THERMODYNAMIC REPRESENTATION OF THE PERIODIC SET APPEARING AS A RESULT OF THE HOPF BIFURCATION

A.I. Olemskoi, I.A. Shuda

Sumy State University
(*2, Rimskii-Korsakov Str., Sumy 40007, Ukraine; e-mail: alex@ufn.ru*)

S u m m a r y

On the base of the Hamiltonian formalism, we show that the Hopf bifurcation arrives, in the course of the system evolution, at the creation of a revolving region of the phase plane being bounded by the limit cycle. A revolving phase plane with a set of limit cycles is presented in analogy with a revolving vessel containing superfluid He^4. Within such a representation, the fast varying angle is shown to be reduced to the phase of the complex order parameter, whose modulus squared plays a role of action. Respectively, the vector potential of the conjugate field is reduced to the relative velocity of motion of the limit cycle interior with respect to its exterior. From the physical point of view, this means that the nontrivial self-organized system suppresses entirely the external periodic fields with frequencies ω_0 bounded by a limit ω_{c1}, whereas this field within the domain $\omega_{c1} < \omega_0 < \omega_{c2}$ arrives at the resonance series, whose coordinates and momenta are varied within the periodically distributed domains.