Massive star formation around I05345+3157 -- I. The dense gas

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We present observations of the intermediate to massive star-forming region I05345+3157 using the molecular line tracer CS(2-1) with CARMA to reveal the properties of the dense gas cores. Seven gas cores are identified in the integrated intensity map of CS(2-1). Among these, core 1 and core 3 have counterparts in the 2.7 millimeter continuum data. We suggest that core 1 and core 3 are star-forming cores that may already or will very soon harbor young massive protostars. The total masses of core 1 estimated from the LTE method and dust emission by assuming a gas-to-dust ratio are 5 +- 1 solar masses and 18 +- 6 solar masses, and that of core 3 are 15 +- 7 solar masses and 11 +- 3 solar masses. The spectrum of core 3 shows blue-skewed self-absorption, which suggests gas infall -- a collapsing core. The observed broad linewidths of the seven gas cores indicate non-thermal motions. These non-thermal motions can be interactions with nearby outflows or due to the initial turbulence; the former is observed, while the role of initial turbulence is less certain. Finally, the virial masses of the gas cores are larger than the LTE masses, which for a bound core implies a requirement on the external pressure of ~ 10^8 K/cm^3. The cores have the potential to further form massive stars.

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