

# Certificate

This is to certify that the thesis titled *Investigating various aspects of non-standard interaction in neutrino*, submitted by *Trisha Sarkar (P18PH006)* to the Indian Institute of Technology Jodhpur for the award of the degree of *Doctor of Philosophy*, is a bonafide record of the research work done by her under my supervision. To the best of my knowledge, the contents of this report, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

*Monika Sinha.*

*Dr. Monika Sinha*  
*Ph.D. Thesis Supervisor*

# Declaration

I hereby declare that the work presented in this thesis entitled *Investigating various aspects of non-standard interaction in neutrino* submitted to the Indian Institute of Technology Jodhpur in partial fulfillment of the requirements for the award of the degree of Doctor of Philosophy, is a bonafide record of the research work carried out under the supervision of Dr. Monika Sinha. The contents of this thesis in full or in parts, have not been submitted to, and will not be submitted by me to, any other Institute or University in India or abroad for the award of any degree or diploma.



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*Trisha Sarkar*

# List of acronyms

- CP** Charge conjugation-Parity
- CPT** Charge conjugation-Parity-Time
- BH** Black Hole
- DUNE** Deep Underground Neutrino Experiment
- LBL** Long Baseline
- SBL** Short Baseline
- SM** Standard Model
- BSM** Beyond Standard Model
- NP** New Physics
- NSI** Non Standard Interaction
- CC** Charged Current
- NC** Neutral Current
- NO** Normal Ordering
- IO** Inverted Ordering
- DIS** Deep Inelastic Scattering
- PDF** Parton Distribution Function
- LGI** Leggett-Garg Inequality
- LGI** Leggett-Garg type Inequality
- EPR** Einstein-Podolsky-Rosen
- CHSH** Clauser-Horne-Shimony-Holt
- MR** Macroscopic Realism
- NIM** Non-Invasive Measurement
- BNL** Brookhaven National Laboratory
- DONUT** Direct Observation of the Nu Tau
- LSND** Liquid Scintillator Neutrino Detector

**MiniBooNE** Mini Booster Neutrino Experiment

**PMNS** Pontecorvo-Maki-Nakagawa-Sakata

**CERN** European Council for Nuclear Research

**ARA** Askaryan Radio Astronomy

**ANTARES** Astronomy with a Neutrino Telescope and Abyss environmental RESearch project

**ANITA** Antarctic Impulsive Transient Antenna

**CKM** Cabibbo-Kobayashi-Maskawa

**WIMP** Weakly Interacting Massive Particle

**CMB** Cosmic Microwave Background

**WMAP** Wilkinson Microwave Anisotropy Probe

**LFV** Lepton Flavour Violation

**LFUV** Lepton Flavour Universality Violation

**GZK** Greisen-Zatsepin-Kuzmin

**AGN** Active Galactic Nuclei

**GRB** Gamma Ray Burst

**KATRIN** Karlsruhe Tritium Neutrino Experiment

**LMA** Large Mixing Angle

**GALLEX/GNO** Gallium Experiment/Gallium Neutrino Observatory

**SAGE** Soviet-American Gallium Experiment

**KamLAND** Kamioka Liquid Scintillator Antineutrino Detector

**SK** Super Kamiokande

**RENO** Reactor Experiment for Neutrino Oscillation

**LED** Large Extra Dimension

**EWSB** Electroweak Symmetry Breaking

**UHE** Ultra High Energy

**NESTOR** Neutrino Extended Submarine Telescope with Oceanographic Research Project

**NEMO** Neutrino Ettore Majorana Observatory

**KM3NeT** Cubic Kilometre Neutrino Telescope

**ARIANNA** Antarctic Ross Ice-Shelf Antenna Neutrino Array

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