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Radium clocks

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We are developing optical clocks based on radium. Though unstable it has potential for low instability clocks as radium's high mass reduces sensitivity to leading systematic uncertainties. The wavelengths needed for a radium clock are in relatively photonic technology friendly parts of the spectrum, making it appealing for a robust and compact optical clock. The nuclear instability is an asset to address the recently posed question: do atoms age? This could be addressed by running a clock for time scales comparable to an isotope's half-life and looking for drift in the clock transition's frequency. We have realized a clock with radium-226 (1600 y half-life). We'll discuss laser cooling and trapping of radium-224 (3.6 d half-life) and radium-225 (15 d half-life) and progress towards making clocks with these isotopes. Radium-225 is appealing as it has a nuclear spin of 1/2 which makes it less sensitive to magnetic field noise than spin zero isotopes.

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