

Kination cosmology from scalar fields and gravitational-wave signatures

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A scalar field with large kinetic energy can dominate the Universe at early times and generates the so-called kination era. We present a natural and well-motivated particle physics realization, based simply on a Peccei-Quinn mechanism. The presence of kination imprints a smoking-gun spectral enhancement in the stochastic gravitational-wave (GW) background. Current and future-planned GW observatories could constrain particle theories that generate the kination phase. This work explores kination from a complex scalar field responsible for spontaneous symmetry-breaking of a $U(1)$ -symmetry related to baryogenesis and axion physics. Surprisingly, the viable parameter space allows for a kination era at the TeV 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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