Classical analogue of the Unruh effect

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In the Unruh effect [1] an accelerated observer perceives the quantum vacuum as thermal radiation. This has been one of the most significant results of theoretical physics of the second half of the 20th century, but it has never been observed yet. We discovered that the Unruh effect has a deep root in the classical physics of waves. Although noise like the vacuum noise is random in space, it is organized in space-time, because it is carried by waves. This organization of wave noise creates the Unruh effect. Following this idea we performed a simple experiment with water waves where we see the first indications of a Planck spectrum in the correlation energy [2]. We have thus observed an Unruh effect for the first time.

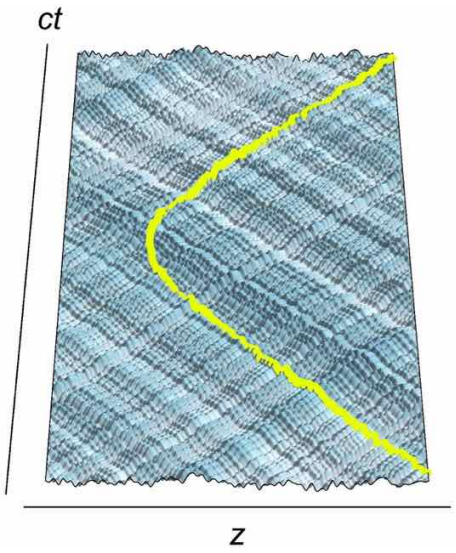

Figure 1: Principal idea. A container is filled with water subject to noise creating ripples on the water surface. Spatial noise is organized in space time. Correlations are observed along the trajectory of an accelerated observer.

[1] W. G. Unruh, Notes on black-hole evaporation, Phys. Rev. D **14**, 870 (1976).

[2] U. Leonhardt, I. Griniasty, S. Wildeman, E. Fort and M. Fink, Classical analogue of the Unruh effect, arXiv:1709.02200 (2017).