

# FCC BT LE REPORT

## Certification

**Applicant Name:**  
SAMSUNG Electronics Co., Ltd.

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

**Date of Issue:**  
May 16, 2023

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

**Report No.:** HCT-RF-2305-FC048

**FCC ID:** A3LSMX810

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

**Model:** SM-X810

**EUT Type:** Tablet

**Average Output Power:**  
Ant.1: 9.42 dBm (8.74 mW)  
Ant.2: 8.77 dBm (7.53 mW)

**Frequency Range:** 2 402 MHz ~ 2 480 MHz

**Modulation type** GFSK

**FCC Classification:** Digital Transmission System(DTS)

**FCC Rule Part(s):** Part 15.247

**Engineering Statement:**

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC Rules under normal use and maintenance.

Report No.: HCT-RF-2305-FC048

---

REVIEWED BY



---

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

---

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

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

This laboratory is not accredited for the test results marked \*.

The above Test Report is the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA. (HCT Accreditation No.: KT197)

\* The report shall not be reproduced except in full(only partly) without approval of the laboratory.

## Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2305-FC048	May 16, 2023	- First Approval Report

# Table of Contents

REVIEWED BY .....	2
1. EUT DESCRIPTION .....	5
ANTENNA CONFIGURATIONS .....	6
2. TEST METHODOLOGY .....	7
EUT CONFIGURATION .....	7
EUT EXERCISE .....	7
GENERAL TEST PROCEDURES .....	7
DESCRIPTION OF TEST MODES .....	8
3. INSTRUMENT CALIBRATION.....	8
4. FACILITIES AND ACCREDITATIONS .....	8
FACILITIES .....	8
EQUIPMENT .....	8
5. ANTENNA REQUIREMENTS .....	9
6. MEASUREMENT UNCERTAINTY .....	9
7. DESCRIPTION OF TESTS.....	10
8. SUMMARY TEST OF RESULTS .....	25
9. TEST RESULT .....	26
9.1 DUTY CYCLE.....	26
9.2 6 dB BANDWIDTH .....	31
9.3 OUTPUT POWER .....	49
9.4 POWER SPECTRAL DENSITY .....	53
9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS.....	59
9.6 RADIATED SPURIOUS EMISSIONS .....	65
9.7 RADIATED RESTRICTED BAND EDGES .....	76
9.8 POWERLINE CONDUCTED EMISSIONS .....	80
10. LIST OF TEST EQUIPMENT .....	81
11. ANNEX A_ TEST SETUP PHOTO .....	84

**1. EUT DESCRIPTION**

<b>Model</b>	SM-X810			
<b>Additional Model</b>	-			
<b>EUT Type</b>	Tablet			
<b>Power Supply</b>	DC 3.88 V			
<b>Frequency Range</b>	2 402 MHz ~ 2 480 MHz			
<b>Max. RF Output Power (Normal)</b>	Ant.1	Peak (For information only)	1 M Bit/s :	9.485 dBm (8.88 mW)
			2 M Bit/s :	9.628 dBm (9.18 mW)
	Average		125 k Bit/s :	9.453 dBm (8.82 mW)
			500 k Bit/s :	9.474 dBm (8.86 mW)
Ant.2	Peak (For information only)		1 M Bit/s :	8.871 dBm (7.71 mW)
			2 M Bit/s :	9.030 dBm (8.00 mW)
	Average		125 k Bit/s :	8.843 dBm (7.66 mW)
			500 k Bit/s :	8.930 dBm (7.82 mW)
<b>Modulation Type</b>	GFSK			
<b>Bluetooth Version</b>	5.3			
<b>Number of Channels</b>	40 Channels			
<b>Date(s) of Tests</b>	March 13, 2023 ~ May 16, 2023			
<b>Serial number</b>	Radiated: R32W3000QXA Conducted: R32W3000NWT			

### ANTENNA CONFIGURATIONS

1. Below table is the possible configurations.

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

**Note:**

- 1) O = Support, X = Not Support
- 2) SISO = Single Input Single Output
- 3) Dual BT = Single Output 1 & 2

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 bands simultaneously on each antenna.

RSDB Scenario	2.4 GHz	2.4 GHz	5 GHz	5 GHz	6 GHz	6 GHz	Bluetooth	Bluetooth	Test Case
	WiFi Ant.1	WiFi Ant.2	WiFi Ant.1	WiFi Ant.2	WiFi Ant.1	WiFi Ant.2			
2.4 GHz WiFi MIMO + 6 GHz WiFi MIMO	on	on			on	on			Scenario 1
2.4 GHz WiFi MIMO + 5 GHz WiFi MIMO	on	on	on	on					Scenario 2
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 5 GHz WiFi MIMO		on	on	on			on		Scenario 3
Bluetooth ANT.1 + 2.4 GHz WiFi ANT.2 + 6 GHz WiFi MIMO		on			on	on	on		

## **2. TEST METHODOLOGY**

FCC KDB 558074 D01 15.247 Meas Guidance v05r02 dated April 02, 2019 entitled “guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices and the measurement procedure described in ANSI C63.10(Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

### **EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### **EUT EXERCISE**

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## **GENERAL TEST PROCEDURES**

### **Conducted Emissions**

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

### **Radiated Emissions**

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

## **DESCRIPTION OF TEST MODES**

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

## **3. INSTRUMENT CALIBRATION**

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

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

## **4. FACILITIES AND ACCREDITATIONS**

### **FACILITIES**

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 74, Seoicheon-ro 578beon-gil,

Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA.

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

Detailed description of test facility was submitted to the Commission and accepted dated April 02, 2018 (Registration Number: KR0032).

### **EQUIPMENT**

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."



## 5. ANTENNA REQUIREMENTS

### According to FCC 47 CFR §15.203

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- (1) The antennas of this E.U.T are permanently attached.
- (2) The E.U.T Complies with the requirement of §15.203

## 6. MEASUREMENT UNCERTAINTY

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

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

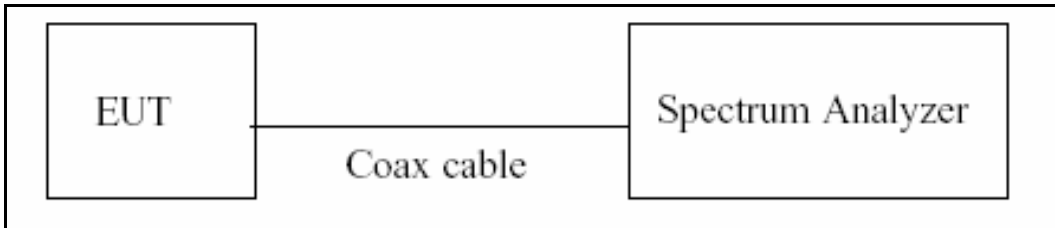
The measurement data shown herein meets or exceeds the  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Disturbance (150 kHz ~ 30 MHz)	1.90 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (9 kHz ~ 30 MHz)	4.14 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (30 MHz ~ 1 GHz)	5.82 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (1 GHz ~ 18 GHz)	5.74 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (18 GHz ~ 40 GHz)	5.76 ( Confidence level about 95 %, $k=2$ )
Radiated Disturbance (Above 40 GHz)	5.52 ( Confidence level about 95 %, $k=2$ )

## 7. DESCRIPTION OF TESTS

### 7.1. Duty Cycle

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method, 6.0)b) in KDB 558074 v05r02.

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

The zero-span method of measuring duty cycle shall not be used if  $T \leq 6.25$  microseconds. ( $50/6.25 = 8$ )

The zero-span method was used because all measured T data are  $> 6.25$  microseconds and both RBW and VBW are  $> 50/T$ .

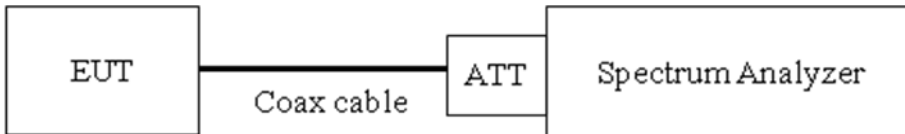
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz ( $\geq$  RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep  $> 100$
6. Trace mode = Clear write
7. Measure  $T_{total}$  and  $T_{on}$
8. Calculate Duty Cycle =  $T_{on} / T_{total}$  and Duty Cycle Factor =  $10\log(1/\text{Duty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

## 7.2. 6 dB Bandwidth

### Limit

The minimum permissible 6 dB bandwidth is 500 kHz.

### Test Configuration



### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to

(Procedure 8.2 in KDB 558074 v05r02, Procedure 11.8.1 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW  $\geq 3 \times$  RBW
- 3) Detector = Peak
- 4) Trace mode = max hold
- 5) Sweep = auto couple
- 6) Allow the trace to stabilize
- 7) We tested 6 dB bandwidth using the automatic bandwidth measurement capability of a spectrum analyzer. X dB is set 6 dB.

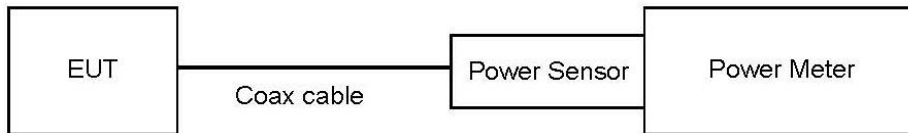
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

### 7.3. Output Power

#### Limit

The maximum permissible conducted output power is 1 Watt.

#### Test Configuration



#### Test Procedure

The transmitter output is connected to the Power Meter.

- Peak Power (Procedure 11.9.1.3 in ANSI 63.10-2013)  
: Measure the peak power of the transmitter.
  
- Average Power (Procedure 8.3.2.3 in KDB 558074 v05r02, Procedure 11.9.2.3 in ANSI 63.10-2013)
  - 1) Measure the duty cycle.
  - 2) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
  - 3) Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

#### Sample Calculation

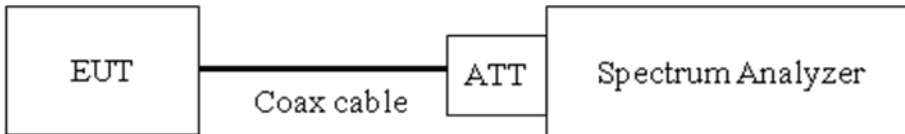
- Conducted Output Power(Peak) = Measured Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

## 7.4. Power Spectral Density

### Limit

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

### Test Configuration



### Test Procedure

The transmitter output is connected to the Spectrum Analyzer.

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

The spectrum analyzer is set to :

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set span to at least 1.5 times the OBW.
- 3)  $RBW = 3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$ .
- 4)  $VBW \geq 3 \times RBW$ .
- 5) Sweep = auto couple
- 6) Detector = power averaging (rms) or sample detector (when rms not available).
- 7) Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / RBW]$ .
- 8) Employ trace averaging (rms) mode over a minimum of 100 traces
- 9) Use the peak marker function to determine the maximum amplitude level.
- 10) Use the peak marker function to determine the maximum amplitude level within the RBW.  
If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
- 11) if then duty factor shall be added to adjust the result if the duty cycle is less than 98 %

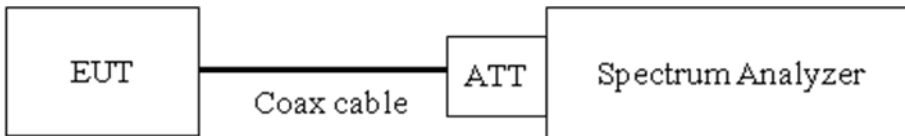
## 7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

### Limit

The maximum conducted (average) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

[ Conducted > 30 dBc ]

### Test Configuration



### Test Procedure

The transmitter output is connected to the spectrum analyzer.

(Procedure 8.5 in KDB 558074 v05r02, Procedure 11.11 in ANSI 63.10-2013)

- 1) RBW = 100 kHz
- 2) VBW  $\geq 3 \times$  RBW
- 3) Set span to encompass the spectrum to be examined
- 4) Detector = Peak
- 5) Trace Mode = max hold
- 6) Sweep time = auto couple
- 7) Ensure that the number of measurement points  $\geq 2 \times$  Span/VBW
- 8) Allow trace to fully stabilize.
- 9) Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

**Factors for frequency**

Freq(MHz)	Factor(dB)
30	10.03
100	10.05
200	10.08
300	10.10
400	10.14
500	10.16
600	10.18
700	10.20
800	10.27
900	10.35
1000	10.41
2000	10.57
2400	10.63
2412	10.82
2437	10.82
2462	10.82
2500	10.86
3000	11.04
4000	11.24
5000	11.42
5700	11.87
5800	11.87
6000	11.98
7000	12.07
8000	12.19
9000	12.24
10000	12.38
11000	12.43
12000	12.49
13000	12.66
14000	12.96
15000	13.12
16000	13.15
17000	13.05
18000	13.08
19000	12.97
20000	13.23
21000	13.67
22000	13.49
23000	13.62
24000	13.60
25000	13.92

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

2. Factor = Attenuator loss + Cable loss

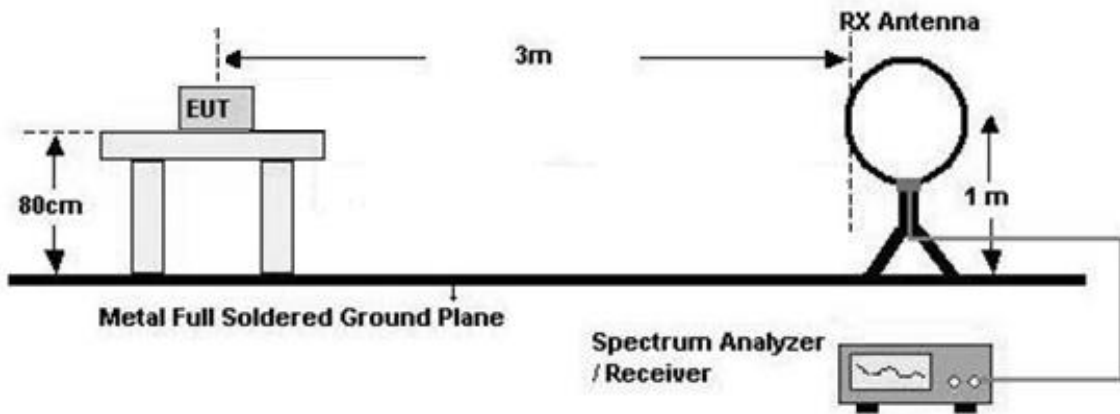
**7.6. Radiated Test**

**Limit**

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

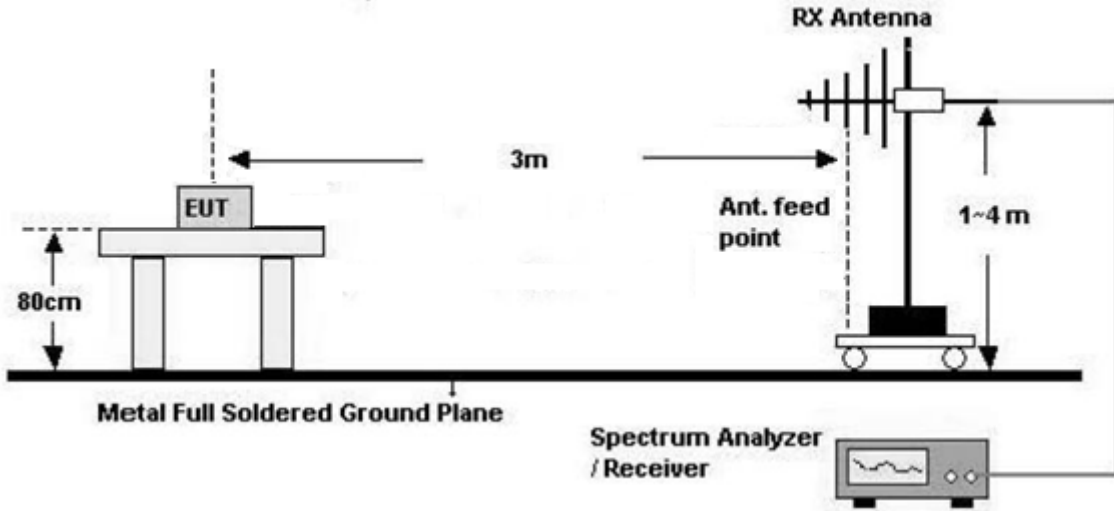
**Test Configuration**

Below 30 MHz

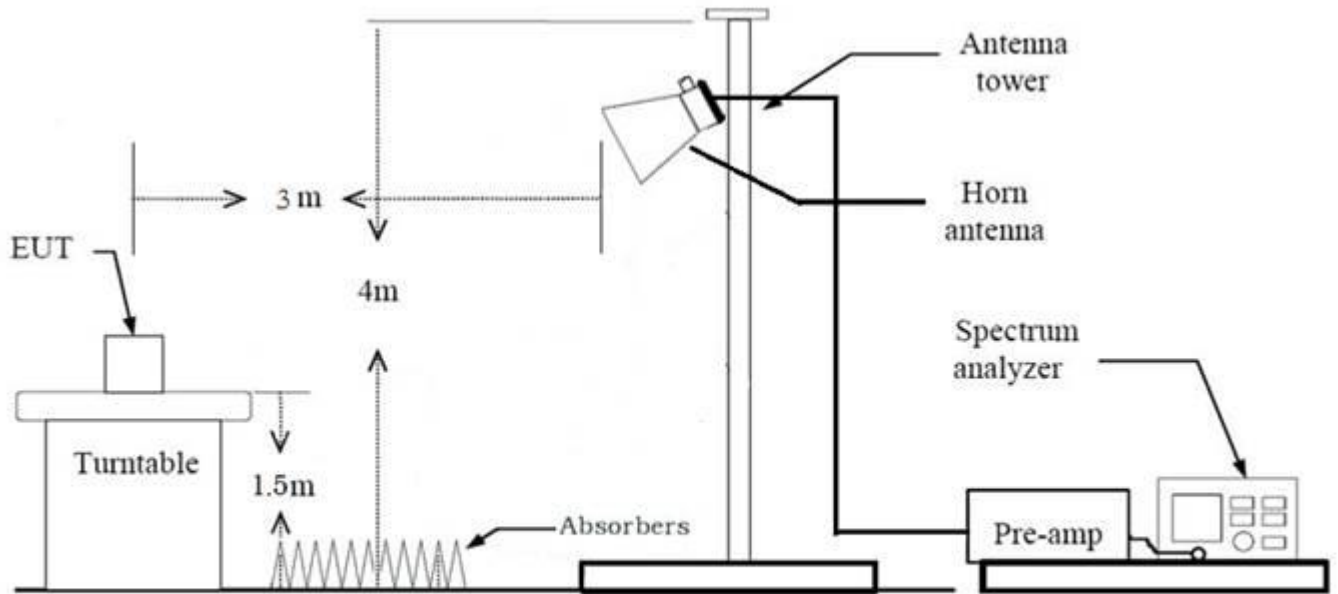




30 MHz - 1 GHz



Above 1 GHz



**Test Procedure of Radiated spurious emissions(Below 30 MHz)**

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3 m from the EUT
3. The EUT is placed on a turntable, which is 0.8 m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor(0.009 MHz – 0.490 MHz) =  $40\log(3\text{ m}/300\text{ m}) = - 80\text{ dB}$   
Measurement Distance : 3 m
7. Distance Correction Factor(0.490 MHz – 30 MHz) =  $40\log(3\text{ m}/30\text{ m}) = - 40\text{ dB}$   
Measurement Distance : 3 m
8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Maxhold
  - RBW = 9 kHz
  - VBW  $\geq 3 \times$  RBW
9. Total = Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F)
10. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

**KDB 414788 OFS and Chamber Correlation Justification**

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

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

**Test Procedure of Radiated spurious emissions(Below 1 GHz)**

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

(1) Measurement Type(Peak):

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

(2) Measurement Type(Quasi-peak):

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

In general, (1) is used mainly

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

**Test Procedure of Radiated spurious emissions (Above 1 GHz)**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = Peak
    - Trace = Max hold
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Average):
    - Duty cycle < 98 %, duty cycle variations are less than  $\pm 2$  %
    - Measured Frequency Range : 1 GHz – 25 GHz
    - Detector = RMS
    - Averaging type = power (*i.e.*, RMS)
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
    - Sweep time = auto.
    - Trace mode = average (at least 100 traces).
    - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1
9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
10. Distance extrapolation factor =  $20\log$  (test distance / specific distance) (dB)
11. Total (Measurement Type : Peak)
  - = Peak Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(A.G)
  - + Distance Factor(D.F)

Total (Measurement Type : Average)

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

### **Test Procedure of Radiated Restricted Band Edge**

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting
  - (1) Measurement Type(Peak):
    - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
    - Detector = Peak
    - Trace = Max hold
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
  - (2) Measurement Type(Average):
    - Duty cycle < 98 %, duty cycle variations are less than  $\pm 2$  %
    - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
    - Detector = RMS
    - Averaging type = power (i.e., RMS)
    - RBW = 1 MHz
    - VBW  $\geq$  3 x RBW
    - Sweep time = auto.
    - Trace mode = average (at least 100 traces).
    - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.
    - Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.
9. Measurement value only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

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

11. Total(Measurement Type : Peak)

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

Total(Measurement Type : Average)

= Average Measured Value + Antenna Factor(A.F) + Cable Loss(C.L) + Distance Factor(D.F) + Duty  
Cycle Factor

## 7.7. AC Power line Conducted Emissions

### Limit

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

### Sample Calculation

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

## 7.8. Worst case configuration and mode

### Radiated Test

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone, Stand alone + External accessories(Earphone etc)
  - Worstcase : Stand alone
2. EUT Axis:
  - (1) Ant 1
    - Radiated Spurious Emissions : X
    - Radiated Restricted Band Edge : Z
  - (2) Ant 2
    - Radiated Spurious Emissions : X
    - Radiated Restricted Band Edge : X
3. All packet length of operation were investigated and the test results are worst case in lowest packet length.  
(Worst case :1M Bit/s 37 Byte, 2M Bit/s 37 Byte)  
(125k, 500k, 1M Bit/s all have the same 1MHz Band width and only Worst result is attached.)
4. All datarate of operation were investigated and the worst case configuration results are reported.
  - Worst case : 1 M, 2 M
5. All position of loop antenna were investigated and the test result is a no critical peak found at all positions.
  - Position : Horizontal, Vertical, Parallel to the ground plane

### Radiated test(RSDB)

1. Please refer to the [DTS], [BT], [UNII ax], [UNII 6e] Test Report.

### AC Power line Conducted Emissions

1. All modes of operation were investigated and the worst case configuration results are reported.
  - Mode : Stand alone + External accessories(Earphone etc) + Travel Adapter,  
Stand alone + Travel Adapter
  - Worstcase : Stand alone + Travel Adapter

### Conducted test

1. The EUT was configured with packet length of highest power.
  - ALL supported mode tested.
  - Worst Results refer to Notes for each test item



**8. SUMMARY TEST OF RESULTS**

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

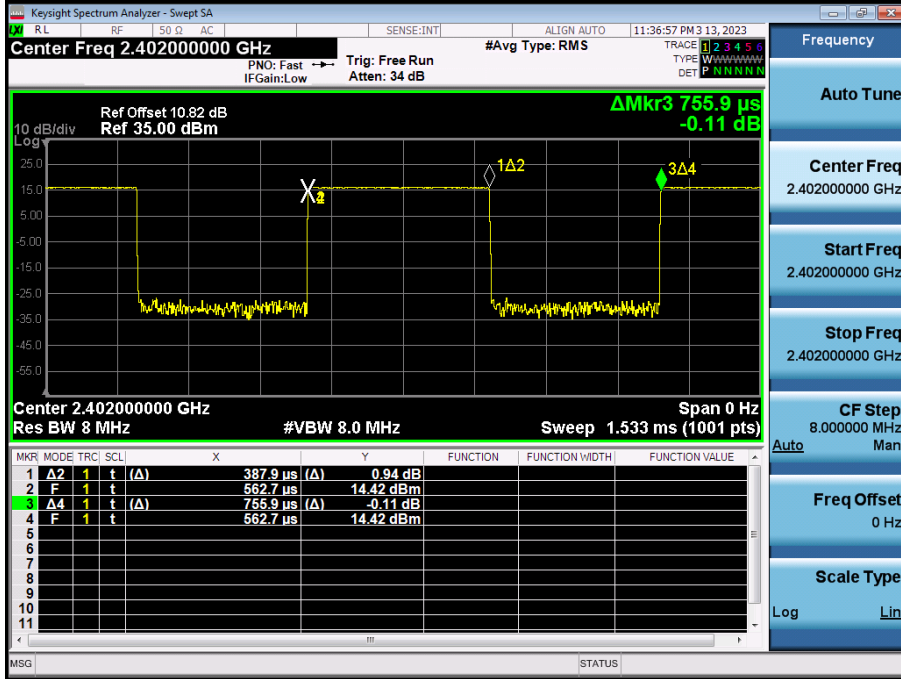
## 9. TEST RESULT

### 9.1 DUTY CYCLE

Data rate (Bit/s)	Packet length (Byte)	T <sub>on</sub> (ms)	T <sub>total</sub> (ms)	Duty Cycle	Duty Cycle Factor (dB)
1M	37	0.388	0.756	0.513	2.897
	255	2.135	2.500	0.854	0.685
2M	37	0.205	0.536	0.383	4.172
	255	1.075	1.408	0.764	1.170
125k	37	3.100	4.110	0.754	1.225
	255	17.033	18.067	0.943	0.256
500k	37	1.067	1.819	0.587	2.316
	255	4.560	5.310	0.859	0.661

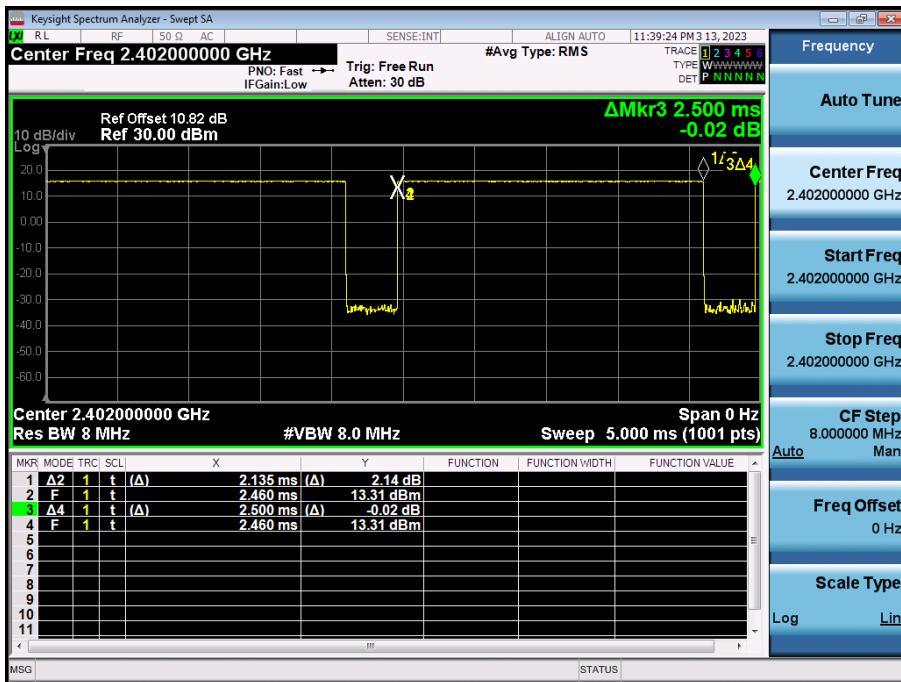
1 M Bit/s (37 Byte) Test Plots

Duty Cycle (Low-CH 0)



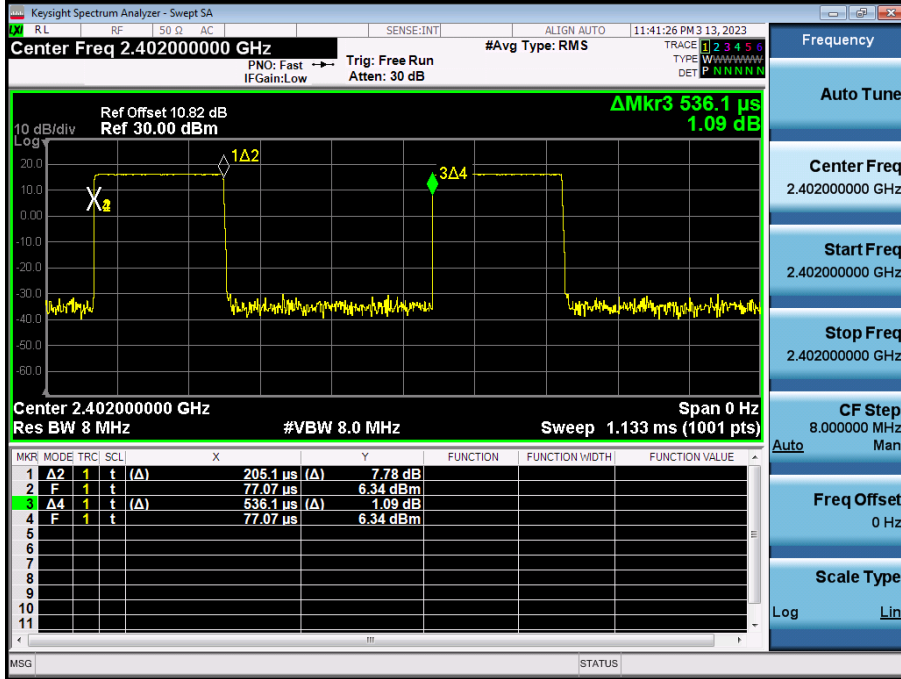
1 M Bit/s (255 Byte) Test Plots

Duty Cycle (Low-CH 0)



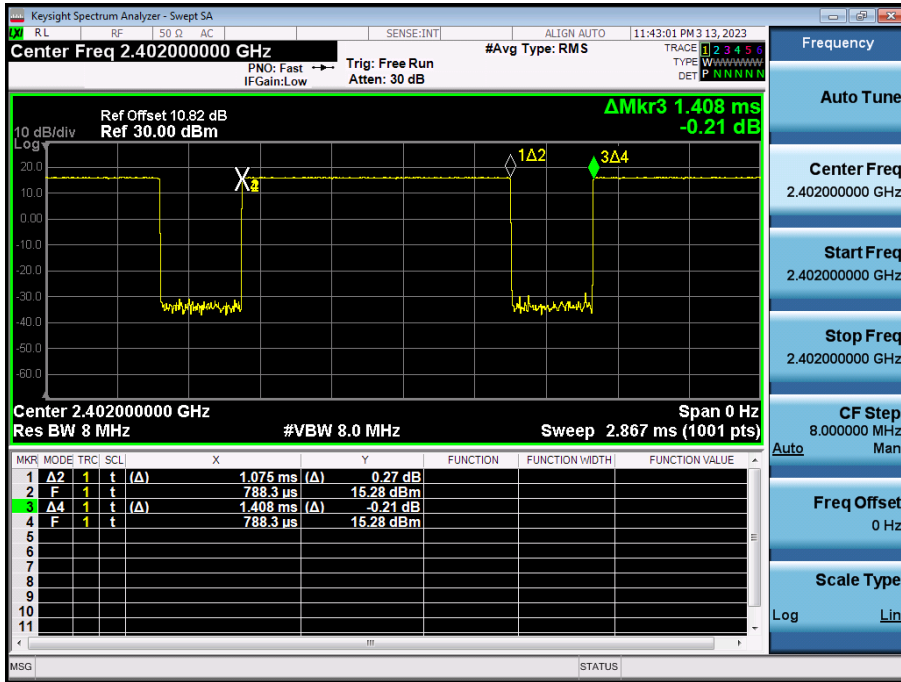
2 M Bit/s (37 Byte) Test Plots

Duty Cycle (Low-CH 0)



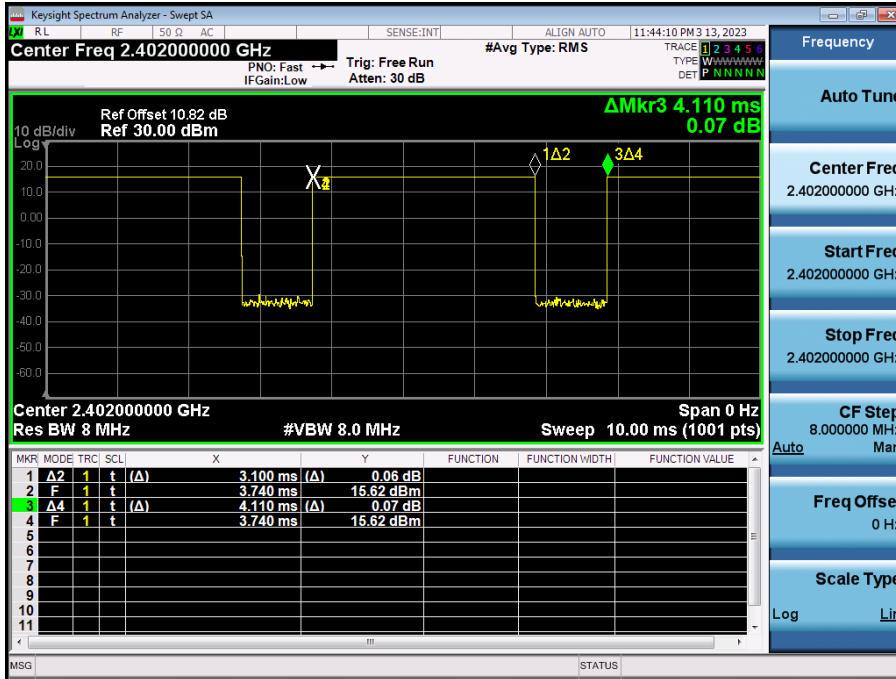
2 M Bit/s (255 Byte) Test Plots

Duty Cycle (Low-CH 0)



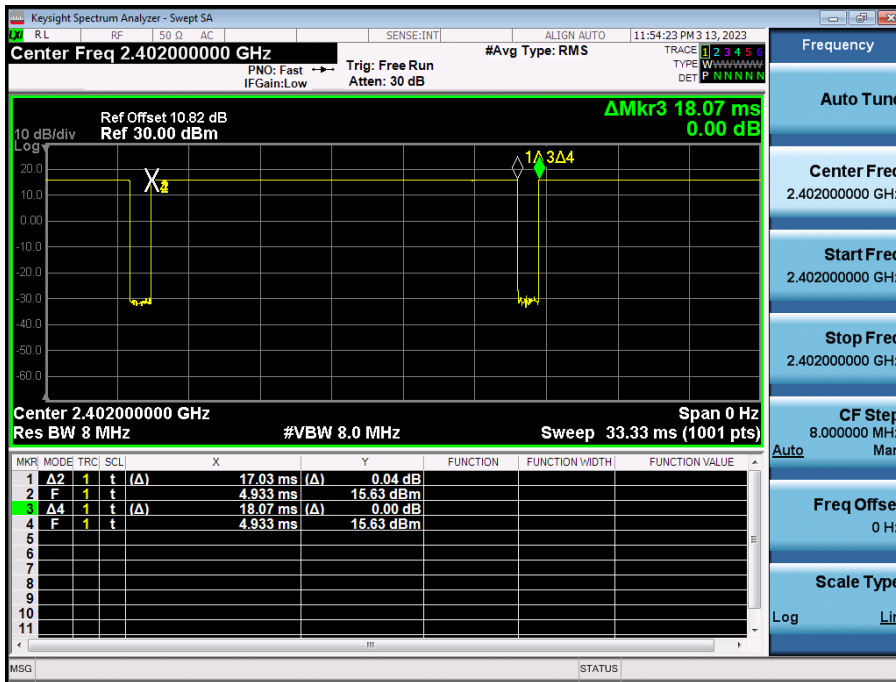
▣ 125 k Bit/s(37 Byte) Test Plots

Duty Cycle (Low-CH 0)



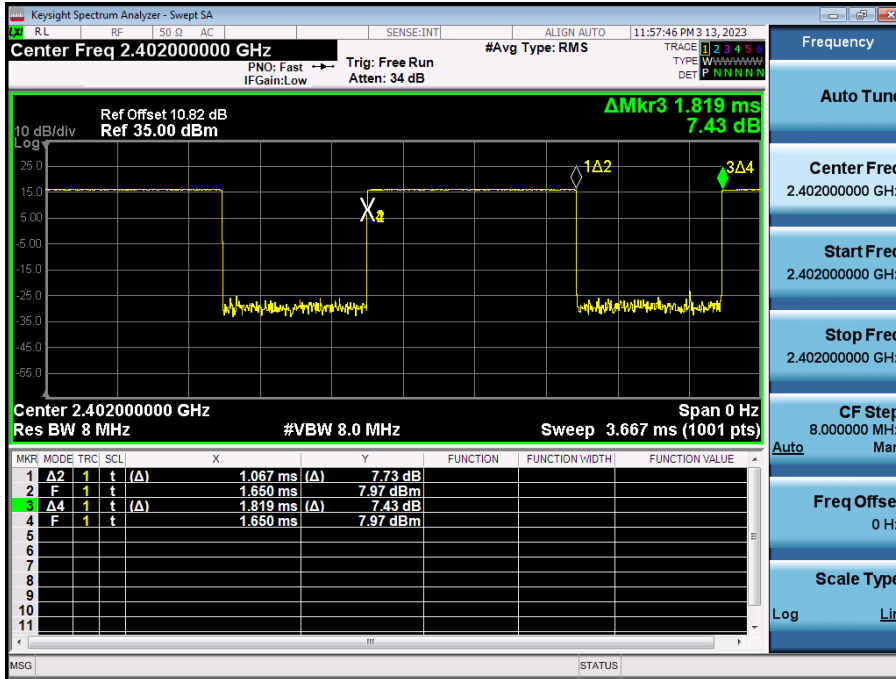
▣ 125 k Bit/s(255 Byte) Test Plots

Duty Cycle (Low-CH 0)



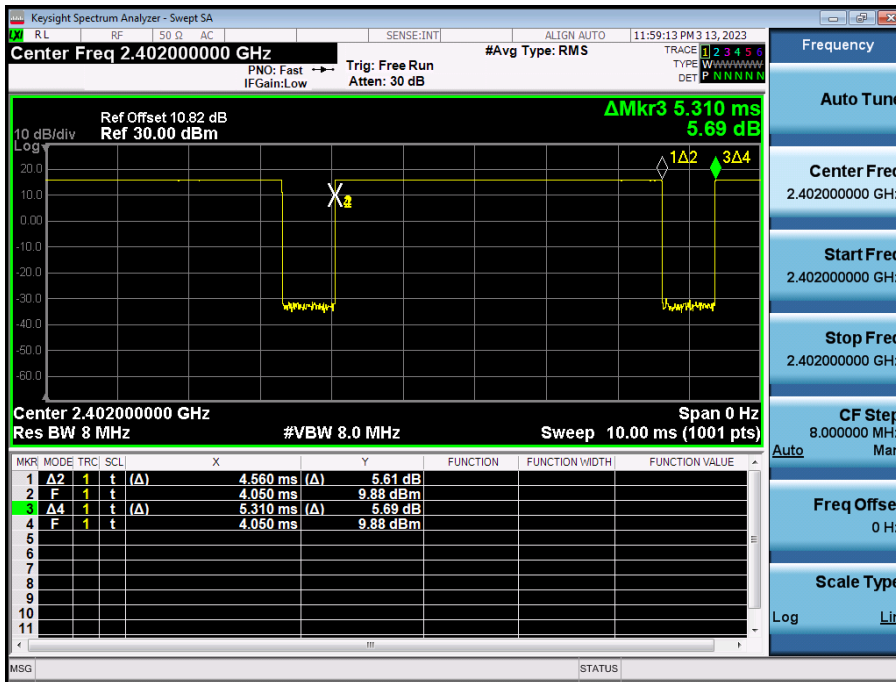
500 k Bit/s(37 Byte) Test Plots

Duty Cycle (Low-CH 0)



500 k Bit/s(255 Byte) Test Plots

Duty Cycle (Low-CH 0)



## 9.2 6 dB BANDWIDTH

[Ant.1]

Mode (Bit/s)	Channel	6 dB Bandwidth (kHz)	Limit (kHz)
1M(37)	0	671.9	> 500
	19	671.9	
	39	674.1	
1M(255)	0	667.0	> 500
	19	668.1	
	39	669.8	
2M(37)	0	1143	> 500
	19	1148	
	39	1151	
2M(255)	0	1157	> 500
	19	1155	
	39	1162	
125k(37)	0	628.0	> 500
	19	627.1	
	39	627.3	
125k(255)	0	627.9	> 500
	19	628.7	
	39	627.9	
500k(37)	0	667.8	> 500
	19	666.1	
	39	662.9	
500k(255)	0	665.4	> 500
	19	667.8	
	39	665.4	

**Note:**

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

1M Bit/s: 255 Byte

2M Bit/s: 37 Byte

125k Bit/s: 37 Byte

500k Bit/s: 37 Byte

**[Ant.2]**

Mode (Bit/s)	Channel	6 dB Bandwidth (kHz)	Limit (kHz)
1M(37)	0	671.3	> 500
	19	671.1	
	39	668.0	
1M(255)	0	668.1	> 500
	19	666.9	
	39	665.3	
2M(37)	0	1145	> 500
	19	1148	
	39	1147	
2M(255)	0	1159	> 500
	19	1161	
	39	1161	
125k(37)	0	627.6	> 500
	19	627.3	
	39	626.3	
125k(255)	0	628.3	> 500
	19	627.8	
	39	627.2	
500k(37)	0	666.7	> 500
	19	663.8	
	39	663.4	
500k(255)	0	667.2	> 500
	19	666.6	
	39	665.4	

**Note:**

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

1M Bit/s: 255 Byte

2M Bit/s: 37 Byte

125k Bit/s: 37 Byte

500k Bit/s: 37 Byte



[Ant.1]

▣ 1 MBit/s (255 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

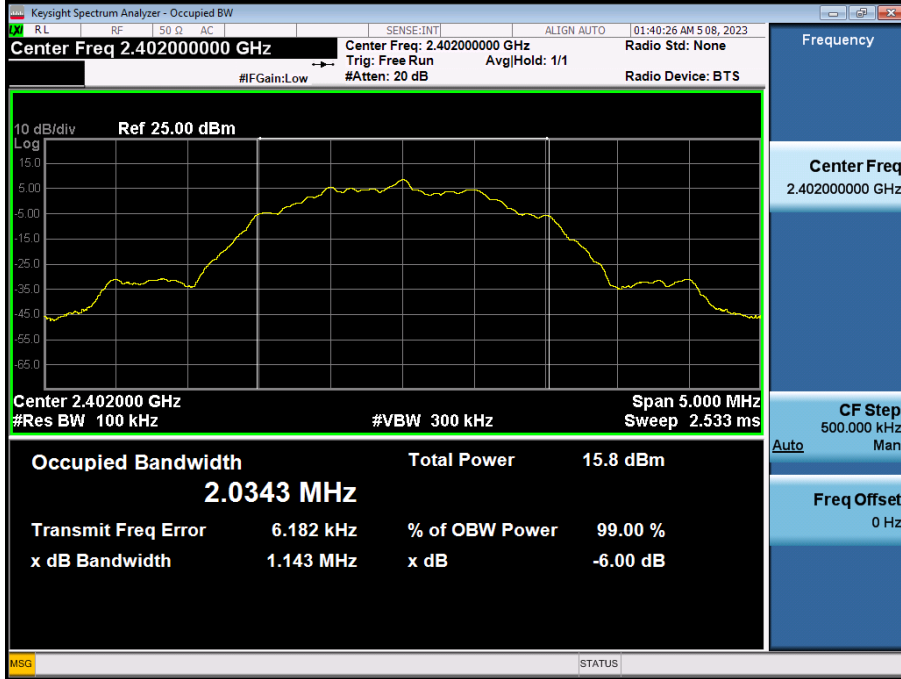


6 dB Bandwidth plot (High-CH 39)

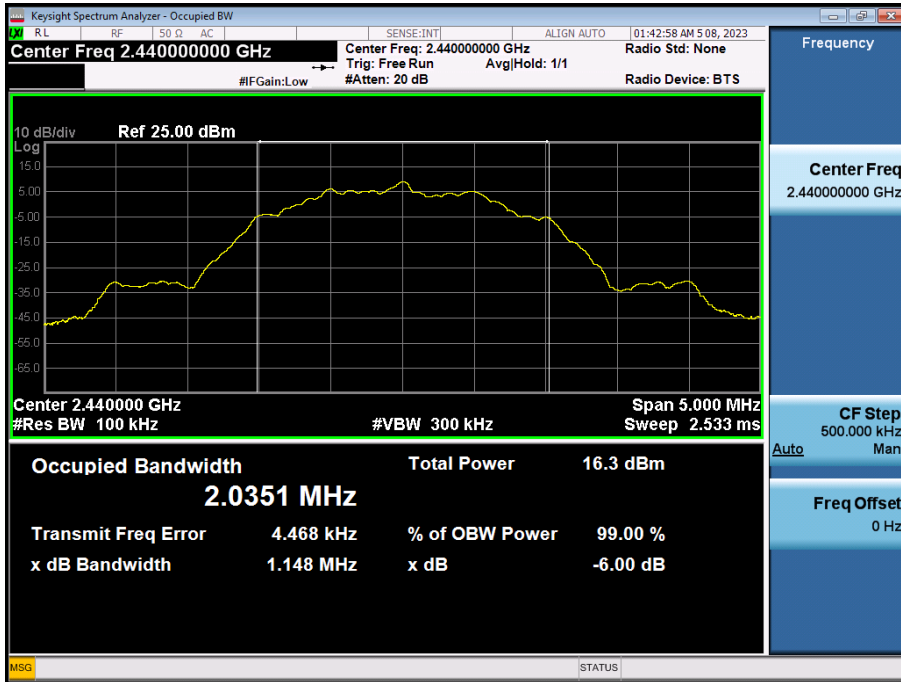


2 MBit/s (37 Byte) Test Plots

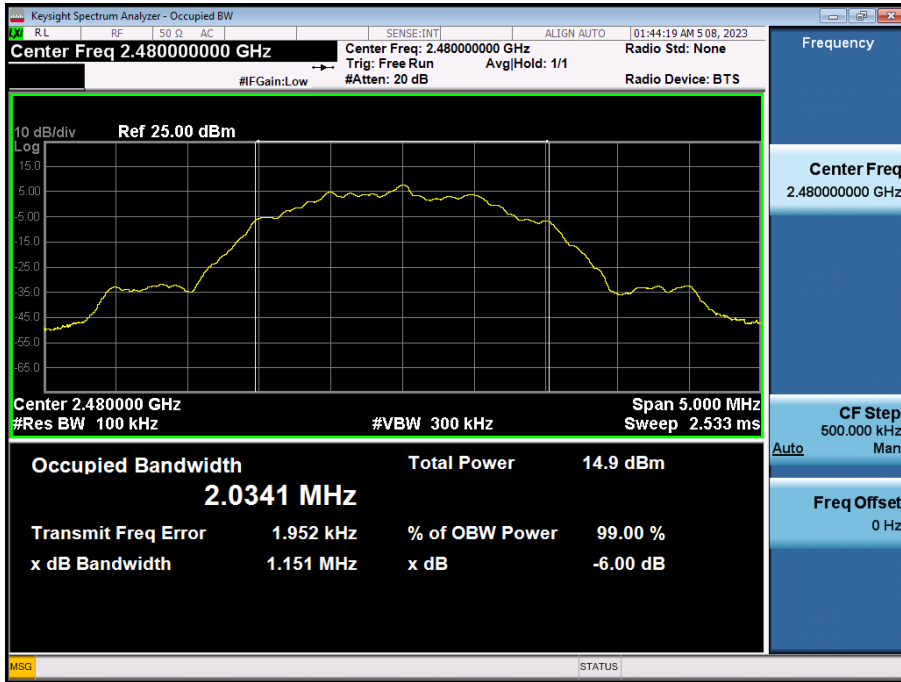
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)



6 dB Bandwidth plot (High-CH 39)

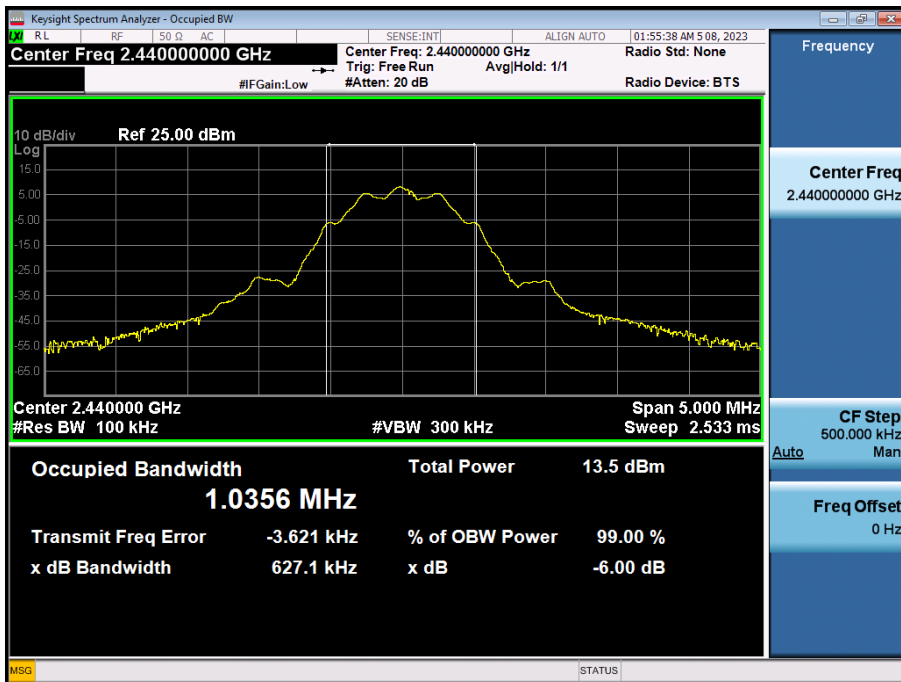


125k Bit/s(37 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

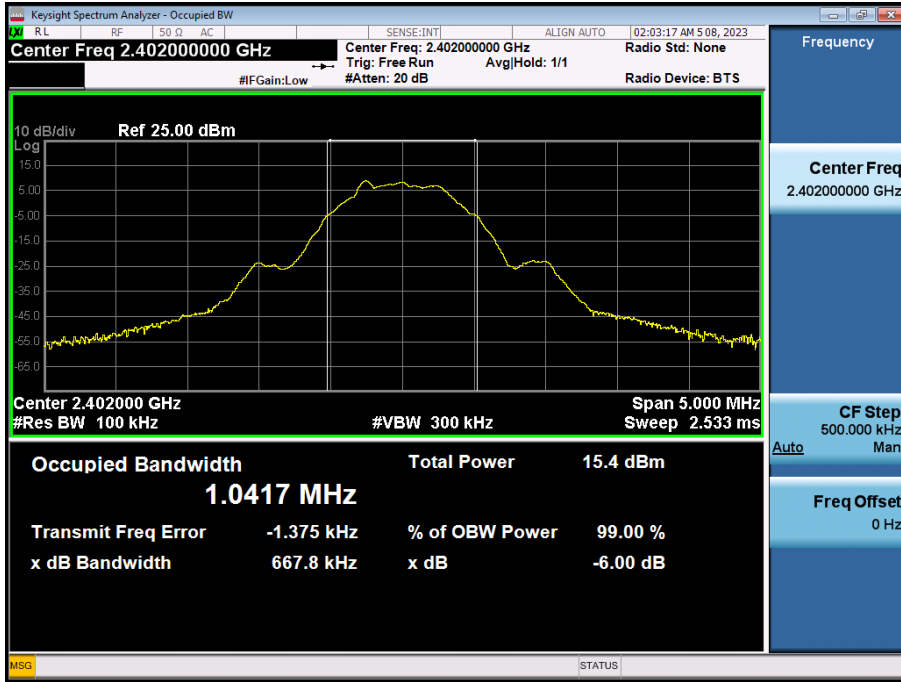


6 dB Bandwidth plot (High-CH 39)

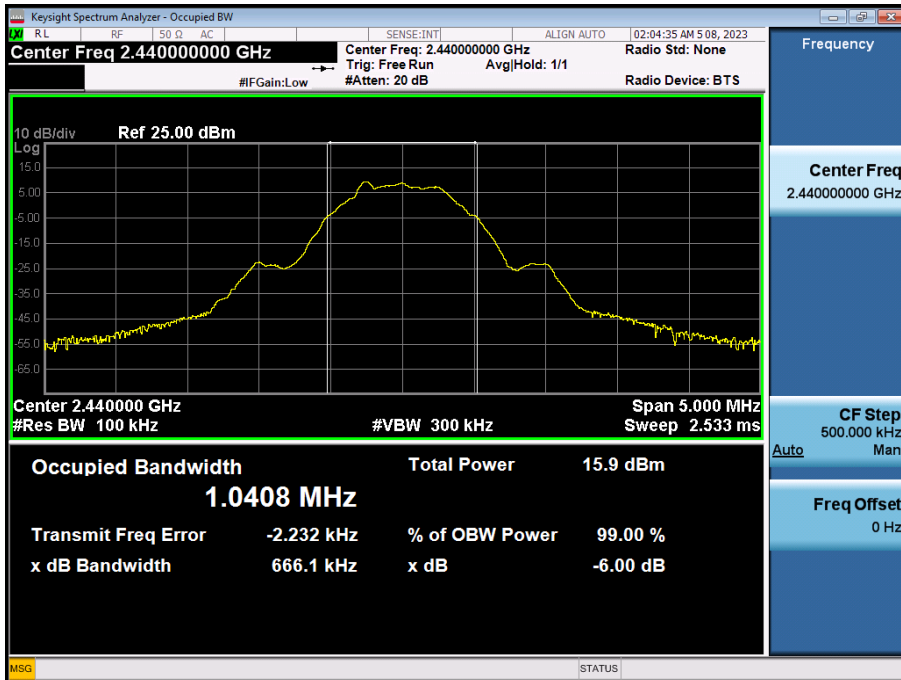


500k Bit/s(37 Byte) Test Plots

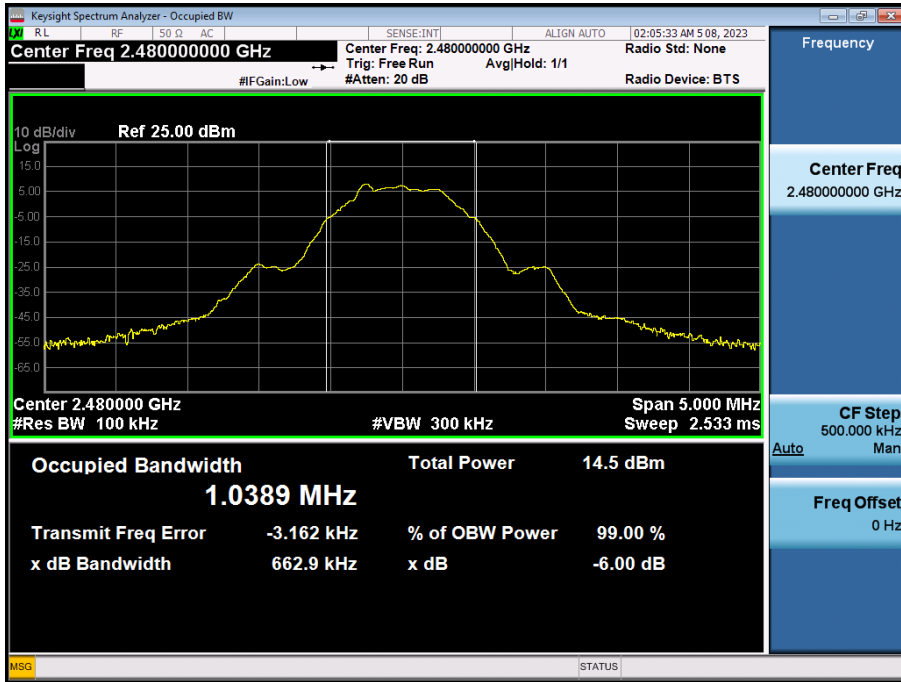
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)



6 dB Bandwidth plot (High-CH 39)

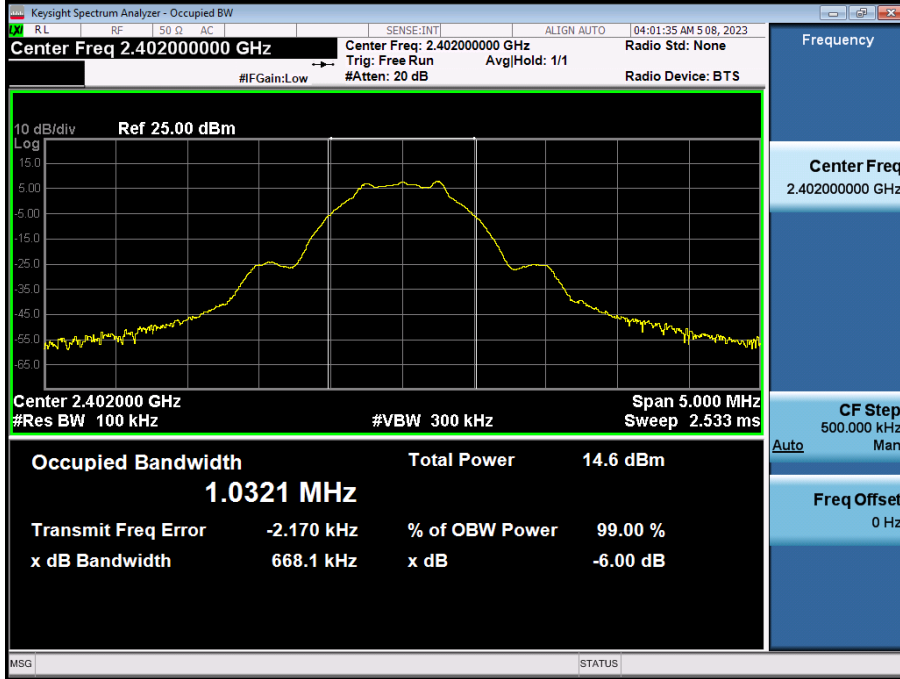




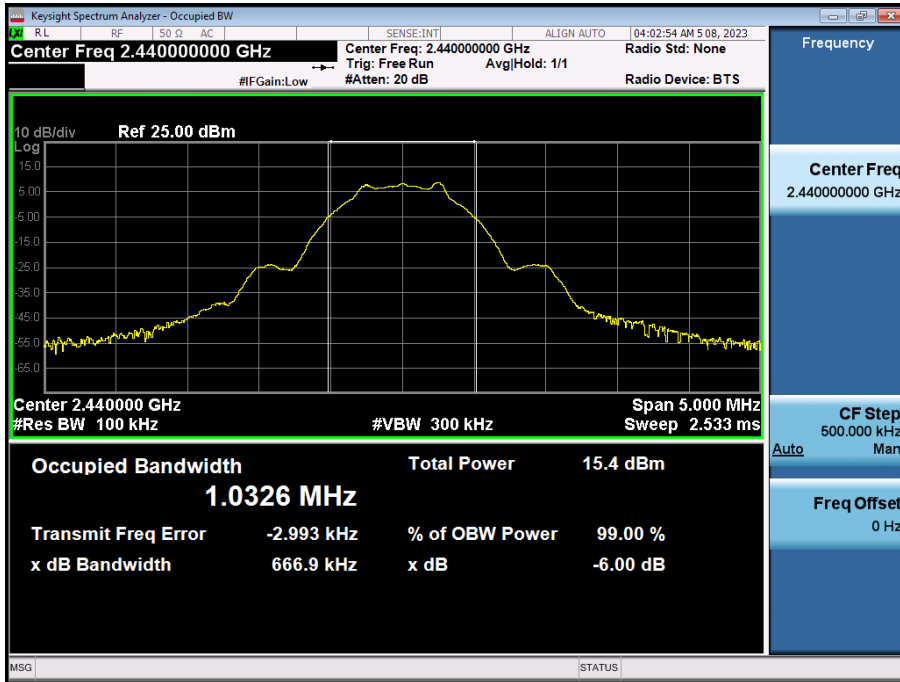
[Ant.2]

▣ 1 MBit/s (255 Byte) Test Plots

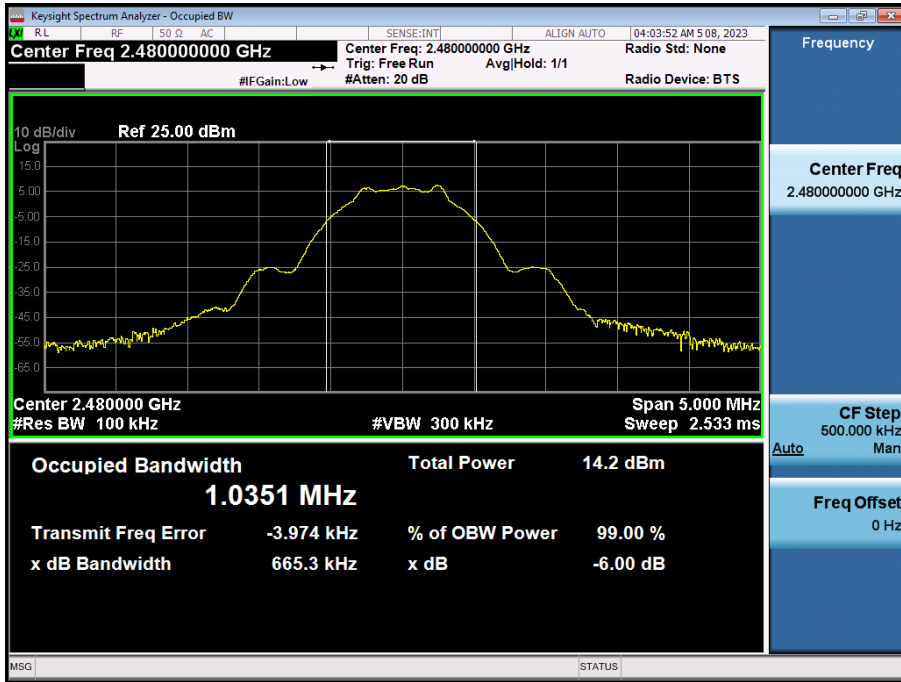
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

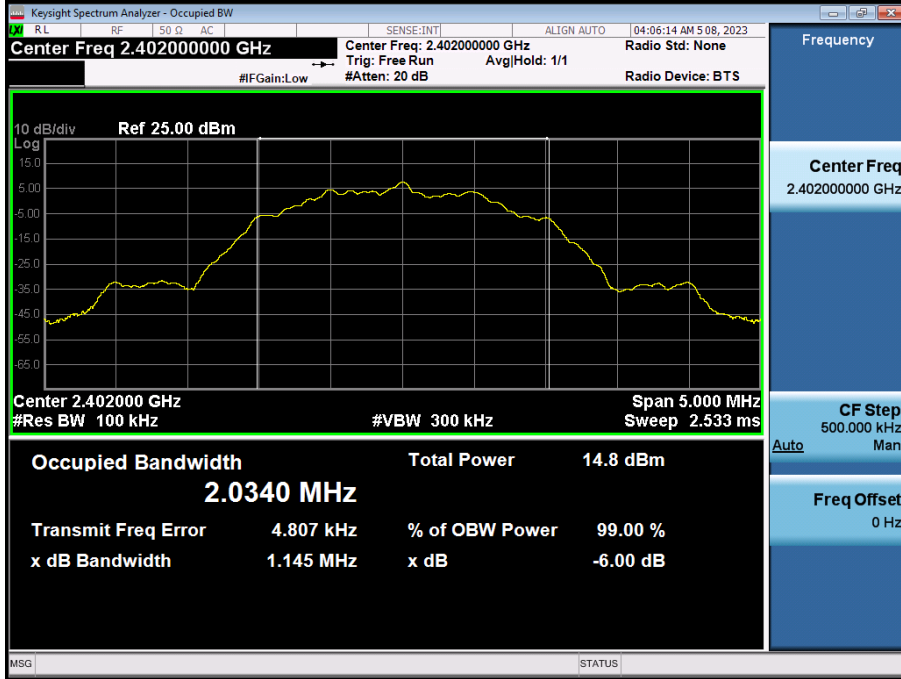


6 dB Bandwidth plot (High-CH 39)

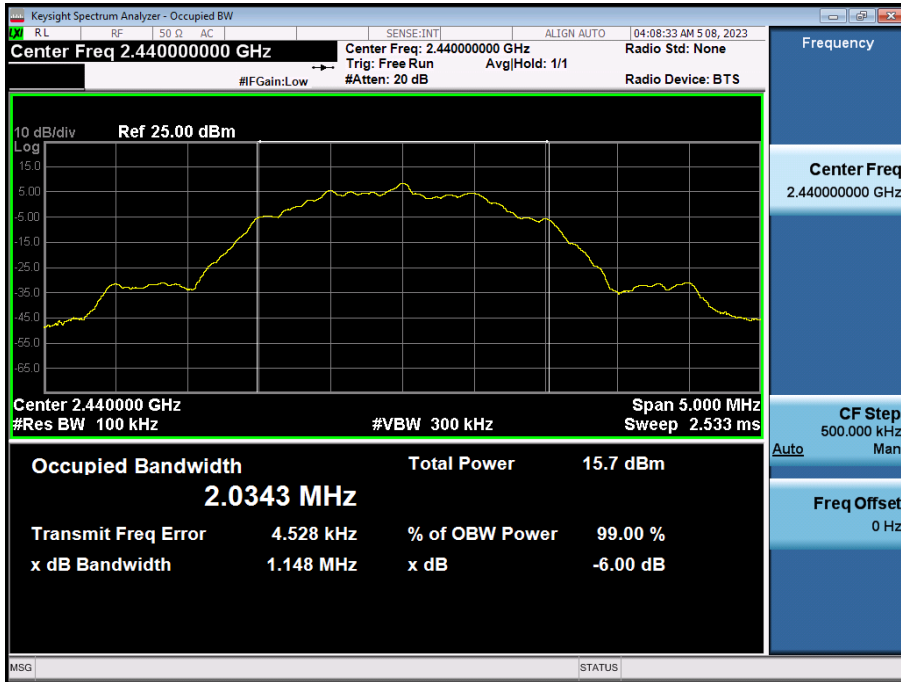


2 MBit/s (37 Byte) Test Plots

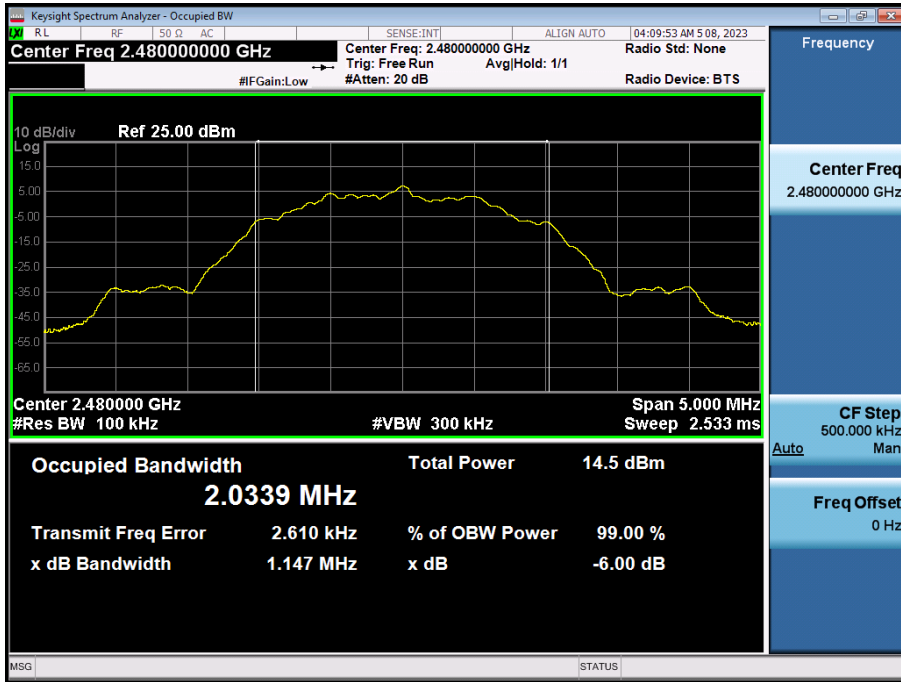
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

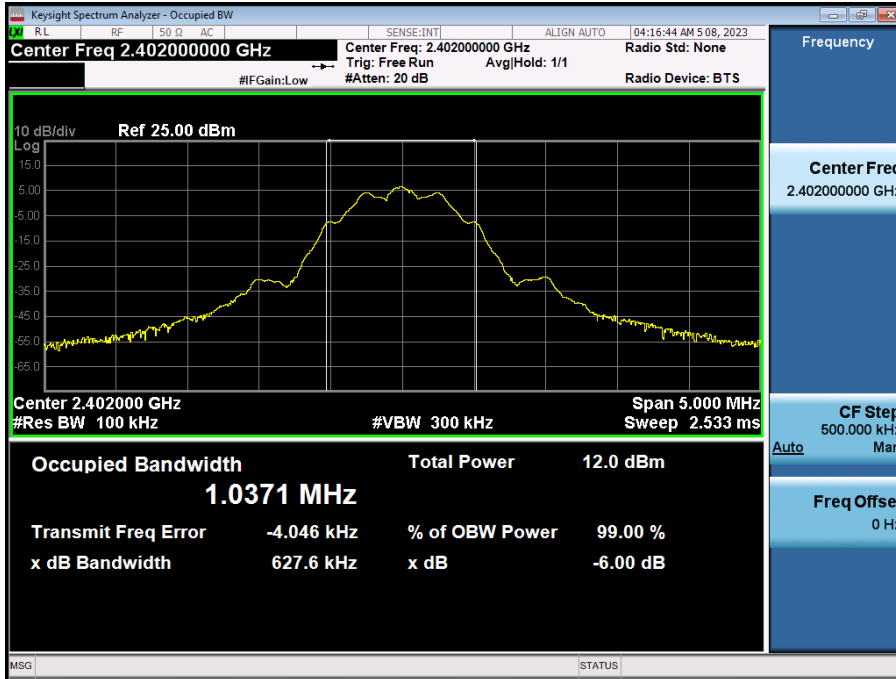


6 dB Bandwidth plot (High-CH 39)

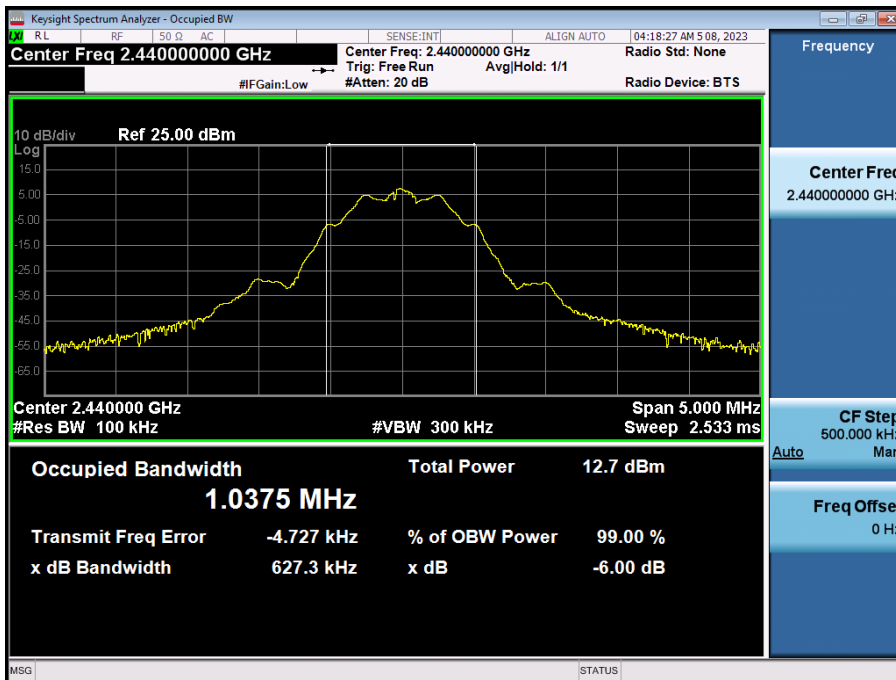


125k Bit/s(37 Byte) Test Plots

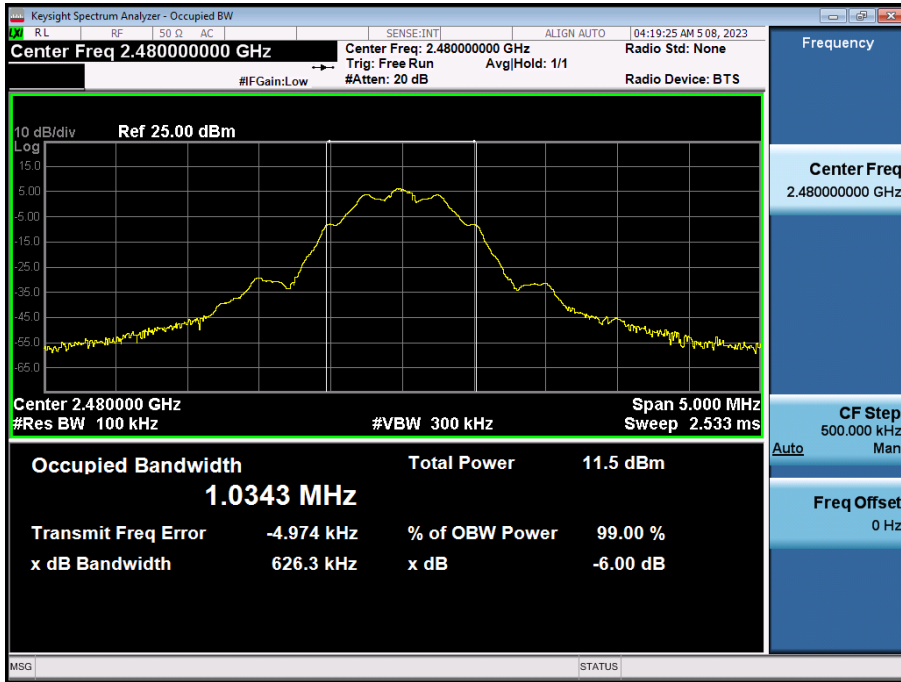
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

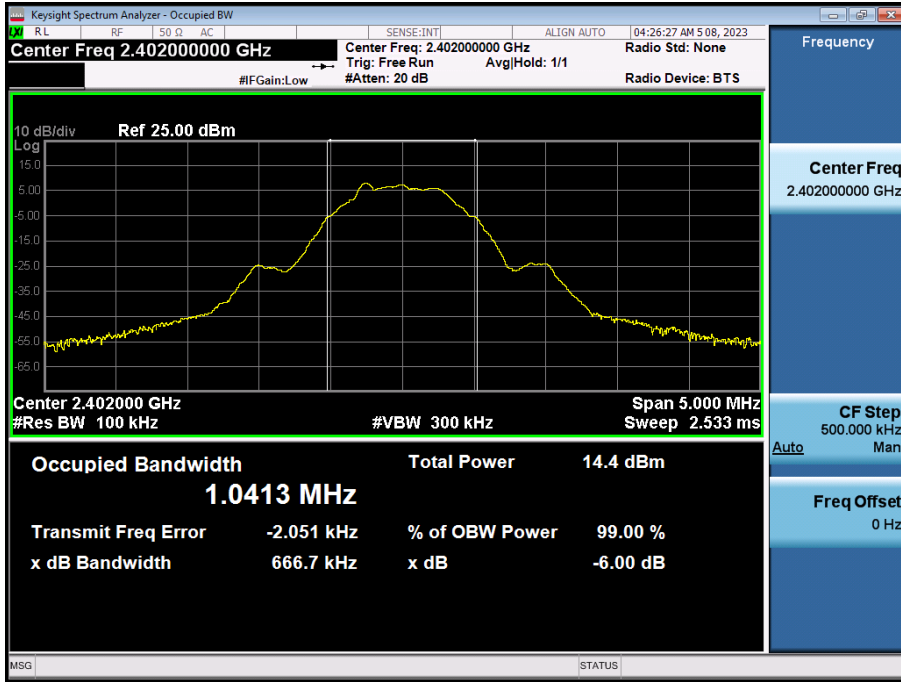


6 dB Bandwidth plot (High-CH 39)

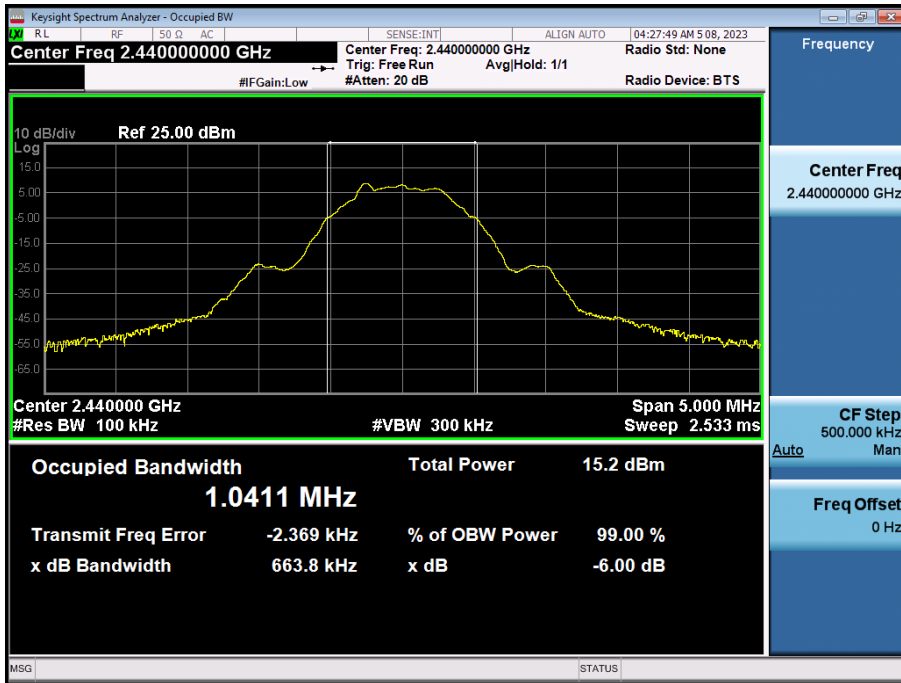


500k Bit/s(37 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)



6 dB Bandwidth plot (High-CH 39)





### 9.3 OUTPUT POWER

[Ant.1]

**Peak Power**

Data rate (Bit/s)	Packet length (Byte)	LE Mode		Measured Power(dBm)	Limit (dBm)
		Frequency [MHz]	Channel		
1M	37	2402	0	8.970	30
		2440	19	9.485	
		2480	39	8.132	
	255	2402	0	8.932	
		2440	19	9.429	
		2480	39	8.052	
2M	37	2402	0	9.098	
		2440	19	9.628	
		2480	39	8.311	
	255	2402	0	9.084	
		2440	19	9.567	
		2480	39	8.197	
125k	37	2402	0	8.933	
		2440	19	9.453	
		2480	39	8.185	
	255	2402	0	8.921	
		2440	19	9.407	
		2480	39	8.192	
500k	37	2402	0	8.958	
		2440	19	9.474	
		2480	39	8.266	
	255	2402	0	8.909	
		2440	19	9.418	
		2480	39	8.156	

**[Ant.2]**
**Peak Power**

Data rate (Bit/s)	Packet length (Byte)	LE Mode		Measured Power(dBm)	Limit (dBm)
		Frequency [MHz]	Channel		
1M	37	2402	0	8.113	30
		2440	19	8.871	
		2480	39	7.791	
	255	2402	0	8.083	
		2440	19	8.842	
		2480	39	7.719	
2M	37	2402	0	8.281	
		2440	19	9.030	
		2480	39	7.932	
	255	2402	0	8.214	
		2440	19	8.969	
		2480	39	7.853	
125k	37	2402	0	8.088	
		2440	19	8.843	
		2480	39	7.710	
	255	2402	0	8.043	
		2440	19	8.838	
		2480	39	7.659	
500k	37	2402	0	8.108	
		2440	19	8.860	
		2480	39	7.764	
	255	2402	0	8.073	
		2440	19	8.930	
		2480	39	7.801	

[Ant.1]

Average Power

Data rate (Bit/s)	Packet length (Byte)	LE Mode		Measured Power (dBm)	Duty Cycle Factor (dB)	Result (dBm)	Limit (dBm)
		Frequency [MHz]	Channel				
1M	37	2402	0	5.92	2.90	8.82	30
		2440	19	6.52	2.90	9.42	
		2480	39	5.19	2.90	8.09	
	255	2402	0	8.06	0.69	8.75	
		2440	19	8.65	0.69	9.34	
		2480	39	7.34	0.69	8.03	
2M	37	2402	0	4.57	4.17	8.74	
		2440	19	5.19	4.17	9.36	
		2480	39	3.90	4.17	8.07	
	255	2402	0	7.57	1.17	8.74	
		2440	19	8.17	1.17	9.34	
		2480	39	6.85	1.17	8.02	
125k	37	2402	0	7.53	1.22	8.75	
		2440	19	8.14	1.22	9.36	
		2480	39	6.85	1.22	8.07	
	255	2402	0	8.51	0.26	8.77	
		2440	19	9.10	0.26	9.36	
		2480	39	7.80	0.26	8.06	
500k	37	2402	0	6.46	2.32	8.78	
		2440	19	7.09	2.32	9.41	
		2480	39	5.81	2.32	8.13	
	255	2402	0	8.12	0.66	8.78	
		2440	19	8.69	0.66	9.35	
		2480	39	7.39	0.66	8.05	

[Ant.2]

Average Power

Data rate (Bit/s)	Packet length (Byte)	LE Mode		Measured Power (dBm)	Duty Cycle Factor (dB)	Result (dBm)	Limit (dBm)
		Frequency [MHz]	Channel				
1M	37	2402	0	5.06	2.90	7.96	30
		2440	19	5.87	2.90	8.77	
		2480	39	4.73	2.90	7.63	
	255	2402	0	7.21	0.69	7.90	
		2440	19	8.00	0.69	8.69	
		2480	39	6.88	0.69	7.57	
2M	37	2402	0	3.76	4.17	7.93	
		2440	19	4.53	4.17	8.70	
		2480	39	3.35	4.17	7.52	
	255	2402	0	6.67	1.17	7.84	
		2440	19	7.49	1.17	8.66	
		2480	39	6.36	1.17	7.53	
125k	37	2402	0	6.72	1.22	7.94	
		2440	19	7.50	1.22	8.72	
		2480	39	6.32	1.22	7.54	
	255	2402	0	7.66	0.26	7.92	
		2440	19	8.45	0.26	8.71	
		2480	39	7.30	0.26	7.56	
500k	37	2402	0	5.65	2.32	7.97	
		2440	19	6.44	2.32	8.76	
		2480	39	5.25	2.32	7.57	
	255	2402	0	7.15	0.66	7.81	
		2440	19	8.10	0.66	8.76	
		2480	39	6.95	0.66	7.61	

## 9.4 POWER SPECTRAL DENSITY

[Ant.1]

Frequency (MHz)	Channel No.	Mode	Test Result			Limit
			Measured PSD (dBm/3 kHz)	Duty Cycle Factor(dB)	Total PSD (dBm/ 3kHz)	
2402	0	1 MBit/s 37 Byte	-10.544	2.90	-7.647	8 dBm / 3 kHz
2440	19		-10.064	2.90	-7.167	
2480	39		-11.276	2.90	-8.379	
2402	0	1 MBit/s 255 Byte	-13.171	0.69	-12.486	
2440	19		-12.191	0.69	-11.506	
2480	39		-13.926	0.69	-13.241	
2402	0	2 MBit/s 37 Byte	-13.490	4.17	-9.318	
2440	19		-12.963	4.17	-8.791	
2480	39		-13.999	4.17	-9.827	
2402	0	2 MBit/s 255 Byte	-15.510	1.17	-14.340	
2440	19		-15.119	1.17	-13.949	
2480	39		-16.803	1.17	-15.633	
2402	0	125k 37 Byte	0.882	1.22	2.107	
2440	19		1.340	1.22	2.565	
2480	39		-0.772	1.22	0.453	
2402	0	125k 255 Byte	1.434	0.26	1.690	
2440	19		1.728	0.26	1.984	
2480	39		0.747	0.26	1.003	
2402	0	500k 37 Byte	-4.651	2.32	-2.335	
2440	19		-5.602	2.32	-3.286	
2480	39		-6.740	0.66	-6.079	
2402	0	500k 255 Byte	-10.322	0.66	-9.661	
2440	19		-8.171	0.66	-7.510	
2480	39		-10.669	0.66	-10.008	

**Note :**

1. Spectrum measured Value not plot data.

The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Spectrum offset = Attenuator loss + Cable loss + EUT Cable loss.

3. Total PSD = Measured PSD + Duty Cycle Factor

4. In order to simplify the report, The plots were attached with the highest PSD Mode.

Worst case : 125k Bit/s (37 Byte)

**[Ant.2]**

Frequency (MHz)	Channel No.	Mode	Test Result			
			Measured PSD (dBm/3 kHz)	Duty Cycle Factor(dB)	Total PSD (dBm/ 3kHz)	Limit (dBm)
2402	0	1 MBit/s 37 Byte	-11.455	2.90	-8.558	8 dBm / 3 kHz
2440	19		-10.977	2.90	-8.080	
2480	39		-12.191	2.90	-9.294	
2402	0	1 MBit/s 255 Byte	-14.089	0.69	-13.404	
2440	19		-13.365	0.69	-12.680	
2480	39		-14.465	0.69	-13.780	
2402	0	2 MBit/s 37 Byte	-14.012	4.17	-9.840	
2440	19		-13.720	4.17	-9.548	
2480	39		-14.435	4.17	-10.263	
2402	0	2 MBit/s 255 Byte	-16.435	1.17	-15.265	
2440	19		-15.396	1.17	-14.226	
2480	39		-16.900	1.17	-15.730	
2402	0	125k 37 Byte	-0.677	1.22	0.548	
2440	19		0.140	1.22	1.365	
2480	39		-0.663	1.22	0.562	
2402	0	125k 255 Byte	0.588	0.26	0.844	
2440	19		1.276	0.26	1.532	
2480	39		0.343	0.26	0.599	
2402	0	500k 37 Byte	-6.180	2.32	-3.864	
2440	19		-6.871	2.32	-4.555	
2480	39		-7.169	0.66	-6.508	
2402	0	500k 255 Byte	-10.666	0.66	-10.005	
2440	19		-8.113	0.66	-7.452	
2480	39		-9.880	0.66	-9.219	

**Note :**

1. Spectrum measured Value not plot data.

The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Spectrum offset = Attenuator loss + Cable loss + EUT Cable loss

3. Total PSD = Measured PSD + Duty Cycle Factor

4. In order to simplify the report, The plots were attached with the highest PSD Mode.

Worst case : 125k Bit/s (255 Byte)

[Ant.1]

125k Bit/s (37 Byte) Test Plots

Power Spectral Density (Low-CH 0)



Power Spectral Density (Mid-CH 19)



Power Spectral Density (High-CH 39)

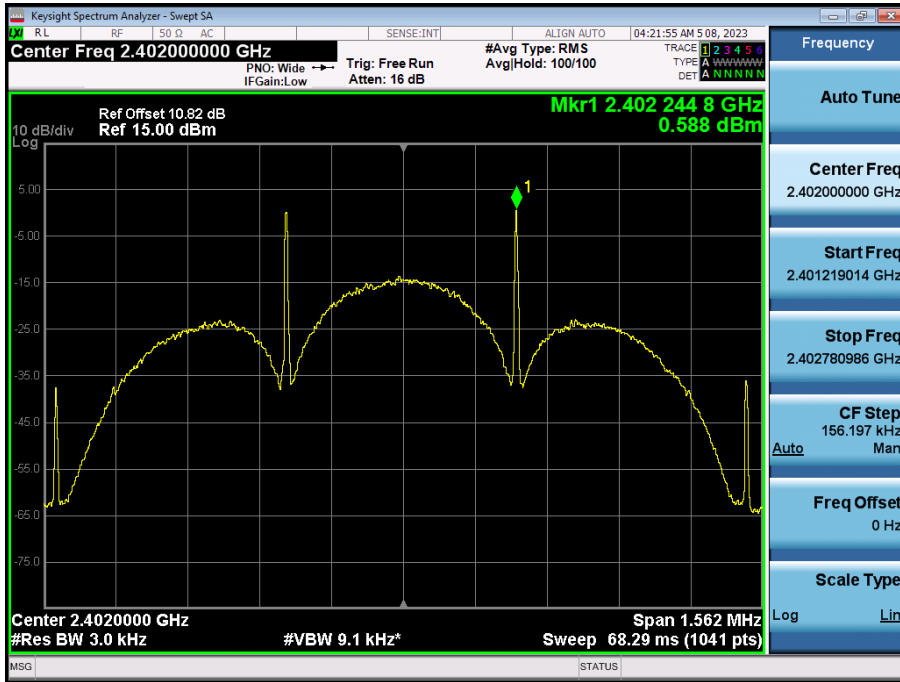




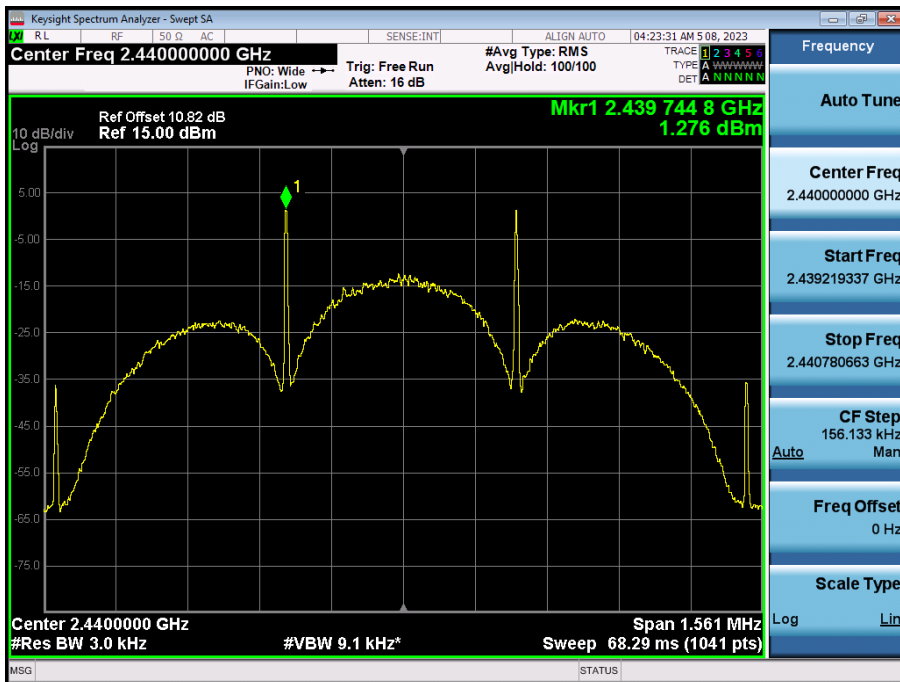
[Ant.2]

125k Bit/s (255 Byte) Test Plots

Power Spectral Density (Low-CH 0)



Power Spectral Density (Mid-CH 19)



Power Spectral Density (High-CH 39)



**9.5 BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS**

[Ant.1]

[BAND EDGE]

Frequency (MHz)	Mode	Channel No.	Position	Test Result	
				Measured Level (dB)	Limit (dBc)
2402	1M Bit/s 37 Byte	0	Lower	57.821	30
2480		39	Upper	59.109	30
2402	1M Bit/s 255 Byte	0	Lower	58.743	30
2480		39	Upper	60.493	30
2402	2M Bit/s 37 Byte	0	Lower	39.546	30
2480		39	Upper	60.560	30
2402	2M Bit/s 255 Byte	0	Lower	39.676	30
2480		39	Upper	59.535	30
2402	125k Bit/s 37 Byte	0	Lower	58.755	30
2480		39	Upper	58.362	30
2402	125k Bit/s 255 Byte	0	Lower	57.737	30
2480		39	Upper	57.824	30
2402	500k Bit/s 37 Byte	0	Lower	58.969	30
2480		39	Upper	60.121	30
2402	500k Bit/s 255 Byte	0	Lower	58.310	30
2480		39	Upper	60.139	30

**Note :**

- In order to simplify the report, attached plots were only the worst case channel and data rate.
  - Lower Band Edge 2M Bit/s (37 Byte)
  - Upper Band Edge 125k Bit/s (255 Byte)

**[CONDUCTED SPURIOUS EMISSIONS]**

**Note :**

- In order to simplify the report, attached plots were only the worst case channel and data rate. Worst case 1M Bit/s (37 Byte)

**[Ant.2]**

**[BAND EDGE]**

Frequency (MHz)	Mode	Channel No.	Position	Test Result	
				Measured Level (dB)	Limit (dBc)
2402	1M Bit/s 37 Byte	0	Lower	57.496	30
2480		39	Upper	59.205	30
2402	1M Bit/s 255 Byte	0	Lower	59.122	30
2480		39	Upper	59.182	30
2402	2M Bit/s 37 Byte	0	Lower	39.545	30
2480		39	Upper	59.402	30
2402	2M Bit/s 255 Byte	0	Lower	39.683	30
2480		39	Upper	59.488	30
2402	125k Bit/s 37 Byte	0	Lower	56.690	30
2480		39	Upper	57.754	30
2402	125k Bit/s 255 Byte	0	Lower	57.836	30
2480		39	Upper	62.399	30
2402	500k Bit/s 37 Byte	0	Lower	59.100	30
2480		39	Upper	60.050	30
2402	500k Bit/s 255 Byte	0	Lower	58.379	30
2480		39	Upper	59.408	30

**Note :**

1. In order to simplify the report, attached plots were only the worst case channel and data rate.
  - (1) Lower 2M Bit/s (37 Byte)
  - (2) Upper 125k Bit/s (37 Byte)

**[CONDUCTED SPURIOUS EMISSIONS]**

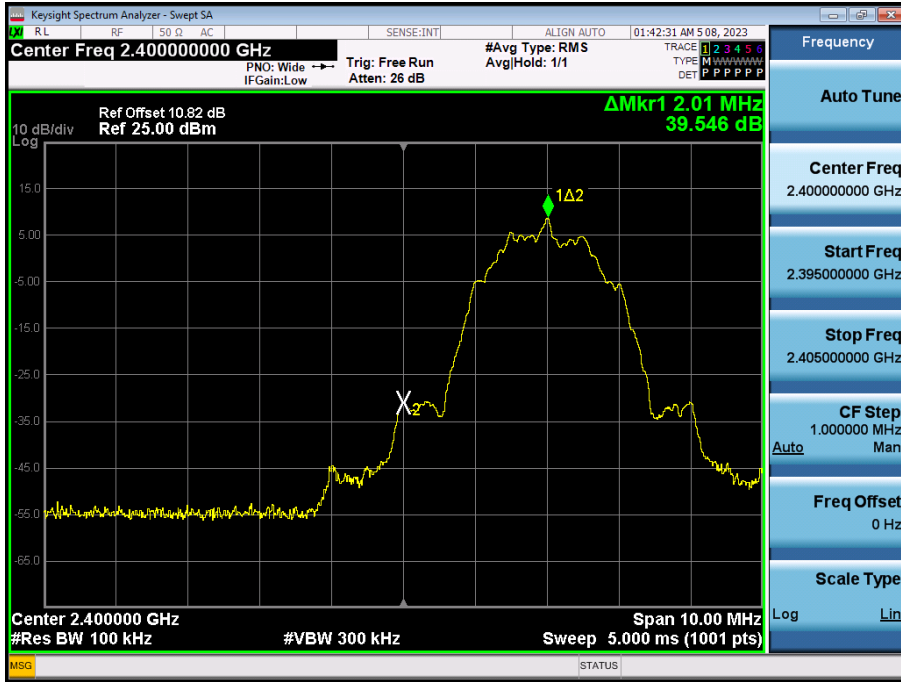
**Note :**

1. In order to simplify the report, attached plots were only the worst case channel and data rate. Worst case 1M Bit/s (37 Byte)

[Ant.1]

▣ Test Plots(Band Edge\_Lower)

2M Bit/s (37 Byte) Low Channel(Ch. 0)



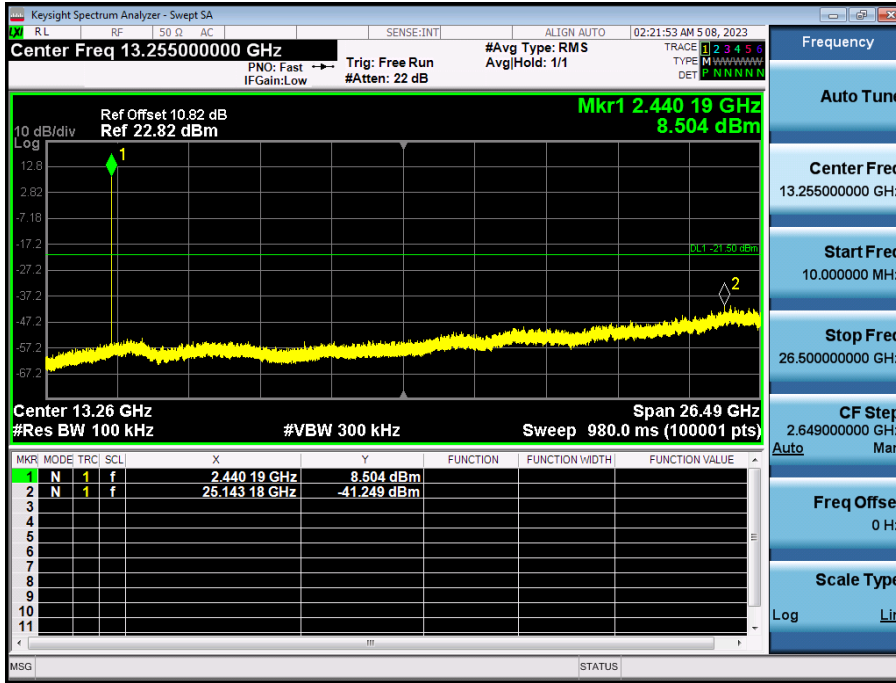
▣ Test Plots(Band Edge\_Upper)

125k Bit/s (255 Byte) High Channel(Ch. 39)



☑ 1M Bit/s (37 Byte) Test Plots  
[CONDUCTED SPURIOUS EMISSIONS]

Spurious Emission (30 MHz – 26.5 GHz)



Limit (dBm): -21.496

[Ant.2]

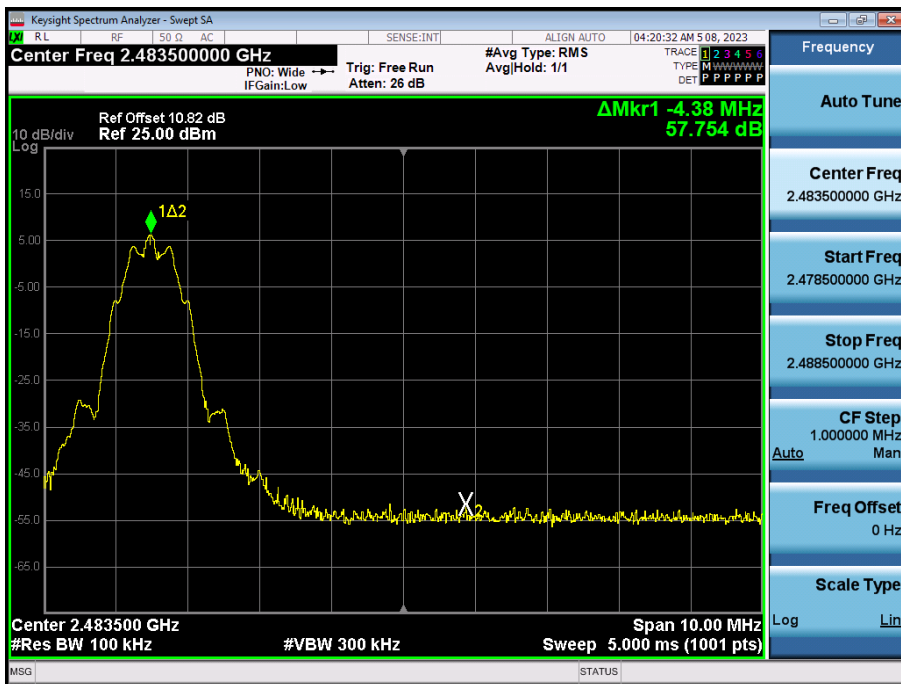
☐ Test Plots(Band Edge\_Lower)

2M Bit/s (37 Byte) Low Channel(Ch. 0)



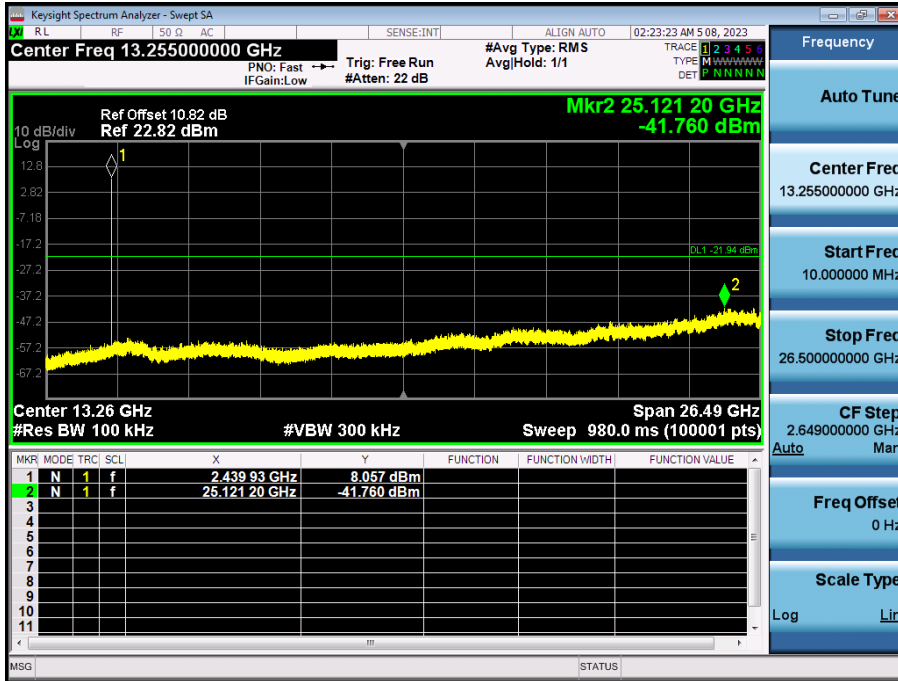
☐ Test Plots(Band Edge\_Upper)

125k Bit/s (37 Byte) High Channel(Ch. 39)



**1M Bit/s (37 Byte) Test Plots**  
**[CONDUCTED SPURIOUS EMISSIONS]**

**Spurious Emission (30 MHz – 26.5 GHz)**



Limit (dBm): -21.943



**9.6 RADIATED SPURIOUS EMISSIONS**

**Frequency Range : 9 kHz – 30 MHz**

Frequency	Measured Value	A.F+C.L+D.F	POL	Total	Limit	Margin
[MHz]	[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 =  $40\log(\text{specific distance} / \text{test distance})$  (dB)
3. Limit line = specific Limits (dBµV) + Distance extrapolation factor

**Frequency Range : Below 1 GHz**

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

**Note:**

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

**Frequency Range : Above 1 GHz**
**[Ant.1]**
**Mode : 1M Bit/s (37 Bytes)**

Operating Frequency : 2 402 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4804	45.36	0.00	2.51	V	47.87	73.98	26.11	PK
4804	35.09	2.90	2.51	V	40.50	53.98	13.48	AV
7206	41.67	0.00	9.10	V	50.77	73.98	23.21	PK
7206	29.60	2.90	9.10	V	41.59	53.98	12.39	AV
4804	45.95	0.00	2.51	H	48.46	73.98	25.52	PK
4804	35.35	2.90	2.51	H	40.76	53.98	13.22	AV
7206	41.61	0.00	9.10	H	50.71	73.98	23.27	PK
7206	29.58	2.90	9.10	H	41.57	53.98	12.41	AV

Operating Frequency : 2 440 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4880	42.94	0.00	2.92	V	45.86	73.98	28.12	PK
4880	31.10	2.90	2.92	V	36.92	53.98	17.06	AV
7320	41.55	0.00	9.42	V	50.97	73.98	23.01	PK
7320	30.01	2.90	9.42	V	42.33	53.98	11.65	AV
4880	42.64	0.00	2.92	H	45.56	73.98	28.42	PK
4880	31.28	2.90	2.92	H	37.10	53.98	16.88	AV
7320	41.39	0.00	9.42	H	50.81	73.98	23.17	PK
7320	29.94	2.90	9.42	H	42.26	53.98	11.72	AV

Operating Frequency : 2 480 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4960	43.38	0.00	2.00	V	45.38	73.98	28.60	PK
4960	30.77	2.90	2.00	V	35.67	53.98	18.31	AV
7440	41.30	0.00	9.99	V	51.29	73.98	22.69	PK
7440	29.48	2.90	9.99	V	42.37	53.98	11.61	AV
4960	43.25	0.00	2.00	H	45.25	73.98	28.73	PK
4960	30.69	2.90	2.00	H	35.59	53.98	18.39	AV
7440	41.22	0.00	9.99	H	51.21	73.98	22.77	PK
7440	29.58	2.90	9.99	H	42.47	53.98	11.51	AV

**Mode : 2M Bit/s (37 Bytes)**

Operating Frequency : 2 402 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4804	46.58	0.00	2.51	V	49.09	73.98	24.89	PK
4804	33.89	4.17	2.51	V	40.58	53.98	13.40	AV
7206	40.96	0.00	9.10	V	50.06	73.98	23.92	PK
7206	29.18	4.17	9.10	V	42.45	53.98	11.53	AV
4804	46.68	0.00	2.51	H	49.19	73.98	24.79	PK
4804	33.96	4.17	2.51	H	40.65	53.98	13.33	AV
7206	40.61	0.00	9.10	H	49.71	73.98	24.27	PK
7206	29.10	4.17	9.10	H	42.37	53.98	11.61	AV

Operating Frequency : 2 440 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4880	42.72	0.00	2.92	V	45.64	73.98	28.34	PK
4880	30.86	4.17	2.92	V	37.95	53.98	16.03	AV
7320	41.85	0.00	9.42	V	51.27	73.98	22.71	PK
7320	29.72	4.17	9.42	V	43.31	53.98	10.67	AV
4880	43.31	0.00	2.92	H	46.23	73.98	27.75	PK
4880	30.78	4.17	2.92	H	37.87	53.98	16.11	AV
7320	41.62	0.00	9.42	H	51.04	73.98	22.94	PK
7320	29.66	4.17	9.42	H	43.25	53.98	10.73	AV

Operating Frequency : 2 480 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4960	42.66	0.00	2.00	V	44.66	73.98	29.32	PK
4960	30.77	4.17	2.00	V	36.94	53.98	17.04	AV
7440	41.82	0.00	9.99	V	51.81	73.98	22.17	PK
7440	29.42	4.17	9.99	V	43.58	53.98	10.40	AV
4960	42.52	0.00	2.00	H	44.52	73.98	29.46	PK
4960	30.67	4.17	2.00	H	36.84	53.98	17.14	AV
7440	41.51	0.00	9.99	H	51.50	73.98	22.48	PK
7440	29.41	4.17	9.99	H	43.57	53.98	10.41	AV

[Ant.2]

Mode : 1M Bit/s (37 Bytes)

Operating Frequency : 2 402 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4804	44.74	0.00	2.51	V	47.25	73.98	26.73	PK
4804	32.09	2.90	2.51	V	37.50	53.98	16.48	AV
7206	41.09	0.00	9.10	V	50.19	73.98	23.79	PK
7206	29.26	2.90	9.10	V	41.25	53.98	12.73	AV
4804	44.28	0.00	2.51	H	46.79	73.98	27.19	PK
4804	31.96	2.90	2.51	H	37.37	53.98	16.61	AV
7206	40.16	0.00	9.10	H	49.26	73.98	24.72	PK
7206	28.84	2.90	9.10	H	40.83	53.98	13.15	AV

Operating Frequency : 2 440 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4880	30.75	0.00	2.92	V	33.67	73.98	40.31	PK
4880	30.73	2.90	2.92	V	36.55	53.98	17.43	AV
7320	41.84	0.00	9.42	V	51.26	73.98	22.72	PK
7320	29.67	2.90	9.42	V	41.99	53.98	11.99	AV
4880	29.91	0.00	2.92	H	32.83	73.98	41.15	PK
4880	30.66	2.90	2.92	H	36.48	53.98	17.50	AV
7320	41.17	0.00	9.42	H	50.59	73.98	23.39	PK
7320	29.48	2.90	9.42	H	41.80	53.98	12.18	AV

Operating Frequency : 2 480 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4960	43.19	0.00	2.00	V	45.19	73.98	28.79	PK
4960	30.70	2.90	2.00	V	35.60	53.98	18.38	AV
7440	41.33	0.00	9.99	V	51.32	73.98	22.66	PK
7440	29.29	2.90	9.99	V	42.18	53.98	11.80	AV
4960	42.47	0.00	2.00	H	44.47	73.98	29.51	PK
4960	30.21	2.90	2.00	H	35.11	53.98	18.87	AV
7440	41.14	0.00	9.99	H	51.13	73.98	22.85	PK
7440	28.75	2.90	9.99	H	41.64	53.98	12.34	AV

**Mode : 2M Bit/s (37 Bytes)**

Operating Frequency : 2 402 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4804	44.18	0.00	2.51	V	46.69	73.98	27.29	PK
4804	32.12	4.17	2.51	V	38.81	53.98	15.17	AV
7206	42.42	0.00	9.10	V	51.52	73.98	22.46	PK
7206	29.11	4.17	9.10	V	42.38	53.98	11.60	AV
4804	43.38	0.00	2.51	H	45.89	73.98	28.09	PK
4804	31.49	4.17	2.51	H	38.18	53.98	15.80	AV
7206	42.25	0.00	9.10	H	51.35	73.98	22.63	PK
7206	28.90	4.17	9.10	H	42.17	53.98	11.81	AV

Operating Frequency : 2 440 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4880	43.23	0.00	2.92	V	46.15	73.98	27.83	PK
4880	30.75	4.17	2.92	V	37.84	53.98	16.14	AV
7320	41.84	0.00	9.42	V	51.26	73.98	22.72	PK
7320	29.52	4.17	9.42	V	43.11	53.98	10.87	AV
4880	42.66	0.00	2.92	H	45.58	73.98	28.40	PK
4880	30.61	4.17	2.92	H	37.70	53.98	16.28	AV
7320	41.48	0.00	9.42	H	50.90	73.98	23.08	PK
7320	28.76	4.17	9.42	H	42.35	53.98	11.63	AV



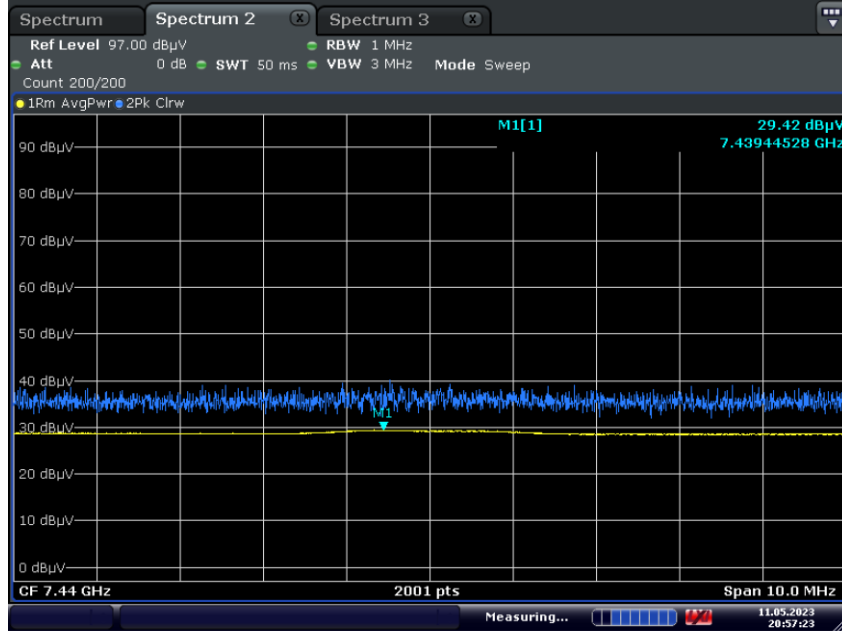
Operating Frequency : 2 480 MHz

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF-AG [dB/m]	Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
4960	42.31	0.00	2.00	V	44.31	73.98	29.67	PK
4960	30.71	4.17	2.00	V	36.88	53.98	17.10	AV
7440	42.03	0.00	9.99	V	52.02	73.98	21.96	PK
7440	29.34	4.17	9.99	V	43.50	53.98	10.48	AV
4960	42.01	0.00	2.00	H	44.01	73.98	29.97	PK
4960	29.75	4.17	2.00	H	35.92	53.98	18.06	AV
7440	41.15	0.00	9.99	H	51.14	73.98	22.84	PK
7440	28.16	4.17	9.99	H	42.32	53.98	11.66	AV

[Ant.1]

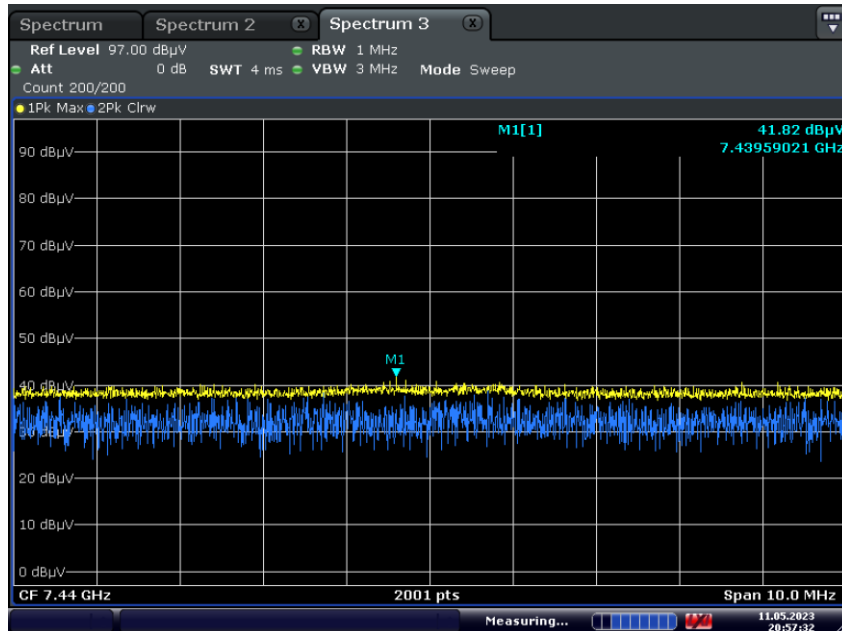
Mode : 2M Bit/s (37 Bytes) Test Plots

Radiated Spurious Emissions plot – Average Result (Ch. 39 3rd Harmonic, Y-V)



Date: 11.MAY.2023 20:57:23

Radiated Spurious Emissions plot – Peak Result (Ch. 39 3rd Harmonic, Y-V)

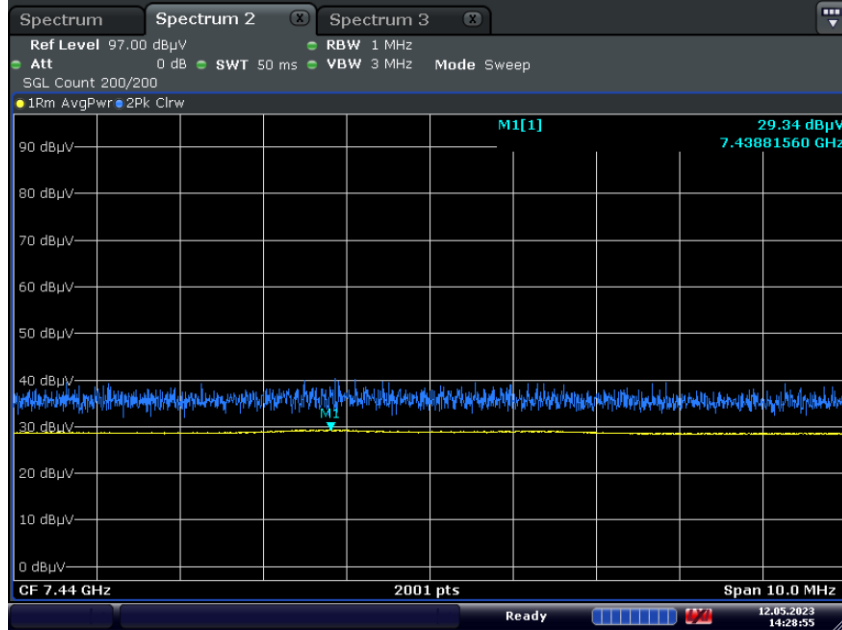


Date: 11.MAY.2023 20:57:32

**[Ant.2]**

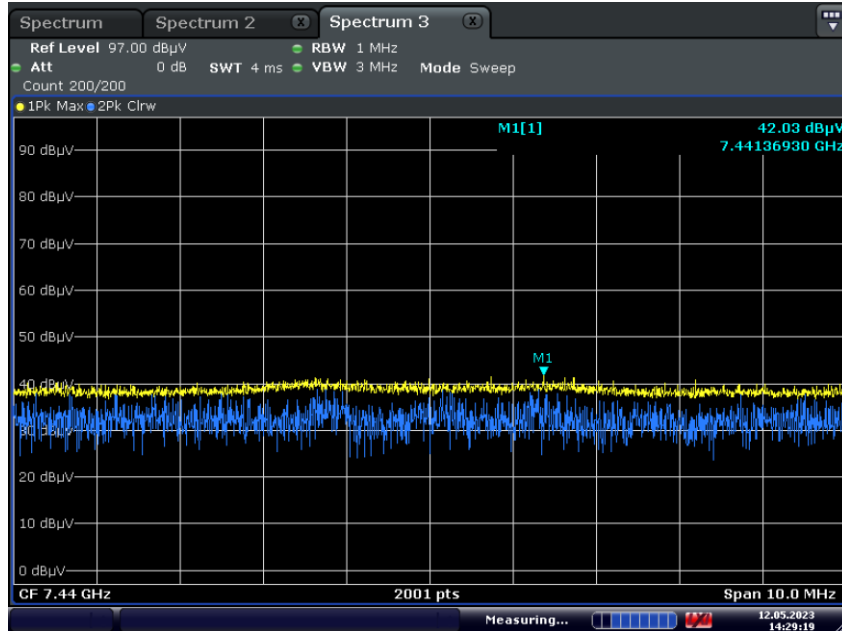
**Mode : 2M Bit/s (37 Bytes) Test Plots**

Radiated Spurious Emissions plot – Average Result (Ch. 39 3rd Harmonic, Y-V)



Date: 12.MAY.2023 14:28:55

Radiated Spurious Emissions plot – Peak Result (Ch. 39 3rd Harmonic, Y-V)



Date: 12.MAY.2023 14:29:19

**Note:**

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

## 9.7 RADIATED RESTRICTED BAND EDGES

[Ant.1]

Mode : 1 M Bit/s (37 Bytes)

Operating Frequency 2402 MHz, 2480 MHz

Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dB $\mu$ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Measurement Type
2390.0	18.92	0.00	34.90	H	53.82	73.98	20.16	PK
2390.0	6.10	2.90	34.90	H	43.89	53.98	10.09	AV
2390.0	18.39	0.00	34.90	V	53.29	73.98	20.69	PK
2390.0	6.09	2.90	34.90	V	43.88	53.98	10.10	AV
2483.5	20.93	0.00	35.10	H	56.03	73.98	17.95	PK
2483.5	6.69	2.90	35.10	H	44.68	53.98	9.30	AV
2483.5	19.99	0.00	35.10	V	55.09	73.98	18.89	PK
2483.5	6.65	2.90	35.10	V	44.64	53.98	9.34	AV

Mode : 2 M Bit/s (37 Bytes)

Operating Frequency 2402 MHz, 2480 MHz

Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dB $\mu$ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Measurement Type
2390.0	17.82	0.00	34.90	H	52.72	73.98	21.26	PK
2390.0	6.08	4.17	34.90	H	45.15	53.98	8.83	AV
2390.0	17.49	0.00	34.90	V	52.39	73.98	21.59	PK
2390.0	6.05	4.17	34.90	V	45.12	53.98	8.86	AV
2483.5	21.38	0.00	35.10	H	56.48	73.98	17.50	PK
2483.5	6.67	4.17	35.10	H	45.94	53.98	8.04	AV
2483.5	21.32	0.00	35.10	V	56.42	73.98	17.56	PK
2483.5	6.59	4.17	35.10	V	45.86	53.98	8.12	AV

**[Ant.2]**

**Mode : 1 M Bit/s (37 Bytes)**

Operating Frequency 2402 MHz, 2480 MHz

Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2390.0	17.86	0.00	34.90	H	52.76	73.98	21.22	PK
2390.0	5.83	2.90	34.90	H	43.62	53.98	10.36	AV
2390.0	17.36	0.00	34.90	V	52.26	73.98	21.72	PK
2390.0	5.75	2.90	34.90	V	43.54	53.98	10.44	AV
2483.5	19.03	0.00	35.10	H	54.13	73.98	19.85	PK
2483.5	6.38	2.90	35.10	H	44.37	53.98	9.61	AV
2483.5	18.53	0.00	35.10	V	53.63	73.98	20.35	PK
2483.5	6.19	2.90	35.10	V	44.18	53.98	9.80	AV

**Mode : 2 M Bit/s (37 Bytes)**

Operating Frequency 2402 MHz, 2480 MHz

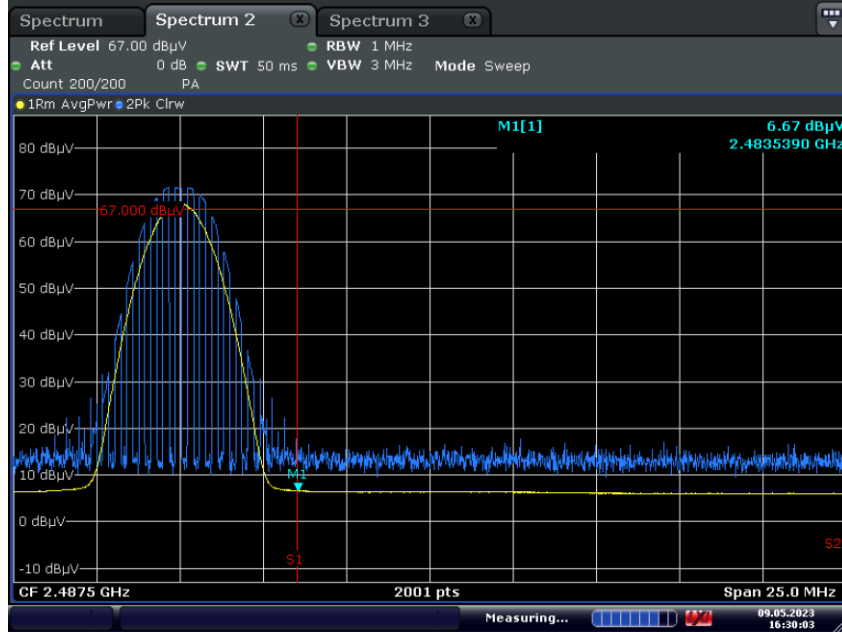
Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dBμV]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Measurement Type
2390.0	18.05	0.00	34.90	H	52.95	73.98	21.03	PK
2390.0	5.91	4.17	34.90	H	44.98	53.98	9.00	AV
2390.0	17.06	0.00	34.90	V	51.96	73.98	22.02	PK
2390.0	5.81	4.17	34.90	V	44.88	53.98	9.10	AV
2483.5	21.31	0.00	35.10	H	56.41	73.98	17.57	PK
2483.5	8.20	4.17	35.10	H	47.47	53.98	6.51	AV
2483.5	18.39	0.00	35.10	V	53.49	73.98	20.49	PK
2483.5	6.54	4.17	35.10	V	45.81	53.98	8.17	AV

[Ant.1]

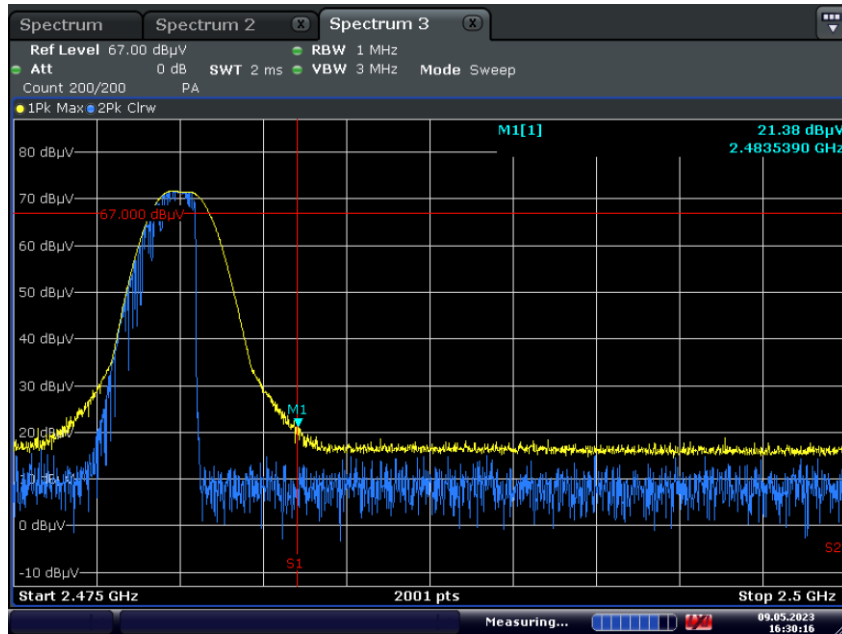
Mode : 2 M Bit/s (37 Bytes) Test Plots

Radiated Restricted Band Edges plot – Average Result (Ch.39, X-H)



Date: 9.MAY.2023 16:30:03

Radiated Restricted Band Edges plot – Peak Result (Ch.39, X-H)

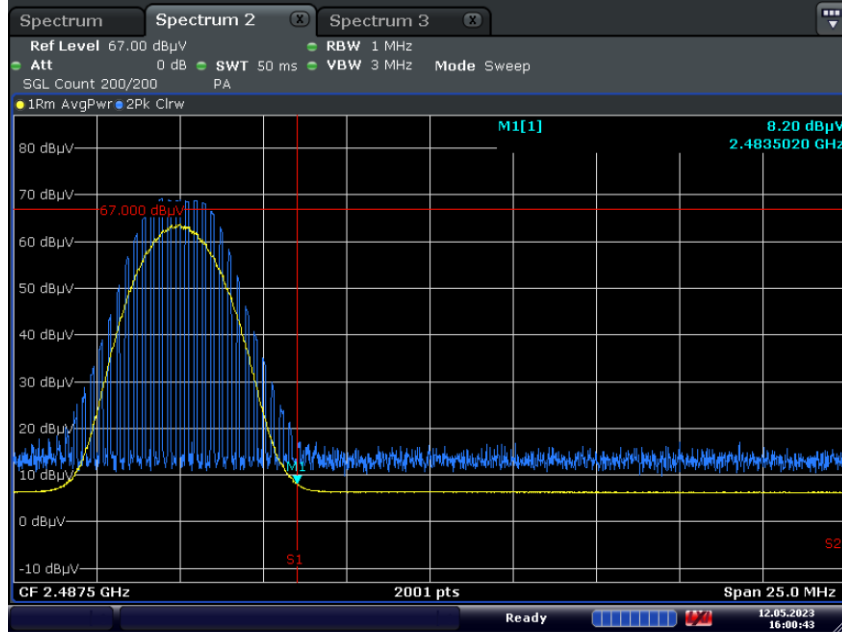


Date: 9.MAY.2023 16:30:17

[Ant.2]

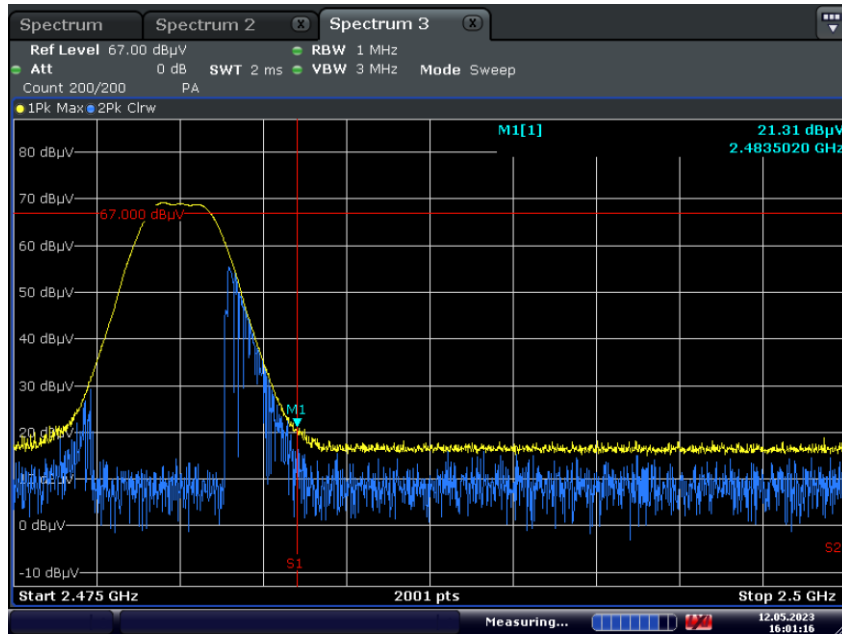
Mode : 2 M Bit/s (37 Bytes) Test Plots

Radiated Restricted Band Edges plot – Peak Result (Ch.39, X-H)



Date: 12.MAY.2023 16:00:43

Radiated Restricted Band Edges plot – Average Result (Ch.39, X-H)



Date: 12.MAY.2023 16:01:17

**Note:**

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

**9.8 POWERLINE CONDUCTED EMISSIONS**

**Conducted Emissions**

Test

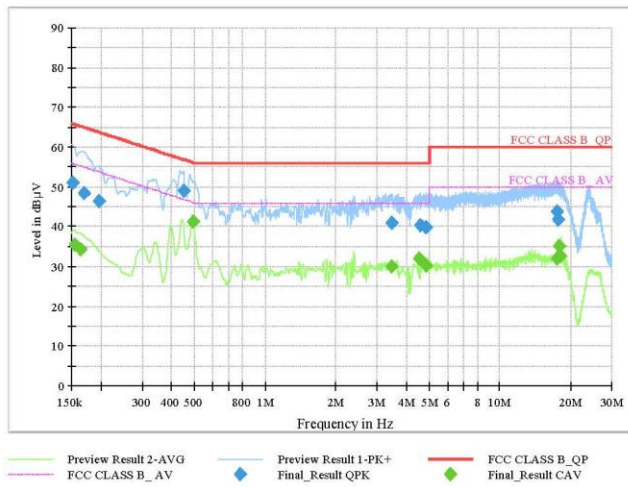
1 / 1

**Test Report**

**Common Information**

EUT : SM-X810  
 Operating Conditions : BTLE Mode  
 Comment :

Full Spectrum



**Final Result QPK**

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1523	51.13	65.88	14.74	1000.0	9.000	N	OFF	9.6
0.1703	48.57	64.95	16.38	1000.0	9.000	L1	OFF	9.7
0.1973	46.53	63.73	17.20	1000.0	9.000	L1	OFF	9.7
0.4493	48.99	56.89	7.90	1000.0	9.000	N	OFF	9.6
3.4790	41.04	56.00	14.96	1000.0	9.000	N	OFF	9.8
4.6018	40.49	56.00	15.51	1000.0	9.000	N	OFF	9.8
4.8245	39.68	56.00	16.32	1000.0	9.000	N	OFF	9.8
17.4470	43.72	60.00	16.28	1000.0	9.000	N	OFF	10.4
17.6698	41.88	60.00	18.12	1000.0	9.000	N	OFF	10.4

**Final Result CAV**

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.1545	35.51	55.75	20.24	1000.0	9.000	N	OFF	9.6
0.1635	34.24	55.28	21.05	1000.0	9.000	L1	OFF	9.7
0.4920	41.28	46.13	4.85	1000.0	9.000	N	OFF	9.6
3.4745	30.08	46.00	15.92	1000.0	9.000	N	OFF	9.8
4.5343	32.02	46.00	13.98	1000.0	9.000	N	OFF	9.8
4.8245	30.21	46.00	15.79	1000.0	9.000	N	OFF	9.8
17.5640	31.94	50.00	18.06	1000.0	9.000	N	OFF	10.4
17.8430	35.06	50.00	14.94	1000.0	9.000	N	OFF	10.4
18.0613	32.48	50.00	17.52	1000.0	9.000	N	OFF	10.4

2023-05-16

오전 8:13:56



## 10. LIST OF TEST EQUIPMENT

### Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/22/2023	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	06/07/2023	Annual
Temperature Chamber	SU-642	ESPEC	0093008124	02/22/2024	Annual
Signal Analyzer	N9030A	Keysight	MY55410508	09/06/2023	Annual
Power Meter	N1911A	Agilent	MY45100523	03/06/2024	Annual
Power Sensor	N1921A	Agilent	MY57820067	03/06/2024	Annual
Directional Coupler	87300B	Agilent	3116A03621	11/02/2023	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2024	Annual
DC Power Supply	E3632A	Agilent	KR75305528	01/03/2024	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C-010	Agilent	08285	06/21/2023	Annual
Attenuator(20 dB)	18N-20dB	Rohde & Schwarz	8	03/08/2024	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	02/16/2024	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.

**Radiated Test**

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
Controller(Antenna mast)	CO3000	Innco system	CO3000-4p	N/A	N/A
Antenna Position Tower	MA4640/800-XP-EP	Innco system	N/A	N/A	N/A
Controller	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	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1191	11/18/2023	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	01/05/2024	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	5	06/13/2023	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/13/2023	Annual
Band Reject Filter	WRCJV5100/5850-40/50-8EEK	Wainwright Instruments	1	02/09/2024	Annual
ATT(3 dB) + LNA2(6~18 GHz)	18B-03, CBL06185030	WEINSCHEL CERNEX	N/A	12/05/2023	Annual
ATT(10 dB) + LNA1(0.1~18 GHz)	56-10, CBLU1183540B-01	Api tech, CERNEX	N/A	12/05/2023	Annual
High Pass Filter	WHKX10-2700-3000-18000-40SS	Wainwright Instruments	N/A	12/05/2023	Annual
High Pass Filter	WHKX8-6090-7000-18000-40SS	Wainwright Instruments	N/A	12/05/2023	Annual
Thru	COAXIAL ATTENUATOR	T&M SYSTEM	N/A	12/05/2023	Annual
Power Amplifier	CBL18265035	CERNEX	22966	12/01/2023	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/02/2024	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/28/2024	Annual
Spectrum Analyzer	FSP(9 kHz ~ 30 GHz)	Rohde & Schwarz	836650/016	09/06/2023	Annual
Spectrum Analyzer	FSVA40(10 Hz ~ 40 GHz)	Rohde & Schwarz	101502	03/17/2024	Annual
Spectrum Analyzer	FSW	Rohde & Schwarz	101736	05/17/2023	Annual
Signal Analyzer	N9030A	Keysight	MY52350879	01/02/2024	Annual

**Note:**

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

**11. ANNEX A\_ TEST SETUP PHOTO**

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

No.	Description
1	HCT-RF-2305-FC048-P