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Nondispersive wave packets – control through chaos

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Nondispersive wave packets were predicted to emerge in periodically driven Rydberg atoms a little more than 10 years ago [1], and have now been observed in the laboratory [2]. I shall illustrate how these robust, generic "quantum particles" and their relatives naturally emerge from the theory of chaotic quantum systems [3], and thus open new perspectives for robust quantum control in various experimental settings – from one and two-electron [4] atoms under periodic or impulsive [5] driving to cold atoms in flashing periodic potentials, possibly amended by harmonic confinement [6]. Besides the fundamental underlying (nonlinear) resonance phenomena also some more subtle properties will be discussed, including open questions within the realm of spectral theory.

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