Summary and Future plan for Phenomenology study

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Prepared the initial facility parameters

Beam	ESSnuSB total running time	10			yrs	$1.7 \cdot 10^7$ s per year assumed (200 days)
Beam	ESSnuSB Neutrino/Antineutrino runs	5/5	1/9	9/1	yrs	To be optimized
Far Detector	Expected performance for signal and background components	yes				Migration matrices and efficiencies from ESSnuSB project
Far Detector	Overall normalization systematic uncertainty for signal	5 %	2 %	10 %		
Far Detector	Overall normalization systematic uncertainty for background	10 %	5 %	15 %		
Far Detector	Overall shape systematic uncertainty for signal	2 %	0 %	5 %		
Far Detector	Overall shape systematic uncertainty for background	2 %	0 %	5 %		
Near Detectors	Neutrino energy resolution	15 %	5%	25%		
Near Detectors	Signal selection efficiency	50 %	40 %	70 %		
Near Detectors	Background rejection efficiency	99 %	90 %	99 %		
Near Detectors	Overall normalization systematic uncertainty for signal	5 %	5 %	10 %		
Near Detectors	Overall normalization systematic uncertainty for background	10 %	10 %	20 %		
Near Detectors	Overall shape systematic uncertainty for signal	2 %	0 %	10 %		
Near Detectors	Overall shape systematic uncertainty for background	2 %	0 %	10 %		
Oscillation Parameters	θ_{12}	33.41	31.31	35.75	degrees	NuFit 5.2 (http://www.nu-fit.org)
Oscillation Parameters	θ_{13}	8.58	8.23	8.94	degrees	NuFit 5.2 (http://www.nu-fit.org)
Oscillation Parameters	θ_{23}	42.2	39.0	52.0	degrees	NuFit 5.2 (http://www.nu-fit.org)
Oscillation Parameters	Δm^2_{21}	7.41	6.82	8.03	10^-5 eV^2	NuFit 5.2 (http://www.nu-fit.org)
Oscillation Parameters	$\lvert \Delta m^2_{31} \rvert$	2.507	2.406	2.590	10^-3 eV^2	NuFit 5.2 (http://www.nu-fit.org)
Oscillation Parameters	δ_{CP}	232	0	360	degrees	NuFit 5.2 (http://www.nu-fit.org)

Statistical Model

- Discussed an improved satitiscal analysis method – Discussed by Spyros and summarized by George F and Spyros
- Will proceed to implement this method in the phenomenology studies
- Till then will continue with the current method i.e.,

$$\chi 2 = 2 \sum_{i=1}^{n} \left[N_i^{test} - N_i^{true} - N_i^{true} \, ln \left(\frac{N_i^{test}}{N_i^{true}} \right) \right]$$

Supernova Study at FD

- Will wait for the migration matrices
- In the meantime will proceed with a Gaussian resolution
- Estimate event rates
- Study physics scenarios

Atmospheric Study at FD

- Will continue to develop a code
- Study physics scenarios

Solar Study at FD

- Will look at the possibilities

Study at NDs

- Will wait for the fluxes for LEnuSTORM and LEMNB
- Will wait for the migration matrices for LEMON-D and END

  (Can work with Gaussian energy resolution)
- Study physics scenarios
- Sterile: Performed a preliminary studies considering production of neutrinos at different points in the race-track/decay tunnel - Alessio

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Thanks everyone for very fruiyful meeting