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Physics of an isolated electron puddle revealed via dephasing in thermal equilibrium EMIL WEISZ, HYUNGKOOK CHOI, OKTAY GÖKTAŞ, MOTY HEIBLUM, YUVAL GEFEN, VLADIMIR UMANSKY, DIANA MAHALU, Weizmann Institute of Science — Low dimensional electron systems serve as a good setup for studying interactions among quantum systems. In our study, we examined a system comprised of an electron puddle, confined in a quantum dot, coupled to an electronic Mach-Zehnder interferometer via Coulomb interactions. Surprisingly, even when the electron puddle was in thermal equilibrium and nearly isolated, it induced full and robust dephasing in the nearby interferometer when the average puddle's occupation was N+1/2. We attribute this unexpected behavior to a unique manifestation of the Friedel Sum Rule, which connects the occupation of a system with its scattering phase. Furthermore, this phenomena allowed accessing various properties of the isolated electron puddle, such as its average occupation, in thermal equilibrium and under bias, and decoherence rate of the confined electrons.

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