

Technical Page

Proposal Type: Regular
 General Category: Astronomy
 Sub-Category: Spectroscopy
 Observation Category: Galactic
 Total Time Requested: 84 Hours
 Minimum Useful Time: full sidereal pass is the minimum

Proposal Title: Stalking the Cosmic 3-Helium Abundance

ABSTRACT:

Our measurements of 3-He in the Galaxy have led to "The 3-He Problem" whereby HII region abundances do not show the 3-He enrichment expected from standard stellar nucleosynthesis yet some planetary nebulae (PNe) have 3-He abundances that are in accord with standard models. Recently Eggleton et al. used a new 3D hydrodynamic code to model a low-mass star at the tip of the red giant branch. They claim to have discovered an instability that leads to extra-mixing and a concomitant destruction of 3-He. They claim this is a Raleigh-Taylor instability caused by a molecular weight inversion that is produced by 3-He burning at the edge of the hydrogen burning shell. This scenario predicts that ALL stars should experience this instability and destroy the 3-He produced during main sequence evolution. This is inconsistent with our detections of 3-He at canonical abundances in NGC3242 and J320. We will use the unique spectral sensitivity of the Arecibo telescope to confirm our J320 detection and to improve the tentative detections we have for 2 more PNe. Robust 3-He PNe detections at canonical abundances will falsify the universality of the Eggleton et al. mixing hypothesis.

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Remote Observing Request

- Observer will travel to AO
- Remote Observing
- In Absentia (instructions to operator)

Instrument Setup

X-high X-high

Atmospheric Observation Instruments:

Special Equipment or setup: none

RFI Considerations

Frequency Ranges Planned

8 - 10 GHz experience shows
RFI at relevant bands is not
an issue.