

S37a ALMA View of the Circum-nuclear Disk of the Galactic Center

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The Circum-nuclear Disk (CND) of the Galactic center is a torus-like molecular gas around Sagittarius A* (Sgr A*); the overall motion of the CND is interpreted as rotation around Sgr A* with a velocity of ~ 100 km s⁻¹. However, the observed kinematics of the CND has not been fully explained by the rotation. There remains considerable controversy about the origin and life time of the CND.

We observed the CND in the CS, C³⁴S, SiO, H¹³CO⁺, CH₃OH, C₂H, and other emission lines with the Atacama Large Millimeter/submillimeter Array (ALMA) Band 3 in Cycle 1. The observation has been performed as a part of the large area mapping project of the Sgr A molecular cloud complex (2012.1.00080.S.). The data have angular resolutions of $(2.2 - 2.5)'' \times (1.5 - 1.8)''$ using “natural weighting” in UV sampling. The ALMA synthesized beam is approximately 4 times smaller than those of previous molecular line observations.

The CND is seen clearly as a rigid-body rotation like feature in the position-velocity diagrams of the CS, C³⁴S, SiO, and H¹³CO⁺ emission lines. The feature indicates that a ring-like structure really rotates around Sgr A*. There are also other peculiar features associating with the CND in the diagrams. One of these is the “tidally disrupted falling molecular cloud” which had been reported in the 2016 Spring Annual Meeting. Another is a molecular cloud seen toward the “Western Arc” of the “Minispiral”, which has a different radial velocity from that of the arc. These anomalies would be key information to understand the origin of the CND.