

Analogue cosmological particle creation in an ultracold quantum fluid of light

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It is thought that the rapid expansion of the early universe resulted in the spontaneous production of cosmological particles [1]. The latter evolved into the patterns in the cosmic microwave background visible today [2]. The analogue of cosmological particle creation in a quantum fluid could provide insight, but an observation was not achieved previously. This talk presents our observation of analogue cosmological particle creation in a 3-dimensional quantum fluid of light [3]. The process is seen to be spontaneous, and in close quantitative agreement with the quantum-field theoretical prediction. We find that the long-wavelength particles provide a window to early times. This work introduces a new quantum fluid, as cold as an atomic Bose-Einstein condensate.

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- [2] N. Aghanim, et al., Planck 2018 results. I. Overview and the cosmological legacy of Planck, *Astronomy and Astrophysics* 641 (2019) A1.
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