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This paper presents a new X-Band Polarimetric Weather Radar System designed and manufactured by Remote Sensing Technologies (RST). It is a cost effective system with full weather radar capabilities at X-Band price. Polarimetric weather radars have the advantage of dual polarization features. They gain more information on characteristics of clouds and precipitation, compared to single polarization weather radars. This means more accurate prediction and detection of precipitation type and rate.

The designed X-Band Polarimetric Weather Radar System has a novel system architecture with simultaneous transmit and receive (STAR) topology. It is based on magnetron technology in transmitter using a long life high power magnetron with coherent-on receive techniques. Non coherent operation and frequency drifts are main issues to be handled in magnetron based radars. However, the progress in digital signal processing techniques mitigates effects of these disadvantageous features and make utilization of magnetrons possible. Non coherency is eliminated with coherent on receive architecture and pulse-to-pulse frequency deviation is corrected with automatic frequency correction. The system applies these techniques with state of the art signal processor unit successfully. On the other hand fast frequency agility is not a critical issue for weather radars. Achievable performance level of magnetron based radars shows that it is appropriate to meet most of weather radar requirements. Therefore magnetrons become more attractive for weather radar applications due to their long life time and low cost.

The system has been designed to support both magnetron and solid state high power amplifier in transmitter. Attenuation correction and GMAP algorithms have been developed for the radar and specifically tuned for high performance at X-band. A novel calibration architecture has been developed to correct horizontal and vertical path imbalances. The system is optimized for short and medium range weather detection, reliable hydrometeor classification with high resolution data. The system has X-band advantage of detecting even tiny particles, such as drizzle or light snow. System improvement for detection of biological scatterers such as birds and insects is a continuing part of the development activities. Detection of biological scatterers is important for airplanes especially at low altitude, which shows the need of such radars also at airports. Operating at X-band results also in compact size of the system and making the system perfect choice for portable applications in addition to fixed installations. This make it suitable for usage as gap-filler radar in existing meteorological radar networks.