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Random search for a dark resonance[1] ALEXANDER HOLM KIILERICH, KLAUS MLMER, Department of Physics and Astronomy, Aarhus University — A pair of resonant laser fields can drive a three-level system into a dark state where it seizes to absorb and emit radiation due to destructive interference. We propose a scheme to search for this resonance by randomly changing the frequency of one of the fields each time a fluorescence photon is detected. The longer the system is probed, the more likely the frequency is close to resonance and the system populates the dark state. Due to the correspondingly long waiting times between detection events, the evolution is non-ergodic and the precision of the frequency estimate does not follow from the conventional Cramér-Rao bound of parameter estimation. Instead, a Lévy statistical analysis yields the scaling of the estimation error with time for precision probing of this kind.

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