FCC Radio Test Report

FCC ID: 2ATEYWS7200

This report concerns: Original Grant

Project No.	:	2006C031C
Equipment	:	3000Mbps Wi-Fi 6 Router
Brand Name	:	HUAWEI
Test Model	:	WS7200
Series Model	:	N/A
Applicant	:	Huawei Device Co., Ltd.
Address	:	No.2 of Xincheng Road, Songshan Lake Zone, Dongguan, Guangdong 523808, People's Republic of China
Manufacturer	:	Huawei Device Co., Ltd.
Address	:	No.2 of Xincheng Road, Songshan Lake Zone, Dongguan, Guangdong 523808, People's Republic of China
Date of Receipt	:	Jun. 08, 2020 Jul. 29, 2020 May 17, 2021
Date of Test	:	Jun. 15, 2020 ~ Jul. 08, 2020 Aug. 11, 2020 ~ Sep. 11, 2020 May 17, 2021 ~ May 20, 2021
Issued Date	:	May 21, 2021
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG2020061653 & DG20200810147 & DG202105173 for conducted, DG2020070261& DG20200810152 & DG202105171 for radiated.
Standard(s)	:	FCC Part15, Subpart E(15.407) ANSI C63.10-2013 FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 FCC KDB 662911 D01 Multiple Transmitter Output v02r01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	May 21, 2021

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart E(15.407)				
Standard(s) Section	**Test Item**	**Test Result**	**Judgment**	**Remark**
15.207 15.407(b)	AC Power Line Conducted Emissions	APPENDIX A	PASS	------
15.407(b) 15.205(a) 15.209(a)	Radiated Emissions	APPENDIX B APPENDIX C APPENDIX D	PASS	------
15.407(a) 15.407(e)	Spectrum Bandwidth	APPENDIX E	PASS	------
15.407(a)	Maximum Output Power	APPENDIX F	PASS	------
15.407(a)	Power Spectral Density	APPENDIX G	PASS	------
15.407(g)	Frequency Stability	APPENDIX H	PASS	------
15.203	Antenna Requirements	------	PASS	**NOTE (2)**
15.407(c)	Automatically Discontinue Transmission	------	PASS	**NOTE (3)**

Note:

(1) "N/A" denotes test is not applicable in this test report.

(2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

(3) During no any information transmission, the EUT can automatically discontinue transmission and become standby mode for power saving. the EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.

(4) According to client's specification:

1) Removed the description and data of operation frequency bands UNII-2A and UNII-2C based on report No.: BTL-FCCP-2-2006C031A.

2) The changed data are following detailed table:

Test Item	Maximum Output Power	Power Spectral Density
Test Mode & Test Channel	A Mode (CH149, CH157, CH165) Non Beamforming	A Mode (CH149, CH157, CH165) Non Beamforming
	N20 Mode (CH149, CH157) Non Beamforming	N20 Mode (CH149, CH157) Non Beamforming
	AC20 Mode (CH149, CH157, CH165) Non Beamforming	AC20 Mode (CH149, CH157, CH165) Non Beamforming
	AC80 Mode (CH42, CH155) Non Beamforming	AC80 Mode (CH42, CH155) Non Beamforming
	AX20 Mode_242 Tone (CH149, CH157, CH165) Non Beamforming	AX20 Mode_242 Tone (CH149, CH157, CH165) Non Beamforming
	AX80 Mode_242 Tone (CH42) Non Beamforming	AX80 Mode_242 Tone (CH42) Non Beamforming
	AC20 Mode (CH149, CH157, CH165) Beamforming	-
	AX20 Mode_242 Tone (CH149, CH157, CH165) Beamforming	-

Except above changes, other test data are kept the same with report No.: BTL-FCCP-2-2006C031A.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.
BTL's Test Firm Registration Number for FCC: 357015
BTL's Designation Number for FCC: CN1240

1.2 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))
The BTL measurement uncertainty as below table:

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U, (dB)
DG-C02	CISPR	150kHz ~ 30MHz	2.60

B. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	9kHz ~ 30MHz	V	3.79
		9kHz ~ 30MHz	H	3.57
		30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80
		1GHz ~ 6GHz	-	4.58
		6GHz ~ 18GHz	-	5.18
		18GHz ~ 26.5GHz	-	3.62
		26.5GHz ~ 40GHz	-	4.00

C. Other Measurement:

Parameter	Uncertainty
Spectrum Bandwidth	±3.8 %
Maximum Output Power	±0.95 dB
Power Spectral Density	±0.86 dB
Frequency Stability	±0.16 dB
Temperature	±0.08 °C
Time	±0.58 %
Supply voltages	±0.3 %

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
AC Power Line Conducted Emissions	25°C	3%	AC 120V/60Hz	Kwok Guo
Radiated Emissions-9K-30MHz	25°C	0%	AC 120V/60Hz	Kwok Guo
Radiated Emissions-30 MHz to 1GHz	25°C	60%	AC 120V/60Hz	Kwok Guo
Radiated Emissions-Above 1000 MHz	22°C	54%	AC 120V/60Hz	Kwok Guo
Spectrum Bandwidth	27°C	52%	DC 12V	Hayden Chen
Maximum Output Power	27°C	52%	DC 12V	Laughing Zhang
Power Spectral Density	27°C	52%	DC 12V	Hayden Chen
Frequency Stability	Normal & Extreme	52%	Normal & Extreme	Hayden Chen

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	3000Mbps Wi-Fi 6 Router
Brand Name	HUAWEI
Test Model	WS7200
Series Model	N/A
Model Difference(s)	N/A
Hardware Version	AM1WS7200M
Software Version	10.0.5.28
Power Source	DC voltage supplied from AC adapter. Brand: FUHUA, HONOR Model: HW-120200E01, HW-120200B01, HW-120200U01
Power Rating	I/P: 100-240V ~50/60Hz, 0.8A O/P: 12V ⎓ 2A
Operation Frequency Bands	UNII-1: 5150 MHz~5250 MHz UNII-3: 5725 MHz~5850 MHz
Modulation Type	IEEE 802.11a/n/ac: OFDM IEEE 802.11ax: OFDMA
Bit Rate of Transmitter	IEEE 802.11a: 54/48/36/24/18/12/9/6 Mbps IEEE 802.11n: up to 300 Mbps IEEE 802.11ac: up to 1733.4 Mbps IEEE 802.11ax: up to 2402 Mbps
Maximum Output Power _UNII-1 Non Beamforming	IEEE 802.11a: 19.34 dBm (0.0859 W) IEEE 802.11n (HT20): 19.13 dBm (0.0817 W) IEEE 802.11n (HT40): 17.55 dBm (0.0569 W) IEEE 802.11ac (VHT20): 19.34 dBm (0.0859 W) IEEE 802.11ac (VHT40): 17.64 dBm (0.0581 W) IEEE 802.11ac (VHT80): 11.84 dBm (0.0153 W) IEEE 802.11ax (HEW20)_26 Tone: 15.06 dBm (0.0321 W) IEEE 802.11ax (HEW20)_52 Tone: 17.01 dBm (0.0502 W) IEEE 802.11ax (HEW20)_106 Tone: 18.12 dBm (0.0649 W) IEEE 802.11ax (HEW20)_242 Tone: 19.00 dBm (0.0794 W) IEEE 802.11ax (HEW40)_26 Tone: 13.22 dBm (0.0210 W) IEEE 802.11ax (HEW40)_52 Tone: 13.79 dBm (0.0239 W) IEEE 802.11ax (HEW40)_106 Tone: 15.25 dBm (0.0335 W) IEEE 802.11ax (HEW40)_242 Tone: 16.54 dBm (0.0451 W) IEEE 802.11ax (HEW40)_484 Tone: 17.36 dBm (0.0545 W) IEEE 802.11ax (HEW80)_52 Tone: 7.34 dBm (0.0054 W) IEEE 802.11ax (HEW80)_106 Tone: 7.17 dBm (0.0052 W) IEEE 802.11ax (HEW80)_242 Tone: 9.73 dBm (0.0094 W) IEEE 802.11ax (HEW80)_484 Tone: 11.44 dBm (0.0139 W) IEEE 802.11ax (HEW80)_996 Tone: 11.84 dBm (0.0153 W)

Maximum Output Power _UNII-3 Non Beamforming	IEEE 802.11a: 23.37 dBm (0.2173 W) IEEE 802.11n (HT20): 23.37 dBm (0.2173 W) IEEE 802.11n (HT40): 22.26 dBm (0.1683 W) IEEE 802.11ac (VHT20): 22.92 dBm (0.1959 W) IEEE 802.11ac (VHT40): 21.59 dBm (0.1442 W) IEEE 802.11ac (VHT80): 20.82 dBm (0.1208 W) IEEE 802.11ax (HEW20)_26 Tone: 18.40 dBm (0.0692 W) IEEE 802.11ax (HEW20)_52 Tone: 20.49 dBm (0.1119 W) IEEE 802.11ax (HEW20)_106 Tone: 23.17 dBm (0.2075 W) IEEE 802.11ax (HEW20)_242 Tone: 23.16 dBm (0.2070 W) IEEE 802.11ax (HEW40)_26 Tone: 17.05 dBm (0.0507 W) IEEE 802.11ax (HEW40)_52 Tone: 17.83 dBm (0.0607 W) IEEE 802.11ax (HEW40)_106 Tone: 19.42 dBm (0.0875 W) IEEE 802.11ax (HEW40)_242 Tone: 20.54 dBm (0.1132 W) IEEE 802.11ax (HEW40)_484 Tone: 21.47 dBm (0.1403 W) IEEE 802.11ax (HEW80)_52 Tone: 17.74 dBm (0.0594 W) IEEE 802.11ax (HEW80)_106 Tone: 17.67 dBm (0.0585 W) IEEE 802.11ax (HEW80)_242 Tone: 19.82 dBm (0.0959 W) IEEE 802.11ax (HEW80)_484 Tone: 20.17 dBm (0.1040 W) IEEE 802.11ax (HEW80)_996 Tone: 21.29 dBm (0.1346 W)
Maximum Output Power _UNII-1 Beamforming	IEEE 802.11ac (VHT20): 18.86 dBm (0.0769 W) IEEE 802.11ac (VHT40): 16.88 dBm (0.0488 W) IEEE 802.11ac (VHT80): 12.01 dBm (0.0159 W) IEEE 802.11ax (HEW20)_242 Tone: 18.94 dBm (0.0783 W) IEEE 802.11ax (HEW40)_484 Tone: 17.12 dBm (0.0515 W) IEEE 802.11ax (HEW80)_996 Tone: 12.35 dBm (0.0172 W)
Maximum Output Power _UNII-3 Beamforming	IEEE 802.11ac (VHT20): 22.53 dBm (0.1791 W) IEEE 802.11ac (VHT40): 21.07 dBm (0.1279 W) IEEE 802.11ac (VHT80): 21.00 dBm (0.1259 W) IEEE 802.11ax (HEW20)_242 Tone: 22.59 dBm (0.1816 W) IEEE 802.11ax (HEW40)_484 Tone: 21.29 dBm (0.1346 W) IEEE 802.11ax (HEW80)_996 Tone: 21.28 dBm (0.1343 W)

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
UNII-1		UNII-1		UNII-1	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230		
44	5220				
48	5240				

IEEE 802.11a IEEE 802.11n (HT20) IEEE 802.11ac (VHT20) IEEE 802.11ax (HEW20)		IEEE 802.11n (HT40) IEEE 802.11ac (VHT40) IEEE 802.11ax (HEW40)		IEEE 802.11ac (VHT80) IEEE 802.11ax (HEW80)	
UNII-3		UNII-3		UNII-3	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
149	5745	151	5755	155	5775
153	5765	159	5795		
157	5785				
161	5805				
165	5825				

3. RU Configuration:

Operating Mode	Resource Unit	26 Tone(2M)
IEEE 802.11ax(HEW20)	Specific Resource Unit	0
		1
		2
		3
		4
		5
		6
		7
		8
	Resource Unit	52 Tone(4M)
	Specific Resource Unit	37
		38
		39
		40
	Resource Unit	106 Tone(8M)
	Specific Resource Unit	53
		54
	Resource Unit	242 Tone(20M)
	Specific Resource Unit	61

Operating Mode	Resource Unit	26 Tone(2M)	
IEEE 802.11ax(HEW40)	Specific Resource Unit	0	9
		1	10
		2	11
		3	12
		4	13
		5	14
		6	15
		7	16
		8	17
	Resource Unit	52 Tone(4M)	
	Specific Resource Unit	37	41
		38	42
		39	43
		40	44
	Resource Unit	106 Tone(8M)	
	Specific Resource Unit	53	55
		54	56
	Resource Unit	242 Tone(20M)	
	Specific Resource Unit	61	62
	Resource Unit	484 Tone(40M)	
	Specific Resource Unit	65	

Operating Mode	Resource Unit	52 Tone(4M)			
IEEE 802.11ax(HEW80)	Specific Resource Unit	37	41	45	49
		38	42	46	50
		39	43	47	51
		40	44	48	52
	Resource Unit	106 Tone(8M)			
	Specific Resource Unit	53	55	57	59
		54	56	58	60
	Resource Unit	242 Tone(20M)			
	Specific Resource Unit	61	62	63	64
	Resource Unit	484 Tone(40M)			
	Specific Resource Unit	65		66	
	Resource Unit	996 Tone(80M)			
	Specific Resource Unit	67			

Note:
In an HE MU PPDU, at least N x 4 x 26 subcarriers (contiguous or non-contiguous) shall be occupied throughout the signaled BW, where N is the number of 20 MHz subchannels occupied by non-HE portions of the HE PPDU preamble.

4. Antenna Specification:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	External	N/A	5.5
2	N/A	N/A	External	N/A	5.5

Note:
1) This EUT supports CDD and MIMO, any transmit signals are uncorrelated with each other. So the Directional gain = Antenna Gain = 5.5 dBi.
2) Beamforming Gain: 0.1 dB. So the Directional gain = 0.1+5.5=5.6dB.

5. Table for Antenna Configuration:

Non Beamforming:

Operating Mode / TX Mode	1TX	2TX
IEEE 802.11a	V (SISO 1 / SISO 2)	V (CDD)
IEEE 802.11n(HT20)	V (SISO 1 / SISO 2)	V (MIMO)
IEEE 802.11n(HT40)	V (SISO 1 / SISO 2)	V (MIMO)
IEEE 802.11ac(VHT20)	V (SISO 1 / SISO 2)	V (MIMO)
IEEE 802.11ac(VHT40)	V (SISO 1 / SISO 2)	V (MIMO)
IEEE 802.11ac(VHT80)	V (SISO 1 / SISO 2)	V (MIMO)
IEEE 802.11ax(HEW20)	V (SISO 1 / SISO 2)	V (MIMO)
IEEE 802.11ax(HEW40)	V (SISO 1 / SISO 2)	V (MIMO)
IEEE 802.11ax(HEW80)	V (SISO 1 / SISO 2)	V (MIMO)

Beamforming:

Operating Mode / TX Mode	2TX
IEEE 802.11ac(VHT20)	V (MIMO)
IEEE 802.11ac(VHT40)	V (MIMO)
IEEE 802.11ac(VHT80)	V (MIMO)
IEEE 802.11ax(HEW20)	V (MIMO)
IEEE 802.11ax(HEW40)	V (MIMO)
IEEE 802.11ax(HEW80)	V (MIMO)

2.2 TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)
Mode 2	TX A Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 3	TX N (HT20) Mode / CH36, CH40, CH48 (UNII-1)
Mode 4	TX N (HT20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 5	TX N (HT40) Mode / CH38, CH46 (UNII-1)
Mode 6	TX AC (VHT20) Mode / CH36, CH40, CH48 (UNII-1)
Mode 7	TX AC (VHT20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 8	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)
Mode 9	TX AC (VHT80) Mode / CH42 (UNII-1)
Mode 10	TX AX (HEW20) Mode / CH36, CH40, CH48 (UNII-1)
Mode 11	TX AX (HEW20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 12	TX AX (HEW40) Mode / CH38, CH46 (UNII-1)
Mode 13	TX AX (HEW80) Mode / CH42 (UNII-1)
Mode 14	TX A Mode / CH149,CH157,CH165 (UNII-3)
Mode 15	TX N (HT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 16	TX N (HT40) Mode / CH151,CH159 (UNII-3)
Mode 17	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 18	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)
Mode 19	TX AC (VHT80) Mode / CH155 (UNII-3)
Mode 20	TX AX (HEW20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 21	TX AX (HEW40) Mode / CH151,CH159 (UNII-3)
Mode 22	TX AX (HEW80) Mode / CH155 (UNII-3)
Mode 23	TX AX (HEW20) Mode / CH149 (UNII-3)

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

AC power line conducted emissions test	
Final Test Mode	Description
Mode 23	TX AX (HEW20) Mode / CH149 (UNII-3)

Radiated emissions test - Below 1GHz	
Final Test Mode	Description
Mode 23	TX AX (HEW20) Mode / CH149 (UNII-3)

Radiated emissions test	
Final Test Mode	Description
Mode 2	TX A Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 4	TX N (HT20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 5	TX N (HT40) Mode / CH38, CH46 (UNII-1)
Mode 7	TX AC (VHT20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 8	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)
Mode 9	TX AC (VHT80) Mode / CH42 (UNII-1)
Mode 11	TX AX (HEW20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 12	TX AX (HEW40) Mode / CH38, CH46 (UNII-1)
Mode 13	TX AX (HEW80) Mode / CH42 (UNII-1)
Mode 14	TX A Mode / CH149,CH157,CH165 (UNII-3)
Mode 15	TX N (HT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 16	TX N (HT40) Mode / CH151,CH159 (UNII-3)
Mode 17	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 18	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)
Mode 19	TX AC (VHT80) Mode / CH155 (UNII-3)
Mode 20	TX AX (HEW20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 21	TX AX (HEW40) Mode / CH151,CH159 (UNII-3)
Mode 22	TX AX (HEW80) Mode / CH155 (UNII-3)

Maximun Output Power test_Non Beamforming	
Final Test Mode	Description
Mode 2	TX A Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 4	TX N (HT20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 5	TX N (HT40) Mode / CH38, CH46 (UNII-1)
Mode 7	TX AC (VHT20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 8	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)
Mode 9	TX AC (VHT80) Mode / CH42 (UNII-1)
Mode 11	TX AX (HEW20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 12	TX AX (HEW40) Mode / CH38, CH46 (UNII-1)
Mode 13	TX AX (HEW80) Mode / CH42 (UNII-1)
Mode 14	TX A Mode / CH149,CH157,CH165 (UNII-3)
Mode 15	TX N (HT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 16	TX N (HT40) Mode / CH151,CH159 (UNII-3)
Mode 17	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 18	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)
Mode 19	TX AC (VHT80) Mode / CH155 (UNII-3)
Mode 20	TX AX (HEW20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 21	TX AX (HEW40) Mode / CH151,CH159 (UNII-3)
Mode 22	TX AX (HEW80) Mode / CH155 (UNII-3)

Maximum Output Power test_Beamforming	
Final Test Mode	Description
Mode 7	TX AC (VHT20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 8	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)
Mode 9	TX AC (VHT80) Mode / CH42 (UNII-1)
Mode 11	TX AX (HEW20) Mode / CH36, CH40, CH44, CH48 (UNII-1)
Mode 12	TX AX (HEW40) Mode / CH38, CH46 (UNII-1)
Mode 13	TX AX (HEW80) Mode / CH42 (UNII-1)
Mode 17	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 18	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)
Mode 19	TX AC (VHT80) Mode / CH155 (UNII-3)
Mode 20	TX AX (HEW20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 21	TX AX (HEW40) Mode / CH151,CH159 (UNII-3)
Mode 22	TX AX (HEW80) Mode / CH155 (UNII-3)

Other Conducted test	
Final Test Mode	Description
Mode 1	TX A Mode / CH36, CH40, CH48 (UNII-1)
Mode 3	TX N (HT20) Mode / CH36, CH40, CH48 (UNII-1)
Mode 5	TX N (HT40) Mode / CH38, CH46 (UNII-1)
Mode 6	TX AC (VHT20) Mode / CH36, CH40, CH48 (UNII-1)
Mode 8	TX AC (VHT40) Mode / CH38, CH46 (UNII-1)
Mode 9	TX AC (VHT80) Mode / CH42 (UNII-1)
Mode 10	TX AX (HEW20) Mode / CH36, CH40, CH48 (UNII-1)
Mode 12	TX AX (HEW40) Mode / CH38, CH46 (UNII-1)
Mode 13	TX AX (HEW80) Mode / CH42 (UNII-1)
Mode 14	TX A Mode / CH149,CH157,CH165 (UNII-3)
Mode 15	TX N (HT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 16	TX N (HT40) Mode / CH151,CH159 (UNII-3)
Mode 17	TX AC (VHT20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 18	TX AC (VHT40) Mode / CH151,CH159 (UNII-3)
Mode 19	TX AC (VHT80) Mode / CH155 (UNII-3)
Mode 20	TX AX (HEW20) Mode / CH149,CH157,CH165 (UNII-3)
Mode 21	TX AX (HEW40) Mode / CH151,CH159 (UNII-3)
Mode 22	TX AX (HEW80) Mode / CH155 (UNII-3)

Note:
(1) For radiated emission below 1 GHz test, the IEEE 802.11ax20 channel 149 is found to be the worst case and recorded.
(2) For conducted emissions and radiated spurious emissions below 1 GHz test, all adapters had been pre-tested and in this report only recorded the worst case.
(3) The measurements for Output Power were tested, the Non Beamforming and Beamforming are recorded in the report. The worst case was Non Beamforming and only worst case were documented for other test items.
(4) All the bit rate of transmitter have been tested and found the lowest rate is found to be the worst case and recorded.

2.3 PARAMETERS OF TEST SOFTWARE

Non Beamforming

UNII-1				
Test Software	IPOP			
Test Frequency (MHz)	5180	5200	5220	5240
IEEE 802.11a_MIMO	Default	Default	Default	Default
IEEE 802.11n (HT20) _MIMO	Default	Default	Default	Default
IEEE 802.11ac (VHT20) _MIMO	Default	Default	Default	Default
IEEE 802.11ax (HEW20) _MIMO	Default	Default	Default	Default
Test Frequency (MHz)	5190	5230		
IEEE 802.11n (HT40) _MIMO	Default	Default		
IEEE 802.11ac (VHT40) _MIMO	Default	Default		
IEEE 802.11ax (HEW40) _MIMO	Default	Default		
Test Frequency (MHz)	5210			
IEEE 802.11ac (VHT80) _MIMO	Default			
IEEE 802.11ax (HEW80) _MIMO	Default			

UNII-3			
Test Software	IPOP		
Test Frequency (MHz)	5745	5785	5825
IEEE 802.11a_MIMO	Default	Default	Default
IEEE 802.11n (HT20) _MIMO	Default	Default	Default
IEEE 802.11ac (VHT20) _MIMO	Default	Default	Default
IEEE 802.11ax (HEW20) _MIMO	Default	Default	Default
Test Frequency (MHz)	5755	5795	
IEEE 802.11n (HT40) _MIMO	Default	Default	
IEEE 802.11ac (VHT40) _MIMO	Default	Default	
IEEE 802.11ax (HEW40) _MIMO	Default	Default	
Test Frequency (MHz)	5775		
IEEE 802.11ac (VHT80) _MIMO	Default		
IEEE 802.11ax (HEW80) _MIMO	Default		

Beamforming

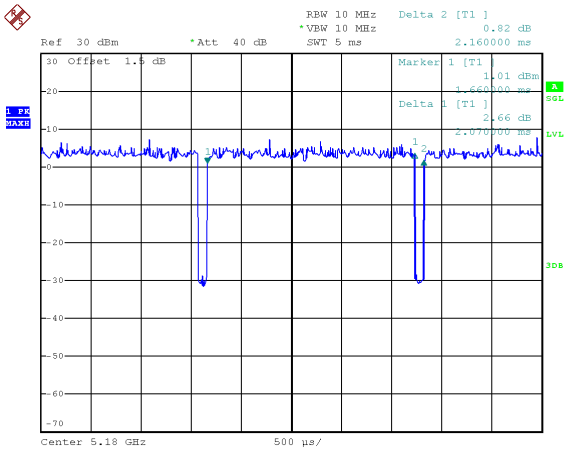
UNII-1				
Test Software	IPOP			
Test Frequency (MHz)	5180	5200	5220	5240
IEEE 802.11ac (VHT20)_MIMO	Default	Default	Default	Default
IEEE 802.11ax (HEW20)_MIMO	Default	Default	Default	Default
Test Frequency (MHz)	5190	5230		
IEEE 802.11ac (VHT40) _MIMO	Default	Default		
IEEE 802.11ax (HEW40) _MIMO	Default	Default		
Test Frequency (MHz)	5210			
IEEE 802.11ac (VHT80) _MIMO	Default			
IEEE 802.11ax (HEW80) _MIMO	Default			

UNII-3			
Test Software	IPOP		
Test Frequency (MHz)	5745	5785	5825
IEEE 802.11ac (VHT20) _MIMO	Default	Default	Default
IEEE 802.11ax (HEW20) _MIMO	Default	Default	Default
Test Frequency (MHz)	5755	5795	
IEEE 802.11ac (VHT40) _MIMO	Default	Default	
IEEE 802.11ax (HEW40) _MIMO	Default	Default	
Test Frequency (MHz)	5775		
IEEE 802.11ac (VHT80) _MIMO	Default		
IEEE 802.11ax (HEW80) _MIMO	Default		

2.4 DUTY CYCLE

If duty cycle is ≥ 98 %, duty factor is not required.
If duty cycle is < 98 %, duty factor shall be considered.
The output power = measured power + duty factor.
The power spectral density = measured power spectral density + duty factor.

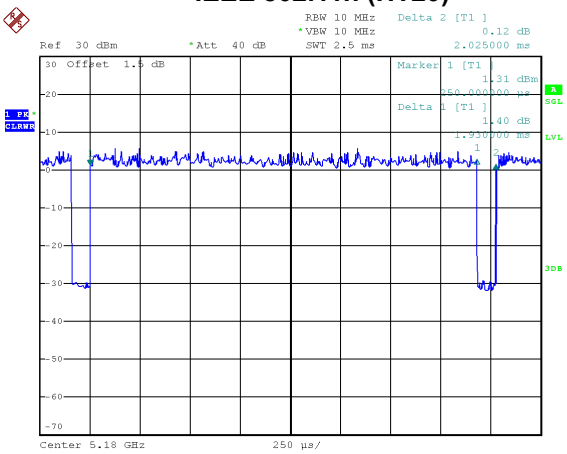
IEEE 802.11a



Date: 23.JUN.2020 21:32:06

Duty cycle = 2.070 ms / 2.160 ms = 95.83%
Duty Factor = 10 log(1 / Duty cycle) = 0.18

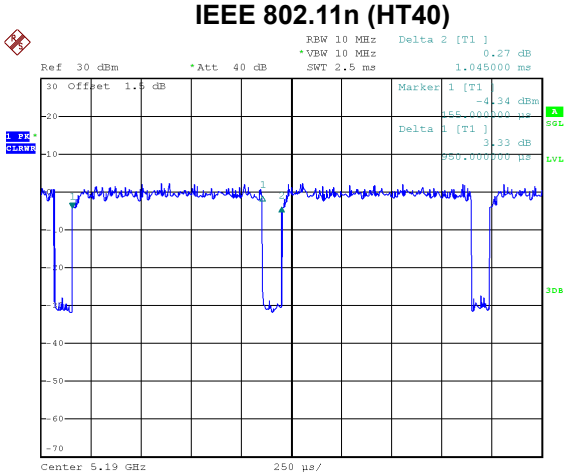
IEEE 802.11n (HT20)



Date: 23.JUN.2020 21:33:31

Duty cycle = 1.930 ms / 2.025 ms = 95.31%
Duty Factor = 10 log(1 / Duty cycle) = 0.21

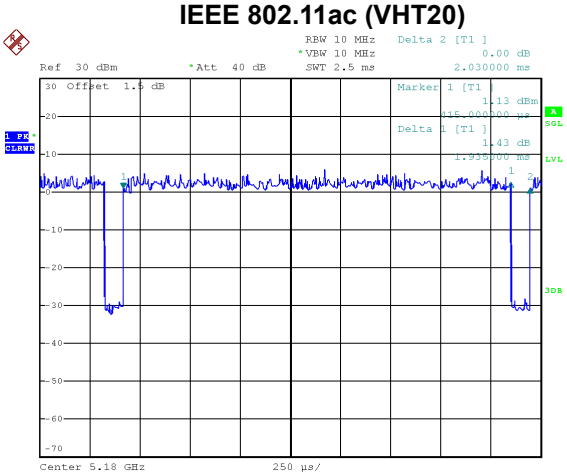
IEEE 802.11n (HT40)



Date: 23.JUN.2020 21:38:52

Duty cycle = 0.950 ms / 1.045 ms = 90.91%
Duty Factor = 10 log(1 / Duty cycle) = 0.41

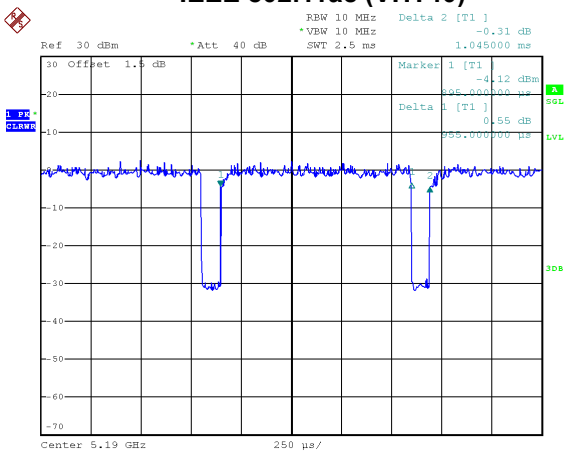
IEEE 802.11ac (VHT20)



Date: 23.JUN.2020 21:35:44

Duty cycle = 1.935 ms / 2.030 ms = 95.32%
Duty Factor = 10 log(1 / Duty cycle) = 0.21

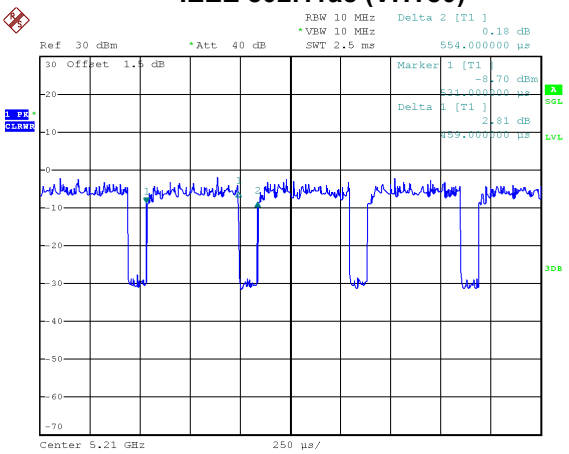
IEEE 802.11ac (VHT40)



Date: 23.JUN.2020 21:40:23

Duty cycle = 0.955 ms / 1.045 ms = 91.39%
Duty Factor = 10 log(1 / Duty cycle) = 0.39

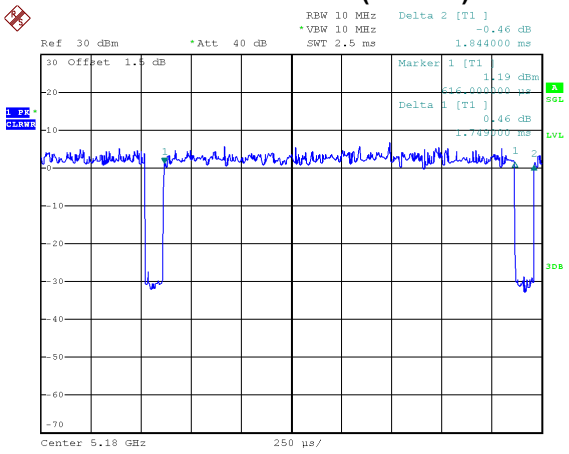
IEEE 802.11ac (VHT80)



Date: 23.JUN.2020 21:43:16

Duty cycle = 0.459 ms / 0.554 ms = 82.85%
Duty Factor = 10 log(1 / Duty cycle) = 0.82

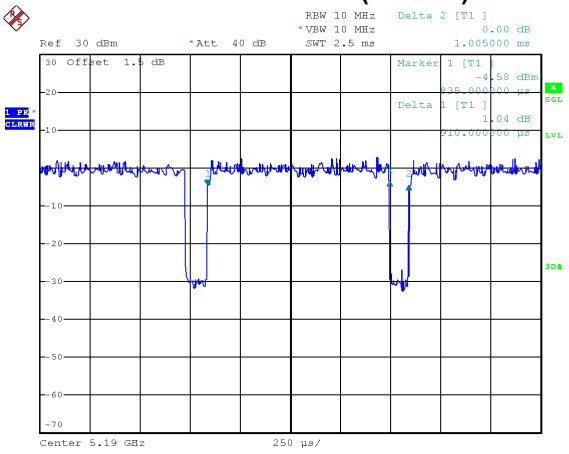
IEEE 802.11ax (HEW20)



Date: 23.JUN.2020 21:37:10

Duty cycle = 1.749 ms / 1.844 ms = 94.85%
Duty Factor = 10 log(1 / Duty cycle) = 0.23

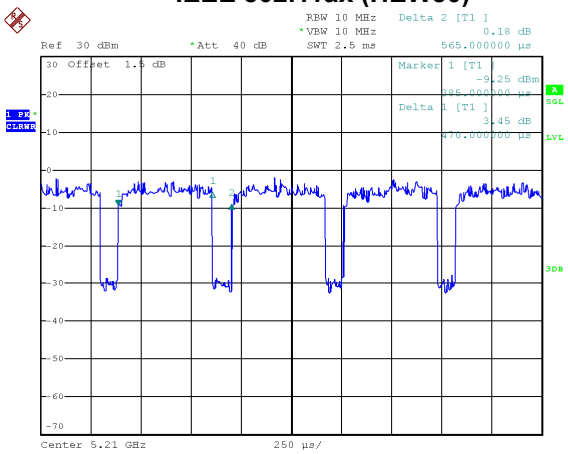
IEEE 802.11ax (HEW40)



Date: 23.JUN.2020 21:41:33

Duty cycle = 0.910 ms / 1.005 ms = 90.55%
Duty Factor = 10 log(1 / Duty cycle) = 0.43

IEEE 802.11ax (HEW80)



Duty cycle = 0.470 ms / 0.565 ms = 83.19%
Duty Factor = 10 log(1 / Duty cycle) = 0.80

NOTE:
For IEEE 802.11a:
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 483 Hz (Duty cycle < 98%).

For IEEE 802.11n(HT20):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 518 Hz (Duty cycle < 98%).

For IEEE 802.11n(HT40):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1053 Hz (Duty cycle < 98%).

For IEEE 802.11ac(VHT20):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 517 Hz (Duty cycle < 98%).

For IEEE 802.11ac(VHT40):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1047 Hz (Duty cycle < 98%).

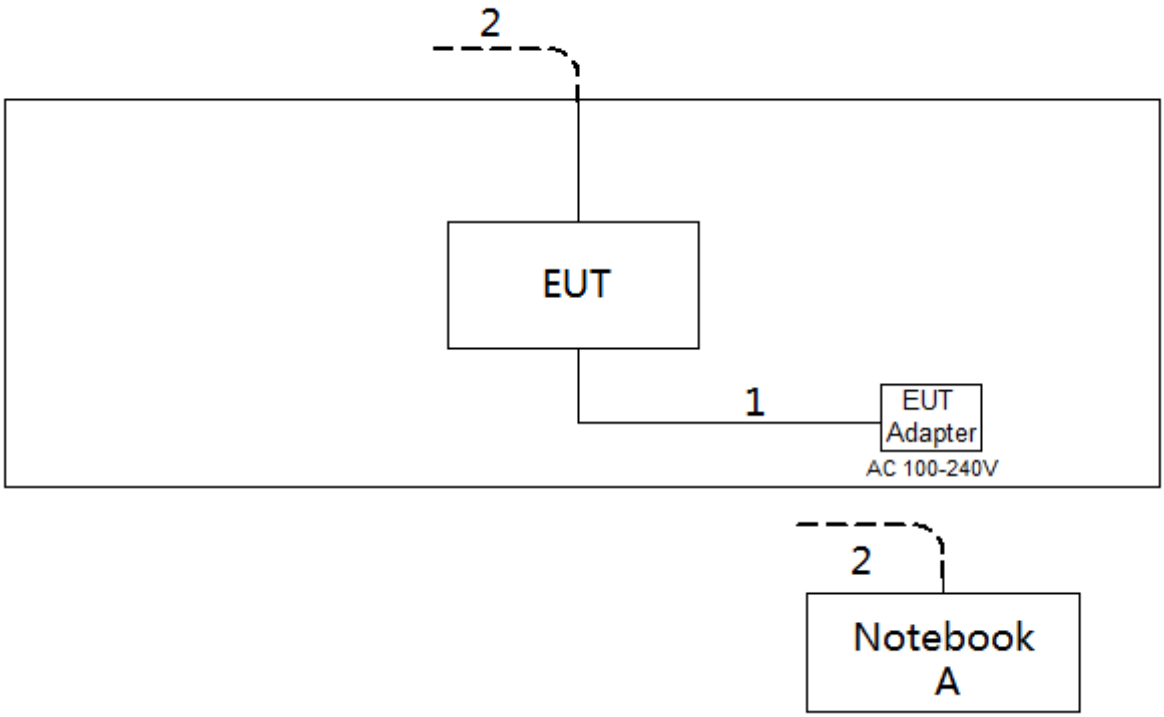
For IEEE 802.11ac(VHT80):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 2179 Hz (Duty cycle < 98%).

For IEEE 802.11ax(HE20):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 572 Hz (Duty cycle < 98%).

For IEEE 802.11ax(HE40):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1099 Hz (Duty cycle < 98%).

For IEEE 802.11ax(HE80):
For radiated emissions frequency above 1 GHz, the resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 2128 Hz (Duty cycle < 98%).

2.5 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.6 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.
A	Notebook	Dell	Inspiron 15-7559	N/A

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	1.5m
2	RJ45 Cable	NO	NO	10m

3. AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
□.15 - 0.5	66 to 56*	56 to 46*
0.5 □ 5.0	56	46
5.0 - 30.0	60	50

NOTE:
(1) The tighter limit applies at the band edges.
(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

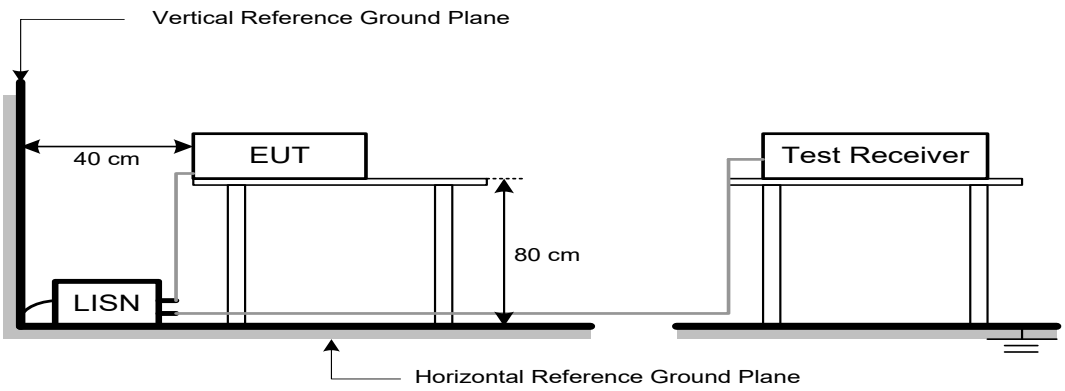
3.2 TEST PROCEDURE

a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item -EUT Test Photos.

3.3 DEVIATION FROM TEST STANDARD

No deviation

3.4 TEST SETUP



3.5 EUT OPERATION CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.
The EUT was programmed to be in continuously transmitting/TX mode.

3.6 TEST RESULTS

Please refer to the APPENDIX A.

4. RADIATED EMISSIONS TEST

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

LIMITS OF UNWANTED EMISSION OUT OF THE RESTRICTED BANDS

Frequency (MHz)	EIRP Limit (dBm/MHz)	Band edge at 3m (dBμV/m)	Harmonic at 1.5m (dBμV/m)
5150-5250	-27	68.3	74.3 (Note 3)
5250-5350	-27	68.3	74.3 (Note 3)
5470-5725	-27	68.3	74.3 (Note 3)
5725-5850	-27 NOTE (2)	68.3	74.3 (Note 3)
	10 NOTE (2)	105.3	111.3(Note 3)
	15.6 NOTE (2)	110.9	116.9(Note 3)
	27 NOTE (2)	122.3	128.3(Note 3)

NOTE:

(1) The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

(2) According to 15.407(b)(4)(i), all emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(3)

$$FS_{\text{limit}} = FS_{\max} - 20\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

20log d limit/d measure=20log 3/1.5=6 dB.

4.2 TEST PROCEDURE

a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance of 3 m or 1.5m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
c. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn‘t perform. (below 1 GHz)
h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn‘t perform. (above 1 GHz)
i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

The following table is the setting of the receiver:

Spectrum Parameters	Setting
Start ~ Stop Frequency	9 kHz~150 kHz for RBW 200 Hz, VBW 1 kHz
Start ~ Stop Frequency	0.15 MHz~30 MHz for RBW 9 kHz, VBW 30 kHz
Start ~ Stop Frequency	30 MHz~1000 MHz for RBW 100 kHz, VBW 300 kHz

Spectrum Parameters	Setting
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic or 40 GHz, whichever is lower
RBW / VBW (Emission in restricted band)	1 MHz / 3 MHz for PK value 1 MHz / 1/T Hz for AVG value

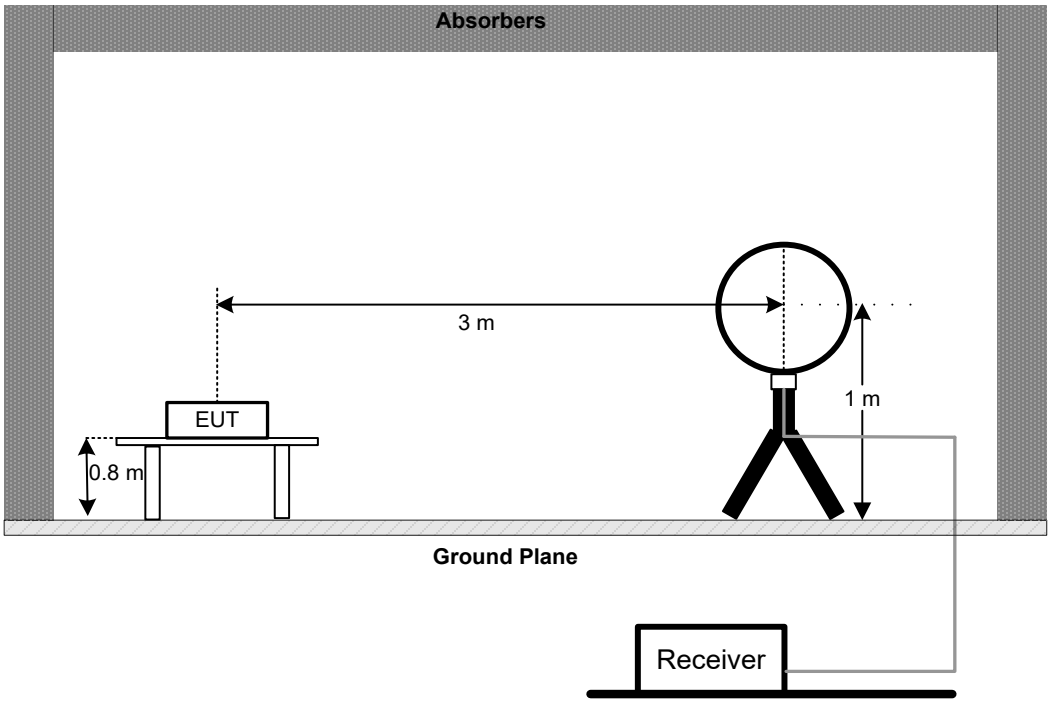
Receiver Parameters	Setting
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector
Start ~ Stop Frequency	1 GHz~40 GHz for PK/AVG detector

4.3 DEVIATION FROM TEST STANDARD

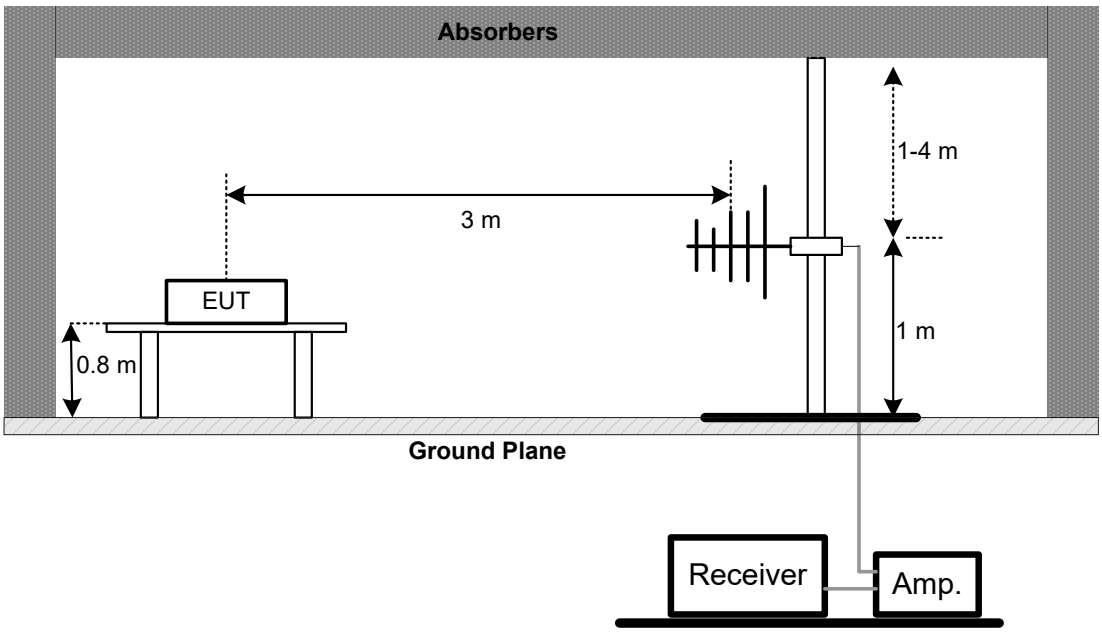
No deviation

4.4 TEST SETUP

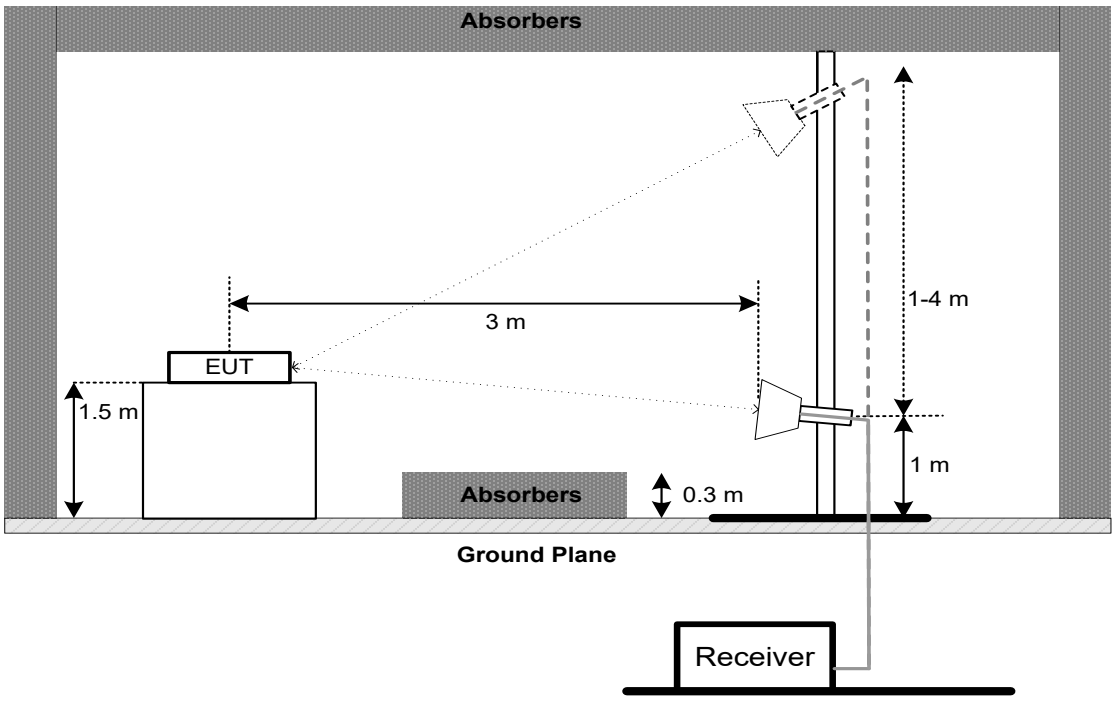
9 kHz to 30 MHz



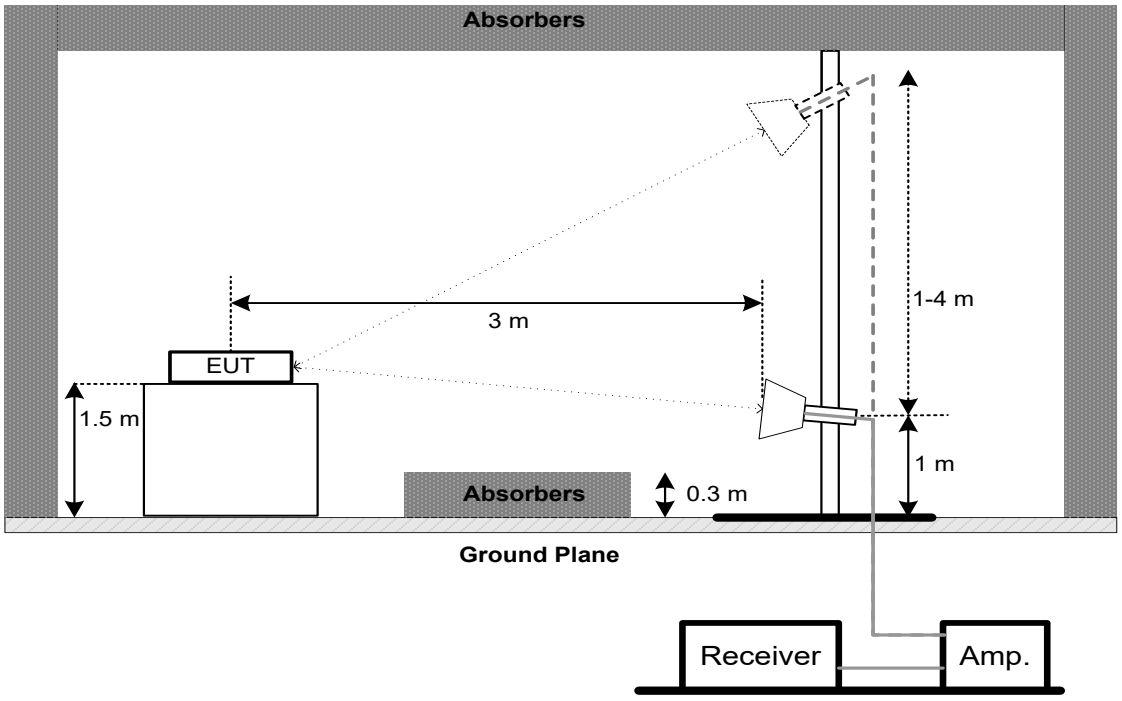
30 MHz to 1 GHz



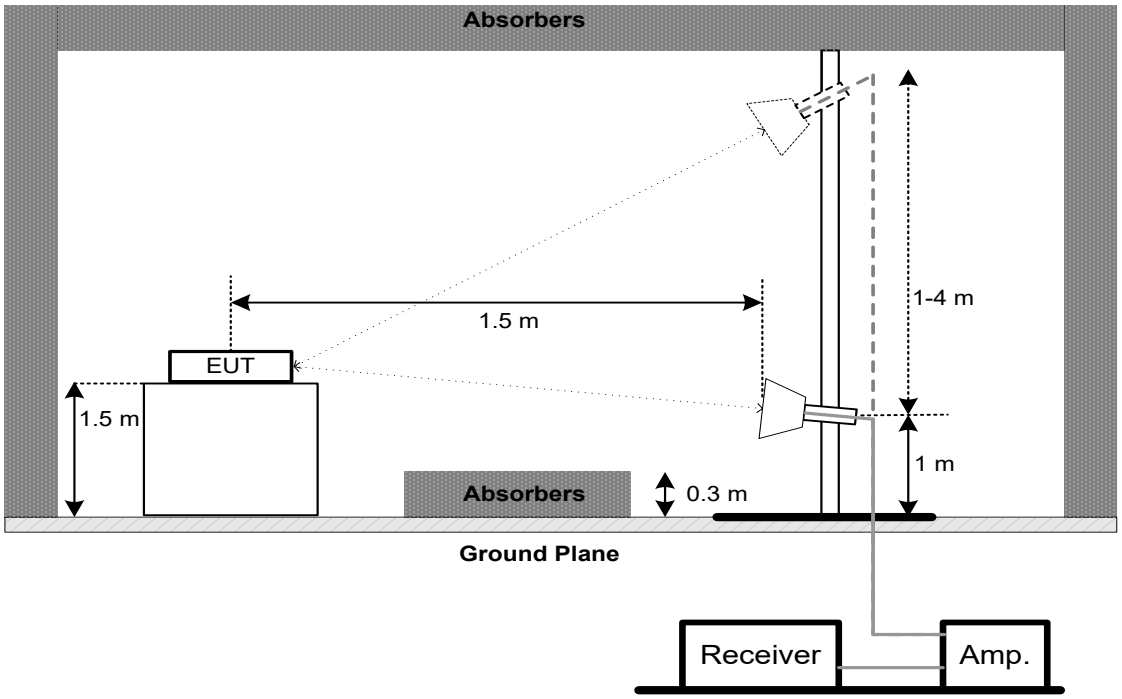
Above 1 GHz
Band edge



Harmonic (1 GHz to 18 GHz)



Harmonic (Above 18 GHz)



4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS - 9 KHZ to 30 MHZ

Please refer to the APPENDIX B

Remark:

(1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(2) Limit line = specific limits (dBuV) + distance extrapolation factor.

4.7 TEST RESULTS - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

4.8 TEST RESULTS - ABOVE 1000 MHz

Please refer to the APPENDIX D.

Remark:

(1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5. BANDWIDTH TEST

5.1 LIMIT

FCC Part15, Subpart E (15.407)			
Section	Test Item	Limit	Frequency Range (MHz)
15.407(a) 15.407(e)	26 dB Bandwidth	-	5150-5250
	26 dB Bandwidth	-	5250-5350
	26 dB Bandwidth	-	5470-5725
	6 dB Bandwidth	Minimum 500 kHz	5725-5850

5.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below

b. Spectrum Setting:
For UNII-1:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 26 dB Bandwidth
RBW	300 kHz (Bandwidth 20 MHz and Bandwidth 40 MHz) 1 MHz (Bandwidth 80 MHz)
VBW	1 MHz (Bandwidth 20 MHz and Bandwidth 40 MHz) 3 MHz (Bandwidth 80 MHz)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

For UNII-3:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	6 dB Bandwidth
RBW	100 kHz
VBW	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

c. Measured the spectrum width with power higher than 26 dB / 6 dB below carrier.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP

5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULTS

Please refer to the APPENDIX E.

6. MAXIMUM OUTPUT POWER TEST

6.1 LIMIT

FCC Part15, Subpart E (15.407)			
Section	Test Item	Limit	Frequency Range (MHz)
15.407(a)	Maximum Output Power	AP device: 1 Watt (30 dBm) Client device: 250 mW (24 dBm)	5150-5250
		1 Watt (30dBm)	5725-5850

Note:

a. For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

b. For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10log B, where B is the 26dB Bandwidth in megahertz.

6.2 TEST PROCEDURE

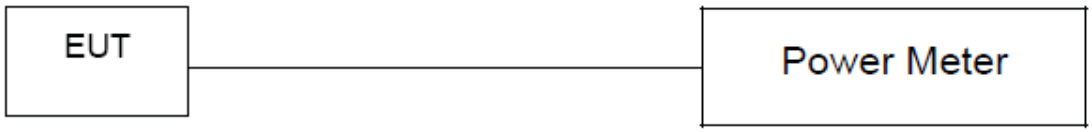
a. The EUT was directly connected to the power meter and antenna output port as show in the block diagram below.

b. Test test was performed in accordance with method of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

6.6 TEST RESULTS

Please refer to the APPENDIX F.

7. POWER SPECTRAL DENSITY TEST

7.1 LIMIT

FCC Part15, Subpart E (15.407)			
Section	Test Item	Limit	Frequency Range (MHz)
15.407(a)	Power Spectral Density	AP device: 17 dBm/MHz Client device: 11 dBm/MHz	5150-5250
		11 dBm/MHz	5250-5350
		11 dBm/MHz	5470-5725
		30 dBm/500 kHz	5725-5850

7.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

b. Spectrum Setting:

For UNII-1:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RBW	= 1 MHz.
VBW	≥ 3 MHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

For UNII-3:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW□ of the si□nal
RBW	100 kHz.
VBW	300 kHz.
Detector	RMS
Trace average	100 trace
Sweep Time	Auto

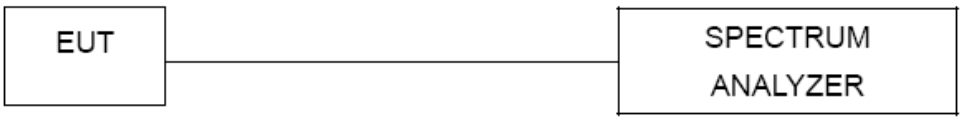
Note:

1. For UNII-3, according to KDB publication 789033 D02 General UNII Test Procedures New Rules v02r01, section II.F.5., it is acceptable to set RBW at 100kHz and VBW at 300kHz if the spectrum analyzer does not have 500 kHz RBW.
2. The value measured with RBW=100kHz is to be added with 10log(500 kHz/100kHz) which is +7 dB. During the test, the offset has added 7 dB, For example, if the offset value is +2dB , then the converted value will be 2+7=9dB using RBW=100kHz.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

7.6 TEST RESULTS

Please refer to the APPENDIX G.

8. FREQUENCY STABILITY MEASUREMENT

8.1 LIMIT

FCC Part15, Subpart E (15.407)			
Section	Test Item	Limit	Frequency Range (MHz)
15.407(g)	Frequency Stability	An emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.	5150-5250
			5250-5350
			5470-5725
			5725-5850

8.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

b. Spectrum Setting:

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Entire absence of modulation emissions bandwidth
RBW	10 kHz
VBW	10 kHz
Sweep Time	Auto

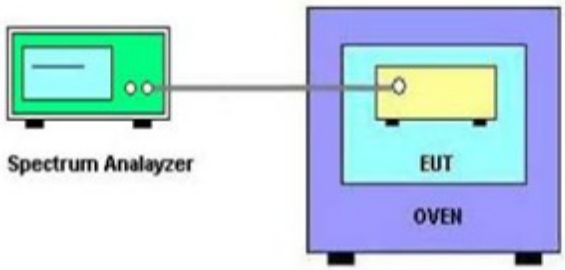
c. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value.

d. User manual temperature is 0°C~40°C.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

8.6 TEST RESULTS

Please refer to the APPENDIX H.

9. MEASUREMENT INSTRUMENTS LIST

AC Power Line Conducted Emissions					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	EMI Test Receiver	R&S	ESCI	100382	Feb. 28, 2021
2	LISN	EMCO	3816/2	52765	Mar. 01, 2021
3	TWO-LINE V-NETWORK	R&S	ENV216	101447	Feb. 28, 2021
4	50Ω Terminator	SHX	TF5-3	15041305	Mar. 01, 2021
5	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
6	Cable	N/A	RG223	12m	Mar. 10, 2021
7	643 Shield Room	ETS	6*4*3m	N/A	N/A

Radiated Emissions - 9 kHz to 30 MHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	EM	EM-6876-1	230	Apr. 16, 2021
2	Cable	N/A	RG 213/U	N/A	May 29, 2021
3	EMI Test Receiver	R&S	ESCI	100895	Feb. 28, 2021
4	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
5	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2021
2*	Amplifier	HP	8447D	2944A09673	Aug. 11, 2021
3	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021
4	Cable	emci	LMR-400(30MHz-1 GHz)(8m+5m)	N/A	May 22, 2021
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
8	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021

Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	May 12, 2021
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jul. 07, 2021
3	Amplifier	Agilent	8449B	3008A02333	Mar. 01, 2021
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 07, 2021
5	Receiver	Agilent	N9038A	MY52130039	Jul. 25, 2021
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	N/A	EMC104-SM-SM-6 000	N/A	May 09, 2021
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A
10	Band Reject Filter	Micro-Tronics	BRC50703-01	7	Feb. 28, 2021
11	Band Reject Filter	Micro-Tronics	BRC50705-01	10	Feb. 28, 2021
12	966 Chambe Room	RM	9*6*6m	N/A	Jul. 25, 2021

Bandwidth					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Jul. 25, 2021
2	RF Cable	Tongkaichuan	N/A	N/A	N/A
3	DC Block	Mini	N/A	N/A	N/A

Power Spectral Density					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Jul. 25, 2021
2	Attenuator	WOKEN	6SM3502	VAS1214NL	Feb. 07, 2022
3	RF Cable	Tongkaichuan	N/A	N/A	N/A
4	DC Block	Mini	N/A	N/A	N/A

Maximum Output Power					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Peak Power Analyzer	Keysight	8990B	MY51000506	Aug. 07, 2021
2	Wideband power sensor	Keysight	N1923A	MY58310004	Jul. 25, 2021
3	Attenuator	WOKEN	6SM3502	VAS1214NL	Feb. 07, 2022
4	RF Cable	Tongkaichuan	N/A	N/A	N/A

Frequency Stability					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Spectrum Analyzer	R&S	FSP40	100185	Jul. 25, 2021
2	Precision Oven Tester	CEPREI	CEEC-M64T-40	15-008	Feb. 28, 2021
3	RF Cable	Tongkaichuan	N/A	N/A	N/A
4	DC Block	Mini	N/A	N/A	N/A

Remark: “N/A” denotes no model name, serial no. or calibration specified.

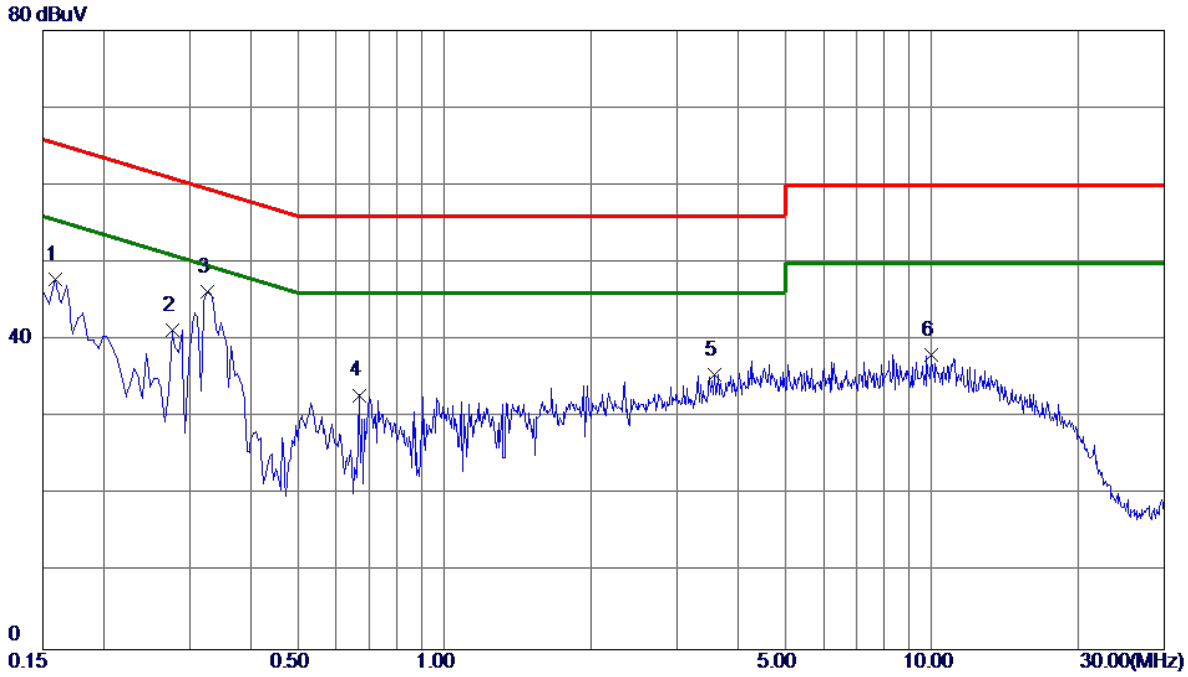
“*” calibration period of equipment list is three year.

Except * item, all calibration period of equipment list is one year.

APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

Test Mode:	TX AX20 MODE CHANNEL 149

Line

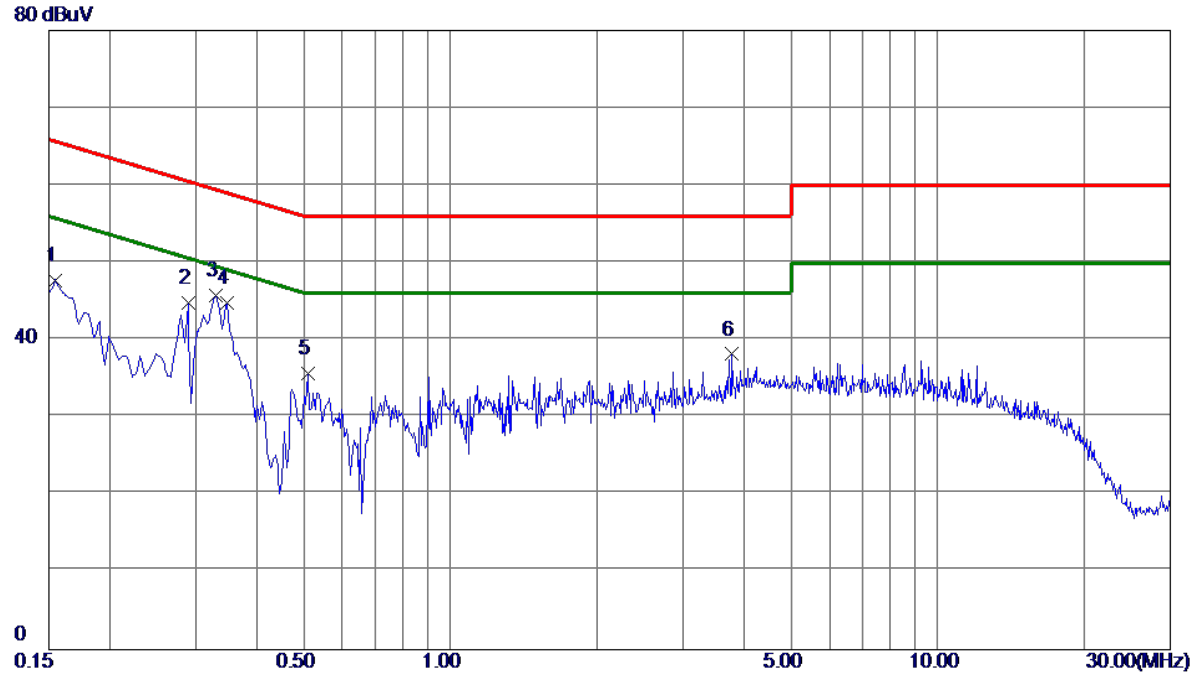


No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1590	38.12	9.74	47.86	65.52	-17.66	Peak	
2	0.2760	31.44	9.88	41.32	60.94	-19.62	Peak	
3 *	0.3255	36.33	9.90	46.23	59.57	-13.34	Peak	
4	0.6675	22.98	9.90	32.88	56.00	-23.12	Peak	
5	3.5745	25.34	10.22	35.56	56.00	-20.44	Peak	
6	9.9600	27.38	10.70	38.08	60.00	-21.92	Peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) The test result has included the cable loss.

Test Mode:	TX AX20 MODE CHANNEL 149

Neutral



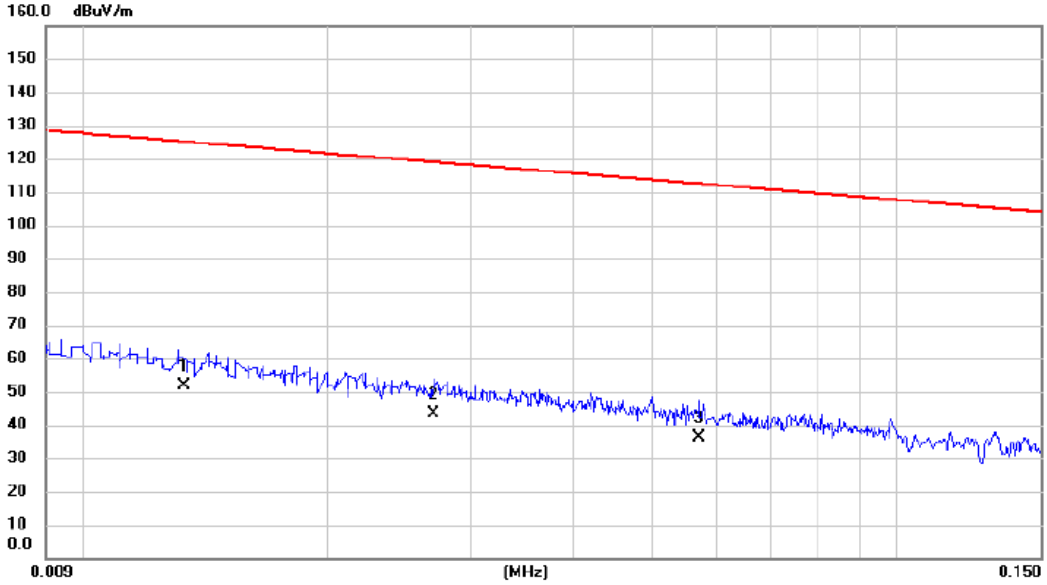
No.	Freq.	Reading Level	Correct Factor	Measure ment	Limit	Margin		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1545	37.98	9.78	47.76	65.75	-17.99	Peak	
2	0.2895	34.73	10.01	44.74	60.54	-15.80	Peak	
3 *	0.3300	35.77	10.04	45.81	59.45	-13.64	Peak	
4	0.3480	34.81	10.05	44.86	59.01	-14.15	Peak	
5	0.5100	25.49	10.14	35.63	56.00	-20.37	Peak	
6	3.7815	27.59	10.57	38.16	56.00	-17.84	Peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.
(3) The test result has included the cable loss.

APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

Test Mode:	TX AX20 MODE CHANNEL 149

Ant 0°

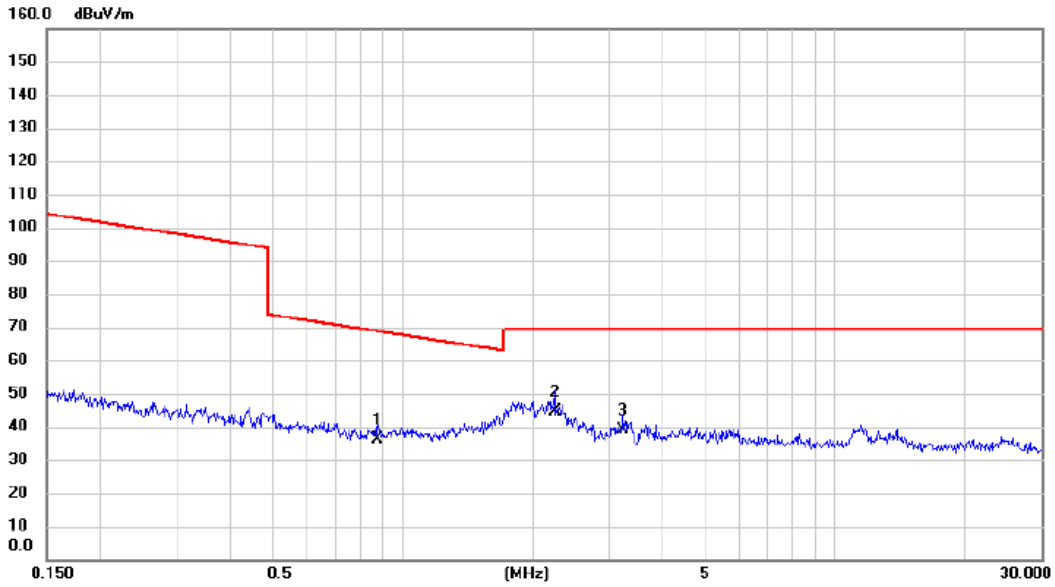


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.013	36.48	15.21	51.69	125.13	-73.44	AVG	
2		0.027	30.37	12.94	43.31	118.98	-75.67	AVG	
3		0.057	23.91	12.38	36.29	112.47	-76.18	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX AX20 MODE CHANNEL 149

Ant 0°

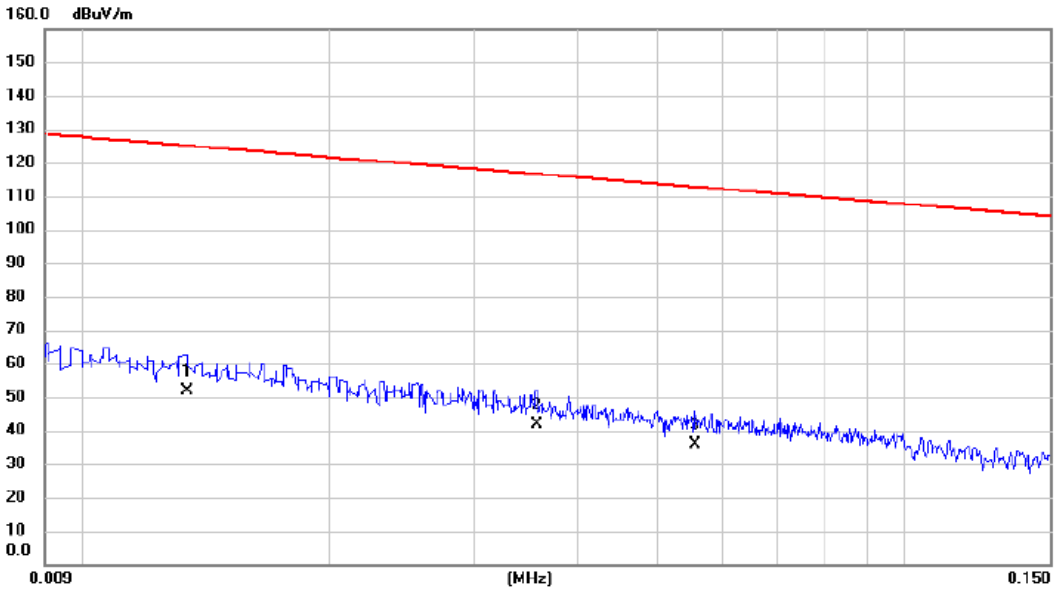


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		0.876	24.59	11.68	36.27	68.76	-32.49	QP	
2	*	2.249	33.83	10.94	44.77	69.54	-24.77	QP	
3		3.241	28.27	10.55	38.82	69.54	-30.72	QP	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX AX20 MODE CHANNEL 149

Ant 90°

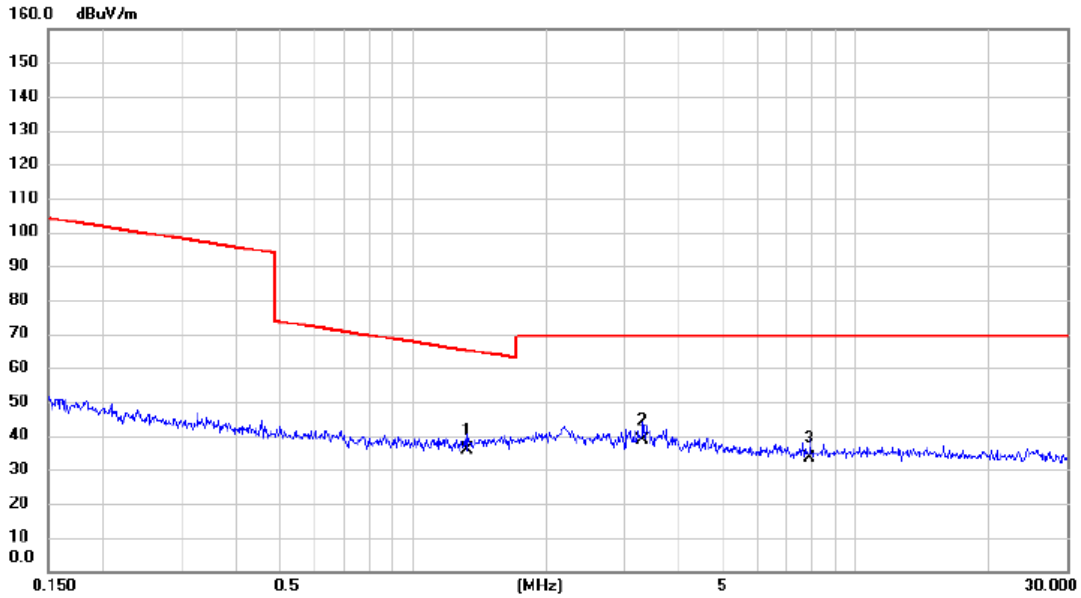


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	0.013	36.64	15.18	51.82	125.06	-73.24	AVG	
2		0.036	28.89	12.72	41.61	116.55	-74.94	AVG	
3		0.056	23.31	12.37	35.68	112.69	-77.01	AVG	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX AX20 MODE CHANNEL 149

Ant 90°



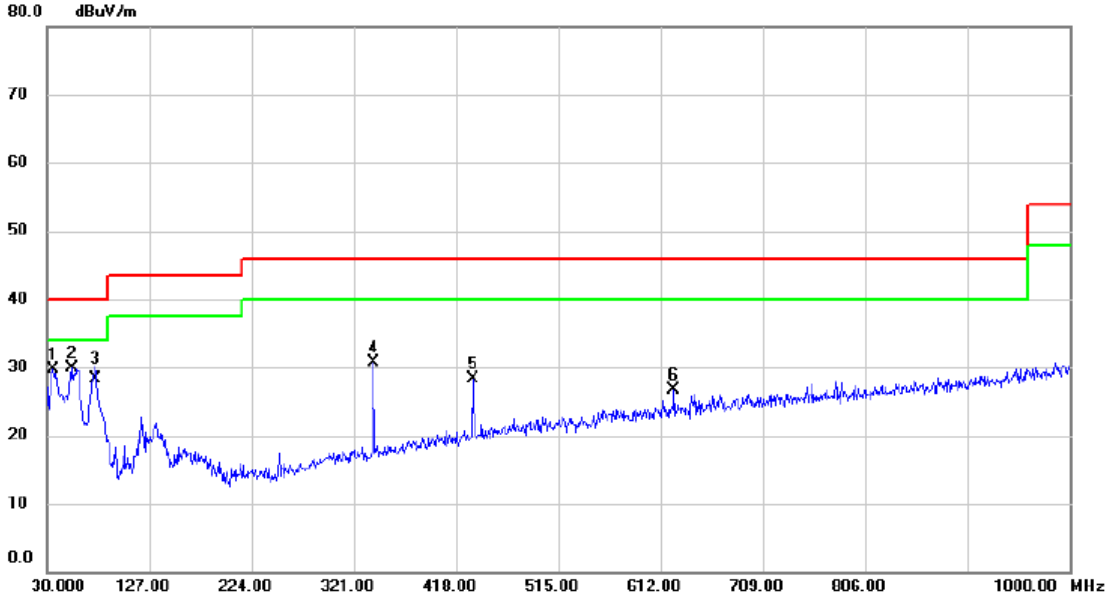
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	1.331	24.47	11.45	35.92	65.12	-29.20	QP	
2		3.310	28.22	10.55	38.77	69.54	-30.77	QP	
3		7.893	22.35	10.89	33.24	69.54	-36.30	QP	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1 GHZ

Test Mode:	TX AX20 MODE CHANNEL 149

Vertical

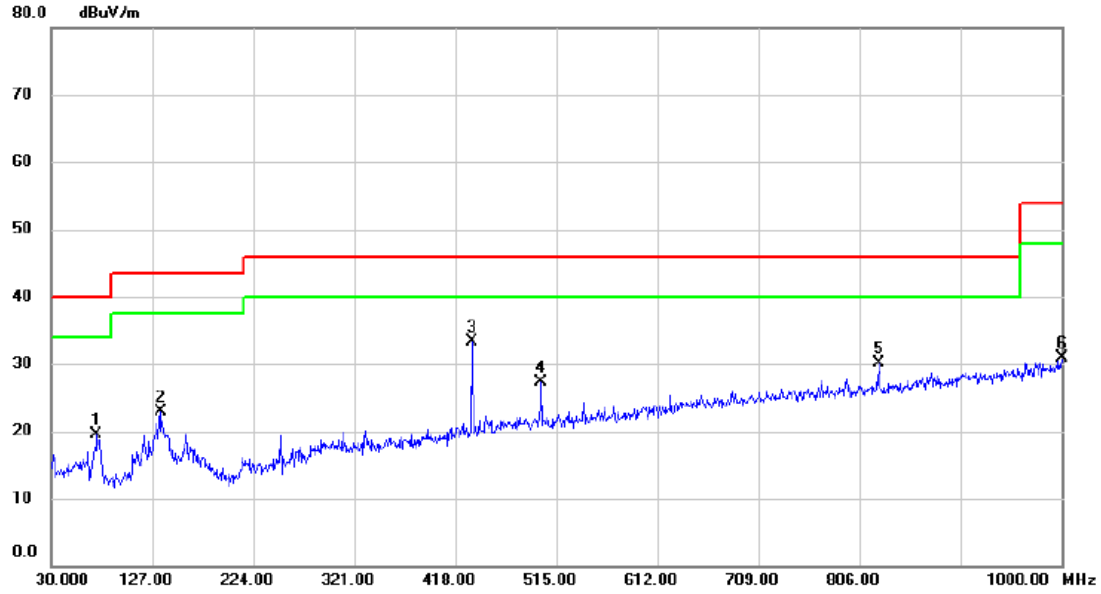


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		35.820	44.06	-14.35	29.71	40.00	-10.29	peak	
2	*	54.250	43.56	-13.61	29.95	40.00	-10.05	peak	
3		75.590	45.31	-16.96	28.35	40.00	-11.65	QP	
4		339.430	41.11	-10.37	30.74	46.00	-15.26	peak	
5		433.520	36.35	-8.09	28.26	46.00	-17.74	peak	
6		624.610	31.49	-4.82	26.67	46.00	-19.33	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

Test Mode:	TX AX20 MODE CHANNEL 149

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		73.650	36.16	-16.59	19.57	40.00	-20.43	peak	
2		134.760	35.62	-12.65	22.97	43.50	-20.53	peak	
3	*	433.520	41.37	-8.09	33.28	46.00	-12.72	peak	
4		500.450	34.56	-7.27	27.29	46.00	-18.71	peak	
5		824.430	32.28	-2.15	30.13	46.00	-15.87	peak	
6		1000.000	29.86	1.12	30.98	54.00	-23.02	peak	

REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.