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TEST REPORT For FCC

FCC Standards : FCC 47CFR part 15 subpart C

Test Report No.	:	CTK-2013-01718
Date of Issue	:	November 28, 2013
FCC ID	:	U5MWD-MSB
Basic Model/Type No.	:	WD-MSB
Variant Model/Type No.	:	-
Kind of Product	:	WIFI Module
Applicant	:	BIXOLON Co., Ltd.
Applicant Address	:	7th~8th FL, Miraeasset Venture Tower, 685, Sampyeong-dong, Bundang-gu Seongnam-si, Gyeonggi-do, Korea
Manufacturer	:	BIXOLON Co., Ltd.
Manufacturer Address	:	7th~8th FL, Miraeasset Venture Tower, 685, Sampyeong-dong, Bundang-gu Seongnam-si, Gyeonggi-do, Korea
Contact Person	:	Shin Ji Sung / Assistant Manager
Telephone	:	+82–31-218-5582
Received Date	:	October 10, 2013
Test period	:	Start : October 27, 2013 End : November 21, 2013
Test Results	:	☒ In Compliance ☐ Not in Compliance

The test results presented in this report relate only to the object tested.

Tested by

Y. T. Lee

Young-taek, Lee
Test Engineer
Date: November 28, 2013

Reviewed by

Y. J. Park

Young-Joon, Park
Technical Manager
Date: November 28, 2013

REPORT REVISION HISTORY

Date	Revision	Page No
November 28, 2013	Issued (CTK-2013-01718)	All

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1.0 General Product Description

Equipment model name	WD-MSB
Serial number	Prototype
EUT condition	Pre-production, not damaged
Frequency Range	802.11b/g/n : 2412 MHz - 2462 MHz
RF output power	802.11b : 14.41 dBm 802.11g : 13.22 dBm 802.11n : 11.47 dBm
Number of channels	802.11b/g/n : 11
Channel Spacing	5 MHz
Transfer Rate	802.11b : 11 / 5.5 / 2 / 1 Mbps 802.11g : 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6 Mbps 802.11n: MCS0-7, up to 72.2 Mbps
Type of Modulation	802.11b : DSSS 802.11g/n : OFDM
Duty cycle	1.0
Power Source	DC 3.3 V
Antenna Type	Chip antenna
Antenna Gain	3.91 dBi

1.1 Tested Frequency

802.11b, 802.11g, 802.11n

	LOW	MID	HIGH
Frequency (MHz)	2412	2437	2462

1.2 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.3 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	TOSHIBA CORPORATION	PSL48K-00L00K	Z7037782R
AC/DC ADAPTER	TOSHIBA CORPORATION	ADP-75SB	708W15Y01MK

1.4 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.5 Test Facility

The measurement facility is located at 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.6 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	**FCC**	3 m & 10 m SAC and Conducted Test Site to perform FCC Part 15/18 measurements	805871
JAPAN	**VCCI**	3 m & 10 m SAC and Conducted Test Site	C-986, T-1843 R-3627, G-387
KOREA	**KCC**	EMI (3 m & 10 m SAC and Conducted Test Site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and Interruptions)	No. 51, KR0025
International	**KOLAS**	EMC	

2 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)	Maximum Output Power	< 1 Watt		C
15.247(d)	Conducted Spurious emission	> 20 dBc		C
15.247(d)	Band Edge	> 20 dBc		C
15.247(e)	Transmitter Power Spectral Density	< 8 dBm @ 3 kHz		C
				C
15.209	Field Strength of Harmonics	15.209(a)	Radiated	C
15.207	AC Conducted Emissions	15.207(a)	Line Conducted	C

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

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:
- FCC Part 15.247, ANSI C63.4-2003

The tests were performed according to the method of measurements prescribed in 558074 D01 DTS Meas Guidance v03r01.

2.1 Technical Characteristic Test

2.1.1 6dB Bandwidth

Procedure:

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

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 channels

RBW = 100 kHz

VBW = 300 kHz (VBW ≥ 3 x RBW)

Sweep = auto

Trace = max hold

Detector function = peak

Measurement Data:

Test mode : 802.11b

Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Bandwidth (MHz)	Result
802.11b	2412	1	11.23	Complies
	2437	6	11.25	Complies
	2462	11	11.26	Complies

Test mode : 802.11g

Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Bandwidth (MHz)	Result
802.11g	2412	1	16.51	Complies
	2437	6	16.51	Complies
	2462	11	16.52	Complies

Test mode : 802.11n

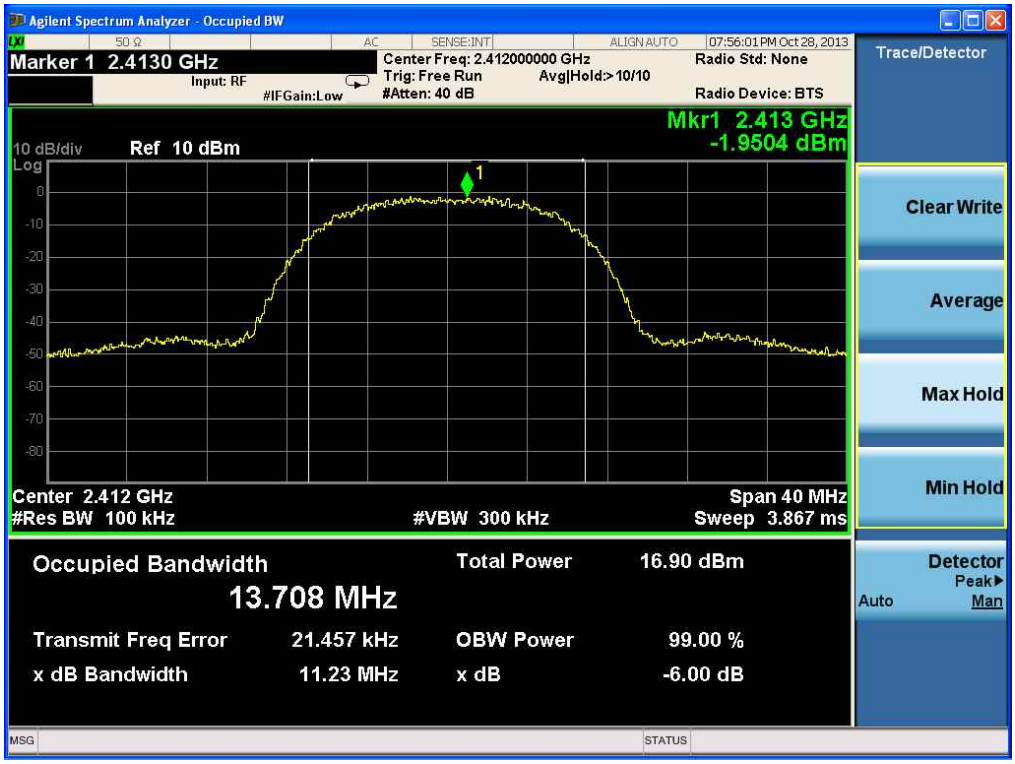
Mode	Frequency (MHz)	Channel No.	Test Results	
			Measured Bandwidth (MHz)	Result
802.11n (20 MHz)	2412	1	17.59	Complies
	2437	6	17.61	Complies
	2462	11	17.62	Complies

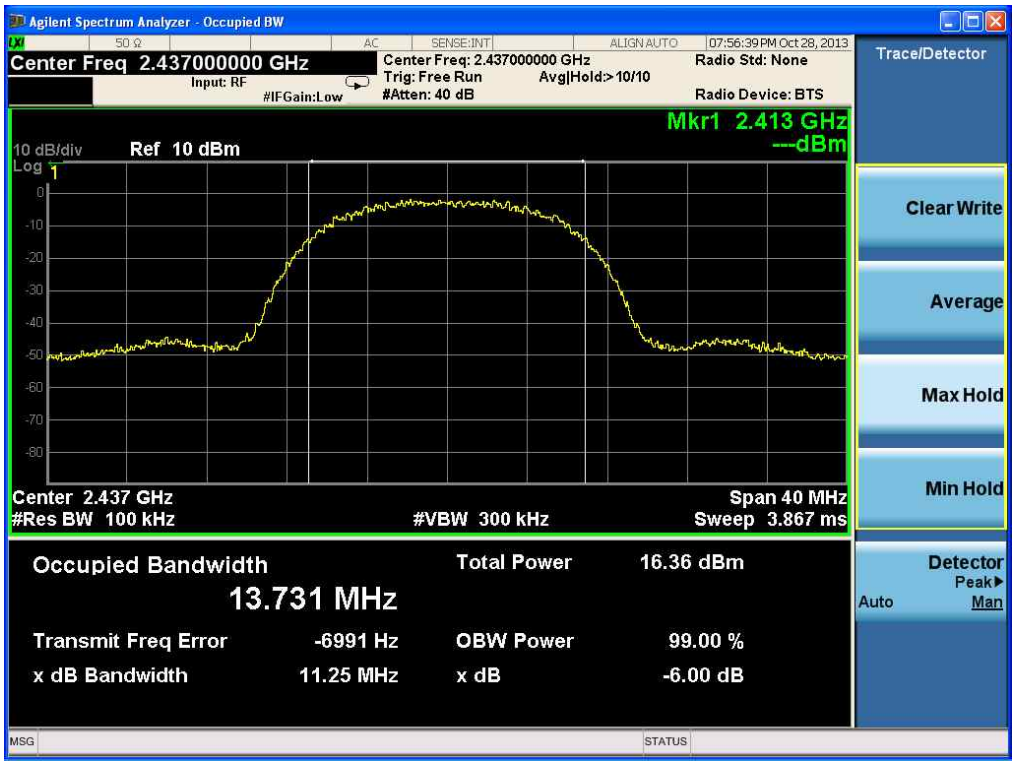
Minimum Standard:

6 dB Bandwidth > 500kHz

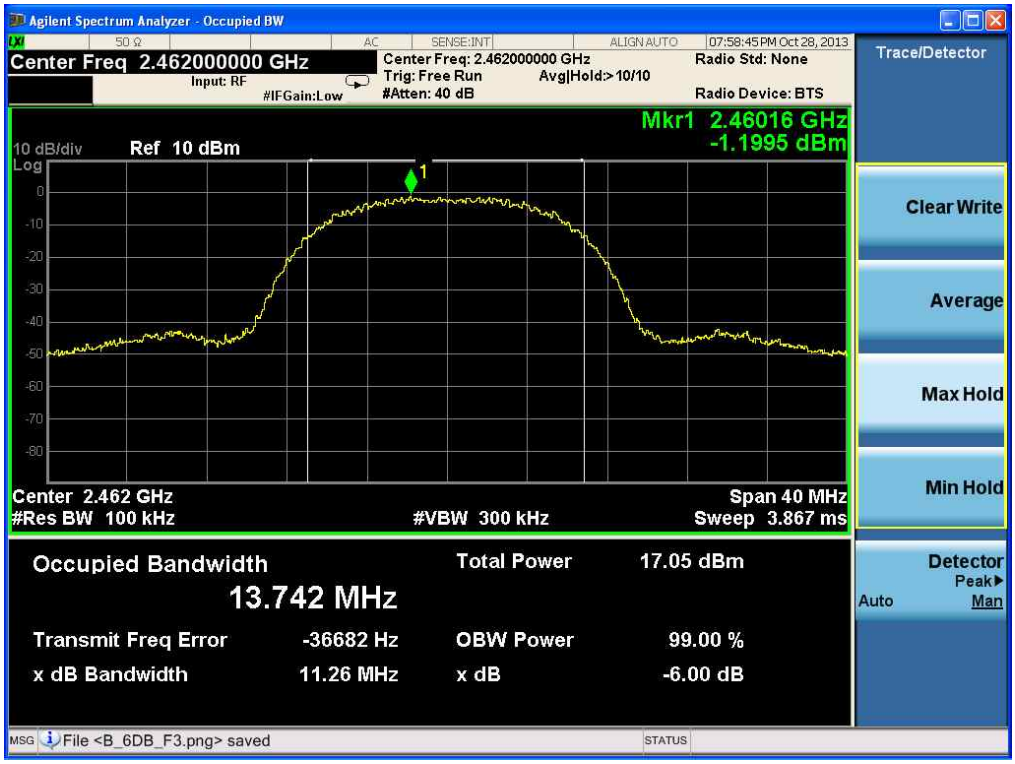
See next pages for actual measured spectrum plots.

802.11b





802.11b



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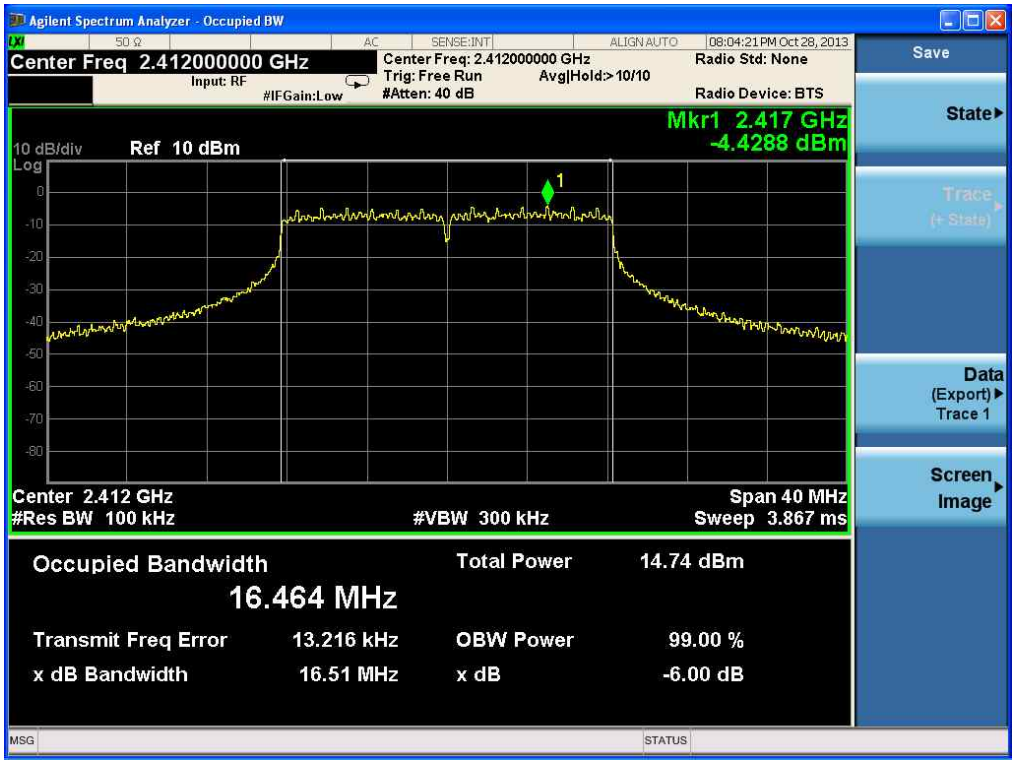

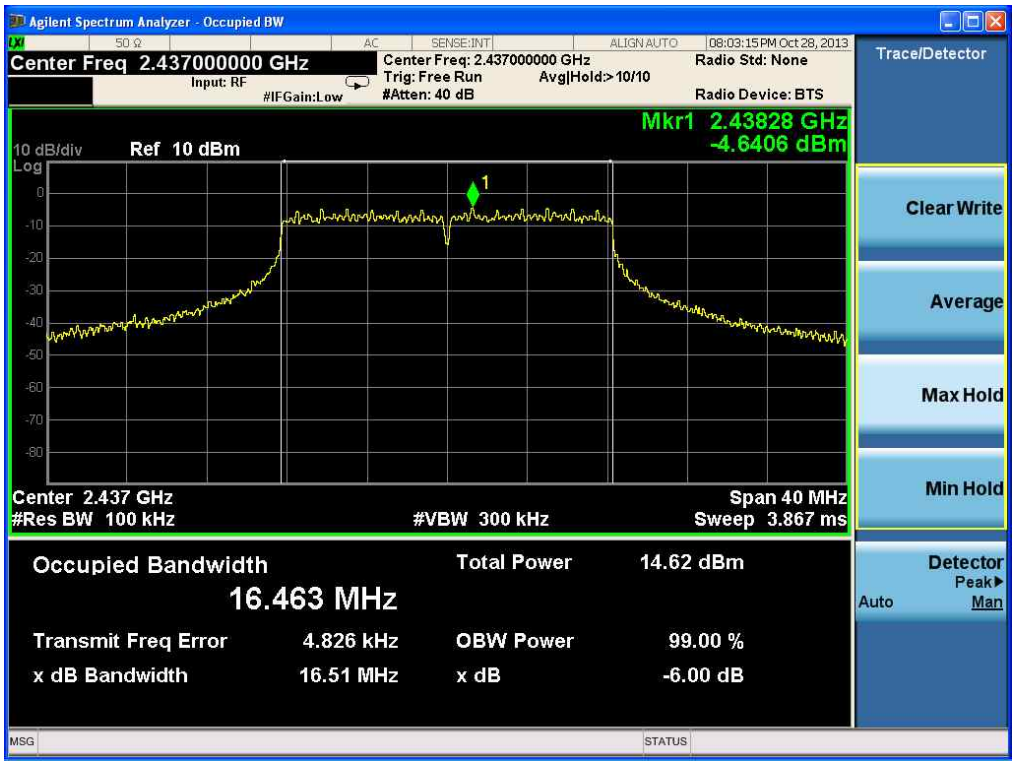

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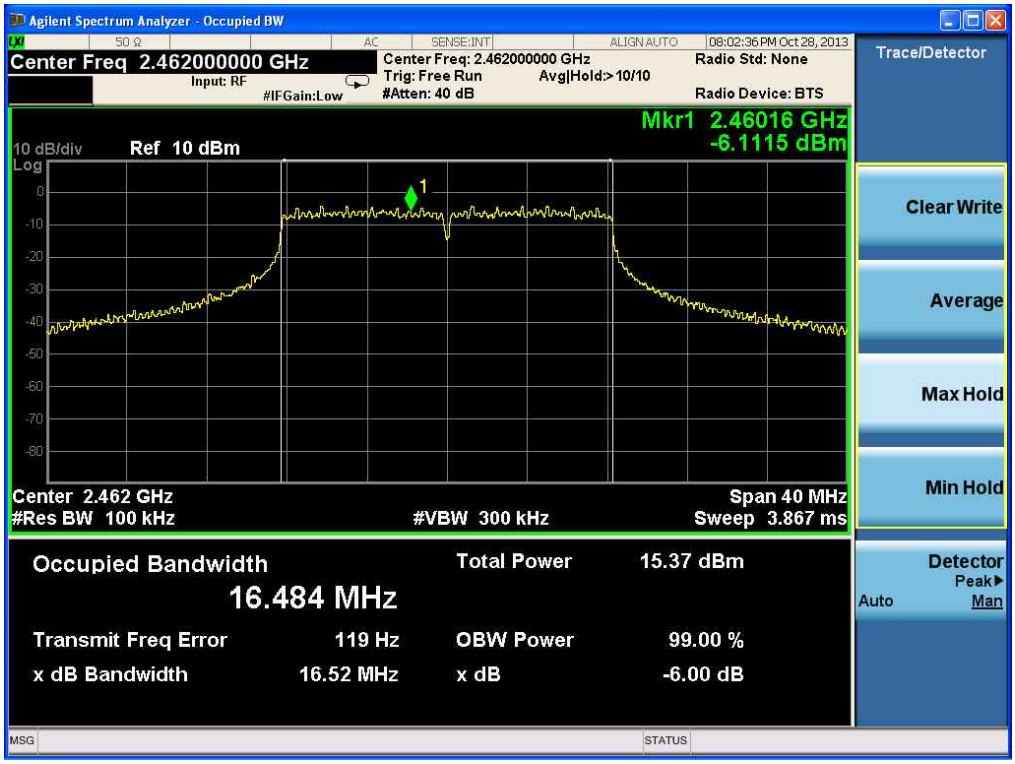
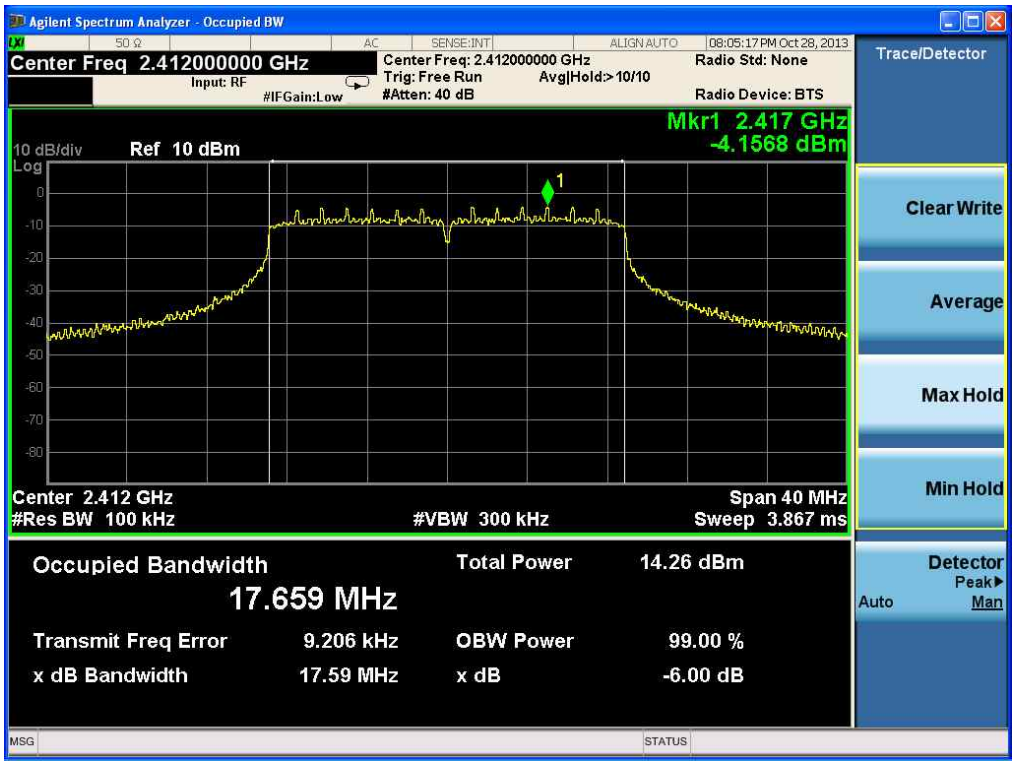
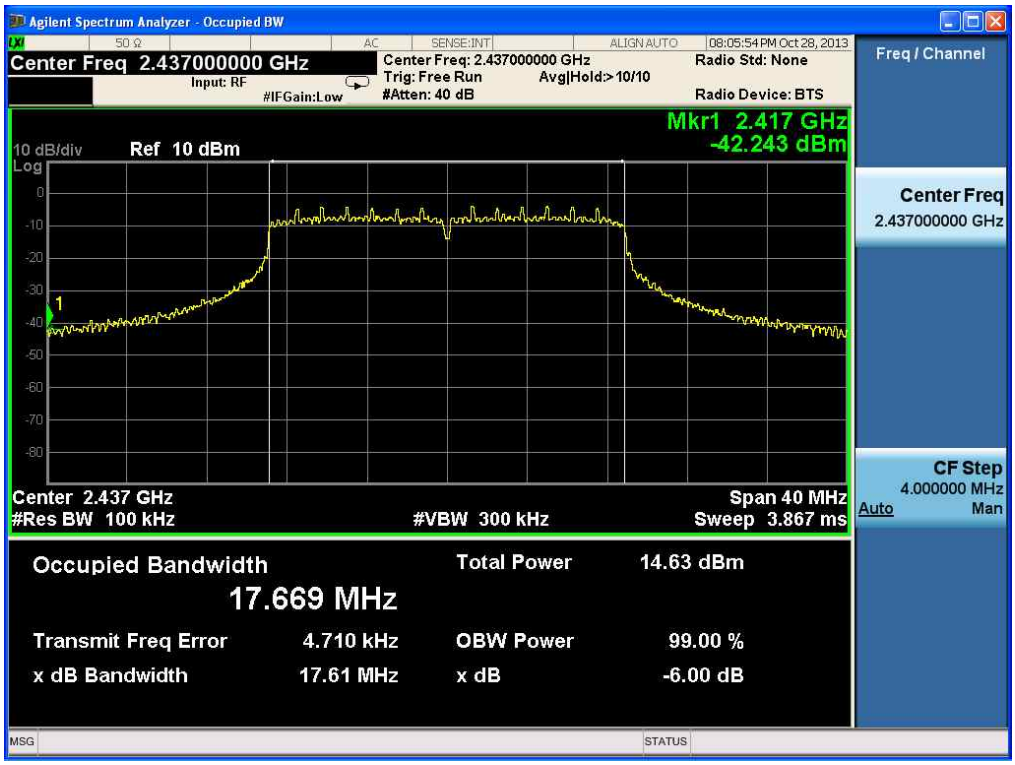
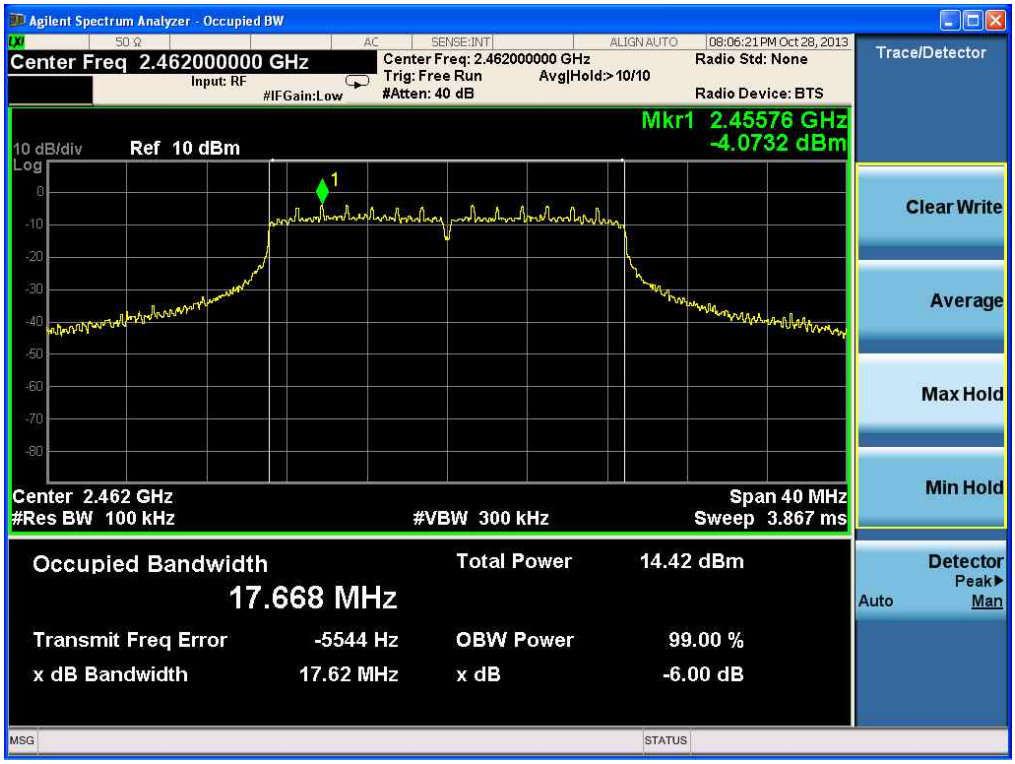


802.11n





802.11n



2.1.2 Maximum Peak Conducted Output Power

Test Location

RF Test Room

Test Procedures

Maximum Peak Output Power from the EUT were measured according to the dictates Integrated band power measurement procedure in section 9.1.2 of KDB 558074.

This procedure shall be used when the maximum available RBW of measurement instrument is less than the DTS bandwidth.

a) Set the RBW = 1 MHz
b) Set the VBW ≥ 3 x RBW
c) Set the span ≥ 1.5 x DTS bandwidth
d) Sweep time = auto couple
e) Detector = peak
e) Trace mode= max hold
f) Allow trace to fully stabilize.
g) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges.

Limit

< 1 W

Test Results

Test mode : 802.11b - 11 Mbps

Channel	Frequency (MHz)	Measurement data (dBm)	Cable loss (dB)	Power Result(dBm)	Limit	Result
Low	2412	13.04	0.90	13.94	30dBm	Complies
Middle	2437	13.37	0.74	14.11	30dBm	Complies
High	2462	13.60	0.81	14.41	30dBm	Complies

Remark.
The 802.11b data rate were set in 11 Mbps, due to the highest RF output power.

Test mode : 802.11g - 12 Mbps

Channel	Frequency (MHz)	Measurement data (dBm)	Cable loss (dB)	Power Result(dBm)	Limit	Result
Low	2412	11.96	0.90	12.86	30dBm	Complies
Middle	2437	12.40	0.74	13.14	30dBm	Complies
High	2462	12.41	0.81	13.22	30dBm	Complies

Remark.
The 802.11g data rate were set in 12 Mbps, due to the highest RF output power.

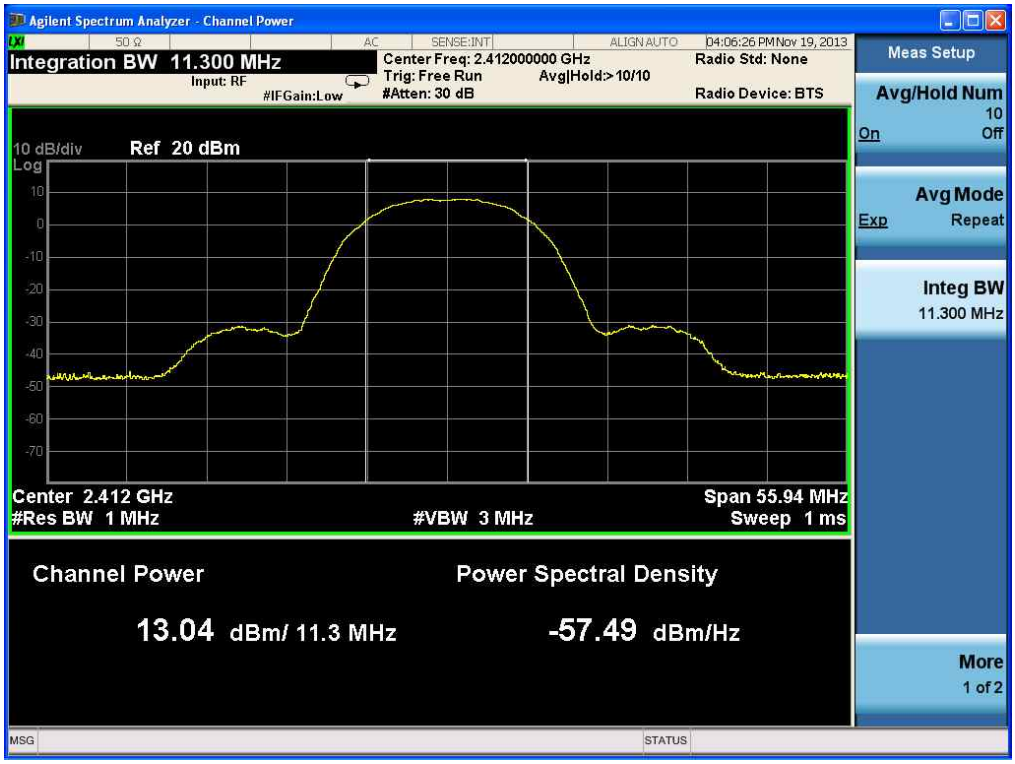
Test mode : 802.11n – MCS2

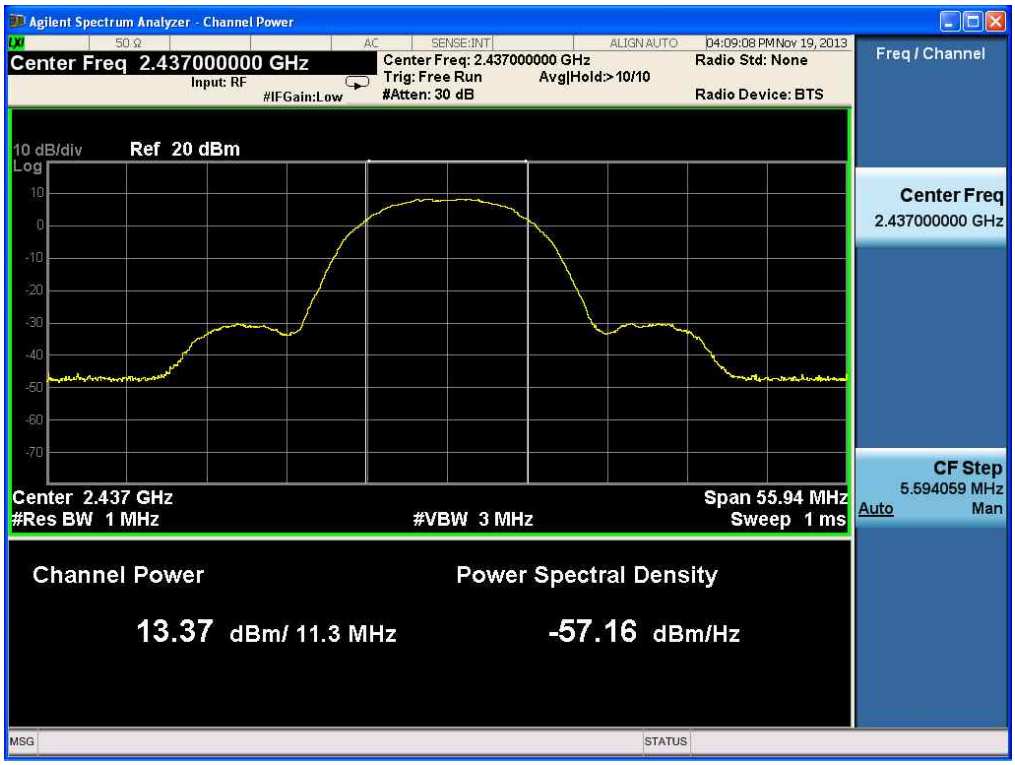
Channel	Frequency (MHz)	Measurement data (dBm)	Cable loss (dB)	Power Result(dBm)	Limit	Result
Low	2412	10.04	0.90	10.94	30dBm	Complies
Middle	2437	10.56	0.74	11.30	30dBm	Complies
High	2462	10.66	0.81	11.47	30dBm	Complies

Remark.
The 802.11n data rate were set in MCS2, due to the highest RF output power.

See next pages for actual measured spectrum plots.

802.11b



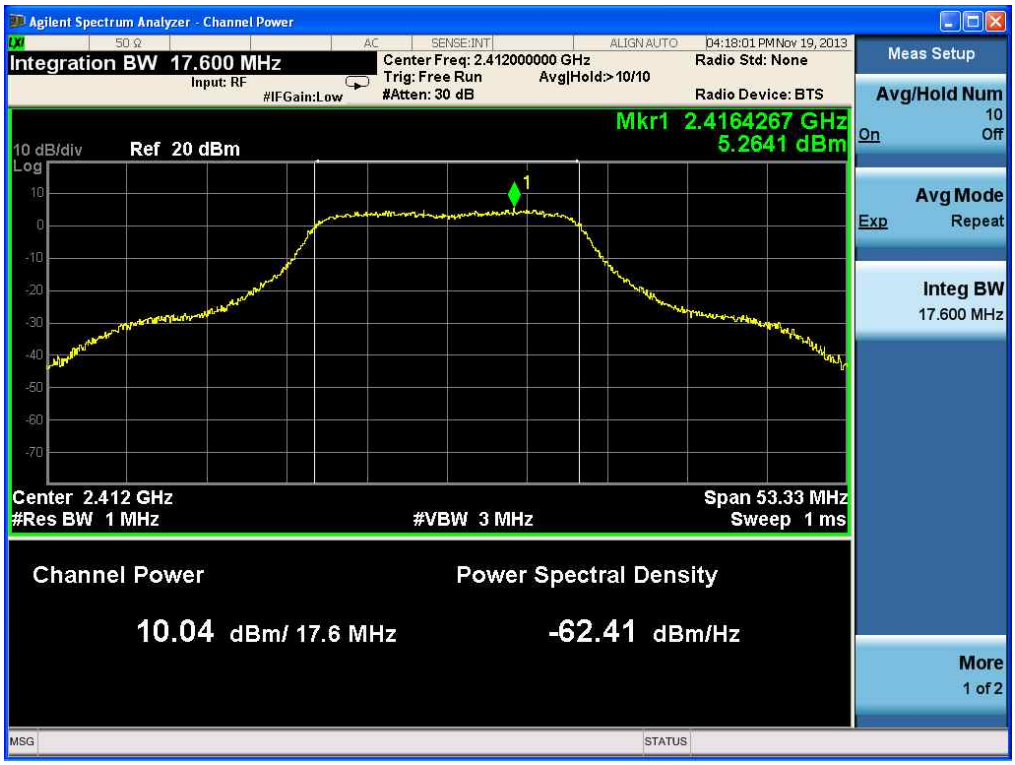


802.11b

802.11g

802.11g

802.11n



802.11n

2.1.3 Power Spectral Density

Procedure:

Power Spectral Density from the EUT were measured according to the dictates PKPSD measurement procedure in section 10.2 of KDB 558074.

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance.

a) Set analyzer center frequency to DTS channel center frequecy.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to : 3 kHz ≤ RBW ≤ 100 kHz
d) Set the VBW ≥ 3 x RBW
e) Detector = peak
f) Sweep time = auto couple
g) Trace mode = max hold
h) Allow trace to fully stabilize
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceed limit, reduce RBW(no less than 3 kHz) and repeat.

Test Results

Test mode : 802.11b

Mode	Frequency (MHz)	Ch.	Test Results	
			dBm	Result
802.11b	2412	1	3.025	Complies
	2437	6	3.128	Complies
	2462	11	3.868	Complies

Test mode : 802.11g

Mode	Frequency (MHz)	Ch.	Test Results	
			dBm	Result
802.11b	2412	1	0.351	Complies
	2437	6	0.902	Complies
	2462	11	1.313	Complies

Test mode : 802.11n

Mode	Frequency (MHz)	Ch.	Test Results	
			dBm	Result
802.11n (20 MHz)	2412	1	-1.606	Complies
	2437	6	-1.051	Complies
	2462	11	-0.672	Complies

Limits :

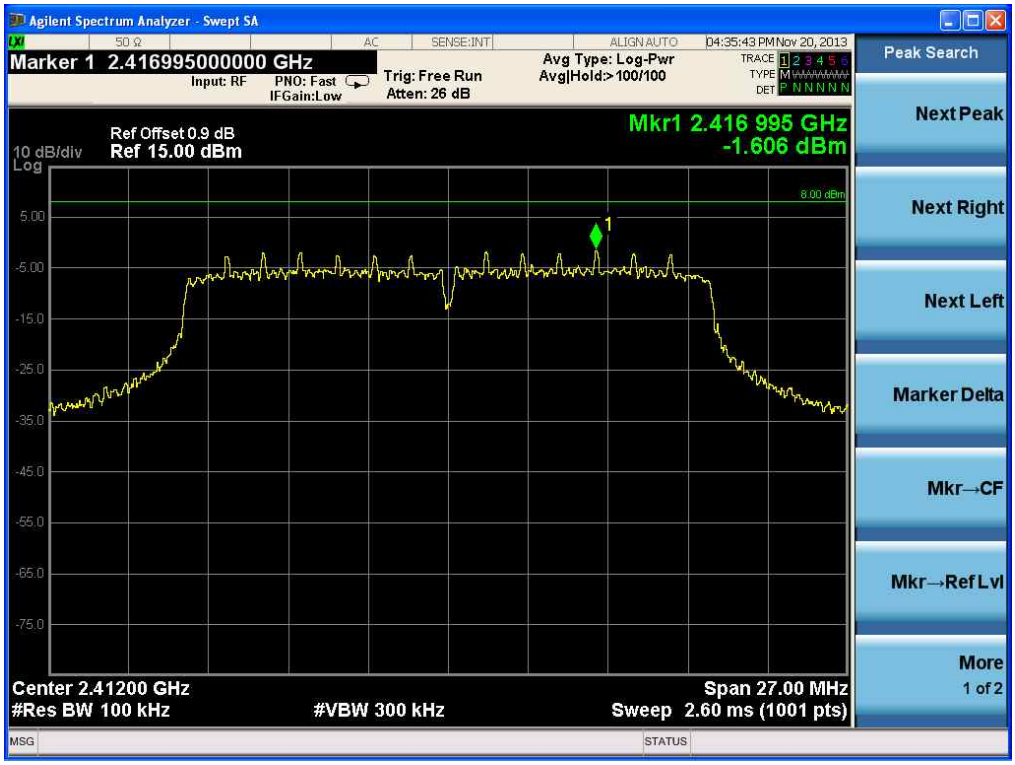
Power Spectral Density	< 8dBm @ 3 kHz BW

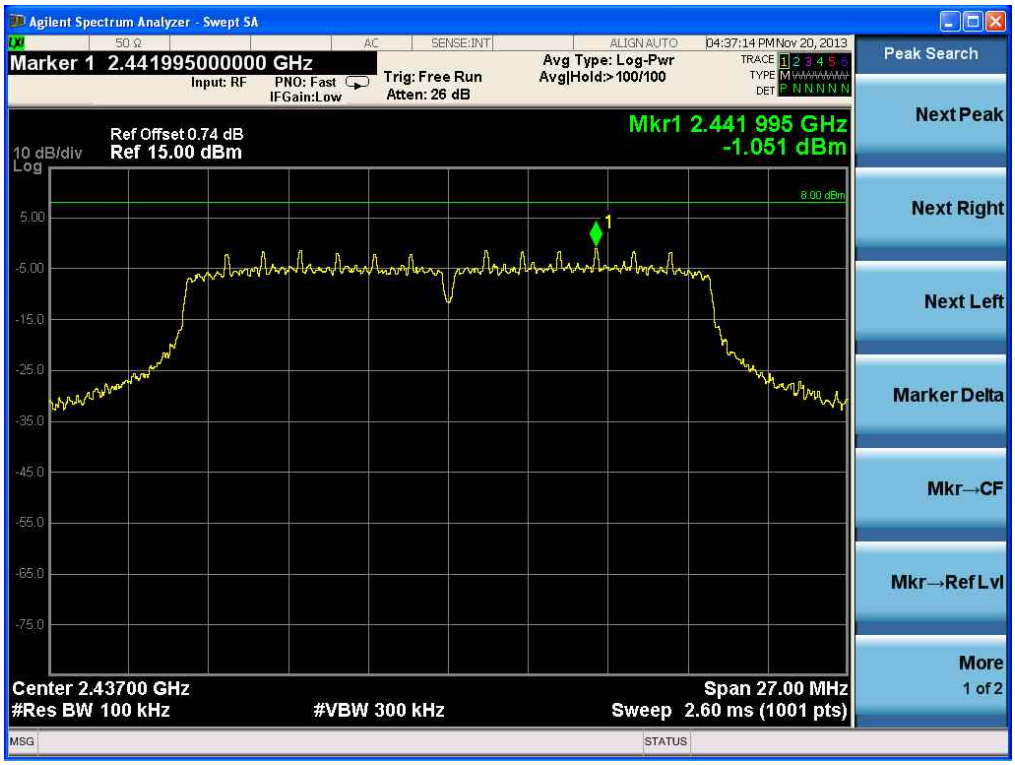
See next pages for actual measured spectrum plots.

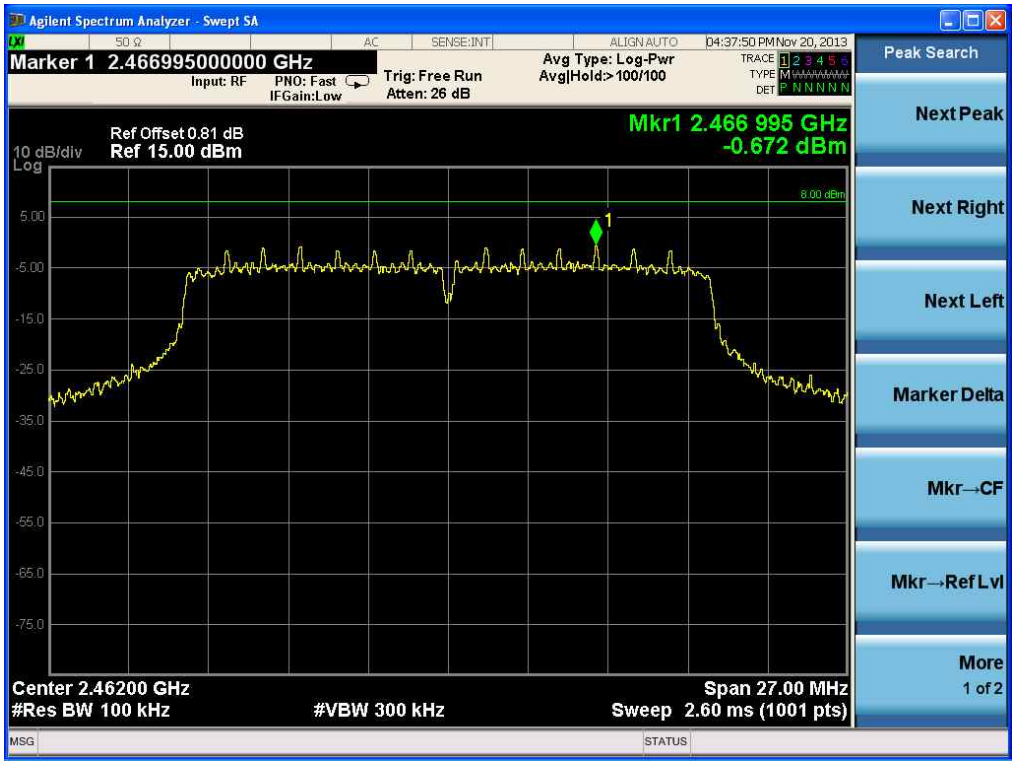
802.11b Power Density Measurement

802.11g Power Density Measurement

802.11n Power Density Measurement







2.1.4 Band - edge

Procedure:

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate frequencies.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz VBW ≥ 3 x RBW

Detector function = peak

Trace = max hold Sweep = auto

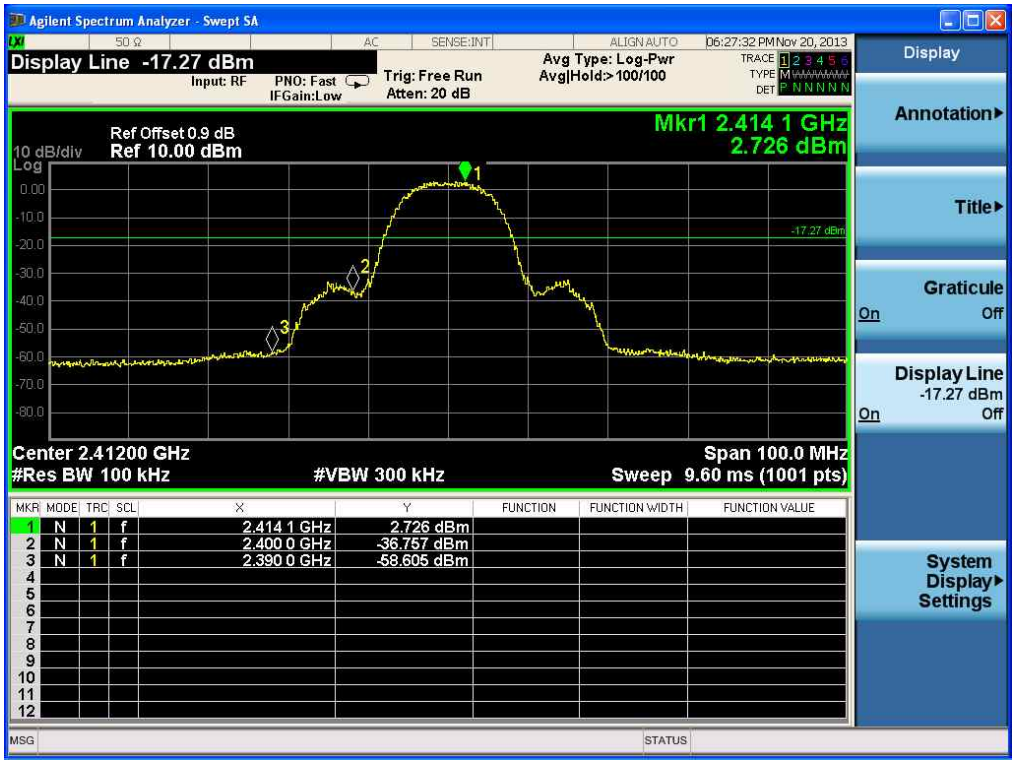
Measurement Data: Complies

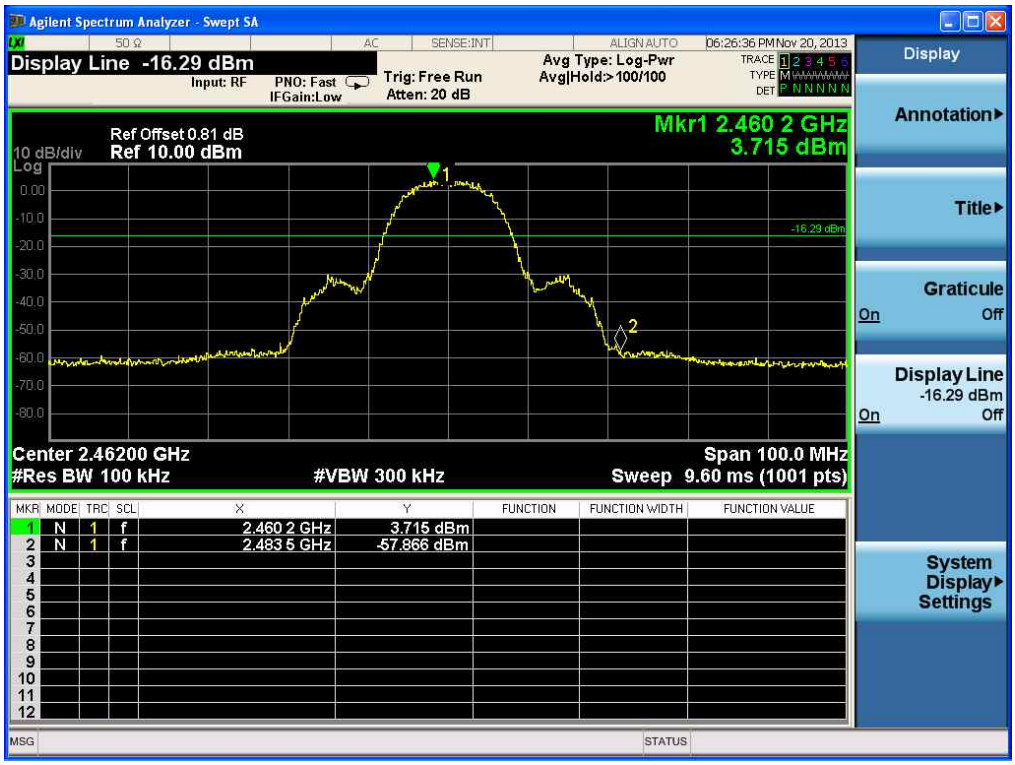
- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.

Minimum Standard:	> 20 dBc

See next pages for actual measured spectrum plots.

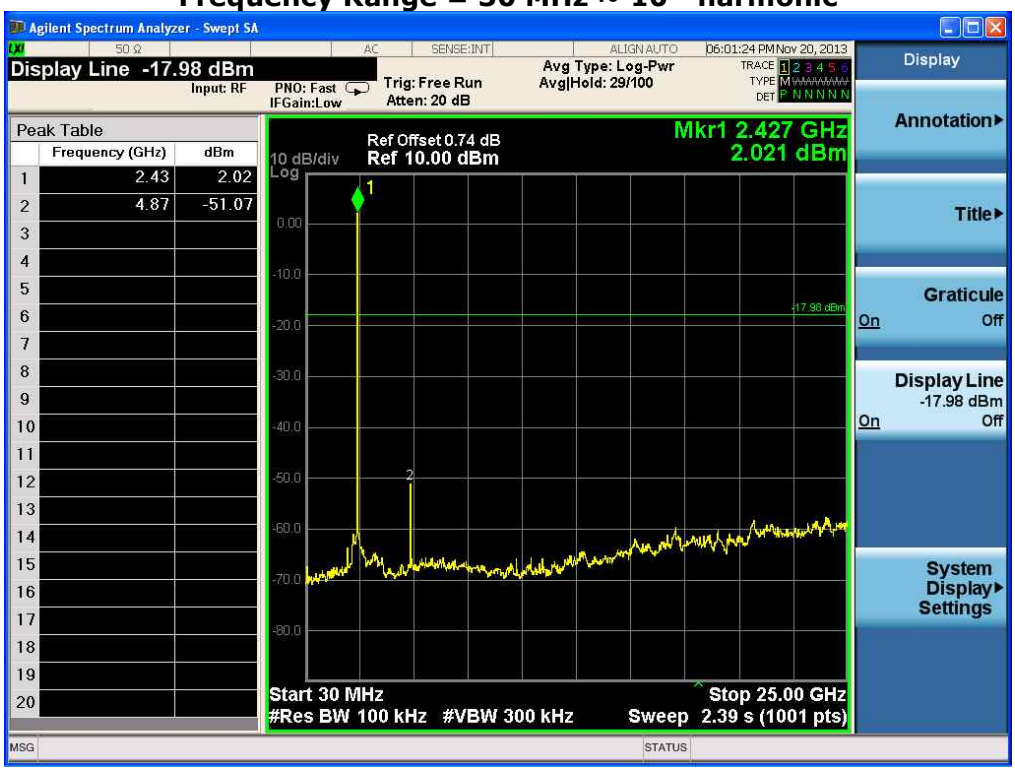
802.11b Band–edge Measurements



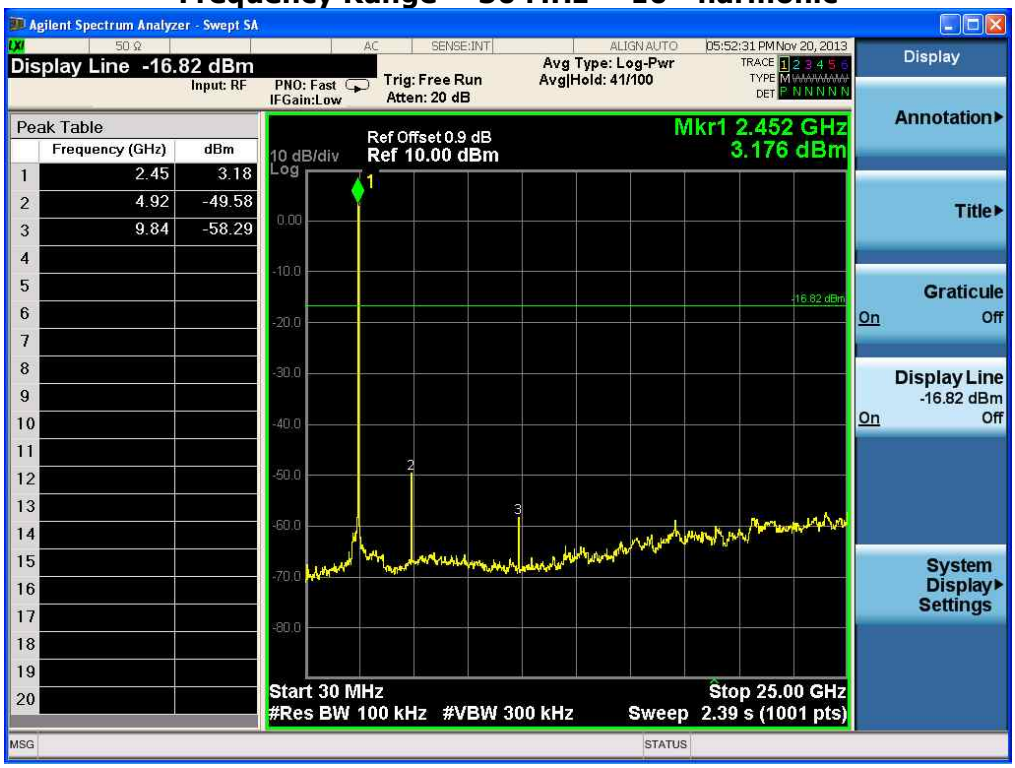


Band – edge (at 20 dB blow) – Low channel(802.11b)
Frequency Range = 30 MHz ~ 10th harmonic

Band – edge (at 20 dB blow) – Mid channel(802.11b)
Frequency Range = 30 MHz ~ 10th harmonic



Band – edge (at 20 dB blow) – High channel(802.11b)
Frequency Range = 30 MHz ~ 10th harmonic



802.11g Band–edge Measurements

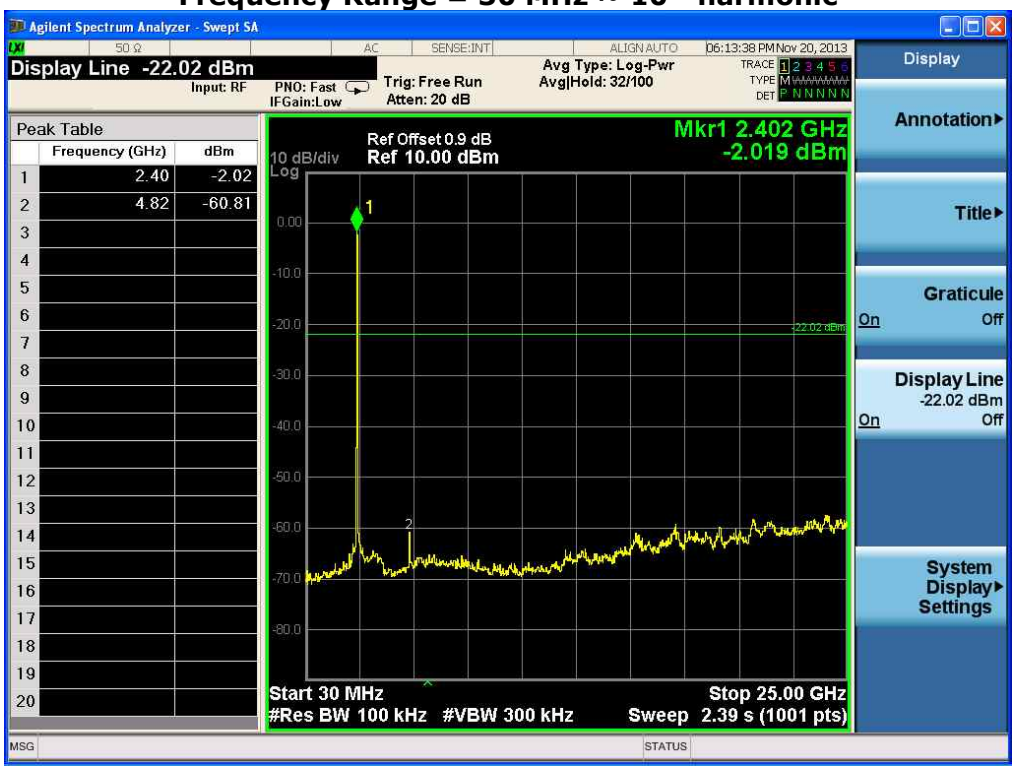
Band – edge (at 20 dB blow) – Low channel(802.11g)
Frequency Range = 30 MHz ~ 10th harmonic

Band – edge (at 20 dB blow) – Mid channel(802.11g)
Frequency Range = 30 MHz ~ 10th harmonic

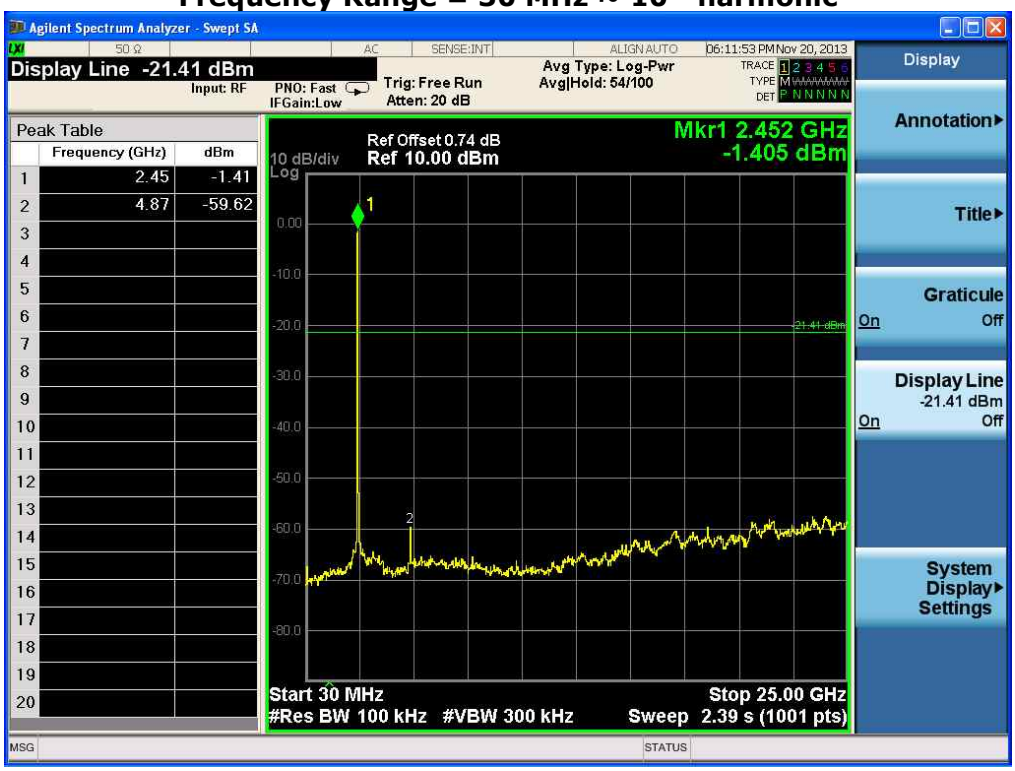
Band – edge (at 20 dB blow) – High channel(802.11g)
Frequency Range = 30 MHz ~ 10th harmonic

802.11n Band–edge Measurements

Band – edge (at 20 dB blow) – Low channel(802.11n)
Frequency Range = 30 MHz ~ 10th harmonic



Band – edge (at 20 dB blow) – Mid channel(802.11n)
Frequency Range = 30 MHz ~ 10th harmonic



Band – edge (at 20 dB blow) – High channel(802.11n)
Frequency Range = 30 MHz ~ 10th harmonic

2.1.5 Field Strength of Emissions

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2) In the frequency rage above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

The spectrum analyzer is set to:

Frequency Range = 9 kHz ~ 25 GHz (2.4 GHz 10^{th} harmonic)
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz
VBW ≥ RBW
Sweep = auto

Limit

§ 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
[1]0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	[2]Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

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

§ 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

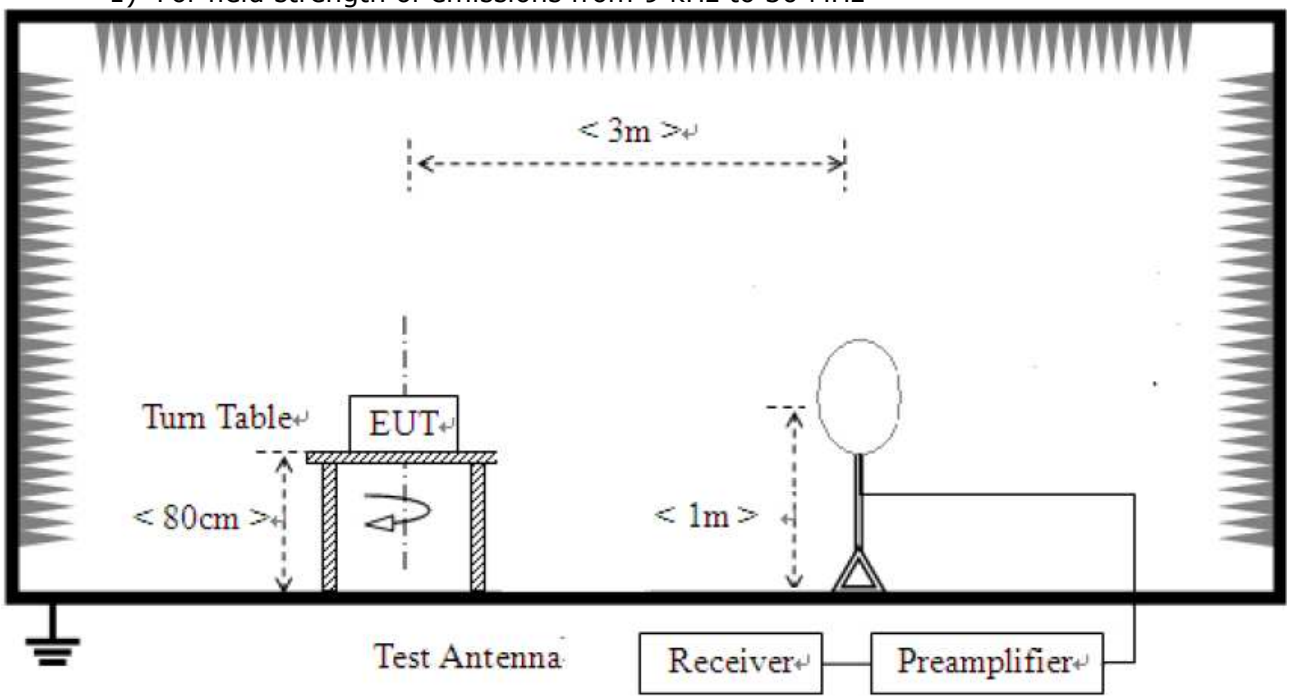
Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

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

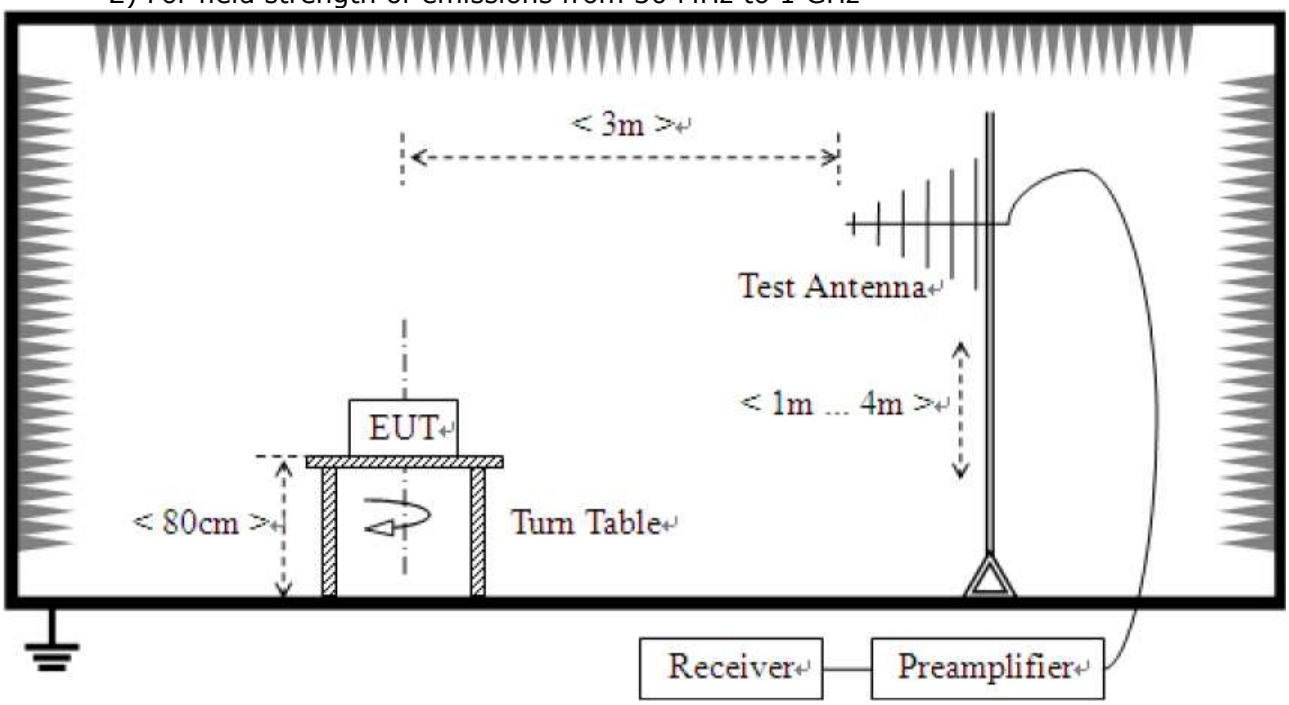
Note :
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)

Test Setup:

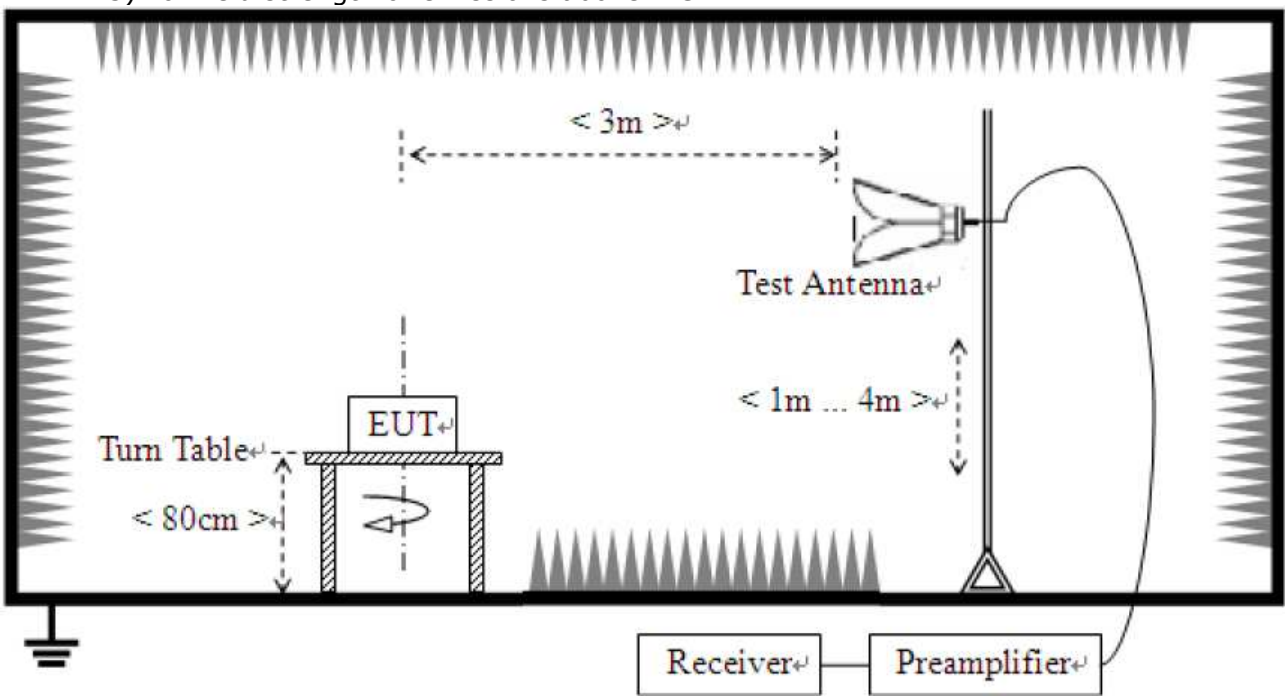
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



Test Results
1) 9 kHz to 30 MHz

EUT	WIFI Module	Measurement Detail	
Model	WD-MSB	Frequency Range	9 kHz – 30 MHz
Test mode	802.11b(worst case)	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	See note

Note :
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

Test Results

Test mode : 802.11b

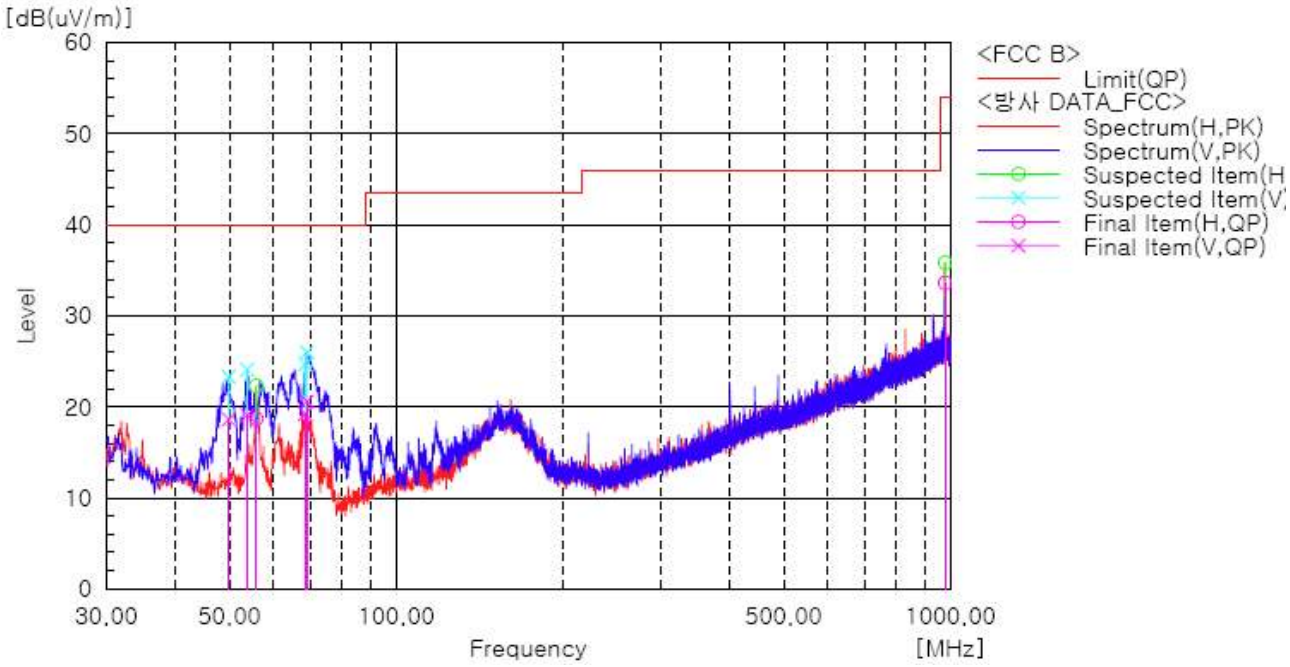
EUT	WIFI Module	Measurement Detail	
Model	WD-MSB	Frequency Range	Below 1000MHz
Mode	802.11b(Worst Case)	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
69.043	20.6	19.4	Quasi-peak

Test data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	49.885	V	31.9	-13.3	18.6	40.0	21.4	100.0	0.0
2	53.886	V	32.6	-13.5	19.1	40.0	20.9	100.0	0.0
3	55.948	H	32.6	-13.9	18.7	40.0	21.3	304.0	290.0
4	68.558	V	34.8	-15.6	19.2	40.0	20.8	100.0	145.0
5	69.043	V	36.2	-15.6	20.6	40.0	19.4	191.0	253.0
6	979.145	H	28.9	4.7	33.6	54.0	20.4	100.0	157.0

Remark :
1. The field strength of spurious emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(X axis) and the worst case was recorded.
2. Result = Reading + Correction factor
3. Correction factor(c.f) = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

Test Results

EUT	WIFI Module	Measurement Detail	
Model	WD-MSB	Frequency Range	1-25GHz
Channel	Low Channel	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
2390	51.9	2.1	Average

Test Data – 802.11b

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
4824.00	21.9 : 35.5	V	1.0	12.7	54.0 : 74.0	34.6 : 48.2	19.4 : 25.8

Test Data – 802.11g

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
4824.00	21.9 : 35.7	V	1.0	12.7	54.0 : 74.0	34.6 : 48.4	19.4 : 25.6

Test Data – 802.11n

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
4824.00	21.9 : 36.1	V	1.0	12.7	54.0 : 74.0	34.6 : 48.8	19.4 : 25.2

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Test data - 802.11b

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2390.00	32.9	43.7	V	1.0	5.1	54.0	74.0	38.0	48.8	16.0	25.2

Test Data – 802.11g

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2390.00	46.8	62.3	V	1.0	5.1	54.0	74.0	51.9	67.4	2.1	6.6

Test Data – 802.11n

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2390.00	44.2	60.6	V	1.0	5.1	54.0	74.0	49.3	65.7	4.7	8.3

Test Results

EUT	WIFI Module	Measurement Detail	
Model	WD-MSB	Frequency Range	1-25GHz
Channel	Mid Channel	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
4874	34.5	19.5	Average

Test Data – 802.11b

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4874.00	21.6	35.5	V	1.0	12.9	54.0	74.0	34.5	48.4	19.5	25.6

Test Data – 802.11g

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4874.00	21.6	35.8	V	1.0	12.9	54.0	74.0	34.5	48.7	19.5	25.3

Test Data – 802.11n

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4874.00	21.6	35.3	V	1.0	12.9	54.0	74.0	34.5	48.2	19.5	25.8

Test Results

EUT	WIFI Module	Measurement Detail	
Model	WD-MSB	Frequency Range	1-25GHz
Channel	High Channel	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
2483.5	51.7	2.3	Average

Test Data – 802.11b

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4924.00	21.7	35.5	H	V	13.1	54.0	74.0	34.8	48.6	19.2	25.4

Test Data – 802.11g

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4924.00	21.7	35.6	V	1.0	13.1	54.0	74.0	34.8	48.7	19.2	25.3

Test Data – 802.11n

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
4924.00	21.7	35.5	V	1.0	13.1	54.0	74.0	34.8	48.6	19.2	25.4

Restricted band edge test data

Measured frequency range : 2310-2390 MHz, 2483.5-2500 MHz

Test data - 802.11b

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2483.50	32.6	42.4	V	1.0	5.4	54.0	74.0	38.0	47.8	16.0	26.2

Test Data – 802.11g

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2483.50	46.3	62.5	V	1.0	5.4	54.0	74.0	51.7	67.9	2.3	6.1

Test Data – 802.11n

Frequency [MHz]	Reading [dBuV/m] AV	Reading [dBuV/m] Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV	Limits [dBuV/m] Peak	Result [dBuV/m] AV	Result [dBuV/m] Peak	Margin [dB] AV	Margin [dB] Peak
2483.50	43.3	60.3	V	1.0	5.4	54.0	74.0	48.7	65.7	5.3	8.3

2.1.6 AC Conducted Emissions

Test Location
Shielded Room

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.
Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

- **15.207(a)**

Frequency (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.

Test Results
The requirements are:

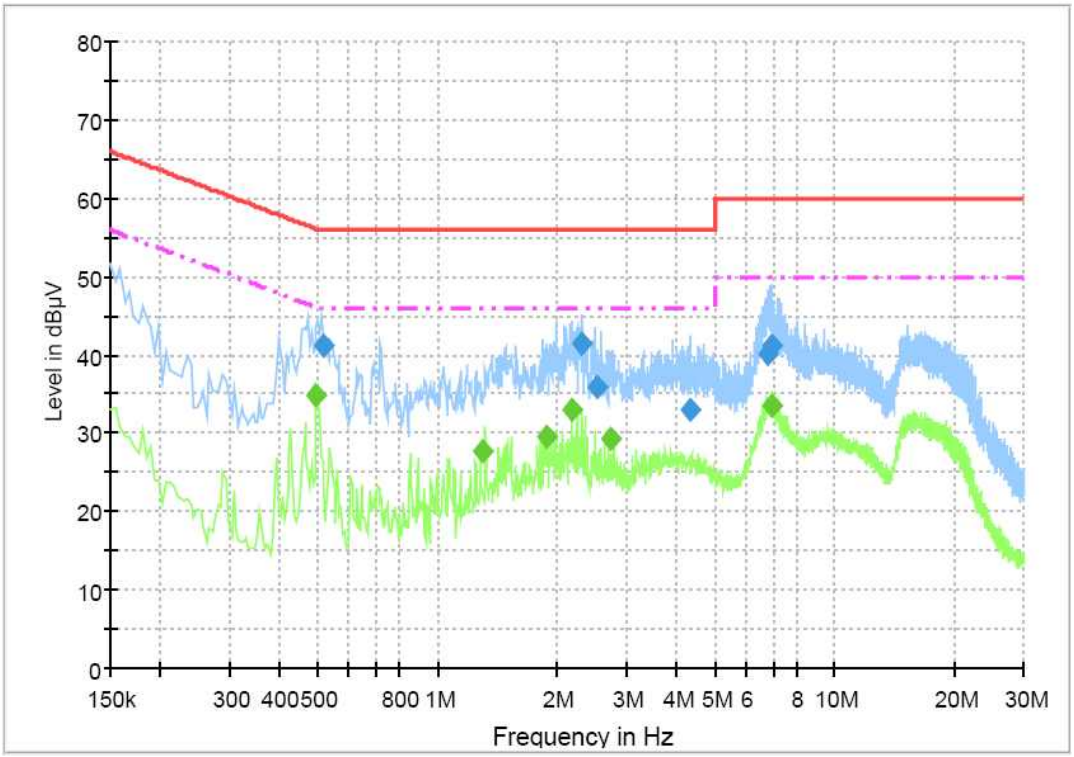
☒ Complies

Test mode : 802.11b

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
0.4965	34.9	11.2	Average

Test Data

[HOT]



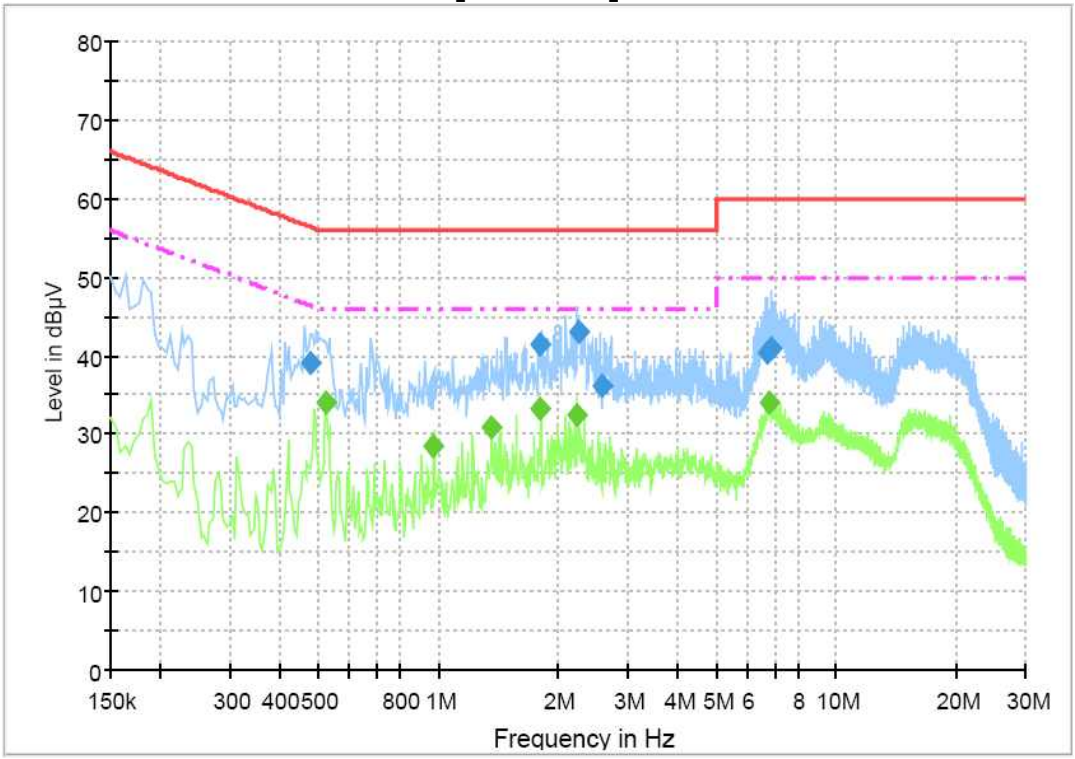
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.514500	41.2	1000.0	9.000	On	L1	10.2	14.8	56.0
2.296500	41.5	1000.0	9.000	On	L1	9.8	14.5	56.0
2.512500	36.0	1000.0	9.000	On	L1	9.8	20.0	56.0
4.330500	32.9	1000.0	9.000	On	L1	9.7	23.1	56.0
6.792000	40.1	1000.0	9.000	On	L1	9.6	19.9	60.0
6.922500	41.1	1000.0	9.000	On	L1	9.6	18.9	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.496500	34.9	1000.0	9.000	On	L1	10.2	11.2	46.1
1.306500	27.6	1000.0	9.000	On	L1	9.9	18.4	46.0
1.878000	29.5	1000.0	9.000	On	L1	9.8	16.5	46.0
2.193000	32.9	1000.0	9.000	On	L1	9.8	13.1	46.0
2.719500	29.2	1000.0	9.000	On	L1	9.8	16.8	46.0
6.922500	33.6	1000.0	9.000	On	L1	9.6	16.4	50.0

[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.478500	39.0	1000.0	9.000	On	N	10.2	17.3	56.4
1.810500	41.6	1000.0	9.000	On	N	9.8	14.4	56.0
2.260500	43.1	1000.0	9.000	On	N	9.8	12.9	56.0
2.571000	36.1	1000.0	9.000	On	N	9.8	19.9	56.0
6.747000	40.5	1000.0	9.000	On	N	9.6	19.5	60.0
6.855000	40.9	1000.0	9.000	On	N	9.6	19.1	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.523500	34.1	1000.0	9.000	On	N	10.2	11.9	46.0
0.973500	28.5	1000.0	9.000	On	N	10.0	17.5	46.0
1.356000	31.0	1000.0	9.000	On	N	9.9	15.0	46.0
1.810500	33.2	1000.0	9.000	On	N	9.8	12.8	46.0
2.229000	32.4	1000.0	9.000	On	N	9.8	13.6	46.0
6.832500	34.1	1000.0	9.000	On	N	9.6	15.9	50.0

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2013-11-08	2014-11-08
2	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2013-12-14	2013-12-14
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2013-12-14	2013-12-14
4	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2013-06-27	2014-06-27
5	Trilog Broadband Antenna	SCHWARZBECK	VULB 9161 SE	9161-4133	2012-06-11	2014-06-11
6	Horn Antenna	ETS-Lindgren	3115	00078895	2013-02-28	2015-02-28
7	DOUBLE RIDGE HORN ANTENNA	ETS-Lindgren	3116	00062916	2013-03-20	2015-03-20
8	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2012-06-06	2014-06-06
9	Attenuator	Rohde & Schwarz	DNF	272.4110.50	2013-11-12	2014-11-12
10	PREAMPLIFIER	Agilent	8449B	3008A02307	2013-11-08	2014-11-08
11	AMPLIFIER	Sonoma Instrument Co.	310	291721	2013-03-21	2014-03-21
12	LISN	Rohde & Schwarz	ENV216	101235	2013-08-02	2014-08-02
13	LISN	Rohde & Schwarz	ENV216	101236	2013-08-02	2014-08-02
14	Band Reject Filter	Wainwright Instruments GmbH	WRCGV 2400/2483-2375/2505-50/10EE	2	2013-09-09	2014-09-09
15	Signal Generator	Agilent	E4432B	US40054094	2013-11-08	2014-11-08
16	Signal Generator	HP	8341B	2819A01563	2013-11-08	2014-11-08