

FCC Test Report

Equipment : 11n/a&11n/g/b Concurrent Smart model
11n/a,11n/g/b Single Smart model

Brand Name : BUFFALO

Model No. : WAPS-APG600H/WAPS-AG300H

FCC ID : FDI04604022-0

Standard : 47 CFR FCC Part 15.407

Applicant : Buffalo Inc.
AKAMONDORI Bldg, 30-20, Ohsu 3-chome,
Naka-ku, Nagoya,460-8315, Japan

Manufacturer : EDIMAX TECHNOLOGY CO., LTD.
No.3, Wu Chuan 3rd Road, Wu-Ku Industrial
Park.Taipei Hsien, Taiwan

The product sample received on Jun. 27, 2012 and completely tested on Aug. 01, 2012. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

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

Reviewed by:

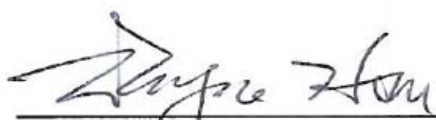

Wayne Hsu / Assistant Manager



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Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	0.72MHz: 28.24dBuV (17.76dB) - AV 27.89dBuV (28.11dB) - QP	FCC 15.207	Complied
3.2	15.407(a)	Emission Bandwidth	Bandwidth [MHz] 20MHz: 19.32 40MHz: 40.83	Information only	Complied
3.3	15.407(a)	RF Output Power (Maximum Conducted (Average) Output Power)	Power [dBm] 5180-5240MHz: 12.53 5190-5230MHz: 15.44	Power [dBm] 5180-5240MHz: 17 5190-5230MHz: 17	Complied
3.4	15.407(a)	Peak Power Spectral Density	PPSD [dBm/MHz] 5180-5240MHz: 1.38 5190-5230MHz: 2.35	PPSD [dBm/MHz] 5180-5240MHz: 4 5190-5230MHz: 4	Complied
3.5	15.407(a)	Peak Excursion	9.13 dB	13 dB	Complied
3.6	15.407(b)	Transmitter Radiated Bandedge Emissions	Restricted Bands [dBuV/m at 1.5m]: 5150.00MHz 77.05 (Margin 6.49dB) - PK 62.18 (Margin 1.36dB) - AV	Non-Restricted Bands: ≤ -27 dBm (68.3dBuV/m@3m) Restricted Bands: FCC 15.209	Complied
3.7	15.407(b)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]: 43.58MHz: 36.85 (Margin 3.15dB) - PK	Non-Restricted Bands: ≤ -27 dBm (68.3dBuV/m@3m) Restricted Bands: FCC 15.209	Complied
3.8	15.407(g)	Frequency Stability	5.77 ppm	Signal shall remain in-band	Complied

Revision History

[illegible]

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11 Protocol	Ch. Frequency (MHz)	Channel Number	RF Output Power (dBm)	Designation of Emission
5150-5250	a	5180-5240	36-48 [4]	12.53	16M8D1D
5150-5250	n (HT20)	5180-5240	36-48 [4]	12.44	17M5D1D
5150-5250	n (HT40)	5190-5230	38-46 [2]	12.51	35M7D1D
Note 1: IEEE Std. 802.11-2007 modulation consists of IEEE Std. 802.11a-1999. Note 2: IEEE Std. 802.11n-2009 modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Note 3: RF output power specifies that Maximum Conducted (Average) Output Power.					

Transmitter Chains & Receiver Chains Information					
IEEE Std. 802.11 Protocol	Number of Transmit Chains (N _{TX})	Number of Receive Chains (N _{RX})	Correlation Signals with Multiple N _{TX}	99% Emission Bandwidth (MHz)	Co-location
a	2	2	Correlated	16.79	Yes
n (HT20)	2	2	Uncorrelated	17.47	Yes
n (HT40)	2	2	Uncorrelated	35.66	Yes
Note 1: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)					

1.1.2 Antenna Information

Antenna Category	
<input type="checkbox"/>	Equipment placed on the market without antennas
<input type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	Temporary RF connector provided
<input type="checkbox"/>	No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
<input checked="" type="checkbox"/>	External antenna (dedicated antennas)
<input type="checkbox"/>	Single power level with corresponding antenna(s). Power Level (PL): 1
<input checked="" type="checkbox"/>	Multiple power level and corresponding antenna(s). Power Level (PL): 1~2
<input type="checkbox"/>	No RF connector provided
<input type="checkbox"/>	Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
<input type="checkbox"/>	RF connector provided
<input type="checkbox"/>	Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type...)
<input type="checkbox"/>	Standard antenna connector. (e.g., SMA, N, BNC, and TNC type...)

Antenna General Information									
Antenna Port (Total 2 Port)					1(TX/RX), 2(TX/RX)				
Maximum RF Output Power Level (PL)					1				
Transmit Chains Power Distribution					<input checked="" type="checkbox"/> symmetrical distribution <input type="checkbox"/> asymmetrical distribution				
Ant. No.	PL	Ant. Port [Ant No. X connect to Ant. Port Y]	Ant. Cat.	Ant. Type	Brand	Model	G _{ANT} (dBi)	DG (dBi) [correlated] N _{TX} = 2	DG (dBi) [uncorrelated] N _{TX} = 2
1	1	1	Internal	Dipole	-	-	2.89	5.9	2.9
2	1	2	Internal	Dipole	-	-	2.89		
<input checked="" type="checkbox"/> The equipment is normally installed and point-to-point or point-to-multipoint systems: Ant. No. <u>1,2</u>									
<p>Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows: Any transmit signals are correlated, Directional Gain (DG) = G_{ANT} + 10 log(N) dBi All transmit signals are completely uncorrelated, Directional Gain (DG) = G_{ANT}</p> <p>Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows: Any transmit signals are correlated, Directional Gain (DG) = $10 \log[(10^{G_{1/20}} + 10^{G_{2/20}} + \dots + 10^{G_{N/20}})^2 / N]$ dBi All transmit signals are completely uncorrelated, Directional Gain (DG) = $10 \log[(10^{G_{1/10}} + 10^{G_{2/10}} + \dots + 10^{G_{N/10}}) / N]$ dBi</p>									

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	<input type="checkbox"/> Production ; <input checked="" type="checkbox"/> Pre-Production ; <input type="checkbox"/> Prototype
Type of EUT	
<input checked="" type="checkbox"/>	Stand-alone
<input type="checkbox"/>	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: ...
<input type="checkbox"/>	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: ...
<input type="checkbox"/>	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle		
<input type="checkbox"/> Operated normally mode for worst duty cycle		
<input checked="" type="checkbox"/> Operated test mode for worst duty cycle		
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)	Voltage Duty Factor [dB] – (20 log 1/x)
<input checked="" type="checkbox"/> 100% - IEEE 802.11a	0.00	0.00
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT20)	0.00	0.00
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT40)	0.00	0.00

1.1.5 EUT Operational Condition

Supply Voltage	<input checked="" type="checkbox"/> AC mains	<input type="checkbox"/> DC	
Type of DC Source	<input checked="" type="checkbox"/> Internal DC supply	<input type="checkbox"/> External DC adapter	<input type="checkbox"/> Battery

1.2 Accessories and Support Equipment

Accessories				
No.	Equipment	Brand Name	Model Name	Serial No.
1	AC Adapter	APD	DA-48P12	-

Support Equipment - Conducted Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	USB Flash 1	TDK	16G	N/A
2	USB Flash 2	LITEON	2G	N/A
3	Notebook	DELL	E5520	DoC
4	iPod	Apple	A1199	DoC
5	USB Mouse	Microsoft	1113	DoC
6	Notebook (Remote Workstation)	DELL	VOSTRO 3350	DoC
7	POE (Remote Workstation)	D-Link	DWL-P200	DoC

Support Equipment - Radiated Emissions				
No.	Equipment	Brand Name	Model Name	Serial No.
1	USB Flash 1	TDK	16G	N/A
2	USB Flash 2	LITEON	2G	N/A
3	Notebook	DELL	E5520	DoC
4	USB Mouse	Microsoft	1113	DoC
5	iPod	Apple	A1199	DoC
6	Notebook (Remote Workstation)	DELL	E5520	DOC
7	POE (Remote Workstation)	D-Link	DWL-P200	DoC

1.3 Testing Applied Standards

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

- ♦ 47 CFR FCC Part 15
- ♦ ANSI C63.10-2009
- ♦ FCC KDB 789033 - Guidance for Performing Compliance Measurements on UNII
- ♦ FCC KDB 662911 - Emissions Testing of Transmitters with Multiple Outputs
- ♦ FCC KDB 412172 - Guidelines for Determining the ERP and EIRP

1.4 Testing Location Information

Testing Location				
<input checked="" type="checkbox"/>	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C		
		TEL : 886-3-327-3456 FAX : 886-3-327-0973		
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
Conducted Emission	CO01-HY	David	25.9°C / 53.6%	30-Jun-12
RF Conducted	TH01-HY	Ian	24.6°C / 44%	01-Aug-12
Radiated Emission	03CH02-HY	Hsiao	24.1°C / 64%	17-Jul-12

1.5 Measurement Uncertainty

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

Measurement Uncertainty			
Test Item		Uncertainty	Limit
AC power-line conducted emissions		±2.26 dB	N/A
Emission bandwidth, 6dB bandwidth		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Power density, conducted		±0.81 dB	N/A
Unwanted emissions, conducted	30 – 1000 MHz	±0.51 dB	N/A
	1 – 18 GHz	±0.67 dB	N/A
	18 – 40 GHz	±0.83 dB	N/A
	40 – 200 GHz	N/A	N/A
All emissions, radiated	30 – 1000 MHz	± 2.54 dB	N/A
	1 – 18 GHz	±3.59 dB	N/A
	18 – 40 GHz	±3.82 dB	N/A
	40 – 200 GHz	N/A	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing						
Power Level		1				
IEEE 802.11 Protocol	Number of Transmit Chains (N _{TX})	Data Rate / MCS	Worst Data Rate / MCS	Worst Modulation Mode	RF Output Power (dBm)	Peak Power Spectral Density (dBm/MHz)
a	2	6-54 Mbps	6Mbps	11A5.2G-20M	12.53	1.38
n (HT20)	2	MCS 0-15	MCS 8	11N5.2G-20M	12.44	0.86
n (HT40)	2	MCS 0-15	MCS 8	11N5.2G-40M	12.51	-2.00
Note 1: IEEE Std. 802.11-2007 modulation consists of IEEE Std. 802.11a-1999. Note 2: IEEE Std. 802.11n-2009 modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Worst modulation mode of Guard Interval (GI) is 400ns. Note 3: Modulation modes consist of 11A5.2G-20M, 11A5.3G-20M, 11A5.6G-20M, 11N5.2G-20M, 11N5.3G-20M, 11N5.6G-20M, 11N5.2G-40M, 11N5.3G-40M, 11N5.6G-40M: 11A: IEEE 802.11a, 11N: IEEE 802.11n. 5.2G: 5.15-5.25 GHz band, 5.3G: 5.25-5.35 GHz band, 5.6G: 5.47-5.725 GHz band. 20M/40M: Channel Bandwidth 20MHz/40MHz Note 4: RF output power specifies that Maximum Conducted (Average) Output Power.						

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration		
IEEE 802.11 Protocol	Worst Modulation Mode	Test Channel Frequencies (MHz) – FX (Frequencies Abbreviations)
a	11A5.2G-20M	5180-(F1), 5200-(F2), 5240-(F3)
n (HT20)	11N5.2G-20M	5180-(F1), 5200-(F2), 5240-(F3)
n (HT40)	11N5.2G-40M	5190-(F1'), 5230-(F2')
Note 1: Modulation modes consist of 11A5.2G-20M, 11A5.3G-20M, 11A5.6G-20M, 11N5.2G-20M, 11N5.3G-20M, 11N5.6G-20M, 11N5.2G-40M, 11N5.3G-40M, 11N5.6G-40M: 11A: IEEE 802.11a, 11N: IEEE 802.11n. 5.2G: 5.15-5.25 GHz band, 5.3G: 5.25-5.35 GHz band, 5.6G: 5.47-5.725 GHz band. 20M/40M: Channel Bandwidth 20MHz/40MHz		

2.3 The Worst Case Power Setting Parameter




The Worst Case Power Setting Parameter					
Power Level		1			
Test Software Version		RT 3883 QA_1.0.4.5			
The Worst Modulation Mode	Number of Transmit Chains (N _{TX})	Frequency (MHz)	Power Setting	Worst Data Rate / MCS	RF Output Power (dBm)
11A5.2G-20M	2	5180	0D,12	6 Mbps	12.31
11A5.2G-20M	2	5200	0C,12	6 Mbps	12.40
11A5.2G-20M	2	5240	0B,10	6 Mbps	12.53
11N5.2G-20M	2	5180	0C,13	MCS 8	12.29
11N5.2G-20M	2	5200	0C,12	MCS 8	12.44
11N5.2G-20M	2	5240	0A,10	MCS 8	12.34
11N5.2G-40M	2	5190	0C,12	MCS 8	12.30
11N5.2G-40M	2	5230	15,17	MCS 8	15.44
Note 1: Modulation modes consist of 11A5.2G-20M, 11A5.3G-20M, 11A5.6G-20M, 11N5.2G-20M, 11N5.3G-20M, 11N5.6G-20M, 11N5.2G-40M, 11N5.3G-40M, 11N5.6G-40M: 11A: IEEE 802.11a, 11N: IEEE 802.11n. 5.2G: 5.15-5.25 GHz band, 5.3G: 5.25-5.35 GHz band, 5.6G: 5.47-5.725 GHz band. 20M/40M: Channel Bandwidth 20MHz/40MHz					

2.4 The Worst Case Measurement Configuration

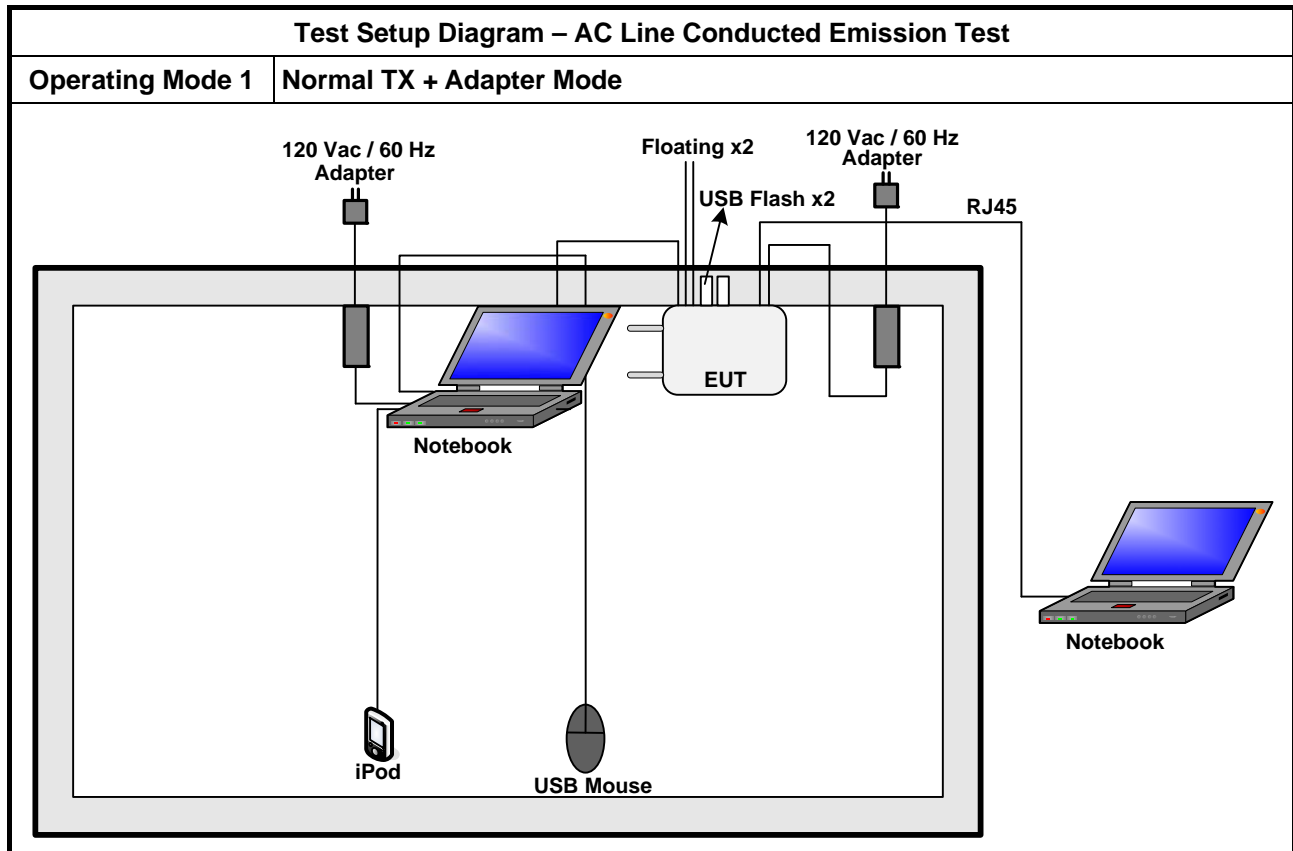
The Worst Case Mode for Following Conformance Tests				
Tests Item	AC power-line conducted emissions			
Condition	AC power-line conducted measurement for line and neutral			
Operating Mode	Operating Mode Description	Worst Modulation Mode	Test Freq.	Power Level
1	Normal TX + Adapter Mode	11N5.2G-40M	F2'	1
2	Normal TX + POE Mode	11N5.2G-40M	F2'	1
For operating mode 1 is the worst case and it was record in this test report.				

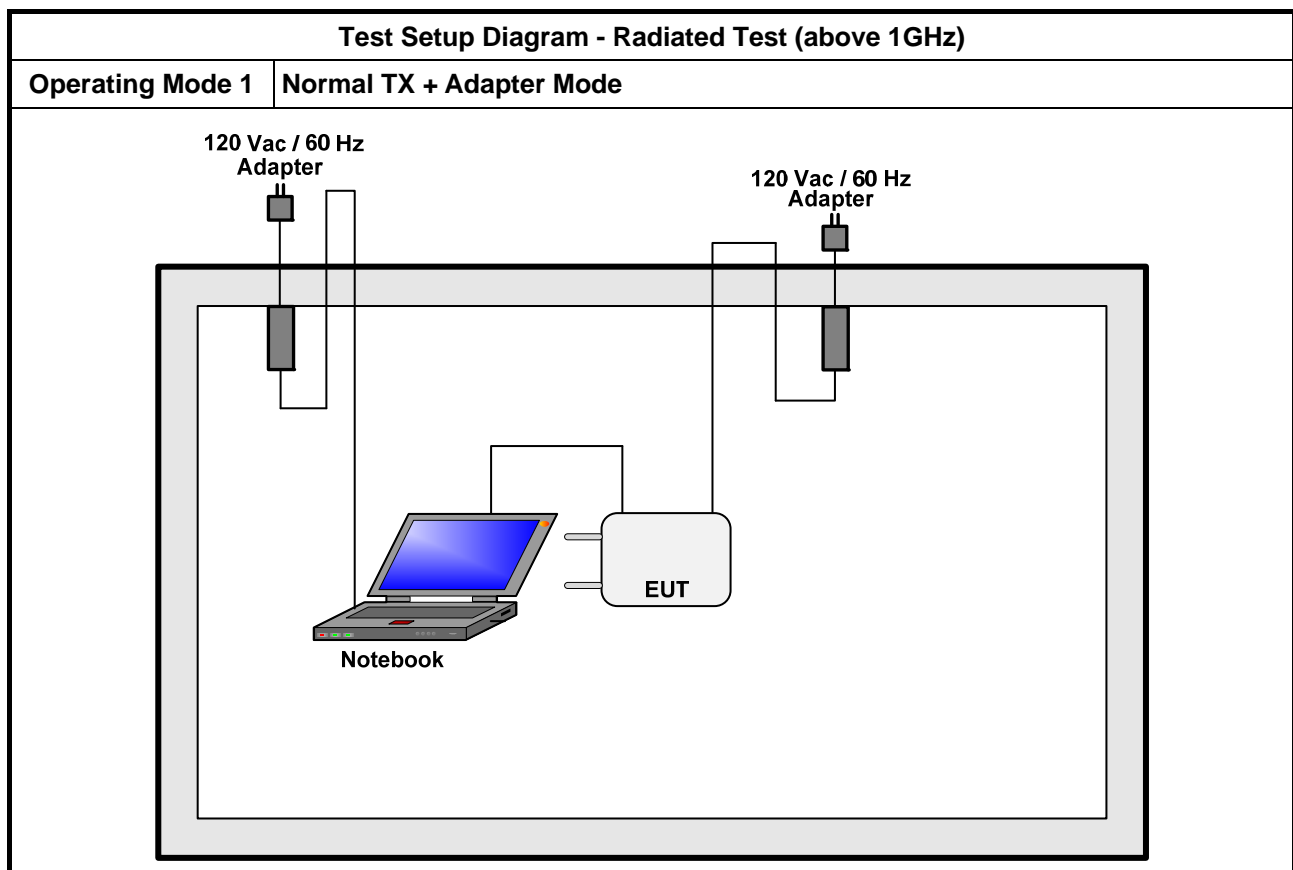
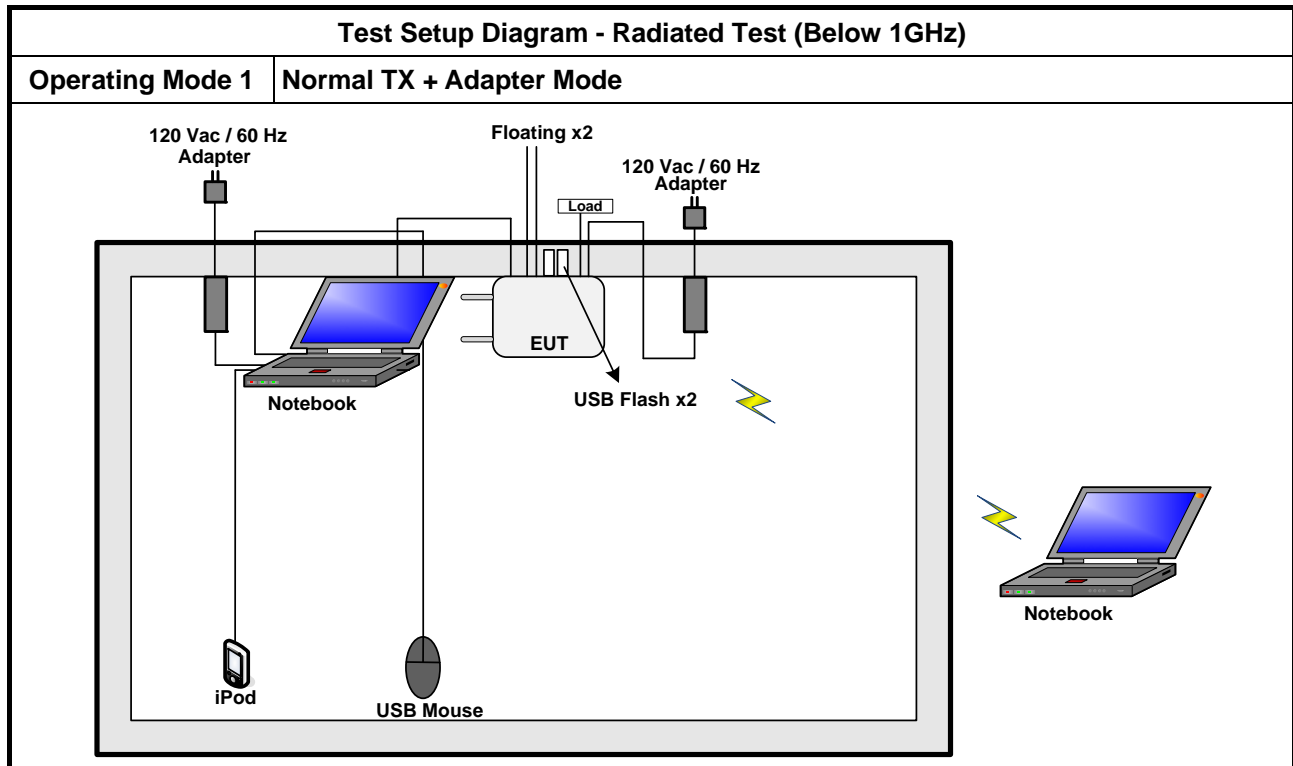
The Worst Case Mode for Following Conformance Tests				
Tests Item	RF Output Power Peak Power Spectral Density Emission Bandwidth Peak Excursion			
Test Condition	Conducted measurement at transmit chains			
Worst Modulation Mode	Number of Transmit Chains (N_{TX})	Worst Data Rate / MCS	Test Frequency	Power Level
11A5.2G-20M	2	6Mbps	F1, F2, F3	1
11N5.2G-20M	2	MCS 8	F1, F2, F3	1
11N5.2G-40M	2	MCS 8	F1', F2'	1

The Worst Case Mode for Following Conformance Tests				
Tests Item	Transmitter Radiated Bandedge Emissions			
Test Condition	Radiated measurement			
Worst Modulation Mode	Number of Transmit Chains (N_{TX})	Worst Data Rate / MCS	Test Frequency	Power Level
11A5.2G-20M	2	6Mbps	F1	1
11A5.2G-20M	2	6Mbps	F3	1
11N5.2G-20M	2	MCS 8	F1	1
11N5.2G-20M	2	MCS 8	F3	1
11N5.2G-40M	2	MCS 8	F1'	1
11N5.2G-40M	2	MCS 8	F2'	1

The Worst Case Mode for Following Conformance Tests						
Tests Item	Transmitter Radiated Unwanted Emissions					
Test Condition	Radiated measurement					
User Position	<input checked="" type="checkbox"/> EUT will be placed in fixed position.					
	<input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two or three orthogonal planes.					
	<input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes.					
Operating Mode < 1GHz	<input checked="" type="checkbox"/> 1. Normal TX + Adapter Mode					
	<input checked="" type="checkbox"/> 2. Normal TX + POE Mode					
Worst Modulation Mode	Number of Transmit Chains (N_{TX})	Worst Data Rate / MCS	Test Frequency	Power Level	Ant No.	Worst Orthogonal Planes of EUT
11A5.2G-20M	2	6Mbps	F1, F2, F3	1	1,2	X Plane
11N5.2G-20M	2	MCS 8	F1, F2, F3	1	1,2	X Plane
11N5.2G-40M	2	MCS 8	F1', F2'	1	1,2	X Plane
Orthogonal Planes of EUT	X Plane		Y Plane		Z Plane	
						
For operating mode 1 is the worst case and it was record in this test report.						

2.5 Test Setup Diagram





3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

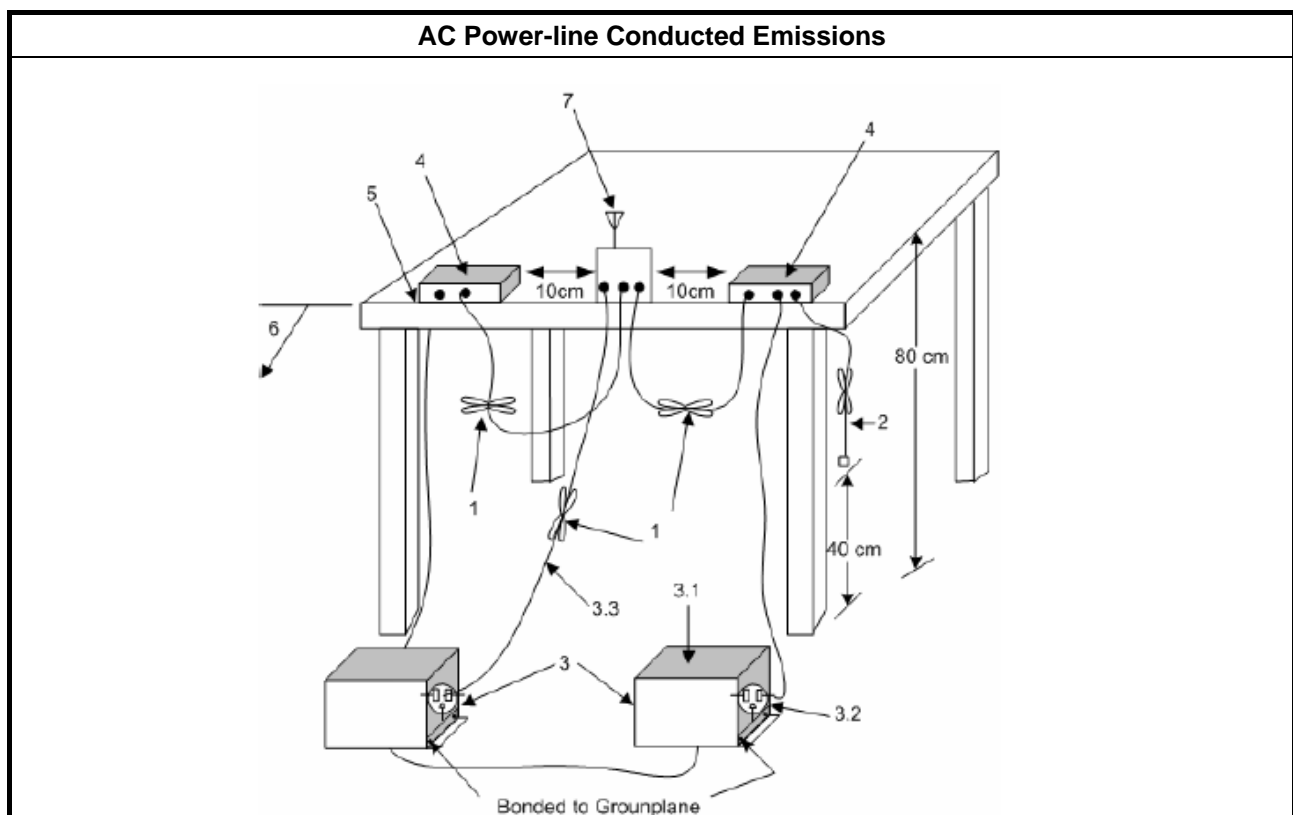
3.1.2 Measuring Instruments

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

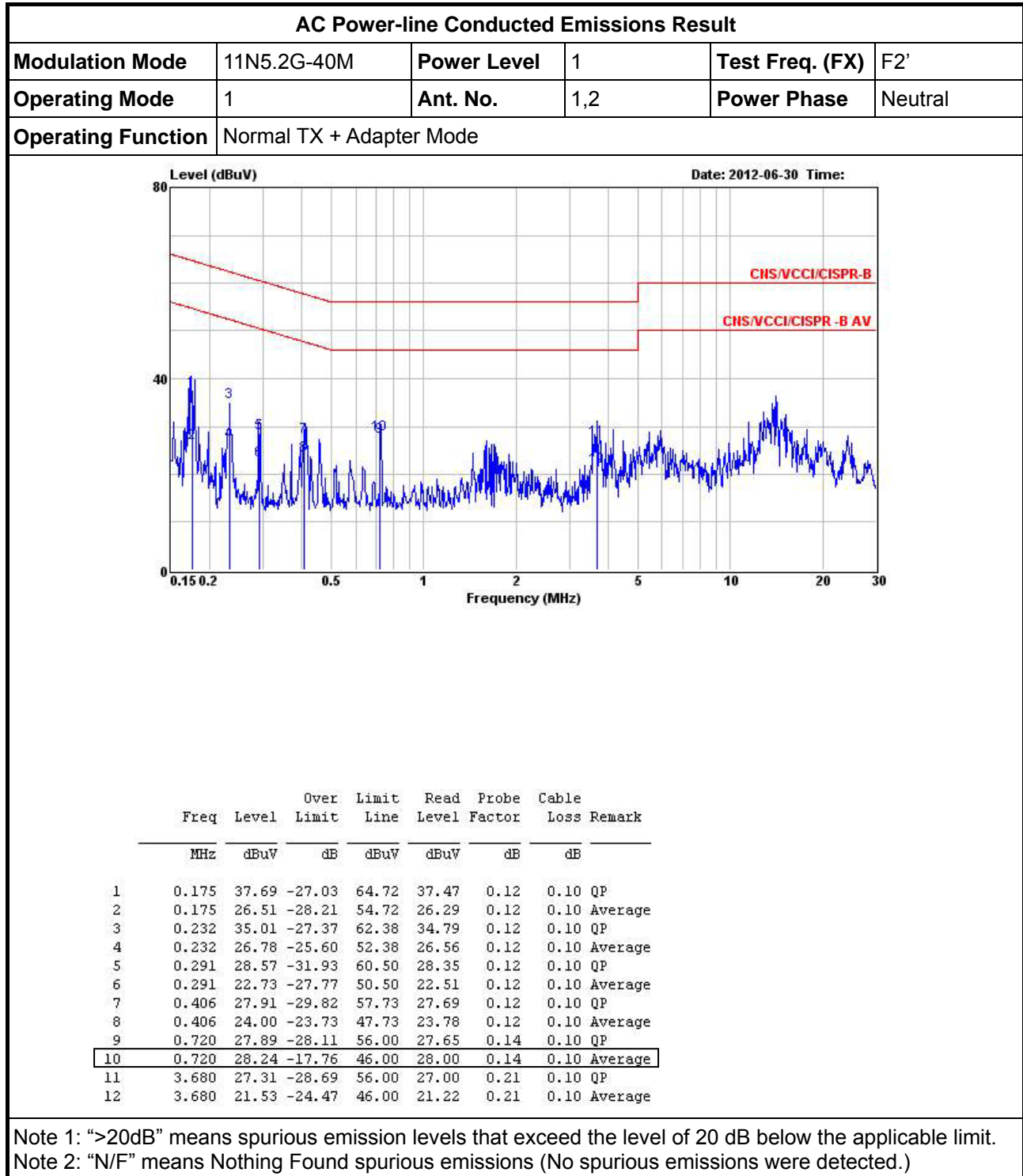
3.1.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

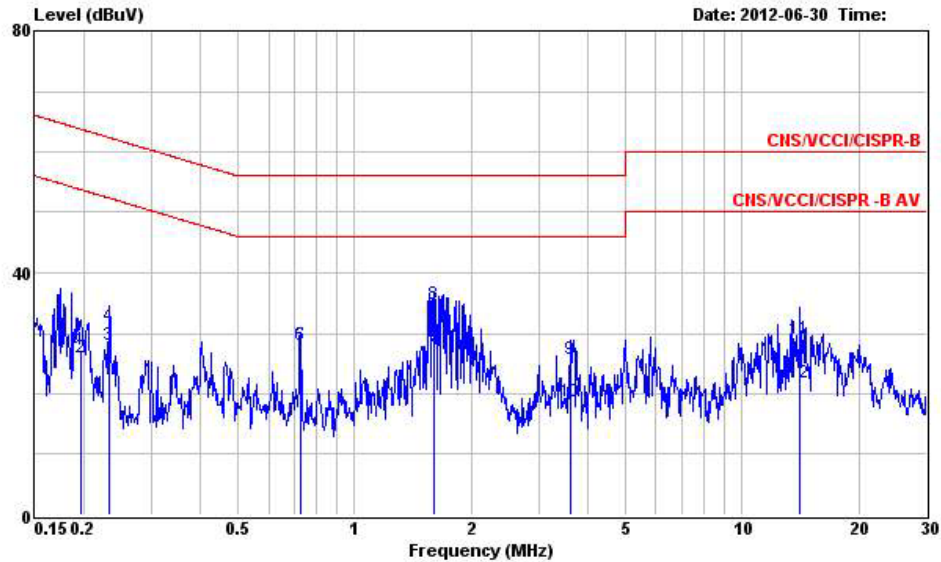


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Modulation Mode	11N5.2G-40M	Power Level	1	Test Freq. (FX)	F2'
Operating Mode	1	Ant. No.	1,2	Power Phase	Line
Operating Function	Normal TX + Adapter Mode				



	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.196	27.24	-36.54	63.78	27.06	0.08	0.10	QP
2	0.196	25.90	-27.88	53.78	25.72	0.08	0.10	Average
3	0.233	27.98	-24.36	52.34	27.80	0.08	0.10	Average
4	0.233	31.13	-31.21	62.34	30.95	0.08	0.10	QP
5	0.724	28.02	-27.98	56.00	27.81	0.11	0.10	QP
6	0.724	28.16	-17.84	46.00	27.95	0.11	0.10	Average
7	1.600	26.90	-19.10	46.00	26.67	0.13	0.10	Average
8	1.600	34.90	-21.10	56.00	34.67	0.13	0.10	QP
9	3.620	25.81	-30.19	56.00	25.53	0.18	0.10	QP
10	3.620	18.81	-27.19	46.00	18.53	0.18	0.10	Average
11	14.140	29.08	-30.92	60.00	28.66	0.32	0.10	QP
12	14.140	21.84	-28.16	50.00	21.42	0.32	0.10	Average

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

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

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth (EBW) Limit

Emission Bandwidth (EBW) Limit	
UNII Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the maximum conducted output power shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.47-5.725 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.725-5.825 GHz band, the maximum conducted output power shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz.
LE-LAN Devices	
<input type="checkbox"/>	For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input checked="" type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input checked="" type="checkbox"/>	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.725-5.825 GHz band, the maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

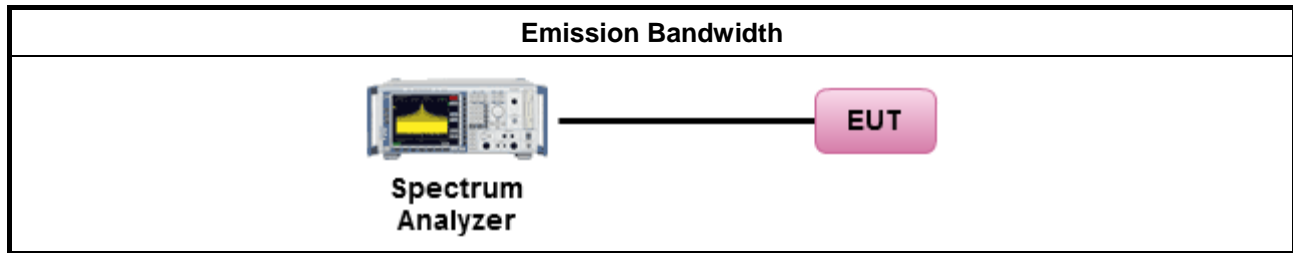
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause D for EBW measurement.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
<input type="checkbox"/>	Refer as IC RSS-Gen, clause 4.6 for bandwidth testing.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	For conducted measurements on devices with multiple transmit chains using options given below:
<input type="checkbox"/>	Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
<input checked="" type="checkbox"/>	Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.
<input type="checkbox"/>	Option 3: A power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point and record a single test point EBW.
<input type="checkbox"/>	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.2.4 Test Setup



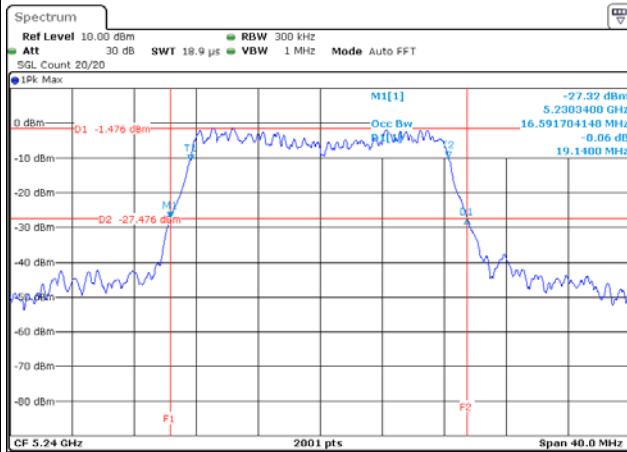
3.2.5 Test Result of Emission Bandwidth

UNII Emission Bandwidth Result								
Power Level	1		Emission Bandwidth (MHz)					
Modulation Mode	N _{TX}	Freq. (MHz)	26dB Bandwidth				Conducted Power Limit (dBm)	
			Chain-Port 1	Chain-Port 2	-	-	Calculation Power Limit	Final Power Limit
11A5.2G-20M	2	5180	18.86	18.56	-	-	16.7	16.7
11A5.2G-20M	2	5200	18.72	18.98	-	-	16.7	16.7
11A5.2G-20M	2	5240	19.14	18.28	-	-	16.6	16.6
11N5.2G-20M	2	5180	18.92	19.10	-	-	16.8	16.8
11N5.2G-20M	2	5200	19.12	19.32	-	-	16.8	16.8
11N5.2G-20M	2	5240	18.94	18.92	-	-	16.8	16.8
11N5.2G-40M	2	5190	38.92	38.88	-	-	19.9	17.0
11N5.2G-40M	2	5230	39.52	38.80	-	-	19.9	19.9
Result			Complied					
Note 1: N _{TX} = Number of Transmit Chains								

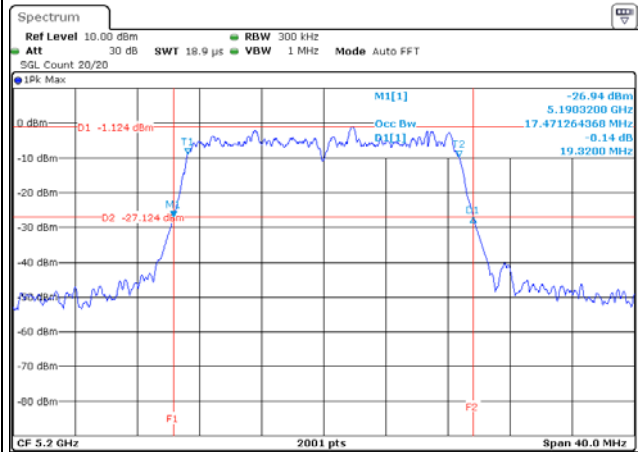
LE-LAN Emission Bandwidth Result								
Power Level	1		Emission Bandwidth (MHz)					
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth				e.i.r.p. Power Limit (dBm)	
			Chain-Port 1	Chain-Port 2	-	-	Calculation Power Limit	Final Power Limit
11A5.2G-20M	2	5180	16.53	16.37	-	-	16.1	16.1
11A5.2G-20M	2	5200	16.79	16.71	-	-	16.2	16.2
11A5.2G-20M	2	5240	16.59	16.41	-	-	16.2	16.2
11N5.2G-20M	2	5180	17.29	17.43	-	-	16.4	16.4
11N5.2G-20M	2	5200	17.37	17.47	-	-	16.4	16.4
11N5.2G-20M	2	5240	17.37	17.41	-	-	16.4	16.4
11N5.2G-40M	2	5190	35.54	35.66	-	-	19.5	17.0
11N5.2G-40M	2	5230	35.66	35.70	-	-	19.5	17.0
Result			Complied					
Note 1: N _{TX} = Number of Transmit Chains								

Emission Bandwidth Plots

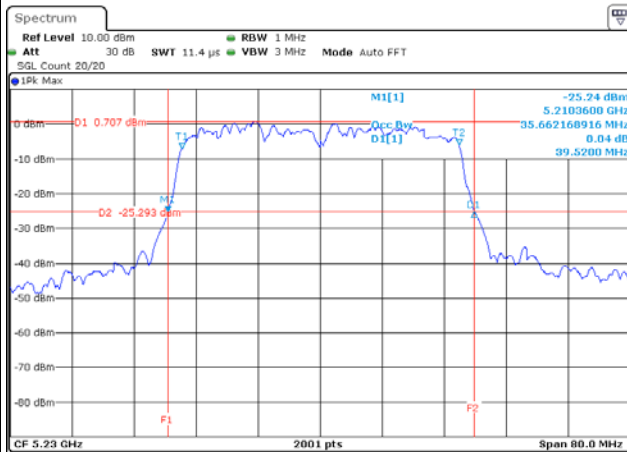
11A5.2G-20M – F3 [Port 1]



11N5.2G-20M – F2 [Port 2]



11N5.2G-40M – F2' [Port 1]



3.3 RF Output Power

3.3.1 RF Output Power Limit

Maximum Conducted Output Power Limit	
UNII Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 17 - (G_{TX} - 6)$.
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 24 - (G_{TX} - 6)$.
<input type="checkbox"/>	For the 5.47-5.725 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 24 - (G_{TX} - 6)$.
<input type="checkbox"/>	For the 5.725-5.825 GHz band:
<input type="checkbox"/>	Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 30 - (G_{TX} - 6)$.
<input type="checkbox"/>	Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 23 \text{ dBi}$, then $P_{Out} = 30 - (G_{TX} - 23)$.
LE-LAN Devices	
<input type="checkbox"/>	For the 5.15-5.25 GHz band, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input checked="" type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input checked="" type="checkbox"/>	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.725-5.825 GHz band, the maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	Point-to-multipoint systems (P2M): the maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	Point-to-point systems (P2P): the maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. If e.i.r.p. > 36 dBm, $G_{TX} \leq P_{Out}$
P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.	

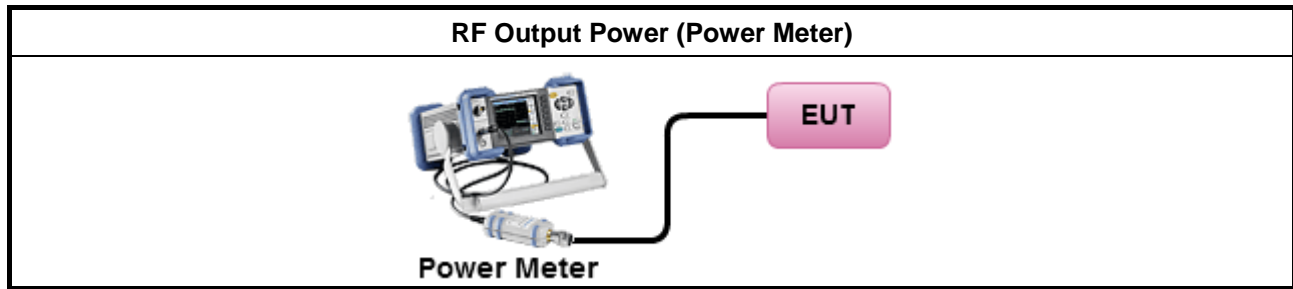
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Maximum Conducted Output Power
	[duty cycle $\geq 98\%$ or external video / power trigger]
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-1 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-1 Alt. (RMS detection with slow sweep speed)
	duty cycle $< 98\%$ and average over on/off periods with duty factor (refer as clause 1.1.4)
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-2 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-2 Alt. (RMS detection with slow sweep speed)
	Without duty cycle restriction
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-3 (band power max-hold).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-3 Alt. (reduced VBW and band power max-hold)
	Wideband RF power meter and average over on/off periods with duty factor (refer as clause 1.1.4)
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method PM (using an RF average power meter).
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.10.3.1 for spectrum analyzer - Method 1 (trace averaging).
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.10.3.2 for spectrum analyzer - Method 2 (zero-span averaging).
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.10.3.2 for spectrum analyzer - Method 3 (band power max-hold).
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	For conducted measurements on devices with multiple transmit chains: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
<input checked="" type="checkbox"/>	If multiple transmit chains, EIRP calculation could be following as methods:
<input type="checkbox"/>	Method 1: $\text{EIRP}_1 = P_1 + G_{\text{ANT}1} ; \text{EIRP}_2 = P_2 + G_{\text{ANT}2} ; \dots \text{EIRP}_n = P_n + G_{\text{ANT}n}$ $\text{EIRP}_{\text{total}} = \text{EIRP}_1 + \text{EIRP}_2 + \dots + \text{EIRP}_n$ (calculated in linear unit [mW] and transfer to log unit [dBm])
<input checked="" type="checkbox"/>	Method 2: $P_{\text{total}} = P_1 + P_2 + \dots + P_n$ $\text{EIRP}_{\text{total}} = P_{\text{total}} + \text{DG}$ (calculated in linear unit [mW] and transfer to log unit [dBm])
<input type="checkbox"/>	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level. The measured radiated field strength or power levels to equivalent isotropic radiated power (EIRP) (see FCC KDB 412172 for guidance). The equivalent maximum conducted output power can then be determined by subtracting the EUT transmit antenna gain from the EIRP.

3.3.4 Test Setup



3.3.5 Test Result of Maximum Conducted (Average) Output Power

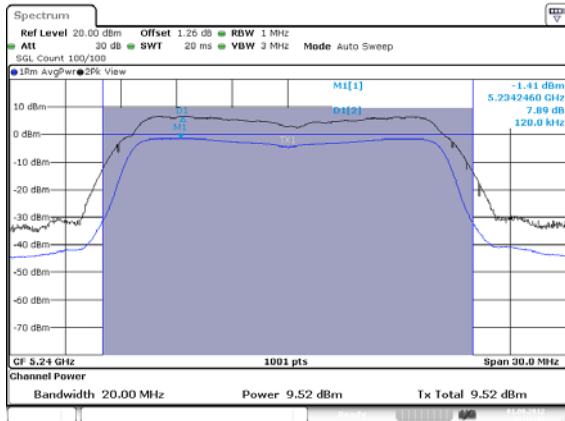
Maximum Conducted Output Power Result										
Power Level		1	RF Output Power (dBm)							
Directional Gain (dBi)		5.9								
Modulation Mode	N _{TX}	Freq. (MHz)	Chain-Port 1	Chain-Port 2	-	-	Sum Chain	Power Limit	EIRP Power	EIRP Limit
11A5.2G-20M	2	5180	9.44	9.16	-	-	12.31	16.7	18.21	22.7
11A5.2G-20M	2	5200	9.27	9.51	-	-	12.40	16.7	18.30	22.7
11A5.2G-20M	2	5240	9.52	9.51	-	-	12.53	16.6	18.43	22.6
Result			Complied							
Note 1: N _{TX} = Number of Transmit Chains										

Maximum Conducted Output Power Result										
Power Level		1	RF Output Power (dBm)							
Directional Gain (dBi)		2.9								
Modulation Mode	N _{TX}	Freq. (MHz)	Chain-Port 1	Chain-Port 2	-	-	Sum Chain	Power Limit	EIRP Power	EIRP Limit
11N5.2G-20M	2	5180	9.14	9.42	-	-	12.29	16.8	15.18	22.8
11N5.2G-20M	2	5200	9.43	9.42	-	-	12.44	16.8	15.33	22.8
11N5.2G-20M	2	5240	9.28	9.37	-	-	12.34	16.8	15.23	22.8
Result			Complied							
Note 1: N _{TX} = Number of Transmit Chains										

Maximum Conducted Output Power Result										
Power Level		1	RF Output Power (dBm)							
Directional Gain (dBi)		2.9								
Modulation Mode	N _{TX}	Freq. (MHz)	Chain-Port 1	Chain-Port 2	-	-	Sum Chain	Power Limit	EIRP Power	EIRP Limit
11N5.2G-40M	2	5190	9.32	9.25			12.30	17.0	15.19	23.0
11N5.2G-40M	2	5230	9.55	9.44			12.51	17.0	15.40	23.0
Result			Complied							
Note 1: N _{TX} = Number of Transmit Chains										

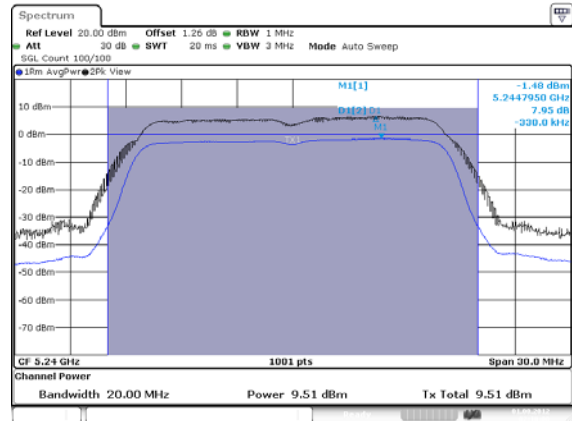
Worst Emission Bandwidth Plots

11A5.2G-20M – F3 [Port 1]



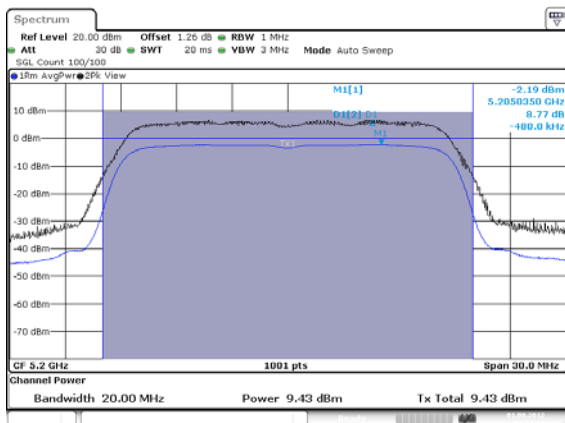
Date: 1.AUG.2012 02:17:50

11A5.2G-20M – F3 [Port 2]



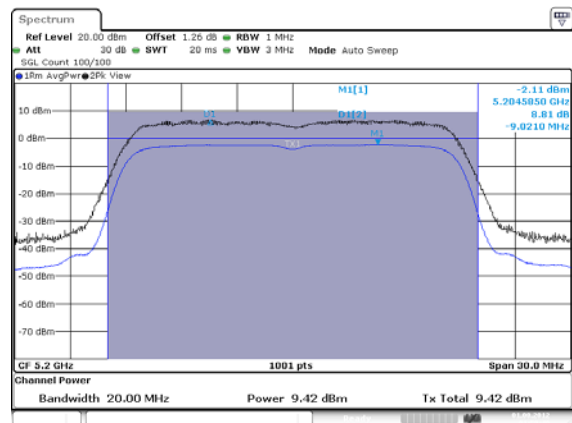
Date: 1.AUG.2012 02:18:00

11N5.2G-20M – F2 [Port 1]



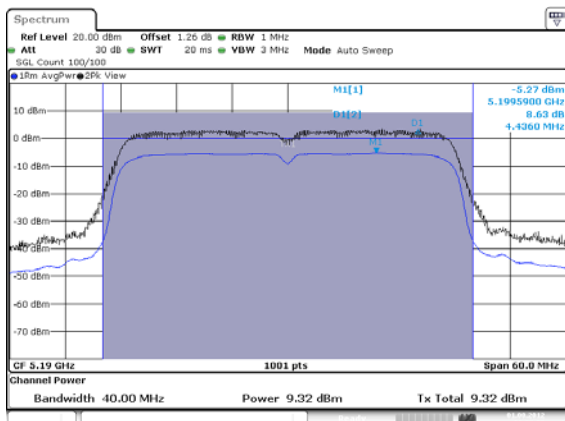
Date: 1.AUG.2012 01:59:39

11N5.2G-20M – F2 [Port 2]



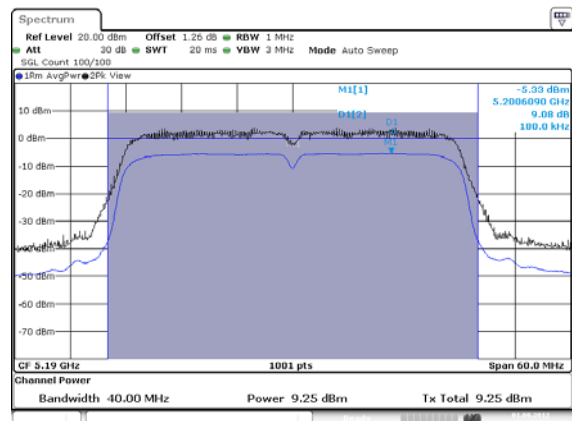
Date: 1.AUG.2012 01:59:49

11N5.2G-40M – F1' [Port 1]



Date: 1.AUG.2012 02:22:59

11N5.2G-40M – F1' [Port 2]



Date: 1.AUG.2012 02:23:09

3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit	
UNII Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the peak power spectral density (PPSD) ≤ 4 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 4 - (G_{TX} - 6)$.
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.
<input type="checkbox"/>	For the 5.47-5.725 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.
<input type="checkbox"/>	For the 5.725-5.825 GHz band:
<input type="checkbox"/>	Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 17 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 17 - (G_{TX} - 6)$.
<input type="checkbox"/>	Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 17 dBm/MHz. If $G_{TX} > 23$ dBi, then $PPSD = 17 - (G_{TX} - 23)$.
LE-LAN Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the peak power spectral density (PPSD) ≤ 4 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 10 dBm/MHz.
<input checked="" type="checkbox"/>	For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 17 dBm/MHz.
<input checked="" type="checkbox"/>	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 17 dBm/MHz.
<input type="checkbox"/>	For the 5.725-5.825 GHz band, the peak power spectral density (PPSD) ≤ 17 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 23 dBm/MHz.
<p>PPSD = peak power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz</p> <p>G_{TX} = the maximum transmitting antenna directional gain in dBi.</p>	

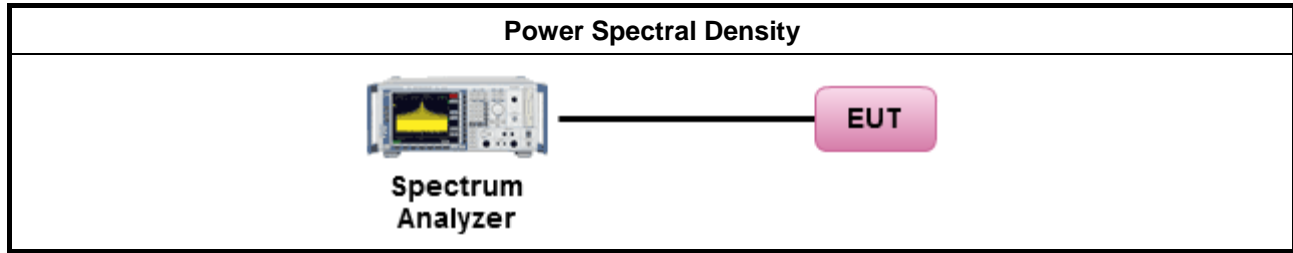
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Peak power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the peak power spectral density and use the peak search function on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density shall be measured using below options:
	[duty cycle $\geq 98\%$ or external video / power trigger]
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-1 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-1 Alt. (RMS detection with slow sweep speed)
	duty cycle $< 98\%$ and average over on/off periods with duty factor (refer as clause 1.1.4
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-2 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-2 Alt. (RMS detection with slow sweep speed)
	Without duty cycle restriction
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-3 (band power max-hold).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause C Method SA-3 Alt. (reduced VBW and band power max-hold). Method SA-3 Alt. was used and the linear mode was used, add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.11.1.2.1 for Method 1—peak measurement.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.11.1.2.2 for Method 2—power averaging.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	For conducted measurements on devices with multiple transmit chains:
<input type="checkbox"/>	Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
<input checked="" type="checkbox"/>	Option 2: Measure and add $10 \log(N)$ dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with $10 \log(N)$. Or each transmit chains shall be add $10 \log(N)$ to compared with the limit.
<input checked="" type="checkbox"/>	If multiple transmit chains, EIRP PPSD calculation could be following as methods:
<input type="checkbox"/>	Method 1: $EIRP_1 = PPSD_1 + G_{ANT1}$; $EIRP_2 = PPSD_2 + G_{ANT2}$; ... $EIRP_n = PPSD_n + G_{ANTn}$ $EIRP_{total} = EIRP_1 + EIRP_2 + \dots + EIRP_n$ (calculated in linear unit [mW] and transfer to log unit [dBm])
<input checked="" type="checkbox"/>	Method 2: $PPSD_{total} = PPSD_1 + PPSD_2 + \dots + PPSD_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = PPSD_{total} + DG$
<input type="checkbox"/>	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level. The measured radiated field strength or power levels to equivalent isotropic radiated power (EIRP) (see FCC KDB 412172 for guidance). The equivalent maximum conducted output power can then be determined by subtracting the EUT transmit antenna gain from the EIRP.

3.4.4 Test Setup



3.4.5 Test Result of Peak Power Spectral Density

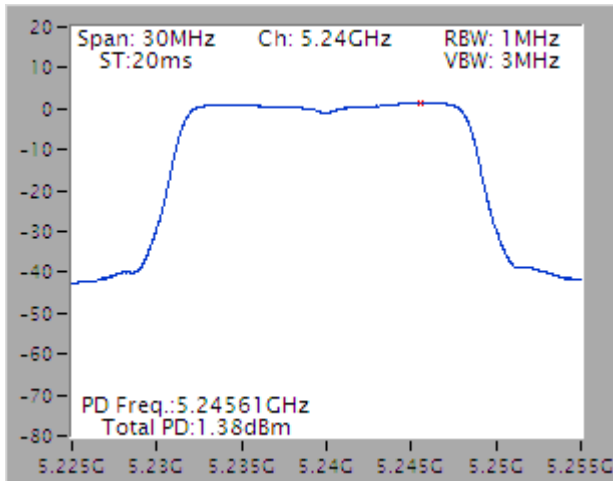
Peak Power Spectral Density Result									
Power Level		1	Peak Power Spectral Density (dBm/MHz)						
Directional Gain (dBi)		5.9							
Modulation Mode	N _{TX}	Freq. (MHz)	Sum All Chains	-	-	-	PSD Limit	EIRP PSD	EIRP PSD Limit
11A5.2G-20M	2	5180	1.16	-	-	-	4.0	7.06	10.0
11A5.2G-20M	2	5200	1.19	-	-	-	4.0	7.09	10.0
11A5.2G-20M	2	5240	1.38	-	-	-	4.0	7.28	10.0
Result			Complied						
Note 1: N _{TX} = Number of Transmit Chains									
Note 2: PPSD [dBm/MHz] = sum each transmit chains by bin-to-bin PPSD [dBm/MHz]									

Peak Power Spectral Density Result									
Power Level		1	Peak Power Spectral Density (dBm/MHz)						
Directional Gain (dBi)		2.89							
Modulation Mode	N _{TX}	Freq. (MHz)	Sum All Chains	-	-	-	PSD Limit	EIRP PSD	EIRP PSD Limit
11N5.2G-20M	2	5180	0.69	-	-	-	4.0	3.58	10.0
11N5.2G-20M	2	5200	0.86	-	-	-	4.0	3.75	10.0
11N5.2G-20M	2	5240	0.79	-	-	-	4.0	3.68	10.0
Result			Complied						
Note 1: N _{TX} = Number of Transmit Chains									
Note 2: PPSD [dBm/MHz] = sum each transmit chains by bin-to-bin PPSD [dBm/MHz]									

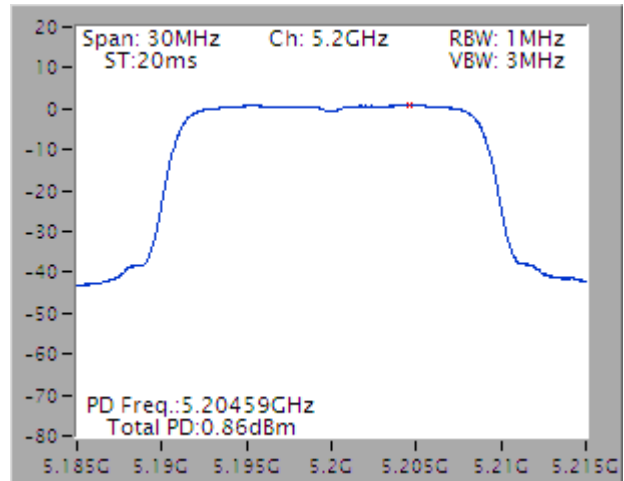
Peak Power Spectral Density Result									
Power Level		1	Power Spectral Density (dBm/MHz)						
Directional Gain (dBi)		2.89							
Modulation Mode	N _{TX}	Freq. (MHz)	Sum All Chains	-	-	-	PSD Limit	EIRP PSD	EIRP PSD Limit
11N5.2G-40M	2	5190	-2.33				4.0	0.56	10.0
11N5.2G-40M	2	5230	-2.00				4.0	5.24	10.0
Result			Complied						
Note 1: N _{TX} = Number of Transmit Chains									
Note 2: PPSD [dBm/MHz] = sum each transmit chains by bin-to-bin PPSD [dBm/MHz]									

Power Spectral Density Plots (w/o Duty Factor)

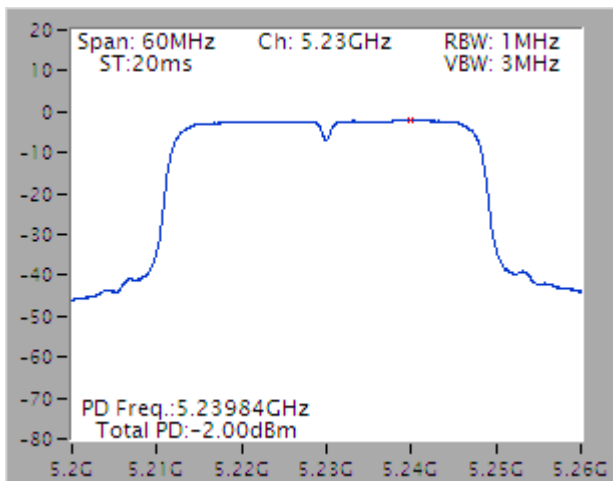
11A5.2G-20M – F3 [Sum All Chains]



11A5.2G-20M – F2 [Sum All Chains]



11N5.2G-40M – F2' [Sum All Chains]



3.5 Peak Excursion

3.5.1 Peak Excursion Limit

Peak Excursion Limit	
UNII Devices	
<input checked="" type="checkbox"/>	Peak excursion ≤ 13 dB. The ratio of the maximum of the peak-max-hold spectrum to the maximum of the average spectrum for continuous transmission does not exceed 13 dB. (Earlier procedures that required computing the ratio of the two spectra at each frequency across the emission bandwidth can lead to unintended failures at band edges and will no longer be required.)
LE-LAN Devices	
<input checked="" type="checkbox"/>	N/A

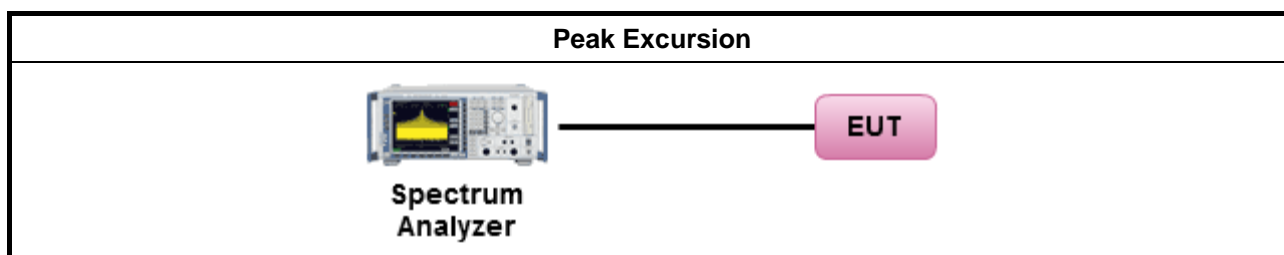
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause F peak excursion method.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	For conducted measurements on devices with multiple transmit chains: Refer as FCC KDB 662911, when testing in-band (peak to average ratio) against relative emission limits, tests may be performed on each output individually without summing or adding $10 \log(N)$.
<input type="checkbox"/>	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.5.4 Test Setup

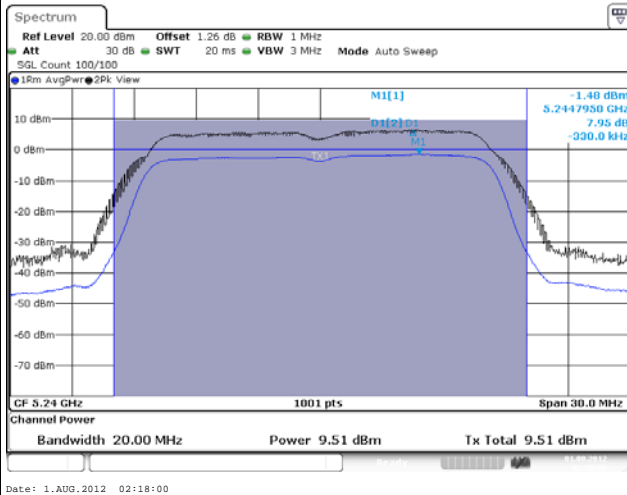


3.5.5 Test Result of Peak Excursion

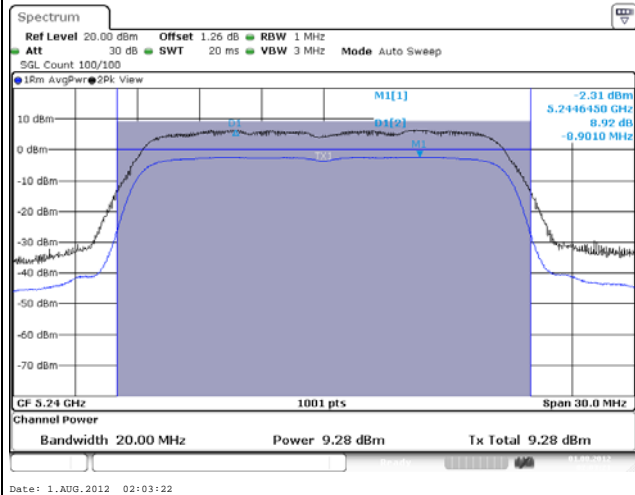
UNII Peak Excursion Result							
Power Level	1		Peak Excursion (dB)				
Modulation Mode	N _{TX}	Freq. (MHz)	Chain-Port 1	Chain-Port 2	-	-	Limit
11A5.2G-20M	2	5180	7.65	7.94	-	-	13.0
11A5.2G-20M	2	5200	7.87	7.94	-	-	13.0
11A5.2G-20M	2	5240	7.89	7.95	-	-	13.0
11N5.2G-20M	2	5180	8.74	8.88	-	-	13.0
11N5.2G-20M	2	5200	8.77	8.81	-	-	13.0
11N5.2G-20M	2	5240	8.92	8.64	-	-	13.0
11N5.2G-40M	2	5190	8.63	9.08	-	-	13.0
11N5.2G-40M	2	5230	8.63	9.13	-	-	13.0
Result			Complied				
Note 1: N _{TX} = Number of Transmit Chains Note 2: Test result plots refer as test report clause 3.3.5 with peak excursion ratio of the maximum of the peak-max-hold spectrum to the maximum of the average spectrum.							

Peak Excursion Plots

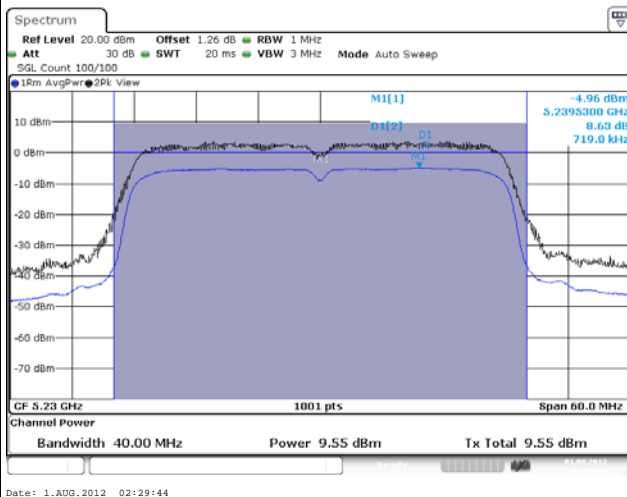
11A5.2G-20M – F3 [Port 2]



11N5.2G-20M – F3 [Port 1]

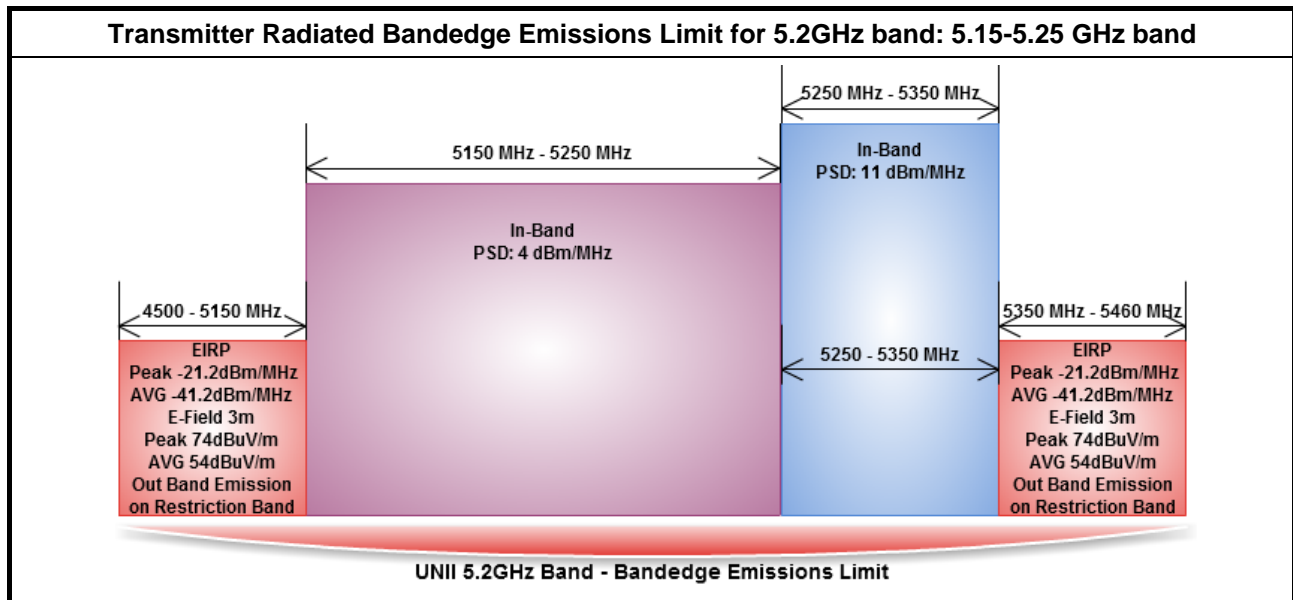


11N5.2G-40M – F2' [Port 1]



3.6 Transmitter Radiated Bandedge Emissions

3.6.1 Transmitter Radiated Bandedge Emissions Limit



3.6.2 Measuring Instruments

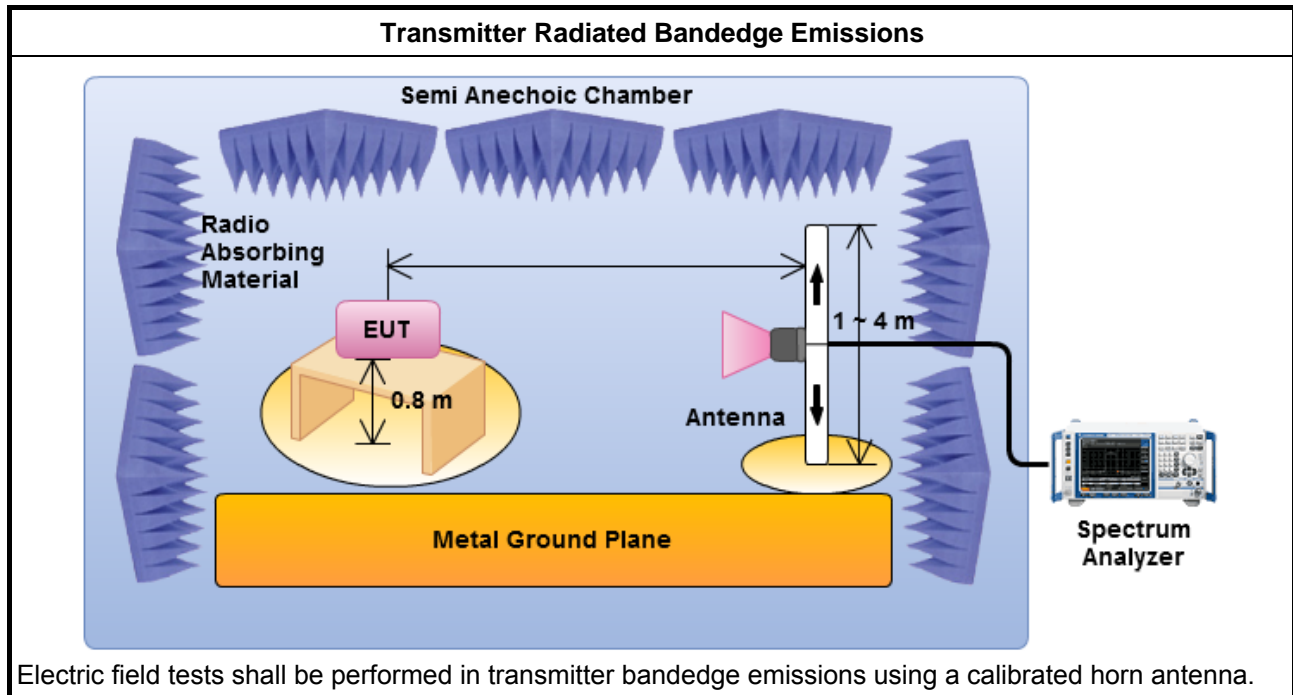
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

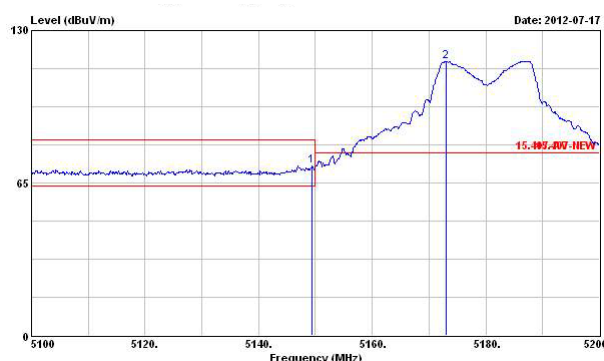
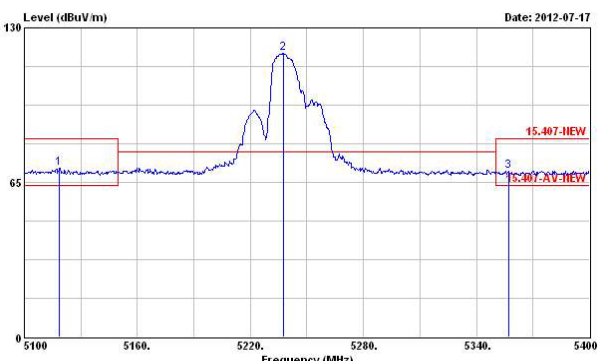
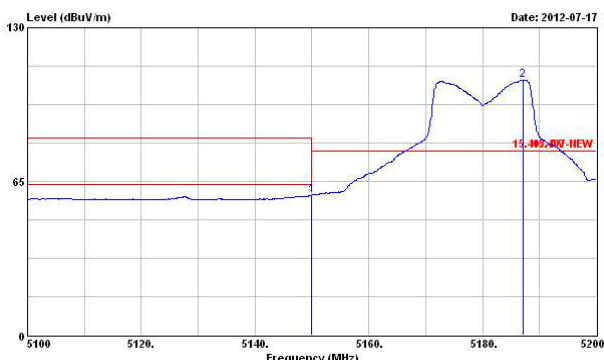
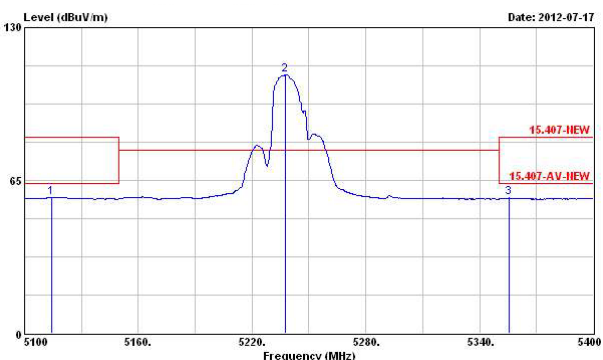
Test Method – General Information	
<input checked="" type="checkbox"/>	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). Measurements in the bandedge are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.2.2 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
<input type="checkbox"/>	If EUT operate in adjacent contiguous bands, bandedge testing performed at the lowest frequency channel at lower-band and highest frequency channel at higher-band. Transmitter in-band emissions will consist of adjacent contiguous bands (e.g., IEEE 802.11ac VHT160 The lowest frequency channel at lower-band and highest frequency channel at higher-band in-band emissions will consist of two adjacent contiguous bands.)
<input type="checkbox"/>	<input type="checkbox"/> Operating in 5.15-5.25 GHz band (lower-band) and 5.25-5.35 GHz band (higher-band). <input type="checkbox"/> Operating in 5.47-5.725 GHz band (lower-band) and 5.725-5.825 GHz band (higher-band).
<input type="checkbox"/>	If EUT operate in individual non-contiguous bands, bandedge testing performed at the lowest frequency channel and highest frequency channel within lower-band and higher-band. (e.g., (e.g., IEEE 802.11ac VHT160)
<input type="checkbox"/>	<input type="checkbox"/> Operating in 5.25-5.35 GHz band (lower-band) and 5.47-5.725 GHz band (higher-band). <input type="checkbox"/> Operating in 5.15-5.25 GHz band (lower-band) and 5.725-5.825 GHz band (higher-band).
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW) - Duty cycle \geq 98%.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For the transmitter bandedge emissions shall be measured using following options below:
<input type="checkbox"/>	Refer as FCC KDB 789033, clause G)3)d) marker-delta method for band-edge measurements.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.

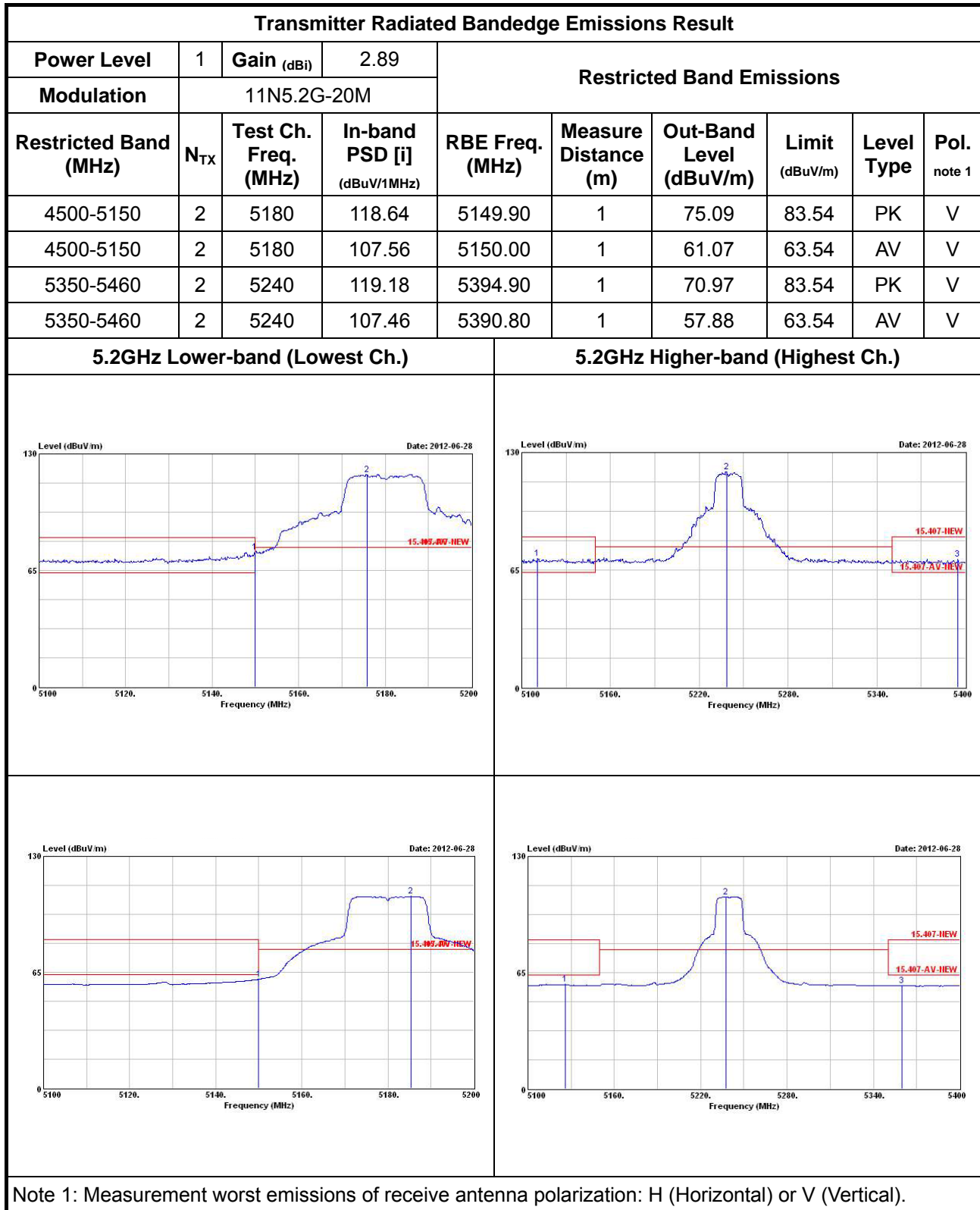
Test Method	
<input type="checkbox"/>	Refer as FCC KDB 789033, clause G)3)b) for conducted measurement.
<input type="checkbox"/>	For unwanted emissions into non-restricted bands (relative emission limits).
<input type="checkbox"/>	For conducted measurements on devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding $10 \log(N)$ if the measurements are made relative to the in-band emissions on the individual outputs.
<input type="checkbox"/>	For unwanted emissions into restricted bands. Test conducted spurious emissions and radiated by the cabinet with the antenna connector(s) terminated by a specified load (cabinet radiation).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause G)4) unwanted emissions in restricted bands on frequencies ≤ 1000 MHz
<input type="checkbox"/>	Refer as FCC KDB 789033, clause G)5) and G)6) unwanted emissions in restricted bands on frequencies > 1000 MHz
<input type="checkbox"/>	For conducted measurements on devices with multiple transmit chains using options given below:
<input type="checkbox"/>	Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, out-of-band and spurious emission measurement. The trace data for each transmit chain has to be individually recorded and each transmit chain trace data shall be added and compared with the limit.
<input type="checkbox"/>	Option 2: Measure and add $10 \log(N)$ dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with $10 \log(N)$. Or each transmit chains shall be add $10 \log(N)$ to compared with the limit.
<input checked="" type="checkbox"/>	For radiated measurement.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.

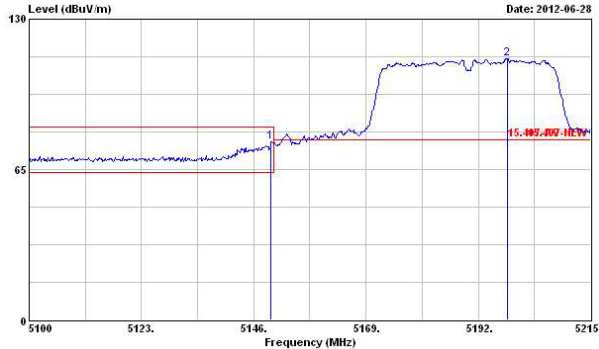
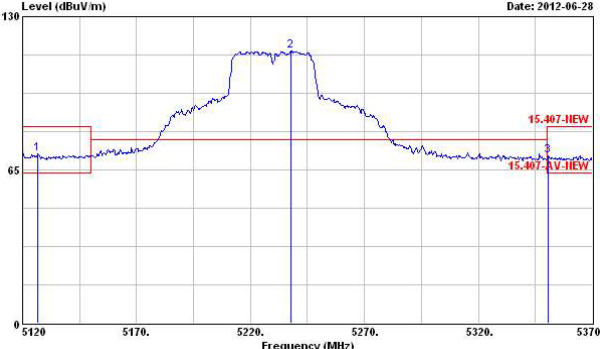
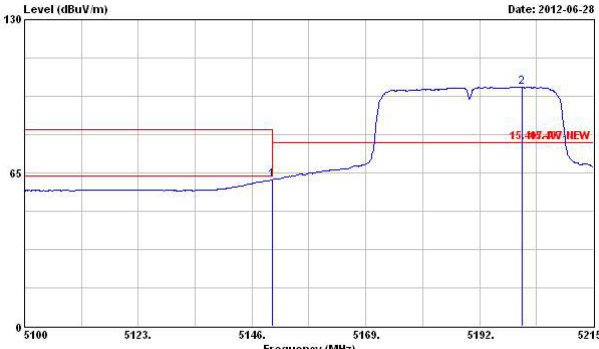
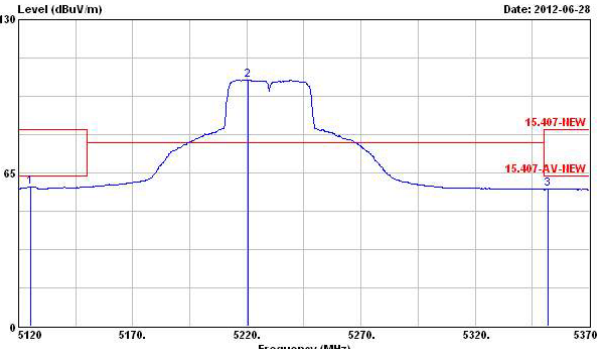
3.6.4 Test Setup



3.6.5 Test Result of Transmitter Radiated Bandedge Emissions

Transmitter Radiated Bandedge Emissions Result									
Power Level	1	Gain (dBi)	5.9	Restricted Band Emissions					
Modulation	11A5.2G-20M								
Restricted Band (MHz)	N _{TX}	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
4500-5150	2	5180	116.92	5149.40	1	72.47	83.54	PK	V
4500-5150	2	5180	107.96	5150.00	1	59.22	63.54	AV	V
5350-5460	2	5240	119.27	5357.40	1	69.91	83.54	PK	V
5350-5460	2	5240	109.90	5355.30	1	57.53	63.54	AV	V
5.2GHz Lower-band (Lowest Ch.)					5.2GHz Lower-band (Highest Ch.)				
									
									
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).									



Transmitter Radiated Bandedge Emissions Result									
Power Level	1	Gain (dBi)	2.89	Restricted Band Emissions					
Modulation	11N5.2G-40M								
Restricted Band (MHz)	N _{TX}	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	RBE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
4500-5150	2	5190	113.01	5149.57	1	77.05	83.54	PK	V
4500-5150	2	5190	101.48	5150.00	1	62.18	63.54	AV	V
5350-5460	2	5230	115.60	5350.75	1	71.12	83.54	PK	V
5350-5460	2	5230	104.49	5351.75	1	58.14	63.54	AV	V
5.2GHz Lower-band (Lowest Ch.)					5.2GHz Higher-band (Highest Ch.)				
									
									
Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal) or V (Vertical).									

3.7 Transmitter Radiated Unwanted Emissions

3.7.1 Transmitter Radiated Unwanted Emissions Limit

Unwanted emissions below 1 GHz and restricted band emissions above 1GHz limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Un-restricted band emissions above 1GHz Limit	
Operating Band	Limit
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.25 - 5.35 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.47 - 5.725 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.725 - 5.825 GHz	5.715 5.725 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] 5.825 5.835 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] Other un-restricted band: e.i.r.p. -27 dBm [68.2 dBuV/m@3m]

Note 1: Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

3.7.2 Measuring Instruments

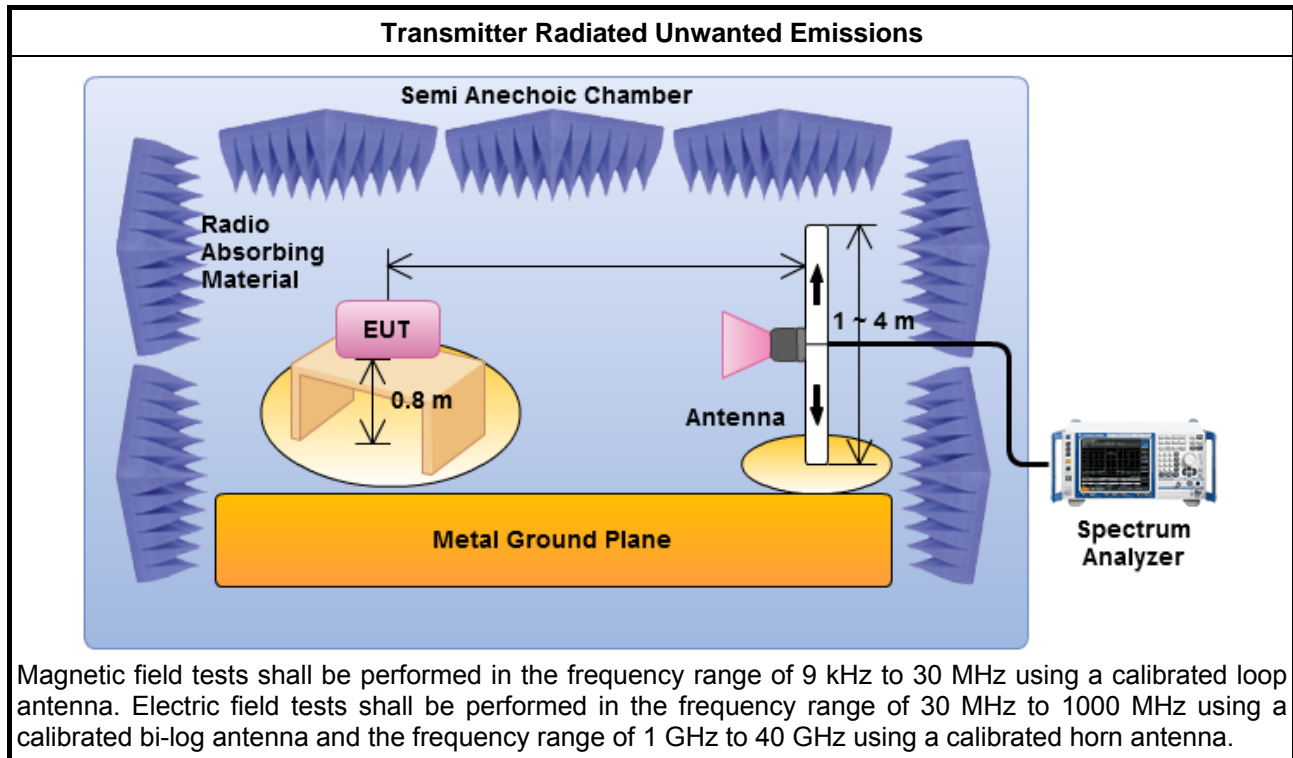
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

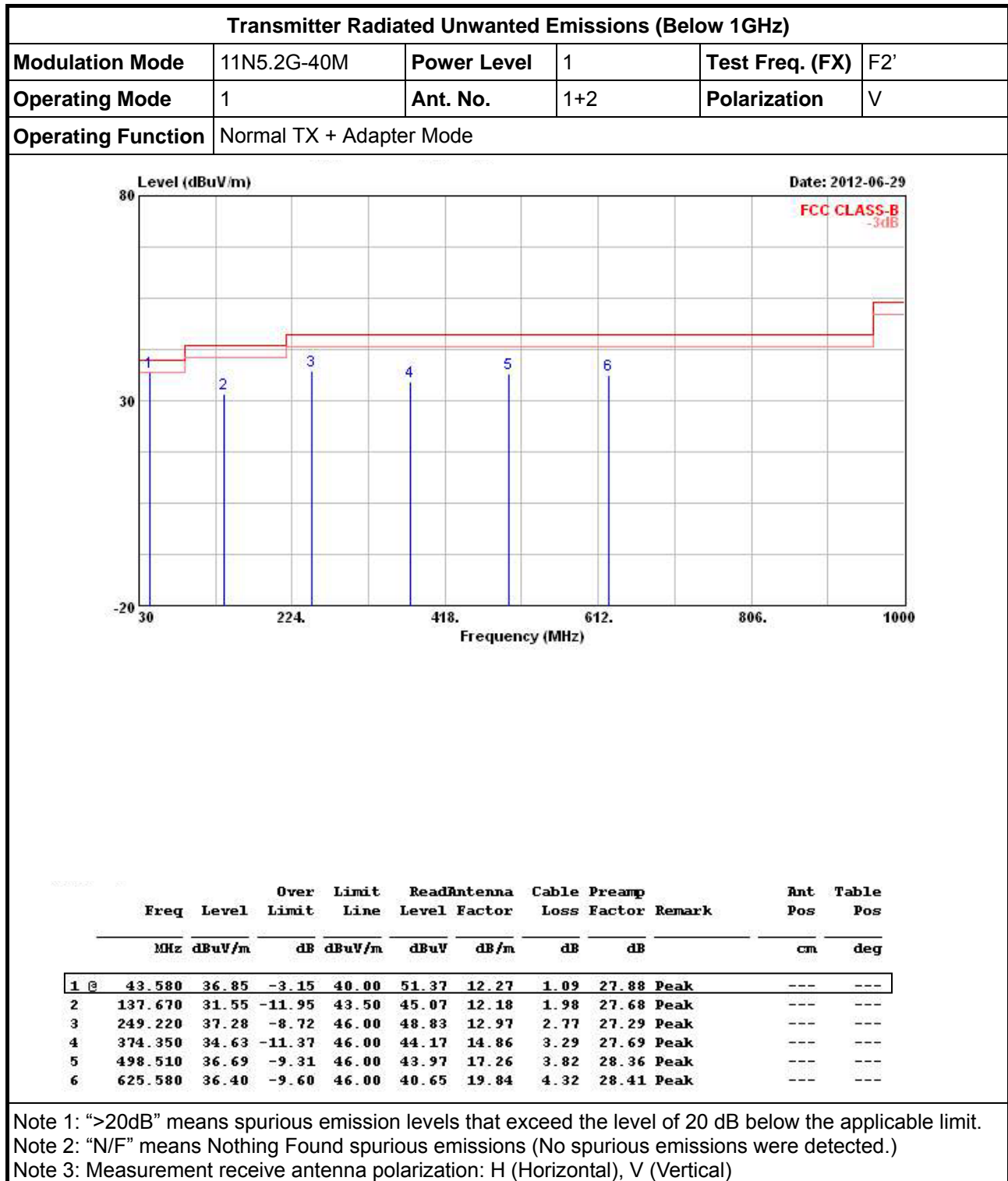
Test Method – General Information	
<input checked="" type="checkbox"/>	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
<input checked="" type="checkbox"/>	Measurements in the frequency range 5 GHz - 10GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.
<input checked="" type="checkbox"/>	Measurements in the frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.
<input checked="" type="checkbox"/>	Measurements in the frequency range above 18 GHz - 40GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW) – Duty \geq 98%.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.

Test Method	
<input type="checkbox"/>	Refer as FCC KDB 789033, G)3)b) for conducted measurement.
<input type="checkbox"/>	For unwanted emissions into non-restricted bands (relative emission limits).
<input type="checkbox"/>	For conducted measurements on devices with multiple transmit chains: Refer as FCC KDB 662911, when testing out-of-band and spurious emissions against relative emission limits, tests may be performed on each output individually without summing or adding $10 \log(N)$ if the measurements are made relative to the in-band emissions on the individual outputs.
<input type="checkbox"/>	For unwanted emissions into restricted bands. Test conducted spurious emissions and radiated by the cabinet with the antenna connector(s) terminated by a specified load (cabinet radiation).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause G)4) unwanted emissions in restricted bands on frequencies ≤ 1000 MHz
<input type="checkbox"/>	Refer as FCC KDB 789033, clause G)5) and G)6) unwanted emissions in restricted bands on frequencies > 1000 MHz
<input type="checkbox"/>	For conducted measurements on devices with multiple transmit chains using options given below:
<input type="checkbox"/>	Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, out-of-band and spurious emission measurement. The trace data for each transmit chain has to be individually recorded and each transmit chain trace data shall be added and compared with the limit.
<input type="checkbox"/>	Option 2: Measure and add $10 \log(N)$ dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with $10 \log(N)$. Or each transmit chains shall be add $10 \log(N)$ to compared with the limit.
<input checked="" type="checkbox"/>	For radiated measurement.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.

3.7.4 Test Setup

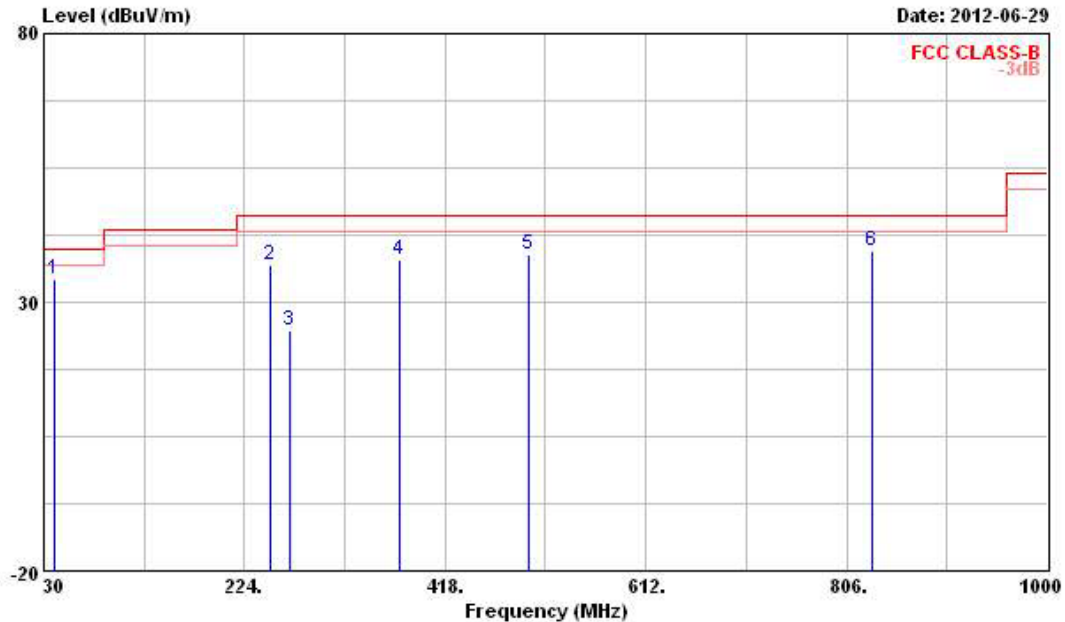


3.7.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation Mode	11N5.2G-40M	Power Level	1	Test Freq. (FX)	F2'
Operating Mode	1	Ant. No.	1,2	Polarization	H
Operating Function	Normal TX + Adapter Mode				



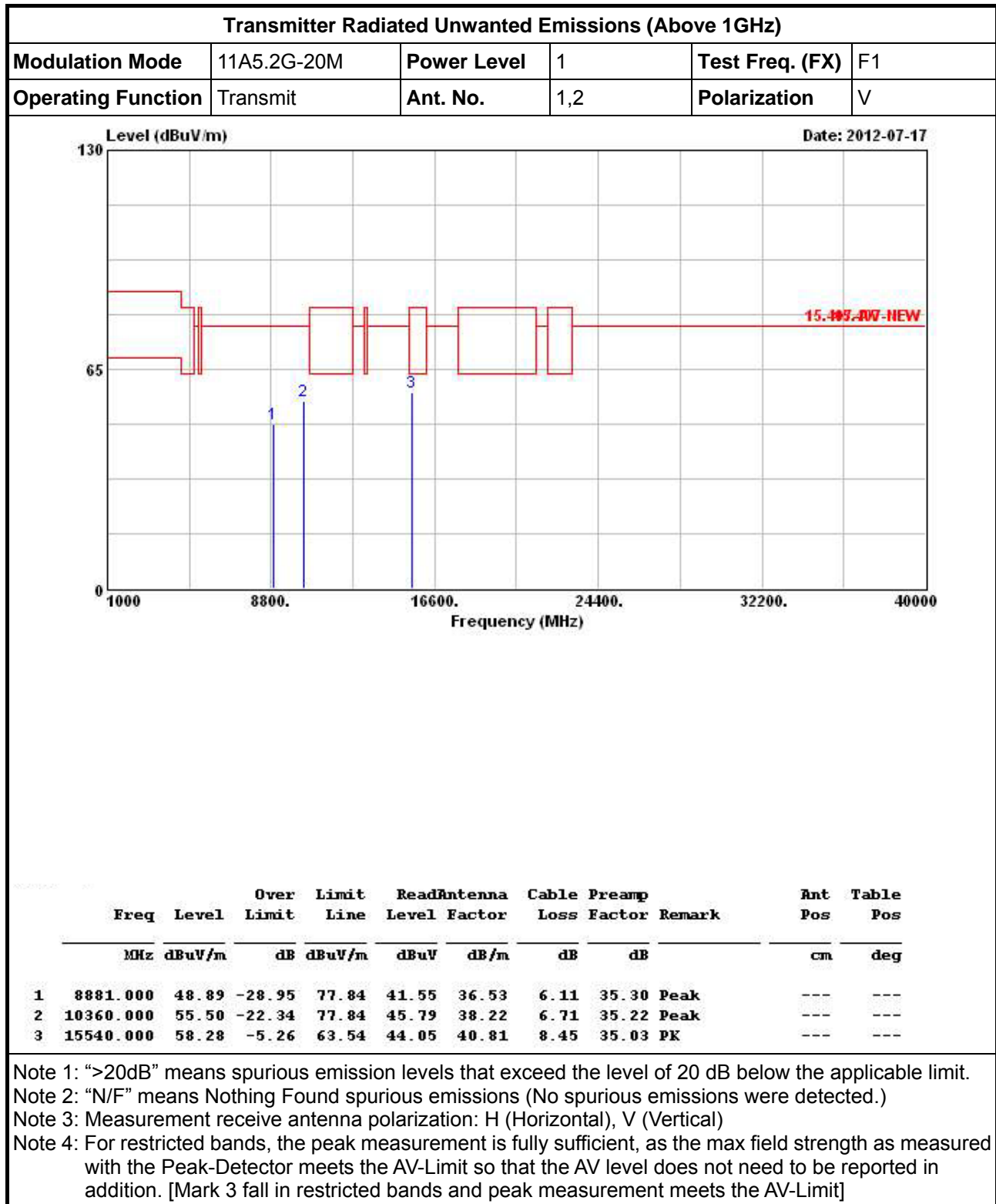
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	40.670	34.18	-5.82	40.00	48.02	13.01	1.05	27.90	Peak	---	---
2	249.220	36.87	-9.13	46.00	48.42	12.97	2.77	27.29	Peak	---	---
3	268.620	24.81	-21.19	46.00	35.94	13.26	2.85	27.24	Peak	---	---
4	374.350	37.83	-8.17	46.00	47.37	14.86	3.29	27.69	Peak	---	---
5	498.510	38.96	-7.04	46.00	46.24	17.26	3.82	28.36	Peak	---	---
6	831.220	39.59	-6.41	46.00	42.24	20.19	4.99	27.83	Peak	---	---

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

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

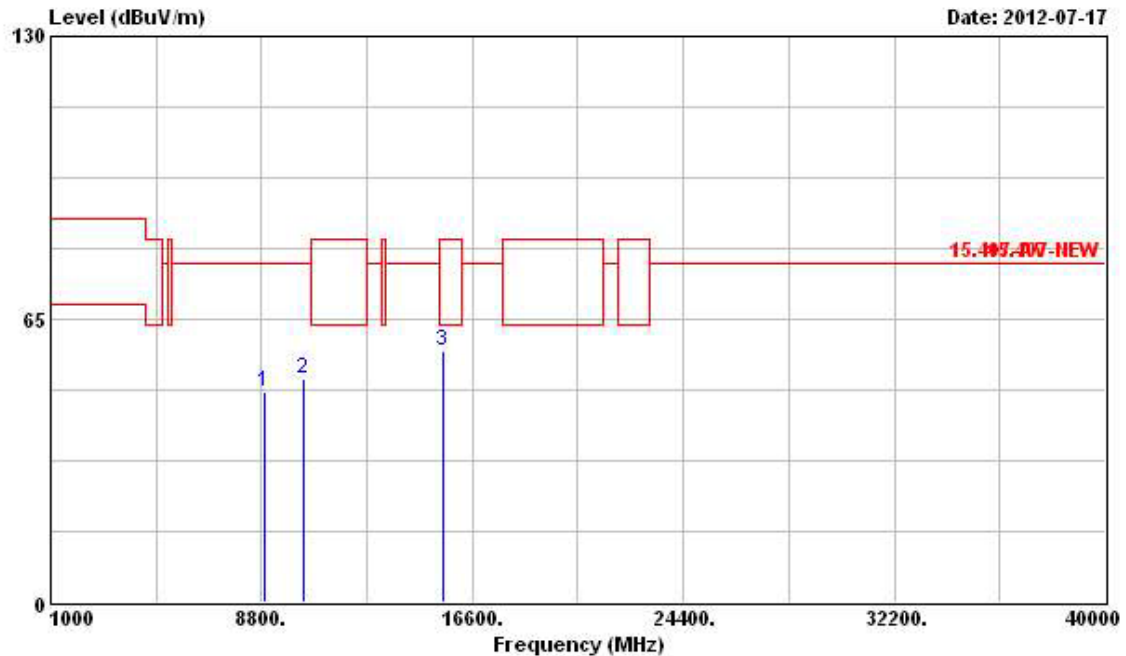
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)

3.7.6 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11A-20M



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11A5.2G-20M	Power Level	1	Test Freq. (FX)	F1
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8914.000	48.52	-29.32	77.84	41.14	36.55	6.13	35.30	Peak	---	---
2	10360.000	51.26	-26.58	77.84	41.55	38.22	6.71	35.22	Peak	---	---
3	15540.000	57.87	-5.67	63.54	43.64	40.81	8.45	35.03	PK	---	---

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

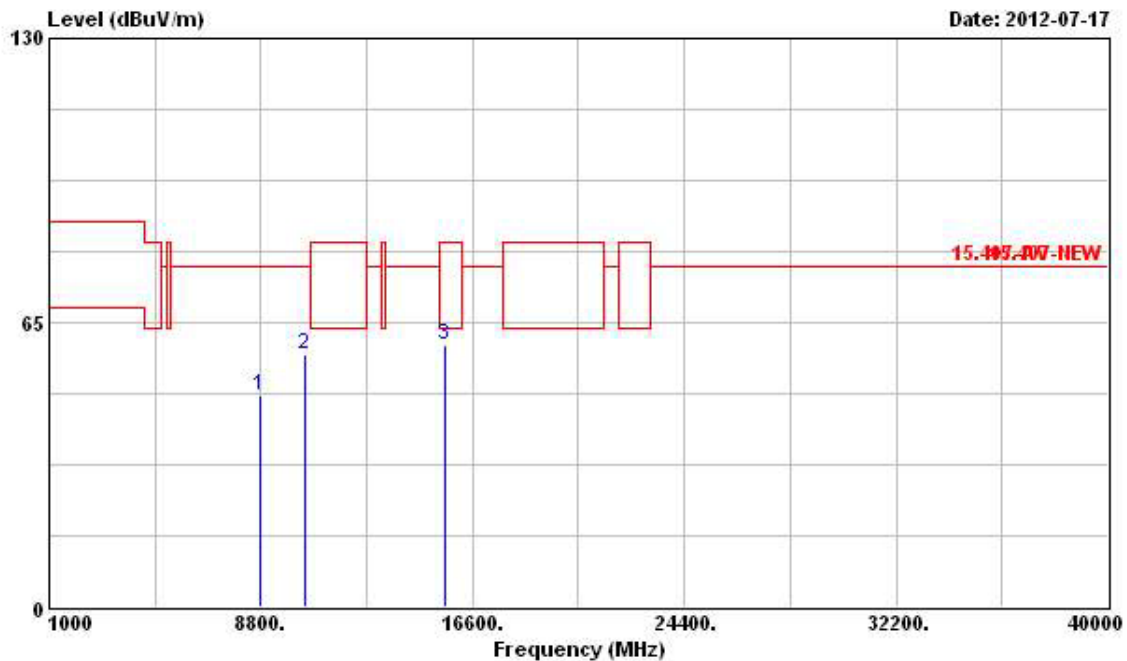
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11A5.2G-20M	Power Level	1	Test Freq. (FX)	F2
Operating Function	Transmit	Ant. No.	1,2	Polarization	V



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	8749.000	48.49	-29.35	77.84	41.26	36.45	6.06	35.28	Peak	---
2	10400.000	57.89	-19.95	77.84	48.08	38.24	6.75	35.18	Peak	---
3	15600.000	59.91	-3.63	63.54	45.72	40.84	8.45	35.10	PK	---

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

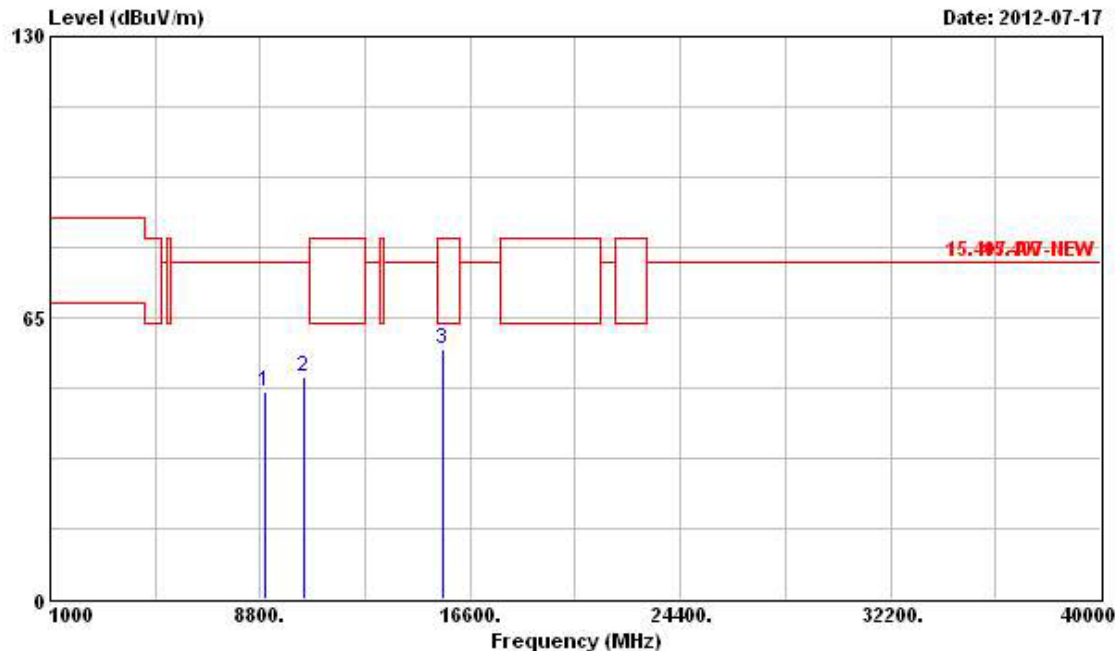
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11A5.2G-20M	Power Level	1	Test Freq. (FX)	F2
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8980.000	47.81	-30.03	77.84	40.39	36.58	6.16	35.32	Peak	---	---
2	10400.000	51.50	-26.34	77.84	41.69	38.24	6.75	35.18	Peak	---	---
3	15600.000	57.69	-5.85	63.54	43.50	40.84	8.45	35.10	PK	---	---

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

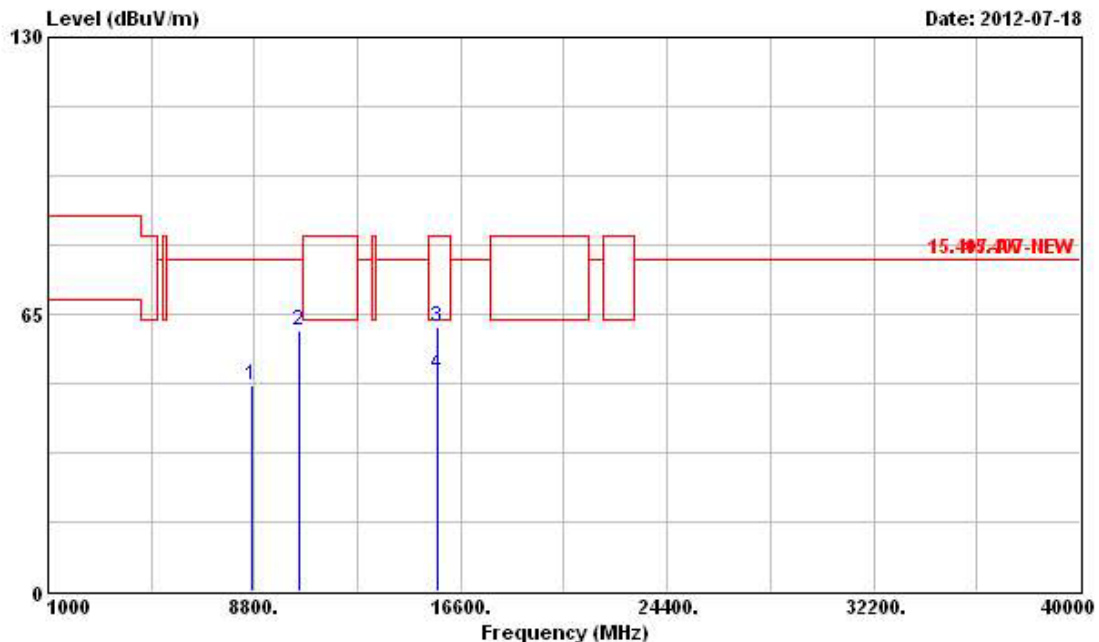
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11A5.2G-20M	Power Level	1	Test Freq. (FX)	F3
Operating Function	Transmit	Ant. No.	1,2	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8705.000	48.24	-29.60	77.84	41.05	36.42	6.04	35.27	Peak	---	---
2	10480.000	60.98	-16.86	77.84	50.99	38.29	6.82	35.12	Peak	---	---
3	15720.000	62.15	-21.39	83.54	48.00	40.89	8.46	35.20	Peak	---	---
4	15720.000	50.86	-12.68	63.54	36.71	40.89	8.46	35.20	Average	---	---

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

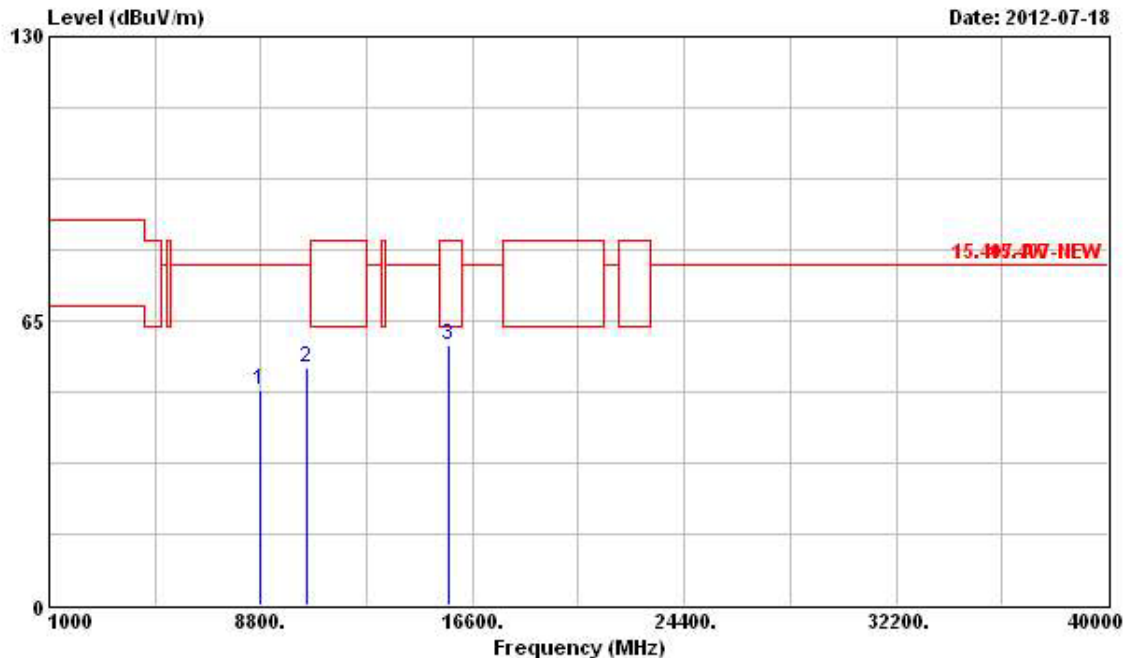
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11A5.2G-20M	Power Level	1	Test Freq. (FX)	F3
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8782.000	49.28	-28.56	77.84	42.01	36.47	6.08	35.28	Peak	---	---
2	10480.000	54.13	-23.71	77.84	44.14	38.29	6.82	35.12	Peak	---	---
3	15720.000	59.50	-4.04	63.54	45.35	40.89	8.46	35.20	PK	---	---

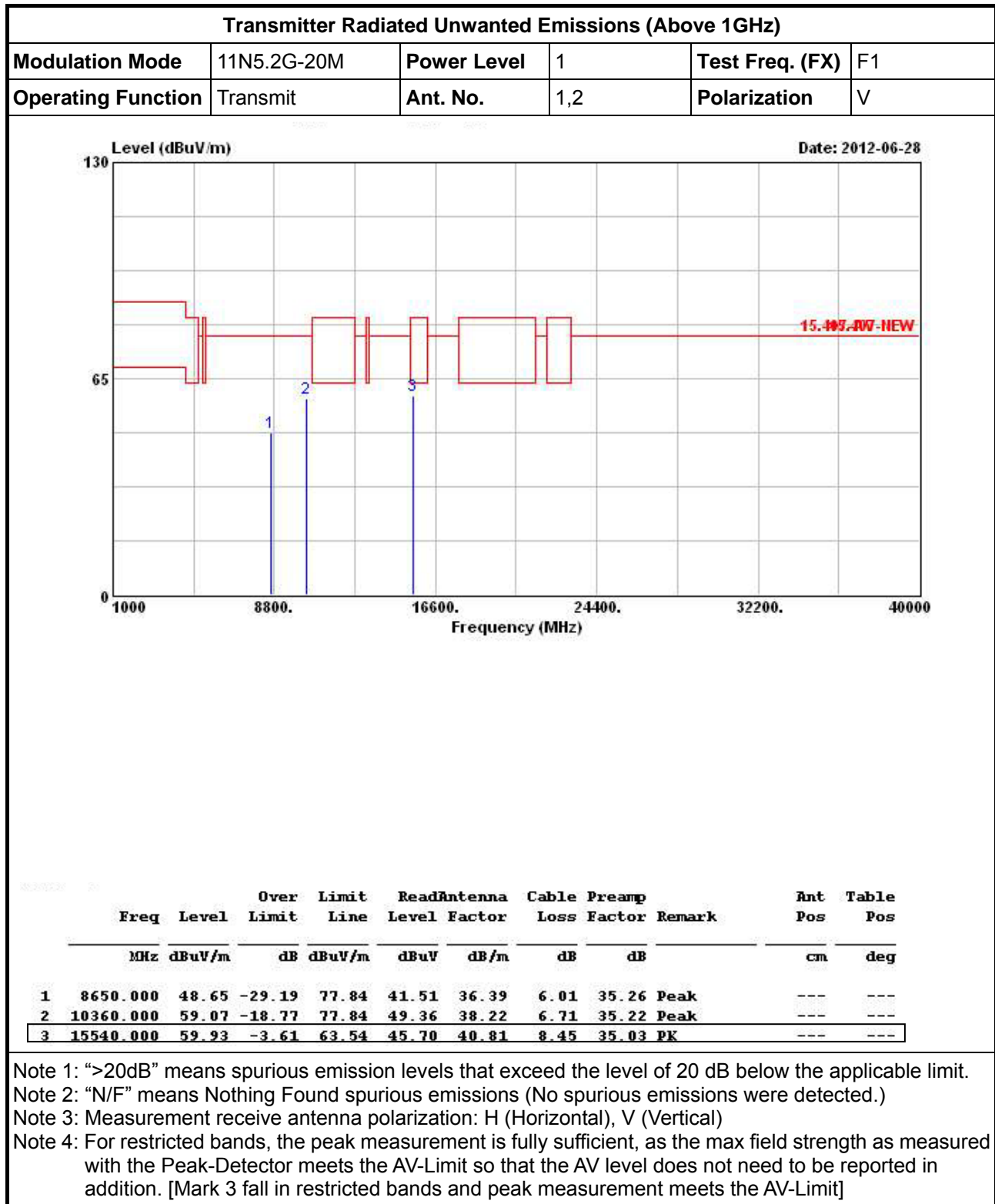
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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

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

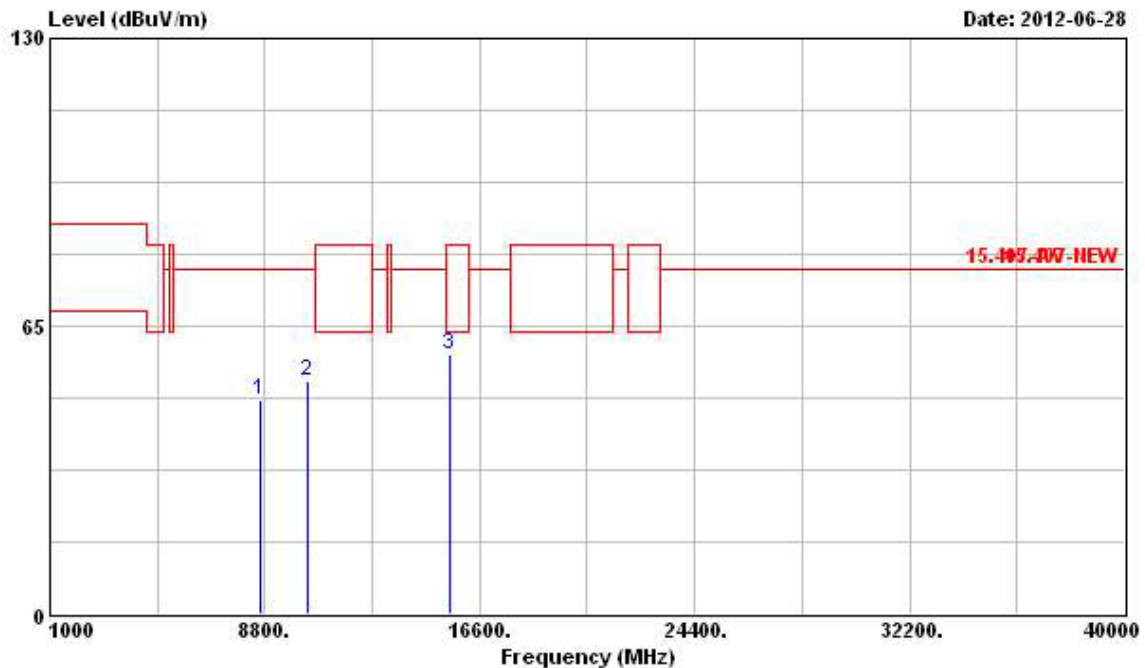
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

3.7.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11N-20M



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-20M	Power Level	1	Test Freq. (FX)	F1
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	8628.000	48.17	-29.67	77.84	41.04	36.38	6.01	35.26	Peak	---
2	10360.000	52.74	-25.10	77.84	43.03	38.22	6.71	35.22	Peak	---
3	15540.000	58.50	-5.04	63.54	44.27	40.81	8.45	35.03	PK	---

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

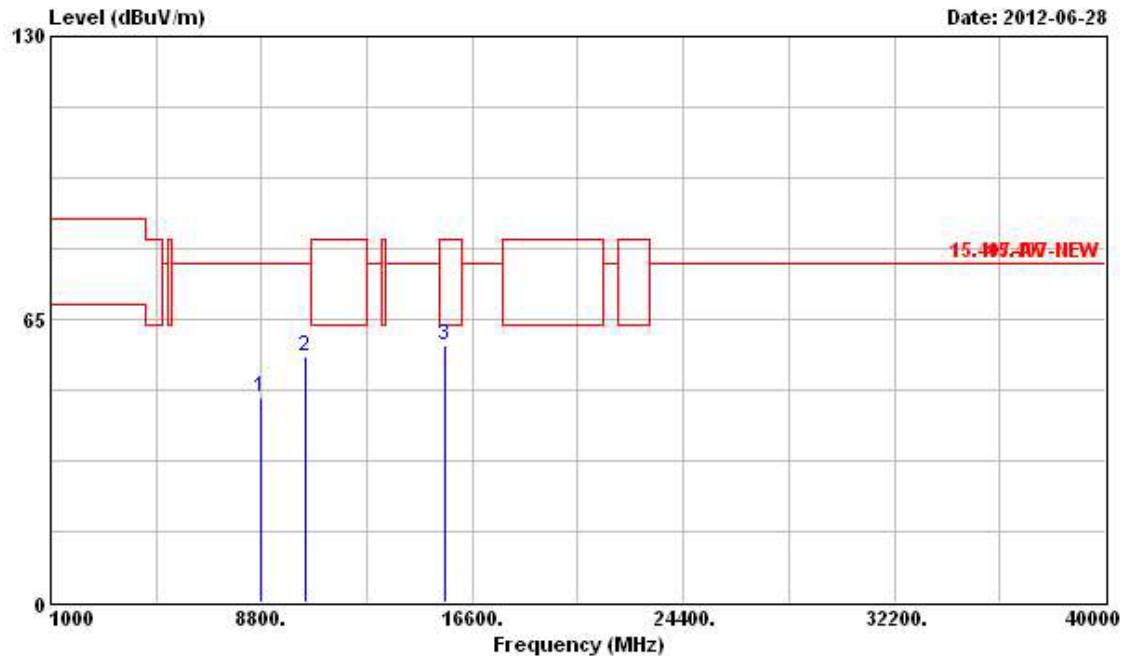
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-20M	Power Level	1	Test Freq. (FX)	F2
Operating Function	Transmit	Ant. No.	1,2	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBUV/m	dB	dBUV/m	dBuV	dB/m	dB	dB		cm	deg
1	8749.000	47.12	-30.72	77.84	39.89	36.45	6.06	35.28	Peak	---	---
2	10400.000	56.54	-21.30	77.84	46.73	38.24	6.75	35.18	Peak	---	---
3	15600.000	59.00	-4.54	63.54	44.81	40.84	8.45	35.10	PK	---	---

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

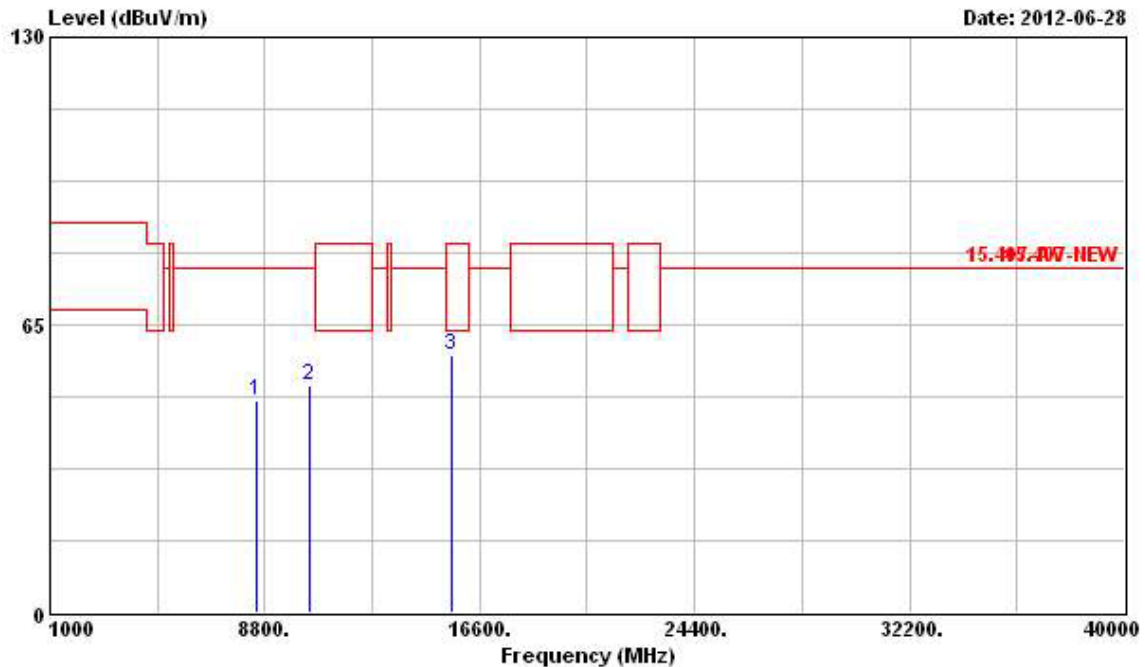
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-20M	Power Level	1	Test Freq. (FX)	F2
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Factor	Preamp Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8529.000	47.93	-29.91	77.84	40.89	36.32	5.96	35.24	Peak	---	---
2	10400.000	51.42	-26.42	77.84	41.61	38.24	6.75	35.18	Peak	---	---
3	15600.000	58.04	-5.50	63.54	43.85	40.84	8.45	35.10	PK	---	---

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

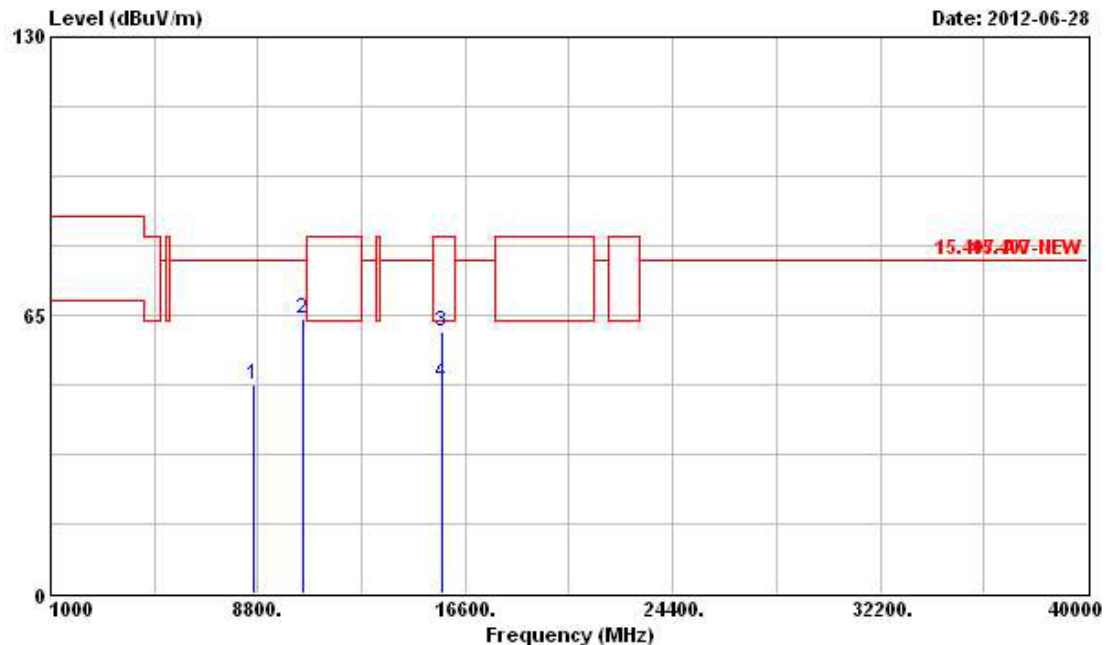
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-20M	Power Level	1	Test Freq. (FX)	F3
Operating Function	Transmit	Ant. No.	1,2	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8617.000	48.62	-29.22	77.84	41.52	36.37	5.99	35.26	Peak	---	---
2	10480.000	64.23	-13.61	77.84	54.24	38.29	6.82	35.12	Peak	---	---
3	15720.000	61.26	-22.28	83.54	47.11	40.89	8.46	35.20	Peak	---	---
4	15720.000	49.22	-14.32	63.54	35.07	40.89	8.46	35.20	Average	---	---

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

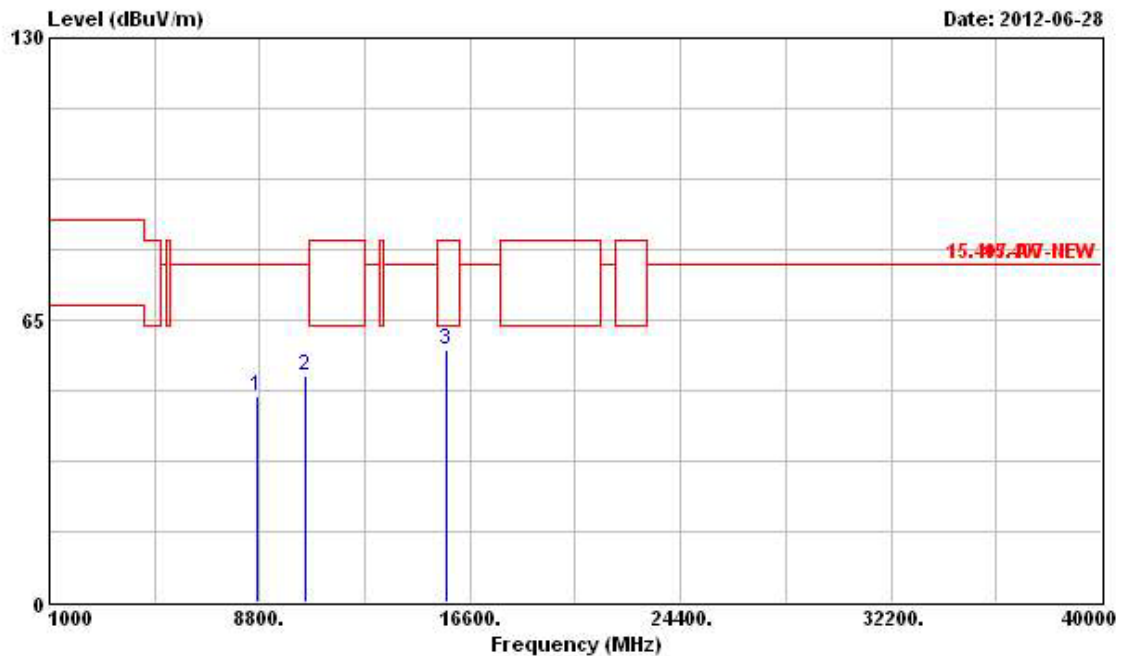
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-20M	Power Level	1	Test Freq. (FX)	F3
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8683.000	47.44	-30.40	77.84	40.28	36.41	6.02	35.27	Peak	---	---
2	10480.000	52.00	-25.84	77.84	42.01	38.29	6.82	35.12	Peak	---	---
3	15720.000	57.97	-5.57	63.54	43.82	40.89	8.46	35.20	PK	---	---

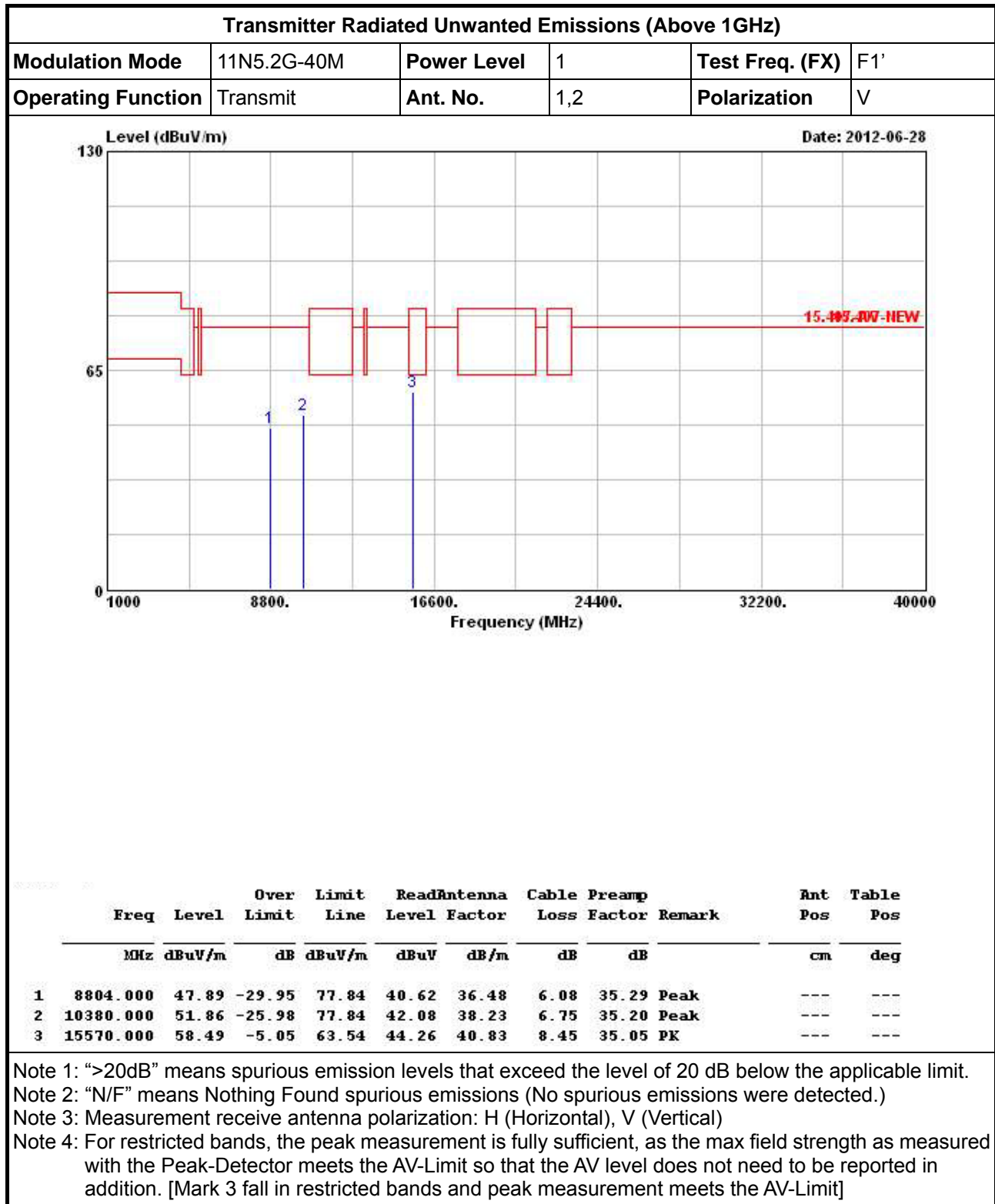
Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.

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

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

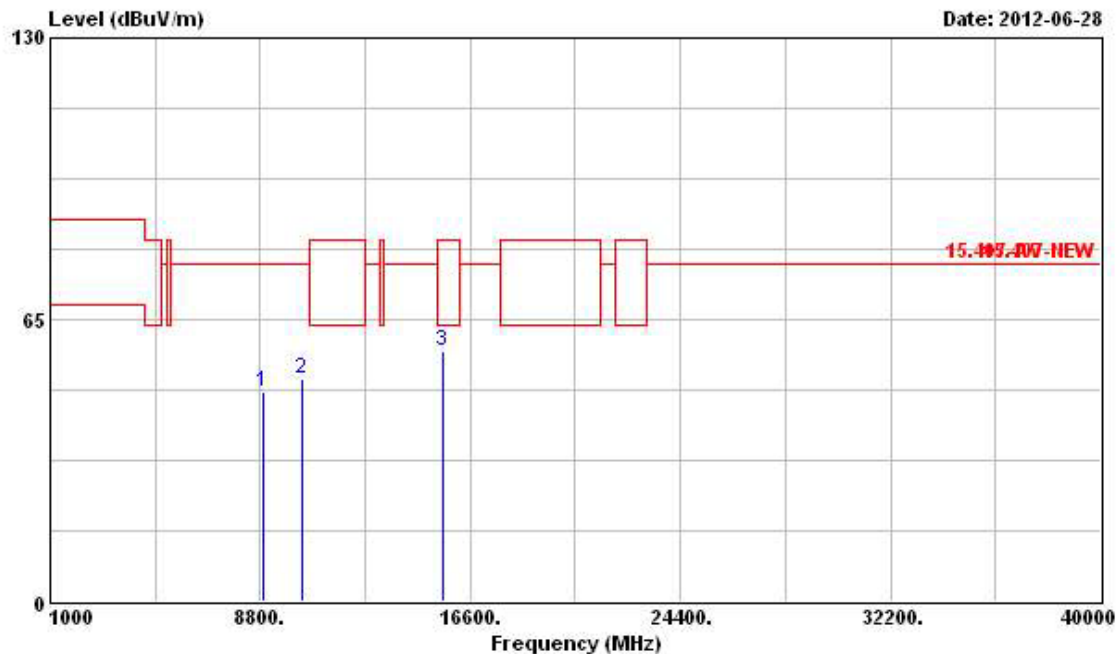
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

3.7.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11N-40M



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-40M	Power Level	1	Test Freq. (FX)	F1'
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8936.000	48.27	-29.57	77.84	40.89	36.56	6.13	35.31	Peak	---	---
2	10380.000	51.39	-26.45	77.84	41.61	38.23	6.75	35.20	Peak	---	---
3	15570.000	57.65	-5.89	63.54	43.42	40.83	8.45	35.05	PK	---	---

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

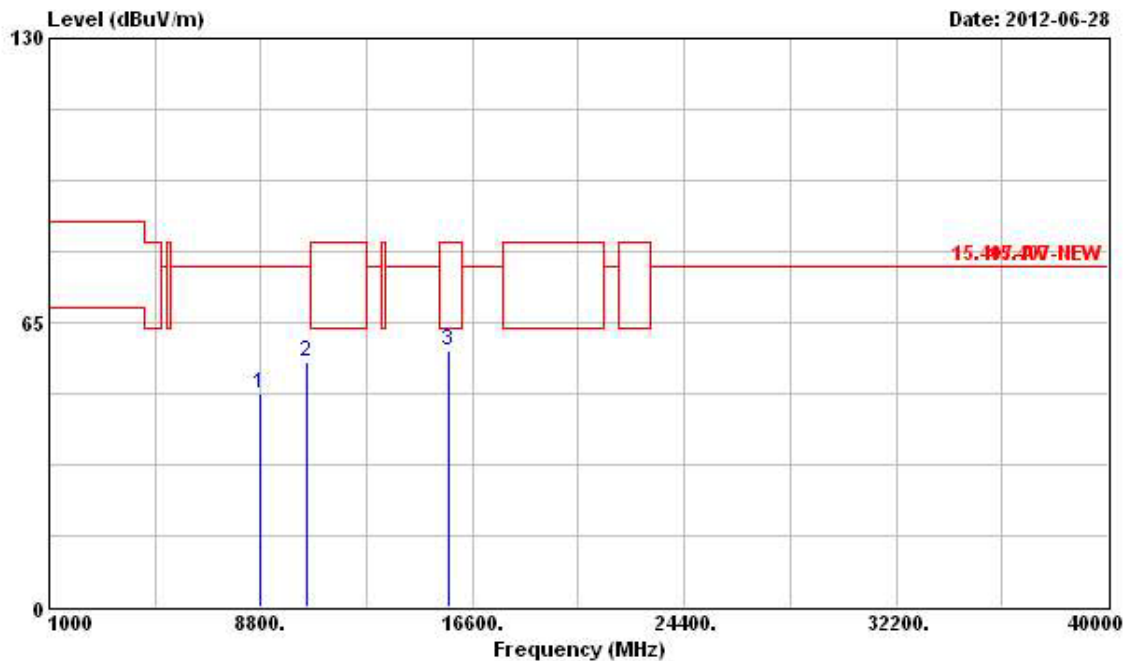
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-40M	Power Level	1	Test Freq. (FX)	F2'
Operating Function	Transmit	Ant. No.	1,2	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8749.000	48.86	-28.98	77.84	41.63	36.45	6.06	35.28	Peak	---	---
2	10460.000	55.82	-22.02	77.84	45.87	38.27	6.82	35.14	Peak	---	---
3	15690.000	58.51	-5.03	63.54	44.35	40.88	8.46	35.18	PK	---	---

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

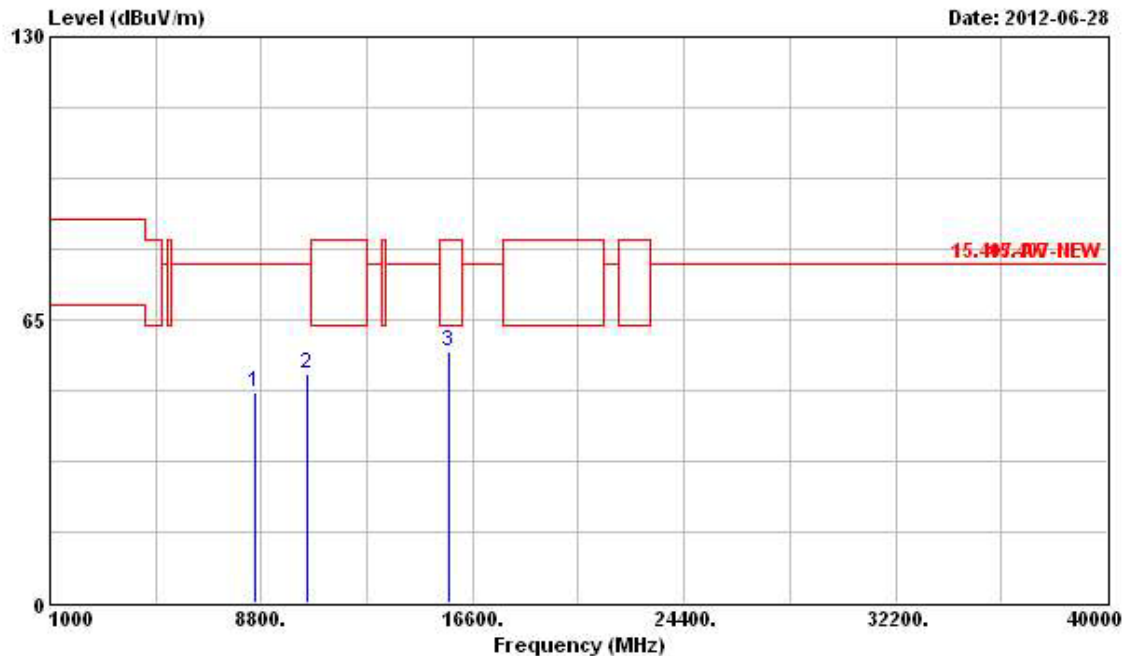
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11N5.2G-40M	Power Level	1	Test Freq. (FX)	F2'
Operating Function	Transmit	Ant. No.	1,2	Polarization	H



Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Ant	Table
MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos
		dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	8573.000	48.49	-29.35	77.84	41.43	36.34	5.97	35.25	Peak
2	10460.000	52.72	-25.12	77.84	42.77	38.27	6.82	35.14	Peak
3	15690.000	57.86	-5.68	63.54	43.70	40.88	8.46	35.18	PK

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

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

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

Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition. [Mark 3 fall in restricted bands and peak measurement meets the AV-Limit]

3.8 Frequency Stability

3.8.1 Frequency Stability Limit

Frequency Stability Limit	
UNII Devices	
<input checked="" type="checkbox"/>	In-band emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.
LE-LAN Devices	
<input checked="" type="checkbox"/>	N/A
IEEE Std. 802.11n-2009	
<input checked="" type="checkbox"/>	The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band and ± 25 ppm maximum for the 2.4 GHz band.

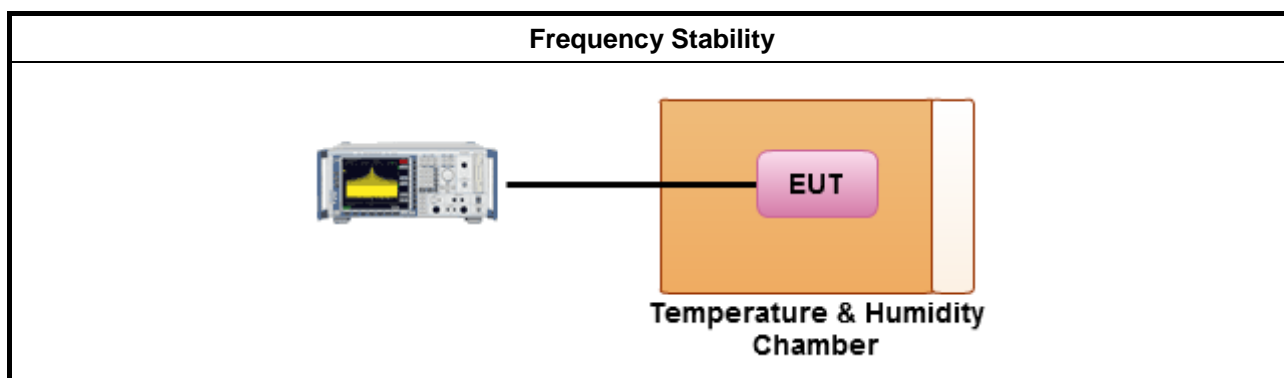
3.8.2 Measuring Instruments

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

3.8.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
<input checked="" type="checkbox"/>	Frequency stability with respect to ambient temperature
<input checked="" type="checkbox"/>	Frequency stability when varying supply voltage
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	For conducted measurements on devices with multiple transmit chains: Measurements need only to be performed on one of the active transmit chains (antenna outputs)
<input type="checkbox"/>	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.8.4 Test Setup



3.8.5 Test Result of Frequency Stability

Frequency Stability Result						
Power Level	1	Frequency Stability (ppm)				
Condition	Freq. (MHz)	0 min	2 min	5 min	10 min	Limit
T _{20°C} Vmax	5200	-2.65	-2.77	-3.12	-3.23	20.0
T _{20°C} Vmin	5200	-2.65	-2.77	-3.12	-3.23	20.0
T _{50°C} Vnom	5200	-4.96	-5.08	-4.73	-4.38	20.0
T _{40°C} Vnom	5200	-5.77	-5.77	-5.65	-5.65	20.0
T _{30°C} Vnom	5200	-4.27	-4.38	-4.85	-5.08	20.0
T _{20°C} Vnom	5200	-2.65	-2.77	-3.12	-3.23	20.0
T _{10°C} Vnom	5200	-1.73	-2.08	-2.19	-2.42	20.0
T _{0°C} Vnom	5200	-0.12	-0.23	-0.35	-0.46	20.0
T _{-10°C} Vnom	5200	0.46	0.35	0.23	0.23	20.0
T _{-20°C} Vnom	5200	0.69	0.58	0.69	0.69	20.0
Result		Complied				
Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom]. The nominal voltage refer test report clause 1.1.5 for EUT operational condition.						

4 Test Equipment and Calibration Data

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9 kHz ~ 2.75 GHz	Mar. 23, 2012	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Feb. 08, 2012	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9 kHz ~ 30 MHz	Apr. 20, 2012	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	CB049	9 kHz ~ 30 MHz	Apr. 25, 2012	Conduction (CO04-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP 40	100305	9 KHz ~ 40 GHz	Feb. 21, 2012	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20~100℃	Dec. 07, 2011	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100302	10MHz ~ 40GHz	Nov. 22, 2011	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Jan. 12, 2012	Conducted (TH01-HY)
RF Cable-1m	Jye Bao	RG142	CB034-1m	20 MHz ~ 7 GHz	Dec. 03, 2011	Conducted (TH01-HY)
RF Cable-2m	Jye Bao	RG142	CB035-2m	20 MHz ~ 1 GHz	Dec. 03, 2011	Conducted (TH01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Jun. 09, 2011*	Conducted (TH01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100593	9kHz ~ 40GHz	Sep. 01, 2011	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 10, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 23, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	Aug. 06, 2012	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz ~ 18GHz	Nov. 15, 2011	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Nov. 11, 2011	Radiation (03CH02-HY)
RF Cable-high	SUHNER	SUCOFLEX106	03CH02-HY	1GHz ~ 40GHz	Mar. 06, 2012	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 22, 2011	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 ~ 4 m	N/A	Radiation (03CH02-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	Teseq	HLA 6120	24155	9 kHz ~ 30 MHz	Sep. 09, 2010*	Radiation (03CH02-HY)

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

5 Certification of TAF Accreditation



Certificate No. : L1190-120405

財團法人全國認證基金會
Taiwan Accreditation Foundation


Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,
Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria : ISO/IEC 17025:2005
Accreditation Number : 1190
Originally Accredited : December 15, 2003
Effective Period : January 10, 2010 to January 09, 2013
Accredited Scope : Testing Field, see described in the Appendix
Specific Accreditation Program : Accreditation Program for Designated Testing Laboratory for Commodities Inspection
Accreditation Program for Telecommunication Equipment Testing Laboratory
Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities


Jay-San Chen
President, Taiwan Accreditation Foundation
Date: April 05, 2012

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