multiplexing, it would be necessary to radically redesign the ROIC, at considerably greater development cost.) Other advantages of the external-control approach over the internal-control approach are greater flexibility and the possibility of using a technique, known as "skimming," for subtracting unwanted dark-, background-, and noise-current contributions from readout signals

The figure schematically depicts the circuitry in one pixel according to an internally controlled multiplexing scheme and according to the proposed externally controlled multiplexing scheme. In both schemes, the time multiplexing would be accomplished by switching (clocking or ramping) the biases applied to the QWIPs via detector common planes. In the internal-control case, a bias signal would be applied via a single detector common plane and two internal electronic switches. In the proposed external-control case, bias signals would be applied via two detector common planes, without internal electronic switches. A previously unmentioned advantage of the external-control scheme shown in the figure is the need for only one indium bump (instead of two) in each pixel.

This work was done by Sir B. Rafol, Sarath Gunapala, Sumith Bandara, John Liu, and Jason Mumolo of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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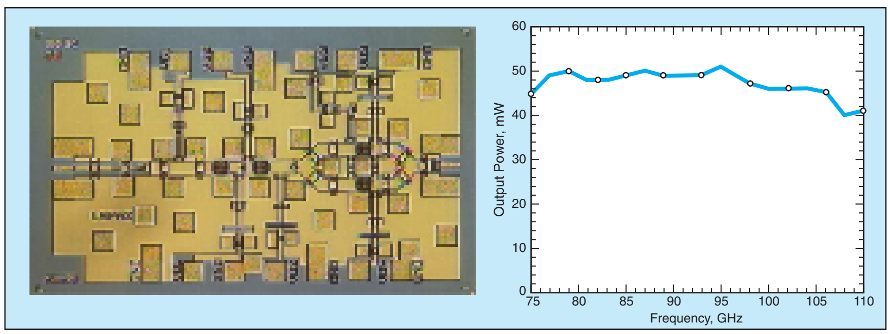
Refer to NPO-30523, volume and number of this NASA Tech Briefs *issue, and the page number.*

MMIC Power Amplifier Puts Out 40 mW From 75 to 110 GHz

This amplifier operates over the full frequency band of the WR-10 waveguide.

NASA's Jet Propulsion Laboratory, Pasadena, California

A three-stage monolithic microwave integrated circuit (MMIC) W-band amplifier has been constructed and tested in a continuing effort to develop amplifiers as well as oscillators, frequency multipliers, and mixers capable of operating over wide frequency bands that extend above 100 GHz. There are numerous potential uses for MMICs like these in scientific instruments, radar systems, communication systems, and test equipment operating in this frequency range.



The **Amplifier Shown in the Photograph** was tested at a supply potential of 2.5 V, a gate bias potential of –0.05 V, and an input excitation power of 2 mW at frequencies from 75 to 110 GHz. The plot of output power vs. frequency can be characterized by a large-signal gain of about 13.5±0.5 dB. (Note: The amplifier is actually about 2 mm long.)

This amplifier can be characterized, in part, as a lower-frequency, narrower-band, higher-gain version of the one described in "Power Amplifier With 9 to 13 dB of Gain from 65 to 146 GHz" (NPO-20880), *NASA Tech Briefs*, Vol. 25, No. 1 (January 2001), page 44. This amplifier includes four InP high-electron-mobility transistors (HEMTs), each having a gate periphery of 148 µm. In the third amplifier stage, two of the HEMTs are combined in parallel to maximize the output power. The amplifier draws a current of 250 mA at a supply potential of 2.5 V.

In a test, this amplifier was driven by a backward-wave oscillator set to provide an input power of 2 mW. The output power of the amplifier was measured by a power meter equipped with a WR-10 waveguide sensor. As shown in the figure, the amplifier put out a power between 40 and 50 mW over the frequency range of 75 to 110 GHz, which is the entire frequency band of the WR-10 waveguide. At the stated power levels, this amplifier offers a power-added efficiency of slightly more than 6 percent.

This work was done by Lorene Samoska of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1). NPO-30577*