

Nemko Korea Co., Ltd.

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FCC and IC EVALUATION REPORT FOR CLASS II PERMISSIVE CHANGE

Applicant :

Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, Korea.
(Post code : 443-742)
Attn. : Mr. Dongwook. Shin

Dates of Issue : September 11, 2013**Test Report No. : NK-13-R-107-1****Test Site : Nemko Korea Co., Ltd.****FCC ID**
IC**Brand Name****Contact Person****A3LWIDT30Q**
649E-WIDT30Q**SAMSUNG**

Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, Korea, 443-742.
Mr. Dongwook. Shin
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Applied Standard: FCC 47 CFR Part 15.247 and IC RSS-210 Issue 8
Classification: Digital modulation Transmitter
EUT Type: WiFi module

The device bearing the brand name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2009, ANSI C63.10-2009. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.


Tested By : Jin-ha Ko
Engineer*Sep. 11, 2013*
Reviewed By : Deokha Ryu
Technical Manager*Sep 11. 2013*

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1. SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15 and IC RSS-210.

Responsible Party :	Samsung Electronics Co., Ltd.
Contact Person :	Mr. Dongwook. Shin
Manufacturer :	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea 443-742

- FCC ID: A3LWIDT30Q
- IC : 649E-WIDT30Q
- Model: WIDT30Q
- Brand Name: SAMSUNG
- EUT Type: WiFi module
- Classification: Digital modulation Transmitter
- Applied Standard: FCC 47 CFR Part 15.247 and IC RSS-210 Issue 8
- Test Procedure(s): ANSI C63.4-2009, ANSI C63.10 and FCC guidance of 558074 D01 DTS Meas. Guidance v02 and 558074 D01 DTS Meas. Guidance v03r01
- Dates of Test: June 23, 2013 ~ July 18, 2013
- Place of Tests: Nemko Korea Co., Ltd.

2. INTRODUCTION

2.1 Test facility

The measurement procedure described in 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 (ANSI C63.4-2009), the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**

FCC ID : A3LWIDT30Q and IC : 649E-WIDT30Q

These measurement tests were conducted at **Nemko Korea Co., Ltd. EMC Laboratory**.

The site address 155 & 159, Osan-Ro, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-852 KOREA, REPUBLIC OF.

The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 km (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 km (18miles) south-southeast from central Seoul.

It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.

The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to ANSI C63.4 2009.



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Fig. 1. The map above shows the Seoul in Korea vicinity area.

The map also shows Nemko Korea Corporation Ltd. EMC Lab. and Incheon Airport.

2.2 Accreditation and listing

Accreditation type		Accreditation number
	FCC part 15/18 Filing site	Registration No. 97992
	CAB Accreditation for DOC	Designation No. KR0026
	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. 155
	Canada IC Registered site	Site No. 2040E
	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
	EMC CBTL	-
	KCC(RRL)Designated Lab.	Registration No. KR0026
	SASO registered Lab and Certification Body	Registration No. 2008-15

3. TEST CONDITIONS & EUT INFORMATION

3.1 Operation During Test

The EUT is the MIMO transceiver which is module supporting the 802.11a/b/g/n mode (802.11a/b/g :1TX/1RX, 802.11n: 2TX/2RX).

During the test, the EUT was connected to laptop PC and then a test program was executed to operate EUT continuously. The operating voltage of EUT was 5 Vdc supplied from a USB port on Laptop PC. The EUT was tested at the lowest channel, middle channel and the highest channel with the maximum output power in accordance with the manufacturer's specifications. The worst data were recorded in the report.

3.1.1 Table of test channels

Frequency band	Mode	Test Channel (CH)	Frequency (MHz)
2.4 GHz	802.11b,g,n(20 MHz)	1	2412
		6	2437
		11	2462
5 GHz	802.11a,n(20 MHz)	149	5745
		157	5785
		165	5825
	802.11n(40 MHz)	151	5755
		159	5795

3.1.2 Table of test modes for 2.4 GHz band:

Test Items	Mode	Data rate (Mbps)	Test Channel (CH)
Conducted Emissions	802.11n(20 MHz)	MCS0	6
Radiated Emissions	802.11n(20 MHz)	MCS0	6
Radiated Spurious Emission, Band edge Emission	802.11b	1	1/6/11
	802.11g	6	1/6/11
	802.11n	MCS0	1/6/11

3.1.3 Table of test modes for 5 GHz band:

Test Items	Mode	Data rate (Mbps)	Test Channel (CH)
Conducted Emissions	802.11n(20 MHz)	MCS0	157
Radiated Emissions	802.11n(20 MHz)	MCS0	157
Radiated Spurious Emission, Band edge Emission	802.11a	6	149/157/165
	802.11n(20 MHz)	MCS0	149/157/165
	802.11n(40 MHz)	MCS0	151/159

3.1.4 Antenna TX mode information:

Frequency band	Mode	Antenna TX mode	Support MIMO
2.4 GHz	802.11b,g	☒ 1TX, ☐ 2TX	☐ Yes, ☒ No
	802.11n(20 MHz)	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No
5 GHz	802.11a	☒ 1TX, ☐ 2TX	☐ Yes, ☒ No
	802.11n(20 MHz) 802.11n(40 MHz)	☐ 1TX, ☒ 2TX	☒ Yes, ☐ No

Note(s) :

1. The EUT support both chains transmit and receive simultaneously for 802.11n(20 MHz/40 MHz).
2. The EUT support the antenna with TX diversity function for 802.11b/g/a.

3.1.5 Description of available antennas

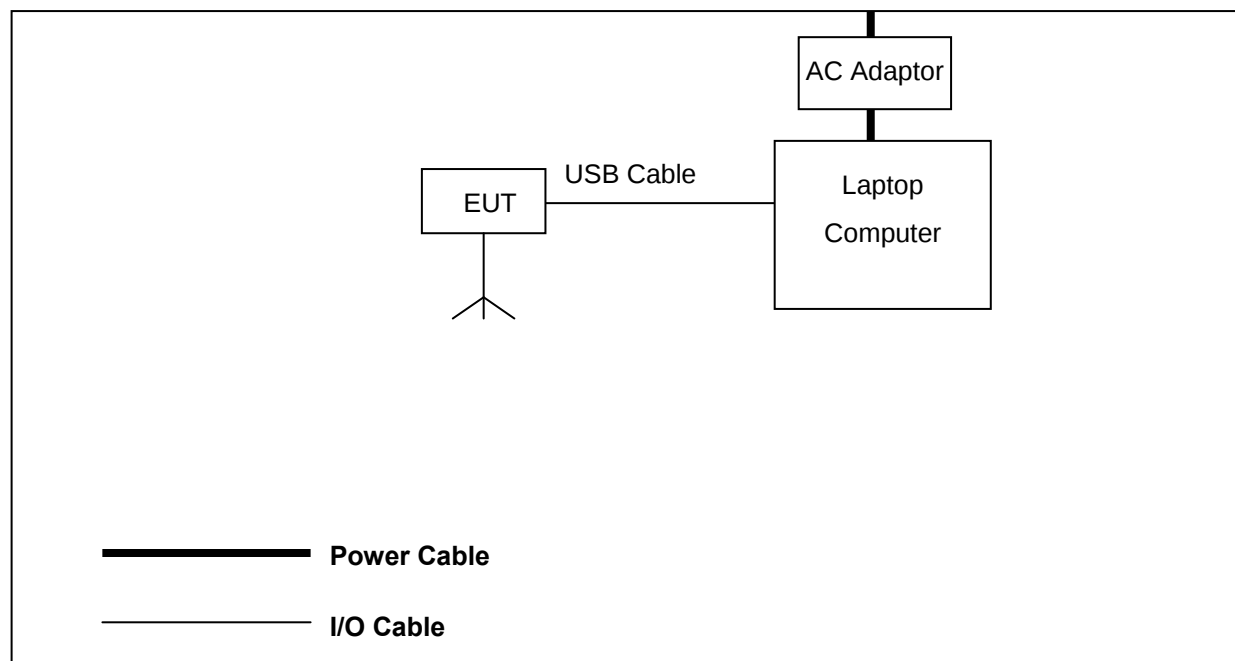
The following is the list of the antennas to be added to WIDT30Q certifications.

Antenna Part Number (main & aux)	Antenna Type	Peak Gain include Cable Loss(dBi)	Frequency band
WIFI-SAMUSNG-002	PIFA	-2.17	2.45 GHz
		-12.82	5.7 GHz
WIFI-SAMSUNG-003	PIFA	-6.84	2.45 GHz
		-13.15	5.8 GHz

3.2 Support Equipment

EUT	Samsung Electronics Co., Ltd. FCC ID: A3LWIDT30Q	S/N: N/A
Laptop Computer	Samsung Electronics Co., Ltd. Model : NT-R55 0.3 m unshielded pin connector cable	FCC DOC S/N : 408L93AP400115W
AC/DC Adapter	Chicony Power Technology Co., Ltd. Model : AD-9019S 1.5 m unshielded power cable	FCC DOC S/N : CNBA4400215ADON81BT01V8

3.3 Setup Drawing



3.4 EUT Information

The EUT is the **Samsung WiFi module FCC ID: A3LWIDT30Q, IC: 649E-WIDT30Q.**

Specifications:

Category	WiFi module
Model Name	WIDT30Q
Brand Name	SAMSUNG
Frequency of Operation	<u>For 2.4 GHz Band</u> 802.11b,g,n(20 MHz): 2412 MHz ~ 2462 MHz <u>For 5 GHz Band</u> 802.11a,n(20 MHz) : 5745 MHz ~ 5825 MHz 802.11n(40 MHz) : 5755 MHz ~ 5795 MHz
Power Output (Conducted)	<u>For 2.4 GHz Band</u> 802.11b : 20.90 dBm 802.11g : 25.91 dBm 802.11n(20 MHz) : 27.88 dBm <u>For 5 GHz Band</u> 802.11a : 23.52 dBm 802.11n(20 MHz) : 24.35 dBm 802.11n(40 MHz) : 20.49 dBm
Channels	<u>For 2.4 GHz Band</u> 802.11b,g,n(20 MHz): 11 CH <u>For 5 GHz Band</u> 802.11a,n(20 MHz) : 5 CH 802.11n(40 MHz) : 2 CH
Antenna Gain (peak)	<u>For 2.4 GHz Band</u> Ant 0 : -2.17 dBi, Ant1 : -6.84 dBi <u>For 5 GHz Band</u> Ant 0 : -12.82 dBi, Ant1 : -13.15 dBi
Antenna Setup	802.11b, 802.11g : 1TX / 1RX 802.11n(20 MHz) : 2TX / 2RX
Modulations	DSSS(BPSK,QPSK,CCK) for 802.11b OFDM(BPSK,QPSK,16QAM,64QAM) for 802.11a,g,n
Temperature Range	-20 °C ~ +50 °C
Voltage	5.0 Vdc
Dimensions (D x W x H)	55 mm x 24 mm x 6 mm (Module only)
Weight	6 g
Remarks	-

3.5 Description of change

- Enclosure of the module was removed.
- Antennas were changed.
- Antenna gain was changed.

Before	After
Integrated type antenna	External type antenna
<u>For 2.4 GHz band</u> Ant 0 : 3.64 dBi, Ant1 : 2.15 dBi <u>For 5 GHz band:</u> Ant 0 : 1.35 dBi, Ant1 : -0.90 dBi	<u>For 2.4 GHz band</u> Ant 0 : -2.17 dBi, Ant1 : -6.84 dBi <u>For 5 GHz band:</u> Ant 0 : -12.82 dBi, Ant1 : -13.15 dBi

- Printed circuit board, component lay out and frequency bands are the same as previous model. Therefore radiated emissions test was performed only.

4. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	FCC Paragraph No.	IC Paragraph No.	Result	Remark
Conducted Emission	15.207	RSS-GEN 7.2.4	Complies	*Tested
Radiated Emission	15.209	RSS-210 Issue 8 A8.5	Complies	*Tested
6 dB Bandwidth	15.247(a)(2)	RSS-210 Issue 8 A8.2	Complies	Excluded
Peak Power Output	15.247(b)(3)	RSS-210 Issue 8 A8.4	Complies	Excluded
Power Spectral Density	15.247(e)	RSS-210 Issue 8 A8.2	Complies	Excluded
Conducted Spurious Emission	15.247(d)	RSS-210 Issue 8 A8.5	Complies	Excluded
Radiated Spurious Emission	15.247(d)	RSS-210 Issue 8 A8.5	Complies	*Tested
Maximum Permissible Exposure	1.1307(b)	RSS-102	Complies	*Tested

Note(s):

* Printed circuit board, component lay out and frequency bands are the same as previous model. Therefore radiated emissions test was performed only.

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung WiFi module FCC ID: A3LWIDT30Q, IC : 649E-WIDT30Q** is in compliance with Part 15.247 of the FCC Rule and RSS-210 Issue 8 of the IC Specification.

6. ANTENNA REQUIREMENTS

§15.203 of the FCC Rules part 15 Subpart C

: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The antenna of the **Samsung WiFi module FCC ID: A3LWIDT30Q, IC: 649E-WIDT30Q** is **external antenna** that is connected with a unique coupling to the module. It complies with the requirement of §15.203.

7. DESCRIPTION OF TESTS

7.1 Conducted Emissions

The Line conducted emission test facility is located inside a 4 x 7 x 2.5 meter shielded enclosure. It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6. A 1 m x 1.5 m wooden table 0.8 m height is placed 0.4 m away from the vertical wall and 1.5 m away from the side of wall of the shielded room Rohde & Schwarz (ESH3-Z5) and (ESH2-Z5) of the 50 ohm/50 μ H Line Impedance Stabilization Network (LISN) are bonded to the shielded room. The EUT is powered from the Rohde & Schwarz LISN (ESH3-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH2-Z5). Power to the LISNs are filtered by high-current high insertion loss Power line filters. The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1 / 2 ".

If DC power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs, All interconnecting cables more than 1 meter were shortened by non inductive bundling (serpentine fashion) to a 1 meter length.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT.

The spectrum was scanned from 150 kHz to 30 MHz with 200 msec sweep time.

The frequency producing the maximum level was re-examined using the EMI test receiver.

(Rohde & Schwarz ESCS30). The detector functions were set to CISPR quasi-peak mode & average mode. The bandwidth of receiver was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.

Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux AC outlet, if applicable; whichever determined the worst case emission.

Each EME reported was calibrated using the R&S signal generator.

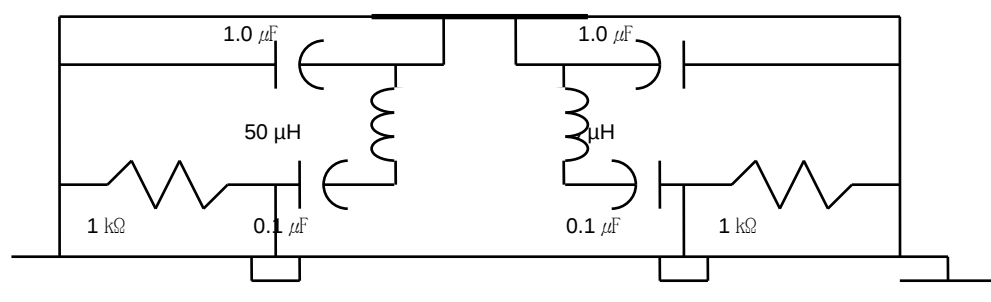


Fig. 2. LISN Schematic Diagram

7.2 Radiated Emissions

The measurement was performed at the test site that is specified in accordance with ANSI C63.4-2009 and ANCI C63.10-2009.

The spurious emission was scanned from 9 kHz to 30 MHz using Loop Antenna(Rohde&Schwarz, HFH2-Z2) and 30 to 1000 MHz using Trilog broadband test antenna(Schwarzbeck, VULB 9163). Above 1 GHz, Horn antenna (Schwarzbeck BBHA 9120D: up to 18 GHz, Q-par Angus QSH20S20 : 18 to 26.5 GHz, QSH22K20: up to 40 GHz) was used.

The test equipment was placed on turntable with 0.8 m above ground. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The EUT, cable, wire arrangement and mode of operation that has the highest amplitude relative to the limit was selected. Then, the turn table was rotated from 0° to 360° and an antenna mast was moved from 1 m to 4 m height to maximize the suspected highest amplitude signal. The final maximized level was recorded.

At frequencies below 1000 MHz, measurements performed using the CISPR quasi-peak detection.

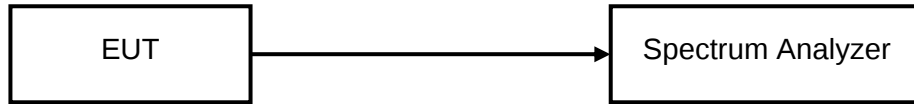
At frequencies above 1000 MHz, measurements performed using the peak and average measurement procedures described in KDB “558074D01 DTS Meas Guidance v03r01” in section 12.2.4 and 12.2.5.1. Peak emission levels were measured by setting the analyzer RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Trace mode = max hold. Average emission levels were measured by setting the analyzer RBW = 1 MHz, VBW = 3 MHz, Detector = RMS, Trace averaging in power averaging (RMS) mode over a minimum of 100 traces, when the EUT was configured to transmit with duty cycle ≥ 98 percent.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88–216	150	3
216–960	200	3
Above 960	500	3

Radiated Emissions Limits per 47 CFR 15.209(a)

7.3 6 dB Bandwidth

Test Setup



Test Procedure

EUTs 6 dB bandwidth is measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.

The spectrum analyzer setting is as follows.

RBW = approximately 1-5 % of the emission bandwidth

VBW $\geq$ 3 x RBW

Detector = Peak

Trace mode = max hold

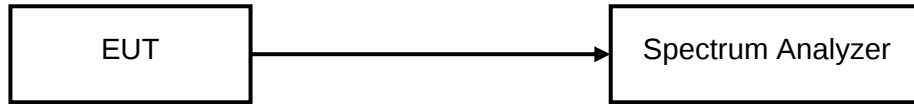
Sweep = auto couple

Allow the trace to stabilize.

The bandwidth measurement function on the spectrum analyzer is used to measure the 6 dB bandwidth.

7.4 Maximum Peak Output Power

Test Setup



Test Procedure

EUTs Maximum Peak Conducted Output Power is measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.

The spectrum analyzer setting is as follows.

RBW = 1 MHz

VBW = 3 MHz

Span = fully encompass the DTS bandwidth

Detector = peak

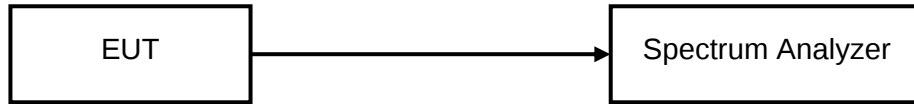
Sweep time = auto couple

Allow the trace to stabilize.

The band power measurement function on the spectrum analyzer is used to measure the Maximum peak conducted output power.

7.5 Peak Power Spectral Density

Test Setup



Test Procedure

EUTs Peak Power Spectral Density is measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.

The spectrum analyzer setting is as follows.

Center frequency = DTS channel center frequency

Span = 1.5 times the DTS channel bandwidth

RBW $\geq$ 3 kHz

VBW $\geq$ 3 x RBW

Detector = peak

Sweep time = auto couple

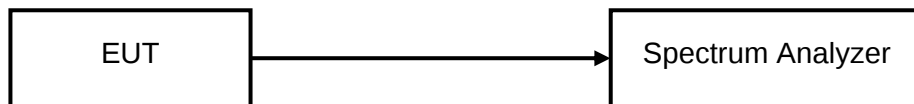
Trace mode = max hold

Allow the trace to stabilize.

The peak search function on the spectrum analyzer is used to determine the maximum amplitude level within the fundamental DTS bandwidth.

7.6 Conducted Spurious Emissions

Test Setup



Test Procedure

EUTs Conducted spurious emissions are measured at low, middle, high channels with a spectrum analyzer connected to the antenna terminal while the EUTs operating at its maximum power control level.

The spectrum analyzer setting is as follows.

1) Reference Level

RBW = 100 kHz

VBW $\geq$ 300 kHz

Span = 1.5 times the DTS channel bandwidth

Detector = peak

Sweep time = auto couple

Trace mode = max hold

Allow the trace to stabilize.

The peak search function on the spectrum analyzer is used to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

2) Unwanted Emissions

RBW = 100 kHz

VBW $\geq$ 300 kHz

Span = encompass the spectrum to be examined

Detector = peak

Sweep time = auto couple

Allow the trace to stabilize.

The amplitude of all unwanted emissions outside of the authorized frequency band is confirmed that it is attenuated by at least the minimum requirements specified.

8. TEST DATA

8.1 Conducted Emissions

FCC §15.207, RSS-Gen

2.4 GHz band

Frequency (MHz)	Level(dBμV)		*)Factor (dB)	**) Line	Limit(dBμV)		Margin(dB)	
	Q-Peak	Average			Q-Peak	Average	Q-Peak	Average
0.17	55.3	37.1	0.2	L	65.0	55.0	9.7	17.9
0.23	46.8	29.8	0.2	N	62.4	52.4	15.6	22.6
0.29	39.4	21.7	0.2	L	60.5	50.5	21.1	28.8
0.43	36.3	24.5	0.2	L	57.3	47.3	21.0	22.8
0.52	35.6	23.2	0.2	L	56.0	46.0	20.4	22.8
20.14	27.5	20.8	1.7	L	60.0	50.0	32.5	29.2

Line Conducted Emissions Tabulated Data

5 GHz band

Frequency (MHz)	Level(dBμV)		*)Factor (dB)	**) Line	Limit(dBμV)		Margin(dB)	
	Q-Peak	Average			Q-Peak	Average	Q-Peak	Average
0.17	57.2	38.0	0.2	N	65.0	55.0	7.8	17.0
0.23	47.6	28.1	0.2	N	62.4	52.4	14.8	24.3
0.28	40.9	23.0	0.2	N	60.8	50.8	19.9	27.8
0.35	37.9	23.3	0.2	N	59.0	49.0	21.1	25.7
0.41	35.4	22.7	0.2	L	57.6	47.6	22.2	24.9
14.51	28.9	26.5	1.0	L	60.0	50.0	31.1	23.5

Line Conducted Emissions Tabulated Data

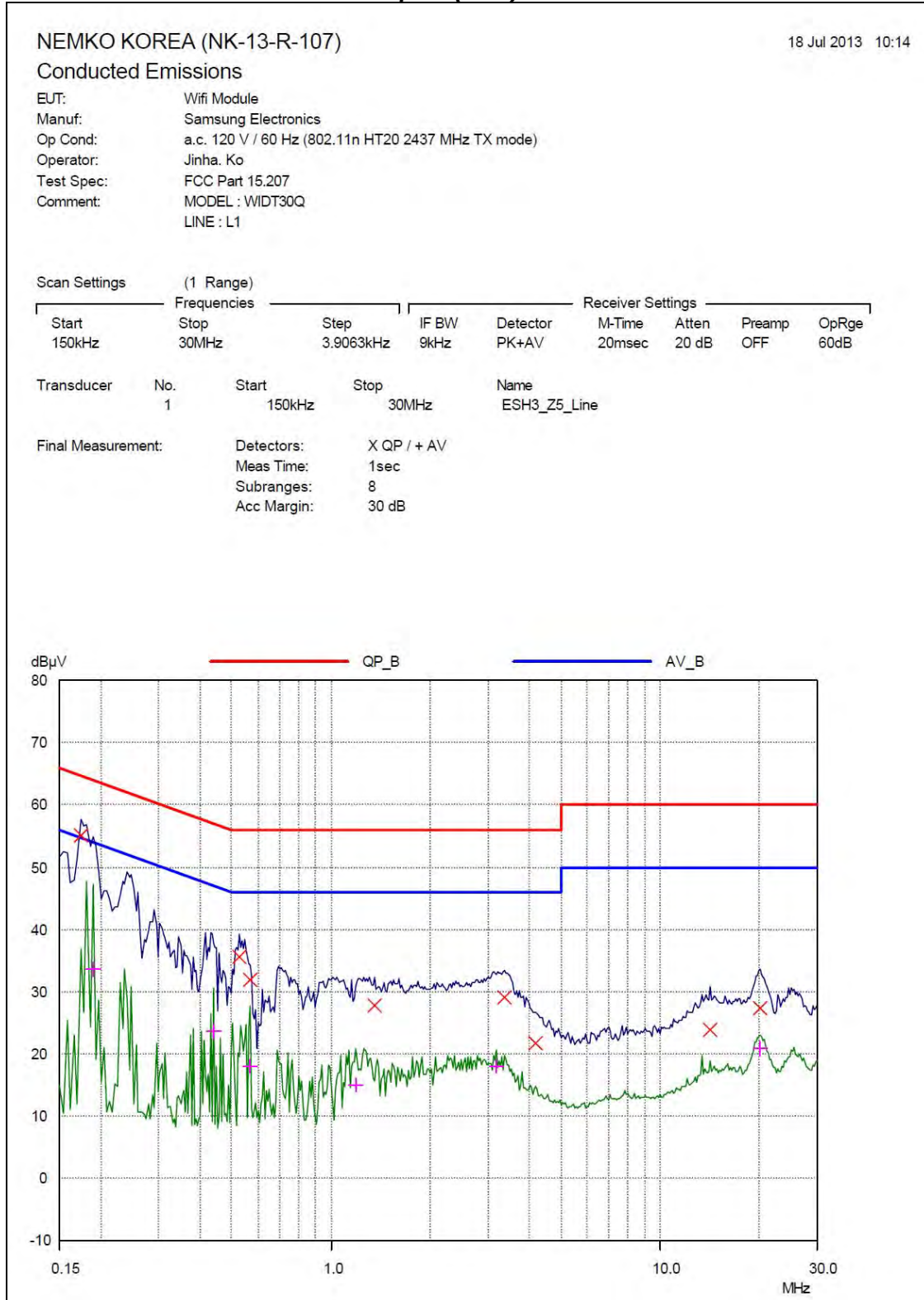
Note(s):

1. Measurements using CISPR quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3. *) Factor = LISN + Cable Loss
4. **) LINE : L = Line , N = Neutral
5. The limit is on the FCC Part section 15.207(a).

PLOTS OF EMISSIONS

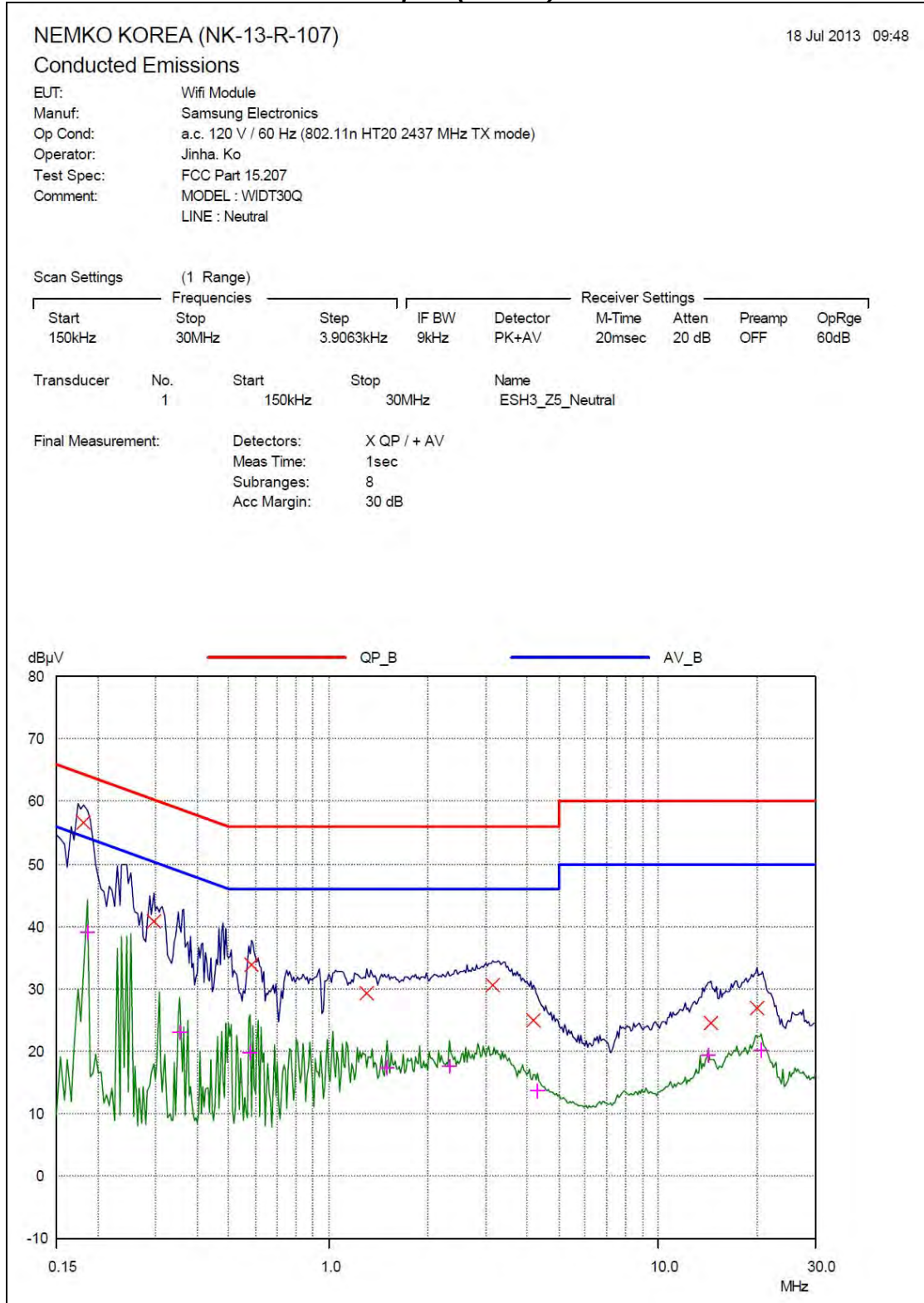
2.4 GHz band

Conducted Emission at the Mains port (Line)



PLOTS OF EMISSIONS

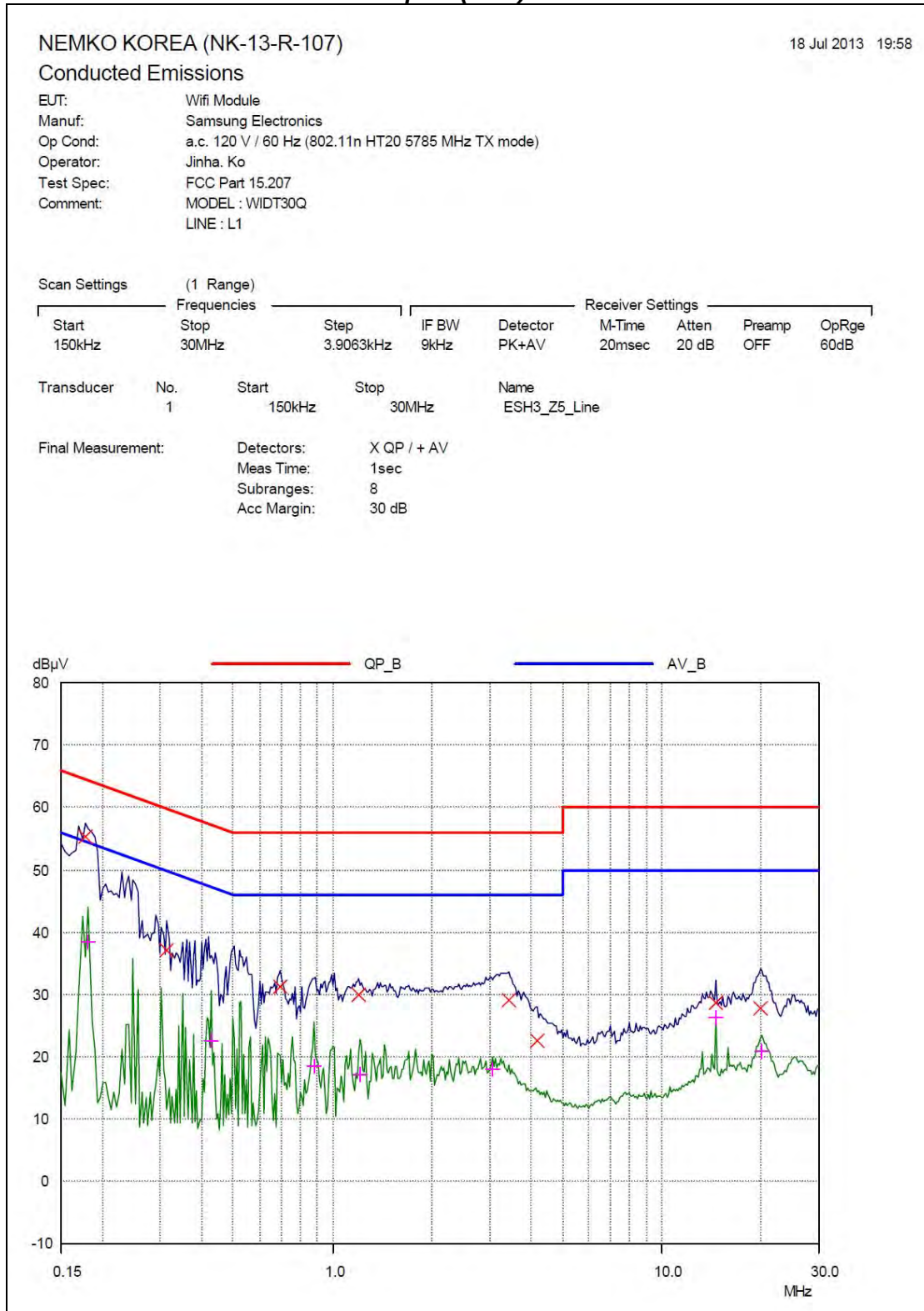
Conducted Emission at the Mains port (Neutral)



PLOTS OF EMISSIONS

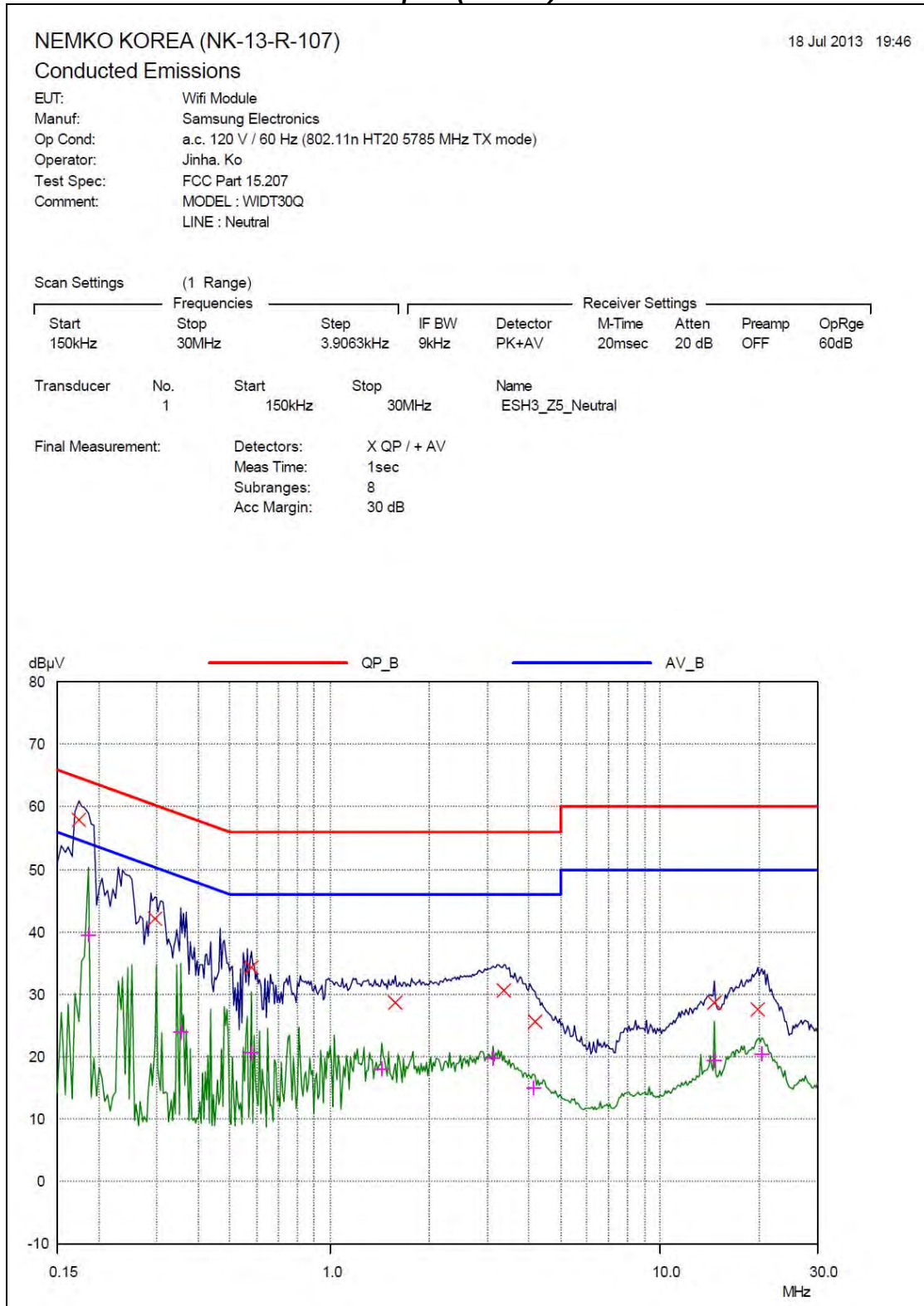
5 GHz band

Conducted Emission at the Mains port (Line)



PLOTS OF EMISSIONS

Conducted Emission at the Mains port (Neutral)



TEST DATA

8.2 Radiated Emissions

FCC §15.209, RSS-210 Issue 8, A8.5

2.4 GHz band

Frequency (MHz)	Reading (dBμV/m)	Pol* (H/V)	Antenna Heights (cm)	Turntable Angles (°)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
75.68	50.50	H	343	272	-18.9	31.6	40.0	8.4
80.01	53.90	H	397	87	-20.8	33.1	40.0	6.9
83.73	51.90	H	386	85	-20.8	31.1	40.0	8.9
229.34	52.01	H	146	160	-19.1	32.9	46.0	13.1
240.01	54.41	H	135	200	-19.1	35.3	46.0	10.7
666.14	36.70	V	114	41	-6.5	30.2	46.0	15.8

Radiated Measurements at 3meters

5 GHz band

Frequency (MHz)	Reading (dBμV/m)	Pol* (H/V)	Antenna Heights (cm)	Turntable Angles (°)	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
75.68	50.70	H	340	271	-18.9	31.8	40.0	8.2
80.01	54.30	H	397	85	-20.8	33.5	40.0	6.5
83.73	51.80	H	380	87	-20.8	31.0	40.0	9.0
240.01	54.91	H	140	197	-19.1	35.8	46.0	10.2
277.32	48.40	H	100	173	-15.5	32.9	46.0	13.1
666.14	37.50	V	110	45	-6.5	31.0	46.0	15.0

Radiated Measurements at 3meters

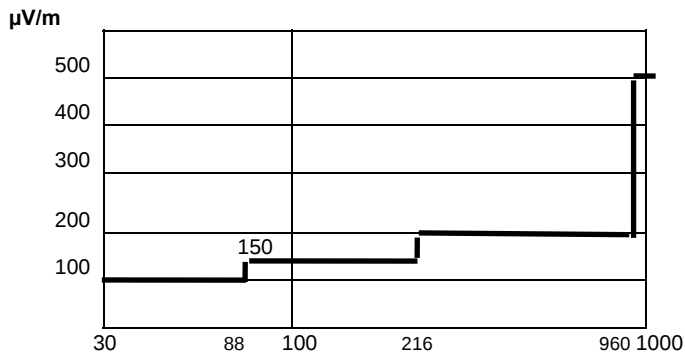


Fig. 3. Limits at 3 meters

Note(s):

1. All modes were measured and the worst-case emission was reported.

2 The radiated limits are shown on Figure 3.

Above 1 GHz the limit is 500 μV/m.

MHz

3. *Pol. H = Horizontal, V = Vertical

4. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.

5. Measurements using CISPR quasi-peak mode.

6. The radiated emissions testing were made by rotating through three orthogonal axes.

The worst date was recorded.

7. The limit is on the FCC Part section 15.209(a).

TEST DATA

8.3 Radiated Spurious Emissions

8.3.1 Radiated Spurious Emissions – 2.4 GHz band

FCC §15.247(d), RSS-210 Issue 8, A8.5

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11 b mode

Chain 0

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1333.00	47.6	H	peak	-4.0	43.6	74.0	30.4
1333.00	39.5	H	average	-4.0	35.5	54.0	18.5
1439.00	47.2	H	peak	-3.9	43.3	74.0	30.7
1439.00	38.9	H	average	-3.9	35.0	54.0	19.0
1498.25	48.2	V	peak	-3.7	44.5	74.0	29.5
1498.25	40.1	V	average	-3.7	36.4	54.0	17.6
1663.50	48.6	V	peak	-3.2	45.4	74.0	28.6
1663.50	39.4	V	average	-3.2	36.2	54.0	17.8
2334.25	51.7	H	peak	-1.1	50.6	74.0	23.4
2334.25	44.0	H	average	-1.1	42.9	54.0	11.1
4823.75	43.0	H	peak	9.2	52.2	74.0	21.8
4823.75	37.4	H	average	9.2	46.6	54.0	7.4

1

TEST DATA

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1496.50	49.5	V	peak	-3.7	45.8	74.0	28.2
1496.50	40.2	V	average	-3.7	36.5	54.0	17.5
1663.25	48.5	V	peak	-3.2	45.3	74.0	28.7
1663.25	39.1	V	average	-3.2	35.9	54.0	18.1
1681.25	47.1	V	peak	-3.1	44.0	74.0	30.0
1681.25	38.6	V	average	-3.1	35.5	54.0	18.5
2244.00	48.9	V	peak	-1.4	47.5	74.0	26.5
2244.00	39.3	V	average	-1.4	37.9	54.0	16.1
2358.25	52.1	H	peak	-1.1	51.0	74.0	23.0
2358.25	44.6	H	average	-1.1	43.5	54.0	10.5
4873.75	41.2	H	peak	9.4	50.6	74.0	23.4
4873.75	35.2	H	average	9.4	44.6	54.0	9.4

Highest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1329.75	49.1	H	peak	-4.0	45.1	74.0	28.9
1329.75	39.9	H	average	-4.0	35.9	54.0	18.1
1497.75	47.7	H	peak	-3.7	44.0	74.0	30.0
1497.75	39.7	H	average	-3.7	36.0	54.0	18.0
1660.75	50.3	V	peak	-3.2	47.1	74.0	26.9
1660.75	41.6	V	average	-3.2	38.4	54.0	15.6
2380.25	49.7	H	peak	-1.0	48.7	74.0	25.3
2380.25	42.9	H	average	-1.0	41.9	54.0	12.1
4923.75	40.1	H	peak	9.6	49.7	74.0	24.3
4923.75	35.3	H	average	9.6	44.9	54.0	9.1

TEST DATA

Chain 1

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1332.00	48.2	H	peak	-4.0	44.2	74.0	29.8
1332.00	39.5	H	average	-4.0	35.5	54.0	18.5
1497.50	49.1	V	peak	-3.7	45.4	74.0	28.6
1497.50	40.2	V	average	-3.7	36.5	54.0	17.5
1617.50	47.6	V	peak	-3.3	44.3	74.0	29.7
1617.50	39.2	V	average	-3.3	35.9	54.0	18.1
1663.75	49.0	V	peak	-3.2	45.8	74.0	28.2
1663.75	39.1	V	average	-3.2	35.9	54.0	18.1
2330.25	50.8	H	peak	-1.2	49.6	74.0	24.4
2330.25	44.0	H	average	-1.2	42.8	54.0	11.2
4824.38	40.4	H	peak	9.2	49.6	74.0	24.4
4824.38	32.2	H	average	9.2	41.4	54.0	12.6

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1495.50	49.3	V	peak	-3.8	45.5	74.0	28.5
1495.50	40.3	V	average	-3.8	36.5	54.0	17.5
1664.75	48.5	V	peak	-3.2	45.3	74.0	28.7
1664.75	39.4	V	average	-3.2	36.2	54.0	17.8
1681.00	49.0	V	peak	-3.1	45.9	74.0	28.1
1681.00	40.6	V	average	-3.1	37.5	54.0	16.5
2280.50	49.2	H	peak	-1.4	47.8	74.0	26.2
2280.50	40.4	H	average	-1.4	39.0	54.0	15.0
2358.25	52.6	H	peak	-1.1	51.5	74.0	22.5
2358.25	45.9	H	average	-1.1	44.8	54.0	9.2
4873.75	42.9	H	peak	9.4	52.3	74.0	21.7
4873.75	36.7	H	average	9.4	46.1	54.0	7.9

TEST DATA

Highest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1472.25	48.1	H	peak	-3.8	44.3	74.0	29.7
1472.25	40.3	H	average	-3.8	36.5	54.0	17.5
1566.25	50.0	H	peak	-3.5	46.5	74.0	27.5
1566.25	42.1	H	average	-3.5	38.6	54.0	15.4
1587.50	48.9	H	peak	-3.5	45.4	74.0	28.6
1587.50	41.1	H	average	-3.5	37.6	54.0	16.4
1679.75	52.0	H	peak	-3.1	48.9	74.0	25.1
1679.75	43.3	H	average	-3.1	40.2	54.0	13.8
2383.75	54.4	H	peak	-1.0	53.4	74.0	20.6
2383.75	48.9	H	average	-1.0	47.9	54.0	6.1
4923.75	40.4	H	peak	9.6	50.0	74.0	24.0
4923.75	33.2	H	average	9.6	42.8	54.0	11.2

TEST DATA

802.11g mode

Chain 0

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1211.00	47.3	H	peak	-4.5	42.8	74.0	31.2
1211.00	38.9	H	average	-4.5	34.4	54.0	19.6
1328.00	47.8	H	peak	-4.0	43.8	74.0	30.2
1328.00	39.9	H	average	-4.0	35.9	54.0	18.1
1496.00	48.4	H	peak	-3.8	44.6	74.0	29.4
1496.00	40.0	H	average	-3.8	36.2	54.0	17.8
1608.25	46.8	V	peak	-3.4	43.4	74.0	30.6
1608.25	39.3	V	average	-3.4	35.9	54.0	18.1
2338.50	53.2	V	peak	-1.1	52.1	74.0	21.9
2338.50	43.4	V	average	-1.1	42.3	54.0	11.7
4821.88	40.2	H	peak	9.2	49.4	74.0	24.6
4821.88	31.5	H	average	9.2	40.7	54.0	13.3

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1305.50	47.2	H	peak	-4.1	43.1	74.0	30.9
1305.50	39.5	H	average	-4.1	35.4	54.0	18.6
1496.75	48.2	V	peak	-3.7	44.5	74.0	29.5
1496.75	39.8	V	average	-3.7	36.1	54.0	17.9
1624.50	47.1	V	peak	-3.3	43.8	74.0	30.2
1624.50	39.6	V	average	-3.3	36.3	54.0	17.7
2288.00	51.3	V	peak	-1.3	50.0	74.0	24.0
2288.00	42.6	V	average	-1.3	41.3	54.0	12.7
2360.50	54.6	V	peak	-1.1	53.5	74.0	20.5
2360.50	47.0	V	average	-1.1	45.9	54.0	8.1
4871.88	40.3	V	peak	9.4	49.7	74.0	24.3
4871.88	31.5	V	average	9.4	40.9	54.0	13.1

TEST DATA

Highest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1328.00	48.3	H	peak	-4.0	44.3	74.0	29.7
1328.00	39.1	H	average	-4.0	35.1	54.0	18.9
1495.00	49.6	V	peak	-3.8	45.8	74.0	28.2
1495.00	40.5	V	average	-3.8	36.7	54.0	17.3
1563.25	48.7	H	peak	-3.5	45.2	74.0	28.8
1563.25	39.8	H	average	-3.5	36.3	54.0	17.7
2359.00	51.5	V	peak	-1.1	50.4	74.0	23.6
2359.00	43.4	V	average	-1.1	42.3	54.0	11.7
4925.63	40.5	H	peak	9.6	50.1	74.0	23.9
4925.63	31.3	H	average	9.6	40.9	54.0	13.1

Chain 1

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1328.50	47.9	H	peak	-4.0	43.9	74.0	30.1
1328.50	39.5	H	average	-4.0	35.5	54.0	18.5
1497.25	49.3	V	peak	-3.7	45.6	74.0	28.4
1497.25	39.9	V	average	-3.7	36.2	54.0	17.8
1665.25	49.3	V	peak	-3.2	46.1	74.0	27.9
1665.25	39.9	V	average	-3.2	36.7	54.0	17.3
1680.00	53.3	H	peak	-3.1	50.2	74.0	23.8
1680.00	44.9	H	average	-3.1	41.8	54.0	12.2
2338.25	48.9	H	peak	-1.1	47.8	74.0	26.2
2338.25	41.0	H	average	-1.1	39.9	54.0	14.1

TEST DATA

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1496.50	48.4	H	peak	-3.7	44.7	74.0	29.3
1496.50	39.8	H	average	-3.7	36.1	54.0	17.9
1624.75	47.1	H	peak	-3.3	43.8	74.0	30.2
1624.75	39.3	H	average	-3.3	36.0	54.0	18.0
1660.75	47.9	V	peak	-3.2	44.7	74.0	29.3
1660.75	38.7	V	average	-3.2	35.5	54.0	18.5
1680.25	48.4	V	peak	-3.1	45.3	74.0	28.7
1680.25	39.9	V	average	-3.1	36.8	54.0	17.2
4876.25	40.3	H	peak	9.4	49.7	74.0	24.3
4876.25	31.6	H	average	9.4	41.0	54.0	13.0
7320.00	39.7	H	peak	16.3	56.0	74.0	18.0
7320.00	31.4	H	average	16.3	47.7	54.0	6.3

Highest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1494.25	49.2	V	peak	-3.8	45.4	74.0	28.6
1494.25	40.7	V	average	-3.8	36.9	54.0	17.1
1575.50	49.1	H	peak	-3.5	45.6	74.0	28.4
1575.50	40.0	H	average	-3.5	36.5	54.0	17.5
1661.50	49.5	V	peak	-3.2	46.3	74.0	27.7
1661.50	39.9	V	average	-3.2	36.7	54.0	17.3
1679.50	54.0	H	peak	-3.1	50.9	74.0	23.1
1679.50	45.1	H	average	-3.1	42.0	54.0	12.0
2378.25	53.0	H	peak	-1.0	52.0	74.0	22.0
2378.25	45.0	H	average	-1.0	44.0	54.0	10.0
4923.13	40.5	V	peak	9.6	50.1	74.0	23.9
4923.13	31.8	V	average	9.6	41.4	54.0	12.6

TEST DATA

802.11n(20 MHz) mode

Chain 0 + Chain 1

Lowest Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1497.50	48.6	H	peak	-3.7	44.9	74.0	29.1
1497.50	39.4	H	average	-3.7	35.7	54.0	18.3
1608.00	47.1	V	peak	-3.4	43.7	74.0	30.3
1608.00	40.8	V	average	-3.4	37.4	54.0	16.6
1664.75	49.1	V	peak	-3.2	45.9	74.0	28.1
1664.75	40.1	V	average	-3.2	36.9	54.0	17.1
1680.25	48.4	H	peak	-3.1	45.3	74.0	28.7
1680.25	39.2	H	average	-3.1	36.1	54.0	17.9
2288.00	49.1	H	peak	-1.3	47.8	74.0	26.2
2288.00	44.6	H	average	-1.3	43.3	54.0	10.7
2328.25	49.7	V	peak	-1.2	48.5	74.0	25.5
2328.25	42.8	V	average	-1.2	41.6	54.0	12.4

Middle Channel

Frequency (MHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1199.50	50.4	H	peak	-4.6	45.8	74.0	28.2
1199.50	41.8	H	average	-4.6	37.2	54.0	16.8
1499.00	48.2	V	peak	-3.7	44.5	74.0	29.5
1499.00	39.7	V	average	-3.7	36.0	54.0	18.0
1624.75	47.7	V	peak	-3.3	44.4	74.0	29.6
1624.75	40.1	V	average	-3.3	36.8	54.0	17.2
1680.50	46.6	V	peak	-3.1	43.5	74.0	30.5
1680.50	39.0	V	average	-3.1	35.9	54.0	18.1
2351.50	53.9	H	peak	-1.1	52.8	74.0	21.2
2351.50	45.2	H	average	-1.1	44.1	54.0	9.9
4871.88	40.3	H	peak	9.4	49.7	74.0	24.3
4871.88	31.4	H	average	9.4	40.8	54.0	13.2

TEST DATA

Highest Channel

Frequency (MHz)	Reading (dB μ V)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1495.00	48.5	H	peak	-3.8	44.7	74.0	29.3
1495.00	39.5	H	average	-3.8	35.7	54.0	18.3
1519.50	47.8	V	peak	-3.7	44.1	74.0	29.9
1519.50	39.3	V	average	-3.7	35.6	54.0	18.4
1661.25	48.9	V	peak	-3.2	45.7	74.0	28.3
1661.25	39.9	V	average	-3.2	36.7	54.0	17.3
2288.25	50.0	H	peak	-1.3	48.7	74.0	25.3
2288.25	43.6	H	average	-1.3	42.3	54.0	11.7
2378.25	52.8	V	peak	-1.0	51.8	74.0	22.2
2378.25	45.1	V	average	-1.0	44.1	54.0	9.9
4930.00	40.1	H	peak	9.6	49.7	74.0	24.3
4930.00	31.1	H	average	9.6	40.7	54.0	13.3

Note(s):

- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- Peak emissions were measured using RBW = 1 MHz, VBW = 1 MHz, Detector = Peak
- For average measurements, "12.2.5.1 Average Power Measurement Procedures" at "558074 D01 DTS Meas Guidance v03r01" was used.
- The spectrum was measured from 9 kHz to 10th harmonic and the worst-case emissions were reported. No significant emissions were found beyond the 2nd harmonic for this device.

TEST DATA

8.3.2 Radiated Spurious Emissions – 5 GHz band

FCC §15.247(d), RSS-210 Issue 8, A8.5

Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11a mode

Chain 0

Lowest Channel (5745 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Lim it (dBμV/m)	Margin (dB)
11.490	54.84	H	peak	6.90	-6.02	55.72	74.0	18.28
11.490	40.50	H	average	6.90	-6.02	41.38	54.0	12.62
11.490	51.26	V	peak	6.90	-6.02	52.14	74.0	21.86
11.490	37.92	V	average	6.90	-6.02	38.80	54.0	15.20

Middle Channel (5785 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Lim it (dBμV/m)	Margin (dB)
11.570	61.63	H	peak	7.32	-6.02	62.93	74.0	11.07
11.570	48.03	H	average	7.32	-6.02	49.33	54.0	4.67
11.570	51.59	V	peak	7.32	-6.02	52.89	74.0	21.11
11.570	38.73	V	average	7.32	-6.02	40.03	54.0	13.97

Highest Channel (5825 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Lim it (dBμV/m)	Margin (dB)
11.650	61.27	H	peak	6.80	-6.02	62.05	74.0	11.95
11.650	47.68	H	average	6.80	-6.02	48.46	54.0	5.54
11.650	55.76	V	peak	6.80	-6.02	56.54	74.0	17.46
11.650	42.45	V	average	6.80	-6.02	43.23	54.0	10.77

TEST DATA

Chain 1

Lowest Channel (5745 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.490	54.33	H	peak	6.90	-6.02	55.21	74.0	18.79
11.490	41.93	H	average	6.90	-6.02	42.81	54.0	11.19
11.490	57.66	V	peak	6.90	-6.02	58.54	74.0	15.46
11.490	44.46	V	average	6.90	-6.02	45.34	54.0	8.66

Middle Channel (5785 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.570	48.39	H	peak	7.32	-6.02	49.69	74.0	24.31
11.570	35.20	H	average	7.32	-6.02	36.50	54.0	17.50
11.570	49.56	V	peak	7.32	-6.02	50.86	74.0	23.14
11.570	36.53	V	average	7.32	-6.02	37.83	54.0	16.17

Highest Channel (5825 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.650	50.33	H	peak	6.80	-6.02	51.11	74.0	22.89
11.650	37.34	H	average	6.80	-6.02	38.12	54.0	15.88
11.650	54.61	V	peak	6.80	-6.02	55.39	74.0	18.61
11.650	40.75	V	average	6.80	-6.02	41.53	54.0	12.47

TEST DATA

802.11n(20 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5745 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.490	56.34	H	peak	6.90	-6.02	57.22	74.0	16.78
11.490	43.52	H	average	6.90	-6.02	44.40	54.0	9.60
11.490	56.92	V	peak	6.90	-6.02	57.80	74.0	16.20
11.490	43.80	V	average	6.90	-6.02	44.68	54.0	9.32

Middle Channel (5785 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.570	55.13	H	peak	7.32	-6.02	56.43	74.0	17.57
11.570	41.06	H	average	7.32	-6.02	42.36	54.0	11.64
11.570	51.33	V	peak	7.32	-6.02	52.63	74.0	21.37
11.570	40.20	V	average	7.32	-6.02	41.50	54.0	12.50

Highest Channel (5825 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.650	57.55	H	peak	6.80	-6.02	58.33	74.0	15.67
11.650	44.47	H	average	6.80	-6.02	45.25	54.0	8.75
11.650	54.28	V	peak	6.80	-6.02	55.06	74.0	18.94
11.650	40.15	V	average	6.80	-6.02	40.93	54.0	13.07

TEST DATA

802.11n(40 MHz) mode

Chain 0 + Chain 1

Lowest Channel (5755 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.510	52.22	H	peak	7.13	-6.02	53.33	74.0	20.67
11.510	38.40	H	average	7.13	-6.02	39.51	54.0	14.49
11.510	51.95	V	peak	7.13	-6.02	53.06	74.0	20.94
11.510	38.33	V	average	7.13	-6.02	39.44	54.0	14.56

Highest Channel (5795 MHz)

Frequency (GHz)	Reading (dBμV)	Pol* (H/V)	mode	AF+CL+Amp (dB)**	Distance (dB)***	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
11.590	54.08	H	peak	7.42	-6.02	55.48	74.0	18.52
11.590	39.76	H	average	7.42	-6.02	41.16	54.0	12.84
11.590	48.70	V	peak	7.42	-6.02	50.10	74.0	23.90
11.590	35.01	V	average	7.42	-6.02	36.41	54.0	17.59

Note(s):

- *Pol. H = Horizontal V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- ***Distance factor = $20 \log (\text{test distance}/\text{specific distance}) = 20 \log (1 / 3)$
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- Peak emissions were measured using RBW = 1 MHz, VBW = 1 MHz, Detector = Peak
- For average measurements, "12.2.5.1 Average Power Measurement Procedures" at "558074 D01 DTS Meas Guidance v03r01" was used.
- The spectrum was measured from 9 kHz to 10th harmonic and the worst-case emissions were reported. No significant emissions were found beyond the 2nd harmonic for this device.

TEST DATA

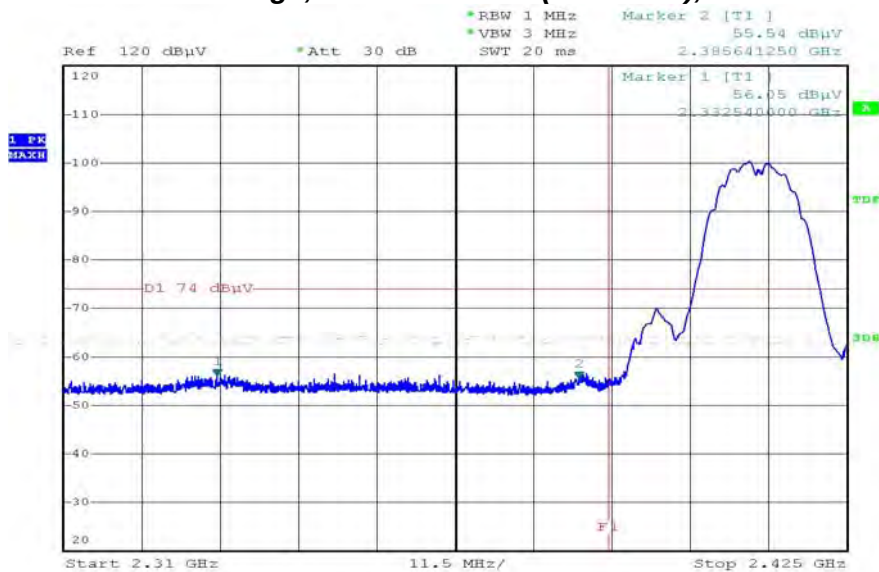
8.3.3 Radiated Band Edge

FCC §15.247(d), RSS-210 Issue 8, A8.5

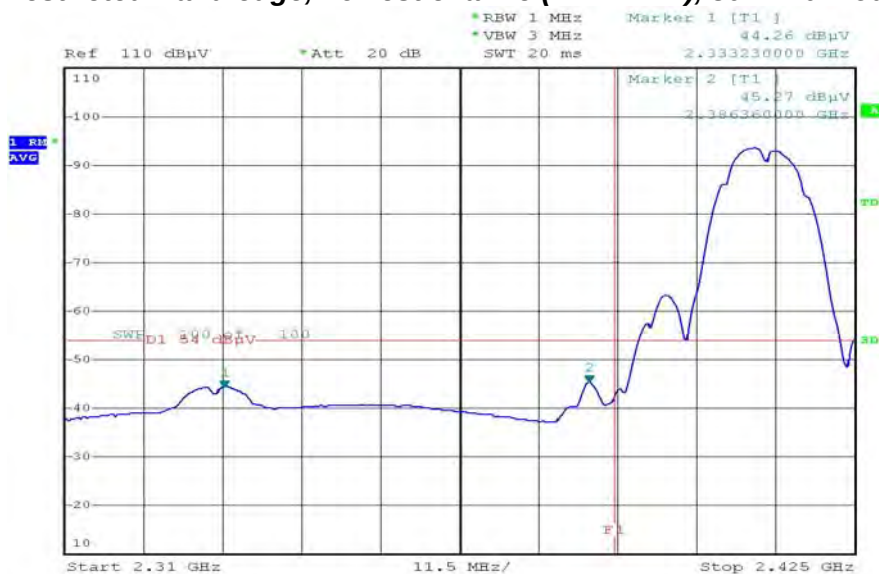
Test Mode : Set to Lowest channel, Middle channel and Highest channel

802.11b mode

Restricted Band edge, Lowest channel(2412 MHz), 802.11b mode Antenna 0, Peak

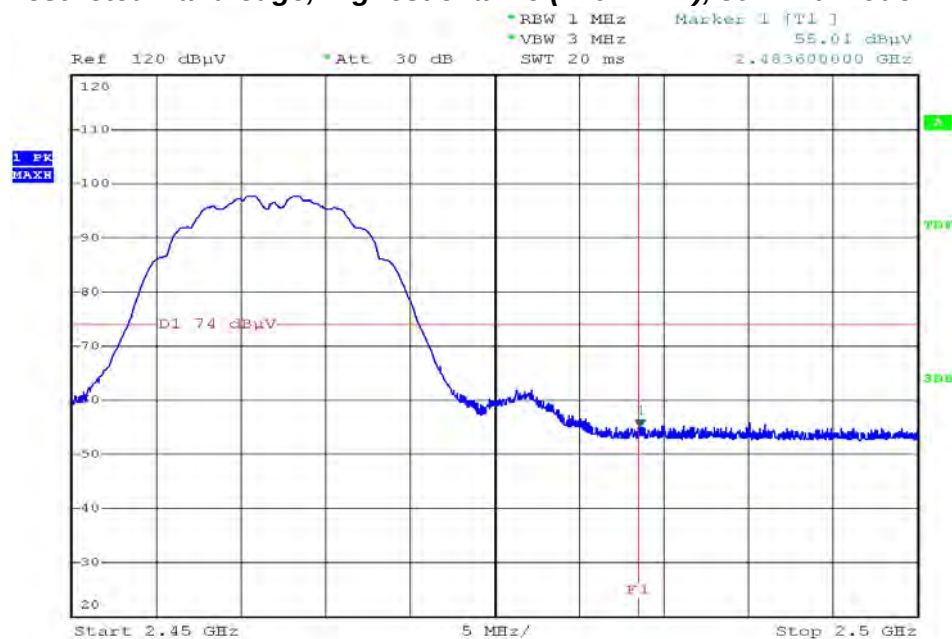


Restricted Band edge, Lowest channel(2412 MHz), 802.11b mode Antenna 0, Average

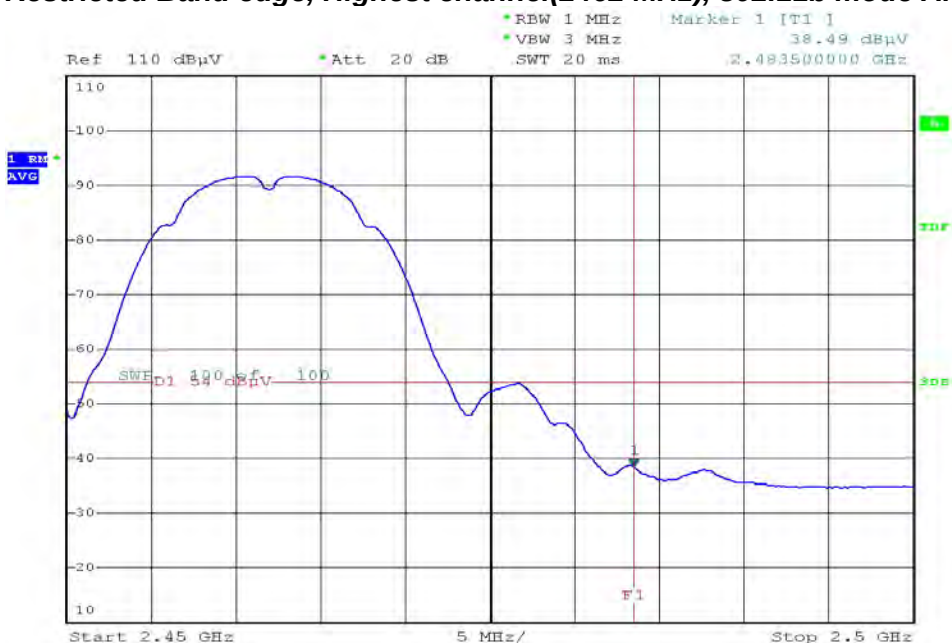


TEST DATA

Restricted Band edge, Highest channel(2462 MHz), 802.11b mode Antenna 0, Peak

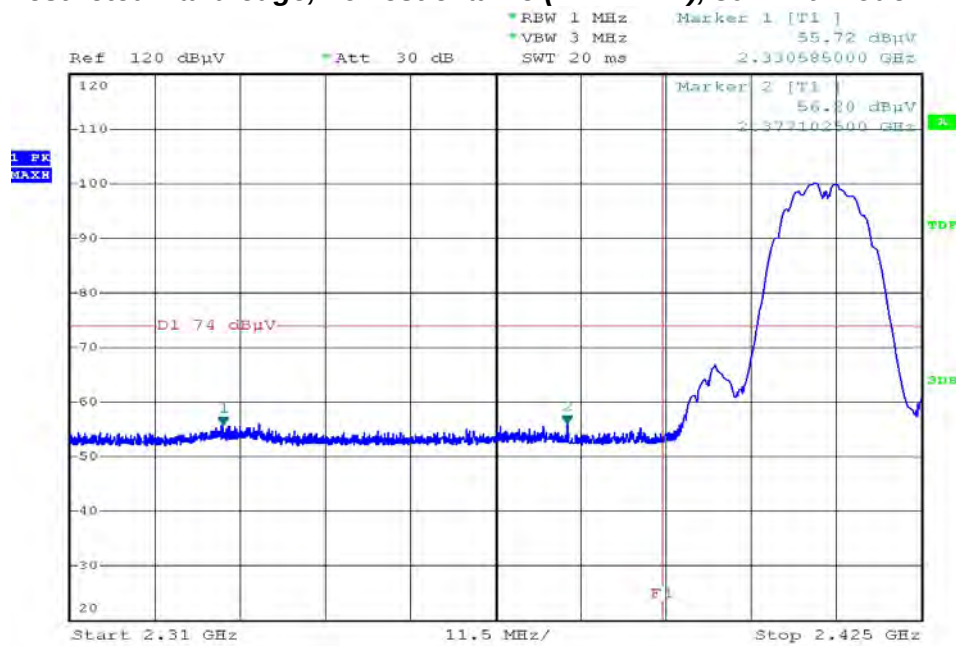


Restricted Band edge, Highest channel(2462 MHz), 802.11b mode Antenna 0, Average

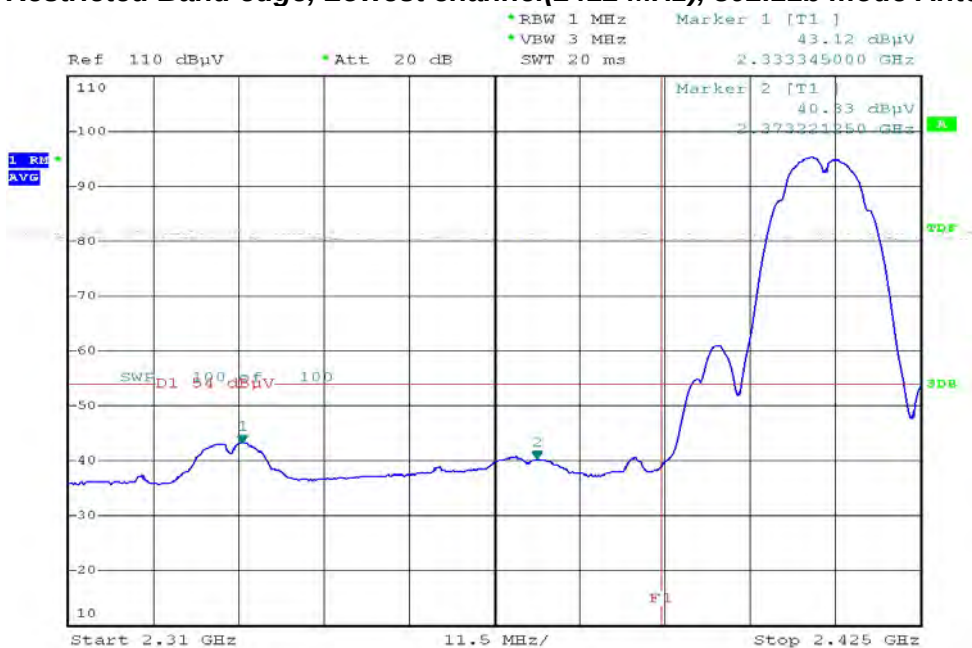


TEST DATA

Restricted Band edge, Lowest channel(2412 MHz), 802.11b mode Antenna 1, Peak

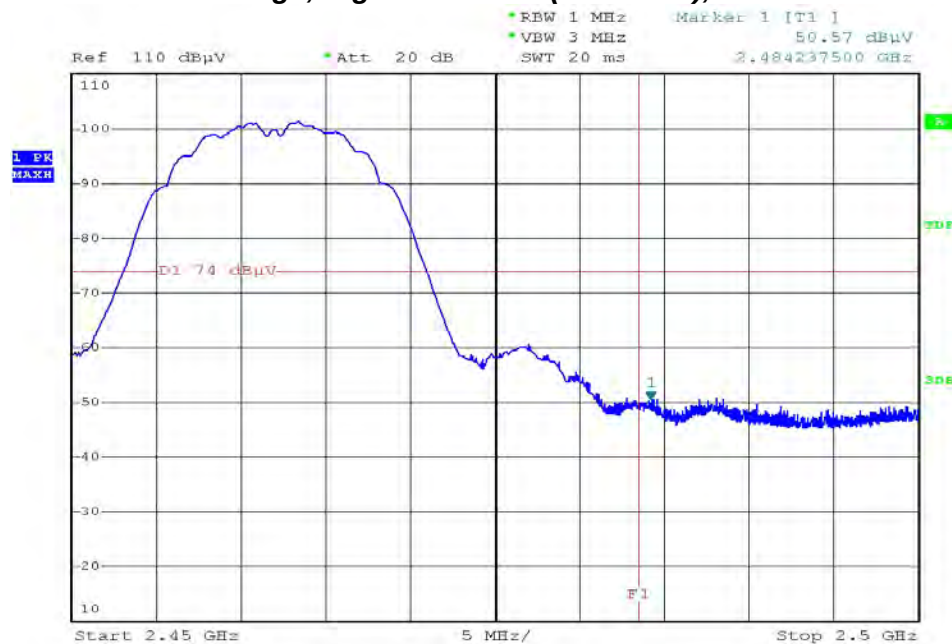


Restricted Band edge, Lowest channel(2412 MHz), 802.11b mode Antenna 1, Average

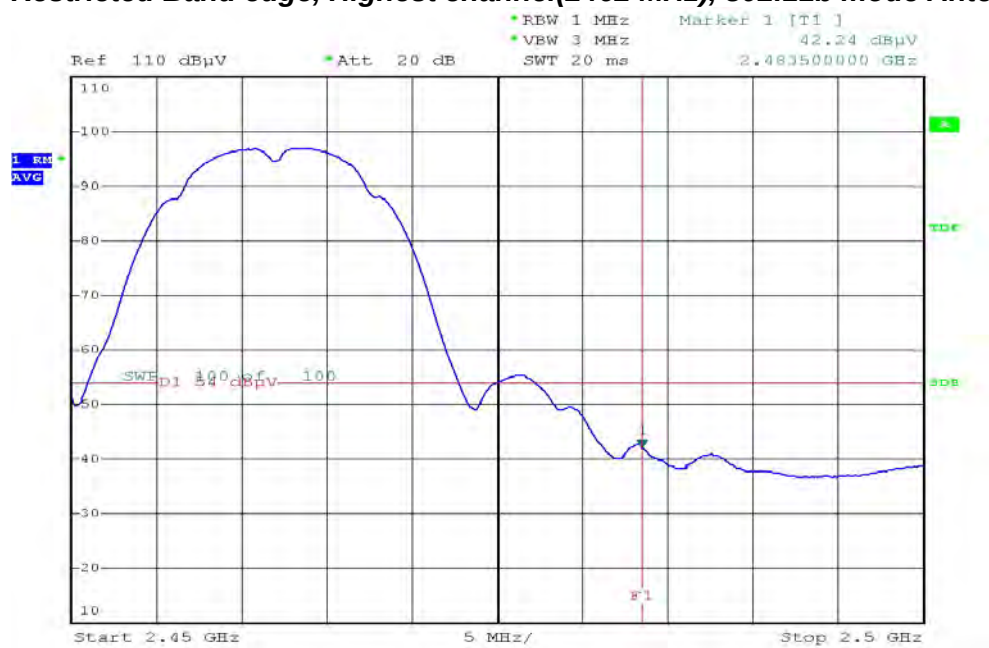


TEST DATA

Restricted Band edge, Highest channel(2462 MHz), 802.11b mode Antenna 1, Peak



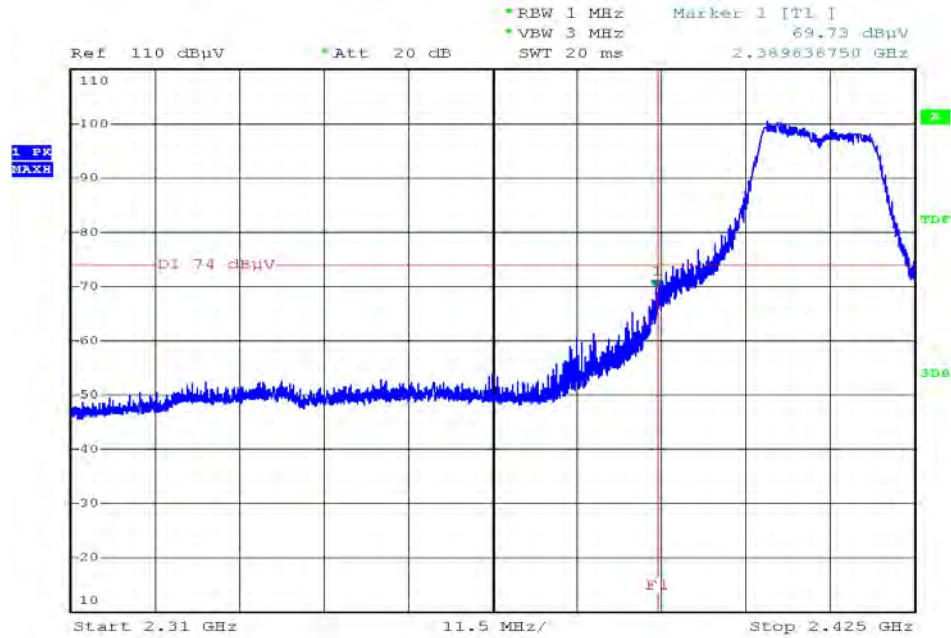
Restricted Band edge, Highest channel(2462 MHz), 802.11b mode Antenna 1, Average



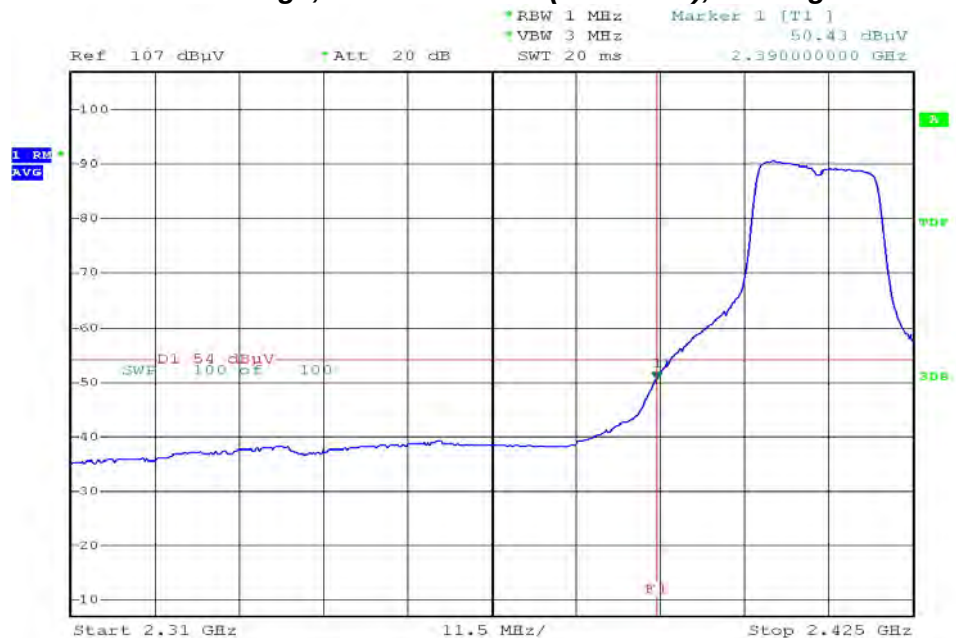
TEST DATA

802.11g mode

Restricted Band edge, Lowest channel(2412 MHz), 802.11g mode Antenna 0, Peak

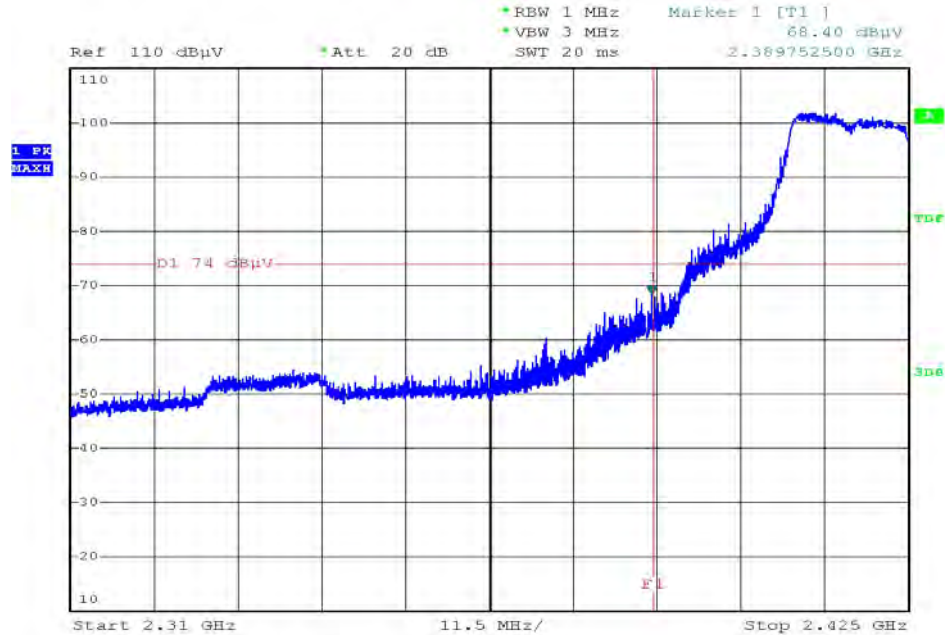


Restricted Band edge, Lowest channel(2412 MHz), 802.11g mode Antenna 0, Average

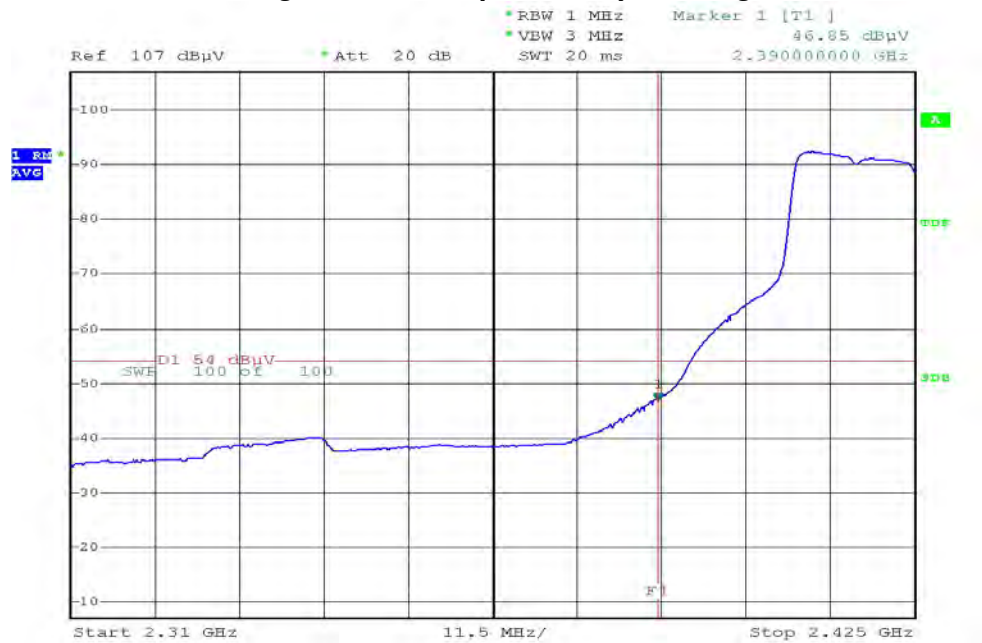


TEST DATA

Restricted Band edge, Channel 2 (2417 MHz), 802.11g mode Antenna 0, Peak

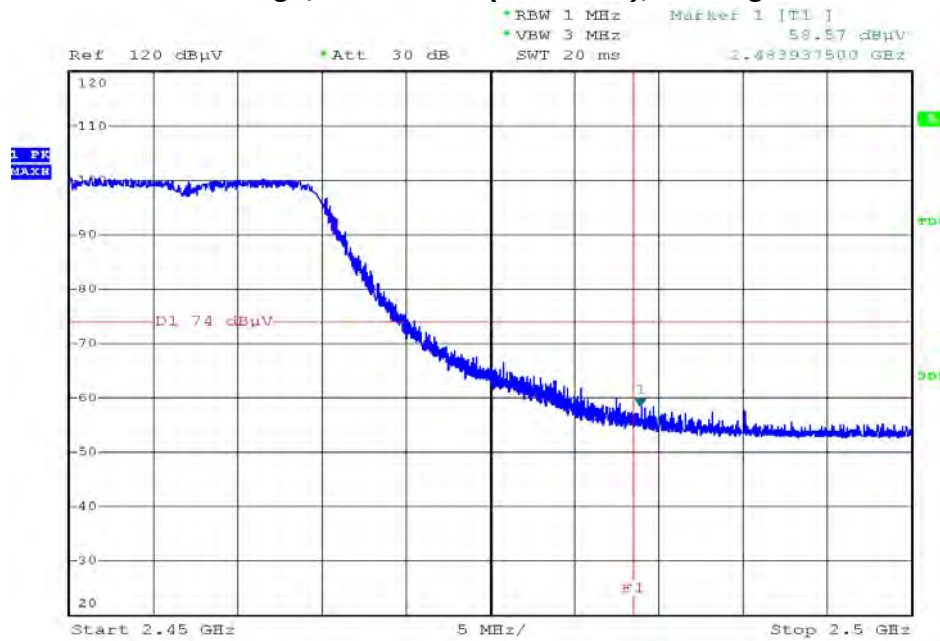


Restricted Band edge, Channel 2 (2417 MHz), 802.11g mode Antenna 0, Average

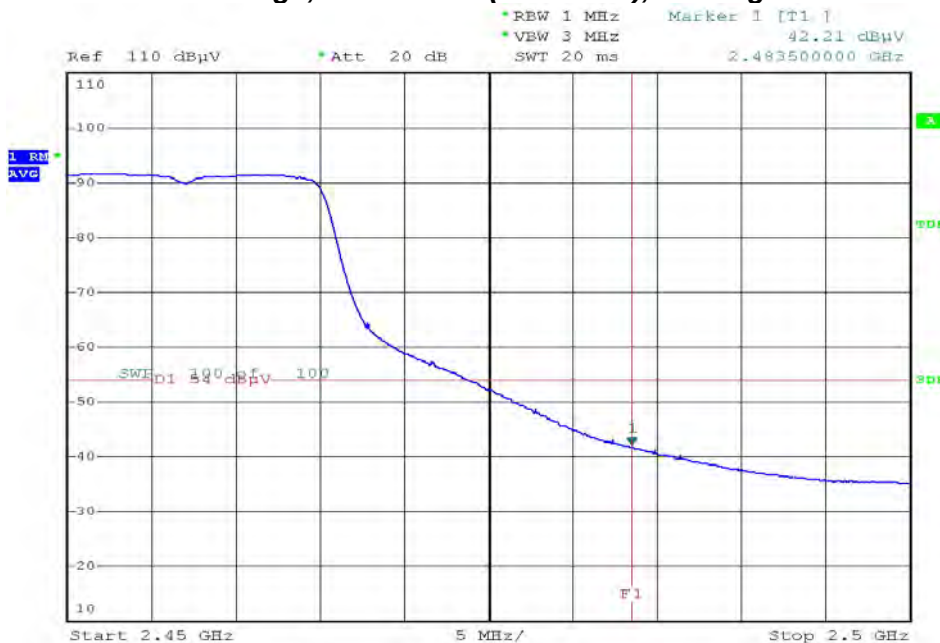


TEST DATA

Restricted Band edge, Channel 10 (2457 MHz), 802.11g mode Antenna 0, Peak

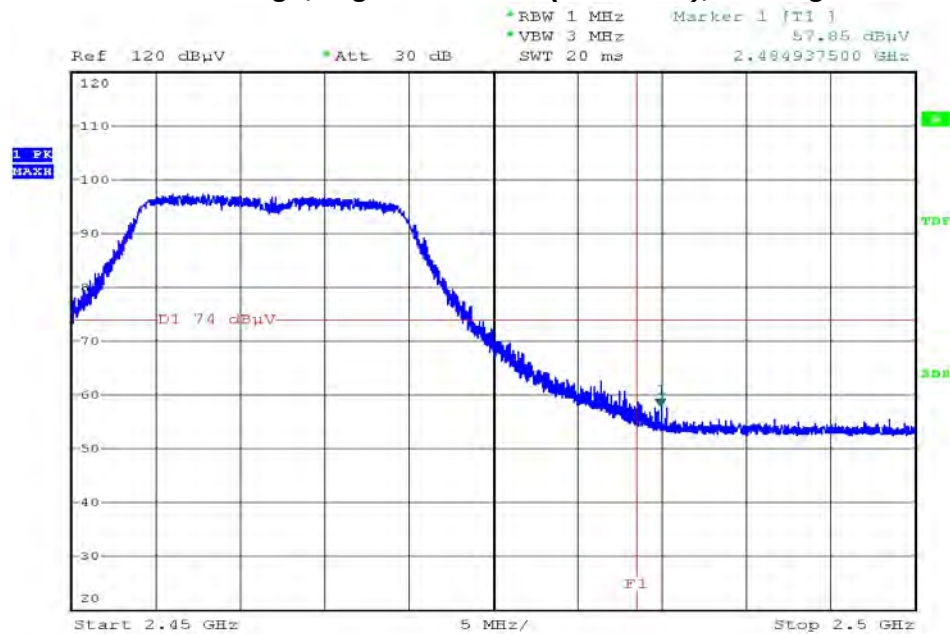


Restricted Band edge, Channel 10 (2457 MHz), 802.11g mode Antenna 0, Average

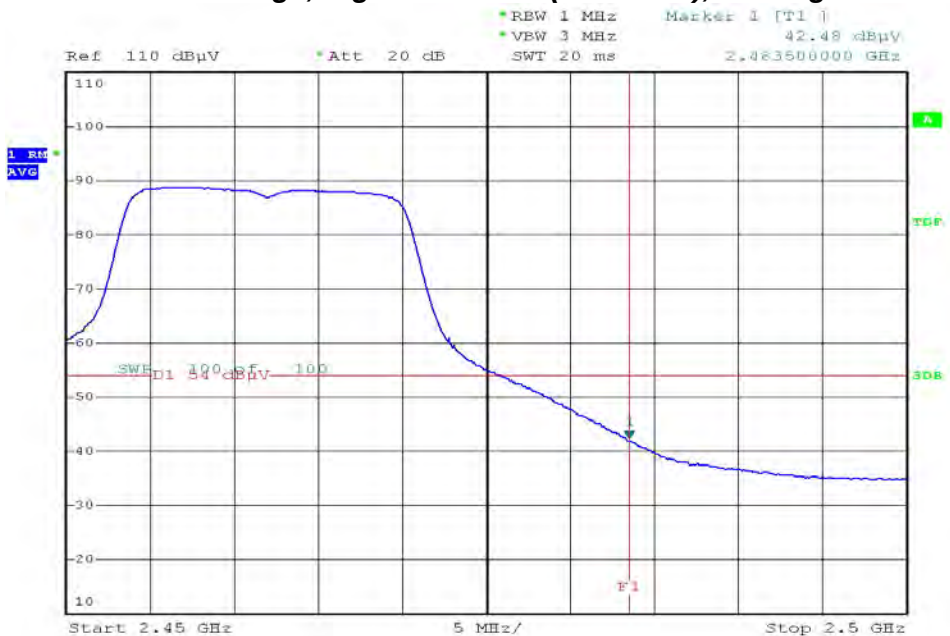


TEST DATA

Restricted Band edge, Highest channel(2462 MHz), 802.11g mode Antenna 0, Peak

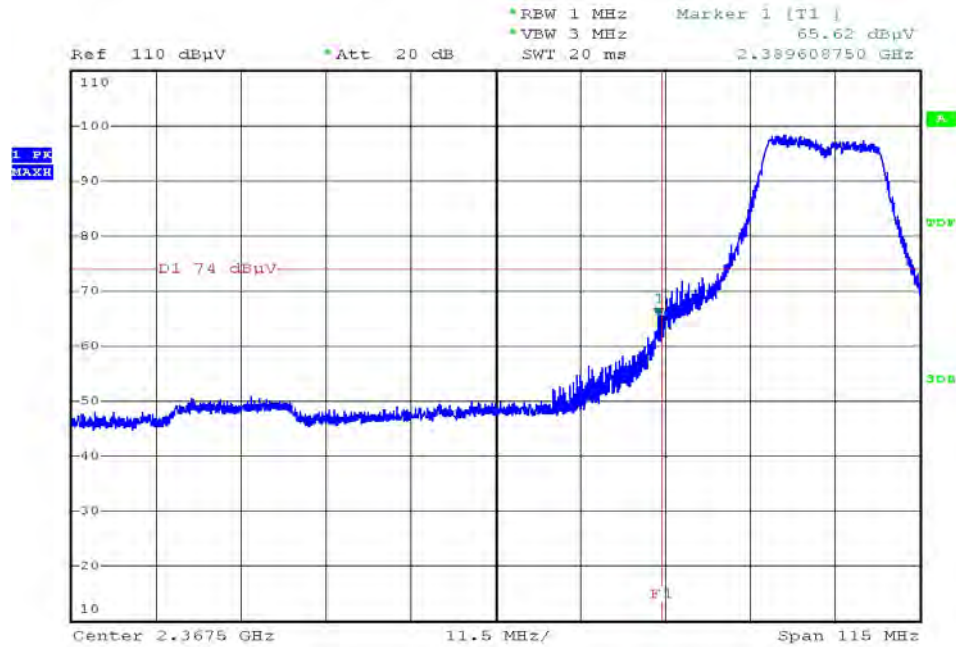


Restricted Band edge, Highest channel(2462 MHz), 802.11g mode Antenna 0, Average

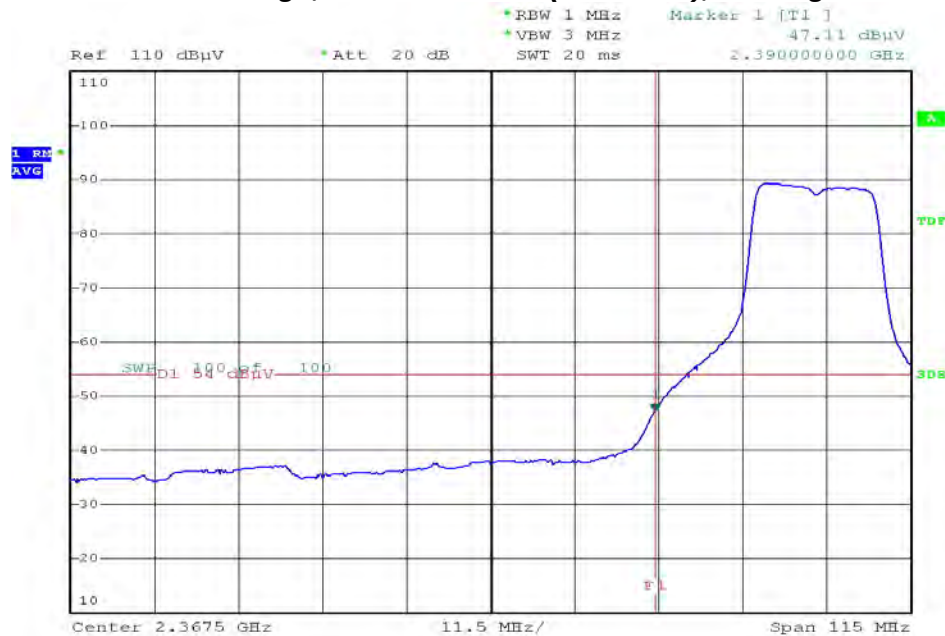


TEST DATA

Restricted Band edge, Lowest channel(2412 MHz), 802.11g mode Antenna 1, Peak

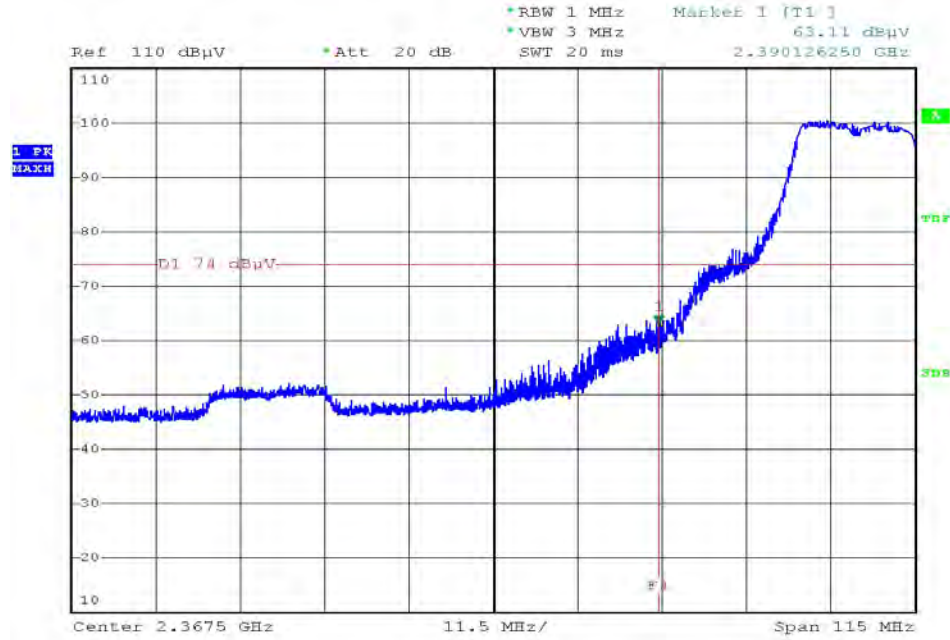


Restricted Band edge, Lowest channel(2412 MHz), 802.11g mode Antenna 1, Average

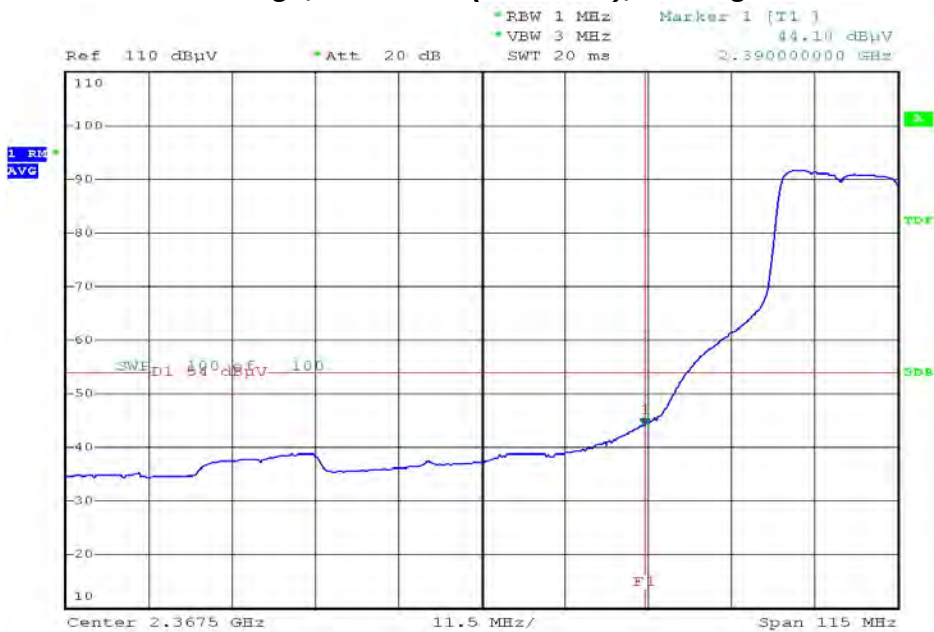


TEST DATA

Restricted Band edge, Channel 2 (2417 MHz), 802.11g mode Antenna 1, Peak

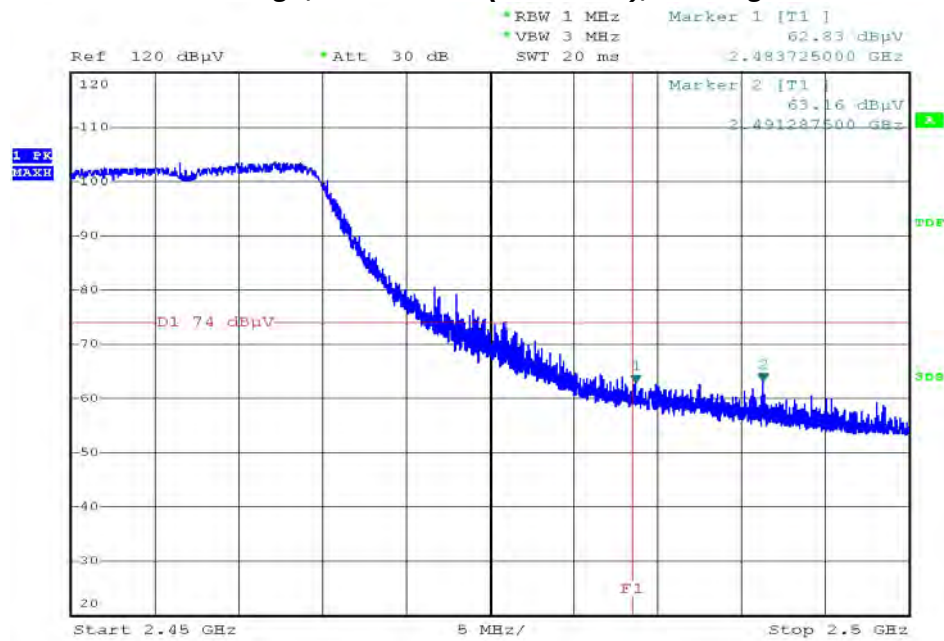


Restricted Band edge, Channel 2 (2417 MHz), 802.11g mode Antenna 1, Average

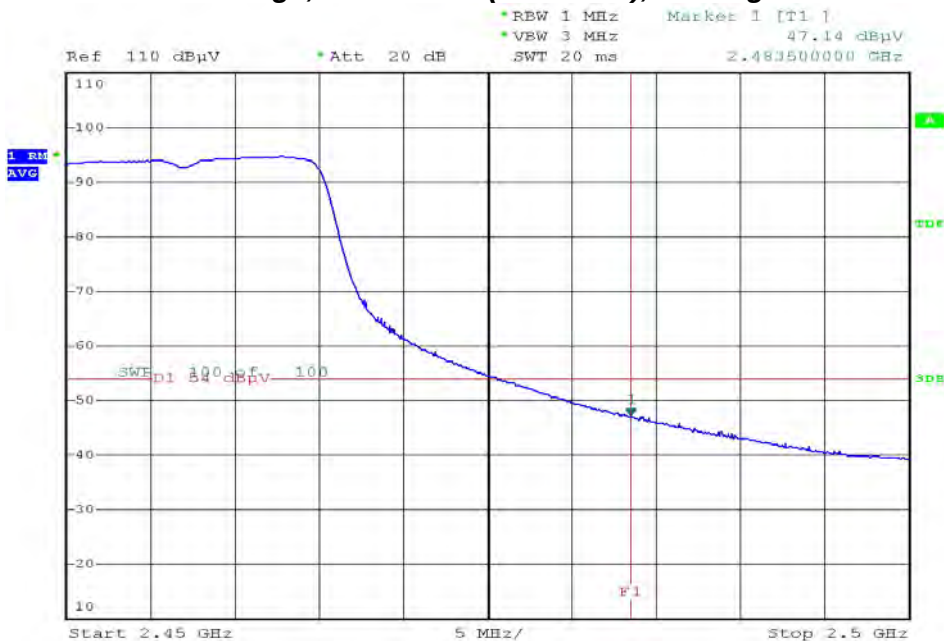


TEST DATA

Restricted Band edge, Channel 10 (2457 MHz), 802.11g mode Antenna 1, Peak

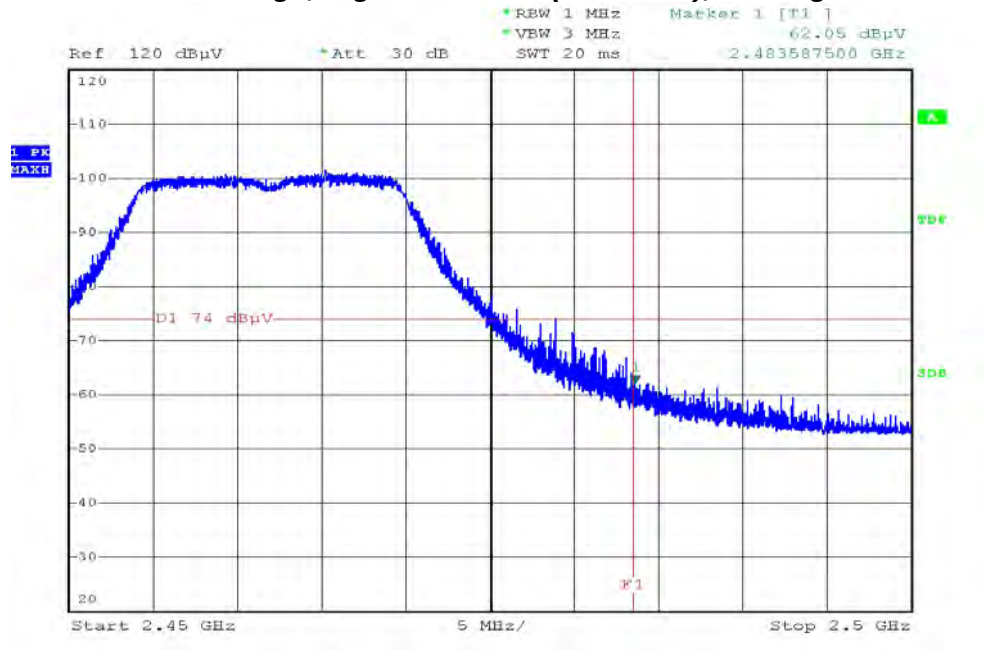


Restricted Band edge, Channel 10 (2457 MHz), 802.11g mode Antenna 1, Average

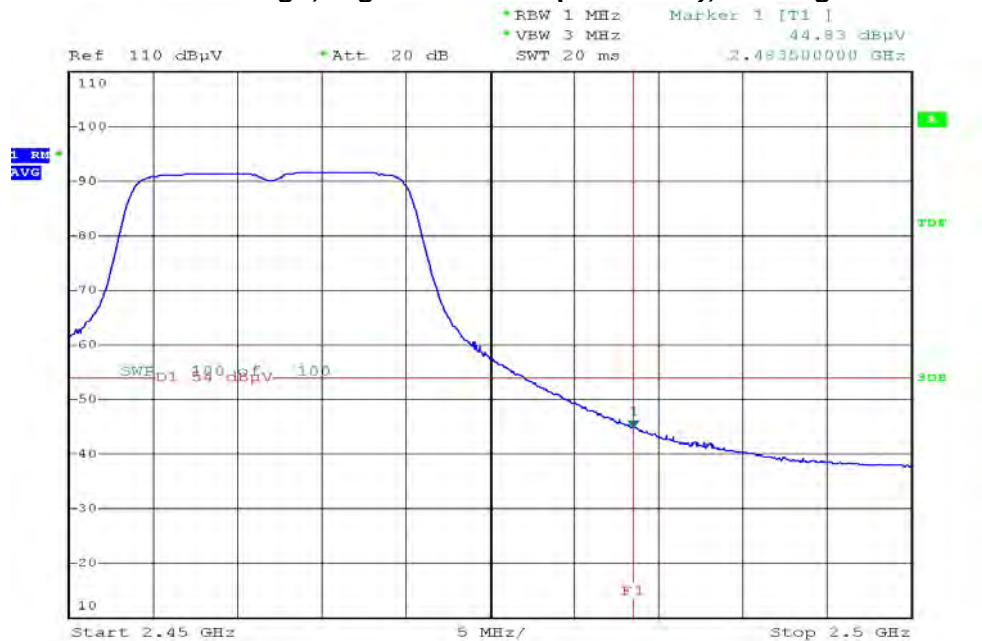


TEST DATA

Restricted Band edge, Highest channel(2462 MHz), 802.11g mode Antenna 1, Peak



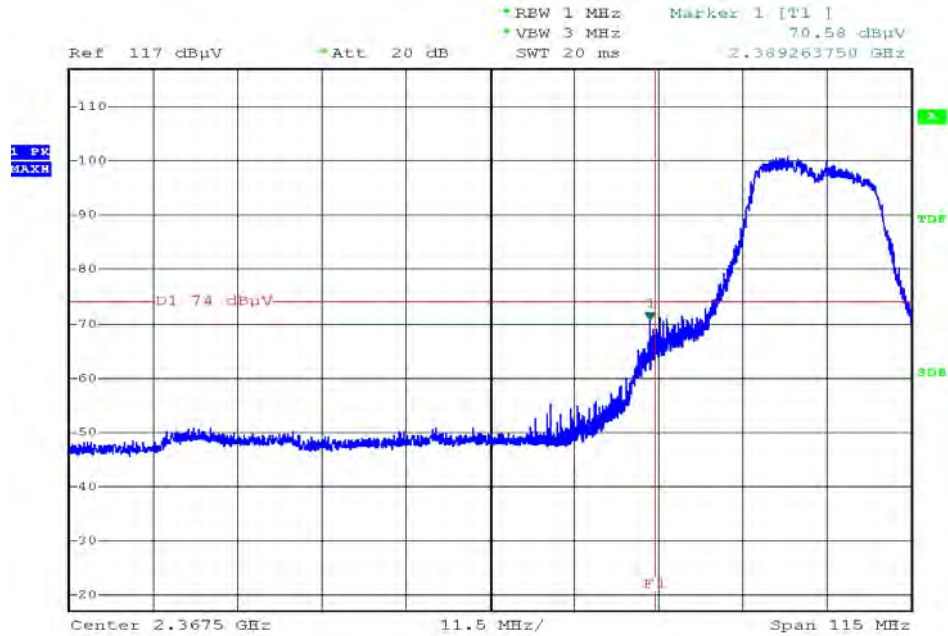
Restricted Band edge, Highest channel(2462 MHz), 802.11g mode Antenna 1, Average



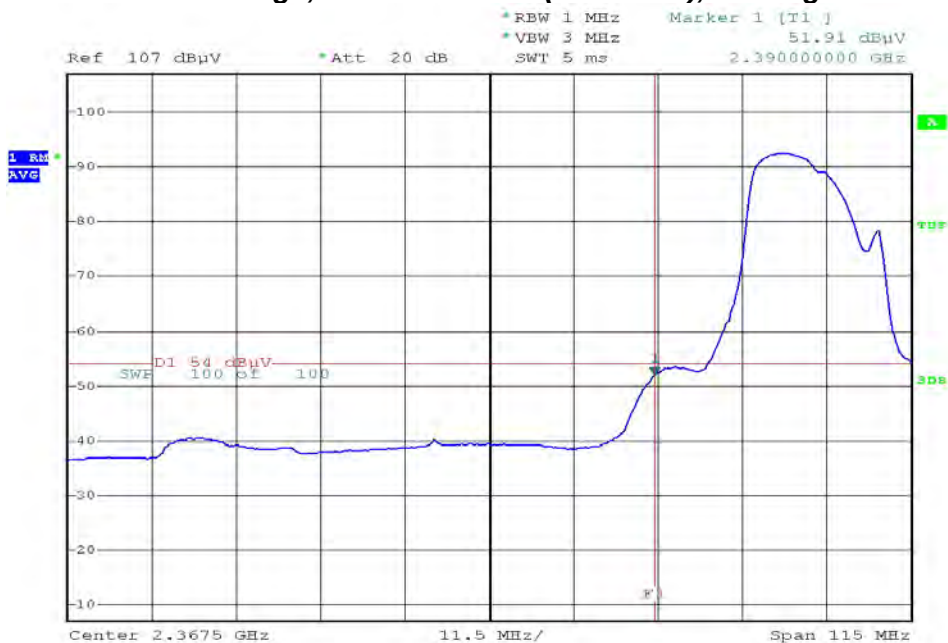
TEST DATA

802.11n HT20 mode

Restricted Band edge, Lowest channel(2412 MHz), 802.11n HT20 mode Ant MIMO, Peak

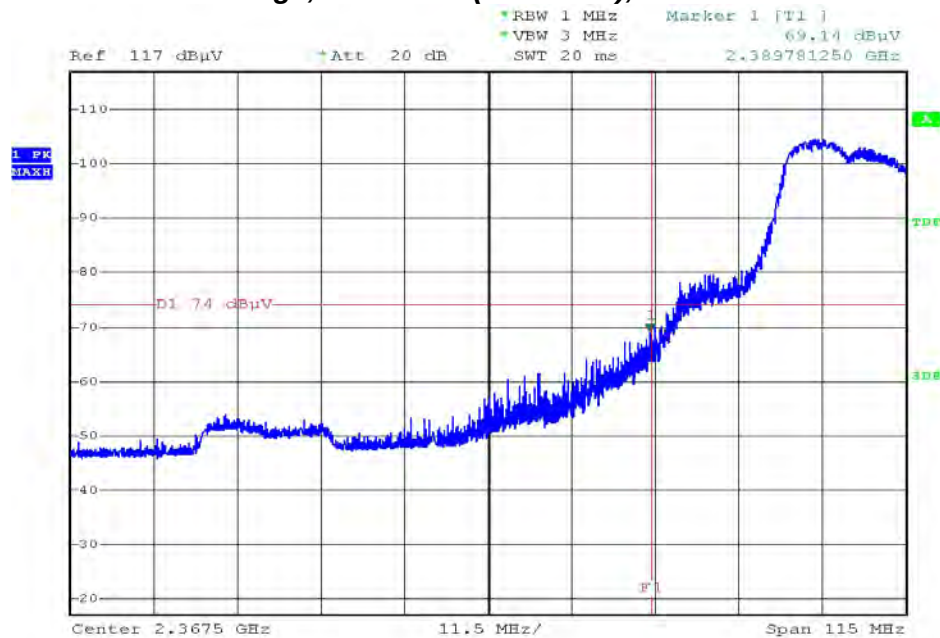


Restricted Band edge, Lowest channel(2412 MHz), 802.11g mode Ant MIMO, Average

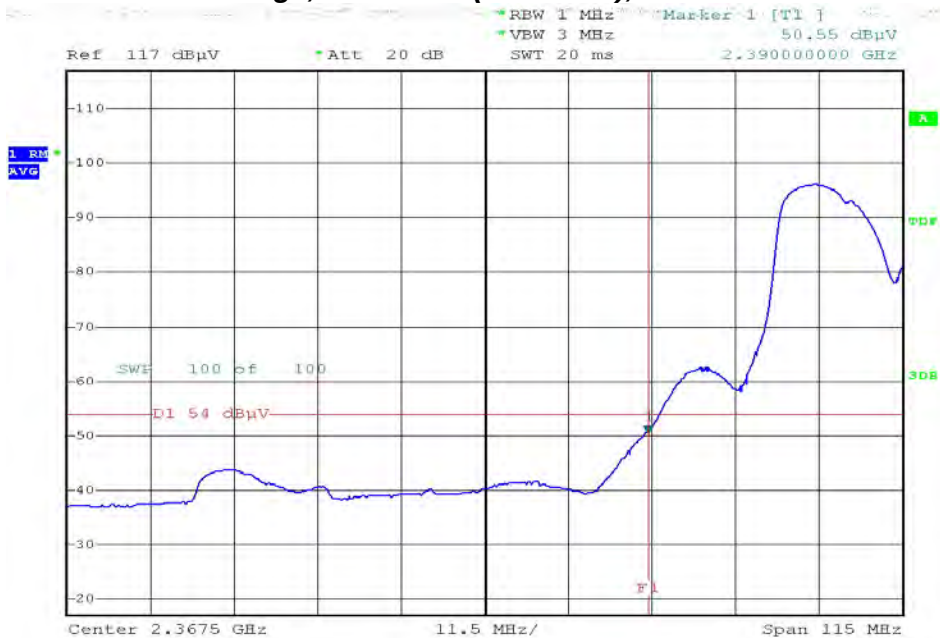


TEST DATA

Restricted Band edge, Channel 2 (2417 MHz), 802.11n HT20 mode Ant MIMO, Peak

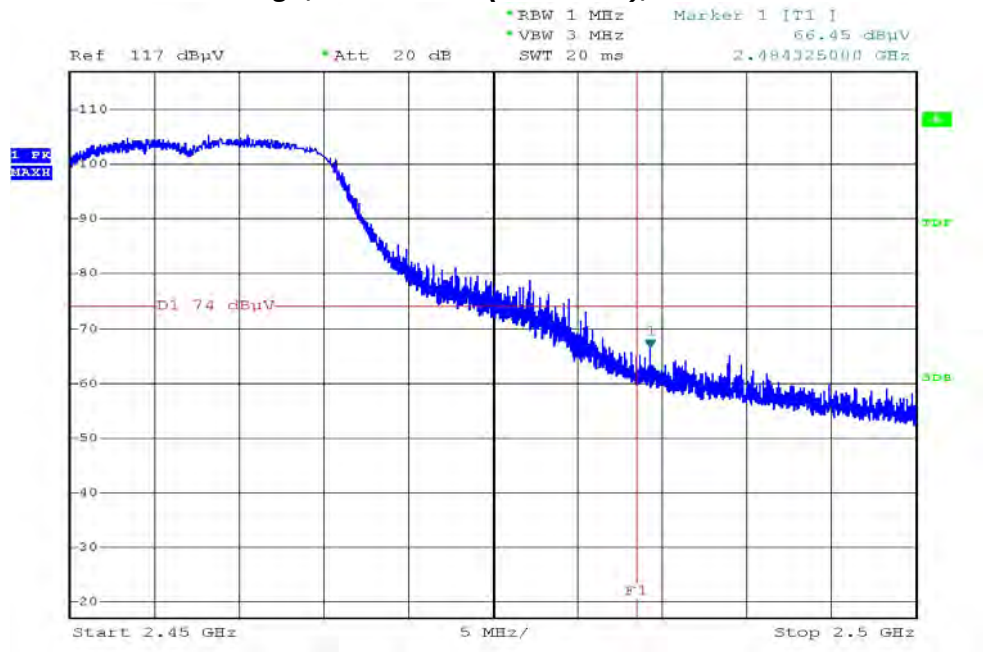


Restricted Band edge, Channel 2 (2417 MHz), 802.11n HT20 mode Ant MIMO, Average

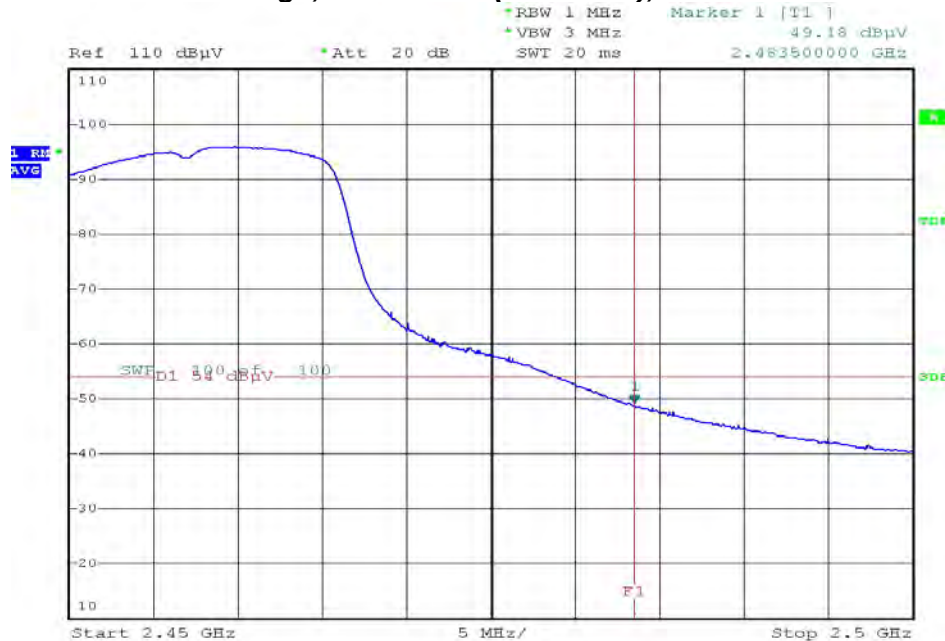


TEST DATA

Restricted Band edge, Channel 10 (2457 MHz), 802.11n HT20 mode Ant MIMO, Peak

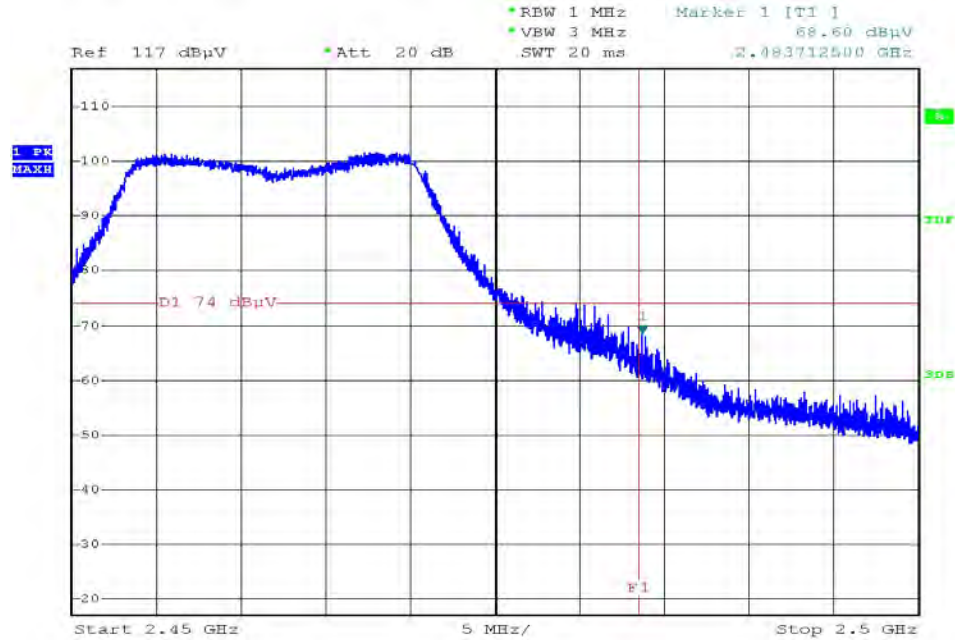


Restricted Band edge, Channel 10 (2457 MHz), 802.11n HT20 mode Ant MIMO, Average

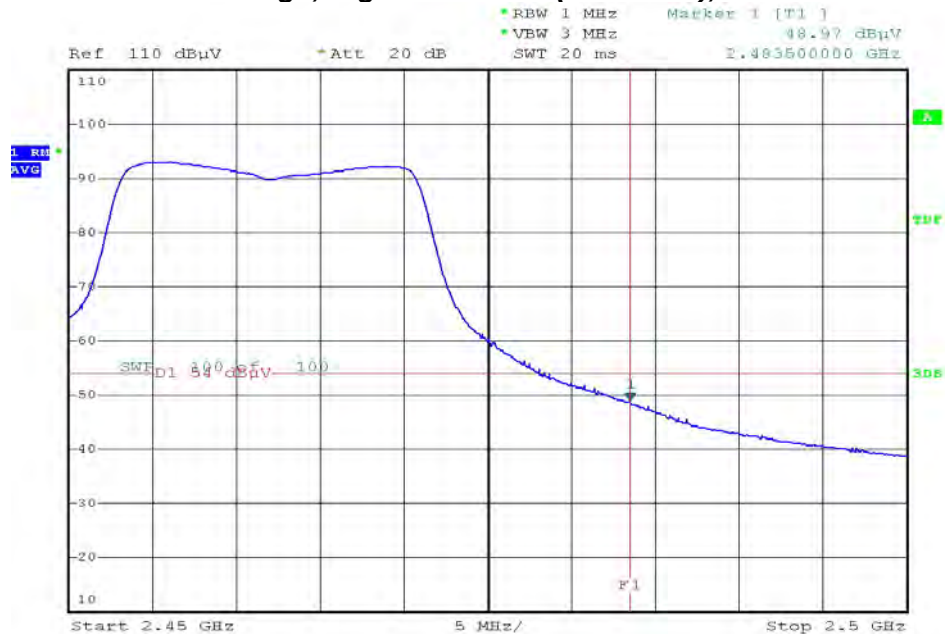


TEST DATA

Restricted Band edge, Highest channel(2462 MHz), 802.11n HT20 mode Ant MIMO, Peak



Restricted Band edge, Highest channel(2462 MHz), 802.11n HT20 mode Ant MIMO, Average



Note(s):

1. *The antenna factor and cable loss were reflected in spectrum analyzer with correction factor for the Band edge radiated test.*
2. *Measurement of the radiated emissions is performed in vertical and horizontal polarizations. The worst data were recorded*
3. *For the radiated band edge test, the EUT was investigated in all available data rates for 802.11b,g,n modes. The worst case band edge emissions were found while EUT was transmitting in 802.11b mode at 1 Mbps, 802.11g mode at 6 Mbps and 802.11n mode at MCS0*
4. *For peak measurements, the resolution bandwidth was set to 1 MHz and the video bandwidth was set to 3 MHz.*
5. *For average measurements, "12.2.5.1 Average Power Measurement Procedures" at "558074 D01 DTS Meas Guidance v03r01" was used.*

9. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESCS 30	833364/020	Jan. 09 2013	1 year
2	*Test Receiver	R & S	ESCS 30	100302	Oct. 08 2012	1 year
3	*Amplifier	R & S	SCU 01	10029	Apr. 05 2013	1 year
4	*Amplifier	Sonoma Instrument	310N	291916	**Jul. 16 2013	1 year
5	*Amplifier	R & S	SCU18	10065	Apr. 05 2013	1 year
6	*Amplifier	R & S	SCU26	10011	***Jul. 08 2013	1 year
7	*Amplifier	R & S	SCU40	10008	***Jul. 08 2013	1 year
8	*Pre Amplifier	HP	8449B	3008A00107	Jan. 09 2013	1 year
9	*Spectrum Analyzer	Agilent	E4440A	MY44303257	**Jul. 16 2013	1 year
10	*Spectrum Analyzer	Agilent	E4440A	MY44022567	Apr. 05 2013	1 year
11	*Spectrum Analyzer	R & S	FSP40	100361	**Jul. 16 2013	1 year
12	*Loop Antenna	R & S	HFH2-Z2	100279	Feb. 21 2012	2 year
13	Wideband Power Sensor	R & S	NRP-Z81	100634	**Jul. 16 2013	1 year
14	*Biconical Log Antenna	ARA	LPB-2520/A	1180	Apr. 26 2012	2 year
15	*Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-474	Aug. 13 2012	2 year
16	*Horn Antenna	Q-par Angus	QSH20S20	8179	Mar. 20 2013	2 year
17	*Horn Antenna	Q-par Angus	QSH22K20	8180	Mar. 20 2013	2 year
18	Trilog-Broadband Antenna	SCHWARZBECK	VULB 9163	9163-454	Feb. 24 2012	2 year
19	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	9168-257	Mar. 06 2013	2 year
20	*LISN	R & S	ESH3-Z5	833874/006	Oct. 08 2012	1 year
21	*LISN	R & S	ESH2-Z5	100227	Apr. 04 2013	1 year
22	*Position Controller	DAEIL EMC	N/A	N/A	N/A	N/A
23	*Turn Table	DAEIL EMC	N/A	N/A	N/A	N/A
24	*Antenna Mast	DAEIL EMC	N/A	N/A	N/A	N/A
25	*Shielded Room	EM Eng.	N/A	N/A	N/A	N/A
26	*Position Controller	INNCO	CO2000	1480406/L	N/A	N/A
27	*Turn Table	INNCO	DS1200S	N/A	N/A	N/A
28	*Antenna Mast	INNCO	MA4000	N/A	N/A	N/A
29	*Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
30	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A

Note(s)

- * Test equipment used during the test.
- ** The calibrations of these equipment were performed for 2 day (7/15~7/16) and they were not used to test during this period.
- *** The calibrations of these equipment were performed for a day (7/8) and they were not used to test during this period.

10. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95%

1. Conducted Uncertainty Calculation

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Receiver reading	RI	± 0.1	normal 1	1.000	0.1	1	0.1
Attenuation AMN-Receiver	LC	± 0.08	normal 2	2.000	0.04	1	0.04
AMN Voltage division factor	LAMN	± 0.8	normal 2	2.000	0.4	1	0.4
Sine wave voltage	dVSW	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	dVPA	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	dVPR	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	dVNF	± 0.00	-	-	0.00	1	0.00
AMN Impedance	dZ	± 1.80	triangular	2.449	0.73	1	0.73
Ⓐ Mismatch	M	+ 0.70	U-Shaped	1.414	0.49	1	0.49
Ⓑ Mismatch	M	- 0.80	U-Shaped	1.414	- 0.56	1	- 0.56
Measurement System Repeatability	RS	0.05	normal 1	1.000	0.05	1	0.05
Remark	Ⓐ: AMN-Receiver Mismatch : + Ⓑ: AMN-Receiver Mismatch : -						
Combined Standard Uncertainty	Normal			± 1.88			
Expended Uncertainty U	Normal ($k = 2$)			± 3.76			

2. Radiation Uncertainty Calculation

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Receiver reading	RI	± 0.10	normal 1	1.000	0.10	1	0.10
Sine wave voltage	dV_{sw}	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	dV_{pa}	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	dV_{pr}	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	dV_{nf}	± 0.50	normal 2	2.000	0.25	1	0.25
Antenna Factor Calibration	AF	± 1.50	normal 2	2.000	0.75	1	0.75
Attenuation Antenna-receiver	CL	± 0.52	normal 2	2.000	0.26	1	0.26
Antenna Directivity	AD	± 1.00	rectangular	1.732	0.58	1	0.58
Antenna Factor Height Dependence	AH	± 0.50	rectangular	1.732	0.29	1	0.29
Antenna Phase Centre Variation	AP	± 0.30	rectangular	1.732	0.17	1	0.17
Antenna Factor Frequency Interpolation	AI	± 0.30	rectangular	1.732	0.17	1	0.17
Site Imperfections	SI	± 4.00	triangular	2.449	1.63	1	1.63
Measurement Distance Variation	DV	± 0.10	rectangular	1.732	0.06	1	0.06
Antenna Balance	$Dbal$	± 0.90	rectangular	1.732	0.52	1	0.52
Cross Polarisation	$DCross$	± 0.90	rectangular	1.732	0.52	1	0.52
Ⓐ Mismatch	M	+ 0.25	U-Shaped	1.414	0.18	1	0.18
Ⓑ Mismatch	M	- 0.26	U-Shaped	1.414	- 0.18	1	- 0.18
Ⓒ Mismatch	M	+ 0.98	U-Shaped	1.414	0.69	1	0.69
Ⓓ Mismatch	M	- 1.11	U-Shaped	1.414	- 0.79	1	- 0.79
Measurement System Repeatability	RS	0.09	normal 1	1.000	0.09	1	0.09
Remark	Ⓐ: Biconical Antenna-receiver Mismatch : + (< 200 MHz) Ⓑ: Biconical Antenna-receiver Mismatch : - (< 200 MHz) Ⓒ: Log Periodic Antenna-receiver Mismatch : + ($\geq$ 200 MHz) Ⓓ: Log Periodic Antenna-receiver Mismatch : - ($\geq$ 200 MHz)						
Combined Standard Uncertainty	Normal			± 2.63 (< 200 MHz) ± 2.74 ($\geq$ 200 MHz)			
Expanded Uncertainty U	Normal ($k = 2$)			± 5.26 (< 200 MHz) ± 5.48 ($\geq$ 200 MHz)			