SIGINT Systems Adapt for Rapidly Changing Threats

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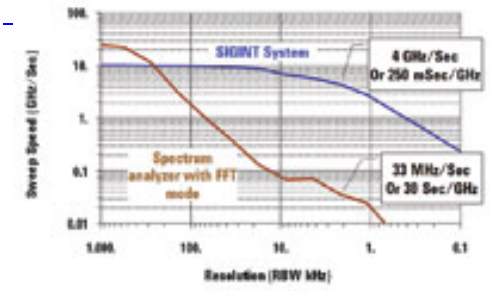
Commercially available RF transmitters in the ever-evolving wireless communications technology give SIGINT and COMINT mission managers a most difficult task. They need to detect traditional push-to-talk signals, wideband digital communications, and always be thinking of future threats. While SWAP and RF performance are easy to quantify and specify in requests for signal detection systems, the less-tangible attributes such as adaptability, flexibility, and ease of deployment, are relatively difficult to quantify. However, it’s these less-tangible attributes that allow SIGINT/COMINT systems to easily adapt and quickly deploy for new missions.

Receiver RF Performance



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For SIGINT and COMINT missions, having the most accurate receiver is not always necessary. Receivers with basic attributes are more than adequate for identifying RF signals in the crowded and complex environment. This table is over-simplified because receiver specifications can include many more parameters and caveats to their performance.

When you are trying to detect intermittent and short-duration signals, the scanning speed of the RF spectrum is critical. Scanning speed is a combination of a number of system factors, including tuner response time, resolution bandwidth, and any system time required for the detection. SIGINT/COMINT systems designed for signal capture have significantly faster scan rates compared to traditional spectrum analyzers, so they can detect intermittent signals shorter than 250 mSec in 1 GHz span. Recently introduced SIGINT systems have even faster scan rates.

Flexible Systems for Changing Missions

With constant change in wireless communications technology, your signal detection system needs to adapt. You likely want a SIGINT system that can deploy quickly for numerous missions. Adaptability, flexibility and rapid deployment are less-tangible attributes, but can have the largest impact on the usefulness of systems in the future. Quantifying these attributes is difficult to put into requests.

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It is common to specify systems that use COTS-based open-system architectures – of which there are many: PCI Express, PXI Express, VITA 49, and VXI to name a few. Interface standards such as GBit Ethernet, GP-IB, and IEEE-1394 (aka Firewire) are also commonly designed in. Some system use a front-panel data port (FPDP) to pile raw spectrum data to a recorder. Comparing open-systems standards may not be productive when specifying equipment, because one isn't necessarily technically better than another. Size, weight, and power are always a concern which may force a decision on which standards to adopt. Interface speed in transferring data will generally dictate which interface standards to adopt. It's not uncommon for these systems to incorporate different aspects of these open architectures for specific design features.

The modularity of card cage or mainframe architectures with functional modules allows you to expand and adapt the system. The functional modules should be designed as building blocks which are optimized for signal detection missions. For example, it should be easy to add HF frequency bands into a system that was originally deployed for V/UHF with new receiver modules. If the mission requires more narrowband collection channels or more signal processing power, those should be modular additions, also. Customized hardware is generally kept to a minimum and software should be used to re-configure the modular hardware. By specifying a modular card cage approach, system performance can scale from smaller, more portable deployments to large, multi-channel, semi-permanent installations.

Software Tools for Highly-Adaptable Solutions

Software has become a key factor in adapting systems to changing missions by re-programming the hardware for specific signal detection. Software can be embedded into the hardware for search and collection of specific signals. Sometimes only the vendors of the equipment can change this embedded software for new missions. Some systems use low-level coding and re-compiling to change the signal detection algorithms. An ideal solution is for experienced users to use sophisticated signal

detection tools that don’t involve programming.

SIGINT systems with powerful signal detection and collection software let you change and re-deploy quickly. There isn’t generally time to do programming or deploy new signals from a vendor. For quick response, a universal signal detector with modulation recognition lets you rapidly prototype signals via bandwidth filtering, frequency plans, wideband detectors using spectral shape, and modulation definitions to confirm the signal of interest.

Mission setups should be able to load numerous detectors and automatically begin the search and detection of specific signals. Signal developers and operators become significantly more efficient which contributes to rapid deployments.

Sub-system Integration

A multi-mission system should cover various frequency ranges, give you ultra high-speed search, sustain multi-band collection of a large number of channels, discern cellular signals, plus integrate with direction finding systems and synchronize with force-protection jammers. You may also need to easily integrate with a wideband recording sub-system for off-line analysis.

Each sub-system should be designed as a building block into a larger project. Those building blocks should be easier to integrate together than starting a complete project from smaller component parts. To integrate the SIGINT/COMINT systems with other systems, you’ll likely use Application Programming Interfaces (API’s) and possibly customize the user interface. The API will let you pass information and controls between the sub-systems. You shouldn’t need to touch the search, intercept and collection software fundamentals, only interface between that core software and the DF sub-system, for instance. Sub-systems designed to be adapted into larger projects will reduce your non-recurring-engineering costs and let you deploy solutions faster.

Conclusion

SIGINT and COMINT systems must have the basic performance characteristics to detect and collect the most difficult RF signals in the environment. The difficult-to-quantify attributes of adaptability, flexibility, and ease of deployment extend the life of these systems and let you deploy the-speed scanning and the modularity to adapt to today’s strategic and tactical SIGINT and COMINT needs and future missions.

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