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TEST REPORT

FCC/ISED DTS Test for DA3300AAN&DA3300AKN
Certification

APPLICANT
HYUNDAI MOBIS CO., LTD.

REPORT NO.
HCT-RF-2211-FI005-R1

DATE OF ISSUE
December 15, 2022

Tested by
Jin Gwan Lee

Technical Manager
Jong Seok Lee

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Additional Model
-

Applicant	**HYUNDAI MOBIS CO., LTD.** 203, Teheran-ro, Gangnam-gu, Seoul, 135-977, South Korea
Eut Type	CAR AUDIO SYSTEM
FCC Model Name	DA3300AAN
ISED Model Name	DA3300AKN
FCC ID	TQ8-DA3300AAN
IC	5074A-DA3300AKN
Max. RF Output Power	802.11b : 10.15 dBm, 802.11g : 12.67 dBm, 802.11n(HT20) : 13.17 dBm
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 2 (February 2017) RSS-Gen Issue 5_Amendment 2 (February 2021)

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.

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	November 30, 2022	Initial Release
1	December 15, 2022	Revised the Antenna type.

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

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

CONTENTS

1. EUT DESCRIPTION

FCC Model	DA3300AAN
ISED Model	DA3300AKN
FCC Additional Model	DA3300AGG, DA3310AGG, DA3320AGG, DA3300AGN, DA3310AGN, DA3300AGL, DA3300AGP, DA3300AFN, DA3300AMG, DA3310AMG, DA3300AEG, DA3310AEG, DA3300AEP, DA3310AEP, DA3320AEP, DA3320AEG, DA3300AUA, DA3310AAN, DA3300AAU, DA3300ARP, DA3301VGG, DA3311VGG, DA3301VMG, DA3311VMG, DA3301VFN, DA3301VEP, DA3301VAN, DA3311VEP, DA3321VGG, DA3301VUA
ISED Additional Model	DA3301VKN
EUT Type	CAR AUDIO SYSTEM
Power Supply	DC 14.4 V
Frequency Range	2 412 MHz ~ 2 462 MHz
Max. RF Output Power	**Peak Power** 802.11b : 10.15 dBm 802.11g : 12.67 dBm 802.11n(HT20) : 13.17 dBm **Average Power** 802.11b : 4.34 dBm 802.11g : 5.01 dBm 802.11n(HT20) : 4.91 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n
Number of Channels	11 Channels
Antenna Specification	Antenna type: PCB Pattern ANT Peak Gain : -0.01 dBi
Date(s) of Tests	October 26, 2022 ~ November 25, 2022
PMN (Product Marketing Number)	DA3300AKN, DA3301VKN
HVIN (Hardware Version Identification Number)	DA3300AKN, DA3301VKN
FVIN (Firmware Version Identification Number)	CN7_PE.USA.0000.142.000.220906
HMN (Host Marketing Name)	N/A
EUT serial numbers	Conducted : 96160-AADA0 (FCC), 96160-AACA0 (ISED) Radiated : 96160-AADA0 (FCC), 96160-AACA0 (ISED)

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 2.

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 1.5m 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)

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, 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 April 02, 2018 (Registration Number: KR0032).
For ISED, test facility was accepted dated January 26, 2021 (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

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.

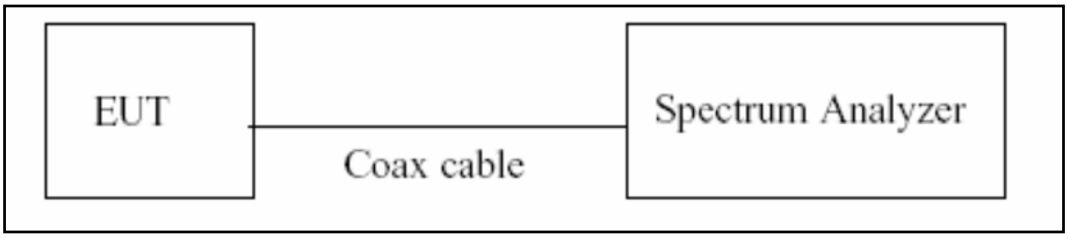
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	2.00 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.74 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.51 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.92 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.48 (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*.

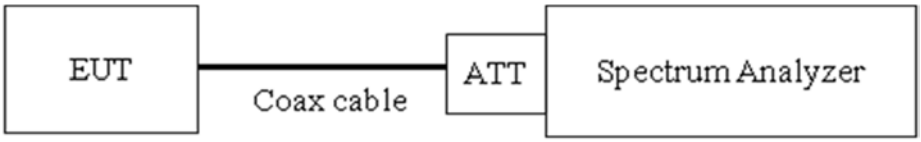
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

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 (99 % Bandwidth 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

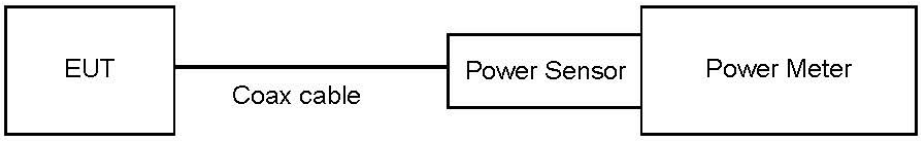
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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

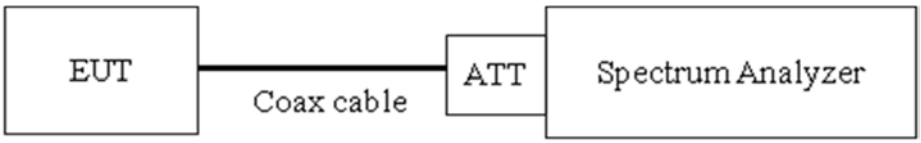
- Conducted Output Power(Peak) = Measured Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

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 11.10.2 in ANSI 63.10-2013.

The spectrum analyzer is set to :

1) Set analyzer center frequency to DTS channel center frequency.
2) Span = 1.5 times the DTS channel 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.
   If Measured Level exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Sample Calculation

- Power Spectral Density = Measured Value + ATT loss + Cable loss

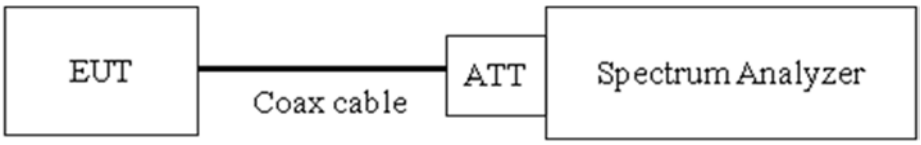
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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	20.04
100	20.09
200	20.13
300	20.19
400	20.22
500	20.23
600	20.23
700	20.25
800	20.27
900	20.29
1000	20.31
2000	20.46
2400	20.52
2480	20.52
2500	20.52
3000	20.57
4000	20.67
5000	20.75
5150	20.77
5850	20.82
6000	20.82
7000	20.91
8000	20.98
9000	21.05
10000	21.12
11000	21.16
12000	21.24
13000	21.32
14000	21.30
15000	21.32
16000	21.37
17000	21.41
18000	21.47
19000	21.50
20000	21.56
21000	21.77
22000	21.74
23000	21.94
24000	21.77
25000	21.80
26000	21.80

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

2. Factor = Attenuator loss(20 dB) + Cable loss

3. EUT Cable : 0.5 dB → Total Port offset : 21.02 dB

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

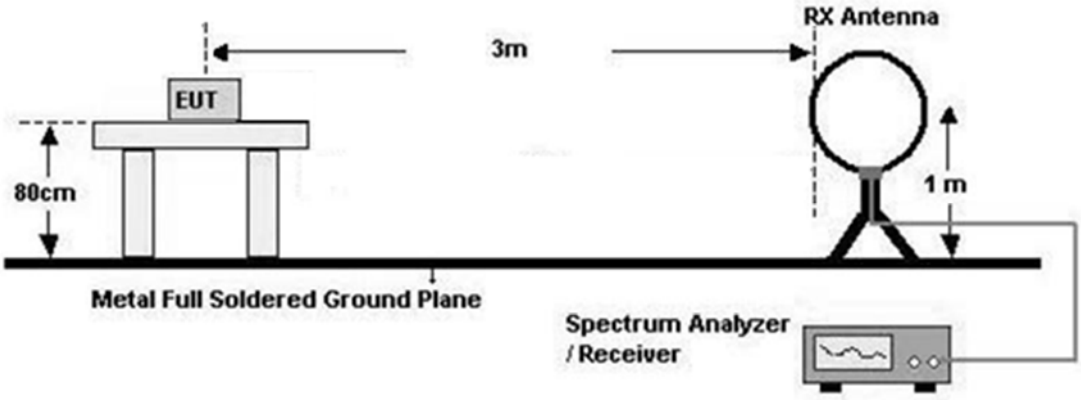
Frequency (MHz)	Field Strength (μA/m)	Measurement Distance (m)
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30

FCC&ISED

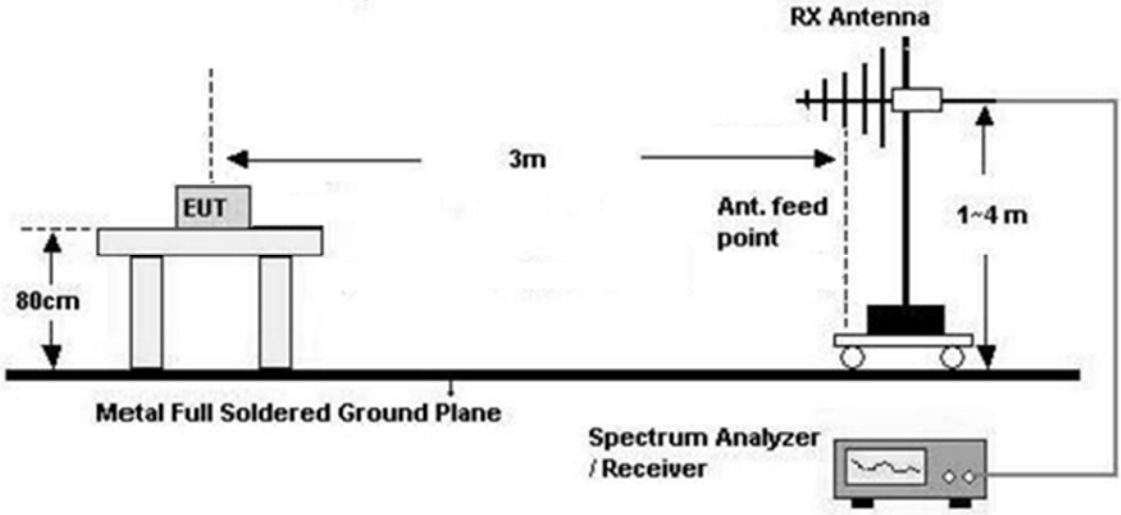
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

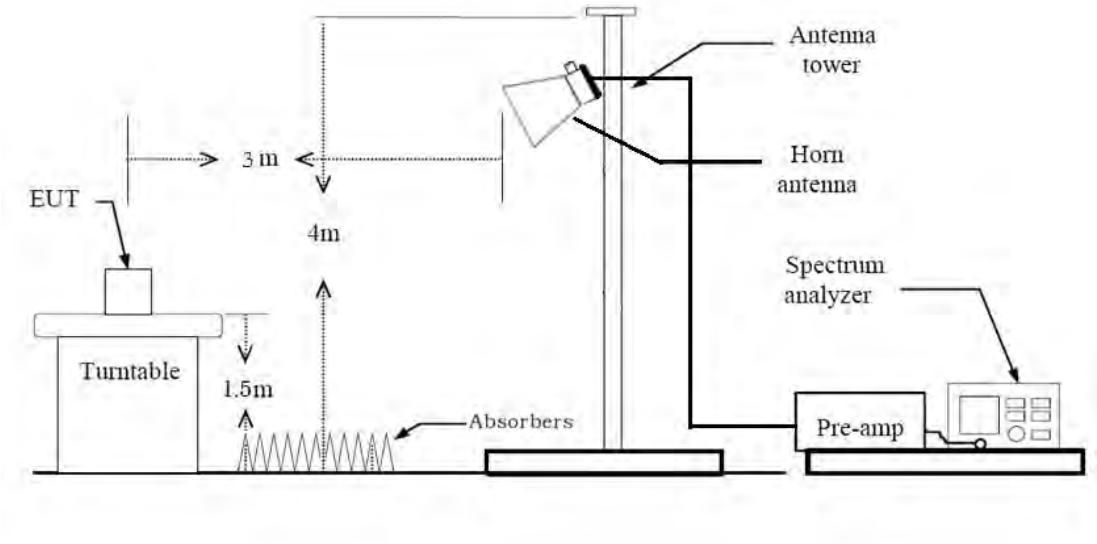
Below 30 MHz



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 = Max hold
   - 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 = Max hold
      - 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. 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 = Max hold
- 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.

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.
9. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
10. 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

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. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
      - Detector = Peak
      - Trace = Max hold
      - 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.

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.
9. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
10. Total(Measurement Type : Peak)
    = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) – Amp Gain(A.G)

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

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

7.7. Receiver Spurious Emissions

Limit

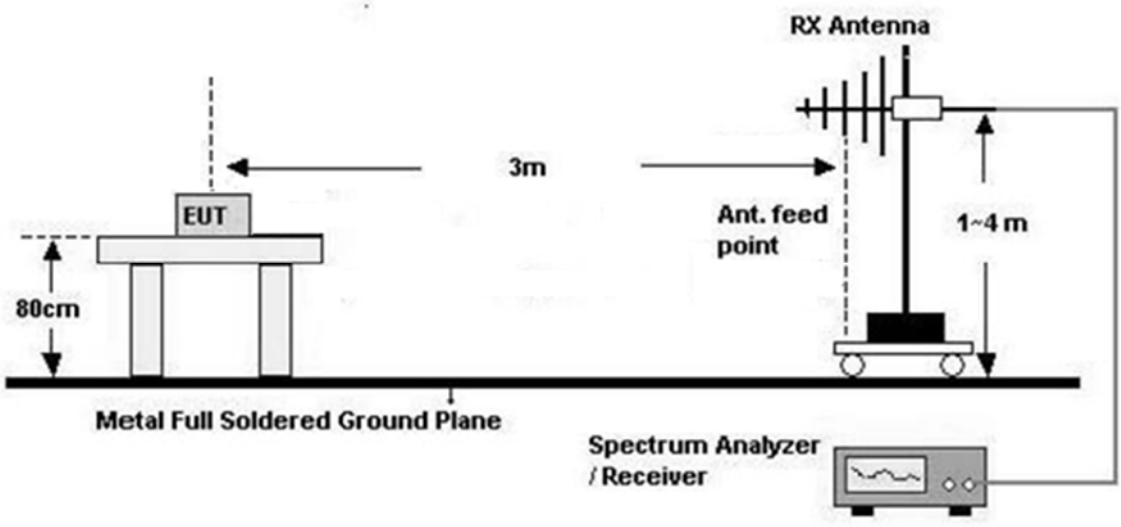
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

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

Test Configuration

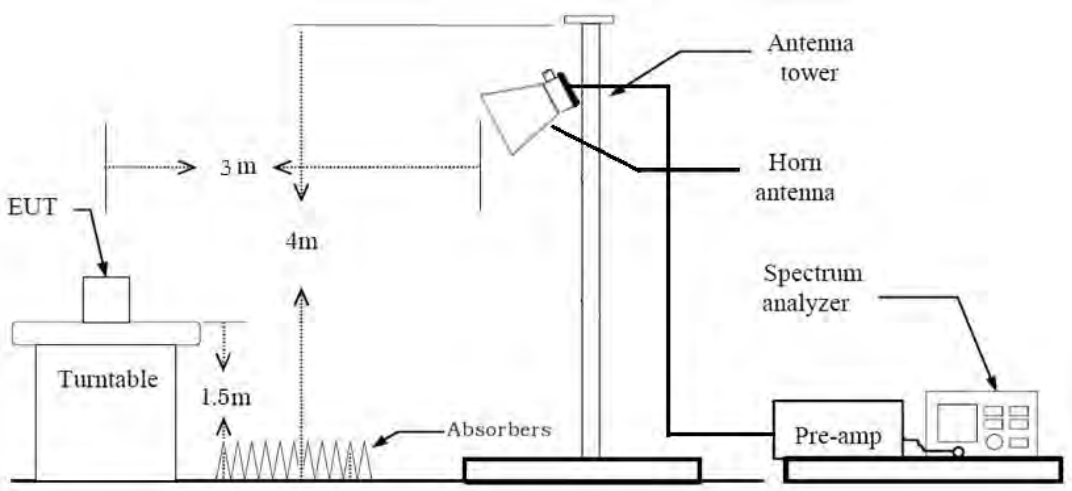
30 MHz - 1 GHz



Test Procedure of Receiver Spurious Emissions (Below 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 = Max hold
      - 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
7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)

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 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. Spectrum Setting
   (1) Measurement Type(Peak):
      - Measured Frequency Range : 1 GHz – 25 GHz
      - Detector = Peak
      - Trace = Max hold
      - RBW = 1 MHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Average):

- We performed using a reduced video BW method was done with the analyzer in linear mode
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW ≥ 3 x RBW

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.
9. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G) + Distance Factor(D.F)

7.8. 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 , Stand alone + Shark Antenna
   - Mode : Stand alone + Shark Antenna
2. EUT Axis
   - Radiated Spurious Emissions : X
   - Radiated Restricted Band Edge : X
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. DA3300AAN(FCC)&DA3300AKN(ISED), Additional Models were tested and the worst case results are reported.

(Worst case : DA3300AAN(FCC)&DA3300AKN(ISED))

AC Power line Conducted Emissions

1. We don’t perform powerline conducted emission test. Because this EUT is used DC.

Conducted test

1. The EUT was configured with data rate of highest power.
2. DA3300AAN(FCC)&DA3300AKN(ISED), Additional Models were tested and the worst case results are reported.

(Worst case : DA3300AAN(FCC)&DA3300AKN(ISED))

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 (#Note1)
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

#Note1 : Not Tested

ISED Part

Test Description	ISED Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	RSS-247, 5.2	> 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.	< 1 Watt <4 Watt(e.i.r.p.)		PASS
Power Spectral Density	RSS-247, 5.2	< 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 (#Note1)
Radiated Spurious Emissions	RSS-GEN, 8.9	cf. Section 7.6	Radiated	PASS
Receiver Spurious Emissions	RSS-GEN, 7	cf. Section 7.8		PASS
Radiated Restricted Band Edge	RSS-GEN, 8.10	cf. Section 7.6		PASS

#Note1 : Not Tested

9. TEST RESULT

9.1 DUTY CYCLE

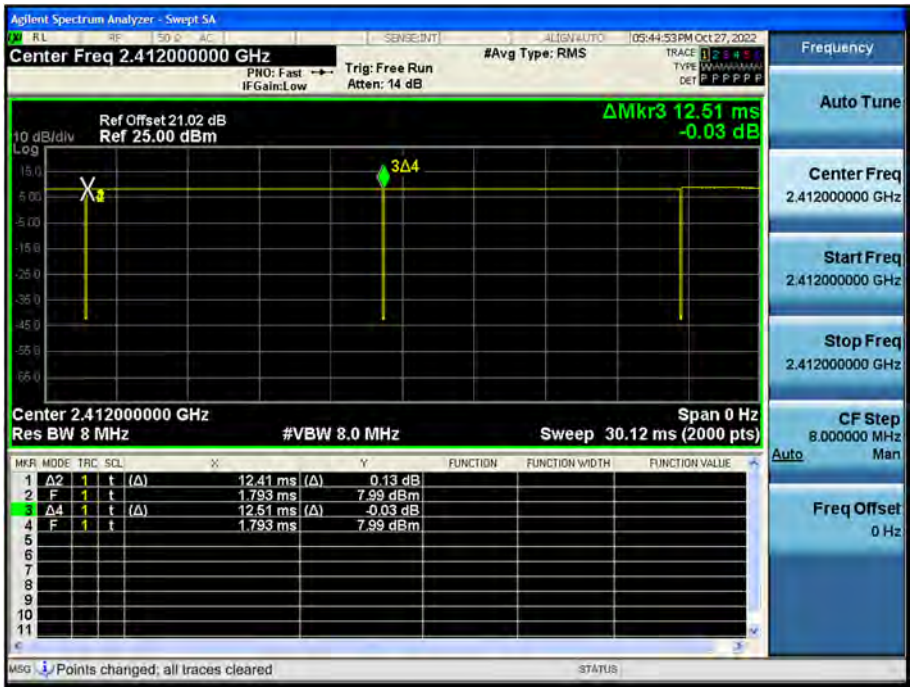
Mode	Data Rate (Mbps)	T_{on} (ms)	T_{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	12.415	12.505	0.993	0.032
	2	6.207	6.313	0.983	0.073
	5.5	2.321	2.412	0.962	0.167
	11	1.208	1.302	0.928	0.324
802.11g	6	2.063	2.167	0.952	0.214
	9	1.385	1.485	0.932	0.304
	12	1.044	1.145	0.912	0.399
	18	0.704	0.806	0.873	0.590
	24	0.532	0.633	0.840	0.757
	36	0.364	0.465	0.782	1.067
	48	0.276	0.377	0.733	1.347
	54	0.248	0.349	0.710	1.489
802.11n (HT20)	6.5 (MCS0)	1.919	2.021	0.950	0.224
	13 (MCS1)	0.980	1.081	0.906	0.427
	19.5 (MCS2)	0.664	0.766	0.867	0.622
	26 (MCS3)	0.508	0.610	0.833	0.796
	39 (MCS4)	0.352	0.454	0.776	1.103
	52 (MCS5)	0.273	0.373	0.730	1.367
	58.5 (MCS6)	0.247	0.349	0.709	1.496
	65 (MCS7)	0.228	0.329	0.692	1.600

Note:

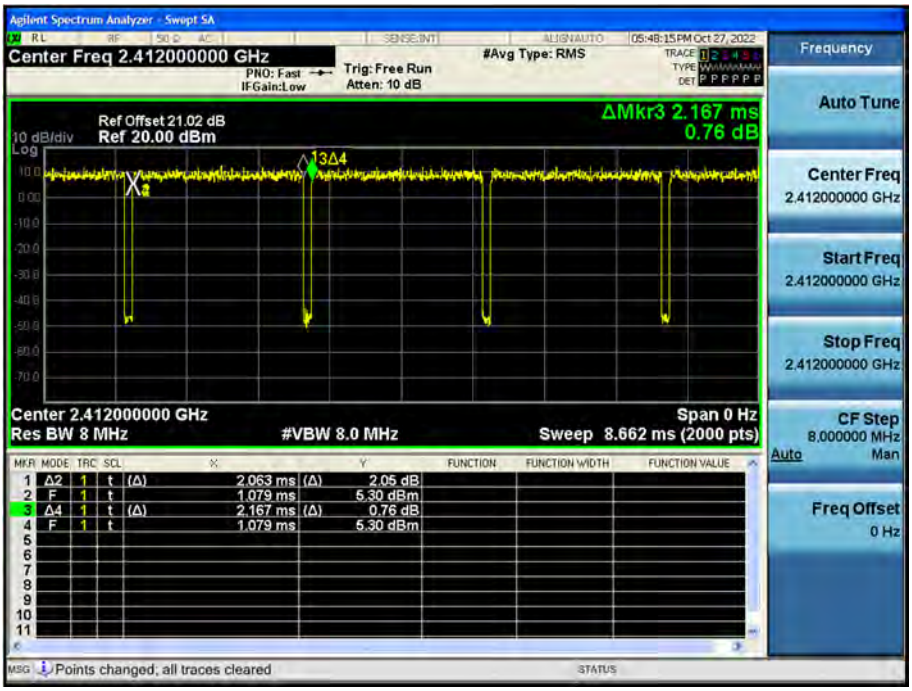
1. Duty Cycle Factor = 10log(1/Duty Cycle). where, Duty Cycle = T_{on} / T_{total}

▣ Test Plots

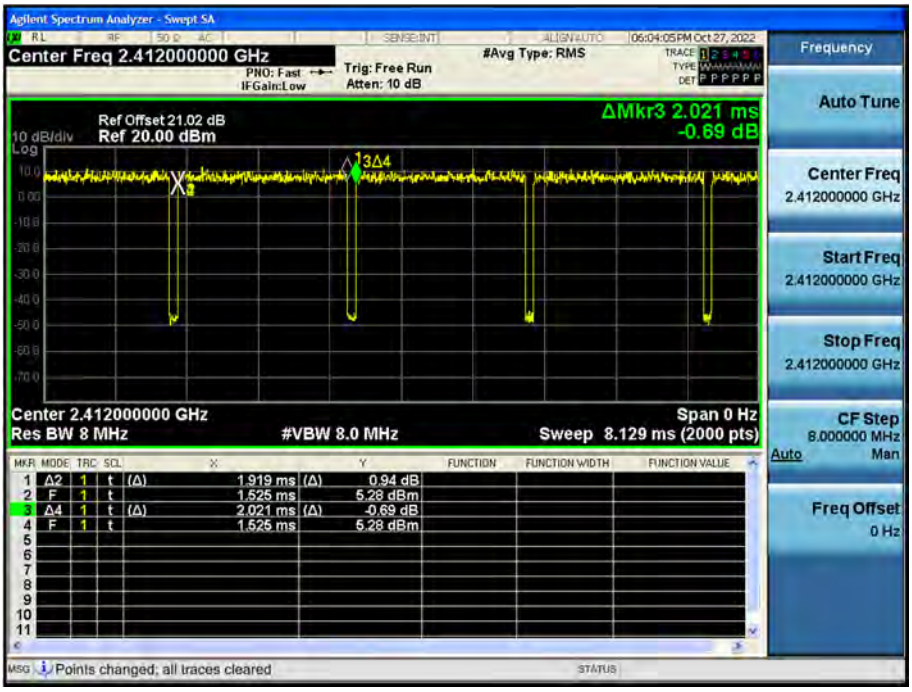
Duty cycle plot (802.11b(1 Mbps))



Duty cycle plot (802.11g(6 Mbps))



Duty cycle plot (802.11n(HT20)(MCS0))



Note:

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

9.2 6dB BANDWIDTH & 99 % BANDWIDTH

FCC

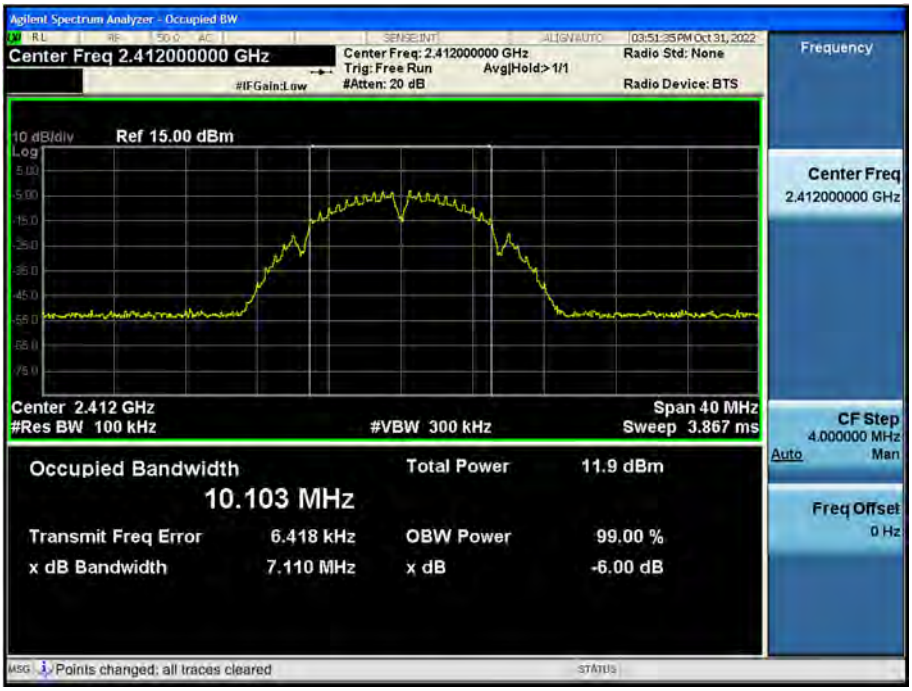
802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	7.110	> 0.5
2437	6	7.113	> 0.5
2462	11	7.120	> 0.5

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	16.09	> 0.5
2437	6	16.35	> 0.5
2462	11	16.35	> 0.5

802.11n(HT20) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	17.58	> 0.5
2437	6	17.32	> 0.5
2462	11	17.56	> 0.5

▣ Test Plots

6 dB Bandwidth plot (802.11b-CH 1)



6 dB Bandwidth plot (802.11g-CH 1)

6 dB Bandwidth plot (802.11n_HT20-CH 6)

Note:

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

99 % Bandwidth Measurements(ISED)

802.11b Mode		OBW Bandwidth [MHz]	Limit [MHz]
Frequency [MHz]	Channel No.		
2412	1	10.389	N/A
2437	6	10.406	N/A
2462	11	10.393	N/A

802.11g Mode		OBW Bandwidth [MHz]	Limit [MHz]
Frequency [MHz]	Channel No.		
2412	1	17.082	N/A
2437	6	17.033	N/A
2462	11	17.071	N/A

802.11n(HT20) Mode		OBW Bandwidth [MHz]	Limit [MHz]
Frequency [MHz]	Channel No.		
2412	1	18.196	N/A
2437	6	18.119	N/A
2462	11	18.165	N/A

▣ Test Plots

99 % Bandwidth plot (802.11b-CH 6)

99 % Bandwidth plot (802.11g-CH 1)

99 % Bandwidth plot (802.11n_HT20-CH 1)

Note:

In order to simplify the report, attached plots were only the widest 99 % Bandwidth channel.

9.3 OUTPUT POWER

Peak Power

1. Power Meter offset = Attenuator loss(20 dB) + Cable loss(1ea) + EUT Cable(For Conducted)
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
So, 21.02 dB is offset for 2.4 GHz Band

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	1	6.73	30.00
		2	6.91	30.00
		5.5	8.39	30.00
		11	10.15	30.00
2437	6	1	5.99	30.00
		2	6.21	30.00
		5.5	7.70	30.00
		11	9.48	30.00
2462	11	1	5.87	30.00
		2	5.60	30.00
		5.5	7.09	30.00
		11	9.38	30.00

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	6	12.67	30.00
		9	12.57	30.00
		12	12.44	30.00
		18	12.08	30.00
		24	12.23	30.00
		36	12.31	30.00
		48	12.35	30.00
		54	12.28	30.00
2437	6	6	12.13	30.00
		9	12.04	30.00
		12	11.86	30.00
		18	11.52	30.00
		24	11.72	30.00
		36	11.82	30.00
		48	11.95	30.00
		54	11.85	30.00
2462	11	6	11.72	30.00
		9	11.63	30.00
		12	11.49	30.00
		18	11.09	30.00
		24	11.55	30.00
		36	11.63	30.00
		48	11.67	30.00
		54	11.56	30.00

802.11n(HT20) Mode		MCS Index	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	0	11.94	30.00
		1	11.95	30.00
		2	11.96	30.00
		3	12.72	30.00
		4	12.68	30.00
		5	12.75	30.00
		6	13.17	30.00
		7	12.77	30.00
2437	6	0	11.41	30.00
		1	11.46	30.00
		2	11.46	30.00
		3	12.11	30.00
		4	12.08	30.00
		5	12.14	30.00
		6	12.61	30.00
		7	12.10	30.00
2462	11	0	11.02	30.00
		1	11.04	30.00
		2	11.00	30.00
		3	11.92	30.00
		4	11.89	30.00
		5	11.89	30.00
		6	12.69	30.00
		7	11.91	30.00

Average Power

1. Power Meter offset = Attenuator loss(20 dB) + Cable loss(1ea) + EUT Cable
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
   So, 21.02 dB is offset for 2.4 GHz Band.

802.11b Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1	4.31	0.032	4.34	30.00
		2	4.18	0.073	4.25	30.00
		5.5	4.06	0.167	4.23	30.00
		11	3.88	0.324	4.20	30.00
2437	6	1	3.54	0.032	3.57	30.00
		2	3.45	0.073	3.52	30.00
		5.5	3.34	0.167	3.50	30.00
		11	3.24	0.324	3.56	30.00
2462	11	1	3.41	0.032	3.44	30.00
		2	2.88	0.073	2.96	30.00
		5.5	2.72	0.167	2.89	30.00
		11	3.08	0.324	3.40	30.00

802.11g Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6	4.78	0.214	5.00	30.00
		9	4.67	0.304	4.98	30.00
		12	4.61	0.399	5.01	30.00
		18	4.01	0.590	4.60	30.00
		24	3.72	0.757	4.47	30.00
		36	3.40	1.067	4.47	30.00
		48	3.25	1.347	4.59	30.00
		54	3.03	1.489	4.52	30.00
2437	6	6	4.21	0.214	4.43	30.00
		9	4.11	0.304	4.41	30.00
		12	4.03	0.399	4.43	30.00
		18	3.44	0.590	4.03	30.00
		24	3.17	0.757	3.92	30.00
		36	2.92	1.067	3.99	30.00
		48	2.79	1.347	4.13	30.00
		54	2.53	1.489	4.02	30.00
2462	11	6	3.80	0.214	4.01	30.00
		9	3.69	0.304	4.00	30.00
		12	3.62	0.399	4.02	30.00
		18	3.01	0.590	3.60	30.00
		24	2.94	0.757	3.69	30.00
		36	2.68	1.067	3.75	30.00
		48	2.53	1.347	3.88	30.00
		54	2.23	1.489	3.72	30.00

802.11n Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	3.98	0.224	4.20	30.00
		1	3.76	0.427	4.18	30.00
		2	3.62	0.622	4.25	30.00
		3	3.68	0.796	4.48	30.00
		4	3.38	1.103	4.48	30.00
		5	3.18	1.367	4.55	30.00
		6	3.41	1.496	4.91	30.00
		7	2.98	1.600	4.58	30.00
2437	6	0	3.47	0.224	3.69	30.00
		1	3.31	0.427	3.74	30.00
		2	3.12	0.622	3.75	30.00
		3	3.14	0.796	3.94	30.00
		4	2.84	1.103	3.94	30.00
		5	2.58	1.367	3.95	30.00
		6	2.86	1.496	4.35	30.00
		7	2.41	1.600	4.00	30.00
2462	11	0	3.04	0.224	3.26	30.00
		1	2.88	0.427	3.31	30.00
		2	2.61	0.622	3.24	30.00
		3	2.91	0.796	3.70	30.00
		4	2.61	1.103	3.72	30.00
		5	2.34	1.367	3.71	30.00
		6	2.93	1.496	4.43	30.00
		7	2.16	1.600	3.75	30.00

9.4 POWER SPECTRAL DENSITY

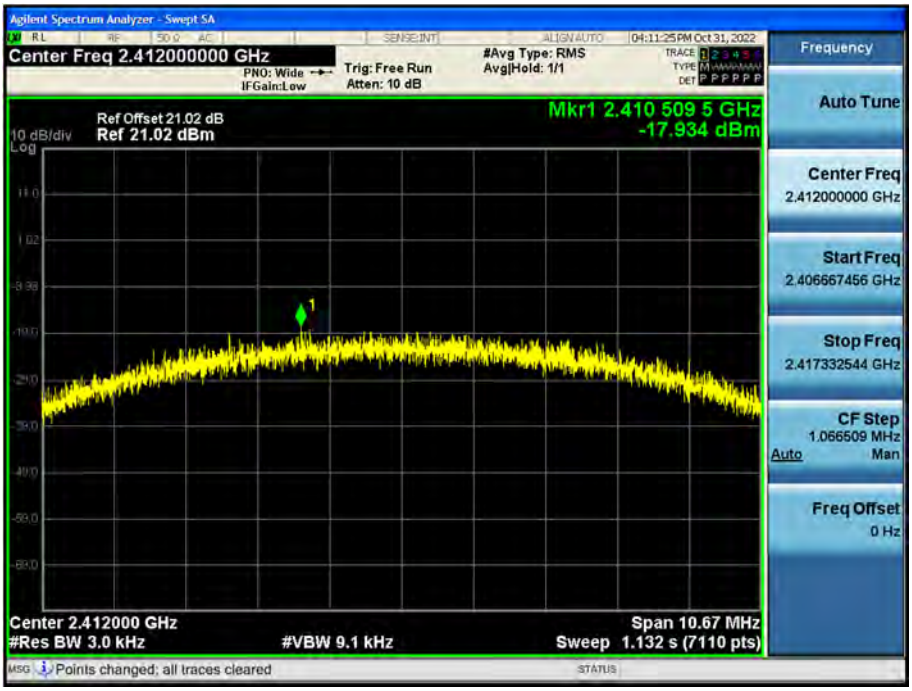
Mode	Frequency (MHz)	Channel No.	Test Result	
			PSD (dBm/3 kHz)	Limit (dBm/3 kHz)
802.11b	2412	1	-17.934	8
	2437	6	-18.540	
	2462	11	-18.638	
802.11g	2412	1	-18.273	
	2437	6	-19.135	
	2462	11	-19.201	
802.11n(HT20)	2412	1	-20.525	
	2437	6	-21.599	
	2462	11	-22.281	

Note :

1. Spectrum Measured Levels are not plot data.
   The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss(20 dB) + Cable loss(1ea) + EUT Cable
3. 21.02 dB is offset for 2.4 GHz Band.

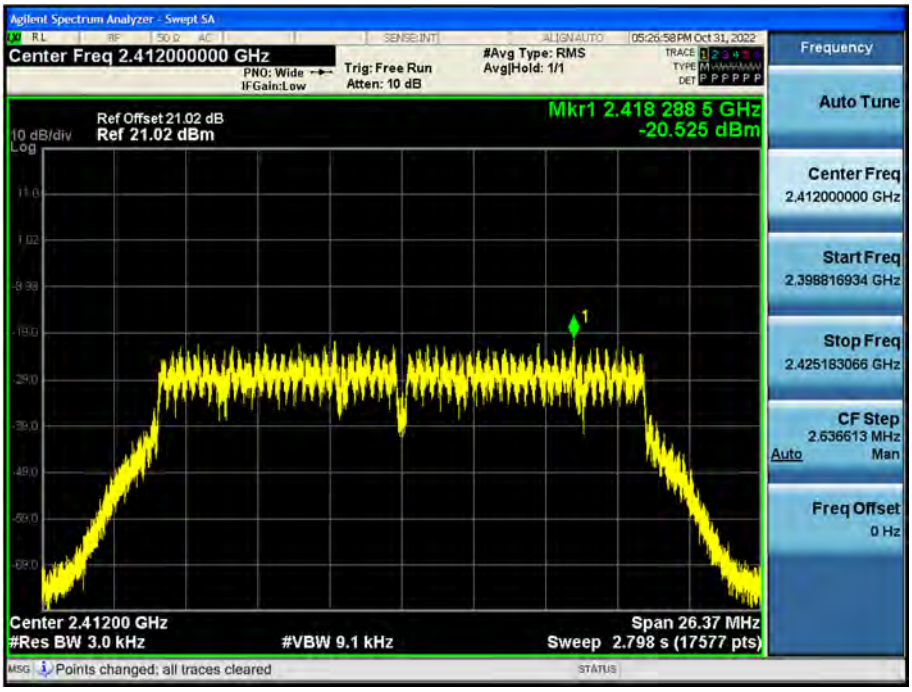
▣ Test Plots

Power Spectral Density (802.11b-CH 1)



Power Spectral Density (802.11g-CH 1)

Power Spectral Density (802.11n_HT20 –CH 1)



Note :

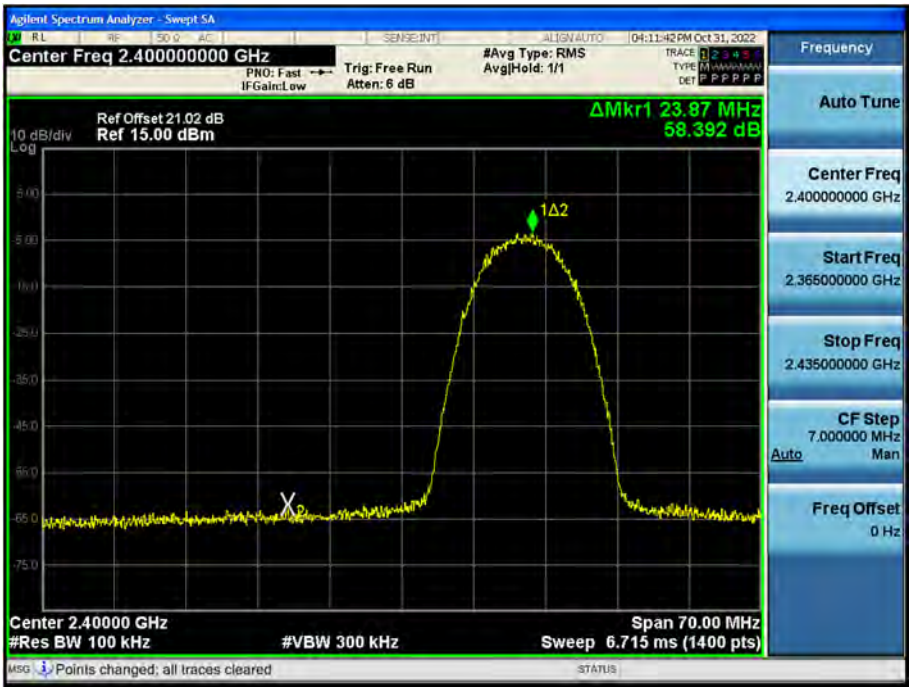
In order to simplify the report, attached plots were only the worst case PSD channel.

9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

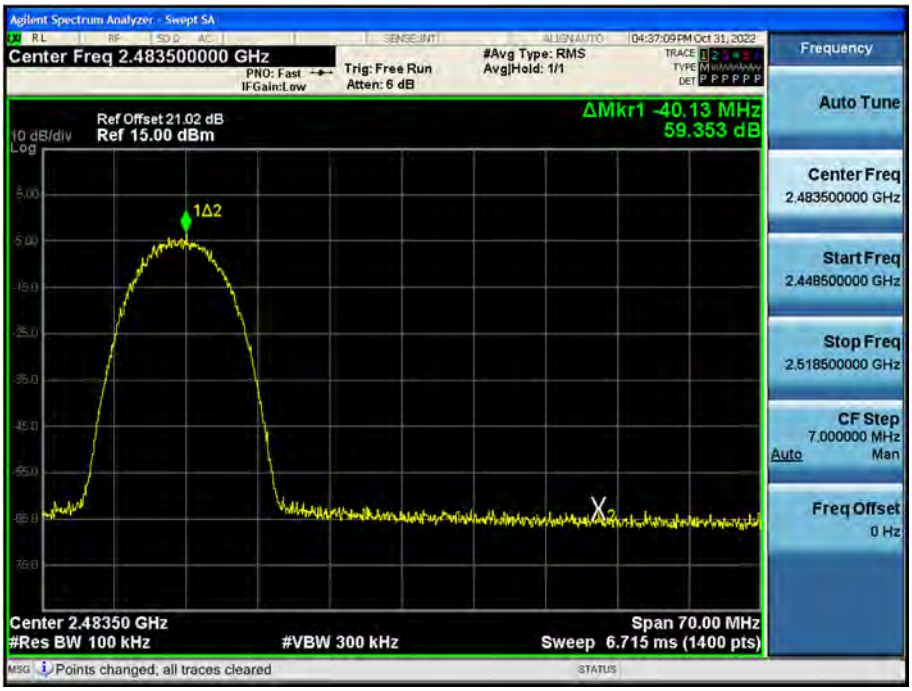
Test Result : please refer to the plot below.
In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ Test Plots(BandEdge)

Band Edge (802.11b-CH1)



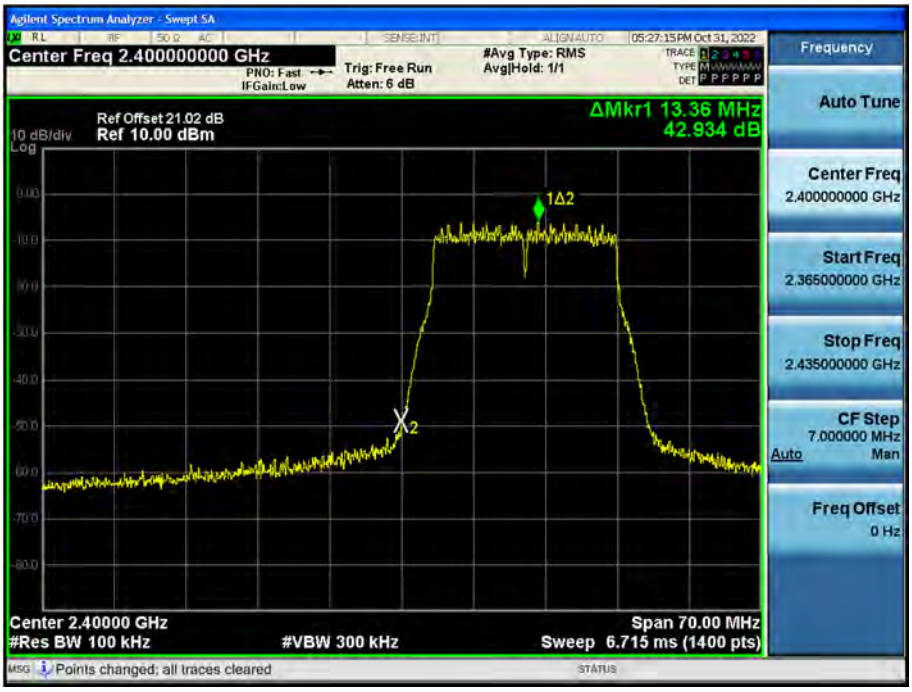
Band Edge (802.11b-CH11)



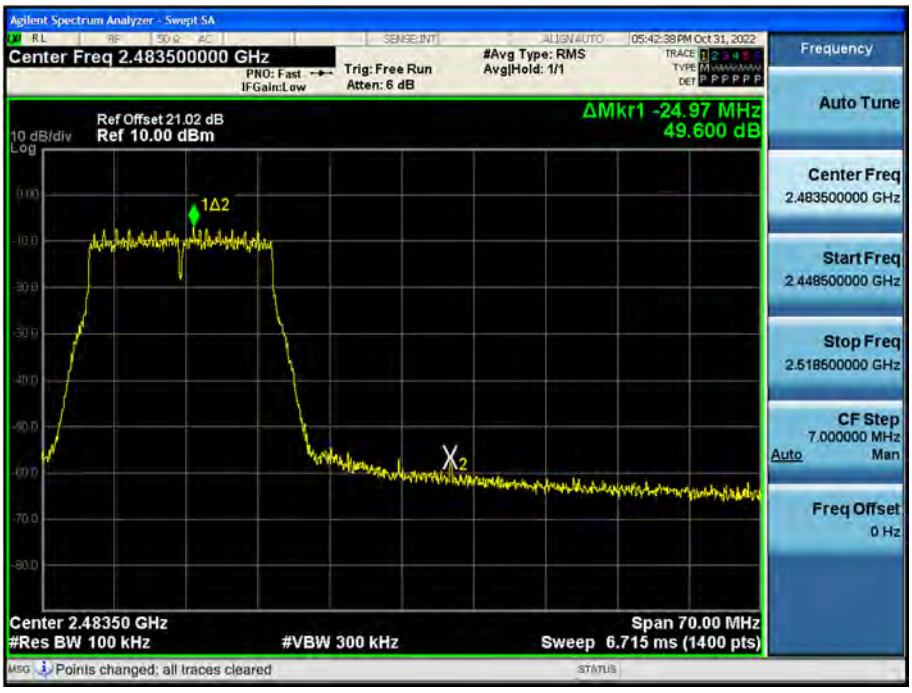
Band Edge (802.11g-CH1)

Band Edge (802.11g-CH11)

Band Edge (802.11n_HT20 -CH1)



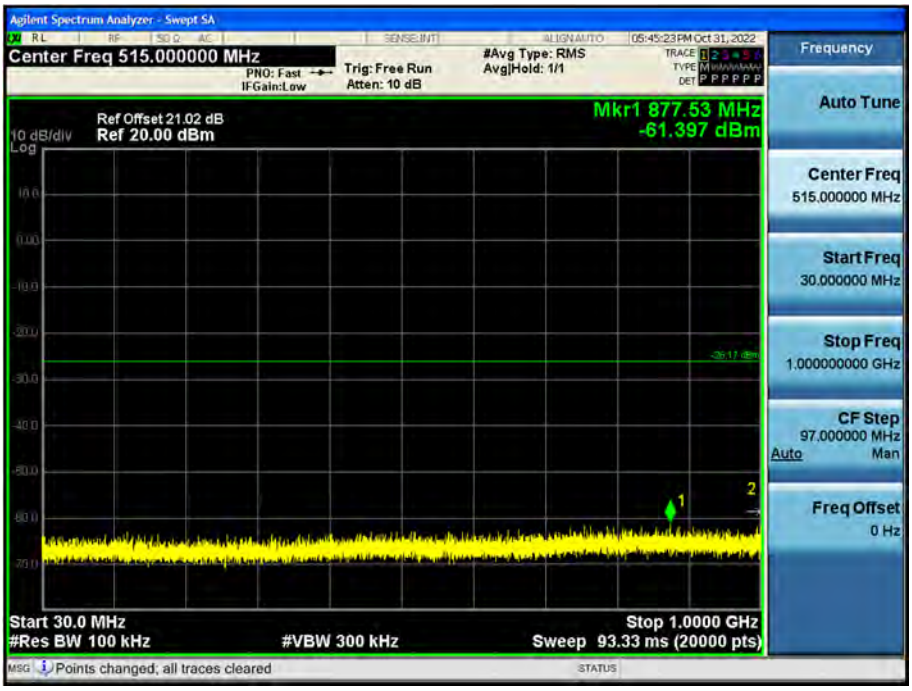
Band Edge (802.11n_HT20 -CH11)



▣ Test Plots(Conducted Spurious Emission)

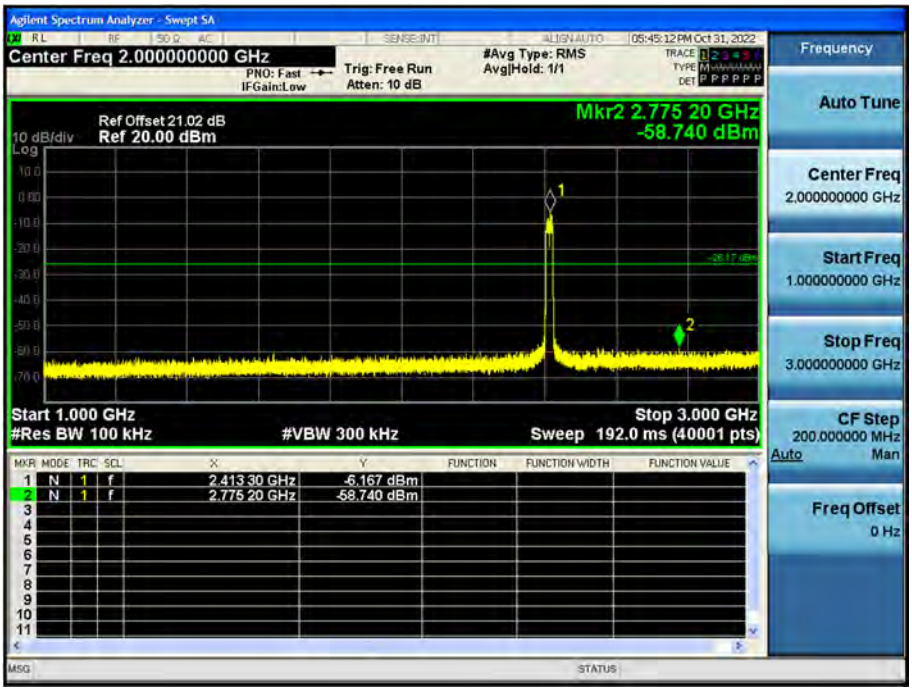
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



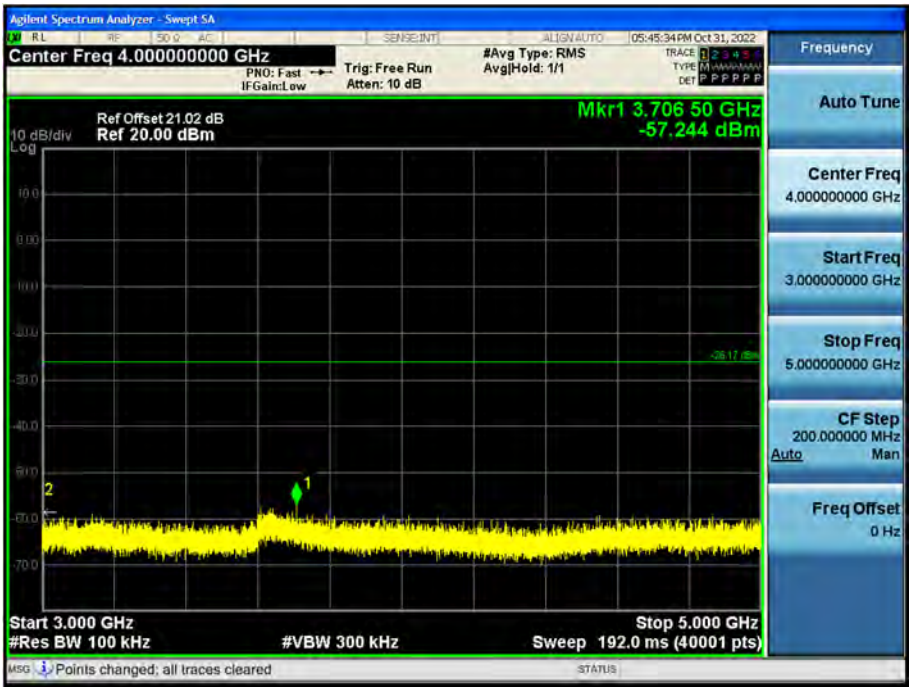
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



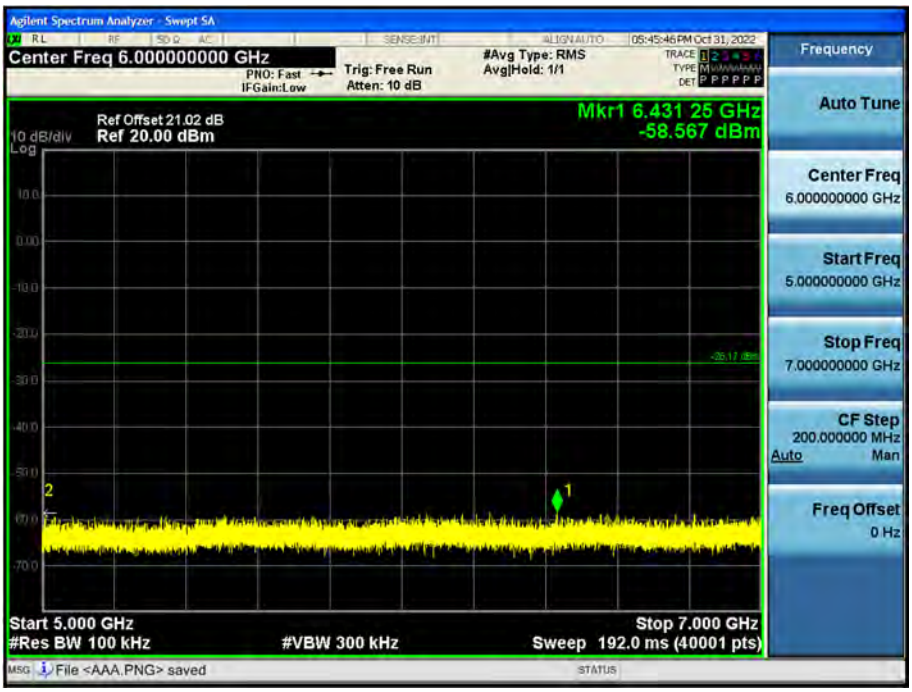
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



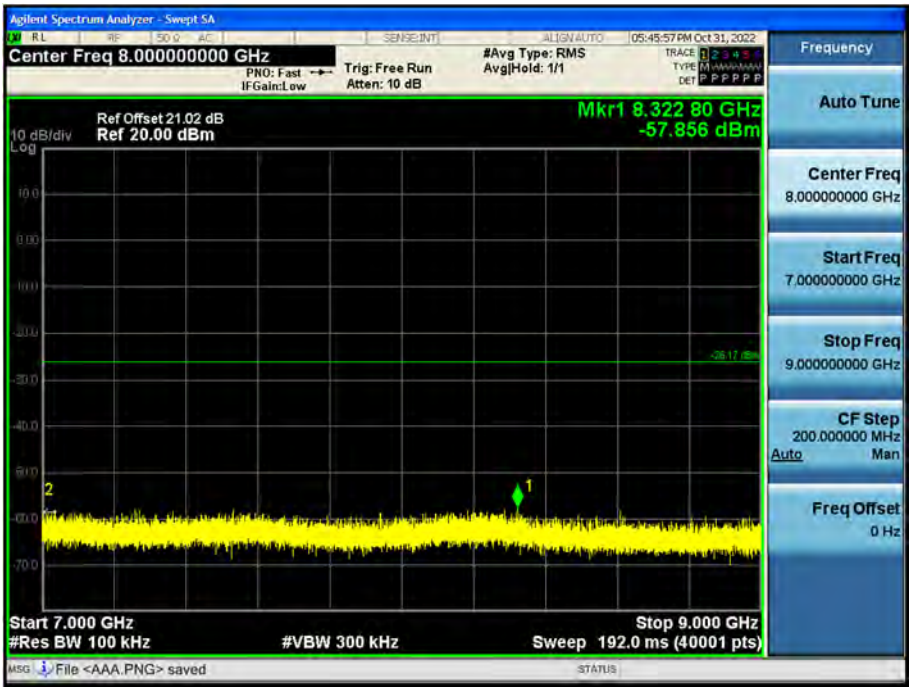
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



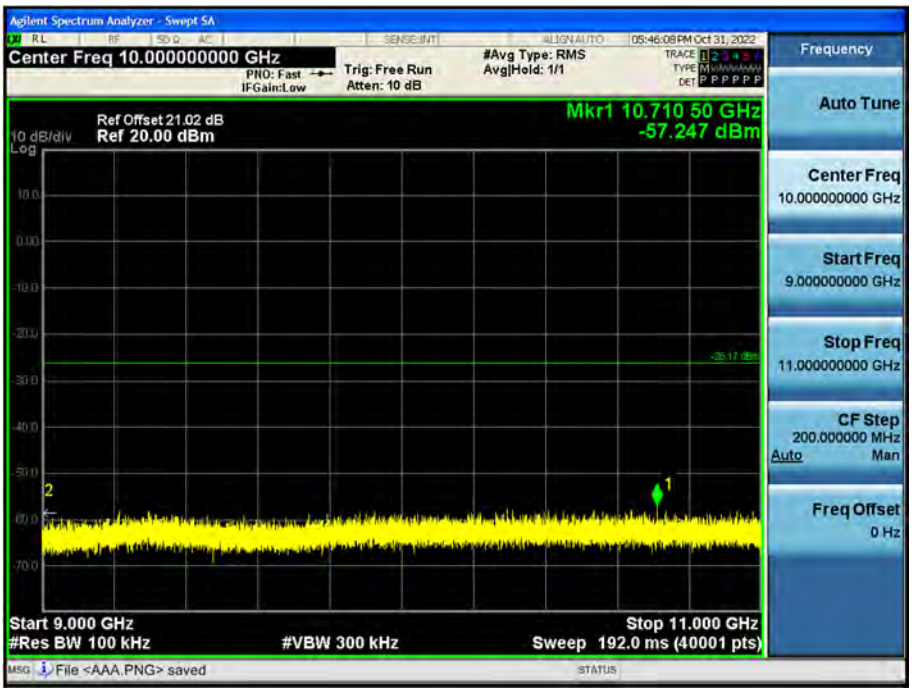
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



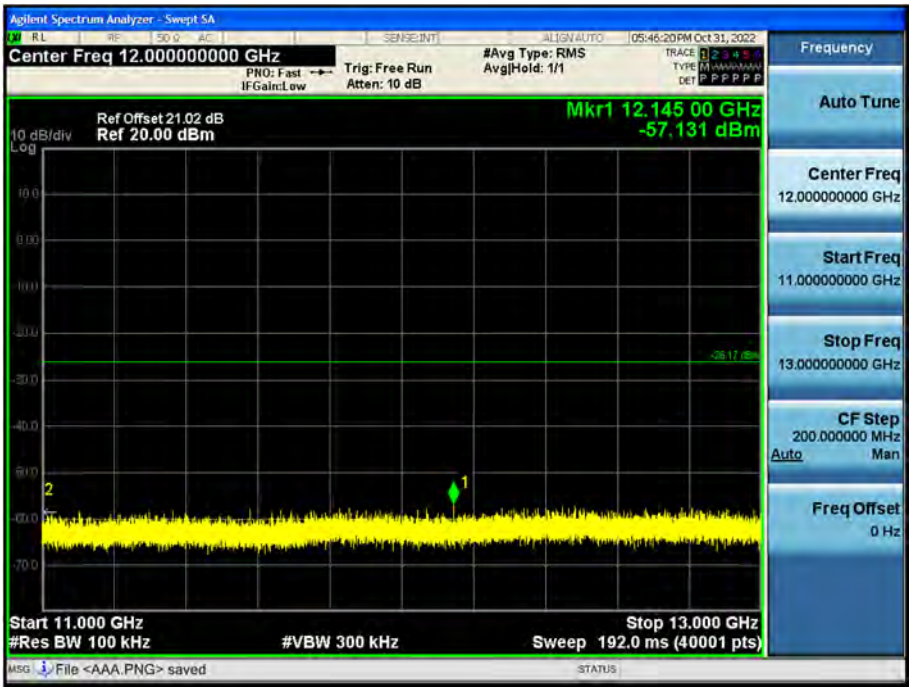
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



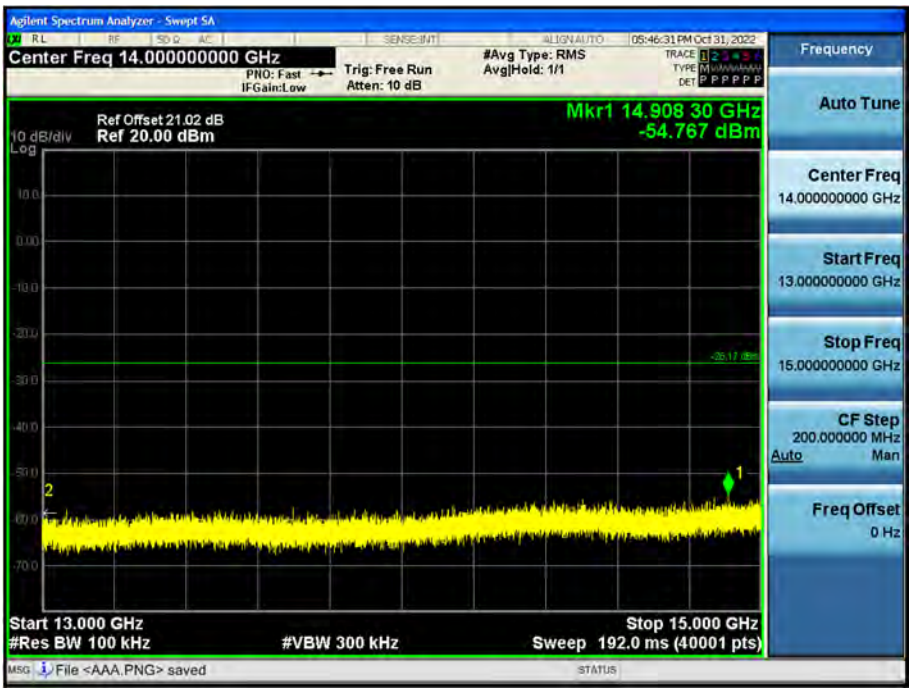
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



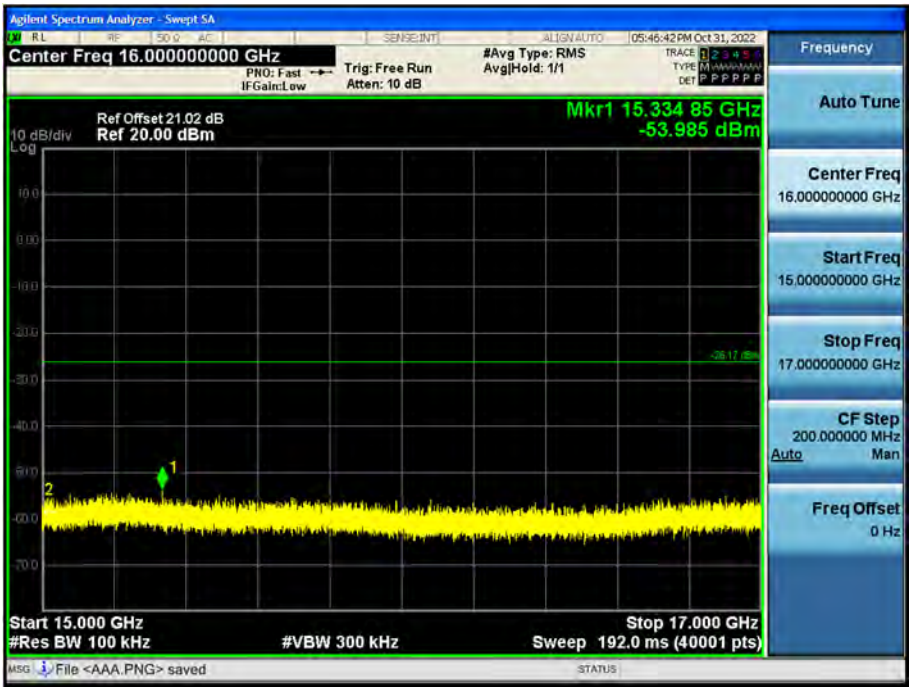
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



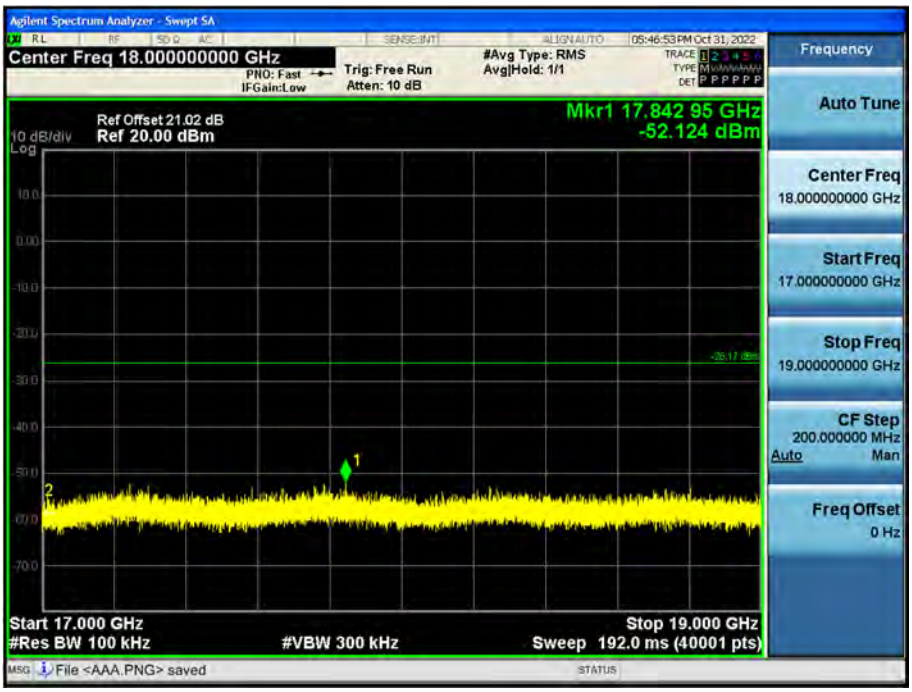
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



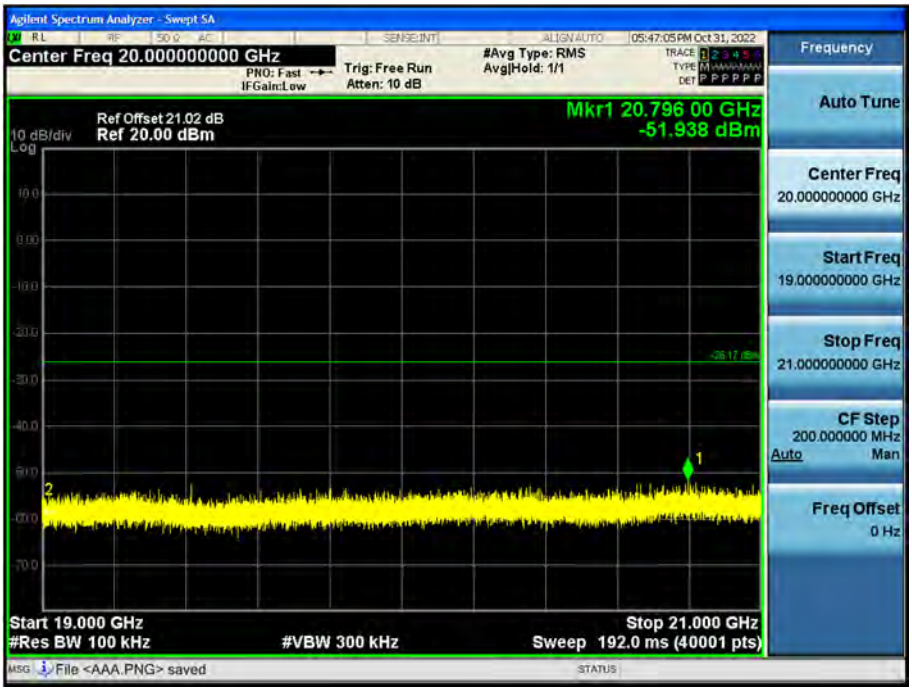
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



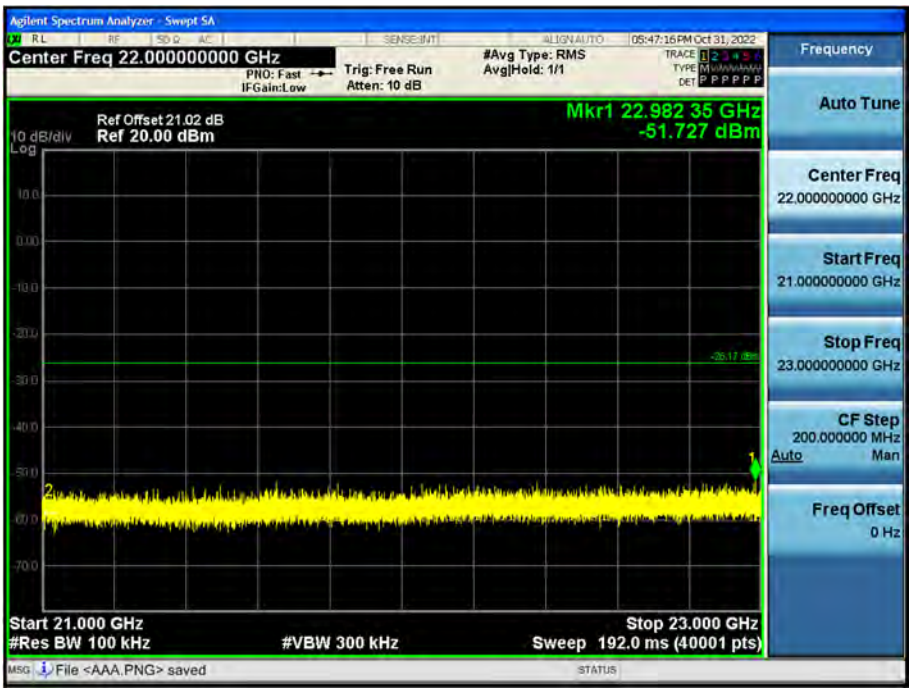
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



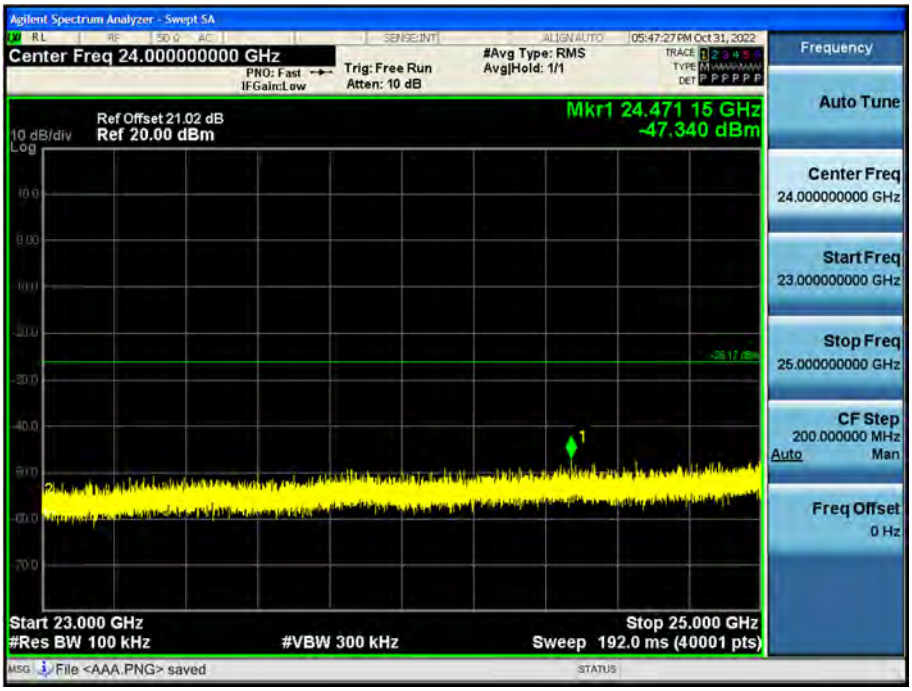
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11n_HT20_Ch.1_MCS6)



Note:

Limit : -26.17 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	dBm/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	dBm/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
Channel No.	01 Ch

Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4824	41.73	4.02	V	45.75	73.98	28.23	PK
4824	29.75	4.02	V	33.77	53.98	20.21	AV
7236	39.22	11.57	V	50.79	73.98	23.19	PK
7236	27.78	11.57	V	39.35	53.98	14.63	AV
4824	41.69	4.02	H	45.71	73.98	28.27	PK
4824	29.66	4.02	H	33.68	53.98	20.30	AV
7236	39.40	11.57	H	50.97	73.98	23.01	PK
7236	27.92	11.57	H	39.49	53.98	14.49	AV

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

Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4874	42.01	4.25	V	46.26	73.98	27.72	PK
4874	29.71	4.25	V	33.96	53.98	20.02	AV
7311	40.11	12.01	V	52.12	73.98	21.86	PK
7311	28.33	12.01	V	40.34	53.98	13.64	AV
4874	41.89	4.25	H	46.14	73.98	27.84	PK
4874	29.65	4.25	H	33.90	53.98	20.08	AV
7311	40.21	12.01	H	52.22	73.98	21.76	PK
7311	28.45	12.01	H	40.46	53.98	13.52	AV

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

Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4924	41.61	4.41	V	46.02	73.98	27.96	PK
4924	29.95	4.41	V	34.36	53.98	19.62	AV
7386	39.33	11.96	V	51.29	73.98	22.69	PK
7386	28.12	11.96	V	40.08	53.98	13.90	AV
4924	41.53	4.41	H	45.94	73.98	28.04	PK
4924	29.81	4.41	H	34.22	53.98	19.76	AV
7386	39.45	11.96	H	51.41	73.98	22.57	PK
7386	28.22	11.96	H	40.18	53.98	13.80	AV

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

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4824	41.99	0.000	4.02	V	46.01	73.98	27.97	PK
4824	29.67	0.214	4.02	V	33.90	53.98	20.08	AV
7236	43.29	0.000	11.57	V	54.86	73.98	19.12	PK
7236	27.04	0.214	11.57	V	38.82	53.98	15.16	AV
4824	41.88	0.000	4.02	H	45.90	73.98	28.08	PK
4824	29.55	0.214	4.02	H	33.78	53.98	20.20	AV
7236	43.52	0.000	11.57	H	55.09	73.98	18.89	PK
7236	27.15	0.214	11.57	H	38.93	53.98	15.05	AV

Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4874	41.69	0.000	4.25	V	45.94	73.98	28.04	PK
4874	29.75	0.214	4.25	V	34.21	53.98	19.77	AV
7311	41.55	0.000	12.01	V	53.56	73.98	20.42	PK
7311	26.95	0.214	12.01	V	39.17	53.98	14.81	AV
4874	41.53	0.000	4.25	H	45.78	73.98	28.20	PK
4874	29.66	0.214	4.25	H	34.12	53.98	19.86	AV
7311	41.62	0.000	12.01	H	53.63	73.98	20.35	PK
7311	27.12	0.214	12.01	H	39.34	53.98	14.64	AV

Operation Mode:	802.11g
Transfer MCS Index:	6 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
4924	41.79	0.000	4.41	V	46.20	73.98	27.78	PK
4924	29.99	0.214	4.41	V	34.61	53.98	19.37	AV
7386	40.84	0.000	11.96	V	52.80	73.98	21.18	PK
7386	26.99	0.214	11.96	V	39.16	53.98	14.82	AV
4924	41.69	0.000	4.41	H	46.10	73.98	27.88	PK
4924	27.79	0.214	4.41	H	32.41	53.98	21.57	AV
7386	40.99	0.000	11.96	H	52.95	73.98	21.03	PK
7386	27.15	0.214	11.96	H	39.32	53.98	14.66	AV

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

Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4824	41.95	0.000	4.02	V	45.97	73.98	28.01	PK
4824	29.69	0.224	4.02	V	33.93	53.98	20.05	AV
7236	44.42	0.000	11.57	V	55.99	73.98	17.99	PK
7236	26.98	0.224	11.57	V	38.77	53.98	15.21	AV
4824	41.85	0.000	4.02	H	45.87	73.98	28.11	PK
4824	26.51	0.224	4.02	H	30.75	53.98	23.23	AV
7236	44.51	0.000	11.57	H	56.08	73.98	17.90	PK
7236	27.01	0.224	11.57	H	38.80	53.98	15.18	AV

Operation Mode:	802.11n(HT20)
Transfer MCS Index:	0
Operating Frequency	2437
Channel No.	06 Ch

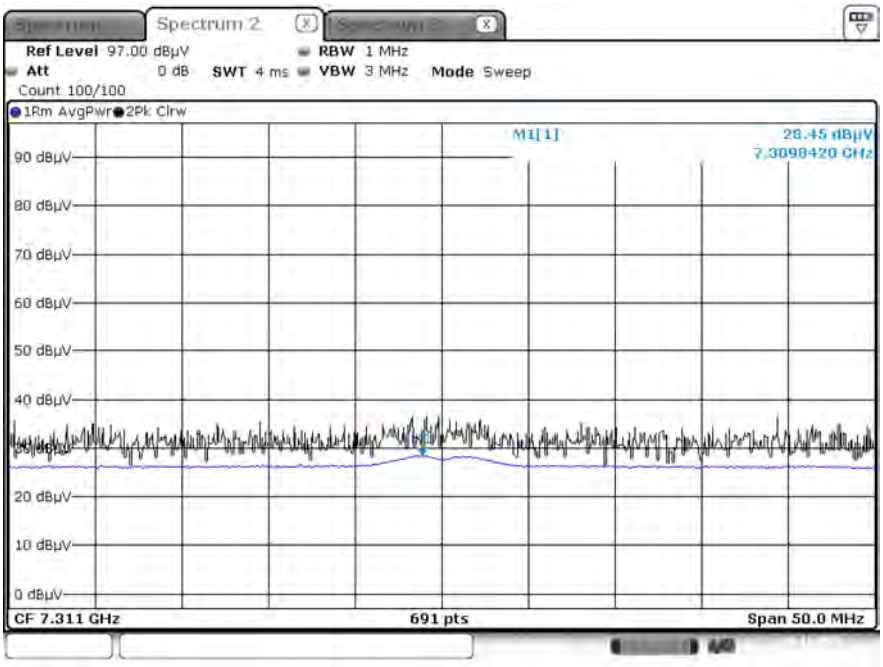
Frequency	Measured Value l	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4874	41.74	0.000	4.25	V	45.99	73.98	27.99	PK
4874	29.79	0.224	4.25	V	34.26	53.98	19.72	AV
7311	43.02	0.000	12.01	V	55.03	73.98	18.95	PK
7311	27.12	0.224	12.01	V	39.35	53.98	14.63	AV
4874	41.59	0.000	4.25	H	45.84	73.98	28.14	PK
4874	29.67	0.224	4.25	H	34.14	53.98	19.84	AV
7311	43.06	0.000	12.01	H	55.07	73.98	18.91	PK
7311	27.22	0.224	12.01	H	39.45	53.98	14.53	AV

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

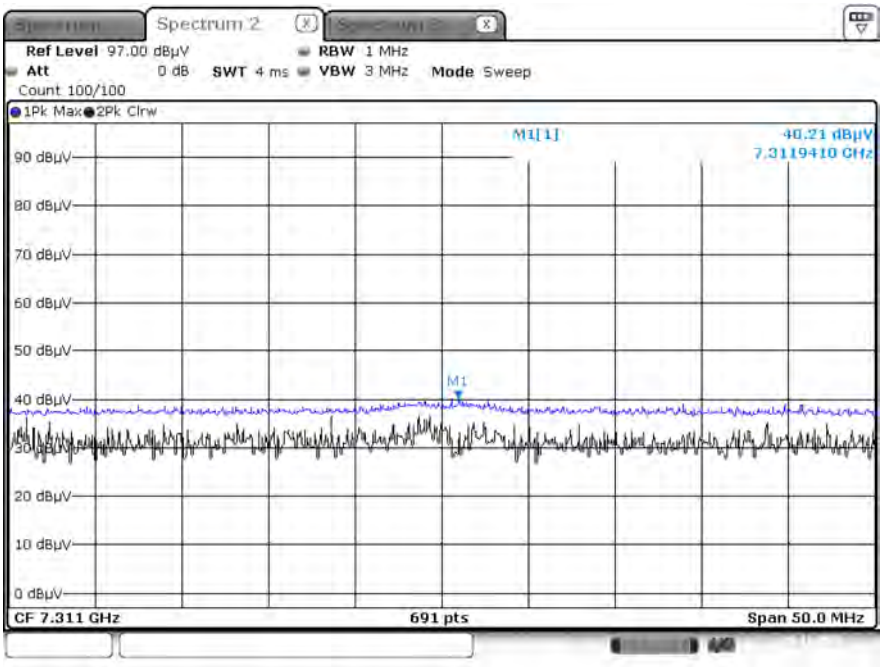
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB]	[dB/m]	[H/V]	[dBµV/m]	[dBµV/m]	[dB]	
4924	41.81	0.000	4.41	V	46.22	73.98	27.76	PK
4924	29.55	0.224	4.41	V	34.18	53.98	19.80	AV
7386	41.01	0.000	11.96	V	52.97	73.98	21.01	PK
7386	27.09	0.224	11.96	V	39.27	53.98	14.71	AV
4924	41.69	0.000	4.41	H	46.10	73.98	27.88	PK
4924	29.43	0.224	4.41	H	34.06	53.98	19.92	AV
7386	41.12	0.000	11.96	H	53.08	73.98	20.90	PK
7386	27.23	0.224	11.96	H	39.41	53.98	14.57	AV

▣ **Test Plots (Worst case : X-H)**

Radiated Spurious Emissions plot – Average Result (802.11b, Ch.6 3rd Harmonic)



Radiated Spurious Emissions plot – Peak Result (802.11b, Ch.6 3rd Harmonic)



Note:

Plot 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	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	47.69	2.45	H	50.14	73.98	23.84	PK
2390.0	35.33	2.45	H	37.78	53.98	16.20	AV
2390.0	47.88	2.45	V	50.33	73.98	23.65	PK
2390.0	35.45	2.45	V	37.90	53.98	16.08	AV
2483.5	47.78	2.65	H	50.43	73.98	23.55	PK
2483.5	35.11	2.65	H	37.76	53.98	16.22	AV
2483.5	47.91	2.65	V	50.56	73.98	23.42	PK
2483.5	35.21	2.65	V	37.86	53.98	16.12	AV

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

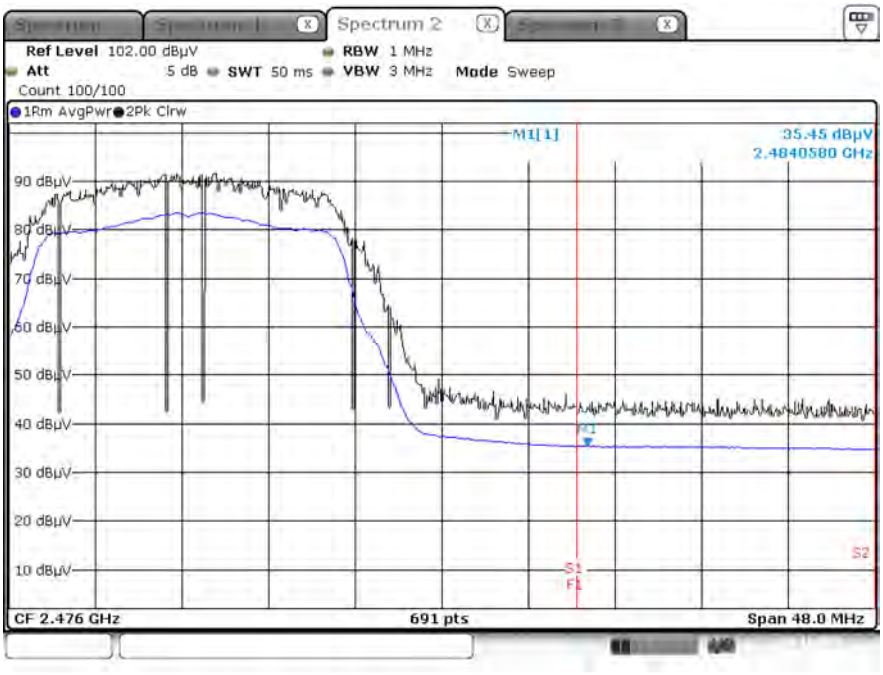
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	47.52	0.000	2.45	H	49.97	73.98	24.01	PK
2390.0	35.31	0.214	2.45	H	37.97	53.98	16.01	AV
2390.0	47.63	0.000	2.45	V	50.08	73.98	23.90	PK
2390.0	35.55	0.214	2.45	V	38.21	53.98	15.77	AV
2483.5	47.88	0.000	2.65	H	50.53	73.98	23.45	PK
2483.5	35.33	0.214	2.65	H	38.19	53.98	15.79	AV
2483.5	47.98	0.000	2.65	V	50.63	73.98	23.35	PK
2483.5	35.45	0.214	2.65	V	38.31	53.98	15.67	AV

Operation Mode:	802.11n (HT20)
Transfer Rate:	MCS0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

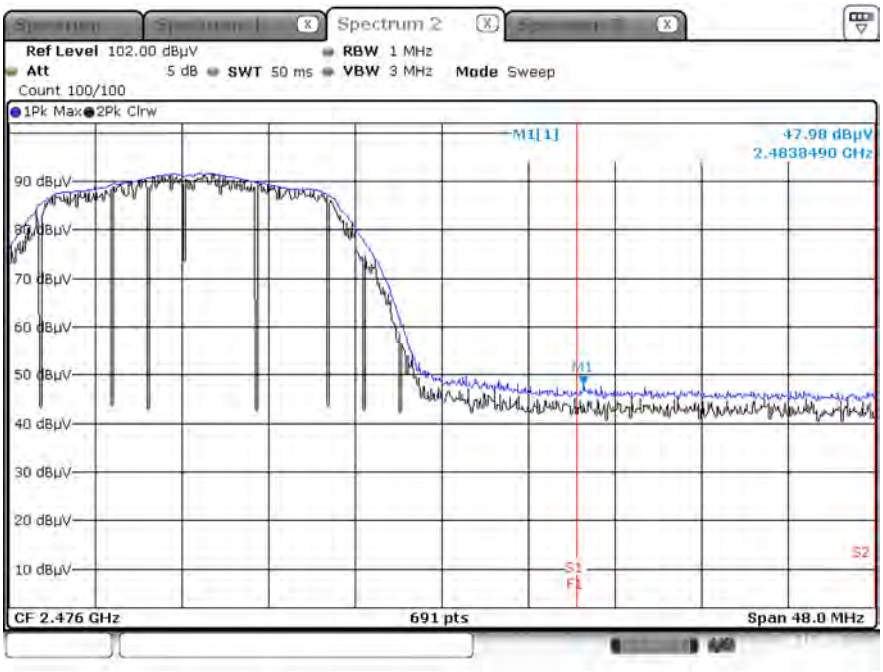
Frequency	Measured Value	Duty Cycle Factor	A.F+C.L-A.G+ ATT+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	48.44	0.000	2.45	H	50.89	73.98	23.09	PK
2390.0	35.23	0.224	2.45	H	37.90	53.98	16.08	AV
2390.0	48.59	0.000	2.45	V	51.04	73.98	22.94	PK
2390.0	35.51	0.224	2.45	V	38.18	53.98	15.80	AV
2483.5	47.51	0.000	2.65	H	50.16	73.98	23.82	PK
2483.5	35.29	0.224	2.65	H	38.16	53.98	15.82	AV
2483.5	47.73	0.000	2.65	V	50.38	73.98	23.60	PK
2483.5	35.33	0.224	2.65	V	38.20	53.98	15.78	AV

▣ Test Plots

Radiated Restricted Band Edges plot – Average Result (802.11g Ch.11, X-V)



Radiated Restricted Band Edges plot – Peak Result (802.11g Ch.11, X-V)



Note:

Plot of worst case are only reported.

9.8 RECEIVER SPURIOUS EMISSIONS

Frequency Range : Below 1 GHz

Frequency	Measured Value	A.F + C.L	Ant. POL	Total	Limit	Margin
MHz	dBμV	dBm/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	Ant. POL	Total	Limit	Margin
MHz	dBμV	dBm/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	08/22/2023	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	06/07/2023	Annual
Temperature Chamber	SU-642	ESPEC	0093008124	03/04/2023	Annual
Signal Analyzer	N9030A	Agilent	MY49432108	03/08/2023	Annual
Power Measurement Set	OSP 120	Rohde & Schwarz	101231	06/14/2023	Annual
Power Meter	N1911A	Agilent	MY45100523	03/24/2023	Annual
Power Sensor	N1921A	Agilent	MY57820067	03/24/2023	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/02/2023	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/03/2023	Annual
DC Power Supply	E3632A	Agilent	KR75303243	04/25/2023	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	03/07/2023	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

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	N/A	N/A	N/A
EM1000 / Controller	EM1000	Audix	060520	N/A	N/A
Turn Table	N/A	Audix	N/A	N/A	N/A
Amp & Filter Bank Switch Controller	FBSM-01B	TNM system	TM19050002	N/A	N/A
Loop Antenna	1513	Schwarzbeck	1513-333	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1300	01/18/2024	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	04/12/2023	Biennial
Spectrum Analyzer	FSV (10 Hz ~ 40 GHz)	Rohde & Schwarz	101055	05/16/2023	Annual
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/06/2023	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/13/2023	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/13/2023	Annual
High Pass Filter(7 GHz ~ 18 GHz)	WHKX10-7150-8000-18000-50SS	Wainwright Instruments	1	03/11/2023	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/11/2023	Annual
HPF(3~18GHz) + LNA1(1~18GHz)	FMSR-05B	TNM system	F6	01/19/2023	Annual
ATT(10dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/19/2023	Annual
ATT(3dB) + LNA1(1~18GHz)	FMSR -05B	TNM system	None	01/19/2023	Annual
LNA1(1~18GHz)	FMSR -05B	TNM system	25540	01/19/2023	Annual
HPF(7~18GHz) + LNA2(6~18GHz)	FMSR -05B	TNM system	28550	01/19/2023	Annual
Thru(30MHz ~ 18GHz)	FMSR -05B	TNM system	None	01/19/2023	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-2211-FI005-P