

## SIGN CHANGES IN THE ELECTRIC DIPOLE MOMENT OF EXCITED STATES IN RUBIDIUM-ALKALINE EARTH DIATOMIC MOLECULES

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In a recent series of combined experimental and theoretical studies we investigated the ground state and several excited states of the Rb-alkaline earth molecules RbSr<sup>a</sup> and RbCa.<sup>b</sup> The group of alkali-alkaline earth (AK-AKE) molecules has drawn attention for applications in ultracold molecular physics and the measurement of fundamental constants<sup>c</sup> due to their large permanent electric and magnetic dipole moments in the ground state. These properties should allow for an easy manipulation of the molecules and simulations of spin models in optical lattices.<sup>d</sup>

In our studies we found that the permanent electric dipole moment points in different directions for certain electronically excited states, and changes the sign in some cases as a function of bond length. We summarize our results, give possible causes for the measured trends in terms of molecular orbital theory and extrapolate the tendencies to other combinations of AK and AKE - elements.

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<sup>a</sup>F. Lackner, G. Krois, T. Buchsteiner, J. V. Pototschnig, and W. E. Ernst, *Phys. Rev. Lett.*, 2014, 113, 153001; G. Krois, F. Lackner, J. V. Pototschnig, T. Buchsteiner, and W. E. Ernst, *Phys. Chem. Chem. Phys.*, 2014, 16, 22373; J. V. Pototschnig, G. Krois, F. Lackner, and W. E. Ernst, *J. Chem. Phys.*, 2014, 141, 234309

<sup>b</sup>J. V. Pototschnig, G. Krois, F. Lackner, and W. E. Ernst, *J. Mol. Spectrosc.*, in Press (2015), doi:10.1016/j.jms.2015.01.006

<sup>c</sup>M. Kajita, G. Gopakumar, M. Abe, and M. Hada, *J. Mol. Spectrosc.*, 2014, 300, 99-107

<sup>d</sup>A. Micheli, G. K. Brennen, and P. Zoller, *Nature Physics*, 2006, 2, 341-347