DECLARATION BY THE CANDIDATE

I, Lavina Sarma, hereby declare that the subject matter in this thesis entitled, **"Theoretical and phenomenological consequences of neutrino mass, leptogenesis and dark matter within Beyond Standard Model (BSM)"**, is a presentation of my original research work. Whenever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature and acknowledgment of collaborative research and discussions.

The work is original and has not been submitted earlier as a whole or in part for a degree or diploma at this or any other Institution or University.

This thesis is being submitted to the Tezpur University for the degree of Doctor of Philosophy in Physics.

Place: Tezpur. Lavina Sarma

Date: Signature of the candidate

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CERTIFICATE OF THE SUPERVISOR

This is to certify that the thesis entitled **"Theoretical and phenomenological consequences of neutrino mass, leptogenesis and dark matter within Beyond Standard Model (BSM)"** submitted to the School of Sciences of Tezpur University in partial fulfillment for the award of the degree of Doctor of Philosophy in Physics is a record of research work carried out by **Ms Lavina Sarma** under my supervision and guidance.

All help received by her from various sources have been duly acknowledged.

No part of this thesis have been submitted elsewhere for award of any other degree.

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CERTIFICATE OF THE EXTERNAL EXAMINER AND ODEC

This is to certify that the thesis entitled **"Theoretical and phenomenological consequences of neutrino mass, leptogenesis and dark matter within Beyond Standard Model (BSM)"** submitted by **Ms Lavina Sarma** to the School of Sciences of Tezpur University in partial fulfillment for the award of the degree of Doctor of Philosophy in Physics has been examined by us on...../...../..... and found to be satisfactory.

(Prof Mrinal Kumar Das) **(External examiner)**

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Date: (Lavina Sarma)

Abbreviations

Abbreviation	Meaning
SLAC	Stanford Linear Accelerator Center
DONUT	Direct Observation of the nu tau
PMNS	Pontecorvo–Maki–Nakagawa–Sakata
SM	Standard Model
CP	Charge-Parity
CL	Confidence Level
BSM	Beyond Standard Model
DM	Dark Matter
BAU	Baryon Asymmetry of Universe
LHC	Large Hadron Collider
keV	Kilo Electron Volt
$0\nu\beta\beta$	Neutrinoless Double Beta Decay
LFV	Lepton Flavor Violation
LRSM	Left-Right Symmetric Model
MSW	Mikheyev-Smirnov-Wolfenstein
SAGE	Soviet–American Gallium Experiment

GALLEX	Gallium Experiment
GUT	Grand Unified Theory
KamLAND-Zen	Kamioka Liquid Scintillator Anti- Neutrino Detector-Xenon
LSND	Liquid Scintillator Neutrino Ditector
MiniBOONE	Mini Booster Neutrino Experiment
MINOS	Main Injector Neutrino Oscillation Search
SNO	Sudbury Neutrino Observatory
K2K	KEK to Kamioka
T2K	Tokai to Kamioka
RENO	Reactor Experiment for Neutrino Oscillation
eV	Electron Volt
TeV	Tera Electron Volt
VEV	Vacuum Expectation Value
NH	Normal Hierarchy
NO	Normal Ordering
IH	Inverted Hierarchy
IO	Inverted Ordering
KATRIN	Karlsruhe Tritium Nneutrino Experiment
DW	Dodelson-Widrow
LEP	Large Electron-Positron Collider
FIMP	Feebly Interacting Massive Particle
EWSB	Electro Weak Symmetry Breaking
ν2HDM	Neutrino Two Higgs Doublet Model
BBN	Big Bang Nucleosynthesis

IHDM	Inert Higgs Doublet Model
RHN	Right-Handed Neutrino
MACHO	Massive Astrophysical Compact Halo Object
HDM	Hot Dark Matter
CDM	Cold Dark Matter
WDM	Warm Dark Matter
WIMP	Weakly Interacting Massive Particle
LUX	Large Underground Xenon Dark-Matter Experiment
Panda	antiProton ANnihilation at DArmstadt
IR	Infrared Radiation
UV	Ultraviolet Radiation
GERDA	Germanium Detector Array
CUORE	Cryogenic Underground Observatory for Rare Events
EXO	Enriched Xenon Observatory
MEG	Mu to E Gamma
CR	Conversion Ratio
COMET	Coherent Muon to Electron Transition
P	Parity
T	Time Reversal

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Dedicated to my parents and brother.