

## A Ti:Sapph laser system for the state-selective preparation of nitrogen ions

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Vibrational transitions in molecules are sensitive to changes in the proton-to-electron mass ratio. In this experiment, we are using spectroscopy in a nitrogen ion clock to search for dark matter and possible time variations in the proton-to-electron mass ratio. For this, we will probe the  $v=0$  to  $v=2$  vibrational transition in nitrogen and look for changes in the frequency over time.

The rotational and vibrational energy levels in nitrogen are not possible to laser cool. Therefore, we must ionise nitrogen state-selectively into its  $v=0$  state for the spectroscopy. We are able to do this using a resonance enhanced multi-photon ionisation (REMPI) scheme. We have therefore set up seeded, Fourier-limited Ti:Sapph lasers to achieve high ionisation efficiency.

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