

Multifrequency Monitoring of Class-II Methanol Masers with the Ibaraki 32-m Radio Telescopes

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Class-II methanol masers are widely used as probes of massive-star forming regions. Hitachi 32-m and Takahagi 32-m radio telescopes operated by Ibaraki University have been conducting long-term monitoring observations of methanol masers at 6.7, 12.2, 19.9, and 23.1 GHz. The monitoring program currently covers more than 400 sources and provides a large dataset for studying the temporal behavior of methanol maser emission.

The 6.7 GHz observations span more than ten years, while observations at 12.2, 19.9, and 23.1 GHz provide complementary information on other Class-II methanol maser transitions. In this presentation, we report the current status of the monitoring program and present updated observational results.

Among the detected sources, 54 sources at 6.7 GHz and 41 at 12.2 GHz were identified as variable. Twenty sources show variability at both frequencies. Periodicity searches using Lomb–Scargle analysis were also performed for variable sources. Several candidate periodic sources were identified, with the longest candidate periods reaching approximately 1300 days at 6.7 GHz and 250 days at 12.2 GHz.

At 19.9 and 23.1 GHz, NGC6334F and W3(OH) were detected, and both sources exhibit variability with possible periodic components of approximately 150 days. In both NGC6334F and W3(OH), comparison of the multifrequency light curves shows similar temporal behavior within the 6.7/12.2 GHz pair and within the 19.9/23.1 GHz pair, whereas the lower- and higher-frequency pairs exhibit different trends.