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**The determination of potential energy curve and dipole moment of the (5)$0^+$ electronic state of $^{85}$Rb$^{133}$Cs molecule by high resolution photoassociation spectroscopy** JINPENG YUAN, YANTING ZHAO, ZHONGHUA JI, ZHONGHAO LI, Shanxi University, China, JIN-TAE KIM, Chosun University, Korea, LIANTUAN XIAO, SUOTANG JIA, Shanxi University, China — The creation and manipulation of ultracold polar molecules have attracted intensive attentions due to their permanent electric dipole moments interacting strongly with an external electric field and with long-range dipole-dipole force, which facilitate applications such as precision measurement, quantum control of cold chemical reactions, and quantum computation. The (5)$0^+$ state is a good candidate to produce ultracold ground state RbCs molecule through a short-range photoassociation (PA). We present the formation of ultracold $^{85}$Rb$^{133}$Cs molecules in the (5)$0^+$ electronic state by PA and their detection via resonance-enhanced two-photon ionization. Up to v = 47 vibrational levels including the lowest v = 0 and lowest J = 0 levels are identified with high resolution. Precise Dunham coefficients and the Rydberg-Klein-Rees potential energy curve of the (5)$0^+$ state are determined The electric dipole moments with respect to the vibrational numbers of the (5)$0^+$ electronic state are also measured in the range between 1.9 and 4.8 D. These comprehensive studies on previously unobserved rovibrational levels of the (5)$0^+$ state are helpful to understand the molecular structure and discover suitable transition pathways for transferring to the lowest rovibrational level of the ground state.

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