Micro Rain Radar (Model: MRR-2)

A Ground-Based Radar for Profiling Precipitation Microphysics and Dynamics

INTRODUCTION:

The Micro Rain Radar (MRR) is a vertically pointing, frequency-modulated continuous wave (FM-CW) radar system designed to measure the vertical structure of precipitation. It provides high-resolution vertical profiles of radar reflectivity, rain rate, and drop size distribution (DSD) up to several kilometers above ground level. MRR is an invaluable tool for understanding microphysical processes in precipitation systems, including light rain and drizzle, where conventional weather radars are less effective. It operates continuously and is ideal for unattended, long-term field deployments in varied environments.

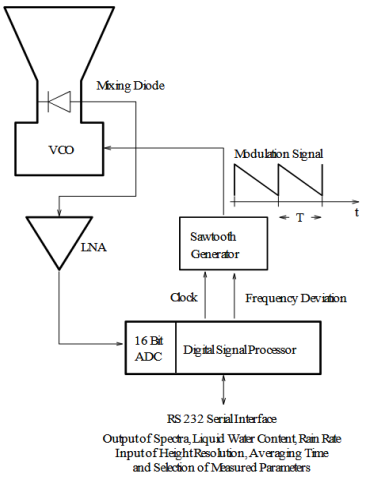
OBJECTIVES:

➢ High-resolution precipitation profiling
➢ Hydrological modeling support
➢ Precipitation microphysics research
➢ Validation of satellite and model precipitation data
➢ Support for weather forecasting and early warning systems

DATA OUTPUT:

➢ Radar Reflectivity (dBZ)
➢ Rain Rate (mm/h)
➢ Drop Size Distribution (DSD)
➢ Liquid Water Content (LWC)
➢ Fall Velocity of Hydrometeors

FLOW DIAGRAM



KEY SPECIFICATIONS:

➢ Operating Frequency: 24.23 GHz
➢ Measurement Height Range: up to 6000 m 30 range gates
➢ Height Resolution: 10 - 200 m (user-selectable)
➢ Averaging interval: 10 - 3600 s
➢ Minimum Detectable Rain: ~0.01 mm/h
➢ Antenna Beamwidth: ~1.5°

MEASUREMENT AND WORKING PRINCIPLE:

The MRR uses an FM-CW radar technique, where a continuous wave is frequency-modulated linearly. It transmits upward and receives backscattered signals from raindrops or hydrometeors falling through the radar beam. By analyzing the Doppler shift and signal attenuation, MRR determines vertical profiles of reflectivity, fall velocities, and estimates drop size distributions and rain rate.

KEY FEATURES:

➢ High Vertical Resolution: Detailed structure up to 6 km
➢ Continuous Operation: Ideal for long-term deployment
➢ Non-Invasive Measurement: Compact and solid-state
➢ Real-Time Data: Immediate output for applications
➢ Lightweight & Portable: Easily deployable
➢ Low Maintenance: Minimal operational overhead

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