

DESIGN AND PERFORMANCE OF A MINIATURIZED
CLOUD LIQUID WATER RADIOMETER TO AUGMENT A
MINIATURIZED WATER VAPOR PROFILING RADIOME-
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A Miniaturized Water Vapor Radiometer (MWVR) was recently devel-
oped at the University of Massachusetts and Colorado State University. This
microwave radiometer measures atmospheric emission at four K-band frequen-
cies to enable inversion of vertical profiles of tropospheric humidity. An addi-
tional Ka-band MMIC radiometer is needed to augment this system in order
to distinguish between precipitable water vapor and cloud liquid water.

This paper focuses on the design, specifications and capabilities of a 31
GHz miniaturized cloud liquid water radiometer to complement the existing
K-band MWVR. The additional radiometer will have a separate antenna and
receiver, while sharing data acquisition, temperature control, and power sup-
ply subsystems with the existing MWVR. The Ka-band radiometer will utilize
commercial MMIC technology to minimize construction cost.

The relatively low cost of fabrication of MMIC-based radiometers makes
possible the deployment of small networks of these radiometers. The objective
of the long-term project is to deploy a four-node network of dual-frequency ra-
diometers to demonstrate the retrieval of the 3-D water vapor and cloud liquid
water fields. Retrievals of water vapor and liquid water from measured bright-
ness temperatures will be validated with NWS radiosonde measurements. Re-
mote measurements of the water vapor and liquid water fields are needed,
along with high-resolution temperature and wind fields, to initialize numerical
weather forecasting models.

In this paper, we will present an analysis of horizontal and vertical res-
olution for a scanning Ka-band radiometer. The resolution of a four-station
network of these radiometers will be analyzed in terms of node topology and
beam scanning. The results of this analysis will be compared to similar simu-
lations for the K-band MWVR in order to determine an optimal configuration
for the dual-frequency, four-station network.

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