Q40a Spiral Magnetic Field and Their Role on Accretion Dynamics in the Circumnuclear Disk of Sagittarius A*: Insight from $\lambda = 850$ μm Polarization Imaging

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We present a study on the physical properties of the Circumnuclear Disk (CND) surrounding the supermassive black hole (SMBH) Sagittarius A* (Sgr A*) of the Galactic Center, emphasizing the role of magnetic field ($\vec{B}$ field) with 0.47 pc spatial resolution, based on the sensitive $\lambda = 850$ μm polarization data taken with JCMT SCUBA2/POL2. Compared the $\lambda = 850$ μm map with CS $J = 2-1$ emission taken with the ALMA, continuum emissions taken at λ= 6 cm and at λ= 37 μm taken with the VLA and SOFIA, we reveal molecular gas clearly extending beyond the CND and a less-defined elliptical cavity at its center, possibly due to the activity of the SMBH, together with the surrounding central stellar cluster. The $\vec{B}$ field within the CND exhibits a coherent spiral pattern. Applying the model described by Wardle and Königl 1990 to the observed $\vec{B}$ field pattern, it favors gas-pressure dominant models without dismissing a gas-and-$\vec{B}$ field comparable model, leading us to estimate the $\vec{B}$-field strength in the inner-ionized cavity around Sgr A* as $0.24^{+0.05}_{-0.04}$ mG. Considering the turbulent pressure, estimated plasma β values indicate the effective gas pressure should surpass the magnetic pressure. Assessing the CND of our Mikly Way Galaxy in the toroidal-and-vertical stability parameter space, we propose that an "effective" magnetorotational instability may likely be active.