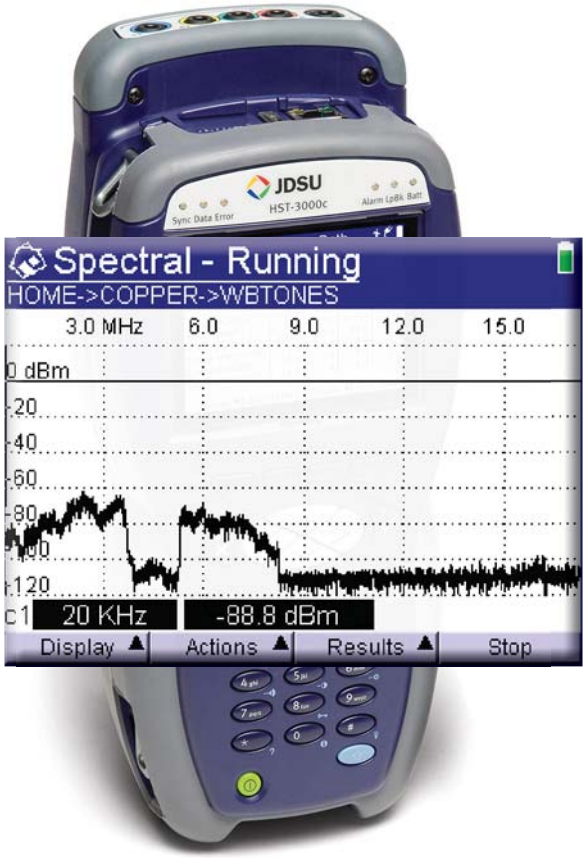
HST-3000 VDSL QUICK CARD

WIDEBAND SPECTRAL ANALYSIS



Revision 9.0
March 2012

Technical Assistance: 1-866-228-3762 TAC@jdsu.com

Wideband Testing - Spectral Analysis

Purpose

The purpose of this test is to analyze wideband noise across the VDSL spectrum. More specifically, if wideband noise issues are suspected or identified during the VDSL Good Pair Check or Wideband Noise test (covered previously) this application provides a more detailed analysis of the noise for more refined isolation of the problem and identification of potential interference sources. Measured noise on the span is plotted (frequency vs. amplitude) in user-selectable bands across the VDSL spectrum for ease of viewing.

This test is typically run from the cross box towards the customer premises. Typically, this test is performed with the pair terminated to the same impendence that will be present when the VDSL circuit is installed (100 Ohms).

The purpose of this test is to quickly verify that the F2 pair is capable of supporting VDSL2 and free of conditions that could cause errors or circuit failure such as foreign voltage, imbalance, noise, resistive faults, load coils, etc.

HST-3000 Test Interface

Connect dual tip & ring + ground leads to the mini-banana connectors on the top of the HST as shown below.

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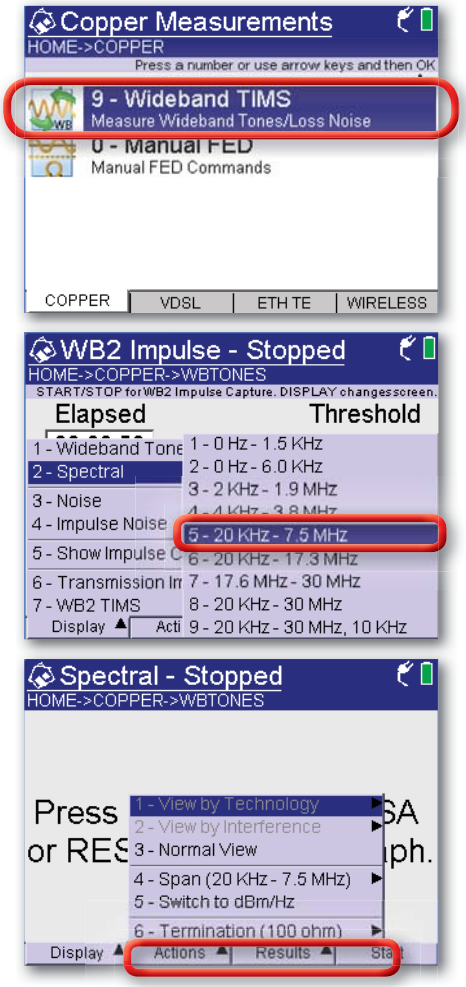
Procedure

1. Press the **Home** navigation key and select **Wideband TIMS (9)** from the menu.
2. Press the **Display** soft key, select **Spectral** and select the desired spectral band to be analyzed from the cascaded menu. Note: the current VDSL band used by ATT is up to 8 MHz, however the 20kHz to 17.3MHz band should be selected as the graph will provide much more detailed view of the spectral noise as well as the noise floor.
3. Before starting the test, ensure that the correct Termination for VDSL loops is selected (**100 Ω**) 100 Ohms is the default and should appear automatically. To modify the Termination, press the **Actions** soft key and select **Termination** from the pop-up menu and modify as required. If **100Ω** is already set, no action is required.
4. From the pop-up menu displayed when the **Actions** soft key is pressed, you can also change the **Span** before starting the test or while the test is running. Again, for ATT VDSL loops, you should use 20kHz to 17.3MHz spans should typically be used.
5. To configure whether the spectral trace is displayed in dBm or dBm/Hz before starting the test or while the test is running, press the **Actions** soft key and select the desired display configuration (dBm or dBm/Hz) from the pop-up menu.



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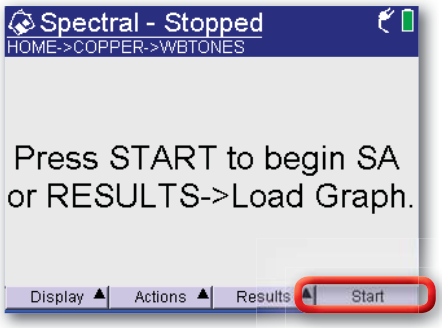
Wideband Testing - Spectral Analysis

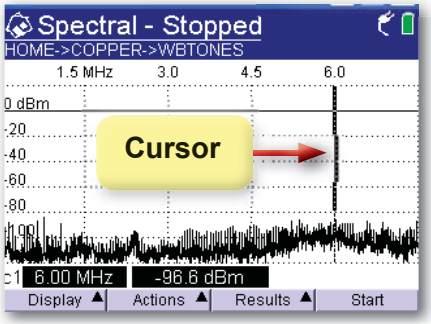
Procedure (continued)

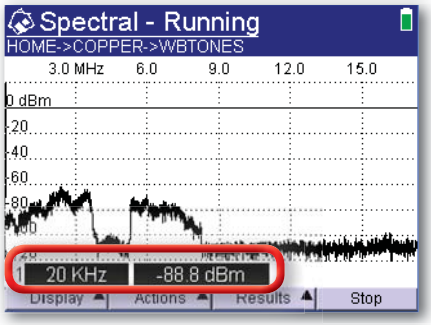
6. Press the **Start / Stop** soft key at the lower right of the display to start or stop the test as required. When the Start soft key is pressed to begin the test, the spectral graph should be displayed on the screen within a few seconds.
7. Use the **Left / Right** arrow keys to navigate the cursor across the graph.
8. As the cursor is scrolled across the trace, the center (vertical) of the cursor will expand and contract automatically around captured the captured signal (vertically with magnitude) to assist in cursor placement. The frequency and magnitude (level) of the measured signal at the cursor position will be displayed, respectively, in the two windows on the lower left hand of the display.
9. Use the menu selections available from the Display soft pop-up menu (**Zoom In / Out** on the X or Y-axis, etc.) to modify the display as required for optimal viewing.
10. Because the noise on the line will often fluctuate naturally under real world conditions it is sometimes challenging to capture the maximum measured signal amplitude (level) at any given time. To assist in this analysis the **Spectral Max Hold** function should be used. The **Max Hold** function enables the capture and display of the maximum signal amplitude (level) measured at each frequency across the span.

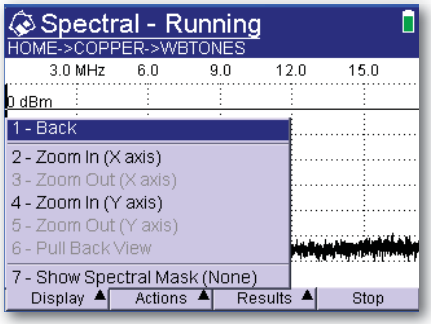
    a. To enable the **Max Hold** function, press the **Actions** soft key and select **Max Hold (6)**.

    b. With **Max Hold** enabled the plot will appear as a line (trace) plotting the maximum measured levels across the span instead of a graph view as shown to the right.









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Procedure (continued)

c. To disable, press the Actions soft key and deselect Max Hold (6). The presence of the check mark (√) next two Max Hold in the pop-up menu indicates that the function is enabled. Selecting it again or pressing 6 in the pop-up menu will disable the function.

11. To automatically display the frequency band associated with common circuit technologies (ADSL, HDSL, etc.) or common interferers (AM Band 1, 2, etc.), press the **Actions** soft key and select **View by Technology** or **View by Interferer** from the pop-up menu. This will automatically adjust the displayed frequency band to that of the selected technology or interferer to assist in troubleshooting potential interference sources. To return to the previously selected frequency band, press the **Actions** soft key and select **Normal View** or reselect the desired **Span** from the pop-up menu.

12. During troubleshooting and when another circuit technology such as ADSL in the same cable is a suspected interference source, it is sometimes useful to overlay the **Mask** for that technology on the graph. To enable this function:

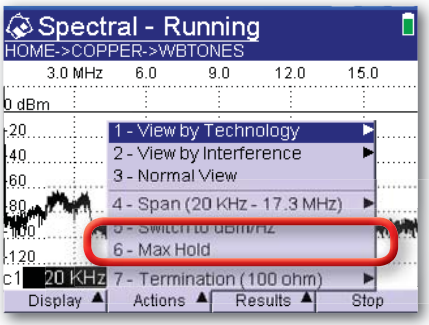
    a. Press the **Display** soft key.

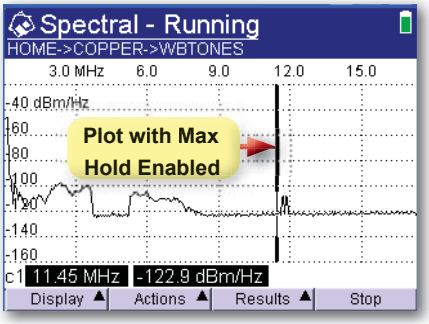
    b. Select **Show Spectral Mask (7)** from the pop-up menu above the **Display** soft key.

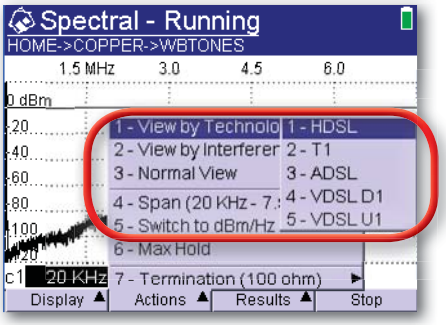
    c. Select the desired mask by technologies from the pop-up window that is displayed using the **Up / Down** arrow keys to highlight and then press **OK**.

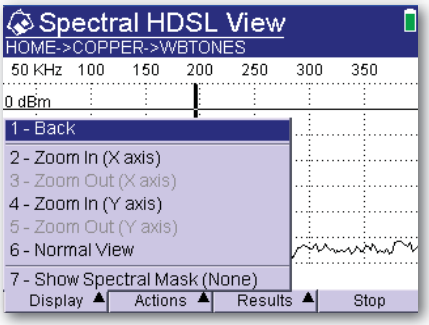
    d. The selected mask will be displayed graphically, superimposed over the spectral plot as shown to the right. Additionally, the circuit technology corresponding to the selected mask will be shown in text in the upper right hand side of the display.

    e. To change between different masks while the Spectral application is running (short cut), press the Shift key (blue up arrow key on the lower right side of the keypad) and then the Up / Down arrow key(s).





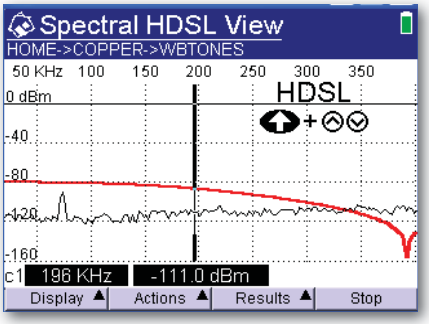




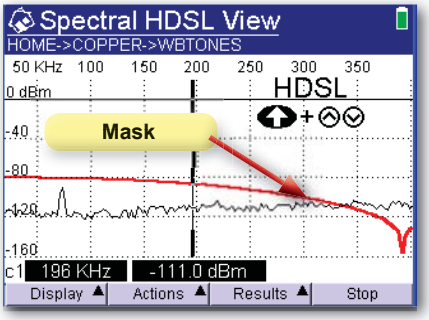
Wideband Testing - Spectral Analysis

Procedure (continued)

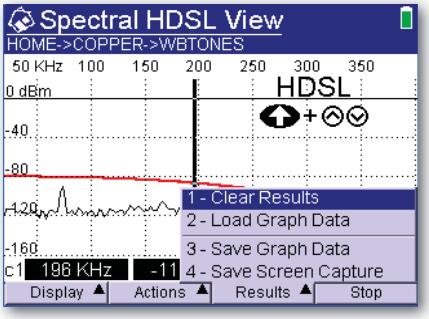
f. For circuit technologies other than VDSL (ADSL, G.SHDSL, etc.) the overlap in the Mask with the VDSL frequency range is usually at the lower end of the VDSL frequency spectrum. Because of this, only the upper (highest frequency) portion of the selected mask may be visible on the display initially when shown on a VDSL frequency span. To assist, in a better determination of whether the measured noise energy displayed on the Spectral graph conforms closely conforms to the selected Mask, press the Actions soft key, select View by Technology from the pop-up menu, and select the technology corresponding to same technology selected for the Mask. As described in Step 11, this will cause the Spectral frequency span for the selected technology to be displayed as shown to the right. Again, this can simplify the assessment as to whether the measured noise conforms to a given mask.



g. To disable the **Spectral Mask**, press the **Display** soft key and select **Hide Spectral Mask** from the pop-up menu.



13. To save Spectral Analysis results, press the **Results** soft key and chose one of the following from the pop-up menu:



a. Select **Save Graph Data** to store the actual array data for the graph itself. This data can then be loaded back into the HST Spectral application for later review, analysis and comparison.

b. Select **Save Screen Capture**. This will cause the portion of the graph currently visible on the screen to be saved as a bitmap file. The file can then be exported for use in reports, presentations, etc.

14. To load previously stored Spectral Graph data for analysis or comparison, press the Display soft key and select Load Graph Data.

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Procedure (continued)

As described in the steps above, the Spectral Analysis application can be used to identify potential interference sources by circuit technology or interferer. If cross talk (noise) from another circuit in the same cable is ruled out as the source of excessive noise and the measured noise does not conform to the signature of other common sources such as AM or HAM radio bands, a wide variety of other noise sources still exists and at a minimum, the measured graph can be stored and catalogued for future reference. Additionally, if the actual interference source is not isolated to a discrete source (as described above) the ability to see the graph of the measured noise in frequency and amplitude is helpful to assessing its impact on the VDSL signal. In general, a typical "good loop" would have a noise floor of approximately -140 dBm/Hz across the VDSL frequency range. Large noise spikes or portions of the graphed noise which significantly exceed this level (~ > 110 dBm/Hz) will be likely to degrade the VDSL and potentially cause errors. When excessive noise is present on the Spectral Graph, you can also view its impact on the VDSL signal by looking at the Bits-per-Tone graph in the VDSL application – dips or breaks in the Bits-per-Tone graph show the areas where the interference (noise) is degrading the VDSL signal.

In general, the root cause of excessive noise is often due to either poor pair balance or bonding and grounding issues, or a combination of both. Pair imbalance should be ruled out prior to troubleshooting potential bonding and grounding issues.

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