VLA observations of Galactic Center OH 1720 MHz Masers: Sagittarius A East and the Circumnuclear Disk

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Abstract. We present new and archival Very Large Array (VLA) radio interferometry observations of the 1720 MHz OH masers in the Galactic Center (GC).

1. Summary

Most 1720 MHz OH masers arise in regions where the supernova remnant Sgr A East is interacting with the interstellar medium (ISM). However, here we also present several high-negative velocity masers, which together with previously detected high-positive velocity masers bracket the GC nuclear continuum radio source Sgr A*, both in position and velocity. The location and velocities of the high-negative and high-positive velocity masers are consistent with their being at the tangent points of, and physically located in the circumnuclear disk (CND).

OH absorption data does not support a direct interaction between the CND material and Sgr A East, ruling out the supernova remnant shock as the pump source for the high velocity masers. Instead we argue that the CND masers are pumped by dissipation between clumps in the CND.

We detected 13 new and 13 previously published masers brighter than ten times the channel rms; two previous detections were not redetected. Three new high-negative velocity masers confirm the existence of such masers after a single, never confirmed redetection of the -132 km/s maser. They are conjugate to the $+132$ km/s masers with respect to Sgr A* and thus must originate in the CND. They are probably unsaturated, and therefore physically different from the SNR OH masers (in green).

These results imply that 1720 MHz OH masers do not occur only in star-forming regions and in SNR/ISM interactions, but can also arise in clumpy and disturbed circumnuclear disks at small radii. If similar conditions occur in circumnuclear disks of extragalactic objects, sufficiently bright 1720 MHz OH maser lines could tentatively serve as an additional tool to study circumnuclear gas dynamics.

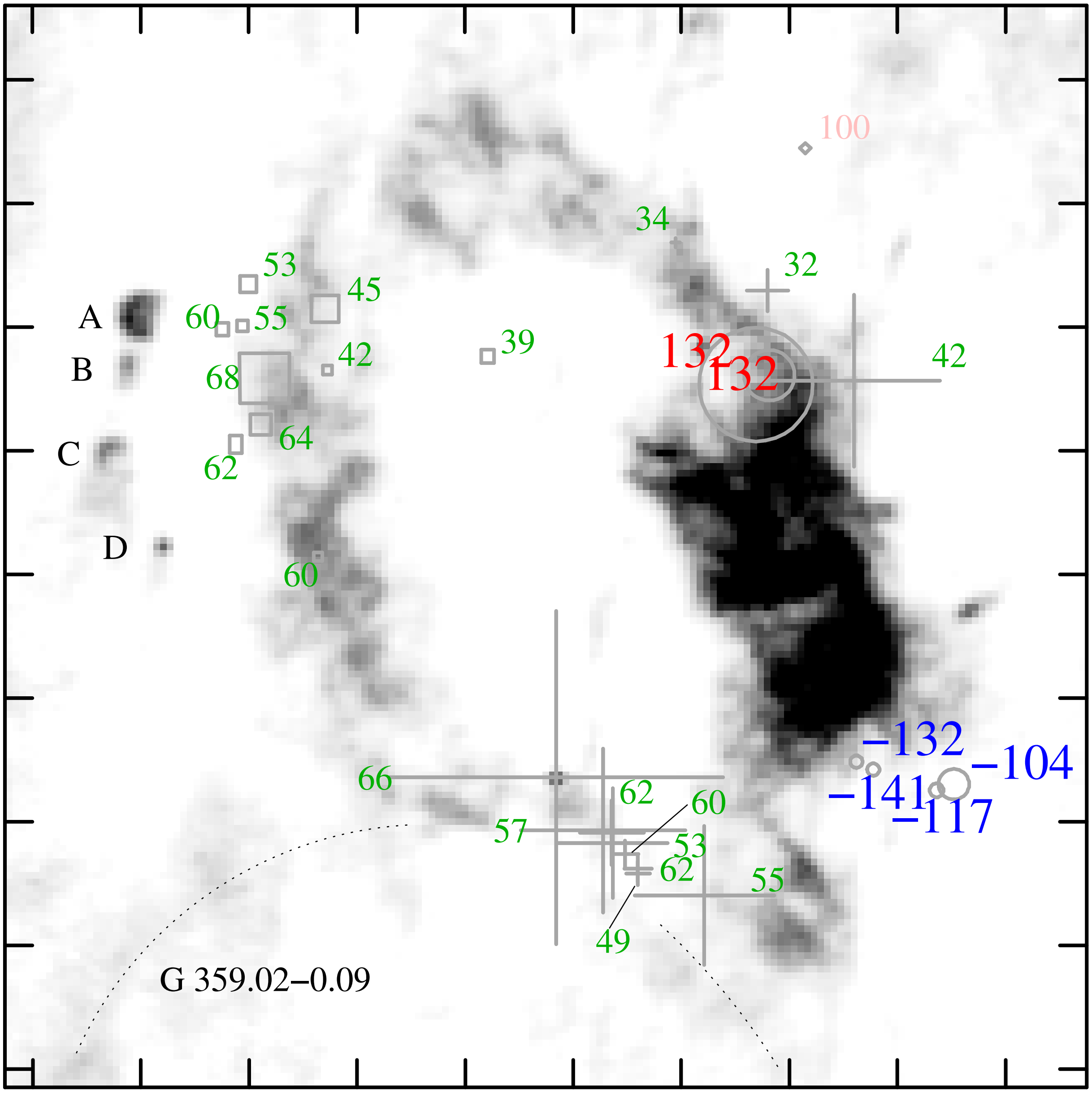

Figure 1. OH 1720 MHz masers superimposed on our 1.7 GHz radio continuum. Numbers associated with symbols are the maser LSR velocities. Pluses and squares denote masers associated with the SNR shell (green), circles are masers associated with the CND (red and blue), and the diamond (pink) represents a newly detected though unrelated maser. The size of the symbol scales with the brightness temperature, except for the brightest maser at +66 km/s, for which the symbol size is divided by a factor of five in order to fit the symbol in the figure. The dotted semi-circle outlines the SNR G359.02-0.09 and labels A-D identify HII regions.