Quantum oscillations of the surface impedance of a layered conductor

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We have analyzed the propagation of electromagnetic waves in layered conductors placed in a quantizing magnetic field, orthogonal to the layers, in a wide range of frequencies at low temperature. By means of the Kubo method we have derived the surface impedance of a layered conductor with the Q2D electron energy spectrum under the condition when the elastic scattering by short-range impurity centers is a main relaxation mechanism in the electron system. In the whole frequency range the Q2D character of the electron energy spectrum results in occurrence of different types of oscillations of the impedance as a function of the inverse magnetic field value: fundamental harmonics possessing a form of beatings, and low-frequency oscillations which have smaller amplitude but decay weakly with temperature. The low-frequency fraction of the quantum oscillations might be observed at such temperatures when the basic harmonics are utterly small. The dependencies on the wave frequency of the amplitude and phase of both types of the oscillations are found, which allows to mark out various regimes of the electromagnetic wave absorption. Besides that, the specificity of the electron spectrum of layered conductors gives rise to the quantum oscillations of the transparency of thin specimens whose thickness does not exceed the electron free path length. These oscillations are related to the weakly attenuating Reuter-Sondheimer waves which propagate with the extreme velocity of electrons motion along the normal to the layers.