

NF08/TF11 – Theory of Neutrino Physics

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Draft Outline for Discussion

1 Introduction

2 Neutrino mass and flavor model-building

2.1 What is the Mechanism Behind Non-Zero Neutrino Masses?

2.2 Neutrinos and the Flavor Puzzle

3 Neutrino Phenomenology

The role of theory in providing guidance for experiments sensitive to neutrino properties and interactions.

We expect other TGs to discuss the experimental and operational aspects.

3.1 Neutrino Oscillations

3.2 The Short-Baseline Anomalies

3.3 Neutrino Scattering

3.4 High Energy Colliders

3.5 Charged-Lepton and Meson Processes

4 Not-Neutrino Phenomenology for Neutrino Experiments

This discusses other phenomenology opportunities for next-generation neutrino experiments

4.1 Near-Detector Opportunities

4.2 Far-Detector Opportunities

5 Neutrinos in Astrophysics and Cosmology

5.1 High-energy neutrinos (sub-GeV to supra-PeV)

5.2 Diffuse supernova neutrinos and galactic supernova

5.3 Solar Neutrinos

5.4 Cosmic neutrino background

5.5 Clustering and large-scale structure

5.6 Hubble Tension and N_{eff}

5.7 Absolute neutrino mass measurements

6 Neutrino cross sections

6.1 The needs of the neutrino experimental program

6.2 Nucleon cross sections

6.3 Coherent elastic neutrino-nucleus scattering

6.4 Nuclear cross sections from QE regime to pion-production and resonance regions

6.5 Neutrino-induced shallow and deep inelastic scattering

6.6 Interface with generators

7 $0\nu\beta\beta$ and other nuclear-physics probes of neutrino properties

7.1 Introduction

7.2 Neutrino mass models

7.3 Bridging particle and nuclear physics with EFTs

7.4 Lattice QCD calculations for neutrinoless double beta decay

7.5 *Ab initio* and many-body calculations of $0\nu\beta\beta$ nuclear matrix elements

8 Outlook: 10 years deliverables and assessment of required resources