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Report On

Application for Grant of Equipment Authorization of the
Hughes Network Systems
Thuraya IP+ Broadband Satellite IP Modem

FCC Part 15 Subpart C §15.247

Report No. SC1410492B **November 2014**

REPORT ON	Radio Testing of the Hughes Network Systems Thuraya IP+ Broadband Satellite IP Modem
TEST REPORT NUMBER	SC1410492B
PREPARED FOR	Hughes Network Systems 9605 Scranton Road, Suite 500 San Diego, CA 92121
CONTACT PERSON	Dave Couchman Principal Engineer (858) 452-4648 Dave.Couchman@hughes.com
PREPARED BY	Alex Chang **Name** Title: EMC/Wireless Test Engineer
APPROVED BY	Ferdinand S. Custodio **Name** Authorized Signatory Title: EMC/Senior Wireless Engineer
DATED	November 20, 2014

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

Revision History

SC1410492B Hughes Network Systems 9104 Broadband Satellite IP Modem					
DATE	OLD REVISION	NEW REVISION	REASON	PAGES AFFECTED	APPROVED BY
11/20/2014	Initial Release				Ferdinand Custodio

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TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

SECTION 1

REPORT SUMMARY

Radio Testing of the
Hughes Network Systems
Thuraya IP+ Broadband Satellite IP Modem

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Hughes Network Systems Thuraya IP+ Broadband Satellite IP Modem to the requirements of FCC Part 15 Subpart C §15.247.

Objective	To perform Radio Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Hughes Network Systems
Model Number(s)	9104
FCC ID Number	K3YHNS9104
IC Number	N/A
Serial Number(s)	EUT#3-EMC
Number of Samples Tested	1
Test Specification/Issue/Date	• FCC Part 15 Subpart C §15.247 (October 1, 2013). • 558074 D01 DTS Meas Guidance v03r02 June 05, 2014 (Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247)
Start of Test	October 29, 2014
Finish of Test	October 31, 2014
Name of Engineer(s)	Alex Chang Kathy Mackenzie
Related Document(s)	None. Supporting documents for EUT certification are separate exhibits.

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC Part 15 Subpart C §15.247 is shown below.

Section	§15.247 Spec Clause	Test Description	Result	Comments/ Base Standard
2.1	§15.247(b)(3)	Peak Output Power	Compliant	
2.2	§15.207(a)	Conducted Emissions	Compliant	
2.3	§15.247(a)(2)	Minimum 6 dB RF Bandwidth	Compliant	
2.4	§15.247(d)	Out-of-Band Emissions - Conducted	Compliant	
2.5	§15.247(d)	Band-edge Compliance of RF Conducted Emissions	Compliant	
2.6	§15.247(d)	Spurious Radiated Emissions	Compliant	
2.7	§15.247(d)	Radiated Band Edge Measurements	Compliant	
2.8	§15.247(e)	Power Spectral Density for Digitally Modulated Device	Compliant	

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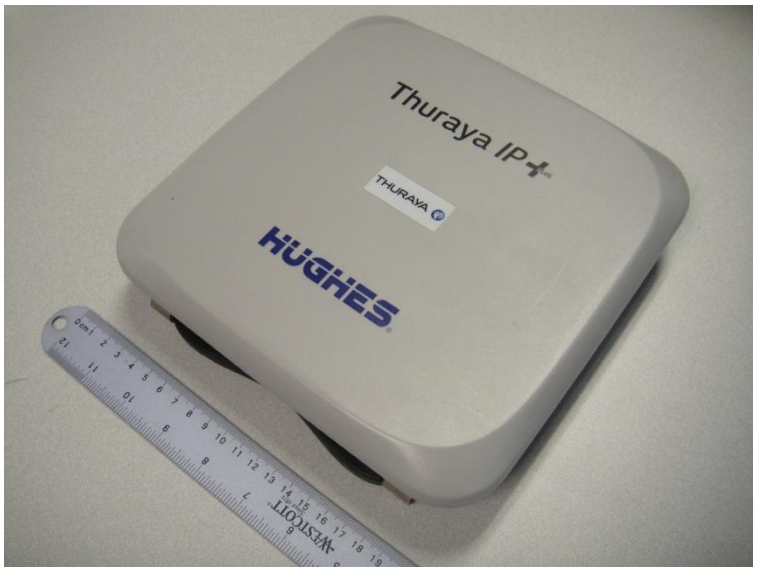
1.3 PRODUCT INFORMATION

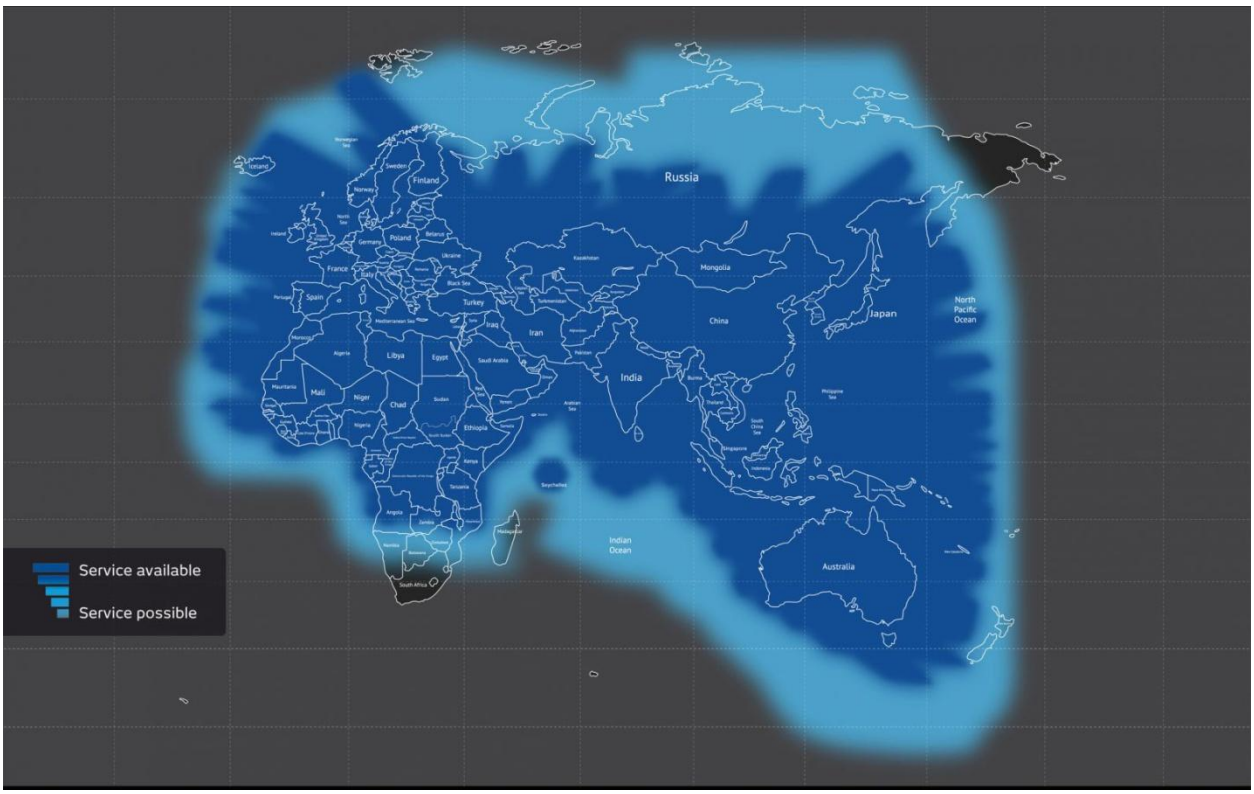
1.3.1 Technical Description

The Equipment Under Test (EUT) was a Hughes Network Systems Thuraya IP+ Broadband Satellite IP Modem model 9104 (FCC ID K3YHNS9104) as shown in the photograph below. The EUT is a broadband satellite IP modem and Wi-Fi Access Point. It is a self-contained communications system designed to provide users with IP network access via satellite. It can use Ethernet or Wi-Fi interfaces for network access. The 9104 allows you to simultaneously send and receive IP packet data via Ethernet and Wi-Fi interfaces over the Thuraya satellite network– see Section 1.3.2 for map coverage. The EUT is being verified with Hughes Network Systems Thuraya IP V2 L-Band Antenna (the antenna assembly has a built-in WLAN and GPS antenna in addition to the main L-Band antenna).



Equipment Under Test

1.3.2 Thuraya Satellite Coverage Map



1.3.3 EUT General Description

EUT Description	Thuraya IP+ Broadband Satellite IP Modem
Model Number(s)	9104
Rated Voltage	7.4VDC Li-Ion battery 19VDC from compatible AC/DC adapter
Mode Verified	802.11 b/g/n (20MHz/40MHz for 802.11n)
Capability	802.11 b/g/n WLAN (DTS) 2.4GHz band (20MHz/40MHz for 802.11n) and 1.6GHz Mobile Satellite Service
Frequency Range	2412 MHz to 2462 MHz in the 2400 MHz to 2483.5 MHz Band
Number of Operating Frequencies	11 (b, g, n HT20), 7 (n HT40)
Channels Verified (b, g, n HT20)	Channel 1 (Low Channel 2412 MHz) Channel 6(Mid Channel 2437 MHz) Channel 11 (High Channel 2462MHz)
Channels Verified(n HT40)	Channel 3 (Low Channel 2422 MHz) Channel 6(Mid Channel 2437 MHz) Channel 9 (High Channel 2452MHz)
Modulation Used	DSSS and OFDM

1.3.4 Antenna Details

Model (MPN)	3500719
Manufacturer	Hughes Network Systems
Antenna Type	Multiband (L-Band LHCP 12 dB Transportable Antenna with WLAN and GPS)
Antenna Gain (Peak)	3.5 dBi (WLAN – Client declared)
EUT Antenna Connector	Hi Rose U.FL-R-SMT-1 Receptacle (connector is integral to the EUT).
Maximum Dimensions	210mm x 210mm x 9.5mm

Please refer to the manufacturer documentation titled “Specification Control Document – Antenna, L-Band, Thuraya IP V2” Cage Code 3L0W2 No. 3500719 Rev. 2 (06/15/2012).

1.3.5 Maximum Conducted Output Power

Mode	Frequency Range (MHz)	Output Power (dBm)	Output Power (mW)
802.11b	2412-2462	12.55	17.99
802.11g	2412-2462	12.20	16.59
802.11n (HT20)	2412-2462	12.25	16.79
802.11n (HT40)	2422-2452	12.19	16.56

1.4 EUT TEST CONFIGURATION

1.4.1 Test Configuration Description

Test Configuration	Description
A	Conducted measurement configuration. The antenna radome was removed to gain access to the main antenna connector.
B	Radiated / Conducted emission configuration. The EUT was set to transmit via integral antenna and connected to supplied AC power adaptor.

1.4.2 EUT Exercise Software

"Perl Command" software provided by the client was used to exercise the EUT. A file containing commands to change channels and modulation was also provided. Specific channel/modulation combination is copied from this file and transferred to the test software, once executed the EUT will transmit at max power (default setting if TX) at that channel.

1.4.3 Support Equipment and I/O cables

Manufacturer	Equipment/Cable	Description
Hughes	AC Adapter for EUT	Model: STD-1934PA
Toshiba	Laptop	Model Satellite Pro 4600 S/N 91225670PU
Toshiba	Laptop External PSU	Model PA3049U-1ACA S/N 0008A0184957G
HP	Mouse for Laptop	Model M-UD43 S/N LZA03401471
-	CAT5e (Laptop to EUT)	2.1m unshielded RJ45 connector

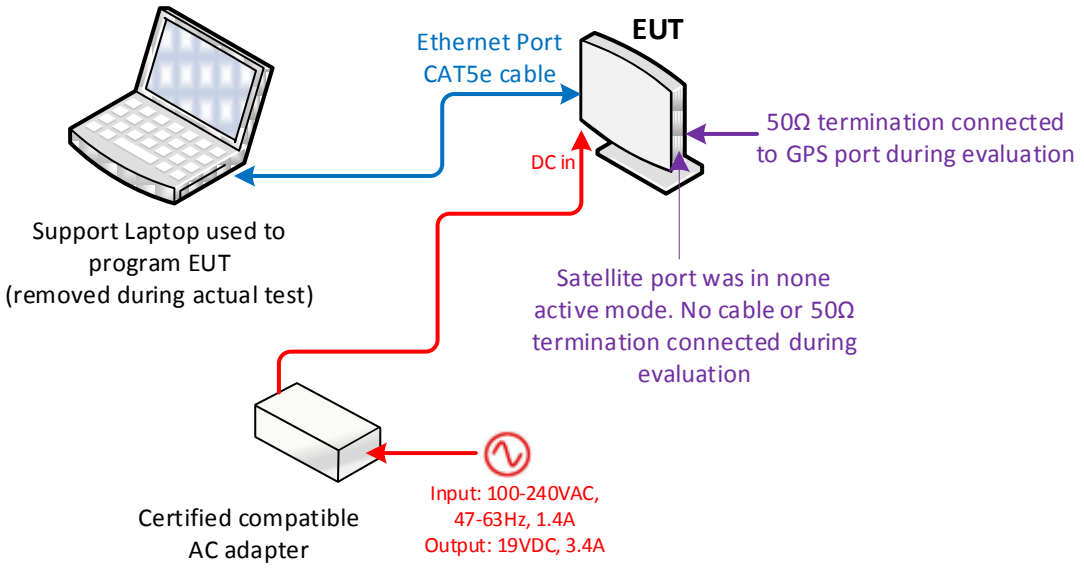
1.4.4 Worst Case Configuration

Worst-case configuration used in this test report as per maximum conducted output power measurements:

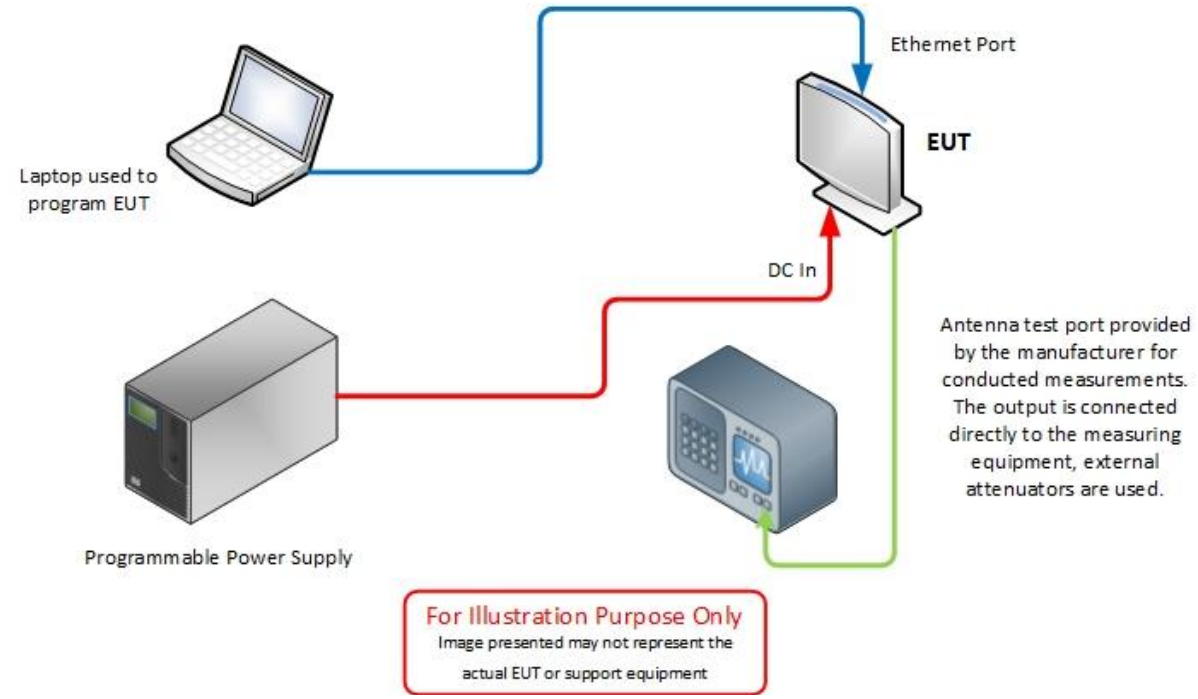
Mode	Channel	Data Rate
802.11b	1 (Low Channel)	5.5 Mbps
802.11g	6 (Mid Channel)	18 Mbps
802.11n (HT20)	6 (Mid Channel)	Mcs 0 (72.0 Mbps)
802.11n (HT40)	6 (Mid Channel)	Mcs 7 (150.0 Mbps)

1.4.5 Simplified Test Configuration Diagram

Emission Test Setup



Conducted Port Measurement Test Setup



1.5 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.6 MODIFICATION RECORD

Description of Modification	Modification Fitted By	Date Modification Fitted
Serial Number EUT#3-EMC		
N/A	—	—

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test (if relevant) are recorded on the appropriate test pages.

1.7 TEST METHODOLOGY

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.
For conducted and radiated emissions the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2009. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

1.8 TEST FACILITY LOCATION

1.8.1 TÜV SÜD America Inc. (Mira Mesa)

10040 Mesa Rim Road, San Diego, CA 92121-2912 (32.901268,-117.177681). Phone: 858 678 1400 FAX: 858-546 0364

1.8.2 TÜV SÜD America Inc. (Rancho Bernardo)

Sony Electronics Inc., Building #8 16530 Via Esprillo, San Diego, CA 92127-1708 (33.018644,-117.092409). Phone: 858 942 5542 FAX: 858-546 0364

1.9 TEST FACILITY REGISTRATION

1.9.1 FCC – Registration No.: US1146

TUV SUD America Inc. (San Diego), is an accredited test facility with the site description report on file and has met all the requirements specified in §2.948 of the FCC rules. The acceptance letter from the FCC is maintained in our files and the Registration is US1146.

1.9.2 Industry Canada (IC) Registration No.: 3067A

The 10m Semi-anechoic chamber of TUV SUD America Inc. (San Diego) has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No. 3067A.

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

SECTION 2

TEST DETAILS

Radio Testing of the
Hughes Network Systems
Thuraya IP+ Broadband Satellite IP Modem

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

2.1 PEAK OUTPUT POWER

2.1.1 Specification Reference

Part 15 Subpart C §15.247(b)(3)

2.1.2 Standard Applicable

(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

2.1.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration A

2.1.4 Date of Test/Initial of test personnel who performed the test

June 17, 2014 / KAM

2.1.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.7°C
Relative Humidity	39.4%
ATM Pressure	98.9 kPa

2.1.7 Additional Observations

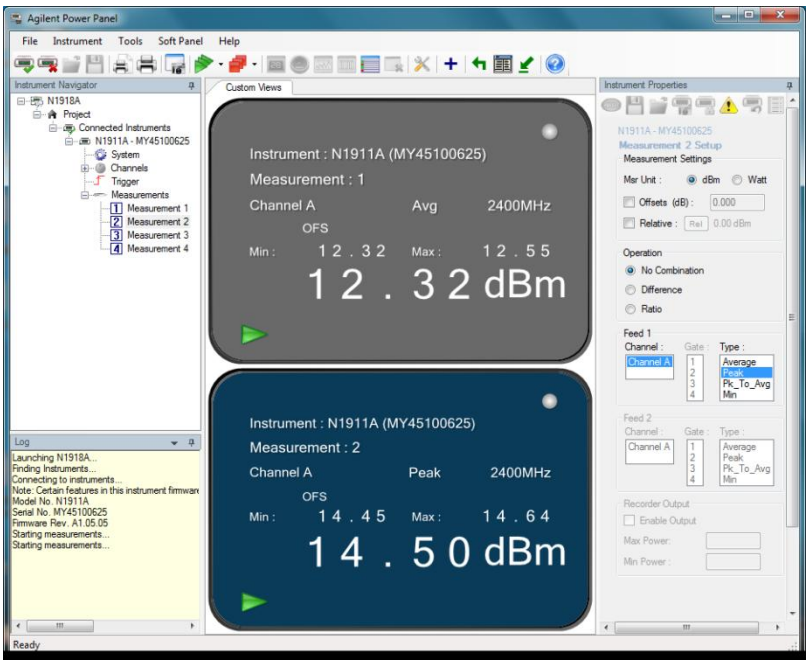
- This is a conducted test (Maximum conducted [average] output power) using direct connection to a power meter.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.
- This is a conducted test using Method A: Peak Power Meter Method per Section 9.2.3 under KDB 558074 D01 DTS Measurement Guidance v03r02 (Compliance Measurement Guidance for 15.247 Digital Transmission Systems, June 05, 2014).
- Both Peak and Average measurements were recorded.
- All available modes and data rates were verified. The worst case data rate for each mode (marked bold and italic) will be verified for each test throughout this test report.

2.1.8 Test Results

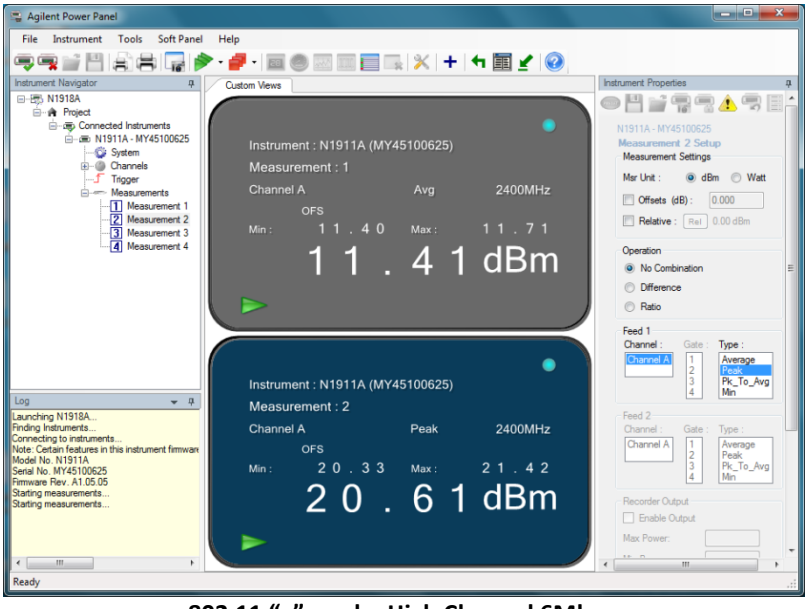
WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11b	1 (2412 MHz)	1	12.22	15.04
		2	12.52	15.27
		5.5	***12.55***	***14.64***
		11	12.49	15.28
	6 (2437 MHz)	1	12.37	15.12
		2	12.22	15.00
		5.5	12.29	14.41
		11	12.27	15.04
	11 (2462 MHz)	1	11.74	14.58
		2	11.87	14.61
		5.5	11.82	13.90
		11	11.84	14.64
802.11g	1 (2412 MHz)	6	11.98	21.51
		9	11.86	21.20
		12	11.88	21.34
		18	11.93	21.29
		24	11.85	21.83
		36	11.86	21.35
		48	11.79	21.38
		54	11.71	21.62
	6 (2437 MHz)	6	12.10	21.64
		9	12.11	21.40
		12	12.14	21.48
		18	***12.20***	***21.49***
		24	12.08	22.07
		36	12.00	21.50
		48	12.09	21.54

WLAN Mode	Channel	Data Rates (Mbps)	Measured Average Power (dBm)	Measured Peak Power (dBm)
802.11g	6 (2437 MHz)	54	12.06	21.85
	11 (2462 MHz)	6	11.71	21.42
		9	11.63	21.14
		12	11.65	21.22
		18	11.70	21.11
		24	11.63	21.74
		36	11.53	21.24
		48	11.59	21.26
		54	11.53	21.58
802.11n (20 MHz BW)	1 (2412 MHz)	mcs 0 (72.0 Mbps)	12.07	21.11
	6 (2437 MHz)	***mcs 0 (72.0 Mbps)***	***12.25***	***21.29***
	11 (2462 MHz)	mcs 0 (72.0 Mbps)	11.69	20.78
802.11n (40 MHz BW)	3 (2422 MHz)	mcs 7 (150.0 Mbps)	11.99	21.46
	6 (2437 MHz)	***mcs 7 (150.0 Mbps)***	***12.19***	***21.55***
	9 (2452 MHz)	mcs 7 (150.0 Mbps)	11.99	21.35

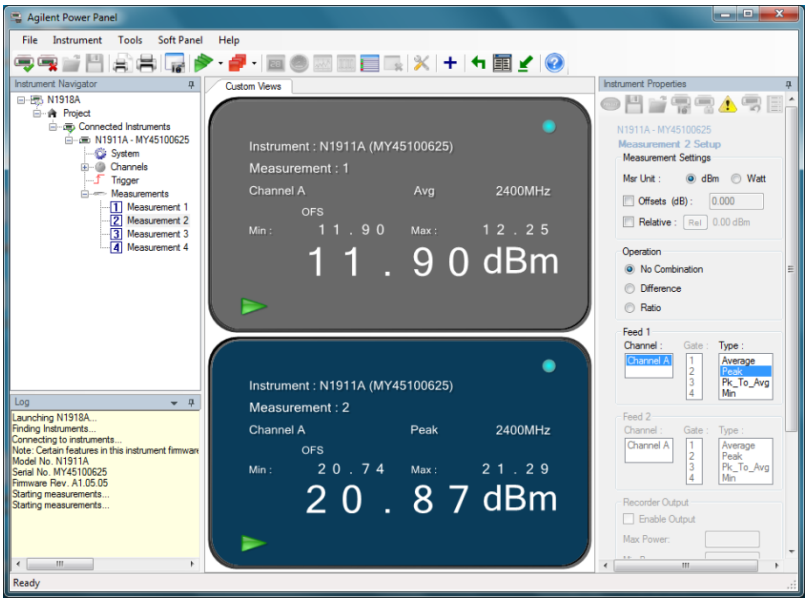
2.1.9 Sample Test Display



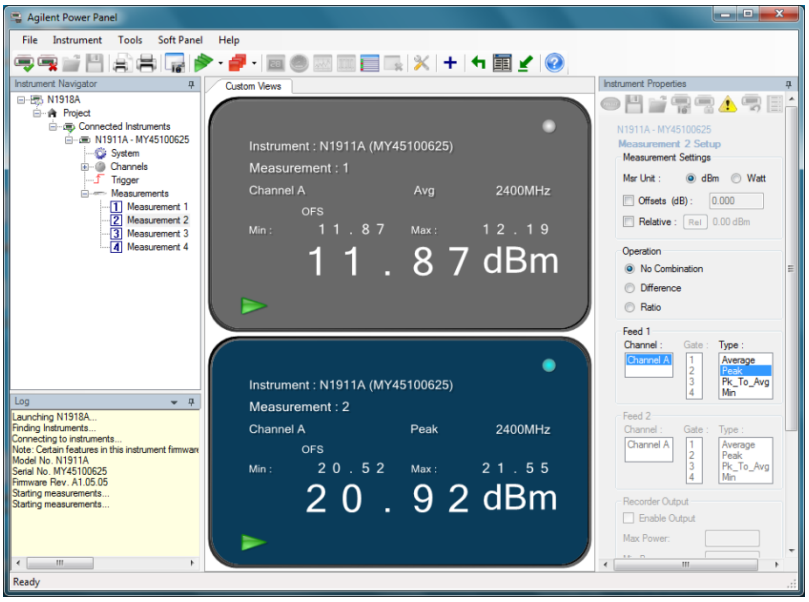
802.11 “b” mode. Low Channel 5.5Mbps



802.11 “g” mode. High Channel 6Mbps



802.11 “n” mode HT20. Mid Channel 72Mbps



802.11 “n” mode HT40. Mid Channel 150Mbps

2.2 CONDUCTED EMISSIONS

2.2.1 Specification Reference

Part 15 Subpart C §15.207(a)

2.2.2 Standard Applicable

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

**Decreases with the logarithm of the frequency.*

2.2.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration B

2.2.4 Date of Test/Initial of test personnel who performed the test

October 31, 2014 / AC

2.2.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.0 °C
Relative Humidity	54.1.%
ATM Pressure	99.0 kPa

2.2.7 Additional Observations

- Verification performed while the EUT is in worst case transmit (802.11b mode, Low channel, 5.5Mbps data rate) and battery charging mode.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.2.8 for sample computation.

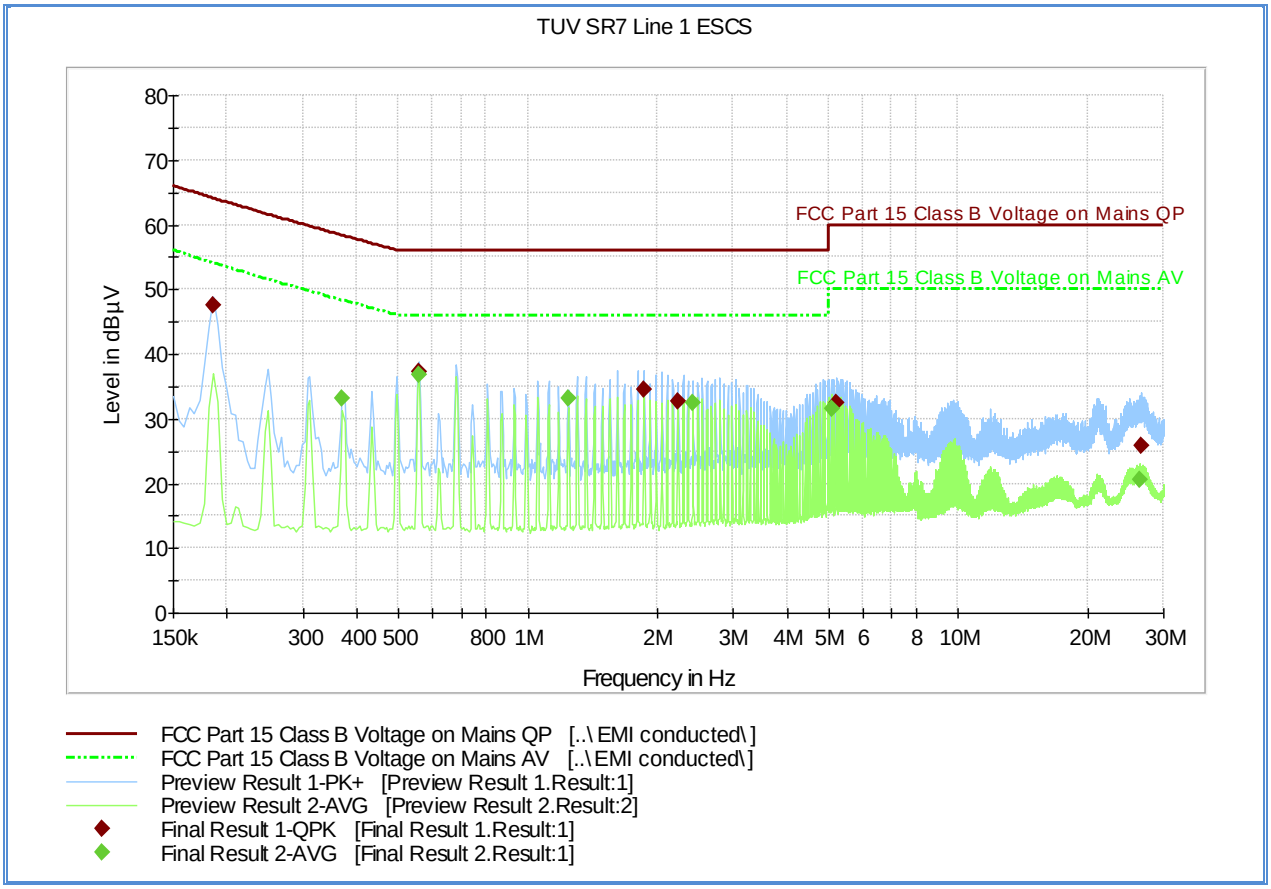
2.2.8 Sample Computation (Conducted Emission – Quasi Peak)

Measuring equipment raw measurement (dbµV) @ 150kHz			5.5
Correction Factor (dB)	Asset# 8607 (20 dB attenuator)	19.9	20.7
	Asset# 1177 (cable)	0.15	
	Asset# 1176 (cable)	0.35	
	Asset# 7567 (LISN)	0.30	
Reported QuasiPeak Final Measurement (dbµV) @ 150kHz			**26.2**

2.2.9 Test Results

Compliant. See attached plots and tables.

2.2.1 FCC Part 15.247 (120VAC/60Hz Line 1)



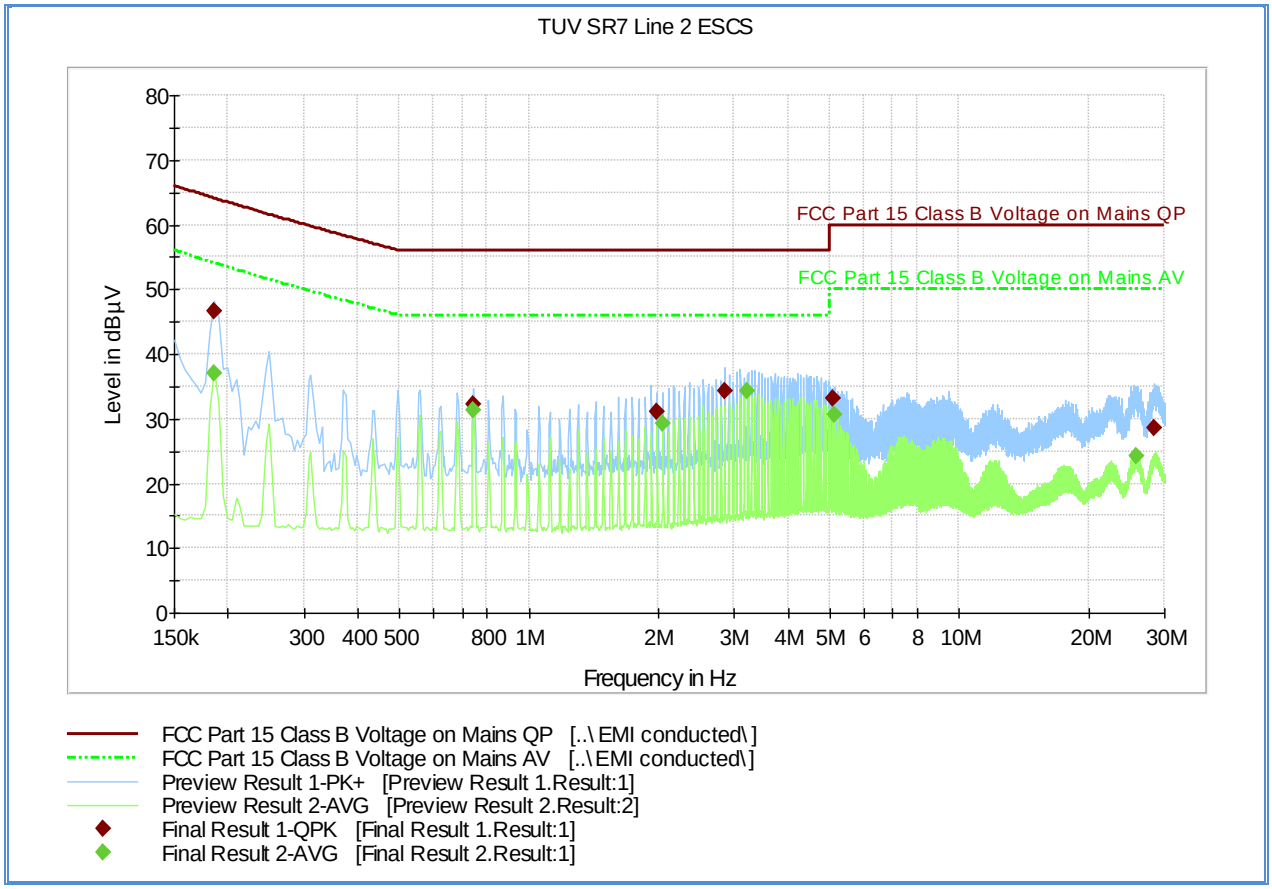
Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.186000	47.4	1000.0	9.000	Off	L1	20.1	16.6	64.1
0.559500	37.2	1000.0	9.000	Off	L1	20.0	18.8	56.0
1.864500	34.5	1000.0	9.000	Off	L1	20.1	21.5	56.0
2.238000	32.8	1000.0	9.000	Off	L1	20.3	23.2	56.0
5.221500	32.4	1000.0	9.000	Off	L1	20.5	27.6	60.0
26.614500	25.8	1000.0	9.000	Off	L1	20.9	34.2	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.370500	33.2	1000.0	9.000	Off	L1	20.1	15.1	48.3
0.559500	36.9	1000.0	9.000	Off	L1	20.0	9.1	46.0
1.243500	33.2	1000.0	9.000	Off	L1	20.1	12.8	46.0
2.422500	32.5	1000.0	9.000	Off	L1	20.5	13.5	46.0
5.095500	31.7	1000.0	9.000	Off	L1	20.5	18.3	50.0
26.484000	20.6	1000.0	9.000	Off	L1	20.9	29.4	50.0

2.2.2 FCC Part 15.247 (120VAC/60Hz Line 2)



Quasi Peak

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)
0.186000	46.6	1000.0	9.000	Off	N	20.1	17.5	64.1
0.744000	32.2	1000.0	9.000	Off	N	20.0	23.8	56.0
1.986000	31.2	1000.0	9.000	Off	N	20.1	24.8	56.0
2.850000	34.3	1000.0	9.000	Off	N	20.4	21.7	56.0
5.082000	33.1	1000.0	9.000	Off	N	20.4	26.9	60.0
28.432500	28.6	1000.0	9.000	Off	N	20.8	31.4	60.0

Average

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin - Ave (dB)	Limit - Ave (dBµV)
0.186000	37.0	1000.0	9.000	Off	N	20.1	17.0	54.1
0.744000	31.2	1000.0	9.000	Off	N	20.0	14.8	46.0
2.044500	29.2	1000.0	9.000	Off	N	20.2	16.8	46.0
3.223500	34.2	1000.0	9.000	Off	N	20.3	11.8	46.0
5.145000	30.7	1000.0	9.000	Off	N	20.5	19.3	50.0
25.723500	24.2	1000.0	9.000	Off	N	20.8	25.8	50.0

2.3 MINIMUM 6 dB RF BANDWIDTH

2.3.1 Specification Reference

Part 15 Subpart C §15.247(a)(2)

2.3.2 Standard Applicable

(2) Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

2.3.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration A

2.3.4 Date of Test/Initial of test personnel who performed the test

June 18, 2014 / KAM

2.3.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.1 °C
Relative Humidity	44.1 %
ATM Pressure	98.9 kPa

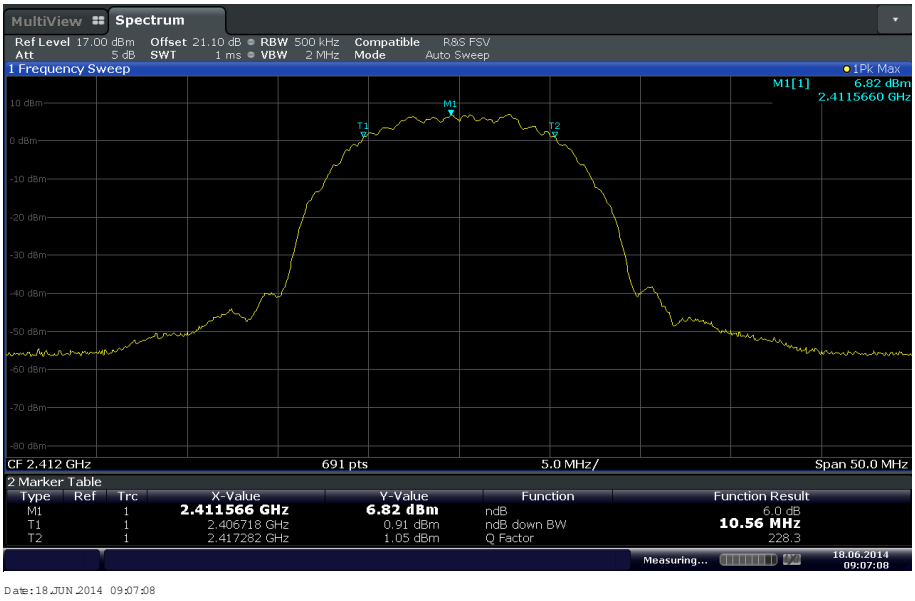
2.3.7 Additional Observations

- This is a conducted test.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.
- Span is wide enough to capture the channel transmission.
- RBW is set to 1% of the span.
- VBW is ≥3X RBW.
- Sweep is auto.
- Detector is peak.
- The “n” dB down marker function of the spectrum analyzer was used for this test.

2.3.8 Test Results

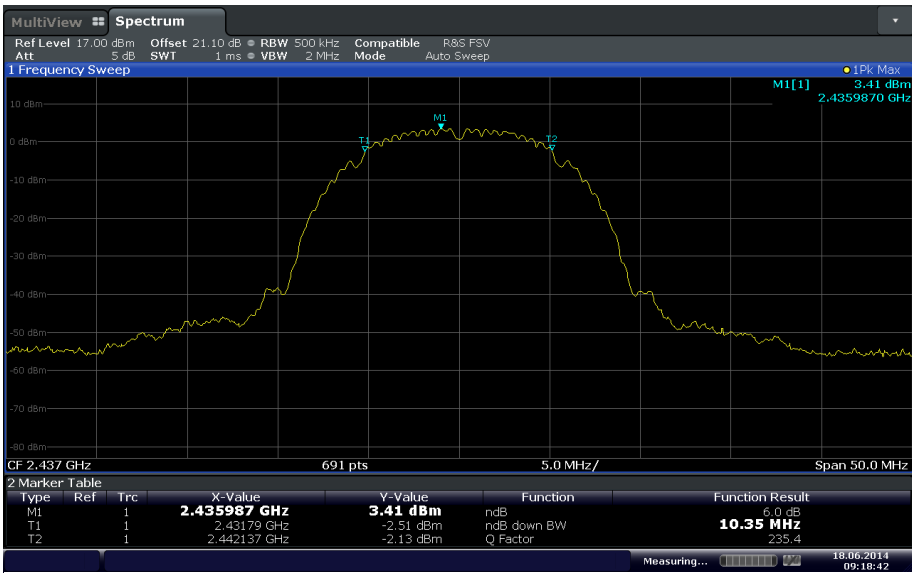
Mode	Channel	Measured Bandwidth (MHz)	Minimum Bandwidth (MHz)	Compliance
802.11b	1 (2412 MHz)	10.56	0.500	Complies
	6 (2437 MHz)	10.35	0.500	Complies
	11 (2462 MHz)	10.20	0.500	Complies
802.11g	1 (2412 MHz)	16.71	0.500	Complies
	6 (2437 MHz)	16.79	0.500	Complies
	11 (2462 MHz)	16.71	0.500	Complies
802.11n HT20	1 (2412 MHz)	17.87	0.500	Complies
	6 (2437 MHz)	17.95	0.500	Complies
	11 (2462 MHz)	17.95	0.500	Complies
802.11n HT40	3 (2422 MHz)	36.90	0.500	Complies
	6 (2437 MHz)	36.90	0.500	Complies
	9 (2452 MHz)	36.90	0.500	Complies

2.3.9 Test Results Plots



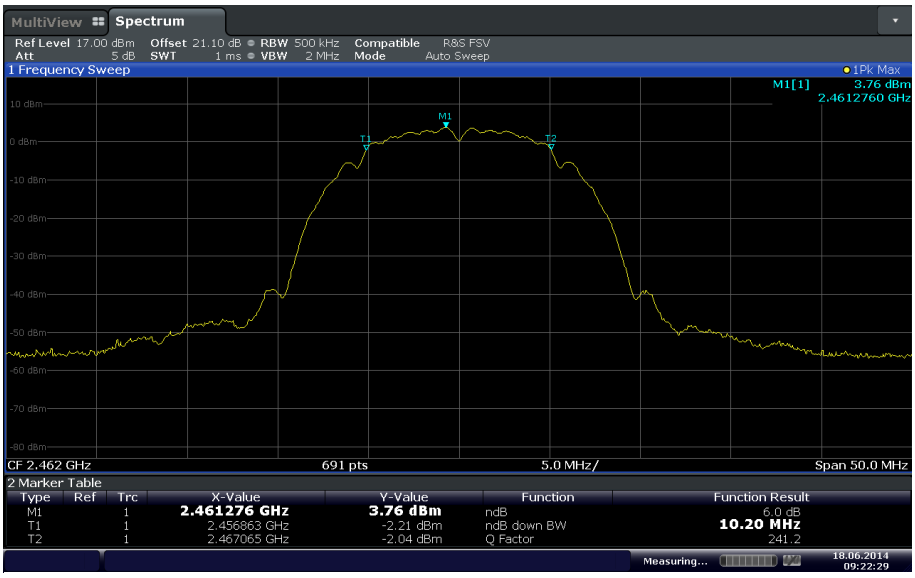
Date: 18.JUN.2014 09:07:08

802.11b Low Channel



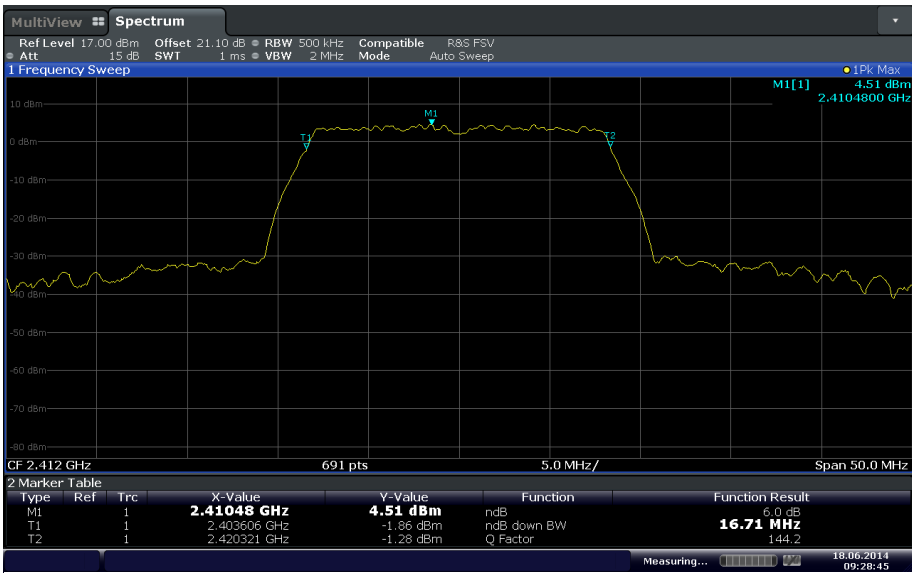
Date:18.JUN.2014 09:18:42

802.11b Mid Channel



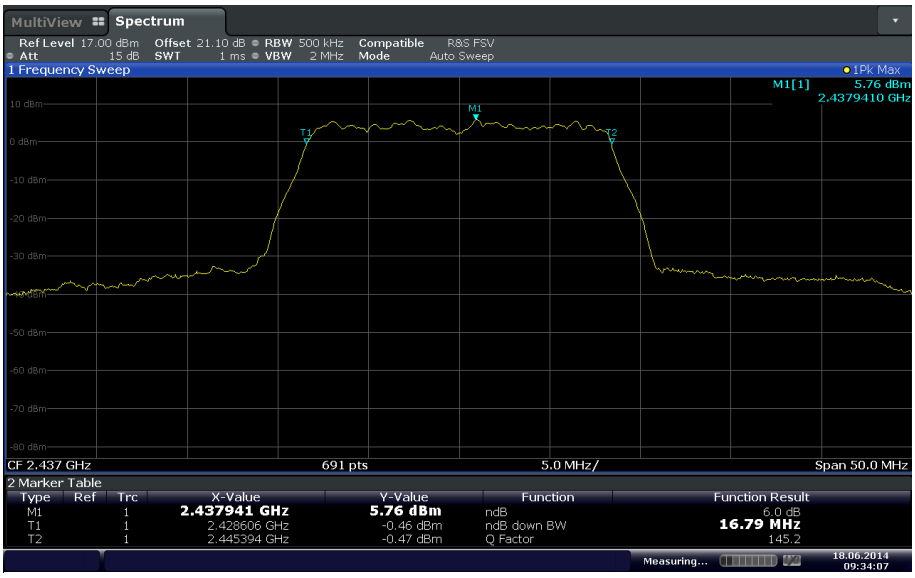
Date:18.JUN.2014 09:22:29

802.11b High Channel



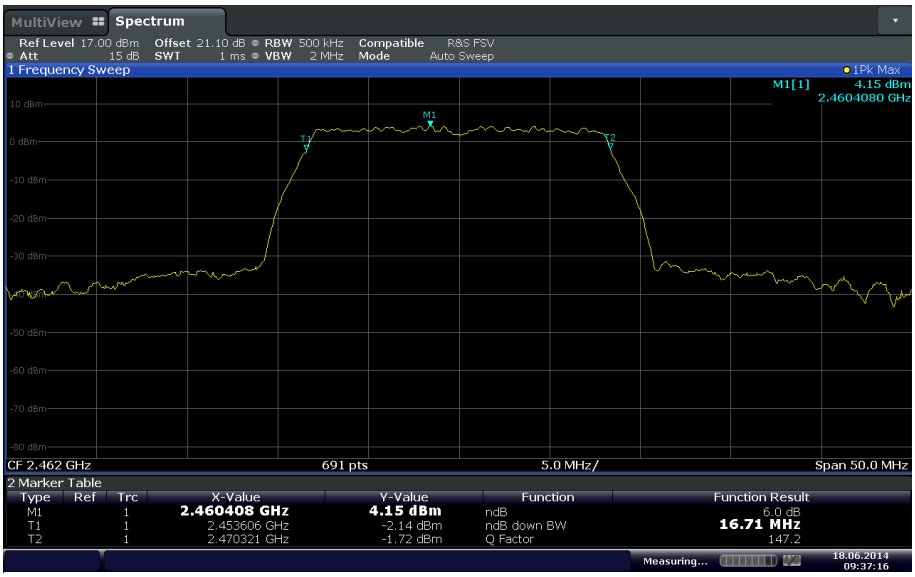
Date: 18.JUN.2014 09:28:45

802.11g Low Channel



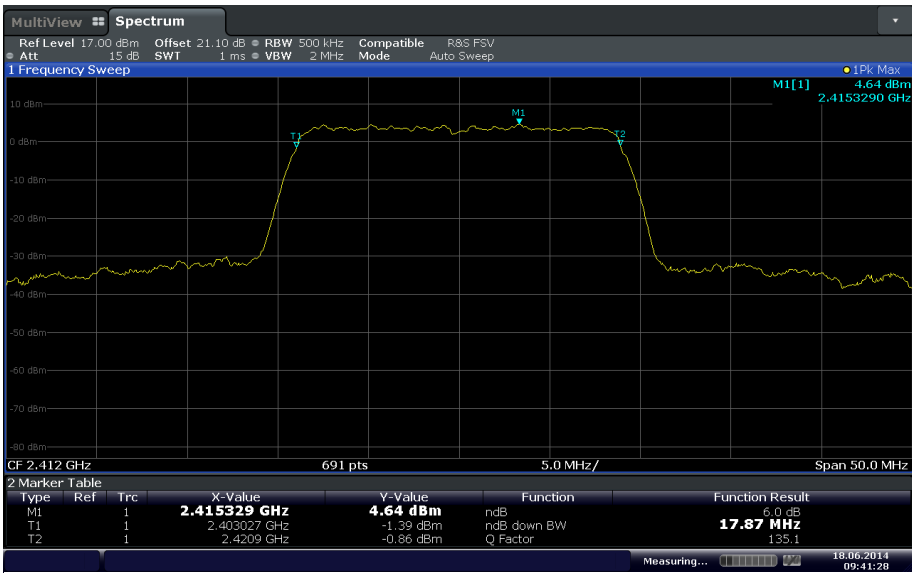
Date: 18.JUN.2014 09:34:07

802.11g Mid Channel



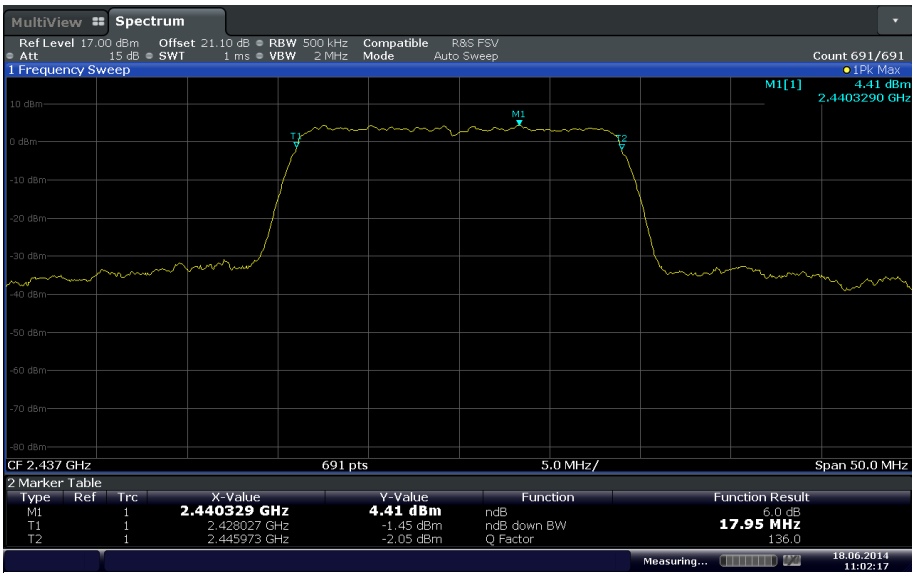
Date:18.JUN.2014 09:37:16

802.11g High Channel



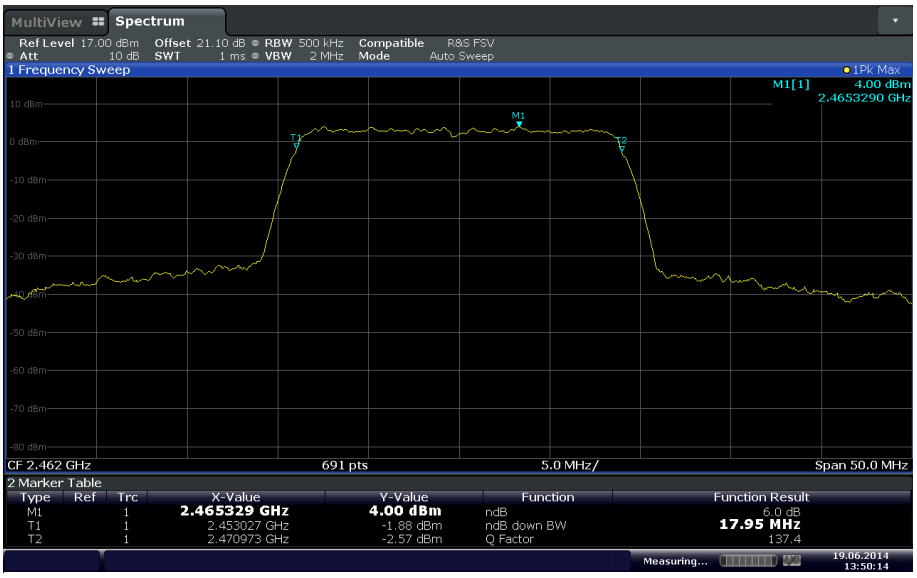
Date:18.JUN.2014 09:41:28

802.11n HT20 Low Channel



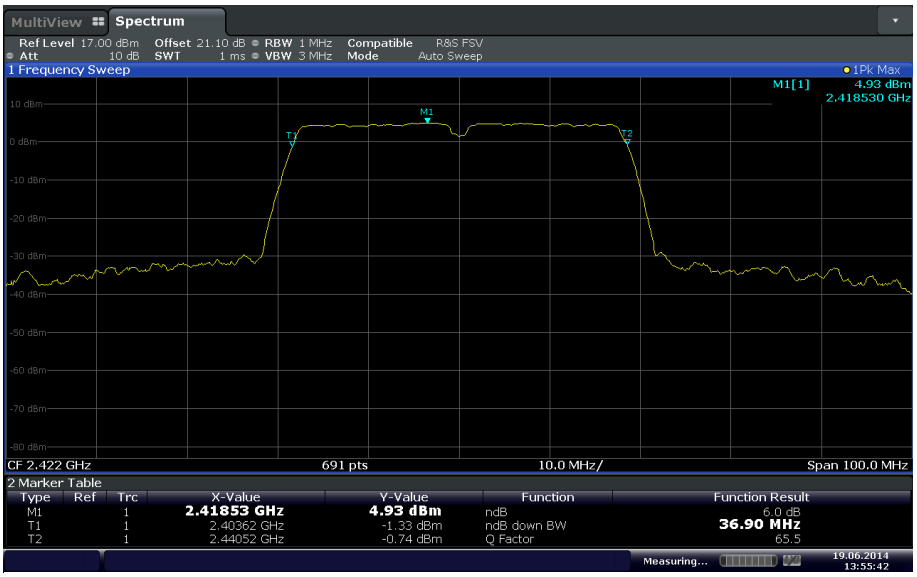
Date:18.JUN.2014 11:02:17

802.11n HT20 Mid Channel



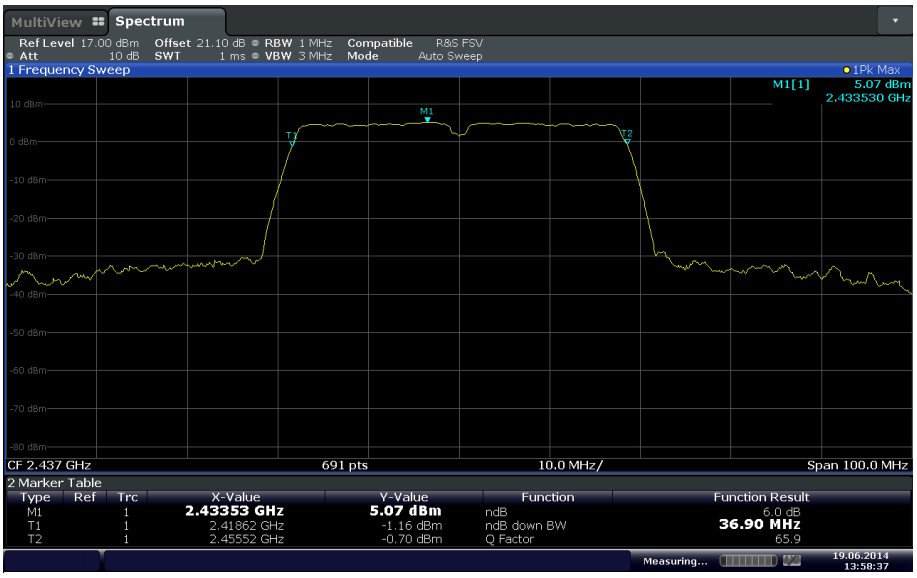
Date:19.JUN.2014 13:50:14

802.11n HT20 High Channel



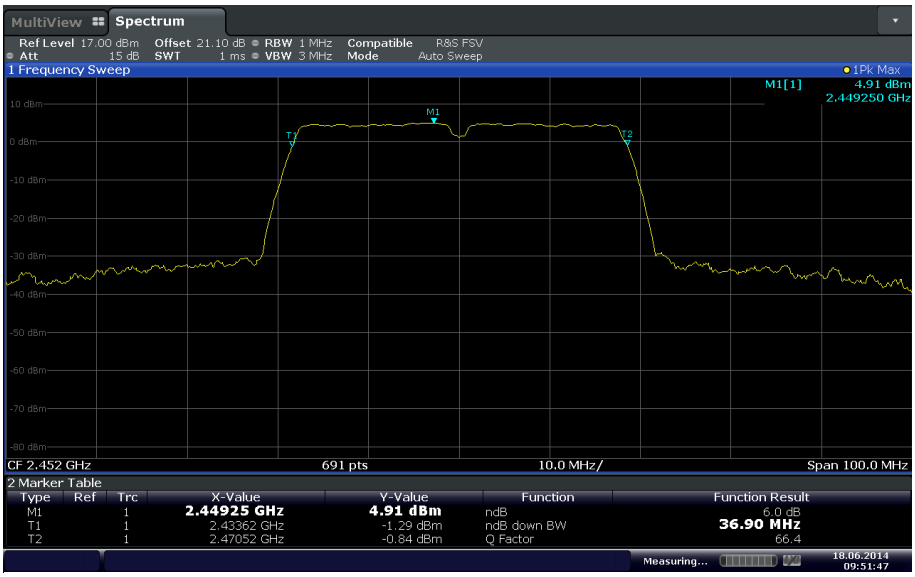
Date:19.JUN.2014 13:55:43

802.11n HT40 Low Channel



Date:19.JUN.2014 13:58:36

802.11n HT40 Mid Channel



802.11n HT40 High Channel

2.4 OUT-OF-BAND EMISSIONS - CONDUCTED

2.4.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.4.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.4.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration A

2.4.4 Date of Test/Initial of test personnel who performed the test

June 18, 2014 / KAM

2.4.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.6 Environmental Conditions/ Test Location

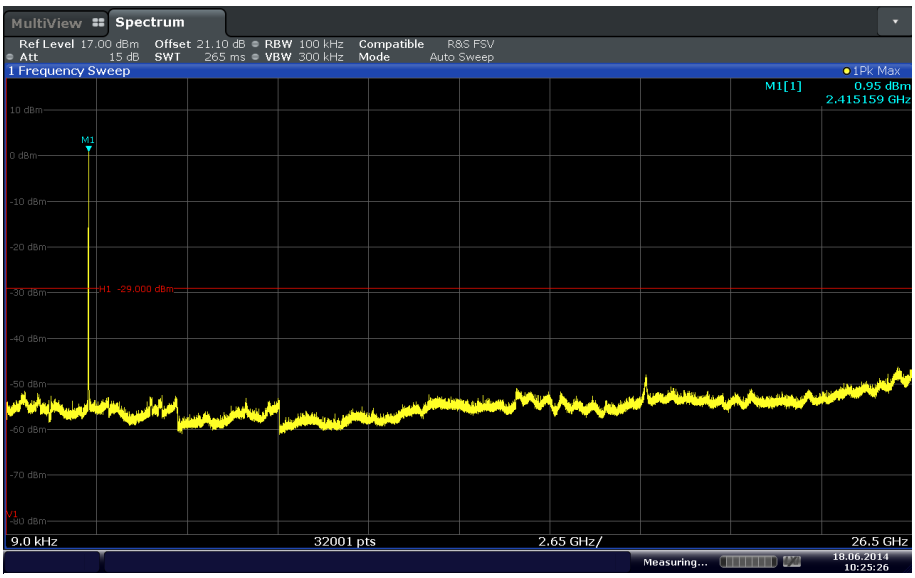
Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.1 °C
Relative Humidity	44.1.%
ATM Pressure	98.9 kPa

2.4.7 Additional Observations

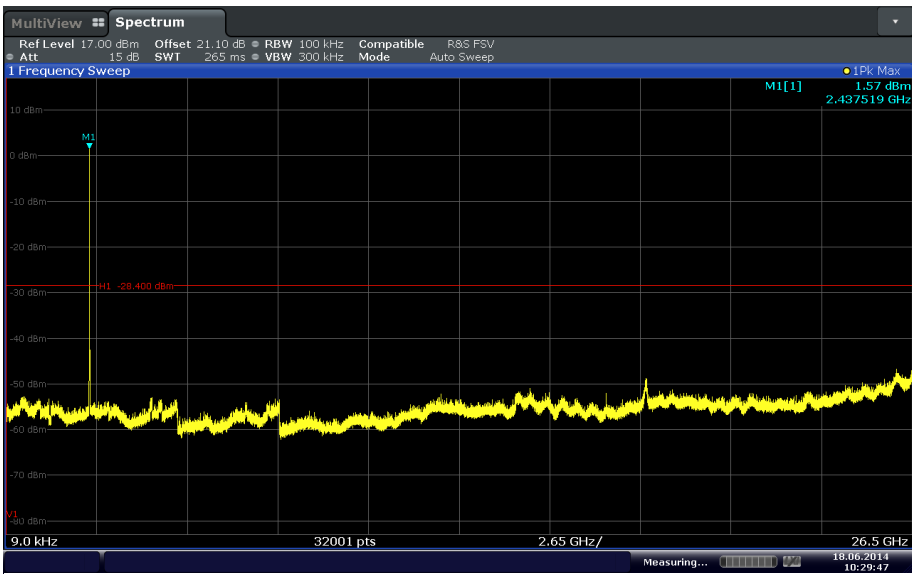
- This is a conducted test.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Initial scan was performed to determine the highest level of the desired power within the band. Limit (display line) was drawn 30dB below this level.
- Spectrum was searched from 9 kHz up to 26.5GHz.

2.4.8 Test Results Plots



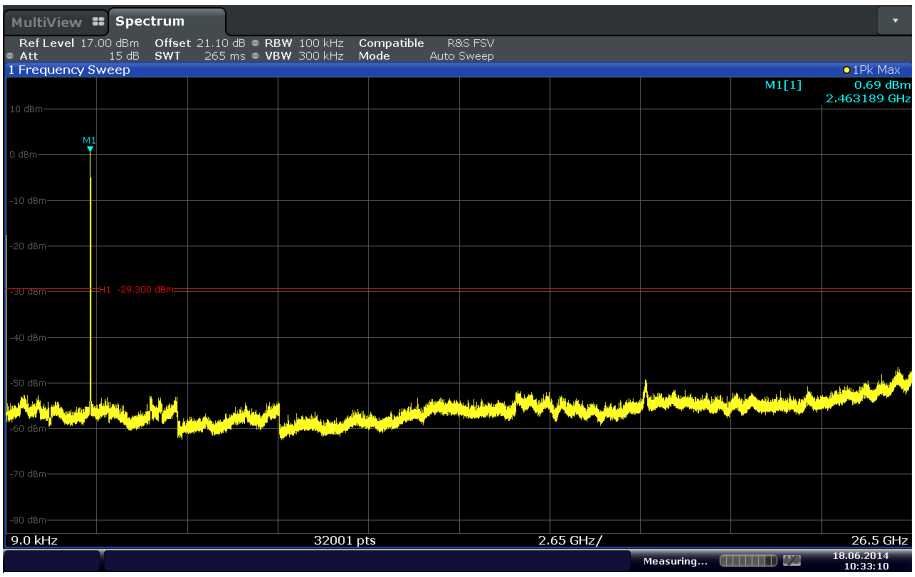
Date: 18.JUN.2014 10:25:26

802.11b Low Channel

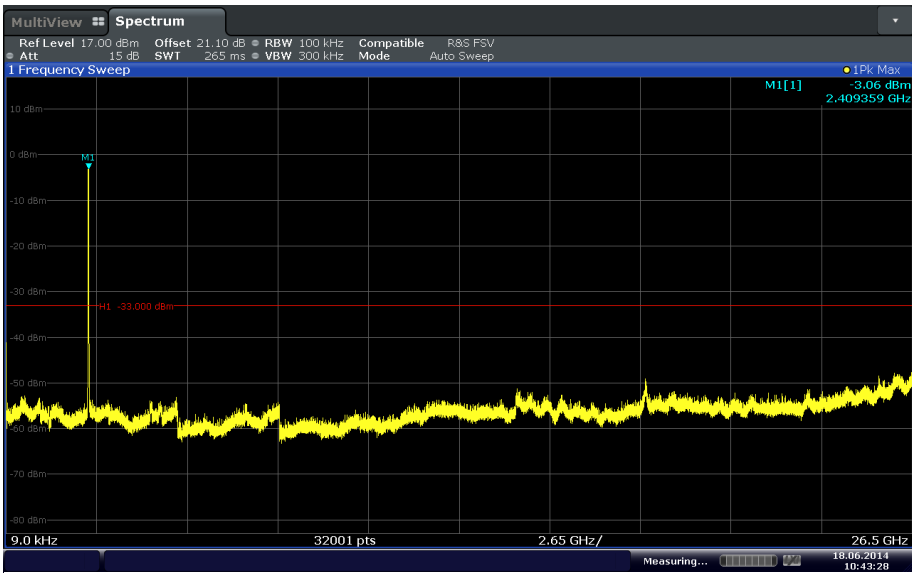


Date: 18.JUN.2014 10:29:47

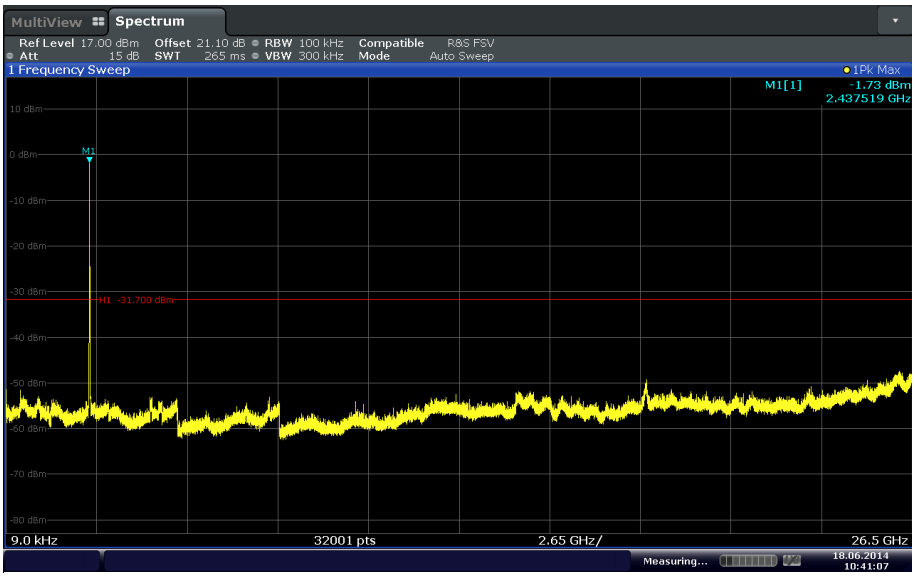
802.11b Mid Channel



802.11b High Channel

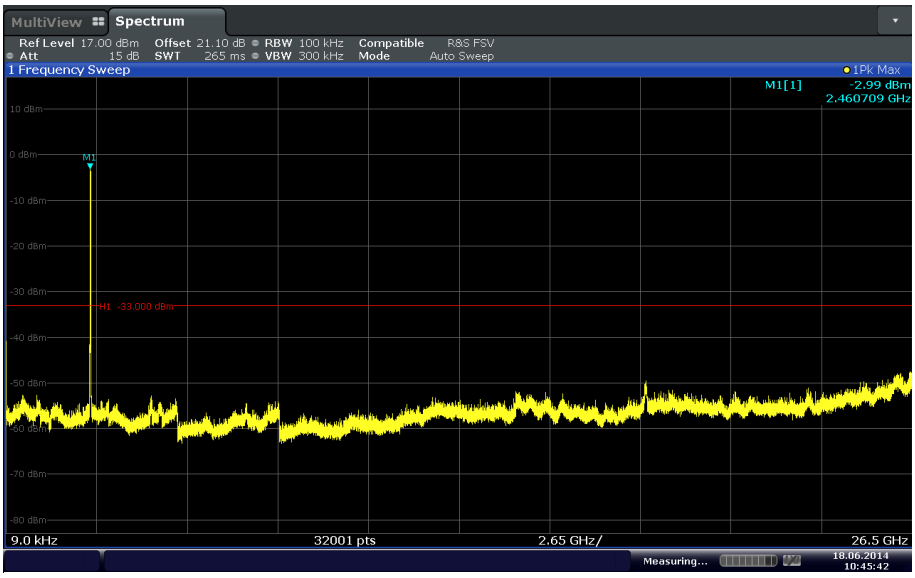


802.11g Low Channel



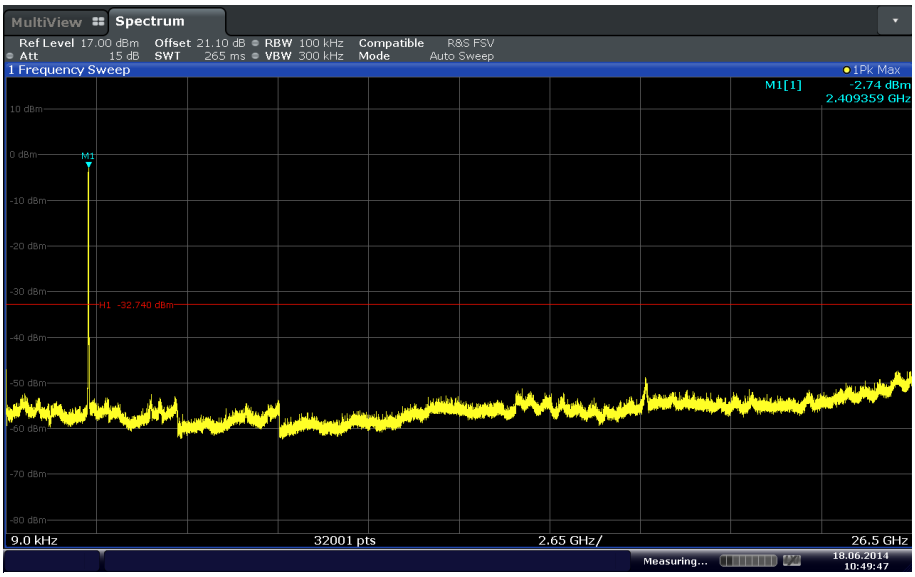
Date:18.JUN.2014 10:41:08

802.11g Mid Channel



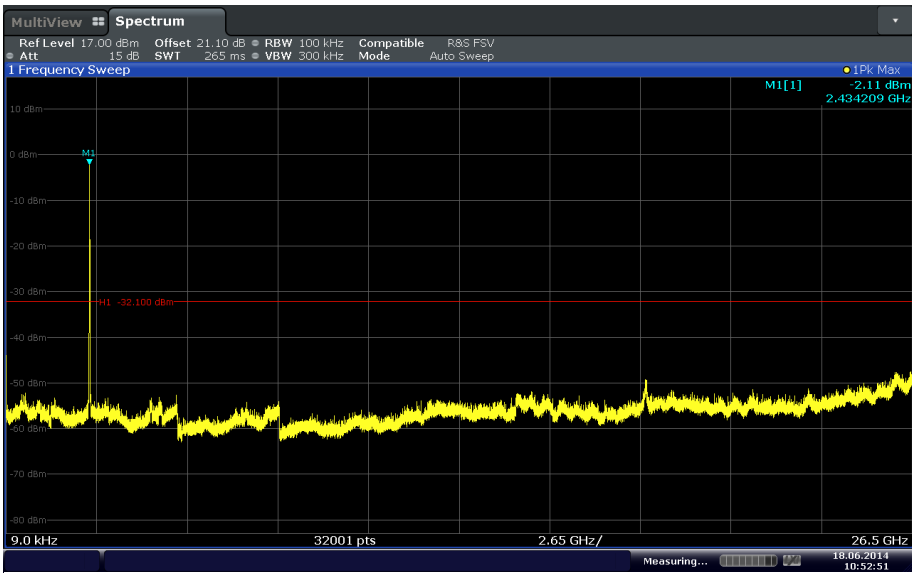
Date:18.JUN.2014 10:45:42

802.11g High Channel



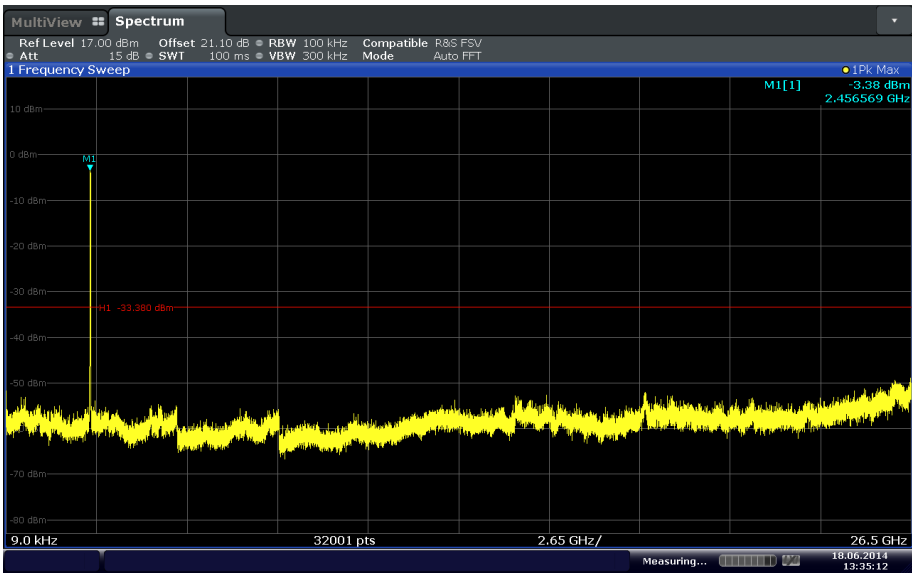
Date:18.JUN.2014 10:49:48

802.11n HT20 Low Channel



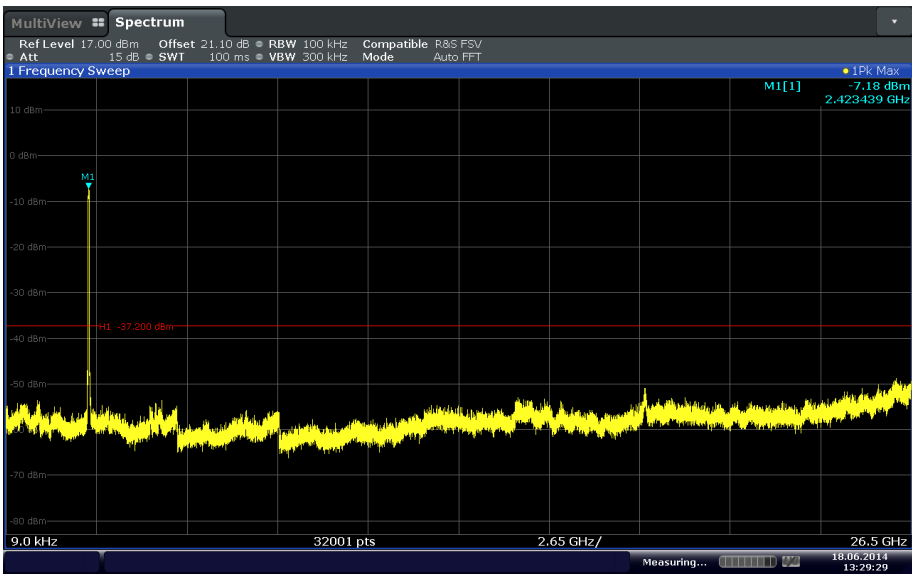
Date:18.JUN.2014 10:52:51

802.11n HT20 Mid Channel



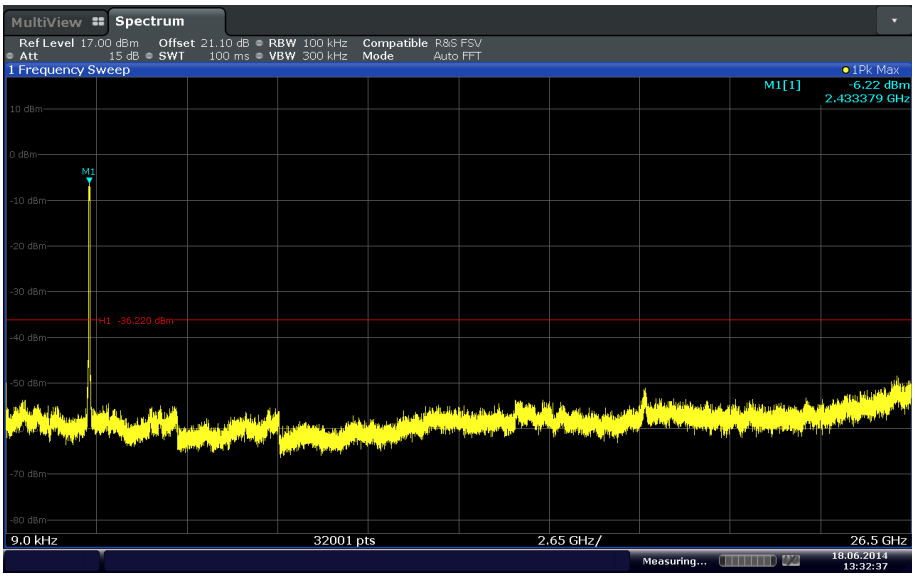
Date: 18.JUN.2014 13:35:13

802.11n HT20 High Channel



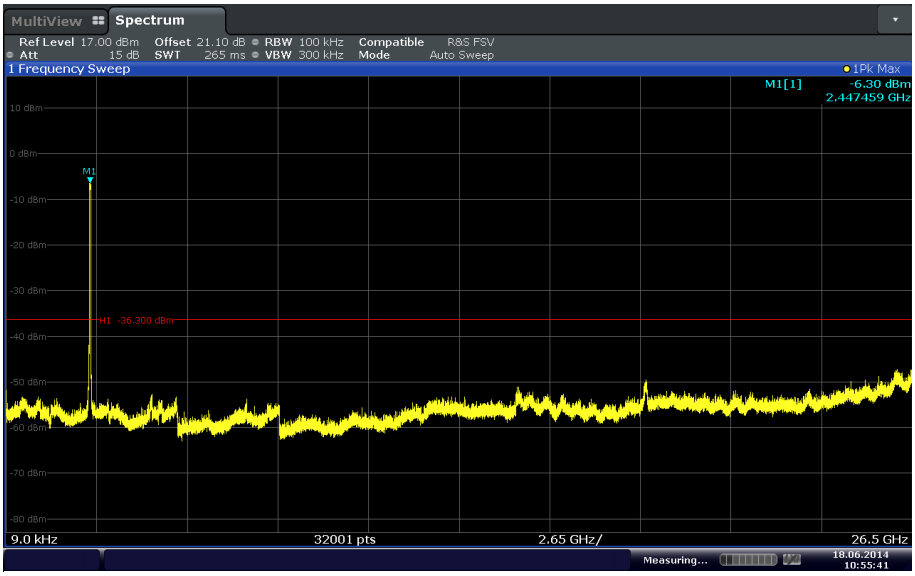
Date: 18.JUN.2014 13:29:28

802.11n HT40 Low Channel



Date: 18.JUN.2014 13:32:38

802.11n HT40 Mid Channel



Date: 18.JUN.2014 10:55:41

802.11n HT40 High Channel

2.5 BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

2.5.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.5.2 Standard Applicable

See previous test.

2.5.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration A

2.5.4 Date of Test/Initial of test personnel who performed the test

June 18, 2014 / KAM

2.5.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

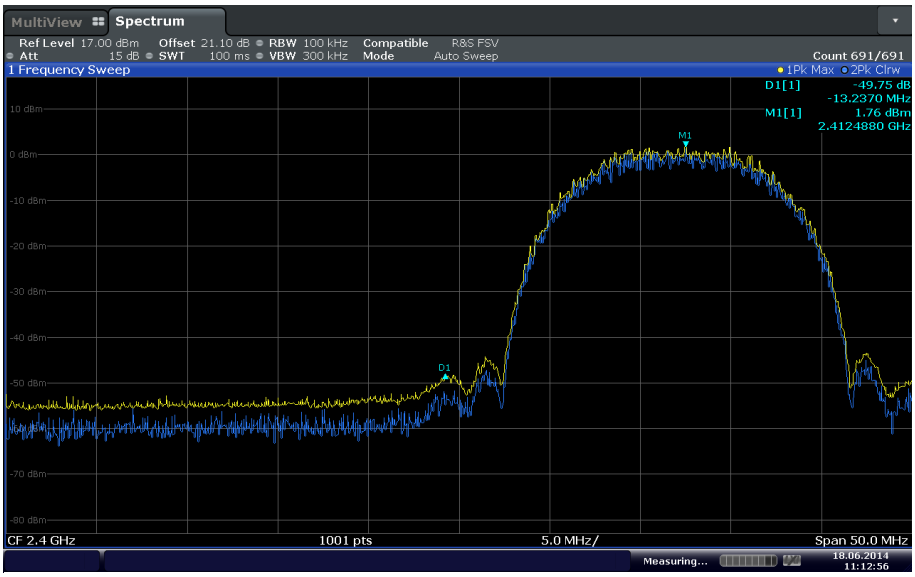
Ambient Temperature	25.1 °C
Relative Humidity	44.1 %
ATM Pressure	98.9 kPa

2.5.7 Additional Observations

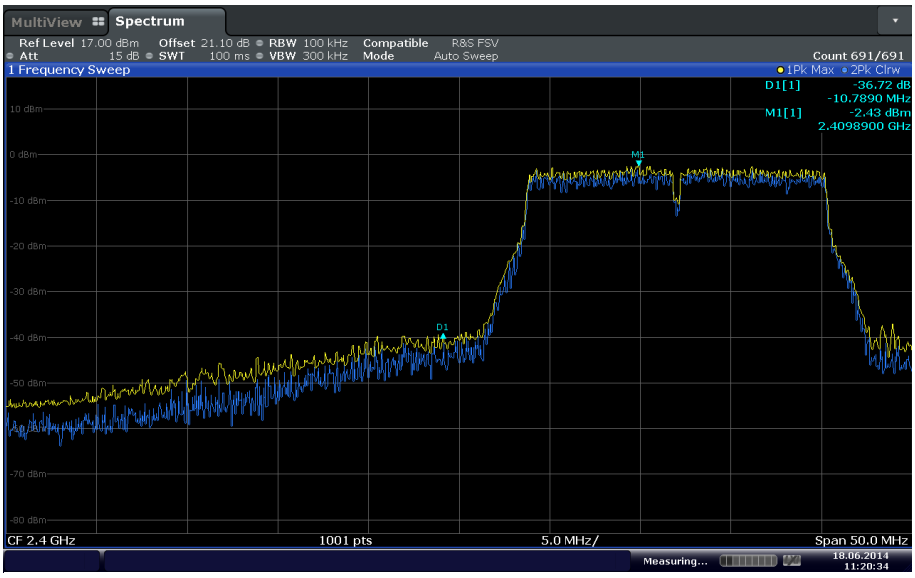
- This is a conducted test.
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.
- RBW is 100kHz.VBW is 3X RBW.
- Sweep is auto. Detector is peak. Trace is max hold.
- Trace was centred on the band-edge frequency.
- Span was set to encompass the band-edge frequency and the peak of the emission.
- Using Marker function, peak of the emission was determined and the delta to the band-edge frequency measured.

2.5.8 Test Results

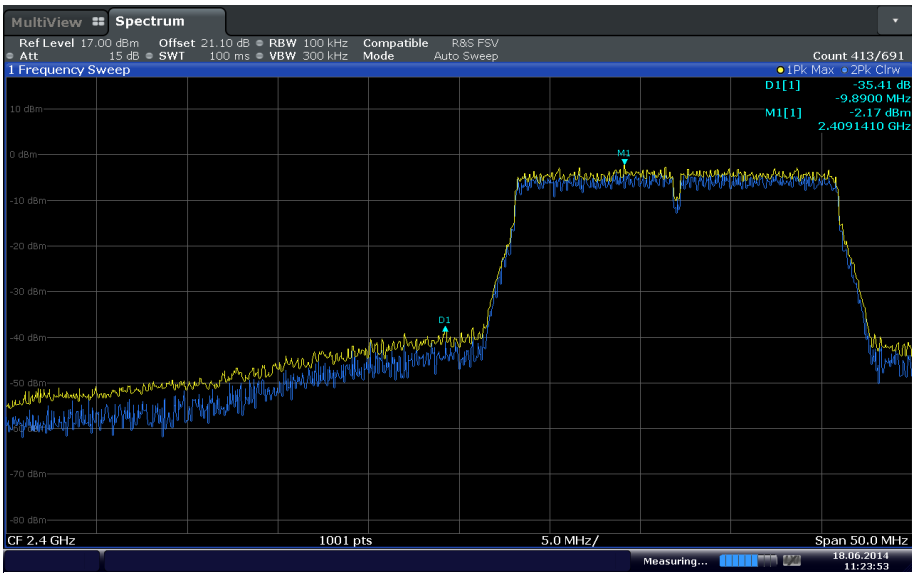
Complies. See attached plots.



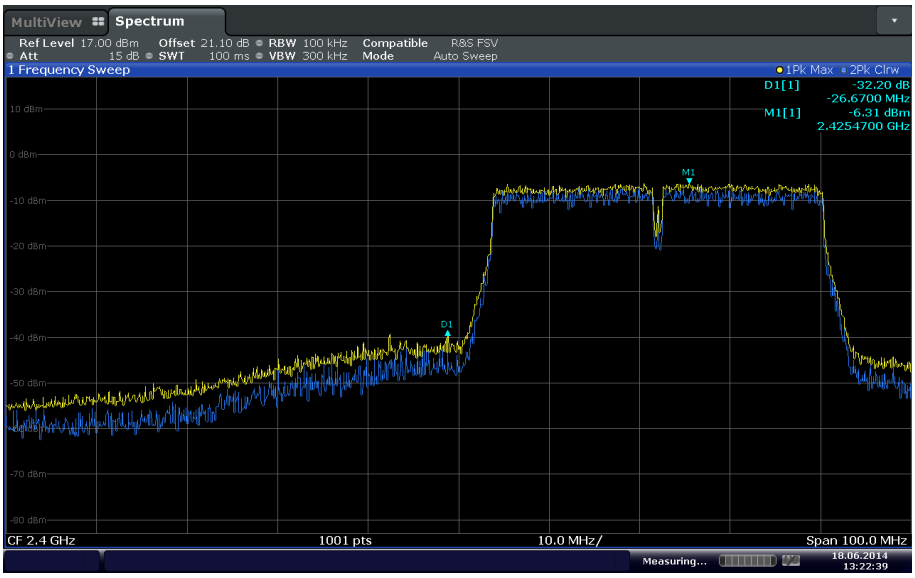
802.11b Low Channel (2412 MHz)



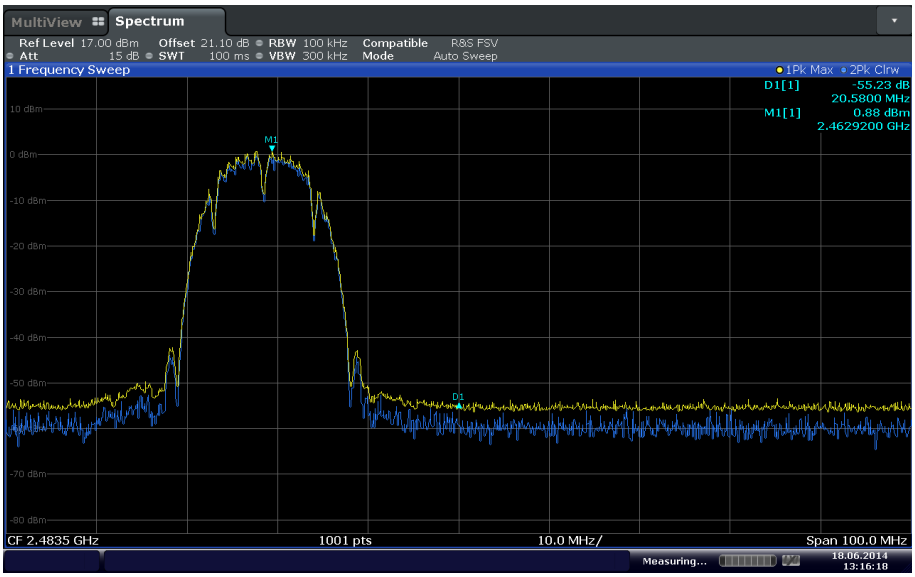
802.11g Low Channel (2412 MHz)



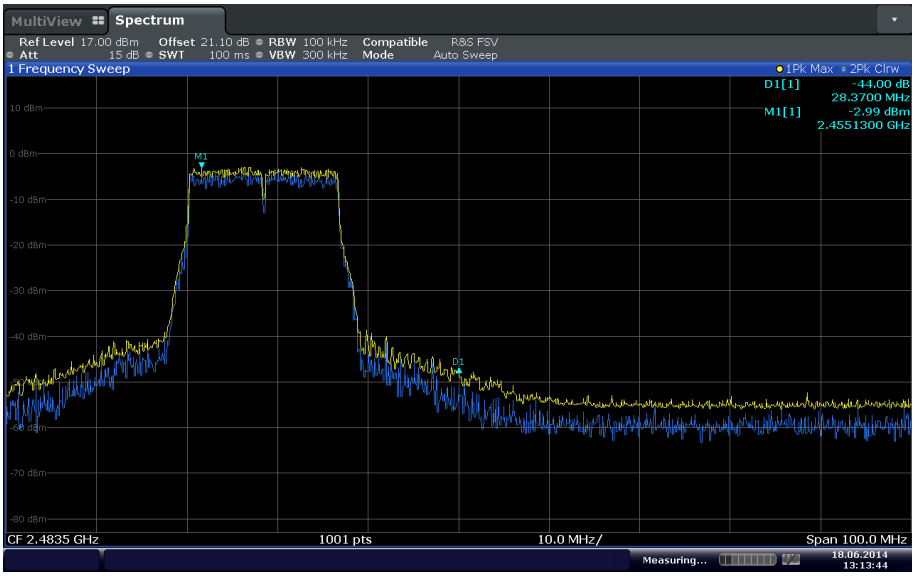
802.11n HT20 Low Channel (2412 MHz)



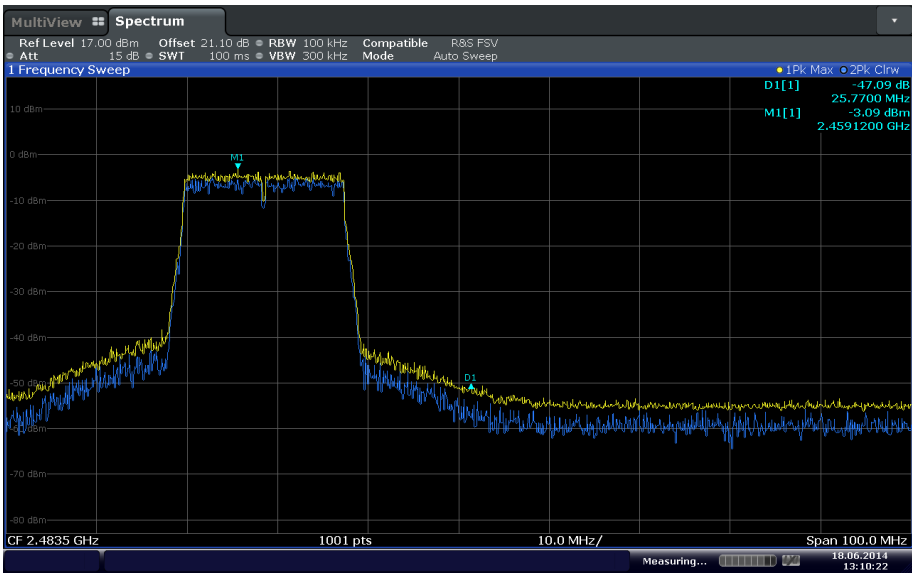
802.11n HT40 Low Channel (2412 MHz)



802.11b High Channel (2462 MHz)

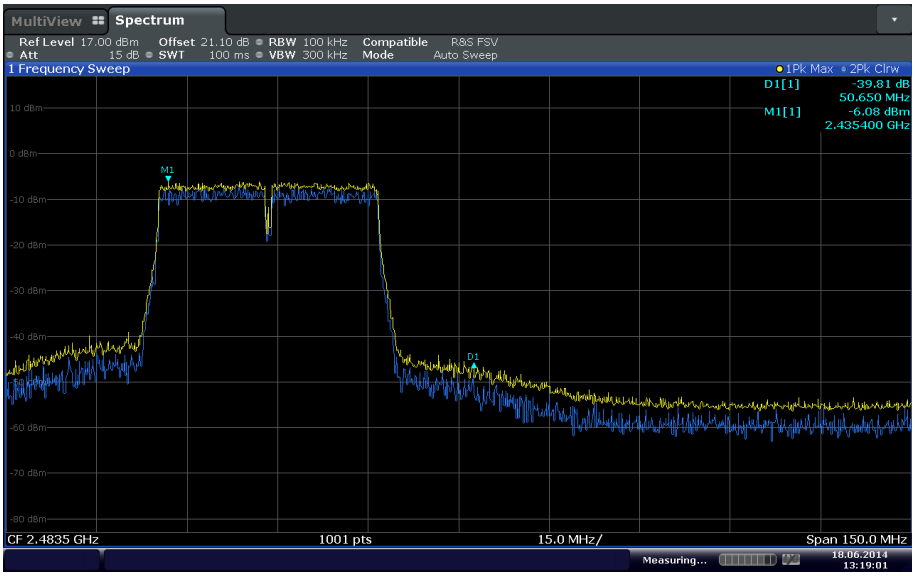


802.11g High Channel (2462 MHz)



Date: 18.JUN.2014 13:10:22

802.11n HT20 High Channel (2462 MHz)



Date: 18.JUN.2014 13:19:01

802.11n HT40 High Channel (2452 MHz)

2.6 SPURIOUS RADIATED EMISSIONS

2.6.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.6.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.6.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration B

2.6.4 Date of Test/Initial of test personnel who performed the test

October 29 and 30, 2014 / AC

2.6.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.6 Environmental Conditions

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.1°C
Relative Humidity	45.8%
ATM Pressure	99.3 kPa

2.6.7 Additional Observations

- This is a radiated test. The spectrum was searched from 30MHz to the 10th harmonic.
- There are no emissions found that do not comply to the restricted bands defined in FCC Part 15 Subpart C, 15.205 or Part 15.247(d).
- Only the considered worst case WLAN configuration (802.11b, Low Channel, 5.5Mbps) presented for radiated emissions below 1GHz. There are no significant differences in emissions between all modes below 1GHz.

TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364

- Only noise floor measurements observed above 18GHz.
- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.7.8 for sample computation.

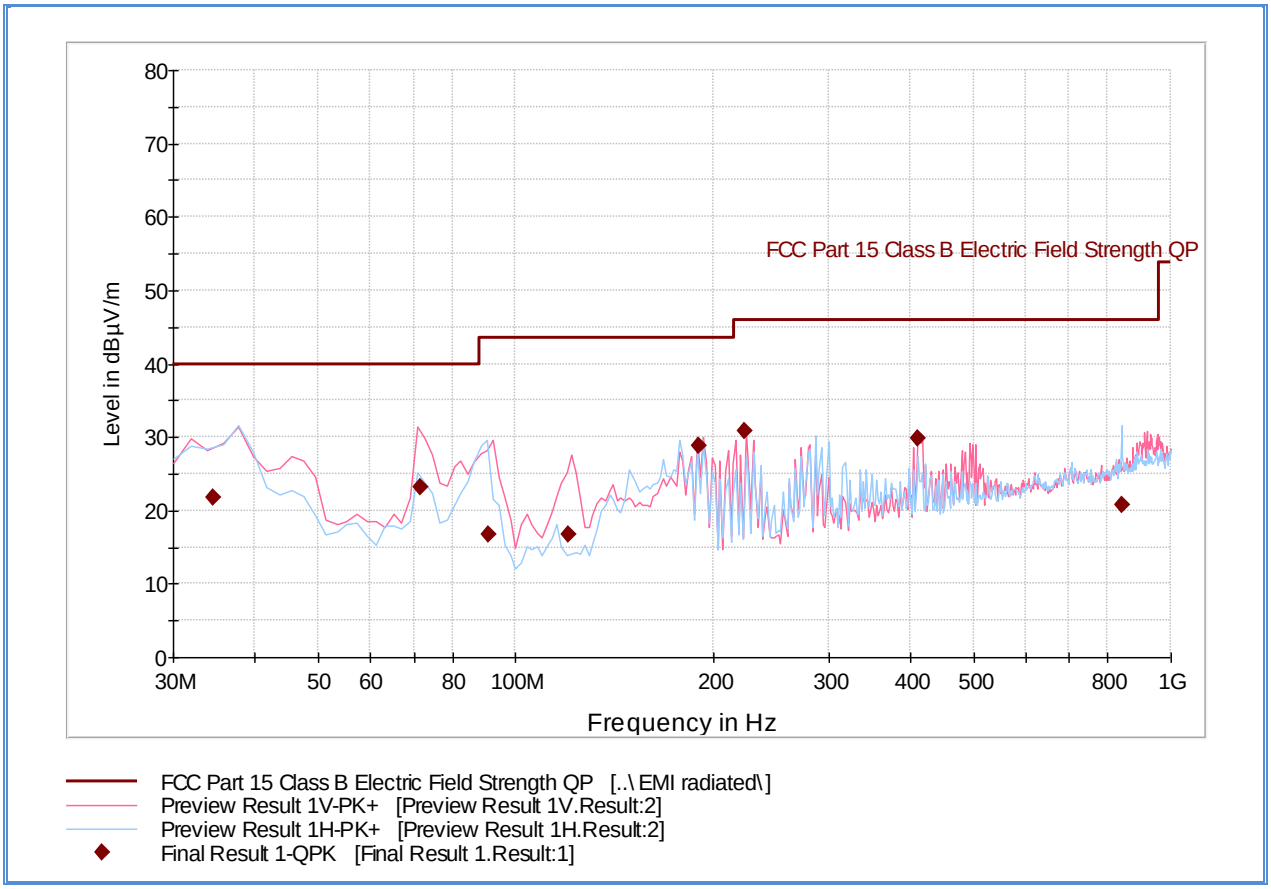
2.6.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 30 MHz			24.4
Correction Factor (dB)	Asset# 1066 (cable)	0.3	-12.6
	Asset# 1172 (cable)	0.3	
	Asset# 1016 (preamplifier)	-30.7	
	Asset# 1175(cable)	0.3	
	Asset# 1002 (antenna)	17.2	
Reported QuasiPeak Final Measurement (dbµV/m) @ 30MHz			**11.8**

2.6.9 Test Results

See attached plots.

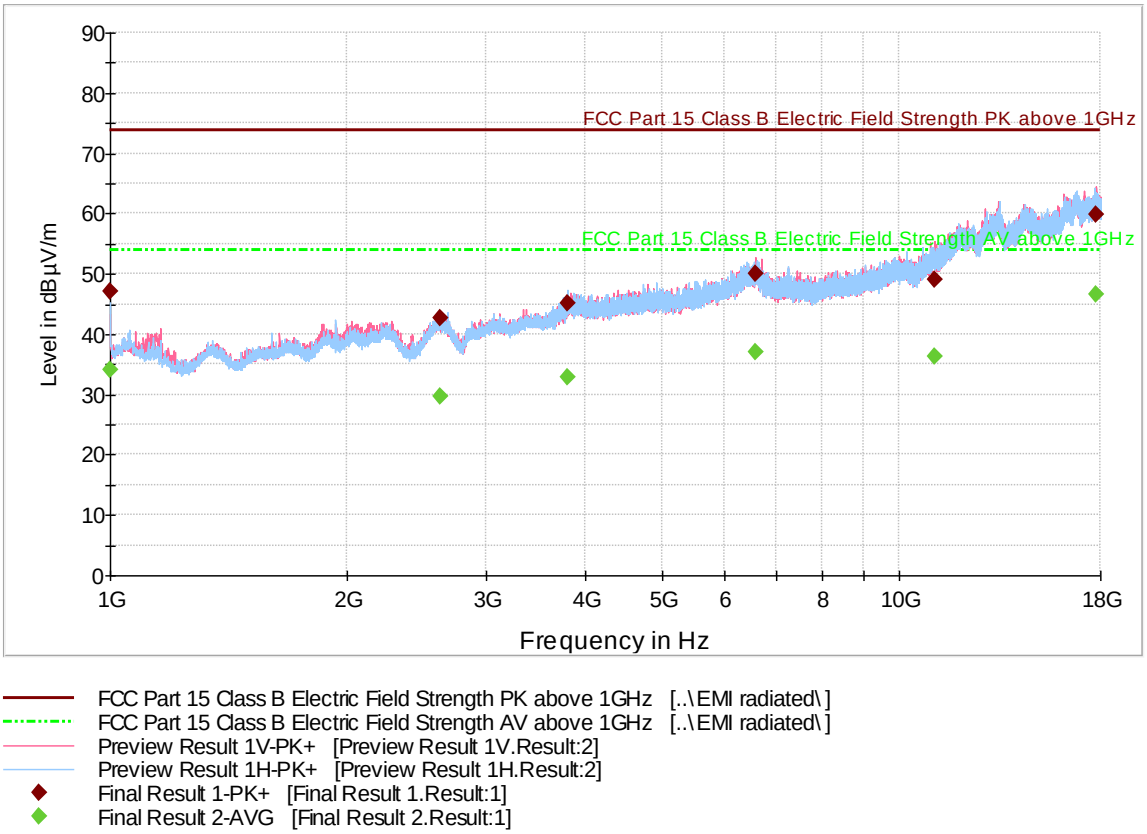
2.6.10 Test Results Below 1GHz (WLAN Worst Case Configuration)



Quasi Peak Data

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
34.575551	21.9	1000.0	120.000	306.0	H	103.0	-13.1	18.1	40.0
71.581643	23.3	1000.0	120.000	200.0	V	229.0	-21.4	16.7	40.0
90.804409	16.7	1000.0	120.000	100.0	V	7.0	-19.8	26.8	43.5
120.642725	16.8	1000.0	120.000	200.0	V	11.0	-19.4	26.7	43.5
189.718798	28.8	1000.0	120.000	100.0	V	61.0	-15.3	14.7	43.5
223.948778	30.8	1000.0	120.000	100.0	V	128.0	-14.4	15.2	46.0
410.562004	29.9	1000.0	120.000	115.0	V	319.0	-8.2	16.1	46.0
840.481202	20.7	1000.0	120.000	350.0	H	34.0	0.8	25.3	46.0

2.6.11 Test Results Above 1GHz (802.11b mode Low Channel)



Peak Data

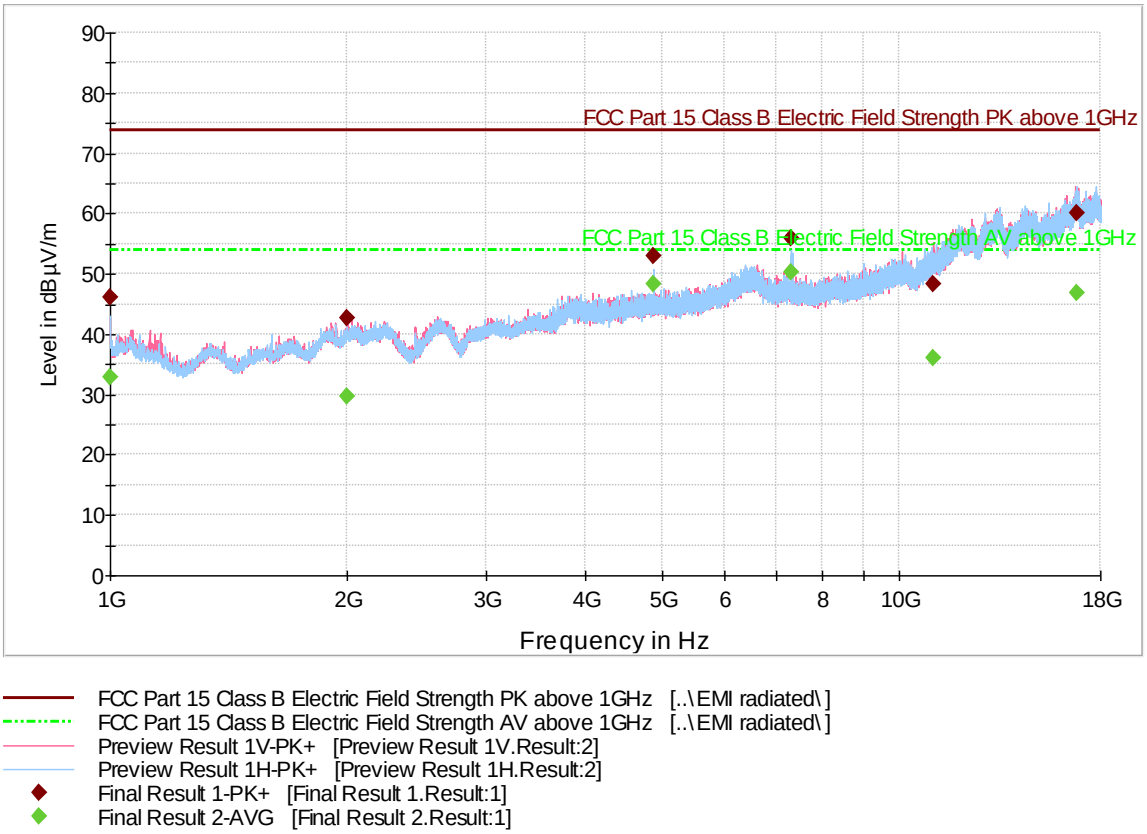
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	47.0	1000.0	1000.000	275.3	H	132.0	-7.0	26.9	73.9
2620.066667	42.7	1000.0	1000.000	355.1	H	37.0	-0.5	31.2	73.9
3801.000000	45.2	1000.0	1000.000	409.3	H	59.0	6.0	28.7	73.9
6572.800000	50.0	1000.0	1000.000	366.1	V	3.0	12.8	23.9	73.9
11090.033333	49.1	1000.0	1000.000	201.5	V	223.0	16.6	24.8	73.9
17785.466667	59.7	1000.0	1000.000	302.2	V	263.0	25.8	14.2	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	34.2	1000.0	1000.000	275.3	H	132.0	-7.0	19.7	53.9
2620.066667	29.7	1000.0	1000.000	355.1	H	37.0	-0.5	24.2	53.9
3801.000000	32.9	1000.0	1000.000	409.3	H	59.0	6.0	21.0	53.9
6572.800000	37.1	1000.0	1000.000	366.1	V	3.0	12.8	16.8	53.9
11090.033333	36.3	1000.0	1000.000	201.5	V	223.0	16.6	17.6	53.9
17785.466667	46.5	1000.0	1000.000	302.2	V	263.0	25.8	7.4	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.12 Test Results Above 1GHz (802.11b mode Mid Channel)



Peak Data

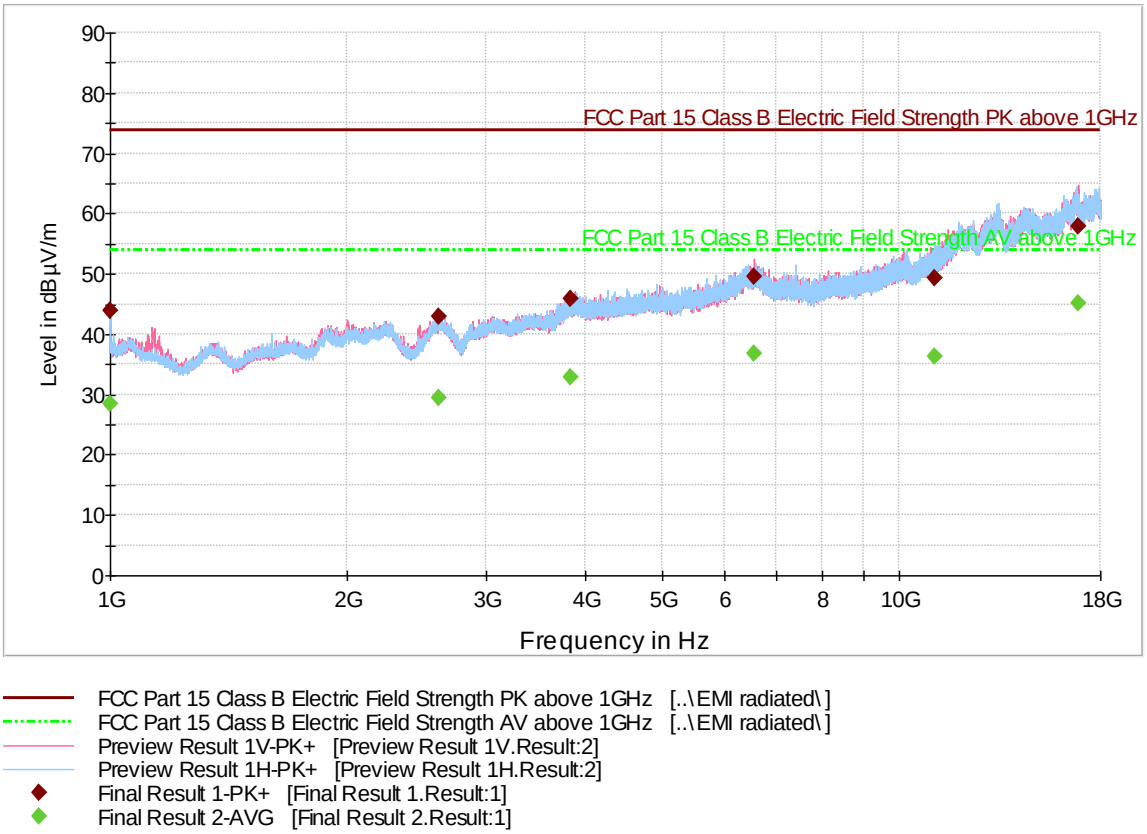
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	46.2	1000.0	1000.000	165.6	H	217.0	-7.0	27.7	73.9
2000.366667	42.7	1000.0	1000.000	216.4	V	152.0	-1.0	31.2	73.9
4873.933333	53.1	1000.0	1000.000	132.7	H	13.0	7.1	20.8	73.9
7309.866667	55.9	1000.0	1000.000	214.4	H	132.0	11.1	18.0	73.9
11030.566667	48.4	1000.0	1000.000	154.6	V	350.0	16.9	25.5	73.9
16769.966667	60.0	1000.0	1000.000	174.6	H	181.0	25.9	13.9	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	33.0	1000.0	1000.000	165.6	H	217.0	-7.0	20.9	53.9
2000.366667	29.8	1000.0	1000.000	216.4	V	152.0	-1.0	24.1	53.9
4873.933333	48.4	1000.0	1000.000	132.7	H	13.0	7.1	5.5	53.9
7309.866667	50.3	1000.0	1000.000	214.4	H	132.0	11.1	3.6	53.9
11030.566667	36.1	1000.0	1000.000	154.6	V	350.0	16.9	17.8	53.9
16769.966667	46.8	1000.0	1000.000	174.6	H	181.0	25.9	7.1	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.13 Test Results Above 1GHz (802.11b mode High Channel)



Peak Data

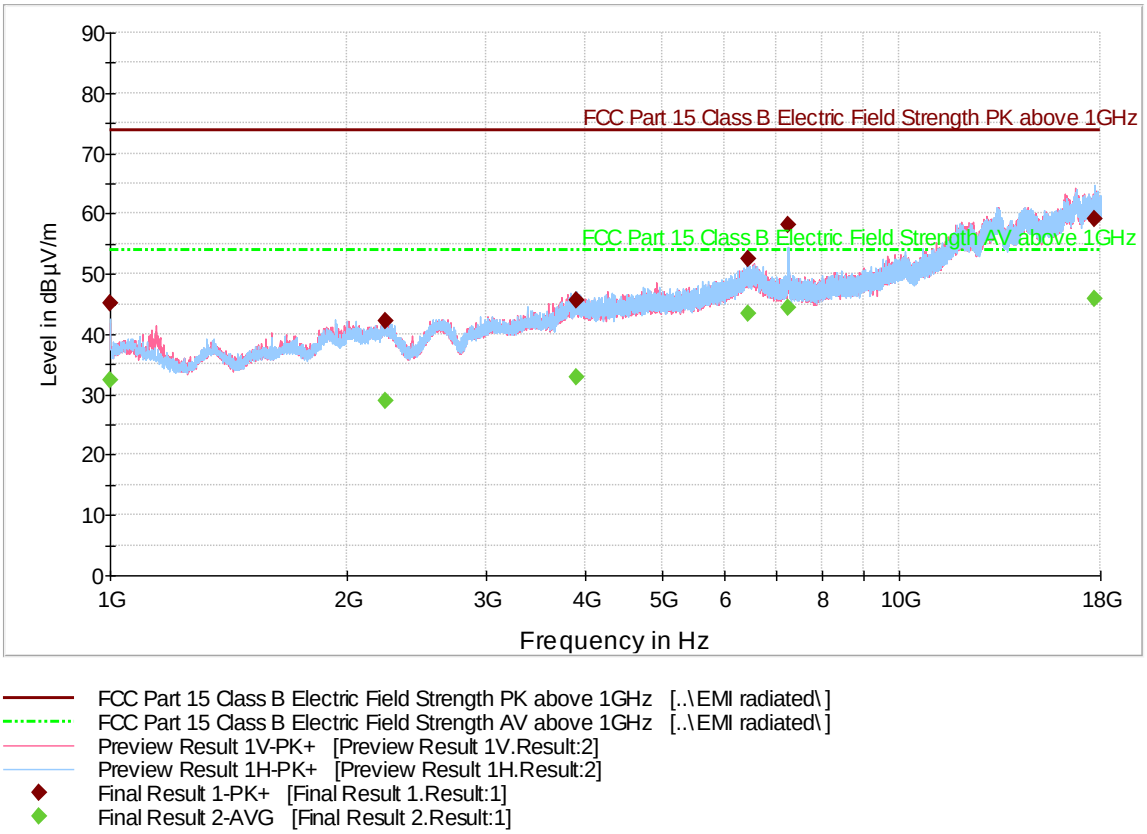
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.800000	43.9	1000.0	1000.000	279.3	H	103.0	-7.0	30.0	73.9
2606.866667	43.0	1000.0	1000.000	180.6	H	-9.0	-0.3	30.9	73.9
3833.166667	45.9	1000.0	1000.000	236.4	H	173.0	6.1	28.0	73.9
6552.433333	49.6	1000.0	1000.000	303.2	V	355.0	12.8	24.3	73.9
11095.166667	49.2	1000.0	1000.000	138.7	H	186.0	16.5	24.7	73.9
16876.900000	57.8	1000.0	1000.000	148.7	V	-3.0	24.7	16.1	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.800000	28.4	1000.0	1000.000	279.3	H	103.0	-7.0	25.5	53.9
2606.866667	29.4	1000.0	1000.000	180.6	H	-9.0	-0.3	24.5	53.9
3833.166667	32.9	1000.0	1000.000	236.4	H	173.0	6.1	21.0	53.9
6552.433333	36.9	1000.0	1000.000	303.2	V	355.0	12.8	17.0	53.9
11095.166667	36.2	1000.0	1000.000	138.7	H	186.0	16.5	17.7	53.9
16876.900000	45.1	1000.0	1000.000	148.7	V	-3.0	24.7	8.8	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.14 Test Results Above 1GHz (802.11g mode Low Channel)



Peak Data

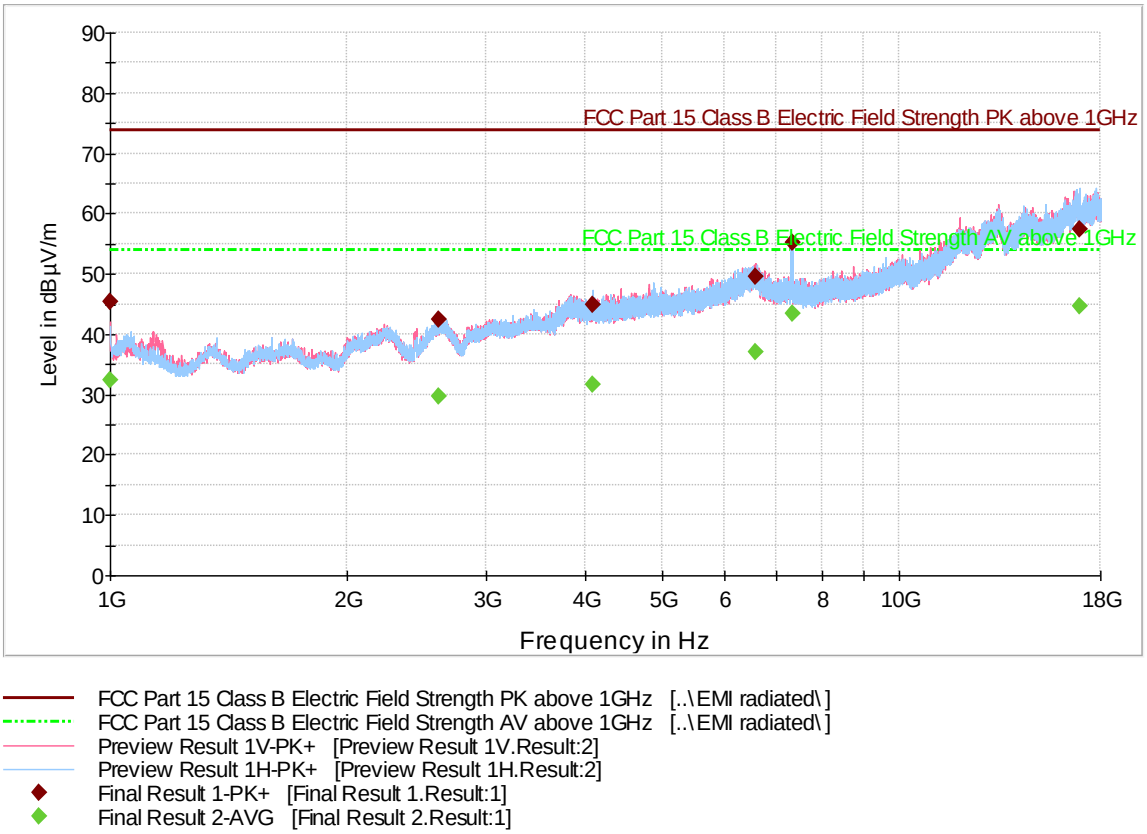
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	45.1	1000.0	1000.000	278.2	H	57.0	-7.0	28.8	73.9
2232.733333	42.2	1000.0	1000.000	103.7	H	250.0	-0.8	31.7	73.9
3906.400000	45.6	1000.0	1000.000	322.1	H	151.0	6.0	28.3	73.9
6431.866667	52.4	1000.0	1000.000	227.4	H	143.0	12.6	21.5	73.9
7236.766667	58.1	1000.0	1000.000	173.5	H	354.0	11.3	15.8	73.9
17692.166667	59.1	1000.0	1000.000	345.1	H	262.0	25.5	14.8	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	32.3	1000.0	1000.000	278.2	H	57.0	-7.0	21.6	53.9
2232.733333	29.0	1000.0	1000.000	103.7	H	250.0	-0.8	24.9	53.9
3906.400000	32.8	1000.0	1000.000	322.1	H	151.0	6.0	21.1	53.9
6431.866667	43.5	1000.0	1000.000	227.4	H	143.0	12.6	10.4	53.9
7236.766667	44.3	1000.0	1000.000	173.5	H	354.0	11.3	9.6	53.9
17692.166667	45.9	1000.0	1000.000	345.1	H	262.0	25.5	8.0	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.15 Test Results Above 1GHz (802.11g mode Mid Channel)



Peak Data

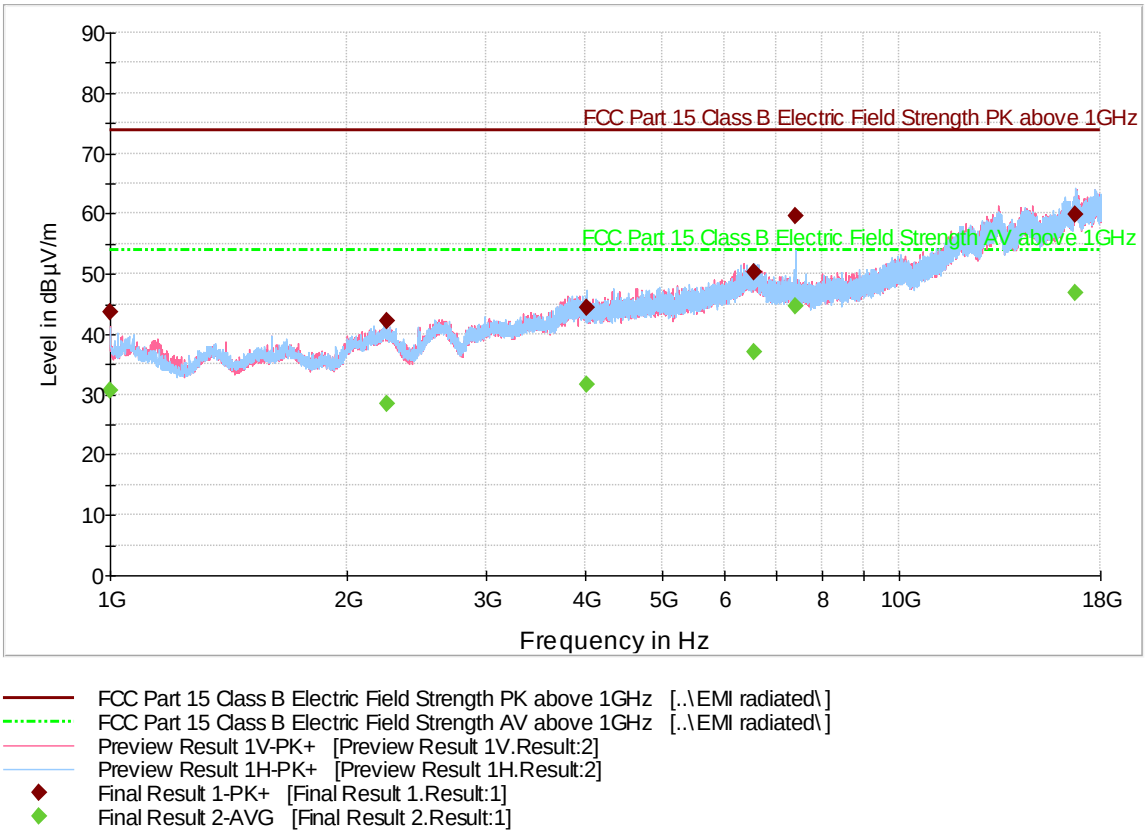
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	45.3	1000.0	1000.000	180.5	V	188.0	-7.0	28.6	73.9
2614.966667	42.3	1000.0	1000.000	173.6	H	5.0	-0.4	31.6	73.9
4094.966667	44.8	1000.0	1000.000	198.5	H	109.0	6.2	29.1	73.9
6575.800000	49.6	1000.0	1000.000	190.5	V	70.0	12.8	24.3	73.9
7314.366667	55.2	1000.0	1000.000	206.5	H	135.0	11.1	18.7	73.9
16913.333333	57.4	1000.0	1000.000	115.7	H	50.0	24.4	16.5	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	32.3	1000.0	1000.000	180.5	V	188.0	-7.0	21.6	53.9
2614.966667	29.6	1000.0	1000.000	173.6	H	5.0	-0.4	24.3	53.9
4094.966667	31.7	1000.0	1000.000	198.5	H	109.0	6.2	22.2	53.9
6575.800000	37.1	1000.0	1000.000	190.5	V	70.0	12.8	16.8	53.9
7314.366667	43.3	1000.0	1000.000	206.5	H	135.0	11.1	10.6	53.9
16913.333333	44.5	1000.0	1000.000	115.7	H	50.0	24.4	9.4	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.16 Test Results Above 1GHz (802.11g mode High Channel)



Peak Data

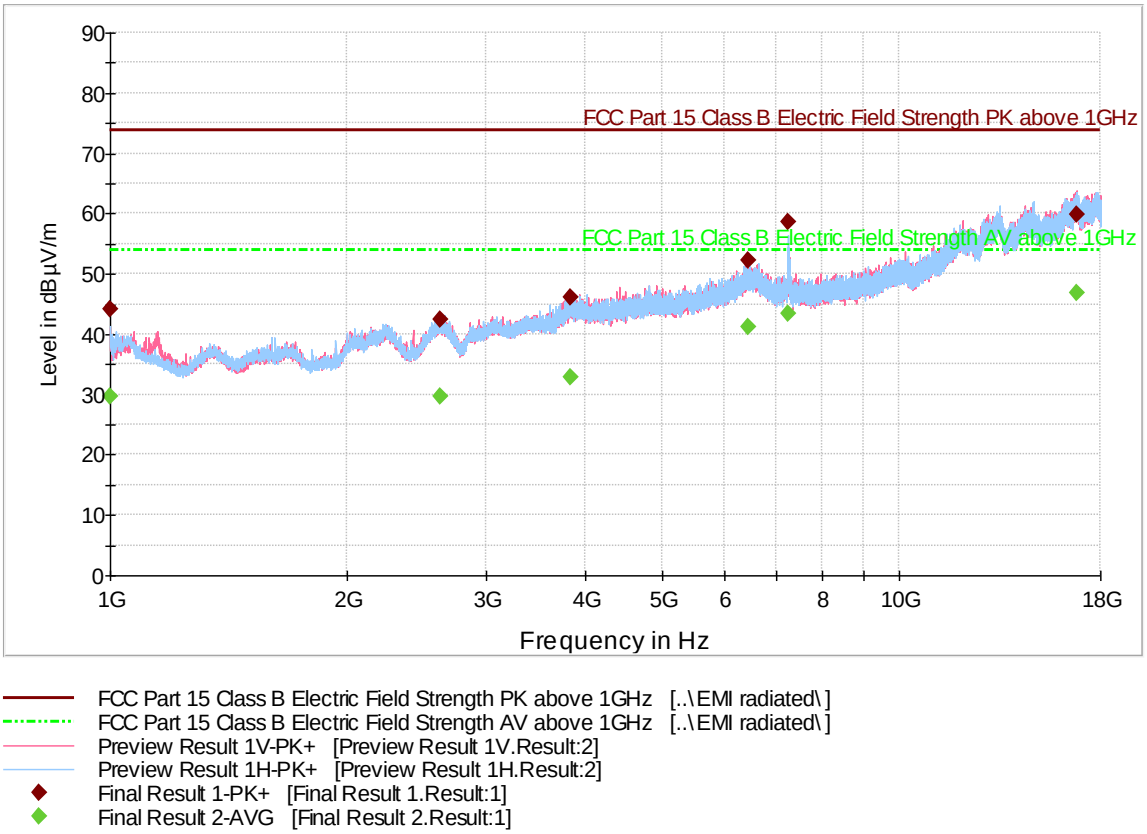
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	43.7	1000.0	1000.000	256.3	V	153.0	-7.0	30.2	73.9
2241.000000	42.1	1000.0	1000.000	115.7	H	-20.0	-0.8	31.8	73.9
4013.366667	44.5	1000.0	1000.000	246.3	H	195.0	6.0	29.4	73.9
6542.433333	50.2	1000.0	1000.000	122.7	H	173.0	12.8	23.7	73.9
7382.733333	59.5	1000.0	1000.000	198.5	H	133.0	10.9	14.4	73.9
16752.600000	59.7	1000.0	1000.000	208.5	H	76.0	25.9	14.2	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	30.6	1000.0	1000.000	256.3	V	153.0	-7.0	23.3	53.9
2241.000000	28.5	1000.0	1000.000	115.7	H	-20.0	-0.8	25.4	53.9
4013.366667	31.8	1000.0	1000.000	246.3	H	195.0	6.0	22.1	53.9
6542.433333	37.1	1000.0	1000.000	122.7	H	173.0	12.8	16.8	53.9
7382.733333	44.5	1000.0	1000.000	198.5	H	133.0	10.9	9.4	53.9
16752.600000	46.7	1000.0	1000.000	208.5	H	76.0	25.9	7.2	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.17 Test Results Above 1GHz (802.11n HT20 mode Low Channel)



Peak Data

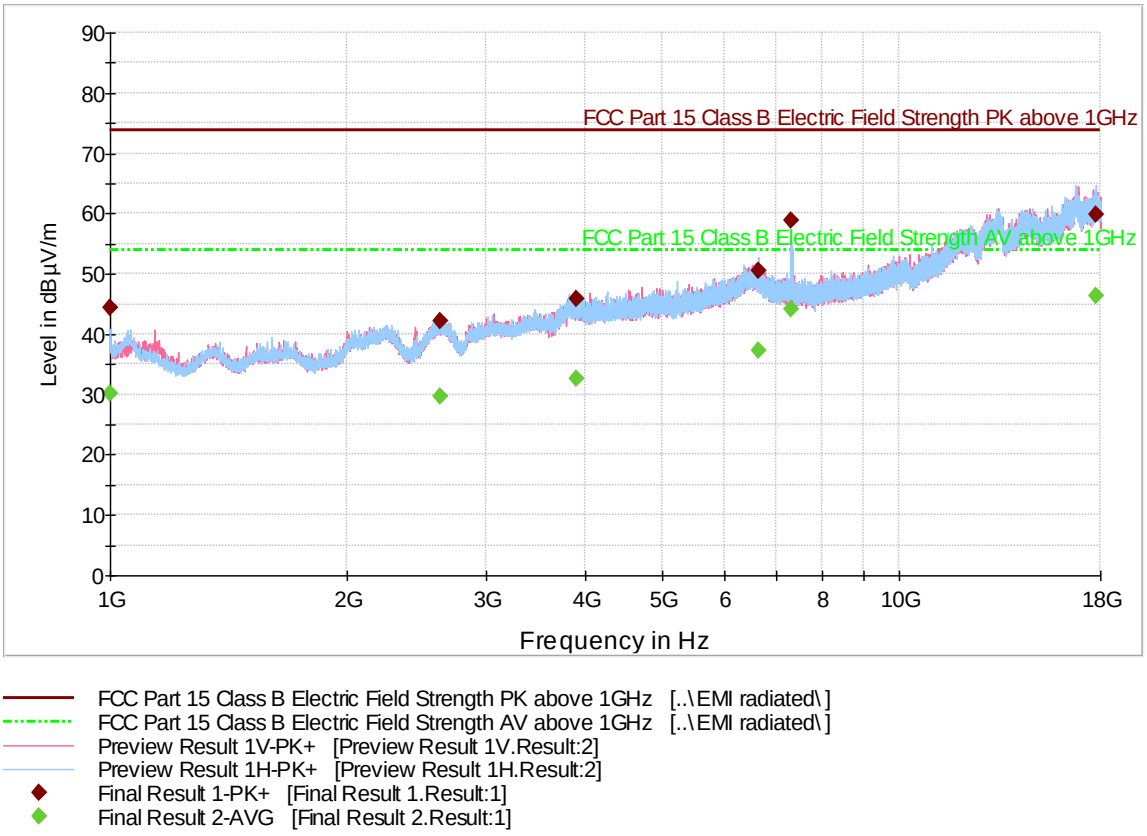
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.500000	44.1	1000.0	1000.000	103.7	H	310.0	-7.0	29.8	73.9
2618.766667	42.3	1000.0	1000.000	102.7	H	61.0	-0.5	31.6	73.9
3840.700000	46.0	1000.0	1000.000	130.7	V	10.0	6.0	27.9	73.9
6432.300000	52.2	1000.0	1000.000	200.5	V	283.0	12.7	21.7	73.9
7229.333333	58.6	1000.0	1000.000	170.6	H	344.0	11.3	15.3	73.9
16799.600000	59.7	1000.0	1000.000	103.7	V	27.0	25.9	14.2	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.500000	29.6	1000.0	1000.000	103.7	H	310.0	-7.0	24.3	53.9
2618.766667	29.7	1000.0	1000.000	102.7	H	61.0	-0.5	24.2	53.9
3840.700000	32.8	1000.0	1000.000	130.7	V	10.0	6.0	21.1	53.9
6432.300000	41.1	1000.0	1000.000	200.5	V	283.0	12.7	12.8	53.9
7229.333333	43.4	1000.0	1000.000	170.6	H	344.0	11.3	10.5	53.9
16799.600000	46.7	1000.0	1000.000	103.7	V	27.0	25.9	7.2	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.18 Test Results Above 1GHz (802.11n HT20 mode Mid Channel)



Peak Data

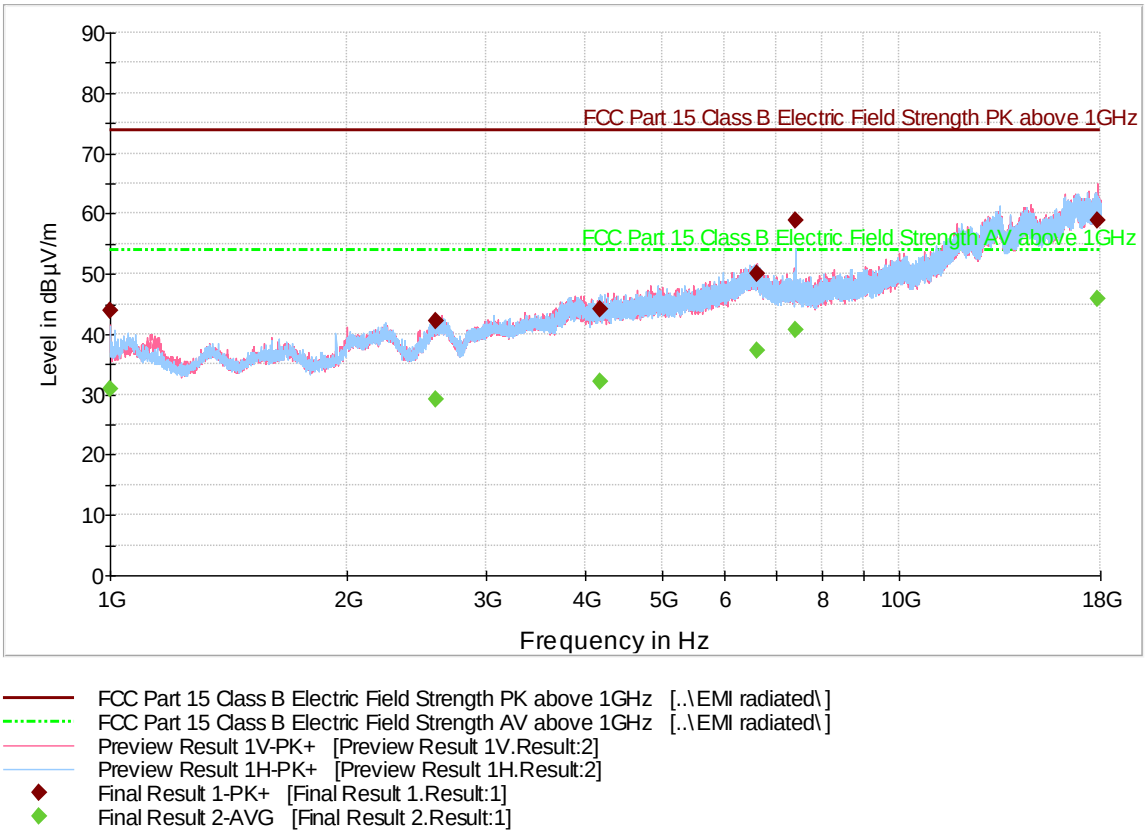
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	44.4	1000.0	1000.000	174.6	H	254.0	-7.0	29.5	73.9
2620.333333	42.2	1000.0	1000.000	148.7	V	3.0	-0.5	31.7	73.9
3898.533333	45.9	1000.0	1000.000	202.3	V	232.0	6.0	28.0	73.9
6625.533333	50.5	1000.0	1000.000	147.7	H	3.0	12.7	23.4	73.9
7306.833333	58.8	1000.0	1000.000	217.4	H	133.0	11.1	15.1	73.9
17785.200000	59.8	1000.0	1000.000	114.7	H	209.0	25.8	14.1	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	30.1	1000.0	1000.000	174.6	H	254.0	-7.0	23.8	53.9
2620.333333	29.6	1000.0	1000.000	148.7	V	3.0	-0.5	24.3	53.9
3898.533333	32.6	1000.0	1000.000	202.3	V	232.0	6.0	21.3	53.9
6625.533333	37.2	1000.0	1000.000	147.7	H	3.0	12.7	16.7	53.9
7306.833333	44.2	1000.0	1000.000	217.4	H	133.0	11.1	9.7	53.9
17785.200000	46.5	1000.0	1000.000	114.7	H	209.0	25.8	7.4	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.19 Test Results Above 1GHz (802.11n HT20 mode High Channel)



Peak Data

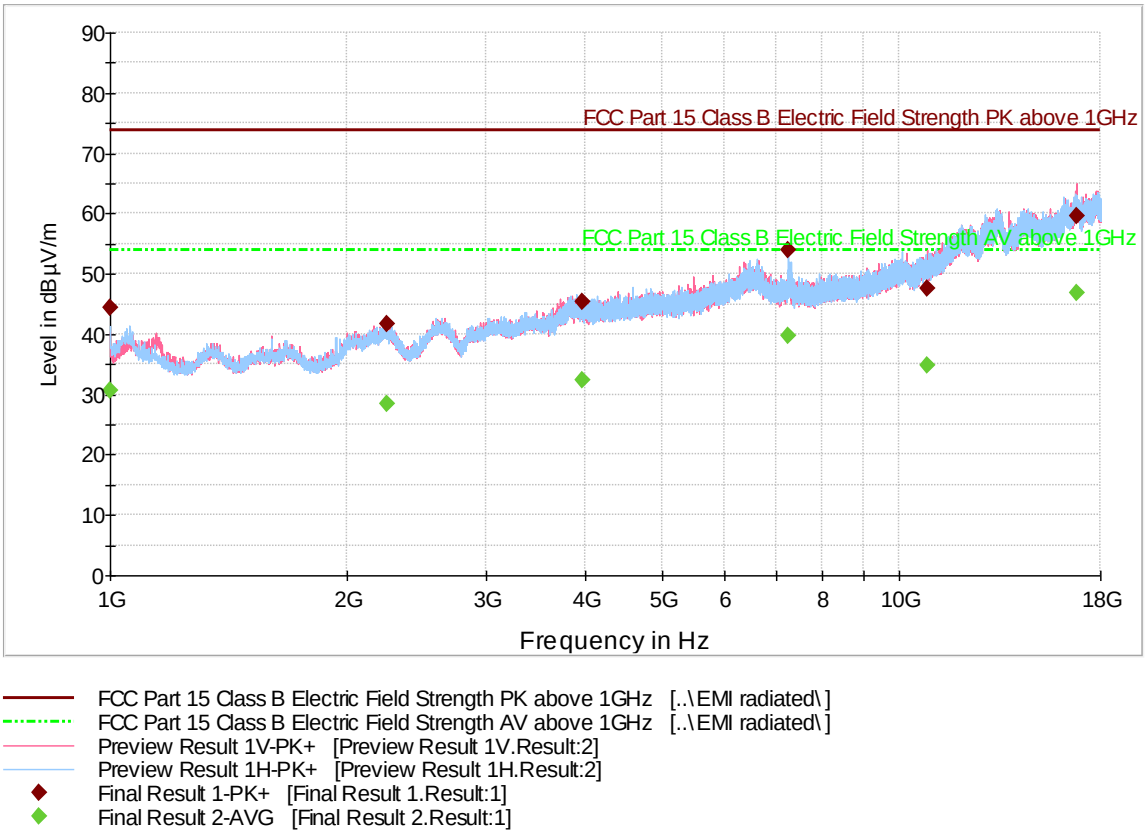
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	44.0	1000.0	1000.000	189.5	V	274.0	-7.0	29.9	73.9
2588.000000	42.1	1000.0	1000.000	103.7	H	336.0	-0.2	31.8	73.9
4177.266667	44.3	1000.0	1000.000	201.3	H	11.0	6.2	29.6	73.9
6592.800000	50.0	1000.0	1000.000	148.7	V	326.0	12.8	23.9	73.9
7399.566667	58.8	1000.0	1000.000	216.4	H	121.0	10.9	15.1	73.9
17821.700000	58.8	1000.0	1000.000	217.4	V	-20.0	25.7	15.1	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	31.0	1000.0	1000.000	189.5	V	274.0	-7.0	22.9	53.9
2588.000000	29.1	1000.0	1000.000	103.7	H	336.0	-0.2	24.8	53.9
4177.266667	32.0	1000.0	1000.000	201.3	H	11.0	6.2	21.9	53.9
6592.800000	37.2	1000.0	1000.000	148.7	V	326.0	12.8	16.7	53.9
7399.566667	40.6	1000.0	1000.000	216.4	H	121.0	10.9	13.3	53.9
17821.700000	45.8	1000.0	1000.000	217.4	V	-20.0	25.7	8.1	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.20 Test Results Above 1GHz (802.11n HT40 mode Low Channel)



Peak Data

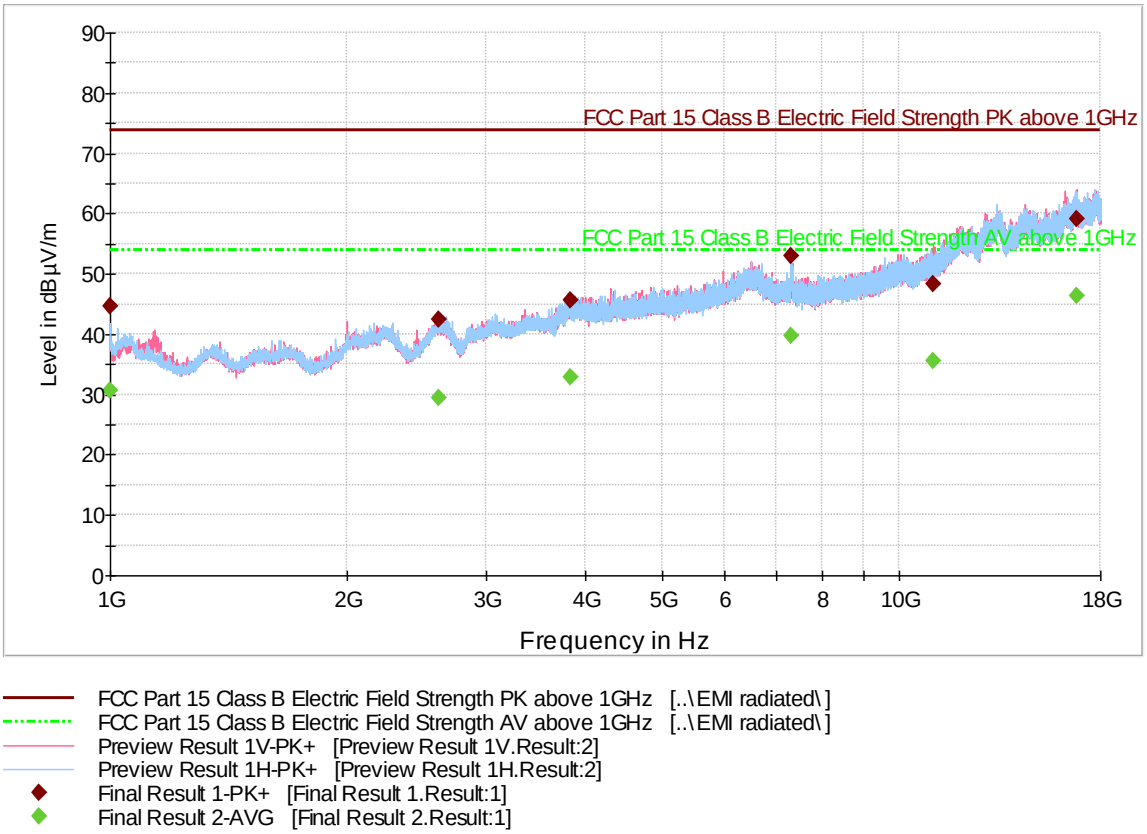
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	44.5	1000.0	1000.000	102.7	H	309.0	-7.0	29.4	73.9
2239.733333	41.8	1000.0	1000.000	180.6	V	265.0	-0.8	32.1	73.9
3974.400000	45.3	1000.0	1000.000	201.3	H	96.0	5.9	28.6	73.9
7244.866667	53.9	1000.0	1000.000	172.6	H	-20.0	11.3	20.0	73.9
10845.466667	47.6	1000.0	1000.000	172.6	V	309.0	16.6	26.3	73.9
16788.500000	59.6	1000.0	1000.000	201.3	V	210.0	25.9	14.3	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	30.7	1000.0	1000.000	102.7	H	309.0	-7.0	23.2	53.9
2239.733333	28.5	1000.0	1000.000	180.6	V	265.0	-0.8	25.4	53.9
3974.400000	32.4	1000.0	1000.000	201.3	H	96.0	5.9	21.5	53.9
7244.866667	39.6	1000.0	1000.000	172.6	H	-20.0	11.3	14.3	53.9
10845.466667	34.7	1000.0	1000.000	172.6	V	309.0	16.6	19.2	53.9
16788.500000	46.7	1000.0	1000.000	201.3	V	210.0	25.9	7.2	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.21 Test Results Above 1GHz (802.11n HT40 mode Mid Channel)



Peak Data

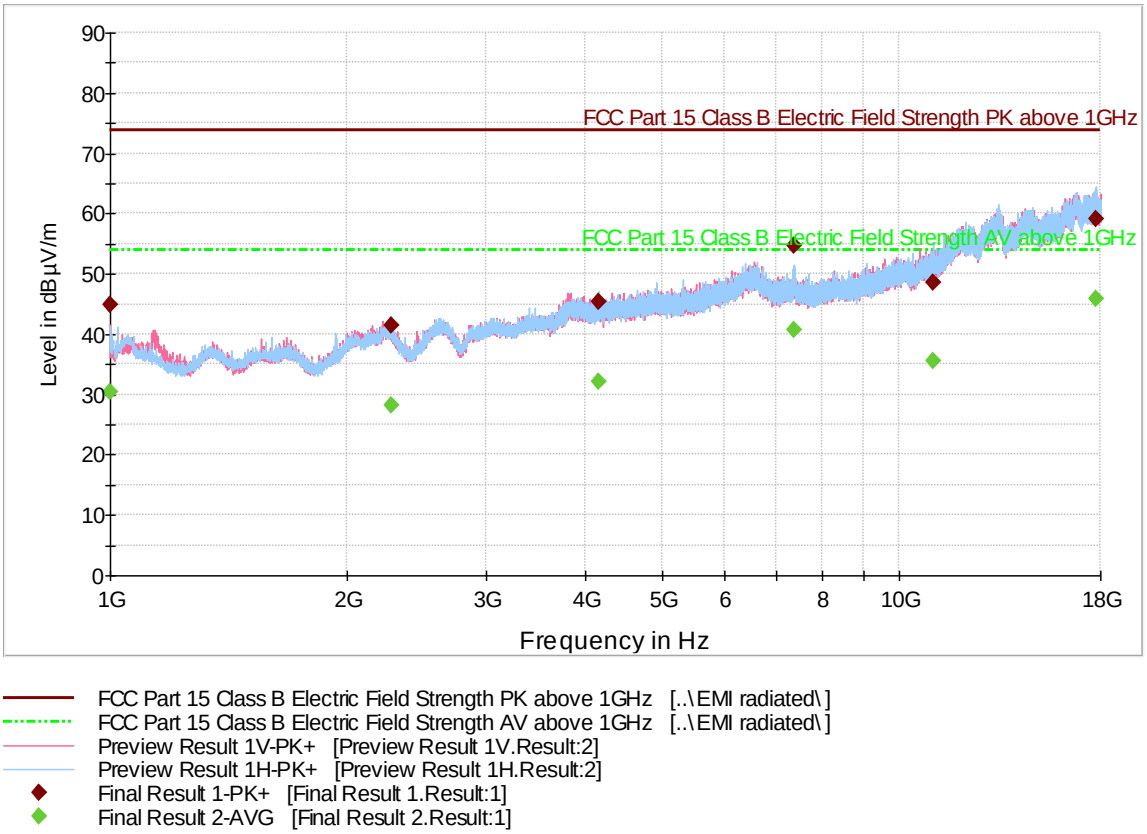
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	44.7	1000.0	1000.000	182.6	H	3.0	-7.0	29.2	73.9
2608.233333	42.4	1000.0	1000.000	156.6	H	3.0	-0.4	31.5	73.9
3825.066667	45.6	1000.0	1000.000	148.7	H	196.0	6.0	28.3	73.9
7306.833333	53.0	1000.0	1000.000	200.5	H	139.0	11.1	20.9	73.9
11030.400000	48.2	1000.0	1000.000	103.7	V	56.0	16.9	25.7	73.9
16816.033333	59.1	1000.0	1000.000	267.3	V	300.0	25.6	14.8	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.000000	30.8	1000.0	1000.000	182.6	H	3.0	-7.0	23.1	53.9
2608.233333	29.5	1000.0	1000.000	156.6	H	3.0	-0.4	24.4	53.9
3825.066667	33.0	1000.0	1000.000	148.7	H	196.0	6.0	20.9	53.9
7306.833333	39.8	1000.0	1000.000	200.5	H	139.0	11.1	14.1	53.9
11030.400000	35.5	1000.0	1000.000	103.7	V	56.0	16.9	18.4	53.9
16816.033333	46.4	1000.0	1000.000	267.3	V	300.0	25.6	7.5	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.6.22 Test Results Above 1GHz (802.11n HT40 mode High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	44.9	1000.0	1000.000	180.5	V	43.0	-7.0	29.0	73.9
2275.566667	41.4	1000.0	1000.000	149.6	H	168.0	-0.8	32.5	73.9
4169.400000	45.4	1000.0	1000.000	247.3	H	52.0	6.2	28.5	73.9
7356.833333	54.8	1000.0	1000.000	218.4	H	127.0	11.0	19.1	73.9
11062.733333	48.7	1000.0	1000.000	208.5	H	83.0	16.7	25.2	73.9
17798.266667	59.2	1000.0	1000.000	141.7	H	215.0	25.8	14.7	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1000.400000	30.4	1000.0	1000.000	180.5	V	43.0	-7.0	23.5	53.9
2275.566667	28.2	1000.0	1000.000	149.6	H	168.0	-0.8	25.7	53.9
4169.400000	32.0	1000.0	1000.000	247.3	H	52.0	6.2	21.9	53.9
7356.833333	40.7	1000.0	1000.000	218.4	H	127.0	11.0	13.2	53.9
11062.733333	35.6	1000.0	1000.000	208.5	H	83.0	16.7	18.3	53.9
17798.266667	45.8	1000.0	1000.000	141.7	H	215.0	25.8	8.1	53.9

Test Notes: Measurement was performed with a 2.4GHz notch filter. No significant emissions observed above 8GHz. Measurements above 8GHz are noise floor figures.

2.7 RADIATED BAND EDGE MEASUREMENTS AND IMMEDIATE RESTRICTED BANDS

2.7.1 Specification Reference

Part 15 Subpart C §15.247(d)

2.7.2 Standard Applicable

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

2.7.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration B

2.7.4 Date of Test/Initial of test personnel who performed the test

October 29 and 30, 2014 / AC

2.7.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	23.1 °C
Relative Humidity	45.8.%
ATM Pressure	99.3 kPa

2.7.7 Additional Observations

- This is a radiated test. The spectrum was searched from 2310MHz to 2390MHz for lower immediate restricted band and 2483.5MHz to 2500MHz for the upper immediate restricted band.
- There are no emissions found that do not comply with the restricted bands defined in FCC Part 15 Subpart C, 15.205.

- Measurement was done using EMC32 automated software. Reported level is the actual level with all the correction factors factored in. Correction Factor column is for informational purposes only. See Section 2.8.8 for sample computation.

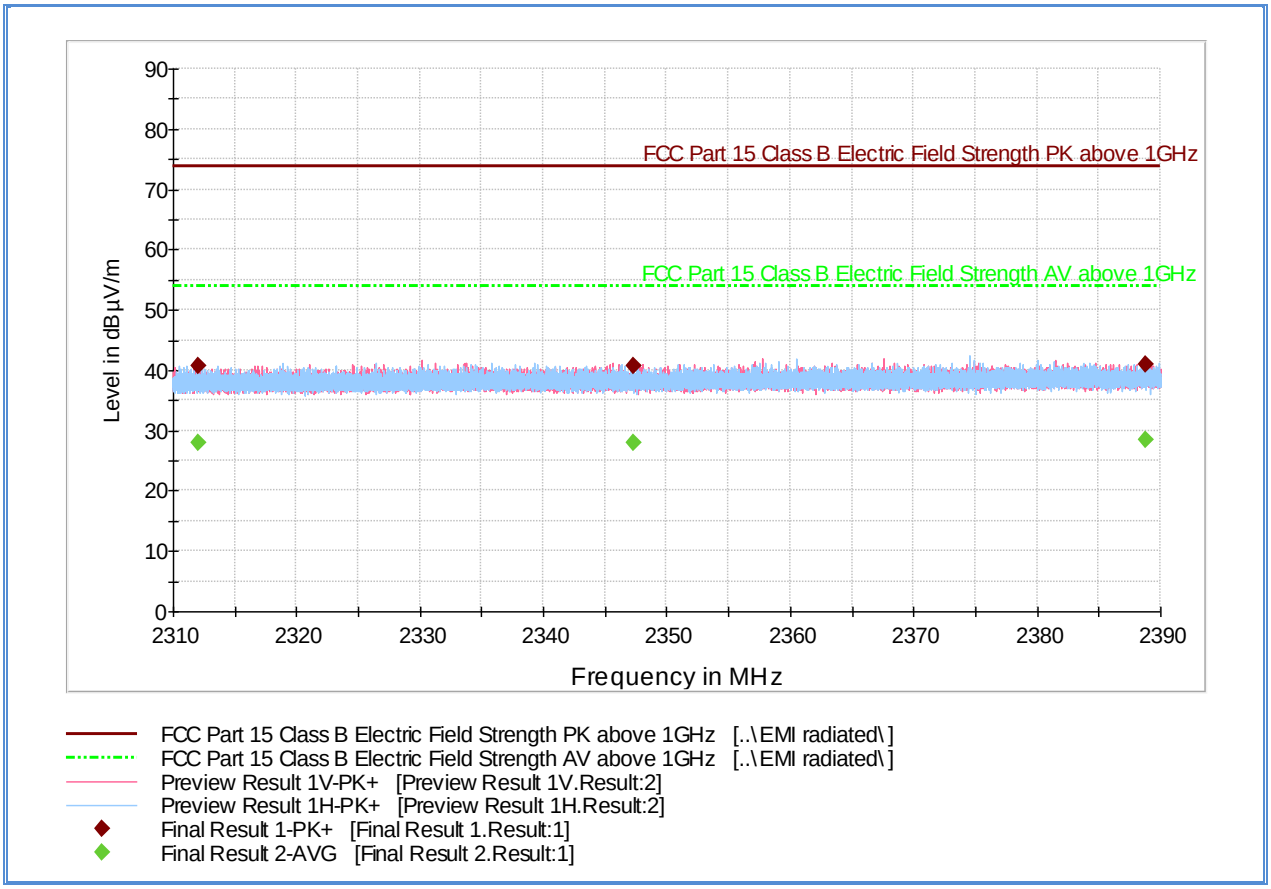
2.7.8 Sample Computation (Radiated Emission)

Measuring equipment raw measurement (dbµV) @ 2400 MHz			53.9
Correction Factor (dB)	Asset# 1153 (cable)	3.4	-0.4
	Asset# 8628(preamplifier)	-36.5	
	Asset#7575 (antenna)	32.7	
Reported Max Peak Final Measurement (dbµV/m) @ 2400 MHz			**53.5**

2.7.9 Test Results

See attached plots.

2.7.10 Test Results Restricted Band 2310MHz to 2390MHz (802.11b mode Low Channel)



Peak Data

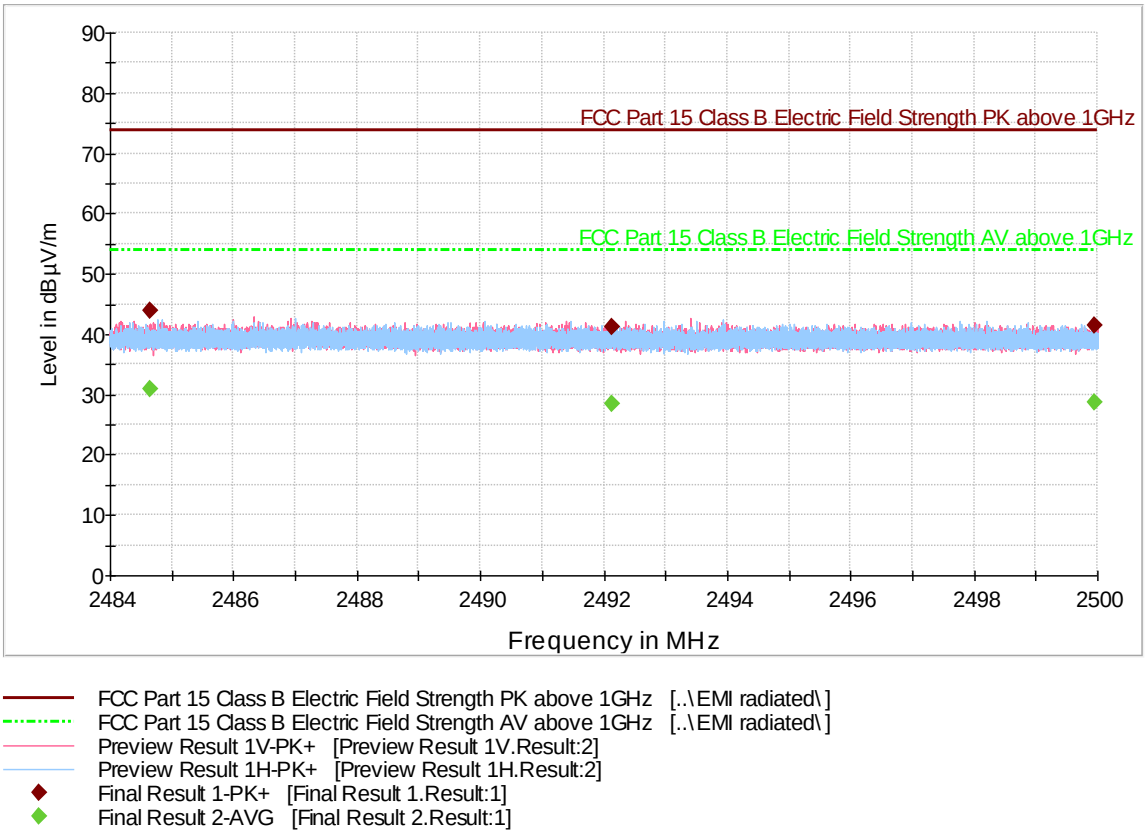
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2312.024000	40.6	1000.0	1000.000	148.7	V	244.0	-0.5	33.3	73.9
2347.317333	40.6	1000.0	1000.000	138.7	H	164.0	-0.4	33.3	73.9
2388.808000	41.1	1000.0	1000.000	163.6	H	309.0	-0.2	32.8	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2312.024000	27.9	1000.0	1000.000	148.7	V	244.0	-0.5	26.0	53.9
2347.317333	28.0	1000.0	1000.000	138.7	H	164.0	-0.4	25.9	53.9
2388.808000	28.4	1000.0	1000.000	163.6	H	309.0	-0.2	25.5	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.11 Test Results Restricted Band 2483.5MHz to 2500MHz (802.11b mode High Channel)



Peak Data

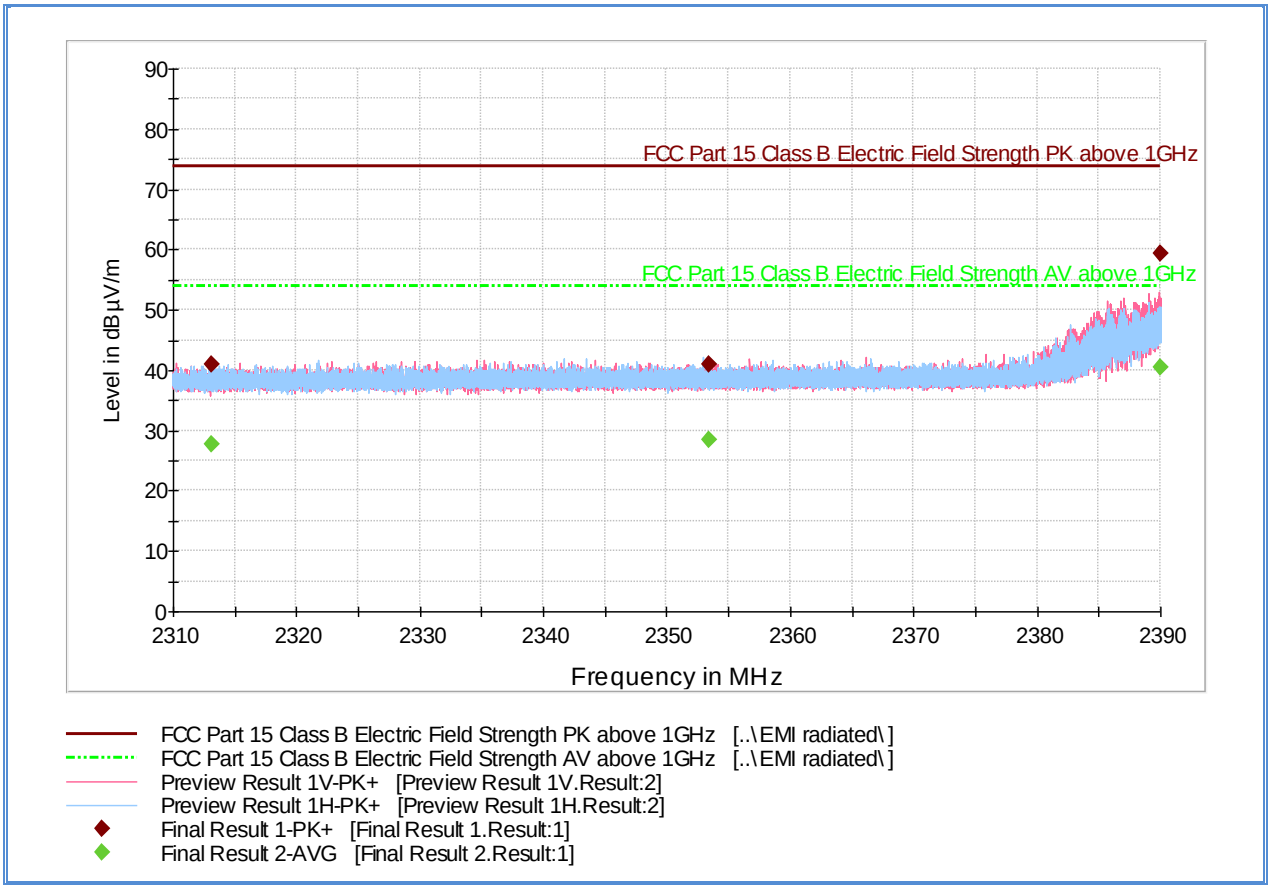
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.658133	43.9	1000.0	1000.000	138.7	V	16.0	0.2	30.0	73.9
2492.143467	41.2	1000.0	1000.000	202.3	V	244.0	0.2	32.7	73.9
2499.947733	41.5	1000.0	1000.000	200.5	H	120.0	0.2	32.4	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.658133	31.0	1000.0	1000.000	138.7	V	16.0	0.2	22.9	53.9
2492.143467	28.5	1000.0	1000.000	202.3	V	244.0	0.2	25.4	53.9
2499.947733	28.6	1000.0	1000.000	200.5	H	120.0	0.2	25.3	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.12 Test Results Restricted Band 2310MHz to 2390MHz (802.11g mode Low Channel)



Peak Data

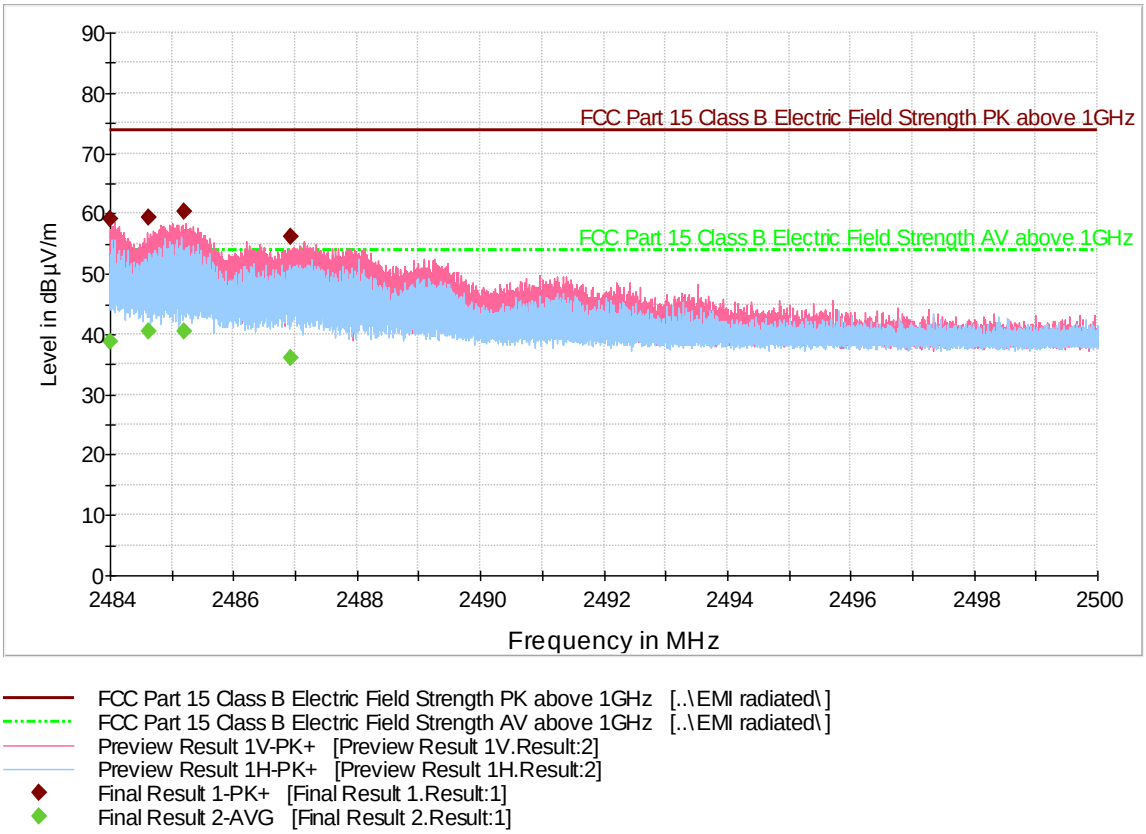
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2313.125333	40.9	1000.0	1000.000	206.5	V	-8.0	-0.5	33.0	73.9
2353.365333	40.9	1000.0	1000.000	155.6	H	290.0	-0.4	33.0	73.9
2390.000000	59.3	1000.0	1000.000	171.6	V	344.0	-0.2	14.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2313.125333	27.8	1000.0	1000.000	206.5	V	-8.0	-0.5	26.1	53.9
2353.365333	28.3	1000.0	1000.000	155.6	H	290.0	-0.4	25.6	53.9
2390.000000	40.4	1000.0	1000.000	171.6	V	344.0	-0.2	13.5	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.13 Test Results Restricted Band 2483.5MHz to 2500MHz (802.11g mode High Channel)



Peak Data

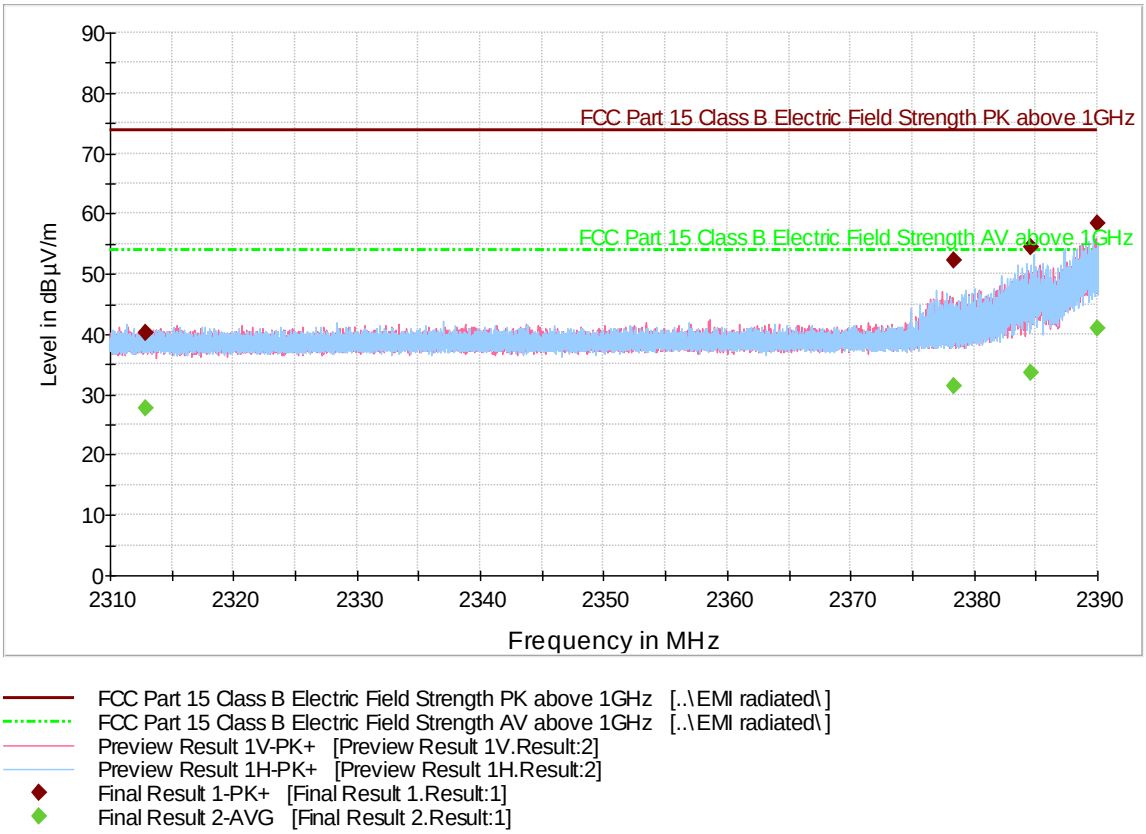
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.000000	59.0	1000.0	1000.000	170.6	V	-9.0	0.1	14.9	73.9
2484.612267	59.4	1000.0	1000.000	139.7	V	5.0	0.2	14.5	73.9
2485.196267	60.3	1000.0	1000.000	162.6	V	-13.0	0.2	13.6	73.9
2486.931200	56.2	1000.0	1000.000	163.6	V	17.0	0.2	17.7	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.000000	38.6	1000.0	1000.000	170.6	V	-9.0	0.1	15.3	53.9
2484.612267	40.4	1000.0	1000.000	139.7	V	5.0	0.2	13.5	53.9
2485.196267	40.4	1000.0	1000.000	162.6	V	-13.0	0.2	13.5	53.9
2486.931200	36.0	1000.0	1000.000	163.6	V	17.0	0.2	17.9	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.14 Test Results Restricted Band 2310MHz to 2390MHz (802.11n HT20 mode Low Channel)



Peak Data

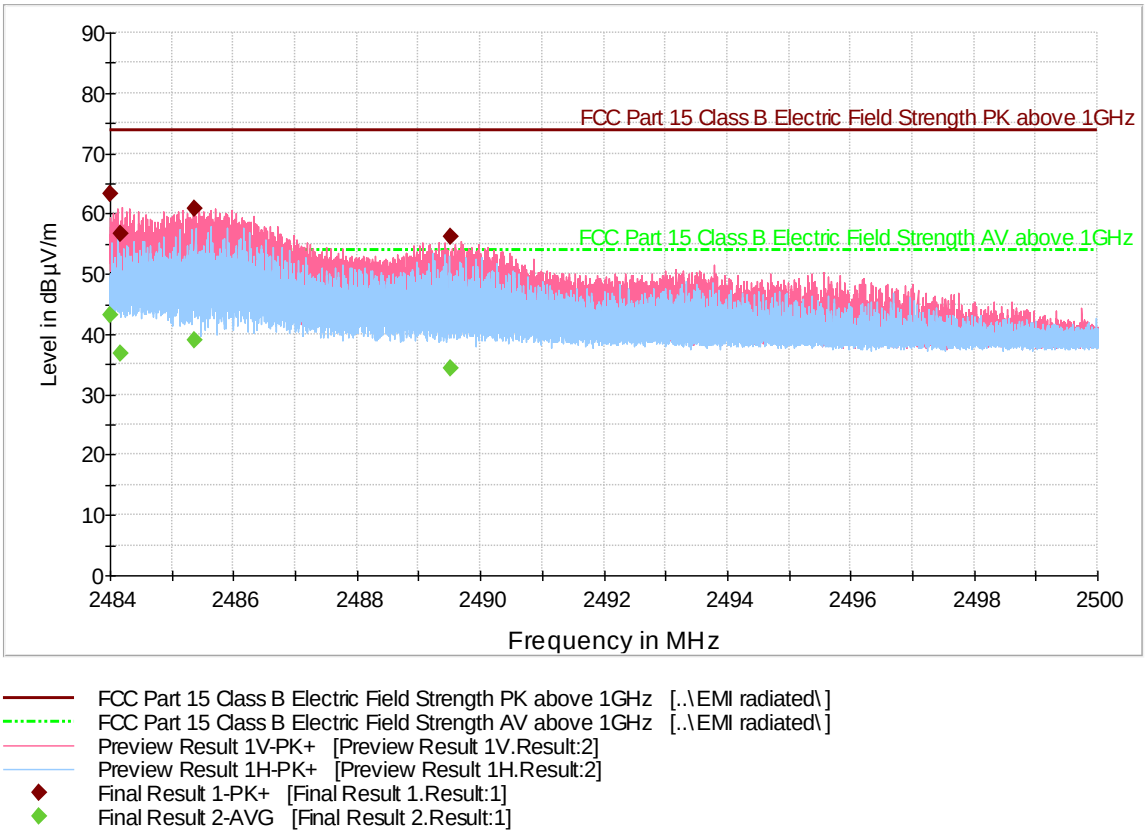
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2312.893333	40.3	1000.0	1000.000	114.7	V	312.0	-0.5	33.6	73.9
2378.410667	52.2	1000.0	1000.000	179.6	V	341.0	-0.3	21.7	73.9
2384.645333	54.5	1000.0	1000.000	145.7	H	-16.0	-0.3	19.5	73.9
2390.000000	58.3	1000.0	1000.000	146.7	H	-16.0	-0.2	15.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2312.893333	27.6	1000.0	1000.000	114.7	V	312.0	-0.5	26.3	53.9
2378.410667	31.3	1000.0	1000.000	179.6	V	341.0	-0.3	22.6	53.9
2384.645333	33.5	1000.0	1000.000	145.7	H	-16.0	-0.3	20.4	53.9
2390.000000	41.0	1000.0	1000.000	146.7	H	-16.0	-0.2	12.9	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.15 Test Results Restricted Band 2483.5MHz to 2500MHz (802.11n HT20 mode High Channel)



Peak Data

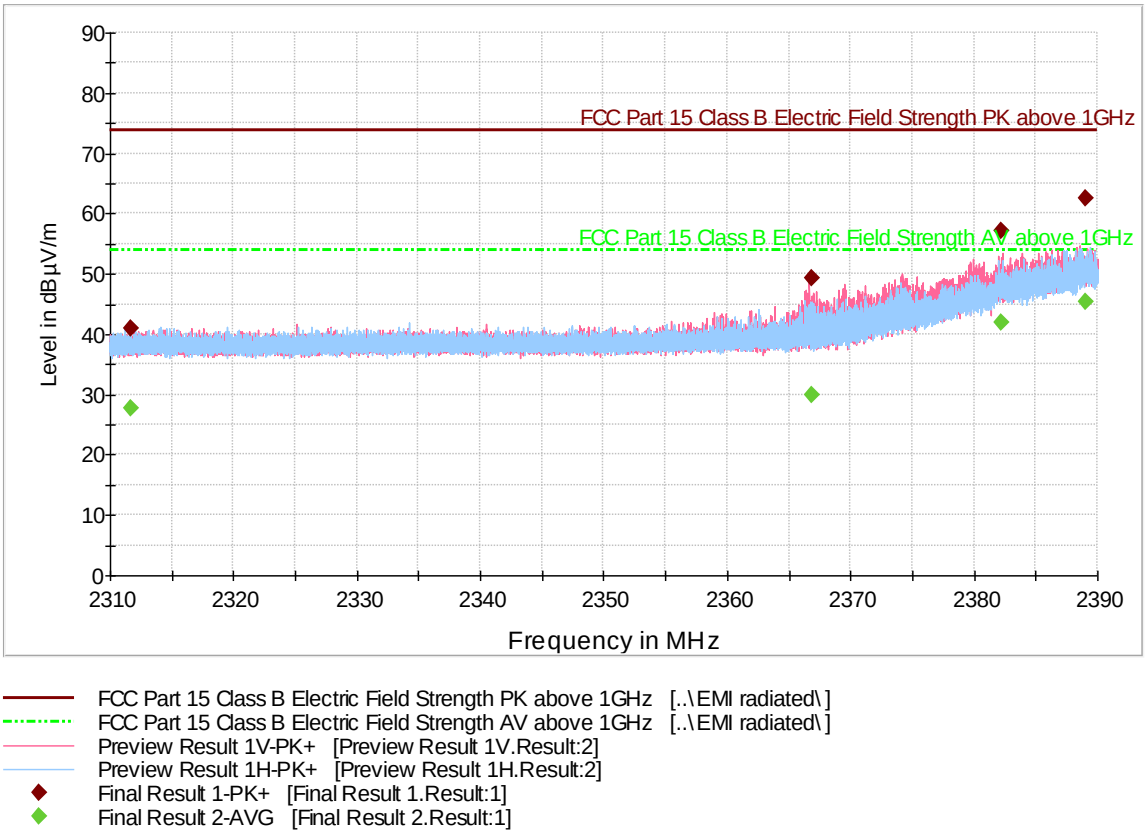
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.000000	63.3	1000.0	1000.000	138.7	V	338.0	0.1	10.6	73.9
2484.179200	56.8	1000.0	1000.000	171.6	V	342.0	0.2	17.1	73.9
2485.363733	60.7	1000.0	1000.000	138.7	V	341.0	0.2	13.2	73.9
2489.518933	56.1	1000.0	1000.000	138.7	V	3.0	0.2	17.8	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.000000	43.1	1000.0	1000.000	138.7	V	338.0	0.1	10.8	53.9
2484.179200	36.9	1000.0	1000.000	171.6	V	342.0	0.2	17.0	53.9
2485.363733	38.9	1000.0	1000.000	138.7	V	341.0	0.2	15.0	53.9
2489.518933	34.2	1000.0	1000.000	138.7	V	3.0	0.2	19.7	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.16 Test Results Restricted Band 2310MHz to 2390MHz (802.11n HT40 mode Low Channel)



Peak Data

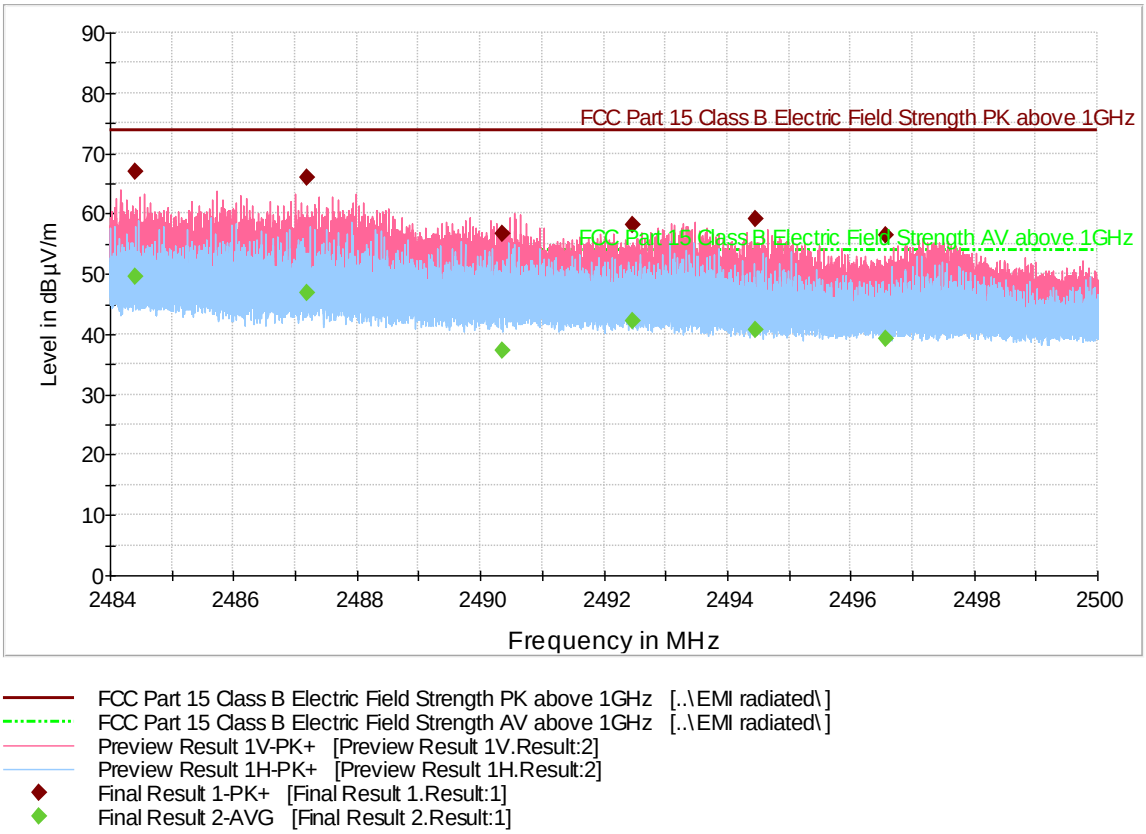
Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2311.720000	41.0	1000.0	1000.000	189.5	V	176.0	-0.5	32.9	73.9
2366.866667	49.4	1000.0	1000.000	154.6	V	0.0	-0.3	24.5	73.9
2382.149333	57.1	1000.0	1000.000	116.7	V	0.0	-0.3	16.8	73.9
2388.986667	62.5	1000.0	1000.000	116.7	V	0.0	-0.2	11.4	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2311.720000	27.7	1000.0	1000.000	189.5	V	176.0	-0.5	26.2	53.9
2366.866667	30.0	1000.0	1000.000	154.6	V	0.0	-0.3	23.9	53.9
2382.149333	41.8	1000.0	1000.000	116.7	V	0.0	-0.3	12.1	53.9
2388.986667	45.3	1000.0	1000.000	116.7	V	0.0	-0.2	8.6	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.7.17 Test Results Restricted Band 2483.5MHz to 2500MHz (802.11n HT40 mode High Channel)



Peak Data

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.400000	67.0	1000.0	1000.000	138.7	V	348.0	0.2	6.9	73.9
2487.192533	66.0	1000.0	1000.000	138.7	V	349.0	0.2	7.9	73.9
2490.345067	56.6	1000.0	1000.000	172.6	V	342.0	0.2	17.3	73.9
2492.475733	58.1	1000.0	1000.000	138.7	V	339.0	0.2	15.8	73.9
2494.455467	59.0	1000.0	1000.000	138.7	V	339.0	0.2	14.9	73.9
2496.570133	56.3	1000.0	1000.000	138.7	V	339.0	0.2	17.6	73.9

Average Data

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2484.400000	49.5	1000.0	1000.000	138.7	V	348.0	0.2	4.4	53.9
2487.192533	46.7	1000.0	1000.000	138.7	V	349.0	0.2	7.2	53.9
2490.345067	37.3	1000.0	1000.000	172.6	V	342.0	0.2	16.6	53.9
2492.475733	42.3	1000.0	1000.000	138.7	V	339.0	0.2	11.6	53.9
2494.455467	40.6	1000.0	1000.000	138.7	V	339.0	0.2	13.3	53.9
2496.570133	39.2	1000.0	1000.000	138.7	V	339.0	0.2	14.7	53.9

Test Notes: 2.4GHz notch filter removed for this test.

2.8 POWER SPECTRAL DENSITY

2.8.1 Specification Reference

Part 15 Subpart C §15.247(e)

2.8.2 Standard Applicable

(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

2.8.3 Equipment Under Test and Modification State

Serial No: EUT#3-EMC / Test Configuration A

2.8.4 Date of Test/Initial of test personnel who performed the test

June 18, 2014 / KAM

2.8.5 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.6 Environmental Conditions/ Test Location

Test performed at TÜV SÜD America Inc. Rancho Bernardo facility

Ambient Temperature	25.1 °C
Relative Humidity	44.1.%
ATM Pressure	98.9 kPa

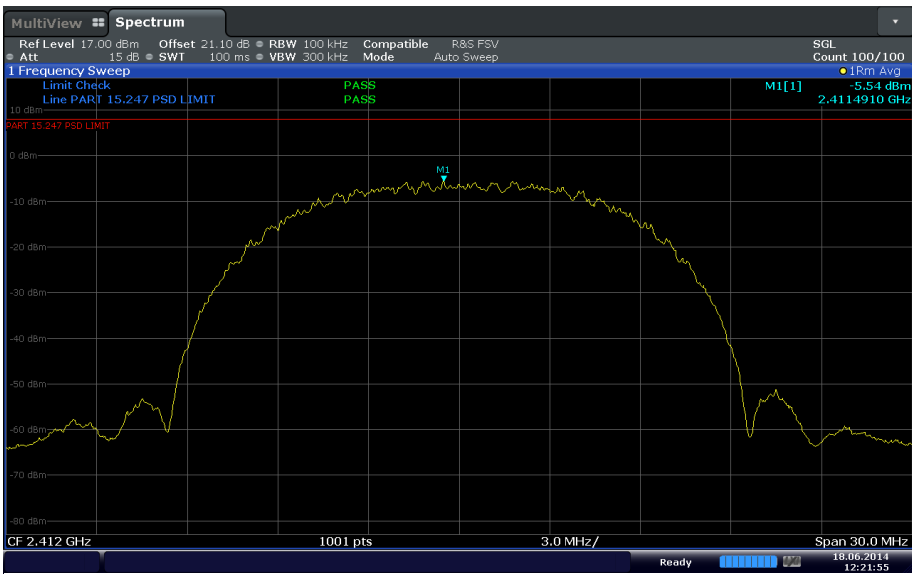
2.8.7 Additional Observations

- This is a conducted test procedure is per Section 10.3 under KDB 558074 D01 DTS Measurement Guidance v03r02 (Compliance Measurement Guidance for 15.247 Digital Transmission Systems, June 05, 2014).
- An offset of 21.1dB was added to compensate for the external attenuator and cable used from the antenna port to the power sensor.
- Detector is RMS power averaging.
- Trace averaging mode over 100 traces.
- Sweep time is Auto Couple.
- EUT complies with 100 kHz RBW.

2.8.8 Test Results Summary

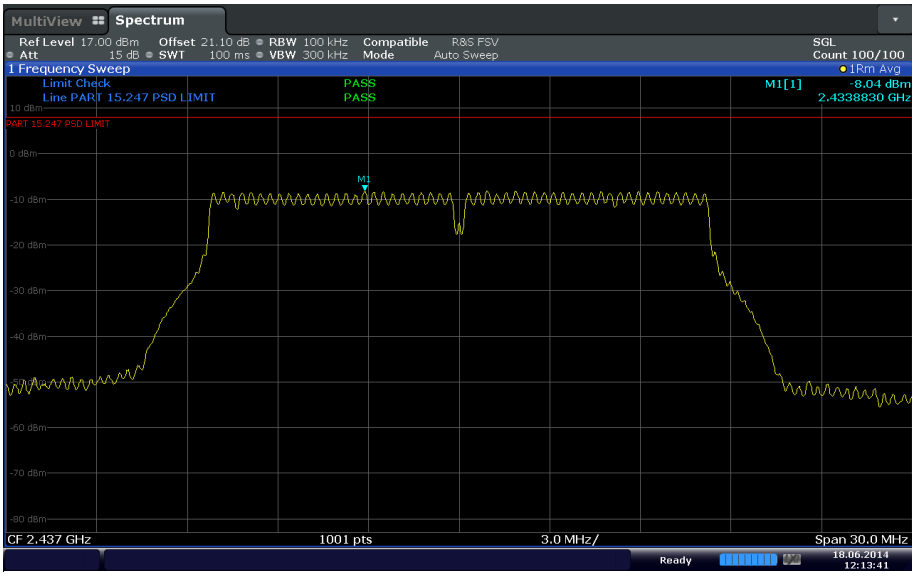
Mode	Channel	Marker Reading using 100 kHz RBW (dBm)	PSD Limit (dBm)	Margin (dB)	Compliance
802.11b	1 (2412 MHz)	-5.54	8	13.54	Complies
	6 (2437 MHz)	-6.39	8	14.39	Complies
	11 (2462 MHz)	-5.83	8	13.83	Complies
802.11g	1 (2412 MHz)	-8.40	8	16.40	Complies
	6 (2437 MHz)	-8.04	8	16.04	Complies
	11 (2462 MHz)	-8.84	8	16.84	Complies
802.11n HT20	1 (2412 MHz)	-8.65	8	16.65	Complies
	6 (2437 MHz)	-8.63	8	16.63	Complies
	11 (2462 MHz)	-9.54	8	17.54	Complies
802.11n HT40	3 (2422 MHz)	-11.86	8	19.86	Complies
	6 (2437 MHz)	-12.28	8	20.28	Complies
	9 (2452 MHz)	-11.78	8	19.78	Complies

2.8.9 Test Results Plots



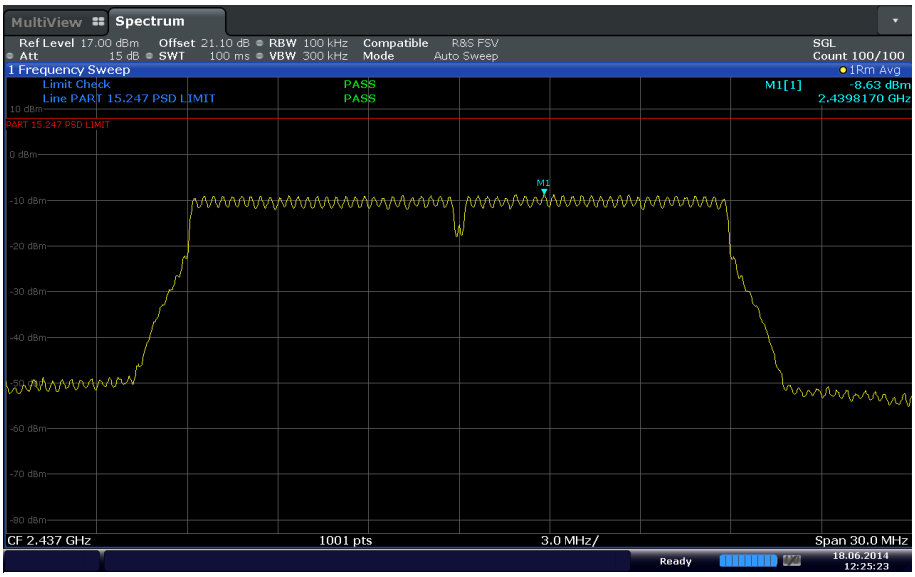
Date:18.JUN.2014 12:21:55

802.11b Worst Case Channel

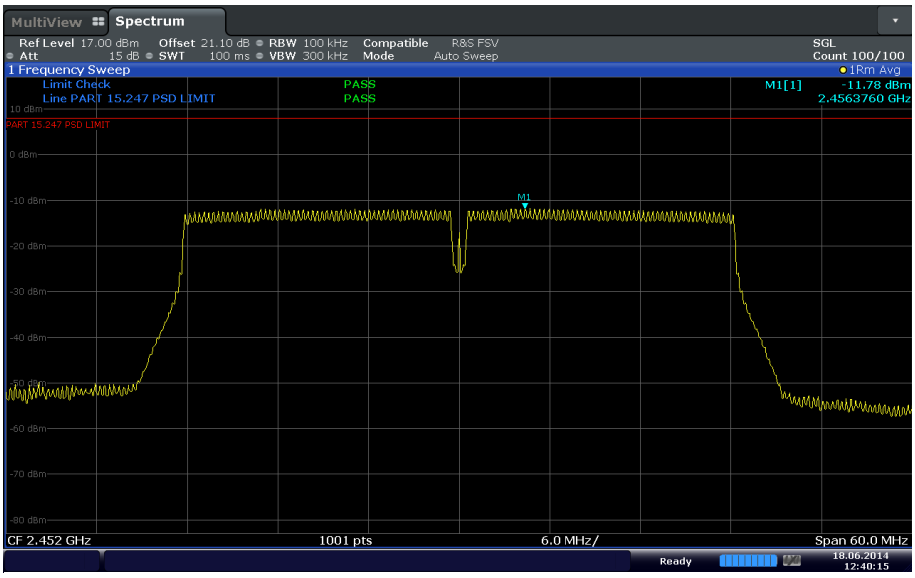


Date:18.JUN.2014 12:13:41

802.11g Worst Case Channel



802.11n HT20 Worst Case Channel



802.11n HT40 Worst Case Channel

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

ID Number (SDGE/SDRB)	Test Equipment	Type	Serial Number	Manufacturer	Cal Date	Cal Due Date
Antenna Conducted Port Setup						
7569	Series Power Meter	N1911A P-	MY45100625	Agilent	04/22/14	04/22/15
7570	50MHz-18GHz Wideband Power Sensor	N1921A	MY45240588	Agilent	04/09/14	04/09/15
7582	Signal/Spectrum Analyzer	FSW26	101614	Rhode & Schwarz	11/19/13	11/19/14
Radiated Test Setup						
1002	Bilog Antenna	3142C	00058717	ETS-Lindgren	01/30/14	01/30/16
7575	Double-ridged waveguide horn antenna	3117	00155511	EMCO	04/08/14	04/08/15
8628	Pre-amplifier	QLJ 01182835-JO	8986002	QuinStar Technologies Inc.	04/03/14	04/03/15
1151	Pre-amplifier	TS-PR26	100026	Rhode & Schwarz	05/02/13	05/02/15
1003	Signal Generator	SMR-40	1104.0002.40	Rhode & Schwarz	01/20/14	01/20/15
1040	EMI Test Receiver	ESIB40	100292	Rhode & Schwarz	08/29/14	08/29/15
1049	EMI Test Receiver	ESU	100133	Rhode & Schwarz	03/17/14	03/17/15
8816	2.4GHz Band Notch Filter	BRM50702	133	Micro-Tronics	Verified by 1040	
1016	Pre-amplifier	PAM-0202	187	PAM	05/05/14	05/05/15
Conducted Emissions						
1024	EMI Test Receiver	ESCS 30	847793/001	Rhode & Schwarz	04/05/14	04/05/15
8822	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	01/30/14	01/30/15
8824	20dB Attenuator	34-20-34	N/A	MCE / Weinschel	01/30/14	01/30/15
7568	LISN	FCC-LISN-50-25-2-10	120305	Fischer Custom Comm.	09/02/14	09/02/15
Miscellaneous						
7560	Barometer/Temperature/Humidity Transmitter	iBTHX-W	1240476	Omega	01/30/14	01/30/15
	Test Software	EMC32	V8.53	Rhode & Schwarz	N/A	

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:

3.2.1 Radiated Emission Measurements (Below 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.45	0.26	0.07
2	Cables	Rectangular	0.50	0.29	0.08
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.75	0.43	0.19
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.41
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.82

3.2.2 Radiated Emission Measurements (Above 1GHz)

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.70	0.40	0.16
3	Preamp	Rectangular	0.50	0.29	0.08
4	Antenna	Rectangular	0.37	0.21	0.05
5	Site	Rectangular	3.89	2.25	5.04
6	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	2.40
				Coverage Factor (k):	2
				Expanded Uncertainty:	4.81

3.2.3 Conducted Antenna Port Measurement

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.57	0.33	0.11
2	Cables	Rectangular	0.50	0.29	0.08
3	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	0.72
				Coverage Factor (k):	2
				Expanded Uncertainty:	1.45

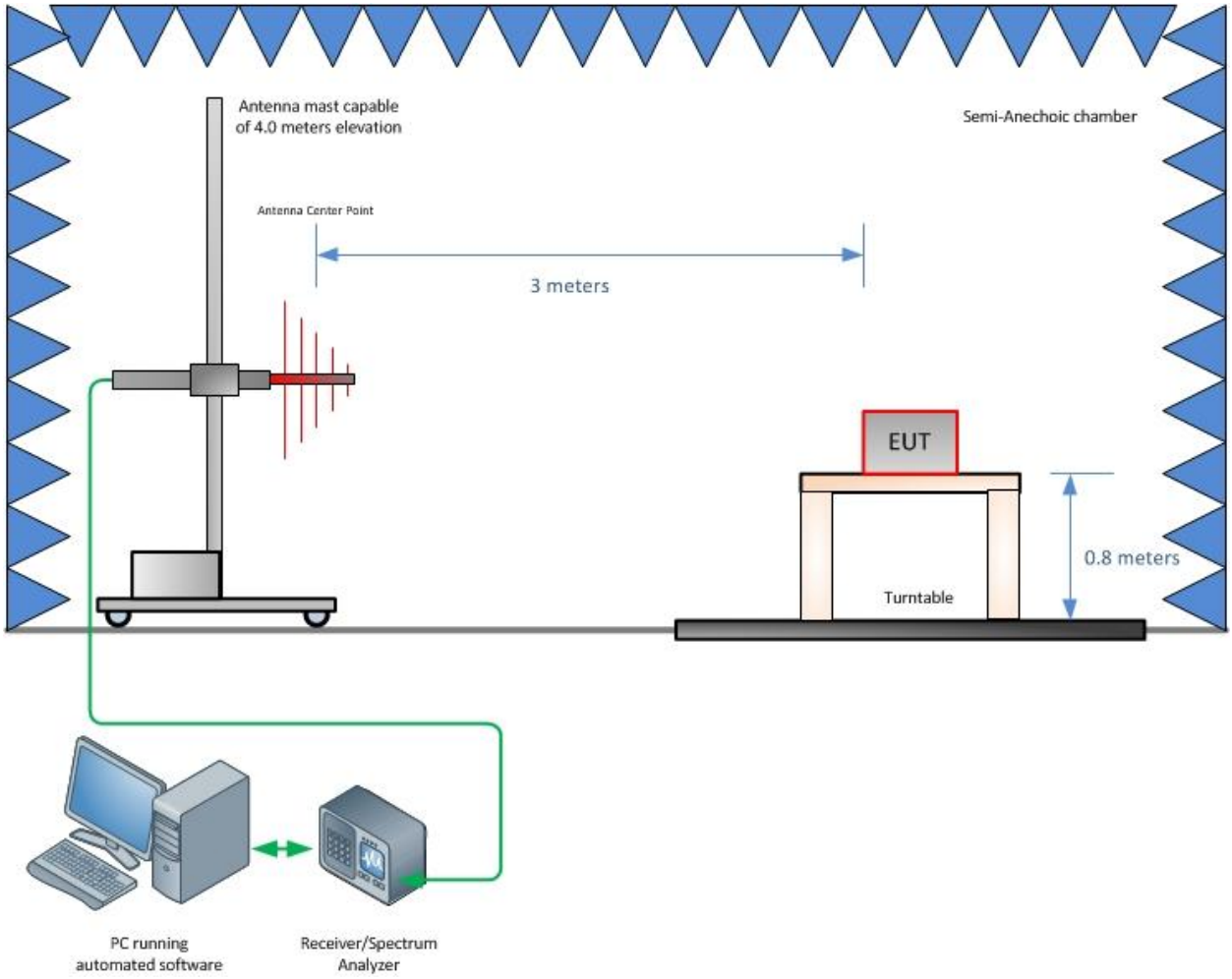
3.2.4 AC Conducted Measurements

	Contribution	Probability Distribution Type	Probability Distribution x_i	Standard Uncertainty $u(x_i)$	$[u(x_i)]^2$
1	Receiver/Spectrum Analyzer	Rectangular	0.36	0.21	0.04
2	Cables	Rectangular	0.50	0.29	0.08
3	LISN	Rectangular	0.66	0.38	0.15
4	Attenuator	Rectangular	0.30	0.17	0.03
5	EUT Setup	Rectangular	1.00	0.58	0.33
				Combined Uncertainty (u_c):	0.80
				Coverage Factor (k):	2
				Expanded Uncertainty:	1.59

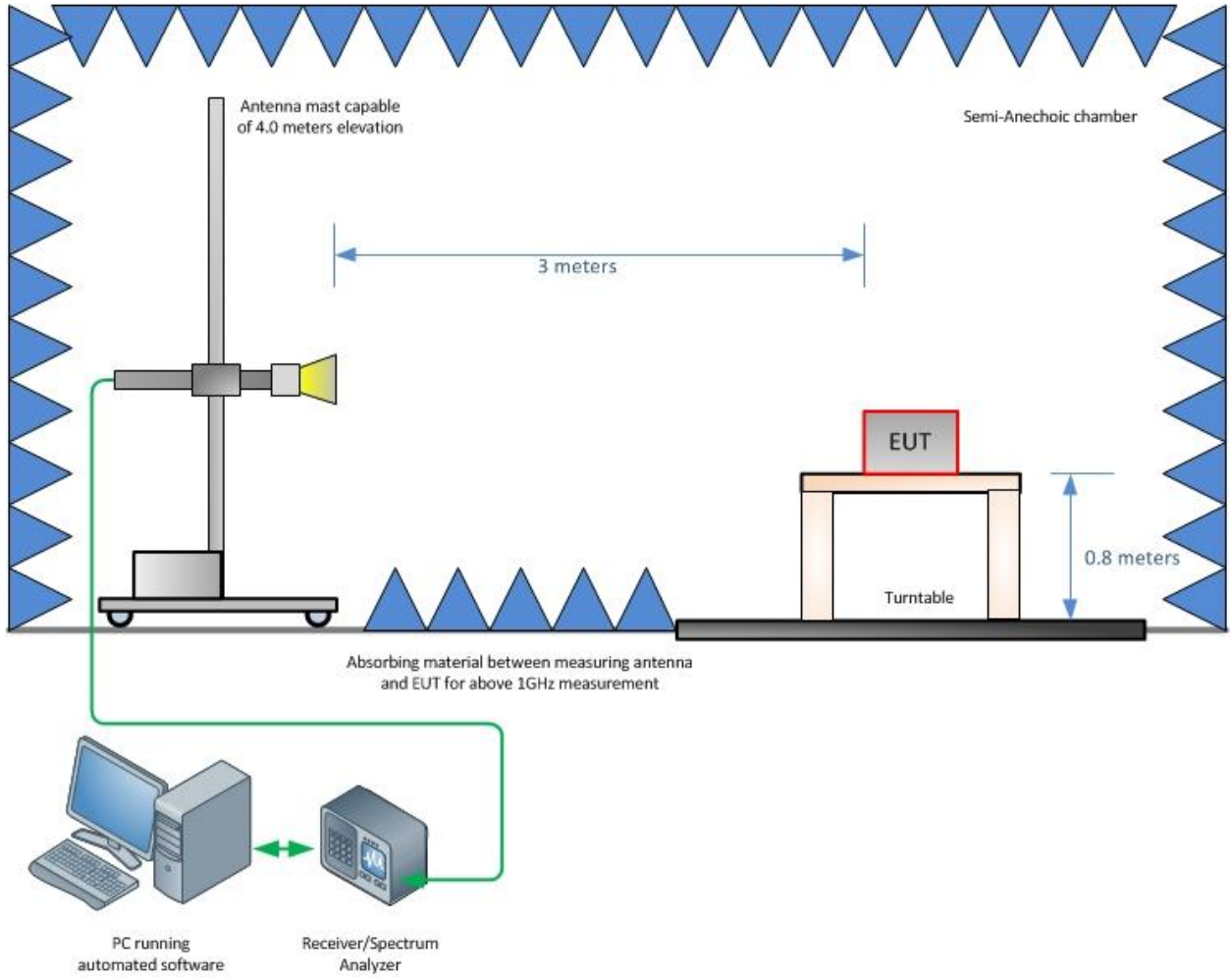
SECTION 4

DIAGRAM OF TEST SETUP

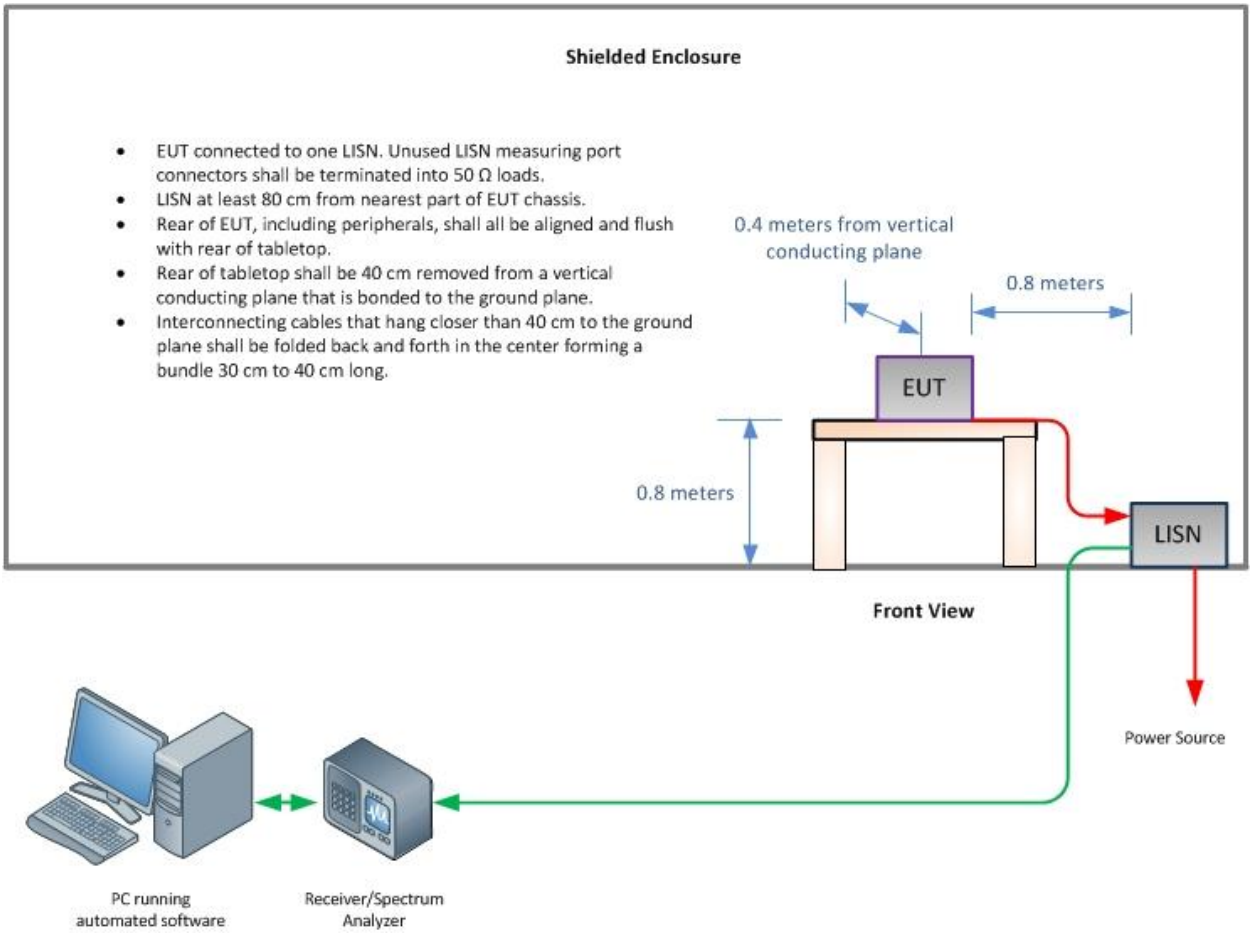
4.1 TEST SETUP DIAGRAM



Radiated Emission Test Setup (Below 1GHz)



Radiated Emission Test Setup (Above 1GHz)



Conducted Emission Test Setup

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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TÜV SÜD AMERICA INC 10040 Mesa Rim Road San Diego, CA 92121-2912 Phone: 858 678 1400 FAX: 858 546 0364