

## **Spaceflight Ka-Band High-Rate Radiation-Hard Modulator**

A document discusses the creation of a Ka-band modulator developed specifically for the NASA/GSFC Solar Dynamics Observatory (SDO). This flight design consists of a high-bandwidth, Quadrature Phase Shift Keying (QPSK) vector modulator with radiation-hardened, high-rate driver circuitry that receives I and Q channel data. The radiation-hard design enables SDO's Ka-band communications downlink system to transmit 130 Mbps (300 Msps after data encoding) of science instrument data to the ground system continuously throughout the mission's minimum life of five years. The low error vector magnitude (EVM) of the modulator lowers the implementation loss of the transmitter in which it is used, thereby increasing the overall communication system link margin.

The modulator comprises a component within the SDO transmitter, and meets the following specifications over a

0 to 40 °C operational temperature range: QPSK/OQPSK modulator, 300-Msps symbol rate, 26.5-GHz center frequency, error vector magnitude  $\leq 10$  percent rms, and compliance with the NTIA (National Telecommunications and Information Administration) spectral mask.

*This work was done by Jeffery M. Jaso of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-15217-1*

## **Enabling Disabled Persons To Gain Access to Digital Media**

A report describes the first phase in an effort to enhance the NaviGaze software to enable profoundly disabled persons to operate computers. (Running on a Windows-based computer equipped with a video camera aimed at the user's head, the original NaviGaze software processes the user's head movements and eye blinks into cursor movements and mouse clicks to enable hands-free

control of the computer.) To accommodate large variations in movement capabilities among disabled individuals, one of the enhancements was the addition of a graphical user interface for selection of parameters that affect the way the software interacts with the computer and tracks the user's movements. Tracking algorithms were improved to reduce sensitivity to rotations and reduce the likelihood of tracking the wrong features. Visual feedback to the user was improved to provide an indication of the state of the computer system. It was found that users can quickly learn to use the enhanced software, performing single clicks, double clicks, and drags within minutes of first use. Available programs that could increase the usability of NaviGaze were identified. One of these enables entry of text by using NaviGaze as a mouse to select keys on a virtual keyboard.

*This work was done by Glenn Beach and Ryan O'Grady of Cybernet Systems Corp. for Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-14930-1*