## 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 $\theta_{13}$, 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 (WC), a magnetised iron calorimeter (MIND), a totally active scintillating detector (TASD), an emulsion cloud chamber (ECC) and a 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 facility, and LAGUNA, a FP7 network focused on the understanding of large underground infrastructures for particle and astroparticle physics.

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 projects as EMMA, MICE and MERIT. However, it does not foresee any prototyping for detectors. EURISOL/Beta-beam is also devoted to the accelerator.

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 labs for a WC or liquid argon TPC.

It can be concluded that detector 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.

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 the 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 TDR. 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, monte-carlo simulations and dedicated test-beams. Existing data that is relevant for detector development will come mainly from Super-Kamiokande, MINOS, OPERA, ICARUS T600, and also from prototypes (MINERVA and INO) that will be tested during 2008 and 2009. Simulations will be mainly proceed in the context of the IDS-NF and EURONU, as mentioned above. Finally, dedicated test-beams should provide missing information that is required for the CDR.

Given the above complex structure a complete and precise CDR 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.

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.

### 2. Organization participation

| **Participant acronym** | IFIC | Geneva | Glasgow | IN2P3 | Bulgaria (Sofia) | | |
|---|---|---|---|---|---|---|---|
| **Estimated person-months per participant:** | 7 | 3 (?) | 3 (?) | 19<br>To be distributed among 3 tasks | ? | | |

### 3. Objectives

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

### 4. Description of work

A person should be fully dedicated to this task, since communication and information exchange is crucial for this WP. Three subtasks have been identified.

### 4.1. Information exchange

A 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:

- *Organisation:* contact persons, WP managers, etc.
- *Relevant information from other projects*: IDS-NF, EURISOL, EURONU, LAGUNA, etc. Mainly current detector designs, performance estimations, issues, cost estimates, etc.
- *Relevant information from WP2:* status of software tools. Documentation on how to use the simulation, reconstruction and analysis software packages. Information about CVS (or svn) repository.
- *Relevant information from WP3*: current status of electronics development for neutrino detectors. This has an important impact on the detector design and cost.
- *Relevant information from WP6 and WP7*: test-beam schedules.
- *Relevant information from WP11:* design of the beam line and beam instrumentation, requirements, technical drawings, schedules, etc.
- *Links:* other DEVDET web sites, neutrino experiments, international neutrino networks, etc.
- *Meetings:* Schedule, agendas, presentations, etc.
- *Draft of the CDR.*

The WEB site should be continuously updated.

### 4.2. Documentation

All activities in DEVDET should be properly documented. This WP would be in charge of collecting the documentation to be posted on the WEB site. It will also help in writing the documentation. Documentation includes:

- Software package manuals
- Information about software repository (CVS or svn)
- Design reports
- Status reports

### 4.3. Meetings

This task also includes the organization of tele/video meetings and in-person meetings, with a frequency that needs still to be decided. Three types of meetings can be foreseen:

1. Plenary DEVDET meetings.
2. Combined meetings with other international networks.
3. DEVDET/neutrino meetings, where the neutrino part of the different WPs is discussed
4. DEVDET/neutrino steering group meetings

In some cases (3) WP5 will organize the meetings, while in others (1 and 2) WP5 will organize the contribution of the neutrino part of DEVDET to the meetings.

This subtask also includes the participation in the meetings but providing travel support in some cases. NOT CLEAR YET !!!!

### List of Deliverables for the task

| Deliverables of task 1 | Person month estimate | Description/title | Nature[1] | Delivery month[2] |
|---|---|---|---|---|
| 5.1.1 | 10 | Web site | O | 12 |
| 5.1.2 | 20 | Documentation | O | 24 |
| 5.1.3 | 16 | Web site maintenance | O | Continuous |
| 5.1.5 | 2 | Organisation of meetings | O | Continuous |

### 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 | |

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

## WP.5-Task.2 – Definition and planning of test-beam activities

### 1. General description of the task activities

Test-beam data should be one of the main outcomes of DEVDET. In what neutrino detectors concerns detector prototyping and test-beams in essential

While WP11 would be in charge of providing the infrastructure for the test-beams, WP5 should coordinate the definition of the measurements to be done and the detector prototypes to be tested. This requires a deep understanding of the current design and performance of the different detector options, and the identification of the key issues that cannot be addressed with simulations or existing data. This work should be done in close cooperation with other international networks.

In addition WP5 would provide input for a possible upgrade of the test-beam infrastructure. This subtask would require feedback between WP5 and WP11.

### 2. Organization participation

| **Participant acronym** | IFIC | Geneva | Glasgow | | | | |
|---|---|---|---|---|---|---|---|
| **Estimated person-months per participant:** | 6 | 5 (?) | 5 (?) | ? | | | |

### 3. Objectives

- Collect information from IDS-NF and EURONU on simulation results, which is relevant for dedicated test beam measurements
- Propose list of measurements to be done at the test-beams
- Collect requirement list for test-beam setup: particle types, purity, energy, magnet, …
- Coordinate the design of test-beam detector prototypes

### 4. Description of work

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. This subtask needs a close cooperation with all other international networks. 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 list of requirements for the test-beam infrastructure (input to WP11) should be proposed. This list includes:

- Particle types and energy,
- precision of particle identification devices in the beam instrumentation,
- magnetic field strength,
- moving systems,
- etc.

The final requirements list should be defined in cooperation with WP11, since given the

Although DEVDET funding is devoted to the test-beam infrastructure, it is the task of the coordination office to ensure that the proposed detector prototypes fulfill the requirements and that the list of measurements can be completed.

### 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 | 3 |
| 5.2.2 | 2 | List of test-beam requirements | R | 4 |
| 5.2.3 | 4 | Test-beam detectors: conceptual design report | R | 12 |
| 5.2.4 | 12 | Test-beam detectors: technical design report | R | 24 |
| 5.2.5 | | Schedule for test-beams | R | 24 |

### 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 | Steering group |
| 5.2.2 | List of test-beam requirements ready | 5.2.2 | 4 | Steering group |
| 5.2.3 | | | | |

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

## WP.5-Task.3 – Coherent evaluation of detector options for the CDR

### 1. General description of the task activities

The combined information from other international networks and results from DEVDET should lead to the CDR by 2012. The final decision 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. While physics performance will be mainly addressed in the context of WP5, the results on electronics developments from WP3 can have serious implications on the cost and feasibility of the detectors.

This subtask will start once the first test-beam data and WP3 studies are available. WP5 should ensure that the information from DEVDET is correctly used for the evaluation of detector options and that the correct output is … into the CDR.

WP5 should also ensure a continuous feedback between simulations and real data, crucial for realistic performance estimation.

### 2. Organization participation

| **Participant acronym** | IFIC | Geneva | Glasgow | Oxford | | |
|---|---|---|---|---|---|---|
| **Estimated person-months per participant:** | 7 | 3 (?) | 3 (?) | 2 (?) | | |

### 3. Objectives

- 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 results from WP3
- Contribute to the CDR

### 4. Description of work

This substask will come in the last part of DEVDET. WP5 should coordinate the analysis of the test-beam data, such that all relevant information is extracted:

- Scintillator, photo-detector and electronics response
- Showering profiles
- Alignment precision (mainly for emulsion based detectors)
- Muon charge misidentification (mainly due to non Gaussian scatters)
- Electron charge misidentification (shower development)
- Detector optimization: segmentation, magnetic field strength, etc.

All this should be introduced into the simulations.

In addition WP3 studies should have some impact in the

### List of Deliverables for the task

| Deliverables of task 3 | Person month estimate | Description/title | Nature[1] | Delivery month[2] |
|---|---|---|---|---|
| 5.3.1 | 1 | First cost estimate based on WP3 results and current design of the detectors | R | 24 |
| 5.3.2 | 12 | Performance report of the different prototypes | R | 40 |
| 5.3.3 | 2 | Final cost estimate based on WP3 results and current design of the detectors | R | 42 |
| 5.3.4 | 6 | Contribution to the CDR | R | 48 |

### List of Milestones for the task

| Milestones | Description/title | Tasks involved | Delivery month[2] | Means of verification |
|---|---|---|---|---|
| 5.3.1 | First feedback from WP3 | WP3 | 20 | |
| 5.3.2 | Cost estimate | | | |
| | | | | |
| | | | | |

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