



Mathematical Physics

Non-adiabatic transitions in a massless scalar field

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We consider the dynamics of a massless scalar field with time-dependent sources in the adiabatic limit. This is an example of an adiabatic problem without spectral gap. The main goal of our paper is to illustrate the difference between the error of the adiabatic approximation and the concept of non-adiabatic transitions for gapless systems. In our example the non-adiabatic transitions correspond to emission of free bosons, while the error of the adiabatic approximation is dominated by a velocity-dependent deformation of the ground state of the field. In order to capture these concepts precisely, we show how to construct super-adiabatic approximations for a gapless system.

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