

# 2000 Microwave Pioneer Award

## Yevgenii M. Kuleshov

The Microwave Pioneer Award recognizes an individual or a team not exceeding three persons having made outstanding pioneering technical contributions that advance microwave theory and techniques and described in an archival paper published at least 20 years prior to the year of the award. This year's recipient is Dr. Yevgenii M. Kuleshov, and his citation reads: "FOR DEVELOPMENT OF A HOLLOW-RIBBED DIELECTRIC BEAMGUIDE TECHNOLOGY AND QUASI-OPTICAL MEASURING TECHNIQUE IN THE SHORT-MILLIMETER AND SUB-MILLIMETER WAVELENGTH REGIONS."

**Yevgenii M. Kuleshov** was born on February 21, 1922 in Voronezh, then USSR. He received an MS degree from the Kiev Polytechnical Institute (now National Technical University) in 1946, a Ph.D. degree in Radio Engineering from the Kharkov Military Academy of Radio-Engineering and Radars (now Kharkov Military University) in 1957, and a Senior Scientist title from the USSR Academy of Sciences in 1958, respectively.

From 1951 to 1953 he worked as an assistant professor at the Kharkov Polytechnical University. He also taught, as a part-time associate professor, at the Kharkov Aerospace Engineering University in 1962 and 1963. But the primary part of his career was related to R&D and practical engineering. From 1953 to 1955, he was a head of laboratory at the Kharkov Institute of Physics and Technology (now National Scientific Center for Plasma and Particle Acceleration). After branching off a new R&D institute in 1955, he headed a department in the Institute of Radio-Physics and Electronics of the Ukrainian Academy of Sciences (now IRE NASU), in Kharkov. It has had various names around quasi-optical measurements and now is called quasi-optics department. From 1988 to present time, he is a principal scientist at IRE.



Dr. Kuleshov started his career in the measurements in millimeter (mm) wave band in the 50's. Then, and until the 90's, the main task of his laboratory was development of mm and sub-mm wave technologies for a hot-plasma diagnostics in TOKAMAK fusion machines. At the initial stage, he successfully used a conventional technology based on the downscaled hollow metal waveguides. However, soon it became clear for him that the short mm and sub-mm wave bands called for some principally new technology.

In the late 50's, he proposed first ideas about such a new quasi-optical technology, based on the "oversized hollow-ribbed dielectric waveguide", called also a "beamguide". In December of 1963, the first official R&D project was formulated and funded by the USSR Academy of Sciences. By the end of 1964, all principal points of the new technology had been clarified; prototype devices had been manufactured and tested, and a (classified) technical report was published. Also classified until 1992 was the Soviet patent "Dielectric beamguide for mm and sub-mm wave bands" first disclosed by Kuleshov and his team in 1969. The very first open-literature publication on the beamguide itself appeared only in 1972, in a disguise of a student's work on validating a specific mode-attenuation formula, in a limited-circulation university journal.

In the meantime, the practical engineering side of his work was very active and fruitful. Based on this technology, original complete sets of the mm and sub-mm band measuring devices had been elaborated by Dr. Kuleshov in the 70's to 90's. All of them are manufactured in small numbers until the present time. This technology has been applied by him in various microwave fields to design complete measuring systems. For example, the series of multi-channel interferometers and polarimeters for a hot-plasma diagnostics in the large TOKAMAK fusion machines (wavelength of 0.2 to 0.3 mm) resulted in a 9-channel system used in the most powerful Soviet TOKAMAK-15. Other important applications covered FIR lasers, spectroscopy, reflectometry, radiometry, ellipsometry, biomedicine and mm-wave therapy, and others.

His awards are Lenin Prize (1960, team member) - for the works on research and application of microwave devices, State Prize of Ukraine (1972, team leader) - for development of a set of quasi-optical measuring devices - both awards had been classified until 1992. He was also decorated with the USSR order Sign of Honor (1976) and three medals. He holds honorary titles of the Senior Scientist (1958), Honored Inventor of USSR (1978), Honored Radio Engineer of USSR (1980), and Honored Inventor of Ukraine (1998). Since 1998, he is a Senior Member of IEEE MTT Society.

He supervised seven Ph.D. candidates and has authored and co-authored over 100 journal papers and 45 patents. He is on the editorial board of the journal "Radio-Physics and Electronics" published by IRE NASU.