Waveguide Power-Amplifier Module for 80 to 150 GHz

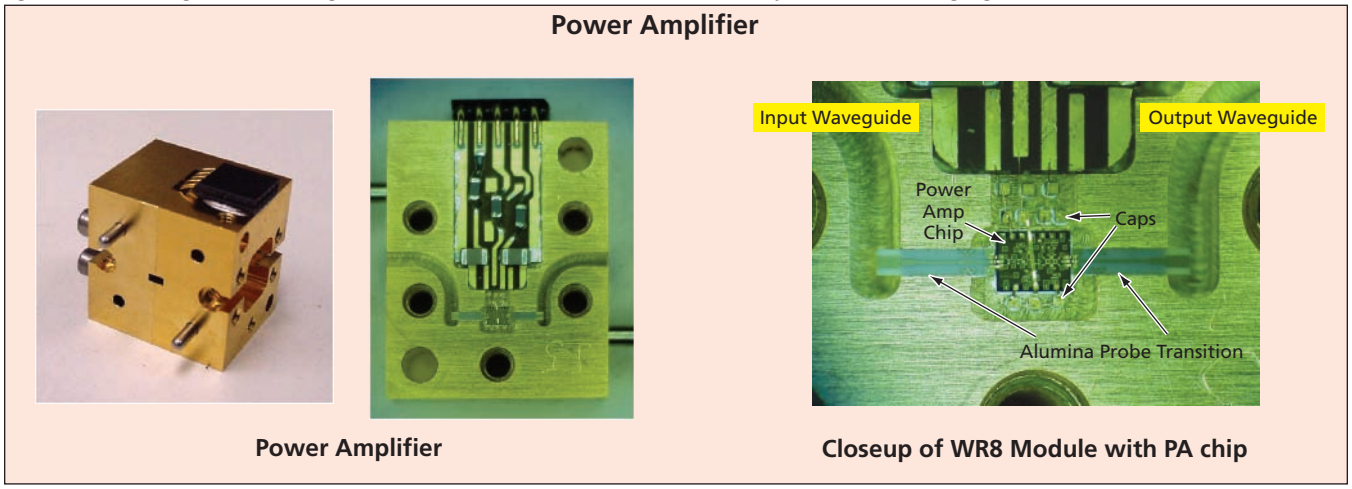
The amplifier can now be connected to other equipment more easily.

NASA's Jet Propulsion Laboratory, Pasadena, California

A waveguide power-amplifier module capable of operating over the frequency range from 80 to 150 GHz has been constructed. The module comprises a previously reported power amplifier packaged in a waveguide housing that is compatible with WR-8 waveguides. (WR-8 is a standard waveguide size for the nominal frequency range from 90 to 140 GHz.) Because the amplifier in its unpackaged form was a single, fragile InP chip, it was necessary to use special probes to make electrical connections between the amplifier and test equipment in order to measure the power gain and other aspects of amplifier performance. In contrast, the waveguide power-amplifier module is robust and can be bolted to test equipment and to other electronic circuits with which the amplifier must be connected for normal operation.

The amplifier in its unpackaged form was reported 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. To recapitulate: the amplifier provides three stages of amplification, implemented by means of four InP high-electron-mobility transistors in a grounded coplanar waveguide circuit with lumped-element interstage and shunt capacitors. The circuit also features a unique coplanar waveguide power-combining structure in the output stage. The output radio-frequency power was measured to be 25 to 40 mW from 106 to 140 GHz.

The figure shows selected aspects of the amplifier in its present packaged form. In addition to packaging in a waveguide housing, the amplifier was modified to suppress low-frequency oscillations, to which the amplifier was previously susceptible because it had high gain at DC. The modifications consisted mostly of special placement of bypass capacitors and radio-frequency chokes within the package. The packaged amplifier was found to operate stably, and to produce a gain of at least 7 dB while producing output power of at least 10 mW at frequencies from 80 to 150 GHz.



The **Amplifier Module** features a housing that is compatible with WR-8 waveguides. (Note: The largest dimension of the waveguide block is smaller than the size of a quarter.)

This work was done by Lorene Samoska, Sander Weinreb, and Alejandro Peralta of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

NPO-30576

Better Back Contacts for Solar Cells on Flexible Substrates

Advantages are greater efficiency and tighter adhesion.

John H. Glenn Research Center, Cleveland, Ohio

Improved low-resistance, semitransparent back contacts, and a method of fabricating them, have been developed for solar photovoltaic cells that are made from thin films of I-III-VI_2 semiconductor materials on flexible, high-temperature-resistant polyimide substrates or superstrates. [The term "I-III-VI_2" is an abbreviated indication that the semiconductor materials are compounds of elements in periods IB, IIIA, and VIA of the periodic table in the stoichiometric ratio of 1:1:2.