

FCC Radio Test Report

FCC ID: TX2-RTL8822CE

This report concerns: ☒ Class II Change

Project No. : 1812C003B
Equipment : 802.11a/b/g/n/ac RTL8822CE Combo module
Test Model : RTL8822CE
Series Model : N/A
Applicant : Realtek Semiconductor Corp.
Address : No.2, Innovation Road II, Hsinchu Science Park,
Hsinchu 300, Taiwan

Date of Receipt : Jul. 01, 2019
Date of Test : Jul. 03, 2019 ~ Aug. 02, 2019
Issued Date : Aug. 02, 2019
Tested by : BTL Inc.

Testing Engineer : Welly Zhou
(Welly Zhou)

Technical Manager : Steven Lu
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Certificate #5123.02

Declaration

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

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

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

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

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Aug. 02, 2019

1. GENERAL SUMMARY

Equipment : 802.11a/b/g/n/ac RTL8822CE Combo module
Brand Name : Realtek
Test Model : RTL8822CE
Series Model : N/A
Applicant : Realtek Semiconductor Corp.
Manufacturer : Realtek Semiconductor Corp.
Address : No.2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
Date of Test : Jul. 03, 2019 ~ Aug. 02, 2019
Test Sample : Engineering Sample No.: DG190701138
Standard(s) : FCC Part15, Subpart C (15.247)
ANSI C63.10-2013

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

The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCCP-3-1812C003B) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of A2LA according to the ISO/IEC 17025 quality assessment standard and technical standard(s).

Test results included in this report are only for the WLAN 2.4 GHz part.

2. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part15, Subpart C (15.247)				
Standard(s) Section	Test Item	Test Result	Judgment	Remark
15.207	AC Power Line Conducted Emissions	-----	PASS	-----
15.247(d) 15.205(a) 15.209(a)	Radiated Emissions	Appendix A Appendix B	PASS	-----
15.247(a)(2)	Bandwidth	-----	PASS	-----
15.247(b)(3)	Maximum Output Power	-----	PASS	-----
15.247(d)	Conducted Spurious Emissions	-----	PASS	-----
15.247(e)	Power Spectral Density	-----	PASS	-----
15.203	Antenna Requirement	-----	PASS	Note(2)

Note:

- (1) "N/A" denotes test is not applicable in this test report.
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.
- (3) In this report only the radiated spurious emissions were evaluated and recorded. For the test results of other test items please refer to module test report.

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.

BTL's Test Firm Registration Number for FCC: 357015

BTL's Designation Number for FCC: CN1240

2.2 MEASUREMENT UNCERTAINTY

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

The BTL measurement uncertainty as below table:

A. Radiated emissions test:

Test Site	Method	Measurement Frequency Range	Ant. H / V	U, (dB)
DG-CB03	CISPR	30MHz ~ 200MHz	V	4.88
		30MHz ~ 200MHz	H	4.14
		200MHz ~ 1,000MHz	V	4.62
		200MHz ~ 1,000MHz	H	4.80
		1GHz ~ 6GHz	-	4.58
		6GHz ~ 18GHz	-	5.18
		18 ~ 26.5 GHz	-	3.80
		26.5 ~ 40 GHz	-	4.30

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

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Equipment	802.11a/b/g/n/ac RTL8822CE Combo module
Brand Name	Realtek
Test Model	RTL8822CE
Series Model	N/A
Model Difference(s)	N/A
Power Source	<p>1# DC voltage supplied from AC/DC adapter.</p> <ol style="list-style-type: none"> 1) Manufacturer / Model: Chicony / ADLX65CCGE2A 2) Manufacturer / Model: Delta / ADLX65CDGE2A 3) Manufacturer / Model: Lite-ON / ADLX65CLGE2A 4) Manufacturer / Model: Chicony / ADLX65NCC3A 5) Manufacturer / Model: Delta / ADLX65NDC3A 6) Manufacturer / Model: Lite-ON / ADLX65NLC3A <p>2# Rechargeable Li-ion Battery supplied.</p> <ol style="list-style-type: none"> 1) Manufacturer / Model: Simplo / L18M4PF5 2) Manufacturer / Model: Simplo / L18M3PF8 3) Manufacturer / Model: LGC / L18L4PF0 4) Manufacturer / Model: LGC / L18L3PF4
Power Rating	<p>1# For adapter:</p> <p>I/P: 100-240V~1.8A/1.5A/1.7A/1.8A max. 50-60Hz</p> <p>O/P: 20V --- 3.25A</p> <p>2# For battery:</p> <ol style="list-style-type: none"> 1) 15.2V --- Typical Capacity 4610mAh / 70Wh, Rated Capacity 4480mAh / 68 Wh 2) 11.4V --- Typical Capacity 4610mAh / 52.5Wh, Rated Capacity 4480mAh / 51 Wh 3) 15.12V --- Typical Capacity 4630mAh / 70Wh, Rated Capacity 4497mAh / 68 Wh 4) 11.34V --- Typical Capacity 4630mAh / 52.5Wh, Rated Capacity 4498mAh / 51 Wh
Operation Frequency	2412 MHz ~ 2462 MHz
Modulation Type	<p>IEEE 802.11b: DSSS</p> <p>IEEE 802.11g: OFDM</p> <p>IEEE 802.11n: OFDM</p>
Bit Rate of Transmitter	<p>IEEE 802.11b: 11/5.5/2/1 Mbps</p> <p>IEEE 802.11g: 54/48/36/24/18/12/9/6 Mbps</p> <p>IEEE 802.11n: up to 300 Mbps</p>

Note:

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

2. Channel List:

CH01 - CH11 for IEEE 802.11b, IEEE 802.11g, IEEE 802.11n (HT20)							
CH03 - CH09 for IEEE 802.11n (HT40)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

3. Table for Filed Antenna:

Ant. Part Number (main & aux parts)	Type	Antenna Mfr.	Antenna Gain(dBi)				
			2.4G	5.15G-5.25G	5.25G-5.35G	5.47G-5.725G	5.725G-5.85G
NB8606	PIFA	South Star	3.31 3.81	3.14 2.13	3.11 2.21	2.74 2.42	2.35 2.23
N/A	PIFA	INPAQ	1.26 1.42	0.39 0.57	0.01 1.25	2.27 1.24	2.45 1.00

Note:

- (1) Both groups of antennas were evaluated, the worst was the South Star, and recorded in the test report.

3.2 DESCRIPTION OF TEST MODES

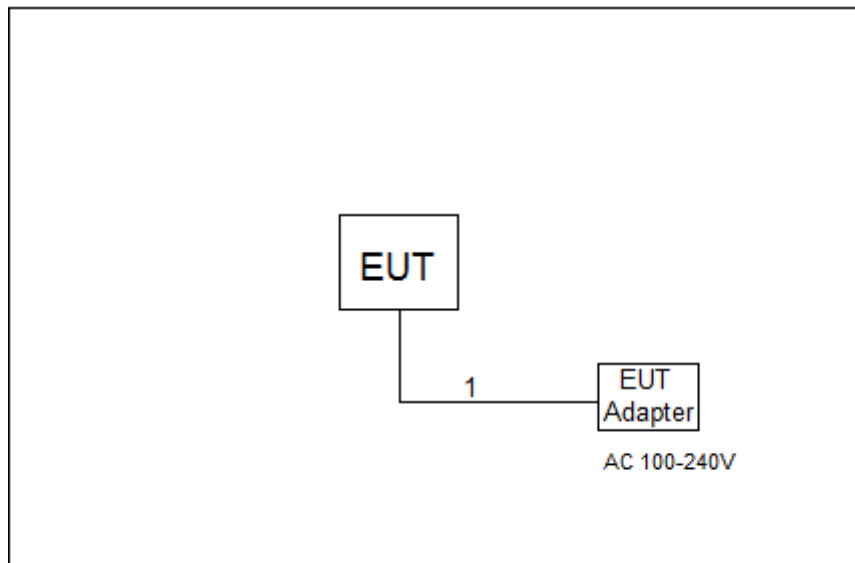
The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

Pretest Mode	Description
Mode 1	TX B Mode Channel 06

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

Radiated emissions test	
Final Test Mode:	Description
Mode 1	TX B Mode Channel 06

3.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



3.4 SUPPORT UNITS

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.
-	-	-	-	-

Item	Cable Type	Shielded Type	Ferrite Core	Length
1	DC Cable	NO	NO	2.0m

4. RADIATED EMISSIONS TEST

4.1 LIMIT

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

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000 MHz)

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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	(dBuV/m at 3 m)	
	Peak	Average
Above 1000	74	54

NOTE:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1 MHz / 3 MHz for Peak, 1 MHz / 1/T for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9 kHz~90 kHz for PK/AVG detector
Start ~ Stop Frequency	90 kHz~110 kHz for QP detector
Start ~ Stop Frequency	110 kHz~490 kHz for PK/AVG detector
Start ~ Stop Frequency	490 kHz~30 MHz for QP detector
Start ~ Stop Frequency	30 MHz~1000 MHz for QP detector

4.2 TEST PROCEDURE

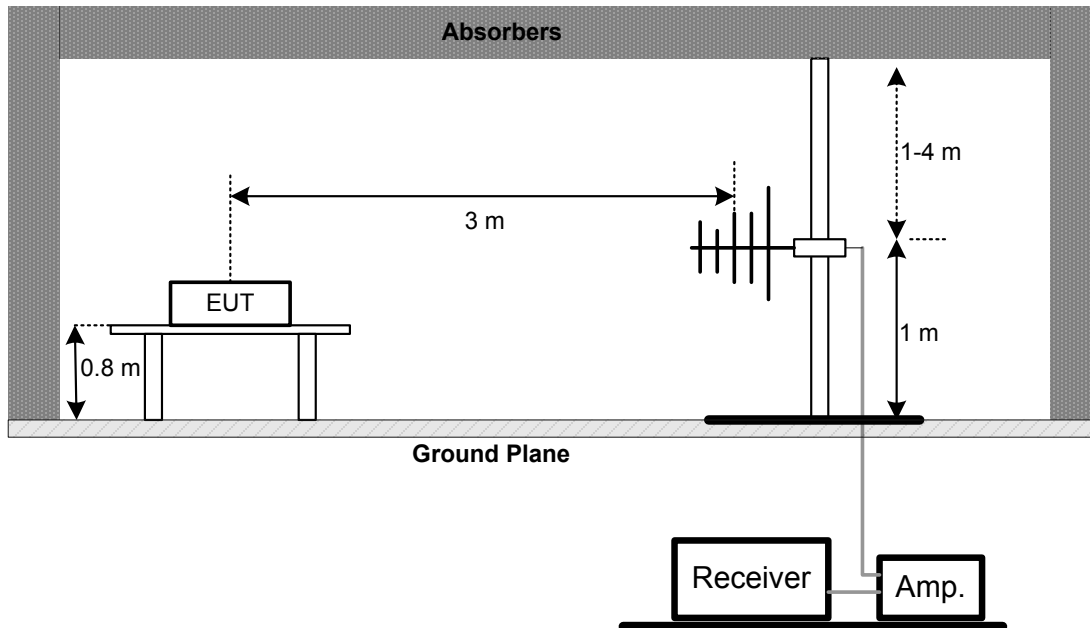
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
- The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1 GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- For the actual test configuration, please refer to the related Item -EUT Test Photos.

4.3 DEVIATION FROM TEST STANDARD

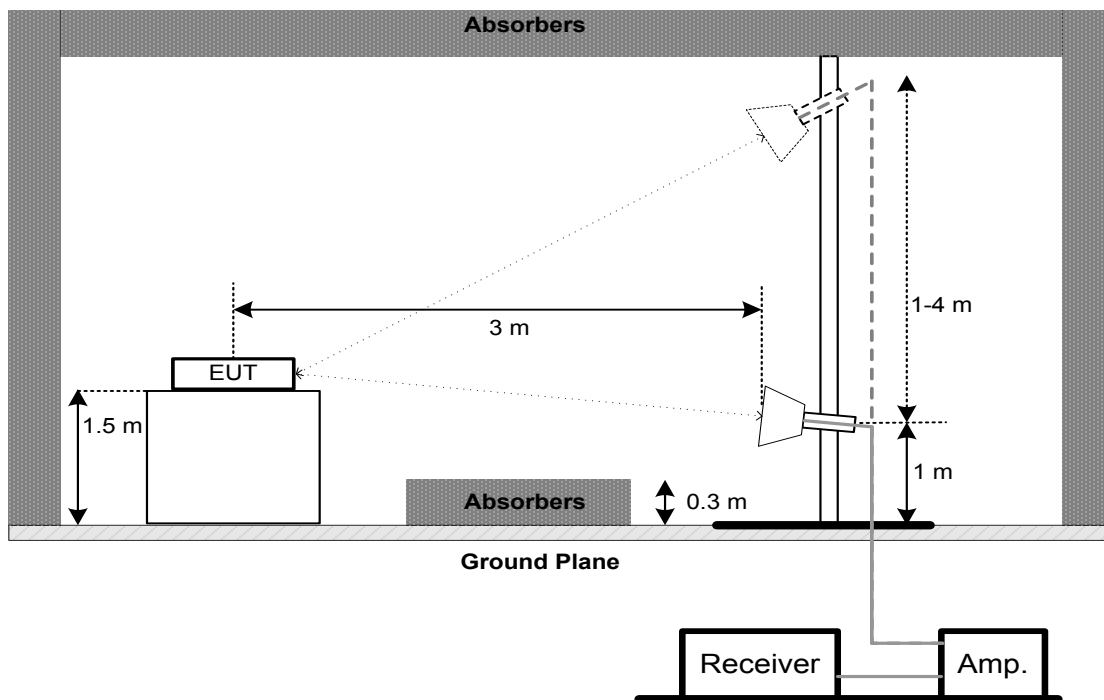
No deviation

4.4 TEST SETUP

30 MHz to 1 GHz



Above 1 GHz



4.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 EUT TEST CONDITIONS

Temperature: 25°C Relative Humidity: 55% Test Voltage: AC 120V/60Hz

4.7 TEST RESULTS - 30 MHZ TO 1000 MHZ

Please refer to the APPENDIX A.

4.8 TEST RESULTS - ABOVE 1000 MHZ

Please refer to the APPENDIX B.

Remark:

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

5. MEASUREMENT INSTRUMENTS LIST

Radiated Emissions - 30 MHz to 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Antenna	Schwarzbeck	VULB9160	9160-3232	Mar. 09, 2020
2	Amplifier	HP	8447D	2944A09673	Aug. 11, 2019
3	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
4	Cable	emci	LMR-400(30MHz-1GHz)(8m+5m)	N/A	May 24, 2020
5	Controller	CT	SC100	N/A	N/A
6	Controller	MF	MF-7802	MF780208416	N/A
7	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

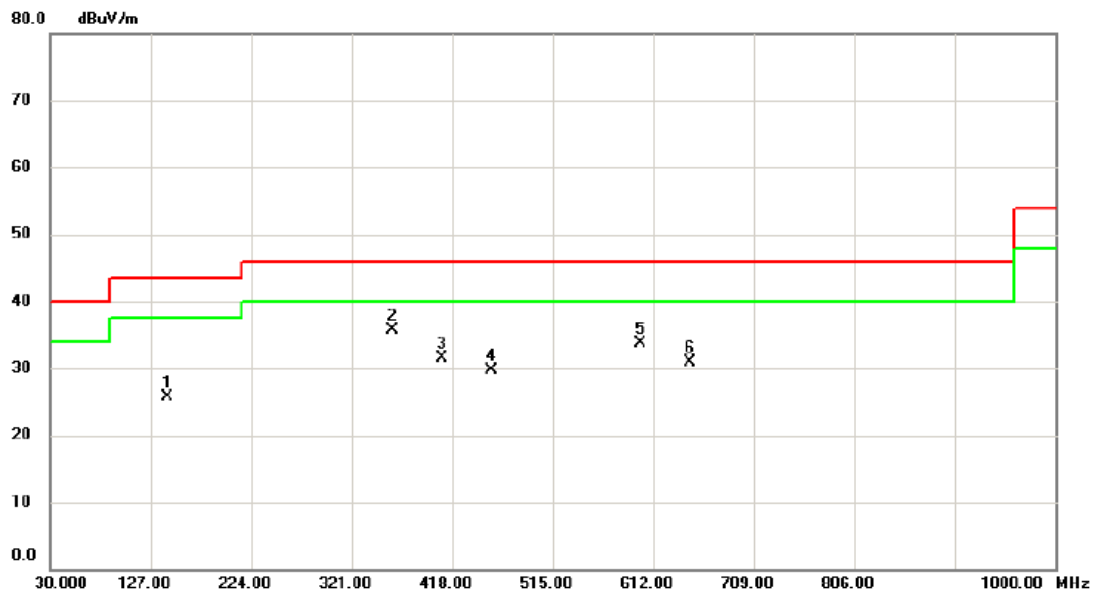
Radiated Emissions - Above 1 GHz					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Double Ridged Guide Antenna	ETS	3115	75789	Mar. 09, 2020
2	Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	Jun. 23, 2020
3	Amplifier	Agilent	8449B	3008A02333	Mar. 10, 2020
4	Microwave Preamplifier With Adaptor	EMC INSTRUMENT	EMC2654045	980039 & HA01	Mar. 10, 2020
5	Receiver	Agilent	N9038A	MY52130039	Aug. 11, 2019
6	Controller	CT	SC100	N/A	N/A
7	Controller	MF	MF-7802	MF780208416	N/A
8	Cable	mitron	B10-01-01-12M	18072744	Jun. 29, 2020
9	Measurement Software	Farad	EZ-EMC Ver.NB-03A1-01	N/A	N/A

Remark: "N/A" denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

APPENDIX A - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode: TX B Mode Channel 06

Vertical



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		143.490	38.28	-12.67	25.61	43.50	-17.89	peak	
2	*	359.800	46.13	-10.42	35.71	46.00	-10.29	peak	
3		407.815	40.71	-9.24	31.47	46.00	-14.53	peak	
4		455.830	37.67	-8.03	29.64	46.00	-16.36	peak	
5		599.875	39.54	-5.74	33.80	46.00	-12.20	peak	
6		647.890	35.70	-4.72	30.98	46.00	-15.02	peak	

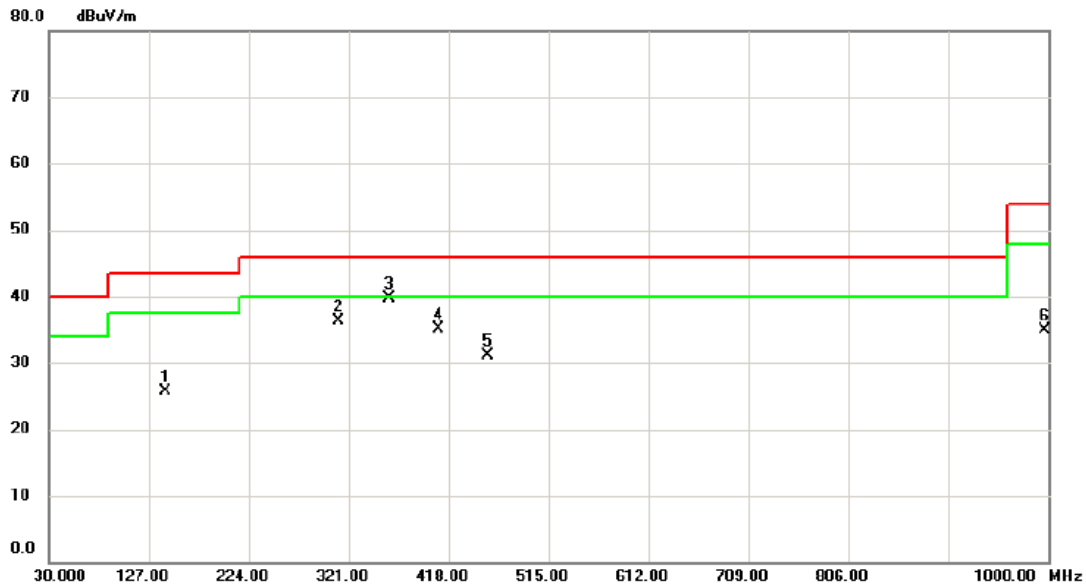
REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

Test Mode: TX B Mode Channel 06

Horizontal



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1		142.520	38.34	-12.72	25.62	43.50	-17.88	peak	
2		311.785	47.51	-11.29	36.22	46.00	-9.78	peak	
3	*	359.800	50.04	-10.42	39.62	46.00	-6.38	peak	
4		407.815	44.27	-9.24	35.03	46.00	-10.97	peak	
5		455.830	39.23	-8.03	31.20	46.00	-14.80	peak	
6		996.120	34.98	0.01	34.99	54.00	-19.01	peak	

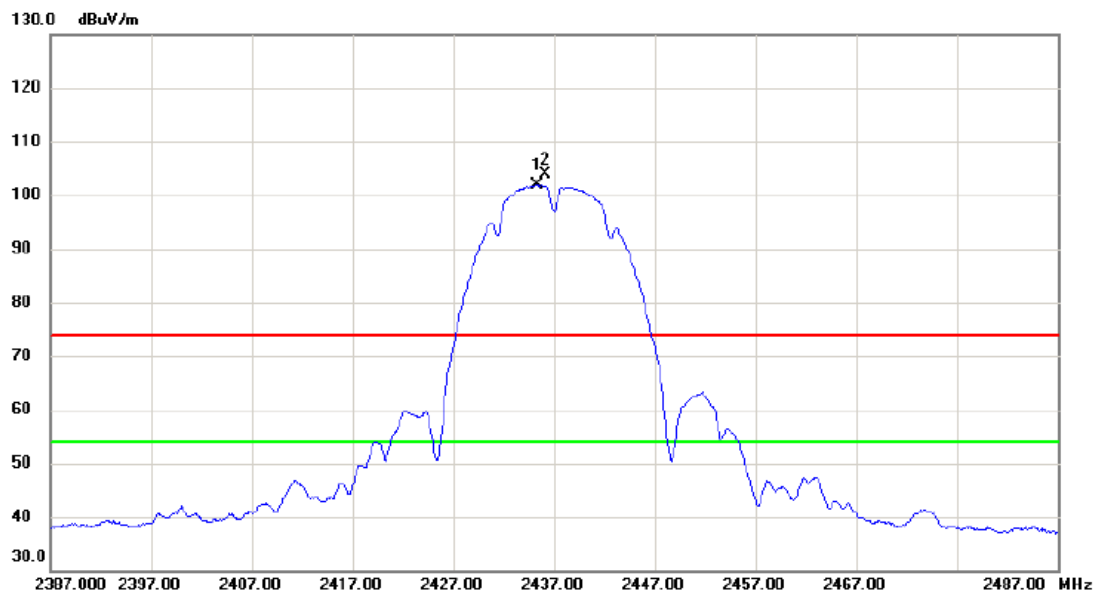
REMARKS:

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

APPENDIX B - RADIATED EMISSION- ABOVE 1000 MHZ

Test Mode: TX B Mode 2437 MHz

Vertical



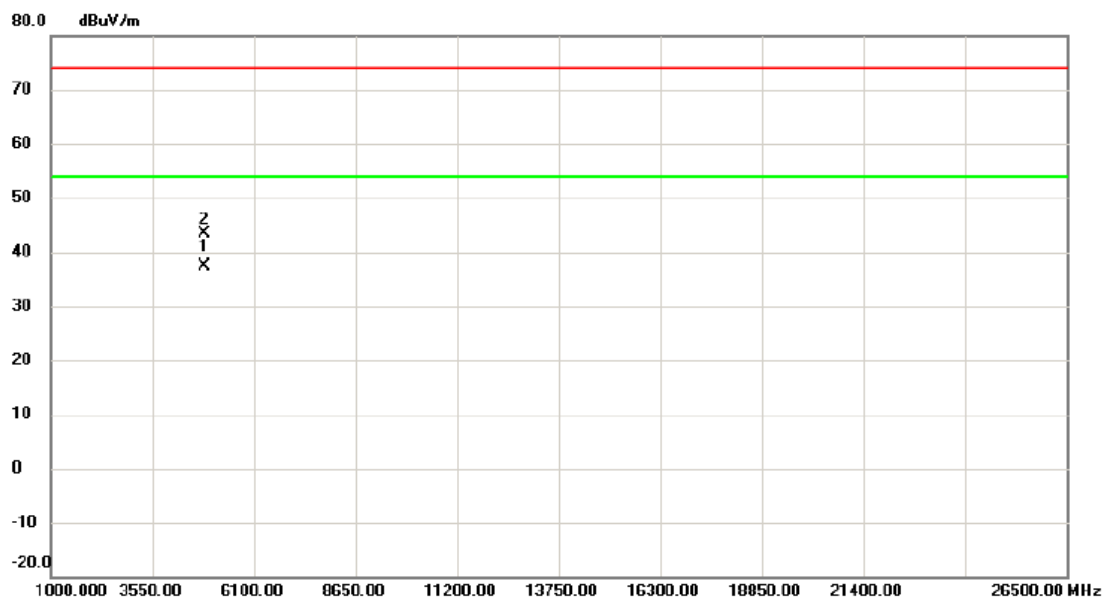
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2435.300	95.41	6.49	101.90	54.00	47.90	AVG	No Limit
2	X	2436.150	97.35	6.48	103.83	74.00	29.83	peak	No Limit

REMARKS:

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

Test Mode: TX B Mode 2437 MHz

Vertical



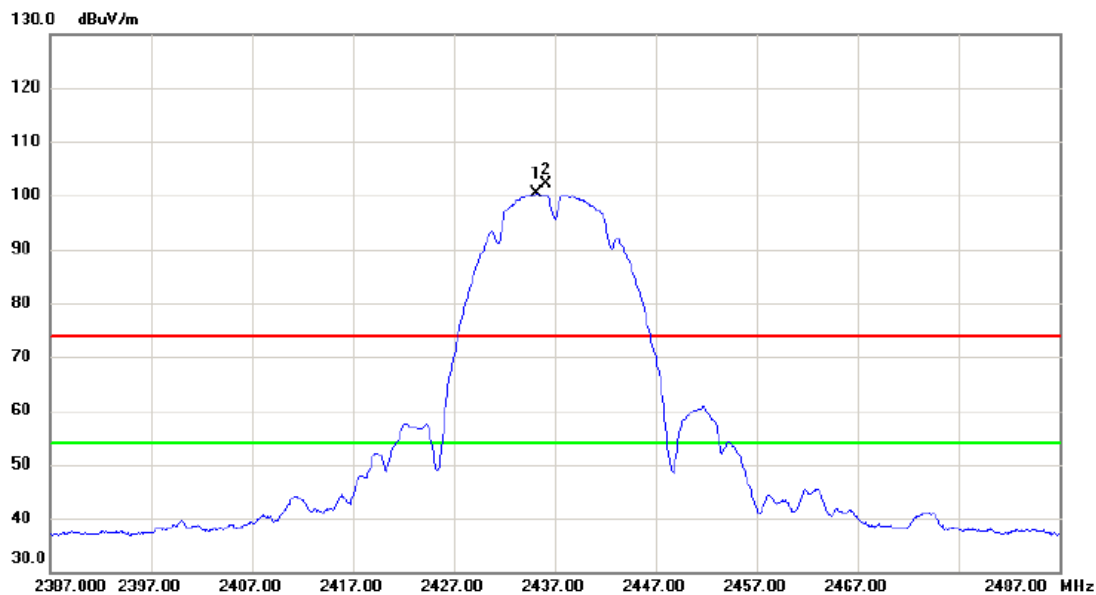
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4873.990	33.76	3.58	37.34	54.00	-16.66	AVG	
2		4874.217	39.92	3.58	43.50	74.00	-30.50	peak	

REMARKS:

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

Test Mode: TX B Mode 2437 MHz

Horizontal



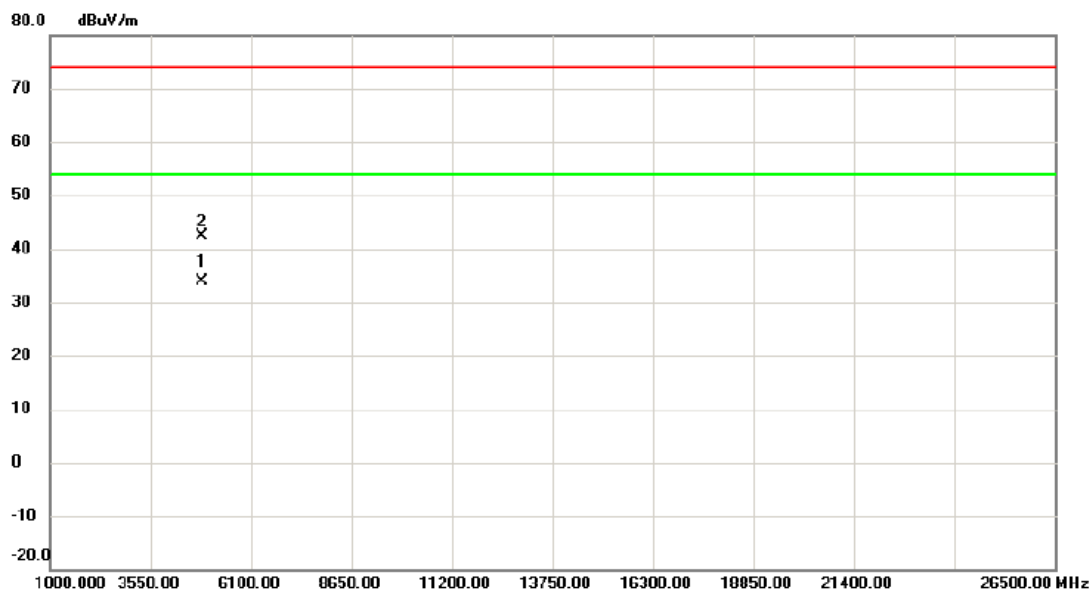
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Comment
1	*	2435.250	93.84	6.49	100.33	54.00	46.33	AVG	No Limit
2	X	2436.150	95.74	6.48	102.22	74.00	28.22	peak	No Limit

REMARKS:

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

Test Mode: TX B Mode 2437 MHz

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	4873.927	30.33	3.58	33.91	54.00	-20.09	AVG	
2		4874.127	38.72	3.58	42.30	74.00	-31.70	peak	

REMARKS:

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

End of Test Report