

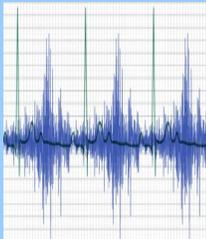
MARKET BRIEFS



**Executive summaries of market trends and opportunities
in key market segments and regions worldwide**

Monitoring RF Signals

Highlights



- The breakout of demand for carrier monitoring products coming from satellite operators at over 50%, with teleports accounting for roughly 22%, while broadcasters and others yield another 25%.
- The Satellite Industry Association data estimated that over 6,000 HDTV channels alone were distributed via satellite in 2013, all of which need to be watched 24/7/365.
- Carrier Monitoring is a very specific market, where the typical customers are satellite operators, teleports, governments and the broadcast industry.

by Dan Freyer and Virgil Labrador

Years ago, spectrum analysis equipment from vendors like Hewlett Packard costing up to tens of thousands of dollars each sat in earth stations and satellite control centers. There, operators and engineers tweaked knobs and pushed buttons to print thermal paper snapshots of the signals in order to check signal parameters, seek uplink authorizations, or try to get interfering neighboring or cross-pol carriers to turn down. Today's RF carrier monitoring equipment employs powerful processing systems, with sweep times as fast as 200 x per second, real-time viewing, and the ability to record years of 24x7 activity and data for analysis. Handheld devices, and smart phone apps help installers set up VSAT transmit sites in rapid time. And that's a good thing, because radio frequency interference (RFI) continues to be a vexing issue for satellite operators and users.

Riding Industry Growth

With broadband two-way terminals available for under US\$ 1,000 and as many as 100,000 new VSATs entering uplink service each year, plus no shortage of transportable, mobility and on-the-pause uplinks adding video and data signals around the world, the tasks of satellite carrier monitoring continues to expand. The Satellite Industry Association data estimated that over 6,000 HDTV channels alone were distributed via satellite in 2013, all of which need to be watched 24/7/365.

One source estimated the breakout of de-

mand for carrier monitoring products coming from satellite operators at over 50%, with teleports accounting for roughly 22%, while broadcasters and others yield another 25%. The market landscape includes spectrum analysis hardware manufacturers, such as Agilent, Tektronix, Anritsu, as well as monitoring software solutions and providers such as Skylink Technology, Comtech EF Data, Crystal Solutions, INTEGRASYS S.A., SAT Corporation, Glowlink, and Intorel (Luxembourg), among others.

"Customers want to be able to view their network from both IP and physical layer perspectives. Meeting Key Performance Indicators (KPIs) and enforcing Service Level Agreements (SLAs) requires views and analysis from both perspectives. Having carrier monitoring is a critical element for managing satellite networks," said Fred Morris, Vice-President, Product Marketing of Comtech EF Data.

The Spectrum of User Types

"Carrier Monitoring is a very specific market, where the typical customers are satellite operators, teleports, governments and the broadcast industry," says Alvaro Sanchez, sales manager for INTEGRASYS S.A., a privately owned software development, engineering and integration company that provides satellite monitoring products.

"The market is determined by applications where high reliability is an issue, and any dropouts of signals are costly to the operator," says Andrea F. Franz, PhD, Partner in A.G.Franz, LLC, Plainsboro, the N.J, USA-based consulting firm that distributes products in North America for

Narda Test Solutions, the German subsidiary of L-3 Communications. "Any U.S. teleport could benefit from a high-quality monitoring device, such as the Narda Remote Spectrum Analyzer products, as well as SNG and VSAT sites."

"Satellite operators are getting extremely price-sensitive, while content providers are more willing to invest in high quality equipment," according to Franz. Among the suppliers of spectrum monitoring systems primarily targeting satellite users rather than operators is Crystal Solutions whose products are used by major U.S. broadcast networks. Roger Franklin, President & CEO of the Duluth, Georgia, USA based company, estimates that the number of satellite transponders allocated to video offers a proxy for the potential number of carriers that need to be monitored in markets segments it targets with solutions. But he concedes that the potential applications for carrier monitoring is much larger. "We also have customers that use the core software to monitor narrow-band audio or data carriers. They can look at a few kHz of spectrum to see if there's power within a certain frequency and power level range. The military uses a lot of those types of carriers, so for example, we have on a customer monitoring over 200 carriers for the US Navy."

Multi-Tasking Analyzers

"Customers want to be able to monitor multiple transponders simultaneously, and to have the spectrum analyzers integrated into either an existing monitoring system or be offered a monitoring software package from providers such as Crystal Solutions, or Skylink Technology," according to Franz. She likes the Narda Remote Analyzer (NRA) line because they can be very easily integrated, and A.G. Franz has several partners who have integrated it into their commercial monitoring software.

"Spectrum analyzers normally tune to

a fixed bandwidth, normally between 1 MHz to 100 MHz and stay locked on that. "We provide a very cost effective means to monitor multiple carriers across multiple bandwidth segments using a very small number of spectrum analyzers, so customers can monitor up to 10 different carriers with a single analyzer," says Franklin.

VSAT and Data

Very Small Aperture Terminal (VSAT) and data carrier monitoring is a unique segment. With VSAT signals coming up

minals are often located in remote environments and operate where satellite is the only possible communications connection. In most cases, VSAT networks are also unmanned and left to operate automatically for years—even when they are not operating correctly, many times those on site aren't trained in actually operating the satellite equipment.

These factors bring a variety of concerns. First, at installation, the installer often needs to travel long distances and then spend a considerable amount of time carrying out the VSAT installation. Also, if any mistakes are made at this stage,

which is often the case, even more time is required for someone to return to the site and correct those errors while the VSAT keeps operating with poor performance, degrading the overall service and causing interference.

The complexity of VSAT networks, however, is not limited to installation. Errors can easily occur during operation, either due to human error from onsite personnel or other factors that are beyond the operator's control, such as atmospheric conditions. This problem can also lead to satellite interference.

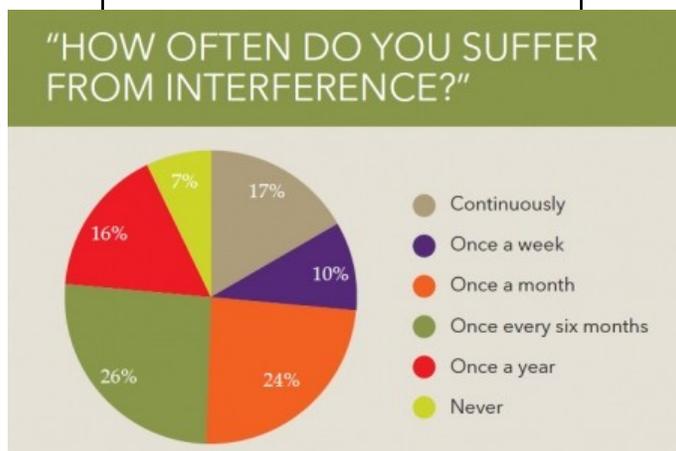
In a world where VSAT networks can be huge, if one single VSAT is mispointed or saturated, that can have an impact on the entire service performance, especially on adaptive power adjustment and HTS networks.

Correcting Errors

Currently, when errors are detected, which is usually once interference has occurred, someone must travel to the site and analyze and correct the error.

As with installation, this can require a substantial amount of time and resources, from traveling to the site and then with the additional time necessary to correct the error.

An added complication is that many VSAT networks are also mobile. Take mari-



Satellite interference is major problem all satellite operators and users are forced to contend with. Pictured here is a graph from a survey on satellite interference conducted by Newtec. A good satellite monitoring system can help alleviate the problem.

and down quickly, it is technically challenging for some systems to monitor them. But suppliers see healthy demand from VSAT users on the commissioning side. VSAT installs present many challenges such as installer coordination with a NOC while without cell phone service, limited time available, interference, and language differences in multi-national networks.

The VSAT market provides vital communications to remote areas for a whole range of different services, such as oil and gas, maritime, environmental monitoring, e-learning, disaster recovery and cellular backhaul, to name but a few segments.

Maintaining VSAT networks is extremely complex. By its very nature, ter-

time, for example, or the military, where the unit is constantly on the move. In those cases, the VSAT may have been perfectly installed and pointed; however, every time relocation occurs, those same misalign problems can occur, once again.

Often the personnel accompanying the unit won't be highly trained in satellite communications, but even when they are, there is a constant job of realignment to ensure the equipment is always optimally operating and without satellite interference.

In most cases, for someone to spend vast amount of time dealing with the equipment while in the field, especially in a military situation, is simply not practical. Yet, at the same time, ensuring a continuous connection can often be crucial to a mission's effectiveness.

"The trend is either to go to low-cost, quick-check monitoring equipment for line-up with satellites, or to have very sophisticated monitoring equipment. The Narda Remote Analyzer is right in between, quite sophisticated without the typical price-tag," says Franz, who notes that the NRA now offers real-time stream / spectrum analysis using more than 600,000 samples.

"We are seeing new customer demand from satellite service providers looking for new systems that can help with VSAT deployment. From our experience, the fastest growing application is solutions for VSAT line ups. Specifically, VSAT auto-commissioning products is the most dynamic segment," says Sanchez.

As a result, INTEGRASYS has invested

"...We are seeing new customer demand from satellite service providers looking for new systems that can help with VSAT deployment. ..."

in several years of development in order to create a very effective auto-commissioning system that allows VSAT installers to commission remotes rapidly, while minimum Cross Pol and Adjacent Satellite Interference, according to the company. A smart phone app receives line-up information from a Carrier Monitoring system, says Sanchez. VSAT hardware and software provider iDirect the VSAT is commercializing the INTEGRASYS system for its platforms. There is a need for realtime monitoring systems.

"Obviously, speed is highly important to users, who require a fast response with professional systems. Another trend is combining monitoring and Link budget calculation software," says Sanchez, "because it allows you to check that the calculated values are transmitted correctly at the desired transponders," he added.

HTS and Ka-Band VSATs

One monitoring technical challenge from the growth of HTS Ka-Band systems is they can have very wide transponders, with beams, for instance from 500-1500 MHz, compared to traditional 36-72 MHz C/Ku-band systems. According to Agilent's Richard Overdorf, "More work is

going into Ka band," because bandwidths are expanding in some systems. The combination of wider bandwidths and higher frequencies makes testing more difficult."

High Throughput Satellite (HTS) is making those terminals all the more efficient and, consequently, in greater higher demand. That rapid growth means that operators are having to install more and more networks to cope with all of the extra demand. Add to that the fact that VSAT networks

already come with their own set of challenges, and you have a new set of challenges that were already unique.

"By their design, HTS have many more beams than current generation FSS satellites. Our networking products are built for use on HTS, and carrier monitoring is essential for these designs. I'm sure that is the case with carrier monitoring in any of its' product forms," says Comtech EF Data's Morris.

With the growth in Ku and Ka-Band services, power control becomes extremely important for weather considerations. With the use of uplink power control (UPLC) systems, comes the need also for a monitoring system to validate that the uplink power control was properly managed. Recorded monitoring data can be correlated with weather data to determine the cause of real outages that may have been the cause of weather events.

"In our view, instead of using spectrum analyzers, the VSAT hubs are going to need to get more intelligent," says Crystal's Franklin, "so that they can look at typical transmission levels for individual remote sites, and correlate that data with weather patterns, so the hub can tell if the performance of a particular remote has degraded over time."

"We recognized the need and the demand for carrier monitoring and added it to our NetVue network management product suite. Network operators use it to determine whether or not there are issues on the air, or wireless, side of the network interface, said Comtech EF Data's Morris.

Customers wanted more than just equipment monitoring, which limits them to the data points that are sensed on the ground equipment. Providing them with an additional view into the part of their network where they have limited control, between the RF air interfaces, and combining that with network sensing trending and analysis, gives the customer greater



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Asia

Pay TV boom boosts satellite services markets in Asia in 2013

Pay TV boom in Asia has boosted satellite services markets in 2013. The report covers the market for satellite services in Asia, including the impact of pay TV on satellite services. It also discusses the growth of satellite services in the region and the challenges faced by operators.

USA's Pay TV Revenue

The report also covers the USA's Pay TV revenue, which is expected to reach \$18 billion in 2013. This is a significant increase from the \$15 billion reported in 2012. The growth is driven by the increasing number of pay TV subscribers and the higher prices charged by operators.

Africa

The African Satellite Market

The African satellite market is expected to grow significantly in 2013. This is due to the increasing demand for satellite services in the region, particularly in the areas of telecommunications and navigation. The report also discusses the challenges faced by operators in the region and the opportunities for growth.

Key factors for growth:

- 1. Increasing demand for satellite services in the region.
- 2. Growing awareness of the benefits of satellite services.
- 3. Improving infrastructure in the region.

Middle East

Update on the Middle East Satellite Market

The Middle East satellite market is expected to continue its growth in 2013. This is due to the increasing demand for satellite services in the region, particularly in the areas of telecommunications and navigation. The report also discusses the challenges faced by operators in the region and the opportunities for growth.

Key factors for growth:

- 1. Increasing demand for satellite services in the region.
- 2. Growing awareness of the benefits of satellite services.
- 3. Improving infrastructure in the region.

North America Broadband Market

The North American Broadband Satellite Market

The North American broadband satellite market is expected to continue its growth in 2013. This is due to the increasing demand for satellite broadband services in the region, particularly in the areas of telecommunications and navigation. The report also discusses the challenges faced by operators in the region and the opportunities for growth.

Key factors for growth:

- 1. Increasing demand for satellite broadband services in the region.
- 2. Growing awareness of the benefits of satellite broadband services.
- 3. Improving infrastructure in the region.

SNG Market

The SNG Market

The SNG (Satellite News Gathering) market is expected to continue its growth in 2013. This is due to the increasing demand for satellite news gathering services in the region, particularly in the areas of telecommunications and navigation. The report also discusses the challenges faced by operators in the region and the opportunities for growth.

Key factors for growth:

- 1. Increasing demand for satellite news gathering services in the region.
- 2. Growing awareness of the benefits of satellite news gathering services.
- 3. Improving infrastructure in the region.

Manufacturing Market

Trends in Satellite Manufacturing

The satellite manufacturing market is expected to continue its growth in 2013. This is due to the increasing demand for satellite manufacturing services in the region, particularly in the areas of telecommunications and navigation. The report also discusses the challenges faced by operators in the region and the opportunities for growth.

Key factors for growth:

- 1. Increasing demand for satellite manufacturing services in the region.
- 2. Growing awareness of the benefits of satellite manufacturing services.
- 3. Improving infrastructure in the region.

COTS

The Military COTS Market

The Military COTS (Commercial Off-The-Shelf) market is expected to continue its growth in 2013. This is due to the increasing demand for military COTS services in the region, particularly in the areas of telecommunications and navigation. The report also discusses the challenges faced by operators in the region and the opportunities for growth.

Key factors for growth:

- 1. Increasing demand for military COTS services in the region.
- 2. Growing awareness of the benefits of military COTS services.
- 3. Improving infrastructure in the region.

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Spectrum Monitoring Solutions

With the influx of new HTS systems, there is a need for more sophisticated carrier monitoring solutions.

Carrier Monitoring or spectrum analysis systems are the best way to ensure the quality of service for satellite communications. Therefore are commonly used in teleports, satellite operator NOCs, and service providers' operational teams and regulatory agencies for ensuring quality of service and interference free communications.

Satellite communications are affected by Radio Frequency (RF) signals and weather changes; therefore real time monitoring is required for fast solve of any possible issue without any service degradation. For many industries, such as military, Oil & Gas, the availability is critical therefore providers with automated monitoring capabilities are able to provide a much greater service than the once which have manual intervention.

Teleports today has more automated systems which allow them to save time and resources on daily tasks allowing the operator to focus more and more where the customers demand them by automating the signal monitoring with Controlsat Carrier Monitoring systems. One example of this success is Telespazio Brazil which today is more efficient using Controlsat monitoring system by allowing operators to be notified with email alarms and target actions to be done when any of their customers suffers from rain attenuation, sun isolation, or any possible RF interference. Any possible event gets stored for later analysis and possible report.

Controlsat is the fastest spectrum monitoring system on the market able to measure up to 200 carriers per second, this speed allows real-time quality of service monitoring for any customer on any payload, being able to share one system for several customers and networks; and even more, up to 20 operators can access the system for their particular measurements.

Controlsat is fully capable of measuring and characterizing any satellite signals from TV transmissions and Occasional Use with or without Carrier ID to VSAT transmission in return or forward links; this flexibility allows operators to analyze the services remotely in real time or post measure at any time if required.

Today HTS provides much more capacity than the traditional satellite technology; this is achieved by a high level frequency re-use and spot beam technology which enables frequency re-use across multiple narrowly focused, spot beams (usually in the

order of 100s of kilometers). By contrast traditional satellite technology utilizes a broad single beam (usually in the order of 1000s of kilometers) to cover wide regions or even entire continents. In the ground station field, HTS brings many advantages however also brings complexity, therefore Integrasy's has been working on the best monitoring systems for HTS ever built.



Controlsat fully automated or unattended, so lists of carriers/transponders are user defined or retrieved from the system's DataBase. The system performs a definable carrier sequencing process according to the frequency plan monitoring list. Carrier parameters such as Carrier Center Frequency, Carrier Level, Transmission Bandwidth, Carrier Power and Carrier to Noise ratio or modulation parameters are measured and compared against several adjustable thresholds fixed automatically or fixed by the operator. It allows ensuring the quality of service and availability, and notifies with

alarms and warnings in the following events: interferences, intruding carriers, transponder saturation, atmospheric events such as rain, isolation, sun outage and other degradation causes. This way the operator can take actions rapidly for come back to normal operation.

Controlsat Carrier Monitoring System can be upgraded to Vectorsat for adding vectorial analysis and Carrier Under Carrier Interference Detection, I/Q Demodulation, constellation display and automated modulation measurements such as Symbol rate, MER, FEC and Constellation.

Vectorsat is very easy to use system for solving a complex challenge such as signal modulation distortion and hidden interference inside carriers. Vectosat nowadays is the most powerful Carrier Under Carrier Interference Detection System.

Moreover nowadays, customers are demanding smarter and more automated, therefore Integrasy's has been working in new technologies of automating the lineups creating the Satmotion family with Satmotion Pocket as VSAT commissioning and Satmotion SNG as Occasional Use Access automation allowing service providers to save cost while broadcasters and field operators do their daily tasks much quicker and faster without the need to call to the NOC.

The latest product as an evolution of Satmotion technology is Alusat which allows an unmanned VSAT network maintenance at the NOC, being able to calibrate the overall network fully automated with a single click.

Integrasys S.A.

To shed light on their company and products, Francisco Fornes, Product Manager of Spain-based Integrasys shared his insights to Satellite Markets and Research.

What distinct competitive advantage does Integrasys have over your competitors?

Integrasys has a huge advantage which is Innovation, at Integrasys we trust our customers which demand new, faster, more flexible and easier to use systems. Therefore Integrasys has developed a wide cutting-edge Carrier Monitoring product line which allow our customers to reduce significant OPEX with state of the art technology, to have more carrier samples and measurements and ever before by speeding up the measurement up to 200 carrier per second. Currently Integrasys Monitoring Systems are the fastest by far to any other competitor solution. The satellite industry has recognize Integrasys as an innovative company awarding the company with Innovation Awards at the Vision Awards at SATCON 2014 and VSAT 2015.



Francisco Fornes

What are the unique features of your carrier monitoring systems and who uses them?

Integrasys systems differs from our competitors on the systems speed, flexibility and ease of use. Moreover Integrasys is specialized in the VSAT market, allowing service providers to communicate between Integrasys systems and Hub and remote equipment, this brings unlimited possibilities for service providers or satellite operators in HTS environments. As Integrasys has a wide Carrier Monitoring Systems (CMS) product line, I would like to cite some examples:

Controlsat is the base of our CMS product line and allows the operator to monitor fully automated or manually any kind of signals from SCPC to TDMA, wide transponders, detecting any possible service degradation or interference, Controlsat allows service providers such as Telespazio do Brasil, to monitor autonomously all their services and receive an alarm if something goes wrong in order to correct the communication issue in real time. This product could be complemented with Carrier Under Carrier Interference Detection for satellite operators and service providers who suffer interferences.

Satmotion Pocket, is our VSAT commissioning system which allows to self-install the remote sites, in minimum time and maximum accuracy and performance with a very intuitive and easy to use smartphone app. Integrasys has partner with different VSAT manufacturers such as iDirect, Hughes and Comtech for making available this unique technology to their customers.

Alusat, is an evolution of Satmotion Pocket, currently we are introducing it to the market as the seamless VSAT network maintenance system which allows the operator to virtually visit every remote sites at the hub and perform any functionality that Satmotion is capable to but without the need to re-visit the site. Alusat also allows the consistent monitoring of a VSAT site after installation to ensure optimization of operation and the minimization of costs caused by service failures.

Does being located in Spain provide you with any advantage or benefit?

Yes, to have our two main offices in Spain (Madrid and Seville) allow as to be much more cost efficient than US companies as our staff have great expertise on RF engineering and computer programming skills for a lower expenses than we would need to invest in United States, so this expertise and investment cost allow us to be a very profitable entity serving our customers with high quality products to a very competitive price.

What markets are you active in and how have you fared in those markets?

We are very active in different markets and applications, the main once are the VSAT and DTH markets.

In the VSAT market, Integrasys has been extremely successful designing, developing, and commercializing the systems required by the VSAT industry having a significant number of customers worldwide, with Controlsat and Satmotion Pocket systems. These networks serves different applications such as bridging the digital divides in schools, e-learning in the Amazonas, Oil & Gas, disaster recovery, maritime connectivity or even trains and aeronautical.

In the DTH market, Integrasys has been in the satellite business since 1990, with customers using our systems for more than 20 years for broadcast transmission and reception monitoring. Our systems were fully designed for this markets and they have been upgraded. The latest product for broadcast is Satmotion SNG which allows to simplify the Occasional Use access to the satellite.

control and insight," Morris added.

Integrasys has been focused on the unique set of challenges posed by HTS systems. "upgrading our systems the more flexible, the more scalable and even faster for these new satellite networks. HTS is designed for being able to reuse the frequencies by using spot beam architecture. This capability brings complexity in the ground station as in general case multiple teleports are required, with multiple systems, so the need of an scalable and flexible CMS is required as well as extremely fast in order to be able to measure large number of beams, not only locally at the teleports also remotely at the user beams." said Francisco Fornes, Product Manager of Integrasys.

Weather Outage Impact Prevention

Today, weather event-driven diversity switch decisions can be made last-minute at a facility, based on weather readings. Some facilities may have a harder time switching to backup links on five minutes warning, for instance. The ability to look at historical spectrum monitoring data and correlate it with other data may become increasingly important as the industry evolves.

"There will be a day fairly soon when customers will want to correlate atmospheric interference being detected in nearby weather, so that diversity system switches can be made *before* an outage. If the data is available historically so that you can plan how much time you have to go off the air, it could prove very helpful. I think that will be a future requirement we'll see out of our customers," says Crystal Solutions' Franklin.

Interference Detection

Perhaps the hottest area in monitoring is interference detection and reduction. When you pay tens or hundreds of thousands of dollars a month for satellite transponder capacity, making sure you can run services interference-free is critical. As a buyer, if you do not monitor your own bandwidth, you are relying on a satellite operator's busy team to perceive in-

"...The capabilities that come from greater processing horsepower will continue to drive innovation in analytics, trending tools and automation..."

terference for you. However well intentioned they are, they may not have all the insights into your network which you have that are needed to anticipate and address problems.

According to a Carrier ID survey, carried out by the Satellite Interference Reduction Group (IRG) and satellite communications specialist, Newtec, 93% of respondents suffer from satellite interference at least once a year, with more than half suffering at least once a month and 17% continuously in their day to day operations.

Thousands of incidents of satellite interference are reported each year and thousand more are unreported according to the IRG.

"We are frequently also asked for the capability to be able to identify signals in order to identify the interference," says Franz, and to better address these needs A.G. Franz LLC has partnered with COMINT Consulting who are experts in the field of demodulation, decoding and parsing of RF signals. Richard Overdorf, application engineer, Microwave & Communications Division, Agilent Technologies, Inc., shares a similar view. "We see increased needs for troubleshooting and identifying interference in the environment," said Overdorf.

"Satellite users definitely want to have their own evidence of outside interference and these systems provide that evidence. Everybody wants to see the his-

tory," adds Franklin.

As digital signal processing (DSP) and storage performance has increased in power, extensive stream recording has become more cost-effective than ever. "Customers asked us to record the information so they can send it to operators of satellites to diagnose problems, and get problems resolved. Our systems provide information so operators can get information to their management chains. So our system provides information they can do something with or to see if was beyond their control," said Franklin.

Conclusion

The influx of new HTS systems will require more sophisticated carrier monitoring systems. This presents a unique opportunity for both providers of CMS and the users. Users of CMS should have a wide choice of alternatives among various providers. It's important, however, to make an informed choice based on the company's track record and customer service.

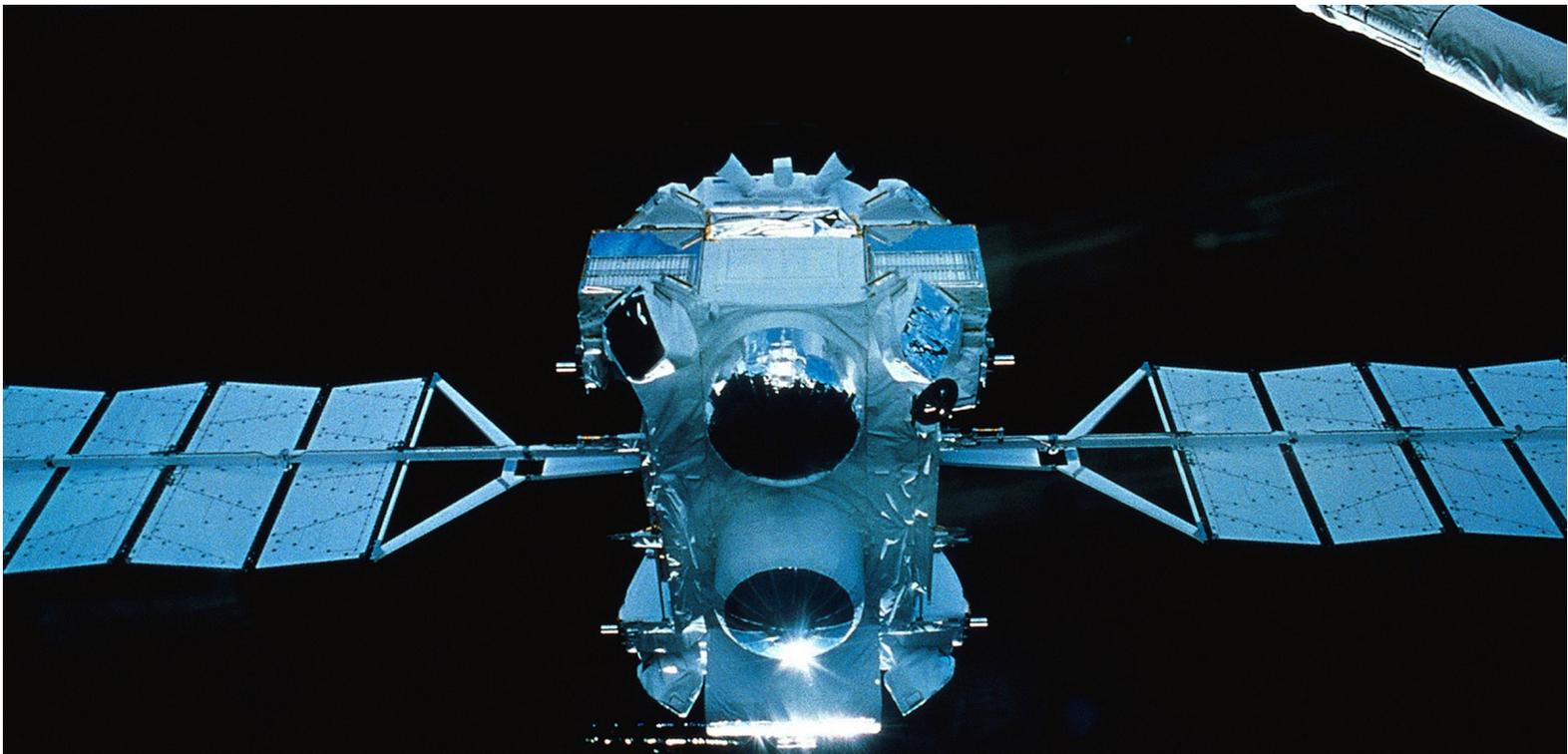
"The capabilities that come from greater processing horsepower will continue to drive innovation in analytics, trending tools and automation. We believe that we are on top of the currently available technology in this sector, and we intend to stay on top," says Comtech EF Data's Morris.



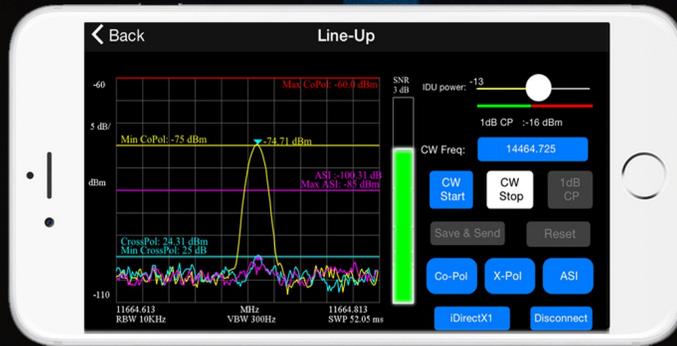
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