

## To the 80th birthday of A.A. Manenkov



Aleksander Alekseevich Manenkov, a well-known Russian physicist, doctor of science in physics and mathematics, professor, one of the pioneers of quantum electronics, who made a significant contribution to its establishment and development, was 80 on 2 January 2010.

A.A. Manenkov was born into the family of workers on 2 January 1930 in the village of Kirel'sk, Kamsko-Ust'inskii region, Tatar Autonomous Soviet Socialist Republic. After graduating in 1952 from the faculty of physics and mathematics of the Ul'yanov-Lenin Kazan State University, he continued his post-graduate study at the Kazan Institute of Physics and Technology (nowadays Zavoisky Physical-Technical Institute of the Kazan Scientific Center of the Russian Academy of Sciences) and in 1953 he was sent to Moscow, to the P.N. Lebedev Physics Institute, Academy of Sciences of the USSR (FIAN), where he continued his post-graduate study under the supervision of A.M. Prokhorov. After defending his candidate's thesis in 1955, Aleksander Alekseevich started working at the Oscillation Laboratory in FIAN.

A.M. Prokhorov, under whose supervision Aleksander Alekseevich Manenkov conducted his first research, produced a decisive influence on the formation of his 'scientific face' and directions of his scientific activities. Their close collaboration during which many works were performed and many papers were published continued later. The scope of scientific interests of A.A. Manenkov covers a wide range of problems: magnetic resonance physics, solid-state physics, quantum electronics, laser physics, and nonlinear optics.

In the field of the EPR radiospectroscopy, Aleksander Alekseevich was the first to determine the level structure and the wave functions of the ground state of  $\text{Cr}^{3+}$  ions in ruby, and elucidated the mechanisms of the EPR line broadening. These results formed the basis for creating highly efficient microwave quantum amplifiers in a wide wavelength range. In 1956, A.A. Manenkov and A.M. Prokhorov proposed to use ruby as an active material for quantum amplifiers. In 1958, they realised it for the first time (together with the colleagues from the Moscow State University).

For designing such amplifiers, Aleksander Alekseevich together with other collaborators was awarded the State Prize of the USSR in 1976. The successful development of the research on ruby microwave quantum amplifiers (masers) stimulated extension of the principles of quantum electronics to the optical frequency range: the first laser was created, as is known, using ruby.

A.A. Manenkov obtained the results of fundamental importance for physics of nonequilibrium processes in spin systems: new spin-lattice relaxation processes were discovered – so-called resonance processes via the intermediate state and new spin-spin cross-relaxation processes – so-called combination processes.

Note also the important results obtained by A.A. Manenkov in studying the quantum generator dynamics. By the example of ruby and rutile masers, the nature of radiation oscillations was elucidated: it was shown that they are caused by the transient relaxation processes before reaching the steady state.

After defending the doctoral dissertation at FIAN in 1965, A.A. Manenkov concentrated his attention on research in the fields of optical quantum electronics, physics of solid-state lasers, interaction of high-power laser radiation with matter, and nonlinear optics.

Based on the results of investigations performed by Aleksander Alekseevich, the fundamental mechanisms of laser-induced damage to optical materials of different types (crystals, glasses, polymers) were found, adequate theoretical models of such mechanisms were developed (impact and multiphoton ionisation, thermal explosion of absorbing inclusions), and their role in different materials and under various interaction conditions was determined (in particular, in varying the laser pulse duration in a broad range – from milliseconds to femtoseconds). He proposed and realised a number of efficient methods for increasing substantially the laser damage resistance of the surface and volume of the optical materials used in high-power lasers.

Aleksander Alekseevich predicted the phenomenon of nonlinear light scattering in heterogeneous media caused by the difference in the nonlinear refractive indices of the medium components. Studies of this phenomenon performed by him and his co-authors showed that it can have important practical applications, in particular, based on the use of the discovered effect of heterogeneous medium bleaching.

High scientific proficiency and erudition in different spheres of physics as well as scientific and civil adherence to his principles made A.A. Manenkov highly respectable in the scientific community both in our country and abroad. For many years, he was the member of the council of experts of the Highest Certificate Committee of the USSR. Aleksander Alekseevich is the member of the International Council on Quantum Electronics, the member of the Scientific Council of the RAS on Optics and Laser Physics.

Under the supervision of A.A. Manenkov, many of his pupils became candidates and doctors of science and now are heading scientific institutions both in Russia and abroad.

Scientific achievements of A.A. Manenkov are highly appraised by the State and the scientific community. He was awarded the State Prize of the USSR (1976) and the first A.M. Prokhorov Gold medal of the Russian Academy of Sciences (2008).

A.A. Manenkov is the author of more than 350 scientific papers published in our country and abroad. He continues to work actively in science, participates in Russian and international conferences.

We congratulate Aleksander Alekseevich on the jubilee and wish him further success in his creative activities.

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