

ALMA CO Observations in the Northwestern Shell of the Gamma-Ray SNR RX J1713.7-3946

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We report on results of CO observations in the northwestern shell of the supernova remnant (SNR) RX J1713.7–3946 using the Atacama Large Millimeter/submillimeter Array (ALMA). We recently found dozens of molecular cloudlets with typical radii of $\sim 0.03\text{--}0.05$ pc and densities of $\sim 10^4$ cm $^{-3}$, which have survived shock passage due to their high density. These cloudlets are located not only along synchrotron X-ray filaments, but also in the vicinity of X-ray hotspots with month- or year-scale time variations. We argue that X-ray hotspots and filaments were generated by shock-cloudlet interactions through magnetic-field amplification up to mG. The gas density contrast of $\sim 10^5$, the coexistence of molecular cloudlets and low-density diffuse medium of ~ 0.1 cm $^{-3}$, is consistent with such a magnetic field amplification and a wind-bubble scenario. The small-scale cloud structures also affect hadronic gamma-ray spectra considering the magnetic field amplification on surface and inside clouds.

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