



K_a -band Synthetic Aperture Radar (SAR) Application

CASE STUDY: TCS003

Claude Sweeton
Sr. Sales Engineer
TEVET

CUSTOMER: DoE Sandia National Labs
SOW: DE-AC04-94AL85000

For more than 60 years, Sandia National Labs has delivered essential science and technology to resolve the nation's most challenging security issues. Sandia National Labs' Airborne Intelligence Surveillance and Reconnaissance (ISR) systems enable a new product paradigm in radar capabilities and modalities. With the ability to shrink sensor size, increase resolution, raise image quality, and advance real-time on-board processing, Airborne ISR has been dedicated to producing the continuous cycle of next generation systems. Airborne ISR specializes in the full system design of exquisite Synthetic Aperture Radar (SAR), Ground Moving Target Indicator (GMTI), target recognition, and other sensor systems for the DoD, other Government Agencies, and industry partners.

MINIMUM REQUIREMENTS

Airborne ISR required a handheld RF analyzer that could cover all test requirements in the Ka-band (SHF - ITU) of the RF spectrum - 26.5 to 40 GHz. The Ka-band has been deemed the future for satellite communications and Airborne ISR systems designs in both SAR and GMTI. SAR and GMTI are at the forefront of this movement. GMTI radar is used to first detect and then

characterize moving objects with a high Probability of Detection (PD), while maintaining a low Probability of False Alarm (PFA). A principal radar metric to achieve this is the Signal-to-Noise (energy) Ratio (SNR) in the GMTI Range-Doppler map.



Synthetic Aperture Radar with Ground Moving Target Indicator



www.tevetllc.com

caseSTUDY

MINIMUM TECHNICAL REQUIREMENTS

- Handheld instrument for field test environment
- Lightweight (under 8lbs including battery), compliance with Ingress IP53 (IEC/EN 60529) and MIL-PRF-28800F Class 2
- Cover entire Ka-band RF spectrum, with built-in full Ka-band Tracking Generator – 26.5 to 40 GHz
- Displayed Average Noise Level (DANL) better than -150dBm
- Ka-band Millimeter-wave SAR measurements
 - o Transmitter Spectrum Analysis – Channel Scanner
 - Measure Transmitted Power
 - Measure Channel Power – Chirped, Modulated, Pulsed
 - Measure Burst Power – Compressed RF
 - Measure Pulsed-RF signals with Time Gating
 - Measure Pulse Repetition Frequency (PRF)
 - o Received Signal Analysis
 - Measure In-band Interference
 - Measure Co-channel Interference
 - Measure Out-of-band Spurious Signals
 - Measure Adjacent Channel Interference
 - Measure Uplink / Downlink Interference
 - Measure Occupied Bandwidth (OBW)
 - o Display Spectrogram – Frequency Hopping
 - o Signal Strength Mapping to determine suitable locations for antennas, repeaters, and base stations
- Field Ready – field swappable battery, daylight-viewable display, ruggedized for all outdoor environments
- Minimum 3 years warranty

TEVET SOLUTION

TEVET engaged directly with the engineering team at Airborne ISR to gain a full understanding of the application and the test challenges they were faced with. TEVET conducted a full gap analysis to gain further insight to what was required for not only today's need, but also future capabilities the customer may have. Determining factors of the gap analysis for identifying the best COTS solution included: selecting a Handheld RF Analyzer that not only covered the entire Ka-band RF spectrum, but had a built-in full Ka-band Tracking Generator. After evaluating several technologies from different instrumentation providers, TEVET settled on the Keysight RF Spectrum Monitoring System comprised of the N9951A.

www.tevetllc.com

caseSTUDY

KEY TECHNICAL ADVANTAGES

Ka-band Handheld RF Analyzer

- N9951A 44GHz Handheld RF Combo Analyzer – the world's most integrated full Ka -band field analyzer
 - o Cable and Antenna Analyzer
 - o Spectrum Analyzer with Gated FFT function
 - o DANL -159dBm
 - o 44GHz Tracking Generator/ Independent CW Source
 - o Vector Network Analyzer (VNA)
 - o Vector Voltmeter
 - o Built-in Power Meter
 - o USB Power Sensor port (USB Peak Power Sensor)
 - o Interference Analyzer for RF Site Survey, Spectrum Recording, Security Surveillance, Defense Sigmon, and Intruder Watch with GPS to identify locations
 - o Time Domain Measurements
 - o Built-in variable DC Source
 - o Display modes include – outdoors in sunlight and night-time with backlit keys and display
 - o Compliance to Ingress IP53 (IEC/EN 60529) and MIL-PRF-28800F Class 2
 - o Weight 7.1lbs, battery included



Cable and antenna analysis

Vector network analysis

Spectrum analysis

DC source & current monitor

Time domain



Interference analysis

Full-band tracking generator

Vector voltmeter

Channel power measurement

Built-in power meter

www.tevetllc.com