

WiPry 5x User Manual

2.4 & 5 GHz Wireless Troubleshooting

Dual Band Spectrum Analyzer



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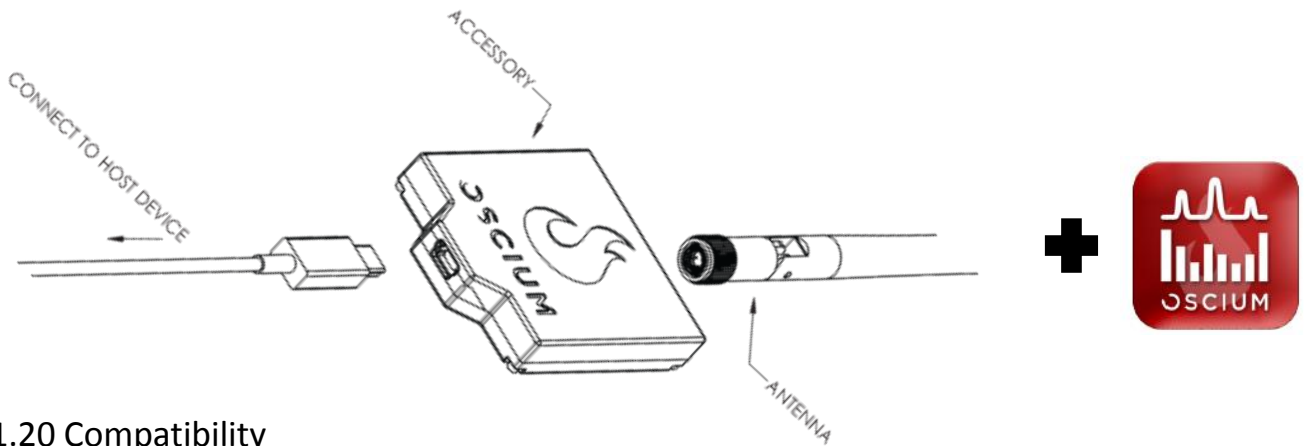
 *The 'Best Practice' Icon*

 *The 'Field Application' Icon*

Section 1 Getting Started

1.10 Quickstart Guide

Insert hardware into smartphone or tablet. Then download WiPry software from either Apple App Store or Google Play Store.



1.20 Compatibility

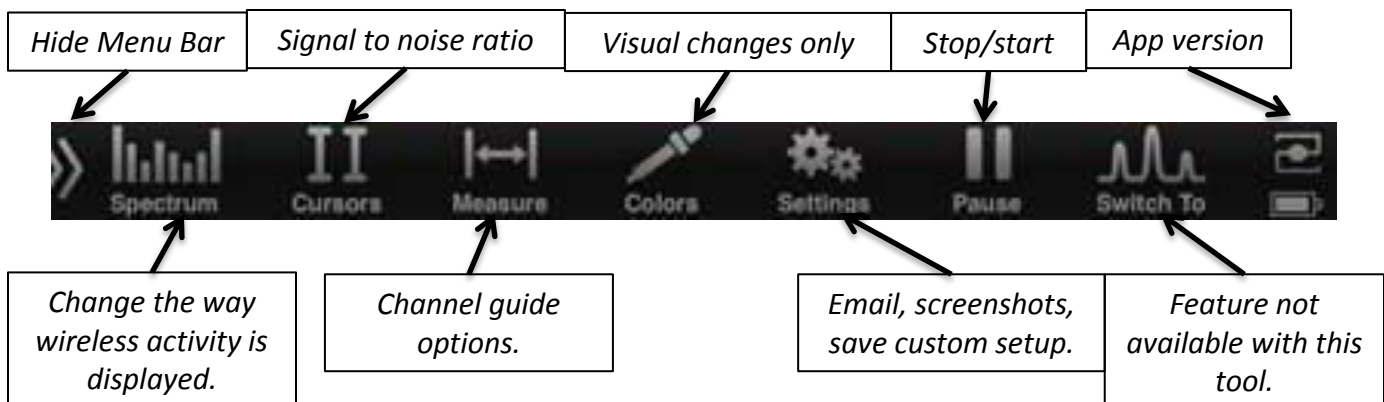
WiPry is a dual band spectrum analyzer (2.4 GHz & 5 GHz) that works with a smartphone or tablet. Hardware compatibility includes Apple lightning devices with iOS version 7.0 or higher. Android support includes version 4.0.3 & higher. Android hardware compatibility includes devices that have USB OTG. Support for additional platforms like MAC and PC may be available in the future. These additional platforms will be available with no changes required to the hardware. WiPry 5x is built for universal platform support.



Section 2 How WiPry Works

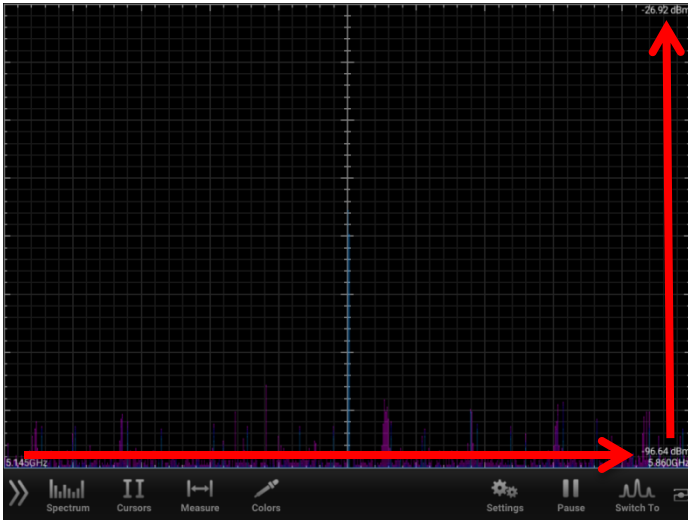
2.11 Screen Layout

Across the bottom of the screen, menu options exist. Tapping on any of these options, reveals features within that menu:




Section 2 How WiPry Works



2.11 Screen Layout

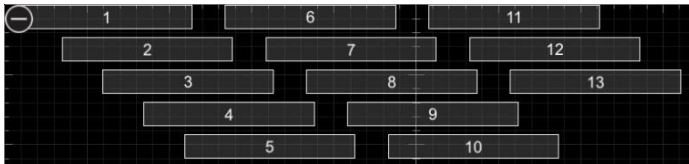




The arrow pointing up represents amplitude. The higher the signals are on the screen, the stronger the signal.

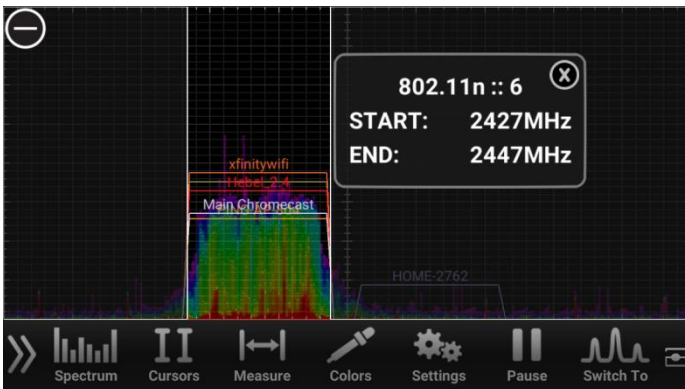
The arrow pointing to the right represents frequency. This tool visualizes all wireless signals from 2.4 to 2.5 GHz and from 5.15 to 5.85 GHz, which covers everything needed to troubleshoot Wi-Fi. The view pictured to the left shows signals from 5.15 to 5.85 GHz.

 Touching the screen at any point will provide the x and y markings, showing the range in frequency (x axis) and in amplitude (y axis). The image picture above is 5 GHz.

? Switching between 2.4 & 5 GHz modes can be done quickly by selecting the spectrum menu option and then tapping the desired frequency:  



To enable the Wi-Fi channel guide, tap  located in the top left corner. Then, tap any of the boxes listed (1-13) to highlight channel activity. To hide the Wi-Fi guide, just tap .

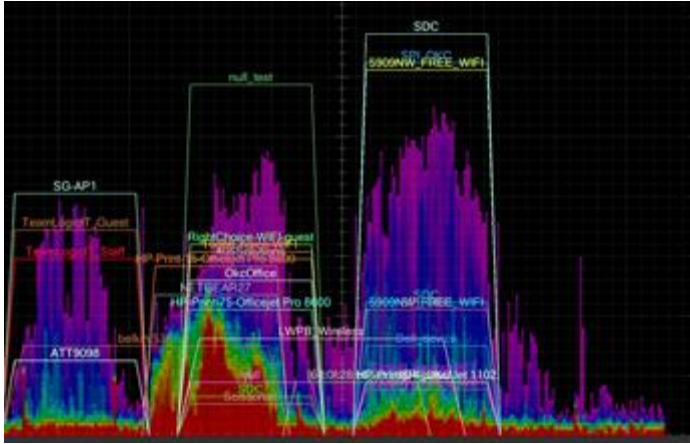


Channel-specific activity is important to the speed and reliability of your wireless signal. Interference can cause slow speeds and at times no connection at all.

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2.11 Color Legend

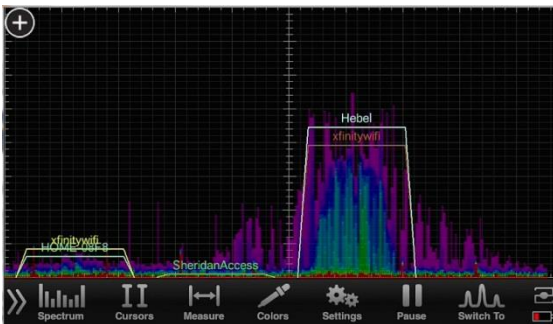
The colors listed in the default view illustrate a 'heat map' of the wireless activity as pictured below. The hot colors (like red) represent continuous transmissions.



- Light purple - single packet
- Blue - less than green
- Green - less than yellow
- Yellow - less than red
- Red - noise floor, continuous transmissions

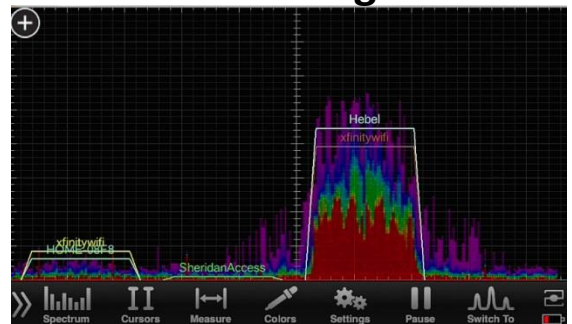
? Red activity can cause significant interference, which affects wireless speed and reliability. Here's what activity looks like and how it affects speed:

Baseline



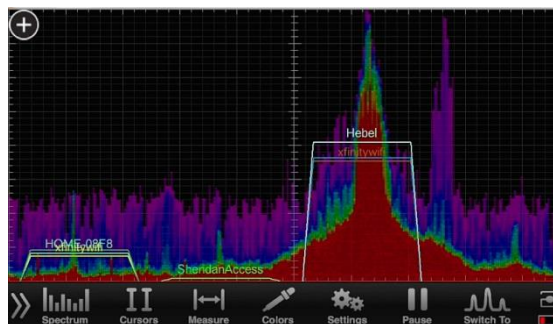
iPhone 5 = 37.4 megs (Ookla)

Video Streaming on iPad



iPhone 5 = 27.2 megs (Ookla)

Video Streaming + Microwave Oven



iPhone 5 = 8.9 megs (Ookla)

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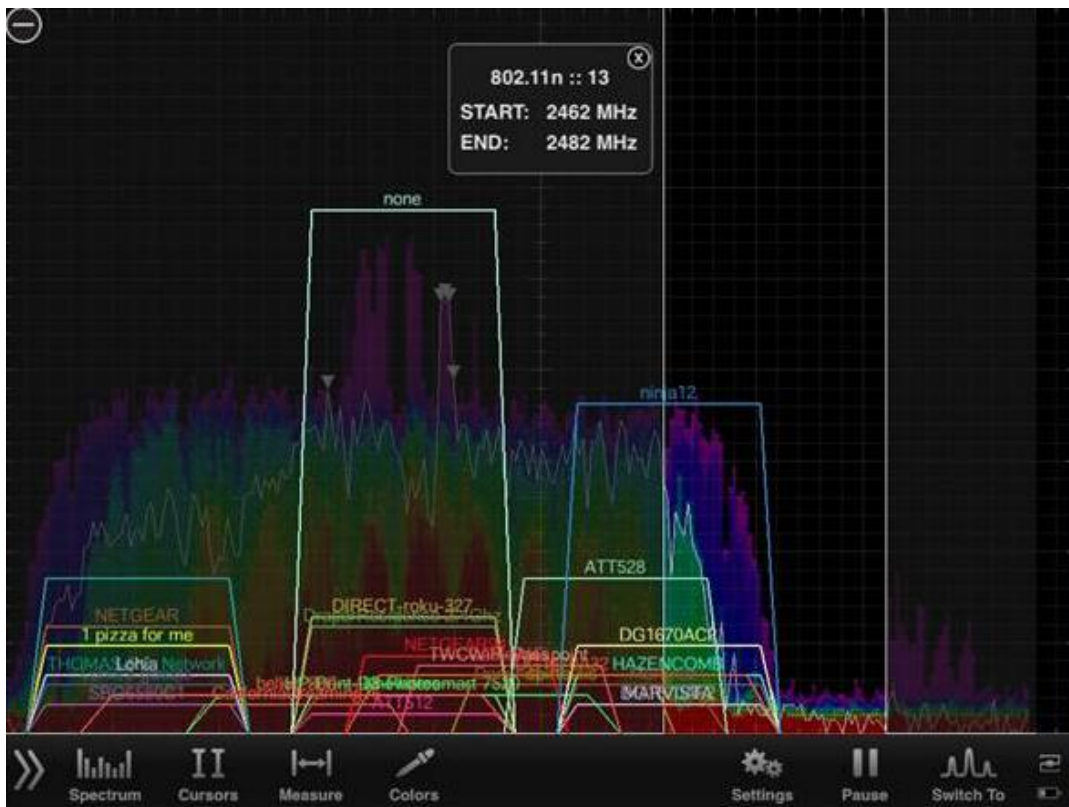
2.21 Avoid Interference

Interference across the entire 2.4 GHz spectrum is visualized below. Here's how to duplicate the setup shown below:

Step #1 The default view includes the heat map, which is the setting that displays the colors below.

Step #2 In this illustration, decay is also enabled. Decay is the white squiggly line that provides an average of the signal, which fades (or decays) over time. Enabling decay can be done by tapping the 'spectrum' menu in the bottom left corner. Then, tap 'none' below **HEAT MAP**. Then tap **DECAY**.

Step #3 Tapping the **+** sign in the top left corner will expand the channel guide. Then, tapping on any of the boxes will highlight the channel activity. Channel 13 is highlighted.



? In this example, there is no clear channel in 2.4 GHz. This interference was limited to the inside of the home (interference was not visible when leaving the residence). In this example although 2.4 GHz was very congested, 5 GHz was not. It was recommended that the customer add dual band adapters on wireless devices to utilize 5 GHz for best speeds...or accept slower speeds on 2.4 GHz.

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2.22 Educate

Apartment complexes are notorious for having wireless issues. That's partly because wireless bandwidth is being shared not just within a particular home but with nearby neighbors that share the same channel. 'Access Point Utilization' grades each AWG/Router within a given wireless environment. Showing a customer a poor grade of D (like shown below) helps put wireless congestion in context. Unfortunately, this is the best that could be done for this customer. Although speeds were not improved, educated customers are much more understanding. Here's how to duplicate the setup shown below:

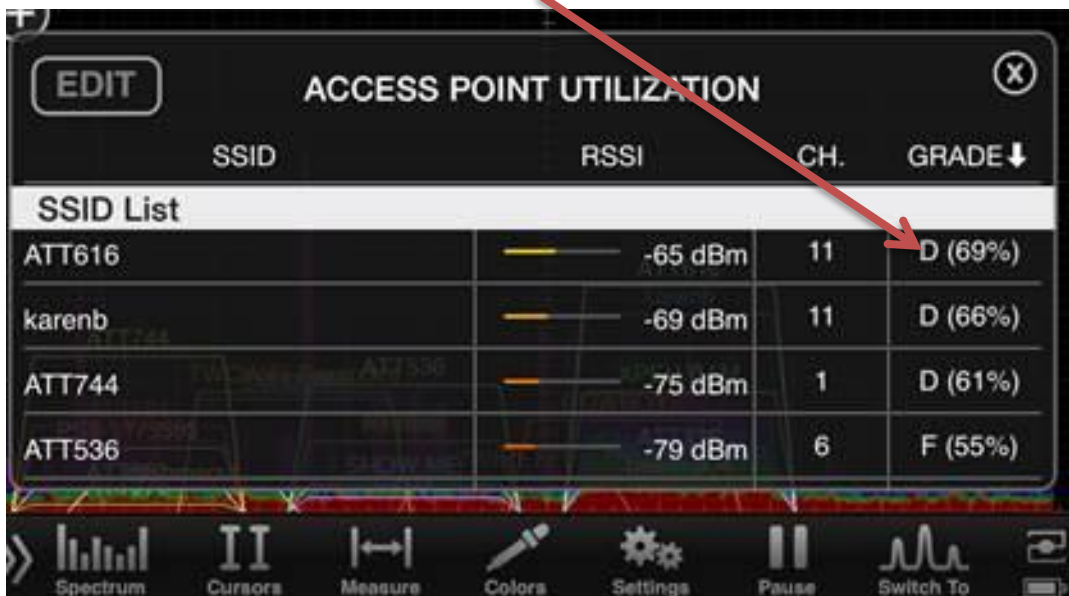
Step #1 Tap 'spectrum' menu option in the bottom left corner. Then, tap


ACCESS POINT UTILIZATION

just above

HEAT MAP

Step #2 Each AWG/Router is graded in the far right column.



 *Disabling Wi-Fi inside your host device will reduce noise and improve the accuracy of your assessment.*

Section 2 How WiPry Works

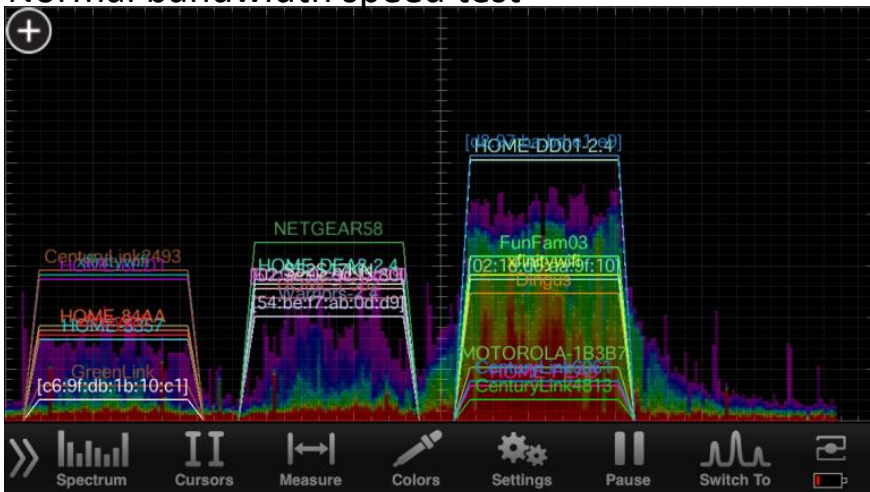
2.23 Identify Interference Source


This screenshot was captured during speed test on an HP laptop. Not only were wireless speeds affected on the laptop but it was also causing problems for every other wireless device. Powering down the laptop fixed the problem for all devices. It was recommended that the customer disable HP wireless network card and directly connect the laptop using an Ethernet cable. No actions are required to duplicate the setup. This is the default view with heat map.

HP Laptop – Bandwidth Speed Test (This is a problem!)



Normal bandwidth speed test



 It's easy to reset the software back to the default view. Just tap the 'settings' menu option. Then, tap **RESET CONFIG**. Super-savvy techs may also want to save their favorite setup(s). Just below the reset config option is an option to save three different setups. After a setup has been saved, just tap **LOAD** and the screen will load.

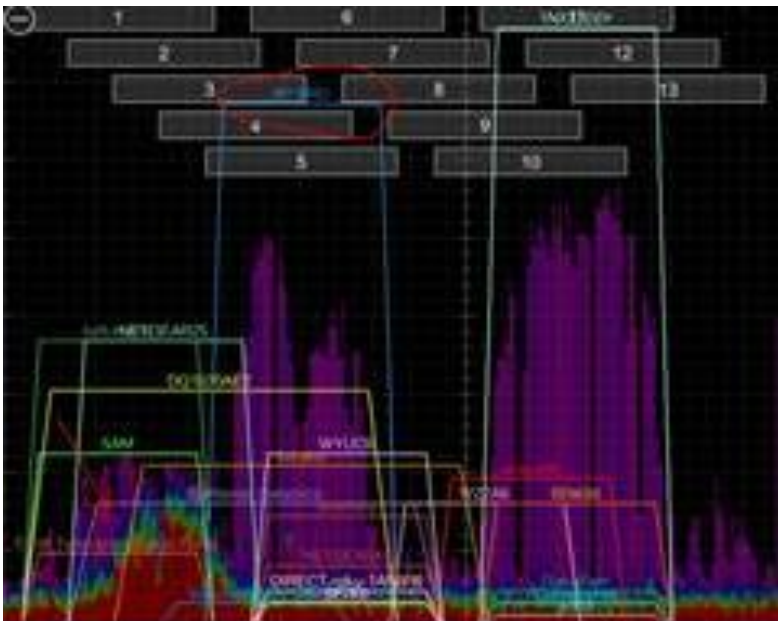
Section 2 How WiPry Works

2.24 Optimize Channel

Not every channel yields the same wireless speeds. Manually testing speeds on various channels gives significantly different results. In this example, speeds vary from 23-31 megs down after optimization and 4.74 megs down before the change. Here's how to duplicate the setup shown below:

Step #1 Heat map is enabled as part of the default view. Tap the plus sign in the top left corner to expand the channel guide shown below. This is helpful to quickly identify the channel of each AWG/Router.

Step #2 Ookla is a separate app (very bottom of screen). It tracks each speed test and displays the actual wireless bandwidth.



Before optimizing channel



Best practices include using channels 1, 6 and 11 only for deployment of Wi-Fi over 2.4 GHz since these channels represent non-overlapping frequencies. Channels on 5 GHz do not overlap. The example above is for illustration purposes only, that manually selecting channels does impact wireless speed.

Section 2 How WiPry Works

2.25 Undo / Relocate Hardware

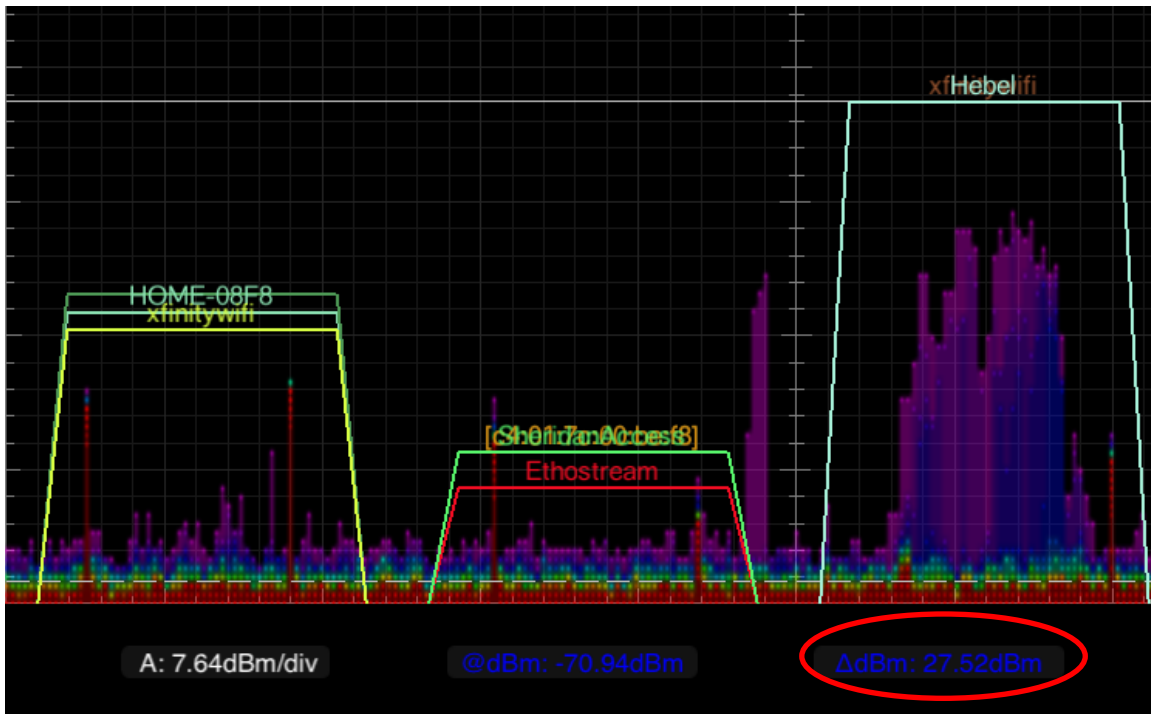
Convenient setup of the AWG/Router is often in a basement or mechanical room far away from where wireless internet is used. This can be a problem because the signal strength will attenuate (or lose strength) as it travels further away from the source. So when should the AWG/Router be relocated to a more central location? If the Signal to Noise (SNR) ratio is too low. The industry minimum is 25 dBm for VOIP and video streaming. Here's how to duplicate the setup shown below:


Step #1 Tap 'cursors' menu option.

Step #2 Tap 'on'. Ensure setup matches the image here

Step #3 Then, set one cursor at the potential of your access point (solid line) and the other one at the noise level (dotted line at the bottom of the screen). The SNR is calculated for you (27.52dBm). This was not sufficient for a VOIP AT&T MicroCell. Recommended relocating the router closer to the VOIP system.

Step #4 To view SNR ratio slide the menu bar away by swiping 'arrow' in bottom left.



 VOIP over a cell phone (especially on 2.4 GHz) is a challenging request. Customer could improve telecommunications by hard-wiring VOIP box (like an OBi) directly into the router. Using a cordless phone with this setup yields a far superior experience for the customer AND the AWG/Router would not need to be relocated.

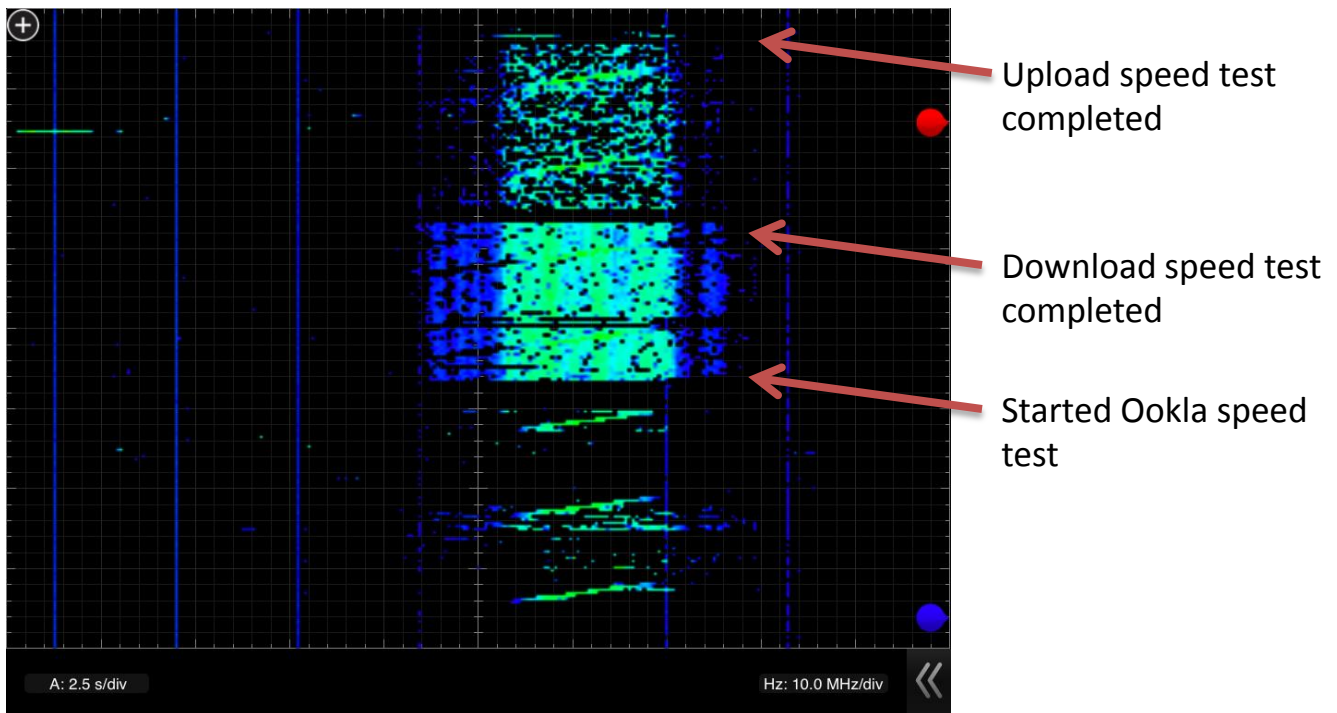
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2.31 Waterfall Mode

One of the challenges with RF is that the environment is constantly changing. The default setting on our app is for a real wave view. This displays activity in real time. But interference can come and go. Waterfall displays RF over time. The newest activity is at the top of the screen. And it 'falls' down the screen as time elapses. The oldest activity is at the bottom of the screen.

Step #1 To view waterfall mode, tap the 'spectrum' menu.

Step #2 Then, tap **WATERFALL**.



? *Logging activity on site is a great way to create a reference point at a particular location. And although it is possible to log the data in WiPry, it's not currently possible to save (and replay) that log exactly as you see it on the screen. Logged data is currently displayed as numbers / data points.*


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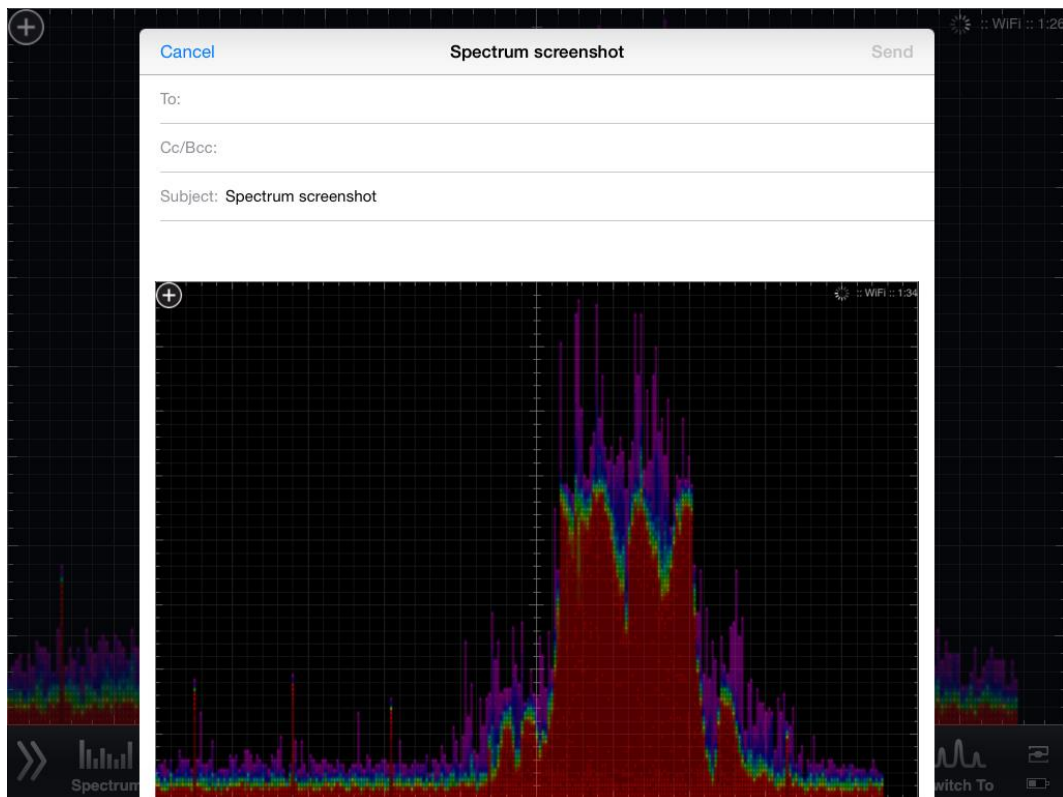
2.32 Screenshots / Email

Capturing and emailing screenshots is helpful for supervisors . Difficult wireless issues can be forwarded to managers or Wi-Fi experts for immediate feedback. Here's how to capture screenshots and use email inside the WiPry app:

Step #1 Tap 'settings' menu option.

Step #2 Then, tap **EMAIL** and a picture of the screen will be captured and emailed (see image below). Or, if multiple screenshots are needed, tap **SCREENSHOT** instead and images will be stored in photos.

 *Screenshots can also be captured by simultaneously pressing the power button (on the Apple device) and the menu button (on the Apple device). The screen will briefly flash white. This feature is available at any time, not just while using WiPry software.*



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2.33 Datalogging

Datalogging creates a record of activity while using the WiPry tool. Although it is possible to log as long as there is battery life on the iOS device, the data is represented by numbers in a CSV file. This is a bit cryptic without a way to re-create the waveforms. So, it is not recommended that this feature be used for this application.

2.34 Other Features

Pause / play - located on the menu bar and it simply pauses the screen. It does not take a screenshot/photo. So, it is not recommended that this feature be used at this time.

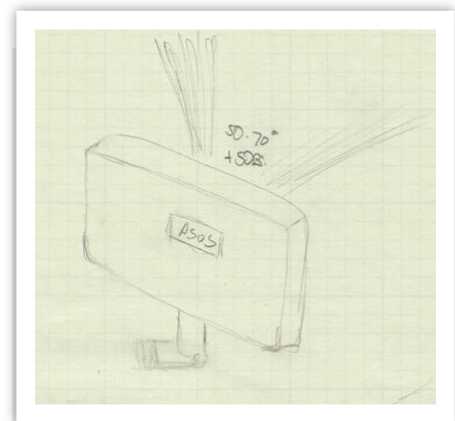
Power meter – located on the menu bar and is represented by a ‘switch to’ menu option. This feature is only available with a different piece of hardware. It is not recommended that this feature be used at this time.

Colors – located on the menu bar and is represented by ‘colors’. Changing the colors does not have any material advantage, and as a result, it is not recommended that this feature be used at this time.

2.4 GHz Directional antenna – the supplied antenna is omnidirectional. That is, it exists in every direction. But, it is possible to amplify signals in a particular direction. This could be used to pinpoint the exact location of an interference source. Directional antennas are not supplied standard. They can be purchased separately. Here is what is needed: 1 x Asus WL-ANT-157 (supplied by Asus) and 1 x Conducted Measurement Kit (supplied by Oscium):



Asus WL-ANT-157

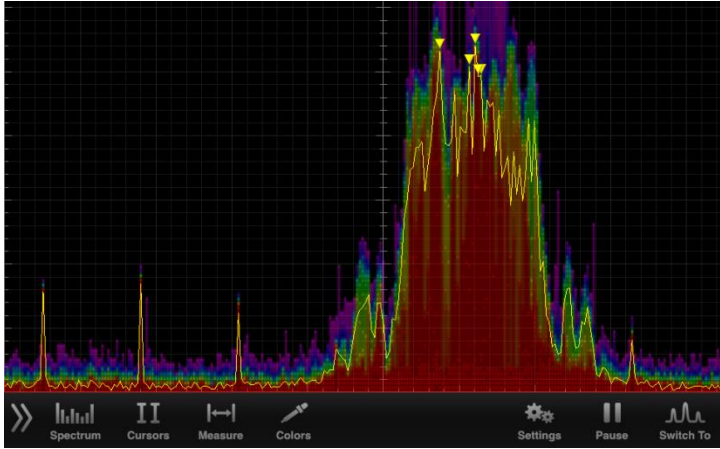


How It Amplifies Signal

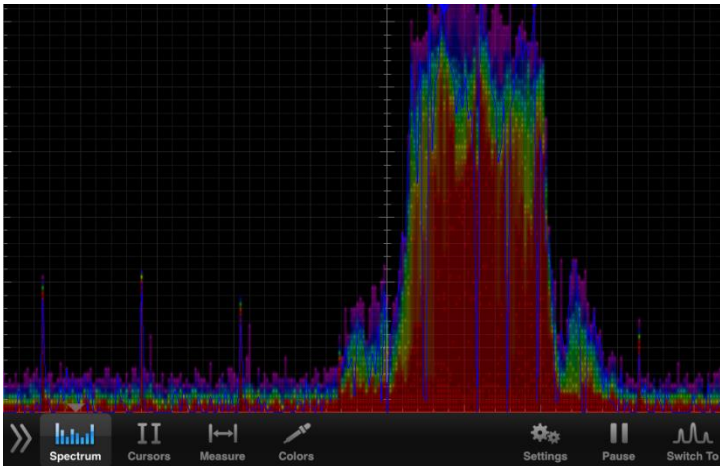
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2.34 Other Features

Average – provides a yellow line that averages the signal. Very similar to decay functionality described in more detail on page six.



Raw – represents the raw spectral data and is visualized by the blue squiggly line. The problem with raw view is the signals are so fast that it's impossible to do anything with the data. Image captures here:




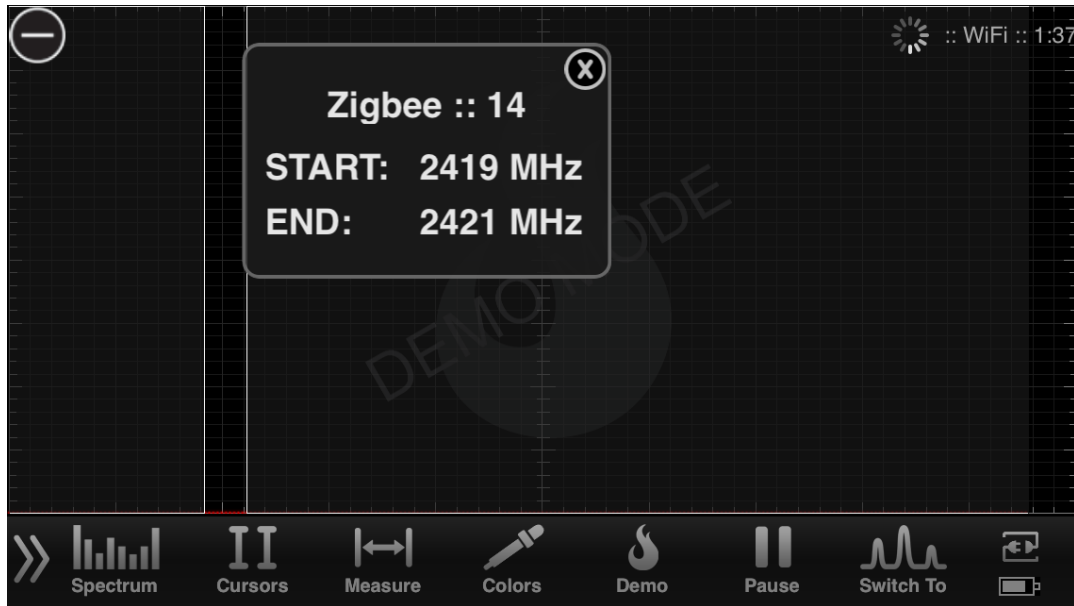
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2.34 Other Features

ZigBee – Viewing ZigBee’s specific channel guide is helpful for troubleshooting ZigBee systems. To access this feature:

Step 1 Tap the measure menu option. Then, scroll down and tap 802.15.4 – ZigBee.

Step 2 The ZigBee channel guide has been loaded. Now tap  in the top left corner.



 Since most AWG/Router’s default to channels 1, 6 or 11, the best ZigBee channels to use are often 15, 20 or 25. These channels do not overlap with the majority of Wi-Fi traffic, which helps improve performance.

Reference

Access Point Utilization (2, 7)
Apartment Complex (7)
Android (3)
Average (2, 14)
Avoid interference (6)
AWG / Router (7, 9, 10)
Bandwidth Speed Test (5, 8, 9, 11)
Best Practices (2, 4, 7, 8, 9, 10, 11, 15)
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Cursors (10)
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