VIBRATIONAL SPECTROSCOPY OF SYMPATHETICALLY COOLED CaH^+ MOLECULAR IONS

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The search for time variation in the fundamental constants of nature such as the fine structure constant(α) and the proton/electron mass ratio(μ), is an area of active research[a].Comparing the vibrational overtones of CaH^+ with electronic transitions in atoms has been proposed as a means to detect possible time variation of μ [b]. Before these precision measurements can be realized, the survey spectroscopy needs to be performed. We describe our experiments using a Coulomb crystal of sympathetically cooled CaH^+ and laser-cooled Ca^+ ions to measure the vibrational overtones by resonance-enhanced multiphoton photo-dissociation (REMPD) in a linear Paul trap. The dissociation of CaH^+ is detected by observing the change in the crystal composition by monitoring the Ca^+ fluorescence. Future single ion experiments for the precision measurement are also discussed.

[a] J. Uzan, Rev. Mod. Phys. 75, 403 (2003).
[b] M. Kajita and Y. Moriwaki, J. Phys. B: At. Mol. Opt. Phys. 42, 154022(2009).