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On your side

TEST REPORT

FCC/ISED DTS Test for LCWB-005
Certification

APPLICANT
LG Electronics Inc.

REPORT NO.
HCT-RF-2312-FI001

DATE OF ISSUE
December 6, 2023

Tested by
Kyung Jun Woo

Technical Manager
Jong Seok Lee

Accredited by KOLAS, Republic of KOREA

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TEST REPORT

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LCWB-005

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Additional Model
-

Applicant	**LG Electronics Inc.** 170, SeongsanPachong-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do 51533, Republic of Korea
Eut Type Model Name	RF Module LCWB-005
FCC ID IC	BEJ-LCWB005 2703N-LCWB005
Modulation type	CCK/DSSS/OFDM
FCC Classification	Digital Transmission System(DTS)
FCC Rule Part(s)	Part 15.247
ISED Rule Part(s)	RSS-247 Issue 3 (August 2023) RSS-Gen Issue 5_Amendment 2 (February 2021)
Brand	LG
Test Site/Location	■ Permanent Testing Lab. (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea) ☐ On Site Testing

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.
This laboratory is not accredited for the test results marked *.

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	December 06, 2023	Initial Release

Engineering Statement:
The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC / ISED Rules under normal use and maintenance.

KOLAS Statement:
The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (KOLAS Accreditation No. KT197)

If this report is required to confirmation of authenticity, please contact to www.hct.co.kr

CONTENTS

1. EUT DESCRIPTION 5
2. TEST METHODOLOGY 6
EUT CONFIGURATION 6
EUT EXERCISE 6
GENERAL TEST PROCEDURES 6
DESCRIPTION OF TEST MODES 7
3. INSTRUMENT CALIBRATION 7
4. FACILITIES AND ACCREDITATIONS 7
FACILITIES 7
EQUIPMENT 7
5. ANTENNA REQUIREMENTS 8
6. MEASUREMENT UNCERTAINTY 9
7. DESCRIPTION OF TESTS 10
8. SUMMARY TEST OF RESULTS 28
9. TEST RESULT 30
9.1 DUTY CYCLE 30
9.2 6 dB BANDWIDTH & 99 % BANDWIDTH 32
9.3 OUTPUT POWER 35
9.4 POWER SPECTRAL DENSITY 36
9.5 BAND EDGE / CONDUCTED SPURIOUS EMISSIONS 38
9.6 RADIATED SPURIOUS EMISSIONS 41
9.7 RADIATED RESTRICTED BAND EDGES 45
9.8 POWERLINE CONDUCTED EMISSIONS 48
9.9 RECEIVER SPURIOUS EMISSIONS 52
10. LIST OF TEST EQUIPMENT 53
11. ANNEX A_ TEST SETUP PHOTO 55

1. EUT DESCRIPTION

Model	LCWB-005		
Additional Model	-		
EUT Type	RF Module		
Power Supply	DC 5.0 V / 12.0 V		
Frequency Range	2 412 MHz – 2 462 MHz		
Max. RF Output Power	Peak Power	802.11b: 802.11g: 802.11n(HT20):	22.78 dBm 22.64 dBm 21.69 dBm
	Average Power	802.11b: 802.11g: 802.11n(HT20):	16.89 dBm 14.98 dBm 13.98 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n(HT20)		
Number of Channels	11 Channels		
Antenna Specification	Antenna type: PCB Pattern Antenna Peak Gain : 2.07 dBi		
Date(s) of Tests	November 20, 2023 ~ December 06, 2023		
PMN (Product Marketing Number)	RF Module		
HVIN (Hardware Version Identification Number)	LCWB-005		
FVIN (Firmware Version Identification Number)	V1.0		
HMN (Host Marketing Name)	N/A		
EUT Serial number	Conducted : 1C3929CA377B Radiated : 1C3929CA36E3		

2. TEST METHODOLOGY

FCC KDB 558074 D01 15.247 Meas Guidance v05r02 dated April 02, 2019 entitled “guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices and the measurement procedure described in ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C. / RSS-Gen issue 5, RSS-247 issue 3.

GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1 GHz. Above 1 GHz with 1.5 m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 6.6.5 of ANSI C63.10. (Version: 2013)

DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.
Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.
Detailed description of test facility was submitted to the Commission and accepted dated March 31, 2022 (CAB identifier: KR0032).
For ISED, test facility was accepted dated April 06, 2022 (CAB identifier: KR0032).

EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5. ANTENNA REQUIREMENTS

According to FCC 47 CFR § 15.203:

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

(1) The antennas of this E.U.T are permanently attached.

(2) The E.U.T Complies with the requirement of § 15.203

According to RSS-Gen(Issue 5) Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

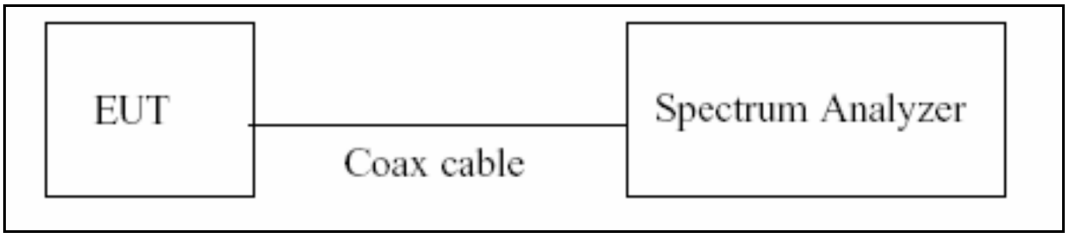
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.90 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.82 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.74 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.52 (Confidence level about 95 %, k=2)

7. DESCRIPTION OF TESTS

7.1. Duty Cycle

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method.

The largest available value of RBW is 8 MHz and VBW is 50 MHz.

The zero-span method of measuring duty cycle shall not be used if T ≤ 6.25 microseconds. (50/6.25 = 8)

The zero-span method was used because all measured T data are > 6.25 microseconds and both RBW and VBW are > 50/ *T*.

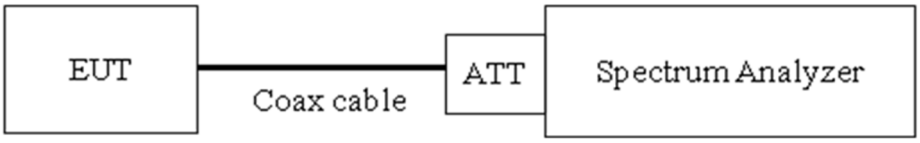
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Average
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

7.2. 6 dB Bandwidth & 99 % Bandwidth

Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Procedure 11.8.1 in ANSI 63.10-2013)

1) RBW = 100 kHz
2) VBW ≥ 3 x RBW
3) Detector = Peak
4) Trace mode = max hold
5) Sweep = auto couple
6) Allow the trace to stabilize
7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

Test Procedure (for ISED)

The transmitter output is connected to the spectrum analyzer.

RBW = 1% ~ 5% of the occupied bandwidth

VBW ≒ 3 x RBW

Detector = Peak

Trace mode = max hold

Sweep = auto couple

Allow the trace to stabilize

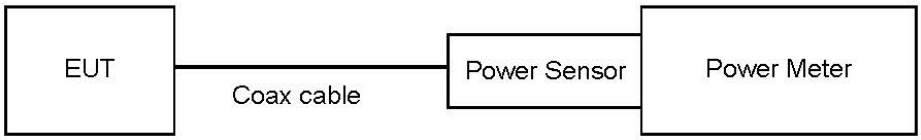
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

7.3. Output Power

Limit

The maximum permissible conducted output power is 1 Watt.

Test Configuration



Test Procedure

The transmitter output is connected to the Power Meter.

- Peak Power (Procedure 11.9.1.3 in ANSI 63.10-2013)
  : Measure the peak power of the transmitter.

- Average Power (Procedure 11.9.2.3 in ANSI 63.10-2013)
  1) Measure the duty cycle.
  2) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
  3) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Sample Calculation

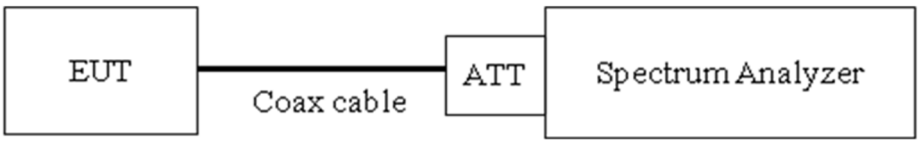
- Conducted Output Power(Peak) = Measured Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

7.4. Power Spectral Density

Limit

The transmitter power density average over 1-second interval shall not be greater than 8 dBm in any 3 kHz BW.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 8.4 in KDB 558074 v05r02, Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

1) Set analyzer center frequency to DTS channel center frequency.
2) Set span to at least 1.5 times the OBW.
3) RBW = 3 kHz ≤ RBW ≤ 100 kHz.
4) VBW ≥ 3 x RBW.
5) Sweep = auto couple
6) Detector = power averaging (rms) or sample detector (when rms not available).
7) Ensure that the number of measurement points in the sweep ≥ [2 × span / RBW].
8) Employ trace averaging (rms) mode over a minimum of 100 traces
9) Use the peak marker function to determine the maximum amplitude level.
10) Use the peak marker function to determine the maximum amplitude level within the RBW.
    If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11) if then duty factor shall be added to adjust the result if the duty cycle is less than 98 %

Sample Calculation

▪ Power Spectral Density = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

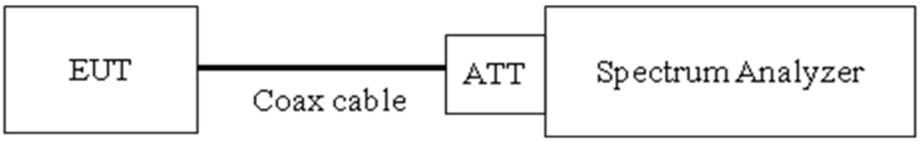
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

Limit

The maximum conducted (Peak) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

[Conducted > 20 dBc]

Test Configuration



Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 11.11 in ANSI 63.10-2013)

1) RBW = 100 kHz
2) VBW ≥ 3 x RBW
3) Set span to encompass the spectrum to be examined
4) Detector = Peak
5) Trace Mode = max hold
6) Sweep time = auto couple
7) Ensure that the number of measurement points ≥ 2 x Span/RBW
8) Allow trace to fully stabilize.
9) Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

Factors for frequency

Freq(MHz)	Factor(dB)
30	11.10
100	11.15
200	11.19
300	11.24
400	11.30
500	11.30
600	11.31
700	11.32
800	11.33
900	11.35
1 000	11.40
2 000	11.55
2 400	**11.60**
2 500	**11.60**
3 000	11.69
4 000	11.77
5 000	11.84
5 700	11.85
5 800	11.92
6 000	11.93
7 000	12.06
8 000	12.06
9 000	12.14
10 000	12.24
11 000	12.33
12 000	12.42
13 000	12.43
14 000	12.46
15 000	12.56
16 000	12.64
17 000	12.85
18 000	12.98
19 000	12.90
20 000	12.57
21 000	12.70
22 000	12.69
23 000	12.70
24 000	12.71
25 000	12.81

Note : 1. 2400 ~ 2500 MHz is fundamental frequency range.

2. Factor = Attenuator loss + Cable loss

7.6. Radiated Test

Limit

FCC

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30

ISED

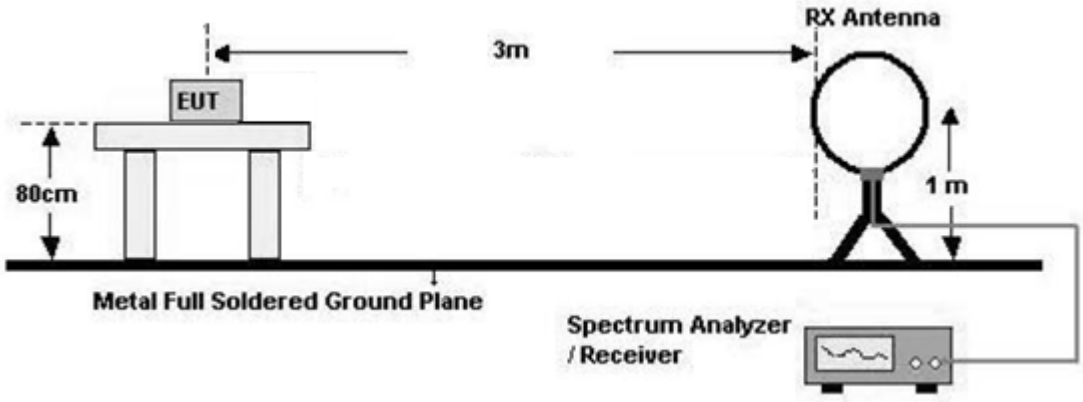
Frequency (MHz)	Field Strength (μA/m)	Measurement Distance (m)
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

FCC&ISED

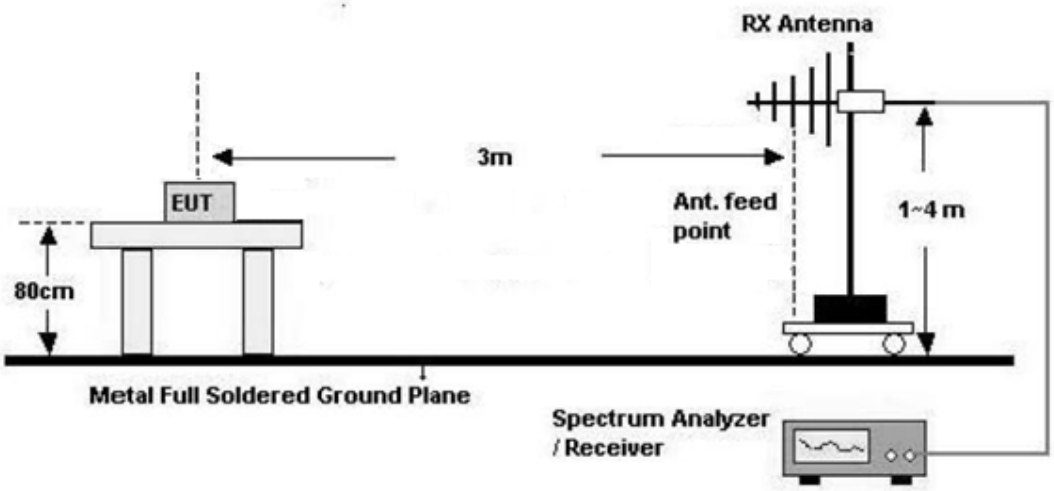
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

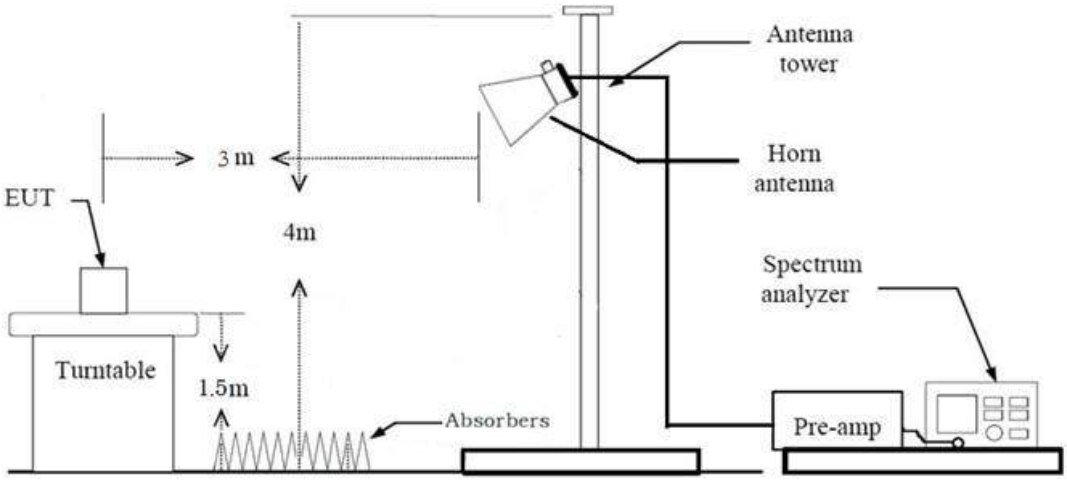
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions (Below 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m from the EUT
3. The EUT is placed on a turntable, which is 0.8 m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) = 40log(3 m/300 m) = - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = 40log(3 m/30 m) = - 40 dB
   Measurement Distance : 3 m
8. Spectrum Setting
   - Frequency Range = 9 kHz ~ 30 MHz
   - Detector = Peak
   - Trace = Maxhold
   - RBW = 9 kHz
   - VBW ≥ 3 x RBW
9. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

Test Procedure of Radiated spurious emissions (Below 1 GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8 m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1 m to 4 m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Quasi-peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Quasi-Peak
      - RBW = 120 kHz

   In general, (1) is used mainly
7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)
8. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 1 MHz
      - VBW ≥ 3 x RBW

   (2) Measurement Type(Average): Duty cycle ≥ 98 %
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = RMS
      - Averaging type = power (*i.e.*, RMS)
      - RBW = 1 MHz
      - VBW ≥ 3 x RBW
      - Sweep time = auto.
      - Trace mode = average (at least 100 traces).

   (3) Measurement Type(Average): Duty cycle < 98 %, duty cycle variations are less than ±2 %
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = RMS
      - Averaging type = power (*i.e.*, RMS)
      - RBW = 1 MHz
      - VBW ≥ 3 x RBW
      - Sweep time = auto.
      - Trace mode = average (at least 100 traces).
      - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.
      - Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.
9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

10. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
11. Total(Measurement Type : Peak)
= Peak Measured Value
Total(Measurement Type : Average, Duty cycle ≥ 98 %)
= Average Measured Value
Total(Measurement Type : Average, Duty cycle < 98 %)
= Average Measured Value + Duty Cycle Factor
- We apply to the offset in range 1 GHz - 18 GHz
- The offset = Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) - Amp.Gain(A.G)

Test Procedure of Radiated Restricted Band Edge

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
(1) Measurement Type(Peak):
- Measured Frequency Range : 2310 MHz ~ 2390 MHz / 2483.5 MHz ~ 2500 MHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Average): Duty cycle ≥ 98 %,
- Measured Frequency Range : 2310 MHz ~ 2390 MHz / 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW ≥ 3 x RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).

(3) Measurement Type(Average): Duty cycle < 98 %, duty cycle variations are less than ± 2 %

- Measured Frequency Range : 2310 MHz ~ 2390 MHz / 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW ≥ 3 x RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
10. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
11. Total(Measurement Type : Peak)
 = Peak Measured Value
 Total(Measurement Type : Average, Duty cycle ≥ 98 %)
 = Average Measured Value
 Total(Measurement Type : Average, Duty cycle < 98 %)
 = Average Measured Value + Duty Cycle Factor
    - We apply to the offset in range 1 GHz - 18 GHz
    - The offset = Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

7.7. AC Power line Conducted Emissions

Limit

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56[a]	56 to 46[a]
0.50 to 5	56	46
5 to 30	60	50

[a]Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.

Sample Calculation

Quasi-peak(Final Result) = Measured Value + Correction Factor

7.8. Receiver Spurious Emissions

Limit

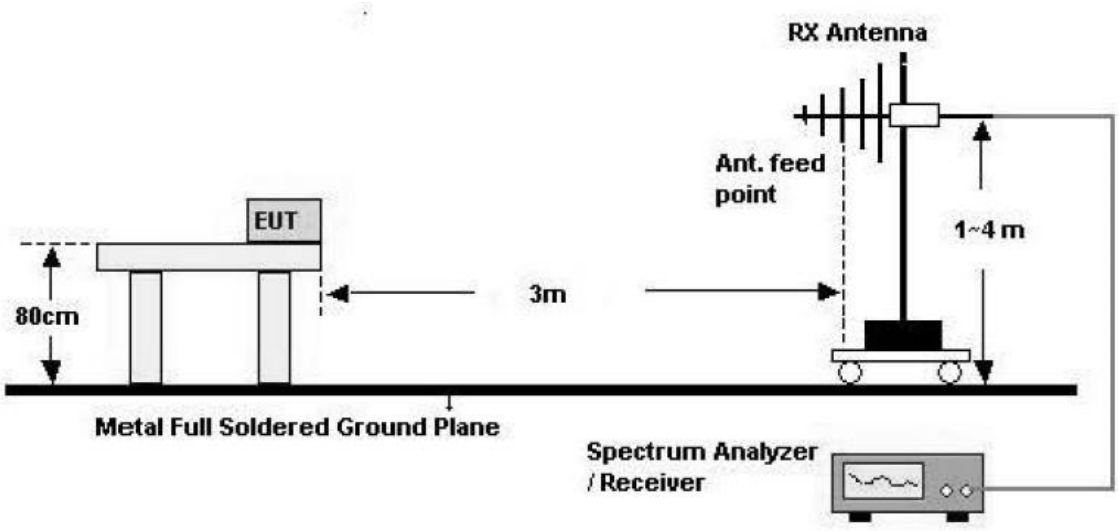
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

Measurements for compliance with the limits in table may be performed at distances other than 3 metres.

Test Configuration

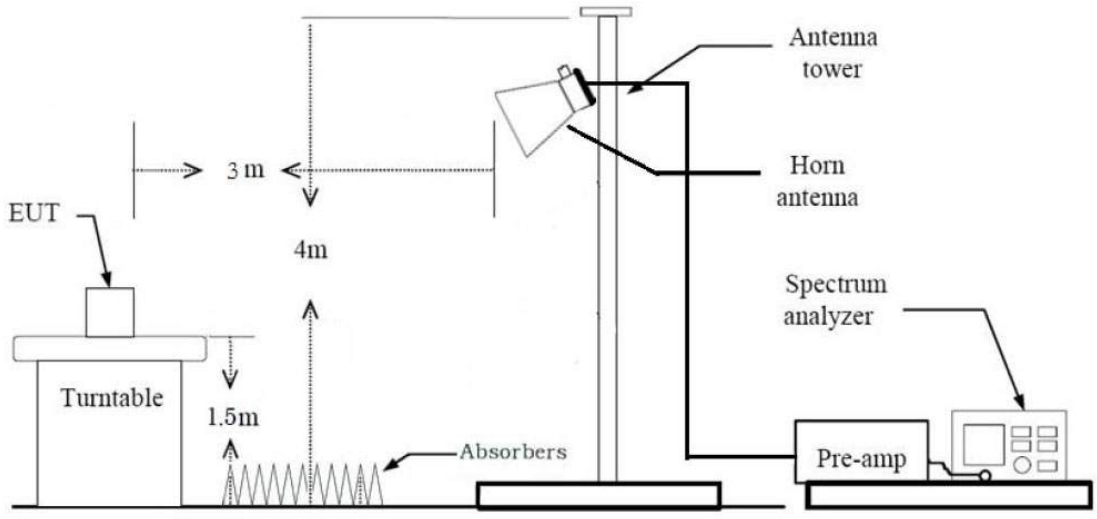
30 MHz - 1 GHz



Test Procedure of Receiver Spurious Emissions (Below 1GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The Hybrid antenna was placed at a location 3m from the EUT, which is varied from 1m to 4m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 30 MHz – 1 GHz
      - Detector = Peak
      - Trace = Maxhold
      - RBW = 100 kHz
      - VBW ≥ 3 x RBW
7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) – Amp Gain(A.G)

Above 1 GHz



Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
   (1) Measurement Type(Average):
      - RBW = 1 MHz
      - VBW = 3 MHz
      - Detector = Average(RMS)
      - Trace = Average
      - Trace was allowed to stabilize
9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
10. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)

7.9. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone(DC 5V), Stand alone(DC 12V)
   - Worstcase : Stand alone(DC 5V)
2. EUT Axis
   - Radiated Spurious Emissions : Z
   - Radiated Restricted Band Edge : Y
3. Duty cycle factor applies only 802.11 g, 802.11 n Mode. (Duty cycle < 98 %).
4. All data rate of operation were investigated and the test results are worst case in lowest Data Rate of each mode.
   - 802.11b : 1 Mbps
   - 802.11g : 6 Mbps
   - 802.11n(HT20): MCS0
5. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.

- Position : Horizontal, Vertical, Parallel to the ground plane

6. Radiated Spurious Emission
   - All mode of operation were investigated and the worst case results are reported.
   - Mode: 802.11b, 802.11g, 802.11n(HT20)
   - Worstcase: 802.11b

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone(DC 5V), Stand alone(DC 12V)

Conducted test

1. The EUT was configured with data rate of highest power.
2. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone(DC 5V), Stand alone(DC 12V)
   - Worstcase : Stand alone(DC 5V)

8. SUMMARY TEST OF RESULTS

FCC Part

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§ 15.247(a)(2)	> 500 kHz	Conducted	PASS
Conducted Maximum Output Power	§ 15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§ 15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	§ 15.247(d)	Conducted > 30 dBc		PASS
AC Power line Conducted Emissions	§ 15.207	cf. Section 7.7		PASS
Radiated Spurious Emissions	§ 15.247(d), 15.205, 15.209	cf. Section 7.6	Radiated	PASS
Radiated Restricted Band Edge	§ 15.247(d), 15.205, 15.209	cf. Section 7.6		PASS

ISED Part

Test Description	ISED Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-247, 5.2.(a)	> 500 kHz	Conducted	PASS
99% Bandwidth	RSS-GEN, 6.7	N/A		PASS
Conducted Maximum Peak Output Power And e.i.r.p.	RSS-247, 5.4.(d)	< 1 Watt <4 Watt(e.i.r.p.)		PASS
Power Spectral Density	RSS-247, 5.2.(b)	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	RSS-247, 5.5	Conducted > 30 dBc		PASS
AC Power line Conducted Emissions	RSS-GEN, 8.8	cf. Section 7.7		PASS
Radiated Spurious Emissions	RSS-GEN, 8.9	cf. Section 7.6	Radiated	PASS
Receiver Spurious Emissions	RSS-GEN, 5 RSS-GEN, 7.3	cf. Section 7.8		PASS
Radiated Restricted Band Edge	RSS-GEN, 8.9 RSS-GEN, 8.10	cf. Section 7.6		PASS

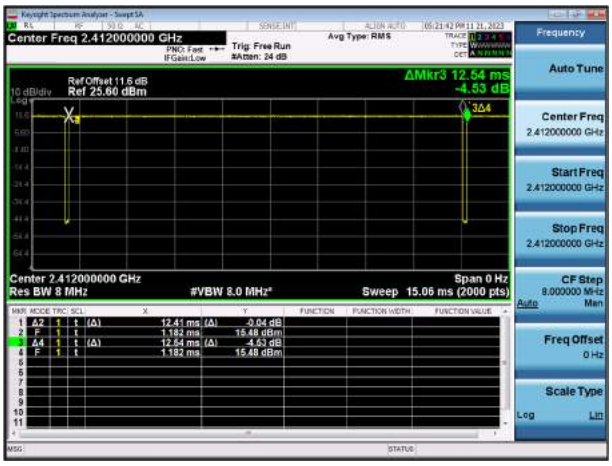
9. TEST RESULT

9.1 DUTY CYCLE

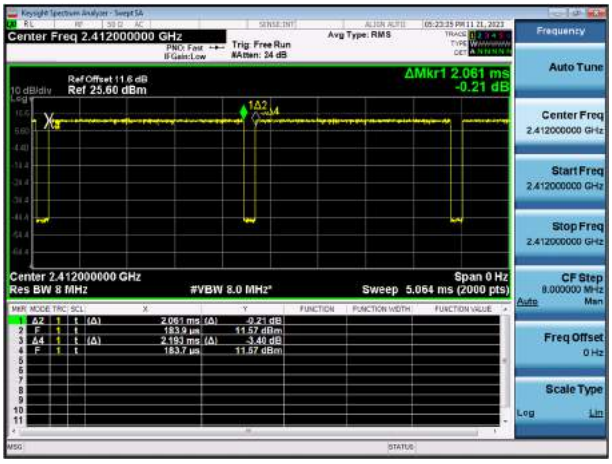
Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	12.410	12.540	0.990	0.045
	2	6.300	6.429	0.980	0.088
	5.5	2.421	2.548	0.950	0.223
	11	1.305	1.435	0.909	0.412
802.11g	6	2.061	2.193	0.940	0.270
	9	1.384	1.516	0.913	0.394
	12	1.044	1.175	0.889	0.512
	18	0.704	0.833	0.845	0.732
	24	0.531	0.661	0.803	0.951
	36	0.364	0.494	0.737	1.326
	48	0.276	0.406	0.680	1.674
	54	0.248	0.378	0.656	1.830
802.11n (HT20)	6.5 (MCS0)	1.917	2.048	0.936	0.287
	13 (MCS1)	0.980	1.110	0.882	0.543
	19.5 (MCS2)	0.664	0.794	0.836	0.777
	26 (MCS3)	0.508	0.638	0.796	0.990
	39 (MCS4)	0.353	0.483	0.730	1.365
	52 (MCS5)	0.272	0.402	0.676	1.700
	58.5 (MCS6)	0.248	0.378	0.655	1.835
	65 (MCS7)	0.228	0.358	0.637	1.962

▣ Test Plots

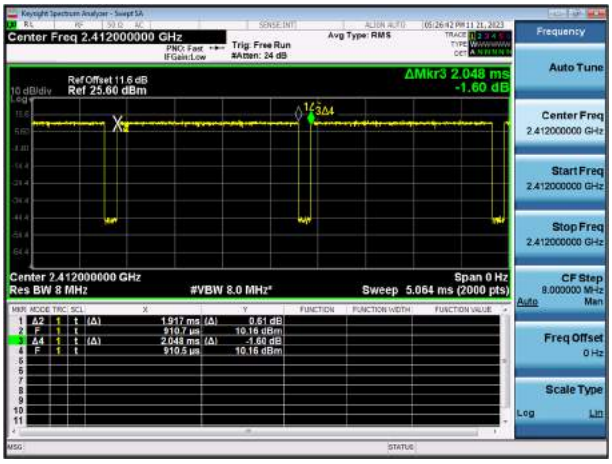
Duty cycle plot (802.11b(1 Mbps))



Duty cycle plot (802.11g(6 Mbps))



Duty cycle plot (802. 11n(MCS0))



Note:

In order to simplify the report, attached plots were only the lowest data rate.

9.2 6 dB BANDWIDTH & 99 % BANDWIDTH

FCC

Mode	Frequency [MHz]	Channel No.	Occupied Bandwidth [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
802.11b	2412	1	14.054	9.093	0.5
	2437	6	14.065	9.093	0.5
	2462	11	14.066	9.105	0.5
802.11g	2412	1	16.462	16.35	0.5
	2437	6	16.477	16.38	0.5
	2462	11	16.490	16.35	0.5
802.11n(HT20)	2412	1	17.675	17.60	0.5
	2437	6	17.699	17.61	0.5
	2462	11	17.647	17.56	0.5

ISED

Mode	Frequency [MHz]	Channel No.	Occupied Bandwidth [MHz]	6 dB Bandwidth [MHz]	Limit [MHz]
802.11b	2412	1	14.072	9.276	0.5
	2437	6	14.076	9.282	0.5
	2462	11	14.080	9.278	0.5
802.11g	2412	1	17.175	16.46	0.5
	2437	6	17.142	16.48	0.5
	2462	11	17.199	16.54	0.5
802.11n(HT20)	2412	1	18.426	17.75	0.5
	2437	6	18.374	17.72	0.5
	2462	11	18.267	17.66	0.5

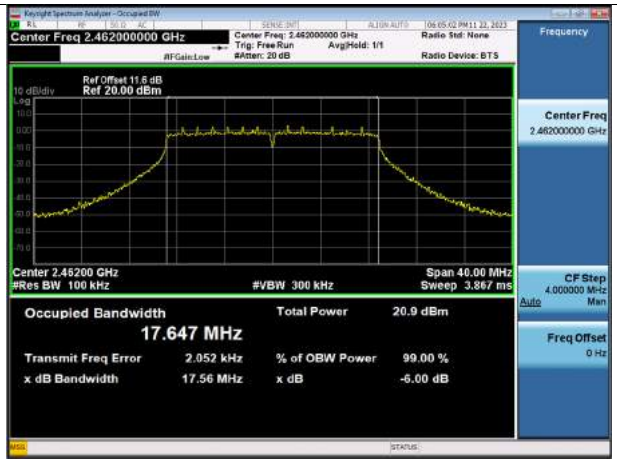
▣ Test Plots(FCC)

Note:
In order to simplify the report, attached plots were only the narrowest 6 dB BW channel.

6 dB Bandwidth plot (802.11b-CH 6)

6 dB Bandwidth plot (802.11g-CH 11)

6 dB Bandwidth plot (802.11n_HT20-CH 11)



▣ Test Plots(ISED)

Note:
In order to simplify the report, attached plots were only the narrowest 6 dB BW channel.

99 % Bandwidth plot (802.11b-CH 1)

99 % Bandwidth plot (802.11g-CH 1)

99 % Bandwidth plot (802.11n_HT20-CH 11)

9.3 OUTPUT POWER

Peak Output Power

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Peak Power [dBm]	Limit [dBm]
802.11b	2412	1	11 Mbps	22.45	30
	2437	6	11 Mbps	22.55	30
	2462	11	11 Mbps	22.78	30
802.11g	2412	1	6 Mbps	22.08	30
	2437	6	6 Mbps	22.36	30
	2462	11	6 Mbps	22.64	30
802.11n	2412	1	MCS0	21.23	30
	2437	6	MCS0	21.47	30
	2462	11	MCS0	21.69	30

Average Output Power

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Average Power [dBm]			Limit [dBm]
				Measured Power [dBm]	Duty Cycle Factor [dB]	Total Power [dBm]	
802.11b	2412	1	11 Mbps	16.13	0.412	16.54	30
	2437	6	11 Mbps	16.33	0.412	16.74	30
	2462	11	11 Mbps	16.48	0.412	16.89	30
802.11g	2412	1	6 Mbps	14.28	0.270	14.55	30
	2437	6	6 Mbps	14.62	0.270	14.89	30
	2462	11	6 Mbps	14.71	0.270	14.98	30
802.11n	2412	1	MCS0	13.34	0.287	13.62	30
	2437	6	MCS0	13.44	0.287	13.72	30
	2462	11	MCS0	13.69	0.287	13.98	30

9.4 POWER SPECTRAL DENSITY

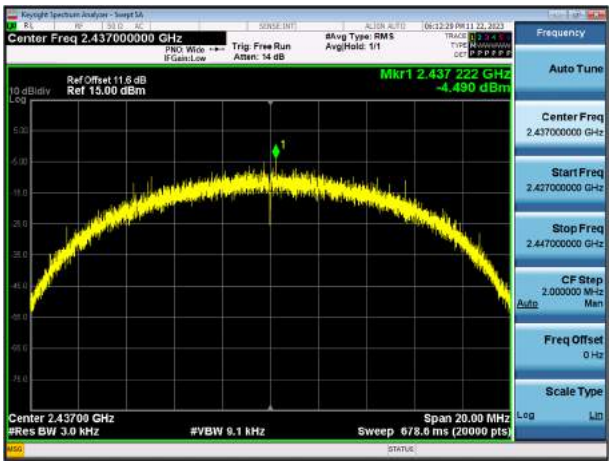
Mode	Frequency (MHz)	Channel No.	Data Rate	Power Spectral Density [dBm/3 kHz]	
				Measured PSD [dBm/3 kHz]	Limit (dBm/3 kHz)
802.11b	2412	1	11 Mbps	-5.342	8
	2437	6	11 Mbps	-4.490	
	2462	11	11 Mbps	-6.486	
802.11g	2412	1	6 Mbps	-10.244	
	2437	6	6 Mbps	-10.785	
	2462	11	6 Mbps	-10.338	
802.11n(HT20)	2412	1	MCS 0	-12.771	
	2437	6	MCS 0	-11.236	
	2462	11	MCS 0	-11.525	

▣ Test Plots

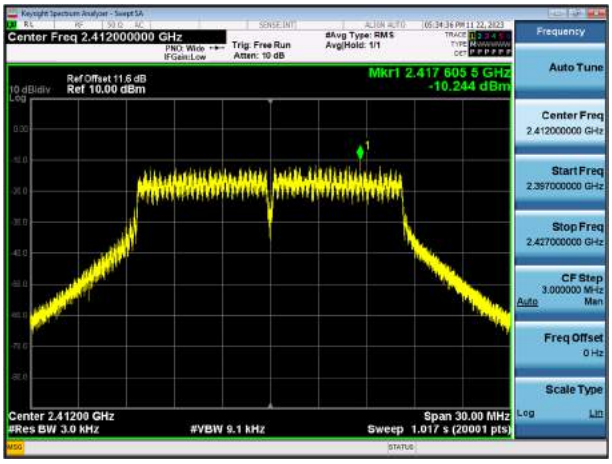
Note :

In order to simplify the report, attached plots were only the worst case PSD channel

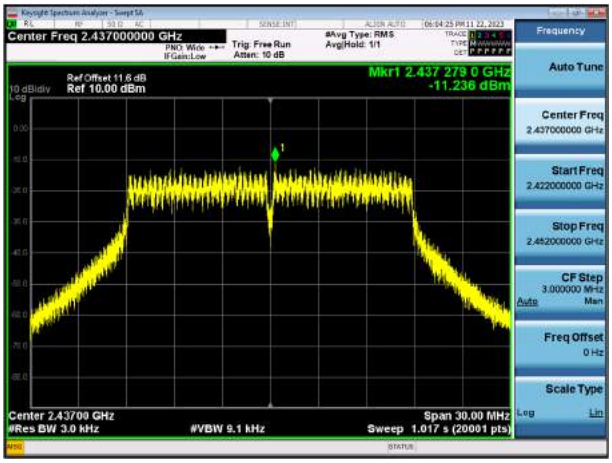
Power Spectral Density (802.11b-CH 6)



Power Spectral Density (802.11g-CH 1)



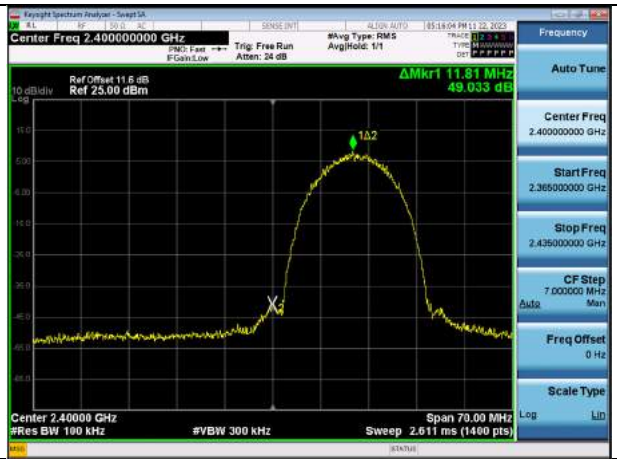
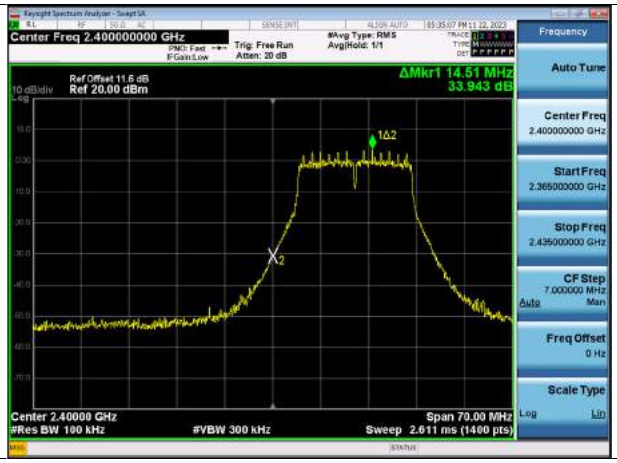
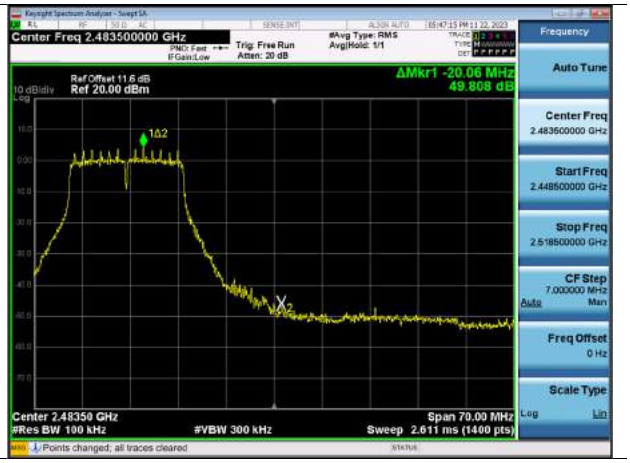
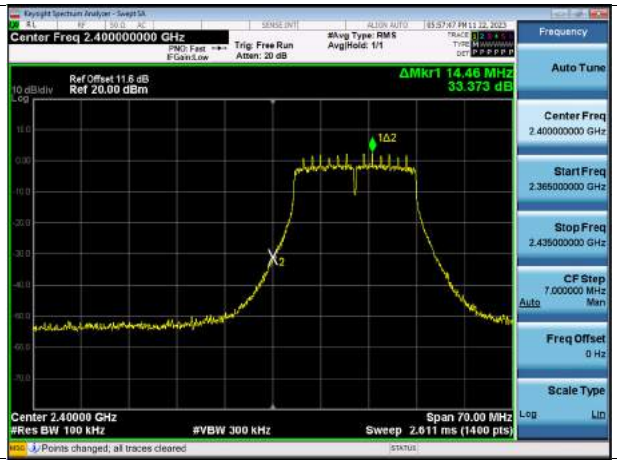
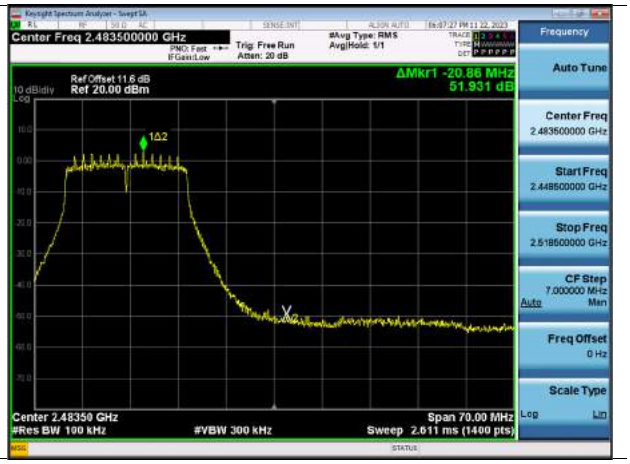
Power Spectral Density (802.11n_HT20-CH 6)



9.5 BAND EDGE / CONDUCTED SPURIOUS EMISSIONS

Test Result : please refer to the plot below.
In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ Test Plots(Band Edge)

Band Edge (802.11b-CH1)	Band Edge (802.11b-CH11)
	
Band Edge (802.11g-CH1)	**Band Edge (802.11g-CH11)**
	
Band Edge (802.11n_HT20-CH1)	**Band Edge (802.11n_HT20-CH11)**
	

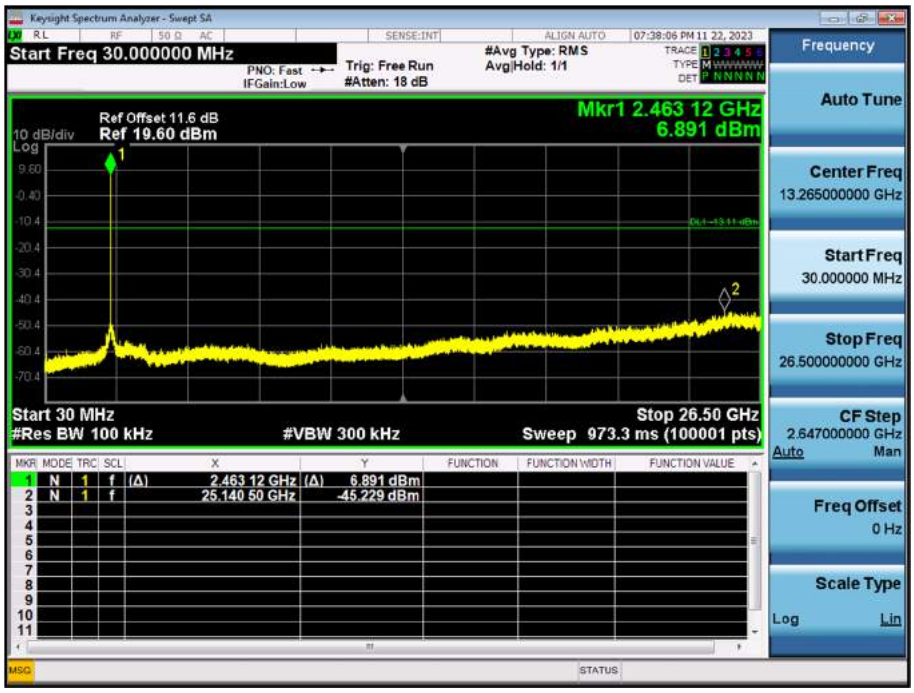
▣ Test Plots(Conducted Spurious Emission)

In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ TEST PLOTS

Worst case : 802.11b_Ch.11(2462 MHz)_11 Mbps

Spurious Emission (30 MHz – 26.50 GHz)



Note:

Limit : -13.109 dBm

9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30 MHz

Frequency	Measured Value	A.F+C.L+D.F	Ant. POL	Total	Limit	Margin
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]
No Critical peaks found						

Note:

1. The Measured value of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = 40log (specific distance / test distance) (dB)
3. Limit line = specific Limits (dBµV) + Distance extrapolation factor

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F+C.L	Ant. POL	Total	Limit	Margin
[MHz]	[dBµV]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]
No Critical peaks found						

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

Frequency Range : Above 1 GHz

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2412 MHz
Channel No.	01 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
4824	49.85	V	49.85	73.98	24.13	PK
4824	40.64	V	40.64	53.98	13.34	AV
7236	52.28	V	52.28	73.98	21.70	PK
7236	40.79	V	40.79	53.98	13.19	AV
4824	49.47	H	49.47	73.98	24.51	PK
4824	41.54	H	41.54	53.98	12.44	AV
7236	51.77	H	51.77	73.98	22.21	PK
7236	40.87	H	40.87	53.98	13.11	AV

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2437 MHz
Channel No.	06 Ch

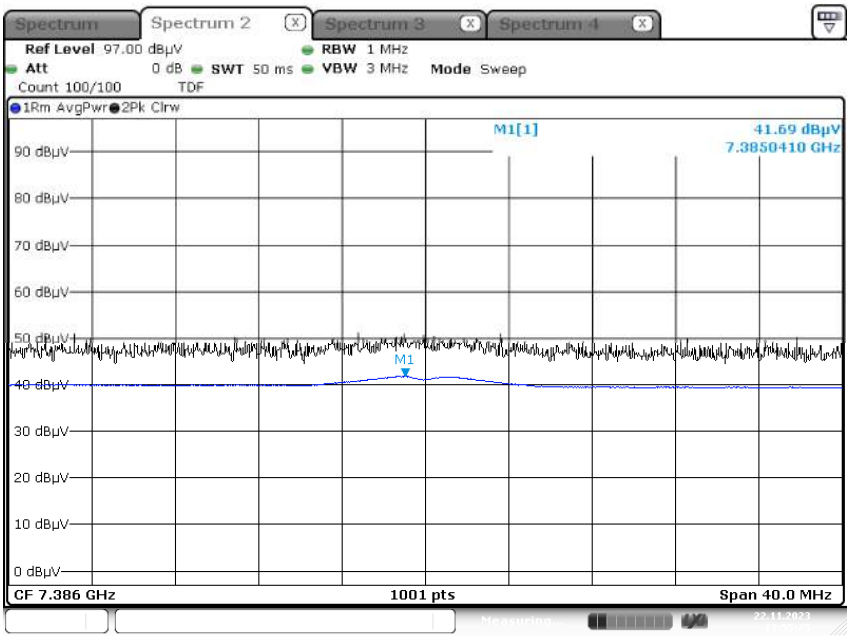
Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
4874	48.94	V	48.94	73.98	25.04	PK
4874	41.67	V	41.67	53.98	12.31	AV
7311	52.12	V	52.12	73.98	21.86	PK
7311	40.80	V	40.80	53.98	13.18	AV
4874	48.72	H	48.72	73.98	25.26	PK
4874	41.59	H	41.59	53.98	12.39	AV
7311	52.57	H	52.57	73.98	21.41	PK
7311	41.35	H	41.35	53.98	12.63	AV

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2462 MHz
Channel No.	11 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
4924	48.17	V	48.17	73.98	25.81	PK
4924	40.90	V	40.90	53.98	13.08	AV
7386	53.02	V	53.02	73.98	20.96	PK
7386	41.45	V	41.45	53.98	12.53	AV
4924	48.05	H	48.05	73.98	25.93	PK
4924	40.63	H	40.63	53.98	13.35	AV
7386	53.65	H	53.65	73.98	20.33	PK
7386	41.69	H	41.69	53.98	12.29	AV

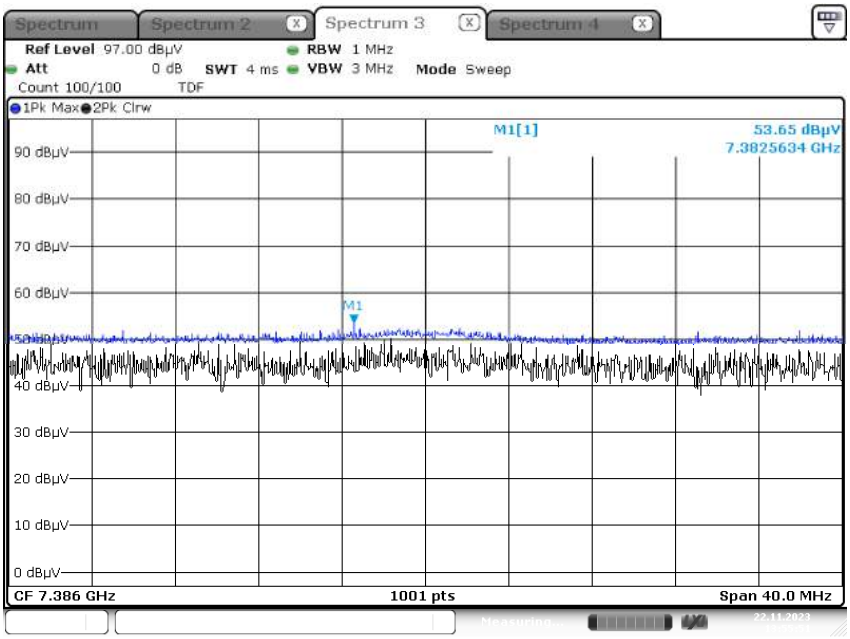
▣ Test Plots (Worst case : Z-V)

Radiated Spurious Emissions plot – Average Result (802.11b_1 Mbps, Ch.11 3rd Harmonic)



Date: 22.NOV.2023 13:55:26

Radiated Spurious Emissions plot – Peak Result (802.11b_1 Mbps, Ch.11 3rd Harmonic)



Date: 22.NOV.2023 13:55:51

Note:

Plots of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

Operation Mode:	802.11b
Transfer Rate:	1 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency	Measured Value	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2310.0~2390.0	57.42	H	57.42	73.98	16.56	PK
2310.0~2390.0	46.50	H	46.50	53.98	7.48	AV
2310.0~2390.0	57.22	V	57.22	73.98	16.76	PK
2310.0~2390.0	46.28	V	46.28	53.98	7.70	AV
2483.5~2500.0	59.50	H	59.50	73.98	14.48	PK
2483.5~2500.0	47.77	H	47.77	53.98	6.21	AV
2483.5~2500.0	60.96	V	60.96	73.98	13.02	PK
2483.5~2500.0	48.74	V	48.74	53.98	5.24	AV

Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

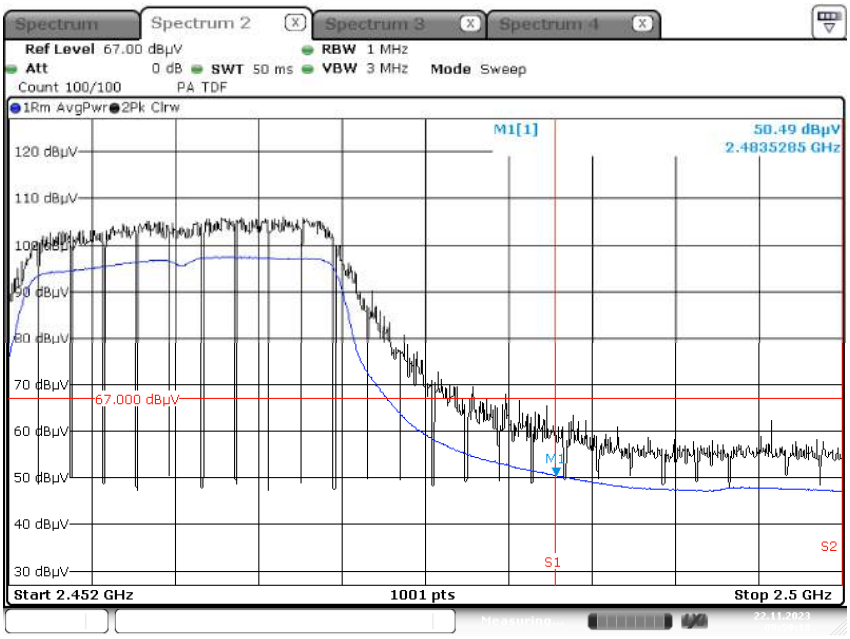
Frequency	Measured Value	Duty Cycle Factor	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2310.0~2390.0	62.66	0.00	H	62.66	73.98	11.32	PK
2310.0~2390.0	47.89	0.27	H	48.16	53.98	5.82	AV
2310.0~2390.0	62.57	0.00	V	62.57	73.98	11.41	PK
2310.0~2390.0	47.55	0.27	V	47.82	53.98	6.16	AV
2483.5~2500.0	68.87	0.00	H	68.87	73.98	5.11	PK
2483.5~2500.0	50.38	0.27	H	50.65	53.98	3.33	AV
2483.5~2500.0	66.54	0.00	V	66.54	73.98	7.44	PK
2483.5~2500.0	50.22	0.27	V	50.49	53.98	3.49	AV

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency	Measured Value	Duty Cycle Factor	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2310.0~2390.0	60.35	0.00	H	60.35	73.98	13.63	PK
2310.0~2390.0	47.47	0.29	H	47.76	53.98	6.22	AV
2310.0~2390.0	59.91	0.00	V	59.91	73.98	14.07	PK
2310.0~2390.0	47.35	0.29	V	47.64	53.98	6.34	AV
2483.5~2500.0	65.29	0.00	H	65.29	73.98	8.69	PK
2483.5~2500.0	49.99	0.29	H	50.28	53.98	3.70	AV
2483.5~2500.0	65.20	0.00	V	65.20	73.98	8.78	PK
2483.5~2500.0	50.49	0.29	V	50.78	53.98	3.20	AV

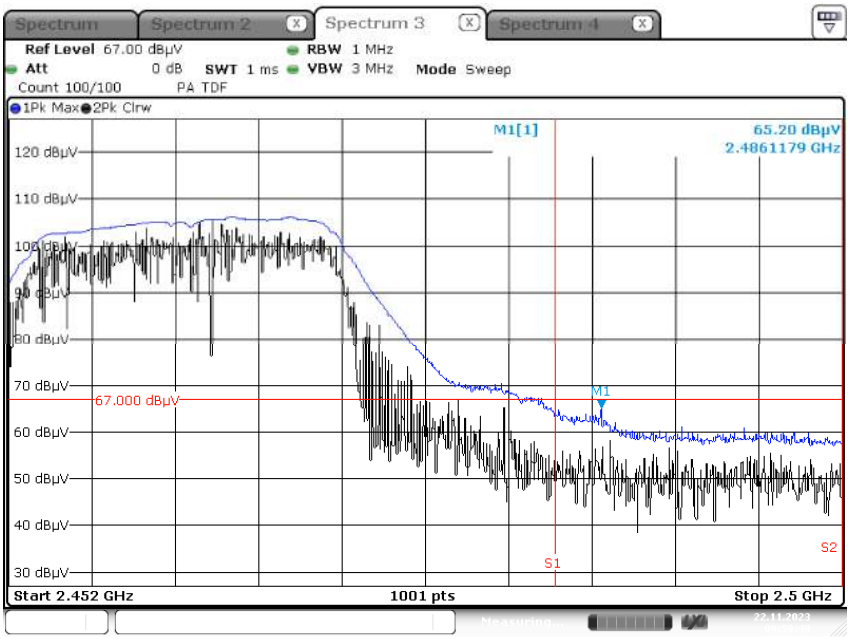
▣ Test Plots

Radiated Restricted Band Edges plot – Average Result (802.11n (HT20), MCS 0, Ch.11, Y-V)



Date: 22.NOV.2023 09:59:19

Radiated Restricted Band Edges plot – Peak Result (802.11n (HT20), MCS 0, Ch.11, Y-V)



Date: 22.NOV.2023 09:59:49

Note:

Plots of worst case are only reported.

9.8 POWERLINE CONDUCTED EMISSIONS

[5V]

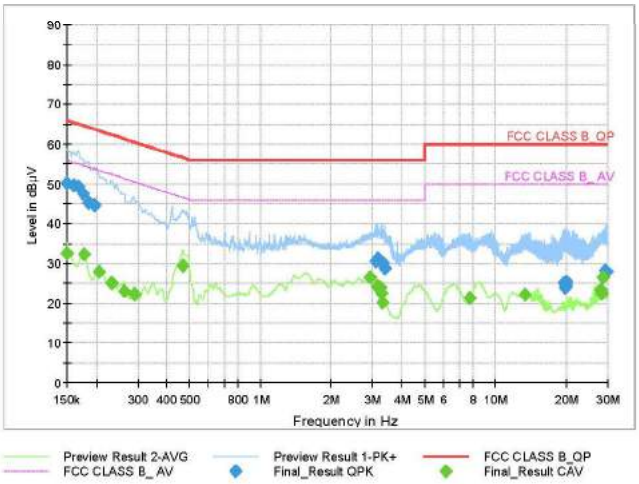
Test 1 / 2

Test Report

Common Information

EUT : LCWB-005
Operating Conditions : 2.4G WLAN_5V
Comment :

Full Spectrum



Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1500	50.19	66.00	15.81	9.000	N	9.7
0.1613	49.50	65.40	15.90	9.000	N	9.7
0.1680	49.20	65.06	15.85	9.000	L1	9.7
0.1748	47.53	64.73	17.21	9.000	N	9.7
0.1860	45.24	64.21	18.97	9.000	N	9.7
0.1973	44.77	63.73	18.95	9.000	L1	9.7
3.1078	30.64	56.00	25.36	9.000	N	10.0
3.1595	31.31	56.00	24.69	9.000	N	10.0
3.2540	30.14	56.00	25.86	9.000	N	10.0
3.2900	30.30	56.00	25.70	9.000	N	10.0
3.3170	30.08	56.00	25.92	9.000	L1	10.0
3.3868	28.74	56.00	27.26	9.000	N	10.0
19.5350	25.21	60.00	34.79	9.000	N	10.5
19.7533	24.05	60.00	35.95	9.000	N	10.5
19.9310	24.62	60.00	35.38	9.000	N	10.5
19.9873	25.38	60.00	34.62	9.000	N	10.5
29.3000	28.19	60.00	31.81	9.000	N	10.7
29.5295	27.89	60.00	32.11	9.000	N	10.7

2023-12-01 오전 9:31:29

Test 2 / 2

Final_Result_CAV

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1500	32.66	56.00	23.34	9.000	L1	9.7
0.1770	32.29	54.63	22.33	9.000	N	9.7
0.2063	28.11	53.36	25.24	9.000	N	9.7
0.2333	25.00	52.33	27.33	9.000	N	9.7
0.2625	23.08	51.35	28.27	9.000	N	9.7
0.2918	22.07	50.47	28.40	9.000	N	9.7
0.4673	29.32	46.56	17.24	9.000	N	9.8
2.9323	26.55	46.00	19.45	9.000	N	10.0
3.1123	24.19	46.00	21.81	9.000	N	10.0
3.1595	24.33	46.00	21.67	9.000	N	10.0
3.2203	24.08	46.00	21.92	9.000	N	10.0
3.2563	22.48	46.00	23.52	9.000	N	10.0
3.3193	20.31	46.00	25.69	9.000	N	10.0
7.7855	21.46	50.00	28.54	9.000	N	10.2
13.3115	22.34	50.00	27.66	9.000	N	10.4
28.0400	23.40	50.00	26.60	9.000	L1	10.6
28.4788	22.47	50.00	27.53	9.000	L1	10.6
28.8388	26.48	50.00	23.52	9.000	L1	10.6

2023-12-01 오전 9:31:29

[12V]

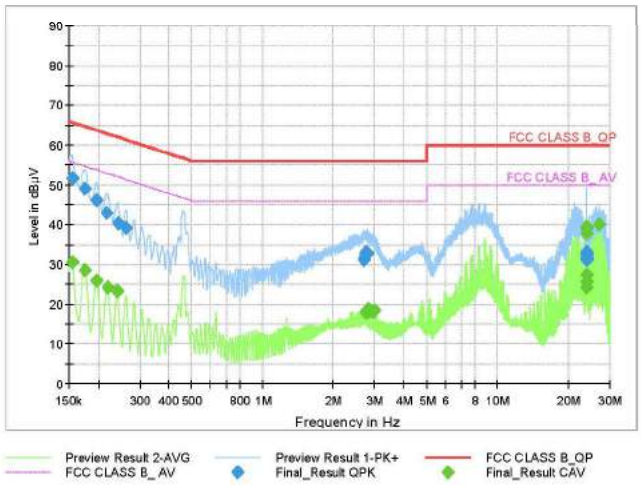
Test 1 / 2

Test Report

Common Information

EUT : LCWB-005
Operating Conditions : 2.4G WLAN_12V
Comment :

Full Spectrum



Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	51.50	65.75	14.25	9.000	L1	9.7
0.1748	49.11	64.73	15.62	9.000	L1	9.7
0.1973	46.16	63.73	17.57	9.000	N	9.7
0.2175	42.95	62.91	19.96	9.000	L1	9.7
0.2423	40.35	62.02	21.67	9.000	L1	9.7
0.2625	39.10	61.35	22.25	9.000	N	9.7
2.6938	31.05	56.00	24.95	9.000	N	10.0
2.7163	31.48	56.00	24.52	9.000	N	10.0
2.7343	32.70	56.00	23.30	9.000	N	10.0
2.7568	33.12	56.00	22.88	9.000	N	10.0
2.7770	33.08	56.00	22.92	9.000	N	10.0
2.7995	32.87	56.00	23.13	9.000	N	10.0
23.9090	31.64	60.00	28.36	9.000	L1	10.5
23.9360	31.37	60.00	28.63	9.000	L1	10.5
23.9428	33.10	60.00	26.90	9.000	L1	10.5
23.9720	31.22	60.00	28.78	9.000	L1	10.5
23.9810	32.62	60.00	27.38	9.000	L1	10.5
23.9968	39.18	60.00	20.82	9.000	N	10.6

2023-12-01 오전 10:05:04

Test 2 / 2

Final_Result_CAV

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	30.60	55.75	25.16	9.000	N	9.7
0.1748	28.48	54.73	26.25	9.000	N	9.7
0.1973	25.83	53.73	27.89	9.000	N	9.7
0.2198	24.18	52.83	28.65	9.000	N	9.7
0.2400	23.28	52.10	28.81	9.000	N	9.7
2.7500	17.92	46.00	28.08	9.000	N	10.0
2.7725	18.04	46.00	27.96	9.000	N	10.0
2.7950	17.87	46.00	28.13	9.000	N	10.0
2.8400	18.72	46.00	27.28	9.000	N	10.0
2.9593	18.29	46.00	27.71	9.000	L1	10.0
2.9998	18.35	46.00	27.65	9.000	L1	10.0
23.9023	27.50	50.00	22.50	9.000	L1	10.5
23.9405	25.57	50.00	24.43	9.000	L1	10.5
23.9608	37.93	50.00	12.07	9.000	L1	10.5
23.9810	24.14	50.00	25.86	9.000	L1	10.5
23.9990	39.62	50.00	10.38	9.000	L1	10.5
24.0215	25.58	50.00	24.42	9.000	L1	10.5
27.1603	39.99	50.00	10.01	9.000	L1	10.6

2023-12-01 오전 10:05:04

9.9 RECEIVER SPURIOUS EMISSIONS

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F+C.L	POL	Total	Limit	Margin
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

Frequency Range : Above 1 GHz

Frequency	Measured Value	A.F+C.L+A.G+D.F	POL	Total	Limit	Margin
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/02/2024	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	05/26/2024	Annual
Temperature Chamber	SU-642	ESPEC	93008124	02/22/2024	Annual
Signal Analyzer	N9030A	Keysight	MY55410508	09/04/2024	Annual
Power Meter	N1911A	Agilent	MY45100523	03/06/2024	Annual
Power Sensor	N1921A	Agilent	MY57820067	03/06/2024	Annual
Directional Coupler	87300B	Agilent	3116A03621	10/30/2024	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2024	Annual
DC Power Supply	E3632A	Agilent	KR75305528	01/03/2024	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C-010	Agilent	08285	06/02/2024	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	03/08/2024	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	HCT CO., LTD.	N/A	N/A	N/A
Bluetooth Tester	CBT	Rohde & Schwarz	100808	02/16/2024	Annual

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Radiated Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	S3AM	08/03/2025	Biennial
Controller	EM2090	Emco	060520	N/A	N/A
Turn Table	N/A	Ets	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/07/2025	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Amp & Filter Bank Switch Controller	FBSM-01A	TNM system	0	N/A	N/A
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/05/2024	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/12/2024	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/12/2024	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/09/2024	Annual
RF Switching System	FBSR-03A (3G HPF+LNA)	T&M SYSTEM	S3L1	11/17/2024	Annual
RF Switching System	FBSR-03A (10dB ATT+LNA)	T&M SYSTEM	S3L2	11/17/2024	Annual
RF Switching System	FBSR-03A (7G HPF+LNA)	T&M SYSTEM	S3L3	11/17/2024	Annual
RF Switching System	FBSR-03A (3dB ATT+LNA)	T&M SYSTEM	S3L4	11/17/2024	Annual
Power Amplifier	CBL18265035	CERNEX	22966	11/17/2024	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/02/2024	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/28/2024	Annual
Spectrum Analyzer	FSVA40 (10 Hz ~ 40 GHz)	Rohde & Schwarz	101502	03/17/2024	Annual

Note:
1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.
3. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5(Version : 2017).

11. ANNEX A_ TEST SETUP PHOTO

Please refer to test setup photo file no. as follows;

No.	Description
1	HCT-RF-2312-FI001-P