

S13b High resolution imaging of the molecular torus in NGC 1052 with VLBI

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We present the first subparsec-scale maps of HCN J=1-0 and HCO+ J=10 absorption in the circumnuclear region of the nearby radio galaxy NGC 1052. NGC 1052 is known to host a circumnuclear torus surrounding its central engine. The presence of a parsec-scale dense plasma torus has been proposed based on the measurements of free-free absorption in the innermost region of the radio jet obtained by the multi-frequency VLBI observations. Utilizing the 1 milli arcsec resolution achieved by the Korean VLBI Network, we have spatially resolved the HCN and HCO+ absorption against a double-sided nuclear jet structure. HCN and HCO+ are both known as good dense molecular gas tracers in galaxies. The absorptions show high optical depth concentrated on the receding jet and the nuclear components, where the free-free absorption occurred due to the torus. The HCN and HCO+ absorbing gases are likely to be associated with the torus. From the estimations of the column density and the volume density of molecular hydrogen, the size of the molecular gas region in the torus is at least 1 pc. The redshifted velocities of the HCN and HCO+ absorption features imply that HCN and HCO+ absorbing gas traces ongoing infall motion inside the circumnuclear torus onto the central engine.