

Proposal of Observing 183 GHz Water Megamasers with VLBI: Scientific motivation and Feasibility

This study explores the scientific motivation and feasibility of observing water megamasers at 183 GHz using VLBI techniques. To date, more than a dozen extragalactic 183 GHz megamasers have been detected, with a high detection rate achieved through ALMA observations targeting known 22 GHz megamaser sources. Compared to the 22 GHz masers,

183 GHz millimeter-wave megamasers suffer less absorption around galactic nuclei, allowing access to regions previously unobservable with 22 GHz lines. Moreover, 183 GHz masers can trace regions of temperature and density where 22 GHz masers are not efficiently excited, providing complementary physical diagnostics. The shorter wavelength also enables spatial resolution approximately eight times higher than that of 22 GHz observations, making it possible to map these unique regions with unprecedented scales.

In the Northern Hemisphere, facilities such as the IRAM 30m, NOEMA, GLT 10m in Europe, as well as LMT, JCMT, and potentially KVN–Pyeongchang, are equipped for the 183 GHz observations. By combining these telescopes, we aim to realize VLBI observations of megamasers at this frequency band.

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