FCC Test Report

Equipment	:	**Wireless AC1000 Dual Band Cloud Router**
Brand Name	:	**D-Link**
Model No.	:	**DIR-820L**
FCC ID	:	**KA2IR820LB1**
Standard	:	**47 CFR FCC Part 15.407**
Operating Band	:	**5150 MHz – 5250 MHz**
FCC Classification	:	**NII**
Applicant	:	**D-Link Corporation** **17595 Mt. Herrmann, Fountain Valley, CA 92708 U.S.A.**

The product sample received on Mar. 10, 2014 and completely tested on Mar. 28, 2014. 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:

James Fan / Assistant Manager

Testing Laboratory
1190

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APPENDIX A. TEST PHOTOS A1-A3

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]: 28.684MHz 49.20 (Margin 10.80dB) - QP 45.51 (Margin 4.49dB) - AV	FCC 15.207	Complied
3.2	15.407(a)	Emission Bandwidth	Bandwidth [MHz] 20M:21.91 / 40M:44.52 80M:83.48	Information only	Complied
3.3	15.407(a)	RF Output Power (Maximum Conducted (Average) Output Power)	Power [dBm] 5150-5250MHz:16.87	Power [dBm] 5150-5250MHz:17	Complied
3.4	15.407(a)	Peak Power Spectral Density	PPSD [dBm/MHz] 5150-5250MHz:3.75	PPSD [dBm/MHz] 5150-5250MHz:4	Complied
3.5	15.407(a)	Peak Excursion	8.52 dB	13 dB	Complied
3.6	15.407(b)	Transmitter Unwanted Emissions and Band Edge	Restricted Bands [dBuV/m at 3m]: 5150.00MHz 52.58 (Margin 1.42dB) – AV	Non-Restricted Bands: ≤ -27dBm (68.3dBuV/m@3m) Restricted Bands: FCC 15.209	Complied
3.7	15.407(g)	Frequency Stability	3.5942 ppm	Signal shall remain in-band	Complied

Revision History

Report No.	Version	Description	Issued Date
FR430734AN	Rev. 01	Initial issue of report	Apr. 14, 2014

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)	Co-location
5150-5250	a	5180-5240	36-48 [4]	2	16.78	Yes
5150-5250	n(HT20)	5180-5240	36-48 [4]	2	16.71	Yes
5150-5250	n(HT40)	5190-5230	38-46 [2]	2	16.84	Yes
5150-5250	ac(VHT20)	5180-5240	36-48 [4]	2	16.77	Yes
5150-5250	ac(VHT40)	5190-5230	38-46 [2]	2	16.87	Yes
5150-5250	ac(VHT80)	5210	42 [1]	2	16.09	Yes

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.
Note 2: 802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
Note 3: 802.11ac uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.
Note 4: 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			
☐	Equipment placed on the market without antennas		
☒	Integral antenna (antenna permanently attached)		
	☒	Temporary RF connector provided	
	☐	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.	
☐	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**	**Connector**	**Gain (dBi)**
1	Integral	PCB	I-PEX	0
2	Integral	PCB	I-PEX	0

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)**
☒ 94.20% - IEEE 802.11a	0.26
☒ 91.87% - IEEE 802.11ac (VHT20)	0.37
☒ 80.20% - IEEE 802.11ac (VHT40)	0.96
☒ 65.30% - IEEE 802.11ac (VHT80)	1.85

1.1.5 EUT Operational Condition

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

1.2 Accessories and Support Equipment

Accessories				
No.	**Equipment**	**Brand Name**	**Model Name**	**Spec.**
1	Adapter 1	D-Link	AMS9-1201000FU2	I/P: 100-240Vac, 50-60Hz, 0.5A, O/P: 12Vdc, 1.0A 1.22m non-shielded without core.
2	Adapter 2	D-Link	F12W-120100SPAU	I/P: 100-240Vac, 50-60Hz, 0.3A, O/P: 12Vdc, 1.0A 1.23m non-shielded without core.
3	Adapter 3	D-Link	F12W3-120100SPAU	I/P: 100-240Vac, 50-60Hz, 0.3A, O/P: 12Vdc, 1.0A 1.20m non-shielded without core.

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	E6430	DoC
2	Notebook	DELL	E6410	DoC
3	USB Dongle	Transcend	4G	---

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 v01r03
- FCC KDB 662911 v02r01
- FCC KDB 412172 v01

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	Mark Liao	21°C / 64%	Mar. 28, 2014	
AC Conduction	CO04-HY	Skys Huang	20°C / 67%	Mar. 27, 2014	
Radiated Emission	03CH08-HY	Jack Li	18-20°C / 66-68%	Mar. 10 ~ Mar. 24, 2014	
Test site registered number [636805] with FCC Test site registered number [4086B-2] with IC					

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
All emissions, radiated	30 – 1000 MHz	±3.9 dB	N/A
	Above 1GHz	±4.2 dB	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 (5150-5250MHz)			
Modulation Mode	**Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Worst Data Rate / MCS**
11a	2	6-54Mbps	6 Mbps
HT20	2	M0-15	M0
HT40	2	M0-15	M0
VHT20	2	M0-8	M0
VHT40	2	M0-9	M0
VHT80	2	M0-9	M0

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (5150-5250MHz band)							
Test Software	MTool						
Test Software Version	RTL819x 2.3						
Modulation Mode	**N_{TX}**	**Test Frequency (MHz)**					
		NCB: 20MHz			**NCB: 40MHz**		**NCB: 80MHz**
		5180	**5200**	**5240**	**5190**	**5230**	**5210**
11a,6-54Mbps	2	39/38	37/36	36/35	--	--	--
HT20,M0-15	2	39/38	38/37	37/36	--	--	--
HT40,M0-15	2	--	--	--	40/39	39/37	--
VHT20,M0-8	2	39/38	38/37	37/36	--	--	--
VHT40,M0-9	2	--	--	--	40/39	39/37	--
VHT80,M0-9	2	--	--	--	--	--	38/36

2.3 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), Adapter 1
Note: Adapter 1, Adapter 2, and Adapter 3 had been pretested and found that the **Adapter 1** was the worst case and was selected for final test.	

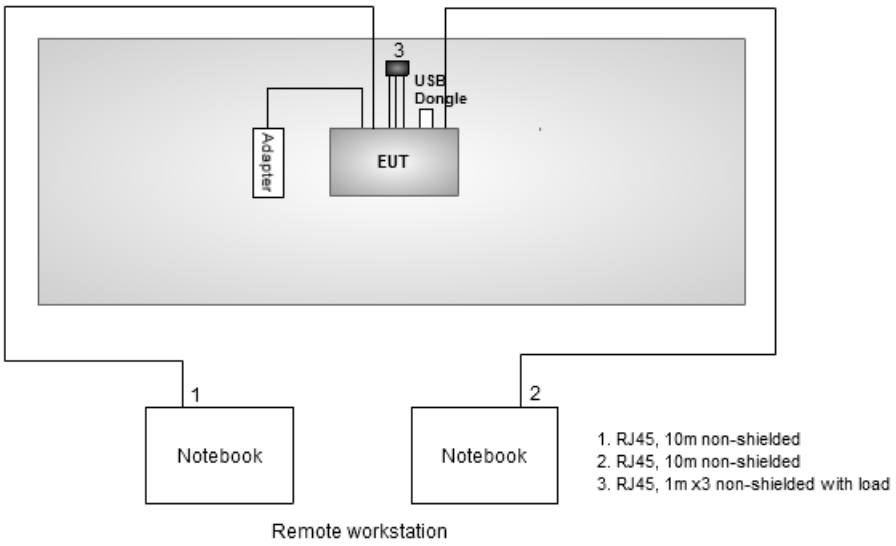
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, HT20, HT40, VHT20, VHT40, VHT80
Operating Mode	Operating Mode Description
1	AC Power & Radio link (WLAN), Adapter 1

The Worst Case Mode for Following Conformance Tests	
Tests Item	Peak Power Spectral Density, Peak Excursion, Emission Bandwidth
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, VHT20, VHT40, VHT80
Operating Mode	Operating Mode Description
1	AC Power & Radio link (WLAN), Adapter 1

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 X.		
	☐ 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. The worst planes is X.		
Operating Mode	☒ 1. AC Power & Radio link (WLAN), Adapter 1		
Modulation Mode	11a, VHT20, VHT40, VHT80		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
Note: Adapter 1, Adapter 2, and Adapter 3 had been pretested and found that the **Adapter 1** was the worst case and was selected for final test.			

2.4 Test Setup Diagram

Test Setup Diagram –Radiated Emission Test



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

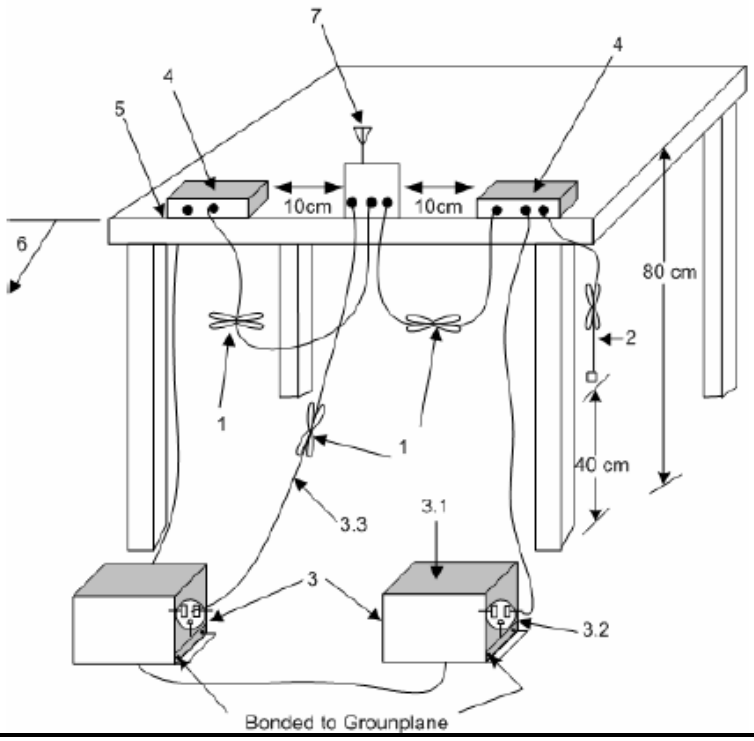
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

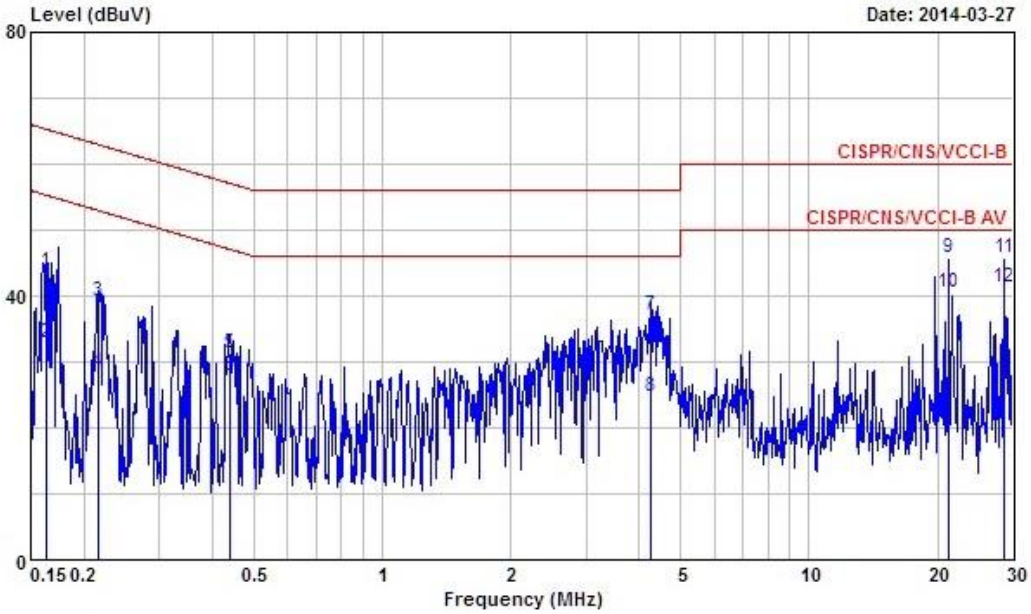
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

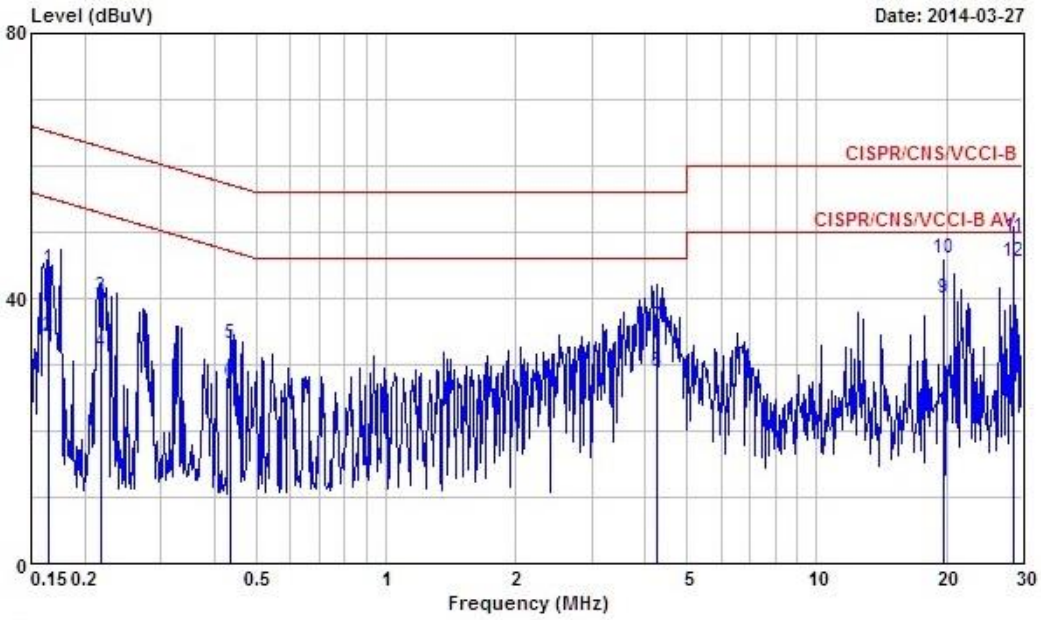
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	AC Power & Radio link (WLAN), Adapter 1		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1632710	43.75	-21.55	65.30	43.35	0.02	0.38	QP
2	0.1632710	32.81	-22.49	55.30	32.41	0.02	0.38	Average
3	0.2165340	39.30	-23.65	62.95	38.77	0.02	0.51	QP
4	0.2165340	28.45	-24.50	52.95	27.92	0.02	0.51	Average
5	0.4374210	31.44	-25.67	57.11	30.79	0.03	0.62	QP
6	0.4374210	27.93	-19.18	47.11	27.28	0.03	0.62	Average
7	4.270	37.00	-19.00	56.00	36.19	0.10	0.71	QP
8	4.270	24.84	-21.16	46.00	24.03	0.10	0.71	Average
9	21.171	45.83	-14.17	60.00	44.82	0.34	0.67	QP
10	21.171	40.52	-9.48	50.00	39.51	0.34	0.67	Average
11	28.686	45.67	-14.33	60.00	44.71	0.43	0.53	QP
12	28.686	41.22	-8.78	50.00	40.26	0.43	0.53	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), Adapter 1		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1650100	44.43	-20.78	65.21	44.01	0.03	0.39	QP
2	0.1650100	34.21	-21.00	55.21	33.79	0.03	0.39	Average
3	0.2185070	40.23	-22.65	62.88	39.69	0.03	0.51	QP
4	0.2185070	31.74	-21.14	52.88	31.20	0.03	0.51	Average
5	0.4351090	33.22	-23.93	57.15	32.57	0.03	0.62	QP
6	0.4351090	27.39	-19.76	47.15	26.74	0.03	0.62	Average
7	4.270	35.89	-20.11	56.00	35.07	0.11	0.71	QP
8	4.270	29.04	-16.96	46.00	28.22	0.11	0.71	Average
9	19.709	40.10	-9.90	50.00	39.08	0.31	0.71	Average
10	19.709	45.92	-14.08	60.00	44.90	0.31	0.71	QP
11	28.684	49.20	-10.80	60.00	48.25	0.42	0.53	QP
12 @	28.684	45.51	-4.49	50.00	44.56	0.42	0.53	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.

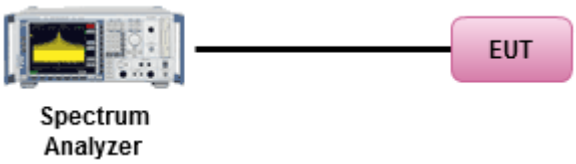
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

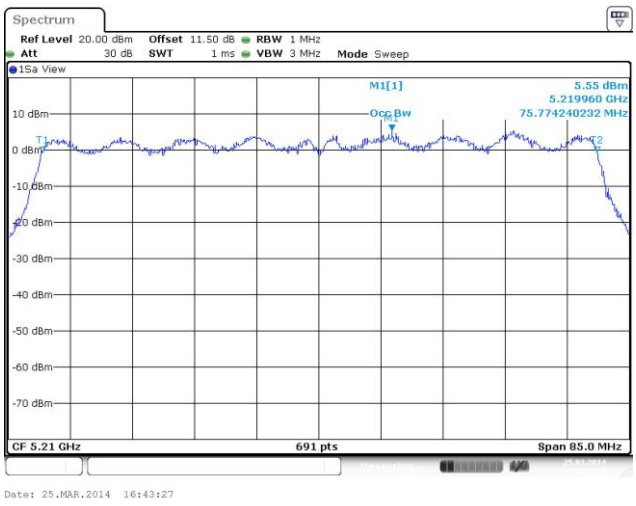
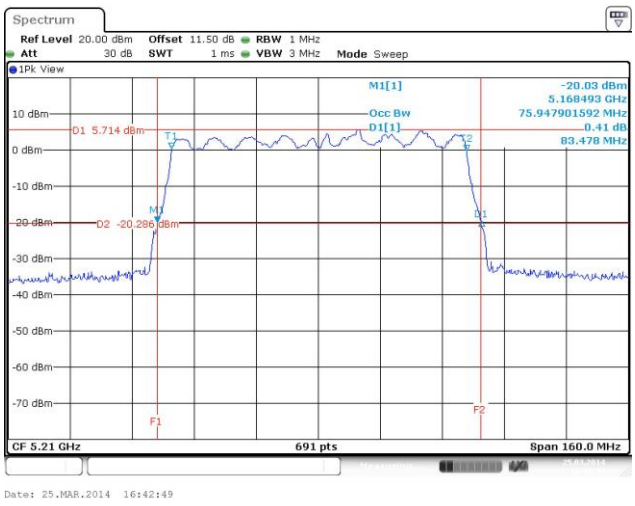
Test Method			
☒	For the emission bandwidth shall be measured using one of the options below:		
	☒	Refer as FCC KDB 789033 v01r03, clause C for EBW and clause D for OBW measurement.	
	☐	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.	
	☒	Refer as IC RSS-Gen, clause 4.6 for bandwidth 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 (5150-5250MHz 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	2	5180	16.75	16.79	--	--	20.93	21.45	--	--	16.24	17.00
11a	2	5200	16.75	16.79	--	--	21.16	21.39	--	--	16.24	17.00
11a	2	5240	16.75	16.79	--	--	20.99	21.39	--	--	16.24	17.00
VHT20	2	5180	17.87	17.91	--	--	21.86	21.86	--	--	16.52	17.00
VHT20	2	5200	17.91	17.84	--	--	21.91	21.86	--	--	16.51	17.00
VHT20	2	5240	17.91	17.87	--	--	21.80	21.80	--	--	16.52	17.00
VHT40	2	5190	36.79	36.86	--	--	44.52	44.41	--	--	17.00	17.00
VHT40	2	5230	36.73	36.79	--	--	44.52	44.41	--	--	17.00	17.00
VHT80	2	5210	75.77	75.77	--	--	83.48	83.48	--	--	17.00	17.00
Result			Complied									

Worst Emission Bandwidth Plots	
99% Bandwidth	26dB Bandwidth
	

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	
	☐	Refer as FCC KDB 789033 v01r03, clause E Method SA-1 (spectral trace averaging).
	☐	Refer as FCC KDB 789033 v01r03, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)
	☐	Refer as FCC KDB 789033 v01r03, clause E Method SA-2 (spectral trace averaging).
	☐	Refer as FCC KDB 789033 v01r03, clause E 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 v01r03, clause E Method PM-G (using a gated 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 (Power Meter)

3.3.5 Directional Gain for Power Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	-	-
Maximum G_{ANT} (dBi)		0	0	-	-
Modulation Mode	**DG (dBi)**	**N_{TX}**	**N_{SS}**	**STBC**	**Array Gain (dB)**
11a,6-54Mbps	0	2	1	-	-
HT20,M0-15	0	2	1	-	-
HT40,M0-15	0	2	1	-	-
VHT20,M0-8	0	2	1	-	-
VHT40,M0-9	0	2	1	-	-
VHT80,M0-9	0	2	1		-

Note 1: For CDD transmissions, directional gain is calculated as power measurements:
Directional Gain (DG) = G_{ANT} + Array Gain, where Array Gain is as follows:
Array Gain = 0 dB (i.e., no array gain) for $N_{TX} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{TX};

3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted (Average) Output Power (5150-5250MHz 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	2	5180	13.78	13.75	--	--	16.78	17.00	0	16.78	23.00
11a	2	5200	13.49	13.21	--	--	16.36	17.00	0	16.36	23.00
11a	2	5240	13.26	13.35	--	--	16.32	17.00	0	16.32	23.00
HT20	2	5180	13.67	13.73	--	--	16.71	17.00	0	16.71	23.00
HT20	2	5200	13.50	13.61	--	--	16.57	17.00	0	16.57	23.00
HT20	2	5240	13.29	13.47	--	--	16.39	17.00	0	16.39	23.00
HT40	2	5190	13.78	13.88	--	--	16.84	17.00	0	16.84	23.00
HT40	2	5230	13.56	13.42	--	--	16.50	17.00	0	16.50	23.00
VHT20	2	5180	13.75	13.76	--	--	16.77	17.00	0	16.77	23.00
VHT20	2	5200	13.53	13.64	--	--	16.60	17.00	0	16.60	23.00
VHT20	2	5240	13.33	13.51	--	--	16.43	17.00	0	16.43	23.00
VHT40	2	5190	13.82	13.90	--	--	16.87	17.00	0	16.87	23.00
VHT40	2	5230	13.61	13.45	--	--	16.54	17.00	0	16.54	23.00
VHT80	2	5210	13.10	13.05	--	--	16.09	17.00	0	16.09	23.00
Result			Complied								

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.	

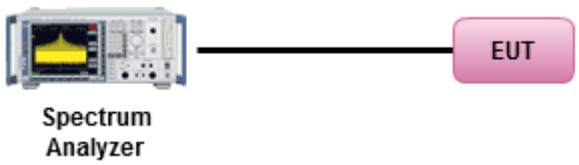
3.4.2 Measuring Instruments

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:		
	☐	Refer as FCC KDB 789033 v01r03, F)5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth	
	☐	Refer as FCC KDB 789033 v01r03, clause E Method SA-1 (spectral trace averaging).	
	☐	Refer as FCC KDB 789033 v01r03, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)	
	☐	Refer as FCC KDB 789033 v01r03, clause E Method SA-2 (spectral trace averaging).	
	☒	Refer as FCC KDB 789033 v01r03, clause E 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


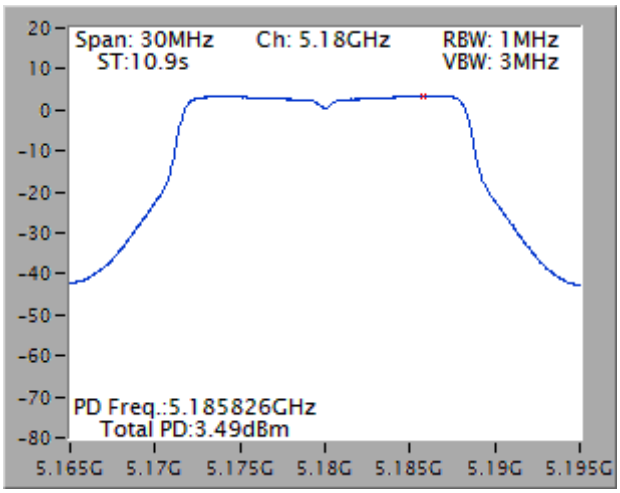
3.4.5 Directional Gain for Power Spectral Density Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	--	--
Maximum G_{ANT} (dBi)		0	0	--	--
Modulation Mode	**DG (dBi)**	**N_{TX}**	**N_{SS}**	**STBC**	**Array Gain (dB)**
11a,6-54Mbps	3.01	2	1	--	--
VHT20,M0-8	3.01	2	1	--	--
VHT40,M0-9	3.01	2	1	--	--
VHT80,M0-9	3.01	2	1	--	--
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 = G_{ANT} + 10 log(N_{TX})					

3.4.6 Test Result of Peak Power Spectral Density

Peak Power Spectral Density Result (5150-5250MHz band)							
Condition			Peak Power Spectral Density (dBm/MHz)				
Modulation Mode	N_{TX}	Freq. (MHz)	Sum Chain	PSD Limit	DG (dBi)	EIRP PSD	EIRP Limit
11a	2	5180	3.75	4.00	3.01	6.76	10.00
11a	2	5200	3.36	4.00	3.01	6.37	10.00
11a	2	5240	3.41	4.00	3.01	6.42	10.00
VHT20	2	5180	3.27	4.00	3.01	6.28	10.00
VHT20	2	5200	3.14	4.00	3.01	6.15	10.00
VHT20	2	5240	3.08	4.00	3.01	6.09	10.00
VHT40	2	5190	0.12	4.00	3.01	3.13	10.00
VHT40	2	5230	-0.10	4.00	3.01	2.91	10.00
VHT80	2	5210	-3.44	4.00	3.01	-0.43	10.00
Result			Complied				

Worst Power Spectral Density Plots



Note 1: Peak Power Spectral Density w/o Duty Factor.

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

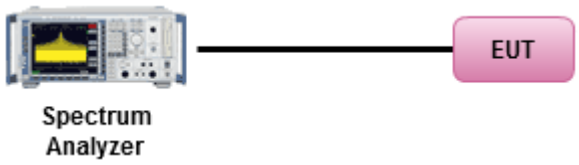
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
☒ Refer as FCC KDB 789033 v01r03, clause G peak excursion method.	
☒ Testing each modulation mode on a single channel is sufficient to demonstrate compliance with the peak excursion requirement	
☒ For conducted measurement.	
	☒ Testing a single output port is sufficient to demonstrate compliance with the peak excursion.
	☒ 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.

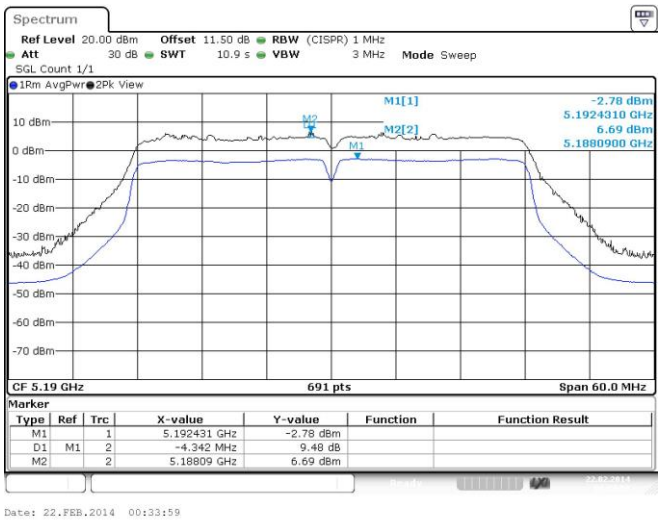
3.5.4 Test Setup

Peak Excursion


3.5.5 Test Result of Peak Excursion

Peak Excursion (dB)								
Mode	N_{TX}	Freq. (MHz)	Modulation Mode					Limit
			BPSK	QPSK	16QAM	64QAM	256QAM	
11a	2	5180	7.84	8.22	7.67	7.98	-	13
VHT20	2	5180	8.31	8.17	8.25	7.41	7.08	13
VHT40	2	5190	8.52	7.83	8.35	7.12	7.13	13
VHT80	2	5210	7.96	7.66	6.48	6.92	5.79	13

Worst Peak Excursion Plots



Note 1: Peak excursion = Mark2 value – (Mark 1 value + duty factor)

3.6 Transmitter Radiated Unwanted Emissions and Band Edge

3.6.1 Transmitter Radiated Unwanted Emissions and Band Edge 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).

3.6.2 Measuring Instruments

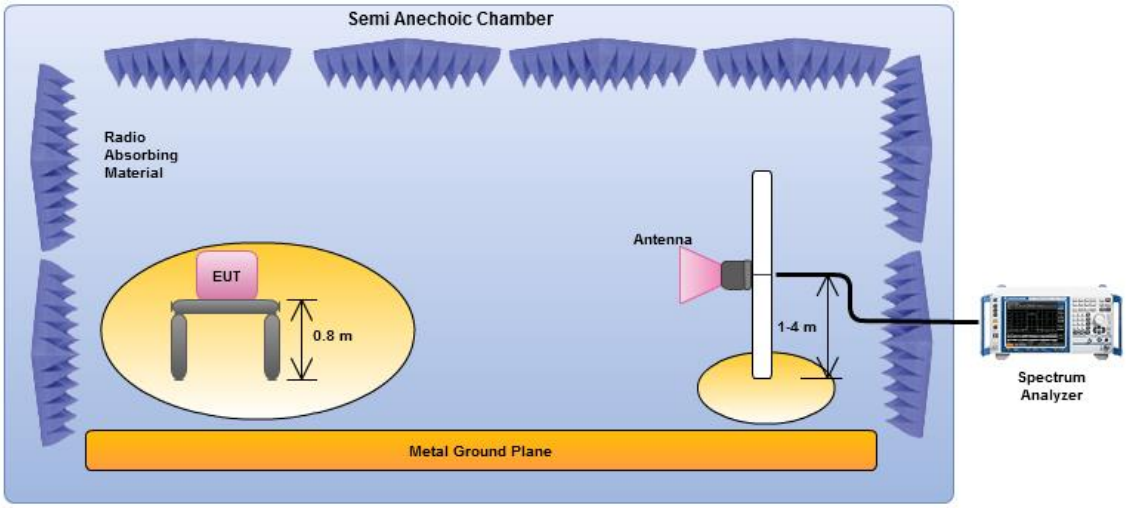
Refer a test equipment and calibration data table in this test report.

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. 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).		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC KDB 789033 v01r03, clause H)2) for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 789033 v01r03, clause H)1) for unwanted emissions into restricted bands.	
		☐	Refer as FCC KDB 789033 v01r03, H)6) Method AD (Trace Averaging).
		☐	Refer as FCC KDB 789033 v01r03, H)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 v01r03, clause H)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.	
☐	For conducted and cabinet radiation measurement, refer as FCC KDB 789033 v01r03, clause H)3).		
	☐	For conducted unwanted emissions into non-restricted bands (relative emission limits). 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.	
	☐	For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB	
	☐	For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.	

3.6.4 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.

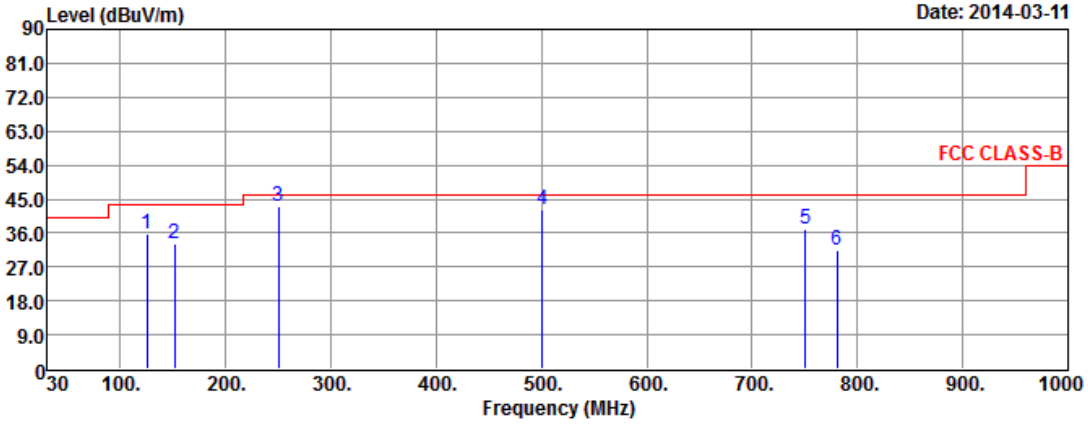
Note: Test distance is 3m.

3.6.5 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.

3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

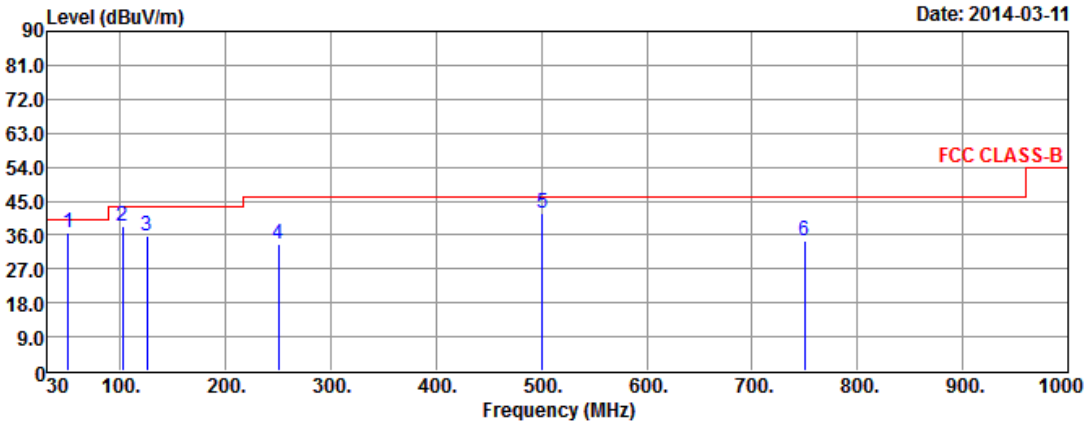
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5190
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	125.06	35.94	-7.56	43.50	54.61	12.26	0.73	31.66	---	---	Peak
2	151.25	32.99	-10.51	43.50	49.73	14.10	0.79	31.63	---	---	Peak
3	250.19	42.87	-3.13	46.00	60.84	12.51	1.03	31.51	---	---	Peak
4	500.45	42.41	-3.59	46.00	54.10	18.21	1.51	31.41	143	198	QP
5	750.71	37.16	-8.84	46.00	44.56	22.11	1.88	31.39	---	---	Peak
6	780.78	31.28	-14.72	46.00	38.24	22.47	1.94	31.37	---	---	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)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5190
Operating Mode	1	**Polarization**	V

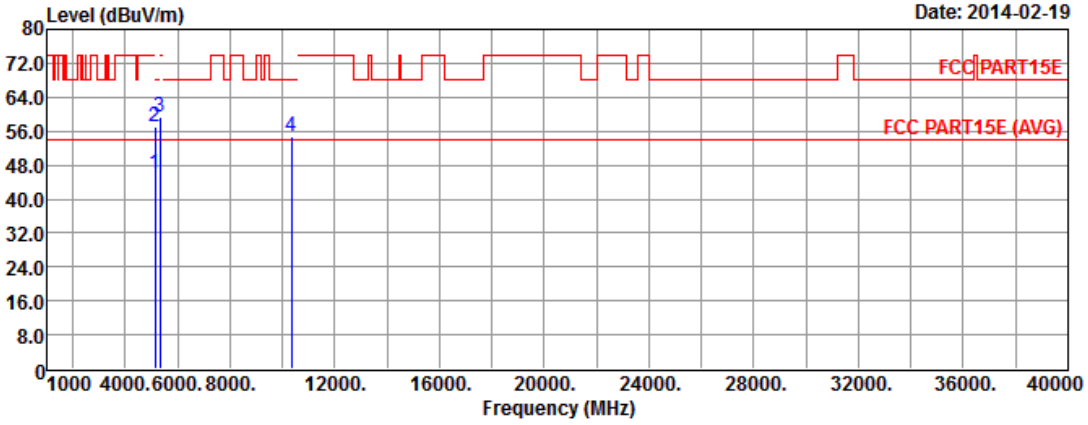


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	50.37	36.46	-3.54	40.00	52.78	14.96	0.50	31.78	100	8	QP
2	101.78	38.31	-5.19	43.50	59.67	9.67	0.66	31.69	---	---	Peak
3	125.06	35.69	-7.81	43.50	54.36	12.26	0.73	31.66	---	---	Peak
4	250.19	33.52	-12.48	46.00	51.49	12.51	1.03	31.51	---	---	Peak
5	500.45	41.76	-4.24	46.00	53.45	18.21	1.51	31.41	---	---	Peak
6	749.74	34.58	-11.42	46.00	41.99	22.10	1.88	31.39	---	---	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)

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

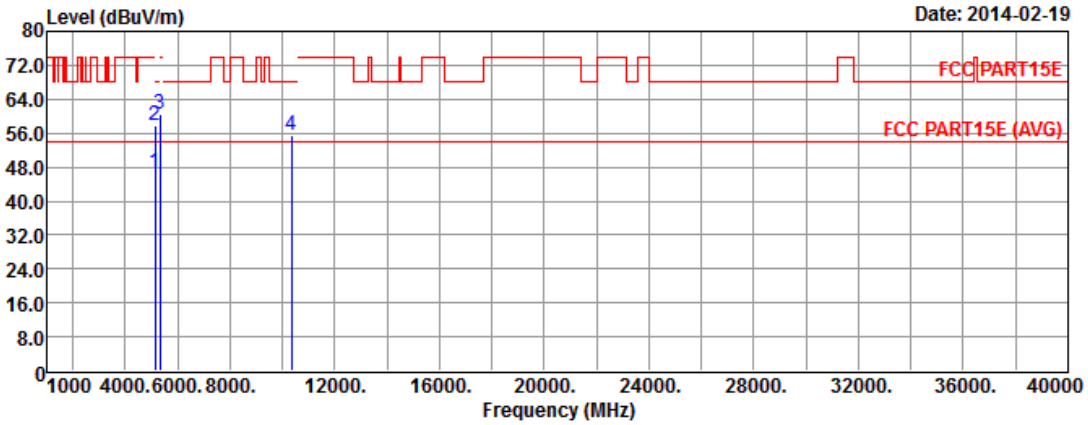
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5180
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	45.83	-8.17	54.00	40.12	31.86	6.93	33.08	---	---	Average
2	5150.00	57.08	-16.92	74.00	51.37	31.86	6.93	33.08	---	---	Peak
3	5340.00	59.42	-8.78	68.20	53.44	31.94	7.11	33.07	---	---	Peak
4	10360.00	54.69	-13.51	68.20	40.25	39.85	10.06	35.47	---	---	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.

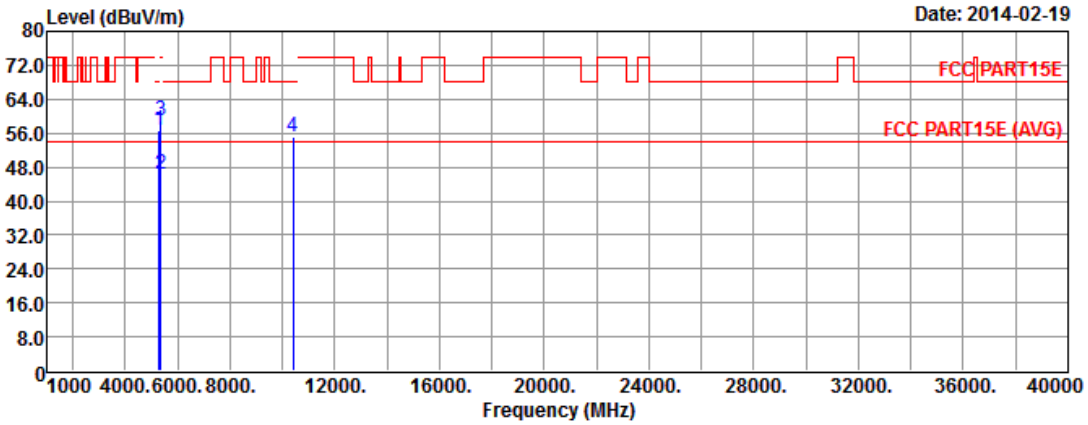
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5180
Operating Mode	1	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.55	-7.45	54.00	40.84	31.86	6.93	33.08	---	---	Average
2	5150.00	57.89	-16.11	74.00	52.18	31.86	6.93	33.08	---	---	Peak
3	5340.00	60.62	-7.58	68.20	54.64	31.94	7.11	33.07	---	---	Peak
4	10360.00	55.69	-12.51	68.20	41.25	39.85	10.06	35.47	---	---	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.

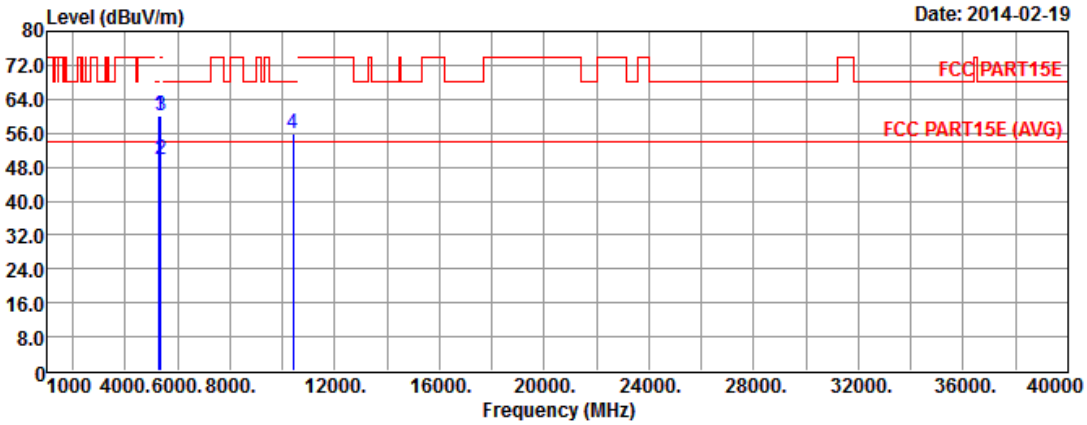
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5200
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5280.00	56.47	-11.73	68.20	50.57	31.91	7.06	33.07	---	---	Peak
2	5360.00	46.23	-7.77	54.00	40.23	31.94	7.12	33.06	---	---	Average
3	5360.00	59.11	-14.89	74.00	53.11	31.94	7.12	33.06	---	---	Peak
4	10400.00	55.03	-13.17	68.20	40.53	39.92	10.06	35.48	---	---	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.

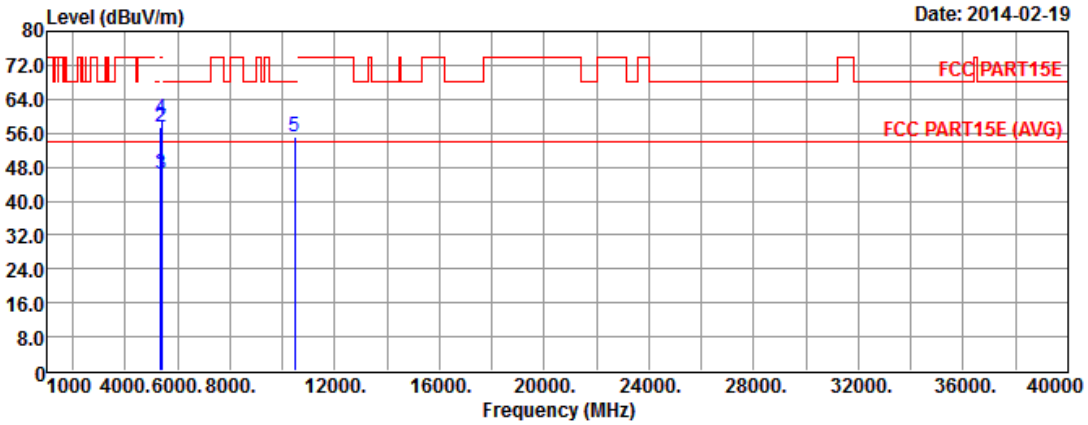
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5200
Operating Mode	1	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5280.00	60.15	-8.05	68.20	54.25	31.91	7.06	33.07	---	---	Peak
2	5360.00	49.68	-4.32	54.00	43.68	31.94	7.12	33.06	---	---	Average
3	5360.00	60.19	-13.81	74.00	54.19	31.94	7.12	33.06	---	---	Peak
4	10400.00	55.74	-12.46	68.20	41.24	39.92	10.06	35.48	---	---	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.

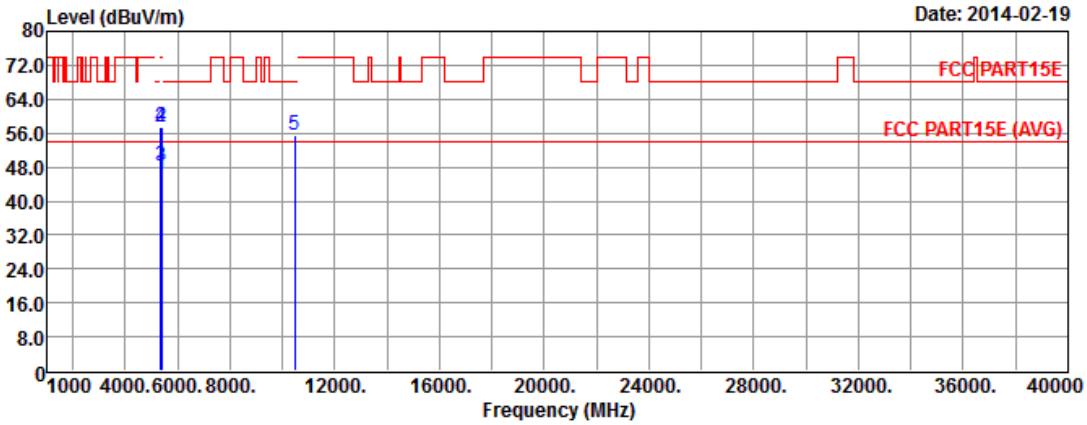
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5240
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5350.00	46.14	-7.86	54.00	40.15	31.94	7.11	33.06	---	---	Average
2	5350.00	57.36	-16.64	74.00	51.37	31.94	7.11	33.06	---	---	Peak
3	5400.00	46.40	-7.60	54.00	40.35	31.96	7.15	33.06	---	---	Average
4	5400.00	59.24	-14.76	74.00	53.19	31.96	7.15	33.06	---	---	Peak
5	10480.00	54.96	-13.24	68.20	40.33	40.06	10.07	35.50	---	---	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. (MHz)**	5240
Operating Mode	1	**Polarization**	V

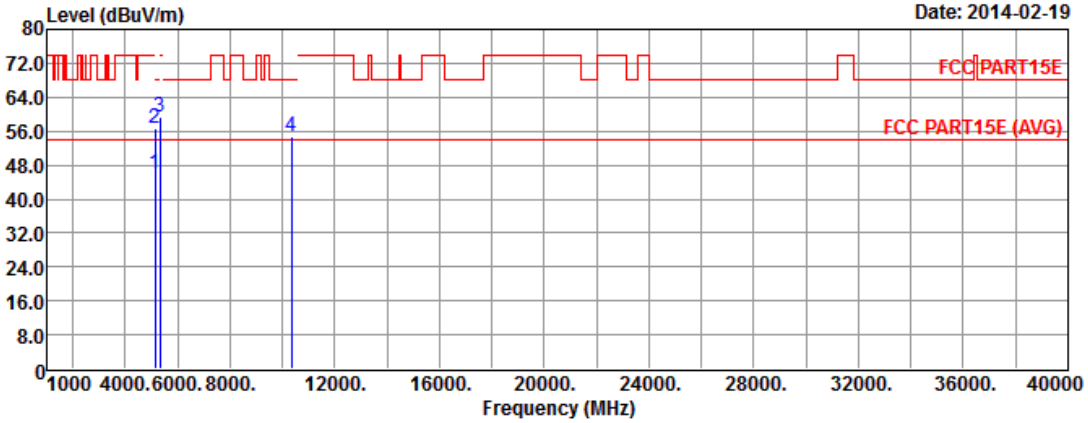


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5350.00	46.61	-7.39	54.00	40.62	31.94	7.11	33.06	---	---	Average
2	5350.00	57.37	-16.63	74.00	51.38	31.94	7.11	33.06	---	---	Peak
3	5400.00	48.28	-5.72	54.00	42.23	31.96	7.15	33.06	---	---	Average
4	5400.00	57.24	-16.76	74.00	51.19	31.96	7.15	33.06	---	---	Peak
5	10480.00	55.61	-12.59	68.20	40.98	40.06	10.07	35.50	---	---	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.

3.6.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT20

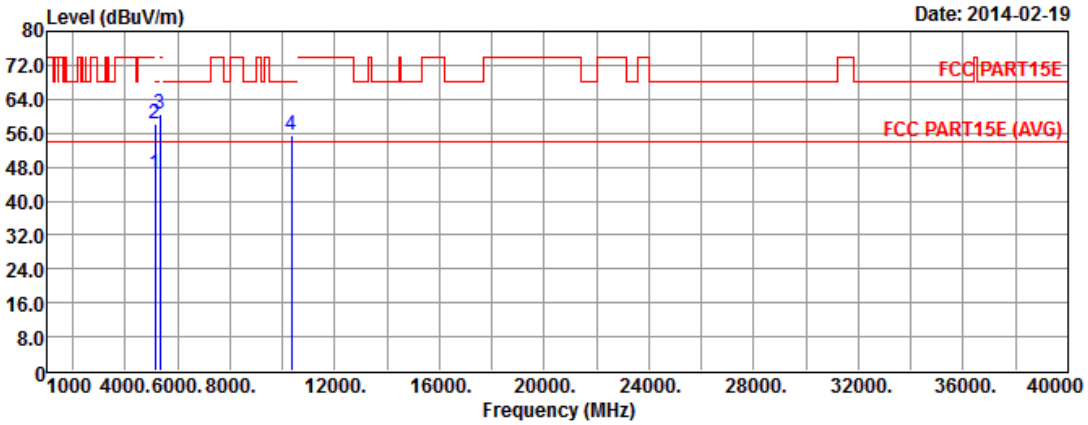
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5180
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	45.94	-8.06	54.00	40.23	31.86	6.93	33.08	---	---	Average
2	5150.00	56.57	-17.43	74.00	50.86	31.86	6.93	33.08	---	---	Peak
3	5340.00	59.44	-8.76	68.20	53.46	31.94	7.11	33.07	---	---	Peak
4	10360.00	54.62	-13.58	68.20	40.18	39.85	10.06	35.47	---	---	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.

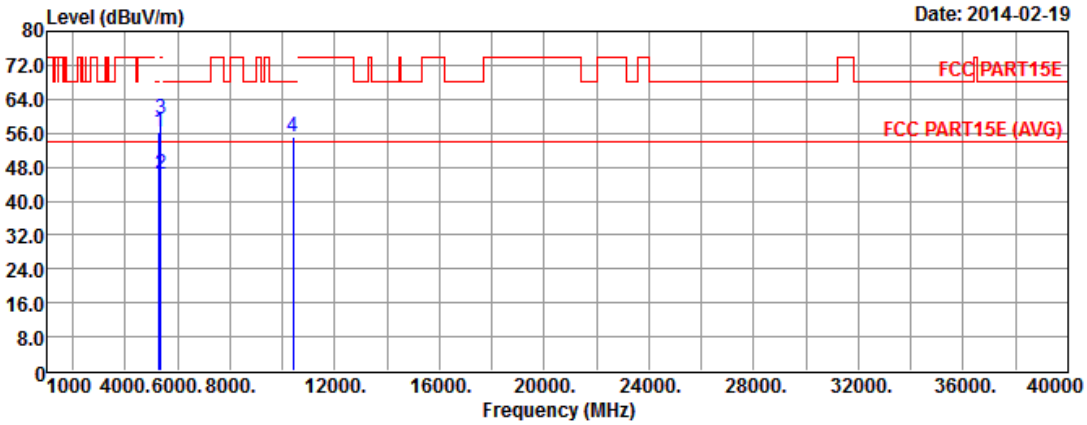
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5180
Operating Mode	1	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.19	-7.81	54.00	40.48	31.86	6.93	33.08	---	---	Average
2	5150.00	58.05	-15.95	74.00	52.34	31.86	6.93	33.08	---	---	Peak
3	5340.00	60.56	-7.64	68.20	54.58	31.94	7.11	33.07	---	---	Peak
4	10360.00	55.41	-12.79	68.20	40.97	39.85	10.06	35.47	---	---	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.

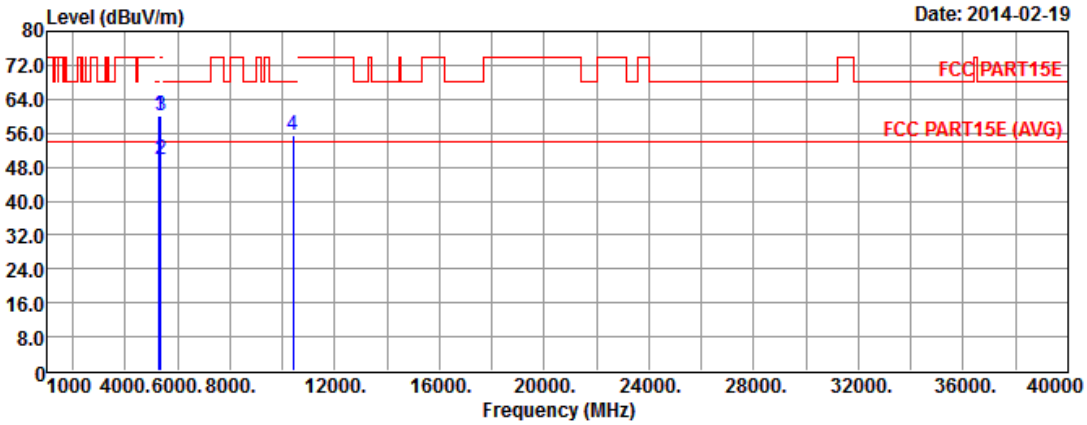
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5200
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5280.00	56.38	-11.82	68.20	50.48	31.91	7.06	33.07	---	---	Peak
2	5360.00	46.35	-7.65	54.00	40.35	31.94	7.12	33.06	---	---	Average
3	5360.00	59.24	-14.76	74.00	53.24	31.94	7.12	33.06	---	---	Peak
4	10400.00	54.99	-13.21	68.20	40.49	39.92	10.06	35.48	---	---	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.

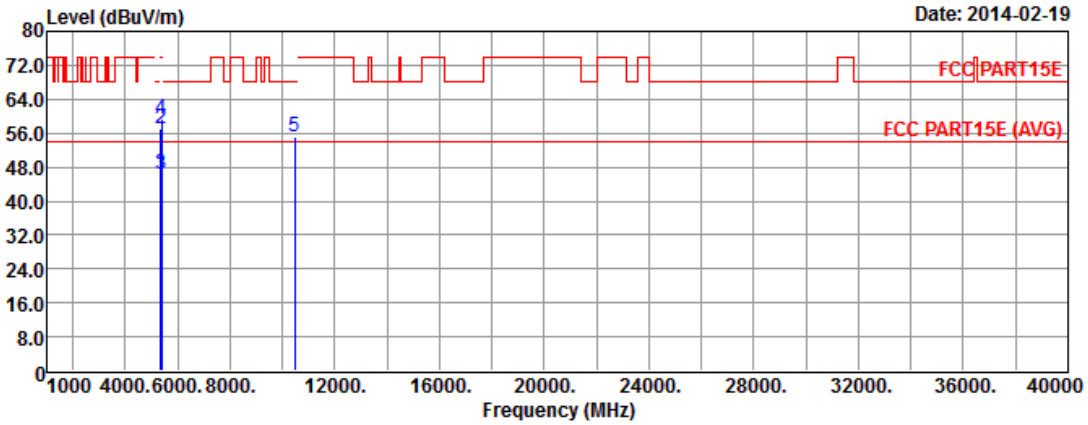
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5200
Operating Mode	1	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5280.00	60.21	-7.99	68.20	54.31	31.91	7.06	33.07	---	---	Peak
2	5360.00	49.69	-4.31	54.00	43.69	31.94	7.12	33.06	---	---	Average
3	5360.00	60.22	-13.78	74.00	54.22	31.94	7.12	33.06	---	---	Peak
4	10400.00	55.41	-12.79	68.20	40.91	39.92	10.06	35.48	---	---	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.

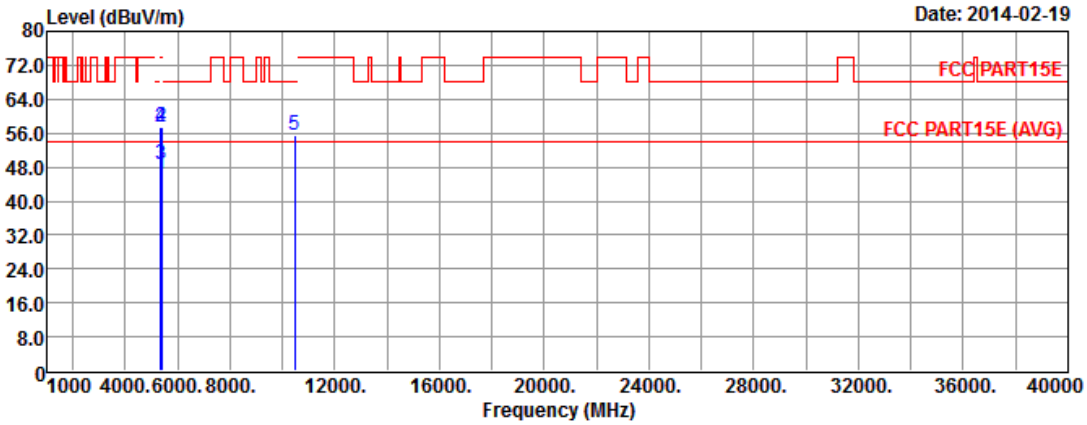
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5240
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5350.00	46.24	-7.76	54.00	40.25	31.94	7.11	33.06	---	---	Average
2	5350.00	56.97	-17.03	74.00	50.98	31.94	7.11	33.06	---	---	Peak
3	5400.00	46.49	-7.51	54.00	40.44	31.96	7.15	33.06	---	---	Average
4	5400.00	59.32	-14.68	74.00	53.27	31.96	7.15	33.06	---	---	Peak
5	10480.00	55.01	-13.19	68.20	40.38	40.06	10.07	35.50	---	---	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	VHT20	**Test Freq. (MHz)**	5240
Operating Mode	1	**Polarization**	V

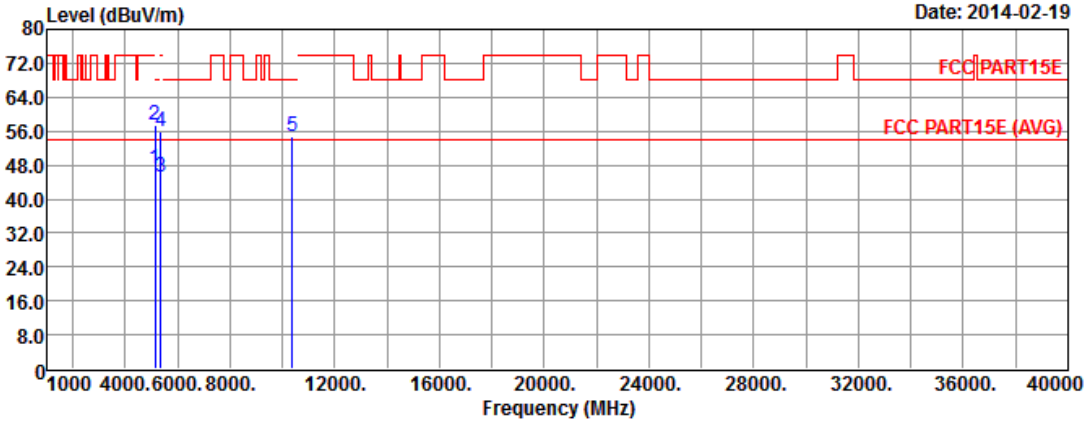


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5350.00	46.47	-7.53	54.00	40.48	31.94	7.11	33.06	---	---	Average
2	5350.00	57.40	-16.60	74.00	51.41	31.94	7.11	33.06	---	---	Peak
3	5400.00	48.49	-5.51	54.00	42.44	31.96	7.15	33.06	---	---	Average
4	5400.00	57.39	-16.61	74.00	51.34	31.96	7.15	33.06	---	---	Peak
5	10480.00	55.38	-12.82	68.20	40.75	40.06	10.07	35.50	---	---	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.

3.6.9 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT40

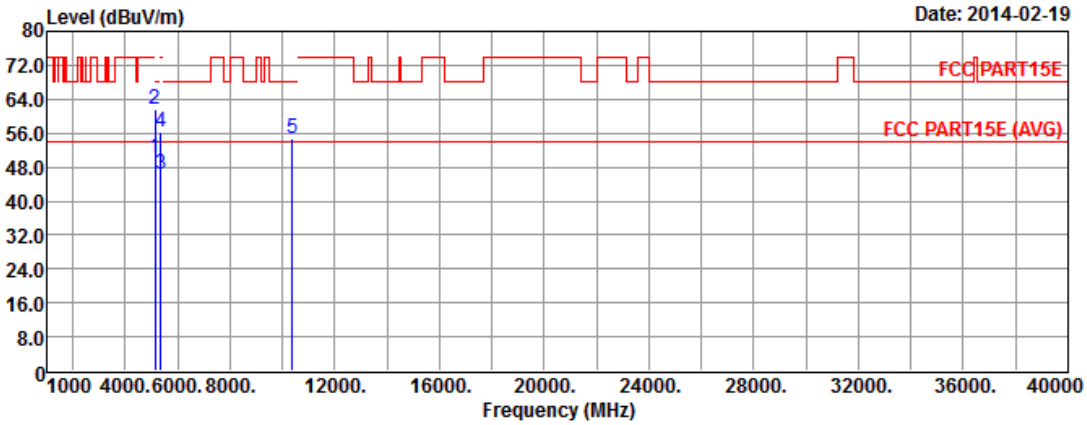
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5190
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	47.24	-6.76	54.00	41.53	31.86	6.93	33.08	---	---	Average
2	5150.00	57.42	-16.58	74.00	51.71	31.86	6.93	33.08	---	---	Peak
3	5350.00	45.23	-8.77	54.00	39.24	31.94	7.11	33.06	---	---	Average
4	5350.00	55.93	-18.07	74.00	49.94	31.94	7.11	33.06	---	---	Peak
5	10380.00	54.82	-13.38	68.20	40.36	39.88	10.06	35.48	---	---	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.

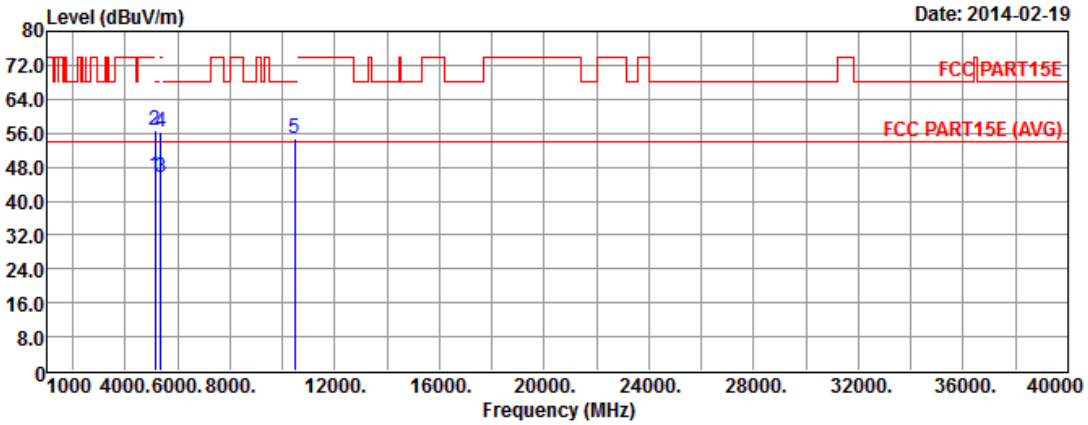
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5190
Operating Mode	1	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	50.17	-3.83	54.00	44.46	31.86	6.93	33.08	---	---	Average
2	5150.00	61.69	-12.31	74.00	55.98	31.86	6.93	33.08	---	---	Peak
3	5350.00	46.24	-7.76	54.00	40.25	31.94	7.11	33.06	---	---	Average
4	5350.00	56.28	-17.72	74.00	50.29	31.94	7.11	33.06	---	---	Peak
5	10380.00	54.80	-13.40	68.20	40.34	39.88	10.06	35.48	---	---	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.

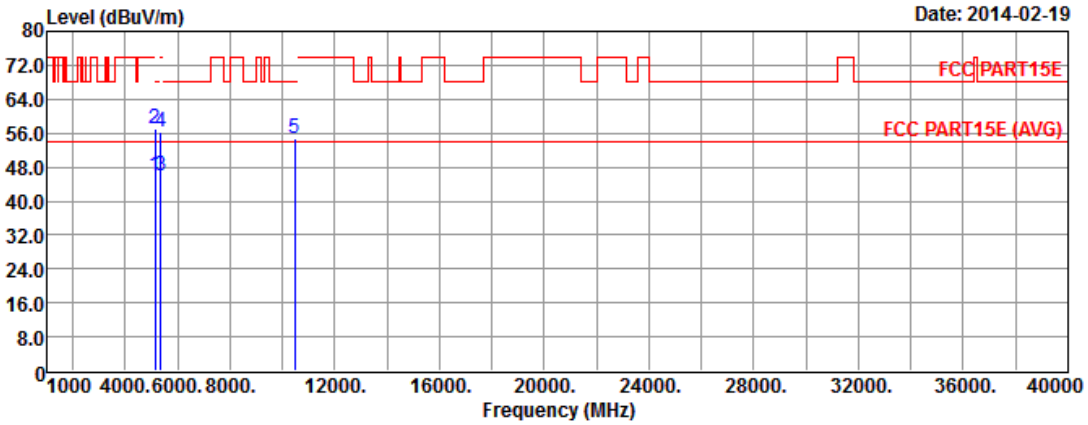
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5230
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	45.92	-8.08	54.00	40.21	31.86	6.93	33.08	---	---	Average
2	5150.00	56.73	-17.27	74.00	51.02	31.86	6.93	33.08	---	---	Peak
3	5350.00	45.37	-8.63	54.00	39.38	31.94	7.11	33.06	---	---	Average
4	5350.00	56.23	-17.77	74.00	50.24	31.94	7.11	33.06	---	---	Peak
5	10460.00	54.88	-13.32	68.20	40.28	40.03	10.07	35.50	---	---	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	VHT40	**Test Freq. (MHz)**	5230
Operating Mode	1	**Polarization**	V

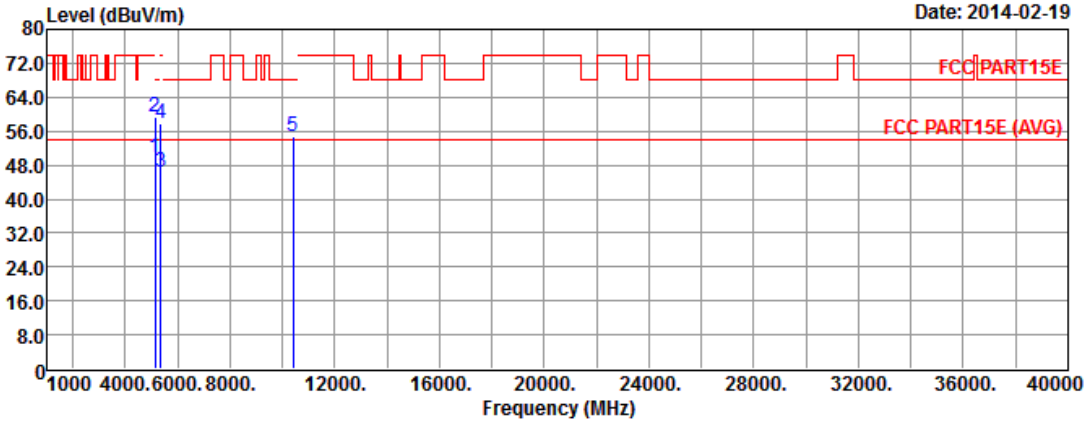


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.06	-7.94	54.00	40.35	31.86	6.93	33.08	---	---	Average
2	5150.00	57.19	-16.81	74.00	51.48	31.86	6.93	33.08	---	---	Peak
3	5350.00	46.09	-7.91	54.00	40.10	31.94	7.11	33.06	---	---	Average
4	5350.00	56.26	-17.74	74.00	50.27	31.94	7.11	33.06	---	---	Peak
5	10460.00	54.88	-13.32	68.20	40.28	40.03	10.07	35.50	---	---	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.

3.6.10 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT80

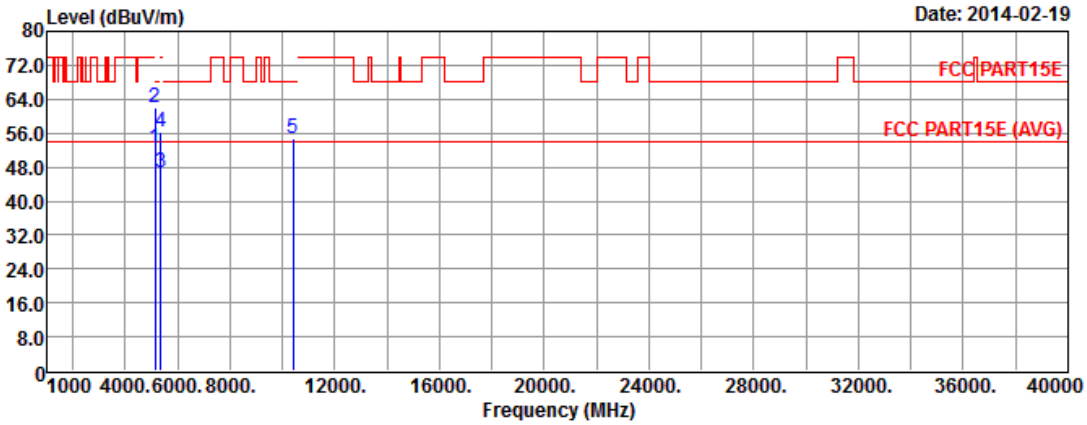
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT80	**Test Freq. (MHz)**	5210
Operating Mode	1	**Polarization**	H



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	49.85	-4.15	54.00	44.14	31.86	6.93	33.08	---	---	Average
2	5150.00	59.26	-14.74	74.00	53.55	31.86	6.93	33.08	---	---	Peak
3	5350.00	46.47	-7.53	54.00	40.48	31.94	7.11	33.06	---	---	Average
4	5350.00	57.67	-16.33	74.00	51.68	31.94	7.11	33.06	---	---	Peak
5	10420.00	54.91	-13.29	68.20	40.37	39.96	10.07	35.49	---	---	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	VHT80	**Test Freq. (MHz)**	5210
Operating Mode	1	**Polarization**	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	52.58	-1.42	54.00	46.87	31.86	6.93	33.08	---	---	Average
2	5150.00	62.05	-11.95	74.00	56.34	31.86	6.93	33.08	---	---	Peak
3	5350.00	46.54	-7.46	54.00	40.55	31.94	7.11	33.06	---	---	Average
4	5350.00	56.41	-17.59	74.00	50.42	31.94	7.11	33.06	---	---	Peak
5	10420.00	54.68	-13.52	68.20	40.14	39.96	10.07	35.49	---	---	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.

3.7 Frequency Stability

3.7.1 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.

3.7.2 Measuring Instruments

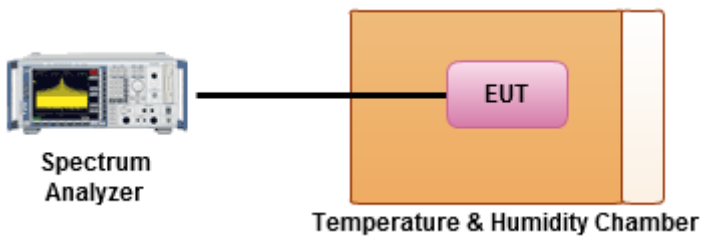
Refer a test equipment and calibration data table in this test report.

3.7.3 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.	

3.7.4 Test Setup

Frequency Stability



3.7.5 Test Result of Frequency Stability

Frequency Stability Result			
Mode		**Frequency Stability (ppm)**	
Condition	**Freq. (MHz)**	**Test Frequency (MHz)**	**Frequency Stability (ppm)**
$T_{20°C}$Vmax	5200	5200.01517	2.9173
$T_{20°C}$Vmin	5200	5200.01325	2.5481
$T_{55°C}$Vnom	5200	5200.01080	2.0769
$T_{50°C}$Vnom	5200	5200.01359	2.6135
$T_{40°C}$Vnom	5200	5200.01101	2.1173
$T_{30°C}$Vnom	5200	5200.01425	2.7404
$T_{20°C}$Vnom	5200	5200.01869	3.5942
$T_{10°C}$Vnom	5200	5200.01249	2.4019
$T_{0°C}$Vnom	5200	5200.01561	3.0019
$T_{-10°C}$Vnom	5200	5200.01654	3.1808
$T_{-20°C}$Vnom	5200	5200.01149	2.2096
$T_{-30°C}$Vnom	5200	5200.01130	2.1731
Limit (ppm)		20	
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	100132	9kHz ~ 2.75GHz	Nov. 14, 2013	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 21, 2014	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	Apr. 18, 2013	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832010001	9kHz ~ 30MHz	Oct. 30, 2013	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-01-04	N/A	Feb. 25, 2014	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	FSV40	101499	9Kz – 40GHz	Feb. 08, 2014	Radiation (03CH08-HY)
Receiver	R&S	ESR3	101657	9KHz – 3GHz	Jan. 18, 2014	Radiation (03CH08-HY)
Amplifier	Burgeon	BPA-530	100218	30MHz ~ 1000MHz	Dec. 09, 2013	Radiation (03CH08-HY)
Amplifier	Agilent	8449B	3008A02665	1GHz – 26.5 GHz	Sep. 04, 2013	Radiation (03CH08-HY)
Horn Antenna	ETS-LINDGREN	3117	66584	1GHz~18GHz	Aug. 07, 2013	Radiation (03CH08-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170517	15GHz~40GHz	Dec. 27, 2013	Radiation (03CH08-HY)
Bilog Antenna	Teseq GmbH	CBL6112D	35379	30 MHz - 1 GHz	Oct. 10, 2013	Radiation (03CH08-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	EM	EM18G40G	060572	26.5GHz ~ 40GHz	Jun. 20, 2013	Radiation (03CH08-HY)
Loop Antenna	R&S	HFH2-Z2	860004/0001	9 kHz - 30 MHz	Jul. 03, 2012	Radiation (03CH08-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	FSV 40	101063	9KHz~40GHz	Feb. 17, 2014	Conducted (TH01-HY)
Spectrum Analyzer	Agilent	N9010A	MY53400091	9KHz~44GHz	Oct. 07, 2013	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Nov. 21, 2013	Conducted (TH01-HY)
Signal Generator	R&S	SMB100A	175727	10MHz ~ 40GHz	Jan. 07, 2014	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1207366	300MHz ~ 40GHz	Oct. 24, 2013	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1241002	300MHz ~ 40GHz	Oct. 24, 2013	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 21, 2013	Conducted (TH01-HY)
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jul. 16, 2013	Conducted (TH01-HY)

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