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Nonlinear calcium King plot: implications for new bosons and nuclear properties [REMOTE]

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At the TIQI group at ETH, we recently measured isotope shifts on the 729nm electric quadrupole transition between pairs of co-trapped calcium ions at 100mHz precision, two orders of magnitude below the previous best measurement. We combined our measurements with IS measurements made by the group of Piet Schmidt on the 570nm transition in Ca^{14+} and improved nuclear mass measurements made by the group of Klaus Blaum, to produce the first sub-Hz King plot. King plots in calcium had previously remained linear up to the 10Hz level – our improved precision now reveals a large King non-linearity. Whilst the second-order mass shift is an expected SM source of nonlinearity, a decomposition analysis of the nonlinearity pattern we observe reveals evidence for at least one other contributing source. I will discuss the implications of these results, combined with input from our theory collaborators, both to our understanding of nuclear structure and to the search for new physics.

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