Dedicated to

Maa and Deuta

For dust you are and to dust you will return

-- Genesis 3:19

Declaration by the candidate

I, **OLAG PRATIM BORDOLOI**, declare that the thesis entitled **"A multi-wavelength study of the interstellar medium of dwarf irregular galaxies**" is a record of my own work carried out under the supervision of **Dr. Rupjyoti Gogoi** during the period from **July, 2018** to **January, 2024**. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree in Doctor of Philosophy at Tezpur University. Where no part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work. I have acknowledged all main sources of help.
- Whereas the thesis is based on the work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

Olag Pratim Bordoloi

Date: 25-07-2024 (Olag Pratim Bordoloi)

Place: Tezpur University Regd. No.: TZ201052 of 2019

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Certificate from the Supervisor

This is to certify that the thesis entitled **"A multi-wavelength study of the interstellar medium of dwarf irregular galaxies"**, submitted to the School of Sciences, Tezpur University in partial fulfillment of the requirements for the award of the degree of **Doctor of Philosophy** in **Physics** is a record of original research work carried out by **Mr. Olag Pratim Bordoloi** under my supervision and guidance.

All help received by him from various sources have been duly acknowledged. No part of this thesis has been submitted elsewhere for award of any other degree.

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"Kind words can be short and easy to speak, but their echoes are truly endless"

- Mother Teresa

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Olag Pratim Bordoloi

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Nomenclature

Acronyms / Abbreviations

AGB Asymptotic Giant Branch

BCD Blue Compact Dwarf

CMB Cosmic Microwave Background

CNM Cold Neutral Medium

CZTI Cadmium Zinc Telluride Imager

dIrr Dwarf Irregular

dSph Dwarf Spheroidal

FIGGS Faint Irregular Galaxies GMRT Survey

FIR Far Infrared

FUSE Far Ultraviolet Spectroscopic Explorer

FUV Far Ultraviolet

FWHM Full Width at Half Maximum

GDL GNU Data Language

HIFI Heterodyne Instrument for the Far Infrared

HIM Hot Ionized Medium

Ho II Holmberg II

HST Hubble Space Telescope

IRAC Infrared Array Camera

IR Infrared

IRS Infrared Spectrograph

ISM Interstellar Medium

JUDE Jayant's UVIT Data Explorer

JWST James Webb Space Telescope

LAXPC Large Area X-ray Proportional Counter

LEGUS Legacy Extragalactic UV Survey

LMC Large Magellanic Cloud

MIPS Multiband Imaging Photometer for Spitzer

NIR Near Infrared

NUV Near Ultraviolet

PACS Photoconductor Array Camera and Spectrometer

PAH Polycyclic Aromatic Hydrocarbon

PSF Point Spread Function

SDSS Sloan Digital Sky Survey

SED Spectral Energy Distribution

SFR Star Formation Rate

SHIELD Survey of HI in Extremely Low Mass Dwarfs

SMC Small Magellanic Cloud

SNe Supernovae

SPIRE Spectral and Photometric Imaging Receiver

SSM Scanning Sky Monitor

SXT Soft X-ray Telescope

THINGS The HI Nearby Galaxy Survey

UIT Ultraviolet Imaging Telescope

ULXP Ultra luminous X-ray Pulsars

ULX Ultra luminous X-ray

UVIT Ultra Violet Imaging Telescope

UV Ultraviolet

VSG Very Small Grains

WIM Warm Ionized Medium

WNM Warm Neutral Medium

XMM X-ray Multi-Mirror Mission