

FCC BT LE REPORT

Certification

Applicant Name:
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Date of Issue:
May 09, 2023

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

Report No.: HCT-RF-2305-FC039

FCC ID:	A3LSMX818U
APPLICANT:	SAMSUNG Electronics Co., Ltd.

Model: SM-X818U
EUT Type: Tablet
Average Output Power: Ant.1: 11.44 dBm (13.92 mW)
Ant.2: 10.86 dBm (12.18 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-FC039

REVIEWED BY



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

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

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

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

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

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2305-FC039	May 09, 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	82
11. ANNEX A_ TEST SETUP PHOTO	85

1. EUT DESCRIPTION

Model	SM-X818U			
Additional Model	-			
EUT Type	Tablet			
Power Supply	DC 3.88 V			
Frequency Range	2 402 MHz ~ 2 480 MHz			
Max. RF Output Power (Normal)	Ant.1	Peak (For information only)	1 M Bit/s :	11.926 dBm (15.58 mW)
			2 M Bit/s :	11.909 dBm (15.52 mW)
	Average	125 k Bit/s :	11.639 dBm (14.58 mW)	
		500 k Bit/s :	11.805 dBm (15.15 mW)	
Ant.2	Peak (For information only)	1 M Bit/s :	11.360 dBm (13.68 mW)	
		2 M Bit/s :	11.672 dBm (14.70 mW)	
	Average	125 k Bit/s :	11.195 dBm (13.17 mW)	
		500 k Bit/s :	11.362 dBm (13.68 mW)	
Modulation Type	GFSK			
Bluetooth Version	5.3			
Number of Channels	40 Channels			
Date(s) of Tests	March 13, 2023 ~ May 09, 2023			
Serial number	Radiated: R32W2003JZY Conducted: R32W2003J2A			

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	WiFi	WiFi	WiFi	WiFi	WiFi			
	Ant.1	Ant.2	Ant.1	Ant.2	Ant.1	Ant.2	Ant.1	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.

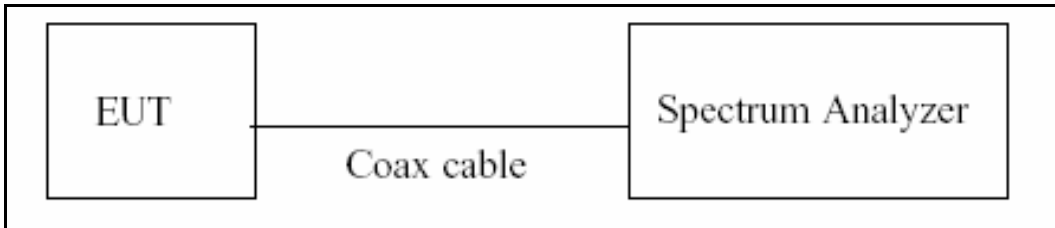
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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 $> 50/T$.

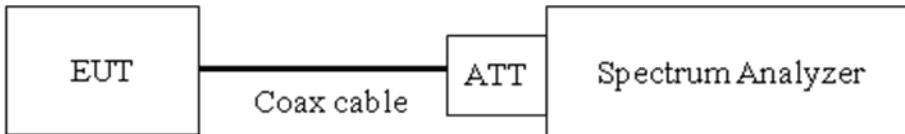
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (\geq RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = $10\log(1/\text{Duty Cycle})$

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.

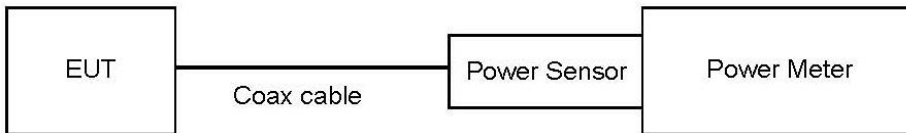
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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

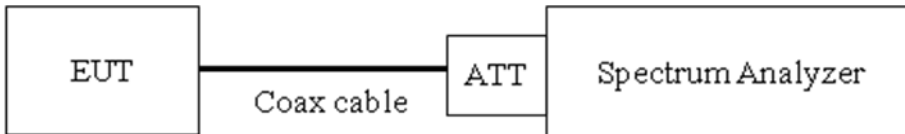
- Conducted Output Power(Peak) = Measured Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

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 %

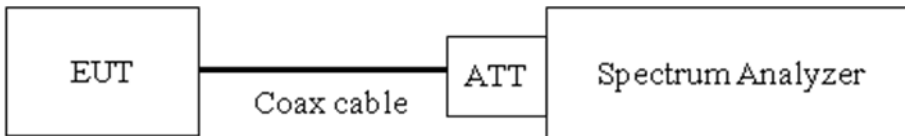
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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

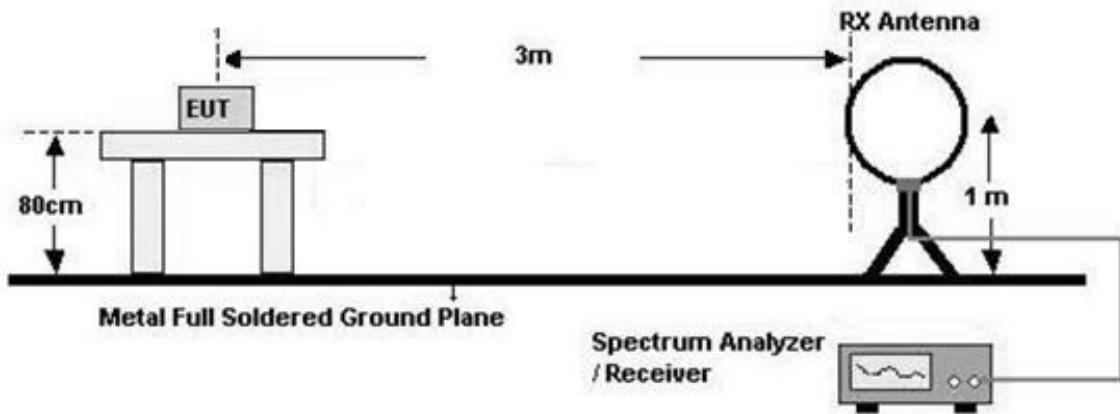
7.6. Radiated Test

Limit

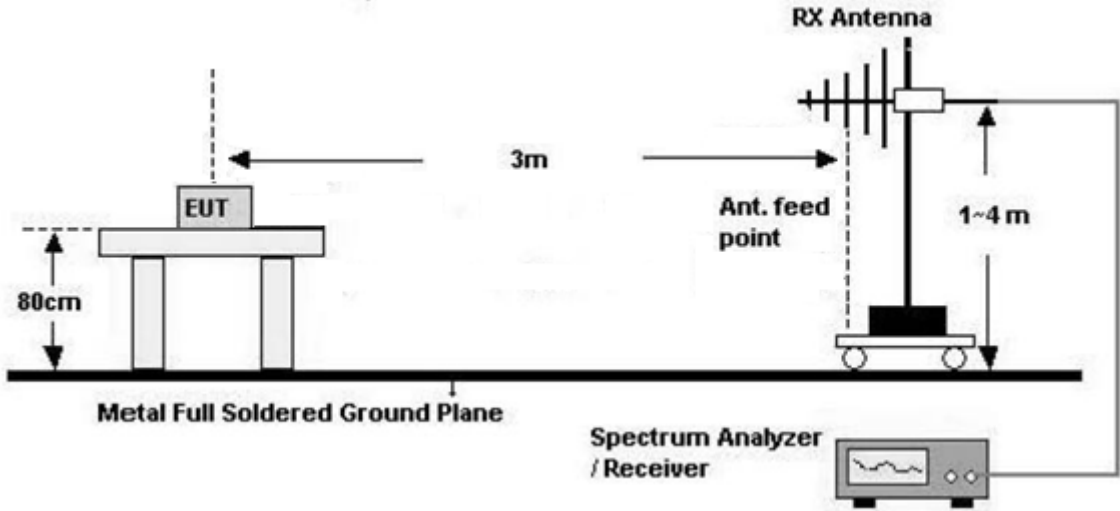
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

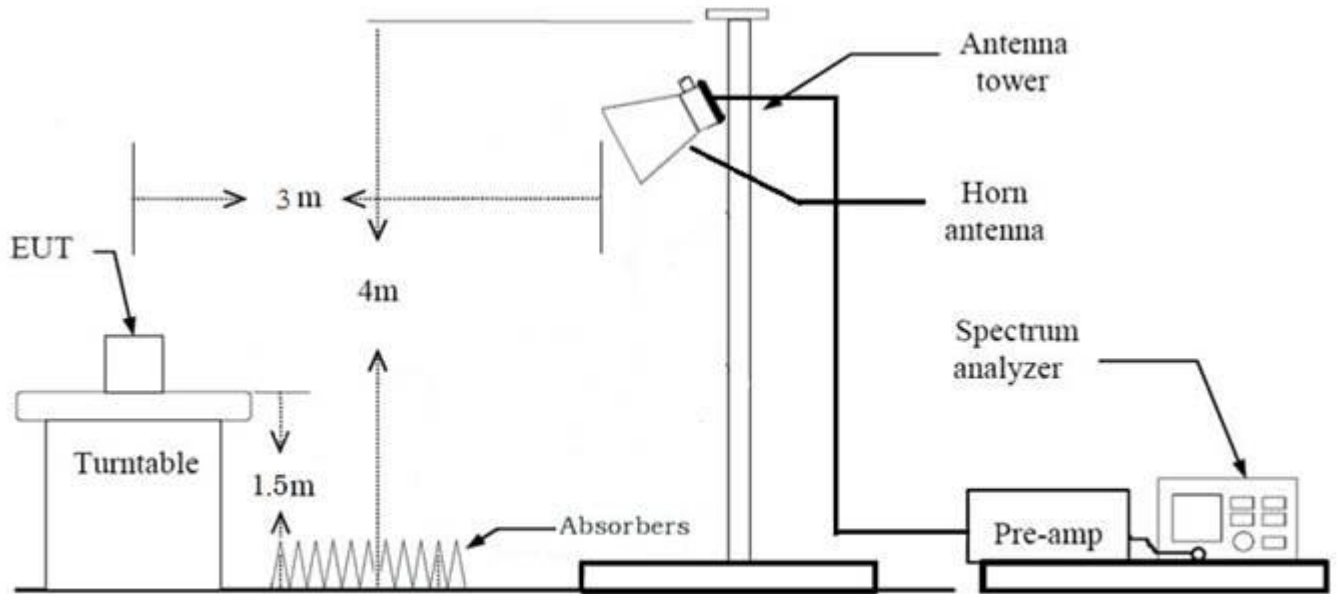
Below 30 MHz



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 ± 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 $\geq 3 \times$ RBW
 - (2) Measurement Type(Average):
 - Duty cycle < 98 %, duty cycle variations are less than ± 2 %
 - Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
 - Detector = RMS
 - Averaging type = power (i.e., RMS)
 - RBW = 1 MHz
 - VBW $\geq 3 \times$ RBW
 - Sweep time = auto.
 - Trace mode = average (at least 100 traces).
 - Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 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 μ H/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56 ^(a)	56 to 46 ^(a)
0.50 to 5	56	46
5 to 30	60	50

^(a)Decreases with the logarithm of the frequency.

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

Test Configuration

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

Test Procedure

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

Sample Calculation

Quasi-peak(Final Result) = Measured 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

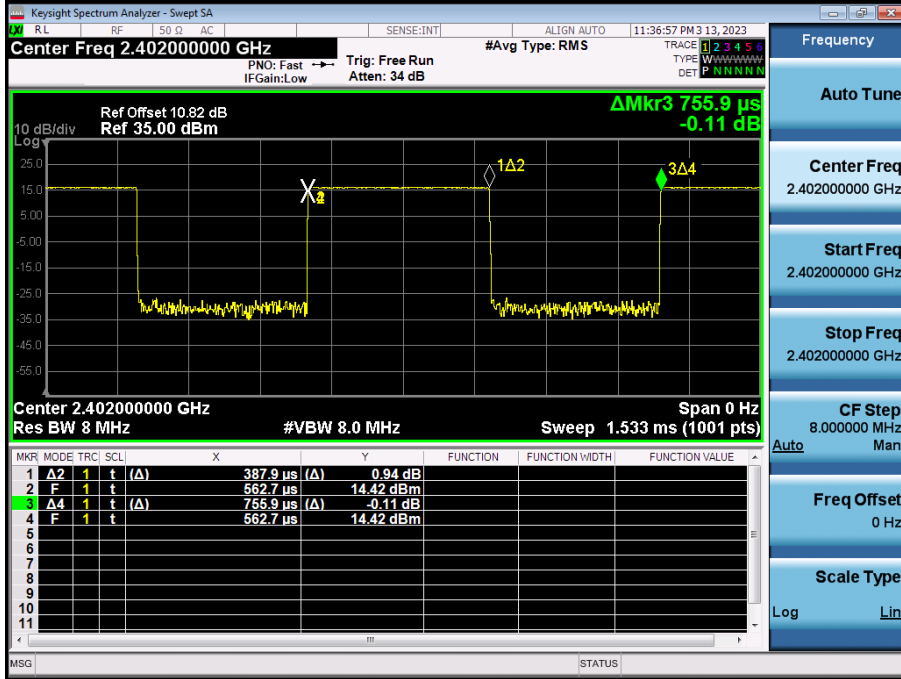
9. TEST RESULT

9.1 DUTY CYCLE

Data rate (Bit/s)	Packet length (Byte)	T _{on} (ms)	T _{total} (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

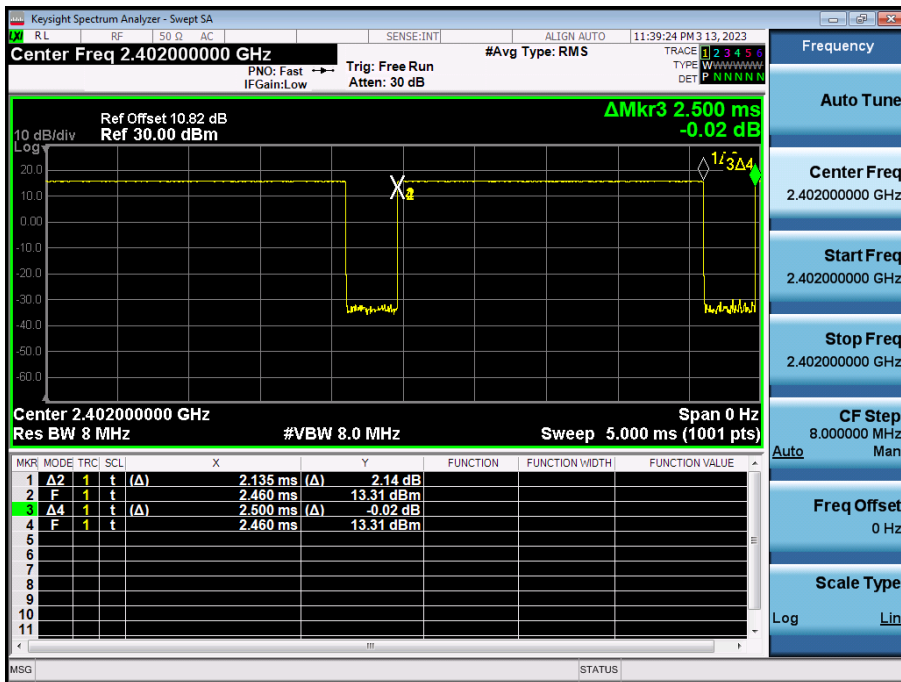
1 M Bit/s (37 Byte) Test Plots

Duty Cycle (Low-CH 0)



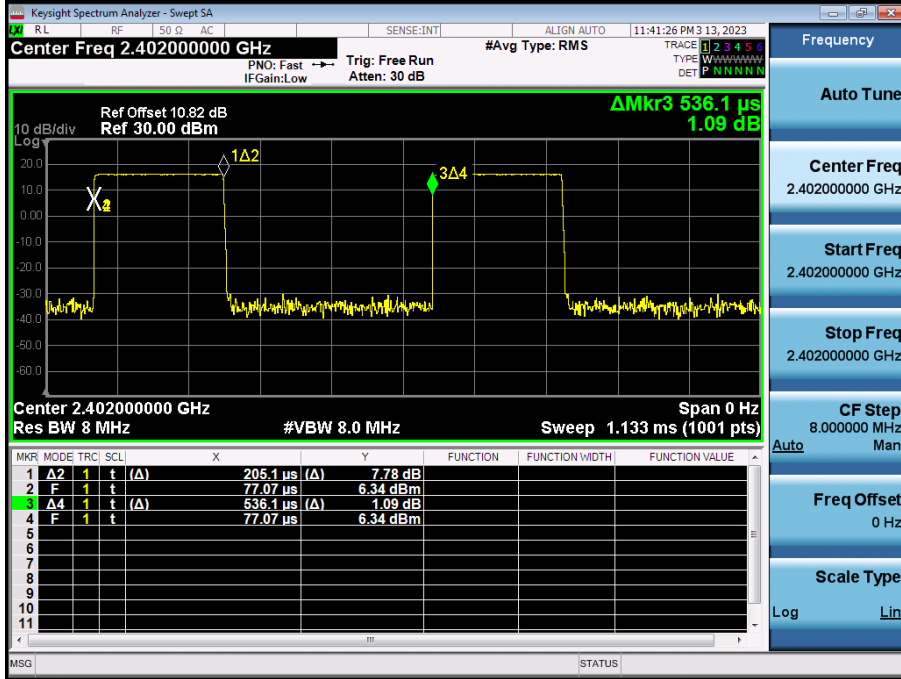
1 M Bit/s (255 Byte) Test Plots

Duty Cycle (Low-CH 0)



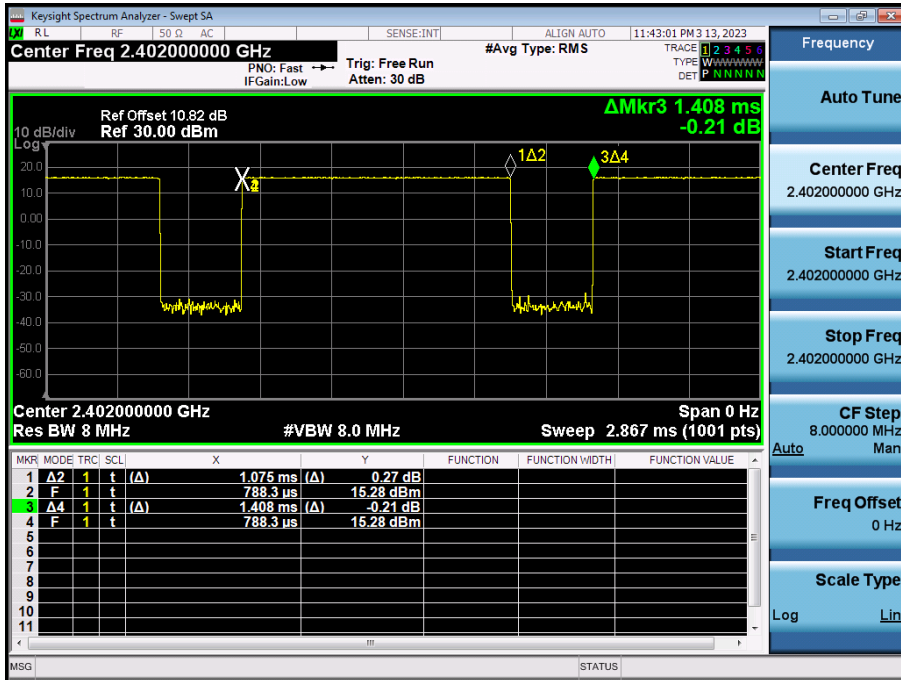
2 M Bit/s (37 Byte) Test Plots

Duty Cycle (Low-CH 0)



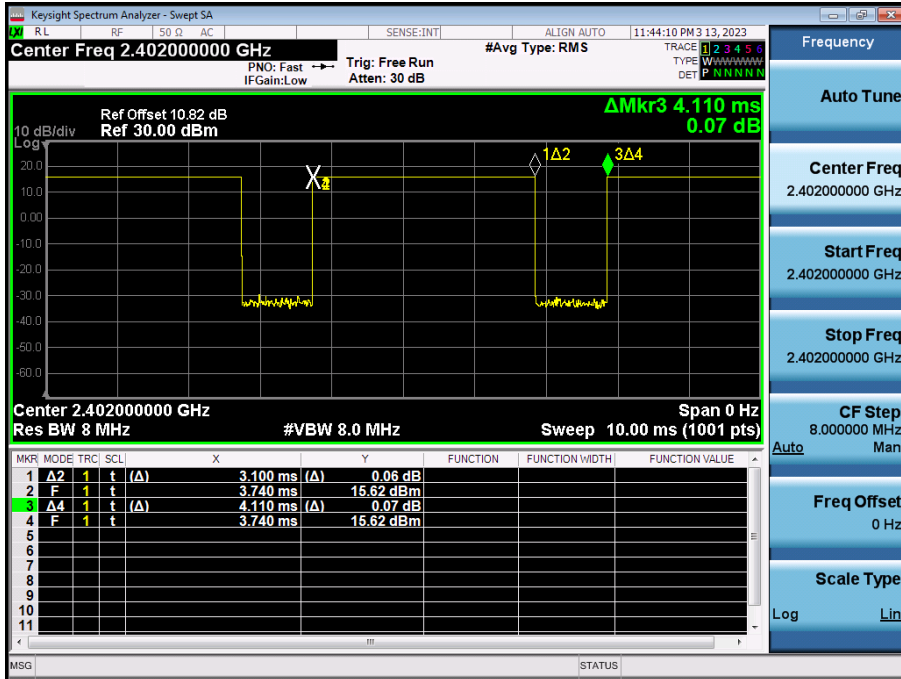
2 M Bit/s (255 Byte) Test Plots

Duty Cycle (Low-CH 0)



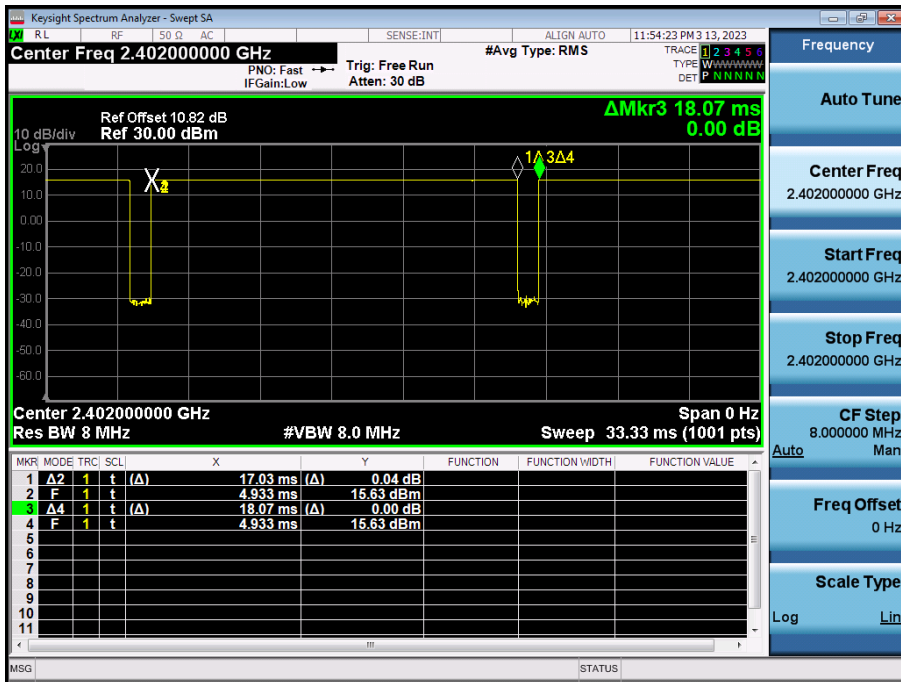
▣ 125 k Bit/s(37 Byte) Test Plots

Duty Cycle (Low-CH 0)



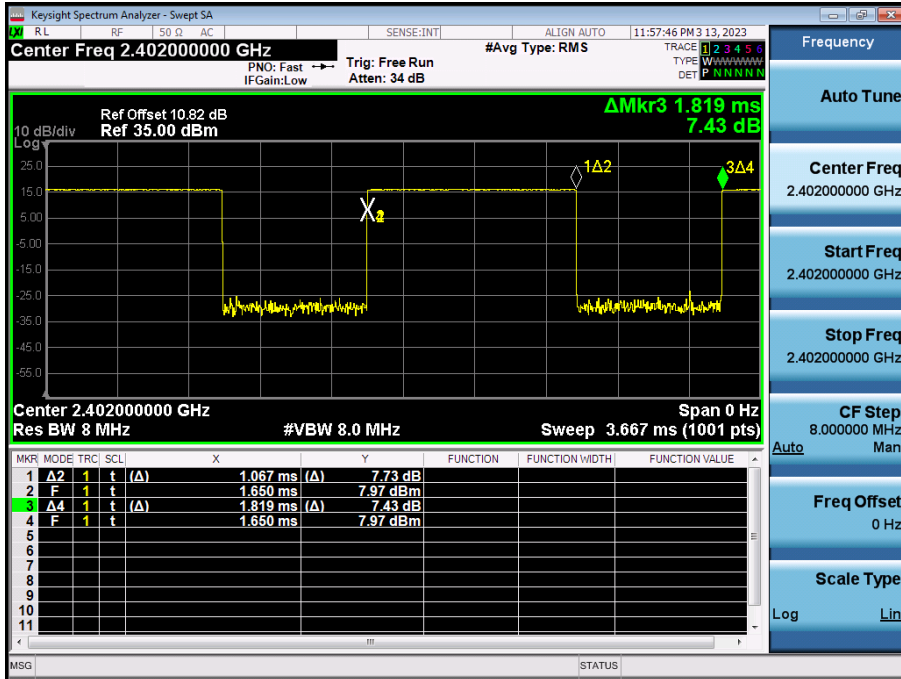
▣ 125 k Bit/s(255 Byte) Test Plots

Duty Cycle (Low-CH 0)



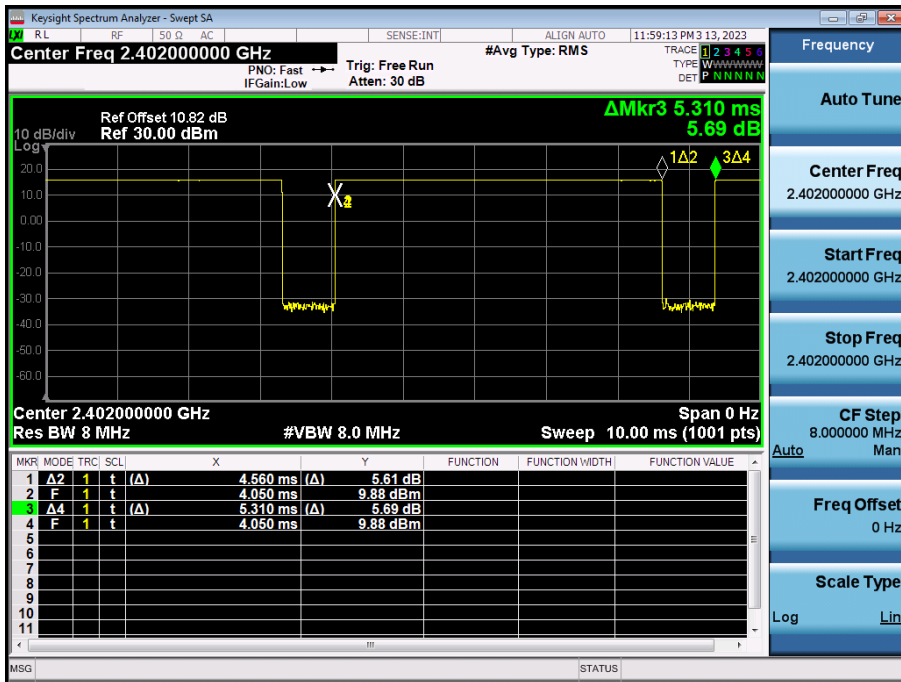
500 k Bit/s(37 Byte) Test Plots

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	671.6	> 500
	19	673.0	
	39	671.6	
1M(255)	0	665.9	> 500
	19	665.5	
	39	666.6	
2M(37)	0	1150	> 500
	19	1150	
	39	1151	
2M(255)	0	1156	> 500
	19	1160	
	39	1157	
125k(37)	0	627.7	> 500
	19	628.6	
	39	628.1	
125k(255)	0	627.6	> 500
	19	628.0	
	39	628.2	
500k(37)	0	665.1	> 500
	19	662.4	
	39	662.5	
500k(255)	0	664.3	> 500
	19	663.8	
	39	664.5	

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: 255 Byte

500k Bit/s: 37 Byte

[Ant.2]

Mode (Bit/s)	Channel	6 dB Bandwidth (kHz)	Limit (kHz)
1M(37)	0	673.0	> 500
	19	671.4	
	39	674.5	
1M(255)	0	666.6	> 500
	19	667.3	
	39	668.8	
2M(37)	0	1146	> 500
	19	1148	
	39	1147	
2M(255)	0	1158	> 500
	19	1159	
	39	1161	
125k(37)	0	628.9	> 500
	19	628.5	
	39	629.0	
125k(255)	0	629.5	> 500
	19	629.1	
	39	629.6	
500k(37)	0	664.5	> 500
	19	663.6	
	39	664.5	
500k(255)	0	667.5	> 500
	19	665.3	
	39	664.1	

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

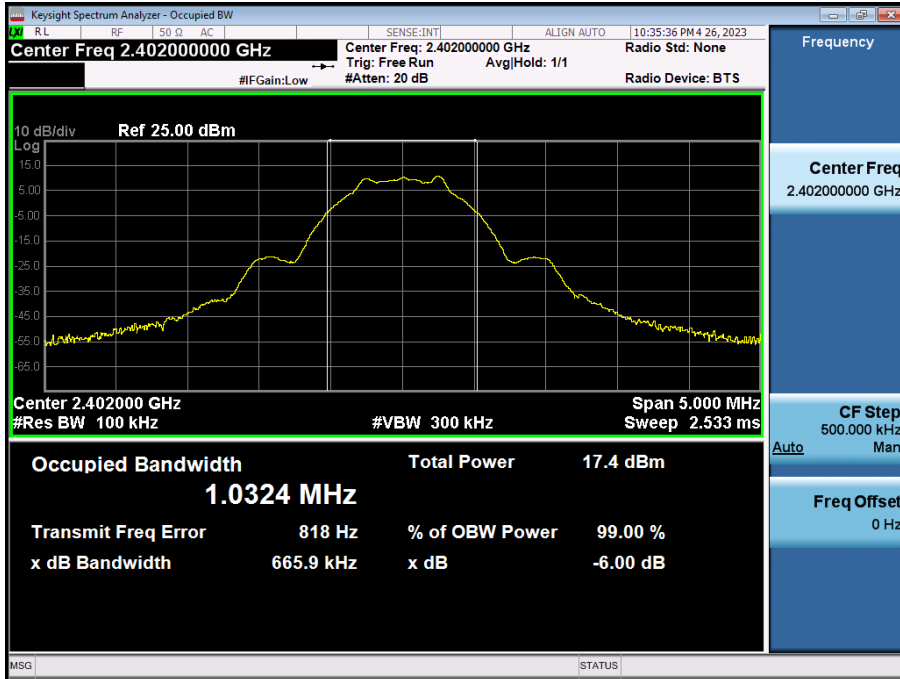
125k Bit/s: 37 Byte

500k Bit/s: 37 Byte

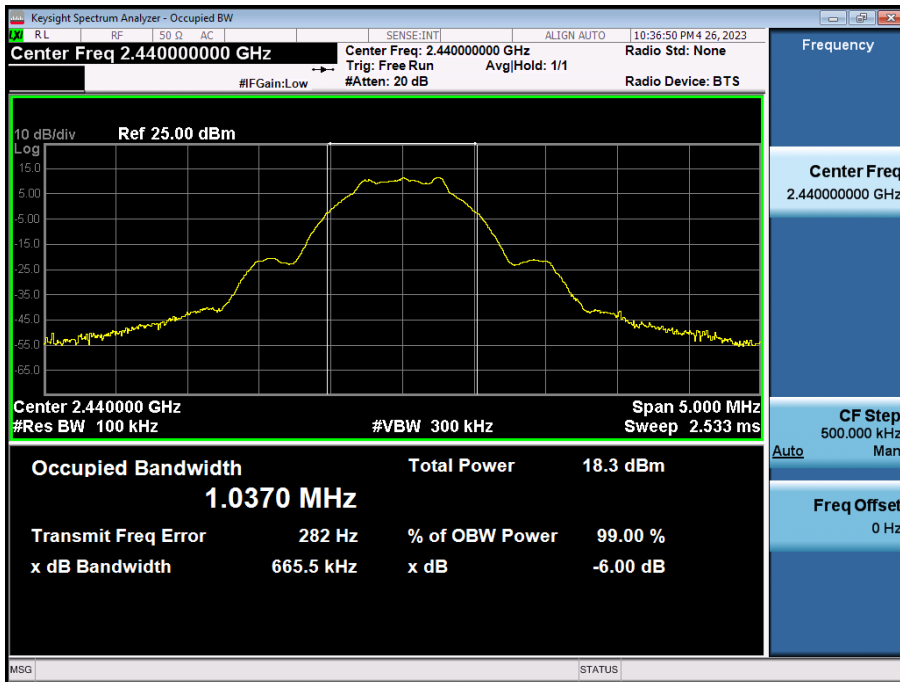
[Ant.1]

▣ 1 MBit/s (255 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

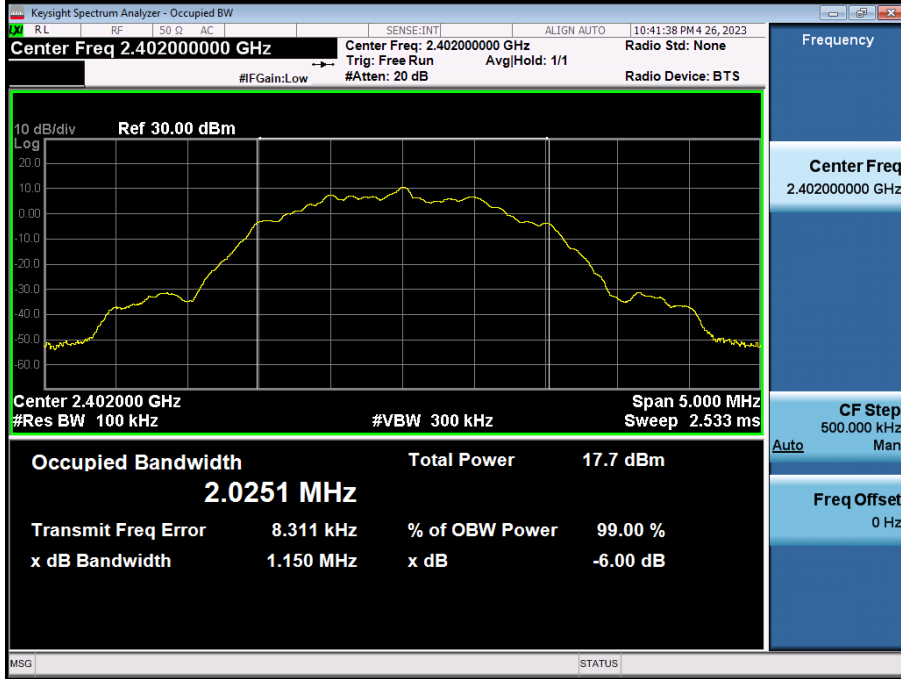


6 dB Bandwidth plot (High-CH 39)



2 MBit/s (37 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

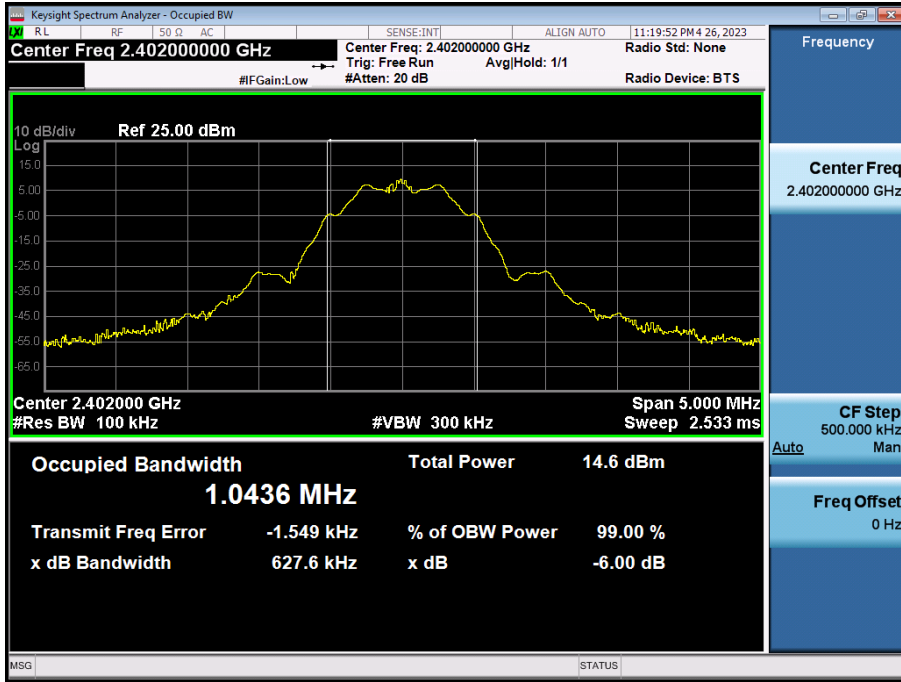


6 dB Bandwidth plot (High-CH 39)

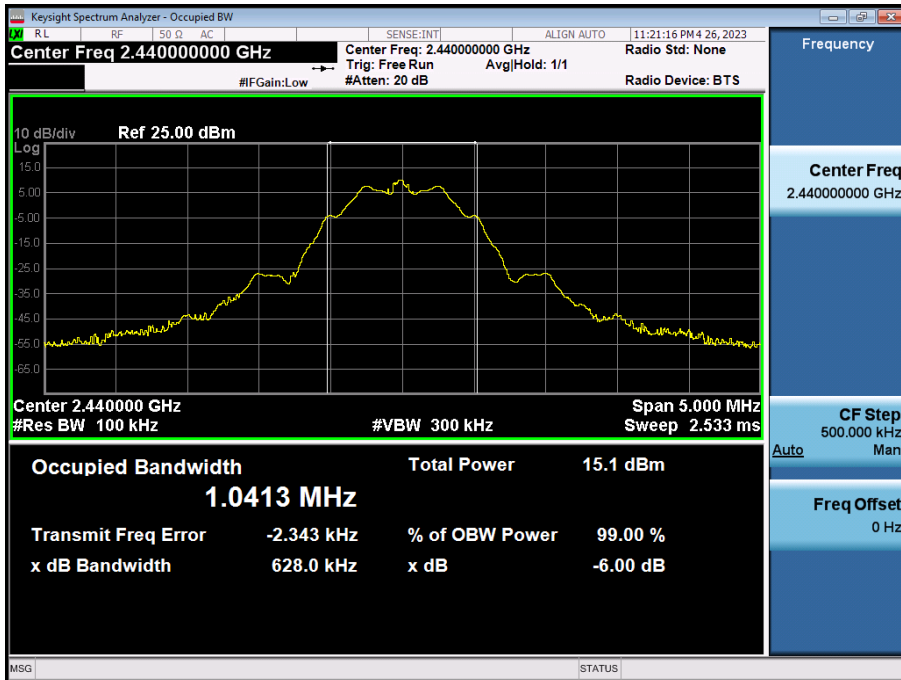


125k Bit/s(255 Byte) Test Plots

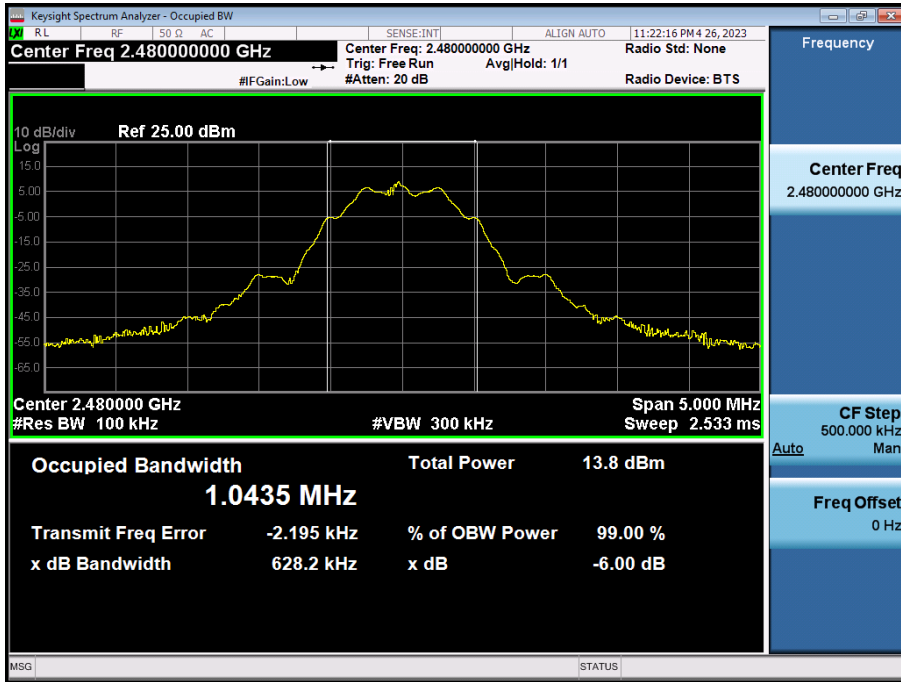
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

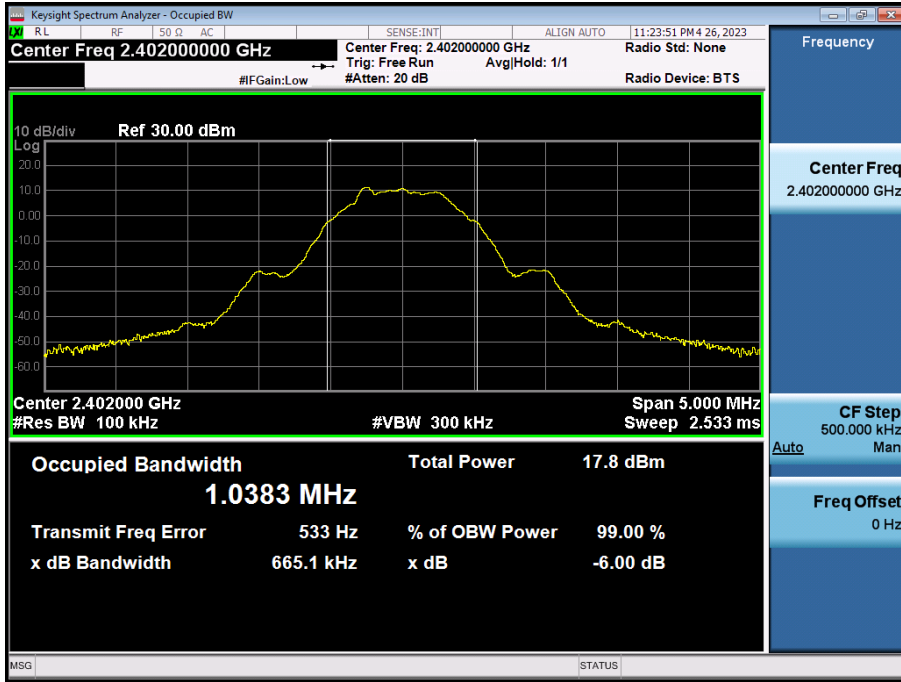


6 dB Bandwidth plot (High-CH 39)



500k Bit/s(37 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)



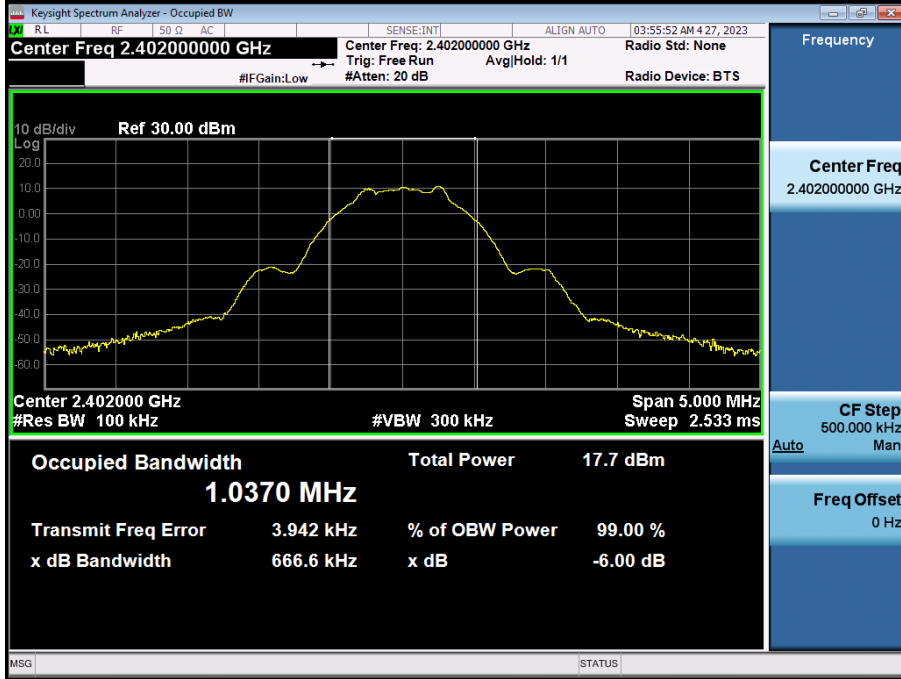
6 dB Bandwidth plot (High-CH 39)



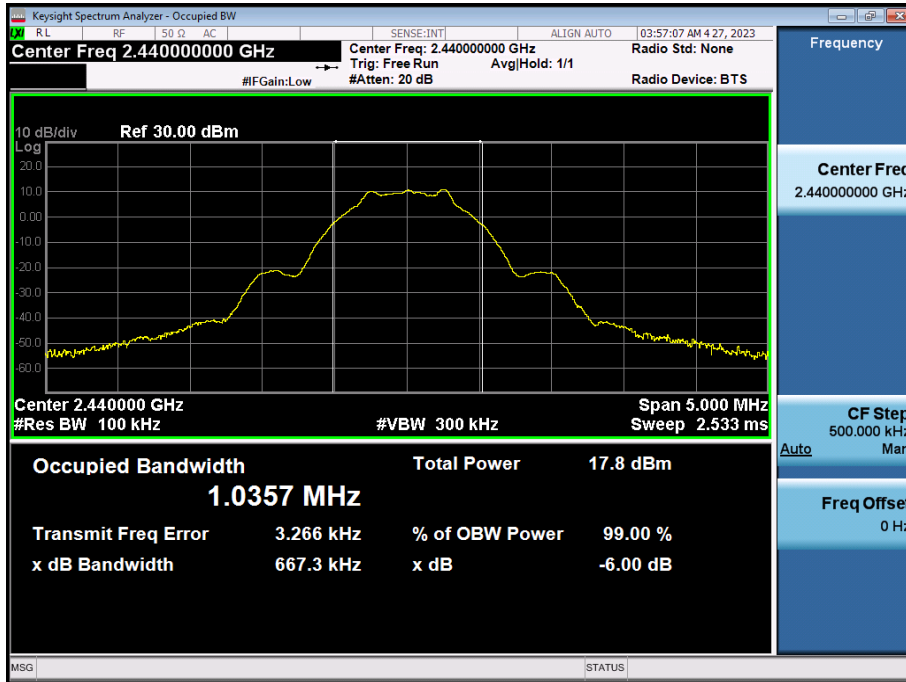
[Ant.2]

▣ 1 MBit/s (255 Byte) Test Plots

6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

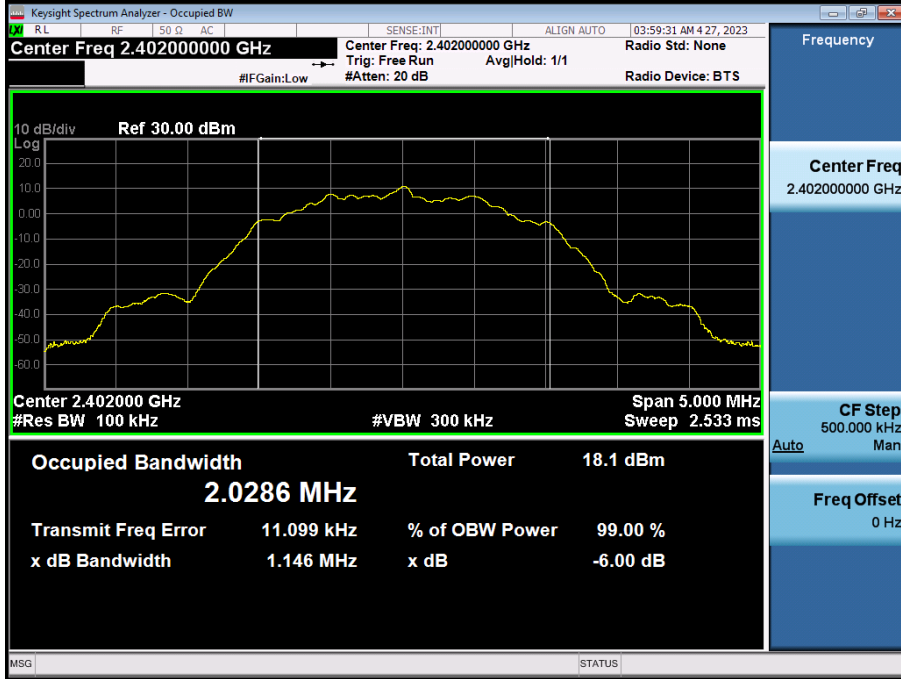


6 dB Bandwidth plot (High-CH 39)

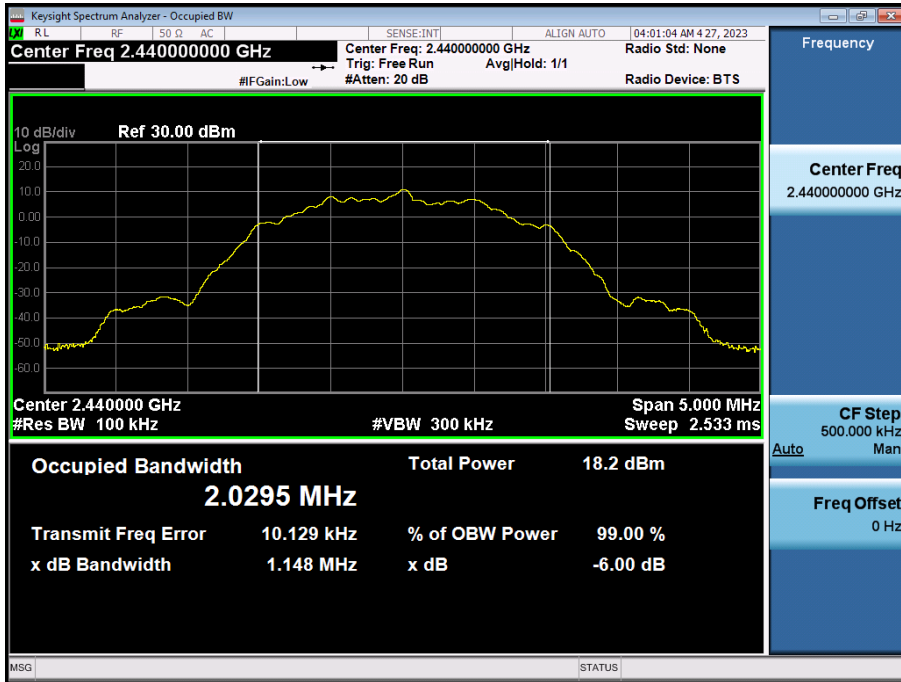


2 MBit/s (37 Byte) Test Plots

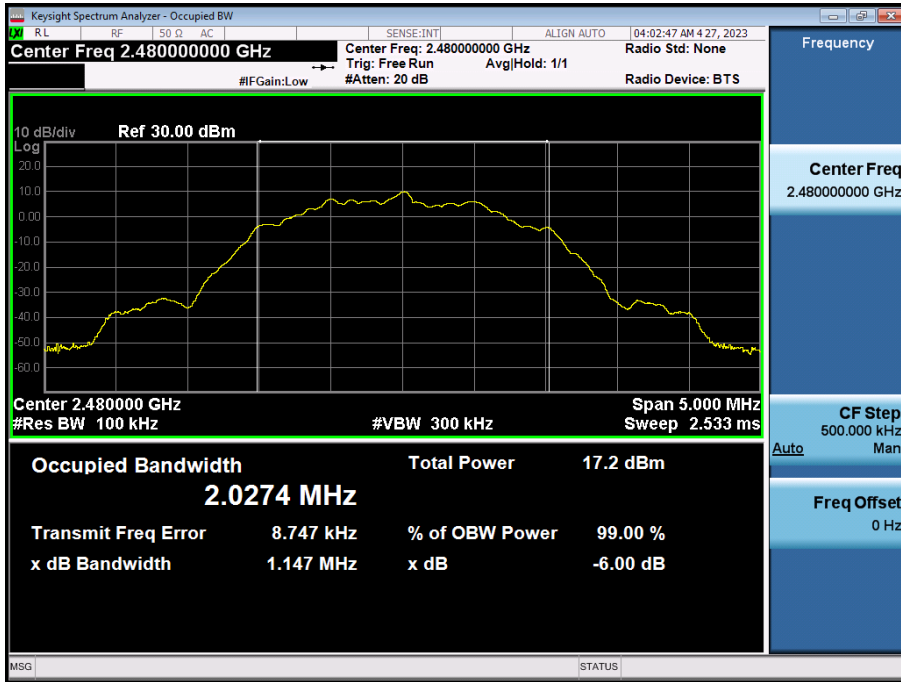
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

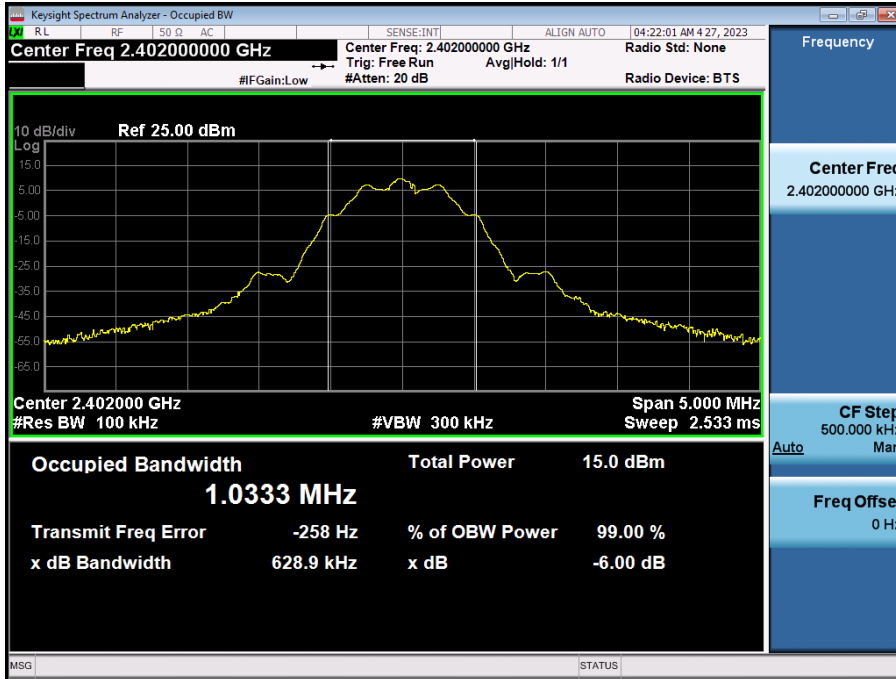


6 dB Bandwidth plot (High-CH 39)

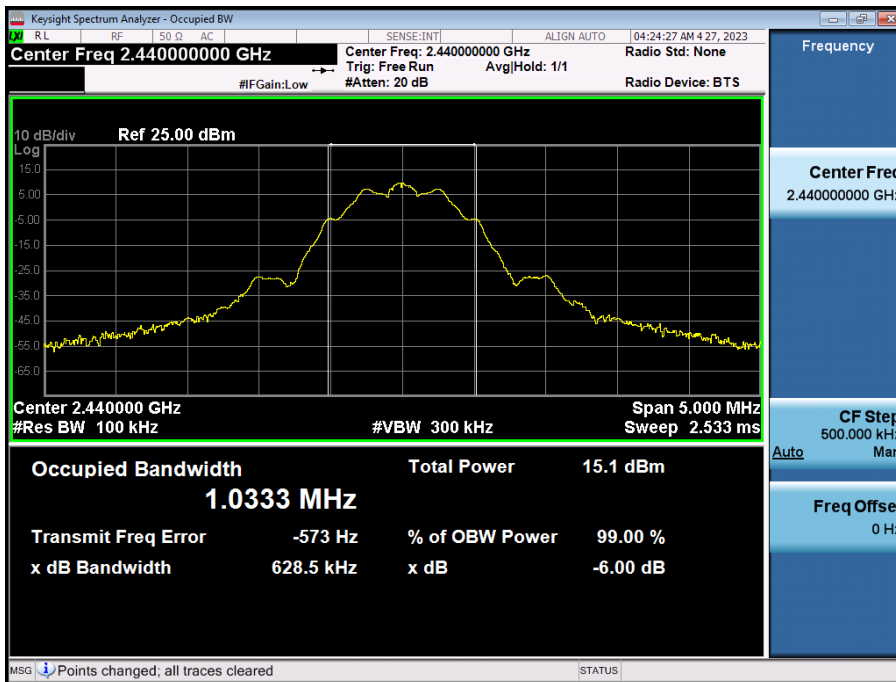


125k Bit/s(37 Byte) Test Plots

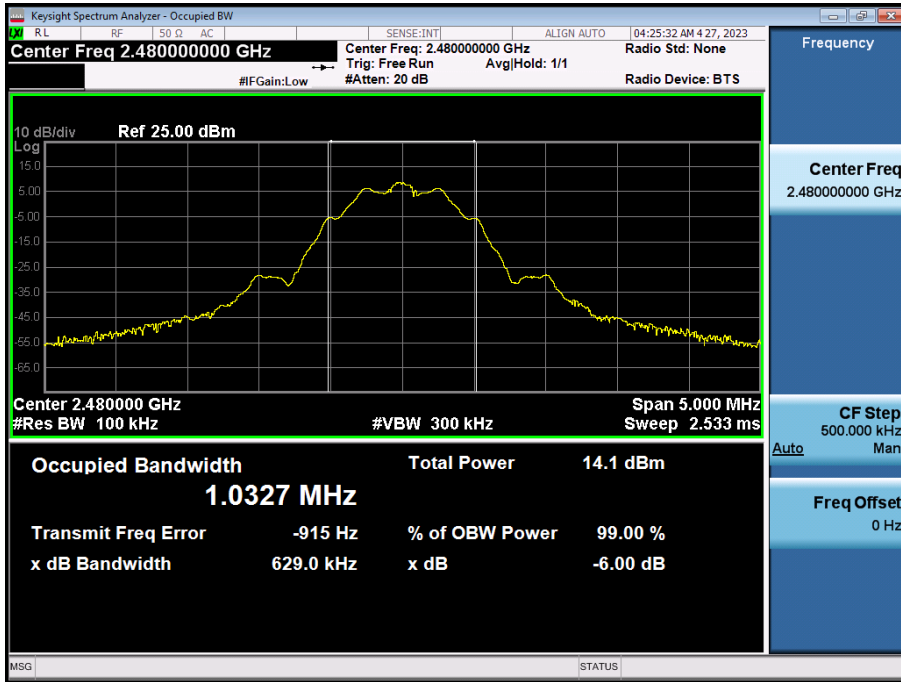
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

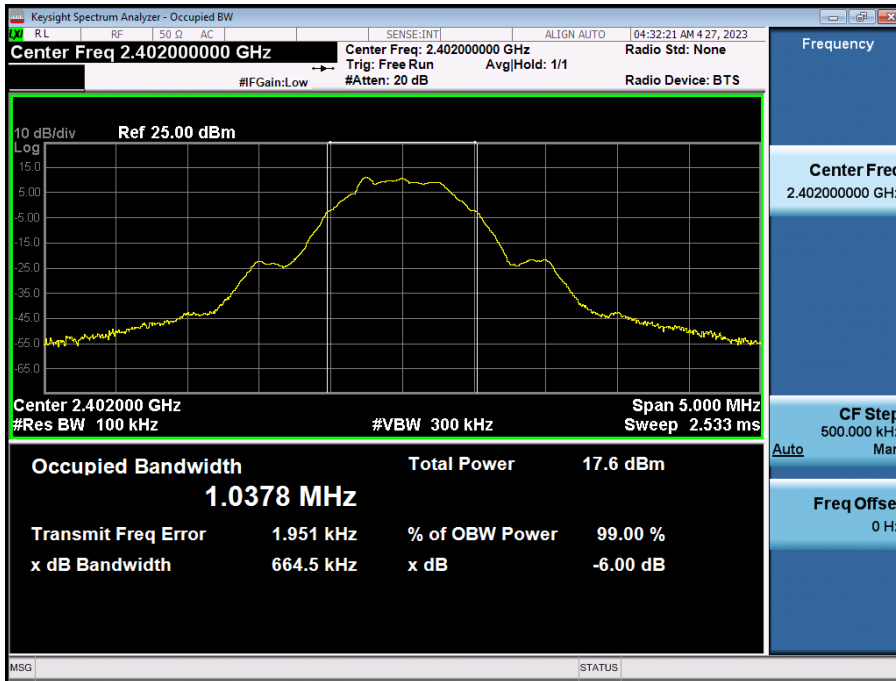


6 dB Bandwidth plot (High-CH 39)

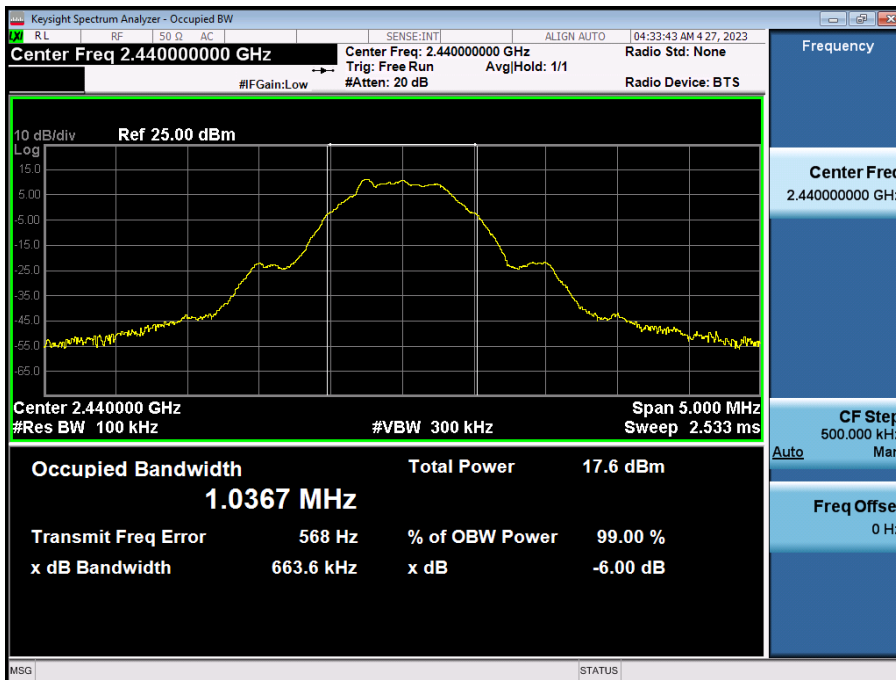


500k Bit/s(37 Byte) Test Plots

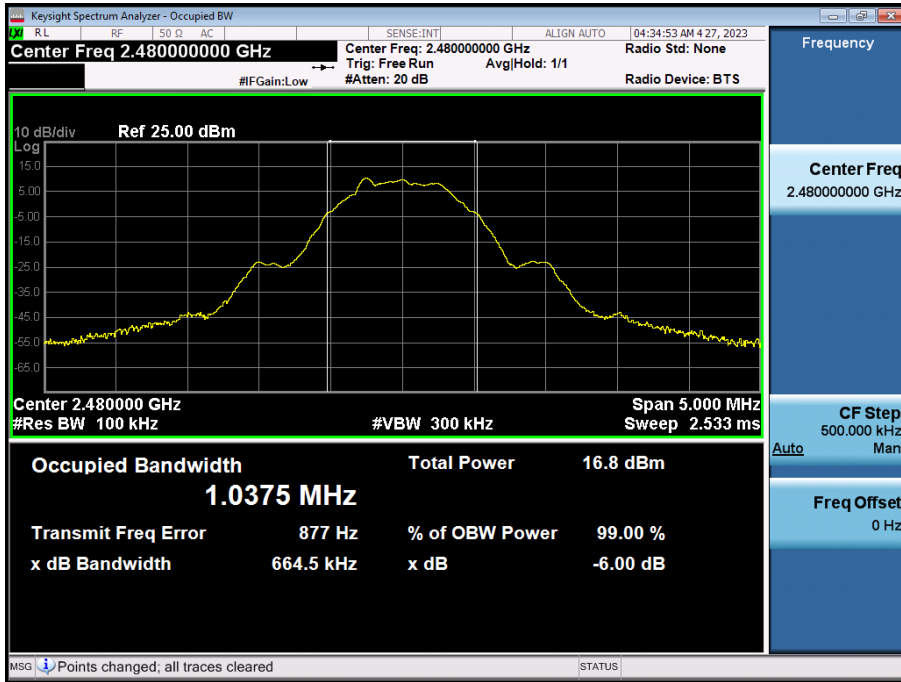
6 dB Bandwidth plot (Low-CH 0)



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	11.589	30
		2440	19	11.926	
		2480	39	10.813	
	255	2402	0	11.338	
		2440	19	11.660	
		2480	39	10.567	
2M	37	2402	0	11.186	
		2440	19	11.555	
		2480	39	10.469	
	255	2402	0	11.614	
		2440	19	11.909	
		2480	39	10.813	
125k	37	2402	0	11.348	
		2440	19	11.639	
		2480	39	10.571	
	255	2402	0	11.245	
		2440	19	11.544	
		2480	39	10.447	
500k	37	2402	0	11.491	
		2440	19	11.805	
		2480	39	10.729	
	255	2402	0	11.559	
		2440	19	11.602	
		2480	39	10.489	

[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	11.307	30
		2440	19	11.360	
		2480	39	10.455	
	255	2402	0	11.113	
		2440	19	11.139	
		2480	39	10.159	
2M	37	2402	0	11.612	
		2440	19	11.672	
		2480	39	10.758	
	255	2402	0	11.367	
		2440	19	11.385	
		2480	39	10.444	
125k	37	2402	0	11.169	
		2440	19	11.195	
		2480	39	10.284	
	255	2402	0	11.044	
		2440	19	11.036	
		2480	39	10.098	
500k	37	2402	0	11.244	
		2440	19	11.362	
		2480	39	10.429	
	255	2402	0	11.105	
		2440	19	11.167	
		2480	39	10.201	

[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	8.10	2.90	11.00	30
		2440	19	8.54	2.90	11.44	
		2480	39	7.36	2.90	10.26	
	255	2402	0	10.10	0.69	10.79	
		2440	19	10.55	0.69	11.24	
		2480	39	9.40	0.69	10.09	
2M	37	2402	0	6.79	4.17	10.96	
		2440	19	7.23	4.17	11.40	
		2480	39	6.08	4.17	10.25	
	255	2402	0	9.66	1.17	10.83	
		2440	19	9.99	1.17	11.16	
		2480	39	8.86	1.17	10.03	
125k	37	2402	0	9.70	1.22	10.92	
		2440	19	10.06	1.22	11.28	
		2480	39	8.93	1.22	10.15	
	255	2402	0	10.51	0.26	10.77	
		2440	19	10.93	0.26	11.19	
		2480	39	9.79	0.26	10.05	
500k	37	2402	0	8.71	2.32	11.03	
		2440	19	9.05	2.32	11.37	
		2480	39	7.88	2.32	10.20	
	255	2402	0	10.15	0.66	10.81	
		2440	19	10.58	0.66	11.24	
		2480	39	9.40	0.66	10.06	

[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	7.74	2.90	10.64	30
		2440	19	7.96	2.90	10.86	
		2480	39	6.87	2.90	9.77	
	255	2402	0	9.82	0.69	10.51	
		2440	19	9.94	0.69	10.63	
		2480	39	8.95	0.69	9.64	
2M	37	2402	0	6.45	4.17	10.62	
		2440	19	6.56	4.17	10.73	
		2480	39	5.57	4.17	9.74	
	255	2402	0	9.38	1.17	10.55	
		2440	19	9.53	1.17	10.70	
		2480	39	8.49	1.17	9.66	
125k	37	2402	0	9.43	1.22	10.65	
		2440	19	9.53	1.22	10.75	
		2480	39	8.56	1.22	9.78	
	255	2402	0	10.17	0.26	10.43	
		2440	19	10.31	0.26	10.57	
		2480	39	9.31	0.26	9.57	
500k	37	2402	0	8.41	2.32	10.73	
		2440	19	8.52	2.32	10.84	
		2480	39	7.45	2.32	9.77	
	255	2402	0	9.99	0.66	10.65	
		2440	19	10.03	0.66	10.69	
		2480	39	9.01	0.66	9.67	

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	-7.996	2.90	-5.099	8 dBm / 3 kHz
2440	19		-7.778	2.90	-4.881	
2480	39		-8.935	2.90	-6.038	
2402	0	1 MBit/s 255 Byte	-11.025	0.69	-10.340	
2440	19		-9.994	0.69	-9.309	
2480	39		-10.091	0.69	-9.406	
2402	0	2 MBit/s 37 Byte	-11.359	4.17	-7.187	
2440	19		-11.291	4.17	-7.119	
2480	39		-12.226	4.17	-8.054	
2402	0	2 MBit/s 255 Byte	-13.242	1.17	-12.072	
2440	19		-13.045	1.17	-11.875	
2480	39		-14.358	1.17	-13.188	
2402	0	125k 37 Byte	3.045	1.22	4.270	
2440	19		3.502	1.22	4.727	
2480	39		3.047	1.22	4.272	
2402	0	125k 255 Byte	3.458	0.26	3.714	
2440	19		3.978	0.26	4.234	
2480	39		3.260	0.26	3.516	
2402	0	500k 37 Byte	-2.444	2.32	-0.128	
2440	19		-2.802	2.32	-0.486	
2480	39		-2.806	0.66	-2.145	
2402	0	500k 255 Byte	-2.809	0.66	-2.148	
2440	19		-5.550	0.66	-4.889	
2480	39		-8.301	0.66	-7.640	

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			Limit (dBm)
			Measured PSD (dBm/3 kHz)	Duty Cycle Factor(dB)	Total PSD (dBm/ 3kHz)	
2402	0	1 MBit/s 37 Byte	-8.259	2.90	-5.362	8 dBm / 3 kHz
2440	19		-8.616	2.90	-5.719	
2480	39		-9.325	2.90	-6.428	
2402	0	1 MBit/s 255 Byte	-11.042	0.69	-10.357	
2440	19		-11.195	0.69	-10.510	
2480	39		-12.011	0.69	-11.326	
2402	0	2 MBit/s 37 Byte	-10.844	4.17	-6.672	
2440	19		-11.113	4.17	-6.941	
2480	39		-11.624	4.17	-7.452	
2402	0	2 MBit/s 255 Byte	-13.456	1.17	-12.286	
2440	19		-13.672	1.17	-12.502	
2480	39		-14.532	1.17	-13.362	
2402	0	125k 37 Byte	2.796	1.22	4.021	
2440	19		3.061	1.22	4.286	
2480	39		2.957	1.22	4.182	
2402	0	125k 255 Byte	3.859	0.26	4.115	
2440	19		4.024	0.26	4.280	
2480	39		2.512	0.26	2.768	
2402	0	500k 37 Byte	-3.168	2.32	-0.852	
2440	19		-3.524	2.32	-1.208	
2480	39		-4.057	0.66	-3.396	
2402	0	500k 255 Byte	-6.337	0.66	-5.676	
2440	19		-6.405	0.66	-5.744	
2480	39		-7.173	0.66	-6.512	

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)

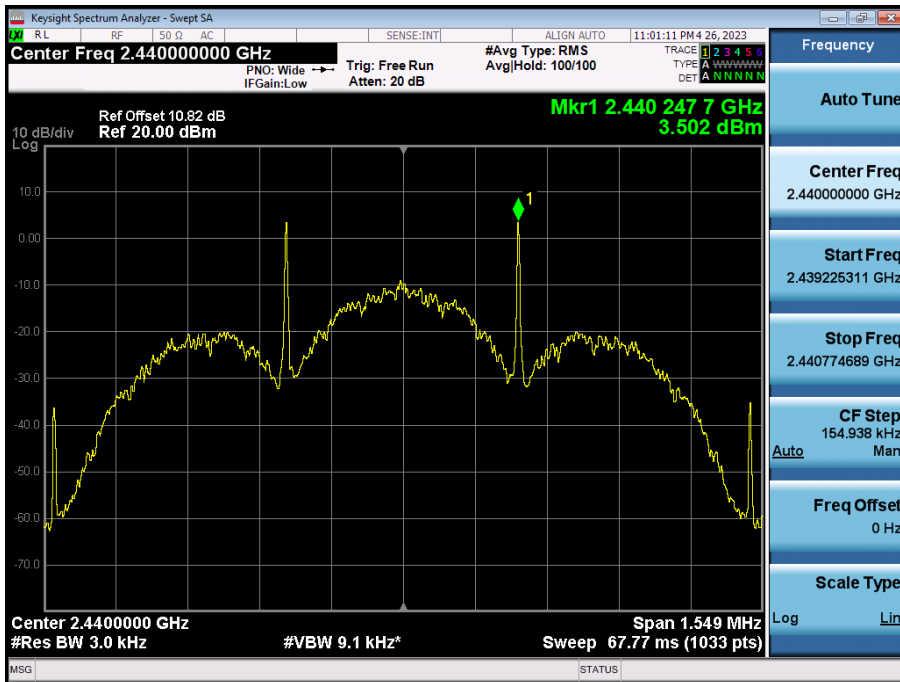
[Ant.1]

▣ 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 (37 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	58.743	30
2480		39	Upper	61.448	30
2402	1M Bit/s 255 Byte	0	Lower	60.084	30
2480		39	Upper	61.515	30
2402	2M Bit/s 37 Byte	0	Lower	47.456	30
2480		39	Upper	57.100	30
2402	2M Bit/s 255 Byte	0	Lower	46.758	30
2480		39	Upper	58.361	30
2402	125k Bit/s 37 Byte	0	Lower	57.908	30
2480		39	Upper	61.424	30
2402	125k Bit/s 255 Byte	0	Lower	59.949	30
2480		39	Upper	60.797	30
2402	500k Bit/s 37 Byte	0	Lower	59.154	30
2480		39	Upper	58.050	30
2402	500k Bit/s 255 Byte	0	Lower	60.467	30
2480		39	Upper	61.856	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 (255 Byte)
 - Upper Band Edge 2M Bit/s (37 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	57.735	30
2480		39	Upper	58.239	30
2402	1M Bit/s 255 Byte	0	Lower	57.038	30
2480		39	Upper	57.520	30
2402	2M Bit/s 37 Byte	0	Lower	47.018	30
2480		39	Upper	58.321	30
2402	2M Bit/s 255 Byte	0	Lower	47.561	30
2480		39	Upper	61.186	30
2402	125k Bit/s 37 Byte	0	Lower	58.630	30
2480		39	Upper	60.027	30
2402	125k Bit/s 255 Byte	0	Lower	58.776	30
2480		39	Upper	59.757	30
2402	500k Bit/s 37 Byte	0	Lower	59.638	30
2480		39	Upper	61.871	30
2402	500k Bit/s 255 Byte	0	Lower	58.182	30
2480		39	Upper	57.555	30

Note :

- In order to simplify the report, attached plots were only the worst case channel and data rate.
 - Lower 2M Bit/s (37 Byte)
 - Upper 1M Bit/s (255 Byte)

[CONDUCTED SPURIOUS EMISSIONS]

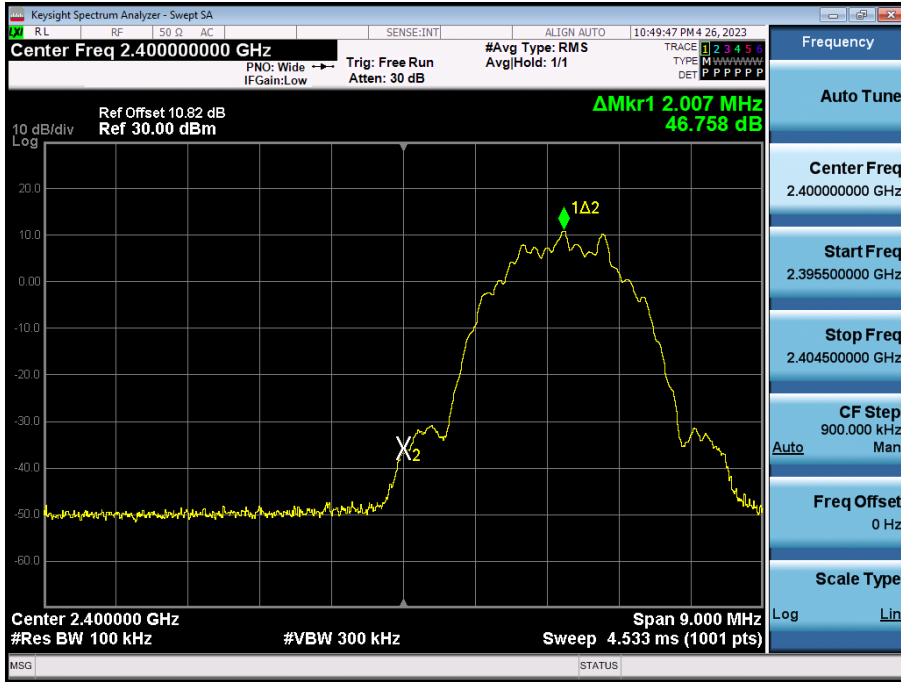
Note :

- 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.1]

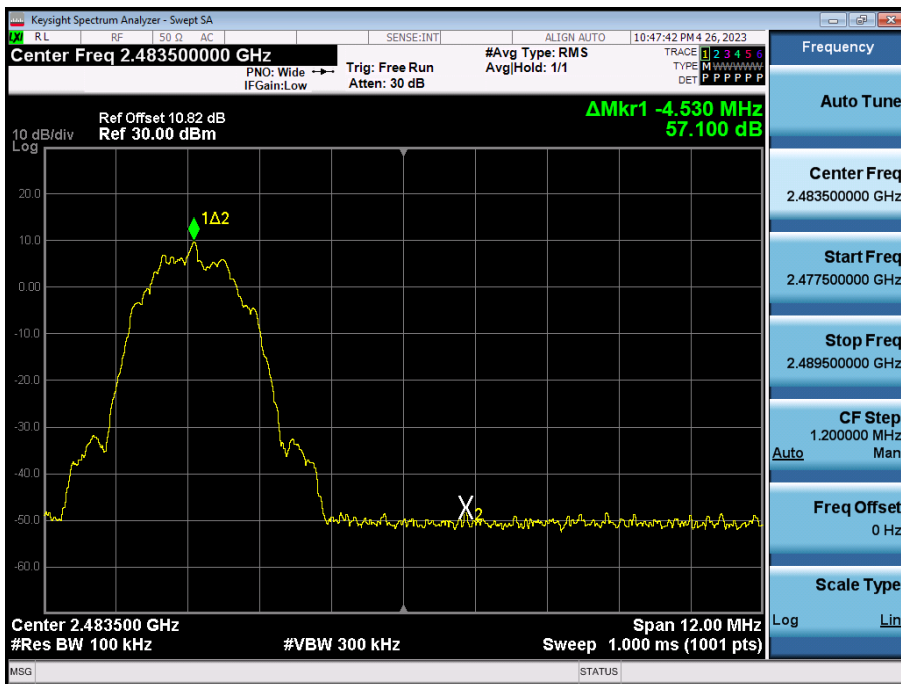
▣ Test Plots(Band Edge_Lower)

2M Bit/s (255 Byte) Low Channel(Ch. 0)



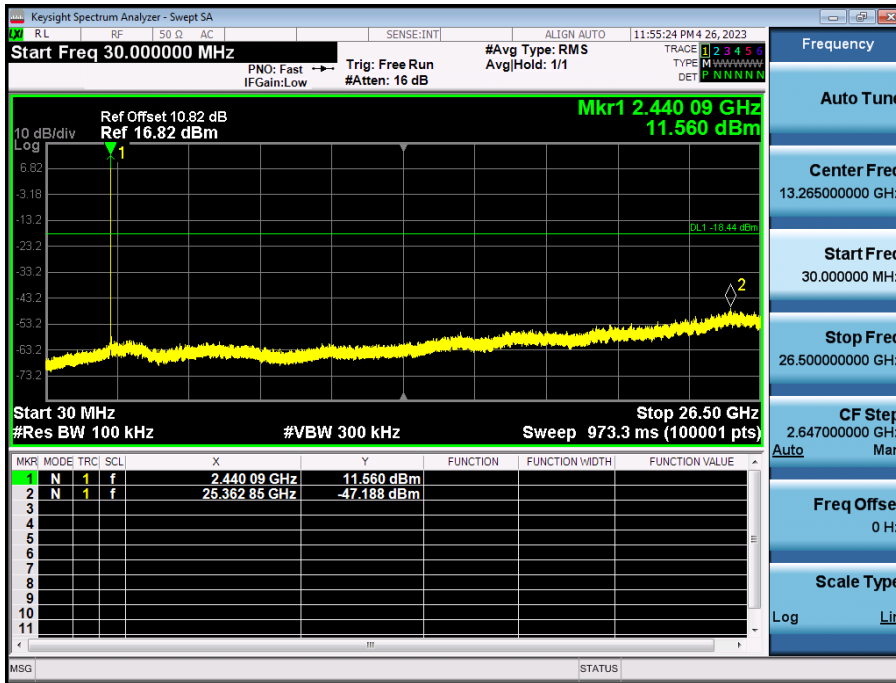
▣ Test Plots(Band Edge_Upper)

2M 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): -18.44

[Ant.2]

▣ Test Plots(Band Edge_Lower)

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



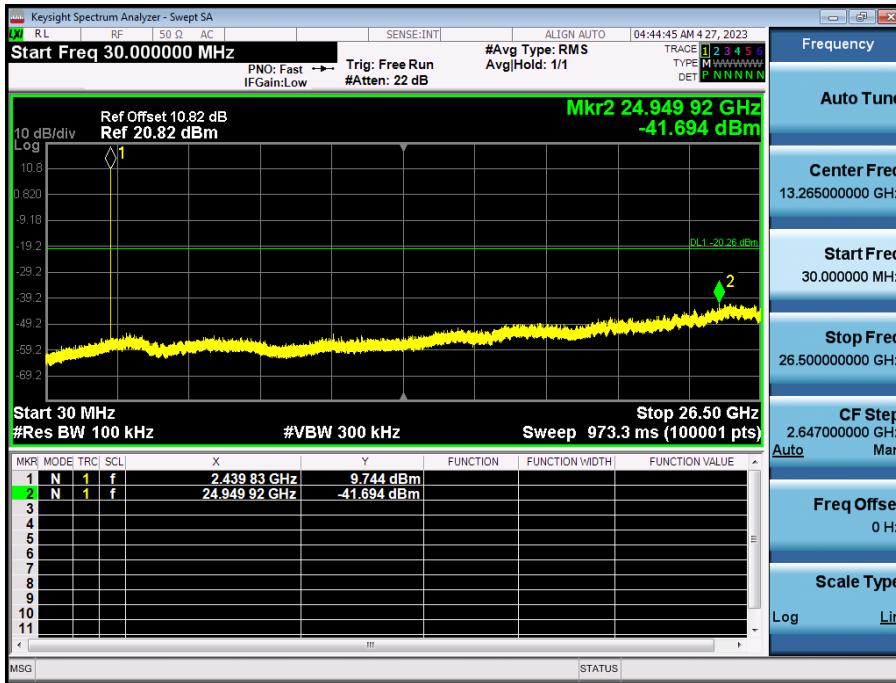
▣ Test Plots(Band Edge_Upper)

1M 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): -20.26

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	50.39	0.00	2.51	V	52.90	73.98	21.08	PK
4804	41.91	2.90	2.51	V	47.32	53.98	6.66	AV
7206	43.21	0.00	9.10	V	52.31	73.98	21.67	PK
7206	32.14	2.90	9.10	V	44.13	53.98	9.85	AV
4804	50.96	0.00	2.51	H	53.47	73.98	20.51	PK
4804	42.62	2.90	2.51	H	48.03	53.98	5.95	AV
7206	43.51	0.00	9.10	H	52.61	73.98	21.37	PK
7206	32.48	2.90	9.10	H	44.47	53.98	9.51	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	48.17	0.00	2.92	V	51.09	73.98	22.89	PK
4880	39.32	2.90	2.92	V	45.14	53.98	8.84	AV
7320	45.03	0.00	9.42	V	54.45	73.98	19.53	PK
7320	33.52	2.90	9.42	V	45.84	53.98	8.14	AV
4880	48.42	0.00	2.92	H	51.34	73.98	22.64	PK
4880	39.40	2.90	2.92	H	45.22	53.98	8.76	AV
7320	45.14	0.00	9.42	H	54.56	73.98	19.42	PK
7320	33.84	2.90	9.42	H	46.16	53.98	7.82	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	43.81	0.00	2.00	V	45.81	73.98	28.17	PK
4960	31.63	2.90	2.00	V	36.53	53.98	17.45	AV
7440	42.65	0.00	9.99	V	52.64	73.98	21.34	PK
7440	31.93	2.90	9.99	V	44.82	53.98	9.16	AV
4960	43.90	0.00	2.00	H	45.90	73.98	28.08	PK
4960	31.90	2.90	2.00	H	36.80	53.98	17.18	AV
7440	42.97	0.00	9.99	H	52.96	73.98	21.02	PK
7440	32.03	2.90	9.99	H	44.92	53.98	9.06	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	50.43	0.00	2.51	V	52.94	73.98	21.04	PK
4804	39.52	4.17	2.51	V	46.21	53.98	7.77	AV
7206	43.07	0.00	9.10	V	52.17	73.98	21.81	PK
7206	31.25	4.17	9.10	V	44.52	53.98	9.46	AV
4804	50.75	0.00	2.51	H	53.26	73.98	20.72	PK
4804	39.80	4.17	2.51	H	46.49	53.98	7.49	AV
7206	43.59	0.00	9.10	H	52.69	73.98	21.29	PK
7206	31.36	4.17	9.10	H	44.63	53.98	9.35	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	48.22	0.00	2.92	V	51.14	73.98	22.84	PK
4880	36.51	4.17	2.92	V	43.60	53.98	10.38	AV
7320	43.58	0.00	9.42	V	53.00	73.98	20.98	PK
7320	31.28	4.17	9.42	V	44.87	53.98	9.11	AV
4880	48.34	0.00	2.92	H	51.26	73.98	22.72	PK
4880	36.73	4.17	2.92	H	43.82	53.98	10.16	AV
7320	43.91	0.00	9.42	H	53.33	73.98	20.65	PK
7320	31.80	4.17	9.42	H	45.39	53.98	8.59	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	42.97	0.00	2.00	V	44.97	73.98	29.01	PK
4960	31.05	4.17	2.00	V	37.22	53.98	16.76	AV
7440	43.14	0.00	9.99	V	53.13	73.98	20.85	PK
7440	30.29	4.17	9.99	V	44.45	53.98	9.53	AV
4960	43.44	0.00	2.00	H	45.44	73.98	28.54	PK
4960	31.23	4.17	2.00	H	37.40	53.98	16.58	AV
7440	43.31	0.00	9.99	H	53.30	73.98	20.68	PK
7440	30.57	4.17	9.99	H	44.73	53.98	9.25	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	45.37	0.00	2.51	V	47.88	73.98	26.10	PK
4804	32.42	2.90	2.51	V	37.83	53.98	16.15	AV
7206	42.52	0.00	9.10	V	51.62	73.98	22.36	PK
7206	29.60	2.90	9.10	V	41.59	53.98	12.39	AV
4804	45.59	0.00	2.51	H	48.10	73.98	25.88	PK
4804	32.53	2.90	2.51	H	37.94	53.98	16.04	AV
7206	42.66	0.00	9.10	H	51.76	73.98	22.22	PK
7206	29.64	2.90	9.10	H	41.63	53.98	12.35	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	42.57	0.00	2.92	V	45.49	73.98	28.49	PK
4880	31.07	2.90	2.92	V	36.89	53.98	17.09	AV
7320	32.17	0.00	9.42	V	41.59	73.98	32.39	PK
7320	29.54	2.90	9.42	V	41.86	53.98	12.12	AV
4880	43.08	0.00	2.92	H	46.00	73.98	27.98	PK
4880	31.11	2.90	2.92	H	36.93	53.98	17.05	AV
7320	32.53	0.00	9.42	H	41.95	73.98	32.03	PK
7320	29.73	2.90	9.42	H	42.05	53.98	11.93	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	43.03	0.00	2.00	V	45.03	73.98	28.95	PK
4960	32.11	2.90	2.00	V	37.01	53.98	16.97	AV
7440	41.18	0.00	9.99	V	51.17	73.98	22.81	PK
7440	29.08	2.90	9.99	V	41.97	53.98	12.01	AV
4960	43.22	0.00	2.00	H	45.22	73.98	28.76	PK
4960	32.24	2.90	2.00	H	37.14	53.98	16.84	AV
7440	41.30	0.00	9.99	H	51.29	73.98	22.69	PK
7440	29.27	2.90	9.99	H	42.16	53.98	11.82	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	45.28	0.00	2.51	V	47.79	73.98	26.19	PK
4804	32.42	4.17	2.51	V	39.11	53.98	14.87	AV
7206	42.09	0.00	9.10	V	51.19	73.98	22.79	PK
7206	29.61	4.17	9.10	V	42.88	53.98	11.10	AV
4804	45.30	0.00	2.51	H	47.81	73.98	26.17	PK
4804	32.57	4.17	2.51	H	39.26	53.98	14.72	AV
7206	42.31	0.00	9.10	H	51.41	73.98	22.57	PK
7206	29.64	4.17	9.10	H	42.91	53.98	11.07	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	44.19	0.00	2.92	V	47.11	73.98	26.87	PK
4880	30.59	4.17	2.92	V	37.68	53.98	16.30	AV
7320	42.04	0.00	9.42	V	51.46	73.98	22.52	PK
7320	29.67	4.17	9.42	V	43.26	53.98	10.72	AV
4880	44.22	0.00	2.92	H	47.14	73.98	26.84	PK
4880	30.99	4.17	2.92	H	38.08	53.98	15.90	AV
7320	42.27	0.00	9.42	H	51.69	73.98	22.29	PK
7320	29.70	4.17	9.42	H	43.29	53.98	10.69	AV

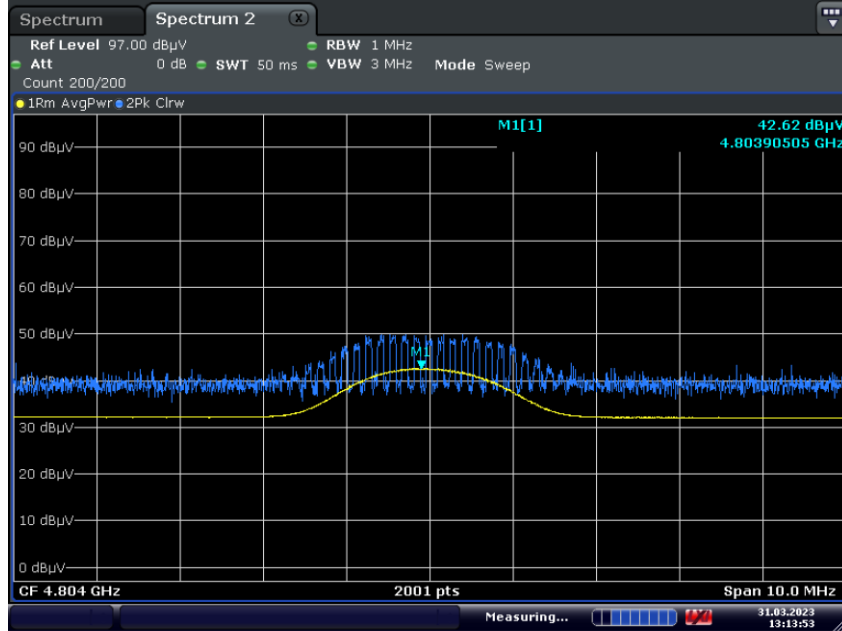
Operating Frequency : 2 480 MHz

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	44.05	0.00	2.00	V	46.05	73.98	27.93	PK
4960	31.05	4.17	2.00	V	37.22	53.98	16.76	AV
7440	41.20	0.00	9.99	V	51.19	73.98	22.79	PK
7440	29.17	4.17	9.99	V	43.33	53.98	10.65	AV
4960	44.20	0.00	2.00	H	46.20	73.98	27.78	PK
4960	31.22	4.17	2.00	H	37.39	53.98	16.59	AV
7440	41.33	0.00	9.99	H	51.32	73.98	22.66	PK
7440	29.28	4.17	9.99	H	43.44	53.98	10.54	AV

[Ant.1]

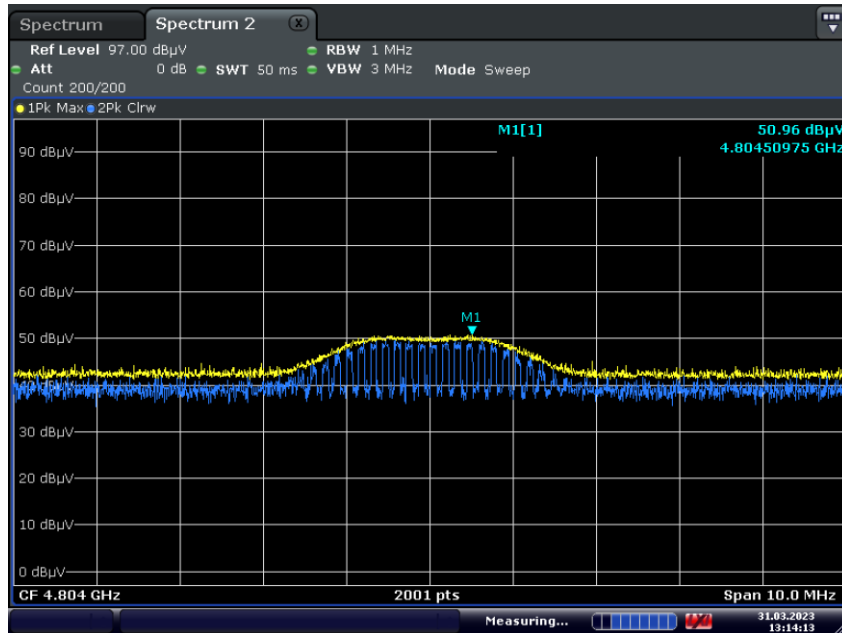
Mode : 1M Bit/s (37 Bytes) Test Plots

Radiated Spurious Emissions plot – Average Result (Ch. 0 3rd Harmonic, X-H)



Date: 31.MAR.2023 13:13:53

Radiated Spurious Emissions plot – Peak Result (Ch. 0 3rd Harmonic, X-H)

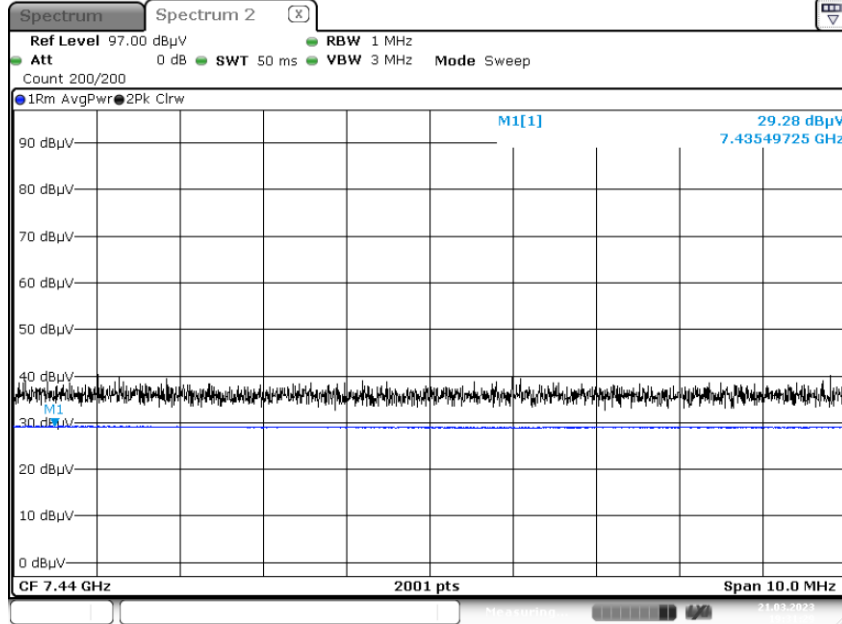


Date: 31.MAR.2023 13:14:14

[Ant.2]

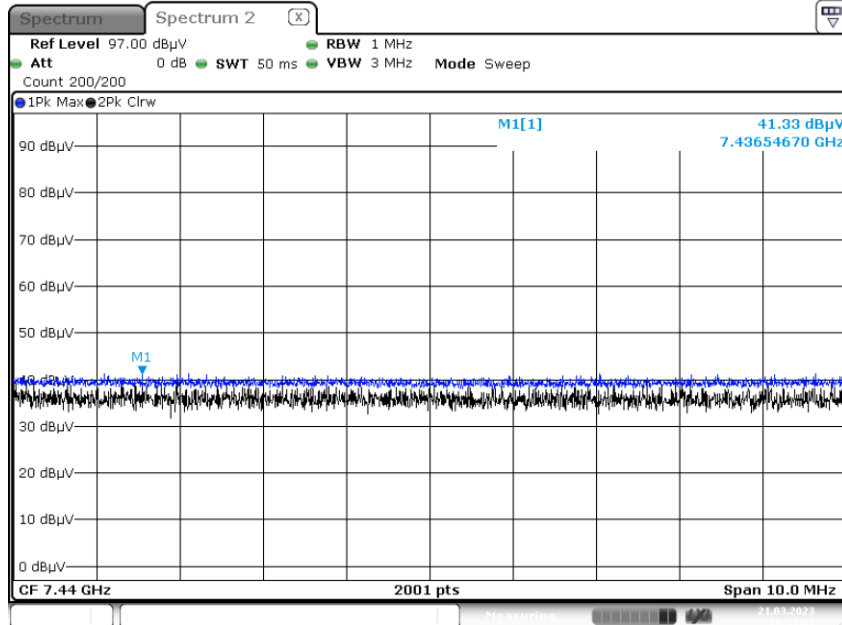
Mode : 2M Bit/s (37 Bytes) Test Plots

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



Date: 21.MAR.2023 19:31:29

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



Date: 21.MAR.2023 19:34:04

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 μ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	18.98	0.00	34.90	H	53.88	73.98	20.10	PK
2390.0	6.63	2.90	34.90	H	44.42	53.98	9.56	AV
2390.0	18.87	0.00	34.90	V	53.77	73.98	20.21	PK
2390.0	6.58	2.90	34.90	V	44.37	53.98	9.61	AV
2483.5	25.58	0.00	35.10	H	60.68	73.98	13.30	PK
2483.5	8.32	2.90	35.10	H	46.31	53.98	7.67	AV
2483.5	25.42	0.00	35.10	V	60.52	73.98	13.46	PK
2483.5	8.19	2.90	35.10	V	46.18	53.98	7.80	AV

Mode : 2 M Bit/s (37 Bytes)

Operating Frequency 2402 MHz, 2480 MHz

Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dB μ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	18.56	0.00	34.90	H	53.46	73.98	20.52	PK
2390.0	6.50	4.17	34.90	H	45.57	53.98	8.41	AV
2390.0	18.42	0.00	34.90	V	53.32	73.98	20.66	PK
2390.0	6.15	4.17	34.90	V	45.22	53.98	8.76	AV
2483.5	27.14	0.00	35.10	H	62.24	73.98	11.74	PK
2483.5	9.69	4.17	35.10	H	48.96	53.98	5.02	AV
2483.5	27.03	0.00	35.10	V	62.13	73.98	11.85	PK
2483.5	9.45	4.17	35.10	V	48.72	53.98	5.26	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 [dB μ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	18.70	0.00	34.90	H	53.60	73.98	20.38	PK
2390.0	6.39	2.90	34.90	H	44.18	53.98	9.80	AV
2390.0	18.51	0.00	34.90	V	53.41	73.98	20.57	PK
2390.0	6.20	2.90	34.90	V	43.99	53.98	9.99	AV
2483.5	23.78	0.00	35.10	H	58.88	73.98	15.10	PK
2483.5	7.67	2.90	35.10	H	45.66	53.98	8.32	AV
2483.5	23.17	0.00	35.10	V	58.27	73.98	15.71	PK
2483.5	7.54	2.90	35.10	V	45.53	53.98	8.45	AV

Mode : 2 M Bit/s (37 Bytes)

Operating Frequency 2402 MHz, 2480 MHz

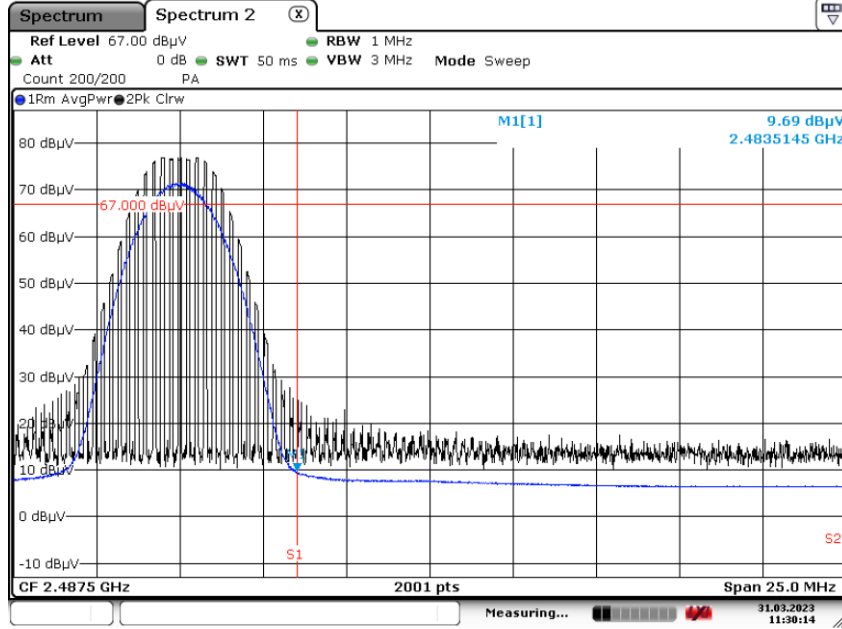
Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dB μ V]	Duty Cycle Factor [dB]	AF+CL+DF [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	18.40	0.00	34.90	H	53.30	73.98	20.68	PK
2390.0	6.27	4.17	34.90	H	45.34	53.98	8.64	AV
2390.0	18.23	0.00	34.90	V	53.13	73.98	20.85	PK
2390.0	6.21	4.17	34.90	V	45.28	53.98	8.70	AV
2483.5	25.59	0.00	35.10	H	60.69	73.98	13.29	PK
2483.5	8.62	4.17	35.10	H	47.89	53.98	6.09	AV
2483.5	25.19	0.00	35.10	V	60.29	73.98	13.69	PK
2483.5	8.57	4.17	35.10	V	47.84	53.98	6.14	AV

[Ant.1]

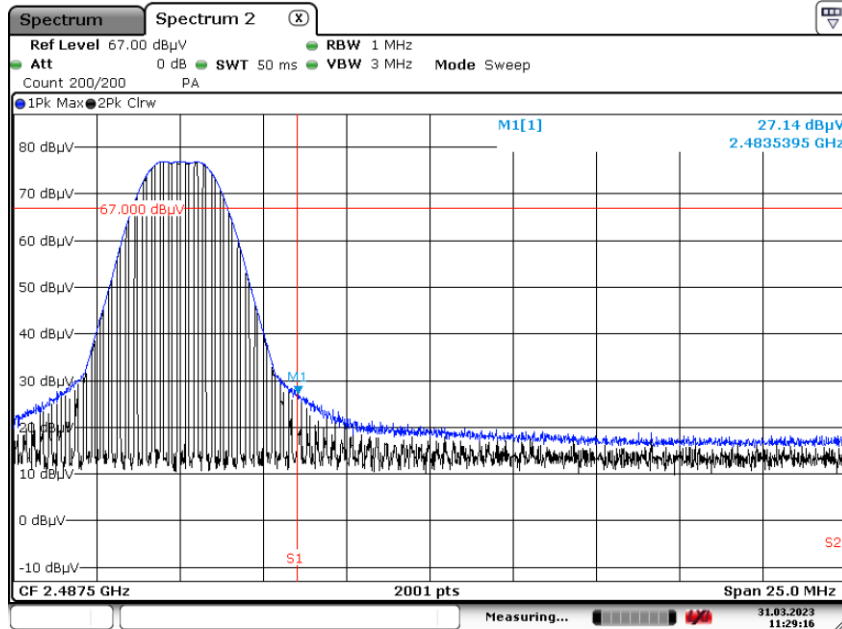
Mode : 2 M Bit/s (37 Bytes) Test Plots

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



Date: 31.MAR.2023 11:30:15

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

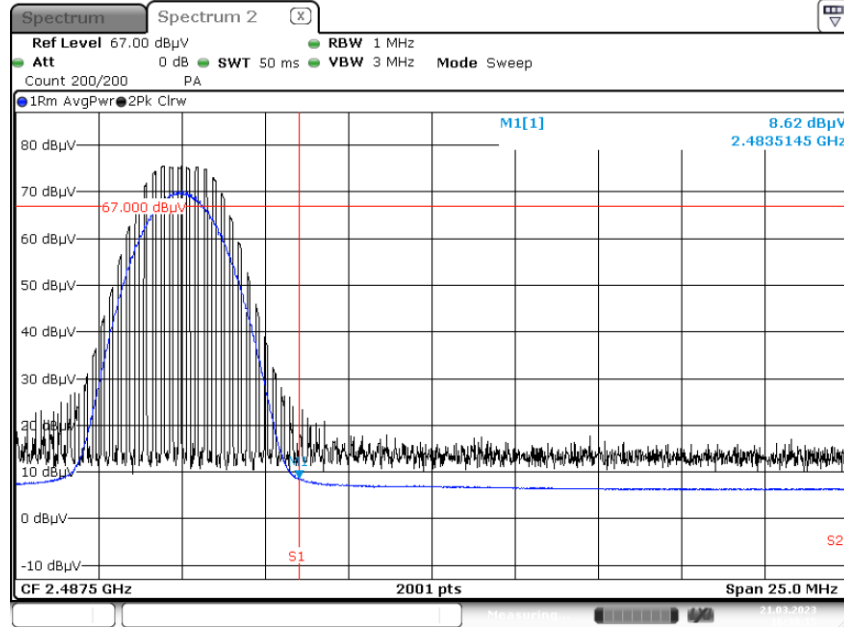


Date: 31.MAR.2023 11:29:16

[Ant.2]

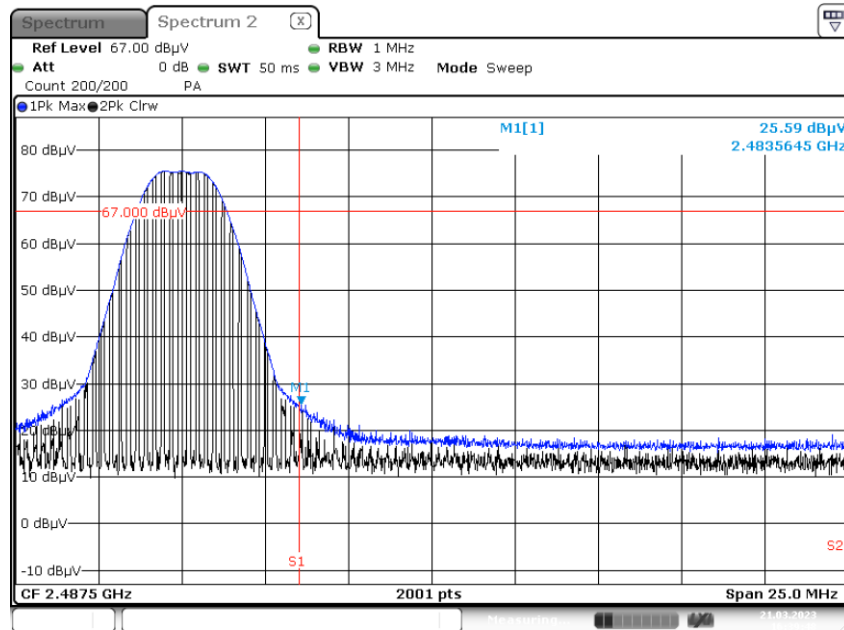
Mode : 2 M Bit/s (37 Bytes) Test Plots

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



Date: 21.MAR.2023 16:39:15

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



Date: 21.MAR.2023 16:39:48

Note:

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

9.8 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions

Test

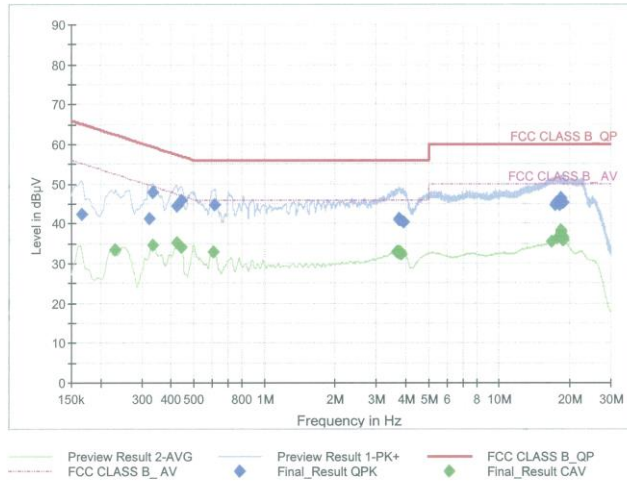
1 / 2

Test Report

Common Information

EUT : SM-X818U
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)
0.1658	42.45	65.17	22.72	1000.0	9.000	N	OFF	9.6
0.3210	41.12	59.68	18.56	1000.0	9.000	L1	OFF	9.7
0.3345	47.87	59.34	11.47	1000.0	9.000	L1	OFF	9.7
0.4200	44.50	57.45	12.95	1000.0	9.000	L1	OFF	9.7
0.4425	45.82	57.02	11.19	1000.0	9.000	L1	OFF	9.7
0.6148	44.68	56.00	11.32	1000.0	9.000	L1	OFF	9.7
3.7378	41.16	56.00	14.84	1000.0	9.000	L1	OFF	9.8
3.7535	41.29	56.00	14.71	1000.0	9.000	L1	OFF	9.8
3.7603	41.05	56.00	14.95	1000.0	9.000	L1	OFF	9.8
3.7805	40.99	56.00	15.01	1000.0	9.000	L1	OFF	9.8
3.8030	40.97	56.00	15.03	1000.0	9.000	L1	OFF	9.8
3.9155	40.34	56.00	15.66	1000.0	9.000	L1	OFF	9.8
17.2378	44.79	60.00	15.21	1000.0	9.000	L1	OFF	10.3
17.5168	45.25	60.00	14.75	1000.0	9.000	L1	OFF	10.3
17.9938	44.74	60.00	15.26	1000.0	9.000	L1	OFF	10.3
18.3650	46.34	60.00	13.66	1000.0	9.000	L1	OFF	10.3
18.5518	45.30	60.00	14.70	1000.0	9.000	L1	OFF	10.3
18.7228	45.29	60.00	14.71	1000.0	9.000	L1	OFF	10.3

2023-04-18

오전 3:27:36

Test

2 / 2

Final Result CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.2310	33.51	52.41	18.91	1000.0	9.000	L1	OFF	9.7
0.3345	34.52	49.34	14.82	1000.0	9.000	L1	OFF	9.7
0.4245	35.26	47.36	12.10	1000.0	9.000	L1	OFF	9.7
0.4403	34.18	47.06	12.88	1000.0	9.000	L1	OFF	9.7
0.6058	32.77	46.00	13.23	1000.0	9.000	L1	OFF	9.7
3.6500	32.91	46.00	13.09	1000.0	9.000	L1	OFF	9.8
3.7063	32.95	46.00	13.05	1000.0	9.000	L1	OFF	9.8
3.7400	32.79	46.00	13.21	1000.0	9.000	L1	OFF	9.8
3.7558	32.68	46.00	13.32	1000.0	9.000	L1	OFF	9.8
3.7693	32.80	46.00	13.20	1000.0	9.000	L1	OFF	9.8
3.8143	32.40	46.00	13.60	1000.0	9.000	L1	OFF	9.8
16.6730	35.56	50.00	14.44	1000.0	9.000	L1	OFF	10.3
17.6900	36.26	50.00	13.74	1000.0	9.000	L1	OFF	10.3
18.2480	37.93	50.00	12.07	1000.0	9.000	L1	OFF	10.3
18.3583	38.33	50.00	11.67	1000.0	9.000	L1	OFF	10.3
18.5630	36.79	50.00	13.21	1000.0	9.000	L1	OFF	10.3
18.6148	35.74	50.00	14.26	1000.0	9.000	L1	OFF	10.3
18.7273	36.28	50.00	13.72	1000.0	9.000	L1	OFF	10.3

2023-04-18

오전 3:27:36

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-FC039-P