

TEST REPORT

FCC DTS Test for SM-S721U
Certification

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-2407-FC011

DATE OF ISSUE
July 18, 2024

Tested by
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TEST REPORT

REPORT NO.

HCT-RF-2407-FC011

DATE OF ISSUE

July 18, 2024

Additional Model

SM-S721U1

Applicant

SAMSUNG Electronics Co., Ltd.

129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

**Product Name
Model Name**

Mobile Phone
SM-S721U

FCC ID

A3LSMS721U

Average Output Power

SISO(Ant.1) : 19.22 dBm
SISO(Ant.2) : 19.02 dBm
MIMO_CDD (Ant.1+ Ant.2) : 19.95 dBm

Date of Test

May 20, 2024 ~ July 18, 2024

FCC Classification

Digital Transmission System(DTS)

Test Standard Used

FCC Rule Part(s): Part 15.247

Test Results

PASS

Location of Test

☒ Permanent Testing Lab ☐ On Site Testing Lab

(Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	July 18, 2024	Initial Release

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 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).

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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1. EUT DESCRIPTION

Model	SM-S721U	
Additional Model	SM-S721U1	
EUT Type	Mobile Phone	
Power Supply	DC 3.88 V	
Frequency Range	2 412 MHz ~ 2 462 MHz	
Max. RF Output Power	<u>Average Power</u>	SISO(Ant.1) : 19.22 dBm SISO(Ant.2) : 19.02 dBm MIMO_CDD (Ant.1+ Ant.2) : 19.95 dBm
	<u>Peak Power</u>	SISO(Ant.1) : 25.21 dBm SISO(Ant.2) : 25.06 dBm MIMO_CDD (Ant.1+ Ant.2) : 28.08 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n, 802.11ac	
Number of Channels	11 Channels	
Antenna Specification	Type: Metal	
Serial number	Conducted : R3CX40SW7YH Radiated : 67d50971db197ece	

ANTENNA CONFIGURATIONS

1. Antenna configuration

Configurations	SISO		MIMO	
	Ant1	Ant2	CDD	SDM
802.11b	O	O	X	X
802.11g	O	O	O	X
802.11n(HT20)	O	O	O	O
802.11ac(VHT20)	O	O	O	O

Note:

- (1) O = Support, X = Not Support
- (2) SISO = Single Input Single Output
- (3) SDM = Spatial Diversity Multiplexing
- (4) CDD = Cyclic Delay Diversity

2.This device supports simultaneous transmission operation, which allows for two channels to operate independent of one another in the 2.4 GHz and 5 GHz or 6GHz Bands simultaneously on each antenna.

RSDB Scenario	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5 GHz WiFi Ant.1	5 GHz WiFi Ant.2	6 GHz WiFi Ant.1	6 GHz WiFi Ant.2	BT Ant.1	BT Ant.2	Test Case
Dual Bluetooth + 5 GHz WiFi MIMO			on	on			on	on	Scenario1
Dual Bluetooth + 6 GHz WiFi MIMO					on	on	on	on	
2.4 GHz WiFi MIMO + 5 GHz WiFi MIMO	on	on	on	on					Scenario2
2.4 GHz WiFi MIMO + 6 GHz WiFi MIMO	on	on			on	on			
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO		on	on	on			on		Scenario3
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 6 GHz WiFi MIMO		on			on	on	on		

3. Directional Gain Calculation

According to KDB 662911 D01 Multiple Transmitter Output v02r01 F) 2) e) (iii), f) ii)

$$\text{Directional Gain(CDD)} = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{k=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right]$$

$$\text{Directional gain(SDM)} = G_{\max} + 10 \cdot \text{LOG}(N_{ANT} / N_{SS})$$

Ant Gain (dBi)		N _{ANT} / N _{ss}	Directional Gain (dBi)	
			CDD	SDM
ANT.1	-1.58	2/2	-0.03	-1.58
ANT.2	-4.79			

Note

According to ANSI C63.10-2013 section 14.4.3, the directional gain is calculated using the formula, where G_N is the gain of the nth antenna and N_{ANT} is the total number of antennas used.

$$\text{Directional gain(CDD)} = 10 \cdot \log \left(\left(\frac{10^{(\text{ANT.0 Gain}/20)} + 10^{(\text{ANT.1 Gain}/20)} \right)^2 / 2 \right) \text{ dBi}$$

$$\text{Directional gain(SDM)} = G_{\max} + 10 \cdot \log(N_{ANT} / N_{SS})$$

Sample MIMO Calculation:

Ex) ANT.1 : 11.58 dBm ANT.2 : 12.08 dBm

$$\text{MIMO} = \text{ANT.1} + \text{ANT.2}$$

$$(11.58 \text{ dBm} + 12.08 \text{ dBm}) = (14.387 \text{ mW} + 16.143 \text{ mW}) = 30.53 \text{ mW} = 14.88 \text{ dBm}$$

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.

GENERAL TEST PROCEDURES

Conducted Emissions

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

Radiated Emissions

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

DESCRIPTION OF TEST MODES

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

3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

4. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated March 11, 2024 (Registration Number: 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.

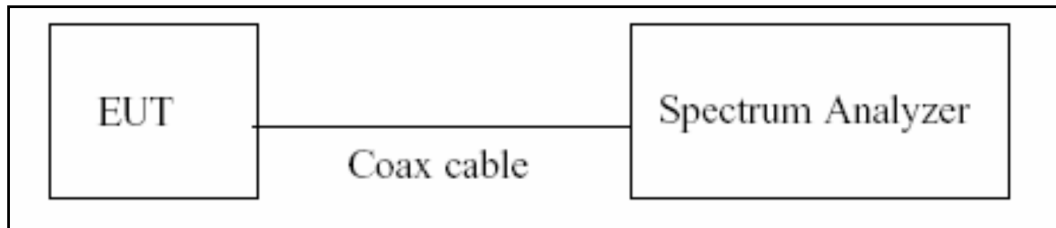
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	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 %, $k=2$)

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 $T \leq 6.25$ 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 $> 50/T$.

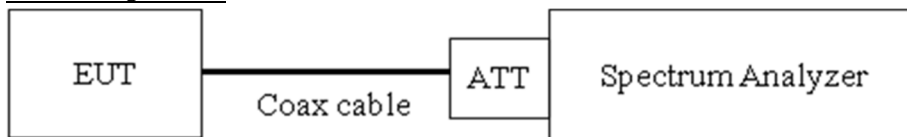
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz or 50 MHz ($\geq$ RBW)
3. SPAN = 0 Hz
4. Detector = Average
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = $T_{\text{on}} / T_{\text{total}}$ and Duty Cycle Factor = $10\log(1/\text{Duty Cycle})$

7.2. 6 dB 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 $\geq 3 \times$ 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.

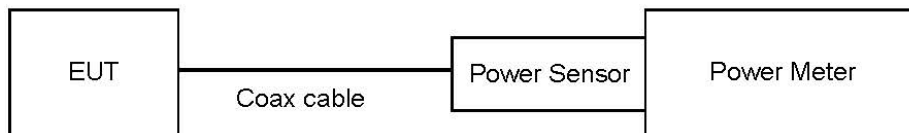
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

7.3. Output Power

Limit

The maximum permissible conducted output power is 1 Watt.

Test Configuration



Test Procedure

The transmitter output is connected to the Power Meter.

- Peak Power (Procedure 11.9.1.3 in ANSI 63.10-2013)
 - : Measure the peak power of the transmitter.
- Average Power (Procedure 11.9.2.3 in ANSI 63.10-2013)
 - 1) Measure the duty cycle.
 - 2) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
 - 3) Add $10 \log (1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Sample Calculation

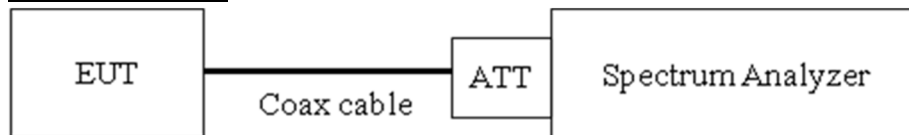
- Conducted Output Power(Peak) = Measured Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

7.4. Power Spectral Density

Limit

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

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

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

The spectrum analyzer is set to :

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set span to at least 1.5 times the OBW.
- 3) $RBW = 3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$.
- 4) $VBW \geq 3 \times RBW$.
- 5) Sweep = auto couple
- 6) Detector = power averaging (rms) or sample detector (when rms not available).
- 7) Ensure that the number of measurement points in the sweep $\geq [2 \times \text{span} / RBW]$.
- 8) Employ trace averaging (rms) mode over a minimum of 100 traces
- 9) Use the peak marker function to determine the maximum amplitude level.
- 10) Use the peak marker function to determine the maximum amplitude level within the RBW.

If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

- 11) if then duty factor shall be added to adjust the result if the duty cycle is less than 98 %

Sample Calculation

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

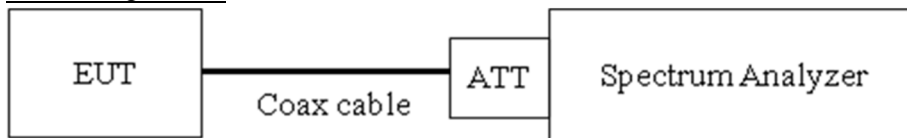
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

Limit

The maximum conducted (Average) 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 relative to the maximum in-band peak PSD level in 100 kHz.

[Conducted > 30 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 $\geq 3 \times$ 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 $\geq 2 \times$ 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	10.04
100	10.20
200	10.23
300	10.22
400	10.23
500	10.41
600	10.44
700	10.58
800	10.60
900	10.70
1 000	10.71
2 000	10.73
2 400	10.84
2 500	10.84
3 000	10.99
4 000	10.98
5 000	11.97
6 000	11.97
7 000	12.08
8 000	12.11
9 000	12.25
10 000	12.26
11 000	12.41
12 000	12.43
13 000	12.58
14 000	12.61
15 000	12.75
16 000	12.80
17 000	12.81
18 000	12.86
19 000	12.84
20 000	12.91
21 000	12.92
22 000	12.98
23 000	13.01
24 000	13.01
25 000	13.05
26 000	13.13

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

2. Factor = Attenuator loss + Cable loss

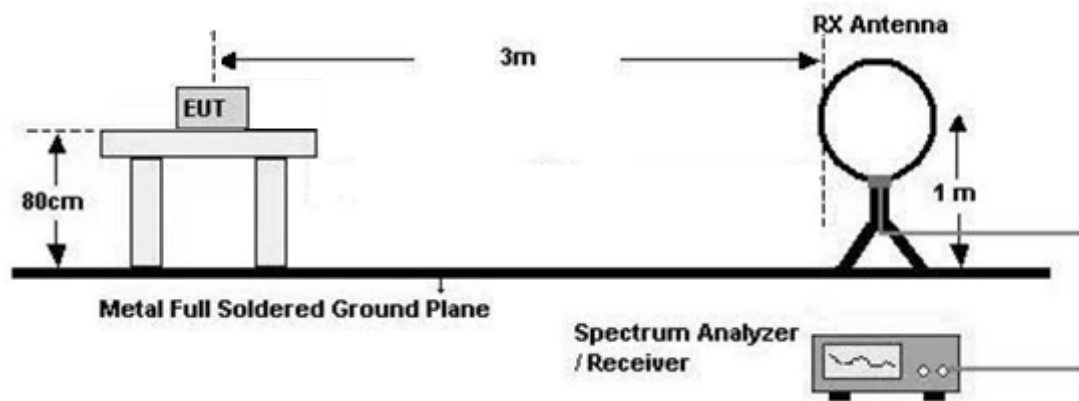
7.6. Radiated Test

Limit

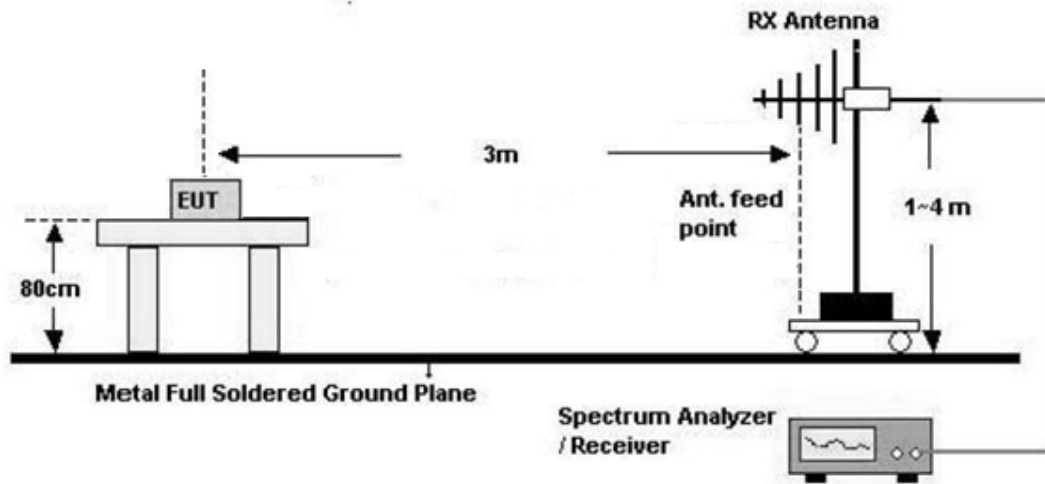
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

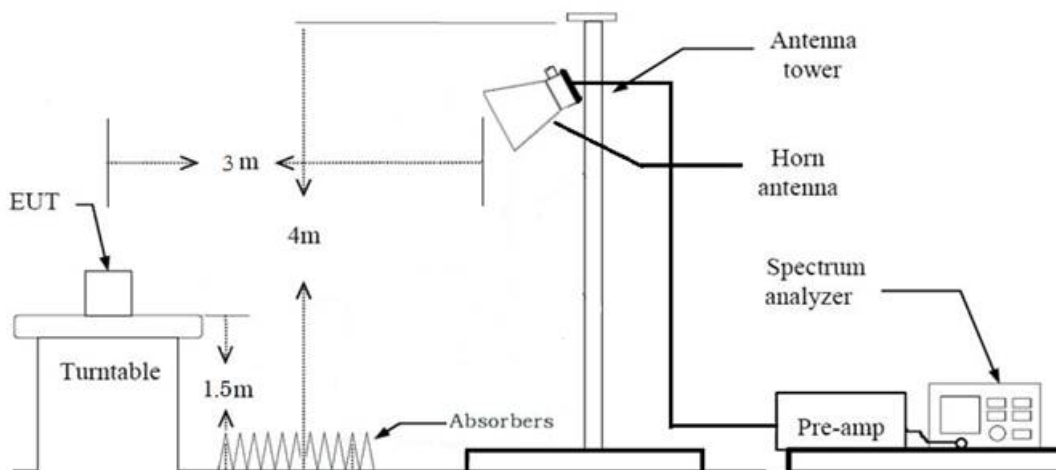
Below 30 MHz



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) = $40\log(3\text{ m}/300\text{ m}) = -80\text{ dB}$
Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) = $40\log(3\text{ m}/30\text{ m}) = -40\text{ dB}$
Measurement Distance : 3 m
8. Spectrum Setting
 - Frequency Range = 9 kHz ~ 30 MHz
 - Detector = Peak
 - Trace = Maxhold
 - RBW = 9 kHz
 - VBW $\geq 3 \times$ RBW
9. Total = Measured value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

KDB 414788 OFS and Chamber Correlation Justification

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

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

Test Procedure of Radiated spurious emissions (Below 1 GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8 m above ground plane.
3. The Hybrid antenna was placed at a location 3 m from the EUT, which is varied from 1 m to 4 m to find out the highest emissions.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

6. Spectrum Setting**(1) Measurement Type(Peak):**

- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 100 kHz
- VBW $\geq 3 \times$ RBW

(2) Measurement Type(Quasi-peak):

- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Quasi-Peak
- RBW = 120 kHz

In general, (1) is used mainly

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

Test Procedure of Radiated spurious emissions (Above 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Maxhold
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW

(2) Measurement Type(Average): Duty cycle $\geq 98 \%$

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).

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

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

10. Distance extrapolation factor = $20\log(\text{test distance} / \text{specific distance})$ (dB)

11. Total(Measurement Type : Peak)

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

Total(Measurement Type : Average, Duty cycle $\geq 98 \%$)

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

Total(Measurement Type : Average, Duty cycle $< 98 \%$)

= Measured value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.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. 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 $\geq 3 \times$ RBW

(2) Measurement Type(Average): Duty cycle $\geq 98 \%$,

- Measured Frequency Range : 2310 MHz ~ 2390 MHz / 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).

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

- Measured Frequency Range : 2310 MHz ~ 2390 MHz / 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW $\geq 3 \times$ RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the

emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.

- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

10. Distance extrapolation factor = $20\log(\text{test distance} / \text{specific distance})$ (dB)

11. Total (Measurement Type : Peak)

= Peak Measured Value

Total(Measurement Type : Average, Duty cycle $\geq 98\%$)

= Average Measured Value

Total(Measurement Type : Average, Duty cycle < 98 %)

= Average Measured Value + Duty Cycle Factor

- We apply to the offset in the range 1 GHz - 18 GHz.

- The offset = Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)

7.7. AC Power line Conducted Emissions

Limit

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

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)Decreases with the logarithm of the frequency.

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

Test Configuration

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

Test Procedure

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

Sample Calculation

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

7.8. 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 + External accessories(Earphone, etc)
- Worstcase : Stand alone

2. All Antenna of operation were investigated and the worst case results are reported

- Antenna Operation Type : SISO, MIMO_CDD(Ant.1+Ant.2), MIMO_SDM(Ant.1+Ant.2)
- Worstcase :

Mode	Antenna configuration
802.11b	SISO Ant.1, SISO Ant.2
802.11g, 802.11n(HT20), 802.11ac(VHT20)	MIMO_CDD(Ant.1+Ant.2)

3. EUT Axis

(1) SISO Ant.1

- Radiated Spurious Emissions : Y
- Radiated Restricted Band Edge : X

(2) SISO Ant.2

- Radiated Spurious Emissions : Y
- Radiated Restricted Band Edge : Y

(3) MIMO

- Radiated Spurious Emissions : Y
- Radiated Restricted Band Edge : X

4. Duty cycle factor applies only 802.11g/n (Duty cycle < 98 %).

5. All data rate of operation were investigated and the test results are worst case in lowest Data Rate of each mode.

- 802.11b : 1 Mbps
- 802.11g : 6 Mbps
- 802.11n(HT20): MCS0
- 802.11ac(VHT20): MCS0

6. 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

7. Radiated Spurious Emission

- All mode of operation were investigated and the worst case results are reported.
- Mode: 802.11b(SISO), 802.11g, 802.11n(HT20), 802.11ac(VHT20)
- Worst case: 802.11b(SISO), 802.11g

8. SM-S721U, SM-S721U1 were tested and the worst case results are reported.

(Worst case: SM-S721U)

Radiated test(RSDB)

1. All modes of operation were investigated and the worst case configuration results are reported.

- Mode : Stand alone, Stand alone + External accessories(Earphone, Keyboard, etc)
- Worstcase : Stand alone

2. EUT Axis

- Radiated Spurious Emissions : Y

3. All of RSDB Scenario were investigated and the worst case configuration results are reported.

RSDB Scenario	2.4 GHz WiFi Ant.1	2.4 GHz WiFi Ant.2	5 GHz WiFi Ant.1	5 GHz WiFi Ant.2	6 GHz WiFi Ant.1	6 GHz WiFi Ant.2	BT Ant.1	BT Ant.2	Test Case
Dual Bluetooth + 5 GHz WiFi MIMO			on	on			on	on	Scenario1
Dual Bluetooth + 6 GHz WiFi MIMO					on	on	on	on	
2.4 GHz WiFi MIMO + 5 GHz WiFi MIMO	on	on	on	on					Scenario2
2.4 GHz WiFi MIMO + 6 GHz WiFi MIMO	on	on			on	on			
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO		on	on	on			on		Scenario3
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 6 GHz WiFi MIMO		on			on	on	on		

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 10.6.2.

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 2	Description	2.4GHz Emission	5 GHz Emission
2.4 GHz WiFi MIMO + 5 GHz WiFi MIMO	Antenna	Ant All	Ant All
	Channel	11	177
	Data Rate	6 Mbps	6 Mbps
	Mode	802.11g	802.11a

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

RSDB Scenario 3	Description	Bluetooth Emission	2.4GHz Emission	5 GHz Emission
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO	Antenna	ANT1	ANT2	Ant All
	Channel	78	11	177
	Data Rate	1 Mbps	1 Mbps	6 Mbps
	Mode	GFSK	802.11b	802.11a

Note : BT, UNII RSDB Data refer to [BT], [UNII] Test Report

6. SM-S721U, SM-S721U1 were tested and the worst case results are reported.

(Worst case: SM-S721U)

AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.

- Mode : Stand alone+ External accessories(Earphone,etc) + Travel Adapter

Stand alone + Travel Adapter

- Worstcase : Stand alone + Travel Adapter

2. SM-S721U, SM-S721U1 were tested and the worst case results are reported.

(Worst case: SM-S721U)

Conducted test

1. The EUT was configured with data rate of highest power.

2. SM-S721U, SM-S721U1 were tested and the worst case results are reported.

(Worst case: SM-S721U)

8. SUMMARY TEST OF RESULTS

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

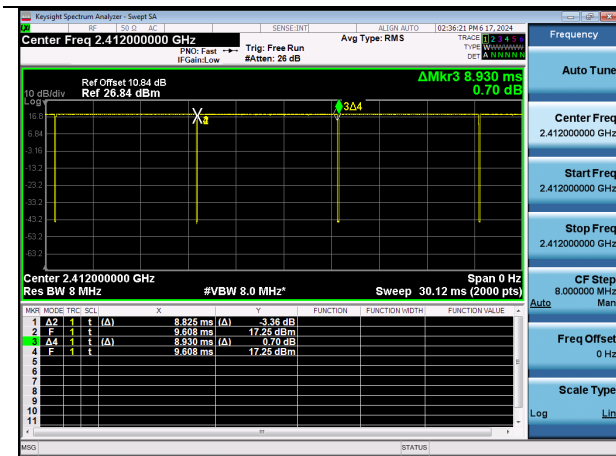
9. TEST RESULT

9.1 DUTY CYCLE

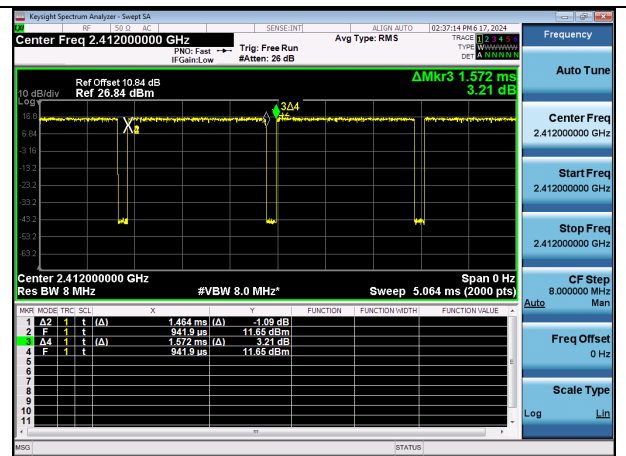
Mode	Data Rate	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1 Mbps	8.825	8.930	0.988	0.051
	2 Mbps	4.408	4.511	0.977	0.100
	5.5 Mbps	1.664	1.766	0.943	0.257
	11 Mbps	0.882	0.983	0.897	0.473
802.11g	6 Mbps	1.464	1.572	0.931	0.309
	9 Mbps	0.985	1.092	0.903	0.445
	12 Mbps	0.745	0.851	0.875	0.580
	18 Mbps	0.507	0.613	0.826	0.828
	24 Mbps	0.385	0.491	0.784	1.060
	36 Mbps	0.266	0.372	0.714	1.461
	48 Mbps	0.205	0.350	0.587	2.314
	54 Mbps	0.187	0.357	0.525	2.800
802.11n (HT20)	MCS0	1.246	1.355	0.920	0.364
	MCS1	0.646	0.752	0.859	0.662
	MCS2	0.441	0.550	0.802	0.959
	MCS3	0.339	0.448	0.757	1.209
	MCS4	0.251	0.380	0.661	1.801
	MCS5	0.190	0.350	0.543	2.648
	MCS6	0.172	0.345	0.500	3.010
	MCS7	0.168	0.364	0.462	3.358
802.11ac (VHT20)	MCS0	1.251	1.362	0.919	0.369
	MCS1	0.651	0.757	0.860	0.657
	MCS2	0.446	0.552	0.807	0.929
	MCS3	0.345	0.453	0.760	1.193
	MCS4	0.243	0.352	0.691	1.607
	MCS5	0.210	0.374	0.561	2.507
	MCS6	0.175	0.357	0.489	3.104
	MCS7	0.165	0.355	0.464	3.332
	MCS8	0.147	0.352	0.417	3.796

Test Plots

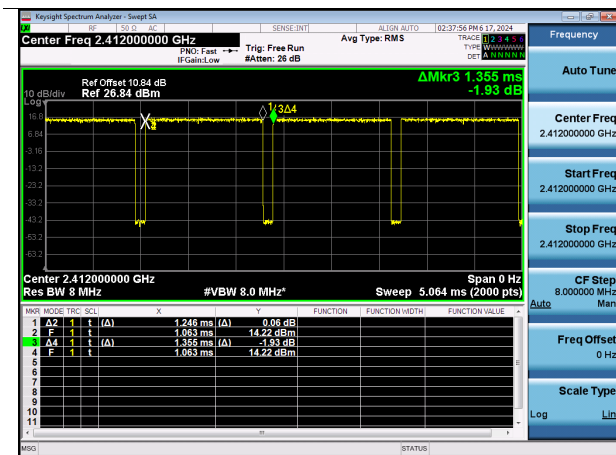
802.11b (1 Mbps)



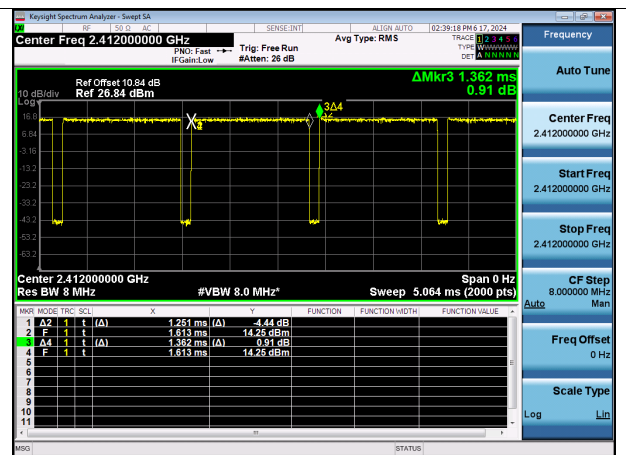
802.11g (6 Mbps)



802.11n (MCS0)



802.11ac (MCS0)



Note:

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

9.2 6 dB BANDWIDTH

[ANT. 1]

Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Minimum Bandwidth [MHz]
802.11b	2412	1	7.609	0.50
	2437	6	8.057	0.50
	2462	11	8.080	0.50
802.11g	2412	1	16.39	0.50
	2437	6	16.37	0.50
	2462	11	16.40	0.50
802.11n(HT20)	2412	1	17.62	0.50
	2437	6	17.32	0.50
	2462	11	17.65	0.50
802.11ac(VHT20)	2412	1	17.64	0.50
	2437	6	17.29	0.50
	2462	11	17.66	0.50

[ANT. 2]

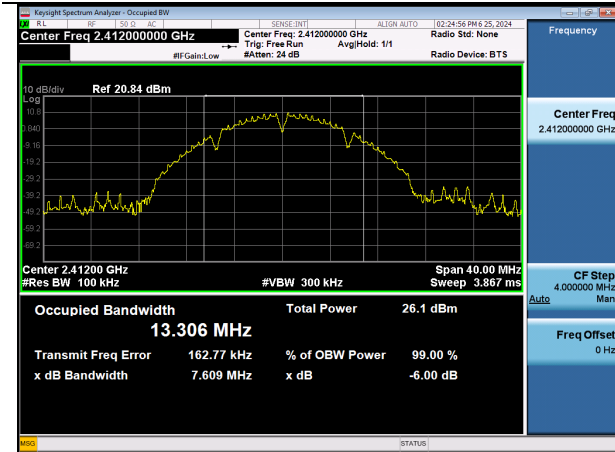
Mode	Frequency [MHz]	Channel No.	6 dB Bandwidth [MHz]	Minimum Bandwidth [MHz]
802.11b	2412	1	8.103	0.50
	2437	6	8.110	0.50
	2462	11	8.117	0.50
802.11g	2412	1	16.40	0.50
	2437	6	16.40	0.50
	2462	11	16.38	0.50
802.11n(HT20)	2412	1	17.64	0.50
	2437	6	17.65	0.50
	2462	11	17.27	0.50
802.11ac(VHT20)	2412	1	17.64	0.50
	2437	6	17.65	0.50
	2462	11	17.27	0.50

Test Plots

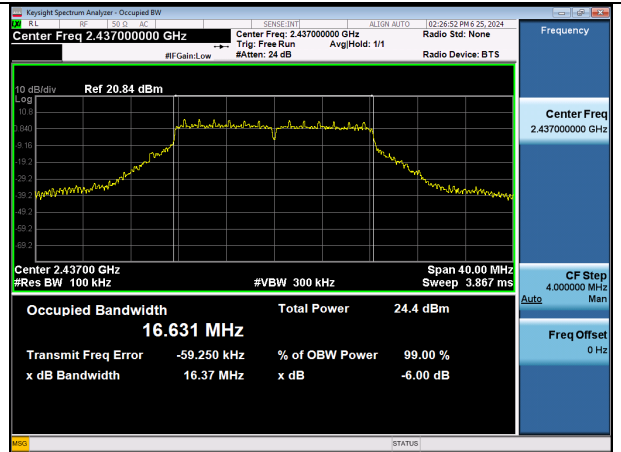
[ANT. 1]

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

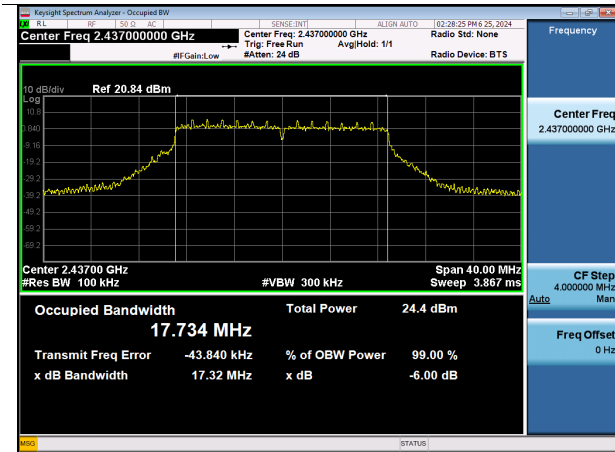
802.11b-CH 1



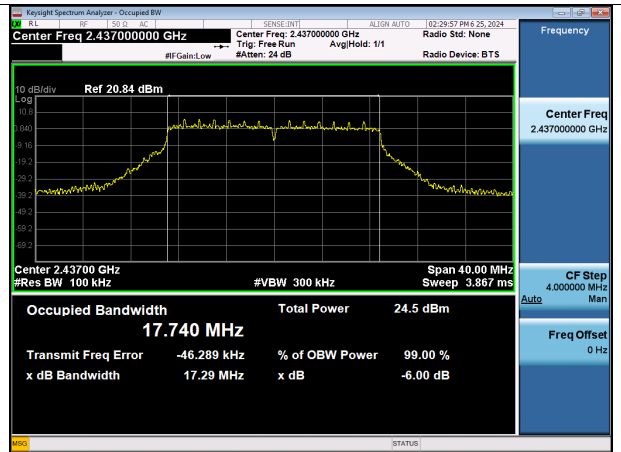
802.11g-CH 6



802.11n_HT20-CH 6



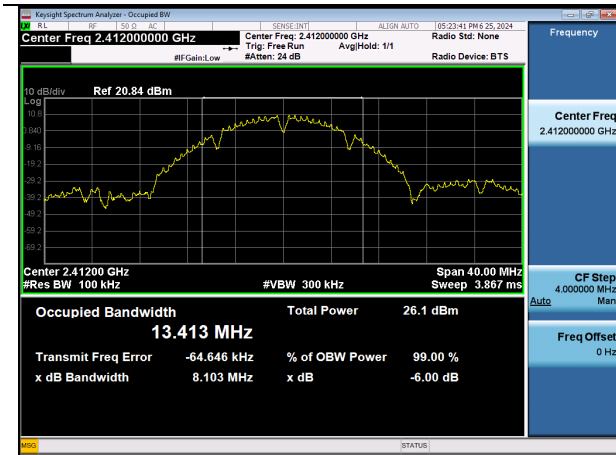
802.11ac_VHT20-CH 6



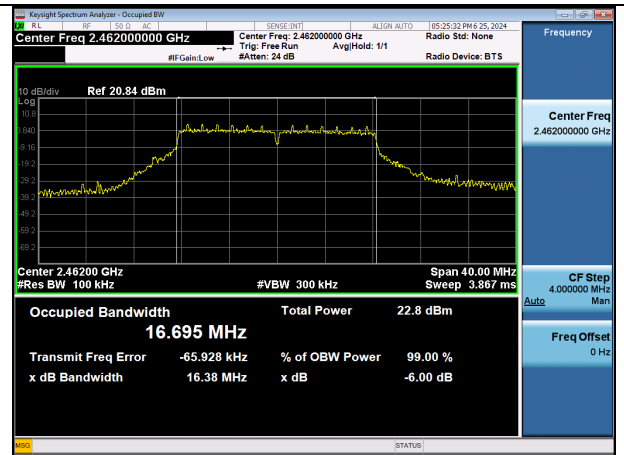
[ANT. 2]

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

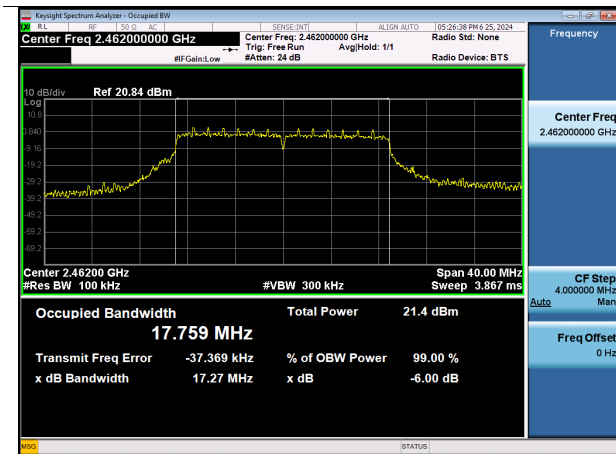
802.11b-CH 1



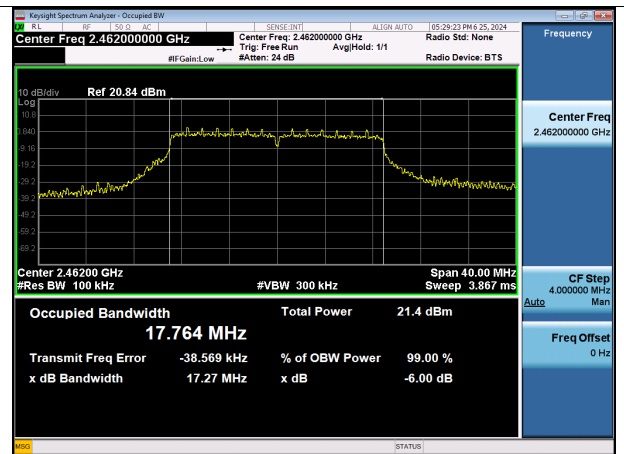
802.11g-CH 11



802.11n_HT20-CH 11



802.11ac_VHT20-CH 11



9.3 OUTPUT POWER

Note :

1. MIMO_CDD(Ant1+Ant2) Power = $10 \cdot \log((10^{(\text{Ant. 1 power} / 10)}) + (10^{(\text{Ant. 2 power} / 10)}))$

Peak Power

[SISO]

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Peak Power [dBm]		Limit [dBm]
				ANT1	ANT2	
802.11b	2412	1	11M	24.78	25.01	30
	2437	6	11M	25.01	25.06	30
	2462	11	11M	25.15	24.58	30

[MIMO_CDD(Ant1+Ant2)]

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Peak Power [dBm]			Limit [dBm]
				ANT1	ANT2	MIMO	
802.11g	2412	1	6M	24.01	23.98	27.01	30
	2437	6	6M	25.21	24.80	28.02	30
	2462	11	6M	24.27	23.42	26.88	30
802.11n	2412	1	MCS0	24.12	24.05	27.10	30
	2437	6	MCS0	25.20	24.90	28.06	30
	2462	11	MCS0	22.78	22.10	25.46	30
802.11ac	2412	1	MCS0	24.12	24.04	27.09	30
	2437	6	MCS0	25.21	24.93	28.08	30
	2462	11	MCS0	22.83	22.14	25.51	30

Average Power

Note :

1. Total Power [dBm] = Measured Power [dBm] + Duty Cycle Factor [dB]

[SISO]

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Average Power [dBm]		Limit [dBm]
				ANT1	ANT2	
802.11b	2412	1	1M	19.15	19.02	30
	2437	6	1M	19.22	18.89	30
	2462	11	1M	19.15	18.48	30

[MIMO_CDD(Ant1+Ant2)]

Mode	Frequency [MHz]	Channel No.	Data Rate	Conducted Average Power [dBm]			Limit [dBm]
				ANT1	ANT2	MIMO	
802.11g	2412	1	6M	15.83	15.78	18.82	30
	2437	6	6M	17.12	16.71	19.93	30
	2462	11	6M	16.07	15.14	18.64	30
802.11n	2412	1	MCS0	15.92	15.70	18.82	30
	2437	6	MCS0	17.08	16.68	19.89	30
	2462	11	MCS0	14.53	14.02	17.29	30
802.11ac	2412	1	MCS0	15.90	15.73	18.83	30
	2437	6	MCS0	17.10	16.69	19.91	30
	2462	11	MCS0	14.56	14.05	17.32	30

9.4 POWER SPECTRAL DENSITY

Note :

1. MIMO_CDD(Ant1+Ant2) PSD = $10 \cdot \log((10^{(\text{Ant. 1 PSD} / 10)}) + (10^{(\text{Ant. 2 PSD} / 10)}))$
2. Total PSD = Measured Value + Duty Cycle Factor

[SISO]

Mode	Frequency [MHz]	Channel No.	Data Rate	Power Spectral Density [dBm]		Limit [dBm]
				ANT1	ANT2	
802.11b	2412	1	1M	-2.588	-2.422	8 dBm / 3 kHz
	2437	6	1M	-2.281	-2.602	
	2462	11	1M	-2.332	-3.028	

[MIMO_CDD(Ant1+Ant2)]

BW	Frequency [MHz]	Channel No.	Data Rate	Power Spectral Density [dBm]			Limit
				ANT1	ANT2	MIMO	
802.11g	2412	1	6M	-8.159	-9.149	-5.616	8 dBm / 3 kHz
	2437	6	6M	-7.639	-8.290	-4.942	
	2462	11	6M	-8.262	-9.327	-5.752	
802.11n	2412	1	MCS0	-8.801	-9.203	-5.987	
	2437	6	MCS0	-7.759	-8.485	-5.097	
	2462	11	MCS0	-10.312	-10.753	-7.517	
802.11ac	2412	1	MCS0	-8.725	-9.175	-5.934	
	2437	6	MCS0	-7.828	-8.230	-5.014	
	2462	11	MCS0	-10.542	-10.960	-7.736	

Test Plots

Note :

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

[SISO]

[ANT. 1] Power Spectral Density (802.11b-CH 6)



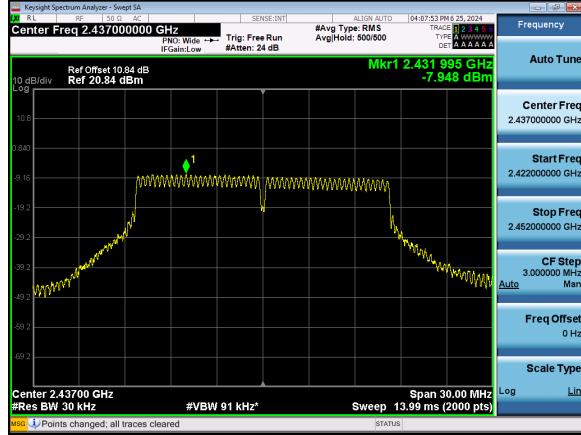
[ANT. 2] Power Spectral Density (802.11b-CH 1)



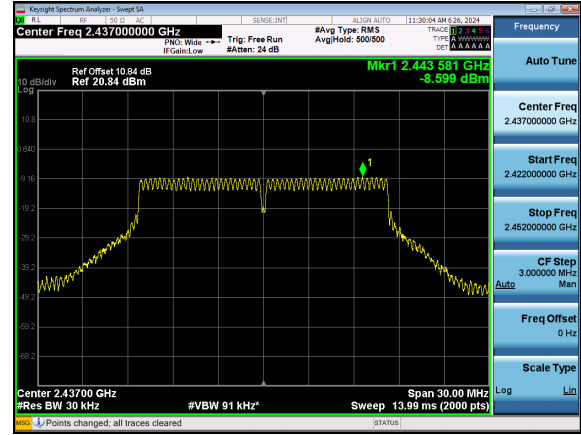
[MIMO_CDD(Ant1+Ant2)]

Power Spectral Density (802.11g-CH 6)

ANT. 1

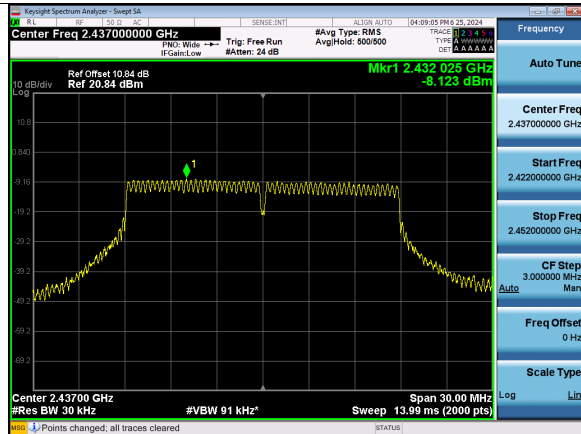


ANT. 2

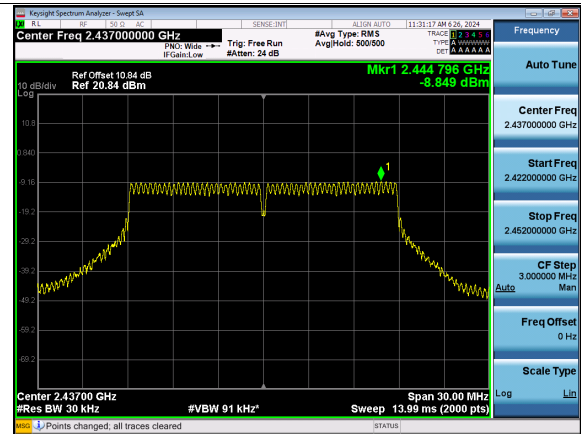


Power Spectral Density (802.11n-CH 6)

ANT. 1

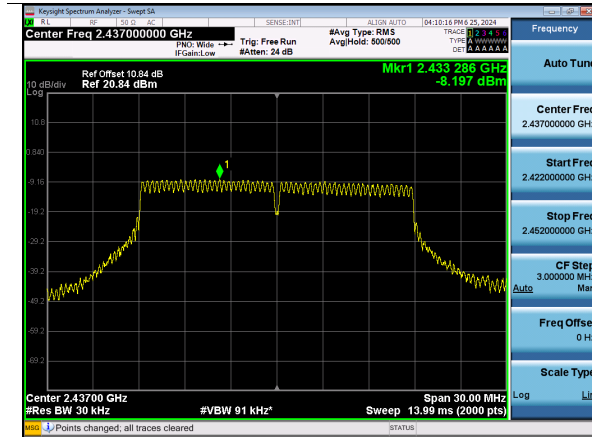


ANT. 2

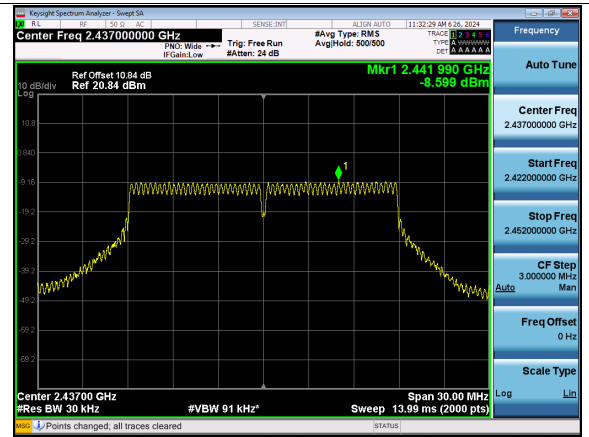


Power Spectral Density (802.11ac-CH 6)

ANT. 1



ANT. 2



9.5 BAND EDGE / CONDUCTED SPURIOUS EMISSIONS

Band Edge

Limit : 30 dBc

[ANT. 1]

Mode	Freq. [MHz]	CH.	Measured Position	Band edge[dB]
802.11b	2 412	1	Lowest Bandedge	40.352
	2 462	11	Highest Bandedge	55.064
802.11g	2 412	1	Lowest Bandedge	31.058
	2 462	11	Highest Bandedge	42.447
802.11n	2 412	1	Lowest Bandedge	30.958
	2 462	11	Highest Bandedge	39.755
802.11ac	2 412	1	Lowest Bandedge	30.721
	2 462	11	Highest Bandedge	39.403

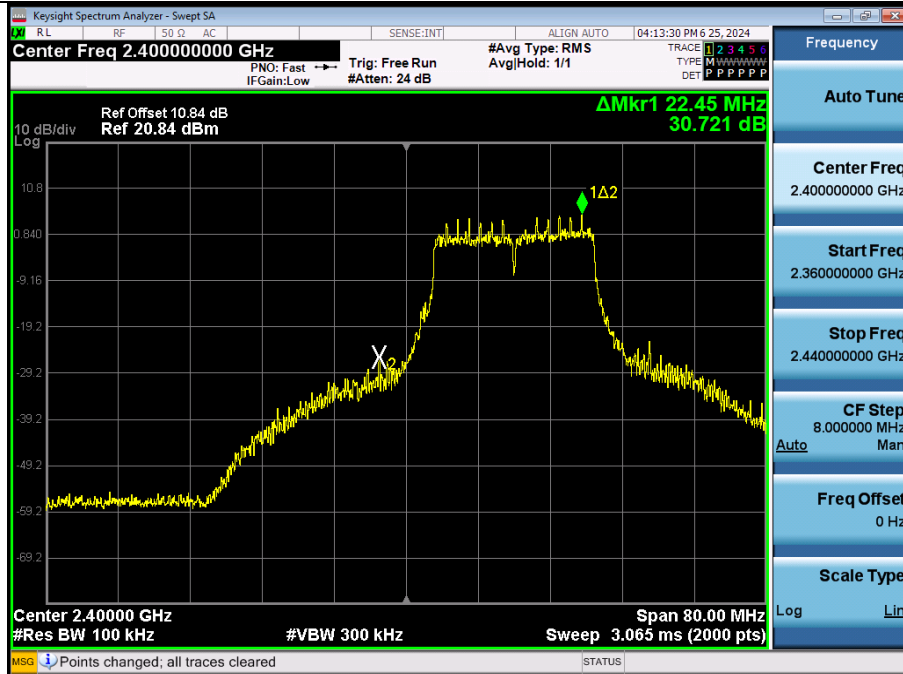
[ANT. 2]

Mode	Freq. [MHz]	CH.	Measured Position	Band edge[dB]
802.11b	2 412	1	Lowest Bandedge	42.636
	2 462	11	Highest Bandedge	51.064
802.11g	2 412	1	Lowest Bandedge	31.638
	2 462	11	Highest Bandedge	37.991
802.11n	2 412	1	Lowest Bandedge	31.184
	2 462	11	Highest Bandedge	36.165
802.11ac	2 412	1	Lowest Bandedge	32.434
	2 462	11	Highest Bandedge	37.255

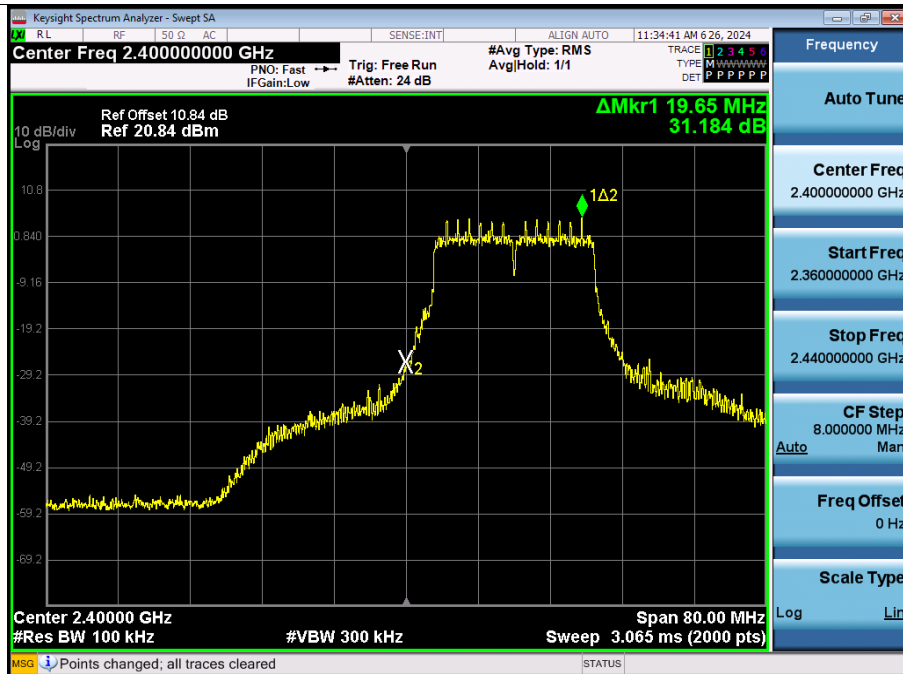
Test Plots

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

[ANT. 1] 802.11ac_VHT20-CH 1



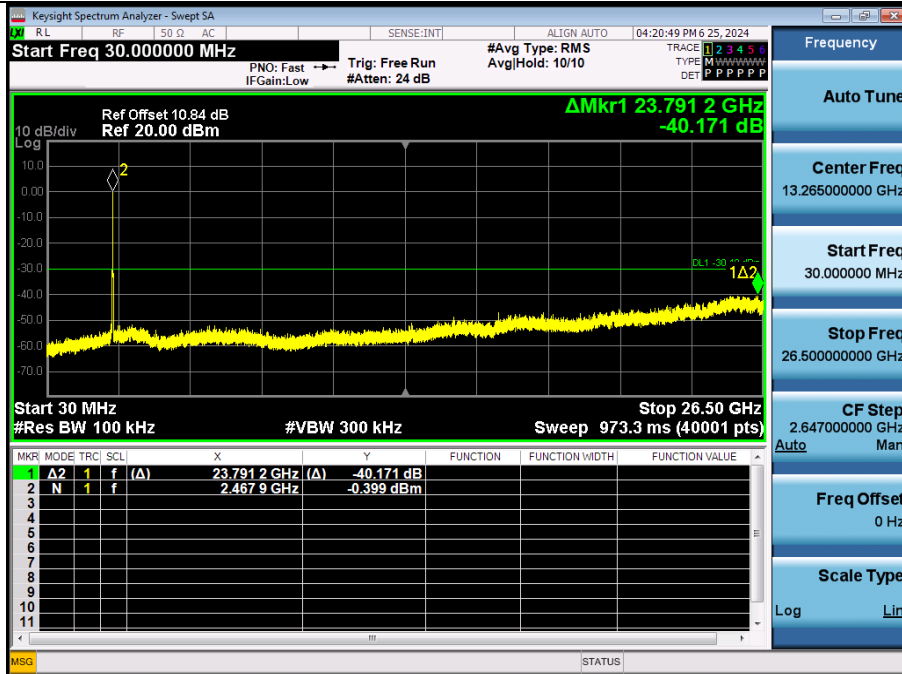
[ANT. 2] 802.11n_HT20-CH 1



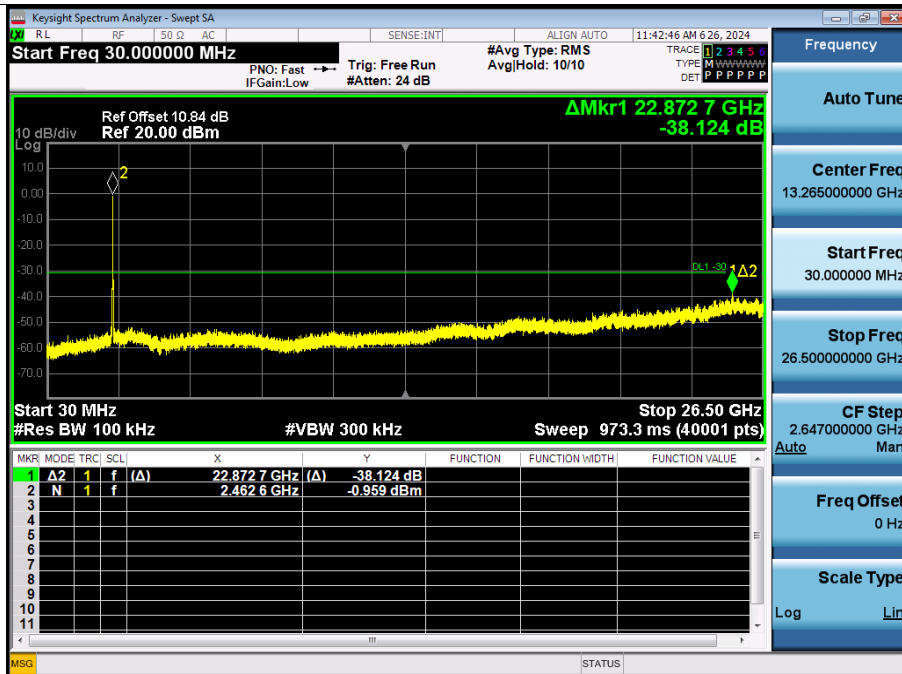
Test Plots(Conducted Spurious Emission)

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

[ANT. 1] 802.11n (HT20)_Ch.11_MCS0



[ANT. 2] 802.11n (HT20)_Ch.11_MCS0



Limit

ANT.1 : -30.399 dBm, ANT.2 : -30.959 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/m]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

Note:

1. The Measured value of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (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/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.

Frequency Range : Above 1 GHz

[SISO(Ant1)]

Band : DTS			Operation Mode : 802.11b				
CH.1 2412 MHz			Transfer Rate : 1Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4824	43.18	3.87	V	47.05	73.98	26.93	PK
4824	32.06	3.87	V	35.93	53.98	18.05	AV
7236	41.55	9.57	V	51.12	73.98	22.86	PK
7236	29.38	9.57	V	38.95	53.98	15.03	AV
4824	43.64	3.87	H	47.51	73.98	26.47	PK
4824	32.14	3.87	H	36.01	53.98	17.97	AV
7236	41.66	9.57	H	51.23	73.98	22.75	PK
7236	29.55	9.57	H	39.12	53.98	14.86	AV
Band : DTS			Operation Mode : 802.11b				
CH.6 2437 MHz			Transfer Rate : 1Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4874	41.13	3.84	V	44.97	73.98	29.01	PK
4874	31.05	3.84	V	34.89	53.98	19.09	AV
7311	41.27	10.11	V	51.38	73.98	22.60	PK
7311	29.61	10.11	V	39.72	53.98	14.26	AV
4874	41.66	3.84	H	45.50	73.98	28.48	PK
4874	31.17	3.84	H	35.01	53.98	18.97	AV
7311	41.80	10.11	H	51.91	73.98	22.07	PK
7311	29.69	10.11	H	39.80	53.98	14.18	AV
Band : DTS			Operation Mode : 802.11b				
CH.11 2462 MHz			Transfer Rate : 1Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4924	42.54	3.27	V	45.81	73.98	28.17	PK
4924	31.97	3.27	V	35.24	53.98	18.74	AV
7386	41.16	11.01	V	52.17	73.98	21.81	PK
7386	29.22	11.01	V	40.23	53.98	13.75	AV
4924	42.80	3.27	H	46.07	73.98	27.91	PK
4924	32.05	3.27	H	35.32	53.98	18.66	AV
7386	41.28	11.01	H	52.29	73.98	21.69	PK
7386	29.34	11.01	H	40.35	53.98	13.63	AV

[SISO(Ant2)]

Band : DTS			Operation Mode : 802.11b				
CH.1 2412 MHz			Transfer Rate : 1Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4824	43.29	3.87	V	47.16	73.98	26.82	PK
4824	32.05	3.87	V	35.92	53.98	18.06	AV
7236	41.12	9.57	V	50.69	73.98	23.29	PK
7236	29.60	9.57	V	39.17	53.98	14.81	AV
4824	43.49	3.87	H	47.36	73.98	26.62	PK
4824	32.18	3.87	H	36.05	53.98	17.93	AV
7236	41.24	9.57	H	50.81	73.98	23.17	PK
7236	29.70	9.57	H	39.27	53.98	14.71	AV
Band : DTS			Operation Mode : 802.11b				
CH.6 2437 MHz			Transfer Rate : 1Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4874	41.57	3.84	V	45.41	73.98	28.57	PK
4874	31.07	3.84	V	34.91	53.98	19.07	AV
7311	41.15	10.11	V	51.26	73.98	22.72	PK
7311	29.67	10.11	V	39.78	53.98	14.20	AV
4874	42.02	3.84	H	45.86	73.98	28.12	PK
4874	31.38	3.84	H	35.22	53.98	18.76	AV
7311	41.63	10.11	H	51.74	73.98	22.24	PK
7311	29.95	10.11	H	40.06	53.98	13.92	AV
Band : DTS			Operation Mode : 802.11b				
CH.11 2462 MHz			Transfer Rate : 1Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4924	41.26	3.27	V	44.53	73.98	29.45	PK
4924	31.36	3.27	V	34.63	53.98	19.35	AV
7386	41.02	11.01	V	52.03	73.98	21.95	PK
7386	29.11	11.01	V	40.12	53.98	13.86	AV
4924	41.73	3.27	H	45.00	73.98	28.98	PK
4924	31.56	3.27	H	34.83	53.98	19.15	AV
7386	41.36	11.01	H	52.37	73.98	21.61	PK
7386	29.40	11.01	H	40.41	53.98	13.57	AV

[MIMO_CDD(Ant1+Ant2)]

Band : DTS			Operation Mode : 802.11g				
CH.1 2412 MHz			Transfer Rate : 6Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4824	42.57	3.87	V	46.44	73.98	27.54	PK
4824	30.86	3.87	V	34.73	53.98	19.25	AV
7236	40.89	9.57	V	50.46	73.98	23.52	PK
7236	29.25	9.57	V	38.82	53.98	15.16	AV
4824	42.71	3.87	H	46.58	73.98	27.40	PK
4824	31.03	3.87	H	34.90	53.98	19.08	AV
7236	41.61	9.57	H	51.18	73.98	22.80	PK
7236	29.46	9.57	H	39.03	53.98	14.95	AV
Band : DTS			Operation Mode : 802.11g				
CH.6 2437 MHz			Transfer Rate : 6Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4874	41.65	3.84	V	45.49	73.98	28.49	PK
4874	29.84	3.84	V	33.68	53.98	20.30	AV
7311	40.87	10.11	V	50.98	73.98	23.00	PK
7311	29.58	10.11	V	39.69	53.98	14.29	AV
4874	41.71	3.84	H	45.55	73.98	28.43	PK
4874	29.92	3.84	H	33.76	53.98	20.22	AV
7311	41.13	10.11	H	51.24	73.98	22.74	PK
7311	29.64	10.11	H	39.75	53.98	14.23	AV
Band : DTS			Operation Mode : 802.11g				
CH.11 2462 MHz			Transfer Rate : 6Mbps				
Frequency [MHz]	Measured value [dBμV]	CL+AF+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detect
4924	41.24	3.27	V	44.51	73.98	29.47	PK
4924	29.61	3.27	V	32.88	53.98	21.10	AV
7386	40.46	11.01	V	51.47	73.98	22.51	PK
7386	29.18	11.01	V	40.19	53.98	13.79	AV
4924	41.34	3.27	H	44.61	73.98	29.37	PK
4924	29.87	3.27	H	33.14	53.98	20.84	AV
7386	41.04	11.01	H	52.05	73.98	21.93	PK
7386	29.31	11.01	H	40.32	53.98	13.66	AV

[RSDB]

Scenario 2

Ant All(MIMO) 2.4 GHz 802.11b_Ch.11 + Ant All(MIMO) 5 GHz 802.11a_Ch.177

Frequency	Measured Value	CL+AF+ DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4924	42.67	3.27	V	45.94	73.98	28.04	PK
4924	30.79	3.27	V	34.06	53.98	19.92	AV
7386	41.05	11.01	V	52.06	73.98	21.92	PK
7386	29.35	11.01	V	40.36	53.98	13.62	AV
4924	42.87	3.27	H	46.14	73.98	27.84	PK
4924	30.89	3.27	H	34.16	53.98	19.82	AV
7386	41.22	11.01	H	52.23	73.98	21.75	PK
7386	29.41	11.01	H	40.42	53.98	13.56	AV

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

Scenario 3

Ant.1 Bluetooth DH5_Ch.78 + Ant.2 2.4 GHz 802.11b_Ch.11 + Ant All(MIMO) 5 GHz 802.11a_Ch.177

Frequency	Measured Value	CL+AF+ DF-AG	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
4924	45.14	3.27	V	48.41	73.98	25.57	PK
4924	39.16	3.27	V	42.43	53.98	11.55	AV
7386	41.52	11.01	V	52.53	73.98	21.45	PK
7386	29.35	11.01	V	40.36	53.98	13.62	AV
4924	46.24	3.27	H	49.51	73.98	24.47	PK
4924	40.27	3.27	H	43.54	53.98	10.44	AV
7386	41.81	11.01	H	52.82	73.98	21.16	PK
7386	29.51	11.01	H	40.52	53.98	13.46	AV

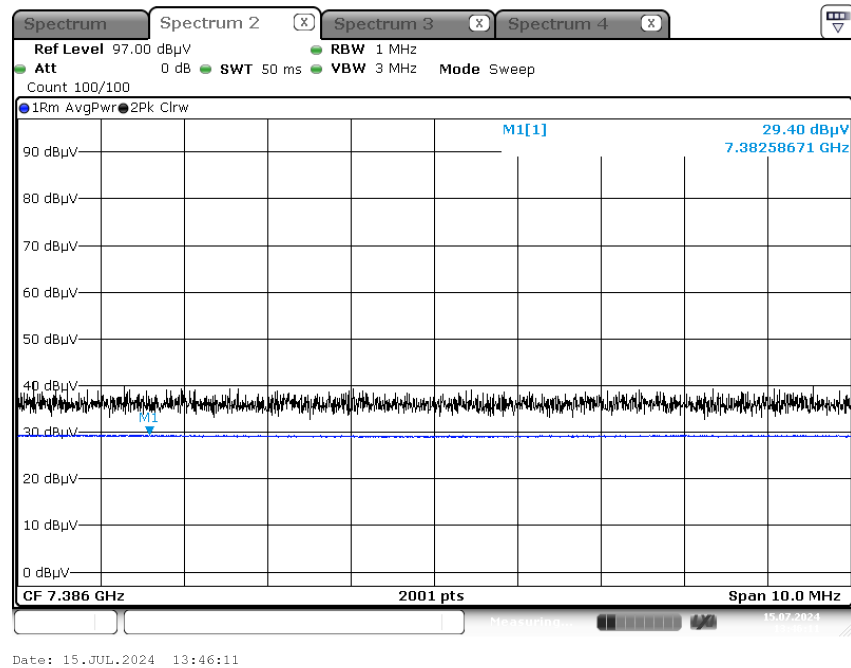
Note : BT, UNII RSDB Data refer to [BT], [UNII] Test Report

Test Plots

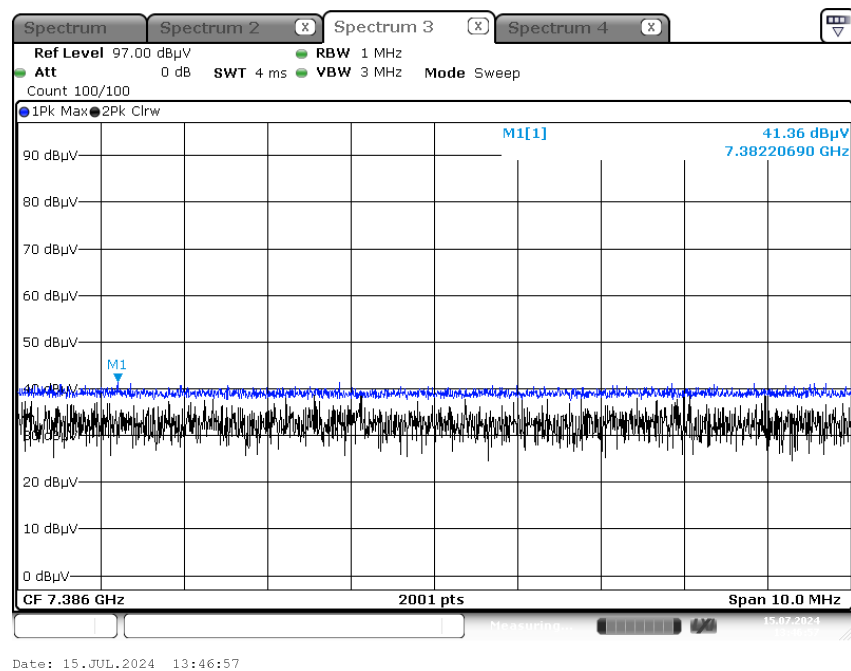
Note: In order to simplify the report, Plot of worst case are only reported.

[SISO(Ant2)]

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



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



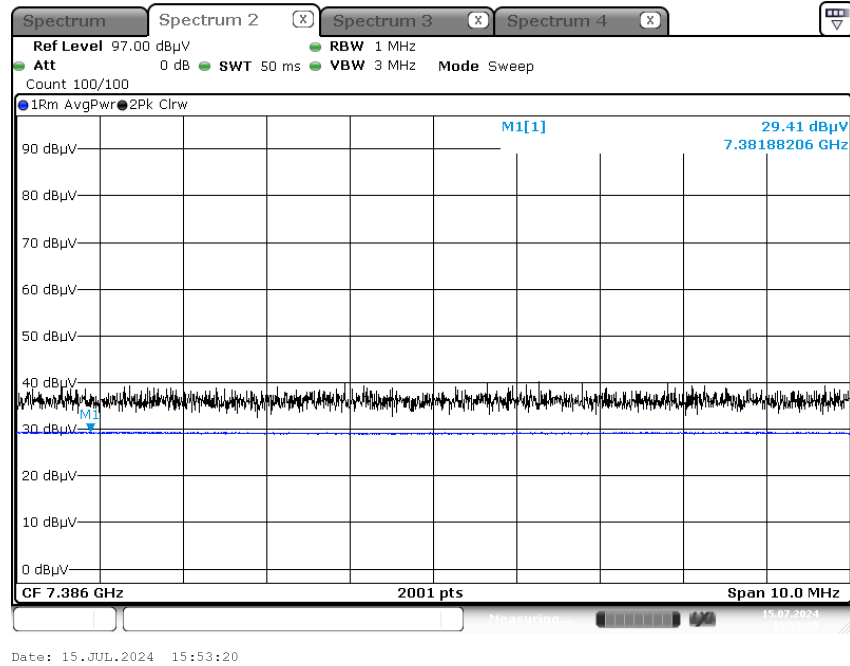
[RSDB]

Scenario 2

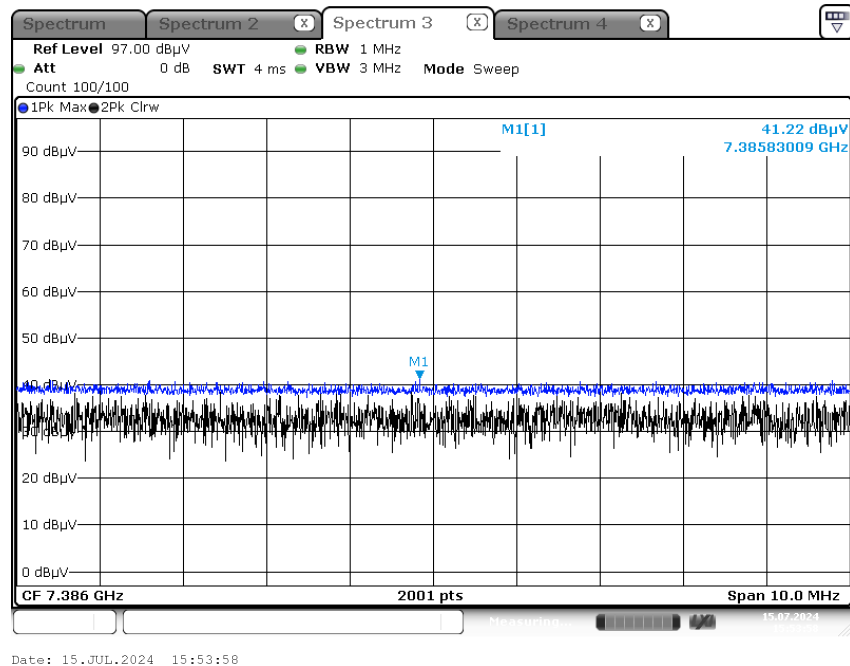
Ant All(MIMO) 2.4 GHz 802.11g_Ch.11 + Ant All(MIMO) 5 GHz 802.11a_Ch.177

[MIMO_CDD(Ant1+Ant2)]

Radiated Spurious Emissions plot – Average Result (802.11g_6 Mbps, Ch.11 3rd Harmonic, Y-H)



Radiated Spurious Emissions plot – Peak Result (802.11g_6 Mbps, Ch.11 3rd Harmonic, Y-H))

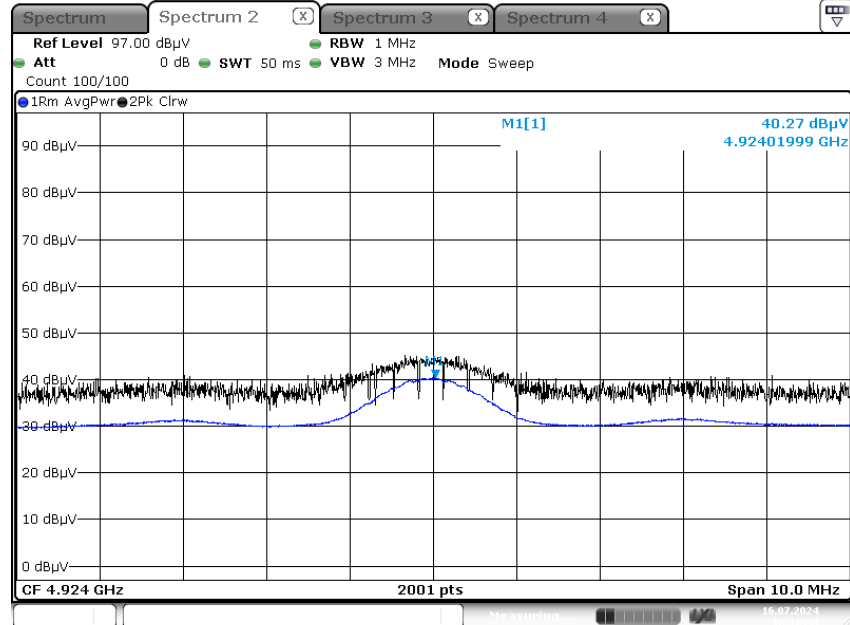


Scenario 3

Ant.1 Bluetooth DH5_Ch.78 + Ant.2 2.4 GHz 802.11b_Ch.11 + Ant All(MIMO) 5 GHz 802.11a_Ch.177

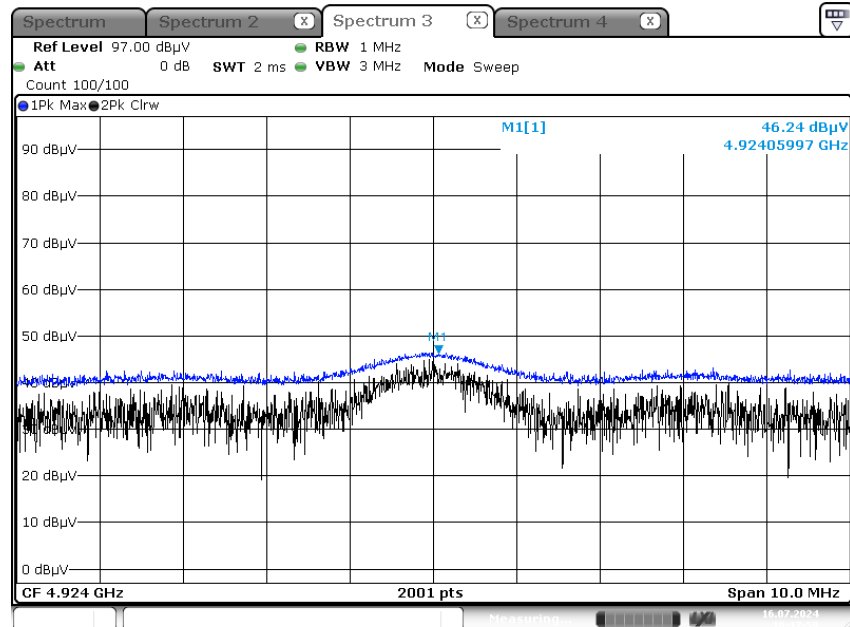
[SISO(Ant2)]

Radiated Spurious Emissions plot –Average Result (802.11b_1 Mbps, Ch.11 2nd Harmonic, Y-H)



Date: 16.JUL.2024 10:16:35

Radiated Spurious Emissions plot – Peak Result (802.11b_1 Mbps, Ch.11 2nd Harmonic, Y-H)



Date: 16.JUL.2024 10:17:59

9.7 RADIATED RESTRICTED BAND EDGES

[SISO(Ant1)]

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+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	56.48	-	H	56.48	73.98	17.50	PK
2390.0	44.94	-	H	44.94	53.98	9.04	AV
2390.0	54.84	-	V	54.84	73.98	19.14	PK
2390.0	44.26	-	V	44.26	53.98	9.72	AV
2483.5	55.23	-	H	55.23	73.98	18.75	PK
2483.5	43.18	-	H	43.18	53.98	10.80	AV
2483.5	54.85	-	V	54.85	73.98	19.13	PK
2483.5	42.86	-	V	42.86	53.98	11.12	AV

[SISO(Ant2)]

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+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	56.50	-	H	56.50	73.98	17.48	PK
2390.0	46.83	-	H	46.83	53.98	7.15	AV
2390.0	56.19	-	V	56.19	73.98	17.79	PK
2390.0	46.28	-	V	46.28	53.98	7.70	AV
2483.5	55.94	-	H	55.94	73.98	18.04	PK
2483.5	43.67	-	H	43.67	53.98	10.31	AV
2483.5	55.28	-	V	55.28	73.98	18.70	PK
2483.5	43.61	-	V	43.61	53.98	10.37	AV

[MIMO_CDD(Ant1+Ant2)]

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+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
#2390	61.14	0.00	-	H	61.14	73.98	12.84	PK
#2390	50.28	0.31	-	H	50.59	53.98	3.39	AV
#2390	59.86	0.00	-	V	59.86	73.98	14.12	PK
#2390	50.03	0.31	-	V	50.34	53.98	3.64	AV
#2483.5	61.57	0.00	-	H	61.57	73.98	12.41	PK
#2483.5	51.20	0.31	-	H	51.51	53.98	2.47	AV
#2483.5	60.11	0.00	-	V	60.11	73.98	13.87	PK
#2483.5	50.04	0.31	-	V	50.35	53.98	3.63	AV

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

Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2417 MHz, 2457 MHz
Channel No.	02 Ch, 10 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F.+C.L+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	64.49	0.00	-	H	64.49	73.98	9.49	PK
2390.0	49.72	0.31	-	H	50.03	53.98	3.95	AV
2390.0	63.27	0.00	-	V	63.27	73.98	10.71	PK
2390.0	49.26	0.31	-	V	49.57	53.98	4.41	AV
#2483.5	62.27	0.00	-	H	62.27	73.98	11.71	PK
#2483.5	51.13	0.31	-	H	51.44	53.98	2.54	AV
#2483.5	61.55	0.00	-	V	61.55	73.98	12.43	PK
#2483.5	50.06	0.31	-	V	50.37	53.98	3.61	AV

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

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

Frequency	Measured Value	Duty Cycle Factor	A.F.+C.L+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
#2390	61.51	0.00	-	H	61.51	73.98	12.47	PK
#2390	51.30	0.36	-	H	51.66	53.98	2.32	AV
#2390	60.36	0.00	-	V	60.36	73.98	13.62	PK
#2390	50.19	0.36	-	V	50.55	53.98	3.43	AV
#2483.5	62.01	0.00	-	H	62.01	73.98	11.97	PK
#2483.5	51.43	0.36	-	H	51.79	53.98	2.19	AV
#2483.5	61.08	0.00	-	V	61.08	73.98	12.90	PK
#2483.5	51.19	0.36	-	V	51.55	53.98	2.43	AV

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

Operation Mode:	802.11n (HT20)
Transfer MCS Index:	0
Operating Frequency	2417 MHz, 2457 MHz
Channel No.	02 Ch, 10 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F.+C.L+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	63.02	0.00	-	H	63.02	73.98	10.96	PK
2390.0	50.32	0.36	-	H	50.68	53.98	3.30	AV
2390.0	61.26	0.00	-	V	61.26	73.98	12.72	PK
2390.0	50.07	0.36	-	V	50.43	53.98	3.55	AV
#2483.5	62.13	0.00	-	H	62.13	73.98	11.85	PK
#2483.5	51.39	0.36	-	H	51.75	53.98	2.23	AV
#2483.5	61.07	0.00	-	V	61.07	73.98	12.91	PK
#2483.5	49.85	0.36	-	V	50.21	53.98	3.77	AV

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

Operation Mode:	802.11ac (VHT20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F.+C.L+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
#2390	61.18	0.00	-	H	61.18	73.98	12.80	PK
#2390	51.39	0.37	-	H	51.76	53.98	2.22	AV
#2390	60.06	0.00	-	V	60.06	73.98	13.92	PK
#2390	50.22	0.37	-	V	50.59	53.98	3.39	AV
#2483.5	63.02	0.00	-	H	63.02	73.98	10.96	PK
#2483.5	51.51	0.37	-	H	51.88	53.98	2.10	AV
#2483.5	62.08	0.00	-	V	62.08	73.98	11.90	PK
#2483.5	51.28	0.37	-	V	51.65	53.98	2.33	AV

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

Operation Mode:	802.11ac (VHT20)
Transfer MCS Index:	0
Operating Frequency	2417 MHz, 2457 MHz
Channel No.	02 Ch, 10 Ch

Frequency	Measured Value	Duty Cycle Factor	A.F.+C.L+D.F	ANT. POL	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB]	[dB]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	63.82	0.00	-	H	63.82	73.98	10.16	PK
2390.0	50.57	0.37	-	H	50.94	53.98	3.04	AV
2390.0	63.29	0.00	-	V	63.29	73.98	10.69	PK
2390.0	50.28	0.37	-	V	50.65	53.98	3.33	AV
#2483.5	61.31	0.00	-	H	61.31	73.98	12.67	PK
#2483.5	51.32	0.37	-	H	51.69	53.98	2.29	AV
#2483.5	60.22	0.00	-	V	60.22	73.98	13.76	PK
#2483.5	50.06	0.37	-	V	50.43	53.98	3.55	AV

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

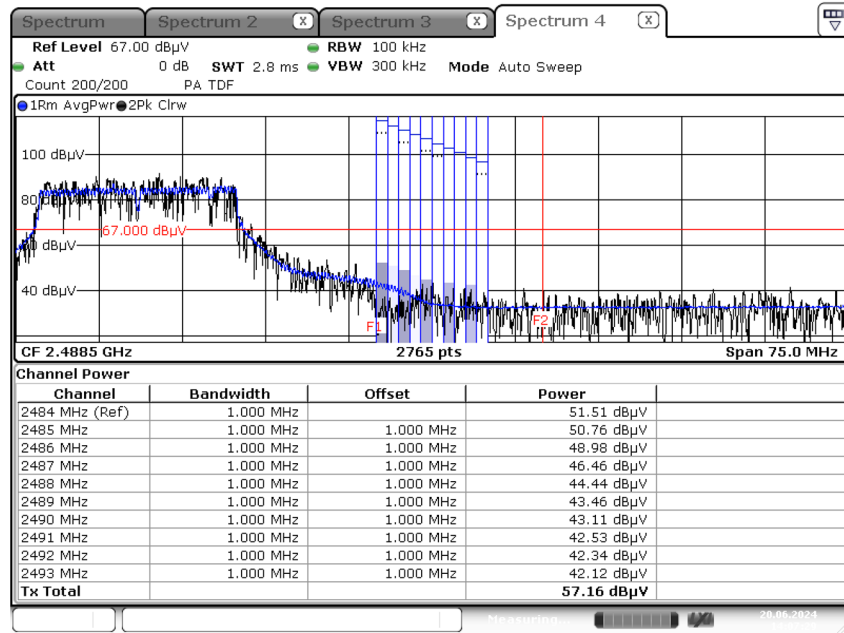
Test Plots

Note: In order to simplify the report, Plots of worst case are only reported.

[MIMO_CDD(Ant1+Ant2)]

Radiated Restricted Band Edges plot – Average Result (802.11ac (VHT20)_ MCS0, Ch.11, Y-H)

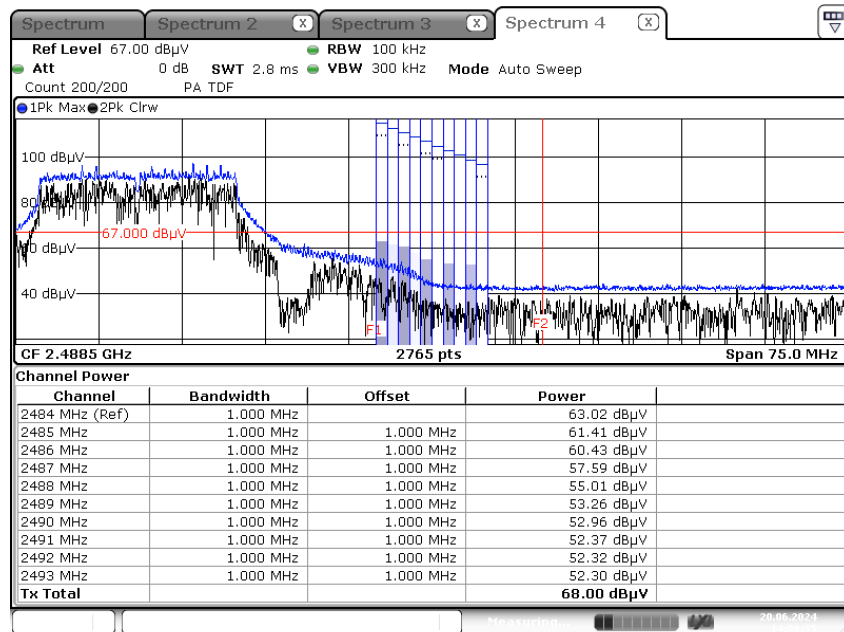
(Integration method Used)



Date: 20.JUN.2024 14:07:29

Radiated Restricted Band Edges plot – Peak Result (802.11ac (VHT20)_ MCS0, Ch.11, Y-H)

(Integration method Used)



Date: 20.JUN.2024 14:09:35

9.8 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions

Test

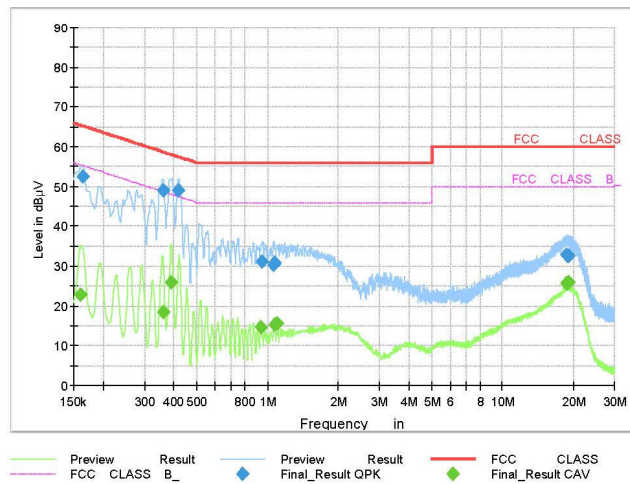
1 / 1

Test Report

Common Information

EUT : SM-S721U
Operating Conditions : 2.4G WLAN Mode
Comment :

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1635	52.52	65.28	12.77	9.000	N	9.6
0.3615	49.12	58.69	9.58	9.000	N	9.6
0.4178	48.92	57.49	8.57	9.000	L1	9.6
0.9523	31.17	56.00	24.83	9.000	L1	9.7
1.0625	30.34	56.00	25.66	9.000	L1	9.7
1.0693	30.98	56.00	25.02	9.000	L1	9.7
18.6575	32.84	60.00	27.16	9.000	L1	10.3
19.0085	32.71	60.00	27.29	9.000	L1	10.4
19.2335	32.62	60.00	27.38	9.000	L1	10.4

Final Result CAV

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1613	22.92	55.40	32.48	9.000	N	9.6
0.3593	18.40	48.75	30.34	9.000	N	9.6
0.3908	25.90	48.05	22.15	9.000	N	9.6
0.9410	14.72	46.00	31.28	9.000	L1	9.7
1.0693	15.42	46.00	30.58	9.000	L1	9.7
1.1030	15.45	46.00	30.55	9.000	L1	9.7
18.6575	25.81	50.00	24.19	9.000	L1	10.3
19.0085	25.72	50.00	24.28	9.000	L1	10.4
19.2020	25.87	50.00	24.13	9.000	L1	10.4

2024-07-10

오후 1:21:16

9.9 CONFIRMATION OF GEO-LOCATION MECHANISM

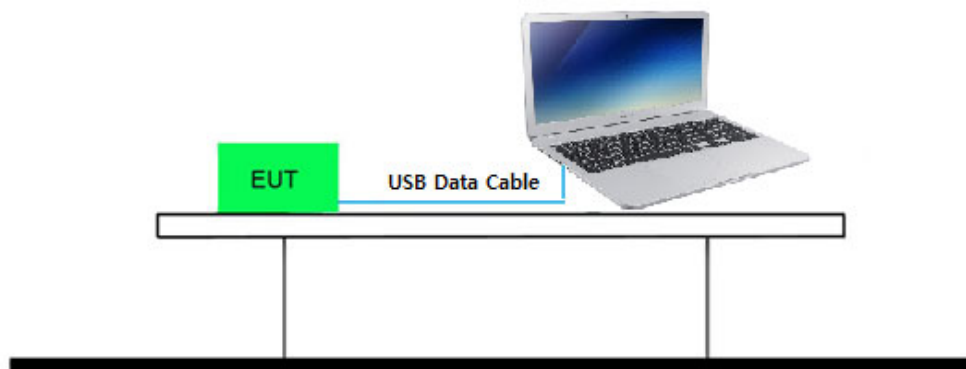
The device uses MCC information obtained from the public cellular carrier to determine that it is operating outside the U.S. and then enable channels 12 and 13 only if a non-US MCC that supports channel 12 and 13 is confirmed.

The device uses a geo-location mechanism based on the Country in order to only enable certain WLAN DTS bands when the device is not in the USA.

WLAN	Country code = US	Country code = KR(Korea)
CH 12	Did not connect	Connected
CH 13	Did not connect	Connected

The verification tests confirmed the operational of the geo-location mechanism.

Test Setup



Test Procedure

In case of Country code

1. Open Command Prompt.
2. Setting the country for product
3. At the Command Prompt, enter the command.
>adb root
>adb remount
>adb shell cmd wifi get-country-code
>adb shell iw phy phy0 channels

Setting the country for product

Country code = US

Hotspot antenna test

CHECK CURRENT MODE

☒ MIMO ☐ SISO

MODULE TYPE
null

CHANGE THE MAC

Samsung MLO Control
☒

Current CountryCode : US

US

Country code = KR(Korea)

Hotspot antenna test

CHECK CURRENT MODE

☒ MIMO ☐ SISO

MODULE TYPE
null

CHANGE THE MAC

Samsung MLO Control
☒

Current CountryCode : KR

KR

Country code = US	Country code = KR (Korea)
<pre> C:\Wad>adb shell cmd wifi get-country-code Wifi Country Code = US C:\Wad>adb shell iw phy phy0 channels Band 1: * 2412 MHz [1] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40+ * 2417 MHz [2] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40+ * 2422 MHz [3] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40+ * 2427 MHz [4] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40+ * 2432 MHz [5] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40- HT40+ * 2437 MHz [6] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40- HT40+ * 2442 MHz [7] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40- HT40+ * 2447 MHz [8] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40- * 2452 MHz [9] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40- * 2457 MHz [10] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40- * 2462 MHz [11] Maximum TX power: 30.0 dBm Channel widths: 20MHz HT40- * 2467 MHz [12] (disabled) * 2472 MHz [13] (disabled) * 2484 MHz [14] (disabled) </pre>	<pre> C:\Wad>adb shell cmd wifi get-country-code Wifi Country Code = KR C:\Wad>adb shell iw phy phy0 channels Band 1: * 2412 MHz [1] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40+ * 2417 MHz [2] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40+ * 2422 MHz [3] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40+ * 2427 MHz [4] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40+ * 2432 MHz [5] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- HT40+ * 2437 MHz [6] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- HT40+ * 2442 MHz [7] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- HT40+ * 2447 MHz [8] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- HT40+ * 2452 MHz [9] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- HT40+ * 2457 MHz [10] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- * 2462 MHz [11] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- * 2467 MHz [12] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- * 2472 MHz [13] Maximum TX power: 23.0 dBm Channel widths: 20MHz HT40- * 2484 MHz [14] (disabled) </pre>

10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	07/17/2025	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	07/02/2025	Annual
Temperature Chamber	SU-642	ESPEC	93008124	02/19/2025	Annual
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	KR01009150	04/18/2025	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.

Radiated Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	S3AM	08/03/2025	Biennial
Controller	EM2090	Emco	060520	N/A	N/A
Turn Table	N/A	Ets	N/A	N/A	N/A
Amp & Filter Bank Switch Controller	FBSM-01A	TNM system	0	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(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
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	FBSR-03A (10dB ATT+LNA)	T&M SYSTEM	S3L2	11/17/2024	Annual
RF Switching System	FBSR-03A (7G HPF+LNA)	T&M SYSTEM	S3L3	11/17/2024	Annual
RF Switching System	FBSR-03A (3dB ATT+LNA)	T&M SYSTEM	S3L4	11/17/2024	Annual
Power Amplifier	CBL18265035	CERNEX	22966	11/17/2024	Annual
Power Amplifier	CBL26405040	CERNEX	25956	02/26/2025	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/19/2025	Annual
Spectrum Analyzer	FSV40 (9 kHz ~ 40 GHz)	Rohde & Schwarz	100900	12/06/2024	Annual

Note:

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

11. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2407-FC011-P