Observations of the 9 GHz transition of Cyanoacetylene at the GBT

Stevens Johnson, Hyunjoo Kim, Marko Krčo, Yvonne Tang

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1 THE HC$_3$N MOLECULE

- HC$_3$N is one of the HC$_{2n+1}$N family of complex molecules
- Often found in carbon rich regions (e.g. circumstellar envelopes) (Jewell & Snyder, 1984)
- Typical line widths of $0.5 km/sec$ indicate HC$_3$N is likely a tracer of high density regions.
2 Observations

- GBT X-Band (8-10GHz receiver)
- 9.1 GHz rest frame frequency with a 50MHz bandwidth
- Position Switched single point spectra of 3 sources
- Off positions 1 degree off in Dec.
3 W51M

- A portion of a supernova remnant heated by a nearby young star (15 $M_{\text{sol}}$)
- No HC$_3$N or HC$_7$N detections. Upper limit of 0.09 K required for a $3\sigma$ detection
- No other molecular lines detected in band, perhaps we missed the source
A post-AGB F5 star in the egg nebula with a carbon-rich circumstellar disk.

No convincing HC$_3$N or HC$_7$N detections. No other molecular lines in band.
5 TMC1

- Strong 3K main line, 2 hyperfine lines \((8 \times 10^{-9}eV & 5.4 \times 10^{-9}eV)\)
- Well known dense cloud in the Taurus Molecular Cloud Complex (a large star formation region)
- Optically thin emission, hyperfine line intensity ratios correspond to atomic physics
- Definitely fills the beam
- Typical excitation temperatures for TMC1 of 8K
- Used integrated intensity of all three lines to compute the column density of HC$_3$N.
- Our value of $2 \times 10^{15} \text{cm}^{-2}$ agrees “reasonably” well with accepted values
- Our thanks to Harvey Liszt