CRFS

RFeye Guard

Continuous real-time In-Place
Monitoring System (IPMS) for
sensitive or secure facilities

What is RFeye Guard?

The RFeye® Guard is an in-place monitoring system for continuous TSCM (Technical Surveillance Countermeasures). It is a cost-effective alternative to bug sweeping strategies with guaranteed detection 24 Hours, 365 days a year.

If you are concerned about potential threats to the security of your facility, your private conversations, your plans and secrets, why settle for partial assurance when you can have complete assurance? RFeye Guard is an integrated continuous monitoring and threat geolocation system using indoor and outdoor RFeye sensors, high accuracy wired synchronization system and automated software for building and facility security control.

Typical applications for autonomous in-place monitoring systems include:

Embassies and Diplomatic Buildings

In a world of constantly shifting social and political landscapes, it is important that nations have safe-spaces to discuss ongoing events and policy both at home and outside home borders. Safe-spaces must exist without fear of bugging, interception or eavesdropping technologies. These secure spaces exist within government buildings as well as embassies and other diplomatic buildings such as diplomatic residences. These environments need a solution to ensure those spaces are continually free from transmitting devices and assure absolute freedom to discuss ongoing policy, strategy or intelligence.

National Critical Infrastructure

Infrastructure related to energy, transport, communications and public health are essential to a nation's safety, prosperity and wellbeing and this has increasingly made them a target for both physical and cyber attacks. Critical Infrastructure Protection (CIP) measures are vital to key assets such as nuclear reactors, water treatment plants and dams. Protection from electromagnetic threats needs to fit seamlessly into the infrastructure environment alongside physical and cyber measures to ensure that operation is both smooth and secure.
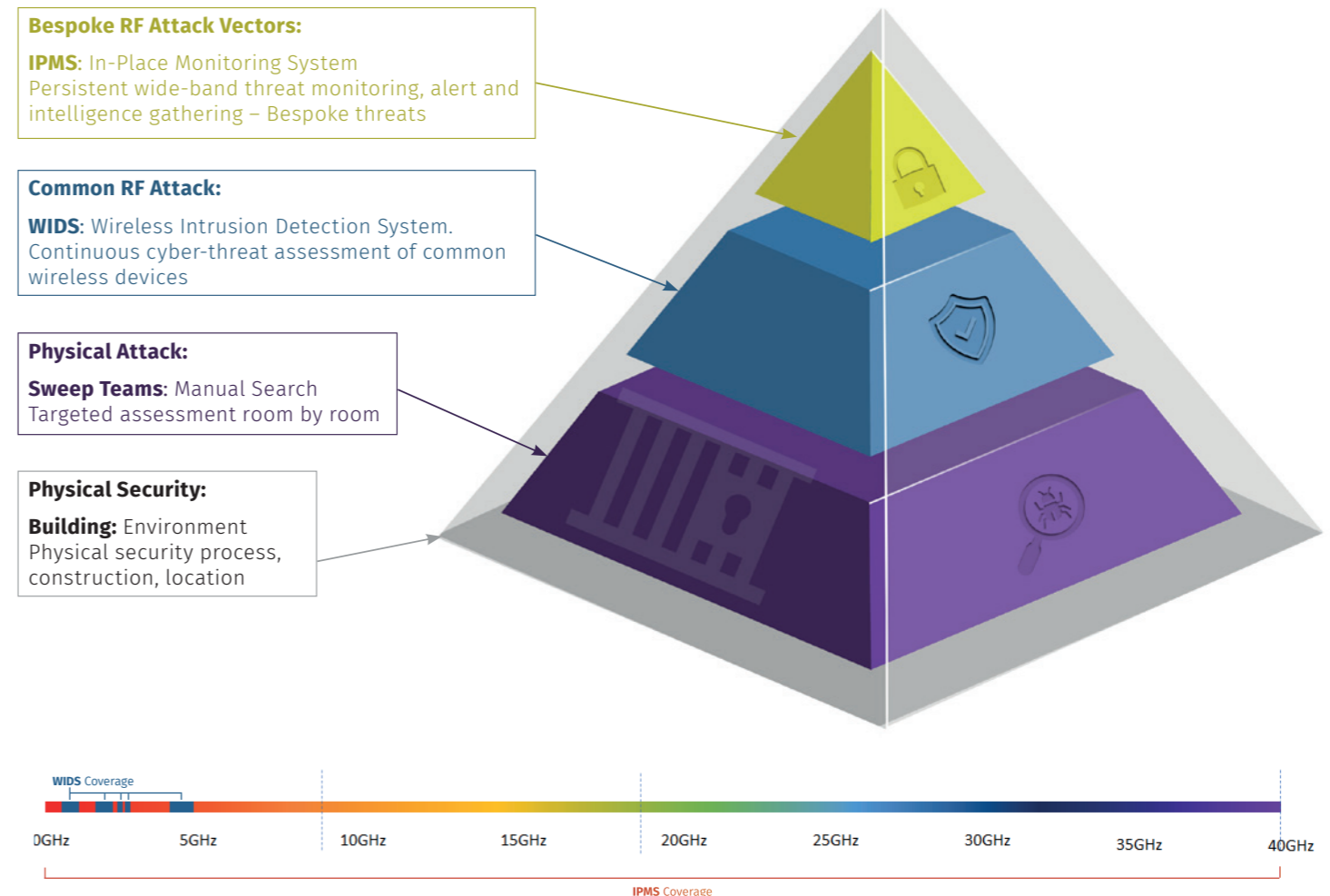
Secure Offices

Companies win commercial business through their employees ability to talk, develop, design and plan. From board rooms to engineering labs, critical tactical and strategic decisions are made and discussed in great detail. This is why, in modern business, security has to be a key area of focus. We are all familiar with the need for network security to keep intrusions out, which is perhaps why so many security breaches take place inside the organization.

The Pillars of RF Technical Security

The RFeye® Guard system sits on-top of the fundamental elements of technical security counter measures. Bespoke devices are designed to exploit the gaps left by these fundamentals, and it is those vulnerabilities that RFeye Guard secures.

There are many documented methods to plant a device inside a facility, from social engineering through to war-shipping. Our physical security cannot counter these. Our sweep teams, although highly effective cannot search everywhere all of the time, so leave windows of opportunity. WIDS (wireless intrusion detection) systems focus only on common frequencies e.g. WiFi, Cell Networks, Bluetooth etc. RFeye guard in contrast looks at all energy within a space day and night to discover threats, and give our sweep teams defined search locations and parameters.

Bespoke RF Attack Vectors:

IPMS: In-Place Monitoring System
Persistent wide-band threat monitoring, alert and intelligence gathering – Bespoke threats

Common RF Attack:

WIDS: Wireless Intrusion Detection System.
Continuous cyber-threat assessment of common wireless devices

Physical Attack:

Sweep Teams: Manual Search
Targeted assessment room by room

Physical Security:

Building: Environment
Physical security process, construction, location

WIDS Coverage

0GHz   5GHz   10GHz   15GHz   20GHz   25GHz   30GHz   35GHz   40GHz

IPMS Coverage

How RFeye Guard forms an essential part of your TSCM strategy

GSM bugging devices are available today from well-known online retailers for less than $50. Meanwhile, non-commercial devices are becoming increasingly sophisticated and harder for traditional TSCM (Technical Surveillance Countermeasures) operatives to detect. The consequences of undetected RF surveillance and data transmission include: financial losses to corporate organizations, compromise of law enforcement and intelligence agency operations and eavesdropping on what should be secret government conversations by hostile state actors.

When addressing the RF piece in the security puzzle, the traditional approach of using sweep teams is no longer sufficient. Such sweeps can easily be defeated by a device using techniques to avoid detection, e.g. frequency hopping, hiding close to a high power signal or transmitting in short infrequent bursts. And of course, a device can be switched off during a sweep, or placed after a sweep is conducted.

To provide complete assurance against RF surveillance, there is a need for continuous real-time TSCM in the form of an In-Place Monitoring System. With many of our customers, we have found that the barriers to implementation have been the assumed cost, alongside concerns that the installation process would be invasive. They have been pleasantly surprised to discover that RFeye Guard can be installed with a minimum of disruption and at a much lower cost than expected.

Why settle for partial assurance when you can have complete assurance?

RFeye Guard is CRFS's solution for continuous TSCM monitoring in secure buildings and facilities. It is deployed as a network of synchronized indoor and outdoor sensors to detect suspect signals, locate and alarm in real time.

It is cost effective, discreet, easy to deploy, easy to use and provides our security customers with true peace of mind 24hrs, 365 days a year.

Monitor 24/7

RFeye Guard monitors 24/7 to instantly detect suspect signals in real time. Fast sweep speeds and exceptionally low noise figures allow our RFeye sensors to detect even the lowest power and shortest duration signals. These intelligent sensors, combined with the Guard software suite, operate autonomously and can make their own decisions to conduct additional high resolution sweeps in response to detected signals.

ROOF MOUNTS

GUARD NODE

VOID COOLING

SYNCLINC

MATRIX MOUNTS

ANTENNA
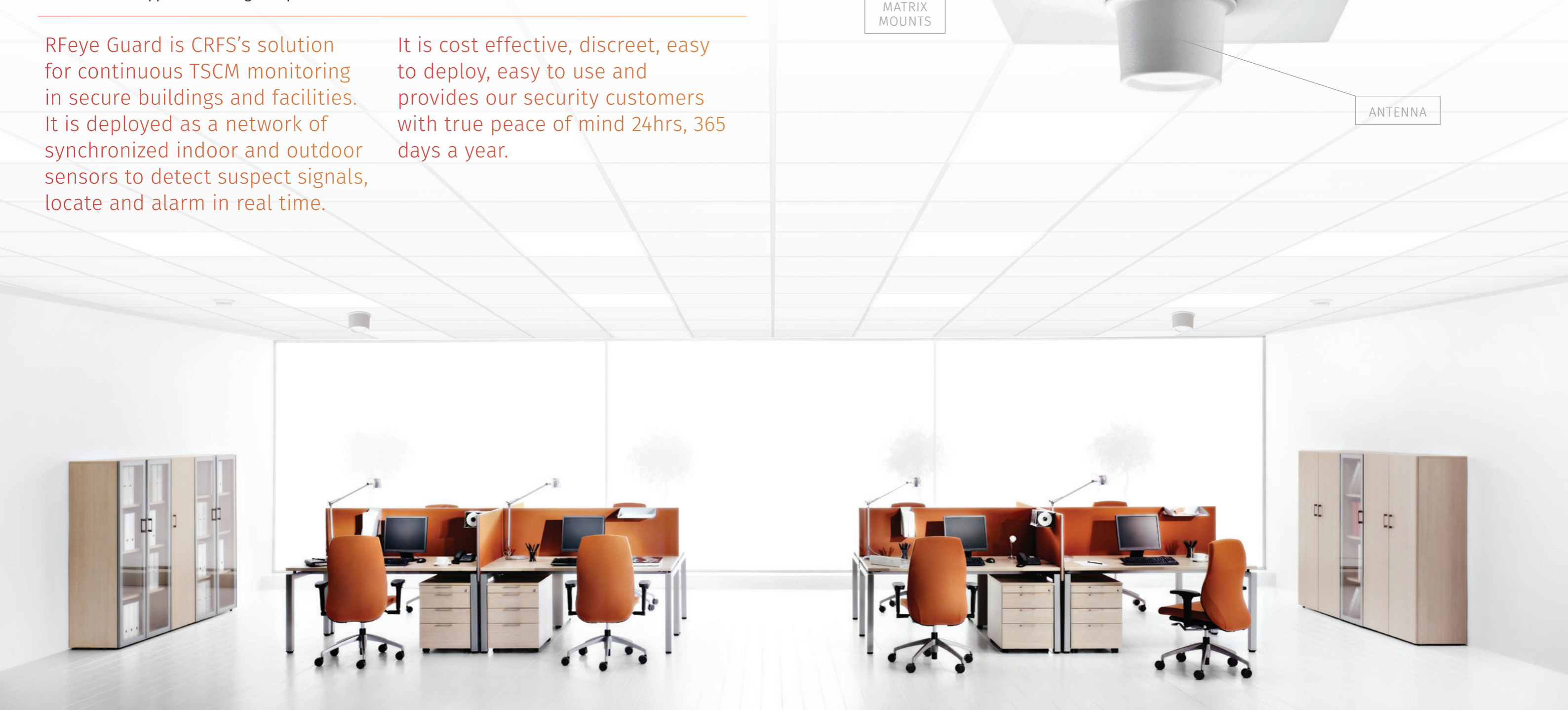
RFeye Guard
Deployment

How is the system deployed?

RFeye Guard has two key components:
Hardware sensors and Software ecosystem.

Hardware:

The RF sensors or Guard Nodes, are designed to be fitted in common ceiling systems, although can be fitted in different ways depending upon the environment you need to protect. If you are retrofiting security into a historic building for example, the system can be deployed in component form, or even wall mounted.

Antennas are housed in a discreet enclosure which can either sit below the ceiling, or be mounted flush to minimize visual disruption.

The system is linked together using RFeye Synclinc which delivers precision timing across the network, required for accurate geolocation. This can be deployed using either copper network cables or fiber.

Each Guard Node is then connected via IP back to your security control center which can be located anywhere in the world.

Software:

There are two key pieces of software recommended for an installation. These are RFeye Site and RFeye Mission.

RFeye Site

RFeye Site is your expert toolset and is PC based. This gives an operator the ability to view the RF spectrum in detail, geolocate signals on the fly, and capture examples for use in a signal library or for external decode and decrypt. This allows an investigator to gather critical intelligence on the device and its use or purpose.

RFeye Mission

RFeye Mission is a browser based system accessed from a central server. It is used as a command and control (c2) system. It allows you to securely manage a vast network of Guard nodes, anywhere in the world. It alerts operators to the existence of a threat, logs details of any threat or change which occurs and allows live multi-layered visual inspection of any area currently under investigation. The system supports multi floor buildings, and within each floor, multiple layers of interest can be visualised, from physical floor plan through to electrical circuits and air conditioning for example.
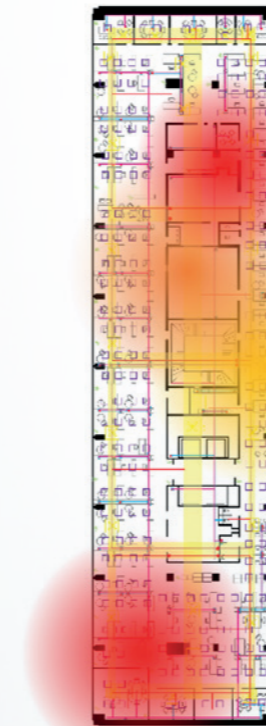
RFeye Guard
Workflow

How is the system operated?

RFeye Guard has two key components: Hardware sensors and Software ecosystem.

Step One:
Baseline Facility

What is normal? The system first needs to look at the typical RF signature within an environment. Maybe there are existing communications devices in place.

Step Two:
Mask Baseline

Once we know what is expected, we can mask those devices from further investigation, essentially white-listing the energy in that space. It is against this energy that RFeye Guard will hunt for differences.
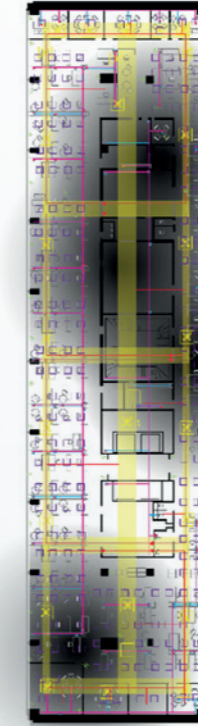
Step Three:
Delta Baseline

RFeye Guard is operational, and looks for large and small differences from the baseline survey. This way, Guard will identify devices which have been co-located with existing transmitters, or devices attempting to snuggle their signature against something else e.g. wifi.
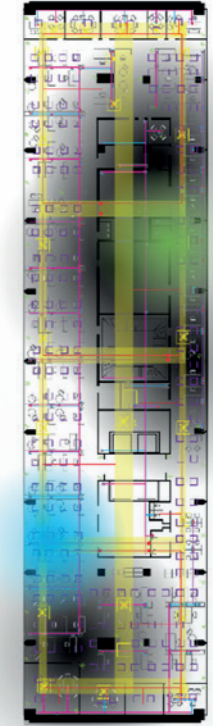
Step Four:
Internal v External

Mounting RFeye Nodes on the external face of your building allows even greater functionality, including the ability to differentiate signals which originate outside vs those which originate inside your facility. This minimizes false alarms and allows deployment in complex RF environments such as a city. Your mission capabilities can then be further enhanced deliver SIGINT, Drone/UAV detection and more.

Locate

GPS signal reception is generally poor inside buildings, but RFeye Guard includes our SyncLinc system for wired or optical timing synchronization in and around buildings. The use of indoor and outdoor sensors allows the system to discriminate between signals transmitting from inside and outside the building to minimize false alarms. Once it is confirmed that a signal originates inside the building, POA geolocation can then be used to locate the signal source. One or many signals can be located simultaneously.

LOCATE

Alarm

When a suspicious signal has been located, a quick response is needed. RFeye Guard can trigger alarms from third party security systems and provide a real-time alert and location to a security guard. Signal detection can also trigger a recording so that the signal can be analyzed in more detail after the event.

Indoor/outdoor signal discrimination and frequency masks tuned to the 'typical' RF environment for a building ensure a minimum of false alarms.

ALARM

Analyze

RFeye Guard provides a simple interface for those users who just need to see alarms and signal locations. For those users wishing to analyze signals in more detail the expert interface is available. This provides a suite of powerful tools for forensic signal analysis. This can be carried out in real-time or signals can be recorded for post-event analysis, including classification and demodulation.
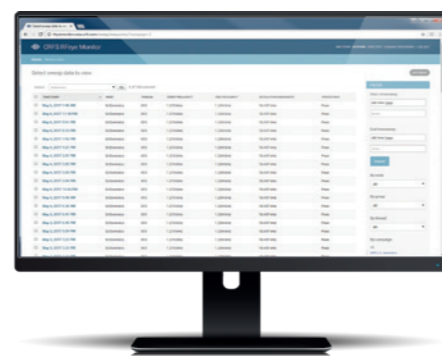

ANALYZE

Manage

You don't need to keep a constant watch over RFeye Guard. The system monitors 24/7 behind the scenes, and only alerts you when you need to know about a signal.

However, if you do want to manage the network and access more data you can. Database features allow you to explore historical sweep data and event logs to see the bigger picture.

Our software can also be used to manage work-flow and assign incidents to different users.

MANAGE

RFeye Guard
Key Software Capabilities

Alarms | Recorder | Notifications | Sweep & Capture | Automation | Realtime | Database | POA
Power | SMS Alerts | Email Alerts | User Controlled | Script | Big Data | Modulation Recognition

Hardware
Example Node Specifications
Example based on selection of Node 40-8 hardware

Single channel receiver

Switchable RF inputs	4 x SMA connectors

Frequency

Range	9 kHz to 8 GHz

Noise figures at maximum sensitivity

9 kHz to 0.1 GHz	10 dB typical
0.1 GHz to 2.4 GHz	6 dB typical
2.4 GHz to 6 GHz	7 dB typical
6 GHz to 8 GHz	8 dB typical

Phase noise

Receiver input at 1 GHz	-103 dBc/Hz at 20 kHz offset, typ.
Receiver input at 8 GHz	-107 dBc/Hz at 20 kHz offset, typ.

Signal analysis

Instantaneous bandwidth	40 MHz
Tuning resolution	1 Hz

Internal frequency reference

Initial accuracy @20°C	±0.1 ppm typ.
Stability over temperature	±0.3 ppm
Ageing over 1 day	±0.04 ppm

Programmable sweep modes

Sweep speed at 2 MHz RBW	100 GHz/s typ.
User programmable modes	free run continuous, single timed, user trigger and adaptive
Trigger-on-event modes	user defined masks, actions and alarms

Sampling

Rate	62.5 MS/s I&Q

Local oscillator emissions

Re-radiation	≤ -90 dBm typical

Frequency references

Selectable	Internal, GNSS or external
External input	10 MHz ± 10ppm

Location & Timing

GNSS device (standard)	GPS, GLONASS, Galileo
GNSS timing accuracy	20 ns

Processor sub-system

CPU	Intel E3845 quad core

I/O

Network	1 x 1 GigE, with POnE
Universal Serial Bus	1 x USB3.0, 1 x USB2.0
2 x IEEE1394 expansion ports configurable as:	2 x SyncLinc ext peripheral control
GNSS antenna input	1 x SMA passive or active (3.3 VDC)

Data storage

Internal SSD (*optional*)	512 GB
External SSD (*optional*)	via USB interfaces

System software

Boot firmware	BIOS
Operating system	Linux, kernel v 2.6
RFeye Node Control Protocol	NCP Server (NCPd)
Node Apps (*optional*)	Logger, EMP, Detectors

Size, weight and power

Dimensions (Node only) (w, h, d)	200 x 50 x 130 mm (7.9 x 2.0 x 5.1 inches)
Dimensions (w. end plates & heatsink)	200 x 74 x 330 mm (7.9 x 3.0 x 13 inches)
Weight (Node only)	2.1 kg (5 lbs)
Weight (w. end plates & heatsink)	4.5 kg (10.7 lbs)
DC power	12 VDC
POnE	48 VDC

Power consumption

Typical	20 W
Maximum	25 W

Environmental

Operating temperature	-30 to +55 °C (-22 to 131°F)
Storage temperature	-40 to +71 °C (-40 to 160°F)
Ingress protection	IP67 (*w. optional end plates*)

The CRFS difference

CRFS is at the forefront of new technology for distributed monitoring and geolocation, featuring wideband receivers with lightning-fast sweep speeds and best-in-class noise figures and phase noise. These high-sensitivity receivers are known as RFeye Nodes.

For our military customers, fast sweep speeds and instantaneous bandwidth mean higher probability of intercept (POI). This translates to confidence that potential threats can be detected for real-time tracking, recording and further analysis.

Low noise means that operators can detect and locate lower-power, more distant signals that might otherwise have been missed entirely, providing earlier threat warning indicators (TWIs) and better situational awareness of an area of operations (AO).

RFeye's high-performance hardware and state-of-the-art software enable extremely fast processing to give much faster geolocation updates than other systems. Our TDOA geolocation algorithms typically update 10 times per second compared to similar systems that may only update once every 30 seconds. Fast geolocation updates are crucial in situations where hostile targets may be moving at speeds of over 1,000 mph.

How we work with our customers

CRFS is recognized as a best-in-class COTS supplier by defense forces and system integrators, and our systems have been widely deployed with outstanding results over many years.

CRFS is known not just for the hardware and software we provide, but also for our support. We have long-term partnerships with many of our military customers, working closely with them not just to ensure the successful deployment of equipment, but also to develop new features to meet their specific mission requirements.

Military & government contract vehicles

Many of our Mil/Gov customers prefer to purchase CRFS products using an existing approved contract vehicle. Our products are available through a range of different contract vehicles, and the list is always growing. If you have a specific request, please do not hesitate to get in contact with us directly via **enquiries@crfs.com**.

RFeye Mission

Automated RF situational awareness

RFeye Mission is CRFS's flagship solution for automated spectrum operations. It enables spectrum stakeholders to derive useful and actionable intelligence from their deployed RFeye receivers without the need for teams of RF experts. It has been designed for use with RFeye assets deployed over wide areas such as ranges, test sites, borders and cities, as well as small networks such as indoor technical surveillance countermeasures (TSCM).

RFeye Mission is controlled via a web browser interface. It allows even novice operators to automate spectrum monitoring task schedules without junior analysts having to view a "wall of spectrum data." Sweeps, scans and surveys can be set up quickly, and operating zones, geolocations and authorized transmitters are clearly displayed alongside immediate alarms as incident logs as violations happen.

Software Solutions

Site

RFeye Site is our state-of-the-art desktop application for real-time monitoring and geolocation requirements.

Monitoring, Geolocation, Indoor Geolocation, 3DTDOA MLAT, Signal Classification, Propagation, Map, Signal Verification

DeepView

RFeye DeepView software is the ultimate forensic tool for searching through multi-terabyte datasets for signals of interest.

Big data view: time/spectrogram & heatmap, Live mode: Real-time Spectrum Analyzer, Fast zoom/scroll through IQ data, Select export: filtered IQ data, Full dataset or selection playback, Marker: Delta function with live recording, Unlimited file duration, Screens: Dataset, Analysis region overview, Analysis region Spectrum, Time cursor Spectrum, Power/Time

3D TDOA

3D TDOA (or MLAT) is a recent advance in our geolocation software enabling passive tracking of targets in three dimensions even with a ground-based network of Nodes.

This is used to track objects such as military/civilian aircraft, commercial drones and more advanced military UAVs. As the method is entirely passive it allows targets to be tracked without any emissions which may alert those targets.

About CRFS

CRFS provides best-in-class solutions for radio spectrum monitoring, management and geolocation.

CRFS offers a new generation of technology for the detection, identification and geolocation of signals in complex RF environments.

CRFS is recognized as delivering truly "best in class" technology - our RFeye systems are deployed worldwide by regulatory, military, law enforcement and intelligence agencies.

For further information or to schedule a demonstration visit:

crfs.com

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