WP5. Coordination office for long baseline neutrino experiments

General introduction to WP (refer to other WPs, beamlines, experiments)

Unlike in other fields, the neutrino community does not know yet which the next neutrino oscillation facility will be. This decision strongly depends on the value of the mixing angle θ_{13}, which will be probably known by 2011, from Double-Chooz and T2K. The proposed facilities are Neutrino Factories, Beta-beams and Super-beams. The detector options: a large water cerenkov detector, a magnetised iron calorimeter, a totally active scintillating detector, an emulsion cloud chamber and a giant liquid argon TPC.

It is widely accepted that a Conceptual Design Report (CDR) of the facility(s) and detector(s) should be submitted by 2012. A comprehensive CDR requires a realistic performance, feasibility and cost evaluation. It's the task of this WP to contribute significantly to the CDR of the detector(s) for this future neutrino oscillation facility.

The CDR involves however other international networks as the International Design Study for a Neutrino Factory (IDS-NF) and EURONU, the FP7 network devoted to R&D of all three facilities. Other international studies are EURISOL/Beta-beam, dedicated to the design of a Beta-beam accelerator facility, and LAGUNA, a FP7 Design Study focused on the feasibility of Pan-European Underground Infrastructure for Large Apparatus studying Grand Unification and Neutrino Astrophysics.

IDS-NF is dedicated exclusively to the Neutrino Factory. It includes the design studies for accelerator and detectors, based mainly on simulations, but it also acts as a network for existing accelerator R&D experiments (EMMA, MICE and MERIT). In the context of the EU FP7 proposals, EURONU is focused on monte-carlo simulations for all three facilities and the corresponding detectors, while LAGUNA is devoted to the underground excavation, construction and operation of large liquid detectors of three technologies (Water, Liquid Argon and Scintillator) and their safety and environmental impact at the potential sites hosting of the facility.

It can be concluded that detector instrumentation R&D is not contemplated in any of the ongoing international projects. DEVDET is therefore the ideal framework to complement the above projects with detector prototyping and test-beams for the understanding of the key issues.

Given the complex structure described above, the success of the neutrino detector R&D program strongly depends on a good communication procedure between the different international communities and also among different work packages in DEVDET. WP5 task is to ensure that the information is correctly shared and that the correct physics output is obtained from DEVDET studies. Three main subtasks have been identified: information exchange, definition and planning of test-beam activities and coherent evaluation of detector options for the CDR. They are now developed in detail.

WP.5-Task.1 – Coordination and information exchange

1. General description of the task activities

Input to the CDR should come from existing data[1], monte-carlo simulations[2] and dedicated test-beams. This requires a fluid information exchange among all international projects contributing to it. Obviously, communication between the different WPs in DEVDET is also vital. Information exchange includes documentation, WEB site and meetings.

2. Organization participation

Participant acronym	France (CNRS)	Spain (CSIC)	Switzerland (UNIGE)	UK (UNIGLA)	Germany (AACHEM)		
Estimated person-months per participant:	7	7	7	4	2		

3. Objectives

- Create and maintain a web site
- Help in writing documentation
- Coordinate information exchange with other international neutrino projects
- Organization of meetings

4. Description of work

A professional web master is desirable, since a considerable amount of work is needed, as described below. This person would be also in charge of helping writing the documentation and organizing the meetings.

The web site should be created soon. An interactive (wiki, …) web site, where people can edit and add documents is desirable. This web site should contain the relevant information from other projects and from other DEVDET WPs (2, 3, 6, 7, and 11), information about meetings, current status of CDR, etc. The WEB site should be continuously updated.

All activities in DEVDET should be properly documented. This WP would be in charge of collecting the documentation (software manuals, technical drawings, detector designs, etc) to be posted on the WEB site. It will also help in writing the documentation.

This task also includes the organization of tele/video meetings and in-person meetings, both in the context of DEVDET and in the context of other international neutrino networks[3].

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[1] From currently or soon running experiments: Super-Kamiokande, MINOS, T2K, OPERA, ICARUS T600, but also from others like MINERVA and INO that will be tested in the coming years. In addition, smaller scale prototypes will provide vital information and answers to specific issues of the instrumentation.

[2] In the context of the IDS-NF and EURONU

[3] In some cases WP5 will not organize the meetings but the contribution of the DEVDET/neutrino to the meetings

List of Deliverables for the task

Deliverables of task 1	Person month estimate	Description/title	Nature[4]	Delivery month[5]
5.1.1	10	Web site	D	12
5.1.2	40	Documentation	O	24

List of Milestones for the task

Milestones	Description/title	Tasks involved	Delivery month[2]	Means of verification
5.1.1	First version of web site available	5.1.1	3	Test functionality
5.1.2	Web site ready	5.1.1	12	Test functionality
5.1.3	First version of documentation ready	5.1.2	24	

WP.5-Task.2 – Definition and planning of test-beam activities and coherent evaluation of detector options for the CDR

1. General description of the task activities

While WP11 would be in charge of providing the infrastructure for the test-beams, WP5 should coordinate (in close cooperation with other networks) the definition of the measurements to be done and the detector prototypes to be tested. In addition WP5 would provide input for a possible upgrade of the test-beam infrastructure.

The evaluation of detector options should be driven by physics performance, where the main indicator is the sensitivity to the oscillation parameters. However, cost and feasibility should be also taken into account. The results on electronics developments from WP3 can have serious implications on the cost and feasibility of the detectors, and therefore should be properly used by WP5. This WP should also coordinate the analysis of test-beam data and make the final evaluation of detector options for the CDR, again in cooperation with the other neutrino networks.

2. Organization participation

Participant acronym	France (CNRS)	Spain (CSIC)	Switzerland (UNIGE)	UK (UNIGLA)	Germany (AACHEM)		
Estimated person-months per participant:	12	6	13	6	3		

In principle a detector prototype for each detector option will be tested.

[4] Nature: R=Report, P=Prototype, D=Demonstrator, O=Other
[5] Counted from the starting date

3. Objectives

- Collect information from IDS-NF and EURONU on simulation results
- Propose list of measurements to be done at the test-beams
- Collect requirement list for test-beam setup
- Coordinate the design of test-beam detector prototypes
- Coordinate test-beam data analysis
- Extract the relevant information from the analysis of the DEVDET test-beams to tune the IDS-NF and EURONU monte-carlo simulations
- Cost estimates for the different detectors options based on WP3 results
- Contribute to the CDR

4. Description of work

As described above, five detector options will be studied. There will be a coordinator for each of the options. The first step is to understand from the current designs and performance evaluations what are the key issues to be understood at dedicated test-beams. A list of measurements to be done at the test-beams should be proposed soon. This list should take into account the available test-beam areas and infrastructures defined in WP11.

A possible upgrade of the test-beam infrastructure would require intensive feedback between WP5 and WP11. In this case a list of requirements for the test-beam infrastructure (input to WP11) should be proposed.

WP5 should coordinate the design of detector prototypes, ensuring that the proposed prototypes fulfill the requirements and that the list of measurements can be completed. The design process would be followed up by the usual CDR and TDR (Technical Design Report).

Finally, WP5 should coordinate the analysis of the test-beam data, such that all relevant information is extracted and exported, first into the simulations (IDS-NF and EURONU) and later into the CDR.

List of Deliverables for the task

Deliverables of task 2	**Person month estimate**	**Description/title**	**Nature**[1]	**Delivery month**[2]
5.2.1	2	List of measurements to be done	R	2
5.2.2	2	List of test-beam requirements	R	4
5.2.3	20	Test-beam detectors: technical design report	R	20
5.2.4	20	Performance report of the different prototypes	R	40
5.2.5	4	Cost estimate based on WP3 results and current design of the detectors	R	42
5.2.6	10	Contribution to the CDR	R	48

List of Milestones for the task

Milestones	Description/title	Tasks involved	Delivery month[2]	Means of verification
5.2.1	List of measurements ready	5.2.1	3	
5.2.2	List of test-beam requirements ready	5.2.2	4	
5.2.3	Test-beam detectors: conceptual design report	5.2.3	10	
5.2.4	Test-beam detectors: technical design report	5.2.3	20	
5.2.5	First feedback from WP3	WP3	20	
5.2.6	Preliminary cost estimate	5.2.5	22	
5.2.7	Performance report ready	5.2.4	40	
5.2.8	Second feedback from WP3	WP3	40	
5.2.9	Final cost estimate	5.2.5	42	
5.2.10	CDR ready	5.2.6	48	

[1] Nature: R=Report, P=Prototype, D=Demonstrator, O=Other
[2] Counted from the starting date