RF TEST REPORT

Test item	:	Wireless LAN Module
Model No.	:	WizFi220
Order No.	:	1105-00700
Date of receipt	:	2011-05-25
Test duration	:	2011-05-30 ~ 2011-06-03
Date of issue	:	2011-06-08
Use of report	:	FCC Original Grant

Applicant : WIZNET Co., LTD.
4F Humax Village, 11-4 Sunae-dong, Bundang-gu, Seongnam-si
Gyeonggi-do, 463-825, Korea

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	FCC Part 15 Subpart C 247
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer S.K. Ryu	N/A	Manager W.J. Lee

CONTENTS

1. Equipment information

1.1 Equipment description

FCC Equipment Class	Digital Transmission System (DTS)
Equipment type	Wireless LAN Module
Equipment model name	WizFi220
Equipment add model name	N/A
Equipment serial no.	Identical prototype
Frequency band	2412 ~ 2462 MHz
Modulation type	CCK
Channel Access Protocol	CSMA/CA
Channel Spacing	5.0 MHz
Antenna type	External Type: Dipole antenna (Max. Peak Gain: 3.377 dBi)
Power Supply	DC 3.3 V

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2. Information about test items

2.1 Test mode

This device was tested in continuous transmitting mode at maximum power.

Test Case 1	802.11b 1Mbps
Test Case 2	-

Note: The maximum power was investigated at each transmission rate.
(The Maximum power mode: 1Mbps)

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
WizFi2xo Test Board	N/A	N/A	WIZnet	V1.0
AC-DC Adapter	DP-05020DG	N/A	-	-

2.3 Tested frequency

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	2412	2412
Middle Channel	2437	2437
Highest Channel	2462	2462

2.4 Tested environment

Temperature	:	22 ~ 25 °C
Relative humidity content	:	32 ~ 38 % R.H.
Details of power supply	:	DC 3.3 V AC-DC Adapter : 120 V 60 Hz

2.5 EMI Suppression Device(s)/Modifications

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

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit (Using in 2400 ~ 2483.5MHz)	Test Condition	Status Note 1
I. Test Items				
15.247(a)(2)	6 dB Bandwidth	> 500 kHz	Conducted	**C**
15.247(b)(3)	Transmitter Output Power	< 1Watt		**C**
15.247(c)	Out of Band Emissions / Band Edge	20dBc in any 100kHz BW		**C**
15.247(d)	Transmitter Power Spectral Density	< 8dBm / 3kHz		**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	EN 55022	AC Line Conducted	**C**
15.203	Antenna Requirements	FCC 15.203	-	**C**

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

The sample was tested according to the following specification:
ANSI C-63.4-2003, DA00-705

3.2 Transmitter requirements

3.2.1 6 dB Bandwidth

- Procedure:

The bandwidth at 6 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal at the highest, middle and the lowest available channels.
After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 6dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level.
The marker-delta reading at this point is the 6 dB bandwidth of the emission.

The spectrum analyzer is set to:
Center frequency = the highest, middle and the lowest Frequencies
Span = 50 MHz (Greater than EBW)
RBW = 100 kHz
VBW = ≥ RBW
Trace = max hold
Sweep = auto
Detector function = peak

- Measurement Data: Comply

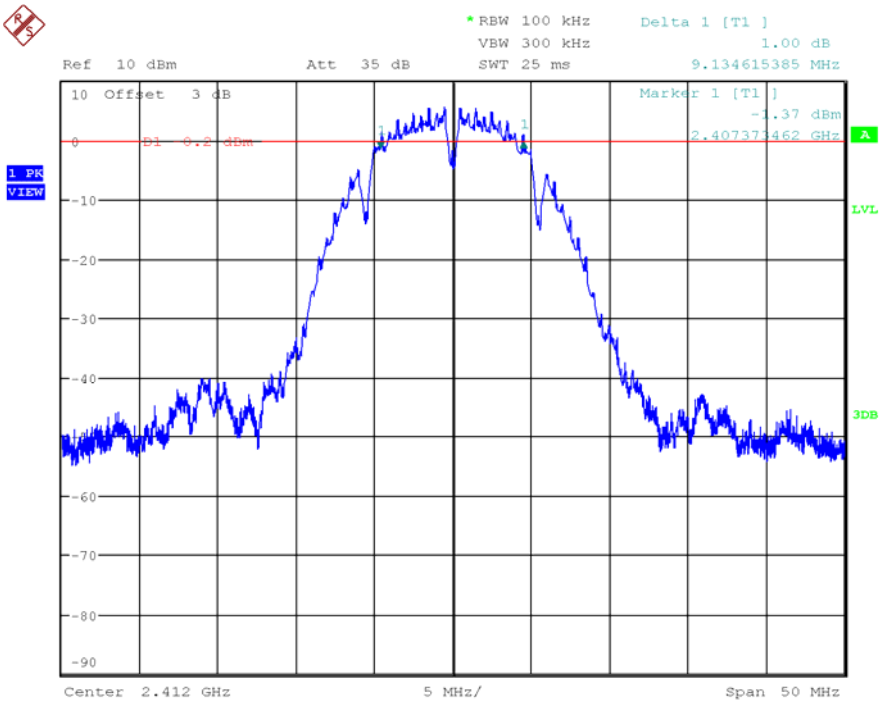
Test Mode	Frequency	Test Results (MHz)
Test case 1	Lowest	9.135
	Middle	9.119
	Highest	9.375

Note 1: See next pages for actual measured spectrum plots.

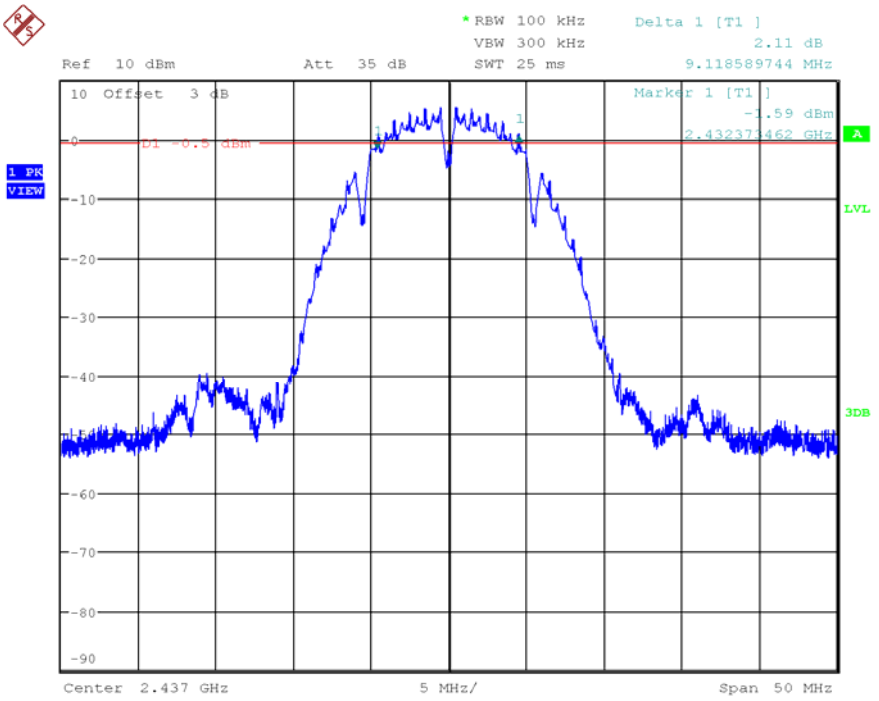
- **Minimum Standard:**

The minimum 6 dB bandwidth shall be at least 500 kHz

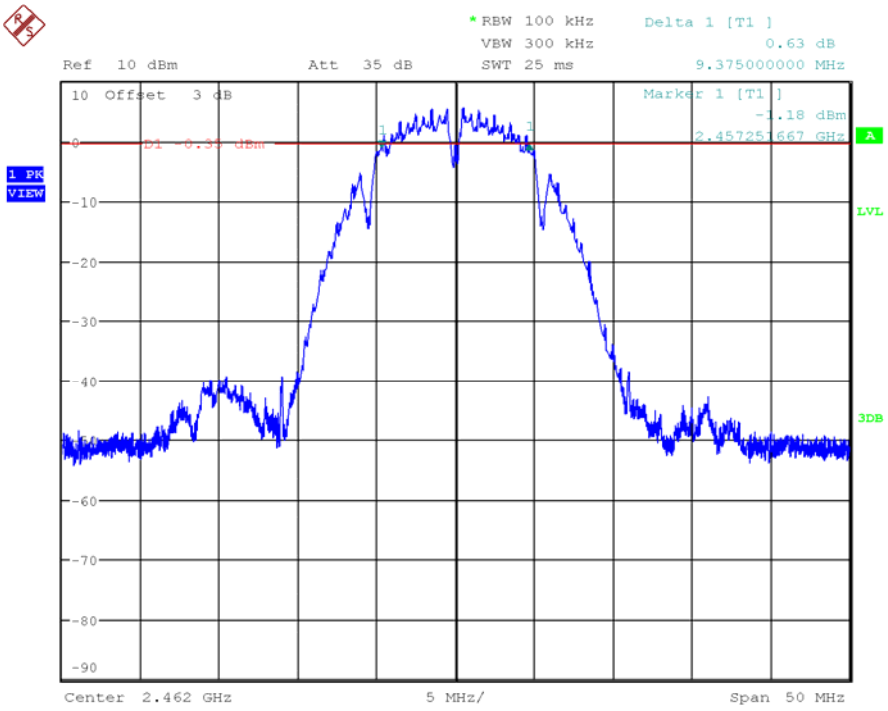
6 dB Bandwidth Test case 1 & Lowest Frequency



6 dB Bandwidth Test case 1 & Middle Frequency



6 dB Bandwidth Test case 1 & Highest Frequency



3.2.2 Peak Output Power

- Test Procedure and Spectrum Analyzer setting:
This is an RF conducted test. Use a direct connection between the antenna port of the transmitter and the spectrum analyzer, through suitable attenuation. Power Output Option 1 is a peak measurement. Power Output Option 2 is the same procedure used for UNII output power measurements. Either option can be used for DTS devices.

This test items was used Power Output Option 1.

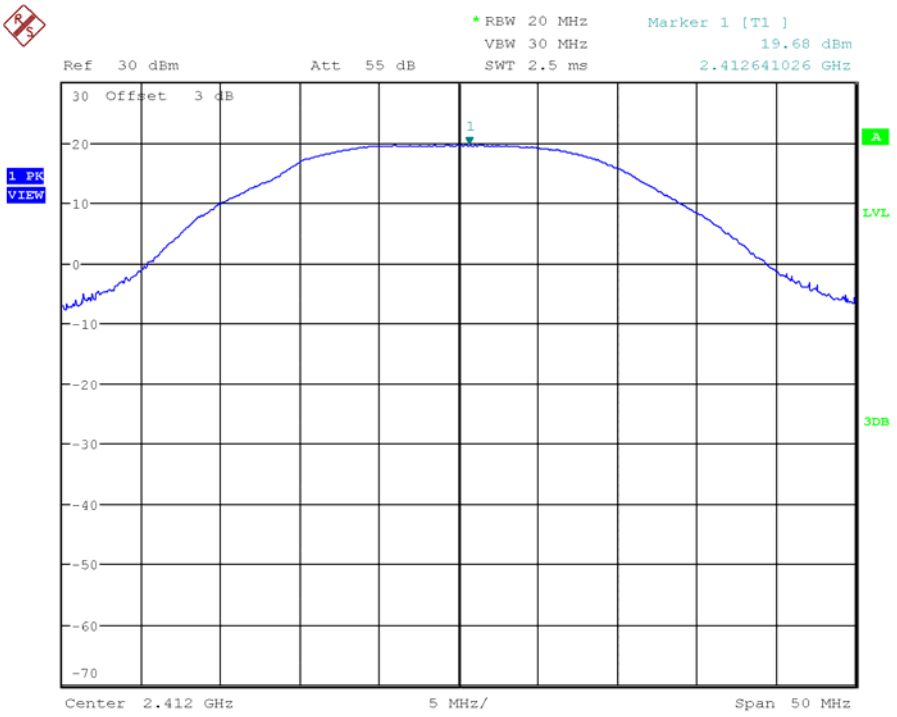
- **Measurement Data: Comply**

Test Mode	Frequency	Test Results	
		dBm	W
Test case 1	Lowest	19.68	0.093
	Middle	19.55	0.090
	Highest	20.06	0.101

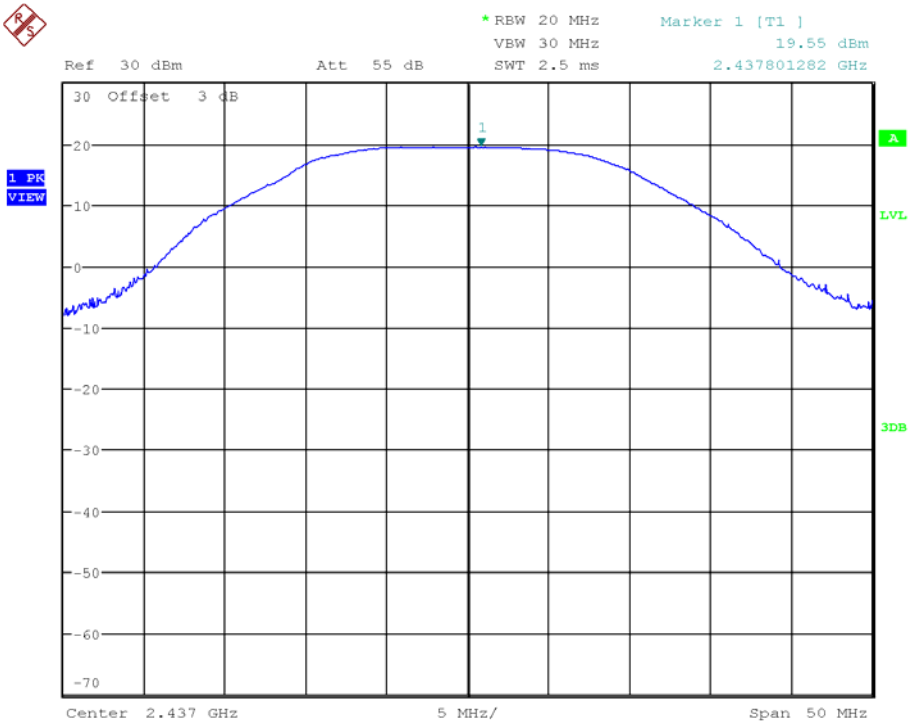
Note 1: See next pages for actual measured spectrum plots.

Minimum Standard:	< 1W

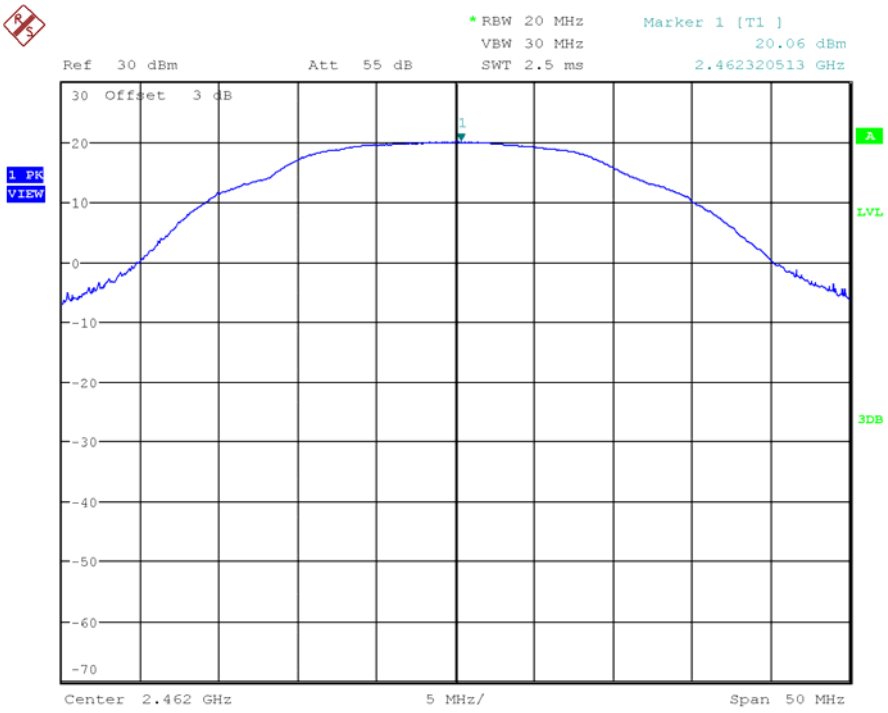
Peak Output Power Test case 1 & Lowest Frequency



Peak Output Power Test case 1 & Middle Frequency



Peak Output Power Test case 1 & Highest Frequency



3.2.3 Out of Band Emissions / Band Edge

- Procedure:

All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB.

For Band-edge testing the spectrum analyzer is set to:
Tested frequency = the highest and the lowest Frequencies
Center frequency = 2400MHz, 2483.5MHz
Span = 100MHz Detector function = peak
RBW = 1% of the span VBW = 100 kHz
Trace = max hold Sweep = auto

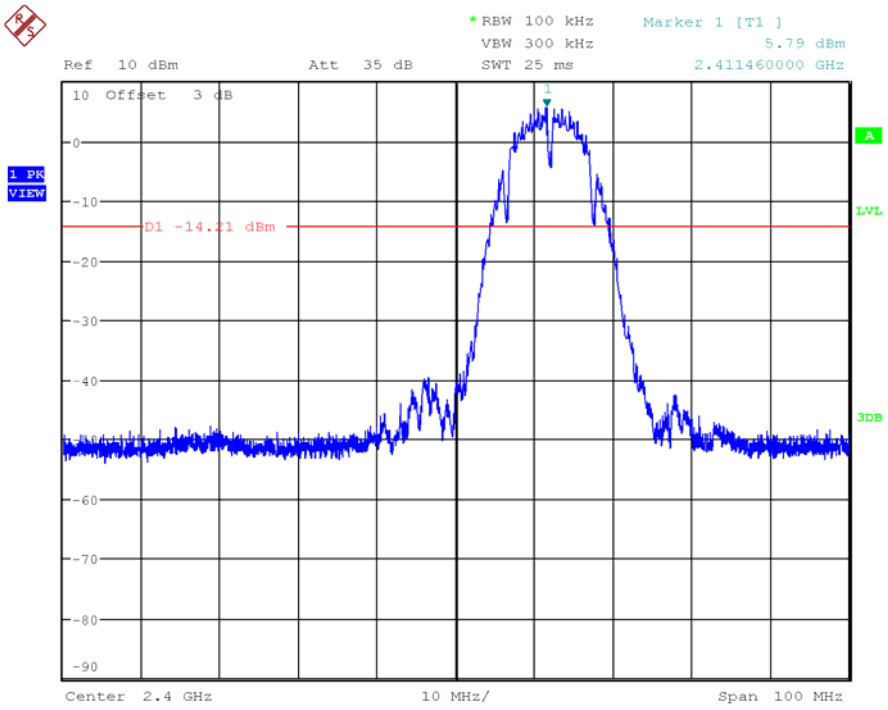
For spurious testing the spectrum analyzer is set to:
Tested frequency = the highest, middle and the lowest Frequencies
RBW = 100 kHz VBW = 100 kHz
Detector function = peak Sweep = auto
Trace = max hold

- Measurement Data: Comply

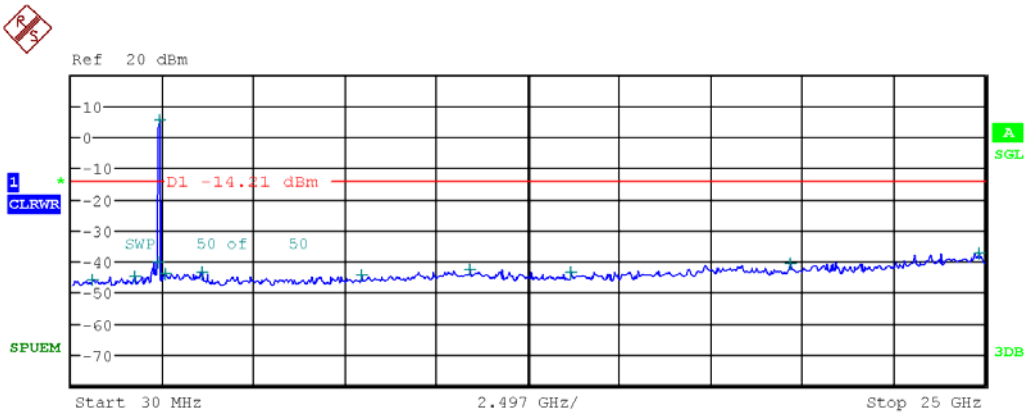
Note 1: See next pages for actual measured spectrum plots.

Minimum Standard:	> 30 dBc

Low Band-edge at 30 dB blow Test case 1

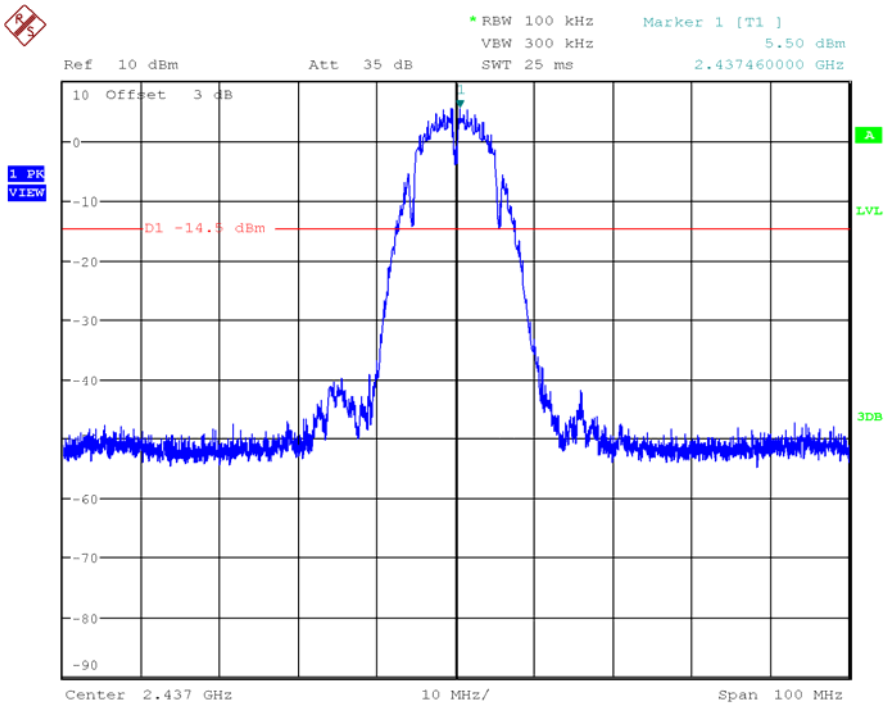


Conducted Spurious Emissions Test case 1 & Lowest Frequency

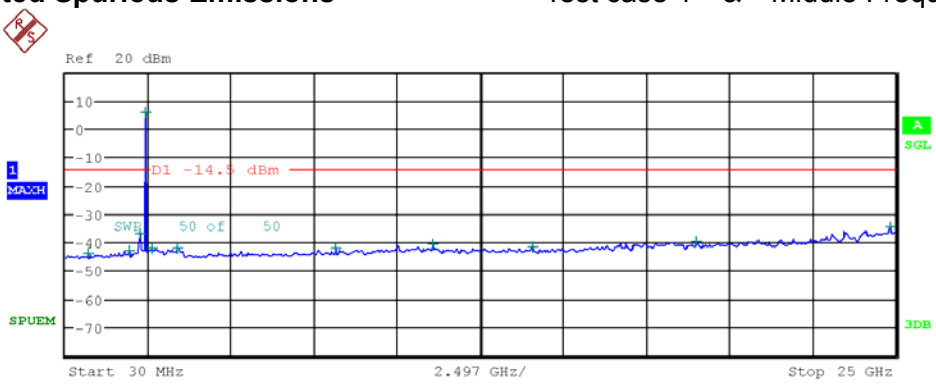


Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	Δ Limit [dB]
30.000 M	1.000 G	100.00 k	610.060000 M	-46.11	-200.00
1.000 G	2.000 G	100.00 k	1.755000 G	-44.79	-200.00
2.000 G	2.400 G	100.00 k	2.396000 G	-40.12	-200.00
2.400 G	2.483 G	100.00 k	2.413464 G	5.33	-200.00
2.483 G	3.000 G	100.00 k	2.589176 G	-43.98	-200.00
3.000 G	6.000 G	100.00 k	3.575333 G	-43.70	-200.00
6.000 G	9.000 G	100.00 k	7.945000 G	-44.68	-200.00
9.000 G	12.000 G	100.00 k	10.926000 G	-42.58	-200.00
12.000 G	15.000 G	100.00 k	13.686000 G	-43.39	-200.00
15.000 G	20.000 G	100.00 k	19.663333 G	-40.95	-200.00
20.000 G	25.000 G	100.00 k	24.820000 G	-37.32	-200.00

Reference for limit Test case 1 & Middle Frequency

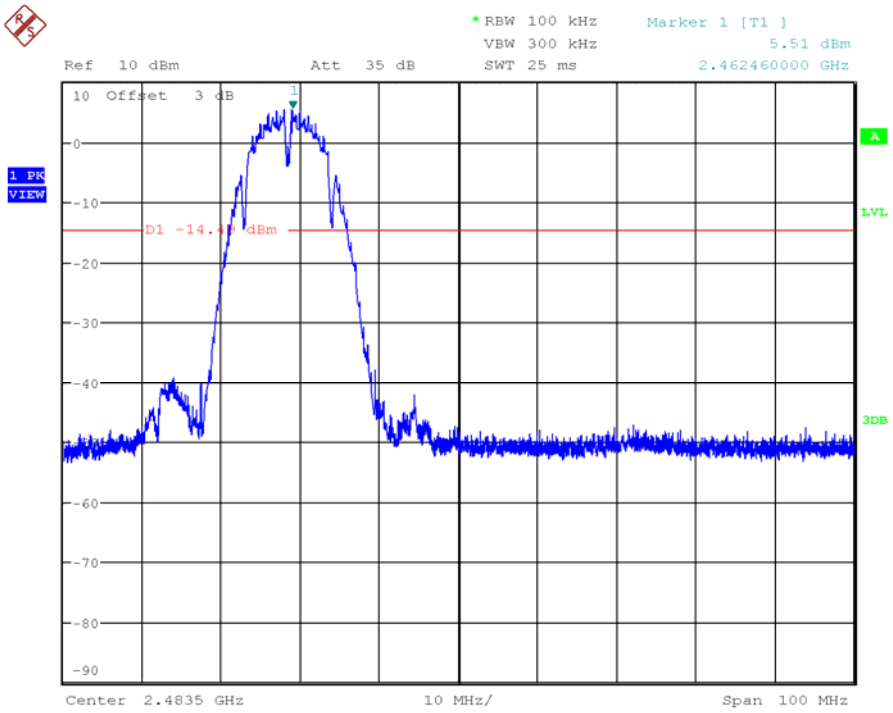


Conducted Spurious Emissions Test case 1 & Middle Frequency

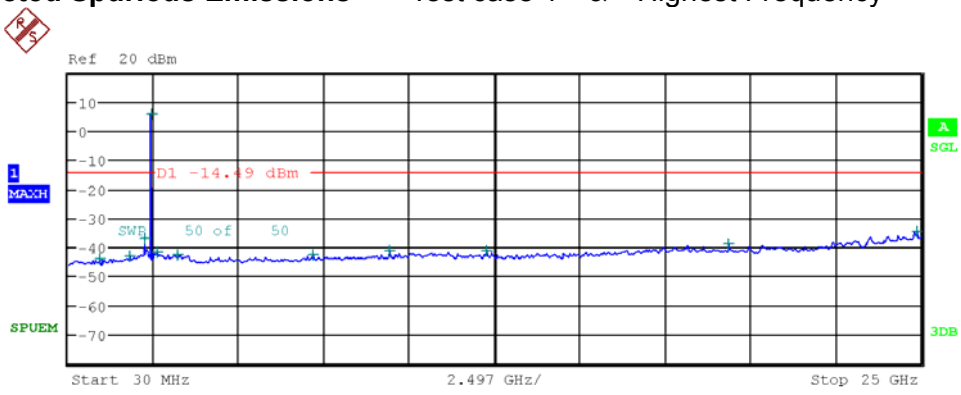


Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
30.000 M	1.000 G	100.00 k	720.640000 M	-43.87	-200.00
1.000 G	2.000 G	100.00 k	1.938000 G	-43.30	-200.00
2.000 G	2.400 G	100.00 k	2.262440 G	-37.24	-200.00
2.400 G	2.483 G	100.00 k	2.436448 G	5.50	-200.00
2.483 G	3.000 G	100.00 k	2.612315 G	-42.12	-200.00
3.000 G	6.000 G	100.00 k	3.405333 G	-42.30	-200.00
6.000 G	9.000 G	100.00 k	8.153667 G	-42.37	-200.00
9.000 G	12.000 G	100.00 k	11.074667 G	-40.86	-200.00
12.000 G	15.000 G	100.00 k	14.093333 G	-41.70	-200.00
15.000 G	20.000 G	100.00 k	19.001667 G	-40.09	-200.00
20.000 G	25.000 G	100.00 k	24.834444 G	-34.86	-200.00

High Band-edge at 30 dB blow Test case 1 & Highest Frequency



Conducted Spurious Emissions Test case 1 & Highest Frequency



Start [Hz]	Stop [Hz]	RBW [Hz]	Freq [Hz]	PwrAbs [dBm]	ΔLimit [dB]
30.000 M	1.000 G	100.00 k	941.800000 M	-44.24	-200.00
1.000 G	2.000 G	100.00 k	1.847000 G	-42.98	-200.00
2.000 G	2.400 G	100.00 k	2.285480 G	-36.86	-200.00
2.400 G	2.483 G	100.00 k	2.462458 G	5.62	-200.00
2.483 G	3.000 G	100.00 k	2.636900 G	-41.59	-200.00
3.000 G	6.000 G	100.00 k	3.248667 G	-42.59	-200.00
6.000 G	9.000 G	100.00 k	7.209333 G	-42.87	-200.00
9.000 G	12.000 G	100.00 k	9.428333 G	-41.34	-200.00
12.000 G	15.000 G	100.00 k	12.288333 G	-41.27	-200.00
15.000 G	20.000 G	100.00 k	19.350556 G	-39.12	-200.00
20.000 G	25.000 G	100.00 k	24.869444 G	-34.60	-200.00

3.2.4 Out of band Emission – Radiated

- Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:
Tested frequency = Low, Middle, High Frequencies
Frequency Range = 30 MHz ~ 10th harmonic.
RBW and VBW = 1. Frequency range: 30MHz ~ 1GHz
RBW = 120KHz / VBW = ≥ RBW
2. Frequency range: 1GHz ~ 10th harmonics
Peak mode: RBW = 1MHz / VBW = ≥ RBW
Average mode: RBW = 1MHz / VBW = 10Hz
Detector function = Peak Sweep = auto
Trace = max hold

- Measurement Data: Comply

Note 1: See next pages for actual measured spectrum plots and data.

- Minimum Standard:

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

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

▪ 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.

30MHz ~ 25GHz Radiated Spurious Emissions

▪ Lowest Channel

Freq. (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
54.936	V	Y Axis	QP	52.30	-14.20	38.10	40.00	1.90
123.429	H	X Axis	QP	44.48	-13.90	30.58	43.50	12.92
266.281	H	X Axis	QP	45.00	-8.40	36.60	46.00	9.40
2235.300	V	X Axis	PK	57.20	-6.00	51.20	74.00	22.80
2237.400	V	X Axis	AV	48.18	-5.98	42.20	54.00	11.80
2281.200	V	X Axis	PK	61.26	-5.83	55.43	74.00	18.57
2281.400	V	X Axis	AV	52.43	-5.83	46.60	54.00	7.40
2324.000	V	X Axis	PK	55.65	-5.68	49.97	74.00	24.03
2324.000	V	X Axis	AV	46.01	-5.68	40.33	54.00	13.67
2369.200	V	X Axis	PK	54.60	-5.52	49.08	74.00	24.92
2369.210	V	X Axis	AV	45.14	-5.52	39.62	54.00	14.38
2543.700	V	X Axis	PK	53.61	-4.91	48.70	74.00	25.30
2544.230	V	X Axis	AV	43.09	-4.91	38.18	54.00	15.82
2587.800	V	X Axis	PK	59.23	-4.75	54.48	74.00	19.52
2588.100	V	X Axis	AV	50.19	-4.75	45.44	54.00	8.56

Note.

1. No other spurious and harmonic emissions were detected greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

30MHz ~ 25GHz Radiated Spurious Emissions

▪ Middle Channel

Freq. (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
54.877	V	Y Axis	QP	51.80	-14.20	37.60	40.00	2.40
123.511	H	X Axis	QP	45.10	-13.90	31.20	43.50	12.30
266.278	H	X Axis	QP	45.20	-8.40	36.80	46.00	9.20
2206.300	H	Y Axis	PK	54.54	-6.09	48.45	74.00	25.55
2206.560	H	Y Axis	AV	48.52	-6.09	42.43	54.00	11.57
2260.300	V	X Axis	PK	62.88	-5.90	56.98	74.00	17.02
2261.540	V	X Axis	AV	53.89	-5.90	47.99	54.00	6.01
2279.500	V	Y Axis	PK	55.61	-5.84	49.77	74.00	24.23
2280.770	V	Y Axis	AV	43.40	-5.83	37.57	54.00	16.43
2305.300	V	X Axis	PK	62.09	-5.75	56.34	74.00	17.66
2305.580	V	X Axis	AV	53.69	-5.74	47.95	54.00	6.05
2568.700	V	Y Axis	PK	54.88	-4.82	50.06	74.00	23.94
2569.100	V	Y Axis	AV	44.99	-4.82	40.17	54.00	13.83
2612.800	V	X Axis	PK	59.55	-4.66	54.89	74.00	19.11
2613.200	V	X Axis	PK	50.56	-4.66	45.90	74.00	28.10

Note.

1. No other spurious and harmonic emissions were detected greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

30MHz ~ 25GHz Radiated Spurious Emissions

▪ Highest Channel

Freq. (MHz)	ANT Pol	The worst case EUT Position	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
54.917	V	Y Axis	QP	52.10	-14.20	37.90	40.00	2.10
123.400	H	X Axis	QP	45.20	-13.90	31.30	43.50	12.20
266.300	H	X Axis	QP	45.50	-8.40	37.10	46.00	8.90
2287.800	V	X Axis	PK	66.38	-5.81	60.57	74.00	13.43
2286.520	V	X Axis	AV	58.03	-5.81	52.22	54.00	1.78
2306.200	V	X Axis	PK	60.09	-5.74	54.35	74.00	19.65
2305.900	V	X Axis	AV	48.07	-5.74	42.33	54.00	11.67
2332.000	V	X Axis	PK	60.81	-5.65	55.16	74.00	18.84
2331.400	V	X Axis	AV	52.78	-5.65	47.13	54.00	6.87
2483.640	V	X Axis	PK	63.30	-5.12	58.18	74.00	15.82
2483.500	V	X Axis	AV	52.16	-5.11	47.05	54.00	6.95
2593.700	V	Y Axis	PK	53.73	-4.73	49.00	74.00	25.00
2594.000	V	Y Axis	AV	44.40	-4.73	39.67	54.00	14.33
2637.000	V	X Axis	PK	60.00	-4.58	55.42	74.00	18.58
2637.870	V	X Axis	AV	50.14	-4.57	45.57	54.00	8.43

Note.

1. No other spurious and harmonic emissions were detected greater than listed emissions on above table.
2. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

3.2.5 Transmitter Power Spectral Density

- Procedure:

The same method of determining the conducted output power shall be used to determine the power spectral density. If a peak output power is measured, then a peak power spectral density measurement is required. If an average output power is measured, then an average power spectral density measurement should be used. Use PSD Option 1 if Power output Option 1 was used. Use PSD Option 2 if power output Option 2 was used.

This test item was used PSD Option 1.

The spectrum analyzer is set to:
Center frequency = the highest, middle and the lowest Frequencies
Span = 900KHz
RBW = 3KHz
VBW = ≥ RBW
Sweep = 300s
Trace = max hold

- Measurement Data: Comply

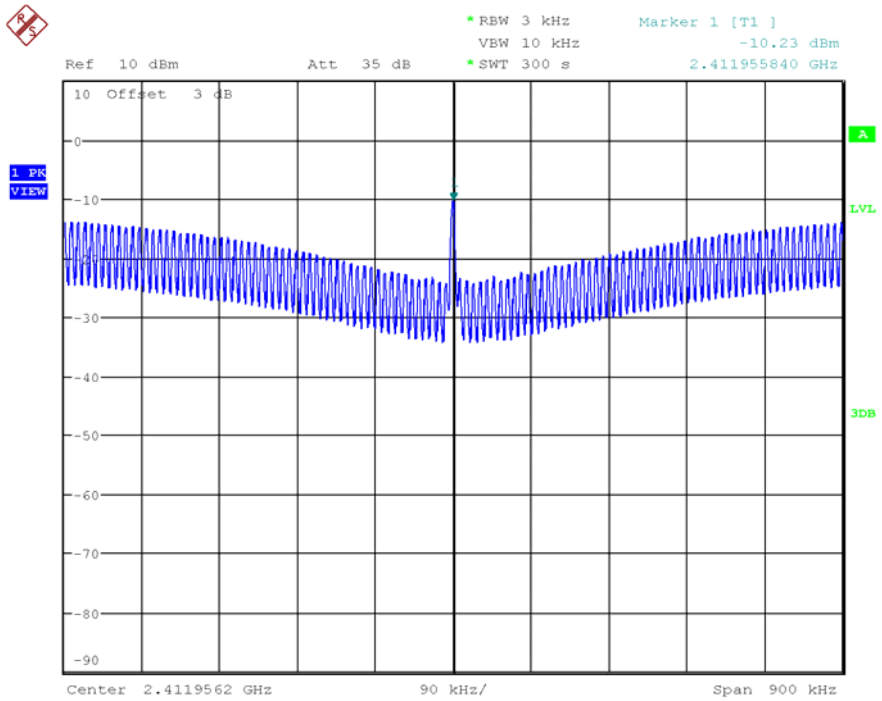
Test Mode	Frequency	Test Results (dBm)
Test case 1	Lowest	-10.230
	Middle	-10.650
	Highest	-10.250

Note 1: See next pages for actual measured spectrum plots.

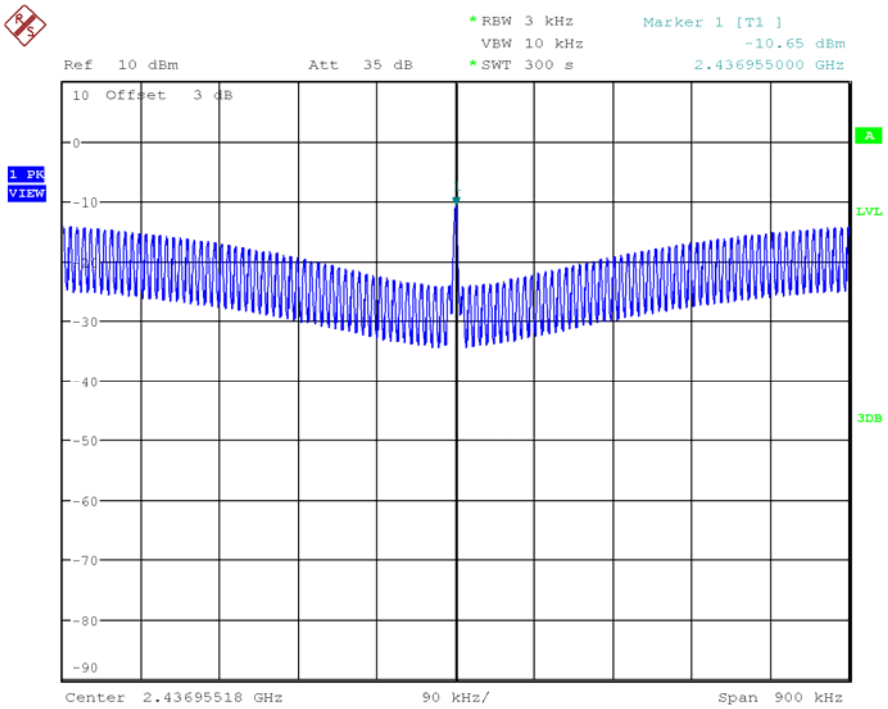
- Minimum Standard:

The transmitter power density average over 1-second interval shall not be greater than 8 dBm in any 3kHz BW.

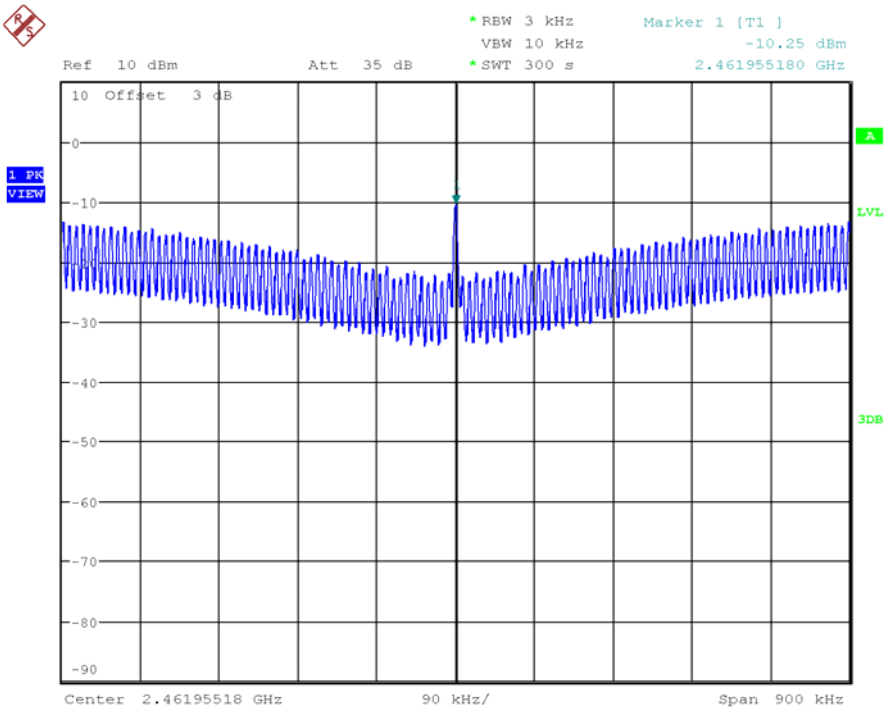
Transmitter Power Spectral Density Test case 1 & Lowest Frequency



Transmitter Power Spectral Density Test case 1 & Middle Frequency



Transmitter Power Spectral Density Test case 1 & Highest Frequency



3.2.6 AC Conducted Emissions

- Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. Emissions closest to the limit are measured in the quasi-peak mode (QP) and average mode (AV) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

- Measurement Data: Comply

Note 1: See next pages for actual measured spectrum plots and data.

- Minimum Standard: FCC Part 15.207(a)/EN 55022

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

AC Line Conducted Emissions (Graph)

Digital EMC

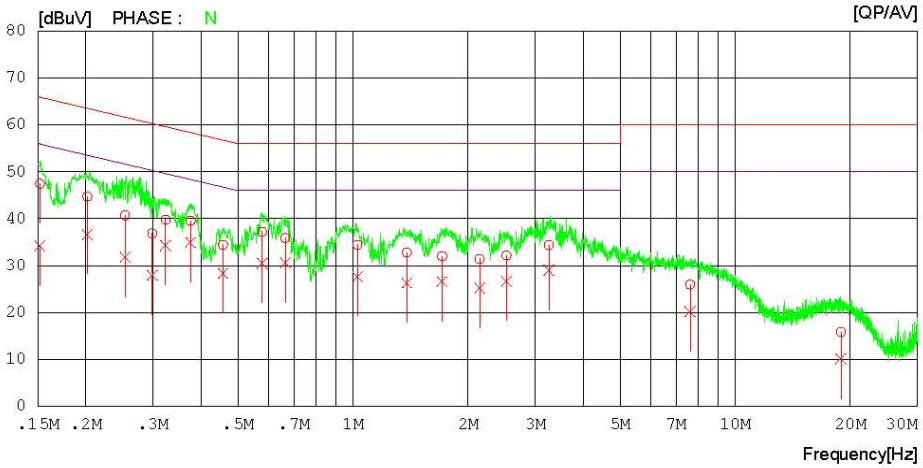
Results of Conducted Emission

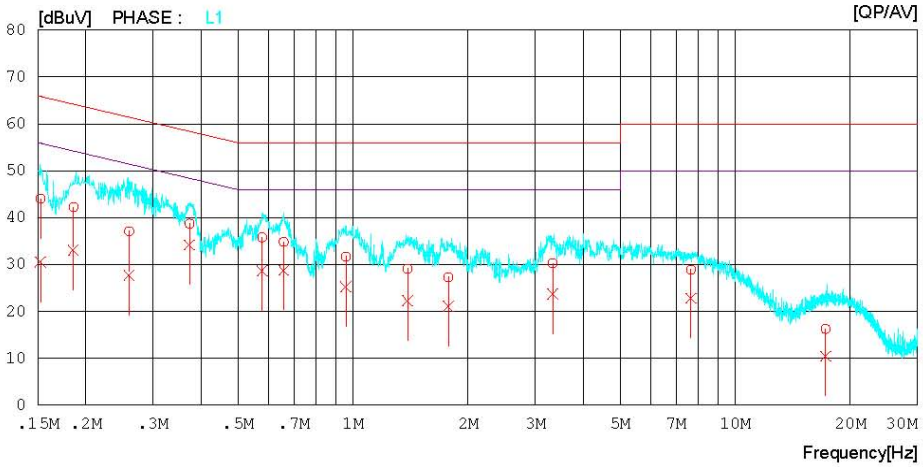
Digital EMC
Date : 2011/06/03

Model No.	:	WizFi220	Referrence No.	:	FCC Part 15
Type	:	WLAN Module	Power Supply	:	120V 60Hz
Serial No.	:	N/A	Temp/Humi.	:	25`C 32% R.H.
Test Condition	:	802.11b Transmitting mode	Operator	:	S.K.RYU

Memo : Channel: 6

LIMIT : CISPR22_B QP
CISPR22_B AV





AC Line Conducted Emissions (Data List)

Results of Conducted Emission

Digital EMC
Date : 2011/06/03

Model No.	:	WizFi220	Referrence No.	:	FCC Part 15
Type	:	WLAN Module	Power Supply	:	120V 60Hz
Serial No.	:	N/A	Temp/Humi.	:	25°C 32% R.H.
Test Condition	:	802.11b Transmitting mode	Operator	:	S.K.RYU

Memo : Channel: 6

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ	READING QP	READING AV	C.FACTOR	RESULT QP	RESULT AV	LIMIT QP	LIMIT AV	MARGIN QP	MARGIN AV	PHASE
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15174	47.3	34.1	0.1	47.4	34.2	65.9	55.9	18.5	21.7	N
2	0.29833	36.8	27.8	0.1	36.9	27.9	60.3	50.3	23.4	22.4	N
3	0.57850	37.1	30.4	0.1	37.2	30.5	56.0	46.0	18.8	15.5	N
4	7.61200	25.5	19.8	0.4	25.9	20.2	60.0	50.0	34.1	29.8	N
5	0.20173	44.6	36.5	0.1	44.7	36.6	63.5	53.5	18.8	16.9	N
6	0.25350	40.6	31.6	0.1	40.7	31.7	61.6	51.6	20.9	19.9	N
7	0.32329	39.7	34.2	0.1	39.8	34.3	59.6	49.6	19.8	15.3	N
8	0.37614	39.4	34.8	0.1	39.5	34.9	58.4	48.4	18.9	13.5	N
9	0.45691	34.3	28.2	0.1	34.4	28.3	56.7	46.7	22.3	18.4	N
10	0.66494	35.7	30.4	0.2	35.9	30.6	56.0	46.0	20.1	15.4	N
11	1.02700	34.2	27.5	0.2	34.4	27.7	56.0	46.0	21.6	18.3	N
12	1.38350	32.6	26.1	0.2	32.8	26.3	56.0	46.0	23.2	19.7	N
13	1.71000	31.8	26.3	0.2	32.0	26.5	56.0	46.0	24.0	19.5	N
14	2.14550	31.2	25.0	0.2	31.4	25.2	56.0	46.0	24.6	20.8	N
15	2.52050	32.0	26.5	0.2	32.2	26.7	56.0	46.0	23.8	19.3	N
16	3.25250	34.0	28.7	0.3	34.3	29.0	56.0	46.0	21.7	17.0	N
17	18.89200	15.2	9.5	0.6	15.8	10.1	60.0	50.0	44.2	39.9	N
18	0.15213	44.0	30.4	0.1	44.1	30.5	65.9	55.9	21.8	25.4	L1
19	0.18555	42.2	33.0	0.1	42.3	33.1	64.2	54.2	21.9	21.1	L1
20	0.37341	38.6	34.1	0.1	38.7	34.2	58.4	48.4	19.7	14.2	L1
21	0.57819	35.7	28.6	0.1	35.8	28.7	56.0	46.0	20.2	17.3	L1
22	7.65300	28.5	22.4	0.4	28.9	22.8	60.0	50.0	31.1	27.2	L1
23	0.25975	37.0	27.6	0.1	37.1	27.7	61.4	51.4	24.3	23.7	L1
24	0.65865	34.6	28.6	0.2	34.8	28.8	56.0	46.0	21.2	17.2	L1
25	0.95794	31.5	25.1	0.2	31.7	25.3	56.0	46.0	24.3	20.7	L1
26	1.38950	28.9	22.1	0.2	29.1	22.3	56.0	46.0	26.9	23.7	L1
27	1.77550	27.2	20.9	0.2	27.4	21.1	56.0	46.0	28.6	24.9	L1
28	3.32800	30.0	23.4	0.3	30.3	23.7	56.0	46.0	25.7	22.3	L1
29	17.23150	15.7	9.9	0.6	16.3	10.5	60.0	50.0	43.7	39.5	L1

3.2.7 Antenna Requirements

- Procedure:

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

- Conclusion: Comply

→ This module uses a Dipole antenna. The antenna connector is a left hand SMA.
And the antenna with a cable is connected to the module using U-FL connector.
(Refer to External photo file.)

- Minimum Standard:

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

APPENDIX

TEST EQUIPMENT FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
☐	Spectrum Analyzer	Agilent	E4440A	10/09/30	11/09/30	MY45304199
☒	Spectrum Analyzer	Rohde Schwarz	FSQ26	11/01/11	12/01/11	200445
☐	Spectrum analyzer	Agilent	E4404B	11/03/08	12/03/08	US41061134
☐	Spectrum Analyzer(RE)	H.P	8563E	10/10/04	11/10/04	3551A04634
☐	MXA Signal Analyzer	Agilent Technologies, Inc	N9020A	11/01/07	12/01/07	MY49100833
☐	Power Meter	H.P	EPM-442A	10/07/01	11/07/01	GB37170413
☐	Power Sensor	H.P	8481A	10/07/01	11/07/01	3318A96332
☐	Power Divider	Agilent	11636B	10/10/05	11/10/05	56471
☐	4-Way Power Divider	ET Industries	D-0526-4	10/12/24	11/12/24	210195001
☐	Power Splitter	Anritsu	K241B	10/10/05	11/10/05	020611
☐	Power Splitter	Anritsu	K241B	10/07/01	11/07/01	017060
☐	Power Splitters & Dividers	Aeroflex/Weinschel	1594	11/02/21	12/02/21	1177
☐	Frequency Counter	H.P	5342A	10/07/01	11/07/01	2119A04450
☐	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	10/10/04	11/10/04	30604493/021031
☒	Digital Multimeter	H.P	34401A	11/03/07	12/03/07	3146A13475, US36122178
☐	Multifunction Synthesizer	HP	8904A	10/10/11	11/10/11	3633A08404
☒	Signal Generator	Rohde Schwarz	SMR20	11/03/08	12/03/08	101251
☐	Signal Generator	H.P	ESG-3000A	10/07/01	11/07/01	US37230529
☐	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/11	12/01/11	100148
☐	Vector Signal Generator	Rohde Schwarz	SMBV100A	11/01/11	12/01/11	255571
☐	Audio Analyzer	H.P	8903B	10/07/02	11/07/02	3011A09448
☐	Modulation Analyzer	H.P	8901B	10/07/01	11/07/01	3028A03029
☐	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	11/03/07	12/03/07	GB43461134
☐	Universal Radio communication Tester	Rohde Schwarz	CMU200	11/03/07	12/03/07	106760
☐	Bluetooth Tester	TESCOM	TC-3000B	10/07/01	11/07/01	3000B000268
☐	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-3
☐	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-2
☒	Thermo hygrometer	BODYCOM	BJ5478	11/01/13	12/01/13	090205-4
☐	AC Power supply	DAEKWANG	5KVA	11/03/08	12/03/08	20060321-1
☒	DC Power Supply	HP	6622A	11/03/07	12/03/07	3448A03760
☐	DC Power Supply	HP	6633A	11/03/07	12/03/07	3524A06634
☐	DC Power Supply	Protek	PWS-3010D	10/10/04	11/10/04	4072702
☐	BAND Reject Filter	Microwave Circuits	N0308372	10/10/05	11/10/05	3125-01DC0352
☐	BAND Reject Filter	Wainwright	WRCG1750	10/10/05	11/10/05	2
☐	High-Pass Filter	ANRITSU	MP526D	10/10/04	11/10/04	M27756
☐	High-pass filter	Wainwright	WHNX2.1	N/A	N/A	1
☒	High-pass filter	Wainwright	WHNX3.0	N/A	N/A	9
☐	High-pass filter	Wainwright	WHNX5.0	N/A	N/A	8

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
☐	High-Pass Filter	Wainwright	WHKX8.5	N/A	N/A	1
☐	High-Pass Filter	Wainwright	D82346	N/A	N/A	9
☐	Tunable Notch Filter	Wainwright	WRCT800.0 /960.0-0.2/40-8SSK	N/A	N/A	32
☐	Tunable Notch Filter	Wainwright	WRCD1700.0 /2000.0-0.2/40-10SSK	N/A	N/A	53
☐	Tunable Notch Filter	Wainwright	WRCT1900.0/ 2200.0-5/40-10SSK	N/A	N/A	30
☒	HORN ANT	ETS	3115	10/10/04	11/10/04	21097
☐	HORN ANT	ETS	3115	11/03/22	12/03/22	6419
☒	HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	154
☐	HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	155
☐	HORN ANT	SCHWARZBECK	BBHA9120A	10/04/13	12/04/13	322
☐	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2116
☐	Dipole Antenna	Schwarzbeck	VHA9103	10/11/29	11/11/29	2117
☐	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2261
☐	Dipole Antenna	Schwarzbeck	UHA9105	10/11/29	11/11/29	2262
☐	LOOP Antenna	ETS	6502	10/11/29	11/11/29	3471
☐	Coaxial Fixed Attenuators	Agilent	8491B	10/07/01	11/07/01	MY39260700
☒	Attenuator (3dB)	WEINSCHEL	56-3	10/10/05	11/10/05	Y2342
☐	Attenuator (3dB)	WEINSCHEL	56-3	10/10/05	11/10/05	Y2370
☐	Attenuator (10dB)	WEINSCHEL	23-10-34	10/10/01	11/10/01	BP4386
☐	Attenuator (10dB)	WEINSCHEL	23-10-34	11/01/11	12/01/11	BP4387
☐	Attenuator (10dB)	WEINSCHEL	86-10-11	10/10/05	11/10/05	446
☐	Attenuator (10dB)	WEINSCHEL	86-10-11	10/10/05	11/10/05	408
☐	Attenuator (20dB)	WEINSCHEL	86-20-11	10/10/05	11/10/05	432
☐	Attenuator (30dB)	JFW	50FH-030-300	11/03/07	12/03/07	060320-1
☐	Attenuator (40dB)	WEINSCHEL	57-40-33	10/10/01	11/10/01	NN837
☐	Termination	H.P	HP-909D	10/07/02	11/07/02	02750
☐	Termination	H.P	HP-909D	10/07/02	11/07/02	02702
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0088CAN	10/07/01	11/07/01	788
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0185CAN	10/07/01	11/07/01	790
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0215CAN	10/07/01	11/07/01	112
☐	Amplifier (30dB)	Agilent	8449B	11/03/07	12/03/07	3008A01590
☒	Amplifier (30dB)	H.P	8449B	11/03/07	12/03/07	3008A00370
☐	Amplifier	EMPOWER	BBS3Q7ELU	10/10/04	11/10/04	1020
☐	RF Power Amplifier	OPHIRRF	5069F	10/07/01	11/07/01	1006
☒	EMI TEST RECEIVER	R&S	ESU	11/01/20	12/01/20	100014
☒	BILOG ANTENNA	SCHAFFNER	CBL6112B	10/07/14	11/07/14	2737
☒	Amplifier (22dB)	H.P	8447E	11/01/11	12/01/11	2945A02865

	Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
☐	BICONICAL ANT.	Schwarzbeck	VHA 9103	10/11/29	11/11/29	91032789
☐	LOG-PERIODIC ANT.	Schwarzbeck	UHALP9108A1	10/11/29	12/11/29	1098
☐	BICONICAL ANT.	Schwarzbeck	VHA 9103	10/12/21	12/12/21	91031946
☐	LOG-PERIODIC ANT.	Schwarzbeck	UHALP9108A1	10/07/07	11/07/07	0590
☒	Low Noise Pre Amplifier	TSJ	MLA-100K01-B01-2	11/03/07	12/03/07	1252741
☐	Low Noise Pre Amplifier	TSJ	MLA-00108-B02-36	11/01/11	12/01/11	1518831
☐	Amplifier (25dB)	Agilent	8447D	11/03/07	12/03/07	2944A10144
☐	Amplifier (25dB)	Agilent	8447D	10/07/01	11/07/01	2648A04922
☐	Spectrum Analyzer(CE)	H.P	8591E	11/03/07	12/03/07	3649A05889
☐	Spectrum Analyzer(CE)	H.P	8591E	11/03/07	12/03/07	3649A05889
☐	LISN	Kyoritsu	KNW-407	11/01/11	12/01/11	8-317-8
☐	LISN	Kyoritsu	KNW-242	10/07/02	11/07/02	8-654-15
☒	LISN	R&S	ESH2-Z5	10/10/01	11/10/01	828739006
☐	CVCF	NF Electronic	4420	11/03/08	12/03/08	304935/337980
☒	CVCF	NF Electronic	4420	11/03/08	12/03/08	3049354420023
☐	50 ohm Terminator	HME	CT-01	11/01/11	12/01/11	N/A
☐	RFI/FIELD Intensity Meter	Kyoritsu	KNM-2402	10/07/02	11/07/02	4N-170-3
☒	EMI TEST RECEIVER	R&S	ESCI	11/03/08	12/03/08	100364