TECHNICAL SURVEILLANCE COUNTERMEASURES

RFEYE GUARD



Continuous real-time in-building monitoring for Technical Surveillance Countermeasures

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VDK TELECOMMUNICATIONS

CRFS

EXTRAORDINARY **RF TECHNOLOGY**

CR-005311-MD

RFEYE GUARD **AT A GLANCE**

RFeye Guard is an in-building Technical Surveillance Countermeasures (TSCM) spectrum monitoring solution that detects modern surveillance threats.

The system is built upon a network of discreetly installed RF sensors. When an illicit signal is detected, the system uses geolocation techniques to locate the signal source, raising alerts for further investigation.

Unlike traditional TSCM strategies, which may miss devices transmitting intermittently or employing complex signal patterns such as frequency hopping, RFeye Guard's continuous monitoring capability ensures that even the most advanced and low-power signals are detected.

RFeye Guard is particularly suitable for environments where security and privacy are paramount, such as government buildings, corporate boardrooms, banking institutions, national critical infrastructure, and data centers.

BENEFITS

Intelligent RF sensor

High-performance, intelligent RF sensor with in-built edge processing, reducing backhaul data bandwidth.

Gateway to powerful software & APIs

CRFS hardware works with a software suite to monitor, capture, analyze, and geolocate signals of interest for complete spectrum visibility.

Timing synchronization indoors

Distributed Node synchronization technology (SyncLinc) enables synchronous in-building operations (in GNSS-denied environments) whereGNSS signals are not available indoors.

Easy installation, setup, & operation

COTS-optimized, RFeye technology is easy to connect and install and does not require recalibration.

9KHz 40GHz

100 MHz IBW wideband frequency monitoring

Quickly sweep from 9 kHz up to 40 GHz with a high probability of intercept.



RFEYE GUARD
EQUIPMENT



RFEYE NODE

RFeye Nodes are high-performance RF sensors for real-time 24/7 spectrum monitoring and geolocation of transmitters. Four versions are available for monitoring up to 40 GHz. Their fast sweep speeds and low noise figures can detect even the lowest power and shortest duration signals.



CEILING KIT

The indoor ceiling kit is designed to integrate seamlessly with existing office aesthetics. It is easy to install and houses the RFeye Node, a network switch, and a SyncLinc module.



RFEYE SYNCLINC

RFeye SyncLinc is a synchronization solution for RFeye Nodes that delivers precision timing across the network—required for accurate geolocation. It provides an accurate timing solution where GNSS signals are not available indoors.



RFEYE SITE SOFTWARE

RFeye Nodes are high-performance RF sensor for real-time 24/7 spectrum monitoring and geolocation of transmitters. Four versions are available for monitoring up to 40 GHz and their fast sweep speeds and low noise figures can detect even the lowest power and shortest duration signals.



RFEYE MISSION MANAGER SOFTWARE

RFeye Mission Manager allows users to automate spectrum monitoring—permitting 24/7/365 monitoring. A non-RF or non-TSCM expert can monitor the system by adding automation to the operation. Sweeps and scans can be scheduled, and alerts automatically triggered.

- Real-time and automated 24/7/365 surveillance
- Complete RF security
- Integrates with existing building aesthetics
- In-building geolocation of bugs and exterior monitoring
- SyncLinc technology for accurate geolocation

THE THREAT OF COVERT **SURVEILLANCE DEVICES**

There is an understandable lack of statistics demonstrating the incidence of state and corporate espionage. However, anecdotal research suggests the trend is increasing exponentially.

Critical infrastructure, corporations, and government entities are vulnerable to internal threats, competitors seeking to steal secrets, and foreign state-sponsored espionage. RF transmitters used for espionage are discrete, capable, and accessible—from $20 bugs available online to highly sophisticated RF covert listening devices hidden inside USB cables, light bulbs, or authorized electronic devices.

These devices are very difficult to locate and can lie dormant until connected to a network. A device may only need to "shake hands" momentarily once every eight hours; at other times, it remains RF invisible.

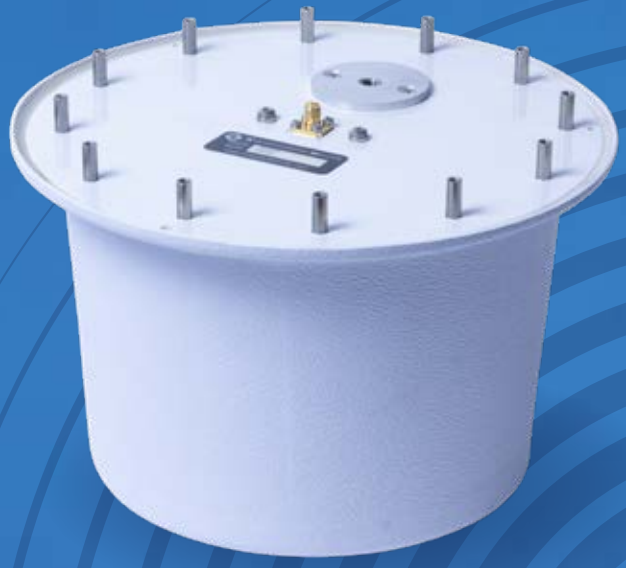
Many entities are likely to be targets of espionage, eavesdropping, or unauthorized information gathering.

- Government agencies
- Embassies
- Sensitive Compartmented Information Facilities (SCIFs)
- Large corporations
- Secure facilities
- Critical national infrastructure
- Banks
- Data centers
- Political offices
- Law firms
- Research institutions and universities

Without good operational security (OPSEC), undetected RF surveillance and data transmissions can allow an adversary to:

- Conduct ISR operations against the organization
- Breach the integrity of secure communications
- Collect and disclose classified information
- Steal intellectual property and violate privacy
- Hijack critical signals that can cause loss of finances, assets, or life
- Obtain money and financial data
- Compromise law enforcement and intelligence agency operations

Entities must be vigilant by conducting regular security audits, training employees to recognize suspicious activities, and investing in Technical Surveillance Countermeasures to detect and address threats.



TECHNICAL SURVEILLANCE **COUNTERMEASURES (TSCM)**

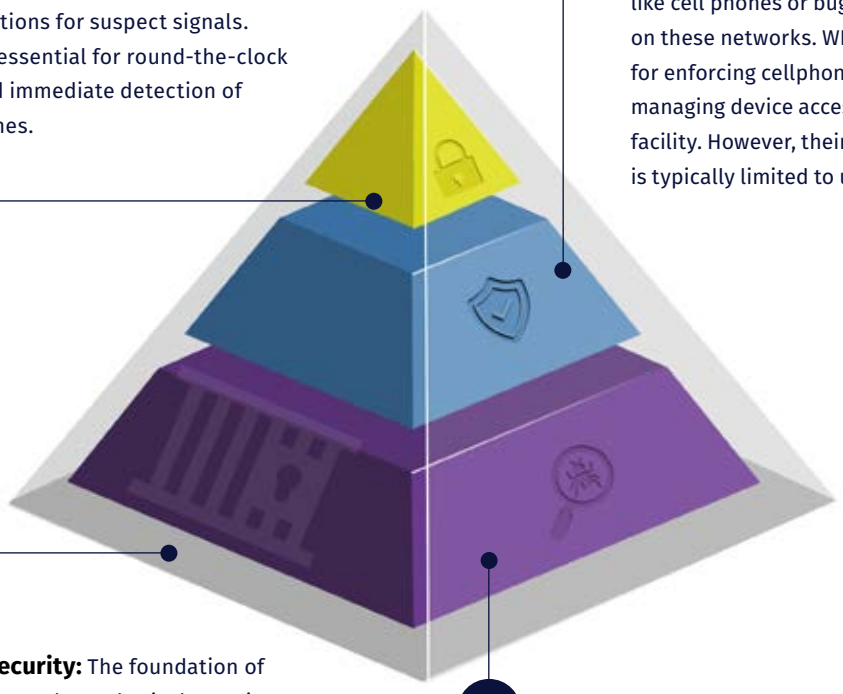
TSCM, also known as electronic counter-surveillance, detects and neutralizes surveillance devices, including hidden cameras, microphones, and other electronic eavesdropping tools.

The traditional approach to RF security involves using sweep teams; however, sweeps can easily be defeated by using detection-avoiding techniques, including frequency hopping, hiding close to a high-power signal, or transmitting in short, infrequent bursts. Devices can also be deactivated during a sweep and turned on when complete. Traditional approaches are now impotent. The most robust strategy against RF surveillance involves a multi-layered approach that carries our continuous, real-time TSCM.

WHAT IS A MULTI-LAYERED TSCM APPROACH?

4 **In-place monitoring system (IPMS):** As they are continuous, wideband TSCM solutions, IPMS offer complete assurance against RF surveillance. The RFeye Guard system continuously monitors the RF environment up to 40GHz. It can detect brief and low-power signals, sending real-time alerts and locations for suspect signals. This system is essential for round-the-clock monitoring and immediate detection of security breaches.

3 **Wireless intrusion detection systems (WIDS):** These systems monitor cellular, Wi-Fi, and Bluetooth signals to detect and locate devices like cell phones or bugs transmitting on these networks. WIDS are helpful for enforcing cellphone policies and managing device access within a facility. However, their frequency range is typically limited to up to 6GHz.



1 **Physical security:** The foundation of TSCM involves robust physical security measures. This includes security personnel, access controls, and the strategic layout and construction of buildings to prevent unauthorized access and surveillance.

2 **Bug sweeping:** Traditional bug sweeping involves handheld devices scanning rooms for electronic surveillance equipment. While effective, these methods can miss devices that transmit infrequently or are hidden near strong signals. Bug sweeps are critical but can be time-consuming and disruptive, meaning they are used infrequently.

WHO BENEFITS FROM IN-PLACE **MONITORING SYSTEMS WITH CONTINUOUS TSCM?**

Any facility needing permanent, comprehensive surveillance countermeasures to protect against espionage, unauthorized data access, and other security breaches will benefit from a layered approach and continuous TSCM.

Security breaches must be discovered the instant devices are activated. Previous TSCM sweeps cannot detect present threats. They cannot detect bugs activated in the middle of the night. They often cannot detect frequency hopping bugs or where the signal is hidden close to another high-power signal.

However, in-place monitoring systems can detect any device transmitting the moment it is activated, regardless of when the device was brought into the facility. A security team can be immediately alerted to the location of the signal.

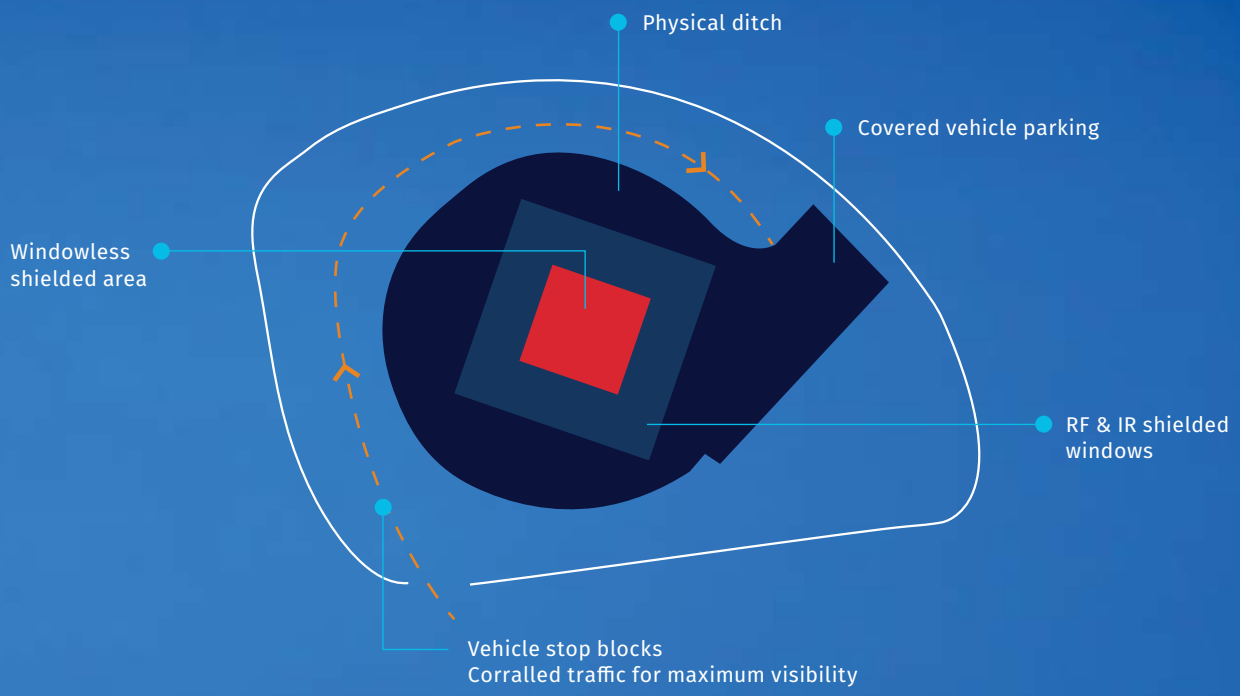
In-place monitoring systems provide security against three different methods of deploying covert surveillance devices:

Zero-day installations: Technical surveillance devices are deployed when a facility is being built or refurbished.

Social engineering: A trusted insider is manipulated or threatened to place a device.

War-shipping: A package is posted or shipped into a facility with a device hidden between cardboard or within an object.

MULTI-LAYERED SECURITY APPROACH



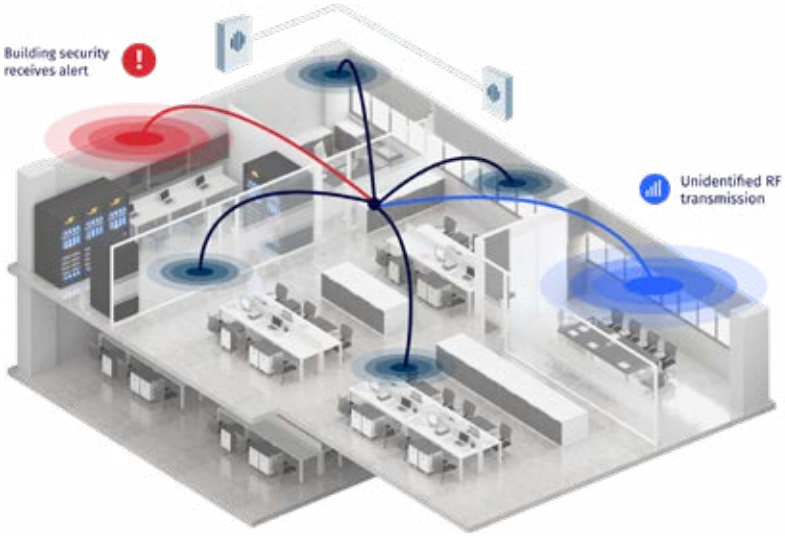
WHAT SHOULD THE **RF SPECTRUM LOOK LIKE?**

RFeye Guard is a sophisticated in-place spectrum monitoring and threat geolocation system for 24/7/365 TSCM. It combines highly sensitive and broad bandwidth receivers with real-time and autonomous software to ensure you never miss an illicit signal.

This high-specification technology offers continuous spectrum monitoring up to 40 GHz and is designed to detect signals that are likely to be missed by handheld sweepers. Its high sweep rates of almost 400 GHz/s and resolution down to 1 Hz make it a robust system providing a high probability of intercept (POI) for unauthorized transmissions in real time.



RFeye Guard relies on a network of permanent RF receivers discreetly installed in ceiling kits. They continuously scan and sweep the electromagnetic spectrum for unauthorized transmissions. When they detect an illicit signal, RFeye software calculates its exact location using Power on Arrival (PoA) and issues security with an alert.





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Our online deployment stories library showcases CRFS' expertise across multiple domains and sectors.

COMPONENTS OF **RFEYE GUARD**

RFeye Guard comprises four elements: highly sensitive RF receivers, a ceiling unit to house the receivers, a synchronization solution, and spectrum monitoring software. Together, this ecosystem means you will ensure the integrity and security of your facility.



RFEYE NODES

For the most effective TSCM solution, a network of RFeye Nodes should be placed inside and outside the target area. While indoor Nodes detect signals inside an area, mounting Nodes on the external face of a building permits advanced functionality: users can differentiate signals originating outside from those originating inside. This allows users to differentiate threats from passing traffic and/or drones.

This minimizes false alarms and allows deployment in complex RF environments such as cities. Also, an outdoor Node network further enhances mission capabilities by offering SIGINT and drone detection solutions.

CRFS' creates a range of highly sensitive radio receivers for high-performance, real-time, 24/7 spectrum monitoring.

Their fast sweep speeds and low noise figures can detect even the lowest power and shortest duration signals. In combination with RFeye software, Nodes can operate autonomously, conducting additional high-resolution sweeps in response to detected signals.

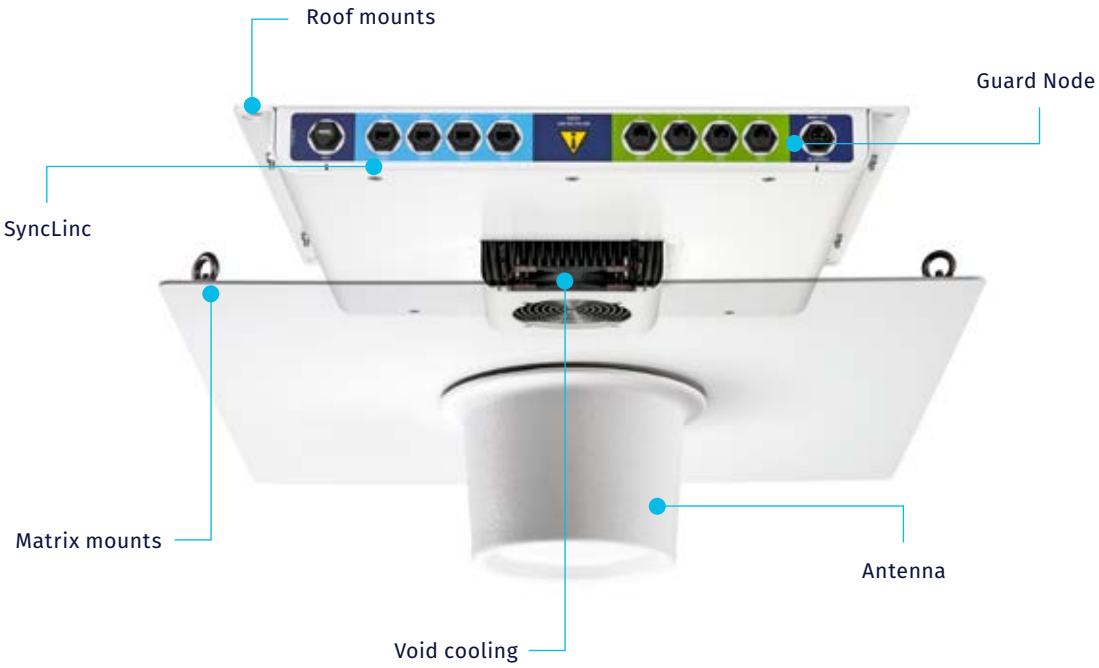
The correct Node for the task depends on the application and the mission requirements.

	RFEYE 40-8	RFEYE 100-8	RFEYE 100-18	RFEYE 100-40
Frequency range	9 kHz - 8 GHz	9 kHz - 8 GHz	9 kHz - 18 GHz	9 kHz - 40 GHz
Noise figures at maximum sensitivity	6-10 dB typical	6-10 dB typical	7-21 dB typical	8.5-16 dB typical
Phase Noise at 1 GHz (20 kHz offset)	-110 dBc/Hz	-130 dBc/Hz	-126 dBc/Hz	-126 dBc/Hz
Instantaneous bandwidth (IBW)	40 MHz	100 MHz	100 MHz	100 MHz
Sweep rate	245 GHz/s	280 GHz/s	390 GHz/s	390 GHz/s
Node weight (ex noses / heatsink)	2.1 kg (5 lbs)	2.4 kg (5 lbs)	2.9 kg (6.4 lbs)	3.5 kg (8 lbs)
Application	Ruggedized, weatherproof, and optimized for SWaP			
Primary use	Primarily designed for regulators, spectrum monitoring and geolocation up to 8 GHz	Spectrum monitoring and geolocation up to 8 GHz	Spectrum monitoring and geolocation up to 18 GHz	Spectrum monitoring and geolocation in higher frequencies (up to 40 GHz)
Benefits	Easy to retrofit, does not require recalibration, high RF performance, multi-mission capabilities			

INDOOR CEILING KIT

The indoor ceiling kit is engineered for discreet and continuous spectrum monitoring within office environments. It is designed to integrate seamlessly with existing office aesthetics; the omnidirectional antenna resembles a standard fixture such as a smoke detector.

This pre-assembled kit, which includes an RFeye Node, a network switch, and a SyncLinc module, promises easy installation into various suspended ceiling types. It does not require maintenance.



RFEYE SYNCLINC

The RFeye SyncLinc is a synchronization solution for RFeye Nodes that delivers precision timing across the network, which is required for accurate geolocation. Each Node is then connected via an IP connection to the security control center, which can be located anywhere in the world.

SyncLinc functions in settings where GPS timing is unavailable, such as indoor environments. SyncLinc ensures that multiple Nodes capture data as a network, providing a common-timing reference essential for advanced operations like high-accuracy Power On Arrival geolocation.

It operates over a dedicated internal network, using either copper or optical connections, and allows chaining distribution modules to expand the system. It has a timing resolution of 100 ns and various module dimensions, with environmental ratings indicating robust operating and storage temperatures.



RFEYE SOFTWARE **ECOSYSTEM**

CRFS software integrates seamlessly with the hardware, providing a user interface to configure and control RFeye Nodes, visualize the spectrum data collected by the sensors, and analyze that data for various applications.

For TSCM, the software works with the hardware to scan for signals across a wide frequency range, identify potential threats, and support the investigative process. Three software products offer complimentary capabilities for TSCM applications:



RFEYE SITE

Real-time spectrum monitoring & geolocation toolkit

RFeye Site is a desktop application for real-time spectrum monitoring and geolocation. It includes all the essential functionality needed for full spectrum operations, turning spectrum data into RF intelligence.



RFEYE MISSION MANAGER

Automated spectrum management & near-time incident reporting

RFeye Mission Manager allows users to automate spectrum monitoring—permitting 24/7/365 monitoring. A non-RF or non-TSCM expert can monitor the system by adding automation to the operation. Sweeps and scans can be scheduled, and alerts automatically triggered.



RFEYE DEEPVIEW

Forensic signal analysis software with 100% probability of intercept

RFeye DeepView is a forensic signal analysis tool that allows users to quickly measure spectrum bursts and hops and compare two sets of I/Q waterfalls side by side. This is a complimentary, non-mandatory software for TSCM.

BENEFITS OF **RFEYE GUARD**

BENEFIT	DESCRIPTION
Continuous surveillance	Provides 24/7/365 monitoring, ensuring constant vigilance against illicit surveillance devices.
Complete RF security	Addresses every method of planting a device inside a facility, which is impossible for physical security and sweep teams.
Flexible deployment	Modular design suitable for various environments, from single rooms to extensive facilities.
Temporary deployment	It can be used in a temporary deployment: TEMPEST testing, single room SCIF (sensitive compartmented information facility) monitoring, or mobile monitoring.
Early threat detection	2.4 kg (5 lbs)
High sensitivity	Capable of detecting low-power and advanced signals that manual sweeps might miss.
Broad spectrum coverage	Monitors a wide range of frequencies, up to 40 GHz, covering most communication and surveillance devices.
Geolocation capabilities	Uses Power on Arrival (PoA) for precise in-building location of illicit devices.
Reduced false positives	Geofencing RF emissions allows operators to differentiate between authorized and unauthorized signals, minimizing false positives.
Data storage and analysis	Stores detected signals for historical analysis, aiding understanding and countering threats.
Automation and ease of use	Automated missions and user-friendly software allow non-experts to monitor the system effectively.
Actionable Intelligence	Provides actionable information for security teams to respond to threats appropriately.
Central management	Multiple sites can be managed from one central location.
Integration with other security measures	Complements existing security systems (cameras, Wi-Fi shut-off).

HOW TO USE RFEYE GUARD

Set up the RFeye Node network

RFeye Nodes are discreetly installed inside and outside the building using a ceiling mounting kit to monitor internal and external signal origins. Inside, the RFeye SyncLinc system replaces GPS to synchronize the Nodes with precise timing. The building's floor plan is uploaded to RFeye Site software, allowing for accurate mapping and geolocation of detected signals.

Conduct an initial survey

Post-installation, a site survey establishes a "normal" signal activity baseline by scanning and recording all detectable signals. Analysts can then classify permitted signals into a whitelist and suspicious signals into a blacklist, defining specific operational times for each.

To establish a baseline, the system initially analyzes the standard RF signature of the environment. This involves identifying typical emissions, power ranges, and locations to determine what constitutes 'normal' within the facility.

The system is configured to precisely exclude specific frequencies, power levels, and locations from its detection range, establishing a baseline for normal activity. Known and expected devices are then masked or 'whitelisted,' excluding them from further scrutiny. RFeye Guard uses this established baseline to detect deviations or unaccounted energy within the space.

Additionally, this survey serves to audit an organization's Operational Security (OPSEC) policies, such as restrictions on device presence, ensuring compliance with internal security protocols.

Continuous monitoring

The RFeye Guard system should be switched to continuous monitoring mode after completing and analyzing the initial survey. It will then scan for signals not on the whitelist, automatically notifying security personnel of any detected unauthorized devices. RFeye Nodes are operated via RFeye Site and RFeye Mission Manager.

Detect suspect signals

RFeye software detects significant and subtle deviations from the facility's established baseline. It can identify devices co-located with existing transmitters or those attempting to conceal their transmissions by blending in with other signals, such as Wi-Fi.

Upon detecting a suspicious signal, the security team can employ one of several strategies: Using RFeye Guard's geolocation data, the team can locate and eliminate the device. However, in certain situations, it might be strategic to leave the device undisturbed.

Detecting a covert surveillance device enables security teams to gather evidence for legal action. RFeye Guard compes a detailed historical analysis of the device's activity.

Conduct post-analysis

All detected signals are recorded in the RFeye Guard database, allowing post-analysis to ascertain a device's capabilities, movements, modulation, and operational schedule. This intelligence is vital for developing countermeasures, gathering evidence, or strategizing during denial and deception operations.

KEY CONSIDERATIONS WHEN **PURCHASING RFEYE GUARD**

CONSIDERATION	QUESTION
Installation environment	What is the type and size of the facility where the system will be installed? (single room, entire building, entire facility).
Spectrum monitoring needs	What specific frequency ranges and types of signals need to be detected?
Integration with existing systems	How will RFeye Guard integrate with our current security or surveillance systems?
Technical expertise	What level of technical expertise is available for operating and maintaining the system?
Budget and cost	What is the budget range for purchasing and installing the system, including any additional components?
Ongoing maintenance	What are the maintenance requirements, and how easy is it to update the system?
Customization and scalability	Does the system's modularity and software customization meet specific needs and allow for future scalability?
Compliance with regulations	Does the system comply with local laws and regulations on surveillance and privacy?
Training requirements	What training is required for staff to operate the system effectively?
Post-installation support	What level of customer support and technical assistance is provided by CRFS post-installation (including SSUS and warranties)?

RESOURCES

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Discuss your RFeye Node deployment requirements.

CRFS

CRFS is an RF technology specialist for defense, national security agencies and systems integration partners. We provide advanced capabilities for real-time spectrum monitoring, situational awareness and electronic warfare support to help our customers understand and exploit the electromagnetic environment.

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