User Guide

SpectraVision™ Software

MX280010A

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Chapter 1 — SpectraVision

1-1 Introduction

This user guide describes the software functions and working instructions of the SpectraVision software. Based on an efficient, proven client-server principle, the software architecture allows for shared devices (instruments) and remote services. SpectraVision software works only with Anritsu's product line of remote Spectrum Monitors (Models MS27100A, MS27101A, MS27102A and MS27103A).

Figure 1-1, "SpectraVision User Interface" is an example of the SpectraVision User Interface. It includes the measurement display and Device Setting panels on the right of the UI window. Depending on the mode selected, other panels or graphs will display under the measurement display. In this example it shows the 2-D and 3-D spectrogram of the measurement.

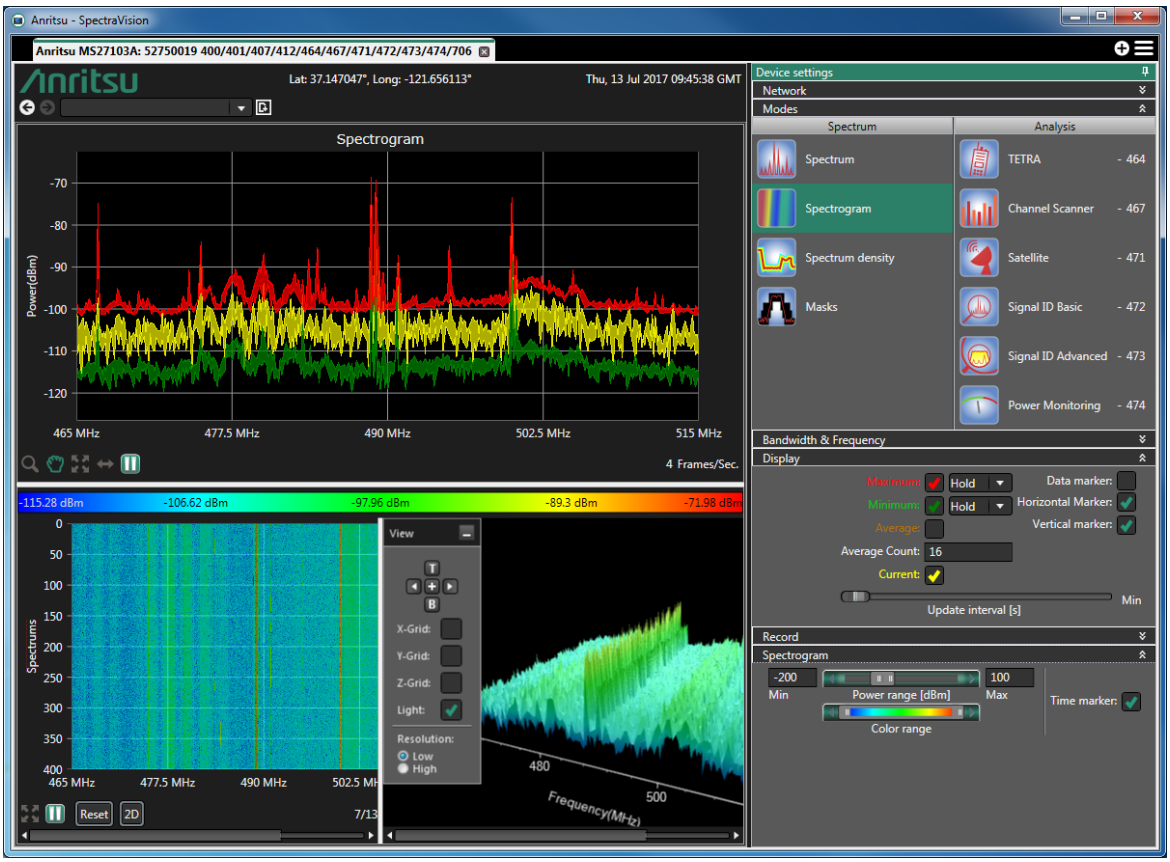


Figure 1-1. SpectraVision User Interface

1-2 System Requirements (minimum)

- Microsoft Windows 7 or Higher
- 1 GB of RAM
- 100 GB of hard-disk space
- Microsoft.Net Framework 4.5 or higher
- 800x600 screen resolution

1-3 Graphical User Interface

The main window is divided up into multiple displays, setup panels, and a status bar. Main options and application controls for SpectraVision are found in the Device Settings panels in the right section of the display. Expand a panel by clicking on the title bar to configure software settings, select a particular measurement mode, access advanced functionality, search for monitors by name and filter the monitor list based on various criteria options.

After connecting to a device in the Network Panel, its signal is displayed in the main window and its device name in the tab above the main display. When connected to multiple devices, each tab displays the name of the device connected that it is connected to. The active tab is highlighted white and the inactive tabs gray. See Figure 1-1, “SpectraVision User Interface”.

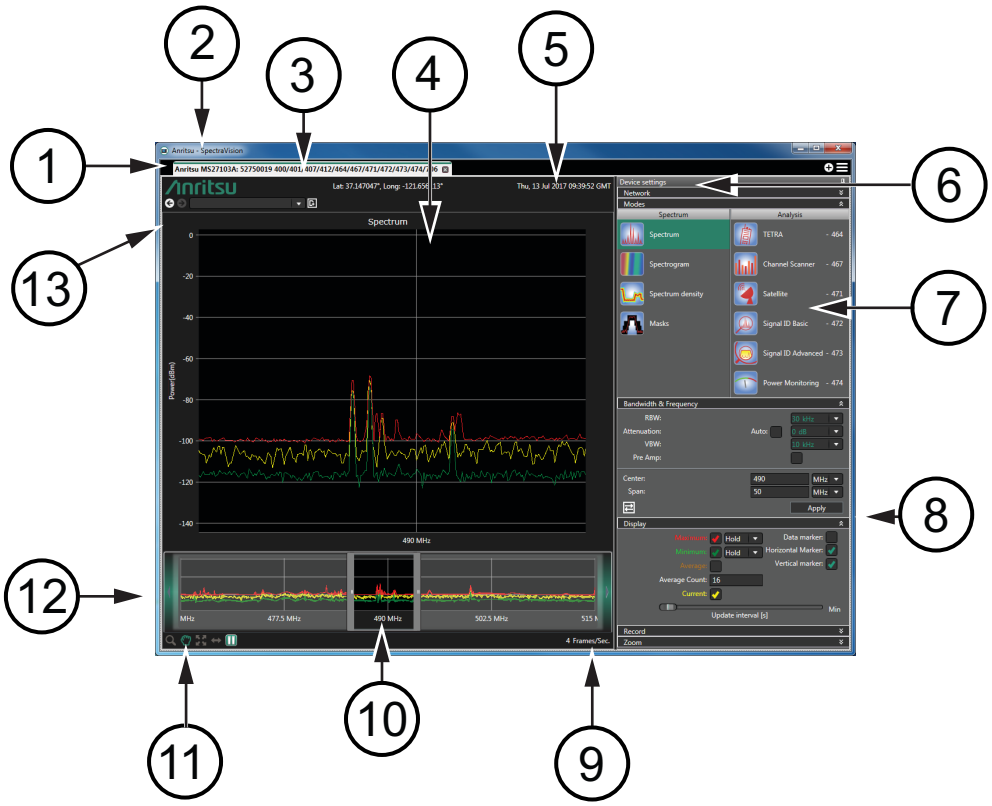


Figure 1-2. Graphical User Interface Section Labels

Table 1-1. Network Panel Components

Number	Title	Number	Title
1	Active Measurement Tabs	**8**	Setup Panels
2	Title Bar	**9**	Frames/Second Status
3	Live Measurement	**10**	Zoom Window
4	Main Display	**11**	Chart Controls
5	Longitude/Latitude and Date/Time Status	**12**	Full Span Window
6	Device Settings	**13**	Settings File Display and Save Settings Button
7	Mode Panel		

There is a feature to automatically hide the setup panels. This allows you to view the main window the full length of the program window. The pin at the right of the Device settings bar allows you to lock the setup panels to always be in view or to hide when not in use. The pin will be positioned vertically when the setup panels are locked in view. Click the pin so that it positions horizontally. The setup panels will automatically hide from view when not in use. To return the panels back into view, click the **Device** settings label on the vertical bar.

1-4 Network Panel

The Network panel contains parameters for selecting and setting up communication to the measurement device.

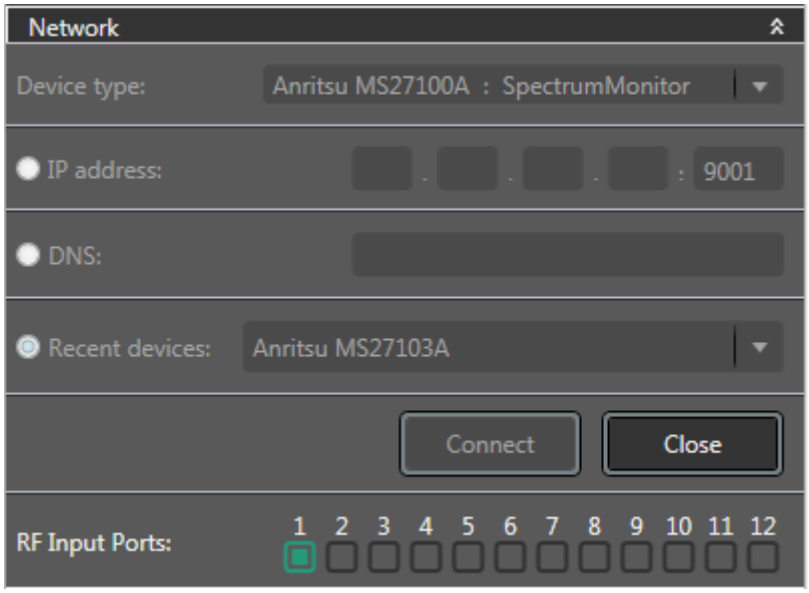


Figure 1-3. Network Panel

Table 1-2. Network Panel Components

Component	Definition
Device Type	The spectrum monitor model used. Also listed are several demonstration signals that can be used to illustrate SpectraVision capabilities.
IP address	The numerical label assigned to the instrument connected to the network. For Anritsu spectrum monitors, 9001 should be used for the port address.
DNS	The name of the instrument connected to network.
Recent Devices	A pull down list of recently used spectrum monitors or demonstration signals.
Connect Button	Initiates communication to the device selected.
Close Button	Disconnects SpectraVision from the spectrum monitor. The application window is cleared.
RF Input Ports	Displays the number of RF input ports used on an MS2710xA spectrum monitor.

1-5 Modes Panel

SpectraVision monitoring modes. See Modes Panel in Figure 1-1, “SpectraVision User Interface”.

Table 1-3. Mode Panel Components

Component	Definition
Spectrum	Monitor the spectral density of any spectrum analyzer input signal.
Spectrogram	Monitors the power spectral density of continuous spectrum over time.
Spectrum Density	Monitor time-varying and superimposed signals by capturing and analyzing continuous spectrums over time
Masks	Used to trigger alarms by defining a boundary in the spectrum.
TETRA Signal Analyzer (option 464)	Option mode for conducting measurements of TETRA signals.
Channel Scanner (option 467)	Optional mode for scanning and measuring user-settable frequency bands.
Satellite Signal Analyzer (option 471)	Option mode for conducting measurements of satellite signals.
Signal ID Basic (option 472)	Signal detection, processing, and identification.
Signal ID Advanced (option 473)	Finds interfering signals underneath satellite carriers.
Power Monitoring (option 474)	Monitor RF power of various sub bands in parallel over a certain amount of time.

1-6 Bandwidth & Frequency Panel

Bandwidth and Frequency setup parameters for the tests to be performed.

Table 1-4. Bandwidth and Frequency Components

Component	Definition
RBW	Set resolution bandwidth on the spectrum monitor.
Attenuation, Auto	Reduce large signals to levels that make best use of the monitor's dynamic range. When Auto is selected, as the reference level is increased the attenuation is increased.
VBW	Set video bandwidth on the spectrum monitor.
Pre Amp	Turn on the Pre Amp by clicking the check box. Click the check box again to turn off the Pre Amp.
Center	Center frequency selection.
Span	The frequency range of sampled spectrum in relation the center frequency.
	Switches between the Center and Span frequency setup parameters and Lower bound and Upper bound frequency setup parameters.
Lower bound	The low frequency setting of the sampled spectrum. Use this setting to manually set the lower frequency.
Upper bound	The high frequency setting of the sampled spectrum. Use this setting to manually set the upper frequency.
Apply	Sets the entered parameters.

1-7 Display Panel

Display Panel settings used in measurement modes setup

Table 1-5. Display Panel Components

Component	Definition
Maximum Hold/Rolling	The maximum power ever displayed per channel can be turned on/off. Trace is red. When 'Rolling' is selected, a rolling maximum average is displayed.
Minimum Hold/Rolling	The minimum power ever displayed per channel can be turned on/off. Trace is green. When 'Rolling' is selected, a rolling minimum average is displayed.
Average	The average power displayed per channel can be turned on/off.
Average Count	The number of traces used to determine Average.
Current	Turns on/off the active trace from view. By default, the box is checked.
Data Marker	Turns data markers on/off. When Data Marker is selected, the user can move the mouse across trace screen to observe amplitude and frequency points.
Horizontal Marker	Turns horizontal markers on/off. Place the mouse cursor on the trace display. Holding down the **Shift** key, click the left mouse button to set the marker at the desired position.Remove the line by holding **Shift** and clicking the right mouse button.
Vertical Marker	Turns vertical markers on/off. Hold down **Ctrl** and place the mouse cursor on the trace display. Click the left mouse button at the desired frequency. Remove the line by holding **Ctrl** key and clicking the right mouse button.
Update Interval(s)	The slider modifies the update rate of the spectrum displayed. This option becomes important if a low bandwidth connection is used and the monitoring overhead has to be minimized.

1-8 Record Panel

The recording measurements feature can be used in certain modes to store measurements over time or take simple snapshots of a window and store into the database. If both buttons are enabled the current mode is able to do recorded measurements or snap-shots. Not all modes support recorded measurements or snapshots being stored into the database. See also Chapter 11, “Measurement Management”. The following picture demonstrates one mode that has no Record Measurement feature:

Table 1-6. Record Panel Components

Component	Definition
Snapshot	Save an image of the current program window to either SpectraVision's own internal database or on to the PC/laptop being used.
Measurement	Record a trace measurement for a user-settable amount of time. Measurements are stored in SpectraVision's own internal database. Measurements can be played back as videos using the 'Records' feature.

Mode Dependant Panels

Below is a list of measurement modes where Snapshot is active and Measurement is inactive when selected:

- Spectrum Density
- Masks
- TETRA (464)
- Channel Scanner (467)
- Satellite (471)
- Signal ID Basic (472)
- Signal ID Advanced (473)

See also Table 11-1, “Record Functions per Mode” on page 11-1.

1-9 Additional Panels

Some of the measurement modes open additional settings panels:

Zoom (Spectrum Mode Only)

Enable the Zoom Window, located under the Main Display, by clicking the Window check box in the Zoom panel.

Figure 1-4. Zoom Window

Table 1-7. Zoom Panel Component

Component	Definition
Window	The zoom window allows for displaying a user-defined area of the spectrum chart. The left and right edge of the window can be dragged in order to change the window width. The Zoom window can be seen, in Figure 1-4 Zoom Window, underneath the main spectrum display.

Spectrogram

The Spectrogram Panel displays when the Spectrogram Mode is selected.

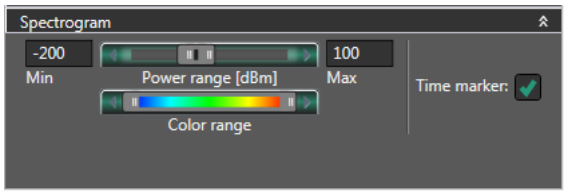


Figure 1-5. Spectrogram Panel

Table 1-8. Spectrogram Panel Components

Component	Definition
Power Range	Determines the minimum and maximum power values. Power values below the range are displayed in black. Power values above the range are displayed in the top most color. The double slider allows setting a user-defined minimum value and maximum value. Users may also enter minimum and maximum power values in the boxes next to the double slider.
Color Range	Defines which colors are mapped to the specified power range.
Time Marker	Allows you to place a Time Marker on the Spectrogram window. Placing two Time Markers will display a third time box with the difference between the two time markers.

Spectrum Density Panel (Spectrum Density)

Table 1-9. Spectrum Density Panel Components

Component	Definition
Memory Size	The number of spectrums considered in the spectral density increases the spectrum counter. If the counter exceeds the memory size, new spectra will account proportionally to the memory size. Hence, older events are lost over time.
Color Map	The color map assigns a color range to a range of occurrence probabilities in percentage for the captured power level values.

Mask (Mask)

Table 1-10. Mask Panel Component

Component	Definition
Mask Settings	Opens the Mask settings dialog to create a new mask or load a previously created mask. E-mail alerts can be sent based on mask threshold violations. The e-mail server must first be set up in SpectraVision to enable this feature.

1-10 Chart Controls

At the bottom of the trace display are five common and two optional chart tools.

Table 1-11. Chart Controls

Tools	Definition
	**Zoom tool:** Activates the zoom tool. Zoom windows are defined directly inside the chart by mouse left click hold down events.
	**Hand tool activation:** Enables the hand tool to navigate directly inside the chart by drag-and-drop mouse events. The frequency and reference level can be changed here.
	**Target:** Activates single carrier creation via chart. For use **only** in Signal ID Basic mode.
	**Fit to screen:** Reset the chart amplitude axis to default view.
	**Full span:** Will set the entire bandwidth (Fmin/Fmax) which is supported by the remote spectrum monitor device.
	**Freeze – Release:** Freezes the chart at a desired time instant. Releases the freeze conversely.
	**Detection Threshold:** Enables setting a horizontal threshold line for signal detection. For use in Tetra and Signal ID Basic modes.

1-11 Access to Multiple Devices

The SpectraVision software allows for simultaneously monitoring of multiple devices. Each device is added by clicking the plus sign above the Device Settings bar. A New Device window will open with the tab also titled New Device. Proceed to set up the new monitoring mode. The name of the device connected to will be updated in the window tab.

Chapter 2 — Spectrum Measurement

The spectrum measurement feature is used to monitor the power spectral density of any spectrum monitor input signal.

2-1 General Overview

Figure 2-1, "Spectrum Window" provides the spectrum mode display window with multiple setup panels open. Most of the functions described can only be used, if the user has the rights to control the remote spectrum monitor device.

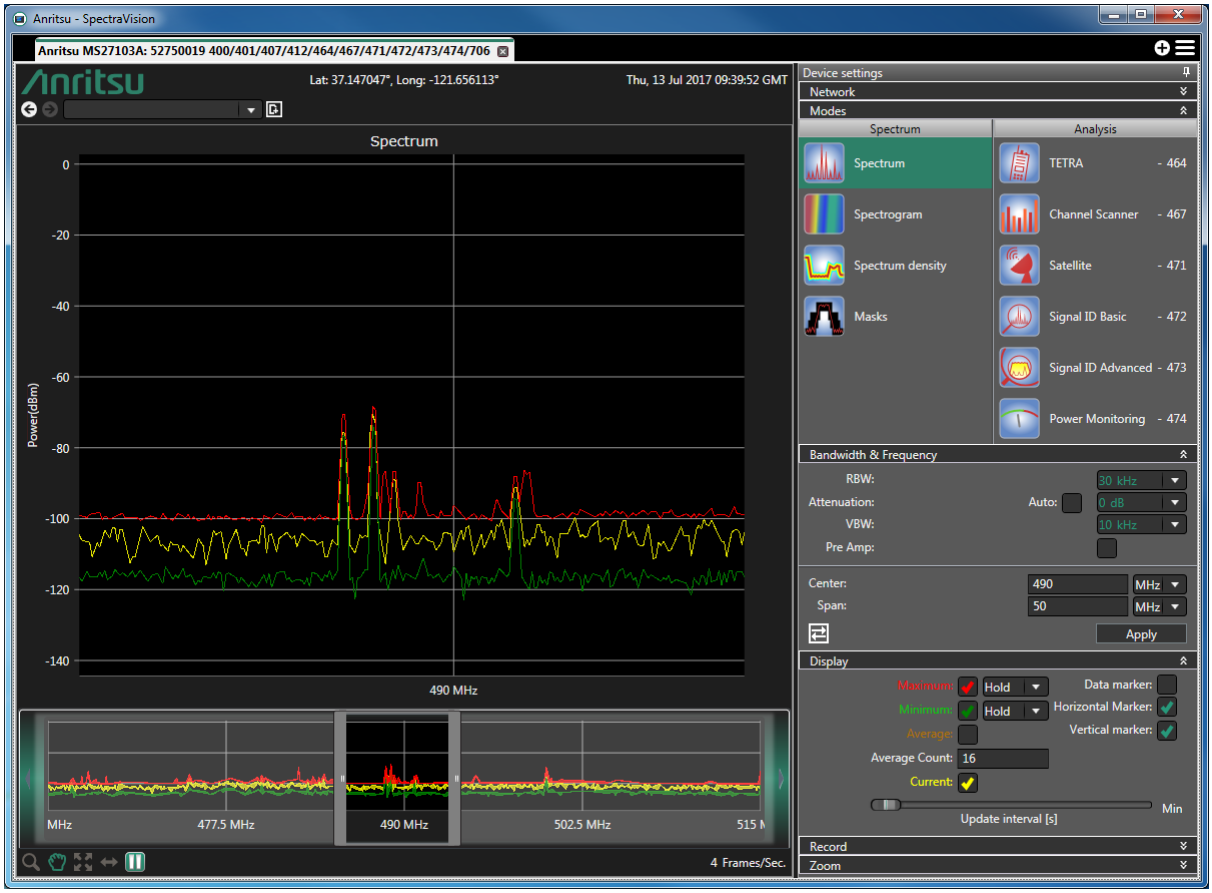


Figure 2-1. Spectrum Window

2-2 General Setup

Measurement Settings (Bandwidth & Frequency Panel)

Setup the bandwidth and frequency in the Bandwidth & Frequency panel. In the upper half of the panel are parameters related to the bandwidth of the signal being measured. The bottom half of the panel is for setting up frequency parameters. In the frequency section there is a button to switch the frequency parameters from Center and Span to Lower bound and Upper bound. Set these parameters as desired.

- **RBW**: Modifies the resolution bandwidth of the spectrum. The resolution bandwidth directly determines the number of samples per spectrum, i.e. the spectral distance between two adjacent samples in the spectrum.
- **Attenuation**: Reduces large signals to levels that make the best use of the spectrum monitor's dynamic range.
- **VBW**: Modifies the video bandwidth of the spectrum. The video bandwidth determines how many single spectrum sweeps are averaged for one single spectrum chart.
- **Pre Amp:** Toggles the Pre Amp On (if check-box checked) and OFF (if check-box unchecked).
- **Center:** The measurement center frequency.
- **Span:** Includes the center frequency and the upper and lower bandwidths.
- **Lower bound:** The lower frequency of the display.
- **Upper bound:** The upper frequency of the display.
- **Apply:** Updates the remote spectrum monitor settings accordingly.

Hold Settings (Display Panel)

- **Max Hold/Rolling**: The maximum power ever displayed per channel can be turned on/off. Trace is red. When 'Rolling' is selected, a rolling maximum average is displayed.
- **Min Hold/Rolling**: The minimum power ever displayed per channel can be turned on/off. Trace is green. When 'Rolling' is selected, a rolling minimum average is displayed.
- **Average**: The average power displayed per channel can be turned on/off.
- **Average Count**: The number of traces used to determine Average.
- **Current**: Turns on/off the active trace from view. Default, the box is checked.
- **Update interval(s)**: The slider modifies the update rate of the spectrum displayed. This option becomes important if a low bandwidth connection is used and the monitoring overhead has to be minimized.

Marker Settings (Display Panel)

- **Data marker**: Turns data markers on/off. When the data marker is enabled, users can move their mouse across the spectrum screen. The amplitude level and frequency is displayed accordingly.
- **Vertical marker**: Turns vertical markers on/off. When the Vertical marker function is checked (enabled), users can hold down the <Ctrl> key while dragging the mouse over the spectrum screen. A vertical line will appear. Clicking the mouse will place a marker on screen. Unchecking the vertical marker selection will remove markers from the spectrum display. Remove the line by holding <Ctrl> key and clicking the right mouse button.
- **Horizontal marker**: Turns horizontal markers on/off. When the Horizontal marker function is checked (enabled), users can hold down the <Shift> key while dragging the mouse over the spectrum screen. A Horizontal line will appear. Clicking the mouse will place a marker on screen. Unchecking the Horizontal marker selection will remove markers from the spectrum display. Markers can be removed by holding <Shift> and clicking the right mouse button.

Record Panel Settings

See also Section 11-1 “Recording Measurements” on page 11-1.

- **Snapshot**: Take a snapshot as a picture to save either in SpectraVision's own internal database or on to the PC/laptop being used. If saved in the database, review the snapshot in the records section.
- **Measurement**: Take measurements over a certain period of time and review it in the record section again. Measurements are taken for the time duration as specified by the user. The format of the file saved is *.dat. Measurements play back as a video in the SpectraVision main window.

Playback

- To review either a snapshot or measurement, click on the three horizontal lines located at the top right of the SpectraVision window. Select records. A window with then pop up allowing either snapshots or measurements (as videos) to be reviewed.

Zoom Panel Setting

Clicking the **Window** check box will activate the zoom window below the spectrum chart. The zoom window allows for displaying a user-defined area of the spectrum chart. The left and right edge of the window can be dragged in order to change the window width. By clicking in the window and dragging it, its position can be shifted. In Section1-9 Additional Panels, see “Zoom (Spectrum Mode Only)” on page 1-9.

Spectrum Scale Adjustment

The amplitude and frequency spectrum scale can be adjusted to narrow or widen the range of signal monitoring.

- Adjust the y-axis power values by placing the cursor over the y-axis numbers and rolling the mouse wheel forward or backward to attain the desired scale.
- Adjust the x-axis frequency values by placing the cursor over the x-axis numbers and rolling the mouse wheel forward or backward to attain the desired scale.
- The measurement can be moved into view by placing the cursor in the spectrum display, hold down the left mouse button, and move the display up or down into view.
- Hold CTRL and use the mouse-wheel to zoom into the chart.
- Use Maximum-Hold + Auto-Fit for bursty signals.
- Auto-fit

Chart Controls

See “Chart Controls” on page 1-11

2-3 Reference Level Sensitivity Control

Weak input signals can be displayed only if the RF Gain control is set to the minimum. If the RF gain step is set too high, weak signals are superposed by amplified noise of the RF stage. A measurement of FM signals recorded at lowest gain step is depicted in Figure 2-2, “FM Spectrum High Reference Level”. Every carrier is received with a 30 dB signal to noise ratio. If the reference level is set too high, the signal to noise ratio is significantly reduced. Figure 2-2 is also an example of the reference level setting being set too high for the signal displayed.

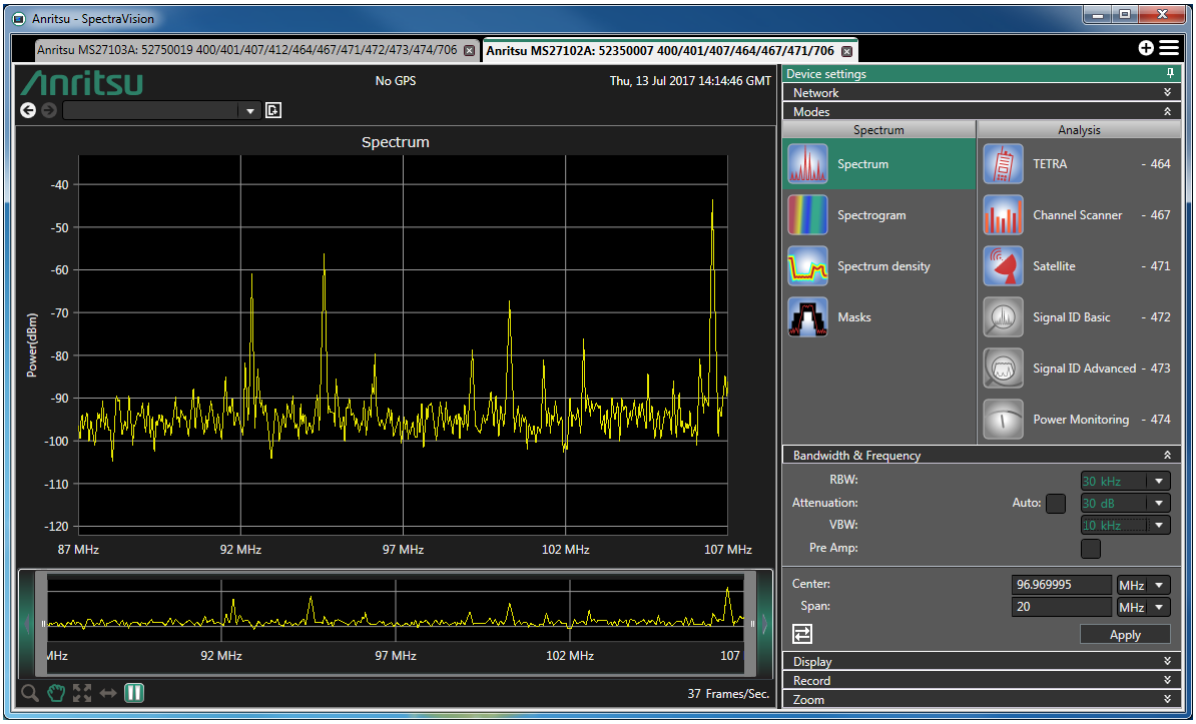


Figure 2-2. FM Spectrum High Reference Level

2-4 Spectrum Smoothing

Spectrum averaging can be used to clearly distinguish between any artificial signal and spectrally flat thermal noise. The averaging value can be adjusted using the video bandwidth (VBW).

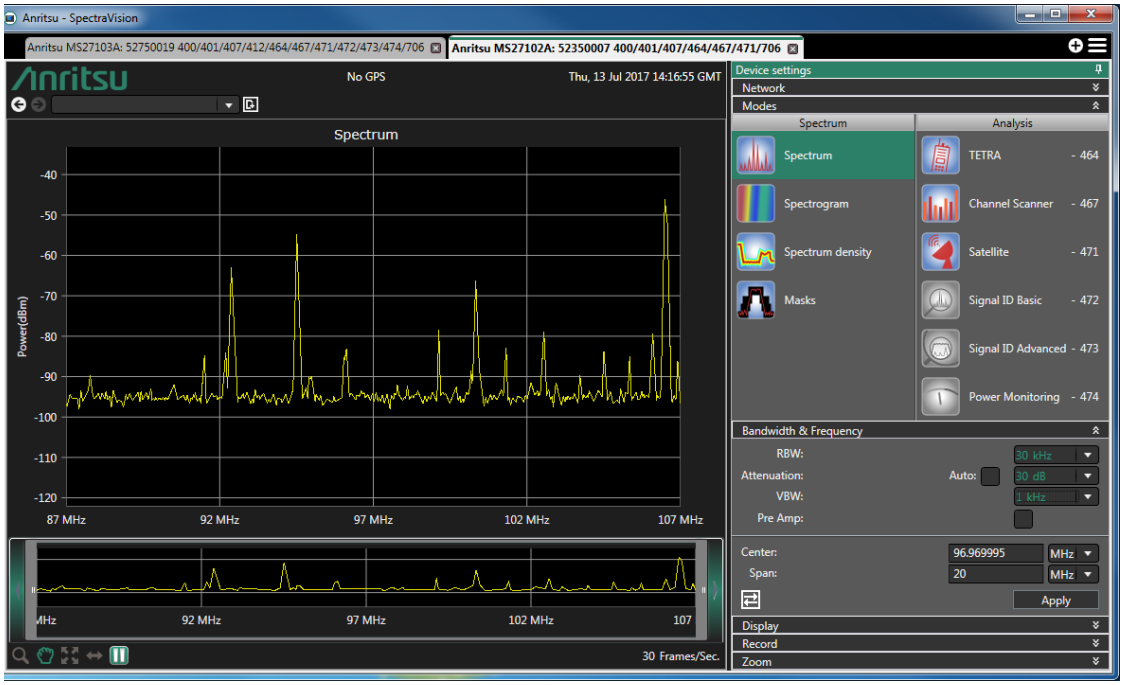


Figure 2-3. FM Spectrum Smoothing Using VBW Settings

2-5 Min/Max Hold Display Functions

In a highly volatile spectrum, the range between minimum and maximum power spectral density can be of great importance. The max and min hold function can be used to visualize this range as depicted in Figure 2-4, “Example of Min/Max Envelope”.

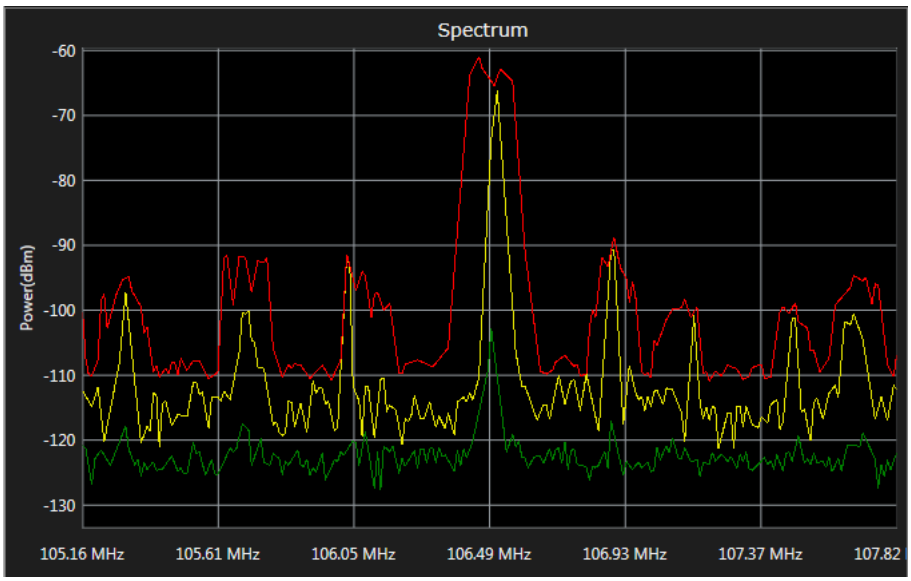


Figure 2-4. Example of Min/Max Envelope

2-6 Marker Settings

One can use the hand tool to quickly adjust the spectrum limits by clicking and holding down the left mouse button while moving the mouse pointer. The hand tool icon is located at the bottom of the display and highlighted in green when active. Holding down the button results in the center frequency being highlighted as a red vertical line in order to allow accurate adjustment of the spectrum as depicted in Figure 2-5, “Drag and Drop Spectrum Browsing Using Center Frequency Marker”.

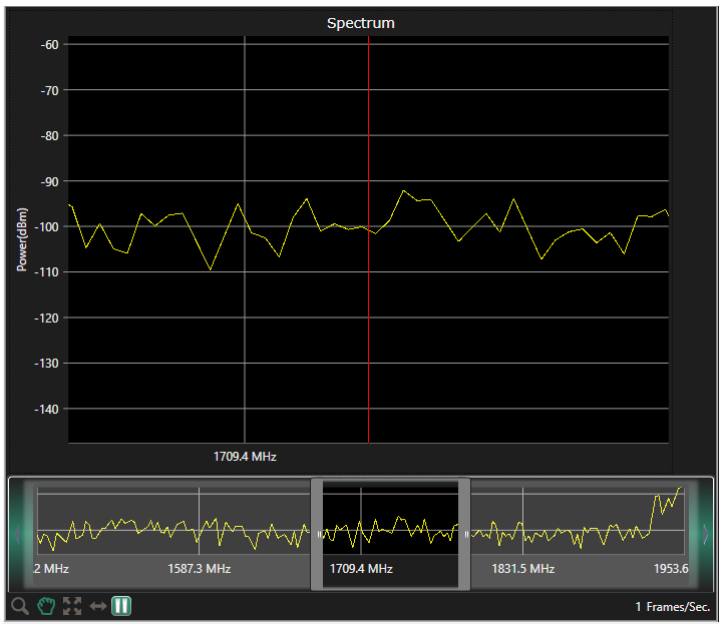


Figure 2-5. Drag and Drop Spectrum Browsing Using Center Frequency Marker

Zooming can be done either by using the mouse wheel along with pressing the “**Ctrl**” key or by the adjusting the Zoom Tool Locater.

Mouse wheel zoom inside the spectrum chart will affect frequency and power axis scaling simultaneously. Conversely mouse wheel zoom can be done for either of the axes if the mouse pointer is directly set on the axis.

The zoom tool can be used by clicking on the zoom icon below the spectrum chart. Clicking and holding the left mouse button in the chart area allows defining a zoom area. Releasing the mouse button activates the new spectrum settings. By clicking the **Hand Tool** icon, the Zoom Tool is deactivated.

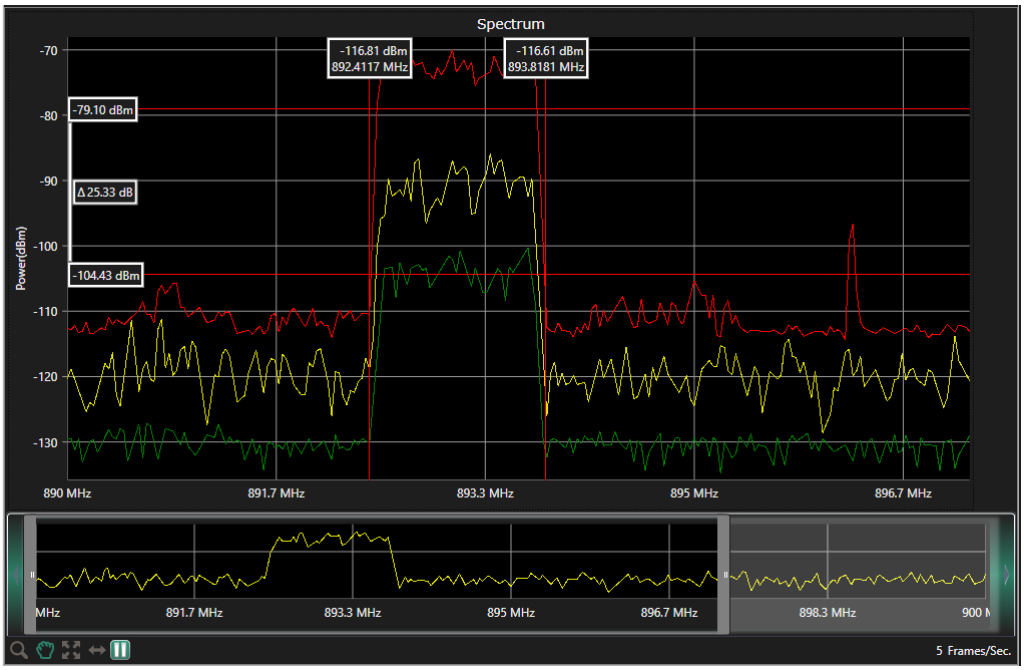


Figure 2-6. Horizontal and Vertical Markers

For an instant power measurement between distinct frequencies in the spectrum, one can use the vertical marker function (see Figure 2-6, “Horizontal and Vertical Markers”). Vertical markers can be set by pressing and holding the **Ctrl** key while moving the mouse pointer to the desired frequency in the spectrum window. A left click will drop the marker to its final position.

A second marker can be added in the same way in order to calculate the power between the region indicated by the two markers in the spectrum. Pressing the right mouse button, while having the “Ctrl” key pressed, erases all vertical markers.

The spectrum chart provides zoom functionality which can be activated by holding down the **Ctrl** key while moving the mouse wheel. One can also set horizontal markers in order to display power thresholds by keeping the “Shift” key pressed and moving the mouse to the desired position. Clicking the left mouse button fixes the marker position. Additional markers can be placed by repeating this procedure. Clicking the right mouse button along with the “Shift” key erases all horizontal markers.

2-7 Masks

The Masks feature is used to trigger alarms by defining a certain mask in the spectrum. This can be done by various types of masks. After defining and activating a mask it will recognize every hit by the spectrum and fire the alarm.

General Functions

The following screen provides the masks mode working pane.

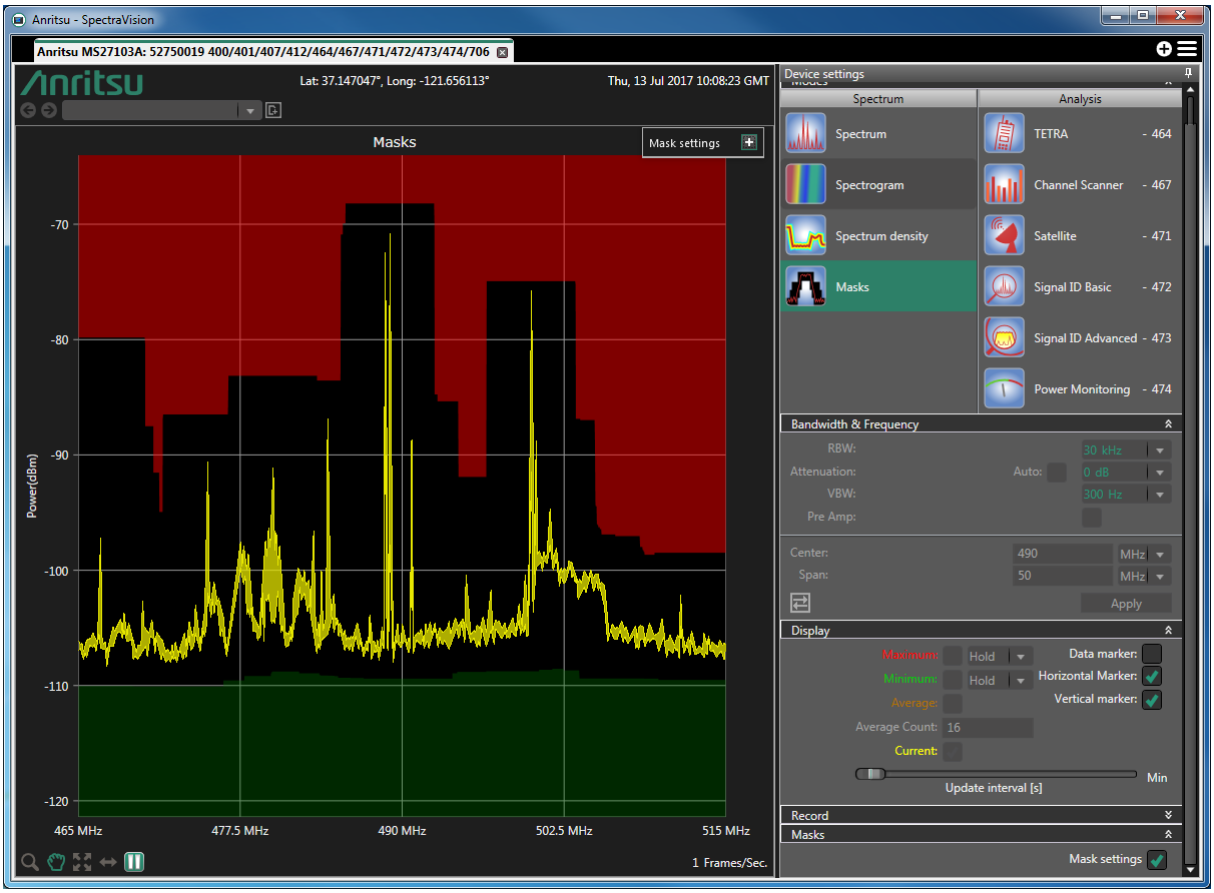


Figure 2-7. Mask Mode

Spectrum Settings

The spectrum settings are the same as in the spectrum mode. (See Section 2-2 “General Setup”). Only the reference level of the device can be changed here.)

Enable Mask Settings

- If enabled, you can add, delete or modify masks but cannot modify device settings.
- If disabled, you are able to modify device settings but cannot add, delete or modify masks.

Mask Settings

This window maintains the masks. It can be dragged around or minimized.

Spectrum Chart Controls

The spectrum chart controls are the same as in the spectrum mode.

Adding New Masks

For defining new masks, enable the mask settings and select the **New** tab. Figure 2-8, "Adding a New Mask" shows the resulting view.

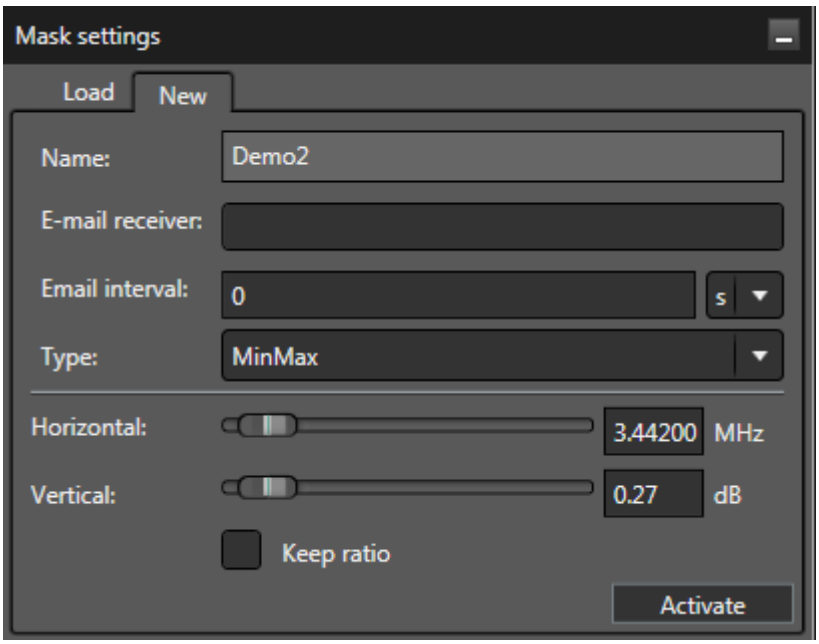


Figure 2-8. Adding a New Mask

First, define the name of the mask. The email address(es) of the people to be notified in the event of a mask violation can be entered in the E-mail receiver box. If you enter a number greater than "0" in the "Email interval" field, you will get a new notification email if a new violation was triggered after this interval.

To use the email feature, an email server will first need to be set up. See "Setting Up Email Server" on page 2-10.

If you change the mask type you will see the changes in the chart as shown in Figure 2-9, "Mask Changes Directly by Changing Settings".

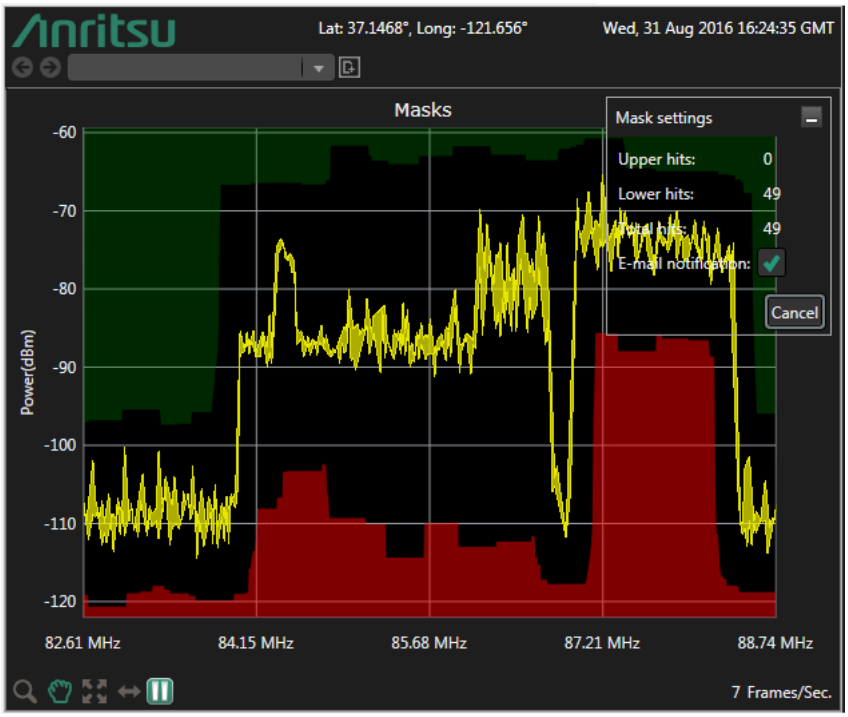


Figure 2-9. Mask Changes Directly by Changing Settings

Setting Up Email Server

Make sure that you have set up the E-Mail Server settings before enabling the E-Mail notification feature.

1. Click the **three horizontal bars** in the top right corner of the SpectraVision Window.
2. Click **Notifications**. The setup panel for the email server opens on the left or the SpectraVision Window.
3. Fill in the setup parameters for the email server. Consult with your IT administrator if you have questions regarding this setup.

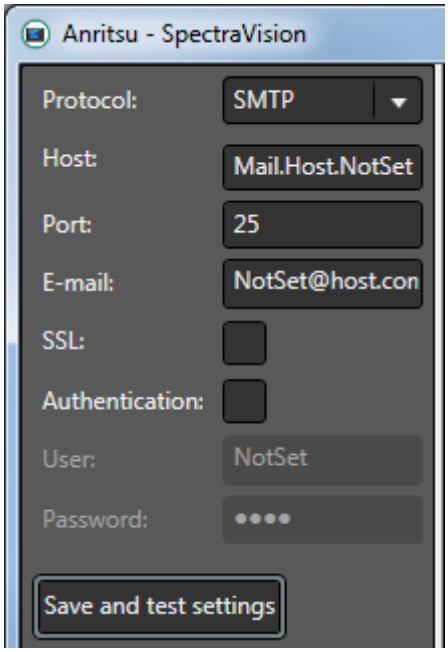


Figure 2-10. Set E-mail Notification Settings

By activating the mask it will be stored into the database. From now on, you will be notified in the event of a mask violation.

The green mask areas indicate that the system is working properly (Figure 2-11, "Green Masks Indicate No Violations"). The mask settings window is then replaced by the statistics window, containing the mask violations counter.

If a signal violates the mask, the corresponding mask turns red as shown in Figure 2-12, "The Lower Mask was Violated; Measurement Continues". An email notification will be sent. If you want to reactivate the mask you must reset the current alarm and activate the mask again.

Loading a mask changes the settings of the device, because the mask settings include the device settings.

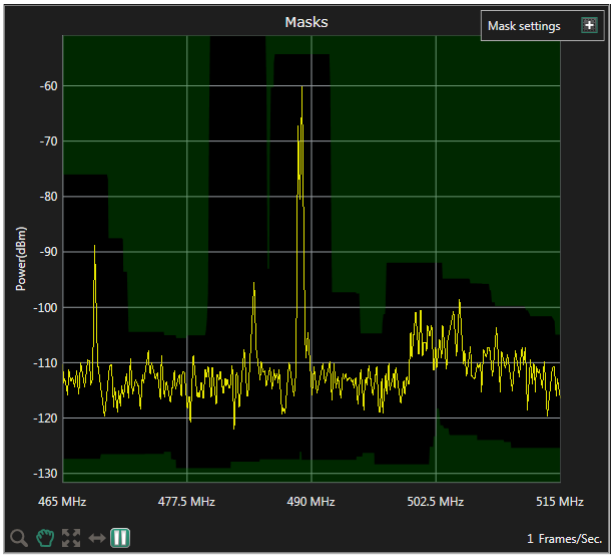


Figure 2-11. Green Masks Indicate No Violations

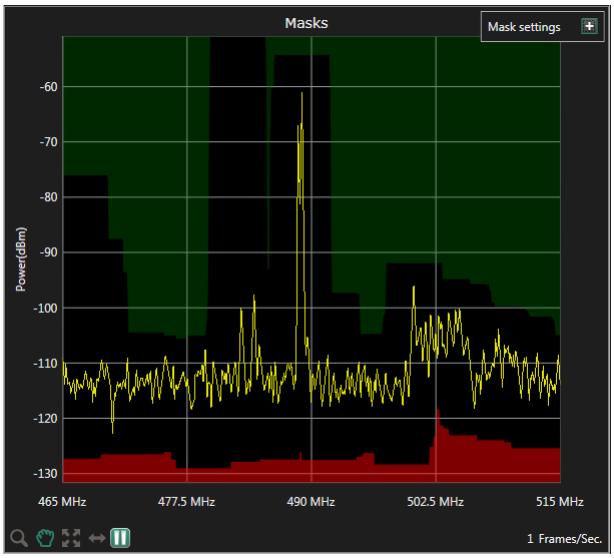


Figure 2-12. The Lower Mask was Violated; Measurement Continues

Chapter 3 — Spectrogram Measurement

The spectrogram measurement feature is used to monitor the power spectral density of continuous spectrums over time. It is suited to visualize and analyze time-varying spectral activity. Communication standards, based on frequency division multiple access (FDMA) and time division multiple access (TDMA) techniques, can be analyzed through a spectrogram. In the spectrogram chart, the horizontal axis shows the frequency (FFT points) and the vertical axis represents the time (duration). Each line in the chart defines a time frame. Therein, the power levels at the frequencies are drawn using a pre-defined color range. That means each color defines a certain power level. A spectrogram starts with an empty pane and the topmost line is always the latest spectrum. As the measuring advances, the pane is continuously filled with the colored power levels of the time frames. In case there is no empty line left, the eldest time frame is discarded.

A maximum level of color details should be displayed in a spectrogram. This requires an adequate, user-defined mapping of a color range to a targeted power range.

3-1 General Overview

The following screen provides the spectrogram mode working pane.

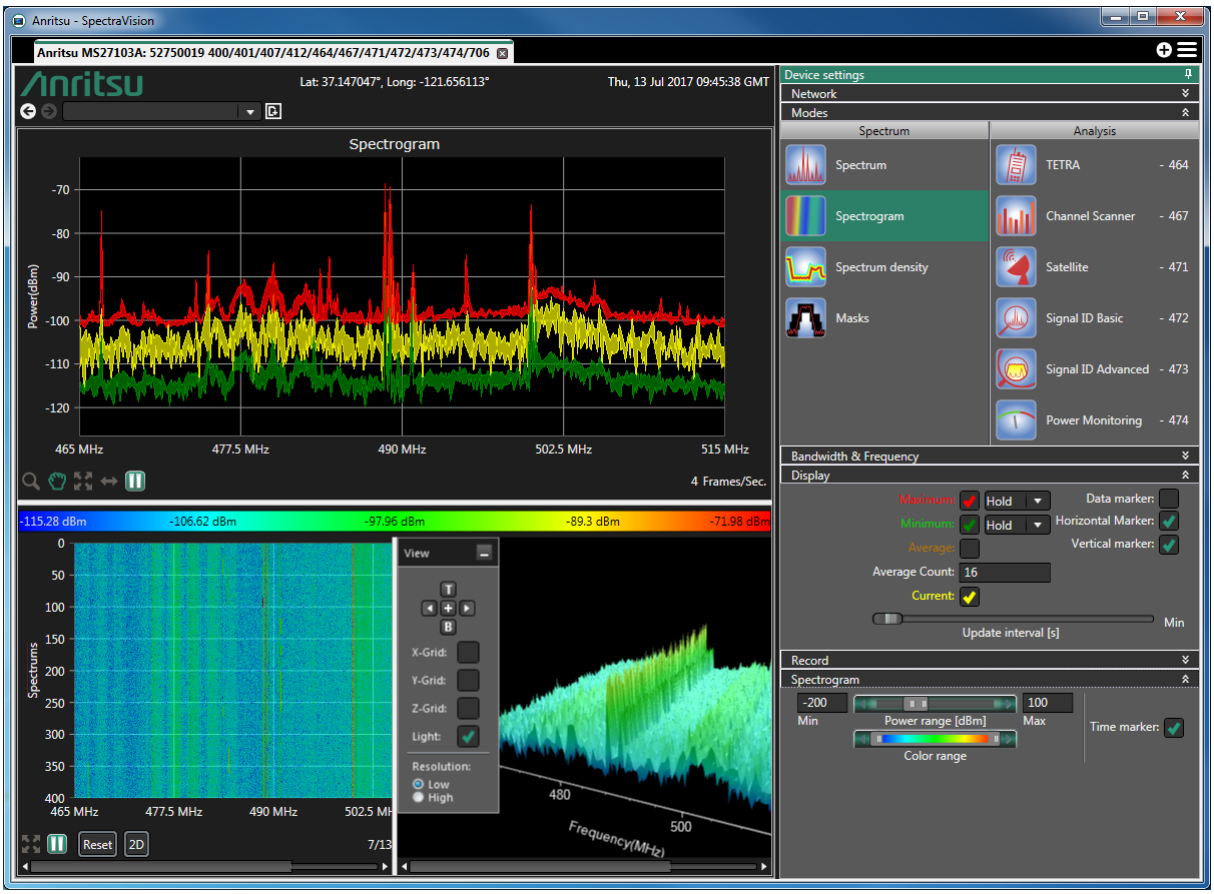


Figure 3-1. Spectrogram Window

Spectrum Settings

The spectrum settings are the same as in the spectrum mode (See Section 2-2 “General Setup”)

Spectrogram Panel Settings

When clicking on the **Spectrogram** icon in the Modes menu, a new Spectrogram tab appears at the bottom right side of the display window.

- **Power range (dBm)**: Determines the minimum and maximum power values. Power values below the range are displayed in black. Power values above the range are displayed in the topmost color. The double slider allows setting a user-defined minimum value and maximum value.
- **Color range**: Color range: defines which colors are mapped to the specified power range.
- **Time marker**: Activates time markers in the spectrogram chart. A marker is set by a left mouse click while holding down the “Shift” key.
- **Delta Time marker**: A Delta time marker can be displayed in the spectrogram window. Set the first marker by holding down the shift key and click the left mouse button. Then move to the second point while continuing to hold down the shift key. With another left mouse click, apply the second marker. A 'delta' marker will then be positioned between the two markers.

Spectrum Chart

You can scroll/browse through the spectrum using the mouse by simply dragging a displayed spectrum chart.

Color Map Bar

The color map is displayed according to the current spectrogram settings. It shows the color values assigned to the specified power range.

Spectrogram

The spectrogram chart is filled from top to bottom where the bottommost line represents the eldest time frame. You can browse through the time frames of a spectrogram by holding down the **Shift** key and rolling mouse over the spectrogram. In the spectrogram, the selected time frame is highlighted as red line. The time difference between two spectrums can be measured using two time markers inserted by holding down the “Shift” key and a left mouse click on each time frame.

Spectrum and Spectrogram Controls

- The 'Fit Visible Area' (4 arrows icon under the spectrogram chart) will adjust colors for the spectrogram.
- The two double vertical line icon starts/stops the spectrogram measurement.
- Reset: resets the spectrogram and starts drawing a new chart.

Switching to 3D

After clicking the **3D** button, a 3D representation of the spectrogram will appear to the right shown in Figure 3-2, "Spectrogram 2D & 3D View". Clicking on the **2D** button reverts back the window to a 2D-only display.

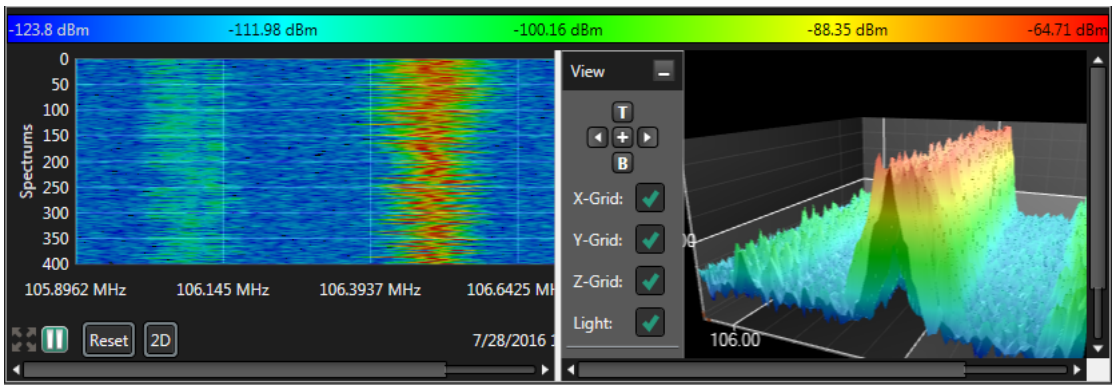


Figure 3-2. Spectrogram 2D & 3D View

3D Chart: 3D performance depends on the graphics performance of your PC/laptop. To enhance the performance, you can turn off the light or reduce the resolution. Zoom into the chart by scrolling the mouse wheel or move around by holding down the left mouse button.

As shown in Figure 3-2, "Spectrogram 2D & 3D View", users can select grid backgrounds for each dimension of the display. Other options include a high or low display resolution.

There are also view selections buttons that can be clicked for the corresponding displays of the 3D spectrogram.

- **T** - top
- **B** - bottom
- **<** - left
- **>** - right
- **+** - brings the 3D spectrogram back to its original view.

Chapter 4 — Spectrum Density

The spectrum density measurement feature is used to monitor time-varying and superimposed signals by capturing and analyzing continuous spectrums over time. Rare or superimposed events, which cannot be discovered using the ordinary Spectrum Measurement Mode, can be visualized in a spectrum density chart. Therein, the horizontal axis shows the frequency (FFT points) and the vertical axis represents the power level, which resembles the spectrum chart. In addition, the probability of an occurring power level at a certain frequency is displayed using a pre-defined color range. That means each color defines a certain probability of occurrence. The spectrum density is also called a spectral histogram.

Starting with an empty spectrum density, each event accounts for the histogram proportionally to the number of currently captured spectrums. When the spectrum counter reaches the user defined memory size, new events account proportionally to the memory size. Hence, elder events are lost over time by reducing their contribution to the histogram. In case a probability value reaches a certain threshold, the value in the spectrum will disappear from the screen. The disappearance is visualized as a “persistence” or “after glowing” effect.

The accuracy of a spectral density chart increases with the number of captured spectrums. Consequently, the progress of accuracy increase depends on the sweep time of the remote spectrum monitor, the network bandwidth, and network delay.

4-1 General Overview

The following screen provides the spectrum density mode working pane.

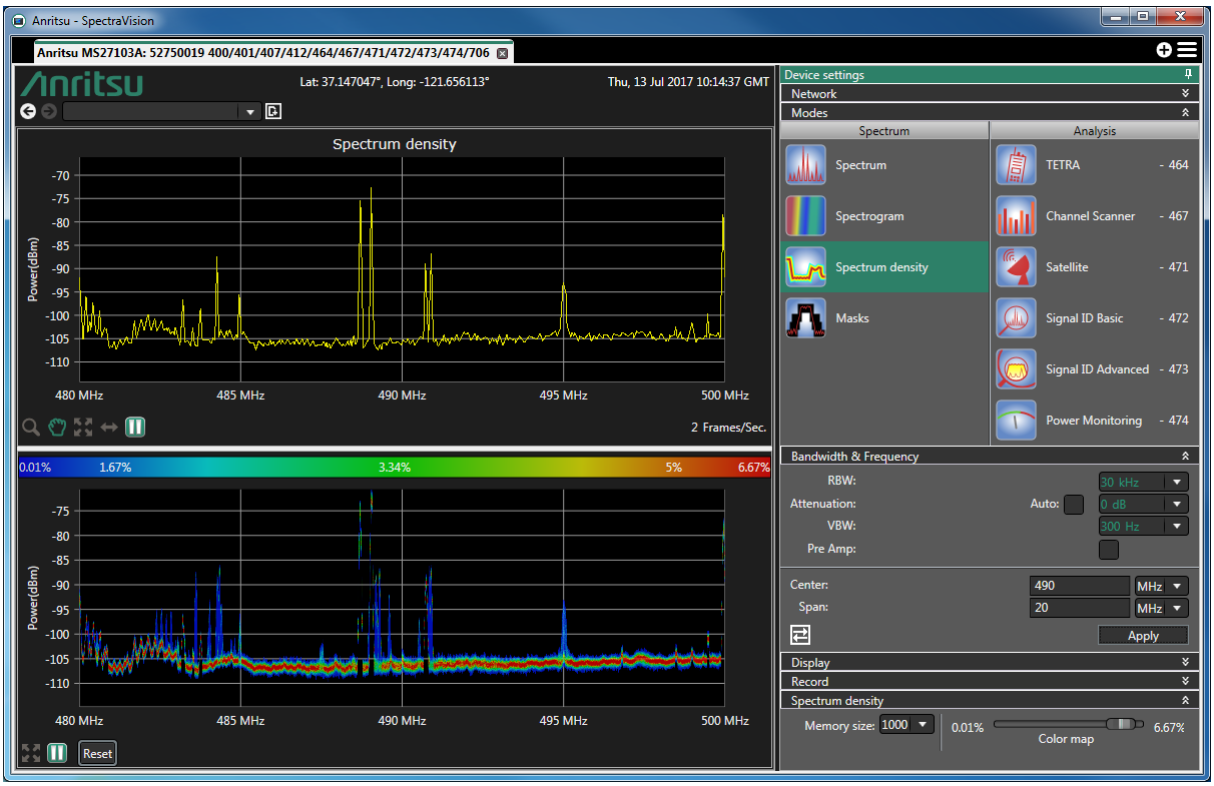


Figure 4-1. Spectrum Density Display

Spectrum Settings

The spectrum settings are the same as in the spectrum mode (See Section 2-2 “General Setup”). The following instructions are for creating maps used in setting the Spectrum Display parameters.

Click **Spectrum Density** in the Mode Panel. The Spectrum Density display opens and the Spectrum Density panel opens.

Spectrum Density Setup

The number of spectra considered in the spectra density increases the spectrum counter. If the counter exceeds the memory size, new spectra will be generated. Hence, elder events are lost over time.

The color map assigns a color range to a range of occurrence probabilities (given in percentage) for the captured power level values. By increasing the memory size, larger probabilities are also displayed. The level of color details will adapt automatically in the spectrum density chart.

Spectrum Chart

You can scroll/browse through the spectrum using the mouse by simply dragging a displayed spectrum chart.

Spectrum Chart Controls

The spectrum chart controls are the same as in the spectrum mode.

Color Map Bar

The color map is displayed according to the current setting. It shows the color values assigned to the specified occurrence probabilities in percentage.

Spectrum Density Chart

The quality of the occurrence probabilities improves for the power level values with an increasing number of captured spectrums. Starting with an empty pane, the level of color details will increase in a spectrum density chart over time until the memory size is reached. Then, a “persistence” or “after glowing” effect can be observed. The reason is that a probability value will disappear from the screen when it reaches a certain threshold. In addition, the coloring is strongly influenced by the chosen color map. You can scroll/browse through the spectrum density using the mouse by simply dragging a displayed chart.

Spectrum Density Chart Controls

- **Fit to screen:** Resets the frequency and amplitude axis according to the spectrum chart.
- **Reset**: Resets the spectrum density and starts drawing a new chart.
- **Continue/Pause:** Continue, default, continually collects trace data. Pause or freezes the chart at a desired time instant.

Note	Sporadic spectrum events, which last shorter than the sweep time of the remote spectrum monitor cannot be captured. Hence, such rare, time-varying signals are not covered using a spectrum density measurement.

Chapter 5 — Channel Scanner (Option 476)

The multi-channel power (MCP) measurement feature can be used to monitor the RF power of various sub bands (channels) in parallel. One complete set of channels is called a “service table”. The screen shot below depicts the default view of this software feature.

5-1 General Overview

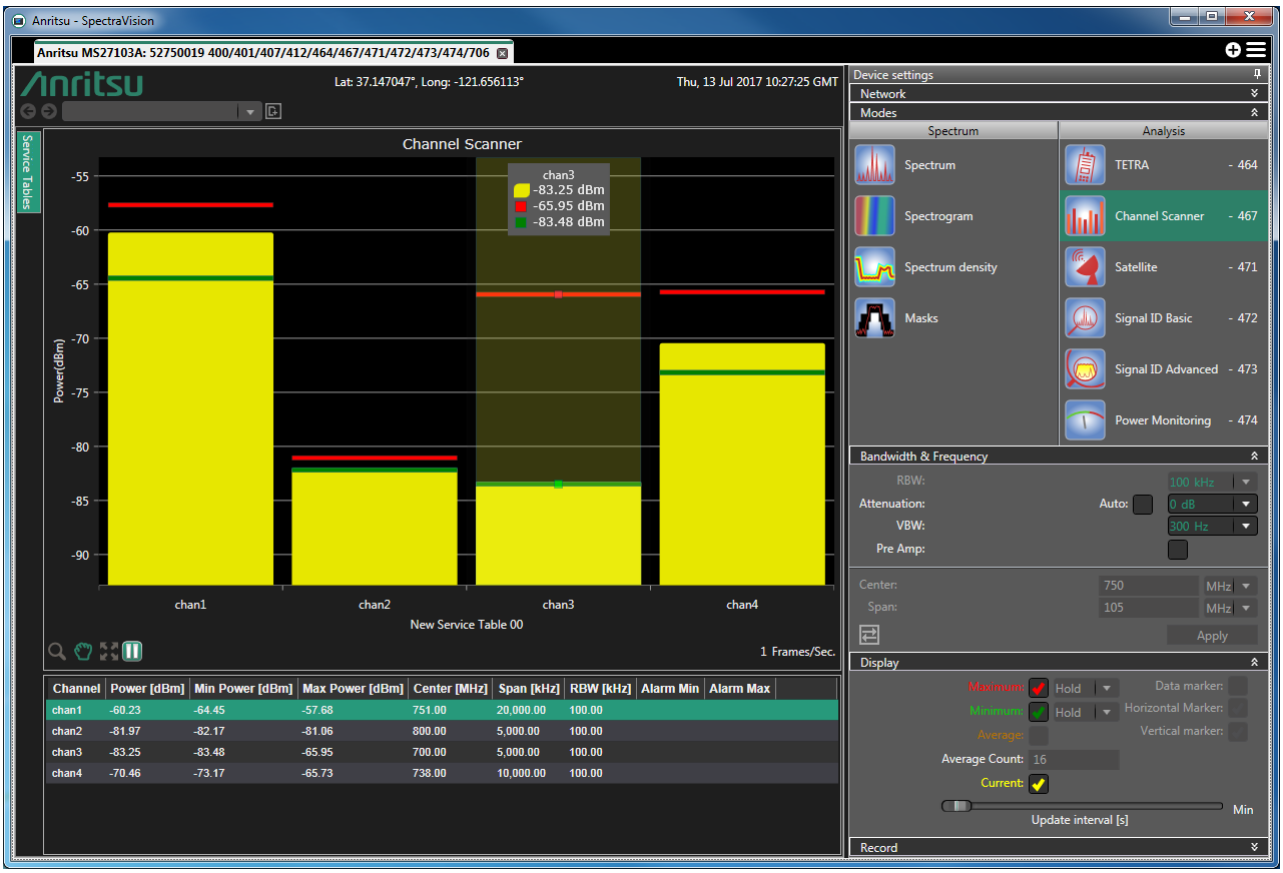


Figure 5-1. Channel Measurement

Spectrum Settings

The spectrum settings are the same as in the spectrum mode. (See Chapter 2, “General Setup”.

Multi-Channel Power Column Chart

Every channel’s power is displayed in this column chart. Tool tips provide the current power values per channel by hovering over it.

Power Table

The power table provides a live view of the measurement results per channel.

Service Table

At the sidebar of the mode (located near the top left part of the SpectraVision window), you can find the service table control panel. Click on the vertical **Service Tables** label to open the panel. Click anywhere else in the mode to close it again.

Figure 5-1, “Channel Measurement” shows the display setting along with the min/max hold value feature and a minimized power table.

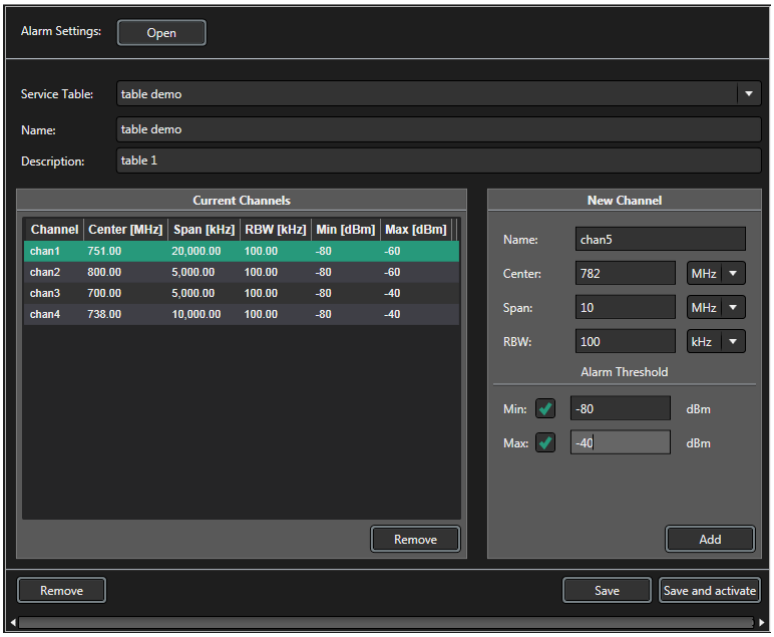


Figure 5-2. Channel Power’s Service Table

5-2 Creating New Service Tables

A new service table can be defined by using the “Service Table” panel as depicted in Figure 5-2, “Channel Power’s Service Table”.

Every previously created service table is listed in the Service Table dropdown list. Select “**New Service Table**” to create a new service table.

The name of the service table has to be defined first. The description can be entered as well. The channels are defined by using the subsequent fields containing a channel name, center frequency, bandwidth and resolution bandwidth. After clicking **Add**, the current defined channel will be stored in the list “Current Channels”. A new table can only be stored if at least one channel is defined.

Maximum and Minimum values can also be set here. These values are used in conjunction with the alarm feature. Alarms can be generated if the channel power measured in a given band exceeds either the maximum or minimum thresholds set.

By clicking **Save and activate** the current service table is stored into the database and is available for measurement. Recall a previously saved file by clicking the **Service Table** label and then selecting a table from the Service Table dropdown list. Finally, press the **Save and activate** button.

At the top of the Service Table is a button to open the Alarm Settings. If a MAX or MIN threshold was set for an individual channel, the alarm function needs to be activated in the Alarm Settings box.

Alarm Settings

Alarms can be set for each channel entered. This allows you to receive an email notification that a channel threshold has been violated.

After entering the parameters for a New Channel, enter Min and Max threshold values for that channel and click their respective checkbox. At the top of the Service Table window is the label **Alarm Settings** and next to it a button labeled Open. Click **Open** and the Alarm Settings window displays. Check the **E-mail notification** checkbox. Enter an email address for the E-mail receiver and click **Activate**. Press **OK** when done.

If a MAX or MIN threshold value has been set and alarms have been activated, the date and time for any alarm trigger will be shown in the table summary shown below the channel scanner.

Chapter 6 — Signal Analysis: Satellite (Option 471)

The signal analysis is split into a detection phase and a subsequent identification phase. Both phases use digital signal processing algorithms including frequency and time domain transformations. The results are estimates of the center frequencies and bandwidths of both detected carriers and identified carriers. For the latter, several statistics, such as C/N, constellation diagram, etc. will be provided.

6-1 General Overview

The Satellite signal analysis mode is organized into three sections: Satellite signals, Signal Parameters, and Identification Results.

Figure 6-1. Satellite Mode Display

Spectrum Settings

The spectrum settings are the same as in the spectrum mode. (See Section 2-2 “General Setup”)

Detection, Identification and Analysis of Satellite Signals

The Satellite Signal Analysis option is both a scanner and signal analysis tool. This option allows the user to perform demodulation analysis on these types of satellite signals:

- DVB-S1
- DVB-S2
- IESS

Demodulation parameters such as data rates, modulation/coding schemes, SNR, MER, EVM, etc can be quickly provided on a satellite signal of interest. A unique feature of the analysis feature is the recording of important signal parameters as a moving average over time. Measurements such as MER and EVM are evaluated for trends. In this way, any developing degradation of the signal can be evaluated before it becomes a major problem.

After a certain frequency is scanned, the satellite signal of interest can be evaluated. In the 'Signal Parameters' window, select the type of signal to be analyzed: DVB-S1, DVB-S2 or IESS. Then enter the center frequency and bandwidth. Currently, SpectraVision limits the bandwidth of signals to be analyzed to a maximum of 20 MHz. Click on 'Start' to start the measurement.

One can add a horizontal threshold for Satellite signals to be captured by holding **shift** and left-clicking the mouse at the power level desired. Signals which fall below this threshold will not be identified. Remove the horizontal line by holding **Shift** and clicking the right mouse button. If a horizontal line is not placed, the scan will then identify all active Satellite signals regardless of amplitude.

To create a PDF or CSV file reporting the results of your scan, click on the 'Export' button located at the bottom right of the 'Signal Parameters' window.

Alarms

Located at the bottom of the Signal Parameters window is an **Alarm** button. The Alarm button will enable an alarm setup to be configured. If an email server is specified, an email alert will be automatically sent to a specified user. Alarms can be set according to the following parameters:

- **EVM** - alarm set when Error Vector Magnitude falls below a certain user-settable threshold.
- **SNR** - alarm set when Signal-to-Noise Ratio falls below a certain user-settable threshold.
- **MER** - alarm set when Modulation Error Ratio falls below a certain user-settable threshold.

The threshold is entered in the 'Alarm Settings' window. If desired, a delay can be entered to avoid alarming when a threshold is violated only for a short time. An 'Alarm Delay' value can be entered by the user. See Figure 6-2, "Satellite Alarm Settings Window Showing Alarm Parameter Options". The left window displays the Parameter list with SNR highlighted. The right window displays SNR as the Parameter alarm selected.

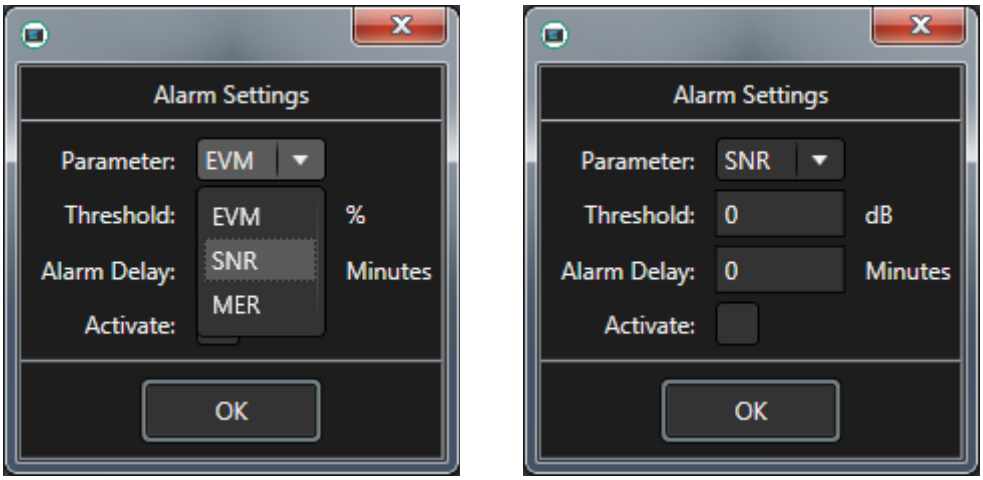


Figure 6-2. Satellite Alarm Settings Window Showing Alarm Parameter Options

Chapter 7 — Signal Analysis: TETRA (Option 464)

The signal analysis is split into a scanning, detection and identification phase. Both phases use digital signal processing algorithms including frequency and time domain transformations. The results are estimates of the center frequencies and bandwidths of both detected carriers and identified carriers. For the latter, several statistics, such as C/N, constellation diagram, etc. will be provided.

7-1 General Overview

The TETRA signal analysis mode is organized into multiple sections: TETRA signals, Channel Presets, Identification, Identification Results, and Identification Results (Carrier) Overview.

Figure 7-1. Tetra Mode Display

Spectrum Settings

The spectrum settings are the same as in the spectrum mode. (See Section 2-2 “General Setup”.)

Detection, Identification and Analysis of TETRA Signals

There are five main windows in the TETRA mode display:

- Spectrum
- Channel Presets
- Identification
- Identification Results
- Identification Results (Carrier) Overview

Figure 7-2. TETRA Mode Display

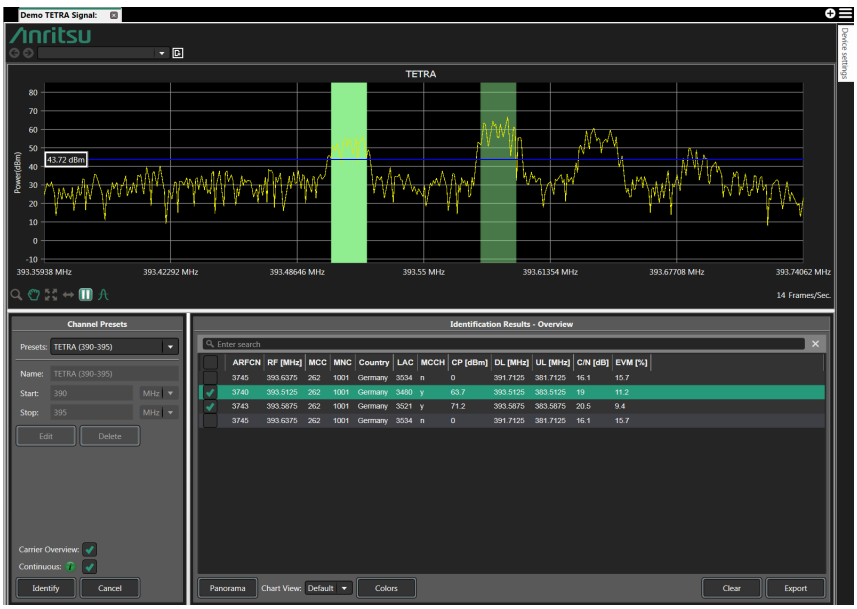


Figure 7-3. TETRA Mode Display with Carrier Overview

Channel Presets

In the dropdown list, one can either use one of the preset frequency ranges or create your own range to scan (by selecting 'New' in the drop-down list). Users can then name their own scan, set start/stop frequencies and add them to the software database for future use.

The checkbox titled 'Carrier Overview' toggles between showing an overview of frequencies and measurement parameters in the scan Figure 7-3, “TETRA Mode Display with Carrier Overview”)or demodulation results as shown in Figure 7-2, “TETRA Mode Display”.

Checking the continuous checkbox results in a continuous scan of the selected frequency range to look for and analyze unidentified carriers.

You can add a horizontal threshold for TETRA signals to be captured by holding “shift” and left-clicking the mouse at the power level desired. Signals which fall below this threshold will not be identified. Remove the horizontal line by holding “Shift” and clicking the right mouse button. If a horizontal line is not placed, the scan will then identify all active TETRA signals regardless of amplitude.

Beneath the box for entering the Stop Frequency, you will see a setting called Offset. Even though TETRA is a standardized modulation format, there can be various carrier frequency offsets as defined in clause 21.4.4.1 in EN 300 392-2 [1]. Various countries can adopt their own offsets in their frequency allocation systems. Carrier frequencies can be offset by the following frequencies:

- – 6.25 kHz
- 0 kHz
- +6.25 kHz
- +12.5 kHz

Please use the correct offset frequencies allocated for your country. Users can also observe a TETRA signal on the trace window. When the proper offset is selected, a green rectangular box will be centered on the TETRA signal. See Fig XYZ where a 12.5 kHz offset has been applied.

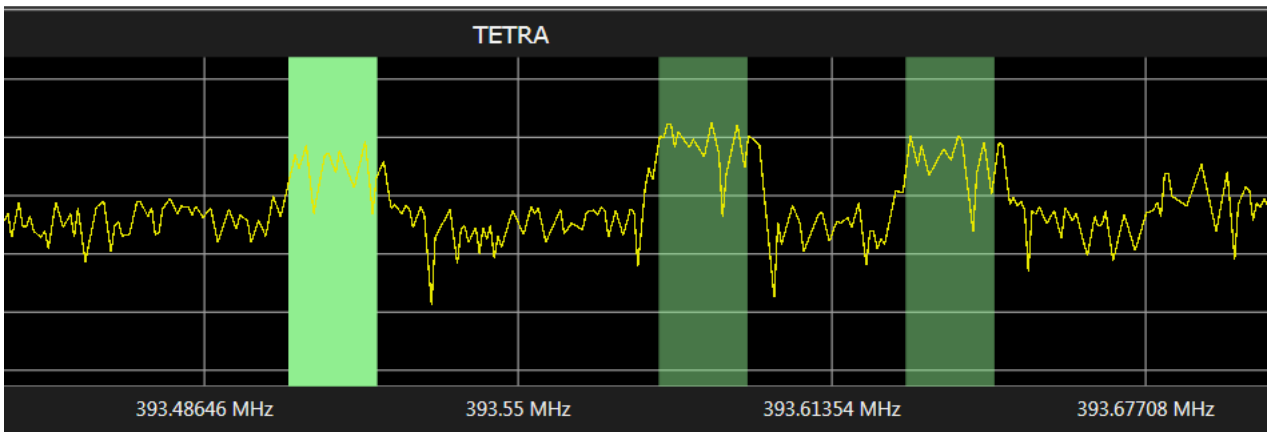


Figure 7-4. TETRA Signals with Correct Offset Applied

Once the Channel Presets are complete, click on **Identify** to begin the frequency scan and identification process.

Identification (when 'Carrier Overview' is unchecked in the Channel Presets window)

Once 'Identify' has been clicked in the Channel Presets window, various carrier frequencies will appear in the Identification window.

Checking the box to the left of each Center frequency will enable a colored rectangle to appear on the TETRA spectrum screen. Clicking inside the box to the right of the Bandwidth column will cause the Identification Results to appear in its respective window. Signal demodulation parameters and a Constellation Diagram will appear in this window for the TETRA signal selected.

To create a PDF or CSV file reporting the results of your scan, click on the **Export** button at the bottom right of the Identification window. The Panorama button will be discussed later in this manual.

Identification (when 'Carrier Overview' is checked in the Channel Presets window)

The Carrier Overview selection will display a window called 'Identification Results - Overview' to be displayed. Here you can see a listing of all signals captured in the scan with signal parameters such as ARFCN, RF frequency, MCC/MNC codes, EVM percentage, etc. Selecting the 'Colors' button allows users to color code the scanned TETRA signals according to the country of origin.

The Identification window also contains a Clear button, when selected, deletes the highlighted signal in the window.

Panorama Scan

Clicking on the **Panorama** button at the bottom the Identification windows will produce a new window. See Figure 7-5, "Tetra Window - Empty Panoramic View" below. The Panorama Measurement allows users to measure and record power levels according to a specific Location Area Code (LAC). The field strength of the TETRA carrier as well as all neighborhood cells is recorded. The data is stored in dBm units (along with the location coordinates) as a directional antenna is swept across a 360 degree circle.

Users can choose azimuth precision by selecting the number of degree increments in the drop-down list. Using a directional antenna sweeping in a circle, measurements are taken every 'X' degrees (with 'X' being the Azimuth setting).

Once the measurement is started, a measurement is taken at the 0 degree direction. The **Start** button will then change to 'Continue'. Each time the **Continue** button is clicked, a new measurement is taken at a new angle dictated by the azimuth setting.

The Site Survey can then be exported in PDF or CSV file format as a permanent record of the survey.

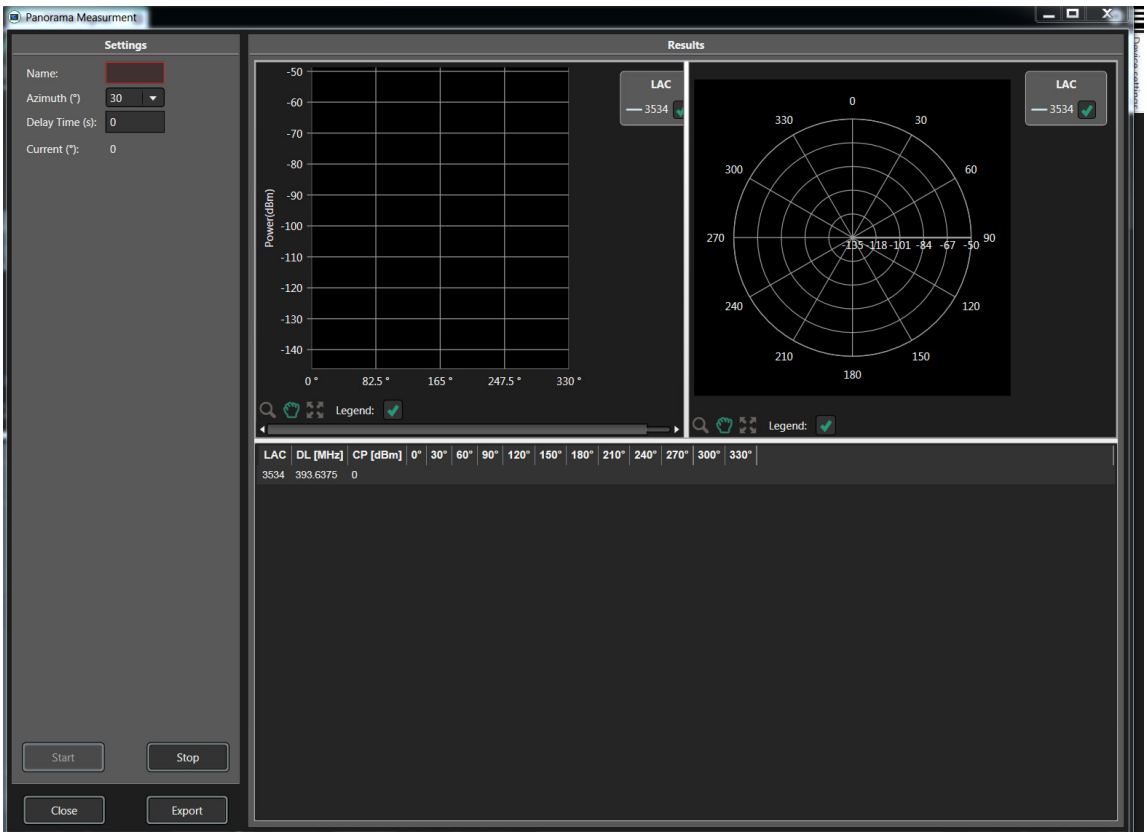


Figure 7-5. Tetra Window - Empty Panoramic View

Chapter 8 — Signal Identification and Analysis: Basic (Option 472)

The signal analysis is divided into a scanning, detection and identification phase. Both phases use digital signal processing algorithms including frequency and time domain transformations. The results are estimates of the center frequencies and bandwidths of both detected carriers and identified carriers. For the latter, several statistics, such as C/N, constellation diagram, etc. will be provided.

8-1 General Overview

The following screen displays the panels for Signal Analysis: Basic. These additional panels are Interference Detection, Identification, and Identification Results.

Figure 8-1. Signal ID Basic Display

Spectrum Settings

The spectrum settings are the same as in the spectrum mode. (See Section 2-2 “General Setup”.)

Detection Threshold

Using a threshold allows you to select signals greater than or equal to the threshold for detection. Add a horizontal threshold by holding **Shift** and clicking the mouse at the appropriate level on the trace screen. Remove the line by placing the cursor on the threshold value box and clicking the **X** button.

Detection & Identification Table

Detection finds carrier candidates. Select the desired carrier frequencies and move them to the Identification table. This is done by clicking on the right-arrow symbol located between the Detection and Identification windows. In the Identification window, click on the **Standards** button. This brings up a separate window for users to select the types of modulation used for the identification. Users can also check the box to the left of **Standard** at the top of the window. This selects all modulation types that will be used in the identification process. The identification supports many standards. Click on any of the frequencies to be identified. Users can click on the top checkbox to select all frequencies in the table for identification. Click on the **Identify** button to begin the identification process.

Identification Results

Detected carriers and identified standards will be displayed here. Additional information and a constellation diagram are also shown if available. Users can show results for various signals by clicking on the associated frequency in the Identification window. The signal that is highlighted in green is used for the Identification Results window.

8-2 Signal Detection

As mentioned above, the signal analysis allows signal identification with the help of previously detected carriers. Both fluctuating and non-fluctuating carriers can be detected. The carrier candidates can be automatically determined from the spectrum data or are manually inserted. Moreover, a correct detection requires a previously defined threshold, manually inserted in the spectrum chart.

Note	DVB-S1/2 broadcasting are examples of non-fluctuating carrier allocation. Opposed to that, cellular and Wi-Fi standards show fluctuating carriers due to resource allocation via time-division multiple access techniques.

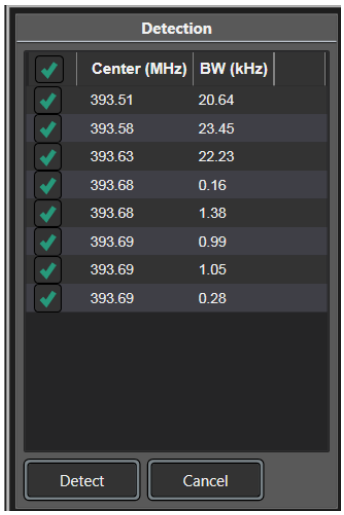


Figure 8-2. Signal Detection Panel

Spectrum Settings

The update interval and video bandwidth (VBW) settings can be used to smooth a spectrum if necessary. Moreover, the max hold function helps to visualize fluctuating carriers. In addition, the resolution bandwidth (RBW) setting needs to be carefully chosen in order to avoid merged or split carriers. Otherwise a detection may result in insufficient or excessive carriers. The reference level setting also needs to be carefully chosen since it greatly influences the signal-to-noise ratio in a given spectrum.

Detection Controls

The detection is started via the Detect button.

Detected Carriers

The list shows the detected carriers in terms of a center frequency (MHz) and a bandwidth (kHz).

Note	The frequency span and RBW settings can significantly affect a detection time since the latter increases with an amount of spectral data taken from a remote spectrum monitor.

8-3 Signal Identification

An identification uses the detected carriers as input and tries to find an underlying communication standard.

Note	An identification performance greatly depends on the accuracy of the detected carriers. In addition, identifying all standards and all detected carriers at the same time might be very time consuming and not reasonable.

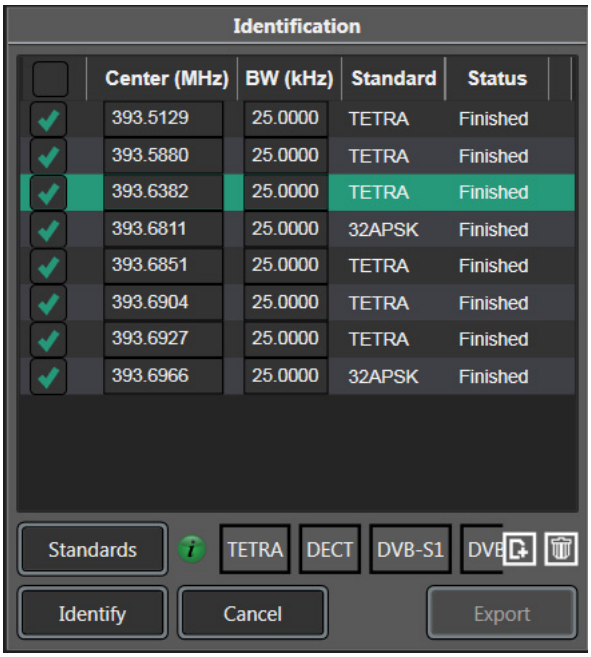


Figure 8-3. Signal Identification Panel

Standard Selection

Satellite (DVB-S1, DVB-S2, and IESS), cellular, public safety and Wi-Fi (802.11a/b/g) standards are currently available for signal identification. Multiple standards can be chosen in the list.

Identification Controls

The identification is started via the **Identify** button. A cancel button allows to abort an identification process. It is also possible to export analysis results to PDF.

Identified Carriers

The progress status is displayed for each carrier identification and, if known, an underlying standard is shown afterwards. The highlighted carrier signal area will be colored green in the trace display. If a carrier cannot be identified, its Standard will list as Unknown and the carrier signal area in the trace display will be colored red. Carriers can also be added with an **Add** icon. Carriers are deleted through selection and applying a **Trash Can** icon.

8-4 Identification Results

The Identification Results panel initially displays the results for first carrier frequency in the Identification. More detailed information about an identified carrier will be displayed by clicking on the desired carrier frequency in the Identification Table list. Depending on the standard and signal quality, different statistics will be available, such as data rate, modulation/coding scheme, symbol rate, C/N, and Eb/No. In addition, a constellation diagram is shown depending on the signal quality and underlying analysis algorithm.

Note	Exporting identified carriers only works for the TETRA standard at the moment.

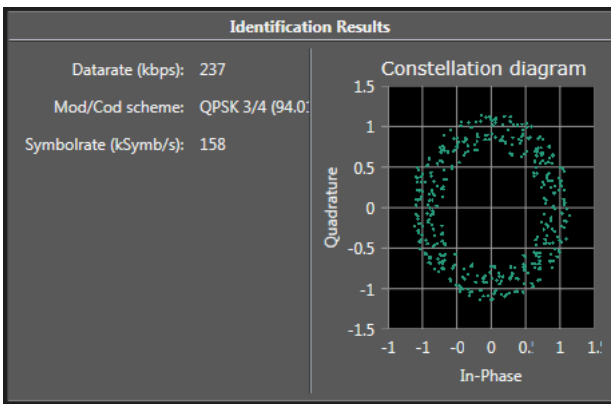


Figure 8-4. Identification Results Display

Chapter 9 — Signal Identification and Analysis: Advanced (Option 473)

The Signal Analysis Advanced feature is used to find interfering signals underneath the satellite carriers and tries to identify the interferer as well. This option is used only with satellite signals (DVB-S1/S2) which hide a smaller signal. Identification of the hidden signal can be done for any of the signals available in the signal identification library. See Chapter 8, “Signal Identification and Analysis: Basic (Option 472)”.

9-1 General Overview

The following screen displays the panels for Signal Analysis: Advanced. The additional panels for Signal Analysis: Advanced are Interference Detection, Received Signal, Remodulated Signal, and Interfering Signal.

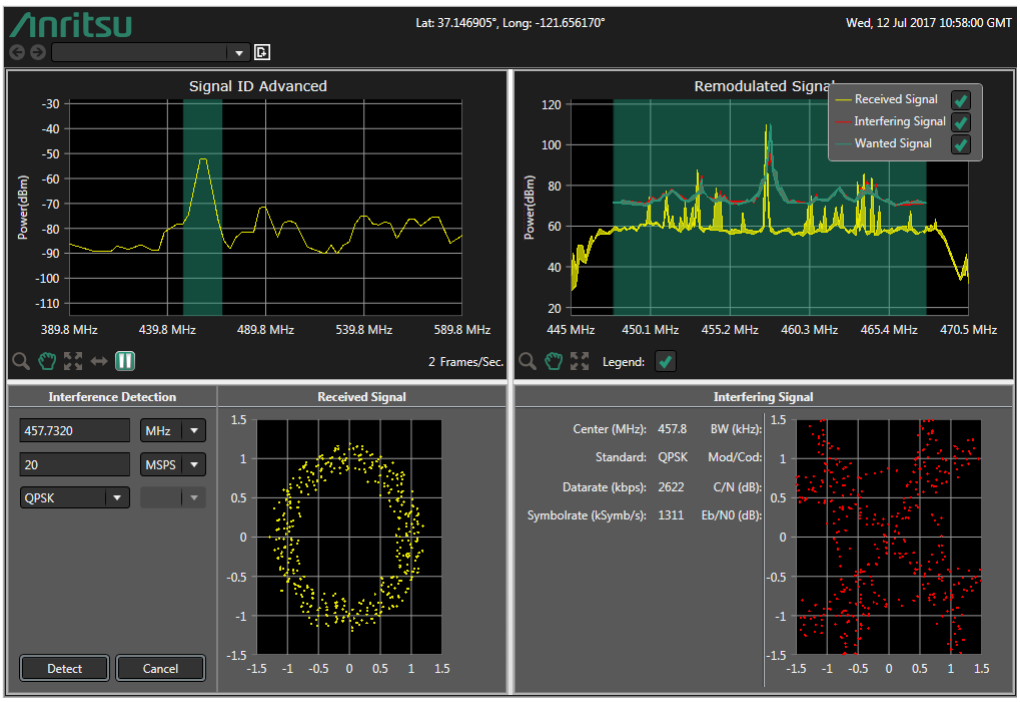


Figure 9-1. Signal ID: Advanced Display

Spectrum Settings

The spectrum settings are the same as in the spectrum mode. (See Section 2-2 “General Setup”.)

Spectrum Chart

You can scroll/browse through the spectrum using the mouse by simply dragging the displayed spectrum chart.

Known Carrier Parameters

In order to detect underlying carriers you have to specify the parameters of the wanted signal.

Constellation Diagrams

Shown constellation points: received and interfering signal.

Remodulated Signal Display

Shown spectrums: received, wanted and interfering signal

Interfering Signal Display

Detailed information regarding the interfering signal is shown.

9-2 Detecting Interfering Signals

Before looking for signals underneath carriers, the parameters of the wanted signal must be specified as shown in Figure 9-2, “Interference Detection Window”

Figure 9-2. Interference Detection Window

To use carrier-in-carrier detection, the smaller signal needs to be 6 dB (or less) power than the primary (or larger) signal. In the case of more than one interfering signal, there needs to be a > 6 dB power ratio between the larger host carrier and the sum of all underlying interference.

The center frequency of the carrier must be entered as precisely as possible to cancel the carrier correctly from the entire signal. This can be obtained during signal identification Signal Analysis: Basic.

After clicking **Detect** the calculation starts. It takes some time to remove the wanted carrier from the signal but after that, the results for the following screens are displayed - Received Signal, Remodulated Signal, and the Interfering Signal. See Figure 9-1, “Signal ID: Advanced Display”.

You see the remodulated signal after the calculation. The yellow spectrum is the received signal. The green spectrum is the wanted signal. The red spectrum is the interfering signal. See Figure 9-3, “Remodulated Signal”.

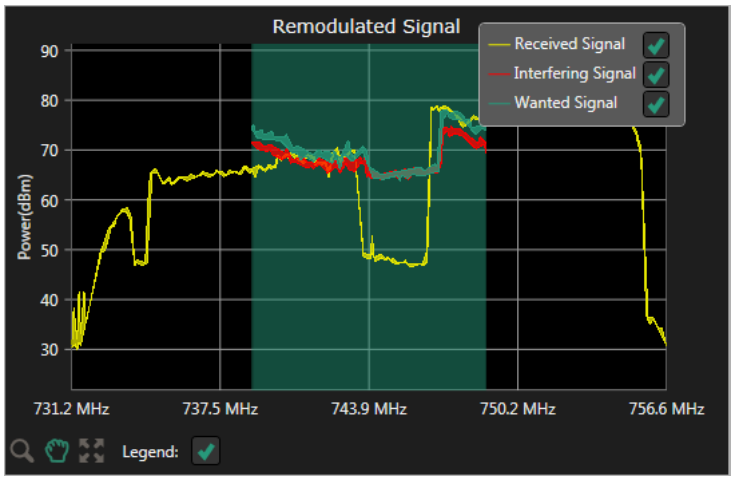


Figure 9-3. Remodulated Signal

If enough samples can be acquired, the interferer is analyzed further as shown in Figure 9-4, “Interfering Signal”.

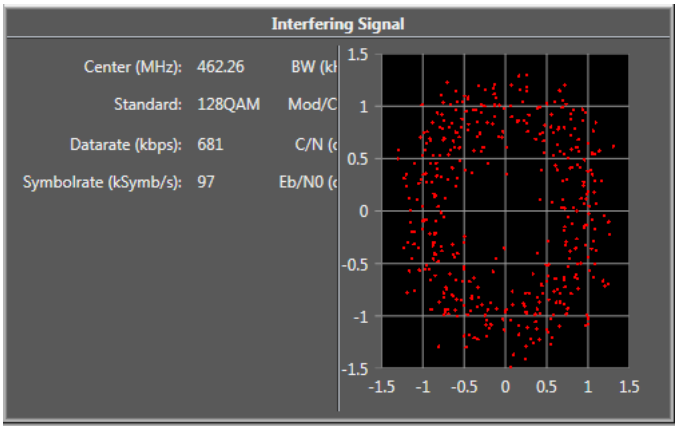


Figure 9-4. Interfering Signal

Chapter 10 — Power Monitoring Measurement (Option 474)

The power monitoring measurement feature can be used to monitor the RF power of various sub bands in parallel over a certain amount of time.

10-1 General Overview

The Power Monitoring display with the Power settings panel and two example Power Charts open.

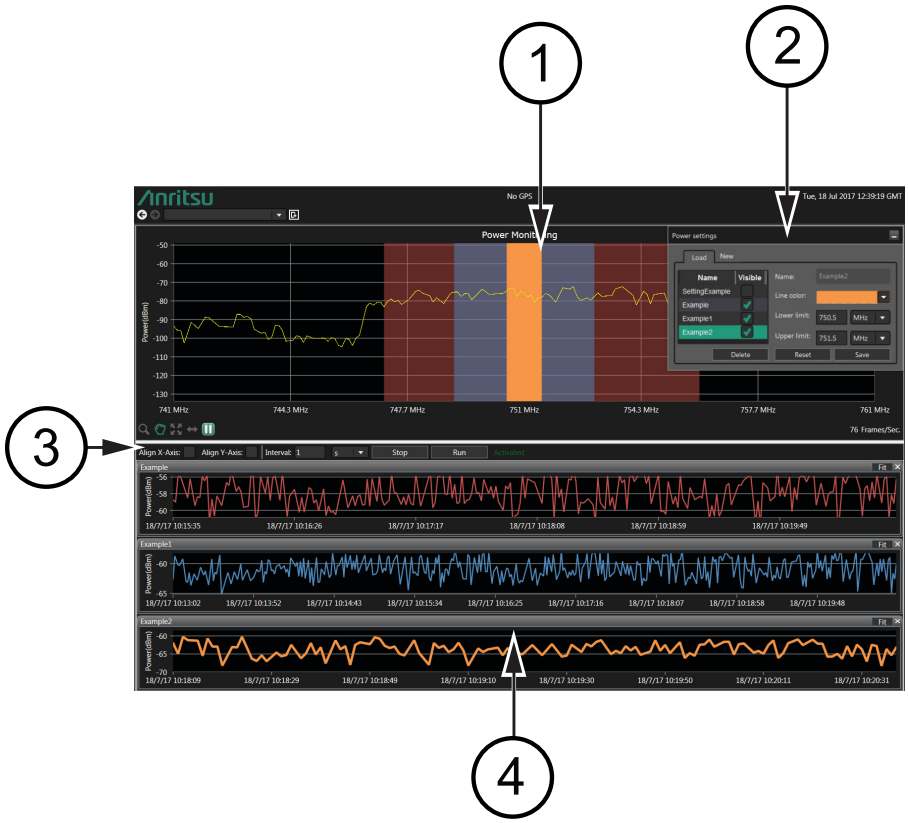


Figure 10-1. Power Monitoring View

Spectrum Settings

The spectrum settings are the same as in the spectrum mode. (See Chapter 2, “General Setup”.)

Table 10-1. Power Monitor Window Definition

Number & Title	Definition
1 **Spectrum Chart**	Browse through the spectrum using the mouse by simply dragging the displayed spectrum chart. Every defined power display will be displayed as well with its corresponding color.
2 **Power Settings**	This window maintains the power display settings. The New tab allows you to create a new power monitoring area. The Load tab allows you to use any previously saved power monitoring setup. It can be dragged around or minimized. If previously created Power Setting files were saved, settings of the first fill will be displayed in the Load panel. Otherwise, the Load panel will be empty.
3 **Power Display Controls**	• **Align-X-Axis**: Aligns every power chart to the x-axis of the longest running power display measurement • **Align-Y-Axis**: Aligns every chart to the y-axis according to the global minimum and the global maximum power of every chart • **Interval**: Defines the interval when the power display should be updated. • **Run/Stop**: Start or stop the measurement
4 **Power Charts Over Time**	Every defined power area will be displayed in this section.

10-2 Adding New Power Display

Define a new power display. See Figure 10-2, “Power Settings Entry Dialog”.

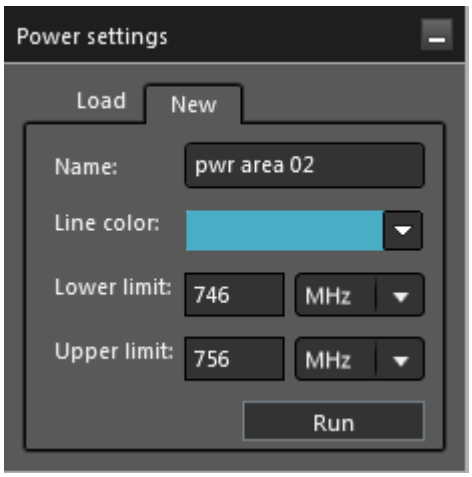


Figure 10-2. Power Settings Entry Dialog

1. Click the **New** tab in the Power settings entry window.
2. Enter a name for the power display.
3. For Line color, click the drop-down list arrow button to display the color palate.
4. Enter a frequency value for Lower limit and select the desired unit.
5. Enter a frequency value for Upper limit and select the desired unit.
6. Press the **Run** button.

If you click **Run**, the current defined power display is stored in the database and a new power chart appears in the lower section of the mode.

10-3 Working with Power Display

After successfully defining power display, the power chart over time section could look like that which is illustrated in number 4 in Figure 10-1, “Power Monitoring View”.

A power chart may not fit in it's display view completely. Each power chart display can have the scale adjusted by clicking **Fit**. Clicking **X** removes the chart display from view. It can be restored again by re-checking it's visibility from the Power Settings window.

While measuring power, you can change to another mode but the power measurement will stop. Upon returning to the power monitoring mode, the measurement continues. Any discontinuation (e.g. change of mode or stop/start power measurement), will be illustrated by red vertical dotted lines in each power chart.

Sometimes it can be advantageous to change the order of the power charts. You can change the order by clicking the header area of one chart and dragging it over another chart to modify the order.

Chapter 11 — Measurement Management

The recording measurements feature can be used in certain modes to store measurements over time or take simple snapshots of a mode in the database.

11-1 Recording Measurements

Record Panel

The Record panel contain the buttons for taking a snapshot or measurement of the signal displayed (Figure 11-1, "Record Panel").

Figure 11-1. Record Panel

Not all modes support recorded measurements or snapshots being stored into the database. If the mode is gray the record measurement feature is not active.

Table 11-1. Record Functions per Mode

Mode	Snapshot	Measurement
Spectrum	yes	yes
Spectrogram	yes	yes
Spectrum Density	yes	no
Mask	yes	no
Satellite (471)	yes	no
TETRA (464)	yes	no
Channel Scanner (476)	yes	no
Signal ID Basic (472)	yes	no
Signal ID Advanced (473)	yes	no
Power Monitoring (474)	yes	yes

Snapshots

Snapshots can be divided into two different types:

- Stored into the database.
- Stored as image or CSV file.

By clicking the **Snapshot** button in the "Record" section of the device ribbon the resulting view looks like Figure 11-2, "Save Snapshot View".

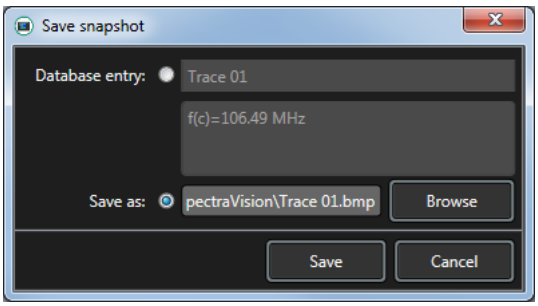


Figure 11-2. Save Snapshot View

You can store the snapshot into the SpectraVision database. This snapshot can be reviewed at a later time. See the "Review Records" section below for information on viewing snapshots and recorded (video) measurements within the SpectraVision application.

You can also save the current snapshot on to your laptop/PC by selecting the **Save As** radio button and entering the location where the file is to be saved.

Snapshots can be saved in the following formats - BMP, CSV, GIF, JPG, and PNG.

Table 11-2. Snapshot Save Location

Mode	SpectraVision Database	Save as: Local PC
Spectrum	yes	yes
Spectrogram	yes	yes
Spectrum Density	no	yes
Mask	no	yes
Satellite (471)	no	yes
TETRA (464)	no	yes
Channel Scanner (476)	no	yes
Signal ID Basic (472)	no	yes
Signal ID Advanced (473)	no	yes
Power Monitoring (474)	no	yes

Recorded Measurements

Recorded measurements are video files that are stored either in the SpectraVision database or on your PC/laptop. Once recorded, the video can play within the SpectraVision application with functions such as start, stop, fast forward, fast reverse, pause and run.

If the measurement feature is enabled for the current mode, you can click on **Measurements** to open the corresponding window as shown in Figure 11-3, "Start Measurement Window".

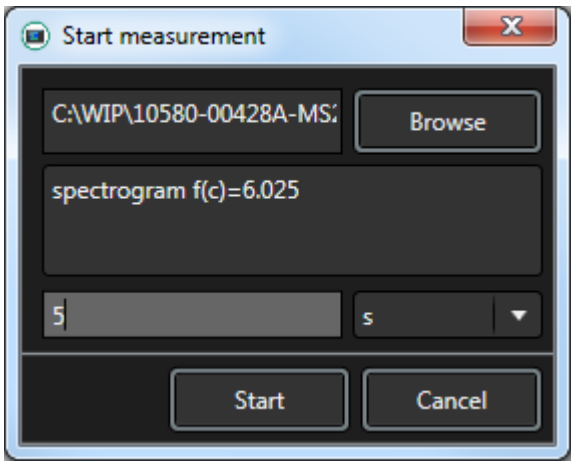


Figure 11-3. Start Measurement Window

First, click in the **Browse** button and select the location and filename for the measurement file. If you want to enter a comment as well, you can do so in the comments section. Afterwards, enter the duration of the measurement. This is actually only an approximate value, because the duration of one measurement depends on the network connection speed between the device and the software. The round trip time is the time from receiving one sweep to the next sweep. As already mentioned, this time can vary. The interval is calculated by the round trip time and the sweep count entered above.

By clicking **Start** the measurement starts and the data is gathered and stored. To control the current measurement, the "Record" section will now look like Figure 11-4, "Active Record Measurement Panel".

Figure 11-4. Active Record Measurement Panel

While the recording is running, you cannot use the "Snapshot" and "Measurement" feature. The currently gathered data chunks are shown in white as **9/52** in Figure 11-4, "Active Record Measurement Panel". In this instance, once the counter reaches 52 the measurement is complete."Additionally, you can pause and continue the current recording.

Review Records

After running a measurement or taking a snapshot, every record can be viewed by clicking on the **three pull down list bars** in the top right corner of the SpectraVision window and then clicking on **Records**. The pull down list shown in Figure 11-5, "View Records in the Record Pane".

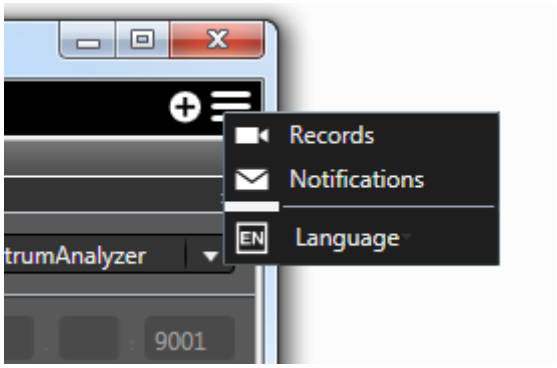


Figure 11-5. View Records in the Record Pane

Once Records is selected in the pull-down list. The Records window for Measurements and Snapshots is displayed in Figure 11-6, "Records Window".

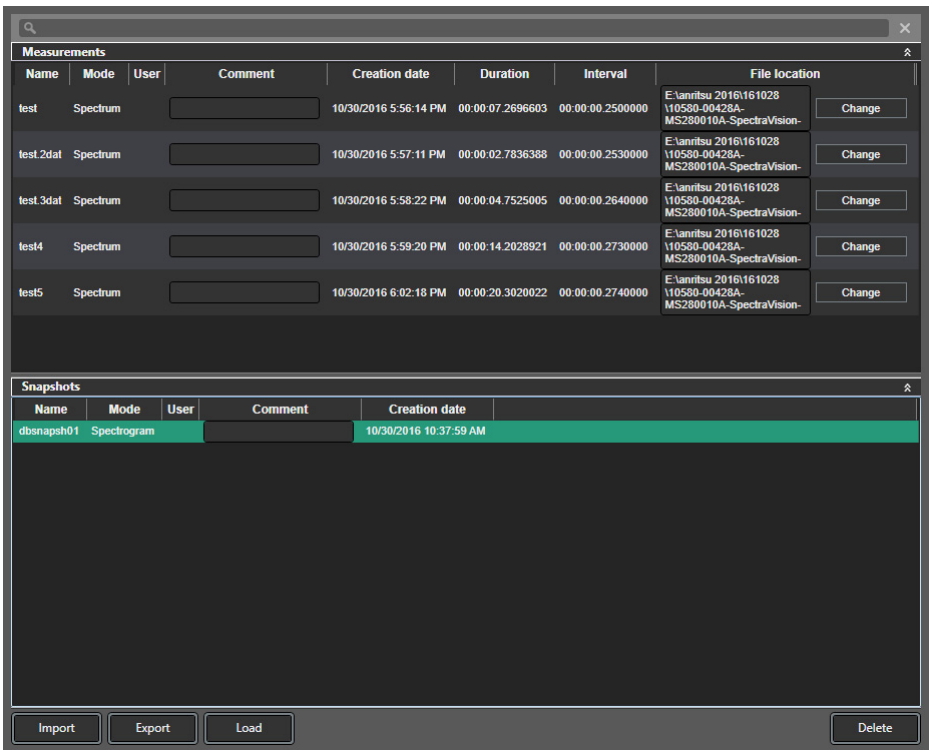


Figure 11-6. Records Window

If you want to play a measurement, double click the item in the list or select the item and click "**Load**". The selected recording opens in another measurement window with the name of the recording on the title bar. The corresponding mode and a replay bar at the bottom of the view shows up (Figure 11-7, "Recording Replay Display"). It is possible to play the entire measurement or jump to specific positions by modifying the replay slider. The device tab title will include the word "Offline". Device settings are generally disabled for "Offline" devices. Possible user interactions include adding markers, moving the spectrum mode specific zoom window or activating minimum or maximum hold.

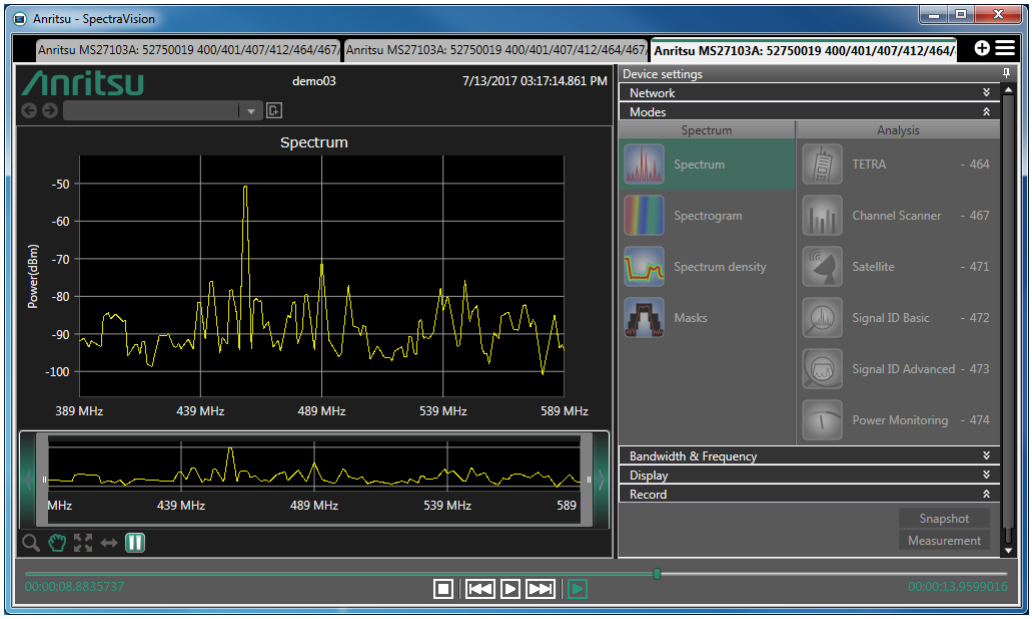


Figure 11-7. Recording Replay Display

The same procedure is done to view snapshots. The only difference here is that there is no replay possible. Every other user interaction can be done as well.

11-2 Export and Import Records

If you want to exchange certain records with another client, you are able to use the export and import functionalities. Click the **Export** button and the export window appears (Figure 11-8, “Export Records Dialog”).

Select the corresponding measurements and/or snapshots and choose the path where the export file is being stored. The file extension for every export object is “db3ext”. The file contains all necessary information of the selected measurement or snapshot.

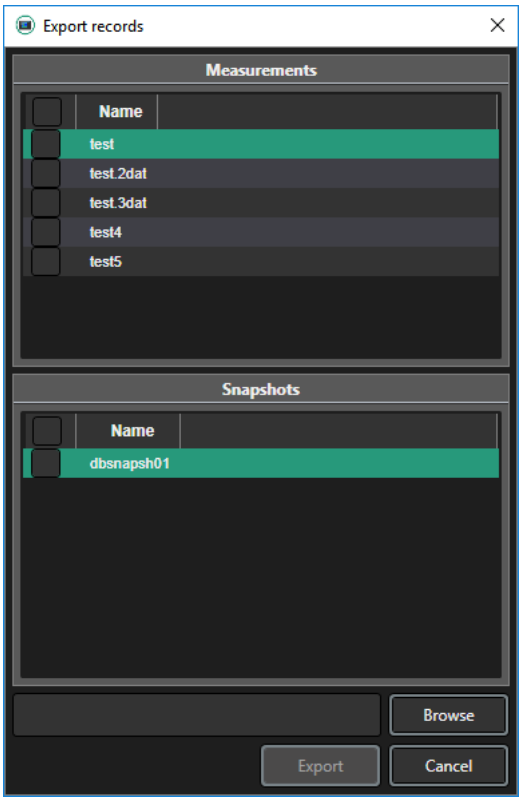
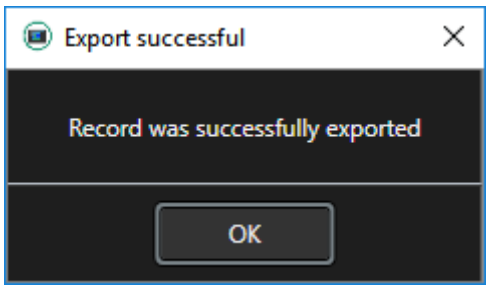


Figure 11-8. Export Records Dialog

After clicking **Export** the file will be created and an “Export successful” dialog pops up.



This file can be used to import it into client software.You can import objects by clicking the **Import** button, navigate to the saved records folder and selecting the corresponding file.If you want to delete a certain record, select the item and click **Delete**.

Note	You have to export items because copying the objects from the hard drive will have no effect for the software.

Appendix A — Demo Signals

In order to become better familiar with SpectraVision operation, several demonstration (Demo) signals have been added to the database. These signals were captured over-the-air.

A-1 Demo Satellite Signal

1. Select **Demo Satellite** from the drop-down list for Device Type.
2. Click **Connect**. See red highlights in Figure A-1, "Device Type Drop-Down List: Demo Satellite Selected".

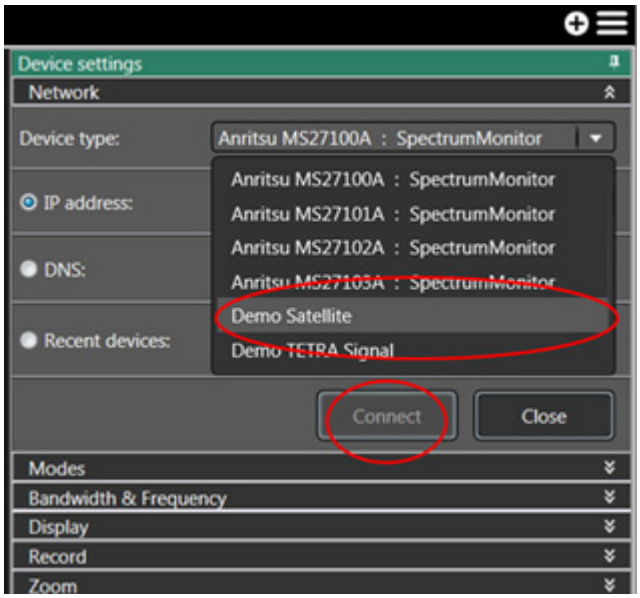


Figure A-1. Device Type Drop-Down List: Demo Satellite Selected

3. Select the **Satellite** icon (option 471) under the Modes tab. See Figure A-2, "Satellite -471 Mode Selected".

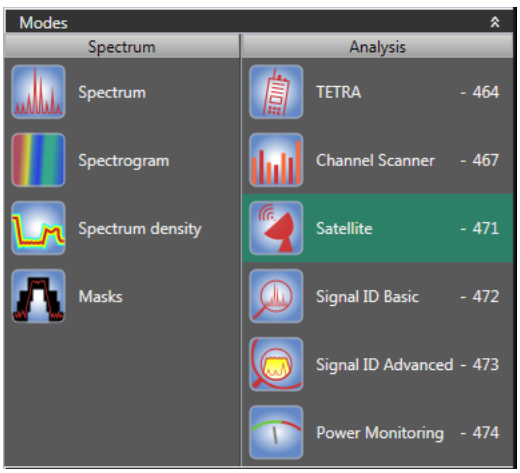


Figure A-2. Satellite -471 Mode Selected

4. Close the Device Settings window.

5. Fill in Center frequency of 1501 MHz and Bandwidth of 40 MHz. Insure that DVB-S2 is highlighted.
6. After clicking **Start**, you should see the following screen Figure A-3, "Demo Satellite Signal with Identification Results".

Figure A-3. Demo Satellite Signal with Identification Results

Note	Signal quality metrics are displayed in the bottom right window. For satellite signals whose bandwidths are 20 MHz or less, constellation diagrams are also shown.

Note	Signal parameters metrics over time can be seen in the bottom left window. One can use this information to track signal degradation over time, in many cases before a catastrophic failure develops.

7. Click the **Export** button to generate a PDF or CSV report.

A-2 Demo TETRA Signal

1. Select **Demo TETRA Signal** from the drop-down list for your network signal.
2. Click **Connect** to the view signal.
3. Under the Modes drop-down list, choose the **TETRA – 464** icon.
4. Close the Device Settings menu by minimizing the window at the top right of the SpectraVision screen.See Figure A-4, "Demo TETRA Signal Main Window (Option 464)".

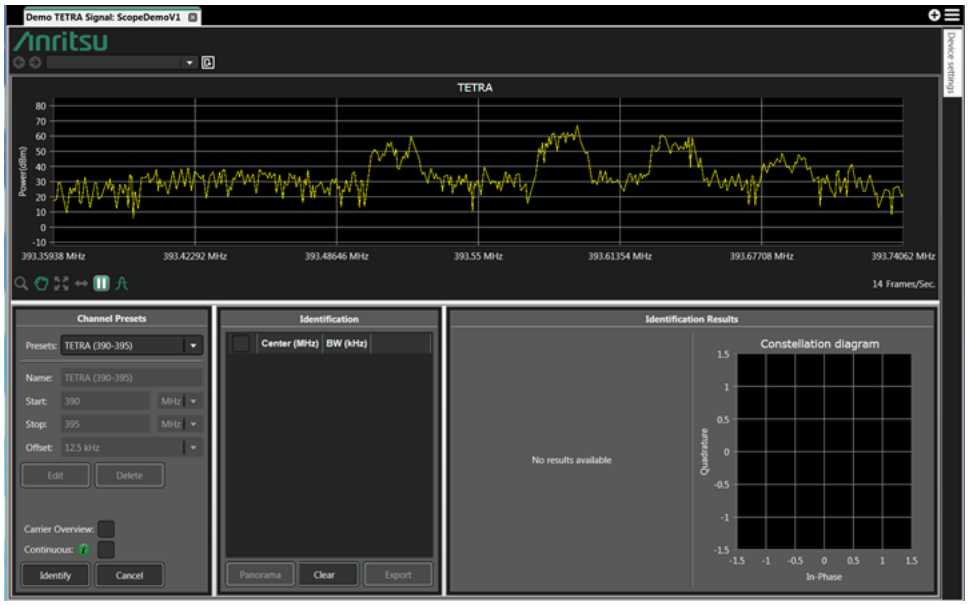


Figure A-4. Demo TETRA Signal Main Window (Option 464)

5. In the Channel Presets box (lower-left of the window), insure that Presets are set to TETRA (390-395) in order to cover the frequency range of the demo signal. There are a number of preset signal bandwidths available. Users can also choose to develop and name their own frequency bandwidth.

6. Click **Identify**. The algorithm will then scan and identify any possible signals. Initially there will be many signals shown in the Identification window. However, after the program runs there should be 3 TETRA signals discovered. See Figure A-5, "Demo TETRA Signal: Demodulation Parameters and Constellation Diagram".

Figure A-5. Demo TETRA Signal: Demodulation Parameters and Constellation Diagram

In the Identification window, users can check on any of the three TETRA signal frequencies displayed. You will notice that a green rectangle appears on the trace screen as each TETRA signal is checked.

7. To view the demodulation parameters of any of the three signals, click on the bar located to the right of the bandwidth. See Figure A-6, "Identification Window" for the picture of the Identification window with the 'bar' area circled in red.

Figure A-6. Identification Window

8. Users can also select the **Carrier Overview** checkbox to view TETRA signal information for all the signals scanned. See Figure A-7, "Carrier Overview Window".

Figure A-7. Carrier Overview Window

9. Users may also select Colors in the Identification Results – Overview window. Scanned TETRA signals can be color-coded according to country.
10. Finally, users can select the **Panorama** button to generate a 360 degree scan of frequencies. In the Settings window, enter a name an Azimuth. Measurements will be taken according to direction of the antenna used. Delay time allows the measurement to dwell in each direction to average measurements.
11. Click **Start**. The measurement will be made according to the delay time chosen.
12. Click **Continue** to proceed with measurements at each angle (Azimuth).

13. Once completed, click **Export** to view the report. See Figure A-8, "Panorama Measurement" for the illustration of a completed measurement.

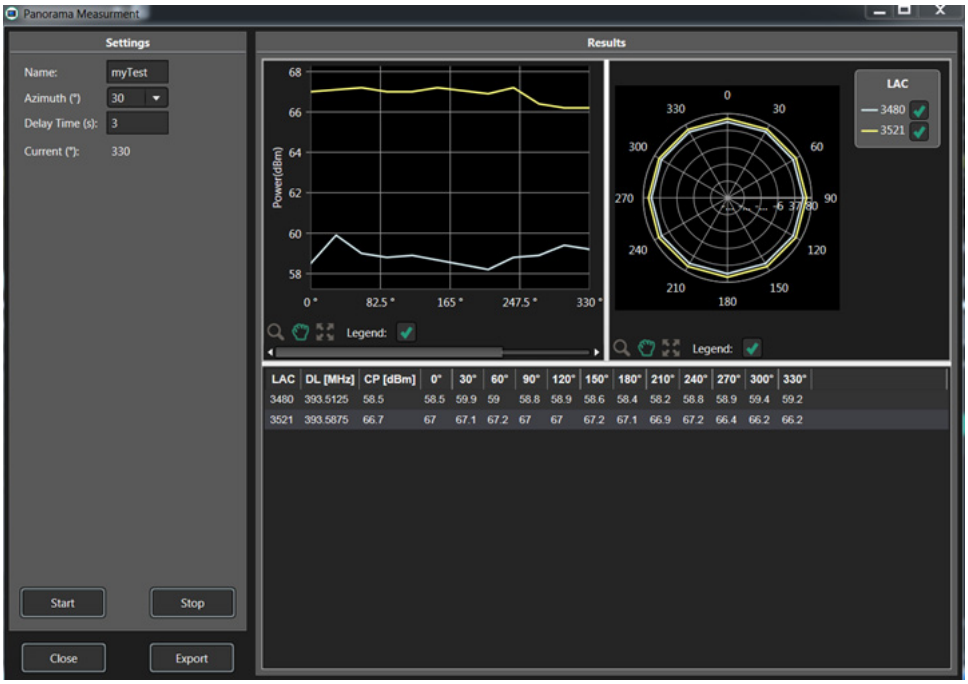
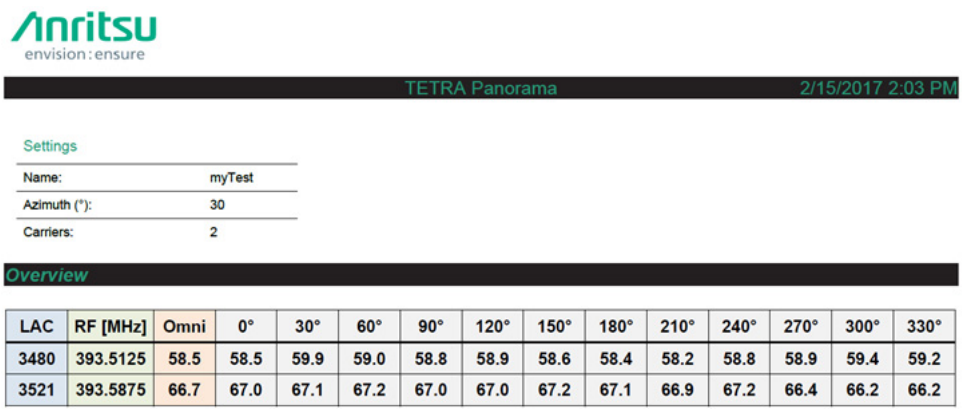


Figure A-8. Panorama Measurement

14. Note that this is a demo program only, so measurements for each LAC signal will not vary a lot. Click **Export** to see report generated in Figure A-9, "Panorama Measurement Report".



LAC	RF [MHz]	Omni	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°
3480	393.5125	58.5	58.5	59.9	59.0	58.8	58.9	58.6	58.4	58.2	58.8	58.9	59.4	59.2
3521	393.5875	66.7	67.0	67.1	67.2	67.0	67.0	67.2	67.1	66.9	67.2	66.4	66.2	66.2

Figure A-9. Panorama Measurement Report

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