

Multipole Analysis of Radio-Frequency Reactions in Ultracold Atoms

Betzalel Bazak^(a), Nir Barnea^(a)

^(a) The Racah Institute of Physics, The Hebrew University, 91904, Jerusalem, Israel

Using the multipole expansion, we analyze photo induced reactions in an ultra-cold atomic gas composed of neutral bosons. While the Frank-Condon factor dominates the photo induced spin flip reactions, we have found that for frozen-spin process the reaction rate is governed by the dipole term for non-identical particles, and by the r^2 and quadrupole terms for identical particles. In both dimer and trimer photoassociation, the s -mode reaction is found to be dominant at low temperature, while as the temperature increases the d -mode becomes as significant.

Studying the response of universal trimer to photo reactions, we found that in all partial waves the response function exhibits log periodic oscillations at the high frequency tail. At threshold, in contrast, log periodic oscillations appear only in the leading s -wave component. These oscillations are the fingerprints of universal Efimov physics.

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[2] E. Liverts, B. Bazak, and N. Barnea, Phys. Rev. Lett. **108**, 112501 (2012)

[3] B. Bazak and N. Barnea, in preparation (2013)

E-mail: betzalel.bazak@mail.huji.ac.il