

An Airborne Ka-Band PMS Probe Radar

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ProSensing is developing millimeter wavelength remote sensing instruments that operate from PMS (Particle Measurement Systems) probe canisters. An ultra-sensitive G-band water Vapor Radiometer (GVR) was first flown in 2006 and is currently being upgraded to be able to convert between G and W-bands.

A Ka-band precipitation radar is now being constructed for the University of Wyoming. Ground testing will be conducted during the summer of 2014 and test flights are planned for early 2015 onboard the University of Wyoming King Air.

The key components of this Ka-band Probe Radar (KPR) are an arbitrary pulse waveform generator, a 10 W pulsed solid state power amplifier, and a low-loss latching circulator switch network. The radar can be configured to profile above and below the aircraft using a pair of 5.5" diameter, 4.2 deg beamwidth, flat plate waveguide array antennas, or look forward with a single dual-polarized lens antenna. KPR is also equipped with a noise source and a warm reference load to operate in radiometer mode in the zenith beam. The planned radar transmit pulse consists of a linear-FM waveform followed by an offset frequency short RF pulse. This allows the radar to measure precipitation as close as 100 m from the aircraft using the short pulse return, while achieving enhanced sensitivity at farther ranges using a digital pulse compression filter. The recorded radar parameters include profiles of radar reflectivity and Doppler velocity in the up/down antenna configuration, and polarimetric parameters using ATAR (alternating transmission, alternating reception) mode.

This paper will describe this compact Ka-band radar system and present preliminary test results.