

HMD device tracks the direction of gaze of the wearer, providing data that are used to select, for display, the portion of the mosaic image corresponding to the direction of gaze.

The basic functionality of the system has been demonstrated by mounting the cameras on the roof of a van and steering the van by use of the images presented on the HMD device.

*This work was done by Amarnath Banerjee of Texas A&M University for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-23777-1*

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## Spacesuit Data Display and Management System

*John H. Glenn Research Center, Cleveland, Ohio*

A prototype embedded avionics system has been designed for the next generation of NASA extra-vehicular-activity (EVA) spacesuits. The system performs biomedical and other sensor monitoring, image capture, data display, and data transmission. An existing NASA Phase I and II award winning design for an embedded computing system (ZIN vMetrics – BioWATCH) has been modified.

The unit has a reliable, compact form factor with flexible packaging options. These innovations are significant, because current state-of-the-art EVA spacesuits do not provide capability for data displays or embedded data acquisition and management. The Phase I effort achieved Technology Readiness Level 4 (high fidelity breadboard demonstration). The breadboard uses a commercial-grade field-programmable gate array (FPGA) with embedded

processor core that can be upgraded to a space-rated device for future revisions.

*This work was done by David G. Hall, Aaron Sells, and Hemal Shah of ZIN Technologies, Inc. for Glenn Research Center.*

*Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steve Fedor, Mail Stop 4-8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18399-1.*

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## IEEE 1394 Hub With Fault Containment

*Lyndon B. Johnson Space Center, Houston, Texas*

This innovation is designed to prevent a single end system communication node from negatively influencing the whole system's behavior so that the network system can still operate if an end node is faulty. Placing a hub (star) in the middle of the system prevents propagation of critical control information that other end systems would react to, like block reset messages.

*This work was done by Michael Paulitsch, Brendan Hall, and Kevin R. Driscoll of Honeywell, Inc. for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809.*

*Title to this invention has been waived under the provisions of the National Aeronautics and Space Act {42 U.S.C. 2457(f)}*

*to Honeywell, Inc. Inquiries concerning licenses for its commercial development should be addressed to:*

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*Phoenix, AZ 85072*

*Refer to MSC-24459-1, volume and number of this NASA Tech Briefs issue, and the page number.*

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## Compact, Miniature MMIC Receiver Modules for an MMIC Array Spectrograph

**MMIC multi-chip modules can be used in astrophysics telescopes, automotive radar, and communication links.**

*NASA's Jet Propulsion Laboratory, Pasadena, California*

A single-pixel prototype of a W-band detector module with a digital back-end was developed to serve as a building block for large focal-plane arrays of monolithic millimeter-wave integrated circuit (MMIC) detectors. The module uses low-noise amplifiers, diode-based mixers, and a WR10 waveguide input with a coaxial local oscillator. State-of-the-art InP HEMT (high electron mobility transistor) MMIC amplifiers at the front end provide approximately 40 dB of gain. The measured noise tempera-

ture of the module, at an ambient temperature of 300 K, was found to be as low as 450 K at 95 GHz.

The modules will be used to develop multiple instruments for astrophysics radio telescopes, both on the ground and in space. The prototype is being used by Stanford University to characterize noise performance at cryogenic temperatures. The goal is to achieve a 30–50 K noise temperature around 90 GHz when cooled to a 20 K ambient temperature. Further developments include

characterization of the IF in-phase (I) and quadrature (Q) signals as a function of frequency to check amplitude and phase; replacing the InP low-noise amplifiers with state-of-the-art 35-nm-gate-length NGC low-noise amplifiers; interfacing the front-end module with a digital back-end spectrometer; and developing a scheme for local oscillator and IF distribution in a future array.

While this MMIC is being developed for use in radio astronomy, it has the potential for use in other industries. Appli-