

RF TEST REPORT

Test item : Wi-Fi Transmitter
Model No. : WCH730B
Order No. : DTNC1502-00793
Date of receipt : 2015-02-24
Test duration : 2015-02-24 ~ 2015-03-09, 2015-03-19 ~ 2015-03-20
Date of issue : 2015-03-20
Use of report : Class II Permissive Change for FCC

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Test laboratory : DT&C Co., Ltd.
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Test specification : FCC Part 15 Subpart C 247
Test environment : See appended test report
Test result : ☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DT&C Co., Ltd.

Tested by:



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Test Report Version

Test Report No.	Date	Description
DRTFCC1503-0042	Mar. 13, 2015	Initial issue
DRTFCC1503-0042(1)	Mar. 20, 2015	Removed IC information & updated test result

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1. EUT DESCRIPTION

FCC Equipment Class	Digital Transmission System(DTS)
Product	Wi-Fi Transmitter
Model Name	WCH730B
Add Model Name	NA
Power Supply	DC 5 V
Frequency Range	2.4 GHz Band ▪ 802.11g: 2412 MHz ~ 2462 MHz
Modulation Type	▪ 802.11g: OFDM
Transmissions category	Completely uncorrelated signal
Antenna Specification	Antenna type: Internal Antenna Antenna gain ▪ 2.4 GHz Band: ANT 1 : 2.200 dBi & ANT 2 : 1.900 dBi Antenna configuration ▪ 802.11g : Single or Multiple Transmitting

2. INFORMATION ABOUT TESTING

2.1 Test mode

Transmitting Mode	Test mode	Worst case data rate	Tested Frequency(MHz)		
			Lowest	Middle	Highest
Single & Multiple	802.11g	6 Mbps	2412	2437	2462

Note 1: The worst case data rate is determined as above test mode according to the power measurements. And all test items were performed at the worst case data rate.

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
Notebook PC	20095	WB06116969	Lenovo	DOC
-	-	-	-	-

2.3 Tested environment

Temperature	: 22 ~ 25 °C
Relative humidity content	: 43 ~ 47 % R.H.
Details of power supply	: DC 5.0 V

2.4 EMI suppression Device(s) / Modifications

EMI suppression device(s) added and/or modifications made during testing
→ None

3. SUMMARY OF TESTS

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
15.247(a)	6 dB Bandwidth	> 500 kHz	Conducted	C
15.247(b)	Transmitter Output Power	< 1 Watt		C
15.247(d)	Out of Band Emissions / Band Edge	20 dBc in any 100 kHz BW		C
15.247(e)	Transmitter Power Spectral Density	< 8 dBm / 3 kHz		C
15.205 15.209	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	FCC 15.209 limits	Radiated	C
15.207	AC Conducted Emissions	FCC 15.207 limits	AC Line Conducted	NT Note 2
15.203	Antenna Requirements	FCC 15.203 limits	-	C

Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable

Note 2: This test item was performed at the worst case mode when original grant. Therefore this test item is not performed for this class II permissive change.

Note 3: The test items were performed in single & multiple transmitting mode.

And the worst data(Single transmitting mode) was reported except clause 8.2, 8.5.

4. TEST METHODOLOGY

Generally the tests were performed according to the KDB 558074 D01 DTS Meas. Guidance v03r2 and KDB 662911 D01 v02r01 for the measure-and-sum technique. And ANSI C63.10-2009 was used to reference appropriate EUT setup and maximizing procedures of radiated spurious emission and AC line conducted emission testing

4.1 EUT configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT exercise

The EUT was operated in the test mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

4.3 General test procedures

Conducted Emissions

The power-line conducted emission test procedure is not described on the KDB 558074 D01 DTS Meas. Guidance v03r2. So this test was fulfilled with the requirements in Section 6.2 of ANSI C63.10.

The EUT is placed on a non-conductive table, which is 0.8 m above ground plane and the conducted emissions from the EUT measured in the frequency range between 0.15MHz and 30MHz using CISPR Quasi-peak and Average detector.

Radiated Emissions

Basically the radiated tests were performed with KDB 558074 D01 DTS Meas. Guidance v03r2. But some requirements and procedures like test site requirements, EUT setup and maximizing procedure were fulfilled with the requirements in Section 5 and 6 of the ANSI C63.10 as stated on section 12.1 of the KDB 558074 D01 DTS Meas. Guidance v03r2.

The EUT is placed on a non-conductive table, which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axis.

4.4 Description of test modes

A test program is used to control the EUT for staying in continuous transmitting mode.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 Facilities

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 449-935 The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number: 678747

6.2 Equipment

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

7. ANTENNA REQUIREMENTS

7.1 According to FCC 47 CFR §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 internal antenna of this E.U.T is permanently attached on the main PCB.(Refer to Internal Photo.) Therefore this module Complies with the requirement of §15.203

7.2 Directional antenna gain(worst case):

Bands	ANT 1 [dBi]	ANT 2 [dBi]	Directional Gain [dBi]
2.4 GHz	2.200	1.900	5.062 ^{Note 1.}

Note 1. Directional gain(correlated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N^{ANT}] \text{ dBi}$$

Note 2. Directional gain(completely uncorrelated signal with unequal antenna gain and equal transmit power)

$$10 \log [(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10}) / N^{ANT}] \text{ dBi}$$

Note 3. Directional gain(spatial multiplexing)

$$G_{ANT \text{ MAX}} + 10 \log (N_{ANT} / N_{SS}) \text{ dBi}$$

8. TEST RESULT

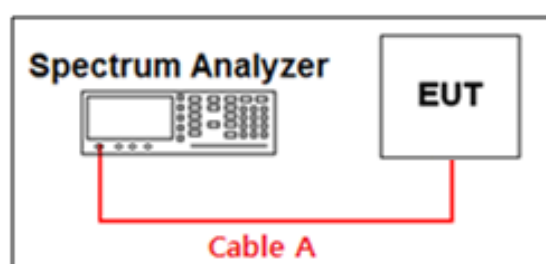
8.1 6dB bandwidth

■ Test Requirements and limit, §15.247(a)

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

■ Test Configuration



■ Test Procedure: KDB 558074 D01 DTS Meas. Guidance v03r2

1. Set resolution bandwidth (RBW) = 100 kHz & video bandwidth (VBW) $\geq 3 \times$ RBW.
(RBW: 100kHz & VBW: 300 kHz)
2. Detector = **Peak**.
3. Trace mode = **max hold**.
4. Sweep = **auto couple**.
5. Allow the trace to stabilize.
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

■ Test Results: **Comply**

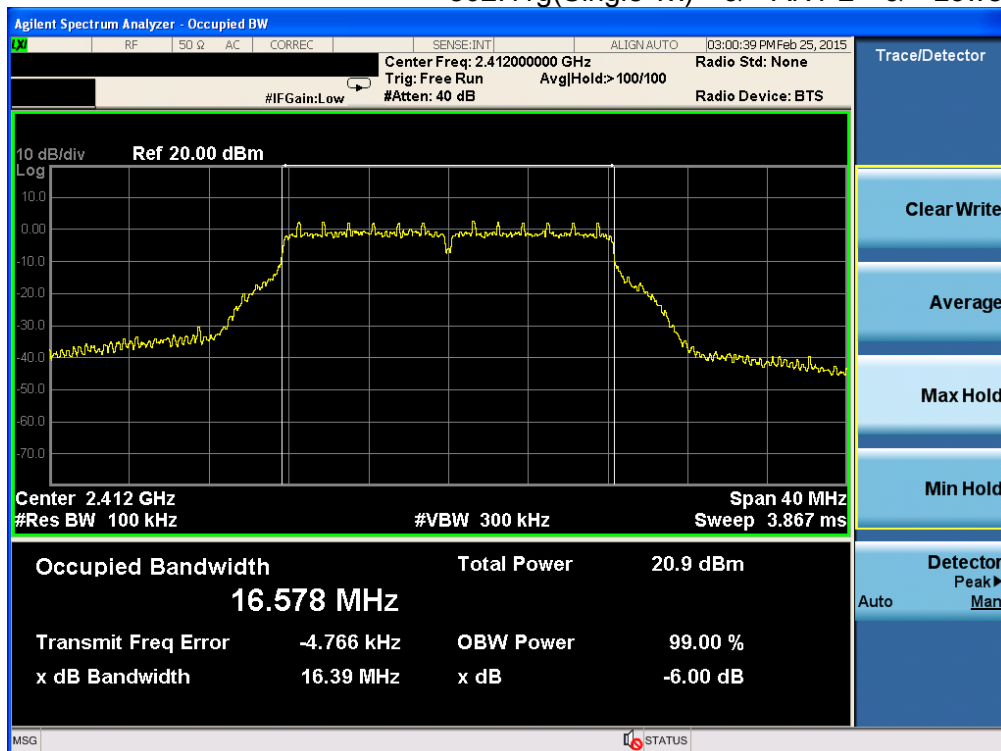
Test Mode	Frequency	Test Results[MHz]	
		ANT 1	ANT 2
802.11g (Single Transmit)	Lowest	-	16.390
	Middle	-	16.390
	Highest	-	16.390

Note. This test item for ANT 1 of single transmitting mode was performed in original grant.

■ Result Plots

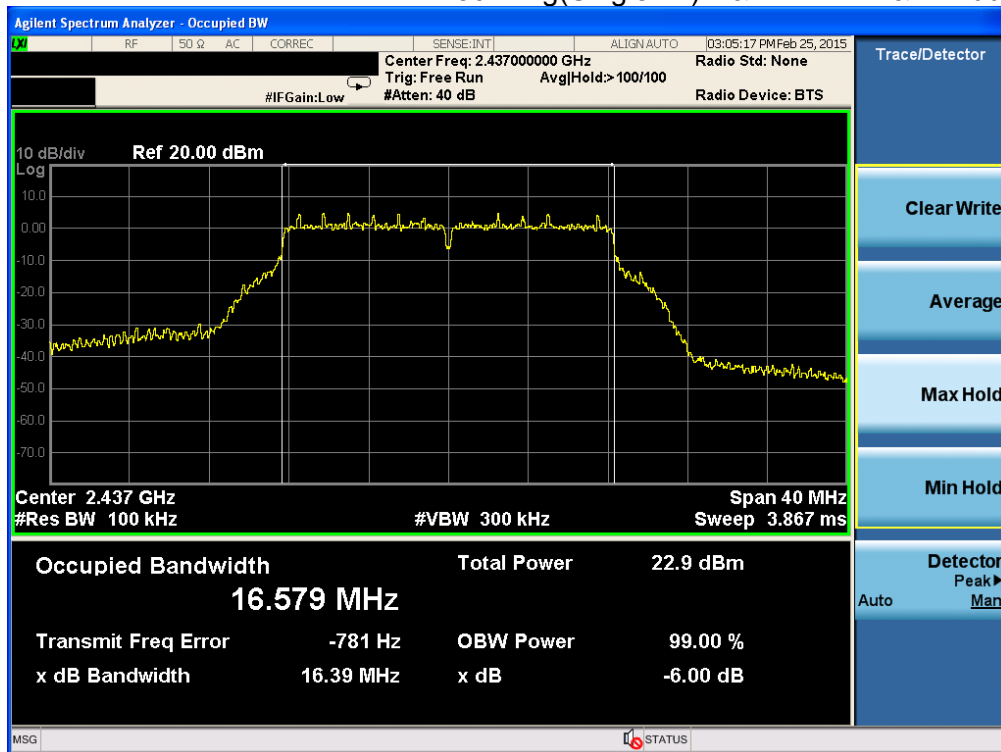
6dB Bandwidth

802.11g(Single Tx) & ANT 2 & Lowest

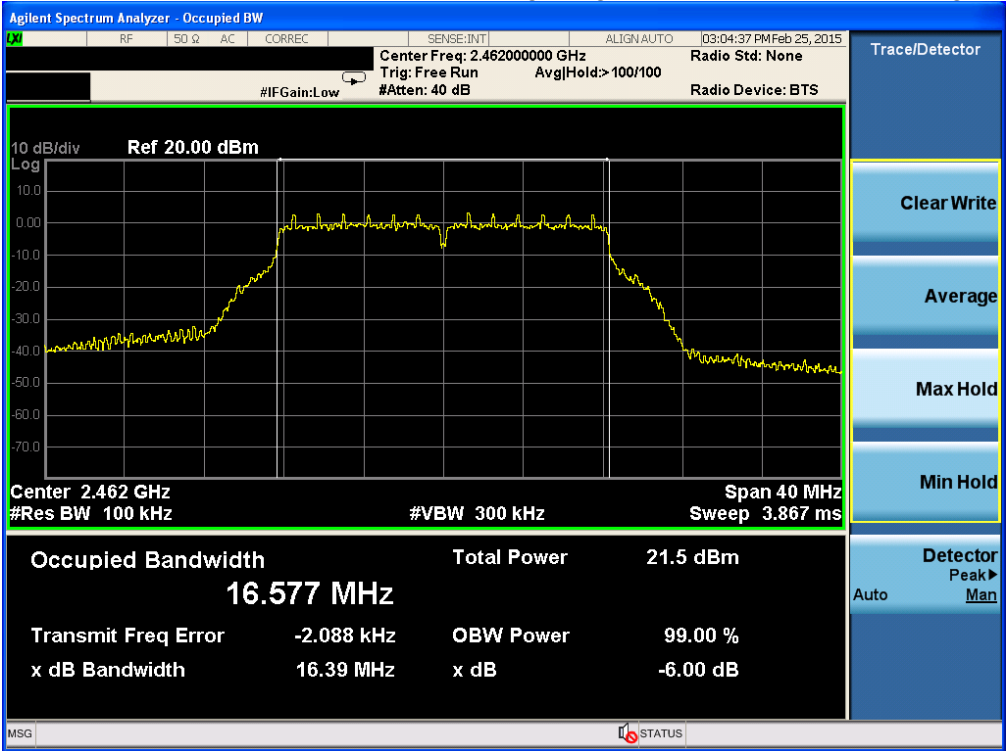


6dB Bandwidth

802.11g(Single Tx) & ANT 2 & Middle



6dB Bandwidth 802.11g(Single Tx) & ANT 2 & Highest

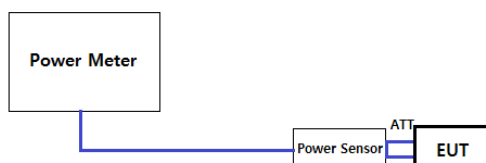


8.2 Maximum peak conducted output power

■ Test Requirements and limit, §15.247(b)

The maximum permissible conducted output power is **1 Watt**.

■ Test Configuration



■ Test Procedure: KDB 558074 D01 DTS Meas. Guidance v03r2

1. PKPM1 Peak power meter method

The maximum conducted output powers were measured using a broadband peak RF power meter which has greater video bandwidth than DUT's DTS bandwidth and utilize a fast-responding diode detector.

2. Method AVGPM-G (Measurement using a gated RF average power meter)

The average conducted output powers were measured using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

Note: The measure-and-sum technique is used for test mode with multiple transmitting.

■ Test Results: **Comply**

▪ Single transmitting mode

ANT	Freq. (MHz)	Det.	Test Result(dBm) for 802.11g							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
ANT 2	2412	PK	17.288	17.166	17.198	17.195	17.157	17.189	17.192	17.156
		AV	9.941	9.860	9.864	9.828	9.868	9.887	9.880	9.848
	2437	PK	21.795	21.663	21.761	21.666	21.691	21.735	21.764	21.746
		AV	14.654	14.544	14.591	14.592	14.552	14.589	14.566	14.538
	2462	PK	20.505	20.464	20.476	20.448	20.428	20.438	20.448	20.479
		AV	13.313	13.214	13.200	13.224	13.173	13.238	13.204	13.217

Note. This test item for ANT 1 was performed in original grant.

▪ Multiple transmitting mode

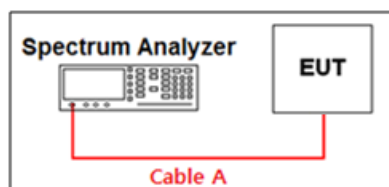
ANT	Freq. (MHz)	Det.	Test Results (dBm) for 802.11g							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
ANT 1	2412	PK	14.269	14.149	14.182	14.179	14.147	14.169	14.174	14.141
		AV	6.924	6.843	6.849	6.810	6.858	6.874	6.864	6.829
	2437	PK	18.779	18.649	18.751	18.656	18.680	18.719	18.747	18.729
		AV	11.641	11.534	11.580	11.581	11.539	11.577	11.554	11.525
	2462	PK	17.489	17.453	17.465	17.433	17.416	17.420	17.438	17.468
		AV	10.297	10.194	10.190	10.213	10.159	10.225	10.189	10.207
ANT 2	2412	PK	14.257	14.139	14.165	14.165	14.126	14.158	14.158	14.126
		AV	6.910	6.830	6.832	6.807	6.845	6.849	6.845	6.812
	2437	PK	18.774	18.637	18.728	18.634	18.662	18.705	18.733	18.714
		AV	11.628	11.514	11.562	11.569	11.521	11.564	11.535	11.512
	2462	PK	17.477	17.434	17.445	17.410	17.402	17.412	17.423	17.451
		AV	10.282	10.191	10.163	10.193	10.144	10.208	10.172	10.188
Sum (ANT 1+2)	2412	PK	17.274	17.155	17.184	17.183	17.147	17.174	17.177	17.144
	2437	PK	21.787	21.654	21.750	21.656	21.682	21.723	21.751	21.732
	2462	PK	20.494	20.454	20.466	20.432	20.420	20.427	20.441	20.470

8.3 Maximum power spectral density

■ Test requirements and limit, §15.247(e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

■ Test Configuration



■ Test Procedure: KDB 558074 D01 DTS Meas. Guidance v03r2

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to **1.5 times** the DTS bandwidth.
3. Set the RBW to: **3 kHz ≤ RBW ≤ 100 kHz**
4. Set the VBW ≥ **3 x RBW**
5. Detector = **peak**
6. Sweep time = **auto couple**
7. Trace mode = **max hold**.
8. Allow trace to fully stabilize.
9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

■ Test Results: **Comply**

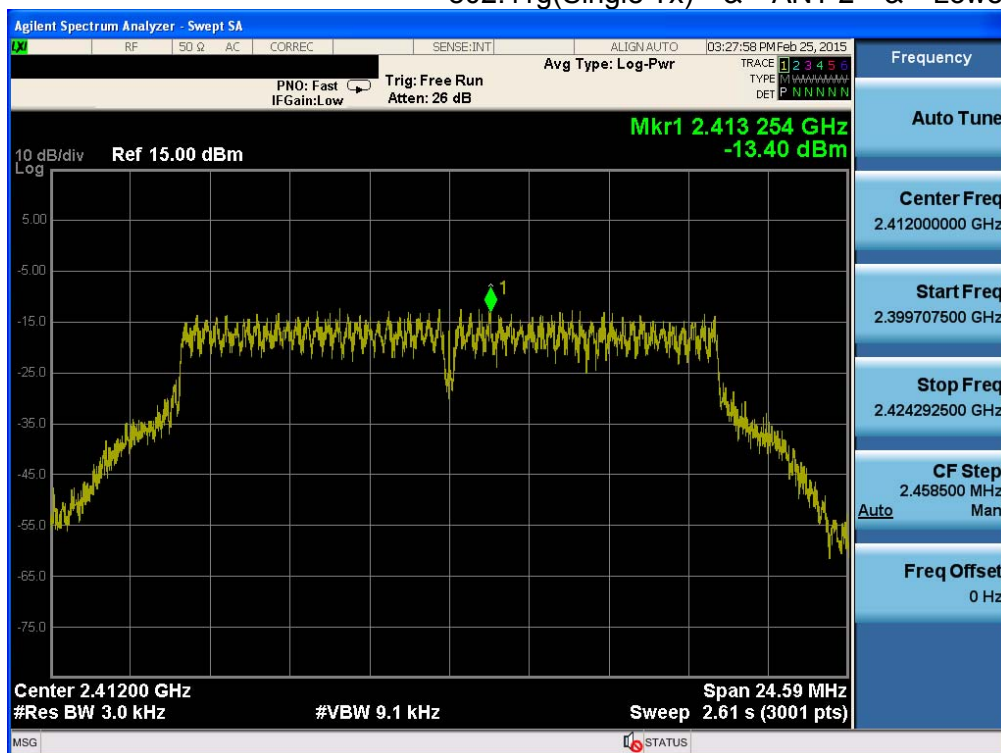
Test Mode	Frequency	RBW	PKPSD [dBm]		
			ANT 1	ANT 2	SUM (ANT 1 + ANT 2)
802.11g (Single transmitting)	Lowest	3 kHz	-	-13.400	-
	Middle	3 kHz	-	-10.290	-
	Highest	3 kHz	-	-11.170	-

Note. This test item for ANT 1 of single transmitting mode was performed in original grant.

■ Result Plots

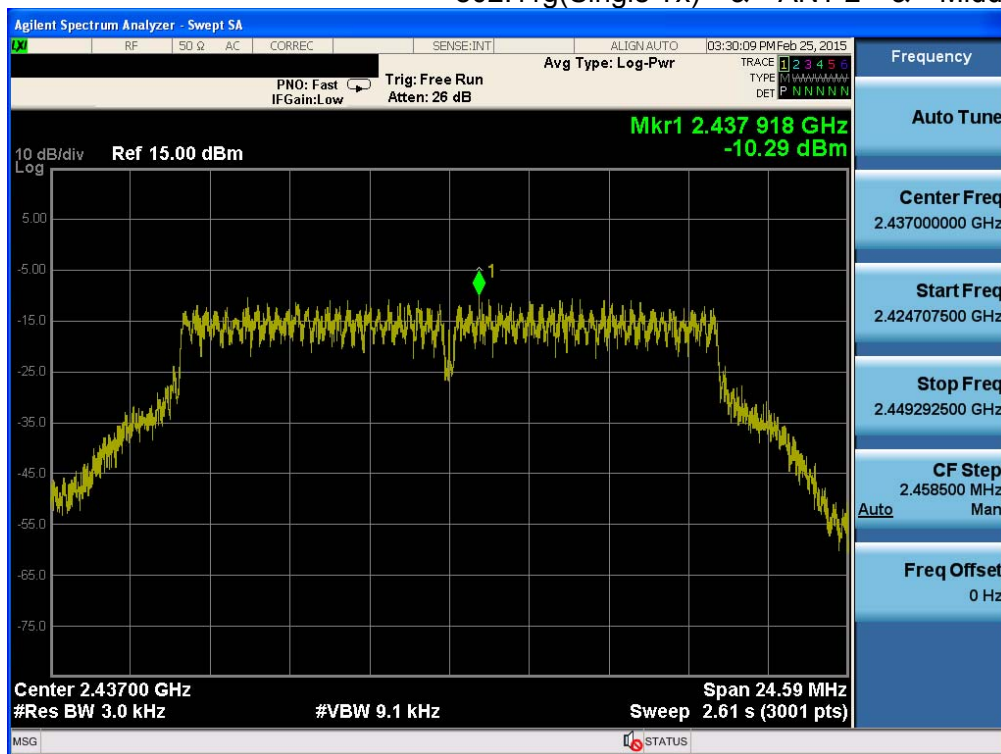
Maximum PPSD

802.11g(Single Tx) & ANT 2 & Lowest



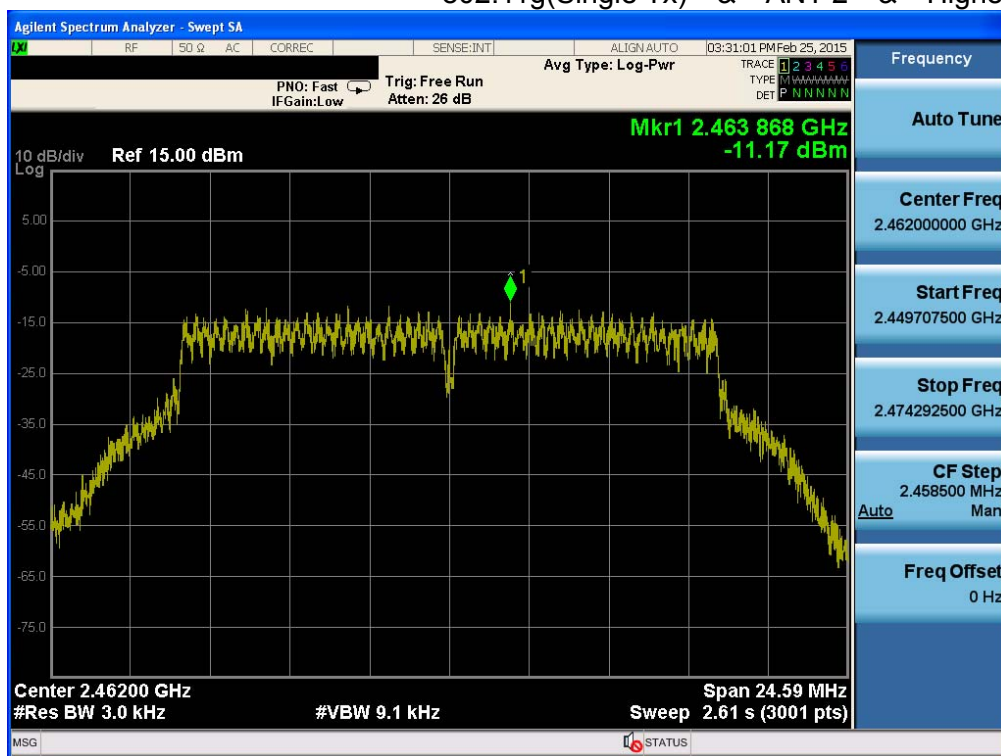
Maximum PPSD

802.11g(Single Tx) & ANT 2 & Middle



Maximum PPSD

802.11g(Single Tx) & ANT 2 & Highest



8.4 Out of band emissions at the band edge / conducted spurious emissions

■ Test requirements and limit, §15.247(d)

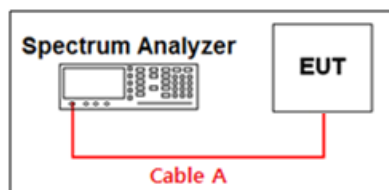
§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If the **peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in band average PSD level.

In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

■ Test Configuration



■ Test Procedure: KDB 558074 D01 DTS Meas. Guidance v03r2

- Measurement Procedure 1 – Reference Level

1. Set instrument center frequency to DTS channel center frequency.
2. Set the span to ≥ 1.5 times the DTS bandwidth.
3. Set the RBW = 100 kHz.
4. Set the VBW $\geq 3 \times$ RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum PSD level

- Measurement Procedure 2 - Unwanted Emissions

1. Set the center frequency and span to encompass frequency range to be measured.
2. Set the RBW = **100 kHz for below 1 GHz, 1 MHz for above 1 GHz(Actual 1 MHz , See below note)**
3. Set the VBW $\geq 3 \times$ RBW (**Actual 3 MHz, See below note**)
4. Detector = **peak**.
5. Ensure that the number of measurement points $\geq$ span/RBW
6. Sweep time = **auto couple**.
7. Trace mode = **max hold**.
8. **Allow the trace to stabilize** (this may take some time, depending on the extent of the span).
9. Use the peak marker function to determine the maximum amplitude level.

Note: The conducted spurious emission was tested with below settings.

Frequency range: 9 kHz ~ 30 MHz

RBW= 100 kHz, VBW= 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 40001

Frequency range: 30 MHz ~ 10 GHz, 10 GHz~25 GHz

RBW= 1MHz, VBW= 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT: 40001

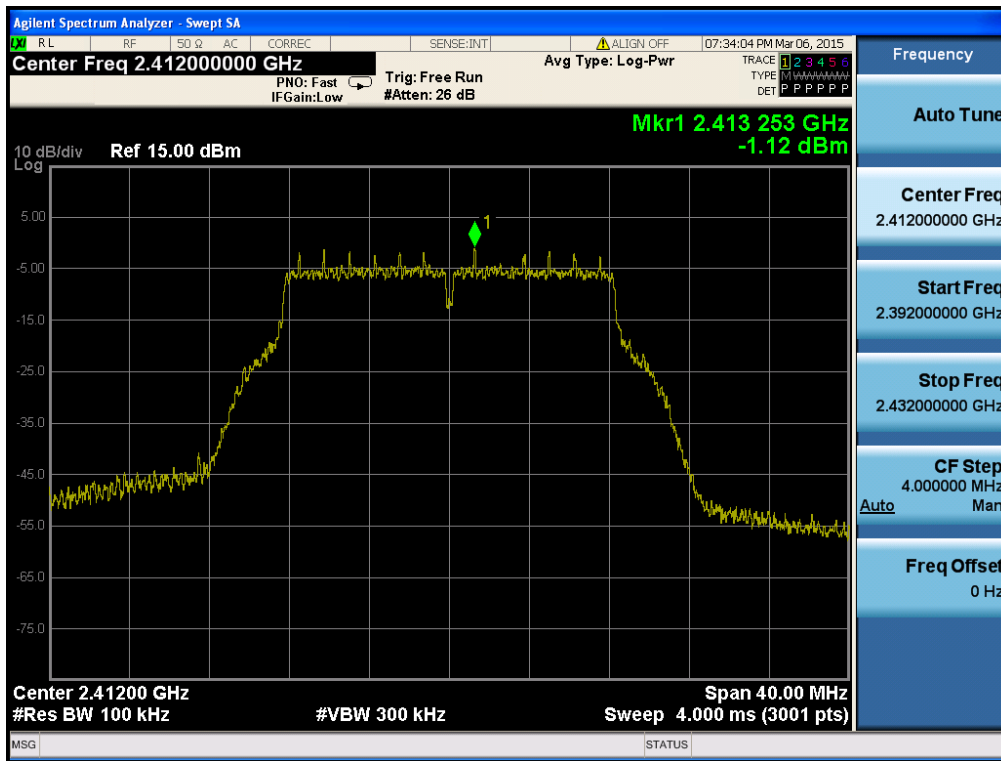
If the emission level with above setting was close to the limit(less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SAPN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

Note: This test item for ANT 1 of single transmitting mode was performed in original grant.

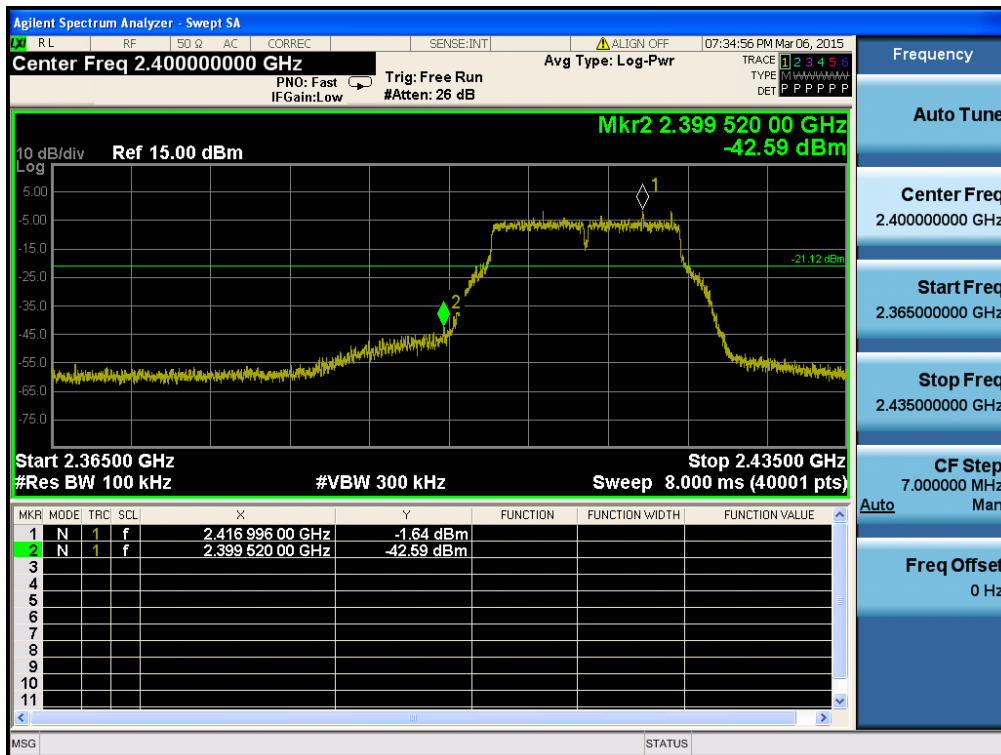
■ Result Plots

802.11g(Single TX) & ANT 2 & Lowest

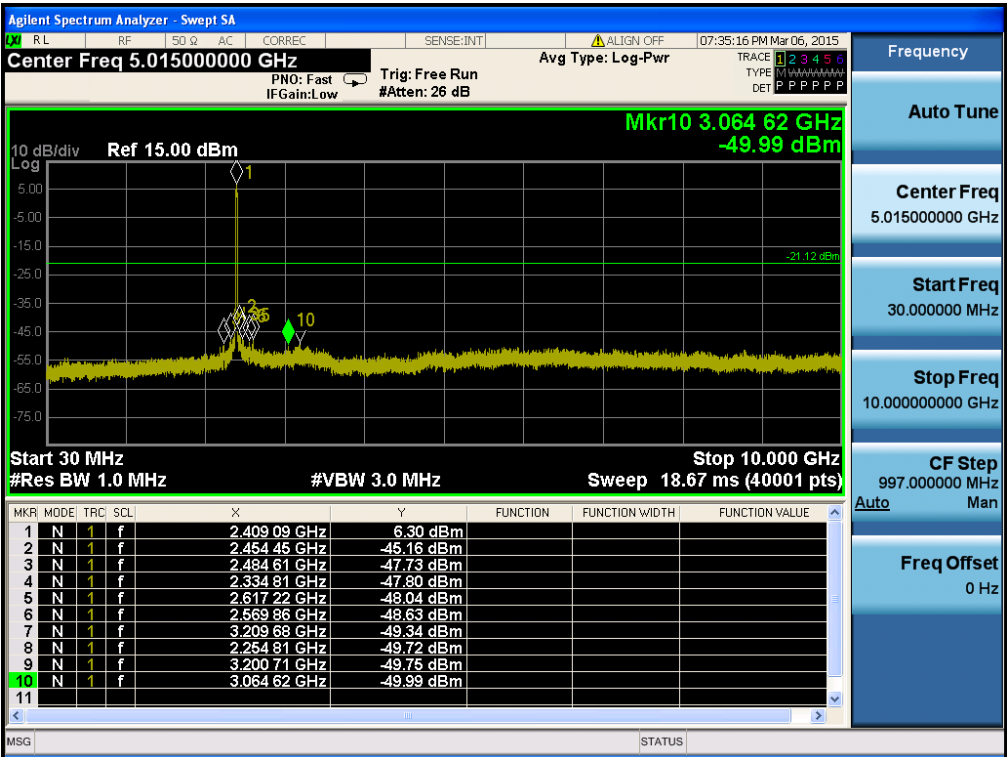
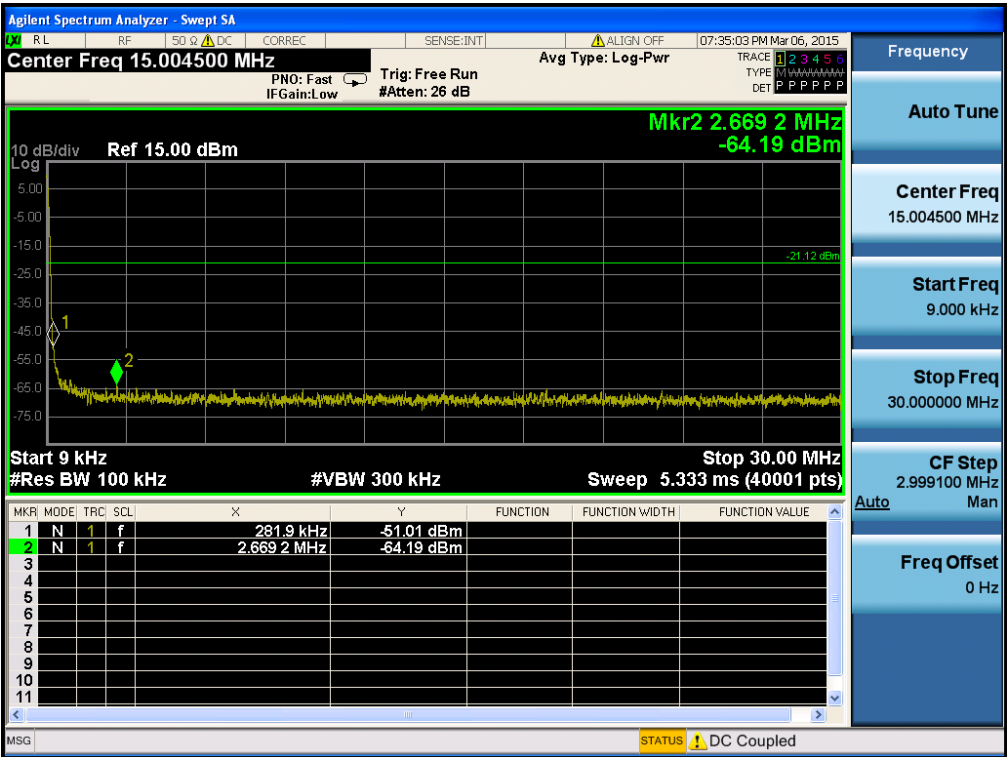
Reference



Low Band-edge



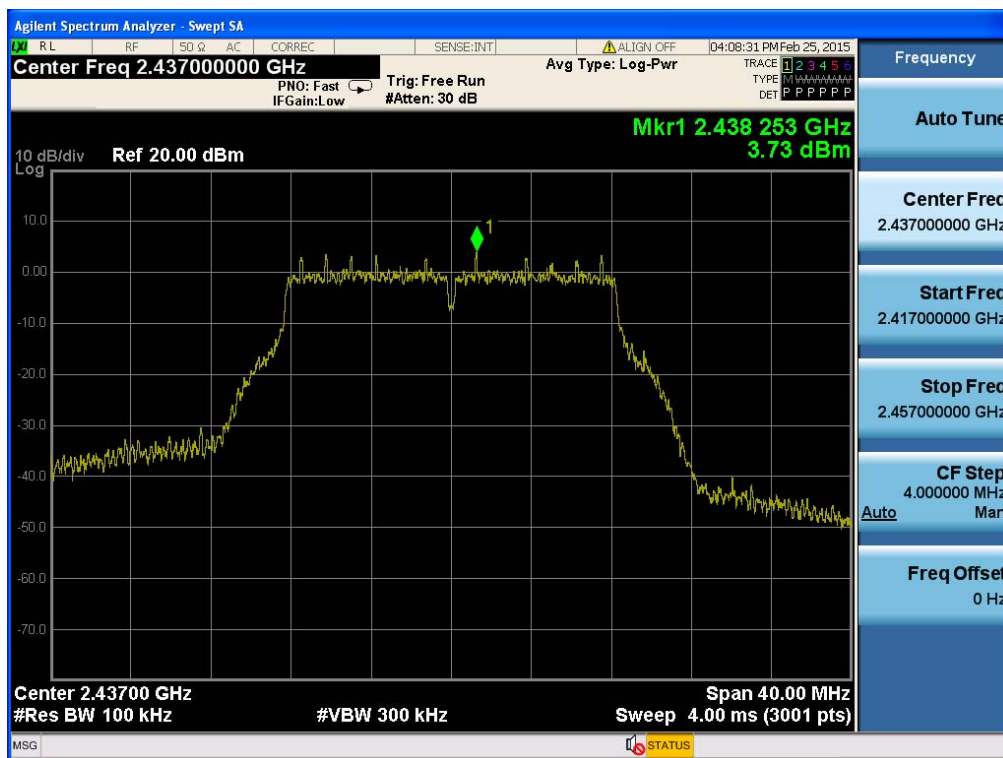
Conducted Spurious Emissions



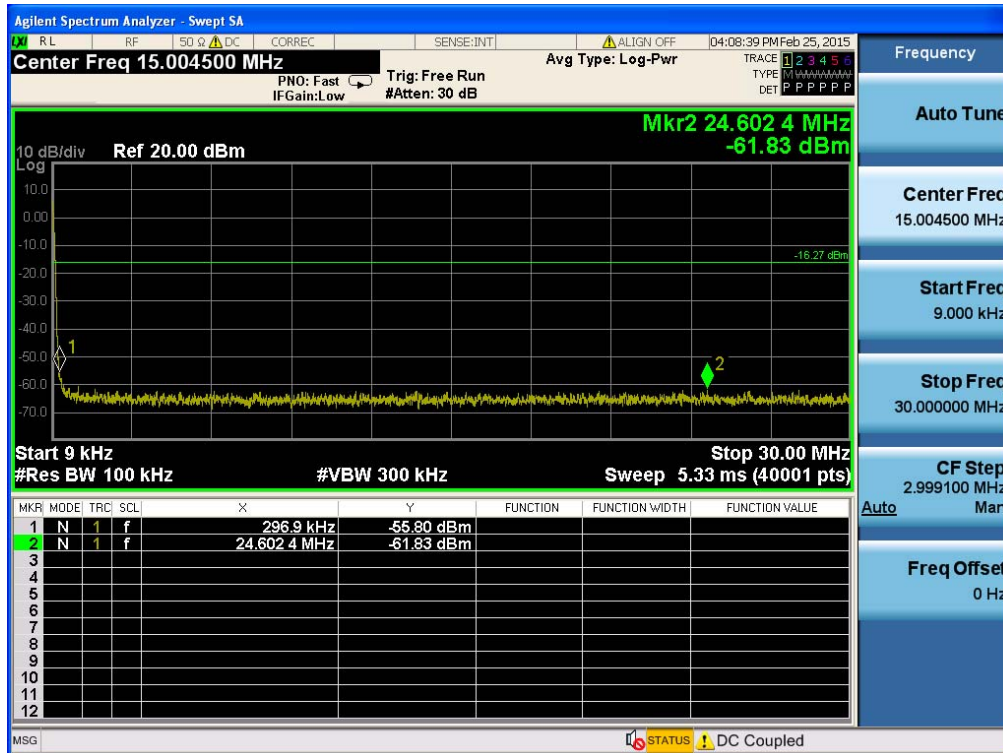
[illegible]

802.11g(Single TX) & ANT 2 & Middle

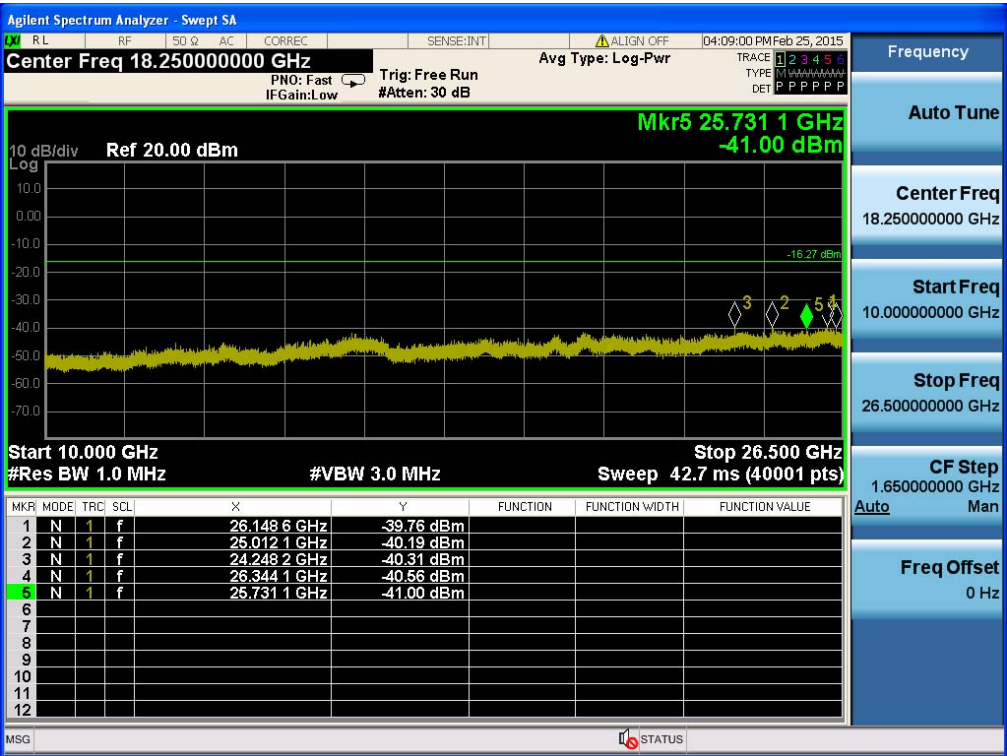
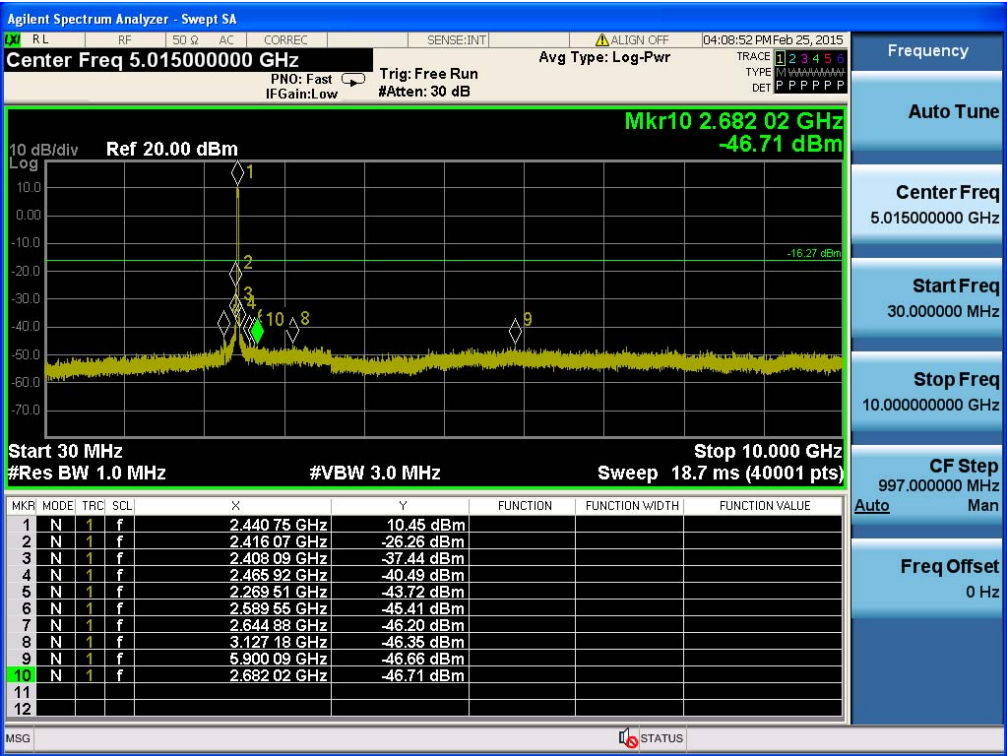
Reference



Conducted Spurious Emissions

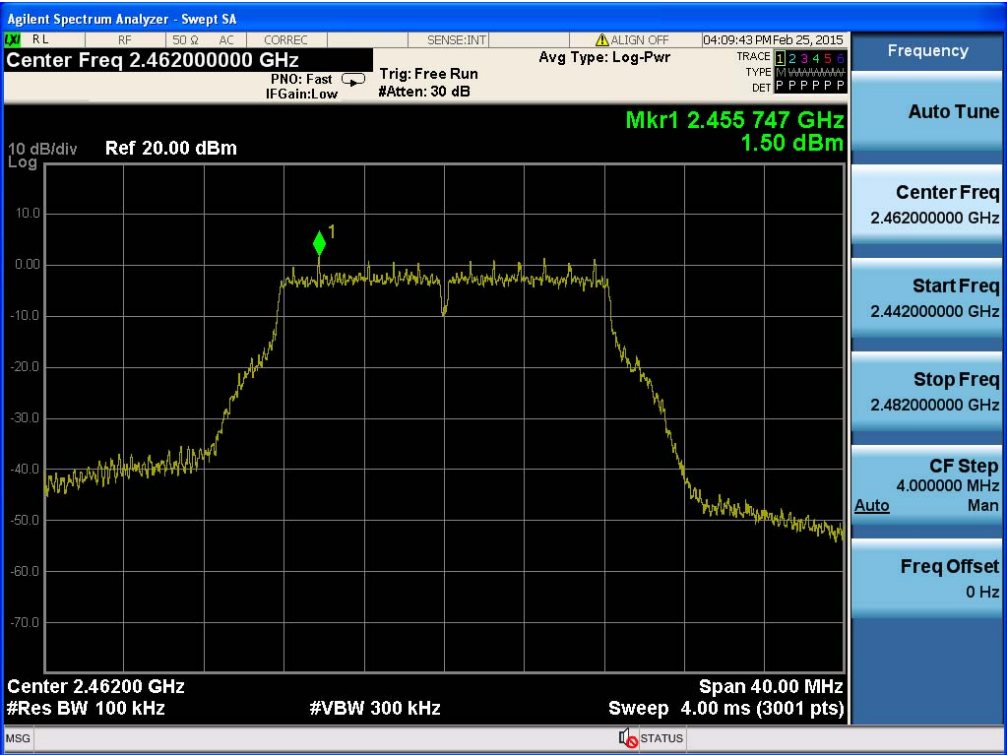


Conducted Spurious Emissions

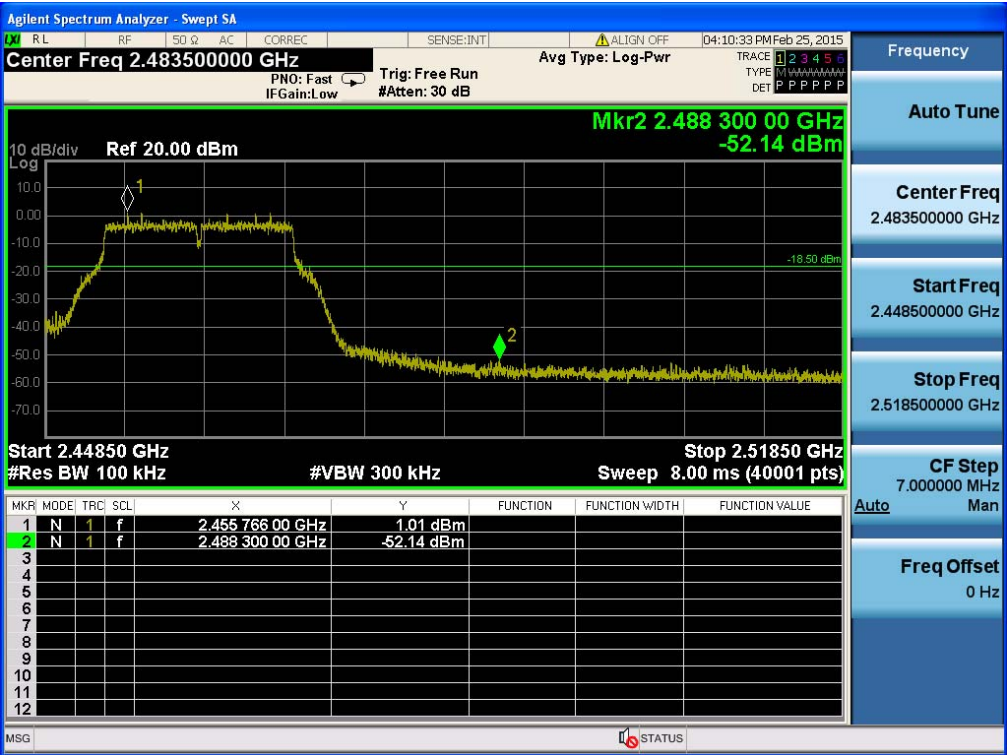


802.11g(Single TX) & ANT 2 & Highest

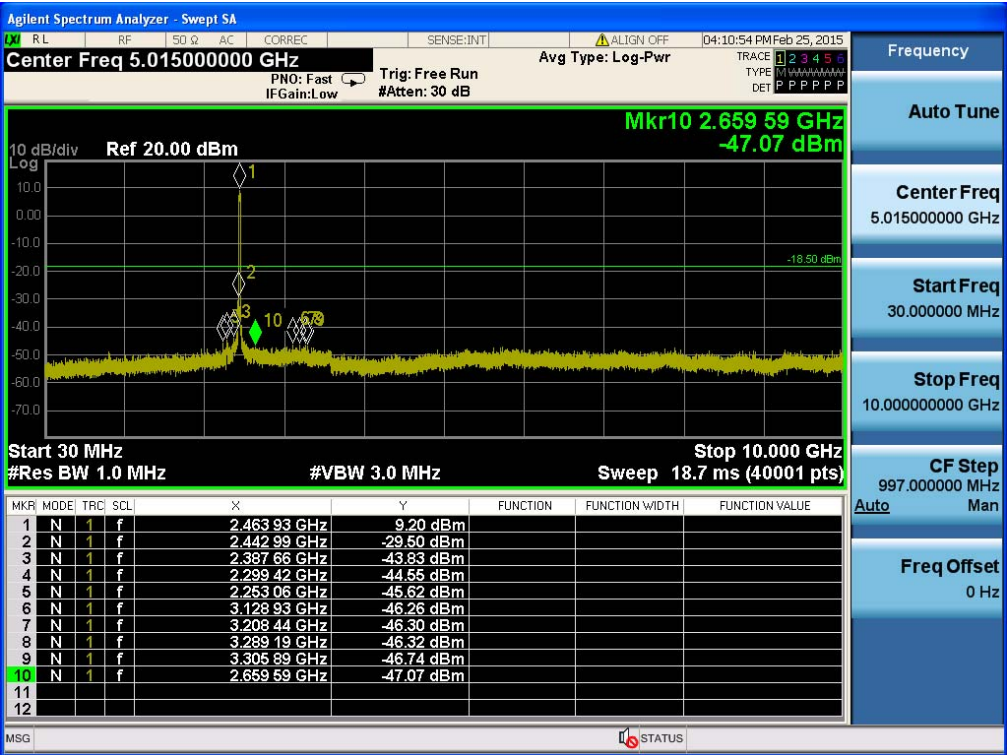
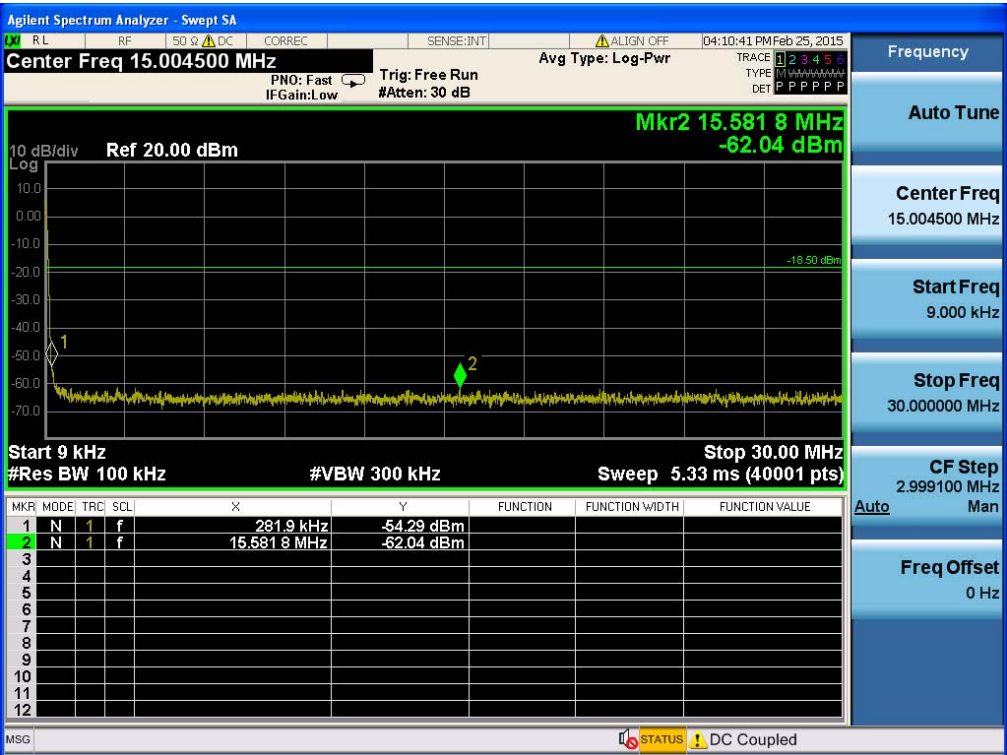
Reference



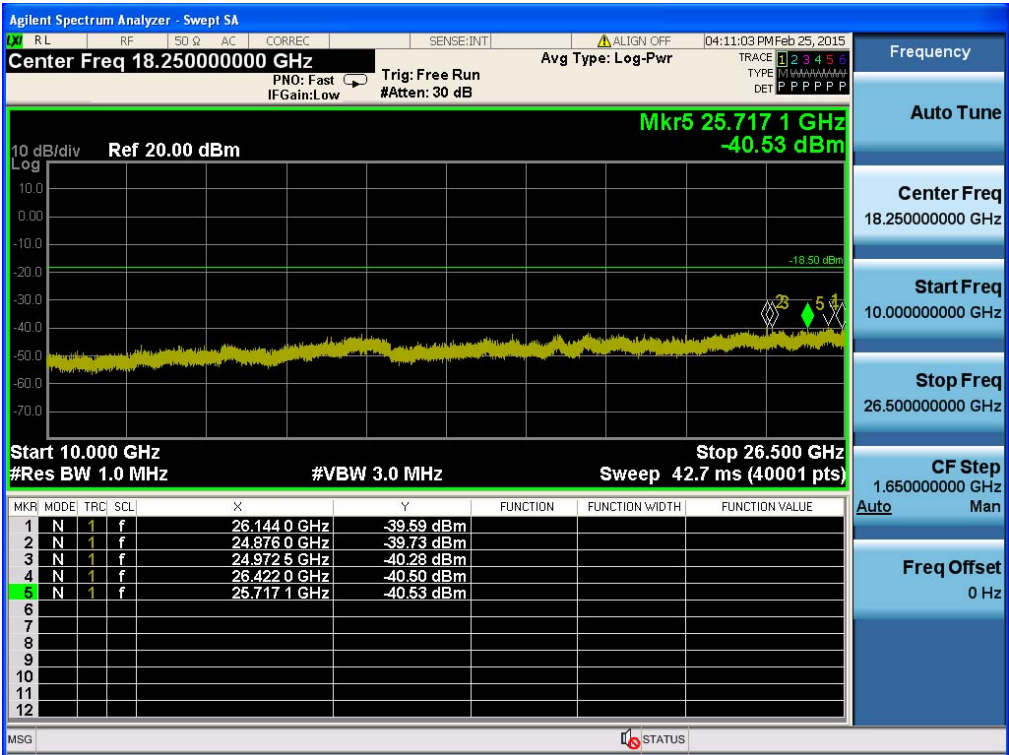
High Band-edge



Conducted Spurious Emissions



Conducted Spurious Emissions



8.5 Radiated spurious emissions

■ Test Requirements and limit, §15.247(d), §15.205, §15.209

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
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

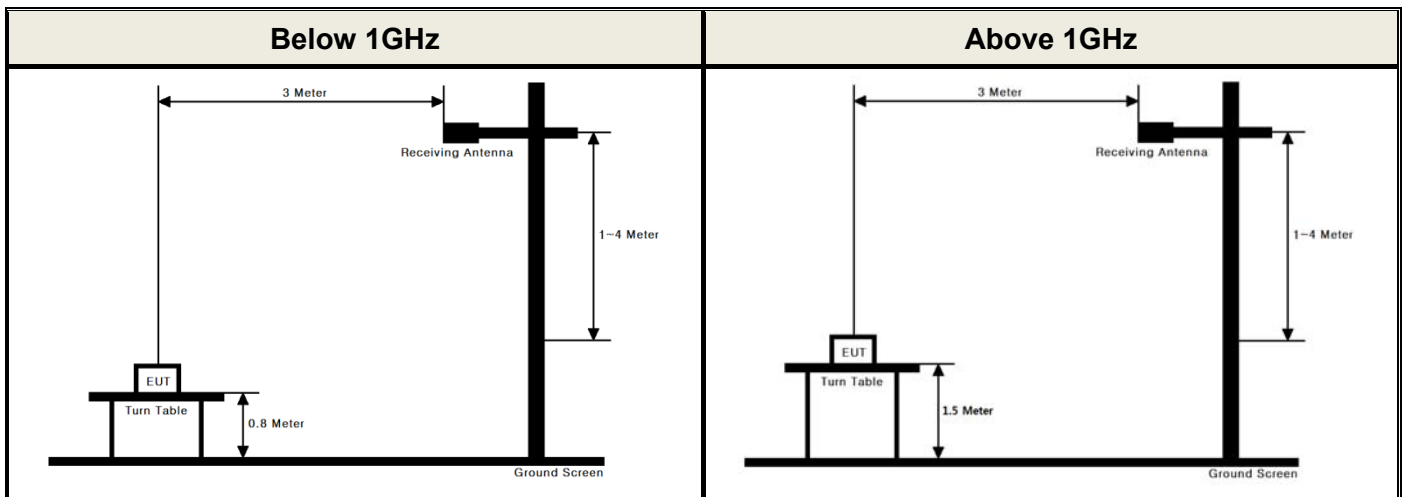
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240	3600 ~ 4400		

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

■ Test Configuration



■ Test Procedure

1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m..
2. The turn table shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

■ Measurement Instrument Setting for Radiated Emission Measurements.

Peak Measurement: 12.2.4 of KDB 558074 D01 DTS Meas Guidance v03r2

RBW = As specified in below table, VBW $\geq 3 \times$ RBW, Sweep = Auto, Detector = Peak, Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

Average Measurement: 12.2.5.2 of KDB 558074 D01 DTS Meas. Guidance v03r2

1. RBW = 1MHz(unless otherwise specified)
2. VBW $\geq 3 \times$ RBW
3. Detector = RMS, if span / sweep point $\leq$ (RBW/2)
4. Averaging type = Power
5. Sweep time = auto
6. Trace average = At least 100 traces
7. A duty cycle correction factor($10\log(1/x)$, where x is the duty cycle) shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

Test Mode	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11g	94.95	0.23

Note: Please refer to Appendix I for detailed information.

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : 802.11g

Tested ANT	Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCCF (dB)	DCF (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Single (ANT 2)	Lowest	2389.88	H	X	PK	64.10	2.76	N/A	N/A	66.86	74.00	7.14
		2390.00	H	X	AV	48.65	2.76	0.23	N/A	51.64	54.00	2.36
		-	-	-	-	-	-	-	-	-	-	-
	Middle	7314.12	H	Z	PK	51.77	16.24	N/A	-9.54	58.47	74.00	15.53
		7313.51	H	Z	AV	39.84	16.24	0.23	-9.54	46.77	54.00	7.23
		-	-	-	-	-	-	-	-	-	-	-
	Highest	2484.42	H	Y	PK	61.44	2.80	N/A	N/A	64.24	74.00	9.76
		2483.57	H	Y	AV	48.96	2.80	0.23	N/A	51.99	54.00	2.01
		-	-	-	-	-	-	-	-	-	-	-
Multiple (ANT 1+2)	Lowest	2387.63	H	X	PK	64.35	2.73	N/A	N/A	67.08	74.00	6.92
		2388.09	H	X	AV	48.94	2.73	0.23	N/A	51.90	54.00	2.10
		-	-	-	-	-	-	-	-	-	-	-
	Middle	7313.10	H	Z	PK	51.99	16.25	N/A	-9.54	58.70	74.00	15.30
		7312.32	H	Z	AV	40.11	16.25	0.23	-9.54	47.05	54.00	6.95
		-	-	-	-	-	-	-	-	-	-	-
	Highest	2484.27	H	Y	PK	61.70	2.80	N/A	N/A	64.50	74.00	9.50
		2484.67	H	Y	AV	49.19	2.80	0.23	N/A	52.22	54.00	1.78
		-	-	-	-	-	-	-	-	-	-	-

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
3. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1\text{m}/3\text{m})$
4. This test item for ANT 1 of single transmitting mode was performed in original grant.

8.6 Power-line conducted emissions

■ Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

■ Test Procedure:

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to the test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

■ Test Results: **Not Tested**

This test item was performed at the worst case mode for original grant.
Therefore this test item is not performed for this class II permissive change.

9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent	N9020A	14/09/15	15/09/15	MY50410163
MXA Signal Analyzer	Agilent	N9020A	14/03/28	15/03/28	MY50200828
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A/ MA2490A	14/03/12	15/03/12	1306007 / 1249001
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2495A/ MA2490A	14/10/21	15/10/21	1338003/1249304
Digital Multimeter	H.P	34401A	15/02/25	16/02/25	3146A13475
Dynamic Measurement DC Source	Agilent	66332A	14/09/11	15/09/11	US37473627
Thermohygrometer	BODYCOM	BJ5478	14/05/13	15/05/13	120612-1
Vector Signal Generator	Rohde Schwarz	SMJ100A	15/01/06	16/01/06	100148
Signal Generator	Rohde Schwarz	SMF100A	14/07/01	15/07/01	102341
Attenuator(3dB)	SMAJK	SMAJK-2-3	14/10/21	15/10/21	3
High-pass filter	Wainwright	WHKX3.0	14/09/11	15/09/11	9
LOOP Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
BILOG Antenna	Schwarzbeck	VULB 9160	14/04/04	16/04/04	3357
Horn Antenna	ETS-LINDGREN	3117	14/05/12	16/05/12	00140394
Horn Antenna	A.H.Systems	SAS-574	13/03/20	15/03/20	154
Amplifier (30dB)	Agilent	8449B	14/02/27	15/02/27	3008A00370

APPENDIX I

Duty cycle information

■ Test Procedure

Duty cycle measured using **section 6.0 b) of KDB 558074 D01 DTS Meas. Guidance v03r2** :

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

Set the center frequency of the instrument to the center frequency of the transmission. Set RBW $\geq$ OBW if possible; otherwise, set RBW to the largest available value. Set VBW $\geq$ RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

■ Test Data

Test Mode	Tested frequency	T _{ON} (ms)	T _{ON+OFF} (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11g	Lowest	2.07	2.18	94.95	0.23

■ Result Plots

Duty Cycle

802.11g(Single Tx) & ANT 2 & Lowest

