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Atomic clocks sensitive to variation of the fine structure constant.

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The hypothetical variation of the fine structure constant α can be studied in a laboratory by comparing two exceptionally accurate atomic clocks over a long period of time. It is especially convenient when the two clock transitions, sensitive to the variation of α are found in the same atom. We identify two such systems, the neutral ytterbium and gold atoms. The Yb I atom has at least three clock transitions between ground state and the metastable states at $E=17288$, 19710 , and 23188 cm^{-1} , and Au I has two transitions between ground state and metastable states at $E=9161$ and 39535 cm^{-1} . While first of these transitions in Yb is already used as a clock transition of extremely high accuracy, four new proposals have all features of atomic clock transitions with good prospects for very accurate measurements. They also have large and different sensitivity to the variation of the fine structure constant. In particular, clock transitions in Au have the largest sensitivity found so far in neutral systems.

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