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Impact of trans-Planckian excitations on black-hole radiation in dipolar Bose-Einstein condensates

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We consider a quasi-one-dimensional dipolar condensate in a step-like analogue black hole setup. It is shown that the existence of roton excitations impacts significantly the Hawking radiation spectrum:
The emitted radiation depends on the depth of the roton minimum, and is in general more intense. In addition, we find a novel spontaneous particle creation mechanism with no counterpart in non-dipolar condensates. Our results establish that dipolar condensates offer a far richer and more versatile environment for the simulation of particle production from the quantum vacuum in the presence of horizon-interfaces than contact-interaction condensates.

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