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FCC DTS REPORT

Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

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

Date of Issue:
November 08, 2021

Test Site/Location:
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA

Report No.: HCT-RF-2110-FC069-R2

FCC ID:	**A3LSMN980F1**
APPLICANT:	**SAMSUNG Electronics Co., Ltd.**

According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : A3LSMN981B1 report.

Model:	SM-N980F/DS
Additional Model:	SM-N980F
EUT Type:	Mobile Phone
Average Output Power:	802.11ax(HE20) SUM (MIMO Ant 1 + MIMO Ant 2): 19.91 dBm
Frequency Range:	2 412 MHz ~ 2 472 MHz (US Only: 2 412 MHz ~ 2 462 MHz)
Modulation type:	OFDMA
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s):	Part 15.247

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.

REVIEWED BY

Report prepared by : Jin Gwan Lee
Engineer of Telecommunication Testing Center

Report approved by : Jong Seok Lee
Manager of Telecommunication Testing Center

This test results were applied only to the test methods required by the standard.

This laboratory is not accredited for the test results marked *.
The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2110-FC069	October 29, 2021	- First Approval Report
HCT-RF-2110-FC069-R1	November 05, 2021	- FCC ID revised - All Plot indicated RU Tones - Duty cycle >98%, not added the duty factor - Page 6, 26, 27, Typo. - Page 39-50, Added SISO Mode ANT1&2 Data - Page 74-83, 26T Band edge retest & Data revised
HCT-RF-2110-FC069-R2	November 08, 2021	- Page 1, 5, Revised the Average Output Power - Page 75, Recalculation - Page 78, Revised Peak data - Page 84, Revised Plot - Page 63-71, 78-83, Revised Duty factor

Table of Contents

1. EUT DESCRIPTION

Model	SM-N980F/DS	
Additional Model	SM-N980F	
EUT Type	Mobile Phone	
Power Supply	DC 3.88 V	
Frequency Range	2 412 MHz ~ 2 472 MHz(US Only: 2 412 MHz ~ 2 462 MHz)	
Max. RF Output Power SUM (MIMO Ant 1 + MIMO Ant 2)	Peak Power (For information only)	28.76 dBm
	Average Power	19.91 dBm
Modulation Type	OFDMA	
Number of Channels	13 Channels	
Date(s) of Tests	September 27, 2021 ~ October 27, 2021	
Serial number	Radiated: UIR1409M Conducted: UIR1403M	

ANTENNA CONFIGURATIONS

1. The device employs MIMO technology. Below are the possible configurations

Configurations	SISO		SDM	CDD
	Ant1	Ant2	Ant1 + Ant2	Ant1 + Ant2
802.11ax	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 2.4GHz and 5GHz bands simultaneously on each antenna.

	5GHz WIFI		2.4GHz WIFI		Test case
	Ant1	Ant2	Ant1	Ant2	
2.4 GHz + 5 GHz RSDB Only	A			B	-
		A	B		-
	A		B		-
		A		B	-
2.4 GHz + 5 GHz RSDB & MIMO	A	A	B		-
	A	A		B	-
	A		B	B	-
		A	B	B	-
2.4 GHz + 5 GHz RSDB MIMO	A	A	B	B	O

3. Directional Gain Calculation

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

Directional gain =

$$\bullet \quad DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

Ant Gain (dBi)		N_{ANT}/ N_{SS}	Directional Gain (dBi)
ANT1	-0.63	2 / 2	2.93
ANT2	0.43		

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 1.5m 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'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 April 02, 2018 (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.

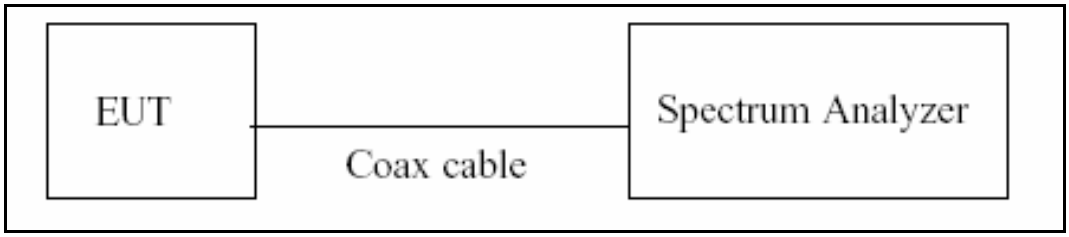
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.82 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	3.40 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	4.80 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.05 (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*.

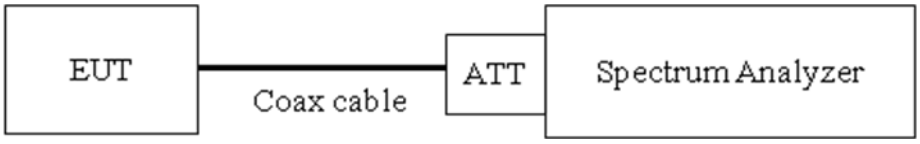
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (≥ RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on}/ T_{total} and Duty Cycle Factor = 10log(1/Duty Cycle)

7.2. 6 dB Bandwidth

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.

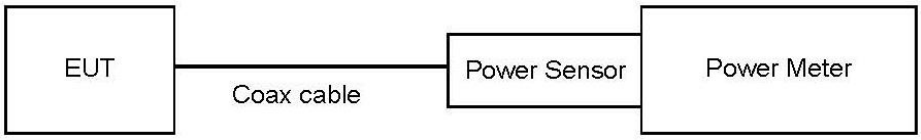
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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 Level + ATT loss + Cable loss

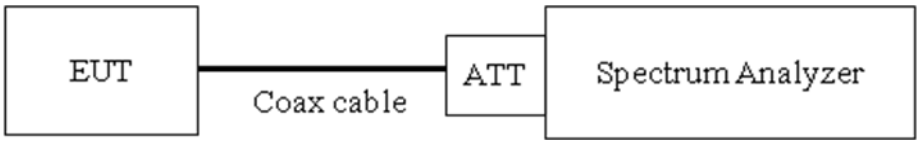
▪ Conducted Output Power(Average) = Measured L Value + ATT loss + Cable loss + Duty Cycle Factor

7.4. Power Spectral Density

Limit

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

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

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

The spectrum analyzer is set to :

1) Set analyzer center frequency to DTS channel center frequency.
2) Set span to at least 1.5 times the OBW.
3) RBW = 3 kHz ≤ RBW ≤ 100 kHz.
4) VBW ≥ 3 x RBW.
5) Sweep = auto couple
6) Detector = power averaging (rms) or sample detector (when rms not available).
7) Ensure that the number of measurement points in the sweep ≥ [2 ×span / RBW].
8) Employ trace averaging (rms) mode over a minimum of 100 traces
9) Use the peak marker function to determine the maximum amplitude level.
10) Use the peak marker function to determine the maximum amplitude level within the RBW.
    If Measured Level 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 Level + ATT loss + Cable loss

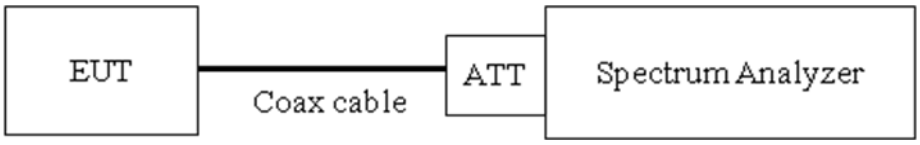
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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 30 dB 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 ≥ 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	10.10
100	10.15
200	10.19
300	10.24
400	10.30
500	10.30
600	10.31
700	10.32
800	10.33
900	10.35
1000	10.40
2000	10.41
2400	10.44
2412	10.47
2437	10.47
2462	10.47
2500	10.49
3000	10.59
4000	10.67
5000	10.69
5700	10.73
5800	10.73
6000	11.07
7000	11.20
8000	11.20
9000	11.28
10 000	11.38
11 000	11.47
12 000	11.56
13 000	11.57
14 000	11.60
15 000	11.70
16 000	11.78
17 000	11.99
18 000	12.12
19 000	12.04
20 000	11.71
21 000	11.84

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

2. Factor = Attenuator loss(10 dB) + Cable loss(1ea)

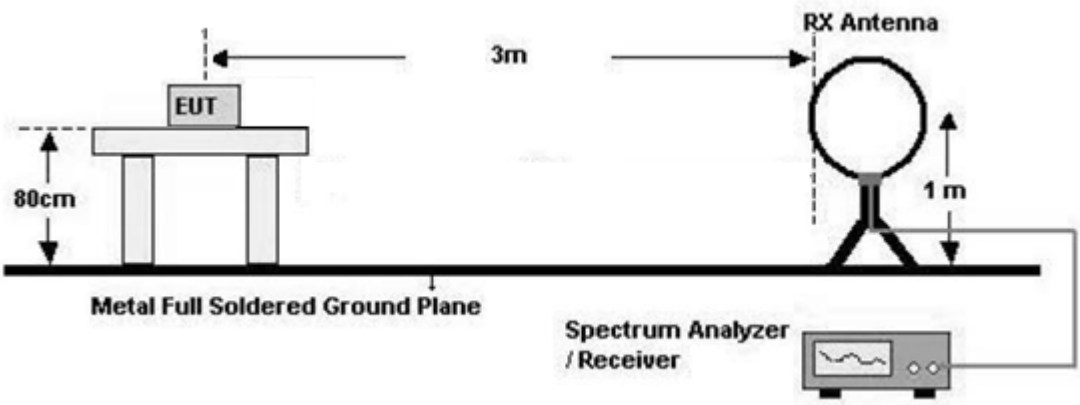
7.6. Radiated Test

Limit

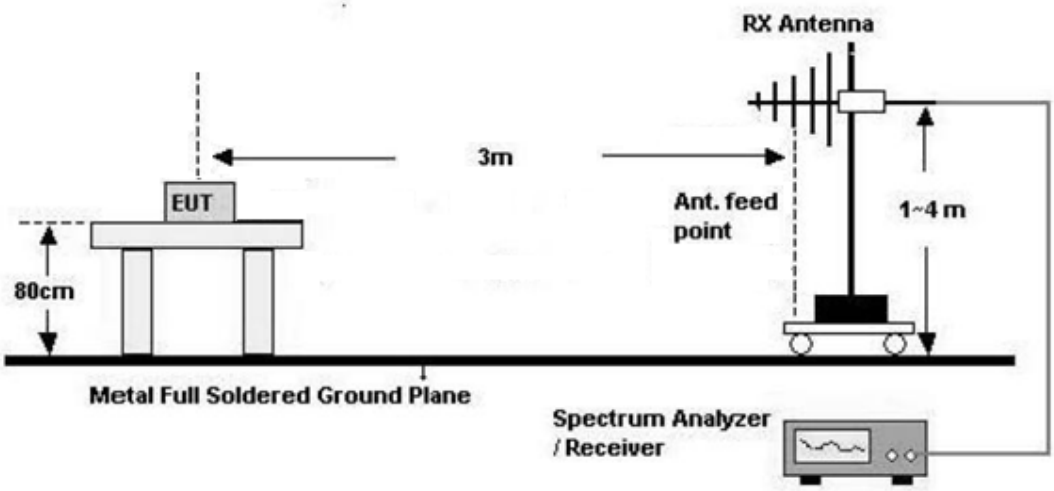
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

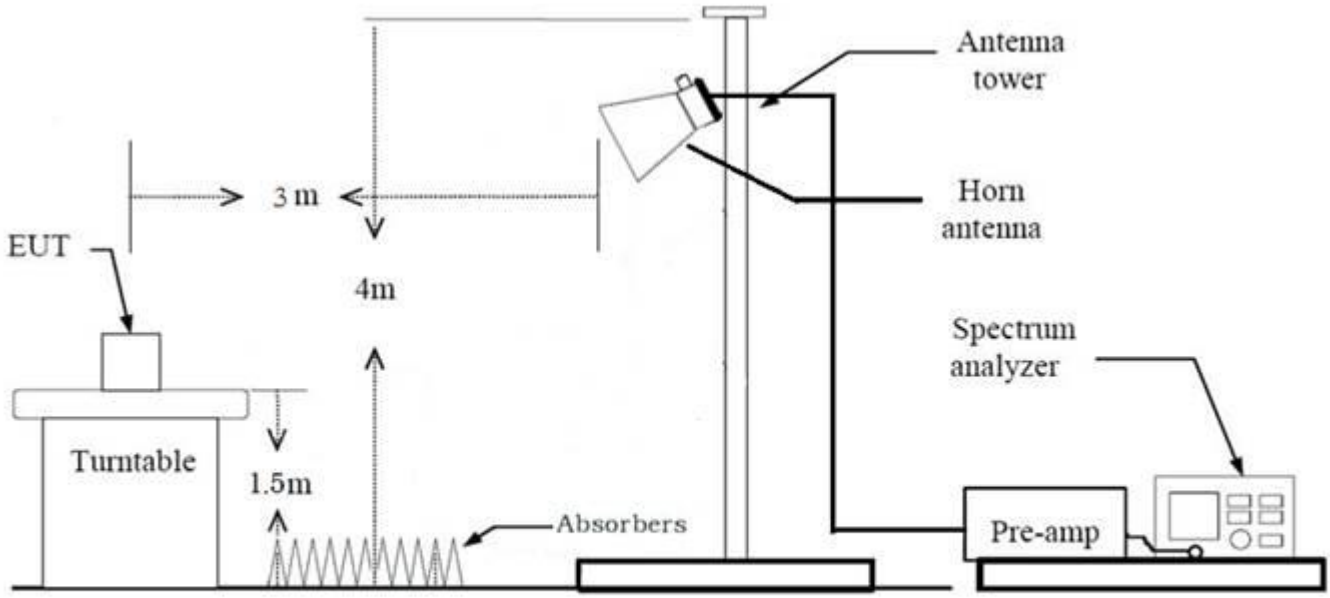
Below 30 MHz



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

KDB 414788 OFS and Chamber Correlation Justification

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

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

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 Level + 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 = 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.

9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
10. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
11. Total (Measurement Type : Peak)

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

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

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

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

= Measured Level + 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 = 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.

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

7.7. AC Power line Conducted Emissions

Limit

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

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

[a]Decreases with the logarithm of the frequency.

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

Test Configuration

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

Test Procedure

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

Sample Calculation

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

7.8. Test RU offset for Tones

BW (MHz)	Tones (T)	RU offset	Test RU offset		
			Low	Mid	High
20	26	0~8	0	4	8
	52	37~40	37	38	40
	106	53~54	53	-	54
	242	61	-	61	-

7.9. Worst case configuration and mode

Conducted test

1. All data rate of operation were investigated and the worst case results are reported.
   (Worst case : MCS0)
2. SM-N980F/DS, SM-N980F were tested and the worst case results are reported.
(Worst case : SM-N980F/DS)
3. Bandedge (Conducted)
 : All Mode(Channel, Tone, RU Offset) of operation were investigated and the worst case configuration results are reported

Tone	Channel	RU Index
26	1, 11	0, 8
52	1, 11	37, 40
106	1, 11	53, 54
242	1, 11	61
Tone	**Channel**	**RU Index**
26	12, 13	8
52	12, 13	40
106	12, 13	54
242	12, 13	61

Radiated test

1. Full RU(Resource Unit) mode and SU(Single Unit) mode have no difference in physical waveform.
   This Report has been described only Full RU(Resource Unit) mode with worst output power
2. 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
3. EUT Axis
   - Radiated Spurious Emissions : Z
   - Radiated Restricted Band Edge : X
4. All data rate of operation were investigated and the worst case results are reported.
   (Worst case : MCS0)
5. All Antenna of operation were investigated and the worst case results are reported
   - Mode : Ant1(SISO), Ant2(SISO), Ant1+Ant2(SDM), Ant1+Ant2(CDD)
   - Worstcase : Ant1+Ant2(CDD)
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. SM-N980F/DS, SM-N980F were tested and the worst case results are reported.

(Worst case : SM-N980F/DS)

8. All mode(Tone, RU Offset) of operation were investigated and the worst case configuration results are reported

Test	Tone	RU Offset
RSE	Worst case(Highest Power & PSD) : 26T	8
	Additional Tone : 26T, 52T	Low : 0 Mid : 4 High : 40
Bandedge	Worst case(Highest Power) : 26T	Low Edge: 0, SU High Edge: 8, SU
	Additional Tone : 52T, 106T, 242T	Low Edge: 37, 53, 61 High Edge: 40, 54, 61

Radiated test(DBS)

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. SM-N980F/DS, SM-N980F were tested and the worst case results are reported.

(Worst case : SM-N980F/DS)

3. EUT Axis

- Radiated Spurious Emissions : Y

4. Test case

RSDB	5GHz WIFI		2.4GHz WIFI		Test case
	Ant1	Ant2	Ant1	Ant2	
2.4 GHz + 5 GHz RSDB Only	A			B	-
		A	B		-
	A		B		-
		A		B	-
2.4 GHz + 5 GHz RSDB & MIMO	A	A	B		-
	A	A		B	-
	A		B	B	-
		A	B	B	-
2.4 GHz + 5 GHz RSDB MIMO	A	A	B	B	Case1

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.)

Test Case	Description	2.4 GHz Emission	5 GHz Emission
1	Antenna	Ant ALL	Ant ALL
	Channel	11	151
	Data Rate	MCS 0	MCS 0
	Mode	802.11ax (HE20)	802.11ax (HE40)
	Tone / RU	52 / 40	52 / 41

(Test case 1 Result : Please refer to the SM-N980F/DS [UNII ax] Test Report.)

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-N980F/DS, SM-N980F were tested and the worst case results are reported.

(Worst case : SM-N980F/DS)

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 (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

Note:

1. Please refer to the SM-N980F/DS[DTS] Test Report.

9. TEST RESULT

9.1 DUTY CYCLE

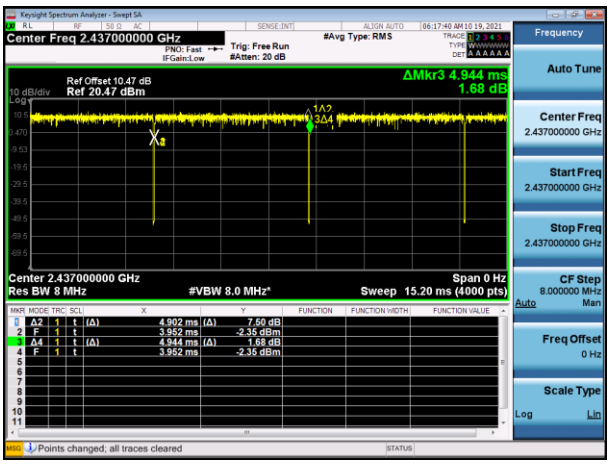
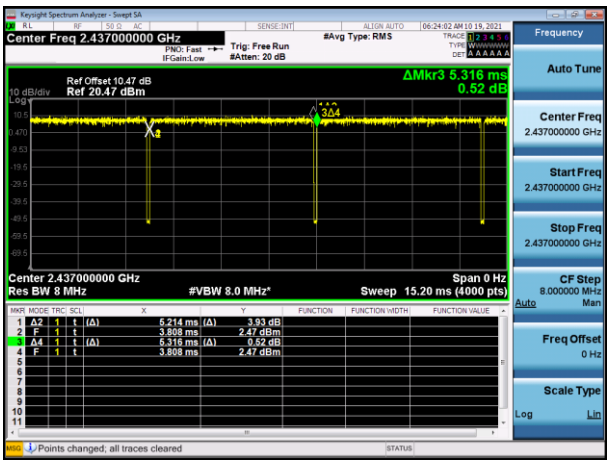
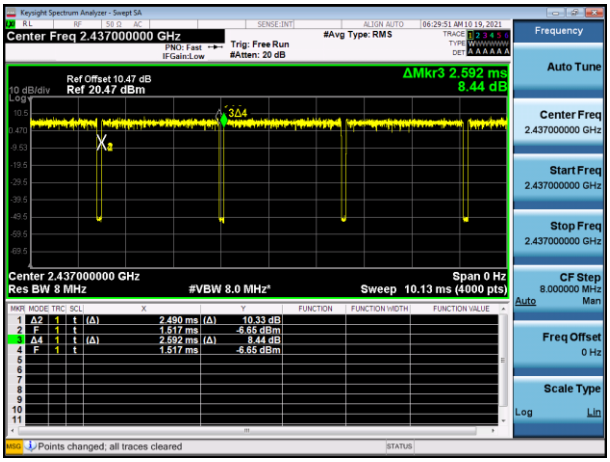
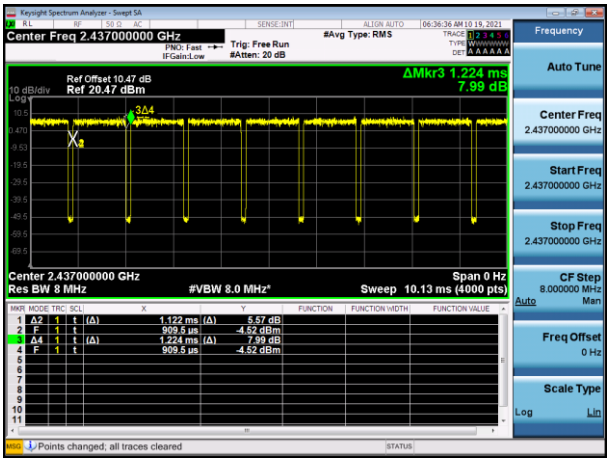
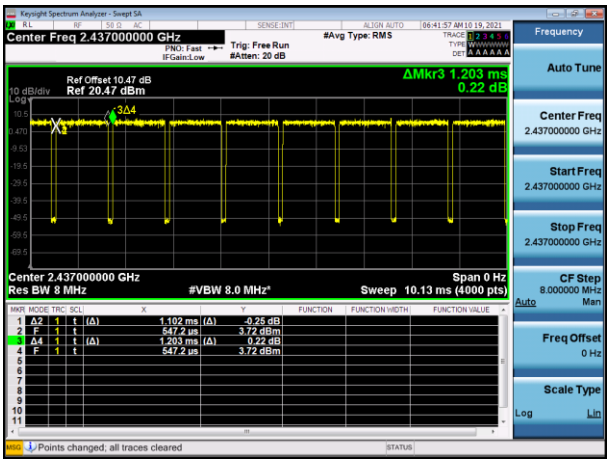
Mode	Tone (T)	Data Rate	On Time (ms)	Total Time (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11ax (HE20)	26	MCS0	4.902	4.944	0.992	0.037
		MCS1	5.216	5.318	0.981	0.083
		MCS2	3.499	3.600	0.972	0.124
		MCS3	2.642	2.744	0.963	0.163
		MCS4	1.778	1.882	0.945	0.247
		MCS5	1.353	1.454	0.930	0.314
		MCS6	1.206	1.310	0.921	0.359
		MCS7	1.099	1.201	0.916	0.383
		MCS8	0.922	1.023	0.901	0.453
		MCS9	0.841	0.942	0.892	0.494
	52	MCS0	5.214	5.316	0.981	0.085
		MCS1	2.642	2.744	0.963	0.163
		MCS2	1.781	1.882	0.946	0.240
		MCS3	1.353	1.452	0.932	0.306
		MCS4	0.925	1.026	0.901	0.452
		MCS5	0.707	0.808	0.875	0.582
		MCS6	0.636	0.737	0.863	0.642
		MCS7	0.585	0.687	0.852	0.694
		MCS8	0.497	0.598	0.831	0.807
		MCS9	0.456	0.557	0.818	0.871
	106	MCS0	2.490	2.592	0.961	0.173
		MCS1	1.277	1.378	0.926	0.332
		MCS2	0.871	0.973	0.896	0.478
		MCS3	0.671	0.773	0.869	0.611
		MCS4	0.471	0.570	0.827	0.827
		MCS5	0.370	0.471	0.785	1.052
		MCS6	0.337	0.438	0.769	1.142
		MCS7	0.312	0.410	0.759	1.196
		MCS8	0.269	0.370	0.726	1.390
		MCS9	0.251	0.352	0.712	1.474

Mode	Tone (T)	Data Rate	On Time (ms)	Total Time (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11ax (HE20)	242	MCS0	1.122	1.224	0.917	0.375
		MCS1	0.593	0.694	0.854	0.685
		MCS2	0.418	0.517	0.809	0.921
		MCS3	0.329	0.431	0.765	1.165
		MCS4	0.238	0.339	0.701	1.540
		MCS5	0.195	0.296	0.658	1.817
		MCS6	0.182	0.284	0.643	1.919
		MCS7	0.170	0.271	0.626	2.033
		MCS8	0.157	0.258	0.608	2.162
		MCS9	0.144	0.246	0.588	2.309
802.11ax(SU)	BW 20	MCS0	1.102	1.203	0.916	0.382
		MCS1	0.580	0.681	0.851	0.699
		MCS2	0.408	0.507	0.805	0.942
		MCS3	0.322	0.423	0.760	1.189
		MCS4	0.236	0.337	0.699	1.554
		MCS5	0.195	0.294	0.664	1.780
		MCS6	0.177	0.279	0.636	1.963
		MCS7	0.167	0.266	0.629	2.016
		MCS8	0.152	0.253	0.600	2.218
		MCS9	0.142	0.241	0.589	2.295

▣ Test Plots

Note:

In order to simplify the report, attached plots were only the most lowest datarate.

26 Tones MCS0	52 Tones MCS0
	
106 Tones MCS0	**242 Tones MCS0**
	
SU MCS0	
	

9.2 6 dB BANDWIDTH

[ANT1]

BW	Frequency [MHz]	Channel No.	RU Index	6 dB BW (MHz)				
				26 T	52 T	106 T	242 T	SU
HE20	2 412	1	Low	2.115	14.56	17.16	-	-
			Mid	2.690	10.38	-	19.03	19.02
			High	2.045	14.53	17.11	-	-
	2 437	6	Low	2.126	17.06	17.18	-	-
			Mid	2.701	6.661	-	19.08	19.10
			High	2.102	8.262	17.18	-	-
	2 462	11	Low	2.114	14.53	17.19	-	-
			Mid	2.696	11.28	-	19.13	19.12
			High	2.075	15.80	17.16	-	-
	2 467	12	Low	2.138	17.04	17.17	-	-
			Mid	2.700	7.904	-	19.13	19.12
			High	2.097	15.78	17.16	-	-
	2 472	13	Low	2.127	12.01	17.14	-	-
			Mid	2.702	7.902	-	19.07	19.08
			High	2.077	15.76	17.11	-	-

Limit : > 500 kHz

[ANT2]

BW	Frequency [MHz]	Channel No.	RU Index	6 dB BW (MHz)				
				26 T	52 T	106 T	242 T	SU
HE20	2 412	1	Low	2.126	17.00	18.13	-	-
			Mid	2.702	12.91	-	19.07	19.06
			High	2.084	8.228	17.16	-	-
	2 437	6	Low	2.073	10.83	17.17	-	-
			Mid	2.689	7.895	-	19.08	19.01
			High	2.087	15.79	17.17	-	-
	2 462	11	Low	2.096	17.03	17.18	-	-
			Mid	2.695	7.874	-	19.12	19.11
			High	2.099	8.258	17.17	-	-
	2 467	12	Low	2.141	10.78	17.17	-	-
			Mid	2.691	6.663	-	19.15	19.12
			High	2.052	8.275	17.17	-	-
	2 472	13	Low	2.127	14.55	17.19	-	-
			Mid	2.693	4.072	-	19.10	19.10
			High	2.098	15.79	17.14	-	-

Limit : > 500 kHz

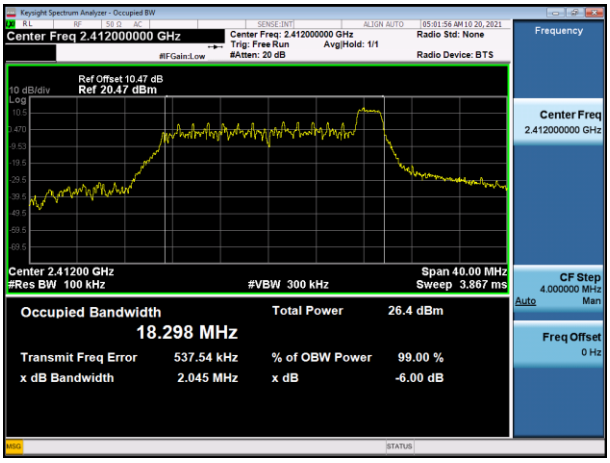
▣ Test Plots

Note:

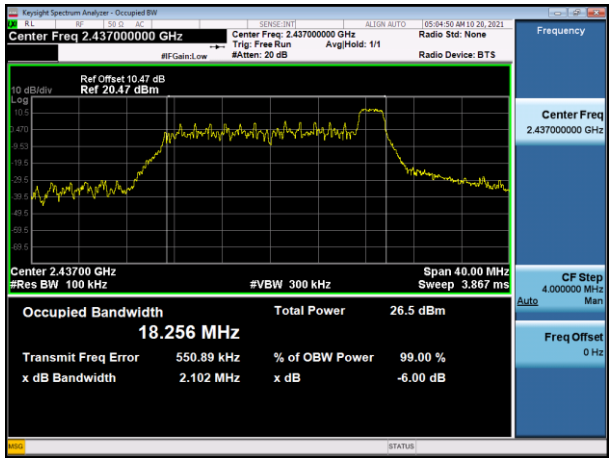
In order to simplify the report, attached plots were only the most narrow 6 dB BW channel.

[ANT1]

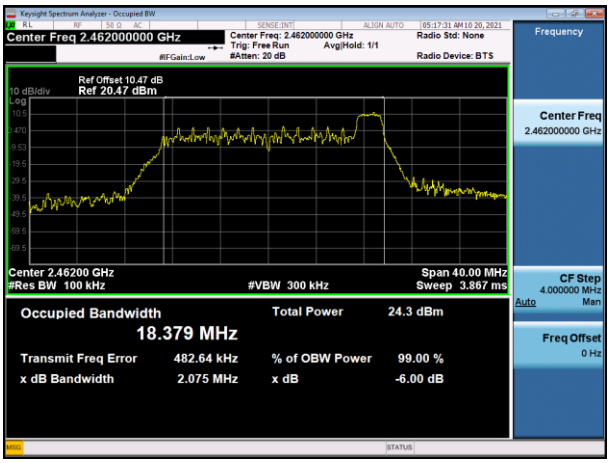
BW20M Ch.1(2 412 MHz) 26 Tones RU 8



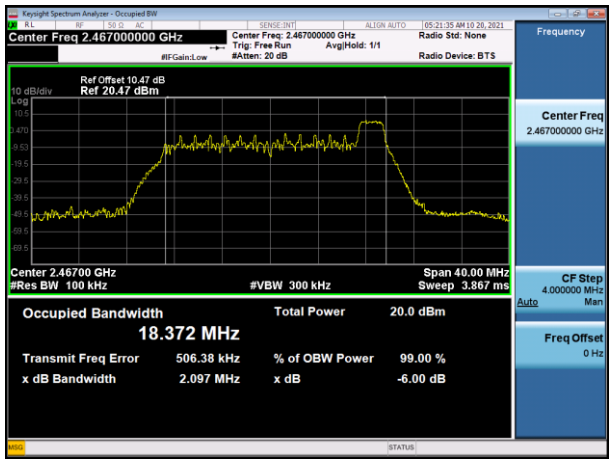
BW20M Ch.6(2 437 MHz) 26 Tones RU 8



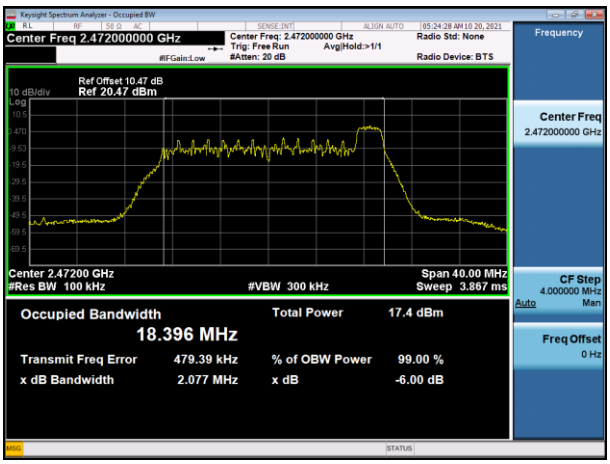
BW20M Ch.11(2 462 MHz) 26 Tones RU 8



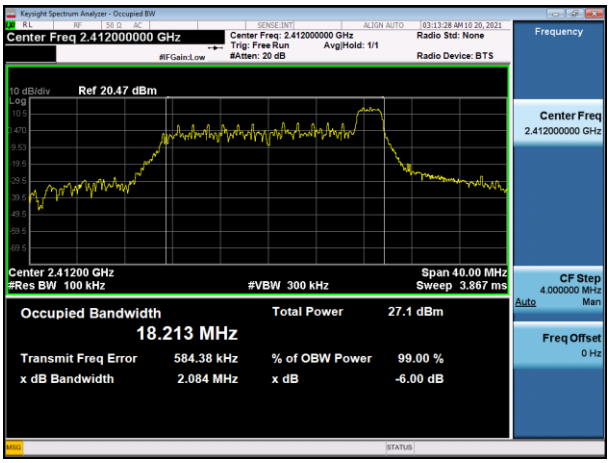
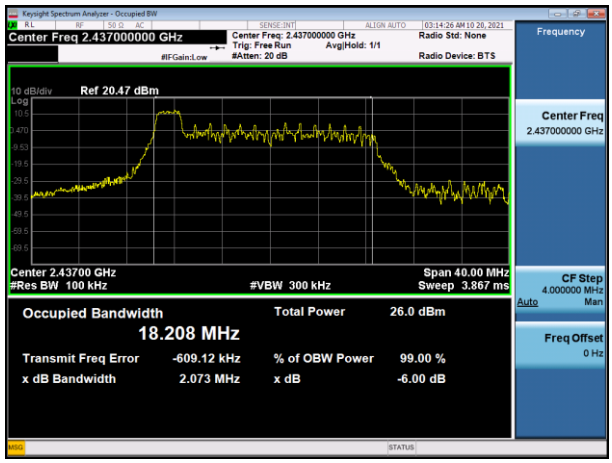
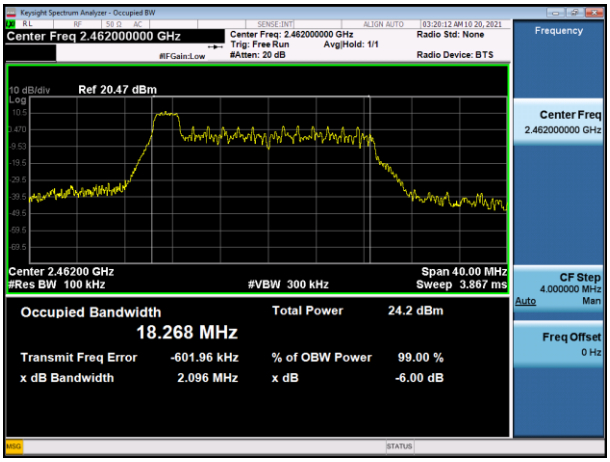
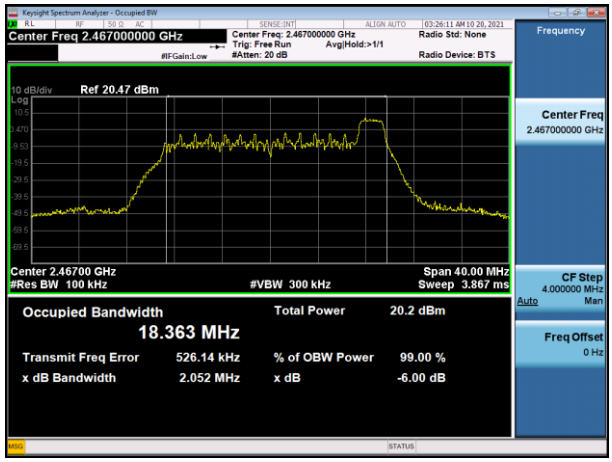
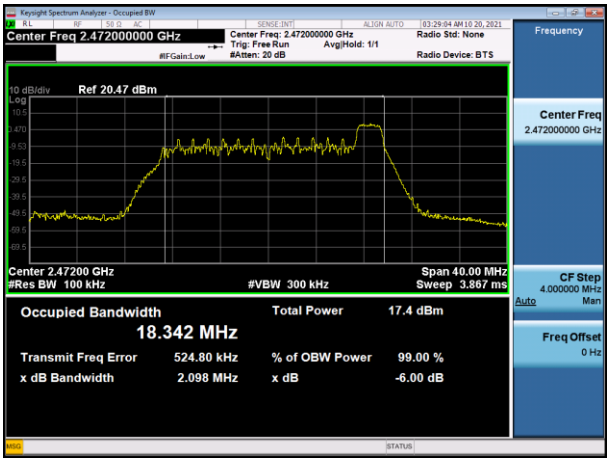
BW20M Ch.12(2 467 MHz) 26 Tones RU 8



BW20M Ch.13(2 472 MHz) 26 Tones RU 8



[ANT2]

BW20M Ch.1(2 412 MHz) 26 Tones RU 8	BW20M Ch.6(2 437 MHz) 26 Tones RU 0
	
BW20M Ch.11(2 462 MHz) 26 Tones RU 0	**BW20M Ch.12(2 467 MHz) 26 Tones RU 8**
	
BW20M Ch.13(2 472 MHz) 26 Tones RU 8	
	

9.3 OUTPUT POWER

Power Level Setting

802.11ax Mode	Frequency [MHz]	Channel No.	26 T	52T	106T	242 T
Low	2412	1	16	16	15	14
Mid	2437	6	16	16	16	16
High	2462	11	14	16	16	13
	2467	12	10	10	10	10
	2472	13	7	7	7	7

Peak Power

1. Power Meter offset = Attenuator loss + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
So, 10.47 dB is offset for 2.4 GHz Band

[ANT 1]

BW	Frequency [MHz]	Channel No.	RU Index	Total Peak Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	25.39	25.03	23.34	-	-
			Mid	25.58	25.19	-	21.52	21.54
			High	25.81	25.27	23.68	-	-
	2437	6	Low	25.14	24.59	24.22	-	-
			Mid	24.95	24.67	-	23.34	23.22
			High	25.19	24.96	24.24	-	-
	2462	11	Low	23.38	25.15	24.55	-	-
			Mid	23.35	25.04	-	21.58	21.61
			High	23.40	25.12	24.55	-	-
	2467	12	Low	18.91	18.97	18.40	-	-
			Mid	19.52	18.99	-	17.62	17.50
			High	19.21	19.20	18.67	-	-
	2472	13	Low	16.41	16.22	15.69	-	-
			Mid	16.39	16.34	-	14.16	14.30
			High	16.16	15.97	15.23	-	-

Limit : 30 dBm

[ANT 2]

BW	Frequency [MHz]	Channel No.	RU Index	Total Peak Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	24.98	24.82	23.36	-	-
			Mid	25.12	24.59	-	21.49	21.40
			High	25.69	25.65	23.80	-	-
	2437	6	Low	24.87	24.69	24.06	-	-
			Mid	25.01	24.69	-	23.00	22.98
			High	24.89	24.66	24.05	-	-
	2462	11	Low	23.33	24.76	24.30	-	-
			Mid	23.32	24.81	-	21.56	21.60
			High	23.39	24.82	24.31	-	-
	2467	12	Low	19.09	18.67	18.28	-	-
			Mid	19.23	18.85	-	17.45	17.43
			High	19.33	18.96	18.43	-	-
	2472	13	Low	15.77	15.59	15.19	-	-
			Mid	16.26	15.60	-	14.14	14.12
			High	16.23	15.92	15.21	-	-

Limit : 30 dBm

[SUM (MIMO Ant 1 + MIMO Ant 2)]

1. Total peak power for MIMO=10*LOG((10^(MIMO Ant1 Total power /10))+(10^(MIMO Ant2 Total power /10)))

BW	Frequency [MHz]	Channel No.	RU Index	SUM Peak Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	28.20	27.94	26.36	-	-
			Mid	28.37	27.91	-	24.51	24.48
			High	28.76	28.48	26.75	-	-
	2437	6	Low	28.02	27.65	27.15	-	-
			Mid	27.99	27.69	-	26.19	26.12
			High	28.05	27.82	27.16	-	-
	2462	11	Low	26.36	27.97	27.44	-	-
			Mid	26.34	27.93	-	24.58	24.61
			High	26.41	27.98	27.44	-	-
	2467	12	Low	22.01	21.83	21.35	-	-
			Mid	22.39	21.93	-	20.55	20.47
			High	22.28	22.09	21.57	-	-
	2472	13	Low	19.11	18.93	18.46	-	-
			Mid	19.33	19.00	-	17.16	17.22
			High	19.20	18.95	18.23	-	-

Limit : 30 dBm

Average Power

1. Power Meter offset = Attenuator loss + Cable loss
2. We apply to the offset in the 2.4 GHz range that was rounded off to the closest tenth dB.
So, 10.47 dB is offset for 2.4 GHz Band
3. Total Average Power = Measured Average Power + Duty cycle Factor

[ANT 1]

BW	Frequency [MHz]	Channel No.	RU Index	Measured Average Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	16.07	15.79	14.69	-	-
			Mid	16.50	15.92	-	13.75	13.81
			High	16.91	16.74	15.48	-	-
	2437	6	Low	15.74	15.59	15.58	-	-
			Mid	16.33	16.05	-	15.37	15.14
			High	15.55	15.24	15.41	-	-
	2462	11	Low	14.28	16.04	15.73	-	-
			Mid	14.49	16.08	-	12.81	12.80
			High	14.29	16.08	15.85	-	-
	2467	12	Low	10.15	10.08	9.93	-	-
			Mid	10.55	10.27	-	9.94	9.84
			High	10.60	10.40	10.26	-	-
	2472	13	Low	6.85	6.86	6.78	-	-
			Mid	7.40	7.16	-	6.50	6.52
			High	7.29	7.29	6.88	-	-

Limit : 30 dBm

BW	Frequency [MHz]	Channel No.	RU Index	Total Average Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	16.07	15.79	14.86	-	-
			Mid	16.50	15.92	-	14.13	14.19
			High	16.91	16.74	15.65	-	-
	2437	6	Low	15.74	15.59	15.75	-	-
			Mid	16.33	16.05	-	15.75	15.52
			High	15.55	15.24	15.58	-	-
	2462	11	Low	14.28	16.04	15.90	-	-
			Mid	14.49	16.08	-	13.19	13.18
			High	14.29	16.08	16.02	-	-
	2467	12	Low	10.15	10.08	10.10	-	-
			Mid	10.55	10.27	-	10.32	10.22
			High	10.60	10.40	10.43	-	-
	2472	13	Low	6.85	6.86	6.95	-	-
			Mid	7.40	7.16	-	6.88	6.90
			High	7.29	7.29	7.05	-	-

Limit : 30 dBm

[ANT 2]

BW	Frequency [MHz]	Channel No.	RU Index	Measured Average Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	15.73	15.68	14.29	-	-
			Mid	16.36	15.86	-	13.71	13.51
			High	16.88	16.47	14.97	-	-
	2437	6	Low	15.70	15.57	15.46	-	-
			Mid	16.16	15.93	-	15.62	15.42
			High	16.21	15.94	15.53	-	-
	2462	11	Low	14.78	16.40	16.26	-	-
			Mid	14.70	16.39	-	12.93	12.90
			High	14.62	16.32	16.27	-	-
	2467	12	Low	10.07	9.80	9.78	-	-
			Mid	10.28	9.95	-	9.76	9.56
			High	10.36	10.00	9.97	-	-
	2472	13	Low	6.90	6.49	6.39	-	-
			Mid	7.05	6.78	-	6.55	6.34
			High	7.05	6.77	6.69	-	-

Limit : 30 dBm

BW	Frequency [MHz]	Channel No.	RU Index	Total Average Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	15.73	15.68	14.46	-	-
			Mid	16.36	15.86	-	14.09	13.89
			High	16.88	16.47	15.14	-	-
	2437	6	Low	15.70	15.57	15.63	-	-
			Mid	16.16	15.93	-	16.00	15.80
			High	16.21	15.94	15.70	-	-
	2462	11	Low	14.78	16.40	16.43	-	-
			Mid	14.70	16.39	-	13.31	13.28
			High	14.62	16.32	16.44	-	-
	2467	12	Low	10.07	9.80	9.95	-	-
			Mid	10.28	9.95	-	10.14	9.94
			High	10.36	10.00	10.14	-	-
	2472	13	Low	6.90	6.49	6.56	-	-
			Mid	7.05	6.78	-	6.93	6.72
			High	7.05	6.77	6.86	-	-

Limit : 30 dBm

[SUM (MIMO Ant 1 + MIMO Ant 2)]

1. Total average power for MIMO=10*LOG((10^(Ant1 Total power /10))+(10^(Ant2 Total power /10)))

BW	Frequency [MHz]	Channel No.	RU Index	SUM Average Power (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	18.91	18.75	17.68	-	-
			Mid	19.44	18.90	-	17.12	17.05
			High	19.91	19.61	18.41	-	-
	2437	6	Low	18.73	18.59	18.70	-	-
			Mid	19.26	19.00	-	18.89	18.67
			High	18.90	18.61	18.65	-	-
	2462	11	Low	17.55	19.23	19.18	-	-
			Mid	17.61	19.25	-	16.26	16.24
			High	17.47	19.21	19.25	-	-
	2467	12	Low	13.12	12.95	13.04	-	-
			Mid	13.43	13.12	-	13.24	13.09
			High	13.49	13.22	13.30	-	-
	2472	13	Low	9.89	9.69	9.77	-	-
			Mid	10.24	9.98	-	9.91	9.82
			High	10.18	10.05	9.97	-	-

Limit : 30 dBm

Note:

1. See section 9.1 for duty factor.
2. 26, 52T are Continuous wave. (Duty Cycle > 98%)
3. All data rate of operation were investigated and the worst case results are reported.

(Worst case : MCS0)

9.4 POWER SPECTRAL DENSITY

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(10 dB) + Cable loss(1ea)
3. 10.47 dB is offset for 2.4 GHz Band.
4. Total PSD = Measured PSD + Duty Cycle Factor

[Ant1]

BW	Frequency [MHz]	Channel No.	RU Index	Measured PSD (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	-1.287	-4.406	-8.059	-	-
			Mid	-0.614	-3.740	-	-11.842	-12.054
			High	-0.862	-3.556	-7.769	-	-
	2437	6	Low	-1.532	-4.692	-7.420	-	-
			Mid	-1.293	-4.339	-	-10.715	-10.439
			High	-0.853	-3.987	-7.049	-	-
	2462	11	Low	-3.232	-3.984	-7.042	-	-
			Mid	-2.912	-3.963	-	-13.582	-13.212
			High	-2.782	-3.802	-6.961	-	-
	2467	12	Low	-7.496	-10.444	-12.951	-	-
			Mid	-6.763	-9.745	-	-16.507	-15.774
			High	-7.222	-10.093	-12.594	-	-
	2472	13	Low	-9.899	-12.817	-15.586	-	-
			Mid	-9.479	-12.449	-	-19.249	-18.467
			High	-9.911	-12.967	-15.288	-	-

BW	Frequency [MHz]	Channel No.	RU Index	Total PSD (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	-1.287	-4.406	-7.889	-	-
			Mid	-0.614	-3.740	-	-11.462	-11.674
			High	-0.862	-3.556	-7.599	-	-
	2437	6	Low	-1.532	-4.692	-7.250	-	-
			Mid	-1.293	-4.339	-	-10.335	-10.059
			High	-0.853	-3.987	-6.879	-	-
	2462	11	Low	-3.232	-3.984	-6.872	-	-
			Mid	-2.912	-3.963	-	-13.202	-12.832
			High	-2.782	-3.802	-6.791	-	-
	2467	12	Low	-7.496	-10.444	-12.781	-	-
			Mid	-6.763	-9.745	-	-16.127	-15.394
			High	-7.222	-10.093	-12.424	-	-
	2472	13	Low	-9.899	-12.817	-15.416	-	-
			Mid	-9.479	-12.449	-	-18.869	-18.087
			High	-9.911	-12.967	-15.118	-	-

[Ant2]

BW	Frequency [MHz]	Channel No.	RU Index	Measured PSD (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	-1.469	-4.368	-8.090	-	-
			Mid	-0.742	-4.168	-	-12.632	-11.691
			High	-0.134	-3.283	-7.305	-	-
	2437	6	Low	-1.628	-4.372	-7.346	-	-
			Mid	-1.337	-4.325	-	-10.120	-10.502
			High	-1.777	-4.797	-7.090	-	-
	2462	11	Low	-3.178	-4.383	-7.490	-	-
			Mid	-3.020	-4.216	-	-13.449	-12.957
			High	-3.141	-4.281	-6.918	-	-
	2467	12	Low	-7.313	-10.284	-13.215	-	-
			Mid	-7.103	-10.154	-	-16.271	-16.185
			High	-6.633	-9.835	-12.766	-	-
	2472	13	Low	-10.694	-13.012	-15.826	-	-
			Mid	-9.906	-13.033	-	-19.001	-19.540
			High	-10.224	-12.527	-15.649	-	-

BW	Frequency [MHz]	Channel No.	RU Index	Total PSD (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	-1.469	-4.368	-7.920	-	-
			Mid	-0.742	-4.168	-	-12.252	-11.311
			High	-0.134	-3.283	-7.135	-	-
	2437	6	Low	-1.628	-4.372	-7.176	-	-
			Mid	-1.337	-4.325	-	-9.740	-10.122
			High	-1.777	-4.797	-6.920	-	-
	2462	11	Low	-3.178	-4.383	-7.320	-	-
			Mid	-3.020	-4.216	-	-13.069	-12.577
			High	-3.141	-4.281	-6.748	-	-
	2467	12	Low	-7.313	-10.284	-13.045	-	-
			Mid	-7.103	-10.154	-	-15.891	-15.805
			High	-6.633	-9.835	-12.596	-	-
	2472	13	Low	-10.694	-13.012	-15.656	-	-
			Mid	-9.906	-13.033	-	-18.621	-19.160
			High	-10.224	-12.527	-15.479	-	-

[SUM (MIMO Ant 1 + MIMO Ant 2)]

BW	Frequency [MHz]	Channel No.	RU Index	SUM Total PSD (dBm)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	1.633	-1.377	-4.894	-	-
			Mid	2.333	-0.939	-	-8.828	-8.478
			High	2.527	-0.407	-4.350	-	-
	2437	6	Low	1.430	-1.519	-4.202	-	-
			Mid	1.695	-1.322	-	-7.017	-7.080
			High	1.720	-1.363	-3.889	-	-
	2462	11	Low	-0.195	-1.169	-4.080	-	-
			Mid	0.045	-1.078	-	-10.124	-9.692
			High	0.052	-1.025	-3.759	-	-
	2467	12	Low	-4.393	-7.353	-9.900	-	-
			Mid	-3.919	-6.935	-	-12.997	-12.584
			High	-3.907	-6.952	-9.499	-	-
	2472	13	Low	-7.268	-9.903	-12.524	-	-
			Mid	-6.677	-9.721	-	-15.733	-15.580
			High	-7.055	-9.731	-12.284	-	-

Limit : 8 dBm

Note:

1. See section 9.1 for duty factor.
2. 26, 52T are Continuous wave. (Duty Cycle > 98%)
3. All data rate of operation were investigated and the worst case results are reported.

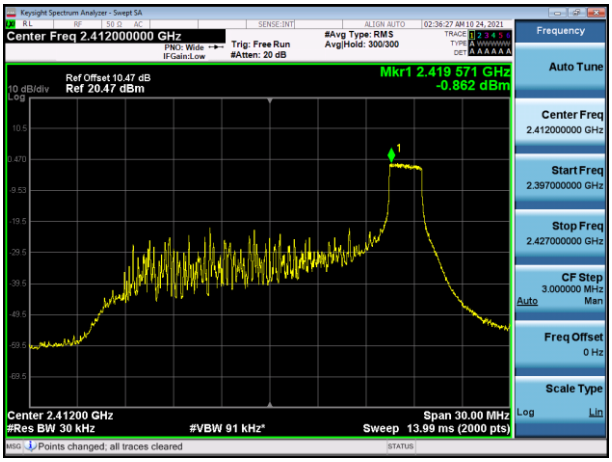
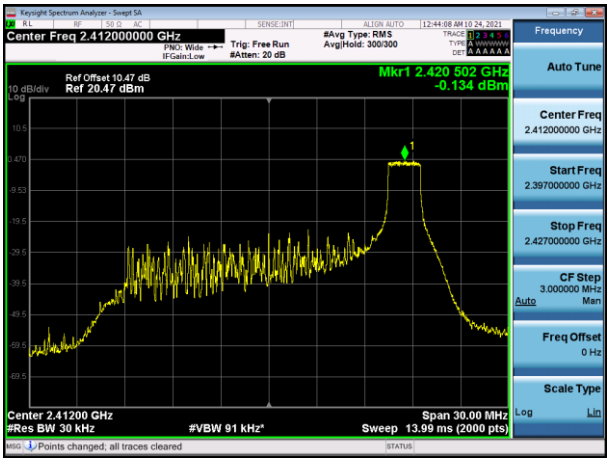
(Worst case : MCS0)

▣ Test Plots

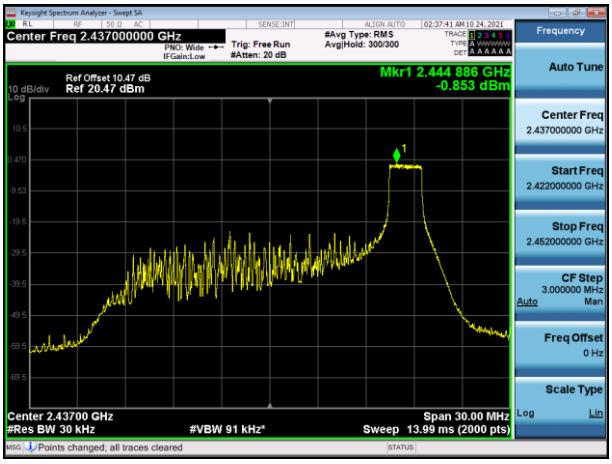
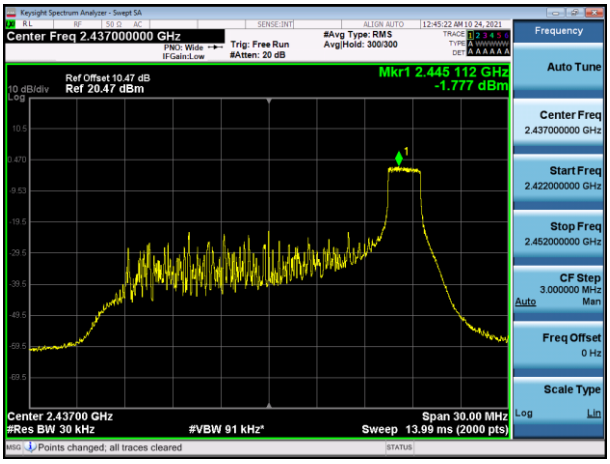
Note:

1. In order to simplify the report, attached plots were only the worst case PSD channel.
2. Total PSD(dBm) = Measured Level + Duty Cycle Factor

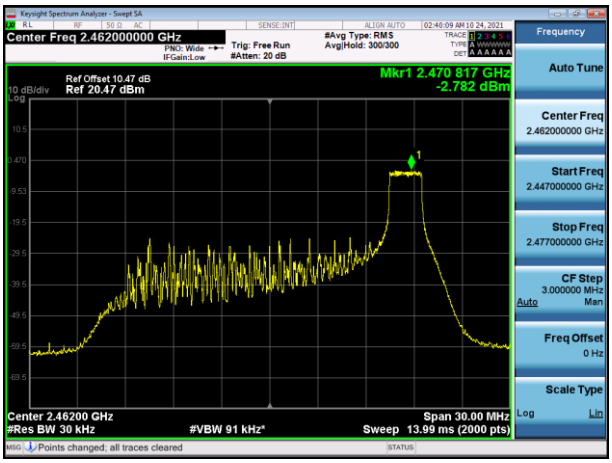
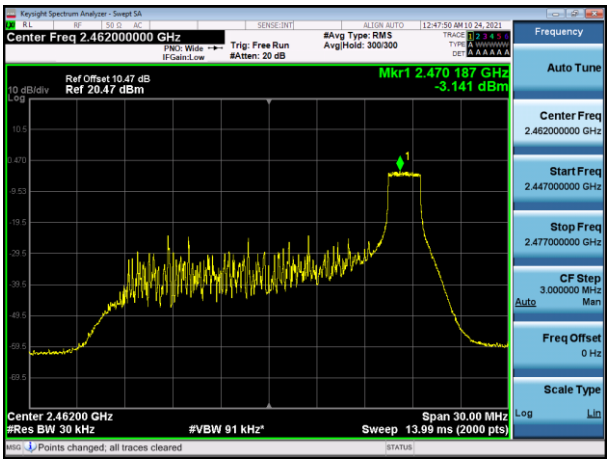
[SUM (MIMO Ant 1 + MIMO Ant 2)]

BW20M Ch.1(2412 MHz) 26 Tones RU 8	
Ant1	**Ant2**
	

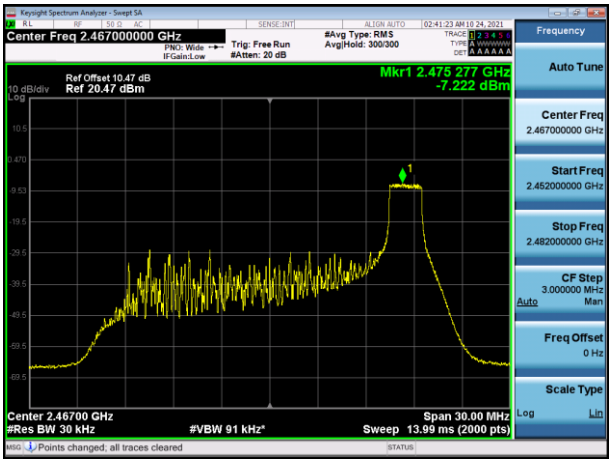
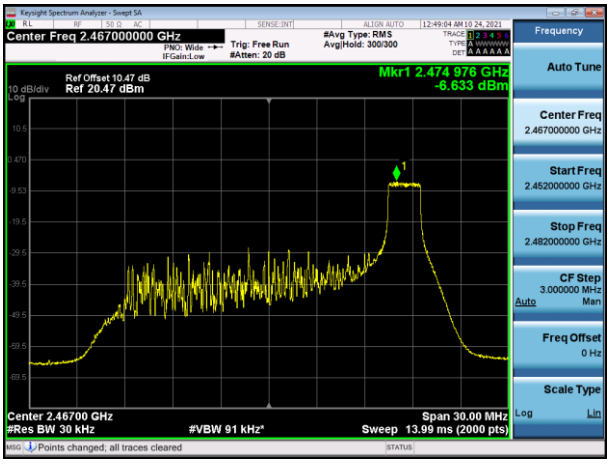
SUM PSD (dBm)	Duty Cycle Factor (dB)	Total SUM PSD (dBm)
2.527	0.000	2.527

BW20M Ch.6(2437 MHz) 26 Tones RU 8	
Ant1	Ant2
	

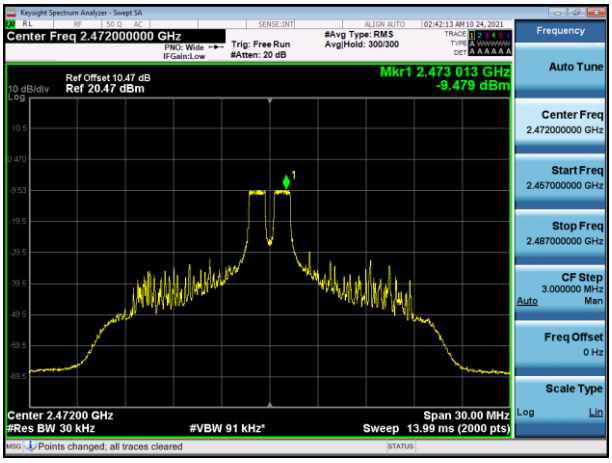
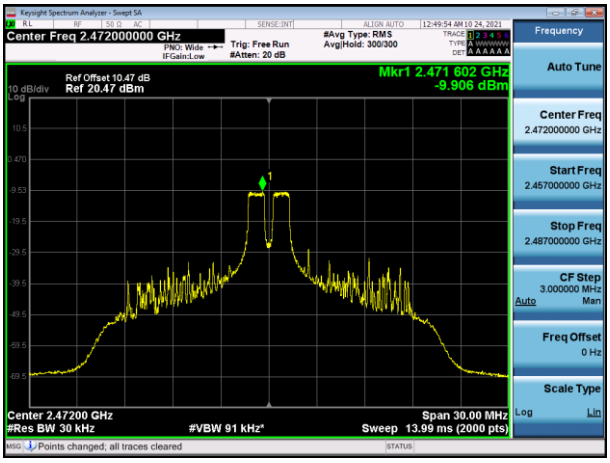
SUM PSD (dBm)	Duty Cycle Factor (dB)	Total SUM PSD (dBm)
1.720	0.000	1.720

BW20M Ch.11(2462 MHz) 26 Tones RU 8	
Ant1	Ant2
	

SUM PSD (dBm)	Duty Cycle Factor (dB)	Total SUM PSD (dBm)
0.052	0.000	0.052

BW20M Ch.12(2467MHz) 26 Tones RU 8	
Ant1	**Ant2**
	

SUM PSD (dBm)	Duty Cycle Factor (dB)	Total SUM PSD (dBm)
-3.907	0.000	-3.907

BW20M Ch.13(2472MHz) 26 Tones RU 4	
Ant1	**Ant2**
	

SUM PSD (dBm)	Duty Cycle Factor (dB)	Total SUM PSD (dBm)
-6.677	0.000	-6.677

9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Band Edge

[MIMO Ant1]

BW	Frequency [MHz]	Channel No.	RU Index	Measured Position	Result (dB)		
					26 T	52 T	106 T
HE20	2412	1	Low	Lowest Bandedge	36.085	34.757	34.731
	2462	11	High	Highest Bandedge	48.751	44.992	44.973
	2467	12	High	Highest Bandedge	42.435	42.016	39.164
	2472	13	High	Highest Bandedge	36.961	37.068	33.955

Limit : 30 dBc

BW	Frequency [MHz]	Channel No.	RU Index	Measured Position	Result (dB)	
					242 T	SU
HE20	2412	1	Mid	Lowest Bandedge	36.737	37.123
	2462	11		Highest Bandedge	36.165	37.377
	2467	12		Highest Bandedge	35.677	35.112
	2472	13		Highest Bandedge	37.878	38.370

Limit : 30 dBc

[MIMO Ant2]

BW	Frequency [MHz]	Channel No.	RU Index	Measured Position	Result (dB)		
					26 T	52 T	106 T
HE20	2412	1	Low	Lowest Bandedge	37.817	33.215	34.083
	2462	11	High	Highest Bandedge	48.429	48.637	46.033
	2467	12	High	Highest Bandedge	43.588	42.232	38.684
	2472	13	High	Highest Bandedge	40.273	37.300	31.575

Limit : 30 dBc

BW	Frequency [MHz]	Channel No.	RU Index	Measured Position	Result (dB)	
					242 T	SU
HE20	2412	1	Mid	Lowest Bandedge	35.776	36.389
	2462	11		Highest Bandedge	37.673	37.769
	2467	12		Highest Bandedge	36.721	35.334
	2472	13		Highest Bandedge	38.113	37.917

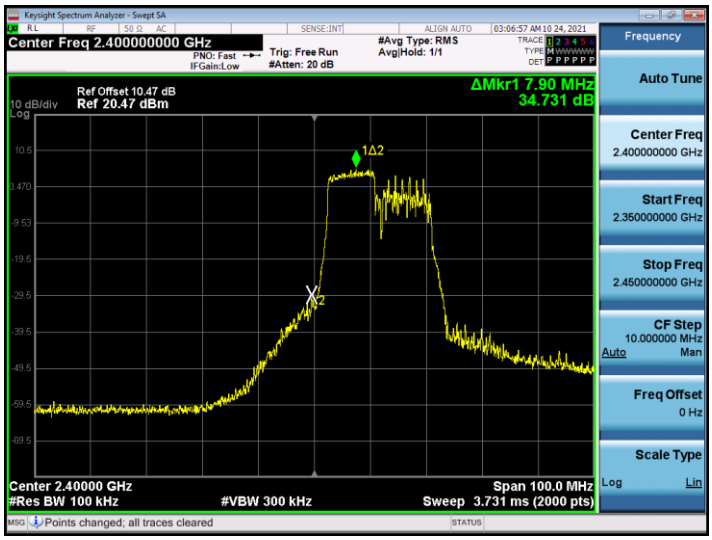
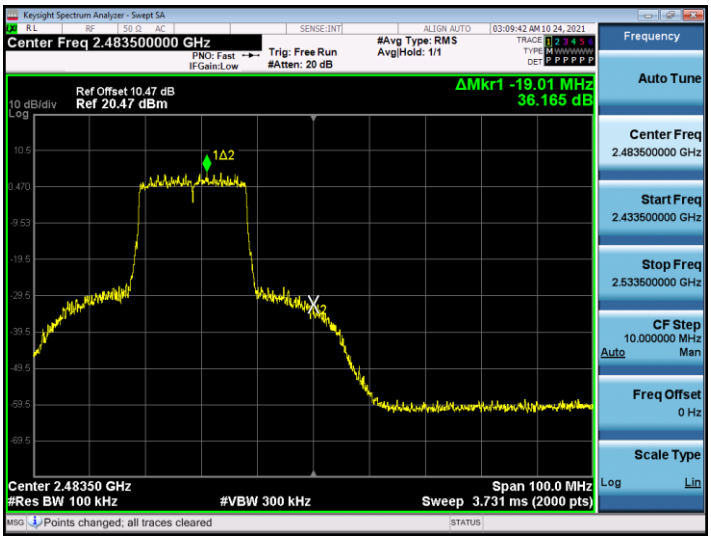
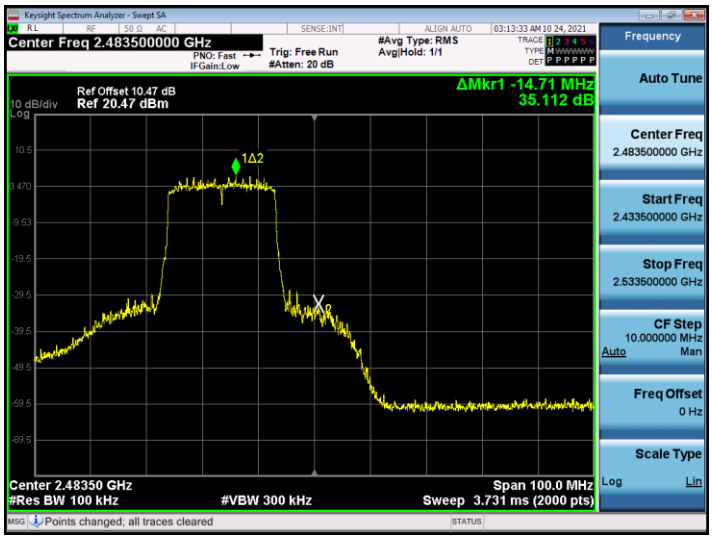
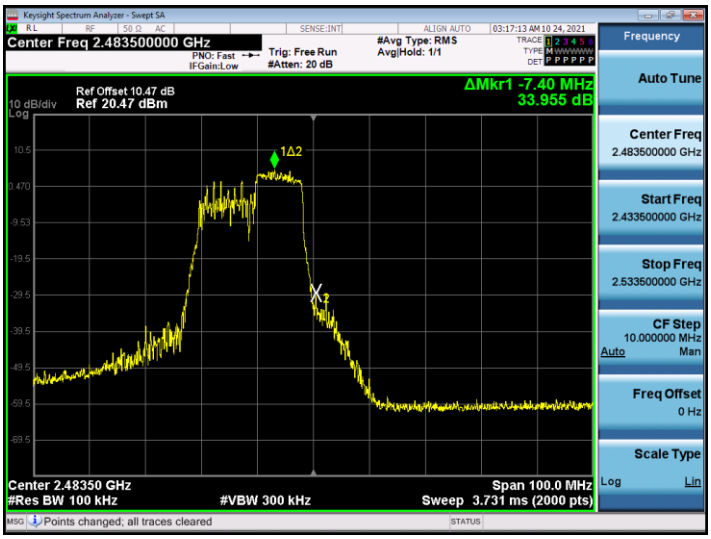
Limit : 30 dBc

▣ Test Plots

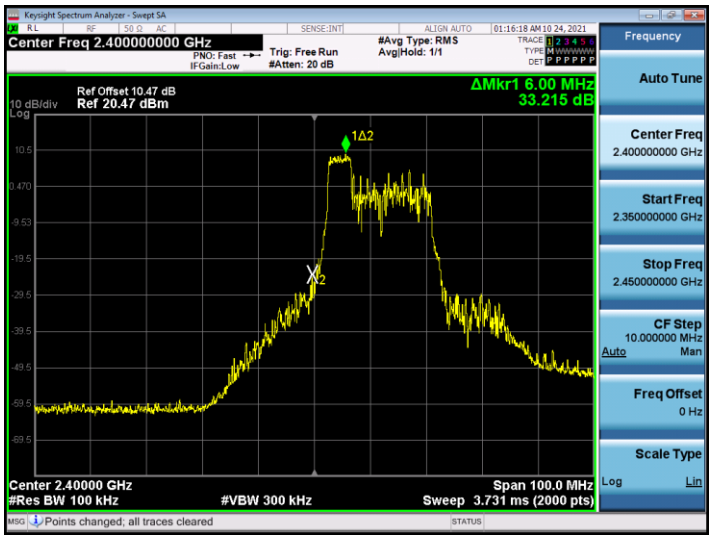
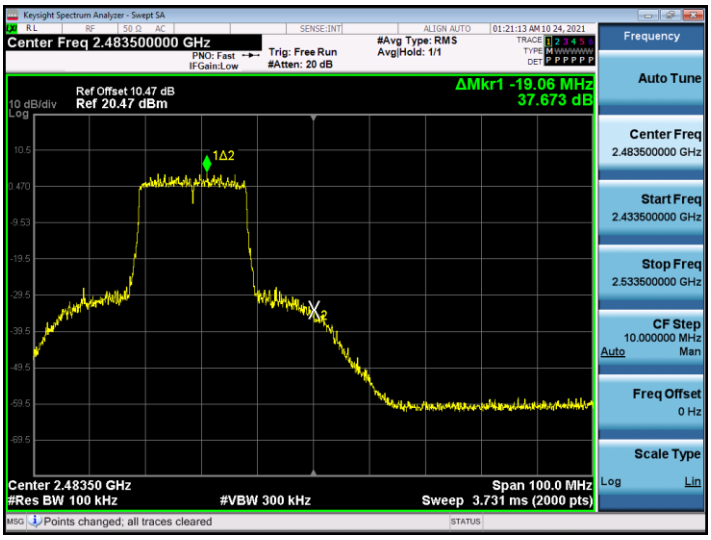
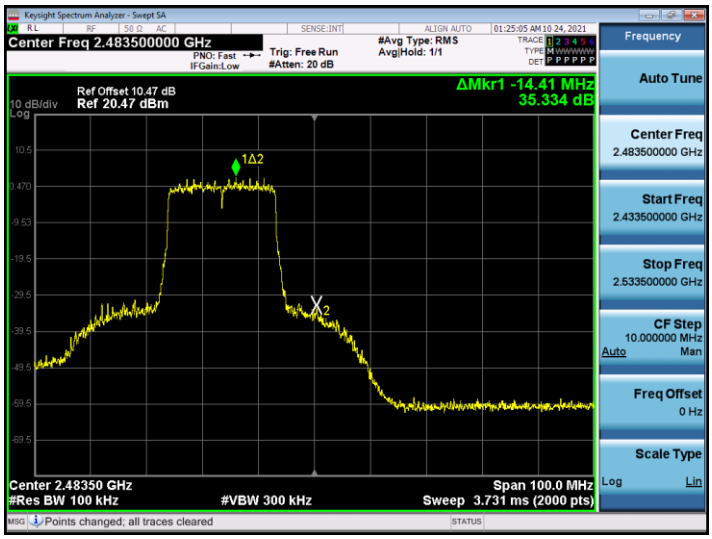
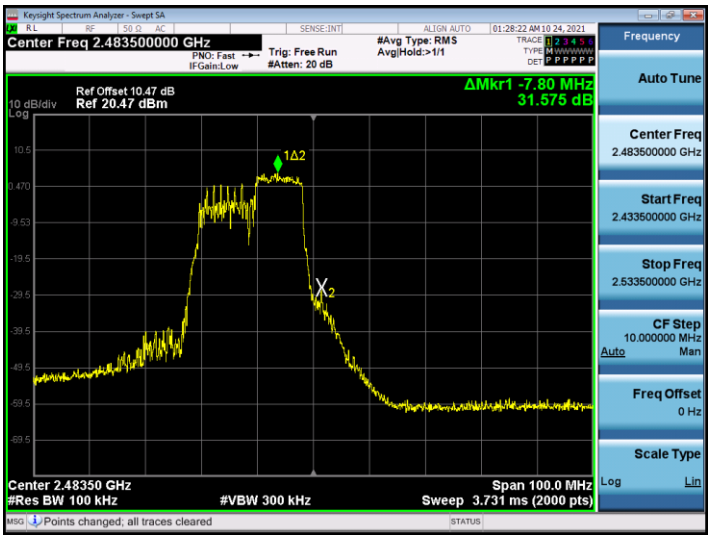
Note:

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

[MIMO Ant1]

BW20M Ch.1(2412MHz) 106 Tones RU 53	BW20M Ch.11(2462MHz) 242 Tones RU 61
	
BW20M Ch.12(2467MHz) SU	**BW20M Ch.13(2472MHz) 106 Tones RU 54**
	

[MIMO Ant2]

BW20M Ch.1(2412MHz) 52 Tones RU 37	BW20M Ch.11(2462MHz) 242 Tones RU 61
	
BW20M Ch.12(2467MHz) SU	**BW20M Ch.13(2472MHz) 106 Tones RU 54**
	

Conducted Spurious Emissions

[MIMO ANT1]

BW	Frequency [MHz]	Channel No.	RU Index	Result (dB)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	55.041	52.913	48.274	-	-
			Mid	53.679	51.414	-	45.673	45.296
			High	55.434	52.943	48.511	-	-
	2437	6	Low	53.655	51.940	49.758	-	-
			Mid	54.623	50.090	-	47.084	48.099
			High	56.080	51.552	49.805	-	-
	2462	11	Low	53.002	50.551	49.739	-	-
			Mid	52.272	51.145	-	42.854	44.656
			High	53.096	51.729	50.744	-	-
	2467	12	Low	48.894	46.987	43.534	-	-
			Mid	49.270	47.492	-	41.952	40.719
			High	48.586	45.761	43.953	-	-
	2472	13	Low	46.297	42.985	40.020	-	-
			Mid	47.116	44.998	-	36.886	40.369
			High	46.595	43.690	40.391	-	-

Limit : 30 dBc

[MIMO ANT2]

BW	Frequency [MHz]	Channel No.	RU Index	Result (dB)				
				26 T	52 T	106 T	242 T	SU
HE20	2412	1	Low	55.697	52.072	48.585	-	-
			Mid	53.005	52.922	-	45.491	46.482
			High	55.461	54.471	49.847	-	-
	2437	6	Low	55.426	51.226	49.055	-	-
			Mid	54.123	52.126	-	46.415	47.600
			High	55.002	52.400	49.181	-	-
	2462	11	Low	51.809	51.867	49.180	-	-
			Mid	51.436	52.335	-	44.699	42.255
			High	51.601	52.786	50.212	-	-
	2467	12	Low	47.814	46.133	42.352	-	-
			Mid	47.941	46.358	-	40.665	40.684
			High	46.751	44.803	42.651	-	-
	2472	13	Low	45.585	42.678	40.010	-	-
			Mid	46.823	44.626	-	38.867	36.979
			High	45.939	45.259	39.947	-	-

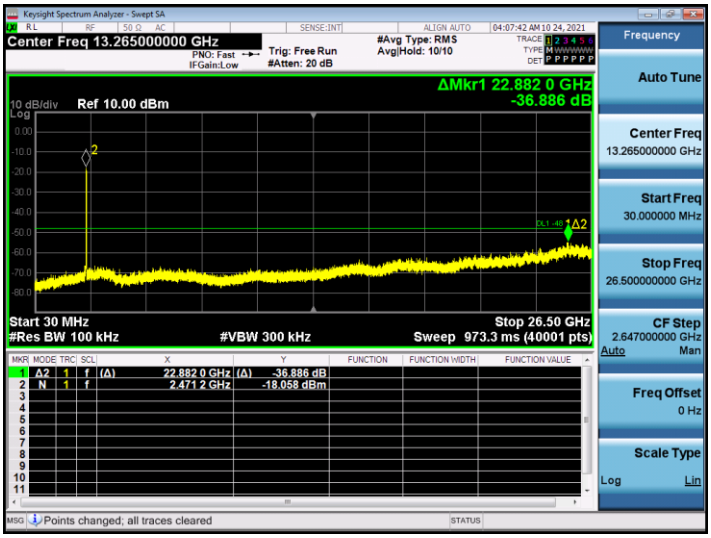
Limit : 30 dBc

▣ Test Plots

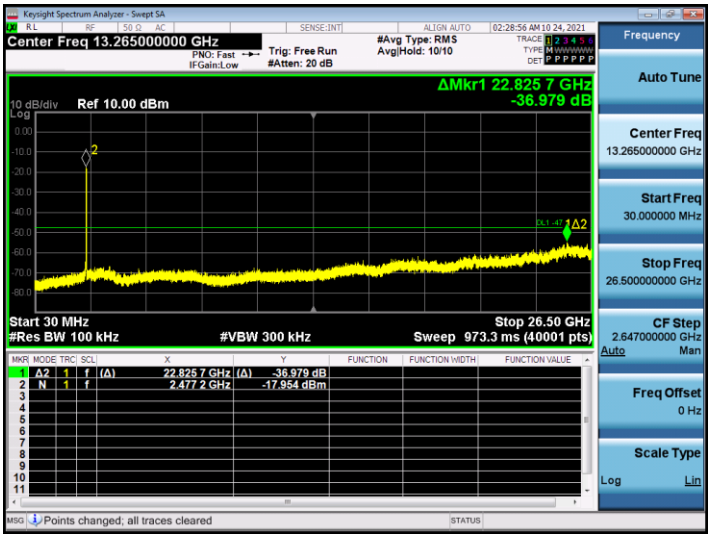
Note:

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

[MIMO ANT1] BW20M Ch.13(2 472 MHz) 242 Tones RU 61



[MIMO ANT2] BW20M Ch.13(2 472 MHz) SU



9.6 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30 MHz

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

Note:

1. The Measured level 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 Level	A.F+C.L	ANT. POL	Total	Limit	Margin
[MHz]	[dBμV]	[dB/m]	[H/V]	[dBμV/m]	[dBμV/m]	[dB]
No Critical peaks found						

Note:

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

Frequency Range : Above 1 GHz [MIMO]

1. 26 Tone

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412
Channel No.	01 Ch
RU offset	0

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4824	46.57	0.000	3.48	V	50.05	73.98	23.93	PK
4824	35.95	0.000	3.48	V	39.43	53.98	14.55	AV
7236	50.57	0.000	8.67	V	59.24	73.98	14.74	PK
7236	34.40	0.000	8.67	V	43.07	53.98	10.91	AV
4824	47.49	0.000	3.48	H	50.97	73.98	23.01	PK
4824	36.00	0.000	3.48	H	39.48	53.98	14.50	AV
7236	49.24	0.000	8.67	H	57.91	73.98	16.07	PK
7236	33.57	0.000	8.67	H	42.24	53.98	11.74	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2437
Channel No.	06 Ch
RU offset	0

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4874	46.24	0.000	3.19	V	49.43	73.98	24.55	PK
4874	34.41	0.000	3.19	V	37.60	53.98	16.38	AV
7311	47.58	0.000	9.41	V	56.99	73.98	16.99	PK
7311	31.80	0.000	9.41	V	41.21	53.98	12.77	AV
4874	47.55	0.000	3.19	H	50.74	73.98	23.24	PK
4874	35.18	0.000	3.19	H	38.37	53.98	15.61	AV
7311	48.81	0.000	9.41	H	58.22	73.98	15.76	PK
7311	32.45	0.000	9.41	H	41.86	53.98	12.12	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2462
Channel No.	11 Ch
RU offset	0

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4924	45.90	0.000	2.54	V	48.44	73.98	25.54	PK
4924	34.01	0.000	2.54	V	36.55	53.98	17.43	AV
7386	47.74	0.000	10.04	V	57.78	73.98	16.20	PK
7386	30.98	0.000	10.04	V	41.02	53.98	12.96	AV
4924	46.76	0.000	2.54	H	49.30	73.98	24.68	PK
4924	34.69	0.000	2.54	H	37.23	53.98	16.75	AV
7386	44.99	0.000	10.04	H	55.03	73.98	18.95	PK
7386	30.69	0.000	10.04	H	40.73	53.98	13.25	AV

Note:

Channel 12 and 13 are less powerful than channel 11 so the test for high channel was performed at channel 11.

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412
Channel No.	01 Ch
RU offset	4

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4824	46.13	0.000	3.48	V	49.61	73.98	24.37	PK
4824	34.44	0.000	3.48	V	37.92	53.98	16.06	AV
7236	52.72	0.000	8.67	V	61.39	73.98	12.59	PK
7236	35.22	0.000	8.67	V	43.89	53.98	10.09	AV
4824	46.54	0.000	3.48	H	50.02	73.98	23.96	PK
4824	34.72	0.000	3.48	H	38.20	53.98	15.78	AV
7236	53.38	0.000	8.67	H	62.05	73.98	11.93	PK
7236	34.97	0.000	8.67	H	43.64	53.98	10.34	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2437
Channel No.	06 Ch
RU offset	4

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4874	45.10	0.000	3.19	V	48.29	73.98	25.69	PK
4874	33.45	0.000	3.19	V	36.64	53.98	17.34	AV
7311	48.25	0.000	9.41	V	57.66	73.98	16.32	PK
7311	32.36	0.000	9.41	V	41.77	53.98	12.21	AV
4874	45.66	0.000	3.19	H	48.85	73.98	25.13	PK
4874	34.13	0.000	3.19	H	37.32	53.98	16.66	AV
7311	47.89	0.000	9.41	H	57.30	73.98	16.68	PK
7311	32.66	0.000	9.41	H	42.07	53.98	11.91	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2462
Channel No.	11 Ch
RU offset	4

Frequency [MHz]	Measured Level [dBμV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4924	47.11	0.000	2.54	V	49.65	73.98	24.33	PK
4924	35.21	0.000	2.54	V	37.75	53.98	16.23	AV
7386	52.82	0.000	10.04	V	62.86	73.98	11.12	PK
7386	30.92	0.000	10.04	V	40.96	53.98	13.02	AV
4924	47.18	0.000	2.54	H	49.72	73.98	24.26	PK
4924	35.48	0.000	2.54	H	38.02	53.98	15.96	AV
7386	52.28	0.000	10.04	H	62.32	73.98	11.66	PK
7386	30.83	0.000	10.04	H	40.87	53.98	13.11	AV

Note:

Channel 12 and 13 are less powerful than channel 11 so the test for high channel was performed at channel 11.

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412
Channel No.	01 Ch
RU offset	8

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4824	47.07	0.000	3.48	V	50.55	73.98	23.43	PK
4824	34.99	0.000	3.48	V	38.47	53.98	15.51	AV
7236	53.86	0.000	8.67	V	62.53	73.98	11.45	PK
7236	36.59	0.000	8.67	V	45.26	53.98	8.72	AV
4824	47.78	0.000	3.48	H	51.26	73.98	22.72	PK
4824	35.83	0.000	3.48	H	39.31	53.98	14.67	AV
7236	52.17	0.000	8.67	H	60.84	73.98	13.14	PK
7236	36.29	0.000	8.67	H	44.96	53.98	9.02	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2437
Channel No.	06 Ch
RU offset	8

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4874	43.24	0.000	3.19	V	46.43	73.98	27.55	PK
4874	32.18	0.000	3.19	V	35.37	53.98	18.61	AV
7311	43.67	0.000	9.41	V	53.08	73.98	20.90	PK
7311	29.67	0.000	9.41	V	39.08	53.98	14.90	AV
4874	44.69	0.000	3.19	H	47.88	73.98	26.10	PK
4874	32.94	0.000	3.19	H	36.13	53.98	17.85	AV
7311	44.58	0.000	9.41	H	53.99	73.98	19.99	PK
7311	30.68	0.000	9.41	H	40.09	53.98	13.89	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2462
Channel No.	11 Ch
RU offset	8

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4924	46.92	0.000	2.54	V	49.46	73.98	24.52	PK
4924	34.59	0.000	2.54	V	37.13	53.98	16.85	AV
7386	54.64	0.000	10.04	V	64.68	73.98	9.30	PK
7386	31.91	0.000	10.04	V	41.95	53.98	12.03	AV
4924	47.18	0.000	2.54	H	49.72	73.98	24.26	PK
4924	35.01	0.000	2.54	H	37.55	53.98	16.43	AV
7386	54.59	0.000	10.04	H	64.63	73.98	9.35	PK
7386	32.05	0.000	10.04	H	42.09	53.98	11.89	AV

Note:

Channel 12 and 13 are less powerful than channel 11 so the test for high channel was performed at channel 11.

2. 52 Tone

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412
Channel No.	01 Ch
RU offset	40

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4824	45.88	0.000	3.48	V	49.36	73.98	24.62	PK
4824	33.87	0.000	3.48	V	37.35	53.98	16.63	AV
7236	54.18	0.000	8.67	V	62.85	73.98	11.13	PK
7236	34.52	0.000	8.67	V	43.19	53.98	10.79	AV
4824	46.11	0.000	3.48	H	49.59	73.98	24.39	PK
4824	34.20	0.000	3.48	H	37.68	53.98	16.30	AV
7236	52.10	0.000	8.67	H	60.77	73.98	13.21	PK
7236	35.22	0.000	8.67	H	43.89	53.98	10.09	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2437
Channel No.	06 Ch
RU offset	40

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4874	42.95	0.000	3.19	V	46.14	73.98	27.84	PK
4874	31.21	0.000	3.19	V	34.40	53.98	19.58	AV
7311	43.75	0.000	9.41	V	53.16	73.98	20.82	PK
7311	30.01	0.000	9.41	V	39.42	53.98	14.56	AV
4874	43.65	0.000	3.19	H	46.84	73.98	27.14	PK
4874	31.90	0.000	3.19	H	35.09	53.98	18.89	AV
7311	44.09	0.000	9.41	H	53.50	73.98	20.48	PK
7311	30.32	0.000	9.41	H	39.73	53.98	14.25	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2462
Channel No.	11 Ch
RU offset	40

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4924	46.25	0.000	2.54	V	48.79	73.98	25.19	PK
4924	34.53	0.000	2.54	V	37.07	53.98	16.91	AV
7386	55.98	0.000	10.04	V	66.02	73.98	7.96	PK
7386	33.85	0.000	10.04	V	43.89	53.98	10.09	AV
4924	46.51	0.000	2.54	H	49.05	73.98	24.93	PK
4924	35.06	0.000	2.54	H	37.60	53.98	16.38	AV
7386	55.03	0.000	10.04	H	65.07	73.98	8.91	PK
7386	33.57	0.000	10.04	H	43.61	53.98	10.37	AV

Note:

Channel 12 and 13 are less powerful than channel 11 so the test for high channel was performed at channel 11.

[DBS Mode]

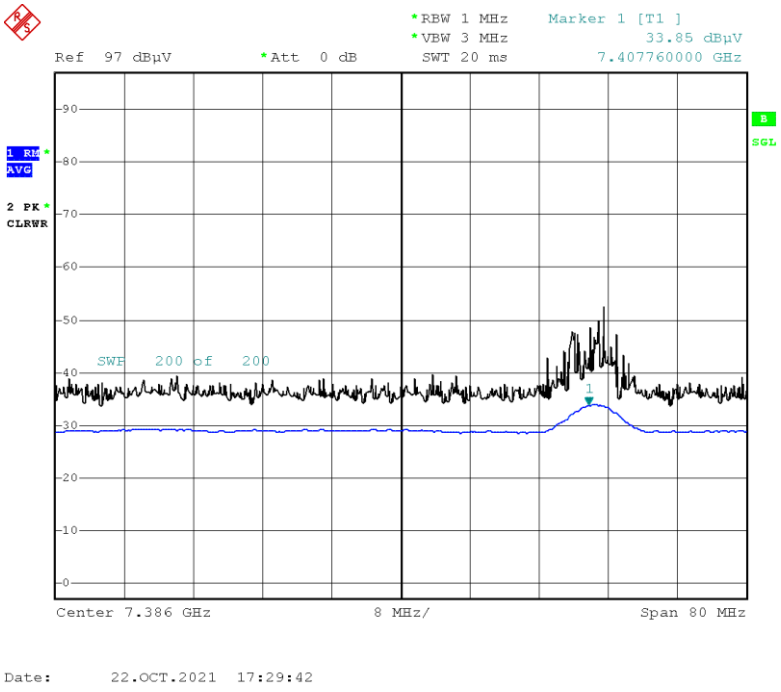
2.4 GHz MIMO 802.11ax(HE20) 52 Tone, RU 40 Ch.11 & 5 GHz MIMO 802.11ax(HE40) Ch.151 52 Tone, RU 41

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F+C.L-A.G+D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
4924	54.37	0.000	2.54	V	56.91	73.98	17.07	PK
4924	42.57	0.000	2.54	V	45.11	53.98	8.87	AV
7386	51.29	0.000	10.04	V	61.33	73.98	12.65	PK
7386	33.11	0.000	10.04	V	43.15	53.98	10.83	AV
4924	54.87	0.000	2.54	H	57.41	73.98	16.57	PK
4924	42.90	0.000	2.54	H	45.44	53.98	8.54	AV
7386	51.09	0.000	10.04	H	61.13	73.98	12.85	PK
7386	33.07	0.000	10.04	H	43.11	53.98	10.87	AV

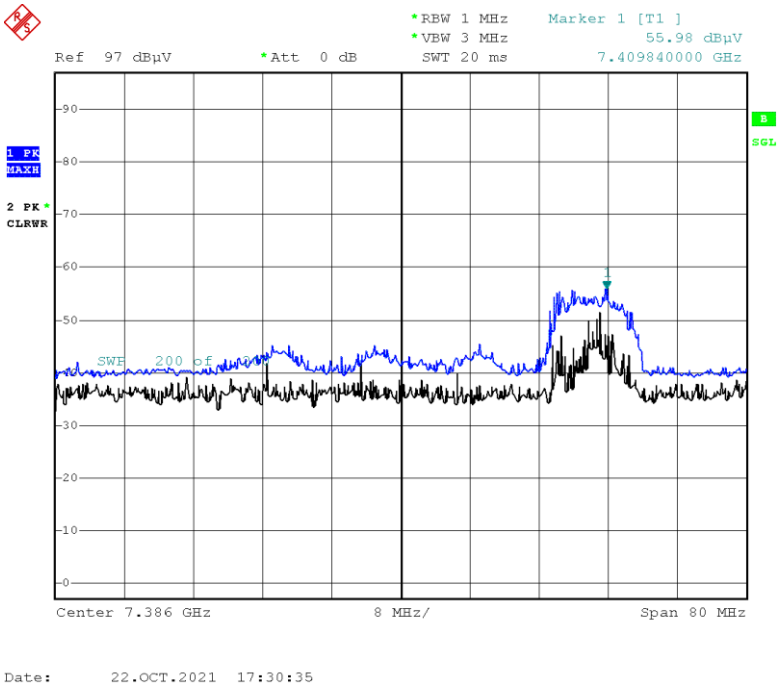
▣ Test Plots

[MIMO] (52 Tone RU 40) – Z-V

Radiated Spurious Emissions plot – Average result (802.11ax(HE20), Ch.11 3rd Harmonic)



Radiated Spurious Emissions plot – Peak result (802.11ax(HE20), Ch.11 3rd Harmonic)



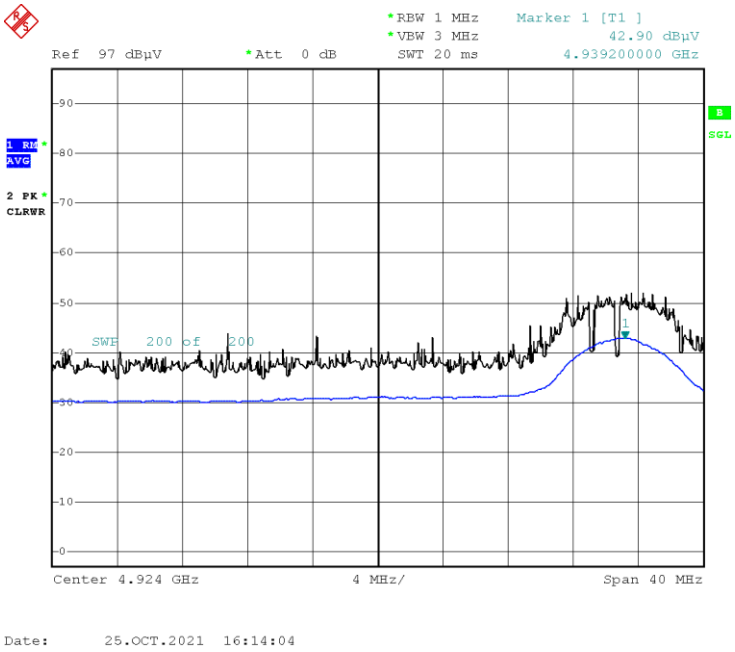
Note:

Plot of worst case are only reported.

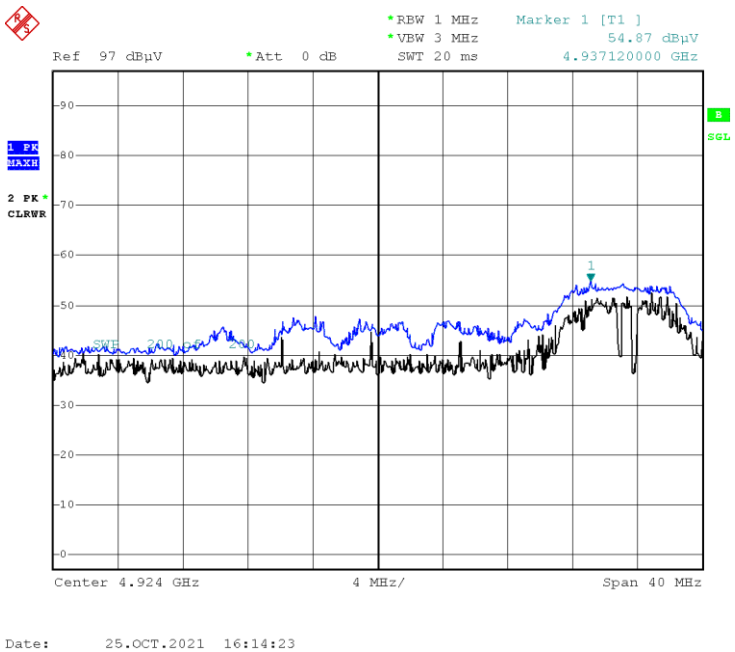
[DBS Mode]

2.4 GHz MIMO 802.11ax(HE20) 52 Tone, RU 40 Ch.11 & 5 GHz MIMO 802.11ax(HE40) Ch.151 52 Tone, RU 41

Radiated Spurious Emissions plot – Average result (802.11ax(HE20), Ch.11 2nd Harmonic)



Radiated Spurious Emissions plot – Peak result (802.11ax(HE20), Ch.11 2nd Harmonic)



Note:

Plot of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

[MIMO]

1. 26 Tone

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Measured Level [dBµV]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2300.0 - 2390.0	33.25	33.78	H	67.03	73.98	6.95	PK
2300.0 - 2390.0	12.18	33.78	H	45.96	53.98	8.02	AV
2300.0 - 2390.0	32.78	33.78	V	66.56	73.98	7.42	PK
2300.0 - 2390.0	12.08	33.78	V	45.85	53.98	8.13	AV
#2483.5 – 2484.5	30.38	34.10	H	64.48	73.98	9.50	PK
2484.5 – 2500.0	36.86	34.10	H	70.96	73.98	3.02	PK
2483.5 – 2500.0	13.14	34.10	H	47.24	53.98	6.74	AV
#2483.5 – 2484.5	30.05	34.10	V	64.15	73.98	9.83	PK
2484.5 – 2500.0	36.77	34.10	V	70.87	73.98	3.11	PK
2483.5 – 2500.0	12.97	34.10	V	47.07	53.98	6.91	AV

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

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2467 MHz
Channel No.	12 Ch

Frequency [MHz]	Measured Level [dBµV]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	32.87	34.10	H	66.97	73.98	7.01	PK
2483.5 – 2500.0	12.61	34.10	H	46.71	53.98	7.27	AV
2483.5 – 2500.0	31.87	34.10	V	65.97	73.98	8.01	PK
2483.5 – 2500.0	12.10	34.10	V	46.19	53.98	7.79	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2472 MHz
Channel No.	13 Ch

Frequency [MHz]	Measured Level [dBµV]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
#2483.5 – 2484.5	27.90	34.10	H	62.00	73.98	11.98	PK
2484.5 – 2500.0	32.78	34.10	H	66.87	73.98	7.11	PK
#2483.5 – 2484.5	14.80	34.10	H	48.90	53.98	5.08	AV
2484.5 – 2500.0	12.55	34.10	H	46.65	53.98	7.33	AV
#2483.5 – 2484.5	27.67	34.10	V	61.77	73.98	12.21	PK
2484.5 – 2500.0	31.89	34.10	V	65.98	73.98	8.00	PK
#2483.5 – 2484.5	14.18	34.10	V	48.28	53.98	5.70	AV
2484.5 – 2500.0	12.29	34.10	V	46.39	53.98	7.59	AV

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

2. 52 Tone

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Measured Level [dBµV]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2300.0 - 2390.0	31.50	33.78	H	65.28	73.98	8.70	PK
2300.0 - 2390.0	12.17	33.78	H	46.03	53.98	7.95	AV
2300.0 - 2390.0	30.87	33.78	V	64.65	73.98	9.33	PK
2300.0 - 2390.0	12.03	33.78	V	45.89	53.98	8.09	AV
#2483.5 – 2484.5	32.41	34.10	H	66.51	73.98	7.47	PK
2484.5 – 2500.0	37.21	34.10	H	71.30	73.98	2.68	PK
2483.5 – 2500.0	15.00	34.10	H	49.19	53.98	4.79	AV
#2483.5 – 2484.5	31.28	34.10	V	65.38	73.98	8.60	PK
2484.5 – 2500.0	37.02	34.10	V	71.12	73.98	2.86	PK
2483.5 – 2500.0	14.90	34.10	V	49.08	53.98	4.90	AV

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

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2467 MHz
Channel No.	12 Ch

Frequency [MHz]	Measured Level [dBµV]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	29.42	34.10	H	63.52	73.98	10.46	PK
2483.5 – 2500.0	11.58	34.10	H	45.68	53.98	8.30	AV
2483.5 – 2500.0	29.34	34.10	V	63.44	73.98	10.54	PK
2483.5 – 2500.0	11.18	34.10	V	45.28	53.98	8.70	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2472 MHz
Channel No.	13 Ch

Frequency [MHz]	Measured Level [dBµV]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
#2483.5 – 2484.5	26.05	34.10	H	60.15	73.98	13.83	PK
2484.5 – 2500.0	30.56	34.10	H	64.65	73.98	9.33	PK
#2483.5 – 2484.5	13.78	34.10	H	47.88	53.98	6.10	AV
2484.5 – 2500.0	12.28	34.10	H	46.38	53.98	7.60	AV
#2483.5 – 2484.5	25.99	34.10	V	60.09	73.98	13.89	PK
2484.5 – 2500.0	30.18	34.10	V	64.28	73.98	9.70	PK
#2483.5 – 2484.5	13.21	34.10	V	47.31	53.98	6.67	AV
2484.5 – 2500.0	12.10	34.10	V	46.20	53.98	7.78	AV

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

3. 106 Tone

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Measured Level [dBμV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2310.0 - 2390.0	34.22	0.000	33.78	H	68.00	73.98	5.98	PK
#2389.0 – 2390.0	16.16	0.173	33.78	H	50.11	53.98	3.87	AV
#2388.0 – 2389.0	14.13	0.173	33.78	H	48.08	53.98	5.90	AV
2310.0 - 2388.0	16.71	0.173	33.78	H	50.66	53.98	3.32	AV
2310.0 - 2390.0	33.85	0.000	33.78	V	67.63	73.98	6.35	PK
#2389.0 – 2390.0	16.04	0.173	33.78	V	49.99	53.98	3.99	AV
#2388.0 – 2389.0	13.99	0.173	33.78	V	47.94	53.98	6.04	AV
2310.0 - 2388.0	15.89	0.173	33.78	V	49.84	53.98	4.14	AV
#2483.5 – 2484.5	31.26	0.000	34.10	H	65.36	73.98	8.62	PK
2484.5 – 2500.0	35.05	0.000	34.10	H	69.15	73.98	4.83	PK
2483.5 – 2500.0	16.69	0.173	34.10	H	50.96	53.98	3.02	AV
#2483.5 – 2484.5	31.06	0.000	34.10	V	65.16	73.98	8.82	PK
2484.5 – 2500.0	34.96	0.000	34.10	V	69.06	73.98	4.92	PK
2483.5 – 2500.0	16.32	0.173	34.10	V	50.59	53.98	3.39	AV

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

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2467 MHz
Channel No.	12 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	34.69	0.000	34.10	H	68.79	73.98	5.19	PK
2483.5 – 2500.0	11.78	0.173	34.10	H	46.05	53.98	7.93	AV
2483.5 – 2500.0	34.04	0.000	34.10	V	68.14	73.98	5.84	PK
2483.5 – 2500.0	11.27	0.173	34.10	V	45.54	53.98	8.44	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2472 MHz
Channel No.	13 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	24.28	0.000	34.10	H	58.38	73.98	15.60	PK
2483.5 – 2500.0	12.40	0.173	34.10	H	46.67	53.98	7.31	AV
2483.5 – 2500.0	23.97	0.000	34.10	V	58.07	73.98	15.91	PK
2483.5 – 2500.0	12.17	0.173	34.10	V	46.44	53.98	7.54	AV

4. 242 Tone

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2310.0 - 2390.0	30.45	0.000	33.78	H	64.23	73.98	9.75	PK
2310.0 - 2390.0	15.05	0.375	33.78	H	49.20	53.98	4.78	AV
2310.0 - 2390.0	29.69	0.000	33.78	V	63.47	73.98	10.51	PK
2310.0 - 2390.0	14.82	0.375	33.78	V	48.97	53.98	5.01	AV
2483.5 – 2500.0	33.26	0.000	34.10	H	67.36	73.98	6.62	PK
2483.5 – 2500.0	16.01	0.375	34.10	H	50.49	53.98	3.49	AV
2483.5 – 2500.0	32.84	0.000	34.10	V	66.94	73.98	7.04	PK
2483.5 – 2500.0	15.99	0.375	34.10	V	50.47	53.98	3.51	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2467 MHz
Channel No.	12 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	31.30	0.000	34.10	H	65.40	73.98	8.58	PK
2483.5 – 2500.0	13.14	0.375	34.10	H	47.62	53.98	6.36	AV
2483.5 – 2500.0	30.84	0.000	34.10	V	64.94	73.98	9.04	PK
2483.5 – 2500.0	12.94	0.375	34.10	V	47.41	53.98	6.57	AV

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2472 MHz
Channel No.	13 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	37.32	0.000	34.10	H	71.42	73.98	2.56	PK
2483.5 – 2500.0	16.02	0.375	34.10	H	50.49	53.98	3.49	AV
2483.5 – 2500.0	36.86	0.000	34.10	V	70.96	73.98	3.02	PK
2483.5 – 2500.0	15.80	0.375	34.10	V	50.27	53.98	3.71	AV

5. SU

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2310.0 - 2390.0	31.75	0.000	33.78	H	65.53	73.98	8.45	PK
#2389.0 – 2390.0	14.25	0.382	33.78	H	48.41	53.98	5.57	AV
2310.0 - 2389.0	16.62	0.000	33.78	H	50.78	53.98	3.20	AV
2310.0 - 2390.0	30.99	0.382	33.78	V	64.77	73.98	9.21	PK
#2389.0 – 2390.0	14.05	0.000	33.78	V	48.21	53.98	5.77	AV
2310.0 - 2389.0	16.24	0.382	33.78	V	50.40	53.98	3.58	AV
2483.5 – 2500.0	32.90	0.000	34.10	H	67.00	73.98	6.98	PK
2483.5 – 2500.0	16.01	0.382	34.10	H	50.49	53.98	3.49	AV
2483.5 – 2500.0	31.99	0.000	34.10	V	66.09	73.98	7.89	PK
2483.5 – 2500.0	15.95	0.382	34.10	V	50.43	53.98	3.55	AV

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

Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2467 MHz
Channel No.	12 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	31.82	0.000	34.10	H	65.92	73.98	8.06	PK
2483.5 – 2500.0	13.05	0.382	34.10	H	47.53	53.98	6.45	AV
2483.5 – 2500.0	31.43	0.000	34.10	V	65.52	73.98	8.46	PK
2483.5 – 2500.0	12.96	0.382	34.10	V	47.44	53.98	6.54	AV

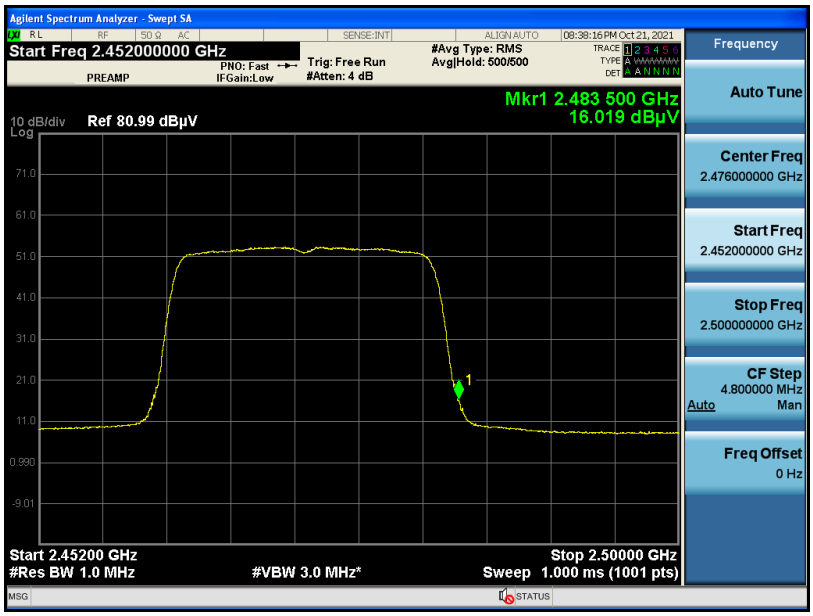
Operation Mode:	802.11ax(HE20)
Transfer MCS Index:	0
Operating Frequency	2472 MHz
Channel No.	13 Ch

Frequency [MHz]	Measured Level [dBµV]	Duty Cycle Factor [dB]	A.F.+C.L+ D.F [dB/m]	ANT. POL [H/V]	Total [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Measurement Type
2483.5 – 2500.0	37.23	0.000	34.10	H	71.32	73.98	2.66	PK
2483.5 – 2500.0	16.01	0.382	34.10	H	50.49	53.98	3.49	AV
2483.5 – 2500.0	36.28	0.000	34.10	V	70.38	73.98	3.60	PK
2483.5 – 2500.0	15.97	0.382	34.10	V	50.45	53.98	3.53	AV

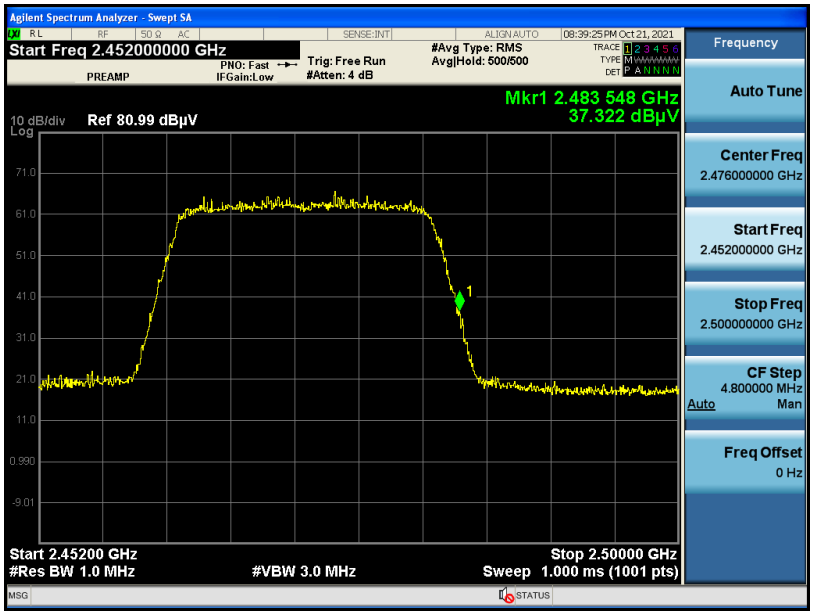
▣ Test Plots (242 Tone RU 61) X-H

[MIMO]

Radiated Restricted Band Edges plot – Average result (802.11ax(HE20) Ch.13)



Radiated Restricted Band Edges plot – Peak result (802.11ax(HE20) Ch.13)



Note:

Plot of worst case are only reported.

10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/23/2022	Annual
Test Receiver	ESCI	Rohde & Schwarz	100033	06/15/2022	Annual
Temperature Chamber	SU-642	ESPAC	0093008124	03/15/2022	Annual
Signal Analyzer	N9020A	Agilent	MY47380318	01/28/2022	Annual
Signal Analyzer	N9030A	Agilent	MY55410508	09/07/2022	Annual
Power Meter	N1911A	Agilent	MY45100523	04/08/2022	Annual
Power Sensor	N1921A	Agilent	MY57820067	04/08/2022	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/10/2021	Annual
Power Splitter	11667B	Hewlett Packard	05001	05/20/2022	Annual
DC Power Supply	E3632A	Hewlett Packard	KR75303960	06/10/2022	Annual
Attenuator (10 dB)	8493C-010	Agilent	08285	06/28/2022	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	FCC WLAN&BT&BLE Conducted Test Software v3.0	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
Controller	2090	Emco	060520	N/A	N/A
Turn Table	Turn Table	Ets	N/A	N/A	N/A
Loop Antenna	Loop Antenna	Rohde & Schwarz	1513-333	03/19/2022	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	09/04/2022	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/18/2021	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170541	11/29/2021	Biennial
Spectrum Analyzer	FSP (9 kHz ~ 30 GHz)	Rohde & Schwarz	836650/016	09/13/2022	Annual
Spectrum Analyzer	FSV40-N	Rohde & Schwarz	101068-SZ	09/15/2022	Annual
Signal Analyzer	N9020A	Agilent	MY50200093	11/17/2021	Annual
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/06/2022	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/08/2022	Annual
Attenuator (10 dB) 56-10	CBLU1183540B-01 56-10	CERNEX WEINSCHEL	N/A	12/23/2021	Annual
Broadband Low Noise Amplifier Attenuator (3 dB)	CBL06185030 18B-03	CERNEX Api tech.	N/A	12/23/2021	Annual
High Pass Filter	WHKX10-2700-3000-18000-40SS	Wainwright Instruments	N/A	12/23/2021	Annual
High Pass Filter	WHKX8-6090-7000-18000-40SS	Wainwright Instruments	N/A	12/23/2021	Annual
Thru	COAXIAL ATTENUATOR	T&M SYSTEM	N/A	12/23/2021	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/04/2021	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/23/2022	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-2110-FC069-P