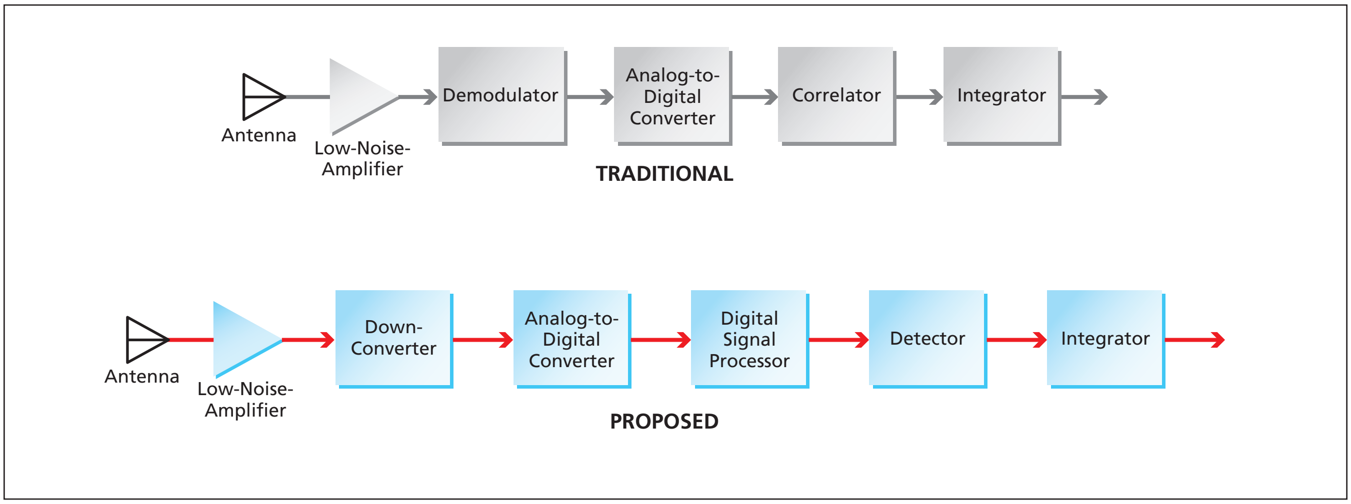
Digital Receiver for Microwave Radiometry

Interfering signals would be suppressed in digital signal processing.

Goddard Space Flight Center, Greenbelt, Maryland



The **Proposed Microwave Radiometer Receiver** would include a digital signal processor that would execute interference-suppression algorithms.

A receiver proposed for use in L-band microwave radiometry (for measuring soil moisture and sea salinity) would utilize digital signal processing to suppress interfering signals. Heretofore, radio-frequency interference has made it necessary to limit such radiometry to a frequency band about 20 MHz wide, centered at ≈1,413 MHz. The suppression of interference in the proposed receiver would make it possible to expand the frequency band to a width of 100 MHz, thereby making it possible to obtain greater sensitivity and accuracy in measuring moisture and salinity.

The receiver would digitize a portion of the received signal spectrum up to 100 MHz wide. The digitized signals would be processed to extract either the total power or the power spectral density associated with the physical processes of interest. The processing would involve the use of adaptive and parametric filtering techniques implemented in real time by use of reconfigurable digital hardware in the form of field-programmable gate arrays.

The microwave signals emitted by the physical processes of interest are quasi-stationary and noiselike. The signal-processing algorithms would include interference-suppression algorithms, which would be based partly on the assumption that signals that are not both quasi-stationary and noiselike must be interfering signals. For example, pulses would be detected and blanked. Following blanking of pulse and other suppression of interfering signals, a fast Fourier transform (FFT) would be applied. The FFT outputs would be integrated, and the results of the integrations would be transferred to a computer for storage.

This work was done by Steven W. Ellingson, Grant A. Hampson, and Joel T. Johnson of Ohio State University for **Goddard Space Flight Center**. *Further information is contained in a TSP (see page 1).*
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Printed Antennas Made Reconfigurable by Use of MEMS Switches

MEMS switches offer advantages over electronic control circuits.

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A class of reconfigurable microwave antennas now undergoing development comprise fairly conventional printed-circuit feed elements and radiating patches integrated with novel switches containing actuators of the micro-electromechanical systems (MEMS) type. In comparison with solid-state electronic control devices incorporated into some prior printed microwave antennas, the MEMS-based switches in these antennas impose lower insertion losses and consume less power. Because the radio-frequency responses of the MEMS switches are more nearly linear, they introduce less signal distortion. In addition, construction and operation are simplified because only a single DC bias line is needed to control each MEMS actuator.

The incorporation of the MEMS switches makes it possible for an antenna of this class to operate over several frequency bands without undergoing changes in its dimensions other than the small deflections associated with opening and closing gaps between switch contacts. In addition, the polarization of the radiation emitted or received by the antenna can be