

ICFA Neutrino Panel phone meeting #15 19-Apr-2015 14:30 UTC

London	19-Apr-2015 15:30	BST	UTC + 01:00
Beijing	19-Apr-2015 22:30	CST	UTC + 08:00
Chicago	19-Apr-2015 09:30	CDT	UTC - 05:00
Madrid	19-Apr-2015 16:30	CEST	UTC + 02:00
Mumbai	19-Apr-2015 20:00	IST	UTC + 05:30
Padova	19-Apr-2015 16:30	CEST	UTC + 02:00
Paris	19-Apr-2015 16:30	CEST	UTC + 02:00
Sao Paulo	19-Apr-2015 11:30	BRST	UTC - 03:00
Seoul	19-Apr-2015 23:30	KST	UTC + 09:00
Tokyo	19-Apr-2015 23:30	JST	UTC + 09:00
Vancouver	19-Apr-2015 07:30	PDT	UTC - 07:00
Wroclaw	19-Apr-2015 16:30	CEST	UTC + 02:00

Present: J. Cao, D. Duchesneau, S. Geer, R. Gomes, A. de Gouvea, K. Long, S.B. Kim, T. Kobayashi, M. Shiozawa, H. Tanaka, M. Wascko, G. Zeller

Apologies: M. Maltoni, M. Mezzetto, N. Mondal, J. Sobczyk

Notes:**1. Introduction and adoption of agenda****All**

- Goal of meeting to make first complete discussion of the status of preparation of our roadmap.

2. Notes on recent meetings and actions arising:

Notes of the previous meeting were accepted. Status of actions:

- **KL:** Catalyse production of initial draft of straw-man RD programme;
 - **Superceded:** now to be taken up in the preparation of the roadmap.
- **DD:** Contact NM re “non-terrestrial source” input to the roadmap;
 - **Done.**
- **AdeG:** Contact M.Maltoni and JS re code, simulation, theory input to the roadmap;
 - **Superceded.** Will now take forward in context of roadmap.
- **KL:** assimilate the headings for the RD programme from the initial report;
 - **Superceded.** Will now take forward in context of roadmap.
- **KL:** Flag the balance of discussion of accelerator and the non-accelerator programme in the Large Neutrino Infrastructures meeting.
 - **Done.**
- **KL:** Make skeleton of roadmap.
 - **Done.**
- **KL:** Make Doodle for late March for a meeting as appropriate.
 - **Superceded.**

3. Development of roadmap:**All**

Skeleton document that had been circulated was discussed. Modifications, in particular to timeline we agreed. Goal is to have a draft circulating amongst the Panel by end May. Then get a version for discussion with the peers and stakeholders around June/July. We also discussed the need to make a survey of the persons active in the field and possibly of the resource requirements and investment plans. We were not confident that we could gather this data. A graphic of the scientific programme would be valuable in the introduction.

Slides prepared for the discussion are on the meeting WWW site:

- <https://indico.fnal.gov/conferenceOtherViews.py?view=standard&confId=9858>

The sections and “rapporteurs” for the various sections are:

- LBL NBB: Kobayashi, Shiozawa
- LBL WBB: Tanaka, Wascko
- SBL:
 - Accelerator-based sterile: Geer
 - Reactor (oscillation and sterile): Kim, Cao
- Deep underground: Mezzetto
- Non-terrestrial source: Mondal, Duchesneau
- Neutrino fixed-target: Sobczyk, Zeller
- Supporting programme: Wascko
- Simulation, combination and code development: Maltoni, de Gouvea, Sobczyk
- Non-oscillation programme: de Gouvea

Only points noted or issues will be recorded here.

- Need to work to refine the way in which we interact with ApPIC and ApPEC. ApPEC will make their own roadmap and we need to take care to understand the areas of overlap. Most powerful if the conclusions can be aligned.
- J-PARC plan is to provide 0.75 MW over a 10^7 s operating year by 2018. Then seek to increase towards 1.2 MW. Performance calculations assume the 0.75 MW and 10 years of operation. R&D planned for photosensors, in particular cost reduction of bulk production. Do not believe that there are particular development needs for the accelerator. The main-ring upgrade is planned. An enhanced near-detector programme is being discussed. A water near detector is critical and nuPRISM is being considered to improve the constraints on the cross sections.
- In seeking branch points, we agreed that the impact of indications of new phenomena need to be addressed. As an example, the sterile-neutrino programme has a number of dates when new information may lead to a re-alignment of the scientific necessities. In addition, the next generation of experiments should have the power to begin the testing of the SvM either through inconsistencies between measurements or because of the observation of

- non-standard phenomena. Though harder, it will be important to identify points at which such new science drivers may arise.
- The determination of the mass hierarchy and indications of the value of δ may come “early” through the combination of data. When considering the branch points we need also to consider the possible impact of early determination of, for example, the MH or δ .
 - Both the observation of new phenomena and the early determination of the MH or δ are driven by the precision with which measurements are made. Therefore we need to be clear about the implications for the supporting programme. For example, when the statistical weight of the ν_e -appearance signal becomes sufficient to have inconsistencies between the observations at (e.g.) Hyper-K and DUNE it will be critical to be confident that the differences are not arising due to arcane differences in with the ν_e -cross section, the hadronic final states or the detector response.
 - **We agreed** to emphasise the evolution of sensitivity to inconsistencies in the data set.
 - In considering the figures of merit for the long-baseline programme it will be necessary to consider the oscillation parameters as well;
 - Possibly also seek the earliest time when can get 95% confidence level on MH (CPiV) from 2 (or more) experiments;
 - Consideration of establishment of ν vs $\bar{\nu}$ differences with through atmospheric (e.g. INO), through parameter fits or through hypothesis testing;
 - There will be decision points for projects beyond, say, 2035 (for example the Neutrino Factory) that fall within our roadmap. In addition, we will need to be clear about the maintenance and development of the capability necessary to deliver these projects should the science require them.
 - AdeG explained that the non-oscillation programme had three aspects: tritium-beta-decay end point measurements (e.g. Katrin); $0\nu 2\beta$ searches; and surveys of cosmic radiation (microwave and neutrino). Impact here in large-scale structure, neutrino mass and number of light degrees of freedom. Katrin will start taking data in 2016. Other experiments include Project-8, Tolomey (?).
 - Need to recognize contribution that could be made by SHIP heavy neutrino search.
 - We noted that accelerator-based measurements might be essential to get the best out of particle-astro measurements. One example might be the cross section uncertainties in PINGU and ORCA.
 - The fixed-target neutrino programme is relevant to nuclear physics (e.g. nuclear effects in coherent scattering) and has an overlap with the short-baseline programme.
 - Proposed experiments such as ISODAR, Daedalus, ESSnuSB need to be considered appropriately. In particular, there may be R&D needs to develop capability such that the experiment can be mounted if/when required. Perhaps

- we need to develop a technical readiness score? In addition, should code as a decision/branch point identifying when investment could be made.
- Sterile searches (including e.g. SOX) may lead to need to follow up with e.g. ISODAR, nuSTORM etc. Again, need to identify a decision point and argue that capability must be present.
 - We discussed the development of codes, fitting, etc. and the desirability of a articulating a programme for the development of theory and phenomenology, including nuclear theory. The latter would require the input of hadroproduction measurements and cross section measurements.
 - **Agreed:** AdeG will seek to work with theorists on Panel to see how to consult the theory/phenomenology/nuclear-theory peer group to develop such a programme. It was felt that being able to articulate such a programme might be beneficial in arguing for resource.
 - Possible that SciBooNE Hall can be exploited to yield a Neutrino Platform at FNAL. We should consider what is missing from platforms at CERN and FNAL (and in Japan). FNAL “platform” should be considered as including the SBN detectors too.

4. Discussion of presentation to Large Neutrino Infrastructures meeting: ALL

- Content of talk discussed. Now documented in the slides presented in the 2nd Large Neutrino Infrastructures meeting.

5. DONM

- To be confirmed after discussion on Wednesday 22Apr15.

6. AoB

- None.

PTO!

Actions:

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Reminder of our goals for our second year:

1. Engage with establishment: FA reps and Directors;
2. Develop road-map for InuP;
3. Develop proposal for RD programme;
4. Explore opportunities for international collaboration necessary to realise NF
5. Establish clear set of goals for the precision with which ν_μ and ν_e cross section measurements must be made;
6. Initiative to promote best practice in s/w & codes;