DYNAMICS OF PULSE PROPAGATION IN NONLINEAR TRANSMISSION LINE BASED ON FERRITE FILM

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Microstrip transmission line based on ferrite film of yttrium iron garnet can operate as a nonlinear device in which microwave signals propagate and demonstrate the following features: having a power P less than threshold power P_0, these signals are attenuated greater than signals with a power $P > P_0$. Theoretical analysis of this device has significant difficulties, since the nonlinearity is occurred due to parametric coupling between excited magnetostatic waves and other types of spin waves. The characteristics of the transmission line are studied in the framework of the proposed physical model of a two-level absorbing medium. In this model, the power of electromagnetic wave passing through the microstrip line and its absorption coefficient at the signal frequency f are described by a system of rate equations. The model includes two parameters: a relaxation time of the system and a saturation power. The values of these parameters can be found experimentally. In the frequency range 2-3 GHz, the experimental and theoretical study of the transmission of a weak sinusoidal signal and rectangular microwave pulses through the microstrip line is provided. The pulse duration and repetition period depend on their power. Good agreement is found between the theoretical model and experimental investigations.

9.7 cm

13.4 cm

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