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Centrifugal Distortion Causes Anderson Localization in Laser Kicked Molecules JOHANNES FLOSS, ILYA SH. AVERBUKH, Weizmann Institute of Science — The periodically kicked 2D rotor is a textbook model in nonlinear dynamics. The classical kicked rotor can exhibit truly chaotic motion, whilst in the quantum regime this chaotic motion is suppressed by a mechanism similar to Anderson Localization. Up to now, these effects have been mainly observed in an atom optics analogue of a quantum rotor: cold atoms in a standing light wave. We demonstrate that common linear molecules (like N_2, O_2, CO_2, ...), kicked by a train of short linearly polarized laser pulses, can exhibit a new mechanism for dynamical Anderson Localization due to their non-rigidity. When the pulses are separated by the rotational revival time $t_{rev} = \pi\hbar/B$, the angular momentum J grows ballistically (Quantum Resonance). We show that, due to the centrifugal distortion of fast spinning molecules, above some critical value $J = J_{cr}$ the Quantum Resonance is suppressed via the mechanism of Anderson Localization. This leads to a non-sinusoidal oscillation of the angular momentum distribution, which may be experimentally observed even at ambient conditions by using current techniques for laser molecular alignment.

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