Vibrational temperatures of HC_3N in Sagittarius B2(N)

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Sagittarius (Sgr) B2(N) having complicated cores is one of the most famous massive star-forming regions. Investigation of its core structures is a crucial step to understand the formation process of those regions. As a previous work, Belloche *et al*. observed the rotational lines of various vibrational states for HC_3N in the 80-267 GHz region and divided them into four velocity components of 51, 63, 72 and 78 km/s [1]. The assumed rotational temperatures of 200-230 K could reproduce intensities of the observed lines in their analysis. In the present work, we observed the J = 12-11 transitions of the vibrational states of $v_6 = 1$, $v_7 = 1$ and $v_6 = v_7 = 1$ with Nobeyama 45 m radio telescope. The vibrational temperatures of HC_3N in the 108.9-110.5 GHz region for individual velocity components were derived independently by using the rotation diagram of these components, as shown in Fig.1. The vibrational temperatures of 255-417 K obtained, as shown in Table 1, were higher than the assumed rotational temperatures in the previous work [1]. These higher temperatures are thought to be due to radiative pumping.

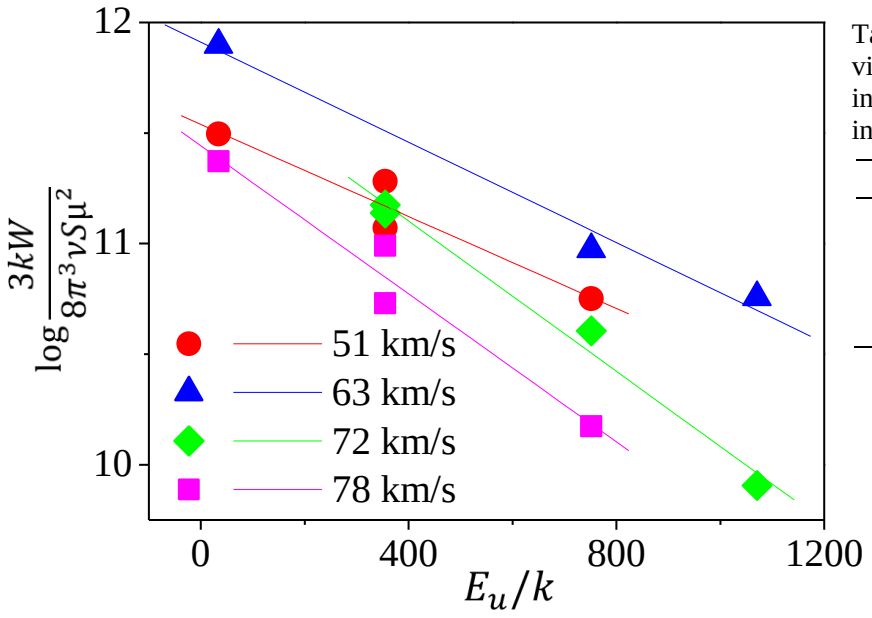

Figure 1: The rotation diagram of four velocity components for HC_3N in Sgr B2(N).

Table 1: The determined vibrational temperatures of individual components in Sgr B2(N).

V (km/s)	T_{vib} (K)
51	417 ± 83
63	383 ± 48
72	255 ± 22
78	259 ± 40

References

[1] A. Belloche, H. S. P. Müller, K. M. Menten, P. Schilke & C. Comito, 2013, A&A 559, A47.