



Signal Vision: Helping the Marines Manage Their Electromagnetic Spectrum Signature

The importance of spectrum dominance

From radars and radios to sensors and cellphones, the communication systems used by the U.S. armed services all have one thing in common: they rely on signals that operate in the electromagnetic spectrum. They can't be seen by the human eye but these signals, both ours and our adversaries, are far from invisible. This makes the ability to see, understand, and control the spectrum imperative to mission success.

To ensure both the safety and lethality of its forces, the U.S. Marine Corps needed to gain a better understanding of what their radio frequency (RF) signature emissions looked like to adversaries. This was especially important for contested multi-domain environments, where the ability to minimize the observability and targetability of your signals is critical. In addition to revealing sensitive information such as troop location, size, or actions, the inability to manage these signal emissions could ultimately allow adversaries to affect the Marines' ability to communicate and to properly use their weapon, targeting, and intelligence systems.

To better understand their footprint on the electromagnetic spectrum in a multi-domain environment, the Marines looked to the Indo-Pacific theater — where it was conducting multi-island exercises — and to a small and portable signal detection product named Spectrum Guard.

12 lbs.

WEIGHT OF ONE
SPECTRUM GUARD

**1 kHz-
40 GHz**


FREQUENCY DETECTION
RANGE OF A SPECTRUM GUARD

~1,000

DEPLOYED SPECTRUM
GUARD UNITS ACROSS ALL
U.S. ARMED SERVICES

The Challenge: Multi-domain signal detection and determination across the spectrum

Marine Corps exercises in the Indo-Pacific region were spread across different islands and involved everything from seizing and holding to protecting an island chain. These exercises required the use of communications technology across domains: space-based satellites, vessels at sea, drones in the sky, and boots on the ground. Connecting assets across these distances requires sending and receiving numerous electromagnetic signals, all of which utilize different portions of the spectrum depending on the activity they are performing or type of signal or communication they are sending.



Any one of these signals across bands could, under the wrong circumstances, reveal critical information. It was therefore crucial to capture them all so decision-makers could have a true picture of how each was contributing to the overall signal emission signature. For example, something as routine as a comms check by a deploying convoy may reveal a pattern that can be used by adversaries to detect when similar convoys deploy in the future. In addition, the Marines also needed to be better able to do exactly what they were trying to defend against: capture, interpret, and identify adversarial signals for intelligence purposes.

The Marines Corps turned to CACI and its Spectrum Guard product, a small, rugged, and portable RF detection and monitoring system. With the ability to run off battery, vehicle, or traditional power sources, Spectrum Guard had the potential to close the critical capability gap at the user level and provide the Marines with the ability to properly monitor the signal emissions of both their own and adversarial forces.

The Results

CACI'S Spectrum Guard technology proved vital to multi-island exercises in the Pacific, allowing command and forces to practice a digital hub-and-spoke concept where battalions, companies, and platoons across islands could monitor baseline signals. The Marines were able to fully understand their wireless footprint in the environment, and better able to develop guidelines for signal emissions that could be followed for future operations.

Spectrum Guard allows the Marines to:

- Observe and assess environments in support of static, vehicle, or mobile operations via detection of RF frequency signals ranging from 1 kHz to 40 GHz
- Collect, record, and analyze Wi-Fi, Bluetooth, Zigbee, cellular, and analog and digital radio RF signals and data
- Determine the location and hardware manufacturer of signal-emitting devices
- Control the spectrum by detecting jamming or spoofing and making channel adjustments to help overcome the interference
- Set user-defined parameters for specific RF spectrum sweeps
- Understand their own electronic signature to better comprehend how it appears to adversaries and to make countermeasure adjustments in real time
- Connect and scale up with other Spectrum Guard devices to create a mesh of detection capabilities across vast areas
- Integrate with third-party and existing analysis and situational awareness tools

The Future: Ready to meet the rising digital-based threat

Originating from the cellphone detection technology that played a crucial role in countering the use of IEDs (improvised explosive devices) in Iraq and Afghanistan, today's fifth-generation Spectrum Guard is a compact and powerful tool that is well-positioned to help counter the continuing rise of digital and future threats, from electronic warfare to AI-controlled drones. Currently, it is playing a vital role in the defense of Ukraine. To ensure our Allies, the Marine Corps, and other U.S. forces continue to have the situational awareness they deserve in the electromagnetic spectrum, CACI is continually working to develop and advance the platform further.