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VLBI Structure of Sgr A* at 86 GHz

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The compact non-thermal radio source Sgr A*, which could mark the location of a 2.6 million solar mass black hole at the Galactic center, is clearly an important object for detailed study. Despite many years of VLBI observations, the intrinsic source structure of Sgr A* is not well determined because the scattering of the radiation by interstellar electrons leads to an apparent source size that varies with the square of the observing wavelength, λ^2 . The separation of any intrinsic structure from the scattering is of great importance in the discrimination of different models of the accretion process thought to be taking place near the central mass of the Galaxy.

We have carried out VLBI observations of Sgr A* at 86 GHz (λ 3.4 mm) using the Coordinated Millimeter VLBI Array (CMVA). The participating sites were the 25 m VLBA antennas at Pie Town, Fort Davis, Los Alamos, the 12 m antenna at Kitt Peak and the millimeter arrays at Hat Creek and Owens Valley. To avoid systematic calibration errors, which is a serious obstacle at such a short observing wavelength, closure information was used. Closure phases are consistent with a symmetric source structure which has a zero value. The result from closure amplitudes is consistent with a circular Gaussian model of 0.18 ± 0.02 mas (FWHP). The structure in the N-S direction, which is less well determined than in the E-W direction due to limited N-S (u,v) coverage, is constrained to be less than 0.3 mas by these measurements.