Gravitational wave production from preheating: parameter dependence

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Abstract: Parametric resonance is among the most efficient phenomena generating gravitational waves (GW) in the early Universe. The dynamics of parametric resonance, and hence of the GW, depend exclusively on the resonance parameter q. The latter is determined by the properties of each scenario: the initial amplitude of the oscillating field, the curvature of its potential, and its coupling to other species. In my talk, I will present an analytical derivation of the GW amplitude dependence on q, valid for any scenario, which I will confront against numerical results. In particular, by running lattice simulations, we have studied the production of GW in preheating scenarios driven by parametric resonance for a wide range of q values. I will present simple fits for the final amplitude and position of the local maxima in the GW spectrum. The parametrization allows to predict the location and amplitude of the GW background today, for an arbitrary q. The GW signal can be rather large, as $h^2\Omega_{\rm GW}(f_p) \lesssim 10^{-11}$, but it is always peaked at high frequencies $f_p \gtrsim 10^7$ Hz.

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