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Primordial gravitational waves revealed by a spinning axion

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A fast-spinning axion can dominate the Universe at early times and generates the so-called kination era. The presence of kination imprints a smoking-gun spectral enhancement in the primordial gravitational-wave (GW) background. Current and future-planned GW observatories could constrain particle theories that generate the kination phase. Surprisingly, the viable parameter space allows for a kination era at the PeV-EeV scale and generates a peaked spectrum of GW from either cosmic strings or primordial inflation, which lies inside ET and CE windows.

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