The 1976 S-MTT National Lectureship

Microwave Solid-State Devices

REMARKABLE progress is being made in improving the performance of microwave solid-state devices used for signal processing and power generation. As a result, microwave solid-state amplifiers and oscillators are replacing low-noise and medium-power traveling-wave tubes (TWT's) and backward-wave oscillators (BWO's), and entirely new applications for microwave technologies are being created.

Replacing low-noise and medium-power TWT's and BWO's with solid-state amplifiers and oscillators has been an important goal of microwave research for many years. At the lower microwave frequencies, amplifiers using silicon bipolar transistors began to replace TWT's several years ago, but attempts to replace TWT's at the higher microwave frequencies with two-terminal negative resistance amplifiers were, in general, not successful. During the past two years, however, GaAs field-effect transistors (FET's) have become available that make possible the design of solid-state amplifiers that can compete successfully with TWT's in many applications at frequencies as high as 18 GHz. As far as BWO's are concerned, they are rapidly being replaced by varactor-tuned transistor or transferred electron oscillators followed by medium-power broad-band transistor amplifiers.

One of the most interesting new areas where solid-state microwave technologies are being applied is digital computing at multigigabit rates. Two types of microwave solid-state devices—GaAs FET's and transferred electron devices—show promise of being able to process digital information at rates that are several times as high as the highest rates possible with the fastest silicon digital devices. There are many important uses for gigabit computing circuits, including applications in radar, electronic warfare, and communications.

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He joined the RCA Corporation in 1954 and has worked there on the development of traveling-wave tubes, optical components, high-speed logic, and microwave solid-state devices and circuits. He is currently Director of the Microwave Technology Center at the RCA Laboratories where he directs R & D and pilot production of microwave and high-speed logic components and subsystems. He is the author of over 55 papers and he holds 27 patents.

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