

ALMA2019: Science Results and Cross-Facility Synergies



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Sub-mm Water Vapor Megamasers in Nearby AGNs

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Contributed talk

Abstract:

“Water vapor megamasers in the accretion disks of active galactic nuclei uniquely probe sub-pc scale geometry and kinematics of nuclear molecular gas, provide gold-standard masses of supermassive black holes, and in some cases give geometric distances to the host galaxies, enabling a one-step measurement of the Hubble constant. Most previous observational work on water vapor megamasers has focused on the 22 GHz line, where masers in these circumnuclear disks can trace precise Keplerian rotation about the central black hole. Recent observations with ALMA have demonstrated for the first time that sub-mm lines, as well, can be detected in circumnuclear disks. Initial programs have targeted galaxies already known to host 22 GHz masers. We will discuss recent megamaser detections of the 321 GHz and 325 GHz water transitions, and then focus on the 183 GHz line. The 183 GHz transition is widely detected in known 22 GHz megamasers with peak line intensities typically a few times smaller than the 22 GHz lines. In some cases the sub-mm masers originate in the same thin, edge-on disk delineated by the 22 GHz lines, with sub-mm emission lines detected both at systemic and high rotation velocities, indicating masers on the front-side of the disk as well as on the edges, along the midline. Sub-mm masers can be used to probe temperatures and densities of gas in the accretion disk. With future observations, they also open up the opportunity to expand the number of precise, maser-determined black hole mass measurements.”

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Session Classification: Galaxies