FCC Test Report

Equipment	:	**AC800 Selectable Dual Band VPN Business Router**
Brand Name	:	**D-Link**
Model No.	:	**DSR-500AC**
FCC ID	:	**KA2SR500ACA1**
Standard	:	**47 CFR FCC Part 15.407**
Operating Band	:	**5725 MHz – 5850 MHz**
FCC Classification	:	**NII**
Applicant	:	**D-Link Corporation** **17595 Mt. Herrmann, Fountain Valley, CA 92708 U.S.A.**

The product sample received on Aug. 27, 2014 and completely tested on Jan. 05, 2015. 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-A5

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]:0.3751190MHz 49.31 (Margin 9.08dB) – QP 45.23 (Margin 3.16dB) – AV	FCC 15.207	Complied
3.2	15.407(a)	Emission Bandwidth	26dB Bandwidth [MHz] 20M: 52.09 / 40M: 84.26 80M: 89.04 6dB Bandwidth [MHz] 20M: 16.35 / 40M: 36.17 80M: 76.29	Information only for 26dB bandwidth 500kHz for 6dB bandwidth	Complied
3.3	15.407(a)	RF Output Power (Maximum Conducted (Average) Output Power)	Power [dBm] 5725-5850MHz: 23.92	Power [dBm] 5725-5850MHz: 30	Complied
3.4	15.407(a)	Peak Power Spectral Density	PPSD [dBm/MHz] 5725-5850MHz: 7.27	PPSD [dBm/500kHz] 5725-5850MHz: 30	Complied
3.5	15.407(b)	Transmitter Unwanted Emissions and Band Edge	Restricted Bands [dBuV/m at 3m]: 5715.00MHz 52.96 (Margin 1.04dB) – AV	Non-Restricted Bands: ≤ -27dBm (68.2dBuV/m@3m) Restricted Bands: FCC 15.209	Complied
3.6	15.407(g)	Frequency Stability	3.7373 ppm	Signal shall remain in-band	Complied

Revision History

Report No.	Version	Description	Issued Date
FR4N2636AI	Rev. 01	Initial issue of report	Feb. 04, 2015
FR4N2636AI	Rev. 02	Modify ANSI C63.10 version	May 21, 2015

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
5725-5850	a	5745-5825	149-165 [5]	2	23.66	No
5725-5850	n(HT20)	5745-5825	149-165 [5]	2	23.86	No
5725-5850	n(HT40)	5755-5795	151-159 [2]	2	21.71	No
5725-5850	ac(VHT20)	5745-5825	149-165 [5]	2	23.92	No
5725-5850	ac(VHT40)	5755-5795	151-159 [2]	2	21.76	No
5725-5850	ac(VHT80)	5775	155 [1]	2	14.04	No

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			
☐	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.	Type	Connector	Operating Frequencies (MHz) / Antenna Gain (dBi)		
			2400~2483.5	5150~5250	5725~5850
1	Dipole	R-SMA	2	2	2

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 test mode for worst duty cycle	
Test Signal Duty Cycle (x)	**Power Duty Factor [dB] – (10 log 1/x)**
☒ 91.26% - IEEE 802.11a	0.40
☒ 96.46% - IEEE 802.11ac (VHT20)	0.16
☒ 94.17% - IEEE 802.11ac (VHT40)	0.26
☒ 89.05% - IEEE 802.11ac (VHT80)	0.50

1.1.5 EUT Operational Condition

Supply Voltage	☒ 12Vdc from adapter		
Test Voltage	☒ Vnom (120 V)	☒ Vmax (102 V)	☒ Vmin (138 V)
Test Climatic	☒ Tnom (20°C)	☒ Tmax (50°C)	☒ Tmin (-30°C)

1.2 Accessories and Support Equipment

Accessories		
No.	**Equipment**	**Description**
1	AC Adapter	Brand: APD Model: DA-30P12 I/P: 100-240Vac, 50/60Hz, 0.8A Max O/P: 12Vdc, 2.5A DC line: 1.47m non-shielded w/o core

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	Notebook	DELL	Latitude E6440	DoC
2	Notebook	DELL	Latitude E6440	DoC
3	USB 2.0 Flash	hp	V225w	---

Note: No.3 was provided by applicant.

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 D02 v01
- FCC KDB 644545 D03 v01
- FCC KDB 662911 v02r01
- FCC KDB 412172 v01
  Note: FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014

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	20°C / 63%	Jan. 05, 2015	
AC Conduction		CO04-HY	Skys Huang	22°C / 54%	Dec. 15, 2014	
Radiated Emission		03CH03-HY	Jack Li	20-26°C / 64-65%	Aug. 29 ~ Dec. 12, 2014	
Test site registered number [643075] with FCC Test site registered number [4086B-1] 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
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 (5725-5850 MHz)			
Modulation Mode	**Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Worst Data Rate / MCS**
11a	2	6-54Mbps	6 Mbps
HT20	2	MCS 0-15	MCS 0
HT40	2	MCS 0-15	MCS 0
VHT20	2	MCS 0-9	MCS 0
VHT40	2	MCS 0-9	MCS 0
VHT80	2	MCS 0-9	MCS 0

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (5150-5250MHz band)							
Test Software	ART2						
Test Software Version	ver_4_9_802_1_CS_Bin						
Modulation Mode	**N_{TX}**	**Test Frequency (MHz)**					
		NCB: 20MHz			**NCB: 40MHz**		**NCB: 80MHz**
		5745	**5785**	**5825**	**5755**	**5795**	**5775**
11a,6-54Mbps	2	15	24	17.5	--	--	--
HT20,M0-15	2	14.5	24	17	--	--	--
HT40,M0-15	2	--	--	--	15.5	20.5	--
VHT20,M0-9	2	14.5	24	17	--	--	--
VHT40,M0-9	2	--	--	--	15.5	20.5	--
VHT80,M0-9	2	--	--	--	--	--	11

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)

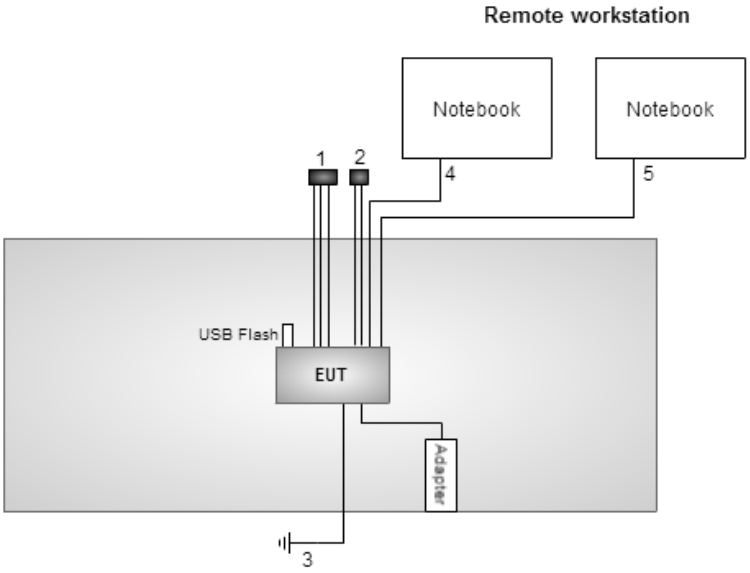
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, HT20, HT40, VHT20, VHT40, VHT80
Operating Mode	Operating Mode Description
1	AC Power & Radio link (WLAN)

The Worst Case Mode for Following Conformance Tests	
Tests Item	Peak Power Spectral Density, 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)

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 three 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. The worst planes is X.		
Operating Mode	☒ 1. AC Power & Radio link (WLAN)		
Modulation Mode	11a, VHT20, VHT40, VHT80		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**

2.4 Test Setup Diagram

Test Setup Diagram –Radiated Emission Test



1. RJ45, 1m non-shielded x3 with load
2. Console, 1.8m shielded x2 with load
3. Ground cable, 1.8m
4. RJ45, 10m non-shielded
5. RJ45, 10m non-shielded

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

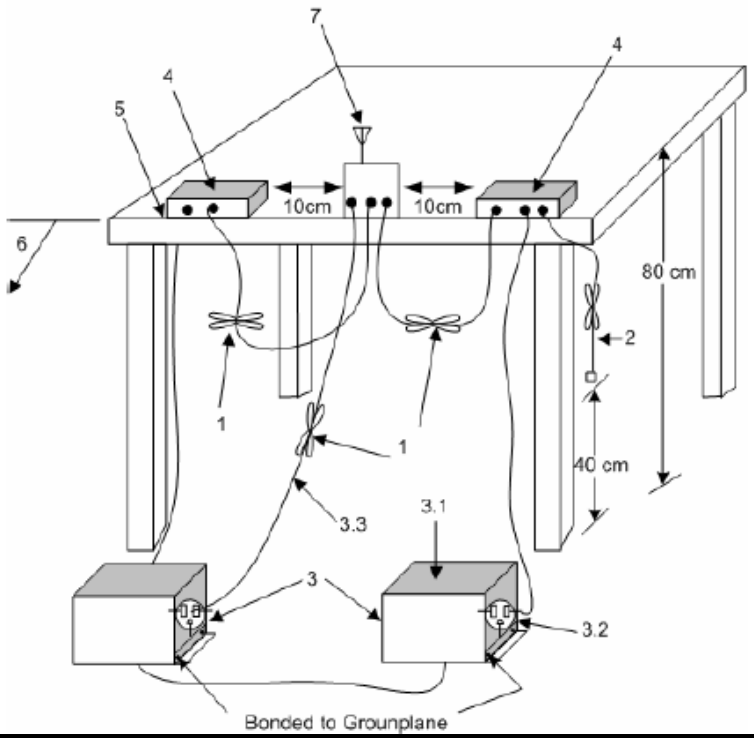
Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

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

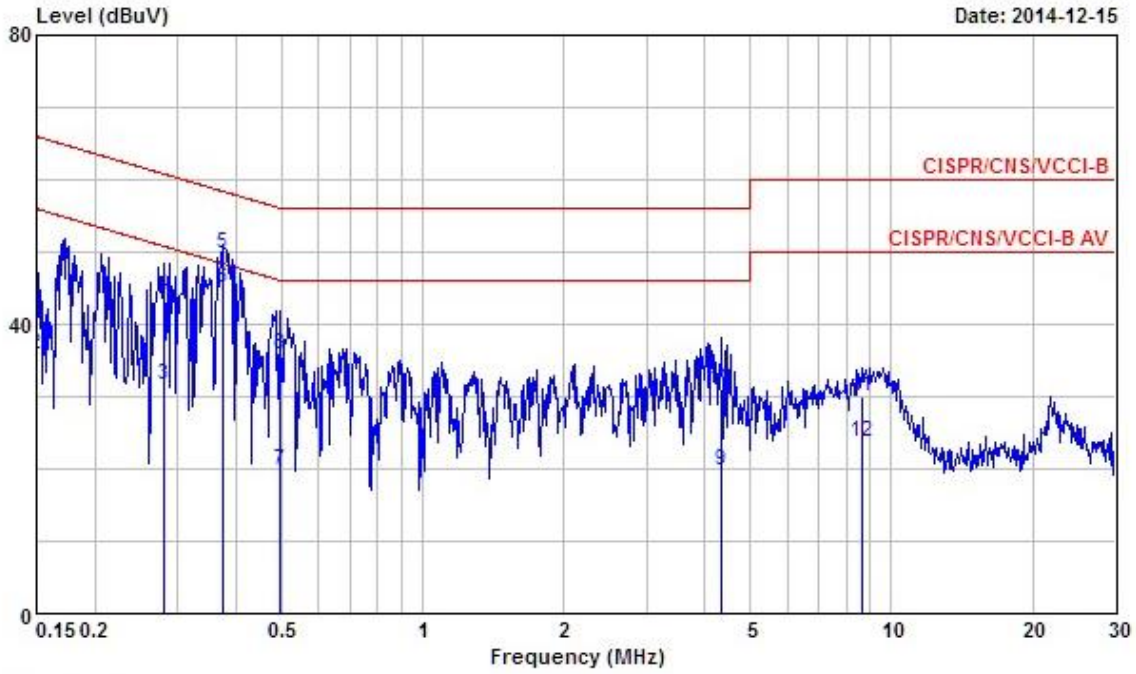
3.1.4 Test Setup

AC Power-line Conducted Emissions



3.1.5 Test Result of AC Power-line Conducted Emissions

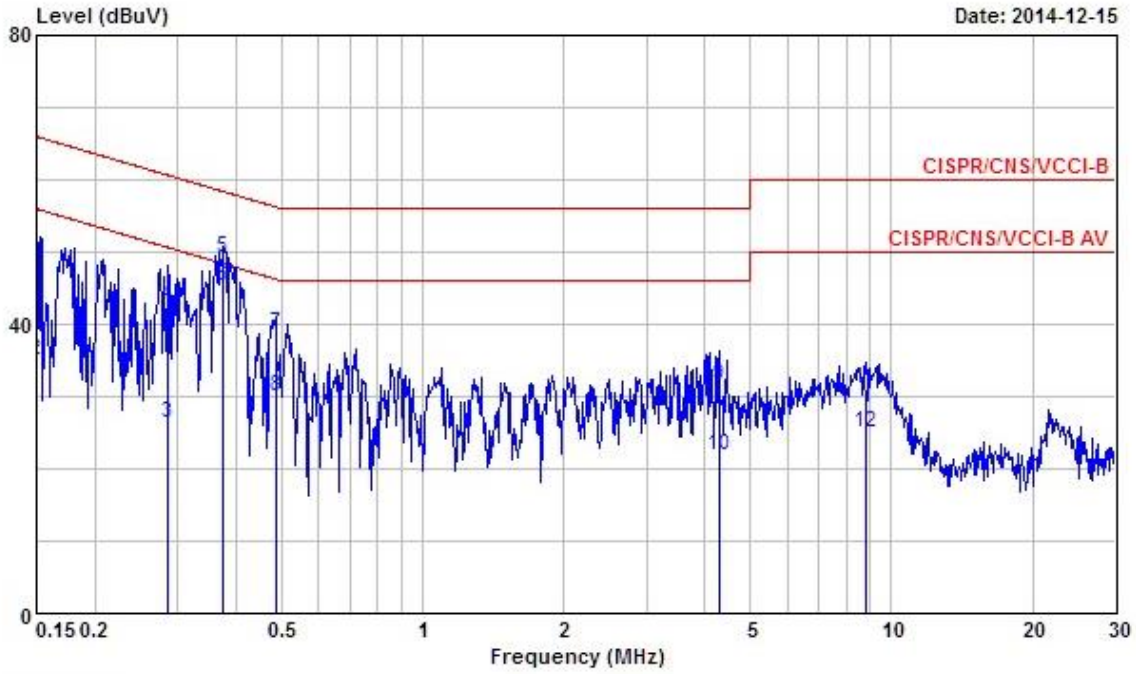
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	51.19	-14.81	66.00	50.83	0.02	0.34	QP
2	0.1500000	35.80	-20.20	56.00	35.44	0.02	0.34	Average
3	0.2817820	31.61	-19.15	50.76	31.04	0.02	0.55	Average
4	0.2817820	43.93	-16.83	60.76	43.36	0.02	0.55	QP
5	0.3751190	49.77	-8.62	58.39	49.15	0.03	0.59	QP
6	@0.3751190	45.12	-3.27	48.39	44.50	0.03	0.59	Average
7	0.4941090	19.69	-26.41	46.10	19.01	0.03	0.65	Average
8	0.4941090	35.72	-20.38	56.10	35.04	0.03	0.65	QP
9	4.340	19.64	-26.36	46.00	18.83	0.10	0.71	Average
10	4.340	31.00	-25.00	56.00	30.19	0.10	0.71	QP
11	8.680	29.94	-30.06	60.00	28.99	0.17	0.78	QP
12	8.680	23.79	-26.21	50.00	22.84	0.17	0.78	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



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1500000	50.38	-15.62	66.00	50.01	0.03	0.34	QP
2	0.1500000	35.02	-20.98	56.00	34.65	0.03	0.34	Average
3	0.2847840	26.40	-24.28	50.68	25.82	0.03	0.55	Average
4	0.2847840	42.69	-17.99	60.68	42.11	0.03	0.55	QP
5	0.3751190	49.31	-9.08	58.39	48.69	0.03	0.59	QP
6	@0.3751190	45.23	-3.16	48.39	44.61	0.03	0.59	Average
7	0.4863180	38.56	-17.67	56.23	37.88	0.04	0.64	QP
8	0.4863180	30.09	-16.14	46.23	29.41	0.04	0.64	Average
9	4.290	31.45	-24.55	56.00	30.63	0.11	0.71	QP
10	4.290	21.85	-24.15	46.00	21.03	0.11	0.71	Average
11	8.820	30.98	-29.02	60.00	30.01	0.18	0.79	QP
12	8.820	25.04	-24.96	50.00	24.07	0.18	0.79	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
Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz

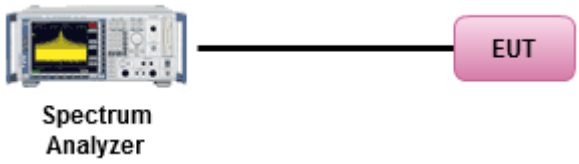
3.2.2 Measuring Instruments

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 D02 v01, clause C for EBW / 6dB bandwidth and clause D for OBW measurement.	
	☐	Refer as ANSI C63.10, clause 6.9 for occupied bandwidth testing.	
	☐	Refer as IC RSS-Gen, clause 6.6 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

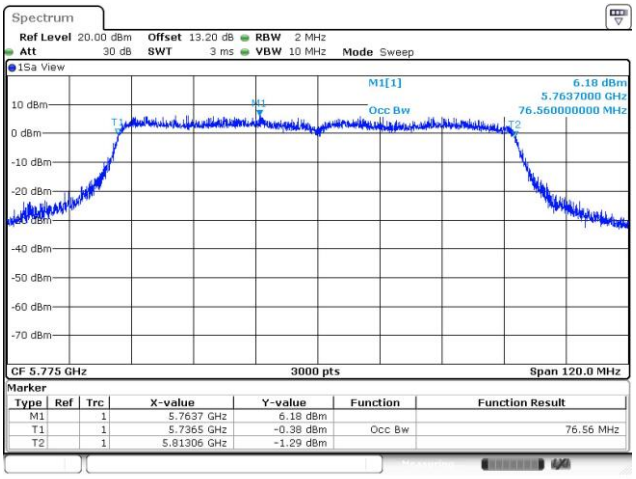
Emission Bandwidth


3.2.5 Test Result of Emission Bandwidth

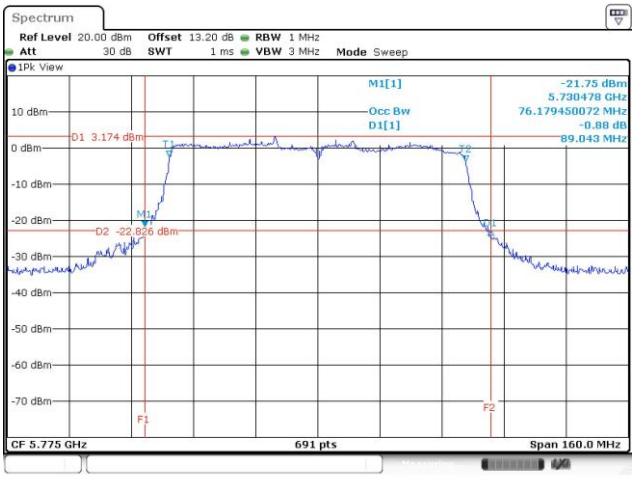
UNII Emission Bandwidth Result														
Condition			Emission Bandwidth (MHz)											
Modulation Mode	N_{TX}	Freq. (MHz)	99% Bandwidth				26dB Bandwidth				6dB Bandwidth			
			Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4
11a	2	5745	16.82	16.83	--	--	24.52	21.91	--	--	16.35	16.35	--	--
11a	2	5785	25.33	25.02	--	--	47.22	46.70	--	--	16.41	16.35	--	--
11a	2	5825	16.98	16.83	--	--	29.16	27.13	--	--	16.35	16.35	--	--
VHT20	2	5745	17.88	17.82	--	--	23.30	24.12	--	--	17.51	17.62	--	--
VHT20	2	5785	25.42	24.91	--	--	52.09	50.26	--	--	17.62	16.87	--	--
VHT20	2	5825	17.94	17.93	--	--	26.72	25.74	--	--	17.62	17.62	--	--
VHT40	2	5755	36.78	36.84	--	--	48.23	46.61	--	--	36.41	36.17	--	--
VHT40	2	5795	37.66	37.34	--	--	84.26	75.78	--	--	36.41	36.17	--	--
VHT80	2	5775	76.56	76.56	--	--	89.04	87.88	--	--	76.29	76.52	--	--
Result			Complied											

Worst Emission Bandwidth Plots

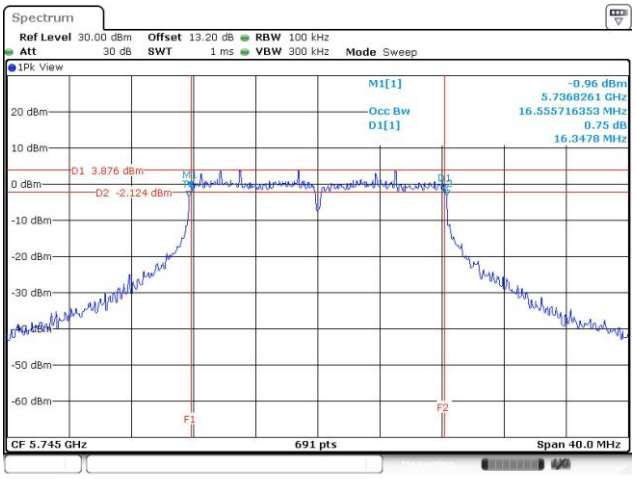
99% Bandwidth



26dB Bandwidth



6dB Bandwidth



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3.3 RF Output Power

3.3.1 RF Output Power Limit

Maximum Conducted Output Power Limit
The maximum conducted output power over the frequency band of operation shall not exceed 1 W. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 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 D02 v01, clause E Method SA-1 (spectral trace averaging).
	☐	Refer as FCC KDB 789033 D02 v01, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)
	☐	Refer as FCC KDB 789033 D02 v01, clause E Method SA-2 (spectral trace averaging).
	☐	Refer as FCC KDB 789033 D02 v01, 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 D02 v01, 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)		2	2	-	-
Modulation Mode	**DG (dBi)**	**N_{TX}**	**N_{SS}**	**STBC**	**Array Gain (dB)**
11a,6-54Mbps	2	2	1	-	-
HT20,M0-15	2	2	1	-	-
HT20,M0-15	2	2	1	-	-
VHT20,M0-9	2	2	1	-	-
VHT40,M0-9	2	2	1	-	-
VHT80,M0-9	2	2	1		-

3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted (Average) Output Power											
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	5745	15.52	13.49	--	--	17.63	30.00	2.00	19.63	36.00
11a	2	5785	20.87	20.41	--	--	23.66	30.00	2.00	25.66	36.00
11a	2	5825	17.86	16.91	--	--	20.42	30.00	2.00	22.42	36.00
HT20	2	5745	15.02	13.25	--	--	17.23	30.00	2.00	19.23	36.00
HT20	2	5785	21.01	20.69	--	--	23.86	30.00	2.00	25.86	36.00
HT20	2	5825	17.11	16.57	--	--	19.86	30.00	2.00	21.86	36.00
HT40	2	5755	14.28	13.43	--	--	16.89	30.00	2.00	18.89	36.00
HT40	2	5795	18.81	18.59	--	--	21.71	30.00	2.00	23.71	36.00
VHT20	2	5745	15.10	13.29	--	--	17.30	30.00	2.00	19.30	36.00
VHT20	2	5785	21.06	20.75	--	--	**23.92**	30.00	2.00	25.92	36.00
VHT20	2	5825	17.15	16.62	--	--	19.90	30.00	2.00	21.90	36.00
VHT40	2	5755	14.32	13.48	--	--	16.93	30.00	2.00	18.93	36.00
VHT40	2	5795	18.86	18.64	--	--	21.76	30.00	2.00	23.76	36.00
VHT80	2	5775	10.69	11.35	--	--	14.04	30.00	2.00	16.04	36.00
Result			Complied								

3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit
The maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

3.4.2 Measuring Instruments

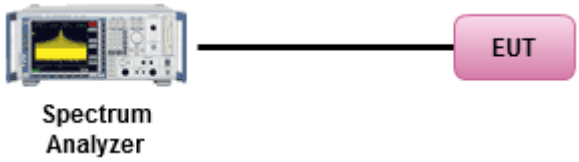
Refer a test equipment and calibration data table in this test report.

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 D02 v01, 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 D02 v01, clause E Method SA-1 (spectral trace averaging).	
	☐	Refer as FCC KDB 789033 D02 v01, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)	
	☐	Refer as FCC KDB 789033 D02 v01, clause E Method SA-2 (spectral trace averaging).	
	☒	Refer as FCC KDB 789033 D02 v01, 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



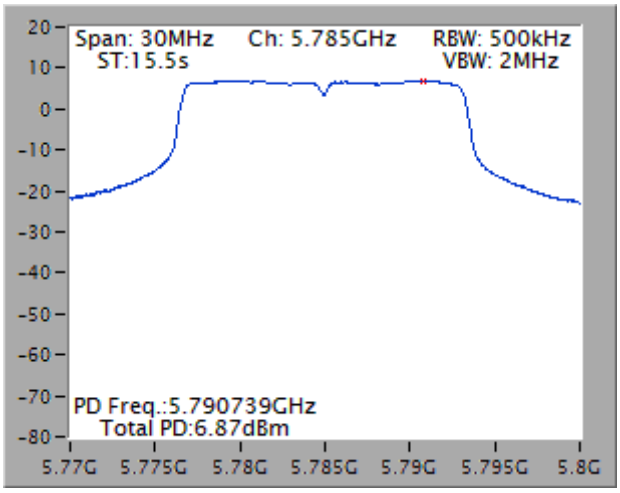
3.4.5 Test Result of Peak Power Spectral Density

Peak Power Spectral Density Result									
Condition			Peak Power Spectral Density (dBm/500kHz)						
Modulation Mode	N_{TX}	Freq. (MHz)	PSD w/o D.F (dBm)	D.F (dB)	PSD with D.F (dBm)	PSD Limit	DG (dBi)	EIRP PSD	EIRP Limit
11a	2	5745	5.56	0.40	5.96	30.00	5.01	10.97	36.00
11a	2	5785	6.87	0.40	7.27	30.00	5.01	12.28	36.00
11a	2	5825	6.07	0.40	6.47	30.00	5.01	11.48	36.00
VHT20	2	5745	3.34	0.16	3.50	30.00	5.01	8.51	36.00
VHT20	2	5785	6.64	0.16	6.80	30.00	5.01	11.81	36.00
VHT20	2	5825	5.42	0.16	5.58	30.00	5.01	10.59	36.00
VHT40	2	5755	-1.19	0.26	-0.93	30.00	5.01	4.08	36.00
VHT40	2	5795	-4.12	0.26	-3.86	30.00	5.01	1.15	36.00
VHT80	2	5775	-7.62	0.50	-7.12	30.00	5.01	-2.11	36.00
Result			Complied						

Note:

1. D.F is duty factor.
2. Test result is bin-by-bin summing measured value of each TX port.

Worst Power Spectral Density Plots



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

3.5 Transmitter Radiated Unwanted Emissions and Band Edge

3.5.1 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 - 5.85 GHz	5.715~ 5.725 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] 5.85 ~5.86 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).

3.5.2 Measuring Instruments

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

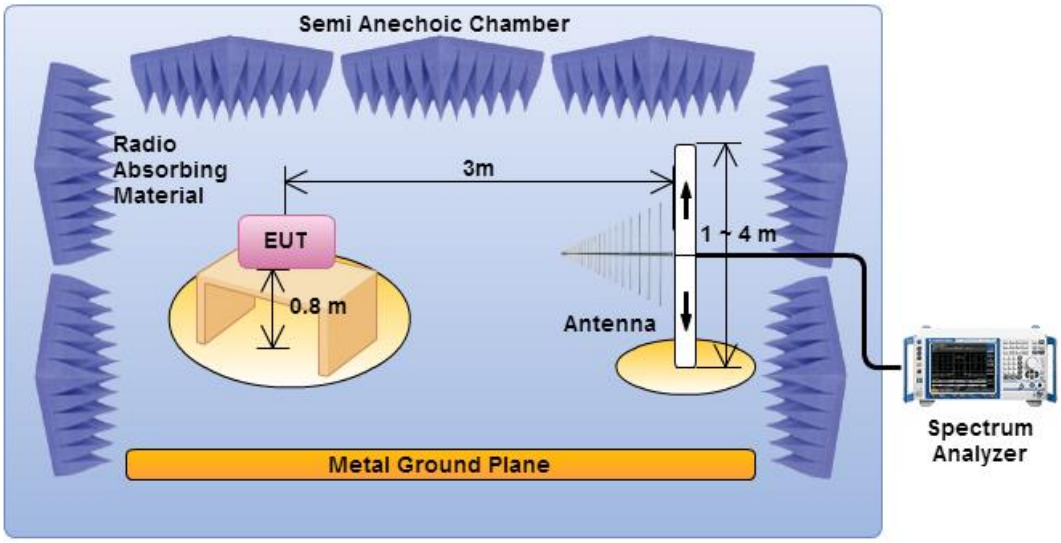
3.5.3 Test Procedures

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 D02 v01, clause G)2) for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 789033 D02 v01, clause G)1) for unwanted emissions into restricted bands.	
		☐	Refer as FCC KDB 789033 D02 v01, G)6) Method AD (Trace Averaging).
		☒	Refer as FCC KDB 789033 D02 v01, G)6) Method VB (Reduced VBW).
		☐	Refer as ANSI C63.10, clause 12.7.7.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		☒	Refer as FCC KDB 789033 D02 v01, clause G)5) measurement procedure peak limit.
		☐	Refer as ANSI C63.10, clause 12.7.6 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 D02 v01, clause G)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.	

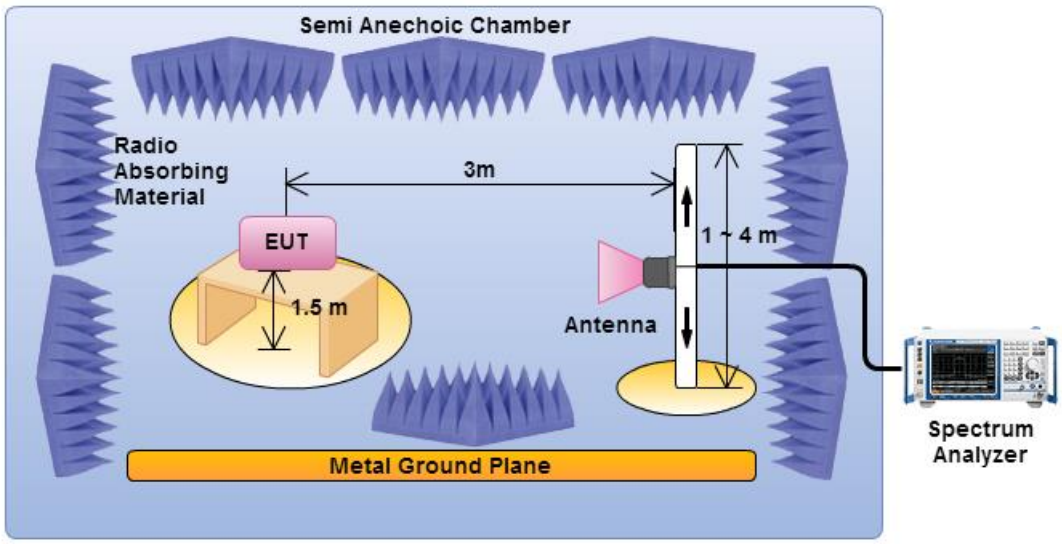
3.5.4 Test Setup

Transmitter Radiated Unwanted Emissions

Below 1GHz test:



Above 1GHz test:



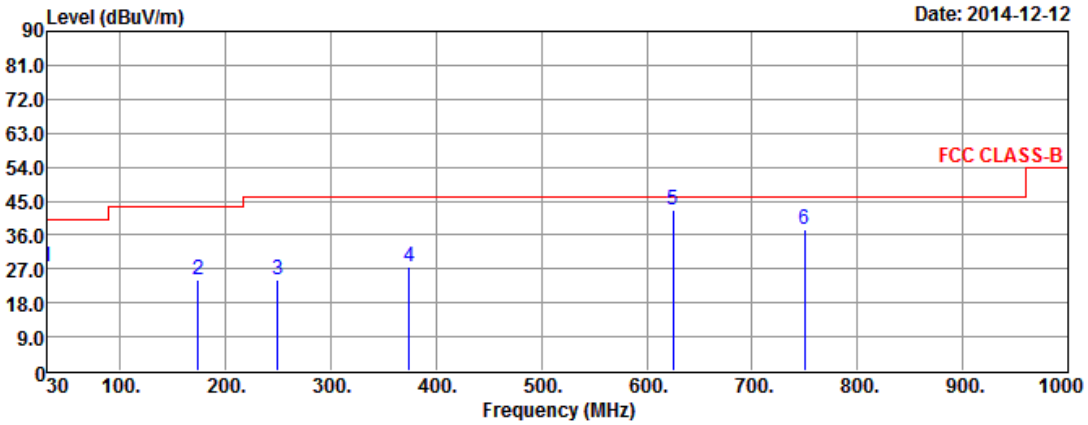
Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna and the frequency range of 1 GHz to 40 GHz using a calibrated horn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

3.5.5 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.

3.5.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

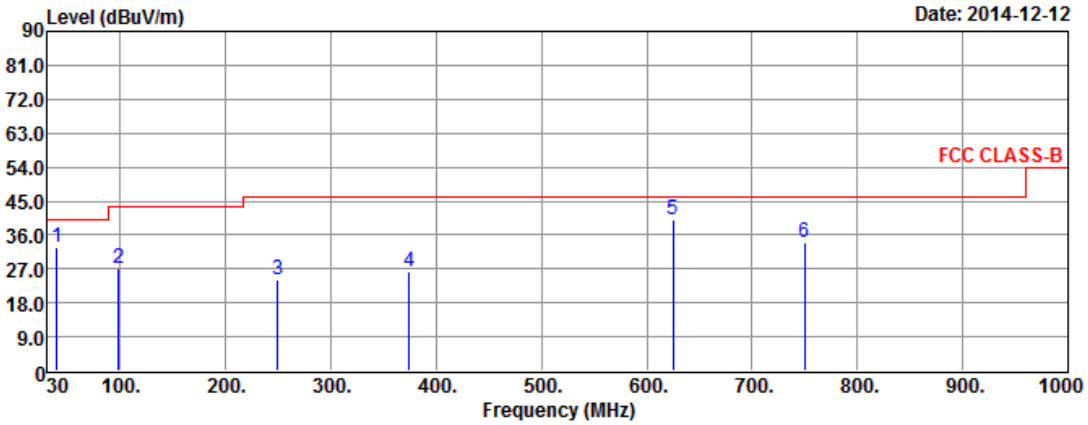
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5785
Polarization	H		



	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	30.00	27.54	-12.46	40.00	45.38	13.60	0.42	31.86	---	---	Peak
2	173.56	24.02	-19.48	43.50	41.96	12.81	0.84	31.59	---	---	Peak
3	249.22	24.33	-21.67	46.00	42.20	12.58	1.03	31.48	---	---	Peak
4	374.35	27.39	-18.61	46.00	41.71	15.83	1.29	31.44	---	---	Peak
5	624.61	42.43	-3.57	46.00	51.60	20.50	1.71	31.38	---	---	Peak
6	749.74	37.38	-8.62	46.00	44.56	22.30	1.88	31.36	---	---	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	VHT20	**Test Freq. (MHz)**	5785
Polarization	V		

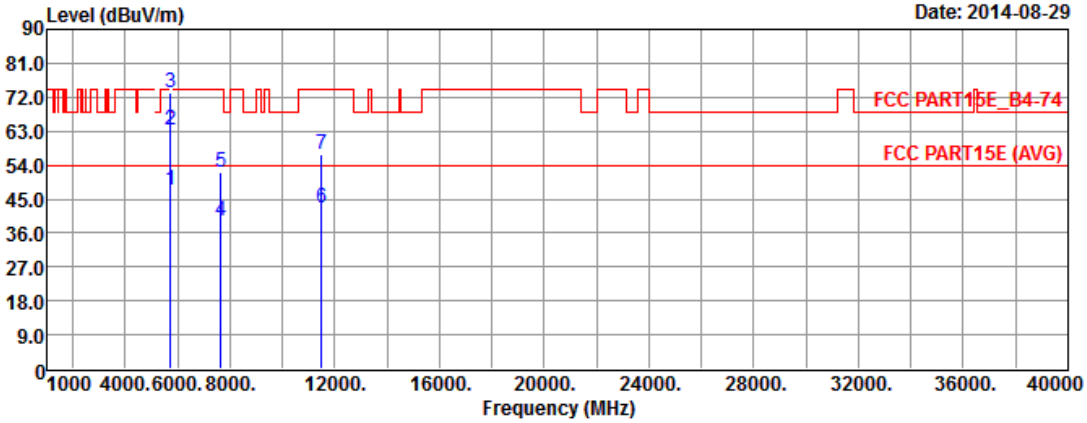


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	39.70	32.53	-7.47	40.00	49.81	14.08	0.47	31.83	---	---	Peak
2	97.90	26.96	-16.54	43.50	49.20	8.83	0.65	31.72	---	---	Peak
3	249.22	24.09	-21.91	46.00	41.96	12.58	1.03	31.48	---	---	Peak
4	374.35	26.33	-19.67	46.00	40.65	15.83	1.29	31.44	---	---	Peak
5	624.61	39.96	-6.04	46.00	49.13	20.50	1.71	31.38	---	---	Peak
6	749.74	33.95	-12.05	46.00	41.13	22.30	1.88	31.36	---	---	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)

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

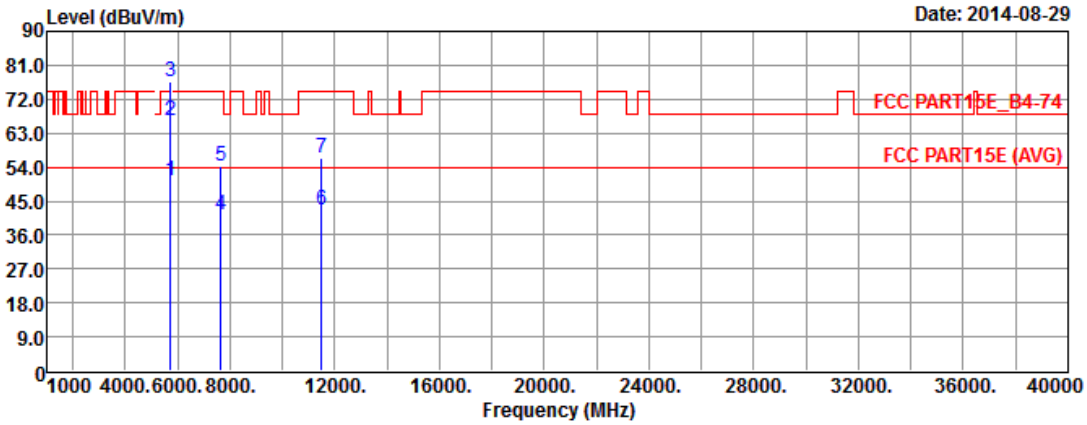
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5745
N_{TX}	2	**Polarization**	H



	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	5715.00	47.23	-6.77	54.00	40.65	32.30	7.41	33.13	---	---	Average
2	5715.00	63.27	-10.73	74.00	56.69	32.30	7.41	33.13	---	---	Peak
3	5725.00	73.34	-4.86	78.20	66.75	32.31	7.42	33.14	---	---	Peak
4	7660.00	39.22	-14.78	54.00	28.11	36.83	9.19	34.91	---	---	Average
5	7660.00	52.29	-21.71	74.00	41.18	36.83	9.19	34.91	---	---	Peak
6	11490.00	42.78	-11.22	54.00	27.58	40.31	10.35	35.46	---	---	Average
7	11490.00	56.91	-17.09	74.00	41.71	40.31	10.35	35.46	---	---	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..

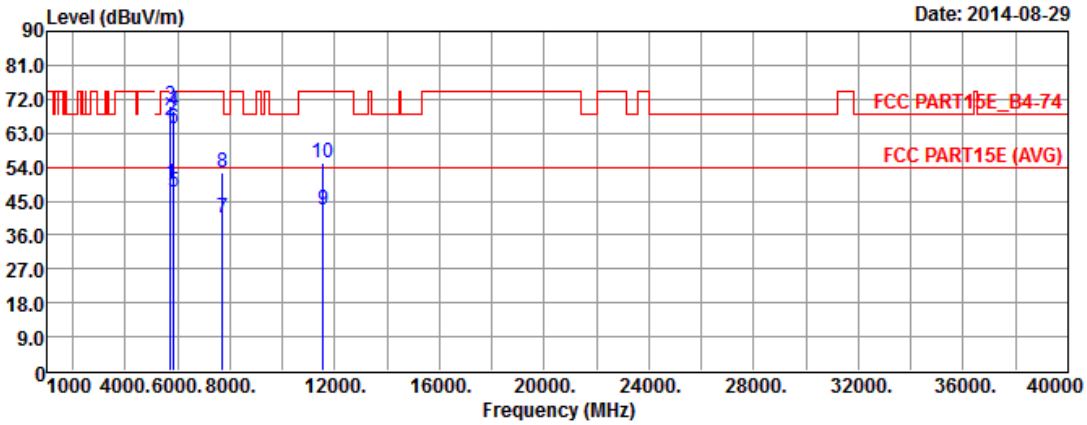
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5745
N_{TX}	2	**Polarization**	V



	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	5715.00	50.38	-3.62	54.00	43.80	32.30	7.41	33.13	---	---	Average
2	5715.00	66.47	-7.53	74.00	59.89	32.30	7.41	33.13	---	---	Peak
3	5725.00	76.75	-1.45	78.20	70.16	32.31	7.42	33.14	---	---	Peak
4	7660.00	41.48	-12.52	54.00	30.37	36.83	9.19	34.91	---	---	Average
5	7660.00	54.35	-19.65	74.00	43.24	36.83	9.19	34.91	---	---	Peak
6	11490.00	42.50	-11.50	54.00	27.30	40.31	10.35	35.46	---	---	Average
7	11490.00	56.50	-17.50	74.00	41.30	40.31	10.35	35.46	---	---	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..

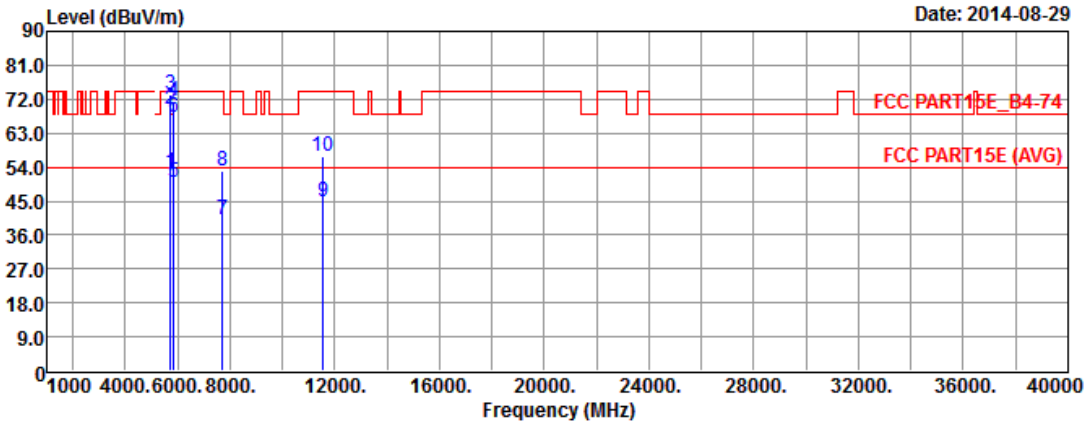
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5785
N_{TX}	2	**Polarization**	H



	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	5715.00	49.33	-4.67	54.00	42.75	32.30	7.41	33.13	---	---	Average
2	5715.00	66.12	-7.88	74.00	59.54	32.30	7.41	33.13	---	---	Peak
3	5725.00	70.15	-8.05	78.20	63.56	32.31	7.42	33.14	---	---	Peak
4	5850.00	68.88	-9.32	78.20	62.09	32.49	7.48	33.18	---	---	Peak
5	5860.00	47.51	-6.49	54.00	40.73	32.50	7.47	33.19	---	---	Average
6	5860.00	64.29	-9.71	74.00	57.51	32.50	7.47	33.19	---	---	Peak
7	7713.00	40.47	-13.53	54.00	29.40	36.87	9.16	34.96	---	---	Average
8	7713.00	52.39	-21.61	74.00	41.32	36.87	9.16	34.96	---	---	Peak
9	11570.00	42.82	-11.18	54.00	27.67	40.15	10.45	35.45	---	---	Average
10	11570.00	55.06	-18.94	74.00	39.91	40.15	10.45	35.45	---	---	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.

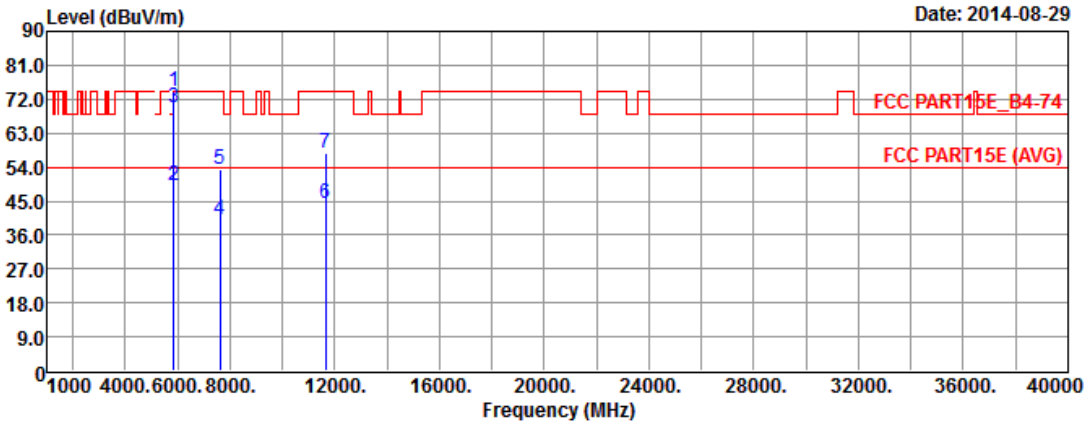
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5785
N_{TX}	2	**Polarization**	V



	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	5715.00	52.68	-1.32	54.00	46.10	32.30	7.41	33.13	---	---	Average
2	5715.00	69.25	-4.75	74.00	62.67	32.30	7.41	33.13	---	---	Peak
3	5725.00	73.21	-4.99	78.20	66.62	32.31	7.42	33.14	---	---	Peak
4	5850.00	71.44	-6.76	78.20	64.65	32.49	7.48	33.18	---	---	Peak
5	5860.00	50.03	-3.97	54.00	43.25	32.50	7.47	33.19	---	---	Average
6	5860.00	67.01	-6.99	74.00	60.23	32.50	7.47	33.19	---	---	Peak
7	7713.00	39.86	-14.14	54.00	28.79	36.87	9.16	34.96	---	---	Average
8	7713.00	53.03	-20.97	74.00	41.96	36.87	9.16	34.96	---	---	Peak
9	11570.00	44.65	-9.35	54.00	29.50	40.15	10.45	35.45	---	---	Average
10	11570.00	57.01	-16.99	74.00	41.86	40.15	10.45	35.45	---	---	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.

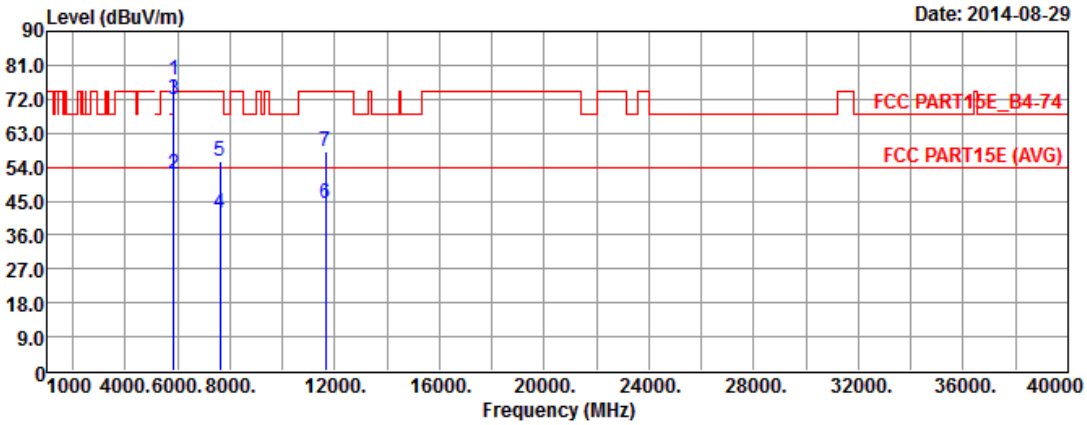
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5825
N_{TX}	2	**Polarization**	H



	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	5850.00	74.09	-4.11	78.20	67.30	32.49	7.48	33.18	---	---	Peak
2	5860.00	49.11	-4.89	54.00	42.33	32.50	7.47	33.19	---	---	Average
3	5860.00	69.82	-4.18	74.00	63.04	32.50	7.47	33.19	---	---	Peak
4	7633.30	39.94	-14.06	54.00	28.81	36.81	9.21	34.89	---	---	Average
5	7633.30	53.27	-20.73	74.00	42.14	36.81	9.21	34.89	---	---	Peak
6	11650.00	44.27	-9.73	54.00	29.16	39.97	10.57	35.43	---	---	Average
7	11650.00	57.63	-16.37	74.00	42.52	39.97	10.57	35.43	---	---	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)**	5825
N_{TX}	2	**Polarization**	V

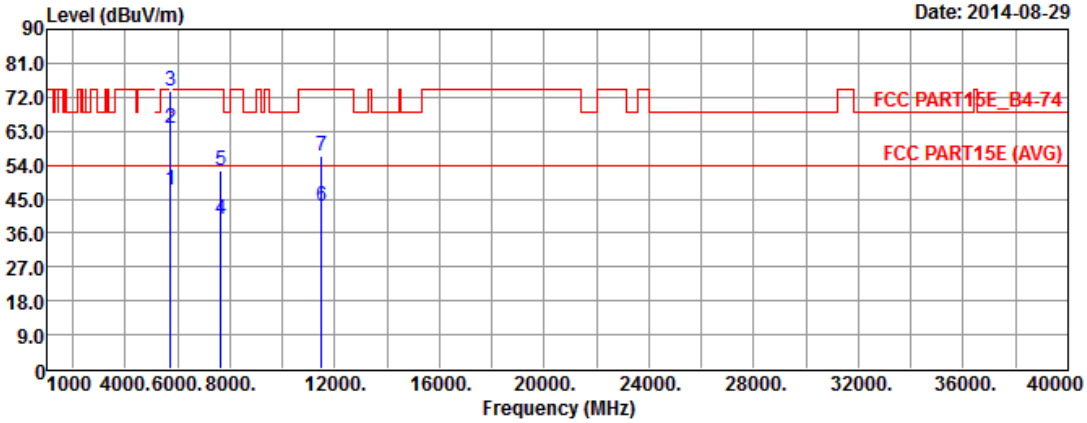


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5850.00	77.13	-1.07	78.20	70.34	32.49	7.48	33.18	---	---	Peak
2	5860.00	52.03	-1.97	54.00	45.25	32.50	7.47	33.19	---	---	Average
3	5860.00	72.00	-2.00	74.00	65.22	32.50	7.47	33.19	---	---	Peak
4	7633.30	41.94	-12.06	54.00	30.81	36.81	9.21	34.89	---	---	Average
5	7633.30	55.36	-18.64	74.00	44.23	36.81	9.21	34.89	---	---	Peak
6	11650.00	44.35	-9.65	54.00	29.24	39.97	10.57	35.43	---	---	Average
7	11650.00	57.98	-16.02	74.00	42.87	39.97	10.57	35.43	---	---	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.

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

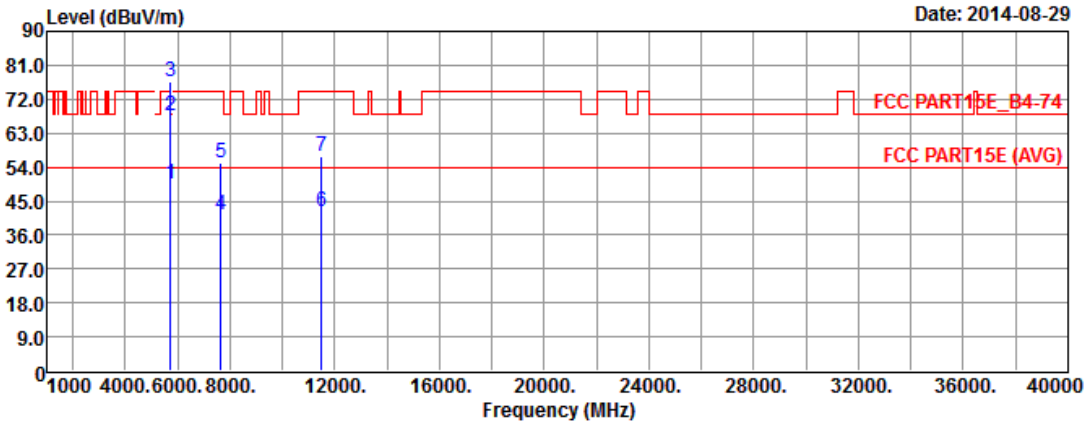
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5745
N_{TX}	2	**Polarization**	H



	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	5715.00	47.54	-6.46	54.00	40.96	32.30	7.41	33.13	---	---	Average
2	5715.00	63.61	-10.39	74.00	57.03	32.30	7.41	33.13	---	---	Peak
3	5725.00	73.55	-4.65	78.20	66.96	32.31	7.42	33.14	---	---	Peak
4	7660.00	39.58	-14.42	54.00	28.47	36.83	9.19	34.91	---	---	Average
5	7660.00	52.37	-21.63	74.00	41.26	36.83	9.19	34.91	---	---	Peak
6	11490.00	42.99	-11.01	54.00	27.79	40.31	10.35	35.46	---	---	Average
7	11490.00	56.45	-17.55	74.00	41.25	40.31	10.35	35.46	---	---	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..

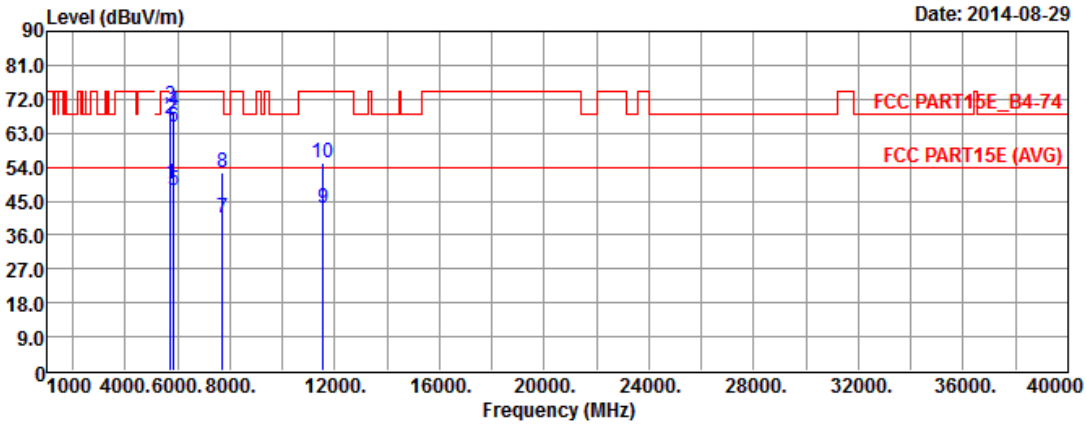
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5745
N_{TX}	2	**Polarization**	V



	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	5715.00	49.61	-4.39	54.00	43.03	32.30	7.41	33.13	---	---	Average
2	5715.00	67.43	-6.57	74.00	60.85	32.30	7.41	33.13	---	---	Peak
3	5725.00	76.86	-1.34	78.20	70.27	32.31	7.42	33.14	---	---	Peak
4	7660.00	41.35	-12.65	54.00	30.24	36.83	9.19	34.91	---	---	Average
5	7660.00	54.98	-19.02	74.00	43.87	36.83	9.19	34.91	---	---	Peak
6	11490.00	42.32	-11.68	54.00	27.12	40.31	10.35	35.46	---	---	Average
7	11490.00	56.76	-17.24	74.00	41.56	40.31	10.35	35.46	---	---	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.

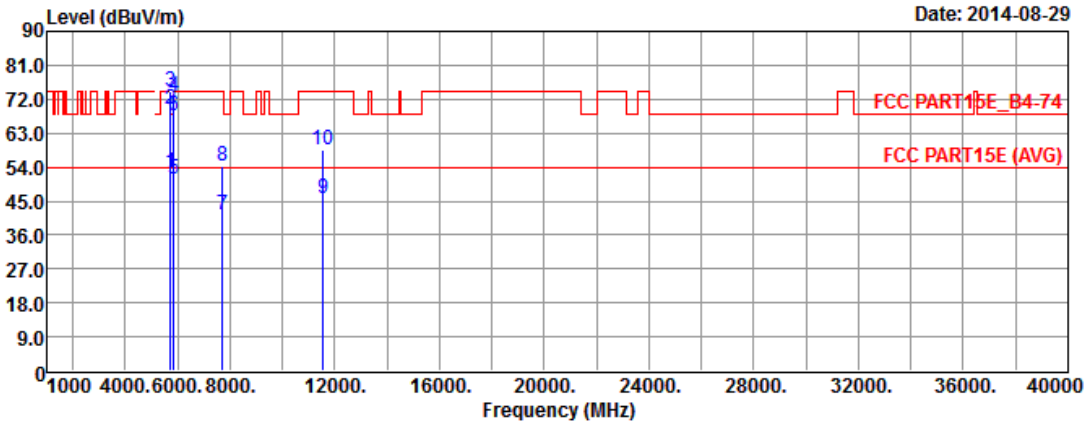
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5785
N_{TX}	2	**Polarization**	H



	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	5715.00	49.64	-4.36	54.00	43.06	32.30	7.41	33.13	---	---	Average
2	5715.00	66.78	-7.22	74.00	60.20	32.30	7.41	33.13	---	---	Peak
3	5725.00	70.39	-7.81	78.20	63.80	32.31	7.42	33.14	---	---	Peak
4	5850.00	69.10	-9.10	78.20	62.31	32.49	7.48	33.18	---	---	Peak
5	5860.00	47.82	-6.18	54.00	41.04	32.50	7.47	33.19	---	---	Average
6	5860.00	64.49	-9.51	74.00	57.71	32.50	7.47	33.19	---	---	Peak
7	7713.00	40.52	-13.48	54.00	29.45	36.87	9.16	34.96	---	---	Average
8	7713.00	52.34	-21.66	74.00	41.27	36.87	9.16	34.96	---	---	Peak
9	11570.00	42.88	-11.12	54.00	27.73	40.15	10.45	35.45	---	---	Average
10	11570.00	54.91	-19.09	74.00	39.76	40.15	10.45	35.45	---	---	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.

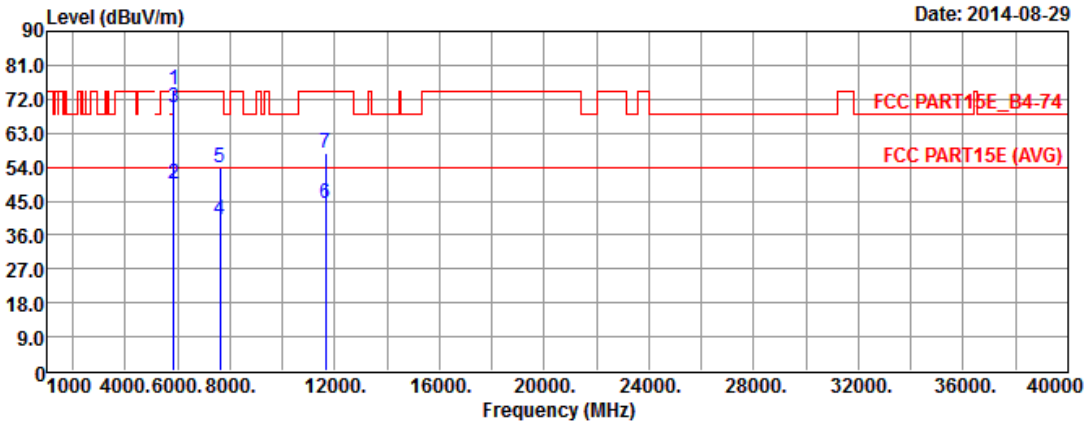
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5785
N_{TX}	2	**Polarization**	V



	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	5715.00	52.64	-1.36	54.00	46.06	32.30	7.41	33.13	---	---	Average
2	5715.00	69.12	-4.88	74.00	62.54	32.30	7.41	33.13	---	---	Peak
3	5725.00	73.98	-4.22	78.20	67.39	32.31	7.42	33.14	---	---	Peak
4	5850.00	72.98	-5.22	78.20	66.19	32.49	7.48	33.18	---	---	Peak
5	5860.00	50.72	-3.28	54.00	43.94	32.50	7.47	33.19	---	---	Average
6	5860.00	67.60	-6.40	74.00	60.82	32.50	7.47	33.19	---	---	Peak
7	7713.00	41.20	-12.80	54.00	30.13	36.87	9.16	34.96	---	---	Average
8	7713.00	54.29	-19.71	74.00	43.22	36.87	9.16	34.96	---	---	Peak
9	11570.00	45.73	-8.27	54.00	30.58	40.15	10.45	35.45	---	---	Average
10	11570.00	58.60	-15.40	74.00	43.45	40.15	10.45	35.45	---	---	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.

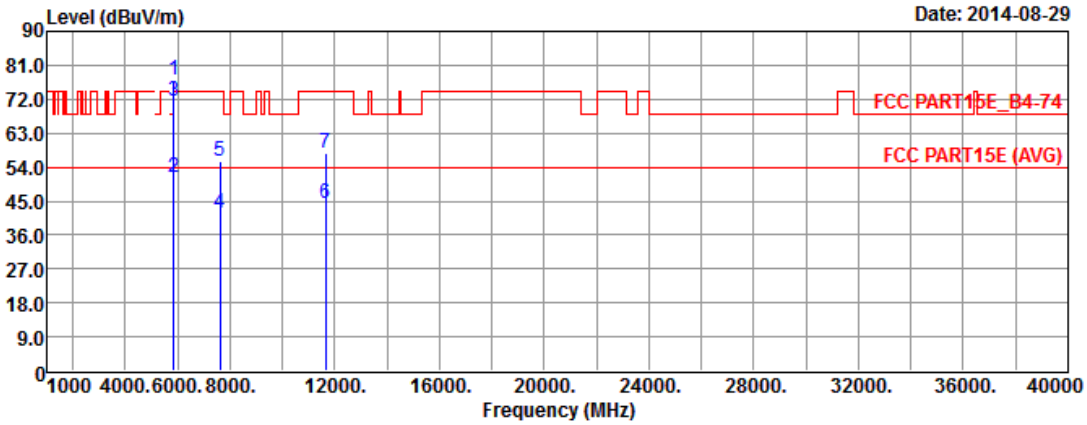
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5825
N_{TX}	2	**Polarization**	H



	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	5850.00	74.36	-3.84	78.20	67.57	32.49	7.48	33.18	---	---	Peak
2	5860.00	49.52	-4.48	54.00	42.74	32.50	7.47	33.19	---	---	Average
3	5860.00	69.97	-4.03	74.00	63.19	32.50	7.47	33.19	---	---	Peak
4	7633.30	40.00	-14.00	54.00	28.87	36.81	9.21	34.89	---	---	Average
5	7633.30	53.66	-20.34	74.00	42.53	36.81	9.21	34.89	---	---	Peak
6	11650.00	44.52	-9.48	54.00	29.41	39.97	10.57	35.43	---	---	Average
7	11650.00	57.83	-16.17	74.00	42.72	39.97	10.57	35.43	---	---	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)**	5825
N_{TX}	2	**Polarization**	V

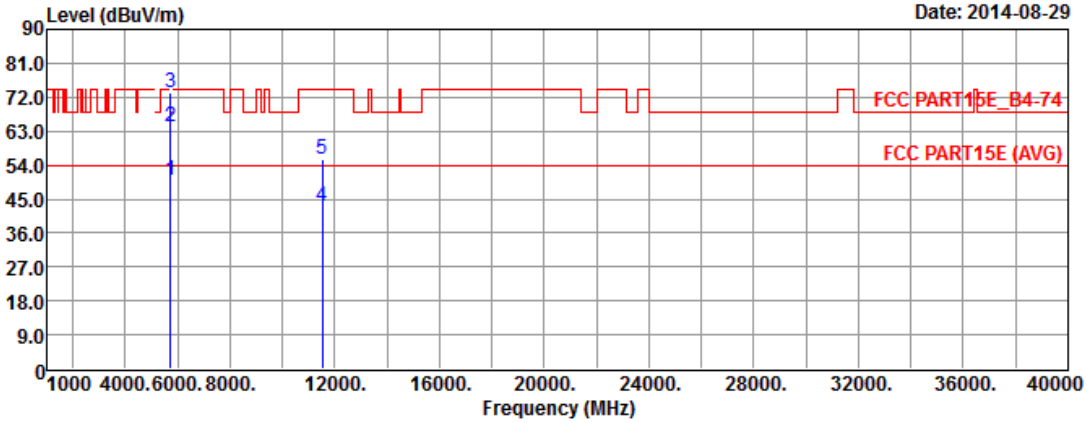


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5850.00	76.96	-1.24	78.20	70.17	32.49	7.48	33.18	---	---	Peak
2	5860.00	51.34	-2.66	54.00	44.56	32.50	7.47	33.19	---	---	Average
3	5860.00	71.55	-2.45	74.00	64.77	32.50	7.47	33.19	---	---	Peak
4	7633.30	41.57	-12.43	54.00	30.44	36.81	9.21	34.89	---	---	Average
5	7633.30	55.39	-18.61	74.00	44.26	36.81	9.21	34.89	---	---	Peak
6	11650.00	44.16	-9.84	54.00	29.05	39.97	10.57	35.43	---	---	Average
7	11650.00	57.52	-16.48	74.00	42.41	39.97	10.57	35.43	---	---	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.

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

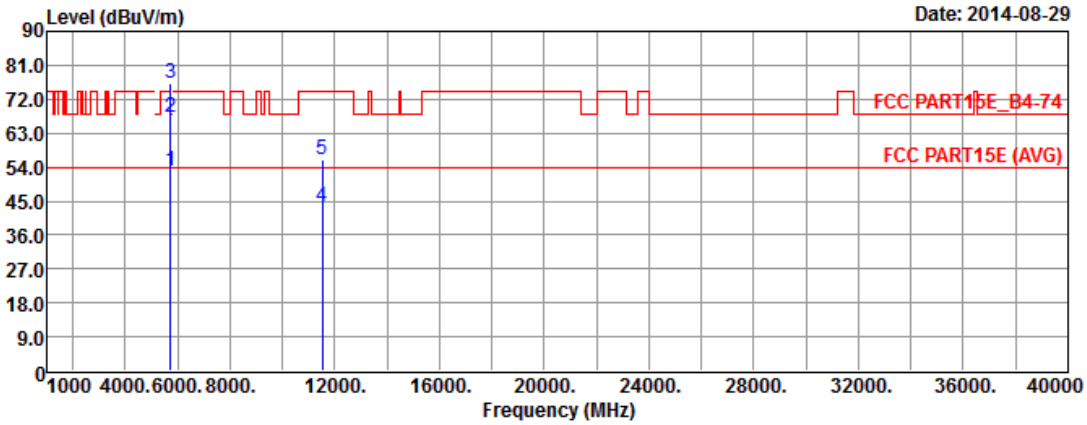
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5755
N_{TX}	2	**Polarization**	H



	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	5715.00	50.11	-3.89	54.00	43.53	32.30	7.41	33.13	---	---	Average
2	5715.00	64.26	-9.74	74.00	57.68	32.30	7.41	33.13	---	---	Peak
3	5725.00	73.06	-5.14	78.20	66.47	32.31	7.42	33.14	---	---	Peak
4	11510.00	43.15	-10.85	54.00	27.97	40.28	10.36	35.46	---	---	Average
5	11510.00	55.43	-18.57	74.00	40.25	40.28	10.36	35.46	---	---	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.

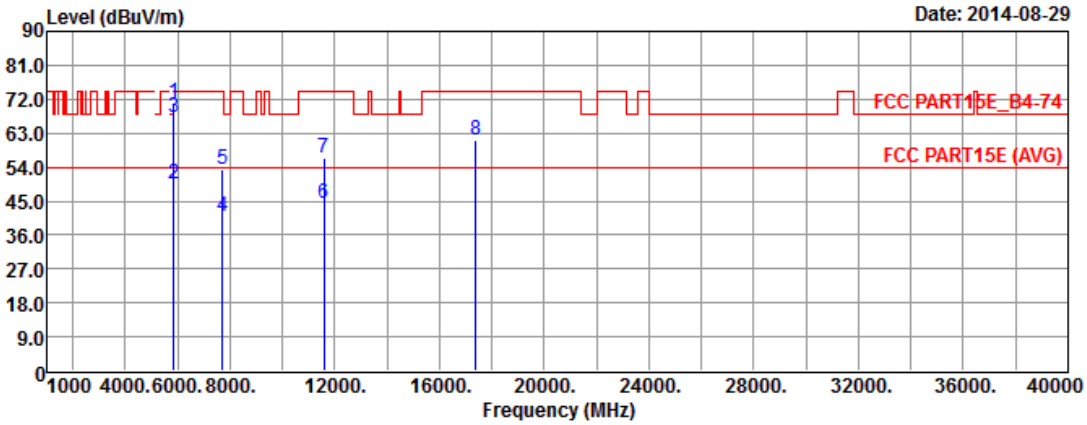
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5755
N_{TX}	2	**Polarization**	V



	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	5715.00	52.96	-1.04	54.00	46.38	32.30	7.41	33.13	---	---	Average
2	5715.00	67.33	-6.67	74.00	60.75	32.30	7.41	33.13	---	---	Peak
3	5725.00	76.25	-1.95	78.20	69.66	32.31	7.42	33.14	---	---	Peak
4	11510.00	43.30	-10.70	54.00	28.12	40.28	10.36	35.46	---	---	Average
5	11510.00	55.87	-18.13	74.00	40.69	40.28	10.36	35.46	---	---	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.

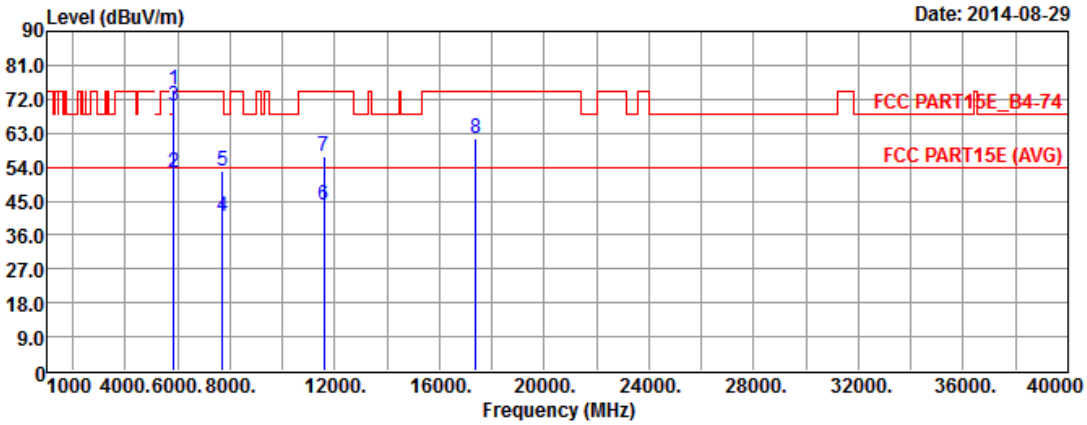
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5795
N_{TX}	2	**Polarization**	H



	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	5850.00	71.24	-6.96	78.20	64.45	32.49	7.48	33.18	---	---	Peak
2	5860.00	49.49	-4.51	54.00	42.71	32.50	7.47	33.19	---	---	Average
3	5860.00	67.30	-6.70	74.00	60.52	32.50	7.47	33.19	---	---	Peak
4	7726.00	40.88	-13.12	54.00	29.82	36.88	9.15	34.97	---	---	Average
5	7726.00	53.43	-20.57	74.00	42.37	36.88	9.15	34.97	---	---	Peak
6	11590.00	44.22	-9.78	54.00	29.08	40.10	10.48	35.44	---	---	Average
7	11590.00	56.36	-17.64	74.00	41.22	40.10	10.48	35.44	---	---	Peak
8	17385.00	61.24	-6.96	68.20	40.97	42.86	12.22	34.81	---	---	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)**	5795
N_{TX}	2	**Polarization**	V

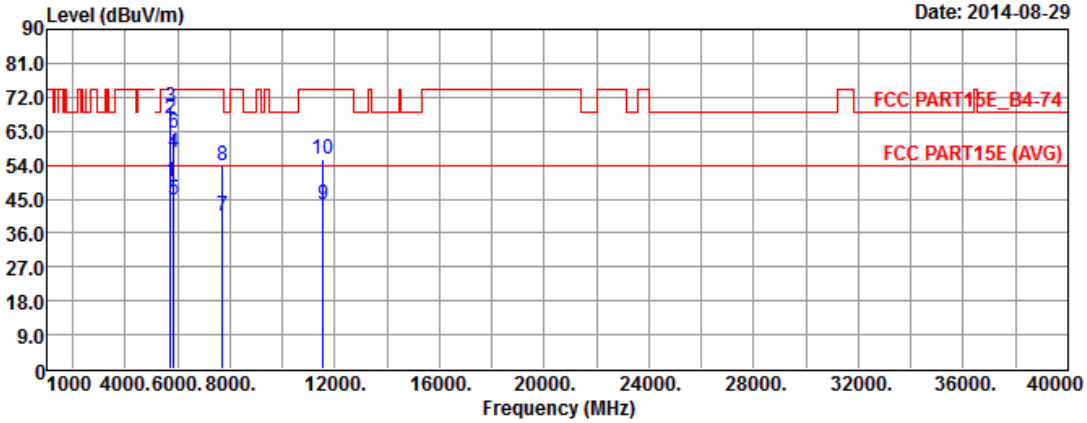


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5850.00	74.59	-3.61	78.20	67.80	32.49	7.48	33.18	---	---	Peak
2	5860.00	52.55	-1.45	54.00	45.77	32.50	7.47	33.19	---	---	Average
3	5860.00	70.01	-3.99	74.00	63.23	32.50	7.47	33.19	---	---	Peak
4	7726.00	40.74	-13.26	54.00	29.68	36.88	9.15	34.97	---	---	Average
5	7726.00	53.15	-20.85	74.00	42.09	36.88	9.15	34.97	---	---	Peak
6	11590.00	44.09	-9.91	54.00	28.95	40.10	10.48	35.44	---	---	Average
7	11590.00	56.89	-17.11	74.00	41.75	40.10	10.48	35.44	---	---	Peak
8	17385.00	61.59	-6.61	68.20	41.32	42.86	12.22	34.81	---	---	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.

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

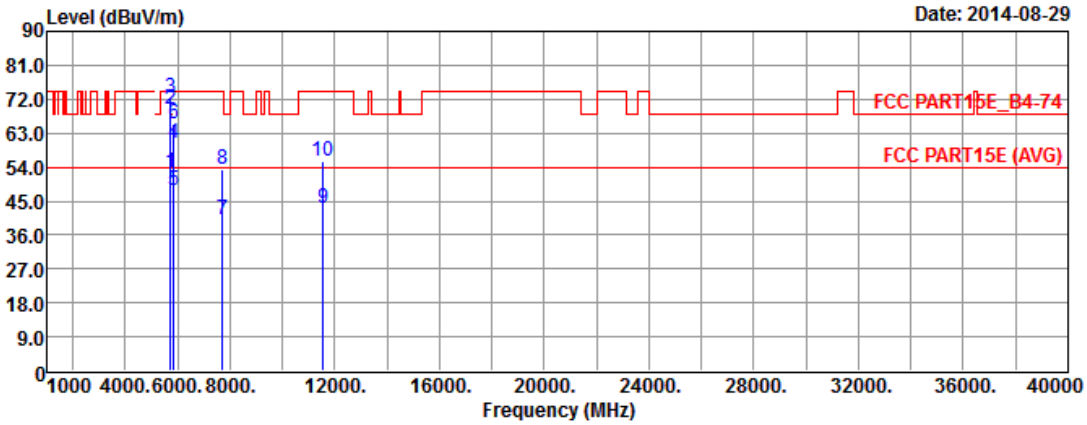
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT80	**Test Freq. (MHz)**	5775
N_{TX}	2	**Polarization**	H



	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	5715.00	49.37	-4.63	54.00	42.79	32.30	7.41	33.13	---	---	Average
2	5715.00	66.27	-7.73	74.00	59.69	32.30	7.41	33.13	---	---	Peak
3	5725.00	69.29	-8.91	78.20	62.70	32.31	7.42	33.14	---	---	Peak
4	5850.00	57.22	-20.98	78.20	50.43	32.49	7.48	33.18	---	---	Peak
5	5860.00	44.69	-9.31	54.00	37.91	32.50	7.47	33.19	---	---	Average
6	5860.00	62.27	-11.73	74.00	55.49	32.50	7.47	33.19	---	---	Peak
7	7700.00	40.30	-13.70	54.00	29.22	36.86	9.17	34.95	---	---	Average
8	7700.00	53.70	-20.30	74.00	42.62	36.86	9.17	34.95	---	---	Peak
9	11550.00	43.50	-10.50	54.00	28.34	40.19	10.42	35.45	---	---	Average
10	11550.00	55.70	-18.30	74.00	40.54	40.19	10.42	35.45	---	---	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)**	5775
N_{TX}	2	**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	5715.00	52.51	-1.49	54.00	45.93	32.30	7.41	33.13	---	---	Average
2	5715.00	69.28	-4.72	74.00	62.70	32.30	7.41	33.13	---	---	Peak
3	5725.00	72.43	-5.77	78.20	65.84	32.31	7.42	33.14	---	---	Peak
4	5850.00	60.40	-17.80	78.20	53.61	32.49	7.48	33.18	---	---	Peak
5	5860.00	47.83	-6.17	54.00	41.05	32.50	7.47	33.19	---	---	Average
6	5860.00	65.46	-8.54	74.00	58.68	32.50	7.47	33.19	---	---	Peak
7	7700.00	40.16	-13.84	54.00	29.08	36.86	9.17	34.95	---	---	Average
8	7700.00	53.43	-20.57	74.00	42.35	36.86	9.17	34.95	---	---	Peak
9	11550.00	43.26	-10.74	54.00	28.10	40.19	10.42	35.45	---	---	Average
10	11550.00	55.52	-18.48	74.00	40.36	40.19	10.42	35.45	---	---	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 Frequency Stability

3.6.1 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.

3.6.2 Measuring Instruments

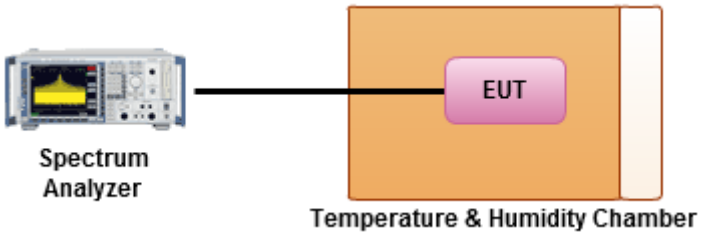
Refer a test equipment and calibration data table in this test report.

3.6.3 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.	

3.6.4 Test Setup

Frequency Stability



3.6.5 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	5785	5785.00343	0.5929
$T_{20°C}$Vmin	5785	5785.01801	3.1132
$T_{50°C}$Vnom	5785	5785.01459	2.5220
$T_{40°C}$Vnom	5785	5785.02162	3.7373
$T_{30°C}$Vnom	5785	5785.01576	2.7243
$T_{20°C}$Vnom	5785	5785.00710	1.2273
$T_{10°C}$Vnom	5785	5785.01457	2.5186
$T_{0°C}$Vnom	5785	5785.01256	2.1711
$T_{-10°C}$Vnom	5785	5785.00596	1.0303
$T_{-20°C}$Vnom	5785	5785.00799	1.3812
$T_{-30°C}$Vnom	5785	5785.00338	0.5843
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
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 05, 2014	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Aug. 20, 2014	Radiation (03CH03-HY)
Spectrum	R&S	FSP40	100004	9kHz ~ 40GHz	Mar. 27, 2014	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Aug. 04, 2014	Radiation (03CH03-HY)
Horn Antenna	ETS・LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 11, 2014	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 10, 2014	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	9kHz ~ 1GHz	Aug. 03, 2014	Radiation (03CH03-HY)
RF Cable-high	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Mar. 05, 2014	Radiation (03CH03-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	EM	EM18G40G	060604	18GHz ~ 40GHz	Oct. 17.2013	Radiation (03CH03-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9kHz ~ 30MHz	Jul. 28, 2014	Radiation (03CH03-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz ~ 2.75GHz	Apr. 14. 2014	Conduction (CO04-HY)
LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	8127-477	9kHz ~ 30MHz	Jan. 22, 2014	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9703-1839	9kHz ~ 30MHz	Apr. 21, 2014	Conduction (CO04-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832020001	9kHz ~ 30MHz	Oct. 31, 2014	Conduction (CO04-HY)
50 ohm terminal	N/A	N/A	CON-01-04	N/A	Feb. 25, 2014	Conduction (CO04-HY)
Software	Audix	E3	3	Conducted	NCR	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	FSV 40	101013	9KHz~40GHz	Jan. 25, 2014	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Nov. 25, 2014	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Jan. 28, 2014	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Jan. 28, 2014	Conducted (TH01-HY)
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	30MHz ~ 26.5GHz	Dec. 01, 2014	Conducted (TH01-HY)
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345669/4	30MHz ~ 26.5GHz	Dec. 01, 2014	Conducted (TH01-HY)

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