

Introduction

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Neutrino Working Group Meeting

October 24, 2011 – FNAL

Overview for the Day

Very full day. We are looking forward to exciting talks and lots of productive discussions!

- Overview talks in the morning – These are 10 minutes long, plus 5 for questions.
- Contributed talks in the afternoon – These are 5 minutes long, no questions. We have allocated discussion time slots throughout the afternoon.

In order for this to work – all speakers have something to say, and we want to have dinner at the end of the day! – we will have to keep **very strict** track of time.

We would like to ask the **contributing speakers** (and anyone else) to give us a **one-page writeup** on their idea for the future (experiment or theory) or their opinion or whatever.

We want to gather these to help provide **input to the white paper** – not necessarily as a cut & paste exercise (although we may indeed grab text), but to inform the white paper's content and emphasis.

Twelve of you volunteered to work as note-takers. Thanks!

- Morning before coffee (9:00-10:40): Breedon, Schellman
- Morning after coffee (11:10-12:30): Escobar, Karagiorgi
- Afternoon session one (14:00-14:51): Katori, Maloney
- Afternoon session two (14:51-15:36): Mills, Mishra
- Afternoon session three (15:56-16:53): Neuffer, Patterson
- Afternoon session four (17:13-18:00): Davies, Guardincerri

Other ad hoc note-takers are certainly welcome!

We'll use note-taker output to help with the white paper too.

Our goal is to write a **white paper** on the **Physics Opportunities in Neutrino Physics**, concentrating on (but not restricted to) the **Intensity Frontier**. A draft is supposed to be ready by the Intensity Frontier Workshop in DC – before November 30.

In order to get the ball rolling, We will go over a very rough draft outline.

DISCLAIMER: This is work in progress. It is not meant to be complete or even close to the “final version”. If your favorite topic is not mentioned (and I am sure it won't be for a subset of you) do not feel offended or left out.

Needless to say, comments, criticisms and other types of feedback are required. This is why we are here!

Last but not least: **Volunteers Welcome!**

1. Introduction

- current status of neutrino physics (experiment and theory). Where we are.
- the pertinent questions we would like to address, and the challenges (experiment and theory).
- where we think we will be by \sim the end of this decade.

2. Testing the standard neutrino paradigm. 3-Flavor Neutrino Oscillations

- phenomenology.
- neutrino sources: accelerators, reactors, and natural sources. Challenges and opportunities.
- neutrino detectors: challenges and opportunities.

3. **Testing the standard neutrino paradigm. Weighing neutrinos**
 - precision measurements of beta-decay. Challenges and opportunities.
 - neutrinos and the early universe.
4. **Testing the standard neutrino paradigm. The nature of the neutrinos (Majorana or Dirac)**
 - theory and phenomenology.
 - double-beta decay.
 - other searches for lepton number violation (colliders, flavor physics).
5. **Neutrino scattering**
 - importance for oscillation searches.
 - theory and phenomenologies. Current and future challenges.
 - experimental challenges and opportunities.
 - neutrino scattering and precision tests of the Standard Model.
 - new physics in neutrino scattering.

6. Neutrinos in Cosmology and Astrophysics

- neutrinos and the early universe. Challenges and opportunities.
- Leptogenesis.
- neutrinos from supernova explosions and other MeV sources. Challenges and opportunities.
- ultra-high energy neutrinos and cosmic rays. Challenges and opportunities.
- solar neutrinos. Challenges and opportunities.
- geoneutrinos. Challenges and opportunities.
- neutrino detectors and the search for dark matter.

7. Short-Baseline Anomalies and New Physics

- introducing the short baseline anomalies.
- theoretical explanations and associated phenomenology.
- short-wavelength oscillation experiments. Challenges and opportunities.
- synergy with plans to test the standard paradigm.
- non-neutrino tests (charged-leptons, mesons, etc).

8. New New Physics and Neutrinos

- looking for new physics with neutrino oscillations.
- some theoretical possibilities and their phenomenology.

9. Neutrinos and the Energy Frontier

- Neutrinos and high energy collider experiments.
- Synergy between neutrino beams (conventional and muon-decay beams) and high energy muon colliders. Challenges and opportunities.

Intensity Frontier Workshop in DC



<http://www.intensityfrontier.org/>

Important: Seriously Consider Signing Up!