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Probing the evolution of merger remnants through formation of cold molecular gas disks

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Recent merger simulations have shown that gas will survive the collision, forming a gaseous and subsequently a stellar) disk, and some mergers will reemerge as a disk dominated late-type galaxy. In order to check this scenario, we have conducted new CO observations toward 27 merger remnants with ALMA, SMA, and CARMA. Our sample is selected solely based on optical morphology that suggests advanced stages of the merger. The final number of our sample is 37 including seven galaxies undetected in CO after compiling with archival data. By investigating the velocity field for 30 sources and fitting with concentric rings, we found that the velocity fields of 24/30 sources can be modeled by circular motion. The size of the CO disk ranges from 1.1 kpc to 9.3 kpc. The spatial extent of the largest molecular disk is smaller to the size of the Milky Way disk. Sources with an extended CO disk have high far-infrared luminosities ($\sim 10^{11}$ $L_{\odot}$), which suggests that active star formation takes place in the extended CO disks and stellar disks will be possibly formed. We also investigated the molecular gas-to-stellar mass ratio (M_{H_2}/M^*) of our sample. The gas mass fraction ranges from a few to few $\times$ 10 % for our sample. This is higher than the gas mass fractions of stellar mass-matched samples from early-type galaxies in the ATLAS^{3D} project, and similar to late-type galaxies in the BIMA-SONG project. We observationally support the scenario that mergers could evolve into a variety of Hubble types.