

1990 Microwave Career Award

Robert A. Pucel



The *Microwave Career Award* is presented to an individual "for a career of meritorious achievement and outstanding technical contributions in the field of microwave theory and techniques". It is the highest award given by the Microwave Theory and Techniques Society. The 1990 Microwave Career Award recipient is Dr. Robert A. Pucel.

Robert A. Pucel (S'48, A'52, M'56, SM'64, F'79) attended M.I.T. and received the bachelor's and master's degrees in 1951. Enrolled in the Cooperative Program his first industrial experience was obtained with the General Electric Company. After a year at the newly formed Raytheon Research Division he returned to M.I.T. to pursue doctoral studies in time-domain synthesis under the late Prof. E.A. Guilleman.

Upon receipt of his degree, Dr. Pucel returned to the Research Division at Raytheon where, as a member of the Theoretical Physics Group, he collaborated on basic studies of bipolar transistors and their potential use at high frequencies. Later he turned his interest to microwave devices and in 1962 Dr. Pucel developed the first comprehensive analysis of the tunnel diode as a microwave mixer.

About this time he joined a group which was developing and characterizing ferroelectric materials for microwave applications. In 1964 Dr. Pucel proposed the use of high dielectric constant substrates such as alumina for the miniaturization of microwave circuits. During this period he formed a group that collaborated on basic studies of propagation of microwaves on conductors printed on dielectric and magnetic substrates, now known as "microstrip". Two results of this work were the discovery of dispersion and a more accurate method of calculating conductor losses on microstrip.

After five years of research in this area, he returned to bipolar transistors, work now centered in another division. In the period 1969–1972 he and a colleague developed (and later patented) a means of interconnecting individual cells of a power transistor, a technique later to be known as the "air-bridge". Returning to the Research Division in 1972, he collaborated on fundamental studies on microwave semiconductor devices such as avalanche diodes and the then new GaAs FET. These studies, which were described in numerous publications not only covered the signal theory of these devices but also their noise properties. A new model for the GaAs FET developed at Raytheon has served as the basis for many later treatments throughout the industry.

In 1974 Dr. Pucel was promoted to Consulting Scientist, Raytheon's highest technical level. During this period he and colleagues conducted a theoretical and experimental study of the FET mixer, which earned them the 1976 MTT-S Microwave Prize.

By 1978 Robert Pucel and his colleagues embarked on an intensive research program to establish the feasibility of fabricating active microwave circuits on GaAs chips entirely by semiconductor processing methods. This technique, now known as the monolithic microwave integrated circuit (MMIC) approach, has come to dominate the microwave field. Dr. Pucel published one of the first papers on this topic in 1979. In 1981, in recognition of his pioneering work he was selected by the Microwave Theory and Techniques Society to be its National Lecturer. In this role, and in the years to follow, he delivered some eighty lectures to promote the MMIC concept. He was selected in 1984 to be the Editor of the IEEE Press reprint volume on MMICs.

Dr. Pucel, a Fellow of the IEEE, has authored over eighty technical papers and two book chapters on microwave topics and holds twenty-one patents on various microwave components. In 1987 he was granted an Excellence in Technology Award by Raytheon, its most prestigious award, in recognition of his technical contributions.