

FCC 15.407 U-NII 5GHz Test Report

for

LG Electronics Inc.

**222, LG-ro, Jinwi-myeon Pyeongtaek-Si, Gyeonggi-Do,
17709 Republic of Korea**

Product Name : Wireless Audio Module
Model Name : WL2SB21
Brand : LG
FCC ID : BEJ-WL2SB21

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.

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Audix Technology Corp.
No. 491, Zhongfu Rd., Linkou Dist.,
New Taipei City 244, Taiwan

Tel: +886 2 26099301
Fax: +886 2 26099303

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TEST REPORT

Applicant : LG Electronics Inc.
Manufacturer : LG Electronics Inc.
Factory : Wistron NeWeb (Kunshan) Corporation
EUT Description
(1) Product : Wireless Audio Module
(2) Model : WL2SB21
(3) Brand : LG
(4) Power Supply: DC 3.3V

Applicable Standards:

Title 47 FCC CFR Part 15 Subpart E

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2022. 09. 05

Reviewed by:

Sabrina Wang

(Sabrina Wang/Administrator)

Approved by:

Johnny Hsueh

(Johnny Hsueh/Section Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Date	Revision Summary	Report Number
0	2022. 09. 05	Original Report	EM-F220560

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission	PASS
15.205/15.209	Undesirable Emissions Limits: Radiated Band Edge and Radiated Spurious Emission	PASS
15.407(a)(5)/15.407(e)	Emission/Occupied Bandwidth	PASS
15.407(a)	Maximum Output Power	PASS
15.407(b)	Conducted Band Edges	N/A
15.407(a)	Power Spectral Density	PASS
15.407	Frequency Stability	PASS
15.407(h)(2)	Dynamic Frequency Selection(DFS)	N/A
15.203	Antenna Requirement	Compliance
Note: The uncertainties value is not used in determining the result.		

3. GENERAL INFORMATION

3.1. Description of Application

Applicant	LG Electronics Inc. 222, LG-ro, Jinwi-myeon Pyeongtaek-Si, Gyeonggi-Do, 17709 Republic of Korea
Manufacturer	LG Electronics Inc. 222, LG-ro, Jinwi-myeon Pyeongtaek-Si, Gyeonggi-Do, 17709 Republic of Korea
Factory	Wistron NeWeb (Kunshan) Corporation 789 Yujinxiang Road, Comprehensive Free Trade Zone, Kunshan City, Jiangsu Province, Province 215300, P.R.C
Product	Wireless Audio Module
Model	WL2SB21
Brand	LG

3.2. Description of EUT

Test Model	WL2SB21		
Serial Number	N/A		
Power Rating	DC 3.3V		
Software Version	104.3.1		
Hardware version	48SWA598.SGB		
RF Features	pi/4-shifted DQPSK		
Transmit Type	1T1R		
Device Category	<input type="checkbox"/> Outdoor Access Point <input type="checkbox"/> Fixed point-to-point Access Point <input type="checkbox"/> Indoor Access Point <input checked="" type="checkbox"/> Mobile and Portable client device		
Test Sample	Sample No.	Test Item	Firmware
	01	AC Conduction, RSE, RF Conducted	N/A
Sample Status	Trial sample		
Date of Receipt	2022. 07. 20		
Date of Test	2022. 07. 01 ~ 09. 05		
Interface Ports of EUT	None		
Accessories Supplied	None		

3.3. Reference Test Guidance

KDB 789033 D02 General UNII Test Procedures New Rules v02r01
KDB 291074 D02 EMC Measurement v01
ANSI C63.10:2013

3.4. Antenna Information

No.	Antenna Part Number	Manufacturer	Antenna Type	Frequency (MHz)	Gain (dBi)
1.	5G1 (Ant 1)	WNC	PCB Printing Antenna	5150	3.43
				5350	2.86
				5550	2.90
				5750	2.84
				5850	3.18
2.	5G2 (Ant 0)	WNC	PCB Printing Antenna	5150	3.26
				5350	3.40
				5550	2.78
				5750	2.91
				5850	2.47

3.5. EUT Specifications Assessed in Current Report

Modulation	U-NII Band	Fundamental Range (MHz)	Channel Number
pi/4-shifted DQPSK	1	5155.35-5247.35	47
	3	5726.35-5848.35	62
	4	5850.35-5874.35	13

Modulation	Data Rate
pi/4-shifted DQPSK	3Mbps

Channel List									
U-NII Band 1									
Channel Number	Frequency (MHz)								
2	5155.35	12	5175.35	22	5195.35	32	5215.35	42	5235.35
3	5157.35	13	5177.35	23	5197.35	33	5217.35	43	5237.35
4	5159.35	14	5179.35	24	5199.35	34	5219.35	44	5239.35
5	5161.35	15	5181.35	25	5201.35	35	5221.35	45	5241.35
6	5163.35	16	5183.35	26	5203.35	36	5223.35	46	5243.35
7	5165.35	17	5185.35	27	5205.35	37	5225.35	47	5245.35
8	5167.35	18	5187.35	28	5207.35	38	5227.35	48	5247.35
9	5169.35	19	5189.35	29	5209.35	39	5229.35		
10	5171.35	20	5191.35	30	5211.35	40	5231.35		
11	5173.35	21	5193.35	31	5213.35	41	5233.35		
Channel List									
U-NII Band 3									
Channel Number	Frequency (MHz)								
0	5726.35	13	5752.35	26	5778.35	39	5804.35	52	5830.35
1	5728.35	14	5754.35	27	5780.35	40	5806.35	53	5832.35
2	5730.35	15	5756.35	28	5782.35	41	5808.35	54	5834.35
3	5732.35	16	5758.35	29	5784.35	42	5810.35	55	5836.35
4	5734.35	17	5760.35	30	5786.35	43	5812.35	56	5838.35
5	5736.35	18	5762.35	31	5788.35	44	5814.35	57	5840.35
6	5738.35	19	5764.35	32	5790.35	45	5816.35	58	5842.35
7	5740.35	20	5766.35	33	5792.35	46	5818.35	59	5844.35
8	5742.35	21	5768.35	34	5794.35	47	5820.35	60	5846.35
9	5744.35	22	5770.35	35	5796.35	48	5822.35	61	5848.35
10	5746.35	23	5772.35	36	5798.35	49	5824.35		
11	5748.35	24	5774.35	37	5800.35	50	5826.35		
12	5750.35	25	5776.35	38	5802.35	51	5828.35		
Channel List									
U-NII Band 4									
Channel Number	Frequency (MHz)								
62	5850.35	65	5856.35	68	5862.35	71	5868.35	74	5874.35
63	5852.35	66	5858.35	69	5864.35	72	5870.35		
64	5854.35	67	5860.35	70	5866.35	73	5872.35		

Note: Test modes are presented at section 3.7.

3.6. Description of Key Components

None

3.7. Test Configuration

Modulation	TX _{on} (ms)	TX _{on+off} (ms)	Duty Cycle (x)	Duty Cycle Factor [10log(1/x)] (dB)
pi/4-shifted DQPSK	N/A ^{Note 2}	N/A ^{Note 2}	1	N/A

Note: 1. When duty cycle is less than 98% (0.98) that duty cycle factor 10log(1/x) is needed to add in conducted test items measured in average detector.

2. N/A represent the duty cycle is 100%, TX_{on} and TX_{on+off} cannot be measured.

Modulation	TX _{on} (ms)	T _{on} +T _{off} (ms)
pi/4-shifted DQPSK		

AC Conduction
Normal Operation

Item	Modulation	Data Rate	Antenna	Test Frequency (MHz)
Radiated Test Case	pi/4-shifted DQPSK	3 Mbps	Ant 0	5788.35
			Ant 1	5247.35
	pi/4-shifted DQPSK	3 Mbps	Ant 0	5155.35 / 5726.35 / 5848.35 / 5878.35
			Ant 1	5155.35 / 5726.35 / 5848.35 / 5878.35
	pi/4-shifted DQPSK	3 Mbps	Ant 0	5247.35 / 5788.35 / 5874.35
			Ant 1	5247.35 / 5726.35 / 5874.35

Item	Modulation	Data Rate	Antenna	Test Frequency (MHz)
Conducted Test Case	pi/4-shifted DQPSK	3 Mbps	Ant 0	5155.35 / 5201.35 / 5247.35 / 5726.35 / 5788.35 / 5848.35 / 5850.35 / 5862.35 / 5874.35
			Ant 1	5155.35 / 5201.35 / 5247.35 / 5726.35 / 5788.35 / 5848.35 / 5850.35 / 5862.35 / 5874.35
	pi/4-shifted DQPSK	3 Mbps	Ant 0	5155.35 / 5201.35 / 5247.35 / 5726.35 / 5788.35 / 5848.35 / 5850.35 / 5862.35 / 5874.35
			Ant 1	5155.35 / 5201.35 / 5247.35 / 5726.35 / 5788.35 / 5848.35 / 5850.35 / 5862.35 / 5874.35
	pi/4-shifted DQPSK	3 Mbps	Ant 0	5155.35 / 5201.35 / 5247.35 / 5726.35 / 5788.35 / 5848.35 / 5850.35 / 5862.35 / 5874.35
			Ant 1	5155.35 / 5201.35 / 5247.35 / 5726.35 / 5788.35 / 5848.35 / 5850.35 / 5862.35 / 5874.35

Note 1: Mobile Device Portable Device,
and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: Lie Side Stand
Note 2: Low, mid, and high channels were measured, only the worst channel was presented in this report.

3.8. Output Power Setting

Mode	U-NII Band	Centre Frequency (MHz)	Power Setting	
			Ant 0	Ant 1
pi/4-shifted DQPSK	1	5155.35	19	21
		5201.35	20	22
		5247.35	20	22
	3	5726.35	20	22
		5788.35	20	22
		5848.35	20	22
	4	5850.35	20	22
		5862.35	20	22
		5874.35	20	22

3.9. Tested Supporting System List

3.9.1. Support Peripheral Unit

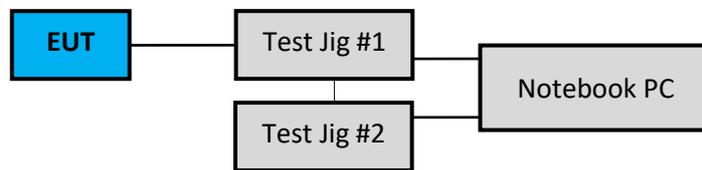
No.	Product	Brand	Model No.	Serial No.	Approval
1.	Test Jig #1	N/A	N/A	N/A	N/A
2.	Test Jig #2	N/A	N/A	N/A	N/A
3.	Notebook PC	hp	TPN-Q189	5CD8175992	Contains FCC ID: PD93168NG Contains IC: 1000M-3168NG

3.9.2. Cable Lists

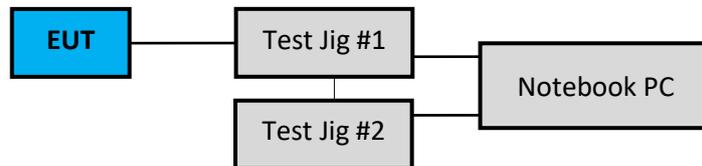
No.	Cable Description Of The Above Support Units
1.	Data Cable: Unshielded, Undetectable, 0.14m
2.	Data Cable: Unshielded, Undetectable, 0.03m
3.	USB Cable: Unshielded, Undetectable, 2.0m USB Cable: Unshielded, Undetectable, 0.8m Adapter: hp, M/N PPP-012C-S DC Power Cord: Unshielded, Undetectable, 2.0m, Bonded a ferrite core AC Power Cable: Unshielded, Detectable, 1.0m

3.10. Setup Configuration

3.10.1. EUT Configuration for Power Line & Radiated Emission



3.10.2. EUT Configuration for RF Conducted Test Items



3.11. Operating Condition of EUT

Test program “CMD” is used for enabling EUT RF function under continues transmitting and choosing channel.

3.12. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 491, Zhongfu Rd., Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2017 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.8 Shielded Room (2) No.1 3m Semi Anechoic Chamber

3.13.Measurement Uncertainty

Test Items/Facilities		Frequency Range	Uncertainty	
Conduction Test		9kHz-150kHz	±3.7dB	
		150kHz-30MHz	±3.4dB	
Radiation Test	<input checked="" type="checkbox"/>	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.8dB
			200MHz-1000MHz, 3m, Horizontal	±4.1dB
			30MHz-200MHz, 3m, Vertical	±4.5dB
			200MHz-1000MHz, 3m, Vertical	±4.5dB
			1GHz-6GHz, 3m	±4.7dB
			6GHz-18GHz, 3m	±4.1dB
			18GHz-40GHz, 3m	±3.52dB
	<input type="checkbox"/>	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.9dB
			200MHz-1000MHz, 3m, Horizontal	±4.2dB
			30MHz-200MHz, 3m, Vertical	±4.3dB
			200MHz-1000MHz, 3m, Vertical	±4.5dB
	<input type="checkbox"/>	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.1dB
			200MHz-1000MHz, 3m, Horizontal	±4.5dB
			30MHz-200MHz, 3m, Vertical	±4.4dB
			200MHz-1000MHz, 3m, Vertical	±4.8dB
			1GHz-6GHz, 3m	±5.0dB
			6GHz-18GHz, 3m	±4.7dB
	<input type="checkbox"/>	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.2dB
			200MHz-1000MHz, 3m, Horizontal	±4.3dB
			30MHz-200MHz, 3m, Vertical	±4.3dB
			200MHz-1000MHz, 3m, Vertical	±4.7dB
			1GHz-6GHz, 3m	±4.8dB
			6GHz-18GHz, 3m	±4.5dB

Remark : Uncertainty = $ku_c(y)$

Test Items	Uncertainty
Bandwidth	± 0.2kHz
Maximum output power	± 0.33dB
Power spectral density	± 0.13dB

4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2022. 01. 11	1 Year
2.	A.M.N.	R&S	ENV432	101567	2022. 05. 26	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2021. 12. 19	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2021. 12. 23	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2022. 04. 14	1 Year
6.	Coaxial Cable	Yeida	RG/58AU	CE-08	2021. 09. 13	1 Year
7.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A-526	MY53400071	2021. 09. 09	1 Year
2.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2022. 04. 08	1 Year
3.	Test Receiver	R&S	ESCS30	100338	2022. 06. 15	1 Year
4.	Amplifier	HP	8447D	2944A06305	2022. 01. 05	1 Year
5.	Microwave Amplifier	EMCI	EMC184045	980175	2021. 09. 04	1 Year
6.	Microwave Amplifier	HP	8449B	3008A01284	2022. 06. 01	1 Year
7.	Loop Antenna	ETS LINDGREN	6512	00035867	2021. 09. 29	1 Year
8.	Bilog Antenna	TESEQ	CBL6112D	33821	2022. 07. 01	1 Year
9.	Double-Ridged Waveguide Horn	EMCO	3115	9112-3775	2022. 05. 18	1 Year
10.	Horn Antenna	COM-POWER	AH-840	101092	2022. 01. 06	1 Year
11.	5G Notch Filter	Microwave Circuits	N0452502	459775	2022. 05. 04	1 Year
12.	5G Notch Filter	Microwave Circuits	N0257881	459776	2022. 08. 10	1 Year
13.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2022. 01. 20	1 Year
14.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 106	RE-14	2022. 01. 20	1 Year
15.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	RE-30	2021. 08. 25	1 Year
16.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2022. 04. 14	1 Year
17.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.3. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9020B-544	MY57120357	2022.03.02	1 Year
2.	Power Meter	Anritsu	ML2495A	1145008	2022.06.22	1 Year
3.	Power Sensor	Anritsu	MA2411B	1126096	2022.06.22	1 Year
4.	Digital Thermo-Hygro Meter	iMax	HTC-1	RF-03	2022.04.14	1 Year

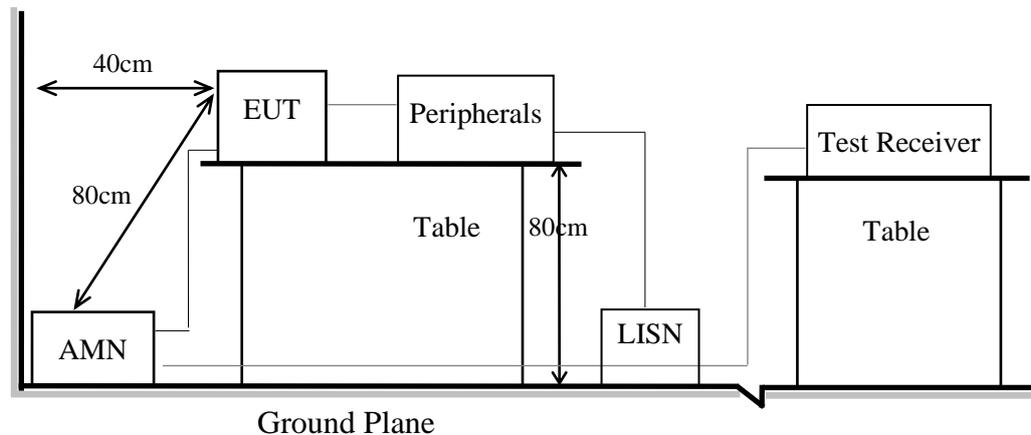
5. CONDUCTED EMISSION

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.10

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

Remark1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
- 5.3.4. Checking frequency range from 150kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

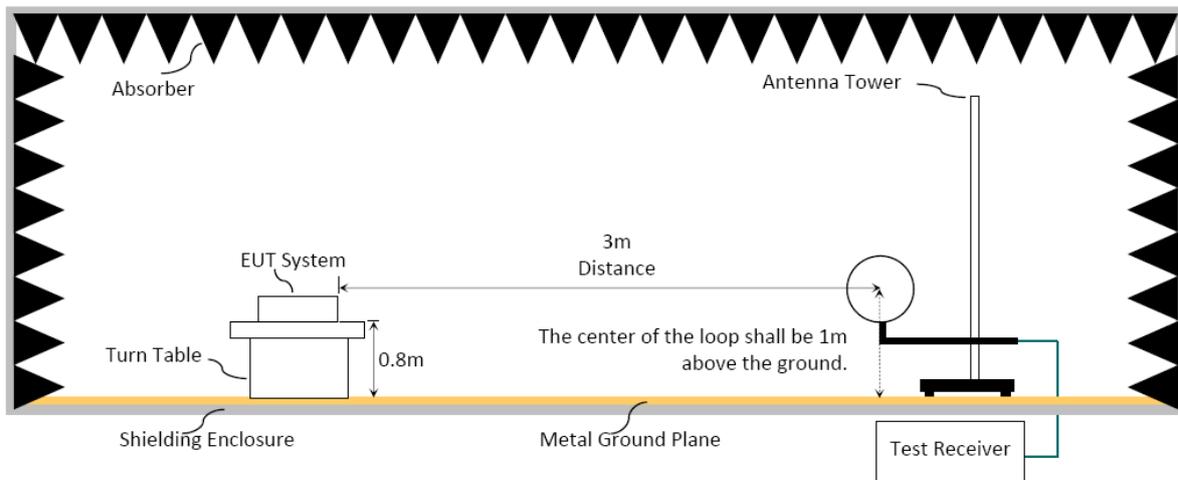
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

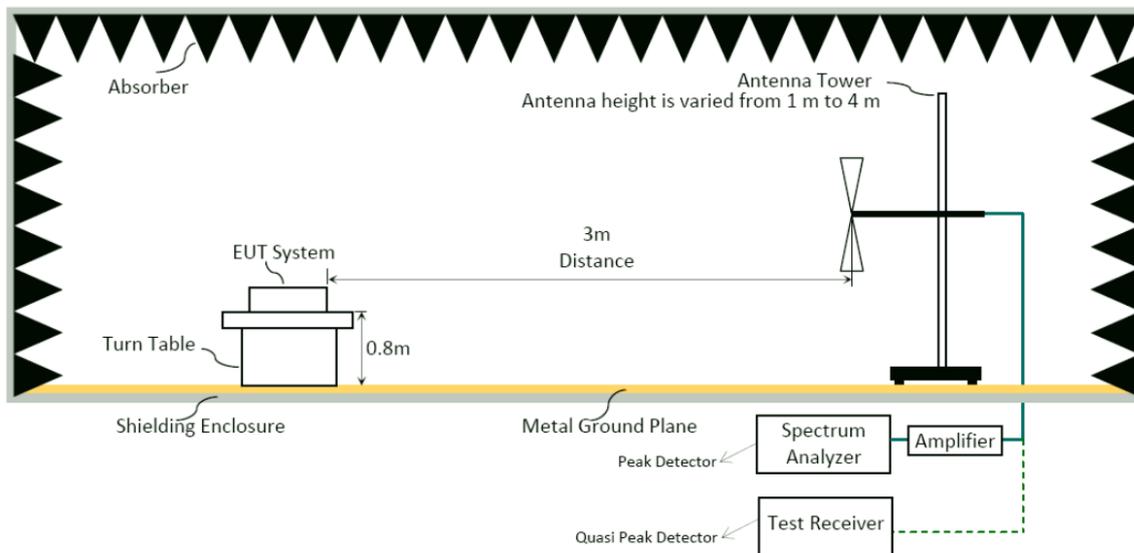
6.1.1. Block Diagram of EUT

Indicated as section 3.10

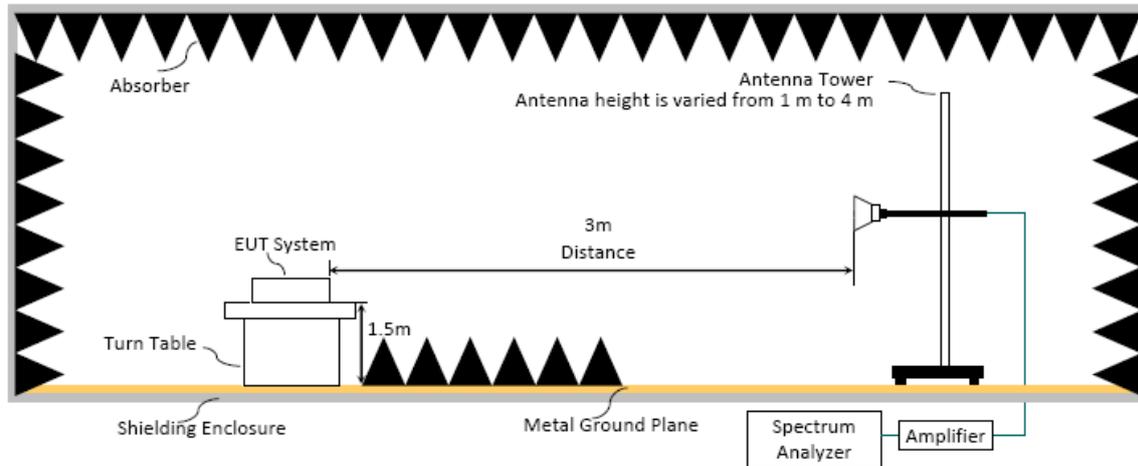
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

Radiated emissions fall in restricted bands, as defined in Section 15.205 must be in compliance with the radiated emission limits specified in 15.209 as below.

6.2.1. General Limit

Frequency (MHz)	Distance(m)	Limits	
		dB μ V/m	μ V/m
0.009 - 0.490	300	67.6-20 log f(kHz)	2400/f kHz
0.490 - 1.705	30	87.6-20 log f(kHz)	24000/f kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dB μ V/m (Peak) 54.0 dB μ V/m (Average)	

Remark : (1) dB μ V/m = 20 log (μ V/m)

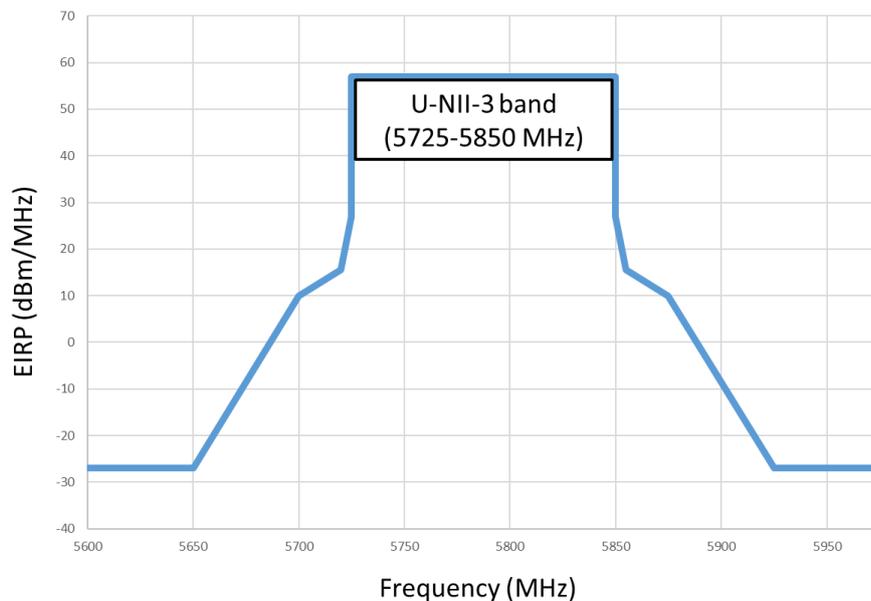
- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.2.2. Limit for non-restricted frequency above 1 GHz

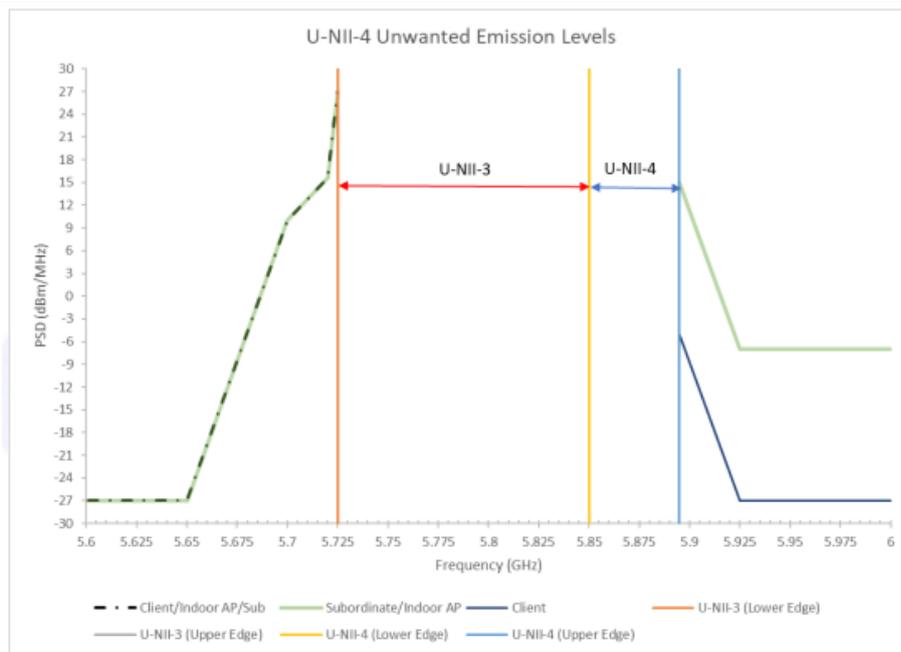
Frequency Band (MHz)	E.I.R.P. Limit	Field Strength Limit at 3 m
5150 to 5250	-27 dBm	68.2 dB μ V/m
5250 to 5350		68.2 dB μ V/m
5470 to 5725		68.2 dB μ V/m

Note: Field Strength at 3 m = E.I.R.P. + 95.2 dB

Frequency Band (MHz)	Field Strength Limit at 3 m
5725 to 5850	<input checked="" type="checkbox"/> 15.407(b)(4)(i) All emissions shall be limited to a level of 68.2 dB μ V/m at 75 MHz or more above or below the band edge increasing linearly to 105.2 dB μ V/m 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 110.8 dB μ V/m 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 122.2 dB μ V/m at the band edge.
	<input type="checkbox"/> 15.407(b)(4)(ii), compliance with the emission limits in § 15.247(d) Shall be at least 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power,. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c))



Frequency Band (MHz)	Field Strength Limit at 3 m	
5850 to 5895	<input type="checkbox"/>	15.407(b)(5)(i) For an indoor access point or subordinate device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of 15 dBm/MHz and shall decrease linearly to an e.i.r.p. of -7 dBm/MHz at or above 5.925 GHz.
	<input checked="" type="checkbox"/>	15.407(b)(5)(ii) , For a client device, all emissions at or above 5.895 GHz shall not exceed an e.i.r.p. of -5 dBm/MHz and shall decrease linearly to an e.i.r.p. of -27 dBm/MHz at or above 5.925 GHz.
	<input checked="" type="checkbox"/>	15.407(b)(5)(iii) , For a client device or indoor access point or subordinate device, all emissions below 5.725 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz at 5.65 GHz increasing linearly to 10 dBm/MHz at 5.7 GHz, and from 5.7 GHz increasing linearly to a level of 15.6 dBm/MHz at 5.72 GHz, and from 5.72 GHz increasing linearly to a level of 27 dBm/MHz at 5.725 GHz.



6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turntable which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 40GHz:

The EUT setup on the turn table which has 80cm (for 30-1000MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1)RBW = 120kHz
- (2)VBW $\geq 3 \times$ RBW.
- (3)Detector = Peak.
- (4)Sweep time = auto.
- (5)Trace mode = max hold.
- (6)Allow sweeps to continue until the trace stabilizes.

Note 1: When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Note 2: When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

Frequency above 1GHz to 10th harmonic(up to 40 GHz):

Peak Detector:

- (1)RBW = 1MHz
- (2)VBW $\geq 3 \times$ RBW.
- (3)Detector = Peak.
- (4)Sweep time = auto.
- (5)Trace mode = max hold.
- (6)Allow sweeps to continue until the trace stabilizes.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Average Detector:**■ Option 1:**

- (1) RBW = 1MHz
 (2) VBW $\geq 1/T$. (Duty Cycle < 98%, when duty cycle presented in section 3.7)
 (3) VBW = set VBW \leq RBW / 100, but not less than 10Hz (Duty Cycle \geq 98%, when duty cycle presented in section 3.7)

Mode	VBW Setting
SRD	10Hz

- (4) Detector = Peak.
 (5) Sweep time = auto.
 (6) Trace mode = max hold.
 (7) Allow sweeps to continue until the trace stabilizes.

□ Option 2:

Average Emission Level(dB μ V/m) = Peak Emission Level(dB μ V/m) + DCCF(dB).

6.4. Measurement Result Explanation

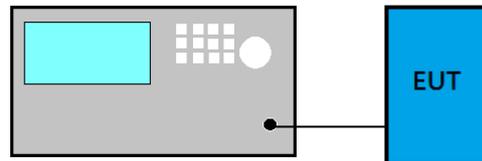
- Peak Emission Level(dB μ V/m) = Antenna Factor(dB/m) + Cable Loss (dB) – Preamp Gain (dB) + Reading(dB μ V).
 ■ Average Emission Level(dB μ V/m) = Antenna Factor(dB/m) + Cable Loss (dB) – Preamp Gain (dB) + Reading(dB μ V).
 □ Average Emission Level(dB μ V/m) = Peak Emission Level(dB μ V/m) + DCCF(dB)
 Duty Cycle Correction Factor (DCCF)(dB) = $20\log(TX_{on}/TX_{on+off})$ presented in section 3.7.
 □ ERP(dBm) = Peak Emission Level(dB μ V/m) - 95.2dB - 2.14dB

6.5. Test Results

Please refer to Appendix A.

7. EMISSION/OCCUPIED BANDWIDTH

7.1. Block Diagram of Test Setup



7.2. Specification Limits

Frequency Band (MHz)	Limit
5150 to 5250	Reference only
5250 to 5350	
5470 to 5725	
5725 to 5895	≥ 500kHz

7.3. Test Procedure

Following measurement procedure is reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 and KDB 291074 D02 EMC Measurement v01:

For Emission Bandwidth

■ Applicable to all bands except to 5725 MHz –5895 MHz.

- (1) Set RBW= 1% of the emission bandwidth
- (2) Set VBW > RBW
- (3) Detector = Peak
- (4) Trace mode = max hold
- (5) Setting channel bandwidth function x dB to -26 dB to record the final bandwidth.

■ **Minimum Emission Bandwidth for the band 5725 MHz –5895 MHz.**

- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -6 dB to record the final bandwidth.

For 99% Occupied Bandwidth

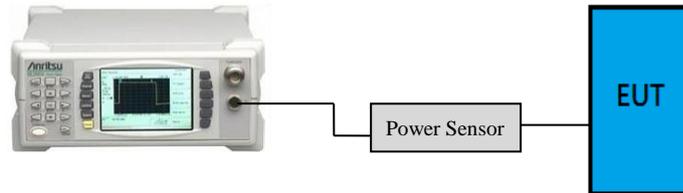
- (1) Set Span range 1.5~5 times the OBW
- (2) Set RBW close to 1% to 5% of OBW.
- (3) Set $VBW \geq 3 \times RBW$.
- (4) Detector = Peak.
- (5) Trace mode = Max hold
- (6) Sweep = Auto couple.
- (7) Allow the trace to stabilize.

7.4. Test Results

Please refer to Appendix A

8. MAXIMUM OUTPUT POWER

8.1. Block Diagram of Test Setup



8.2. Specification Limits

Frequency Band (MHz)	Category	Limit
5150 to 5250	Outdoor Access Point	1 W(30 dBm)/ Max e.i.r.p. ≤ 125 mW(21 dBm) at any elevation angle above 30 degrees as measured from the horizon
	Fixed point-to-point Access Point	1 W(30 dBm)
	Indoor Access Point	1 W(30 dBm)
	Mobile and Portable client device	250 mW(24 dBm)
5250 to 5350	N/A	250 mW or $11 \text{ dBm} + 10 \log B^{\text{Note1}}$
5470 to 5725		250 mW or $11 \text{ dBm} + 10 \log B^{\text{Note1}}$
5725 to 5850	N/A	1 W(30 dBm)
5850 to 5895	indoor access point	4 W (36 dBm) (e.i.r.p.)
	client devices	1 W (30 dBm) (e.i.r.p.)
	subordinate device	4 W (36 dBm) (e.i.r.p.)

Note 1: B is the 26 dB emission bandwidth, which presented in section 7 and appendix A.1.

8.3. Test Procedure

Following measurement procedure is reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 and KDB 291074 D02 EMC Measurement v01:

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

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.7 is < 98%.

Method AVGSA-2 (Spectrum channel power)

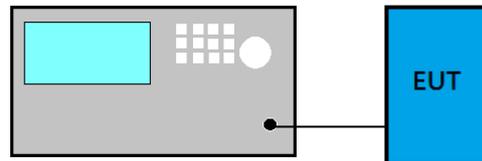
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 MHz
- (3) Set the video bandwidth (VBW) \geq 3 MHz.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is < 98%.

8.4. Test Results

Please refer to Appendix A

9. POWER SPECTRAL DENSITY

9.1. Block Diagram of Test Setup



9.2. Specification Limits

Frequency Band (MHz)	Category	Limit
5150 to 5250	Outdoor Access Point	17dBm/MHz
	Fixed point-to-point Access Point	
	Indoor Access Point	
	Mobile and Portable client device	11 dBm/MHz
5250 to 5350	N/A	11 dBm/MHz
5470 to 5725		11 dBm/MHz
5725 to 5850		30 dBm/500kHz
5850 to 5895	indoor access point	20dBm/MHz(e.i.r.p.)
	client devices	14dBm/MHz(e.i.r.p.)
	subordinate device	20dBm/MHz(e.i.r.p.)

9.3. Test Procedure

Following measurement procedure is reference to KDB 789033 D02 General UNII Test Procedures New Rules v02r01:

■ Method AVGSA-2

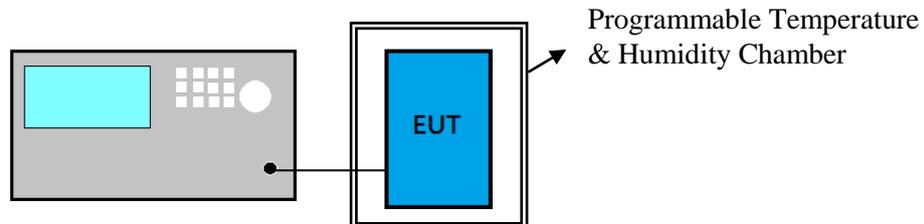
- (1) Set span to encompass the EBW (or 99% OBW) of the signal.
- (2) Set RBW = 1 MHz (Applicable to all bands except to 5725 MHz- 5850 MHz) / Set RBW=100 KHz(when EUT operate at 5725 MHz- 5850 MHz)
- (3) Set the video bandwidth (VBW) ≥ 3 RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Use peak search function to find out the maximum power density.
- (8) Duty cycle factor is added when duty cycle presented in section 3.7 is $< 98\%$.
- (9) Offset BWCF (7dB) when EUT operate at 5725 MHz –5850 MHz.

9.4. Test Results

Please refer to Appendix A

10. FREQUENCY STABILITY

10.1. Block Diagram of Test Setup



10.2. Specification Limits

NONE

10.3. Test Procedure

- (1) Frequency: Test frequency.
- (2) Span: enough to cover the complete power envelope
- (3) RBW: 1MHz(modulation ON) ; 10KHz(CW)
- (4) VBW: 1MHz(modulation ON) ; 10KHz(CW)
- (5) Detector Mode: Positive Peak
- (6) Indication mode: Max hold
- (7) Find the peak frequency and take calculate by the formula:
(Measurement Value-declaration frequency)/ declaration frequency)

10.4. Test Results

Please refer to Appendix A

11. DEVIATION TO TEST SPECIFICATIONS

【NONE】



APPDNDIX A

TEST DATA AND PLOTS

(Model: WL2SB21)



Audix Technology Corp.
No. 491, Zhongfu Rd., Linkou Dist.,
New Taipei City 244, Taiwan

Tel: +886 2 26099301
Fax: +886 2 26099303

APPDNDIX B

TEST PHOTOGRAPHS

(Model: WL2SB21)