

METRAD is the novel X-Band weather radar with high sensitivity and large dynamic range, which enable the detection of even the weakest hydro-meteorological targets, such as drizzles or light snow. The compact size and transportability of this complete X-Band system will make it the perfect choice for fixed installation and mobile operations, including rapid deployment for regional campaigns.

Application areas;

- Meteorological measurements
- Scientific weather data collection
- Struggle against natural disasters like flood, landslide etc.
- Harbors and Airports
- Sporting events



METRAD

X-Band Transportable Polarimetric
Weather Radar



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The fully-calibrated dual-polarization STAR (Simultaneous Transmit and Receive) topology, the state-of-the-art 16-bit signal processor unit and weather-radar algorithms optimized at X Band facilitate a wide-variety of applications such as nowcasting, flood or hail alerts, scientific research, and “filling-in” geographical areas that C-Band radars skip over. In this context, METRAD provides full weather measurement radar capabilities in short and medium range. The System is capable of 7/24 unattended remote operation; in a stand-alone mode, as well as in a network-based configuration, where both base-moment and resultant rain-product information is transmitted via 4G modem or SATCOM terminal.

It is possible to operate METRAD in both civilian and military airports as a Terminal Doppler Weather Radar, with optional Wind Products Software Suite, that enables the detection of not only hydro-meteorological targets, but also the Microbursts or Gust Fronts in rainy weather.

METRAD has been configured in a modular fashion, where almost all electronic equipment is designed as LRUs to enable the Operator/Maintenance Personnel to easily access these referred equipment. The reverse-U-shaped radome is optimized for polarimetric applications with minimum cross-polarization and differential phase values at all angles. The pedestal enables a full hemi-spherical coverage and accurate antenna positioning.



The system compasses a magnetron-based transmitter and employs coherent-on-receive techniques to obtain high resolution in both Range and Doppler. But the system-level design has been carried out under the requirement of an easy transition to solid-state-based transmitter, if requested. Both transmit and receive RF chains possess automatic or user-initiated dynamic calibration topologies in amplitude and phase to minimize ZDR and ØDP errors.



The User Interface Unit, a standard COTS laptop can either be used at the vicinity of the radar system via local connection to the system or at any convenient location where it is possible to make an Internet connection to the METRAD System. The GUI and its indigenous software is developed for operation on multiple operating systems and optimized for assignment of various tasks and monitoring of multiple products, simultaneously.



The indigenous signal processor employs high-dynamic-range ADCs and DACs in order to cover for both magnetron-based and solid-state-transmitter-based operations. The hardware that runs the data processing and rain-product-generation applications is a powerful COTS octa-core Xeon server with much room for further development and operation in high-resolution applications. It is also possible to store a vast amount of both raw and processed data on this server, in order to facilitate subsequent data analysis for the Operators.

The System is run by a custom Power Distribution Unit that runs a Continuous BIT feature throughout the System, where it continuously receives, processes, and records heat and current values of all supported electronic and electro-mechanical equipment. The Power Distribution Unit also contains a powerful software-controlled UPS to maintain continuous operation in case of a mains power failure or voltage irregularity. The trailer is custom designed for METRAD and compliant to all affiliated rules to enable safe land transportation.

Parameter	Range
Frequency	9325 MHz
Pulse Repetition Frequency (PRF)	0.2 – 3 KHz (Selectable)
Pulse Width (PW)	0.33 μ s-4 μ s (Selectable)
Operational Range	>75 km
Data Output	Reflectivity (Z)* Radial Velocity (V)* Spectral Width (W)* Differential Reflectivity (Z_{DR}) Differential Phase Shift (ϕ_{DP}) Specific Differential Phase Shift (K_{DP}) Polarimetric Correlation Coefficient (ρ_{HV}) Signal Quality Index (SQI) Note: Clutter corrected and uncorrected versions are available for all above parameters
Meteorological Products	PPI : Plan Position Indicator RHI : Range Height Indicator CAPPI : Constant Altitude Plan Position Indicator PCAPPI : Pseudo Constant Altitude Plan Position Indicator MAX : Maximum Display ETOPS : Echo Top Height EBASE : Echo Base Height VAD : Velocity Azimuth Display WVP : Vertical Wind Profile SRI : Surface Rainfall Intensity VIL : Vertically Integrated Liquid RSHEAR : Radial Shear ASHEAR : Azimuthal Shear ESHEAR : Elevation Shear HCI : Hydro Meteor Classification

* Both vertical and horizontal versions available

Transmitter	
Type	Long-Lifetime Magnetron with solid-state modulator (dynamically calibrated for optimum ZDR performance in STAR Mode)
Peak Power	20 KW (Supports up to 50 KW)

Receiver	
Type	Multiple-Channel Superheterodyne Receiver (dynamically calibrated in both amplitude and phase)
Noise Figure	<2.5 dB
Dynamic Range	>90 dB
Sensitivity	< -111dBm

Digital Receiver & Signal Processor	
Type	Modular multi-channel receiver
IF Sampling	2 parallel channels, 16-bit per polarization
Processing Mode	Multi-lag autocorrelation with pulse-pair or FFT

Antenna and Pedestal	
Antenna Diameter	1.5 m (Supports up to 1.8 m)
Antenna Gain	41 dBi
Antenna Beamwidth	1.5°
Antenna Coverage	360° continuous in azimuth, -2° - +90° in elevation
Positioning Accuracy	0.1°
Angular Speed	Up to 6 RPM

Dimensions and Weight of System on Trailer	
Width	255 cm
Length	300 cm
Height	380 cm
Weight	Less than 2500 kg