TEST REPORT

FCC BT Test for SM-S931U
Certification

APPLICANT
SAMSUNG Electronics Co., Ltd.

REPORT NO.
HCT-RF-2410-FC019-R1

DATE OF ISSUE
October 31, 2024

Tested by
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Additional Model
SM-S931U1

Applicant	**SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Product Name Model Name	Mobile Phone SM-S931U
FCC ID	A3LSMS931U
Date of Test	August 26, 2024 ~ October 22, 2024
Test Results	PASS
FCC Classification	FCC Part 15 Spread Spectrum Transmitter
Test Standard Used	FCC Rule Part(s): Part 15 subpart C 15.247
Location of Test	■ Permanent Testing Lab ☐ On Site Testing Lab (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)

REVISION HISTORY

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

Revision No.	Date of Issue	Description
0	October 22, 2024	Initial Release
1	October 31, 2024	Page 24-26, Added calculation formula for Duty Cycle Correction Factor

Notice

Content
Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance. The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s). The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***. When confirmation of authenticity of this test report is required, please contact www.hct.co.kr The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

CONTENTS

1. EUT DESCRIPTION

Model	SM-S931U
Additional Model	SM-S931U1
EUT Type	Mobile Phone
Power Supply	DC 3.88V
Frequency Range	2 402 MHz - 2 480 MHz
Max. RF Output Power	Ant.1 : 18.450 dBm (69.98 mW) Ant.2 : 19.084 dBm (80.98 mW) Dual Ant.1+ Ant.2 : 15.767 dBm (37.73 mW)
BT Operating Mode	Normal, EDR, AFH
Modulation Type	GFSK(Normal), π/4DQPSK and 8DPSK(EDR)
Modulation Technique	FHSS
Number of Channels	79 Channels, Minimum 20 Channels(AFH)
Antenna Specification	Type: Metal ANT.1 Peak Gain: -1.05 dBi, ANT.2 Peak Gain: -4.74 dBi
Serial number	Conducted : R3CX80PTBVX Radiated : R3CX80BGC4E

ANTENNA CONFIGURATIONS

1. Below Tables are the possible configurations.

Configurations	SISO		Dual BT
	Ant1(Core-0)	Ant2(Core-1)	Ant1 & Ant2
Bluetooth	O	O	O

Note:

O = Support, X = Not Support

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

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

2. Requirements for Bluetooth transmitter(15.247)

This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following:

1) This system is hopping pseudo-randomly.
2) Each frequency is used equally on the average by each transmitter.
3) The receiver input bandwidths that match the hopping channel bandwidths of their corresponding transmitters
4) The receiver shifts frequencies in synchronization with the transmitted signals.
   - 15.247(g): The system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this Section 15.247 should the transmitter be presented with a continuous data (or information) stream.
   - 15.247(h): The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

3. TEST METHODOLOGY

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Device (ANSI C63.10-2013, KDB 558074) is used in the measurement of the test device.

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). To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120 kHz for frequencies below 1 GHz or 1 MHz for frequencies above 1 GHz. For average measurements above 1 GHz, the analyzer was set to peak detector and add the DCCF calculations.

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.

4. 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).

5. FACILITIES AND ACCREDITATIONS

FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.
Detailed description of test facility was submitted to the Commission and accepted dated March 11, 2024 (Registration Number: KR0032).

EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.
Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6. 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

7. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

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

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.98 (Confidence level about 95 %, k=2)
Radiated Disturbance (9 kHz ~ 30 MHz)	4.36 (Confidence level about 95 %, k=2)
Radiated Disturbance (30 MHz ~ 1 GHz)	5.70 (Confidence level about 95 %, k=2)
Radiated Disturbance (1 GHz ~ 18 GHz)	5.52 (Confidence level about 95 %, k=2)
Radiated Disturbance (18 GHz ~ 40 GHz)	5.66 (Confidence level about 95 %, k=2)
Radiated Disturbance (Above 40 GHz)	5.58 (Confidence level about 95 %, k=2)

8. DESCRIPTION OF TESTS

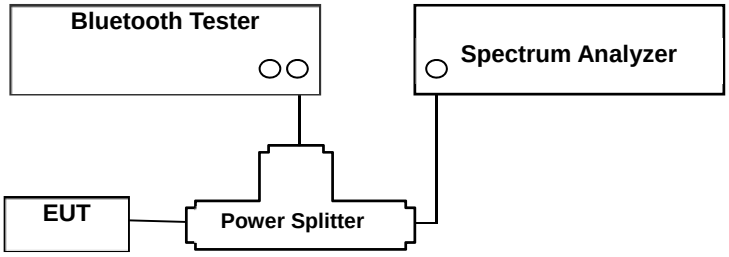
8.1. Conducted Maximum Peak Output Power

Limit

The maximum peak output power of the intentional radiator shall not exceed the following:

1. For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 W. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 W.
2. The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

Test Configuration



Test Procedure

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the peak detector mode. This test is performed with hopping off.

The Spectrum Analyzer is set to (7.8.5 in ANSI 63.10-2013& Procedure 9(b) in KDB 558074 v05r02)

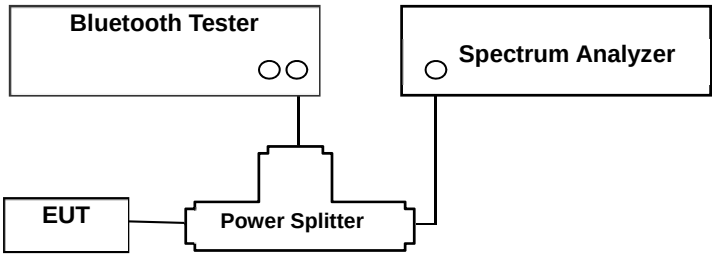
1) Span: approximately 5 times the 20 dB bandwidth, centered on a hopping channel
2) RBW> the 20 dB bandwidth of the emission being measured
3) VBW ≥ RBW
4) Sweep = Auto
5) Detector = Peak
6) Trace = Max hold

8.2. Conducted Band Edge(Out of Band Emissions)

Limit

According to § 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Configuration



Test Procedure

This test is performed with hopping off and hopping on.

The Spectrum Analyzer is set to (6.10.4 in ANSI 63.10-2013& Procedure 8.5 and 8.6 in KDB 558074 v05r02)

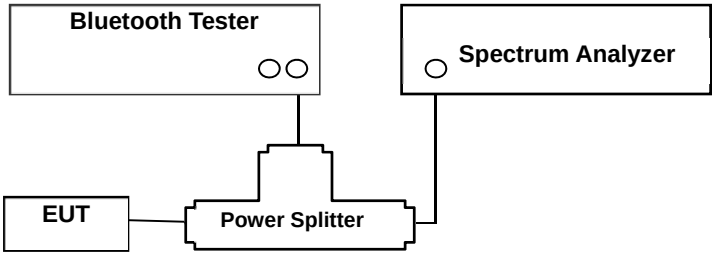
1) Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
2) Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log (OBW/RBW)] below the reference level.
3) Attenuation: Auto (at least 10 dB preferred).
4) Sweep time: Coupled.
5) RBW: 100 kHz
6) VBW: 300 kHz
7) Detector: Peak
8) Trace: Max hold

8.3. Frequency Separation & 20 dB Bandwidth

Limit

According to § 15.247(a)(1), Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Configuration



Test Procedure(Frequency Separation)

The Channel Separation test is performed with hopping on.
And the 20 dB Bandwidth test is performed with hopping off.

The Spectrum Analyzer is set to (7.8.2 in ANSI 63.10-2013& Procedure 9(b) in KDB 558074 v05r02)

1) Span: Wide enough to capture the peaks of two adjacent channels
2) RBW: Start with the RBW set to approximately 30 % of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3) VBW ≥ RBW
4) Sweep: Auto
5) Detector: Peak
6) Trace: Max hold
7) All the trace to stabilize.
8) Use the marker-delta function to determine the separation between the peaks of the adjacent channels. Compliance of an EUT with the appropriate regulatory limit shall be determined. A plot of the data shall be included in the test report.

Test Procedure (20 dB Bandwidth)

And the 20 dB Bandwidth test is performed with hopping off.

The Spectrum Analyzer is set to (6.9.2 in ANSI 63.10-2013)

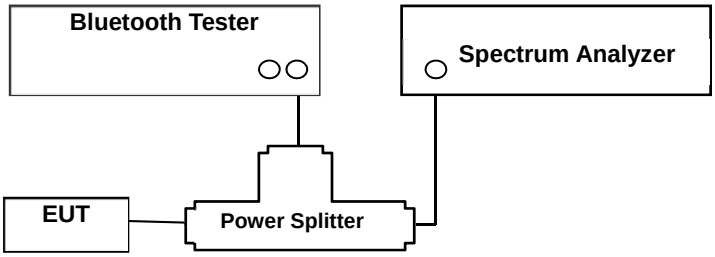
1) Span: Set between two times and five times the OBW
2) RBW: 1 % to 5 % of the OBW.
3) VBW ≥ 3 x RBW
4) Sweep: Auto
5) Detector: Peak
6) Trace: Max hold
7) All the trace to stabilize.

8.4. Number of Hopping Frequencies

Limit

According to § 15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands shall use at least 15 hopping frequencies.

Test Configuration



Test Procedure

The Bluetooth frequency hopping function of the EUT was enabled.

The Spectrum Analyzer is set to (7.8.3 in ANSI 63.10-2013& Procedure 9(b) in KDB 558074 v05r02)

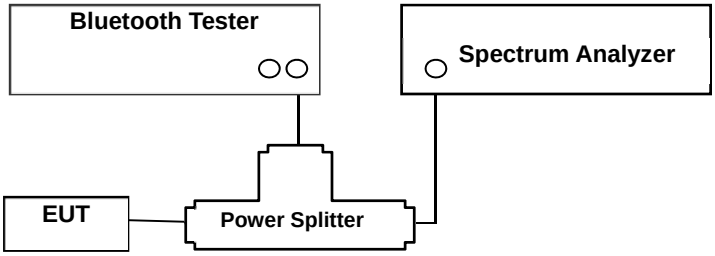
1) Span: the frequency band of operation
2) RBW: To identify clearly the individual channels, set the RBW to less than 30 % of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3) VBW ≥ RBW
4) Sweep: Auto
5) Detector: Peak
6) Trace: Max hold
7) Allow the trace to stabilize.

8.5. Time of Occupancy

Limit

According to § 15.247(a)(1)(iii), Frequency hopping systems operating in the 2400 MHz ~ 2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

Test Configuration



Test Procedure

This test is performed with hopping off.

The Spectrum Analyzer is set to (7.8.4 in ANSI 63.10-2013& Procedure 9(b) in KDB 558074 v05r02)

1) Span: Zero span, centered on a hopping channel
2) RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3) Sweep = as necessary to capture the entire dwell time per hopping channel
4) Detector: Peak
5) Trace: Max hold

The marker-delta function was used to determine the dwell time.

Sample Calculation

The following calculation process is not relevant to our measurement results. It is just an example.

(1) Non-AFH Mode

- DH 5 (GFSK) : 2.890 x (1600/6)/79 x 31.6 = 308.27 (ms)
- 2-DH 5 (π/4DQPSK) : 2.890 x (1600/6)/79 x 31.6 = 308.27 (ms)
- 3-DH 5 (8DPSK) : 2.890 x (1600/6)/79 x 31.6 = 308.27 (ms)

(2) AFH Mode

- DH 5 (GFSK) : 2.890 x (800/6)/20 x 8.0 = 154.13 (ms)
- 2-DH 5 (π/4DQPSK) : 2.890 x (800/6)/20 x 8.0 = 154.13 (ms)
- 3-DH 5 (8DPSK) : 2.890 x (800/6)/20 x 8.0 = 154.13 (ms)

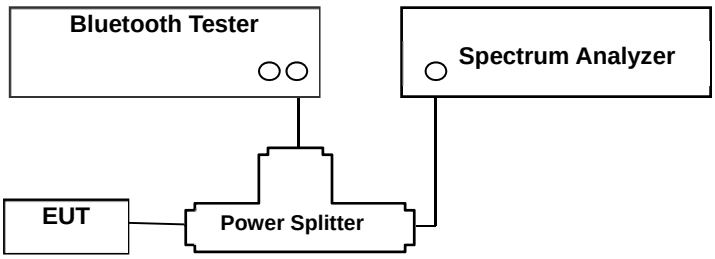
Note :
DH5 Packet need 5 time slot for transmitting and 1 time slot for receiving.
Then the system makes worst case 1600/6 hops per second with 79 channels. So the system have each channel 3.3755 times per second and so for 31.6 seconds the system have 106.667 times of appearance.
Each tx-time per appearance of DH5 is 2.890 ms.
Dwell time = Tx-time x 106.667 = 308.27 (ms)

8.6. Conducted Spurious Emissions

Limit

Conducted > 20 dBc

Test Configuration



Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer.
The Spectrum Analyzer is set to (7.8.8 in ANSI 63.10-2013& Procedure 8.5 and 8.6 in KDB 558074 v05r02)

1) Span:30 MHz to 10 times the operating frequency in GHz.
2) RBW: 100 kHz
3) VBW: 300 kHz
4) Sweep: Coupled
5) Detector: Peak

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.
This test is performed with hopping off.

Factors for frequency

Freq(MHz)	ANT.1 Factor(dB)	ANT.2 Factor(dB)
30	16.41	16.41
100	16.49	16.49
200	16.57	16.57
300	16.70	16.70
400	16.76	16.76
500	16.78	16.78
600	16.78	16.78
700	16.82	16.82
800	16.86	16.86
900	17.09	17.09
1000	16.93	16.93
2000	17.04	17.04
2400	17.28	17.28
2500	17.28	17.28
3000	17.41	17.41
4000	17.59	17.59
5000	17.79	17.79
6000	17.79	17.79
7000	17.90	17.90
8000	17.89	17.89
9000	18.08	18.08
10000	18.20	18.20
11000	18.33	18.33
12000	18.47	18.47
13000	17.84	17.84
14000	18.67	18.67
15000	18.79	18.79
16000	18.89	18.89
17000	18.99	18.99
18000	16.01	16.01
19000	19.00	19.00
20000	19.05	19.05
21000	19.08	19.08
22000	19.15	19.15
23000	19.31	19.31
24000	19.32	19.32
25000	19.34	19.34
26000	19.40	19.40

Note :

1. 2400 ~ 2500 MHz is fundamental frequency range.

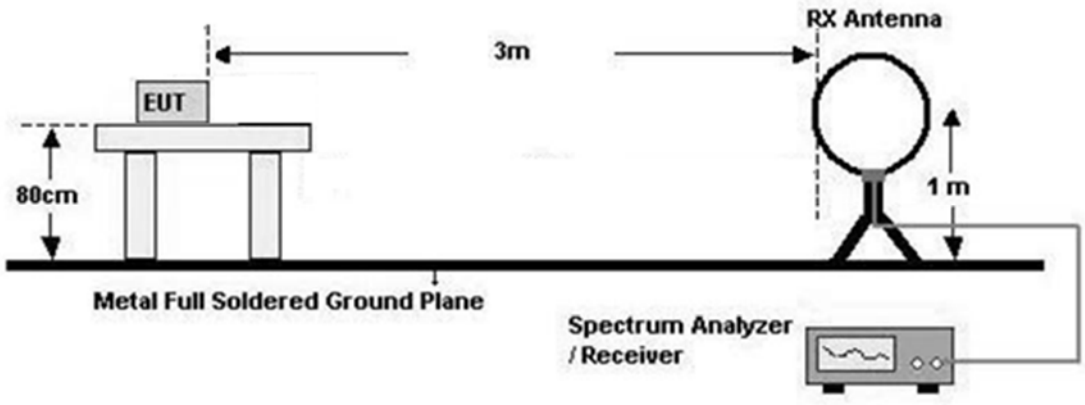
8.7. Radiated Test

Limit

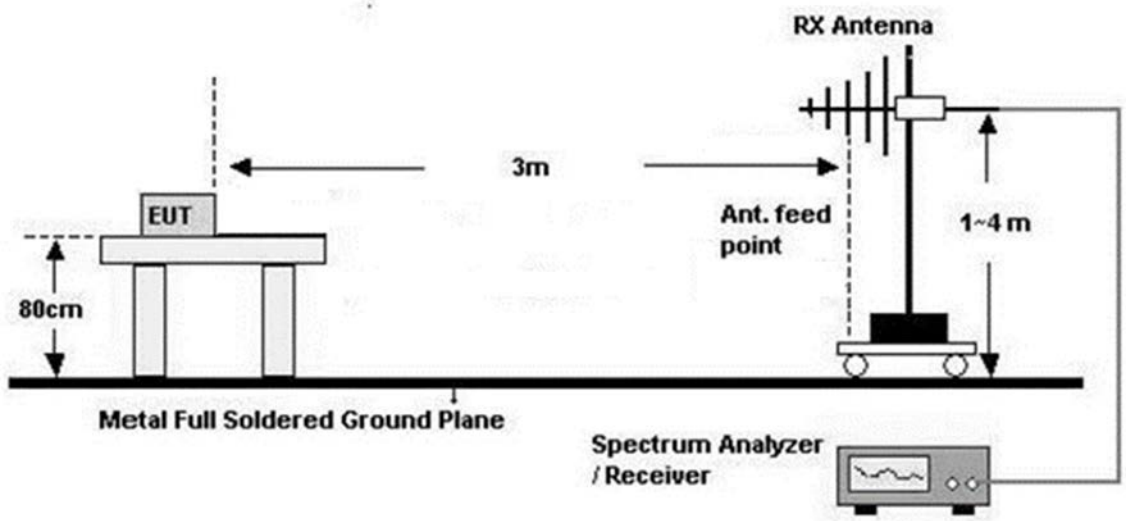
Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

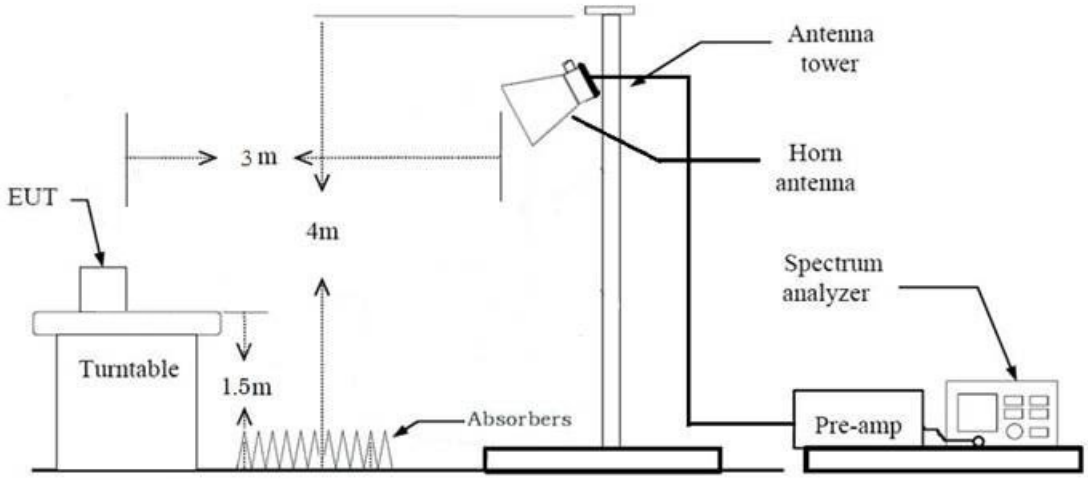
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



Test Procedure of Radiated spurious emissions(Below30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) =40log(3 m/300 m)= - 80 dB
   Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) =40log(3 m/30 m)= - 40 dB

Measurement Distance : 3 m

8. Spectrum Setting

- Frequency Range = 9 kHz ~ 30 MHz
- Detector = Peak
- Trace = Max hold
- RBW = 9 kHz
- VBW ≥ 3 x RBW

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

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

KDB 414788 OFS and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.
OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

Test Procedure of Radiated spurious emissions(Below 1 GHz)

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

(1) Measurement Type(Peak):

- Measured Frequency Range : 30 MHz – 1 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 100 kHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Quasi-peak):

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

※In general, (1) is used mainly

7. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L)

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

Test Procedure of Radiated spurious emissions (Above 1 GHz)

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

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Average):

- Average value of pulsed emissions
- Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determine from the peak field strength after correcting for the worst-case duty cycle as described in Number.14 (On Page. 23)

◆ Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

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.
11. Distance extrapolation factor = 20log (test distance / specific distance) (dB)
12. Total(Measurement Type : Peak)

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

Total(Measurement Type : Average)

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

13. Duty Cycle Correction Factor (79 channel hopping)
    a. Time to cycle through all channels= t= [ms] x 79 channels = 229.100 ms, where = pulse width
    b. 100 ms/ Δt [ms] = H → Round up to next highest integer, H ' =1
    c. Worst Case Dwell Time = [ms] x H ' = 2.9 ms
    d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB
14. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
    a. Time to cycle through all channels= t= [ms] x 20 channels = 58.00 ms, where = pulse width
    b. 100 ms/ Δt [ms] = H → Round up to next highest integer, H ' = 2
    c. Worst Case Dwell Time = [ms] x H ' = 5.800 ms
    d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

Test Procedure of Radiated Restricted Band Edge

1. Radiated test is performed with hopping off.
2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
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):
      - Detector = Peak
      - Trace = Max hold
      - RBW = 1 MHz
      - VBW ≥ 3 x RBW
   (2) Measurement Type(Average):
      - Average value of pulsed emissions
      - Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission and pulsed operation is employed, the average measurement shall determine from the peak field strength after correcting for the worst-case duty cycle as described in Number.14 (On Page. 23)
   ◆ Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB
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

(1)Measurement(Peak)

= Measured Value(Peak)

(2)Measurement(Avg)

= Measured Value(Peak) + D.C.C.F(AFH)

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

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

12. Duty Cycle Correction Factor (79 channel hopping)

a. Time to cycle through all channels= t= [ms] x 79 channels = 229.100 ms, where = pulse width

b. 100 ms/ Δt [ms] = H → Round up to next highest integer, H ' =1

c. Worst Case Dwell Time = [ms] x H ' = 2.9 ms

d. Duty Cycle Correction = 20log (Worst Case Dwell Time/ 100ms) dB = -30.752 dB

13. Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)

a. Time to cycle through all channels= t= [ms] x 20 channels = 58.00 ms, where = pulse width

b. 100 ms/ Δt [ms] = H → Round up to next highest integer, H ' = 2

c. Worst Case Dwell Time = [ms] x H ' = 5.800 ms

d. Duty Cycle Correction(AFH) = 20log (Worst Case Dwell Time/ 100ms) dB = -24.7314 dB

8.8. 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.
5. The EUT is the device operating below 30MHz.
   - For unterminated the Antenna, the AC line conducted tests are performed with the antenna connected
   - For terminated the Antenna, the AC line conducted tests are performed with a dummy load connected to the EUT antenna output terminal.

Sample Calculation

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

8.9. Worst case configuration and mode

Radiated test

1. All modes of operation were investigated and the worst case configuration results are reported.
   - Mode : Stand alone, Stand alone + External accessories(Earphone etc)
   - Worstcase : Stand alone
2. EUT Axis
   (1) Ant.1
      - Radiated Spurious Emissions : X-V
      - Radiated Restricted Band Edge : X-H
   (2) Ant.2
      - Radiated Spurious Emissions : X-V
      - Radiated Restricted Band Edge : Y-H
   (3) Dual Ant.1+ Ant.2
      - Radiated Spurious Emissions : Z-H
      - Radiated Restricted Band Edge : X-H
3. All data rate of operation were investigated and the test results are worst case in highest datarate of each mode.
   - GFSK : DH5
   - π/4DQPSK : 2-DH5
   - 8DPSK : 3-DH5
4. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
   - Position : Horizontal, Vertical, Parallel to the ground plane
5. SM-S931U, SM-S931U1 were tested and the worst case results are reported.

(Worst case : SM-S931U)

6. Radiated Spurious Emission
   - All mode of operation were investigated and the worst case results are reported.
   - GFSK : DH5
   - π/4DQPSK : 2-DH5
   - 8DPSK : 3-DH5

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, Keyboard, etc)
   - Worstcase : Stand alone
2. EUT Axis
   - Radiated Spurious Emissions : Z
3. All of RSDB Scenario were investigated and the worst case configuration results are reported.

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

4. The RSDB mode test investigated both intermodulation and radiated spurious emissions.
   And the worst results were reported.
   - Worst result: Radiated spurious emissions
   - Intermodulation: No signals are generated.
   - Radiated spurious emissions: cf. Section 10.6.2.

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

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

RSDB Scenario 1	Description	Bluetooth Emission	5 GHz Emission
Dual Bluetooth + 5 GHz WiFi MIMO	Antenna	Dual ANT	Ant All
	Channel	39	48
	Data Rate	1 Mbps	6 Mbps
	Mode	GFSK	802.11a

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

RSDB Scenario 3	Description	Bluetooth Emission	2.4GHz Emission	5 GHz Emission
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO	Antenna	ANT1	ANT2	Ant All
	Channel	0	11	48
	Data Rate	1 Mbps	1 Mbps	6 Mbps
	Mode	GFSK	802.11b	802.11a

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

6. SM-S931U, SM-S931U1 were tested and the worst case results are reported.

(Worst case : SM-S931U)

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-S931U, SM-S931U1 were tested and the worst case results are reported.

(Worst case : SM-S931U)

Conducted test

1. The EUT was configured with data rate of highest power.
   - GFSK : DH5
   - π/4DQPSK : 2-DH5
   - 8DPSK : 3-DH5
2. AFH & Non-AFH were tested and the worst case results are reported.

   (Worst case : Non-AFH)
3. SM-S931U, SM-S931U1 were tested and the worst case results are reported.

(Worst case : SM-S931U)

9. SUMMARY OF TEST RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
20 dB Bandwidth	§ 15.247(a)(1)	N/A	Conducted	PASS
Occupied Bandwidth	N/A	N/A		N/A
Conducted Maximum Peak Output Power	§ 15.247(b)(1)	<0.125 W		PASS
Carrier Frequency Separation	§ 15.247(a)(1)	>25 kHz or >2/3 of the 20 dB BW		PASS
Number of Hopping Frequencies	§ 15.247(a)(1)(iii)	≥ 15		PASS
Time of Occupancy	§ 15.247(a)(1)(iii)	<400 ms		PASS
Conducted Spurious Emissions	§ 15.247(d)	> 20 dB for all out-of band emissions		PASS
Band Edge (Out of Band Emissions)	§ 15.247(d)	> 20 dB for all out-of band emissions		PASS
AC Power line Conducted Emissions	§ 15.207(a)	cf. Section 8.8		PASS
Radiated Spurious Emissions	§ 15.247(d), 15.205, 15.209	cf. Section 8.7	Radiated	PASS
Radiated Restricted Band Edge	§ 15.247(d), 15.205, 15.209	cf. Section 8.7		PASS

Note: Average Power data refer to SAR report

10. TEST RESULT

10.1 PEAK POWER

[Ant.1]

Channel	Frequency (MHz)	Output Power (GFSK)		Limit (mW)
		(dBm)	(mW)	
Ch. 0	2402	17.866	61.18	125
Ch. 39	2441	18.450	69.98	
Ch. 78	2480	17.904	61.72	

Channel	Frequency (MHz)	Output Power (8DPSK)		Limit (mW)
		(dBm)	(mW)	
Ch. 0	2402	16.663	46.38	125
Ch. 39	2441	17.463	55.76	
Ch. 78	2480	16.942	49.45	

Channel	Frequency (MHz)	Output Power (π/4DQPSK)		Limit (mW)
		(dBm)	(mW)	
Ch. 0	2402	16.109	40.82	125
Ch. 39	2441	16.819	48.07	
Ch. 78	2480	16.442	44.08	

[Ant.2]

Channel	Frequency (MHz)	Output Power (GFSK)		Limit (mW)
		(dBm)	(mW)	
Ch. 0	2402	18.417	69.45	125
Ch. 39	2441	19.084	80.98	
Ch. 78	2480	18.528	71.25	

Channel	Frequency (MHz)	Output Power (8DPSK)		Limit (mW)
		(dBm)	(mW)	
Ch. 0	2402	16.781	47.65	125
Ch. 39	2441	17.827	60.63	
Ch. 78	2480	16.835	48.25	

Channel	Frequency (MHz)	Output Power (π/4DQPSK)		Limit (mW)
		(dBm)	(mW)	
Ch. 0	2402	16.261	42.28	125
Ch. 39	2441	17.289	53.57	
Ch. 78	2480	16.762	47.45	

[Dual Ant.1 + Ant. 2]

Channel	Frequency (MHz)	Output Power (GFSK)						Limit (mW)
		Dual Ant.1		Dual Ant.2		Dual(Ant.1 + Ant.2)		
		(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)	
Ch. 0	2402	12.753	18.85	12.761	18.88	15.767	37.73	125
Ch. 39	2441	12.707	18.65	12.696	18.60	15.712	37.25	
Ch. 78	2480	12.606	18.22	11.929	15.59	15.291	33.81	

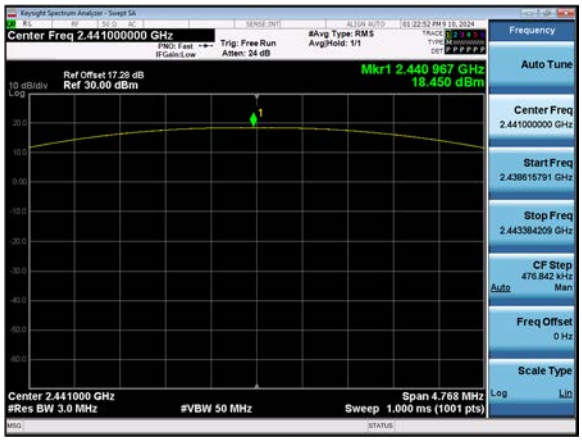
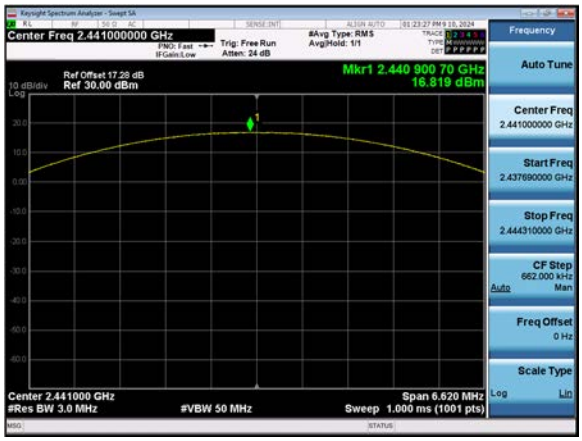
Channel	Frequency (MHz)	Output Power (8DPSK)						Limit (mW)
		Dual Ant.1		Dual Ant.2		Dual(Ant.1 + Ant.2)		
		(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)	
Ch. 0	2402	11.528	14.22	10.857	12.18	14.216	26.40	125
Ch. 39	2441	11.839	15.27	10.901	12.31	14.406	27.58	
Ch. 78	2480	11.096	12.87	9.894	9.76	13.547	22.63	

Channel	Frequency (MHz)	Output Power (π /4DQPSK)						Limit (mW)
		Dual Ant.1		Dual Ant.2		Dual(Ant.1 + Ant.2)		
		(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)	
Ch. 0	2402	11.279	13.42	10.453	11.10	13.896	24.52	125
Ch. 39	2441	11.492	14.10	10.580	11.43	14.070	25.53	
Ch. 78	2480	10.695	11.74	9.783	9.51	13.273	21.25	

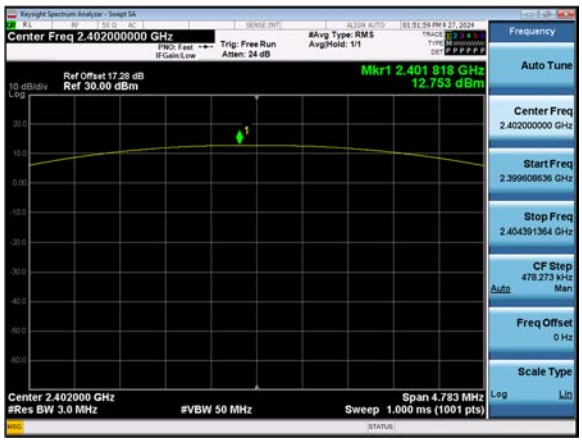
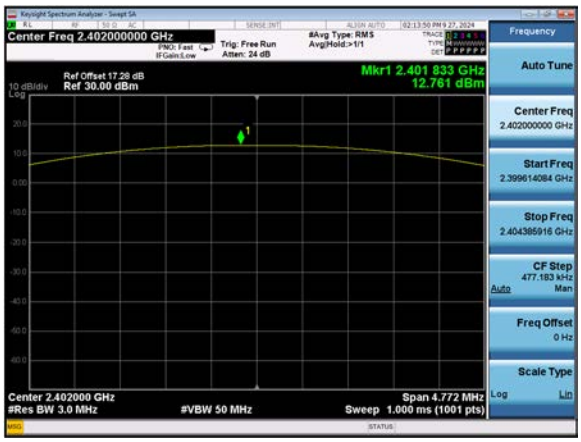
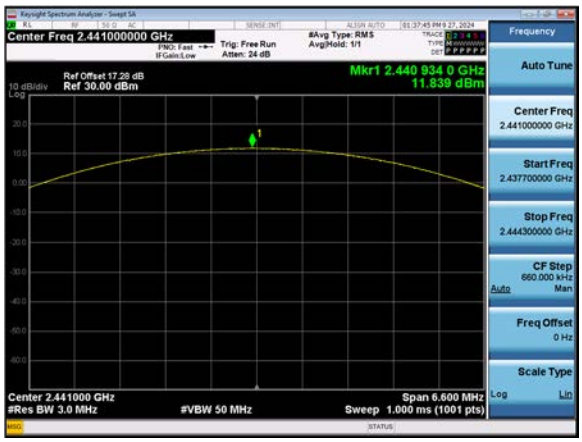
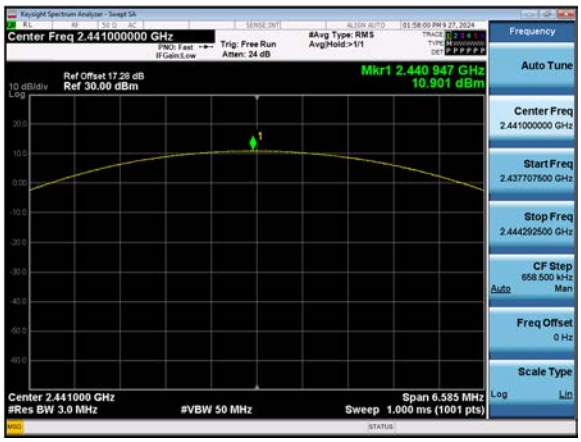
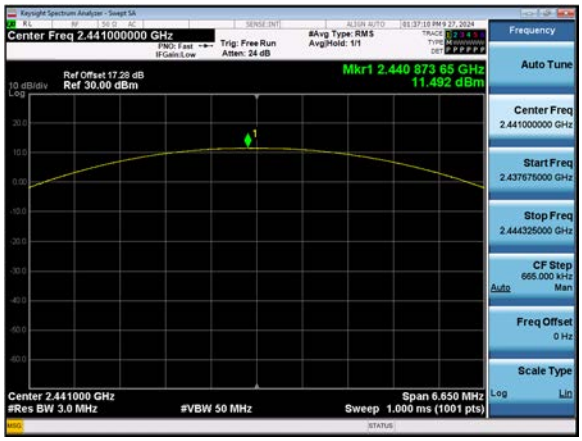
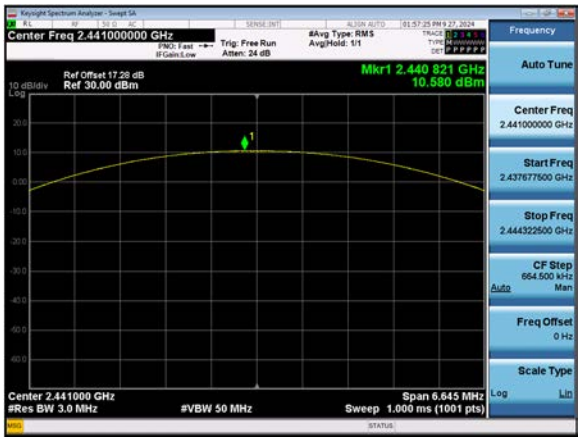
▣ TEST PLOTS(Peak Power)

Note :

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

ANT.1 GFSK : Peak Power (Ch. 39)	ANT.2 GFSK : Peak Power (Ch. 39)
	
ANT.1 8DPSK : Peak Power (Ch. 39)	ANT.2 8DPSK : Peak Power (Ch. 39)
	
ANT.1 π /4DQPSK : Peak Power (Ch. 39)	ANT.2 π /4DQPSK : Peak Power (Ch. 39)
	

[Dual ANT]

Dual ANT.1 GFSK : Peak Power (Ch. 0)	Dual ANT.2 GFSK : Peak Power (Ch. 0)
	
Dual ANT.1 8DPSK : Peak Power (Ch. 39)	Dual ANT.2 8DPSK : Peak Power (Ch. 39)
	
Dual ANT.1 π /4DQPSK : Peak Power (Ch. 39)	Dual ANT.2 π /4DQPSK : Peak Power (Ch. 39)
	

10.2 BAND EDGES

[Ant. 1]

Without hopping

Outside Frequency Band	GFSK (dB)	8DPSK (dB)	π /4DQPSK (dB)	Limit (dBc)
Lower	58.733	52.289	52.163	20
Upper	64.519	61.214	60.831	

With hopping

Outside Frequency Band	GFSK (dB)	8DPSK (dB)	π /4DQPSK (dB)	Limit (dBc)
Lower	59.548	52.782	52.339	20
Upper	64.791	60.656	60.763	

[Ant. 2]

Without hopping

Outside Frequency Band	GFSK (dB)	8DPSK (dB)	π /4DQPSK (dB)	Limit (dBc)
Lower	55.752	56.443	56.102	20
Upper	64.397	60.749	61.276	

With hopping

Outside Frequency Band	GFSK (dB)	8DPSK (dB)	/4DQPSK (dB)	Limit (dBc)
Lower	56.548	56.490	56.801	20
Upper	64.161	61.005	61.024	

[Dual Ant. 1]

Without hopping

Outside Frequency Band	GFSK (dB)	8DPSK (dB)	π /4DQPSK (dB)	Limit (dBc)
Lower	57.271	55.702	55.587	20
Upper	58.046	55.771	55.124	

With hopping

Outside Frequency Band	GFSK (dB)	8DPSK (dB)	π /4DQPSK (dB)	Limit (dBc)
Lower	57.979	57.448	55.976	20
Upper	59.326	56.268	55.463	

[Dual Ant. 2]

Without hopping

Outside Frequency Band	GFSK (dB)	8DPSK (dB)	π /4DQPSK (dB)	Limit (dBc)
Lower	59.040	44.764	44.903	20
Upper	59.048	55.182	55.351	

With hopping

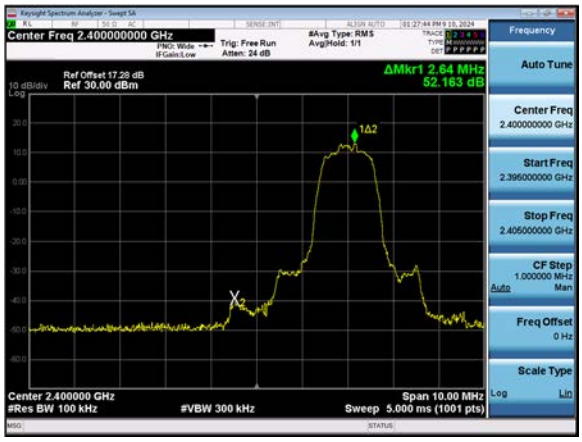
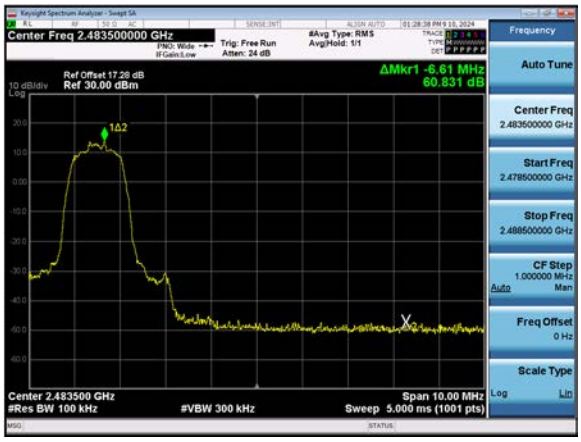
Outside Frequency Band	GFSK (dB)	8DPSK (dB)	π /4DQPSK (dB)	Limit (dBc)
Lower	59.192	49.488	50.153	20
Upper	59.226	56.065	56.023	

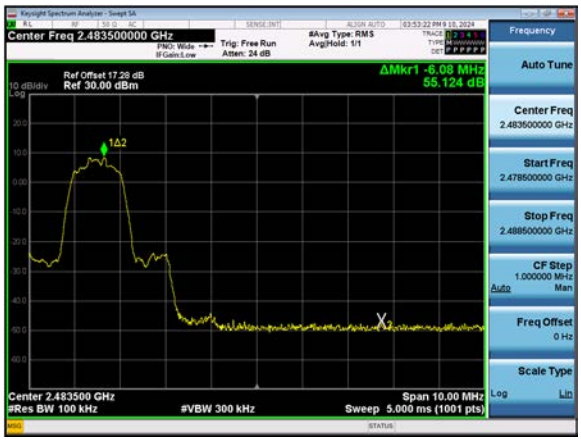
▣ TEST PLOTS(BAND EDGES)

Note :

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

-Without hopping

ANT.1 π /4DQPSKBand Edge(Ch. 0)	ANT.1 π /4DQPSKBand Edge(Ch. 78)
	
ANT.2 GFSKBand Edge(Ch. 0)	ANT.2 8DPSKBand Edge(Ch. 78)
	

Dual ANT.1 π /4DQPSKBand Edge(Ch. 0)	Dual ANT.1 π/4DQPSKBand Edge(Ch. 78)
	
Dual ANT.2 8DPSKBand Edge(Ch. 0)	Dual ANT.2 8DPSKBand Edge(Ch. 78)
	

-With hopping

ANT.1 π/4DQPSKBand Edge(Ch. 0)	ANT.1 8DPSKBand Edge(Ch. 78)
	
ANT.2 8DPSKBand Edge(Ch. 0)	ANT.2 8DPSKBand Edge(Ch. 78)
	

Dual ANT.1 π/4DQPSKBand Edge(Ch. 0)	Dual ANT.1 π/4DQPSKBand Edge(Ch. 78)
	
Dual ANT.2 8DPSKBand Edge(Ch. 0)	Dual ANT.2 π/4DQPSKBand Edge(Ch. 78)
	

10.3 FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (99 % BW)

[Ant.1]

99% BW (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	851.60	1182.5	1175.7
Ch. 39	850.79	1181.6	1175.6
Ch. 78	852.31	1186.5	1176.8

20dB Bandwidth (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	959.1	1314	1324
Ch. 39	953.7	1314	1324
Ch. 78	954.4	1318	1324

Channel Separation (kHz)			Limit
GFSK	8DPSK	/4DQPSK	(kHz)
998	1001	998	>25 kHz or >2/3 of the 20 dB BW

[Ant.2]

99% BW (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	855.81	1182.6	1176.5
Ch. 39	851.57	1180.9	1179.0
Ch. 78	859.10	1184.3	1177.4

20dB Bandwidth (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	956.9	1313	1325
Ch. 39	959.3	1313	1324
Ch. 78	960.3	1312	1325

Channel Separation (kHz)			Limit (kHz)
GFSK	8DPSK	π /4DQPSK	
998	998	998	>25 kHz or >2/3 of the 20 dB BW

[Dual Ant.1]

99% BW (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	855.24	1193.9	1183.5
Ch. 39	856.49	1195.9	1185.7
Ch. 78	859.87	1206.4	1193.1

20dB Bandwidth (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	956.5	1328	1330
Ch. 39	958.5	1320	1330
Ch. 78	960.1	1325	1324

Channel Separation (kHz)			Limit (kHz)
GFSK	8DPSK	π /4DQPSK	
1001	994	998	>25 kHz or >2/3 of the 20 dB BW

[Dual Ant.2]

99% BW (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	856.54	1202.0	1187.8
Ch. 39	857.74	1194.5	1182.5
Ch. 78	853.10	1193.5	1185.6

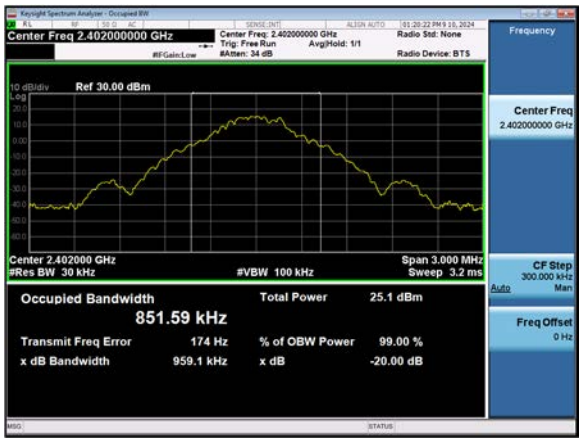
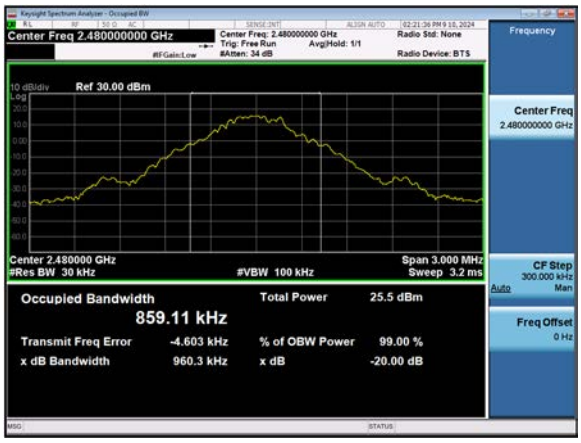
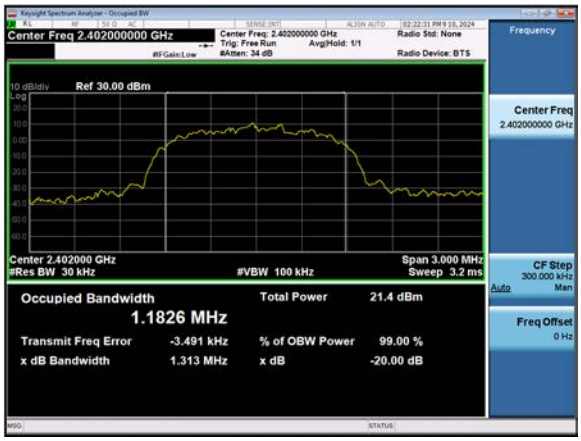
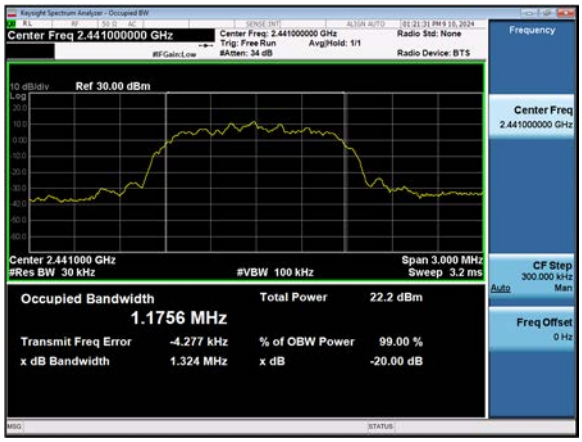
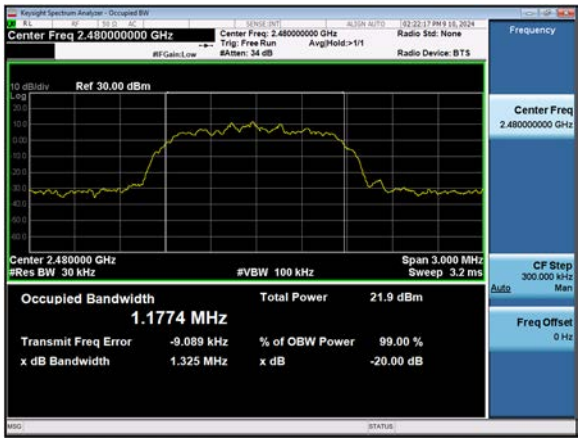
20dB Bandwidth (kHz)			
Channel	GFSK	8DPSK	π /4DQPSK
Ch. 0	954.4	1318	1340
Ch. 39	956.9	1317	1329
Ch. 78	957.4	1314	1330

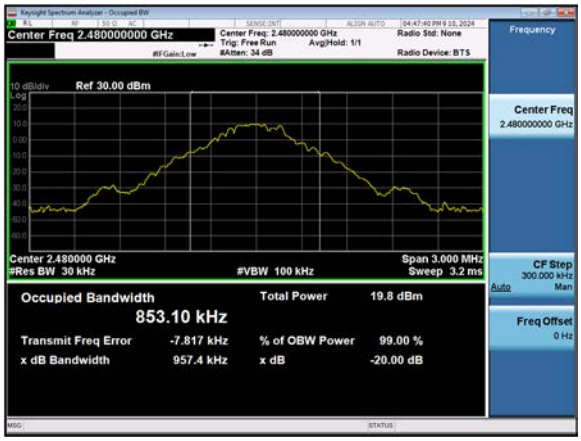
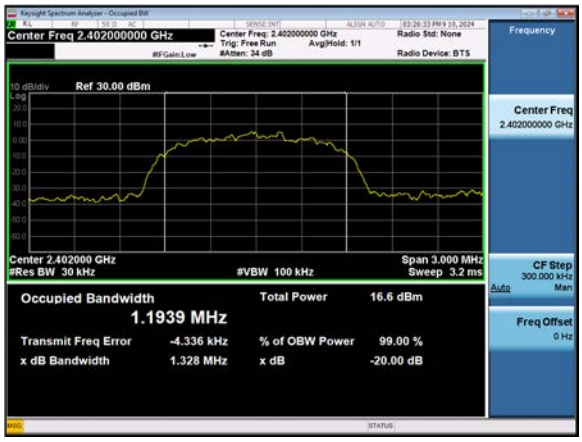
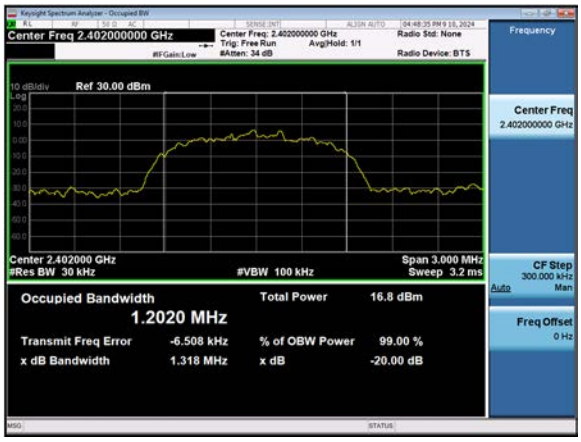
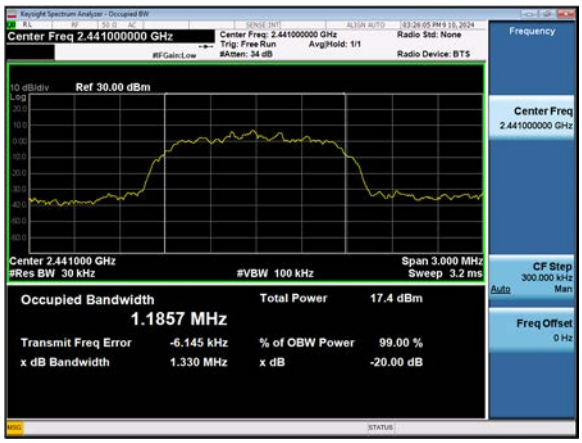
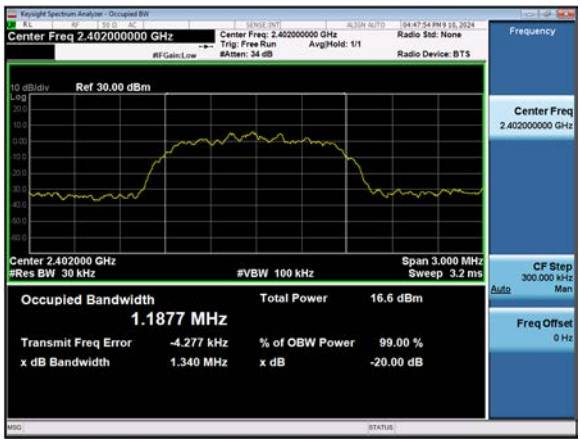
Channel Separation (kHz)			Limit
GFSK	8DPSK	/4DQPSK	(kHz)
998	998	1001	>25 kHz or >2/3 of the 20 dB BW

▣ TEST PLOTS(20 dB Bandwidth & 99% Bandwidth)

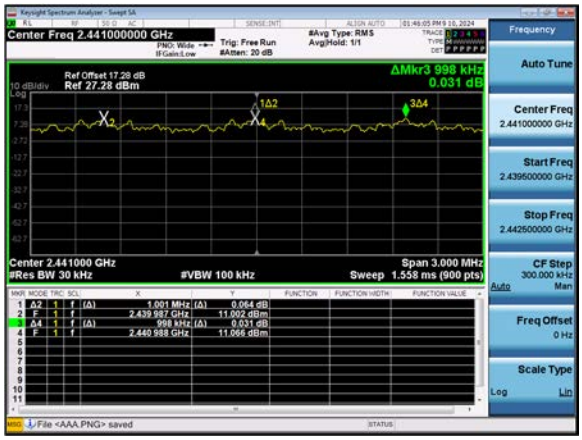
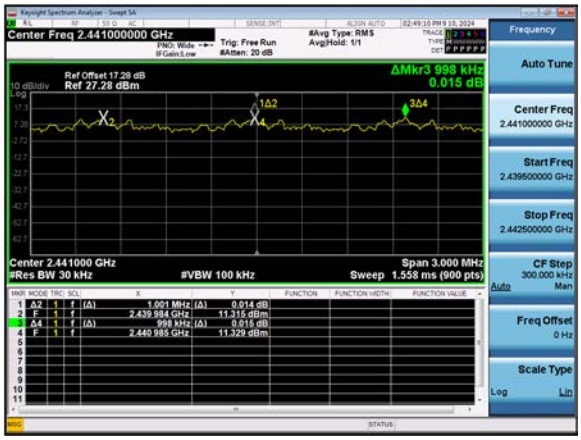
Note:

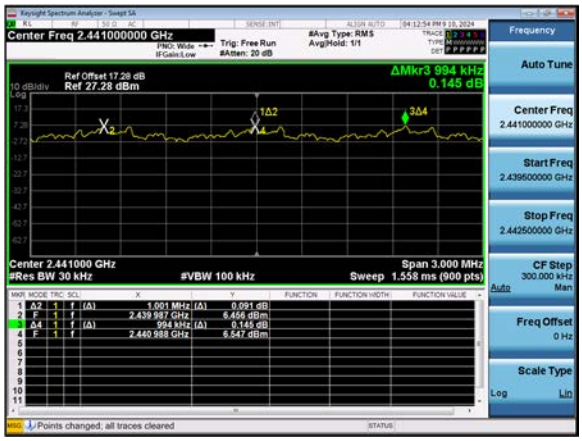
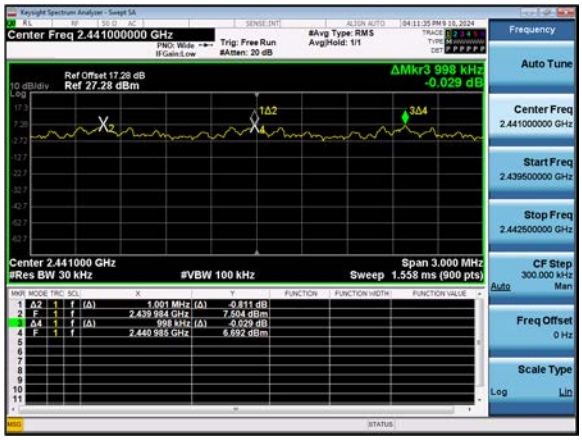
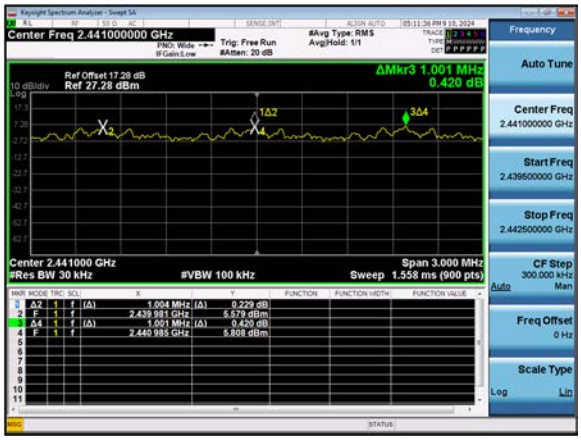
In order to simplify the report, attached plots were only the widest 20 dB BW channel.

ANT. 1 GFSK 20 dB BW & 99% OBW (Ch. 0)	ANT. 2 GFSK 20 dB BW & 99% OBW (Ch. 78)
	
ANT. 1 8DPSK 20 dB BW & 99% OBW (Ch. 78)	ANT. 2 8DPSK 20 dB BW & 99% OBW (Ch. 0)
	
ANT. 1 π /4DQPSK 20 dB BW & 99% OBW (Ch. 39)	ANT. 2 π /4DQPSK 20 dB BW & 99% OBW (Ch. 78)
	

Dual ANT. 1 GFSK 20 dB BW & 99% OBW (Ch. 78)	Dual ANT. 2 GFSK 20 dB BW & 99% OBW (Ch. 78)
	
Dual ANT. 1 8DPSK 20 dB BW & 99% OBW (Ch. 0)	Dual ANT. 2 8DPSK 20 dB BW & 99% OBW (Ch. 0)
	
Dual ANT. 1 π /4DQPSK 20 dB BW & 99% OBW (Ch. 39)	Dual ANT. 2 π /4DQPSK 20 dB BW & 99% OBW (Ch. 0)
	

▣ TEST PLOTS(Channel Separation)

ANT. 1 GFSK : Channel Separation	ANT. 2 GFSK : Channel Separation
	
ANT. 1 8DPSK : Channel Separation	ANT. 2 8DPSK : Channel Separation
	
ANT. 1 π /4DQPSK : Channel Separation	ANT. 2 π /4DQPSK : Channel Separation
	

Dual ANT. 1 GFSK : Channel Separation	Dual ANT. 2 GFSK : Channel Separation
	
Dual ANT. 1 8DPSK : Channel Separation	Dual ANT. 2 8DPSK : Channel Separation
	
Dual ANT. 1 π /4DQPSK : Channel Separation	Dual ANT. 2 π /4DQPSK : Channel Separation
	

10.4 NUMBER OF HOPPING FREQUENCY

[Ant.1]

Result (No. of CH)			Limit
GFSK	8DPSK	π/4DQPSK	
79	79	79	>15

[Ant.2]

Result (No. of CH)			Limit
GFSK	8DPSK	π/4DQPSK	
79	79	79	>15

[Dual Ant.1]

Result (No. of CH)			Limit
GFSK	8DPSK	π/4DQPSK	
79	79	79	>15

[Dual Ant.2]

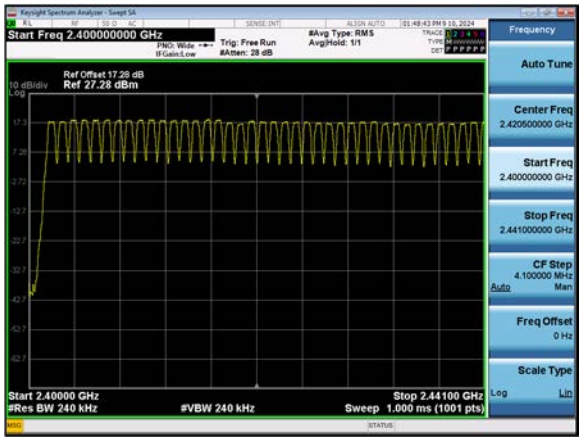
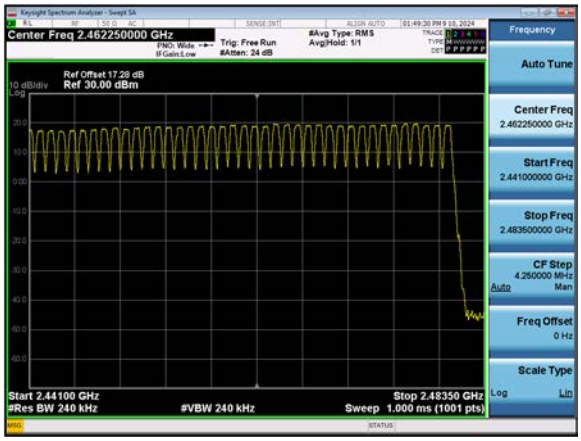
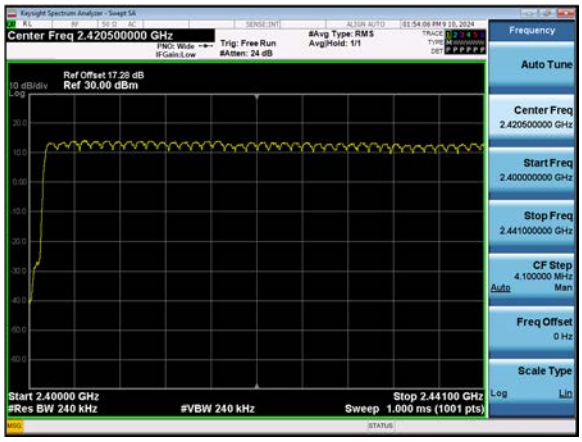
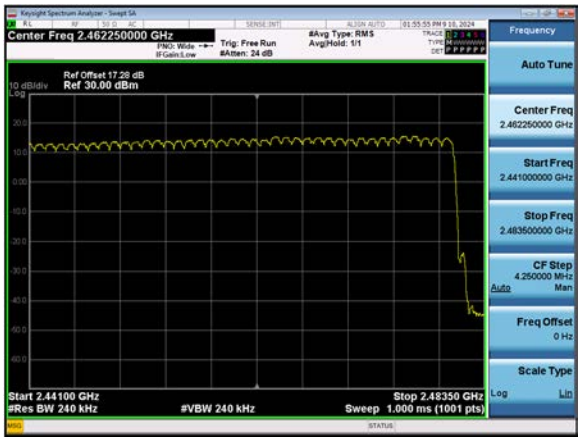
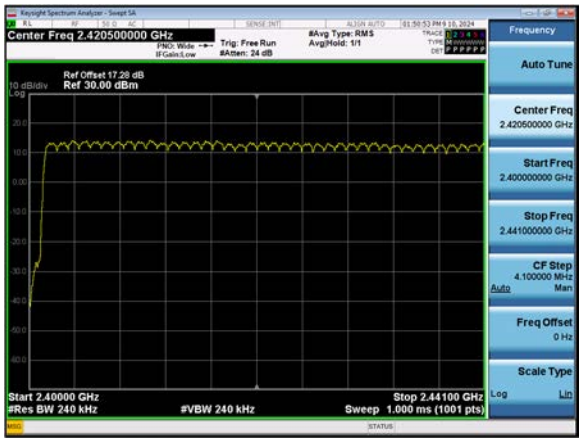
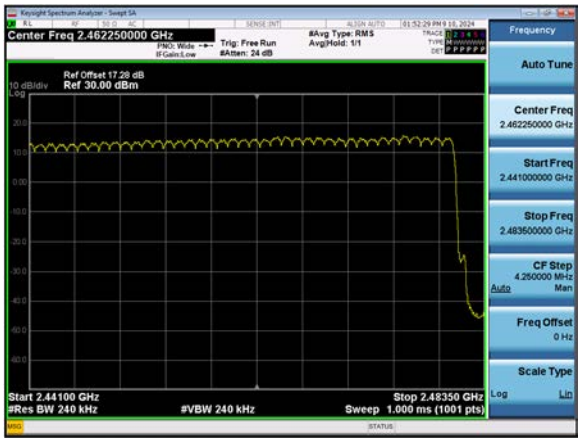
Result (No. of CH)			Limit
GFSK	8DPSK	π/4DQPSK	
79	79	79	>15

Note :

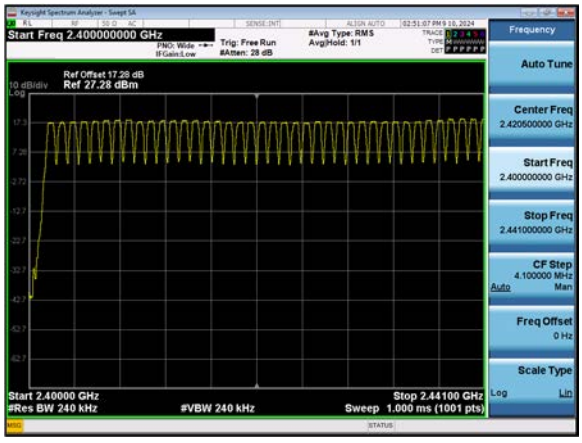
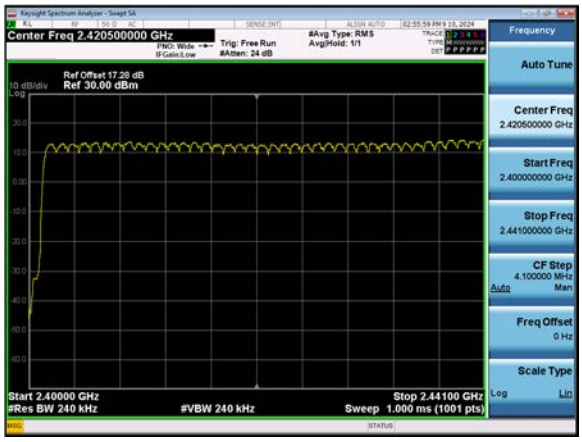
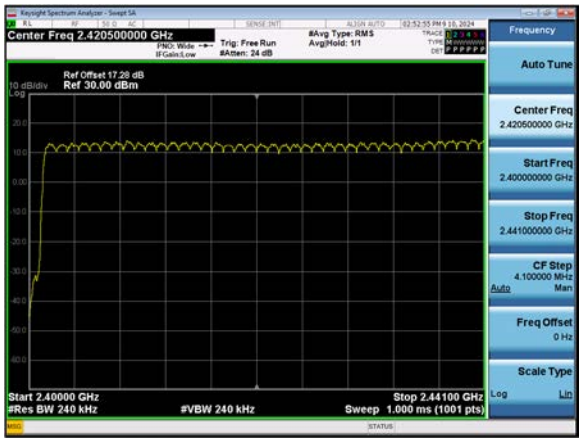
In case of AFH mode, minimum number of hopping channels is 20.

▣ TEST PLOTS(NUMBER OF HOPPING FREQUENCY)

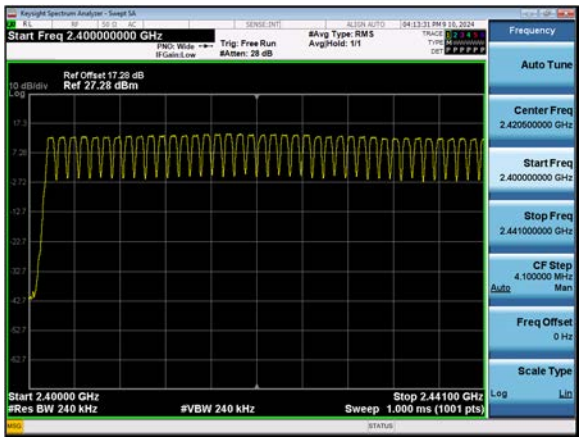
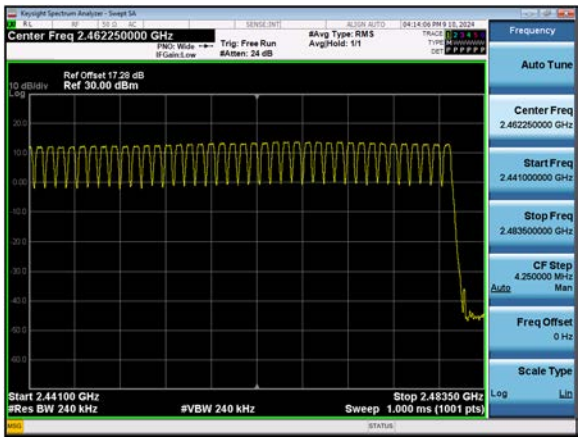
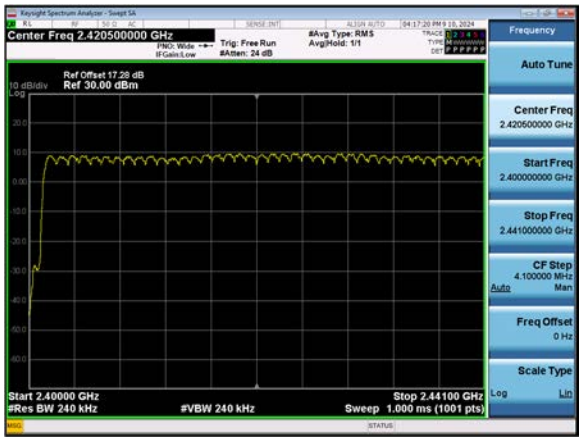
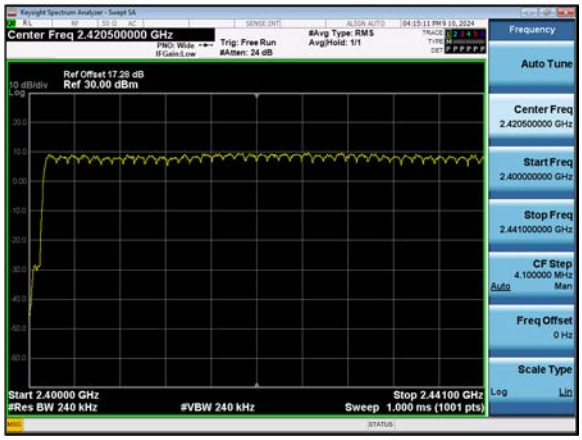
[ANT.1]

ANT.1 GFSK (2.4 GHz - 2.441 GHz)	ANT.1 GFSK (2.441 GHz - 2.483.5 GHz)
	
ANT.1 8DPSK (2.4 GHz - 2.441 GHz)	ANT.1 8DPSK (2.441 GHz - 2.483.5 GHz)
	
ANT.1 π/4DQPSK (2.4 GHz - 2.441 GHz)	ANT.1 π/4DQPSK (2.441 GHz - 2.483.5 GHz)
	

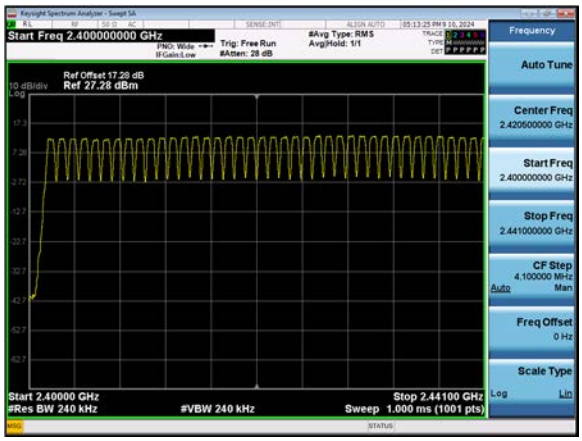
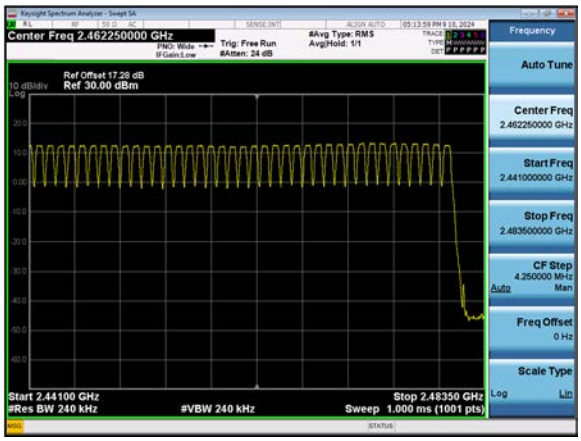
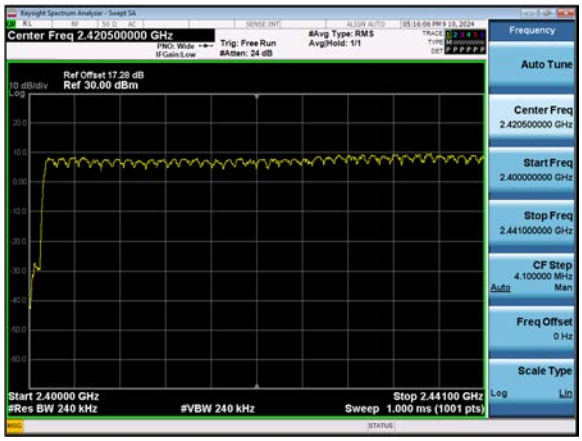
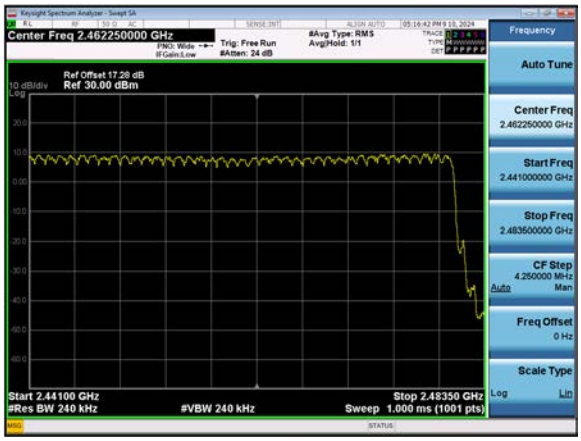
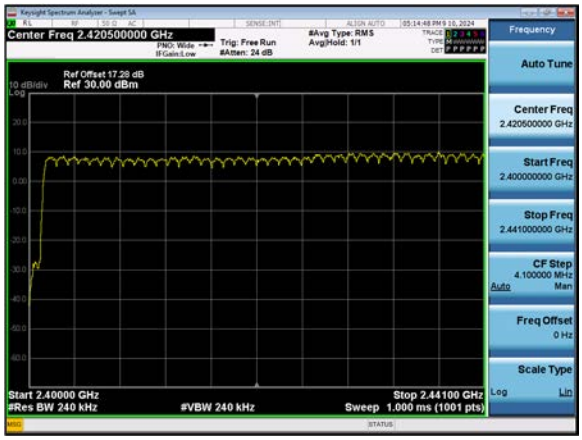
[ANT.2]

ANT.2 GFSK (2.4 GHz - 2.441 GHz)	ANT.2 GFSK (2.441 GHz - 2.483.5 GHz)
	
ANT.2 8DPSK (2.4 GHz - 2.441 GHz)	ANT.2 8DPSK (2.441 GHz - 2.483.5 GHz)
	
ANT.2 π/4DQPSK (2.4 GHz - 2.441 GHz)	ANT.2 π/4DQPSK (2.441 GHz - 2.483.5 GHz)
	

[Dual ANT.1]

Dual ANT.1 GFSK (2.4 GHz - 2.441 GHz)	Dual ANT.1 GFSK (2.441 GHz - 2.483.5 GHz)
	
Dual ANT.1 8DPSK (2.4 GHz - 2.441 GHz)	Dual ANT.1 8DPSK (2.441 GHz - 2.483.5 GHz)
	
Dual ANT.1 π/4DQPSK (2.4 GHz - 2.441 GHz)	Dual ANT.1 π/4DQPSK (2.441 GHz - 2.483.5 GHz)
	

[Dual ANT.2]

Dual ANT.2 GFSK (2.4 GHz - 2.441 GHz)	Dual ANT.2 GFSK (2.441 GHz - 2.483.5 GHz)
	
Dual ANT.2 8DPSK (2.4 GHz - 2.441 GHz)	Dual ANT.2 8DPSK (2.441 GHz - 2.483.5 GHz)
	
Dual ANT.2 π/4DQPSK (2.4 GHz - 2.441 GHz)	Dual ANT.2 π/4DQPSK (2.441 GHz - 2.483.5 GHz)
	

10.5 TIME OF OCCUPANCY (DWELL TIME)

[Ant.1]

	Channel	GFSK	8DPSK	π/4DQPSK
Pulse Time (ms)	Ch. 0	2.890	2.890	2.890
	Ch. 39	2.885	2.890	2.890
	Ch. 78	2.890	2.895	2.890

Non-AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	308.27	308.27	308.27	31.6	400
	Ch. 39	307.73	308.27	308.27	31.6	
	Ch. 78	308.27	308.80	308.27	31.6	

AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	154.13	154.13	154.13	8	400
	Ch. 39	153.87	154.13	154.13	8	
	Ch. 78	154.13	154.40	154.13	8	

[Ant.2]

	Channel	GFSK	8DPSK	π/4DQPSK
Pulse Time (ms)	Ch. 0	2.890	2.890	2.890
	Ch. 39	2.890	2.890	2.885
	Ch. 78	2.890	2.890	2.890

Non-AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	308.27	308.27	308.27	31.6	400
	Ch. 39	308.27	308.27	307.73	31.6	
	Ch. 78	308.27	308.27	308.27	31.6	

AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	154.13	154.13	154.13	8	400
	Ch. 39	154.13	154.13	153.87	8	
	Ch. 78	154.13	154.13	154.13	8	

[Dual Ant.1]

	Channel	GFSK	8DPSK	π/4DQPSK
Pulse Time (ms)	Ch. 0	2.890	2.890	2.885
	Ch. 39	2.890	2.890	2.890
	Ch. 78	2.885	2.890	2.885

Non-AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	308.27	308.27	307.73	31.6	400
	Ch. 39	308.27	308.27	308.27	31.6	
	Ch. 78	307.73	308.27	307.73	31.6	

AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	154.13	154.13	153.87	8	400
	Ch. 39	154.13	154.13	154.13	8	
	Ch. 78	153.87	154.13	153.87	8	

[Dual Ant.2]

	Channel	GFSK	8DPSK	π/4DQPSK
Pulse Time (ms)	Ch. 0	2.890	2.890	2.890
	Ch. 39	2.890	2.895	2.885
	Ch. 78	2.890	2.890	2.890

Non-AFH Mode

	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	308.27	308.27	308.27	31.6	400
	Ch. 39	308.27	308.80	307.73	31.6	
	Ch. 78	308.27	308.27	308.27	31.6	

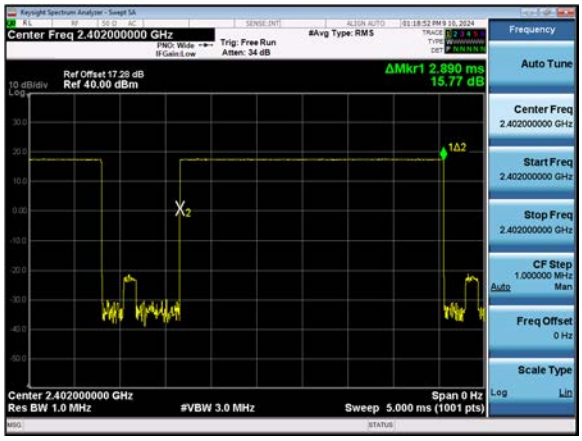
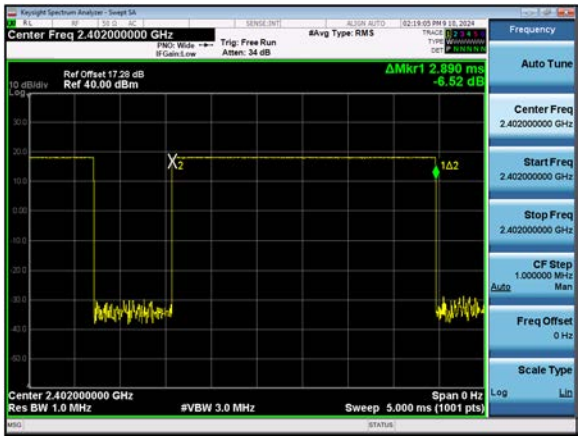
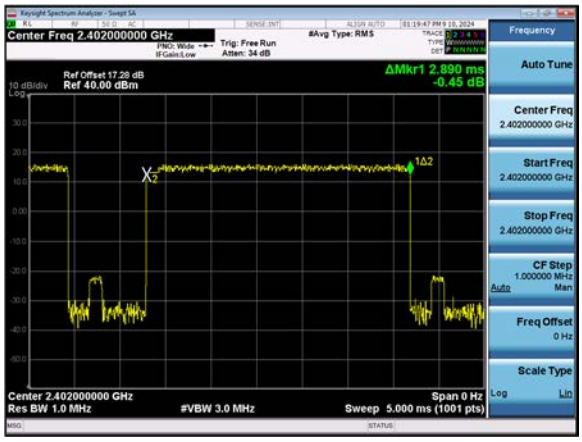
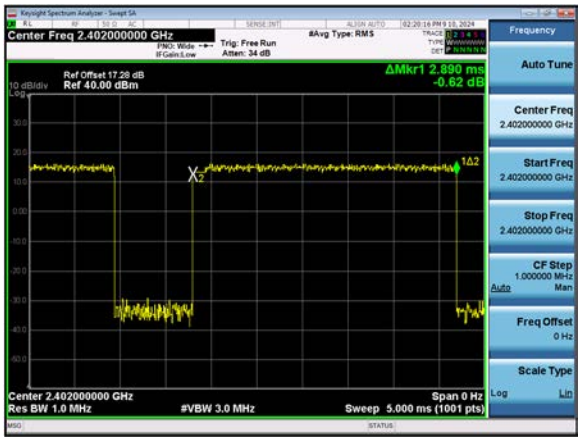
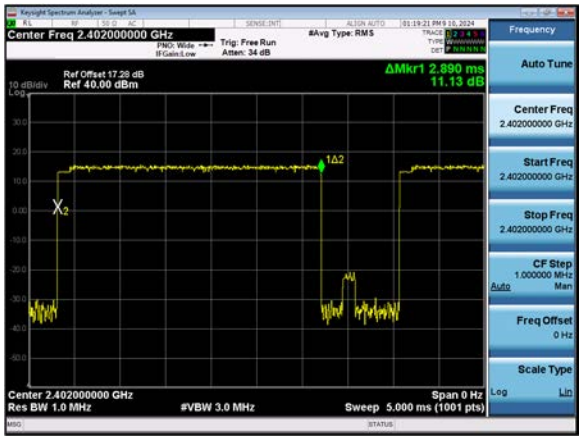
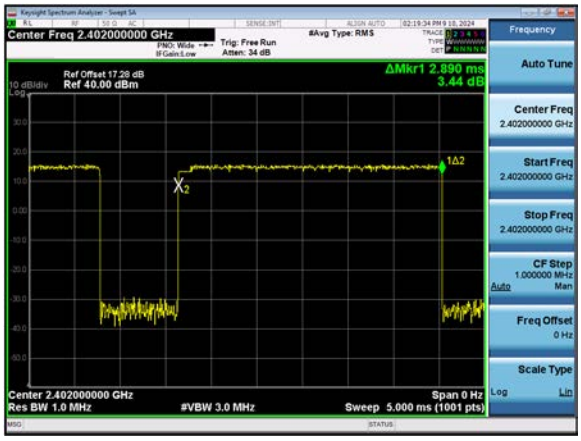
AFH Mode

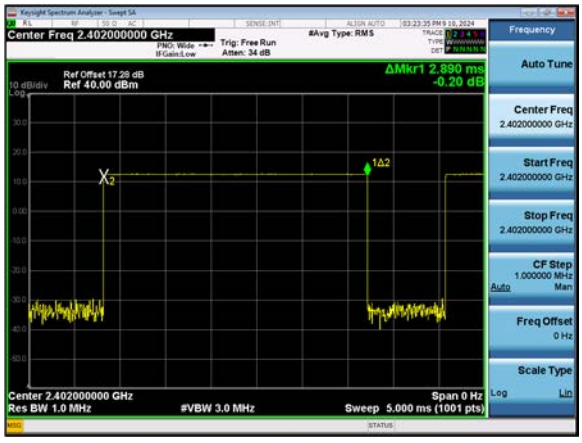
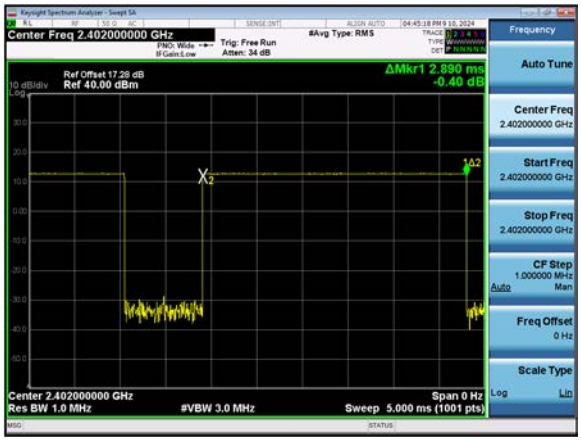
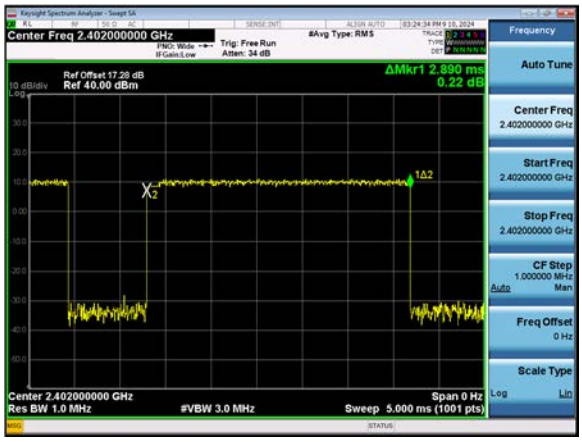
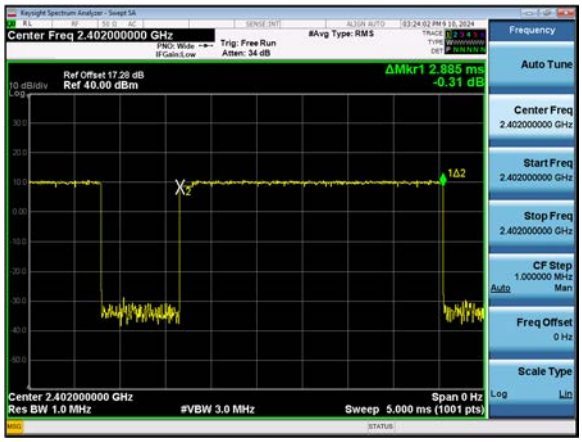
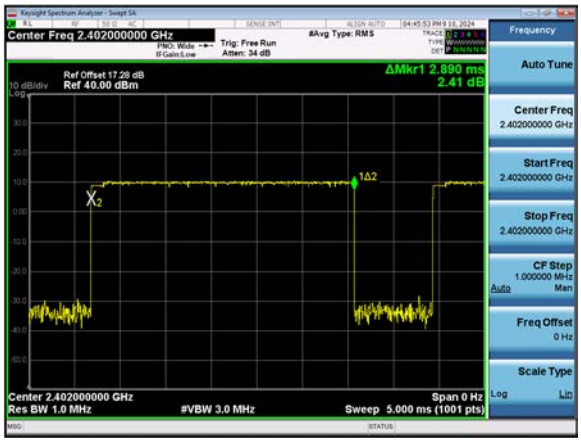
	Channel	GFSK	8DPSK	π/4DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Ch. 0	154.13	154.13	154.13	8	400
	Ch. 39	154.13	154.40	153.87	8	
	Ch. 78	154.13	154.13	154.13	8	

▣ TEST PLOTS(Dwell Time)

Note:

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

ANT.1 GFSK : Dwell Time(Ch. 0)	ANT.2 GFSK : Dwell Time(Ch. 0)
	
ANT.1 8DPSK : Dwell Time(Ch. 0)	ANT.2 8DPSK : Dwell Time(Ch. 0)
	
ANT.1 π/4DQPSK : Dwell Time(Ch. 0)	ANT.2 π/4DQPSK : Dwell Time(Ch. 0)
	

Dual ANT.1 GFSK : Dwell Time(Ch. 0)	Dual ANT.2 GFSK : Dwell Time(Ch. 0)
	
Dual ANT.1 8DPSK : Dwell Time(Ch. 0)	Dual ANT.2 8DPSK : Dwell Time(Ch. 0)
	
Dual ANT.1 π/4DQPSK : Dwell Time(Ch. 0)	Dual ANT.2 π/4DQPSK : Dwell Time(Ch. 0)
	

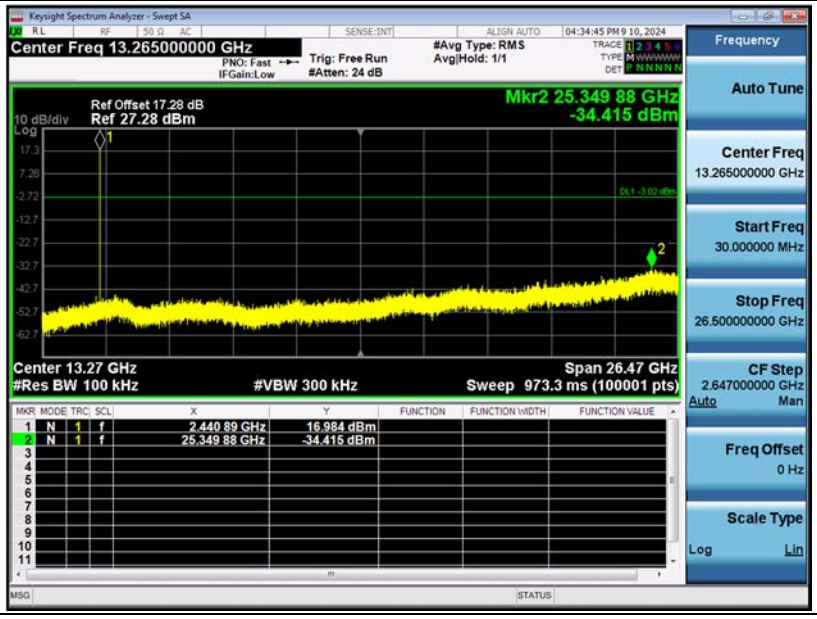
10.6 SPURIOUS EMISSIONS

10.6.1 CONDUCTED SPURIOUS EMISSIONS

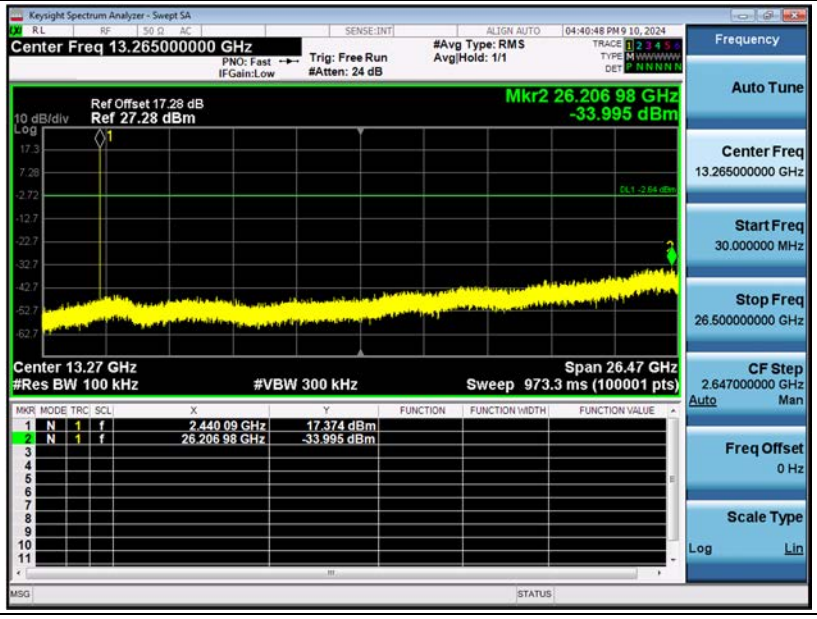
In order to simplify the report, attached plots were only the worst case channel and data rate.

▣ TEST PLOTS(CONDUCTED SPURIOUS EMISSIONS)

Spurious Emission (30 MHz - 26.50 GHz)Ant.1, GFSK Ch. 39



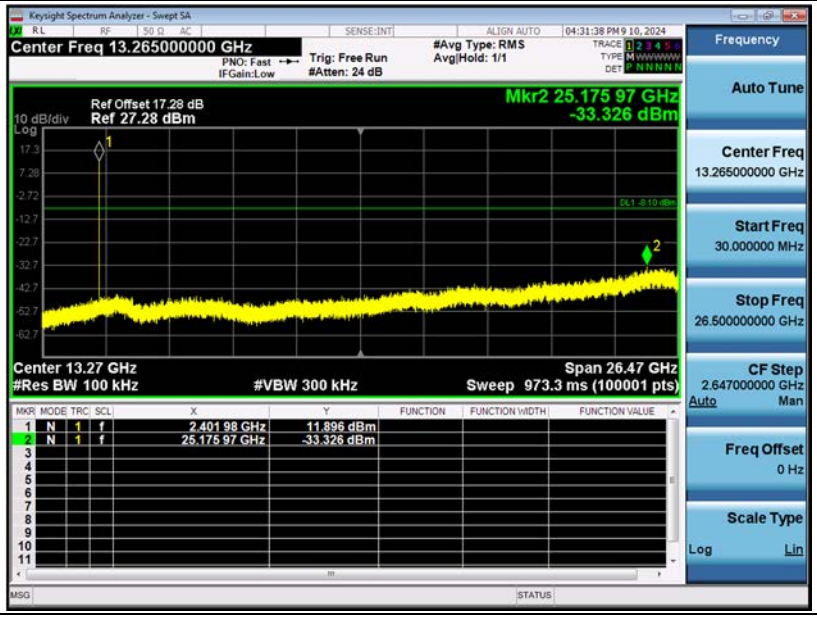
Spurious Emission (30 MHz - 26.50 GHz)Ant.2, GFSK Ch. 39



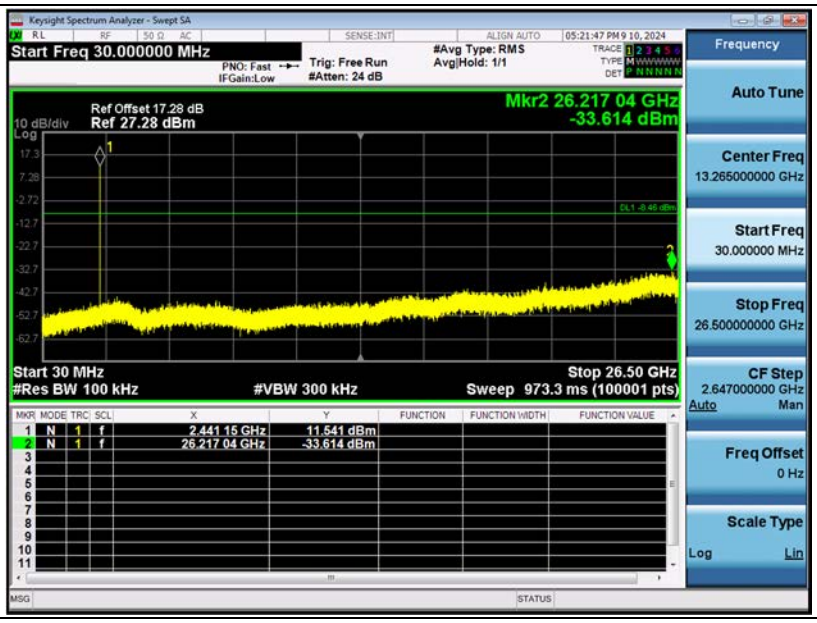
Note

1. Ant.1 Limit (dBm): -3.016, Ant.2 Limit (dBm): -2.636

Spurious Emission (30 MHz - 26.50 GHz) Dual Ant.1, GFSK Ch. 0



Spurious Emission (30 MHz - 26.50 GHz) Dual Ant.2, GFSK Ch. 0



Note

1. Dual Ant.1 Limit (dBm): -8.104, Dual Ant.2 Limit (dBm): -8.459

10.6.2 RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30 MHz

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

Note:

1. The Measured of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
2. Distance extrapolation factor = 40log (specific distance / test distance) (dB)
3. Limit line = specific Limits (dBμV) + Distance extrapolation factor
4. Radiated test is performed with hopping off.

Frequency Range : Below 1 GHz

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

Note:

1. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
2. Radiated test is performed with hopping off.

Frequency Range : Above 1 GHz

[Ant.1]

CH 0	2402	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4804	50.90	-5.49	V	0.00	45.41	73.98	28.57	PK
4804	50.90	-5.49	V	-24.73	20.68	53.98	33.30	AV
7206	50.18	1.86	V	0.00	52.04	73.98	21.94	PK
7206	50.18	1.86	V	-24.73	27.31	53.98	26.67	AV
4804	51.50	-5.49	H	0.00	46.01	73.98	27.97	PK
4804	51.50	-5.49	H	-24.73	21.28	53.98	32.70	AV
7206	49.35	1.86	H	0.00	51.21	73.98	22.77	PK
7206	49.35	1.86	H	-24.73	26.48	53.98	27.50	AV

CH 39	2441	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4882	51.59	-5.18	V	0.00	46.41	73.98	27.57	PK
4882	51.59	-5.18	V	-24.73	21.68	53.98	32.30	AV
7323	49.05	1.94	V	0.00	50.99	73.98	22.99	PK
7323	49.05	1.94	V	-24.73	26.26	53.98	27.72	AV
4882	51.85	-5.18	H	0.00	46.67	73.98	27.31	PK
4882	51.85	-5.18	H	-24.73	21.94	53.98	32.04	AV
7323	49.93	1.94	H	0.00	51.87	73.98	22.11	PK
7323	49.93	1.94	H	-24.73	27.14	53.98	26.84	AV

CH 78	2480	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	52.11	-4.82	V	0.00	47.29	73.98	26.69	PK
4960	52.11	-4.82	V	-24.73	22.55	53.98	31.43	AV
7440	48.58	2.13	V	0.00	50.71	73.98	23.27	PK
7440	48.58	2.13	V	-24.73	25.98	53.98	28.00	AV
4960	53.02	-4.82	H	0.00	48.20	73.98	25.78	PK
4960	53.02	-4.82	H	-24.73	23.46	53.98	30.52	AV
7440	48.64	2.13	H	0.00	50.77	73.98	23.21	PK
7440	48.64	2.13	H	-24.73	26.04	53.98	27.94	AV

[Ant.2]

CH 0	2402	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4804	51.68	-5.49	V	0.00	46.19	73.98	27.79	PK
4804	51.68	-5.49	V	-24.73	21.46	53.98	32.52	AV
7206	49.94	1.86	V	0.00	51.80	73.98	22.18	PK
7206	49.94	1.86	V	-24.73	27.07	53.98	26.91	AV
4804	52.51	-5.49	H	0.00	47.02	73.98	26.96	PK
4804	52.51	-5.49	H	-24.73	22.29	53.98	31.69	AV
7206	49.68	1.86	H	0.00	51.54	73.98	22.44	PK
7206	49.68	1.86	H	-24.73	26.81	53.98	27.17	AV

CH 39	2441	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4882	52.14	-5.18	V	0.00	46.96	73.98	27.02	PK
4882	52.14	-5.18	V	-24.73	22.23	53.98	31.75	AV
7323	49.65	1.94	V	0.00	51.59	73.98	22.39	PK
7323	49.65	1.94	V	-24.73	26.86	53.98	27.12	AV
4882	51.80	-5.18	H	0.00	46.62	73.98	27.36	PK
4882	51.80	-5.18	H	-24.73	21.89	53.98	32.09	AV
7323	49.37	1.94	H	0.00	51.31	73.98	22.67	PK
7323	49.37	1.94	H	-24.73	26.58	53.98	27.40	AV

CH 78	2480	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	51.62	-4.82	V	0.00	46.80	73.98	27.18	PK
4960	51.62	-4.82	V	-24.73	22.06	53.98	31.92	AV
7440	48.41	2.13	V	0.00	50.54	73.98	23.44	PK
7440	48.41	2.13	V	-24.73	25.81	53.98	28.17	AV
4960	52.25	-4.82	H	0.00	47.43	73.98	26.55	PK
4960	52.25	-4.82	H	-24.73	22.69	53.98	31.29	AV
7440	48.18	2.13	H	0.00	50.31	73.98	23.67	PK
7440	48.18	2.13	H	-24.73	25.58	53.98	28.40	AV

[Dual Ant.1+ Ant.2]

CH 0	2402	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4804	50.70	-5.49	V	0.00	45.21	73.98	28.77	PK
4804	50.70	-5.49	V	-24.73	20.48	53.98	33.50	AV
7206	48.61	1.86	V	0.00	50.47	73.98	23.51	PK
7206	48.61	1.86	V	-24.73	25.74	53.98	28.24	AV
4804	49.93	-5.49	H	0.00	44.44	73.98	29.54	PK
4804	49.93	-5.49	H	-24.73	19.71	53.98	34.27	AV
7206	48.59	1.86	H	0.00	50.45	73.98	23.53	PK
7206	48.59	1.86	H	-24.73	25.72	53.98	28.26	AV

CH 39	2441	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4882	51.27	-5.18	V	0.00	46.09	73.98	27.89	PK
4882	51.27	-5.18	V	-24.73	21.36	53.98	32.62	AV
7323	48.57	1.94	V	0.00	50.51	73.98	23.47	PK
7323	48.57	1.94	V	-24.73	25.78	53.98	28.20	AV
4882	51.53	-5.18	H	0.00	46.35	73.98	27.63	PK
4882	51.53	-5.18	H	-24.73	21.62	53.98	32.36	AV
7323	49.10	1.94	H	0.00	51.04	73.98	22.94	PK
7323	49.10	1.94	H	-24.73	26.31	53.98	27.67	AV

CH 78	2480	MHz	Mode :			Normal(GFSK)		
Frequency	Measured value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	51.14	-4.82	V	0.00	46.32	73.98	27.66	PK
4960	51.14	-4.82	V	-24.73	21.58	53.98	32.40	AV
7440	48.51	2.13	V	0.00	50.64	73.98	23.34	PK
7440	48.51	2.13	V	-24.73	25.91	53.98	28.07	AV
4960	51.31	-4.82	H	0.00	46.49	73.98	27.49	PK
4960	51.31	-4.82	H	-24.73	21.75	53.98	32.23	AV
7440	48.69	2.13	H	0.00	50.82	73.98	23.16	PK
7440	48.69	2.13	H	-24.73	26.09	53.98	27.89	AV

[DBS]

Scenario 1

Dual Bluetooth DH5_Ch.39 + Ant All(MIMO) 5 GHz 802.11a_Ch.48_6 Mbps

Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4882	54.88	-5.18	V	0.00	49.70	73.98	24.28	PK
4882	54.88	-5.18	V	-24.73	24.97	53.98	29.01	AV
7323	51.78	1.94	V	0.00	53.72	73.98	20.26	PK
7323	51.78	1.94	V	-24.73	28.99	53.98	24.99	AV
4882	56.78	-5.18	H	0.00	51.60	73.98	22.38	PK
4882	56.78	-5.18	H	-24.73	26.87	53.98	27.11	AV
7323	54.03	1.94	H	0.00	55.97	73.98	18.01	PK
7323	54.03	1.94	H	-24.73	31.24	53.98	22.74	AV

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

Scenario 3

Ant.1_Bluetooth DH5_Ch.0 + Ant.2_2.4 GHz 802.11b _1 Mbps Ch.11 + Ant All(MIMO) 5 GHz 802.11a_6 Mbps Ch.48

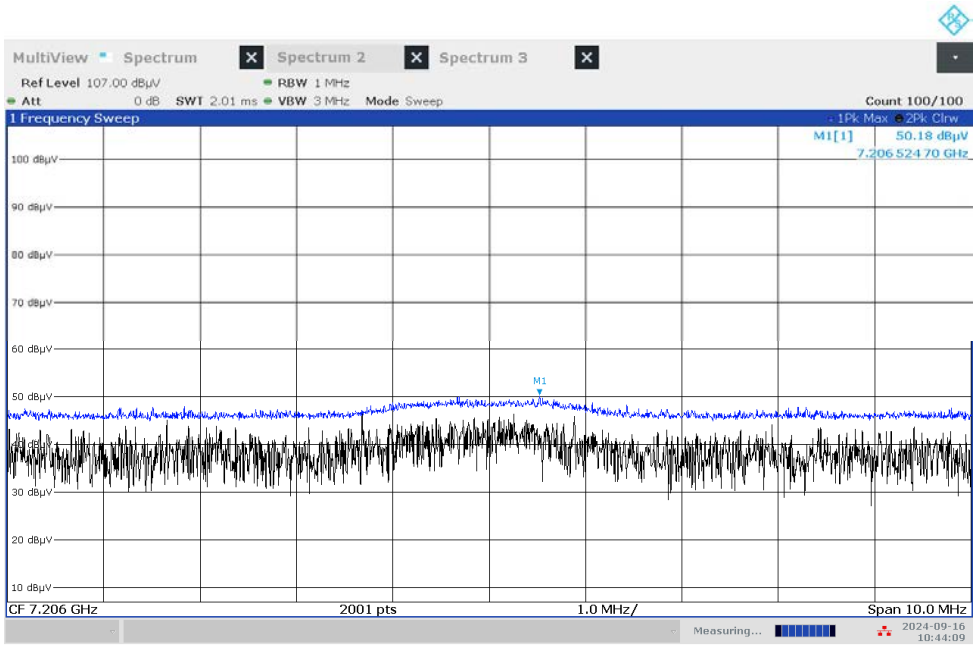
Frequency	Measured Value	A.F+C.L-A.G+D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBµV]	[dB/m]	[H/V]	[dB]	[dBµV/m]	[dBµV/m]	[dB]	
4804	66.02	-5.49	V	0.00	60.53	73.98	13.45	PK
4804	66.02	-5.49	V	-24.73	35.80	53.98	18.18	AV
7206	50.92	1.86	V	0.00	52.78	73.98	21.20	PK
7206	50.92	1.86	V	-24.73	28.05	53.98	25.93	AV
4804	70.61	-5.49	H	0.00	65.12	73.98	8.86	PK
4804	70.61	-5.49	H	-24.73	40.39	53.98	13.59	AV
7206	51.17	1.86	H	0.00	53.03	73.98	20.95	PK
7206	51.17	1.86	H	-24.73	28.30	53.98	25.68	AV

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

RESULT PLOTS

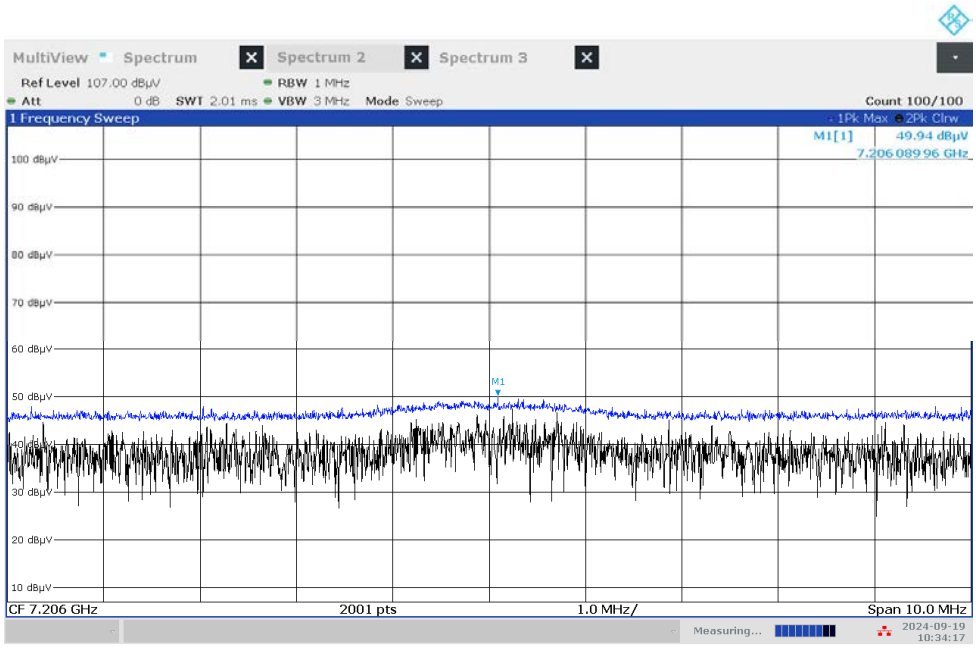
[Ant.1]

Radiated Spurious Emissions plot – Peak & Average Result (GFSK, Ch. 0 3rd Harmonic, X-V)



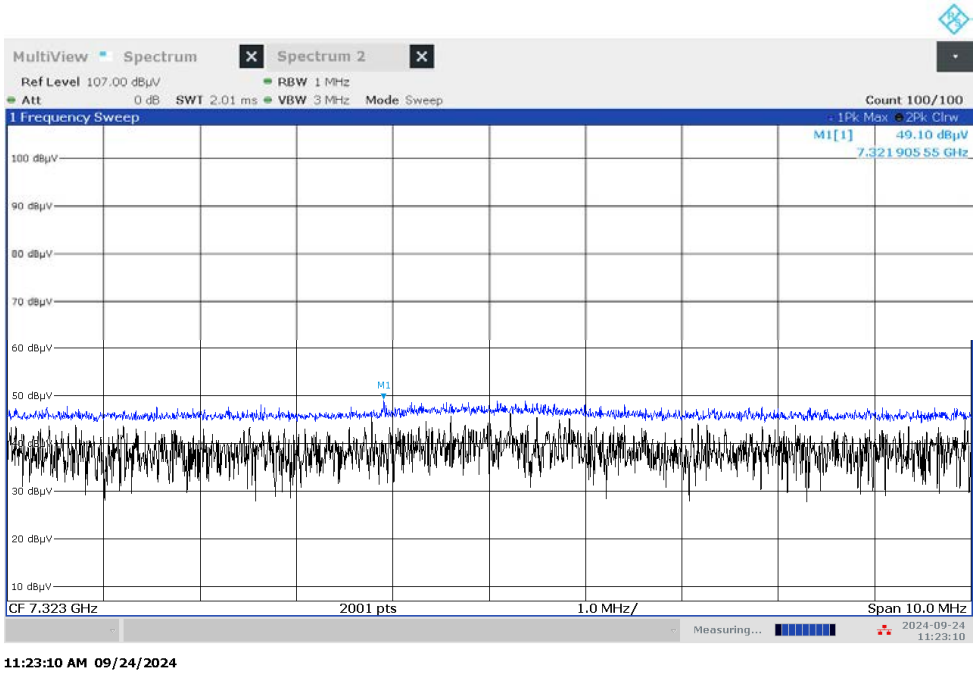
[Ant.2]

Radiated Spurious Emissions plot – Peak & Average Result (GFSK, Ch. 0 3rd Harmonic, X-V)



[Dual Ant.1+ Ant.2]

Radiated Spurious Emissions plot – Peak & Average Result (GFSK, Ch. 39 3rd Harmonic, Z-H)

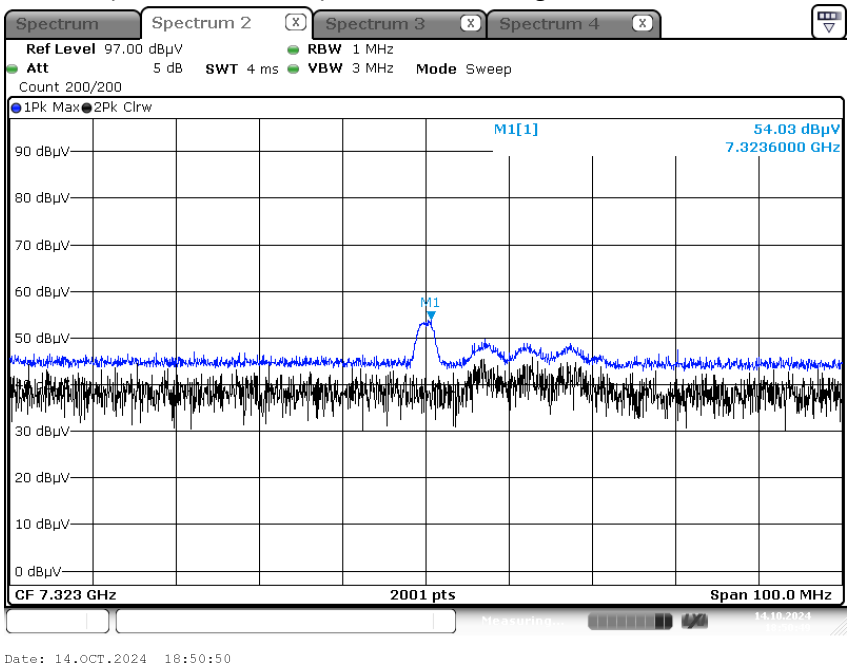


[DBS]

Scenario 1

Dual Bluetooth DH5_Ch.39 + Ant All(MIMO) 5 GHz 802.11a_Ch.48_6 Mbps

Radiated Spurious Emissions plot – Peak & Average Result (3rd Harmonic, Z-H)

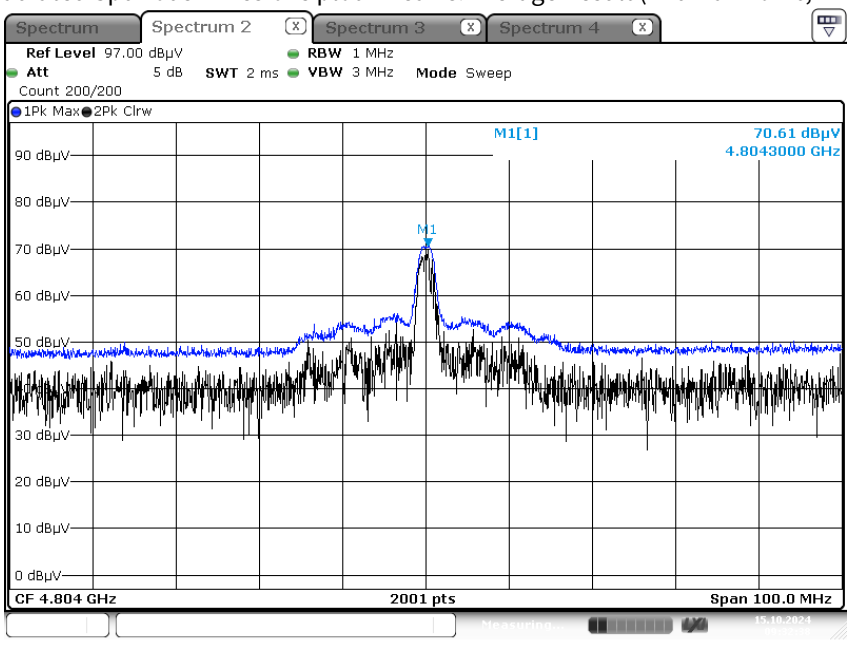


Date: 14.OCT.2024 18:50:50

Scenario 3

Ant.1_Bluetooth DH5_Ch.0 + Ant.2_2.4 GHz 802.11b _1 Mbps Ch.11 + Ant All(MIMO) 5 GHz 802.11a_6 Mbps Ch.48

Radiated Spurious Emissions plot – Peak & Average Result (2nd Harmonic, Z-H)



Date: 15.OCT.2024 09:32:38

Note: Plots of worst case are only reported.

10.6.3 RADIATED RESTRICTED BAND EDGES

[Ant.1]

Normal(GFSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.81	0.00	H	0.00	52.81	73.98	21.17	PK
2390	52.81	0.00	H	-24.73	28.08	53.98	25.90	AV
2483.5	62.55	0.00	H	0.00	62.55	73.98	11.43	PK
2483.5	62.55	0.00	H	-24.73	37.82	53.98	16.16	AV

EDR(π/4DQPSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.41	0.00	H	0.00	52.41	73.98	21.57	PK
2390	52.41	0.00	H	-24.73	27.68	53.98	26.30	AV
2483.5	58.18	0.00	H	0.00	58.18	73.98	15.80	PK
2483.5	58.18	0.00	H	-24.73	33.45	53.98	20.53	AV

EDR(8DPSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.29	0.00	H	0.00	52.29	73.98	21.69	PK
2390	52.29	0.00	H	-24.73	27.56	53.98	26.42	AV
2483.5	58.26	0.00	H	0.00	58.26	73.98	15.72	PK
2483.5	58.26	0.00	H	-24.73	33.53	53.98	20.45	AV

[Ant.2]

Normal(GFSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.98	0.00	H	0.00	52.98	73.98	21.00	PK
2390	52.98	0.00	H	-24.73	28.25	53.98	25.73	AV
2483.5	60.00	0.00	H	0.00	60.00	73.98	13.98	PK
2483.5	60.00	0.00	H	-24.73	35.27	53.98	18.71	AV

EDR(π/4DQPSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.45	0.00	H	0.00	52.45	73.98	21.53	PK
2390	52.45	0.00	H	-24.73	27.72	53.98	26.26	AV
2483.5	56.95	0.00	H	0.00	56.95	73.98	17.03	PK
2483.5	56.95	0.00	H	-24.73	32.22	53.98	21.76	AV

EDR(8DPSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.75	0.00	H	0.00	52.75	73.98	21.23	PK
2390	52.75	0.00	H	-24.73	28.02	53.98	25.96	AV
2483.5	57.38	0.00	H	0.00	57.38	73.98	16.60	PK
2483.5	57.38	0.00	H	-24.73	32.65	53.98	21.33	AV

[Dual Ant.1+ Ant.2]

Normal(GFSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.50	0.00	H	0.00	52.50	73.98	21.48	PK
2390	52.50	0.00	H	-24.73	27.77	53.98	26.21	AV
2483.5	58.78	0.00	H	0.00	58.78	73.98	15.20	PK
2483.5	58.78	0.00	H	-24.73	34.05	53.98	19.93	AV

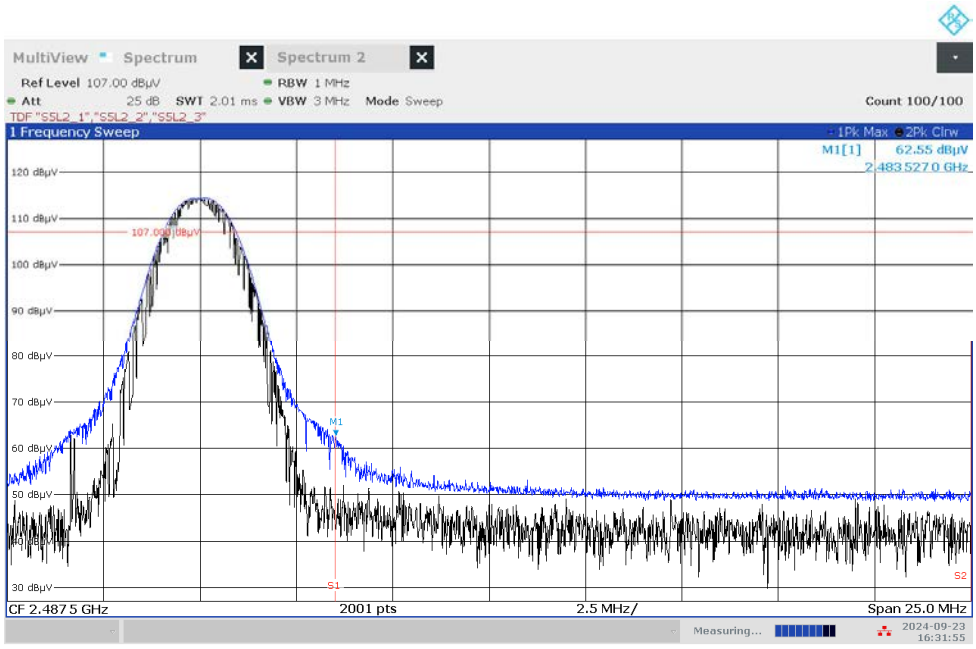
EDR(π/4DQPSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.89	0.00	H	0.00	52.89	73.98	21.09	PK
2390	52.89	0.00	H	-24.73	28.16	53.98	25.82	AV
2483.5	54.34	0.00	H	0.00	54.34	73.98	19.64	PK
2483.5	54.34	0.00	H	-24.73	29.61	53.98	24.37	AV

EDR(8DPSK)	Channel	CH. 0, CH. 78		Channel No		2402 MHz, 2480 MHz		
Frequency	Measured Value	A.F+C.L +D.F	ANT. POL	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390	52.57	0.00	H	0.00	52.57	73.98	21.41	PK
2390	52.57	0.00	H	-24.73	27.84	53.98	26.14	AV
2483.5	55.70	0.00	H	0.00	55.70	73.98	18.28	PK
2483.5	55.70	0.00	H	-24.73	30.97	53.98	23.01	AV

RESULT PLOTS

[Ant.1]

Radiated Restricted Band Edges plot – Average & Peak Result (GFSK, Ch. 78, X-H)



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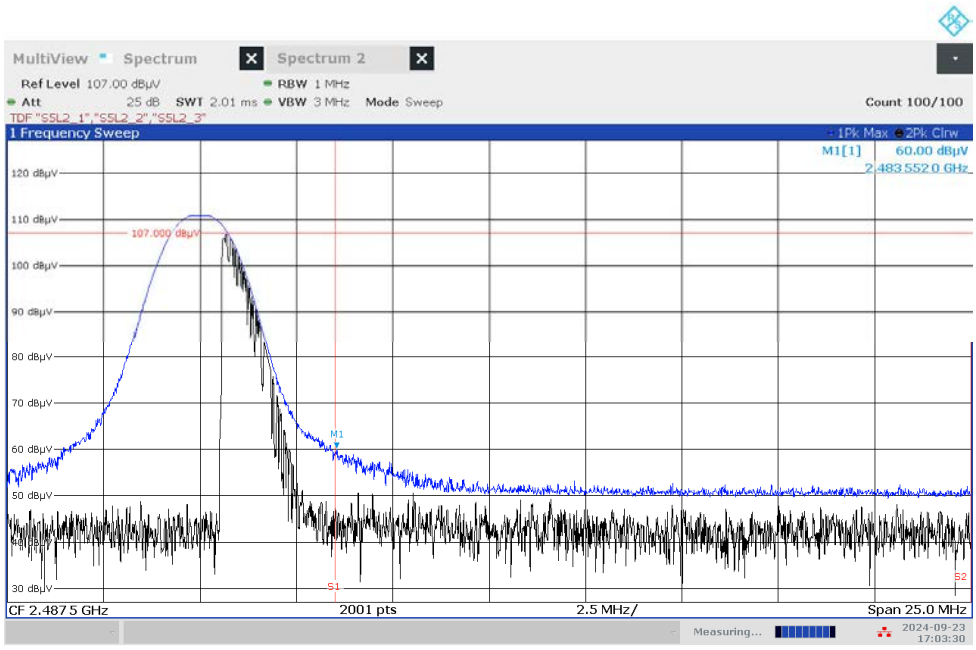
[Ant.2]

Radiated Restricted Band Edges plot – Average & Peak Result (GFSK, Ch. 78, Y-H)



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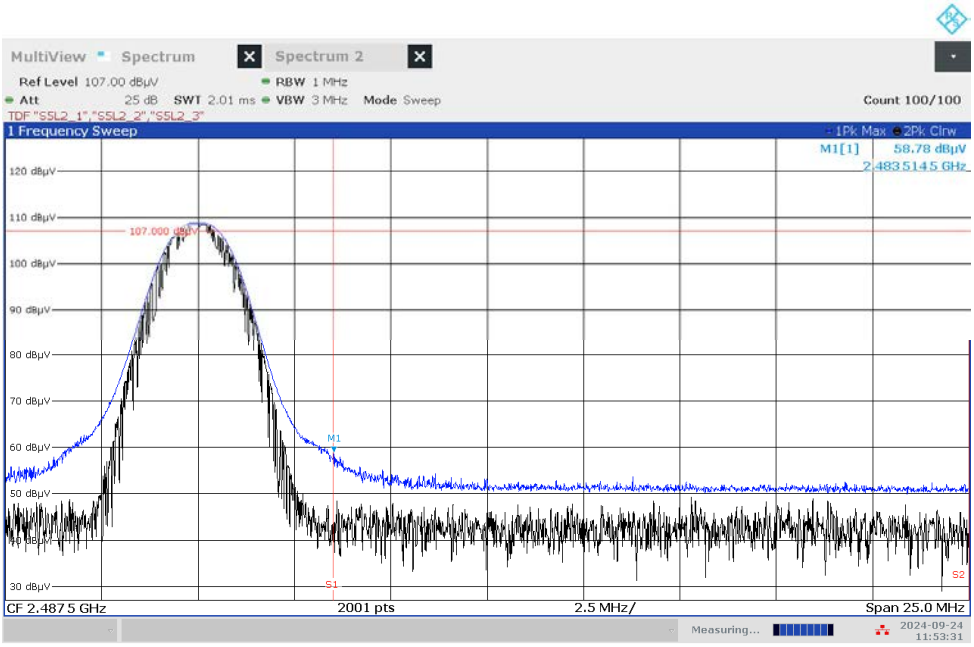
[Dual Ant.1+ Ant.2]

Radiated Restricted Band Edges plot – Average & Peak Result (GFSK, Ch. 78, X-H)



Note:

Plots of worst case are only reported.

10.7 POWERLINE CONDUCTED EMISSIONS

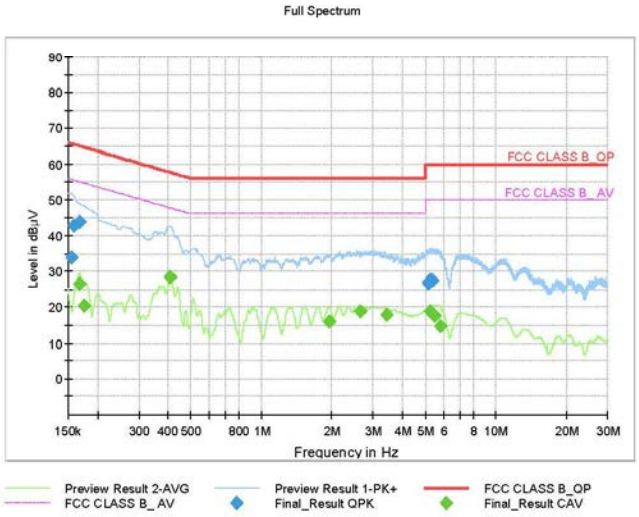
Conducted Emissions

Test 1 / 1

Test Report

Common Information

EUT : SM-S931U
Operating Conditions : BT Mode
Comment :



Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	33.91	65.75	31.84	9.000	N	9.6
0.1590	42.79	65.52	22.73	9.000	N	9.6
0.1680	43.94	65.06	21.12	9.000	N	9.6
5.1575	26.99	60.00	33.01	9.000	L1	9.9
5.1643	27.24	60.00	32.76	9.000	L1	9.9
5.1800	26.75	60.00	33.25	9.000	L1	9.9
5.2723	27.51	60.00	32.49	9.000	L1	9.9
5.3128	27.50	60.00	32.50	9.000	L1	9.9
5.3645	27.37	60.00	32.63	9.000	L1	9.9

Final_Result_CAV

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1680	26.50	55.06	28.56	9.000	L1	9.6
0.1748	20.39	54.73	34.35	9.000	N	9.6
0.4065	28.41	47.72	19.31	9.000	N	9.6
1.9490	15.83	46.00	30.17	9.000	N	9.7
2.6488	18.94	46.00	27.06	9.000	N	9.8
3.4138	17.92	46.00	28.08	9.000	N	9.8
5.2588	18.71	50.00	31.29	9.000	N	9.9
5.4860	17.71	50.00	32.29	9.000	N	9.9
5.8348	14.70	50.00	35.30	9.000	N	9.9

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11. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	07/17/2025	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	07/02/2025	Annual
Temperature Chamber	SU-642	ESPEC	93008124	02/19/2025	Annual
Signal Analyzer	N9030A	Keysight	MY55410508	08/23/2025	Annual
Power Meter	N1911A	Agilent	MY45100523	02/28/2025	Annual
Power Sensor	N1921A	Agilent	MY57820067	02/22/2025	Annual
Directional Coupler	87300B	Agilent	3116A03621	10/30/2024	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2025	Annual
DC Power Supply	E3632A	Agilent	KR01009150	04/18/2025	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C-010	Agilent	08285	05/28/2025	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	02/20/2025	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	HCT CO., LTD.	N/A	N/A	N/A
Bluetooth Tester	CBT	Rohde & Schwarz	100808	02/15/2025	Annual

Note:

1. Equipment listed above that calibrated during the testing period was set for test after the calibration.
2. Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date.

Radiated Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller (Antenna mast & Turn Table)	CO3000	Innco system	CO3000/ 15421/57580623/G	N/A	N/A
Antenna Position Tower	MA4640	Innco system	9320422	04/05/2025	Biennial
Turn Table	N/A	Innco system	5930623	N/A	N/A
Loop Antenna	FMZB 1513	Schwarzbeck	1513-175	01/16/2025	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-1135	08/19/2026	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1151	07/14/2025	Biennial
Horn Antenna (15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Amp & Filter Bank Switch Controller	FBSM-01B	T&M system	TM2009001	N/A	N/A
Band Reject Filter	WRCJV2400/2483.5-2370/2520-60/12SS	Wainwright Instruments	2	01/02/2025	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/04/2025	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/04/2025	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/14/2025	Annual
RF Switching System	FMSR-05B (HPF(3~18GHz) + LNA1(1~18GHz))	T&M system	S5L1	03/12/2025	Annual
RF Switching System	FMSR -05B (ATT(10dB) + LNA1(1~18GHz))	T&M system	S5L2	03/12/2025	Annual
RF Switching System	FMSR -05B (ATT(3dB) + LNA1(1~18GHz))	T&M system	S5L3	03/12/2025	Annual
RF Switching System	FMSR -05B (LNA1(1~18GHz))	T&M system	S5L4	03/12/2025	Annual
RF Switching System	FMSR -05B (HPF(7~18GHz) + LNA2(6~18GHz))	T&M system	S5L5	03/12/2025	Annual
RF Switching System	FMSR -05B (Thru(30MHz ~ 18GHz))	T&M system	S5L6	03/12/2025	Annual
Power Amplifier	CBL18265035	CERNEX	22966	11/17/2024	Annual
Power Amplifier	CBL26405040	CERNEX	25956	02/26/2025	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/19/2025	Annual
Spectrum Analyzer	FSW (2 Hz ~ 67 GHz)	Rohde & Schwarz	101736	05/23/2025	Annual
Spectrum Analyzer	FSV40 (9 kHz ~ 40 GHz)	Rohde & Schwarz	101510	03/28/2025	Annual

Note:

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

12. ANNEX A_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2410-FC019-P