

S11b How far is the real distance between Sgr A* and IRS 13E3?

Masato Tsuboi (ISAS), Yoshimi Kitamura (ISAS), Ryosuke Miyawaki (J.F. Oberlin Univ), Takahiro Tsutsumi (NRAO), Atsushi Miyazaki (JSF), and Makoto Miyoshi (NAOJ)

Galactic Center IRS 13E3 would be located at considerably farther than the projection distance from Sgr A*, ~ 0.13 pc. In the 2019 Autumn Annual Meeting, we reported the detection of the rotating ionized gas ring around IRS 13E3 in the continuum emission at 232 GHz and H30 α recombination line using ALMA Cy.5 observation (2017.1.00503.S, P.I. M.Tsuboi). The structure is seen as an inclined linear feature in the position-velocity diagram along the major axis. Such a feature is usually a defining characteristic of a gas ring rotating around a massive object. The rotating velocity and orbit radius are estimated to be $V_{\text{rot}} \simeq 230$ km s $^{-1}$ and $r \simeq 6 \times 10^{15}$ cm, respectively. The enclosed mass is derived to be $M_{\text{encl.}} \simeq 2.4 \times 10^4 M_{\odot}$, which agrees with an IMBH. There is the astrometric upper limit mass of the IMBH around Sgr A*, which depends on the real distance from Sgr A*. The real distance is very important to study the IMBH. However, it is unlikely that the the real distance is nearly equal to the projection distance. We would attempt to estimate it by spectroscopic informations. IRS 13E3 also has the ionized gas stream which is extended to south. We detected a highly excited CH₃OH emission line in the stream. CH₃OH molecule is easily destroyed by cosmic ray around Sgr A*. This is also why the CH₃OH emission line is very weak in the Circumnuclear Ring. Therefore the detection of the CH₃OH emission line suggests that the stream is located at farther than at least 1 pc from Sgr A*. If the stream is associated physically with IRS 13E3, it is also located at a similar real distance.