Precision isotope-shift spectroscopy in neutral Yb and joint Yb/Yb$^{+}$ King-plot analysis

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The isotope shifts (IS) in the frequency of an atomic transition are approximately linearly correlated with the shifts in another transition. This linearity is reflected in the so-called King-plot analysis. It has been suggested to search for deviations from linearity as a way to probe beyond-Standard-Model interactions mediated by light bosons [1]. These searches require availability of precision IS data in a chain of isotopes of a given element. In a recent report on precision spectroscopy in a pair of Yb$^{+}$ transitions [2], a large nonlinearity was observed in the King-plot, that primarily arises due to the quadratic field shift [2], or the influence of the nuclear deformation on the field shift [3]. Further availability of precision IS data in the same element is crucial to check modeling of the cause of the nonlinearity [3], and potentially separate within Standard-Model effects from possible new physics contributions to the nonlinearity [4].

We will discuss an experiment involving precision spectroscopy of the $^{1}S_{0} - ^{1}D_{2}$ optical transition in neutral Yb, in order to determine the IS in the naturally abundant, nuclear-spin zero Yb isotopes. We will present our preliminary experimental results, and show a joint King-plot of our data combined with those on Yb$^{+}$, that reveals an order of magnitude larger nonlinearity, compared to that of the Yb$^{+}$ work.