

Technical Page

Proposal Type: Regular
 General Category: Astronomy
 Sub-Category: Spectroscopy
 Observation Category:
 Total Time Requested: 51 Hours

Proposal Title: Probing Low Temperature and High Density Clouds via 6 cm Formaldehyde Absorption of the CBR

ABSTRACT:

The lowest transition of ortho-formaldehyde (H₂CO) is seen in absorption against the cosmic background radiation in molecular clouds. The reason for this peculiar behavior is that the excitation temperature of these levels is lowered by collisional pumping. As the density rises, however, the level populations are forced toward equilibrium at the kinetic temperature, and the line goes into emission. Since these levels lie very low in energy, they provide a probe of high density material at low temperature. A previous proposal was assigned observing time in December 2001. Considerable time was required to develop the optimum observing strategy for this type of observation at Arecibo, and we determined that total power “on source” observations were ideal for these very narrow lines, and yielded baseline noise consistent with radiometric fluctuations, once a low-order polynomial was removed. With the improvement in sensitivity resulting from elimination of switching, we were able to obtain limited measurements of three pre-protostellar clouds. The formaldehyde absorption is clearly mappable, and we have achieved unparalleled resolution of the hyperfine components of the 6cm inversion doublet. We are here proposing to extend the observations to fully define the extent of the absorption in these clouds. We are also proposing to expand our source list to include other protostellar clouds which may be dense enough in their central regions to drive this transition into emission.

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Service Observing Request

- None
- All of the observing run.
- Part of the observing run.
- Queue Observing

Remote Observing Request

- No
- Maybe
- Yes

Instrument Setup

C

Atmospheric Observation Instruments:

Special Equipment or setup: none

RFI Considerations

Frequency Ranges Planned