

## R30a Sub-millimeter Detection of a Galactic Center Cool Star IRS 7 by ALMA

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The Nuclear star cluster (NSC) is a bright star cluster within 0.5 pc of Sgr A\*, which was found by IR observations. The NSC contains several tens of Wolf-Rayet and OB stars. IRS 7 is a strong IR star which is located at 5".5 north of Sgr A\*. Although IRS 7 has been thought to be a member star of the NSC, this is classified into an M supergiant star according to IR spectroscopy. In radio wavelength, IRS 7 has been observed as a half-shell like feature with north extension. However, IRS 7 itself does not have been detected although early-type stars in the NSC have been detected in radio wavelength. The continuum emission from the photosphere should increase with increasing observation frequency because this emission is optically thick thermal one. The line to continuum ratio of Hydrogen recombination lines should also increase with increasing frequency. Then the observations in millimeter or sub-millimeter wavelengths are suitable to detect these. The point-like emission of IRS 7 itself was identified in the continuum map at 340 GHz by ALMA. This is the first sub-millimeter detection of a cool star in the NSC. The flux density is  $S_\nu = 448 \pm 45 \mu\text{Jy}$ . The flux density suggests that IRS 7 has the radius of  $R \sim 1000 R_\odot$ , which is consistent with the previous GRAVITY measurement. We also detected the half-shell like feature with north extension in the H30 $\alpha$  recombination line by ALMA. The kinematics of the ionized gas would support the hypothesis that this feature is a cometary-like structure made by strong UV radiation and/or stellar wind from early-type stars surrounding Sgr A\*.