



Mobile Three Frequency Radar as Research Platform for Precipitation Profiling

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Precipitation profiling at the frequency bands of Ku, Ka and W bands are becoming increasingly popular in the studies of atmospheric microphysics. Ever since the introduction of Ku / Ka pair of frequencies for the Global Precipitation Measurement mission (GPM) and the success of W band in Cloudsat, the interest in precipitation profiling using these frequencies has increased. The profiling observations will also serve as ground validation instruments for several space missions such as GPM and EarthCARE [1]. In order to get better information to retrieve ice microphysics as well as to enhance sensitivity, we need to move from the standard S- and C-band weather radars to higher frequencies [2]. As was recently shown, the use of multi- frequency profiling yields important additional information compared to single-frequency radar mapping [3].

During the past four years a consortium of research, academic and private industries in Finland has been developing a flexible low-cost mobile three-band radar system for precipitation profiling. The feasibility of the concept is being demonstrated by implementing the Ku- and Ka-band part of the system. The antenna structure with antennas for Ku-, Ka- and W-band is completed allowing the pointing of all three antenna systems into the same direction during an azimuth and elevation scan. Using a freely programmable digital waveform generator and decoding electronics for the received data, the implementation of different wave form generation, compression and decoding schemes and their influence on the radar performance in the different bands can be evaluated and optimized. The modular design allows the connection of different transmitter control and receiver decoding units to any of the three band front-end electronics to evaluate the performance of different approaches in the various bands simultaneously.

A real-time analysis software supports the data interpretation and system optimization during field tests. Via mobile internet connection and standard data formats the collected data can be made available for operative use. The mechanical integration on a standard car trailer allows the fast deployment to different locations.

References

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