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Gravitational waves from a thermal first order phase transition: numerical simulations

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We present large-scale numerical simulations of the gravitational radiation produced by a first order thermal phase transition in the early universe. The dominant source of gravitational waves is sound waves generated by the expanding bubbles of the low-temperature phase. The resulting gravitational wave power spectrum has a power-law form between scales set by the average bubble separation and the bubble wall width. However, the general form of the power spectrum is different from that predicted by the widely-applied envelope approximation, and the predicted gravitational wave energy density is at least two orders of magnitude larger.

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