rival and the position of the transmitter, is done in a computer external to the clusters. For this purpose, the received waveforms are digitized in the receivers, and the waveform data are sent to the computer via a hub. Even though no attempt is made to synchronize operation of the two receivers, the data from the receivers are quasi-synchronized by means of interface software that effects parallel socket communication with data segmentation, summarized as follows: Waveform data are collected from each receiver in segments, whenever they become available and the computer is ready to collect them. The segments from each receiver are labeled as having come from that receiver and, in the collection process, are interleaved with those from the other receiver in chronological order of collection. Within the computer, the segments from each receiver are stored in a separate buffer. Thus, the contents of the buffers are representations of the same UWB pulse waveform arriving at the two receivers at approximately the same time. When the buffers for both receivers contain complete representations of a UWB pulse waveform, the data from that buffer are copied into an array for use in the calculations described above.

This work was done by G. Dickey Arndt, Phong H. Ngo, Chau T. Phan, and Julia Gross of Johnson Space Center; Jianjun Ni NRC fellow; and John Dusl of Jacobs Sverdrup. Further information is contained in a TSP (see page 1).

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Johnson Space Center, (281) 483-1003. Refer to MSC-24184-1.

Update on Waveguide-Embedded Differential MMIC Amplifiers

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There is an update on the subject matter of "Differential InP HEMT MMIC Amplifiers Embedded in Waveguides" (NPO-42857) *NASA Tech Briefs,* Vol. 33, No. 9 (September 2009), page 35. To recapitulate: Monolithic microwave integrated-circuit (MMIC) amplifiers of a type now being developed for operation at frequencies of hundreds of gigahertz contain InP high-electron-mobility transistors (HEMTs) in a differential configuration. The MMICs are designed integrally with, and embedded in, waveguide packages. The instant work does not mention InP HEMTs but otherwise reiterates part of the subject matter of the cited prior article, with emphasis on the following salient points:

- An MMIC is mounted in the electric-field plane ("E-plane") of a waveguide and includes a finline transition to each differential-amplifier stage.
- The differential configuration creates a virtual ground within each pair of transistor-gate fingers, eliminating the need for external radio-frequency grounding.

This work concludes by describing a single-stage differential submillimeter-wave amplifier packaged in a rectangular waveguide and summarizing results of tests of this amplifier at frequencies of 220 and 305 GHz.

This work was done by Pekka Kangaslahti and Erich Schlecht of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.

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-44401, volume and number of this NASA Tech Briefs *issue, and the page number.*