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Probed quantum systems from the inside –on the attosecond time scale

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Attosecond pulses are generated by electrons that are extracted from a quantum system by tunneling in an intense light pulse and travel through the continuum. Portions of each electron wave packet are forced to re-collide with its parent ion by the oscillating force of the time dependent electric field. Upon re-collision, the electron and ion can re-combine, emitting soft X-ray radiation. This highly nonlinear process occurs in atoms, molecules and solids and offers unique measurement opportunities –of the attosecond pulses themselves; of molecular orbitals; and even the band structure of large bandgap semiconductors.

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