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Superoscillations in Waves: Old, New, Common, Uncommon

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Abstract

In physics, the mathematical phenomenon of superoscillations, in which functions vary faster than their fastest Fourier components ('faster than they should'), is associated with almost-destructive interference, and occurs near phase singularities in optics and on the world's ocean tides; and it is associated with quantum weak measurements. They are a compact way to represent fractals. In light represented by scalar waves, and in many contexts in quantum physics, superoscillations are rather common; but in light represented by electric fields - and more so when magnetic fields are included - they are unexpectedly rare. Superoscillations in red light can escape as gamma radiation.

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