FCC Test Report

Equipment	:	**5G Wireless Audio Transceiver Module ; 5G Wireless Audio Receiver Module**
Brand Name	:	**AMTRAN**
Model No.	:	**WLL7010-D113 ; WLL7011-D113**
FCC ID	:	**MDZ-WLL701X**
Standard	:	**47 CFR FCC Part 15.407**
Operating Band	:	**5725 MHz – 5825 MHz**
Equipment Class	:	**NII**
Applicant	:	**Amtran Technology Co. Ltd 17F, No. 268, Lien Chen Rd. Chung Ho City, Taipei County 235 Taiwan**
Manufacturer	:	**Askey Computer Corp. 10F, No. 119, Chienkang Rd., Chung-Ho, Taiwan, R.O.C.** **ASKEY TECHNOLOGY (JIANG SU) LTD. No. 1388, Jiao Tong Road, Wujiang Economic-Technological Development Area, Jiangsu Province, P.R. China**

The product sample received on Jan. 28, 2013 and completely tested on Feb. 04, 2013. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

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

Reviewed by:

Wayne Hsu / Assistant Manager

Testing Laboratory 1190

Table of Contents

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	[dBuV]: 0.1815220MHz 32.00 (Margin 22.42dB) - AV 54.20 (Margin 10.22dB) - QP	FCC 15.207	Complied
3.2	15.407(a)	Emission Bandwidth	Bandwidth [MHz] 20M: 16.65	Information only	Complied
3.3	15.407(a)	RF Output Power (Maximum Conducted Output Power)	Power [dBm] 5725-5825MHz: 10.65	Power [dBm] 5150-5250MHz:17	Complied
3.4	15.407(a)	Peak Power Spectral Density	PPSD [dBm/MHz] 5725-5825MHz: 1.23	PPSD [dBm/MHz] 5150-5250MHz:4	Complied
3.5	15.407(a)	Peak Excursion	4.00 dB	13 dB	Complied
3.6	15.407(b)	Transmitter Radiated Bandedge Emissions	[dBuV/m at 1m]: 5711.52MHz 69.64 (Margin 8.20dB) - PK	Non-Restricted Bands: ≤ -27dBm (68.3dBuV/m@3m) Restricted Bands: FCC 15.209	Complied
3.7	15.407(b)	Transmitter Radiated Unwanted Emissions	[dBuV/m at 3m]: 40.670MHz 27.89 (Margin 12.11dB) - PK	Non-Restricted Bands: ≤ -27dBm (68.3dBuV/m@3m) Restricted Bands: FCC 15.209	Complied
3.8	15.407(g)	Frequency Stability	6.54 ppm	Signal shall remain in-band	Complied

Revision History

Report No.	Version	Description	Issued Date
FR2N2126-01	Rev. 01	Initial issue of report	Feb. 07, 2013

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information					
Frequency Range (MHz)	**IEEE Std. 802.11**	**Ch. Freq. (MHz)**	**Channel Number**	**Transmit Chains (N_{TX})**	**RF Output Power (dBm)**
5725-5825	a	5736, 5762, 5814	3	1	10.65
Note 1: RF output power specifies that Maximum Conducted Output Power. Note 2: 802.11a uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.					

1.1.2 Antenna Information

Antenna Category	
☒	External antenna (dedicated antennas)
	☒ Single power level with corresponding antenna(s).
	☐ Multiple power level and corresponding antenna(s).
	☐ RF connector provided
	☐ Unique antenna connector. (e.g., MMCX, U.FL, IPX, and RP-SMA, RP-N type…)
	☐ Standard antenna connector. (e.g., SMA, N, BNC, and TNC type…)

Antenna General Information			
No.	**Ant. Cat.**	**Ant. Type**	**Gain (dBi)**
1	Integral	PCB	5.36

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	☐ Production ; ☐ Pre-Production ; ☒ Prototype

Type of EUT	
☒	Stand-alone
☐	Combined (EUT where the radio part is fully integrated within another device) Combined Equipment - Brand Name / Model No.: …
☐	Plug-in radio (EUT intended for a variety of host systems) Host System - Brand Name / Model No.: …
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☐ Operated normally mode for worst duty cycle	
☒ Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	**Power Duty Factor [dB] – (10 log 1/x)**
☒ 100% - IEEE 802.11a	0

1.1.5 EUT Operational Condition

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

1.2 Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**Serial No.**
1	Test Fixture	-	-	-
2	AC Adapter	AMIGO	AMS9-0502000FU2	-

Reminder: The support equipment provide by customer.

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
- FCC KDB 662911
- FCC KDB 412172

1.4 Testing Location Information

Testing Location						
☒	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**	
RF Conducted		TH01-HY	Ian Lee	24.6°C / 42%	28-Jan-13 31-Jan-13	
AC Conduction		CO04-HY	Bill Hsiao	24.5°C / 51%	04-Feb-13	
Radiated Emission		03CH02-HY	Daniel Hsu	22.8°C / 52%	30-Jan-13	

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

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing					
Frequency Band	**Modulation Mode**	**Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Worst Data Rate / MCS**	**RF Output Power (dBm)**
5.8G	11a	1	6-54Mbps	6 Mbps	10.65

2.2 Test Channel Frequencies Configuration

Test Channel Frequencies Configuration		
Frequency Range (MHz)	**IEEE Std. 802.11**	**Test Channel Freq. (MHz) – FX (Frequencies Abbreviations)**
5725-5825	a	5736-(F10), 5762-(F11), 5814-(F12)

2.3 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter	
Test Software Version	Transmitter continuous
Modulation Mode of Power Setting for 20MHz Channel Bandwidth	
Frequency (MHz)	**11a**
5736	Default
5762	Default
5814	Default

2.4 The Worst Case Measurement Configuration

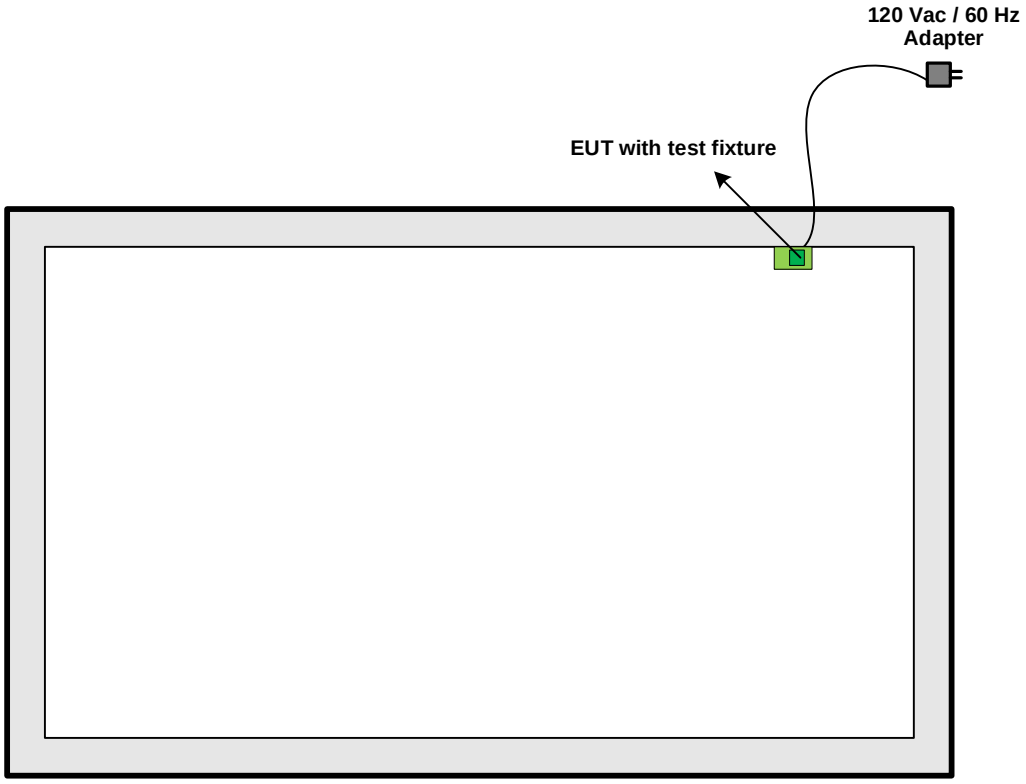
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	AC Power & Radio link (WLAN)

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
Modulation Mode	11a

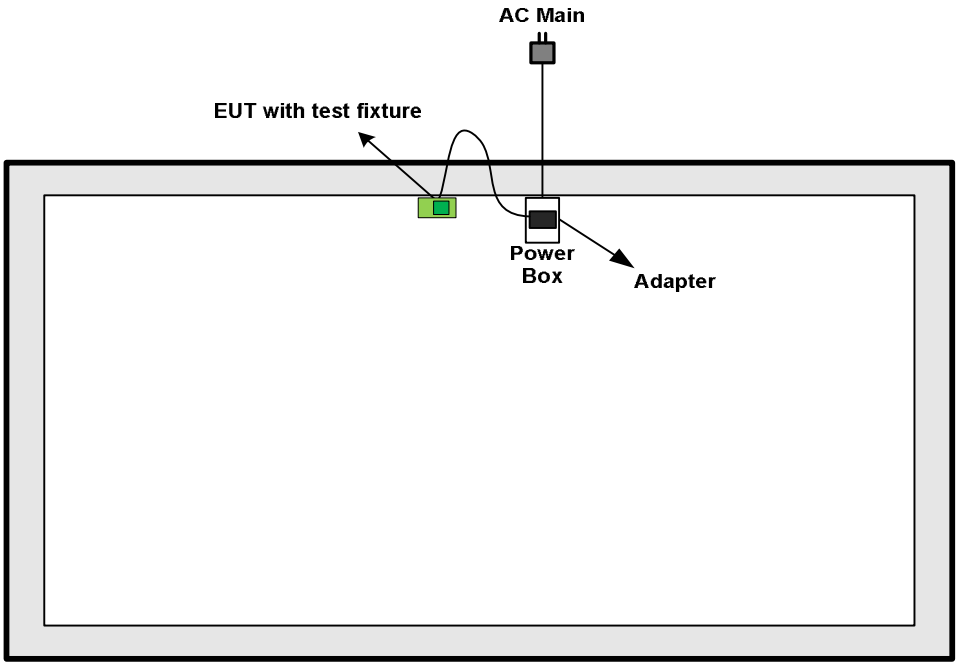
The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted Emissions Transmitter Radiated Bandedge Emissions		
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.		
User Position	☐ EUT will be placed in fixed position.		
	☒ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. The worst planes is Z.		
	☐ 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	☒ 1. AC Power & Radio link (WLAN)		
Modulation Mode	11a		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
			

2.5 Test Setup Diagram

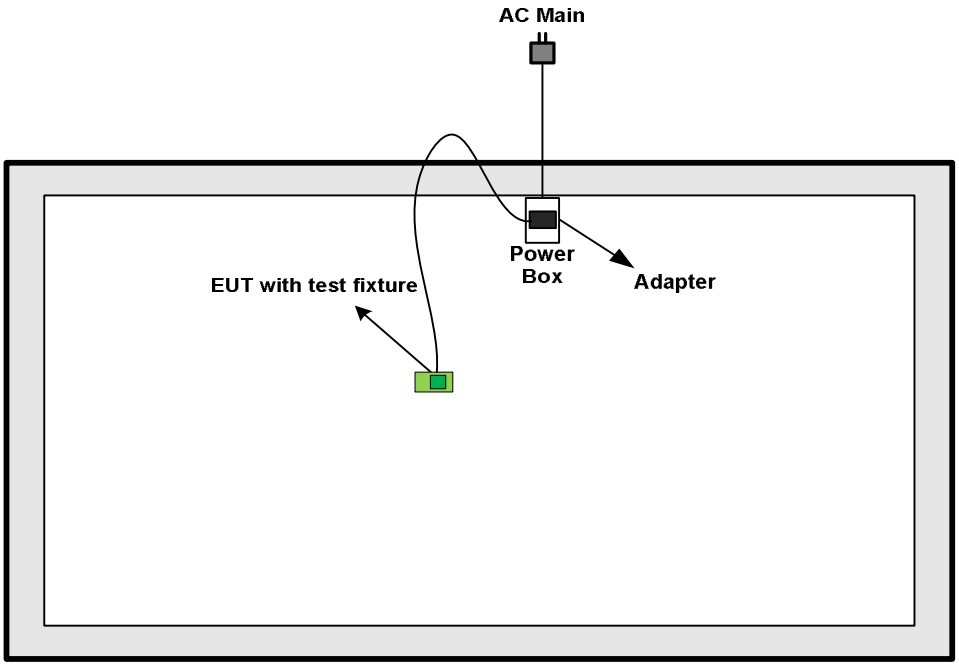
Test Setup Diagram – AC Line Conducted Emission Test	
Operating Mode 1	AC Power & Radio link (WLAN)



Test Setup Diagram - Radiated Test Below 1GHz	
Operating Mode 1	AC Power & Radio link (WLAN)



Test Setup Diagram - Radiated Test Above 1GHz	
Operating Mode 1	AC Power & Radio link (WLAN)



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

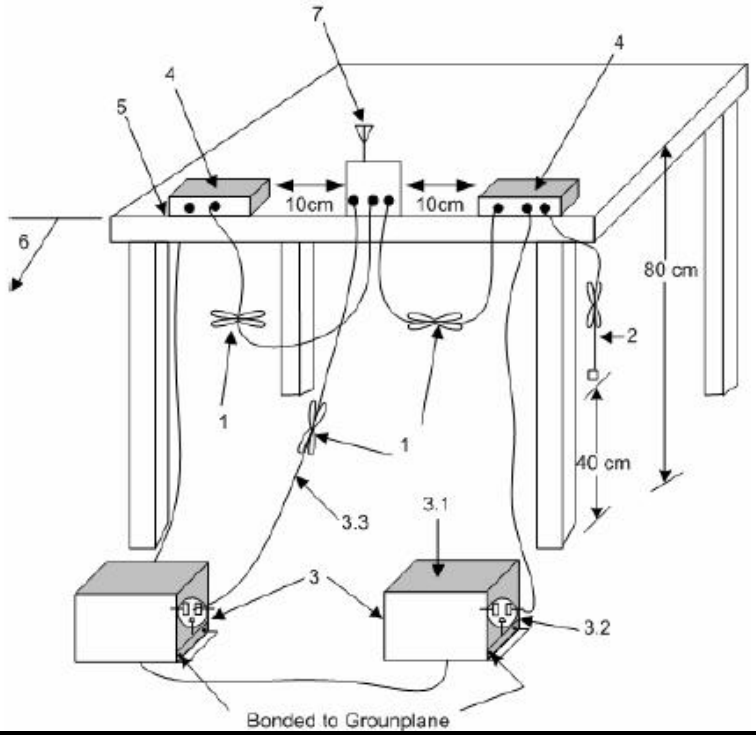
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

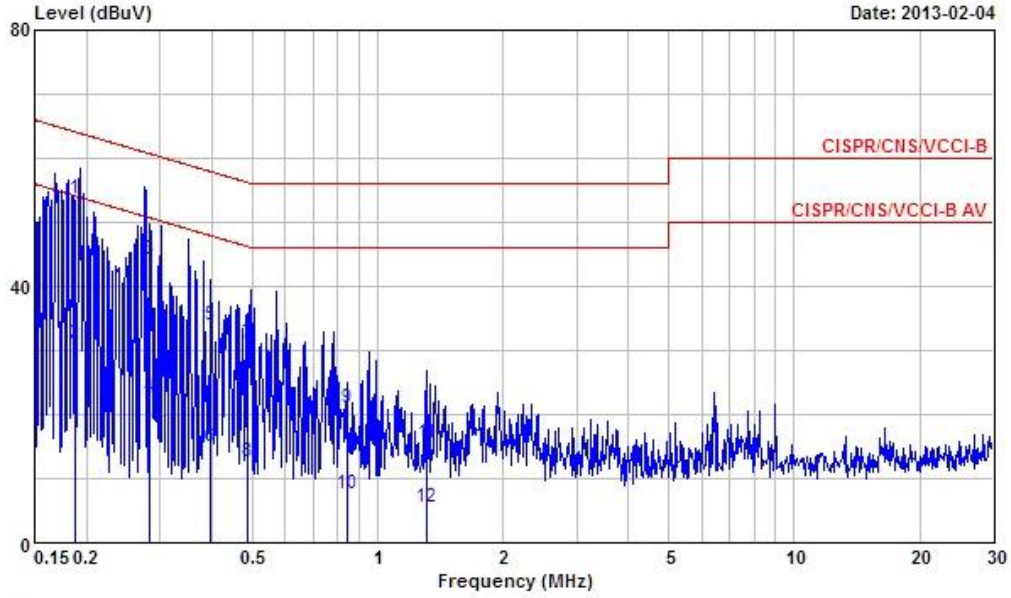
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

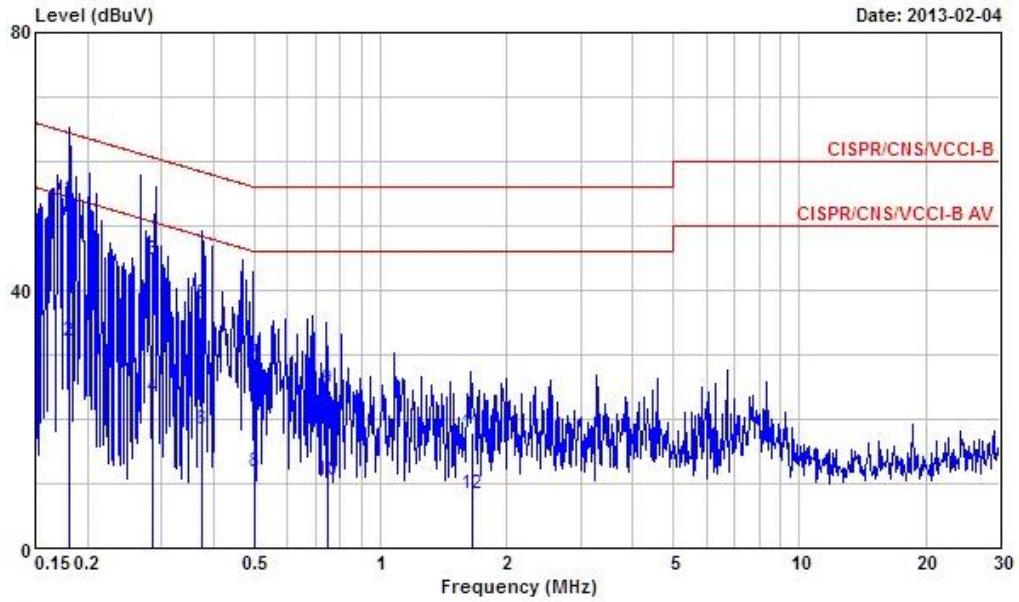
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	AC Power & Radio link (WLAN)		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1874380	53.77	-10.38	64.15	53.66	0.11	0.00	QP
2	0.1874380	31.15	-23.00	54.15	31.04	0.11	0.00	Average
3	0.2824160	44.12	-16.62	60.74	44.01	0.11	0.00	QP
4	0.2824160	22.61	-28.13	50.74	22.50	0.11	0.00	Average
5	0.3980120	34.04	-23.85	57.89	33.94	0.10	0.00	QP
6	0.3980120	15.03	-32.86	47.89	14.93	0.10	0.00	Average
7	0.4867340	31.11	-25.11	56.22	30.99	0.10	0.02	QP
8	0.4867340	12.61	-33.61	46.22	12.49	0.10	0.02	Average
9	0.8474520	21.15	-34.85	56.00	20.96	0.11	0.08	QP
10	0.8474520	7.70	-38.30	46.00	7.51	0.11	0.08	Average
11	1.316	15.57	-40.43	56.00	15.35	0.12	0.10	QP
12	1.316	5.55	-40.45	46.00	5.33	0.12	0.10	Average

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

AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Line
Operating Function	AC Power & Radio link (WLAN)		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	@0.1815220	54.20	-10.22	64.42	53.97	0.23	0.00	QP
2	0.1815220	32.00	-22.42	54.42	31.77	0.23	0.00	Average
3	0.2852410	44.77	-15.89	60.66	44.55	0.22	0.00	QP
4	0.2852410	23.52	-27.14	50.66	23.30	0.22	0.00	Average
5	0.3731370	37.80	-20.63	58.43	37.58	0.22	0.00	QP
6	0.3731370	18.44	-29.99	48.43	18.22	0.22	0.00	Average
7	0.5000000	28.59	-27.41	56.00	28.35	0.22	0.02	QP
8	0.5000000	11.85	-34.15	46.00	11.61	0.22	0.02	Average
9	0.7490230	24.73	-31.27	56.00	24.43	0.23	0.07	QP
10	0.7490230	10.55	-35.45	46.00	10.25	0.23	0.07	Average
11	1.656	17.77	-38.23	56.00	17.43	0.24	0.10	QP
12	1.656	8.34	-37.66	46.00	8.00	0.24	0.10	Average

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

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth (EBW) Limit

Emission Bandwidth (EBW) Limit	
UNII Devices	
☐	For the 5.15-5.25 GHz band, the maximum conducted output power shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
☐	For the 5.25-5.35 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
☐	For the 5.47-5.725 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
☒	For the 5.725-5.825 GHz band, the maximum conducted output power shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz
LE-LAN Devices	
☐	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.
☐	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
☐	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
☒	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.

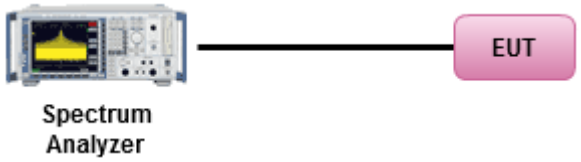
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method			
☒	For the emission bandwidth shall be measured using one of the options below:		
	☒	Refer as FCC KDB 789033, clause D for EBW measurement.	
	☐	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.	
	☒	Refer as IC RSS-Gen, clause 4.6 for bandwidth testing.	
☒	For conducted measurement.		
	☒	The EUT supports single transmit chain and measurements performed on this transmit chain.	
	☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.	
	☐	The EUT supports multiple transmit chains using options given below:	
		☐	Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
		☐	Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.

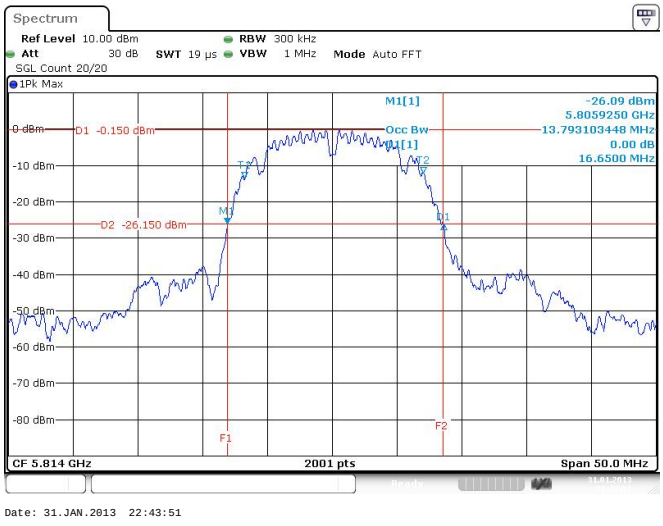
3.2.4 Test Setup

Emission Bandwidth


3.2.5 Test Result of Emission Bandwidth

UNII Emission Bandwidth Result (5725-5825MHz band)												
Condition			Emission Bandwidth (MHz)									
Modulation Mode	N_{TX}	Freq. (MHz)	99% Bandwidth				26dB Bandwidth				Power Limit	
			Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	99% BW	26dB BW
11a	1	5736	13.81	-	-	-	16.62	-	-	-	28.40	29.21
11a	1	5762	13.81	-	-	-	16.57	-	-	-	28.40	29.19
11a	1	5814	13.79	-	-	-	16.65	-	-	-	28.40	29.21
Result			Complied									

Worst Emission Bandwidth Plots
11a – F12 [Port 1]



3.3 RF Output Power

3.3.1 RF Output Power Limit

Maximum Conducted Output Power Limit	
UNII Devices	
☐	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 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If G_{TX} > 6 dBi, then P_{Out} = 17 – (G_{TX} – 6).
☐	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 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6).
☐	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 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If G_{TX} > 6 dBi, then P_{Out} = 24 – (G_{TX} – 6).
☒	For the 5.725-5.825 GHz band:
☒	Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If G_{TX} > 6 dBi, then P_{Out} = 30 – (G_{TX} – 6).
☐	Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If G_{TX} > 23 dBi, then P_{Out} = 30 – (G_{TX} – 23).
LE-LAN Devices	
☐	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.
☐	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
☐	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
☒	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.
☒	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.
☐	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.	

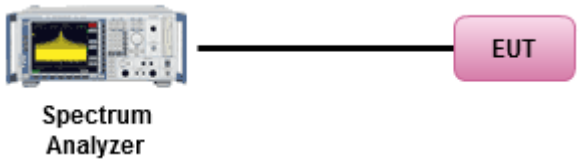
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
☒	Maximum Conducted Output Power
	[duty cycle ≥ 98% or external video / power trigger]
	☒ Refer as FCC KDB 789033, clause C Method SA-1 (spectral trace averaging).
	☐ 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 FCC KDB 789033, clause C Method SA-2 (spectral trace averaging).
	☐ Refer as FCC KDB 789033, clause C Method SA-2 Alt. (RMS detection with slow sweep speed)
	Wideband RF power meter and average over on/off periods with duty factor
	☐ Refer as FCC KDB 789033, clause C Method PM (using an RF average power meter).
☒	For conducted measurement.
	☒ The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐ The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	☐ The EUT supports multiple transmit chains using options given below: Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
	☐ If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \ldots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup

RF Output Power (Spectrum Analyzer)


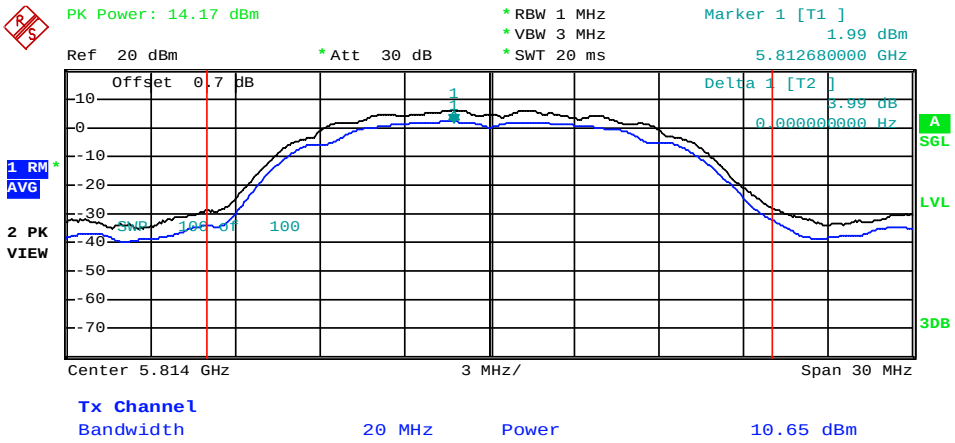
RF Output Power (Power Meter)


3.3.5 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power (5725-5825MHz band)											
Condition			RF Output Power (dBm)								
Modulation Mode	N_{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11a	1	5736	8.37	-	-	-	8.37	29.21	5.36	13.73	34.40
11a	1	5762	8.88	-	-	-	8.88	29.19	5.36	14.24	34.40
11a	1	5814	10.65	-	-	-	10.65	29.21	5.36	16.01	34.40
Result			Complied								

Worst RF Output Power and Peak Excursion Plots

11a – F12 [Port 1]



Date: 28.JAN.2013 21:38:22

3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit	
UNII Devices	
☐	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).
☐	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).
☐	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).
☒	For the 5.725-5.825 GHz band:
☒	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).
☐	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	
☐	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.
☐	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.
☐	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.
☒	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.
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 **G_{TX}** = the maximum transmitting antenna directional gain in dBi.	

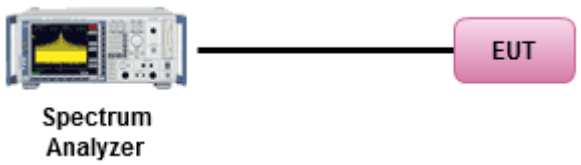
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

Test Method		
☒	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 ≥ 98% or external video / power trigger]	
	☒	Refer as FCC KDB 789033, clause C Method SA-1 (spectral trace averaging).
	☐	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 FCC KDB 789033, clause C Method SA-2 (spectral trace averaging).
	☐	Refer as FCC KDB 789033, clause C Method SA-2 Alt. (RMS detection with slow sweep speed)
☒	For conducted measurement.	
	☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	☐	The EUT supports multiple transmit chains using options given below:
		☐ Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power 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.
		☐ 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.
	☐	If multiple transmit chains, EIRP PPSD calculation could be following as methods: $PPSD_{total} = PPSD_1 + PPSD_2 + \ldots + PPSD_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = PPSD_{total} + DG$
	☐	Each individually PPSD plots refer as test report clause 3.3.5 with each individually PPSD plots.

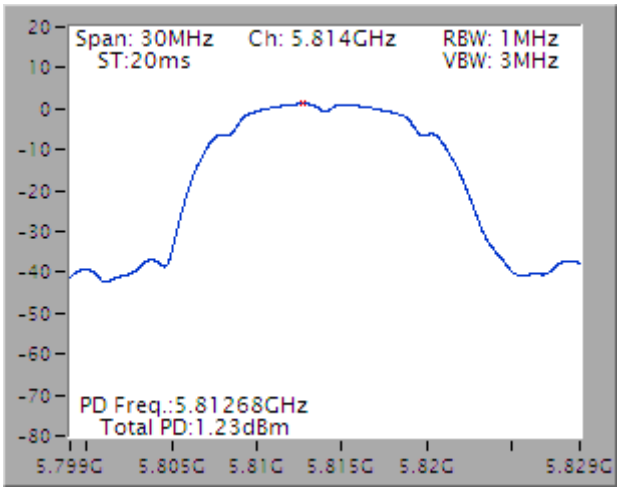
3.4.4 Test Setup

Power Spectral Density


3.4.5 Test Result of Peak Power Spectral Density

Peak Power Spectral Density Result (5725-5825MHz band)											
Condition			Peak Power Spectral Density (dBm/MHz)								
Modulation Mode	N_{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	PSD Limit	DG (dBi)	EIRP PSD	EIRP Limit
11a	1	5736	-0.02	-	-	-	-0.02	17.0	5.36	5.34	23.0
11a	1	5762	0.91	-	-	-	0.91	17.0	5.36	6.27	23.0
11a	1	5814	1.23	-	-	-	1.23	17.0	5.36	6.59	23.0
Result			Complied								

Worst Power Spectral Density Plots
11a – F12 [Port 1]



3.5 Peak Excursion

3.5.1 Peak Excursion Limit

Peak Excursion Limit
UNII Devices
☒ 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
☒ N/A

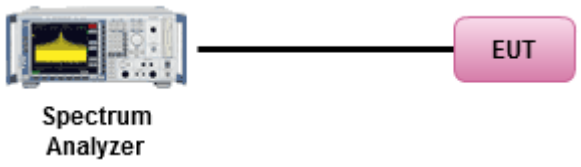
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method		
☒	Refer as FCC KDB 789033, clause F peak excursion method.	
☒	Testing each modulation mode on a single channel is sufficient to demonstrate compliance with the peak excursion requirement	
☒	For conducted measurement.	
	☒	The EUT supports single transmit chain and measurements performed on this transmit chain.
	☐	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
	☐	The EUT supports multiple transmit chains using given below method: 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).
	☐	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.

3.5.4 Test Setup

Peak Excursion


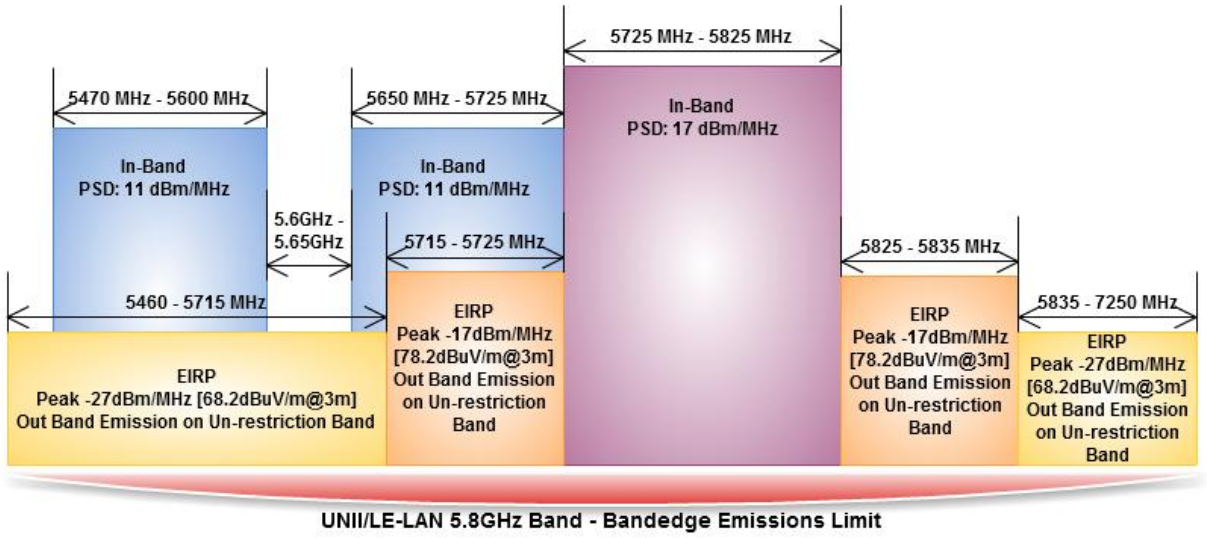
3.5.5 Test Result of Peak Excursion

UNII Peak Excursion Result (5725-5825MHz band)							
Condition			Peak Excursion (dB)				
Modulation Mode	N_{TX}	Freq. (MHz)	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Limit
11a	1	5736	4.00	-	-	-	13.0
Result			Complied				

3.6 Transmitter Radiated Bandedge Emissions

3.6.1 Transmitter Radiated Bandedge Emissions Limit

Transmitter Radiated Bandedge Emissions Limit for 5.8GHz band: 5.725-5.825 GHz band



Refer as FCC KDB 789033, G)2)c)(i) specifying that if a non-restricted-band out-of-band emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm or -17 dBm peak emission limit. Reason for change: to ensure that emission requirements in the non-restricted bands are not more stringent than those in the restricted bands.

3.6.2 Measuring Instruments

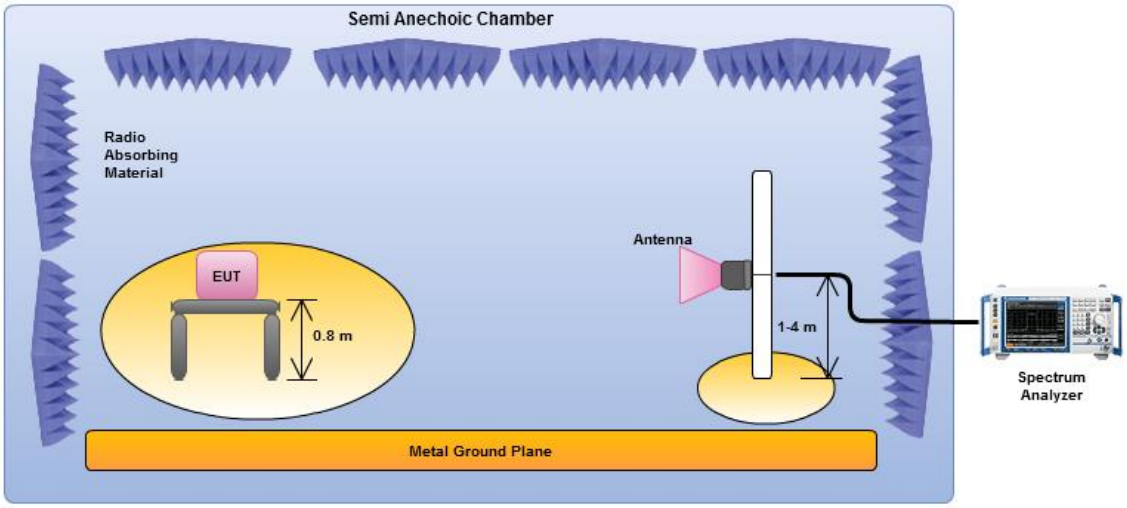
Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

Test Method			
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). Measurements in the bandedge are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.		
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	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.		
	☐	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.)	
		☐	Operating in 5.15-5.25 GHz band (lower-band) and 5.25-5.35 GHz band (higher-band).
		☐	Operating in 5.47-5.725 GHz band (lower-band) and 5.725-5.825 GHz band (higher-band).
	☐	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)	
		☐	Operating in 5.25-5.35 GHz band (lower-band) and 5.47-5.725 GHz band (higher-band).
		☐	Operating in 5.15-5.25 GHz band (lower-band) and 5.725-5.825 GHz band (higher-band).
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.	
		☒	Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
		☐	Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
		☐	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒	Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For the transmitter bandedge emissions shall be measured using following options below:		
	☐	Refer as FCC KDB 789033, clause G)3)d) marker-delta method for band-edge measurements.	
	☒	Refer as ANSI C63.10, clause 6.9.2 for band-edge testing.	
	☐	Refer as ANSI C63.10, clause 6.9.3 for marker-delta method for band-edge measurements.	
☒	For radiated measurement, refer as ANSI C63.10, clause 6.5 for radiated emissions from above 1 GHz.		

3.6.4 Test Setup

Transmitter Radiated Bandedge Emissions

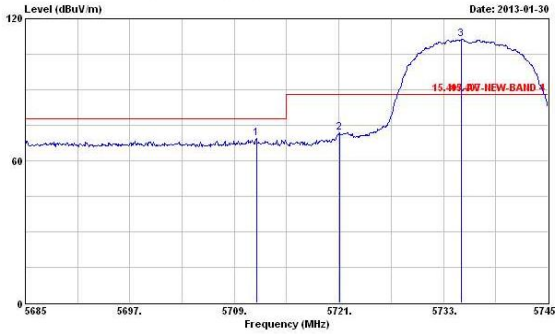


Electric field tests shall be performed in transmitter bandedge emissions using a calibrated horn antenna.

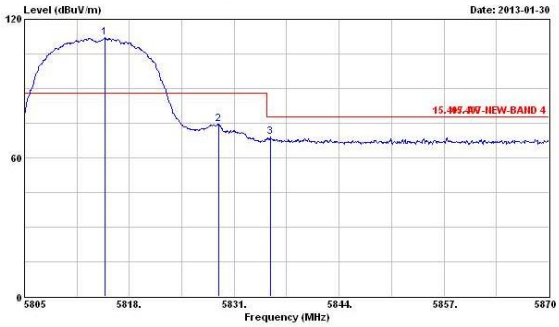
3.6.5 Test Result of Transmitter Radiated Bandedge Emissions

Transmitter Radiated Bandedge Emissions Result								
Modulation	11a		Band Emissions					
Band (MHz)	Test Ch. Freq. (MHz)	In-band PSD [i] (dBuV/1MHz)	BE Freq. (MHz)	Measure Distance (m)	Out-Band Level (dBuV/m)	Limit (dBuV/m)	Level Type	Pol. note 1
5460-5725	5736	111.43	5711.52	1	69.64	77.84	PK	H
5825-7250	5814	111.93	5835.55	1	69.24	77.84	PK	H

5.8GHz Lower-band (Lowest Ch.)



5.8GHz 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

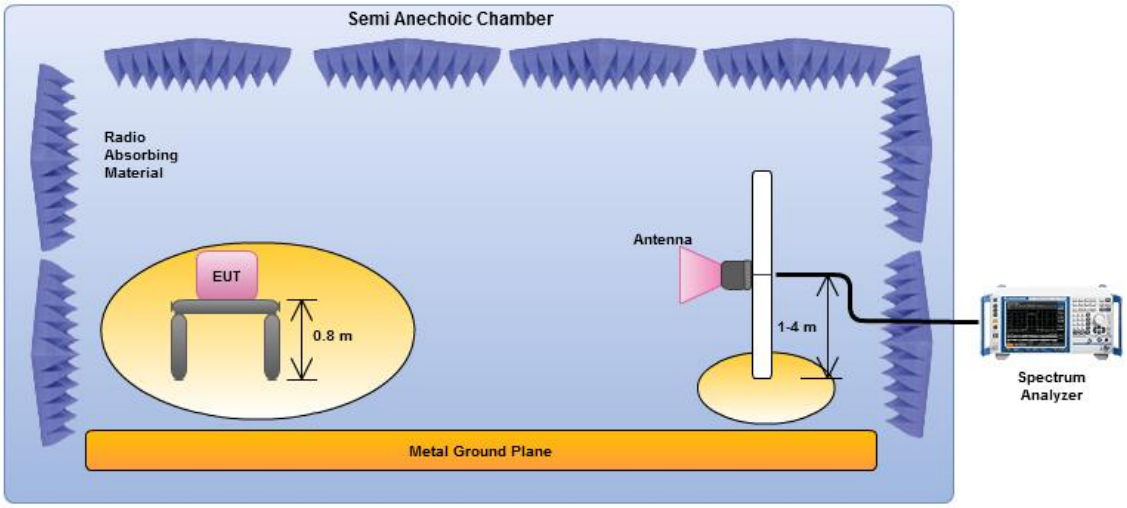
Refer a test equipment and calibration data table in this test report.

3.7.3 Test Procedures

Test Method			
☒	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).		
	☒	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.	
	☒	Measurements in the frequency range 10 GHz - 18GHz are typically made at a closer distance 1m, because the instrumentation noise floor is typically close to the radiated emission limit.	
	☒	Measurements in the frequency range above 18 GHz - 40GHz are typically made at a closer distance 0.5m, because the instrumentation noise floor is typically close to the radiated emission limit.	
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.	
		☒	Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
		☐	Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
		☐	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
		☒	Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
		☐	Refer as ANSI C63.10, clause 4.2.3.2.2 measurement procedure peak limit.
☒	For radiated measurement.		
	☒	Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz.	
	☒	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.	
	☒	Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz.	

3.7.4 Test Setup

Transmitter Radiated Unwanted Emissions



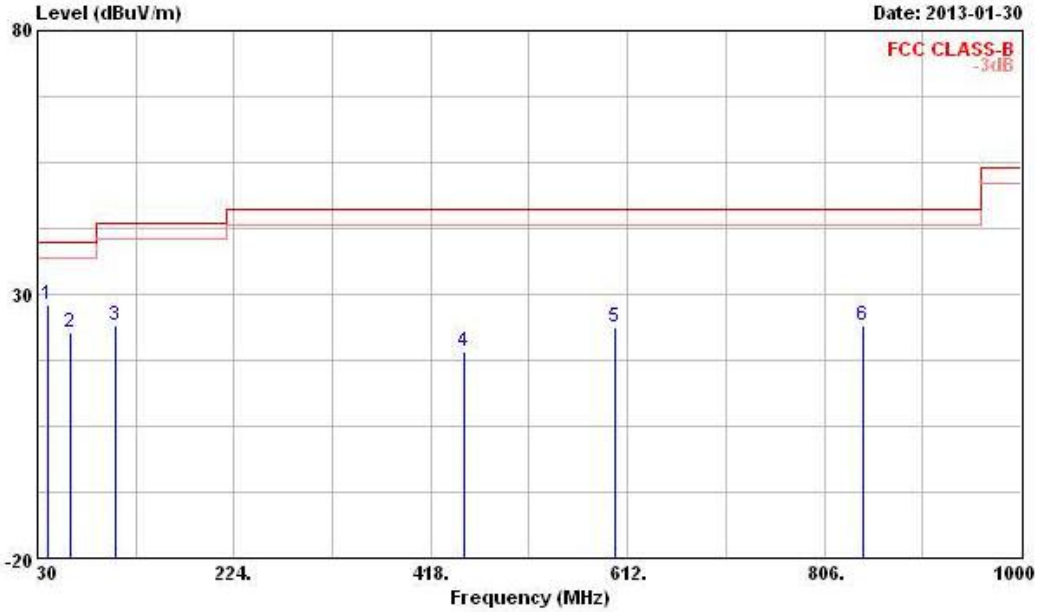
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna and the frequency range of 1 GHz to 40 GHz using a calibrated horn antenna.

3.7.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

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

3.7.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

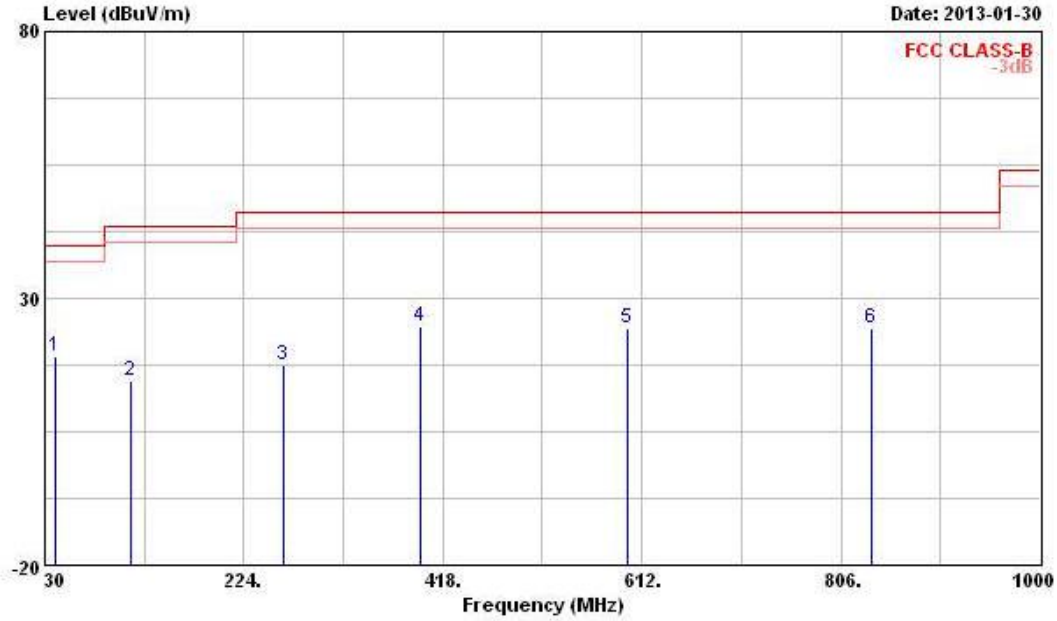
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Operating Mode	1	**Polarization**	V
Operating Function	AC Power & Radio link (WLAN)		



	Freq	Level	Over Limit	Limit Line	Read 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	27.89	-12.11	40.00	41.73	13.01	1.05	27.90	Peak	---	---
2	62.980	22.61	-17.39	40.00	42.09	7.03	1.34	27.85	Peak	---	---
3	106.630	23.96	-19.54	43.50	38.07	11.99	1.72	27.82	Peak	---	---
4	450.980	19.23	-26.77	46.00	27.49	16.29	3.58	28.13	Peak	---	---
5	599.390	23.87	-22.13	46.00	27.94	20.15	4.24	28.46	Peak	---	---
6	843.830	23.95	-22.05	46.00	26.55	20.16	5.03	27.79	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)

Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Operating Mode	1	**Polarization**	H
Operating Function	AC Power & Radio link (WLAN)		

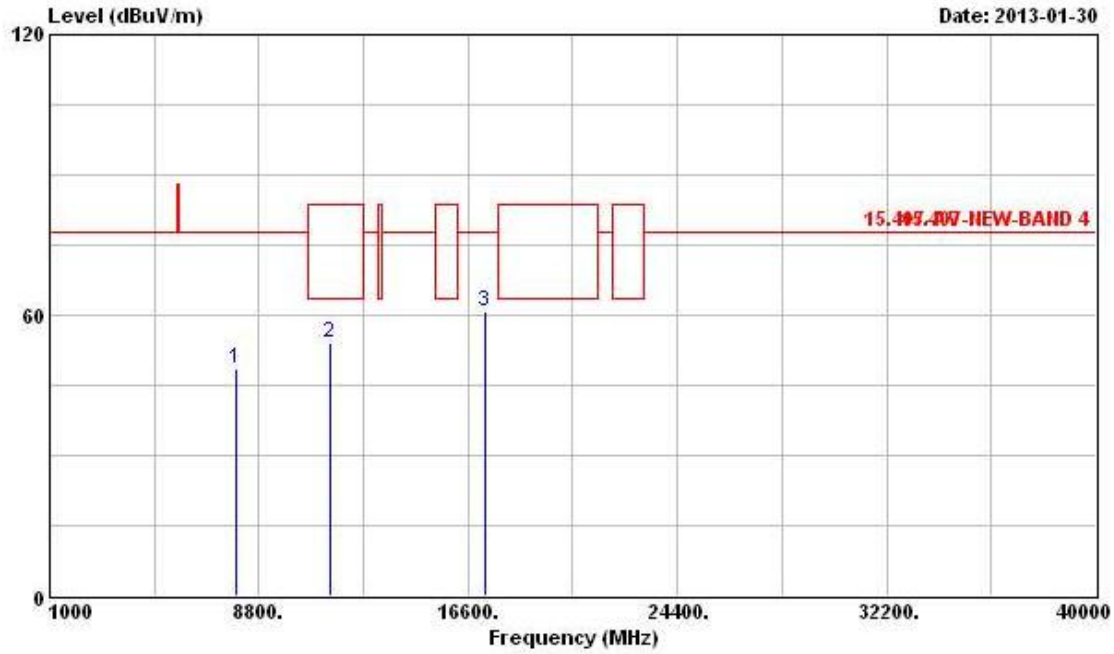


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	40.670	19.27	-20.73	40.00	33.11	13.01	1.05	27.90	Peak	---	---
2	113.420	14.69	-28.81	43.50	27.91	12.80	1.77	27.79	Peak	---	---
3	261.830	17.47	-28.53	46.00	28.75	13.16	2.82	27.26	Peak	---	---
4	396.660	24.90	-21.10	46.00	34.15	15.21	3.39	27.85	Peak	---	---
5	598.420	24.31	-21.69	46.00	28.42	20.12	4.23	28.46	Peak	---	---
6	836.070	24.35	-21.65	46.00	26.99	20.18	5.00	27.82	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)

3.7.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 11a

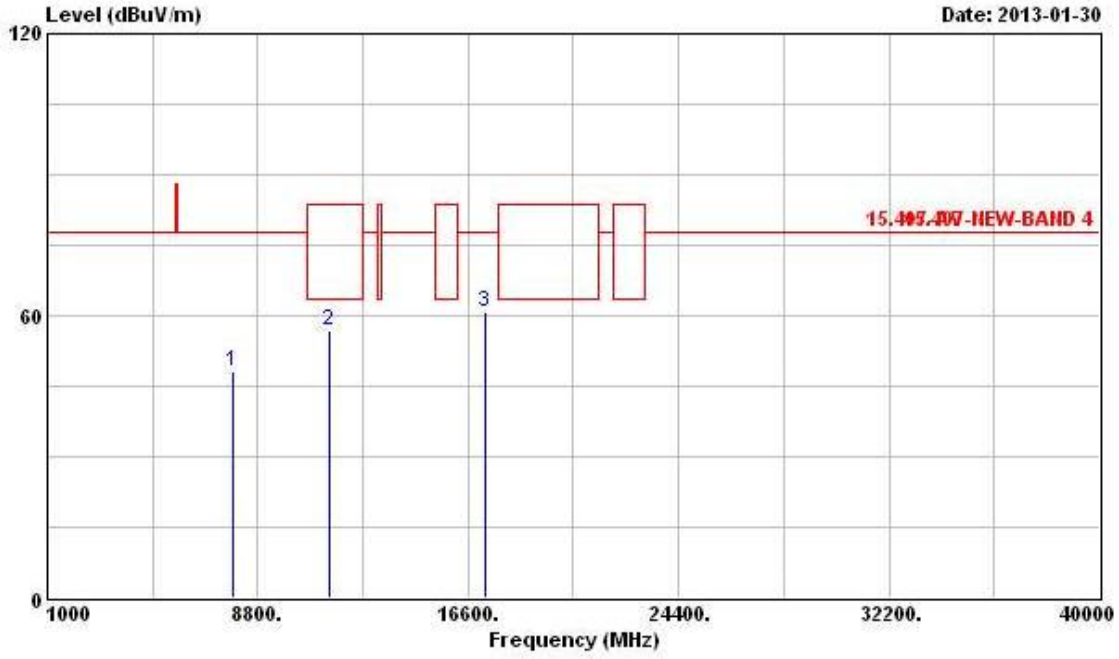
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (FX)**	F10
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read 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	7946.000	48.48	-29.36	77.84	42.13	35.30	6.30	35.25	Peak	---	---
2	11472.000	54.12	-29.42	83.54	43.97	38.27	6.60	34.72	PK	---	---
3	@17208.000	60.81	-17.03	77.84	45.41	40.94	8.44	33.98	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

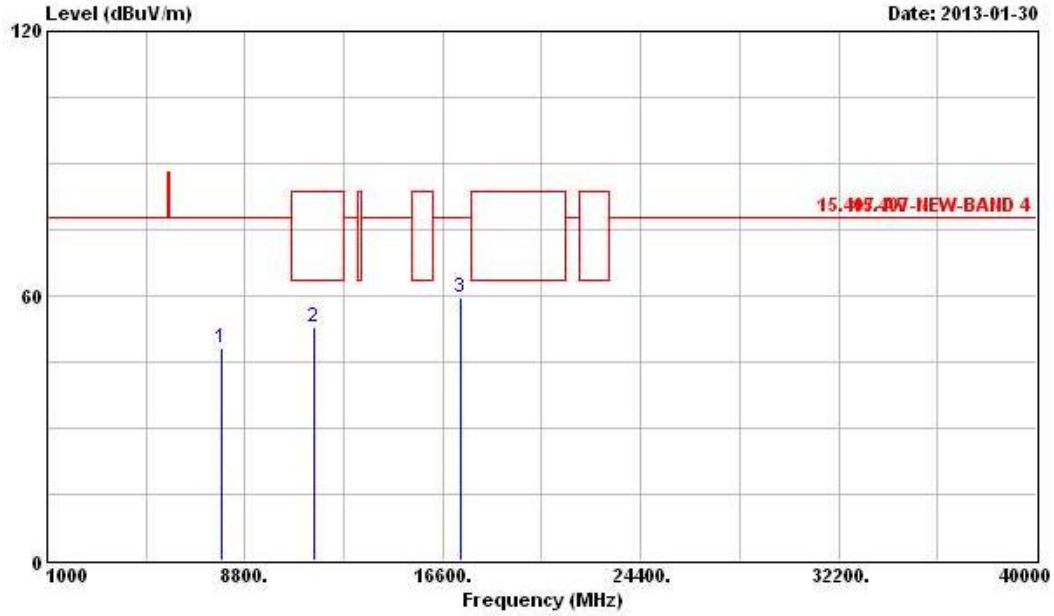
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (FX)**	F10
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read 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	7891.000	48.16	-29.68	77.84	41.86	35.30	6.24	35.24	Peak	---	---
2	11472.000	56.98	-26.56	83.54	46.83	38.27	6.60	34.72	PK	---	---
3	@17208.000	60.70	-17.14	77.84	45.30	40.94	8.44	33.98	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

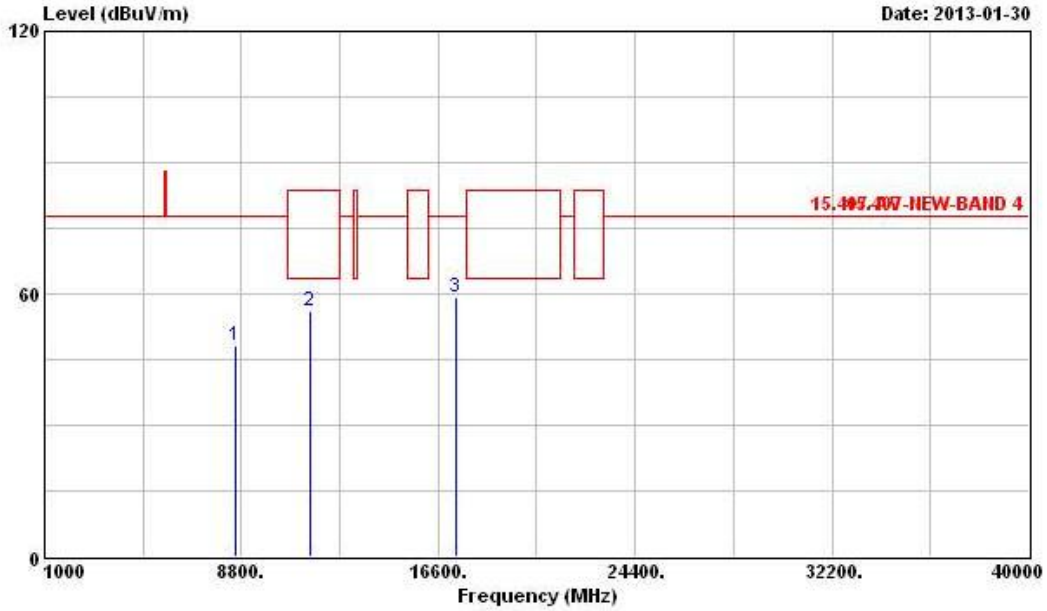
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (FX)**	F11
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read 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	7858.000	48.21	-29.63	77.84	41.95	35.30	6.19	35.23	Peak	---	---
2	11524.000	52.83	-30.71	83.54	42.67	38.31	6.58	34.73	PK	---	---
3	@17286.000	59.73	-18.11	77.84	44.35	40.96	8.40	33.98	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

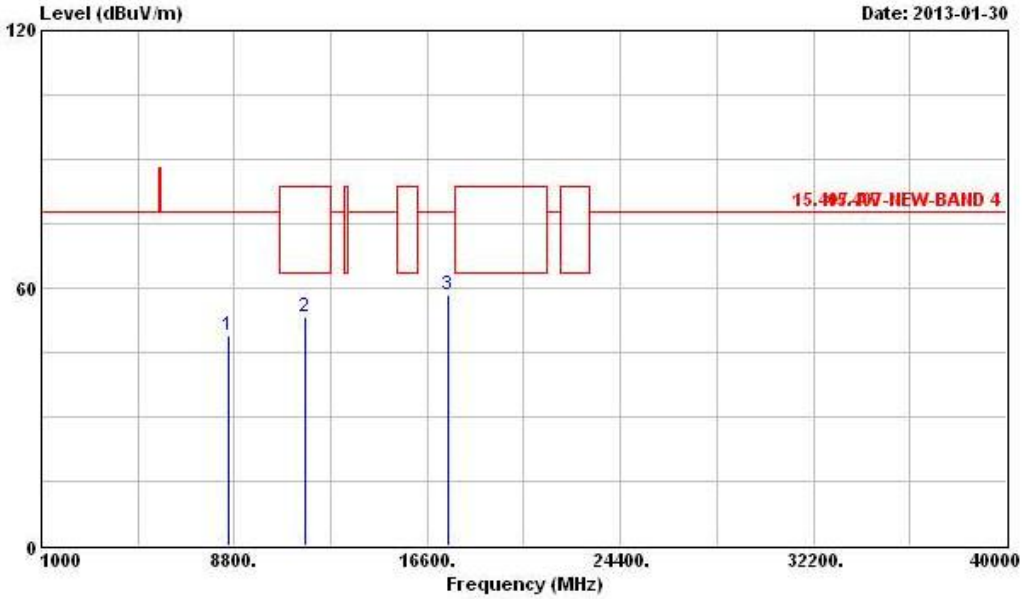
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (FX)**	F11
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read 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	8562.000	48.30	-29.54	77.84	41.92	35.64	5.99	35.25	Peak	---	---
2	11524.000	55.98	-27.56	83.54	45.82	38.31	6.58	34.73	PK	---	---
3	@17286.000	59.34	-18.50	77.84	43.96	40.96	8.40	33.98	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

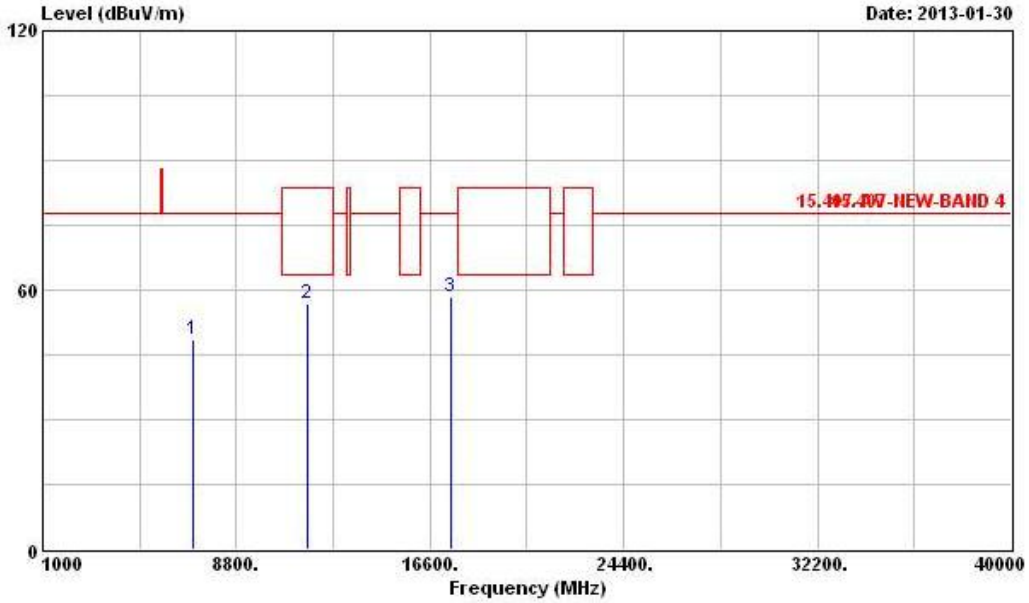
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (FX)**	F12
Operating Function	Transmit	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read 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	8573.000	49.06	-28.78	77.84	42.68	35.64	5.99	35.25	Peak	---	---
2	11628.000	53.15	-30.39	83.54	43.03	38.40	6.51	34.79	PK	---	---
3	@17442.000	58.59	-19.25	77.84	43.26	40.99	8.32	33.98	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (FX)**	F12
Operating Function	Transmit	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read 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	7033.000	48.47	-29.37	77.84	42.50	35.30	5.70	35.03	Peak	---	---
2	11628.000	56.88	-26.66	83.54	46.76	38.40	6.51	34.79	PK	---	---
3	@17442.000	58.60	-19.24	77.84	43.27	40.99	8.32	33.98	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

3.8 Frequency Stability

3.8.1 Frequency Stability Limit

Frequency Stability Limit
UNII Devices
☒ 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
☒ N/A
IEEE Std. 802.11n-2009
☒ 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.

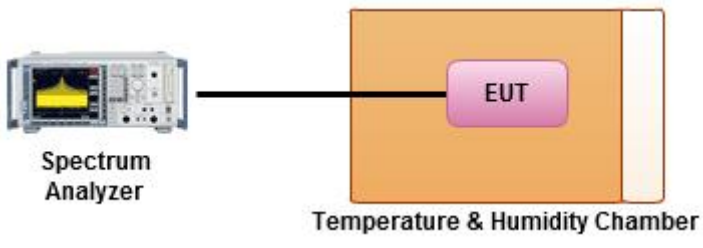
3.8.2 Measuring Instruments

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

3.8.3 Test Procedures

Test Method	
☒	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
	☒ Frequency stability with respect to ambient temperature
	☒ Frequency stability when varying supply voltage
☒	For conducted measurement.
	☒ For conducted measurements on devices with multiple transmit chains: Measurements need only to be performed on one of the active transmit chains (antenna outputs)
☐	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

Frequency Stability


3.8.5 Test Result of Frequency Stability

Frequency Stability Result						
Mode		Frequency Stability (ppm)				
Condition	Freq. (MHz)	0 min	2 min	5 min	10 min	Limit
$T_{20°C}$Vmax	5762	4.75	4.75	4.67	4.67	20.0
$T_{20°C}$Vmin	5762	4.75	4.75	4.67	4.67	20.0
$T_{50°C}$Vnom	5762	5.88	5.88	5.95	5.95	20.0
$T_{40°C}$Vnom	5762	3.62	3.62	3.99	3.99	20.0
$T_{30°C}$Vnom	5762	3.69	3.69	3.62	3.62	20.0
$T_{20°C}$Vnom	5762	4.75	4.75	4.67	4.67	20.0
$T_{10°C}$Vnom	5762	4.90	4.90	4.82	4.82	20.0
$T_{0°C}$Vnom	5762	6.10	6.10	6.18	6.18	20.0
$T_{-10°C}$Vnom	5762	5.50	5.50	6.54	6.54	20.0
$T_{-20°C}$Vnom	5762	5.73	5.73	5.80	5.80	20.0
Result		Complied				

Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom].
Note 2: 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	9kHz ~ 2.75GHz	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	9kHz ~ 30MHz	Apr. 20, 2012	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	CB049	9kHz ~ 30MHz	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	9KHz~40GHz	Feb. 21, 2012	Conducted (TH01-HY)
Spectrum Analyzer	R&S	FSV 40	15195-01-00	9KHz~40GHz	Jan. 06, 2012	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 19, 2012	Conducted (TH01-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 02, 2012	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Nov. 21, 2012	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 26, 2012	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Sep. 08, 2012	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Sep. 08, 2012	Conducted (TH01-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	1 ~ 26.5GHz	NA	Conducted (TH01-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345669/4	1 ~ 26.5GHz	NA	Conducted (TH01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100593	9kHz ~ 40GHz	Sep. 14, 2012	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 10, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 23, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1 ~ 26.5GHz	Aug. 10, 2012	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1 ~ 18GHz	Nov. 16, 2012	Radiation (03CH02-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jan. 08, 2013	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Nov. 10, 2012	Radiation (03CH02-HY)
RF Cable-high	SUHNER	SUCOFLEX106	03CH02-HY	1 ~ 40GHz	Mar. 06, 2012	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 22, 2012	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 ~ 4 m	N/A	Radiation (03CH02-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5 ~ 40GHz	Apr. 19, 2011	Radiation (03CH02-HY)
Loop Antenna	R&S	HFH2-Z2	860004/0001	9 kHz - 30 MHz	Jul. 03, 2012	Radiation (03CH02-HY)

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