TEST REPORT

VERIWAVE

WF1101

FCC ID: YATA001Y10

IC: 8936A-A001Y10

2.400-2.4835 GHz
5.15-5.35 GHz
5.47-5.725 GHz
5.725-5.850 GHz

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Contents

0.1 Introduction

A summary of the measurements made of the VeriWave WF1101 to support application for FCC ID YATA001Y10 and IC ID 8936A-A001Y10 .

Test report 1 covers 2.4GHz and 5.725–5.850 GHz operation.

Test report 2 covers 5.15–5.35 GHz and 5.47–5.725 GHz operation.

This report provides summary information common to the operation at all frequencies.

0.2 Test Equipment

Manufacturer	Model	Description	Next Cal Date
Agilent	E4445A	Spectrum Analyzer 3Hz-13.2GHz	10 Aug 10
Agilent	E4405B	Spectrum Analyzer 9kHz-13.2GHz	26 Feb 11
Agilent	E4418B	Power Meter	10 Aug 10
Agilent	E4412A	Power Sensor	10 Aug 10
Cisco	AIR-RM1252G-A-K9 FCC ID: LDK102061	802.11a Access Point	N/A
Tenney	T10C	Temperature Chamber	N/A
Watlow	942	Temperature Controller	N/A
Partlow	MRC5000	Chart Recorder	17 Jun 2010
Fluke	177	Multimeter	24 Sep 10
Technipower	Variac	W20MT3A	N/A

Table 1: Equipment List

0.2.1 Test Setup

The test-setup used for both the conducted measurements and the average power measurements is shown in fig. 1.

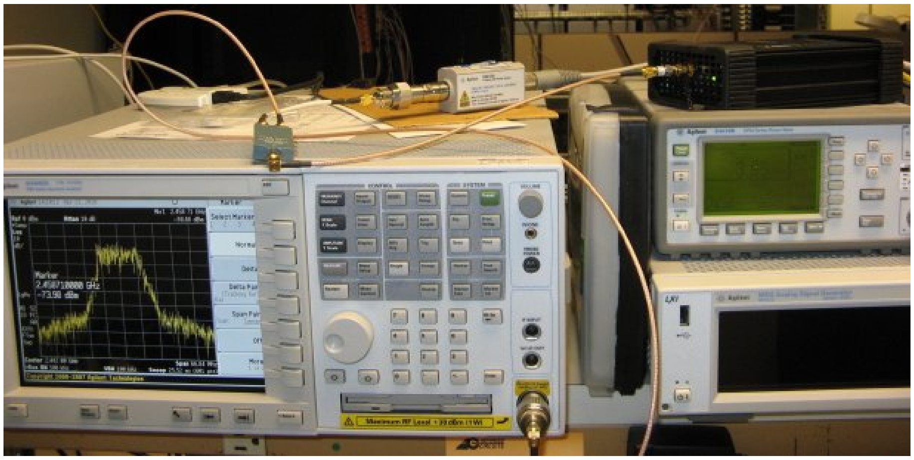

Figure 1: Test setup for conducted measurements up to 13.2GHz.

0.3 Frequency Accuracy

0.3.1 Introduction

2.1055 Measurements required: Frequency stability.

(a) The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From –30 to +50 centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

All testing in this document was performed May 18, 2010 at CascadeTek for unit with controller serial number 00-13-E9-1D-00-E3 and radio serial number M33142-001-0007 .

The nominal supply voltage to the unit is 120V.

0.3.2 Measurement Procedure - Temperature

The carrier can be observed during OFDM transmit operation if the span is narrow enough. The marker count function can is then used to measure the accuracy of the carrier, which represents the frequency accuracy over all modes of operation.

Dwell time per temperature setting is at least 25 minutes.

1. Detector ← Normal
2. Ref Level ← +20dBm
3. Span ← 50kHz
4. RBW ← AUTO

5. VBW ← AUTO
6. Sweep Time ← AUTO
7. Marker Function ← COUNT
   The marker peak function is used to find the frequency of the carrier.

Temp = 0.0 C			
Freq MHz	Measured Hz	Freq Error Hz	Freq Error ppm
Temp = -30.0 C			
2412	2412001584	1584	0.66
2462	2462001535	1535	0.62
5180	5180003211	3211	0.62
5700	5700003601	3601	0.63
5825	5825003675	3675	0.63
Temp = -20.0 C			
2412	2412001525	1525	0.63
2462	2462001482	1482	0.6
5180	5180003112	3112	0.6
5700	5700003415	3415	0.6
5825	5825003491	3491	0.6
Temp = -10.0 C			
2412	2412000908	908	0.38
2462	2462000880	880	0.36
5180	5180001935	1935	0.37
5700	5700002360	2360	0.41
5825	5825002519	2519	0.43
Temp = 0.0 C			
2412	2412000776	776	0.32
2462	2462000736	736	0.3
5180	5180001596	1596	0.31
5700	5700001867	1867	0.33
5825	5825002029	2029	0.35
Temp = 10.0 C			
2412	2412001037	1037	0.43
2462	2462001044	1044	0.42
5180	5180002338	2338	0.45
5700	5700002778	2778	0.49
5825	5825002961	2961	0.51

Freq MHz	Measured Hz	Freq Error Hz	Freq Error ppm
Temp = Room Temp			
2412	2412000485	485	0.2
2462	2462000422	422	0.17
5180	5180000937	937	0.18
5700	5700000715	715	0.13
5825	5825001103	1103	0.19
Temp = 30 C			
2412	2412000509	509	0.21
2462	2462000247	247	0.1
5180	5180001111	1111	0.21
5700	5700001043	1043	0.18
5825	5825000679	679	0.12
Temp = 40 C			
2412	2411999611	-389	-0.16
2462	2461999513	-487	-0.2
5180	5179998974	-1026	-0.2
5700	5699998928	-1072	-0.19
5825	5824998899	-1101	-0.19
Temp = 50 C			
2412	2411999030	-970	-0.4
2462	2461998937	-1063	-0.43
5180	5179997773	-2227	-0.43
5700	5699997601	-2399	-0.42
5825	5824997527	-2473	-0.42

0.3.3 Measurement Procedure - Supply Variation

2.1055

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

Using a variac to vary the supply voltage, set the voltage to -15% and +15% of nominal (120V). The actual supply voltage is verified with a multimeter.

The frequency measurement is then made in the same manner as for temperature testing.

Freq MHz	Measured Hz	Freq Error Hz	Freq Error ppm
Supply = Nominal+15% (102V)			
2412	2412001084	1084	0.45
2462	2462000835	835	0.34
5180	5180001920	1920	0.37
5700	5700001808	1808	0.32
5825	5825002162	2162	0.37
Supply = Nominal-15% (138V)			
2412	2412000860	860	0.36
2462	2462000992	992	0.4
5180	5180001751	1751	0.34
5700	5700002141	2141	0.38
5825	5825002274	2274	0.39

0.4 DFS Client Testing

0.4.1 Introduction

15.407 (h) (2) Radar Detection Function of Dynamic Frequency Selection (DFS). UNII devices operating in the 5.255.35 GHz and 5.475.725 GHz bands shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems.

The DUT for this application is a WLAN *client* which does NOT include ad-hoc or peer-to-peer modes, i.e. TX activity by the DUT is strictly controlled by the access point behavior. Unless there is a request by an access point, the DUT will not transmit.

0.4.2 Test Setup

The Access Point (AP), DUT, spectrum analyzer, oscilloscope and radar pulse generator are configured as shown in figure 2.

Since both the DUT and access point used for the DFS testing have output power less than 200mW, -62dBm was used for the radar pulse signal level.

The radar pulse level is calibrated to -62dBm at the input of the AP using a spectrum analyzer by varying the attenuation in the path from the radar pulse generator and the AP.

The DUT and radar signals are both visible at the monitoring spectrum analyzer. The TX power level of the DUT is adjusted such that the radar pulses are at a higher level than the DUT TX level (at the monitoring spectrum analyzer). This allow the spectrum analyzer to be triggered (using Video trigger) on the radar pulse level alone.

0.4.3 Data Transfer Setup

The DUT is a standalone client device which does not have the capability of displaying video data transferred to the unit. Therefore the standard multimedia file was not used, an alternate method was used instead.

The DUT unit is able to establish datastreams with the AP of specified packet size and data rate. The test was conducted with the following data transfer parameters

- Downstream (AP to DUT) 4 Mbit/s
- Upstream (DUT to AP) 2 Mbit/s
- 54 Mbit/s datarate in both directions
- 1518 byte TCP packets in both directions

The fact that the DUT and AP are using TCP, means that there is additional channel activity due to the TCP ack frames being sent in both directions in addition to the WLAN ack frames. The overall channel utilization and activity is therefore much higher than experienced during the standard test.

It is important to note that the client is actively transmitting data upstream, i.e. to the AP, and not simply in response to the AP, which makes it readily apparent when it has stopped transmitting data due to the channel change order. This can be seen in the spectrum analyzer screen captures provided.

0.4.4 Test Results

Figures 3 and 4 show the AP (lower level) and DUT/client (higher level) traffic pulses.

The radar pulse causes the AP to issue a channel change command. The DUT, upon recognizing the channel change command, ceases transmission. This is shown in figure 5. The screen captures shows that the client ceases transmission in approximately 41ms.

The DUT must also stay off the air for the next 30 minutes. The spectrum analyzer sweep time is set to 1801 sec (30 min + 1 s). The radar pulses are transmitted which triggers the spectrum analyzer and the sweep allowed to proceed.

The full 30 minute sweep is shown in figure 6.

The image in figure 7, recorded simultaneously during the 30 minute test, shows the radar pulse and the client TX.

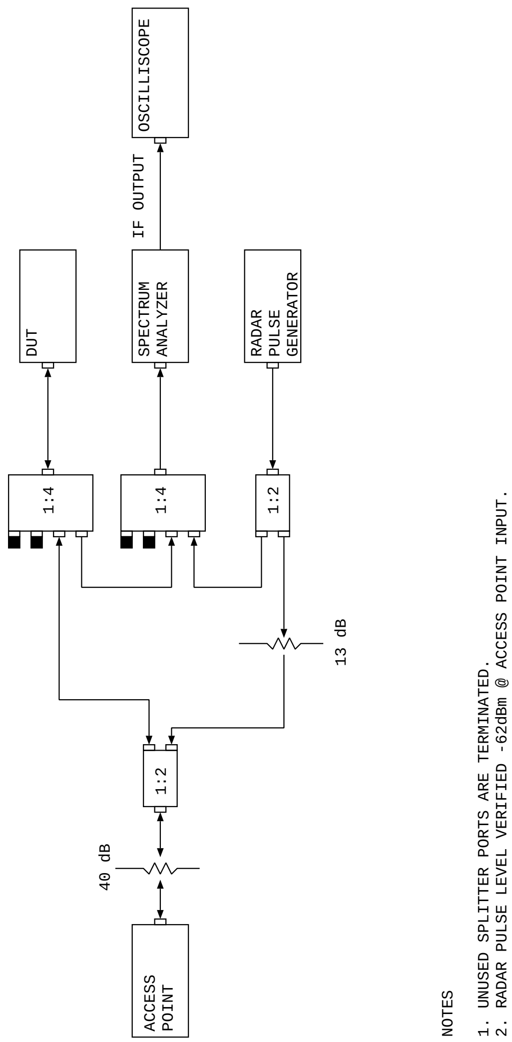

Figure 2: DFS Testing Setup

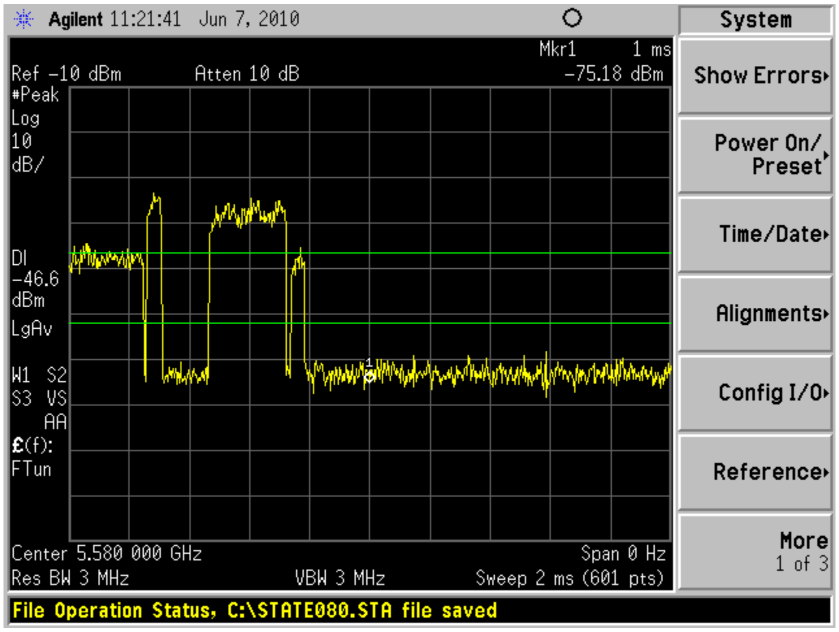

Figure 3: AP and DUT traffic (close in).

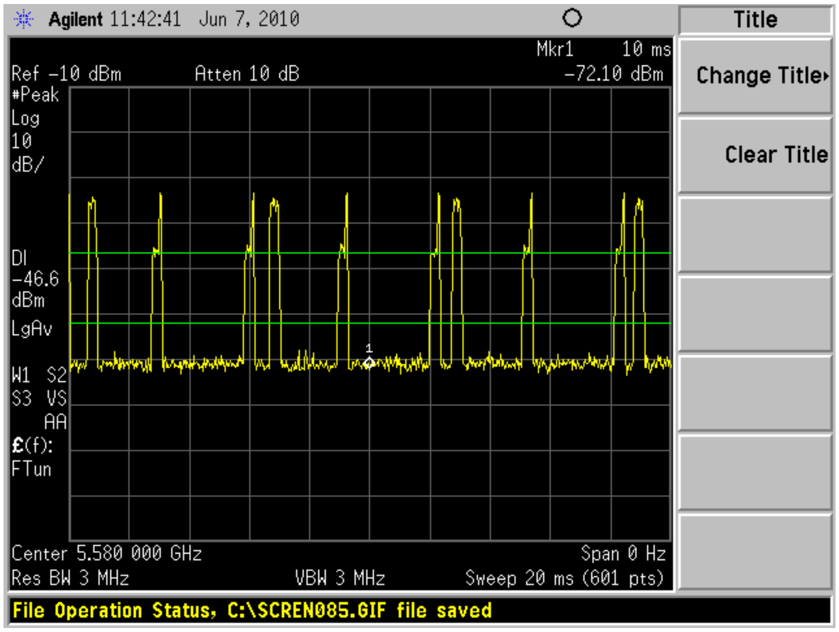

Figure 4: AP and DUT traffic (wider view).

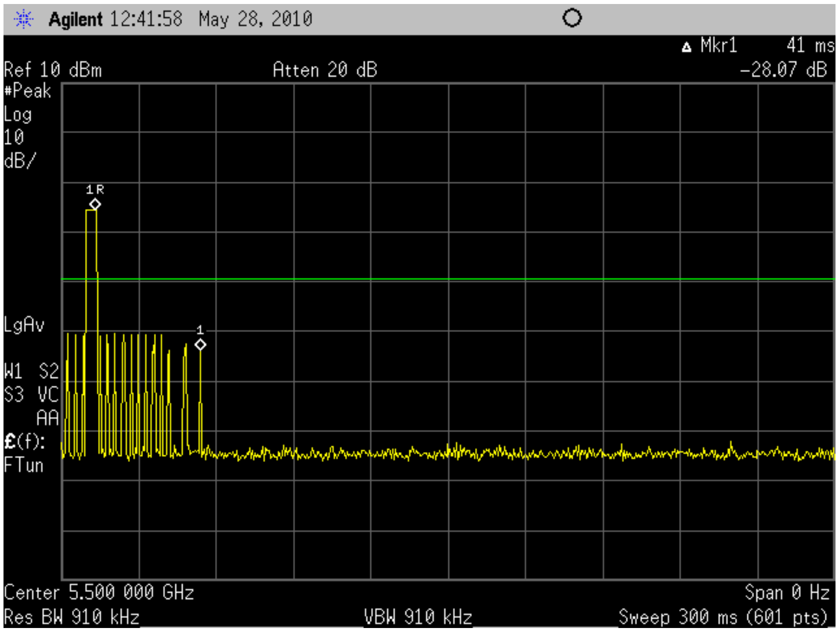

Figure 5: Radar Pulse and Client TX

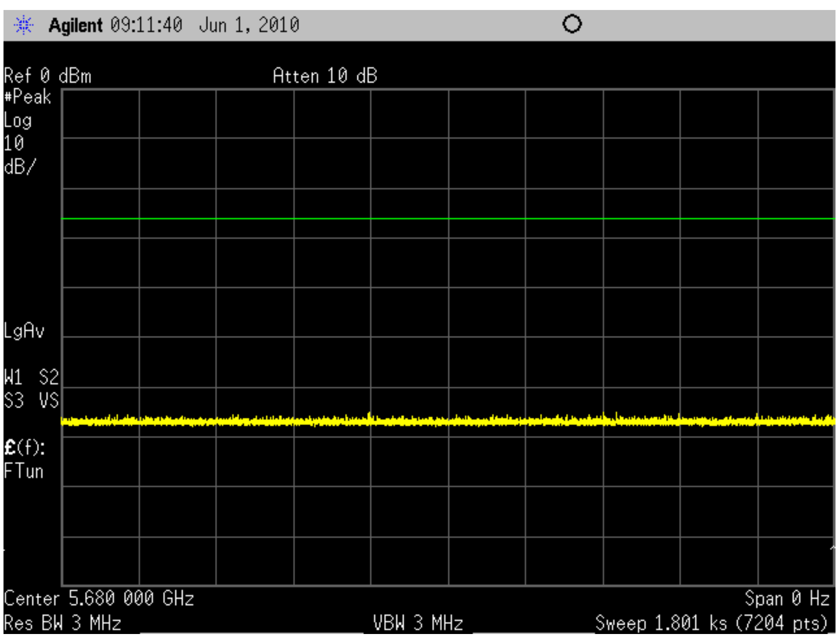

Figure 6: 30 minute sweep.

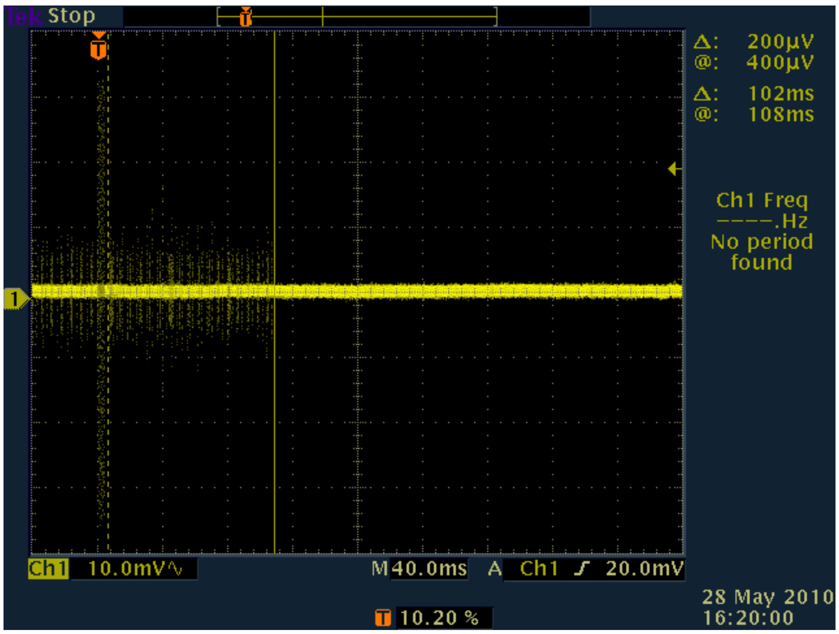

Figure 7: Close in view of trigger and TX halt for 30 min sweep.