

ALEXANDER ALEKSEEVICH POTAPOV

(to 70th Anniversary of Birth)

UDC 929.53



Alexander A. Potapov is a doctor of physical and mathematical sciences, a well-known scientist in the field of radiophysics and radar, statistical radio engineering, recognition and processing of images and signals, fractal and texture analysis, fractional operators, fractal electrodynamics, fractal antennas and deterministic chaos.

Alexander Alekseevich Potapov was born on May 4, 1951 in the village of Lukino, Rzhaksinsky District, Tambov Region, Russia. After graduating from high school with a gold medal in 1968, he entered the radio engineering department at the Ryazan Radio Engineering Institute. Then in 1979 he graduated from the evening department (engineering flow) of the physics department of Lomonosov Moscow State University.

Since 1979 A.A. Potapov works at the Institute of Radioengineering and Electronics of the Russian Academy of Sciences. Aleksandr Alekseevich went through all the stages from junior to chief researcher. In 1989 he defended his Ph.D. thesis on a special topic at the Moscow Institute of Physics and Technology, and in 1994 - his doctoral dissertation at the IRE RAS on the topic: "Synthesis of images of the earth's covers in the optical and millimeter wave ranges".

Since 1979, the main scientific direction of A.A. Potapov - application of the theory of fractals, fractional operators, scaling effects and deterministic chaos in radiophysics, radar, radio electronics, electrodynamics, control theory and a wide range of related scientific and technical areas for the creation and development of breakthrough information technologies. He is currently working on combining fractals, photonics and

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nanotechnology. A.A. Potapov is the initiator of the first research and development work in Russia on radiophysical applications of the theory of fractals, scaling effects and fractional operators in radio systems.

The results of the scientific activity of A.A. Potapov on fractal information processing in intense interference, as well as on fractal radio systems, sensors and fractal radioelements were published in four reports of the Presidium of the Russian Academy of Sciences (Scientific achievements of the Russian Academy of Sciences. Moscow, Nauka Publ., 2008, 2010, 2012 and 2013), and also in a report to the Government of the Russian Federation - Moscow, Nauka Publ., 2012. All these priority results in the world make it possible to move to a new level of information structure of real non-Markov signals and fields.

At present, based on the pioneering work of A.A. Potapov and his students at the Kotelnikov IRE RAS, a new fundamental direction "Fractal radiophysics and fractal radio electronics: design of fractal radio systems" was formed and the Russian scientific school of fractal methods, well known in the world, was created.

A.A. Potapov - Scientific Secretary of the Dissertation Council at the Kotelnikov IRE RAS (1999-2018). Twice (1997 and 2000) he was awarded the State Scientific Scholarship. He is Deputy Chairman of the Scientific Qualification Seminar "Problems of Modern Radiophysics" and a member of the NKS "Informatics" at the Kotelnikov IRE RAS. In the period 2000-2002. A.A. Potapov is a professor at MIREA (SU), from 2008 to 2019 - a professor at the Tupolev Kazan State Technical University. Member of the Nizhny Novgorod Mathematical Society (2017). In 2015 A.A. Potapov was elected a full member of the Non-Departmental Expert Council on Aerospace Problems.

During the period of his work at the Kotelnikov IRE RAS gave a reliable physical substantiation of the practical application of fractal methods in modern fields of radiophysics, radio electronics and information-control systems; for the first time, the effectiveness and prospects of applying fractional measure theory, dimension theory and scaling relations (for textures and fractals) in the case of detecting and recognizing (filtering) one-dimensional and multidimensional radar signals from low-contrast targets against the background of intense non-Gaussian interference of various kinds was proposed and proved. He proposed the concept of creating fundamentally new

fractal radio systems, fractal sensors and fractal element base. In Kotelnikov IRE RAS in 2005, a working model of the world's first fractal nonparametric radar signal detector was created. A rigorous electrodynamic calculation of numerous types of fractal antennas has been carried out, the design principles of which underlie fractal frequency-selective surfaces and volumes (fractal "sandwiches"). For the first time, a model of a "fractal" capacitor was proposed and implemented as a fractal impedance and fractal labyrinths for the synthesis of microwave structures. In 1997, methods of fractal modulation and fractal broadband signals were developed for the first time. For the first time, a new class of informative features is proposed, based on the fine structure of reflected millimeter-wave radar signals. Also, for the first time, complete ensembles of textural features of optical and radar images of real earth covers have been investigated. The presence of a strange attractor is predicted to control radar scatter from vegetation. Subsequently (2002) the effect was discovered experimentally at a wavelength of 2.2 mm. In 2015 A.A. Potapov, for the first time in world practice, discovered, proposed, substantiated and developed the principles of a new type and a new method of radar, namely, fractal-scaling or scale-invariant radar. The efficiency of functionals, which are determined by the topology, fractional dimension and texture of the received multidimensional signal, for the synthesis of fundamentally new non-energy detectors of low-contrast objects against the background of noise has been proved. The postulates of fractal radar have been developed: 1 - intelligent signal/image processing based on the theory of fractional measures and scaling effects for calculating the field of fractal dimensions D ; 2 - the sample of the received signal in noise belongs to the class of stable non-Gaussian probability distributions D of the signal; 3 - maximum topology with minimum energy of the input random signal (ie, maximum "deviation" from the energy of the received signal). This entails fundamental changes in the structure of theoretical radar, as well as in its mathematical apparatus.

A.A. Potapov - the author of the first in Russia monograph "Fractals in radiophysics and radar" (Moscow, Logos Publ., 2002, 664 p.), Which was revised and supplemented (Potapov A.A. Fractals in radiophysics and radar: sampling topology. Moscow, Universitetskaya kniga Publ., 2005, 848 p.). These two monographs have become the reference books of scientists of various specialties. A.A. Potapov - Author and co-author of a number of monographs on radar and the use of fractals in science and technology. Giving lectures on fractal technologies developed by him at the IRE RAS and reports on the ISTC project (together with the Almaz Central Design Bureau) in 2000 and 2005.

in the USA (Washington, New York, Huntsville, Atlanta, Franklin), in China (2011 to the present) and at numerous international conferences (England, USA, Canada, Holland, Austria, Germany, France, Spain, Italy, Hungary, Greece, Turkey, Scotland, Switzerland, Sweden, Mexico, China, Serbia, Montenegro, Bulgaria, Kazakhstan, Belarus, Ukraine) brought him wide popularity in the international scientific community. In 2005, a significant meeting of A.A. Potapov with the founder of fractal geometry B.B. Mandelbrot, who warmly supported the work of A.A. Potapov.

A.A. Potapov published personally and in co-authorship over 1150 scientific papers in domestic and international publications, including over 45 monographs and chapters in books in Russian and English, 2 patents and 9 textbooks. He developed a course of lectures on the use of fractals and wavelets in radar for the Training Center of the Concern RTI Systems (A.L. Mints RTI and JSC NPK NIIDAR). Honorary Professor of the Eurasian National University (Astana, Kazakhstan, 2010), Honorary Professor of Jinan University, Guangzhou, China, 2011. In March 2012, A.A. Potapov was appointed President of the Sino-Russian Laboratory of Information Technologies and Fractal Signal Processing. A.A. Potapov is a member of the organizing committees of numerous international and Russian conferences. In 1997, he was awarded the medal "In Commemoration of the 850th Anniversary of Moscow". He was awarded the badge "Honorary Radio Operator of the Russian Federation" (2006) and eighteen medals. Laureate of the Prize. Academician A.M. Prokhorov (2013) and the WES VKS Prize (2016).

A.A. Potapov - organizer and editor-in-chief of the journal "Nonlinear World" (2003), member of the editorial boards and editorial boards of 13 Russian and international journals. The biography of Alexander Alekseevich was published in the encyclopedia "Who is Who in Russia" (Verlag fur Personencyklopadien AG - Switzerland) at the personal request of the Publisher (2009-2010).

A.A. Potapov - Academician of the Russian Academy of Natural Sciences in the Department of Problems of Radioelectronics, Nanophysics and Information Technologies and Academician of the A.M. Prokhorov Academy of Engineering Sciences.

A.A. Potapov has a well-deserved authority and is widely known among scientists.

Friends, colleagues and students congratulate Aleksandr Alekseevich Potapov on his glorious anniversary and sincerely wish him health, new successes, long years and fruitful work.

The editorial board of the journal of the RANS Branch cordially joins these wishes to their colleague.

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