

## Abstract

### The Frequency Dependence of the Localization Length in One-Dimensional System

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The effect of localization both quantum and classical waves has been intensively studied thorough the last decade. The apparent simplicity of the one-dimensional system attracts the investigators but does not give simple answers. This concerns the frequency dependence of the localization length. In spite of the Herbert-Jones-Thouless theorem that there should be a high frequency limit, which is equal either to zero or to a constant, and of theoretical investigations that connect the zero limit with smooth interface between layers and the non-zero valued limit with sharp one [1], there are systems in which there is neither the limit nor even localization [1].

Is shown that the zero-valued limit is observed in a delta- correlated-process only [2] where there is no reference scale of length, and the scaling could be applied. According to scaling the localization length is inversely proportional to the square of frequency [2].

Any system with final thickness of layers exhibits non-zero limit if such a limit exists at all. Moreover, is shown that the existence of high frequency limit is connected with a presence of an infinite set of incommensurable optical path in the system (the merge of layers with commensurable optical paths should be equal to zero). The value of the limit is determined by the mean thickness of the layer. While dealing with electromagnetic waves the existence of localization demands the impedance distribution. However this requirement is feebler than the requirement of optical path distribution. For example, two different values of impedance are enough for existence both of localization and of limit of localization length in the system where there are the merge of layers with identical optical paths is equal to zero.

The literature.

1. P. Sheng "Introduction to wave scattering, localization and mesoscopic" Academic Press, London (1995)
2. V. I. Klyatskin and A. I. Saichev UFN 162 161 (1992)

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