

FCC Test Report

Equipment : 11ac Wireless Single-Band 5G Only USB Adapter
Brand Name : EDIMAX
Model No. : EW-7711ULC / GWU-H11ULC / EW-7711MAC
FCC ID : NDD9577111306
Standard : 47 CFR FCC Part 15.407
Operating Band : 5725 MHz – 5850 MHz
FCC Classification : UNII
Applicant : EDIMAX TECHNOLOGY CO., LTD.
Manufacturer : No.3, Wu-Chuan 3rd Road, Wu-Ku Industrial Park, New Taipei City, Taiwan
Function : Portable Client

The product sample received on Sep. 27, 2013 and completely tested on Apr. 29, 2016. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 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:


Kevin Liang / Assistant Manager

Table of Contents

1	GENERAL DESCRIPTION	5
1.1	Information.....	5
1.2	Accessories and Support Equipment.....	7
1.3	Testing Applied Standards	7
1.4	Testing Location Information.....	7
1.5	Measurement Uncertainty	8
2	TEST CONFIGURATION OF EUT	9
2.1	The Worst Case Modulation Configuration	9
2.2	The Worst Case Power Setting Parameter.....	9
2.3	The Worst Case Measurement Configuration.....	10
2.4	Test Setup Diagram	11
3	TRANSMITTER TEST RESULT	12
3.1	AC Power-line Conducted Emissions	12
3.2	Emission Bandwidth.....	15
3.3	RF Output Power.....	17
3.4	Peak Power Spectral Density.....	20
3.5	Transmitter Bandedge Emissions	23
3.6	Transmitter Unwanted Emissions.....	26
3.7	Frequency Stability.....	49
4	TEST EQUIPMENT AND CALIBRATION DATA	51

APPENDIX A. TEST PHOTOS

APPENDIX B. PHOTOGRAPHS OF EUT

Summary of Test Result

Conformance Test Specifications			
Report Clause	Ref. Std. Clause	Description	Result
1.1.2	15.203	Antenna Requirement	Complied
3.1	15.207	AC Power-line Conducted Emissions	Complied
3.2	15.407(a)	Emission Bandwidth	Complied
3.3	15.407(a)	RF Output Power (Maximum Conducted (Average) Output Power)	Complied
3.4	15.407(a)	Peak Power Spectral Density	Complied
3.5	15.407(b)	Transmitter Bandedge Emissions	Complied
3.6	15.407(b)	Transmitter Unwanted Emissions	Complied
3.7	15.407(g)	Frequency Stability	Complied

Revision History

[illegible]

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information (5725-5850MHz band)					
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	RF Output Power (dBm)
5725-5850	a	5745-5825	149-165 [5]	1	16.06
5725-5850	n (HT20)	5745-5825	149-165 [5]	1	15.97
5725-5850	n (HT40)	5755-5795	151-159 [2]	1	16.04
5725-5850	ac (VHT20)	5745-5825	149-165 [5]	1	16.09
5725-5850	ac (VHT40)	5755-5795	151-159 [2]	1	15.99
5725-5850	ac (VHT80)	5775	155 [1]	1	14.35

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.

1.1.2 Antenna Information

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

Antenna General Information		
Ant. Cat.	Ant. Type	Gain (dBi)
Integral	---	5.82

1.1.3 Type of EUT

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

1.1.4 Test Signal Duty Cycle

Operated Mode for Worst Duty Cycle	
<input type="checkbox"/> Operated normally mode for worst duty cycle	
<input checked="" type="checkbox"/> Operated test mode for worst duty cycle	
Test Signal Duty Cycle (x)	Power Duty Factor [dB] – (10 log 1/x)
<input checked="" type="checkbox"/> 100% - IEEE 802.11a	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT20)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11n (HT40)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11ac (VHT20)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11ac (VHT40)	0
<input checked="" type="checkbox"/> 100% - IEEE 802.11ac (VHT80)	0

1.1.5 EUT Operational Condition

Supply Voltage	<input type="checkbox"/> AC mains	<input checked="" type="checkbox"/> DC (5Vdc)	
Type of DC Source	<input type="checkbox"/> Internal DC supply	<input type="checkbox"/> External DC adapter	<input checked="" type="checkbox"/> From Host
Operational Voltage	<input checked="" type="checkbox"/> Vnom (110 V)	<input checked="" type="checkbox"/> Vmax (126.5 V)	<input checked="" type="checkbox"/> Vmin (93.5 V)
Operational Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (55°C)	<input checked="" type="checkbox"/> Tmin (-30°C)

1.2 Accessories and Support Equipment

Support Equipment – Radiated Emission				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E5530	R33002
2	Adapter	DELL	LA65NS2-01	-

Support Equipment – RF Conducted				
No.	Equipment	Brand Name	Model Name	FCC ID
1	NoteBook	DELL	E5540	R33002 / DOC
2	Adapter	DELL	HA65NM130	R35737/DOC

1.3 Testing Applied Standards

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

- ◆ 47 CFR FCC Part 15
- ◆ ANSI C63.10-2013
- ◆ FCC KDB 789033 D02 v01r02
- ◆ FCC KDB 644545 D03 v01
- ◆ FCC-14-30A1-UNII
- ◆

1.4 Testing Location Information

Testing Location				
<input checked="" type="checkbox"/>	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.		
		TEL : 886-3-327-3456 FAX : 886-3-327-0973		
Test Condition		Test Site No.	Test Engineer	Test Environment
AC Conduction		CO01-WS	Skys Huang	23°C / 66%
RF Conducted		TH01-HY	Howard	23°C / 63%
Radiated Emission		03CH03-HY	Jeff	23.1°C / 57%

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
AC power-line conducted emissions		±2.3 dB
Emission bandwidth, 26dB bandwidth		±0.5%
RF output power, conducted		±0.1 dB
Power density, conducted		±0.5 dB
Unwanted emissions, conducted	9 – 150 kHz	±0.4 dB
	0.15 – 30 MHz	±0.4 dB
	30 – 1000 MHz	±0.6 dB
	1 – 18 GHz	±0.5 dB
	18 – 40 GHz	±0.5 dB
	40 – 200 GHz	N/A
All emissions, radiated	9 – 150 kHz	±2.5 dB
	0.15 – 30 MHz	±2.3 dB
	30 – 1000 MHz	±2.6 dB
	1 – 18 GHz	±3.6 dB
	18 – 40 GHz	±3.8 dB
	40 – 200 GHz	N/A
Temperature		±0.8 °C
Humidity		±5 %
DC and low frequency voltages		±0.9%
Time		±1.4 %
Duty Cycle		±0.5 %

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	1	6-54Mbps	6 Mbps
HT20	1	MCS 0-7	MCS 0
HT40	1	MCS 0-7	MCS 0
VHT20	1	MCS 0-8	MCS 0
VHT40	1	MCS 0-9	MCS 0
VHT80	1	MCS 0-9	MCS 0

2.2 The Worst Case Power Setting Parameter




The Worst Case Power Setting Parameter (5725-5850MHz band)							
Test Software Version	MT76xxU QA v2.0.9.0						
Modulation Mode	N _{TX}	Test Frequency (MHz)					
		NCB: 20MHz			NCB: 40MHz		NCB: 80MHz
		5745	5785	5825	5755	5795	5775
11a	1	17	1A	1E	-	-	-
HT20	1	1C	1E	1F	-	-	-
HT40	1	-	-	-	1C	1F	-
VHT20	1	1F	1F	22	-	-	-
VHT40	1	-	-	-	20	20	-
VHT80	1	-	-	-	-	-	1D

2.3 The Worst Case Measurement Configuration

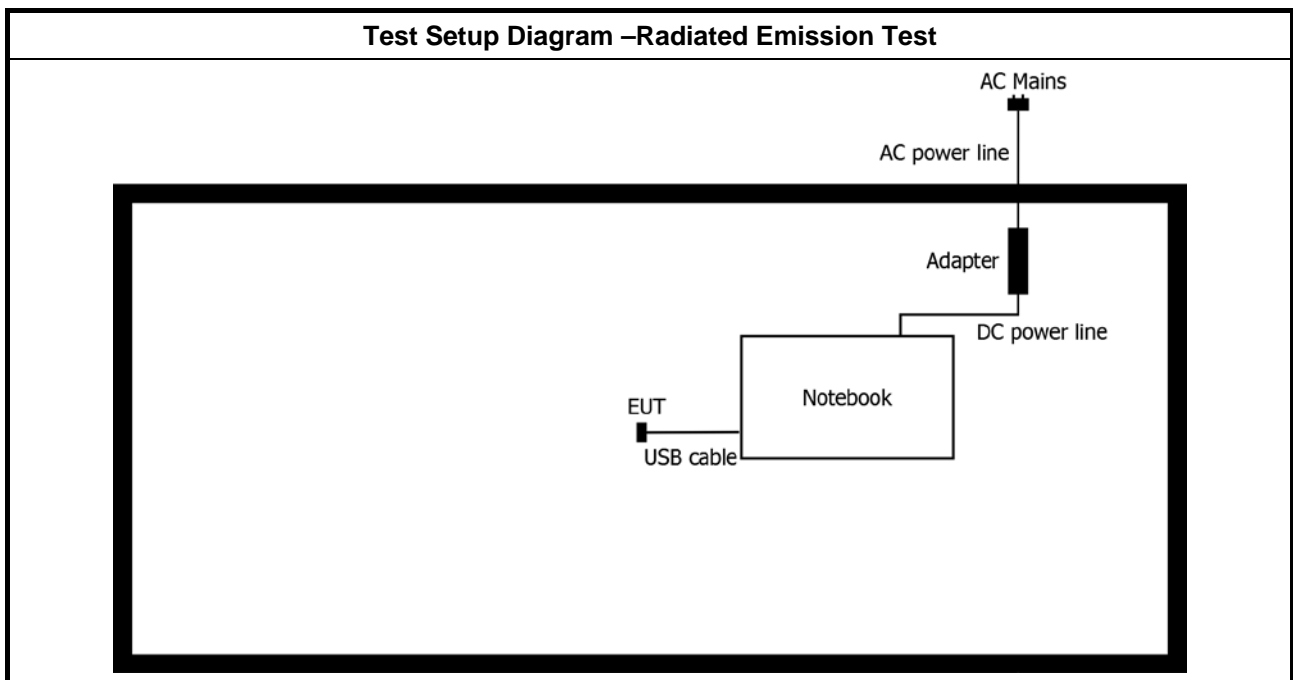
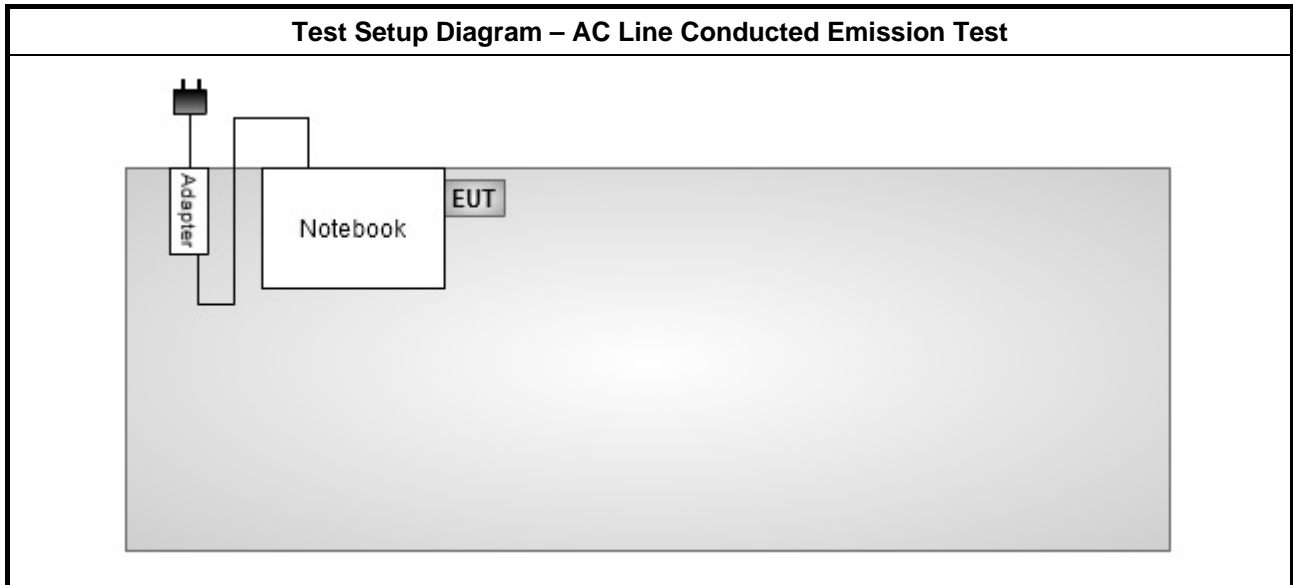
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	Radio link (WLAN)

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	Radio link (WLAN)

The Worst Case Mode for Following Conformance Tests	
Tests Item	Peak Power Spectral Density, Peak Excursion, Emission Bandwidth
Test Condition	Conducted measurement at transmit chains
Modulation Mode	11a, VHT20, VHT40, VHT80
Operating Mode	Operating Mode Description
1	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	<input type="checkbox"/> EUT will be placed in fixed position.		
	<input checked="" type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed three orthogonal planes. The worst planes is Z.		
	<input type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed two or three orthogonal planes.		
Operating Mode	<input checked="" type="checkbox"/> 1. Radio link (WLAN)		
Modulation Mode	11a, VHT20, VHT40, VHT80		
Orthogonal Planes of EUT	X Plane	Y Plane	Z Plane
			

2.4 Test Setup Diagram



3 Transmitter Test Result

3.1 AC Power-line Conducted Emissions

3.1.1 AC Power-line Conducted Emissions Limit

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

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

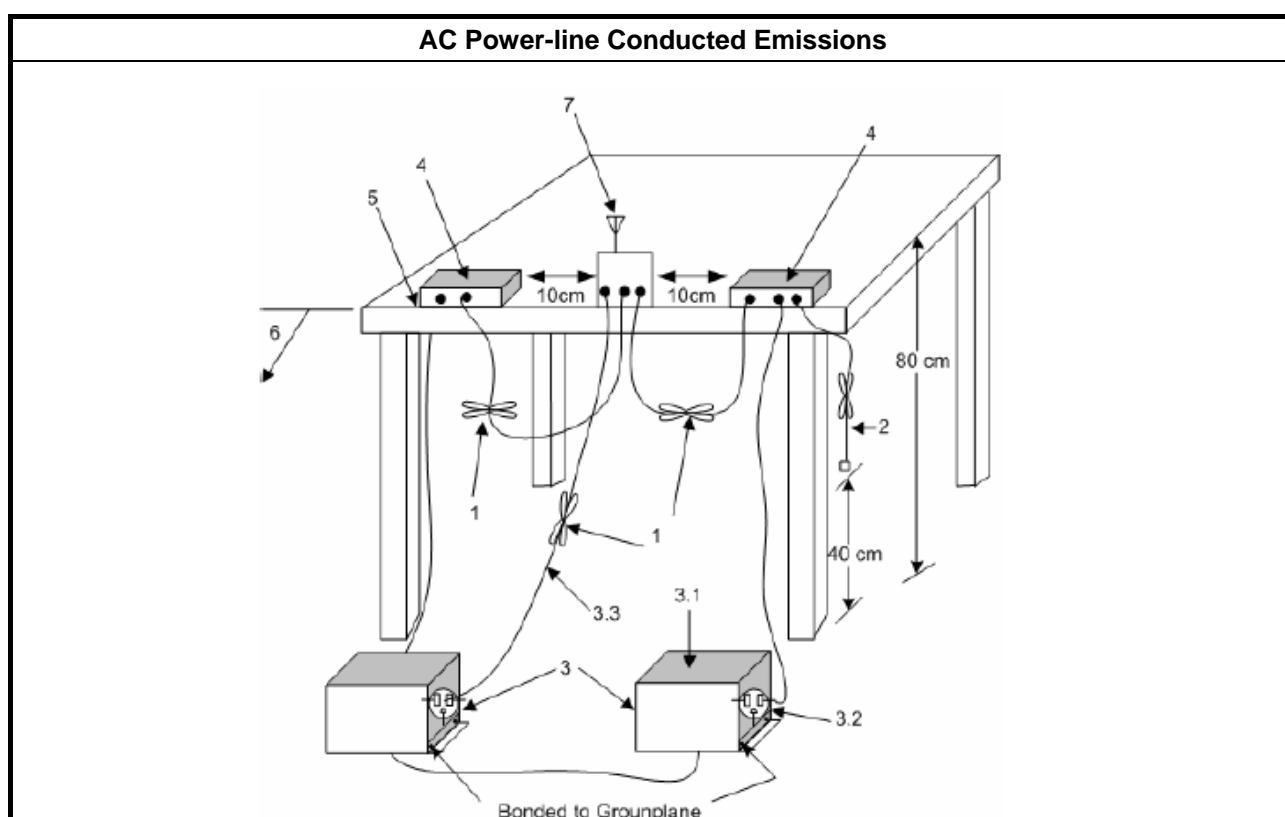
3.1.2 Measuring Instruments

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

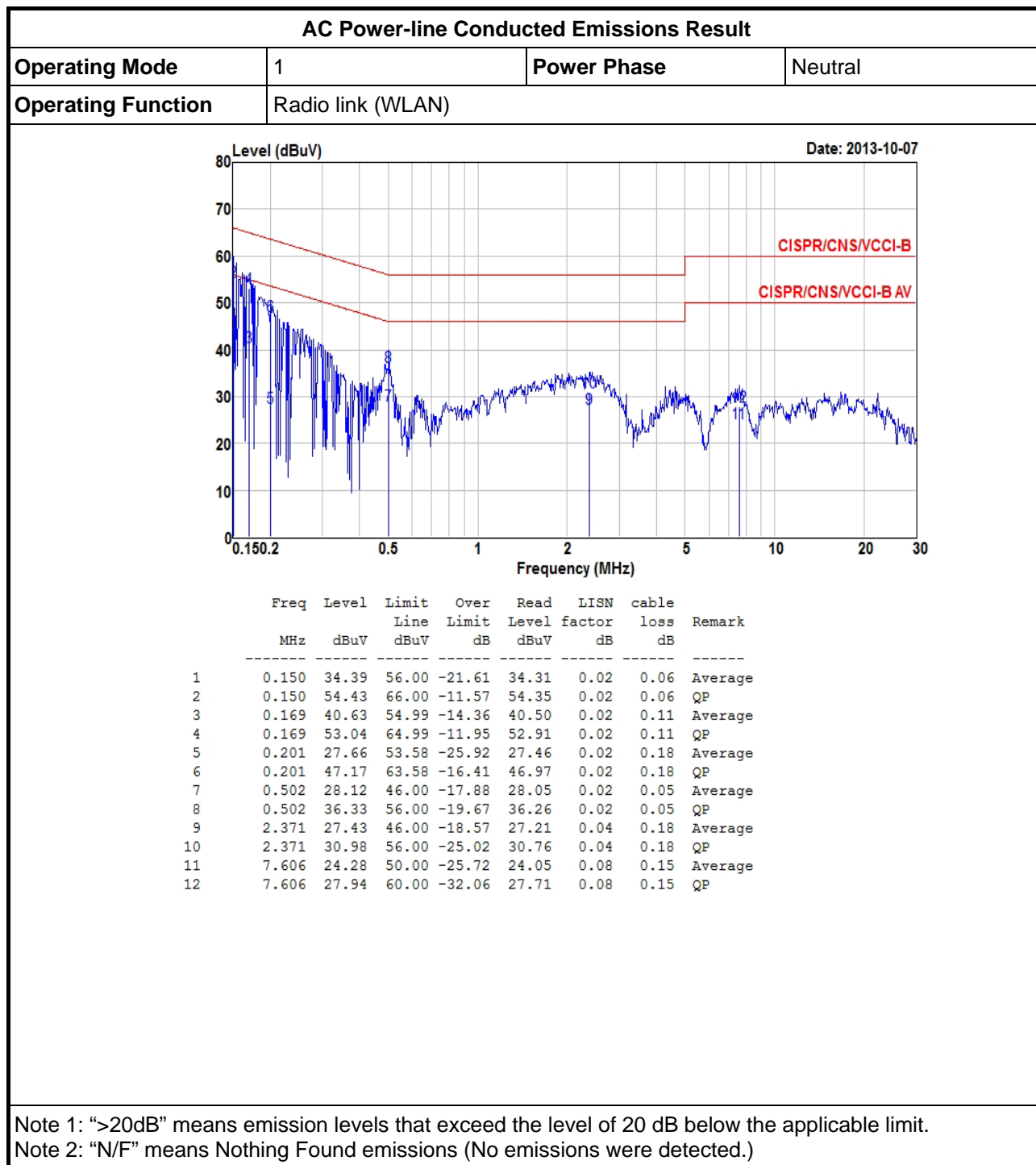
3.1.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

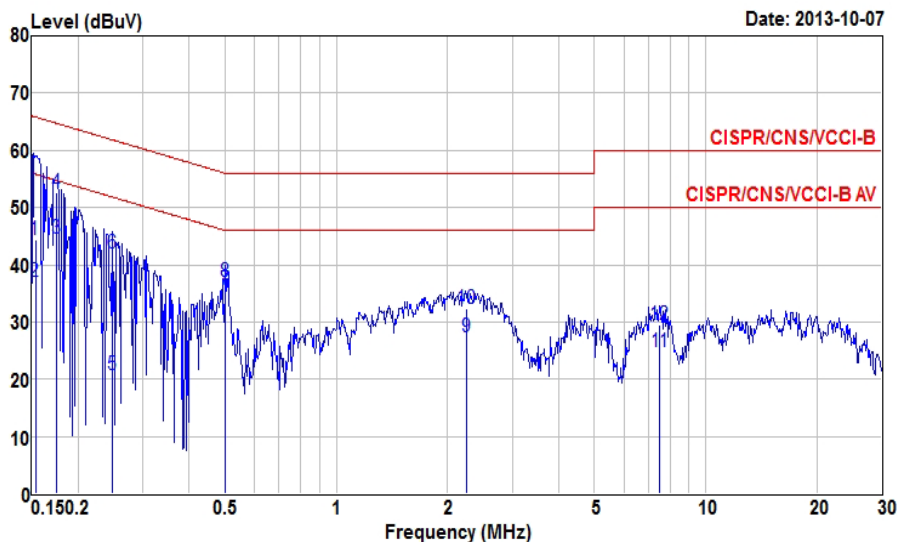


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

Operating Mode	1	Power Phase	Line
Operating Function	Radio link (WLAN)		



	Freq	Level	Limit	Over	Read	LISN	cable	
	MHz	dBuV	Line	Limit	Level	factor	loss	Remark
			dBuV	dB	dBuV	dB	dB	
1	0.153	44.34	55.82	-11.48	44.24	0.03	0.07	Average
2	0.153	36.98	65.82	-28.84	36.88	0.03	0.07	QP
3	0.175	44.51	54.72	-10.21	44.35	0.03	0.13	Average
4	0.175	52.55	64.72	-12.17	52.39	0.03	0.13	QP
5	0.247	20.86	51.86	-31.00	20.69	0.03	0.14	Average
6	0.247	42.13	61.86	-19.73	41.96	0.03	0.14	QP
7	0.502	35.65	46.00	-10.35	35.57	0.03	0.05	Average
8	0.502	37.12	56.00	-18.88	37.04	0.03	0.05	QP
9	2.249	27.31	46.00	-18.69	27.09	0.05	0.17	Average
10	2.249	32.27	56.00	-23.73	32.05	0.05	0.17	QP
11	7.526	24.71	50.00	-25.29	24.47	0.09	0.15	Average
12	7.526	29.62	60.00	-30.38	29.38	0.09	0.15	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 Emission Bandwidth

3.2.1 Emission Bandwidth Limit

Emission Bandwidth Limit	
UNII Devices	
<input type="checkbox"/>	For the 5.15-5.25 GHz band, N/A
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.47-5.725 GHz band, the maximum conducted output power shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
<input checked="" type="checkbox"/>	For the 5.725-5.85 GHz band, 6 dB emission bandwidth \geq 500kHz.

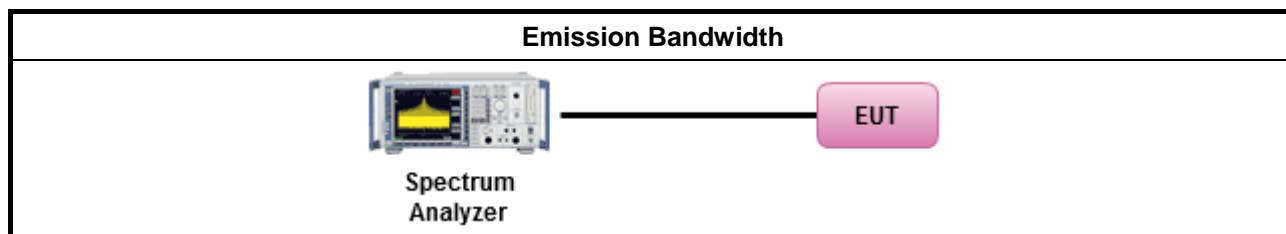
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause C for EBW and clause D for OBW measurement.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
<input type="checkbox"/>	Refer as IC RSS-Gen, clause 6.6 for bandwidth testing.
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input type="checkbox"/>	The EUT supports multiple transmit chains using options given below:
<input type="checkbox"/>	Option 1: Multiple transmit chains measurements need to be performed on one of the active transmit chains (antenna outputs). All measurement had be performed on transmit chains 1.
<input type="checkbox"/>	Option 2: Multiple transmit chains measurements need to be performed on each transmit chains individually (antenna outputs). All measurement had be performed on all transmit chains.

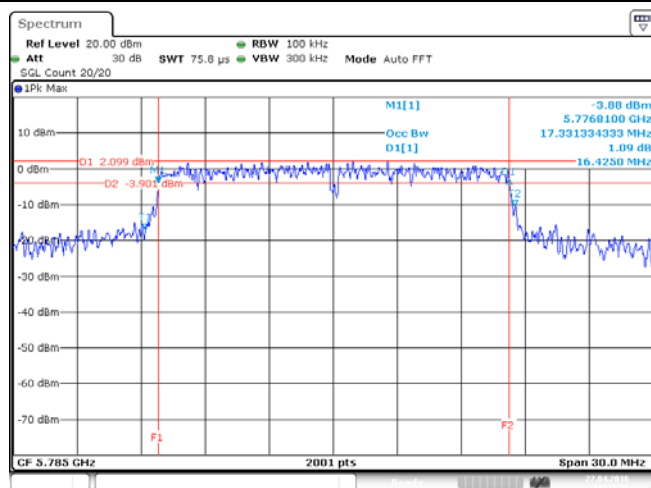
3.2.4 Test Setup



3.2.5 Test Result of Emission Bandwidth

UNII Emission Bandwidth Result (5725-5850MHz band)				
Condition			Emission Bandwidth (MHz)	
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth	6dB Bandwidth
11a	1	5745	16.35	16.44
11a	1	5785	17.33	16.42
11a	1	5825	17.66	16.48
VHT20	1	5745	17.58	17.59
VHT20	1	5785	17.61	17.58
VHT20	1	5825	17.58	17.61
VHT40	1	5755	36.14	36.40
VHT40	1	5795	36.26	36.36
VHT80	1	5775	75.40	76.32
Limit			-	≥ 500 kHz
Result			Complied	

5725-5850MHz - Worst Emission 6Bandwidth Plots



3.3 RF Output Power

3.3.1 RF Output Power Limit

Maximum Conducted Output Power Limit	
UNII Devices	
<input type="checkbox"/> For the 5.15-5.25 GHz band:	
<input type="checkbox"/>	Outdoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$. e.i.r.p. at any elevation angle above 30 degrees ≤ 125 mW [21dBm]
<input type="checkbox"/>	Indoor AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$
<input type="checkbox"/>	Point-to-point AP: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 23$ dBi, then $P_{Out} = 30 - (G_{TX} - 23)$.
<input type="checkbox"/>	Mobile or Portable Client: the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.
<input type="checkbox"/> For the 5.25-5.35 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.	
<input type="checkbox"/> For the 5.47-5.725 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 24 - (G_{TX} - 6)$.	
<input checked="" type="checkbox"/> For the 5.725-5.85 GHz band:	
<input checked="" type="checkbox"/>	Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W. If $G_{TX} > 6$ dBi, then $P_{Out} = 30 - (G_{TX} - 6)$.
<input type="checkbox"/>	Point-to-point systems (P2P): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W.
P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.	

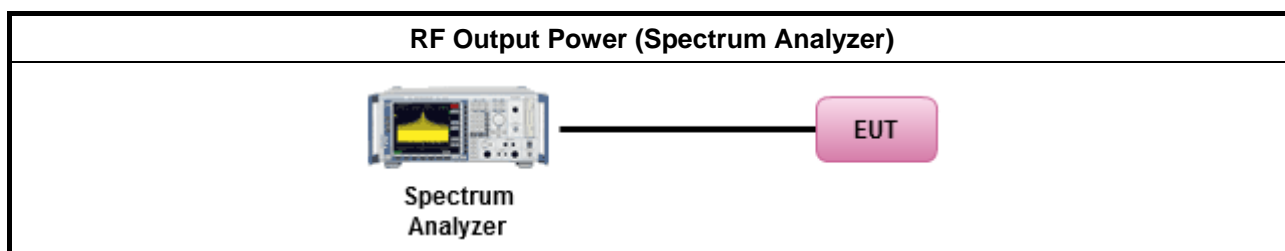
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

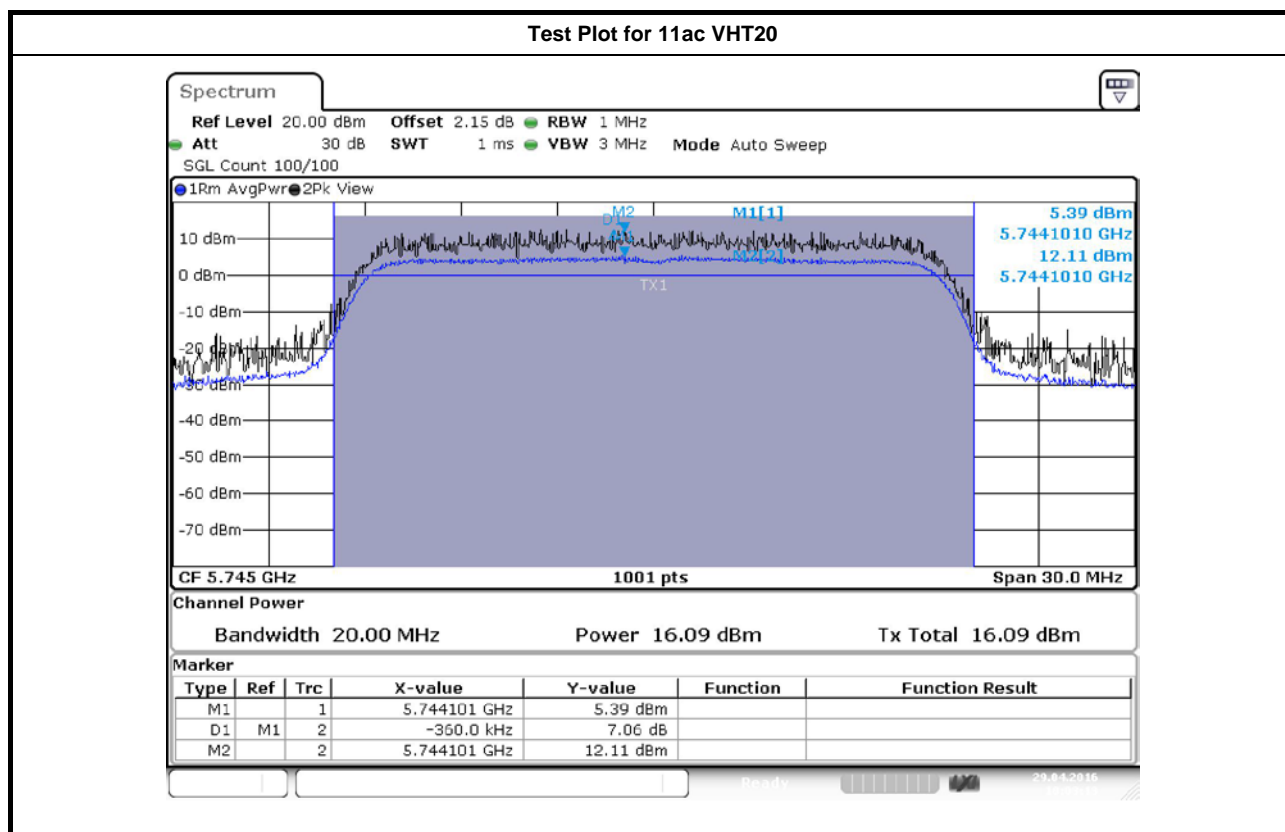
Test Method	
<input checked="" type="checkbox"/>	Maximum Conducted Output Power
	[duty cycle $\geq 98\%$ or external video / power trigger]
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause E Method SA-1 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)
	duty cycle $< 98\%$ and average over on/off periods with duty factor
<input type="checkbox"/>	Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, 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
<input type="checkbox"/>	Refer as FCC KDB 789033, clause E Method PM (using an RF average power meter).
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input type="checkbox"/>	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.
<input type="checkbox"/>	If multiple transmit chains, EIRP calculation could be following as methods: $P_{\text{total}} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $\text{EIRP}_{\text{total}} = P_{\text{total}} + \text{DG}$

3.3.4 Test Setup



3.3.5 Test Result of Maximum Conducted Output Power

Maximum Conducted Output Power (5725-5850MHz band)					
Modulation Mode	N _{TX}	Freq. (MHz)	Output Power (dBm)	Antenna Gain (dBi)	Power Limit
11a	1	5745	16.05	5.82	30.00
11a	1	5785	15.97	5.82	30.00
11a	1	5825	16.06	5.82	30.00
HT20	1	5745	15.97	5.82	30.00
HT20	1	5785	15.89	5.82	30.00
HT20	1	5825	15.93	5.82	30.00
HT40	1	5755	15.89	5.82	30.00
HT40	1	5795	16.04	5.82	30.00
VHT20	1	5745	16.09	5.82	30.00
VHT20	1	5785	16.08	5.82	30.00
VHT20	1	5825	15.94	5.82	30.00
VHT40	1	5755	15.99	5.82	30.00
VHT40	1	5795	15.94	5.82	30.00
VHT80	1	5775	14.35	5.82	30.00
Result			Complied		



3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit	
UNII Devices	
<input type="checkbox"/> For the 5.15-5.25 GHz band:	
<input type="checkbox"/>	Outdoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 17 - (G_{TX} - 6)$.
<input type="checkbox"/>	Indoor AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 6$ dBi, then $P_{Out} = 17 - (G_{TX} - 6)$.
<input type="checkbox"/>	Point-to-point AP: the peak power spectral density (PPSD) shall not exceed the lesser of 17dBm/MHz. If $G_{TX} > 23$ dBi, then $P_{Out} = 17 - (G_{TX} - 23)$.
<input type="checkbox"/>	Mobile or Portable Client: the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.
<input type="checkbox"/> For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.	
<input type="checkbox"/> For the 5.47-5.725 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 11 - (G_{TX} - 6)$.	
<input checked="" type="checkbox"/> For the 5.725-5.85 GHz band:	
<input checked="" type="checkbox"/>	Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz. If $G_{TX} > 6$ dBi, then $PPSD = 30 - (G_{TX} - 6)$.
<input type="checkbox"/>	Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 30 dBm/500kHz.
PPSD = peak power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz G_{TX} = the maximum transmitting antenna directional gain in dBi.	

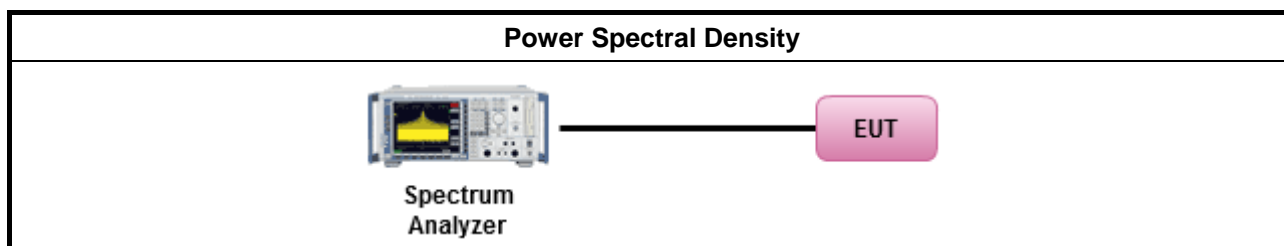
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

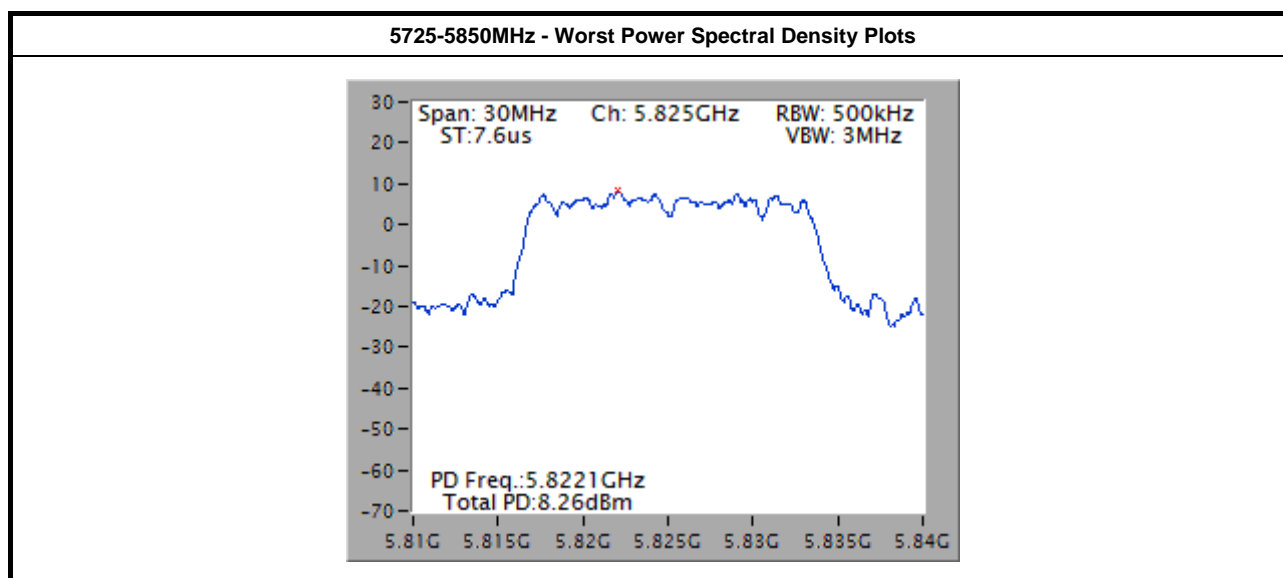
Test Method	
<input checked="" type="checkbox"/>	Peak power spectral density procedures that the same method as used to determine the conducted output power shall be used to determine the peak power spectral density and use the peak search function on the spectrum analyzer to find the peak of the spectrum. For the peak power spectral density shall be measured using below options:
<input type="checkbox"/>	Refer as FCC KDB 789033, F)5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth
	[duty cycle ≥ 98% or external video / power trigger]
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause E Method SA-1 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)
	duty cycle < 98% and average over on/off periods with duty factor
<input type="checkbox"/>	Refer as FCC KDB 789033, clause E Method SA-2 (spectral trace averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	The EUT supports single transmit chain and measurements performed on this transmit chain.
<input type="checkbox"/>	The EUT supports diversity transmitting and the results on transmit chain port 1 is the worst case.
<input type="checkbox"/>	The EUT supports multiple transmit chains using options given below:
<input type="checkbox"/>	Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power measurements. Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.
<input type="checkbox"/>	Option 2: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.
<input type="checkbox"/>	If multiple transmit chains, EIRP PPSD calculation could be following as methods: $PPSD_{total} = PPSD_1 + PPSD_2 + \dots + PPSD_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = PPSD_{total} + DG$
<input type="checkbox"/>	Each individually PPSD plots refer as test report clause 3.3.5 with each individually PPSD plots.

3.4.4 Test Setup



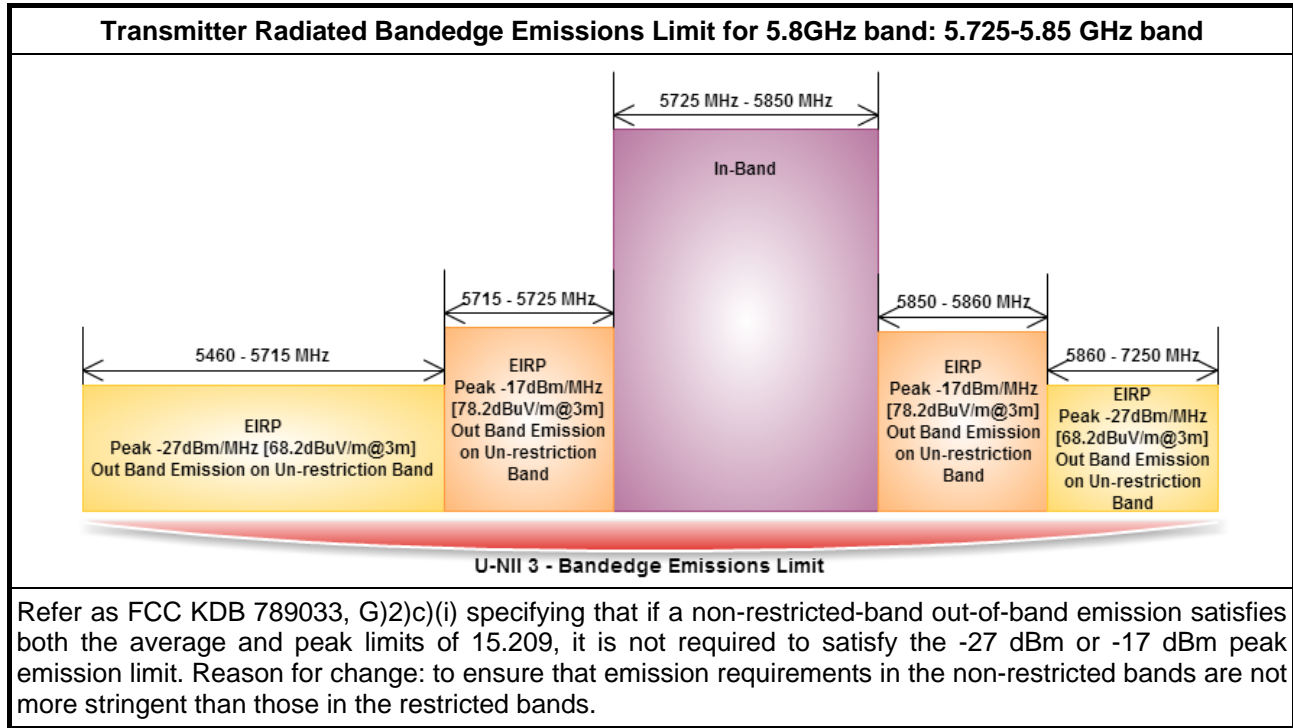
3.4.5 Test Result of Peak Power Spectral Density

Peak Power Spectral Density Result (5725-5850MHz band)					
Modulation Mode	N _{TX}	Freq. (MHz)	Peak Power Spectral Density (dBm/500kHz)	PSD Limit (dBm/500kHz)	Antenna Gain (dBi)
11a	1	5745	6.87	30.00	5.82
11a	1	5785	7.26	30.00	5.82
11a	1	5825	8.26	30.00	5.82
VHT20	1	5745	7.83	30.00	5.82
VHT20	1	5785	7.84	30.00	5.82
VHT20	1	5825	7.23	30.00	5.82
VHT40	1	5755	4.87	30.00	5.82
VHT40	1	5795	5.06	30.00	5.82
VHT80	1	5775	0.77	30.00	5.82
Result			Complied		



3.5 Transmitter Bandedge Emissions

3.5.1 Transmitter Radiated Bandedge Emissions Limit



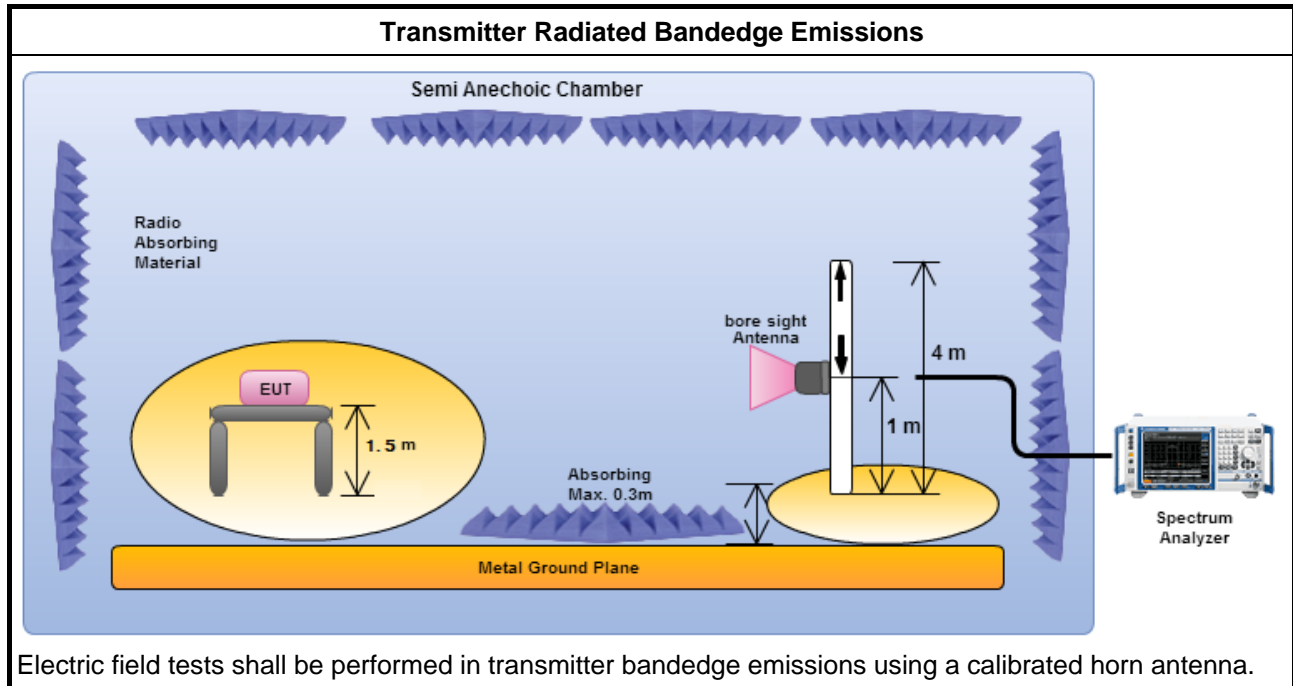
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.10 bandedge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.
<input type="checkbox"/>	If EUT operate in adjacent contiguous bands, bandedge testing performed at the lowest frequency channel at lower-band and highest frequency channel at higher-band. Transmitter in-band emissions will consist of adjacent contiguous bands (e.g., IEEE 802.11ac VHT160 The lowest frequency channel at lower-band and highest frequency channel at higher-band in-band emissions will consist of two adjacent contiguous bands.)
<input type="checkbox"/>	<input type="checkbox"/> Operating in 5.15-5.25 GHz band (lower-band) and 5.25-5.35 GHz band (higher-band). <input type="checkbox"/> Operating in 5.47-5.725 GHz band (lower-band) and 5.725-5.85 GHz band (higher-band).
<input type="checkbox"/>	If EUT operate in individual non-contiguous bands, bandedge testing performed at the lowest frequency channel and highest frequency channel within lower-band and higher-band. (e.g., (e.g., IEEE 802.11ac VHT160)
<input type="checkbox"/>	<input type="checkbox"/> Operating in 5.25-5.35 GHz band (lower-band) and 5.47-5.725 GHz band (higher-band). <input type="checkbox"/> Operating in 5.15-5.25 GHz band (lower-band) and 5.725-5.85 GHz band (higher-band).
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.
<input type="checkbox"/>	<input type="checkbox"/> Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
<input type="checkbox"/>	<input type="checkbox"/> Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.3 (Reduced VBW). VBW \geq 1/T, where T is pulse time.
<input type="checkbox"/>	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
<input type="checkbox"/>	<input type="checkbox"/> Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For the transmitter bandedge emissions shall be measured using following options below:
<input type="checkbox"/>	<input type="checkbox"/> Refer as FCC KDB 789033, clause H)3)d) for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Refer as ANSI C63.10, clause 6.10 for band-edge testing.
<input type="checkbox"/>	<input type="checkbox"/> Refer as ANSI C63.10, clause 6.10.6.2 for marker-delta method for band-edge measurements.
<input checked="" type="checkbox"/>	For radiated measurement, refer as ANSI C63.10, clause 6.6. Test distance is 3m.
<input checked="" type="checkbox"/>	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements). Measurements in the bandedge are typically made at a closer distance 3m, because the instrumentation noise floor is typically close to the radiated emission limit.

3.5.4 Test Setup



3.5.5 Transmitter Radiated Bandedge Emissions (with Antenna)

U-NII 5725-5850MHz Transmitter Radiated Bandedge (with Antenna)										
Modulation Mode	N _{TX}	Freq. (MHz)	Measure Distance (m)	Freq. (MHz) PK	Level (dBuV/m) PK	Limit (dBuV/m) PK	Freq. (MHz) PK	Level (dBuV/m) PK	Limit (dBuV/m) PK	Pol.
11a	1	5745	3	5714.26	66.59	68.2	5722.45	74.58	78.2	V
11a	1	5825	3	5882.83	63.71	68.2	5855.11	63.08	78.2	V
VHT20	1	5745	3	5710.69	65.70	68.2	5723.92	74.55	78.2	V
VHT20	1	5825	3	5865.40	63.85	68.2	5858.05	63.83	78.2	V
VHT40	1	5755	3	5711.62	66.36	68.2	5721.50	69.86	78.2	V
VHT40	1	5795	3	5863.30	64.04	68.2	5852.50	65.61	78.2	V
VHT80	1	5775	3	5708.32	66.19	68.2	5722.36	67.43	78.2	V

Note 1: Measurement worst emissions of receive antenna polarization.

3.6 Transmitter Unwanted Emissions

3.6.1 Transmitter Radiated Unwanted Emissions Limit

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

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

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

Un-restricted band emissions above 1GHz Limit	
Operating Band	Limit
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.25 - 5.35 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.47 - 5.725 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.725 - 5.85 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).

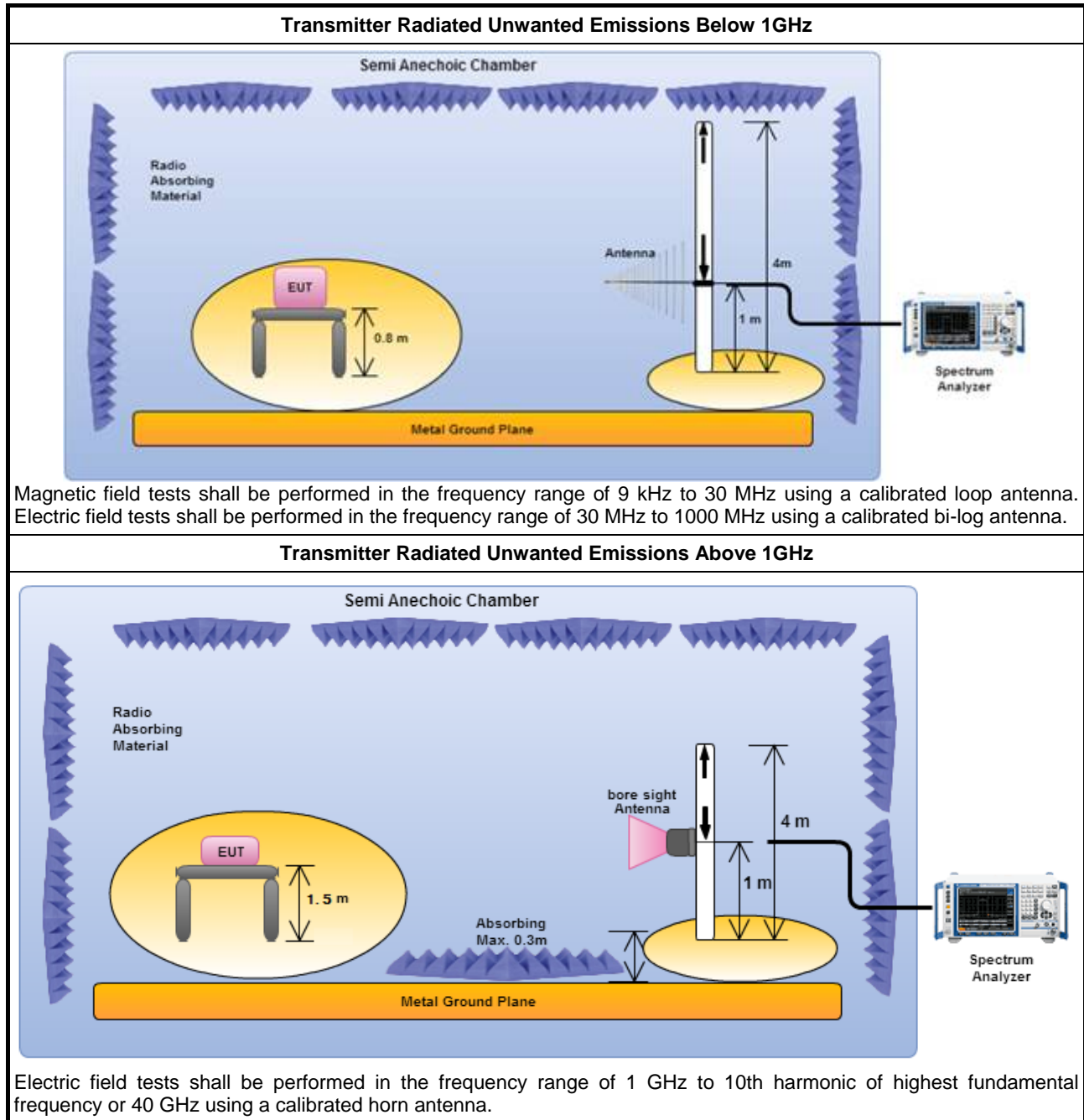
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).
<input checked="" type="checkbox"/>	The average emission levels shall be measured in [duty cycle \geq 98 or duty factor].
<input checked="" type="checkbox"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)2) for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)1) for unwanted emissions into restricted bands.
<input type="checkbox"/>	Refer as FCC KDB 789033, G)6) Method AD (Trace Averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033, G)6) Method VB (Reduced VBW).
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.3 (Reduced VBW). VBW \geq 1/T, where T is pulse time.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.4 average value of pulsed emissions.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033, clause G)5) measurement procedure peak limit.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.1.4.2.2 measurement procedure peak limit.
<input checked="" type="checkbox"/>	For radiated measurement.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.4 for radiated emissions below 30 MHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions 30 MHz to 1 GHz and test distance is 3m.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.6 for radiated emissions above 1GHz. For 1 GHz to 5 GHz, test distance is 3m; For 5 GHz to 40 GHz, test distance is 3m.
<input checked="" type="checkbox"/>	The any unwanted emissions level shall not exceed the fundamental emission level.
<input checked="" type="checkbox"/>	All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

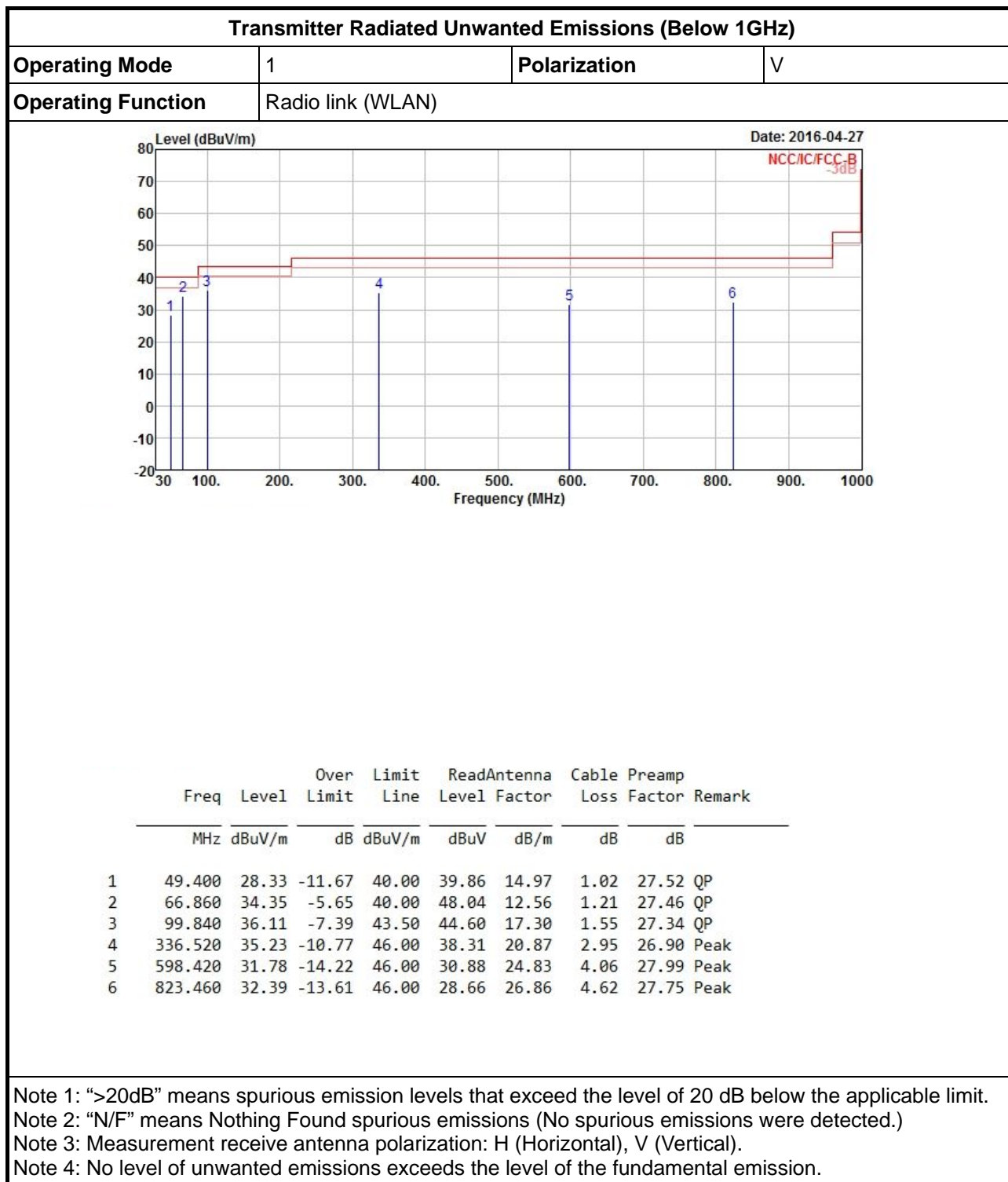
3.6.4 Test Setup



3.6.5 Transmitter Radiated Unwanted Emissions-with Antenna (Below 30MHz)

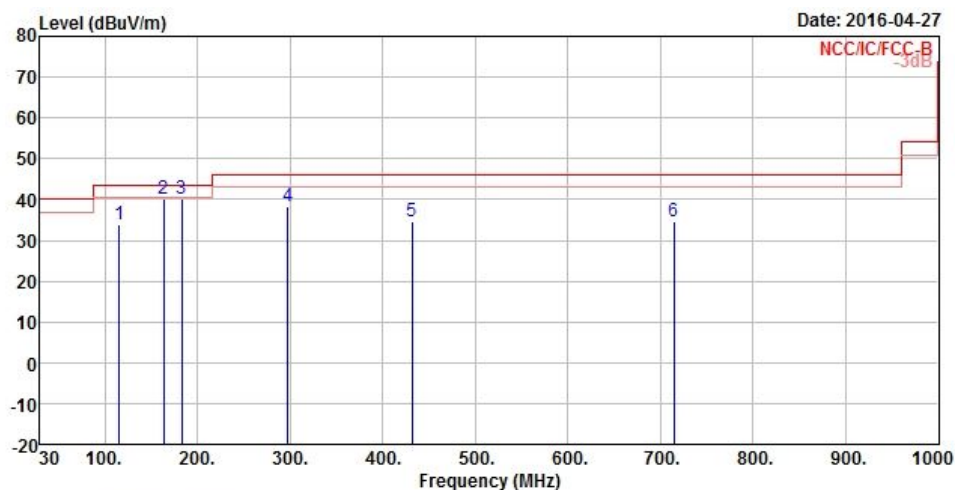
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)



Transmitter Radiated Unwanted Emissions (Below 1GHz)

Operating Mode	1	Polarization	H
Operating Function	Radio link (WLAN)		



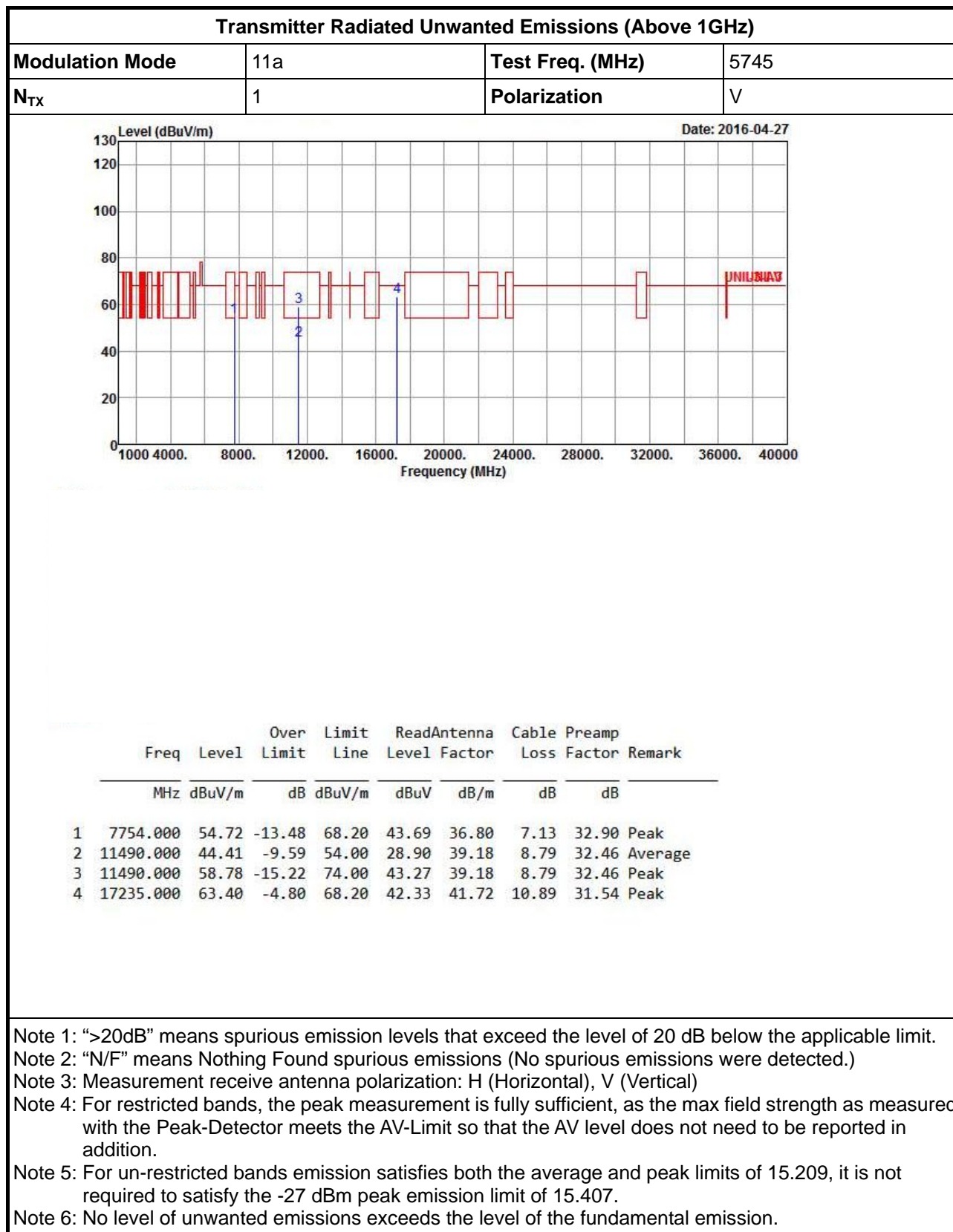
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp	Loss Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	115.360	34.00	-9.50	43.50	40.97	18.65	1.66	27.28 QP
2	163.860	40.15	-3.35	43.50	49.00	16.24	2.01	27.10 Peak
3	183.260	39.96	-3.54	43.50	49.25	15.57	2.16	27.02 Peak
4	297.720	38.42	-7.58	46.00	42.76	19.73	2.60	26.67 Peak
5	431.580	34.60	-11.40	46.00	36.05	22.71	3.33	27.49 Peak
6	714.820	34.66	-11.34	46.00	32.42	25.70	4.44	27.90 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.)

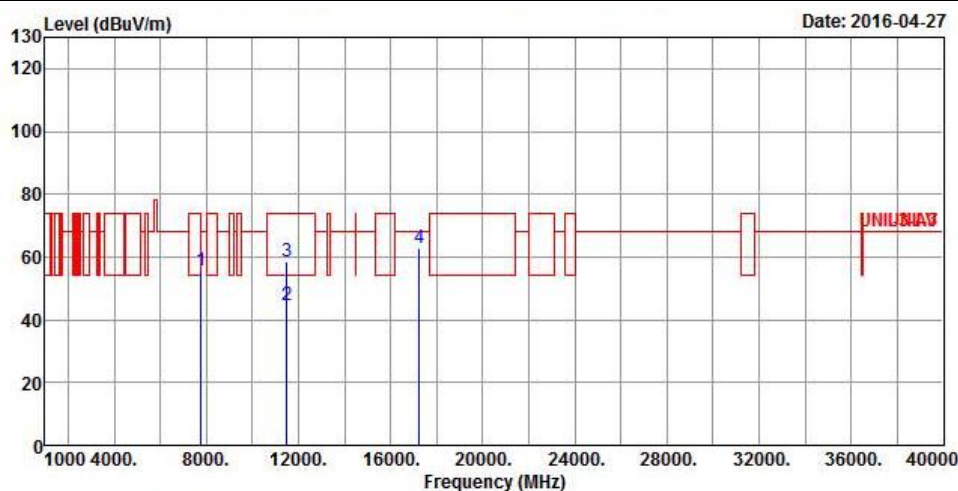
Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical).

Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

3.6.7 Transmitter Radiated Unwanted Emissions (Above 1GHz) for 5725-5850MHz


Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5745
N_{TX}	1	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7763.000	55.43	-12.77	68.20	44.38	36.82	7.13	32.90 Peak
2	11490.000	44.42	-9.58	54.00	28.91	39.18	8.79	32.46 Average
3	11490.000	58.41	-15.59	74.00	42.90	39.18	8.79	32.46 Peak
4	17235.000	62.89	-5.31	68.20	41.82	41.72	10.89	31.54 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)

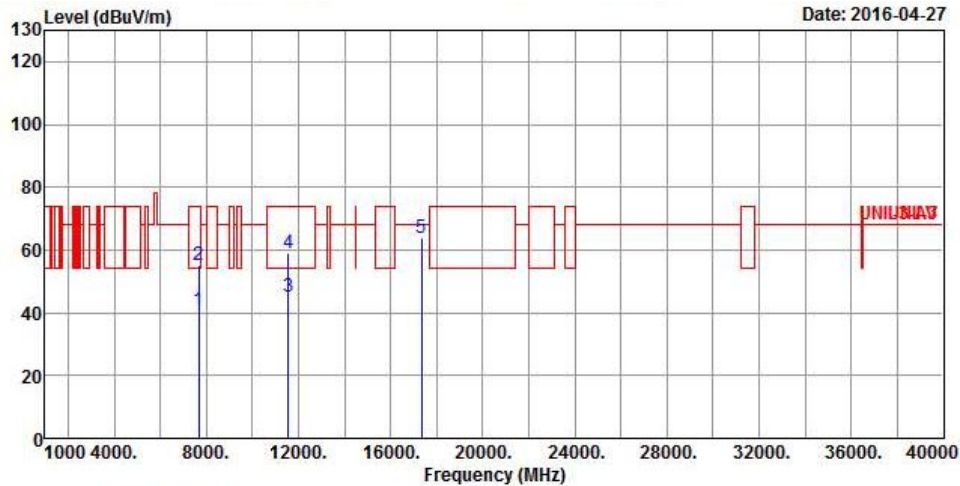
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5785
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7672.000	40.79	-13.21	54.00	29.84	36.70	7.14	32.89 Average
2	7672.000	55.06	-18.94	74.00	44.11	36.70	7.14	32.89 Peak
3	11570.000	44.86	-9.14	54.00	29.21	39.23	8.89	32.47 Average
4	11570.000	58.95	-15.05	74.00	43.30	39.23	8.89	32.47 Peak
5	17355.000	63.60	-4.60	68.20	41.60	42.63	10.94	31.57 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)

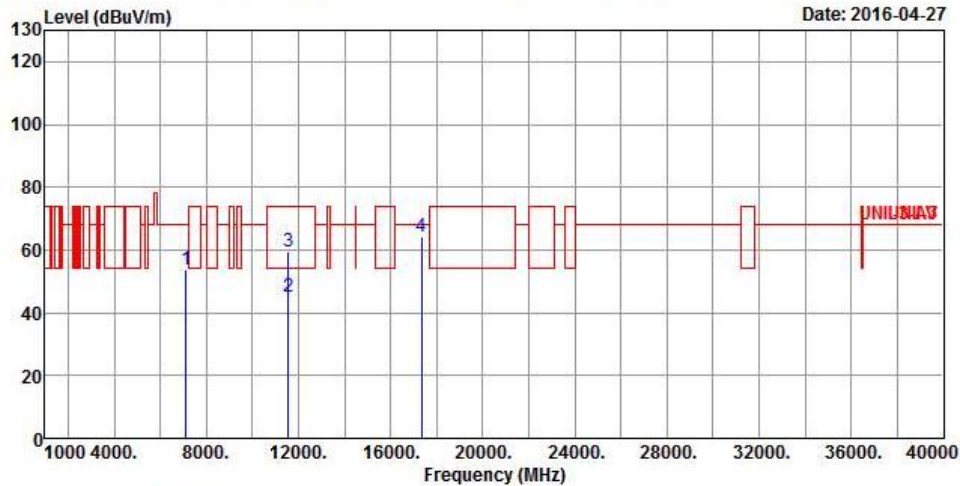
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5785
N_{TX}	1	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7113.000	53.53	-14.67	68.20	43.68	35.51	7.09	32.75 Peak
2	11570.000	45.05	-8.95	54.00	29.40	39.23	8.89	32.47 Average
3	11570.000	59.39	-14.61	74.00	43.74	39.23	8.89	32.47 Peak
4	17355.000	64.40	-3.80	68.20	42.40	42.63	10.94	31.57 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)

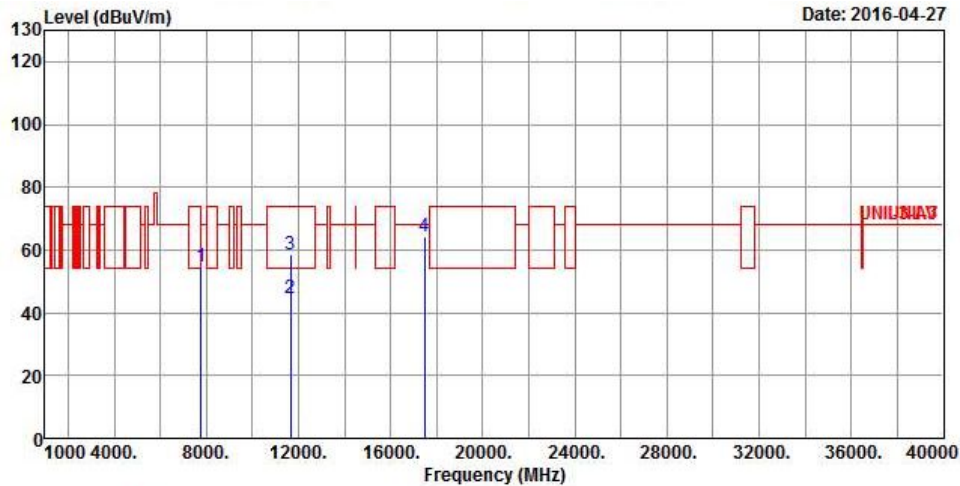
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5825
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit	ReadAntenna	Cable	Preamp	
	MHz	dBuV/m	dB	dBuV/m	Level	Loss	Factor	Remark
					dBuV	dB/m	dB	dB
1	7785.000	54.87	-13.33	68.20	43.80	36.84	7.13	32.90 Peak
2	11650.000	44.49	-9.51	54.00	28.70	39.26	9.01	32.48 Average
3	11650.000	58.59	-15.41	74.00	42.80	39.26	9.01	32.48 Peak
4	17475.000	64.26	-3.94	68.20	41.34	43.54	10.99	31.61 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)

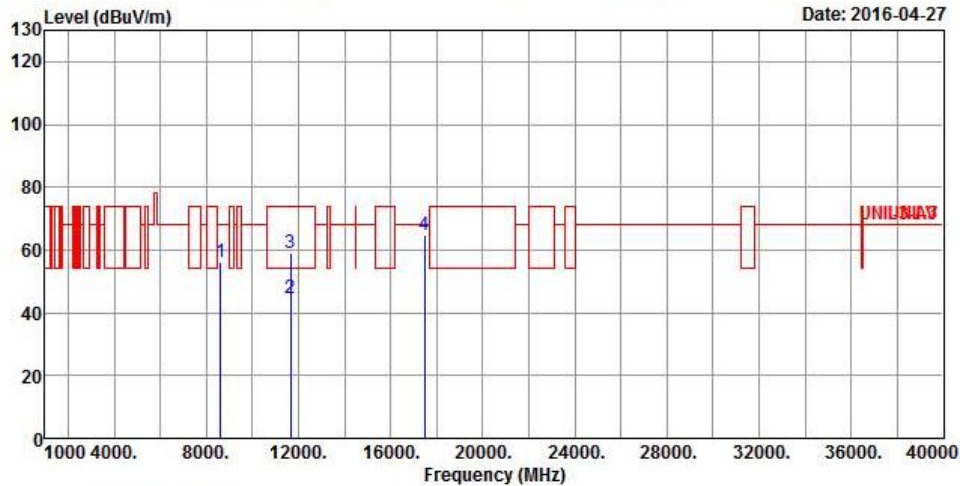
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5825
N_{TX}	1	Polarization	H



	Freq	Level	Over Limit	Limit	ReadAntenna	Cable	Preamp	
	MHz	dBuV/m	dB	dBuV/m	Level	Loss	Factor	Remark
					dBuV	dB/m	dB	dB
1	8624.000	56.28	-11.92	68.20	43.77	37.72	7.77	32.98 Peak
2	11650.000	44.55	-9.45	54.00	28.76	39.26	9.01	32.48 Average
3	11650.000	58.91	-15.09	74.00	43.12	39.26	9.01	32.48 Peak
4	17475.000	64.72	-3.48	68.20	41.80	43.54	10.99	31.61 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)

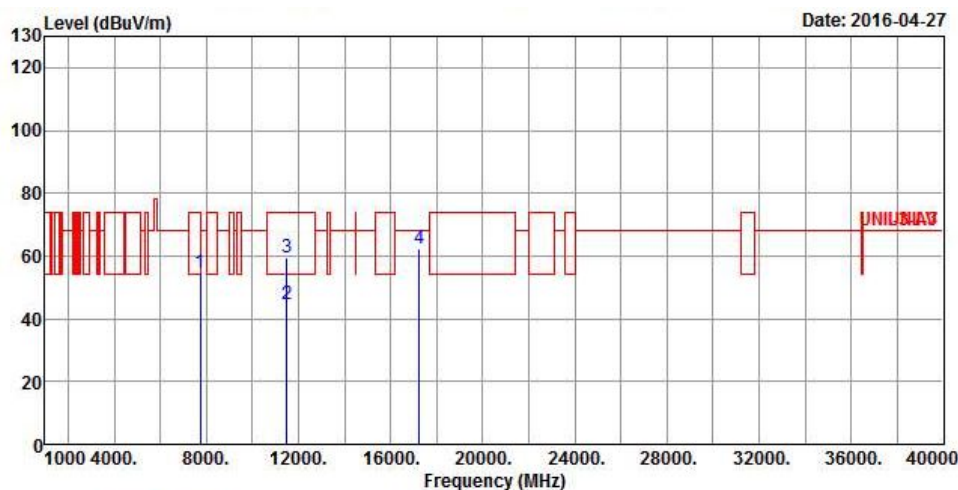
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5745
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7753.000	54.81	-13.39	68.20	43.78	36.80	7.13	32.90 Peak
2	11490.000	44.47	-9.53	54.00	28.96	39.18	8.79	32.46 Average
3	11490.000	59.29	-14.71	74.00	43.78	39.18	8.79	32.46 Peak
4	17235.000	62.49	-5.71	68.20	41.42	41.72	10.89	31.54 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)

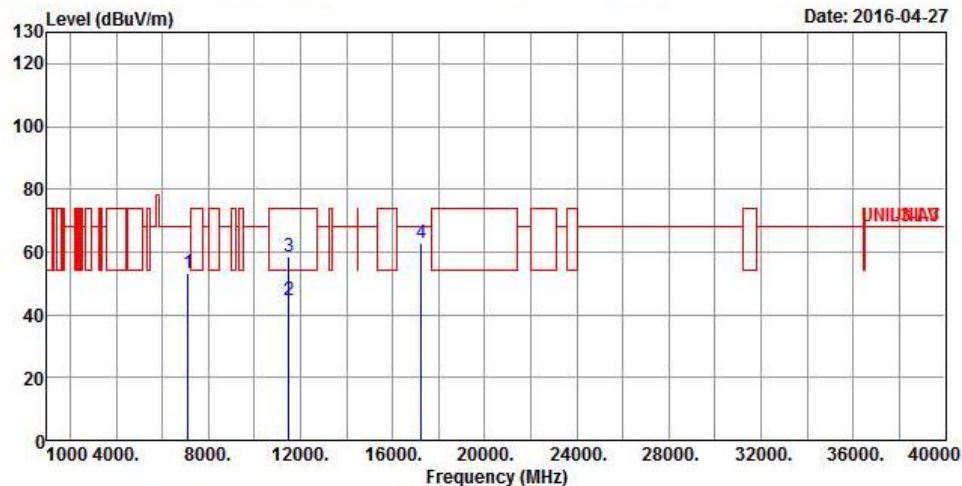
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5745
N_{TX}	1	Polarization	H

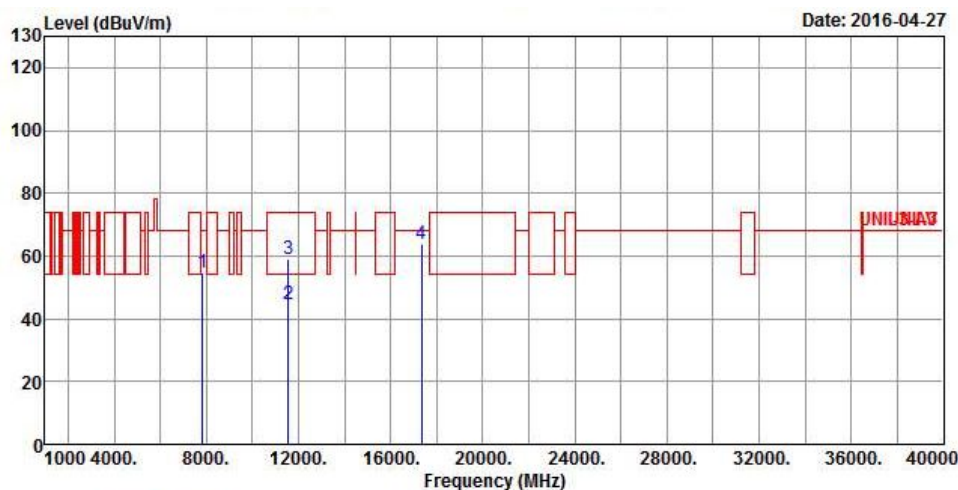


	Freq	Level	Over Limit	Limit	ReadAntenna	Cable	Preamp	
	MHz	dBuV/m	dB	dBuV/m	Level	Loss	Factor	Remark
					Factor			
					dB/m	dB	dB	
1	7121.000	53.27	-14.93	68.20	43.43	35.51	7.08	32.75 Peak
2	11490.000	44.39	-9.61	54.00	28.88	39.18	8.79	32.46 Average
3	11490.000	58.46	-15.54	74.00	42.95	39.18	8.79	32.46 Peak
4	17235.000	62.89	-5.31	68.20	41.82	41.72	10.89	31.54 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 emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.
 Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5785
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7832.000	54.68	-13.52	68.20	43.53	36.90	7.16	32.91 Peak
2	11570.000	44.69	-9.31	54.00	29.04	39.23	8.89	32.47 Average
3	11570.000	58.86	-15.14	74.00	43.21	39.23	8.89	32.47 Peak
4	17355.000	63.98	-4.22	68.20	41.98	42.63	10.94	31.57 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)

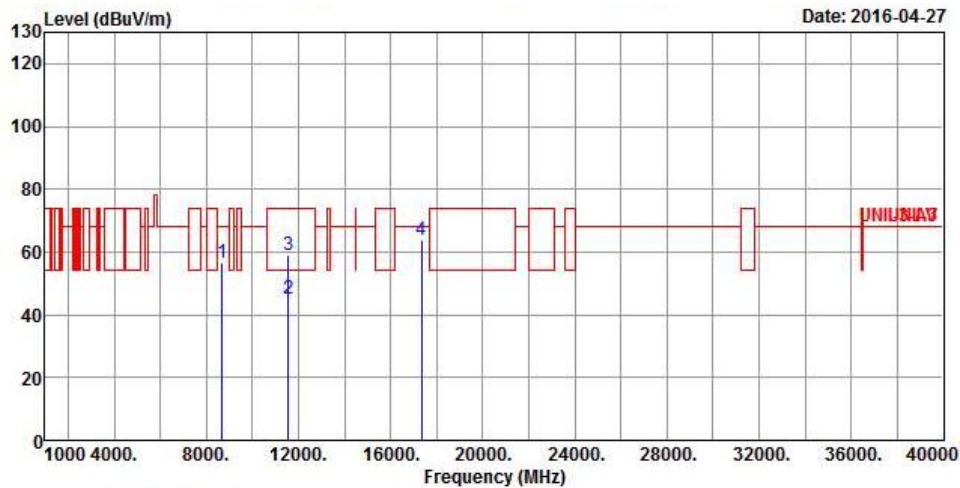
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5785
N_{TX}	1	Polarization	H

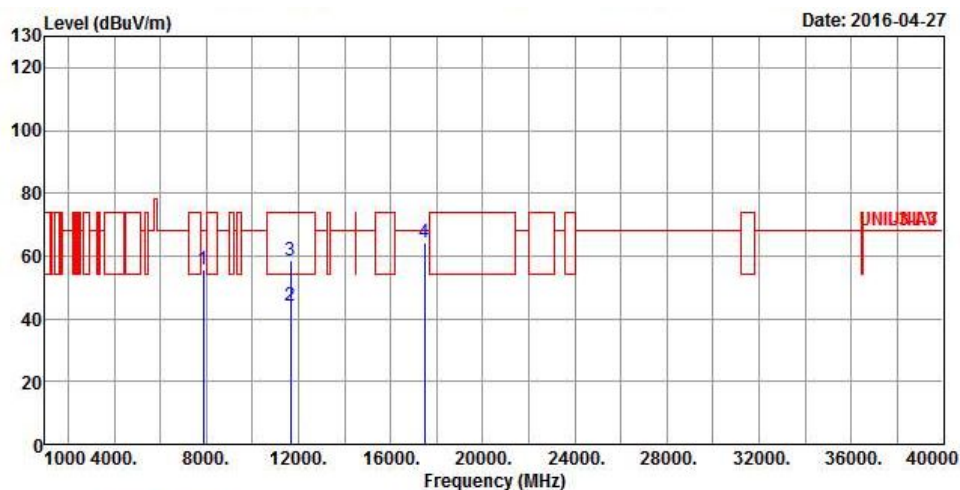


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	8682.000	56.52	-11.68	68.20	43.97	37.74	7.81	33.00 Peak
2	11570.000	44.97	-9.03	54.00	29.32	39.23	8.89	32.47 Average
3	11570.000	59.02	-14.98	74.00	43.37	39.23	8.89	32.47 Peak
4	17355.000	63.84	-4.36	68.20	41.84	42.63	10.94	31.57 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 emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.
 Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5825
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp	Loss Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7882.000	55.51	-12.69	68.20	44.25	36.96	7.22	32.92 Peak
2	11650.000	44.37	-9.63	54.00	28.58	39.26	9.01	32.48 Average
3	11650.000	58.62	-15.38	74.00	42.83	39.26	9.01	32.48 Peak
4	17475.000	64.28	-3.92	68.20	41.36	43.54	10.99	31.61 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)

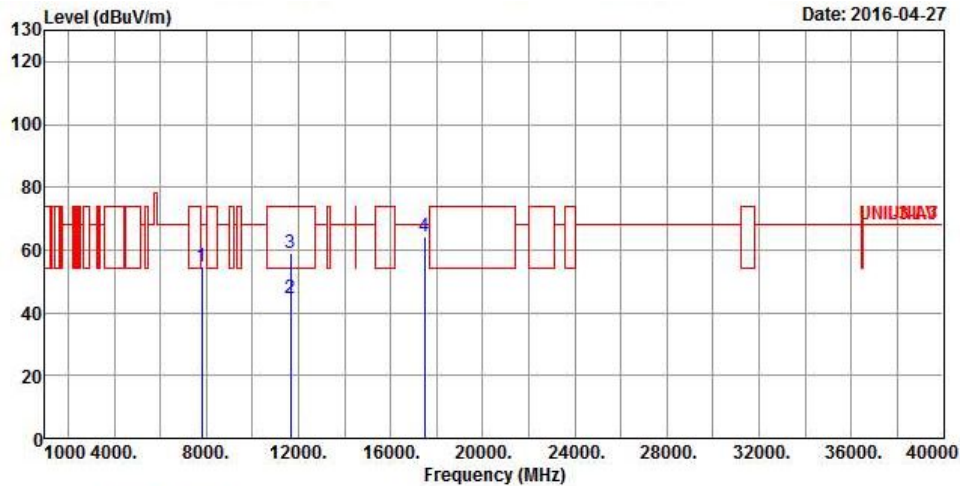
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5825
N_{TX}	1	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	7812.000	54.50	-13.70	68.20	43.39	36.88	7.14	32.91	Peak
2	11650.000	44.46	-9.54	54.00	28.67	39.26	9.01	32.48	Average
3	11650.000	58.83	-15.17	74.00	43.04	39.26	9.01	32.48	Peak
4	17475.000	64.50	-3.70	68.20	41.58	43.54	10.99	31.61	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)

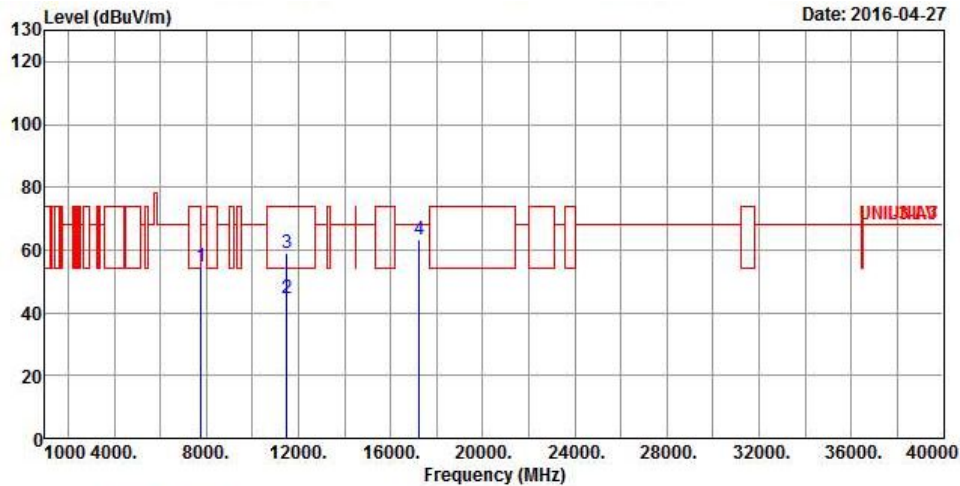
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT40	Test Freq. (MHz)	5755
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit	ReadAntenna	Cable	Preamp	
	MHz	dBuV/m	dB	dBuV/m	Level	Loss	Factor	Remark
					dBuV	dB/m	dB	dB
1	7784.000	54.82	-13.38	68.20	43.75	36.84	7.13	32.90 Peak
2	11510.000	44.60	-9.40	54.00	29.06	39.20	8.80	32.46 Average
3	11510.000	58.96	-15.04	74.00	43.42	39.20	8.80	32.46 Peak
4	17265.000	63.42	-4.78	68.20	42.09	41.98	10.90	31.55 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)

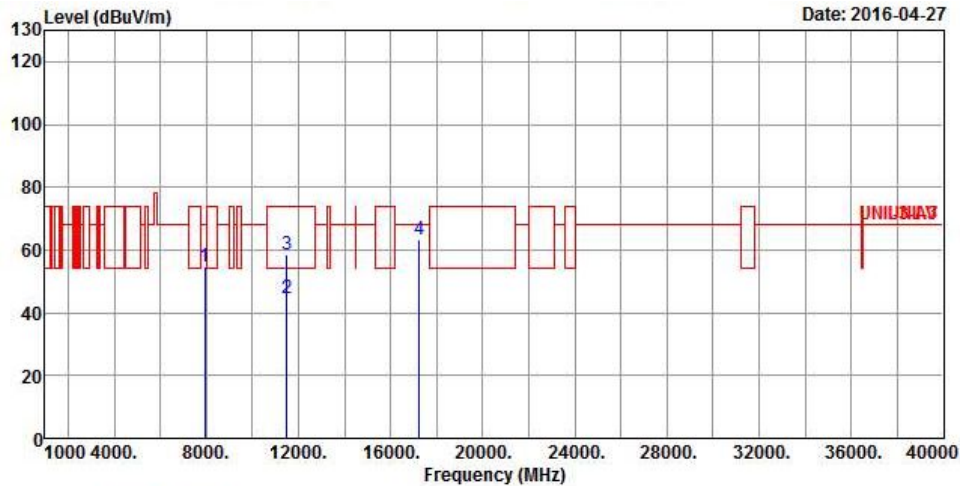
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT40	Test Freq. (MHz)	5755
N_{TX}	1	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7923.000	54.85	-13.35	68.20	43.51	37.00	7.26	32.92 Peak
2	11510.000	44.56	-9.44	54.00	29.02	39.20	8.80	32.46 Average
3	11510.000	58.60	-15.40	74.00	43.06	39.20	8.80	32.46 Peak
4	17265.000	63.46	-4.74	68.20	42.13	41.98	10.90	31.55 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)

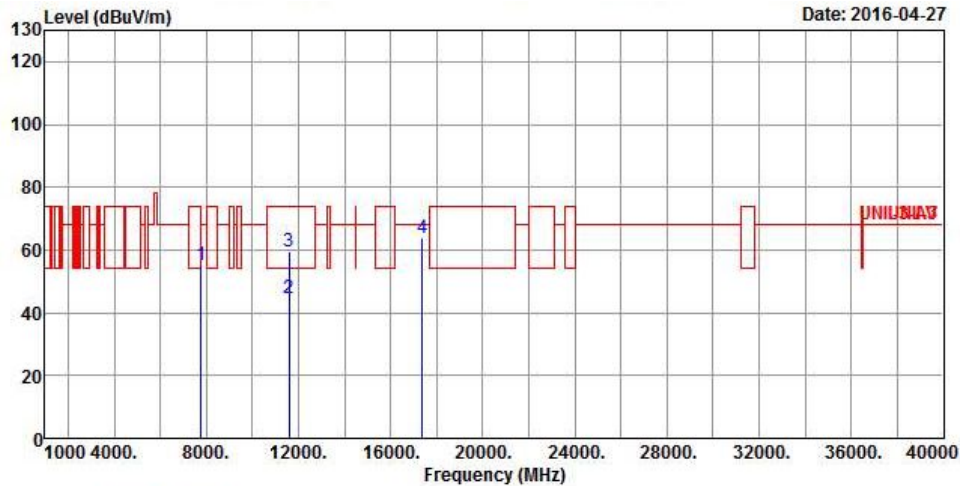
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT40	Test Freq. (MHz)	5795
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7772.000	55.04	-13.16	68.20	43.99	36.82	7.13	32.90 Peak
2	11590.000	44.68	-9.32	54.00	29.00	39.23	8.92	32.47 Average
3	11590.000	59.60	-14.40	74.00	43.92	39.23	8.92	32.47 Peak
4	17385.000	63.70	-4.50	68.20	41.45	42.89	10.95	31.59 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)

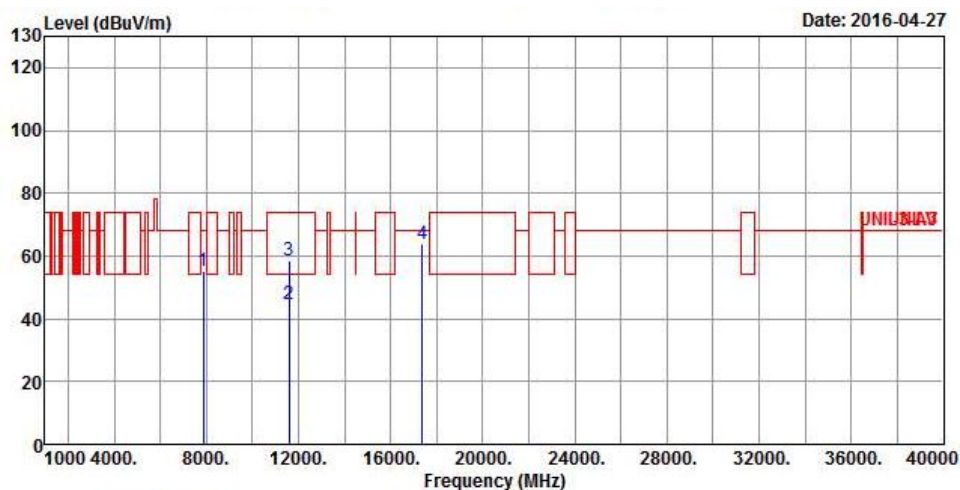
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT40	Test Freq. (MHz)	5795
N_{TX}	1	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7885.000	54.93	-13.27	68.20	43.67	36.96	7.22	32.92 Peak
2	11590.000	44.66	-9.34	54.00	28.98	39.23	8.92	32.47 Average
3	11590.000	58.74	-15.26	74.00	43.06	39.23	8.92	32.47 Peak
4	17385.000	63.78	-4.42	68.20	41.53	42.89	10.95	31.59 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)

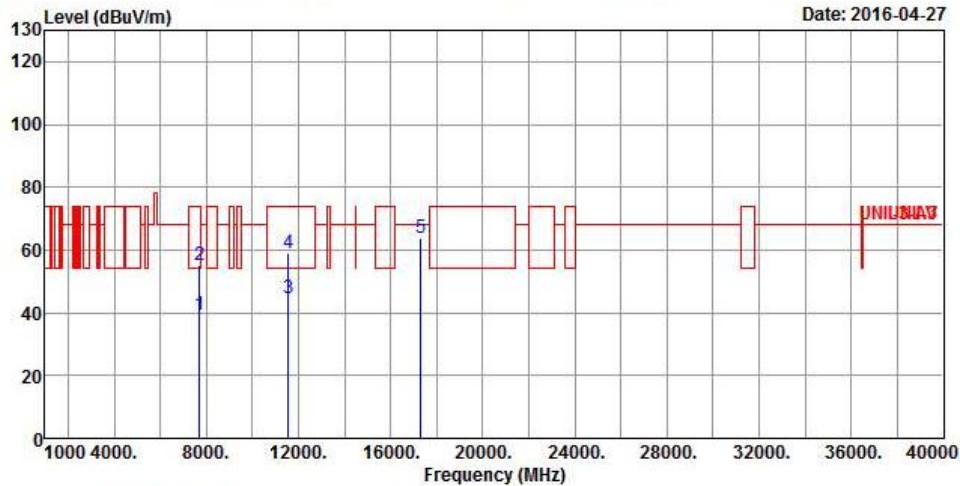
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT80	Test Freq. (MHz)	5775
N_{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp Loss	Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7716.000	39.43	-14.57	54.00	28.42	36.76	7.14	32.89 Average
2	7716.000	54.94	-19.06	74.00	43.93	36.76	7.14	32.89 Peak
3	11550.000	44.79	-9.21	54.00	29.18	39.22	8.86	32.47 Average
4	11550.000	58.92	-15.08	74.00	43.31	39.22	8.86	32.47 Peak
5	17325.000	63.74	-4.46	68.20	42.00	42.37	10.93	31.56 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)

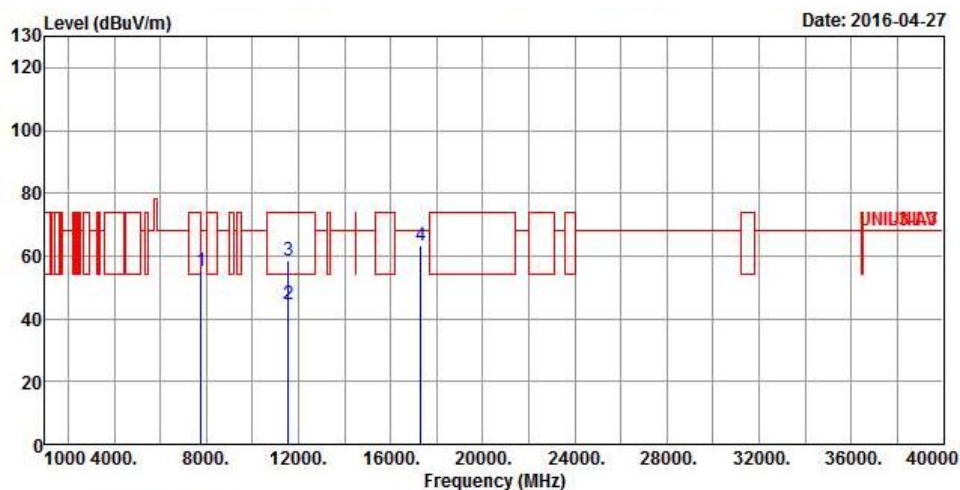
Note 4: For restricted bands, the peak measurement is fully sufficient, as the max field strength as measured with the Peak-Detector meets the AV-Limit so that the AV level does not need to be reported in addition.

Note 5: For un-restricted bands emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT80	Test Freq. (MHz)	5775
N_{TX}	1	Polarization	H



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp	Loss Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	7768.000	55.10	-13.10	68.20	44.05	36.82	7.13	32.90 Peak
2	11550.000	44.71	-9.29	54.00	29.10	39.22	8.86	32.47 Average
3	11550.000	58.73	-15.27	74.00	43.12	39.22	8.86	32.47 Peak
4	17325.000	63.36	-4.84	68.20	41.62	42.37	10.93	31.56 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 emission satisfies both the average and peak limits of 15.209, it is not required to satisfy the -27 dBm peak emission limit of 15.407.

Note 6: No level of unwanted emissions exceeds the level of the fundamental emission.

3.7 Frequency Stability

3.7.1 Frequency Stability Limit

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

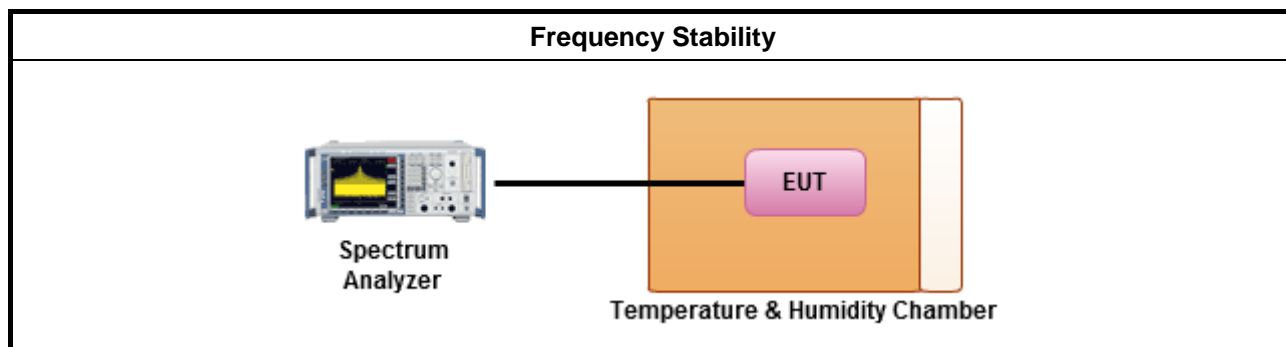
3.7.2 Measuring Instruments

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

3.7.3 Test Procedures

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

3.7.4 Test Setup



3.7.5 Test Result of Frequency Stability

Condition			Frequency (MHz)				Freq Error (ppm)			
Extreme	Modulation Mode	Test Freq	0 min	2 min	5 min	10 min	0 min	2 min	5 min	10 min
T ₂₀ °C Vmax	CW	5745	5744.97742	5744.97786	5744.97829	5744.97829	-3.9304	-3.8538	-3.7789	-3.7789
T ₂₀ °C Vmin	CW	5745	5744.97699	5744.97699	5744.97786	5744.97873	-4.0052	-4.0052	-3.8538	-3.7023
T ₄₀ °C Vnom	CW	5745	5745.08119	5745.08162	5745.08075	5745.08190	14.1323	14.2071	14.0557	14.2559
T ₃₀ °C Vnom	CW	5745	5745.00651	5745.00695	5745.00731	5745.00738	1.1332	1.2097	1.2724	1.2846
T ₂₀ °C Vnom	CW	5745	5744.97742	5744.97786	5744.97829	5744.97873	-3.9304	-3.8538	-3.7789	-3.7023
T ₁₀ °C Vnom	CW	5745	5744.97178	5744.97221	5744.97178	5744.97135	-4.9121	-4.8372	-4.9121	-4.9869
T ₀ °C Vnom	CW	5745	5744.97656	5744.97699	5744.97656	5744.97612	-4.0801	-4.0052	-4.0801	-4.1567
Limit (ppm)			-				20			
Result			Pass							

Note 1: Measure at 85 % [V_{min}] and 115 % [V_{max}] of the nominal voltage [V_{nom}].

Note 2: The nominal voltage refer test report clause 1.1.5 for EUT operational condition

4 Test Equipment and Calibration Data

< AC Conduction >

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
EMC Receiver	R&S	ESCS 30	100132	Nov. 14, 2012	Nov. 13, 2013
LISN	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-667	Dec. 04, 2012	Dec. 03, 2013
LISN (Support Unit)	SCHWARZBECK MESS-ELEKTRONIK	Schwarzbeck 8127	8127-666	Dec. 04, 2012	Dec. 03, 2013
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Dec. 25, 2012	Dec. 24, 2013
50 ohm terminal	NA	50	01	Apr. 22, 2013	Apr. 21, 2014
50 ohm terminal	NA	50	02	Apr. 22, 2013	Apr. 21, 2014
50 ohm terminal	NA	50	03	Apr. 22, 2013	Apr. 21, 2014
50 ohm terminal (Support Unit)	NA	50	04	Apr. 22, 2013	Apr. 21, 2014

< RF Conducted >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Spectrum Analyzer	R&S	FSV 40	101500	9KHz~40GHz	May 06, 2015	May 05, 2016
Temp. and Humidity Chamber	Giant Force	GTH-225-20-S	MAB0103-001	-20 ~ 100℃	Jun. 12, 2015	Jun. 11, 2016
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jul. 28, 2015	Jul. 27, 2016
AC Power Source	G.W	APS-9102	EL920581	AC 0V ~ 300V	Jun. 25, 2015	Jun. 24, 2016

< Radiated Emission >

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Nov. 28, 2015	Nov. 27, 2016
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	1GHz ~ 18GHz 3m	Dec. 16, 2015	Dec. 15, 2016
Amplifier	HP	8447D	2944A08033	10kHz ~ 1.3GHz	May 11, 2015	May 10, 2016
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	Sep. 02, 2015	Sep. 01, 2016
Spectrum	R&S	FSV40	101513	9kHz ~ 40GHz	Feb. 16, 2016	Feb. 15, 2017
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30MHz ~ 1GHz	Sep. 18, 2015	Sep. 17, 2016
Horn Antenna	ETS • LINDGREN	3115	6741	1GHz ~ 18GHz	Jul. 15, 2015	Jul. 14, 2016
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	18GHz ~ 40GHz	Jan. 29, 2016	Jan. 28, 2017

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Last Cal.	Calibration Due Date
Amplifier	MITEQ	JS44-18004000-33-8P	1840917	18GHz ~ 40GHz	Jun. 02, 2015	Jun. 01, 2017
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	Feb.02.2015	Feb.01.2017