Mo.G-P21 - Modeling of rf nonlinear dynamics of magnetoelastic oscillations in a ferrite layers

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The system of ordinary differential equations described in the paper [1], is dealing with the electromagnetic excitation of nonlinear magnetoelastic oscillations in the normally magnetized ferrite plate when the parametric excitation of spin waves was blocked and is introduced in the given paper. The present paper deals with investigation of features of the magnetization vector nonlinear precession and the elastic displacement close to ferromagnetic resonance condition by two methods, the first one - by the eigenfunction expansion method and the second one - by the method of lines. The research was made for one-layer and two-layer ferrite plates. The case of the first elastic mode excitation is the only one that is considered in the research. The alternating circular polarized magnetic field was oriented in the plane of the plate. The systems of ordinary differential equations in nodes of the spatial grid were solved numerically by the Runge-Kutta 7-8 orders method with control of the integration at every step length. The time evolution of magnetic and elastic oscillations caused by the alternating field was analyzed. Dependences of magnetoelastic oscillation relaxation time on magnitudes of dc and alternating magnetic fields, saturation magnetization, the magnetoelasticity constant, magnetic and elastic relaxation parameters were determined. Magnetoelastic coupling efficiency in particular is determined by the ratio of the relaxation times of magnetic and elastic subsystems was revealed. Several regimes of precession changing each other by increase of the alternating field amplitude were identified. It was found that the magnetoelastic interaction changed the character of the observed precession regimes especially under the condition of the elastic resonance. In case of detuning the eigenfrequency of magnetic and elastic resonances, chaotic oscillation modes took place. The boundaries between regular

and chaotic oscillations depending on the magnetic dissipation parameter, frequency and amplitude of the alternating field were determined.

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[1] V.S. Vlasov, L.N. Kotov, V.G. Shavrov, V.I. Shcheglov, J. Comm. Tech. El., 54 (2009) 821-832