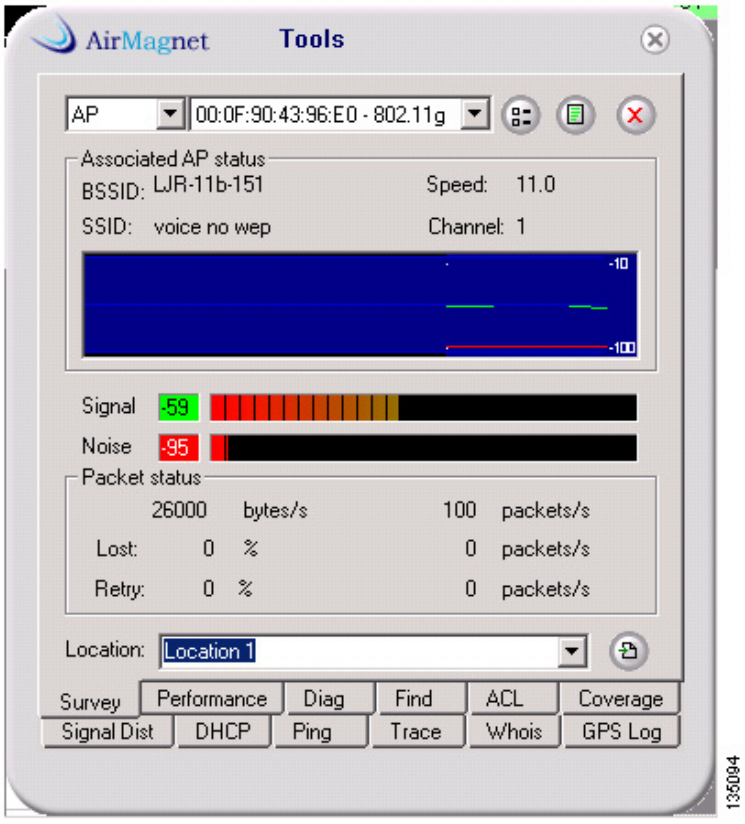
Survey Tools

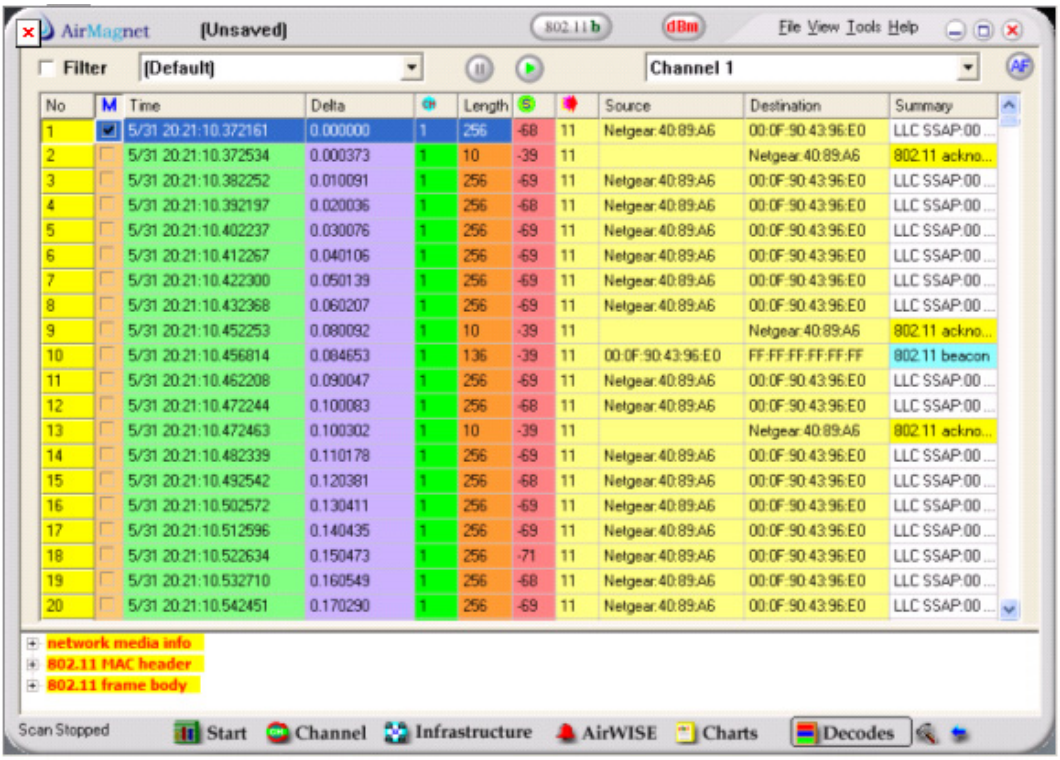
AirMagnet offers many tools for analyzing 802.11 performance at a site. Figure 2-1 shows the AirMagnet Survey tool. Cisco recommends AirMagnet for data and WIPT surveys.

Figure 2-1 AirMagnet Survey Tool



An accurate survey requires packets sent in both directions. The size of the packets needs to equal the size of the packets used by the primary applications used at the survey site. Figure 2-2 shows a packet capture of the AirMagnet Survey tool survey packets. This window shows that the AirMagnet tool is actively sending packets.

Figure 2-2 AirMagnet Packet Decode Tool



The 7920 survey tool reports the signal strength of the signal from the access point as an RSSI value. Most client card utilities report signal strength as dBm or percent of signal strength. In this chapter, each of the tools tested will be reviewed showing how they measure signal strength. Table 2-1 provides a cross reference of RSSI, dBm, and percent of signal strength as reported by different cards and utilities. The numbers were captured in a live over-the-air test with each device in the same location for comparison. These are not exact numbers. A plus or minus of five percent in radio-to-radio performance is considered within tolerance. All surveys regardless of the tool used must be measured to the signal strength requirements of the 7920. Cisco recommends that cell size for the 7920 be an RSSI value of 35 for the 7920 survey utility; this equals a PCM350 ACU value of -67 dBm and a Cisco a/b/g client Aironet Desktop Utility (ADU) value of -66dBm.

Table 2-1 RSSI, dBm, and Signal Strength Cross-Referenced for 7920 Phones

1200 Series Access Point @ 11 Mbps @ 20 mW with 2.2 dBm Antennas							
Feet	**SniffPro Signal %**	**access point dBm**	**7920 RSSI**	**350 ACU dBm**	**AirMagnet 350 (PDA)**	**AiroPeek CB21 dBm**	**ADU CB21 dBm**
10	78	–55	52	> –45	–47	–51	–51
20	72	–60	46	–52	–49	–52	–53
30	68	–67	46	–55	–54	–58	–60
40	63	–72	43	–59	–54	–68	–68
50	68	–74	37	–59	–58	–68	–70
60	72	–72	38	–63	–64	–68	–67
70	30	–78	35	–67	–67	–68	–66

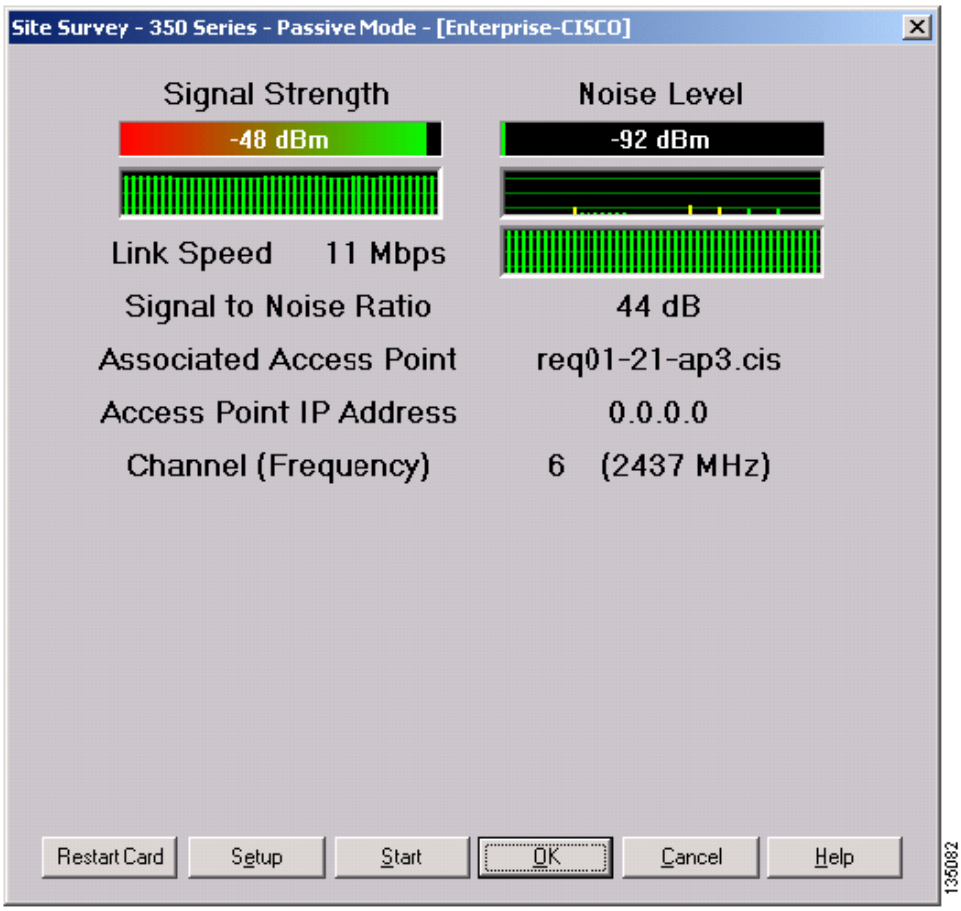
Table 2-1 RSSI, dBm, and Signal Strength Cross-Referenced for 7920 Phones (continued)

1200 Series Access Point @ 11 Mbps @ 20 mW with 2.2 dBm Antennas							
Feet	**SniffPro Signal %**	**access point dBm**	**7920 RSSI**	**350 ACU dBm**	**AirMagnet 350 (PDA)**	**AiroPeek CB21 dBm**	**ADU CB21 dBm**
80	47	–74	34	–69	–67	–72	–69
90	59	–84	31	–68	–70	–71	–71
100	28	–80	31	–72	–78	–69	–75
110	28	–78	34	–78	–70	–77	–79
120	33	–84	32	–77	–71	–77	–78

The data in Table 2-1 was created from live tests. Each tool and card combination data point was taken at the same time from the same distance. The environment was an open office. The floor plan used for the test is shown in Figure 2-12.

Figure 2-3 shows the ACU screen for dBm. The signal strength shown is -48 dBm, which is equal to a 7920 RSSI value of 51.

Figure 2-3 ACU Site Survey Window



The Cisco CB21 ADU reports signal strength in dBm. Figure 2-4 shows the ADU Advanced Status window.

Figure 2-4 ADU Advanced Status Window

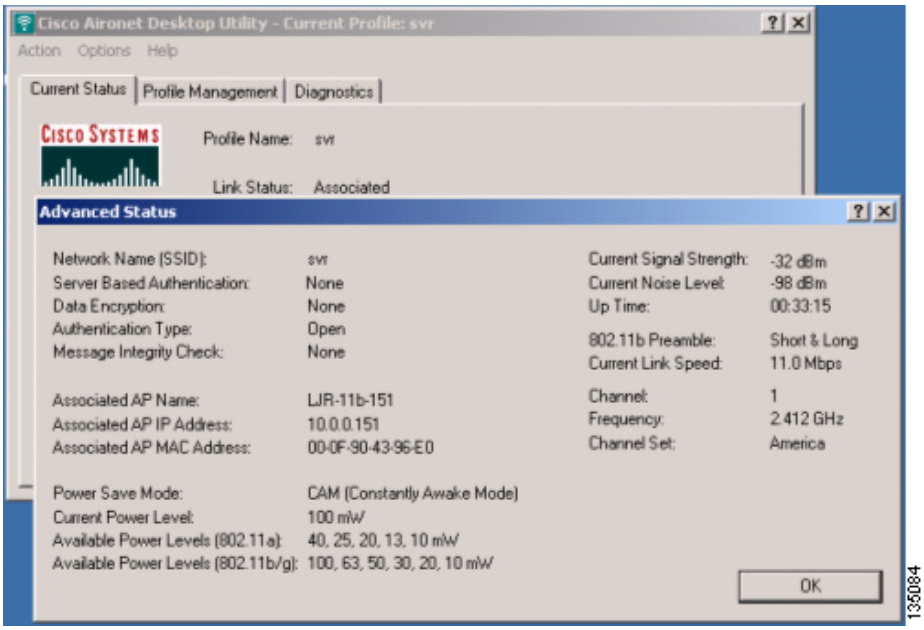
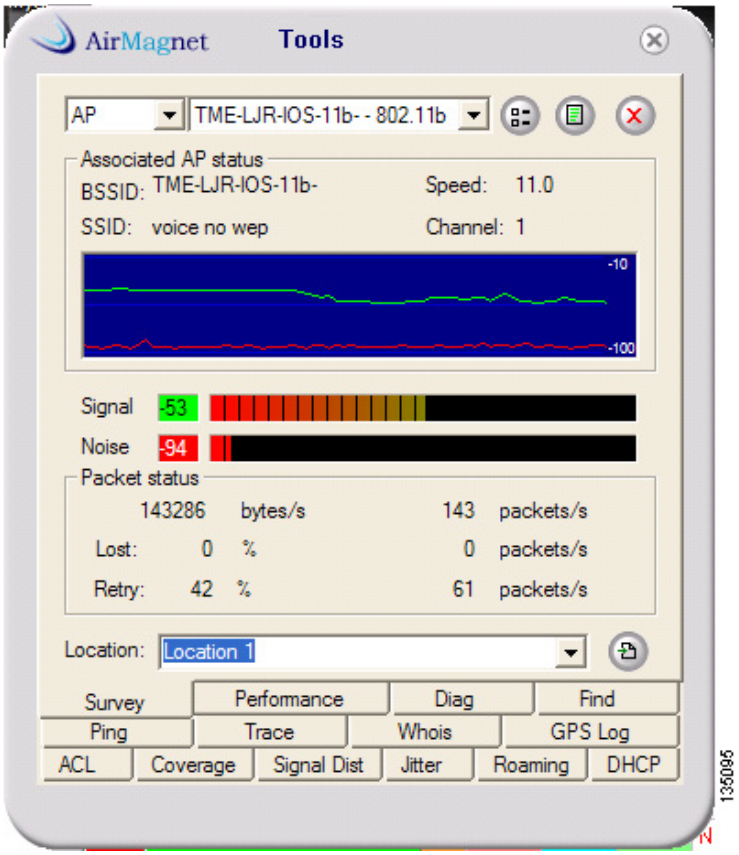
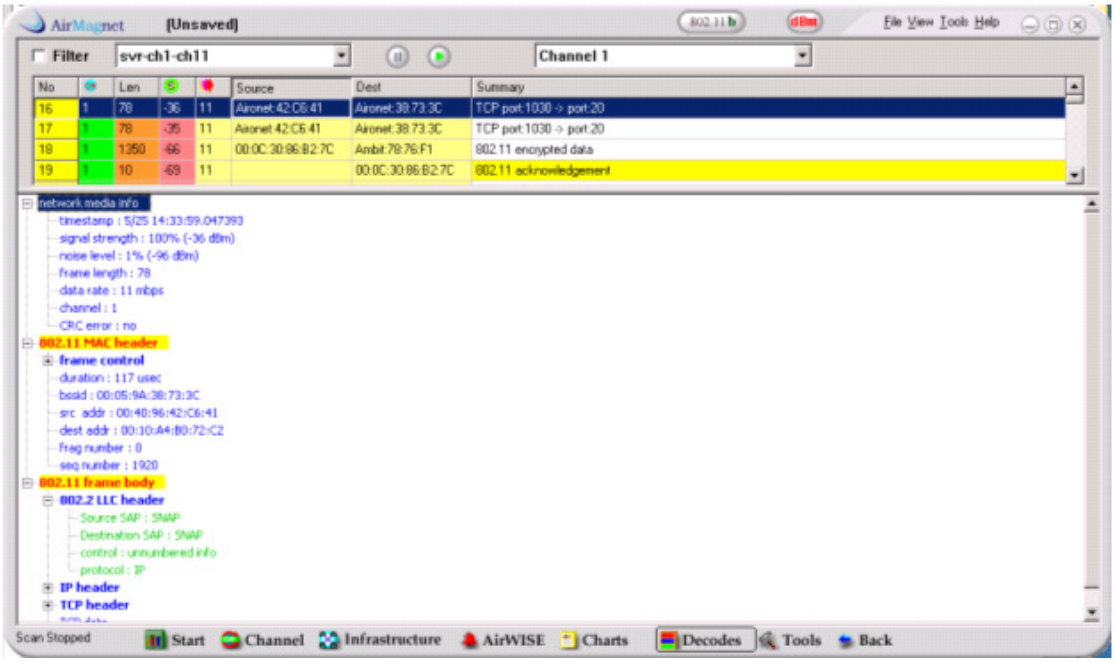


Figure 2-5 AirMagnet Survey Tool



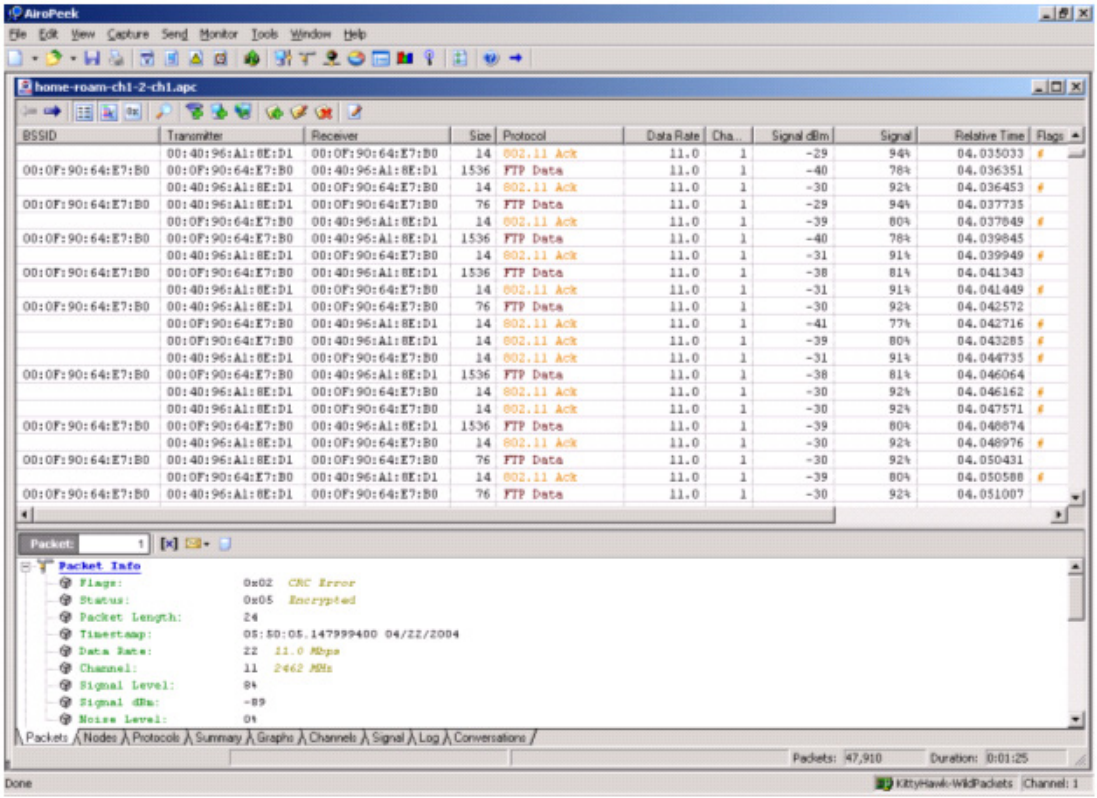
The AirMagnet Survey packet decode tool shows signal strength in dBm. Figure 2-6 shows the AirMagnet Survey Packet Decode window.

Figure 2-6 AirMagnet Packet Decode Window



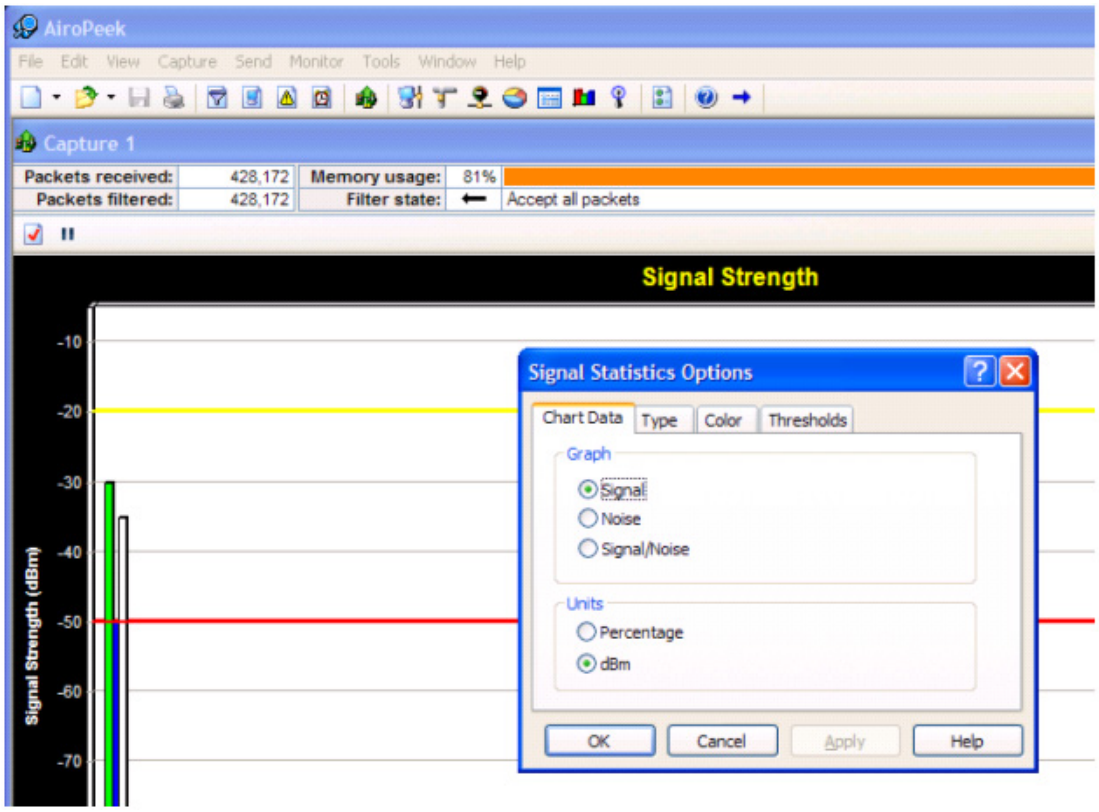
The AiroPeek trace shows the signal dBm value and signal percentage with the PCM 350 client radio. It does give relative time between packets so that jitter can be investigated if you suspect inter-packet delays. Figure 2-7 shows the AiroPeek window.

Figure 2-7 AiroPeek Window



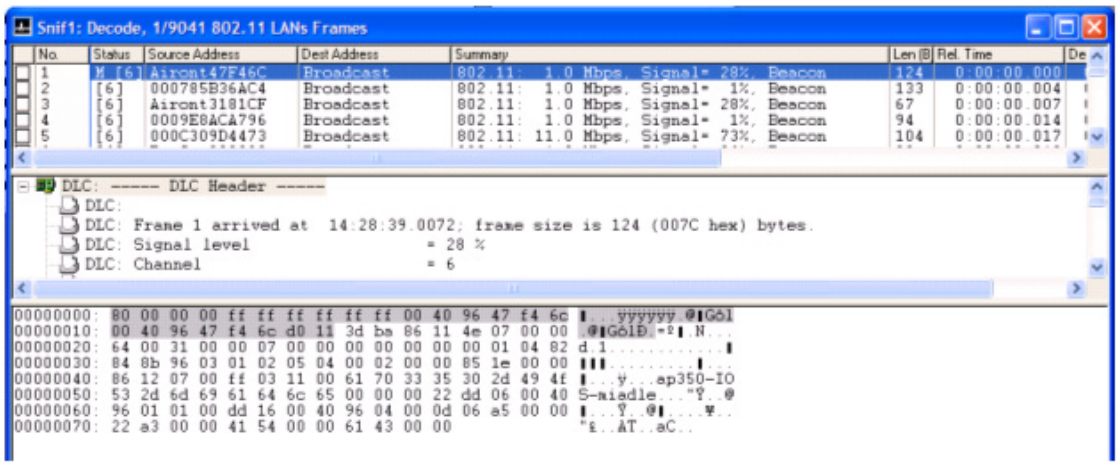
AiroPeek has options to show real-time graphs of current signal strength and current noise levels both in dBm and percentages, but it does not have a survey tool like ACU or AirMagnet. Figure 2-8 shows the AiroPeek real-time graphs.

Figure 2-8 AiroPeek dBm and Signal Percentage Real-Time Graphs



Sniffer Pro from Network Associates shows the signal strength in a percent value. There is no option to show RSSI or dBm values. Sniffer Pro is trace utility with no support for a site survey. Figure 2-9 shows the Sniffer Pro window with signal strength at 28 percent.

Figure 2-9 Wireless Sniffer Pro Displays Percent of Signal Strength



The Cisco access point displays the signal strength of the packets from the client. The signal strength of the access point as reported by the client utility should be relatively close to the signal strength reported by the access point for the client. It is important that the signals between the access point and the 7920 be relatively the same. This design avoids a call in which one side of the call has poor connectivity.

The Station Information and Status page on the access point shows the signal strength of the client as seen by the access point. Figure 2-10 shows the access point Station Information and Status page, with client signal strength at -31 dBm.

Figure 2-10 Access Point Station Information and Status Page

Association: Station View- Client			
Station Information and Status			
MAC Address	00d0.59c8.cf79	Name	larryr
IP Address	0.0.0.0	Class	client
Device	350-client	Software Version	5.2
State	Associated	Parent	self
SSID	stevierayvaughn	VLAN	none
Hops To Infrastructure	1	Communication Over Interface	Radio0-802.11G
Clients Associated	0	Repeaters Associated	0
Key Mgmt type	NONE	Encryption	Off
Current Rate (Mb/sec)	11.0	Capability	ShortHdr
Supported Rates(Mb/sec)	1.0, 2.0, 5.5, 11.0	Association Id	6
Signal Strength (dBm)	-31	Connected For (sec)	4568
Signal Quality (%)	N/A	Activity TimeOut (sec)	16
Power-save	Off	Last Activity (sec)	10
Receive/Transmit Statistics			
Total Packets Input	687	Total Packets Output	22007
Total Bytes Input	53009	Total Bytes Output	6337602

135104

The survey utility for the 7920 is hidden by default. To enter the survey tool and to change the settings for data rate and transmit power, follow these steps:

Step 1 Select **Menu**.

Step 2 Press * once.

Step 3 Press # twice.

Step 4 Press the **send** key, which on the 7920 is the key labeled with a green phone symbol.

Step 5 Choose the **Network Config** tab.

Step 6 Scroll down to the **802.11b Configuration** option and choose it.

Step 7 Choose **Wireless Settings**.

Step 8 Choose **Data Rate**.

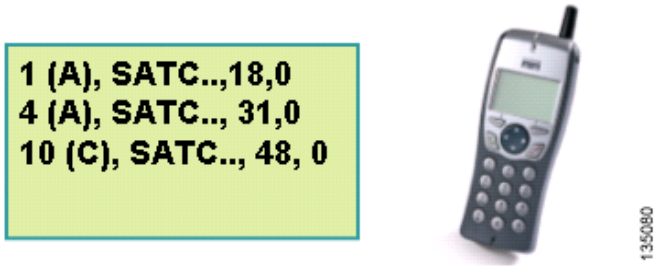
Step 9 Choose **11Mb**.

Step 10 Choose **Transmit Power**.

Step 11 Choose the power value that matches the power setting on the access point.

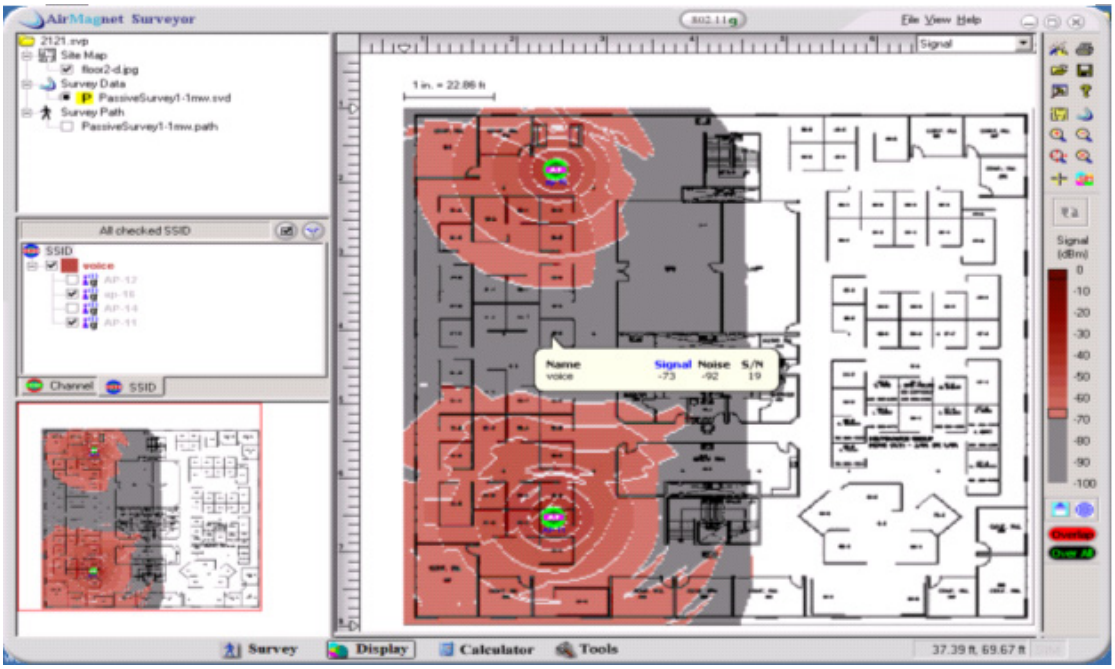
Figure 2-11 shows that the 7920 hears three access points and the RSSI values of those access points are 18, 31, and 48.

Figure 2-11 Cisco 7920 IP Phone Survey Screen



You can also use AirMagnet Surveyor to determine channel separation. Figure 2-12 shows the two access points on channel 1 with 1-mW transmit power. The dBm values from 0 to -70 dBm are shown in brown. Any signal below that is shown in dark grey. You can control the values that appear in grey by sliding the Signal gauge. The popup bubble shows the signal at any location in the coverage area.

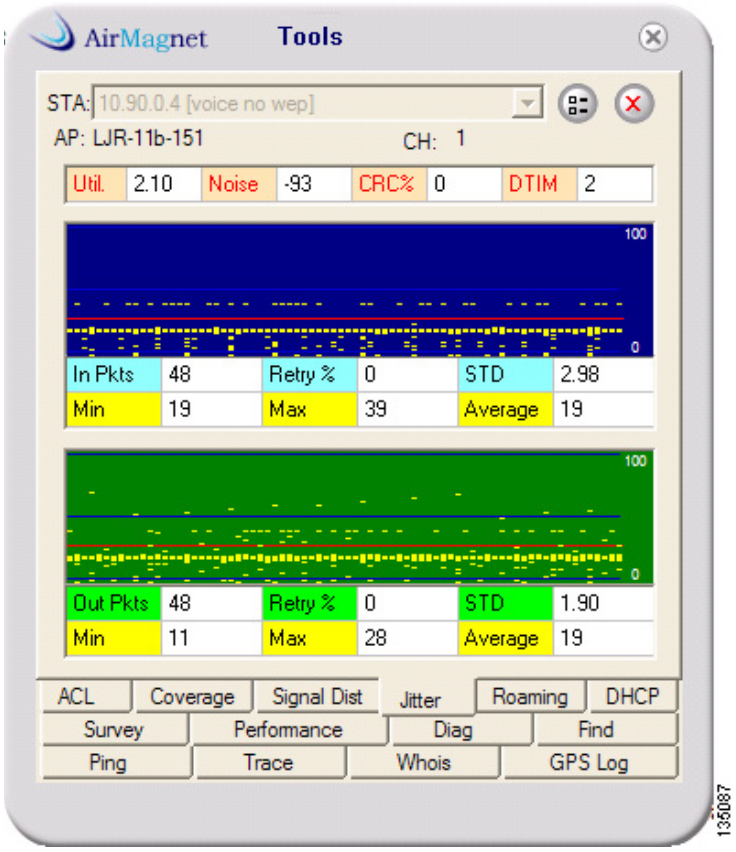
Figure 2-12 AirMagnet Surveyor Tool



Survey Tools for Packet Jitter

Typically, voice packets are sent every 20 ms. Voice calls are usually bursty, consisting of a group of tightly packed packets in a transmit direction followed by a tightly packed group in a receive direction. The users of WIPT are typically mobile users who have active calls while moving between WLAN coverage cells and hence roaming between coverage cells. AirMagnet Surveyor provides a tool for this type of possible packet jitter and the trace decode tool provides interpacket timings. Over-the-air packet jitter tools measure the WLAN packets. A WIPT call will also at some point be on a wired segment or segments, which could also be a source of jitter. Figure 2-13 shows the AirMagnet jitter tool.

Figure 2-13 AirMagnet Jitter Tool



The AirMagnet jitter tool allows for the monitoring of a WIPT client during an active call. The tool reports the standard deviation (STD) of the transmit side and the receive side of the client packets. It reports the average interpacket delay plus the minimum and maximum delays. The jitter measurement of this tool is just from access point to WIPT client and WIPT client to the access point. This is not an end-to-end measurement of jitter or latency for a VoIP call.

Figure 2-14 shows there is significant data and noise on all channels. The effect of the data and noise on the quality of voice is shown with STD values of 4.87 and 6.02. The channel utilization is 30.65. The Cisco AVVID design guide states for quality VoIP calls the **Delay Variation (Jitter)** should not exceed 30 ms. In an office with heavy use of 802.11, the average in-packet delay might vary from 19ms to a high of 32ms, and the average out-packet delay might vary from 18 ms to a high of 41 ms. Those delay averages would produce intermittent but noticeable jitter during active calls and a noticeable delay during roams.

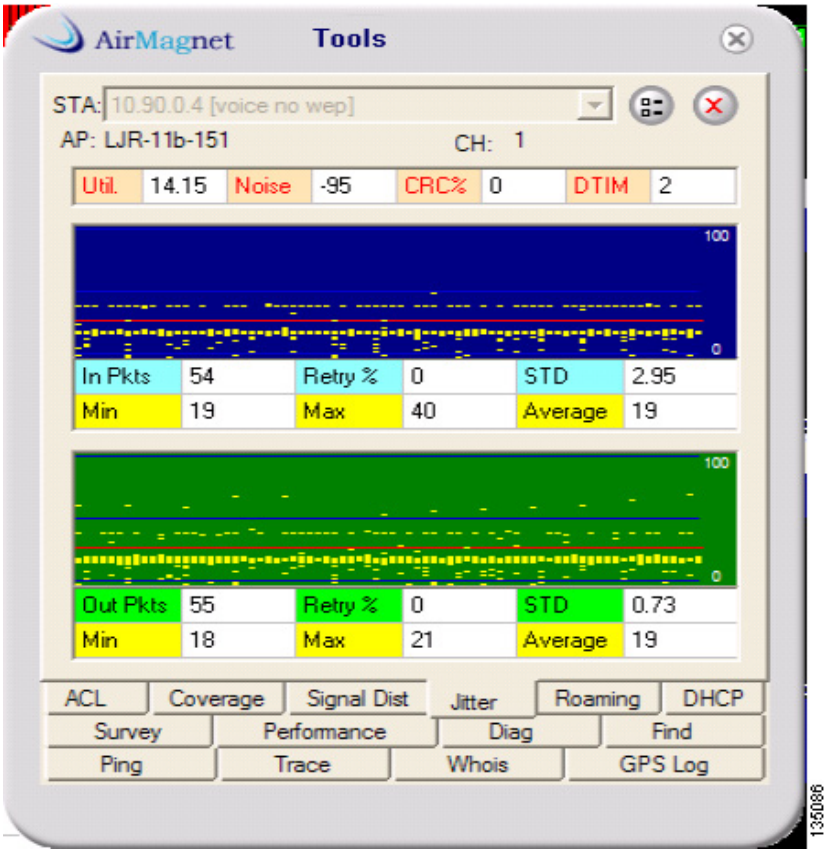
Figure 2-14 AirMagnet Jitter Tool in an Enterprise Office with High 802.11 Traffic

Figure 2-15 and Figure 2-16 show the LiveCapture window and the Station window results in a home office with low 802.11 traffic.

Figure 2-15 AirMagnet in a Home Office with Low 802.11 Traffic

Home office utilization is 2.18 percent and the throughput is 246 kbps for 11 Mbps-only calls, with a single active WIPT call, but utilization is 15.41 percent with throughput of 248 kbps for 1 Mbps-only calls.

Figure 2-16 AirMagnet in a Home Office with Low 802.11 Traffic



The 14.15 percent utilization result reflects a call at 1 Mbps.