with the small investment of a proton range stack to the approved E19 setup. **The PAC recognizes the importance of the physics goal of P27 and therefore recommends Stage-1 approval.**

2. **P28:** (Study of the isospin dependence of the kaon-nucleus interaction by in-flight $^3He(K^-,n/p)$ reactions)

   The experiment proposes to measure the $^3He(K^-,p)$ reaction as an addition to the $^3He(K^-,n)$ reaction to be measured by the approved experiment E15.

   The proponent plans to add TOF counters for the proton detection, drift chambers and a glass Cherenkov counter to the E15 setup. Data can be simultaneously taken and the interference with the original E15 measurement is expected to cause minimum impact. The collaborations of P28 and E15 are the same and no extra beam time is requested for P28. The PAC recognizes the importance of studying the

isospin-dependence of the kaon-nucleus interactions by comparing the (K^-,p) and (K^-,n) channels but judges that an independent proposal is not necessary. The PAC considers the P28 a part of the E15 experiment and encourages the collaboration to improve the E15 setup to measure the $^3He(K^-,p)$ reaction in addition to the $^3He(K^-,n)$ reaction.

3. **P29:** (Study of in medium mass modification for the ϕ meson using ϕ meson bound state in nucleus)

The mass modification of the ϕ meson in a nuclear medium was observed in the p+A reaction by the KEK-PS experiment E325. The proposed experiment measures the mass modification of the ϕ meson in a different way assuming that ϕ-meson bound states are indeed formed in nuclei. They proposed to observe the mass modification by missing-mass spectroscopy of the ($\bar{p}$, ϕ) reaction with $K^+\Lambda$ tagging. The PAC recognizes that the proposed experiment addresses an important issue of the mass modification of hadrons when the spontaneous breaking of chiral symmetry is partially restored in a nuclear medium. However, there are several issues with experiment that need to be clarified by the proponent. The PAC recommends that this proposal be deferred and that the following points be explained before there is further review.

1) The estimation of the count rate is to be clarified. For example, the branching fraction of the decay into a $K^+\Lambda$ is presented in Table 1. It is not clear if this branching fraction is included in the "acceptance for decay particle" given in Table 3.

2) The proponent should prepare a simulation showing that the expected signal to background ratio is achievable after all the trigger and final-particle decay selections are made.

3) It is not clear if double ϕ production which is dominant in $p\bar{p}$ annihilation in the vacuum still dominates in the annihilation in nuclei. There is a possibility that the final $K^+\Lambda$ may come directly from a nuclear reaction, such as $\bar{p}+(pp)\rightarrow\phi+K^++\Lambda$, rather than from a boundϕ. The proponent should consider and comment on this possible effect.

4) The K1.1 beamline is not completed yet, so that the proponents should consider an alternative possibility to do this experiment in another beamline.

4. **P30:** (The investigation of $\Lambda(1405)$ state via the $d(K^-_{stopped}, n)$ $(\Sigma\pi)^0$ reaction)

The primary goal of the proposed experiment is to study the structure of the $\Lambda(1405)$ via a $d(K^-_{stopped},n)$ missing mass measurement. By requiring a neutron and charged pions in the final state, an effective selection of the $(\Sigma\pi)^0$ system can be made. The experimental aim is to discriminate between the two models (single pole and double pole) for the I=0 $\bar{K}N$ -$\pi\Sigma$ coupled channel via the spectral shape of the missing mass spectrum.

Although the PAC recognizes the importance of the physics of the $\Lambda(1405)$ baryon,

1) The PAC was not convinced that the proposed experiment provides a sound way to discriminate between the two models motivating the proposal. The theoretical curves labeled "1405" and "1420" in Figs. 1 and 6 relate to single-pole models only, not to the double-pole models which were the underlying theoretical work that motivated the P30 proposal.

2) The PAC was not convinced that a study of the $\Lambda(1405)$ in a nuclear environment without clearly observing a related peak provides a sufficiently unambiguous procedure to determine the parameters of the $\Lambda(1405)$ in free space.

3) The efficiencies for the low energy neutron, which has vital importance for the measurement of spectral shape, are estimated only by a Monte Carlo simulation. These should be experimentally studied and verified.

Due to the above issues, the PAC recommends that this proposal be rejected. However, the PAC encourages the proponents to explore the feasibility of the experiment during the commissioning of the E15/E17 experiments.

5. **P31:** (Spectroscopic study of hyperon resonances below $\bar{K}N$ threshold via the (K^-, n) reaction on deuteron)

The primary goal of the proposed experiment is to study the structure of the $\Lambda(1405)$ via the in-flight $d(K^-,n)$ missing mass measurement with $\Sigma\pi$ tagging. The experimental aim is to obtain the missing mass spectra for the $\Sigma^+\pi^-$, $\Sigma^-\pi^+$ and $\Sigma^0\pi^0$ decay channels by using the E15/E17 setup with a small modification. The in-flight experiment provides a reasonable acceptance of the mass region covering the $\Lambda(1405)$.

The PAC recognizes the importance of the physics of the proposed measurements. However, there are important questions which remain to be addressed by the proponent. The PAC recommends that this proposal be deferred and reconsidered

after the following questions are answered:

1) How are the additional data going to accomplish the stated goals of the proposal? Can an I = 0 component of the spectra be extracted unambiguously?

2) Is the experimental setup suitable for the measurement of the $\Sigma^0\pi^0$ decay channel? Is it possible to discriminate the background of $\Sigma^*(1385)\rightarrow\Lambda\pi^0$?

6. **E14:** Proposal for $K_L \rightarrow \pi^0 \nu\bar{\nu}$ Experiment at J-PARC (The KOTO Experiment)

The KOTO collaboration aims to search for the CP violating transition $K_L\rightarrow\pi^0 \nu\bar{\nu}$ with single-event sensitivity close to the standard model prediction. This requires 3×10^7 seconds of slowly extracted beam at 300 kW, which is a challenging goal for the J-PARC accelerator. The collaboration, however, has made a strong case that the physics sensitivity below the Grossman-Nir limit ($\Gamma(K_L\rightarrow\pi^0 \nu\bar{\nu}) \sim \Gamma(K^+\rightarrow\pi^+ \nu\bar{\nu})$) is within reach even with conservative kaon yield and accelerator performance assumptions. It is thus likely that the actual sensitivity will reach the range where new physics effects might be present.

The collaboration has reported good progress toward a neutral beam survey to be performed this fall and in the development of sub-detector systems for the eventual experiment. The beam survey will measure the core K_L, the core neutron, and the halo neutron. For this survey, the requirements on the beam time and beam intensity are modest. The committee strongly endorses the goals of the beam survey planned to commence this fall, and recommends that the Lab make their best effort to provide the necessary support in timely manner.

The beam survey will substantially reduce the uncertainty in the eventual sensitivity of E14. Already at this stage, however, one sees good prospects that the experiment will produce a meaningful result in the end. **For these reasons the PAC reiterates support for Stage-2 approval.**

7. **E11:** Tokai-to-Kamioka Long Baseline Neutrino Oscillation Experiment (The T2K experiment)

T2K remains one of the most anticipated experiments in the field. The experiment should make the most precise determination of the θ_{23} mixing angle and has one of the best ultimate sensitivities to θ_{13} among the current experiments including Double Chooz, Daya Bay, RENO, and Nova. Over the past four months, the T2K experiment has made major and impressive progress on the neutrino beam and near

detector. This progress is consistent with the milestone to start data taking with near and far detectors by the beginning of 2010.

During April and May, an initial beam commissioning run was completed which achieved a number of milestones including demonstrating the stability of the MR orbit, the performance of the combined function magnets, the beam line monitoring and exercising the first horn at near full current with observed pion-decay muons behind the beam dump. Another beam commissioning period is scheduled in October where all three horns will be used. For this period, a 14 day commissioning plan has been developed where there will be a one day run with high intensity beam that should provide observed neutrino events in the INGRID detectors. The successful completion of this commissioning run should bring the beam line to full readiness for the start of the 2010 data run. With respect to the focusing magnetic horn system, the PAC encourages the Lab to do some testing of the horn replacement procedure before irradiating the target area with high intensity beam.

The preparation of the near ND280 detector is going well and most detector elements are at J-PARC or on their way. The installation will start in mid-September after the magnetic field mapping is completed. It is expected that the ND280 detector can be completed (except for 1 TPC and 11 ECAL modules) by the start of data taking in early 2010. Now that the construction phase for the detectors is coming to completion, it is important that the collaboration ramp up the efforts on the data acquisition, calibration, and data/physics analysis. For the initial 2010 data run, it is desirable that the near detector be able to make initial predictions of the Super-K neutrino rate, energy distribution and electron neutrino fraction in the beam.

The goal for the 2010 data run is 10^7 seconds at 100 kW beam power. Reaching this power level may be difficult due to various accelerator issues, but the PAC reiterates the importance of achieving a data set close to this level in order for T2K to produce timely results especially for θ_{13}. In conjunction with achieving this data set, the collaboration now needs to make a concerted effort towards preparing for the analysis of this data in timely but careful way. Doing physics with a new beam and detector will require the exploration of a wide range of calibration and detector issues which will take time to address.

8. **Muon Task Force Report and P21:** An experimental Search for Lepton Flavour Violating mu-e conversion (The COMET experiment)

This proposal aims to improve the experimental sensitivity to detecting muon-to-electron conversion by 4 orders of magnitude over the current value. Measurements at this sensitivity level would probe the region of branching fractions expected by many well-studied new physics models such as SUSY-GUT. As such, COMET could become one of the flag-ship experiments at J-PARC.

The collaboration presented reasonable responses to the issues the PAC pointed out in the March 2009 meeting and has notably identified several resource opportunities for experiment sub-systems within the growing collaboration.

The committee was pleased to hear detailed reports from the Muon Task Force (MTF) and the COMET collaboration on the recently completed Conceptual Design Report (CDR). The MTF reported on recent developments in beam extinction studies, beam-line studies, superconducting solenoid R&D and experiment infrastructure. There is good progress on all of these fronts and there is a focus now on investigating the radiation hardness of solenoids near the production target. The beam extinction measurements presented by the MTF and in the comprehensive CDR of the experiment are both major accomplishments of the laboratory and the collaboration and are discussed in some detail below.

The extraordinary beam extinction required by the experiment ($1x10^{-9}$) is one of the most important performance parameter and is critical to the eventual success of the experiment. The MTF presented preliminary results of single-bunch studies of the RCS and MR that suggest that a beam extinction of better than $1x10^{-5}$ can be achieved internally with the accelerator complex. A detailed simulation of an external extinction system based on AC dipoles was presented in the CDR that suggests that an additional multiplicative factor of $1x10^{-3}$ can be realized, yielding a combined extinction of less than $1x10^{-8}$. Clearly further R&D and dedicated beam extinction studies are necessary and should be a central concern of the laboratory and the collaboration in advancing the experiment. Multi-bunch studies with slow extracted beam are particularly important.

The PAC was impressed by the quality of the work presented in the CDR and congratulates the COMET collaboration. The experimental technique is a derivative of the MECO design with several well motivated changes that have the potential to improve the detector rate performance and control of backgrounds.

The background study presented in the CDR is the first analysis independent of MECO and, as such, is major piece of work and contribution to the field. Although much work remains to be done, the CDR plausibly argues that backgrounds can be controlled to less than a partial rate of $1x10^{-16}$, which is the physics measurement goal of the experiment. Further work validating the claim that the COMET electron spectrometer will operate in a relatively low-rate environment is of particular importance in advancing the experiment.

The CDR presents an estimated capital cost of about 100 Oku-Yen (10 billion Yen) for the experiment. Operation of the experiment will require about $2x10^{7}$ dedicated seconds of MR operation, which is nominally about two years of running. If scheduling concerns arise, the COMET operations could be interlaced with other operations which would then lengthen the total calendar running time of the experiment. The capital costs and operational costs of the COMET experiment are clearly large, but are matched by the potential physics payoff. **The PAC finds the physics motivation for the experiment to be very high, and the proposed experimental methods to be sound and hence recommends Stage-1 approval.**

In order to move toward Stage-2 approval in a timely way, the collaboration needs to grow substantially in strength and commitment. The fruitful collaboration with the mu2e experiment on common areas of key R&D should likewise continue and be strengthened. The committee is hopeful that Stage-1 approval will be useful in growing the collaboration and the base of resources available to the experiment.

6. DATE FOR THE NEXT J-PARC PAC MEETING

The date for the 9th PAC meeting is 15-17 January 2010. It will be a joint meeting with the current and new members, the latter of whom will officially take seats from the 1st of April in 2010.

The tentative agenda is;

- Status report on J-PARC
- Report from the muon task force
- Report from the KOTO experiment
- Report from the COMET experiment
- Report from the T2K experiment

7. FOR THIS MEETING, THE J-PARC PAC RECEIVED THE FOLLOWING DOCUMENTS:

- Minutes of the J-PARC PAC meeting held on 6-7, March 2009 (KEK/J-PARC-PAC 2008-15)

- Experimental Proposal for J-PARC: Search for a nuclear $\overline{K}$ bound state K^-pp in the $d(\pi^+,K^+)$ (KEK/J-PARC-PAC 2009-1)

- Experimental Proposal for J-PARC: Study of isospin dependence of kaon-nucleus interaction by in-flight $^3He(\overline{K},n/p)$ reactions (KEK/J-PARC-PAC 2009-2)

- Experimental Proposal for J-PARC: Study of in medium mass modification for the ϕ meson using ϕ meson bound state in nucleus (KEK/J-PARC-PAC 2009-3)

- Experimental Proposal for J-PARC: The investigation of $\Lambda(1405)$ state via the $d(K^-_{\text{stopped}}, n)(\Sigma\pi)^0$ reaction (KEK/J-PARC-PAC 2009-4)

- Experimental Proposal for J-PARC: Spectroscopic study of hyperon resonances below $\overline{K}N$ threshold via the (K^-,n) reaction on Deuteron (KEK/J-PARC-PAC 2009-5)

- LOI for J-PARC: New Measurement of Muon Anomalous Magnetic Moment *g-2* and Electric Dipole Moment at J-PARC (KEK/J-PARC-PAC 2009-6)

- LOI for J-PARC: Double Anti-kaon Production in Nuclei by Stopped Anti-proton Annihilation (KEK/J-PARC-PAC 2009-7)

- Conceptual Design Report for Experimental Search for Lepton Flavor Violating $\mu^- - e^-$ Conversion at Sensitivity of 10^{-16} with a Slow-Extracted Bunched Proton Beam (COMET) (KEK/J-PARC-PAC 2009-8)