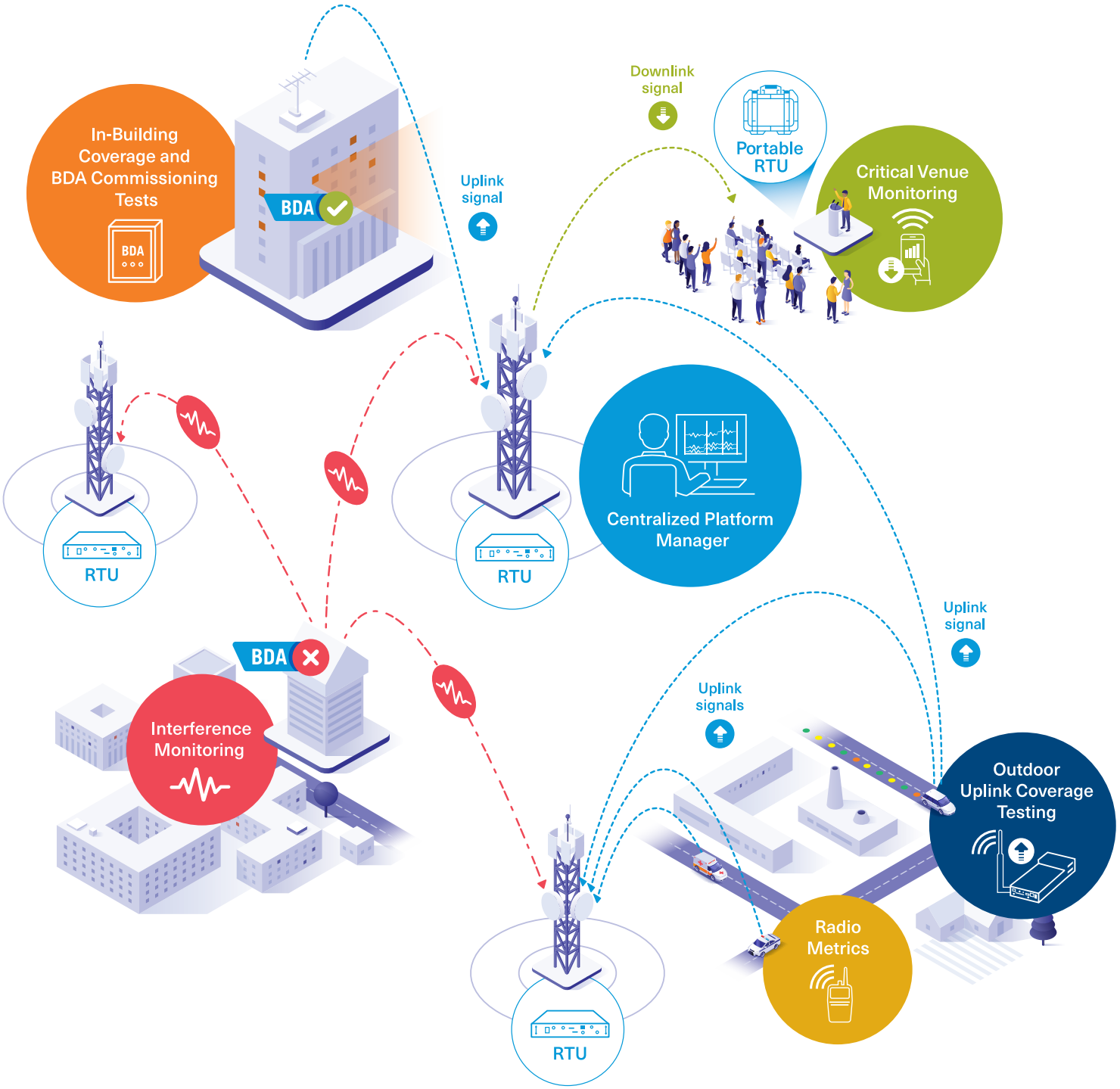
SeeHawk® *Monitor*

TOOLS FOR MANAGING CRITICAL COMMUNICATIONS SYSTEMS



MADE IN THE USA
of U.S. and imported parts

PCTEL
an **Amphenol** company

INTERFERENCE MONITORING

Improve network quality by quickly identifying interference and noise issues

- Continuously monitor spectrum across multiple radio sites
- Rapidly detect under-detected service impacting problems
- Characterize the potential source of the problem
- Troubleshoot with real-time spectrum analysis
- Easily manage Remote Test Units (RTUs) from one software platform

"The PCTEL SeeHawk *Monitor* system is very useful for monitoring interference and for BDA system testing."

– Lewis Cheatham
MANAGER, CITY OF GREENSBORO TECHNICAL SERVICES DIVISION

How Spectrum Monitoring Works

1 CONFIGURE

User configures Remote Test Unit (RTU) monitoring, including noise thresholds and other parameters in the SeeHawk *Monitor* Platform Manager software

2 MEASURE

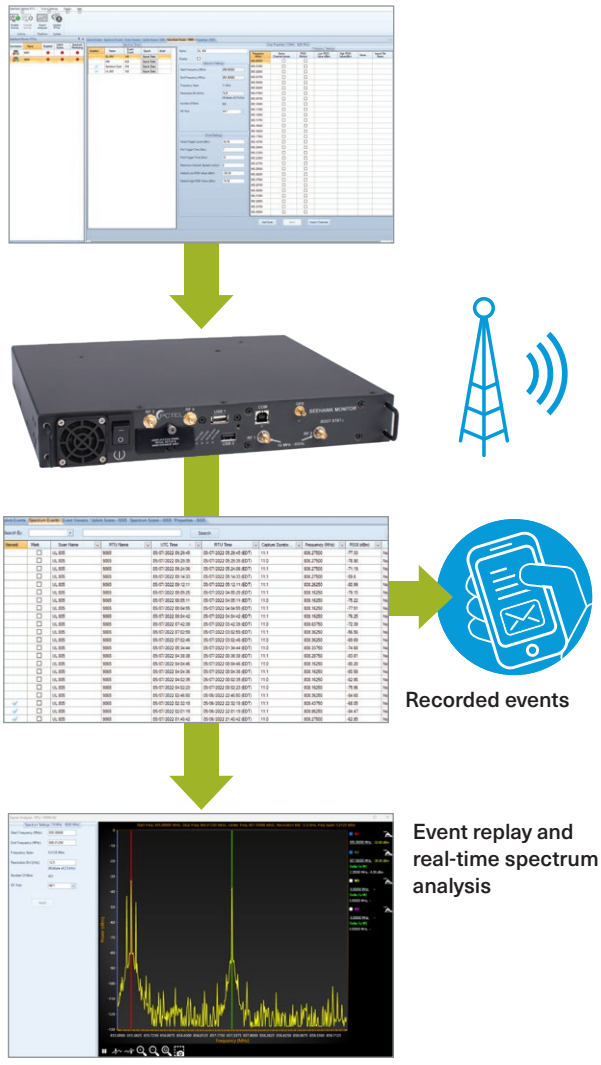
RTU located at site detects spectrum anomaly on the network *(noise floor rise, intermittent spike, etc.),* records and sends event data to Platform Manager via the cloud

3 NOTIFY

Platform Manager notifies the user of new events via email

4 INVESTIGATE

User investigates the event and identifies ongoing issues using Platform Manager's event replay and real-time spectrum analyzer



Recorded events

Event replay and real-time spectrum analysis

RADIO METRICS

Use frequency offset to help determine when radios require maintenance

- Track frequency offset, radio usage and other KPIs
- Sort and filter data by radio ID
- Identify usage of lost or stolen radios
- Detect unauthorized radios

AUTOMATED UPLINK TESTING

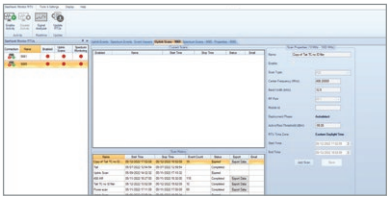
Easily verify P25 and Analog FM radio uplink signal quality, plus channel power for all technologies

- Automate uplink testing with SeeHawk® *Touch* software throughout your network
  - In-building **grid-based testing** for NFPA, IFC, and local code compliance
  - In-building system **commissioning and FCC compliance** testing
  - Indoor/outdoor **walk testing and drive testing** for network design, optimization and troubleshooting
- Prevent or mitigate interference between in-building systems and the outdoor network
- Objectively measure P25 (SINR and BER) and Analog FM (SINR) uplink signal quality, plus channel power for any technology
- Easily schedule testing for multiple radio sites on the SeeHawk® *Monitor* Platform Manager

How Uplink Testing Works

1 PREPARE

Remotely schedule uplink testing on SeeHawk *Monitor (no on-site support required)*



2 TEST UPLINK

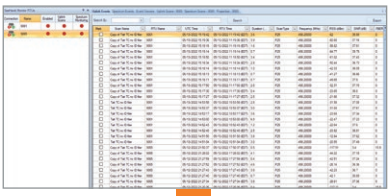
A single technician can conduct uplink testing with the PCTEL® Public Safety Network Testing Solution by activating a test radio during grid, BDA commissioning, drive or walk testing

3 RECORD

Remote Test Unit at radio site automatically measures the uplink signal, records the results, and sends data back to Platform Manager

4 EXPORT DATA

Authorized user exports uplink data from Platform Manager for import and synchronization in SeeHawk *Touch* software (included with the PCTEL Public Safety Network Testing Solution)



5 REPORT

SeeHawk *Touch* automatically synchronizes data from SeeHawk *Monitor* and generates reports. Drive test reports can be generated automatically in SeeHawk *Reports* software.

Generate reports in real-time or on demand with user-customizable pass-fail criteria

6 SHARE (OPTIONAL)

Users share and track grid and BDA commissioning test results online with the SeeHawk® *Central* cloud platform

DOWNLINK PERFORMANCE MONITORING AND NETWORK DETECTION

Monitor spectrum for 4G/5G networks and rapidly detect service-impacting issues

- Monitor spectrum for 4G/5G coverage and service quality
- Rapidly identify service-impacting issues
- Detect rogue base stations
- Manage multi-tenant or cross-border spectrum usage
- Support coverage at live events, major venues, and critical infrastructure

How Downlink Monitoring Works

1 CONFIGURE

RTU scans user-selected spectrum for 4G/5G networks, providing a list of active cell IDs and channels with baseline measurements of KPIs such as RSSI, RSRP, and SINR. User configures events in the SeeHawk *Monitor* Platform Manager.

2 MONITOR

RTU continuously scans spectrum and sends data via the cloud to Platform Manager. Platform Manager compares new data to established baselines and event thresholds.

3 NOTIFY

Platform Manager notifies user of events via email. Events may include KPIs significantly higher or lower than baseline, disappearing channels, or the presence of a new channel or cell ID.

4 INVESTIGATE

Real-time monitoring aids in identifying ongoing issues by providing continuously updated measurements and health ratings compared to a baseline.

Real-time monitoring

SeeHawk® *Monitor* Specifications

RTU SPECIFICATIONS

P25 (Phase 1 and Phase 2)		
Measurement modes		UL Decode, RSSI
Data modes		SINR, RSSI, Frame BER, Network ID, Auto Classification of Phase and Modulation Type, Frequency Offset
Channel bandwidths		12.5 kHz
Measurement rate		5.4 Decodes/sec (maximum), 2.7 Decodes/sec (typical), 100 RSSI/sec
Dynamic range (SINR)		1 dB minimum detection
SINR Relative accuracy for Phase 1 C4FM and Phase 2 HDQPSK **BER Relative accuracy**		±1 dB over +10 to +25 dB; ±2 dB over +7 to +10 dB, 25 to 30 dB ±1 dB over -118 to -10 dBm
Adjacent channel rejection		49 dB
Analog FM		
Measurement modes		Decode, RSSI, Squelch Type
Data modes		SINR, RSSI
Channel bandwidths		12.5 kHz; 25 kHz
Measurement rate		2.7 Decodes/sec (4 frequencies)
Dynamic range (SINR)		1.5 dB minimum detection for PL (>90% detection) 2 dB minimum detection for DPL (>90% detection)
Accuracy	SINR RSSI	±1 dB over +5 to +40 dB; ±2 dB over +1 to +5 dB and +41 to +45db; ±3 dB over -3 to 0 db and +45 to +50 db ±1 dB over -118 to -10 dBm
Mixed Analog/P25		
P25 specifications		See P25 Phase 1 specifications above
Analog FM specifications		See Analog FM specifications above
5G New Radio (NR)		
Measurement modes		Blind Scan: Synchronization channels (PSS/SSS) & PBCH; Layer 3 Reporting: MIB, SIB1
Data modes		PCI, Beam Index, SSS-RQ [dB], SS-CINR [dB], SSS-CINR [dB]
Sub carrier spacing		15/30 kHz
Max. number of channels		24
Max. number of PCIs		8
Max. number of beams/PCI		8
Measurement rate (typical)		30/sec
Dynamic range (CINR)	PSS/SSS CINR PBCH DMRS CINR	-10 to +33 dB -8 to +40 dB
Min. detection level	RP	SCS @15 kHz: -135 dBm, SCS @30 kHz:-132 dBm
Accuracy (CINR)	PSS/SSS, PBCH DMRS	±2 dB
LTE FDD and TD-LTE		
Measurement modes		Mobile Blind Scan: Synchronization Channel Reference Signal (P-SCH/S-SCH) and Resource Block (Wideband, Subband); Dynamic Spectrum Sharing (DSS); Layer 3 Reporting: MIB, SIB 1
Data modes		PCI, RP, RQ, CINR
Channel bandwidths		1.4 / 3 / 5 / 10 / 15 / 20 MHz
Max. number of channels		24
Measurement rates	Sync Channel RS	LTE FDD: 50/sec; TD-LTE: 25/sec
Dynamic Range (CINR) @ **10/15/20 MHz**	RS P-SCH/S-SCH	-25 to +40 dB -10 to +18 dB
Min. detection level	P-SCH/S-SCH & RS	-140 dBm (RSRP @ 15 kHz)
Accuracy (CINR)	P-SCH/S-SCH & RS	±1 dB
Max. number of PCIs		16

Power Measurements	
Accuracy	±1 dB (across basic RF input power range)
Dynamic range	-120 to -20 dBm @ 30 kHz
Custom channel power 12.5 kHz (P25, DMR, EDACS, Analog LMR)	25,500 ch/sec (maximum, contiguous channels)
Custom channel power 25 kHz (TETRA, EDACS, Analog LMR)	14,025 ch/sec (maximum, contiguous channels)
Enhanced Power Scan (EPS™) 5 kHz to 20 MHz in 2.5 kHz increments	1,000 MHz/sec @ 5 MHz (typical)
Spectrum analysis Range: >90 dB	>270 MHz/sec (single sweep)
RF Characteristics	
Frequency range	10 MHz - 6 GHz
Internally generated spurious response	-110 dBm (typical)
Conducted local oscillator	- 75 dBm max.
RF operating range	- 15 dBm max.
Desensitization Adjacent channel	>55 dB
Desensitization Alternate channel	>65 dB
Safe RF input range	10 dBm
Frequency accuracy	±0.1 ppm
Intermodulation-free dynamic range	2 tone (level 2) @ -40 dBm, 6 GHz, -68 dBc (typical), -12.6 dBm TOI; @ -25 dBm, 6 GHz, -70 dBc (typical), 10 dBm TOI
Physical	
Power switch	Front panel rocker switch, On/Off
Maximum power	+9V to +18V DC 22 W typical, 40 W when operating in a hot environment and both fans are providing maximum cooling
Size (without a shelf)	12" wide 12" deep 1.7" tall
Weight	5.8 pounds
Temperature range Operating Storage	0° C to +50° C -40° C to +85° C
Data communications interface	Ethernet 10/100/1000 via rear panel RJ-45 Cellular Modem via Ethernet

SYSTEM REQUIREMENTS

Network Requirements	
Maximum speeds	150 Mbs
Total daily average transmissions per RTU	25-30 MB/day
Computer Requirements	
Supported operating systems	• Windows 10 Professional Edition (32/64 bit), U.S. version only • Windows 11 Professional Edition, U.S. version only
Recommended specifications	• PC or laptop with Intel Core i5, 2.60 GHz or higher processor • Windows 10 (64bit) Professional Edition (U.S. Version Only) • 16 GB RAM or higher • 512 GB or larger hard disk for collecting data

Specifications subject to change without notice. Supported bands, technologies, data modes, software features, and frequency ranges vary by configuration. Upgrades may be available for previously purchased RTUs. Please contact a sales representative for more information.

SeeHawk® *Monitor* System

AT A GLANCE

Remote Test Units (RTUs) installed at each radio site or deployed at critical coverage areas monitor spectrum and radios, and send data to Platform Manager.

Internet Connection

Platform Manager software remotely configures RTUs, schedules uplink testing and interference monitoring, and reports test results, radio metrics, downlink performance, and interference problems.

COMPLETE YOUR SOLUTION

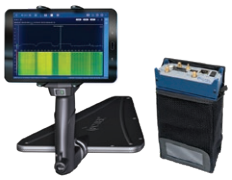
Gain visibility and insight into your wireless network with real-world data and easy-to-use testing solutions.

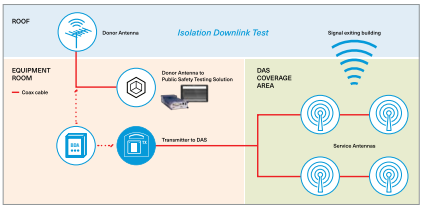
Public Safety Network Testing Solution

Verify and document critical communications coverage, including uplink test data from SeeHawk® *Monitor*

SeeWave® Interference Locating System

Accelerate interference hunting for improved network performance





BDA Commissioning Test Option
Automated testing and reporting for FCC-compliant installation and configuration

SeeHawk® *Central*

Automated Workflow Management and collaboration platform for public safety testers, radio systems, and AHJs

SeeHawk® *Reports*
Automatically generate drive and walk test reports from PCTEL testing solution data

CW Transmitter (OP714) 100 MHz – 2.5 GHz

Portable CW and programmable sweep transmitter for network commissioning and design

PCTEL
an Amphenol company

PCTEL, Inc.

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"I would recommend this solution to anyone in a congested RF environment."

– Les Potts
OPERATIONS MANAGER, BEARCOM