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Dr. Steinbrecher joined the Submarine Electromagnetic Systems Department of the Naval Undersea Warfare Center in January 1998 after a brief retirement. He is currently developing concepts for electromagnetic energy collection and management that will enhance Submarine communications and intercept performance.

Dr. Steinbrecher received a BSEE degree, with highest honors, from the University of Florida in June 1960. He entered the Massachusetts Institute of Technology graduate studies program in Electrical Engineering and Computer Science, after a brief tenure in the communications industry, and received a Master of Science in 1963 and completed the Ph.D. degree in June 1966. He remained with the Massachusetts Institute of Technology Department of Electrical Engineering and Computer Science and The Research Laboratory of Electronics until June 1972. As a member of the Department of Electrical Engineering and Computer Science, he taught courses specializing in solid-state device properties and applications. He was promoted to Associate Professor in June 1969. As a member of the Research Laboratory of Electronics, he conducted research in microwave and millimeter wave circuits with an emphasis on communications applications. His research provided a technical foundation for early experiments in millimeter wave communications satellites developed by the Massachusetts Institute of Technology Lincoln Laboratory, the LES 8-9 Program.

Dr. Steinbrecher founded *Steinbrecher Corporation*. The Company, incorporated in Massachusetts in 1973, was acquired by Tellabs, Inc. in 1996. Dr. Steinbrecher retired as Chairman of the Board of *Steinbrecher* when the acquisition was completed. The *Steinbrecher* charter was "*Advanced Communications Technology*". The company became the world's leading supplier of digital receivers and transmitters. Many of these high-performance ACCUVERTER™ systems found their way into Government programs. *Steinbrecher* technology was directly responsible for the successful performance of the US Navy ROTH radar system. ROTH is the first HF OTH radar to successfully employ digital beamforming. ROTH represents a large-scale stepping stone toward the SNAP vision.

Dr. Steinbrecher has been awarded six patents for his PARAMIXER™ designs and Digital Communications System concepts. He has received several industrial awards for his concept. The ACCUVERTER converts high-bandwidth, high dynamic-range RF signals to a digital format and makes possible direct digital signal processing of the RF signals. The SNAP air interface could be realized today if the performance of an ACCUVERTER could be realized on a monolithic circuit. George Gilder, in Forbes ASAP, published a third-party view of the impact on wireless communications of Dr. Steinbrecher's work. The article appeared in the April 11, 1994 issue under the title *Auctioning the Airwaves*.

Dr. Steinbrecher and Professor Charles C. Counselman of the Massachusetts Institute of Technology are credited with having developed the first Federal-Geodetic-Control-Committee certified land-surveying system using the GPS satellite constellation. The MACROMETER® system was deemed by the committee to be suitable for control surveying in January 1983. The original MACROMETER has been selected for exhibit at the National Museum of American History in Washington, D.C. During the course of the MACROMETER development, the concept of using the GPS signals as an observable to 'tag' widely separated systems was borne. Carefully controlled experiments were performed to establish the accuracy that could be achieved using this technique. The experiments indicated that differential-time accuracy of less than 75 PicoSecond could be established at sites separated by 80 Kilometers after about 15-minutes integration. Since these experiments, significant improvements have been made in

differential space-time GPS measurements. One element of SNAP is to incorporate a GPS-based observable to tag the space-time parameter of electromagnetic samples.

Dr. Steinbrecher has authored or co-authored more than a dozen technical papers. He has presented numerous papers and tutorials on high-performance digital receivers and communication-system architectures. He was General Chairman of the 1996 International Conference on Universal Personal Communications, an IEEE-COMSOC sanctioned event. He is a charter member of the Board of Governors and Chairman of the Education Committee of the Massachusetts Telecommunications Council <<http://www.masstel.org>>. He plays tennis and enjoys gourmet cooking, water-color painting, and sculpture.