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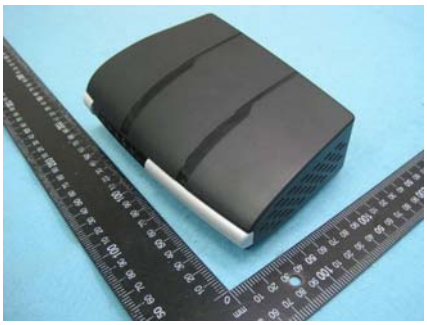
FCC RADIO TEST REPORT

Applicant's company	**Celeno Wireless Communication**
Applicant Address	26 Zarhin St. P.O. Box 4093 Ra'anana 43665 Israel
FCC ID	**Y7E-VXT1836000001**
Manufacturer's company	**ZINWELL CORPORATION**
Manufacturer Address	2, Wen-Hua Road, Hsinchu Industrial Park Hsinchu Hsien 303,Taiwan

Product Name	Single Band 5GHz WiFi HD Video Extender
Brand Name	VXT1836
Model Name	VXT1836
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250MHz
Received Date	Jun. 14, 2012
Final Test Date	Feb. 07, 2013
Submission Type	Original Equipment
Operating Mode	Master



Statement

Test result included is for the IEEE 802.11n (5150 ~ 5250MHz) of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009**, **47 CFR FCC Part 15 Subpart E**, **KDB 789033 D01 v01r02** and **KDB 662911 D01 v01r02.**

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR261473AB	Rev. 01	Initial issue of report	Jan. 08, 2013
FR261473AB	Rev. 02	Changed the brand name	Jan. 25, 2013
FR261473AB	Rev. 03	Revised the applicant's company name and applicant address.	Jan. 25, 2013

Certificate No.: CB10201015

1. CERTIFICATE OF COMPLIANCE

Product Name	:	Single Band 5GHz WIFI HD Video Extender
Brand Name	:	VXT1836
Model Name	:	VXT1836
Applicant	:	Celeno Wireless Communication
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jun. 14, 2012 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Jordan Hsiao

Jordan Hsiao
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	Rule Section	Description of Test	Result	Under Limit
4.1	15.207	AC Power Line Conducted Emissions	Complies	5.15 dB
4.2	15.407(a)	26dB Spectrum Bandwidth	Complies	-
4.3	15.407(a)	Maximum Conducted Output Power	Complies	0.09dB
4.4	15.407(a)	Power Spectral Density	Complies	0.03 dB
4.5	15.407(a)	Peak Excursion	Complies	4.48 dB
4.6	15.407(b)	Radiated Emissions	Complies	3.96dB
4.7	15.407(b)	Transmitter Conducted Bandedge Emissions	Complies	AV: 1.61dB PK: 6.71dB
4.8	15.407(g)	Frequency Stability	Complies	-
4.9	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Conducted Output Power	±0.5dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
Peak Excursion	±0.5dB	Confidence levels of 95%
26dB Spectrum Bandwidth / Frequency Stability	$\pm 8.5\times10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	Confidence levels of 95%
Temperature	±0.7℃	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From Power Adapter
Modulation	see the below table for IEEE 802.11n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n
Frequency Range	5150 ~ 5250MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth
Channel Band Width (99%)	MCS0 (20MHz): 18.40 MHz ; MCS0 (40MHz): 36.48 MHz
Maximum Conducted Output Power	MCS0 (20MHz): 16.91 dBm ; MCS0 (40MHz): 16.83 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3
The product has beam-forming function.	

Antenna & Band width

Antenna	Three (TX)	
Band width Mode	20 MHz	40 MHz
IEEE 802.11n	V	V

IEEE 802.11n spec

MCS	Spatial	Modulation	Coding	Data rate (Mbit/s)			
Index	Streams	Type	Rate	20 MHz channel		40 MHz channel	
				800 ns GI	400 ns GI	800 ns GI	400 ns GI
0	1	BPSK	1/2	6.5	7.2	13.5	15
1	1	QPSK	1/2	13	14.4	27	30
2	1	QPSK	3/4	19.5	21.7	40.5	45
3	1	16-QAM	1/2	26	28.9	54	60
4	1	16-QAM	3/4	39	43.3	81	90
5	1	64-QAM	2/3	52	57.8	108	120
6	1	64-QAM	3/4	58.5	65	121.5	135
7	1	64-QAM	5/6	65	72.2	135	150
8	2	BPSK	1/2	13	14.4	27	30
9	2	QPSK	1/2	26	28.9	54	60
10	2	QPSK	3/4	39	43.3	81	90
11	2	16-QAM	1/2	52	57.8	108	120
12	2	16-QAM	3/4	78	86.7	162	180
13	2	64-QAM	2/3	104	115.6	216	240
14	2	64-QAM	3/4	117	130	243	270
15	2	64-QAM	5/6	130	144.4	270	300
16	3	BPSK	1/2	19.5	21.7	40.5	45
17	3	QPSK	1/2	39	43.3	81	90
18	3	QPSK	3/4	58.5	65	121.5	135
19	3	16-QAM	1/2	78	86.7	162	180
20	3	16-QAM	3/4	117	130	243	270
21	3	64-QAM	2/3	156	173.3	324	360
22	3	64-QAM	3/4	175.5	195	364.5	405
23	3	64-QAM	5/6	195	216.7	405	450

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	guard interval

3.2. Accessories

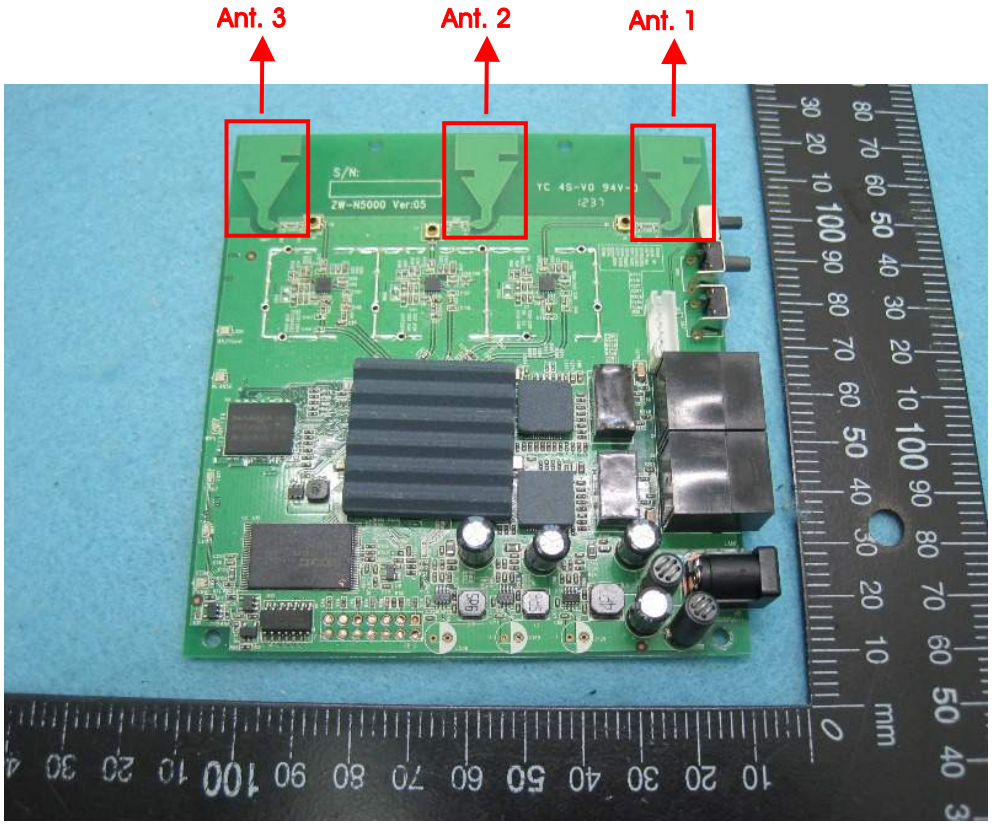
Power	Brand Holder	Model	Rating
Adapter	Asian Power Devices Inc.	WA-12M12FU	Input: 100-240V~50-60Hz, 0.5A Max. Ouput: 12V, 1A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Antenna Gain (dBi)		Remark
					5GHz Band 1	5GHz Band 4	
1	Celeno	OPTIMIZAIR™ SMART PRINTED ANTENNA	PCB Antenna	NA	0.9	2.3	TX, RX
2	Celeno	OPTIMIZAIR™ SMART PRINTED ANTENNA	PCB Antenna	NA	0.9	2.3	TX, RX
3	Celeno	OPTIMIZAIR™ SMART PRINTED ANTENNA	PCB Antenna	NA	0.9	2.3	TX, RX

Note: The EUT has three antennas.

Ant. 1, Ant. 2, Ant. 3 could transmit/receive simultaneously.



3.4. Table for Carrier Frequencies

There are two bandwidth systems for IEEE 802.11n.

For both 20MHz bandwidth systems, use Channel 36, 40, 44, 48.

For both 40MHz bandwidth systems, use Channel 38, 46.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode		Data Rate	Channel	Antenna
AC Power Conducted Emission	Normal Link		Auto	-	-
Max. Conducted Output Power	MCS0/20MHz	Band 1	6.5 Mbps	36/40/48	1/2/3/1+2+3
	MCS0/40MHz	Band 1	13.5 Mbps	38/46	1/2/3/1+2+3
Power Spectral Density	MCS0/20MHz	Band 1	6.5 Mbps	36/40/48	1+2+3
	MCS0/40MHz	Band 1	13.5 Mbps	38/46	1+2+3
26dB Spectrum Bandwidth 99% Occupied Bandwidth Measurement Peak Excursion	MCS0/20MHz	Band 1	6.5 Mbps	36/40/48	1+2+3
	MCS0/40MHz	Band 1	13.5 Mbps	38/46	1+2+3
Radiated Emission Below 1GHz	Normal Link		Auto	-	-
Radiated Emission Above 1GHz	MCS0/20MHz	Band 1	6.5 Mbps	36/40/48	1+2+3
	MCS0/40MHz	Band 1	13.5 Mbps	38/46	1+2+3
Band Edge Emission	MCS0/20MHz	Band 1	6.5 Mbps	36/40/48	1+2+3
	MCS0/40MHz	Band 1	13.5 Mbps	38/46	1+2+3
Frequency Stability	Un-modulation		-	40	N/A

The following test modes were performed for all tests:

For Conducted Emission test:

Mode 1. AP Mode

Mode 2. Client Mode

Mode 1 generated the worst test result, so it was recorded in the report.

For Radiated Emission Below 1GHz test:

Mode 1. AP Mode

Mode 2. Client Mode

Mode 2 generated the worst test result, so it was recorded in the report.

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	262045	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

Please refer section 6 for Test Site Address.

3.7. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6250	E2K4965AGNM
Notebook	DELL	E6220	E2K4965AGNM
Wireless AP	Planex	GW-AP54SGX	N/A
Notebook	DELL	M1330	E2KWM3945ABG

3.8. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

Power Parameters of IEEE 802.11n MCS0 20MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Test Software Version	Ranlink QA Test program for RT3883		
Frequency	5180 MHz	5200 MHz	5240 MHz
MCS0 20MHz	07/04/0D	07/04/0D	08/05/0C

Power Parameters of IEEE 802.11n MCS0 40MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

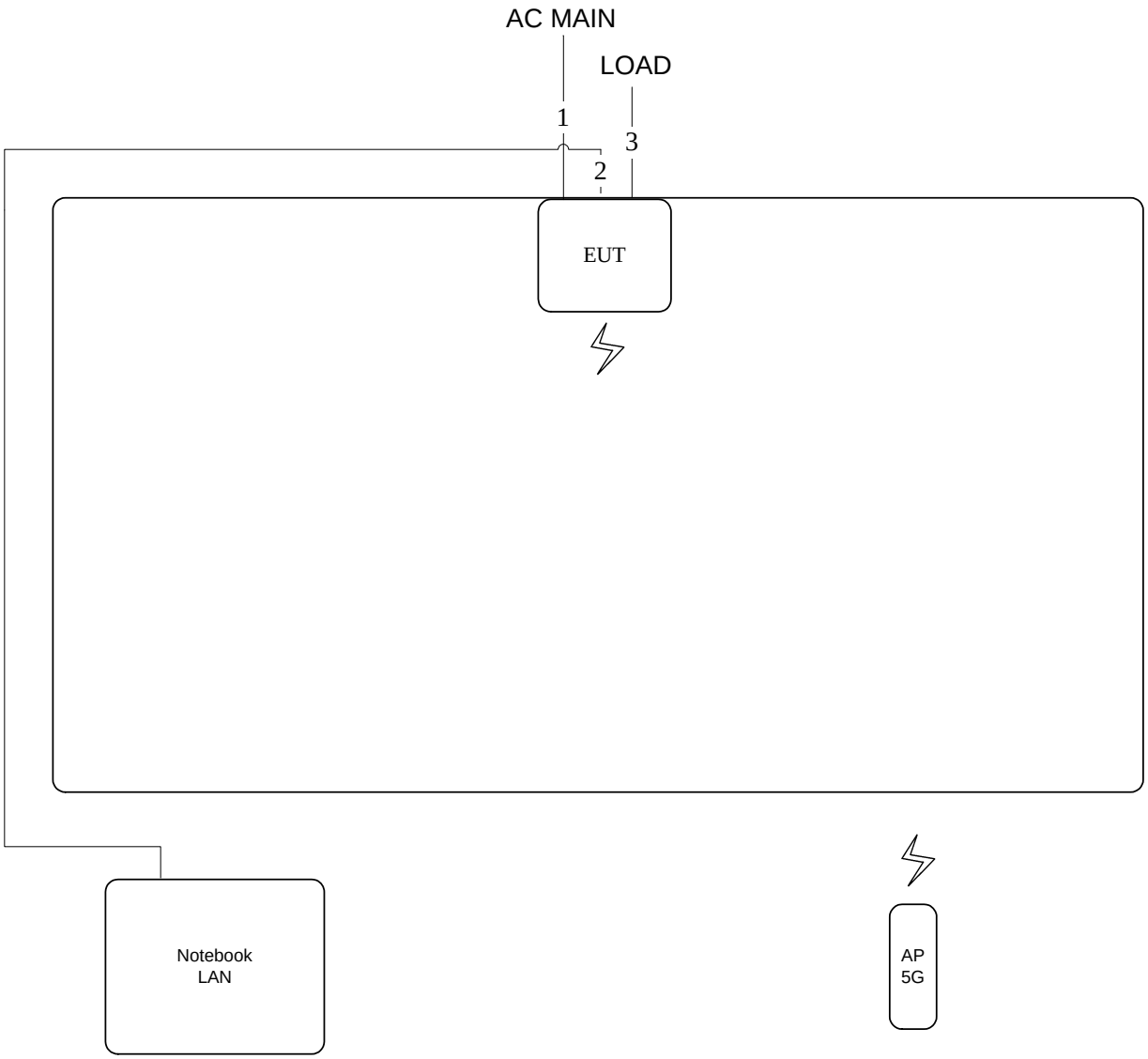
Test Software Version	Ranlink QA Test program for RT3883	
Frequency	5190 MHz	5230 MHz
MCS0 40MHz	04/02/0A	08/06/0D

During the test, "Ranlink QA Test program for RT3883" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

3.9. Test Configurations

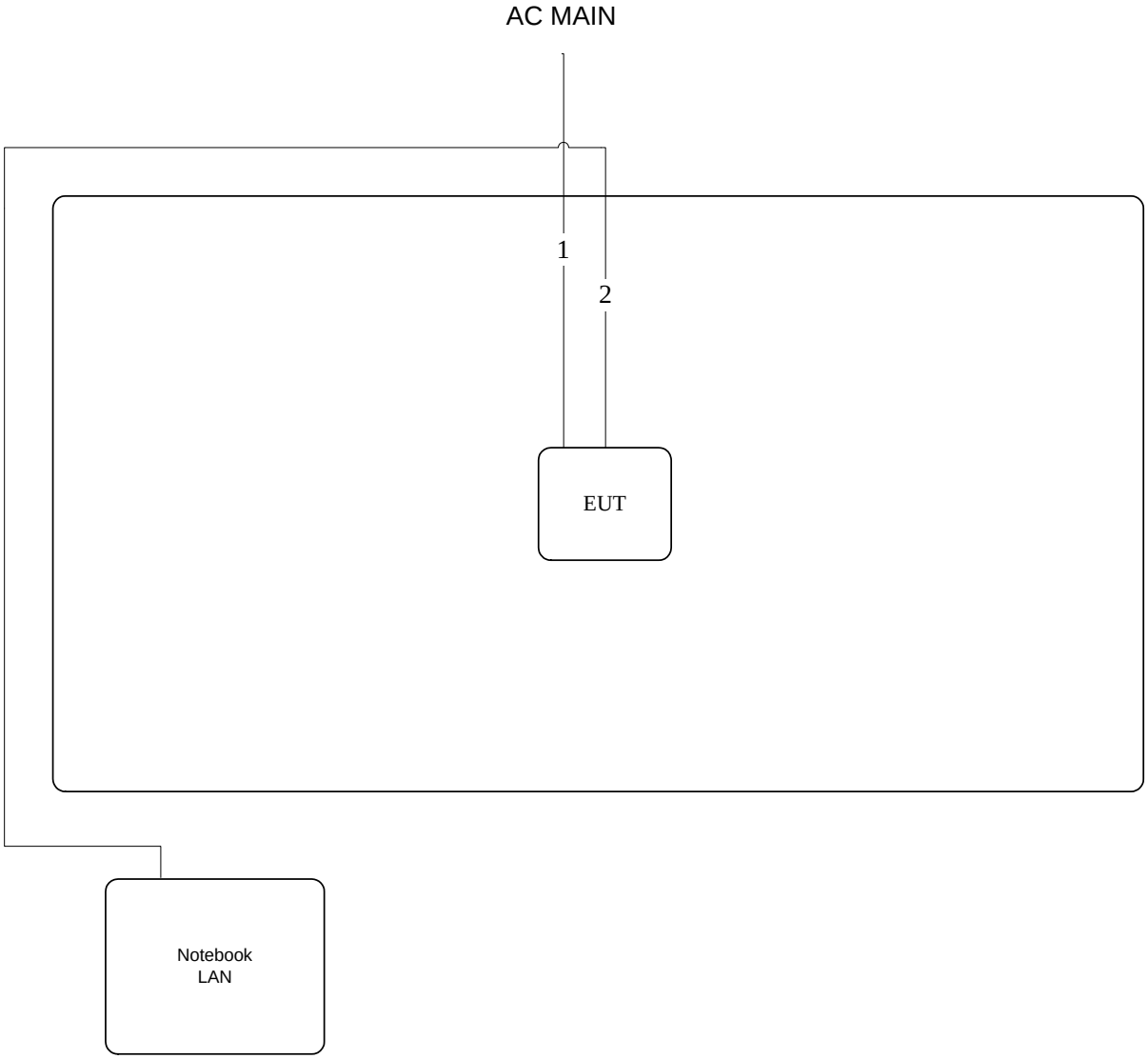
3.9.1. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz / Test Mode: Mode 2. Client Mode



Item	Connection	Shield	Length
1	Power Cable	No	1.5m
2	RJ-45 Cable	No	10m
3	RJ-45 Cable	No	1.5m

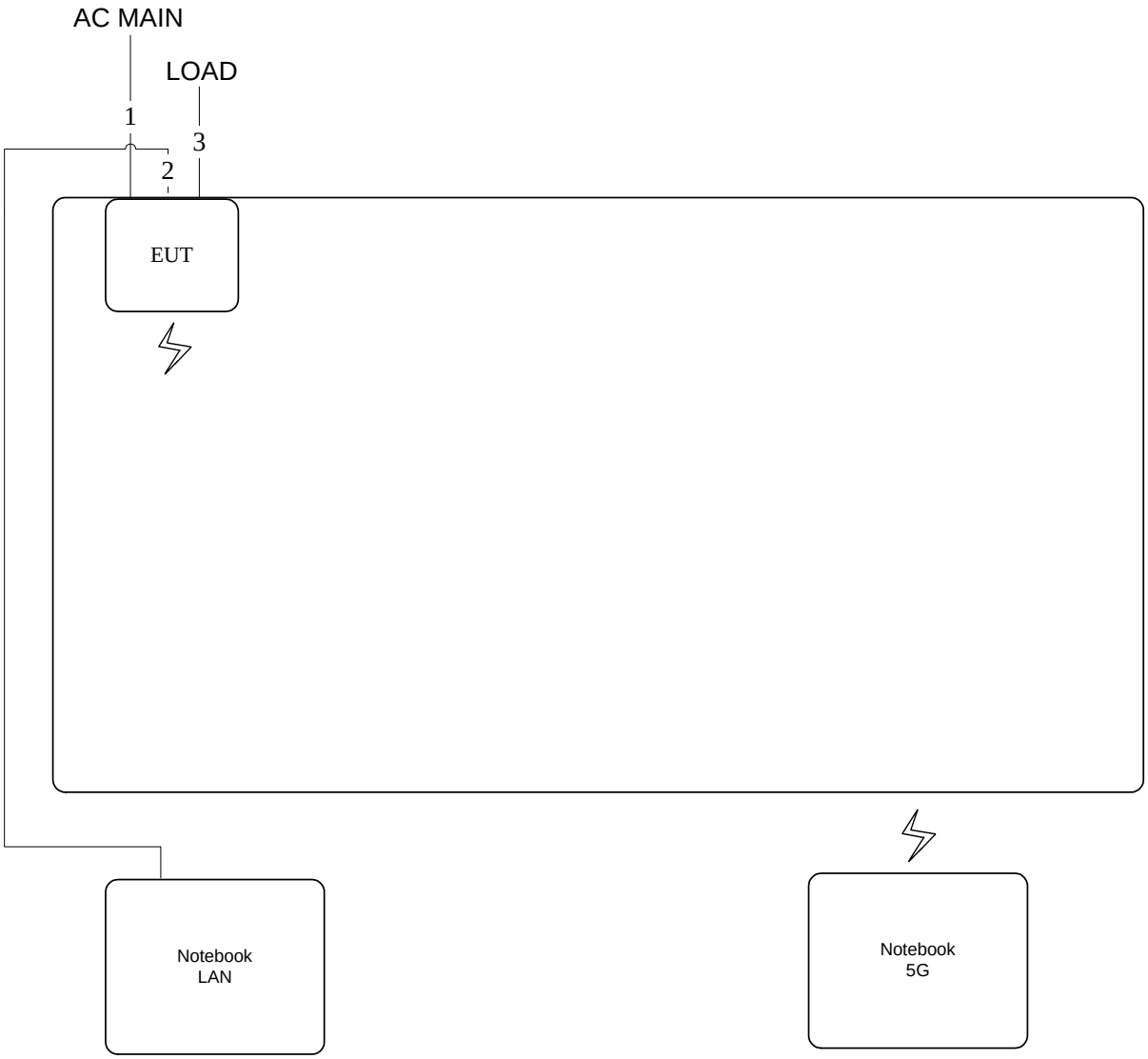
Test Configuration: above 1GHz



Item	Connection	Shield	Length
1	Power Cable	No	1.5m
2	RJ-45 Cable	No	10m

3.9.2. AC Power Line Conduction Emissions Test Configuration

Test Mode: Mode 1. AP Mode



Item	Connection	Shield	Length
1	Power Cable	No	1.5m
2	RJ-45 Cable	No	10m
3	RJ-45 Cable	No	1.5m

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product that is designed to connect to the 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 below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

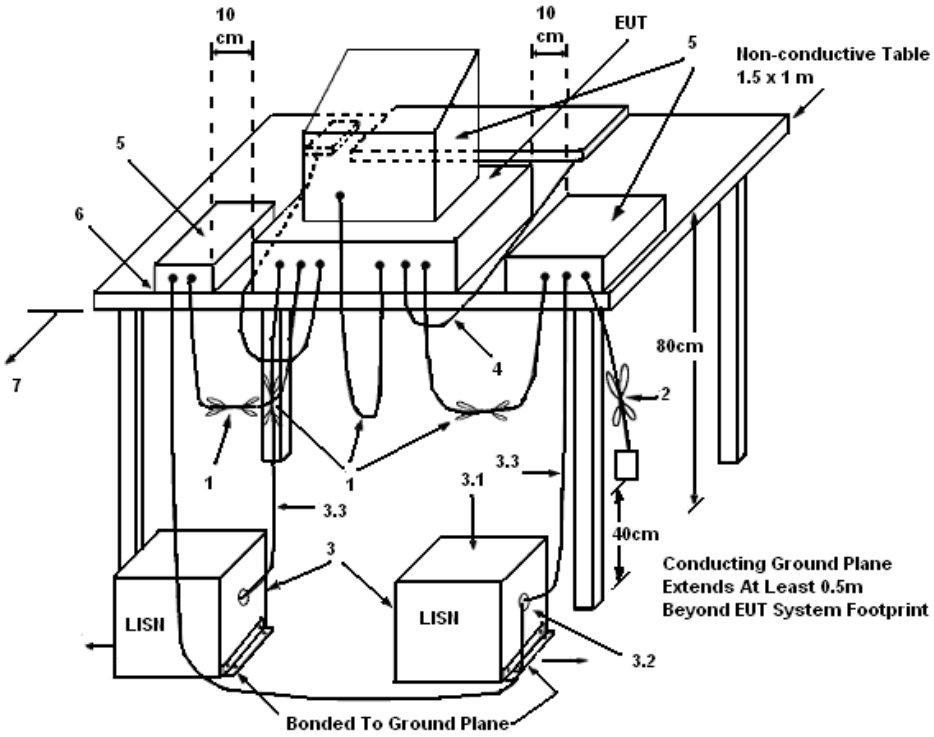
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



LEGEND:

(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

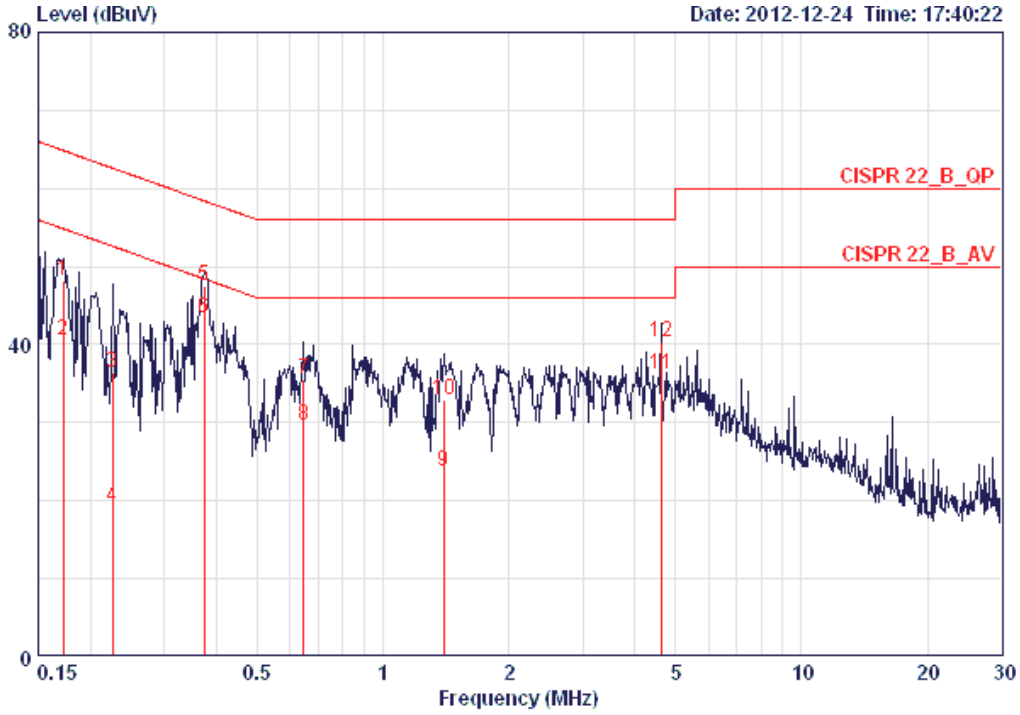
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

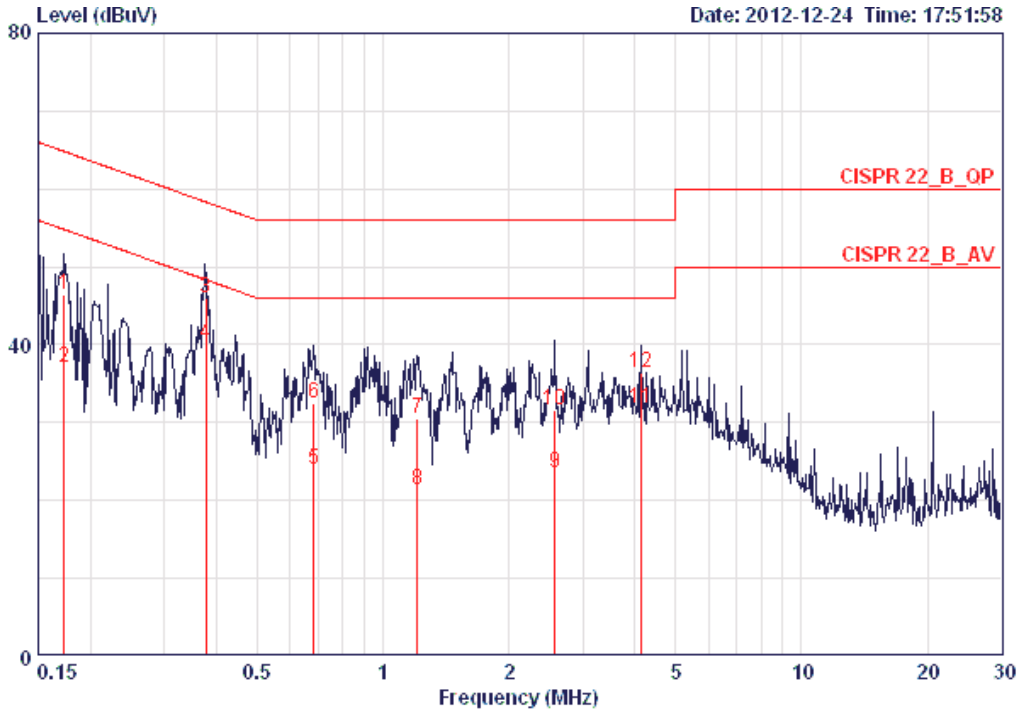
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	60%
Test Engineer	Sollo Luo	Phase	Line
Test Mode	Mode 1. AP Mode	Configuration	Normal Link



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.17215	48.16	-16.70	64.86	47.81	0.16	0.19	LINE	QP
2	0.17215	40.60	-14.26	54.86	40.25	0.16	0.19	LINE	AVERAGE
3	0.22556	36.45	-26.16	62.61	36.10	0.15	0.20	LINE	QP
4	0.22556	19.09	-33.52	52.61	18.74	0.15	0.20	LINE	AVERAGE
5	0.37314	47.45	-10.98	58.43	47.10	0.15	0.20	LINE	QP
6 @	0.37314	43.28	-5.15	48.43	42.93	0.15	0.20	LINE	AVERAGE
7	0.64740	35.51	-20.49	56.00	35.15	0.16	0.20	LINE	QP
8	0.64740	29.62	-16.38	46.00	29.26	0.16	0.20	LINE	AVERAGE
9	1.396	23.70	-22.30	46.00	23.31	0.18	0.21	LINE	AVERAGE
10	1.396	32.83	-23.17	56.00	32.44	0.18	0.21	LINE	QP
11	4.632	36.11	-9.89	46.00	35.56	0.23	0.31	LINE	AVERAGE
12	4.632	40.27	-15.73	56.00	39.72	0.23	0.31	LINE	QP

Temperature	25°C	Humidity	60%
Test Engineer	Sollo Luo	Phase	Neutral
Test Mode	Mode 1. AP Mode	Configuration	Normal Link



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.17307	46.36	-18.45	64.81	46.09	0.08	0.19	NEUTRAL	QP
2	0.17307	37.03	-17.78	54.81	36.76	0.08	0.19	NEUTRAL	AVERAGE
3	0.37787	46.01	-12.32	58.33	45.73	0.08	0.20	NEUTRAL	QP
4	0.37787	40.15	-8.18	48.33	39.87	0.08	0.20	NEUTRAL	AVERAGE
5	0.68263	23.98	-22.02	46.00	23.70	0.08	0.20	NEUTRAL	AVERAGE
6	0.68263	32.46	-23.54	56.00	32.18	0.08	0.20	NEUTRAL	QP
7	1.210	30.44	-25.56	56.00	30.14	0.09	0.21	NEUTRAL	QP
8	1.210	21.43	-24.57	46.00	21.13	0.09	0.21	NEUTRAL	AVERAGE
9	2.581	23.53	-22.47	46.00	23.17	0.12	0.24	NEUTRAL	AVERAGE
10	2.581	31.52	-24.48	56.00	31.16	0.12	0.24	NEUTRAL	QP
11	4.121	31.74	-14.26	46.00	31.31	0.13	0.30	NEUTRAL	AVERAGE
12	4.121	36.47	-19.53	56.00	36.04	0.13	0.30	NEUTRAL	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

4.2. 26dB Bandwidth Measurement

4.2.1. Limit

No restriction limits. But resolution bandwidth within band edge measurement is 1% of the 99% occupied bandwidth.

4.2.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 26dB Bandwidth
RB	300 kHz
VB	3000 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 300 kHz and the video bandwidth of 3000 kHz were used.
3. Measured the spectrum width with power higher than 26dB below carrier.

4.2.4. Test Setup Layout

4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of 26dB Occupied Bandwidth

Temperature	20°C	Humidity	61%
Test Engineer	Denis Su	Configurations	IEEE 802.11n

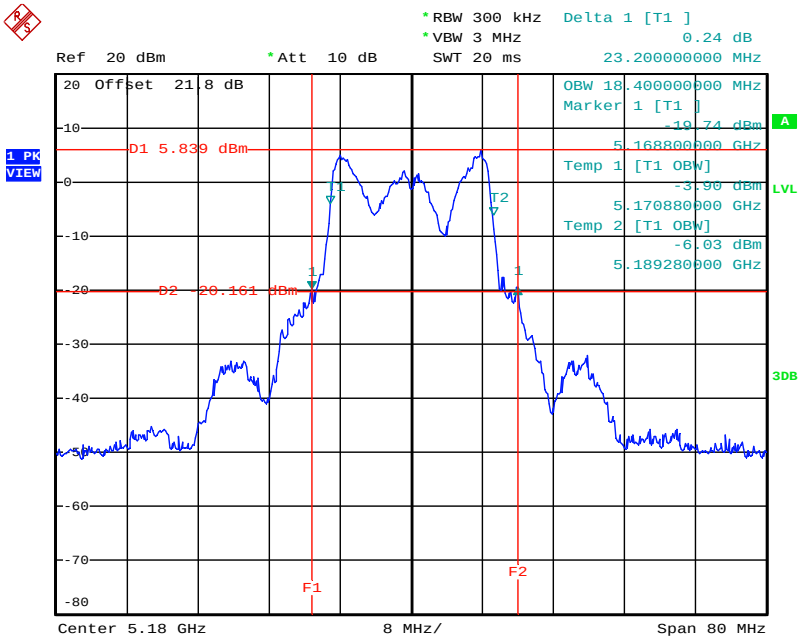
Configuration IEEE 802.11n MCS0 20MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
36	5180 MHz	23.20	18.40
40	5200 MHz	22.88	18.24
48	5240 MHz	21.28	18.24

Configuration IEEE 802.11n MCS0 40MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Channel	Frequency	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	5190 MHz	37.76	35.52
46	5230 MHz	39.68	36.48

26 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 5180 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



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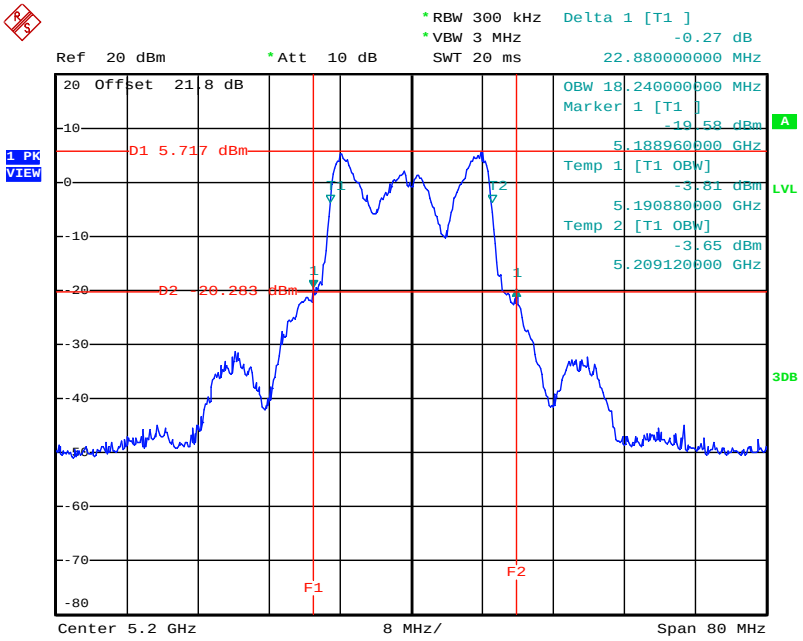
26 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 5200 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



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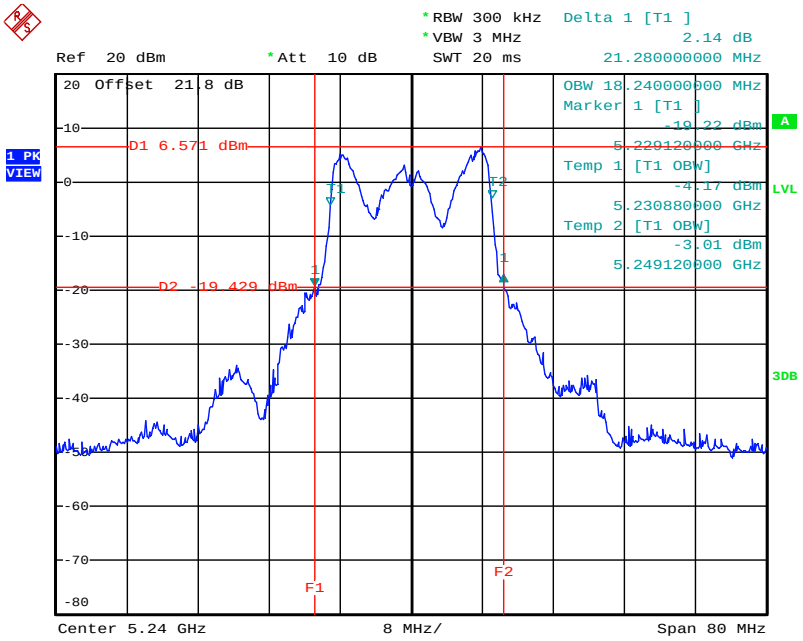
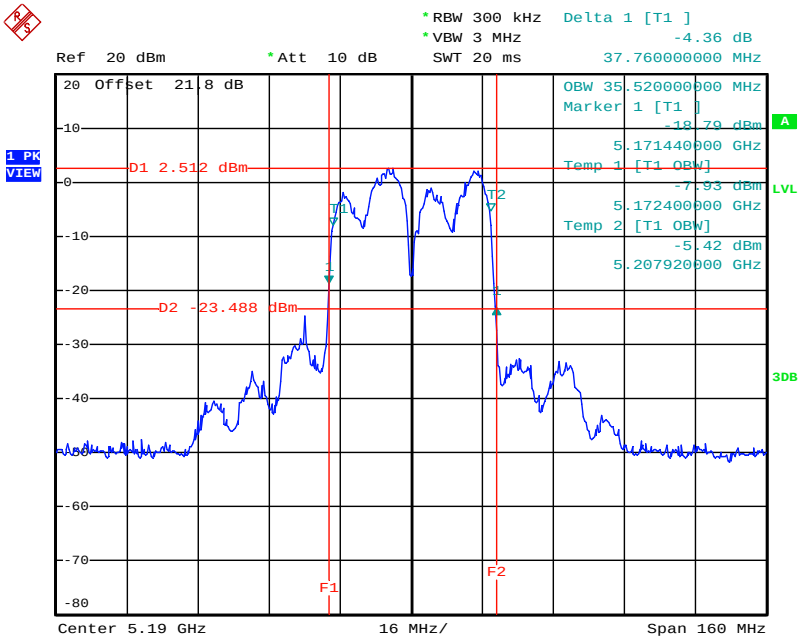
26 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / 5240 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



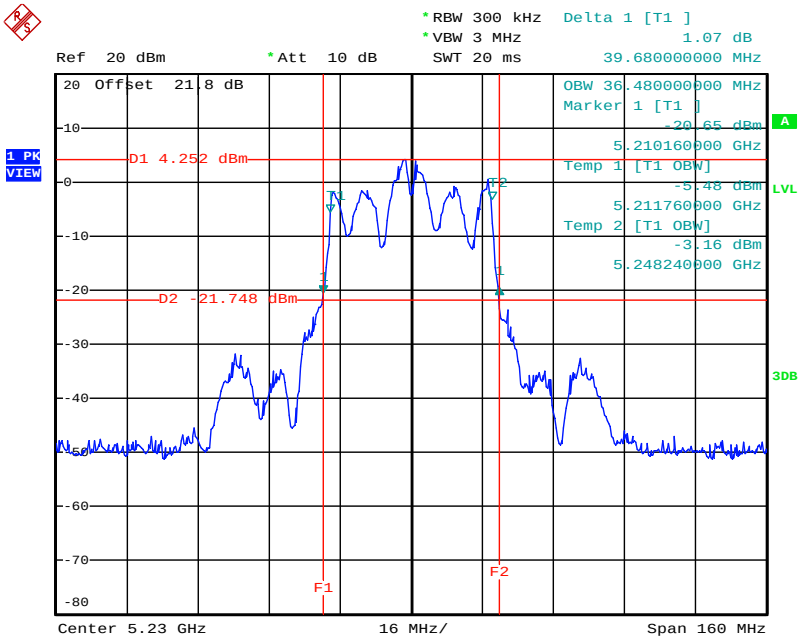
Date: 24.DEC.2012 10:48:54

26 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / 5190 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



Date: 24.DEC.2012 10:43:17

26 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / 5230 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



Date: 24.DEC.2012 10:41:27

4.3. Maximum Conducted Output Power Measurement

4.3.1. Limit

For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B, where B is the 26 dB emissions bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.3.2. Measuring Instruments and Setting

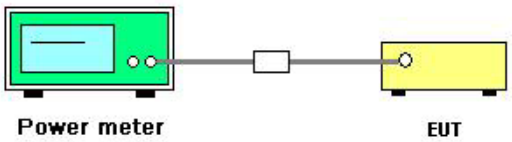
The following table is the setting of the peak power meter.

Power Meter Parameter	Setting
Bandwidth	50MHz bandwidth is greater than the EUT emission bandwidth
Detector	AVERAGE

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB 789033 Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E,section (C) Maximum conducted output power =>(4) Method PM (Measurement using an RF average power meter) Multiple antenna systems was performed in accordance with KDB 662911 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
3. When measuring maximum conducted output power with multiple antenna systems,add every result of the values by mathematic formula.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Maximum Conducted Output Power

Temperature	20°C	Humidity	61%
Test Engineer	Denis Su	Configurations	IEEE 802.11n
Test Date	Dec. 24, 2012		

Configuration IEEE 802.11n MCS0 20MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Channel	Frequency	Conducted Power (dBm)			Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 1	Ant. 2	Ant. 3			
36	5180 MHz	12.06	12.21	12.12	16.90	17.00	Complies
40	5200 MHz	12.15	12.17	12.09	16.91	17.00	Complies
48	5240 MHz	12.18	11.91	11.98	16.80	17.00	Complies

Note: Directional gain=Gant+10*log(Nant/Nss) = 5.67dBi<6dBi, so Limit = 17dBm.

Configuration IEEE 802.11n MCS0 40MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Channel	Frequency	Conducted Power (dBm)			Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 1	Ant. 2	Ant. 3			
38	5190 MHz	10.96	11.05	10.91	15.74	17.00	Complies
46	5230 MHz	12.24	11.98	11.95	16.83	17.00	Complies

Note: Directional gain=Gant+10*log(Nant/Nss) = 5.67dBi<6dBi, so Limit = 17dBm.

4.4. Power Spectral Density Measurement

4.4.1. Limit

The power spectral density is defined as the highest level of power in dBm per MHz generated by the transmitter within the power envelope. The following table is power spectral density limits and decrease power density limit rule refer to section 4.3.1.

Frequency Range	Power Spectral Density limit (dBm/MHz)
5.15~5.25 GHz	4

4.4.2. Measuring Instruments and Setting

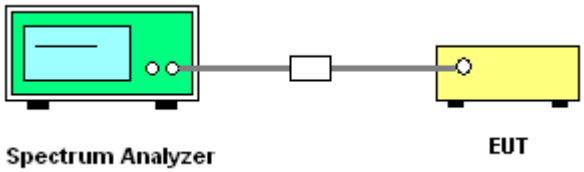
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1000 kHz
VB	3000 kHz
Detector	RMS
Trace	AVERAGE
Sweep Time	Auto
Trace Average	100 times

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected RF switch to the spectrum analyzer.
2. Test was performed in accordance with KDB 789033 Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E,section (C) Maximum conducted output power => (d) Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).
3. Multiple antenna systems was performed in accordance with KDB 662911 in-Band Power Spectral Density (PSD) Measurements (1) Measure and sum the spectra across the outputs.
4. When measuring first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3 and so on up to the Nth output to obtain the value for the first frequency bin of the summed spectrum. The summed spectrum value for each of the other frequency bins is computed in the same way.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Power Spectral Density

Temperature	20°C	Humidity	61%
Test Engineer	Denis Su	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS0 20MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
36	5180 MHz	3.91	4.00	Complies
40	5200 MHz	3.92	4.00	Complies
48	5240 MHz	3.97	4.00	Complies

Note: Directional gain =Gant+10*log(Nant/Nss) =5.67dBi <6dBi, so Limit =4dBm/MHz.

Configuration IEEE 802.11n MCS0 40MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

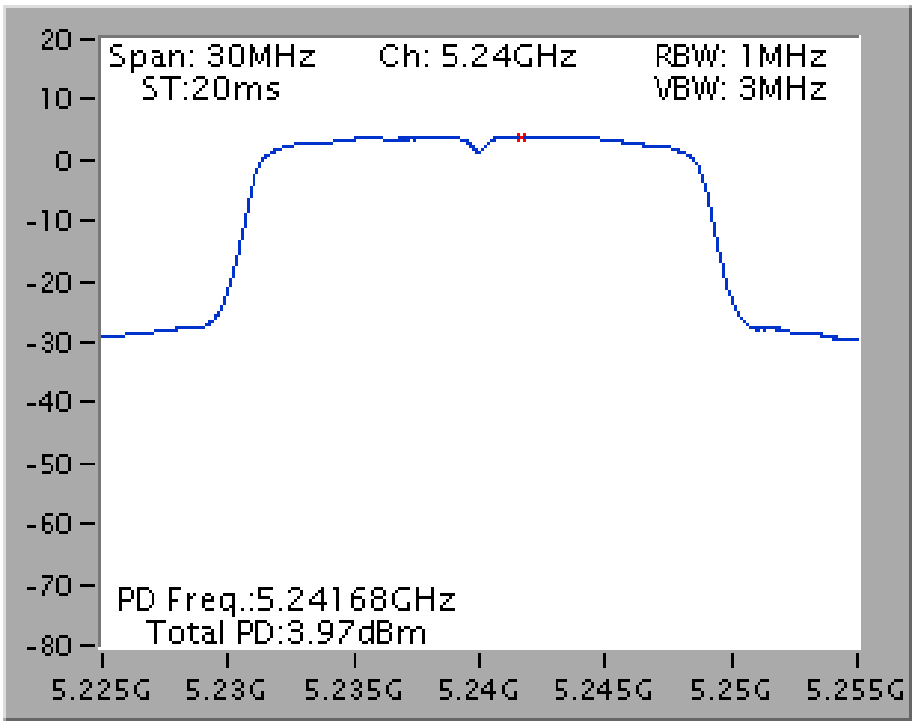
Channel	Frequency	Power Density (dBm/MHz)	Max. Limit (dBm/MHz)	Result
38	5190 MHz	0.31	4.00	Complies
46	5230 MHz	1.82	4.00	Complies

Note: Directional gain =Gant+10*log(Nant/Nss) =5.67dBi <6dBi,So Band1 Limit =4dBm/MHz.

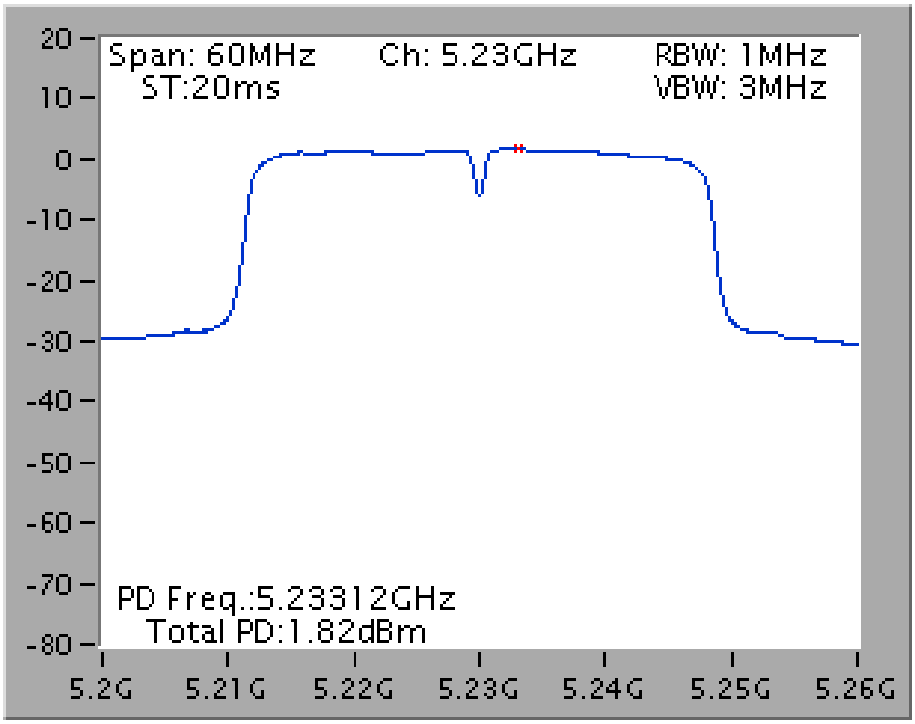
Note: All the test values were listed in the report.

For plots, only the channel with maximum results was shown.

Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / 5240 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



Power Density Plot on Configuration IEEE 802.11n MCS0 40MHz / 5230 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



4.5. Peak Excursion Measurement

4.5.1. Limit

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emissions bandwidth whichever is less.

4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1MHz (Peak Trace) / 1MHz (Average Trace)
VB	3MHz (Peak Trace) / 3MHz (Average Trace)
Detector	Peak (Peak Trace) / RMS
Trace	Peak : Trace :Max hold/Average: Trace Average Sweep Count 100
Sweep Time	AUTO

4.5.3. Test Procedures

1. The test procedure is the same as section 4.6.3.
2. Trace A, Set RBW =1MHz, VBW = 3MHz, Span >26dB bandwidth, Max. hold.
3. Delta Mark trace A Maximum frequency and trace B same frequency.
4. Repeat the above procedure until measurements for all frequencies were complete.

4.5.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.6.4.

4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Test Result of Peak Excursion

Temperature	20°C	Humidity	61%
Test Engineer	Denis Su	Configurations	IEEE 802.11n

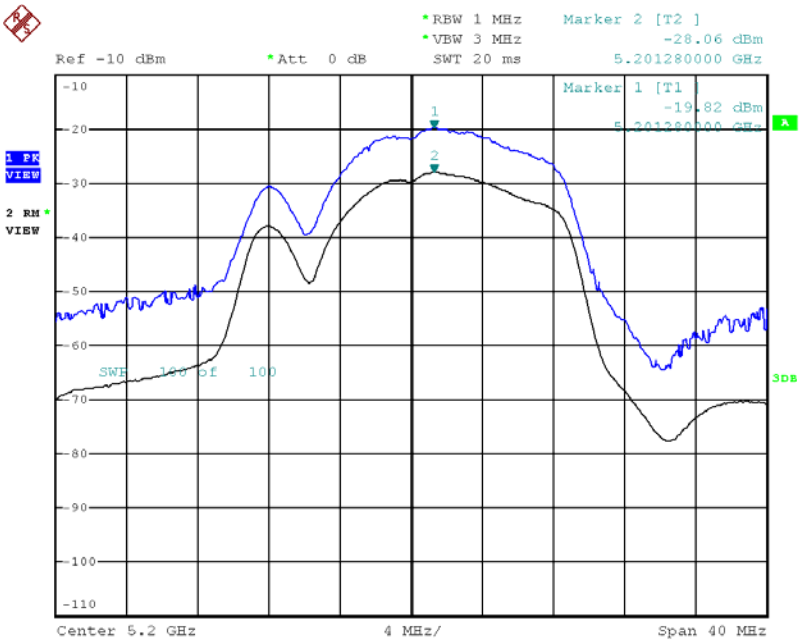
Configuration IEEE 802.11n MCS0 20MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Channel	Frequency	Peak Excursion (dB)	Max. Limit (dB)	Result
40	5200 MHz	8.24	13	Complies

Configuration IEEE 802.11n MCS0 40MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)

Channel	Frequency	Peak Excursion (dB)	Max. Limit (dB)	Result
46	5230 MHz	8.52	13	Complies

Peak Excursion Plot on Configuration IEEE 802.11n MCS0 20MHz / 5200 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



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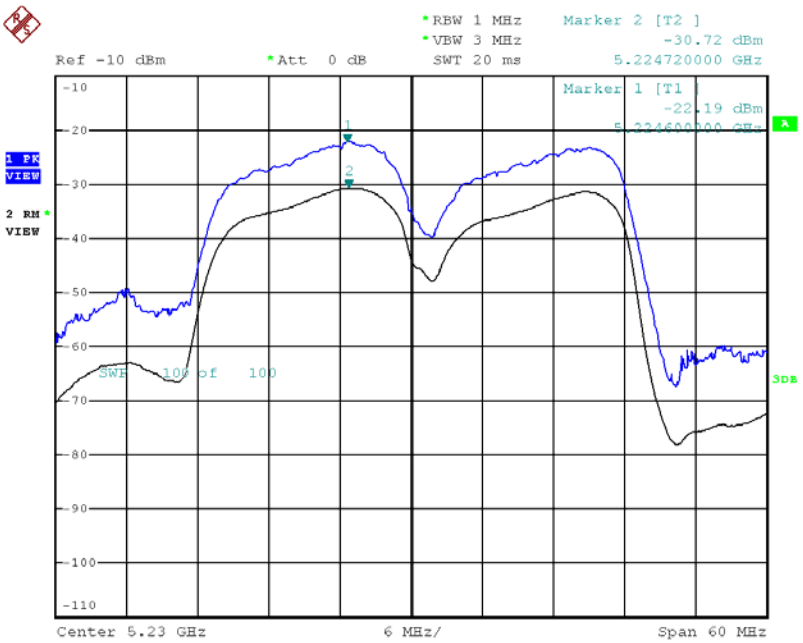
Peak Excursion Plot on Configuration IEEE 802.11n MCS0 40MHz / 5230 MHz / Ant. 1+Ant. 2+Ant. 3 (3TX)



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4.6. Radiated Emissions Measurement

4.6.1. Limit

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz (68.3dBuV/m at 3m). For transmitters operating in the In addition, In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

4.6.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	40 GHz
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for peak

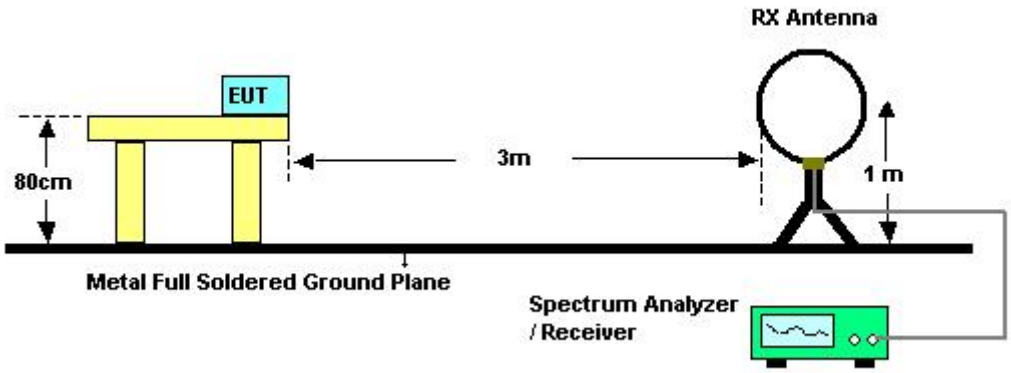
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.6.3. Test Procedures

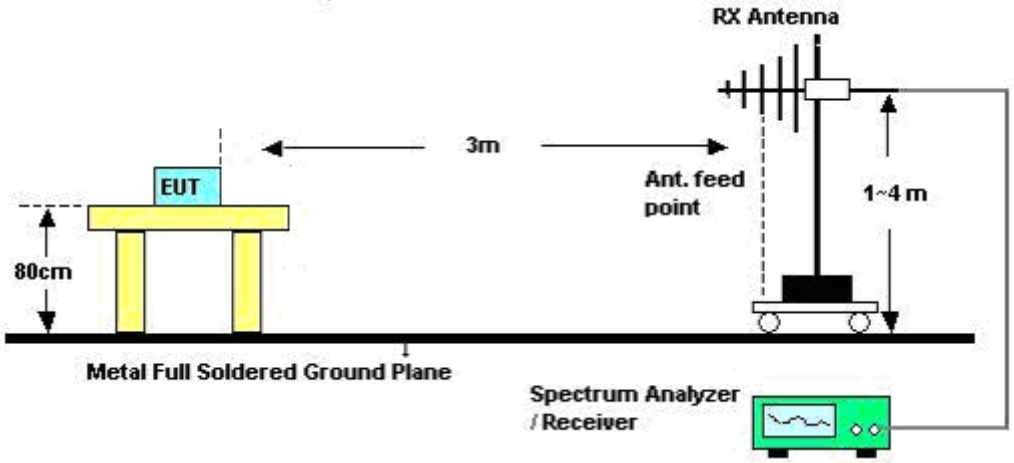
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.6.4. Test Setup Layout

For radiated emissions below 1GHz



For radiated emissions above 1GHz



4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	24.5°C	Humidity	57%
Test Engineer	Satoshi Yang	Configurations	Normal Link
Test Date	Nov. 12, 2012		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

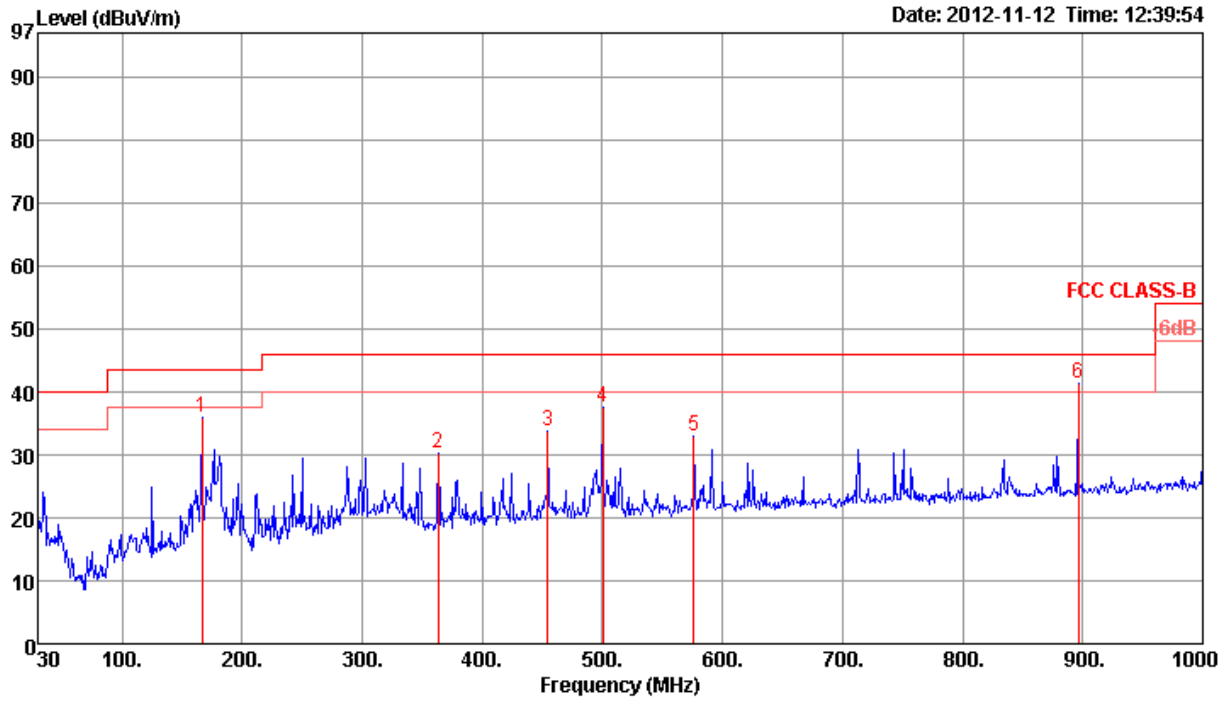
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

4.6.8. Results of Radiated Emissions (30MHz~1GHz)

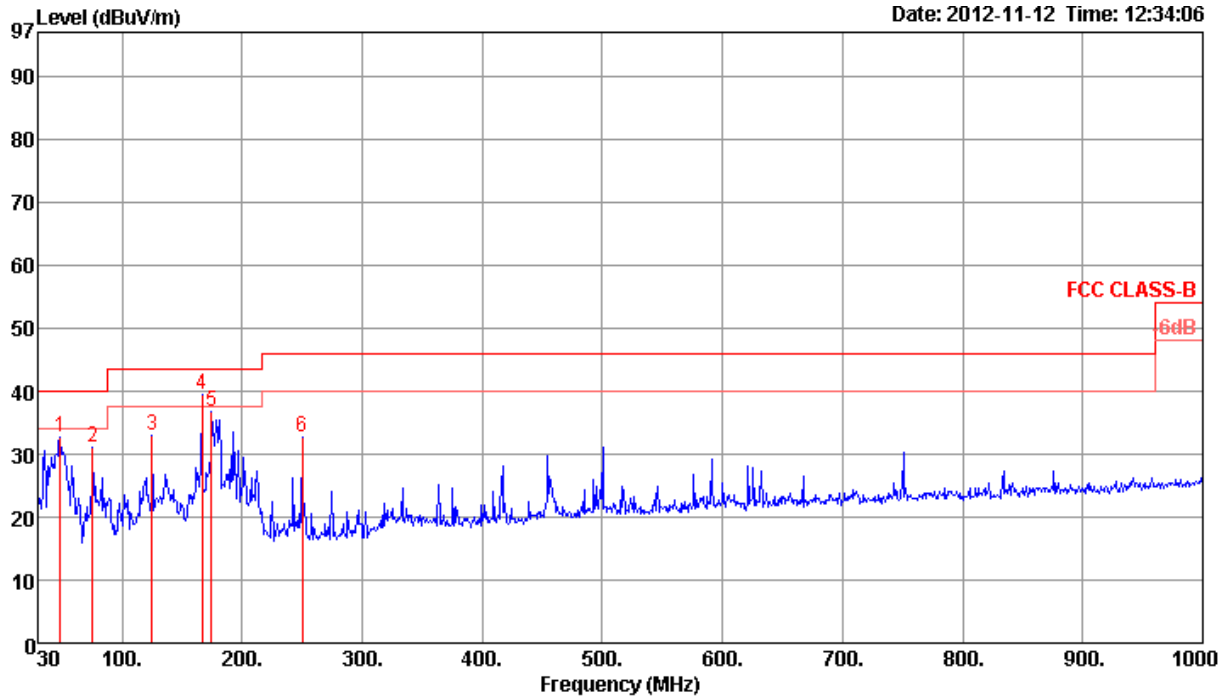
Temperature	24.5°C	Humidity	57%
Test Engineer	Satoshi Yang	Configurations	Normal Link
Test Mode	Mode 2. Client Mode		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	166.77	36.04	43.50	-7.46	49.24	1.53	27.27	12.54	0	400	Peak	HORIZONTAL
2	363.68	30.38	46.00	-15.62	40.41	2.23	27.35	15.09	0	400	Peak	HORIZONTAL
3	454.86	33.75	46.00	-12.25	42.09	2.61	27.87	16.92	0	400	Peak	HORIZONTAL
4	500.45	37.44	46.00	-8.56	45.21	2.70	28.10	17.63	0	400	Peak	HORIZONTAL
5	576.11	32.96	46.00	-13.04	39.72	2.85	28.10	18.49	0	400	Peak	HORIZONTAL
6 p	896.21	41.34	46.00	-4.66	44.67	3.58	27.41	20.50	0	400	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m	deg	cm		
1	48.43	32.56	40.00	-7.44	50.53	0.70	27.80	9.13	0	400	Peak	VERTICAL
2	75.59	31.05	40.00	-8.95	50.89	0.93	27.70	6.93	0	400	Peak	VERTICAL
3	125.06	33.02	43.50	-10.48	47.04	1.25	27.48	12.21	0	400	Peak	VERTICAL
4 p	166.77	39.54	43.50	-3.96	52.74	1.53	27.27	12.54	0	400	Peak	VERTICAL
5	174.53	36.70	43.50	-6.80	49.24	1.57	27.23	13.12	0	400	Peak	VERTICAL
6	250.19	32.73	46.00	-13.27	45.06	1.90	27.00	12.77	0	400	Peak	VERTICAL

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.6.9. Results for Radiated Emissions (1GHz~40GHz)

Temperature	20°C	Humidity	63%
Test Engineer	Jim Huang	Configurations	IEEE 802.11n MCS0 20MHz Ch 36 / Ant. 1+Ant. 2+Ant. 3 (3TX)
Test Date	Nov. 20, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	15538.84	55.90	69.23	-13.33	44.35	7.85	34.79	38.49	Peak	294	100	HORIZONTAL
2 a	15544.96	43.22	49.23	-6.01	31.66	7.86	34.79	38.49	Average	294	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	15535.40	57.27	69.23	-11.96	45.72	7.85	34.79	38.49	Peak	230	100	VERTICAL
2 a	15537.16	43.37	49.23	-5.86	31.82	7.85	34.79	38.49	Average	230	100	VERTICAL

Note:

The product has beam-forming function.

So average limit = 54dBuV/m-(10log(N))=54dBuV/m-4.77dB=49.23dBuV/m.

Peak limit = 74dBuV/m-(10log(N))=74dBuV/m-4.77dB=69.23dBuV/m.

Temperature	20℃	Humidity	63%
Test Engineer	Jim Huang	Configurations	IEEE 802.11n MCS0 20MHz Ch 40 / Ant. 1+Ant. 2+Ant. 3 (3TX)
Test Date	Nov. 20, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	15620.20	54.64	69.23	-14.59	43.14	7.88	34.86	38.48	Peak	96	100	HORIZONTAL
2 a	15620.80	42.42	49.23	-6.81	30.92	7.88	34.86	38.48	Average	96	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	15583.10	54.72	69.23	-14.51	43.20	7.87	34.83	38.48	Peak	167	100	VERTICAL
2 a	15585.50	42.58	49.23	-6.65	31.06	7.87	34.83	38.48	Average	167	100	VERTICAL

Note:

The product has beam-forming function.

So average limit = 54dBuV/m-(10log(N))=54dBuV/m-4.77dB=49.23dBuV/m.

Peak limit = 74dBuV/m-(10log(N))=74dBuV/m-4.77dB=69.23dBuV/m.

Temperature	20℃	Humidity	63%
Test Engineer	Jim Huang	Configurations	IEEE 802.11n MCS0 20MHz Ch 48 / Ant. 1+Ant. 2+Ant. 3 (3TX)
Test Date	Nov. 20, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a 15698.50	42.30	49.23	-6.93	30.85	7.91	34.92	38.46	Average	208	100	HORIZONTAL
2	p 15700.90	54.79	69.23	-14.44	43.36	7.91	34.94	38.46	Peak	208	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a 15721.30	42.49	49.23	-6.74	31.05	7.92	34.94	38.46	Average	325	100	VERTICAL
2	p 15723.10	55.47	69.23	-13.76	44.03	7.92	34.94	38.46	Peak	325	100	VERTICAL

Note:

The product has beam-forming function.

So average limit = 54dBuV/m-(10log(N))=54dBuV/m-4.77dB=49.23dBuV/m.

Peak limit = 74dBuV/m-(10log(N))=74dBuV/m-4.77dB=69.23dBuV/m.

Temperature	20℃	Humidity	63%
Test Engineer	Jim Huang	Configurations	IEEE 802.11n MCS0 40MHz Ch 38 / Ant. 1+Ant. 2+Ant. 3 (3TX)
Test Date	Nov. 20, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a 15550.20	43.09	49.23	-6.14	31.55	7.86	34.81	38.49	Average	120	100	HORIZONTAL
2	p 15551.00	55.44	69.23	-13.79	43.90	7.86	34.81	38.49	Peak	120	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a 15551.30	43.12	49.23	-6.11	31.58	7.86	34.81	38.49	Average	252	100	VERTICAL
2	p 15552.50	54.45	69.23	-14.78	42.91	7.86	34.81	38.49	Peak	252	100	VERTICAL

Note:

The product has beam-forming function.

So average limit = 54dBuV/m-(10log(N))=54dBuV/m-4.77dB=49.23dBuV/m.

Peak limit = 74dBuV/m-(10log(N))=74dBuV/m-4.77dB=69.23dBuV/m.

Temperature	20℃	Humidity	63%
Test Engineer	Jim Huang	Configurations	IEEE 802.11n MCS0 40MHz Ch 46 / Ant. 1+Ant. 2+Ant. 3 (3TX)
Test Date	Nov. 20, 2012		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	p 15701.40	54.61	69.23	-14.62	43.18	7.91	34.94	38.46	Peak	121	100	HORIZONTAL
2	a 15702.40	42.44	49.23	-6.79	31.01	7.91	34.94	38.46	Average	121	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a 15674.40	42.46	49.23	-6.77	30.99	7.90	34.90	38.47	Average	244	100	VERTICAL
2	p 15676.20	55.03	69.23	-14.20	43.58	7.90	34.92	38.47	Peak	244	100	VERTICAL

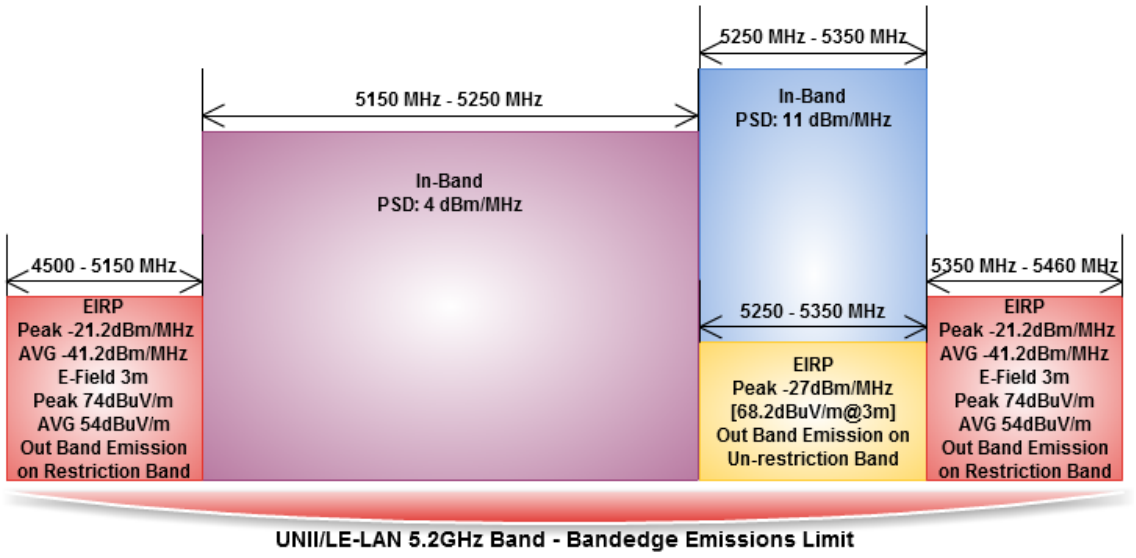
Note:

1. The product has beam-forming function.
   So average limit = 54dBuV/m-(10log(N))=54dBuV/m-4.77dB=49.23dBuV/m.
   Peak limit = 74dBuV/m-(10log(N))=74dBuV/m-4.77dB=69.23dBuV/m.
2. The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
   Emission level (dBuV/m) = 20 log Emission level (uV/m).
   Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.7. Transmitter Conducted Bandedge Emissions

4.7.1. Transmitter Conducted Bandedge Emissions Limit

Transmitter Bandedge Emissions Limit



Refer as FCC KDB 789033, G)2)c)(i) specifying that if a non-restricted-band out-of-band emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm or -17 dBm peak emission limit. Reason for change: to ensure that emission requirements in the non-restricted bands are not more stringent than those in the restricted bands.

4.7.2. Measuring Instruments

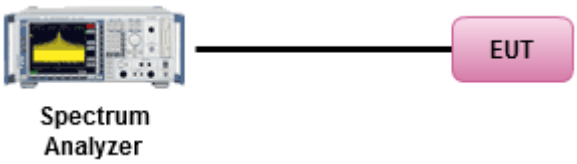
Refer a test equipment and calibration data table in this test report.

4.7.3. Test Procedures

Test Method			
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.	
		☐	Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
		☐	Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
		☒	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW) - Duty cycle ≥ 98%.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒	Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For the transmitter bandedge emissions shall be measured using following options below:		
	☐	Refer as FCC KDB 789033, clause G)3)d) marker-delta method for band-edge measurements.	
	☒	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.	
	☐	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.	
☒	For conducted measurement, refer as FCC KDB 789033, clause G.		

4.7.4. Test Setup

Transmitter Conducted Bandedge Emissions



4.7.5. Test Result of Transmitter Conducted Bandedge Emissions

Transmitter Conducted Bandedge Emissions Result – Average

Freq. (MHz)	Operating Mode	N_{TX}	Correlated Antenna Gain (dBi)	TX1 Bandedge Level (dBm)	TX2 Bandedge Level (dBm)	TX3 Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
5180	HT-20 Beam Forming, MCS0	3	5.67	-52.30	-52.16	-52.25	-45.97	6.19
5200	HT-20 Beam Forming, MCS0	3	5.67	-51.89	-52.05	-51.03	-45.97	5.06
5240	HT-20 Beam Forming, MCS0	3	5.67	-53.85	-55.52	-55.61	-45.97	7.88
5190	HT-40 Beam Forming, MCS0	3	5.67	-47.63	-49.41	-48.32	-45.97	1.66
5230	HT-40 Beam Forming, MCS0	3	5.67	-54.15	-53.53	-54.24	-45.97	7.56

Note: The product has beam-forming function, so average limit = -41.2dBm-(10log(N))
=-41.2dBm-4.77dB=-45.97dBm

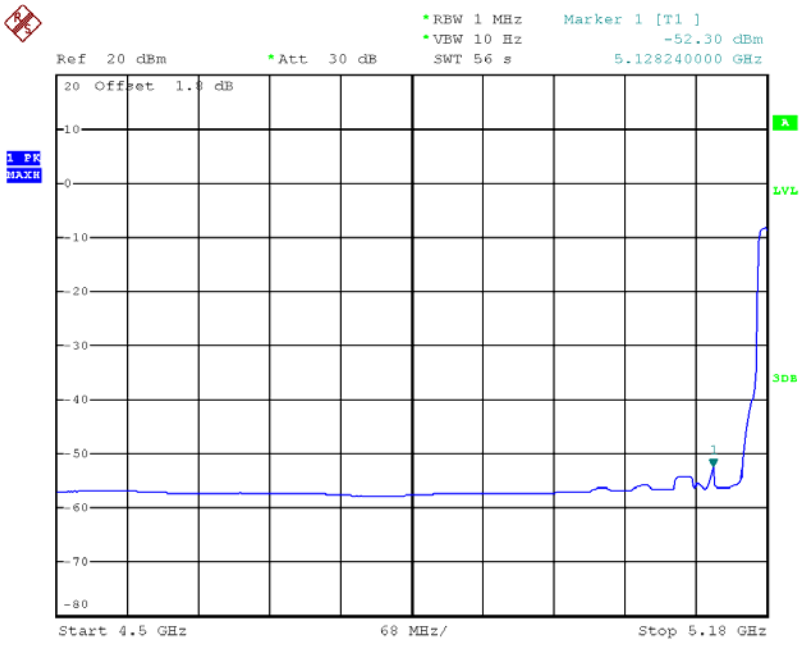
Transmitter Conducted Bandedge Emissions Result – Peak

Freq. (MHz)	Operating Mode	N_{TX}	Correlated Antenna Gain (dBi)	TX1 Bandedge Level (dBm)	TX2 Bandedge Level (dBm)	TX3 Bandedge Level (dBm)	Limit (dBm)	Margin (dB)
5180	HT-20 Beam Forming, MCS0	3	5.67	-40.61	-40.06	-39.94	-25.97	13.97
5200	HT-20 Beam Forming, MCS0	3	5.67	-39.83	-40.87	-40.24	-25.97	13.86
5240	HT-20 Beam Forming, MCS0	3	5.67	-42.67	-43.09	-43.98	-25.97	16.70
5190	HT-40 Beam Forming, MCS0	3	5.67	-33.85	-35.28	-32.91	-25.97	6.94
5230	HT-40 Beam Forming, MCS0	3	5.67	-42.50	-42.32	-42.64	-25.97	16.35

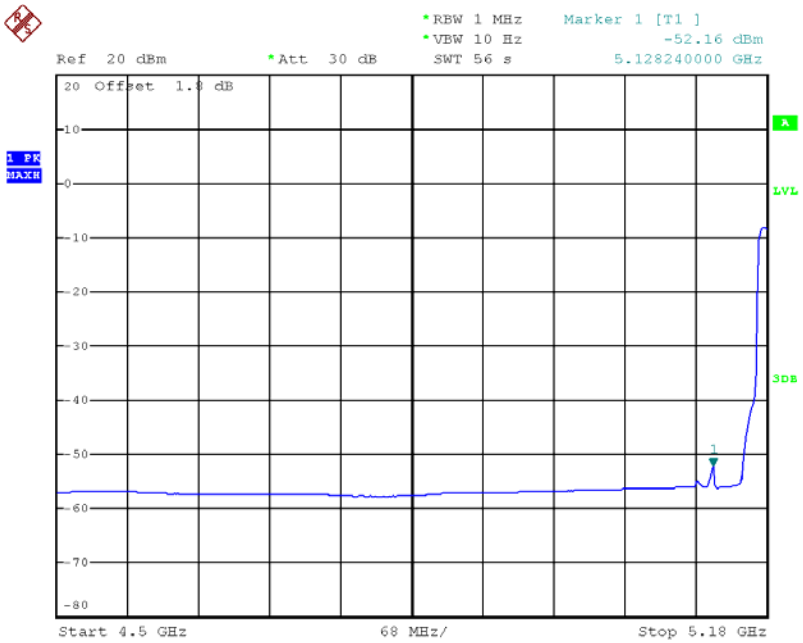
Note:The product has beam-forming function, so peak limit = -21.2dBm-(10log(N))
=-21.2dBm-4.77dB=-25.97dBm

Transmitter Conducted Bandedge Emissions Plot–Average on 5180 MHz, HT-20 Beam Forming, MCS0

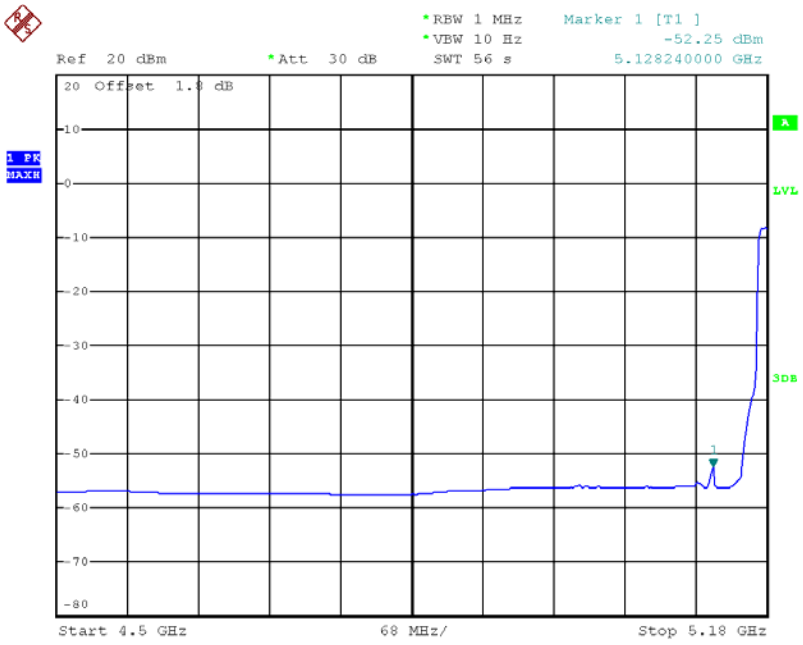
Tx1



Tx2

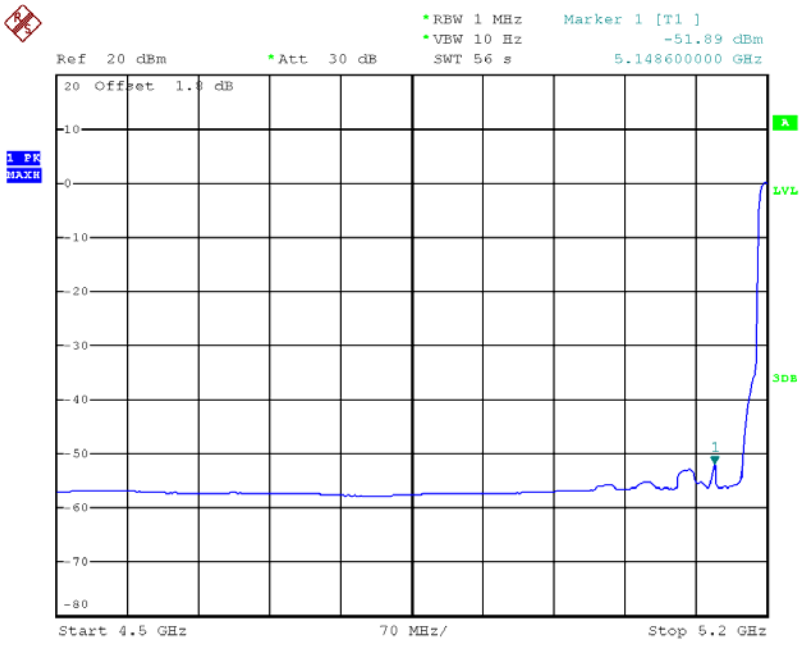


Transmitter Conducted Bandedge Emissions Plot–Average on 5180 MHz, HT-20 Beam Forming, MCS0s
Tx3

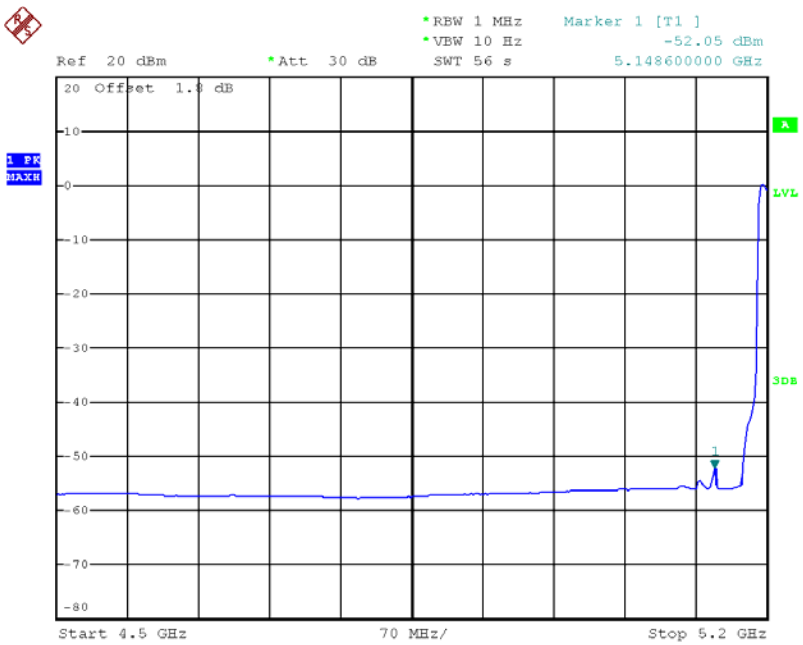


Transmitter Conducted Bandedge Emissions Plot–Average on 5200 MHz, HT-20 Beam Forming, MCS0

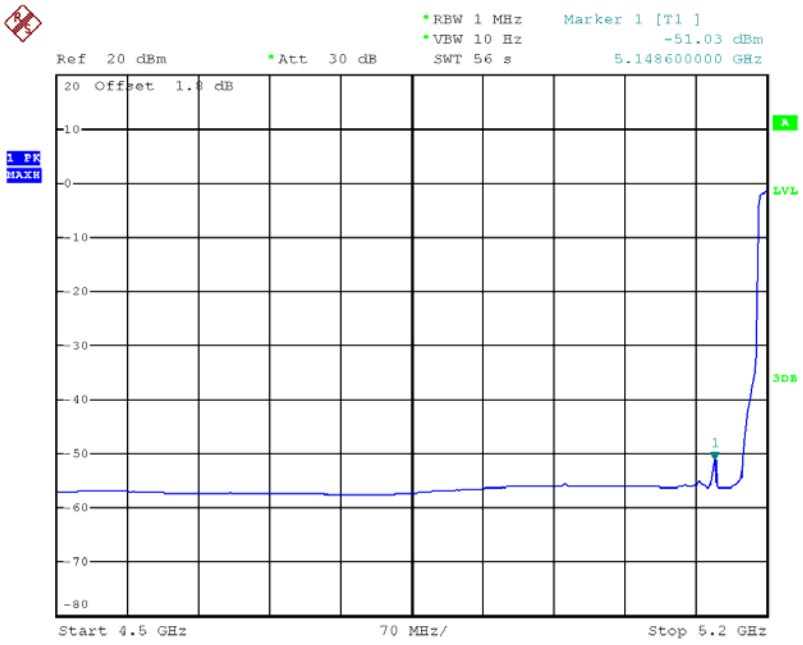
Tx1



Tx2

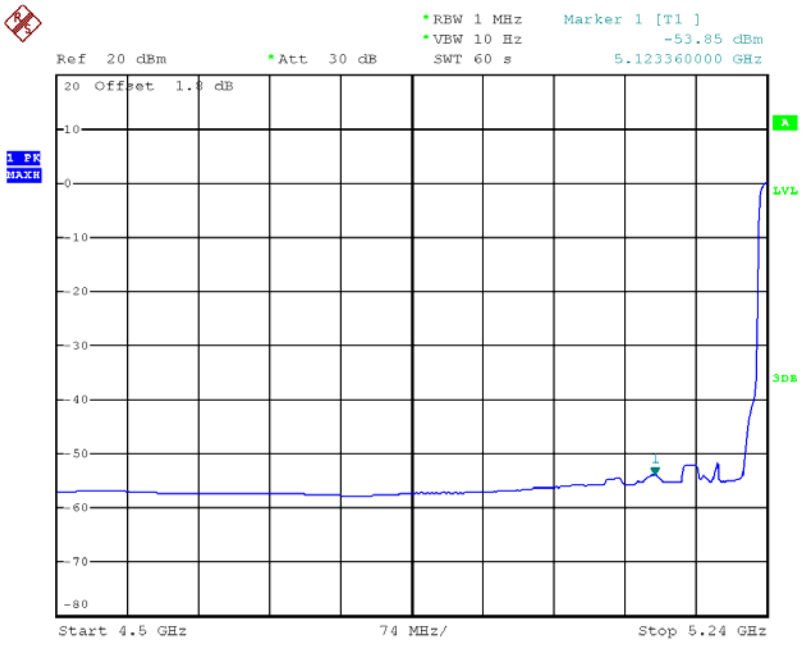


Transmitter Conducted Bandedge Emissions Plot–Average on 5200 MHz, HT-20 Beam Forming, MCS0
Tx3

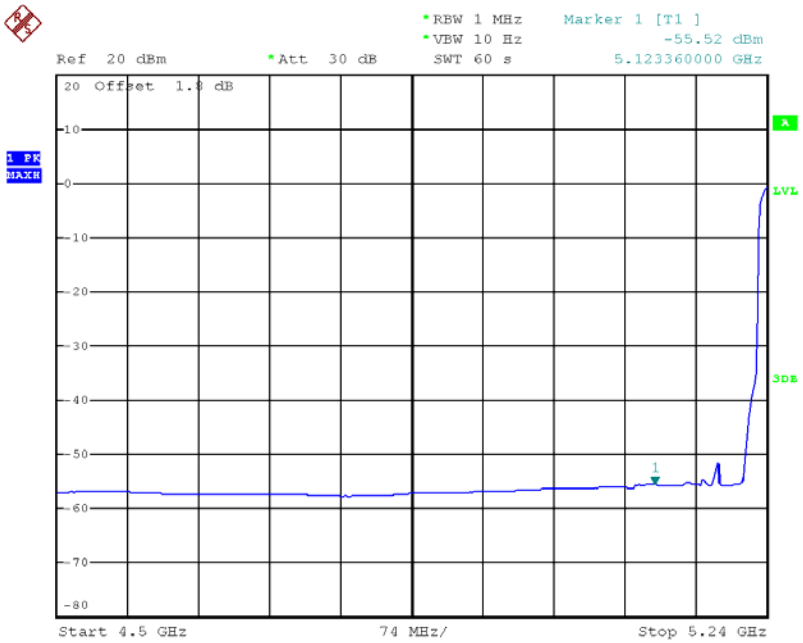


Transmitter Conducted Bandedge Emissions Plot–Average on 5240 MHz, HT-20 Beam Forming, MCS0

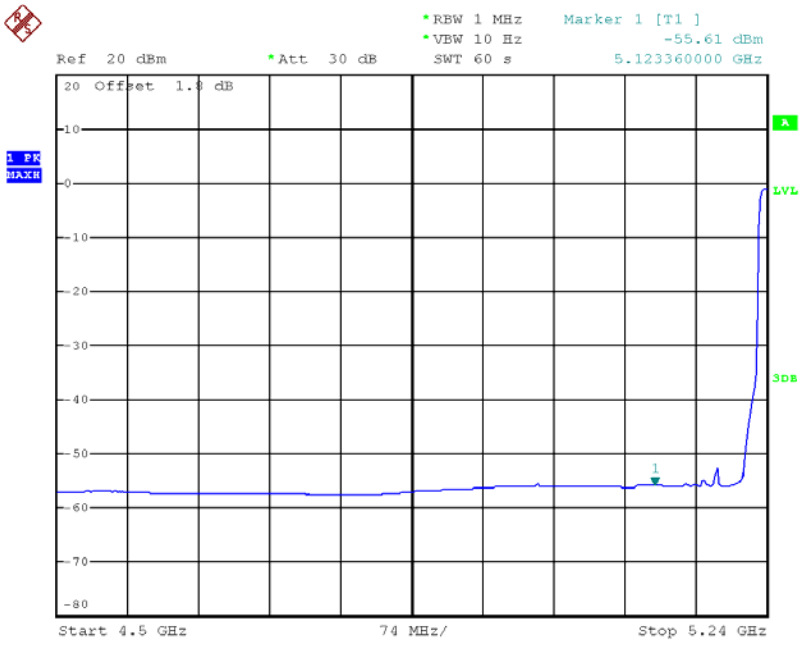
Tx1



Tx2

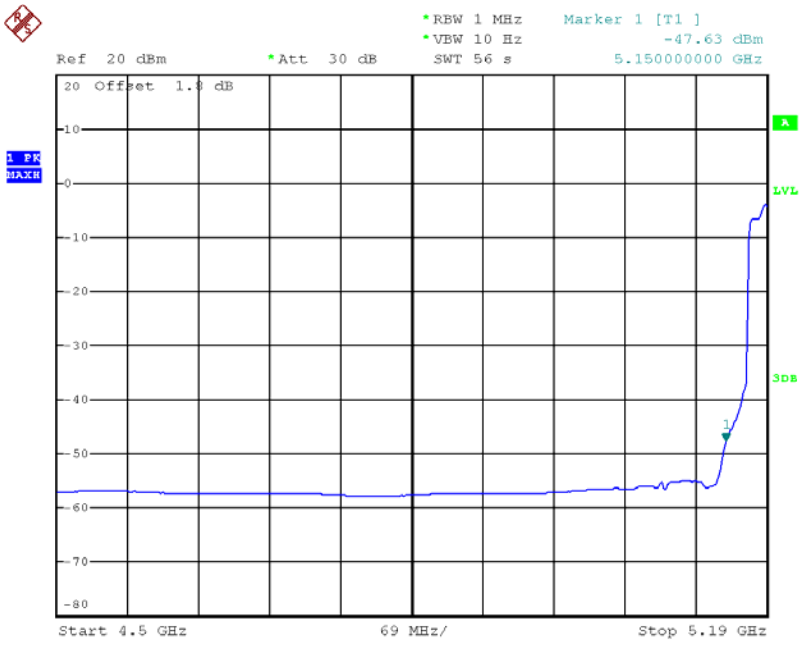


Transmitter Conducted Bandedge Emissions Plot–Average on 5240 MHz, HT-20 Beam Forming, MCS0
Tx3

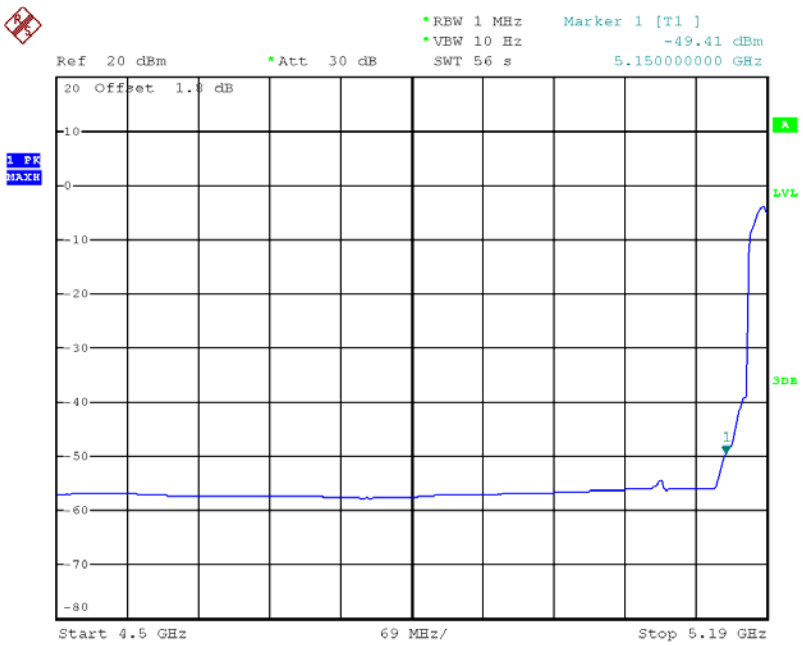


Transmitter Conducted Bandedge Emissions Plot–Average on 5190 MHz, HT-40 Beam Forming, MCS0

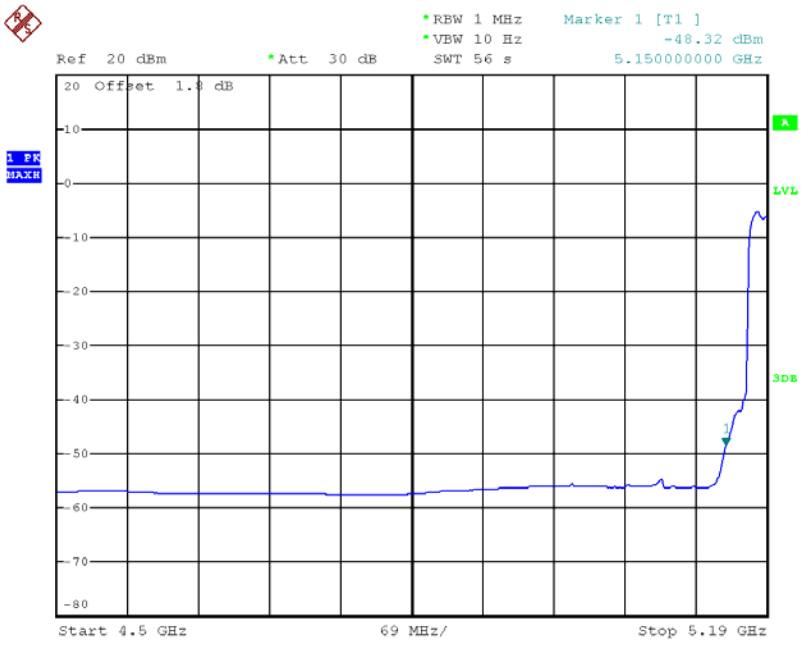
Tx1



Tx2

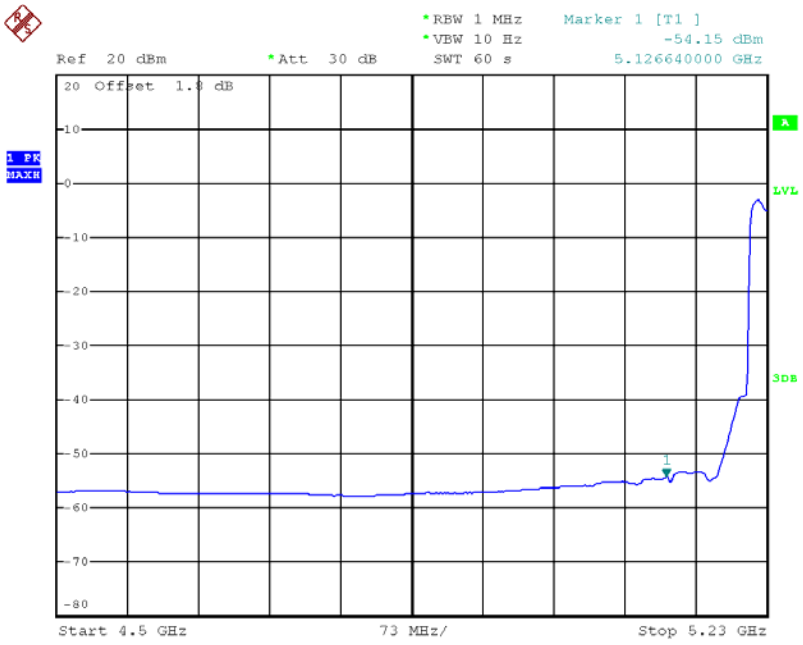


Transmitter Conducted Bandedge Emissions Plot–Average on 5190 MHz, HT-40 Beam Forming, MCS0
Tx3

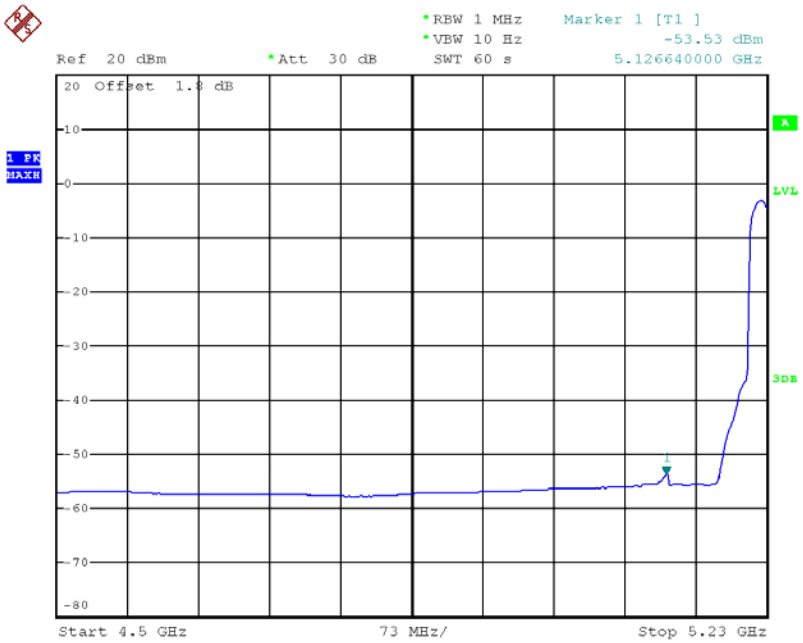


Transmitter Conducted Bandedge Emissions Plot–Average on 5230 MHz, HT-40 Beam Forming, MCS0

Tx1

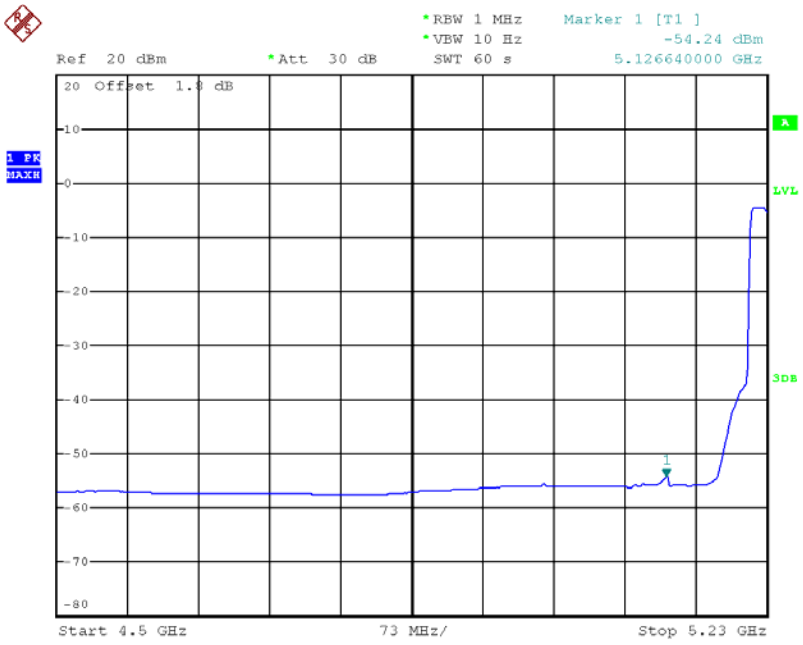


Tx2



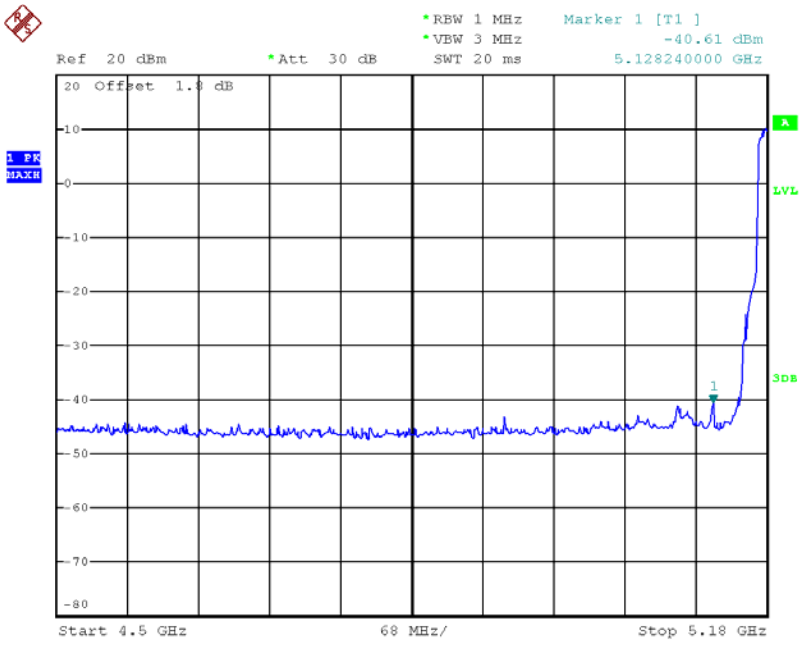
Transmitter Conducted Bandedge Emissions Plot–Average on 5230 MHz, HT-40 Beam Forming, MCS0

Tx3

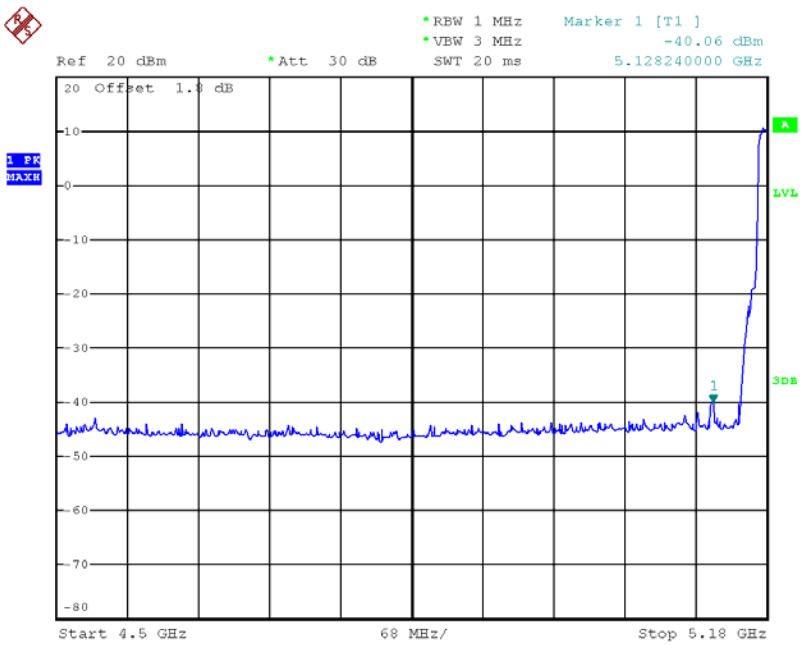


Transmitter Conducted Bandedge Emissions Plot–Peak on 5180 MHz, HT-20 Beam Forming, MCS0

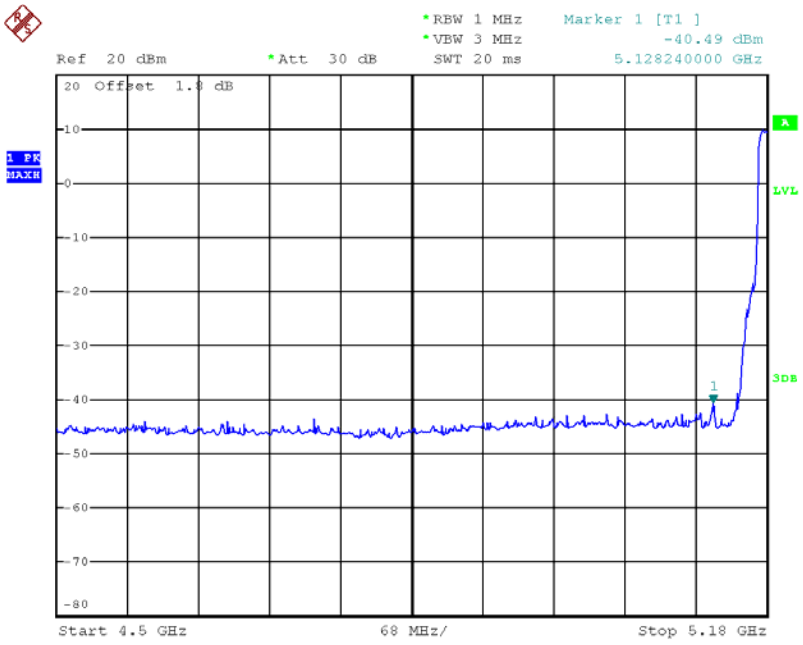
Tx1



Tx2

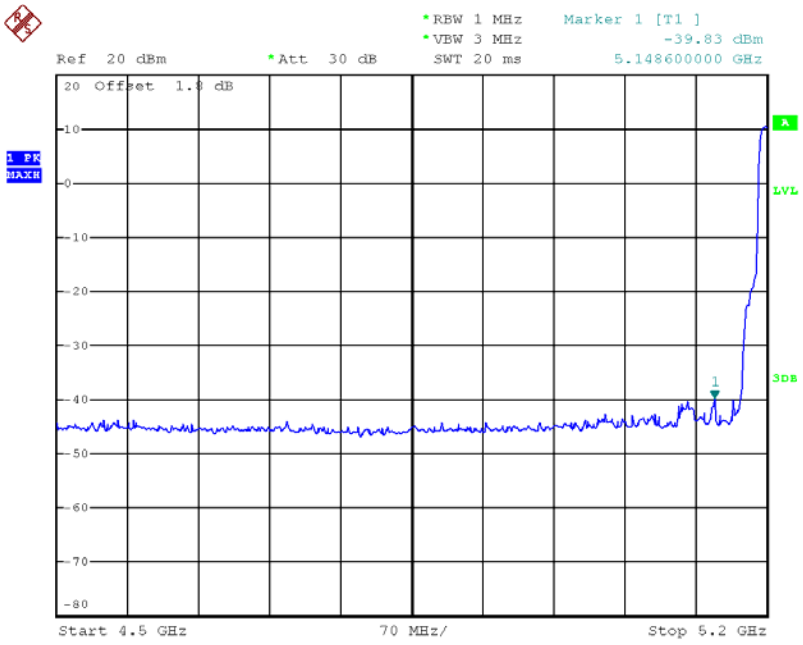


Transmitter Conducted Bandedge Emissions Plot–Peak on 5180 MHz, HT-20 Beam Forming, MCS0
Tx3

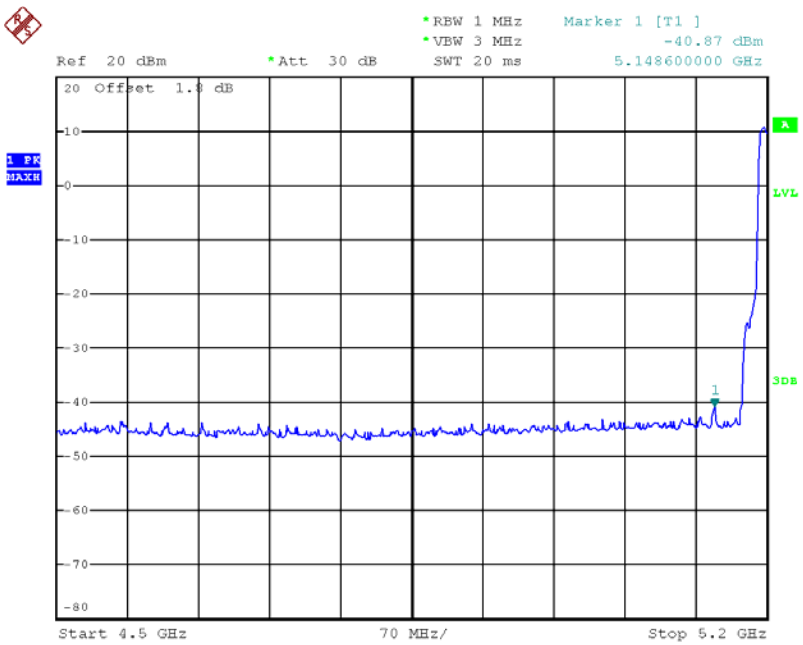


Transmitter Conducted Bandedge Emissions Plot–Peak on 5200 MHz, HT-20 Beam Forming, MCS0

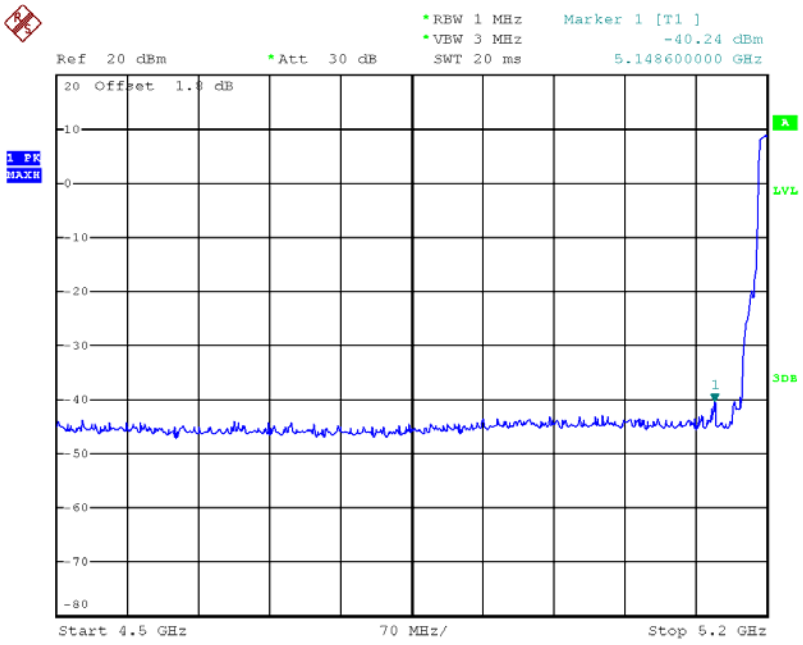
Tx1



Tx2

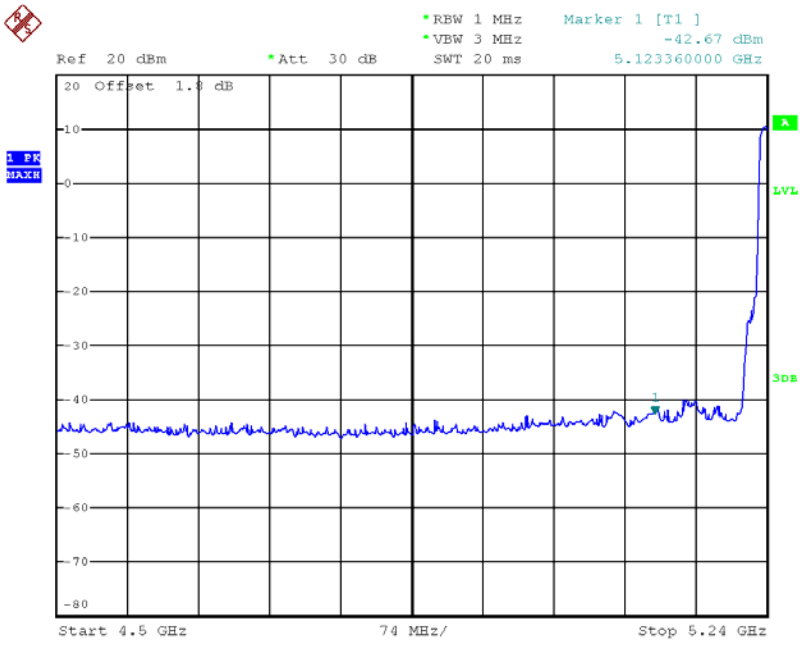


Transmitter Conducted Bandedge Emissions Plot–Peak on 5200 MHz, HT-20 Beam Forming, MCS0
Tx3

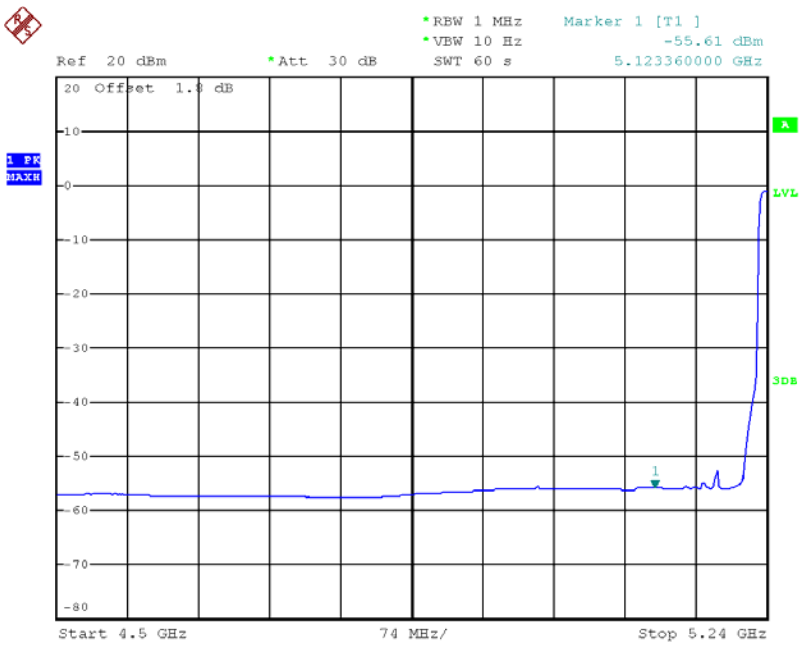


Transmitter Conducted Bandedge Emissions Plot–Peak on 5240 MHz, HT-20 Beam Forming, MCS0

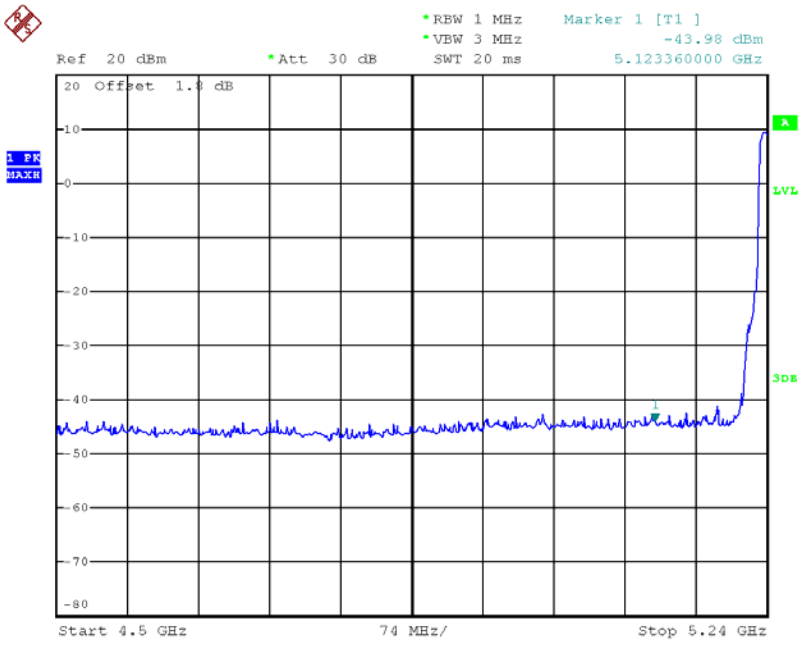
Tx1



Tx2

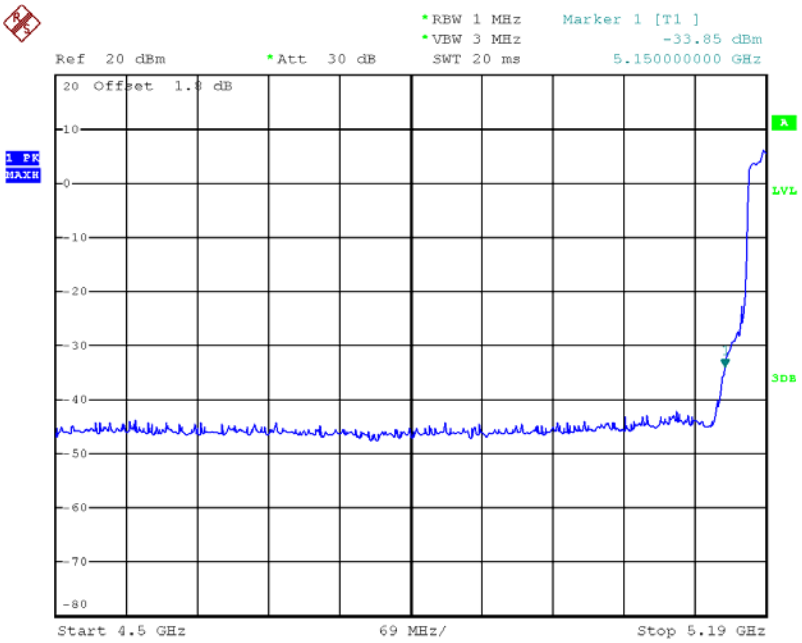


Transmitter Conducted Bandedge Emissions Plot–Peak on 5240 MHz, HT-20 Beam Forming, MCS0
Tx3

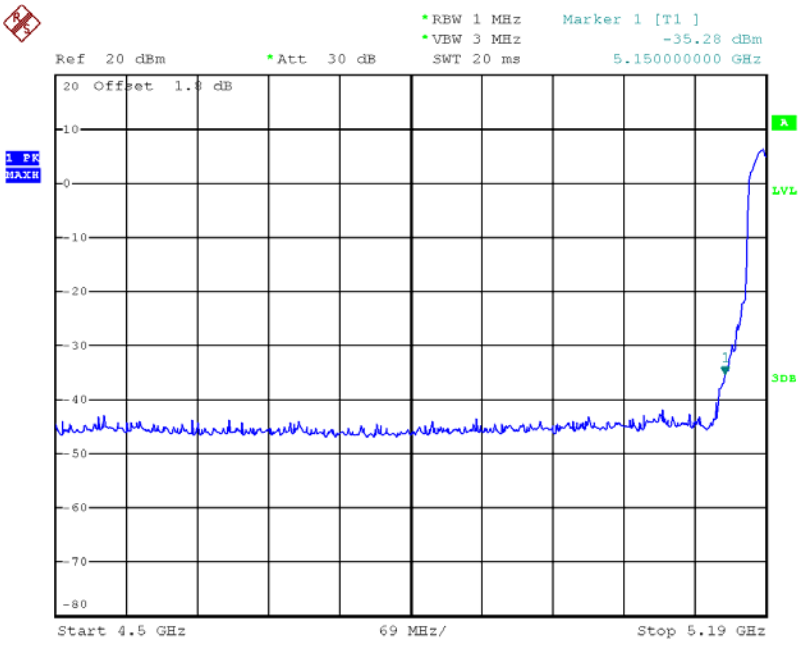


Transmitter Conducted Bandedge Emissions Plot–Peak on 5190 MHz, HT-40 Beam Forming, MCS0

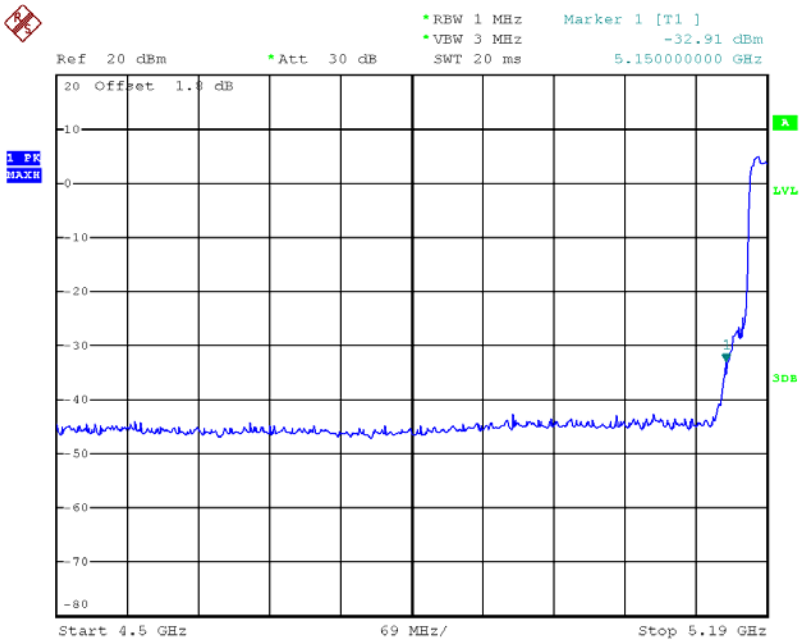
Tx1

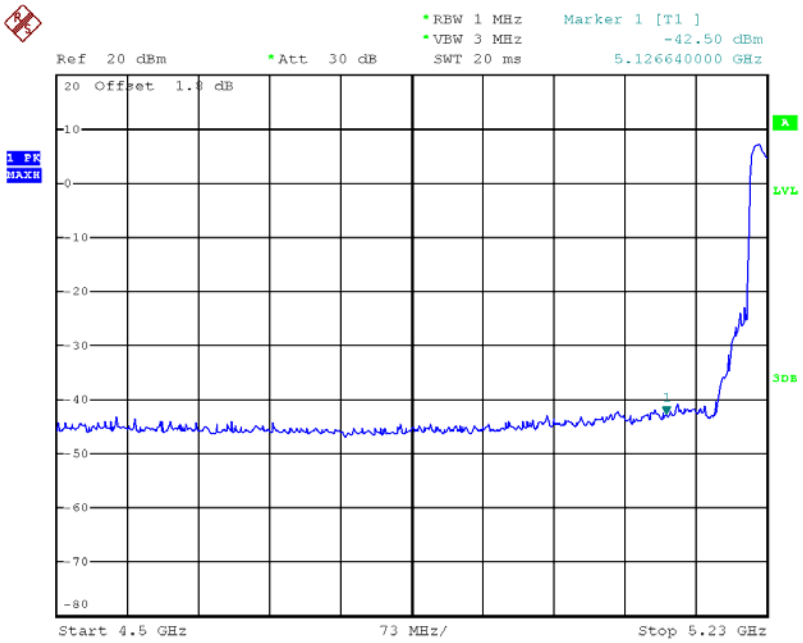
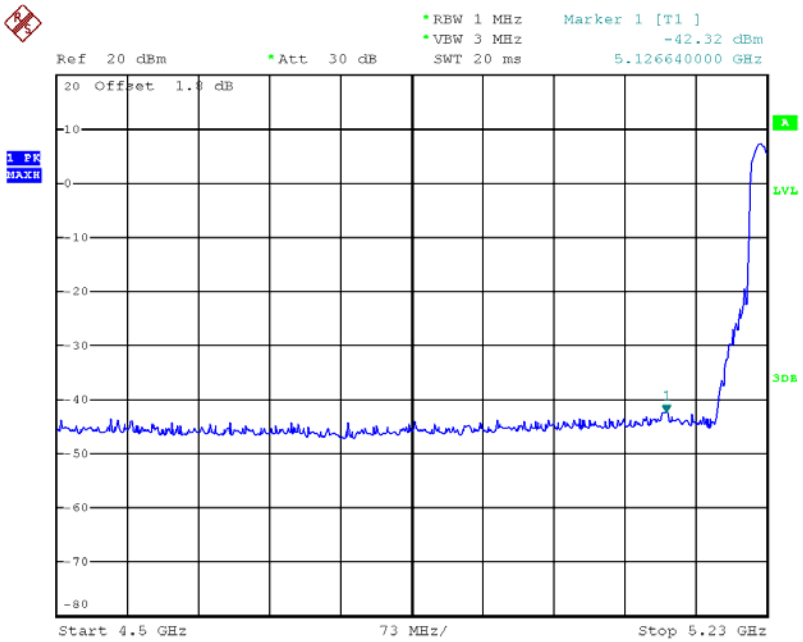


Tx2

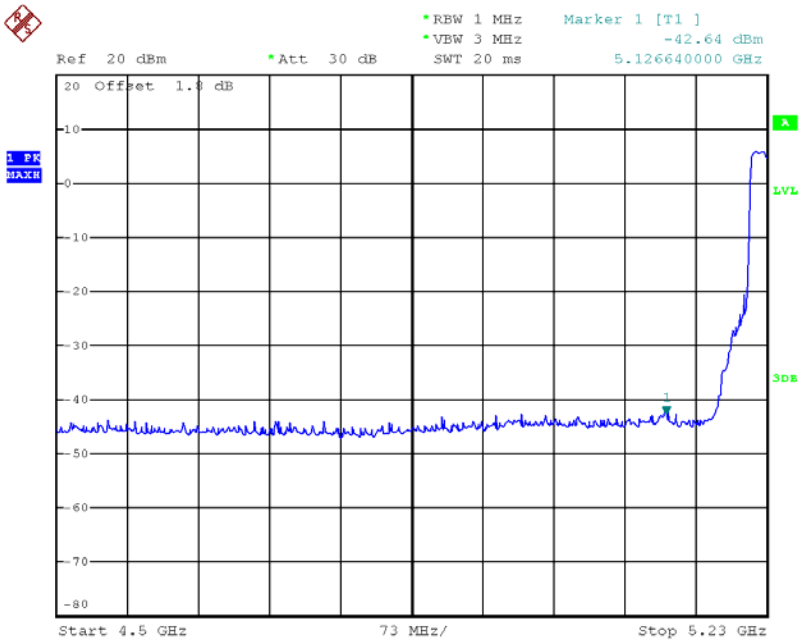


Transmitter Conducted Bandedge Emissions Plot–Peak on 5190 MHz, HT-40 Beam Forming, MCS0
Tx3



Transmitter Conducted Bandedge Emissions Plot–Peak on 5230 MHz, HT-40 Beam Forming, MCS0
Tx1

Tx2


Transmitter Conducted Bandedge Emissions Plot–Peak on 5230 MHz, HT-40 Beam Forming, MCS0
Tx3



4.8. Frequency Stability Measurement

4.8.1. Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emissions is maintained within the band of operation under all conditions of normal operation as specified in the user's manual or ±20ppm (IEEE 802.11nspecification).

4.8.2. Measuring Instruments and Setting

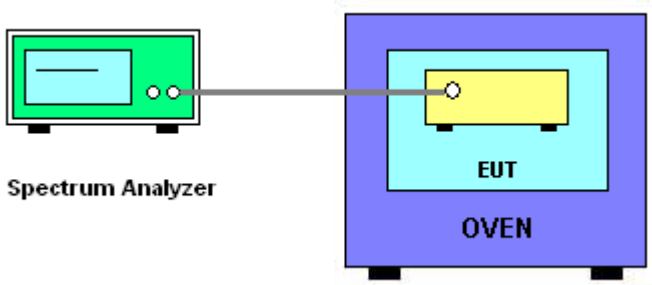
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RB	10 kHz
VB	10 kHz
Sweep Time	Auto

4.8.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 10 kHz, VBW = 10 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±20ppm (IEEE 802.11nspecification).
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is -30°C~50°C.

4.8.4. Test Setup Layout



4.8.5. Test Deviation

There is no deviation with the original standard.

4.8.6. EUT Operation during Test

The EUT was programmed to be in continuously un-modulation transmitting mode.

4.8.7. Test Result of Frequency Stability

Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	**5200**
126.50	5199.9820
110.00	5199.9814
93.50	5199.9812
Max. Deviation (MHz)	**0.018800**
Max. Deviation (ppm)	**3.62**

Temperature vs. Frequency Stability

Temperature	Measurement Frequency (MHz)
(°C)	**5200**
-30	5199.9812
-20	5199.9820
-10	5199.9814
0	5199.9820
10	5199.9808
20	5199.9812
30	5199.9814
40	5199.9814
50	5199.9820
Max. Deviation (MHz)	**0.019200**
Max. Deviation (ppm)	**3.69**

4.9. Antenna Requirements

4.9.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.9.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100377	9kHz ~ 2.75GHz	Oct. 23, 2012	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Nov.26, 2012	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9kHz ~ 30MHz	Jun. 22, 2012	Conduction (CO01-CB)
Coupling and Decoupling Network	TESEQ	ISN PLC 25-25	26476	0.15MHz~30MHz	Feb. 09, 2012	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	0.15MHz~30MHz	Dec. 4, 2012	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-----	-----	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Jan. 11, 2012	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 27, 2011	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Nov. 23, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 27, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 23, 2011	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Jul. 31, 2012	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9KHz~40GHz	Nov. 16, 2011	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 20, 2012	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 18, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9KHz~40GHz	Oct. 08, 2012	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	Jun. 05, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	2 Way	0120A02056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	3 Way	MDC2366	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
RF Power Divider	Woken	4 Way	0120A04056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Nov. 28, 2012	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 27, 2012	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

N.C.R. means Non-Calibration required.

6. TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	:	886-2-2696-2468
	FAX	:	886-2-2696-2255
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	:	886-3-327-3456
	FAX	:	886-3-318-0055
LINKOU	ADD	:	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	:	886-2-2601-1640
	FAX	:	886-2-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	886-2-2631-4739
	FAX	:	886-2-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	:	886-2-2794-8886
	FAX	:	886-2-2794-9777
JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
	TEL	:	886-3-656-9065
	FAX	:	886-3-656-9085