Product Brochure

# MX280001A

## Vision™ Software

## Introduction

Spectrum monitoring systems facilitate the identification and removal of interference signals that degrade network capacity. By monitoring spectrum on a continual basis, problem signals can be identified as they occur in real time. Patterns of unwanted signal activity can also be examined, providing an efficient way to characterize and locate the source of the interference problem.

In addition to interference detection, spectrum monitoring is also used to characterize spectrum occupancy. Government regulators and operators are often interested in determining the usage rate for various frequency bands. Monitoring these frequencies provides the information needed to optimize spectrum for maximum utilization. Spectrum can be re-purposed for other applications or multiplexed with other signals using cognitive radio techniques.

Spectrum monitoring also serves to enforce compliance with government regulations. Police, fire fighters, air traffic control, military and emergency services must all have access to communications free of impediments and distortion. Compliance with spectrum regulations is often enforced by spectrum monitoring. Figure 1 shows spectrum monitors surrounding a prison facility, looking for illegal transmissions.

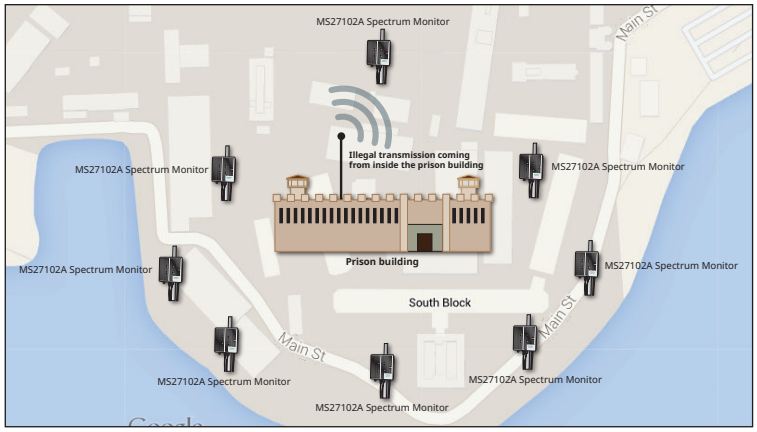


Figure 1: Monitoring for illegal transmissions from prison facility

## Vision™ Software Overview (MX280001A)

The Vision™ software platform works with Anritsu's spectrum monitoring hardware to automate the process of collecting measurement data, providing useful information about network health and use of the spectrum. Using multiple hardware probes covering a wide geographical area, Vision presents a comprehensive picture of spectral activity to assist users in monitoring the spectrum for unusual activity. Figure 2 shows a typical signal monitoring system with Anritsu spectrum monitors positioned for maximum coverage.

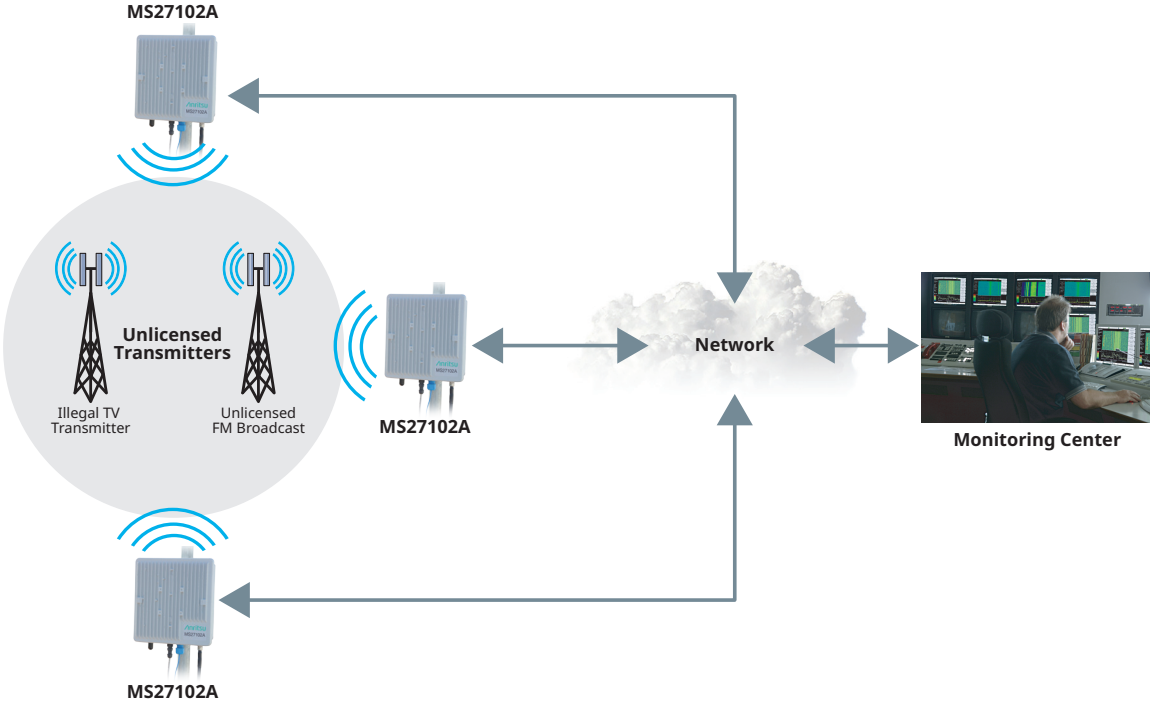


Figure 2: Spectrum monitoring system

Vision software facilitates a variety of applications used for spectrum monitoring systems. One important application includes determining the presence of interferers in a network which can degrade communications services. Cellular operators in particular are vulnerable to such interference that manifests itself in slower data rates and dropped calls. In most cases, network performance is compromised on the uplink frequency bands (communication from the mobile unit to the base station). However, network quality of service can also be impacted by interference on the downlink channels. This type of interference can be prevalent at the cell periphery where the power levels of the interference signals approximate those transmitted by the base station itself.

Another important application for Vision software is the detection of illegal or unlicensed broadcast signals. Illegal broadcasters may set up AM/FM, cellular or other types of transmissions which must be identified and ultimately located. By using spectrum monitors, unlicensed broadcasts can be tracked, processed and stored in a database for further examination and potential use in legal proceedings. See figures 3 and 4 for important spectrum monitoring applications.


Figure 3: Stadium monitoring

Figure 4: Airport frequency monitoring

**Other applications include the following:**

- Inform spectrum policy – accumulate historical spectrum data to determine percent time of occupancy
- Monitor jails/prisons for unauthorized transmissions
- Monitor borders, airports, nuclear facilities and other sensitive areas
- Railroads – monitor spectrum for potential interference of positive train control (PTC) signals
- Satellite reception interference detection
- Interference monitoring at large venues such as stadiums, malls, etc
- White space monitoring
- Indoor monitoring (board rooms, embassies and other sensitive facilities). See Figure 5.

Figure 5: Indoor transmissions detection

## Vision Software – How it Works

Vision is an optional software program which runs on a PC using the Windows operating system (Windows 7 or 8). This software provides control and automation capabilities when used with Anritsu's spectrum monitor hardware. Vision is composed of two components responsible for monitoring and geo-locating interference signals, called Vision Monitor and Vision Locate respectively. Each performs a wide range of spectrum monitoring and control applications designed to mitigate interference problems and detect unusual signal activity. A summary of each Vision software product is presented below.

## Vision Monitor

The Vision Monitor program is the visible user interface for monitoring remote spectrum activity. It provides a listing of all hardware monitors in the system along with a graphic overview of system health. A screenshot of the main user interface for Vision Monitor is shown in figure 6.

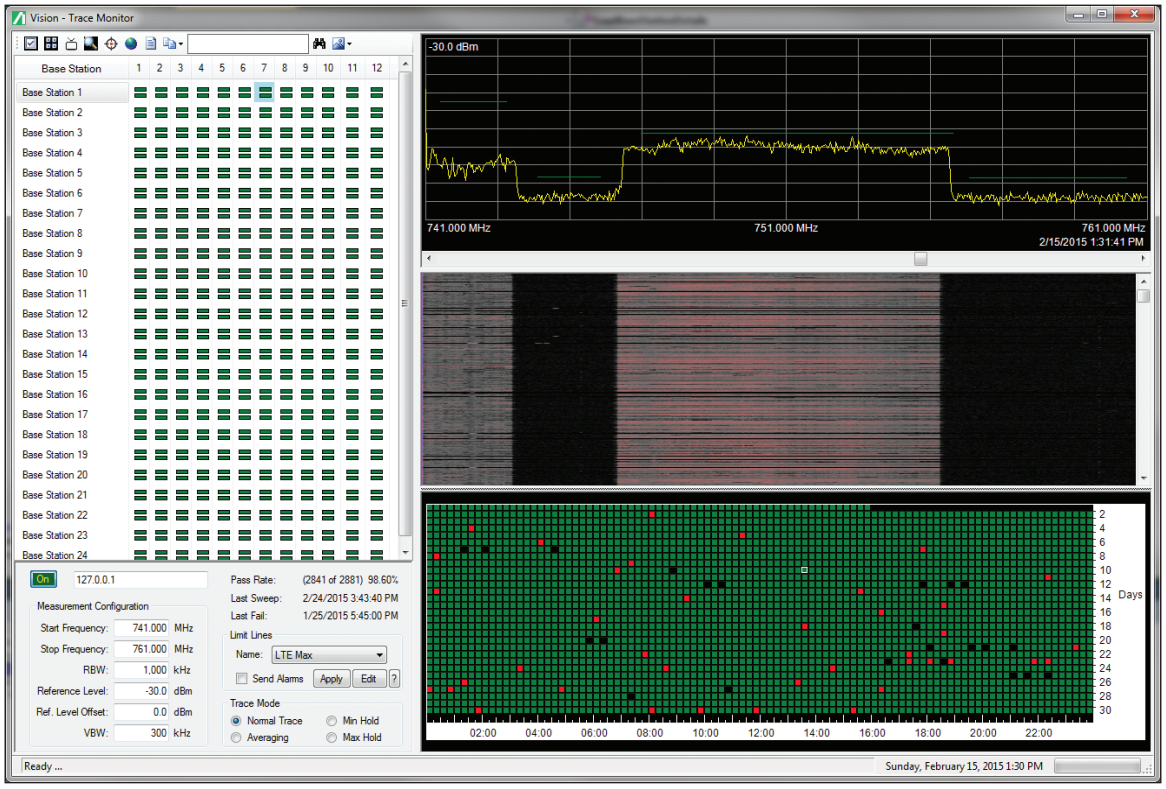


Figure 6: Vision monitor screen

Shown here is a listing of the deployed monitors, with the ability to view both "real-time" and historic measurement trace and spectrogram data.

Vision Monitor performs a wide range of spectrum monitoring duties. These functions include:

- Measurement acquisition
- Data storage
- Threshold setting/Alarm generation
- Reporting

Users can set up the Vision program to take automatic measurements for all spectrum monitors. The measurements are in turn uploaded into a database for further review. The database is updated with new data, while old information is periodically purged according to user settings. Functions are also available for archiving, copying and compressing the database. See Figure 7 for illustration

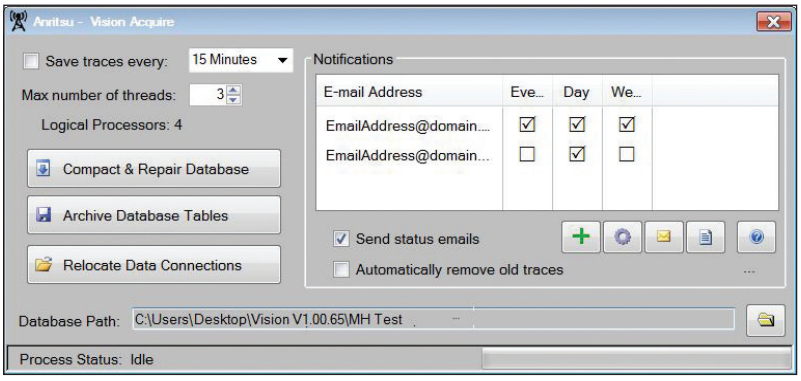


Figure 7: Vision Monitor measurement and database control

With Vision Monitor, the user can set up limit lines for triggering alarms, view spectrum history and change measurement parameters of individual or groups of spectrum monitor probes. The program makes heavy use of intuitive graphics to indicate the presence of interference or other signals of interest. Additionally, searches both in real-time and over history can be made to indicate patterns of interference. In some cases, interference may only occur at certain times of the day or certain days of the week. It is important to be able to capture the signal, identify the pattern and subsequently hunt for the signal location at the appropriate times. In addition to trace data, spectrograms can be viewed to indicate changes in frequency over time for suspicious signals.

For each remote monitor, Vision Monitor is capable of collecting data from as many as 24 input RF ports. This can be ideal for cellular systems with multiple sectors and multiple frequencies per sector. Figure 8 shows a screen shot of the user interface with multiple monitors overlayed on a map. Both GoogleMaps and OpenStreetMap are available. Using this map, alarm threshold violations can be easily seen with color changes on the probe indicating a frequency threshold violation at that site. If needed, automated email alerts can be sent to any email address provided. These alerts can be emailed in real-time or sent as summary reports on a daily or weekly basis. These reports are a great tool for provide a snap shot of the network's health and provide time-stamped indications of when a suspicious signal might be present.

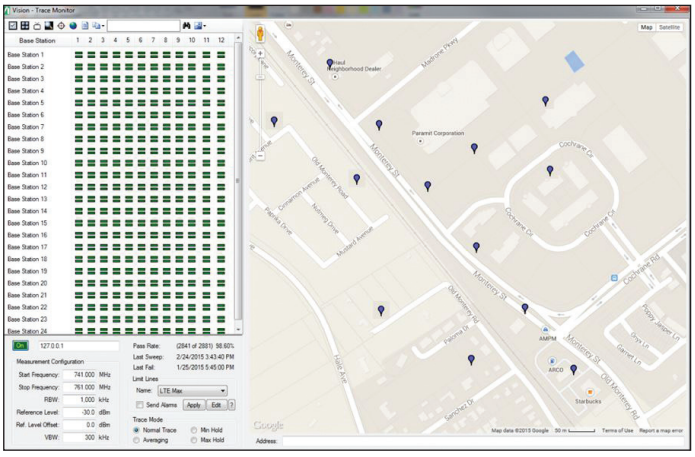

Figure 8: Monitor positions overlaid on map

## Vision Locate

Vision Locate is an optional program used with Vision Monitor. Once an interferer or suspected illegal signal is identified, a geo-location algorithm is employed to fix the approximate position of the signal. This enables the user to narrow down the signal location, minimizing the time and expense for pin-pointing its position. A sample map is shown in Figure 9 showing the suspected interference position. In this window, the probe locations are indicated by the red squares. The interference position is identified by the concentric circles.

For interference that may have occurred in the past, users can also use historical data for positioning the signal of interest. A search can be done for alarm violations that occurred at any of the spectrum monitor probes in the network. Using three probes in the vicinity, the interference position can be geo-located.

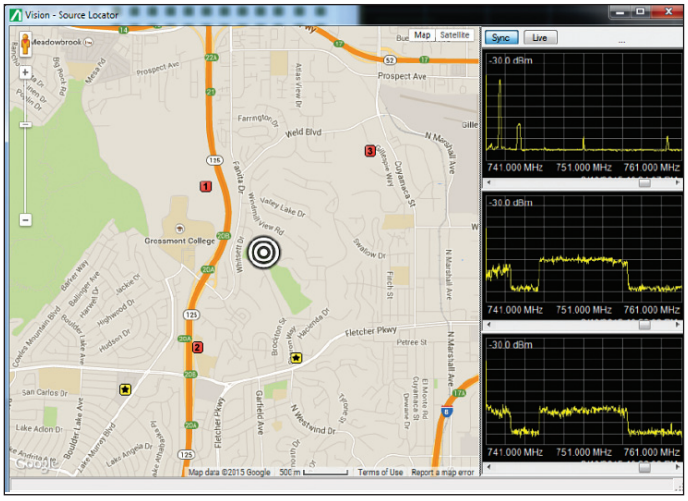


Figure 9. Geo-location of signal on map overlay

Power of Arrival (POA) algorithms are used to position the interference signal. Three or more probes must be in the vicinity to detect the signal of interest in order to correctly triangulate the position.

## Remote Spectrum Monitoring Hardware

Anritsu offers several spectrum monitoring systems designed for both indoor and outdoor environments. The MS27102A monitor is an outdoor IP67-rated probe that can be positioned on towers, rooftops or poles. It is ideally used to monitor for both interference and unusual signal activity. The MS27103A, which maintains 12 or optionally 24 RF inputs, is designed specifically for cellular system or in applications requiring multiple RF inputs. The MS27103A is also ideal for monitoring for interference in DAS environments. Both platforms are designed for stability, sweep speed and low spurious signals. Figures 10 and 11 show each probe.


Figure 10: MS27102A


Figure 11. MS27103A (24-Port RF Input option shown)

**Key features for each hardware platform include the following:**

- 9 kHz to 6 GHz
- Sweep speed up to 24 GHz/s
- Integrated web server to view, control and conduct measurements via a web browser (both Chrome and FireFox supported)
- Remote firmware update capable
- Watchdog timer to insure long-term stability for remotely deployed monitors
- IP67 rated for outdoor deployments
- Linux operating system
- Low spurious signals for accurate signal discovery
- 20 MHz instantaneous FFT bandwidth
- Low power consumption < 11 watts (input voltage 11 to 24 VDC)
- Integrated GPS receiver for monitoring location and time synchronization applications
- Gigabit Ethernet available for high speed transmissions
- Interference analysis: spectrogram and signal strength
- Dynamic range: > 106 dB normalized to 1 Hz BW
- DANL: <–150 dBm referenced to 1 Hz BW, preamp On
- Phase noise: –99 dBc/Hz @ 10 kHz offset at 1 GHz
- IQ block mode and streaming with time stamping for TDOA applications
- Vision™ software optional for automated spectrum measurements, setting alarms and geo-locating signal sources

## Summary

In order to minimize expense while preserving network integrity, a highly automated process is required. Vision software provides an efficient user-friendly method for monitoring frequencies, alerting the user when unusual signal activity is present.  By identifying patterns of interference, recording spectrum history and geo-locating the position of target signals, Vision software is the perfect solution for your interference mitigation needs.

## Ordering Information

The Vision software application can be downloaded from the Anritsu website. In order to use Vision, an Anritsu spectrum monitor must be purchased and enabled with the option. Note that in order to use Vision Locate for geo-location, Vision Monitor must also be purchased.

| | |
|---|---|
| MS27102A-0400 | Vision Monitor enabled on MS27102A |
| MS27102A-0401 | Vision Locate enabled on MS27102A |
| MS27103A-0400 | Vision Monitor enabled on MS27103A |
| MS27103A-0401 | Vision Located enabled on MS27103A |