Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Quantization of a particle guided by its own pilot-wave
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— The association of a particle and a wave can be obtained even at a macroscopic scale, using a simple experimental set up. A liquid bath is set into vertical oscillation so that any drop deposit on it has never the time to break the air layer under it. The drop is always ejected from the bath by the vibration and can then live for hours. The impact generates waves at the surface of the bath which can propel the drop. It becomes a walker, the self-propelled entity formed by a bouncing droplet and its associated surface wave. This system has already shown surprising wave-particle duality as single particle diffraction or Bohr-Sommerfeld quantization of level when the drop is submitted to a transverse force. We now study its motion when the walker is submitted to a central force, which can be tuned at will. In particular, I will present our results in the case of a 2D harmonic potential well. In the case of a strong coupling between the waves and the bouncing drop, the walker exhibit a discrete set of state where the angular momentum and the spatial extend of each level are quantized. Disordered trajectories also appear, as an intermittency between the pure eigenmodes through transitions between them.

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Date submitted: 02 Aug 2013 Electronic form version 1.4