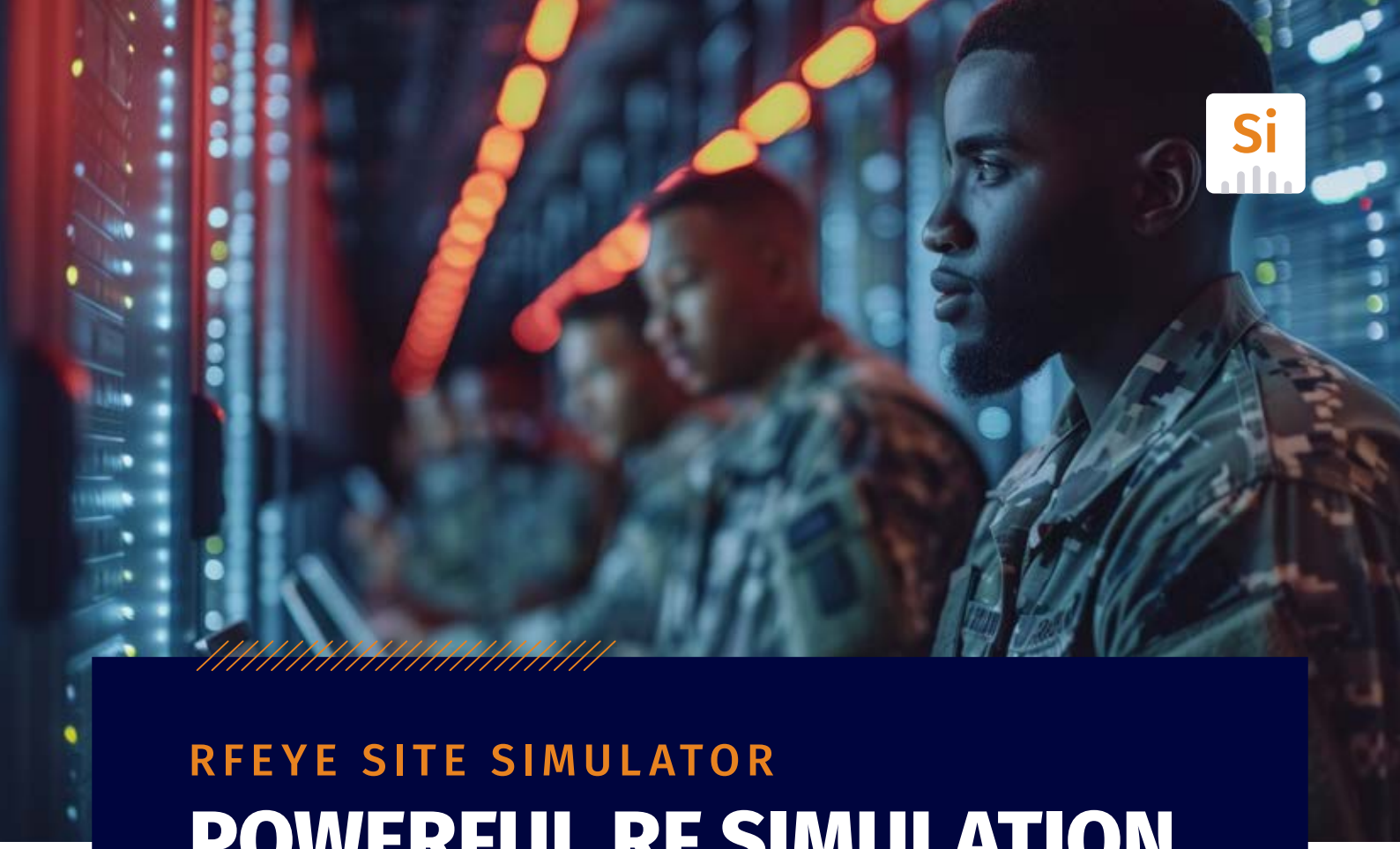

RFEYE SITE SIMULATOR

POWERFUL RF SIMULATION SOFTWARE FOR RF TRAINING & WARGAMING

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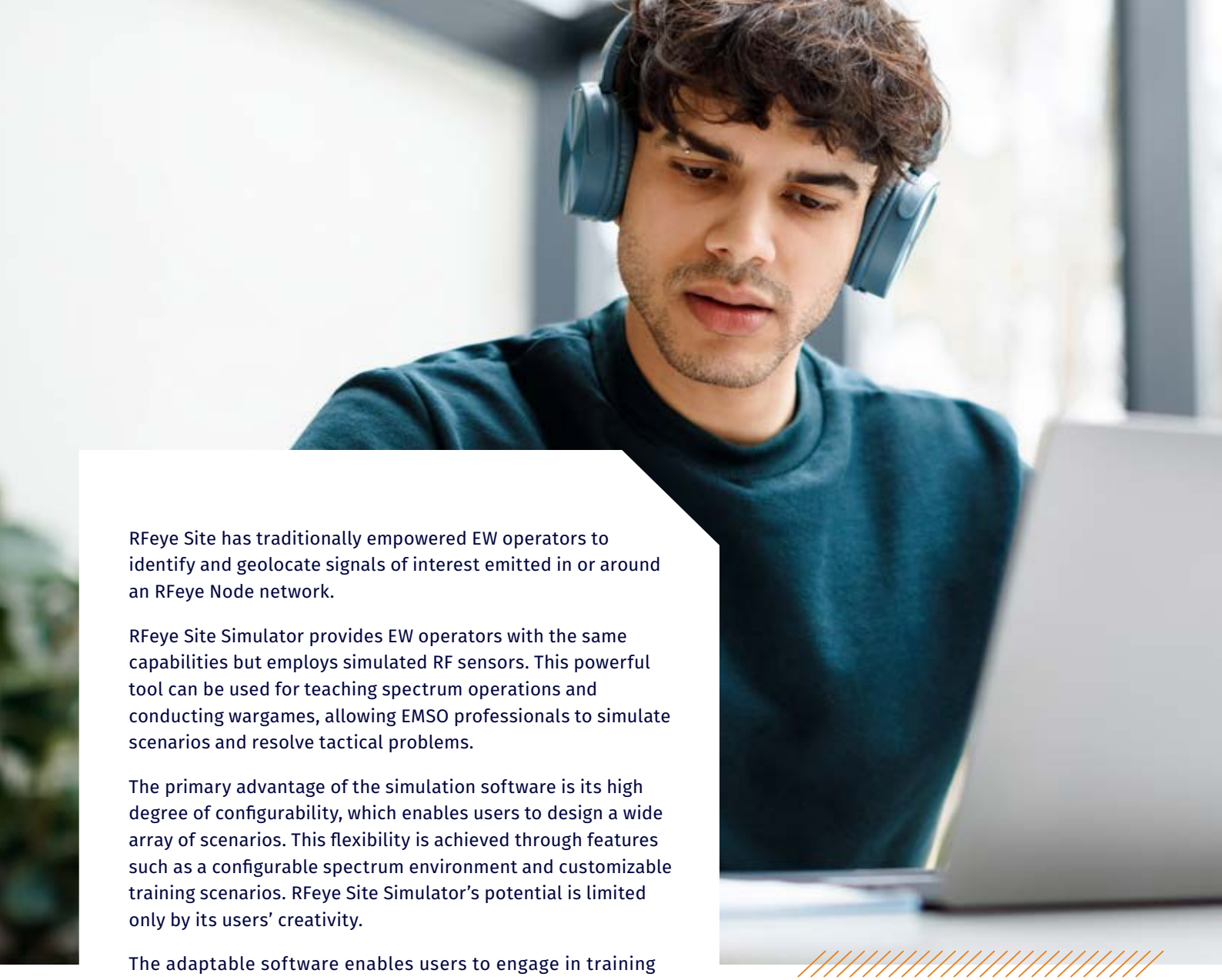
EXTRAORDINARY
RF TECHNOLOGY



RFeye Site has traditionally empowered EW operators to identify and geolocate signals of interest emitted in or around an RFeye Node network.

RFeye Site Simulator provides EW operators with the same capabilities but employs simulated RF sensors. This powerful tool can be used for teaching spectrum operations and conducting wargames, allowing EMSO professionals to simulate scenarios and resolve tactical problems.

The primary advantage of the simulation software is its high degree of configurability, which enables users to design a wide array of scenarios. This flexibility is achieved through features such as a configurable spectrum environment and customizable training scenarios. RFeye Site Simulator's potential is limited only by its users' creativity.

The adaptable software enables users to engage in training or wargaming scenarios that encompass signal detection and target acquisition as part of Intelligence, Surveillance, Target Acquisition, and Reconnaissance (ISTAR) missions, Emission Control (EMCON) procedures, and Electronic Support Measures (ESM).

In training scenarios, instructors maintain dynamic control over the simulation so they can move transmitters, hide signals, and add high-power transmitters during a training session.

In wargaming scenarios, at the planning level, RFeye Site training allows planners to conduct highly realistic simulations that contribute to answering a fundamental combat estimate question: What are the enemy doing and why?

RFeye Site Simulation's mapping functions enable users to effectively plan future deployments by analyzing terrain and determining optimal placement, positioning, and height of RF sensors. This strategic planning capability enhances the capture, detection, and geolocation of signals, thereby supporting mission objectives and maintaining spectrum dominance.

- Lay out baselines
- Practice against any scenario and simulate any capability
- Scalable training
- Dynamic environment
- Multiple missions, multiple students
- Simulate multiple RF sensors
- Randomization can be used to create deviations from a path or track within a zone, mask triggers, and simulate signal masks and randomized breeches

KEY SIMULATION FEATURES

- Pulsed, sweep, co-located, randomized, and timed signals at any frequency or power
- Signals between 9KHz – 40GHz
- Frequency hopping – set frequency range, power, and sequence
- Different noise levels to generate background noise and interference to test RF sensor location planning
- Directional transmitters – set direction and power
- Rotating transmitters – static or moving rotating TX, ideal as radar simulation
- Ground transmitters – static or moving following terrain
- Airborne transmitters – static or moving up to hypersonic speeds
- Marine/seaborne transmitters – include tidal height variance over time
- Terrain-aware simulations that model the real world
- Terrain-aware paths and courses for transmitters to follow

Benefits for trainers

- Teach large classes as students are connected to the trainer's RFeye Site simulated Nodes over remote connections
- Maintain dynamic control over the simulation
- Create a variety of training scenarios with different transmitters placed around any geographic location
- Inject simulated transmission signals of any power, frequency, or modulation type anywhere in the virtual landscape
- For realistic training, use terrain data, such as SRTM elevation data, to simulate shadowing and other propagation conditions over a wide area

Benefits for students

- Train remotely, with data transferred via TCP/IP sockets
- Practice with the same operational software used in the real world
- Practice signal detection, geolocation, and spectrum management
- Place markers based on geolocation results
- Receive data from virtual transmitters (while in moving vehicles) in a modeled landscape

USE CASE

GEOLOCATING TRANSMITTERS OF INTEREST

Locating transmitters of interest is critical for situational awareness and maintaining spectrum dominance. Using the RFeye Site Simulator, trainers or scenario designers can configure simulation transmitters with any power and transmit frequency.

They can establish several different types of transmitter modes, manually program bearing and location, and establish whether the simulation transmitter is located on a fixed or mobile ground base or an aircraft.

Based on the parameters, trainee EW operators or wargame participants can identify hidden transmitters, glean intelligence from the signal's characteristics, and carry out the correct geolocation (PoA, AoA, 2D TDoA, or 3D TDoA) for the mission.

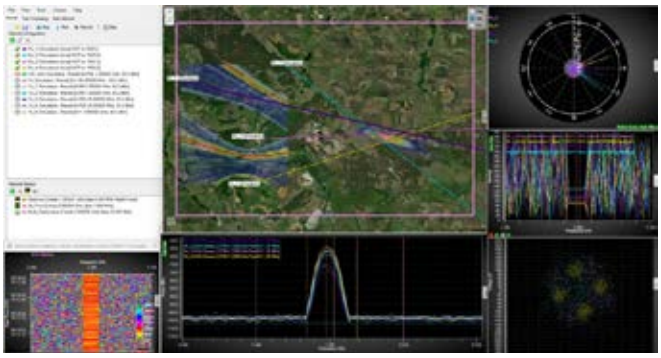


Image 1: *Geolocating a signal in RFeye Site (showing AoA and TDoA as an overlay)*

USE CASE

INTERFERENCE HUNTING

Interference is often the result of issues such as high-powered, low-powered, pulsed signals or signals with a non-standard center frequency. In conflict scenarios, which frequently occur in areas with civilian infrastructure, interference sources are equally likely to originate from civilian frequencies as from military ones.

To effectively practice what to do when interference is detected, instructors can design scenarios that simulate environments with multiple spectrum users, including licensed entities like FM radio broadcasters, across various frequency bands. By intentionally introducing issues—such as increasing signal power within a specific frequency band—operators are prompted to troubleshoot potential interference. This involves examining each frequency band to identify anomalies and subsequently geolocating the interfering transmitter.

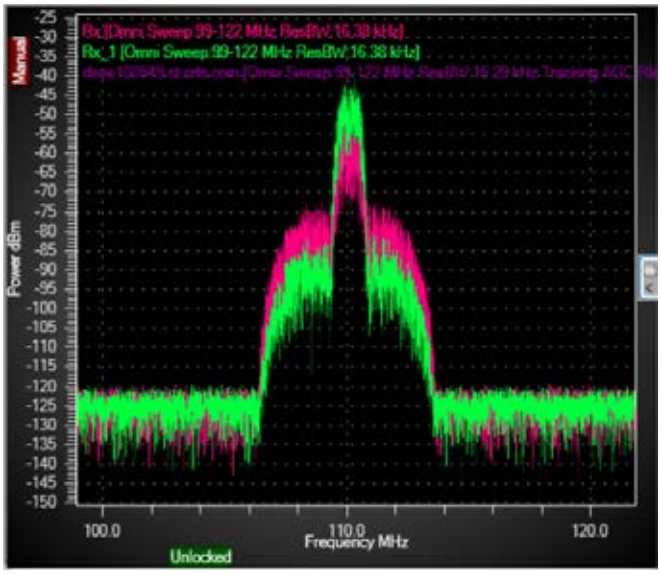


Image 2: *Signal interference from two overlapping signals. The signals share the same center frequency (109 MHz) but have two different power (dBM) levels, causing interference.*

USE CASE

OPTIMAL SENSOR POSITIONING

To effectively understand the electronic space, EW operators and spectrum analysts must strategically establish baselines by optimally positioning RF sensors. RFeye Site simulated Nodes and transmitters allow users to consider how issues such as line-of-site, the curvature of the earth, multipath from natural and artificial obstacles, Fresnel Zones, and free space path loss affect RF signal propagation.*

Users can benefit from RFeye Site Simulator's Propagation Analysis function, which allows them to simulate signal propagation. They can learn how to design and optimize RF sensor networks for efficient monitoring and geolocation and simulate near real-world scenarios.

**Propagation analysis is an add-on feature.*

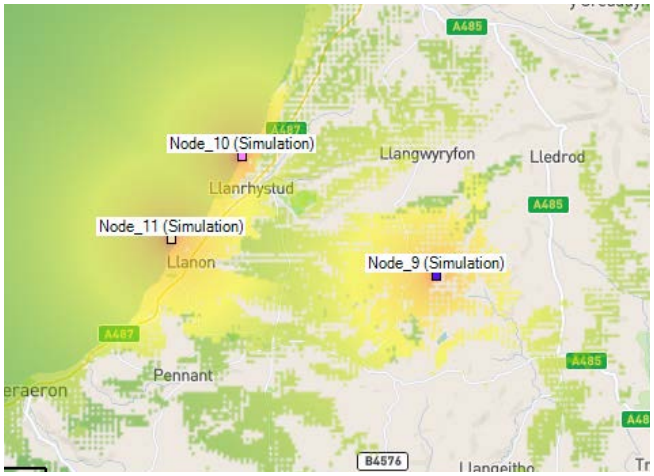
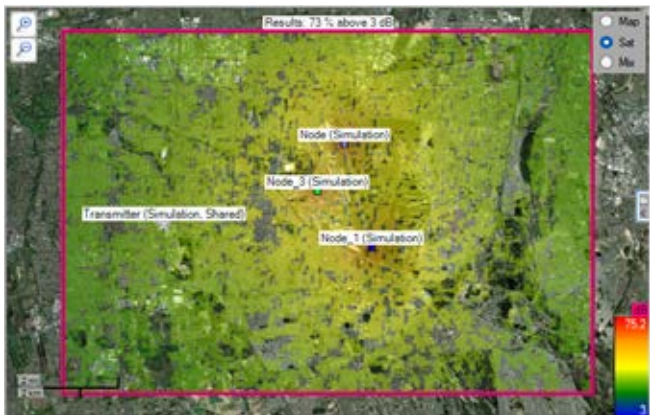


Image 5: *Map image of the areas around Cors Caron Nature Reserve in Wales, UK. The image shows the Fresnel Zone based on the placement of three RFeye Nodes. Moving the RFeye Nodes will change the quality of the signal: Yellow indicates greater power (dB) and green indicates less power (dB), as seen by the Nodes.*



Images 3 and 4: *Map and satellite images (top and bottom) of Cape Town International Airport. The images show the placement of RFeye Nodes around the airport and the resulting Fresnel Zone. Yellow indicates greater power (dB) and green indicates less power (dB), as seen by the Nodes.*

WARGAME USE CASE

ELECTRONIC SURVEILLANCE IN DEFENSE

Participants may be assigned a defense mission involving defensive and offensive actions as part of a wargame.

Defensively, participants may need to understand their formation's electronic footprint to establish the EMCON level for electronic defense measures. Also, the electronic element of the Surveillance and Target Acquisition Plan (STAP) may involve identifying defense gaps where enemy drones, for example, could attack.

RFeye Site Simulator allows users to identify blue force emitters and weak spots. This information will enable wargame participants to carry out electronic Intelligence, Surveillance, Reconnaissance, and Target Acquisition (ISTAR). Understanding an adversary's electronic footprint—by geolocating a squadron using R-187P1 Azart military radios, for example—is critical information when launching a defensive attack.

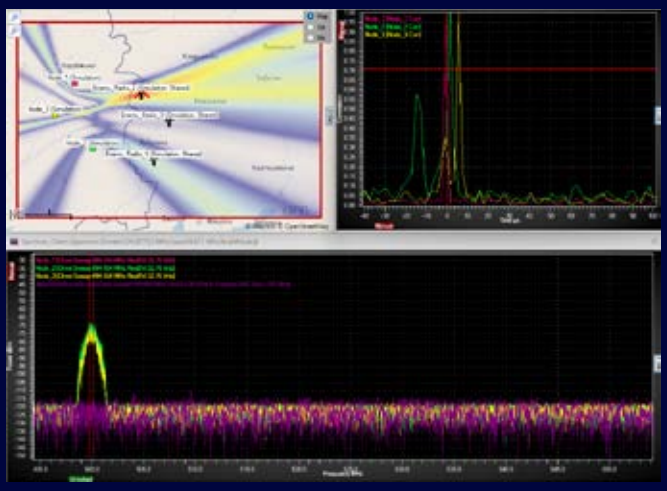
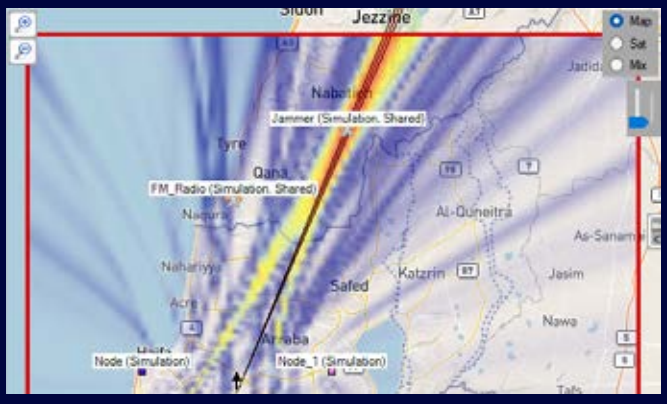


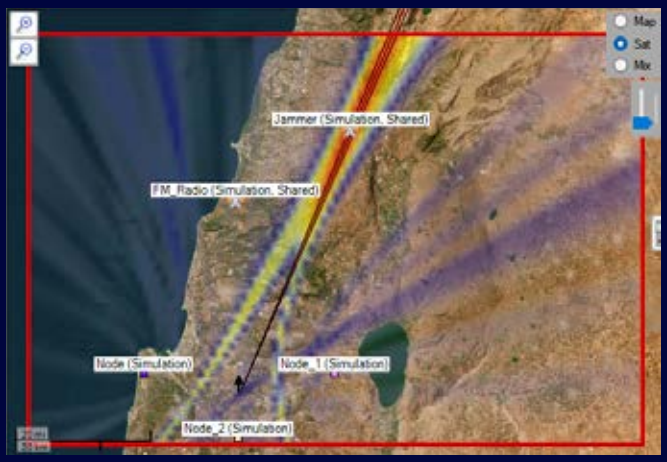
Image 6: *(Top left) An RFeye Node network and geolocations of three different radios transmitting at 500 MHz. The software shows the strongest geolocation for the radio transmitting on the highest power level. (Top right) Three RFeye Nodes have searched for and found the target frequency; therefore, they have carried out a TDoA geolocation. (Bottom) A full spectrum view; the red line intercedes the signal of interest, showing it is transmitting at 500 MHz.*

WARGAME USE CASE

IDENTIFYING GNSS JAMMING

RFeye Site Simulator allows users to simulate areas of high GNSS jamming. After identifying the likely probability of jamming, participants can geolocate target transmitters. The software's map feature will enable participants in the wargame to make tactical decisions about how to address the jamming that would have the most likelihood of success.





Images 7 and 8: *Map and terrain images (top and bottom) showing the location of a high-energy transmitter (a potential source of jamming). The red area where the isochrones from all RFeye Nodes cross indicates the geolocation of the power source.*

WARGAME USE CASE

INTELLIGENCE PREPARATION OF THE BATTLEFIELD (IPB)

When carrying out IPB, it is critical to analyze the electronic space and understand the state of the spectrum.

RFeye Site Simulator allows wargame planners to first simulate several different adversary radios with unique waveforms, signal powers, frequencies, transmission patterns, and modulation types. They can then create a simulated environment, including realistic terrain data, buildings, and other structures where red force transmitters can be hidden at strategic locations.

Detecting and geolocating red force signals will help wargame participants understand the state of the spectrum when carrying out IPB. Using RFeye Site Simulator, communications planners can understand the operational electronic environment for both red and blue forces. A simulated RF environment can help:

- Define the battlefield environment
- Evaluate the threat
- Determine threat courses of action

Beyond solely identifying and geolocating emitters, RFeye Site Simulator can be used to generate an Electronic Order of Battle (EOB) in which the characteristics of the signals can be identified relative to their location, providing users with an insight into the role of the emitter and allowing them to establish their role in the battlegroup.

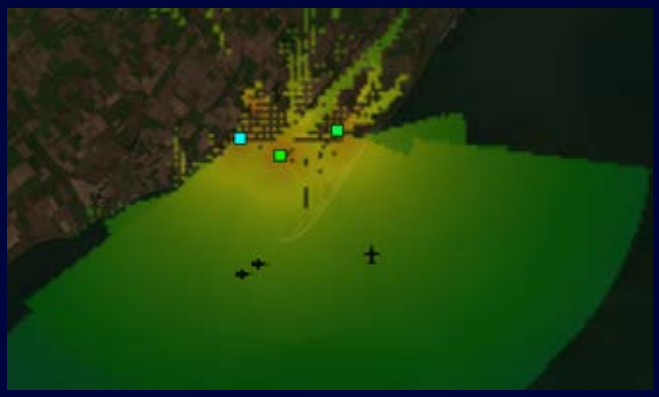


Image 9: *A relief map with a sensor network comprising four RFeye Nodes. The heatmap shows free space RF propagation, with yellow indicating good signal quality, and green indicating fair signal quality. Signals that have been identified and geolocated by RFeye Site are represented by icons.*

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RF TECHNOLOGY

CRFS creates deployable technology to detect, identify and geolocate signals in complex RF environments. With a leading position in the US, Europe and a global reach, our systems are used worldwide by regulatory, military, system integrators, government security agencies and corporates. They require actionable spectrum intelligence across the widest possible frequency range, in both congested and contested environments. They rely on our highly sensitive RF sensors, accurate transmitter geolocation, signal captures, classification and real-time RF intelligence to fulfil EMSO and electronic warfare support missions.

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