Contribution ID: **46** Type: **not specified**

Microwave transitions in metastable CO to probe a possible time-variation of the proton-to-electron-mass ratio

Wednesday, 20 June 2012 16:20 (20 minutes)

The constraint on a possible time-variation of physical constants set by an experiment depends both on the accuracy of the measurement and on the sensitivity of the system the measurement is performed on. Here, we present a laboratory experiment using a system with a highly enhanced sensitivity to a possible time-variation of the proton-to-electron-mass ratio, μ. Due to an incidental degeneracy between the J=8, Ω=0 and the J=6, Ω=1 states in this metastable a^3Π state, the two-photon microwave transition connecting these two states is hundreds times more sensitive than pure rotational transitions. We are planning a molecular beam experiment to measure this transition.

To measure this transition, we excite a supersonic beam of CO molecules to the a^3Π state using a narrow-band pulsed titanium:sapphire laser system. This beam then passes through two microwave cavities, in a Ramsey configuration, after which the molecules are quantum-state selectively deflected using an inhomogeneous electrostatic deflection field. One meter down-stream, the deflected molecules are imaged using a 2D detection system, consisting of an MCP, a phosphor screen and a digital camera.

We have performed UV-spectroscopy to study the a^3Π state and to confirm the expected high sensitivity to variations of the proton-to-electron-mass ratio of the targeted microwave transition. An optimal electrostatic deflection field has been designed, constructed and tested. Here, we present results of recently measured microwave transitions.

Primary author: Mr DE NIJS, Adrian (LaserLaB Vrije Universiteit Amsterdam)

Co-authors: Dr BETHLEM, Rick (LaserLaB Vrije Universiteit Amsterdam); Dr UBACHS, Wim (LaserLaB Vrije Universiteit Amsterdam)

Presenter: Mr DE NIJS, Adrian (LaserLaB Vrije Universiteit Amsterdam)

Session Classification: Wed 16:00-17:40