Technical Page

Proposal Type:	Short
General Category:	Astronomy
Sub-Category:	Spectroscopy
Observation Category:	Extragalactic
Total Time Requested:	4 Hours
Minimum Useful Time:	1 hour

Proposal Title: Direct Temperature Measurement of Star Forming Gas at $z = 2.5$: Ammonia in the Cloverleaf

ABSTRACT:

We propose to observe the ammonia (1,1), (2,2), and (3,3) inversion lines in the Cloverleaf, a lensed quasar host at $z \sim$2.5. The inversion lines of ammonia will be used as an accurate and easy-to-use thermometer of the dense molecular gas. This will allow us to break the notorious temperature-density degeneracy that hampers the interpretation of rotational lines from linear molecules such as CO. The proposed observations will not only allow us to make one of the first *direct* temperature measurements of dense molecular, star forming gas at that redshift, but it would also be the highest redshift ammonia detection by far. The same observations will allow us to search for the redshifted water maser line, a potential tracer of the accretion disk of the central black hole within the Cloverleaf. The incredible collecting area, outstanding receiver performance at the redshifted ~ 6.7 GHz frequency, as well as the versatility of the WAPPs make Arecibo the only telescope in the world to perform this experiment.

Name	Institution	E-mail	Phone	Student
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Remote Observing Request

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

Instrument Setup

C-high

Atmospheric Observation Instruments:

Special Equipment or setup: Cooled C-band high receiver requested.

RFI Considerations

Frequency Ranges Planned

6100-6900