

Optical transitions in highly charged ions for atomic clocks with enhanced sensitivity to variation of fundamental constants

Wednesday, 20 June 2012 16:00 (20 minutes)

Optical transitions can occur in some highly charged ions (HCIs) when the ion stage and nuclear charge are tuned such that orbitals with different principal quantum number and angular momentum are nearly degenerate. In these cases the transition energy may be within laser range even though the ionisation energy is large (of order several hundred eV). We have identified several such systems and shown that they have a number of properties that could make them suitable for atomic clocks with high accuracy. Strong E1 transitions provide options for laser cooling and trapping, while narrow transitions can be used for high-precision spectroscopy and tests of fundamental physics. In particular we found transitions that would have the highest sensitivity to variation of the fine-structure constant ever seen in atomic systems. HCI clocks utilising these transitions could confirm the indications of a spatial gradient in the fine-structure constant observed in quasar absorption spectra data.

Primary authors: Mr ONG, Andrew (University Of New South Wales); Dr BERENGUT, Julian (University Of New South Wales); Prof. FLAMBAUM, Victor (University Of New South Wales); Dr DZUBA, Vladimir (University Of New South Wales)

Presenter: Dr BERENGUT, Julian (University Of New South Wales)

Session Classification: Wed 16:00-17:40