Academic Report (2020-21)

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Research Summary:

My work over the past year has focussed on understanding the anomalous signals observed at the Liquid Scintillator Neutrino Detector (LSND) and at MiniBooNE, both of which have reported an excess of electron-like events in their signal. Over the past decade, empirical evidence has mounted against what was assumed to be the most likely solution, $i.e$, oscillations between active and sterile neutrinos with masses in the $1 - 10$ eV range. This has led to a large number of efforts to find non-oscillation new physics solutions to these anomalies. We have worked on finding a solution which would also explain the observed anomalous muon $g - 2$ value measured at both Brookhaven earlier and Fermilab recently. The papers listed below are a result of these efforts.

Publications:

1. W. Abdallah, R. Gandhi and S. Roy, *Understanding the MiniBooNE and the muon and electron $g - 2$ anomalies with a light Z' and a second Higgs doublet,* JHEP **12**, 188 (2020), doi:10.1007/JHEP12(2020)188 [arXiv:2006.01948 [hep-ph]].

Collaboration Publications:

1. B. Abi *et* al. [DUNE], *Deep Underground Neutrino Experiment (DUNE), Far Detector Technical Design Report, Volume III: DUNE Far Detector Technical Coordination,* JINST **15**, no.08, T08009 (2020) doi:10.1088/1748-0221/15/08/ T08009, [arXiv:2002.03008 [physics.ins-det]].

2. B. Abi *et al.* [DUNE], *Deep Underground Neutrino Experiment (DUNE), Far Detector Technical Design Report, Volume IV: Far Detector Single-phase Technology,* JINST **15**, no.08, T08010 (2020), doi:10.1088/1748-0221/15/08/T08010, [arXiv:2002.03010 [physics.ins-det]].

3. B. Abi *et al.* [DUNE], *Deep Underground Neutrino Experiment (DUNE), Far Detector Technical Design Report, Volume I Introduction to DUNE,* JINST **15**, no.08, T08008 (2020), doi:10.1088/1748-0221/15/08/T08008, [arXiv:2002.02967 [physics.ins-det]].

Collaboration Preprints:

1. A. Abed Abud *et al.* [DUNE], *Deep Underground Neutrino Experiment (DUNE) Near Detector Conceptual Design Report,* [arXiv:2103.13910 [physics.ins-det]].

2. B. Abi *et al.* [DUNE], *Deep Underground Neutrino Experiment (DUNE), Far Detector Technical Design Report, Volume II: DUNE Physics,* [arXiv:2002.03005 [hep-ex]].

Conference/Workshops Attended:

1. NEUTRINO 2020, June 22 to July 3 2020 (Virtual Meeting).

Invited Lectures/Seminars:

1. Theory Seminar, IIT Mumbai, November 2020.

Other Activities:

1. Member, DUNE International Collaboration.
2. Member, Institutional Board, DUNE International Collaboration.
3. Member, Analysis Review Committee, DUNE International Collaboration.
4. Taught Particle Physics, Spring 2020, HRI Graduate Program.
5. Taught Particle Physics, Spring 2021, HRI Graduate Program.