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# Prospects of dark-matter searches via correlation spectroscopy of $I_2^+$ and $Ca^+$

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The nature of dark matter (DM) and its interaction with the Standard Model (SM) is one of the biggest open questions in physics nowadays. Ultralight DM coupling to the SM induces oscillations in fundamental constants that are detectable by comparing clocks with different sensitivities to DM. Vibrational transitions of molecular clocks are more sensitive than electronic transitions of optical atomic clocks when considering DM that couples to the SM's strong sector. Here, we propose the iodine molecular ion, $I_2^+$, as a sensitive detector for DM that couples to the QCD part of the SM. The iodine's dense spectrum allows us to tune its transition frequency to that of an optical atomic clock ($Ca^+$) and perform correlation spectroscopy between the two clock species. With this technique, we project a few-orders-of-magnitude improvement over the most sensitive clock comparisons performed to date.

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