

1999 MICROWAVE CAREER AWARD

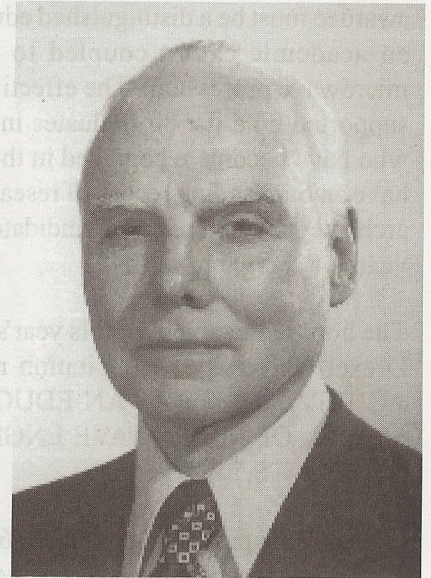
William C. Brown

The Microwave Career Award is the highest honor bestowed by MTT-S. It recognizes an individual for a lifetime career of meritorious service and technical excellence in the field. Our honored recipient is William C. Brown.

The award consists of a plaque, a certificate, and an honorarium of \$2,000. The Career Award Citation reads: "FOR A CAREER OF LEADERSHIP, MERITORIOUS ACHIEVEMENT, CREATIVITY, AND OUTSTANDING CONTRIBUTIONS IN THE FIELD OF MICROWAVE THEORY AND TECHNIQUES."

William C. Brown received the B.S.E.E. from Iowa State University in 1937 and the M.S.E.E from MIT in 1941. He is a Life Fellow of the IEEE.

He joined the Raytheon Co. in 1940, and became involved in making improvements in the design of magnetrons that were used in World War II microwave radar. However, magnetrons are oscillators and were not suitable for the next generation of radars that needed an efficient, high powered and broadband amplifier. In 1952 he made a major contribution in fulfilling that need by converting the magnetron oscillator into a broadband amplifier. This device, variously referred to as the "Platinotron", "Amplitron" or simply as the "CFA" (for crossed field amplifier), found immediate military and civil applications that included the Navy Aegis radar, the Hawk and Patriot Missile Systems, commercial air route surveillance radar, and the high data rate communications system in the Apollo lander that sent televised images from the Moon to Earth. For this contribution Mr. Brown received the MTT-S Pioneer Award in 1995.



Mr. Brown then proposed that the CFA be developed into a super power amplifier and the resulting DOD contract produced a CFA that generated 425 kW of continuous power with an efficiency of 76% at the frequency of 3 GHz. This represented a power increase by two orders of magnitude.

He then proposed the use of microwaves for Wireless Power Transmission (WPT), and wrote the first published article that explored the possibilities in 1961. Then, under an Air Force contract he demonstrated in 1964, on the CBS News hosted by Walter Cronkite, a microwave powered helicopter that received all the power needed for flight from a microwave beam. Key to this flight was the "rectenna" which was invented to absorb the microwave beam and simultaneously convert it to DC power.

Key to future applications of WPT is the overall efficiency or ratio of DC power output to DC power input. In the 1969 to 1975 time period, Mr. Brown managed a program that increased the overall efficiency to a JPL certified value of 54%, several times greater than generally expected. He was also technical director of a JPL Raytheon program that beamed power over a distance of one mile to a rectenna, which intercepted a portion of the beam and converted it to 30 kilowatts of DC power with 84% efficiency.

Mr. Brown formally retired from Raytheon in 1984 but continued there as a consultant. Four volumes of his papers have been preserved in the MTT-S Museum in Baltimore. These same papers, over 2000 pages of final reports authored by Brown, four EBM-sponsored videotaped lectures at Northeastern Univ., and numerous historical physical artifacts have been transferred to archives at Texas A&M Univ. Microwave magnetrons and CFAs are on exhibit in the Raytheon Museum.