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Two clock transitions in neutral Yb for the highest sensitivity to variations of fundamental constants MARIANNA SAFRONOVA, SERGEY PORSEV, University of Delaware, CHRISTIAN SANNER, JUN YE, JILA, NIST and University of Colorado, Boulder — We propose a new frequency standard based on a $4f^{14}6s6p\,{}^3P_0 - 4f^{13}6s^2 5d\,(J=2)$ transition in neutral Yb. This transition has a potential for high stability and accuracy and the advantage of the highest sensitivity among atomic clocks to variation of the fine-structure constant α. We find its dimensionless α-variation enhancement factor to be $K=-15$, in comparison to the most sensitive current clock (Yb^+ E3, $K=-6$), and it is 18 times larger than in any neutral-atomic clocks (Hg, $K=0.8$). Combined with the unprecedented stability of an optical lattice clock for neutral atoms, this high sensitivity opens new perspectives for searches for ultralight dark matter and for tests of theories beyond the standard model of elementary particles. Moreover, together with the well-established ${}^1S_0 - {}^3P_0$ transition one will have two clock transitions operating in neutral Yb, whose interleaved interrogations may further reduce systematic uncertainties of such clock-comparison experiments.

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