

Colloquium

SFB 956

Conditions and Impact of Star Formation

22.10. 2012

Monday 4:00 pm

Physikalische Institute Köln

Lecture Hall III

Zülpicher Straße 77 | 50937 Köln

Wim Ubachs

Institute for Lasers Life & Biophotonics,

VU University Amsterdam, The Netherlands

Laboratory Spectroscopy and Astronomical Observations in Search for a Drifting Proton-Electron Mass Ratio

Since the days of Dirac scientists have speculated about the possibility of varying constants and time-varying laws of nature. In the past decade it has been established that spectral lines of atoms and molecules, which can currently be measured at ever-higher accuracies, form an ideal test ground for probing drifting constants. In particular the spectra of molecules are sensitive for probing a variation of the proton-electron mass ratio μ , either on a cosmological time scale, or on a laboratory time scale. In the talk a comparison will be made between spectra of molecular hydrogen observed in the laboratory and at a high redshift ($z=2-3$), using the Very Large Telescope (Paranal, Chile) and the Keck telescope (Hawaii) [1]. This puts a constraint on a varying mass ratio $\Delta\mu/\mu$ at the 10^{-5} level. The optical work can also be extended to include CO molecules. Further a novel direction will be discussed: radio-astronomy of hindered internal rotor molecules which appear to be very sensitive for a varying proton-electron mass ratio [2].

[1] F. van Weerdenburg et al. Phys. Rev. Lett. 106, 180802 (2011)

[2] P. Jansen et al. Phys. Rev. Lett. 106, 100801 (2011)

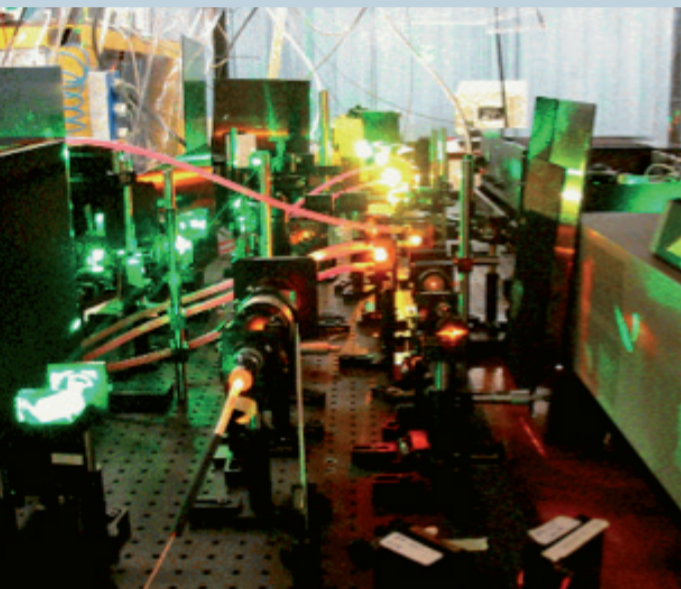


Fig: On the top the laser setup used to measure highly accurate spectra of H₂ molecules in the laboratory; on the lower a view on the Very Large Telescope(s) used to detect H₂ at high redshift.