

## V. SOLID-STATE MICROWAVE ELECTRONICS\*

### Academic and Research Staff

Prof. R. P. Rafuse

### Graduate Students

D. H. Steinbrecker  
K. D. Thompson

A. Vander Vorst  
Z. Vugrinec

### RESEARCH OBJECTIVES

This group, formerly a part of the Radio Astronomy Group, has decided that its aims are wider than those of the Radio Astronomy Group. As a consequence of this decision, a new group has been formed. The general areas of interest are in the generation and amplification of microwave power by solid-state mechanisms with an emphasis on millimeter wavelengths.

Recent developments include a VHF mixer with 130-db dynamic range (5-db noise figure, 100-kc IF bandwidth, and 40-db down third-order intermodulation limit) a 3-GHz, single-sideband mixer with 2-db over-all system noise figure (achieved by careful control of the image impedance in a very good mixer, and a 0.5-db noise figure IF), and a new and very powerful technique for high-efficiency, high-order harmonic multiplication.

Present plans include development of X-band and 4-mm mixers using Shottky-barrier diodes (in order to achieve noise figures of 5 db and lower), continuing investigations of varactor multipliers of high order, high power and high efficiency, with an eventual goal of a 100-watt, cw, solid-state transmitter at 2.5 GHz with an over-all DC-to-RF conversion frequency of better than 50 per cent.

Work also continues on the characterization of millimeter-wave varactors and on synthesis problems associated with low-noise parametric amplifiers at millimeter wavelengths.

R. P. Rafuse

---

\*This work is supported by the National Aeronautics and Space Administration (Grant NsG-22-009-163).

