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Physics and Chemistry in High-frequency Strong Laser Fields
P. BALANARAYAN, NIMROD MOISEYEV, Schulich Faculty of Chemistry and Faculty of Physics, Technion-Israel Institute of Technology — In high frequency strong laser fields the oscillating electrons in an atom behave like they are moving not in a field induced by a positive point charge of the nucleus but in a field which is smeared along the polarization direction of the light and it is peaked at +/- of the quiver length (defined as the ratio between the maximum field amplitude and the square of the laser frequency multiplied by the mass of the electron). We show that for many electron atoms (such as sulfur and oxygen) the ground state of the laser dressed atom has a long lifetime and can be degenerated. *Hence, a strong linear Stark effect rather than the usual quadratic one is obtained.* We show that also a new type of chemical reactions is induced by the high frequency strong laser fields. For example, strong chemical bond (dissociation energy is more than 12 eV) is generated between two helium atoms with a bond length of 2 Angstroms. *Similarly a strong chemical bond is created between sulfur and helium atoms which is somehow similar in its nature to the chemical bond in OH radicals.*

P. Balanarayan and N. Moiseyev, "Strong chemical bond of stable He2 in strong linearly polarized laser fields," Phys. Rev. A **85**, 032516 (2012).
P. Balanarayan and N. Moiseyev, "Chemistry in high-frequency strong laser fields: the story of HeS molecule," Mol. Phys. **111**, 1814 (2013).
P. Balanarayan and N. Moiseyev, "Linear Stark effect for sulfur atom in strong high frequency laser fields," Phys. Rev. Lett. **110**, 253001 (2013).

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