Critical ultrasonic attenuation in magnets under the effect of magnetic field

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The sound attenuation coefficient and velocity are strongly affected by magnetic field. In the ferromagnets the positions of the maximum in attenuation and the minimum in sound velocity depend on the magnetic field [1,2]. The ultrasonic attenuation peak is shifted under the influence of magnetic field towards higher temperatures. When the external magnetic field is applied along the hard axis the position of the peak is moved towards lower temperatures. The physical origin of this scenario is discussed. The scaling expressions for sound attenuation coefficient are given and compared with the results of the Landau-Khalatnikov theory. Four new scaling regimes in addition to two traditional ones: hydrodynamic and critical regimes, are defined in the presence of the magnetic field for which the sound attenuation critical exponents are obtained. The theoretical predictions concerning the critical sound attenuation exponent are compared with the experimental results obtained for MnP in applied strong magnetic fields.

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