

FCC / IC Radio Test Report

Applicant : Qualcomm Atheros, Inc.
Manufacturer : 1700 Technology Drive, San Jose, CA95110
Equipment : Dual Band 2x2 MIMO 802.11ac/abgn WLAN plus BT
Brand Name : Qualcomm Atheros
Model No. : QCWB342
FCC ID : PPD-QCWB342
IC ID : 4104A-QCWB342
Standard : 47 CFR FCC Part 15.247
RSS-210 Issue 8
Operating Band : 2400 MHz – 2483.5 MHz

The product sample received on Feb. 20, 2013 and completely tested on May 17, 2013. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

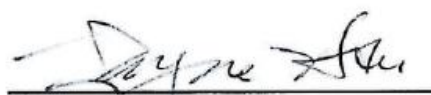

Wayne Hsu

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APPENDIX A. TEST PHOTOS

APPENDIX B. PHOTOGRAPHS OF EUT

Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Typical Data	Limit	Result
1.1.3	15.203	Antenna Requirement	Antenna connector mechanism complied	According to FCC 15.203	Complied
3.1	15.247(a) / RSS-210 A8.2 / /RSS-Gen 4.6.1	6dB Bandwidth	20M: 17.68 MHz 40M: 35.20 MHz	≥500kHz	Complied
		99% Bandwidth	20M: 17.73 MHz 40M: 36.98 MHz		
3.2	15.247(b) / RSS-210 A8.4	RF Output Power (Maximum Peak Conducted Output Power)	11 b: 23.13 dBm 11 g: 25.21 dBm 11 n HT20: 25.03 dBm 11 n HT40: 23.15 dBm	≤ 30 dBm	Complied
3.3	15.247(e) / RSS-210 A8.2	Power Spectral Density	11 b: -2.94 dBm/100kHz 11 g: -9.20 dBm/100kHz 11 n HT20: -8.97 dBm/100kHz 11 n HT40: -6.16 dBm/100kHz	≤ 8 dBm/3kHz	Complied
3.4	15.247(d) / RSS-210 A8.5	Emission in Non-Restricted Frequency Bands	Non-Restricted Bands	Non-Restricted Bands: > 20 dBc	Complied
3.5	15.247(d) / RSS-210 A8.5	Emission in Restricted Frequency Bands	Restricted Bands 4922.99 MHz -34.76 dBm - PK -41.66 dBm - AV	Restricted Bands: According to FCC 15.209 / RSS-Gen 6.1	Complied
3.6	15.207 / RSS-Gen 7.2.4	AC Power-line Conducted Emissions	17.110 MHz 36.91 dBuV - AV 42.70 dBuV - QP	According to FCC 15.207 / RSS-Gen 7.2.4	Complied



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1 General Description

1.1 Information

1.1.1 RF General Information (WLAN)

RF General Information						
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	RF Output Power (dBm)	Co-location
2400~2483.5	b	2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462	11	2	23.13	Yes
	g	2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462	11	2	25.21	Yes
	n (HT20)	2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462	11	2	25.03	Yes
	n (HT40)	2422, 2427, 2432, 2437, 2442, 2447, 2452	7	2	23.15	Yes
Note 1: RF output power specifies that Maximum Peak Conducted Output Power. Note 2: 802.11b uses a combination of DSSS-DBPSK, DQPSK, CCK modulation. Note 3: 802.11g/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation. Note 4: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)						

1.1.2 WLAN/ BT coexistence mode

- ♦ 1X1 WLAN + BT: WLAN/BT concurrent at different antenna port and 18MHz separation between WLAN and BT fundamental.
- ♦ 2X2 WLAN + BT: 5GHz 802.11a/an (or 11ac) transmit concurrent with BT. - 2.4GHz WLAN + BT is timely shared coexistence.

1.1.3 Antenna Information

Antenna Category	
☒	External antenna (dedicated antennas)
☒	RF connector provided
☒	Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type...)
☐	Standard antenna connector. (e.g., SMA, N, BNC, and TNC type...)

Antenna General Information			
No.	Ant. Type	Frequency Band	Maximum Gain (dBi)
1	PIFA	2400~2483.5MHz	3.60

Directional Gain (DG) Result						
Transmit Chains No.	1		2			
Maximum G _{ANT} (dBi)	3.60		3.60			
Modulation Mode	N _{TX}	N _{SS}	Array Gain (dB)	Power DG (dBi) Note ⁴	Array Gain (dB)	PSD DG (dBi) Note ⁵
11b, 1-11Mbps	2	1	0	3.60	3.01	6.61
11g, 6-54Mbps	2	1	0	3.60	3.01	6.61
HT20, M0-15	2	1	0	3.60	3.01	6.61
HT40, M0-M15	2	1	0	3.60	3.01	6.61

Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows:

Any transmit signals are correlated, Directional Gain = $G_{ANT} + 10 \log(N_{TX})$

All transmit signals are completely uncorrelated, Directional Gain = G_{ANT}

Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:

Any transmit signals are correlated, Directional Gain = $10 \log[(10^{G_{1/20}} + \dots + 10^{G_{N/20}})^2 / N_{TX}]$

All transmit signals are completely uncorrelated, Directional Gain = $10 \log[(10^{G_{1/10}} + \dots + 10^{G_{N/10}}) / N_{TX}]$

Note 3: For Spatial Multiplexing, Directional Gain (DG) = $G_{ANT} + 10 \log(N_{TX}/N_{SS})$,

where N_{ss} = the number of independent spatial streams data.

Note 4: For CDD transmissions, directional gain is calculated as power measurements:

Directional Gain (DG) = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows:

Array Gain = 0 dB (i.e., no array gain) for $N_{TX} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{TX} ;

Note 5: For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS})$ dB.

1.1.4 Test Signal Duty Cycle

Operated Mode for Duty Cycle	
☐ Operated normally mode for duty cycle	
☒ Operated test mode for duty cycle	
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)
☒ 100% - IEEE 802.11b	0
☒ 98.57% - IEEE 802.11g	0.06
☒ 97.95% - IEEE 802.11n (HT20)	0.09
☒ 97.98% - IEEE 802.11n (HT40)	0.09

1.1.5 EUT Operational Condition

Supply Voltage	☐ AC mains	☒ DC	
Type of DC Source	☐ Internal DC supply	☒ Host	☐ Battery

1.2 Support Equipment

Support Equipment - Conducted Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	VOSTR3450	DoC
2	(USB) Mouse	Microsoft	1113	DoC
3	(USB) Printer	EPSON	C61	DoC
4	Bluetooth Earphone	SONY	HBH-PV702	--
5	Test Fixture	--	--	--
6	Wireless AP (Remote Workstation)	D-LINK	DNS-G120	DoC

Support Equipment - Radiated Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	Notebook	DELL	E5520	DoC
2	Test Fixture	--	--	--
3	50Ω Terminal	--	--	--

1.3 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 15 Subpart C 15.247
- ♦ RSS-210 Issue 8
- ♦ RSS-GEN Issue 3
- ♦ ANSI C63.10-2009
- ♦ FCC KDB 558074
- ♦ FCC KDB 662911
- ♦ FCC KDB 412172

1.4 Testing Location Information

Testing Location				
☒	HWA YA	ADD : No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.		
		TEL : 886-3-327-3456 FAX : 886-3-327-0973		
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
AC Conduction	CO04-HY	Zeus	19.8°C / 61%	May 17, 2013
RF Conducted	TH01-HY	Ian	24.7°C / 64%	Apr. 18, 2013 ~ May 02, 2013
Radiated Emission	03CH02-HY	Hsiao	23.9°C / 64%	Apr. 26, 2013 ~ May 03, 2013

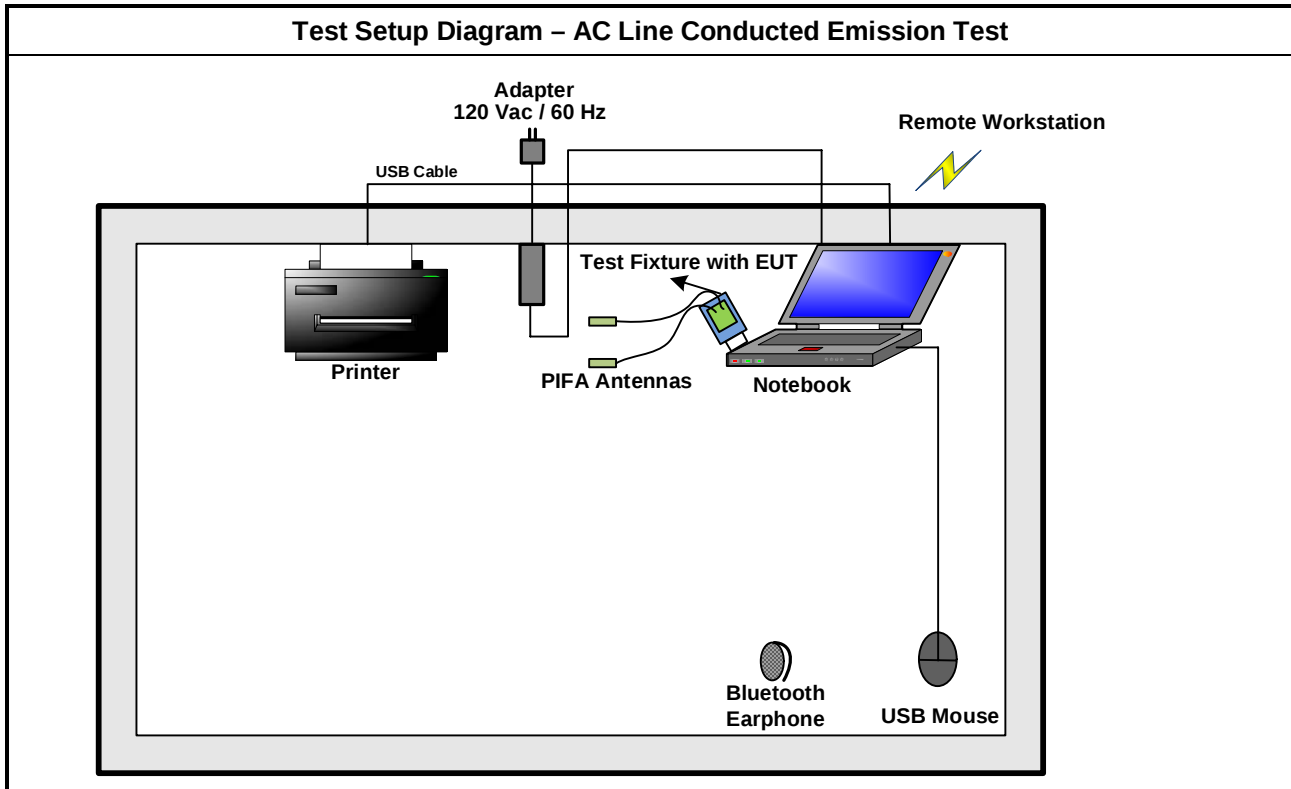
1.5 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

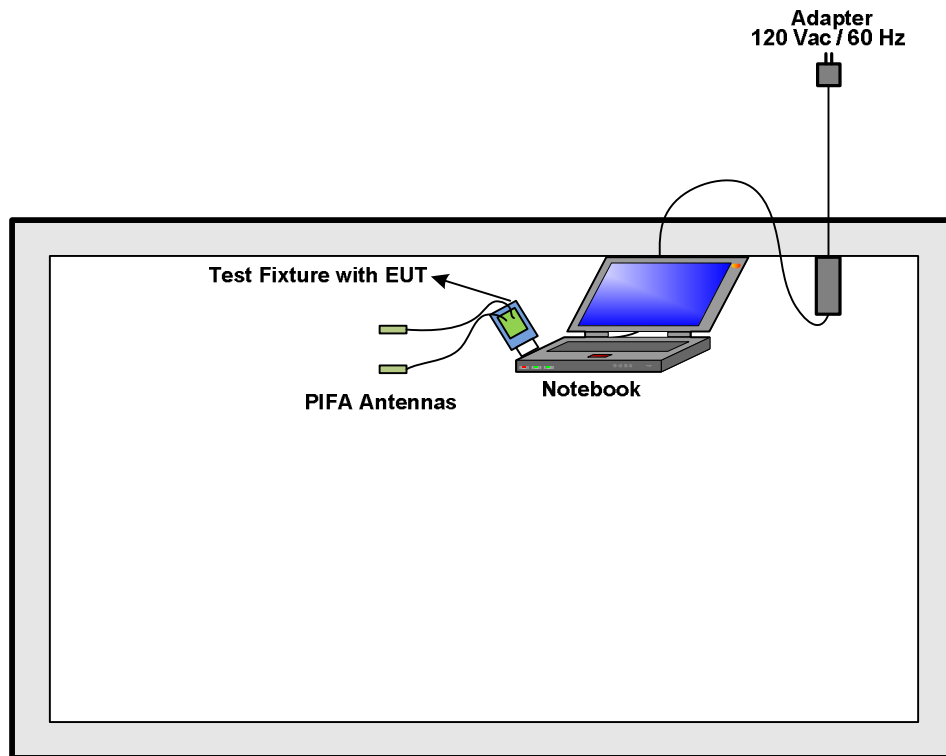
Measurement Uncertainty			
Test Item		Uncertainty	Limit
AC power-line conducted emissions		±2.26 dB	N/A
Emission bandwidth, 6dB bandwidth		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Power density, conducted		±0.81 dB	N/A
Unwanted emissions, conducted	30 – 1000 MHz	±0.51 dB	N/A
	1 – 18 GHz	±0.67 dB	N/A
	18 – 40 GHz	±0.83 dB	N/A
	40 – 200 GHz	N/A	N/A
All emissions, radiated	30 – 1000 MHz	±2.56 dB	N/A
	1 – 18 GHz	±3.59 dB	N/A
	18 – 40 GHz	±3.82 dB	N/A
	40 – 200 GHz	N/A	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

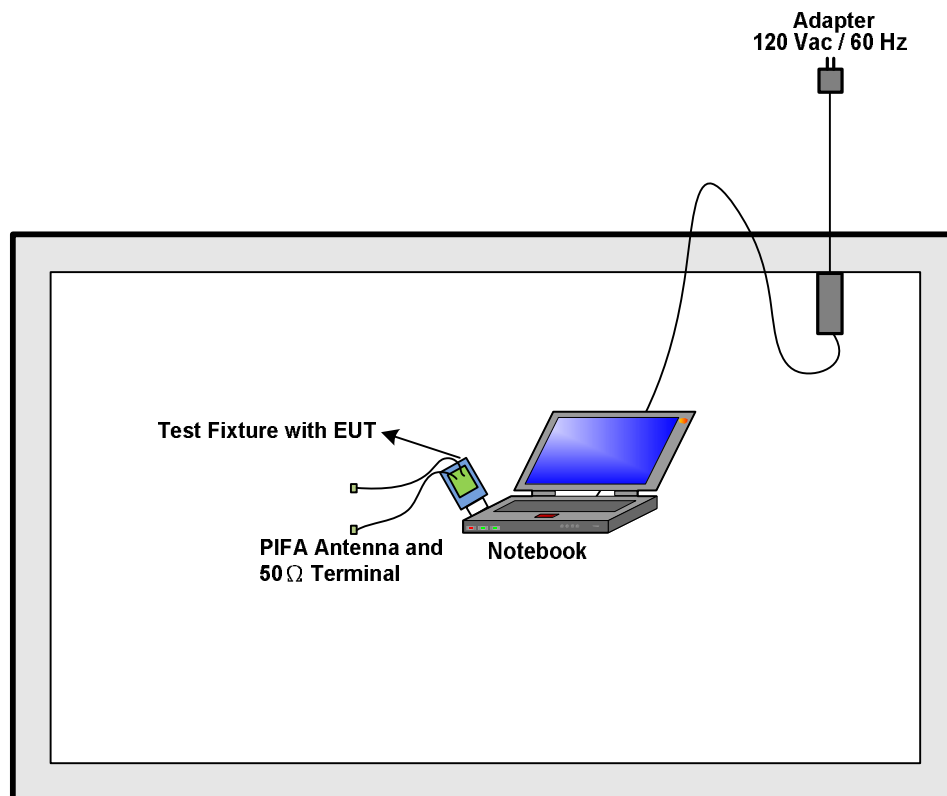
2.1 Test Setup Diagram



Test Setup Diagram - Radiated Test (Below 1GHz)



Test Setup Diagram - Radiated Test (Above 1GHz)



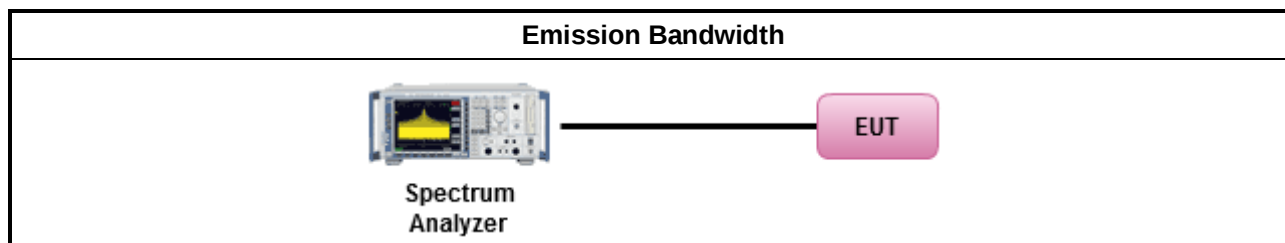
3 Transmitter Test Result

3.1 6dB Bandwidth

3.1.1 Test Procedures

Test Method	
☒	For the emission bandwidth shall be measured using one of the options below:
☒	Refer as FCC KDB 558074, clause 8.1 Option 1 for 6 dB bandwidth measurement.
☒	Refer as RSS-210 A8.2 for 6 dB bandwidth and RSS-Gen section 4.6.1 for 99% dB bandwidth measurement.
☐	Refer as FCC KDB 558074, clause 8.2 Option 2 for 6 dB bandwidth measurement.
☐	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
☒	For conducted measurement.
☐	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
☒	The EUT supports multiple transmit chains using options given below:
☐	Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1
☒	Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.

3.1.2 Test Setup



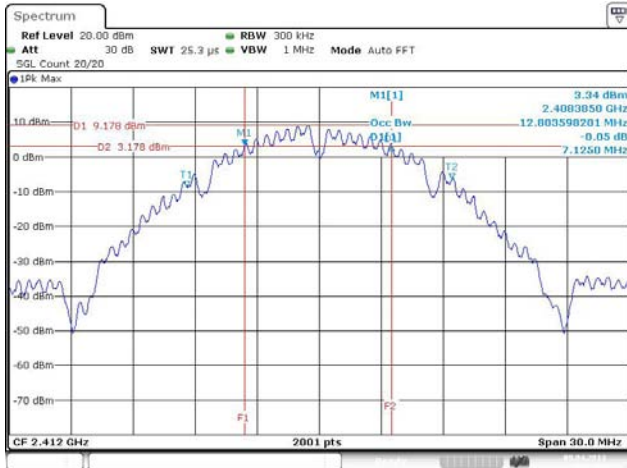
3.1.3 Test Result of Emission Bandwidth

Emission Bandwidth Result						
Condition			Emission Bandwidth (MHz)			
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth		6dB Bandwidth	
			Chain 0	Chain 1	Chain 0	Chain 1
11b_1Mbps	2	2412	12.80	12.66	6.58	6.43
11b_1Mbps	2	2437	12.05	11.94	7.08	7.05
11b_1Mbps	2	2462	12.74	12.71	6.60	6.73
11g_6Mbps	2	2412	17.10	16.77	16.45	16.39
11g_6Mbps	2	2437	17.10	16.76	16.42	16.41
11g_6Mbps	2	2462	16.43	16.47	16.33	16.30
HT-20_MCS0	2	2412	17.61	17.73	17.58	17.59
HT-20_MCS0	2	2437	16.68	16.73	17.68	17.64
HT-20_MCS0	2	2462	17.69	17.70	16.93	16.93
HT-40_MCS0	2	2422	36.70	36.62	33.32	34.72
HT-40_MCS0	2	2437	36.70	36.66	35.04	35.20
HT-40_MCS0	2	2452	36.98	36.82	35.08	31.92
Limit			N/A		≥500 kHz	
Result			Complied			
Note 1: N _{TX} = Number of Transmit Chains						

Worst Emission Bandwidth Plots

99% bandwidth

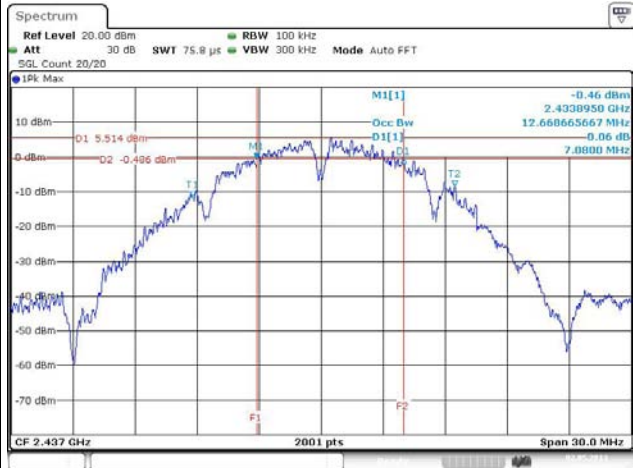
11b



Date: 9. APR. 2013 18:17:01

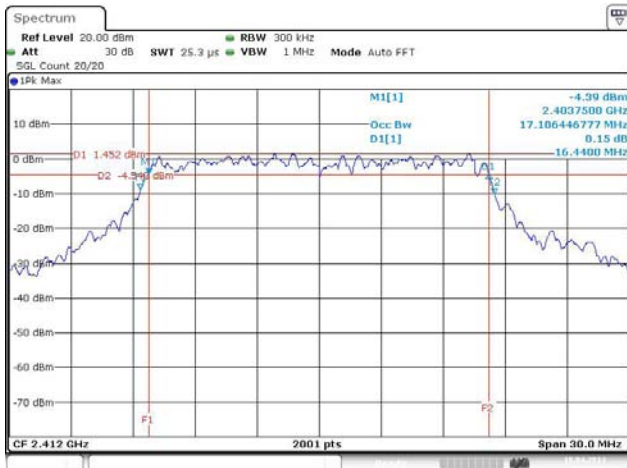
6dB bandwidth

11b



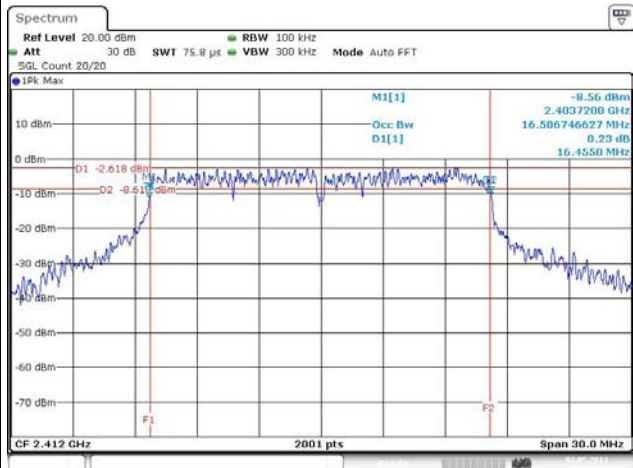
Date: 2. MAY. 2013 03:34:34

11g



Date: 18. APR. 2013 10:15:37

11g

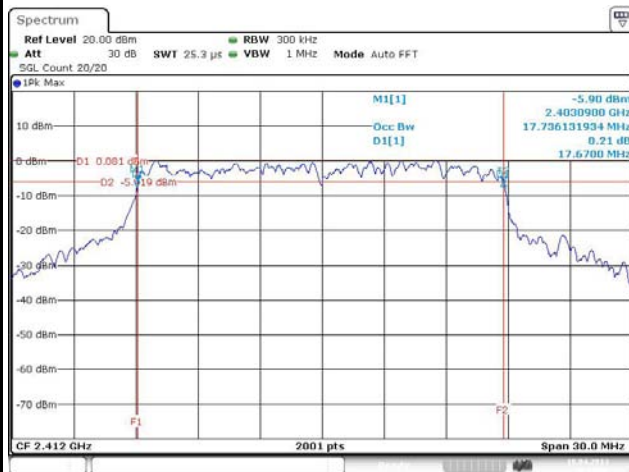


Date: 2. MAY. 2013 03:39:53

Worst Emission Bandwidth Plots

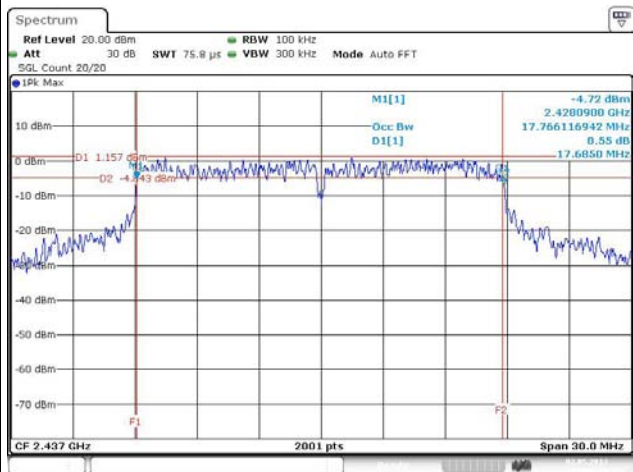
99% bandwidth

HT20

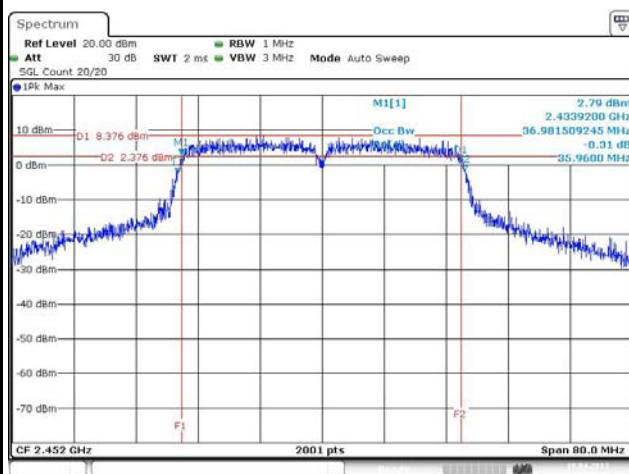


6dB bandwidth

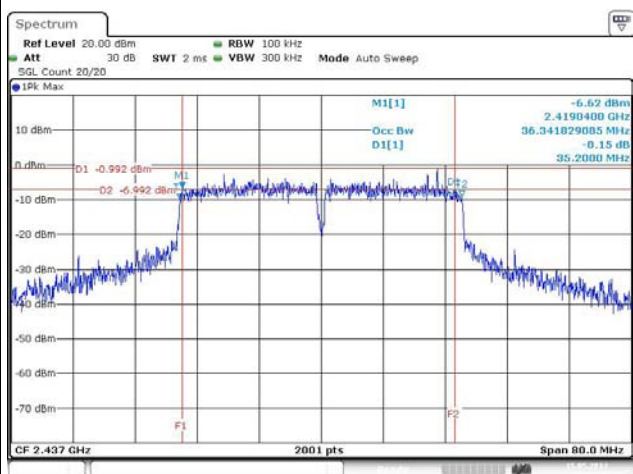
HT20



HT40



HT40

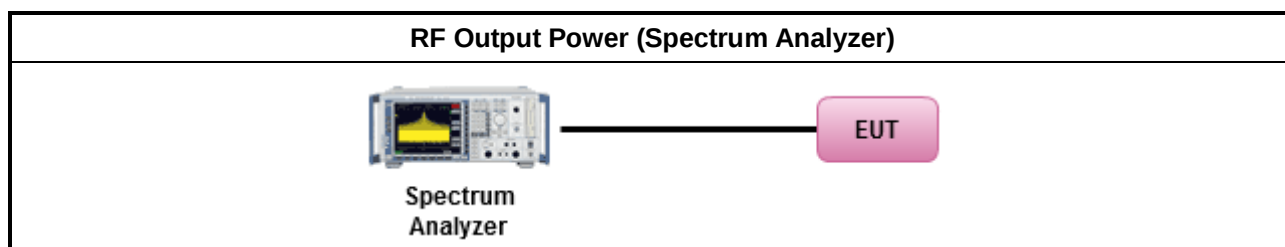


3.2 RF Output Power

3.2.1 Test Procedures

Test Method	
☒	Maximum Peak Conducted Output Power
☐	Refer as FCC KDB 558074, clause 9.1.1 Option 1 (RBW ≥ EBW method).
☒	Refer as FCC KDB 558074, clause 9.1.2 Option 2 (integrated band power method).
☐	Refer as FCC KDB 558074, clause 9.1.3 Option 2 (peak power meter for VBW ≥ DTS BW)
☒	Maximum Conducted Output Power
	[duty cycle ≥ 98% or external video / power trigger]
☐	Refer as FCC KDB 558074, clause 9.2.2.2 Method AVGSA-1 (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 9.2.2.3 Method AVGSA-1 Alt. (slow sweep speed)
	duty cycle < 98% and average over on/off periods with duty factor
☒	Refer as FCC KDB 558074, clause 9.2.2.4 Method AVGSA-2 (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 9.2.2.5 Method AVGSA-2 Alt. (slow sweep speed)
	RF power meter and average over on/off periods with duty factor or gated trigger
☐	Refer as FCC KDB 558074, clause 9.2.3 Method AVGPM (using an RF average power meter).
☒	For conducted measurement.
☐	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
☒	The EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
☒	If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.2.2 Test Setup



3.2.3 Test Result of Maximum Peak Conducted Output Power

Maximum Peak Conducted Output Power Result									
Condition			RF Output Power (dBm)						
Modulation Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11b_1Mbps	2	2412	20.08	20.04	23.07	30.00	3.60	26.67	36.00
11b_1Mbps	2	2437	19.93	20.31	23.13	30.00	3.60	26.73	36.00
11b_1Mbps	2	2462	19.91	20.03	22.98	30.00	3.60	26.58	36.00
11g_6Mbps	2	2412	18.36	18.18	21.28	30.00	3.60	24.88	36.00
11g_6Mbps	2	2437	22.28	22.11	25.21	30.00	3.60	28.81	36.00
11g_6Mbps	2	2462	17.44	17.30	20.38	30.00	3.60	23.98	36.00
HT-20_MCS0	2	2412	16.93	17.40	20.18	30.00	3.60	23.78	36.00
HT-20_MCS0	2	2437	22.08	21.96	25.03	30.00	3.60	28.63	36.00
HT-20_MCS0	2	2462	17.24	17.01	20.14	30.00	3.60	23.74	36.00
HT-40_MCS0	2	2422	13.51	13.79	16.66	30.00	3.60	20.26	36.00
HT-40_MCS0	2	2437	20.20	20.08	23.15	30.00	3.60	26.75	36.00
HT-40_MCS0	2	2452	12.81	12.56	15.70	30.00	3.60	19.30	36.00
Result			Complied						

3.2.4 Test Result of Maximum Average Conducted Output Power

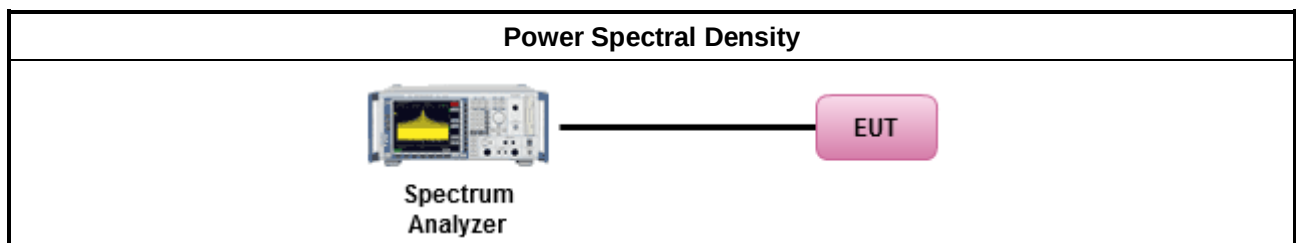
Maximum Average Conducted Output Power									
Condition			RF Output Power (dBm)						
Modulation Mode	N _{TX}	Freq. (MHz)	Chain 0	Chain 1	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11b_1Mbps	2	2412	16.83	17.15	20.00	30.00	3.60	23.60	36.00
11b_1Mbps	2	2437	17.06	17.42	20.25	30.00	3.60	23.85	36.00
11b_1Mbps	2	2462	17.06	17.13	20.11	30.00	3.60	23.71	36.00
11g_6Mbps	2	2412	13.25	13.24	16.26	30.00	3.60	19.86	36.00
11g_6Mbps	2	2437	17.07	17.09	20.09	30.00	3.60	23.69	36.00
11g_6Mbps	2	2462	12.36	12.31	15.35	30.00	3.60	18.95	36.00
HT-20_MCS0	2	2412	12.11	12.42	15.28	30.00	3.60	18.88	36.00
HT-20_MCS0	2	2437	17.05	17.00	20.04	30.00	3.60	23.64	36.00
HT-20_MCS0	2	2462	12.11	12.02	15.08	30.00	3.60	18.68	36.00
HT-40_MCS0	2	2422	8.40	8.76	11.59	30.00	3.60	15.19	36.00
HT-40_MCS0	2	2437	15.26	15.26	18.27	30.00	3.60	21.87	36.00
HT-40_MCS0	2	2452	7.66	7.60	10.64	30.00	3.60	14.24	36.00
Result			Complied						

3.3 Power Spectral Density

3.3.1 Test Procedures

Test Method	
☒	Peak power spectral density procedures that the same method as used to determine the conducted output power. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).
☒	Refer as FCC KDB 558074, clause 10.2 Method PKPSD (RBW=3-100kHz;detector=peak).. [duty cycle $\geq$ 98% or external video / power trigger]
☐	Refer as FCC KDB 558074, clause 10.3 Method AVGPS-1 (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 10.4 Method AVGPS-1 Alt. (slow sweep speed)
	duty cycle < 98% and average over on/off periods with duty factor
☒	Refer as FCC KDB 558074, clause 10.5 Method AVGPS-2 (spectral trace averaging).
☐	Refer as FCC KDB 558074, clause 10.6 Method AVGPS-2 Alt. (slow sweep speed)
☒	For conducted measurement.
☐	The EUT supports single transmit chain and measurements performed on this transmit chain.
☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
☒	The EUT supports multiple transmit chains using options given below:
☒	Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the 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 N _{TX} output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
☐	Option 2: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.

3.3.2 Test Setup

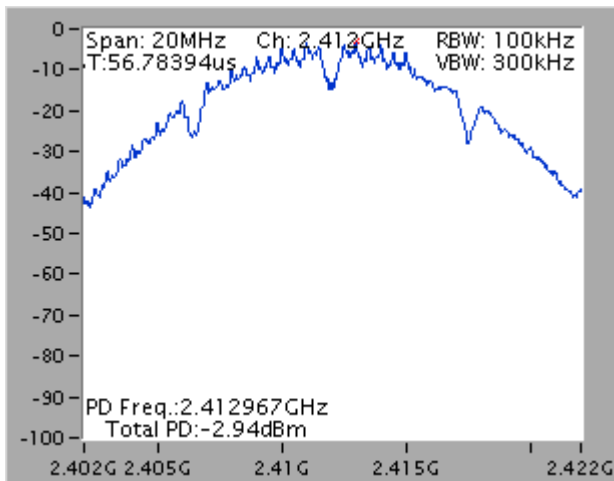


3.3.3 Test Result of Power Spectral Density

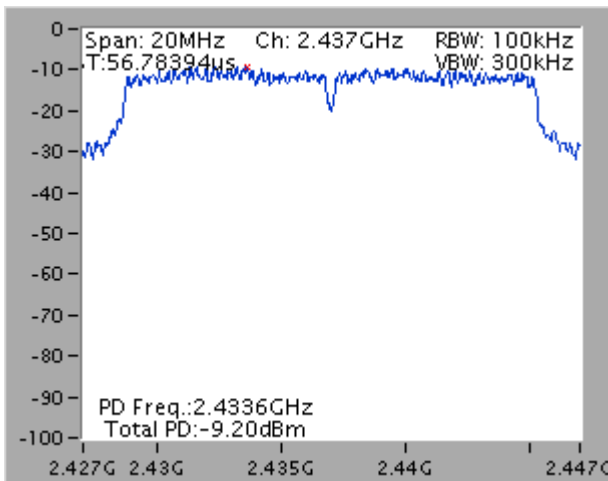
Power Spectral Density Result				
Condition			Power Spectral Density	
Modulation Mode	N _{TX}	Freq. (MHz)	Sum Chain dBm/100kHz	Power Limit dBm/3kHz
11b_1Mbps	2	2412	-2.94	8
11b_1Mbps	2	2437	-3.46	8
11b_1Mbps	2	2462	-5.10	8
11g_6Mbps	2	2412	-12.34	8
11g_6Mbps	2	2437	-9.20	8
11g_6Mbps	2	2462	-13.86	8
HT-20_MCS0	2	2412	-14.51	8
HT-20_MCS0	2	2437	-8.97	8
HT-20_MCS0	2	2462	-13.55	8
HT-40_MCS0	2	2422	-19.21	8
HT-40_MCS0	2	2437	-6.16	8
HT-40_MCS0	2	2452	-13.85	8
Result			Complied	
Note 1: PSD [dBm/3kHz] = sum each transmit chains by bin-to-bin PSD [dBm/100kHz] + BWFC [-15.2 dB]				

Worst Power Spectral Density Plots

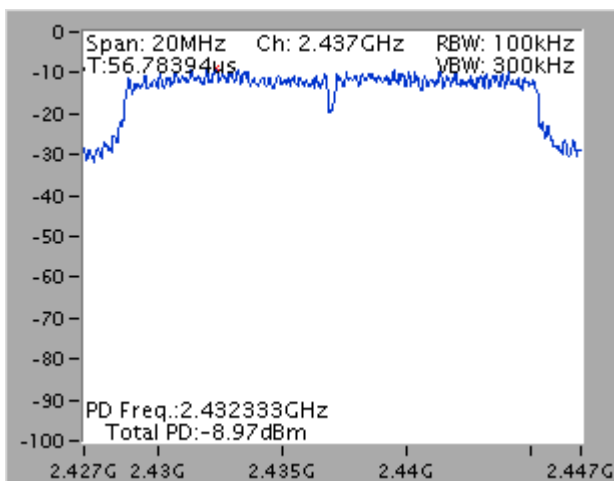
11b [Sum All Chains]



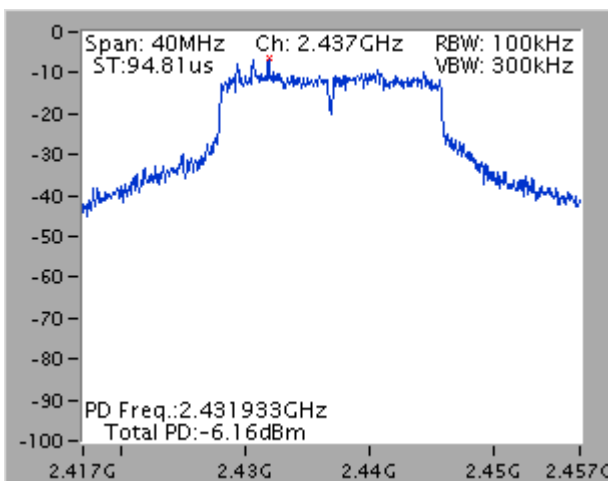
11g [Sum All Chains]



HT-20 [Sum All Chains]



HT-40 [Sum All Chains]

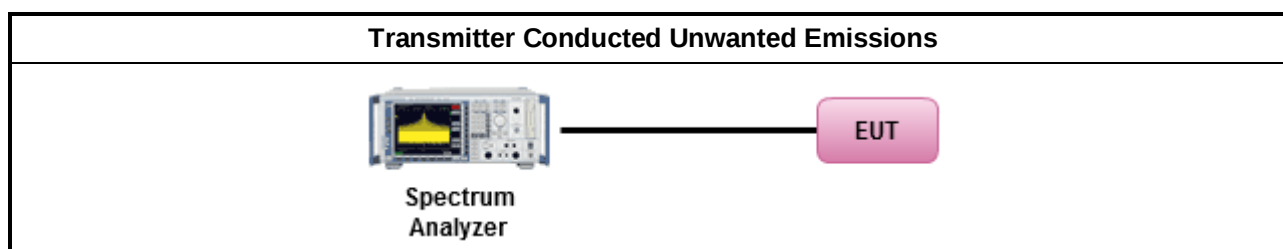


3.4 Emission in Non-Restricted Frequency Bands

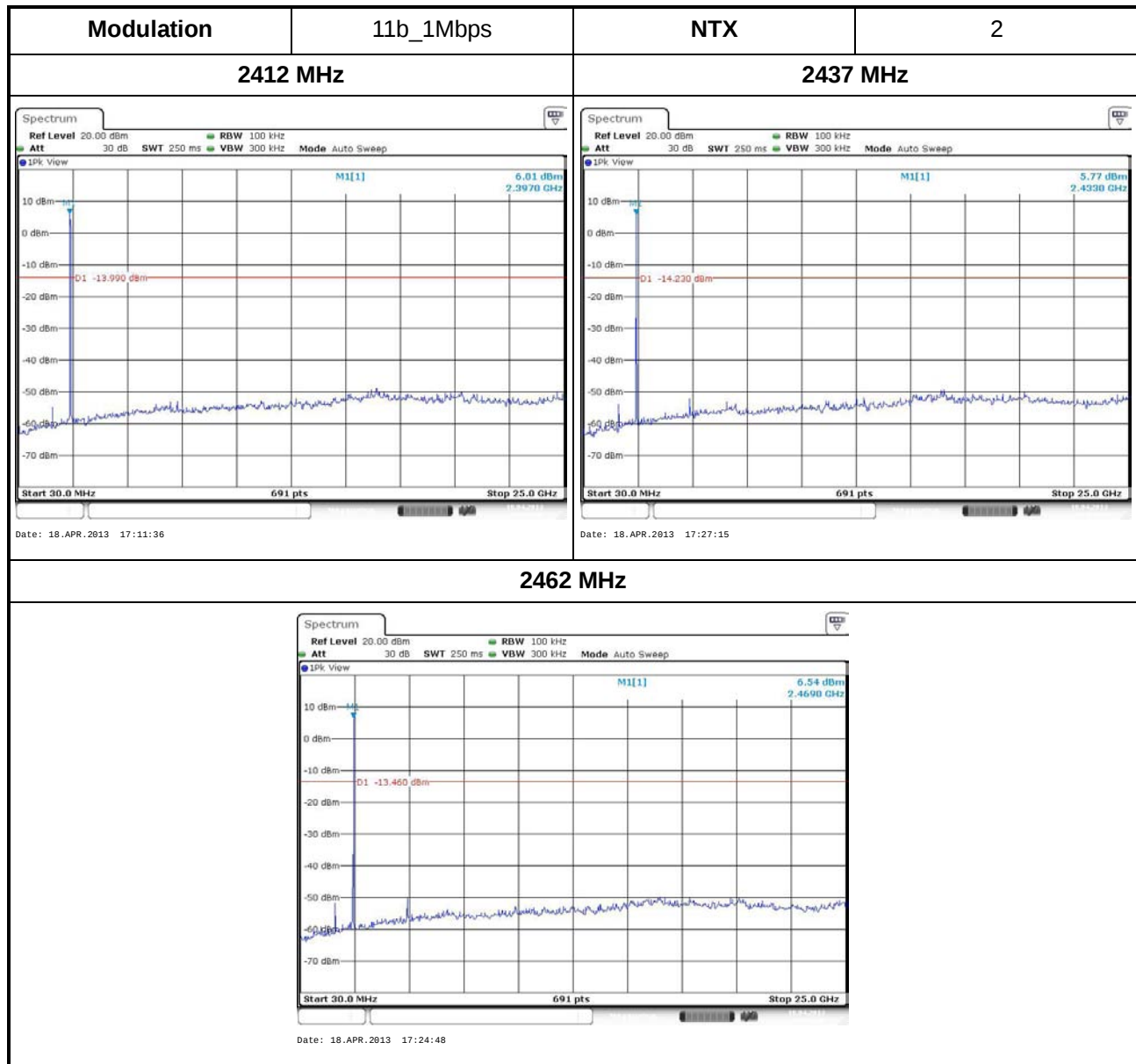
3.4.1 Test Procedures

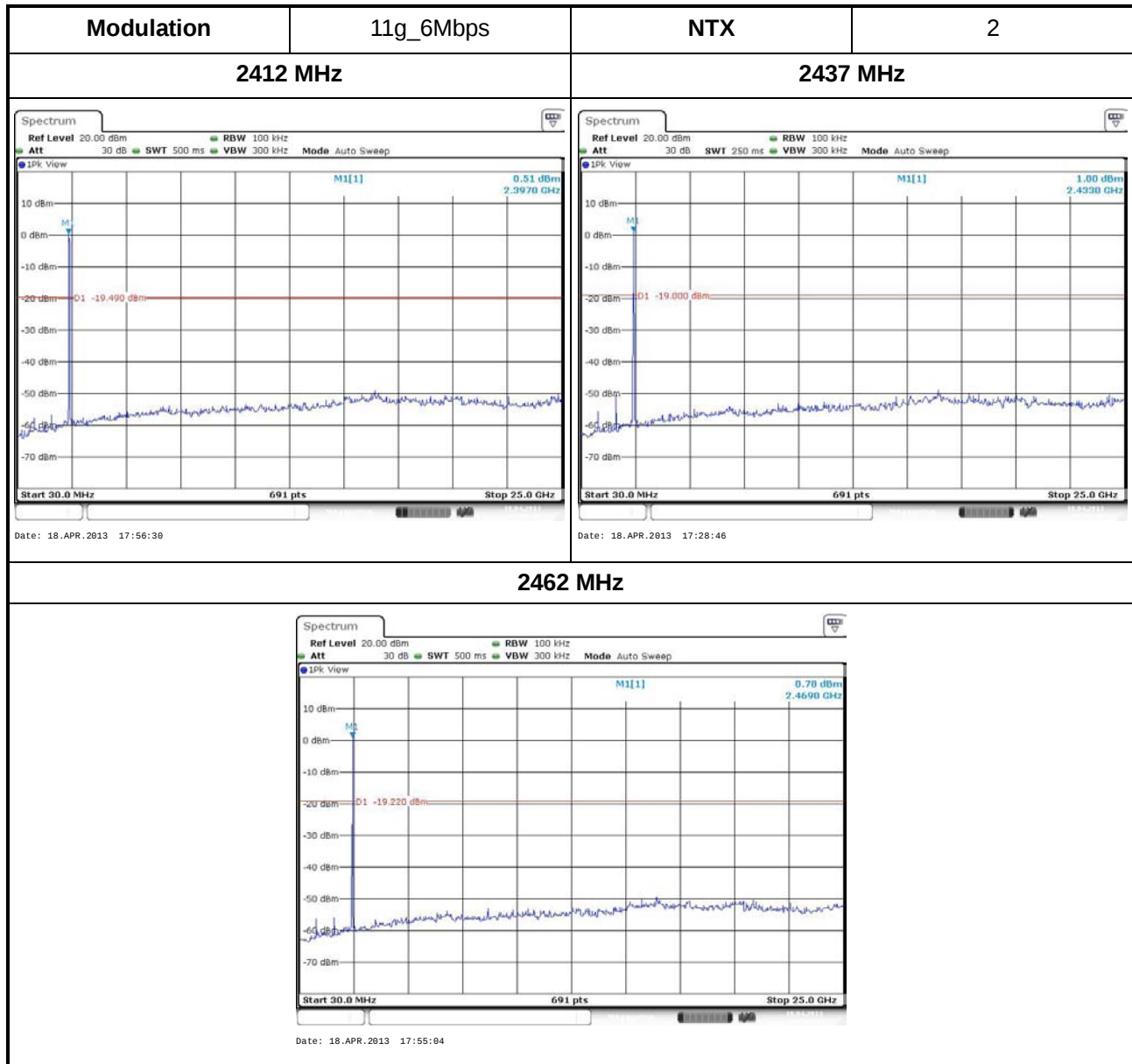
Test Method	
☒	The average emission levels shall be measured in [duty cycle $\geq$ 98 or duty factor].
☒	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
☒	For the transmitter unwanted emissions shall be measured using following options below:
☒	Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
☒	For the transmitter bandedge emissions shall be measured using following options below:
☐	Refer as FCC KDB 558074, clause 13.3 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
☒	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 558074, clause 12.2.2.
☒	For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding 10 log(N) if the measurements are made relative to the in-band emissions on the individual outputs.
☐	For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB
☒	For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.

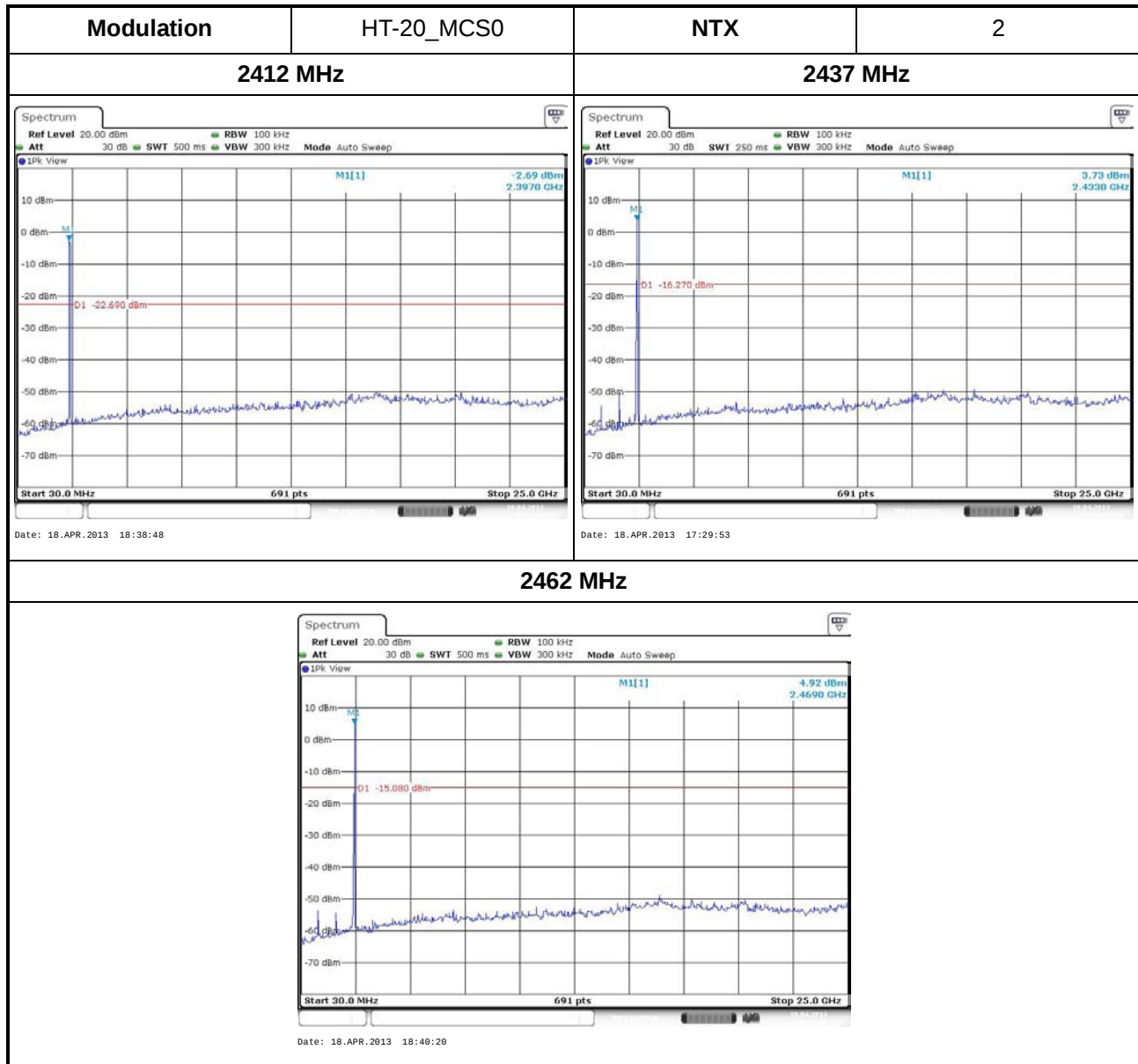
3.4.2 Test Setup

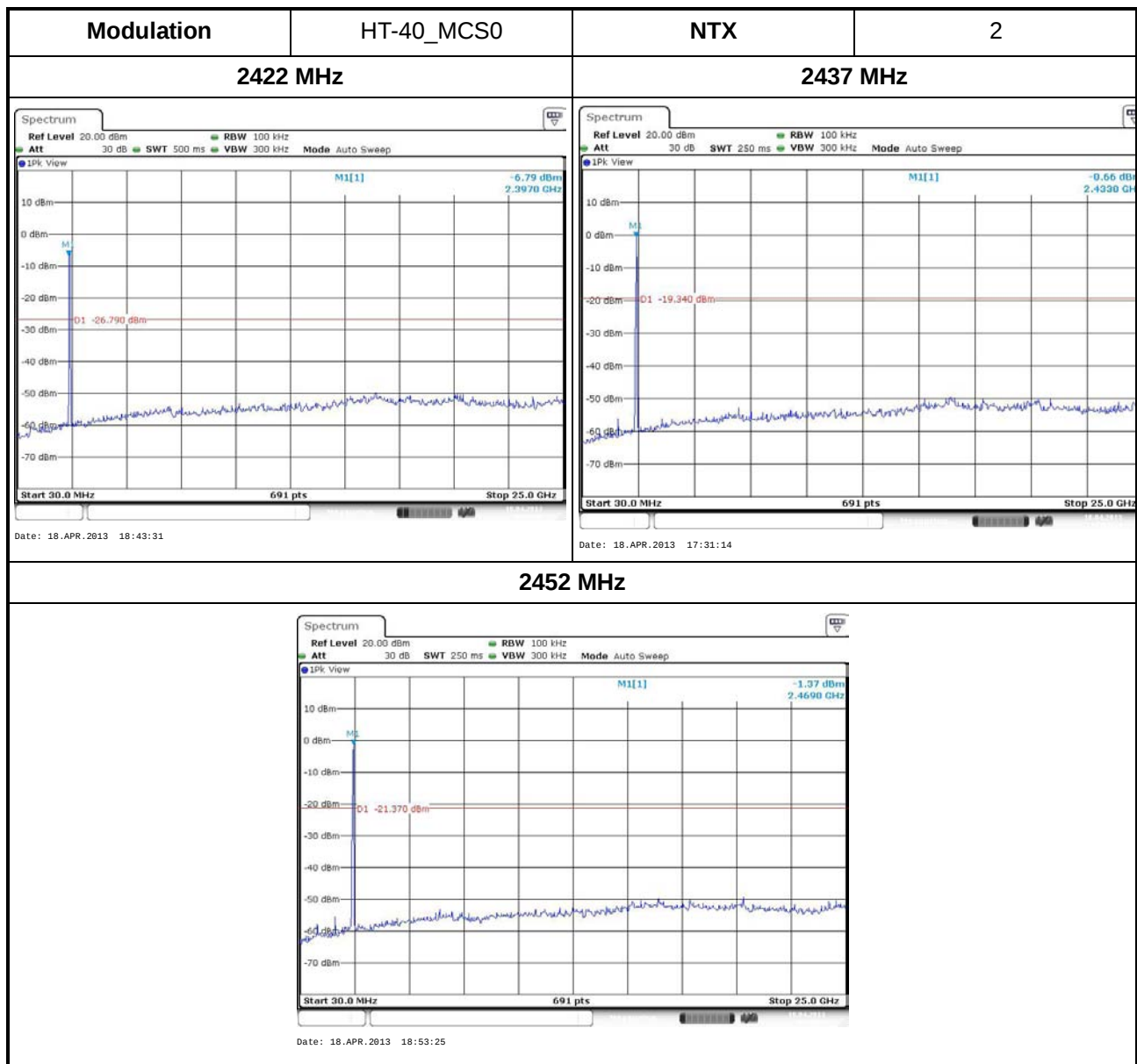


3.4.3 Test Result of Emission in Non-Restricted Frequency Bands







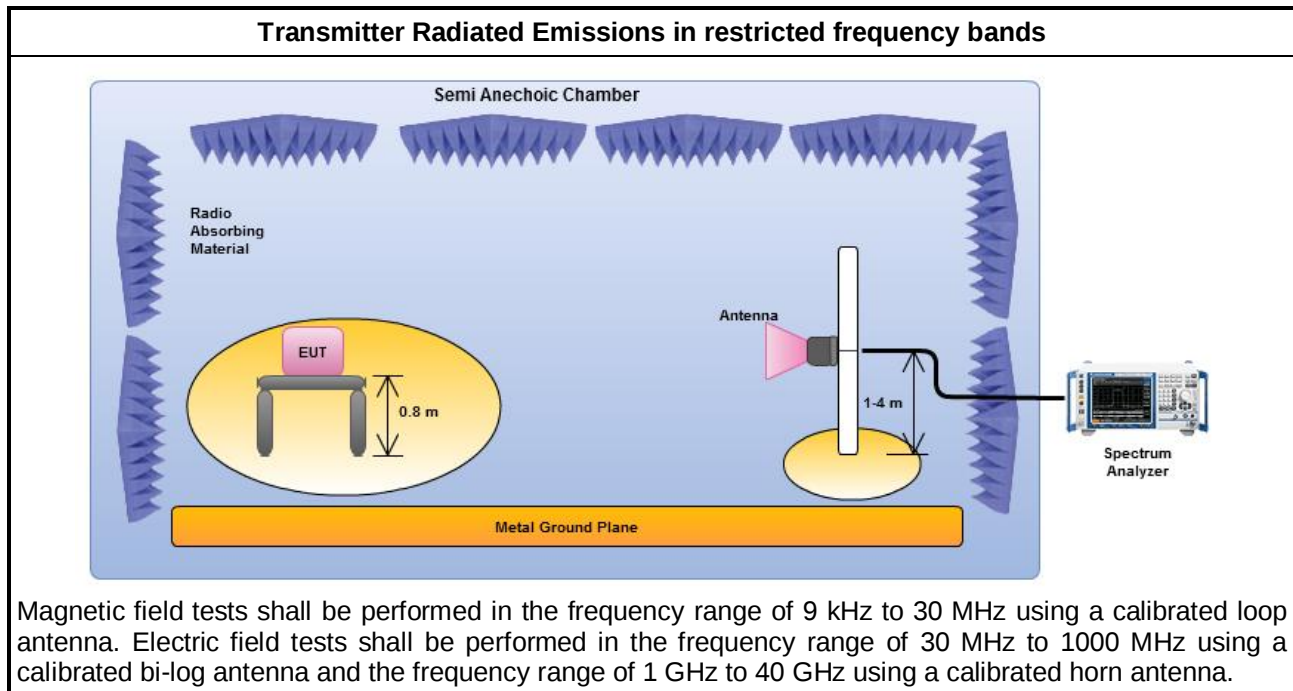
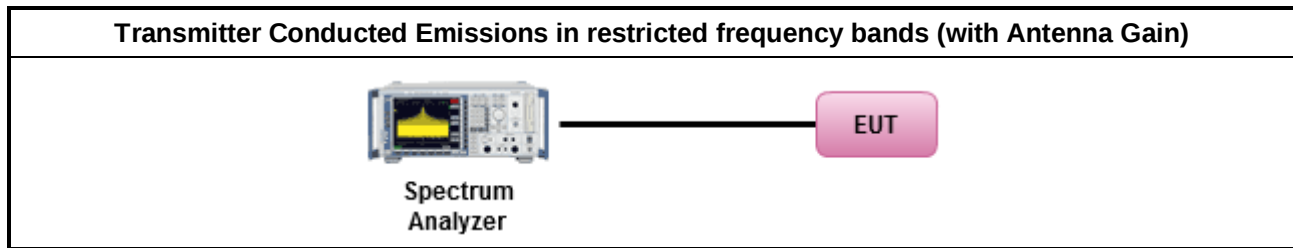


3.5 Emission in Restricted Frequency Bands

3.5.1 Test Procedures

Test Method	
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
☒	Measurements in the frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.
☒	Measurements in the frequency range above 18 GHz - 25GHz are typically made at a closer distance 0.5m, because the instrumentation noise floor is typically close to the radiated emission limit.
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].
☒	For the transmitter unwanted emissions shall be measured using following options below:
☒	Refer as FCC KDB 558074, clause 11 for unwanted emissions into non-restricted bands.
☒	Refer as FCC KDB 558074, clause 12 for unwanted emissions into restricted bands.
☐	Refer as FCC KDB 558074, clause 12.2.5.1 Option 1 (trace averaging for duty cycle $\geq 98\%$)
☐	Refer as FCC KDB 558074, clause 12.2.5.2 Option 2 (trace averaging + duty factor).
☒	Refer as FCC KDB 558074, clause 12.2.5.3 Option 3 (Reduced VBW $\geq 1/T$).
☐	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW $\geq 1/T$, where T is pulse time.
☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
☒	Refer as FCC KDB 558074, clause 11.3 and 12.2.4 measurement procedure peak limit.
☒	Refer as FCC KDB 558074, clause 12.2.3 measurement procedure Quasi-Peak limit.
☒	For radiated measurement, refer as FCC KDB 558074, clause 12.2.7.
☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.
☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.
☒	Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz.
☒	For conducted and cabinet radiation measurement, refer as FCC KDB 558074, clause 12.2.2.
☒	For conducted unwanted emissions into non-restricted bands (relative emission limits). Devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding $10 \log(N)$ if the measurements are made relative to the in-band emissions on the individual outputs.
☒	For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add $10 \log(N)$ dB
☒	For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.

3.5.2 Test Setup

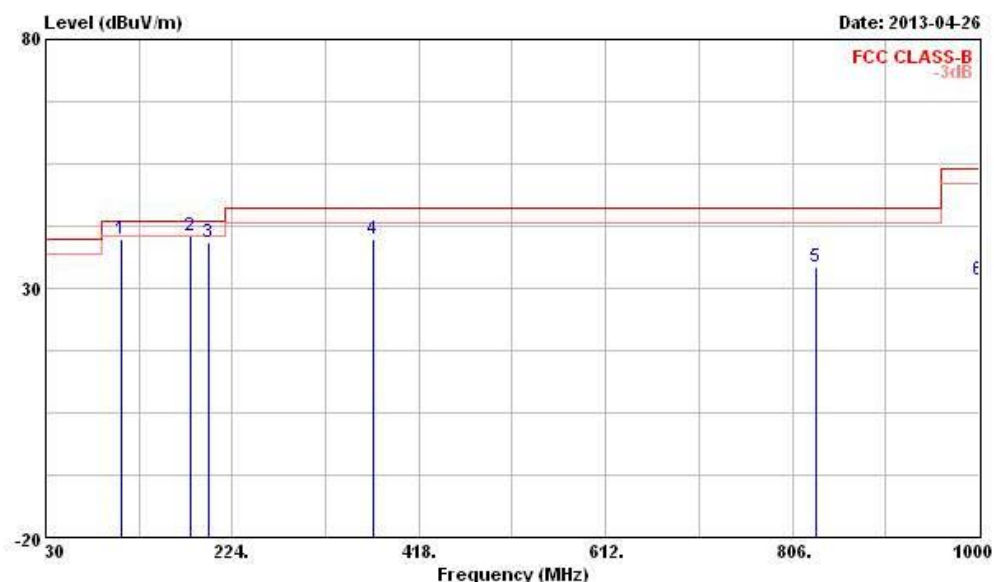


3.5.3 Emission in Restricted Frequency Bands- (Below 30MHz)

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

3.5.4 Emission in Restricted Frequency Bands- (Below 1GHz)

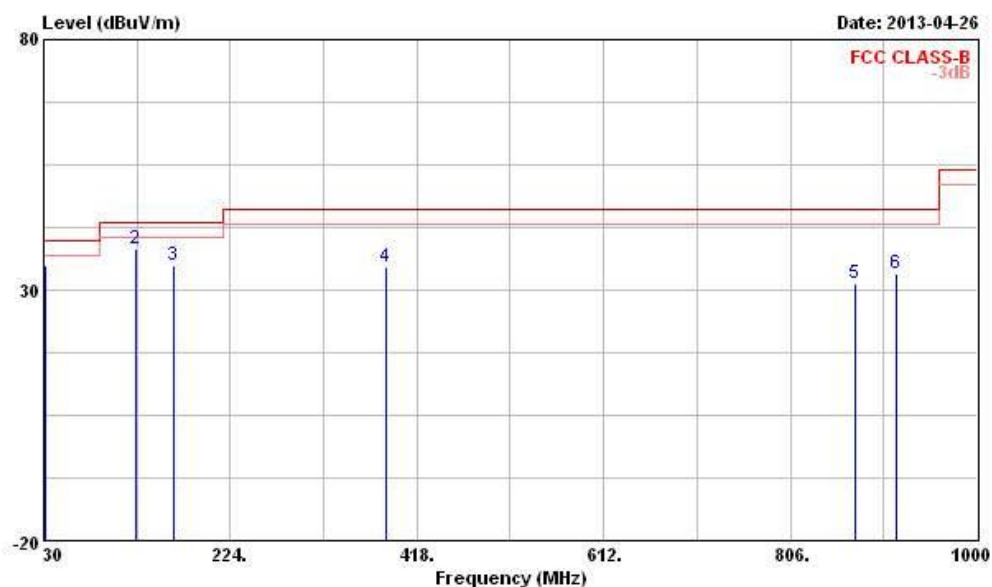
Operating Mode	11b_1Mbps	Polarization	H
Operating Frequency	2437 MHz	Configuration	With PIFA Ant.



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	109.540	40.00	-3.50	43.50	54.05	12.34	1.47	27.86	Peak	---	---
2	180.350	40.38	-3.12	43.50	56.10	9.90	1.96	27.58	Peak	---	---
3	198.780	39.29	-4.21	43.50	53.46	11.28	2.06	27.51	Peak	---	---
4	370.470	39.97	-6.03	46.00	50.01	14.80	2.89	27.73	Peak	---	---
5	831.220	34.20	-11.80	46.00	37.52	20.19	4.48	27.99	Peak	---	---
6	999.990	31.80	-22.20	54.00	31.67	22.50	4.96	27.33	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Operating Mode	11b_1Mbps	Polarization	V
Operating Frequency	2437 MHz	Configuration	With PIFA Ant.



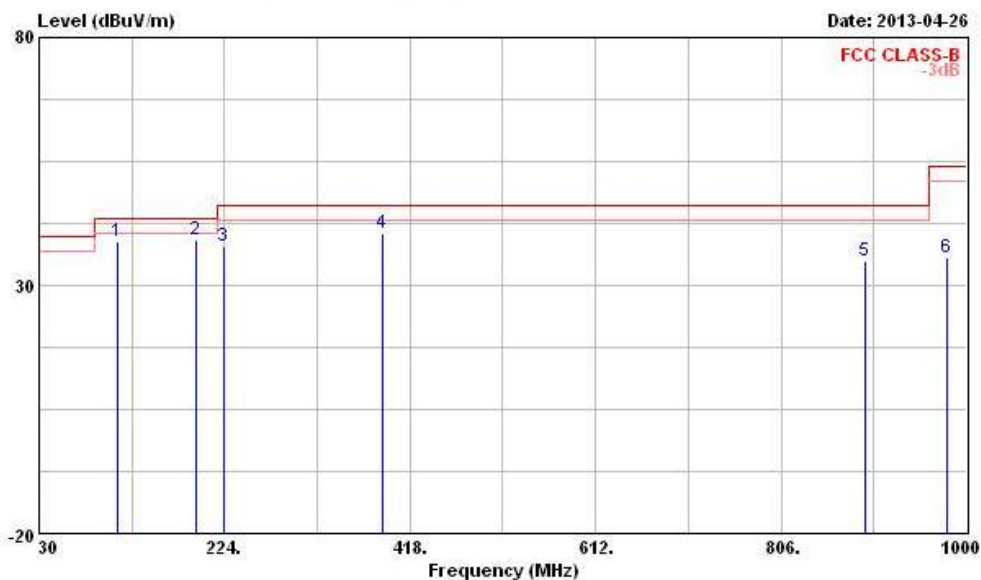
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	31.940	34.85	-5.15	40.00	46.55	15.48	0.79	27.97 Peak	---	---
2	126.030	38.16	-5.34	43.50	51.26	13.10	1.60	27.80 Peak	---	---
3	164.830	34.83	-8.67	43.50	50.31	10.34	1.82	27.64 Peak	---	---
4	385.990	34.76	-11.24	46.00	44.62	15.04	2.94	27.84 Peak	---	---
5	873.900	31.17	-14.83	46.00	34.37	20.09	4.56	27.85 Peak	---	---
6	916.580	33.35	-12.65	46.00	35.93	20.44	4.68	27.70 Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Operating Mode	11g_6Mbps	Polarization	H
Operating Frequency	2437 MHz	Configuration	With PIFA Ant.



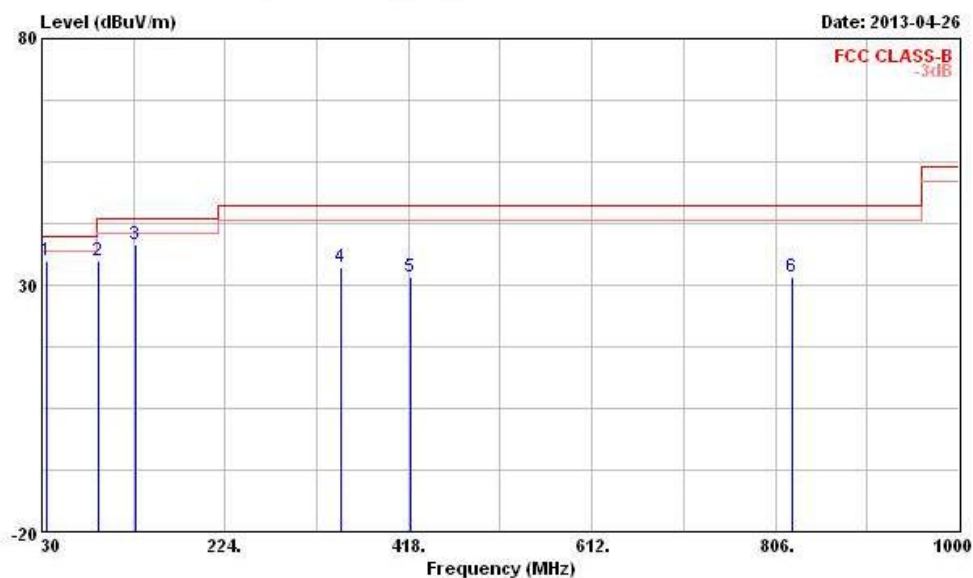
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB	dB		cm	deg
1	112.450	38.89	-4.61	43.50	52.56	12.69	1.49	27.85 Peak	---	---
2	194.900	39.19	-4.31	43.50	53.68	10.99	2.04	27.52 Peak	---	---
3	223.030	37.76	-8.24	46.00	50.87	12.11	2.22	27.44 Peak	---	---
4	388.900	40.61	-5.39	46.00	50.44	15.09	2.94	27.86 Peak	---	---
5	893.300	34.93	-11.07	46.00	38.08	20.04	4.60	27.79 Peak	---	---
6	979.630	35.43	-18.57	54.00	35.95	22.00	4.90	27.42 Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Operating Mode	11g_6Mbps	Polarization	V
Operating Frequency	2437 MHz	Configuration	With PIFA Ant.



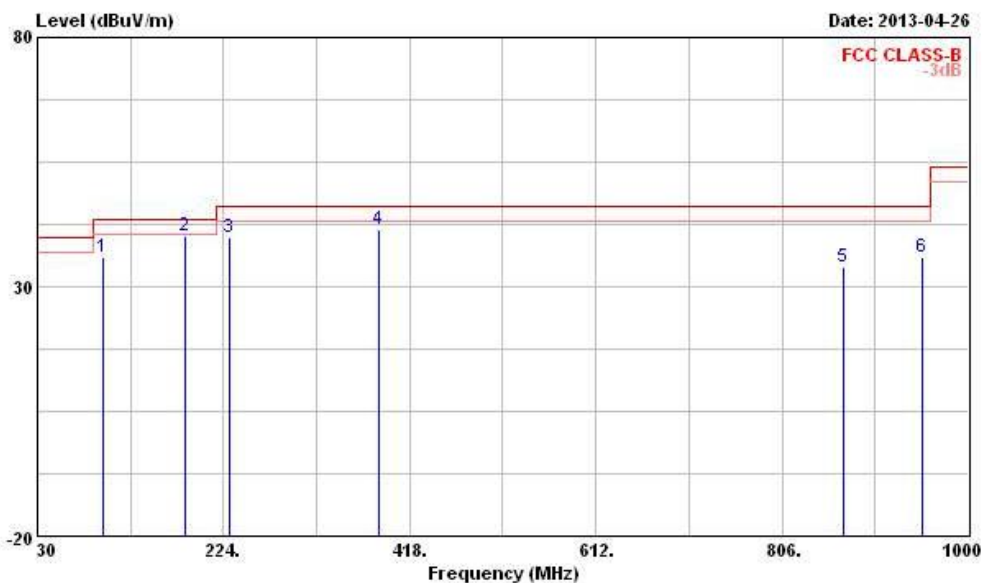
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 @	35.820	34.84	-5.16	40.00	47.81	14.15	0.82	27.94 Peak	---	---
2	90.140	34.79	-8.71	43.50	51.84	9.50	1.34	27.89 Peak	---	---
3 @	128.940	38.06	-5.44	43.50	51.36	12.87	1.62	27.79 Peak	---	---
4	347.190	33.73	-12.27	46.00	44.05	14.43	2.81	27.56 Peak	---	---
5	419.940	31.52	-14.48	46.00	40.85	15.66	3.06	28.05 Peak	---	---
6	824.430	31.64	-14.36	46.00	34.97	20.21	4.47	28.01 Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Operating Mode	HT-20_MCS0	Polarization	H
Operating Frequency	2437 MHz	Configuration	With PIFA Ant.



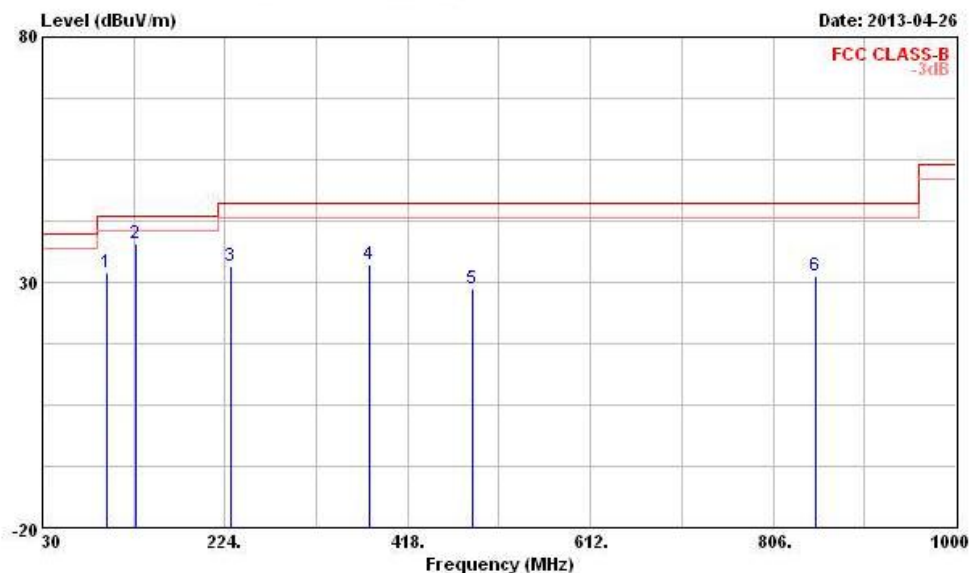
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	98.870	35.80	-7.70	43.50	51.30	11.01	1.39	27.90	Peak	---
2	184.230	40.06	-3.44	43.50	55.45	10.19	1.98	27.56	Peak	---
3	230.790	39.85	-6.15	46.00	52.62	12.37	2.27	27.41	Peak	---
4	385.020	41.38	-4.62	46.00	51.25	15.03	2.93	27.83	Peak	---
5	870.020	34.09	-11.91	46.00	37.30	20.10	4.56	27.87	Peak	---
6	951.500	35.92	-10.08	46.00	37.34	21.30	4.82	27.54	Peak	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Operating Mode	HT-20_MCS0	Polarization	V
Operating Frequency	2437 MHz	Configuration	With PIFA Ant.



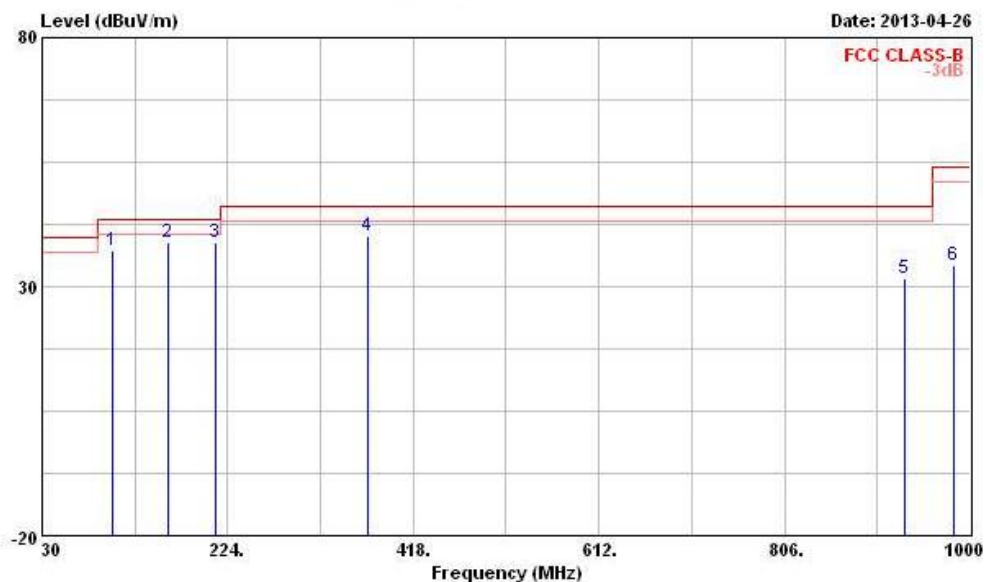
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	98.870	32.03	-11.47	43.50	47.53	11.01	1.39	27.90	Peak	---	---
2	128.940	37.98	-5.52	43.50	51.28	12.87	1.62	27.79	Peak	---	---
3	230.790	33.36	-12.64	46.00	46.13	12.37	2.27	27.41	Peak	---	---
4	377.260	33.58	-12.42	46.00	43.55	14.90	2.91	27.78	Peak	---	---
5	486.870	28.72	-17.28	46.00	36.74	17.02	3.36	28.40	Peak	---	---
6	851.590	31.18	-14.82	46.00	34.43	20.15	4.52	27.92	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Operating Mode	HT-40_MCS0	Polarization	H
Operating Frequency	2462 MHz	Configuration	With PIFA Ant.



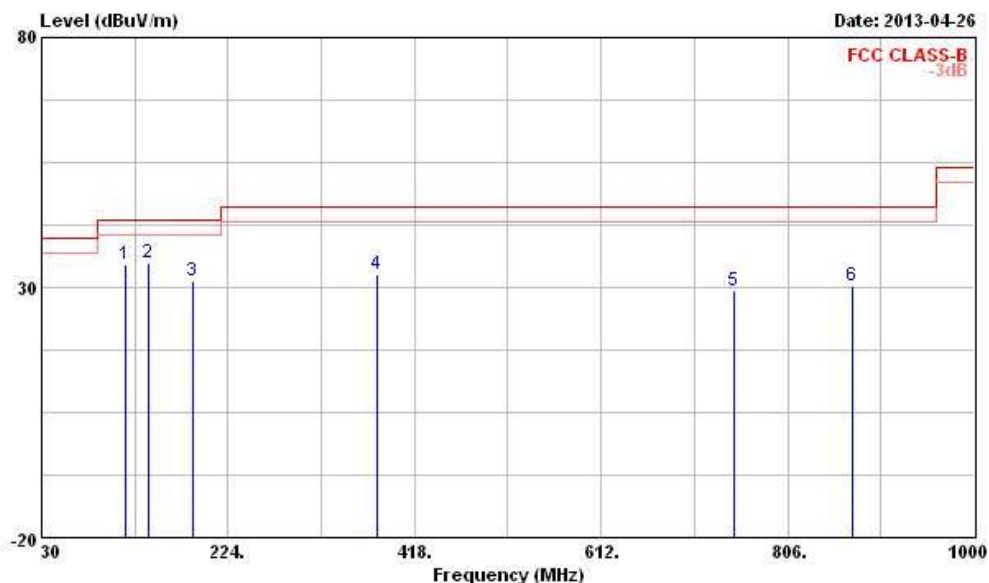
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamplifier Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	102.750	37.16	-6.34	43.50	52.10	11.53	1.42	27.89	Peak	---	---
2	160.950	38.91	-4.59	43.50	54.27	10.51	1.79	27.66	Peak	---	---
3	211.390	38.84	-4.66	43.50	52.44	11.73	2.14	27.47	Peak	---	---
4	370.470	40.20	-5.80	46.00	50.24	14.80	2.89	27.73	Peak	---	---
5	932.100	31.78	-14.22	46.00	33.84	20.82	4.75	27.63	Peak	---	---
6	983.510	34.16	-19.84	54.00	34.55	22.09	4.92	27.40	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Operating Mode	HT-40_MCS0	Polarization	V
Operating Frequency	2462 MHz	Configuration	With PIFA Ant.



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	117.300	34.55	-8.95	43.50	47.58	13.27	1.53	27.83	Peak	---
2	141.550	34.90	-8.60	43.50	49.14	11.78	1.71	27.73	Peak	---
3	187.140	31.16	-12.34	43.50	46.31	10.41	1.99	27.55	Peak	---
4	378.230	32.68	-13.32	46.00	42.64	14.92	2.91	27.79	Peak	---
5	749.740	29.48	-16.52	46.00	34.03	19.55	4.16	28.26	Peak	---
6	873.900	30.36	-15.64	46.00	33.56	20.09	4.56	27.85	Peak	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

3.5.5 Emission in Restricted Frequency Bands- (Above 1GHz)

Antenna-ports conducted measurements are used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands; in the meanwhile, an additional radiated test with 50ohm terminator for cabinet spurious emission is also performed.

Modulation: 11b_1Mbps; Test Frequency: 2412 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2387.48	-	-	6.61	-36.59	-21.2	Peak
2387.00	-	-	6.61	-45.71	-41.2	Average
4823.96	-45.10	-44.37	6.09	-35.63	-21.2	Peak
4822.87	-53.32	-52.61	6.09	-43.86	-41.2	Average

Modulation: 11b_1Mbps; Test Frequency: 2437 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
4873.81	-46.09	-44.02	6.09	-35.84	-21.2	Peak
4872.89	-55.92	-50.66	6.09	-43.45	-41.2	Average

Modulation: 11b_1Mbps; Test Frequency: 2462 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2486.79	-	-	6.61	-36.14	-21.2	Peak
2484.60	-	-	6.61	-45.62	-41.2	Average
4923.83	-44.96	-42.97	6.09	-34.76	-21.2	Peak
4922.99	-52.42	-49.55	6.09	-41.66	-41.2	Average

Transmitter Radiated Unwanted Emissions Result in Restricted Bands
2412 MHz

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	2385.600	62.21	-21.33	83.54	26.60	32.50	3.11	0.00	Peak	---	---
2	2412.930	117.35			81.73	32.51	3.11	0.00	Peak	---	---
1	2387.280	51.05	-12.49	63.54	15.44	32.50	3.11	0.00	Average	---	---
2	2412.820	113.48			77.86	32.51	3.11	0.00	Average	---	---

The item 2 is Fundamental Emissions.

2462 MHz

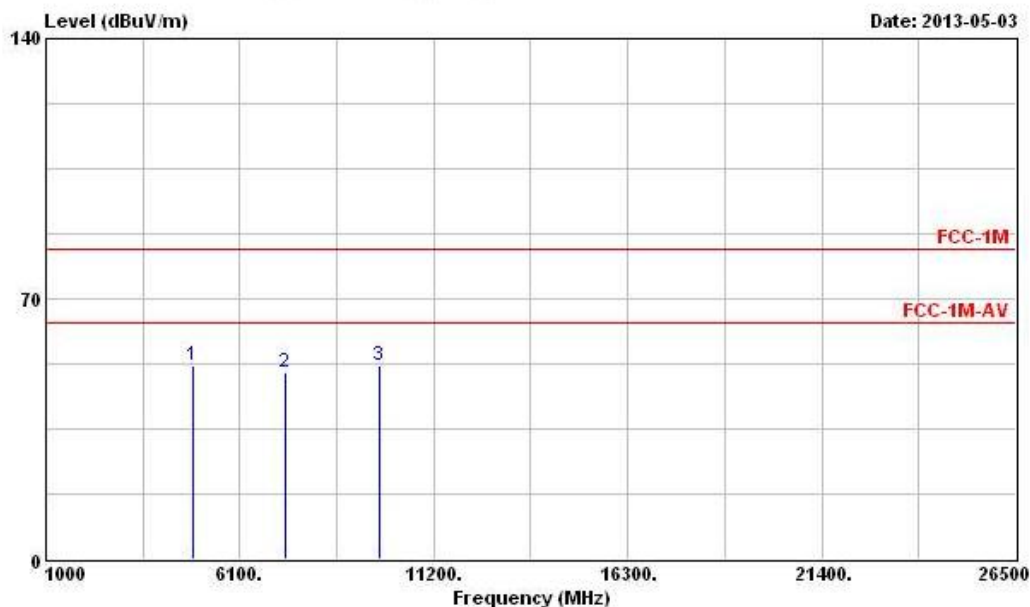
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	2460.700	117.52			81.82	32.57	3.13	0.00	Peak	---	---
2	2489.500	63.32	-20.22	83.54	27.57	32.60	3.15	0.00	Peak	---	---
1	2461.100	113.33			77.63	32.57	3.13	0.00	Average	---	---
2	2485.000	50.90	-12.64	63.54	15.17	32.58	3.15	0.00	Average	---	---

The item 1 is Fundamental Emissions.

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

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

Operating Mode	11b_1Mbps	Polarization	H
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	51.89	-11.65	63.54	48.06	34.38	4.31	34.86	PK	---	---
2	7311.000	50.08	-13.46	63.54	44.24	35.30	5.71	35.17	PK	---	---
3	9748.000	52.16			44.39	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

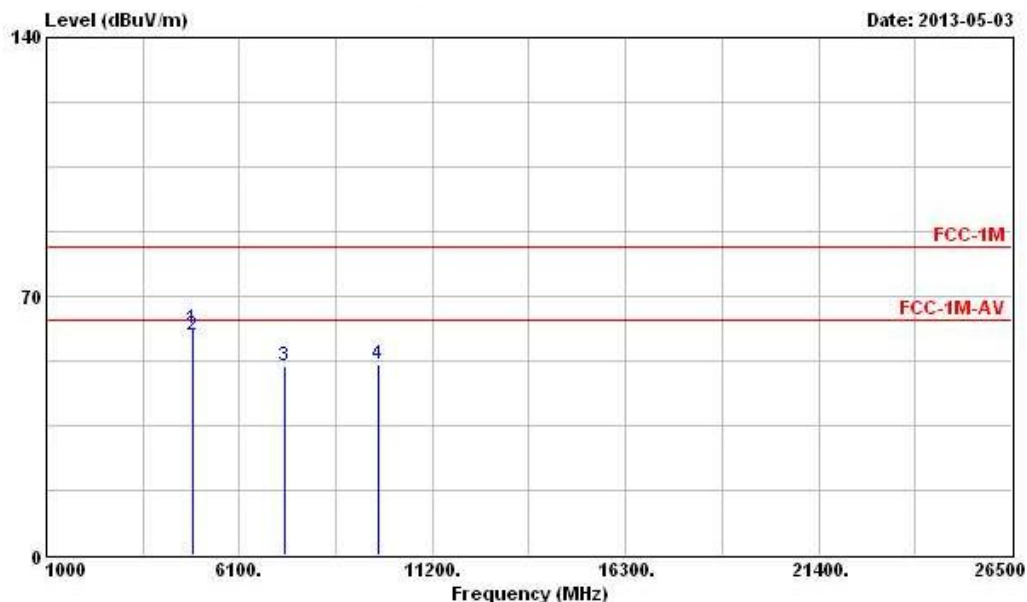
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 3) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Operating Mode	11b_1Mbps	Polarization	V
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	61.41	-22.13	83.54	57.58	34.38	4.31	34.86	Peak	---	---
2	4874.000	59.51	-4.03	63.54	55.68	34.38	4.31	34.86	Average	---	---
3	7311.000	51.23	-12.31	63.54	45.39	35.30	5.71	35.17	PK	---	---
4	9748.000	51.56			43.79	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 4) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Modulation: 11g_6Mbps; Test Frequency: 2412 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2389.88	-	-	6.61	-20.48 ^{Note1}	-21.2	Peak
2389.96	-	-	6.61	-33.39 ^{Note1}	-41.2	Average
4966.58	-47.31	-44.81	6.09	-36.79	-21.2	Peak
4960.82	-56.57	-56.28	6.09	-47.33	-41.2	Average
Note ¹ : Using conducted method with composite antenna gain to test unwanted emissions in restricted bands may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance was demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. The result does show it is compliant. Please refer to radiated section.						

Modulation: 11g_6Mbps; Test Frequency: 2437 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
4876.82	-43.71	-47.55	6.09	-36.13	-21.2	Peak
4875.15	-55.21	-56.93	6.09	-46.90	-41.2	Average

Modulation: 11g_6Mbps; Test Frequency: 2462 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2483.53	-	-	6.61	-21.04 ^{Note1}	-21.2	Peak
2483.57	-	-	6.61	-34.93 ^{Note1}	-41.2	Average
4966.66	-45.73	-45.49	6.09	-36.52	-21.2	Peak
4960.32	-56.86	-56.28	6.09	-47.47	-41.2	Average
Note ¹ : Using conducted method with composite antenna gain to test unwanted emissions in restricted bands may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance was demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. The result does show it is compliant. Please refer to radiated section.						

Transmitter Radiated Unwanted Emissions Result in Restricted Bands
2412 MHz

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	2389.520	81.92	-1.62	83.54	46.31	32.50	3.11	0.00	Peak	---	---
2 @	2406.210	116.91	-----	-----	81.29	32.51	3.11	0.00	Peak	---	---
1 @	2390.000	61.63	-1.91	63.54	26.02	32.50	3.11	0.00	Average	---	---
2 @	2406.990	105.48	-----	-----	69.86	32.51	3.11	0.00	Average	---	---

The item 2 is Fundamental Emissions.

2462 MHz

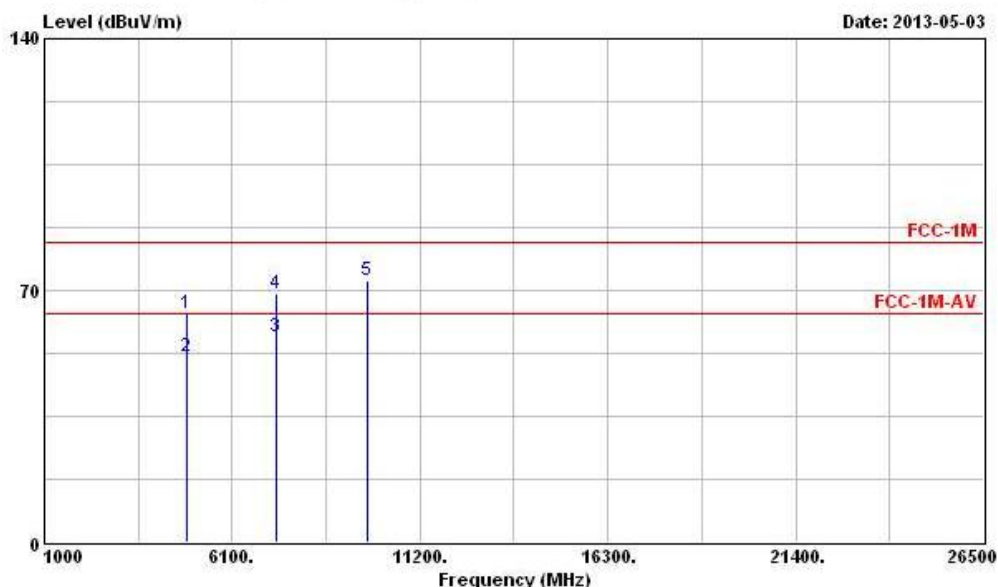
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	2456.600	116.31			80.61	32.57	3.13	0.00	Peak	---	---
2 @	2484.200	79.79	-3.75	83.54	44.06	32.58	3.15	0.00	Peak	---	---
1 @	2456.300	105.05			69.35	32.57	3.13	0.00	Average	---	---
2 @	2483.500	60.62	-2.92	63.54	24.89	32.58	3.15	0.00	Average	---	---

The item 1 is Fundamental Emissions.

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

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

Operating Mode	11g_6Mbps	Polarization	H
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	63.65	-19.89	83.54	59.82	34.38	4.31	34.86	Peak	---	---
2	4874.000	51.77	-11.77	63.54	47.94	34.38	4.31	34.86	Average	---	---
3	7311.000	57.13	-6.41	63.54	51.29	35.30	5.71	35.17	Average	---	---
4	7311.000	69.08	-14.46	83.54	63.24	35.30	5.71	35.17	Peak	---	---
5	9748.000	72.67			64.90	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

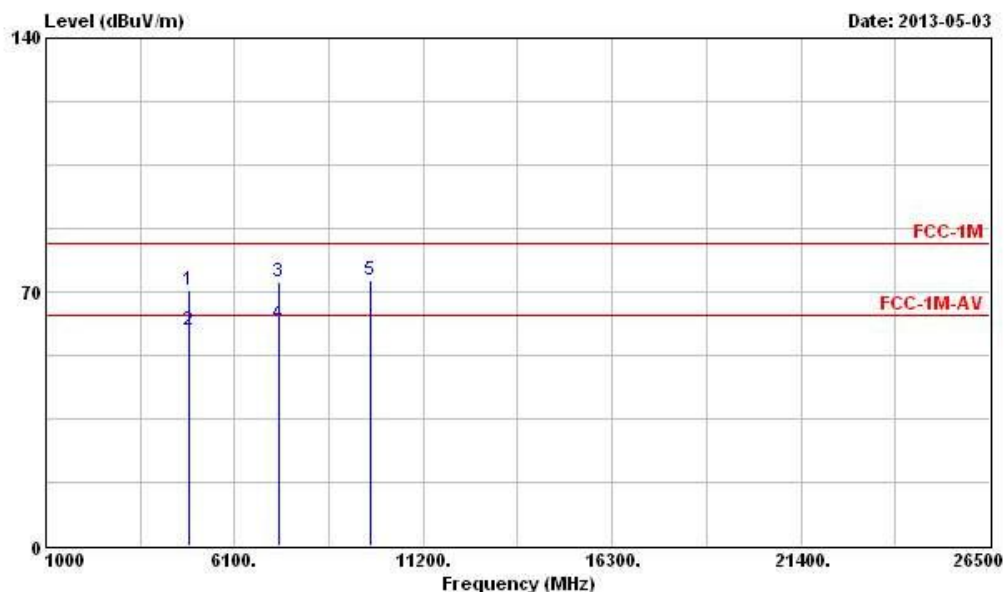
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 5) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Operating Mode	11g_6Mbps	Polarization	V
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	70.42	-13.12	83.54	66.59	34.38	4.31	34.86	Peak	---	---
2	4874.000	59.39	-4.15	63.54	55.56	34.38	4.31	34.86	Average	---	---
3	7311.000	72.57	-10.97	83.54	66.73	35.30	5.71	35.17	Peak	---	---
4	7311.000	61.16	-2.38	63.54	55.32	35.30	5.71	35.17	Average	---	---
5	9748.000	73.22			65.45	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 5) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Modulation: HT-20_MCS0; Test Frequency: 2412 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2389.28	-	-	6.61	-20.98 ^{Note1}	-21.2	Peak
2389.92	-	-	6.61	-33.43 ^{Note1}	-41.2	Average
4924.91	-45.45	-46.07	6.09	-36.66	-21.2	Peak
4960.82	-56.86	-56.01	6.09	-47.32	-41.2	Average
Note ¹ : Using conducted method with composite antenna gain to test unwanted emissions in restricted bands may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance was demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. The result does show it is compliant. Please refer to radiated section.						

Modulation: HT-20_MCS0; Test Frequency: 2437 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
4866.55	-44.37	-48.67	6.09	-36.92	-21.2	Peak
4878.07	-55.65	-57.47	6.09	-47.38	-41.2	Average

Modulation: HT-20_MCS0; Test Frequency: 2462 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2484.21	-	-	6.61	-7.91 ^{Note1}	-21.2	Peak
2483.58	-	-	6.61	-20.78 ^{Note1}	-41.2	Average
4951.55	-46.13	-45.80	6.09	-36.87	-21.2	Peak
4952.97	-56.65	-56.09	6.09	-47.27	-41.2	Average
Note ¹ : Using conducted method with composite antenna gain to test unwanted emissions in restricted bands may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance was demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. The result does show it is compliant. Please refer to radiated section.						

Transmitter Radiated Unwanted Emissions Result in Restricted Bands
2412 MHz

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	2389.520	78.98	-4.56	83.54	43.37	32.50	3.11	0.00	Peak	---	---
2 @	2409.340	115.29			79.67	32.51	3.11	0.00	Peak	---	---
1 @	2390.000	62.09	-1.45	63.54	26.48	32.50	3.11	0.00	Average	---	---
2 @	2408.900	103.59			67.97	32.51	3.11	0.00	Average	---	---

The item 2 is Fundamental Emissions.

2462 MHz

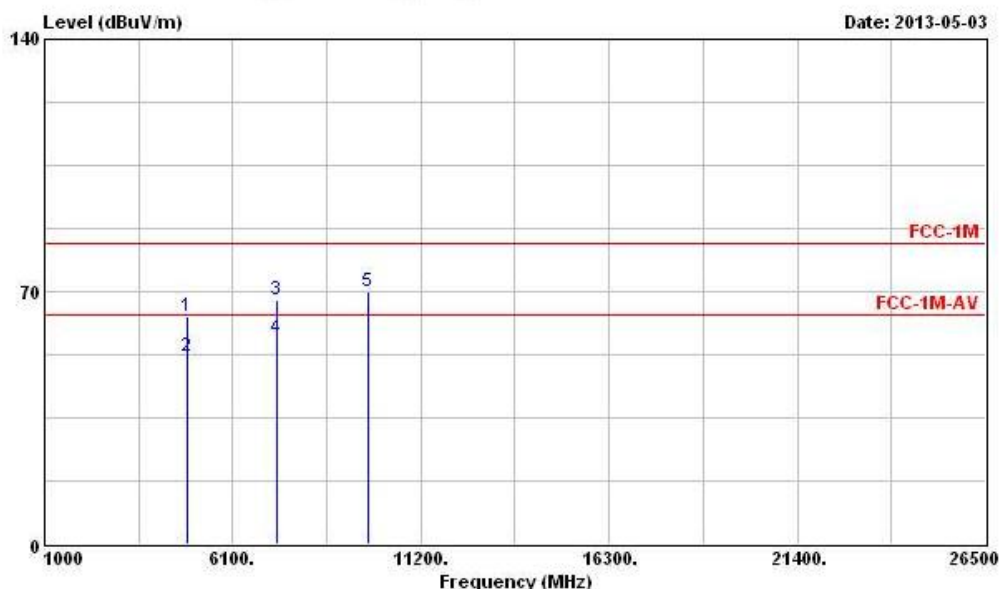
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 @	2459.000	115.16			79.46	32.57	3.13	0.00	Peak	---	---
2	2484.300	77.38	-6.16	83.54	41.65	32.58	3.15	0.00	Peak	---	---
1 @	2468.300	103.97			68.25	32.57	3.15	0.00	Average	---	---
2 @	2483.500	60.89	-2.65	63.54	25.16	32.58	3.15	0.00	Average	---	---

The item 1 is Fundamental Emissions.

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

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

Operating Mode	HT-20_MCS0	Polarization	H
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	63.26	-20.28	83.54	59.43	34.38	4.31	34.86	Peak	---	---
2	4874.000	51.97	-11.57	63.54	48.14	34.38	4.31	34.86	Average	---	---
3	7311.000	67.83	-15.71	83.54	61.99	35.30	5.71	35.17	Peak	---	---
4	7311.000	56.98	-6.56	63.54	51.14	35.30	5.71	35.17	Average	---	---
5	9748.000	69.91			62.14	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

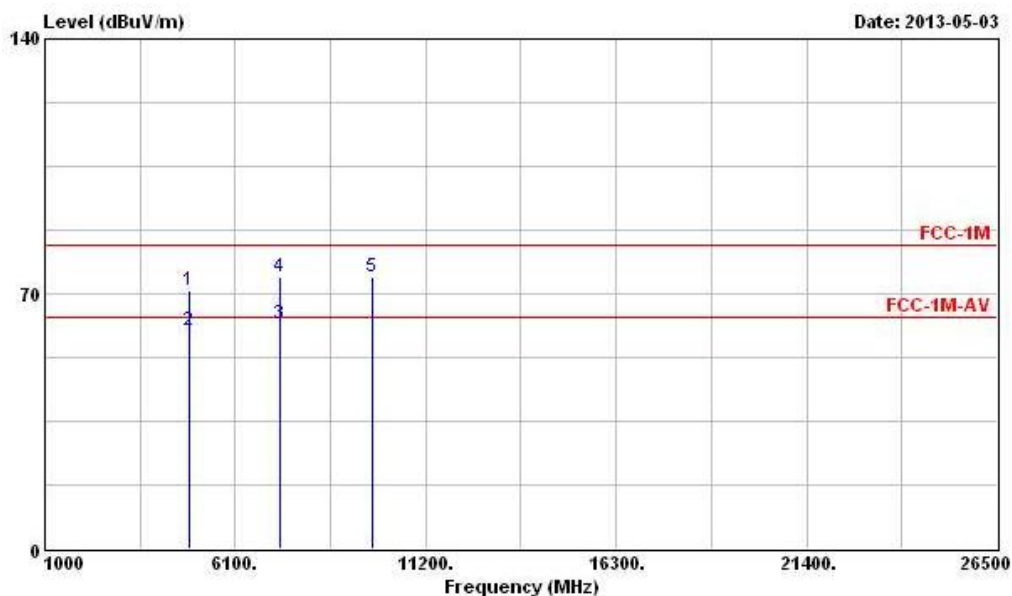
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 5) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Operating Mode	HT-20_MCS0	Polarization	V
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	70.75	-12.79	83.54	66.92	34.38	4.31	34.86	Peak	---	---
2	4874.000	59.99	-3.55	63.54	56.16	34.38	4.31	34.86	Average	---	---
3	7311.000	61.61	-1.93	63.54	55.77	35.30	5.71	35.17	Average	---	---
4	7311.000	74.48	-9.06	83.54	68.64	35.30	5.71	35.17	Peak	---	---
5	9748.000	74.57			66.80	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 5) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Modulation: HT-40_MCS0; Test Frequency: 2422 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2389.56	-	-	6.61	-22.84	-21.2	Peak
2389.88	-	-	6.61	-33.01 ^{Note1}	-41.2	Average
4947.12	-44.94	-46.19	6.09	-36.43	-21.2	Peak
4958.81	-56.29	-56.58	6.09	-47.34	-41.2	Average
Note ¹ : Using conducted method with composite antenna gain to test unwanted emissions in restricted bands may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance was demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. The result does show it is compliant. Please refer to radiated section.						

Modulation: HT-40_MCS0; Test Frequency: 2437 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
4927.00	-46.79	-45.57	6.09	-37.05	-21.2	Peak
4961.90	-56.87	-56.29	6.09	-47.48	-41.2	Average

Modulation: HT-40_MCS0; Test Frequency: 2452 MHz; number of TX Chain: 2

Transmitter Conducted Unwanted Emissions Result in Restricted Bands						
Frequency (MHz)	Chain 0 Test Level (dBm)	Chain 1 Test Level (dBm)	DG (dBi)	EIRP Level (dBm)	Limit (dBm)	Level Type
2389.56	-	-	6.61	-8.41 ^{Note1}	-21.2	Peak
2389.88	-	-	6.61	-20.54 ^{Note1}	-41.2	Average
4947.12	-44.94	-46.19	6.09	-36.96	-21.2	Peak
4958.81	-56.29	-56.58	6.09	-47.45	-41.2	Average
Note ¹ : Using conducted method with composite antenna gain to test unwanted emissions in restricted bands may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance was demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. The result does show it is compliant. Please refer to radiated section.						

Transmitter Radiated Unwanted Emissions Result in Restricted Bands
2422 MHz

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	2388.940	77.81	-5.73	83.54	42.20	32.50	3.11	0.00	Peak	---	---
2	2411.240	108.33			72.71	32.51	3.11	0.00	Peak	---	---
1	2390.000	61.83	-1.71	63.54	26.22	32.50	3.11	0.00	Average	---	---
2	2410.190	95.91			60.29	32.51	3.11	0.00	Average	---	---

The item 2 is Fundamental Emissions.

2452 MHz

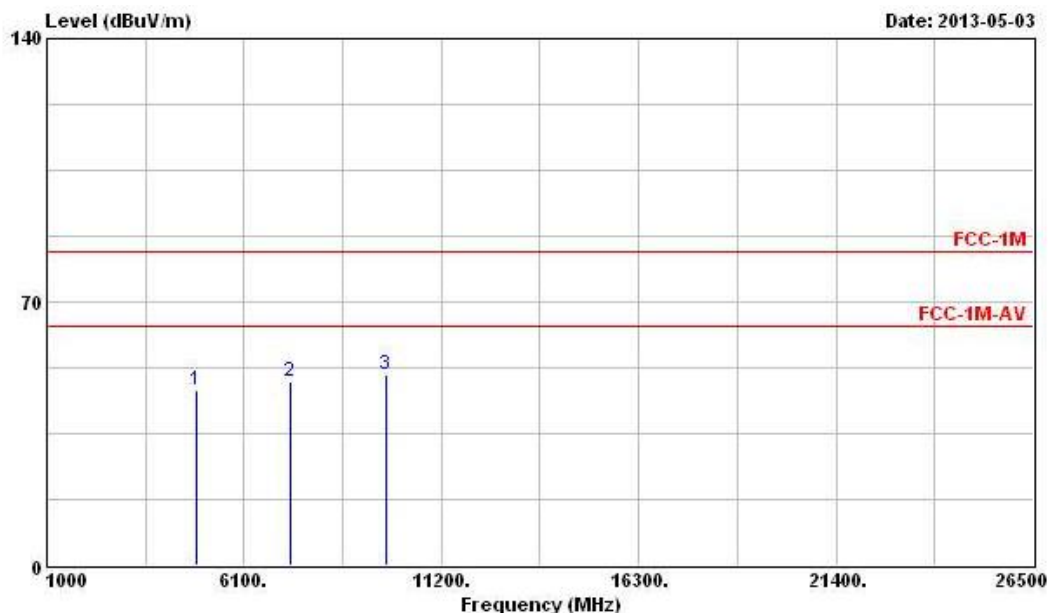
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	2449.640	108.78			73.10	32.55	3.13	0.00	Peak	---	---
2	2483.720	74.88	-8.66	83.54	39.15	32.58	3.15	0.00	Peak	---	---
1	2449.640	96.04			60.36	32.55	3.13	0.00	Average	---	---
2	2483.500	61.17	-2.37	63.54	25.44	32.58	3.15	0.00	Average	---	---

The item 1 is Fundamental Emissions.

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

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

Operating Mode	HT-40_MCS0	Polarization	H
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	46.57	-16.97	63.54	42.74	34.38	4.31	34.86	PK	---	---
2	7311.000	48.89	-14.65	63.54	43.05	35.30	5.71	35.17	PK	---	---
3	9748.000	50.76			42.99	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

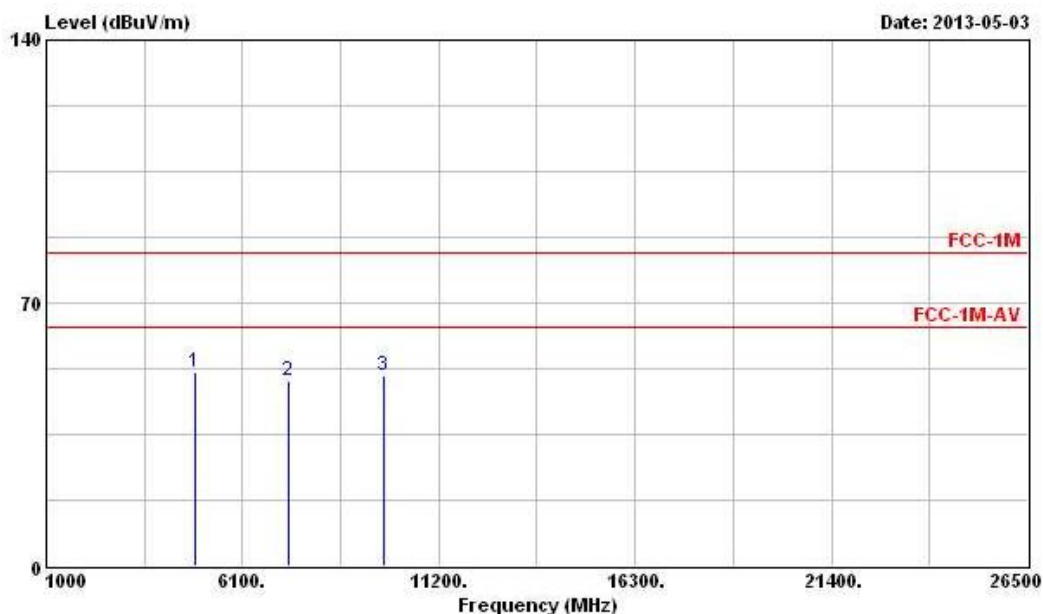
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands, unwanted emissions (item 3) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

Operating Mode	HT-40_MCS0	Polarization	V
Operating Frequency	2437 MHz	Configuration	With 50Ω Terminated



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	51.46	-12.08	63.54	47.63	34.38	4.31	34.86	PK	---	---
2	7311.000	49.19	-14.35	63.54	43.35	35.30	5.71	35.17	PK	---	---
3	9748.000	50.82			43.05	37.01	6.34	35.58	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

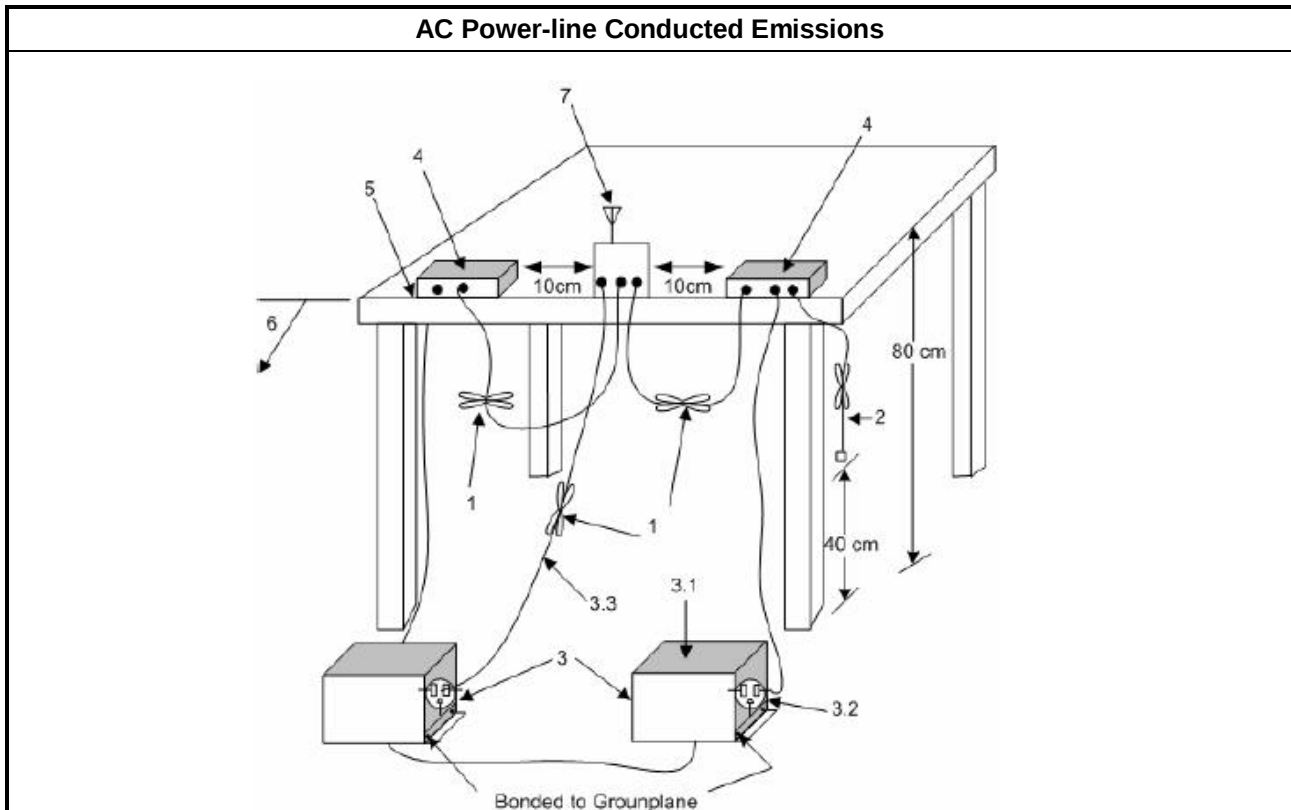
Note 5: For un-restricted bands, unwanted emissions (item 3) shall be attenuated by at least 20 dB relative to the maximum measured in-band level.

3.6 AC Power-line Conducted Emissions

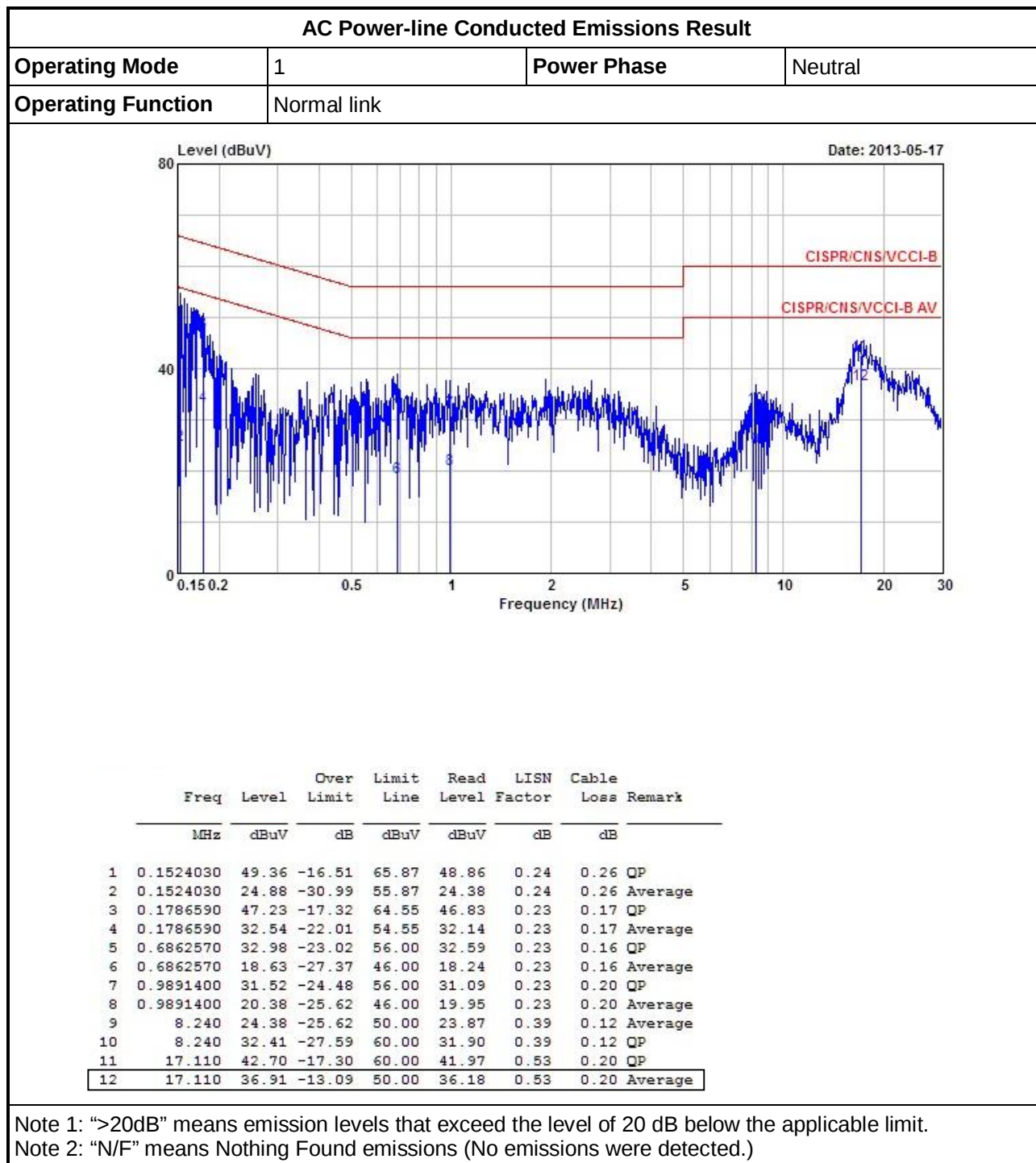
3.6.1 Test Procedures

Test Method
☒ Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.6.2 Test Setup

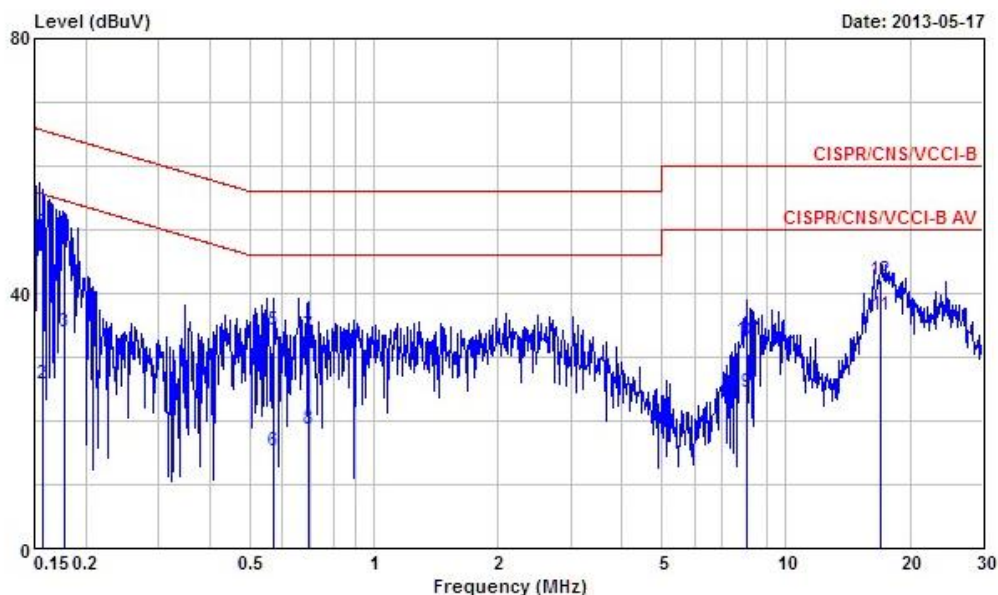


3.6.3 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Normal link		



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.1564950	49.79	-15.86	65.65	49.44	0.11	0.24	QP
2	0.1564950	25.81	-29.84	55.65	25.46	0.11	0.24	Average
3	0.1777150	33.84	-20.75	54.59	33.56	0.11	0.17	Average
4	0.1777150	48.56	-16.03	64.59	48.28	0.11	0.17	QP
5	0.5731280	34.18	-21.82	56.00	33.94	0.10	0.14	QP
6	0.5731280	15.30	-30.70	46.00	15.06	0.10	0.14	Average
7	0.6972520	33.33	-22.67	56.00	33.06	0.11	0.16	QP
8	0.6972520	18.59	-27.41	46.00	18.32	0.11	0.16	Average
9	8.020	24.58	-25.42	50.00	24.24	0.22	0.12	Average
10	8.020	32.58	-27.42	60.00	32.24	0.22	0.12	QP
11	17.020	36.57	-13.43	50.00	36.08	0.29	0.20	Average
12	17.020	42.06	-17.94	60.00	41.57	0.29	0.20	QP

Note 1: ">20dB" means emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found emissions (No emissions were detected.)

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Mar. 26, 2013	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 21, 2013	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	Apr. 18, 2013	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	7.61183201e+012	9kHz ~ 30MHz	Nov. 09, 2012	Conduction (CO04-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP 40	100305	9kHz~40GHz	Mar. 20, 2013	Conducted (TH01-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 02, 2012	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Nov. 21, 2012	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 26, 2012	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Feb. 02, 2013	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Feb. 02, 2013	Conducted (TH01-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	1GHz ~ 26.5GHz	NA	Conducted (TH01-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345669/4	1GHz ~ 26.5GHz	NA	Conducted (TH01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100593	9kHz ~ 40GHz	Sep. 14, 2012	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 10, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 23, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	Aug. 10, 2012	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz ~ 18GHz	Nov. 16, 2012	Radiation (03CH02-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan. 08, 2013	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 10, 2012	Radiation (03CH02-HY)
RF Cable-high	SUHNER	SUCOFLEX106	03CH02-HY	1GHz ~ 40GHz	Mar. 05, 2013	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 22, 2012	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 ~ 4 m	N/A	Radiation (03CH02-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz - 30 MHz	Dec. 02, 2012	Radiation (03CH02-HY)

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