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SOURCE Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol XX, No 12, 1950,
pp 1130-8.MOTION OF THE CENTROID AND VARIATION IN WIDTH OF WAVE PACKETSR. V. Serebryanny
Moscow State U
Submitted 12 Apr 1950

[A brief digest of the above report follows:]

The author considers the motion of a bounded wave packet of general form in a homogeneous isotropic medium for any law of dispersion, and establishes that the width of packet varies as the square of the time and that the packet's centroid moves with constant velocity. The magnitude of this velocity is investigated, and it is shown that for a nonplanar packet in a medium without dispersion the velocity is less than the phase velocity of the planar waves composing the packet, and for an electromagnetic packet the velocity coincides with the velocity of the particle possessing the same momentums and energy as the packet.

The motion of wave packets was considered both in the classical theory of fields and in the quantum theory. (See Ya. P. Terletskiy, Zhur Eksp i Teor Fiz, Vol VII, 1290, 1937; De Broglie, Introduction to Wave Mechanics, translated and published 1934 by GNTU; and Schrodinger.) However, up to the present time only partial cases have been investigated. In the general form and for any law of dispersion, the problem of the time variation of the basic parameters of the wave packet has not been studied. In the present article the author seeks to find the laws governing the motion of the wave packet of the most general form; that is, his aim is to find the time dependence of the packets main parameters: width and coordinate of the packet's centroid. The investigation will be conducted for both scalar and vector waves.

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The author proceeds to find the coordinate x_n of the packet's centroid in terms of the wave function and the width Δx_n^2 . The discussion is developed under the following headings: Scalar Waves, Plane Waves, Motion in a Medium Without Dispersion, and Vector Waves.

The author thanks Prof Ya. P. Terletskiy, who proposed the project, for his assistance in the work.

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