Najdan Aleksic

Corresponding member of SANS since 2021.

Born on May 2, 1954. in Stanjinac, Serbia, from father Branislav and mother Kaja. He studied high school in Pirot, and in 1978 he graduated from the Faculty of Science and Mathematics at the Department of Physics in Belgrade, where he obtained his master's degree on the subject: "Fluctuations of surface waves and radiation from inhomogeneous magnetoactive plasma" (1982). He received his Ph.D. in 1991 on the topic "Theory of nonlinear high-frequency waves in semi-confined plasma" at the Faculty of Physics in Belgrade. From 1979 until his retirement in 2020, he was permanently employed at the Institute of Physics in Belgrade, where he obtained all scientific titles: 1982 - Assistant Research, 1992 - Assistant Research Professor, 2007 - Associate Research Professor, 2011 - Research Professor. Corresponding member of Serbian Academy of Nonlinear Sciences since 2021.

International cooperation: Institute of Theoretical Physics NN Bogolyubov, Kiev (1986-1988, 1991-1992); Physical Institute of USSR Academy of Sciences “P.N. Lebedev” in Moscow (1989, 1990); Visiting professor, Laboratoire POMA UMR CNRS 6136, Université d’Angers from 2002 to 2012 and 2015 (one or two months per year); Participating in the following research projects: National Priority Research Program(NPRP) of Qatar Foundation , within the framework of Texas A&M University in Doha, Qatar (2009-2023); Project of the Russian Science Fundation № 18-11-00247, «Stankin» Moscow, (2018-2022). Participating as one of the chairs in bilateral international cooperation projects with France and Belarus.

Educational activities At the graduate studies on the Faculty of Physics, University of Belgrade, he lectured several courses: 1) Plasma sources and magnetohydrodynamic plasma theory, 2) Numerical methods and simulations in ionized gas and plasma physics; 3) Numerical simulation methods. He was mentoring a few doctoral theses.

Research Interests Development of stability analysis methods of multidimensional dissipative structures modeled by a system of reaction-diffusion type equations.

Contribution to Nonlinear Sciences

In early works, the three-wave and four-wave interaction of electromagnetic waves on the surface of a semi- bounded plasma was studied in the hydrodynamic approximation and within the kinetic theory. The generation of quasi-stationary magnetic fields as a result of three-wave interaction is analyzed and a series of surface waves at the plasma boundary, accompanied by plasma stratification, is predicted. The decay of a bulk wave into two surface waves was studied and it was shown that this process can compete with the modulation instability.

In the last two decades, scientific activity has been devoted to the self-organization of electromagnetic localized structures in nonlinear optics. Within the framework of a *conservative model*, mathematically described by the nonlinear Schrödinger equation (NLSE), the stability conditions of a new type of non-localized vortices in optical media with saturation nonlinearity and their coexistence with localized vortex solutions were studied. In a model with non-local nonlinearity using the calculus of variations, the

difference between the widely used accessible soliton approximation and the self-organized structure in the form of soliton is analytically demonstrated and confirmed by numerical simulations. In addition, it has been shown that, in many works numerically studied, breathing solitons in media with nonlocal nonlinearity are in fact a consequence of the inconsistent solution of the NLSE and the equation describing the nonlocal nonlinearity.

As a special case of self-organization, the dynamics of the generation of solitons, breathers and rogue waves as a consequence of modulation instability, was studied in the model of generalized one-dimensional NLSE up to the fifth order of dispersion.

Non-conservative (dissipative) model of self-organization was studied on the mathematical model of the complex Ginzburg Landau equation, which is used in many scientific fields areas and in nonlinear optics describes the resonant interaction of electromagnetic radiation with a nonlinear dispersive medium. Starting in 2006, highly effective analytical methods and numerical algorithms for stability analysis of multidimensional dissipative fundamental and vortex dissipative structures were systematically developed. One of the significant results of this methodology is the prediction of areas, in the parameter space, in which stable dissipative fundamental or vortex structures of arbitrarily high helicity exist.

The results of scientific activity are presented in more than 90 publications, including more than 60 in leading international journals, as well as several book chapters and monographs.

A List of 5 Selected Research Publications:

1) V Skarka, NB Aleksić, Stability criterion for dissipative soliton solutions of the one-, two-, and three-dimensional complex cubic-quintic Ginzburg-Landau equations, Physical Review Letters 96 (1), 013903 (2006)
2) V Skarka, NB Aleksić, H Leblond, BA Malomed, D Mihalache, Varieties of stable vortical solitons in Ginzburg-Landau media with radially inhomogeneous losses, Physical Review Letters 105 (21), 213901 (2010)
3) BN Aleksić, NB Aleksić, MS Petrović, AI Strinić, MR Belić, Variational and accessible soliton approximations to multidimensional solitons in highly nonlocal nonlinear media, Optics express 22 (26), 31842-31852 (2014)
4) BN Aleksić, NB Aleksić, V Skarka, M Belić Stability and nesting of dissipative vortex solitons with high vorticity, Physical Review A 91 (4), 043832 (2015)
5) Milivoj R Belić, Stanko N Nikolić, Omar A Ashour, Najdan B Aleksić, On different aspects of the optical rogue waves nature, Nonlinear Dynamics 108 (2), 1655-1670 (2022)