



FCC Test Report

Equipment : Wireless AC750 Dual Band Range Extender
Brand Name : D-Link
Model No. : DAP-1520
FCC ID : KA2AP1520A1
Standard : 47 CFR FCC Part 15.407
Operating Band : 5150 MHz – 5250 MHz
FCC Classification : NII
Applicant : D-Link Corporation
Manufacturer : 17595 Mt. Herrmann, Fountain Valley, CA 92708 U.S.A

The product sample received on Sep. 24, 2013 and completely tested on Oct. 14, 2013. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.

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

Reviewed by:

James Fan / Assistant Manager





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Summary of Test Result

Conformance Test Specifications					
Report Clause	Ref. Std. Clause	Description	Measured	Limit	Result
1.1.2	15.203	Antenna Requirement	Antenna connector mechanism complied	FCC 15.203	Complied
3.1	15.207	AC Power-line Conducted Emissions	[dBuV]: 28.686MHz 42.48 (Margin 17.52dB) - QP 39.52 (Margin 10.48dB) - AV	FCC 15.207	Complied
3.2	15.407(a)	Emission Bandwidth	Bandwidth [MHz] 20M:22.55 / 40M:46.84 80M:82.09	Information only	Complied
3.3	15.407(a)	RF Output Power (Maximum Conducted (Average) Output Power)	Power [dBm] 5150-5250MHz:16.72	Power [dBm] 5150-5250MHz:17	Complied
3.4	15.407(a)	Peak Power Spectral Density	PPSD [dBm/MHz] 5150-5250MHz: 3.78	PPSD [dBm/MHz] 5150-5250MHz:4	Complied
3.5	15.407(a)	Peak Excursion	9.12 dB	13 dB	Complied
3.6	15.407(b)	Transmitter Unwanted Emissions and Band Edge	Restricted Bands [dBuV/m at 3m]: 5150.00MHz 52.85 (Margin 1.15dB) – AV	Non-Restricted Bands: ≤ -27dBm (68.3dBuV/m@3m) Restricted Bands: FCC 15.209	Complied
3.7	15.407(g)	Frequency Stability	5.1904 ppm	Signal shall remain in-band	Complied

1 General Description

1.1 Information

1.1.1 RF General Information

RF General Information						
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	RF Output Power (dBm)	Co-location
5150-5250	a	5180-5240	36-48 [4]	1	16.58	Yes
5150-5250	n(HT20)	5180-5240	36-48 [4]	1	16.41	Yes
5150-5250	n(HT40)	5190-5230	38-46 [2]	1	16.65	Yes
5150-5250	ac(VHT20)	5180-5240	36-48 [4]	1	16.49	Yes
5150-5250	ac(VHT40)	5190-5230	38-46 [2]	1	16.72	Yes
5150-5250	ac(VHT80)	5210	42 [1]	1	13.44	Yes

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.
 Note 2: 802.11a/n uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
 Note 3: 802.11ac uses a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM modulation.
 Note 4: Co-location, Co-location is generally defined as simultaneously transmitting (co-transmitting) antennas within 20 cm of each other. (i.e., EUT has simultaneously co-transmitting that operating 2.4GHz and 5GHz.)

1.1.2 Antenna Information

Antenna Category	
<input type="checkbox"/>	Equipment placed on the market without antennas
<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)
	<input checked="" type="checkbox"/> Temporary RF connector provided
	<input 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				
No.	Ant. Cat.	Ant. Type	Connector	Gain (dBi)
1	Integral	PIFA	UFL	1

1.1.3 Type of EUT

Identify EUT	
EUT Serial Number	N/A
Presentation of Equipment	<input type="checkbox"/> Production ; <input checked="" type="checkbox"/> Pre-Production ; <input 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"/> 98.81% - IEEE 802.11a	0.05
<input checked="" type="checkbox"/> 99.16% - IEEE 802.11ac (VHT20)	0.04
<input checked="" type="checkbox"/> 98.34% - IEEE 802.11ac (VHT40)	0.07
<input checked="" type="checkbox"/> 94.50% - IEEE 802.11ac (VHT80)	0.25

1.1.5 EUT Operational Condition

Supply Voltage	<input checked="" type="checkbox"/> AC mains	<input type="checkbox"/> DC	
Type of DC Source	<input type="checkbox"/> Internal DC supply	<input type="checkbox"/> External DC adapter	<input type="checkbox"/> Battery
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 Support Equipment

Support Equipment				
No.	Equipment	Brand Name	Model Name	FCC ID
1	Notebook	DELL	E6430	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 C63.10-2009
- ♦ FCC KDB 789033 v01r03
- ♦ FCC KDB 662911 v02
- ♦ FCC KDB 412172 v01

1.4 Testing Location Information

Testing Location				
<input checked="" type="checkbox"/>	HWA YA	ADD : No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973		
Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
RF Conducted	TH01-HY	Mark Liao	22°C / 61%	Oct. 04, 2013
AC Conduction	CO01-HY	Skys Huang	23°C / 58%	Oct. 14, 2013
Radiated Emission	03CH08-HY	Jack Li	26°C / 63%	Sep. 26 ~ Oct. 09, 2013
Test site registered number [636805] with FCC Test site registered number [4086B-2] with IC				



1.5 Measurement Uncertainty

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

Measurement Uncertainty			
Test Item		Uncertainty	Limit
AC power-line conducted emissions		±2.26 dB	N/A
Emission bandwidth		±1.42 %	N/A
RF output power, conducted		±0.63 dB	N/A
Power density, conducted		±0.81 dB	N/A
All emissions, radiated	30 – 1000 MHz	±3.9 dB	N/A
	Above 1GHz	±4.2 dB	N/A
Temperature		±0.8 °C	N/A
Humidity		±3 %	N/A
DC and low frequency voltages		±3 %	N/A
Time		±1.42 %	N/A
Duty Cycle		±1.42 %	N/A

2 Test Configuration of EUT

2.1 The Worst Case Modulation Configuration

Worst Modulation Used for Conformance Testing (5150-5250MHz)			
Modulation Mode	Transmit Chains (N _{TX})	Data Rate / MCS	Worst Data Rate / MCS
11a	1	6-54Mbps	6 Mbps
HT20	1	M0-15	M0
HT40	1	M0-15	M0
VHT20	1	M0-9	M0
VHT40	1	M0-9	M0
VHT80	1	M0-9	M0

2.2 The Worst Case Power Setting Parameter

The Worst Case Power Setting Parameter (5150-5250MHz band)							
Test Software	MT76XXE_AP						
Test Software Version	2.0.3.0						
Modulation Mode	N _{TX}	Test Frequency (MHz)					
		NCB: 20MHz			NCB: 40MHz		NCB: 80MHz
		5180	5200	5240	5190	5230	5210
11a,6-54Mbps	1	0D	0D	0D	-	-	-
HT20,M0-15	1	0D	0D	0D	-	-	-
HT40,M0-15	1	-	-	-	0C	0E	-
VHT20,M0-9	1	0D	0D	0D	-	-	-
VHT40,M0-9	1	-	-	-	0C	0E	-
VHT80,M0-9	1	-	-	-	-	-	06

2.3 The Worst Case Measurement Configuration

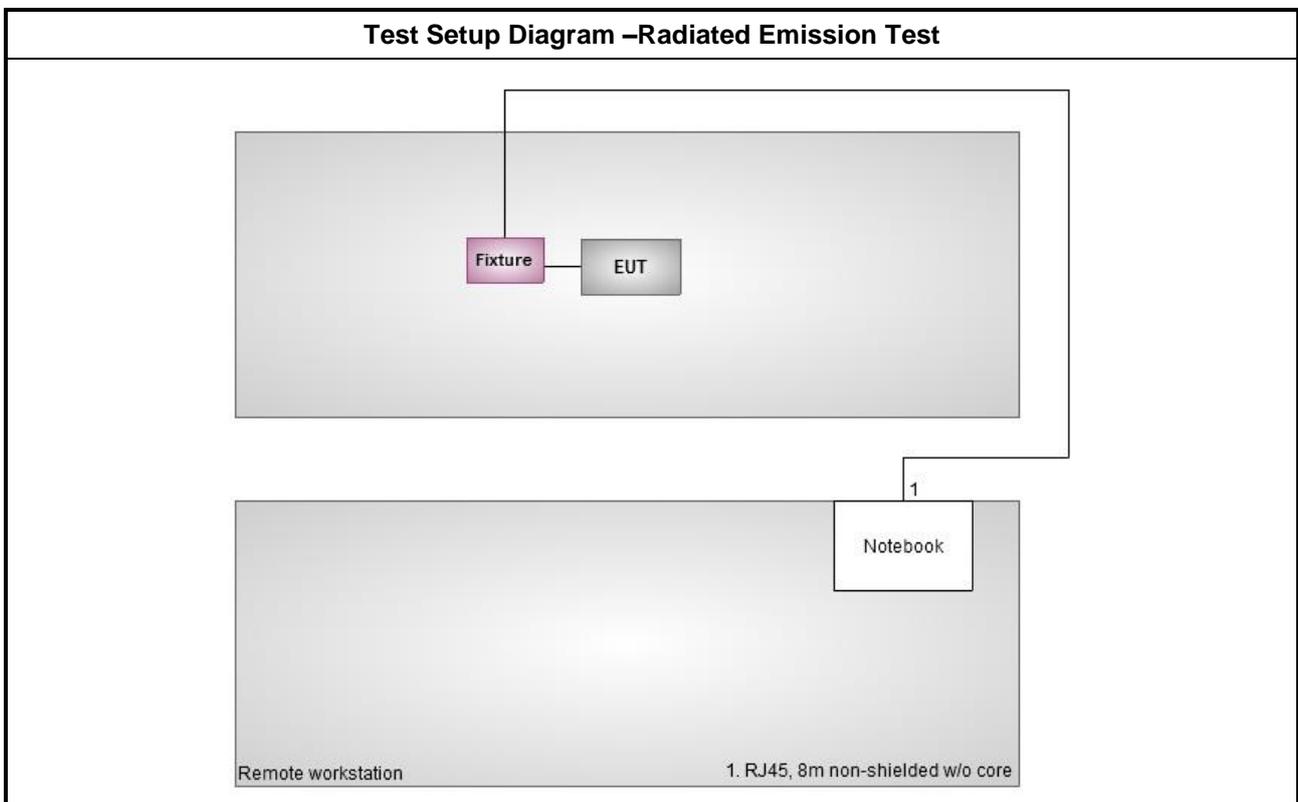
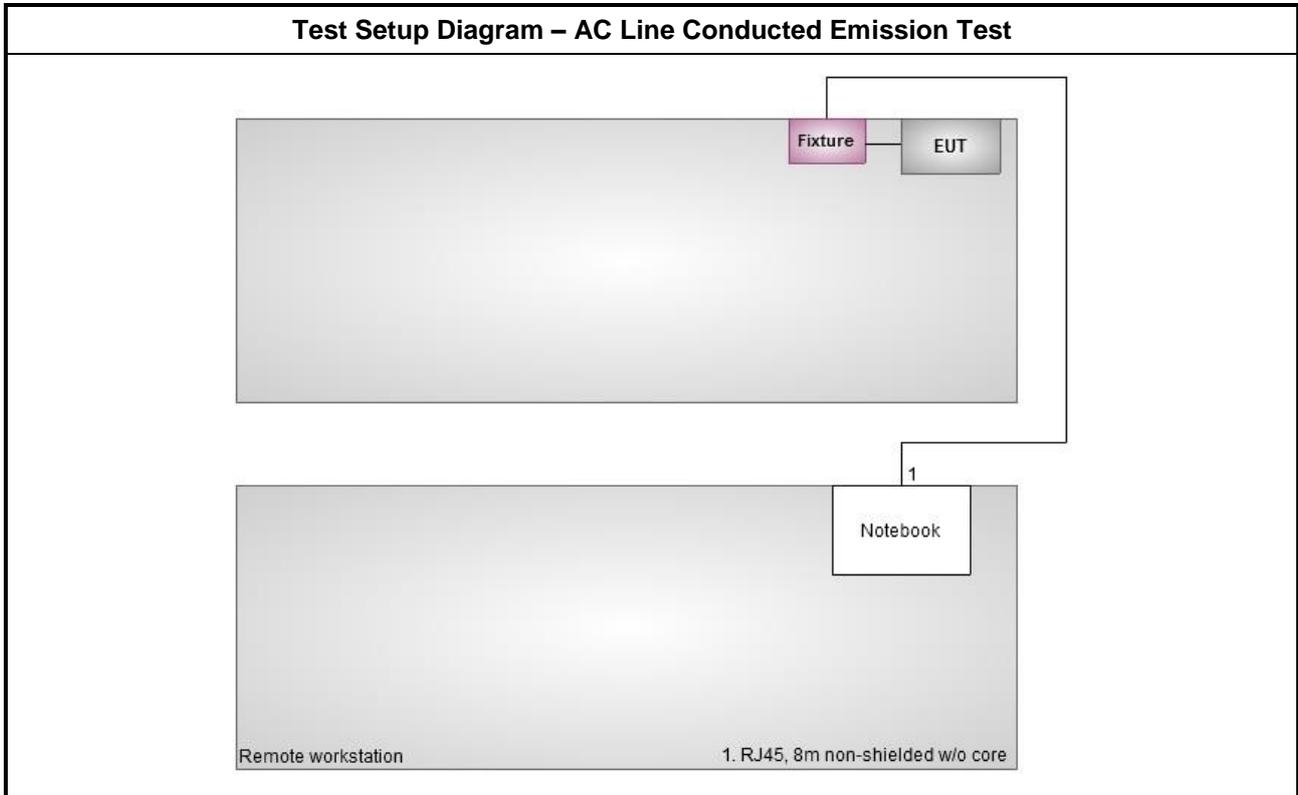
The Worst Case Mode for Following Conformance Tests	
Tests Item	AC power-line conducted emissions
Condition	AC power-line conducted measurement for line and neutral Test Voltage: 120Vac / 60Hz
Operating Mode	Operating Mode Description
1	Radio link (WLAN)

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 type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. The worst planes is X.		
	<input checked="" type="checkbox"/> EUT will be operating multiple positions. EUT shall be performed three orthogonal planes. The worst planes is Z.		
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



Note: The fixture is used for sending command from Notebook to control EUT to transmit continuously.

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.

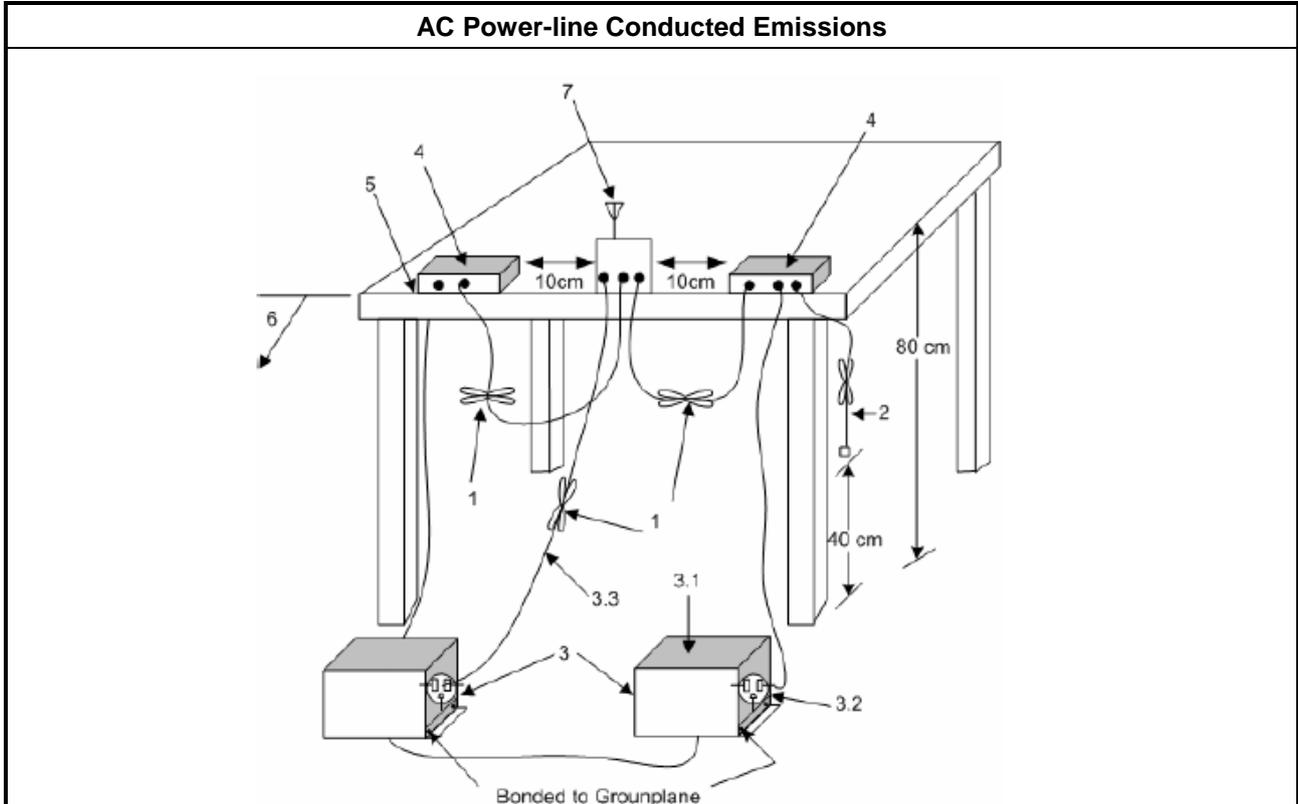
3.1.2 Measuring Instruments

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

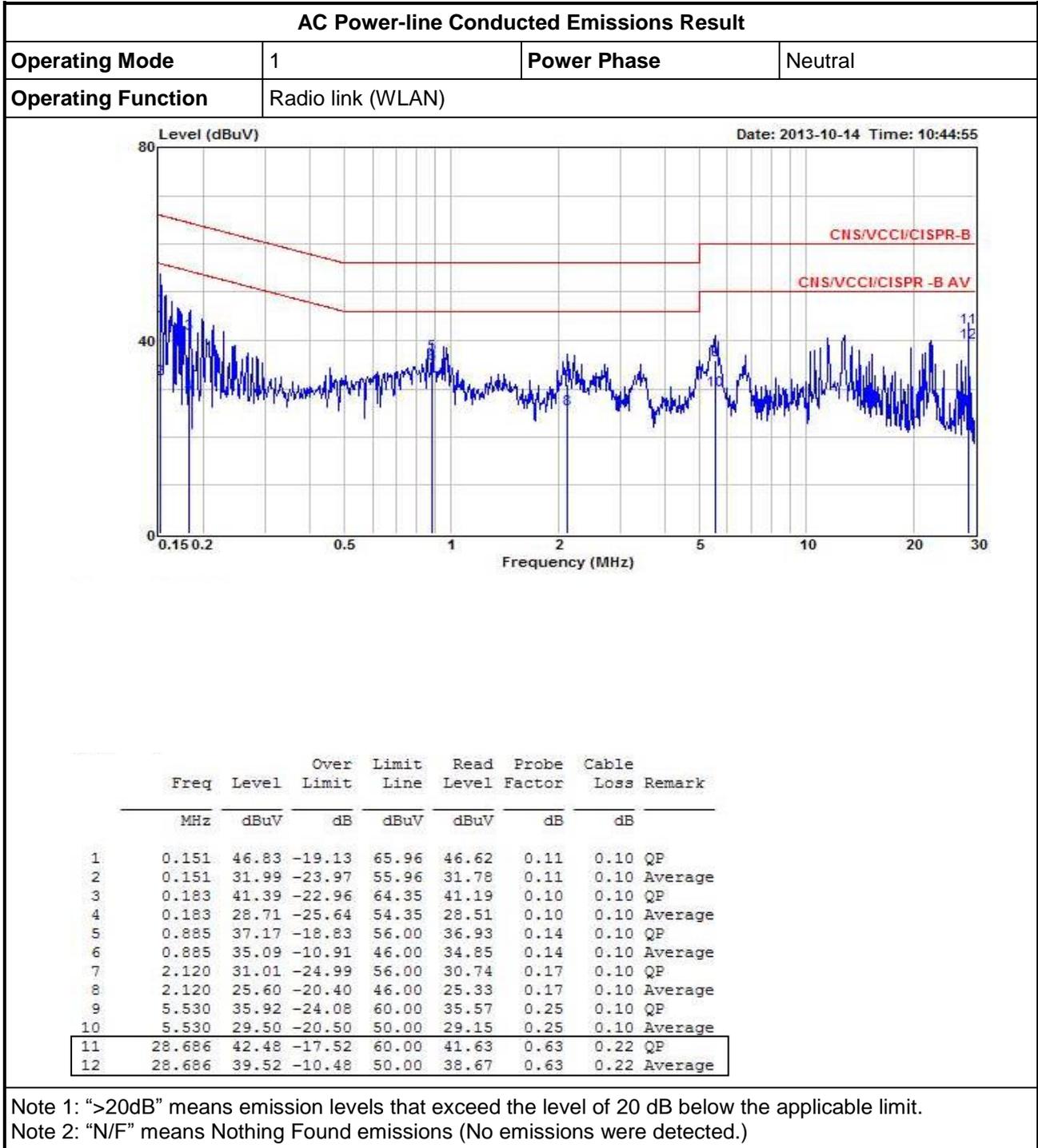
3.1.3 Test Procedures

Test Method
<input checked="" type="checkbox"/> Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions.

3.1.4 Test Setup

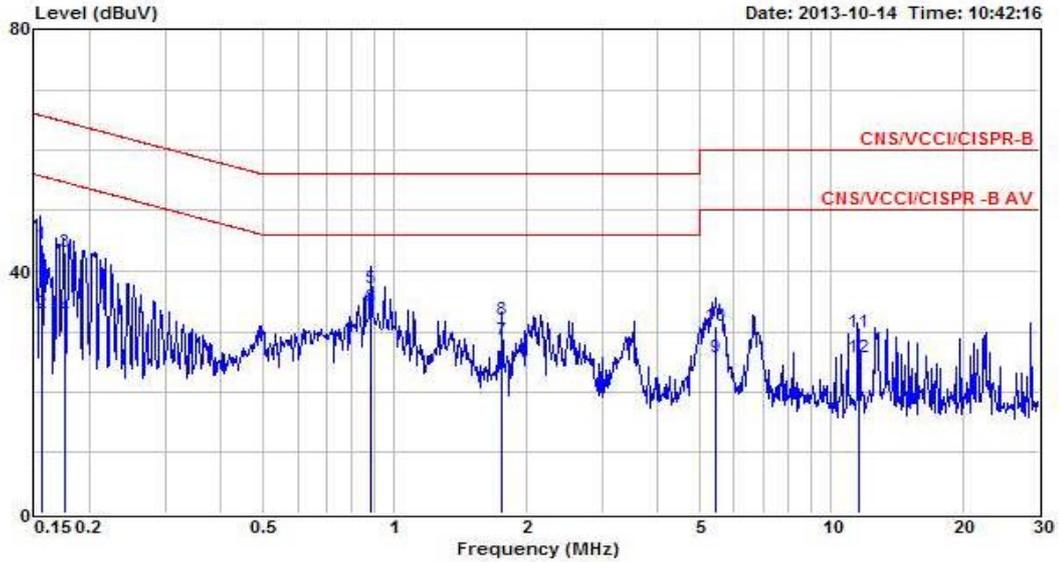


3.1.5 Test Result of AC Power-line Conducted Emissions



AC Power-line Conducted Emissions Result

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



	Freq	Level	Over	Limit	Read	Probe	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
			dB	dBuV	dBuV	dB	dB	
1	0.155	44.40	-21.33	65.73	44.17	0.13	0.10	QP
2	0.155	32.92	-22.81	55.73	32.69	0.13	0.10	Average
3	0.175	43.13	-21.59	64.72	42.89	0.14	0.10	QP
4	0.175	32.41	-22.31	54.72	32.17	0.14	0.10	Average
5	0.885	37.18	-18.82	56.00	36.91	0.17	0.10	QP
6	0.885	34.09	-11.91	46.00	33.82	0.17	0.10	Average
7	1.760	28.52	-17.48	46.00	28.23	0.19	0.10	Average
8	1.760	31.86	-24.14	56.00	31.57	0.19	0.10	QP
9	5.420	25.71	-24.29	50.00	25.35	0.26	0.10	Average
10	5.420	31.00	-29.00	60.00	30.64	0.26	0.10	QP
11	11.547	29.89	-30.11	60.00	29.43	0.33	0.13	QP
12	11.547	25.84	-24.16	50.00	25.38	0.33	0.13	Average

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

3.2 Emission Bandwidth

3.2.1 Emission Bandwidth (EBW) Limit

Emission Bandwidth (EBW) Limit	
UNII Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the maximum conducted output power shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
<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 type="checkbox"/>	For the 5.725-5.825 GHz band, the maximum conducted output power shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26 dB emission bandwidth in MHz.
LE-LAN Devices	
<input checked="" type="checkbox"/>	For the band 5.15-5.25 GHz, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.725-5.825 GHz band, the maximum e.i.r.p. shall not exceed 4.0 W or 23 + 10 log B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

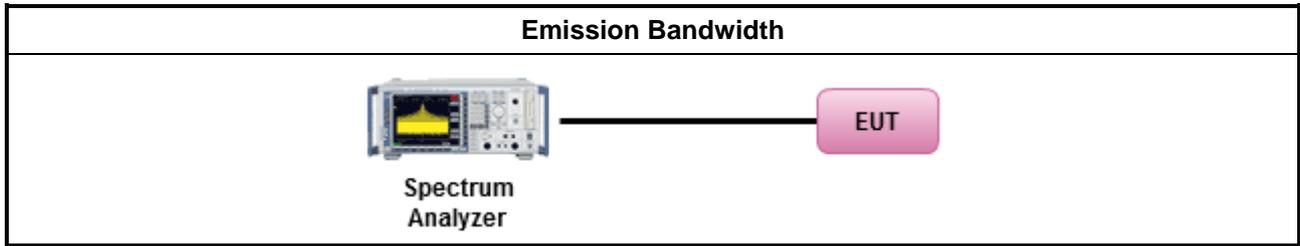
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

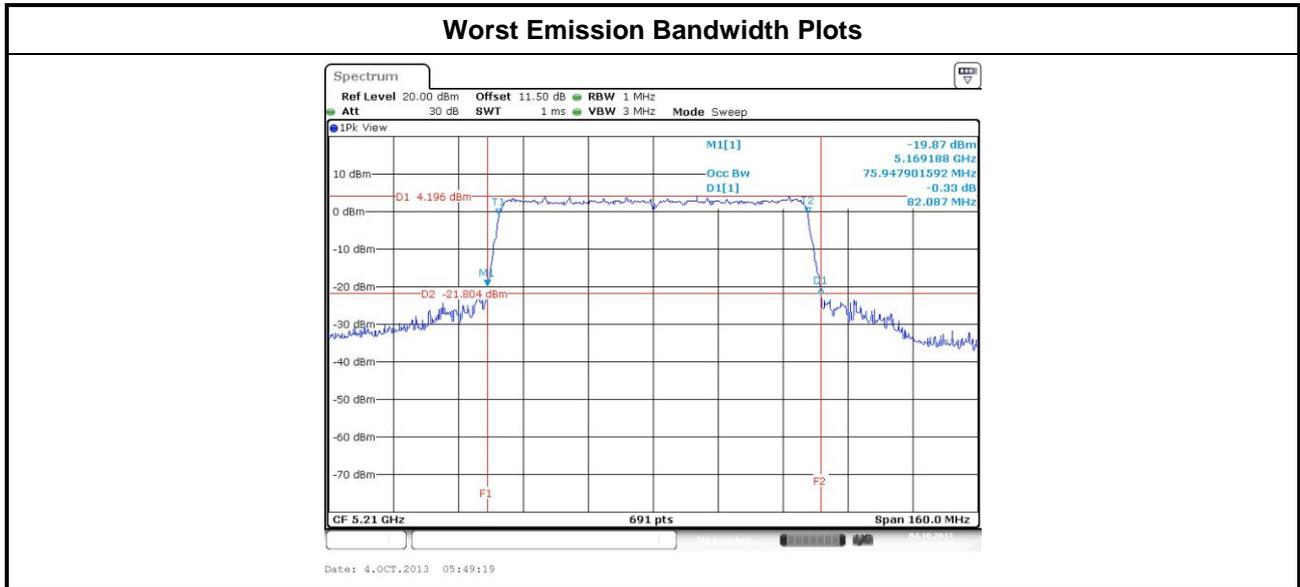
Test Method	
<input checked="" type="checkbox"/>	For the emission bandwidth shall be measured using one of the options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033 v01r03, clause C for EBW and clause D for OBW measurement.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 6.9.1 for occupied bandwidth testing.
<input checked="" type="checkbox"/>	Refer as IC RSS-Gen, clause 4.6 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 (5150-5250MHz band)												
Condition			Emission Bandwidth (MHz)									
Modulation Mode	N _{TX}	Freq. (MHz)	99% Bandwidth				26dB Bandwidth				Power Limit	
			Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	Chain-Port 1	Chain-Port 2	Chain-Port 3	Chain-Port 4	99% BW	26dB BW
11a	1	5180	16.85	-	-	-	22.55	-	-	-	16.27	17.00
11a	1	5200	16.90	-	-	-	22.55	-	-	-	16.28	17.00
11a	1	5240	16.85	-	-	-	22.49	-	-	-	16.27	17.00
VHT20	1	5180	17.60	-	-	-	20.99	-	-	-	16.46	17.00
VHT20	1	5200	17.66	-	-	-	21.45	-	-	-	16.47	17.00
VHT20	1	5240	17.60	-	-	-	21.16	-	-	-	16.46	17.00
VHT40	1	5190	36.47	-	-	-	41.74	-	-	-	17.00	17.00
VHT40	1	5230	36.58	-	-	-	46.84	-	-	-	17.00	17.00
VHT80	1	5210	75.95	-	-	-	82.09	-	-	-	17.00	17.00
Result			Complied									



3.3 RF Output Power

3.3.1 RF Output Power Limit

Maximum Conducted Output Power Limit	
UNII Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the maximum conducted output power (P_{Out}) shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 17 - (G_{TX} - 6)$.
<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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, 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 $11 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, then $P_{Out} = 24 - (G_{TX} - 6)$.
<input type="checkbox"/>	For the 5.725-5.825 GHz band:
<input type="checkbox"/>	Point-to-multipoint systems (P2M): the maximum conducted output power (P_{Out}) shall not exceed the lesser of 1 W or $17 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 6 \text{ dBi}$, 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 or $17 \text{ dBm} + 10 \log B$, where B is the 26 dB emission bandwidth in MHz. If $G_{TX} > 23 \text{ dBi}$, then $P_{Out} = 30 - (G_{TX} - 23)$.
LE-LAN Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	For the 5.725-5.825 GHz band, the maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	Point-to-multipoint systems (P2M): the maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.
<input type="checkbox"/>	Point-to-point systems (P2P): the maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. If e.i.r.p. > 36 dBm, $G_{TX} \leq P_{Out}$.
P_{Out} = maximum conducted output power in dBm, G_{TX} = the maximum transmitting antenna directional gain in dBi.	

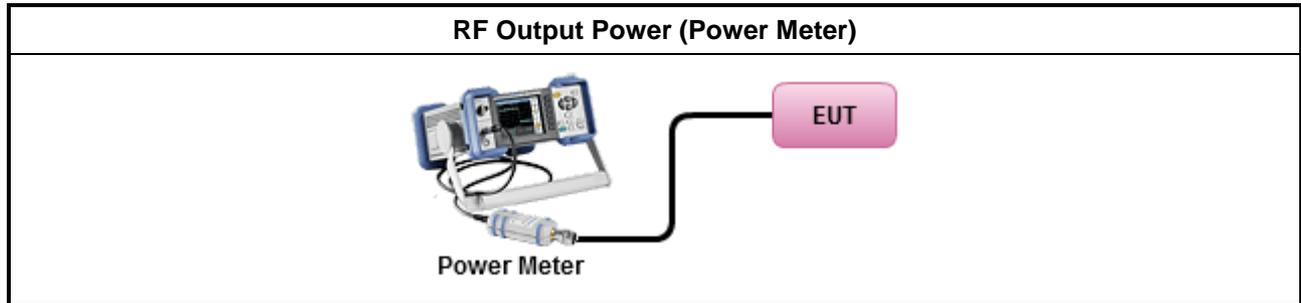
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Maximum Conducted Output Power
	<input type="checkbox"/> Refer as FCC KDB 789033 v01r03, clause E Method SA-1 (spectral trace averaging).
	<input type="checkbox"/> Refer as FCC KDB 789033 v01r03, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)
	<input type="checkbox"/> Refer as FCC KDB 789033 v01r03, clause E Method SA-2 (spectral trace averaging).
	<input type="checkbox"/> Refer as FCC KDB 789033 v01r03, clause E Method SA-2 Alt. (RMS detection with slow sweep speed)
	Wideband RF power meter and average over on/off periods with duty factor
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033 v01r03, clause E Method PM-G (using a gated 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 checked="" type="checkbox"/>	If multiple transmit chains, EIRP calculation could be following as methods: $P_{total} = P_1 + P_2 + \dots + P_n$ (calculated in linear unit [mW] and transfer to log unit [dBm]) $EIRP_{total} = P_{total} + DG$

3.3.4 Test Setup



3.3.5 Directional Gain for Power Measurement

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



3.3.6 Test Result of Maximum Conducted Output Power

Maximum Conducted (Average) Output Power (5150-5250MHz band)											
Condition			RF Output Power (dBm)								
Modulation Mode	N _{TX}	Freq. (MHz)	Chain Port 1	Chain Port 2	Chain Port 3	Chain Port 4	Sum Chain	Power Limit	DG (dBi)	EIRP Power	EIRP Limit
11a	1	5180	16.36				16.36	17.00	1.00	17.36	23.00
11a	1	5200	16.52				16.52	17.00	1.00	17.52	23.00
11a	1	5240	16.58				16.58	17.00	1.00	17.58	23.00
HT20	1	5180	16.25				16.25	17.00	1.00	17.25	23.00
HT20	1	5200	16.39				16.39	17.00	1.00	17.39	23.00
HT20	1	5240	16.41				16.41	17.00	1.00	17.41	23.00
HT40	1	5190	16.11				16.11	17.00	1.00	17.11	23.00
HT40	1	5230	16.65				16.65	17.00	1.00	17.65	23.00
VHT20	1	5180	16.30				16.30	17.00	1.00	17.30	23.00
VHT20	1	5200	16.44				16.44	17.00	1.00	17.44	23.00
VHT20	1	5240	16.49				16.49	17.00	1.00	17.49	23.00
VHT40	1	5190	16.16				16.16	17.00	1.00	17.16	23.00
VHT40	1	5230	16.72				16.72	17.00	1.00	17.72	23.00
VHT80	1	5210	13.44				13.44	17.00	1.00	14.44	23.00
Result			Complied								

3.4 Peak Power Spectral Density

3.4.1 Peak Power Spectral Density Limit

Peak Power Spectral Density Limit	
UNII Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the peak power spectral density (PPSD) ≤ 4 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 4 - (G_{TX} - 6)$.
<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 type="checkbox"/>	For the 5.725-5.825 GHz band:
<input type="checkbox"/>	Point-to-multipoint systems (P2M): the peak power spectral density (PPSD) ≤ 17 dBm/MHz. If $G_{TX} > 6$ dBi, then $PPSD = 17 - (G_{TX} - 6)$.
<input type="checkbox"/>	Point-to-point systems (P2P): the peak power spectral density (PPSD) ≤ 17 dBm/MHz. If $G_{TX} > 23$ dBi, then $PPSD = 17 - (G_{TX} - 23)$.
LE-LAN Devices	
<input checked="" type="checkbox"/>	For the 5.15-5.25 GHz band, the peak power spectral density (PPSD) ≤ 4 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 10 dBm/MHz.
<input type="checkbox"/>	For the 5.25-5.35 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 17 dBm/MHz.
<input type="checkbox"/>	For the 5.47-5.6 GHz band and 5.65-5.725 GHz band, the peak power spectral density (PPSD) ≤ 11 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 17 dBm/MHz.
<input type="checkbox"/>	For the 5.725-5.825 GHz band, the peak power spectral density (PPSD) ≤ 17 dBm/MHz and the e.i.r.p. peak power spectral density (PPSD) ≤ 23 dBm/MHz.
<p>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.</p>	

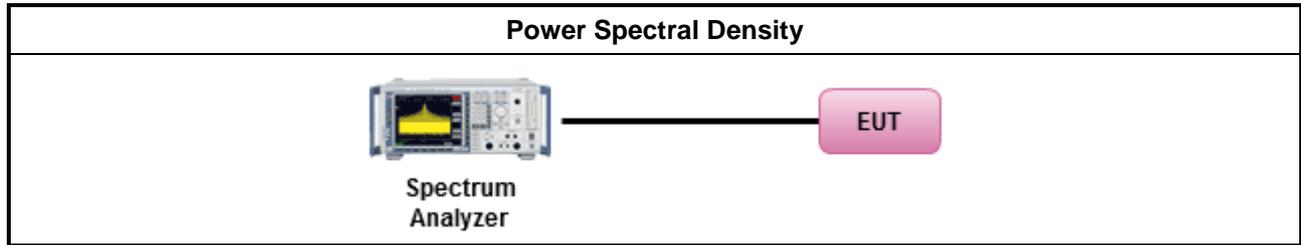
3.4.2 Measuring Instruments

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 v01r03, F5) power spectral density can be measured using resolution bandwidths < 1 MHz provided that the results are integrated over 1 MHz bandwidth
	<input type="checkbox"/> Refer as FCC KDB 789033 v01r03, clause E Method SA-1 (spectral trace averaging).
	<input type="checkbox"/> Refer as FCC KDB 789033 v01r03, clause E Method SA-1 Alt. (RMS detection with slow sweep speed)
	<input type="checkbox"/> Refer as FCC KDB 789033 v01r03, clause E Method SA-2 (spectral trace averaging).
	<input checked="" type="checkbox"/> Refer as FCC KDB 789033 v01r03, 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 checked="" 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 checked="" type="checkbox"/> Each individually PPSD plots refer as test report clause 3.3.5 with each individually PPSD plots.

3.4.4 Test Setup

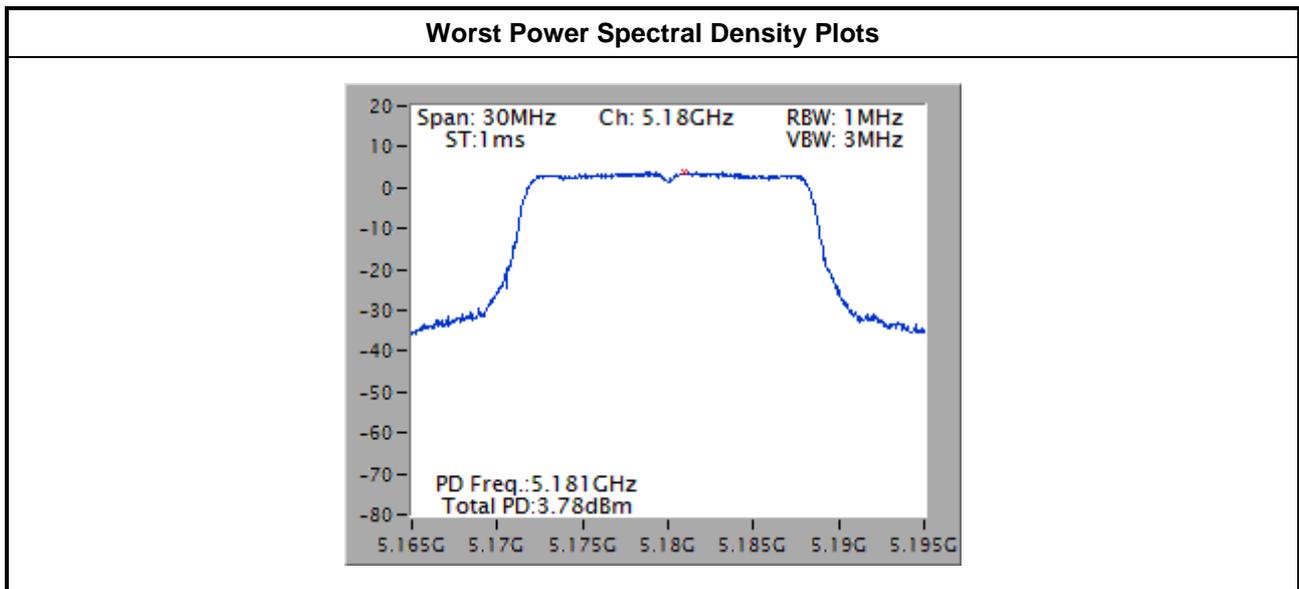


3.4.5 Directional Gain for Power Spectral Density Measurement

Directional Gain (DG) Result					
Transmit Chains No.		1	-	-	-
Maximum G_{ANT} (dBi)		1	-	-	-
Modulation Mode	DG (dBi)	N _{TX}	N _{SS}	STBC	Array Gain (dB)
11a,6-54Mbps	1	1	1	-	-
VHT20,M0-9	1	1	1	-	-
VHT40,M0-9	1	1	1	-	-
VHT80,M0-9	1	1	1		

3.4.6 Test Result of Peak Power Spectral Density

Peak Power Spectral Density Result (5150-5250MHz band)							
Condition			Peak Power Spectral Density (dBm/MHz)				
Modulation Mode	N _{TX}	Freq. (MHz)	Sum Chain	PSD Limit	DG (dBi)	EIRP PSD	EIRP Limit
11a	1	5180	3.78	4.00	1.00	4.78	10.00
11a	1	5200	3.76	4.00	1.00	4.76	10.00
11a	1	5240	3.54	4.00	1.00	4.54	10.00
VHT20	1	5180	3.51	4.00	1.00	4.51	10.00
VHT20	1	5200	3.54	4.00	1.00	4.54	10.00
VHT20	1	5240	3.56	4.00	1.00	4.56	10.00
VHT40	1	5190	-0.78	4.00	1.00	0.22	10.00
VHT40	1	5230	0.32	4.00	1.00	1.32	10.00
VHT80	1	5210	-6.74	4.00	1.00	-5.74	10.00
Result			Complied				



3.5 Peak Excursion

3.5.1 Peak Excursion Limit

Peak Excursion Limit	
UNII Devices	
<input checked="" type="checkbox"/>	Peak excursion ≤ 13 dB. The ratio of the maximum of the peak-max-hold spectrum to the maximum of the average spectrum for continuous transmission does not exceed 13 dB. (Earlier procedures that required computing the ratio of the two spectra at each frequency across the emission bandwidth can lead to unintended failures at band edges and will no longer be required.)
LE-LAN Devices	
<input checked="" type="checkbox"/>	N/A

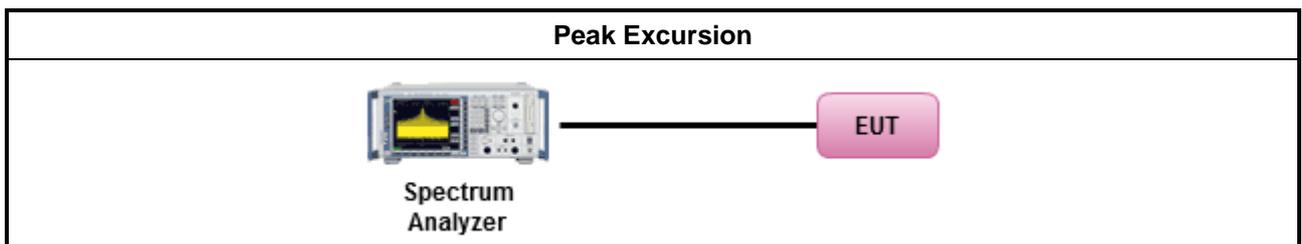
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

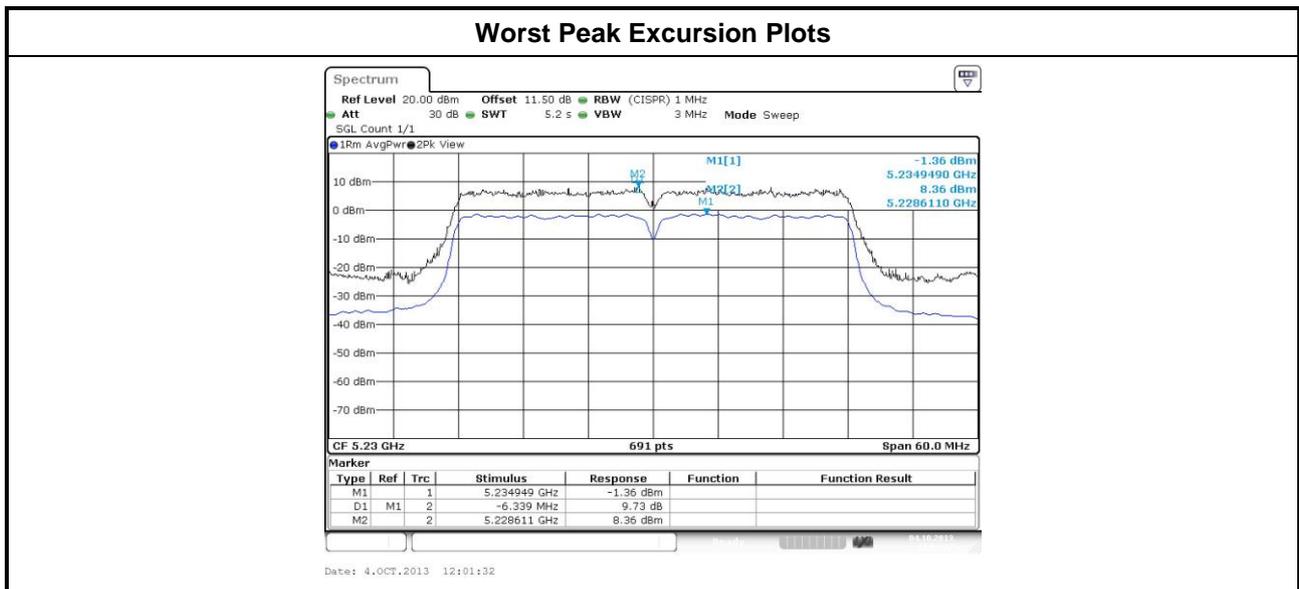
Test Method	
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033 v01r03, clause G peak excursion method.
<input checked="" type="checkbox"/>	Testing each modulation mode on a single channel is sufficient to demonstrate compliance with the peak excursion requirement
<input checked="" type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	Testing a single output port is sufficient to demonstrate compliance with the peak excursion.
<input checked="" type="checkbox"/>	Test result plots refer as test report clause 3.3.5 with peak excursion ratio of the maximum of the peak-max-hold spectrum to the maximum of the average spectrum.

3.5.4 Test Setup



3.5.5 Test Result of Peak Excursion

Mode	Modulation Mode	N _{TX}	Freq. (MHz)	Measured value(dB)	Duty factor (dB)	Peak Excursion (dB)	Limit
11a	BPSK	1	5240	8.24	0.00	8.24	13
11a	QPSK	1	5240	8.70	0.10	8.60	13
11a	16QAM	1	5240	9.27	0.19	9.08	13
11a	64QAM	1	5240	8.86	0.40	8.46	13
VHT20	BPSK	1	5240	7.63	0.00	7.63	13
VHT20	QPSK	1	5240	8.75	0.10	8.65	13
VHT20	16QAM	1	5240	8.93	0.21	8.72	13
VHT20	64QAM	1	5240	8.75	0.37	8.38	13
VHT20	256QAM	1	5240	9.62	0.53	9.09	13
VHT40	BPSK	1	5230	7.40	0.00	7.40	13
VHT40	QPSK	1	5230	8.72	0.20	8.52	13
VHT40	16QAM	1	5230	8.97	0.38	8.59	13
VHT40	64QAM	1	5230	9.73	0.61	9.12	13
VHT40	256QAM	1	5230	9.81	0.79	9.02	13
VHT80	BPSK	1	5210	8.94	0.25	8.69	13
VHT80	QPSK	1	5210	8.25	0.40	7.85	13
VHT80	16QAM	1	5210	9.35	0.67	8.68	13
VHT80	64QAM	1	5210	8.64	0.98	7.66	13
VHT80	256QAM	1	5210	9.52	1.12	8.40	13



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

3.6 Transmitter Radiated Unwanted Emissions and Band Edge

3.6.1 Transmitter Radiated Unwanted Emissions and Band Edge Limit

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

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

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

Un-restricted band emissions above 1GHz Limit	
Operating Band	Limit
5.15 - 5.25 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.25 - 5.35 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.47 - 5.725 GHz	e.i.r.p. -27 dBm [68.2 dBuV/m@3m]
5.725 - 5.825 GHz	5.715 5.725 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] 5.825 5.835 GHz: e.i.r.p. -17 dBm [78.2 dBuV/m@3m] Other un-restricted band: e.i.r.p. -27 dBm [68.2 dBuV/m@3m]

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

3.6.2 Measuring Instruments

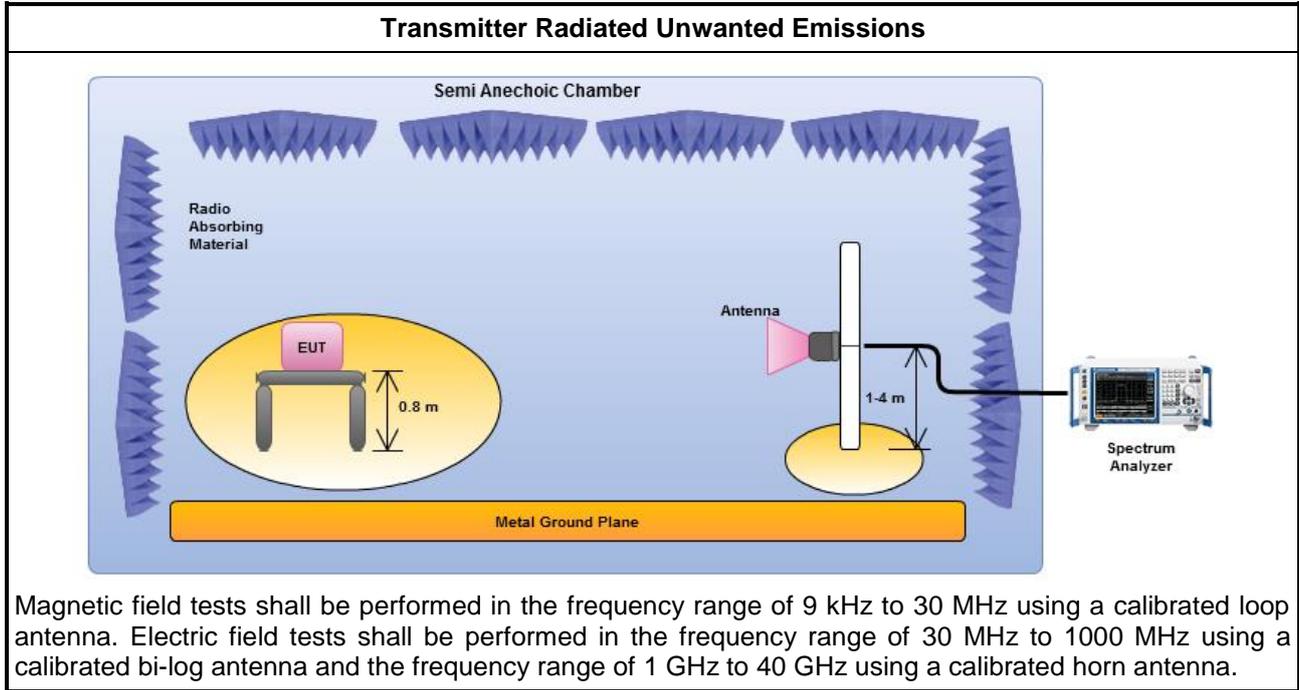
Refer a test equipment and calibration data table in this test report.



3.6.3 Test Procedures

Test Method	
<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"/>	For the transmitter unwanted emissions shall be measured using following options below:
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033 v01r03, clause H)2) for unwanted emissions into non-restricted bands.
<input checked="" type="checkbox"/>	Refer as FCC KDB 789033 v01r03, clause H)1) for unwanted emissions into restricted bands.
<input type="checkbox"/>	Refer as FCC KDB 789033 v01r03, H)6) Method AD (Trace Averaging).
<input type="checkbox"/>	Refer as FCC KDB 789033 v01r03, H)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 v01r03, clause H)5) measurement procedure peak limit.
<input type="checkbox"/>	Refer as ANSI C63.10, clause 4.2.3.2.2 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 from below 30 MHz.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1000 MHz.
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.6 for radiated emissions from above 1 GHz.
<input type="checkbox"/>	For conducted and cabinet radiation measurement, refer as FCC KDB 789033 v01r03, clause H)3).
<input type="checkbox"/>	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.
<input type="checkbox"/>	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
<input type="checkbox"/>	For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.

3.6.4 Test Setup



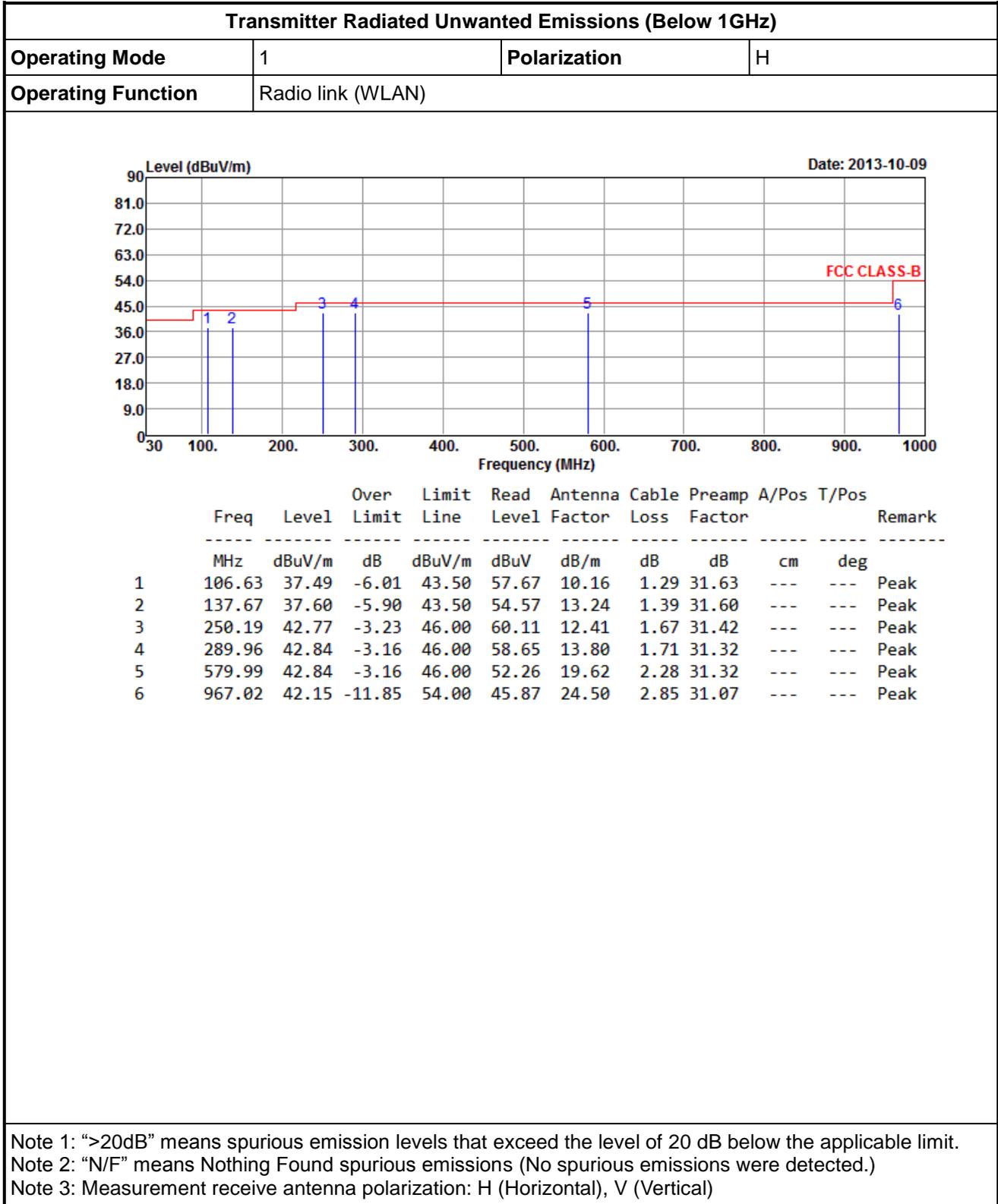
Note: Test distance is 3m.

3.6.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

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



3.6.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)





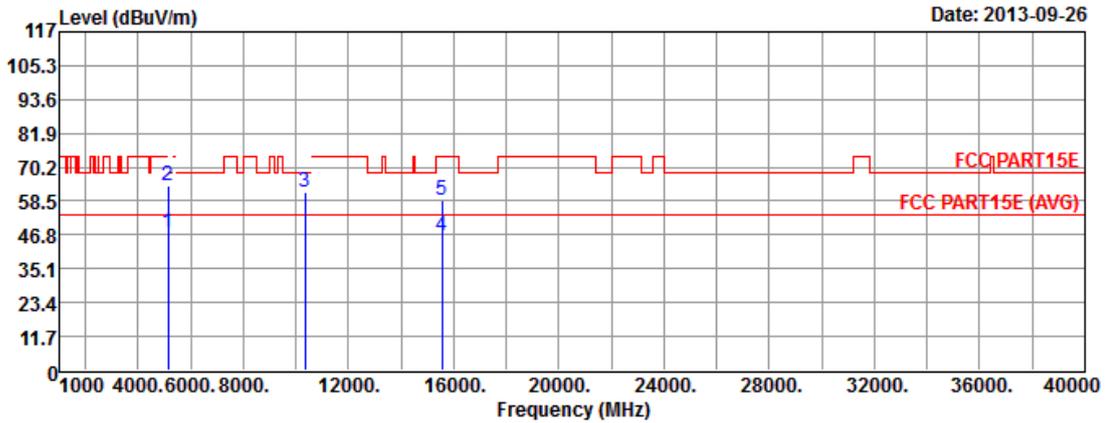
Transmitter Radiated Unwanted Emissions (Below 1GHz)											
Operating Mode	1			Polarization	V						
Operating Function	Radio link (WLAN)										
<div style="display: flex; justify-content: space-between;"> <div> <p>Level (dBuV/m)</p> <p style="text-align: right;">Date: 2013-10-09</p> </div> </div>											
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	60.07	36.83	-3.17	40.00	53.54	13.89	1.19	31.79	100	18	QP
2	125.06	39.80	-3.70	43.50	58.05	11.96	1.40	31.61	---	---	Peak
3	164.83	39.52	-3.98	43.50	56.08	13.51	1.51	31.58	---	---	Peak
4	386.96	42.60	-3.40	46.00	55.99	16.06	1.92	31.37	---	---	Peak
5	579.99	41.36	-4.64	46.00	50.78	19.62	2.28	31.32	---	---	Peak
6	967.02	41.23	-12.77	54.00	44.95	24.50	2.85	31.07	---	---	Peak

Note 1: ">20dB" means spurious emission levels that exceed the level of 20 dB below the applicable limit.
 Note 2: "N/F" means Nothing Found spurious emissions (No spurious emissions were detected.)
 Note 3: Measurement receive antenna polarization: H (Horizontal), V (Vertical)



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

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	11a	Test Freq. (MHz)	5180
N _{TX}	1	Polarization	H



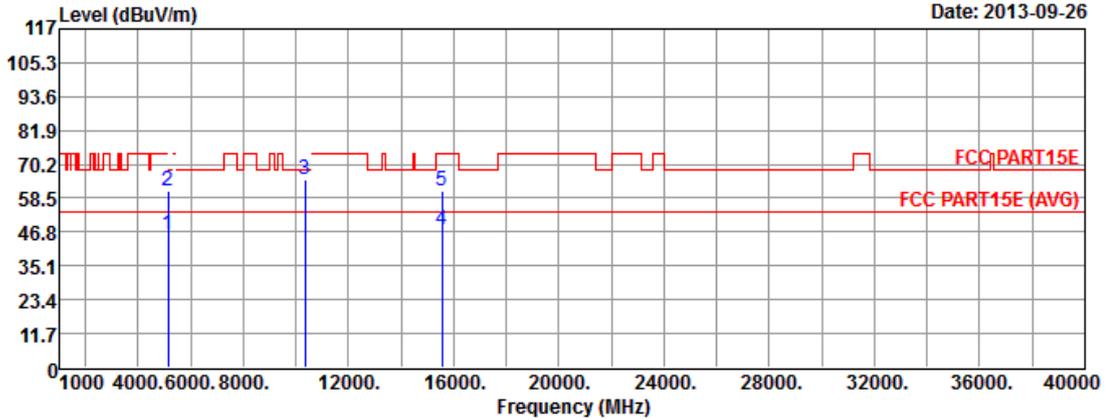
	Over	Limit	Read	Antenna	Cable	Preamp	A/Pos	T/Pos	Remark	
1	2	3	4	5	6	7	8	9	10	
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
5150.00	47.55	-6.45	54.00	42.30	31.36	6.85	32.96	---	---	Average
5150.00	63.55	-10.45	74.00	58.30	31.36	6.85	32.96	---	---	Peak
10360.00	61.53	-6.77	68.30	47.98	39.38	9.49	35.32	---	---	Peak
15540.00	46.52	-7.48	54.00	30.42	38.44	12.46	34.80	---	---	Average
15540.00	58.96	-15.04	74.00	42.86	38.44	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5180
N _{TX}	1	Polarization	V



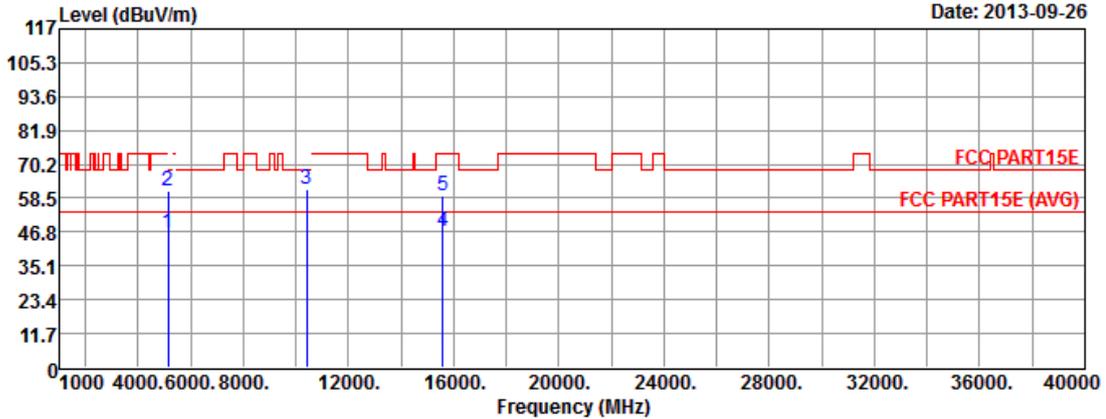
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.03	-7.97	54.00	40.78	31.36	6.85	32.96	---	---	Average
2	5150.00	61.24	-12.76	74.00	55.99	31.36	6.85	32.96	---	---	Peak
3	10360.00	65.15	-3.15	68.30	51.60	39.38	9.49	35.32	---	---	Peak
4	15540.00	47.73	-6.27	54.00	31.63	38.44	12.46	34.80	---	---	Average
5	15540.00	60.99	-13.01	74.00	44.89	38.44	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5200
N _{TX}	1	Polarization	H



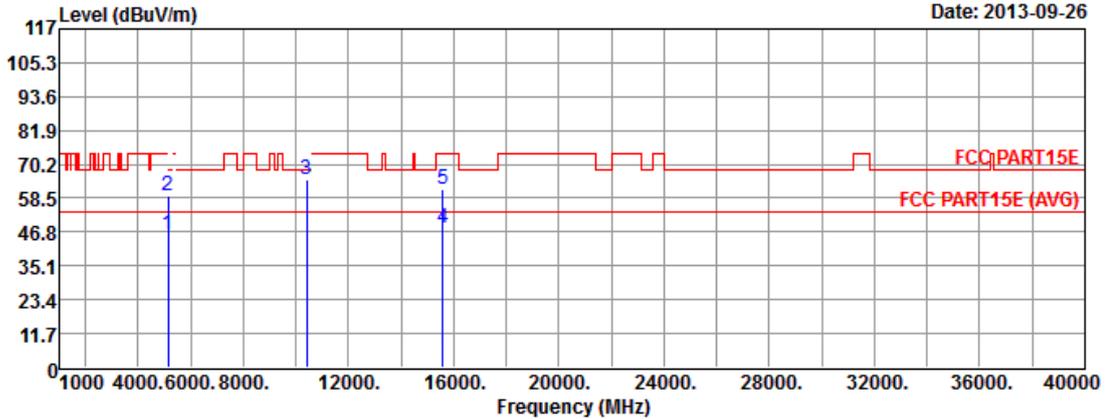
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.66	-7.34	54.00	41.41	31.36	6.85	32.96	---	---	Average
2	5150.00	61.29	-12.71	74.00	56.04	31.36	6.85	32.96	---	---	Peak
3	10400.00	61.72	-6.58	68.30	48.09	39.44	9.52	35.33	---	---	Peak
4	15600.00	47.10	-6.90	54.00	31.10	38.34	12.46	34.80	---	---	Average
5	15600.00	59.44	-14.56	74.00	43.44	38.34	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5200
N _{TX}	1	Polarization	V



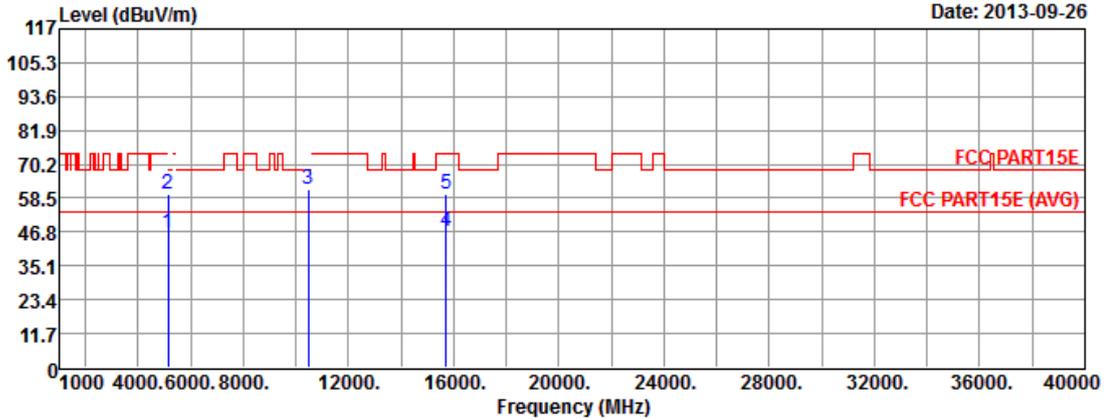
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.03	-7.97	54.00	40.78	31.36	6.85	32.96	---	---	Average
2	5150.00	59.48	-14.52	74.00	54.23	31.36	6.85	32.96	---	---	Peak
3	10400.00	65.21	-3.09	68.30	51.58	39.44	9.52	35.33	---	---	Peak
4	15600.00	48.16	-5.84	54.00	32.16	38.34	12.46	34.80	---	---	Average
5	15600.00	61.43	-12.57	74.00	45.43	38.34	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5240
N _{TX}	1	Polarization	H



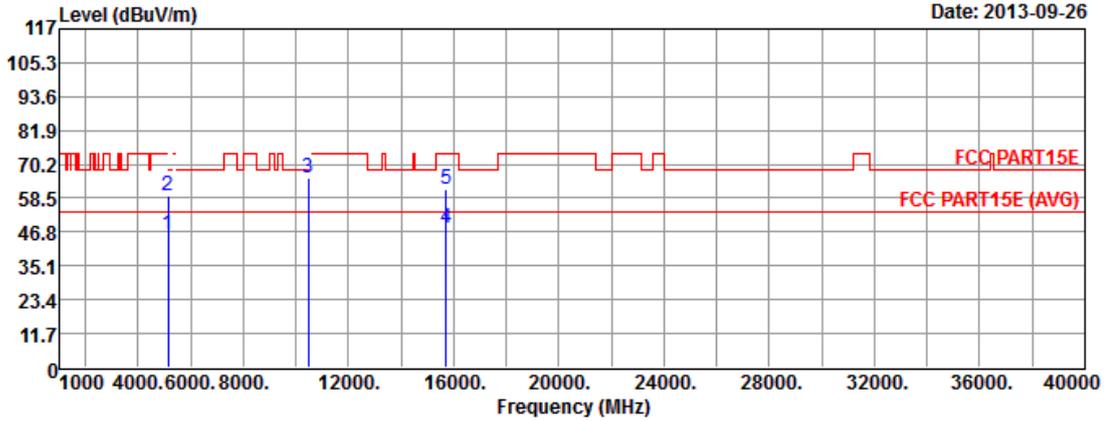
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.39	-7.61	54.00	41.14	31.36	6.85	32.96	---	---	Average
2	5150.00	59.77	-14.23	74.00	54.52	31.36	6.85	32.96	---	---	Peak
3	10480.00	61.74	-6.56	68.30	47.94	39.57	9.58	35.35	---	---	Peak
4	15720.00	47.24	-6.76	54.00	31.42	38.15	12.48	34.81	---	---	Average
5	15720.00	59.66	-14.34	74.00	43.84	38.15	12.48	34.81	---	---	Peak

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



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	11a	Test Freq. (MHz)	5240
N _{TX}	1	Polarization	V

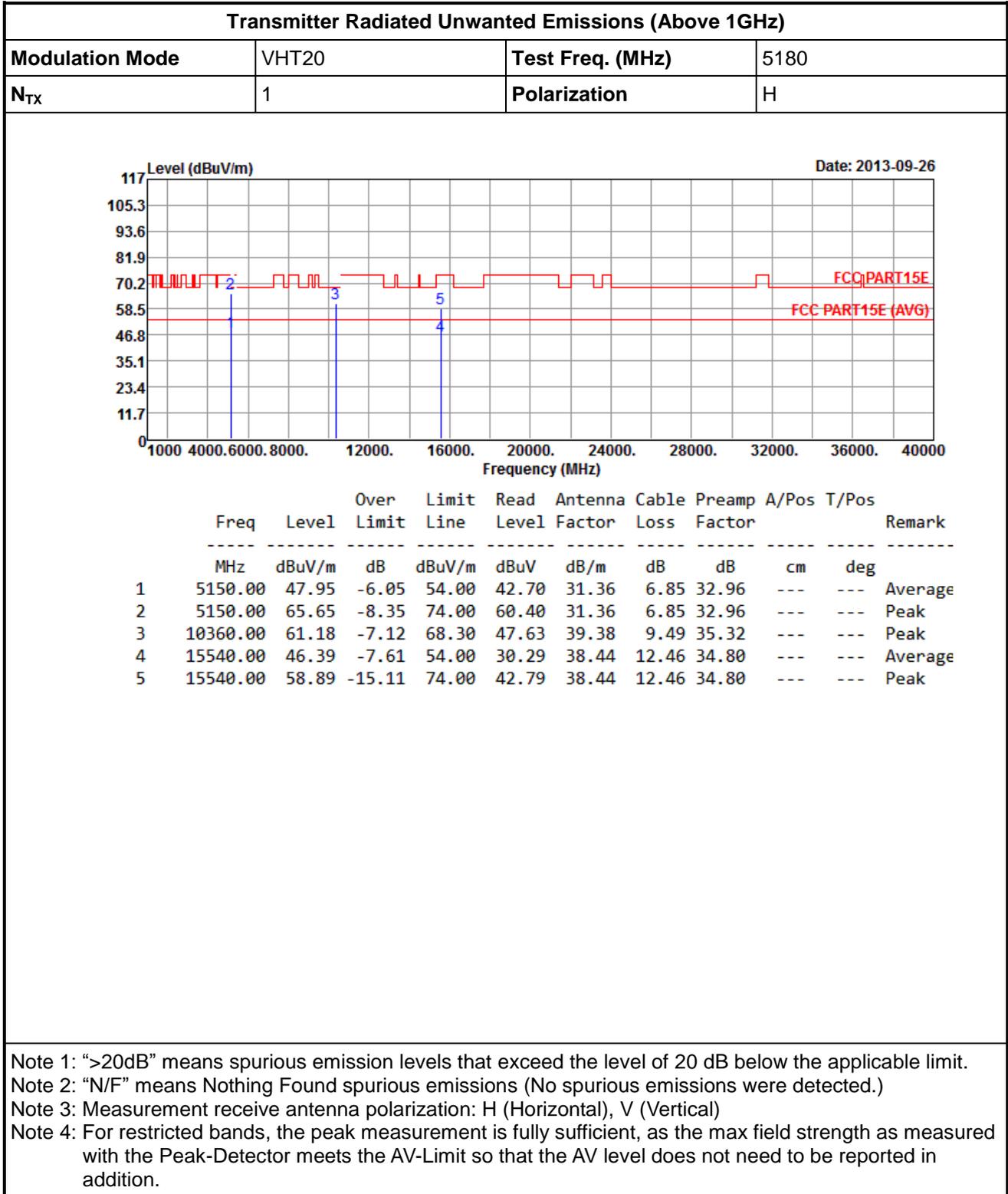


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	45.94	-8.06	54.00	40.69	31.36	6.85	32.96	---	---	Average
2	5150.00	59.16	-14.84	74.00	53.91	31.36	6.85	32.96	---	---	Peak
3	10480.00	65.29	-3.01	68.30	51.49	39.57	9.58	35.35	---	---	Peak
4	15720.00	48.40	-5.60	54.00	32.58	38.15	12.48	34.81	---	---	Average
5	15720.00	61.48	-12.52	74.00	45.66	38.15	12.48	34.81	---	---	Peak

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



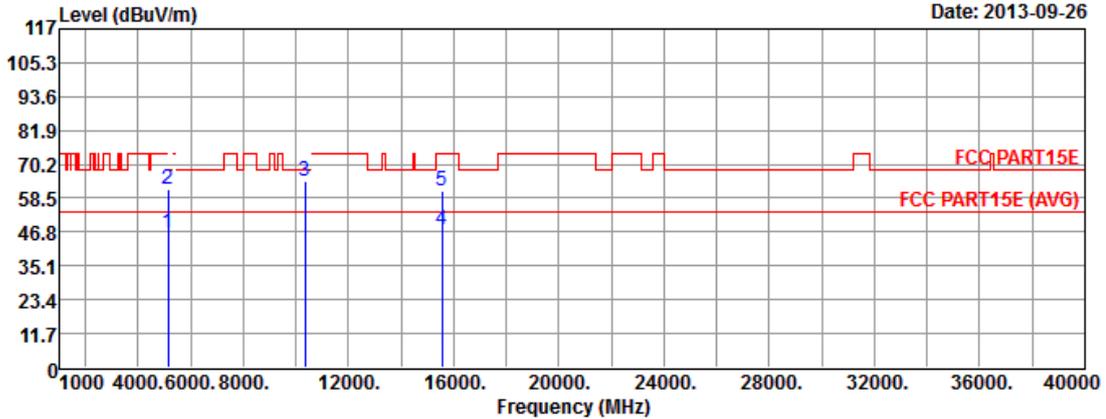
3.6.8 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT20





Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5180
N _{TX}	1	Polarization	V



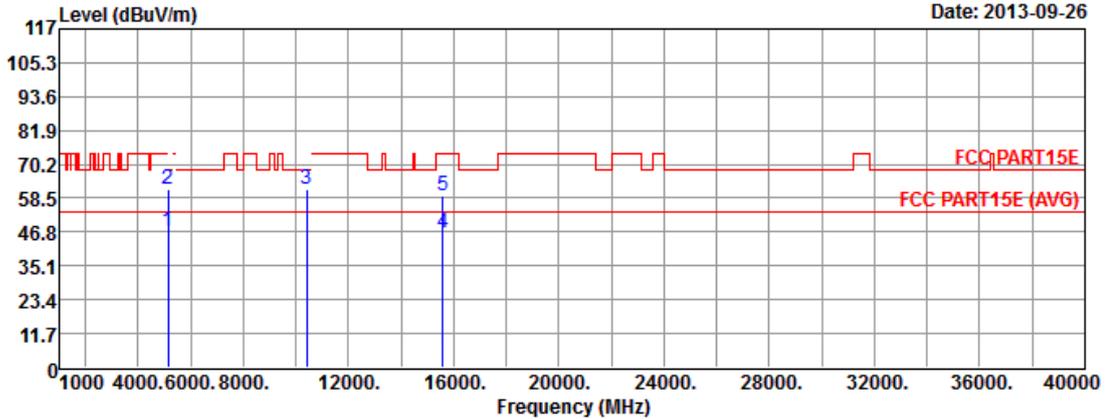
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.35	-7.65	54.00	41.10	31.36	6.85	32.96	---	---	Average
2	5150.00	61.45	-12.55	74.00	56.20	31.36	6.85	32.96	---	---	Peak
3	10360.00	64.65	-3.65	68.30	51.10	39.38	9.49	35.32	---	---	Peak
4	15540.00	47.69	-6.31	54.00	31.59	38.44	12.46	34.80	---	---	Average
5	15540.00	60.79	-13.21	74.00	44.69	38.44	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5200
N _{TX}	1	Polarization	H



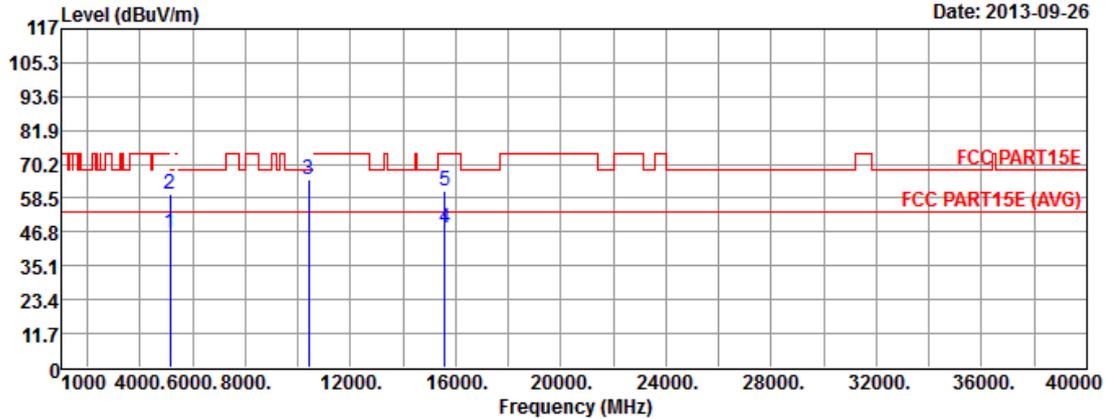
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.85	-7.15	54.00	41.60	31.36	6.85	32.96	---	---	Average
2	5150.00	61.45	-12.55	74.00	56.20	31.36	6.85	32.96	---	---	Peak
3	10400.00	61.42	-6.88	68.30	47.79	39.44	9.52	35.33	---	---	Peak
4	15600.00	46.74	-7.26	54.00	30.74	38.34	12.46	34.80	---	---	Average
5	15600.00	59.13	-14.87	74.00	43.13	38.34	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5200
N _{TX}	1	Polarization	V



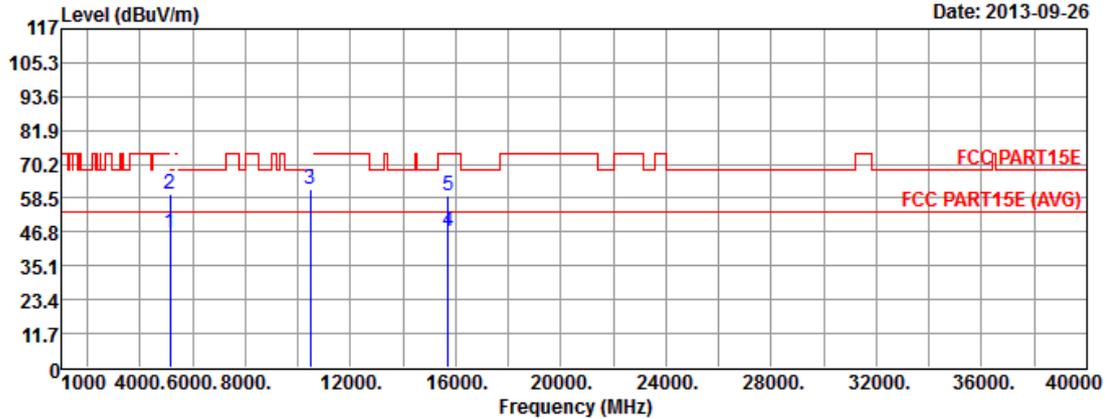
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.23	-7.77	54.00	40.98	31.36	6.85	32.96	---	---	Average
2	5150.00	59.75	-14.25	74.00	54.50	31.36	6.85	32.96	---	---	Peak
3	10400.00	64.93	-3.37	68.30	51.30	39.44	9.52	35.33	---	---	Peak
4	15600.00	47.98	-6.02	54.00	31.98	38.34	12.46	34.80	---	---	Average
5	15600.00	60.93	-13.07	74.00	44.93	38.34	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5240
N _{TX}	1	Polarization	H



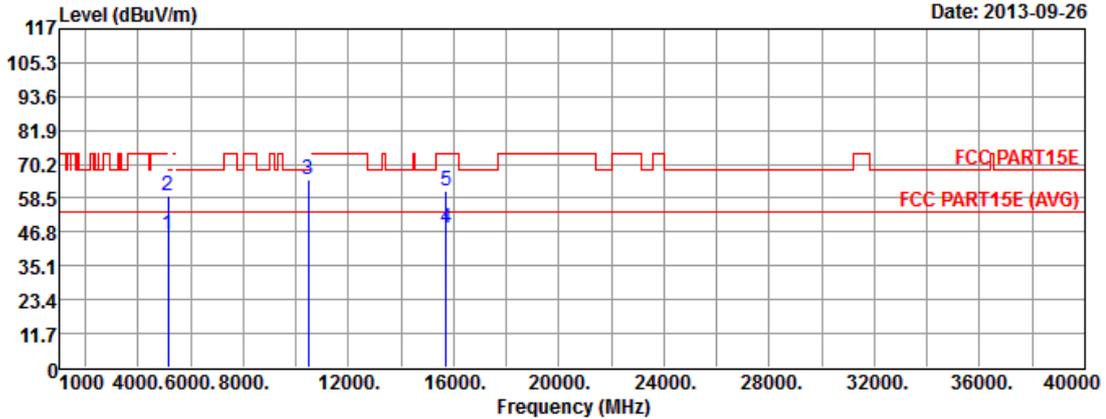
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.55	-7.45	54.00	41.30	31.36	6.85	32.96	---	---	Average
2	5150.00	59.95	-14.05	74.00	54.70	31.36	6.85	32.96	---	---	Peak
3	10480.00	61.67	-6.63	68.30	47.87	39.57	9.58	35.35	---	---	Peak
4	15720.00	46.91	-7.09	54.00	31.09	38.15	12.48	34.81	---	---	Average
5	15720.00	59.54	-14.46	74.00	43.72	38.15	12.48	34.81	---	---	Peak

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



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT20	Test Freq. (MHz)	5240
N _{TX}	1	Polarization	V

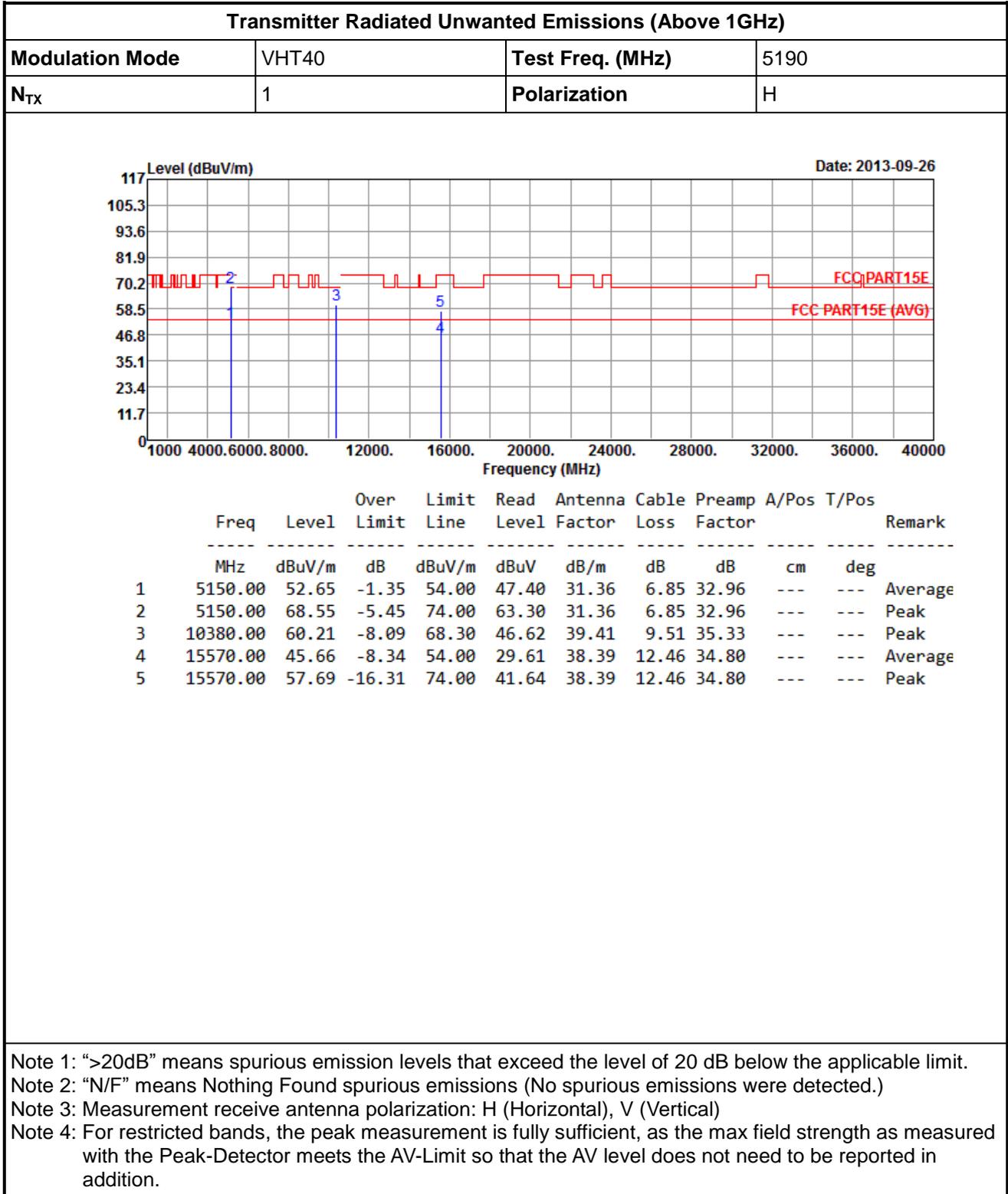


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	46.11	-7.89	54.00	40.86	31.36	6.85	32.96	---	---	Average
2	5150.00	59.45	-14.55	74.00	54.20	31.36	6.85	32.96	---	---	Peak
3	10480.00	65.12	-3.18	68.30	51.32	39.57	9.58	35.35	---	---	Peak
4	15720.00	48.20	-5.80	54.00	32.38	38.15	12.48	34.81	---	---	Average
5	15720.00	61.19	-12.81	74.00	45.37	38.15	12.48	34.81	---	---	Peak

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



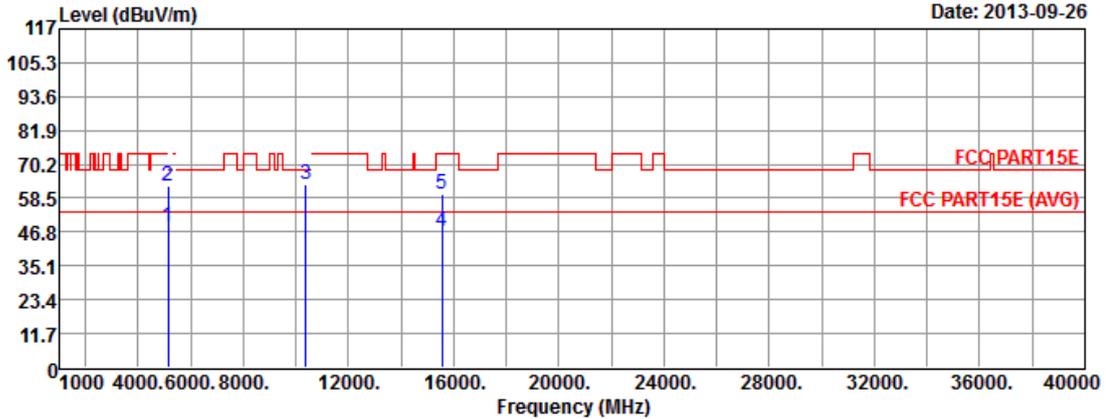
3.6.9 Transmitter Radiated Unwanted Emissions (Above 1GHz) for VHT40





Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT40	Test Freq. (MHz)	5190
N _{TX}	1	Polarization	V



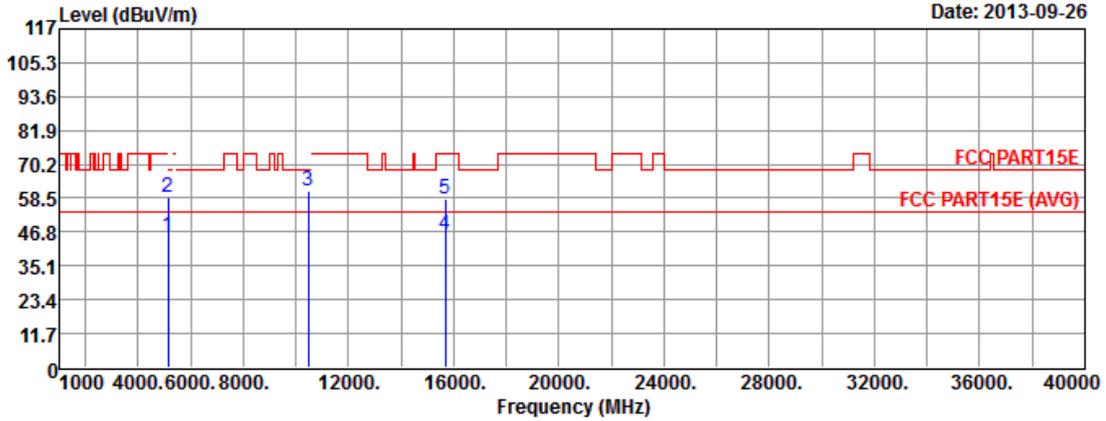
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	48.65	-5.35	54.00	43.40	31.36	6.85	32.96	---	---	Average
2	5150.00	62.55	-11.45	74.00	57.30	31.36	6.85	32.96	---	---	Peak
3	10380.00	63.48	-4.82	68.30	49.89	39.41	9.51	35.33	---	---	Peak
4	15570.00	46.78	-7.22	54.00	30.73	38.39	12.46	34.80	---	---	Average
5	15570.00	59.83	-14.17	74.00	43.78	38.39	12.46	34.80	---	---	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.



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT40	Test Freq. (MHz)	5230
N _{TX}	1	Polarization	H



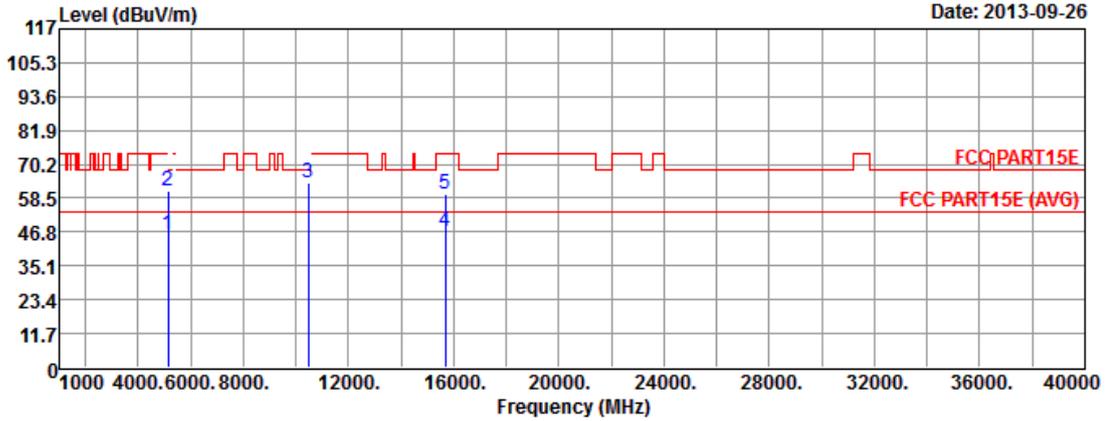
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	45.45	-8.55	54.00	40.20	31.36	6.85	32.96	---	---	Average
2	5150.00	58.95	-15.05	74.00	53.70	31.36	6.85	32.96	---	---	Peak
3	10460.00	60.88	-7.42	68.30	47.13	39.54	9.56	35.35	---	---	Peak
4	15690.00	45.72	-8.28	54.00	29.85	38.20	12.48	34.81	---	---	Average
5	15690.00	58.48	-15.52	74.00	42.61	38.20	12.48	34.81	---	---	Peak

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



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT40	Test Freq. (MHz)	5230
N _{TX}	1	Polarization	V



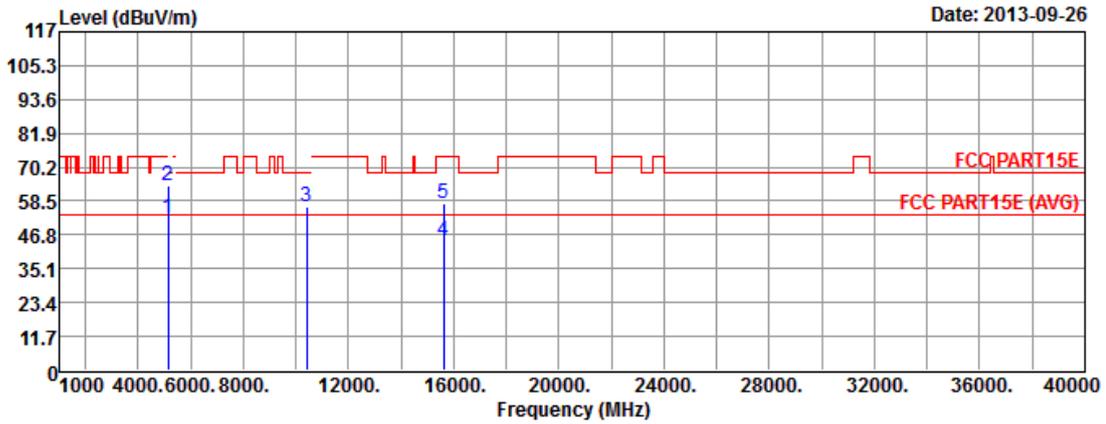
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	45.85	-8.15	54.00	40.60	31.36	6.85	32.96	---	---	Average
2	5150.00	60.75	-13.25	74.00	55.50	31.36	6.85	32.96	---	---	Peak
3	10460.00	64.02	-4.28	68.30	50.27	39.54	9.56	35.35	---	---	Peak
4	15690.00	47.10	-6.90	54.00	31.23	38.20	12.48	34.81	---	---	Average
5	15690.00	60.05	-13.95	74.00	44.18	38.20	12.48	34.81	---	---	Peak

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



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

Transmitter Radiated Unwanted Emissions (Above 1GHz)			
Modulation Mode	VHT80	Test Freq. (MHz)	5210
N _{TX}	1	Polarization	H



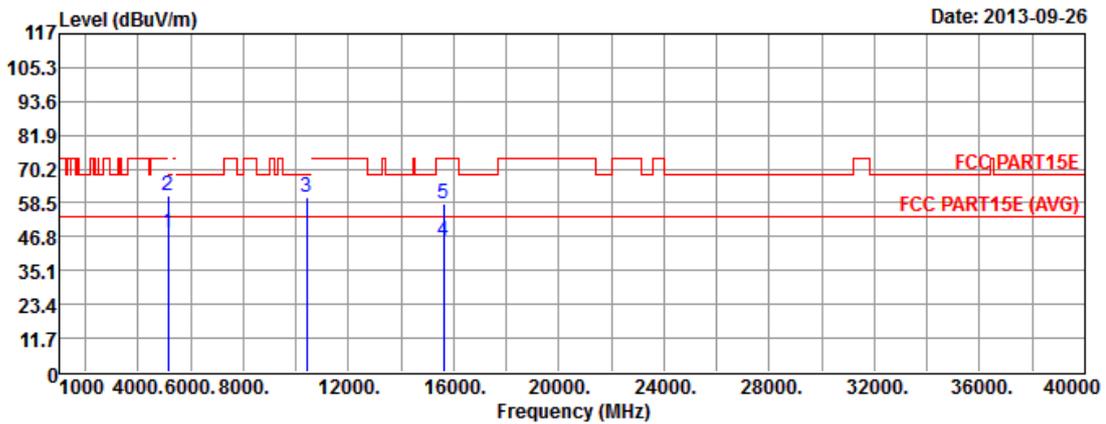
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	52.85	-1.15	54.00	47.60	31.36	6.85	32.96	---	---	Average
2	5150.00	64.05	-9.95	74.00	58.80	31.36	6.85	32.96	---	---	Peak
3	10420.00	56.53	-11.77	68.30	42.86	39.47	9.54	35.34	---	---	Peak
4	15630.00	44.88	-9.12	54.00	28.93	38.29	12.47	34.81	---	---	Average
5	15630.00	57.73	-16.27	74.00	41.78	38.29	12.47	34.81	---	---	Peak

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



Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation Mode	VHT80	Test Freq. (MHz)	5210
N _{TX}	1	Polarization	V



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	5150.00	48.35	-5.65	54.00	43.10	31.36	6.85	32.96	---	---	Average
2	5150.00	60.85	-13.15	74.00	55.60	31.36	6.85	32.96	---	---	Peak
3	10420.00	60.23	-8.07	68.30	46.56	39.47	9.54	35.34	---	---	Peak
4	15630.00	45.42	-8.58	54.00	29.47	38.29	12.47	34.81	---	---	Average
5	15630.00	58.36	-15.64	74.00	42.41	38.29	12.47	34.81	---	---	Peak

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

3.7 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.
LE-LAN Devices	
<input checked="" type="checkbox"/>	N/A
IEEE Std. 802.11n-2009	
<input checked="" type="checkbox"/>	The transmitter center frequency tolerance shall be ± 20 ppm maximum for the 5 GHz band and ± 25 ppm maximum for the 2.4 GHz band.

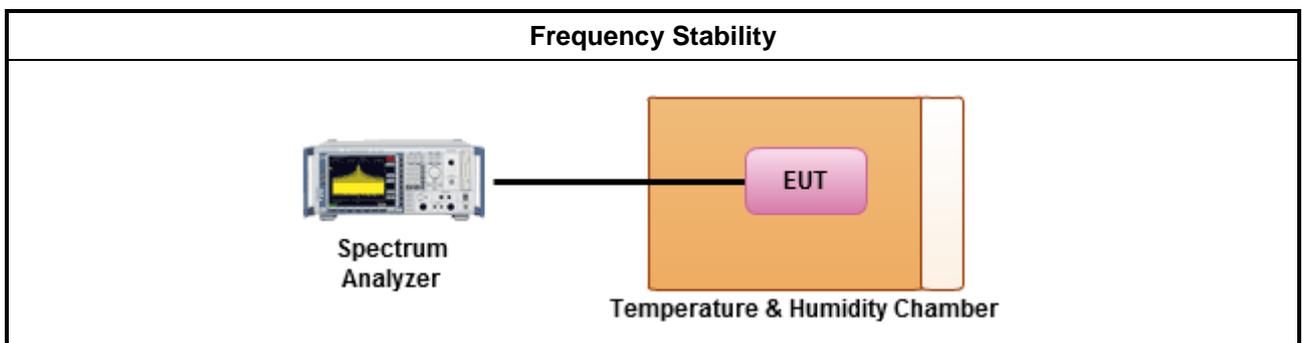
3.7.2 Measuring Instruments

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

3.7.3 Test Procedures

Test Method	
<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

Frequency Stability Result			
Mode		Frequency Stability (ppm)	
Condition	Freq. (MHz)	Test Frequency (MHz)	Frequency Stability (ppm)
T _{20°C} V _{max}	5200	5199.99615	-0.7404
T _{20°C} V _{min}	5200	5200.02699	5.1904
T _{55°C} V _{nom}	5200	5200.02668	5.1308
T _{50°C} V _{nom}	5200	5200.02325	4.4712
T _{40°C} V _{nom}	5200	5199.98357	-3.1596
T _{30°C} V _{nom}	5200	5200.00664	1.2769
T _{20°C} V _{nom}	5200	5200.00608	1.1692
T _{10°C} V _{nom}	5200	5199.99743	-0.4942
T _{0°C} V _{nom}	5200	5200.00215	0.4135
T _{-10°C} V _{nom}	5200	5199.99734	-0.5115
T _{-20°C} V _{nom}	5200	5199.99792	-0.4000
T _{-30°C} V _{nom}	5200	5200.00299	0.5750
Limit (ppm)		20	
Result		Complied	
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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9kHz ~ 2.75GHz	Nov. 14, 2012	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001/004	9kHz ~ 30MHz	Dec. 28, 2012	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001/009	9kHz ~ 30MHz	Jan. 08, 2013	Conduction (CO01-HY)
RF Cable-CON	HUBER+SUHNE R	RG213/U	07611832010001	9kHz ~ 30MHz	Mar. 01, 2013	Conduction (CO01-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV40	101499	9Kz ~ 40GHz	Jan. 28, 2013	Radiation (03CH08-HY)
Receiver	R&S	ESR3	101657	9KHz ~ 3GHz	Jan. 30,2013	Radiation (03CH08-HY)
Amplifier	COM-POWER	PA-103	161241	10MHz ~ 1000MHz	Feb. 26, 2013	Radiation (03CH08-HY)
Amplifier	Agilent	8449B	3008A02665	1GHz ~ 26.5 GHz	Mar 28, 2013	Radiation (03CH08-HY)
Horn Antenna	ETS-LINDGREN	3117	66584	1GHz~18GHz	Apr 29, 2013	Radiation (03CH08-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170517	15GHz~40GHz	Jan. 08, 2013	Radiation (03CH08-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 10, 2013	Radiation (03CH08-HY)

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

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	MITEQ	AMF-7D-001018 00-30-10P	9121372	26.5GHz ~ 40GHz	Feb. 27, 2013	Radiation (03CH08-HY)
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz - 30 MHz	Dec. 02, 2012	Radiation (03CH08-HY)

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



Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSV 40	101063	9KHz~40GHz	Feb. 18, 2013	Conducted (TH01-HY)
Spectrum Analyzer	R&S	FSP 40	100305	9KHz~40GHz	Mar. 20, 2013	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100°C	Nov. 21, 2012	Conducted (TH01-HY)
Signal Generator	R&S	SMB100A	175727	10MHz ~ 40GHz	Jan. 14, 2013	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	0917017	300MHz ~ 40GHz	Feb. 02, 2013	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	0949003	300MHz ~ 40GHz	Feb. 02, 2013	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 21, 2013	Conducted (TH01-HY)
AC Power Source	G.W.	APS-9102	EL920581	AC 0V ~ 300V	Jul. 16, 2013	Conducted (TH01-HY)

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