

# SPC panel

**A. Zalewska**

Workshop on European Strategy for Future Neutrino Physics, 3.10.2009

**On behalf of the SPC Panel on Future Neutrino Facilities:**

R.Aleksan, A.Blondel, P.Dornan, K.Meier (till 31.07.09), T. Nakada  
(from 1.08.2009), A.Zalewska, F.Zwirner

Preparing the report from the SPC to the CERN Council

CERN/SPC/912/Rev.  
CERN/2815/Rev.  
9 December 2008

## Specific Request from Council to the Scientific Policy Committee

### Relations between CERN and the ongoing development work regarding future neutrino facilities

„The UK delegation to the CERN Council notes that there is no European-wide strategy to engage in the precise determination of neutrino oscillation parameters for the period beyond ~2015, after the T2K and Nova experiments. Within the context of ["Questions from Council to the SPC"](#), it requests that the SPC gives its views on several issues pertaining to the physics of neutrinos"

## Question 1

- What is the view of the SPC on the importance of precise measurements of the neutrino oscillation parameters, in particular the  $CP$  violating phase and mass hierarchy?

## Question 2

One of the most promising techniques for such measurements is the neutrino factory and there is currently an International Design Study (IDS) to produce a conceptual design report for a neutrino factory by 2012. This is not site specific. What is the view of the SPC on the overall value of the IDS for the future of the subject? Should CERN take a more active role in enabling the study to reach its goals, irrespective of where such a facility would be sited?

## Question 3

What other high intensity neutrino facilities are technically possible and how would they address the measurements above? What should be the involvement of CERN in studies of these facilities, in particular with regard to the planned LHC upgrades?

## Question 4

What is the view of the SPC on the merit of a European strategy in this phase of neutrino experimentation and whether it should have a place on the future CERN road map?

## The SPC report for the CERN Council

- Thanks to all the convenors, speakers, discussion leaders, authors of the posters and participants for a very valuable input from the workshop,
- The report will also be based on the documents prepared for the panel and on meetings with experts,
- The SPC report has to be ready for the CERN Council week in December (14-18). It will contain answers to the questions asked in the document CERN/SPC/912/Rev., CERN/2815/Rev.
- A special SPC meeting on the 10<sup>th</sup> of November will be an opportunity to give a status report.
- The workshop and the SPC report will be input to establish the Future European Strategy for Neutrino Physics

The following slides contain a few initial impressions about the input from the workshop ,  
**BUT THE WORK IS IN FRONT OF US**

## European neutrino community:

- CNGS programme, T2K experiment, NuMI programme
- DoubleChooz (and Daya Bay) reactor experiments
- Non-accelerator neutrino experiments: searches for  $0\nu 2\beta$  decays, neutrino mass from end-point, neutrino telescopes, solar and atmospheric neutrinos, low energy neutrinos from other astrophysical sources, ...
- R&D programmes for future neutrino accelerator facilities
- R&D programmes for detectors

## Physics issues:

- Lepton flavour still a young field, must catch up with hadron flavour, still a lot of room for fundamental investigations and big discoveries
- Majorana/Dirac nature and CPV are the two main goals, but precise determination of all parameters is also intrinsically important
- Measurements of  $\theta_{13}$  (and  $\theta_{23}$ ) are essential to better define a strategy for measuring CPV and its viability. In a few years we will know much more from reactor and accelerator experiments.
- Neutrinoless double beta decay experiments are essential to address the question of Dirac/Majorana character of neutrinos.
- With the KATRIN experiment we will go further in direct measurements of the neutrino mass.
- Cosmology and astrophysics provide complementary information about neutrinos but cannot replace particle physics experiments.
- Charged lepton flavour violation is also very important.

## Upgrade of the CERN accelerators:

The consolidation of the LHC injection chain (Linac 4, SPL, PS2) in view of the SLHC could open a door for the future neutrino facility at CERN and for other high intensity physics

**BUT** LHC does not require a high power injection chain, so keeping necessary elements upgradable to high power will be needed.

## Future neutrino facilities:

- Superbeams - well defined neutrino program in Japan, rich program in USA, studies for SB from CERN to Frejus in Europe
- Neutrino factory - work coordinated world-wide through the NUFACT workshops and IDS-NF, important European contributions into the NF R&D
- $\beta$  beams - specific for Europe, R&D led by CERN

# Request from EUROnu:

R.Edgecock et al: Proposal for increased contributions from CERN to future neutrino facilities via the EUROnu FP7 Design Study

- This document was prepared in response to a request from the panel
- It has two annexes: from the IDS-NF Steering Group and from the Beta Beam Study Group.

	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Accelerator physicist	2	3	3	3
Engineer/technical support	3	4	5	5
Safety expertise	0.5	1	1	1
Costing expertise	0.5	0.5	1	1
<b>Total</b>	<b>6</b>	<b>8.5</b>	<b>10</b>	<b>10</b>

## Detectors:

- Detector R&D: (1) detectors of a total mass  $10^5 - 10^6$  tons, filled with liquids (water, liquid argon and scintillator) for neutrinos from astrophysical sources, proton decay and accelerator neutrinos, (2) magnetized detectors for NF (3) various detector technologies for neutrinoless double beta decay
- Liquid argon detectors, initially developed in Europe, are now part of the neutrino programme in USA and part of the R&D programme in Japan
- CERN could help with the neutrino detector R&D like it was in the past for the LHC detectors

## Stronger contacts ?

- World-wide coordination **BUT** also within Europe
- Can CERN help with that? Does the community want it?

## In addition:

- Many interesting posters - it would be great to have them uploaded to the workshop web page - [please, do it.](#)
- The CERN yellow report from the workshop has a chance to become an important reference document.
- If you have a brilliant idea which was not presented at the workshop or how to move forward and achieve a consensus, [please, write about it to any member of the panel \(e.g. to Agnieszka.Zalewska@ifj.edu.pl\) before the end of October.](#)