NF01 Report Status

Snowmass BSM Neutrinos

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Three flavor oscillations

- Measuring the six oscillation parameters: Δm^2_{21}, Δm^2_{31}, θ_{12}, θ_{13}, θ_{23}, $\delta_{\rm CP}$.
- What is needed to produce such neutrinos
  - Accelerator upgrades
- What is needed to detect such neutrinos
  - Energy & angular resolution
  - Particle identification
- Control systematics
  - Near detectors to measure flux and cross section
  - Connections of dedicated cross section measurements and calculations
  - Hadron production measurements for fluxes

NF01 Scope: What It Isn't

- Neutrino mass generation, Majorana/Dirac, ... (NF05,TF11)
- New physics scenarios
  - Steriles (NF02)
  - Unitarity violation (NF03,TF11)
  - NSI (NF03,TF11)
  - ... (NF03,TF11)
- Reproduction of existing TDRs/CDRs/Whitepapers
- Cross sections (NF06)
- Neutrino sources (NF04,NF09)
- New neutrino detector technologies (NF10)
  - NF10 is only discussing *new* technology, not LArTPC

Strategy

- Organize experimental effort by facility
  - Show progress within facility
  - Continuity in systematics and accelerator progress
  - 2 pages for existing experiments, 4 pages for funded near-future experiments
  - Facility contributions solicited from the experiments (or us)
- Also include:
  - Introduction
  - Theory overview
  - Theory inputs (cross sections, etc.)
  - Ancillary measurements
  - Possible upgrades
  - Other oscillation probes
  - Far future ideas

Outline

1 Introduction and Current Three-Flavor Status
- 1.1 Neutrino Oscillations in Particle Physics (Messier)
- 1.2 Current Knowns and Known Unknowns in Neutrino Oscillations (Denton)
- 1.3 Neutrino oscillations and the Previous P5 (Tanaka)

2 Three-Flavor Oscillation Theory (Denton)
- 2.1 Neutrino Oscillation Probabilities
- 2.2 Matter Effect
- 2.3 Role of Each Oscillation Parameter
- 2.4 Neutrino Oscillation Sources
  - 2.4.1 Solar
  - 2.4.2 Reactor
  - 2.4.3 Atmospherics
  - 2.4.4 Accelerators
- 2.5 Flavor Model Predictions and Desired Precision

3 Three-Flavor Neutrino Oscillation Facilities (current:2pg, future:4pg)
- 3.1 JUNO (Tanaka)
- 3.2 Fermilab/SURF Program (Messier)
  - 3.2.1 NOvA
  - 3.2.2 DUNE
- 3.3 J-PARC/Kamioka Program (Friend)
  - 3.3.1 SK
  - 3.3.2 T2K
  - 3.3.3 HK
- 3.4 South Pole (Taboada)
  - 3.4.1 IceCube/DeepCore
- 3.5 KM3NeT (Coyle)
- 3.6 Timeline of Sensitivities (Denton)

4 Three Flavor Oscillation Supporting Program
- 4.1 Experiments (Friend)
- 4.2 Theory (Denton)
- 4.3 Joint Fits (Friend)

5 Possible Upgrades to Planned Experiments
- 5.1 Hyper-K (Friend)
  - 5.1.1 Near Detector
  - 5.1.2 Detector in Korea
  - 5.1.3 Accelerator Upgrades
- 5.2 DUNE (Messier&Tanaka)
  - 5.2.1 Realizing the P5 DUNE
  - 5.2.2 Near Detector
  - 5.2.3 Third and Fourth Modules
  - 5.2.4 Accelerator Upgrades

6 Other Oscillation Probes (Denton)
- 6.1 Galactic Supernova
- 6.2 Astrophysical Neutrinos

7 Possible Future Experiments (Tanaka) (1 paragraph to 1.5pgs)
- 7.1 DUNE to THEIA
- 7.2 ESSnuSB
- 7.3 INO
- 7.4 Neutrino Factory
- 7.5 Beta beams
- 7.6 P-ORCA

8 Conclusions

9 Acknowledgements

References

Community Input

in addition to right now

Letters of Interest:

33 LoIs submitted to NF1

Nr	LOI PDF file	Date
1	CompF/SNOWMASS21-CompF2_CompF1-NF1_NF5-CF1_CF2-IF8_IF2_Monzani-085.pdf	31/08/2020
2	CompF/SNOWMASS21-CompF3_CompF2-EF0_EF0-NF1_NF6_Kagan-129.pdf	01/09/2020
3	CompF/SNOWMASS21-CompF3_CompF2-NF1_NF5-CF1_CF2-IF8_IF3_Monzani-084.pdf	31/08/2020
4	NF/SNOWMASS21-NF1_NF0_205.pdf	15/09/2020 late
5	NF/SNOWMASS21-NF1_NF0_DUNE-052.pdf	30/08/2020
6	NF/SNOWMASS21-NF1_NF0_Ryan_Patterson-093.pdf	31/08/2020
7	NF/SNOWMASS21-NF1_NF0_Tom_Stuttard-058.pdf	31/08/2020
8	NF/SNOWMASS21-NF1_NF2_Daya_Bay-086.pdf	08/08/2020
9	NF/SNOWMASS21-NF1_NF3-CompF3_CompF0_Aurisano-152.pdf	31/08/2020
10	NF/SNOWMASS21-NF1_NF3-TF0_TF0_Peter_Denton-010.pdf	18/08/2020
11	NF/SNOWMASS21-NF1_NF3_Jeremy_Wolcott-088.pdf	31/08/2020
12	NF/SNOWMASS21-NF1_NF3_POONAM_MEHTA-027.pdf	28/08/2020
13	NF/SNOWMASS21-NF1_NF3_Patricia_Vahle-145.pdf	31/08/2020
14	NF/SNOWMASS21-NF1_NF3_Poonam_Mehta-204.pdf	16/09/2020 late
15	NF/SNOWMASS21-NF1_NF3__NF06_T2KCollab-130.pdf	31/08/2020
16	NF/SNOWMASS21-NF1_NF4-RF4_RF5_Aurisano-154.pdf	31/08/2020
17	NF/SNOWMASS21-NF1_NF4_Pedro_Ochoa-034.pdf	29/08/2020
18	NF/SNOWMASS21-NF1_NF4_SNOplus-185.pdf	01/09/2020
19	NF/SNOWMASS21-NF1_NF5-TF11_TF0_Julia_Gehrlein-025.pdf	28/08/2020
20	NF/SNOWMASS21-NF1_NF5-TF11_TF0_Kevin_J_Kelly-126.pdf	31/08/2020
21	NF/SNOWMASS21-NF1_NF6-CompF3_CompF4_HarryBool-191.pdf	01/09/2020
22	NF/SNOWMASS21-NF1_NF8_Ivan_Martinez_Soler-176.pdf	31/08/2020
23	NF/SNOWMASS21-NF2_NF1_Joint_Oscillation_Analyses_at_Reactors-115.pdf	31/08/2020
24	NF/SNOWMASS21-NF2_NF1_Rosner-045.pdf	30/08/2020
25	NF/SNOWMASS21-NF3_NF1-CF2_CF0-TF11_TF0_Pedro_Machado-203.pdf	11/09/2020 late
26	NF/SNOWMASS21-NF3_NF1-CF7_CF0-TF11_TF8_Peter_Denton-023.pdf	27/08/2020
27	NF/SNOWMASS21-NF3_NF1-EF9_EF0-RF4_RF6-CF1_CF3-TF11_TF9-AF5_AF0-195.pdf	01/09/2020
28	NF/SNOWMASS21-NF4_NF1-RF4_RF0-CF7_CF1_SUPERK-050.pdf	30/08/2020
29	NF/SNOWMASS21-NF6_NF1-TF11_TF0-CompF2_CompF0_Katori-094.pdf	31/08/2020
30	NF/SNOWMASS21-NF6_NF1-TF11_TF0_Kendall_Mahn-147.pdf	31/08/2020
31	NF/SNOWMASS21-NF6_NF1-TF5_TF11-CompF2_CompF0_Aaron_Meyer-111.pdf	31/08/2020
32	NF/SNOWMASS21-NF6_NF1_Mayly_Sanchez-139.pdf	31/08/2020
33	NF/SNOWMASS21-NF7_NF1-IF2_IF9_Adam_Bernstein-099.pdf	31/08/2020

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