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Vladislav Pavlovich Sarantsev

Professor Vladislav Pavlovich Sarantsev, an outstanding scientist, major specialist in the field of physics and technology of accelerators, Chief Engineer of the Joint Institute for Nuclear Research (JINR) in Dubna, died on 31 January 1995.

V P Sarantsev was born on 23 September 1930 in Saratov. When still a student in the Physics Department of Moscow State University, he participated in his very first year in a mountaineering expedition to the Pamirs, which was organised to study extensive atmospheric particle showers.

After graduation from Moscow State University in 1954, Sarantsev was sent to the Technical Building Directorate (TDS-533), to the future Dubna. There, a team led by Academician V I Veksler was constructing the synchrophasotron, which was then the largest accelerator in the world. This was the kingdom of young scientists with extensive opportunities for creativity and outlets for enthusiasm. Seminars by leading scientists filled auditoria completely. Sarantsev spent countless days and nights on the task of assembling and commissioning the linear accelerator – injector — the synchrophasotron. Finally, in the spring of 1957 the synchrophasotron became operational. This was a brilliant victory for Soviet science.

Later, V P Sarantsev headed the work at the JINR on a new more efficient variant of the injector which made it possible to increase significantly the intensity of the synchrophasotron beam. The work during those years made Sarantsev a specialist in the field of linear accelerators.

Having completed the construction of the synchrophasotron, V I Veksler sought new promising and more economic acceleration methods. The development and implementation of these methods required an experienced and energetic like-minded enthusiast. Sarantsev became this enthusiast. In the first stage of developing a new acceleration method, V I Veksler assembled a group of theoreticians and later also an experimental group led by Sarantsev. Unfortunately, Vladimir Iosifovich Veksler did not live to see the first full-scale experiments and Sarantsev became the leader of research on the collective acceleration method and of the work on solving the related scientific and technical problems.

The first report at the International Conference on Accelerators (held in the USA in 1967) on the theoretical and experimental results obtained in Dubna led to the establishment in many laboratories in the Soviet Union and abroad of groups dedicated to the study of the collective acceleration method. The hopes to achieve ultrahigh energies were pinned to the development of accelerators based on this new method. Theoretical models of a collective accelerator predicted a high rate of energy acquisition by ions and, consequently, a lower cost and smaller size of the accelerator compared with the traditional machines. A major scientific result of V P Sarantsev and of the Division of New Acceleration Methods (ONMU) headed by him was an experimental confirmation of the feasibility of collective acceleration of ions. At the end of 1970 the acceleration of helium ions by the collective method was achieved for the first time ever at the JINR.

The explosive growth of new acceleration techniques throughout the world was directly related to the successes of the Dubna group. This was greatly helped by the idea of creating dense relativistic-electron bunches in the shape of

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rings. The rings were formed in what was called in Russian the 'adgezator' — an adiabatic generator of charged toroids. The use of this generator — representing a classical betatron in which the betatron condition was not satisfied and the radius of an electron ring decreased with increase in the magnetic field — provided a fundamentally new basis for the implementation of the collective acceleration method. This generator eliminated the danger of instabilities, numerous forms of which were discovered in plasmas in the middle and late sixties. Before that, many people felt that the creation of a stable electron ring with positive ions was an impossible task.

The development and construction of a prototype collective accelerator of heavy ions (Russian acronym 'KUTI') began in 1972 in the ONMU. The accelerator was commissisoned in 1977 and it demonstrated that, in principle, the collective acceleration method can be used in heavy-ion accelerators: nitrogen, xenon, and other ions were accelerated. This novel approach to acceleration is now known as the Veksler – Sarantsev method.

Sarantsev's team constructed a fundamentally new accelerator of the induction type, a high-current pulsed linear nanosecond accelerator (Russian acronym 'SILUND'), designed specifically to match the conditions of injection in the adiabatic generator of charged toroids and intended for experiments on the collective acceleration method at the JINR.

Considerable experience in the development of high-current linear accelerators has been gained subsequently and a technology has been developed for inductors (to be used in these accelerators) in which compression circuits, novel high-power pulse power supplies, etc. are used. This brought V P Sarantsev a worldwide recognition. The research team led by Sarantsev made the JINR an international authority in the development of new acceleration methods.

More recently, the scientific interests of Vladislav Pavlovich have been concentrated on a new branch of acceleration physics, which is the construction of linear electron – positron colliders and a framework has been established for cooperation on the subject with CERN and DESY. Sarantsev led the development and experimental tests on a new relativistic klystron, which should make it possible to construct high-power microwave sources for linear colliders.

Vladislav Pavlovich gave much attention to the development of nontraditional microwave sources for linear colliders and the development of gamma – gamma colliders based on the use of free-electron lasers.

In his last scientific work, Vladislav Pavlovich proposed the idea of a driver based on a free-electron laser designed for inertial thermonuclear fusion. Realisation of this concept should open up new avenues in the field of industrial thermonuclear reactors.

In the last two years, V P Sarantsev was the Chief Engineer at the JINR and presided over the technical side of running the Institute and guided the development of new base units at the JINR.

V P Sarantsev was held in great respect as a major scientist and science organiser. He was a member of the Bureau of the Scientific Council on the Problems of Acceleration of Charged Particles of the Russian Academy of Sciences, a member of the working group IKFA, which is concerned with the technology of accelerators, and chairman of the Division of Collective Acceleration Methods of this Council.

V P Sarantsev was awarded orders and medals by the Soviet Union and other member states of the JINR. The picture of Vladimir Pavlovich — a talented scientist, unusually active in creative and social life, a fascinating man who loved life — will always remain in the memory of his colleagues and numerous students.

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