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Acoustic analog of the dynamical Casimir effect in Bose-Einstein Condensates JEAN-CHRISTOPHE JASKULA, GUTHRIE PARTRIDGE, MARIE BONNEAU, JOSSELIN RUAUDEL, DENIS BOIRON, CHRISTOPHER WESTBROOK, Institut d'Optique — Although we often picture the quantum vacuum as containing virtual quanta whose observable effects are only indirect, it is a remarkable prediction of quantum field theory that the vacuum can generate real particles when boundary conditions are suddenly changed. Thus the "dynamical Casimir effect" or the 'Hawking radiation' result in the spontaneous generation of photon pairs in an empty cavity whose boundaries are rapidly moving or at the horizon of a black hole. In 1981, W. Unruh pointed out an acoustic analog to Hawking radiation. Further work on this idea has developed into an entire field, and recently a stimulated analog to Hawking radiation has been observed using surface waves on water. Bose Einstein condensates are attractive candidates in which to study such analog models because their low temperatures promise to reveal quantum effects. We present the realization of an acoustic analog to the dynamical Casimir effect by modulating the confinement of a Bose-Einstein condensate. We show that correlated pairs of Bogoliubov quanta, both phonon-like and particle-like, are excited by this modulation, in a process that formally resembles parametric down conversion.

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