

# TEST REPORT

FCC BT Test for SC-54E  
Certification

**APPLICANT**  
SAMSUNG Electronics Co., Ltd.

**REPORT NO.**  
HCT-RF-2405-FC043

**DATE OF ISSUE**  
May 24, 2024

**Tested by**  
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**TEST  
REPORT**

**REPORT NO.**  
HCT-RF-2405-FC043

**DATE OF ISSUE**  
May 24, 2024

**Additional Model**  
SCG29

**Applicant**                    **SAMSUNG Electronics Co., Ltd.**  
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea

**Product Name**                    Mobile Phone  
**Model Name**                      SC-54E

**FCC ID**                            A3LSMF741JPN

**Max. RF Output Power**                    Ant.1: 19.363 dBm (86.36 mW)  
Ant.2: 18.007 dBm (63.20 mW)  
Dual Ant.1+ Ant.2: 17.381 dBm (54.71 mW)

**Date of Test**                      February 23, 2024 ~ April 26, 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	May 24, 2024	Initial Release

## Notice

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### Content

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According to the Evaluation report, all of the data contained herein is reused from the reference FCC ID : A3LSMF741U report.

#### 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](http://www.hct.co.kr)

The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

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## 1. EUT DESCRIPTION

<b>Model</b>	SC-54E
<b>Additional Model</b>	SCG29
<b>EUT Type</b>	Mobile Phone
<b>Power Supply</b>	DC 3.88 V
<b>Frequency Range</b>	2 402 MHz - 2 480 MHz
<b>Max. RF Output Power</b>	Ant.1: 19.363 dBm (86.36 mW) Ant.2: 18.007 dBm (63.20 mW) Dual Ant.1+ Ant.2: 17.381 dBm (54.71 mW)
<b>BT Operating Mode</b>	Normal, EDR, AFH
<b>Modulation Type</b>	GFSK(Normal), $\pi/4$ DQPSK and 8DPSK(EDR)
<b>Modulation Technique</b>	FHSS
<b>Number of Channels</b>	79 Channels, Minimum 20 Channels(AFH)
<b>Antenna Specification</b>	Type: Metal ANT.1 Peak Gain: -5.28 dBi, ANT.2 Peak Gain: -6.95 dBi
<b>Serial number</b>	Conducted : R3CX30BD5YB Radiated : R3CX20KJSLK

## 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

Amp.	SISO		Dual BT
	Ant1(Core-0)	Ant2(Core-1)	Ant1 & Ant2
ePA Mode	O	O	X
iPA Mode	X	X	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	Bluetooth Ant.1	Bluetooth Ant.2	Test Case
2.4 GHz WiFi MIMO + 6 GHz WiFi MIMO	on	on			on	on			
2.4 GHz WiFi MIMO + 5 GHz WiFi MIMO	on	on	on	on					Scenario1
Dual Bluetooth + 5 GHz WiFi MIMO			on	on			on	on	Scenario2
Dual Bluetooth + 6 GHz WiFi MIMO					on	on	on	on	Scenario3
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO		on	on	on			on		Scenario4
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  $U_{\text{CISPR}}$  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

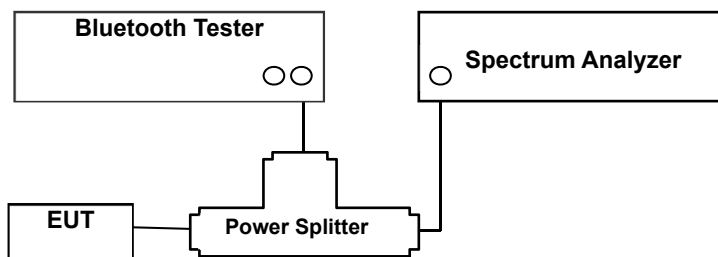
### 8.1. Conducted Maximum Peak Output Power

#### 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)

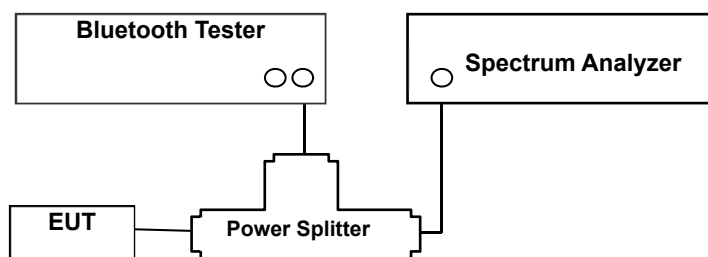
- 1) Span: approximately 5 times the 20 dB bandwidth, centered on a hopping channel
- 2) RBW > the 20 dB bandwidth of the emission being measured
- 3) VBW  $\geq$  RBW
- 4) Sweep = Auto
- 5) Detector = Peak
- 6) Trace = Max hold

## 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)

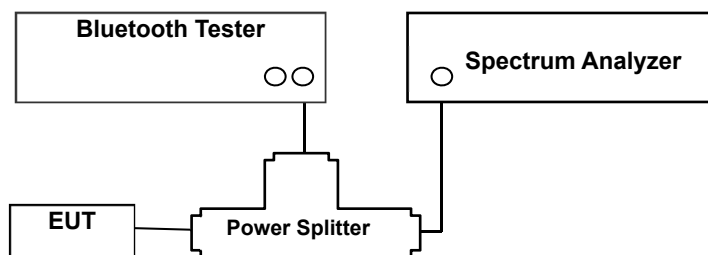
- 1) Span: Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
- 2) Reference level: As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than  $[10 \log (\text{OBW}/\text{RBW})]$  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  $\geq$  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)

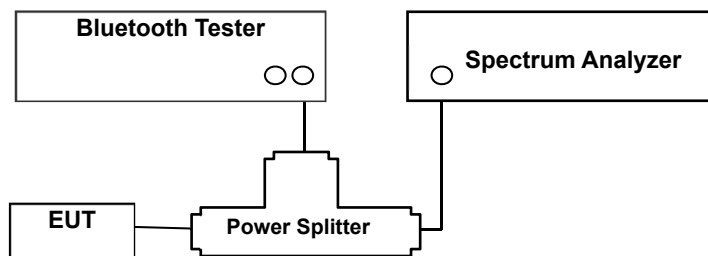
- 1) Span: Set between two times and five times the OBW
- 2) RBW: 1 % to 5 % of the OBW.
- 3) VBW  $\geq 3 \times$  RBW
- 4) Sweep: Auto
- 5) Detector: Peak
- 6) Trace: Max hold
- 7) All the trace to stabilize.

#### 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  $\geq$  RBW
- 4) Sweep: Auto
- 5) Detector: Peak
- 6) Trace: Max hold
- 7) Allow the trace to stabilize.

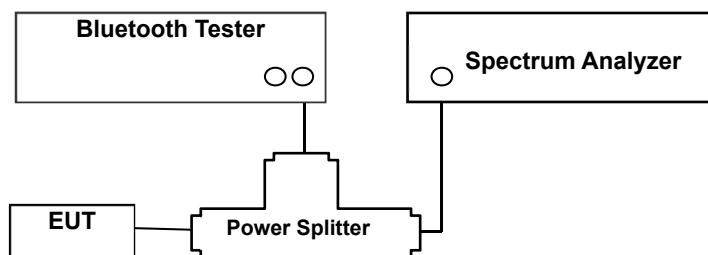


## 8.5. Time of Occupancy

### 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  $\leq$  channel spacing and where possible RBW should be set  $\gg 1 / T$ , 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) :  $2.890 \times (1600/6)/79 \times 31.6 = 308.27$  (ms)
- 2-DH 5 ( $\pi/4$ DQPSK) :  $2.890 \times (1600/6)/79 \times 31.6 = 308.27$  (ms)
- 3-DH 5 (8DPSK) :  $2.890 \times (1600/6)/79 \times 31.6 = 308.27$  (ms)

(2) AFH Mode

- DH 5 (GFSK) :  $2.890 \times (800/6)/20 \times 8.0 = 154.13$  (ms)
- 2-DH 5 ( $\pi/4$ DQPSK) :  $2.890 \times (800/6)/20 \times 8.0 = 154.13$  (ms)
- 3-DH 5 (8DPSK) :  $2.890 \times (800/6)/20 \times 8.0 = 154.13$  (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.

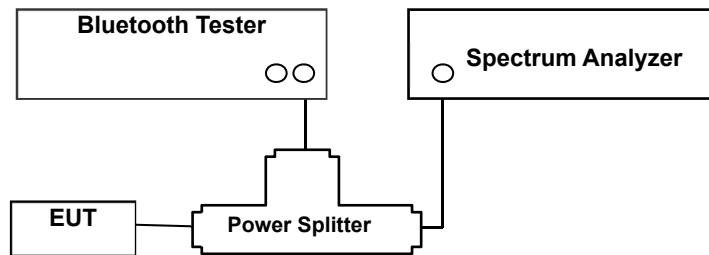
Dwell time = Tx-time x 106.667 = 308.27 (ms)

## 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)	Factor(dB)	
	Ant. 1	Ant.2
30	16.98	16.65
100	17.06	16.72
200	17.14	16.74
300	17.27	16.93
400	17.33	16.93
500	17.35	17.03
600	17.35	17.03
700	17.39	16.99
800	17.43	17.05
900	17.46	17.09
1 000	17.50	17.18
2 000	17.61	17.28
2 400	<b>17.77</b>	<b>17.39</b>
2 500	<b>17.77</b>	<b>17.39</b>
3 000	17.98	17.64
4 000	18.16	17.78
5 000	18.36	18.05
6 000	18.36	17.97
7 000	18.47	18.14
8 000	18.46	18.09
9 000	18.65	18.28
10 000	18.77	18.40
11 000	18.90	18.59
12 000	19.04	18.65
13 000	19.13	18.81
14 000	19.25	18.86
15 000	19.36	19.01
16 000	19.44	19.12
17 000	19.56	19.16
18 000	19.58	19.25
19 000	19.57	19.23
20 000	19.62	19.23
21 000	19.65	19.25
22 000	19.72	19.38
23 000	19.88	19.51
24 000	19.89	19.49
25 000	19.91	19.59
26 000	19.97	19.63

**Note :**

2400 ~ 2500 MHz is fundamental frequency range.

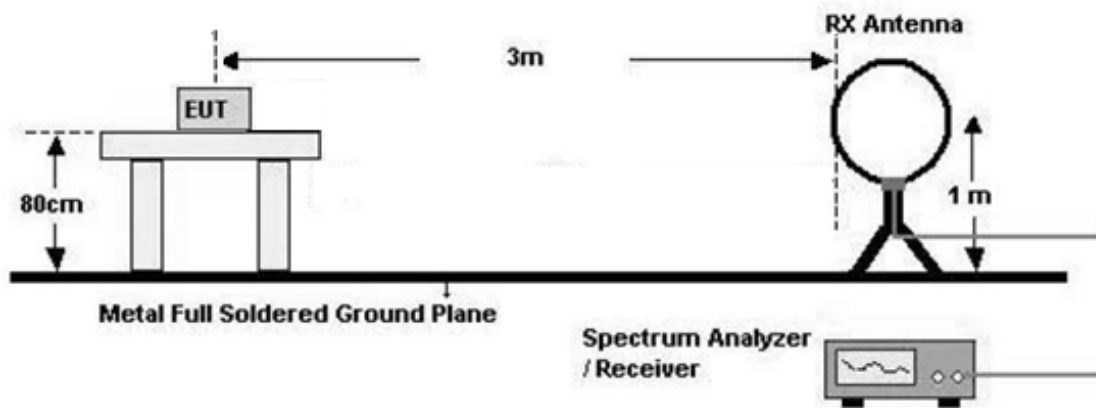
### 8.7. Radiated Test

#### Limit

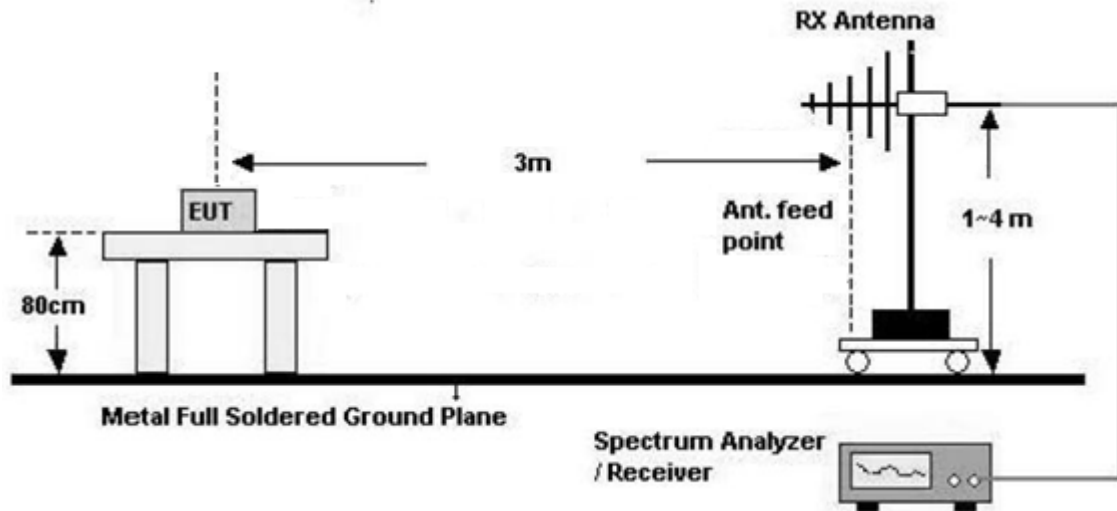
Frequency (MHz)	Field Strength ( $\mu\text{V}/\text{m}$ )	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

#### Test Configuration

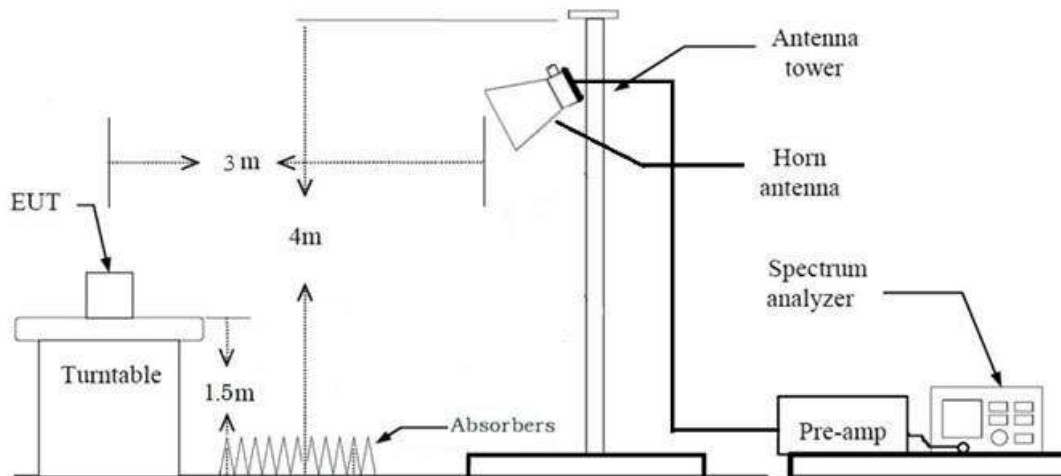
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



### Test Procedure of Radiated spurious emissions(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) =  $40\log(3\text{ m}/300\text{ m}) = - 80\text{ dB}$   
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 = Max hold
- RBW = 9 kHz
- VBW  $\geq$  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  $\geq$  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 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  $\geq$  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) =  $20\log(\text{Worst Case Dwell Time}/100\text{ms})$  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 =  $20\log(\text{test distance} / \text{specific distance})$  (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)

### 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  $\geq$  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) =  $20\log(\text{Worst Case Dwell Time} / 100\text{ms})$  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 =  $20\log(\text{test distance} / \text{specific distance})$  (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)

### 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  $\mu$ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 <sup>(a)</sup>	56 to 46 <sup>(a)</sup>
0.50 to 5	56	46
5 to 30	60	50

<sup>(a)</sup>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
    - Radiated Restricted Band Edge : X
  - (2) Ant.2
    - Radiated Spurious Emissions : Y
    - Radiated Restricted Band Edge : Z
  - (3) Dual Ant.1+ Ant.2
    - Radiated Spurious Emissions : X
    - Radiated Restricted Band Edge :X
3. All data rate of operation were investigated and the test results are worst case in highest datarate of each mode.
  - GFSK : DH5
  - $\pi/4$ DQPSK : 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. The EUT was tested in three modes(Open, Half-open, Closed), the worst case configuration results are reported.
  - (1) Ant.1
    - Radiated Spurious Emissions : Open Mode
    - Radiated Restricted Band Edge : Open Mode
  - (2) Ant.2
    - Radiated Spurious Emissions : Half-Open Mode
    - Radiated Restricted Band Edge : Half-Open Mode
  - (3) Dual Ant.1+ Ant.2
    - Radiated Spurious Emissions : Half-Open Mode
    - Radiated Restricted Band Edge : Open Mode
6. SC-54E, SCG29 were tested and the worst case results are reported.  
(Worst case: SC-54E)
7. Radiated Spurious Emission
  - All mode of operation were investigated and the worst case results are reported.
  - Worst case : GFSK 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 : X, 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	Bluetooth Ant.1	Bluetooth Ant.2	Test Case
2.4 GHz WiFi MIMO + 6 GHz WiFi MIMO	on	on			on	on			
2.4 GHz WiFi MIMO + 5 GHz WiFi MIMO	on	on	on	on					Scenario1
Dual Bluetooth + 5 GHz WiFi MIMO			on	on			on	on	Scenario2
Dual Bluetooth + 6 GHz WiFi MIMO					on	on	on	on	Scenario3
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO		on	on	on			on		Scenario4
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 6 GHz WiFi MIMO		on			on	on	on		

4. The RSDB mode test investigated both intermodulation and radiated spurious emissions.

And the worst results were reported.

- Worst result: Radiated spurious emissions
- Intermodulation: No signals are generated.
- Radiated spurious emissions: cf. Section 10.6.2.

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

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

RSDB Scenario 2	Description	Bluetooth Emission	5 GHz Emission
Dual Bluetooth + 5 GHz WiFi MIMO	Antenna	Dual ANT	Ant All
	Channel	78	36
	Data Rate	1 Mbps	MCS0
	Mode	GFSK	802.11ax(HE20)
	Tone, RU	N/A	106, 53

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

RSDB Scenario 3	Description	Bluetooth Emission	6 GHz Emission
Dual Bluetooth + 6 GHz WiFi MIMO	Antenna	Dual ANT	Ant All
	Channel	78	3
	Data Rate	1 Mbps	MCS0
	Mode	GFSK	802.11ax(HE40)
	Tone, RU	N/A	484, 65

Note : UNII 6e RSDB Data refer to [UNII 6e] Test Report

RSDB Scenario 4	Description	Bluetooth Emission	2.4GHz Emission	5 GHz Emission
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO	Antenna	ANT1	ANT2	Ant All
	Channel	78	11	36
	Data Rate	1 Mbps	MCS0	MCS0
	Mode	GFSK	802.11ax(HE20)	802.11ax(HE20)
	Tone, RU	N/A	106, 53	106, 53

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

6. SC-54E, SCG29 were tested and the worst case results are reported.

(Worst case: SC-54E)

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. SC-54E, SCG29 were tested and the worst case results are reported.

(Worst case: SC-54E)

Conducted test

1. The EUT was configured with data rate of highest power.
  - GFSK : DH5
  - $\pi/4$ DQPSK : 2-DH5
  - 8DPSK : 3-DH5
2. AFH & Non-AFH were tested and the worst case results are reported.  
(Worst case : Non-AFH)
3. SC-54E, SCG29 were tested and the worst case results are reported.  
(Worst case: SC-54E)

## 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)	
Low	2402	18.999	79.41	125
Mid	2441	18.786	75.61	
High	2480	18.604	72.51	

Channel	Frequency (MHz)	Output Power (8DPSK)		Limit (mW)
		(dBm)	(mW)	
Low	2402	19.363	86.36	125
Mid	2441	19.075	80.82	
High	2480	18.808	76.00	

Channel	Frequency (MHz)	Output Power ( $\pi/4$ DQPSK)		Limit (mW)
		(dBm)	(mW)	
Low	2402	18.866	77.02	125
Mid	2441	18.943	78.40	
High	2480	18.504	70.86	



[Ant.2]

Channel	Frequency (MHz)	Output Power (GFSK)		Limit (mW)
		(dBm)	(mW)	
Low	2402	17.313	53.86	125
Mid	2441	17.749	59.55	
High	2480	16.280	42.46	

Channel	Frequency (MHz)	Output Power (8DPSK)		Limit (mW)
		(dBm)	(mW)	
Low	2402	17.451	55.60	125
Mid	2441	18.007	63.20	
High	2480	16.275	42.41	

Channel	Frequency (MHz)	Output Power ( $\pi/4$ DQPSK)		Limit (mW)
		(dBm)	(mW)	
Low	2402	16.976	49.84	125
Mid	2441	17.669	58.47	
High	2480	15.908	38.98	

[Dual Ant.1 + Ant. 2]

Channel	Frequency (MHz)	GFSK						Limit (mW)
		Dual Ant. 1		Dual Ant. 2		Dual(Ant. 1 + Ant. 2)		
		(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)	
Low	2402	14.580	28.71	12.321	17.06	16.606	45.77	125
Mid	2441	14.884	30.79	13.788	23.92	17.381	54.71	
High	2480	13.827	24.14	13.124	20.53	16.500	44.67	

Channel	Frequency (MHz)	8DPSK						Limit (mW)
		Dual Ant. 1		Dual Ant. 2		Dual(Ant. 1 + Ant. 2)		
		(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)	
Low	2402	14.429	27.73	12.520	17.86	16.589	45.59	125
Mid	2441	14.416	27.64	13.670	23.28	17.069	50.92	
High	2480	13.362	21.69	12.819	19.14	16.109	40.83	

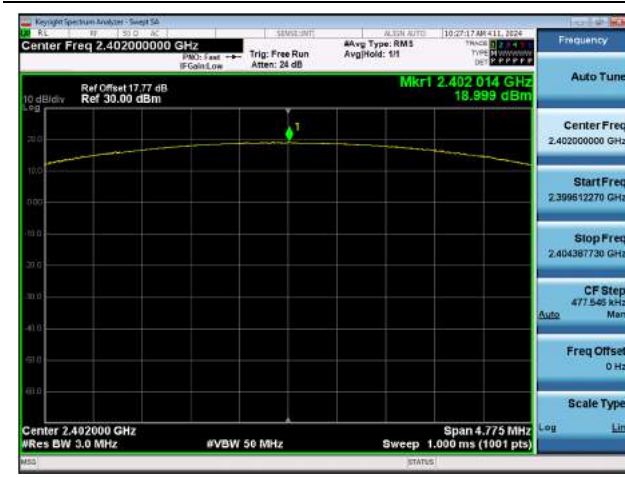
Channel	Frequency (MHz)	$\pi/4$ DQPSK						Limit (mW)
		Dual Ant. 1		Dual Ant. 2		Dual(Ant. 1 + Ant. 2)		
		(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)	
Low	2402	13.970	24.95	12.550	17.99	16.328	42.93	125
Mid	2441	14.026	25.27	13.687	23.37	16.870	48.64	
High	2480	12.965	19.79	12.817	19.13	15.902	38.92	

TEST PLOTS

Note:

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

ANT.1 GFSK : Peak Power (CH. 0)



ANT.2 GFSK : Peak Power (CH. 39)



ANT.1 8DPSK : Peak Power (CH. 0)



ANT.2 8DPSK : Peak Power (CH. 39)



ANT.1  $\pi/4$ DQPSK : Peak Power (CH. 39)



ANT.2  $\pi/4$ DQPSK : Peak Power (CH. 39)



[Dual ANT]

Dual ANT.1 GFSK : Peak Power (CH. 39)



Dual ANT.2 GFSK : Peak Power (CH. 39)



Dual ANT.1 8DPSK : Peak Power (CH. 39)



Dual ANT.2 8DPSK : Peak Power (CH. 39)



Dual ANT.1  $\pi$ /4QPSK : Peak Power (CH. 39)



Dual ANT.2  $\pi$ /4QPSK : Peak Power (CH. 39)



## 10.2 BAND EDGES

### [Ant. 1]

#### Without hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	58.672	49.702	47.002	20
Upper	61.231	60.711	58.029	

#### With hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	58.547	51.801	47.724	20
Upper	64.583	60.989	61.662	

### [Ant. 2]

#### Without hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	56.258	55.065	56.999	20
Upper	62.092	58.769	59.256	

#### With hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	55.737	55.824	58.280	20
Upper	61.594	57.489	58.822	

**[Dual Ant. 1]**
Without hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	56.280	42.127	42.948	20
Upper	58.944	54.587	55.224	

With hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	57.476	42.214	42.133	20
Upper	60.164	55.010	55.871	

**[Dual Ant. 2]**
Without hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	56.991	37.210	36.970	20
Upper	60.487	43.340	43.542	

With hopping

Outside Frequency Band	GFSK	8DPSK	$\pi/4$ DQPSK	Limit (dBc)
	(dB)	(dB)	(dB)	
Lower	56.154	37.084	37.077	20
Upper	60.493	43.796	43.410	



▣ TEST PLOTS

**Note :**

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

**-Without hopping**

ANT.1  $\pi/4$ DQPSK Band Edge(CH.0)



ANT.1  $\pi/4$ DQPSK Band Edge(CH.78)



ANT.2 8DPSK Band Edge(CH.0)



ANT.2 8DPSK Band Edge(CH.78)



Dual ANT.1 8DPSK Band Edge(CH.0)



Dual ANT.1 8DPSK Band Edge(CH.78)



Dual ANT.2  $\pi/4$ DQPSK Band Edge(CH.0)



Dual ANT.2 8DPSK Band Edge(CH.78)





-With hopping

ANT.1  $\pi$ /4QPSK Band Edge(CH.0)



ANT.1 8DPSK Band Edge(CH.78)



ANT.2 GFSK Band Edge(CH.0)



ANT.2 8DPSK Band Edge(CH.78)



Dual ANT.1  $\pi$ /4DQPSK Band Edge(CH.0)



Dual ANT.1 8DPSK Band Edge(CH.78)



Dual ANT.2  $\pi$ /4DQPSK Band Edge(CH.0)



Dual ANT.2  $\pi$ /4DQPSK Band Edge(CH.78)



**10.3 FREQUENCY SEPARATION / OCCUPIED BANDWIDTH (99 % BW)**

[Ant.1]

99 % BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	852.21	1183.1	1178.2
CH.39	850.73	1180.4	1176.4
CH.78	850.95	1182.4	1179.0

20 dB BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	955.1	1313	1326
CH.39	953.5	1312	1325
CH.78	957.3	1314	1328

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

[Ant.2]

99 % BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	850.82	1181.6	1180.3
CH.39	847.95	1180.9	1175.7
CH.78	849.27	1181.5	1177.8

20 dB BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	956.1	1313	1324
CH.39	955.3	1313	1324
CH.78	956.0	1311	1324

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

[Dual Ant.1]

99 % BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	881.53	1187.4	1185.5
CH.39	891.50	1189.5	1182.8
CH.78	909.81	1197.4	1190.3

20 dB BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	967.0	1313	1328
CH.39	1004	1323	1332
CH.78	1041	1319	1326

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

[Dual Ant.2]

99 % BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	879.47	1241.4	1254.8
CH.39	894.69	1342.2	1362.6
CH.78	918.20	1572.0	1647.6

20 dB BW (kHz)			
Channel	GFSK	8DPSK	$\pi/4$ DQPSK
CH.0	965.5	1327	1355
CH.39	1025	1339	1362
CH.78	1040	1345	1370

Channel Separation(kHz)			Limit (kHz)
GFSK	8DPSK	$\pi/4$ DQPSK	
1001	998	991	>25 kHz or >2/3 of the 20 dB BW

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

**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. 78)



ANT. 2 GFSK 20 dB BW & 99% OBW (CH. 0)



ANT. 1  $\pi/4$ DQPSK 20 dB BW & 99% OBW (CH. 78)



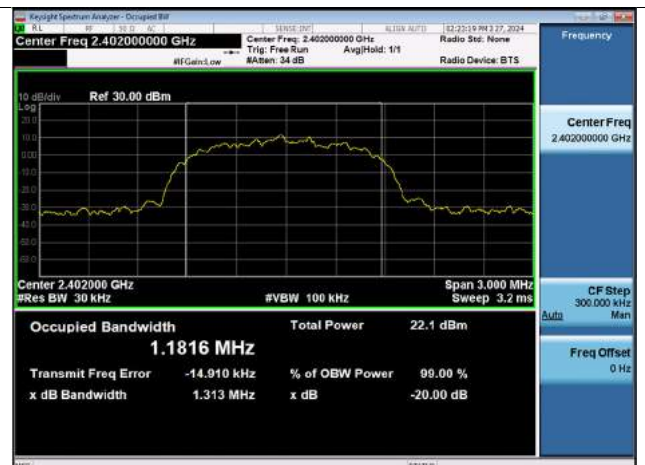
ANT. 2  $\pi/4$ DQPSK 20 dB BW & 99% OBW (CH. 0)



ANT. 1 8DPSK 20 dB BW & 99% OBW (CH. 78)



ANT. 2 8DPSK 20 dB BW & 99% OBW (CH. 0)





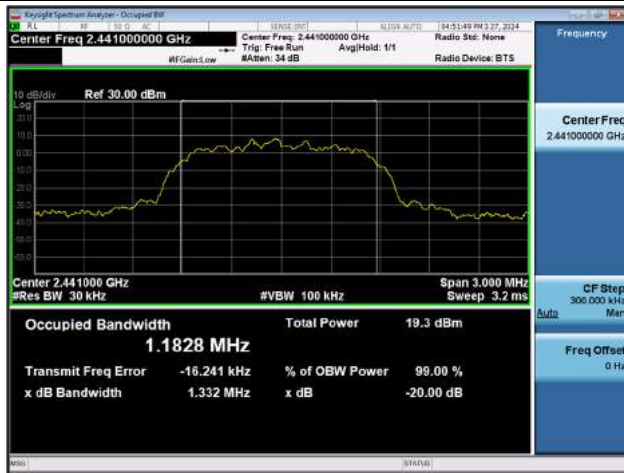
Dual ANT. 1 GFSK 20 dB BW & 99% OBW (CH. 78)



Dual ANT. 2 GFSK 20 dB BW & 99% OBW (CH. 78)



Dual ANT. 1  $\pi$ /4DQPSK 20 dB BW & 99% OBW (CH. 39)



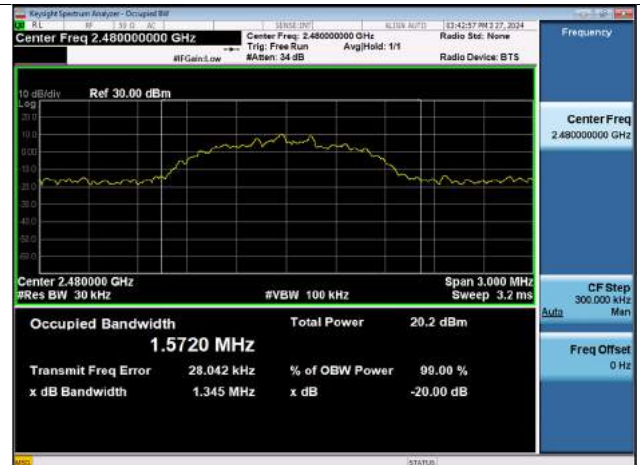
Dual ANT. 2  $\pi$ /4DQPSK 20 dB BW & 99% OBW (CH. 78)



Dual ANT. 1 8DPSK 20 dB BW & 99% OBW (CH. 39)



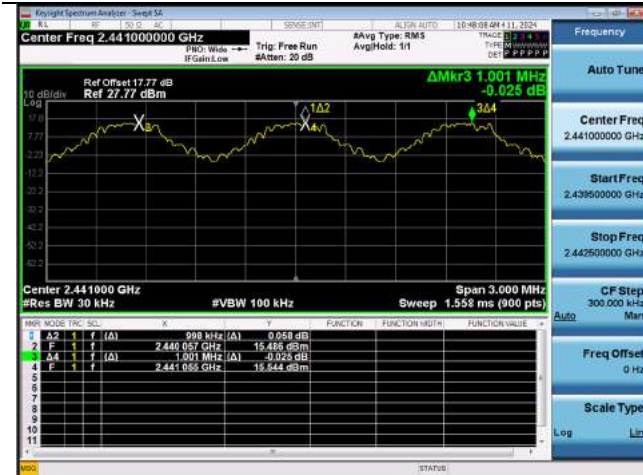
Dual ANT. 2 8DPSK 20 dB BW & 99% OBW (CH. 78)





TEST PLOTS(Channel Separaton)

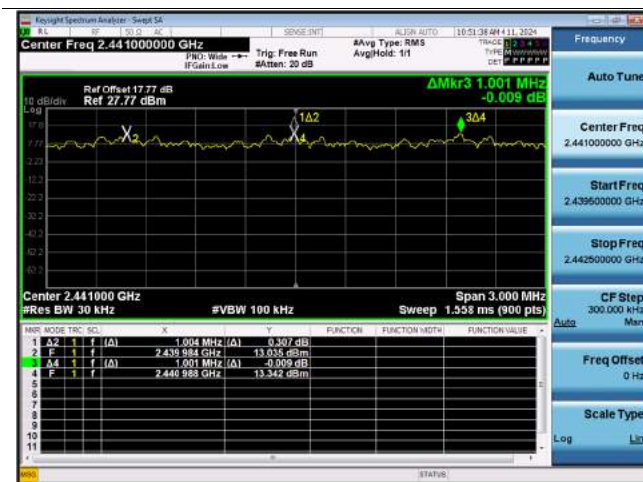
ANT. 1 GFSK : Channel Separation



ANT. 2 GFSK : Channel Separation



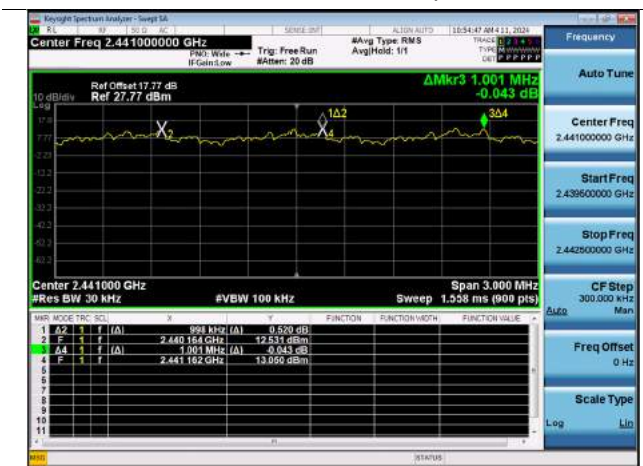
ANT. 1  $\pi$ /4DQPSK : Channel Separation



ANT. 2  $\pi$ /4DQPSK : Channel Separation



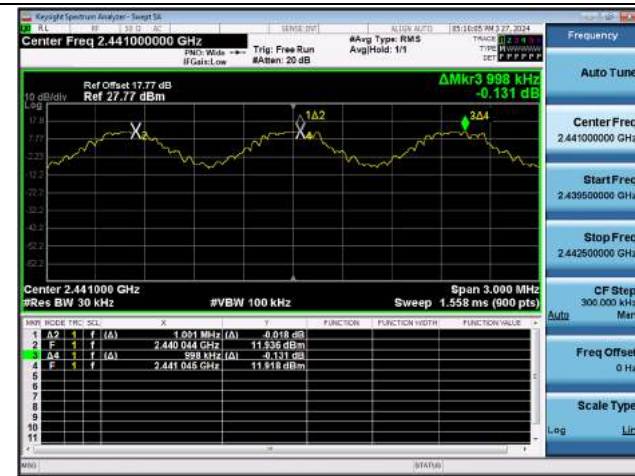
ANT. 1 8DPSK : Channel Separation



ANT. 2 8DPSK : Channel Separation



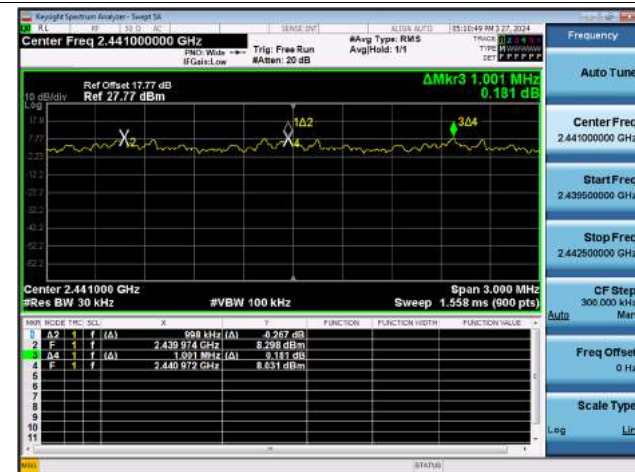
Dual ANT. 1 GFSK : Channel Separation



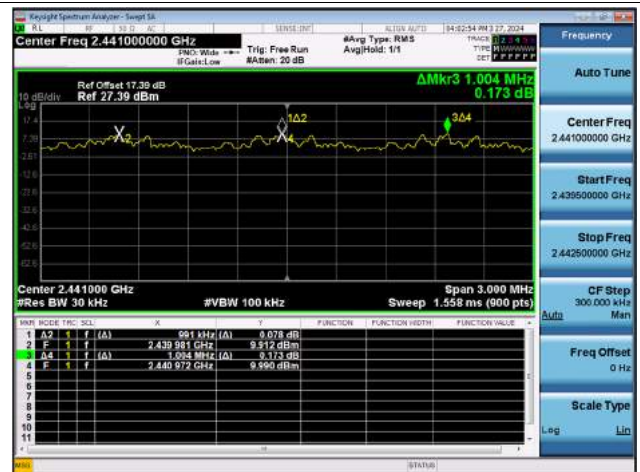
Dual ANT. 2 GFSK : Channel Separation



Dual ANT. 1  $\pi/4$ DQPSK : Channel Separation



Dual ANT. 2  $\pi/4$ DQPSK : Channel Separation



Dual ANT. 1 8DPSK : Channel Separation



Dual ANT. 2 8DPSK : Channel Separation



#### 10.4 NUMBER OF HOPPING FREQUENCY

[Ant.1]

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

[Ant.2]

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

[Dual Ant.1]

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

[Dual Ant.2]

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

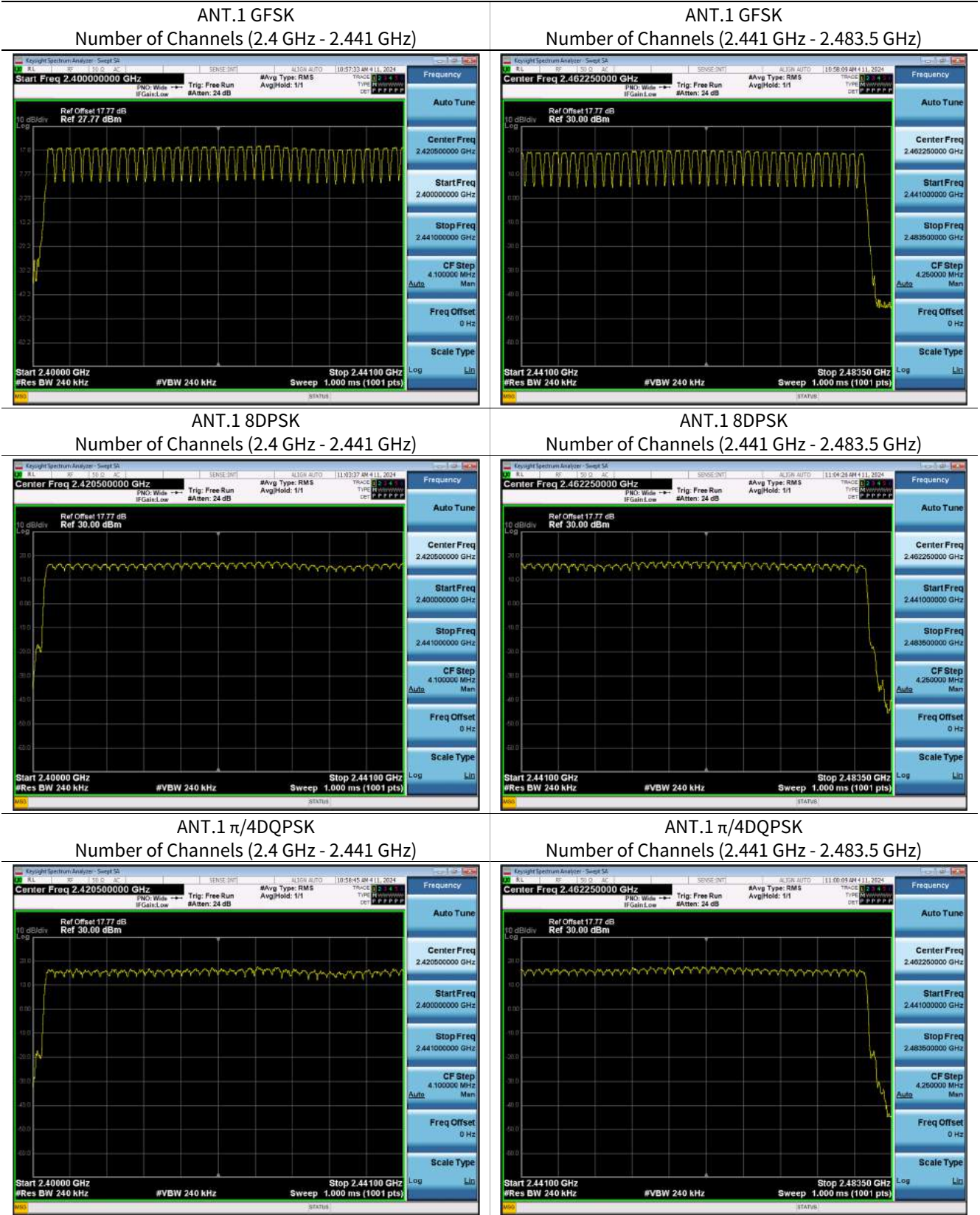
Note :

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

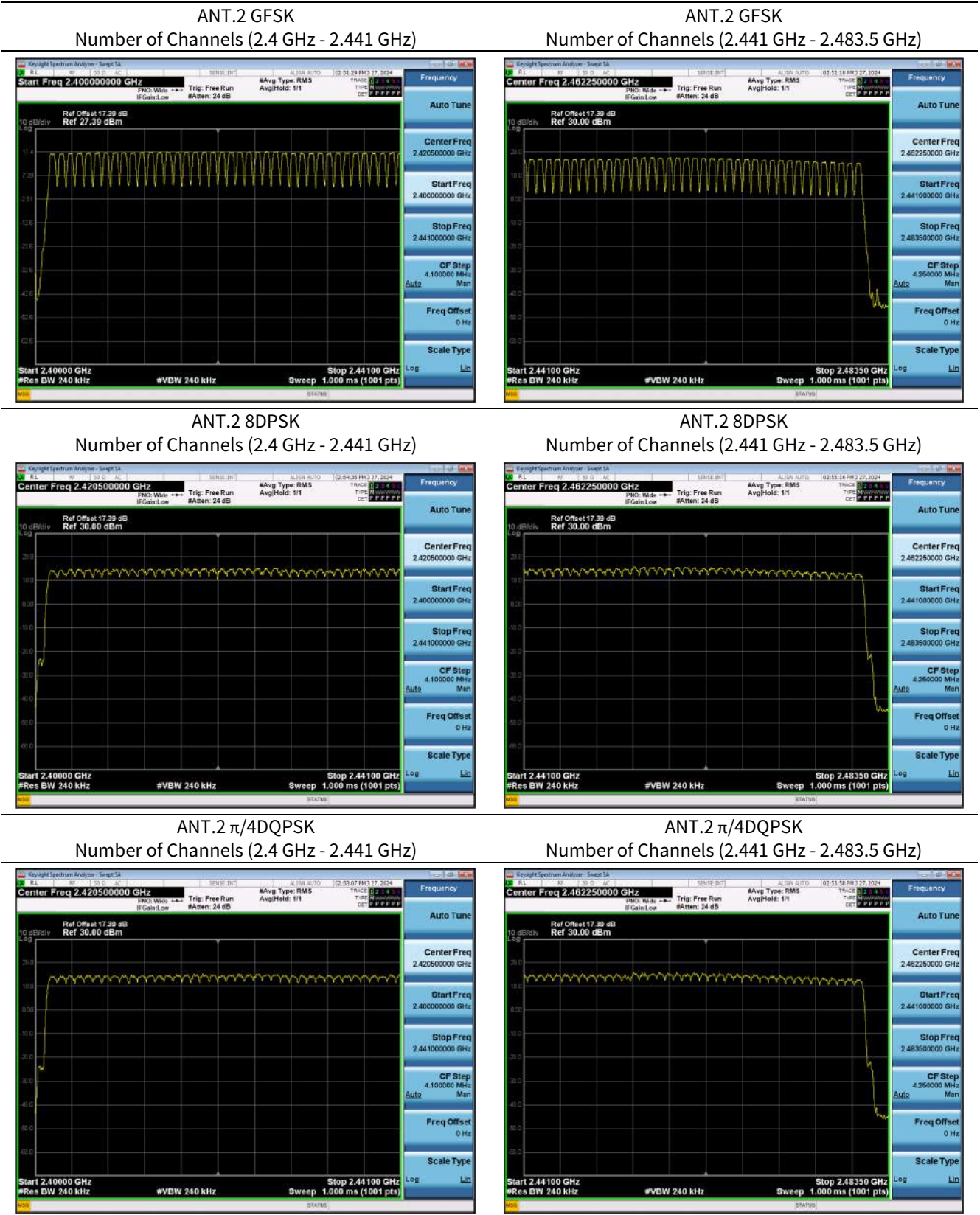


TEST PLOTS

[ANT.1]

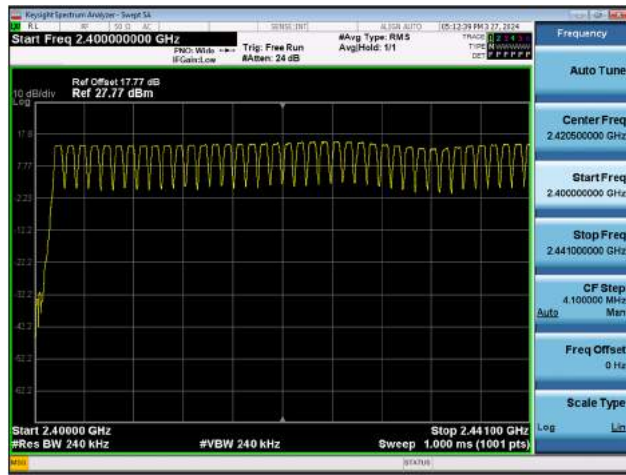


[ANT.2]

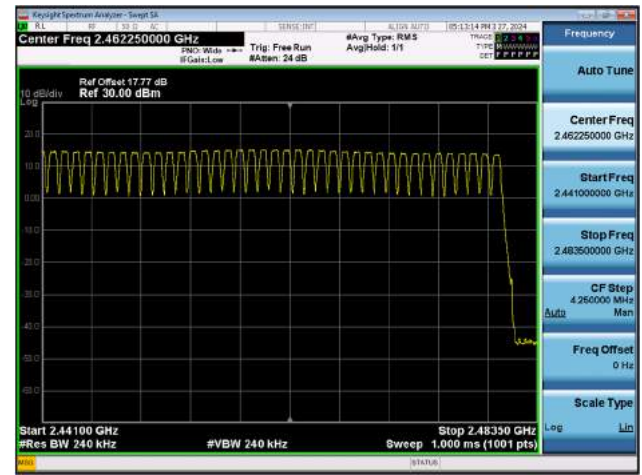


[Dual ANT.1]

Dual ANT.1 GFSK  
Number of Channels (2.4 GHz - 2.441 GHz)



Dual ANT.1 GFSK  
Number of Channels (2.441 GHz - 2.483.5 GHz)



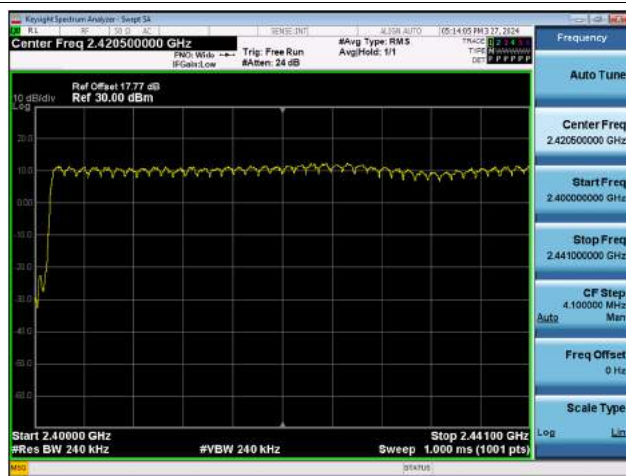
Dual ANT.1 8DPSK  
Number of Channels (2.4 GHz - 2.441 GHz)



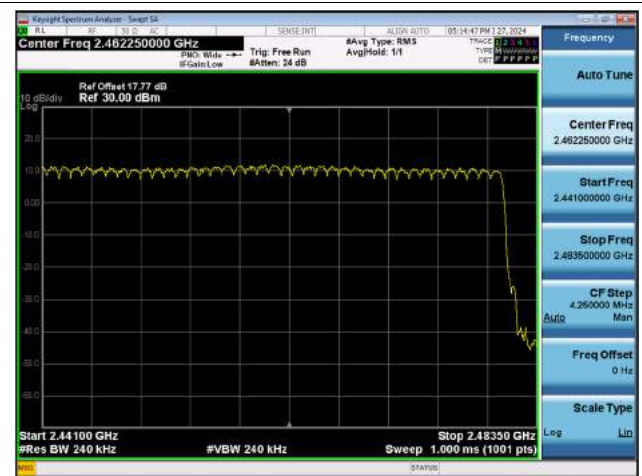
Dual ANT.1 8DPSK  
Number of Channels (2.441 GHz - 2.483.5 GHz)



Dual ANT.1  $\pi/4$ DQPSK  
Number of Channels (2.4 GHz - 2.441 GHz)



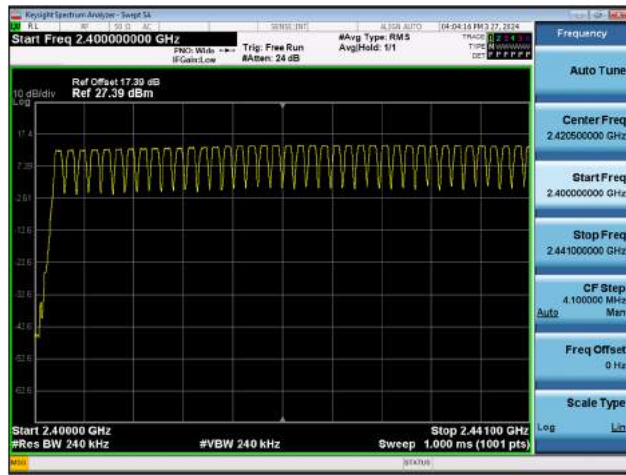
Dual ANT.1  $\pi/4$ DQPSK  
Number of Channels (2.441 GHz - 2.483.5 GHz)



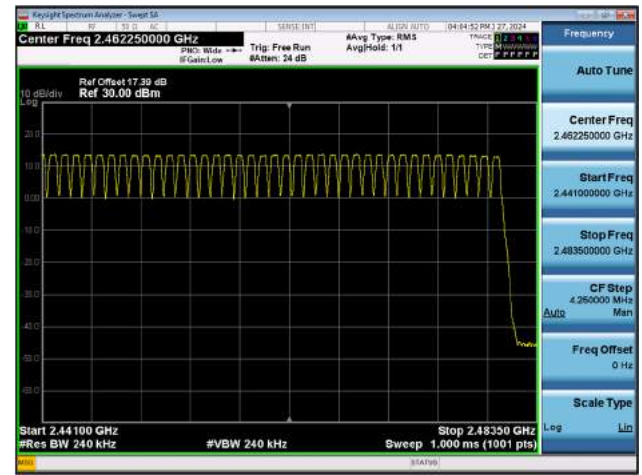


[Dual ANT.2]

Dual ANT.2 GFSK  
Number of Channels (2.4 GHz - 2.441 GHz)



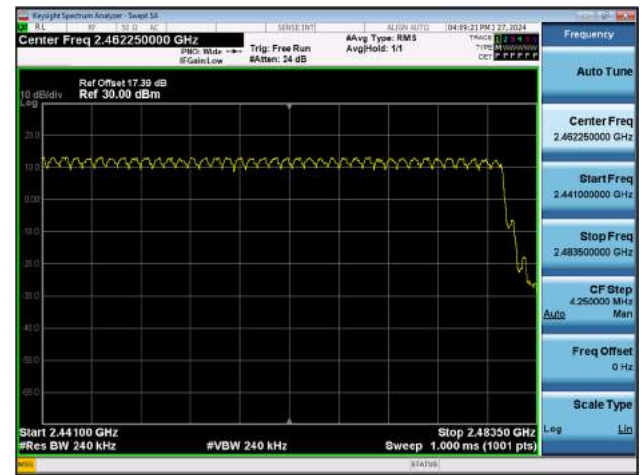
Dual ANT.2 GFSK  
Number of Channels (2.441 GHz - 2.483.5 GHz)



Dual ANT.2 8DPSK  
Number of Channels (2.4 GHz - 2.441 GHz)



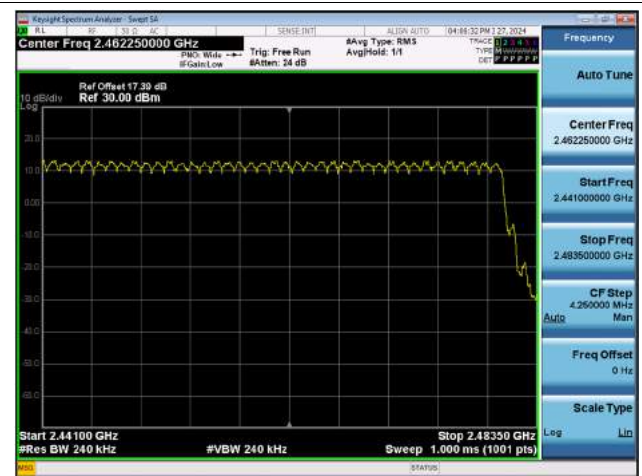
Dual ANT.2 8DPSK  
Number of Channels (2.441 GHz - 2.483.5 GHz)



Dual ANT.2  $\pi/4$ DQPSK  
Number of Channels (2.4 GHz - 2.441 GHz)



Dual ANT.2  $\pi/4$ DQPSK  
Number of Channels (2.441 GHz - 2.483.5 GHz)



**10.5 TIME OF OCCUPANCY (DWELL TIME)**

[Ant.1]

Pulse Time (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK
	Low	2.890	2.890	2.890
	Mid	2.890	2.890	2.890
	High	2.890	2.890	2.890

**Non-AFH Mode**

Total of Dwell (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
	Low	308.27	308.27	308.27	31.6	400
	Mid	308.27	308.27	308.27	31.6	
	High	308.27	308.27	308.27	31.6	

**AFH Mode**

Total of Dwell (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
	Low	154.13	154.13	154.13	8.0	400
	Mid	154.13	154.13	154.13	8.0	
	High	154.13	154.13	154.13	8.0	



[Ant.2]

Pulse Time (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK
	Low	2.890	2.890	2.890
	Mid	2.885	2.890	2.890
	High	2.890	2.890	2.890

**Non-AFH Mode**

Total of Dwell (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
	Low	308.27	308.27	308.27	31.6	400
	Mid	307.73	308.27	308.27	31.6	
	High	308.27	308.27	308.27	31.6	

**AFH Mode**

Total of Dwell (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
	Low	154.13	154.13	154.13	8.0	400
	Mid	153.87	154.13	154.13	8.0	
	High	154.13	154.13	154.13	8.0	

[Dual Ant.1]

	Channel	GFSK	8DPSK	$\pi/4$ DQPSK
Pulse Time (ms)	Low	2.890	2.890	2.890
	Mid	2.890	2.890	2.890
	High	2.890	2.890	2.885

**Non-AFH Mode**

	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Low	308.27	308.27	308.27	31.6	400
	Mid	308.27	308.27	308.27	31.6	
	High	308.27	308.27	307.73	31.6	

**AFH Mode**

	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
Total of Dwell (ms)	Low	154.13	154.13	154.13	8.0	400
	Mid	154.13	154.13	154.13	8.0	
	High	154.13	154.13	153.87	8.0	

[Dual Ant.2]

Pulse Time (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK
	Low	2.885	2.890	2.890
	Mid	2.890	2.890	2.890
	High	2.885	2.890	2.890

**Non-AFH Mode**

Total of Dwell (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
	Low	307.73	308.27	308.27	31.6	400
	Mid	308.27	308.27	308.27	31.6	
	High	307.73	308.27	308.27	31.6	

**AFH Mode**

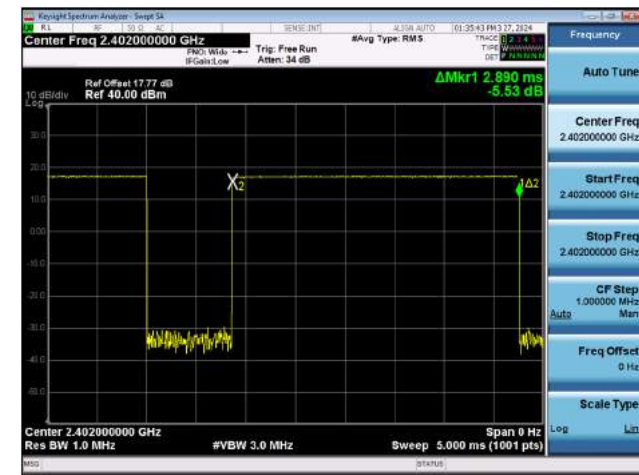
Total of Dwell (ms)	Channel	GFSK	8DPSK	$\pi/4$ DQPSK	Period Time (s)	Limit (ms)
	Low	153.87	154.13	154.13	8.0	400
	Mid	154.13	154.13	154.13	8.0	
	High	153.87	154.13	154.13	8.0	

TEST PLOTS

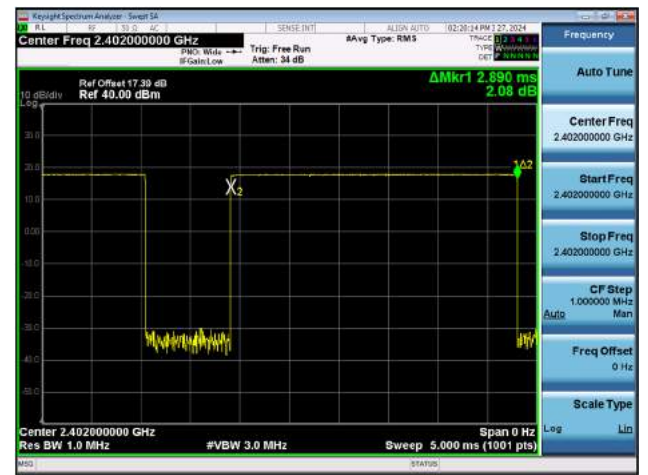
**Note:**

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

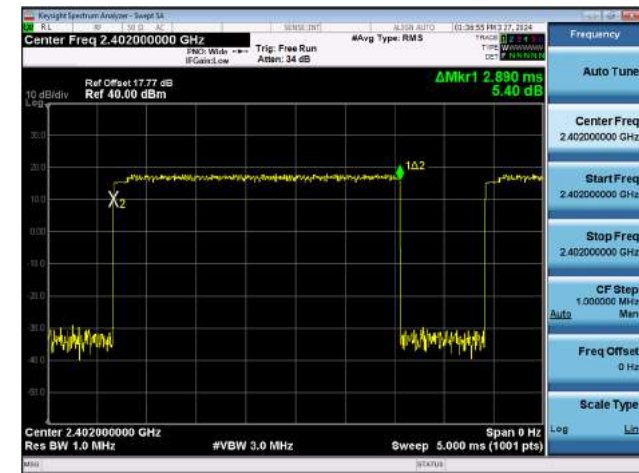
ANT.1 GFSK : Dwell Time(Ch. 0)



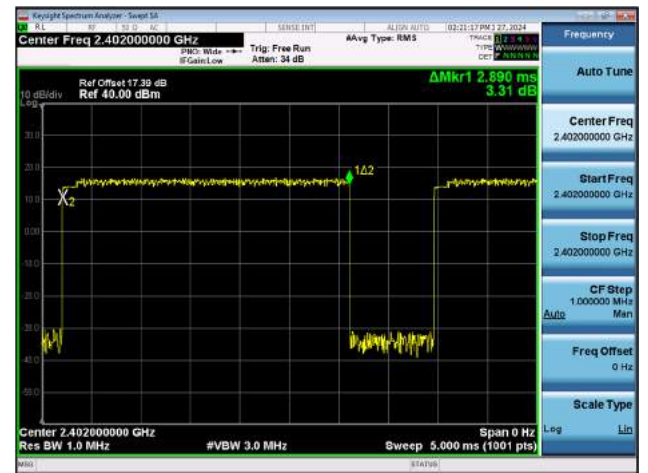
ANT.2 GFSK : Dwell Time(Ch. 0)



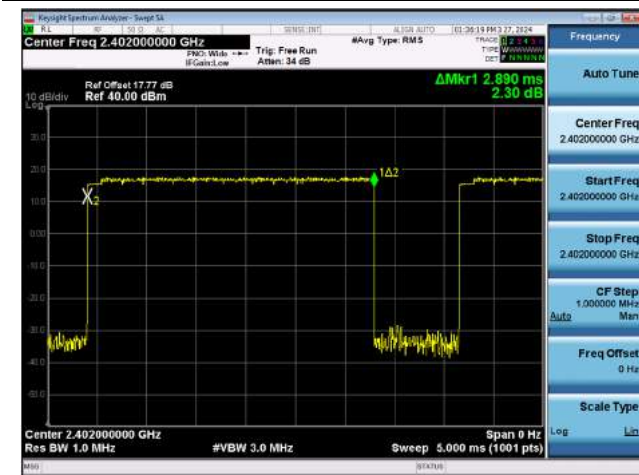
ANT.1 8DPSK : Dwell Time(Ch. 0)



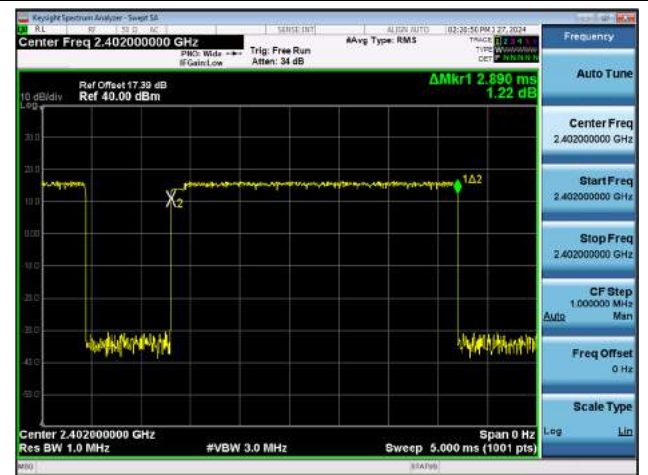
ANT.2 8DPSK : Dwell Time(Ch. 0)



ANT.1  $\pi/4$ DQPSK : Dwell Time(Ch. 0)



ANT.2  $\pi/4$ DQPSK : Dwell Time(Ch. 0)



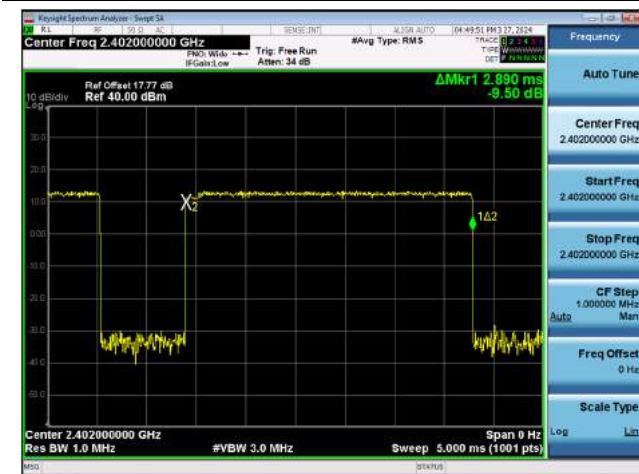
Dual ANT.1 GFSK : Dwell Time(Ch. 0)



Dual ANT.2 GFSK : Dwell Time(Ch. 0)



Dual ANT.1 8DPSK : Dwell Time(Ch. 0)



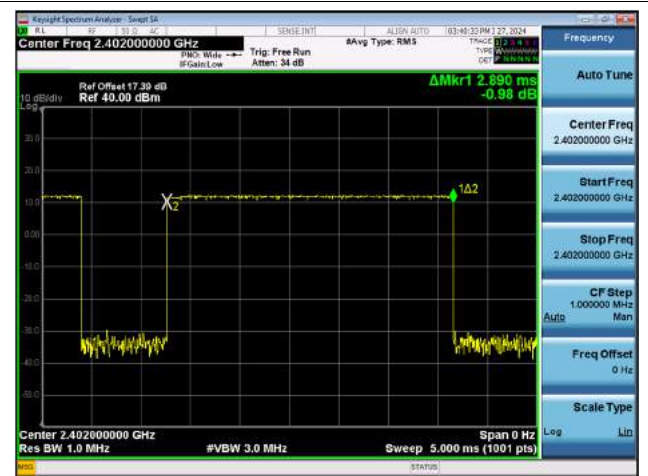
Dual ANT.2 8DPSK : Dwell Time(Ch. 0)



Dual ANT.1  $\pi/4$ DQPSK : Dwell Time(Ch. 0)



Dual ANT.2  $\pi/4$ DQPSK : Dwell Time(Ch. 0)



## 10.6 SPURIOUS EMISSIONS

### 10.6.1 CONDUCTED SPURIOUS EMISSIONS

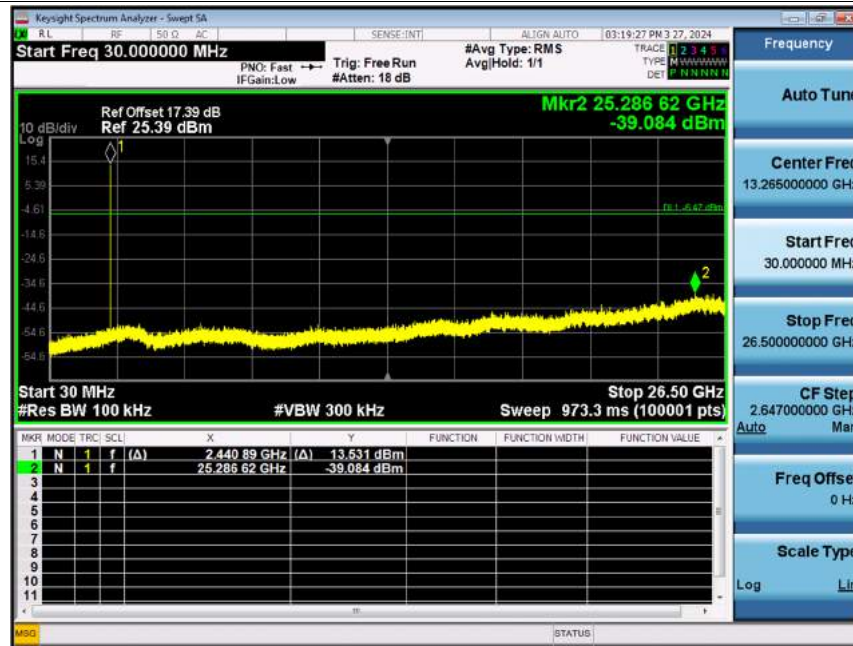
In order to simplify the report, attached plots were only the worst case channel and data rate.

#### TEST PLOTS

Spurious Emission (30 MHz – 26.50 GHz) Ant.1, 8DPSK\_CH. 0



Spurious Emission (30 MHz – 26.50 GHz) Ant.2, 8DPSK\_CH.39

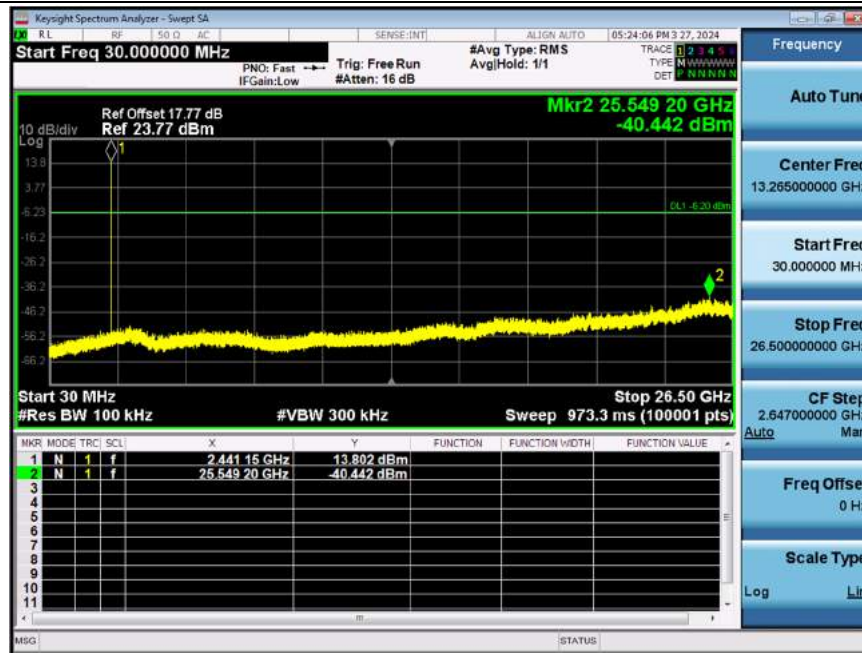


#### Note

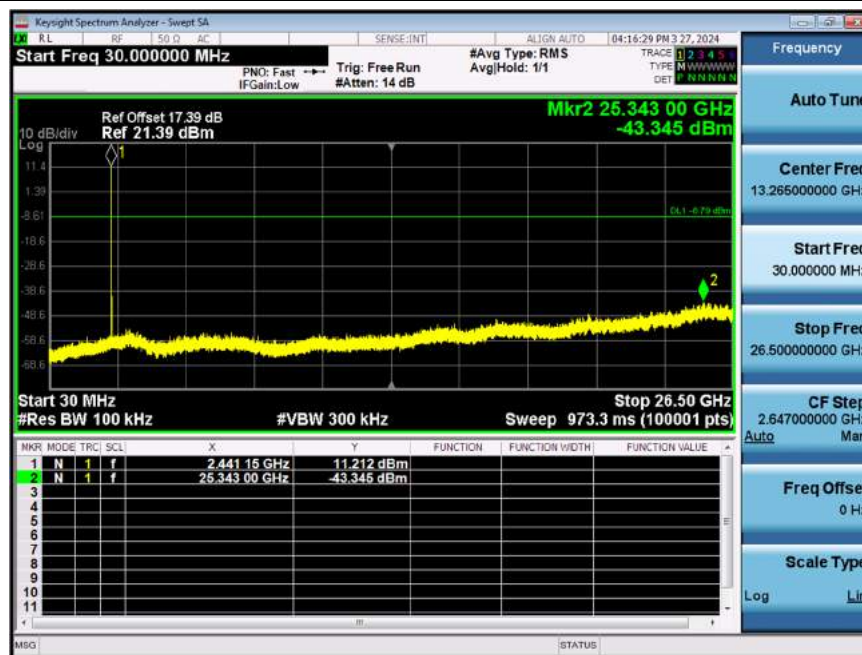
1. Ant.1 Limit (dBm): -5.381, Ant.2 Limit (dBm): -6.469



Spurious Emission (30 MHz – 26.50 GHz) Dual Ant.1, GFSK\_CH.39



Spurious Emission (30 MHz – 26.50 GHz) Dual Ant.2, GFSK\_CH.39



Note

1. Dual Ant.1 Limit (dBm): -6.198, Dual Ant.2 Limit (dBm): -8.788

### 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]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB $\mu$ V/m]	[dB $\mu$ 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 $\mu$ V) + 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]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB $\mu$ V/m]	[dB $\mu$ 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.
2. Radiated test is performed with hopping off.



Frequency Range : Above 1 GHz

**[Ant.1]**

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz
Channel No	CH. 0

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4804	44.16	2.94	V	0.00	47.10	73.98	26.88	PK
4804	44.16	2.94	V	-24.73	22.37	53.98	31.61	AV
7206	42.16	9.79	V	0.00	51.95	73.98	22.03	PK
7206	42.16	9.79	V	-24.73	27.22	53.98	26.76	AV
4804	44.34	2.94	H	0.00	47.28	73.98	26.70	PK
4804	44.34	2.94	H	-24.73	22.55	53.98	31.43	AV
7206	42.44	9.79	H	0.00	52.23	73.98	21.75	PK
7206	42.44	9.79	H	-24.73	27.50	53.98	26.48	AV

Operation Mode	Normal(GFSK)
Operating Frequency	2441 MHz
Channel No	CH. 39

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4882	42.55	3.59	V	0.00	46.14	73.98	27.84	PK
4882	42.55	3.59	V	-24.73	21.41	53.98	32.57	AV
7323	41.09	10.28	V	0.00	51.37	73.98	22.61	PK
7323	41.09	10.28	V	-24.73	26.64	53.98	27.34	AV
4882	42.71	3.59	H	0.00	46.30	73.98	27.68	PK
4882	42.71	3.59	H	-24.73	21.57	53.98	32.41	AV
7323	41.39	10.28	H	0.00	51.67	73.98	22.31	PK
7323	41.39	10.28	H	-24.73	26.94	53.98	27.04	AV

Operation Mode            Normal(GFSK)  
 Operating Frequency      2480 MHz  
 Channel No                CH. 78

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	42.28	2.96	V	0.00	45.24	73.98	28.74	PK
4960	42.28	2.96	V	-24.73	20.51	53.98	33.47	AV
7440	42.16	10.60	V	0.00	52.76	73.98	21.22	PK
7440	42.16	10.60	V	-24.73	28.03	53.98	25.95	AV
4960	42.76	2.96	H	0.00	45.72	73.98	28.26	PK
4960	42.76	2.96	H	-24.73	20.99	53.98	32.99	AV
7440	42.66	10.60	H	0.00	53.26	73.98	20.72	PK
7440	42.66	10.60	H	-24.73	28.53	53.98	25.45	AV

**[Ant.2]**

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz
Channel No	CH. 0

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
4804	43.26	2.94	V	0.00	46.20	73.98	27.78	PK
4804	43.26	2.94	V	-24.73	21.47	53.98	32.51	AV
7206	41.49	9.79	V	0.00	51.28	73.98	22.70	PK
7206	41.49	9.79	V	-24.73	26.55	53.98	27.43	AV
4804	43.63	2.94	H	0.00	46.57	73.98	27.41	PK
4804	43.63	2.94	H	-24.73	21.84	53.98	32.14	AV
7206	41.23	9.79	H	0.00	51.02	73.98	22.96	PK
7206	41.23	9.79	H	-24.73	26.29	53.98	27.69	AV

Operation Mode	Normal(GFSK)
Operating Frequency	2441 MHz
Channel No	CH. 39

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
4882	42.91	3.59	V	0.00	46.50	73.98	27.48	PK
4882	42.91	3.59	V	-24.73	21.77	53.98	32.21	AV
7323	40.94	10.28	V	0.00	51.22	73.98	22.76	PK
7323	40.94	10.28	V	-24.73	26.49	53.98	27.49	AV
4882	42.76	3.59	H	0.00	46.35	73.98	27.63	PK
4882	42.76	3.59	H	-24.73	21.62	53.98	32.36	AV
7323	41.08	10.28	H	0.00	51.36	73.98	22.62	PK
7323	41.08	10.28	H	-24.73	26.63	53.98	27.35	AV

Operation Mode            Normal(GFSK)  
 Operating Frequency      2480 MHz  
 Channel No                 CH. 78

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	42.70	2.96	V	0.00	45.66	73.98	28.32	PK
4960	42.70	2.96	V	-24.73	20.93	53.98	33.05	AV
7440	41.69	10.60	V	0.00	52.29	73.98	21.69	PK
7440	41.69	10.60	V	-24.73	27.56	53.98	26.42	AV
4960	42.58	2.96	H	0.00	45.54	73.98	28.44	PK
4960	42.58	2.96	H	-24.73	20.81	53.98	33.17	AV
7440	42.02	10.60	H	0.00	52.62	73.98	21.36	PK
7440	42.02	10.60	H	-24.73	27.89	53.98	26.09	AV

**[Dual Ant.1+ Ant.2]**

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz
Channel No	CH. 0

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
4804	43.87	2.94	V	0.00	46.81	73.98	27.17	PK
4804	43.87	2.94	V	-24.73	22.08	53.98	31.90	AV
7206	40.70	9.79	V	0.00	50.49	73.98	23.49	PK
7206	40.70	9.79	V	-24.73	25.76	53.98	28.22	AV
4804	43.99	2.94	H	0.00	46.93	73.98	27.05	PK
4804	43.99	2.94	H	-24.73	22.20	53.98	31.78	AV
7206	40.72	9.79	H	0.00	50.51	73.98	23.47	PK
7206	40.72	9.79	H	-24.73	25.78	53.98	28.20	AV

Operation Mode	Normal(GFSK)
Operating Frequency	2441 MHz
Channel No	CH. 39

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
4882	42.28	3.59	V	0.00	45.87	73.98	28.11	PK
4882	42.28	3.59	V	-24.73	21.14	53.98	32.84	AV
7323	41.52	10.28	V	0.00	51.80	73.98	22.18	PK
7323	41.52	10.28	V	-24.73	27.07	53.98	26.91	AV
4882	42.31	3.59	H	0.00	45.90	73.98	28.08	PK
4882	42.31	3.59	H	-24.73	21.17	53.98	32.81	AV
7323	41.53	10.28	H	0.00	51.81	73.98	22.17	PK
7323	41.53	10.28	H	-24.73	27.08	53.98	26.90	AV

Operation Mode	Normal(GFSK)
Operating Frequency	2480 MHz
Channel No	CH. 78

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
4960	42.96	2.96	V	0.00	45.92	73.98	28.06	PK
4960	42.96	2.96	V	-24.73	21.19	53.98	32.79	AV
7440	41.49	10.60	V	0.00	52.09	73.98	21.89	PK
7440	41.49	10.60	V	-24.73	27.36	53.98	26.62	AV
4960	43.18	2.96	H	0.00	46.14	73.98	27.84	PK
4960	43.18	2.96	H	-24.73	21.41	53.98	32.57	AV
7440	41.50	10.60	H	0.00	52.10	73.98	21.88	PK
7440	41.50	10.60	H	-24.73	27.37	53.98	26.61	AV

[DBS]

### Scenario 2

Dual Bluetooth DH5\_Ch.78 + Ant All(MIMO) 5 GHz 802.11ax(HE20)\_Ch.36\_106T\_RU53

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	43.62	2.96	V	0.00	46.58	73.98	27.40	PK
4960	43.62	2.96	V	-24.73	21.85	53.98	32.13	AV
7440	42.52	10.60	V	0.00	53.12	73.98	20.86	PK
7440	42.52	10.60	V	-24.73	28.39	53.98	25.59	AV
4960	44.18	2.96	H	0.00	47.14	73.98	26.84	PK
4960	44.18	2.96	H	-24.73	22.41	53.98	31.57	AV
7440	42.10	10.60	H	0.00	52.70	73.98	21.28	PK
7440	42.10	10.60	H	-24.73	27.97	53.98	26.01	AV

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

### Scenario 3

Dual Bluetooth DH5\_Ch.78 + Ant All(MIMO) 6 GHz 802.11ax(HE40)\_Ch.3\_484T\_RU65

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[dB/m]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
4960	<b>42.51</b>	<b>2.96</b>	<b>V</b>	<b>0.00</b>	<b>45.47</b>	<b>73.98</b>	<b>28.51</b>	<b>PK</b>
4960	<b>42.51</b>	<b>2.96</b>	<b>V</b>	<b>-24.73</b>	<b>20.74</b>	<b>53.98</b>	<b>33.24</b>	<b>AV</b>
7440	<b>41.69</b>	<b>10.60</b>	<b>V</b>	<b>0.00</b>	<b>52.29</b>	<b>73.98</b>	<b>21.69</b>	<b>PK</b>
7440	<b>41.69</b>	<b>10.60</b>	<b>V</b>	<b>-24.73</b>	<b>27.56</b>	<b>53.98</b>	<b>26.42</b>	<b>AV</b>
4960	<b>42.69</b>	<b>2.96</b>	<b>H</b>	<b>0.00</b>	<b>45.65</b>	<b>73.98</b>	<b>28.33</b>	<b>PK</b>
4960	<b>42.69</b>	<b>2.96</b>	<b>H</b>	<b>-24.73</b>	<b>20.92</b>	<b>53.98</b>	<b>33.06</b>	<b>AV</b>
7440	<b>41.80</b>	<b>10.60</b>	<b>H</b>	<b>0.00</b>	<b>52.40</b>	<b>73.98</b>	<b>21.58</b>	<b>PK</b>
7440	<b>41.80</b>	<b>10.60</b>	<b>H</b>	<b>-24.73</b>	<b>27.67</b>	<b>53.98</b>	<b>26.31</b>	<b>AV</b>

Note : UNII 6e RSDB Data refer to [UNII 6e] Test Report

**Scenario 4**

 Ant.1\_Bluetooth DH5\_Ch.78 + Ant.2\_2.4 GHz 802.11ax(HE20)\_Ch.11\_106T\_RU53 + Ant All(MIMO) 5 GHz  
 802.11ax(HE20)\_Ch.36\_106T\_RU53

Frequency	Measured Value	AF+CL-AG	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[dB/m]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
4960	42.75	2.96	V	0.00	45.71	73.98	28.27	PK
4960	42.75	2.96	V	-24.73	20.98	53.98	33.00	AV
7440	41.61	10.60	V	0.00	52.21	73.98	21.77	PK
7440	41.61	10.60	V	-24.73	27.48	53.98	26.50	AV
4960	42.68	2.96	H	0.00	45.64	73.98	28.34	PK
4960	42.68	2.96	H	-24.73	20.91	53.98	33.07	AV
7440	41.58	10.60	H	0.00	52.18	73.98	21.80	PK
7440	41.58	10.60	H	-24.73	27.45	53.98	26.53	AV

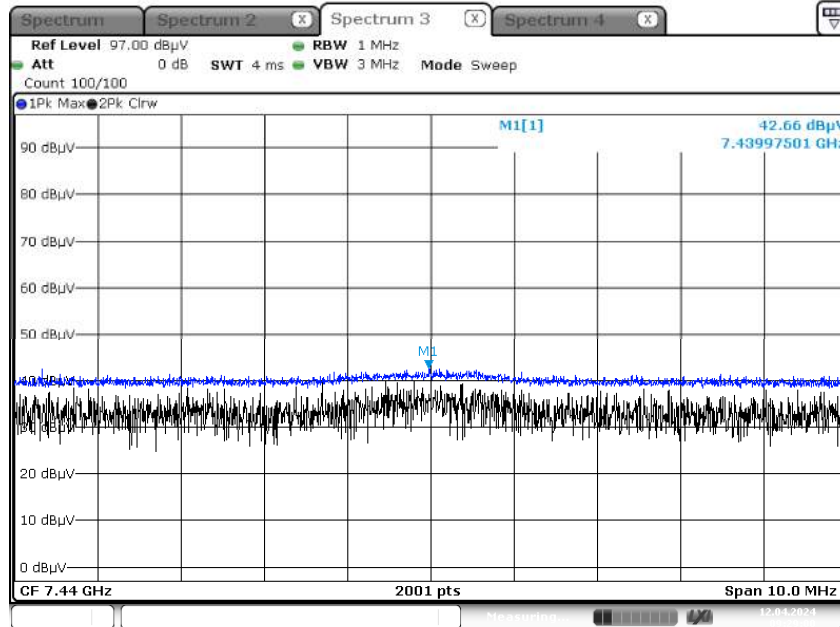
Note : DTS ax, UNII ax RSDB Data refer to [DTS ax], [UNII ax] Test Report



RESULT PLOTS

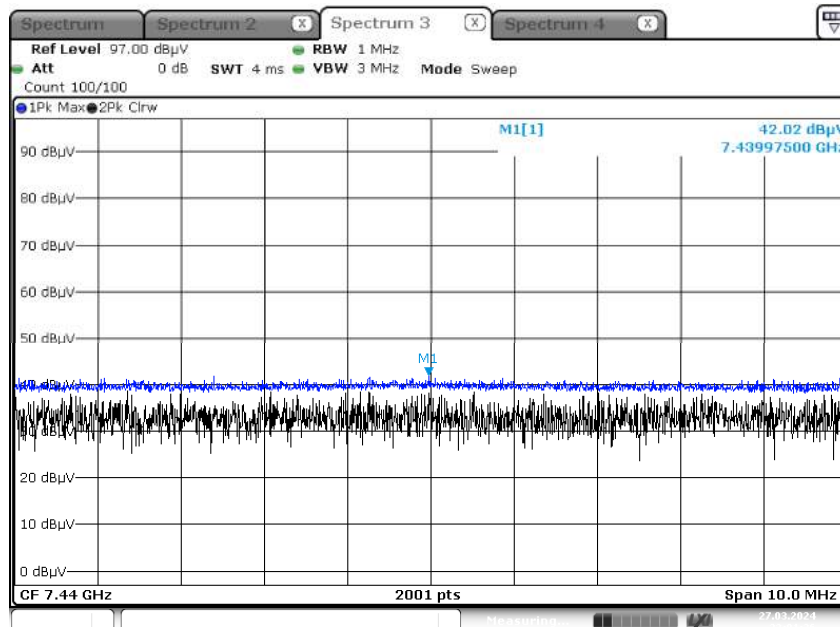
[Ant.1]

Radiated Spurious Emissions plot – Peak & Average Result (GFSK, Ch.78 3rd Harmonic, X-H)



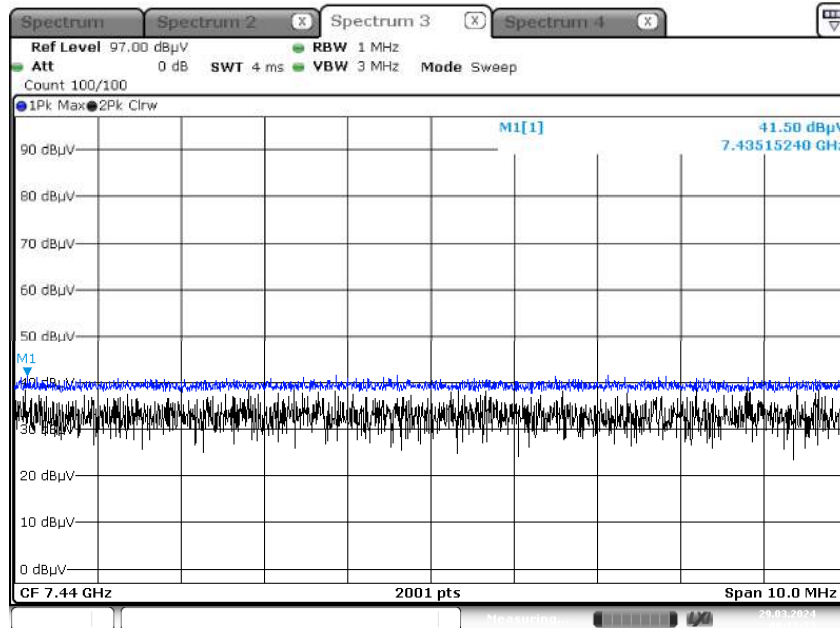
[Ant.2]

Radiated Spurious Emissions plot – Peak & Average Result (GFSK, Ch.78 3rd Harmonic, Y-H)



[Dual Ant.1+ Ant.2]

Radiated Spurious Emissions plot – Peak & Average Result (GFSK, Ch.78 3rd Harmonic, X-H)



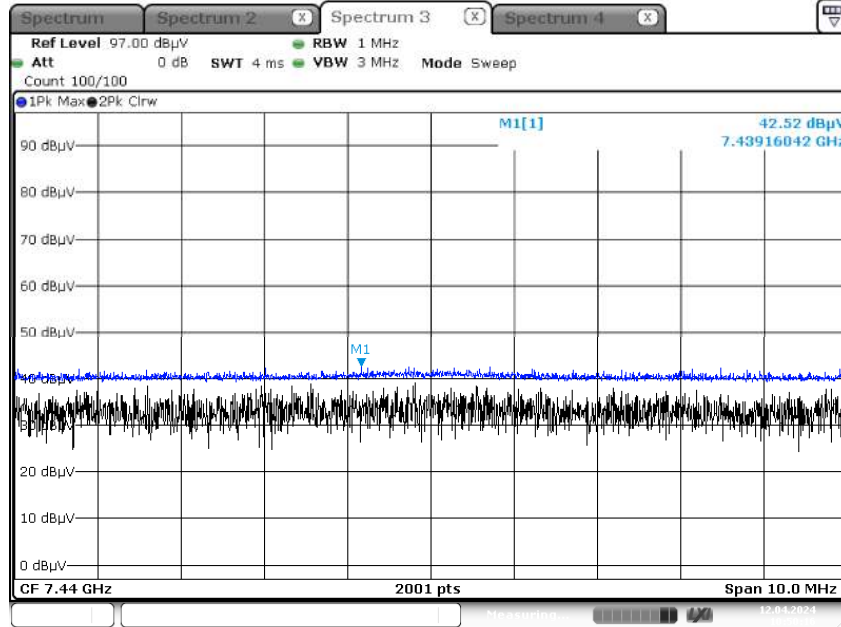
Date: 29.MAR.2024 09:12:23

[DBS]

Scenario 2

Dual Bluetooth DH5\_Ch.78 + Ant All(MIMO) 5 GHz 802.11ax(HE20)\_Ch.36\_106T\_RU53

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

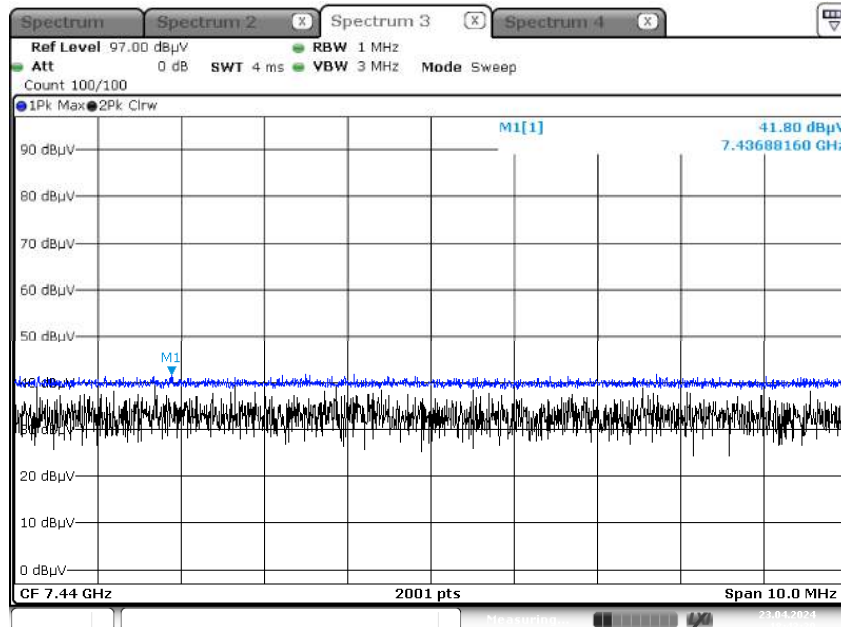


Date: 12.APR.2024 10:50:16

Scenario 3

Dual Bluetooth DH5\_Ch.78 + Ant All(MIMO) 6 GHz 802.11ax(HE40)\_Ch.3\_484T\_RU65

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

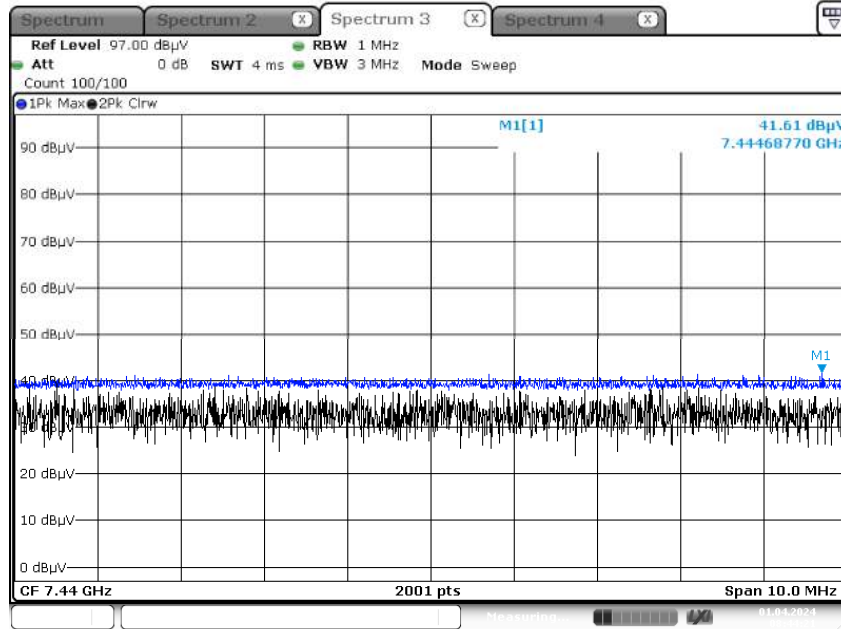


Date: 23.APR.2024 18:43:20

Scenario 4

Ant.1\_Bluetooth DH5\_Ch.78 + Ant.2\_2.4 GHz 802.11ax(HE20)\_Ch.11\_106T\_RU53 + Ant All(MIMO) 5 GHz 802.11ax(HE20)\_Ch.36\_106T\_RU53

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



Date: 1.APR.2024 08:44:21

Note: Plots of worst case are only reported.

### 10.6.3 RADIATED RESTRICTED BAND EDGES

[Ant.1]

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	54.95	H	0.00	54.95	73.98	19.03	PK
2390.0	54.95	H	-24.73	30.22	53.98	23.76	AV
2390.0	53.98	V	0.00	53.98	73.98	20.00	PK
2390.0	53.98	V	-24.73	29.25	53.98	24.73	AV
2483.5	61.03	H	0.00	61.03	73.98	12.95	PK
2483.5	61.03	H	-24.73	36.30	53.98	17.68	AV
2483.5	59.93	V	0.00	59.93	73.98	14.05	PK
2483.5	59.93	V	-24.73	35.20	53.98	18.78	AV

Operation Mode	EDR( $\pi$ /4DQPSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	55.29	H	0.00	55.29	73.98	18.69	PK
2390.0	55.29	H	-24.73	30.56	53.98	23.42	AV
2390.0	55.14	V	0.00	55.14	73.98	18.84	PK
2390.0	55.14	V	-24.73	30.41	53.98	23.57	AV
2483.5	56.95	H	0.00	56.95	73.98	17.03	PK
2483.5	56.95	H	-24.73	32.22	53.98	21.76	AV
2483.5	56.58	V	0.00	56.58	73.98	17.40	PK
2483.5	56.58	V	-24.73	31.85	53.98	22.13	AV

Operation Mode            EDR(8DPSK)  
 Operating Frequency    2402 MHz, 2480 MHz  
 Channel No                CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	55.12	H	0.00	55.12	73.98	18.86	PK
2390.0	55.12	H	-24.73	30.39	53.98	23.59	AV
2390.0	55.06	V	0.00	55.06	73.98	18.92	PK
2390.0	55.06	V	-24.73	30.33	53.98	23.65	AV
2483.5	57.49	H	0.00	57.49	73.98	16.49	PK
2483.5	57.49	H	-24.73	32.76	53.98	21.22	AV
2483.5	57.28	V	0.00	57.28	73.98	16.70	PK
2483.5	57.28	V	-24.73	32.55	53.98	21.43	AV

[Ant.2]

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	55.69	H	0.00	55.69	73.98	18.29	PK
2390.0	55.69	H	-24.73	30.96	53.98	23.02	AV
2390.0	55.71	V	0.00	55.71	73.98	18.27	PK
2390.0	55.71	V	-24.73	30.98	53.98	23.00	AV
2483.5	59.76	H	0.00	59.76	73.98	14.22	PK
2483.5	59.76	H	-24.73	35.03	53.98	18.95	AV
2483.5	60.19	V	0.00	60.19	73.98	13.79	PK
2483.5	60.19	V	-24.73	35.46	53.98	18.52	AV

Operation Mode	EDR( $\pi$ /4DQPSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	55.31	H	0.00	55.31	73.98	18.67	PK
2390.0	55.31	H	-24.73	30.58	53.98	23.40	AV
2390.0	55.35	V	0.00	55.35	73.98	18.63	PK
2390.0	55.35	V	-24.73	30.62	53.98	23.36	AV
2483.5	60.75	H	0.00	60.75	73.98	13.23	PK
2483.5	60.75	H	-24.73	36.02	53.98	17.96	AV
2483.5	61.03	V	0.00	61.03	73.98	12.95	PK
2483.5	61.03	V	-24.73	36.30	53.98	17.68	AV

Operation Mode            EDR(8DPSK)  
 Operating Frequency      2402 MHz, 2480 MHz  
 Channel No                CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dBμV]	[H/V]	[dB]	[dBμV/m]	[dBμV/m]	[dB]	
2390.0	55.38	H	0.00	55.38	73.98	18.60	PK
2390.0	55.38	H	-24.73	30.65	53.98	23.33	AV
2390.0	55.43	V	0.00	55.43	73.98	18.55	PK
2390.0	55.43	V	-24.73	30.70	53.98	23.28	AV
2483.5	58.93	H	0.00	58.93	73.98	15.05	PK
2483.5	58.93	H	-24.73	34.20	53.98	19.78	AV
2483.5	59.52	V	0.00	59.52	73.98	14.46	PK
2483.5	59.52	V	-24.73	34.79	53.98	19.19	AV



[Dual Ant.1+ Ant.2]

Operation Mode	Normal(GFSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	55.22	H	0.00	55.22	73.98	18.76	PK
2390.0	55.22	H	-24.73	30.49	53.98	23.49	AV
2390.0	55.18	V	0.00	55.18	73.98	18.80	PK
2390.0	55.18	V	-24.73	30.45	53.98	23.53	AV
2483.5	54.79	H	0.00	54.79	73.98	19.19	PK
2483.5	54.79	H	-24.73	30.06	53.98	23.92	AV
2483.5	54.69	V	0.00	54.69	73.98	19.29	PK
2483.5	54.69	V	-24.73	29.96	53.98	24.02	AV

Operation Mode	EDR( $\pi$ /4DQPSK)
Operating Frequency	2402 MHz, 2480 MHz
Channel No	CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	55.25	H	0.00	55.25	73.98	18.73	PK
2390.0	55.25	H	-24.73	30.52	53.98	23.46	AV
2390.0	55.23	V	0.00	55.23	73.98	18.75	PK
2390.0	55.23	V	-24.73	30.50	53.98	23.48	AV
2483.5	55.00	H	0.00	55.00	73.98	18.98	PK
2483.5	55.00	H	-24.73	30.27	53.98	23.71	AV
2483.5	54.85	V	0.00	54.85	73.98	19.13	PK
2483.5	54.85	V	-24.73	30.12	53.98	23.86	AV

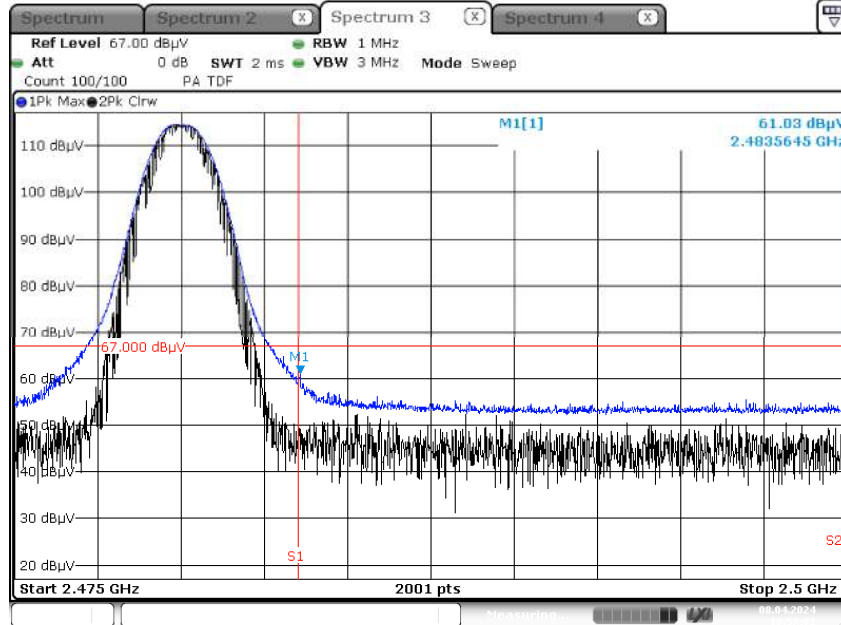
Operation Mode            EDR(8DPSK)  
 Operating Frequency    2402 MHz, 2480 MHz  
 Channel No                CH. 0, CH. 78

Frequency	Measured Level	Pol.	Duty Cycle Correction	Total	Limit	Margin	Measurement Type
[MHz]	[dB $\mu$ V]	[H/V]	[dB]	[dB $\mu$ V/m]	[dB $\mu$ V/m]	[dB]	
2390.0	55.21	H	0.00	55.21	73.98	18.77	PK
2390.0	55.21	H	-24.73	30.48	53.98	23.50	AV
2390.0	55.17	V	0.00	55.17	73.98	18.81	PK
2390.0	55.17	V	-24.73	30.44	53.98	23.54	AV
2483.5	54.63	H	0.00	54.63	73.98	19.35	PK
2483.5	54.63	H	-24.73	29.90	53.98	24.08	AV
2483.5	54.58	V	0.00	54.58	73.98	19.40	PK
2483.5	54.58	V	-24.73	29.85	53.98	24.13	AV

RESULT PLOTS

[Ant.1]

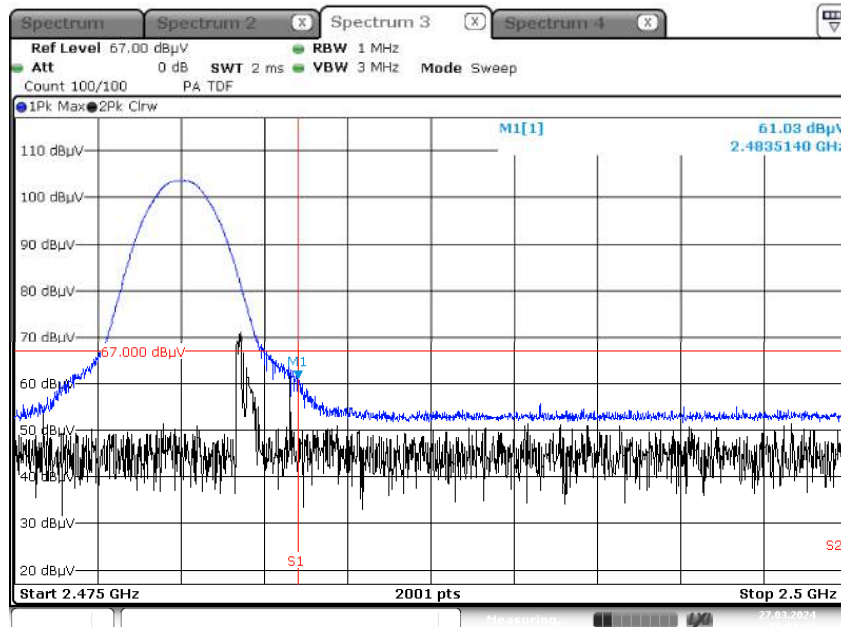
Radiated Restricted Band Edges plot – Average & Peak Result (GFSK, Ch. 78, X-H)



Date: 8.APR.2024 10:57:02

[Ant.2]

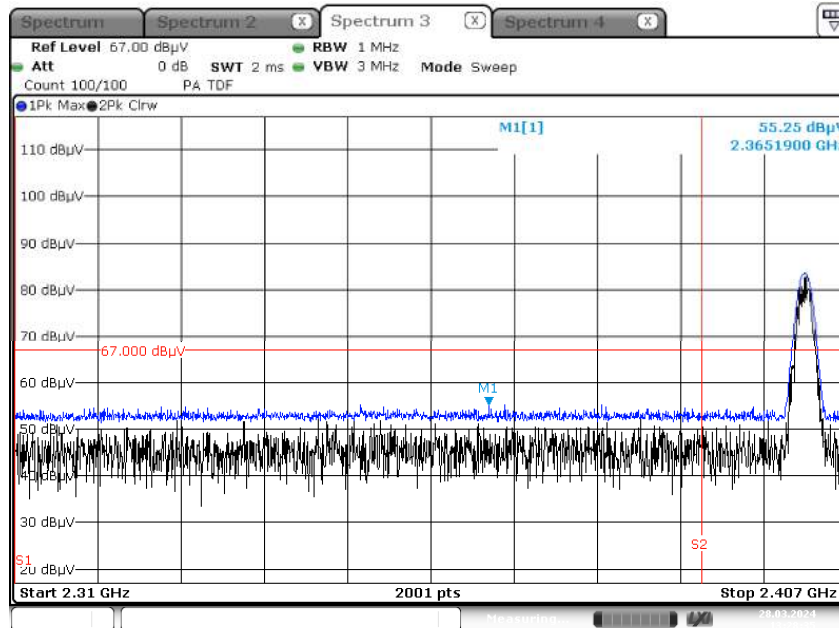
Radiated Restricted Band Edges plot – Average & Peak Result ( $\pi$ /4DQPSK, Ch. 78, Z-V)



Date: 27.MAR.2024 16:01:44

[Dual Ant.1+ Ant.2]

Radiated Restricted Band Edges plot – Average & Peak Result ( $\pi/4$ DQPSK, Ch. 0, X-H)



Date: 28.MAR.2024 13:28:35

Note:

Plots of worst case are only reported.

## 10.7 POWERLINE CONDUCTED EMISSIONS

### Conducted Emissions

Test

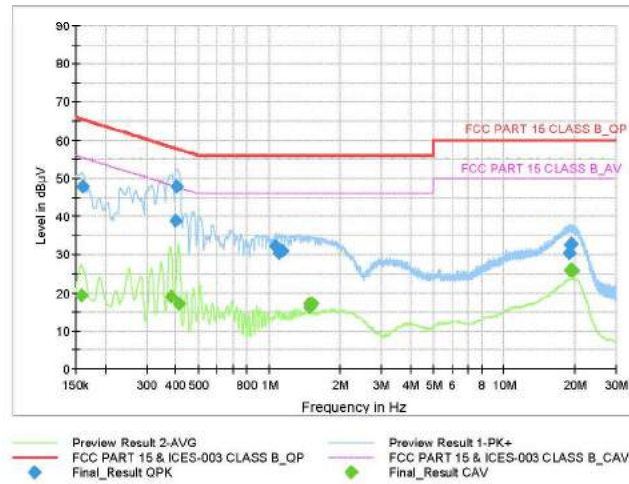
1 / 2

## Test Report

### Common Information

EUT : SM-F741U  
 Operating Conditions : BT Mode  
 Comment :

Full Spectrum



### Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1613	47.90	65.40	17.50	9.000	L1	9.6
0.3998	38.82	57.86	19.04	9.000	L1	9.6
0.4043	47.77	57.77	10.00	9.000	N	9.7
1.0670	32.14	56.00	23.86	9.000	N	9.7
1.1008	30.50	56.00	25.50	9.000	N	9.7
1.1368	31.03	56.00	24.97	9.000	N	9.7
18.8240	30.34	60.00	29.66	9.000	L1	10.4
19.1210	32.61	60.00	27.39	9.000	L1	10.4
19.2920	32.68	60.00	27.32	9.000	L1	10.4

2024-03-07

오전 11:32:25

Test

2 / 2

**Final Result CAV**

Frequency (MHz)	CAverage (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1590	19.18	55.52	36.34	9.000	L1	9.6
0.3795	18.84	48.29	29.45	9.000	N	9.6
0.4110	17.18	47.63	30.45	9.000	L1	9.6
1.4855	16.37	46.00	29.63	9.000	L1	9.7
1.4923	17.09	46.00	28.91	9.000	L1	9.7
1.5260	17.30	46.00	28.70	9.000	L1	9.7
19.0355	25.76	50.00	24.24	9.000	L1	10.4
19.1593	25.86	50.00	24.14	9.000	L1	10.4
19.4585	25.94	50.00	24.06	9.000	L1	10.4

2024-03-07

오전 11:32:25

## 11. LIST OF TEST EQUIPMENT

### Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/02/2024	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	05/26/2024	Annual
Temperature Chamber	SU-642	ESPEC	93008124	02/19/2025	Annual
Signal Analyzer	N9030A	Keysight	MY55410508	09/04/2024	Annual
Power Meter	N1911A	Agilent	MY45100523	02/28/2025	Annual
Power Sensor	N1921A	Agilent	MY57820067	02/22/2025	Annual
Directional Coupler	87300B	Agilent	3116A03621	10/30/2024	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2025	Annual
DC Power Supply	E3632A	Agilent	KR75305528	01/02/2025	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C-010	Agilent	08285	06/02/2024	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	02/20/2025	Annual
Software	EMC32	Rohde & Schwarz	N/A	N/A	N/A
FCC WLAN&BT&BLE Conducted Test Software v3.0	N/A	HCT CO., LTD.	N/A	N/A	N/A
Bluetooth Tester	CBT	Rohde & Schwarz	100808	02/15/2025	Annual

### Note:

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

**Radiated Test**

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	S3AM	08/03/2025	Biennial
Controller	EM2090	Emco	060520	N/A	N/A
Turn Table	N/A	Ets	N/A	N/A	N/A
Loop Antenna	FMZB 1513	Rohde & Schwarz	1513-333	03/07/2026	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/07/2025	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170124	03/28/2025	Biennial
Amp & Filter Bank Switch Controller	FBSM-01A	TNM system	0	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	06/12/2024	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/12/2024	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/14/2025	Annual
RF Switching System	FBSR-03A (3G HPF+LNA)	T&M SYSTEM	S3L1	11/17/2024	Annual
RF Switching System	FBSR-03A (10dB ATT+LNA)	T&M SYSTEM	S3L2	11/17/2024	Annual
RF Switching System	FBSR-03A (7G HPF+LNA)	T&M SYSTEM	S3L3	11/17/2024	Annual
RF Switching System	FBSR-03A (3dB ATT+LNA)	T&M SYSTEM	S3L4	11/17/2024	Annual
Power Amplifier	CBL18265035	CERNEX	22966	11/17/2024	Annual
Power Amplifier	CBL26405040	CERNEX	25956	02/26/2025	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/19/2025	Annual
Spectrum Analyzer	FSV40 (9 kHz ~ 40 GHz)	Rohde & Schwarz	100900	12/06/2024	Annual

**Note:**

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



## 12. ANNEX A\_ TEST SETUP PHOTO

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

No.	Description
1	HCT-RF-2405-FC043-P