Searching for a Variation of the Fine Structure Constant with Highly Charged Ions

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Precision spectroscopy of atomic transitions is a promising tool to test our understanding of fundamental physics and search for new physics beyond the standard model. Combining the excellent precision achievable with single trapped ion clocks with the enhanced sensitivities to relativistic effects in highly charged ions (HCIs) [1,2] yields an ideal platform to search for a variation of the fine-structure constant α - a possibility predicted for example by models for ultralight bosonic dark matter [3,4]. I will present the TwinTraps experiment, where we plan to perform direct simultaneous spectroscopy on two complementary highly charged ions - Cf^{15+} and Cf^{17+} - *via* quantum logic spectroscopy [5,6], and monitor the ratio of these two frequencies to search for a variation of α. I will present our progress on the design and construction of the experimental apparatus comprising of two identical cryogenic vacuum systems and an EBIT and ion beamline for production and delivery of the HCIs.

References

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