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De Broglie waves as a manifestation of clock desynchronization¹ WILLIAM BAYLIS, Physics Dept., Univ. of Windsor — De Broglie matter waves, such as used in atom optics or for interference in a BE condensate, can be viewed as the relativistic effect that spatially separated clocks that are synchronized in the rest frame become desynchronized when set in motion. The “clocks” here are the quantum oscillation of a stationary state. The usual de Broglie wavelength and superluminal wave velocity are easily derived. As simple and obvious as this picture is, I have not seen it described before. It is not only a nice example of clock desynchronization, it also has an interesting consequence: the oscillation of the stationary state must be at the Zitterbewegung frequency, that is, the corresponding energy must include the rest-mass energy. Of course most experiments are only sensitive to frequency differences.

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Prefer Oral Session
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