Plenary Speaker 2

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Microwave Technologies: The First Century

Abstract: The talk describes the history of microwave technologies, reaching back to the late 1800s, a time of experimentation with spark-gaps and waveguides up to 60GHz. Marconi and Hertz also investigated this regime, but turned their attention to low frequencies. For decades crude galena rectifiers were used for detectors, setting the stage for the later development of semiconductor diodes. The triode tube was a great leap for radio, but not as a source of microwave power, due to its long transit times. The 1920 Barkhausen-Kurz oscillator made use of this transit time to generate frequencies up to 700MHz.

Once the idea of exploiting transit times was out of the box, the majority of microwave power sources for the next several decades were based on such methods and some invoked the use of crossed magnetic and electric fields. The cavity magnetron, today found in every home, was invented in 1937 by Boot and Randall at Birmingham University in England. It possessed the astonishing ability to instantly convert simple DC power into RF power in the centimetre range of wavelengths with hitherto unimaginable efficiency. It was followed by a rash of amazing electron tubes with mysterious names: the klystron, twystron, dematron, amplitron, and the scary-sounding carcinotron. Later semiconductor devices would generate their own list of odd abbreviated names: BARRIT, TED, IMPATT, TRAPATT and LSA.

The commercialization of radio communication systems has led to a greater emphasis on two imperatives: very high performance, and extremely low cost. Modern microwave technologies have moved into a new commodity phase, like plastics or steel. However, it is safe to say "You ain't seen nuthin' yet!"

About Barrie Gilbert

Barrie Gilbert (IEEE Life Fellow) has had a severely limited life experience. He has spent all of it doing nothing but dabbling in analog circuits, more or less seriously, dipping his toes into inhospitable digital waters only rarely. He has contributed several seminal cells, and terms, now in common use across the industry. Of especial value has been the concept of translinear cells, allowing algebraic functions to be accurately implemented with great elegance and efficiency. After a long career in both the UK and the US, he founded the first remote design center of Analog Devices Inc., in 1972, later re-located from England to Beaverton, Oregon, and now directs most affairs there, as a freewheeling inventor of new product concepts, urging his team members to follow their instincts. He has received 100+ patents worldwide and a number of IEEE and industry awards. In 1990, he was elected as Oregon Researcher of the Year, and awarded an Honorary Doctorate from Oregon State University in 1997. He was inducted into the National Academy of Engineering in 2009.