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Continuous gravitational waves from self-interacting axion condensate

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Ultra-light particles, such as axions, form a macroscopic condensate around a highly spinning black hole by the superradiant instability. The condensate emits characteristic gravitational waves, such as a monochromatic gravitational wave. The characteristic gravitational waves open the possibility of detecting the axion through gravitational wave search. However, the precise evolution of the condensate must be known for the actual detection. In this talk, we consider the effect of the self-interaction and the black hole spin-down on the evolution of the condensate and the resulting gravitational waves from the condensate. We discuss that the self-interaction will excite various modes, and thus, the condensate emits continuous gravitational waves in several frequencies.

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