

Abstract Submitted
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Visualizing zitterbewegung in spin-orbit coupled semiconductor quantum wires MARKKU JAASKELAINEN, ULRICH ZULICKE — We study a spin-orbit coupled parabolic quantum wire in the ballistic regime and develop a method for visualizing zitterbewegung in phase space. We introduce a Husimi distribution on the transverse coordinate and calculate the distribution of spin by a decomposition into Bloch vector components. The Husimi distribution corresponds to the simultaneous, unsharp measurement of the transverse position and velocity in accordance with the uncertainty principle. In phase space, the distribution exhibits a combination of spin precession and coherent oscillation along the longitudinal coordinate, i.e. zitterbewegung. This behavior closely matches the semiclassical dynamics for small values of the spin-orbit coupling. For increasing spin-orbit coupling strength, the oscillation amplitude initially increases, whereas for very large values the oscillation amplitude is quenched.

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