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Exploring diffraction with a pilot-wave model[1] GIUSEPPE PUCCI, ANTOINE BELLAIGUE, Univ Rennes, CNRS, IPR (Institut de Physique de Rennes) UMR 6251, F35000 Rennes, France, ANAND OZA, Department of Mathematical Sciences Center for Applied Mathematics and Statistics, New Jersey Institute of Technology, Newark, New Jersey 07102, USA — The seminal experiments of Yves Couder and Emmanuel Fort demonstrated that a droplet walking on the surface of a fluid bath may exhibit behavior thought to be peculiar to the microscopic quantum realm. One of their experiments suggested that single-particle diffraction and interference may be obtained when a walker crosses a single- or a double-aperture between submerged barriers (Couder, Y. & Fort, E. Phys. Rev. Lett. 97, 154101, 2006). Later experiments with finer control of experimental parameters yielded different results, thus reopening the question of the extent of the analogy between walkers and quantum particles (Andersen, A. et al. Phys. Rev. E 92, 013006, 2015; Pucci, G. et al. J. Fluid Mech. 835, 1136-1156, 2018; Rode, M. et al. Phys. Rev. Fluids 4, 104801, 2019). Here we use the pilot-wave model developed by Oza et al. (J. Fluid Mech. 737, 552-570, 2013) to explore the diffraction of a two-dimensional, wave-piloted particle by one-dimensional barriers. While our results are generally different from the Fraunhofer diffraction patterns in optics, the statistical distribution of deflection angles generally exhibits multiple peaks, the number of which depends on the obstacle geometry.

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