To be approved at the 26th PAC meeting
KEK/J-PARC-PAC 2018-XX
Feb. 28, 2018

J-PARC Program Advisory Committee
for the Nuclear and Particle Physics Experiments
at the J-PARC Main Ring

Minutes of the 25th meeting held
15(Mon)-17(Wed) January 2018

OPEN SESSION:

1. Welcome and Mandate to the Committee:	K. Tokushuku (KEK)
2. J-PARC Accelerator Status & Plan:	F. Naito (J-PARC/KEK)
3. E56 (Sterile ν Search):	T. Maruyama (J-PARC/KEK)
4. E45 (Baryonic spectroscopy with 3-Body Hadronic Reaction) :	
	H. Sako (JAEA ASRC)
5. FIFC Report:	S. Uno (KEK)
6. E34(g-2/EDM):	T. Mibe (J-PARC/KEK)
7. Hadron Hall & SX beam status, schedule and Target R&D plan:	
	S. Sawada (J-PARC/KEK)
8. E14 (KOTO):	T. Nomura (J-PARC/KEK)
9. E40 (Measurement of the Cross Sections of Σp Scattering):	
	K. Miwa (Tohoku)
10. E62 (Precision Spectroscopy of Kaonic Atom X-rays with TES):	
	J Zmeskal (SMI-OeAW)
11. E57 (Strong Interaction Induced Shift and Width of Kaonic Deuterium):	
	J. Zmeskal (SMI-OeAW)
12. J-PARC Center Report:	N. Saito (J-PARC/KEK)
13. E21(COMET):	Y. Kuno (Osaka)
14. E36 (Lepton Universality):	S. Shimizu (Osaka)
15. Neutrino Experimental Facility:	T. Tsukamoto (J-PARC/KEK)

16. T2K(E11) /T2K-II (E65) status and Plan 1

— Overview, Status report, Beam request — T. Nakaya (Kyoto)

17. T2K (E11)/T2K-II (E65) status and Plan 2

— Upgrade — M. Yokoyama (Tokyo)

18. E61: M. Hartz (IPMU)

19. P69 (BabyMIND): A. Minamino (Yokohama)

20. P71 (NINJA): T. Fukuda (Nagoya)

21. P70 (S-2S): T. Nagae (Kyoto)

22. P72 (Λ*): K. Tanida (JAEA ASRC)

23. P67 (DPA): S. Meigo (JAEA)

24. Beam time schedule for 2018 T. Kobayashi (J-PARC/KEK)

CLOSED SESSION:

Present: N. Aoi (Osaka/RCNP), T. E. Browder (Hawaii), S. I. Eidelman (BINP), J. Haba (Chair, KEK), K. Hanagaki (KEK/Osaka), D. Harris (FNAL), A. Ohnishi (Kyoto/YITP), S. Kettell (BNL), R. Kitano (KEK), M. Kuze (Tokyo Inst. of Tech.), J. Pochodzalla (Mainz), W. Weise (TU Munich), H. Tamura (Tohoku), R. Yoshida (JLab), W.A. Zajc (Columbia), K. Tokushuku (KEK-IPNS Director), T. Kobayashi (KEK-IPNS Deputy Director) and N. Saito (J-PARC Director)

1. PROCEDURAL REPORT

The minutes of the 24th J-PARC-PAC meeting (KEK/J-PARC-PAC 2017-14) were approved.

2. LABORATORY REPORT

2-1 Welcome and Mandate to the Committee (Katsuo TOKUSHUKU, KEK IPNS director)

The director of the Institute of Particle and Nuclear Studies (IPNS), Katsuo Tokushuku, welcomed the PAC members. Tokushuku introduced a new committee member, Dr. Rik Yoshida, who joined on the 2nd day of this meeting. Tokushuku reported that the term of six committee members would end in March 2018, and new committee members would be endorsed in an IPNS committee on January 19, 2018. Both old and new members will attend the next PAC meeting. Tokushuku reminded the committee of the general mandates and the approval process for proposals.

Tokushuku summarized the progress since the previous PAC meeting. An anti-neutrino beam was delivered to E11(T2K) from October to December 2017. The Electro-Static Septum (ESS) for slow extraction has been replaced, and commissioning with beam has started this week. User beam time in the slow extraction mode takes place from January to February 2018.

Tokushuku showed the status of the on-going experiments and proposals, and reported that one test experiment (T68) was approved by the sub-committee after the previous PAC meeting. Tokushuku asked the committee to review four new proposals (P69, P70, P71 and P72), and one revised proposal (P67). Tokushuku also asked the committee to evaluate the technical design reports from the experiments requesting stage-2 approval (E45, E56 and E34).

Tokushuku explained the beam time allocation up to summer 2018. Beam in the slow extraction mode from January to February 2018 is scheduled for the physics run of E31, the pilot-runs for E03 and E40, and the 8 GeV test runs for E21(COMET). Fast extraction beam for E11(T2K) is scheduled from March to May. Tokushuku asked the committee to advise on the beam time allocation among the E62, E40 and E57 experiments during the slow extraction beam time scheduled for June 2018. Tokushuku pointed out that the 2018 schedule is constrained by the long detector maintenance planned by E11(T2K) and E14(KOTO).

Tokushuku explained the progress on the mid-term plan for the J-PARC MR, and the recent budgetary situation of KEK. Although the KEK budget in FY2018 was not yet completely finalized, the budget for the J-PARC operation would be similar to that of FY2017. IPNS and J-PARC are making a FY2018 plan for J-PARC MR operation assuming the tentative policy of putting the first priority on the MR PS upgrade while maintaining the beam time allocation up to the summer of 2018. IPNS and J-PARC are evaluating several case studies that would allow completion of the MR PS upgrade and high-p/COMET beam lines on a reasonable time scale even in the case of no increase in the budget for the next several years.

The beam time allocation from October 2018 to March 2019 will be discussed at the next PAC meeting, because it is not yet clear how much beam time can be allocated during that period. Tokushuku asked the committee to advise on the priority among the experiments ready to run during that period at this PAC meeting.

2-2 J-PARC Center Report (Naohito SAITO, J-PARC Center Director)

The J-PARC Director, Naohito Saito, welcomed the PAC members. He explained the operation status of two accelerators, RCS and MR. For the RCS, the neutron target in MLF was replaced in the autumn of 2017. Stable user operation at a beam power of 400 kW was successfully achieved. Saito explained a scenario with the beam power upgrade reaching 1 MW at the MLF in 2020. For the MR, stable operation of FX at a beam power of 475kW was achieved and SX operation has just started. Saito also mentioned improvements of operational efficiency. He emphasized the variety of scientific topics explored at J-PARC, which is supported by J-PARC's wide cooperation across different experimental facilities.

Collaboration with domestic universities, oversea institutions, and industrial sectors is developing more and more at J-PARC. J-PARC became a member of RADIATE, which is an international collaboration studying radiation damage of materials. J-PARC supports an international collaboration of universities between Japan and Sweden (MIRAI). A kick-off seminar for MIRAI was held October 2017 in Lund, Sweden.

Details of the J-PARC action plan in JFY2018 were shown. The plan aims to maintain safe and stable operation of the facilities while continuing activities for future projects, and increasing scientific outputs. These were rephrased in the list of on-going efforts at J-PARC to continuously attract more users for more scientific results.

2-3 J-PARC Accelerator Status (Fujio Naito, J-PARC/KEK)

Fujio Naito summarized the J-PARC accelerator status and plan. He presented the beam power history of the accelerators during Run 76 after the last PAC meeting. Stable operation of the MR in the FX mode was established with a beam power of 475 kW in December 2017. Single-bunch operation with a beam power of 400 kW was achieved at the RCS to provide beam to the MLF.

Intensive studies were carried out to increase the beam power; the accelerator group identified beam losses at the initial stage of LINAC acceleration to be a critical issue for achieving over 1 MW beam to MLF, and losses at injection and early stage of acceleration at MR for higher-power FX operation. Beam availability during the FX operation in Run 76 is evaluated to be 85.8%, providing user time of 599 hours for physics data production.

It was reported in the last PAC meeting that the Electro-Static Septum (ESS) for SX beam extraction developed a problem at the beginning of the SX operation in spring 2017 (Run 75). Naito explained the replacement work with a new ESS made of titanium (Ti-ESS) and its conditioning in situ during the last summer. A high voltage of 110kV was applied for conditioning with no serious dark current nor x-ray emission. Naito then explained the status of preparations for the coming SX operation. The accelerator group first plans to provide SX beam with 44kW power, the level achieved before the ESS incident, and then to increase the power over 50kW. 8 GeV operation for COMET is also scheduled in the next coming operation period. The beam spill structure of SX operation will be shortened (from 5.52 seconds to a 5.20 second cycle) to provide higher effective beam power (by 6%) with the same number of protons per bunch.

The status of the MR power-supply upgrade was also reported. Construction of three dedicated buildings for new power supplies will be completed by the end of March 2018. Some of new power supplies are already installed in one of the buildings along with capacitor banks. Intensive studies of the safety system implemented in the capacitor bank were explained.

Naito concluded his presentation by showing the MR operation schedule up to the summer of 2018. The MR will be operated in SX mode until the end of February, switched to FX to run until the end of May, and then will be switched back to SX to provide beam until the end of June.

2-4 Hadron Hall Beam Status and Target R&D Plan (Shin'ya Sawada, J-PARC/KEK)

Shin'ya Sawada reported the status of the Hadron Hall including the status of beam delivery and construction of the high-p/COMET beam lines. He also explained the R&D status of the new primary target (T1 target).

Sawada showed the integrated beam power history. In the beam time before the last summer, about the half of the scheduled user operation was not carried out due to the ESS problem. SX beam time is scheduled from January 13 to February 24 in 2018. The beam intensity achieved before the ESS problem was 44 kW.

Sawada reported on the upgrade plan for the T1 target. A special review committee for the new target design was formed, and a meeting was held on December 13, 2017 to discuss the designs of a new target and beam windows. The next primary target will be built using an indirect water cooling scheme with an improved structure. Thermal analysis with the new target design was performed; the maximum beam power is expected to be 90 kW. The hadron beam group plans to install this target in 2019.

Furthermore, a "euro-coin" type target composed of a nickel disk with a gold or platinum edge, capable of receiving higher power beam than 90kW, is in development for the future. The primary proton beam strikes the edge of the disk, which is continuously rotating and cooled directly by water or He gas. A schedule of the R&D was presented.

The status of construction work of the high-p/COMET beam lines was reported. The construction of the high-p beam dump, the shielding wall of the COMET beam line, and stages for magnet power supplies was completed. Finally, Sawada showed the construction schedule of the high-p/COMET beam lines, which is expected to be available at the end of JFY2019.

2-5 FIFC Report (Shoji UNO, IPNS, KEK)

Shoji Uno presented a report from the Facilities Impact and Finance Committee (FIFC). He reported on the meeting held on December 19th, 2017. At this meeting, the feasibility of E45 and E56, both of which are requesting stage-2 approval, were discussed. Prof. Masayuki Koga of the Research Center for Neutrino Science, Tohoku University was invited to this meeting as an expert on liquid scintillator (LS), and provided valuable comments to the E56 group.

E45: The purpose of the E45 experiment is to measure the decay of N* resonances through the $\pi N \rightarrow \pi\pi N$ reactions at the K1.8 beam line. The experimental setup is similar to that of the E42 experiment (H-dibaryon search), which has a stage-2 approval. The superconducting Helmholtz magnet and the main tracking device (TPC) of E42 will be shared with E45 experiment to measure two produced charged tracks (charged pions or protons). Newly installed scintillation hodoscope counters surrounding the TPC generate a trigger signal in the E45 experiment. A liquid hydrogen target is installed inside of the TPC instead of the diamond target for E42.

The E45 group reported that they successfully reduced the operation temperature of the superconducting Helmholtz coils to 4.5K from 6.5K thanks to better thermal conductivity achieved by modifying the conductor configuration. This results in an achievable higher magnetic field, which benefits the experiment. The FIFC recommends to frequently check the insulation of the thin Polyimide film inserted in this modification, which potentially affects the reliability of the system. The E42 group explained the mechanical design of the liquid-hydrogen target and the flow. The FIFC recommends to consider more robust positioning of the target cell and to confirm the tightness of pipe joints by gluing different materials (steel and FRP) as they have to be non-magnetic in order not to affect the magnetic field. The FIFC recommends the group also to consider temperature effects of the target on TPC operation. Finally, the FIFC commented on the hodoscope counters and data acquisition system of the E42 at high counting rates; there are no critical issues in either of these although further consideration of the hodoscope design and an actual test of the data acquisition system should be conducted.

E56: The E56 group proposes observing the oscillation of anti-muon neutrinos to anti-electron neutrinos with a gadolinium (Gd) loaded scintillator detector, which will be placed in the Material and Life Science Experimental Facility (MLF). The E56 group submitted an updated TDR in November 2017. As was indicated in the previous FIFC meeting, the E56 group further considered earthquake safety issues; they explained more details about the pins fixing the detector to the floor, and the sloshing effect inside the scintillator tank. The FIFC found that the critical issues were cleared following these studies. The FIFC advises the E56 group to continue to update the safety measures. The FIFC also found that deterioration of the liquid scintillator (LS) can be avoided with careful treatment of the path of LS and its storage. This is confirmed by an external reviewer (Prof. Koga), who concludes that the E56 experiment would be able maintain its detector performance under the restricted condition of refilling LS once a year.

Discussions at the FIFC meeting are summarized in detail in a separate report.

3. EVALUATIONS OF THE PROPOSALS AND STATUS OF THE ONGOING EXPERIMENTS

E56 (Sterile Neutrino Search)

The JSNS2 experiment (E56) submitted an updated TDR with revisions in response to the last PAC report.

JSNS reported significant progress. The FIFC has reviewed several of these: on the earthquake mitigation, LS (liquid scintillator) spill mitigation, transport of the detector and LS quality during filling, draining, and storage. The FIFC considered these issues to be reasonably well under control.

E56 has performed a number of studies on sloshing of liquid when the detector is moved (via crane or truck), which seem to indicate that there are no major safety issues. There is also some indication that the detector hardware (PMTs) will not move either. They have made further studies showing that the crane can move very slowly to minimize the impact on the detector. The detector will be covered under the fire law when the scintillator is in the detector. They have proposed a plan in which the detector will be emptied of liquid between runs. This will require a scintillator filling/draining system to be installed, presumably in or near the MLF.

They described vertex reconstruction using PMT timing. They quote an uncertainty on the normalization of the $\overline{\nu_e}$ from μ-flux of 50%, which will be fitted as a nuisance parameter once they have data.

JSNS2 requests stage-2 approval. The committee is pleased to note the revisions to the TDR and the initial plan for calibration using cosmic-ray Michel electrons. Recognizing that the collaboration needs to secure funding for the second detector and needs to show further progress in the approval process, the PAC will recommend stage-2 approval after satisfactory review of the answers to the following questions. In addition the PAC strongly recommends that E56 continue efforts to obtain funding for the second detector.

1. List the possible sources of the energy scale and non-linearity uncertainties, and show and defend the estimates of the size for each source. The PAC understands that real data is needed for the final analysis, but achieving a 1% or lower systematic uncertainty requires a large effort. The PAC would like to see a Monte Carlo demonstration that the precision can reach these assumed levels.

2. Related to the energy calibration using Michel electrons, please provide the fitting results for different regions of the detector as a proof of principle of the calibration method. The plot shown at the closed session, similar to Figure 68 in the TDR, is not a convincing evidence that the systematic uncertainty of 1% can be reached.

3. Please confirm that the source calibration will only be on the central z-axis of the detector. How close to the upper and lower vessel walls is the center of the source expected to reach? Describe in more detail how other sources will be used to calibrate the position dependence of the energy response. Can ^{12}B be effectively tagged and used?

4. Please document the collaboration's approach to the concept of a "blind analysis", which is now the international standard. The scientific community will require extraordinary evidence and care before accepting the existence of a fourth generation lepton.

E45 (Baryon PWA)

The E45 experiment aims at measuring the reactions $\pi N \rightarrow \pi\pi N$ and $\pi N \rightarrow KY$ at center of mass energies (W) in the range W=1.54 - 2.15 GeV in order to clarify nucleon resonances up to 2 GeV through partial wave analysis. The experiment is planned at the K1.8 beam line employing the Hyperon Spectrometer (the superconducting Helmholtz magnet and the time projection chamber, HypTPC), which will be also used in E42.

The group submitted a TDR, which has been reviewed by the FIFC. The superconducting magnet has been improved to provide higher magnetic field and a beam test of the HypTPC has been done. The liquid hydrogen target is designed as the same type to be used in E40. All of the apparatus including the target, the target holder, the TPC hodoscope, and the lifting system will be ready by 2019. The PAC does not find any major technical problems in running the experiment, although the results of the planned high-rate test experiment of HypTPC at HIMAC as well as a performance test of the entire DAQ system should be added to the TDR. The PAC appreciates the effort of the group to prepare these new devices.

On the other hand, the physics case in the proposed experiment is not clearly presented. The substantial improvement of the database for N* and Δ* resonances in the mass range around 2 GeV is useful and important by itself. This requires advanced partial wave analysis with inclusion of coupled-channel dynamics. A further motivation of E45 concerns the exploration of hybrid (qqq+g) baryons, the existence of which is suggested by lattice QCD computations. At this point a question arises about the expected sensitivity to possible signatures of hybrid decays into the $\pi\pi N$ channel. The PAC proposes that exploratory studies should be performed, given the theoretical expertise within the E45 collaboration, by combining partial wave analysis with an assumed coupling of a possible hybrid baryon into $\pi\pi N$. Such studies are also necessary to justify the length of beam time being requested.

Considering the severe competition for the SX time among several approved experiments, the required statistical accuracies need to be justified based on the physics goals. In addition, all possible systematic errors coming from background subtraction, event pile-up, trigger bias in the hodoscope as well as overall detector efficiencies should be estimated carefully so that the systematic errors will not dominate over the statistical errors. In addition, in the $\pi^+ p \rightarrow \Sigma^+ K^+$channel, the K^+ momentum exceeds 0.7 GeV/c for W >1.8 GeV, where K^+ identification is impossible in the present setup. The PAC requests that the group describes the achievable data quality for each channel and clarify the physics output that can be extracted before the stage-2 recommendation is made.

E34 (g-2/EDM)

The E34 experiment aims to measure the anomalous magnetic moment and electric dipole moment of the muon. An updated TDR has been submitted in response to the recommendations by the PAC and Focused Review Committee (FRC).

E34 reported progress in many areas, including RF acceleration of muons for the first time, calibration of magnetic field probes at ANL (in good agreement with the FNAL g-

2 probe) and muonium production studies at TRIUMF. Groundwork for the new electrical substation has started. Backup plans, in case R&D for the new ceramic crystal for laser amplification is not successful, were outlined with a mirror-less system and several intermediate amplifiers. A complete list of end-to-end simulations was presented (with efficiencies at each stage and links to the interfaces descriptions). Studies of track reconstruction efficiency as a function of multiplicity were performed and presented. The new collaboration organization was described that is designed to help assure that the overall R&D effort and all of the subsystem interfaces are well managed.

A new E34 systematic uncertainty table was presented and explained. This is generated for E34 explicitly instead of simply projecting from BNL E821. The PAC is pleased to see this progress and looks forward to continued development of this table.

The collaboration submitted responses to the fourty-two recommendations and four concerns outlined by the FRC. Three of these were suggested to be due after the stage-2 approval.

E34 requests stage-2 approval. The committee is very impressed by the responsiveness of the collaboration to the FRC report. The PAC appreciates the progress on the end-to-end simulation, but there is still some lingering concern about the fact that it consists of ~10 individual simulations. The PAC needs additional time to evaluate the FRC responses and new TDR, and plans to send the responses and new TDR to the FRC members and ask for the final response within a couple of months.

E14 (KOTO)

KOTO is an experiment to search for the rare decay $K_L \rightarrow \pi^0 \nu\bar{\nu}$.

KOTO showed an update of the background estimation in their analysis of 2015 data by adding more control samples. They provided updates on two types of background. The first is η*'s* produced by halo neutrons hitting the charged veto detector. In order to suppress this background, a new cut was developed. The second is Ke3 or $K_L \rightarrow 3\pi^0$ decay hidden by accidental activity. They added an estimate for this background and have strategies for suppressing it. With these modifications, the single event sensitivity has changed from 1.1×10^{-9} to 1.2×10^{-9}. The KOTO collaboration plans to open the signal box in June 2018.

KOTO showed the analysis status of 2016/2017 data where the Inner Barrel has been installed to provide a better photon veto. At first glance, it seems cleaner than that of 2015 data although the difference is marginal. The yield and distribution of $K_L \rightarrow 3\pi^0$ have not changed. They continue their effort to understand the difference. KOTO has developed strategies for further background suppression as they progress to higher sensitivity.

KOTO plans some upgrade of detectors including the calorimeter upgrade in which the both-end readout is implemented in order to suppress neutron backgrounds. More charged vetos will be added, and some PMTs for the CsI calorimeter will be replaced. Because of this upgrade they cannot run in autumn 2018. Instead they request two months of beam time before summer 2019.

The PAC agrees to their strategy to open the signal box for the 2015 data. KOTO is encouraged to speed up the analysis of their 2016/2017 data to obtain results in a timely manner.

The PAC notes with some concern the discrepancy of the background estimates near the signal region, which still persists with the loose event selection. Not only the neutron related but also accidental-related backgrounds should be studied more carefully, for example, by making a detailed analysis of the waveform signals.

The PAC understands the importance of the detector upgrade to reject neutron background because it is one of the dominant background sources. At the same time the PAC strongly recommends more explicit calculations and presentation of the background estimates and the expected sensitivity after the detector upgrade.

E40 (Σp)

The E40 experiment will measure the $\Sigma^{\pm}p$ cross section at the K1.8 beam line using the KURAMA spectrometer augmented with a new detector system (CATCH) for scattered protons. Isospin separation will be provided by measurements of $\Sigma^{+} + \mathrm{p} \rightarrow \Sigma^{+} + \mathrm{p}$ and $\Sigma^{-} + \mathrm{p} \rightarrow \Sigma^{-} + \mathrm{p}$ along with $\Sigma^{-} + \mathrm{p} \rightarrow \Lambda + \mathrm{n}$. These data will be of vital importance to our understanding of nuclear matter at high density relevant to recent and future observations of neutron star mergers.

At the previous PAC meeting, the E40 collaboration reported on the commissioning of the CATCH detector using 80 MeV protons from the CYRIC cyclotron facility at Tohoku University. That work has continued, resulting in a good understanding of the detection efficiency over a broad range of angles from the study of p+p elastic scattering events. Work began last summer on reconfiguring the KURAMA spectrometer on the K1.8 beamline. All detectors had been installed by the end of November 2017. The data acquisition system has been upgraded, and has demonstrated a 95% live time at 4.5 kHz.

In its July 2017 meeting the PAC recommended commissioning in February 2018, and also suggested the collaboration to consider whether the subsequent running time requests of 26.5+2.5 days ($\Sigma^{-}\mathrm{p}$ mode) and 22+4 days ($\Sigma^{+}\mathrm{p}$ mode) could be reduced. At this meeting, the collaboration reported on studies indicating that modest (but welcome) reductions in the $\Sigma^{-}\mathrm{p}$ mode were possible, but not in the $\Sigma^{+}\mathrm{p}$ mode. Their revised request for $\Sigma^{-}\mathrm{p}$ running is now 19.5 days of running and 3.5 days of commissioning and calibrations, with 1/3 of this (a total of 8 days) to be provided in June 2018, and the remainder to be allocated in a later running period. For the $\Sigma^{+}\mathrm{p}$ running E40 requests 1/4 of the time (8 days) to be provided following the $\Sigma^{-}\mathrm{p}$ running, after a two-week setup change from the $\Sigma^{-}\mathrm{p}$ to $\Sigma^{+}\mathrm{p}$ modes, with the remainder of the time for $\Sigma^{+}\mathrm{p}$ running (17.5 days) to be provided after that.

The PAC recommends that E40 should run for a minimum of commissioning and initial data taking during the June running period.

E62(TES)

The E62 experiment aims to resolve the long-standing problem concerning the depth of the K^- nucleus potential by measuring the energies of X-rays emitted in the transition from the 3d to the 2p orbitals in kaonic ^4He and ^3He atoms. The experiment is ready to run and the previous PAC recommended allocating the requested beam time after the K1.8BR beam line becomes available for the experiment.

The status of preparations since the last PAC meeting was presented. The energy resolution of transition-edge-sensors (TES) has been improved from 5 eV to 4.5 eV at 6 keV, while the number of working pixels has been increased from 190 pixels to 210 pixels out of 240 pixels. The PAC appreciates the continuous effort to improve the TES detector, which is the heart of this experiment, to observe the 3d to 2p transition with an expected width of around 2 eV.

Since the K1.8BR beam line is available after E31, it is recommended to allocate beam time in June 2018. The PAC thinks it is important to complete the whole measurement in June. However the requested 20 days (four days of commissioning and 16 days of production run) cannot be accommodated with another short commissioning run at the K1.8 beam line withinrather limited time slot of this period. The PAC requests that the proponents make their best effort to shorten the schedule by a few days.

E57 (SDD)

E57 aims at a pioneering measurement of X-rays from K^--d atoms. A precision measurement of the shift and width of the 1s state due to the strong interaction will provide unique information on the kaon-neutron interaction at threshold. Prior to the stage-2 approval, the collaboration intends to validate their Monte Carlo estimates of backgrounds with a short test measurement using a liquid hydrogen target.

E57 reported significant progress towards assembling and characterizing the Silicon Drift Detectors (SDD) that will be used to detect X-rays. The collaboration is continuously improving the properties of the detectors, their readout electronics and their understanding of the setup. In particular, laboratory tests confirmed the stability of the detectors on the eV level over a period of one day. This is small with respect to the needed precision on the level shift, about 60 eV.

The main experiment will require 48 SDD detectors. For the commissioning run, 24 SDD units are needed. As of January 2018, 38 SDD chips were already bonded and tested, and, based on the success rate to produce these detectors, about 20 additional SDD detectors are expected to be ready for use by May 2018. Therefore, all required components of the setup will be available at J-PARC by summer of 2018. E57 may be ready to take data after the summer shutdown. For the pilot experiment with a hydrogen target, E57 requests 3.0 days for beam tuning and detector commissioning, to be followed by 3.5 days of measurements at the 45 kW beam power.

The PAC acknowledges the readiness of E57 for the test run. Considering the fact that this relatively short pilot measurement can provide a very competitive measurement of the hadronic shift and width of kaonic hydrogen, the committee recommends a timely allocation of the requested beam time for the pilot run, which takes into account possible constraints due to the planned activities of the group at DAFNE in Frascati in 2019.

E21 (COMET)

The COMET experiment has a two-step program: Phase I and Phase II (with the full S-bend and highest beam intensities). Most of recent work is focused on Phase I, which is expected to have a single event sensitivity of 3×10^{-15}.

The COMET collaboration has been very responsive to previous PAC recommendations. However, these responses are not quite complete and do not, for example, include a revised schedule with a detailed plan for a cosmic ray and engineering run.

The 8 GeV test of the proton extinction ratio will take place after the PAC meeting. There will be two test periods of 4 days. This is a very important milestone for COMET. The delay in this test (due to problems in the ESS in 2017) is responsible in the delay in the release of the TDR (Technical Design Report) to the ArXiv. We look forward to a report on the results of the 8 GeV test and progress on the COMET beamline at the next PAC meeting.

There have been a number of tests of radiation hardness, which require some follow-up. The CDC shows some degradation after an integrated dose of 20 mC/cm/wire. There are a significant number of single-event upsets in the CDC front-end electronics due to neutron backgrounds in FPGAs. Beam flash studies of the CDC at the MLF are planned.

About a half of the LYSO crystals are in hand, the other half will be purchased soon. Beam tests of the StrECAL have verified position resolution in the straw tubes (<200 microns for an Ar-ethane gas mixture) and energy (4.4% at 105 MeV) and timing (<1 nsec) resolutions in the crystals.

A consistent engineering design with a full 3-D CAD model of the detector should be completed. Detailed plans for the installation of the detector and other components through a narrow aperture on the surface should be finalized.

COMET now has 200 collaborators from 37 institutes and 16 countries. Although the international COMET collaboration has made excellent progress on detector construction, testing and software, no clear plan for operations was presented from the J-PARC laboratory management because of uncertainty in the level of budgetary support.

E36(Lepton Universality)

E36 will measure G($K^+ \rightarrow e^+ \nu$)/G($K^+ \rightarrow \mu^+ \nu$) and search for heavy sterile neutrinos using the TREK detector system.

E36 has completed data taking and is now finalizing the analysis of a lepton universality test. Due to the relatively short data taking period, the expected sensitivity on the lepton universality ratio is 0.5% rather than 0.3% as originally planned. Since the last PAC meeting in July 2017, there has been significant progress in the analysis of the data. With improvements in particle identification, a clear Ke2 signal from a small data subsample is now visible, along with a SD (structure dependent) radiative $K \rightarrow e \nu\gamma$ decay and a Ke3 tail. The SD radiative decay contribution near the two-body Ke2 contribution can be normalized from a separate data sample in which the radiative photon is detected. There is a hint of a problem in the MC simulation of the shape of the Ke2 signal. The fitting procedure including backgrounds should be clarified and finalized soon.

Good control of systematics is required to achieve the 0.5% sensitivity. Various data/MC comparisons were shown and appear to be acceptable. Recently a problem with a drift of pedestals in the aerogel particle identification and lead-glass systems was found. This needs to be understood before obtaining the final result. There are also systematic issues modeling e^+ interactions with the target. In addition, there are checks of the electron-muon acceptance ratio using $K\pi2$ and $K\mu2$ decays as a function of the spectrometer current. The systematic error analysis is expected to be completed in spring 2018. The PAC looks forward to completion of the analysis with systematics and full statistics.

There is also world-wide interest in dark photon searches including on-going dedicated experiments at JLAB and Mainz as well as searches by collider experiments (e.g. at KLOE, BaBar, Belle and Belle II). Progress in this area was presented for the first time at this PAC meeting. The results of the dark photon study with the dark photon decaying to an electron-positron pair should be finalized and should be shown at the next PAC meeting. The case of a two-body decay to a lepton and a dark sector particle should also be investigated. The PAC recommends a timely analysis in this sector given the pressing competition from the NA62 experiment at CERN.

E11/E65 (T2K and T2K-II)

The committee heard two presentations by T2K at this meeting. The first presentation covered the current data taking and analyses, the coming plan for the Super-K upgrade, and the Protons On Target (POT) request.

T2K currently leads the neutrino-oscillation community in its ability to constrain the value of the CP-violating phase in the lepton mixing matrix. They received $\sim 4 \times 10^{20}$ POT in the antineutrino mode since the last PAC meeting, and expect to receive an additional 4×10^{20} POT in the next run period before the 2018 summer shutdown. They have had trouble this past year with the ND280 livetime, most notably because of problems with the cooling of ND280 magnet. INGRID has a high livetime, and demonstrated beam stability during this most recent run period. T2K expects that by the summer 2018 they will have a sensitivity at the 2.7 sigma level for electron antineutrino appearance. Clearly the ND280 magnet cooling problems are a concern, particularly if the experiment plans to change back to the neutrino mode, or change anything in the beamline configuration (for example, a change in the horn current).

The PAC is pleased to note that coordination with NOvA has started, and encourages T2K to consider pushing for a combined oscillation parameter fit as soon as both T2K and NOvA have neutrino and antineutrino appearance results (i.e., shortly after Neutrino 2018) rather than to wait until 2020 for combined oscillation parameter fits.

T2K described near-term work planned for the beamline: repair of the hydrogen recombination system before March 2018, and replacement of the Optical Transition Radiation (OTR) monitor rotation system in the summer of 2018. They plan to increase the horn current once the spare horn arrives in Japan, which is expected in the autumn of 2018. The Super-K detector will be turned off from June 1 through December 31 for repairs. T2K requests 9×10^{20} POT in 2019 once Super-K is operational.

T2K plans to upgrade the beamline to be able to receive up to 1.3MW in the beam power, and plans to upgrade the near detector complex to better constrain the cross section uncertainties in their far detector predictions.

Primary beam monitoring needs to introduce less mass in the beamline and will be improved with new Secondary Emission Monitors (SEM's) and a beam-induced fluorescence monitor. The neutrino beamline DAQ and interlock need to be improved to accommodate the shorter cycle time. The cooling of the target and the horn strip lines need to be improved, and the experiment needs to establish a spare horn supply. The radioactive water disposal and cooling also needs to be improved. A TDR describing these activities is in preparation and will be released in the coming months. A focused review will be scheduled after this new TDR becomes available.

The second presentation covered the future plans for the beamline and ND280 upgrade. The current systematic uncertainty in T2K's far detector electron-neutrino (and anti-neutrino) event rate is dominated by the flux and cross section uncertainties. To improve this situation T2K is proposing to upgrade its ND280 detector. The upgrade involves removing the Pi-zero Detector (POD) and replacing it with a 3-D tracker consisting of stacked scintillator cubes surrounded by TPC's. Assuming that the ND280 analysis strategy remains the same, the collaboration expects an improvement of the far detector predictions of 20-30%. A TDR on the new Near Detector is in preparation and will be completed by the end of this calendar year. The PAC looks forward to hearing about new analysis strategies that become available with the new ND280 capability.

E61:

E61 is proposed to measure neutrino cross sections, and to measure neutrino energy spectra at a wide variety of off-axis angles with a water Cerenkov detector to reduce the interaction-model systematics for the Hyper-K experiment. The experiment gave a status report to the PAC on the considerable progress since the last PAC meeting. Design work and costing were done for a site for Phase-0 and the optimal depth was determined to be 6 m. Measurements of accelerator-induced neutrons were made at the surface at J-PARC to assess the Phase-0 feasibility. An update on the multi-PMT design was reported as well as improvements on analysis tools. No updates were given on site selection for Phase 1.

A new evaluation of the schedule for Phase-0, Phase-1, and Hyper-K was presented. Given the desire to have E61 operational one year before Hyper-K starts, and given the delay in the Phase-0 funding for the multi-PMT's, a new plan has been developed to validate the multi-PMT detector concept without delaying the Phase-1 schedule. This "test experiment" involves building a smaller prototype and instrumenting it with 150 multi-PMT assemblies, and putting it in a low-energy charged-particle test beam at Fermilab. A new schedule with this test experiment incorporated was presented, with running in the Fermilab test beam facility in 2021. Phase-0 would be eliminated and no TDR for Phase-0 would be produced. The test experiment would start taking data about one year before the Phase-1 design is complete.

The PAC encourages E61, aided by J-PARC management, to proceed with Phase-1 site investigations and negotiations, and to develop a plan for the Phase-1 infrastructure construction.

New propsals in the Neutrino Experimental Facility

Neutrino Experimental Facility (Toshifumi Tsukamoto, J-PARC/KEK)

Toshifumi Tsukamoto explained the status of the neutrino experimental facility with a focus on the capacity of the B2 area that the new experimental proposals, P69 and P71, plan to use. The neutrino monitor building has a pit with 17.5m diameter that is designed to accommodate the near detector of E11(T2K). The pit consists of 3 areas; the B1 floor for the T2K off-axis detector, the SS floor for the horizontal array of the T2K on-axis detector and read out electronics, and the B2 floor for the vertical array of the T2K off-axis detector. The properties of the neutrino beam at the neutrino monitor building were also explained.

There is a space unoccupied by T2K at the B2 floor with a height of ~3m. Although the resources in the B2 area are limited at this moment, several test experiments were performed up to now. The B2 area is expected to accommodate the detectors of both P69 and P71 although details should be confirmed.

General remarks by the committee

At this PAC meeting there were reports on a total of four different efforts to make cross section measurements that will improve T2K's far detector predictions for oscillation analyses:

1. The T2K ND280 Upgrade

2. E61

3. WAGASCI (P69)

4. NINJA (P71)

These four efforts are of vastly different scales in both timescale and needed resources. Even the smallest effort described still involves about 50 scientists and involves infrastructure upgrades to the neutrino monitor building. The first effort is being organized within the T2K collaboration; the other three emerged from the T2K-II and Hyper-K community and are considered as separate experiments. We note significant (and in one case complete) overlap between the proposal authors and T2K collaboration.

The PAC appreciates the considerable effort being made to get the most out of the neutrino monitor building. It would be helpful to the PAC at future meetings, that a T2K representative presents how these efforts are complementary and what their potential impact is on systematic uncertainties. The committee's current understanding of this complementarity is the following:

The Super-K far detector measures oscillations by comparing muon and electron neutrino and antineutrino interactions on water at a wide range of outgoing lepton angles to predictions from a detailed simulation. That simulation takes as input the models of neutrino interactions. Those models can be constrained by a wide range of cross section measurements.

The four proposals have the following four primary goals:

1. The ND280 Upgrade will measure cross sections for muon neutrino interactions on Carbon at a broader range of outgoing muon angles than is currently accessible.

2. E61 will measure cross sections for muon neutrino interactions on water for a wide range of angles and neutrino fluxes, but with above the water Cerenkov energy thresholds.

3. WAGASCI will measure the cross section ratio between water and carbon for muon neutrino interactions.

4. NINJA will provide the final-state proton information for muon neutrino interactions on water, which constrain models of neutrino energy transfer to hadrons that are invisible to the Super-K detector. NINJA also will have lower electron thresholds and would be able to measure electron neutrino interactions on iron in the future

To be of the most scientific value, these various efforts should plan to produce cross section measurements that are of use to the world-wide neutrino community. This implies measurements that are as model-independent as possible, and with careful treatment of systematic uncertainties associated with background subtraction, efficiency correction, and neutrino flux.

P69 (BabyMIND)

P69, whose purposal is to measure the neutrino-nucleus interaction at 1 GeV range at the B2 floor of the T2K ND hall, with particular emphasis on “2p2h” interaction where two protons scatter off from the nucleus, has been presented for the first time as a physics proposal to PAC. The off-axis angle from the production target is 1.5 degrees, which gives a slightly harder neutrino spectrum than at ND280 located at 2.5 degrees. The apparatus consists of water-in and water-out WAGASCI plastic scintillator modules and the INGRID proton module (CH target), surrounded by the Baby MIND magnetic muon range detector (MRD) in downstream and the Side MRDs. A measurement of neutrino-water cross section with 4π acceptance for muons and investigation of the 2p2h interaction by detecting the two low momentum proton tracks are feasible. Subtracting the water-out events from water-in events, the ratio of H_2O and CH cross sections can be measured. The collaboration showed the opening angle of the two proton tracks discriminate between the CC quasi-elastic process and 2p2h interactions, but this is a very model-dependent technique and the experiment should pursue more robust methods to estimate the CCQE background. The experiment evolved from the test experiment T59, and the first WAGASCI module has been taking data since 2016. The second WAGASCI was installed in 2017, and Baby MIND was transported from CERN to J-PARC last month. Side MRDs are being assembled. Monte Carlo simulations show that thousands of events are expected in one-year of running. Their request is to have neutrino and anti-neutrino beam running for one year each. They need a 400V, 12kW power line for Baby MIND magnets, which enables charge separation of muons.

Since P69 can be ready for beam by the end of 2018, they should submit a TDR with a discussion of the cross-section extraction technique and preliminary evaluation of systematic uncertainties to the next PAC in July 2018 for the stage-2 approval. Pending an MOU with T2K and coordination on the shared use of the facility of the B2 floor with other experiments, the PAC endorses stage-1 status for P69.

P71 (NINJA)

P71 is proposed by the NINJA (Neutrino Interaction research with Nuclear emulsion and J-PARC Accelerator) collaboration to proceed to the physics study of neutrino-water interactions, having carried out the successful test programs T60, T66 and T68.

The collaboration proposes to place a sandwich structure of emulsion and material (“Emulsion Cloud Chamber” or ECC) followed by an INGRID module in an off-axis beam area in the neutrino experimental facility. The experiment will study low-energy neutrino interactions with water in this proposal. The goals are the measurement of the cross section of the 2p2h interaction to 10%, and the measurement of exclusive ν_μ and ν_e cross sections. The experiment needs 0.5 to 1.0×10^{21} POT running concurrently with T2K.

The PAC recommends proceeding to the stage-1 status, after an MOU with T2K and the coordination of the shared space in the neutrino experimental facility. The collaboration should submit a TDR for the next PAC meeting in July 2018. Among other things, the TDR should address how the absolute cross-section measurements are to be obtained including an assessment of systematic uncertainties. An evaluation of the impact of these measurements on the oscillation analyses should be included. A description of the analysis procedure and the expected time-frame in which the analysis could be completed after data taking should also be included. Given the special needs of the ECC, the TDR should also address its strategy in case the running schedule has large gaps between data taking periods.

P70 (S-2S)

P70 is proposed to take over the E05 experiment and aims at determining the Ξ-hypernuclear binding energy and the width from the missing mass spectrum of $^{12}C(K^-, K^+)$ reaction at the K1.8 beamline using the newly developed S-2S spectrometer.

Ξ hypernuclei are important to obtain information on the ΞN interaction. The ΞN interaction is complementary to NN interaction in a sense that it appears in the flavor SU(3) irreducible representations other than those with NN. It is also important to understand compact astrophysical objects such as neutron stars. Since negatively charged baryons are favored in neutron stars and the Σ baryons are known to feel repulsion in nuclear matter, Ξ^- baryons are conjectured to appear at relatively low density in neutron stars. Because of their small mass difference, the coupling between ΛΛ and ΞN is generally expected to be strong and to give rise to attraction in the ΛΛ channel. However, the attraction may be suppressed in dense matter by Pauli blocking in the intermediate ΞN state. This Pauli blocking mechanism induces effective ΛΛN three-baryon repulsion and may help solving the hyperon puzzle. Thus both the depth of the Ξ-nucleus potential and the width decaying into the ΛΛ channel are important.

In the previous BNL-E885 experiment, events were observed in the bound state region, but the resolution (14 MeV) was insufficient to confirm the existence of bound states. Recently, a Ξ-hypernuclear bound state was found through the reanalysis of emulsion data (KEK-E373), but the binding energy was not uniquely determined. In the E05 pilot run, events were observed in the bound region of Ξ hypernuclei, suggesting the existence of Ξ bound states. However, the statistics and resolution were not sufficient to determine the binding energy and the width of the bound state(s). For example, it is possible to fit the spectrum either by one broad peak or by two narrower peaks. The width of the former seems to be too wide, and the binding energy of the latter seems to be too large compared with recent theoretical model calculations.

In P70, it is proposed to improve the energy resolution significantly, from 5.1 MeV to 2 MeV, without losing statistics. The first contribution comes from the improvement of the resolution of the outgoing momentum (contribution to the mass resolution of 3.74 MeV to 0.62 MeV) by using the newly developed S-2S spectrometer. The second contribution comes from using an active target composed of a stack of scintillating fibers. In this case it becomes possible to measure the energy loss of the incident K^- and the outgoing K^+ particles even in the thick target cases. Degradation of energy resolution due to target thickness can be recovered by a factor of three, from 3 MeV to 0.9 MeV, compared with the E05 pilot run. In total, the energy resolution will be improved to be 2 MeV. These developments expected in P70 are interesting and valuable to examine.

The PAC recommends the stage-1 status for P70 and encourages the group to submit a TDR. In the TDR, details of the S-2S spectrometer and the active target should be described. The TDR should also include (1) an explanation of why 2 MeV resolution is sufficient, (2) the optimization of the active target size, and (3) the required number of K^-'s on target. The beam conditions should be discussed further.

P72 (Λ*)

P72 is a newly proposed experiment to explore a possible narrow Λ(1665) signal and determine its spin and parity with the $K^-p \to \Lambda\eta$ reaction at the K1.8BR beam line using the Hyperon Spectrometer.

The proponents noticed a narrow peaking structure in the Belle data in the pK^- invariant mass in the $\Lambda_c \to pK^-\pi^+$ decay. This peak is consistent with two independent partial wave analysis results with the Crystal Ball data for $K^-p \to \Lambda\eta$ near threshold, which suggest the existence of a Λ* resonance with a spin-parity of $3/2^+$ (P wave) or $3/2^-$(D wave). The P72 experiment proposes a measurement of the differential cross sections of the $K^-p \to \Lambda\eta$ reaction around the threshold with high precision to confirm the existence of the resonance and determine its spin. The key point of this experiment is to also measure the polarization of the final Λ hyperon to determine the parity of this resonance, which is essential information to understand the structure of this state. For this purpose P72 requests two weeks of beam time.

The PAC understands that the experiment is interesting and its physics goal is clear; the confirmation of the resonance and the determination of its spin-parity would give a new insight to our understanding of hadron structure. Thus the PAC recommends a stage-1 status for this experiment. The experiment uses a straightforward missing mass technique, and the cross section and the background are known from previous experiments. Except for the beam line, the setup is almost identical to the E45 experiment at K1.8, for which the TDR has been recently reviewed without any major concerns. The PAC concludes that the experiment is feasible. The PAC encourages the group to submit a TDR including optimization of the setup and the trigger, accuracy of the beam momentum calibration, other systematic uncertainties, as well as more elaborate beam time estimate, based on the realistic performance of the Hyperon Spectrometer and the K1.8BR beam line. In addition, the PAC expects the group to further analyze the existing Belle data.

P67 (Measurement of displacement cross-section of proton of 8 and 30 GeV for high-intensity proton accelerator facilities)

P67 aims to measure the DPA cross section of 30 GeV/c protons in the beamline transporting protons to the beam dump of the MR. This measurement could be relevant to the neutrino and hadron beam lines construction and maintenance. Displacement Per Atom (DPA) is an index widely used to evaluate radiation damage. Such displacement cross sections have been measured mostly at beam energies below 20 MeV, while the experimental data for the higher energy region is scarce. DPA is also evaluated using model calculations, which reproduce well the experimental data below 20 MeV. However, the extrapolation from the energy region below 20 MeV to the GeV region is not reliable at the moment. The P67 proposal extends the energy of DPA measurement up to 3 GeV/c (RCS) and then further to 8 and 30 GeV/c (MR) to establish more reliable evaluation methods applicable up to the 30 GeV region.

The PAC recognizes the potential importance of this proposal for the future development of the high-intensity beam lines. The PAC recommends that the directors of IPNS and J-PARC consider carrying out the experiment within the framework of facility development.

4. Summary of BEAM TIME ALLOCATION in 2018

The PAC is pleased to observe the successful FX operation from October to December in 2017. The committee notes that in the operation plan for SX in the coming two months, E31 is scheduled for 20 days to complete its data taking. Two additional days will be devoted to short pilot/commissioning test runs of E03 and E40. COMET 8 GeV beam tests are planned for two periods, for 8 days in total. A dedicated SX study for the Main Ring accelerator is scheduled to improve effective SX beam power. The committee supports the plan and foresees productive operation.

The committee also endorses the proposed plan from March to June. FX operation will resume around March 10th and continue until the end of May. The SX operation will follow in next June until the summer shutdown. In this period, the committee considers that E62 has priority to complete their data taking while leaving a few days for E40 for their commissioning and for acquiring an initial set of physics data. The beam schedule after the 2018 summer shutdown has not yet been determined given the current tight budgetary situation and will be discussed at the next PAC meeting in July when a clearer budget plan is available. The following are the relevant constraints to consider:

The Super-Kamiokande detector will be refurbished in June-December 2018 in preparation for the addition of Gd.

KOTO will add instrumentation to their CsI calorimeter from July 2018 through January 2019.

The PAC recognizes there are several experiments ready to take physics data by early 2019 such as E40, E57, E14 (KOTO) and E11 (T2K) and also experiments in the Neutrino Experimental Facility such as E69 and E71.

Considering the serious demand from these ongoing experiments, the PAC strongly suggests the IPNS to investigate the possibility of significant MR operation in the January-March period and later in 2019.

6. DATES FOR THE NEXT J-PARC PAC MEETING

The next J-PARC PAC meeting will be held July 18-20, 2018.

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

- Minutes of the 24th J-PARC PAC meeting held on 24-26 July, 2017 (KEK/J-PARC-PAC 2017-14)
- Proposals
  - T59 experiment: Plan of installation of the Baby MIND muon spectrometer (KEK/J-PARC-PAC 2018-3)
  - Proposal for precise measurement of neutrino-water cross-section in NINJA physics run (KEK/J-PARC-PAC 2018-4)
  - Study of neutrino-nucleus interaction at around 1GeV using cuboid lattice neutrino detector, WAGASHI, muon range detectors and magnetized spectrometer, Baby MIND, at J-PARC neutrino monitor hall (KEK/J-PARC-PAC 2018-5)
  - Search for a Narrow Λ^* Resonance using the $p(K^-, \Lambda)\eta$ Reaction with the hypTPC Detector (KEK/J-PARC-PAC 2018-9)
  - Proposal for the next E05 run with the S-2S spectrometer (KEK/J-PARC-PAC 2018-10)
  - Measurement of displacement cross-section of proton of 8 and 30GeV for high-intensity proton accelerator facilities (KEK/J-PARC-PAC 2018-11)
- Technical Design Reports
  - Technical Design Report (TDR): Searching for a Sterile Neutrino at J-PARC MLF (E56, JSNS2) (KEK/J-PARC-PAC 2018-1)

    - Technical Design Report on the Experiment E45 (KEK/J-PARC-PAC 2018-2)

    - Technical Design Report for the Measurement of the Muon Anomalous Magnetic Moment g-2 and Electric Dipole Moment at J-PARC (KEK/J-PARC-PAC 2018-8)

- Status Reports

    - Responses to recommendations given by the focused review committee on J-PARC E34 experiment (KEK/J-PARC-PAC 2018-7)

    - Report from the E61 Experiment (KEK/J-PARC-PAC 2018-12)

- Letter of Intent

    - Intrinsic charm search at the J-PARC high momentum beamline (KEK/J-PARC-PAC 2018-6)

- Supplementary document

    - The T2K-ND280 upgrade proposal (submitted to CERN-SPSC, KEK/J-PARC-PAC 2018-13)