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High-Energy Wave Packets in Processes of Bremsstrahlung, Transition and Coherent Radiation

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The evolution in space and time of localized high-energy wave packets which take place in processes of transition radiation and bremsstrahlung by ultra relativistic electrons is considered. It is shown that high energies make stabilizing influence upon the motion of such packets and that the lengths within which their dispersion and reconstruction into the packets of diverging waves occurs can be macroscopic. In this case the problem of measurement of radiation characteristics in the pre-wave zone arises which consists in dependence of the results of measurements on the detector's size and its position relative to the region of packet formation. It is shown that the structures of electromagnetic wave packets which arise at the instantaneous scattering of a fast electron to a large angle and after its traverse of thin metallic plate are analogous. In both cases, in particular, the ultra relativistic electron can be in 'half-bare' state with considerably suppressed low frequency Fourier-components of the field around it during long period of time. Some manifestations of such state of electron in processes of bremsstrahlung, transition and coherent radiation by ultra relativistic electrons are discussed.

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