Abstract Submitted
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Towards fundamental understanding of ultracold KRb[1] SVETLANA KOTOCHIGOVA — The recent formation of ultracold KRb molecules in their absolute rovibrational ground state [1] has created great promise for study of collective phenomena that rely on the long-range interactions between polar molecules. Here we discuss the theoretical analysis of various essential properties of the KRb molecules [2] that accompanied these experimental advances. This analysis is based on multi-channel bound-state calculations of both ground and excited electronic states. We have found that the theoretical hyperfine and Zeeman mixed $X^1\Sigma^+$ and $a^3\Sigma^+$ vibrational structure shows excellent agreement with the experimentally observed structure. In addition, multi-channel calculations of the rovibrational structure of the excited state potentials have allowed us to find the optimal transitions to the lowest v=0 vibrational levels. Finally, we examine the dynamic polarizability of vibrationally cold KRb molecules as a function of laser frequency. Based on this knowledge, laser frequencies can be selected to minimize decoherence from loss of molecules due to spontaneous or laser-induced transitions. [1] K.-K. Ni, S. Ospelkaus, M. H. G. de Miranda, A. Peer, B. Neyenhuis, J. J. Zirbel, S. Kotochigova, P. S. Julienne, D. S. Jin, and J. Ye, Science **322**, 231 (2008). [2] S. Kotochigova, E. Tiesinga, and P. S. Julienne, submitted to New J. Phys. (2009).

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