TEST REPORT

FCC/ISED DTS Test for IET10N
Certification

APPLICANT
SJIT Co.,Ltd

REPORT NO.
HCT-RF-2406-FI005-R1

DATE OF ISSUE
July 15, 2024

Tested by
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Technical Manager
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Applicant	**SJIT Co.,Ltd** 54-11 Dongtanhana 1-gil, Hwaseong-si, Gyeonggi-do, Republic of Korea
Product Name Model Name	Asset Tracker IET10N
FCC ID IC	2BEK7IET10N 32019-IET10N
Date of Test	February 02, 2024 ~ June 14, 2024 July 10, 2024 ~ July 12, 2024 (Simultaneous transfer operations)
Modulation type	CCK/DSSS/OFDM
FCC Classification	Digital Transmission System(DTS)
Test Standard Used	FCC Rule: Part 15.247 ISED Rule: RSS-247 Issue 3 (August 2023), RSS-Gen Issue 5_Amendment 2 (February 2021)
Location of Test	■ Permanent Testing Lab ☐ On Site Testing (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)
Test Results	PASS

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REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	June 14, 2024	Initial Release
1	July 15, 2024	- Revised Note on page 27, 28 - Revised HVIN/HMN on page 5 - Added tests for simultaneous transfer operations - Added test equipment on page 52

Notice

Content
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. The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s). The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***. When confirmation of authenticity of this test report is required, please contact www.hct.co.kr The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

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CONTENTS

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1. EUT DESCRIPTION

Model	IET10N		
Additional Model	-		
EUT Type	Asset Tracker		
Power Supply	DC 3.6 V		
Frequency Range	2 412 MHz – 2 462 MHz		
Max. RF Output Power	Peak Power	802.11b:	14.26 dBm
		802.11g:	16.87 dBm
		802.11n(HT20):	17.05 dBm
	Average Power	802.11b:	8.79 dBm
		802.11g:	7.84 dBm
		802.11n(HT20):	7.82 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n		
Number of Channels	11 Channels		
Antenna Specification	Chip Antenna Peak Gain : 3.01 dBi		
Date(s) of Tests	February 02, 2024 ~ June 14, 2024		
PMN (Product Marketing Number)	IET10N		
HVIN (Hardware Version Identification Number)	Ver1.1		
FVIN (Firmware Version Identification Number)	N00_V056		
HMN (Host Marketing Name)	N/A		
EUT serial numbers	Radiated : T10BN00G501001 Conducted : T10BN00G501002		

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ANTENNA CONFIGURATIONS

1. This device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the 900M and 2.4 GHz Bands simultaneously on each antenna.

RSDB Scenario	Bluetooth Ant.	SIGFOX Ant.	WiFi Ant.	Test Case
BLE + WiFi	on	on	-	Scenario1
BLE + SIGFOX	on	-	on	Scenario2

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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.

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 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 30MHz 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 1GHz. Above 1GHz with 1.5m 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)

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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 11, 2024 (Registration Number: KR0032).
For ISED, test facility was accepted dated March 13, 2024 (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."

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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.

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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)	1.98 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.36 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.52 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.66 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.58 (Confidence level about 95 %, k=2)

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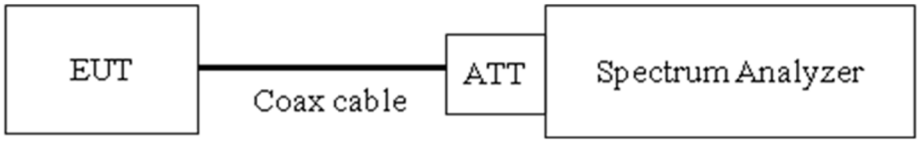
7. DESCRIPTION OF TESTS

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 or 50 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)

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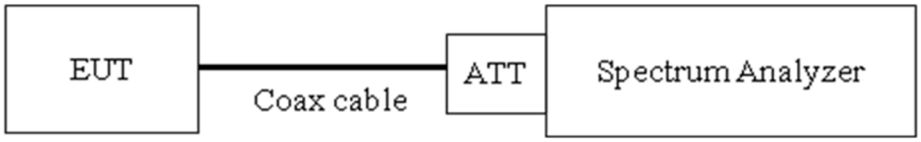
7.2. 6 dB Bandwidth & 99 % Bandwidth

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 (99 % Bandwidth for ISED)

The transmitter output is connected to the spectrum analyzer.

1) RBW = 1 % ~ 5 % of the occupied bandwidth
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.

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

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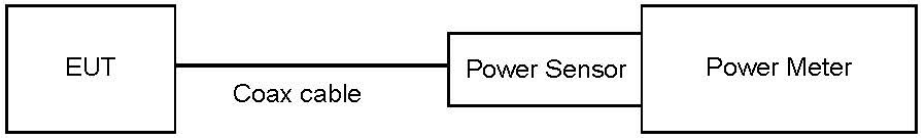
7.3. Output Power

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

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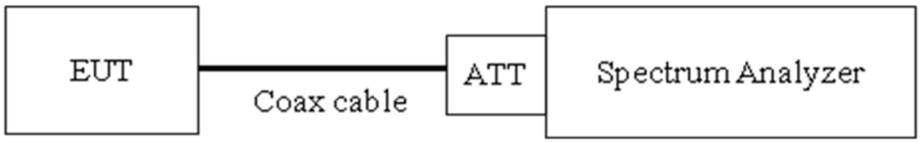
7.4. Power Spectral Density

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 DTS bandwidth.
3) RBW = 3 kHz ≤ RBW ≤ 100 kHz.
4) VBW ≥ 3 x RBW.
5) Sweep = auto couple.
6) Detector = Peak.
7) Trace mode = max hold.
8) Allow trace to fully stabilize.
9) Use the peak marker function to determine the maximum amplitude level within the RBW.
10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

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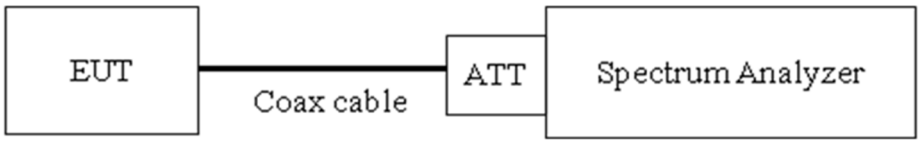
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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.

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Factors for frequency

Freq(MHz)	Factor(dB)
30	10.29
100	10.37
200	10.45
300	10.58
400	10.63
500	10.66
600	10.66
700	10.70
800	10.74
900	10.77
1 000	10.92
2 000	11.17
2 400	11.24
2 500	11.24
3 000	11.85
4 000	12.31
5 000	12.82
6 000	12.82
7 000	12.97
8 000	12.97
9 000	13.15
10 000	13.28
11 000	13.41
12 000	13.55
13 000	13.63
14 000	13.76
15 000	13.87
16 000	13.94
17 000	14.07
18 000	14.08
19 000	14.08
20 000	14.12
21 000	14.16
22 000	14.22
23 000	14.38
24 000	14.39
25 000	14.42
26 000	14.48

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

2. Factor = Attenuator loss + Cable loss

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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 (μV/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

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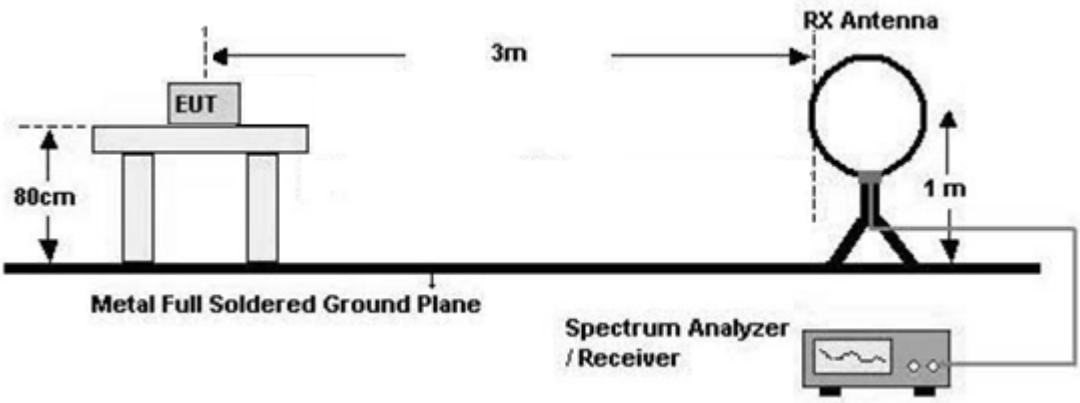
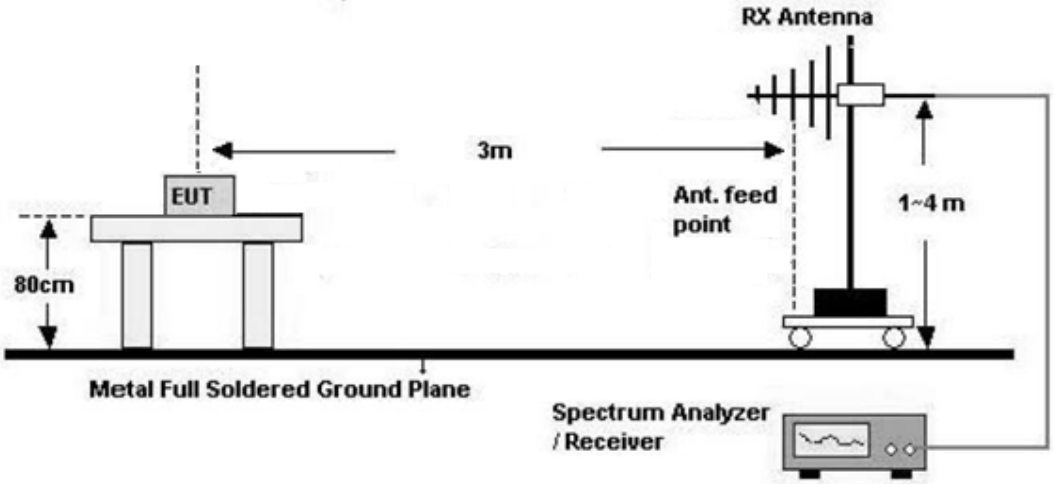
Test Configuration

Below 30 MHz



30 MHz - 1 GHz



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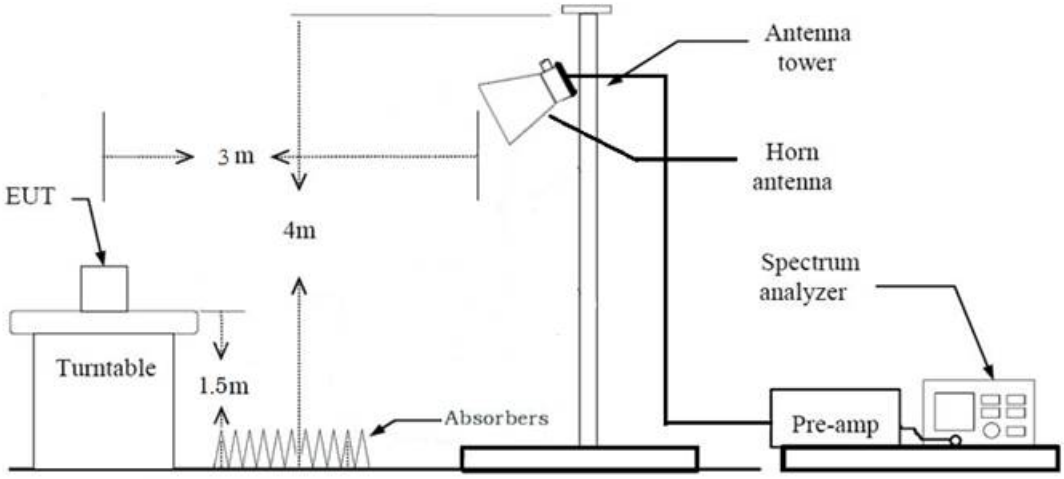
Above 1 GHz



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 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground pl ane 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 Level + 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.

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Test Procedure of Radiated 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
   (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.

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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 (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 percent 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)
    = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)
    Total(Measurement Type : Average, Duty cycle ≥ 98%)
    = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)
    Total(Measurement Type : Average, Duty cycle < 98%)
    = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Distance Factor(D.F)
    + Duty Cycle Factor

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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 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(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 percent 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)

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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.
(b)

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

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7.8. Receiver Spurious Emissions

Limit

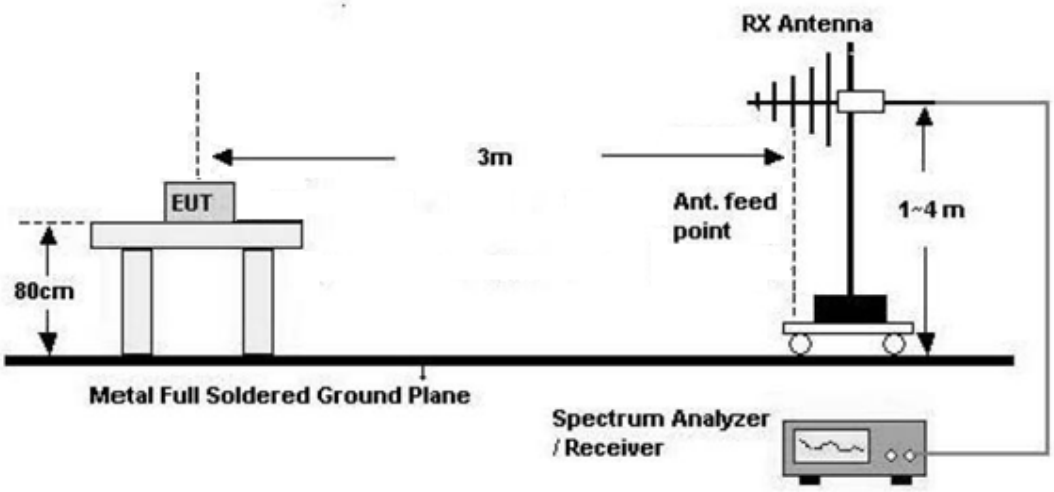
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

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

Test Configuration

30 MHz - 1 GHz



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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)

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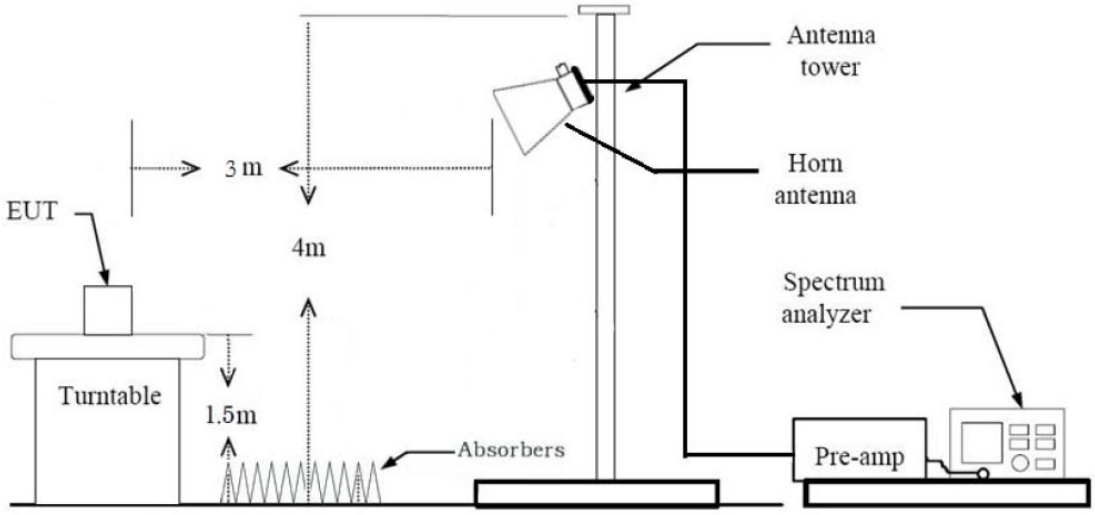
Above 1 GHz



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(A.G) + Distance Factor(D.F)

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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
2. EUT Axis
   - Radiated Spurious Emissions : X-V
   - Radiated Restricted Band Edge : X-H
3. All data rate of operation were investigated and the worst case data rate results are reported
   - 802.11b : 1 Mbps
   - 802.11g : 6 Mbps
   - 802.11n : MCS0
4. 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
5. Radiated Spurious Emission
   - All mode of operation were investigated and the worst case results are reported.
   - 802.11b : 1 Mbps

Radiated test(DBS)

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone
2. EUT Axis
   - RSDB Scenario 1 : X-V
3. All of RSDB Scenario were investigated and the worst case configuration results are reported.
4. The RSDB mode test investigated both intermodulation and radiated spurious emissions.
   And the worst results were reported.
   - Worst result: Radiated spurious emissions
   - Intermodulation: No signals are generated.
   - Radiated spurious emissions: cf. Section 9.6.

RSDB Scenario	Bluetooth Ant.	SIGFOX Ant.	WiFi Ant.	Test Case
BLE + WiFi	on	on		Scenario1
BLE + SIGFOX	on		on	-

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5. The following tables show the worst case configurations determined during testing.

(Worst case: The lowest margin condition the channels and modes were selected for test.)

RSDB Scenario 1	Description	BLE Emission	WiFi Emission
Bluetooth ANT. + WiFi Ant.	Antenna	Ant0	Ant0
	Channel	39	1
	Data Rate	1 Mbps	1 Mbps
	Mode	GFSK	802.11b

Note : BLE RSDB Data refer to [BLE] Test Report

AC Power line Conducted Emissions

1. Not Tested

Conducted test

1. All data rate of operation were investigated and the worst case data rate results are reported.
   - 802.11b : 11 Mbps
   - 802.11g : 6 Mbps
   - 802.11n : MCS0

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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 > 20 dBc		PASS
AC Power line Conducted Emissions	§ 15.207	cf. Section 7.7		N/A (Note.1)
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

Note

1. The device only employ battery power for operation.

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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 > 20 dBc		PASS
AC Power line Conducted Emissions	RSS-GEN, 8.8	cf. Section 7.7		N/A (Note.1)
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

Note

1. The device only employ battery power for operation.

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9. TEST RESULT

9.1 DUTY CYCLE

Mode	Data Rate	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1 Mbps	4.191	4.712	0.890	0.508
	2 Mbps	2.180	2.462	0.885	0.529
	5.5 Mbps	0.918	1.041	0.882	0.547
	11 Mbps	0.550	0.628	0.876	0.576
802.11g	6 Mbps	0.692	0.795	0.869	0.608
	9 Mbps	0.469	0.545	0.860	0.653
	12 Mbps	0.357	0.418	0.855	0.683
	18 Mbps	0.243	0.291	0.835	0.784
	24 Mbps	0.187	0.231	0.813	0.898
	36 Mbps	0.132	0.165	0.800	0.969
	48 Mbps	0.104	0.131	0.793	1.008
	54 Mbps	0.093	0.119	0.782	1.071
802.11n (HT20)	MCS0	0.656	0.760	0.863	0.638
	MCS1	0.347	0.405	0.856	0.674
	MCS2	0.243	0.291	0.835	0.784
	MCS3	0.193	0.235	0.819	0.866
	MCS4	0.139	0.172	0.809	0.921
	MCS5	0.106	0.132	0.805	0.944
	MCS6	0.100	0.126	0.794	1.004
	MCS7	0.093	0.119	0.782	1.071

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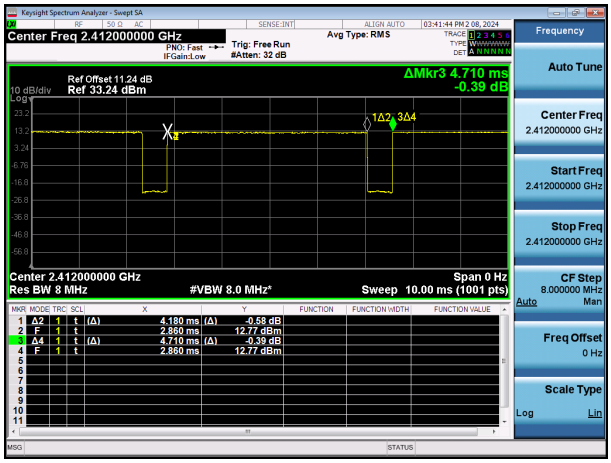
▣ Test Plots

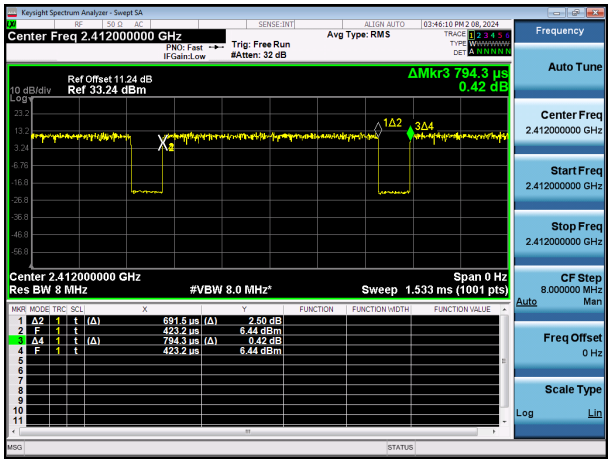
Note:

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

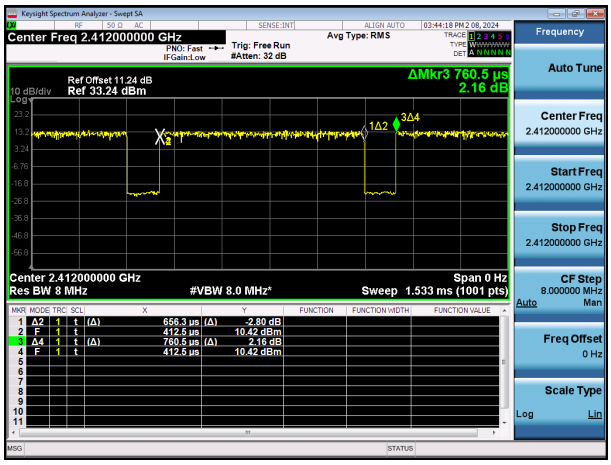
802.11b(1 Mbps)



802.11g(6 Mbps)



802.11n(MCS 0)



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9.2 6 dB BANDWIDTH & 99 % BANDWIDTH

FCC

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Limit [MHz]
802.11b	2412	1	8.131	0.50
	2437	6	8.584	0.50
	2462	11	8.583	0.50
802.11g	2412	1	16.366	0.50
	2437	6	16.357	0.50
	2462	11	16.066	0.50
802.11n(HT20)	2412	1	17.262	0.50
	2437	6	17.019	0.50
	2462	11	17.172	0.50

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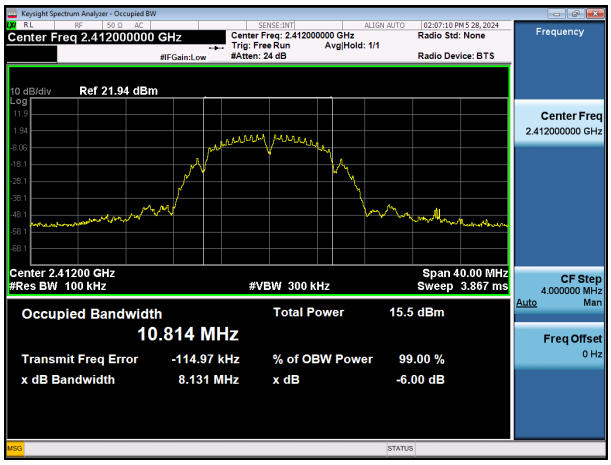
▣ Test Plots

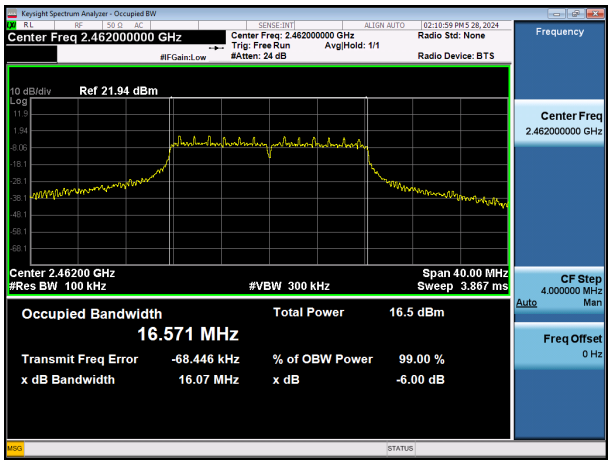
Note:

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

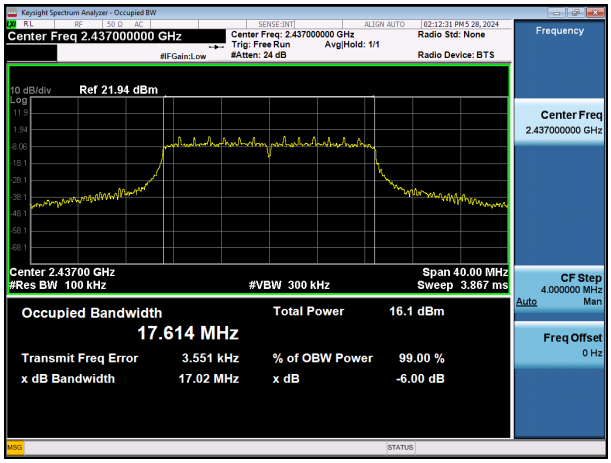
6 dB Bandwidth (802.11b-CH 1)



6 dB Bandwidth (802.11g-CH 11)



6 dB Bandwidth (802.11n_HT20-CH 6)



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6 dB Bandwidth & 99 % Bandwidth Measurements(ISED)

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	99 % Occupied Bandwidth [MHz]	Limit [MHz]
802.11b	2 412	1	8.653	10.927	0.50
	2 437	6	8.670	11.428	0.50
	2 462	11	8.676	11.378	0.50
802.11g	2 412	1	16.455	16.635	0.50
	2 437	6	16.468	16.658	0.50
	2 462	11	16.424	16.831	0.50
802.11n(HT20)	2 412	1	17.617	17.693	0.50
	2 437	6	17.615	17.722	0.50
	2 462	11	17.492	17.835	0.50

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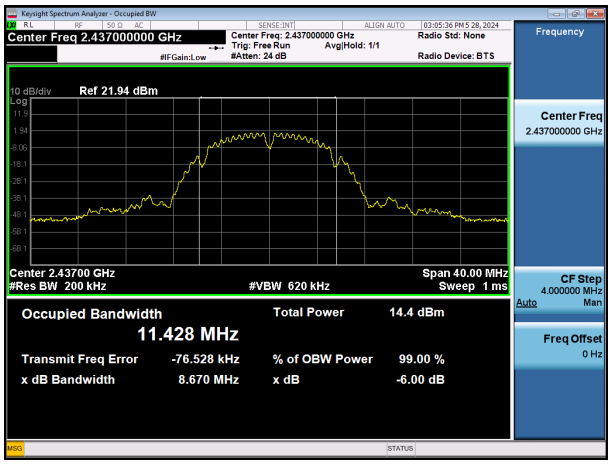
▣ Test Plots

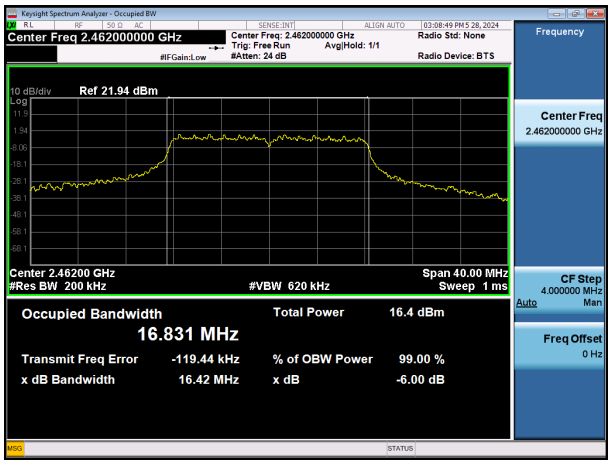
Note:

In order to simplify the report, attached plots were only the widest channel.

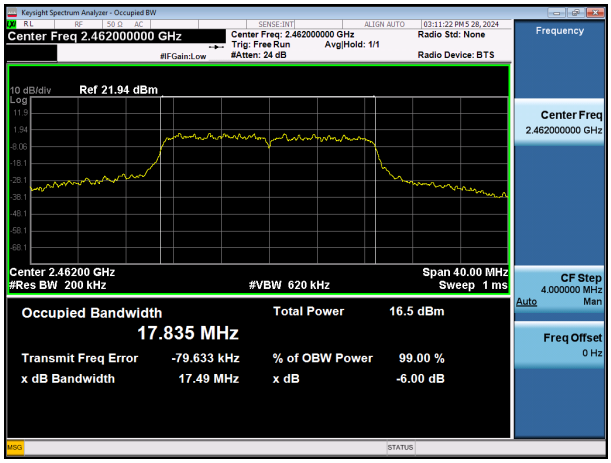
99 % Bandwidth (802.11b-CH 6)



99 % Bandwidth (802.11g-CH 11)



99 % Bandwidth (802.11n_HT20-CH 11)



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9.3 OUTPUT POWER

Peak Power

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Peak Power [dBm]	Limit [dBm]
802.11b	2 412	1	11M	13.47	30
	2 437	6	11M	14.14	30
	2 462	11	11M	14.26	30
802.11g	2 412	1	6M	15.93	30
	2 437	6	6M	16.50	30
	2 462	11	6M	16.87	30
802.11n	2 412	1	MCS0	15.92	30
	2 437	6	MCS0	16.67	30
	2 462	11	MCS0	17.05	30

Average Power

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Average Power [dBm]			Limit [dBm]
				Measured Value	D.C.F	Summed	
802.11b	2 412	1	11M	7.41	0.58	7.99	30
	2 437	6	11M	8.21	0.58	8.79	30
	2 462	11	11M	7.78	0.58	8.36	30
802.11g	2 412	1	6M	7.21	0.61	7.82	30
	2 437	6	6M	7.23	0.61	7.84	30
	2 462	11	6M	6.60	0.61	7.21	30
802.11n	2 412	1	MCS0	7.12	0.64	7.76	30
	2 437	6	MCS0	7.18	0.64	7.82	30
	2 462	11	MCS0	6.51	0.64	7.15	30

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9.4 POWER SPECTRAL DENSITY

Mode	Frequency [MHz]	Channel No.	Data Rate	Power Spectral Density [dBm]	Limit
802.11b	2 412	1	11M	-4.854	8 dBm /3 kHz
	2 437	6	11M	-3.972	
	2 462	11	11M	-4.611	
802.11g	2 412	1	6M	-7.580	
	2 437	6	6M	-6.920	
	2 462	11	6M	-6.630	
802.11n	2 412	1	MCS0	-7.738	
	2 437	6	MCS0	-6.899	
	2 462	11	MCS0	-6.334	

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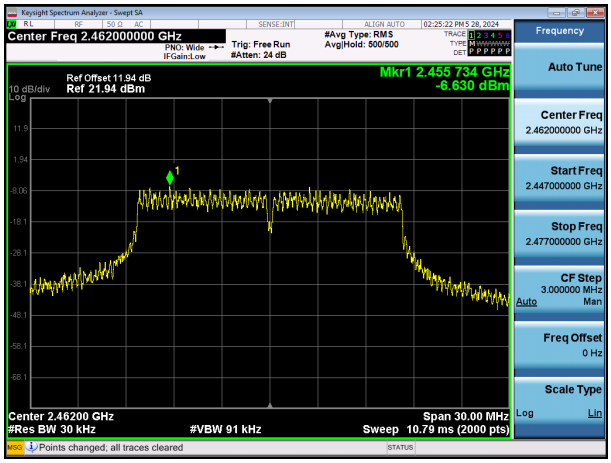
▣ Test Plots

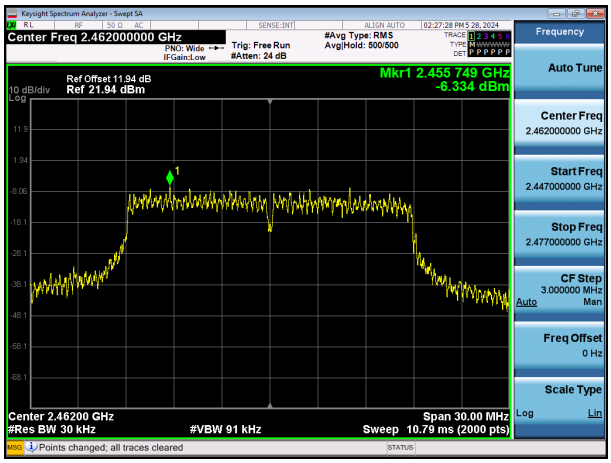
Note : In order to simplify the report, attached plots were only the worst case PSD channel.

Power Spectral Density (802.11b-CH 6)

Power Spectral Density (802.11g-CH 11)



Power Spectral Density (802.11n_HT20-CH 11)



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9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Band Edge

Limit : 20 dBc

Mode	Freq. [MHz]	CH.	Measured Position	Band edge[dB]
802.11b	2 412	1	Lowest Bandedge	48.892
	2 462	11	Highest Bandedge	52.597
802.11g	2 412	1	Lowest Bandedge	37.012
	2 462	11	Highest Bandedge	42.563
802.11n	2 412	1	Lowest Bandedge	35.537
	2 462	11	Highest Bandedge	43.087

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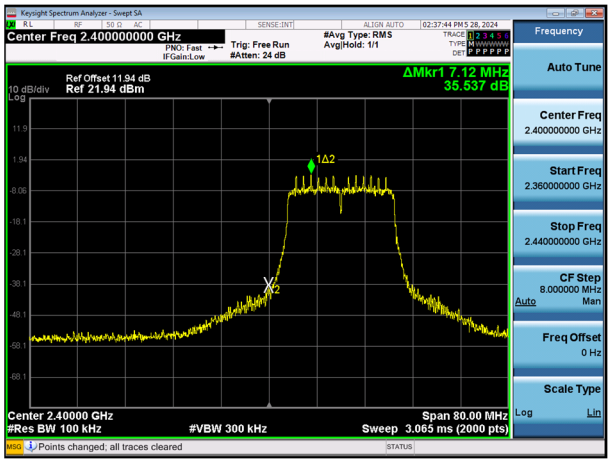
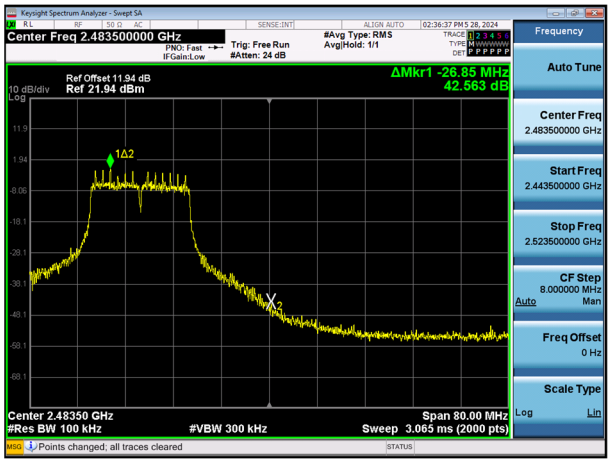
▣ **Test Plots(**Band Edge)

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

802.11n_HT20-CH 1	802.11g-CH 11
	

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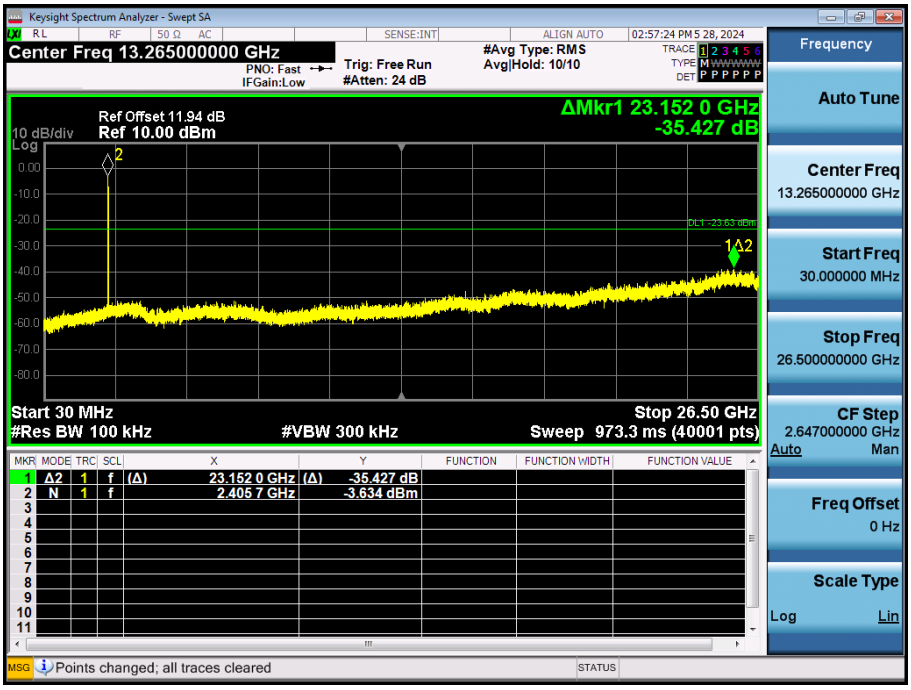
▣ Test Plots(Conducted Spurious Emission)

Note: In order to simplify the report, attached plots were only the worst case.

Worstcase : 802.11n_HT20_Ch. 1(2412 MHz)

Limit : -23.63 dBm

Spurious Emission (30 MHz – 26.5 GHz)



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9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30 MHz

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

Note:

1. The Measured 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	POL	Total	Limit	Margin
[MHz]	[dBμV/m]	[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.

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Frequency Range : Above 1 GHz

Band :	DTS			Operation Mode : 802.11b				
CH.1	2412MHz			Transfer Rate : 1Mbps				
Frequency	Measured value	Duty Cycle	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	Factor	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Type
4 824	50.84	0.00	3.87	V	54.71	73.98	19.27	PK
4 824	46.48	0.52	3.87	V	50.87	53.98	3.11	AV
7 236	41.44	0.00	9.57	V	51.01	73.98	22.97	PK
7 236	29.39	0.52	9.57	V	39.48	53.98	14.50	AV

Band :	DTS			Operation Mode : 802.11b				
CH.6	2437MHz			Transfer Rate : 1Mbps				
Frequency	Measured value	Duty Cycle	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	Factor	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Type
4 874	50.40	0.00	3.84	V	54.24	73.98	19.74	PK
4 874	46.21	0.52	3.84	V	50.57	53.98	3.41	AV
7 311	41.38	0.00	10.11	V	51.49	73.98	22.49	PK
7 311	30.03	0.52	10.11	V	40.65	53.98	13.33	AV

Band :	DTS			Operation Mode : 802.11b				
CH.11	2462MHz			Transfer Rate : 1Mbps				
Frequency	Measured value	Duty Cycle	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	Factor	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Type
4 924	50.86	0.00	3.27	V	54.13	73.98	19.85	PK
4 924	46.73	0.52	3.27	V	50.52	53.98	3.46	AV
7 386	41.91	0.00	11.01	V	52.92	73.98	21.06	PK
7 386	29.88	0.52	11.01	V	41.41	53.98	12.57	AV

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[DBS]

Mode : BT LE 1M + WLAN 2.4G

Band :	DTS			Operation Mode : 802.11b				
CH.1	2412MHz			Transfer Rate : 1Mbps				
Frequency	Measured value	Duty Cycle	CL+AF+DF-AG	ANT. POL	Total	Limit	Margin	Measurement
[MHz]	[dBµV]	Factor	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	Type
4 824	58.97	0.00	-5.39	V	53.58	73.98	20.40	PK
4 824	55.12	0.52	-5.39	V	50.25	53.98	3.73	AV
7 236	48.11	0.00	1.88	V	49.99	73.98	23.99	PK
7 236	36.09	0.52	1.88	V	38.49	53.98	15.49	AV

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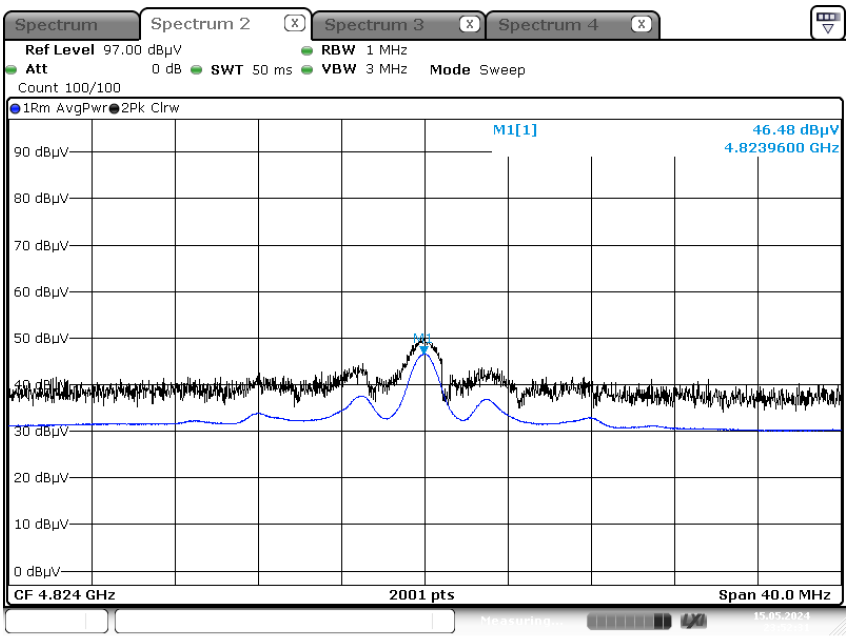
▣ Test Plots (Worst case : X-V)

Note:

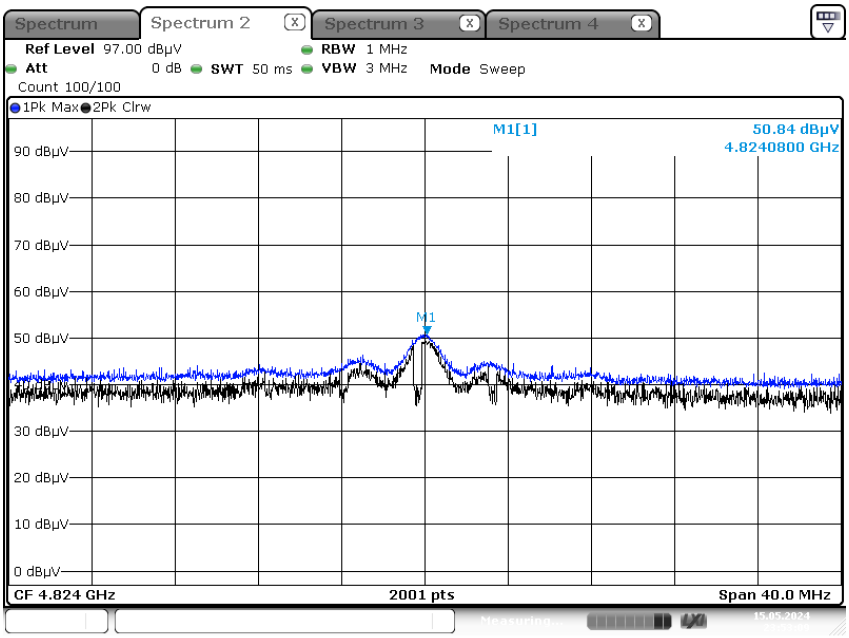
In order to simplify the report, Plot of worst case are only reported.

Radiated Spurious Emissions plot – Average Result (802.11b_1 Mbps, Ch.1 2nd Harmonic)



Date: 15.MAY.2024 23:52:31

Radiated Spurious Emissions plot – Peak Result (802.11b_1 Mbps, Ch.1 2nd Harmonic)



Date: 15.MAY.2024 23:53:09

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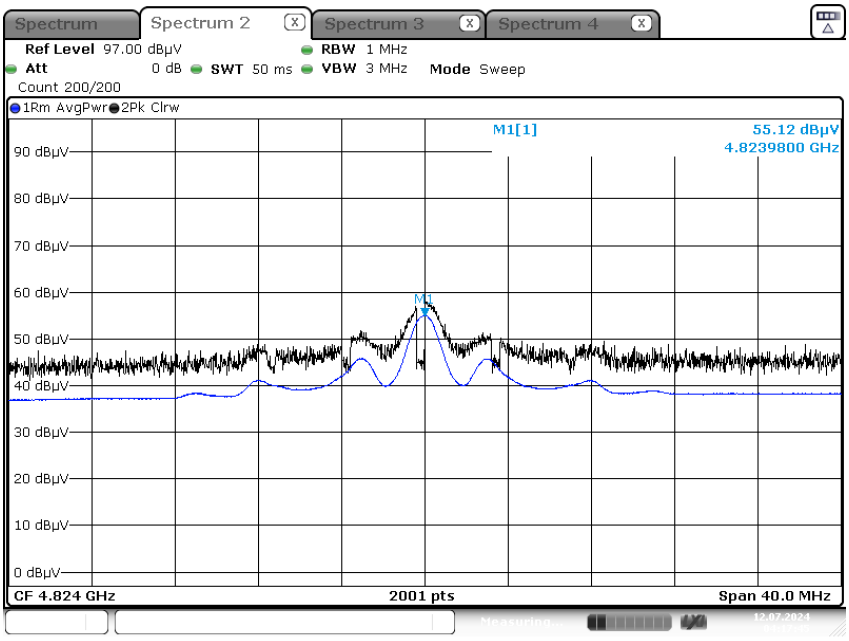
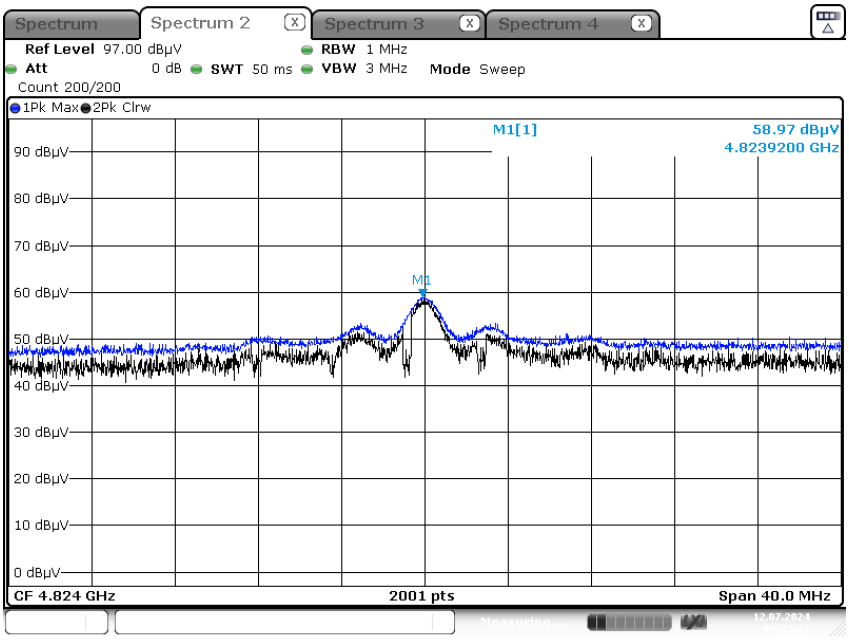
[DBS]

Radiated Spurious Emissions plot – Average Result (802.11b_1 Mbps, Ch.1 2nd Harmonic)



Radiated Spurious Emissions plot – Peak Result (802.11b_1 Mbps, Ch.1 2nd Harmonic)



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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	Duty Cycle	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	Factor	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2 390.0	55.69	0.00	H	55.69	73.98	18.29	PK
2 390.0	43.90	0.52	H	44.42	53.98	9.56	AV
2 483.5	56.42	0.00	H	56.42	73.98	17.56	PK
2 483.5	46.22	0.52	H	46.74	53.98	7.24	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	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	Factor	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2 390.0	62.70	0.00	H	62.70	73.98	11.28	PK
2 390.0	49.27	0.60	H	49.87	53.98	4.11	AV
2 483.5	62.83	0.00	H	62.83	73.98	11.15	PK
2 483.5	50.22	0.60	H	50.82	53.98	3.16	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	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	Factor	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
2 390.0	65.98	0.00	H	65.98	73.98	8.00	PK
2 390.0	49.26	0.64	H	49.90	53.98	4.08	AV
2 483.5	65.68	0.00	H	65.68	73.98	8.30	PK
#2 483.5	50.25	0.64	H	50.89	53.98	3.09	AV

Note : integration method Used (ANSI C63.10 Section11.13.3)

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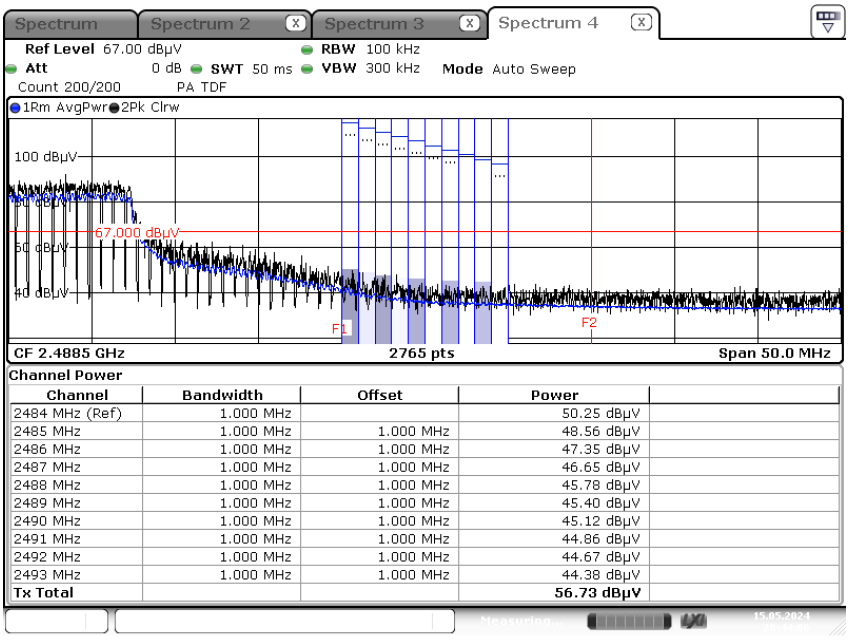
▣ Test Plots (Worst case : X-H)

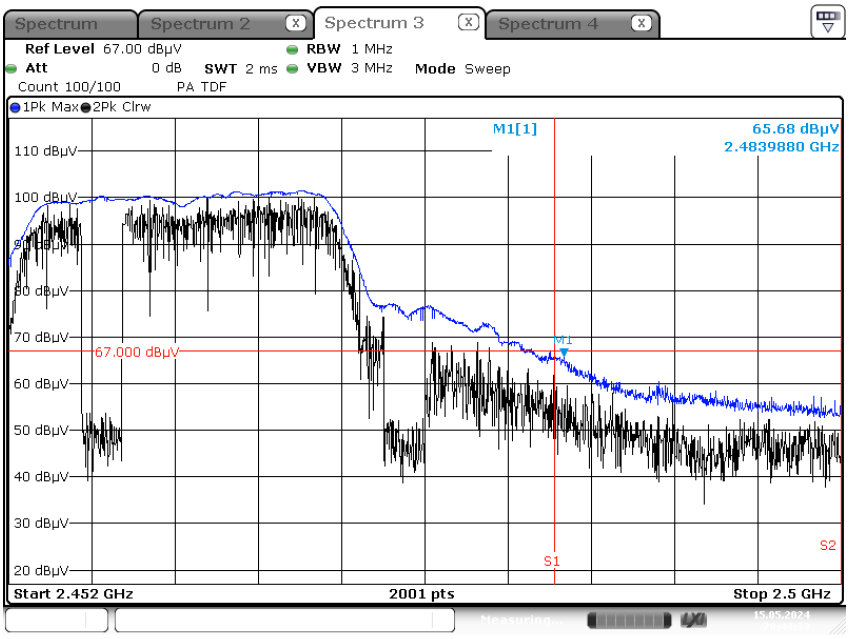
Note:

In order to simplify the report, Plots of worst case were only reported.

Radiated Restricted Band Edges plot – Average Result (802.11n_HT20, Ch.11)



Radiated Restricted Band Edges plot – Peak Result (802.11n_HT20, Ch.11)



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9.8 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						

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10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Signal Analyzer	N9030A	Keysight	MY55410508	09/04/2024	Annual
Power Meter	N1911A	Agilent	MY45100523	02/28/2025	Annual
Power Sensor	N1921A	Agilent	MY57820067	02/22/2025	Annual
Directional Coupler	87300B	Agilent	3116A03621	10/30/2024	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2025	Annual
DC Power Supply	E3632A	Agilent	KR75305528	01/02/2025	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C-010	Agilent	08285	05/28/2025	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	02/20/2025	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	02/15/2025	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.

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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 (Antenna mast & Turn Table)	CO3000	Innco system	CO3000/ 15421/57580623/G	N/A	N/A
Antenna Position Tower	MA4640	Innco system	9320422	04/05/2025	Biennial
Controller	EM2090	Emco	060520	N/A	N/A
Turn Table	N/A	Ets	N/A	N/A	N/A
Turn Table	N/A	Innco system	5930623	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/07/2026	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	BBHA 9120D	Schwarzbeck	9120D-1151	07/14/2025	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
Amp & Filter Bank Switch Controller	FBSM-01B	T&M system	TM2009001	N/A	N/A
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/02/2025	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/04/2025	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/04/2025	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/14/2025	Annual
RF Switching System	FBSR-03A (3G HPF+LNA)	T&M SYSTEM	S3L1	11/17/2024	Annual
RF Switching System	FMSR-05B (HPF(3~18GHz) + LNA1(1~18GHz))	T&M system	S5L1	03/12/2025	Annual
RF Switching System	FBSR-03A (10dB ATT+LNA)	T&M SYSTEM	S3L2	11/17/2024	Annual
RF Switching System	FMSR -05B (LNA1(1~18GHz))	T&M system	S5L4	03/12/2025	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	02/26/2025	Annual

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Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/19/2025	Annual
High Pass Filter	F5	Wainwright Instruments	F5	05/16/2024	Annual
Spectrum Analyzer	FSV40 (9 kHz ~ 40 GHz)	Rohde & Schwarz	100900	12/06/2024	Annual
Spectrum Analyzer	FSV40 (9 kHz ~ 40 GHz)	Rohde & Schwarz	101510	03/28/2025	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).

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11. Annex A_EUT AND TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2406-FI005-P

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