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NEWLY DETECTED RADIO TRANSIENTS AND VARIABLES AT THE GALACTIC CENTER

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A population of ∼1000 compact radio sources is newly detected with the VLA, in the flux-density range between a few tens of μJy and a few mJy at 5.5 GHz, within the radio bright zone (15 arcmin or 35 parsecs) at the Galactic center. With high-resolution VLA observations at multiple epochs, among the thousand compact radio sources detected, we have identified about 80 transients and variables that are distributed along the Galactic plane in the nuclear region. These radio variables likely arise from unstable accretion processes in binary systems associated with stellar black holes and neutron stars. We report our preliminary findings by showing the spatial and flux-density distributions of the radio variables based on the existing 5.5-GHz VLA data observed during 2012 and 2019. Meanwhile, we are proposing a follow-up VLA study of their radio properties in terms of spectral index, intra-day variability and linear polarization as well as a cross-correlation analysis between radio and X-ray. Some of the compact radio sources show remarkable proper motions; for example, the radio counterpart of the X-ray Cannonball shows a significant proper motion as well as the presence of pulsar wind nebula emission, consistent with our earlier hypothesis that the compact radio source is likely associated with a runaway neutron star created in the event that produced the Sgr A East supernova remnant. The sensitive VLA wide-band observations at relatively high resolution may provide important clues for elucidating the problem of the missing populations of millisecond pulsars and ordinary pulsars at the Galactic center.