

FCC 15.407 U-NII & RSS-247 Issue 2 5GHz Test Report

for

LG Electronics USA

**111 Sylvan Avenue, North Building,
Englewood Cliffs, NJ 07632**

Product Name : Wireless Audio Module
Model Name : WL1BKR23
Brand : LG
FCC ID : BEJ-WL1BKR23
IC : 2703H-WL1BKR23

**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 USA
Manufacturer : LG Electronics Inc.
Factory : Shenzhen Shi Xinzhongxin Technology Co., Ltd.
EUT Description
(1) Product : Wireless Audio Module
(2) Model : WL1BKR23
(3) Brand : LG
(4) Power Supply : DC 3.3V

Applicable Standards:

Title 47 FCC CFR Part 15 Subpart E
RSS-Gen (Issue 5), Amendment 2, February 2021
RSS-247 (Issue 2), February 2017

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.

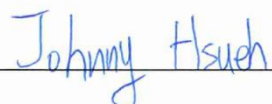
Date of Report: 2023. 03. 07

Reviewed by:



(Sunnie Huang/Administrator)

Approved by:



(Johnny Hsueh/Section Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Date	Revision Summary	Report Number
0	2023. 03. 07	Original Report	EM-F230125

2. SUMMARY OF TEST RESULTS

Rule		Description	Results
FCC	IC		
15.207	RSS-Gen §8.8	Conducted Emission	PASS
15.205/ 15.209	RSS-Gen §8.9/RSS-247 §6.2.1.2/6.2.2.2/6.2.3.2/6.2.4.2	Undesirable Emissions Limits: Radiated Band Edge and Radiated Spurious Emission	PASS
15.407(a)(5)/ 15.407(e)	RSS-247 §6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	Emission/Occupied Bandwidth	PASS
15.407(a)	RSS-247 §6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	Maximum Output Power	PASS
15.407(b)	RSS-247 §6.2.1.2/6.2.2.2/6.2.3.2/6.2.4.2	Conducted Band Edges	N/A
15.407(a)	RSS-247 §6.2.1.1/6.2.2.1/6.2.3.1/6.2.4.1	Power Spectral Density	PASS
15.407	---	Frequency Stability	PASS
15.407(h)(2)	RSS-247 §6.3	Dynamic Frequency Selection(DFS)	N/A
15.203	RSS-Gen §6.8	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 USA 111 Sylvan Avenue, North Building, Englewood Cliffs, NJ 07632
Manufacturer	LG Electronics Inc. 222, LG-ro, Jinwi-myeon Pyeongtaek-Si, Gyeonggi-Do, 17709 Republic of Korea
Factory	Shenzhen Shi Xinzhongxin Technology Co., Ltd Floor 1~3 of Block 1, Dong Huan Industrial Park, NanPu Road No.293, Shang Liao Community, Xin Qiao Street, BaoAn District, Shenzhen City, Guangdong Province, PRC.
Product	Wireless Audio Module
Model	WL1BKR23
Brand	LG

3.2. Description of EUT

Test Model	WL1BKR23		
Serial Number	N/A		
Power Rating	DC 3.3V		
Software Version	V1.1		
Hardware version	V1.3		
RF Features	GFSK		
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 (For FCC 15.407 U-NII) <input checked="" type="checkbox"/> LE-LAN (Indoor only)(For RSS-247 Issue 2)		
Test Sample	Sample No.	Test Item	Firmware
	03	AC Conduction, Radiated	N/A
	02	RF Conducted	N/A
Sample Status	Trial sample		
Date of Receipt	2023. 01. 13		
Date of Test	2023. 01. 30 ~ 03. 07		
Interface Ports of EUT	None		
Accessories Supplied	None		

3.3. Reference Test Guidance

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

3.4. Antenna Information

No.	Antenna Part Number	Manufacturer	Antenna Type	Frequency (MHz)	Gain (dBi)
1.	Antenna_L (ANT 1)	SHENZHEN XINZHONGXIN TECHNOLOGY CO., LTD.	PCB Printing Antenna	5720.0	1.73
				5740.0	1.85
				5760.0	2.36
				5780.0	1.45
				5800.0	2.70
				5820.0	1.78
				5840.0	3.39
				5860.0	2.34
2.	Antenna_R (ANT 2)	SHENZHEN XINZHONGXIN TECHNOLOGY CO., LTD.	PCB Printing Antenna	5720.0	0.96
				5740.0	1.67
				5760.0	1.79
				5780.0	2.73
				5800.0	2.25
				5820.0	0.84
				5840.0	2.08
				5860.0	1.64

3.5. EUT Specifications Assessed in Current Report

Modulation	U-NII Band	Fundamental Range (MHz)	Channel Number	Data Rate
GFSK	3	5730-5848	119	2Mbps

Channel List									
U-NII Band 3									
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
0	5730	24	5754	48	5778	72	5802	96	5826
1	5731	25	5755	49	5779	73	5803	97	5827
2	5732	26	5756	50	5780	74	5804	98	5828
3	5733	27	5757	51	5781	75	5805	99	5829
4	5734	28	5758	52	5782	76	5806	100	5830
5	5735	29	5759	53	5783	77	5807	101	5831
6	5736	30	5760	54	5784	78	5808	102	5832
7	5737	31	5761	55	5785	79	5809	103	5833
8	5738	32	5762	56	5786	80	5810	104	5834
9	5739	33	5763	57	5787	81	5811	105	5835
10	5740	34	5764	58	5788	82	5812	106	5836
11	5741	35	5765	59	5789	83	5813	107	5837
12	5742	36	5766	60	5790	84	5814	108	5838
13	5743	37	5767	61	5791	85	5815	109	5839
14	5744	38	5768	62	5792	86	5816	110	5840
15	5745	39	5769	63	5793	87	5817	111	5841
16	5746	40	5770	64	5794	88	5818	112	5842
17	5747	41	5771	65	5795	89	5819	113	5843
18	5748	42	5772	66	5796	90	5820	114	5844
19	5749	43	5773	67	5797	91	5821	115	5845
20	5750	44	5774	68	5798	92	5822	116	5846
21	5751	45	5775	69	5799	93	5823	117	5847
22	5752	46	5776	70	5800	94	5824	118	5848
23	5753	47	5777	71	5801	95	5825		

Note: Test modes are presented at section 3.7.

Only the duty cycle of 5846 to 5848 MHz is 1 and the bandwidth is 1.6 MHz, the duty cycle of other channels is 0.226 and the bandwidth is 3.9MHz. Please see section 3.7 and appendix A for more information.

3.6. Description of Key Components

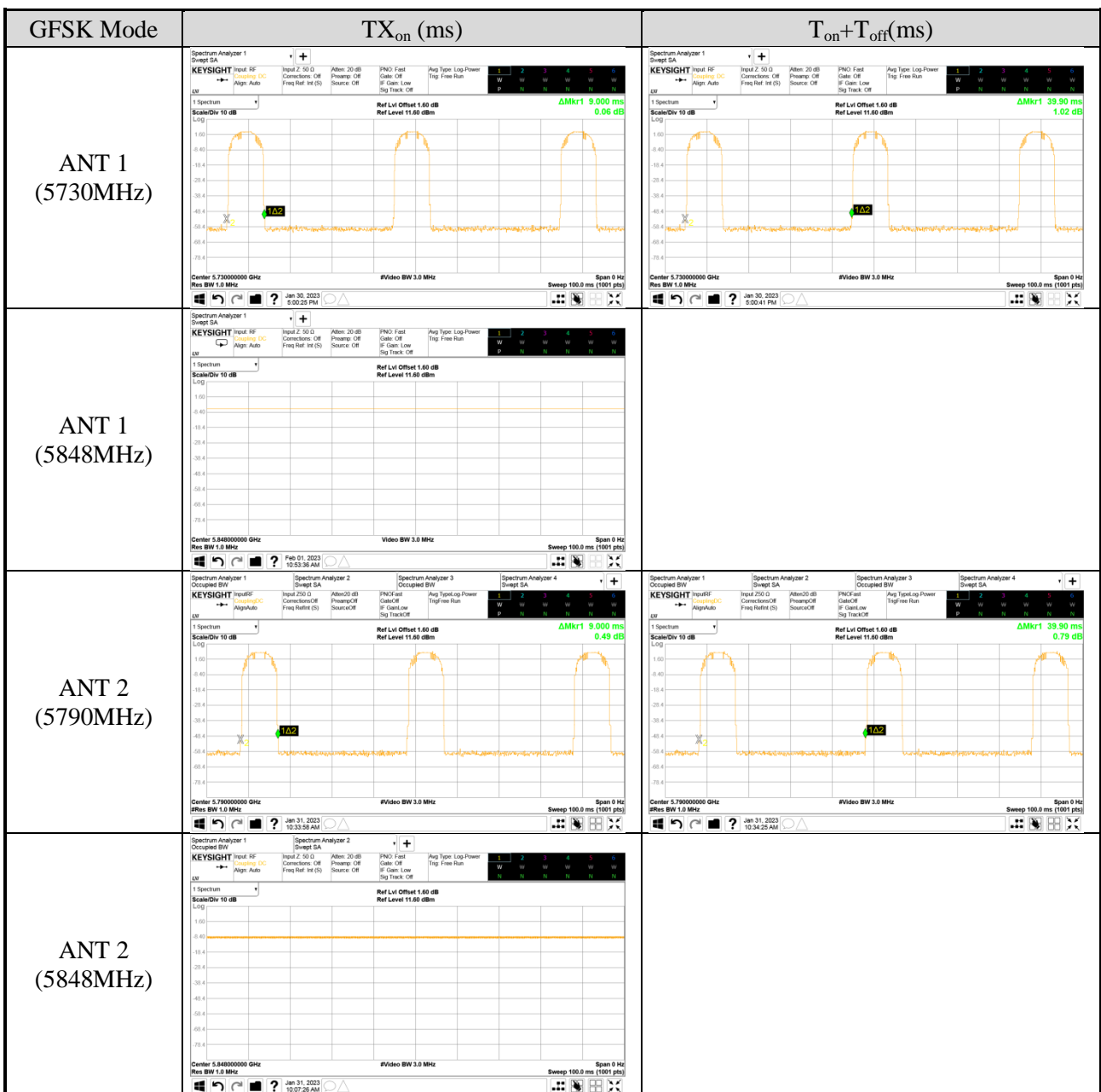
None

3.7. Test Configuration

GFSK Mode		TX _{on} (ms)	TX _{on+off} (ms)	Duty Cycle (x)	Duty Cycle Factor [10log(1/x)] (dB)
ANT 1	5730MHz	9	39.9	0.226	6.459
	5848MHz	N/A ^{Note 2}	N/A ^{Note 2}	1	N/A
ANT 2	5790MHz	9	39.9	0.226	6.459
	5848MHz	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.



AC Conduction
Normal Operation

Item	Modulation	Data Rate	Antenna	Test Frequency (MHz)	
Radiated Test Case	Radiated Spurious Emission (30MHz~1GHz) <small>Note1 & 2</small>	GFSK	2 Mbps	ANT 1	5845
				ANT 2	5790
	Radiated Band Edge	GFSK	2 Mbps	ANT 1	5730 / 5848
				ANT 2	5730 / 5848
	Radiated Spurious Emission (Above 1GHz)	GFSK	2 Mbps	ANT 1	5730 / 5790 / 5845 / 5848
				ANT 2	5730 / 5790 / 5845 / 5848

Item	Modulation	Data Rate	Antenna	Test Frequency (MHz)	
Conducted Test Case	Emission/occupied Bandwidth	GFSK	2 Mbps	ANT 1	5730 / 5790 / 5845 / 5846 / 5847 / 5848
				ANT 2	5730 / 5790 / 5845 / 5846 / 5847 / 5848
	Maximum output power	GFSK	2 Mbps	ANT 1	5730 / 5790 / 5845 / 5846 / 5847 / 5848
				ANT 2	5730 / 5790 / 5845 / 5846 / 5847 / 5848
	Power spectral density	GFSK	2 Mbps	ANT 1	5730 / 5790 / 5845 / 5846 / 5847 / 5848
				ANT 2	5730 / 5790 / 5845 / 5846 / 5847 / 5848

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	Antenna	Centre Frequency (MHz)	POWER SETTING
GFSK	3	ANT 1	5730	Default
			5790	Default
			5848	Default
		ANT 2	5730	Default
			5790	Default
			5848	Default

3.9. Tested Supporting System List

3.9.1. Support Peripheral Unit

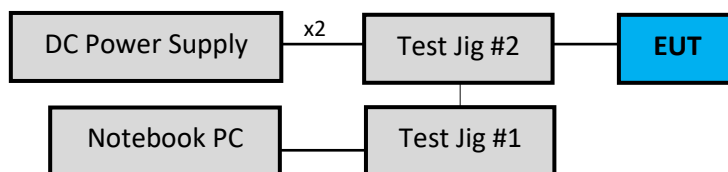
No.	Product	Brand	Model No.	Serial No.	Approval
1.	Test Jig #1	N/A	N/A	N/A	N/A
2.	Test Jig #2	N/A	N/A	N/A	N/A
3.	DC Power Supply	TOP WARD	6303A	N/A	N/A
4.	Notebook PC	ASUS	E403SA	N/A	N/A

3.9.2. Cable Lists

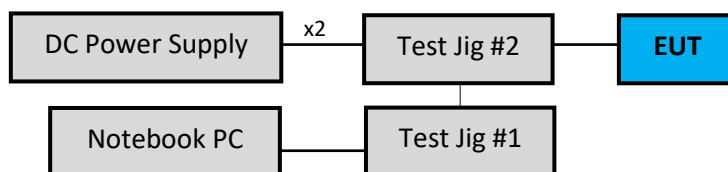
No.	Cable Description Of The Above Support Units
1.	USB Cable: Unshielded, Undetectable, 0.5m, Bonded a ferrite core USB Cable: Unshielded, Undetectable, 0.3m
2.	Data Cable: Unshielded, Undetectable, 0.05m
3.	DC Power Cordx2: Unshielded, Undetectable, 1.0m
4.	Adapter: ASUS, M/N AD890526 DC Power Cord : Unshielded, Undetachable, 2.0m

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 “Uart Assist.exe” 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	<input type="checkbox"/>	No. 7 Shielded Room	30MHz-200MHz, 3m, Horizontal ±3.6dB
			200MHz-1000MHz, 3m, Horizontal ±4.3dB
	<input checked="" type="checkbox"/>	No. 8 Shielded Room	30MHz-200MHz, 3m, Vertical ±4.4dB
			200MHz-1000MHz, 3m, Vertical ±4.8dB
Radiation Test	<input checked="" type="checkbox"/>	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±3.6dB
			200MHz-1000MHz, 3m, Horizontal ±4.3dB
			30MHz-200MHz, 3m, Vertical ±4.4dB
			200MHz-1000MHz, 3m, Vertical ±4.8dB
			1GHz-6GHz, 3m ±4.8dB
			6GHz-18GHz, 3m ±4.5dB
	<input type="checkbox"/>	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±3.7dB
			200MHz-1000MHz, 3m, Horizontal ±4.1dB
			30MHz-200MHz, 3m, Vertical ±4.6dB
			200MHz-1000MHz, 3m, Vertical ±4.9dB
			1GHz-6GHz, 3m ±4.7dB
			6GHz-18GHz, 3m ±4.1dB
	<input type="checkbox"/>	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±4.0dB
			200MHz-1000MHz, 3m, Horizontal ±4.4dB
			30MHz-200MHz, 3m, Vertical ±4.7dB
			200MHz-1000MHz, 3m, Vertical ±4.5dB
			1GHz-6GHz, 3m ±4.8dB
			6GHz-18GHz, 3m ±4.5dB
	<input type="checkbox"/>	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal ±4.3dB
			200MHz-1000MHz, 3m, Horizontal ±4.2dB
			30MHz-200MHz, 3m, Vertical ±4.8dB
			200MHz-1000MHz, 3m, Vertical ±4.7dB
			1GHz-6GHz, 3m ±4.6dB
			6GHz-18GHz, 3m ±4.4dB
Radiated emissions (18GHz-40GHz)		18GHz-40GHz, 3m	±3.4dB

Remark : Uncertainty = $kuc(y)$

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	2023.01.11	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	2022.12.19	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2022.12.14	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	2022.09.07	1 Year
7.	Test Software	Audix	e3	V9 18621a	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	2022.08.24	1 Year
2.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2022.04.08	1 Year
3.	Test Receiver	R&S	ESCS30	100039	2022.06.01	1 Year
4.	Microwave Amplifier	HP	8447D	2944A06305	2022.12.29	1 Year
5.	Microwave Amplifier	HP	8449B	3008A01284	2022.06.01	1 Year
6.	Microwave Amplifier	Keysight	83051A	MY56480113	2022.09.07	1 Year
7.	Bilog Antenna	TESEQ	CBL6112D	33821	2022.07.01	1 Year
8.	Double-Ridged Waveguide Horn	EMCO	3115	9112-3775	2022.05.18	1 Year
9.	Horn Antenna	COM-POWER	AH-840	101092	2022.12.30	1 Year
10.	5G Notch Filter	Microwave	H3G018G1	484796	2022.07.23	1 Year
11.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2023.01.07	1 Year
12.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 106	RE-14	2023.01.07	1 Year
13.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	RE-30	2022.08.22	1 Year
14.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2022.04.14	1 Year
15.	Test Software	Audix	e3	V9 18621a	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	N9010B-544	MY55460198	2022.04.08	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

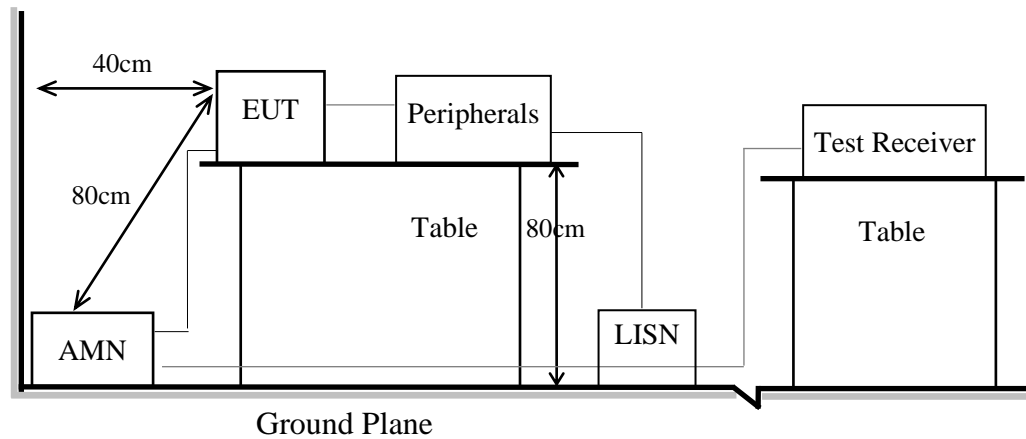
5. CONDUCTED EMISSION

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.

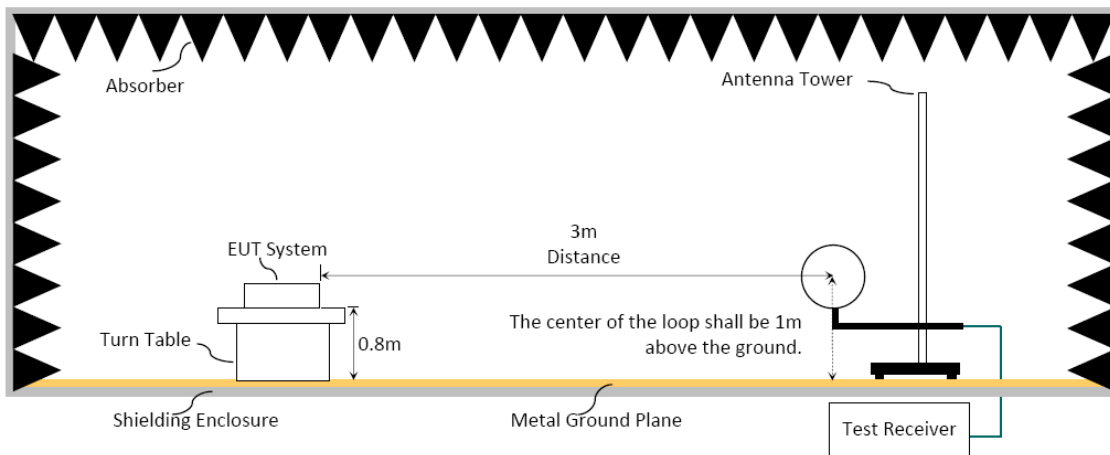
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

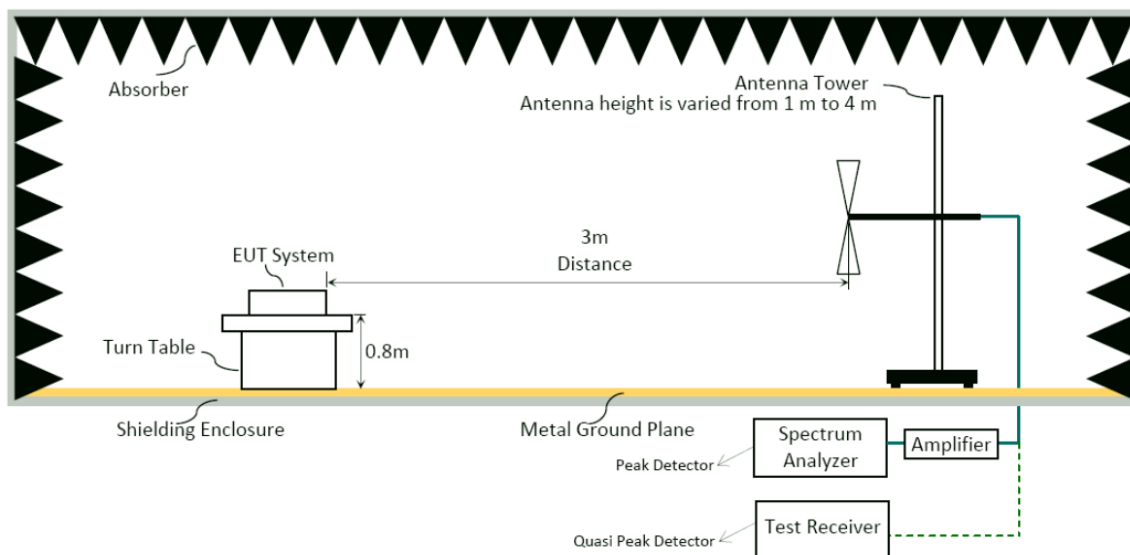
6.1.1. Block Diagram of EUT

Indicated as section 3.10

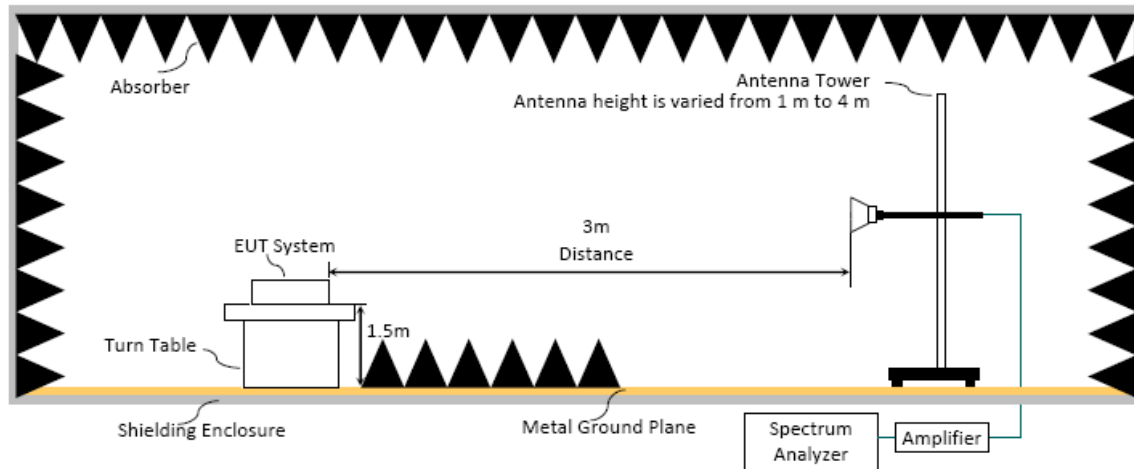
6.1.2. Setup Diagram for 9kHz-30MHz



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.

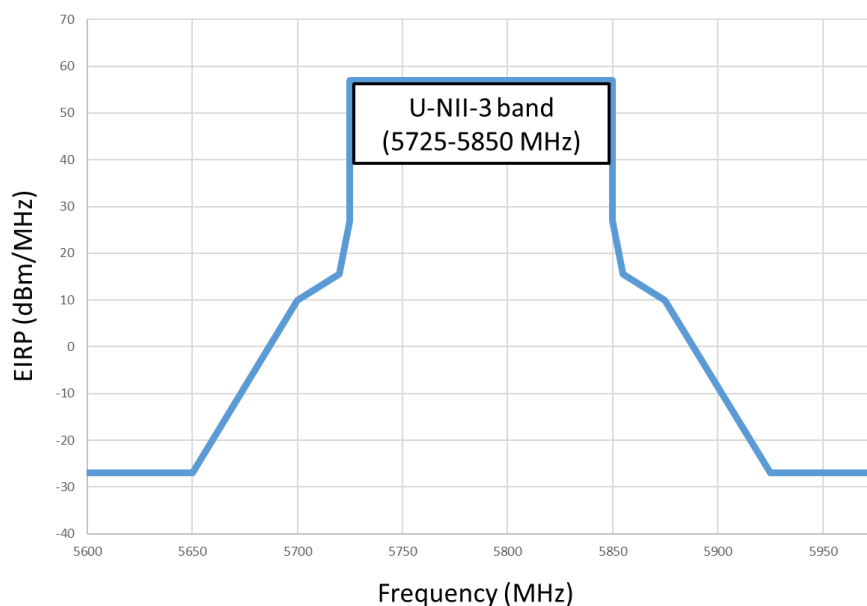
6.2.2. Limit for non-restricted frequency above 1 GHz

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

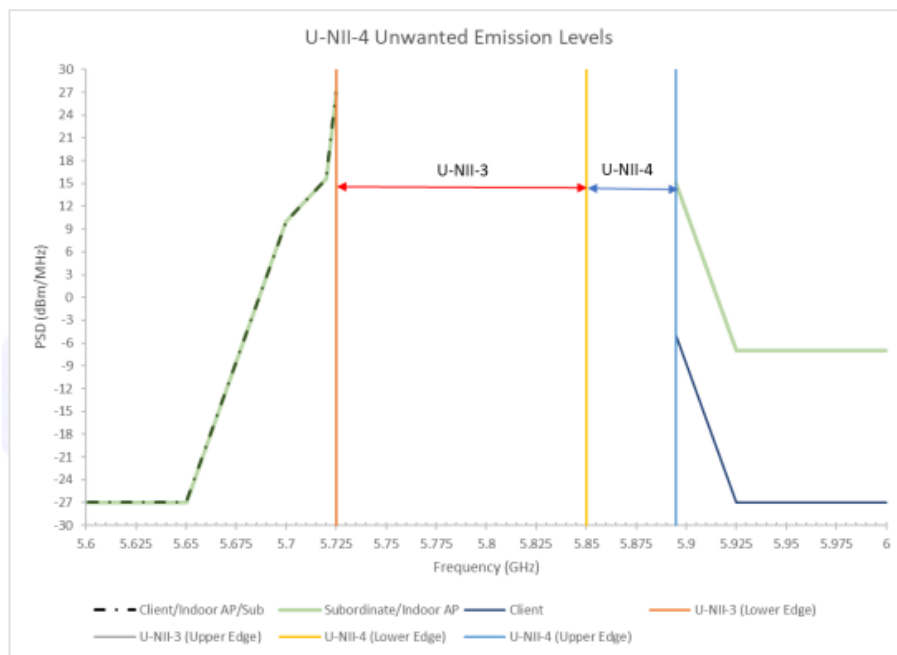
For FCC 15.407 U-NII

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))

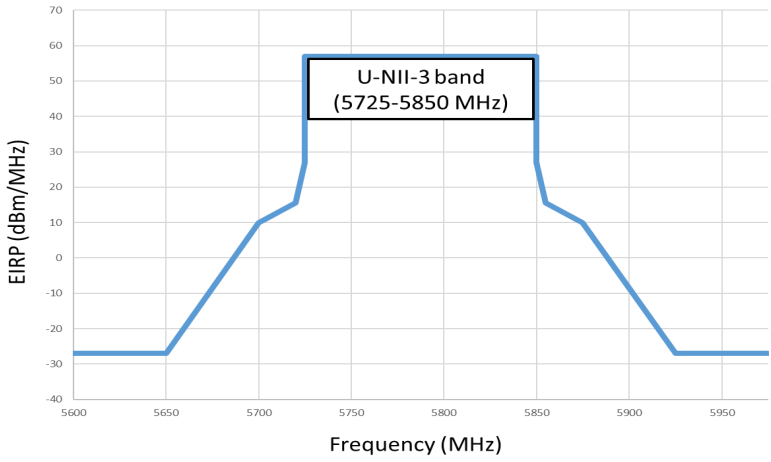


For FCC 15.407 U-NII

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.



For RSS-247 Issue 2

Frequency Band (MHz)	Field Strength Limit at 3 m	
5725 to 5850	☒	RSS-247 Section 6.2.4.2 a) 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges; b) 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges; c) 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm/MHz at 75 MHz above or below the band edges; and d) -27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.
	☐	RSS-247 Section 6.2.4.2, compliance with the emission limits in RSS-247 Section 5.5 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 RSS-Gen Section 8.9 table 4 is not required. In addition, radiated emissions which fall in the restricted bands, as defined in RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in RSS-Gen Section 8.9 table 4
 <p>The graph plots EIRP (dBm/MHz) on the y-axis (ranging from -40 to 70) against Frequency (MHz) on the x-axis (ranging from 5600 to 5950). A blue line represents the emission limit profile. It is constant at -27 dBm/MHz from 5600 to 5650 MHz and from 5900 to 5950 MHz. Between 5650 and 5725 MHz, it increases linearly from -27 dBm/MHz to 57 dBm/MHz. Between 5725 and 5850 MHz, it remains constant at 57 dBm/MHz. Between 5850 and 5900 MHz, it decreases linearly from 57 dBm/MHz to -27 dBm/MHz. A box highlights the 'U-NII-3 band (5725-5850 MHz)'.</p>		

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	Antenna	VBW Setting
GFSK	ANT 1	120Hz
	ANT 2	120Hz

- (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

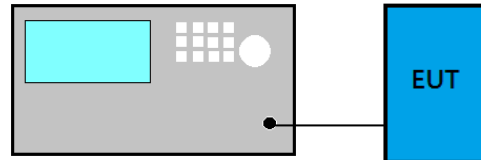
- Peak Emission Level(dB μ V/m) = Antenna Factor(dB/m) + Cable Loss (dB) – Preamp Gain (dB) + Reading(dB μ V).
 ■ Average Emission Level(dB μ V/m) = Antenna Factor(dB/m) + Cable Loss (dB) – Preamp Gain (dB) + Reading(dB μ V).
 □ Average Emission Level(dB μ V/m) = Peak Emission Level(dB μ V/m) + DCCF(dB)
 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 –5850 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 –5850 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

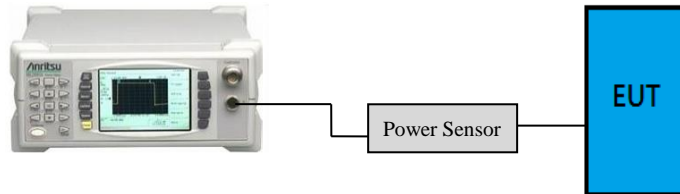
- (1) Set Span range 1.5~5 times the OBW
- (2) Set RBW close to 1% to 5% of OBW.
- (3) Set $VBW \geq 3 \times RBW$.
- (4) Detector = Peak.
- (5) Trace mode = Max hold
- (6) Sweep = Auto couple.
- (7) Allow the trace to stabilize.

7.4. Test Results

Please refer to Appendix A

8. MAXIMUM OUTPUT POWER

8.1. Block Diagram of Test Setup



8.2. Specification Limits

For FCC 15.407 U-NII

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 dBm + 10 log B ^{Note1}
5470 to 5725		250 mW or 11 dBm + 10 log B ^{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.

For RSS-247 Issue 2

Frequency Band (MHz)	Limit	
5150 to 5250	E.I.R.P.	200 mW or 10 dBm + 10 log B ^{Note1}
5250 to 5350	Maximum output power	250 mW or 11 dBm + 10 log B ^{Note1}
	E.I.R.P.	1.0 W or 17dBm + 10 log B ^{Note1}
5470 to 5725	Maximum output power	250 mW or 11 dBm + 10 log B ^{Note1}
	E.I.R.P.	1.0 W or 17dBm + 10 log B ^{Note1}
5725 to 5850	Maximum output power	1 W(30 dBm)

Note 1: B is the 99% 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)

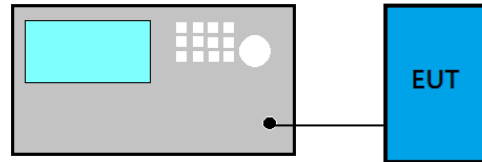
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 MHz
- (3) Set the video bandwidth (VBW) \geq 3 MHz.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the 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

For FCC 15.407 U-NII

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.)

For RSS-247 Issue 2

Frequency Band (MHz)	Limit
5150 to 5250	10 dBm/MHz
5250 to 5350	11 dBm/MHz
5470 to 5725	11 dBm/MHz
5725 to 5850	30dBm/500 kHz

9.3. Test Procedure

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

■ Method AVGSA-2

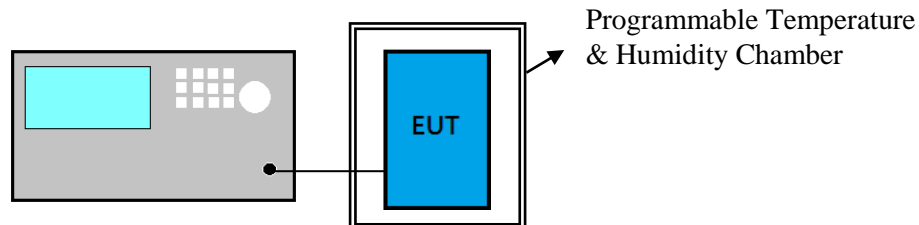
- (1) Set span to encompass the EBW (or 99% OBW) of the signal.
- (2) Set RBW = 1 MHz (Applicable to all bands except to 5725 MHz- 5850 MHz)/
Set RBW=100 KHz(when EUT operate at 5725 MHz- 5850 MHz)
- (3) Set the video bandwidth (VBW) ≥ 3 RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at 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】



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

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

APPDNDIX A

TEST DATA AND PLOTS

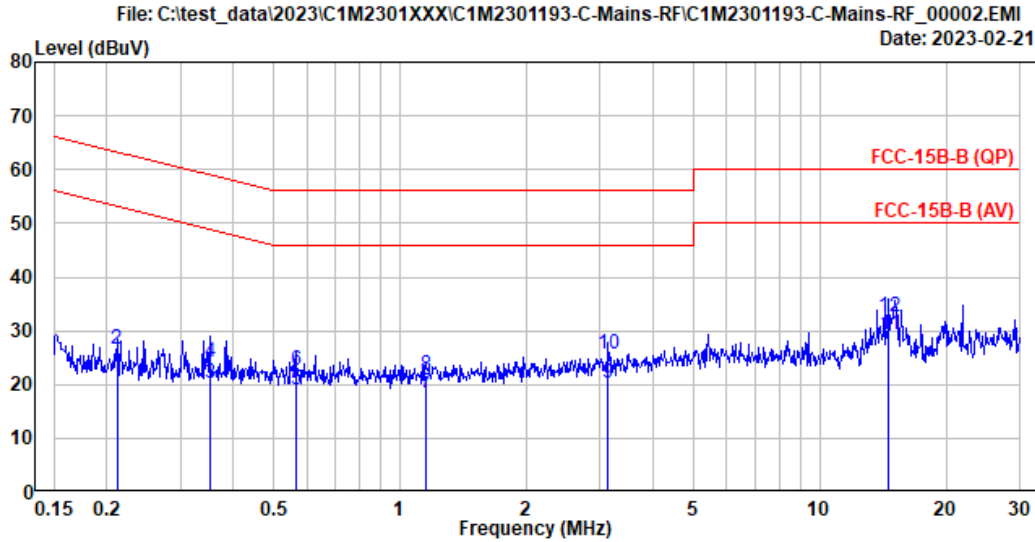
(Model: WL1BKR23)

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A.1 CONDUCTED EMISSION

Test Date	2023/02/21	Temp./Hum.	22°C/50%
Test Voltage	DC 3.3V	Tested By	Joe Kuo



Site No.	: No.8 Shielded Room	Data No.	: 2
Instrument 1	: Receiver ESR(774)		
Instrument 2	: ENV432 (567)(A) CE-08 ESH3-Z2 (354)		
Limit	: FCC-15B-B (QP)	Phase	: Neutral
Environment	: 22°C/50%	Test Rating	: DC 3.3V
EUT Model	: WL1BKR23	Engineer	: Joe_kuo
Test Mode	: Operating		

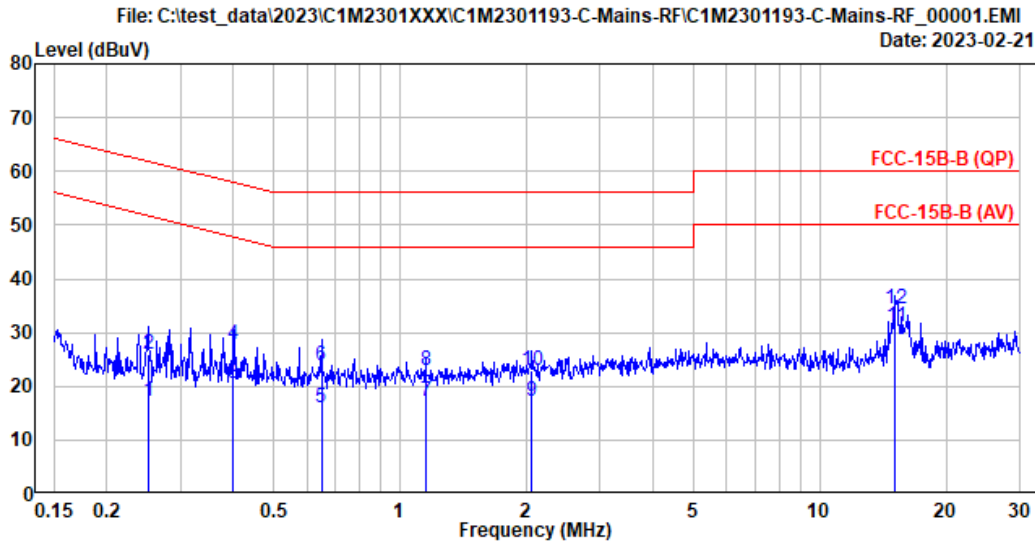
	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.212	10.32	0.03	9.85	1.29	21.49	53.14	31.65	Average
2	0.212	10.32	0.03	9.85	6.48	26.68	63.14	36.46	QP
3	0.352	10.32	0.03	9.85	0.16	20.36	48.92	28.56	Average
4	0.352	10.32	0.03	9.85	4.08	24.28	58.92	34.64	QP
5	0.565	10.33	0.03	9.85	-1.19	19.02	46.00	26.98	Average
6	0.565	10.33	0.03	9.85	2.35	22.56	56.00	33.44	QP
7	1.152	10.34	0.04	9.85	-1.86	18.37	46.00	27.63	Average
8	1.152	10.34	0.04	9.85	1.60	21.83	56.00	34.17	QP
9	3.137	10.39	0.07	9.86	-0.13	20.19	46.00	25.81	Average
10	3.137	10.39	0.07	9.86	5.39	25.71	56.00	30.29	QP
11	14.636	10.86	0.17	9.91	8.23	29.17	50.00	20.83	Average
12	14.636	10.86	0.17	9.91	11.79	32.73	60.00	27.27	QP

Remarks: 1. Emission Level(dBµV)= AMN Factor(dB) + Cable Loss(dB) + Pulse Att.(dB) + Reading(dBµV).

Audix Technology Corp.
 No. 491, Zhongfu Rd., Linkou Dist.,
 New Taipei City244, Taiwan

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

Test Date	2023/02/21	Temp./Hum.	22°C/50%
Test Voltage	DC 3.3V	Tested By	Joe Kuo



Site No.	: No.8 Shielded Room	Data No.	: 1
Instrument 1	: Receiver ESR(774)		
Instrument 2	: ENV432 (567)(A) CE-08 ESH3-Z2 (354)		
Limit	: FCC-15B-B (QP)	Phase	: Line
Environment	: 22°C/50%	Test Rating	: DC 3.3V
EUT Model	: WL1BKR23	Engineer	: Joe_kuo
Test Mode	: Operating		

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.251	10.22	0.03	9.85	-2.93	17.17	51.74	34.57	Average
2	0.251	10.22	0.03	9.85	5.94	26.04	61.74	35.70	QP
3	0.400	10.22	0.03	9.85	0.43	20.53	47.84	27.31	Average
4	0.400	10.22	0.03	9.85	7.62	27.72	57.84	30.12	QP
5	0.649	10.23	0.04	9.85	-4.10	16.02	46.00	29.98	Average
6	0.649	10.23	0.04	9.85	3.59	23.71	56.00	32.29	QP
7	1.152	10.23	0.04	9.85	-2.78	17.34	46.00	28.66	Average
8	1.152	10.23	0.04	9.85	2.86	22.98	56.00	33.02	QP
9	2.064	10.25	0.06	9.86	-2.82	17.35	46.00	28.65	Average
10	2.064	10.25	0.06	9.86	2.89	23.06	56.00	32.94	QP
11	15.155	10.55	0.17	9.91	10.37	31.00	50.00	19.00	Average
12	15.155	10.55	0.17	9.91	13.92	34.55	60.00	25.45	QP

Remarks: 1. Emission Level(dBμV)= AMN Factor(dB) + Cable Loss(dB) + Pulse Att.(dB) + Reading(dBμV).

A.2 RADIATED EMISSION

Test Date	2023/01/30 ~ 03/07	Temp./Hum.	17~20°C/58~68%
Test Voltage	DC 3.3V	Tested By	Brian Hsieh

A.2.1 Emissions within Restricted Frequency Bands

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1GHz

Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5845MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
35.820	21.75	1.55	26.48	34.19	31.01	40.00	8.99	Peak
108.570	17.38	2.72	26.23	38.07	31.94	43.50	11.56	Peak
234.670	17.61	4.10	25.72	41.40	37.39	46.00	8.61	Peak
669.230	24.63	7.47	27.42	32.13	36.81	46.00	9.19	Peak
764.290	25.09	8.01	27.33	30.62	36.39	46.00	9.61	Peak
984.480	26.96	9.22	26.69	28.86	38.35	54.00	15.65	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
43.580	17.37	1.70	26.47	41.75	34.35	40.00	5.65	Peak
102.750	17.02	2.65	26.27	39.35	32.75	43.50	10.75	Peak
237.580	17.75	4.13	25.71	25.81	21.98	46.00	24.02	Peak
616.850	24.45	7.20	27.41	28.06	32.30	46.00	13.70	Peak
842.860	25.61	8.45	27.15	26.97	33.88	46.00	12.12	Peak
981.570	26.93	9.20	26.72	27.41	36.82	54.00	17.18	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5790MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
35.820	21.75	1.55	26.48	34.52	31.34	40.00	8.66	Peak
95.960	16.20	2.56	26.30	46.37	38.83	43.50	4.67	Peak
216.240	16.43	3.89	25.75	43.68	38.25	46.00	7.75	Peak
378.230	21.18	5.69	26.28	37.74	38.33	46.00	7.67	Peak
600.360	24.39	7.10	27.40	32.48	36.57	46.00	9.43	Peak
984.480	26.96	9.22	26.69	29.28	38.77	54.00	15.23	Peak

Antenna at Vertical Polarization

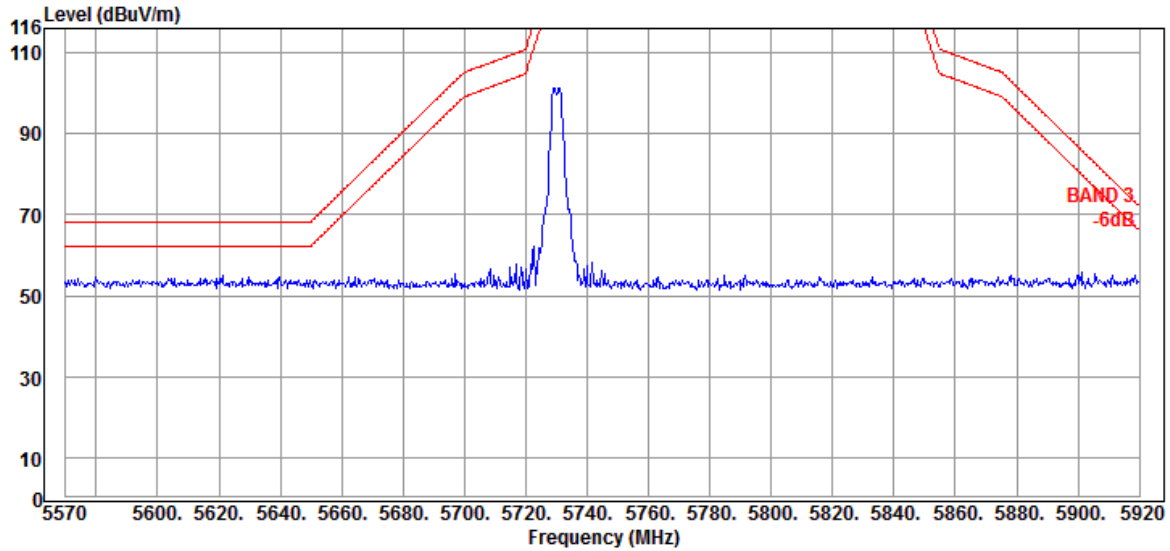
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
40.670	18.91	1.65	26.47	41.74	35.83	40.00	4.17	Peak
108.570	17.38	2.72	26.23	42.02	35.89	43.50	7.61	Peak
323.910	19.93	5.02	25.82	35.81	34.94	46.00	11.06	Peak
533.430	23.81	6.88	27.23	34.65	38.11	46.00	7.89	Peak
865.170	25.78	8.58	27.08	29.52	36.80	46.00	9.20	Peak
972.840	26.82	9.15	26.75	29.45	38.67	54.00	15.33	Peak

A.2.1.3 Frequency Above 1 GHz to 10th harmonics

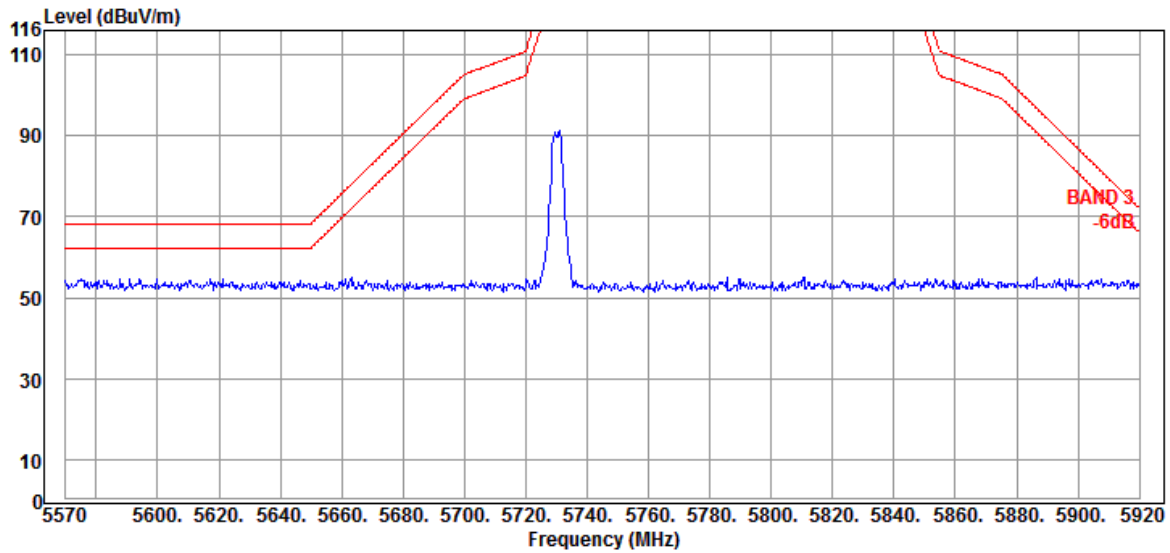
Band Edge:

Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5730MHz

Antenna at Horizontal Polarization

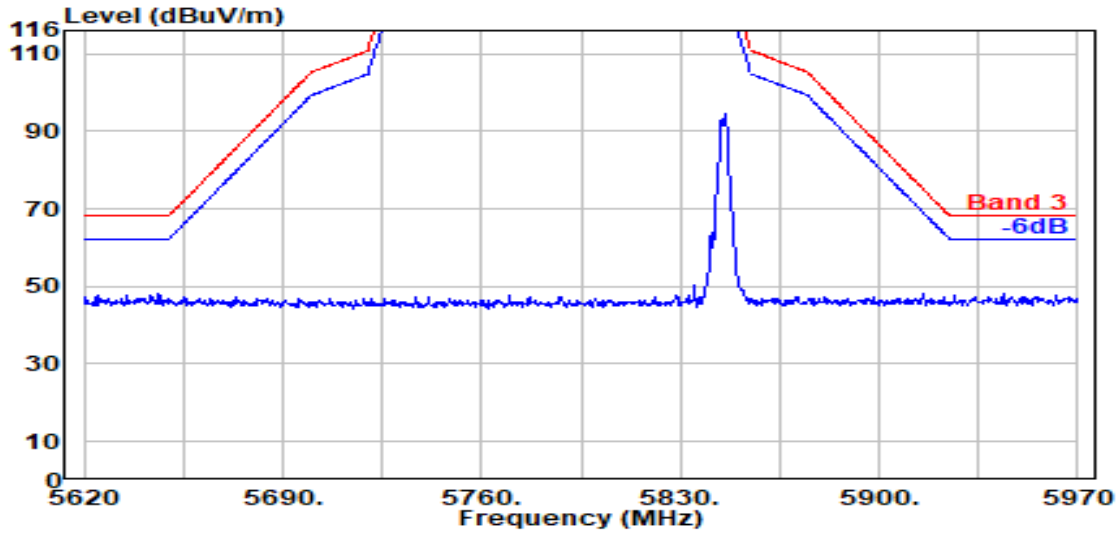


Antenna at Vertical Polarization

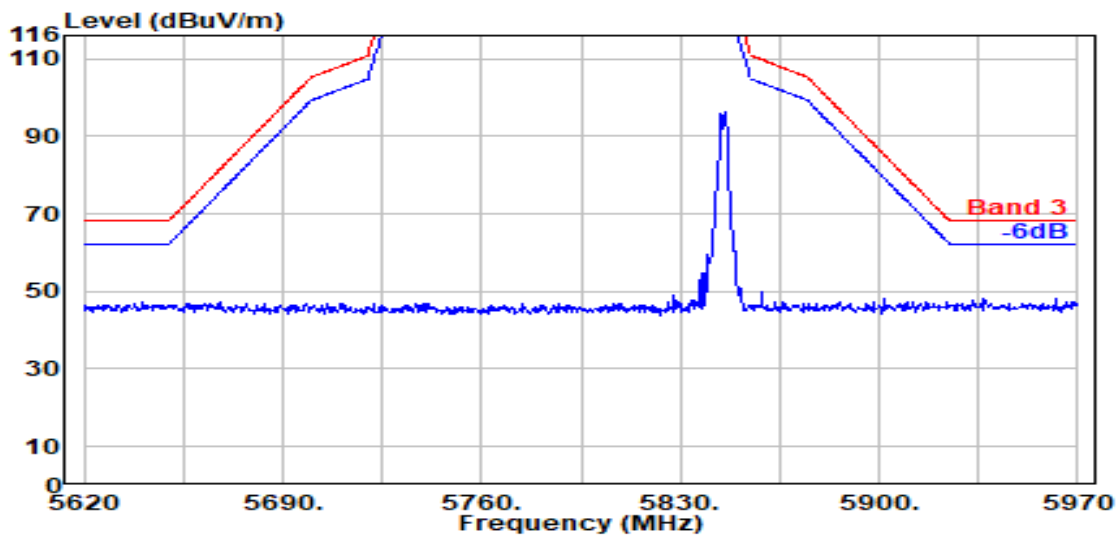


Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5845MHz

Antenna at Horizontal Polarization

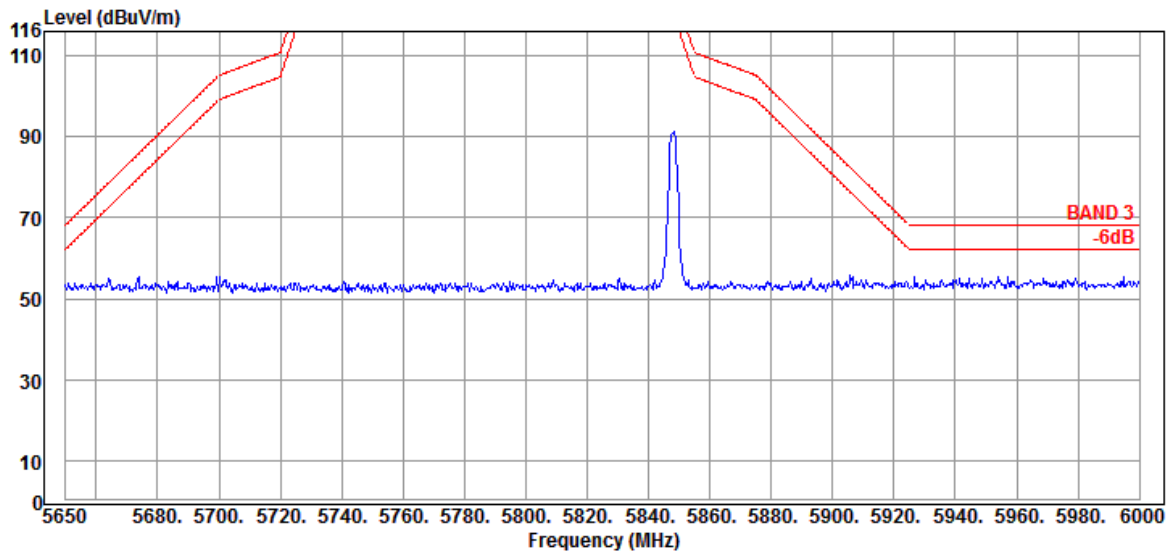


Antenna at Vertical Polarization

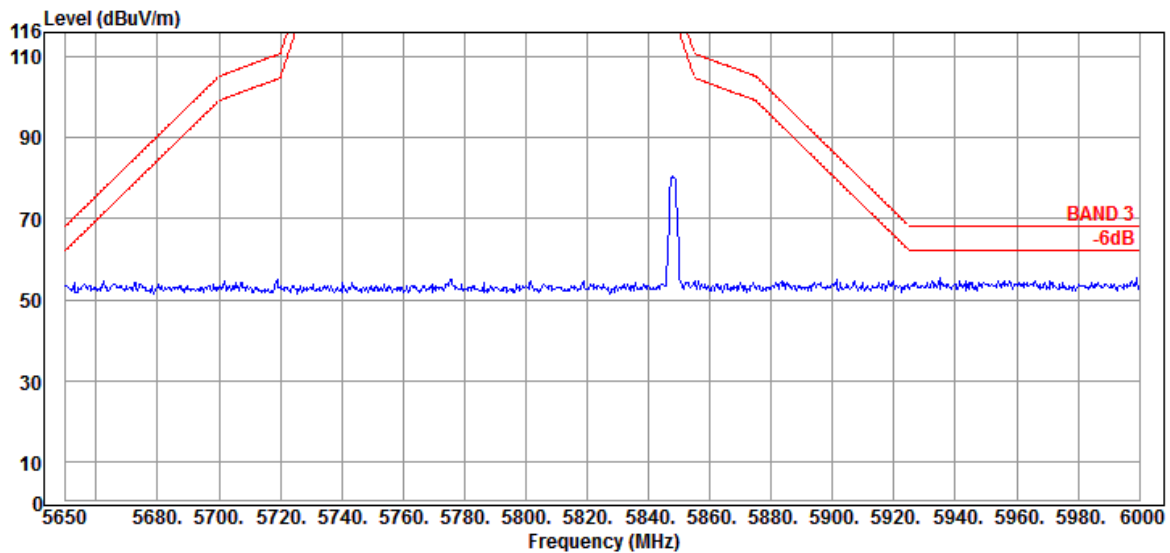


Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5848MHz

Antenna at Horizontal Polarization

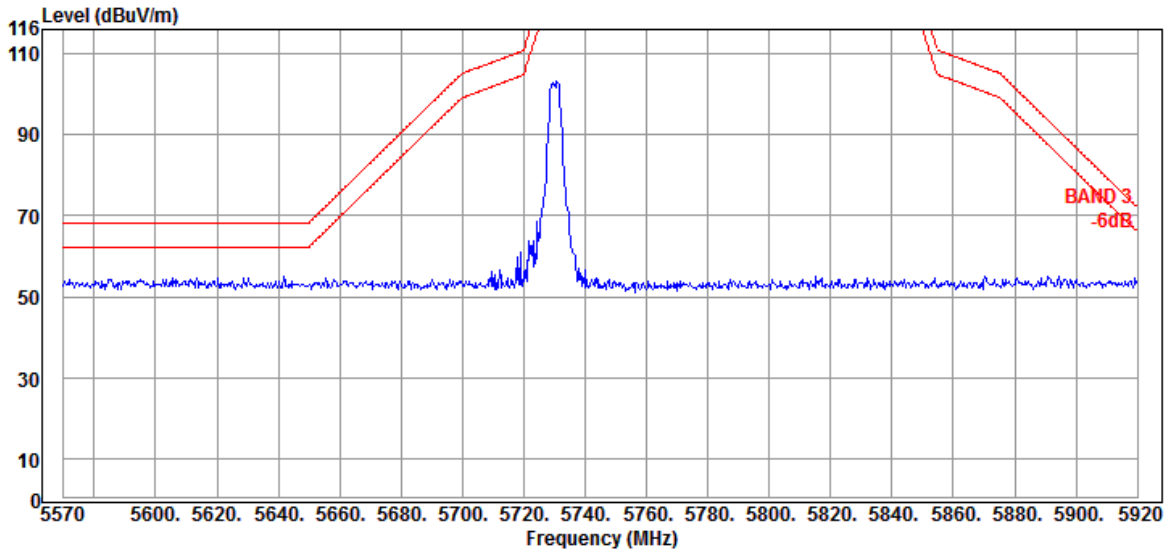


Antenna at Vertical Polarization

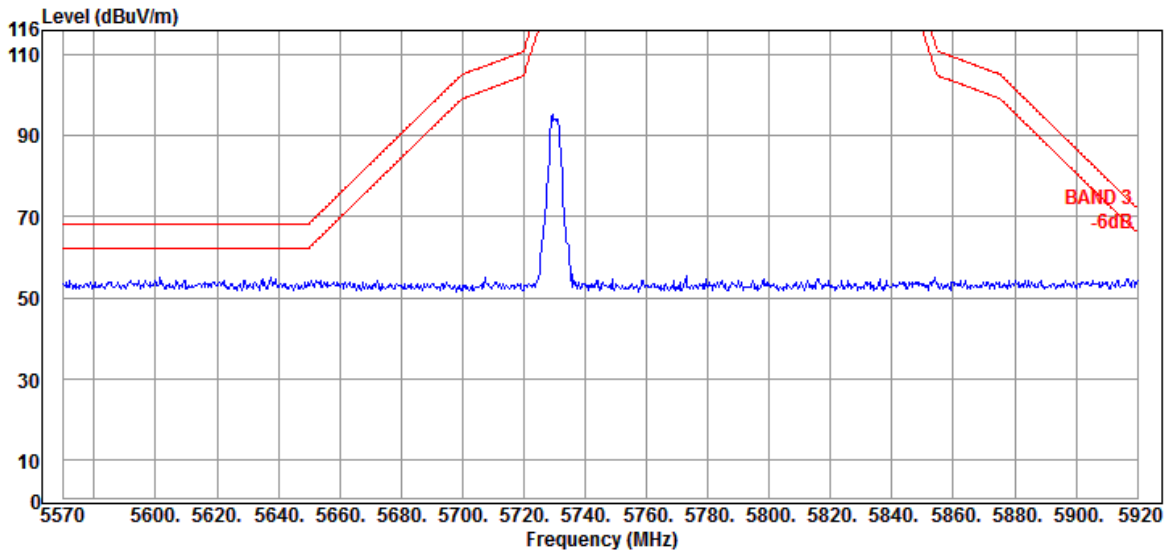


Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5730MHz

Antenna at Horizontal Polarization

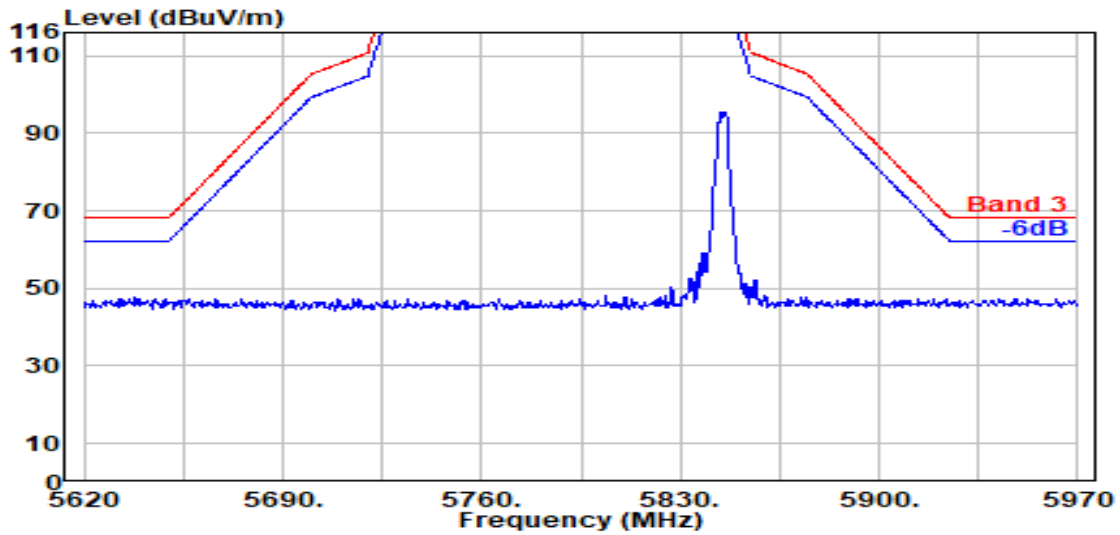


Antenna at Vertical Polarization

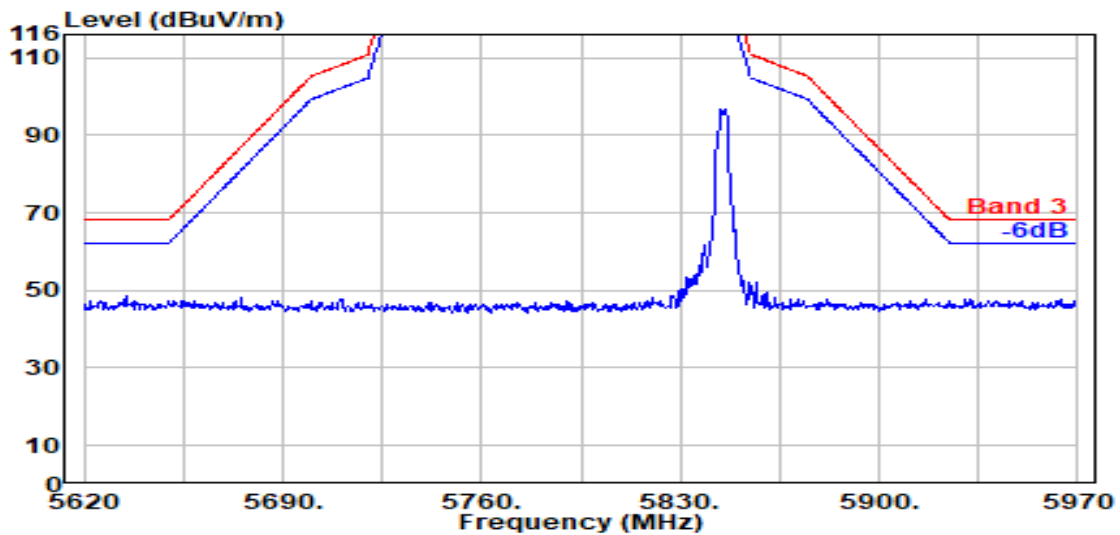


Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5845MHz

Antenna at Horizontal Polarization

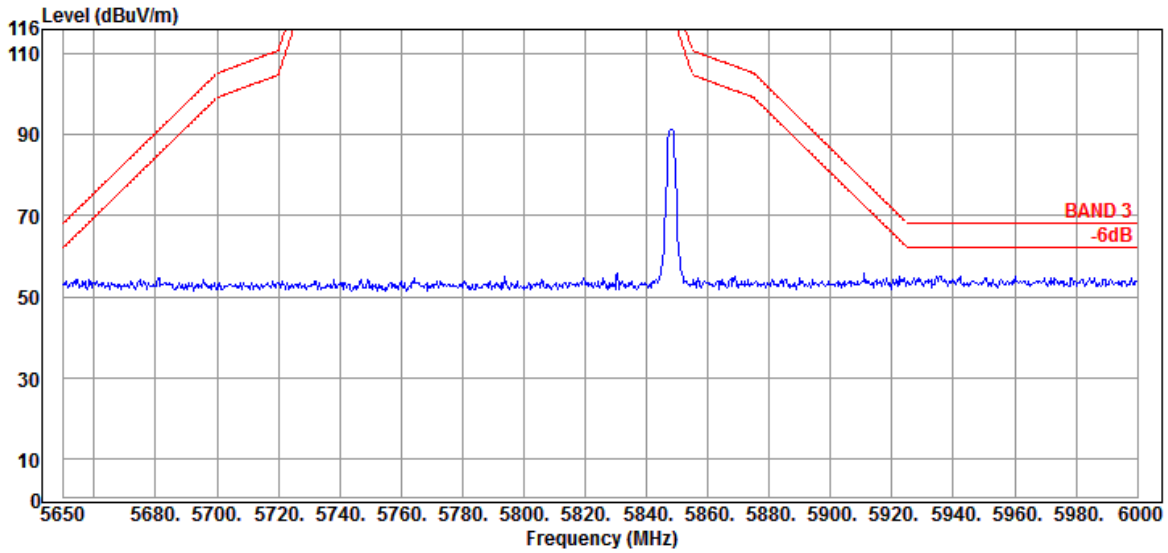


Antenna at Vertical Polarization

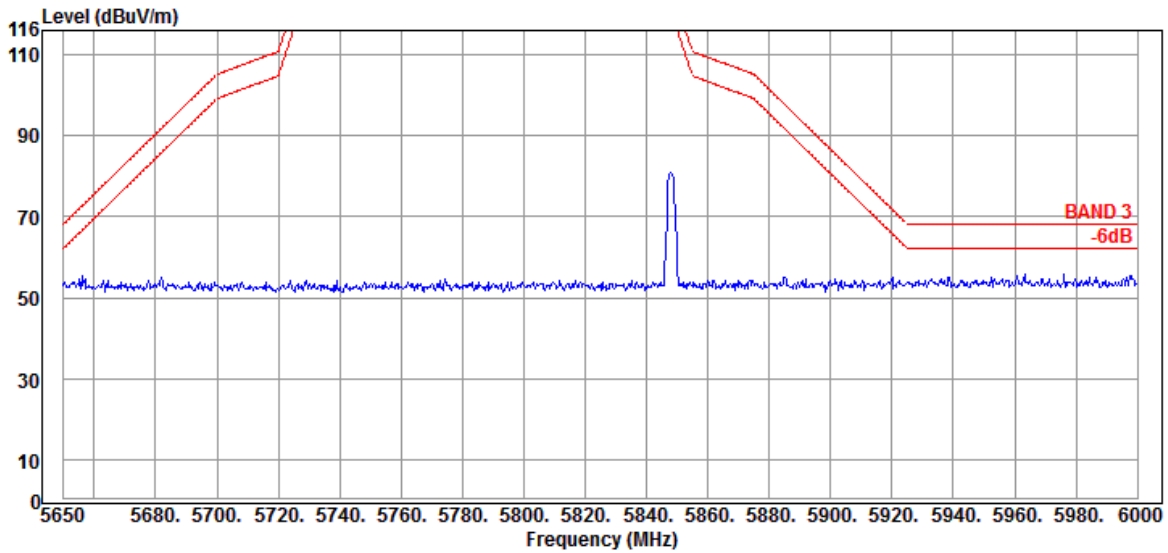


Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5848MHz

Antenna at Horizontal Polarization



Antenna at Vertical Polarization



A.2.2 Emissions outside the frequency band

The emissions (up to 40GHz) not reported for there is no emission be found.

Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5730MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
11460.000	39.03	13.58	39.13	36.60	50.08	54.00	3.92	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
11460.000	39.03	13.58	39.13	35.79	49.27	54.00	4.73	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5790MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
11580.000	39.17	13.69	39.18	36.33	50.01	54.00	3.99	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
11580.000	39.17	13.69	39.18	36.35	50.03	54.00	3.97	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5845MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11690.000	39.38	13.53	39.23	36.88	50.57	54.00	3.43	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11690.000	39.38	13.53	39.23	37.03	50.71	54.00	3.29	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 1	Frequency	TX 5848MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11700.000	39.40	13.83	39.25	36.68	50.66	54.00	3.34	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11700.000	39.40	13.83	39.25	36.51	50.49	54.00	3.51	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5730MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11460.000	39.03	13.58	39.13	36.38	49.86	54.00	4.14	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11460.000	39.03	13.58	39.13	35.74	49.22	54.00	4.78	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5790MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11580.000	39.17	13.69	39.18	36.95	50.63	54.00	3.37	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11580.000	39.17	13.69	39.18	35.88	49.56	54.00	4.44	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5845MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11690.000	39.38	13.53	39.23	36.32	50.00	54.00	4.00	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11690.000	39.38	13.53	39.23	36.52	50.20	54.00	3.80	Peak

Mode	GFSK	U-NII Band	3
Antenna	ANT 2	Frequency	TX 5848MHz

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11700.000	39.40	13.83	39.25	36.68	50.66	54.00	3.34	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
11700.000	39.40	13.83	39.25	36.31	50.29	54.00	3.71	Peak

A.2.3 Emissions in Non-restricted Frequency Bands

Pursuant to KDB 789033 D02 General UNII Test Procedures New Rules v02r01 that emission levels below the 15.209/ RSS-Gen Section 8.9 table 4 general radiated emissions limits is not required.

A.3 MAXIMUM OUTPUT POWER AND EMISSION/OCCUPIED BANDWIDTH

Test Date	2023/01/30 ~ 03/07	Temp./Hum.	17-20°C/52-58%
Cable Loss	1.60dB	Tested By	Brian Hsieh
Test Voltage	DC 3.3V		

A.3.1 Average Output Power and Emission/Occupied Bandwidth

Mode (GFSK)	Centre Frequency (MHz)	Bandwidth(MHz)				Average Output Power (dBm)		Duty Cycle Factor (dB) 10log(1/X)	Max Average Output Power (dBm) Note 3 & 4	Limit (dBm)	Limit(11dBm +10 log B) Note 4
		Emission (6dB) Bandwidth		Occupied (99%) Bandwidth							
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2				
U-NII Band 3	5730	1.9490	2.1760	3.7731	3.7565	-2.25	-0.93	6.459	5.53	30	N/A
	5790	2.0240	2.1300	3.6897	3.8152	-1.15	0.07	6.459	6.53		
	5845	1.9370	2.2050	3.9505	3.9592	-0.52	-1.61	6.459	5.94		
	5846	0.9129	0.9199	1.2227	1.3118	-8.11	-8.95	N/A	-8.11		
	5847	0.9257	0.9393	1.3159	1.5784	-7.92	-8.94	N/A	-7.92		
	5848	0.9391	0.9149	1.2365	1.3391	-8.41	-6.41	N/A	-6.41		

Note: 1. The results have been included cable loss.

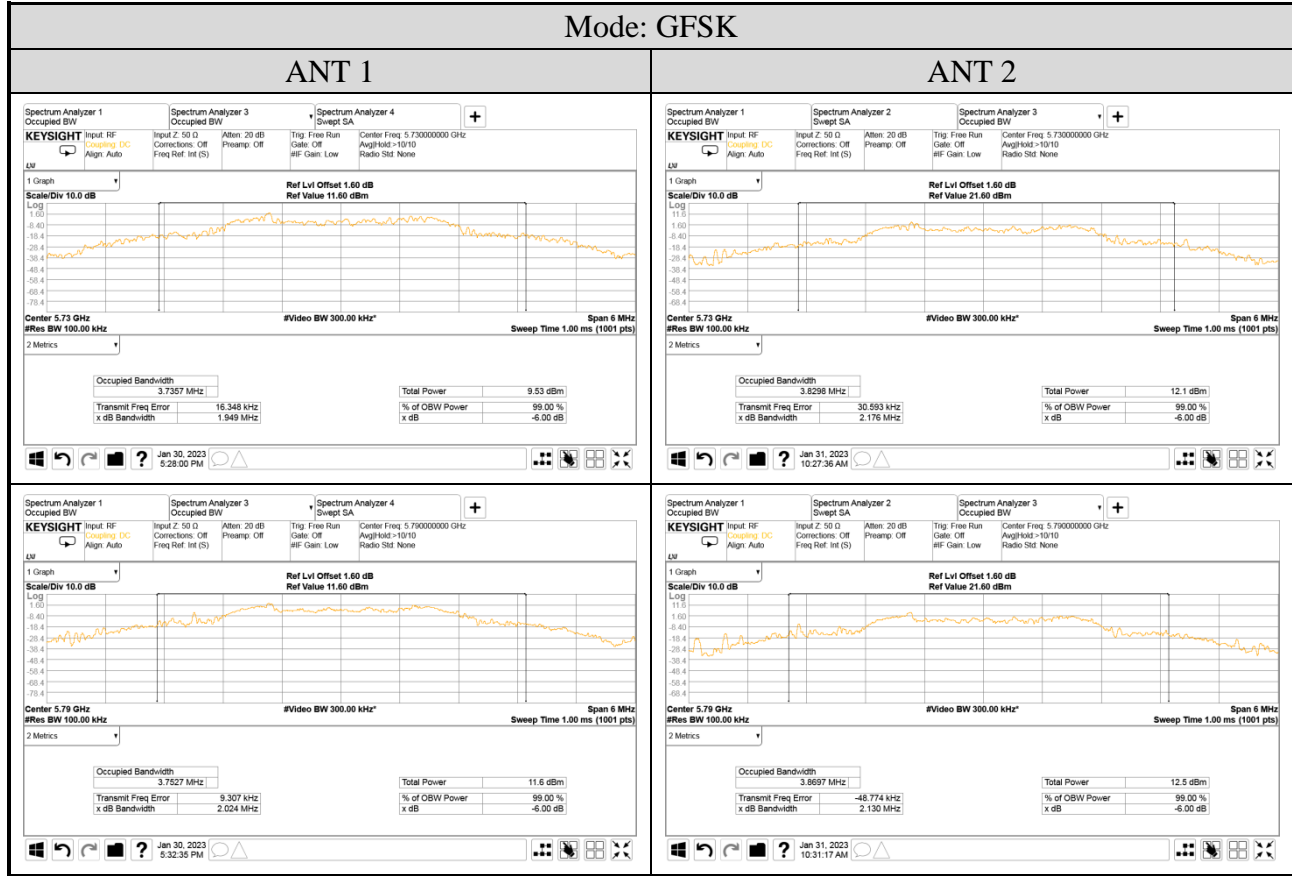
2. Max Average Output Power (dBm) = Max of each average output power (dBm)+ Duty Cycle Factor (dB) when duty cycle is less than 98%.

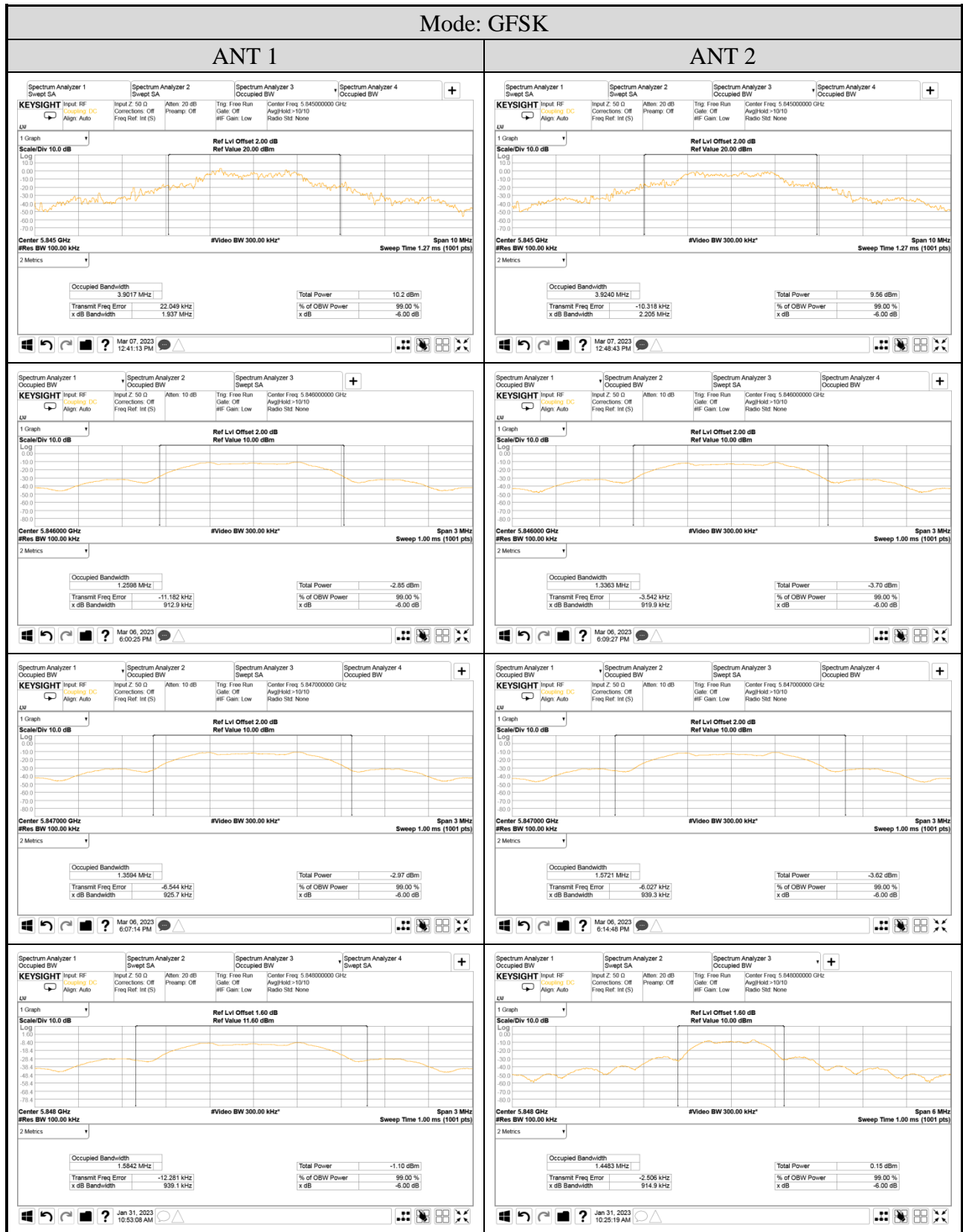
3. N/A represent the duty cycle is 100%, TX_{on} and TX_{on+off} cannot be measured.

4. B is the 26 dB emission bandwidth.

A.3.2 Measurement Plots

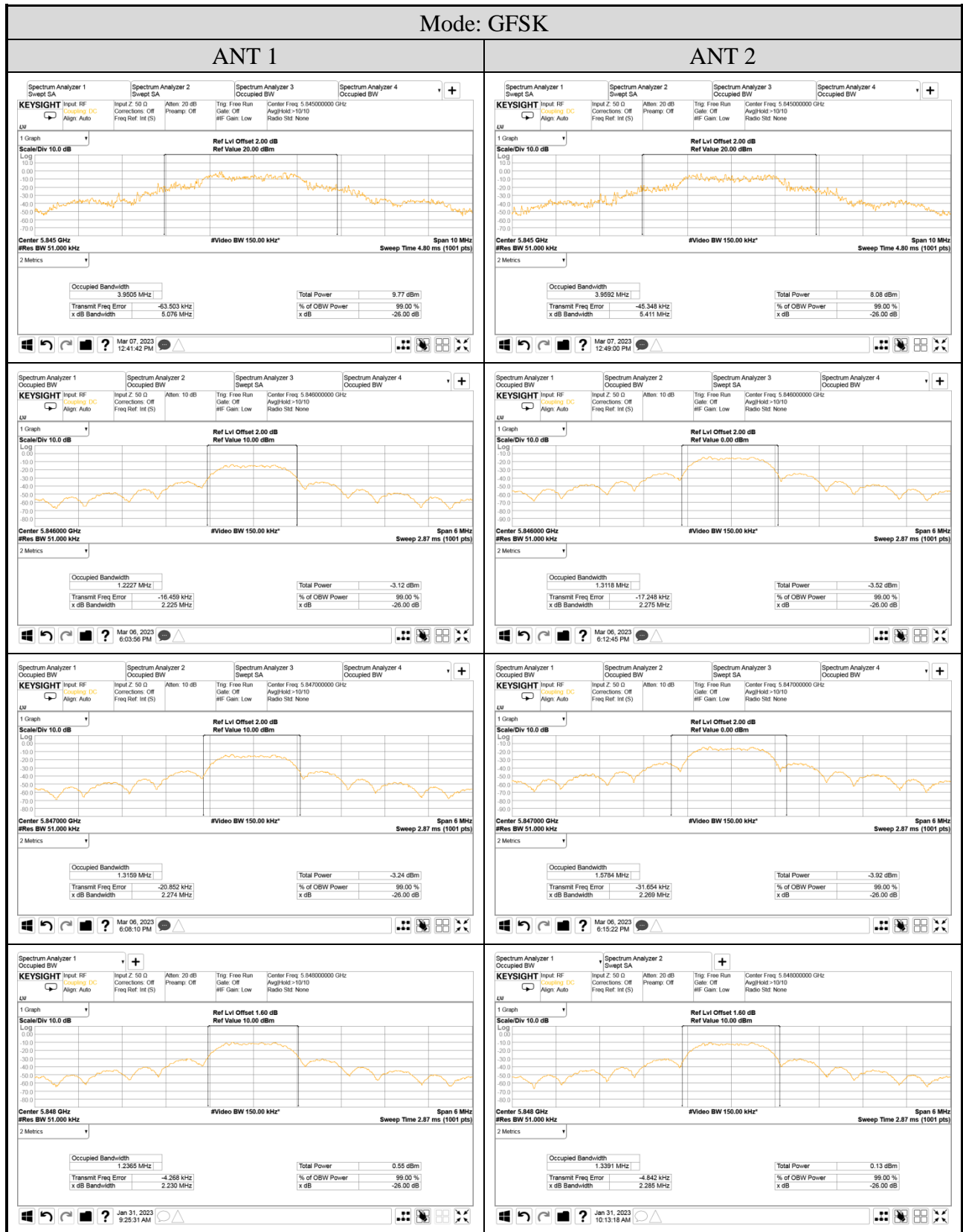
- Emission (6dB) Bandwidth





● Occupied (99%) Bandwidth





A.4 POWER SPECTRAL DENSITY

Test Date	2023/01/30 ~ 03/07	Temp./Hum.	17-22°C/52-42%
Cable Loss	1.60dB	Tested By	Brian Hsieh
Test Voltage	DC 3.3V		

A.4.1 Power Spectral Density Result

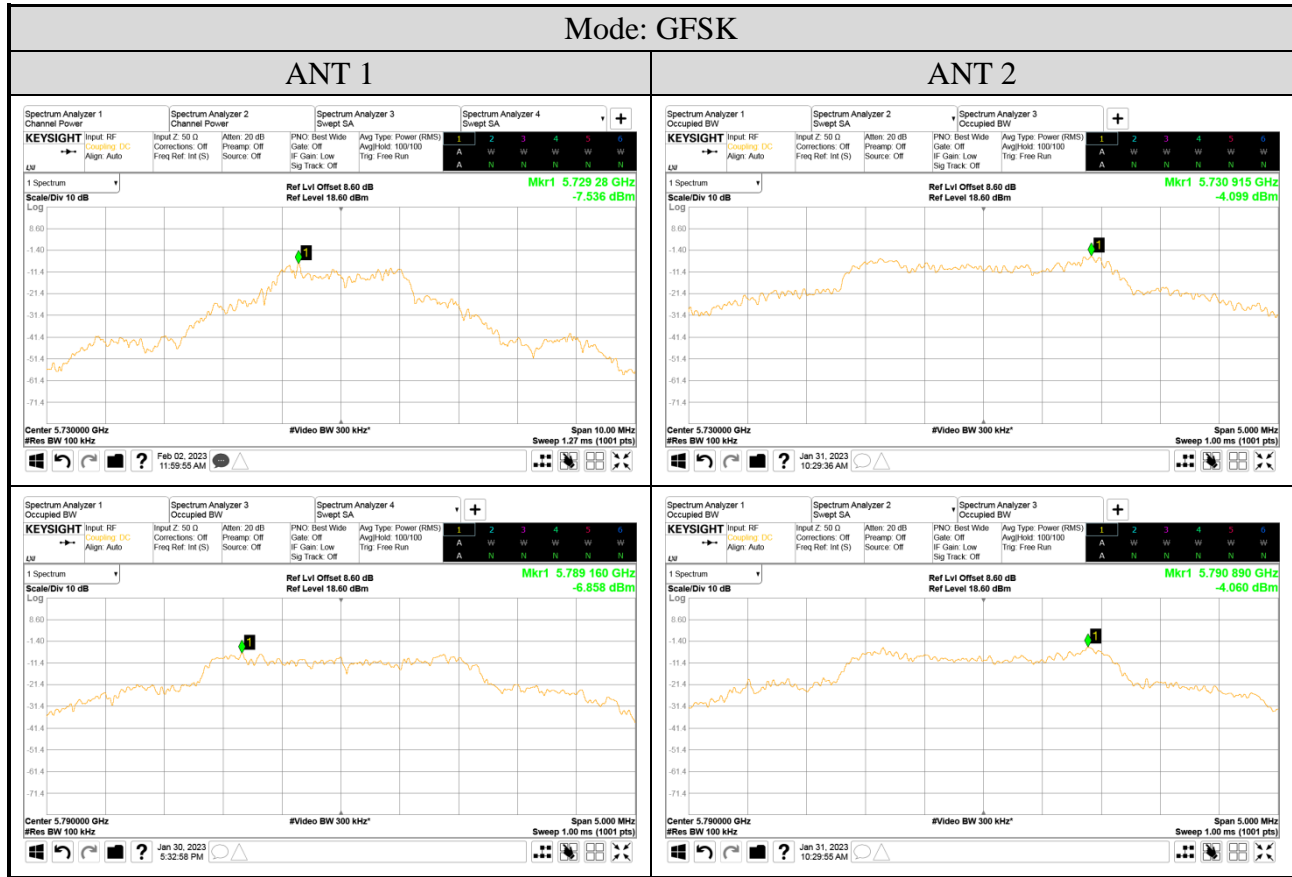
Mode (GFSK)	Centre Frequency (MHz)	Power Spectral Density (dBm/500kHz)		Duty Cycle Factor (dB) 10log(1/X)	Max. Power Spectral Density (dBm/500kHz) Note 3	Limit
		ANT1	ANT2			
U-NII Band 3	5730	-7.536	-4.099	6.459	2.360	30dBm/500 kHz
	5790	-6.858	-4.060	6.459	2.399	
	5845	-6.956	-6.750	6.459	-0.291	
	5846	-9.375	-10.983	N/A	-9.375	
	5847	-9.705	-11.208	N/A	-9.705	
	5848	-9.821	-8.130	N/A	-8.130	

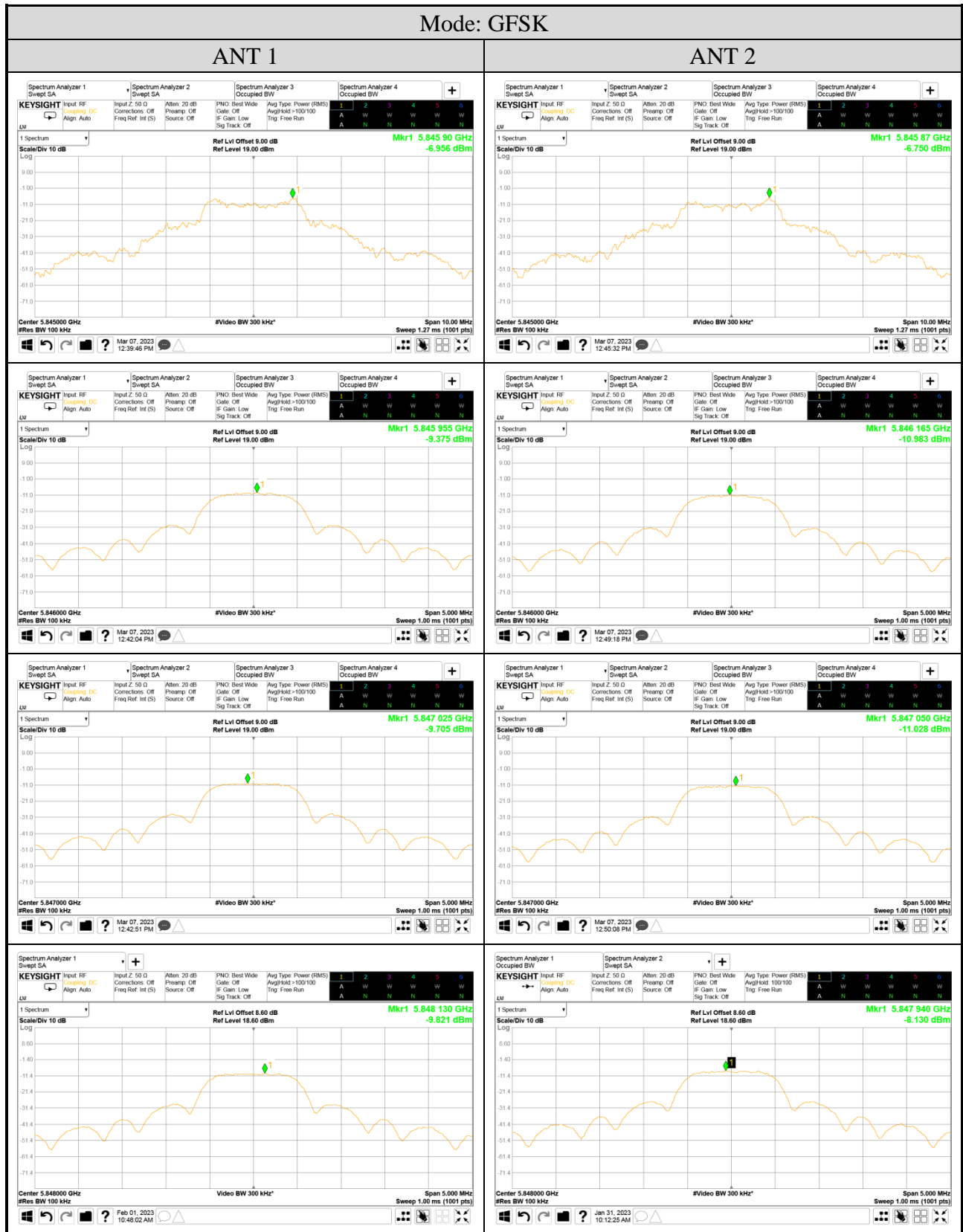
Note :1. All results have been included cable loss.

2. BWCF 7dB (100kHz converted to 500kHz) has been included in the test result.

3. Max. Power Spectral Density (dBm/500kHz) = Max of each PSD (dBm/500kHz) + Duty Cycle Factor(dB) when duty cycle is less than 98%.

A.4.2 Measurement Plots





A.5 FREQUENCY STABILITY

Test Date	2023/02/01	Temp./Hum.	20°C/53%
Test Voltage	DC 3.3V	Tested By	Brian Hsieh

A.5.1 Frequency stability Result

ANT 1

Temperature (°C)	Voltage (Vdc)	Centre Frequency (MHz)	Measurement Value (MHz)	Frequency Stability (ppm)
25	3.30	5730	5730.024	4.188
-30	3.15		5730.011	1.920
	3.45		5730.015	2.618
-20	3.15		5729.97	-5.236
	3.45		5729.984	-2.792
-10	3.15		5730	0.000
	3.45		5730.003	0.524
0	3.15		5729.983	-2.967
	3.45		5730.026	4.538
10	3.15		5729.996	-0.698
	3.45		5730.01	1.745
20	3.15		5729.973	-4.712
	3.45		5729.978	-3.839
30	3.15		5730.021	3.665
	3.45		5730.013	2.269
40	3.15		5730.007	1.222
	3.45		5730.022	3.839
50	3.15		5729.998	-0.349
	3.45		5729.975	-4.363

ANT 2

Temperature (°C)	Voltage (Vdc)	Centre Frequency (MHz)	Measurement Value (MHz)	Frequency Stability (ppm)
25	3.30	5730	5730.000	0.000
-30	3.15		5729.992	-1.396
	3.45		5729.984	-2.792
-20	3.15		5729.996	-0.698
	3.45		5730.006	1.047
-10	3.15		5730.012	2.094
	3.45		5730.03	5.236
0	3.15		5729.991	-1.571
	3.45		5729.979	-3.665
10	3.15		5730.017	2.967
	3.45		5729.99	-1.745
20	3.15		5730.004	0.698
	3.45		5729.999	-0.175
30	3.15		5729.981	-3.316
	3.45		5729.978	-3.839
40	3.15		5730.015	2.618
	3.45		5729.971	-5.061
50	3.15		5729.993	-1.222
	3.45		5729.982	-3.141

Note: The extreme Voltage is declared by manufacturer.