FCC RF Test Report

APPLICANT	:	Nokia Shanghai Bell Co., Ltd.
EQUIPMENT	:	NOKIA ONT
BRAND NAME	:	NOKIA
MODEL NAME	:	XS-2437X-B
FCC ID	:	2ADZRXS2437XB
STANDARD	:	FCC Part 15 Subpart E §15.407
TEST DATE(S)	:	Jul. 24, 2024 ~ Dec. 13, 2024

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in 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. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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History of this test report

Report No.	Version	Description	Issued Date
FR462802C	01	Initial issue of report	Dec. 16, 2024

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.407(a)(11)	26dB Emission Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Pass	-
3.2	15.407(a)(5)(6)	Fundamental Maximum EIRP	Pass	-
3.3	15.407(a)(5)(6)	Fundamental Power Spectral Density	Pass	-
3.4	15.407(b)(7)	In-Band Emissions (Channel Mask)	Pass	-
3.5	15.407(d)(6)	Contention Based Protocol	Pass	
3.6	15.407(b)	Unwanted Emissions	Pass	Under limit 0.93 dB at 7125.00 MHz
3.7	15.207	AC Conducted Emission	Pass	Under limit 11.27 dB at 0.155 MHz
3.8	15.203 15.407(a)	Antenna Requirement	Pass	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1 General Description

1.1 Applicant

Nokia Shanghai Bell Co., Ltd.
No.388, Ningqiao Rd, Pilot Free Trade Zone, Shanghai, 201206 P.R. China

1.2 Manufacturer

Nokia of America Corporation
2301 Sugar Bush Rd. Raleigh, NC 27612

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	NOKIA ONT
Brand Name	NOKIA
Model Name	XS-2437X-B
Part Number	3TN00958xxxx, 3TN00961xxxx (x can be A-Z or blank)
FCC ID	2ADZRXS2437XB
SN Code	Conducted: 00861234 Conduction: D8B020FD6AB0 Radiation/CBP: ALCLEB4BFE45
EUT Stage	Production Unit

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. Part Number are for marketing purpose only, 3TN00958xxxx are identical to 3TN00961xxxx except a power adapter is added to the unit.
3. There are two samples under test, sample 1 is 1st antenna (Inpaq) and sample 2 is 2nd antenna (AOT). For each UNII band, select the maximum MIMO gain corresponding to the sample for testing.

Power Adapter				
AC Adapter 1 US	**Brand Name**	ShenZhen SOY	**Model Name**	SOY-1200400US-433
	Power Rating	I/P: 100-240 Vac, 12000mA , O/P: 12Vdc,4000mA		
AC Adapter 2 US	**Brand Name**	MOSO	**Model Name**	MS-V4000R120-050A0-US
	Power Rating	I/P: 100-240 Vac, 13000mA , O/P: 12Vdc,4000mA		

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	U-NII-5: 5925 MHz – 6425 MHz U-NII-6: 6425 MHz – 6525 MHz U-NII-7: 6525 MHz – 6875 MHz U-NII-8: 6875 MHz – 7125 MHz
Maximum EIRP	**For 1S4T** **MIMO<Ant.1+2+3+4>** 802.11ax HE20 : 12.69 dBm / 0.0186 W 802.11ax HE40 : 15.51 dBm / 0.0356 W 802.11ax HE80 : 18.72 dBm / 0.0745 W 802.11ax HE160 : 21.20 dBm / 0.1318 W 802.11be EHT20 : 12.75 dBm / 0.0188 W 802.11be EHT40 : 15.57 dBm / 0.0361 W 802.11be EHT80 : 18.78 dBm / 0.0755 W 802.11be EHT160 : 21.26 dBm / 0.1337 W 802.11be EHT320 : 24.09 dBm / 0.2564 W **TX Beamforming** 802.11ax HE20 : 16.91 dBm / 0.0491 W 802.11ax HE40 : 19.61 dBm / 0.0914 W 802.11ax HE80 : 22.65 dBm / 0.1841 W 802.11ax HE160 : 25.61 dBm / 0.3639 W 802.11be EHT20 : 16.97 dBm / 0.0498 W 802.11be EHT40 : 19.66 dBm / 0.0925 W 802.11be EHT80 : 22.71 dBm / 0.1866 W 802.11be EHT160 : 25.96 dBm / 0.3945 W 802.11be EHT320 : 27.82 dBm / 0.6053 W **For 4S4T** **MIMO<Ant.1+2+3+4>** 802.11ax HE20 : 17.11 dBm / 0.0514 W 802.11ax HE40 : 19.96 dBm / 0.0991 W 802.11ax HE80 : 23.12 dBm / 0.2051 W 802.11ax HE160 : 25.75 dBm / 0.3758 W 802.11be EHT20 : 17.16 dBm / 0.0520 W 802.11be EHT40 : 20.03 dBm / 0.1007 W 802.11be EHT80 : 23.16 dBm / 0.2070 W 802.11be EHT160 : 25.82 dBm / 0.3819 W 802.11be EHT320 : 28.96 dBm / 0.7870 W
99% Occupied Bandwidth	**MIMO<Ant.1+2+3+4>** 802.11be EHT20 : 19.467 MHz 802.11be EHT40 : 38.705 MHz 802.11be EHT80 : 78.933 MHz 802.11be EHT160 : 159.695 MHz 802.11be EHT320: 316.952 MHz **TX Beamforming** 802.11be EHT20 : 19.505 MHz 802.11be EHT40 : 38.933 MHz 802.11be EHT80 : 79.314 MHz 802.11be EHT160 : 161.219 MHz 802.11be EHT320: 318.781 MHz
Antenna Type	Dipole Antenna
Type of Modulation	802.11ax: OFDM (BPSK / QPSK / 16QAM / 64QAM /

	256QAM / 1024QAM) 802.11be: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM / 4096QAM)

Remark:

1. For SISO&MIMO mode, the whole testing has assessed only MIMO mode by referring to their higher conducted power.
2. WLAN MIMO support CDD mode and Tx Beamforming mode and SDM mode for 802.11ax/be.
3. For 802.11ax & 11be mode, the whole testing has assessed only 802.11be EHT20 / EHT40 / EHT80 / EHT160MHz / EHT320MHz by referring to the higher output power.
4. The device supports 1S4T(CDD&TXBF) and 4S4T(SDM) mode; 1S4T: NSS=1, MIMO 4Tx; 4S4T: NSS=4, MIMO 4Tx
5. The channel puncturing mode is for improving network performance and not available for CBP, the CBP will apply channel bandwidth reduction mechanism to protect incumbent operations.
6. This device supports full RU and OFDMA modes for 802.11ax/be, the PSD of OFDMA modes is reduced to be smaller than full RU, therefore the full RU perform full test to cover OFDMA except for Power/PSD/In-band emissions.
7. Please refer to the antenna report for the maximum Single antenna gain and CDD (Cyclic Delay Diversity) directional gain and TXBF (Tx Beamforming) directional gain and SDM (Space Division Multiplexing) directional gain.

For Sample1 (Inpaq Antenna)

Frequency Band	Maximum Single Antenna gain (dBi)				CDD DG (dBi)		TXBF DG (dBi)		SDM DG (dBi)	
	ANT1	ANT2	ANT3	ANT4	For Power	For PSD	For Power	For PSD	For Power	For PSD
6GHz UNII-5	2.58	1.57	2.97	2.82	-0.16	4.93	4.93	4.93	-0.16	-0.16
6GHz UNII-6	2.33	1.81	2.74	2.67	0.16	4.38	4.38	4.38	0.16	0.16
6GHz UNII-7	2.33	1.81	2.74	2.67	0.16	3.8	3.8	3.8	0.16	0.16
6GHz UNII-8	2.38	1.27	3.02	2.56	-0.05	4.64	4.64	4.64	-0.05	-0.05

For Sample2 (AOT Antenna)

Frequency Band	Maximum Single Antenna gain (dBi)				CDD DG (dBi)		TXBF DG (dBi)		SDM DG (dBi)	
	ANT1	ANT2	ANT3	ANT4	For Power	For PSD	For Power	For PSD	For Power	For PSD
6GHz UNII-5	2.14	2.07	2.24	1.66	0.23	4.98	4.98	4.98	0.23	0.23
6GHz UNII-6	2.34	2.13	1.63	2.30	0.04	4.88	4.88	4.88	0.04	0.04
6GHz UNII-7	2.34	2.13	1.63	2.30	0.04	4.53	4.53	4.53	0.04	0.04
6GHz UNII-8	2.19	2.00	1.71	3.21	-0.15	4.31	4.31	4.31	-0.15	-0.15

CBP test with antenna path of minimum gain (Antenna 2, Minimum gain= 1.27dBi).

8. This device supports channel puncturing for 802.11be EHT80/EHT160//EHT320 as below, which is less than full RU PSD, therefore have assessed only EIRP/PSD/MASK/RSE.

<80M BW Puncturing 20MHz>:

Bandwidth	Tones		Index		For test modes configure
80MHz	242	484	62	66	1
80MHz	242	484	61	66	2
80MHz	484	242	65	64	3
80MHz	484	242	65	63	4

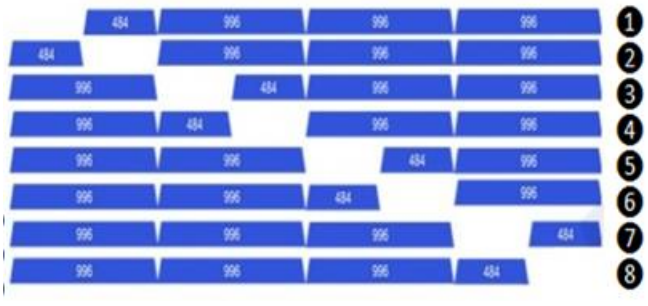
<160M BW Puncturing 20MHz>:

Bandwidth	Tones			Index			For test modes configure
160MHz	242-Left	484-Left	996-Right	62-Left	66-Left	67-Right	1
160MHz	242-Left	484-Left	996-Right	61-Left	66-Left	67-Right	2
160MHz	484-Left	242-Left	996-Right	65-Left	64-Left	67-Right	3
160MHz	484-Left	242-Left	996-Right	65-Left	63-Left	67-Right	4
160MHz	996-Left	242-Right	484-Right	67-Left	62-Right	66-Right	5
160MHz	996-Left	242-Right	484-Right	67-Left	61-Right	66-Right	6
160MHz	996-Left	484-Right	242-Right	67-Left	65-Right	64-Right	7
160MHz	996-Left	484-Right	242-Right	67-Left	65-Right	63-Right	8

<160M BW Puncturing 40MHz>:

Bandwidth	Tones		Index		For test modes configure
160MHz	484-Left	996-Right	66-Left	67-Right	1
160MHz	484-Left	996-Right	65-Left	67-Right	2
160MHz	996-Left	484-Right	67-Left	66-Right	3
160MHz	996-Left	484-Right	67-Left	65-Right	4

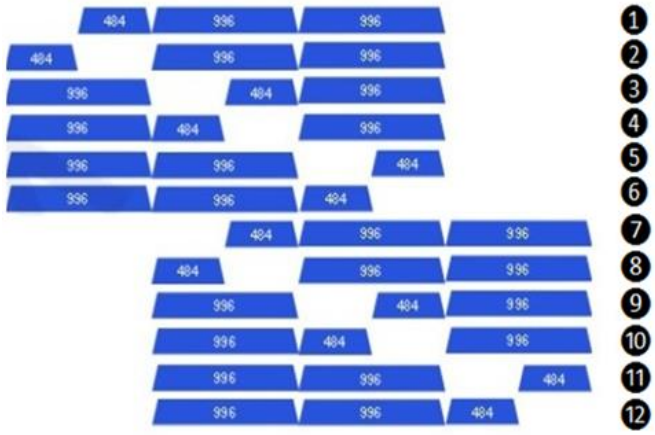
<320M BW Puncturing 40MHz>:

Bandwidth	Tones	Index	For test modes configure
320MHz			1
			2
			3
			4
			5
			6
			7
			8

<320M BW Puncturing 80MHz>:

Bandwidth	Tones	Index	For test modes configure
320MHz			1
			2
			3
			4

<320M BW Puncturing 80+40MHz>:

Bandwidth	Tones	Index	For test modes configure
320MHz			1
			2
			3
			4
			5
			6
			7
			8
			9
			10
			11
			12

Only the worse cases are shown in this report.

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH05-KS TH01-KS DFS01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH05-KS	AUDIX	E3	6.2009-8-24
2.	CO01-KS	AUDIX	E3	6.2009-8-24
3.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10

1.8 Applicable Standards

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

- FCC Part 15 Subpart E
- FCC KDB 987594 D02 U-NII 6 GHz EMC Measurement v03
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane) were recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

<U-NII-5, 6, 7, 8>

BW 20M	**Channel**	1	5	9	13	17	21	25	29
	Freq. (MHz)	5955	5975	5995	6015	6035	6055	6075	6095
BW 40M	**Channel**	3		11		19		27	
	Freq. (MHz)	5965		6005		6045		6085	
BW 80M	**Channel**	7				23			
	Freq. (MHz)	5985				6065			
BW 160M	**Channel**	15							
	Freq. (MHz)	6025							

BW 20M	**Channel**	33	37	41	45	49	53	57	61
	Freq. (MHz)	6115	6135	6155	6175	6195	6215	6235	6255
BW 40M	**Channel**	35		43		51		59	
	Freq. (MHz)	6125		6165		6205		6245	
BW 80M	**Channel**	39				55			
	Freq. (MHz)	6145				6225			
BW 160M	**Channel**	47							
	Freq. (MHz)	6185							
BW 320M	**Channel**	31				63			
	Freq. (MHz)	6105				6265			

BW 20M	Channel	65	69	73	77	81	85	89	93
	Freq. (MHz)	6275	6295	6315	6335	6355	6375	6395	6415
BW 40M	Channel	67		75		83		91	
	Freq. (MHz)	6285		6325		6365		6405	
BW 80M	Channel	71				87			
	Freq. (MHz)	6305				6385			
BW 160M	Channel	79							
	Freq. (MHz)	6345							
BW 320M	Channel	95							
	Freq. (MHz)	6425							

BW 20M	Channel	97	101	105	109	113	117	121	125
	Freq. (MHz)	6435	6455	6475	6495	6515	6535	6555	6575
BW 40M	Channel	99		107		115		123	
	Freq. (MHz)	6445		6485		6525		6565	
BW 80M	Channel	103				119			
	Freq. (MHz)	6465				6545			
BW 160M	Channel	111							
	Freq. (MHz)	6505							

BW 20M	Channel	129	133	137	141	145	149	153	157
	Freq. (MHz)	6595	6615	6635	6655	6675	6695	6715	6735
BW 40M	Channel	131		139		147		155	
	Freq. (MHz)	6605		6645		6685		6725	
BW 80M	Channel	135				151			
	Freq. (MHz)	6625				6705			
BW 160M	Channel	143							
	Freq. (MHz)	6665							
BW 320M	Channel	127							
	Freq. (MHz)	6585							

BW 20M	Channel	161	165	169	173	177	181	185	189
	Freq. (MHz)	6755	6775	6795	6815	6835	6855	6875	6895
BW 40M	Channel	163		171		179		187	
	Freq. (MHz)	6765		6805		6845		6885	
BW 80M	Channel	167				183			
	Freq. (MHz)	6785				6865			
BW 160M	Channel	175							
	Freq. (MHz)	6825							
BW 320M	Channel	159							
	Freq. (MHz)	6745							

BW 20M	Channel	193	197	201	205	209	213	217	221
	Freq. (MHz)	6915	6935	6955	6975	6995	7015	7035	7055
BW 40M	Channel	195		203		211		219	
	Freq. (MHz)	6925		6965		7005		7045	
BW 80M	Channel	199				215			
	Freq. (MHz)	6945				7025			
BW 160M	Channel	207							
	Freq. (MHz)	6985							
BW 320M	Channel	191							
	Freq. (MHz)	6905							

BW 20M	Channel	225	229	233
	Freq. (MHz)	7075	7095	7115
BW 40M	Channel	227		
	Freq. (MHz)	7085		

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

CDD & SDM & TXBF Mode

Modulation	Data Rate
802.11ax HE20(Covered by EHT20)	MCS0
802.11ax HE40(Covered by EHT40)	MCS0
802.11ax HE80(Covered by EHT80)	MCS0
802.11ax HE160(Covered by EHT160)	MCS0
802.11ax HE20 OFDMA mode (Covered by EHT20 OFDMA mode)	MCS0
802.11ax HE40 OFDMA mode (Covered by EHT40 OFDMA mode)	MCS0
802.11ax HE80 OFDMA mode (Covered by EHT80 OFDMA mode)	MCS0
802.11ax HE160 OFDMA mode (Covered by EHT160 OFDMA mode)	MCS0
802.11be EHT20	MCS0
802.11be EHT40	MCS0
802.11be EHT80	MCS0
802.11be EHT160	MCS0
802.11be EHT320	MCS0
802.11be EHT20 OFDMA mode	MCS0
802.11be EHT40 OFDMA mode	MCS0
802.11be EHT80 OFDMA mode	MCS0
802.11be EHT160 OFDMA mode	MCS0
802.11be EHT320 OFDMA mode	MCS0
802.11be EHT20 Puncturing mode	MCS0
802.11be EHT40 Puncturing mode	MCS0
802.11be EHT80 Puncturing mode	MCS0
802.11be EHT160 Puncturing mode	MCS0
802.11be EHT320 Puncturing mode	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : WLAN Link(6G) + Power From Adapter

Remark: For Radiated Test Cases, the tests were performed with Adapter.

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		20M BW	20M BW	20M BW	20M BW
L	Low	001	097	117	189
M	Middle	045	105	149	209
H	High	093	113	181	229/233
Straddle		-	-	-	185

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		40M BW	40M BW	40M BW	40M BW
L	Low	003	099	123	195
M	Middle	043	-	147	203
H	High	091	107	179	227
Straddle		-	115	-	187

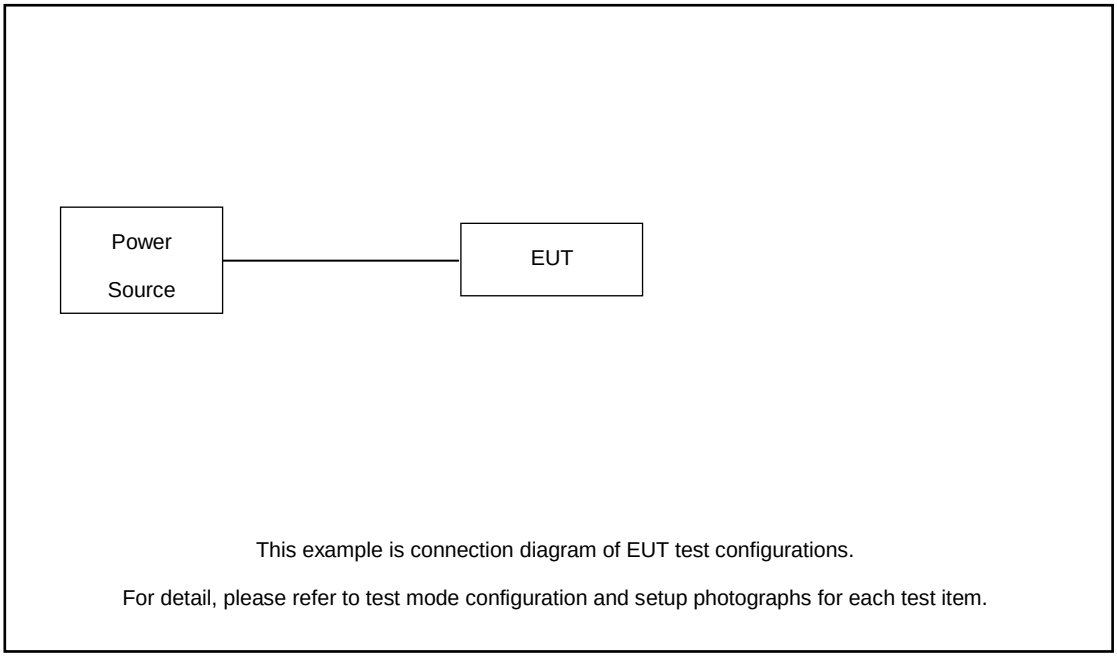
Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		80M BW	80M BW	80M BW	80M BW
L	Low	007	103	135	199
M	Middle	039		151	-
H	High	087		167	215
Straddle		-	119	183	-

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		160M BW	160M BW	160M BW	160M BW
L	Low	015	-	143	207
M	Middle	047			
H	High	079			
Straddle		-	111	175	-

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		320M BW	320M BW	320M BW	320M BW
L	Low	-	-	-	-
M	Middle	031			
H	High	063			
Straddle		095	127	159	191

Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max EIRP power.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Dell	Latitude 3480	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
2.	RJ45 Cable	N/A	N/A	N/A	N/A	N/A
3.	RJ11 Cable	N/A	N/A	N/A	N/A	N/A
4.	Telephone	bubugao	HCD007(6082)TSD	N/A	N/A	N/A
5.	Telephone	bubugao	HCD007(113)TSD	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program “QSPR.5.0-00202” TX Tool was provided and enabled to make EUT continuously transmit.

For AC power line conducted emissions, the EUT WIFI was set to connect with the notebook under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.67 dB and 20dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.67 + 20 = 24.67 (dB)

3 Test Result

3.1 26dB & 99% Occupied Bandwidth Measurement

3.1.1 CFR 15.407 (a)(11)

The maximum transmitter channel bandwidth for U-NII devices in the 5.925-7.125 GHz band is 320 megahertz.

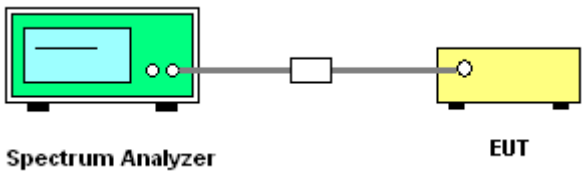
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section C) Emission bandwidth
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.
7. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
8. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 26dB & 99% Occupied Bandwidth

Please refer to Appendix A.

3.2 Maximum EIRP Measurement

3.2.1 Limit of Fundamental Maximum EIRP

<FCC 14-30 CFR 15.407>

(a)(5) For an indoor access point operating in the 5.925-7.125 GHz band, the maximum e.i.r.p. over the frequency band of operation must not exceed 30dBm.
(a)(6) For a subordinate device operating under the control of an indoor access point operating in the 5.925-7.125 GHz band, the maximum e.i.r.p. over the frequency band of operation must not exceed 30dBm.

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.
4. For MIMO mode, the measure-and-sum technique should be used for measuring the in-band transmit power of a device.

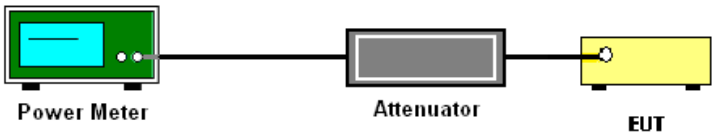
<TXBF Modes>

The testing follows Method PM-G of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01 for TXBF modes.

Method PM-G (Measurement using a gated RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit at its maximum power control level.
3. Measure the average power of the transmitter
4. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

3.2.4 Test Setup



3.2.5 Test Result of Fundamental Maximum EIRP

Please refer to Appendix A.

3.3 Fundamental Power Spectral Density Measurement

3.3.1 Limit of Fundamental Power Spectral Density

<FCC 14-30 CFR 15.407>

(a)(5) For an indoor access point operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5dBm e.i.r.p. in any 1-megahertz band.
(a)(6) For a subordinate device operating under the control of an indoor access point operating in the 5.925-7.125 GHz band, the maximum power spectral density must not exceed 5dBm e.i.r.p. in any 1-megahertz band.

3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Section F) Maximum power spectral density.

 # Method SA-2 #

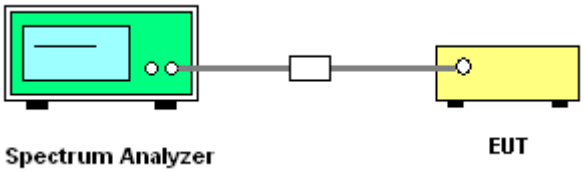
(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW ≥ 3 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, attenuator loss and duty factor. Measure the PPSD and record it.
3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
   Method (a): Measure and sum the spectra across the outputs.
   The total final Power Spectral Density is the bin-by-bin summation to obtain the combined

spectrum. For the device with 4 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2, output 3 and output 4 to obtain the value for the first frequency bin of the summed spectrum.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 In-Band Emissions (Channel Mask)

3.4.1 Limit of Unwanted Emissions

<FCC 14-30 CFR 15.407>

(b)(7) For transmitters operating within the 5.925-7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

The testing follows FCC KDB 987594 D02 U-NII 6GHz EMC Measurement.

Section J) In-Band Emissions.

1. Take nominal bandwidth as reference channel bandwidth provided that 26 dB emission bandwidth is always larger than nominal bandwidth
2. Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:
   a) Set the span to encompass the entire 26 dB EBW of the signal.
   b) Set RBW = same RBW used for 26 dB EBW measurement.
   c) Set VBW ≥ 3 X RBW
   d) Number of points in sweep ≥ [2 X span / RBW].
   e) Sweep time = auto.
   f) Detector = RMS (i.e., power averaging)
   g) Trace average at least 100 traces in power averaging (rms) mode.
   h) Use the peak search function on the instrument to find the peak of the spectrum.
3. Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:
   a. Suppressed by 20 dB at 1 MHz outside of the channel edge.
   b. Suppressed by 28 dB at one channel bandwidth from the channel center.

c. Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.

4. Adjust the span to encompass the entire mask as necessary.
5. Clear trace.
6. Trace average at least 100 traces in power averaging (rms) mode.
7. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

3.4.4 Test Setup

3.4.5 Test Result

Please refer to Appendix A.

3.5 Contention Based Protocol

3.5.1 Limit of Contention Based Protocol

<FCC 14-30 CFR 15.407>

(d)(6) All U-NII transmitters, except for standard power access points and fixed client devices, operating in the 5.925-7.125 GHz band must employ a contention-based protocol.

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel and stay off the channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain. To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

Table 1. Criteria to determine number of times detection threshold test may be performed

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leq BW_{Inc}$	Once	Tune incumbent and EUT transmissions ($f_{c1} = f_{c2}$)
$BW_{Inc} < BW_{EUT} \leq 2BW_{Inc}$	Once	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} < BW_{EUT} \leq 4BW_{Inc}$	Twice. Incumbent transmission is contained within BW_{EUT}	Incumbent transmission is located as closely as possible to the lower edge and upper edge, respectively, of the EUT channel
$BW_{EUT} > 4BW_{Inc}$	Three times	Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of EUT channel, and as closely as possible to the upper edge of the EUT channel

where:
$BWEUT$: Transmission bandwidth of EUT signal
$BWInc$: Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)
$fc1$: Center frequency of EUT transmission
$fc2$: Center frequency of simulated incumbent signal

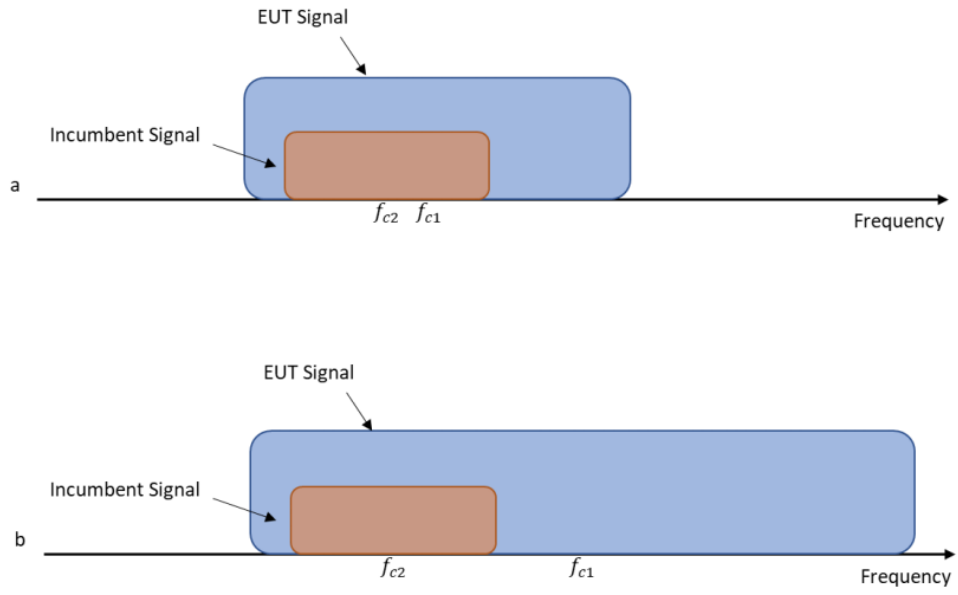


Figure 1. Two possible scenarios where a) center frequency of EUT transmission falls within incumbent's bandwidth, or b) outside of it

3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 Test Procedures

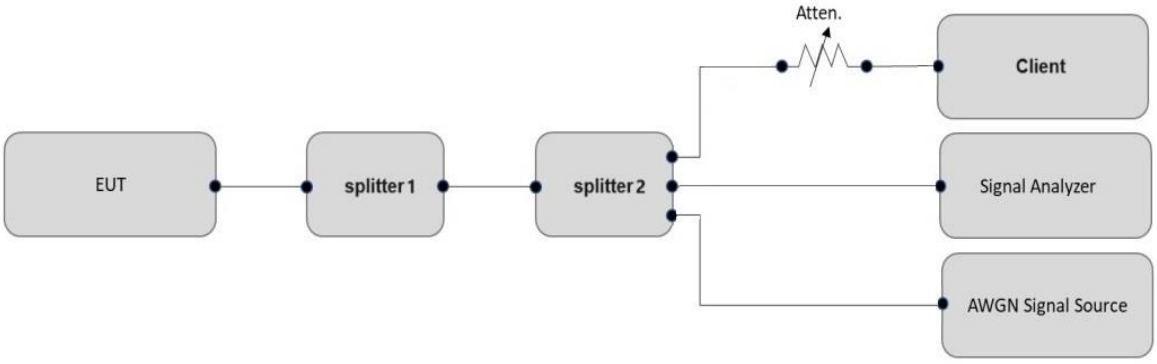
1. To ensure EUT reliably detects an incumbent signal in both scenarios shown in Figure 1, the detection threshold test may be repeated more than once with the incumbent signal (having center frequency $fc2$) tuned to different center frequencies within the UT transmission bandwidth. The criteria specified in Table 1 determines how many times the detection threshold test must be performed
2. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
3. Monitor the signal analyzer to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
4. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
5. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 2, choose a different center

frequency for the AWGN signal and repeat the process.

6. EUT was driven in MIMO mode, the interferer signal was injected to both chains to monitor the performance, while the interferer level is determined according to the lowest antenna gain among both antennas.

3.5.4 Test Setup

Conducted Setup



3.5.5 Support Unit used in test configuration and system

Instrument	Brand Name	Model No.	Characteristics
Signal Generator	Keysight	5182B/5182BX07	9KHz~7.2GHz
Spectrum Analyzer	R&S	FSV40	10kHz~40GHz
Terminal (NB Server)	DELL	P78G	LAN
Combiner (splitter1)	Tojoin	N/A	2G~8GHz
Combiner (splitter2)	MTJ Cooperation	MTJ7144-M	0.5GHz~18GHz
Attenuator	Keysight	8494B	0-110dBm
Client (phone)	N/A	N/A	N/A

3.5.6 Test Summary of Contention Based Protocol Test

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 5	6135	20	6135	-66.63	100	-62	-67.9	5.9
					Result: Stop Transmission			
				-67.63	< 90	-62	-68.9	6.9
					Result: Minimal Operation			
				-72.55	0	-62	-73.82	11.82
					Result: Normal Operation			
UNII Band 5	6105	320	5950	-66.09	100	-62	-67.36	5.36
					Result: Stop Transmission			
				-67.09	< 90	-62	-68.36	6.36
					Result: Minimal Operation			
				-72.01	0	-62	-73.28	11.28
					Result: Normal Operation			
			6105	-67.01	100	-62	-68.28	6.28
					Result: Stop Transmission			
				-68.01	< 90	-62	-69.28	7.28
					Result: Minimal Operation			
				-70.96	0	-62	-72.23	10.23
					Result: Normal Operation			
			6260	-68.25	100	-62	-69.52	7.52
					Result: Stop Transmission			
				-69.25	< 90	-62	-70.52	8.52
					Result: Minimal Operation			
				-73.42	0	-62	-74.69	12.69
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 2, gain = 1.27dBi)

Note 2: Path Loss between antenna and RF connector is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 6	6455	20	6455	-67.90	100	-62	-69.17	7.17
					Result: Stop Transmission			
				-68.90	< 90	-62	-70.17	8.17
					Result: Minimal Operation			
				-71.47	0	-62	-72.74	10.74
					Result: Normal Operation			
UNII Band 5/6/7	6425	320	6270	-63.31	100	-62	-64.58	2.58
					Result: Stop Transmission			
				-64.31	< 90	-62	-65.58	3.58
					Result: Minimal Operation			
				-72.91	0	-62	-74.18	12.18
					Result: Normal Operation			
			6425	**-61.88 (worst case)**	100	-62	-63.15	1.15
					Result: Stop Transmission			
				-62.88	< 90	-62	-64.15	2.15
					Result: Minimal Operation			
				-68.19	0	-62	-69.46	7.46
					Result: Normal Operation			
			6580	-62.65	100	-62	-63.92	1.92
					Result: Stop Transmission			
				-63.65	< 90	-62	-64.92	2.92
					Result: Minimal Operation			
				-70.64	0	-62	-71.91	9.91
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 2, gain = 1.27dBi)

Note 2: Path Loss between antenna and RF connector is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 7	6695	20	6695	-68.75	100	-62	-70.02	8.02
					Result: Stop Transmission			
				-69.75	< 90	-62	-71.02	9.02
					Result: Minimal Operation			
				-72.10	0	-62	-73.37	11.37
					Result: Normal Operation			
UNII Band 7/8	6745	320	6590	-67.21	100	-62	-68.48	6.48
					Result: Stop Transmission			
				-68.21	< 90	-62	-69.48	7.48
					Result: Minimal Operation			
				-72.68	0	-62	-73.95	11.95
					Result: Normal Operation			
			6745	-62.51	100	-62	-63.78	1.78
					Result: Stop Transmission			
				-63.51	< 90	-62	-64.78	2.78
					Result: Minimal Operation			
				-72.55	0	-62	-73.82	11.82
					Result: Normal Operation			
			6900	-64.21	100	-62	-65.48	3.48
					Result: Stop Transmission			
				-65.21	< 90	-62	-66.48	4.48
					Result: Minimal Operation			
				-71.20	0	-62	-72.47	10.47
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 2, gain = 1.27dBi)

Note 2: Path Loss between antenna and RF connector is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

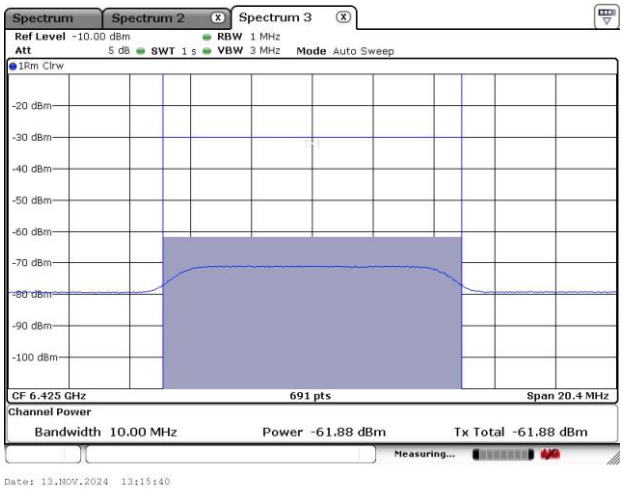
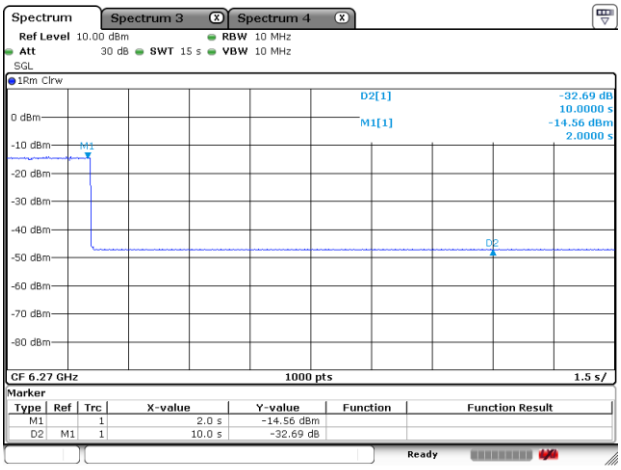
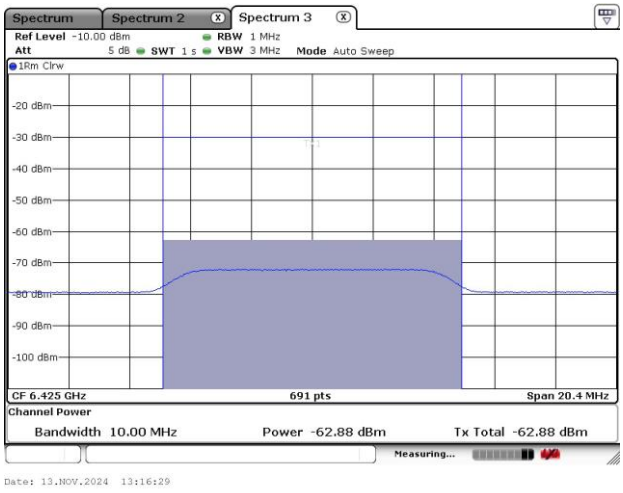
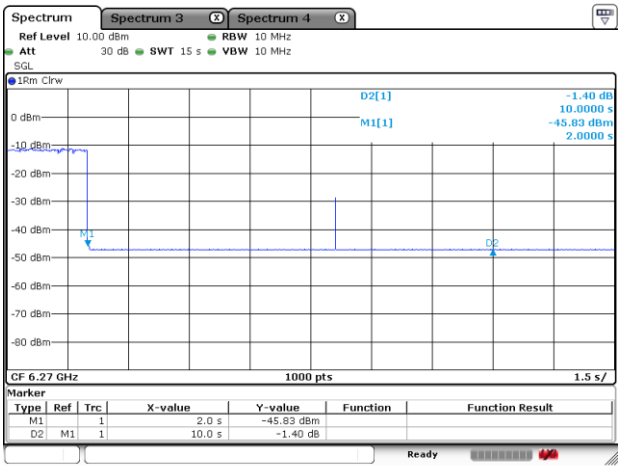
Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 8	7015	20	7015	-68.33	100	-62	-69.6	7.6
					Result: Stop Transmission			
				-69.33	< 90	-62	-70.6	8.6
					Result: Minimal Operation			
				-74.13	0	-62	-75.4	13.4
					Result: Normal Operation			
UNII Band 8	6905	320	6750	-64.13	100	-62	-65.4	3.4
					Result: Stop Transmission			
				-65.13	< 90	-62	-66.4	4.4
					Result: Minimal Operation			
				-67.98	0	-62	-69.25	7.25
					Result: Normal Operation			
			6905	-62.70	100	-62	-63.97	1.97
					Result: Stop Transmission			
				-63.70	< 90	-62	-64.97	2.97
					Result: Minimal Operation			
				-68.59	0	-62	-69.86	7.86
					Result: Normal Operation			
			7060	-66.52	100	-62	-67.79	5.79
					Result: Stop Transmission			
				-67.52	< 90	-62	-68.79	6.79
					Result: Minimal Operation			
				-70.43	0	-62	-71.7	9.7
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 2, gain = 1.27dBi)

Note 2: Path Loss between antenna and RF connector is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

3.5.7 Worst Case Plots of Contention Based Protocol

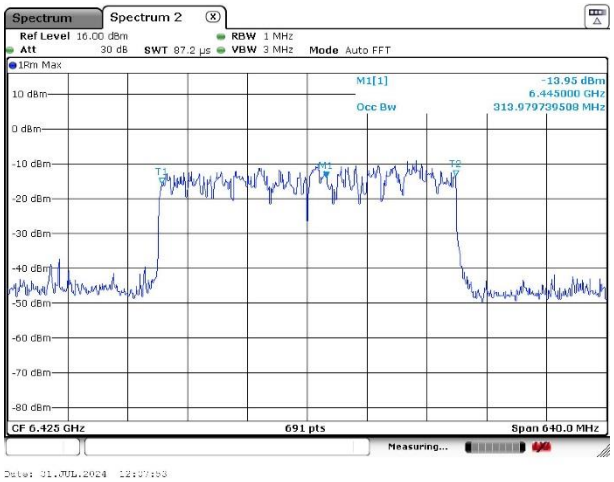
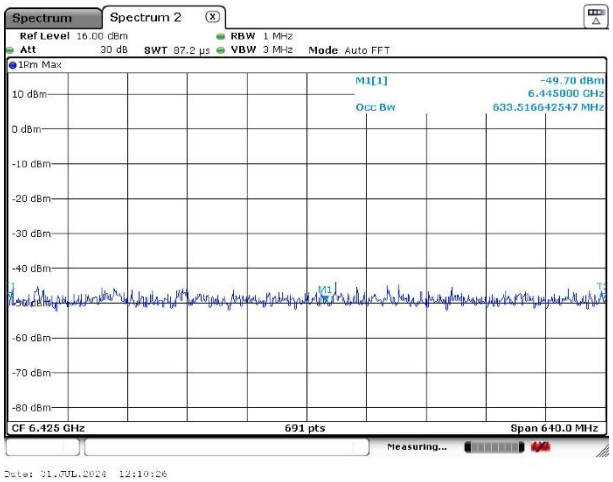
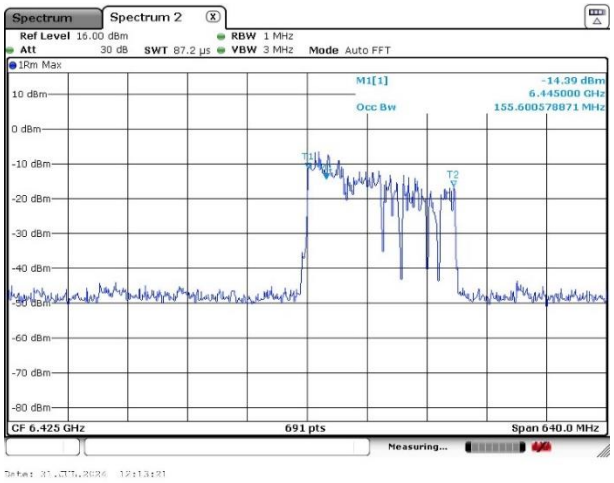
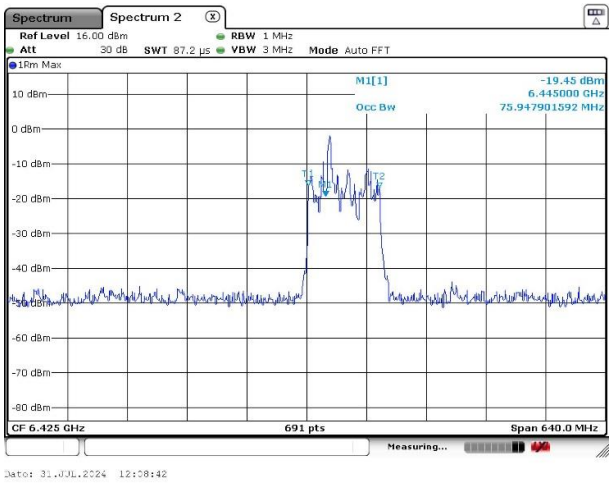
Contention Based Protocol Result Plots on U-NII 5/6/7 (AWGN Interference)	
802.11be (EHT320) / 6425MHz (Middle) Threshold Level (TL) = -61.88 dBm	802.11be (EHT320)/ CH95 (Middle) Test result is pass due to no transmission occur.
	
802.11be (EHT320) / 6425MHz (Middle) Threshold Level (TL) =-62.88 dBm	802.11be (EHT320)/ CH95 (Middle) Transmit when the interferer is 1dB lower.
	

Remark: M1: Injection of AWGN signal, D1: Removal of AWGN signal

3.5.8 Worst Case of Contention Based Protocol Transmission Bandwidth

Verify transmission absence when Incumbent signal at different frequency (frequency domain plots).

1. When Incumbent Signal inject at lowest frequency, the whole 320MHz bandwidth stop transmission;
2. When Incumbent Signal inject at middle frequency, the transmission bandwidth reduced to 160MHz;
3. When Incumbent Signal inject at highest frequency, the transmission bandwidth reduced to 80MHz;
4. The channel puncturing mode is for improving network performance and not available for CBP, the CBP will apply channel bandwidth reduction mechanism to protect incumbent operations.

<table>
<tr><th colspan="2">UNII 6_CH95 (6425MHz / BW=320MHz)</th></tr>
<tr><td>Non-Incumbent Signal</td><td>Incumbent freq @ 6425MHz</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Incumbent freq @ 6270MHz</td><td>Incumbent freq @ 6580 MHz</td></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

3.6 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.6.1 Limit of Unwanted Emissions

(1) For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27 (RMS)	68.3
- 7 (Peak)	88.3

Unwanted emissions outside of restricted bands are measured with a RMS detector.
In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average limit

(2) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table:

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

Note: The following formula is used to convert the EIRP to field strength.

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

3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

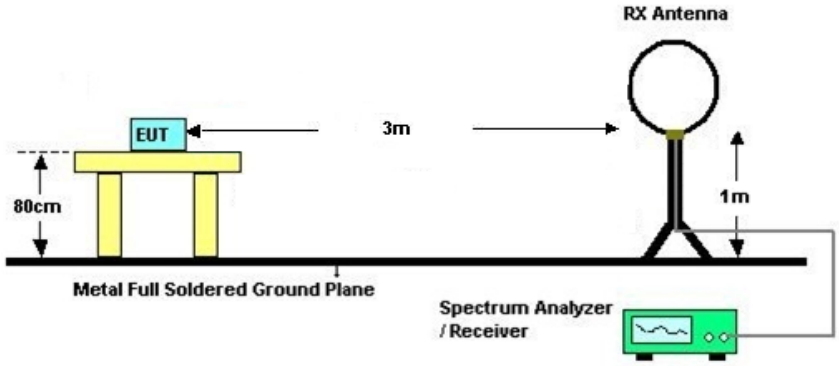
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

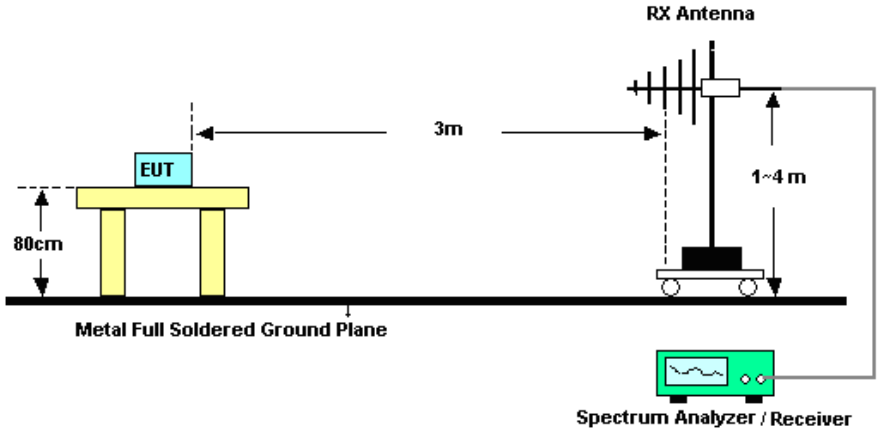
3.6.4 Test Setup

For radiated emissions below 30MHz

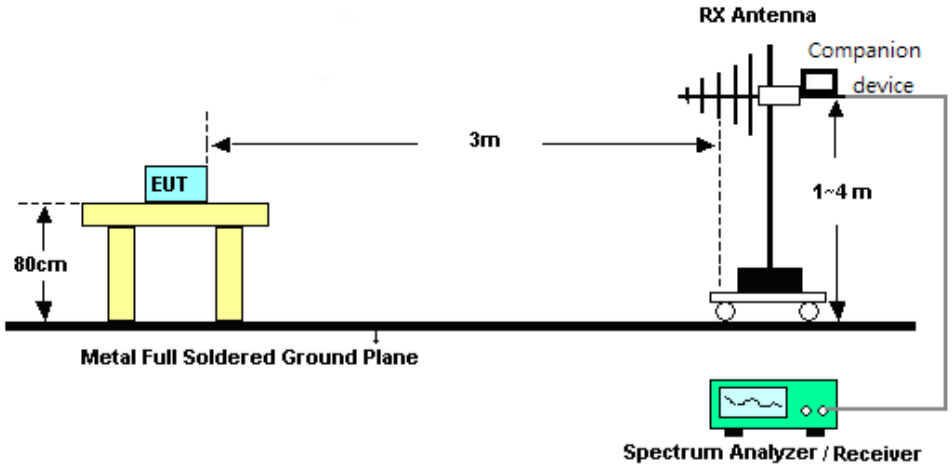


For radiated emissions from 30MHz to 1GHz

<CDD Mode>

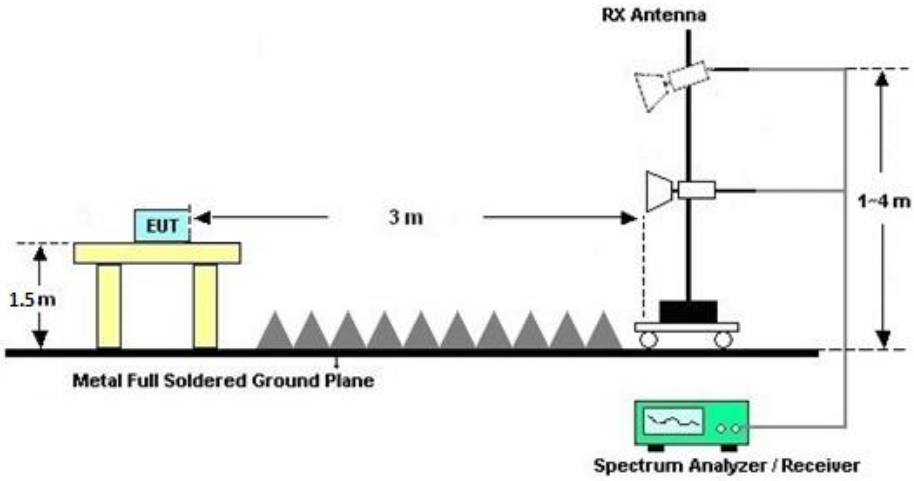


<TXBF Modes>

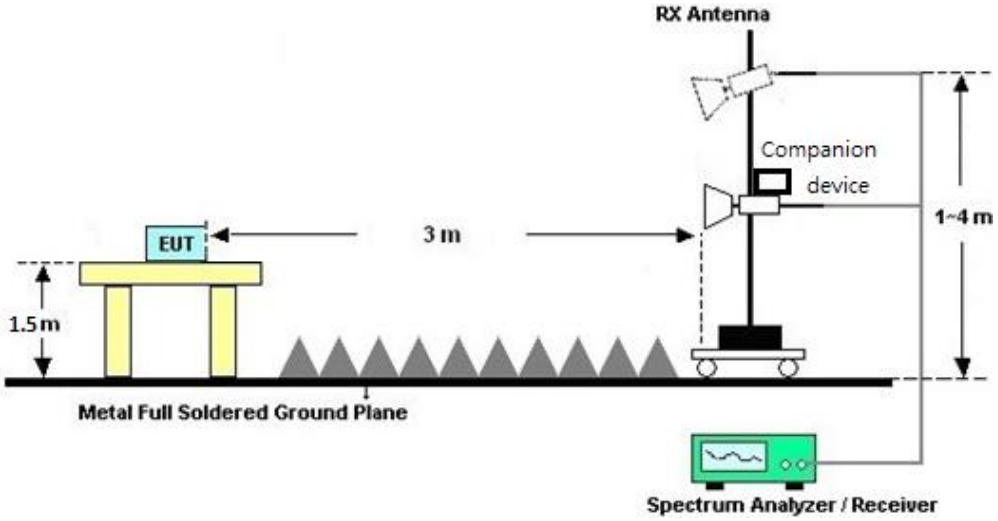


For radiated emissions above 1GHz

<CDD Mode>



<TXBF Modes>



3.6.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.6.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C

3.6.7 Duty Cycle

Please refer to Appendix D.

3.6.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

The emission level above 18GHz is checked that the emission level is noise floor only, so it is not reflected in the report.

3.7 AC Conducted Emission Measurement

3.7.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

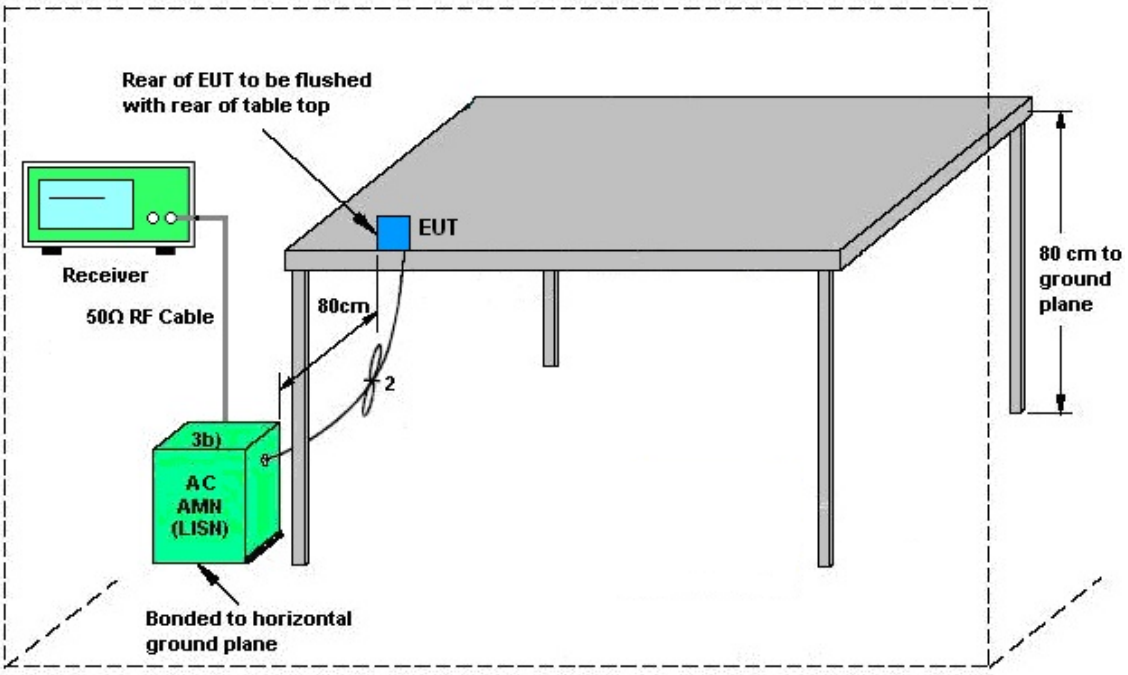
3.7.2 Measuring Instruments

See list of measuring equipment of this test report.

3.7.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.7.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.7.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.8 Antenna Requirements

3.8.1 Standard Applicable

§15.203: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used. The EUT complies with the requirement of 15.203.

3.8.3 Antenna Gain

For Sample1 (Inpaq Antenna)

Frequency Band	Maximum Single Antenna gain (dBi)				CDD DG (dBi)		TXBF DG (dBi)		SDM DG (dBi)	
	ANT1	ANT2	ANT3	ANT4	For Power	For PSD	For Power	For PSD	For Power	For PSD
6GHz UNII-5	2.58	1.57	2.97	2.82	-0.16	4.93	4.93	4.93	-0.16	-0.16
6GHz UNII-6	2.33	1.81	2.74	2.67	0.16	4.38	4.38	4.38	0.16	0.16
6GHz UNII-7	2.33	1.81	2.74	2.67	0.16	3.8	3.8	3.8	0.16	0.16
6GHz UNII-8	2.38	1.27	3.02	2.56	-0.05	4.64	4.64	4.64	-0.05	-0.05

For Sample2 (AOT Antenna)

Frequency Band	Maximum Single Antenna gain (dBi)				CDD DG (dBi)		TXBF DG (dBi)		SDM DG (dBi)	
	ANT1	ANT2	ANT3	ANT4	For Power	For PSD	For Power	For PSD	For Power	For PSD
6GHz UNII-5	2.14	2.07	2.24	1.66	0.23	4.98	4.98	4.98	0.23	0.23
6GHz UNII-6	2.34	2.13	1.63	2.30	0.04	4.88	4.88	4.88	0.04	0.04
6GHz UNII-7	2.34	2.13	1.63	2.30	0.04	4.53	4.53	4.53	0.04	0.04
6GHz UNII-8	2.19	2.00	1.71	3.21	-0.15	4.31	4.31	4.31	-0.15	-0.15

Note:

1. Please refer to the antenna report for the maximum Single antenna gain and CDD (Cyclic Delay Diversity) directional gain and TXBF (Tx Beamforming) directional gain and SDM (Space Division Multiplexing) directional gain.
2. The device supports 1S4T(CDD&TXBF) and 4S4T(SDM) mode;
   1S4T: NSS=1, MIMO 4Tx; 4S4T: NSS=4, MIMO 4Tx

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 11, 2023	Jul. 24, 2024~ Dec. 13, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 10, 2024		Oct. 09, 2025	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 02, 2024	Jul. 24, 2024~ Dec. 13, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	Jul. 24, 2024~ Dec. 13, 2024	Jan. 01, 2025	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY57290151	3Hz~8.5GHz;Max 30dBm	Jul. 04, 2024	Sep. 29, 2024	Jul. 03, 2025	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz-44G,MAX 30dB	Oct. 11, 2023	Sep. 29, 2024	Oct. 10, 2024	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2E	101125	9kHz~30MHz	Sep. 08, 2024	Sep. 29, 2024	Sep. 07, 2025	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	Apr. 18, 2024	Sep. 29, 2024	Apr. 17, 2025	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218642	1GHz~18GHz	Apr. 11, 2024	Sep. 29, 2024	Apr. 10, 2025	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 06, 2024	Sep. 29, 2024	Jan. 05, 2025	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	381512	9KHz-1GHz	Jan. 02, 2024	Sep. 29, 2024	Jan. 01, 2025	Radiation (03CH05-KS)
Amplifier	EM	EM18G40GA	060852	18~40GHz	Jan. 02, 2024	Sep. 29, 2024	Jan. 01, 2025	Radiation (03CH05-KS)
high gain Amplifier	EM	EM01G18GA	060843	1Ghz-18Ghz	Jan. 03, 2024	Sep. 29, 2024	Jan. 02, 2025	Radiation (03CH05-KS)
Amplifier	EM	EM01G18GA	060833	1Ghz-18Ghz	Jan. 03, 2024	Sep. 29, 2024	Jan. 02, 2025	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Sep. 29, 2024	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Sep. 29, 2024	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Sep. 29, 2024	NCR	Radiation (03CH05-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 18, 2024	Oct. 31, 2024	Apr. 17, 2025	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Aug. 20, 2024	Oct. 31, 2024	Aug. 19, 2025	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Apr. 18, 2024	Oct. 31, 2024	Apr. 17, 2025	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 09, 2024	Oct. 31, 2024	Oct. 08, 2025	Conduction (CO01-KS)
Signal Analyzer	R&S	FSV7	101472	10Hz~7GHz	Jan. 02, 2024	Jul. 31, 2024~ Nov. 13, 2024	Jan. 01, 2025	CBP (DFS01-KS)
MXG-B RF Vector Signal Genertor	Keysight	5182B /5182BX07	MY56200417 /MY59360210	9kHz~7.2GHz	Apr 17, 2024	Jul. 31, 2024~ Nov. 13, 2024	Apr 16, 2025	CBP (DFS01-KS)
Combiner	MTJ Cooperation	MTJ7112	N/A	0.4-6GHz	NCR	Jul. 31, 2024~ Nov. 13, 2024	NCR	CBP (DFS01-KS)

NCR: No Calibration Required

5 Measurement Uncertainty

Uncertainty of Conducted Measurement

Conducted Spurious Emission & Bandedge	±2.22 dB
Occupied Channel Bandwidth	±0.1%
Conducted Power	±0.50 dB
Conducted Power Spectral Density	±0.90 dB
Frequency	±0.4 Hz
Conducted Generated signal Levels	±0.56 dB
Conducted Time	0.54%

Uncertainty of AC Conducted Emission Measurement (0.15 MHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.84 dB

Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.30 dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.02 dB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.22 dB

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

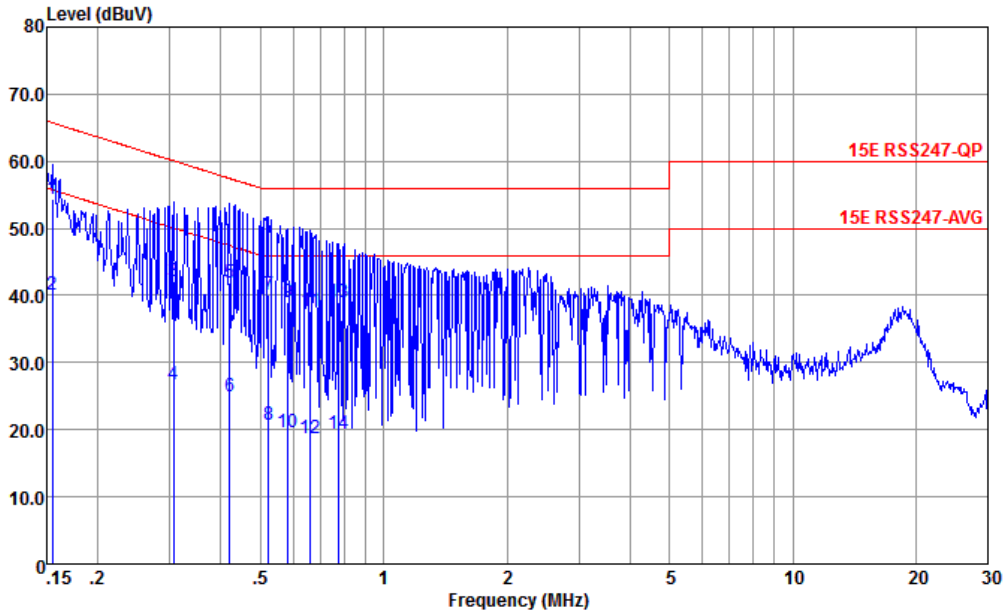
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.34 dB

---------- THE END ----------

Appendix A. Conducted Test Results

Appendix B. AC Conducted Emission Test Results

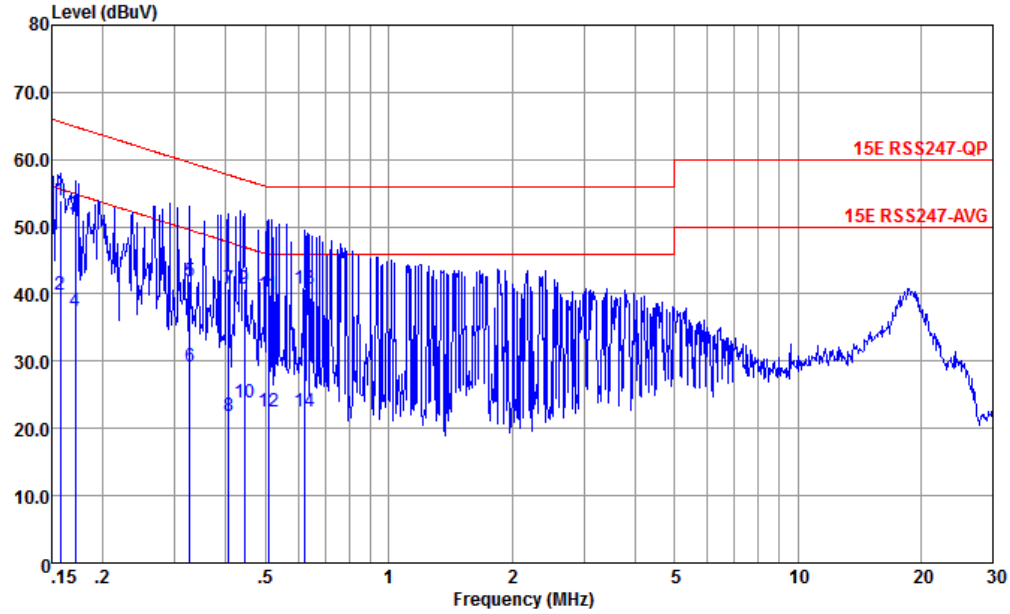
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15E RSS247-QP LISN-060105-L 2024 LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	*	0.155	54.47	-11.27	65.74	43.90	0.12	10.45	QP
2		0.155	40.17	-15.57	55.74	29.60	0.12	10.45	Average
3		0.307	42.06	-18.00	60.06	31.50	0.08	10.48	QP
4		0.307	26.76	-23.30	50.06	16.20	0.08	10.48	Average
5		0.419	41.93	-15.53	57.46	31.50	-0.04	10.47	QP
6		0.419	25.03	-22.43	47.46	14.60	-0.04	10.47	Average
7		0.524	40.18	-15.82	56.00	29.90	-0.12	10.40	QP
8		0.524	20.78	-25.22	46.00	10.50	-0.12	10.40	Average
9		0.582	39.05	-16.95	56.00	28.80	-0.13	10.38	QP
10		0.582	19.55	-26.45	46.00	9.30	-0.13	10.38	Average
11		0.661	37.71	-18.29	56.00	27.50	-0.14	10.35	QP
12		0.661	18.81	-27.19	46.00	8.60	-0.14	10.35	Average
13		0.775	38.96	-17.04	56.00	28.80	-0.16	10.32	QP
14		0.775	19.46	-26.54	46.00	9.30	-0.16	10.32	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15E RSS247-QP LISN-060105-N 2024 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.157	53.87	-11.73	65.60	43.30	0.12	10.45	QP
2	0.157	39.87	-15.73	55.60	29.30	0.12	10.45	Average
3	0.171	51.78	-13.12	64.90	41.21	0.12	10.45	QP
4	0.171	37.48	-17.42	54.90	26.91	0.12	10.45	Average
5	0.327	41.86	-17.67	59.53	31.51	-0.13	10.48	QP
6	0.327	29.26	-20.27	49.53	18.91	-0.13	10.48	Average
7	0.406	40.85	-16.88	57.73	30.51	-0.14	10.48	QP
8	0.406	21.95	-25.78	47.73	11.61	-0.14	10.48	Average
9	0.444	40.81	-16.17	56.98	30.50	-0.14	10.45	QP
10	0.444	23.91	-23.07	46.98	13.60	-0.14	10.45	Average
11	0.507	39.86	-16.14	56.00	29.60	-0.15	10.41	QP
12	0.507	22.46	-23.54	46.00	12.20	-0.15	10.41	Average
13	0.624	40.70	-15.30	56.00	30.50	-0.16	10.36	QP
14	0.624	22.40	-23.60	46.00	12.20	-0.16	10.36	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)