

FCC BT LE REPORT

Certification

Applicant Name:
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Date of Issue:
December 18, 2023

Test Site/Location:
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Report No.: HCT-RF-2312-FC005

FCC ID: A3LSMM156B

APPLICANT: SAMSUNG Electronics Co., Ltd.

Model: SM-M156B/DSN

Additional Model: -

EUT Type: Mobile Phone

Average Output Power: 5.54 dBm (3.58 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-2312-FC005

REVIEWED BY



Report prepared by : Sang Hoon Lee
Engineer of Telecommunication Testing Center

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

The result shown in this test report refer only to the sample(s) tested unless otherwise stated.
This test results were applied only to the test methods required by the standard.

Test Report Statement:

The above Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.

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

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-RF-2312-FC005	December 18, 2023	- First Approval Report

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1. EUT DESCRIPTION

Model	SM-M156B/DSN		
Additional Model	-		
EUT Type	Mobile Phone		
Power Supply	DC 4.20 V		
Frequency Range	2 402 MHz ~ 2 480 MHz		
Max. RF Output Power (Normal)	Peak (For information only)	1 M Bit/s: 2 M Bit/s: 125 k Bit/s : 500 k Bit/s :	5.788 dBm (3.79 mW) 5.862 dBm (3.86 mW) 5.767 dBm (3.77 mW) 5.738 dBm (3.75 mW)
	Average	1 M Bit/s: 2 M Bit/s: 125 k Bit/s : 500 k Bit/s :	5.54 dBm (3.58 mW) 5.51 dBm (3.56 mW) 5.52 dBm (3.57 mW) 5.53 dBm (3.58 mW)
Modulation Type	GFSK		
Bluetooth Version	5.3		
Number of Channels	40 Channels		
Antenna Specification	Type: MFA Peak Gain : -6.0 dBi		
Date(s) of Tests	November 14, 2023 ~ December 14, 2023		
Serial number	Conducted : R3CWA0QSYTA Radiated : R3CWA0QSXYD		

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 March 31, 2022 (CAB identifier: 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.

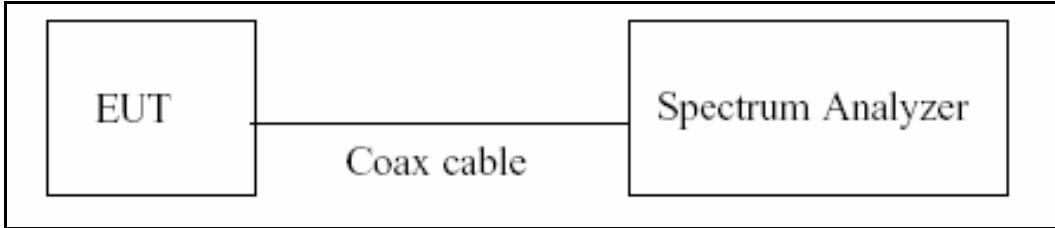
The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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 50 MHz.

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

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

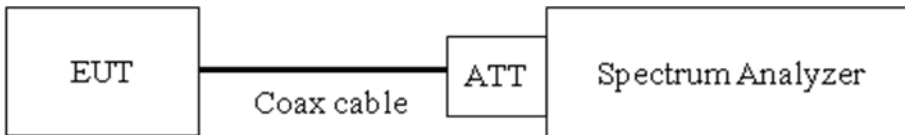
1. RBW = 8 MHz (the largest available value)
2. VBW = 8 MHz (\geq RBW)
3. SPAN = 0 Hz
4. Detector = Peak
5. Number of points in sweep > 100
6. Trace mode = Clear write
7. Measure T_{total} and T_{on}
8. Calculate Duty Cycle = T_{on} / T_{total} and Duty Cycle Factor = $10\log(1/Duty\ Cycle)$

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.

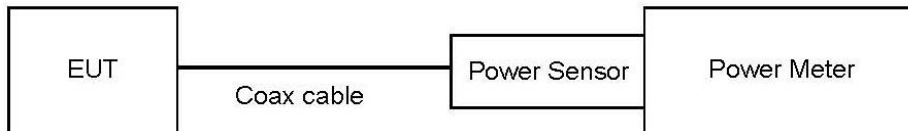
Note : We tested OBW using the automatic bandwidth measurement capability of a spectrum analyzer.

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

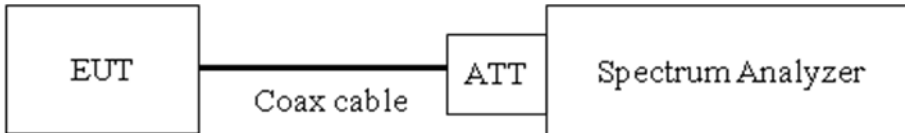
- Conducted Output Power(Peak) = Measured Value + ATT loss + Cable loss
- Conducted Output Power(Average) = Measured Value + ATT loss + Cable loss + Duty Cycle Factor

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 $\geq [2 \times \text{xspan} / RBW]$.
- 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 %

Sample Calculation

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

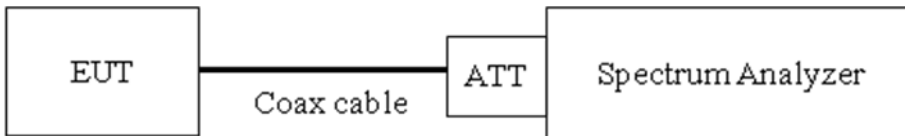
7.5. Conducted Band Edge(Out of Band Emissions) & Conducted Spurious Emissions

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	20.06
100	20.14
200	20.17
300	20.21
400	20.28
500	20.28
600	20.28
700	20.28
800	20.30
900	20.31
1 000	20.35
2 000	20.55
2 400	20.62
3 000	20.67
4 000	20.74
5 000	20.86
5 850	20.84
6 000	20.83
7 000	20.93
8 000	20.97
9 000	21.09
10 000	21.18
11 000	21.27
12 000	21.33
13 000	21.33
14 000	21.40
15 000	21.49
16 000	21.52
17 000	21.55
18 000	21.63
19 000	21.65
20 000	21.66
21 000	21.76
22 000	21.82
23 000	21.86
24 000	21.90
25 000	21.92
26 000	22.04

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

2. Factor = Attenuator loss + Cable loss

3. Spectrum offset Loss = Attenuator loss + Cable loss + EUT Cable loss(0.36 dB) = 20.98 dB

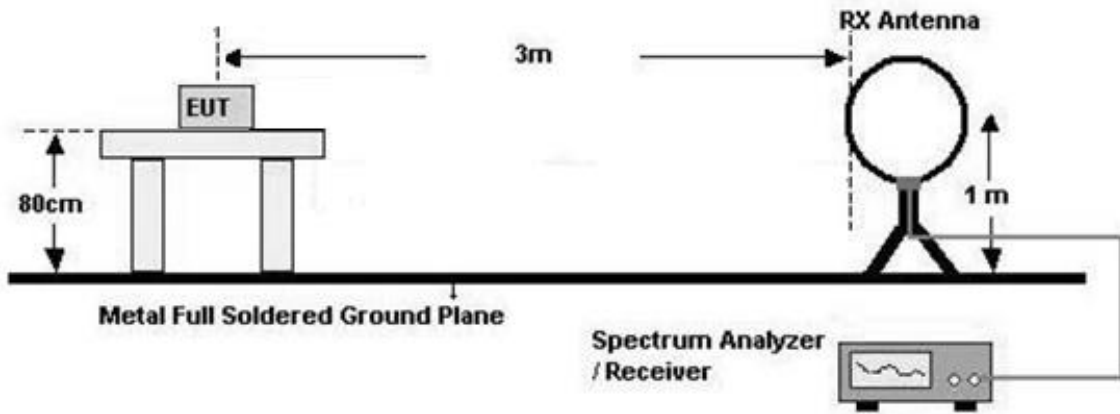
7.6. Radiated Test

Limit

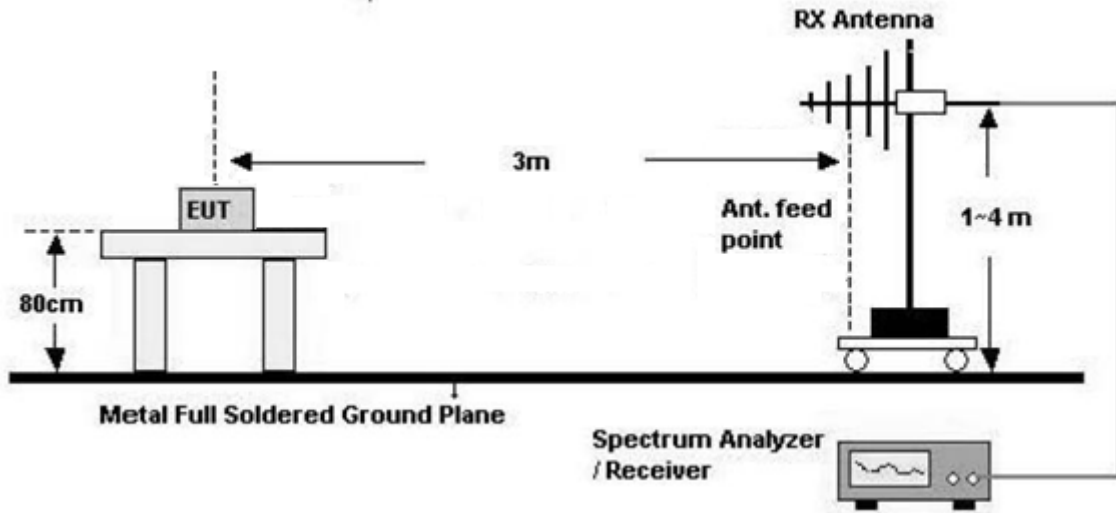
Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
0.009 – 0.490	$2400/F(\text{kHz})$	300
0.490 – 1.705	$24000/F(\text{kHz})$	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

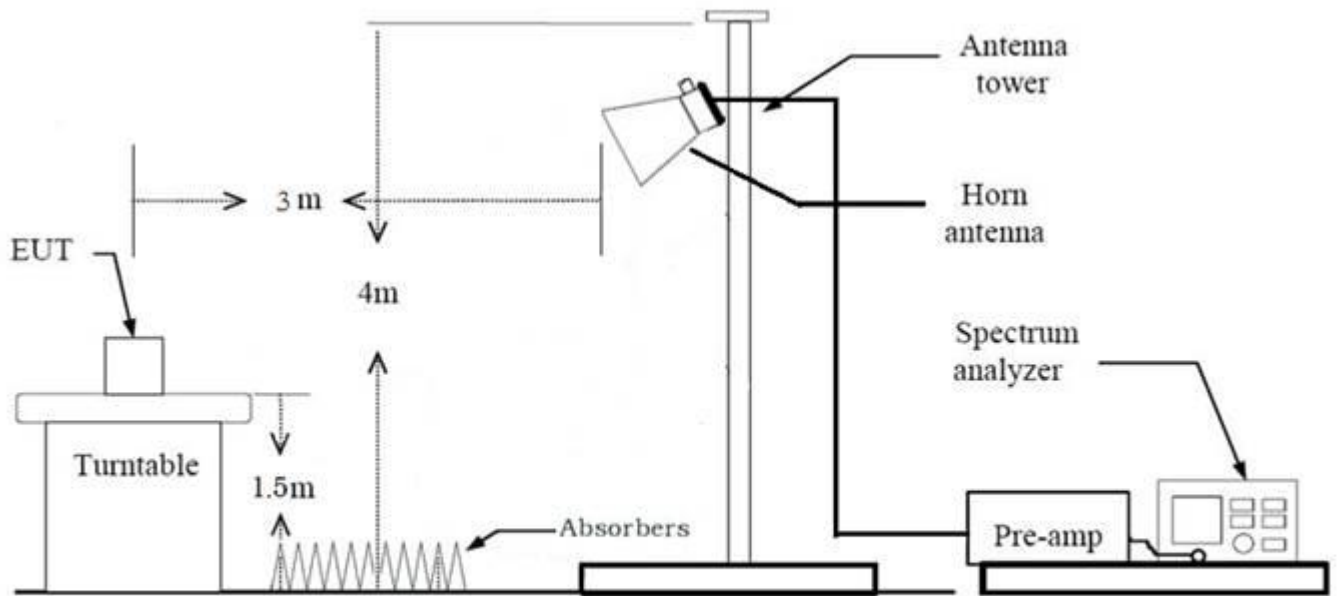
Below 30 MHz



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 = $20 \log(\text{test distance} / \text{specific distance})$ (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)

#Note : Used Average measurement method according to KDB 558074 Section11 Q3

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 ± 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) - 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)

#Note : Used Average measurement method according to KDB 558074 Section11 Q3

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:
 - Radiated Spurious Emissions : Y
 - Radiated Restricted Band Edge : X
3. All packet length of operation were investigated and the test results are worst case in lowest packet length. (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

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

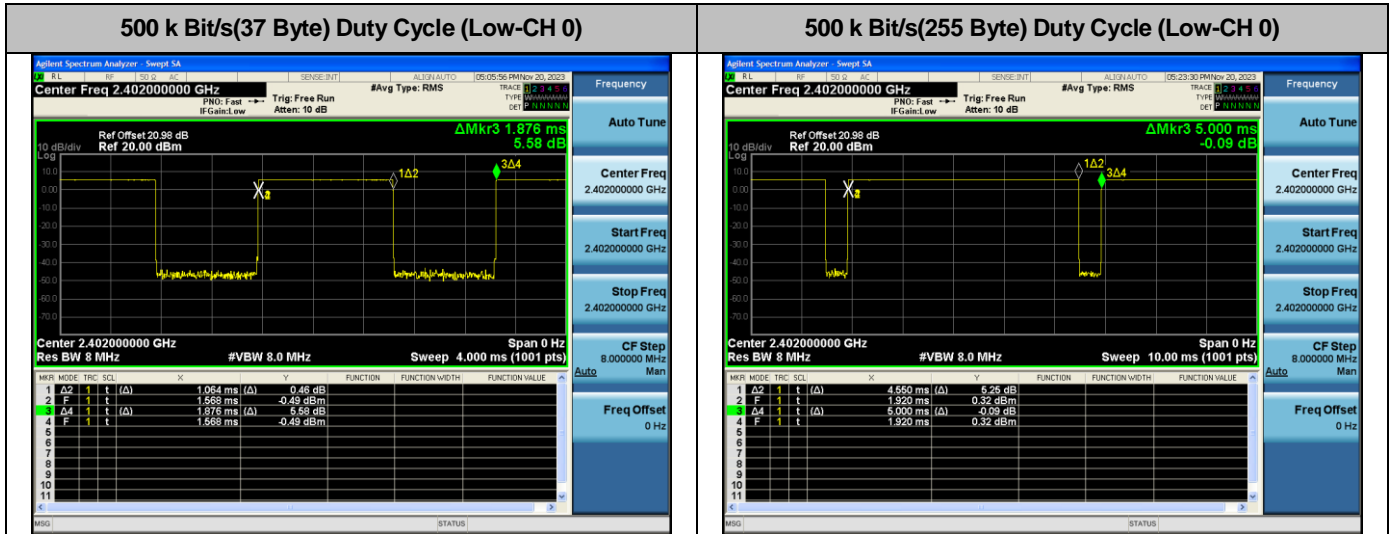
Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	Conducted	PASS
Conducted Maximum Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge (Out of Band Emissions)	§15.247(d)	Conducted > 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	0.383	0.624	0.613	2.128
	255	2.125	2.500	0.850	0.706
2M	37	0.199	0.624	0.318	4.969
	255	1.071	1.877	0.570	2.439
125k	37	3.093	3.747	0.826	0.832
	255	17.033	17.500	0.973	0.117
500k	37	1.064	1.876	0.567	2.463
	255	4.550	5.000	0.910	0.410





9.2 6 dB BANDWIDTH

Mode (Bit/s)	Channel	6 dB Bandwidth (kHz)	Limit (kHz)
1M(37)	0	697.5	> 500
	19	702.8	
	39	702.7	
1M(255)	0	669.8	> 500
	19	672.7	
	39	671.1	
2M(37)	0	1167	> 500
	19	1170	
	39	1168	
2M(255)	0	1173	> 500
	19	1166	
	39	1171	
125k(37)	0	691.6	> 500
	19	690.5	
	39	690.7	
125k(255)	0	690.7	> 500
	19	691.1	
	39	690.5	
500k(37)	0	666.1	> 500
	19	669.6	
	39	667.1	
500k(255)	0	665.6	> 500
	19	666.7	
	39	670.8	

Note:

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

1M Bit/s: 255 Byte

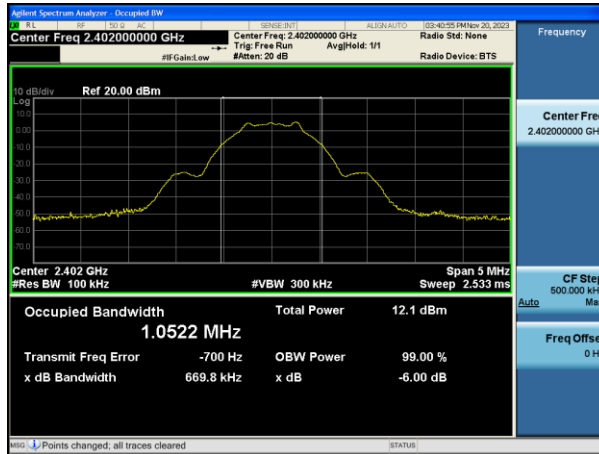
2M Bit/s: 255 Byte

125k Bit/s: 37 Byte

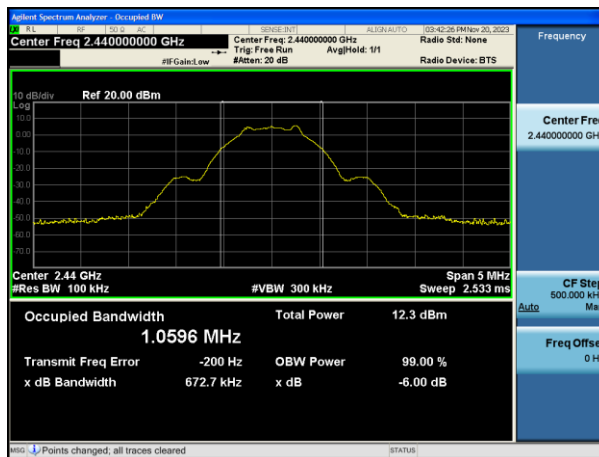
500k Bit/s: 255 Byte

1 MBit/s (255 Byte) Test Plots

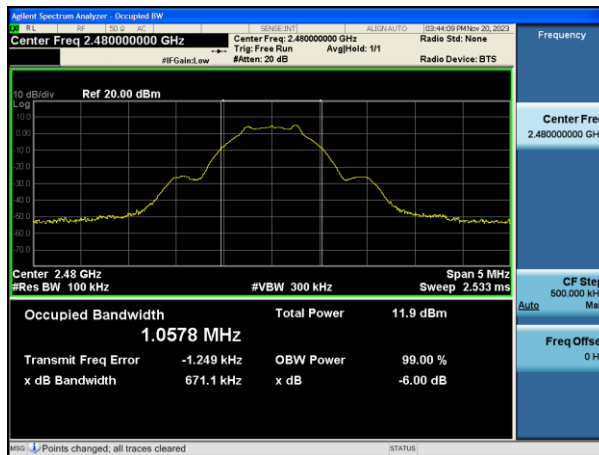
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

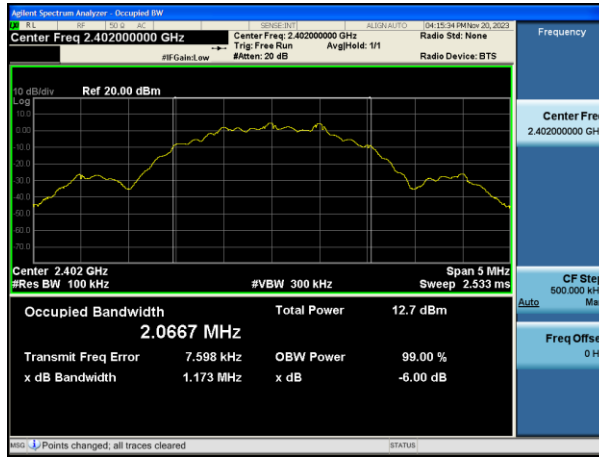


6 dB Bandwidth plot (High-CH 39)

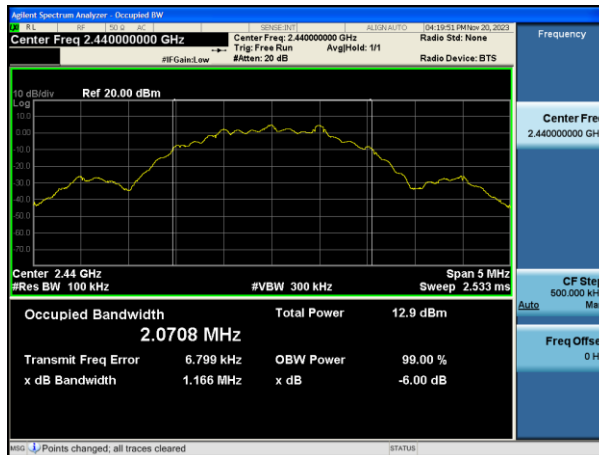


2 MBit/s (255 Byte) Test Plots

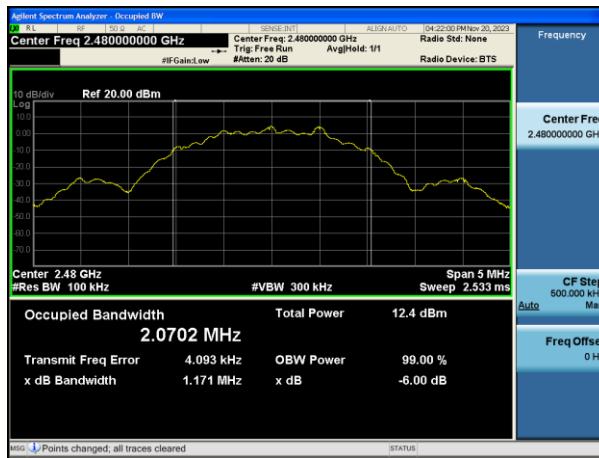
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

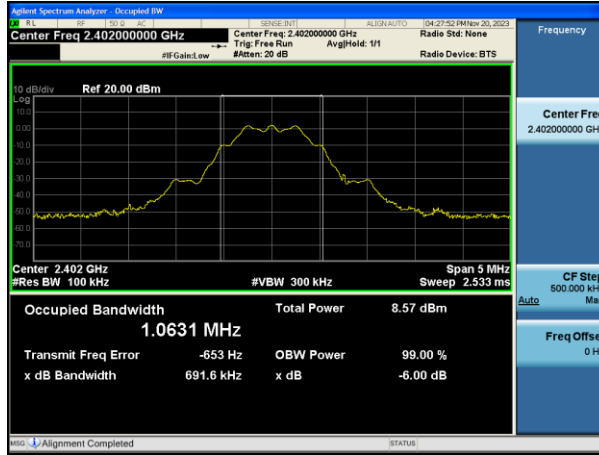


6 dB Bandwidth plot (High-CH 39)

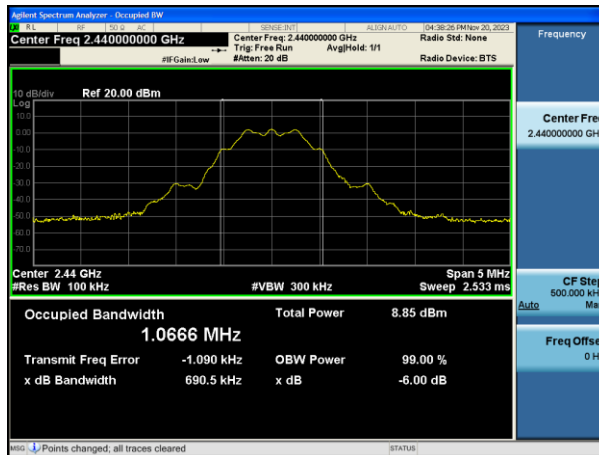


■ 125k Bit/s(37 Byte) Test Plots

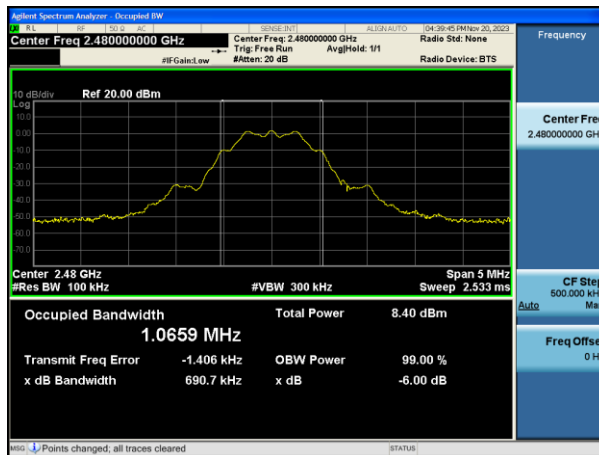
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)

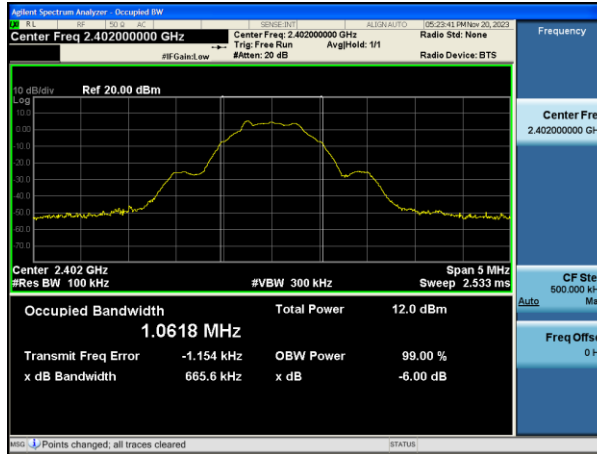


6 dB Bandwidth plot (High-CH 39)

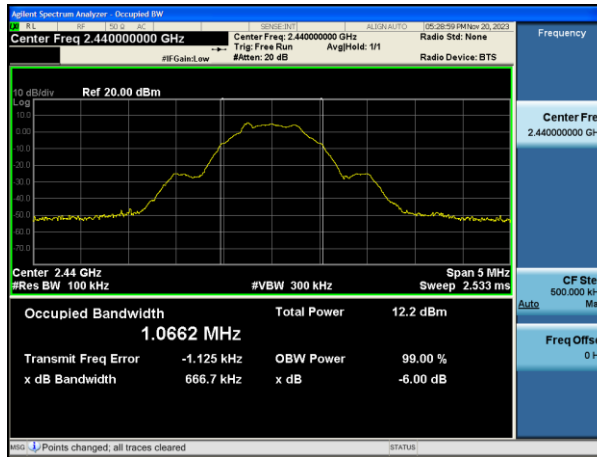


500k Bit/s(255 Byte) Test Plots

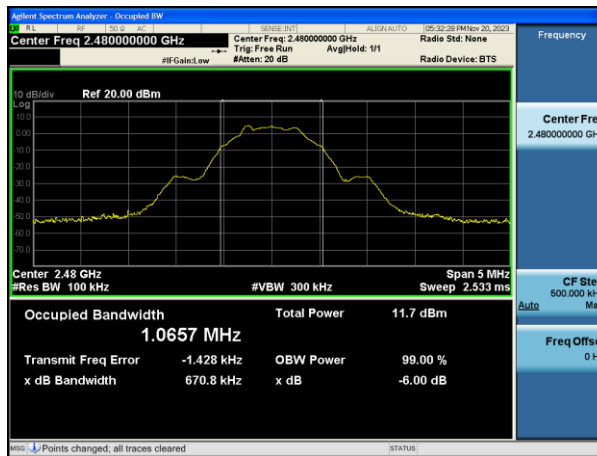
6 dB Bandwidth plot (Low-CH 0)



6 dB Bandwidth plot (Mid-CH 19)



6 dB Bandwidth plot (High-CH 39)



9.3 OUTPUT POWER

Peak Power

Data rate (Bit/s)	Packet length (Byte)	LE Mode		Measured Power(dBm)	Limit (dBm)
		Frequency [MHz]	Channel		
1M	37	2402	0	5.660	30
		2440	19	5.788	
		2480	39	5.328	
	255	2402	0	5.574	
		2440	19	5.763	
		2480	39	5.282	
2M	37	2402	0	5.698	
		2440	19	5.862	
		2480	39	5.408	
	255	2402	0	5.638	
		2440	19	5.800	
		2480	39	5.315	
125k	37	2402	0	5.542	
		2440	19	5.767	
		2480	39	5.279	
	255	2402	0	5.536	
		2440	19	5.735	
		2480	39	5.242	
500k	37	2402	0	5.623	
		2440	19	5.738	
		2480	39	5.263	
	255	2402	0	5.501	
		2440	19	5.688	
		2480	39	5.198	

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	3.24	2.13	5.37	30
		2440	19	3.41	2.13	5.54	
		2480	39	2.99	2.13	5.12	
	255	2402	0	4.59	0.71	5.30	
		2440	19	4.80	0.71	5.51	
		2480	39	4.34	0.71	5.05	
2M	37	2402	0	0.39	4.97	5.36	
		2440	19	0.54	4.97	5.51	
		2480	39	0.08	4.97	5.05	
	255	2402	0	2.89	2.44	5.33	
		2440	19	2.97	2.44	5.41	
		2480	39	2.61	2.44	5.05	
125k	37	2402	0	4.54	0.83	5.37	
		2440	19	4.69	0.83	5.52	
		2480	39	4.29	0.83	5.12	
	255	2402	0	5.20	0.12	5.32	
		2440	19	5.40	0.12	5.52	
		2480	39	4.97	0.12	5.09	
500k	37	2402	0	2.92	2.46	5.38	
		2440	19	3.07	2.46	5.53	
		2480	39	2.65	2.46	5.11	
	255	2402	0	4.85	0.41	5.26	
		2440	19	5.02	0.41	5.43	
		2480	39	4.70	0.41	5.11	

9.4 POWER SPECTRAL DENSITY

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	-2.836	2.13	-0.708	8 dBm / 3 kHz
2440	19		-2.643	2.13	-0.515	
2480	39		-3.282	2.13	-1.154	
2402	0	1 MBit/s 255 Byte	-2.038	0.71	-1.332	
2440	19		-2.026	0.71	-1.320	
2480	39		-2.472	0.71	-1.766	
2402	0	2 MBit/s 37 Byte	-6.877	4.97	-1.908	
2440	19		-7.541	4.97	-2.572	
2480	39		-7.504	4.97	-2.535	
2402	0	2 MBit/s 255 Byte	-6.262	2.44	-3.823	
2440	19		-6.330	2.44	-3.891	
2480	39		-6.363	2.44	-3.924	
2402	0	125k 37 Byte	-1.398	0.83	-0.566	
2440	19		-0.983	0.83	-0.151	
2480	39		-1.640	0.83	-0.808	
2402	0	125k 255 Byte	-0.639	0.12	-0.522	
2440	19		-0.399	0.12	-0.282	
2480	39		-0.795	0.12	-0.678	
2402	0	500k 37 Byte	-4.275	2.46	-1.812	
2440	19		-4.205	2.46	-1.742	
2480	39		-4.438	2.46	-1.975	
2402	0	500k 255 Byte	-1.909	0.41	-1.499	
2440	19		-1.804	0.41	-1.394	
2480	39		-2.268	0.41	-1.858	

Note :

1. Spectrum measured Value not plot data.

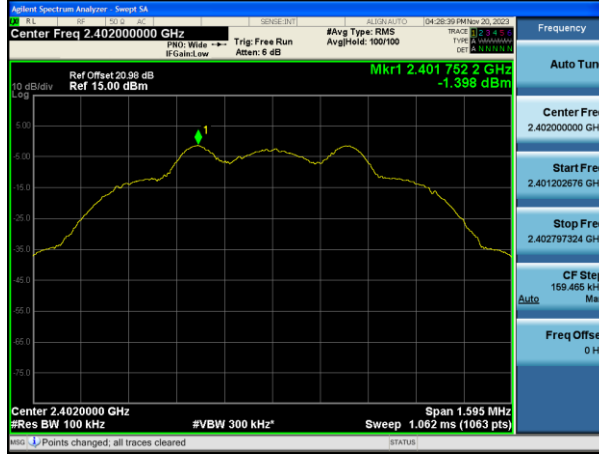
The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.

2. Total PSD = Measured PSD + Duty Cycle Factor

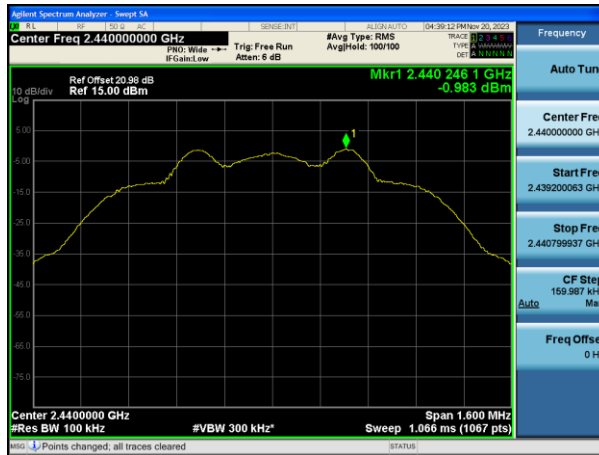
3. Worst case test plot was attached. (Worstcase : 125k Bit/s 37 Byte)

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

Test Result : please refer to the plot below.

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

[BAND EDGE]

Frequency (MHz)	Mode	Channel No.	Position	Test Result	
				Measured Level (dB)	Limit (dBc)
2402	1M Bit/s 37 Byte	0	Lower	60.492	30
2480		39	Upper	64.247	30
2402	1M Bit/s 255 Byte	0	Lower	60.975	30
2480		39	Upper	64.271	30
2402	2M Bit/s 37 Byte	0	Lower	31.064	30
2480		39	Upper	57.516	30
2402	2M Bit/s 255 Byte	0	Lower	30.969	30
2480		39	Upper	58.286	30
2402	125k Bit/s 37 Byte	0	Lower	58.234	30
2480		39	Upper	61.753	30
2402	125k Bit/s 255 Byte	0	Lower	58.621	30
2480		39	Upper	61.888	30
2402	500k Bit/s 37 Byte	0	Lower	60.092	30
2480		39	Upper	64.716	30
2402	500k Bit/s 255 Byte	0	Lower	61.383	30
2480		39	Upper	65.234	30

Note :

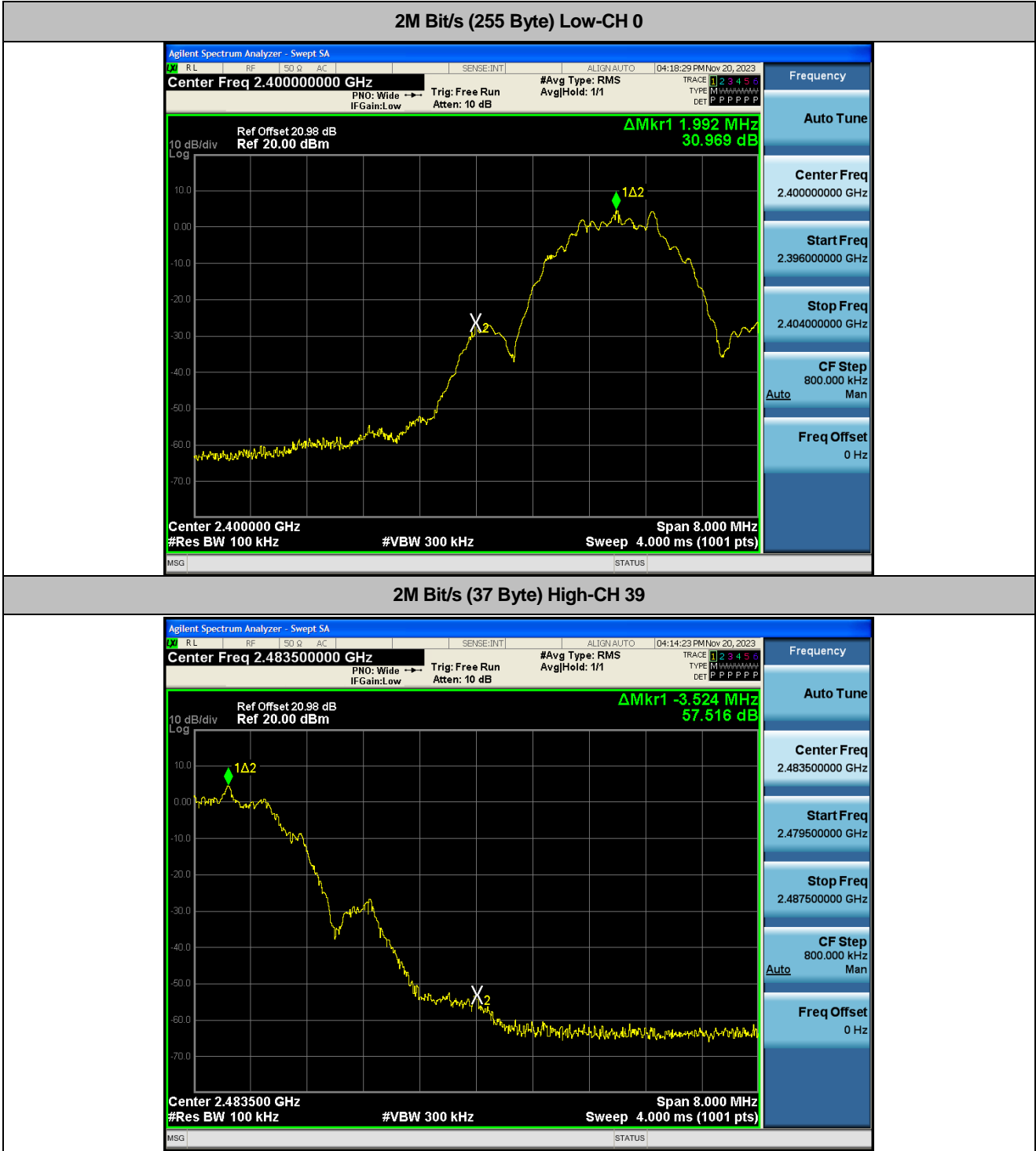
- In order to simplify the report, attached plots were only the worst case channel and data rate.
[Lower: Worst case : 2M Bit/s (255 Byte)]
[Upper: Worst case : 2M Bit/s (37 Byte)]

[CONDUCTED SPURIOUS EMISSIONS]

Note :

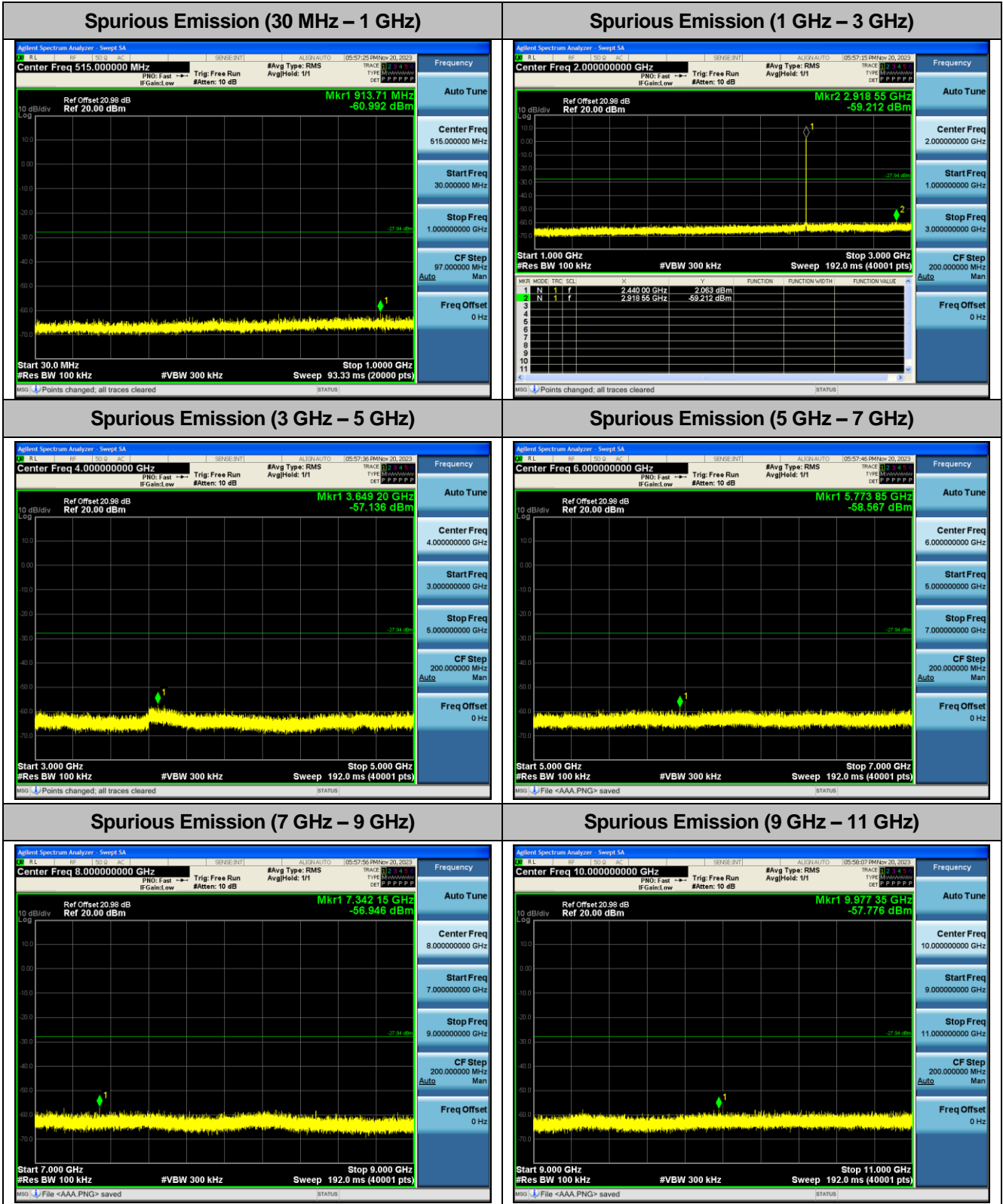
- In order to simplify the report, attached plots were only the worst case channel and data rate.
Worst case 125k Bit/s (37 Byte)

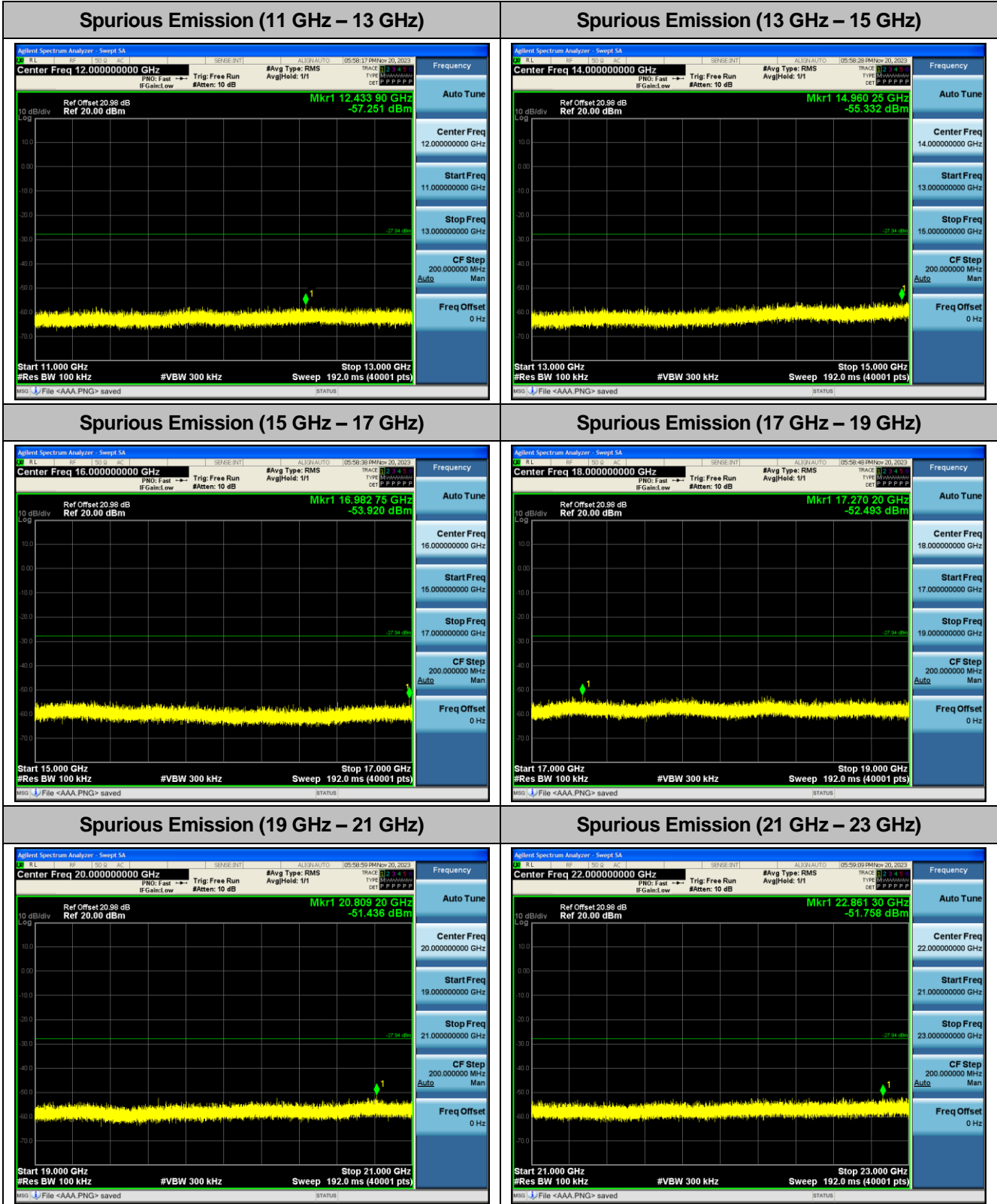
☐ Test Plots - Band Edge

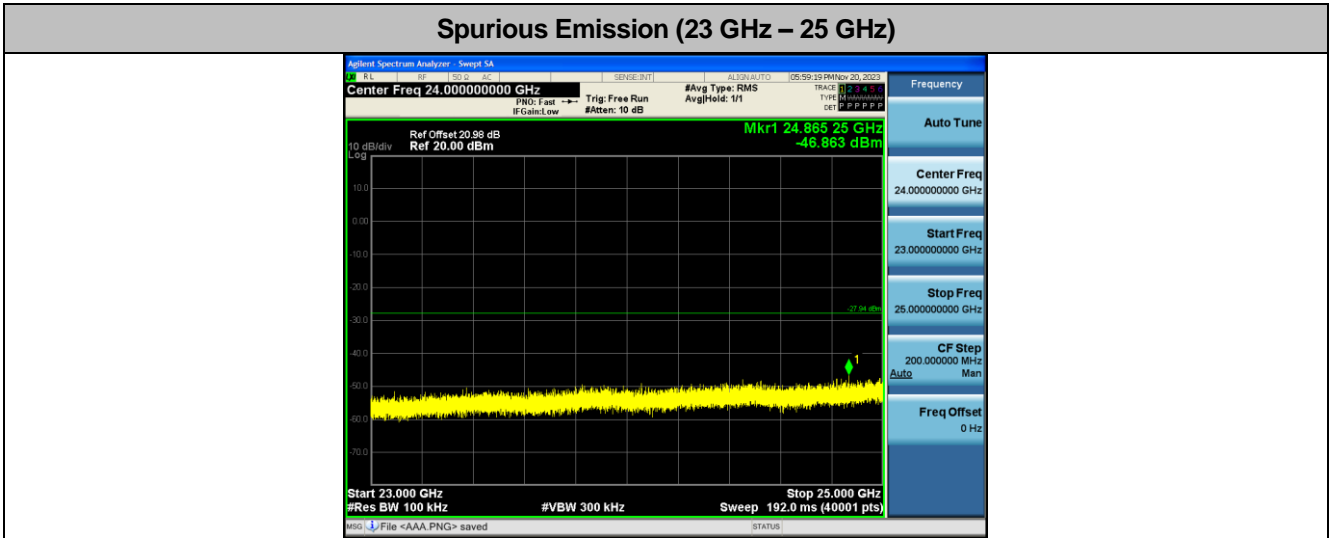


Test Plots - Conducted Spurious Emission

(Worst case : 125k Bit/s (37 Byte)_CH.19)







Note:

1. In order to simplify the report, attached plots were only the worst case channel and data rate.
2. Limit: -27.94 dBm

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
Mode : 1 M Bit/s (37 Bytes)

Operation Frequency : 2402 MHz(Ch. 0)

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
4804	42.62	4.63	V	47.25	73.98	26.73	PK
4804	30.21	4.63	V	34.84	53.98	19.14	AV
7206	40.30	12.46	V	52.76	73.98	21.22	PK
7206	27.85	12.46	V	40.31	53.98	13.67	AV
4804	42.89	4.63	H	47.52	73.98	26.46	PK
4804	30.35	4.63	H	34.98	53.98	19.00	AV
7206	39.54	12.46	H	52.00	73.98	21.98	PK
7206	27.35	12.46	H	39.81	53.98	14.17	AV

Operation Frequency : 2440 MHz(Ch. 19)

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
4880	42.05	5.29	V	47.34	73.98	26.64	PK
4880	29.95	5.29	V	35.24	53.98	18.74	AV
7320	39.89	12.67	V	52.56	73.98	21.42	PK
7320	27.62	12.67	V	40.29	53.98	13.69	AV
4880	42.56	5.29	H	47.85	73.98	26.13	PK
4880	30.05	5.29	H	35.34	53.98	18.64	AV
7320	39.82	12.67	H	52.49	73.98	21.49	PK
7320	27.55	12.67	H	40.22	53.98	13.76	AV

Operation Frequency : 2480 MHz(Ch. 39)

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
4960	42.65	5.72	V	48.37	73.98	25.61	PK
4960	30.33	5.72	V	36.05	53.98	17.93	AV
7440	40.94	12.39	V	53.33	73.98	20.65	PK
7440	27.95	12.39	V	40.34	53.98	13.64	AV
4960	42.87	5.72	H	48.59	73.98	25.39	PK
4960	30.54	5.72	H	36.26	53.98	17.72	AV
7440	40.85	12.39	H	53.24	73.98	20.74	PK
7440	27.89	12.39	H	40.28	53.98	13.70	AV

Mode : 2 M Bit/s (37 Bytes)

Operation Frequency : 2402 MHz(Ch. 0)

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
4804	42.22	4.63	V	46.85	73.98	27.13	PK
4804	30.05	4.63	V	34.68	53.98	19.30	AV
7206	39.95	12.46	V	52.41	73.98	21.57	PK
7206	27.85	12.46	V	40.31	53.98	13.67	AV
4804	42.43	4.63	H	47.06	73.98	26.92	PK
4804	30.15	4.63	H	34.78	53.98	19.20	AV
7206	39.85	12.46	H	52.31	73.98	21.67	PK
7206	27.77	12.46	H	40.23	53.98	13.75	AV

Operation Frequency : 2440 MHz(Ch. 19)

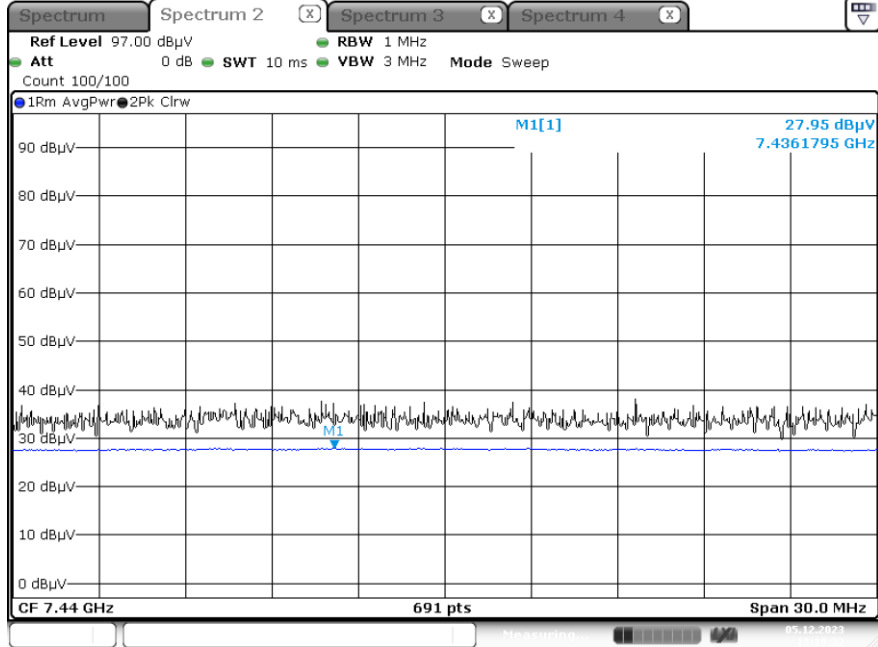
Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
4880	42.15	5.29	V	47.44	73.98	26.54	PK
4880	29.54	5.29	V	34.83	53.98	19.15	AV
7320	39.85	12.67	V	52.52	73.98	21.46	PK
7320	27.51	12.67	V	40.18	53.98	13.80	AV
4880	42.29	5.29	H	47.58	73.98	26.40	PK
4880	29.66	5.29	H	34.95	53.98	19.03	AV
7320	39.71	12.67	H	52.38	73.98	21.60	PK
7320	27.49	12.67	H	40.16	53.98	13.82	AV

Operation Frequency : 2480 MHz(Ch. 39)

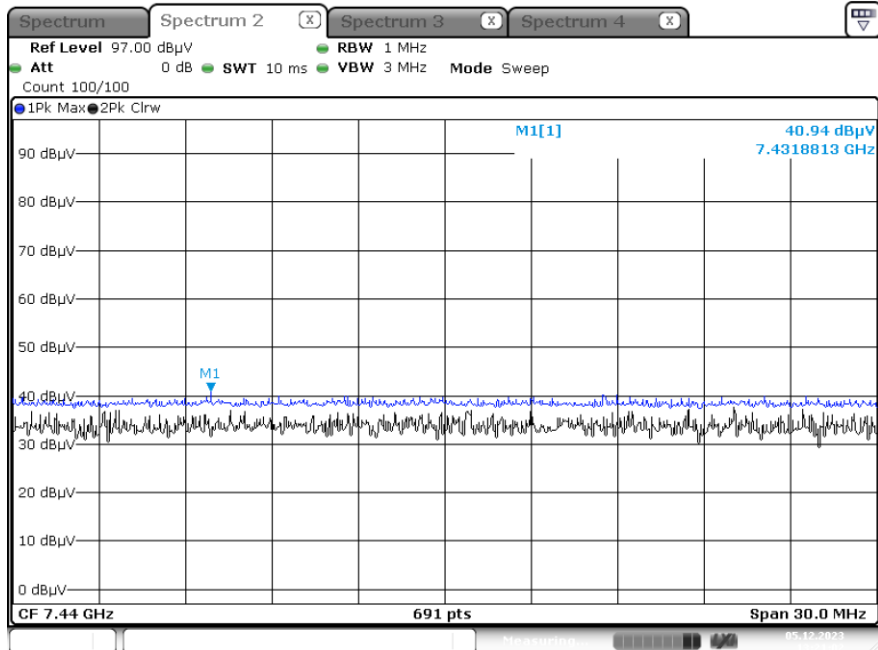
Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L -A.G+D.F [dB/m]	Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
4960	41.62	5.72	V	47.34	73.98	26.64	PK
4960	29.95	5.72	V	35.67	53.98	18.31	AV
7440	40.55	12.39	V	52.94	73.98	21.04	PK
7440	27.89	12.39	V	40.28	53.98	13.70	AV
4960	41.75	5.72	H	47.47	73.98	26.51	PK
4960	30.05	5.72	H	35.77	53.98	18.21	AV
7440	40.32	12.39	H	52.71	73.98	21.27	PK
7440	27.88	12.39	H	40.27	53.98	13.71	AV

▣ 1 M Bit/s 37 Bytes Test Plots (Worst case : Y-V)

Radiated Spurious Emissions plot – Average Result (Ch.39 3rd Harmonic)



Radiated Spurious Emissions plot – Peak Result (Ch.39 3rd Harmonic)



Note:

Plots of worst case are only reported.

9.7 RADIATED RESTRICTED BAND EDGES

Mode : 1M Bit/s (37 Bytes)

Operating Frequency 2402 MHz, 2480 MHz
Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L+ATT -A.G+D.F [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	48.22	2.52	H	50.74	73.98	23.24	PK
2390.0	35.92	2.52	H	38.44	53.98	15.54	AV
2390.0	48.12	2.52	V	50.64	73.98	23.34	PK
2390.0	35.90	2.52	V	38.42	53.98	15.56	AV
2483.5	48.07	3.37	H	51.44	73.98	22.54	PK
2483.5	34.85	3.37	H	38.22	53.98	15.76	AV
2483.5	47.85	3.37	V	51.22	73.98	22.76	PK
2483.5	34.62	3.37	V	37.99	53.98	15.99	AV

Mode : 1M Bit/s (255 Bytes)

Operating Frequency 2402 MHz, 2480 MHz
Channel No. 0 CH, 39 CH

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L+ATT -A.G+D.F [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	48.22	2.52	H	50.74	73.98	23.24	PK
2390.0	35.91	2.52	H	38.43	53.98	15.55	AV
2390.0	48.02	2.52	V	50.54	73.98	23.44	PK
2390.0	35.88	2.52	V	38.40	53.98	15.58	AV
2483.5	48.19	3.37	H	51.56	73.98	22.42	PK
2483.5	35.09	3.37	H	38.46	53.98	15.52	AV
2483.5	48.02	3.37	V	51.39	73.98	22.59	PK
2483.5	34.95	3.37	V	38.32	53.98	15.66	AV

Mode : 2M Bit/s (37 Bytes)

Operating Frequency

2402 MHz, 2480 MHz

Channel No.

0 CH, 39 CH

Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L+ATT -A.G+D.F [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	48.32	2.52	H	50.84	73.98	23.14	PK
2390.0	35.96	2.52	H	38.48	53.98	15.50	AV
2390.0	48.12	2.52	V	50.64	73.98	23.34	PK
2390.0	35.92	2.52	V	38.44	53.98	15.54	AV
2483.5	49.15	3.37	H	52.52	73.98	21.46	PK
2483.5	36.68	3.37	H	40.05	53.98	13.93	AV
2483.5	49.02	3.37	V	52.39	73.98	21.59	PK
2483.5	36.54	3.37	V	39.91	53.98	14.07	AV

Mode : 2M Bit/s (255 Bytes)

Operating Frequency

2402 MHz, 2480 MHz

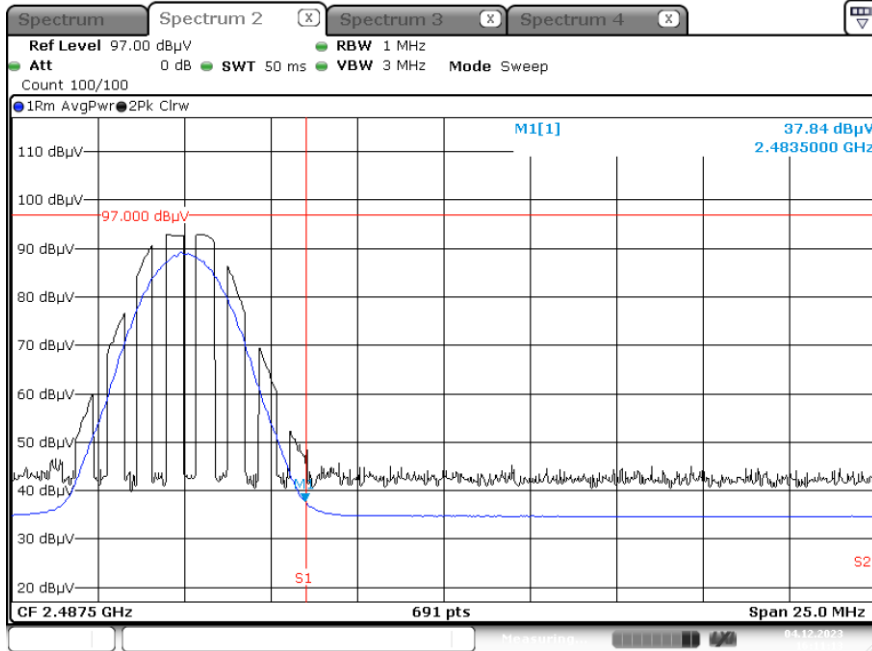
Channel No.

0 CH, 39 CH

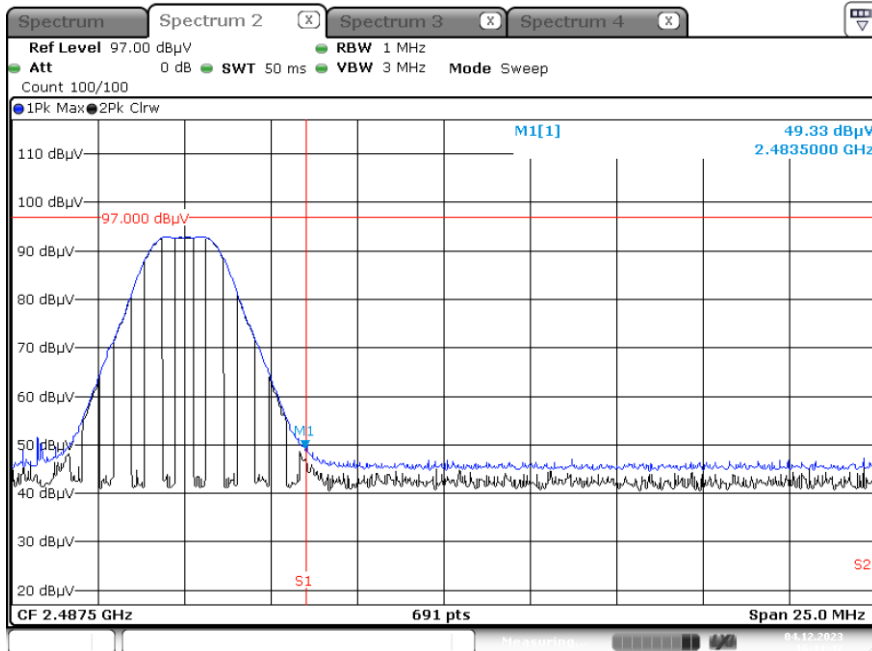
Frequency [MHz]	Measured Value [dB μ V]	A.F+C.L+ATT -A.G+D.F [dB/m]	Ant. Pol. [H/V]	Total [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Measurement Type
2390.0	48.27	2.52	H	50.79	73.98	23.19	PK
2390.0	35.98	2.52	H	38.50	53.98	15.48	AV
2390.0	48.02	2.52	V	50.54	73.98	23.44	PK
2390.0	35.81	2.52	V	38.33	53.98	15.65	AV
2483.5	49.33	3.37	H	52.70	73.98	21.28	PK
2483.5	37.84	3.37	H	41.21	53.98	12.77	AV
2483.5	49.12	3.37	V	52.49	73.98	21.49	PK
2483.5	37.62	3.37	V	40.99	53.98	12.99	AV

Mode : 2 M Bit/s (255 Bytes) Test Plots

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



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



Note:

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

9.8 POWERLINE CONDUCTED EMISSIONS

Conducted Emissions

BTLE MODE

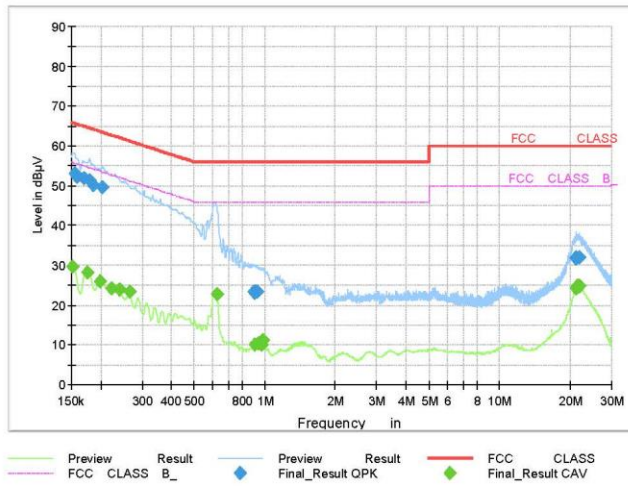
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Test Report

Common Information

EUT : SM-M156B/DSN
Operating Conditions : BTLE MODE

Full Spectrum



Final Result QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1545	53.04	65.75	12.71	9,000	N	9.7
0.1590	52.13	65.52	13.38	9,000	N	9.7
0.1703	51.82	64.95	13.13	9,000	N	9.7
0.1793	51.35	64.52	13.17	9,000	N	9.7
0.1860	50.09	64.21	14.12	9,000	L1	9.7
0.2040	49.70	63.45	13.75	9,000	N	9.7
0.8983	23.45	56.00	32.55	9,000	L1	9.8
0.9028	22.99	56.00	33.01	9,000	N	9.8
0.9073	23.47	56.00	32.53	9,000	L1	9.8
0.9140	23.36	56.00	32.64	9,000	N	9.8
0.9185	23.25	56.00	32.75	9,000	N	9.8
0.9253	23.34	56.00	32.66	9,000	L1	9.8
21.2135	31.88	60.00	28.12	9,000	L1	10.9
21.2270	31.85	60.00	28.15	9,000	L1	10.9
21.2360	31.80	60.00	28.20	9,000	L1	10.9
21.2518	31.93	60.00	28.07	9,000	L1	10.9
21.2788	32.03	60.00	27.97	9,000	L1	10.9
21.8368	32.11	60.00	27.89	9,000	L1	10.9

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BTLE MODE

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Final Result CAV

Frequency (MHz)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.1523	29.80	55.88	26.08	9.000	L1	9.7
0.1748	28.16	54.73	26.57	9.000	L1	9.7
0.1995	26.00	53.63	27.64	9.000	L1	9.7
0.2220	24.18	52.74	28.57	9.000	L1	9.7
0.2400	23.81	52.10	28.29	9.000	L1	9.7
0.2648	23.27	51.28	28.01	9.000	L1	9.7
0.6238	22.80	46.00	23.20	9.000	L1	9.8
0.9095	10.05	46.00	35.95	9.000	L1	9.8
0.9343	10.34	46.00	35.66	9.000	L1	9.8
0.9590	10.42	46.00	35.58	9.000	L1	9.8
0.9703	9.98	46.00	36.02	9.000	L1	9.8
0.9860	11.23	46.00	34.77	9.000	L1	9.8
21.1753	24.27	50.00	25.73	9.000	L1	10.9
21.3170	24.45	50.00	25.55	9.000	L1	10.9
21.4700	24.70	50.00	25.30	9.000	L1	10.9
21.7243	24.79	50.00	25.21	9.000	L1	10.9
21.7895	24.73	50.00	25.27	9.000	L1	10.9
21.8390	24.70	50.00	25.30	9.000	L1	10.9

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10. LIST OF TEST EQUIPMENT

Conducted Test

Equipment	Model	Manufacturer	Serial No.	Due to Calibration	Calibration Interval
LISN	ENV216	Rohde & Schwarz	102245	08/02/2024	Annual
EMI Test Receiver	ESR	Rohde & Schwarz	101910	05/26/2024	Annual
Temperature Chamber	SU-642	ESPEC	0093008124	02/22/2024	Annual
Signal Analyzer	N9030A	Agilent	MY49432108	03/02/2024	Annual
Power Measurement Set	OSP 120	Rohde & Schwarz	101231	06/09/2024	Annual
Power Meter	N1911A	Agilent	MY45100523	03/06/2024	Annual
Power Sensor	N1921A	Agilent	MY57820067	03/06/2024	Annual
Directional Coupler	87300B	Agilent	3116A03621	10/30/2024	Annual
Power Splitter	11667B	Hewlett Packard	10545	02/06/2024	Annual
DC Power Supply	E3632A	Agilent	KR75303243	04/24/2024	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C	HP	07560	06/12/2024	Annual
Attenuator(10 dB)(DC-26.5 GHz)	8493C	HP	08285	06/02/2024	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	100752	01/12/2024	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
EM1000 / Controller	EM1000	Audix	060520	N/A	N/A
Turn Table	N/A	Audix	N/A	N/A	N/A
Amp & Filter Bank Switch Controller	FBSM-01B	T&M system	TM19050002	N/A	N/A
Loop Antenna	1513	Schwarzbeck	1513-333	03/17/2024	Biennial
Hybrid Antenna	VULB 9168	Schwarzbeck	9168-0895	08/16/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-1300	01/18/2024	Biennial
Horn Antenna	BBHA 9120D	Schwarzbeck	9120D-2296	05/18/2024	Biennial
Horn Antenna(15 GHz ~ 40 GHz)	BBHA9170	Schwarzbeck	BBHA9170342	09/29/2024	Biennial
Spectrum Analyzer	FSV(10 Hz ~ 40 GHz)	Rohde & Schwarz	101055	05/12/2024	Annual
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	06/12/2024	Annual
Band Reject Filter	WRCJV12-4900-5100-5900-6100-50SS	Wainwright Instruments	6	06/12/2024	Annual
High Pass Filter(7 GHz ~ 18 GHz)	WHKX10-7150-8000-18000-50SS	Wainwright Instruments	1	03/02/2024	Annual
Power Amplifier	CBL18265035	CERNEX	22966	11/17/2024	Annual
Power Amplifier	CBL26405040	CERNEX	25956	03/02/2024	Annual
Bluetooth Tester	TC-3000C	TESCOM	3000C000175	03/28/2024	Annual
RF Switching System	FMSR-05B (HPF(3~18GHz) + LNA1(1~18GHz))	T&M system	S1L1	01/17/2024	Annual
RF Switching System	FMSR -05B (ATT(10dB) + LNA1(1~18GHz))	T&M system	S1L2	01/17/2024	Annual
RF Switching System	FMSR -05B (ATT(3dB) + LNA1(1~18GHz))	T&M system	S1L3	01/17/2024	Annual
RF Switching System	FMSR -05B (LNA1(1~18GHz))	T&M system	S1L4	01/17/2024	Annual
RF Switching System	FMSR -05B (HPF(7~18GHz) + LNA2(6~18GHz))	T&M system	S1L5	01/17/2024	Annual
RF Switching System	FMSR -05B (Thru(30MHz ~ 18GHz))	T&M system	S1L6	01/17/2024	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-2312-FC005-P