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Tentative Detection of Deuterated Methane toward Low-Mass Protostar IRAS04368+2557 in L1527

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The millimeter-wave rotational transition line ($J_K = 1_0 - 0_0$) of deuterated methane CH_3D has tentatively been detected toward the low-mass Class 0 protostar IRAS 04368+2557 in L1527 with the Heinrich Hertz Submillimeter Telescope. This is the first detection of CH_3D in interstellar clouds, if confirmed. The column density and fractional abundance of CH_3D are determined to be $(9.1 \pm 3.4) \times 10^{15}$ cm^{-2} and $(3.0 \pm 1.1) \times 10^{-7}$, respectively, where we assume the rotational temperature of 25 K. The column density and fractional abundance of the gaseous CH_4 are estimated to be $(1.3 - 4.6) \times 10^{17}$ cm^{-2} and $(4.3 - 15.2) \times 10^{-6}$, respectively, by adopting the molecular D/H ratios of 2–7 % reported for various molecules in L1527. The fractional abundance of CH_4 is higher than or comparable to that found in high-mass star-forming cores by infrared observations. It is sufficiently high for triggering the efficient produc tion of various carbon-chain molecules in a lukewarm region near the protostar, which supports the picture of the warm carbon-chain chemistry.