On the non-equilibrium long wave fluctuations in systems of neutrons interacting with multiplying and capturing media.

S.O. Nikolayenko and Ju.V. Slyusarenko

National Science center "Kharkiv Institute for Physics and Technology", 1 Akademichna Str., 61108 Kharkiv, Ukraine
E–mail: s_nikolayenko@kipt.kharkov.ua

In the present work we study dynamics of non equilibrium long wave fluctuations in systems of particles interacting with multiplying and capturing media. The presented model can describe fluctuations in such systems as neutrons propagating in hydrodynamic media with multiplication and capture. In our model the fluctuations generated by external random force are considered. The initial equations are dynamic equations for our system including external additive noise. The approach is based on averaging of these equations over the external stochastic effect. Such averaging results into a system of dynamic equations for non equilibrium long wave fluctuations. In general case it corresponds to an infinite chain of equations for the description parameters of fluctuating system - the average values of physical properties of the system and their correlations of second and higher orders. We study in detail the case of Gaussian stationary noise and define the conditions when one can cut off the equations chain and consider only pair correlations. For such case we obtained the linearized equations for pair correlations and found the general solution of these equations. Further we consider the case of small spatial inhomogeneities and study the effect of long-wave fluctuations on the stability of the system. The problem considered should be interesting from the viewpoint of the theoretical basis for stable operation of new generation nuclear reactors, and development of the theoretical background for their diagnosis.