SpectraVision MX280010A 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 identify the types of signals present in the environment, characterize signal quality, and continuously scan frequency channels for signal activity. 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 repurposed for other applications or multiplexed with other signals using cognitive radio techniques.

Anritsu’s SpectraVision MX280010A software is a suite of options and tools used with Anritsu's Remote Spectrum Monitor MS2710XA. Various features incorporated into the software allow users to quickly perform automated analyses of the frequency spectrum, record measurements, and generate optional reports detailing signal quality and performance characteristics.

SpectraVision sofware is available on Anritsu's website and can be downloaded free of charge. Options must be purchased on Anritsu's Remote Spectrum Monitor MS2710XA solution before the SpectraVision software options can be used. SpectraVision software initially checks for the presence of the options on the hardware and if enabled will function accordingly.

SpectraVision software can be used for controlling Anritsu's Remote Spectrum Monitor solutions while also visualizing various measurements on a PC or tablet. In addition to the base version, the SpectraVision software suite also includes various paid options for advanced signal measurements.

SpectraVision MX280010A Software Overview

SpectraVision software provides a number of basic functions available free of charge. These include methods for establishing a communications link to the Remote Spectrum Monitor, as well as enabling various controls and settings, marker functions, and other basic services including:

- Control over various spectrum monitor settings including: frequency settings, RBW/VBW, attenuator control, preamp control, and many others
- Establish remote communications with spectrum monitor, DNS setup
- Set-up Max Hold, Min Hold, and various marker capabilities (see Figure 1)
- Configurable spectrogram and spectrum density plots with various chart controls
- Threshold masks with both lower and upper limit capabilities
- Automated alarm capabilities for threshold mask violations
- Record/Replay capabilities to capture snapshots and measurements
- Zoom capabilities to easily focus on frequency bands of interest

Figure 1. Screenshot with Max/Min Hold Enabled
SpectraVision MD280010A Software Options

A number of options are available in the software suite enabling users to perform various signal quality measurements and identification, including:

- Channel scanner (option 467)
- TETRA signal analyzer (option 464)
- Satellite signal analyzer (option 471)
- Signal ID (option 472)
- Signal ID advanced (option 473)
- Power monitor (option 474)

Channel Scanner (Option 467)

The multi-channel scanner and power measurement option is used to monitor the RF power of various sub-bands (channels) in parallel (Figure 2). One complete set of channels can be pre-defined and saved for current or future use. Various channel parameters are entered into a “service table” that is used by the software for assigning channel bands and generating the calculations. Parameters include: channel name, center frequency and span; and, RBW and thresholds for alarming (both maximum and minimum level thresholds are allowed).

Every channel’s power is displayed in the column chart. Additionally, maximum and minimum levels of power measurement can be viewed on this screen. Power values can be viewed by hovering over each column in the chart.

In order to detect the presence of unwanted signals and to insure that signals of interest are functioning properly, threshold settings can be established for each channel. Alarms can then be generated based on these threshold violations. Alarm events can then be recorded along with the date/time of each occurrence.

TETRA Signal Analyzer (Option 464)

The TETRA signal analyzer is designed to find and test over-the-air performance of Terrestrial Trunked Radio (TETRA) systems. Users can select a frequency band to scan for any TETRA signals that exceed a user-settable power threshold. These signals are identified and presented in a table according to center frequency and bandwidth (Figure 3). Any of these signals can then be further demodulated to show various signal quality metrics such as RSSI, channel power, C/N ratio, Eb/No, datarates, EVM, MER, and modulation/coding schemes used. A constellation diagram is also provided to illustrate signal integrity in a graphical format.

Technicians can use this data to verify a transmitter’s coverage and signal quality without taking the cell site off-line.

The TETRA summary screen also provides information on the mobile and base color codes, network codes, location area code. Examining these values can help diagnose the causes and location of user-reported performance issues while helping to ensure that new systems are ready for mission-critical usage.

Measurement results can be exported showing all measurements and signal information in a pdf format. A sample report is shown in Figure 4.
Satellite Signal Analyzer (Option 471)

The satellite signal quality measurement option provides information on link quality and real-time performance data on signals of interest (Figure 5). Parameters such as C/N, MER, EVM, and modulation/code schemes are presented. Users can also take advantage of the statistical table to monitor signal quality parameters over time. In this way, signal integrity issues can be addressed before catastrophic failures result. DVB-S1, DVB-S2, and IESS satellite signal standards are supported.

Alarm capabilities are also provided. Users can monitor signal quality parameters such as EVM or MER, triggering an alarm when values fall below a certain user-defined threshold. Email notifications can then be sent in real time to company technicians responsible for system maintenance. DVB-S2, and IESS satellite signal standards are supported.

The hardware bandwidth of Anritsu Remote Spectrum Monitors (MS2710XA) are set at 20 MHz. Any satellite signals whose bandwidth is greater than 20 MHz cannot be demodulated.

Signal ID (Option 472)

The Signal ID option uses digital signal processing algorithms that include both frequency and time domain transformation. Results include estimates of the center frequencies and bandwidths of both detected carriers and already identified carriers. For the latter, several statistics, such as C/N, constellation diagrams, etc. are provided.

The identification algorithm uses the user detected signals as input and works to find an underlying communications standard. Signals included in the library for matching include satellite (DVB-S1/S2), cellular, and public safety. Additionally, the identification algorithm provides underlying signal modulation characteristics, such as QPSK, PSK, QAM, etc. See Figure 6 for an illustration of the current signal library. All signals to be identified must have a bandwidth of 20 MHz or less.

More detailed information about an identified signal can be displayed. Depending on the standard and signal quality,
different statistics are available, such as data rate, modulation/coding scheme, symbol rate, C/N, and Eb/No. Additionally, constellation diagrams are shown depending on the signal quality and underlying analysis algorithm. This information is shown in Figure 7.

Signal ID Advanced (Option 473)

Signal ID Advanced (or Carrier-In-Carrier) is an option designed to discover and identify signals hidden within larger signals. The primary use case for this option is to find interfering signals underneath satellite carriers. Once these interfering signals are detected, they can be identified. After entering the center frequency and bandwidth of the high-level signal, the algorithm works to remove this carrier from the analysis process. As Figure 8 shows, the interfering signal (outlined in red) is displayed along with its various signal characteristics and corresponding constellation. Both signals in the Signal ID Advanced option must have a bandwidth of 20 MHz or less. Also, there needs to be a greater than 6 dB power ratio between the larger host carrier and the sum of all underlying interferences.
Signal ID Advanced is designed to discover interference signals hidden within larger signals. Any type of interference signal contained in the Signal ID library can be identified and processed. In the screenshot presented in Figure 9, the interfering signal is another satellite signal.

**Power Monitoring (Option 474)**

This option can be used to measure the RF power of various sub-bands in parallel over a certain amount of time. Users can highlight various sections of the main trace display with every power vs. time shown at the bottom of the screen with its corresponding color. Simple adjustments are available to set power ranges, start/stop the measurement, etc. Users can then easily view the power in individual channels, recording any unusual power changes as a function of time. See Figure 9 below which displays this feature.

![Figure 9. Signal ID Advanced Display showing Interfering Signal Hidden underneath Satellite Carrier.](image)

**Who Benefits from SpectraVision Software**

Key markets for SpectraVision software include:

- Satellite operators
- TETRA operators
- Government regulators
- Cellular operators
Satellite Operators

The SpectraVision Satellite Analyzer (Option 471) can find, demodulate, and display satellite signals using the DVB-S1, DVB-S2, or IESS technology standards. Once a communications link is established, SpectraVision software will constantly monitor the satellite signal for quality parameters such as MER, EVM, and C/N. Users can set up a threshold for MER measurements (for example), such that quality measurements that fall below this trigger an alarm. Alarms can then be sent in real-time via email to the appropriate technical personnel for remedial action.

An innovative feature of the SpectraVision satellite monitoring system is its ability to perform moving averages of signal quality over time. These measurements allow the operator to observe trends in signal performance, providing the opportunity to discover problems before they cause major system failures.

The Signal ID Advanced option (option 473) is particularly useful for operators given that many instances of interference are caused by other satellite operators who incorrectly install new satellite systems. Cables for these systems can leak if not properly adjusted. Additionally, antennas can be incorrectly polarized on installed with an incorrect tilt resulting in the signal travelling beyond its intended area.

The perfect hardware solution to accompany the Satellite option is the Remote Spectrum Monitor MS27103A (see Figure 10). This unit provides 12 RF Input ports (24 RF In ports optional) so that up to 12 (or 24) satellite signals can be monitored with one spectrum monitoring receiver. The Remote Spectrum Monitor MS27103A employs an electronic switch to quickly scan each input signal for analysis.

TETRA Operators

The TETRA Signal Analyzer option 464 is both a signal analyzer and scanner in one package. Option 464 scans a user-settable frequency band for all TETRA signals that might be present. Using a horizontal marker line, all signals whose amplitude exceeds the limit line will be captured and demodulated for further analysis. Using FFT technology in the Remote Spectrum Monitor, up to 20 MHz bandwidth can be captured and processed with one measurement. Once downloaded, various signal parameters for each TETRA signal can be displayed. Additionally, each of the TETRA signals is identified and displayed in table format according to center frequency and bandwidth. Some of the displayed signal parameters include:

- RSSI
- EVM
- Channel Power
- MER
- MCC (Mobile Country Code)
- MNC (Mobile Network Code)
- MCCH (Main Control Channel)
- C/N

For convenience, pre-defined “channel preset” tables are available to quickly review individual TETRA channels in authorized frequency bands. A “carrier overview” table is also provided for users to show many of the signal parameters and identity codes for quick sorting according to need. For example, customers can sort the table of identified TETRA signals for power strength, signal quality, or location. Users can then export TETRA measurements for each signal into a PDF format. The report contains an overview table along with all the radio system measurements, signal parameters, and constellation plot.

Government Regulators

Government regulators will use the Channel Scanner (option 467) to examine occupancy usage in each frequency band. This option allows the use of lower limit thresholds to test for the absence of a signal in a given band. Regulators often use this information for potential repurposing of certain frequency bands for other applications.
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Violations of upper threshold limits could be indicative of licensed broadcasters exceeding their authorized power limits or illegal broadcasts in channels that should be vacant. Regulators are often concerned with unauthorized broadcasts in the FM frequency band. Real-time alarm capabilities available on the Channel Scanner option can notify regulators when such violations occur.

Government regulators and cellular operators will both use the Signal ID option (option 472) for identifying unknown signals that may be causing interference to authorized signals. This can be helpful in tracking the source of the interference. Additionally, this option will assist in determining whether or not a given signal is legitimate.

System Requirements

SpectraVision software is a PC application used with the Windows® operating system. Minimum requirements for the PC and operating environment include the following:

Hardware
- 100 MB free hard disk space
- 1 GB RAM (2 GB RAM or higher is recommended)
- 800x600 screen resolution or larger

Operating System
- Microsoft® Windows operating system (Windows 7, Windows 8, or Windows 10)
- Microsoft.NET Framework Version 4.5 or higher

SpectraVision software is a Microsoft .NET Framework based application. The .NET Framework is generally pre-installed on a Microsoft Windows system. If an older version has been installed, the Windows .NET Framework 4.5 needs to be installed. .NET Framework 4.5 or higher can be downloaded free of charge from the Microsoft Windows homepage.

SpectraVision Software Installation

SpectraVision software is available for download from the Anritsu website. The software can be installed into any arbitrary directory on your Windows platform. After the installation, simply double-click on the desktop icon to launch the application.

Licensing Model for SpectraVision Software

The ability to use SpectraVision software works very much like the options currently used on Anritsu’s handheld spectrum analyzers. Options are purchased on the hardware that then enables the use of given firmware applications. With SpectraVision software, the software options will only work if it first detects the presence of an option enabled on the Remote Spectrum Monitor MS2710XA hardware. Users wishing to use any of the SpectraVision software features must first purchase the corresponding option for their spectrum monitor.

Anritsu spectrum monitors that have already been purchased can be retroactively upgraded with SpectraVision software options.

Remote Spectrum Monitoring Hardware

Anritsu offers several spectrum monitoring systems designed for both indoor and outdoor environments. The Remote Spectrum Monitor MS27101A (Figure 11) is housed in a ½-rack size enclosure and is ideal for areas where space is at a premium. This unit is designed for such applications as white space monitoring, harm claim threshold detection, in-building interference monitoring, positive train control, and research/university
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applications. The Remote Spectrum Monitor MS27102A (Figure 12) monitor is an outdoor IP67-rated probe that can be positioned on towers, rooftops, or poles. It is ideally used to monitor both interference and unusual signal activity. The Remote Spectrum Monitor MS27103A (Figure 13), which maintains 12 or optionally 24 RF inputs, is designed specifically for cellular systems or in applications requiring multiple RF inputs. This unit is also ideal for monitoring for interference in DAS environments. All platforms are designed for stability, sweep speed, and low spurious signals.

For OEM solutions, Anritsu offers the Spectrum Monitor Module MS27100A. Users can place these spectrum monitors in their own rack configurations or place the boards in their own enclosures for a customized design. Figure 14 illustrates this design.
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Ordering Information
SpectraVision Software can be downloaded from the Anritsu website. In order to use it, an Anritsu Remote Spectrum Monitor must be purchased and enabled with the proper option.

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<tr>
<th>Part Number</th>
<th>Description</th>
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<tbody>
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