FCC Test Report

Equipment	:	802.11 3T3R a/n/ac module
Brand Name	:	Senao
Model No.	:	PCE4553AH
FCC ID	:	U2M-PCE4553AH
Standard	:	47 CFR FCC Part 15.247
Operating Band	:	5725 MHz – 5850 MHz
FCC Classification	:	DTS
Applicant Manufacturer	:	Senao Networks, Inc. 3F, No. 529, Chung Cheng Rd., Hsintien,Taipei,Taiwan

The product sample received on Nov. 05, 2013 and completely tested on Feb. 20, 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-A7

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]:0.155MHz 46.02 (Margin 9.72dB) - AV 52.11 (Margin 13.63dB) - QP	FCC 15.207	Complied
3.2	15.247(a)	6dB Bandwidth	6dB Bandwidth [MHz] 20M:16.35 / 40M:35.71 80M: 72.58	≥500kHz	Complied
3.3	15.247(b)	RF Output Power (Maximum Conducted (Average) Output Power)	Power [dBm]:26.88	Power [dBm]:30	Complied
3.4	15.247(e)	Power Spectral Density	PSD [dBm/3kHz]:2.17	PSD [dBm/3kHz]:8	Complied
3.5	15.247(d)	Emissions in non-restricted frequency bands	Out-of -band emissions are 30dB below the highest power	Non-Restricted Bands: > 30 dBc Restricted Bands: FCC 15.209	Complied
3.6	15.247(d)	Transmitter Radiated Unwanted Emissions	Restricted Bands [dBuV/m at 3m]:11570.00MHz 53.00 (Margin 1.00dB) - AV	Non-Restricted Bands: > 30 dBc Restricted Bands: FCC 15.209	Complied

Revision History

Report No.	Version	Description	Issued Date
FR3N0541AI	Rev. 01	Initial issue of report	Mar. 28, 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
5725-5850	a	5745-5825	149-165 [5]	3	26.65	N/A
5725-5850	n(HT20)	5745-5825	149-165 [5]	3	26.74	N/A
5725-5850	n(HT40)	5755-5795	151-159 [2]	3	26.82	N/A
5725-5850	ac(VHT20)	5745-5825	149-165 [5]	3	26.81	N/A
5725-5850	ac(VHT40)	5755-5795	151-159 [2]	3	26.88	N/A
5725-5850	ac(VHT80)	5775	155 [1]	3	24.55	N/A

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. Model**	**Ant. Type**	**Connector**	**Gain (dBi)**
1	External	Ant 2 (1002299)	PCB Dipole	UFL	4.2025
2	External	Ant 4 (1002300)	PCB Dipole	UFL	4.0181
3	External	Ant 6 (1002301)	PCB Dipole	UFL	3.4374

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
☐	Other:

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
☐ Operated normally mode for worst duty cycle	
☒ Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	**Power Duty Factor [dB] – (10 log 1/x)**
☒ 100.00% - IEEE 802.11a	0
☒ 100.00% - IEEE 802.11ac (VHT20)	0
☒ 100.00% - IEEE 802.11ac (VHT40)	0
☒ 100.00% - IEEE 802.11ac (VHT80)	0

1.1.5 EUT Operational Condition

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

1.2 Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**Serial No.**
1	Notebook	DELL	E6430	DoC
2	Power Supply	GW INSTEK	GPC-6030D	---
3	Extender card	NA	adapter	NA

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 558074 v03r01
- FCC KDB 662911 v02r01
- FCC KDB 412172 v01

1.4 Testing Location Information

Testing Location								
☒	Sporton Lab	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055						
☒	ICC Lab	ADD : No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Hsiang, Tao Yuan Hsein 333, Taiwan (R.O.C.) TEL : 886-3-271-8666 FAX : 886-3-318-0155						
Test Condition		**Test Site No.**	**Test Engineer**	**Test Environment**	**Test Date**			
RF Conducted		TH01-HY	Mark Liao	22°C / 62%	Feb. 19, 2014			
*AC Conduction		CO01-WS	Skys Huang	15°C / 70%	Feb. 20, 2014			
*Radiated Emission		03CH01-WS	Aska Huang	16-19°C / 62-64%	Feb. 07 ~ Feb. 10, 2014			
Test site registered number [657002] with FCC. Test site registered number [10807A-1] with IC.								

Note: * Sporton Lab subcontracts this test item to ICC lab (TAF: 2732).
ICC lab is a TAF accreditation test firm and also is an approved provider of Sporton lab.

1.5 Measurement Uncertainty

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

Measurement Uncertainty			
Test Item		**Uncertainty**	**Limit**
AC power-line conducted emissions		±2.26 dB	N/A
Emission bandwidth, 6dB bandwidth		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Power density, conducted		±0.81 dB	N/A
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			
Modulation Mode	**Transmit Chains (N_{TX})**	**Data Rate / MCS**	**Worst Data Rate / MCS**
11a	3	6-54Mbps	6 Mbps
HT20	3	M0-23	M0
HT40	3	M0-23	M0
VHT20	3	M0-8	M0
VHT40	3	M0-9	M0
VHT80	3	M0-9	M0

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (5725-5850MHz band)							
Test Software Version	art2, Version: 4_9_575_5_CS_U3						
Modulation Mode	**N_{TX}**	**Test Frequency (MHz)**					
		NCB: 20MHz			**NCB: 40MHz**		**NCB: 80MHz**
		5745	**5785**	**5825**	**5755**	**5795**	**5775**
11a,6-54Mbps	3	21	21	20	---	---	---
HT20,M0-23	3	21	21.5	20.5	---	---	---
HT40,M0-23	3	---	---	---	19.5	21.5	---
VHT20,M0-8	3	21	21.5	20.5	---	---	---
VHT40,M0-9	3	---	---	---	19.5	21.5	---
VHT80,M0-9	3	---	---	---	---	---	18.5

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	DC Power & Radio link(WLAN)

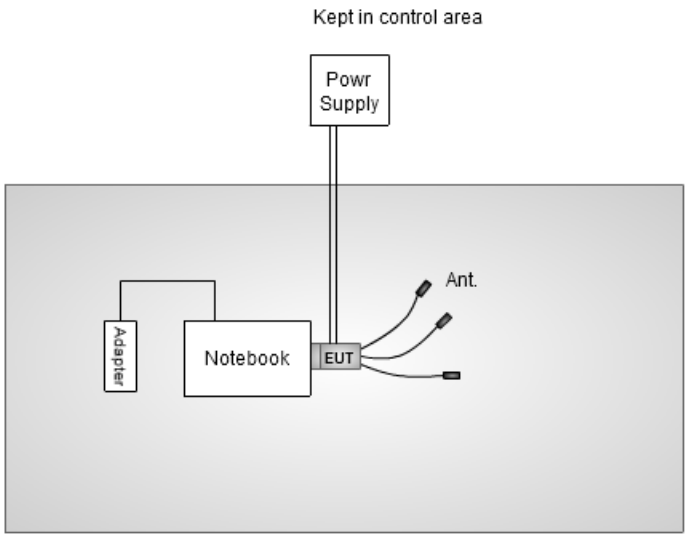
The Worst Case Mode for Following Conformance Tests	
Tests Item	RF Output Power
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, HT20, HT40, VHT20, VHT40, VHT80
Operating Mode	Operating Mode Description
1	DC Power & Radio link(WLAN)

The Worst Case Mode for Following Conformance Tests	
Tests Item	Power Spectral Density, 6 dB Bandwidth
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, VHT20, VHT40, VHT80
Operating Mode	Operating Mode Description
1	DC Power & Radio link(WLAN)
Note: 1. 802.11n/ac modulation modes consist of HT20, HT40, VHT20, VHT40 and VHT80. After pretested, VHT20, VHT40, and VHT80 were the worst cases and were selected for final test.	

The Worst Case Mode for Following Conformance Tests			
Tests Item	Transmitter Radiated Unwanted 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 operating multiple positions. The dipole antenna of EUT was pre-tested on the positioned of each 3 axis. The worst plane is Y.		
Operating Mode	☒ 1. DC Power & Radio link (WLAN)		
Modulation Mode	11a, VHT20, VHT40, VHT80		
Orthogonal Planes of EUT	**X Plane**	**Y Plane**	**Z Plane**
Note: 1. 802.11n/ac modulation modes consist of HT20, HT40, VHT20, VHT40 and VHT80. After pretested, VHT20, VHT40, and VHT80 were the worst cases and were selected for final test.			

2.4 Test Setup Diagram

Test Setup Diagram



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

AC Power-line Conducted Emissions Limit		
Frequency Emission (MHz)	**Quasi-Peak**	**Average**
0.15-0.5	66 – 56 *	56 – 46 *
0.5-5	56	46
5-30	60	50
Note 1: * Decreases with the logarithm of the frequency.		

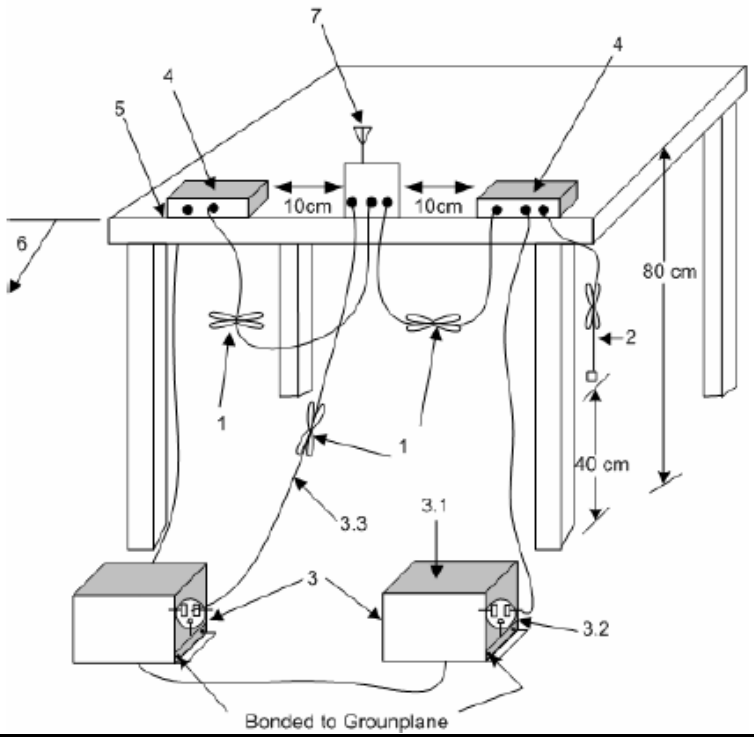
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

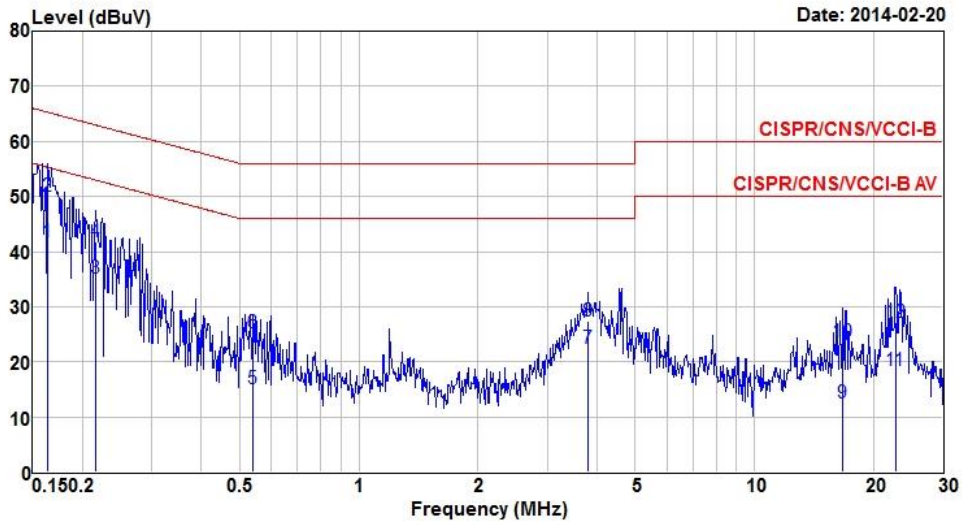
Test Method
☒ Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

AC Power-line Conducted Emissions


3.1.5 Test Result of AC Power-line Conducted Emissions

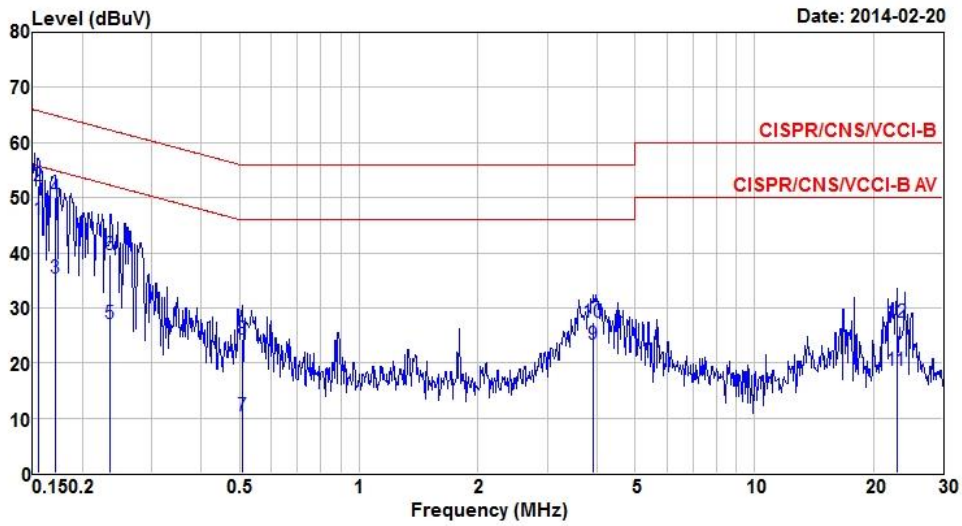
AC Power-line Conducted Emissions Result			
Operating Mode	1	**Power Phase**	Neutral
Operating Function	DC Power & Radio link(WLAN)		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1*	0.163	41.72	55.30	-13.58	41.15	0.48	0.09	Average
2	0.163	50.13	65.30	-15.17	49.56	0.48	0.09	QP
3	0.216	35.06	52.96	-17.90	34.42	0.48	0.16	Average
4	0.216	41.86	62.96	-21.10	41.22	0.48	0.16	QP
5	0.541	15.15	46.00	-30.85	14.63	0.47	0.05	Average
6	0.541	25.23	56.00	-30.77	24.71	0.47	0.05	QP
7	3.799	22.53	46.00	-23.47	21.78	0.52	0.23	Average
8	3.799	27.37	56.00	-28.63	26.62	0.52	0.23	QP
9	16.750	12.50	50.00	-37.50	11.79	0.56	0.15	Average
10	16.750	23.68	60.00	-36.32	22.97	0.56	0.15	QP
11	22.775	18.49	50.00	-31.51	17.58	0.54	0.37	Average
12	22.775	27.15	60.00	-32.85	26.24	0.54	0.37	QP

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	DC Power & Radio link(WLAN)		



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1*	0.155	46.02	55.74	-9.72	45.55	0.40	0.07	Average
2	0.155	52.11	65.74	-13.63	51.64	0.40	0.07	QP
3	0.170	35.39	54.94	-19.55	34.88	0.40	0.11	Average
4	0.170	49.94	64.94	-15.00	49.43	0.40	0.11	QP
5	0.235	27.26	52.26	-25.00	26.72	0.39	0.15	Average
6	0.235	39.74	62.26	-22.52	39.20	0.39	0.15	QP
7	0.507	10.49	46.00	-35.51	10.04	0.40	0.05	Average
8	0.507	24.42	56.00	-31.58	23.97	0.40	0.05	QP
9	3.922	23.37	46.00	-22.63	22.67	0.46	0.24	Average
10	3.922	27.41	56.00	-28.59	26.71	0.46	0.24	QP
11	22.896	18.61	50.00	-31.39	17.68	0.55	0.38	Average
12	22.896	27.40	60.00	-32.60	26.47	0.55	0.38	QP

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 6dB Bandwidth

3.2.1 6dB Bandwidth Limit

6dB Bandwidth Limit
Systems using digital modulation techniques:
☒ 6 dB bandwidth ≥ 500 kHz.

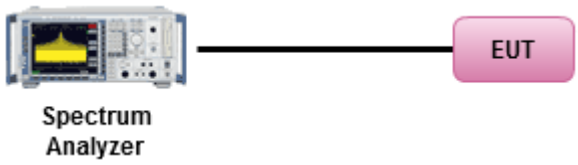
3.2.2 Measuring Instruments

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 558074 v03r01, clause 8.1 Option 1 for 6 dB bandwidth measurement.	
	☐	Refer as FCC KDB 558074 v03r01, clause 8.2 Option 2 for 6 dB bandwidth measurement.	
	☐	Refer as ANSI C63.10, clause 6.9.1 for occupied 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.

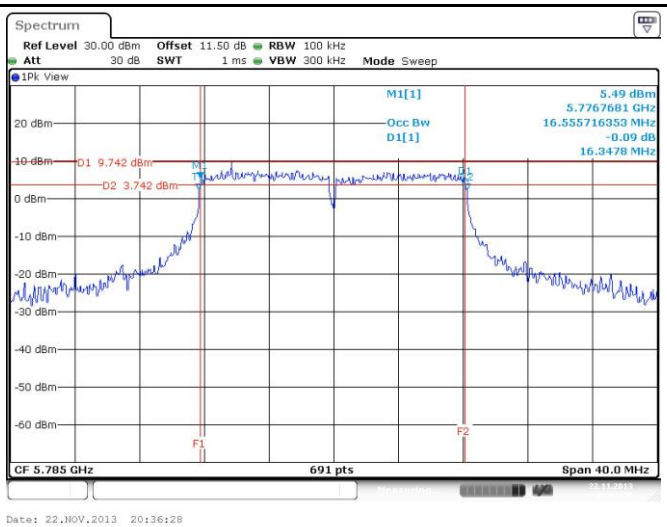
3.2.4 Test Setup

Emission Bandwidth


3.2.5 Test Result of Emission Bandwidth

Emission Bandwidth Result										
Condition			Emission Bandwidth (MHz)							
Modulation Mode	N_{TX}	Freq. (MHz)	99% 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
11a	3	5745	17.08	17.00	17.15	---	16.41	16.52	16.41	---
11a	3	5785	17.15	17.00	17.33	---	16.35	16.58	16.46	---
11a	3	5825	17.00	16.86	16.97	---	16.41	16.52	16.35	---
VHT20	3	5745	18.05	18.20	18.05	---	17.62	17.62	17.62	---
VHT20	3	5785	18.20	18.02	18.34	---	17.80	17.62	17.62	---
VHT20	3	5825	18.16	18.05	18.20	---	17.62	17.74	17.62	---
VHT40	3	5755	37.25	36.79	37.05	---	36.29	36.52	36.29	---
VHT40	3	5795	37.38	37.12	37.12	---	36.29	35.71	36.29	---
VHT80	3	5775	76.14	76.02	75.90	---	76.06	72.58	76.06	---
Limit			N/A				≥500 kHz			
Result			Complied							
Note 1: N_{TX} = Number of Transmit Chains										

Worst Emission Bandwidth Plots



3.3 RF Output Power

3.3.1 RF Output Power Limit

RF Output Power Limit		
Maximum Peak Conducted Output Power or Maximum Conducted Output Power Limit (for ac(VHT80) only)		
☒	5725-5850 MHz Band:	
	☒	If $G_{TX} \leq 6$ dBi, then $P_{Out} \leq 30$ dBm (1 W)
	☒	Point-to-multipoint systems (P2M): If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$ dBm
	☐	Point-to-point systems (P2P): If $G_{TX} > 6$ dBi, then $P_{Out} = 30$ dBm
e.i.r.p. Power Limit:		
☒	5725-5850 MHz Band	
	☒	Point-to-multipoint systems (P2M): $P_{eirp} \leq 36$ dBm (4 W)
	☐	Point-to-point systems (P2P): N/A
$\mathbf{P_{Out}}$ = maximum peak conducted output power or maximum conducted output power in dBm, $\mathbf{G_{TX}}$ = the maximum transmitting antenna directional gain in dBi. $\mathbf{P_{eirp}}$ = e.i.r.p. Power in dBm.		

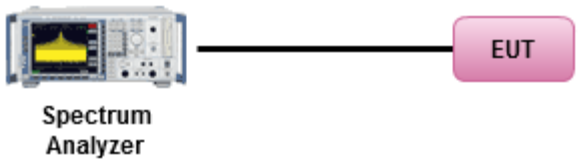
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method		
☐	Maximum Peak Conducted Output Power	
	☐	Refer as FCC KDB 558074 v03r01, clause 9.1.1 (RBW ≥ DTS BW).
	☐	Refer as FCC KDB 558074 v03r01, clause 9.1.2 (Integrated band power method).
	☒	Refer as FCC KDB 558074 v03r01, clause 9.1.3 (Peak power meter)
☒	Maximum Conducted Output Power	
	☐	Refer as FCC KDB 558074 v03r01, clause 9.2.1.2 Method AVGSA-1 (spectral trace averaging).
	☐	Refer as FCC KDB 558074 v03r01, clause 9.2.1.3 Method AVGSA-1 Alt. (slow sweep speed)
	☐	Refer as FCC KDB 558074 v03r01, clause 9.2.1.4 Method AVGSA-2 (spectral trace averaging).
	☐	Refer as FCC KDB 558074 v03r01, clause 9.2.1.5 Method AVGSA-2 Alt. (slow sweep speed)
	RF power meter and average over on/off periods with duty factor or gated trigger	
	☒	Refer as FCC KDB 558074 v03r01, clause 9.2.2 Method AVGPM-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 (Spectrum Analyzer), for 11ac VHT 80


RF Output Power (Power Meter), for all modes except 11ac VHT80.

3.3.5 Directional Gain for Power Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	3	-
Maximum G_{ANT} (dBi)		4.2025	4.0181	3.4374	-
Modulation Mode	**DG (dBi)**	**N_{TX}**	**N_{SS}**	**STBC**	**Array Gain (dB)**
11a,6-54Mbps	4.2025	3	1	-	-
HT20,M0-23	4.2025	3	1	-	-
HT40,M0-23	4.2025	3	1	-	-
VHT20,M0-9	4.2025	3	1	-	-
VHT40,M0-9	4.2025	3	1	-	-
VHT80,M0-9	4.2025	3	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};
Note 2: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain

3.3.6 Test Result of 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	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11a	3	5745	21.26	21.33	22.85	26.65	30.00	4.2025	30.8525	36.00
11a	3	5785	21.14	21.09	22.75	26.50	30.00	4.2025	30.7025	36.00
11a	3	5825	20.22	19.87	22.16	25.64	30.00	4.2025	29.8425	36.00
HT20	3	5745	19.81	19.89	21.42	25.21	30.00	4.2025	29.4125	36.00
HT20	3	5785	21.46	21.26	22.97	26.74	30.00	4.2025	30.9425	36.00
HT20	3	5825	20.42	20.18	22.49	25.93	30.00	4.2025	30.1325	36.00
HT40	3	5755	19.68	19.98	21.45	25.21	30.00	4.2025	29.4125	36.00
HT40	3	5795	21.41	21.39	23.11	26.82	30.00	4.2025	31.0225	36.00
VHT20	3	5745	19.86	19.92	21.48	25.26	30.00	4.2025	29.4625	36.00
VHT20	3	5785	21.53	21.38	23.02	26.81	30.00	4.2025	31.0125	36.00
VHT20	3	5825	20.53	20.27	22.57	26.02	30.00	4.2025	30.2225	36.00
VHT40	3	5755	19.77	20.06	21.52	25.29	30.00	4.2025	29.4925	36.00
VHT40	3	5795	21.48	21.47	23.16	26.88	30.00	4.2025	31.0825	36.00
VHT80	3	5775	18.83	19.31	20.92	24.55	30.00	4.2025	28.7525	36.00
Result			Complied							

3.4 Power Spectral Density

3.4.1 Power Spectral Density Limit

Power Spectral Density Limit
☒ Power Spectral Density (PSD) ≤ 8 dBm/3kHz

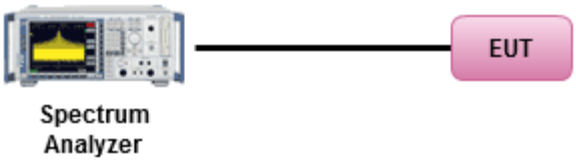
3.4.2 Measuring Instruments

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. If maximum peak conducted output power was measured to demonstrate compliance to the output power limit, then the peak PSD procedure below (Method PKPSD) shall be used. If maximum conducted output power was measured to demonstrate compliance to the output power limit, then one of the average PSD procedures shall be used, as applicable based on the following criteria (the peak PSD procedure is also an acceptable option).		
	☐	Refer as FCC KDB 558074 v03r01, clause 10.2 Method PKPSD (RBW=3kHz; detector=peak)..	
	☒	Refer as FCC KDB 558074 v03r01, clause 10.3 Method AVGPSD-1 (spectral trace averaging). (For 11a / 11ac VHT20)	
	☐	Refer as FCC KDB 558074 v03r01, clause 10.4 Method AVGPSD-1 Alt. (slow sweep speed)	
	☐	Refer as FCC KDB 558074 v03r01, clause 10.5 Method AVGPSD-2 (spectral trace averaging).	
	☒	Refer as FCC KDB 558074 v03r01, clause 10.6 Method AVGPSD-2 Alt. (slow sweep speed) (For 11ac VHT40 / VHT80)	
☒	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 spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the N_{TX} output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.
		☐	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.

3.4.4 Test Setup

Power Spectral Density


3.4.5 Directional Gain for Power Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	2	3	-
Maximum G_{ANT} (dBi)		4.2025	4.0181	3.4374	-
Modulation Mode	**DG (dBi)**	**N_{TX}**	**N_{SS}**	**STBC**	**Array Gain (dB)**
11a,6-54Mbps	8.66	3	1	-	-
HT20,M0-23	8.66	3	1	-	-
HT40,M0-23	8.66	3	1	-	-
VHT20,M0-9	8.66	3	1	-	-
VHT40,M0-9	8.66	3	1	-	-
VHT80,M0-9	8.66	3	1	-	-
Note 1: Directional gain = $10 \log[(10^{4.2025/20} + 10^{4.0181/20} + 10^{3.4374/20})^2/3]$ = 8.66 dBi > 6dBi Power spectral density limit shall be reduced to 8 dBm – (8.66 dBi - 6 dBi) = 5.34 dBm					

3.4.6 Test Result of Power Spectral Density

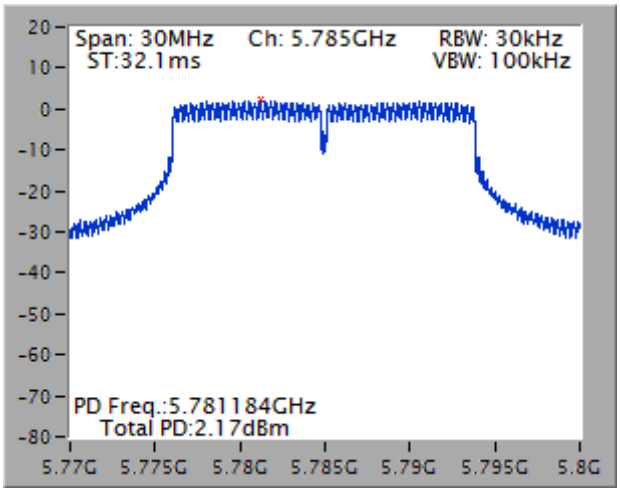
Power Spectral Density Result				
Condition			Power Spectral Density (dBm/3kHz)	
Modulation Mode	N_{TX}	Freq. (MHz)	Sum Chain	Power Limit
11a	3	5745	1.46	5.34
11a	3	5785	1.90	5.34
11a	3	5825	1.13	5.34
VHT20	3	5745	0.06	5.34
VHT20	3	5785	2.17	5.34
VHT20	3	5825	1.59	5.34
VHT40	3	5755	-3.21	5.34
VHT40	3	5795	-1.47	5.34
VHT80	3	5775	-6.57	5.34
Result			Complied	

Note 1: PSD = sum each transmit chains by bin-to-bin PSD

Note 2: Directional gain = $10 \log[(10^{4.2025/20} + 10^{4.0181/20} + 10^{3.4374/20})^2/3] = 8.66$ dBi > 6dBi

Power spectral density limit shall be reduced to 8 dBm – (8.66 dBi - 6 dBi) = 5.34 dBm

Worst Power Spectral Density Plots



3.5 Emissions in non-restricted frequency bands

3.5.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz

3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Reference level measurement

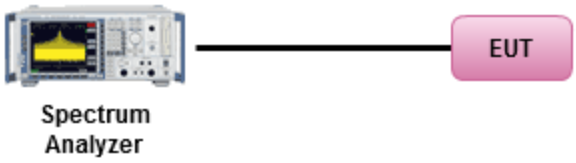
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 40GHz
4. Use the peak marker function to determine the maximum amplitude level

3.5.4 Test Setup

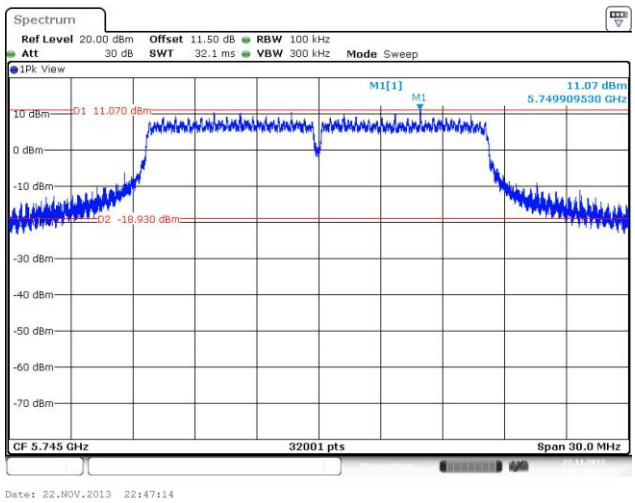
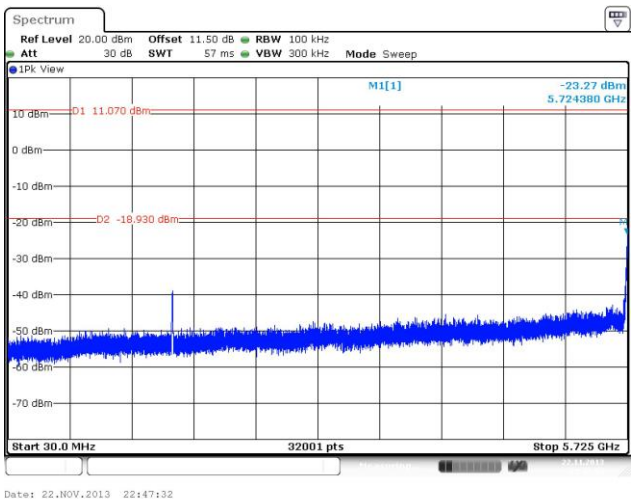
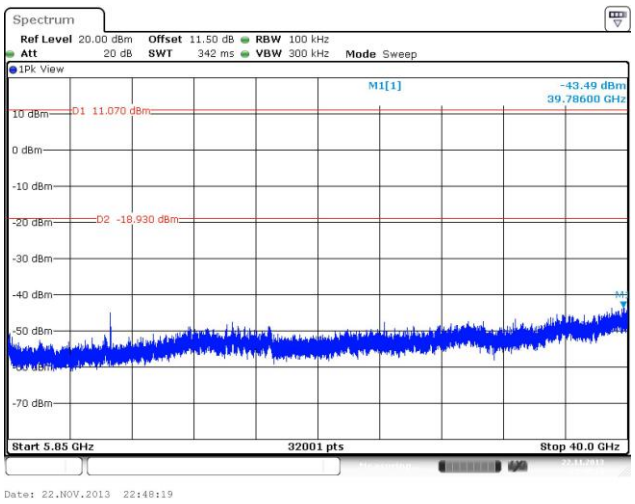
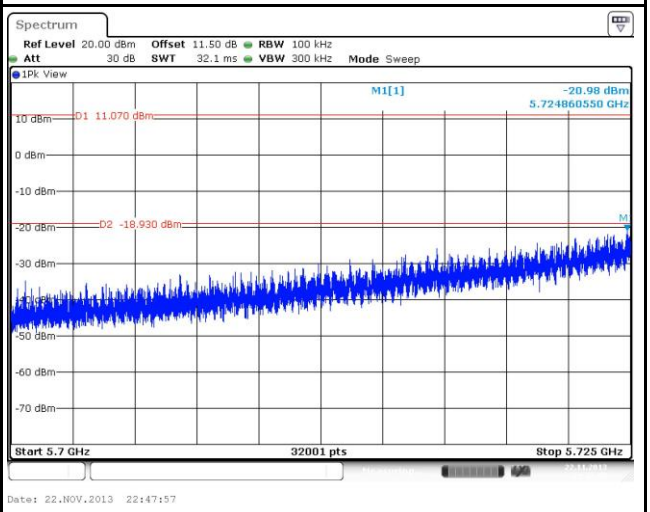
Transmitter Radiated Bandedge Emissions

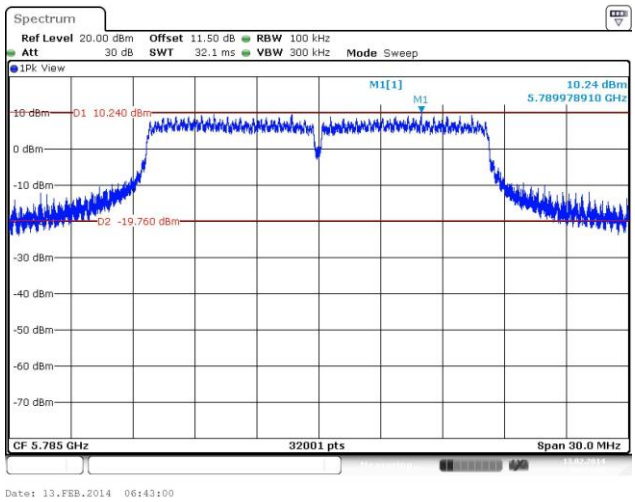
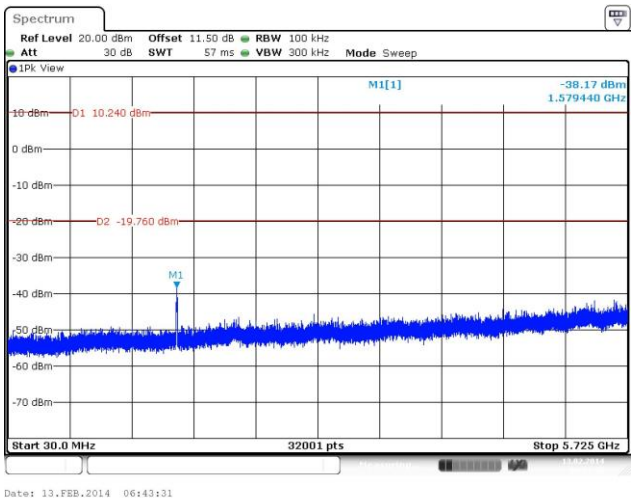
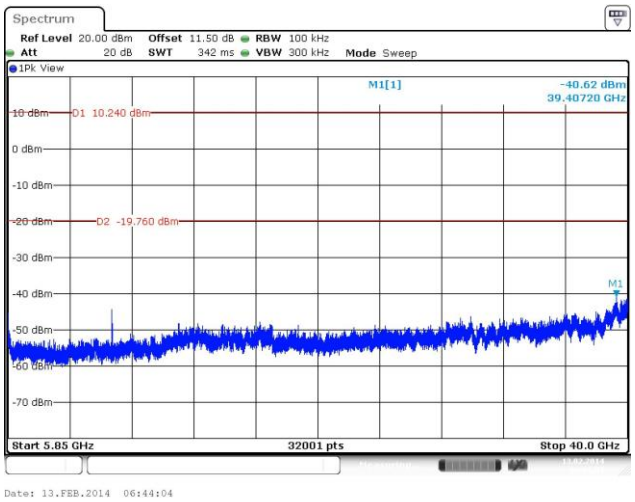
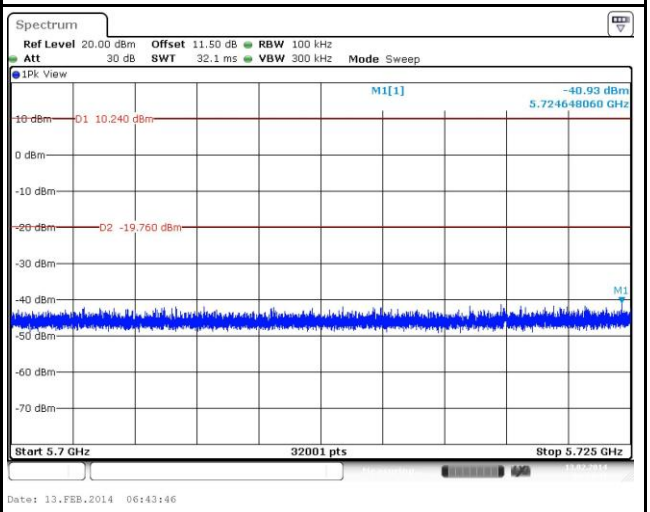


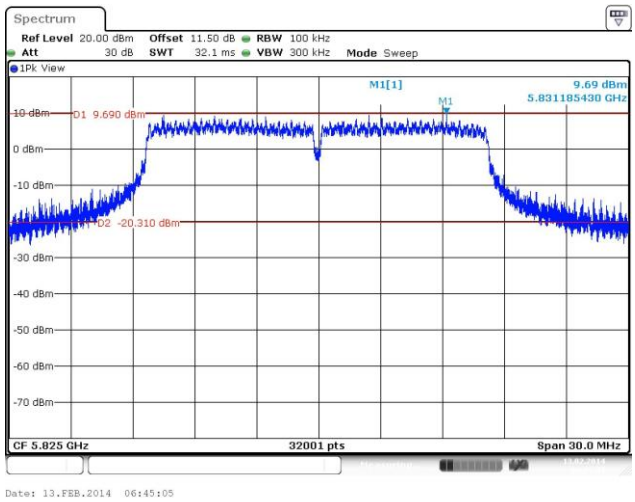
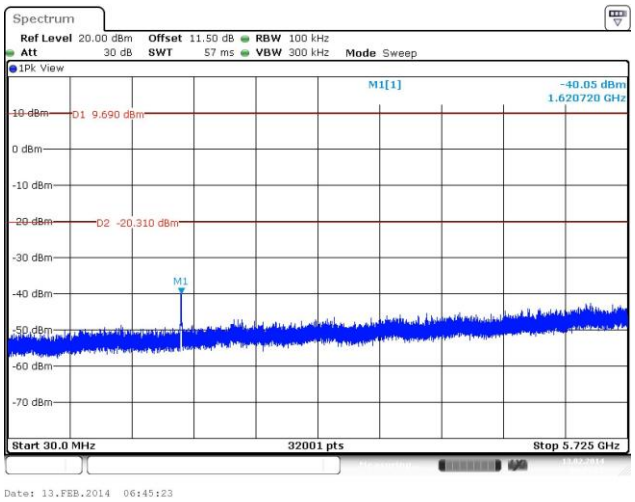
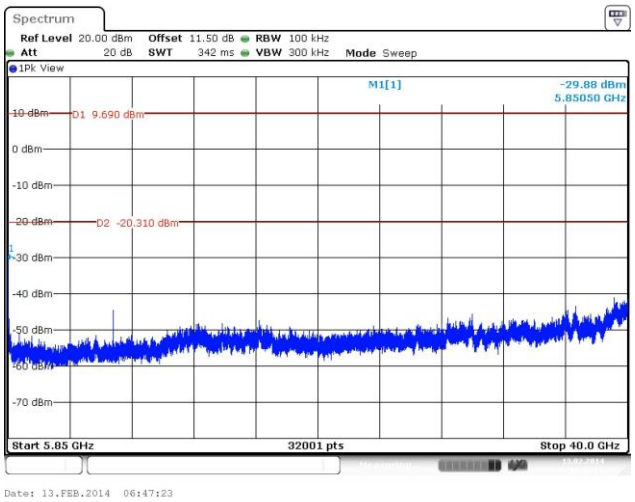
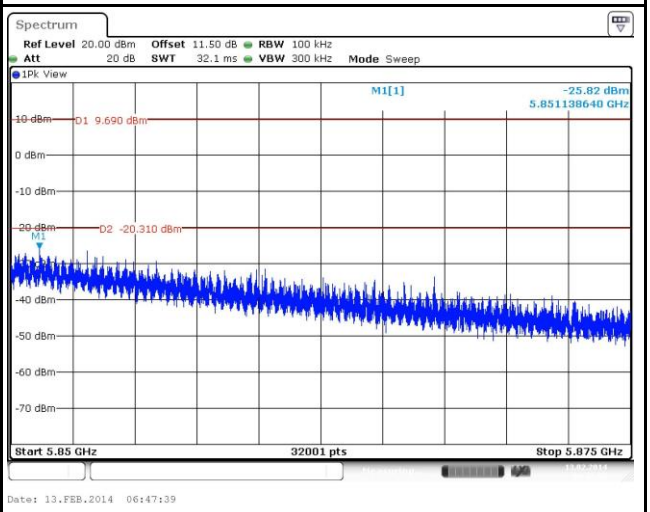
3.5.5 Test Result of Emissions in non-restricted frequency bands

This test item is performed on each TX output individually without summing or adding 10 log(N_{ANT}) since measurements are made relative to the in-band emissions on the individual outputs. Only worst test result of each operating mode is presented.

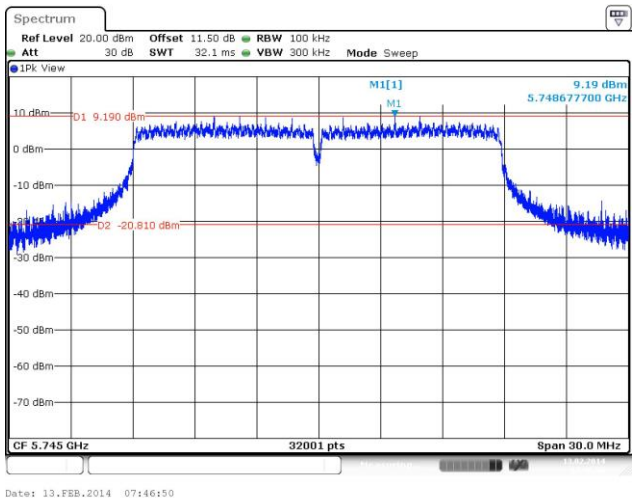
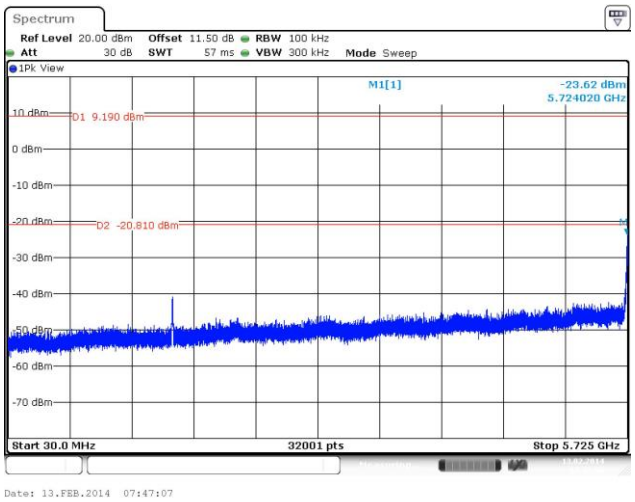
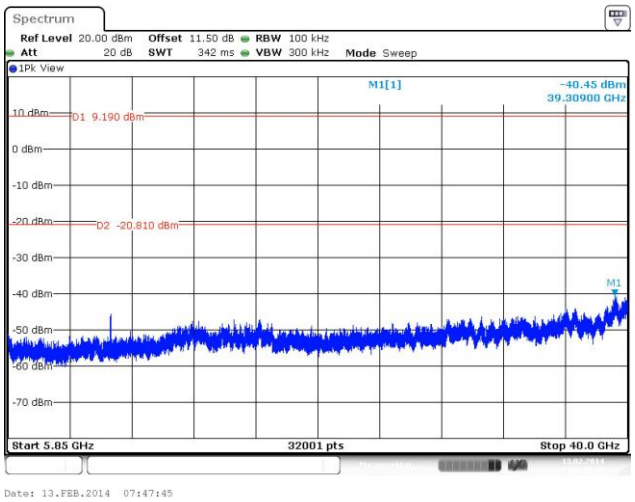
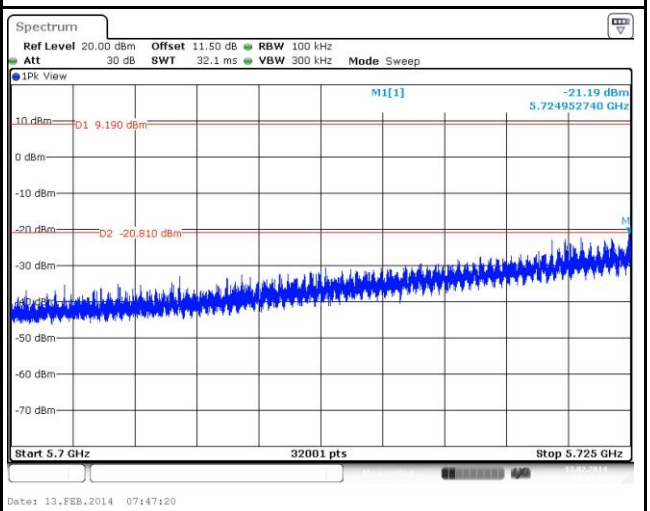
802.11a

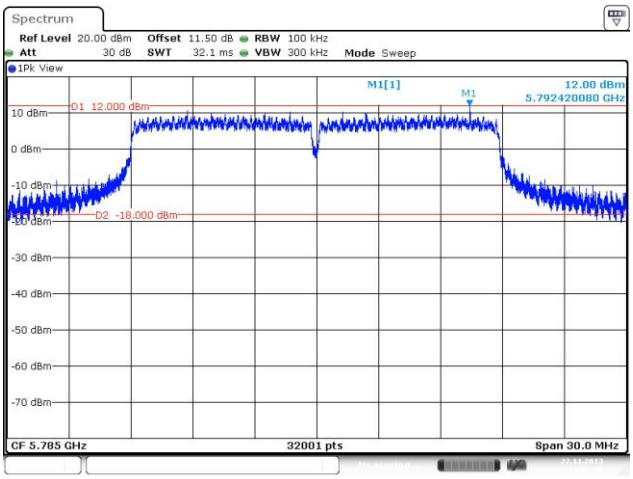
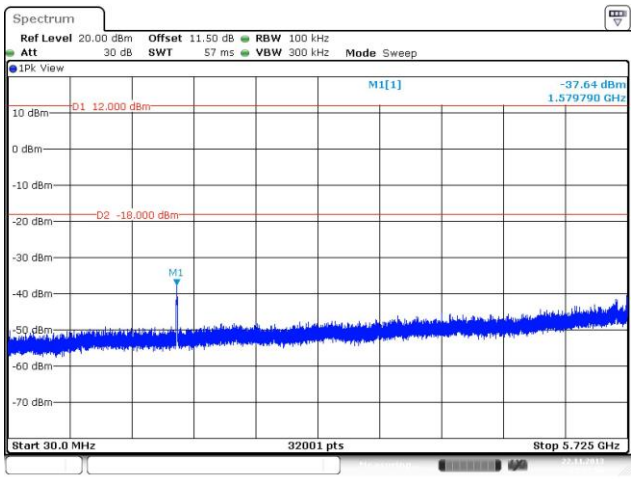
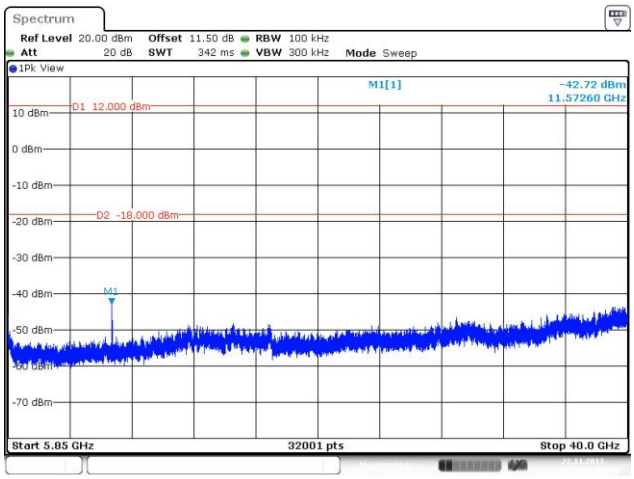
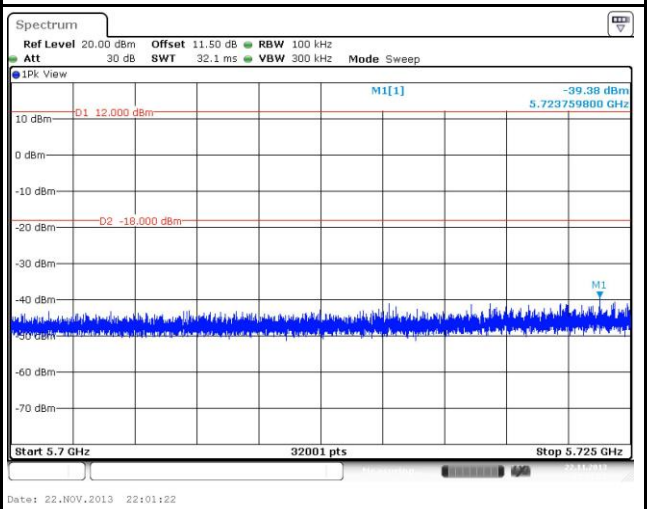
Reference Level	Tx 5745MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

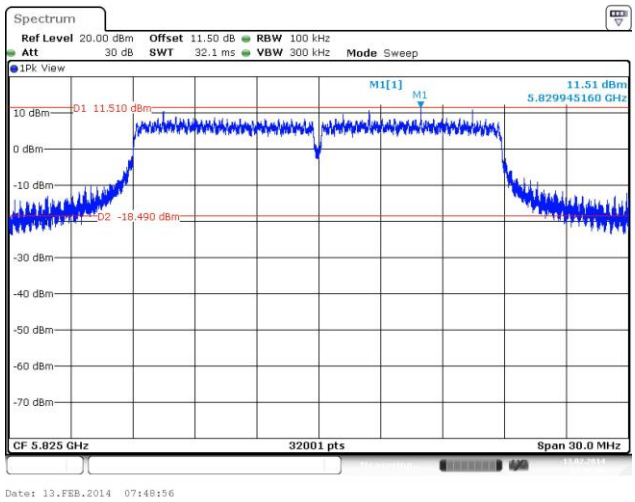
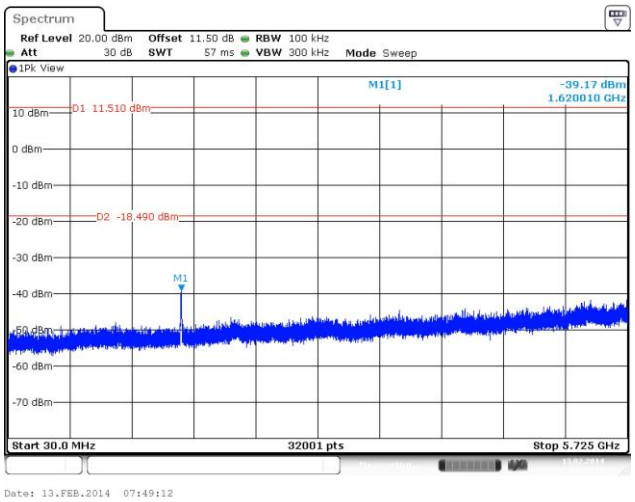
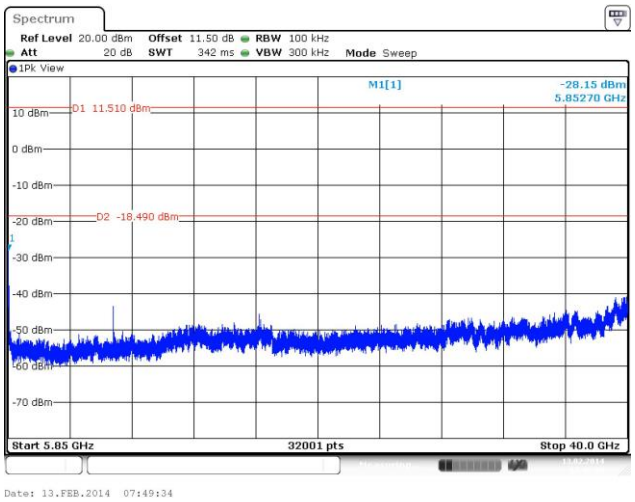
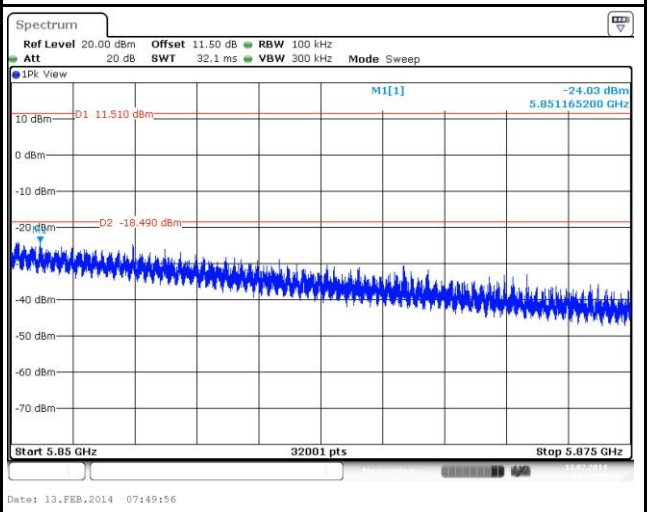
Reference Level	Tx 5785MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

Reference Level	Tx 5825MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

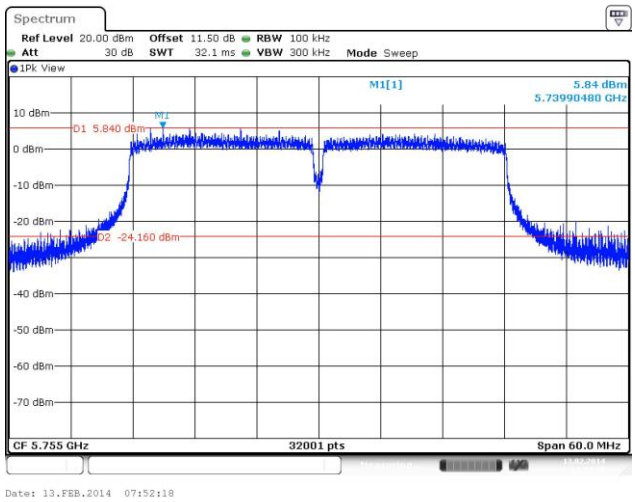
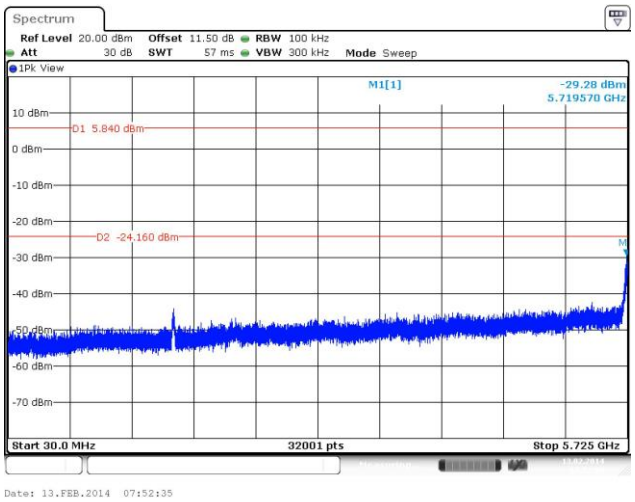
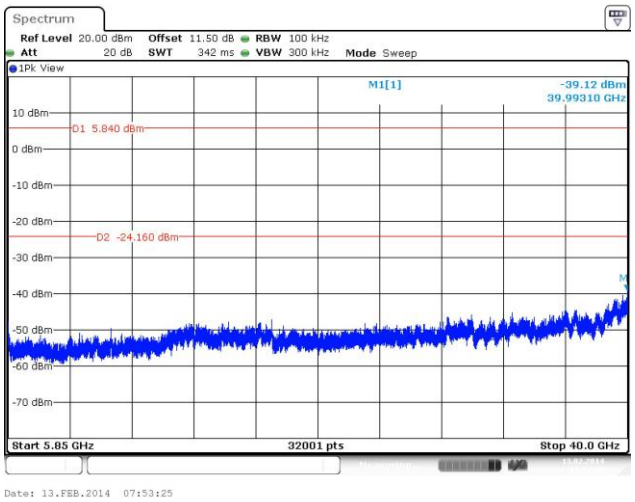
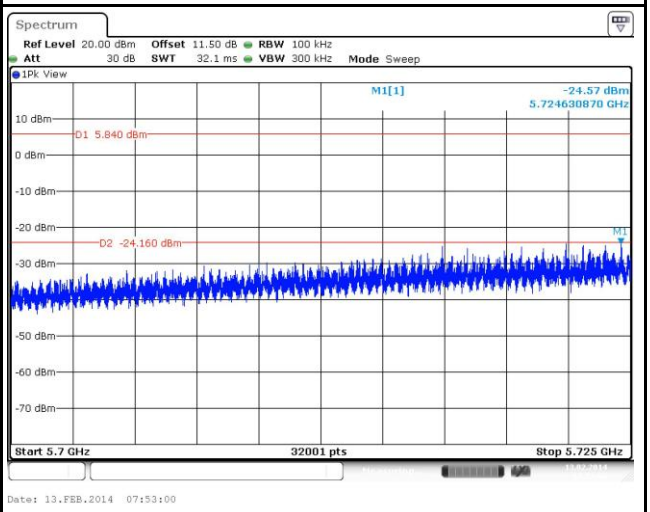
802.11ac VHT20

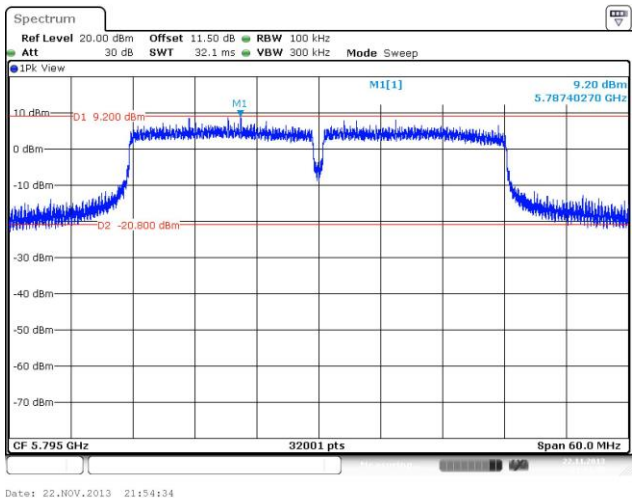
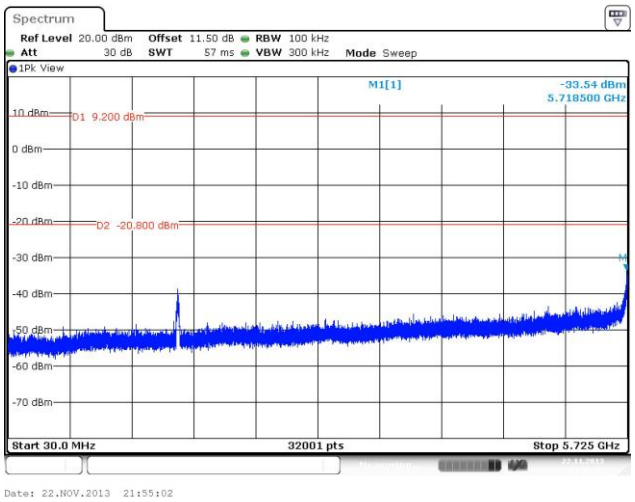
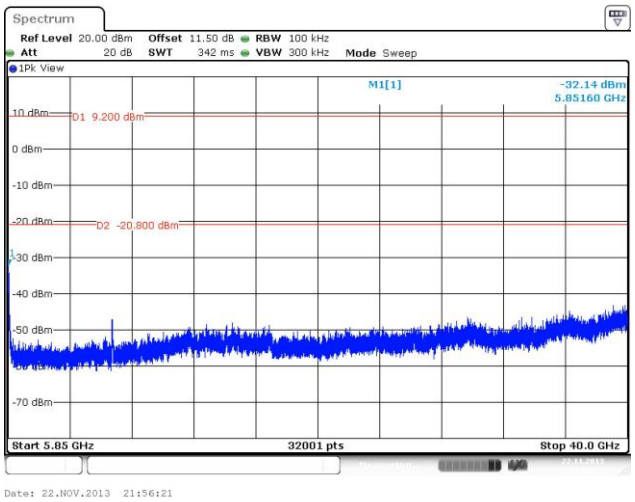
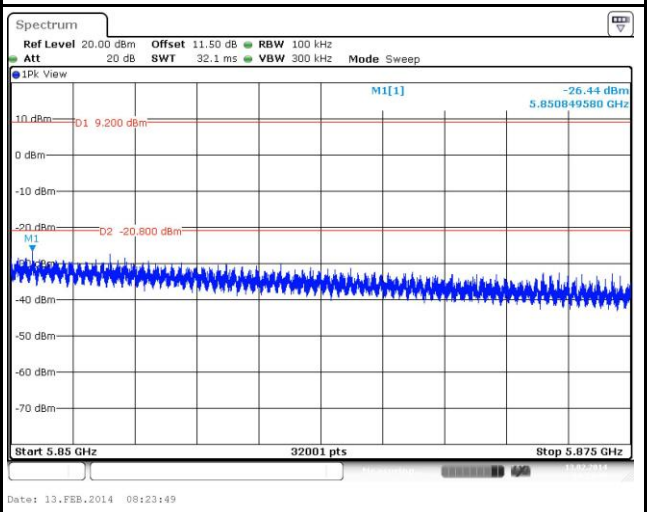
Reference Level	Tx 5745MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

Reference Level	Tx 5785MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

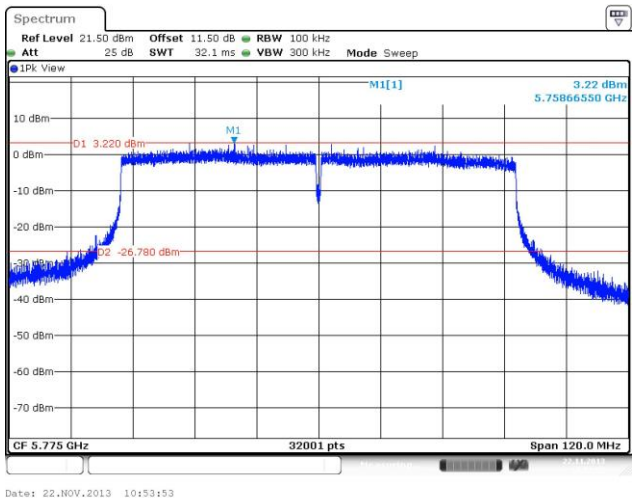
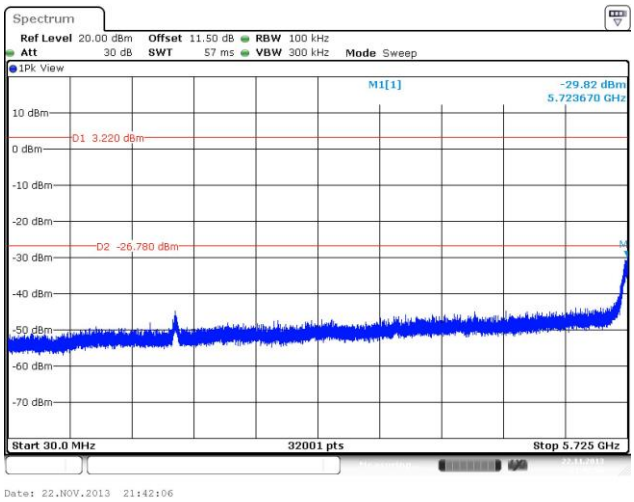
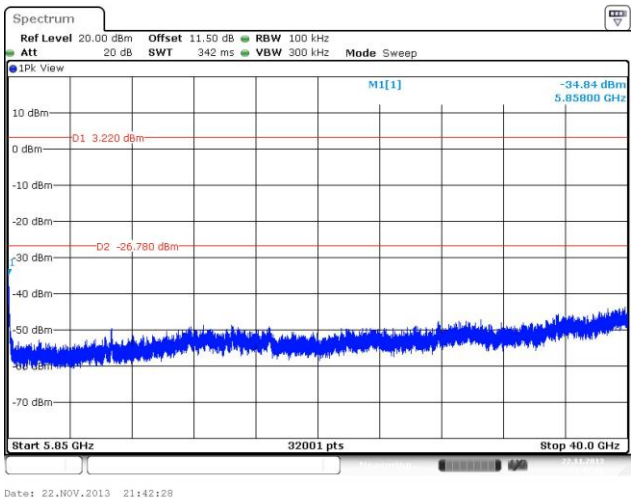
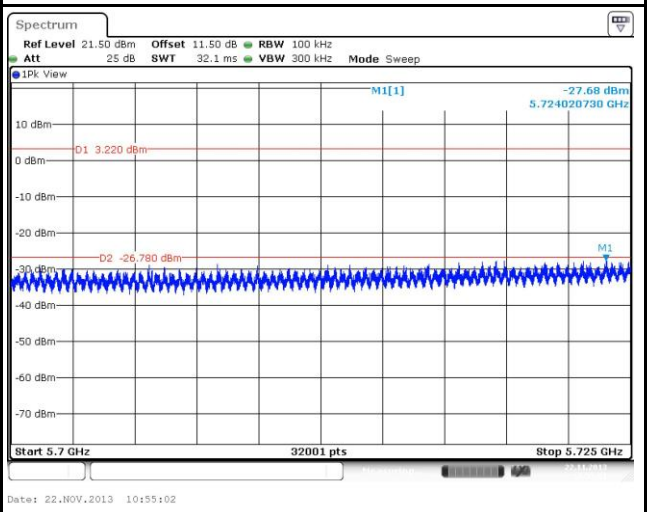
Reference Level	Tx 5825MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

802.11ac VHT40

Reference Level	Tx 5755MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

Reference Level	Tx 5795MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

802.11ac VHT80

Reference Level	Tx 5775MHz / 30MHz~40GHz (down 30dBc)
	
---	
---	

3.6 Transmitter Radiated Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

Restricted Band Emissions 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 Limit	
RF output power procedure	**Limit (dB)**
Peak output power procedure	20
Average output power procedure	30

Note 1: If the peak output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum measured in-band peak PSD level.

Note 2: If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured in-band average PSD level.

3.6.2 Measuring Instruments

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

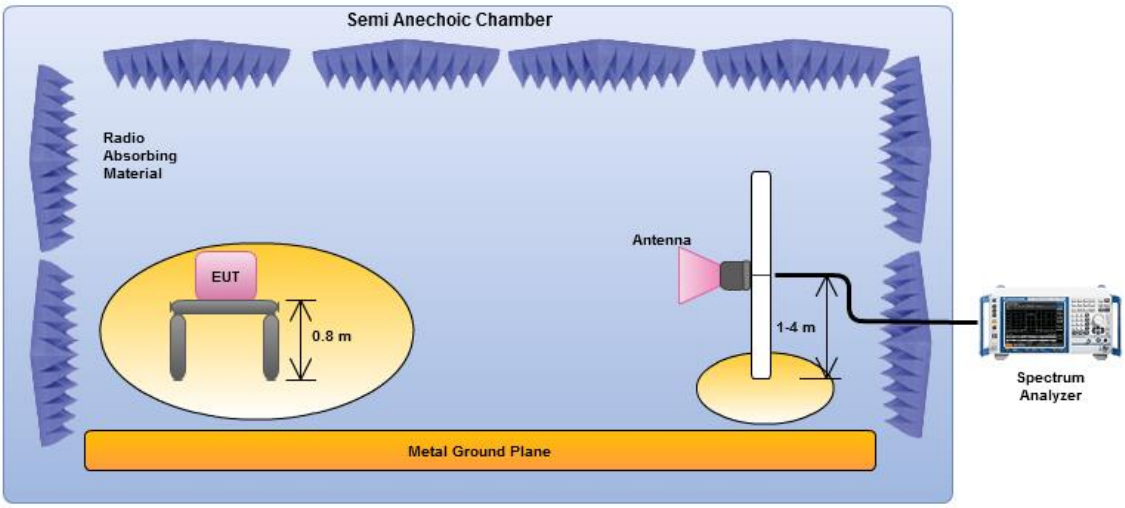
3.6.3 Test Procedures

Test Method			
☒	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).		
☒	The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].		
☒	For the transmitter unwanted emissions shall be measured using following options below:		
	☒	Refer as FCC KDB 558074 v03r01, clause 11 for unwanted emissions into non-restricted bands.	
	☒	Refer as FCC KDB 558074 v03r01, clause 12 for unwanted emissions into restricted bands.	
		☐	Refer as FCC KDB 558074 v03r01, clause 12.2.4.1 Option 1 (trace averaging for duty cycle ≥98%)
		☐	Refer as FCC KDB 558074 v03r01, clause 12.2.4.2 Option 2 (trace averaging + duty factor).
		☒	Refer as FCC KDB 558074 v03r01, clause 12.2.4.3 Option 3 (Reduced VBW≥1/T).
		☐	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 558074 v03r01, 12.2.3 measurement procedure peak limit.
		☐	Refer as FCC KDB 558074 v03r01, clause 12.2.2 measurement procedure Quasi-Peak limit.
☒	For radiated measurement, refer as FCC KDB 558074 v03r01, clause 12.2.6.		
	☒	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.	

Test Method		
☐	For conducted and cabinet radiation measurement, refer as FCC KDB 558074 v03r01, clause 12.2	
	☐	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

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.

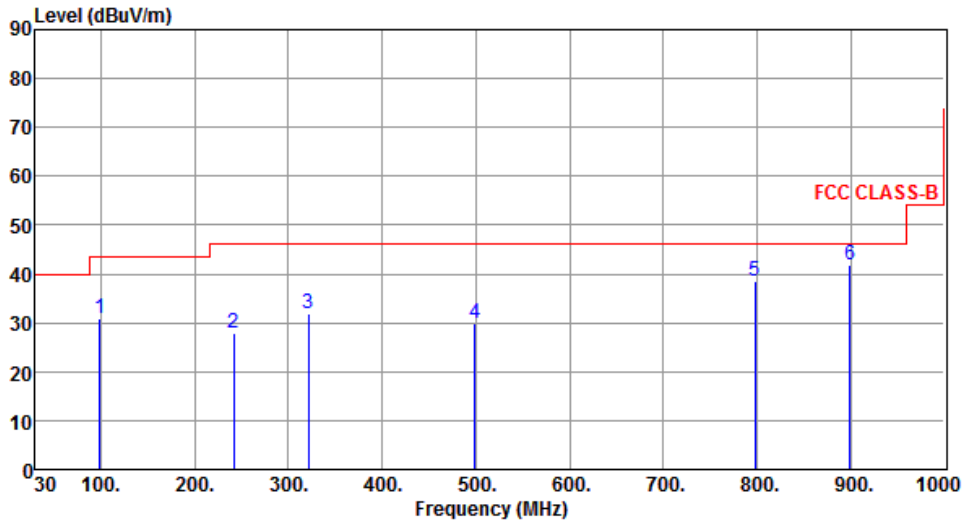
Note: The test distance is 3m.

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)

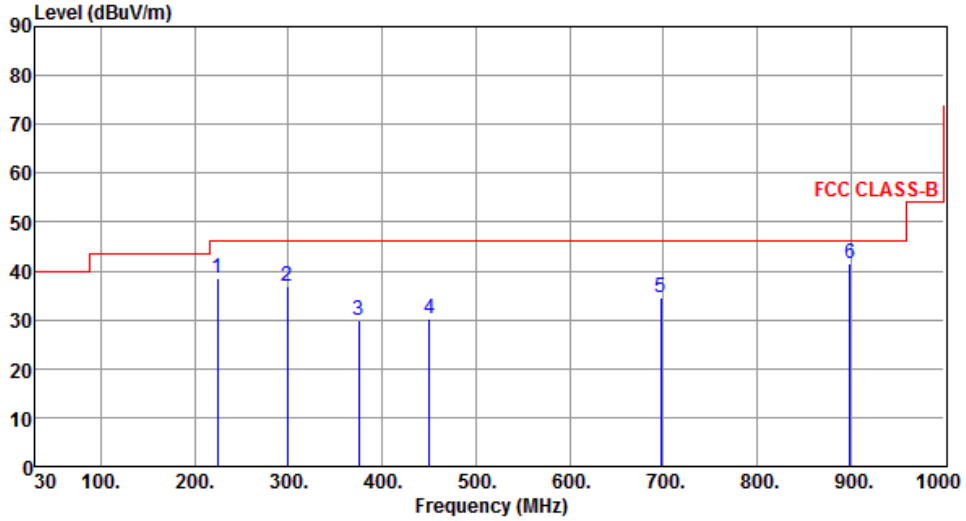
Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5795
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	98.46	30.79	43.50	-12.71	52.81	-22.02	Peak	---	---
2	241.65	27.98	46.00	-18.02	46.10	-18.12	Peak	---	---
3	321.11	31.86	46.00	-14.14	47.55	-15.69	Peak	---	---
4	498.72	30.05	46.00	-15.95	41.63	-11.58	Peak	---	---
5	797.66	38.51	46.00	-7.49	45.31	-6.80	Peak	---	---
6	898.94	41.86	46.00	-4.14	47.36	-5.50	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)

Transmitter Radiated Unwanted Emissions (Below 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5795
Operating Mode	1	**Polarization**	H

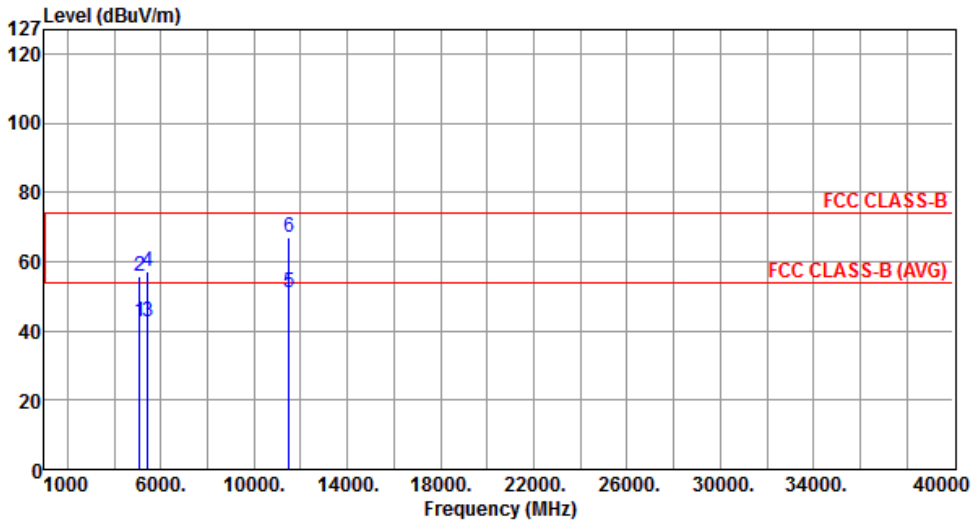


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	224.00	38.62	46.00	-7.38	57.52	-18.90	Peak	---	---
2	298.84	36.89	46.00	-9.11	53.07	-16.18	Peak	---	---
3	375.16	29.87	46.00	-16.13	44.22	-14.35	Peak	---	---
4	450.48	30.26	46.00	-15.74	42.77	-12.51	Peak	---	---
5	697.24	34.55	46.00	-11.45	42.82	-8.27	Peak	---	---
6	898.91	41.63	46.00	-4.37	47.13	-5.50	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)

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

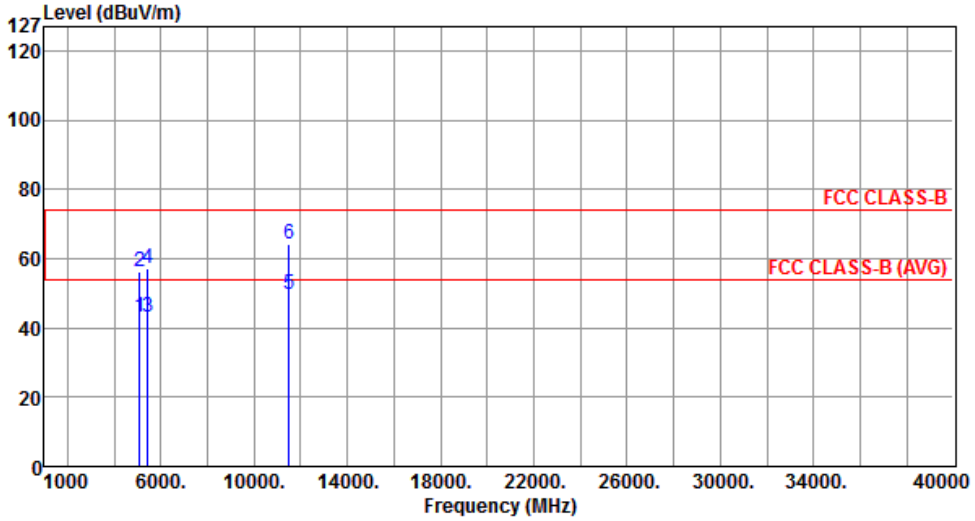
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5745
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	42.59	54.00	-11.41	36.62	5.97	Average	---	---
2	5097.00	55.76	74.00	-18.24	49.79	5.97	Peak	---	---
3	5427.00	42.87	54.00	-11.13	36.75	6.12	Average	---	---
4	5427.00	57.11	74.00	-16.89	50.99	6.12	Peak	---	---
5	11490.00	51.26	54.00	-2.74	36.39	14.87	Average	---	---
6	11490.00	66.89	74.00	-7.11	52.02	14.87	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

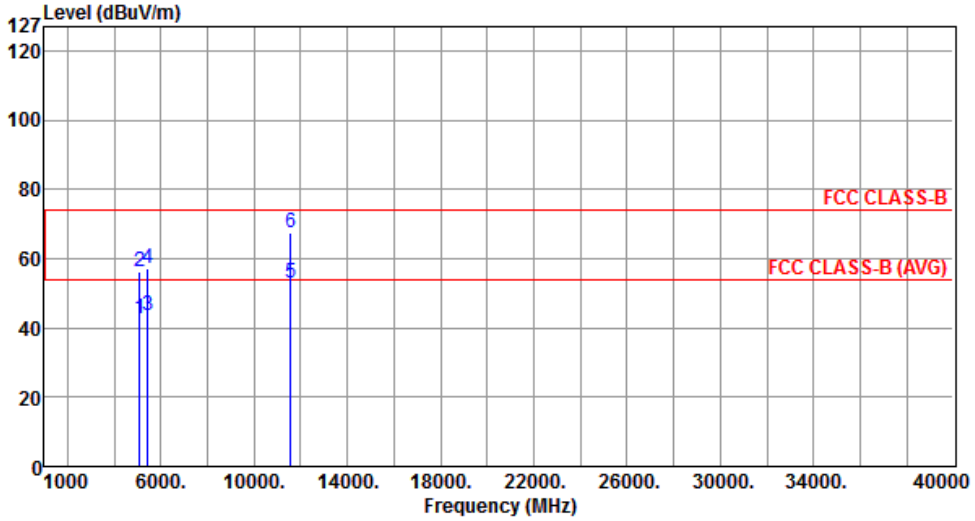
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5745
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.23	54.00	-10.77	37.26	5.97	Average	---	---
2	5097.00	56.22	74.00	-17.78	50.25	5.97	Peak	---	---
3	5427.00	43.33	54.00	-10.67	37.21	6.12	Average	---	---
4	5427.00	56.95	74.00	-17.05	50.83	6.12	Peak	---	---
5	11490.00	49.46	54.00	-4.54	34.59	14.87	Average	---	---
6	11490.00	64.43	74.00	-9.57	49.56	14.87	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

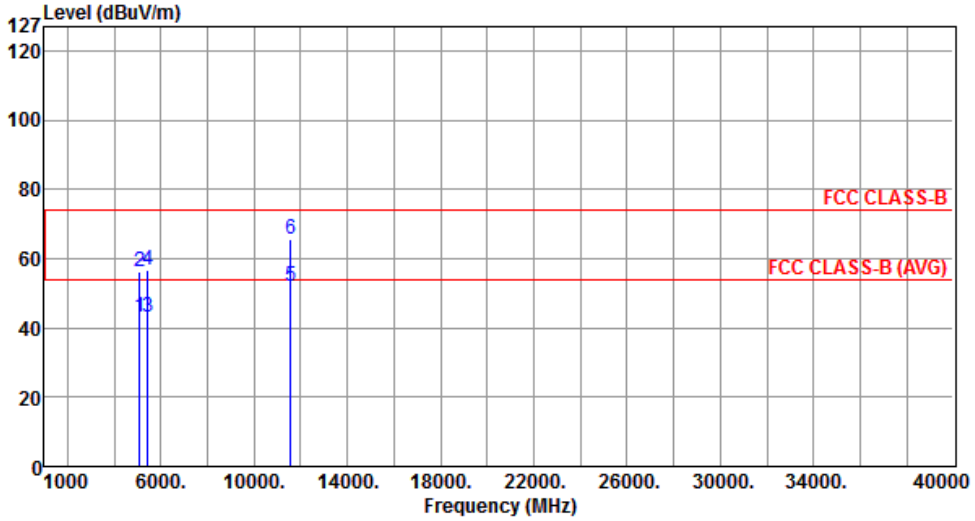
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5785
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	42.82	54.00	-11.18	36.85	5.97	Average	---	---
2	5097.00	56.07	74.00	-17.93	50.10	5.97	Peak	---	---
3	5427.00	43.42	54.00	-10.58	37.30	6.12	Average	---	---
4	5427.00	57.30	74.00	-16.70	51.18	6.12	Peak	---	---
5	11570.00	53.00	54.00	-1.00	38.21	14.79	Average	---	---
6	11570.00	67.56	74.00	-6.44	52.77	14.79	Peak	---	---

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

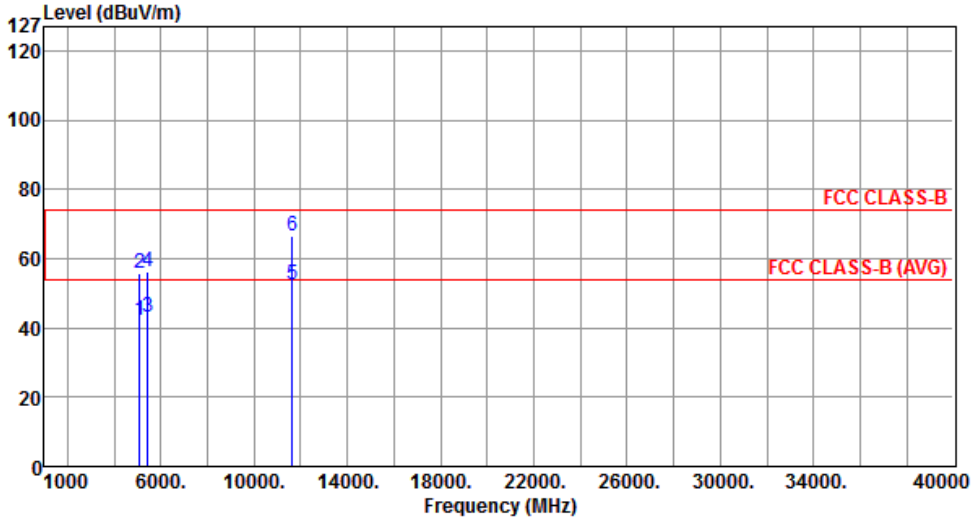
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5785
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	42.94	54.00	-11.06	36.97	5.97	Average	---	---
2	5097.00	56.43	74.00	-17.57	50.46	5.97	Peak	---	---
3	5427.00	43.00	54.00	-11.00	36.88	6.12	Average	---	---
4	5427.00	56.90	74.00	-17.10	50.78	6.12	Peak	---	---
5	11570.00	52.14	54.00	-1.86	37.35	14.79	Average	---	---
6	11570.00	65.71	74.00	-8.29	50.92	14.79	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

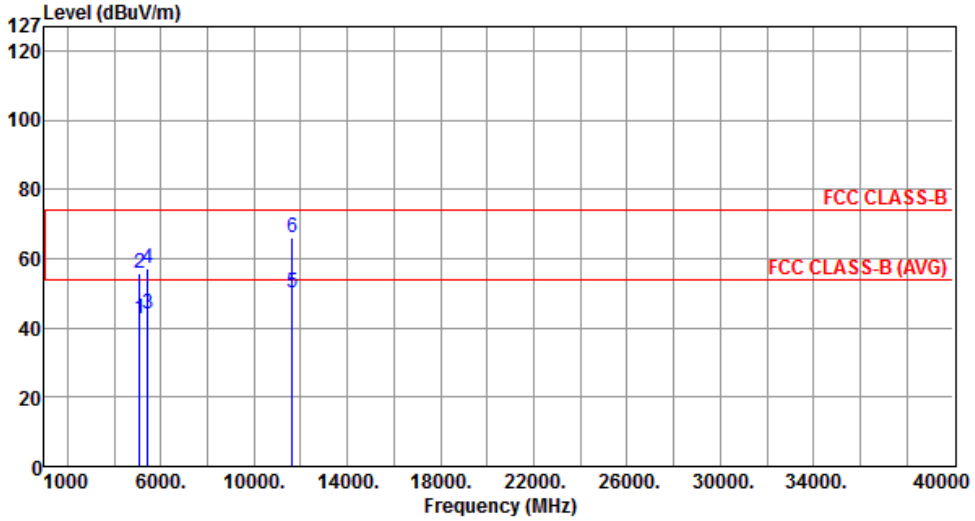
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5825
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	42.40	54.00	-11.60	36.43	5.97	Average	---	---
2	5097.00	55.57	74.00	-18.43	49.60	5.97	Peak	---	---
3	5427.00	43.13	54.00	-10.87	37.01	6.12	Average	---	---
4	5427.00	56.22	74.00	-17.78	50.10	6.12	Peak	---	---
5	11650.00	52.46	54.00	-1.54	37.77	14.69	Average	---	---
6	11650.00	66.44	74.00	-7.56	51.75	14.69	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	**Test Freq. (MHz)**	5825
Operating Mode	1	**Polarization**	H

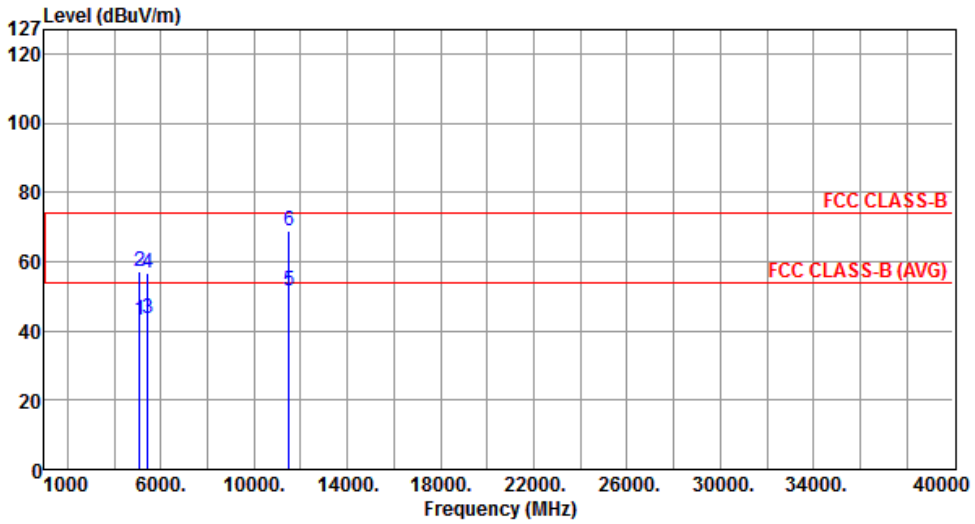


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	42.71	54.00	-11.29	36.74	5.97	Average	---	---
2	5097.00	55.81	74.00	-18.19	49.84	5.97	Peak	---	---
3	5427.00	44.03	54.00	-9.97	37.91	6.12	Average	---	---
4	5427.00	57.17	74.00	-16.83	51.05	6.12	Peak	---	---
5	11650.00	49.98	54.00	-4.02	35.29	14.69	Average	---	---
6	11650.00	66.07	74.00	-7.93	51.38	14.69	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

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

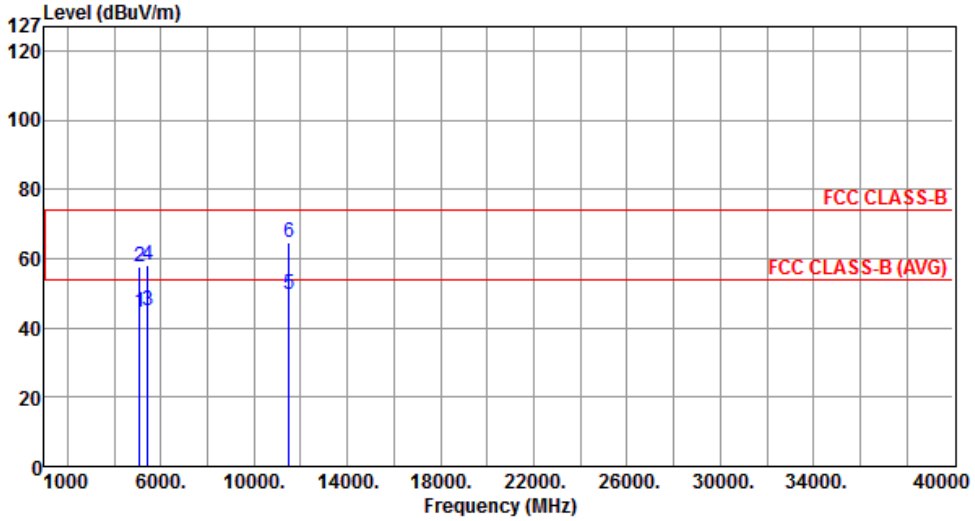
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5745
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.21	54.00	-10.79	37.24	5.97	Average	---	---
2	5097.00	57.18	74.00	-16.82	51.21	5.97	Peak	---	---
3	5427.00	43.62	54.00	-10.38	37.50	6.12	Average	---	---
4	5427.00	56.78	74.00	-17.22	50.66	6.12	Peak	---	---
5	11490.00	51.45	54.00	-2.55	36.58	14.87	Average	---	---
6	11490.00	68.88	74.00	-5.12	54.01	14.87	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

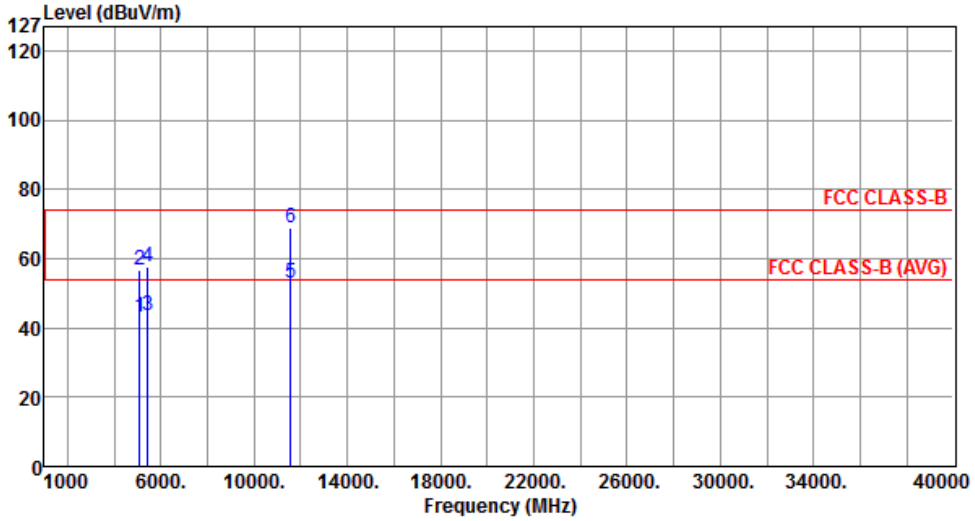
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5745
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	44.32	54.00	-9.68	38.35	5.97	Average	---	---
2	5097.00	57.59	74.00	-16.41	51.62	5.97	Peak	---	---
3	5427.00	44.79	54.00	-9.21	38.67	6.12	Average	---	---
4	5427.00	58.04	74.00	-15.96	51.92	6.12	Peak	---	---
5	11490.00	49.74	54.00	-4.26	34.87	14.87	Average	---	---
6	11490.00	64.68	74.00	-9.32	49.81	14.87	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

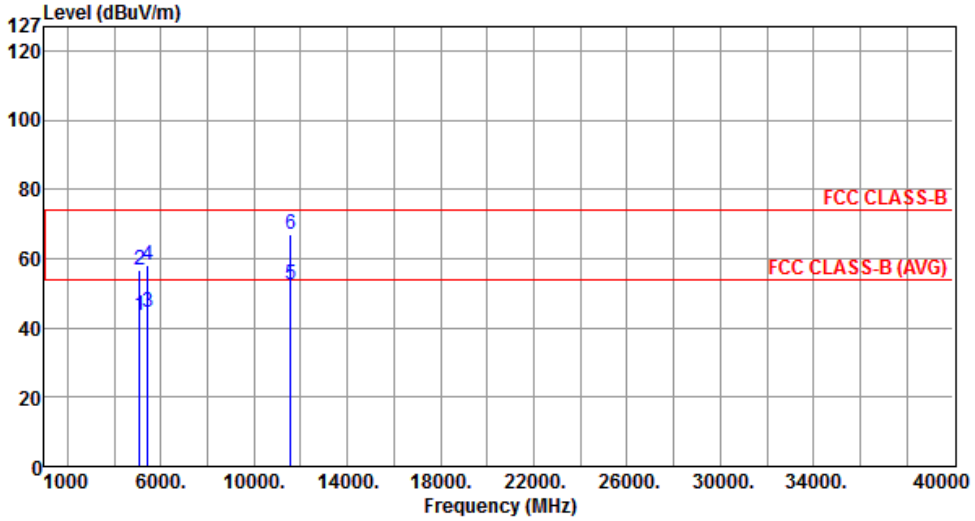
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5785
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.25	54.00	-10.75	37.28	5.97	Average	---	---
2	5097.00	56.73	74.00	-17.27	50.76	5.97	Peak	---	---
3	5427.00	43.65	54.00	-10.35	37.53	6.12	Average	---	---
4	5427.00	57.54	74.00	-16.46	51.42	6.12	Peak	---	---
5	11570.00	52.97	54.00	-1.03	38.18	14.79	Average	---	---
6	11570.00	68.84	74.00	-5.16	54.05	14.79	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

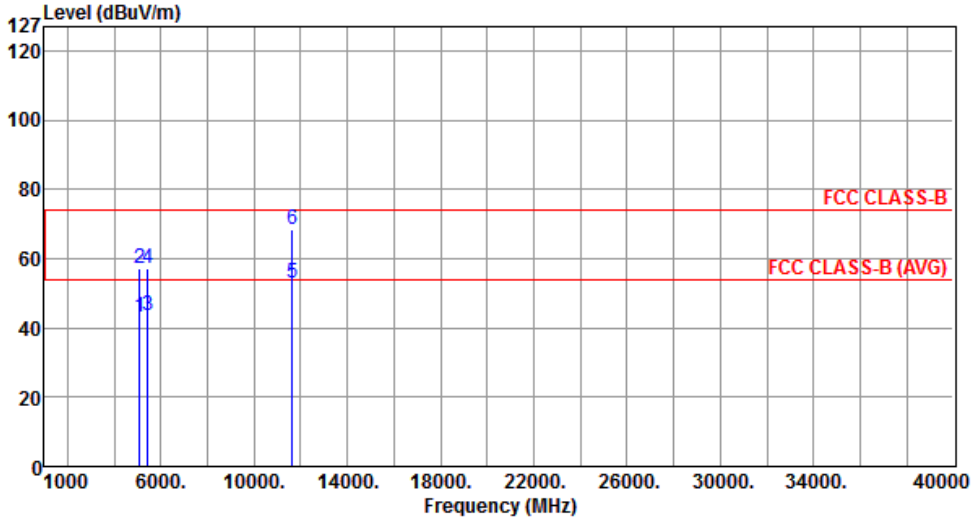
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5785
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.65	54.00	-10.35	37.68	5.97	Average	---	---
2	5097.00	56.86	74.00	-17.14	50.89	5.97	Peak	---	---
3	5427.00	44.60	54.00	-9.40	38.48	6.12	Average	---	---
4	5427.00	58.00	74.00	-16.00	51.88	6.12	Peak	---	---
5	11570.00	52.37	54.00	-1.63	37.58	14.79	Average	---	---
6	11570.00	66.95	74.00	-7.05	52.16	14.79	Peak	---	---

Note 1: “>20dB” means spurious emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)
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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

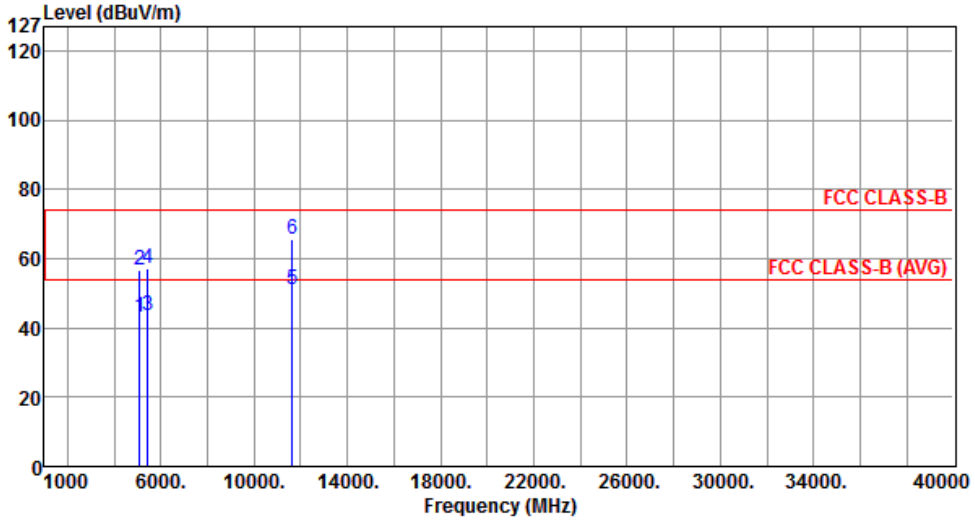
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5825
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.01	54.00	-10.99	37.04	5.97	Average	---	---
2	5097.00	57.08	74.00	-16.92	51.11	5.97	Peak	---	---
3	5427.00	43.63	54.00	-10.37	37.51	6.12	Average	---	---
4	5427.00	57.06	74.00	-16.94	50.94	6.12	Peak	---	---
5	11650.00	52.93	54.00	-1.07	38.24	14.69	Average	---	---
6	11650.00	68.25	74.00	-5.75	53.56	14.69	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT20	**Test Freq. (MHz)**	5825
Operating Mode	1	**Polarization**	H

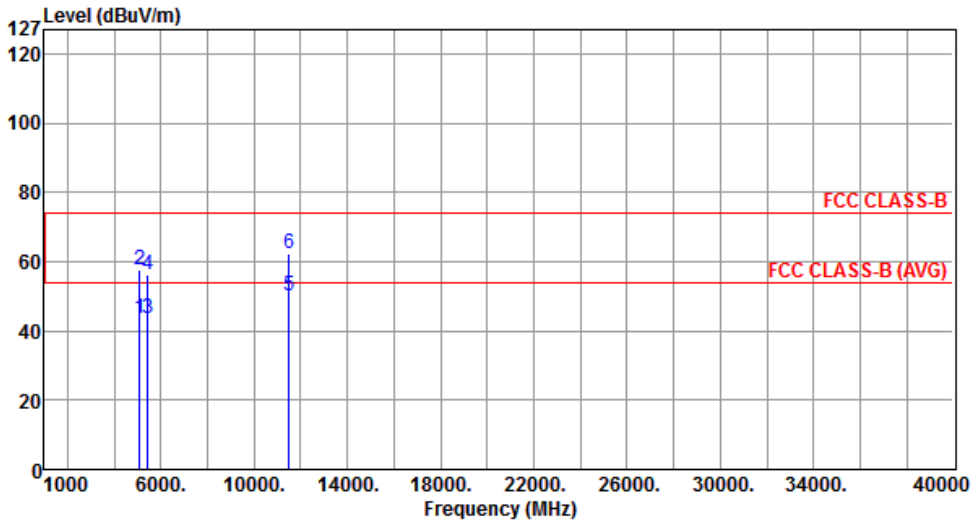


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.27	54.00	-10.73	37.30	5.97	Average	---	---
2	5097.00	56.55	74.00	-17.45	50.58	5.97	Peak	---	---
3	5427.00	43.74	54.00	-10.26	37.62	6.12	Average	---	---
4	5427.00	57.25	74.00	-16.75	51.13	6.12	Peak	---	---
5	11650.00	50.92	54.00	-3.08	36.23	14.69	Average	---	---
6	11650.00	65.46	74.00	-8.54	50.77	14.69	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

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

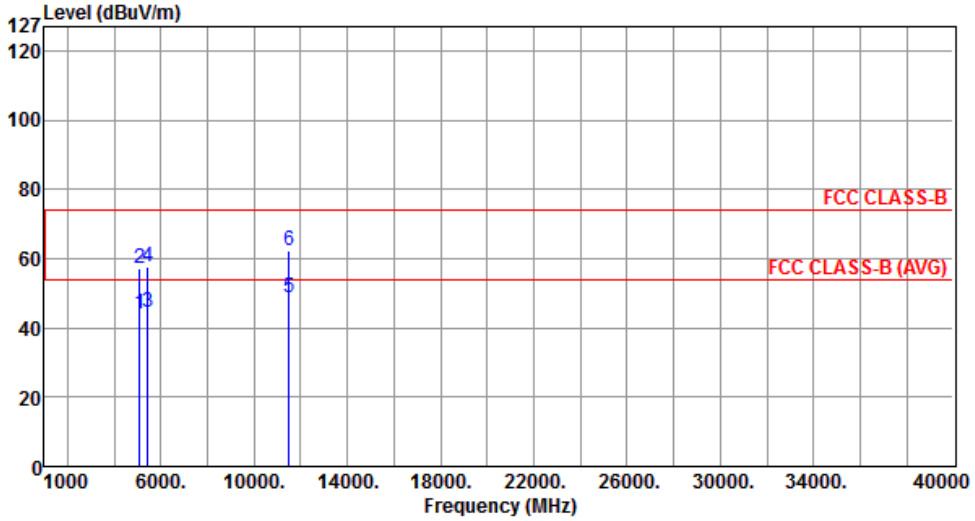
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5755
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.71	54.00	-10.29	37.74	5.97	Average	---	---
2	5097.00	57.43	74.00	-16.57	51.46	5.97	Peak	---	---
3	5427.00	43.72	54.00	-10.28	37.60	6.12	Average	---	---
4	5427.00	56.45	74.00	-17.55	50.33	6.12	Peak	---	---
5	11510.00	50.12	54.00	-3.88	35.27	14.85	Average	---	---
6	11510.00	62.28	74.00	-11.72	47.43	14.85	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

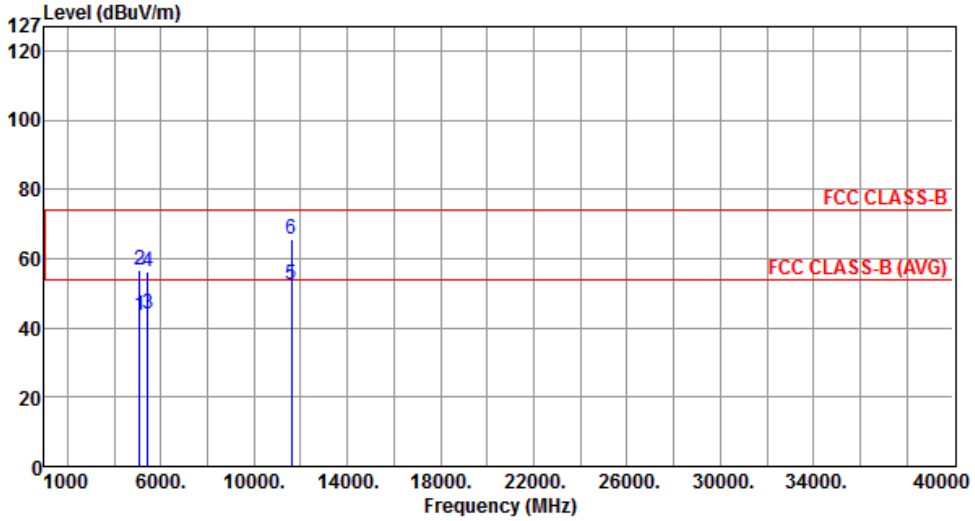
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5755
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.96	54.00	-10.04	37.99	5.97	Average	---	---
2	5097.00	56.94	74.00	-17.06	50.97	5.97	Peak	---	---
3	5427.00	44.33	54.00	-9.67	38.21	6.12	Average	---	---
4	5427.00	57.59	74.00	-16.41	51.47	6.12	Peak	---	---
5	11510.00	48.86	54.00	-5.14	34.01	14.85	Average	---	---
6	11510.00	62.11	74.00	-11.89	47.26	14.85	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

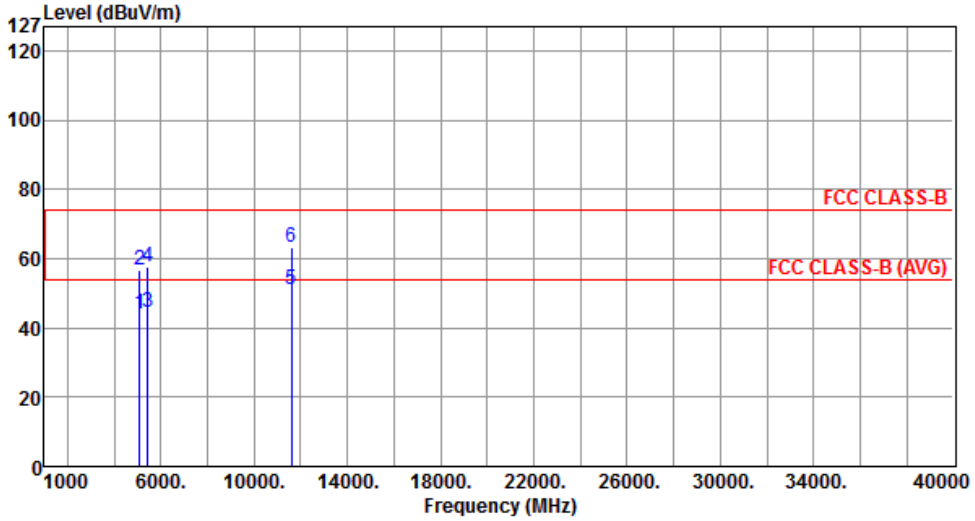
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5795
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.63	54.00	-10.37	37.66	5.97	Average	---	---
2	5097.00	56.49	74.00	-17.51	50.52	5.97	Peak	---	---
3	5427.00	43.95	54.00	-10.05	37.83	6.12	Average	---	---
4	5427.00	56.28	74.00	-17.72	50.16	6.12	Peak	---	---
5	11590.00	52.65	54.00	-1.35	37.90	14.75	Average	---	---
6	11590.00	65.61	74.00	-8.39	50.86	14.75	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT40	**Test Freq. (MHz)**	5795
Operating Mode	1	**Polarization**	H

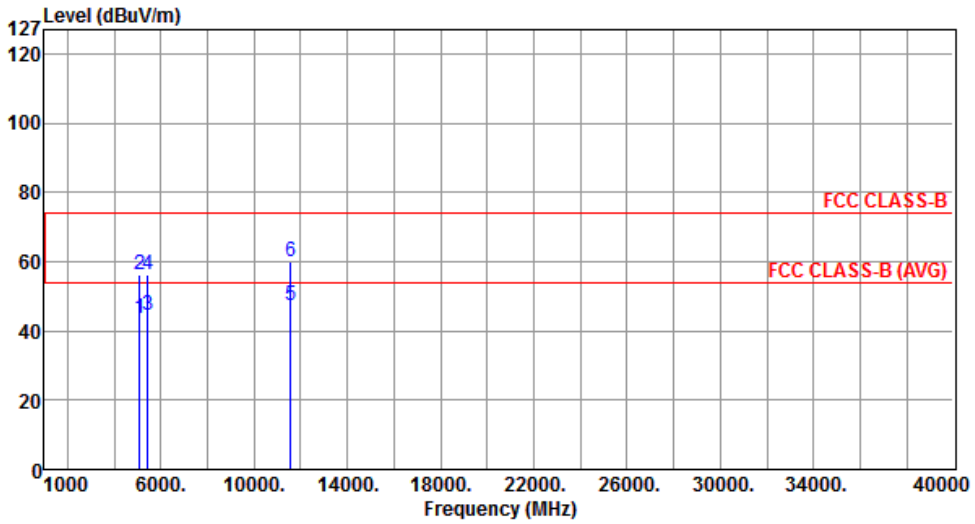


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.82	54.00	-10.18	37.85	5.97	Average	---	---
2	5097.00	56.64	74.00	-17.36	50.67	5.97	Peak	---	---
3	5427.00	44.66	54.00	-9.34	38.54	6.12	Average	---	---
4	5427.00	57.49	74.00	-16.51	51.37	6.12	Peak	---	---
5	11590.00	51.21	54.00	-2.79	36.46	14.75	Average	---	---
6	11590.00	63.28	74.00	-10.72	48.53	14.75	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

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

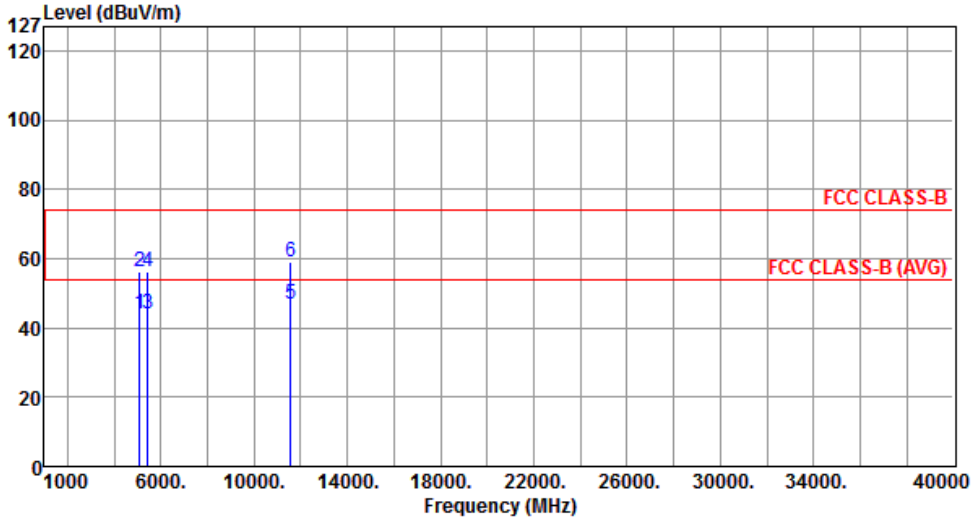
Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT80	**Test Freq. (MHz)**	5775
Operating Mode	1	**Polarization**	V



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.78	54.00	-10.22	37.81	5.97	Average	---	---
2	5097.00	56.10	74.00	-17.90	50.13	5.97	Peak	---	---
3	5427.00	44.32	54.00	-9.68	38.20	6.12	Average	---	---
4	5427.00	56.41	74.00	-17.59	50.29	6.12	Peak	---	---
5	11550.00	47.40	54.00	-6.60	32.60	14.80	Average	---	---
6	11550.00	60.21	74.00	-13.79	45.41	14.80	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT80	**Test Freq. (MHz)**	5775
Operating Mode	1	**Polarization**	H



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	5097.00	43.96	54.00	-10.04	37.99	5.97	Average	---	---
2	5097.00	56.25	74.00	-17.75	50.28	5.97	Peak	---	---
3	5427.00	44.05	54.00	-9.95	37.93	6.12	Average	---	---
4	5427.00	56.20	74.00	-17.80	50.08	6.12	Peak	---	---
5	11550.00	46.86	54.00	-7.14	32.06	14.80	Average	---	---
6	11550.00	59.01	74.00	-14.99	44.21	14.80	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.
Note 5: For un-restricted bands, unwanted emissions shall be attenuated by at least 30 dB relative to the maximum measured in-band level.

4 Test Equipment and Calibration Data

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
EMC Receiver	R&S	ESCS 30	100169	Oct. 15, 2013	Oct. 14, 2014
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 23, 2013	Nov. 22, 2014
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127-666	Dec. 04, 2013	Dec. 03, 2014
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Apr. 24, 2013	Apr. 23, 2014
50 ohm terminal (Support Unit)	NA	50	04	Apr. 22, 2013	Apr. 21, 2014
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Jan. 25, 2014	Jan. 24, 2015
Receiver	R&S	ESR3	101658	Jan. 10, 2014	Jan. 09, 2015
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jan. 02, 2014	Jan. 01, 2015
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120D	BBHA 9120 D 1095	Jan. 07, 2014	Jan. 06, 2015
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Dec. 27, 2013	Dec. 26, 2014
Preamplifier	Burgeon	BPA-530	SN:100219	Nov. 22, 2013	Nov. 21, 2014
Preamplifier	Agilent	83017A	MY39501308	Dec. 16, 2013	Dec. 15, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 16, 2013	Dec. 15, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 16, 2013	Dec. 15, 2014
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 16, 2013	Dec. 15, 2014
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 16, 2013	Dec. 15, 2014
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 16, 2013	Dec. 15, 2014
Note: Calibration Interval of instruments listed above is one year.					

Loop Antenna	R&S	HFH2-Z2	100330	Nov. 15, 2012	Nov. 14, 2014
Preamplifier	EM	EM18G40G	060572	Jun. 20, 2013	Jun. 19, 2014
Note: Calibration Interval of instruments listed above is two year.					

Test Item	RF Conducted				
Test Site	TH01-HY				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV 40	101013	Jan. 25, 2014	Jan. 24, 2015
AC Power Source	G.W	APS-9102	EL920581	Jul. 16, 2013	Jul. 15, 2014
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	Nov. 20, 2013	Nov. 19, 2014
Signal Generator	R&S	SMR40	100116	Jun. 27, 2013	Jun. 26, 2014
Power Sensor	Anritsu	MA2411B	0917017	Jan. 28, 2014	Jan. 27, 2015
Power Meter	Anritsu	ML2495A	0949003	Jan. 28, 2014	Jan. 27, 2015
RF Cable-2m	HUBER+SUHNER	SUCOFLEX_104	SN 345675/4	Dec. 02, 2013	Dec. 01, 2014
RF Cable-3m	HUBER+SUHNER	SUCOFLEX_104	SN 345669/4	Dec. 02, 2013	Dec. 01, 2014
DC Power Source	G.W.	GPC-6030D	C671845	Jun. 21, 2013	Jun. 20, 2014
Note: Calibration Interval of instruments listed above is one year.					