

TID sensor and a RADiation MONitor (RADMON) SEU sensor, SIU #2 monitors EMI through use of two RF antenna, and SIU #3 monitors spacecraft charging conditions by interfacing to an IESDM sensor. The heart of the BIU is a Silicon Laboratories C8051F060, a mixed-signal in-circuit-programmable

(ISP) flash micro controller unit (MCU) with controller-area network (CAN) bus interface.

At the time of this reporting, follow-on work is needed to develop designs that use space-qualified parts, in developing a standard fault-tolerant spacecraft interface, which would spawn a

multidrop backbone SIU bus (i.e. CAN), and in developing the PnP software that leverages off IEEE Std 1451.

*This work was done by Jagdish Patel, David E. Brinza, Tuan A. Tran, and Brent R. Blaes of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-47340*

## ➤ Power-Combined GaN Amplifier With 2.28-W Output Power at 87 GHz

**Applications include radar and remote sensing spectrometers, and W-band communications.**

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Future remote sensing instruments will require focal plane spectrometer arrays with higher resolution at high frequencies. One of the major components of spectrometers are the local oscillator (LO) signal sources that are used to drive mixers to down-convert received radio-frequency (RF) signals to intermediate frequencies (IFs) for analysis. By advancing LO technology through increasing output power and efficiency, and reducing component size, these advances will improve performance and simplify architecture of spectrometer array systems. W-band power amplifiers (PAs) are an essential element of current frequency-multiplied submillimeter-wave LO signal sources. Substantial W-band (75–110 GHz) power is required due to the lossy passive frequency multipliers used to generate higher frequency

signals in nonlinear Schottky diode based LO sources. By advancing PA technology, the LO system performance can be increased with possible cost reductions compared to current gallium arsenide (GaAs) PA technology.

This work utilizes GaN monolithic millimeter-wave integrated circuit (MMIC) PAs developed from a new HRL Laboratories LLC 0.15- $\mu\text{m}$  gate length GaN semiconductor transistor. By additionally waveguide power combining PA MMIC modules, the researchers here target the highest output power performance and efficiency in the smallest volume achievable for W-band. GaN has higher voltage breakdown capability than other currently available W-band semiconductor technology such as GaAs. GaN PAs have shown significant improvements compared to state-of-the-

art GaAs PAs in W-band for output power density and efficiency.

High-power, high-efficiency GaN PAs are cross-cutting and can enable more efficient LO distribution systems for new astrophysics and planetary receivers and heterodyne array instruments. They can also allow for a new electronically scannable solid-state array technology for future Earth science radar instruments and communication platforms.

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