

FCC DTS REPORT

Certification

Applicant Name: SAMSUNG Electronics Co., Ltd.	Date of Issue: April 22, 2022
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	Report No.: HCT-RF-2204-FC019

FCC ID:	A3LSMM135M
APPLICANT:	SAMSUNG Electronics Co., Ltd.

Model:	SM-M135M/DS
Additional Model:	-
EUT Type:	Mobile Phone
Peak Output Power:	802.11b : 24.05 dBm, 802.11g : 24.06 dBm, 802.11n(HT20) : 23.79 dBm
Frequency Range:	2 412 MHz ~ 2 472 MHz
Modulation type:	CCK/DSSS/OFDM
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.

Report No.: HCT-RF-2204-FC019

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)

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2204-FC019	April 22, 2022	- First Approval Report

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1. EUT DESCRIPTION

Model	SM-M135M/DS	
Additional Model	-	
EUT Type	Mobile Phone	
Power Supply	DC 3.85 V	
Frequency Range	2 412 MHz ~ 2 472 MHz	
Max. RF Output Power	<u>Peak Power</u>	802.11b : 24.05 dBm, 802.11g : 24.06 dBm 802.11n(HT20) : 23.79 dBm
	<u>Average Power</u>	802.11b : 18.26 dBm 802.11g : 16.24 dBm 802.11n(HT20) : 15.97 dBm
Modulation Type	DSSS/CCK : 802.11b OFDM : 802.11g, 802.11n	
Number of Channels	13 Channels	
Date(s) of Tests	March 17, 2022~ May 02, 2022	
Serial number	Radiated: R38T20053EJ Conducted: R38T20056NK	

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, Republic 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.

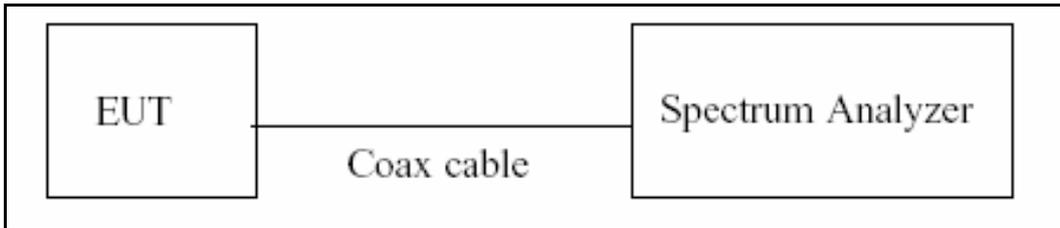
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

7. DESCRIPTION OF TESTS

7.1. Duty Cycle

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method.

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

The zero-span method of measuring duty cycle shall not be used if $T \leq 6.25$ 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 $> 50/T$.

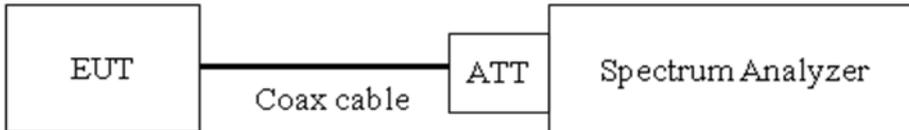
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (\geq RBW)
3. SPAN = 0 Hz
4. Detector = Peak or Average
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = $10\log(1/\text{Duty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

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.

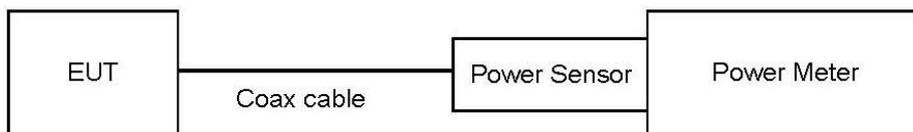
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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

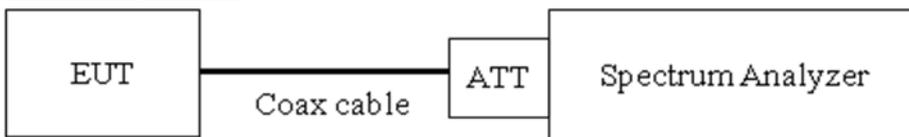
- Conducted Output Power(Peak) = Measured Level + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Level + ATT loss + Cable loss + Duty Cycle Factor

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) Detector = peak.
- 6) Sweep time = No faster than coupled(auto) time.
- 7) Trace mode = max-hold
- 8) Allow trace to fully stabilize.
- 9) Use the peak marker function to determine the maximum amplitude level within the RBW.
- 10) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

Sample Calculation

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

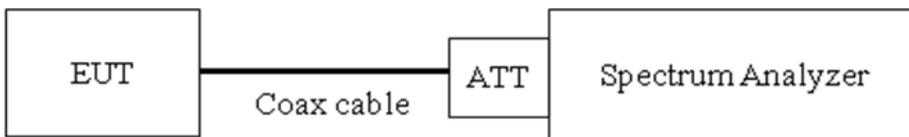
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

Limit

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

[Conducted > 20 dBc]

Test Configuration



Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 11.11 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW $\geq 3 \times$ 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	10.40
100	10.44
200	10.49
300	10.53
400	10.59
500	10.59
600	10.59
700	10.62
800	10.63
900	10.64
1 000	10.69
2 000	10.84
2 400	10.90
2 480	10.90
2 500	10.88
3 000	11.00
4 000	11.06
5 000	11.15
5 150	11.15
5 850	11.22
6 000	11.23
7 000	11.35
8 000	11.34
9 000	11.43
10 000	11.53
11 000	11.62
12 000	11.71
13 000	11.72
14 000	11.76
15 000	11.85
16 000	11.94
17 000	12.13
18 000	12.27
19 000	12.19
20 000	11.86
21 000	11.99
22 000	11.98
23 000	11.95
24 000	12.00

Note : 1. 2 400 ~ 2 500 MHz is fundamental frequency range.

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

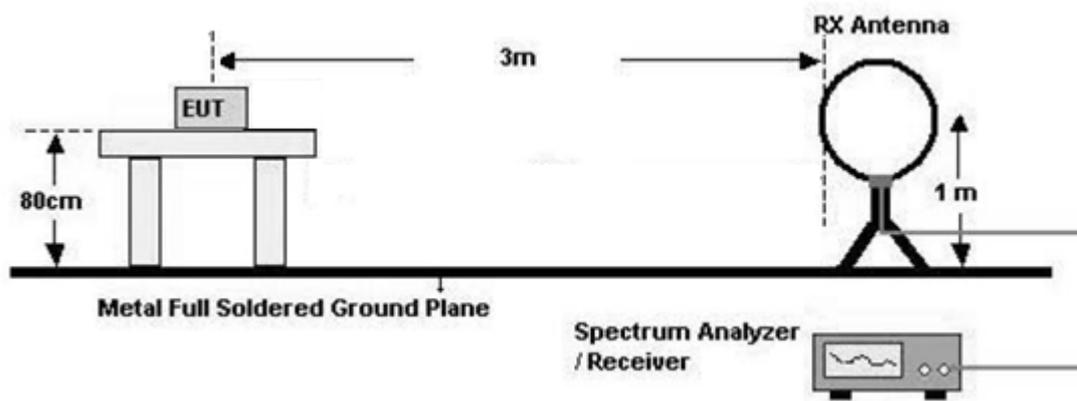
7.6. Radiated Test

Limit

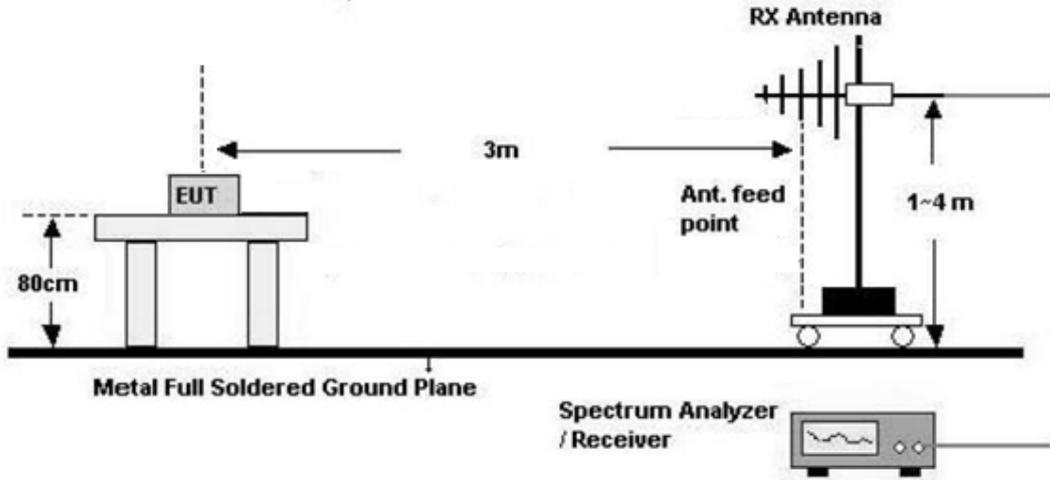
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

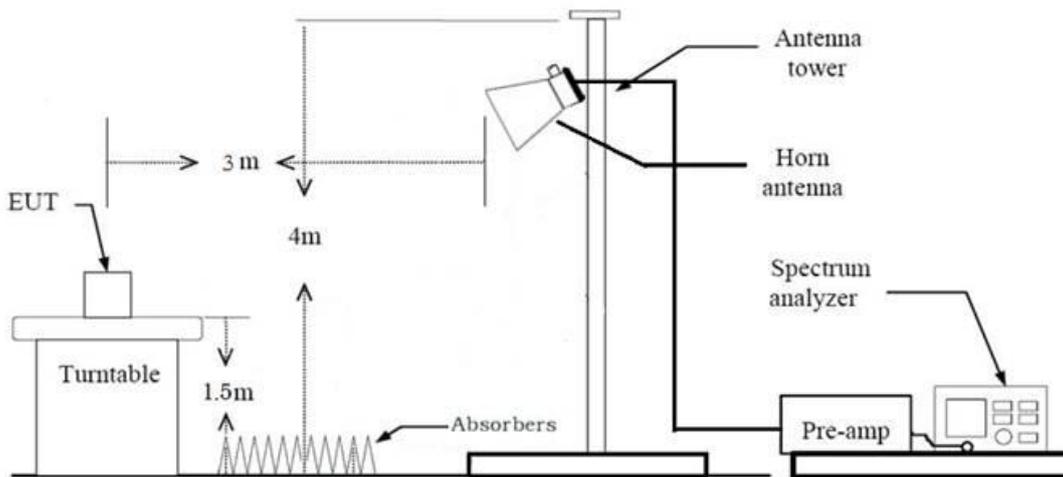
Below 30 MHz



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 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 = Maxhold
 - RBW = 100 kHz
 - VBW \geq 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 = 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 = $20\log$ (test distance / specific distance) (dB)

11. Total(Measurement Type : Peak)

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

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

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

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

$$= \text{Measured Level} + \text{Antenna Factor(A.F)} + \text{Cable Loss(C.L)} - \text{Amp Gain(A.G)} + \text{Distance Factor(D.F)} \\ + \text{Duty Cycle Factor}$$

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 x 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 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 \geq 3 x RBW
 - Sweep time = auto.
 - Trace mode = average (at least 100 traces).
 - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.

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

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

10. Distance extrapolation factor = $20\log(\text{test distance} / \text{specific distance})$ (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 \geq 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 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 Level + 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. EUT Axis
 - Radiated Spurious Emissions : Y
 - Radiated Restricted Band Edge : Z
3. Duty cycle factor applies only 802.11g/n (Duty cycle < 98 %).
4. All data rate of operation were investigated and the test results are worst case in lowest Data Rate of each mode.
 - 802.11b : 1 Mbps
 - 802.11g : 6 Mbps
 - 802.11n(HT20): MCS0
5. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
 - Position : Horizontal, Vertical, Parallel to the ground plane
6. Radiated Spurious Emission
 - All modulation of operation were investigated and the worst case modulation results are reported.
(Worstcase : 802.11b_1 Mbps)

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

Conducted test

1. The EUT was configured with data rate of highest power.
2. All data rate of operation were investigated and the test results are worst case in lowest Data Rate of each mode.
 - 802.11b : 11 Mbps
 - 802.11g : 36 Mbps
 - 802.11n(HT20): MCS3

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 > 20 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

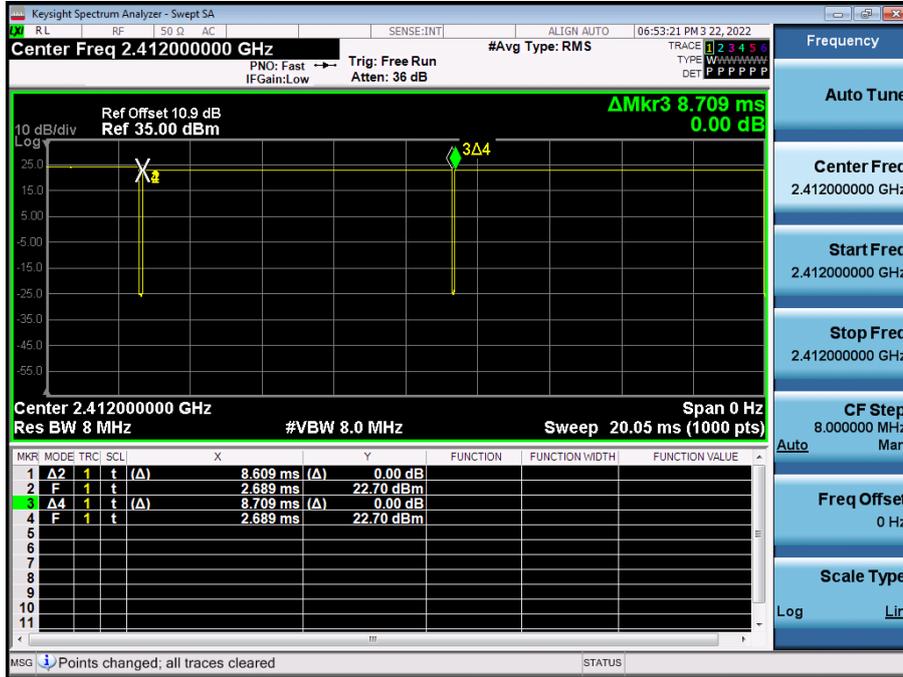
9. TEST RESULT

9.1 DUTY CYCLE

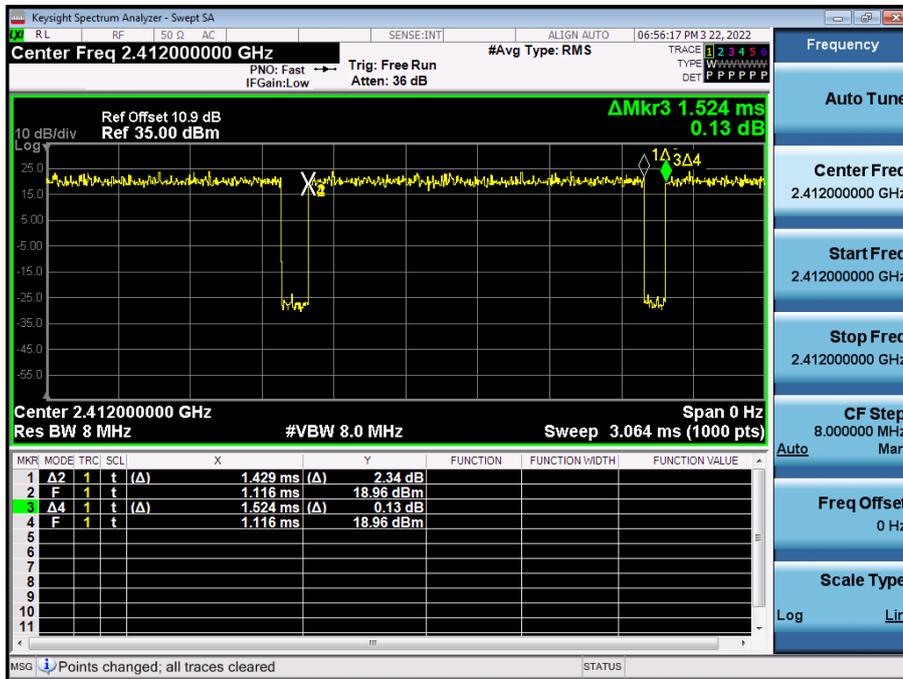
Mode	Data Rate (Mbps)	T _{on} (ms)	T _{total} (ms)	Duty Cycle	Duty Cycle Factor (dB)
802.11b	1	8.609	8.709	0.988	0.050
	2	4.309	4.419	0.975	0.110
	5.5	1.629	1.737	0.937	0.281
	11	0.861	0.972	0.886	0.526
802.11g	6	1.429	1.524	0.938	0.280
	9	0.960	1.073	0.894	0.485
	12	0.725	0.839	0.864	0.637
	18	0.492	0.607	0.810	0.914
	24	0.372	0.487	0.764	1.172
	36	0.257	0.372	0.691	1.607
	48	0.196	0.311	0.630	2.005
	54	0.180	0.294	0.614	2.121
802.11n (HT20)	6.5 (MCS0)	1.336	1.451	0.921	0.358
	13 (MCS1)	0.688	0.783	0.879	0.561
	19.5 (MCS2)	0.471	0.567	0.832	0.799
	26 (MCS3)	0.364	0.459	0.793	1.009
	39 (MCS4)	0.256	0.351	0.729	1.375
	52 (MCS5)	0.200	0.315	0.635	1.973
	58.5 (MCS6)	0.184	0.299	0.615	2.110
	65 (MCS7)	0.168	0.283	0.593	2.268

Test Plots

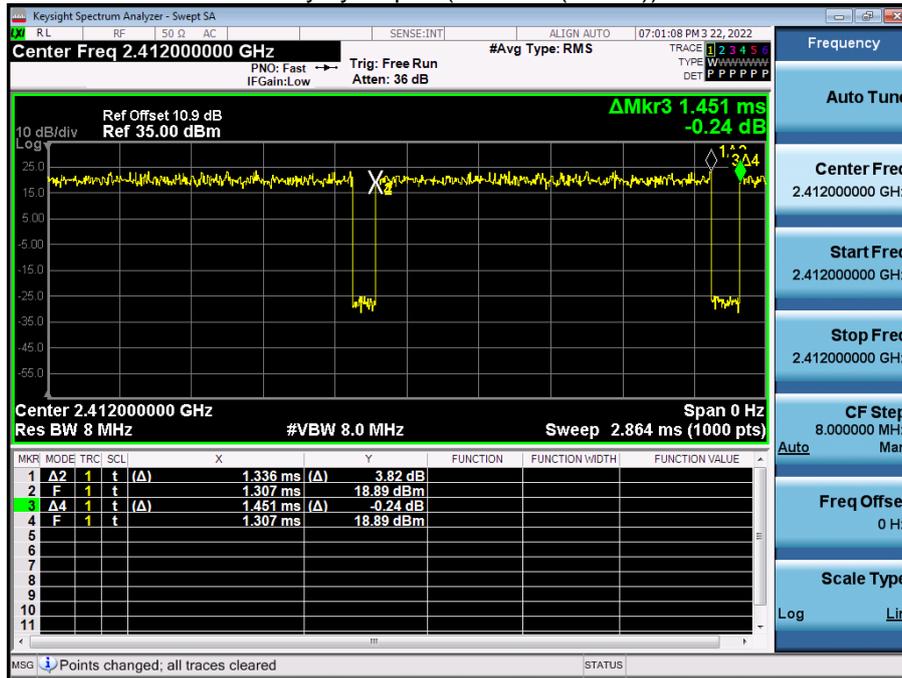
Duty cycle plot (802.11b(1 Mbps))



Duty cycle plot (802.11g(6 Mbps))



Duty cycle plot (802.11n(MCS0))



Note:

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

9.2 6 dB BANDWIDTH

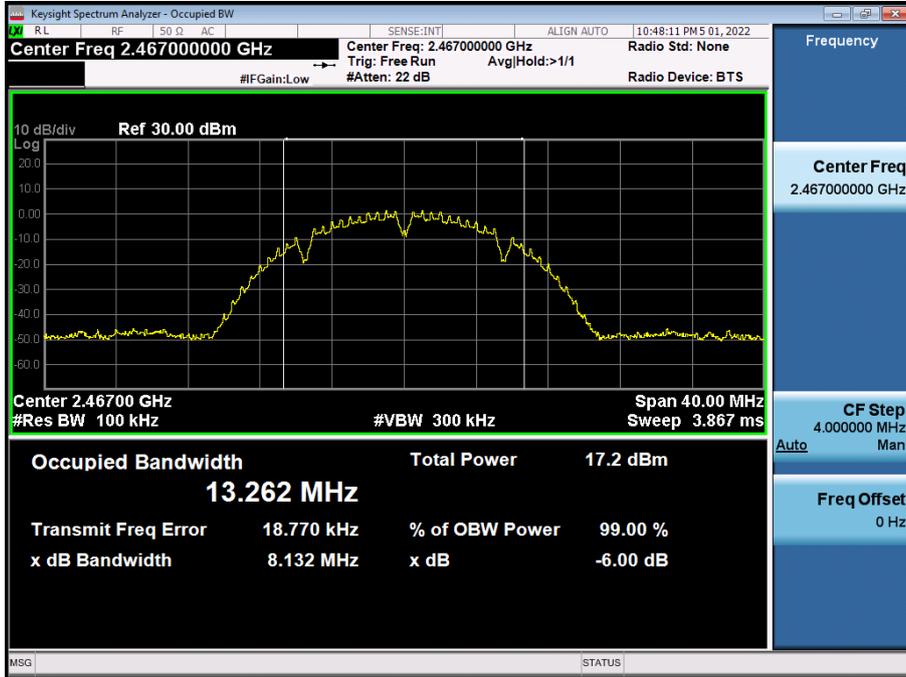
802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	8.593	0.5
2437	6	8.587	0.5
2462	11	8.587	0.5
2467	12	8.132	0.5
2472	13	8.135	0.5

802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.13	0.5
2437	6	15.15	0.5
2462	11	15.15	0.5
2467	12	15.11	0.5
2472	13	15.15	0.5

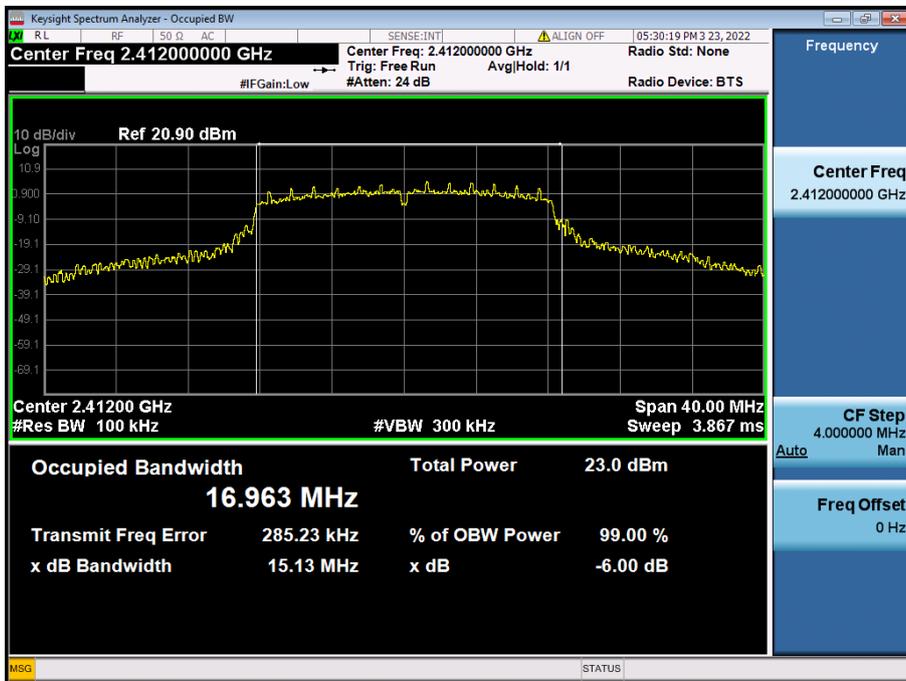
802.11n(HT20) Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
Frequency [MHz]	Channel No.		
2412	1	15.16	0.5
2437	6	15.17	0.5
2462	11	15.15	0.5
2467	12	15.17	0.5
2472	13	15.16	0.5

▣ Test Plots

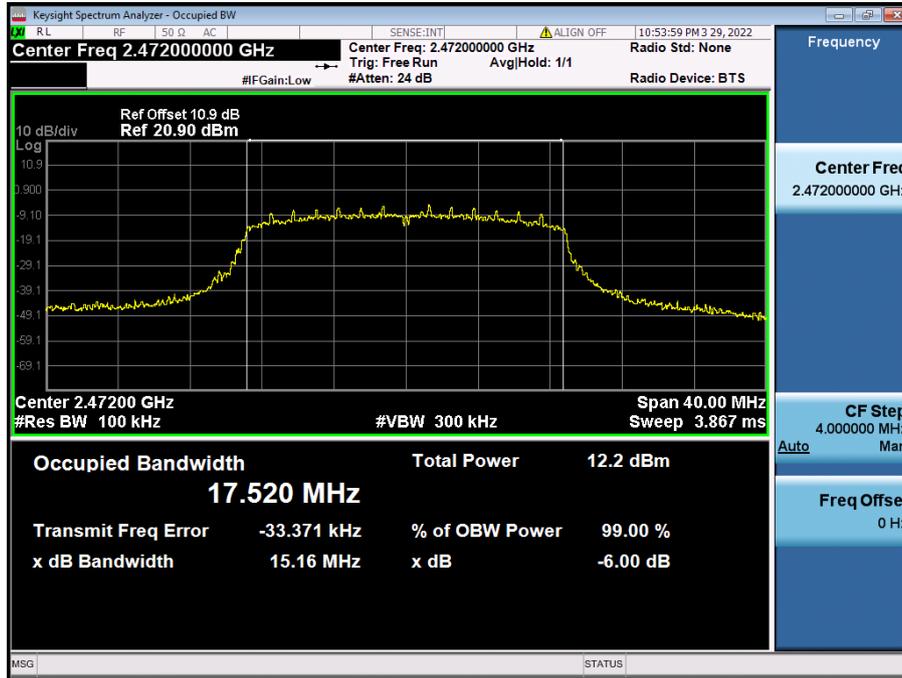
6 dB Bandwidth plot (802.11b-CH 12)



6 dB Bandwidth plot (802.11g-CH 1)



6 dB Bandwidth plot (802.11n_HT20-CH 13)



Note:

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

9.3 OUTPUT POWER

Peak Power

Power Meter offset

Attenuator loss(10 dB) + Cable loss

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	1	20.49	30
		2	20.70	30
		5.5	22.36	30
		11	23.83	30
2437	6	1	20.34	30
		2	20.65	30
		5.5	22.30	30
		11	23.79	30
2462	11	1	20.57	30
		2	20.88	30
		5.5	22.57	30
		11	24.05	30
2467	12	1	12.46	30
		2	13.10	30
		5.5	15.28	30
		11	16.41	30
2472	13	1	12.40	30
		2	13.13	30
		5.5	15.39	30
		11	16.21	30

802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	6	23.98	30
		9	23.85	30
		12	23.15	30
		18	23.17	30
		24	23.99	30
		36	23.94	30
		48	21.87	30
		54	22.05	30
2437	6	6	23.95	30
		9	23.86	30
		12	23.16	30
		18	23.21	30
		24	24.06	30
		36	23.99	30
		48	21.92	30
		54	22.11	30
2462	11	6	22.67	30
		9	22.60	30
		12	21.92	30
		18	21.95	30
		24	22.83	30
		36	22.77	30
		48	22.10	30
		54	22.29	30
2467	12	6	15.06	30
		9	14.94	30
		12	14.25	30
		18	14.28	30
		24	15.18	30
		36	15.10	30
		48	14.73	30
		54	14.97	30
2472	13	6	13.15	30
		9	13.02	30
		12	12.27	30
		18	12.33	30
		24	13.20	30
		36	13.14	30
		48	11.28	30
		54	11.55	30

802.11n(HT20) Mode		MCS Index	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	0	23.66	30
		1	23.12	30
		2	23.20	30
		3	23.79	30
		4	23.61	30
		5	21.74	30
		6	21.72	30
		7	21.93	30
2437	6	0	23.54	30
		1	23.03	30
		2	23.11	30
		3	23.76	30
		4	23.56	30
		5	21.75	30
		6	21.66	30
		7	21.85	30
2462	11	0	21.34	30
		1	20.94	30
		2	20.96	30
		3	21.61	30
		4	21.41	30
		5	21.01	30
		6	20.97	30
		7	21.16	30
2467	12	0	14.72	30
		1	14.30	30
		2	14.27	30
		3	14.92	30
		4	14.67	30
		5	14.71	30
		6	14.57	30
		7	14.76	30
2472	13	0	12.73	30
		1	12.29	30
		2	12.21	30
		3	12.97	30
		4	12.63	30
		5	11.19	30
		6	11.03	30
		7	11.25	30

Average Power

Power Meter offset Loss = Attenuator loss(10 dB) + Cable loss

802.11b 1 Mbps Mode transmits continuously(Duty cycle ≥ 98%)

802.11b Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor (dB)	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	1	17.80	0.000	17.80	30
		2	17.72	0.110	17.83	30
		5.5	17.73	0.281	18.01	30
		11	17.49	0.526	18.02	30
2437	6	1	17.66	0.000	17.66	30
		2	17.65	0.110	17.76	30
		5.5	17.67	0.281	17.95	30
		11	17.48	0.526	18.01	30
2462	11	1	17.90	0.000	17.90	30
		2	17.90	0.110	18.01	30
		5.5	17.95	0.281	18.23	30
		11	17.73	0.526	18.26	30
2467	12	1	9.46	0.000	9.46	30
		2	9.33	0.110	9.44	30
		5.5	9.14	0.281	9.42	30
		11	9.02	0.526	9.55	30
2472	13	1	9.42	0.000	9.42	30
		2	9.32	0.110	9.43	30
		5.5	9.24	0.281	9.52	30
		11	9.09	0.526	9.61	30

802.11g Mode		Rate (Mbps)	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	6	15.66	0.280	15.94	30
		9	15.52	0.485	16.00	30
		12	15.42	0.637	16.05	30
		18	15.23	0.914	16.14	30
		24	14.98	1.172	16.15	30
		36	14.63	1.607	16.24	30
		48	12.41	2.005	14.42	30
		54	12.34	2.121	14.46	30
2437	6	6	15.60	0.280	15.88	30
		9	15.46	0.485	15.95	30
		12	15.33	0.637	15.96	30
		18	15.20	0.914	16.11	30
		24	14.95	1.172	16.12	30
		36	14.62	1.607	16.22	30
		48	12.37	2.005	14.38	30
		54	12.30	2.121	14.43	30
2462	11	6	14.37	0.280	14.65	30
		9	14.26	0.485	14.75	30
		12	14.13	0.637	14.77	30
		18	13.96	0.914	14.87	30
		24	13.72	1.172	14.89	30
		36	13.38	1.607	14.99	30
		48	12.60	2.005	14.60	30
		54	12.52	2.121	14.64	30
2467	12	6	7.59	0.280	7.87	30
		9	7.40	0.485	7.89	30
		12	7.24	0.637	7.88	30
		18	7.07	0.914	7.99	30
		24	6.84	1.172	8.01	30
		36	6.49	1.607	8.10	30
		48	6.04	2.005	8.04	30
		54	5.95	2.121	8.07	30
2472	13	6	4.68	0.280	4.96	30
		9	4.55	0.485	5.04	30
		12	4.40	0.637	5.03	30
		18	4.21	0.914	5.13	30
		24	3.98	1.172	5.15	30
		36	3.62	1.607	5.23	30
		48	1.69	2.005	3.69	30
		54	1.62	2.121	3.74	30

802.11n(HT20) Mode		MCS Index	Measured Power (dBm)	Duty Cycle Factor	Measured Power(dBm) + Duty Cycle Factor	Limit (dBm)
Frequency [MHz]	Channel No.					
2412	1	0	15.58	0.358	15.94	30
		1	15.27	0.561	15.83	30
		2	15.11	0.799	15.91	30
		3	14.91	1.009	15.92	30
		4	14.59	1.375	15.97	30
		5	12.35	1.973	14.33	30
		6	12.31	2.110	14.42	30
		7	12.19	2.268	14.46	30
2437	6	0	15.47	0.358	15.82	30
		1	15.21	0.561	15.77	30
		2	15.05	0.799	15.85	30
		3	14.87	1.009	15.88	30
		4	14.57	1.375	15.95	30
		5	12.28	1.973	14.25	30
		6	12.26	2.110	14.37	30
		7	12.15	2.268	14.42	30
2462	11	0	13.28	0.358	13.64	30
		1	13.00	0.561	13.56	30
		2	12.83	0.799	13.63	30
		3	12.67	1.009	13.68	30
		4	12.35	1.375	13.72	30
		5	11.54	1.973	13.51	30
		6	11.51	2.110	13.62	30
		7	11.43	2.268	13.70	30
2467	12	0	7.28	0.358	7.64	30
		1	6.99	0.561	7.55	30
		2	6.80	0.799	7.60	30
		3	6.60	1.009	7.61	30
		4	6.27	1.375	7.65	30
		5	5.64	1.973	7.61	30
		6	5.53	2.110	7.64	30
		7	5.38	2.268	7.65	30
2472	13	0	4.52	0.358	4.88	30
		1	4.23	0.561	4.79	30
		2	4.05	0.799	4.85	30
		3	3.85	1.009	4.86	30
		4	3.55	1.375	4.93	30
		5	1.61	1.973	3.58	30
		6	1.58	2.110	3.69	30
		7	1.48	2.268	3.75	30

9.4 POWER SPECTRAL DENSITY

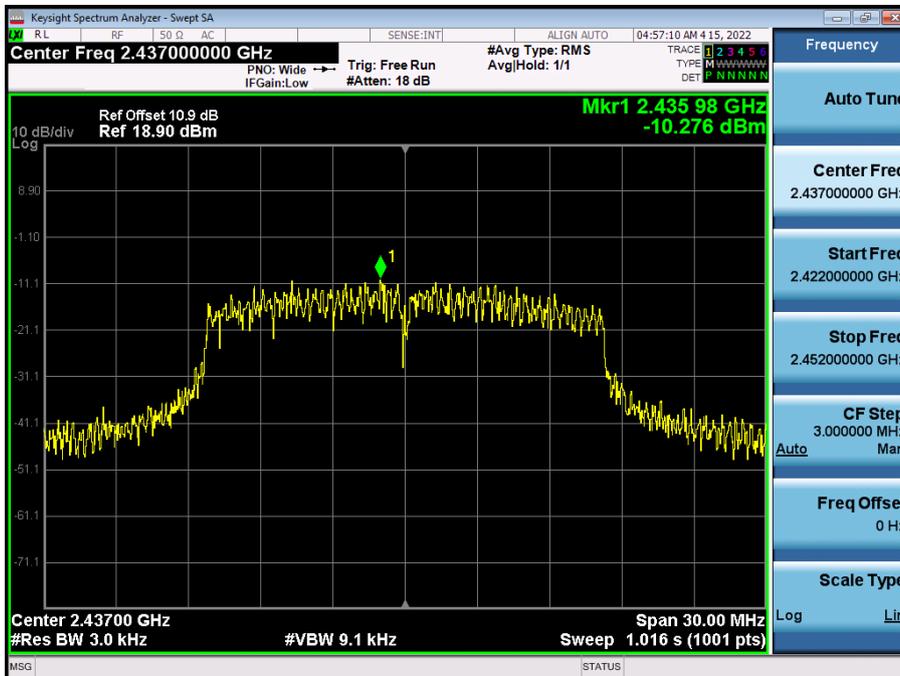
Mode	Frequency (MHz)	Channel No.	Test Result	
			PSD (dBm)	Limit (dBm)
802.11b	2412	1	-5.189	8 dBm / 3 kHz
	2437	6	-5.077	
	2462	11	-4.916	
	2467	12	-13.822	
	2472	13	-13.250	
802.11g	2412	1	-10.743	
	2437	6	-10.276	
	2462	11	-11.782	
	2467	12	-13.682	
	2472	13	-16.873	
802.11n(HT20)	2412	1	-9.903	
	2437	6	-10.071	
	2462	11	-10.095	
	2467	12	-13.704	
	2472	13	-15.564	

Test Plots

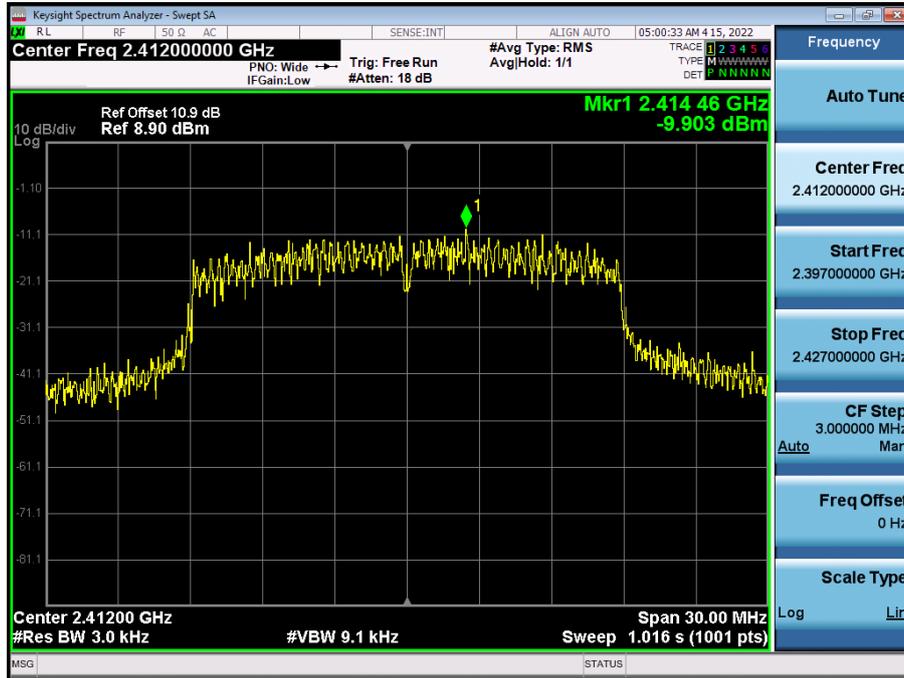
Power Spectral Density (802.11b-CH 11)



Power Spectral Density (802.11g-CH 6)



Power Spectral Density (802.11n_HT20-CH 1)



Note :

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

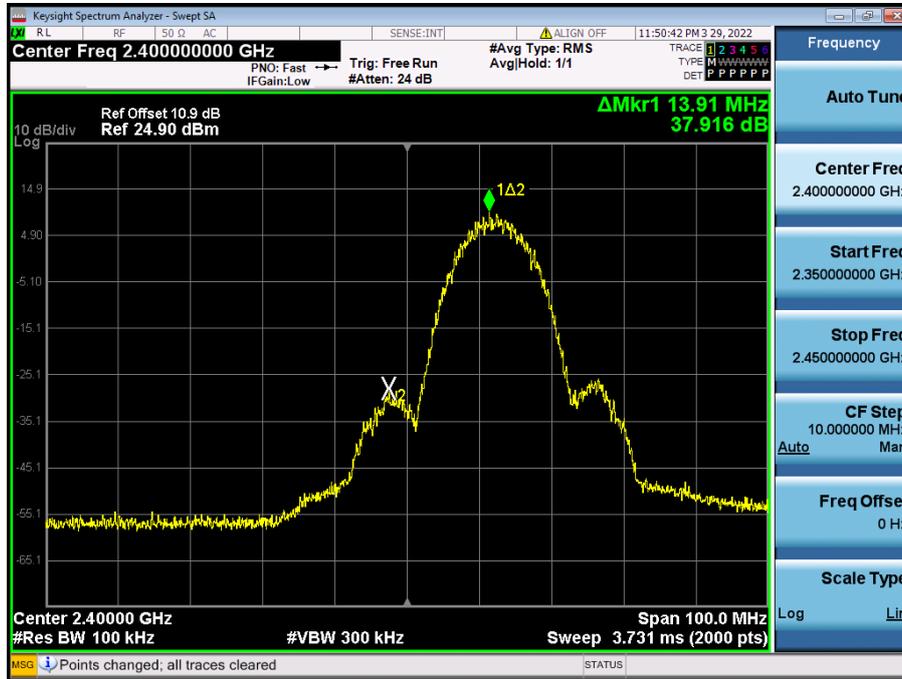
9.5 BAND EDGE / CONDUCTED SPURIOUS EMISSIONS

Test Result : please refer to the plot below.

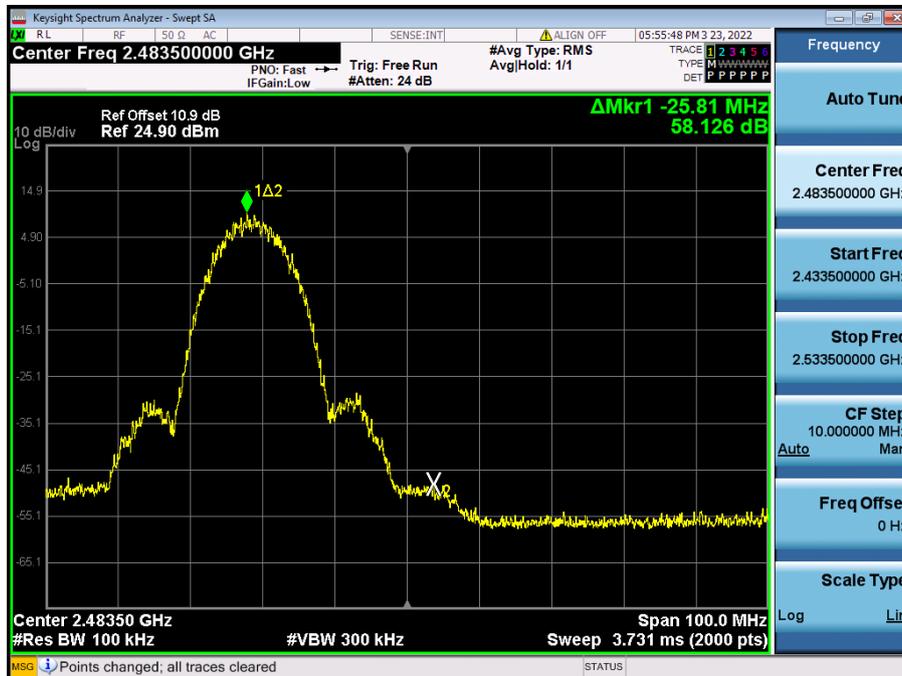
In order to simplify the report, attached plots were only the worst case channel and data rate.

Test Plots(Band Edge)

Band Edge (802.11b -CH1)



Band Edge (802.11b -CH11)



Band Edge (802.11b -CH12)



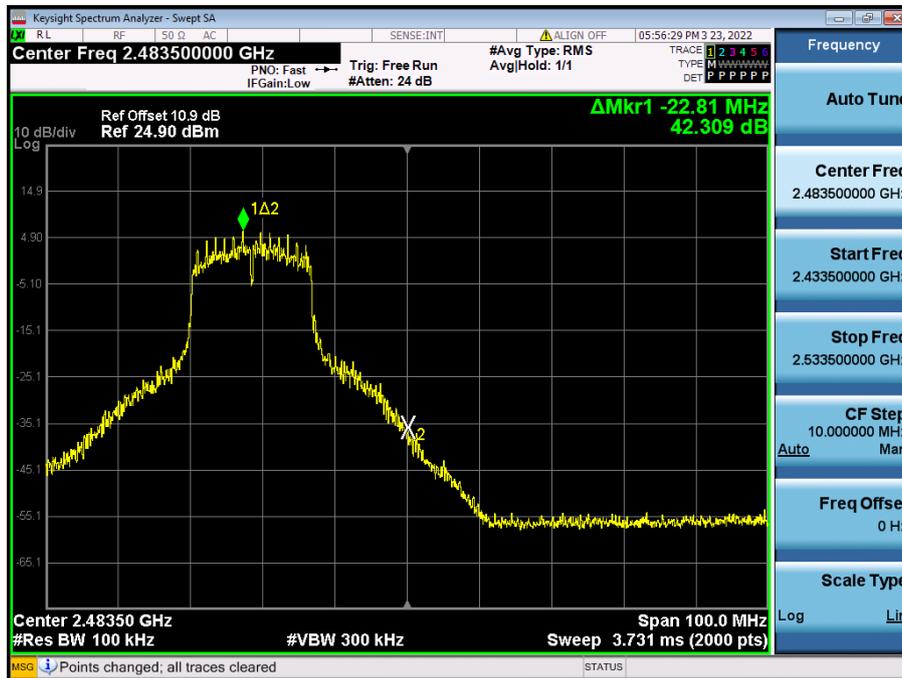
Band Edge (802.11b -CH13)



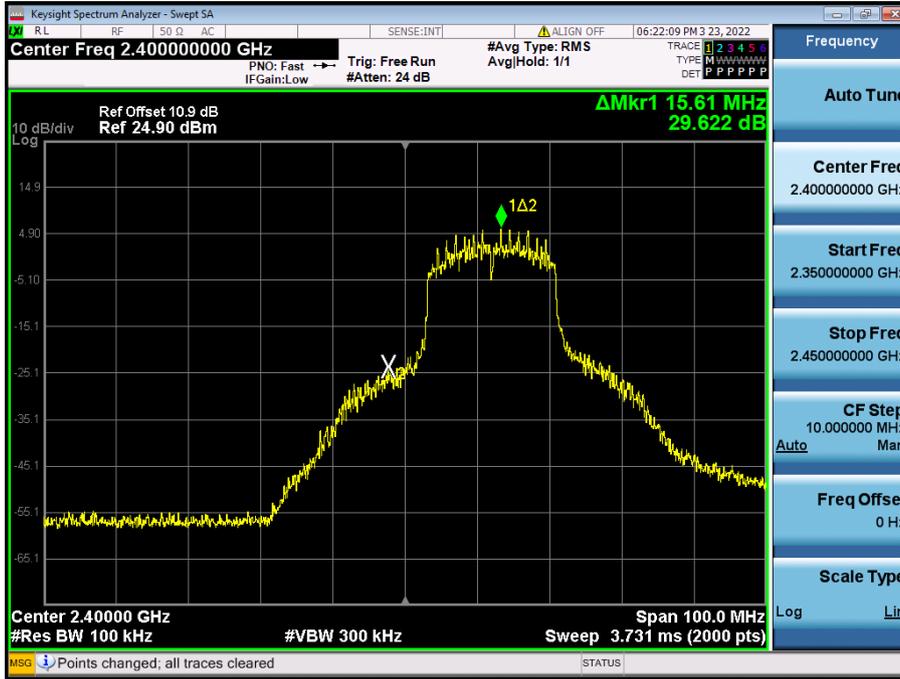
Band Edge (802.11g -CH1)



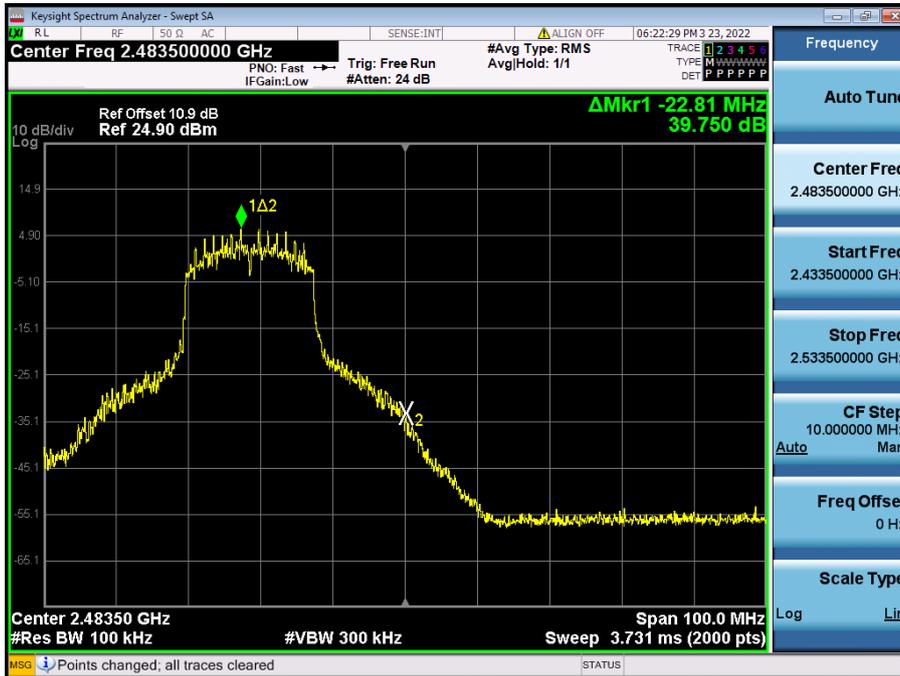
Band Edge (802.11g -CH11)



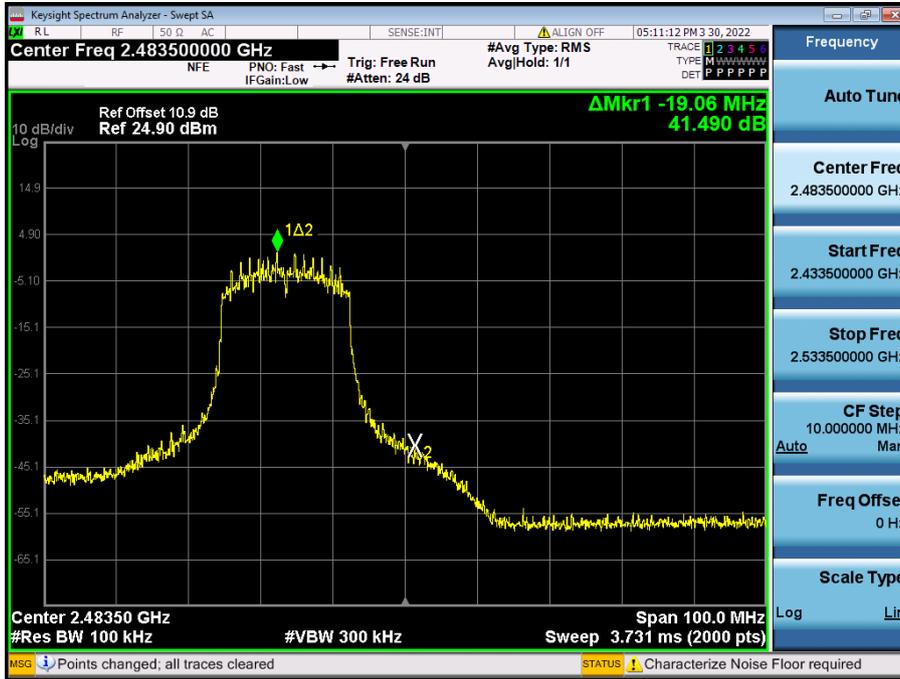
Band Edge (802.11n_HT20-CH1)



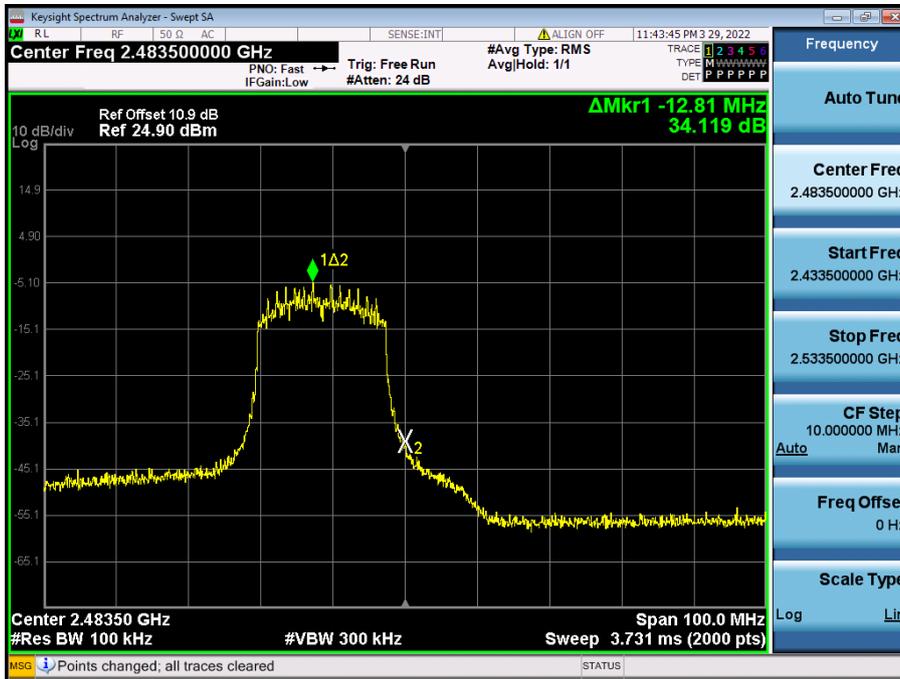
Band Edge (802.11n_HT20-CH11)



Band Edge (802.11n_HT20-CH12)



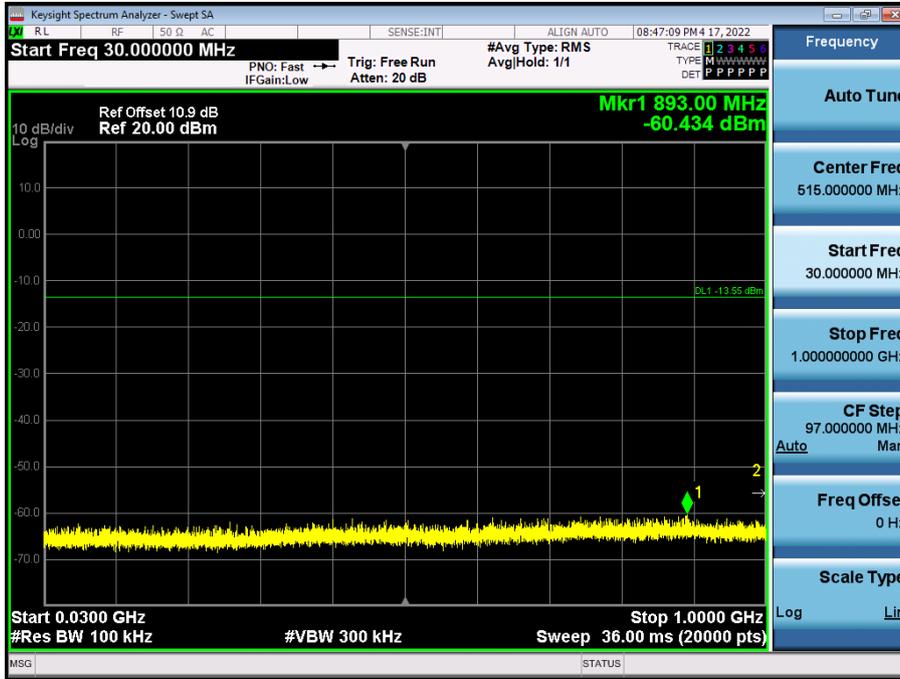
Band Edge (802.11n_HT20-CH13)



Test Plots(Conducted Spurious Emission)

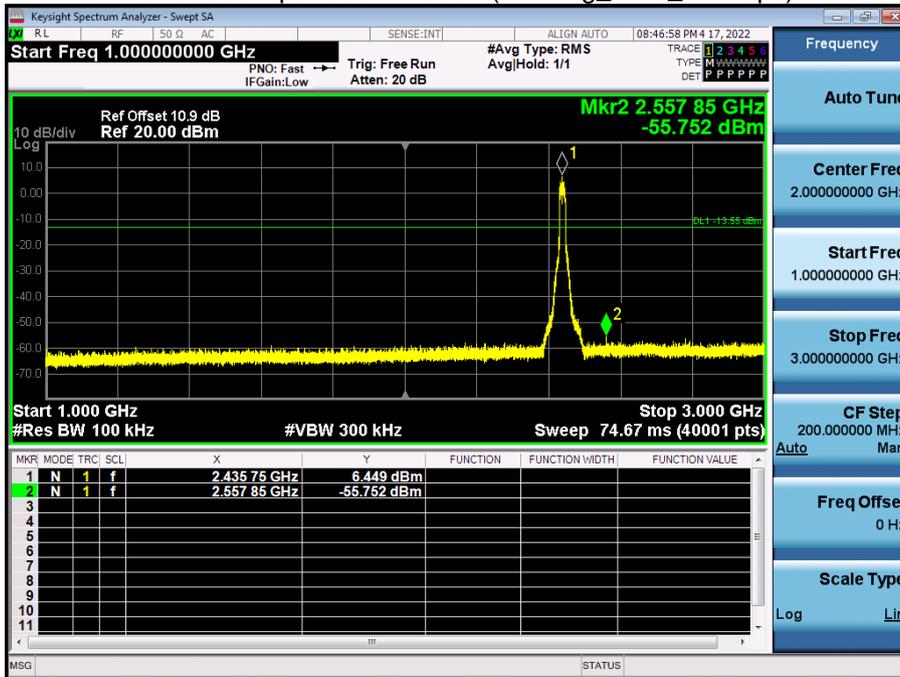
30 MHz ~ 1 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



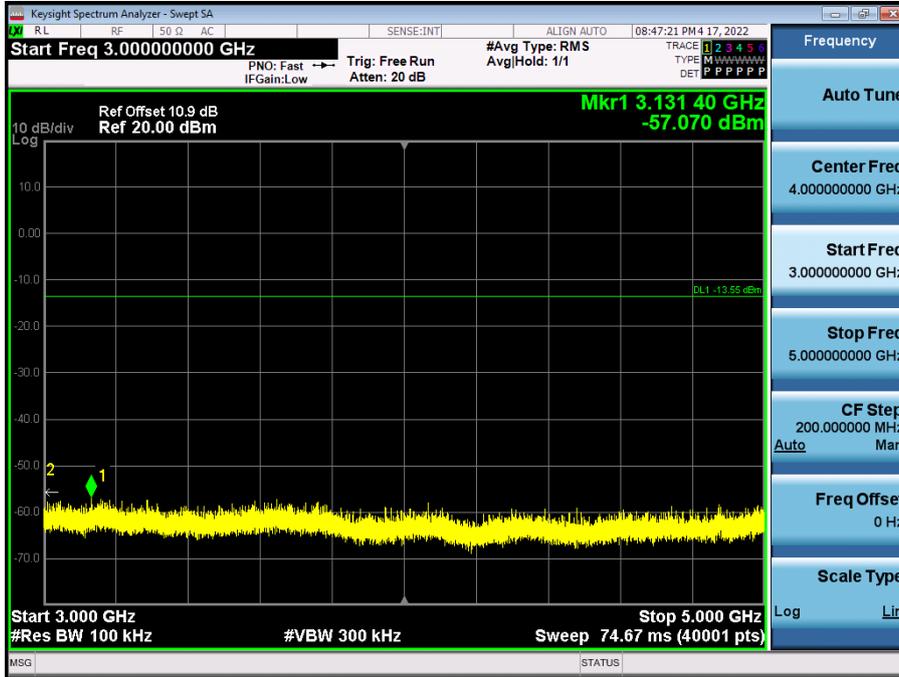
1 GHz ~ 3 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



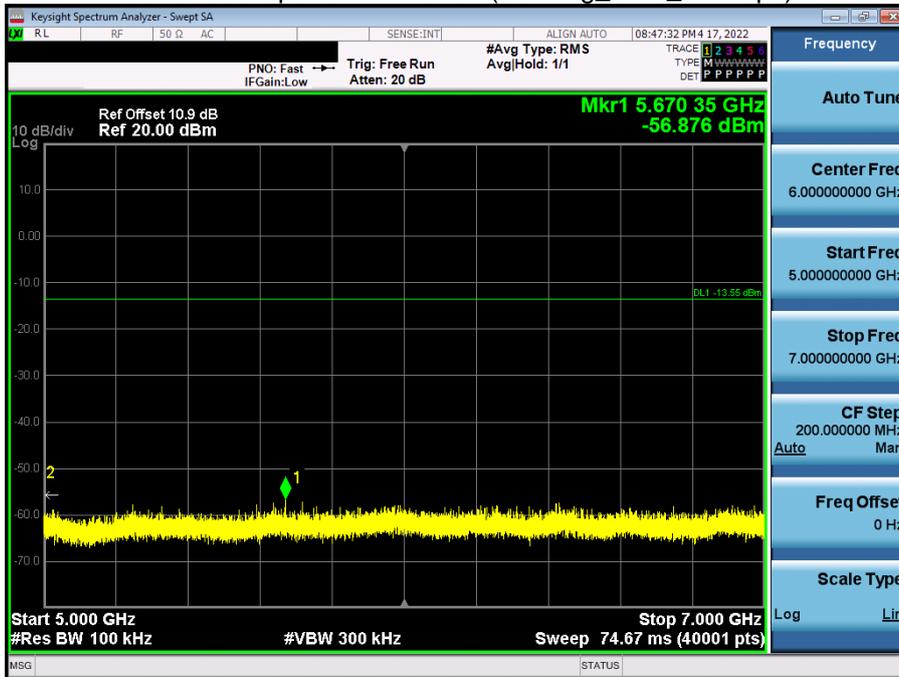
3 GHz ~ 5 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



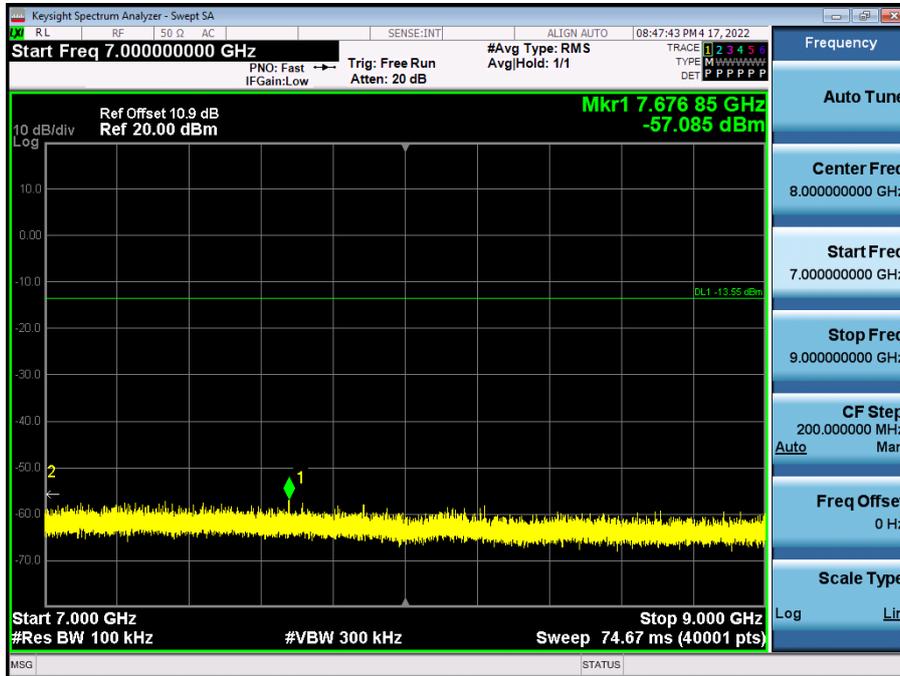
5 GHz ~ 7 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



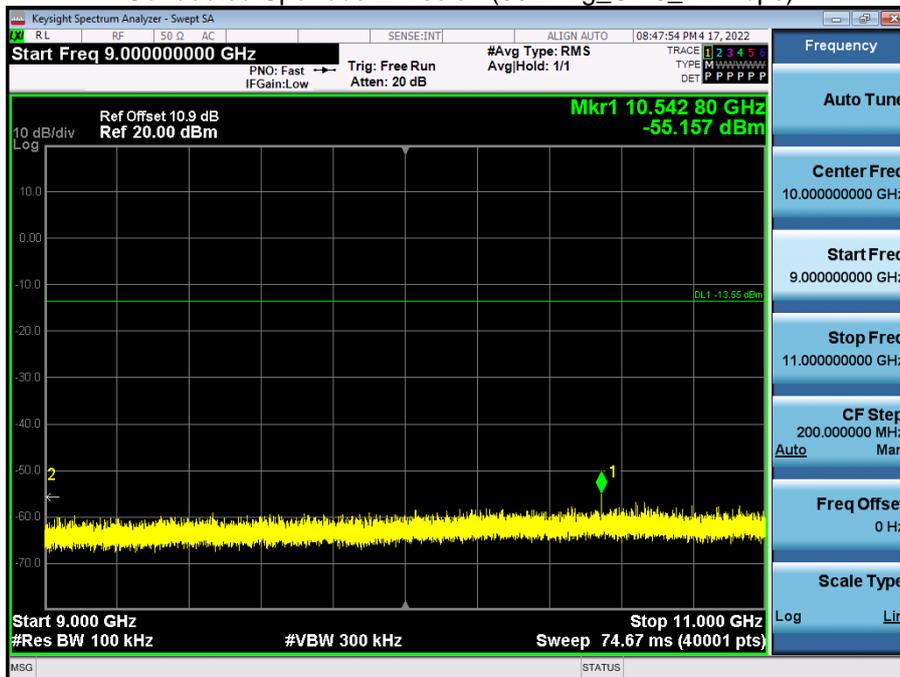
7 GHz ~ 9 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



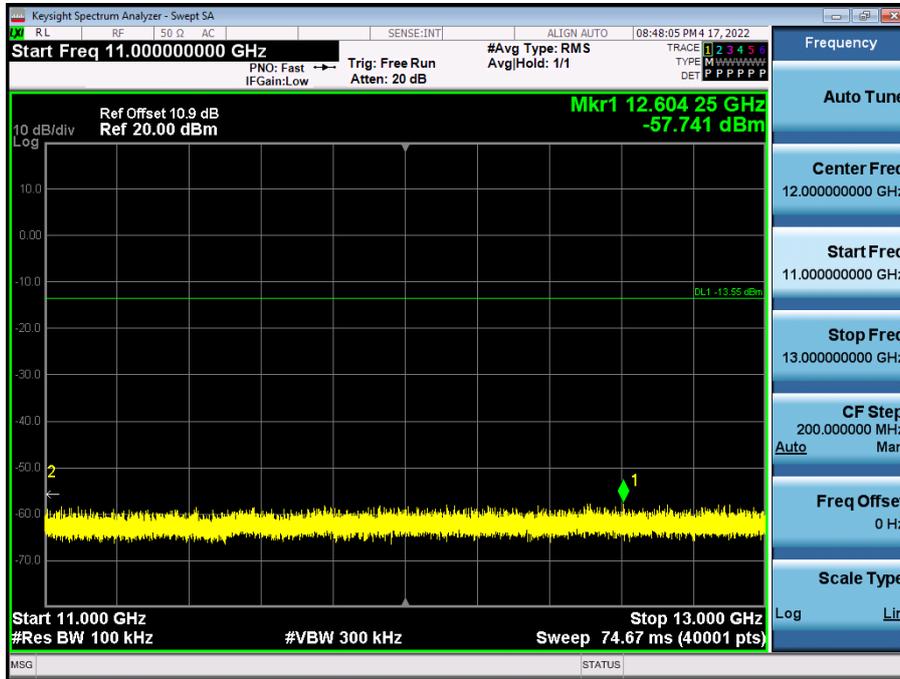
9 GHz ~ 11 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



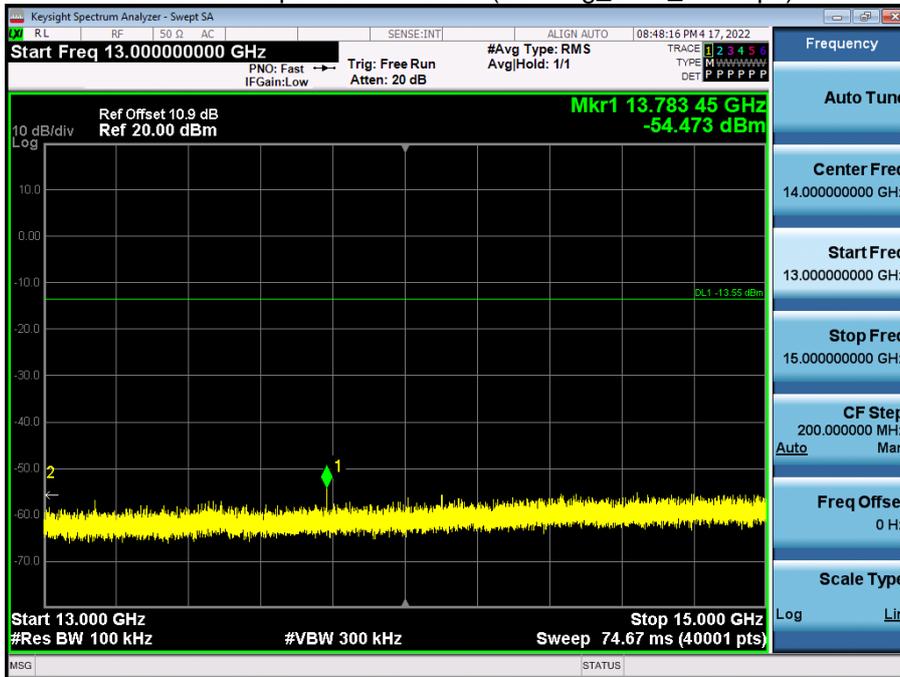
11 GHz ~ 13 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



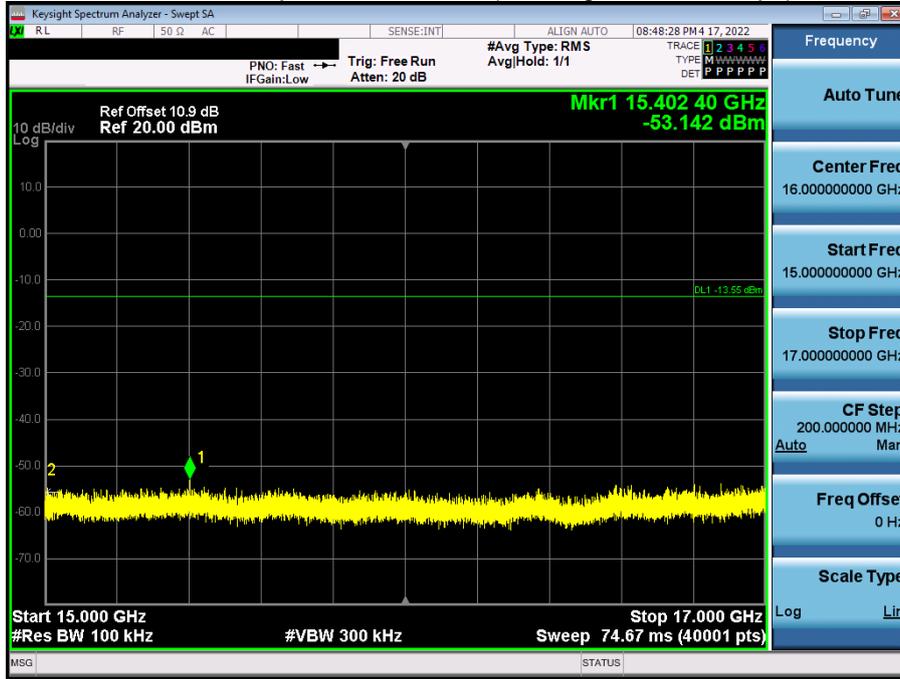
13 GHz ~ 15 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



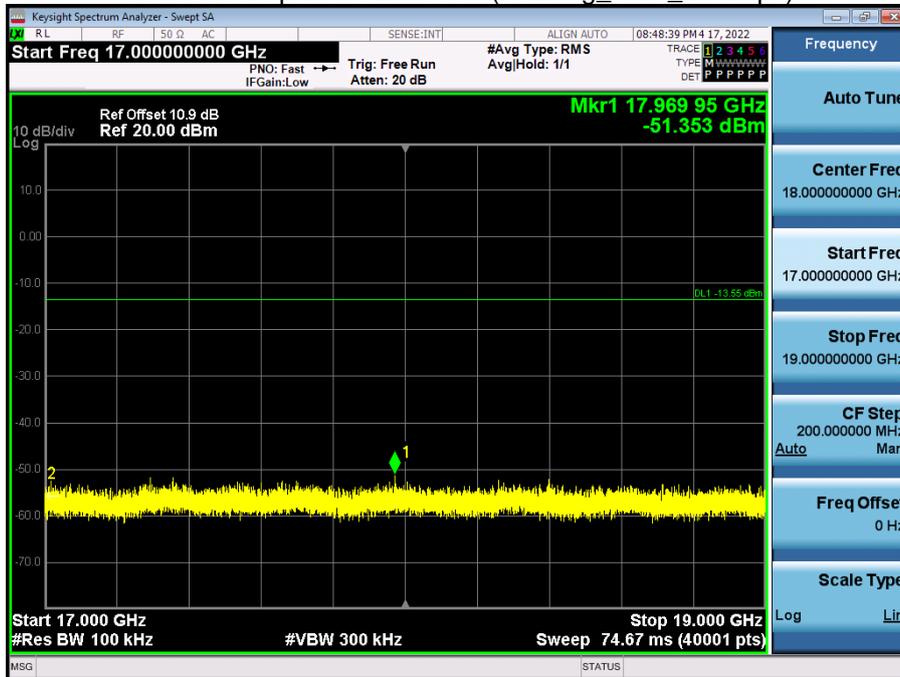
15 GHz ~ 17 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



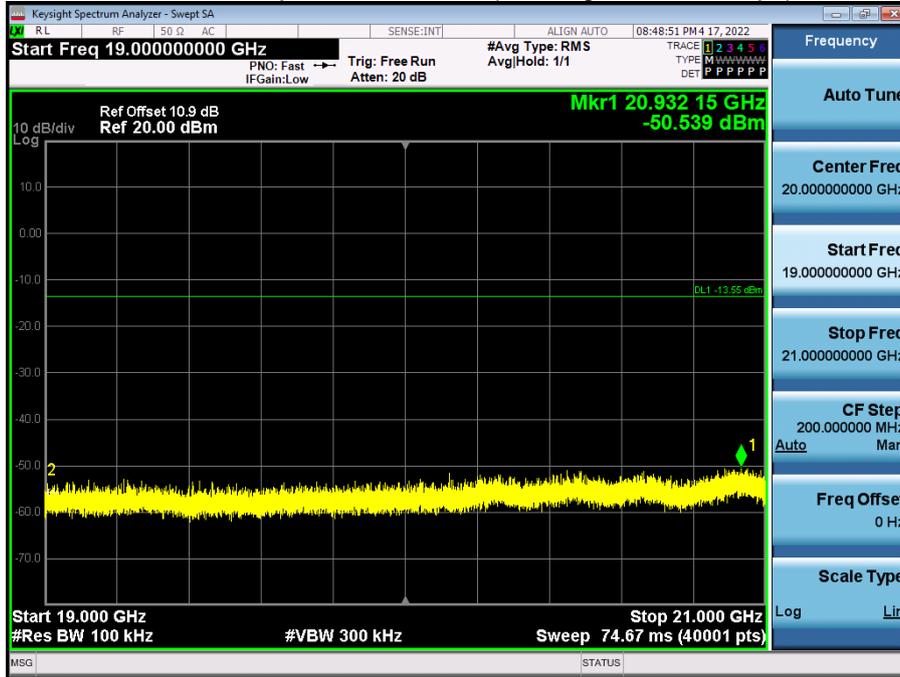
17 GHz ~ 19 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



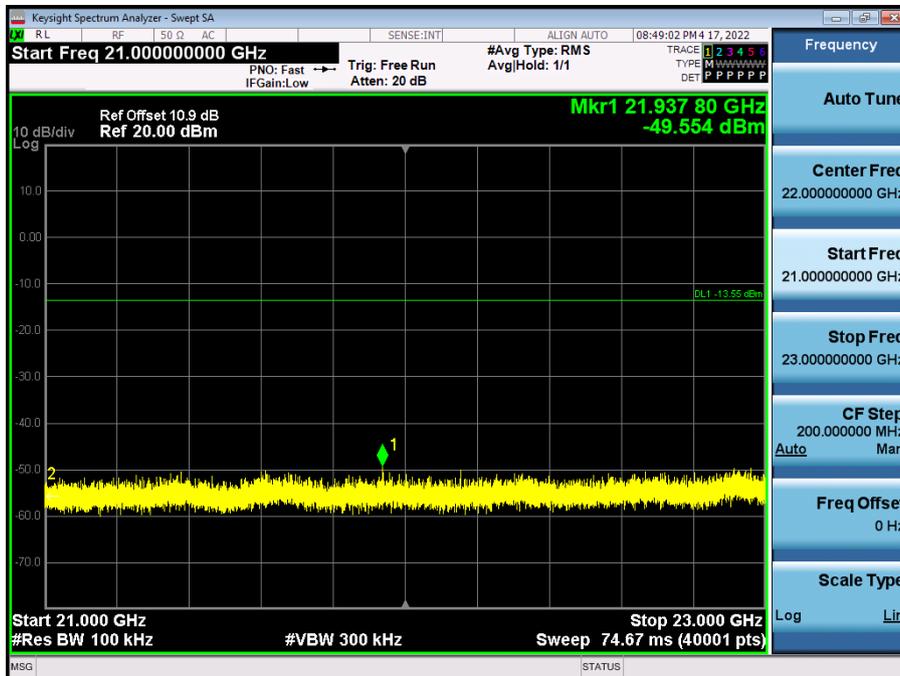
19 GHz ~ 21 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



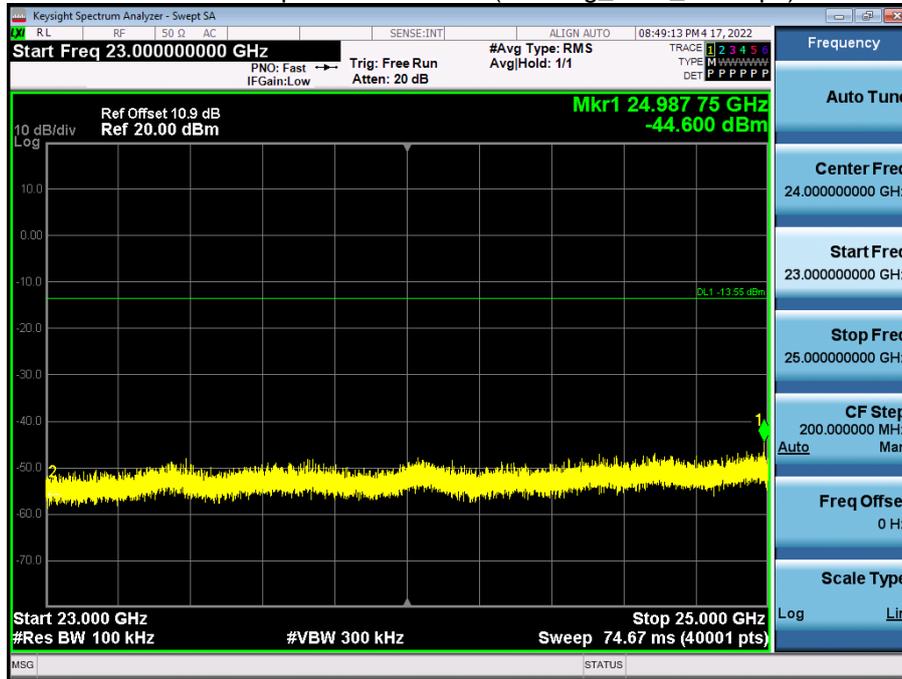
21 GHz ~ 23 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



23 GHz ~ 25 GHz

Conducted Spurious Emission (802.11g_Ch.6_24 Mbps)



9.6 RADIATED SPURIOUS EMISSIONS**Frequency Range : 9 kHz – 30 MHz**

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

Note:

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

Frequency Range : Below 1 GHz

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

Note:

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

Frequency Range : Above 1 GHz

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

Frequency [MHz]	Measured Level [dBμV]	AF+CL+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4824	43.59	3.48	V	47.07	73.98	26.91	PK
4824	33.54	3.48	V	37.02	53.98	16.96	AV
7236	43.20	8.67	V	51.87	73.98	22.11	PK
7236	33.45	8.67	V	42.12	53.98	11.86	AV
4824	44.55	3.48	H	48.03	73.98	25.95	PK
4824	34.57	3.48	H	38.05	53.98	15.93	AV
7236	44.47	8.67	H	53.14	73.98	20.84	PK
7236	34.64	8.67	H	43.31	53.98	10.67	AV

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

Frequency [MHz]	Measured Level [dBμV]	AF+CL+DF-AG [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4874	47.23	3.19	V	50.42	73.98	23.56	PK
4874	41.08	3.19	V	44.27	53.98	9.71	AV
7311	40.08	9.41	V	49.49	73.98	24.49	PK
7311	31.25	9.41	V	40.66	53.98	13.32	AV
4874	48.18	3.19	H	51.37	73.98	22.61	PK
4874	42.94	3.19	H	46.13	53.98	7.85	AV
7311	42.88	9.41	H	52.29	73.98	21.69	PK
7311	33.98	9.41	H	43.39	53.98	10.59	AV

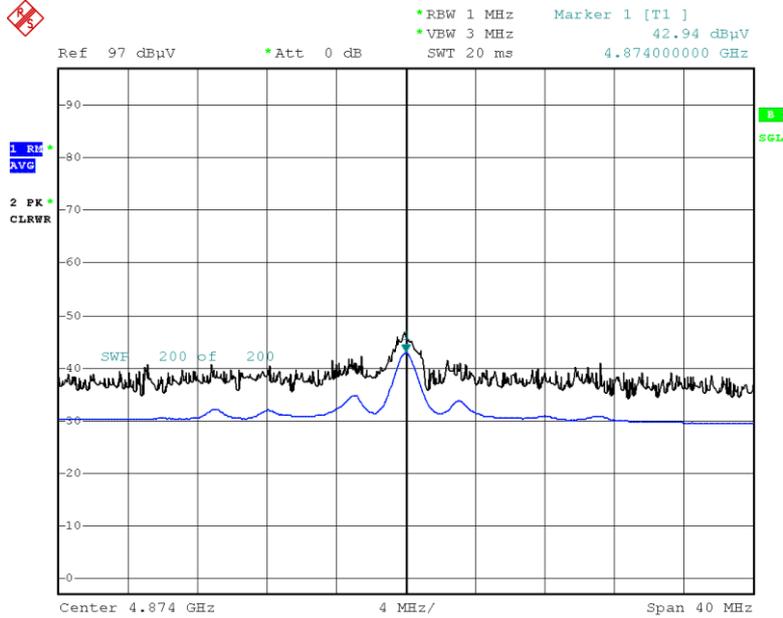
Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency: 2462 MHz
Channel No.: 11 Ch

Frequency [MHz]	Measured Level [dB μ V]	AF+CL+DF-AG [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
4924	43.24	2.54	V	45.78	73.98	28.20	PK
4924	34.60	2.54	V	37.14	53.98	16.84	AV
7386	41.74	10.04	V	51.78	73.98	22.20	PK
7386	29.82	10.04	V	39.86	53.98	14.12	AV
4924	44.53	2.54	H	47.07	73.98	26.91	PK
4924	36.06	2.54	H	38.60	53.98	15.38	AV
7386	41.56	10.04	H	51.60	73.98	22.38	PK
7386	30.73	10.04	H	40.77	53.98	13.21	AV

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

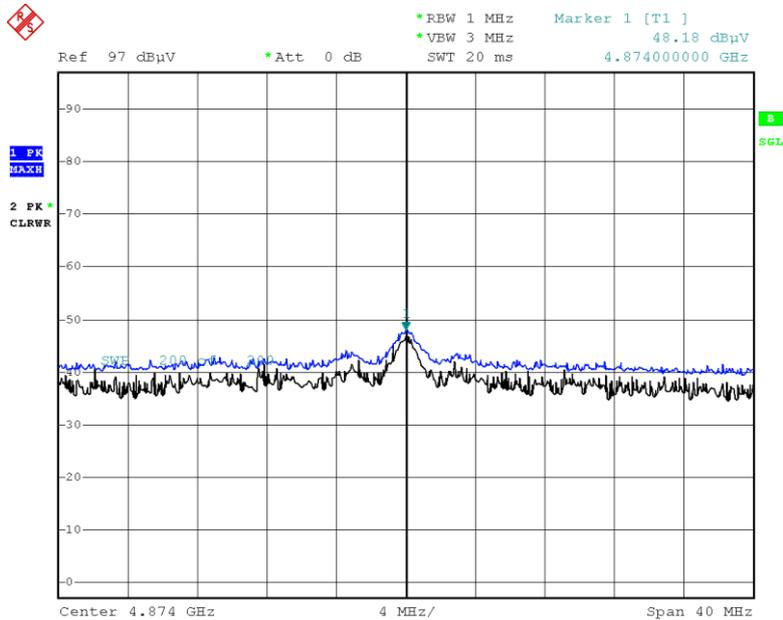
Test Plots (Worst case : Y-H)

Radiated Spurious Emissions plot – Average Result (802.11b_1 Mbps, Ch.6 2nd Harmonic)



Date: 30.MAR.2022 18:20:37

Radiated Spurious Emissions plot – Peak Result (802.11b_1 Mbps, Ch.6 2nd Harmonic)



Date: 30.MAR.2022 18:20:57

Note: Plot of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

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

Frequency [MHz]	Measured Level [dB μ V]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	18.97	33.78	H	52.74	73.98	21.24	PK
2390.0	8.10	33.78	H	41.88	53.98	12.10	AV
2390.0	19.24	33.78	V	53.02	73.98	20.96	PK
2390.0	8.66	33.78	V	42.44	53.98	11.54	AV
2483.5	20.00	34.10	H	54.10	73.98	19.88	PK
2483.5	8.86	34.10	H	42.96	53.98	11.02	AV
2483.5	20.40	34.10	V	54.49	73.98	19.49	PK
2483.5	9.44	34.10	V	43.53	53.98	10.45	AV

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency: 2467 MHz
Channel No. 12 Ch

Frequency [MHz]	Measured Level [dB μ V]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2483.5	20.47	34.10	H	54.57	73.98	19.41	PK
2483.5	9.36	34.10	H	43.46	53.98	10.52	AV
2483.5	20.30	34.10	V	54.40	73.98	19.58	PK
2483.5	9.46	34.10	V	43.56	53.98	10.42	AV

Operation Mode: 802.11b
Transfer Rate: 1 Mbps
Operating Frequency: 2472 MHz
Channel No.: 13 Ch

Frequency [MHz]	Measured Level [dB μ V]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2483.5	21.10	34.10	H	55.20	73.98	18.78	PK
2483.5	9.36	34.10	H	43.46	53.98	10.52	AV
2483.5	21.12	34.10	V	55.22	73.98	18.76	PK
2483.5	9.38	34.10	V	43.48	53.98	10.50	AV

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

Frequency [MHz]	Measured Level [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2390.0	24.09	0.00	33.78	H	57.87	73.98	16.11	PK
2390.0	11.07	0.28	33.78	H	45.12	53.98	8.86	AV
2390.0	26.56	0.00	33.78	V	60.33	73.98	13.65	PK
2390.0	13.49	0.28	33.78	V	47.55	53.98	6.43	AV
2483.5	32.41	0.00	34.10	H	66.51	73.98	7.47	PK
2483.5	15.75	0.28	34.10	H	50.13	53.98	3.85	AV
2483.5	32.46	0.00	34.10	V	66.56	73.98	7.42	PK
2483.5	16.41	0.28	34.10	V	50.79	53.98	3.19	AV

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

Frequency [MHz]	Measured Level [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2483.5	22.16	0.00	34.10	H	56.26	73.98	17.72	PK
2483.5	10.96	0.28	34.10	H	45.34	53.98	8.64	AV
2483.5	23.48	0.00	34.10	V	57.58	73.98	16.40	PK
2483.5	11.53	0.28	34.10	V	45.91	53.98	8.07	AV

Operation Mode: 802.11g
Transfer Rate: 6 Mbps
Operating Frequency: 2467 MHz
Channel No. 12 Ch

Frequency [MHz]	Measured Level [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2483.5	23.43	0.00	34.10	H	57.53	73.98	16.45	PK
2483.5	11.54	0.28	34.10	H	45.92	53.98	8.06	AV
2483.5	22.75	0.00	34.10	V	56.84	73.98	17.14	PK
2483.5	11.78	0.28	34.10	V	46.16	53.98	7.82	AV

Operation Mode: 802.11g
Transfer Rate: 6 Mbps
Operating Frequency: 2472 MHz
Channel No. 13 Ch

Frequency [MHz]	Measured Level [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2483.5	30.13	0.00	34.10	H	64.22	73.98	9.76	PK
2483.5	15.75	0.28	34.10	H	50.13	53.98	3.85	AV
2483.5	31.70	0.00	34.10	V	65.80	73.98	8.18	PK
2483.5	16.51	0.28	34.10	V	50.89	53.98	3.09	AV

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

Frequency [MHz]	Measured Level [dB μ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	29.45	0.00	33.78	H	63.23	73.98	10.75	PK
2390.0	14.57	0.36	33.78	H	48.70	53.98	5.28	AV
2390.0	30.55	0.00	33.78	V	64.33	73.98	9.65	PK
2390.0	15.69	0.36	33.78	V	49.82	53.98	4.16	AV
2483.5	29.56	0.00	34.10	H	63.66	73.98	10.32	PK
2483.5	15.03	0.36	34.10	H	49.49	53.98	4.49	AV
2483.5	31.46	0.00	34.10	V	65.56	73.98	8.42	PK
2483.5	16.04	0.36	34.10	V	50.50	53.98	3.48	AV

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

Frequency [MHz]	Measured Level [dB μ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2483.5	26.01	0.00	34.10	H	60.11	73.98	13.87	PK
2483.5	10.89	0.36	34.10	H	45.34	53.98	8.64	AV
2483.5	27.10	0.00	34.10	V	61.20	73.98	12.78	PK
2483.5	11.83	0.36	34.10	V	46.28	53.98	7.70	AV

Operation Mode: 802.11n (HT20)
 Transfer MCS Index: 0
 Operating Frequency: 2467 MHz
 Channel No.: 12 Ch

Frequency [MHz]	Measured Level [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2483.5	23.46	0.00	34.10	H	57.56	73.98	16.42	PK
2483.5	11.53	0.36	34.10	H	45.98	53.98	8.00	AV
2483.5	24.17	0.00	34.10	V	58.27	73.98	15.71	PK
2483.5	11.93	0.36	34.10	V	46.39	53.98	7.59	AV

Operation Mode: 802.11n (HT20)
 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-A.G +ATT+ D.F [dB/m]	ANT. POL [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2483.5	29.91	0.00	34.10	H	64.01	73.98	9.97	PK
2483.5	15.42	0.36	34.10	H	49.88	53.98	4.10	AV
2483.5	31.86	0.00	34.10	V	65.96	73.98	8.02	PK
2483.5	16.83	0.36	34.10	V	51.29	53.98	2.69	AV

■ Test Plots

(Worst case : Z-V)

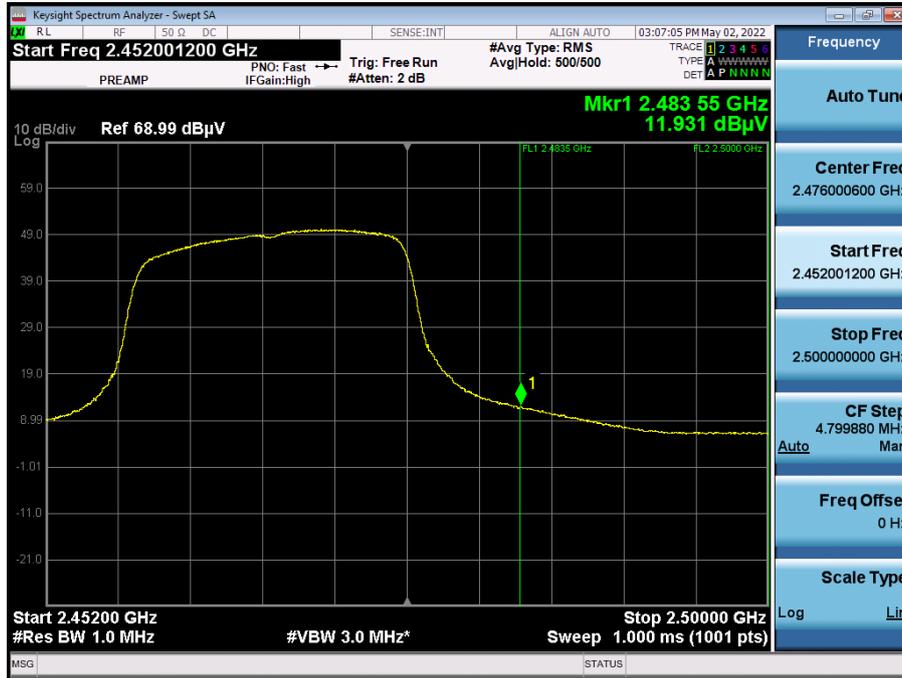
Radiated Restricted Band Edges plot – Average Result (802.11g_ 6 Mbps Ch.11)



Radiated Restricted Band Edges plot – Peak Result (802.11g_ 6Mbps Ch.11)



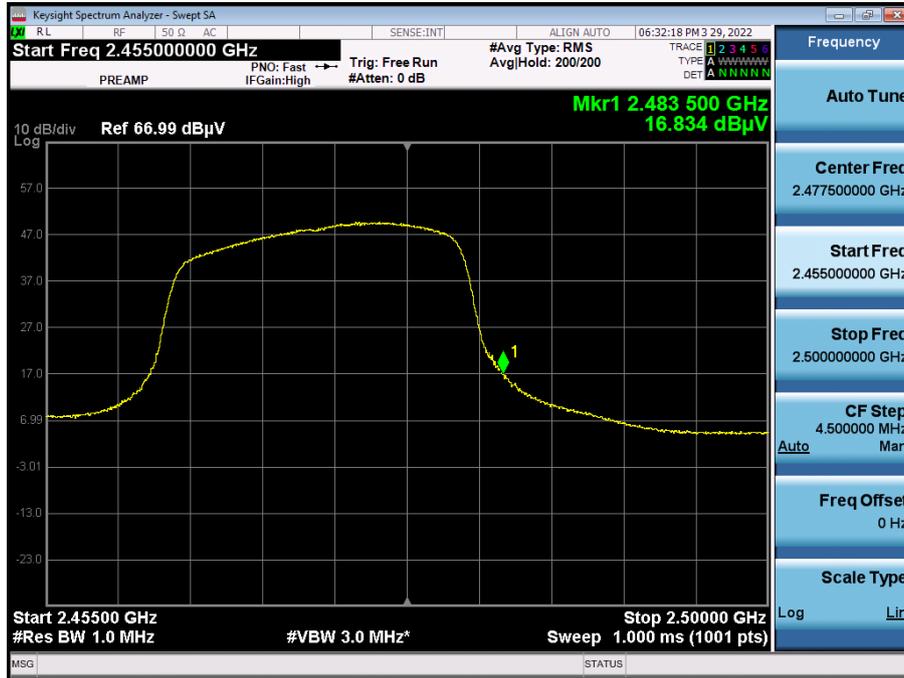
Radiated Restricted Band Edges plot – Average Result (802.11n (HT20)_ MCS0 Ch.12)



Radiated Restricted Band Edges plot – Peak Result (802.11n (HT20)_ MCS0 Ch.12)



Radiated Restricted Band Edges plot – Average Result (802.11n (HT20)_ MCS0 Ch.13)



Radiated Restricted Band Edges plot – Peak Result (802.11n (HT20)_ MCS0 Ch.13)



Note:

Plot of worst case are only reported.

9.8 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions (Line 1)

Test

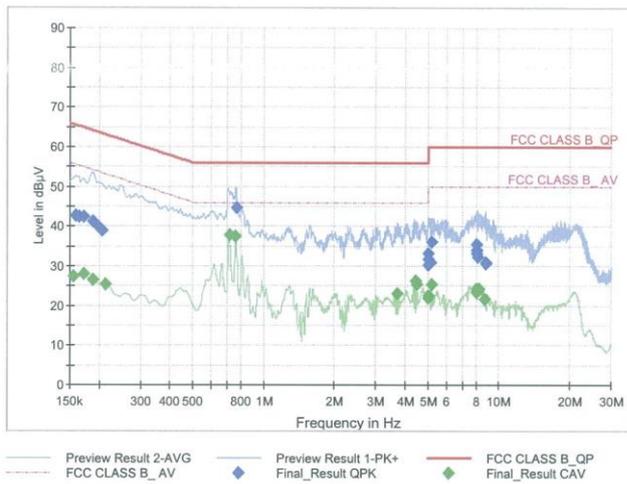
1 / 2

Test Report

Common Information

EUT : SM-M135M/DS
 Manufacturer : SAMSUNG
 Test Site: SHIELD ROOM
 Operating Conditions : 2.4G WLAN_L1
 Operator Name:
 Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1590	42.73	65.52	22.79	9.000	L1	OFF	9.6
0.1635	42.52	65.28	22.77	9.000	L1	OFF	9.6
0.1725	42.54	64.84	22.30	9.000	L1	OFF	9.6
0.1883	41.26	64.11	22.85	9.000	L1	OFF	9.6
0.1995	39.85	63.63	23.78	9.000	L1	OFF	9.6
0.2063	38.98	63.36	24.37	9.000	L1	OFF	9.6
0.7633	44.78	56.00	11.22	9.000	L1	OFF	9.7
5.0090	31.71	60.00	28.29	9.000	L1	OFF	9.9
5.0293	33.11	60.00	26.89	9.000	L1	OFF	9.9
5.0405	30.30	60.00	29.70	9.000	L1	OFF	9.9
5.1013	30.85	60.00	29.15	9.000	L1	OFF	9.9
5.1665	36.14	60.00	23.86	9.000	L1	OFF	9.9
8.0015	35.34	60.00	24.66	9.000	L1	OFF	10.0
8.0488	33.25	60.00	26.75	9.000	L1	OFF	10.0
8.0555	34.13	60.00	25.87	9.000	L1	OFF	10.0
8.1343	32.40	60.00	27.60	9.000	L1	OFF	10.0
8.7598	30.50	60.00	29.50	9.000	L1	OFF	10.0
8.8340	30.76	60.00	29.24	9.000	L1	OFF	10.0

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Test

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Final Result CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	27.34	55.75	28.42	9.000	L1	OFF	9.6
0.1725	28.05	54.84	26.79	9.000	L1	OFF	9.6
0.1883	26.59	54.11	27.53	9.000	L1	OFF	9.6
0.2130	25.29	53.09	27.80	9.000	L1	OFF	9.6
0.7138	37.68	46.00	8.32	9.000	L1	OFF	9.7
0.7610	37.42	46.00	8.58	9.000	L1	OFF	9.7
3.6928	23.00	46.00	23.00	9.000	L1	OFF	9.8
4.4083	26.28	46.00	19.72	9.000	L1	OFF	9.8
4.4578	25.31	46.00	20.69	9.000	L1	OFF	9.8
5.0225	21.95	50.00	28.05	9.000	L1	OFF	9.9
5.0315	22.50	50.00	27.50	9.000	L1	OFF	9.9
5.1710	25.29	50.00	24.71	9.000	L1	OFF	9.9
8.0105	24.33	50.00	25.67	9.000	L1	OFF	10.0
8.0555	23.60	50.00	26.40	9.000	L1	OFF	10.0
8.0825	23.36	50.00	26.64	9.000	L1	OFF	10.0
8.1410	23.59	50.00	26.41	9.000	L1	OFF	10.0
8.1928	24.15	50.00	25.85	9.000	L1	OFF	10.0
8.6878	21.69	50.00	28.31	9.000	L1	OFF	10.0

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Conducted Emissions (Line 2)

Test

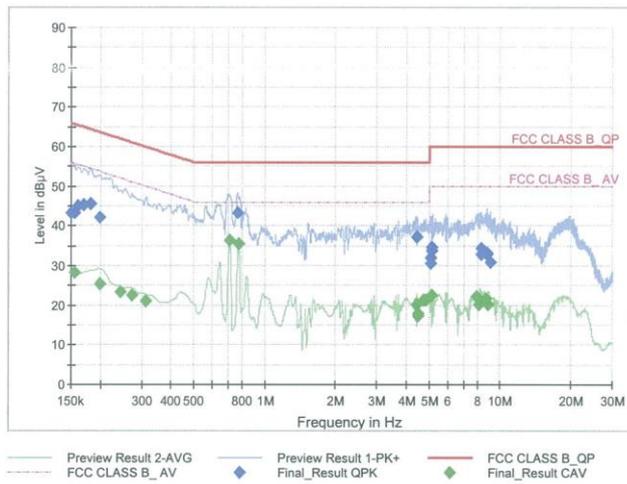
1 / 2

Test Report

Common Information

EUT : SM-M135M/DS
 Manufacturer : SAMSUNG
 Test Site: SHIELD ROOM
 Operating Conditions : 2.4G WLAN_N
 Operator Name:
 Comment:

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1500	43.16	66.00	22.84	9.000	N	OFF	9.6
0.1545	43.22	65.75	22.53	9.000	N	OFF	9.6
0.1613	45.14	65.40	20.26	9.000	N	OFF	9.6
0.1703	45.28	64.95	19.67	9.000	N	OFF	9.6
0.1815	45.46	64.42	18.96	9.000	N	OFF	9.6
0.1995	42.21	63.63	21.42	9.000	N	OFF	9.6
0.7655	43.38	56.00	12.62	9.000	N	OFF	9.7
4.4105	37.11	56.00	18.89	9.000	N	OFF	9.8
5.0900	30.49	60.00	29.51	9.000	N	OFF	9.9
5.0990	31.97	60.00	28.03	9.000	N	OFF	9.9
5.1080	33.73	60.00	26.27	9.000	N	OFF	9.9
5.1170	34.58	60.00	25.42	9.000	N	OFF	9.9
8.2760	34.27	60.00	25.73	9.000	N	OFF	10.0
8.3548	32.82	60.00	27.18	9.000	N	OFF	10.0
8.7598	32.77	60.00	27.23	9.000	N	OFF	10.0
8.7665	33.23	60.00	26.77	9.000	N	OFF	10.0
8.7755	33.23	60.00	26.77	9.000	N	OFF	10.0
9.0635	30.99	60.00	29.01	9.000	N	OFF	10.0

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Test

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Final Result CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	28.16	55.75	27.60	9.000	N	OFF	9.6
0.1995	25.50	53.63	28.13	9.000	N	OFF	9.6
0.2423	23.25	52.02	28.77	9.000	N	OFF	9.6
0.2715	22.55	51.07	28.52	9.000	N	OFF	9.6
0.3120	21.10	49.92	28.82	9.000	N	OFF	9.6
0.7093	36.35	46.00	9.65	9.000	N	OFF	9.7
0.7745	35.39	46.00	10.61	9.000	N	OFF	9.7
4.4150	20.18	46.00	25.82	9.000	N	OFF	9.8
4.4803	17.84	46.00	28.16	9.000	N	OFF	9.8
4.4960	17.45	46.00	28.55	9.000	N	OFF	9.8
4.7525	21.35	46.00	24.65	9.000	N	OFF	9.8
4.8515	21.30	46.00	24.70	9.000	N	OFF	9.8
5.1260	22.36	50.00	27.64	9.000	N	OFF	9.9
7.9858	22.15	50.00	27.85	9.000	N	OFF	10.0
8.1635	20.28	50.00	29.72	9.000	N	OFF	10.0
8.6698	21.63	50.00	28.37	9.000	N	OFF	10.0
8.6968	21.69	50.00	28.31	9.000	N	OFF	10.0
8.8655	20.17	50.00	29.83	9.000	N	OFF	10.0

2022-03-30

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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	03/04/2023	Annual
Signal Analyzer	N9020A	Agilent	MY52440870	09/02/2022	Annual
Signal Analyzer	N9030A	Agilent	MY49431210	01/11/2023	Annual
Power Meter	N1911A	Agilent	MY45100523	03/23/2023	Annual
Power Sensor	N1921A	Agilent	MY57820067	03/23/2023	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/02/2022	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)	5910-N-50-010	H+S	00801	10/29/2022	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	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	09/04/2022	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/18/2023	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	04/12/2023	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
Band Reject Filter	WRCJV2400/2483.5- 2370/2520-60/12SS	Wainwright Instruments	2	01/06/2023	Annual
Band Reject Filter	WRCJV5100/5850- 40/50-8EEK	Wainwright Instruments	1	02/07/2023	Annual
Attenuator (10 dB) 56-10	CBLU1183540B-01 56-10	CERNEX WEINSCHL	N/A	12/22/2022	Annual
Broadband Low Noise Amplifier	CBL06185030	CERNEX	N/A	12/22/2022	Annual
Attenuator (3 dB)	18B-03	Api tech.	N/A	12/22/2022	Annual
High Pass Filter	WHKX10-2700-3000- 18000-40SS	Wainwright Instruments	N/A	12/22/2022	Annual
High Pass Filter	WHKX8-6090-7000- 18000-40SS	Wainwright Instruments	N/A	12/22/2022	Annual
High Pass Filter	WHKX10-7150-8000- 18000-50SS	Wainwright Instruments	1	03/11/2023	Annual
Thru	COAXIAL ATTENUATOR	T&M SYSTEM	N/A	12/22/2022	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/02/2022	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/11/2023	Annual

Note:

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

11. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2204-FC019-P