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PERSONALIA

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Grigory Gennadievich Denisov (on his 70th birthday)

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April 30, 2026 was the 70th birthday of Grigory Gennadievich Denisov — an outstanding physicist, doctor of physical and mathematical sciences, academician of the Russian Academy of Sciences (RAS), a member of the Bureau of the Division of Physical Sciences of RAS, director of the Federal Research Center A.V. Gaponov-Grekhov Institute of Applied Physics of the Russian Academy of Sciences (IAP RAS).

On graduating from the Radiophysical Department of N.I. Lobachevsky Gorky State University (GSU) in 1978, G.G. Denisov began working at the newly founded Institute of Applied Physics of the USSR Academy of Sciences, with which all his further scientific life has been associated and where he consistently passed through all the carrier stages from research intern and postgraduate student to director of the Institute.

Over the years of his work, he became widely known in our country and abroad for his theoretical and experimental works on electrodynamics of multimode systems and high-power electronics. In 1985, he defended his candidate thesis "Relativistic electronic microwave generators of millimeter wave range with highly selective electrodynamic systems" under the supervision of academician A.V. Gaponov-Grekhov, and in 2002 defended his doctoral thesis "Formation, conversion, and transmission of radiation in oversized electrodynamic systems."

From 2012 to 2017, G.G. Denisov was head of the Division of Plasma Physics and High-Power Electronics and deputy director of the Institute for scientific work, and since 2017 to the present time he has been director of IAP RAS. In 2011 he was elected a corresponding member and in 2022 a full member of the Russian Academy of Sciences.

The new methods of transformation of the spatial structure of wave streams, developed by G.G. Denisov, in combination with high-technology engineering solutions, provided the creation of gyrotrons generating Megawatt electromagnetic radiation with generation efficiency exceeding 50% in the short-wave part of millimeter wave range (frequencies from 110 to 170 GHz) in continuous regime (with duration to 1000 seconds). Such devices are in great demand for large-scale thermonuclear installations (tokamaks and stellarators), including the international thermonuclear reactor ITER, now being constructed in France. The planned experiments on plasma production and its stable confinement are now equally provided by the Russian gyrotrons, designed under the guidance and with participation of Denisov, and the gyrotrons of the Japanese Canon corporation (competing corporations from USA and EU have been unable to elaborate devices with needed parameters).

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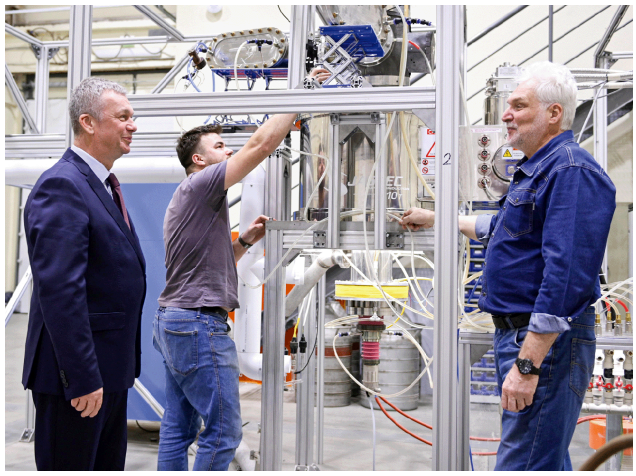
Grigory Gennadievich Denisov

In the mid-1990s, G.G. Denisov suggested the idea of using waveguides with helically corrugated surface for realization of gyroresonant traveling-wave tubes (gyro-TWT), which had been rather well studied theoretically by that time, but did not find practical embodiment because of the low efficiency, instability, and impossibility of work with a broad band and a high amplification factor. Owing to the development of solutions, proposed by G.G. Denisov, created at IAP RAS were a number of experimental samples and devices for practical applications with record parameters of output power and frequency amplification band (up to 20%) in the millimeter waveband for promising means of radiolocation and communication, in particular, high-resolution radio-portraiture of cosmic objects.

The works in the field of gyro-devices with helical waveguides largely stimulated investigations of compression of frequency-modulated pulses. The performed pioneering experiments showed availability of the combination of relativistic backward wave tube (BWT) and helical compressor-waveguide in the development of short-pulse microwave

Visit of the Director General of the International Thermonuclear Experimental Reactor (ITER) Osamu Motojima, Japan at SPE 'Gycom.' From left to right: G.G. Denisov, A.G. Litvak, A.V. Krasilnikov, A.B. Alekseev, O. Motojima, E.M. Tai. IAP RAS, August 28, 2013.



G.G. Denisov, A.A. Ananichev, M.Yu. Glyavin (from left to right) during commissioning works on a short-pulse gyrotron prototype for the tokamak with reactor technologies (TRT) in the Laboratory of Sources and Applications of Powerful Terahertz Radiation at IAP RAS, January 2025.

sources of multigigawatt power for compact high-gradient charged particle accelerators.

For the ninth year now, G.G. Denisov has been director of the Institute of Applied Physics, one of the largest scientific centers of the Russian Academy of Sciences. Over these years, he has successfully managed a complex range of tasks, solving a multitude of scientific, organizational, administrative, and economic problems. Under his leadership, the Institute not only maintains its leading position in domestic and international science, but initiates new large-scale projects for creating unique electromagnetic radiation sources of microwave, optical, and X-ray ranges and studying the radiation-matter interaction, for the development of radiophysical methods and means of natural, laboratory, and medical diagnostics, and for solution of important applied problems.

It is impressive that, despite such an administrative workload, G.G. Denisov is involved in highly productive scientific work in his native professional field. Thus, it was during these years that he obtained promising results in increasing the frequency and power of gyroresonant devices and developing methods to control their spectral characteristics (frequency stabilization and tuning by an external signal, ensuring single-mode generation in fundamentally multimode systems). This, in particular, offers the possibility for designing megawatt gyrotrons at higher frequencies (230–270 GHz), needed for the next-generation thermonuclear reactors currently being developed, that use high-temperature superconducting (HTSC) magnetic field systems, such as, for example, the TRT tokamak.

In 2018, G.G. Denisov proposed a concept of using a quasi-optical zigzag transmission line to implement broadband cyclotron resonance masers operating in the subterahertz range. The development of this idea has led to the creation of a gyro-resonant backward-wave tube (gyro-BWT), which can become a unique alternative both to the ordinary BWT and to gyrotrons in the sub-teraHertz frequency range (0.1–1 THz). Compared to multifrequency gyrotrons, the gyro-BWT 'Zigzag' can provide a virtually continuous generation frequency tuning in the octave band, the same as the ordinary BWT, but with 4 to 5 orders of magnitude higher generated power.

The results of G.G. Denisov's works and the devices designed on their basis are in great demand in many Russian and international plasma laboratories and high-energy physics centers for creating multicharge ion sources; they are widely used in the development of new methods for microwave material processing and for growing diamond films and discs by chemical deposition from the gas phase.

G.G. Denisov is a world-known scientist. His results and elaborations are published in more than 400 scientific papers (the Hirsch index is 40 and the number of citations is over 6500). He is a permanent member of the program committee of the regular international conference "International Conference on Infrared, Millimeter, and Terahertz Waves." The leading scientific school in the field of high-power microwave and terahertz electronics that he directs consists of over 40 scientists, including 8 doctors and 14 candidates of sciences, including 7 candidates and 1 doctor of sciences who defended their theses under his direct supervision.

G.G. Denisov is Chairman of the Academic Council of IAP, RAS, member of the Scientific and Technical Coordination Council of ITER at the State Corporation 'Rosatom,' and member of the Expert Council of the Ministry of Education and Science.

For his scientific achievements, G.G. Denisov received numerous scientific prizes and awards: the Lenin Komsomol Prize (1987), the State Prize of the Russian Federation (2003), the Prize of the RF Government (2011), and the D Rose International Prize for achievements in the field of thermonuclear fusion (1996).

Friends, colleagues, and numerous disciples of Grigory Gennadievich Denisov wish him good health and long life, new interesting scientific results, and success in all his affairs and endeavors.

S.V. Garnov, N.S. Ginzburg, M.Yu. Glyavin, V.I. Ilgisonis, V.V. Kveder, V.V. Kocharovskii, Z.F. Krasil'nik, A.V. Krasilnikov, A.G. Litvak, E.A. Mareev, A.M. Sergeev, M.I. Yalandin