

# IGARSS 2000 ABSTRACT SUBMISSION TEMPLATE

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## ABSTRACT TITLE:

Design Details and Test Results of a High Stability Ground Based Microwave Water Vapor Radiometer

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## ABSTRACT TEXT:

Text block boundaries are fixed. Abstract cannot exceed boundaries.

A pair of identical microwave radiometers operating at 22 to 31 GHz have recently been completed and deployed along side tracking stations at NASA's Deep Space Network (DSN) facility in Goldstone, CA. These instruments will be used to provide accurate measurements of tropospheric path delay due to water vapor for an upcoming series of gravitational wave search experiments involving the Cassini spacecraft. The radiometric stability requirements imposed by this mission are 0.01 Kelvin of brightness temperature on time scales of 100 to 10,000 seconds- which represents about a ten-fold improvement in performance compared with previous generation water vapor radiometers (WVR's).

This paper will present the design details of the new radiometers along with inter-comparison test results. These radiometers are the result of a four year development effort in which many aspects of radiometer design were studied and refined. The lessons learned will be of general interest to microwave system engineers. The instruments are fairly conventional room temperature Dicke radiometers with additive noise injection for gain calibration. Design highlights include: (1) a practical temperature control system capable of stabilizing the entire receiver to a few millikelvin from day to night; (2) multiple independent noise diode injection circuits with 30 parts per million RF stability; and (3) a voice coil actuated waveguide vane attenuator which is used as a high performance Dicke switch.

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