HELLENIC REPUBLIC
MINISTRY OF DEVELOPMENT
GENERAL SECRETARIAT FOR RESEARCH AND TECHNOLOGY

FOUNDATION FOR RESEARCH & TECHNOLOGY - HELLAS
INSTITUTE OF ASTROPHYSICS

Heraklion, 1 May 2020

PhD Fellowships at IA-FORTH

The Institute of Astrophysics of the Foundation for Research and Technology – Hellas (IA-FORTH) announces the availability of PhD fellowships in the four research topics described bellow under the supervision of Dr. Tanio Diaz Santos (tanio@ia.forth.gr). The selected student/students will be registered in the PhD program of the Dept. of Physics of the Univ. of Crete and are expected to commence by the end of 2020 or early 2021. The net monthly fellowship stipend is 750 Euros.

IA-FORTH is located in Heraklion, at the island of Crete, Greece. It was founded in 2018 and offers a stimulating research environment access to unique research facilities, including Skinakas Observatory, as well as international collaborations with leading astrophysics groups at institutes and universities across the globe. A detailed description of the activities of IA-FORTH is available at:

http://www.ia.forth.gr

To obtain more details about the projects one may contact Dr. Tanio Diaz Santos (tanio@ia.forth.gr). For more information on the application process please contact Ms. Eleftheria Tsentelierou (info@ia.forth.gr, phone: +30-2810-394200). To apply provide your CV and a research statement specifying the project of interest, to info@ia.forth.gr. The applications will be reviewed on a first come first serve basis, with a hard deadline July 31, 2020.

A. Star formation across the merger sequence of luminous infrared galaxies

The PhD candidate will use spatially resolved Hubble Space Telescope (HST) observations of near-IR hydrogen recombination lines as well as new CO(2-1) ALMA observations of the molecular gas content of a sample of nearby luminous IR galaxies (LIRGs) undergoing a merger process to investigate the properties of individual star-forming regions and gas clumps at unprecedented physical scales of ~100 pc. The goals of this project are: (1) to establish a connection between the gas clump properties and the dynamical parameters that describe the evolution of the galaxy interaction, (2) to estimate the time-scale of star cluster formation and disruption, and (3) to calculate the molecular gas fraction and star formation efficiency of individual clumps on-and-above the main-sequence of star-forming galaxies. This project will provide the PhD with the opportunity to develop potential future programs investigating the hot dust content of resolved star-forming regions in LIRGs with the James Web Space Telescope.

B. Physical properties of hot dust-obscured galaxies (Hot DOGs)

Hot Dust Obscured Galaxies (Hot DOGs) are a new population of galaxies located at redshifts z ~ 1–4.6, with IR luminosities in excess of 10^{13} $L_{\odot}$, and powered by obscured accretion onto a central super-massive black hole (SMBH). Such luminous active galactic nuclei (AGN) are likely to be at a key stage of

www.ia.forth.gr
Nikolaou Plastira 100
Vasilika Vouton
GR 700 13 Heraklion
Tel. +30 2810-394200
Fax +30 2810-394301
Email: info@ia.forth.gr

their evolution –when feedback from the AGN may have started quenching star formation–, just about to become regular quasars and decay into dead elliptical galaxies. The PhD candidate will analyze ALMA observations of W2246-0526, the most IR-luminous galaxy known, including most of the brightest far-IR fine-structure lines: [CII]158μm, [NII]122μm and 205μm, [OI]63μm, [CI]609μm and 370μm, [OI]145μm and [OIII]88μm. This project aims to constrain the gas properties of W2246's host galaxy and investigate whether feedback from the central hyper-luminous AGN plays an important role in shaping the state of the host's ISM. This study will lay the foundation for follow-up ALMA programs investigating the overall Hot DOG population.

C. The APEX/LABOCA FAr-IR mJy Observations of the RBGS (ALFAJOR) Survey

The PhD candidate will work on the ALFAJOR survey and analyze more than 120 hours of new sub-millimeter APEX/LABOCA 870μm dust continuum observations of a complete, flux-limited sample of more than a hundred IR-bright systems drawn from the Revised Bright Galaxy Survey, which contain the largest sample of luminous and ultra-luminous IR galaxies (U)LIRGs in the local Universe. Combined with multi-wavelength photometry from all-sky surveys like 2MASS, WISE and the available IRAS data, he/she will: (1) construct UV-through-sub-mm spectral energy distributions (SED) and use physically motivated, semi-empirical SED models to accurately constrain their physical properties (stellar, gas and dust masses, star formation rates, ages of the stellar populations, etc.), and (2) place an anchor on the local, sub-mm luminosity function, constraining the galaxy number counts in the nearby Universe. The goal of ALFAJOR is to become the first survey to provide a local benchmark with which to investigate the evolution of the interstellar medium content across cosmic time.

D. The Hot Activity in Dusty Environments Survey (HADES)

The HADES project is focused on the investigation of the physical properties of the warmest, most compact Luminous Infrared Galaxies (LIRGs) in the local Universe. The PhD candidate will analyze 45h of Herschel/PACS integral field observations of the brightest far-IR emission lines: [CII]157.7μm, [OI]63.2μm and [OIII]88μm. Combined with archival near-IR WISE imaging and Spitzer/IRS spectroscopy she/he will use photo-dissociation region (PDR) models and spectral line synthesis codes like CLOUDY to derive the physical conditions (density, n_H, and intensity of the ionizing field, G_0) of the neutral and ionized atomic as well as the molecular gas-phase in these sources. The goal of HADES is to characterize the main energy source powering these galaxies, which are in a critical phase of their evolution, probably a few Myr ahead of becoming optical quasars. This research project is critically connected to the high-redshift population of hot-dust obscured galaxies (Hot DOGs), as the HADES galaxies could potentially be their local counterparts.

www.ia.forth.gr

Nikolaou Plastira 100
Vasilika Vouton
GR 700 13 Heraklion
Tel. +30 2810-394200
Fax +30 2810-394301
Email: info@ia.forth.gr