15th INTERNATIONAL CONFERENCE
Dynamical Systems — Theory and Applications
December 2-5, 2019. Lodz, POLAND.

DSTA 2019

paper id: BIF275

Dynamics of non-linear processes in backward-wave tubes chain: chaos and strange attractors

Valentin Ternovsky, Alexander V. Glushkov, Eugeny Ternovsky, Andrey Tsudik

Abstract: We present the results of the computational analysis, modeling and forecasting the temporal dynamics for the chain of backward-wave tubes with study of a chaos elements, bifurcations and strange attractors. The nonlinear dynamics of the system is described by means of the nonstationary nonlinear theory differential equations for the evolution of the amplitude of the electromagnetic field in time and space and the motion of the beam. The nonlinear analysis methods include advanced versions of the correlation integral and multifractal analysis, algorithms of average mutual information, false nearest neighbors, surrogate data, Lyapunov's exponents and Kolmogorov's energy analysis, non-linear prediction schemes, predicted trajectories algorithms, spectral methods etc (in [1,2]). Using universal chaos-geometric and multisystem approach it is studied chaotic dynamics of the nonlinear processes in the chain of backward-wave tubes. There are theoretically studied scenarios of generating chaos, obtained complete quantitative data on the dynamical and topological parameters of dynamics as in the chaos regime as the hyperchaos regime and for the different modes of operation. References: [1] Glushkov A.V., Methods of a Chaos Theory. Odessa: Astroprint, 2012. [2] Glushkov A.V., Khetselius O.Yu., Svinarenko A.A., Buyadzhi V.V., Methods of computational mathematics and mathematical physics, P.1. Odessa: TEC, 2015.

[1)] Valentin Ternovsky, Associate Professor: Odessa National Maritime Academy, Didrikhsona str., 4, Odessa, 65000, Ukraine (UA), ternovskyvb@gmail.com.

[2)] Alexander V. Glushkov, Professor: Department of Applied Mathematics, Odessa State Environmental University, L'vovskaya str., 15, of. 408, Odessa, 65016, Ukraine (UA), glushkovav@gmail.com.

[3)] Eugeny Ternovsky, M.Sc. (Ph.D. student): Department of Applied Mathematics, Odessa State Environmental University, L'vovskaya str., 15, of. 408, Odessa, 65016, Ukraine (UA), ternovskyev@gmail.com.

[4)] Andrey Tsudik, M.Sc. (Ph.D. student): Department of Applied Mathematics, Odessa State Environmental University, L'vovskaya str., 15, of. 408, Odessa, 65016, Ukraine (UA), tsudik14@gmail.com.