

A Search for Water Masers in the Saturnian System II

Shigeru Takahashi^{1*}, Shuji Deguchi¹, Nario Kuno¹, Tomomi Shimoikura², Fumi Yoshida³

¹Nobeyama Radio Observatory, ²Tokyo Gakugei University, ³NAOJ

The maser emissions are widely found in celestial objects such as dense cores of molecular clouds and circumstellar envelopes of late-type stars. These masers have been used as probes of gases with the H₂ number density of typically 10⁴-10¹⁰ cm⁻³.

For solar system objects, several maser and laser phenomena (CO₂, OH, H₂O etc.) have been found, and each phenomenon would be induced by different physical processes.

As for H₂O maser, the first detection was reported at the catastrophic impact of comet Shoemaker-Levy9 and Jupiter (Cosmovici et al. 1996). Recently, Pogrebenko et al. (2009) have reported the detections of H₂O masers from the Saturnian satellites (Titan, Hyperion, Enceladus and Atlas) with the Medicina 32m and Metsahovi 14m telescopes.

We have searched for the H₂O maser emission at 22.235 GHz from several Saturnian satellites with the Nobeyama 45m radio telescope in May 2009. Observations were made for Titan, Hyperion, Enceladus and Atlas, for which Pogrebenko et al. (2009) had reported detections, and in addition for Iapetus, and other inner satellites. However, we could not detect any signals of the water maser for all the satellites. Sensitivities of our observations were comparable or even better than those of Pogrebenko et al. (2009).

We infer that the water maser emission from the Saturnian system is extremely weak, or sporadic in nature. Monitoring over a long period and obtaining statistical results must be made for the further understanding of the water maser emission in the Saturnian system.

We have already reported the results of Titan, Hyperion, Iapetus, Enceladus and Atlas at the Annual Meeting of the Astronomical Society of Japan (Autumn 2009). In this meeting, we will report the new results of inner Saturnian satellites, and we summarize the water maser observations in 2009.

Cosmovici et al. 1996 Planet. Space. Sci., 44, 735

Pogrebenko et al. 2009, A&A, 494, L1

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