



USB Mini Spectrum Analyzer User's Guide

TSA5G35

Triarchy Technologies, Corp.





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Initial Version November 2011

Documentation version 2.3

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1 Getting Started

1.1 Install PC Application

System Requirements:

To use this USB mini spectrum analyzer, your system must meet the following minimum requirements:

Windows XP, Windows 7, or Windows Vista:

- 1 Gigahertz (GHz) or faster 32-bit (x86) or 64-bit (x64) processor
- 1 Gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit)
- 100 MB hard disk space (Buffered data may need extra space)

Insert CD into the computer, open the **USB_APP** folder at CD root folder, and click the setup.exe to install software. When you see the installation window, click "Next". Please see **Figure 1**



Figure 1 Installation View

Choose the proper installation folder, and then click "Next". Please see **Figure 2**

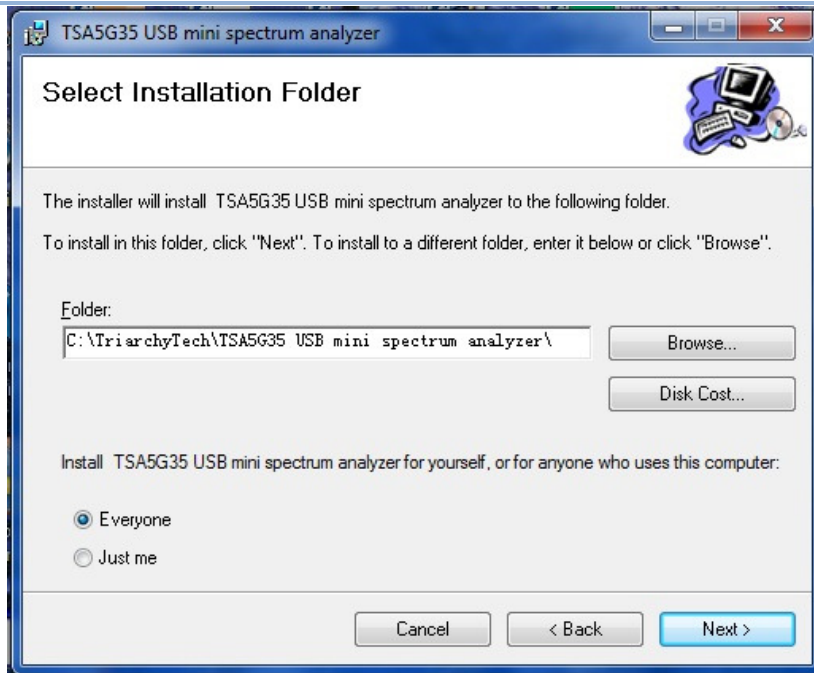


Figure 2 Select Installation Folder

Click “Next” to install program, a warning window may pop up about unknown publisher, which can be ignored. Please click “YES” to continue, then see **Figure 3**

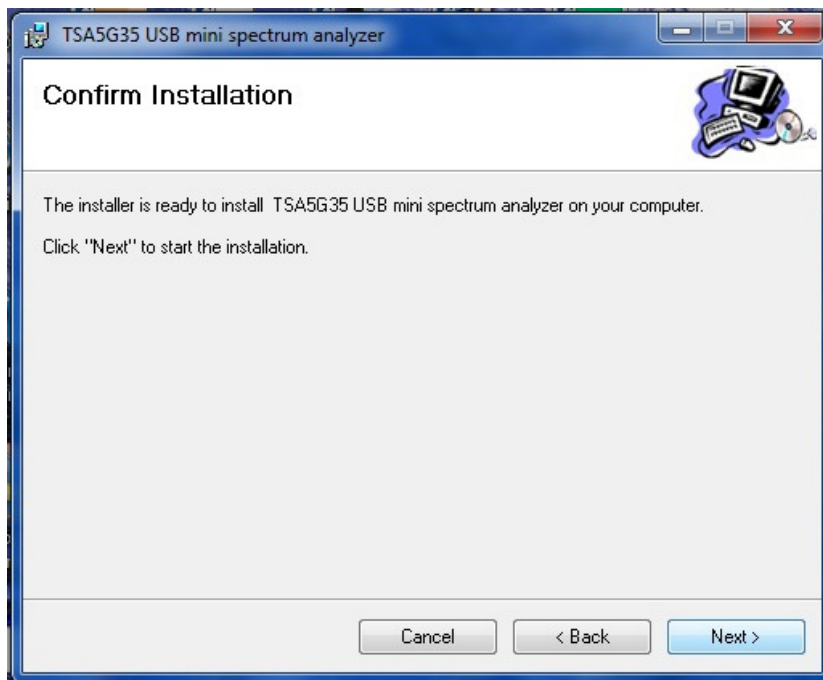


Figure 3 Start Installation



After the program is successfully installed, you will get the message stating the Installation Complete, ,, please see **Figure 4**, then click "Close" to close the installation program.

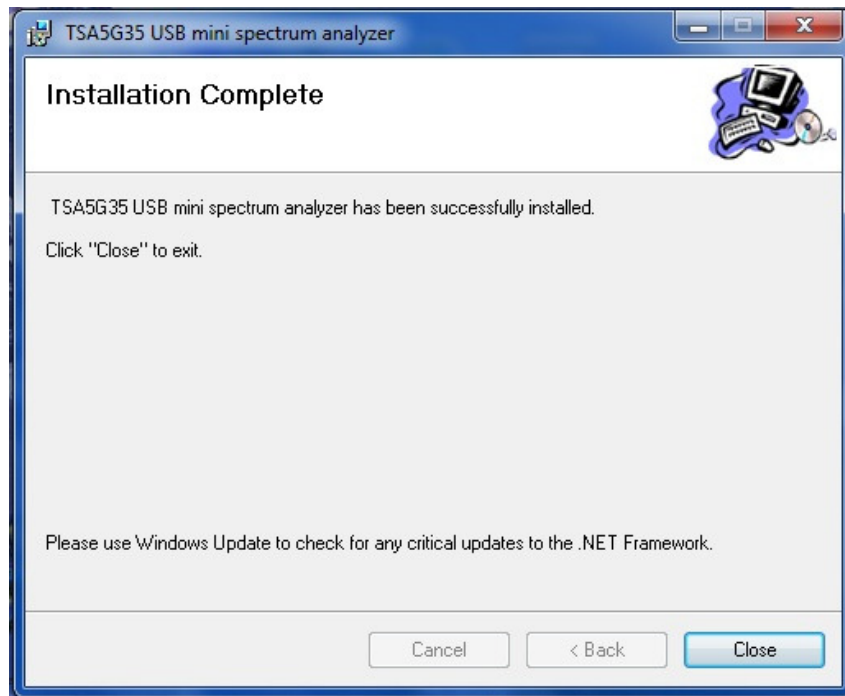


Figure 4 Successfully Installed

You may open the Windows Explorer to find the program folder where application is installed, the folder is **C:/Triarchy Tech** and sub folder is **/TSA5G35 USB mini spectrum analyzer**. Please see **Figure 5**.

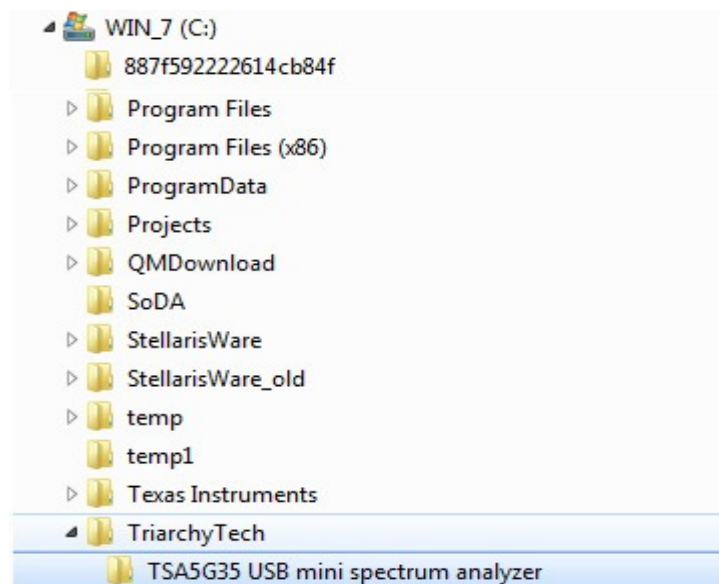


Figure 5 Installation Folder View



In the **/TSA5G35 USB mini spectrum analyzer** folder, you will see the following files after your first installation. Please see **Figure 6**.

Name	Date	Type	Size	Tags
TriarchyTech.ico	28/02/2012 10:47 PM	Icon File	217 KB	
UsbLibrary.DLL	30/03/2012 2:45 AM	Application extens...	20 KB	
Graph.DLL	30/03/2012 2:45 AM	Application extens...	50 KB	
UsbApp.exe	30/03/2012 2:45 AM	Application	267 KB	
Uninstall.exe	13/07/2009 8:14 PM	Application	72 KB	

Figure 6 Installation Files View

Do not run the program right away as the **lic.dat** and **freq_ofst.dat** files are required to run the application. The **lic.dat** file is a licence file and the **freq_ofst.dat** file a calibration file. Please request these 2 files from your sales representative if you do not have . The **lic.dat** and **freq_ofst.dat** files shall be provided together with the hardware USB Device dongle when you purchase this product.

Please copy **lic.dat** and **freq_ofst.dat** files into **/TSA5G35 USB mini spectrum analyzer** folder, please see **Figure 7**.

Name	Date	Type	Size	Tags
lic.dat	11/03/2012 6:00 PM	Video CD Movie	3 KB	
freq_ofst.dat	11/03/2012 3:44 PM	Video CD Movie	1 KB	
TriarchyTech.ico	28/02/2012 10:47 PM	Icon File	217 KB	
UsbLibrary.DLL	30/03/2012 2:45 AM	Application extens...	20 KB	
Graph.DLL	30/03/2012 2:45 AM	Application extens...	50 KB	
UsbApp.exe	30/03/2012 2:45 AM	Application	267 KB	
Uninstall.exe	13/07/2009 8:14 PM	Application	72 KB	

Figure 7 Add the Licence File to the Installation Folder

After copying the **lic.dat** and **freq_ofst.dat** files into installation folder, you can run the program from the desktop, click the UsbApp icon on desktop to start the application, which is automatically added during installation for user's convenience. Please see **Figure 8**.



Figure 8 UsbApp Shortcut Icon on Desktop

You will see spectrum analyzer application start-up window as shown in **Figure 9**.

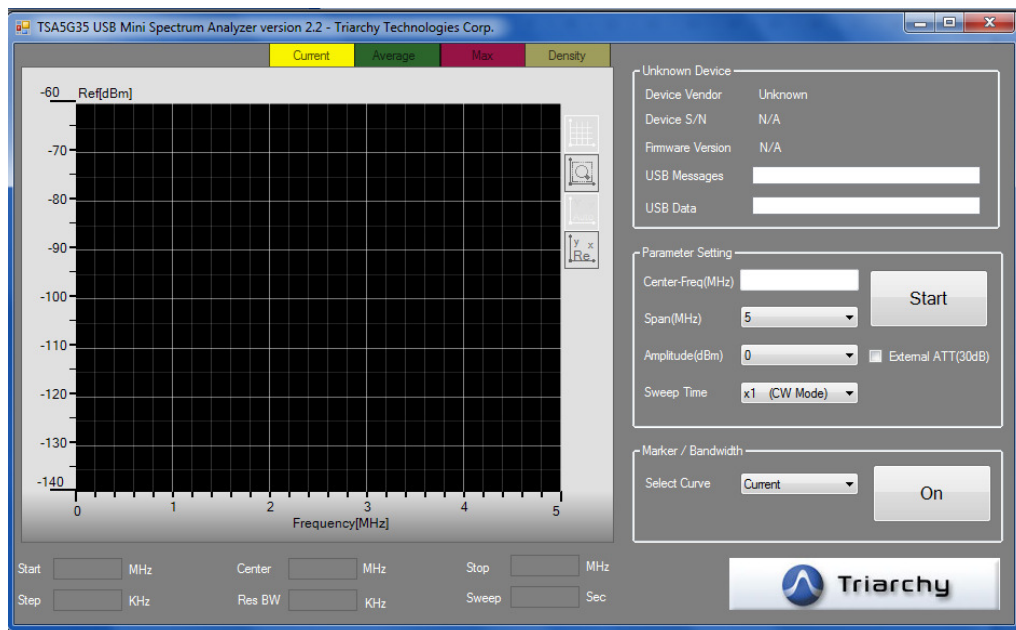


Figure 9 Application Window before USB Device Connected

Plug the **TSA5G35 USB mini spectrum analyzer** into the PC USB port, the program should recognize the USB device, then show Device Vendor, Device S/N and Firmware version. If all the information is correct, the application is connected to the USB device successfully. Please see **Figure 10**

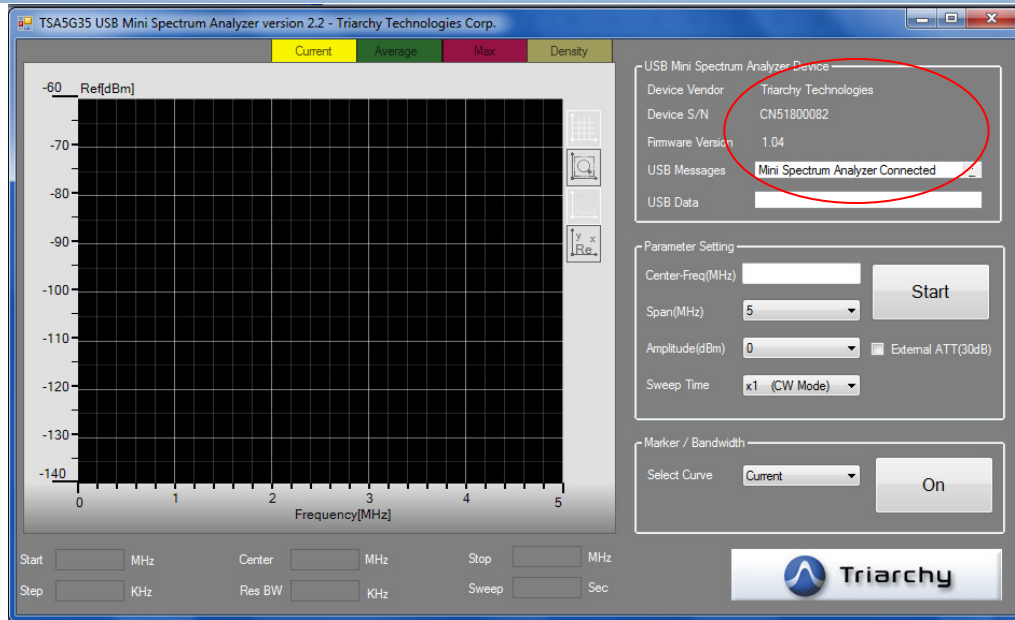


Figure 10 UsbApp Connected with USB Mini Spectrum Analyzer Device

1.2 Uninstall PC Application:

If you want to uninstall the PC program, please go to the control panel to look for the Program/uninstall a program item, you will find the **TSA5G35 USB mini spectrum analyzer** program in the list, double click it, then program will be uninstalled. Please see **Figure 11**.

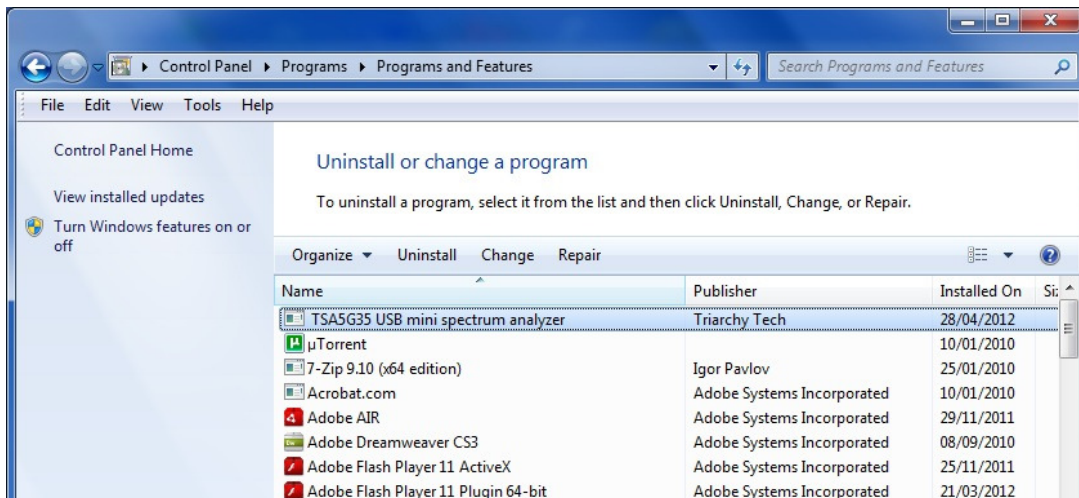


Figure 11 Uninstall View



1.3 System Connection

Figure 12 shows the system connection, TSA5G35 connects to the computer through the USB port and the connection between TSA5G35 and RF signal generator can be wired via coaxial cable or wireless via antenna. The RF signal generator could be any RF transmission device.



Figure 12 System Connection

2. Operations

2.1 Signal Parameters

When the application starts, the screen displays as shown in **Figure 13**. The default span is 5 MHz, the default reference level is 0 dBm, and the center frequency is empty. The center frequency will be set up by the user.

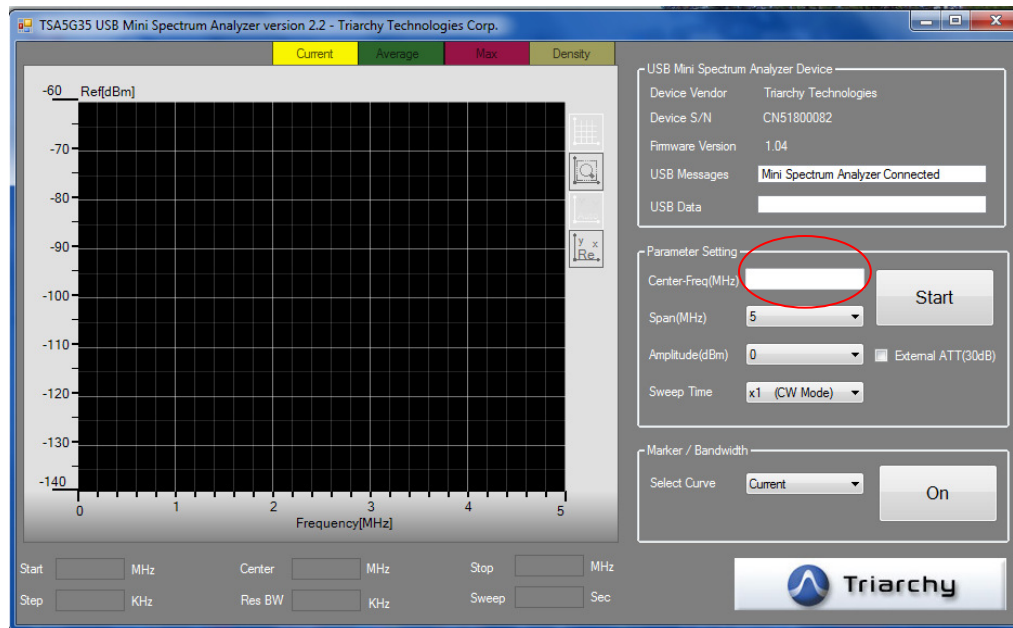




Figure 13 Start Display

If the license file does not match the license number inside the TSA5G35, a warning message will pop up to inform the user, as shown in **Figure 14**. The license file contains the calibration data, which is different from one device dongle to another. The unit will not work correctly if there is no matched license file.

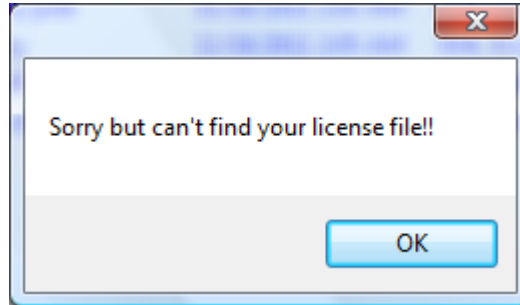


Figure 14 Missing License File Notification Message

When a signal presents at the input, the signal spectrum will be displayed as shown in **Figure 15**. In this example, the signal is centered at 1000 MHz. The spectrum display by default shows only the current trace. The average trace, peak trace, and density of the signal level are turned off. If you want to turn on different traces, you can enable different traces by clicking tabs above display.

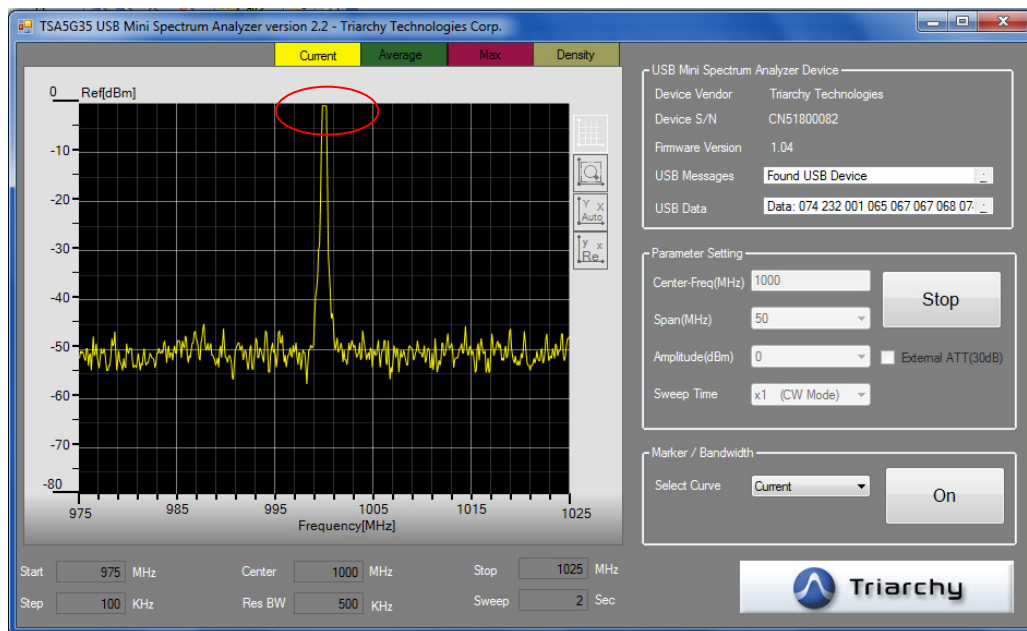


Figure 15 Spectrum Display with Signal



2.2 Frequency Setting

The center frequency is entered into **Center-freq(MHz)** input. Then the **TSA5G35** will scan from center_freq - span/2 to center_freq + span/2. The display window will show the signal spectrum after clicking the start button. The valid center frequency range is from 1 MHz to 5350 MHz.

For example: if the center frequency is set to 5300 MHz and the device is connected with a RF signal generator with frequency of 5300 MHz signal level 0 dBm and, the display will look similar as shown in **Figure 16**.

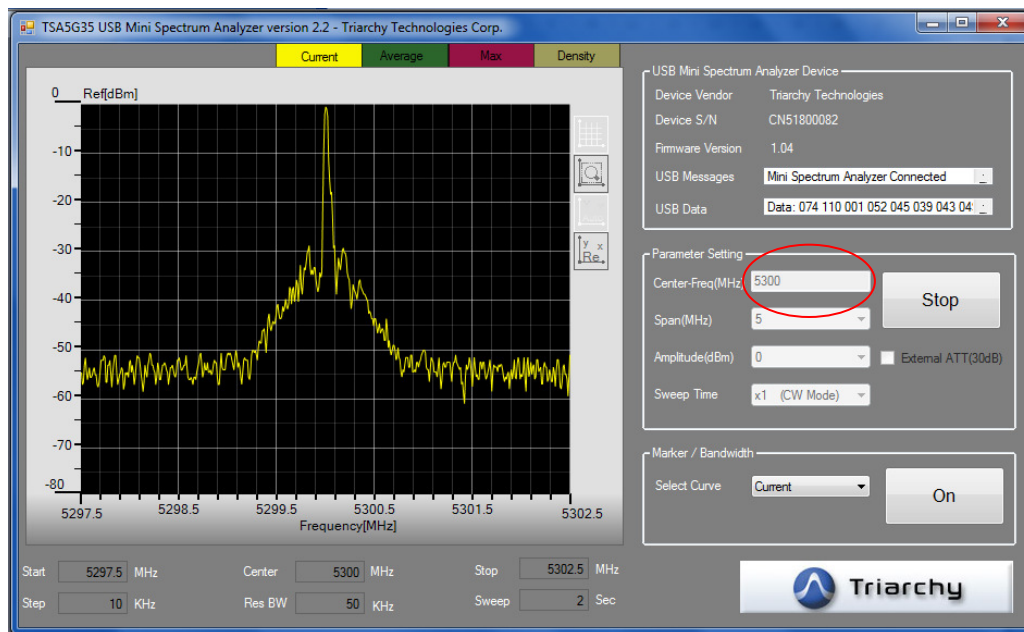


Figure 16 Frequency set at 5300 MHz

2.3 SPAN Setting

The SPAN value can be selected by user. SPAN values are 1 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 500 MHz, and 1000 MHz.

The TSA5G35 has two bands, low band is from 0 to 850 MHz and high band from 850 MHz to 5350 MHz. The 850 MHz frequency is the band edge. When SPAN is set at 500 MHz or 1000 MHz, SPAN range cannot cross over the band edge, so that, 1000 MHz SPAN cannot work at low band.

When SPAN setting is from 1 MHz to 100 MHz, the span range can cross over the 850 MHz band edge.

For example, if SPAN is set to 500 MHz, the frequency is set at 600 MHz, the SPAN range will be from 350 MHz to 850 MHz. If the frequency is set to 700 MHz, the UsbApp will pop up the warning message to remind the user to enter a proper value for the span, Please see the warning message as shown in **Figure 17**.

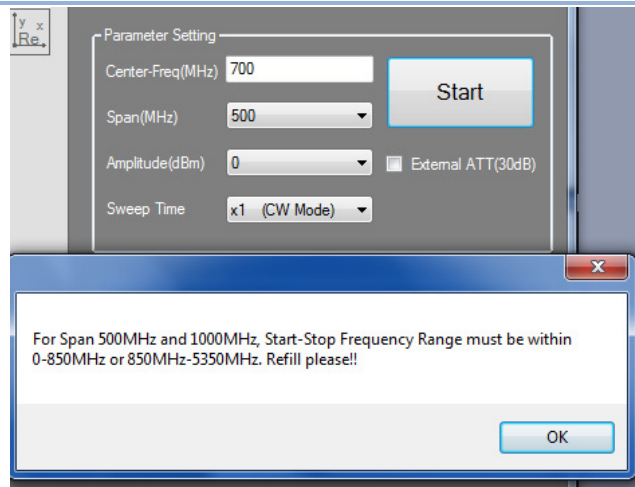


Figure 17 Warning Message for 500 MHz and 1000 MHz SPAN Setting

2.4 Amplitude Setting

The amplitude setting will depend on the signal level to be measured. If the signal is small, the 30 dB attenuator doesn't need to be added, the reference level will be from -60 dBm to 0 dBm at 10 dB step. If the signal level to be measured is large, the 30 dB attenuator will need to be added, and to mark **external ATT (30 dB)** at UsbApp. The reference level will be from -30 dBm to 30dBm at 10 dB step.

If the signal level to be measured is 16dBm, add the attenuator, please see **Figure 18**.

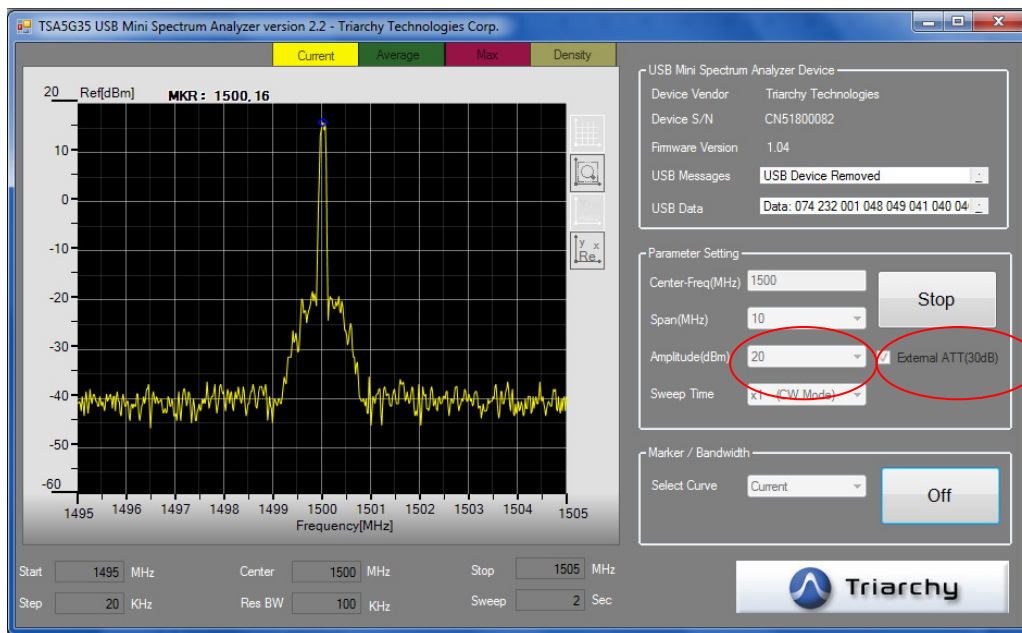


Figure 18 Measuring 16 dBm Signal with External Attenuator Connected



2.5 Sweep Time Setting

When the sweep time is slow, the **TSA5G35** will do oversampling. The oversampling time interval will be 3 μ s. The sweep time needs to be selected based on what kind of signal will be measured.

If the signal to be measured is continuous wave (CW), select x1 (CW Mode).

If the signal to be measured is continuous modulation signal, select x1.5 (Burst Mode) or x2 (Burst Mode)

If the signal to be measured is packet data signal, select x4(Burst Mode) or x8(Burst Mode), or larger.

For example, to measure 2.4 GHz Zigbee signal with continuous modulation, you need to select sweep time with x2(Burst Mode). The measured result will be shown in **Figure 19**.

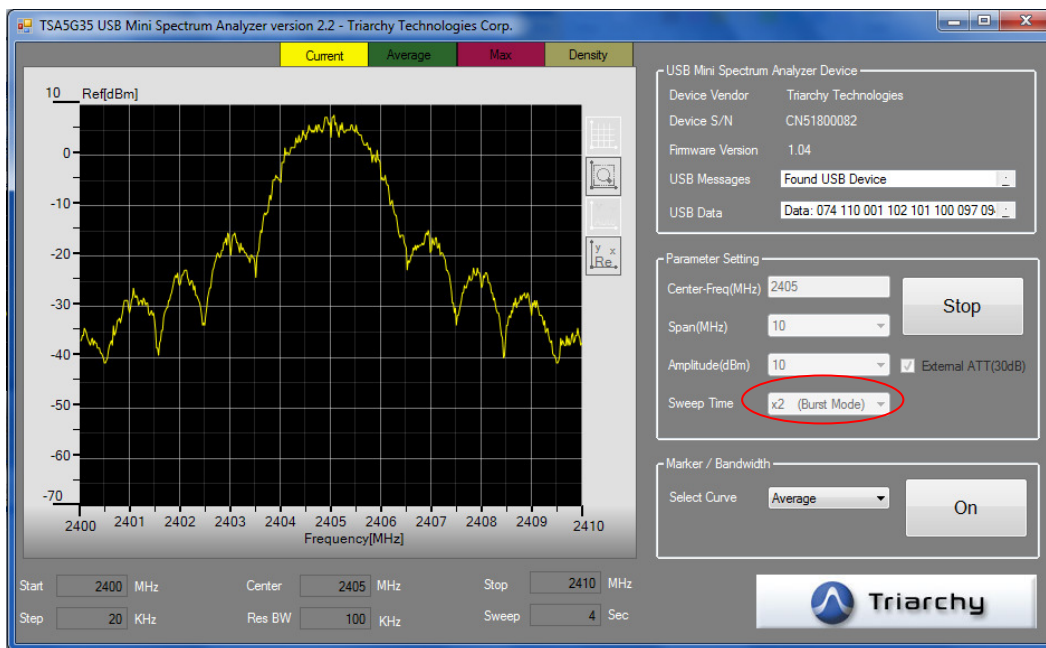


Figure 19 Zigbee Signal Measurement

2.6 Trace Selection

The current trace, average trace, max trace, and density of the measured signal can be turned on or off individually by clicking on the corresponding button on the screen as shown in **Figure 20**, which shows the current trace, average trace, and max trace. The density is turned off.

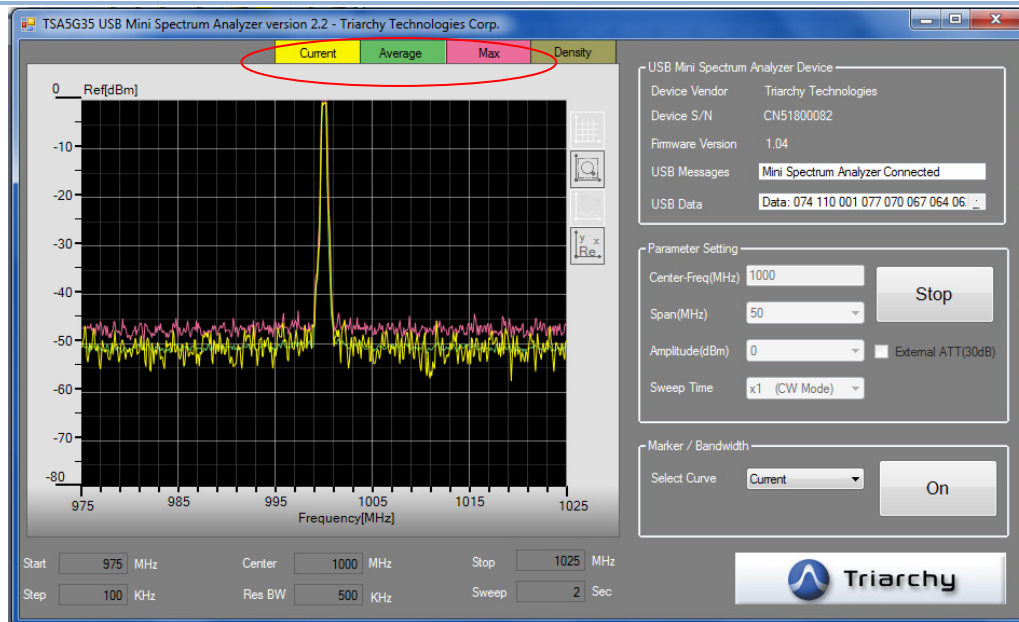


Figure 20 Current Trace, Average Trace, and Max Trace **Are Turned on**

2.7 Current Trace

The current trace is to display the real time signal spectrum, and the default display will be current trace. The current trace will be updated with each scan over the frequency range. When the input signal is changed, the current trace will change immediately. When the device is used to measure the modulated signal and packet signal, you need to increase the sweep time to get a better spectrum waveform.

2.8 Average Trace

The average trace is adopted 16 points of moving average algorithm. It can reduce the signal noise when measuring CW signal. It will conjecture the signal repeat rate for modulated or packet signal measurement, if the average trace is very low comparing to the max trace, it means the signal repeat rate is very low.

2.9 Max Trace

The max trace will hold the maximum signal level with each scan. Max trace can be used to measure the modulated signals, and random signals. The max trace will show envelop of modulated signals. When you do an EMC test, you can use the max trace to pick up the max signal.

2.10 Density Measurement

The density image will show the modulated signal with the detailed signal energy distribution, even when two signals are overlapped, you can still watch and find the two signals from the density image. It is very useful to analyze the modulated signal.



Since density measurement will use up a lot PC computing resource, the default option for density measurement is off. For a low performance PC, turning on this option may cause PC to respond slowly.

3. Measurement Support Features

There are measurement support features, including **Marker**, **Bandwidth Measurement**, trace **Zoom-In**. and **Image Hardcopy**. In this guide curve and trace are interchangeable.

3.1 Select Measurement Curve

Before selecting **Marker/Bandwidth** functions, you shall choose which curve to be measured. There are **Current**, **Average** and **Max** curves, select one on **Select Curves** window and click **“On”** button in the **Marker/Bandwidth** panel as shown in **Figure 21**, and then run into the **Marker/Bandwidth** mode.

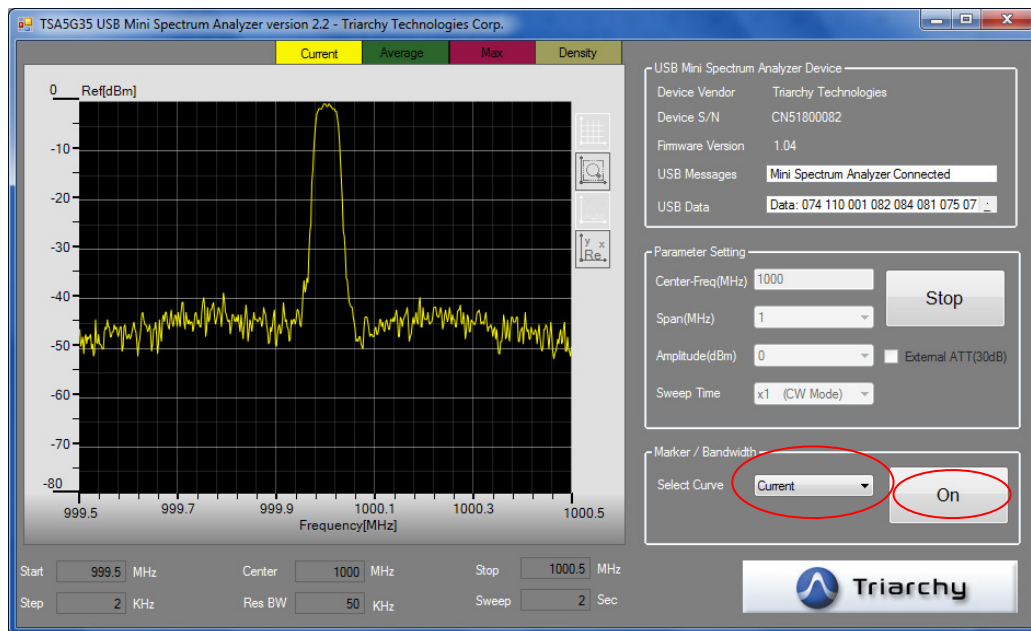


Figure 21 Select Current Trace to Measure

3.2 Marker

To place a marker on the signal by moving the cursor near the peak of the signal, right click the mouse, a pop-up menu will be shown, go into the Marker item:

Selecting the marker “to peak” will place the marker at the peak of the signal around cursor area.

Selecting the marker “to notch” will place the marker at the notch of the signal around cursor area.

Selecting the marker “to curve” will place the marker at cross point of the cursor y axial and curve.



The marker value will be displayed on the screen. Click “Off” button on the **Marker/Bandwidth** panel to turn off the **Marker/bandwidth** measurement mode, and then clear all markers. **Figure 22** shows the marker “to notch” selection on the average trace.

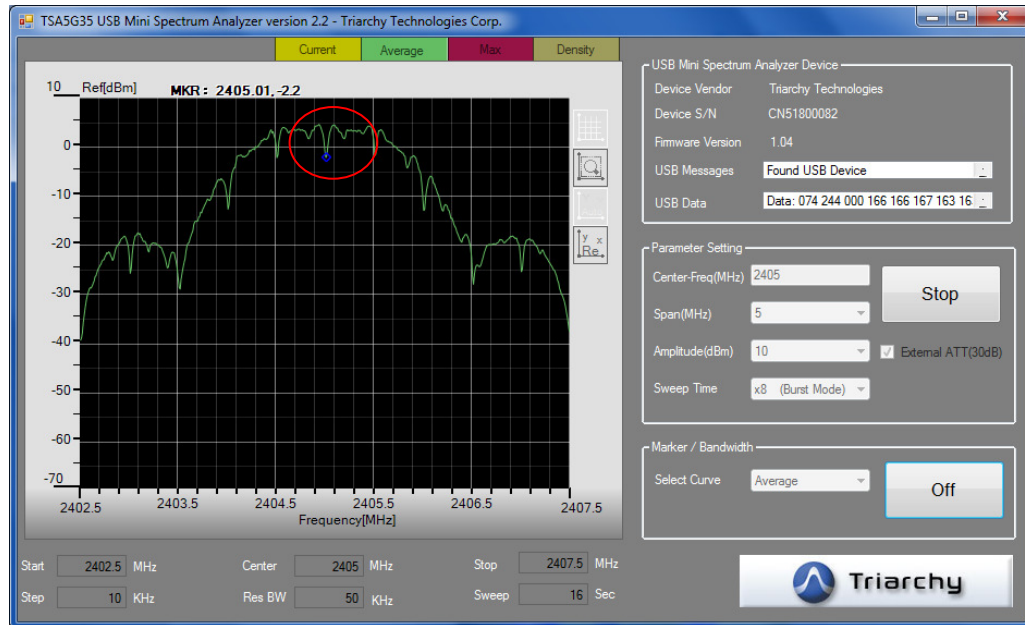


Figure 22 Select the Marker “to notch”

3.3 Bandwidth Measurement

To go into the **Bandwidth** measurement, just move mouse cursor into the display area, right click the mouse, the pop up menu will be shown, go into the **Bandwidth** item.

Please note, before selecting the **bandwidth** item, you should first set one marker as a bandwidth calculation reference point. Otherwise, the **Bandwidth** item will be gray and cannot be selected.

In the bandwidth item, selects the bandwidth measurement selection:

Selecting the 3 dB bandwidth will generate two crossing points on curve below the marker -3dB.

Selecting the 6 dB bandwidth will generate two crossing points on curve below the marker -6dB.

Selecting the 20 dB bandwidth will generate two crossing points on curve below the marker -20dB.

Selecting the “to curve” of bandwidth will generate two crossing points on curve with horizontal line on current cursor.

The selected bandwidth will be displayed on the top of the screen. **Figure 23** shows the spectrum bandwidth measurement results.

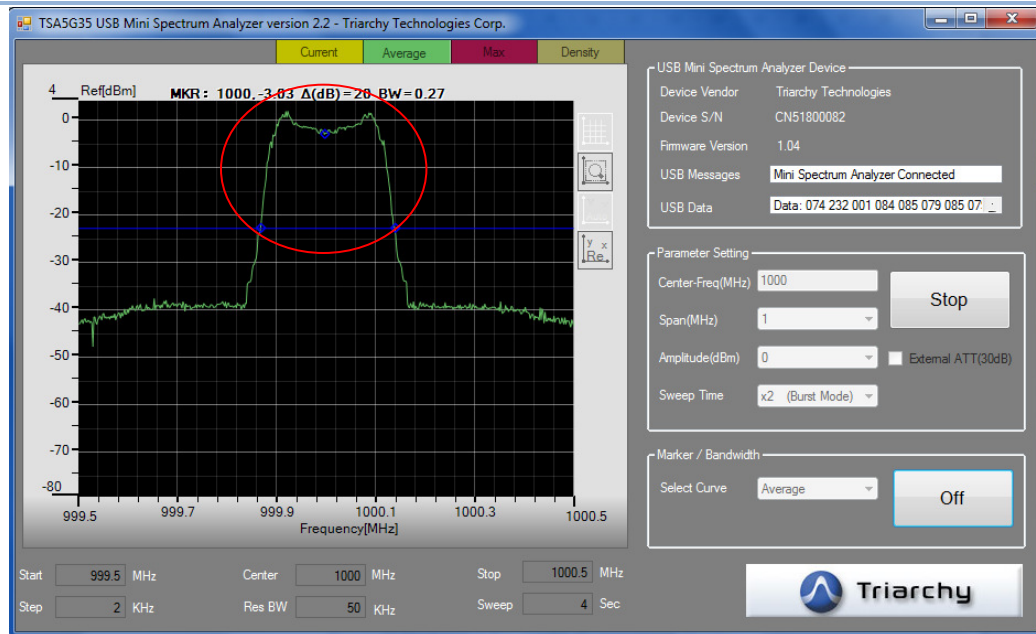


Figure 23 Signal Bandwidth Measurement Function Display

3.4 Zoom-In

There is a **Zoom-In** function to examine the details of the spectrum. Click the **Zoom-In** button to select the **Zoom-In** function. Another way to select Zoom-In is right clicking the mouse, a pop-up menu will show up, then select the **Zoom-In** function.

Left click the mouse and drag the mouse to select the area to be zoomed, click **“OK”** button to confirm the zoom-in area. **Figure 24** shows the spectrum before applying the **Zoom-In** function.

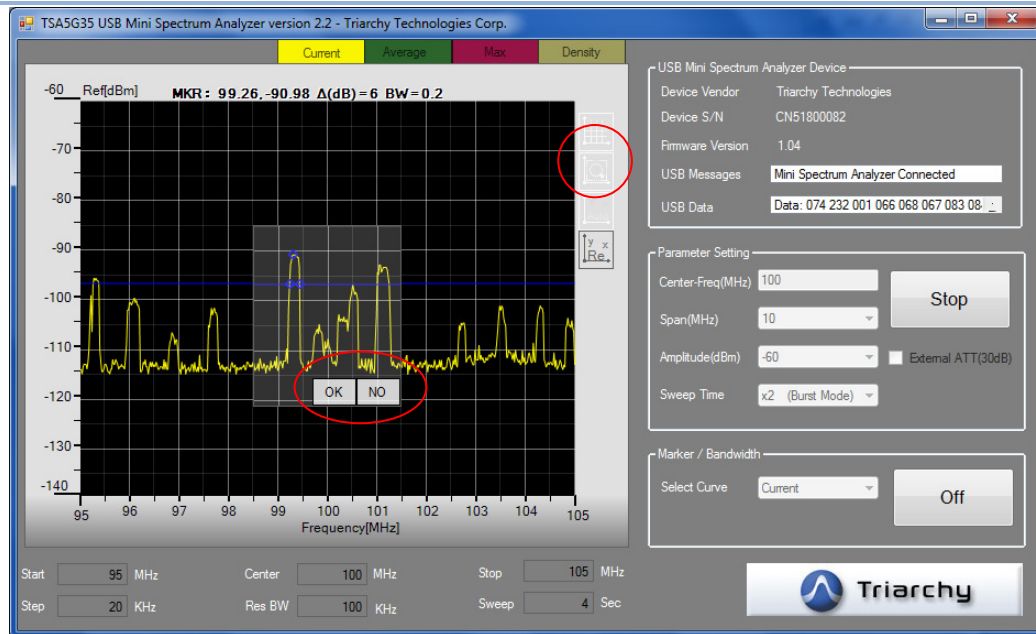


Figure 24 Spectrum Display before Applying the Zoom-In Function

Figure 25 shows the spectrum display after applying the zoom function. The display shows the details of the selected portion.

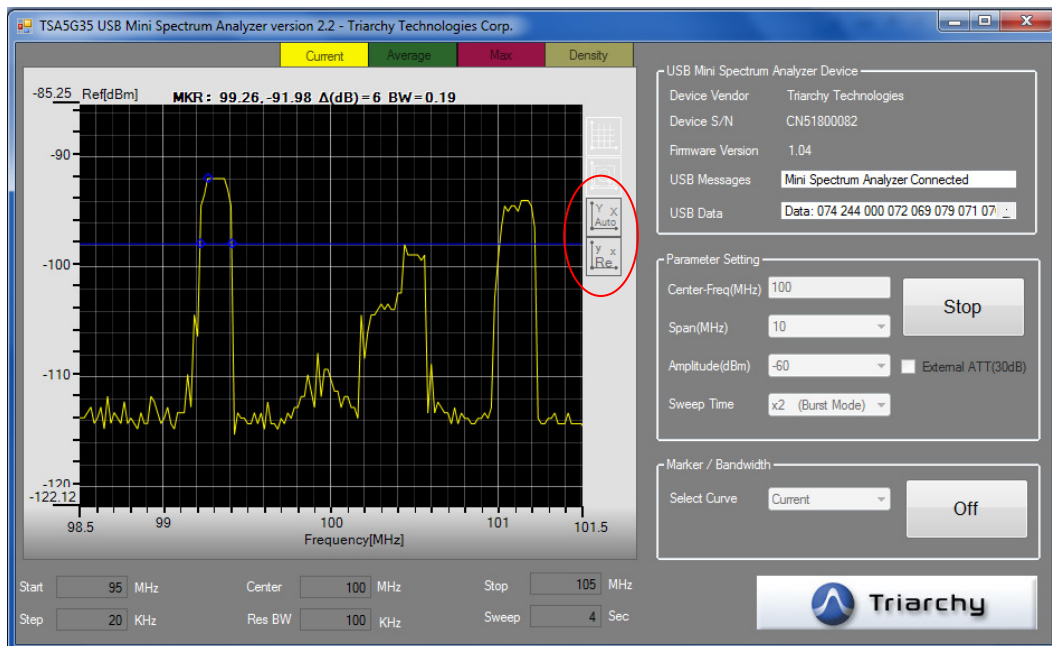


Figure 25 Spectrum Display after Applying the Zoom-In Function

Returning to the original settings is easy. Just click "**Auto Fit**" button or "**Fit Window to Config**" button on the right of display window. Then the display will return to the original display settings or fit trace within windows automatically.



3.5 Image Hardcopy

After you finish all the setting and complete the waveform measurement, you can right click on the display area, in the pop up menu, select **“Save Image to File”**, the current measurement will be saved into an image file **“temp_XXXXXXXXXXXX.bmp”** in the application program folder, and then the measurement will continue. You can navigate to the program folder to look for the saved image file. It is better to move this image file out of the program folder and rename it to your own filename for archive. Please see **Figure 26** for the pop-up menu.

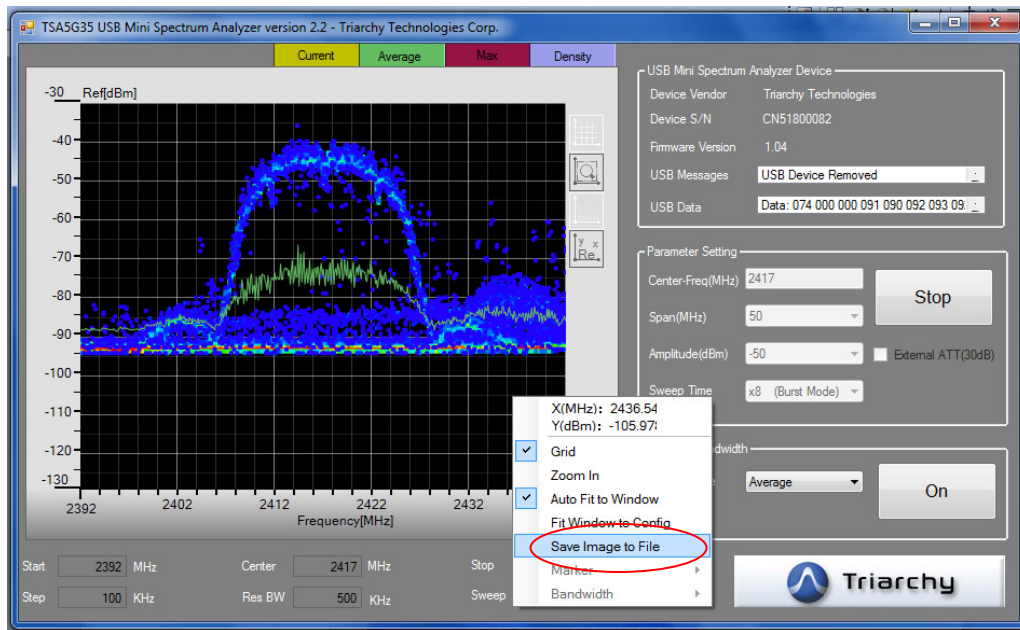


Figure 26 Save Image to a File

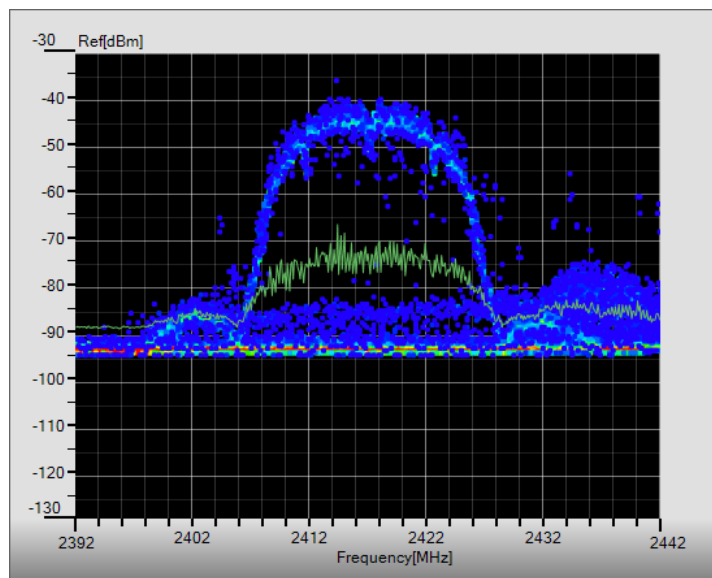


Figure 27 Image Hardcopy Example



3.6 Current Cursor Coordinates on Display

When mouse cursor is located on the display area, right click the mouse, top of the pop-up menu will show the coordinates of current cursor: frequency and level in dBm, this feature can work as a simple marker function. Please see **Figure 28**.

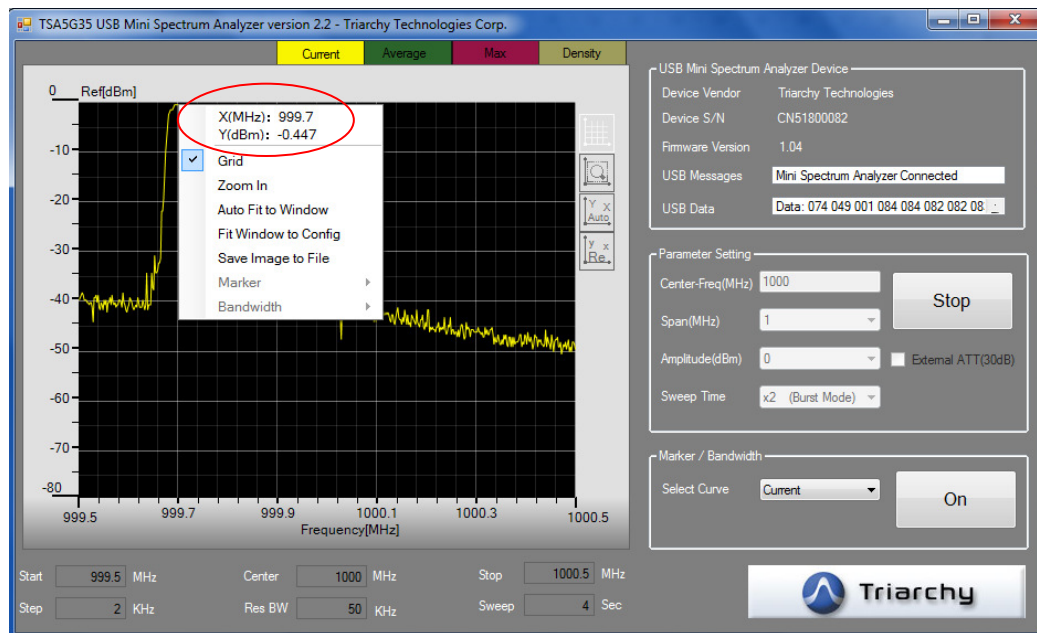


Figure 28 Cursor Coordinates on Display