Methanol maser survey observation with the Nobeyama 45 m telescope

Kazuaki Fukushima,[1] Kaori Kobayashi,[1] Tomoya Hirota,[2]

[1]Department of Physics, University of Toyama, Japan
[2]National Astronomical Observatory of Japan and SOKENDAI (The Graduate University for Advanced Studies), Japan

Circular polarization from methanol masers are observed in star-forming regions at several frequencies (6.7 GHz etc.) [1, 2]. If this circular polarization is caused by the Zeeman effect, it is possible to get information on magnetic field strength. It has been proposed that magnetic field is related to star formation closely and it will be a clue to understanding star formation by obtaining information on magnetic field in star-forming regions. For this purpose, it is essential to know laboratory data of the Zeeman effect of methanol (or, g-factor) so that the magnetic field can be deducted from the splitting of the observed methanol masers. There is a preliminary study on the Zeeman effect of methanol. A series of transitions in the 25 GHz range were observed [3] and the results were applied to the different transitions. This is not appropriate treatment and we have started laboratory measurements of methanol transitions to determine gfactor to obtain Zeeman effect on any transitions.[4]

It is generally expected that the splittings of methanol transitions are larger for low *J*, *K* transitions. From this point of view, the 108 GHz transition, *J*, *K* = (0, 0)-(1, -1) (E sublevel) is one of the most promising transitions. However, the observations of this transition were limited and hence, we carried out a survey of 108 GHz methanol masers along with other transitions at 95, 96, and 107 GHz by using Nobeyama 45 m telescope in April 2016. We observed in total 36 high-mass star-forming regions associated with 6.7 GHz methanol masers. We will discuss the comparison between the sources and the relative intensities of the 4 transitions above.

References

[1] A. P. Sarma, 2012, Proc. IAU Sympos. No. 287, 41.
[2] W. H. T. Vlemmings, 2012, Proc. IAU Symp. No. 287, 31.
[3] C .K. Jen, 1951, Phys. Rev. 81, 197.
[4] K. Takagi, S. Tsunekawa, K. Kobayashi, T. Hirota, F. Matsushima, 2015, The Physical Society of Japan 70(2), 555, 2015-09-16