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Pilot-wave dynamics in a rotating frame: on the emergence of orbital quantization[1] ANAND OZA, DANIEL HARRIS, RODOLFO ROSALES, JOHN BUSH, Massachusetts Institute of Technology — We present the results of a theoretical investigation of droplets walking on a rotating vibrating fluid bath. The droplet's trajectory is described in terms of an integro-differential equation that incorporates the influence of its propulsive wave force. Predictions for the dependence of the orbital radius on the bath's rotation rate compare favorably with experimental data and capture the progression from continuous to quantized orbits as the vibrational acceleration is increased. The orbital quantization is rationalized by assessing the stability of the orbital solutions, and may be understood as resulting directly from the dynamic constraint imposed on the drop by its monochromatic guiding wave. The stability analysis also predicts the existence of wobbling orbital states reported in recent experiments, and the virtual absence of stable orbits in the limit of large vibrational forcing.

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