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Probing new long range interactions via isotope spectroscopy

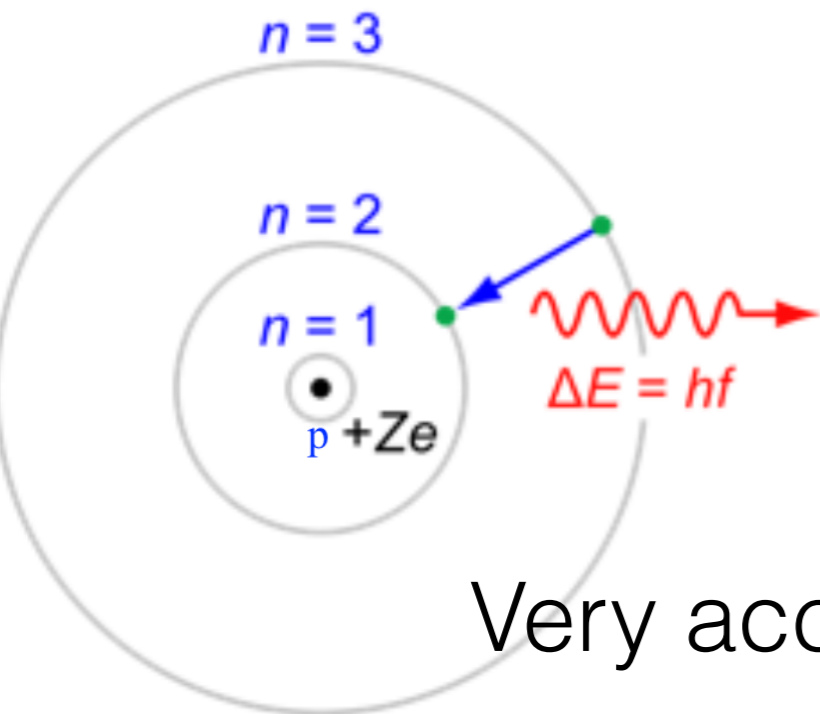
U.S. Cosmic Visions: New Ideas in Dark Matter

Julian C. Berengut, Dmitry Budker, Cedric Delaunay, Victor V. Flambaum, Claudia Frugiuele, Elina Fuchs, Christophe Grojean,

Roni Harnik, Roe Ozeri, Gilad Perez, and Yotam Soreq

to appear soon

Probing electron/neutron coupling



$$V_{NP}(r) = \frac{g_e g_A e^{-M r}}{4\pi r}$$

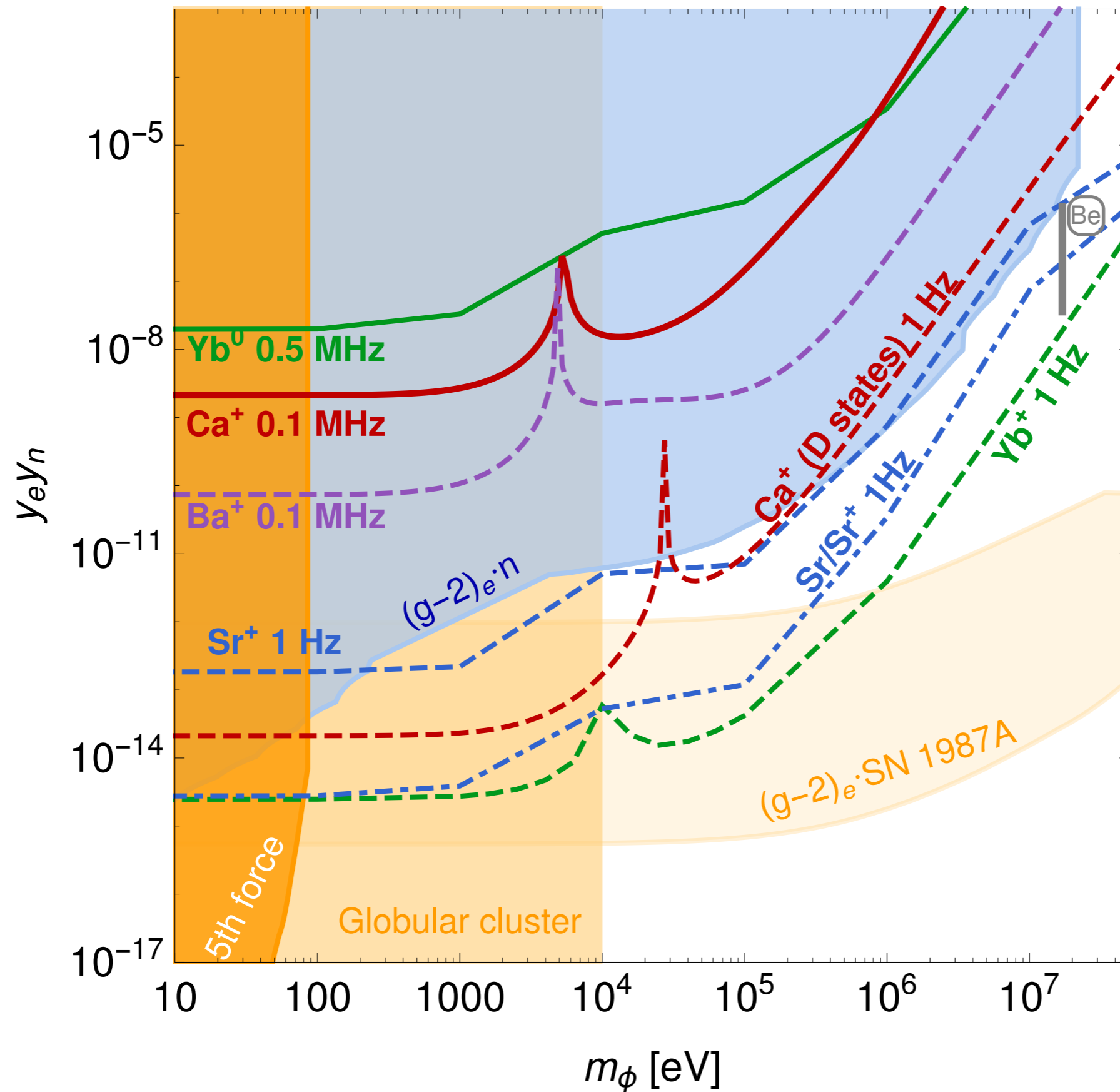
New forces (long or short range)
change the frequency

Very accurate measurements, not enough
theoretical precision

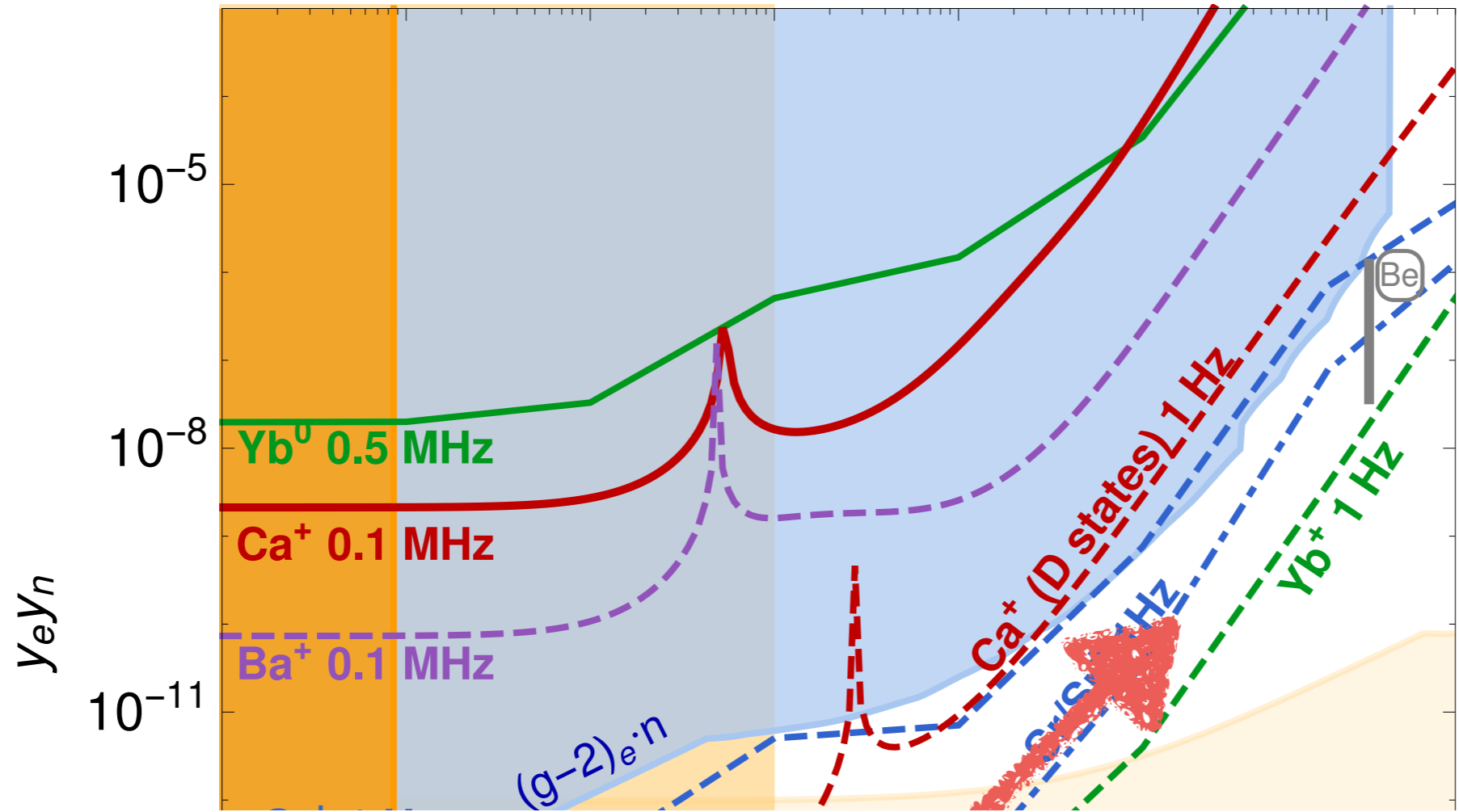
$$\nu_A - \nu_{A'}$$

Isotope shift measurements allow to reduce some of the
theoretical uncertainties

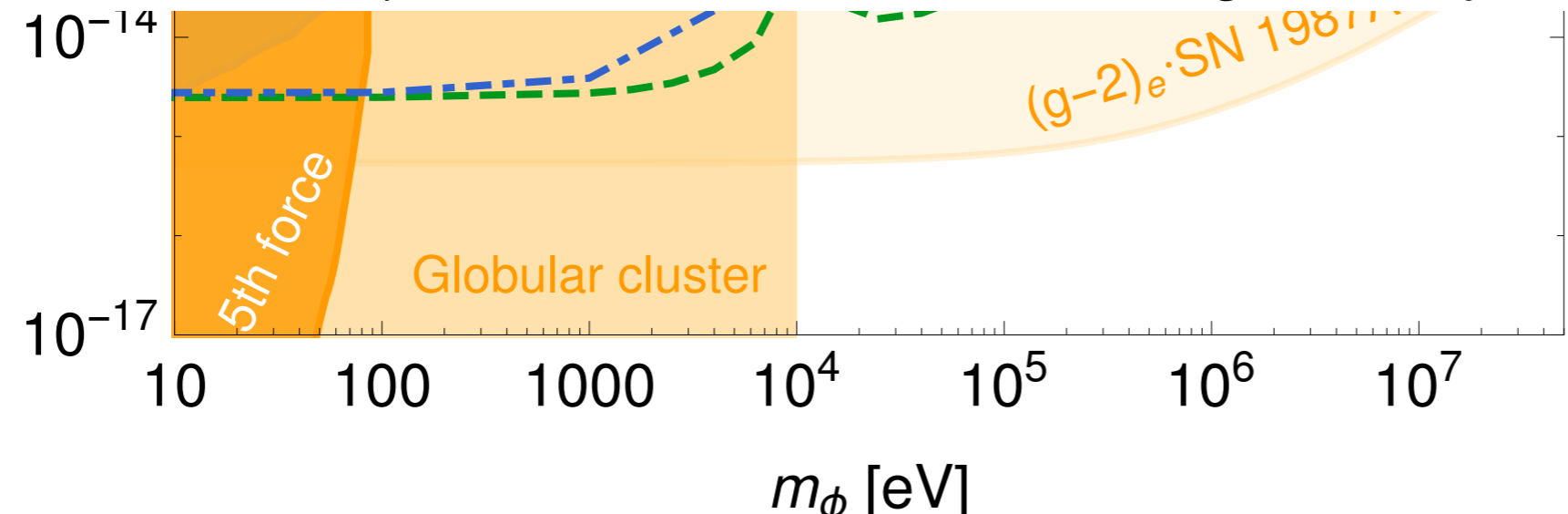
We can even come up with an observable where the SM background is completely data driven



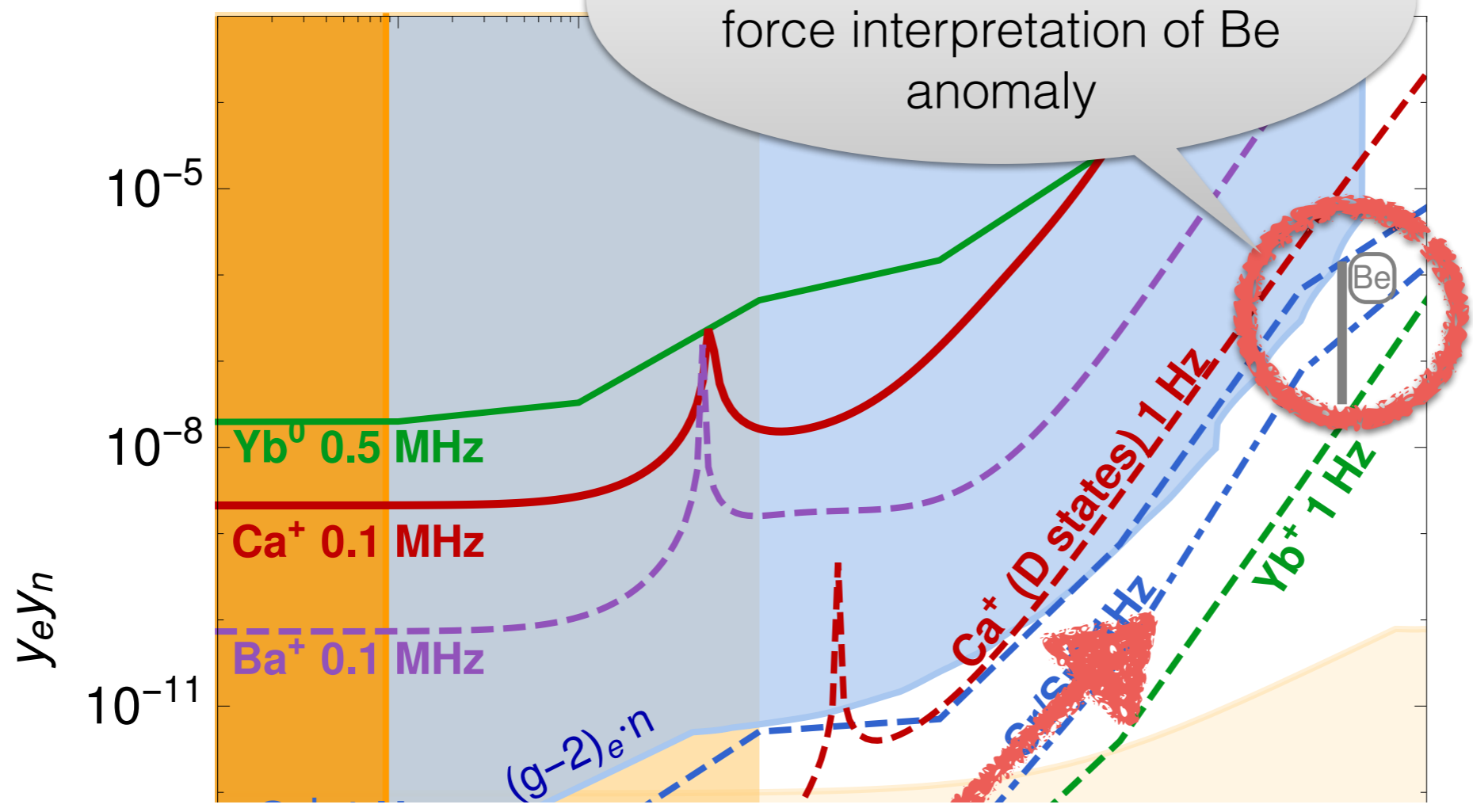
We can even come up with an observable where the SM background is completely data driven



Projections corresponding to the precision of future experiments (1 Hz).
 The reach for NP depends of a certain behavior, Kings linearity, of the measurement



We can even come up with an observable where the SM background is



Projections corresponding to the precision of future experiments (few years time scale).
 The reach for NP depends of a certain behavior, Kings linearity, of the measurement

