International scoping study: Physics working group plan

Key success measures			
1	**Review the physics case for a future neutrino complex with a view to defining the baseline specification for the facility**		
	Description of goal		**Date**
1.1	Review previous analyses of physics reach of future facilities (super-beam, beta-beam, Neutrino Factory) for precision neutrino oscillation studies to identify areas in which data used, assumptions made, or analysis performed need to be extended.	Create list of existing analyses to be included.	Start + 1 month
		Report detailing additional phenomenological work required to extend existing analyses and identification of new data to be included in revised analysis.	Start + 3 months
1.2	Development of benchmarking codes (e.g. GLOBES) to allow performance comparison of options.	Create list of benchmarking codes with advantages and disadvantages of each.	Start + 3 months
		Select benchmark code(s) to be used with a specification of improvements to be made.	Start + 3 months
		Selected benchmark code(s) modified in accordance with the specification.	Start + 6 months
1.3	Evaluate sensitivity to theta_13, leptonic CP violation and the mass hierarchy as a function of the values of theta_13 and delta. Identify the regions of parameter space to which the Neutrino Factory, beta beam and superbeam facilities are sensitive. If there are regions of parameter space in which the sensitivities overlap identify the advantages, if any, offered by the multiplicity of modes available at the Neutrino Factory.	Report summarising study and presenting plots showing the sensitivity of each option separately and indicating their relative sensitivities to theta_13, delta and the mass hierachy.	Start + 9 months
		Summarise the information gained by the various appearance and disappearance modes (including tau appearance) at a future neutrino facility in both the standard three-flavour scenario and more exotic scenarios.	Start + 12 months
1.4	Identify the means by which parameter degeneracies and correlations are resolved and distinguished from four-flavour or other exotic scenarios either using each facility separately or in combination.	Report summarising options for removing such ambiguities and testing the three flavour framework at a Neutrino Factory using multiple baselines and/or neutrino beam energies, tau identification, electron-positron identification etc.	Start + 6 months
		Report summarising options for removing such ambiguities and testing the three-flavour framework at a beta beam facility.	Start + 6 months
		Report summarising options for removing such ambiguities and testing the three flavour framework at a super-beam facility using neutrinos and anti-neutrinos.	Start + 6 months
		Report summarising benefits of combining information from the various facilities both for parameter determination and for the study of sources of systematic uncertainty.	Start + 12 months
1.5	Recognising that each facility will have various sources of systematic uncertainty, identify strategies by which such uncertainties can be quantified.	List principal sources of systematic uncertainty for each facility and estimate size of the uncertainty.	Start + 6 months
		Evaluate strategies by which systematic uncertainties can be quantified and summarise requirements on the facility (for example simultaneous storage of mu+ and mu- at a Neutrino Factory) or the measurement programme (for example cross section measurements for superbeam experiments) required to minimise the uncertainties.	Start + 12 months
1.6	Identify how a muon facility fits into the Neutrino Factory complex, and the muon beam requirements necessary to reach the design goals.	Understand the principal sources of systematic errors for the different experiments which drive the beam design. Evaulate how the design will impact each of the other muon experiments, as well as the neutrino programme.	Start + 12 months

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