RF TEST REPORT

FCC / ISED

APPLICANT
Owl Labs Inc.

MODEL NAME
MTW405

FCC ID
2ALXJ-MTW405

ISED ID
22676-MTW405

REPORT NUMBER
HA240429-OWL-001-R02-1

TEST REPORT

Date of Issue
May 21, 2024

Test Site
Hyundai C-Tech, Inc. dba HCT America, Inc.
1726 Ringwood Ave, San Jose, CA 95131, USA

Applicant	Owl Labs Inc.
Applicant Address	33-1/2 Union Square Somerville, MA 02143 U.S.A.
FCC ID	2ALXJ-MTW405
ISED ID	22676-MTW405
Model Name	MTW405
EUT Type	360-Degree Video Conferencing Platform
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
FCC Classification	Spread Spectrum Transmitter (DSS)
FCC Rule Part(s)	Part 15.247
ISED Rule Part(s)	RSS-247 Issue 3 (August 2023) RSS-Gen Issue 5 Amd 2 (February 2021)
Test Procedure	ANSI C63.10-2013

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures required. The results of testing in this report apply only to the product which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Hyundai C-Tech, Inc. dba HCT America, Inc. certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

John Park

Test Engineer

Reviewed By

Yongsoo Park

Technical Manager

REVISION HISTORY

The revision history for this document is shown in table.

TEST REPORT NO.	DATE	DESCRIPTION
HA240429-OWL-001-R02	May 13, 2024	Initial Issue
HA240429-OWL-001-R02-1	May 21, 2024	Page 6 : Clarify support for each MIMO operation mode Pages 45 – 49, 53 : Makes it clear that each plot includes all correction factors

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Hyundai C-Tech, Inc. dba HCT America, Inc., 1726 Ringwood Avenue, San Jose, CA 95131, USA TEL: +1-510-933-8848 FAX: +1-510-933-8849

1. GENERAL INFORMATION

EUT DESCRIPTION

Model	MTW405
Product Name	Meeting Owl 4+
Serial Number	Conducted : M4FC1324001C Radiated :M4FV13240003
Power Supply	20 V d.c. (USB type C - External adaptor)
RF Specification	WIFI 2.4 GHz : 802.11b/g/ n(HT20, HT40)/ ac(VHT20, VHT40) WIFI 5 GHz : 802.11a/n(HT20/40)/ ac(VHT20/40/80) Bluetooth 5.0 LE (1M / BR / EDR)
Transmitter Chain	WIFI 2.4 GHz / 5 GHz : 2x2 MIMO Bluetooth LE / Bluetooth BR/EDR : SISO
Operating Environment	Indoor
Operating Temperature	5 °C ~ +30 °C

RF SPECIFICATION SUBJECT TO THE REPORT

RF Specification	Bluetooth BR/EDR
Frequency Range	2402 MHz - 2480 MHz
Max. RF Output Power	Peak : 17.98 dBm (62.76 mW)
Modulation Type	GFSK, π/4-DQPSK, 8DPSK
Number of Channels	79 Channels
Antenna Specification [1)]	Antenna Type : PCB Antenna Antenna Model : CU23001-1 Antenna Brand: antenova Peak Gain : 2.9 dBi
Firmware Version [2)]	6.4.21.22
Hardware Version [2)]	OWL-900-00027 Rev 5
Date(s) of Tests	April 29, 2024 ~ May 12, 2024

Note :
1. Antenna information is based on the document provided.
2. Firmware and Hardware Versions are provided by the client.

OPERATING FREQUENCY CHANNELS

Bluetooth (BR/EDR)							
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
00	2 402	**20**	2 422	**40**	2 442	**60**	2 462
01	2 403	**21**	2 423	**41**	2 443	**61**	2 463
02	2 404	**22**	2 424	**42**	2 444	**62**	2 464
03	2 405	**23**	2 425	**43**	2 445	**63**	2 465
04	2 406	**24**	2 426	**44**	2 446	**64**	2 466
05	2 407	**25**	2 427	**45**	2 447	**65**	2 467
06	2 408	**26**	2 428	**46**	2 448	**66**	2 468
07	2 409	**27**	2 429	**47**	2 449	**67**	2 469
08	2 410	**28**	2 430	**48**	2 450	**68**	2 470
09	2 411	**29**	2 431	**49**	2 451	**69**	2 471
10	2 412	**30**	2 432	**50**	2 452	**70**	2 472
11	2 413	**31**	2 433	**51**	2 453	**71**	2 473
12	2 414	**32**	2 434	**52**	2 454	**72**	2 474
13	2 415	**33**	2 435	**53**	2 455	**73**	2 475
14	2 416	**34**	2 436	**54**	2 456	**74**	2 476
15	2 417	**35**	2 437	**55**	2 457	**75**	2 477
16	2 418	**36**	2 438	**56**	2 458	**76**	2 478
17	2 419	**37**	2 439	**57**	2 459	**77**	2 479
18	2 420	**38**	2 440	**58**	2 460	**78**	2 480
19	2 421	**39**	2 441	**59**	2 461	-	-

2. METHODOLOGY

Frequency Hopping Spread Spectrum System (FHSS) 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 and the frequency hopping that were 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 / the RSS-GEN issue 5 amd 2, RSS-247 issue 3.

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 30MHz 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 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. Also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

Conducted Antenna Terminal

ANSI C63.10-2013

DESCRIPTION OF TEST MODES

The EUT has been tested at continuous Bluetooth operating mode. Qualcomm Radio Control Tool was used to control the channels, power setting, continuous TX and normal RX mode.

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 1726 Ringwood Avenue, San Jose, California 95131, USA. (LAB CODE : US0198)
The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.

CABID : 25729

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 antenna of this E.U.T is permanently attached and there is no provision for connection to an external antenna.
(2) The E.U.T Complies with the requirement of §15.203

According to RSS-Gen Issue 5 Amd 2 (Section 6.8) :
The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

6. MEASUREMENT UNCERTAINTY

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

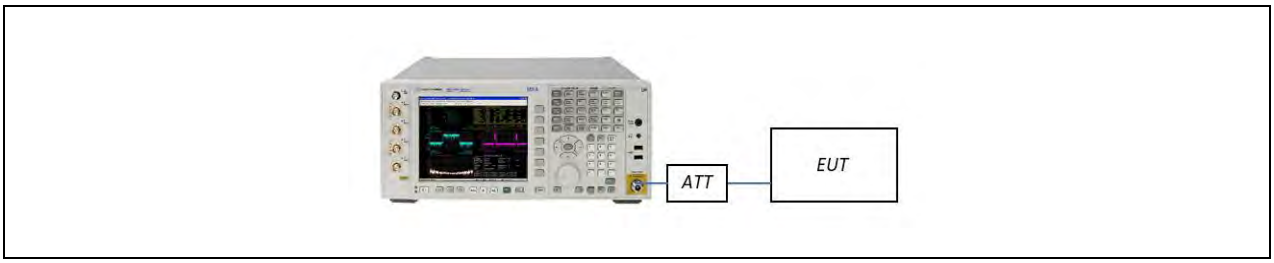
All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty
Output Power, Conducted	± 0.54 dB
Frequency Tolerance	± 16.78 kHz
Occupied Bandwidth	± 120.66 kHz
Unwanted Emissions, Conducted	± 0.54 dB
Radiated Emissions (below 1 GHz)	± 5.70 dB
Radiated Emissions (Above 1 GHz)	± 5.25 dB

7. DESCRIPTION OF TESTS

7.1. 20 dB BANDWIDTH / 99% OCCUPIED BANDWIDTH

TEST SETUP



TEST PROCEDURE (20 dB Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.
(Procedure Section 6.9.2 in ANSI C63.10-2013)

The Spectrum Analyzer Setting :

- RBW = 1% ~ 5% of 20 dB bandwidth
- VBW ≒ 3 x RBW
- Span : 2-5 times the 20 dB bandwidth, centered on the hopping channel
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Used the automatic bandwidth measurement capability of a spectrum analyzer, setting X dB as 20 dB.

TEST PROCEDURE (99 % Bandwidth)

The transmitter output is connected to the Spectrum Analyzer.
(Procedure Section 6.9.3 in ANSI C63.10-2013)

- RBW = 1% ~ 5% of the occupied bandwidth
- VBW ≒ 3 x RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Used the automatic bandwidth measurement capability of a spectrum analyzer.

Note(s) :
Occupied bandwidth profile installed on the spectrum analyzer was used during measurement.

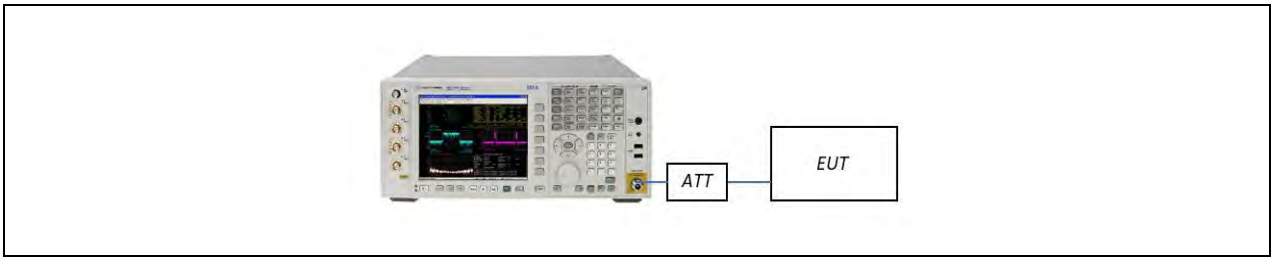
7.2. OUTPUT POWER

LIMIT

§15.247(b)(1)
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels : 1 W

RSS-247 Issue 3, Section 5.4(b)
For FHSS operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels. The e.i.r.p. shall not exceed 4 W.

TEST SETUP



TEST PROCEDURE

The EUT is connected to the Spectrum Analyzer. Hopping mode shall be disabled.

Use the following Spectrum Analyzer setting :
(Procedure Section 7.8.5 in ANSI C63.10-2013)

- RBW ≥ 20 dB Bandwidth
- VBW ≥ RBW
- SPAN = Approximately 5 x RBW
- Detector Mode = Peak
- Sweep = Auto couple
- Trace Mode = Max hold
- Allow trace to fully stabilize.
- Use marker-to-peak function to determine the peak emission level

Note(s) :
Sample Calculation

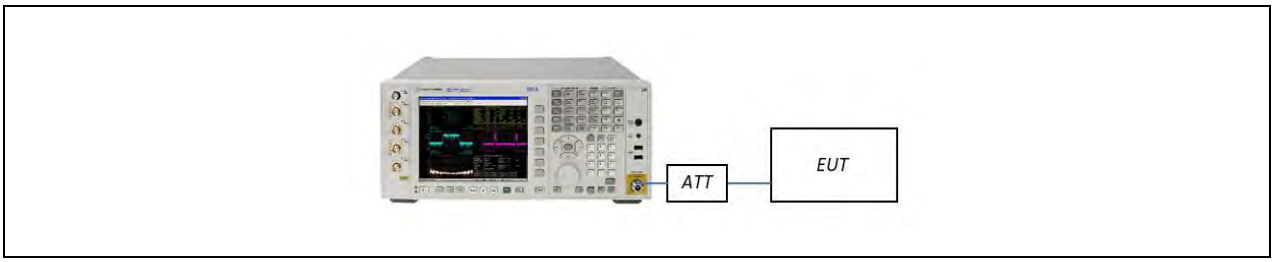
- Conducted Output Power (Peak) = Reading Value + ATT loss + Cable loss

7.3. NUMBER OF HOPPING CHANNELS

LIMIT

§15.247(a)(1)(iii) / RSS-247 Issue 3, Section 5.1(d)
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.
(Procedure 7.8.3 in ANSI C63.10-2013)

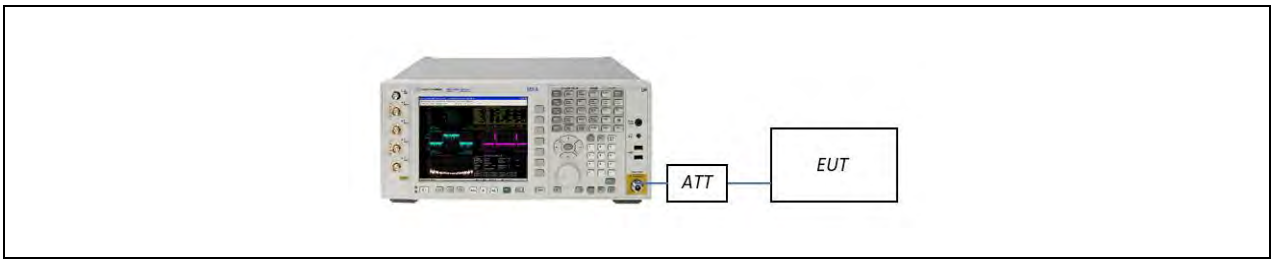
- RBW ≤ 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller
- VBW = 8 MHz (≥ RBW)
- SPAN = Frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans to allow the individual channels to be clearly seen.
- Sweep = Auto.
- Detector = Peak.
- Trace mode = Max hold.
- Allow the trace to stabilize.

7.4. CARRIER FREQUENCY SEPARATION

LIMIT

§15.247(a)(1) / RSS-247 Issue 3, Section 5.1(b)
For the frequency hopping systems operated in 2400 MHz~2483.5 MHz may have the hopping channel carrier frequencies separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power less than or equal to 125 mW.

TEST SETUP



TEST PROCEDURE

The EUT output shall be in the hopping mode and connected to the Spectrum Analyzer.

Use the following spectrum analyzer setting :
(Procedure 7.8.2 in ANSI C63.10-2013)

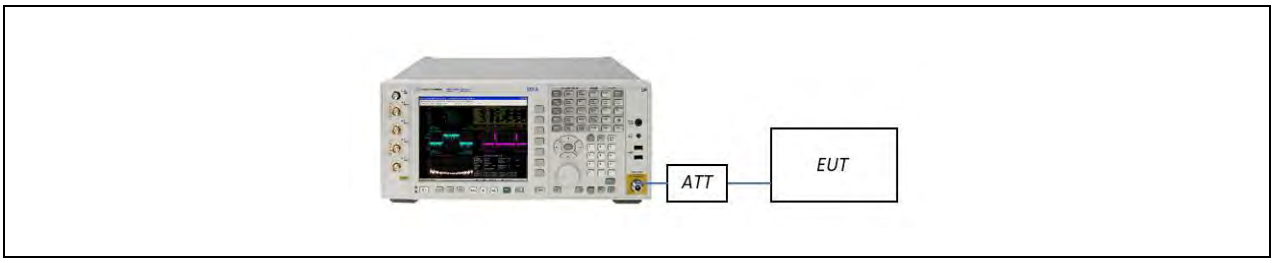
- RBW = Start with approximately 30% of the channel spacing; Then adjust as needed to best identify of each individual channel.
- VBW ≥ RBW.
- SPAN = Wide enough to capture two adjacent peaks.
- Sweep = Auto coupled.
- Detector = Peak.
- Trace mode = Max hold.
- Allow the trace to stabilize.

7.5. TIME OF OCCUPANCY (DWELL TIME)

LIMIT

§15.247(a)(1)(iii) / RSS-247 Issue 3 Section 5.1(d)
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST SETUP



TEST PROCEDURE

The EUT output shall be in the hopping mode and connected to the Spectrum Analyzer.

Use the following spectrum analyzer setting :
(Procedure 7.8.4 in ANSI C63.10-2013)

- RBW ≤ Channel spacing and where possible, RBW should be set >> 1/T, where T is the expected dwell time per channel.
- VBW ≥ RBW.
- Span = Zero span, centered on a hopping channel.
- Sweep = As needed to capture entire dwell time per hopping channel (Use video trigger and trigger delay for the transmitted signal to better show the plot little after start). Second plot might be needed with longer sweep time to show two successive hops on a channel
- Detector = Peak.
- Trace mode = Max hold.

Use the marker-delta function to determine transmit time per hop. Repeat the test for each different mode of operation.

Note(s) :
Sample Calculation

No of hops specified in the requirement
- No of hops on spectrum analyzer x (period specified in the requirement / sweep time on SA)

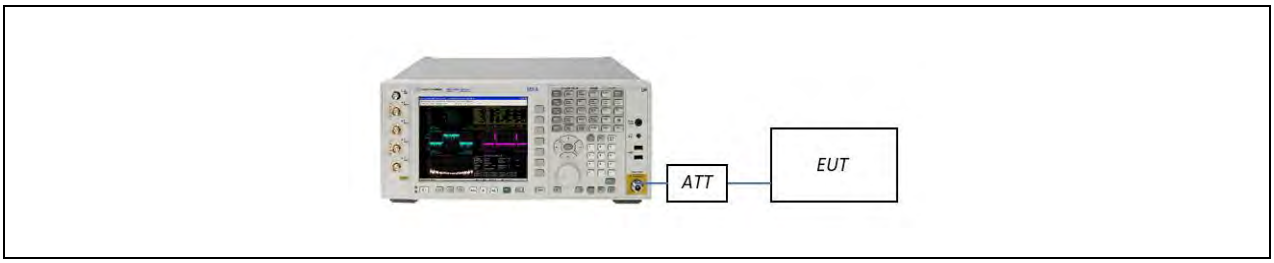
Dwell Time (s)
- Transmit time per hops x No of hops specified in the requirement

7.6. CONDUCTED BAND EDGE / CONDUCTED SPURIOUS EMISSIONS

LIMIT

§15.247(d) / RSS-247 Issue 3, Section 5.5.
The maximum conducted (peak) 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 20 dB relative to the maximum in-band peak PSD level in 100 kHz.
[Conducted > 20 dBc]

TEST SETUP



TEST PROCEDURE

The transmitter output port is connected to the spectrum analyzer.
(Procedure 7.8.6 and 7.8.8 in ANSI C63.10-2013)

- RBW = 100 kHz
- VBW = 300 kHz
- Set span to encompass the spectrum to be examined
- Detector = Peak
- Trace Mode = max hold
- Sweep time = auto couple
- Ensure that the number of measurement points ≥ 2*Span/RBW
- Allow trace to fully stabilize.
- Use peak marker function to determine the maximum amplitude level.

Measurements are made from 30 MHz to ten times operating frequency in GHz for the lowest, middle, and highest channels.

7.7. RADIATED EMISSIONS

RADIATION EMISSION LIMIT

FCC : 47 CFR § 15.209		
Frequency (MHz)	**Field Strength (uV/m)**	**Measurement Distance (m)**
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

ISED : RSS-GEN Section 8.9		
Frequency (MHz)	**Field Strength (uV/m)**	**Measurement Distance (m)**
0.009 – 0.490	6.37/F(kHz)	300
0.490 – 1.705	63.7/F(kHz)	30
1.705 – 30	0.08	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

RECEIVER RADIATED EMISSION LIMIT

ISED : RSS-GEN Section 7.3		
Frequency (MHz)	**Field Strength (uV/m)**	**Measurement Distance (m)**
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

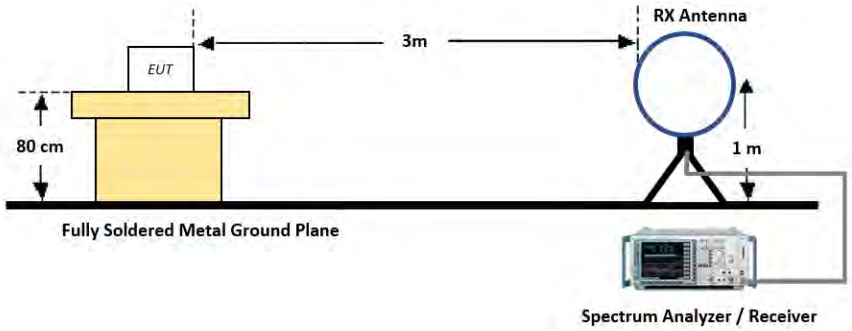
RESTRICTED BANDS OF OPERATION

FCC : 47 CFR § 15.205(a)				
Frequency (MHz)	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**
0.090 – 0.110	12.29 - 12.293	149.9 - 150.05	1660.0 - 1710.0	8025 - 8500
0.495 - 0.505	12.51975 - 12.52025	156.52475 - 156.52525	1718.8 - 1722.2	9000 - 9200
2.1735 - 2.1905	12.57675 - 12.57725	156.7 - 156.9	2200.0 - 2300.0	9300 - 9500
4.125 - 4.128	13.36 - 13.41	162.0125 - 167.17	2310.0 - 2390.0	10600 - 12700
4.17725 - 4.17775	16.42 - 16.423	167.72 - 173.2	2483.5 - 2500.0	13250 - 13400
4.20725 - 4.20775	16.69475 - 16.69525	240.0 - 285.0	2690.0 - 2900.0	14470 - 14500
6.215 - 6.218	16.80425 - 16.80475	322.0 - 335.4	3260.0 - 3267.0	15350 - 16200
6.26775 - 6.26825	25.5 - 25.67	399.9 - 410.0	3332.0 - 3339.0	17700 - 21400
6.31175 - 6.31225	37.5 - 38.25	608.0 - 614.0	3345.8 - 3358.0	22010 - 23120
8.291 - 8.294	73 - 74.6	960.0 - 1240.0	3600.0 - 4400.0	23600 - 24000
8.362 - 8.366	74.8 - 75.2	1300.0 - 1427.0	4500.0 - 5150.0	31200 - 31800
8.37625 - 8.38675	108 - 121.94	1435.0 - 1626.5	5350.0 - 5460.0	36430 - 36500
8.41425 - 8.41475	123 - 138	1645.5 - 1646.5	7250.0 - 7750.0	Above 38600

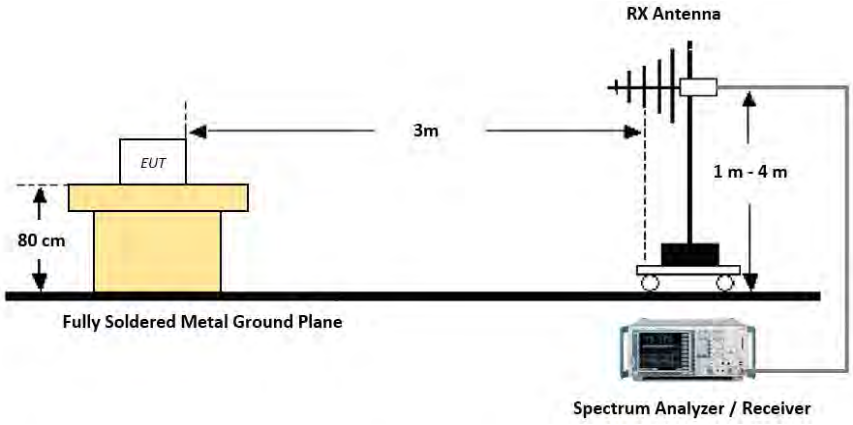
ISED : RSS-GEN Section 8.10				
Frequency (MHz)	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**	**Frequency (MHz)**
0.090 - 0.110	8.37625 - 8.38675	108 – 138	1660 - 1710	8025 - 8500
0.495 - 0.505	8.41425 - 8.41475	149.9 - 150.05	1718.8 - 1722.2	9000 - 9200
2.1735 - 2.1905	12.29 - 12.293	156.52475 - 156.52525	2200 - 2300	9300 - 9500
3.020 - 3.026	12.51975 - 12.52025	156.7 - 156.9	2310 - 2390	10600 - 12700
4.125 - 4.128	12.57675 - 12.57725	162.0125 - 167.17	2483.5 - 2500	13250 - 13400
4.17725 - 4.17775	13.36 - 13.41	167.72 - 173.2	2655 - 2900	14470 - 14500
4.20725 - 4.20775	16.42 - 16.423	240 - 285	3260 - 3267	15350 - 16200
5.677 - 5.683	16.69475 - 16.69525	322 - 335.4	3332 - 3339	17700 - 21400
6.215 - 6.218	16.80425 - 16.80475	399.9 - 410	3345.8 - 3358	22010 - 23120
6.26775 - 6.26825	25.5 - 25.67	608 - 614	3500 - 4400	23600 - 24000
6.31175 - 6.31225	37.5 - 38.25	960 - 1427	4500 - 5150	31200 - 31800
8.291 - 8.294	73 - 74.6	1435 - 1626.5	5350 - 5460	36430 - 36500
8.362 - 8.366	74.8 - 75.2	1645.5 - 1646.5	7250 - 7750	Above 38600

TEST SETUP

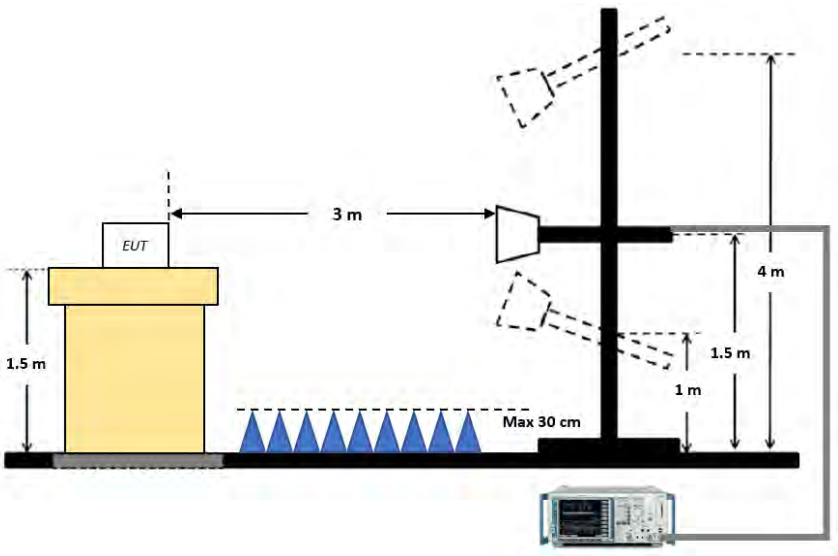
Below 30 MHz



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 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization 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 m/300 m) = - 80 dB
   Measurement Distance: 3 m
7. Distance Correction Factor (0.490 MHz – 30 MHz) = 40*log(3 m/30 m) = - 40 dB
   Measurement Distance: 3 m
8. Spectrum Setting

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

9. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)
10. There is a comparison data both open-field test site and alternative test site – semi-Anechoic chamber according to 414788 D01. And the results are properly calibrated.

TEST PROCEDURE OF RADIATED SPURIOUS EMISSIONS (Below 1GHz)

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. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting

   (1) Measurement Type (Peak):
   - Measured Frequency Range: 30 MHz – 1 GHz
   - Detector = Peak
   - Trace = Max hold
   - RBW = 100 kHz
   - VBW ≥ 3*RBW

   (2) Measurement Type(Quasi-peak):
   - Measured Frequency Range: 30 MHz – 1 GHz
   - Detector = Quasi-Peak
   - RBW = 120 kHz

   Method (2) has been applied

6. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)

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 1m to 4m 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. Use the following Spectrum Analyzer setting :

   (1) Measurement Type(Peak):
   - Measured Frequency Range : Up to 10^{th} harmonics
   - Detector = Peak
   - Trace = Max hold
   - RBW = 1 MHz
   - VBW ≥ 3*RBW

   (2) Measurement Type(Average):
   - Duty Cycle Correction Factor (DCCF) was applied to derive the average field strength from the peak field strength according to the rule part 15.35(c)
   - Duty Cycle = T_{ON} / 100 ms (or T_{ON} / One complete pulse train), whichever comes shorter.
   - T_{ON} = No (Pulse1) x Length (Pulse1) + No (Pulse2) x Length (Pulse2) + …
   - Average Emission Level = Peak Emission Level + 20 log(Duty Cycle)

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

9. Sample Calculation

   (1) Total (Peak) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G)
   (2) Total (Average) = Total (Peak) + 20 log(Duty Cycle)

7.8. AC POWER LINE CONDUCTED EMISSIONS

LIMIT

47 CFR § 15.207, RSS-GEN Section 8.8
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

*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 SETUP

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.

According to FCC KDB 174176 D01 Line Conducted FAQ v01r01 :

Devices Operating Above 30 MHz

For a device with a permanent or detachable antenna operating above 30 MHz, measurements must be performed with the antenna connected as specified in clause 6.2 of ANSI C63.10-2013.

Devices Operating Below 30 MHz

For a device with a permanent or detachable antenna operating at or below 30 MHz, the FCC will accept measurements performed with a suitable dummy load in lieu of the antenna under the following conditions:
(1) Perform the AC power-line conducted tests with the antenna connected to determine compliance with Section 15.207 limits outside the transmitter's fundamental emission band;
(2) Retest with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band. For a detachable antenna, remove the antenna and connect a suitable dummy load to the antenna connector. For a permanent antenna, remove the antenna and terminate the RF output with a dummy load or network which simulates the antenna in the fundamental frequency band. All measurements must be performed as specified in clause 6.2 of ANSI C63.10-2013.

Note(s) :
Sample Calculation
Quasi-peak(Final Result) = Reading Value + Correction Factor

8. SUMMARY OF TEST RESULTS

Test Description	FCC Part Section(s)	ISED Part Section(s)	Test Limit	Test Condition	Test Result
20 dB Bandwidth	§15.247(a)(1)	RSS-247, 5.1 (a)	-	Conducted	PASS
Occupied Bandwidth	-	RSS-GEN, 6.7	-		PASS
Conducted Maximum Peak Output Power	§15.247(b)(1)	RSS-247, 5.4(b)	≤ 1.0 W (channels ≥ 75)		PASS
Maximum e.i.r.p.	-	RSS-247, 5.4(b)	≤ 4 W e.i.r.p. (channels ≥ 75)		PASS
Number of Hopping Channels	§15.247(a)(1)(iii)	RSS-247, 5.1(d)	channels ≥ 15		PASS
Carrier Frequency Separation	§15.247(a)(1)	RSS-247, 5.1(b)	≥ 25 kHz or 2/3 of 20dB BW [1)] Whichever is greater		PASS
Time of Occupancy	§15.247(a)(1)(iii)	RSS-247, 5.1(d)	≤ 0.4 s (within 0.4 s period)		PASS
Conducted Band Edge Conducted Spurious Emission	§15.247(d)	RSS-247, 5.5	≥ 20 dBc		PASS
AC Power line Conducted Emissions	§15.207	RSS-GEN, 8.8	cf. Section 7.8		PASS
Radiated Spurious Emissions	§15.209(a) §15.205(a)	RSS-GEN, 8.9 RSS-GEN, 8.10	cf. Section 7.7	Radiated	PASS
Receiver Spurious Emissions	-	RSS-GEN, 7.3	cf. Section 7.7		PASS

Note(s) :

1. 2/3 of the 20 dB BW, which is greater than 25 kHz, was used as the limit in this report since the peak output power did not exceed 125 mW.

WORST CASE CONFIGURATION

RADIATED TEST

1. EUT Axis

All X, Y, and Z positions for horizontal / vertical antenna polarization were investigated to find the worst-case position. X position was selected as the worst-case for full evaluation.

2. Operations with all the data rates available were investigated for each different channel BW mode. Test result at the lowest datarate was reported as the worst case.

BR : 1-DH1
EDR : 3-DH1

CONDUCTED TEST

1. All the conducted tests were performed at 1-DH1, 2-DH1 and 3-DH1.

2. The time of occupancy test was performed at the following modes.

BR : 1-DH1 / 1-DH3 / 1-DH5
EDR : 2-DH1 / 2-DH3 / 2-DH5 / 3-DH1 / 3-DH3 / 3-DH5

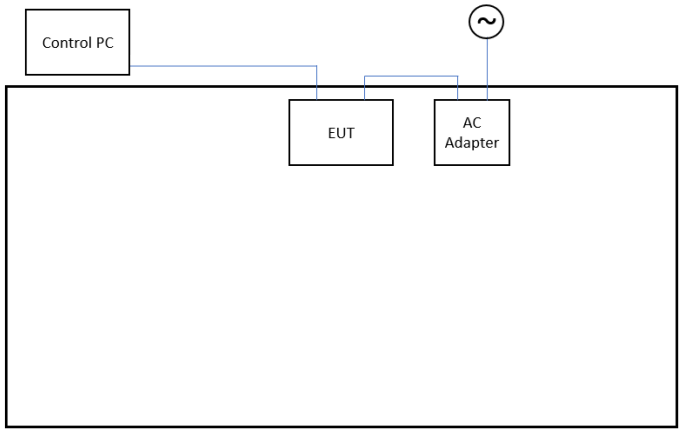
3. AC line conducted emission test was performed at the worst case transmission mode.

OUTPUT POWER SETTING

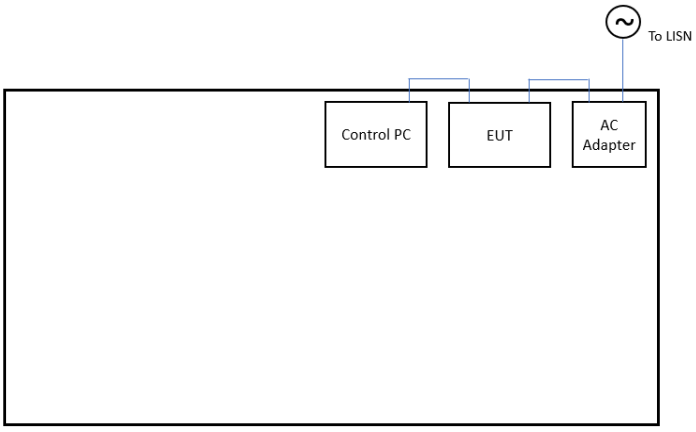
Frequency (MHz)	Channel	Output Power Setting
2 402	0	11
2 441	39	11
2 480	78	11

TEST CONFIGURATION

Radiated Emission



Conducted Emission



LIST OF SUPPORT EQUIPMENT

Equipment Type	Model No.	Serial No.	Manufacturer	Qty	Note
Power Supply	PA-1650-58	165058LT33803287PEA01	LITEON	1	Input : 100-240 V a.c., 50-60 Hz, 1.6 A Output : 20 V d.c., 3.25 A
Laptop	14-dq1038wrn	5CD04524LL	HP	1	For EUT control

9. TEST RESULT

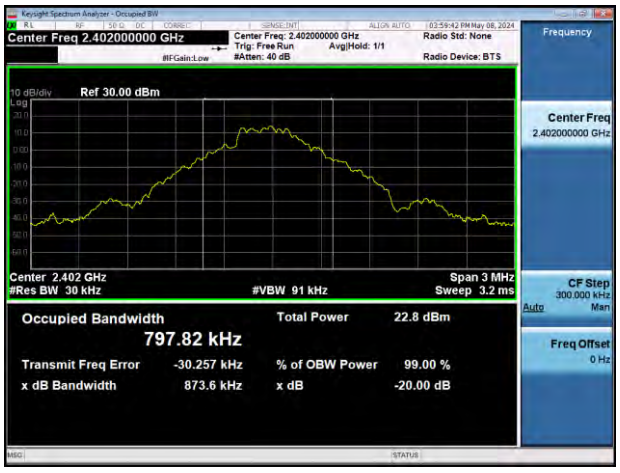
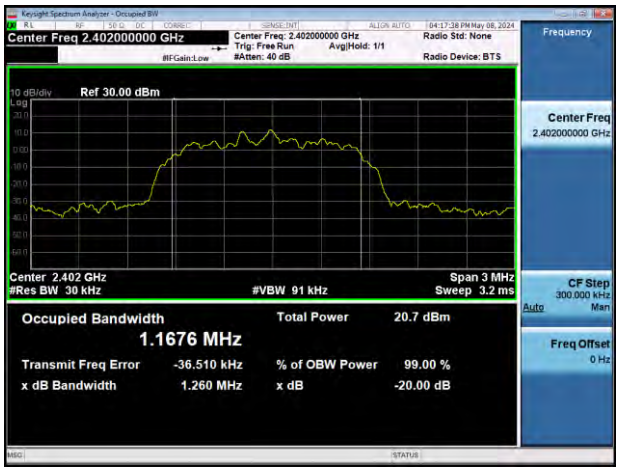
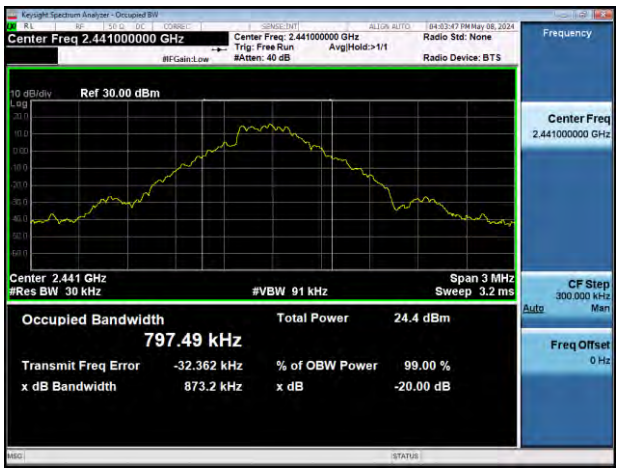
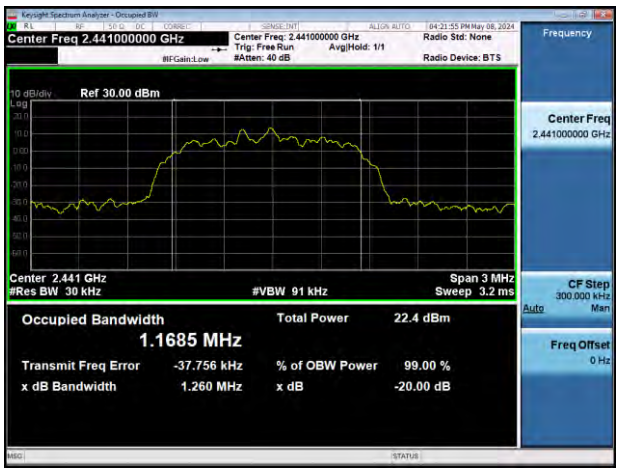
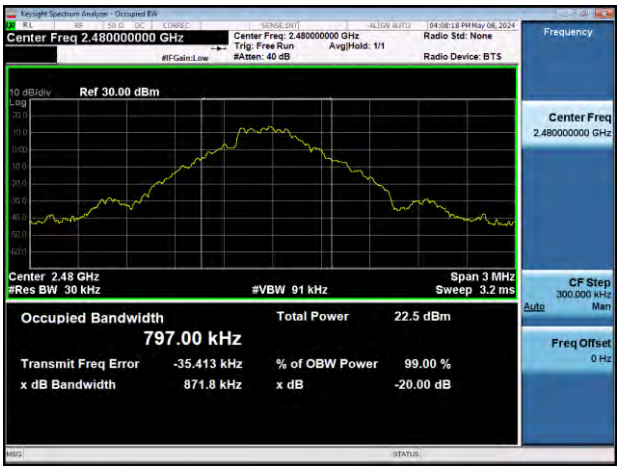
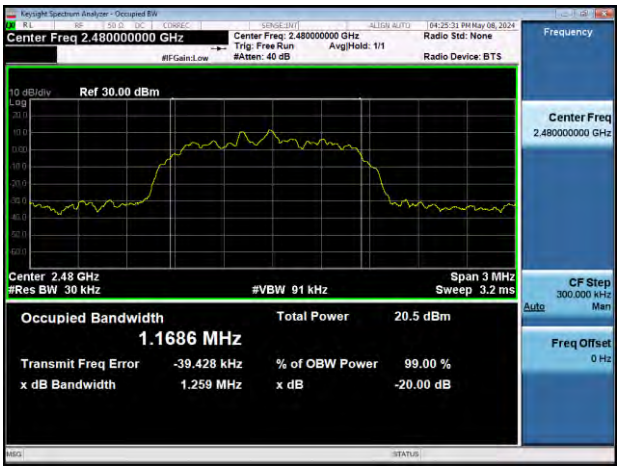
9.1. 20 dB BANDWIDTH

BR (GFSK)		99% Bandwidth (kHz)	20 dB Bandwidth (kHz)	
Frequency (MHz)	Channel	Result	Result	Limit
2 402	0	797.8	873.6	-
2 441	39	797.5	873.2	
2 480	78	797.0	871.8	

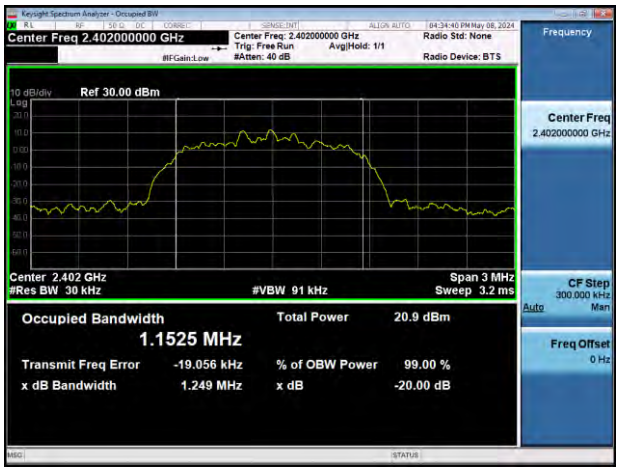
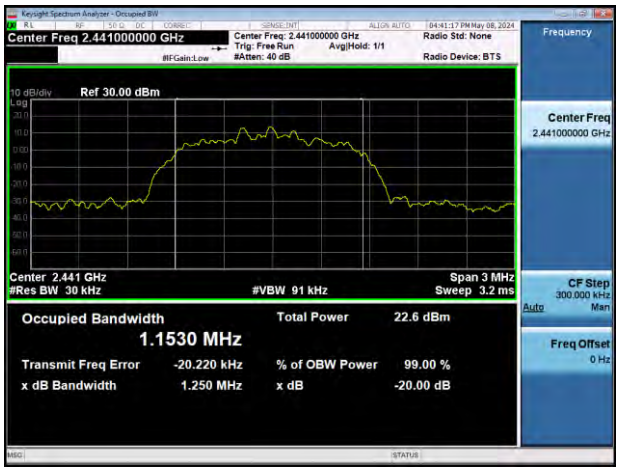
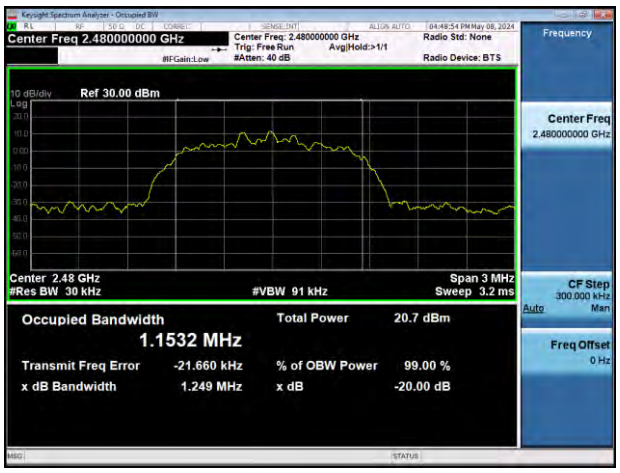
EDR (π/4-DQPSK)		99% Bandwidth (kHz)	20 dB Bandwidth (kHz)	
Frequency (MHz)	Channel	Result	Result	Limit
2 402	0	1167.6	1260.2	-
2 441	39	1168.5	1260.0	
2 480	78	1168.6	1259.0	

EDR (8DPSK)		99% Bandwidth (kHz)	20 dB Bandwidth (kHz)	
Frequency (MHz)	Channel	Result	Result	Limit
2 402	0	1152.5	1249.1	-
2 441	39	1153.0	1249.8	
2 480	78	1153.2	1249.4	

▣ TEST PLOTS

BR (GFSK) : 20 dB BW / OBW (CH0)	EDR (π/4-DQPSK) : 20 dB BW / OBW (CH0)
	
BR (GFSK) : 20 dB BW / OBW (CH39)	**EDR (π/4-DQPSK) : 20 dB BW / OBW (CH39)**
	
BR (GFSK) : 20 dB BW / OBW (CH78)	**EDR (π/4-DQPSK) : 20 dB BW / OBW (CH78)**
	

▣ TEST PLOTS

EDR (8DPSK) : 20dB BW / OBW (CH0)	EDR (8DPSK) : 20dB BW / OBW (CH39)
	
EDR (8DPSK) : 20dB BW / OBW (CH78)	
	

9.2. OUTPUT POWER

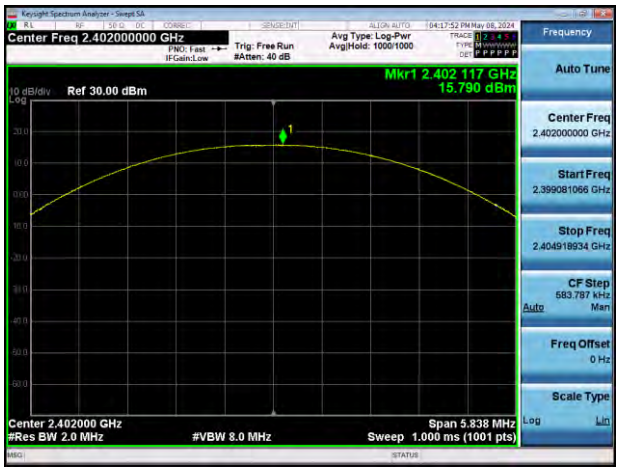
Peak Power

BR (GFSK)		Test Result		
Frequency (MHz)	Channel No.	Measured Power (dBm)	Limit (dBm)	Result
2 402	0	16.315	30	Compliant
2 441	39	17.977	30	Compliant
2 480	78	16.008	30	Compliant

EDR (π/4-DQPSK)		Test Result		
Frequency (MHz)	Channel No.	Measured Power (dBm)	Limit (dBm)	Result
2 402	0	15.790	30	Compliant
2 441	39	17.455	30	Compliant
2 480	78	15.240	30	Compliant

EDR (8DPSK)		Test Result		
Frequency (MHz)	Channel No.	Measured Power (dBm)	Limit (dBm)	Result
2 402	0	16.203	30	Compliant
2 441	39	17.828	30	Compliant
2 480	78	15.868	30	Compliant

▣ TEST PLOTS

BR (GFSK) : Output Power (CH0)	EDR (π/4-DQPSK) : Output Power (CH0)
	
BR (GFSK) : Output Power (CH39)	**EDR (π/4-DQPSK) : Output Power (CH39)**
	
BR (GFSK) : Output Power (CH78)	**EDR (π/4-DQPSK) : Output Power (CH78)**
	

▣ TEST PLOTS

EDR (8DPSK) : Output Power (CH0)	EDR (8DPSK) : Output Power (CH39)
	
EDR (8DPSK) : Output Power (CH78)	
	

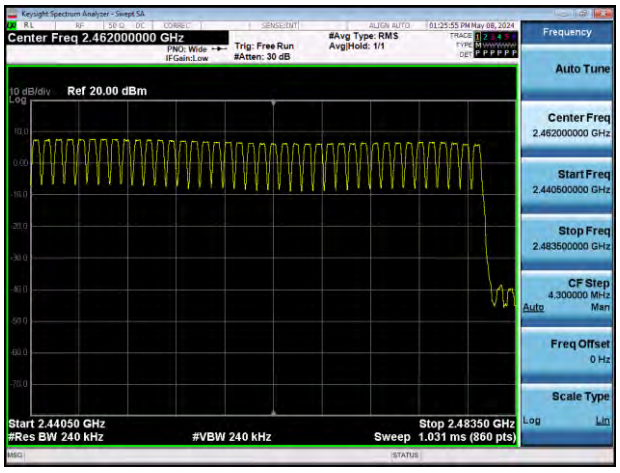
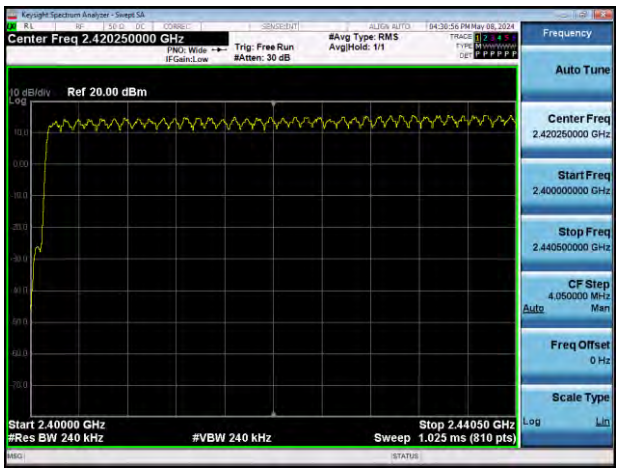
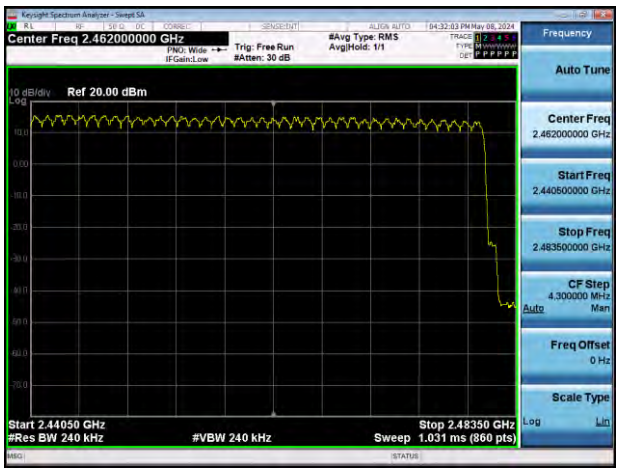
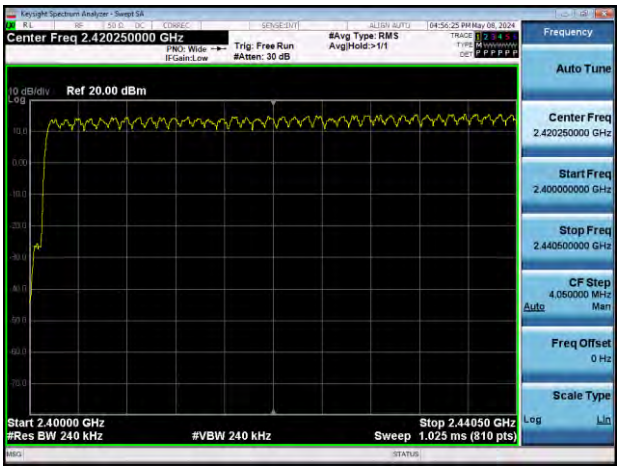
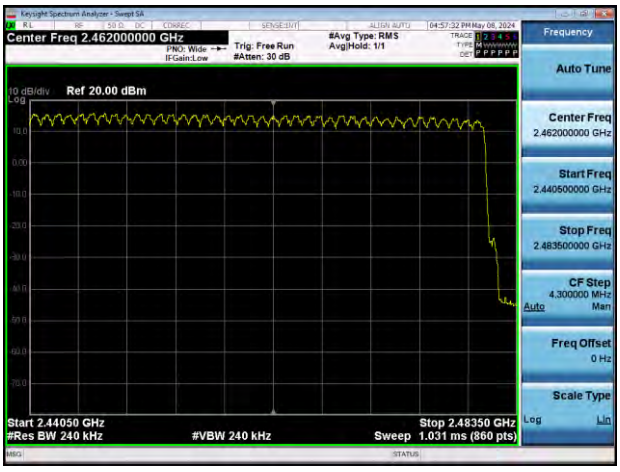
9.3. NUMBER OF HOPPING CHANNELS

BR (GFSK)	Test Result		
Frequency Range (MHz)	No. of Channels	Limit	Result
2 402 – 2 480	79	≥ 15	Compliant

EDR (π/4-DQPSK)	Test Result		
Frequency Range (MHz)	No. of Channels	Limit	Result
2 402 – 2 480	79	≥ 15	Compliant

EDR (8DPSK)	Test Result		
Frequency Range (MHz)	No. of Channels	Limit	Result
2 402 – 2 480	79	≥ 15	Compliant

▣ TEST PLOTS

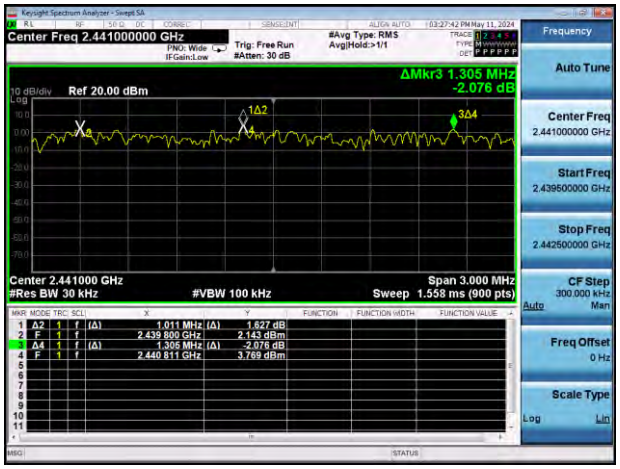
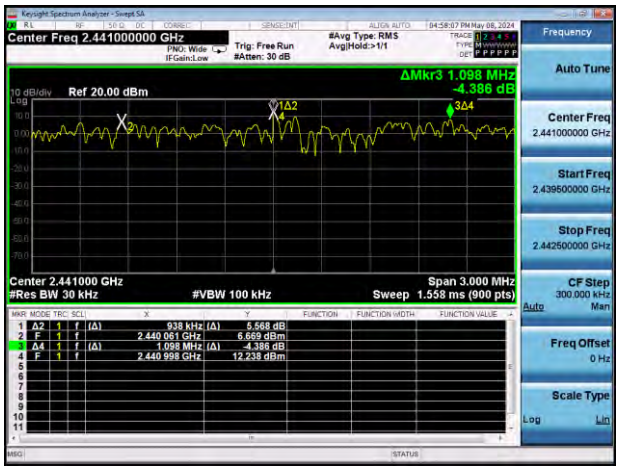
BR (GFSK) : Number of Hopping Channels	
	
EDR (π/4-DQPSK) : Number of Hopping Channels	
	
EDR (8DPSK) : Number of Hopping Channels	
	

9.4. CARRIER FREQUENCY SEPARATION

Mode	Test Result		
	Separation (kHz)	Limit (kHz) [1)]	Result
BR (GFSK)	967.742	≥ 582.370	Compliant
EDR (π/4-DQPSK)	1011.123	≥ 840.110	Compliant
EDR (8DPSK)	937.709	≥ 833.214	Compliant

Note(s) :
1. 2/3 of the highest 20 dB in each channel was used as the limit since it is greater than 25 kHz and the peak output power did not exceed 0.125 W.

▣ TEST PLOTS

BR (GFSK)	EDR (π/4-DQPSK)
	
EDR (8DPSK)	
	

9.5. TIME OF OCCUPANCY

Mode	Data Rate	Frequency (MHz)	Pulse Time (ms)	No of Hops	Dwell Time (ms)	Limit (ms)	Result
BR (GFSK)	1-DH1	2 441	0.380	320	121.6	≤ 400	Compliant
	1-DH3	2 441	1.640	160	262.4		Compliant
	1-DH5	2 441	2.890	106.6	308.1		Compliant
EDR (π/4-DQPSK)	2-DH1	2 441	0.390	320	124.8	≤ 400	Compliant
	2-DH3	2 441	1.640	160	262.4		Compliant
	2-DH5	2 441	2.880	106.6	307.0		Compliant
EDR (8DPSK)	3-DH1	2 441	0.390	320	124.8	≤ 400	Compliant
	3-DH3	2 441	1.640	160	262.4		Compliant
	3-DH5	2 441	2.890	106.6	308.1		Compliant

Note(s) :

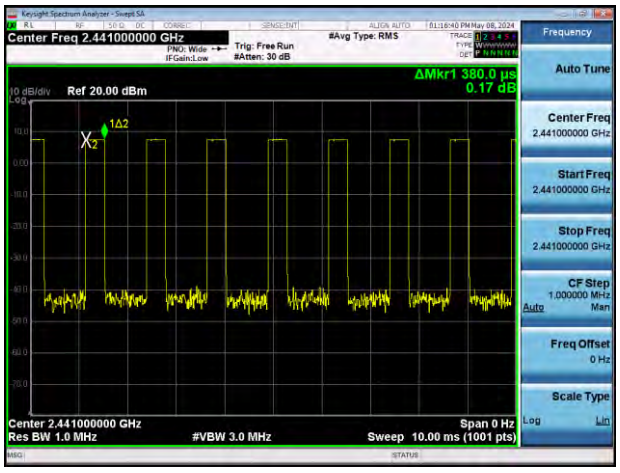
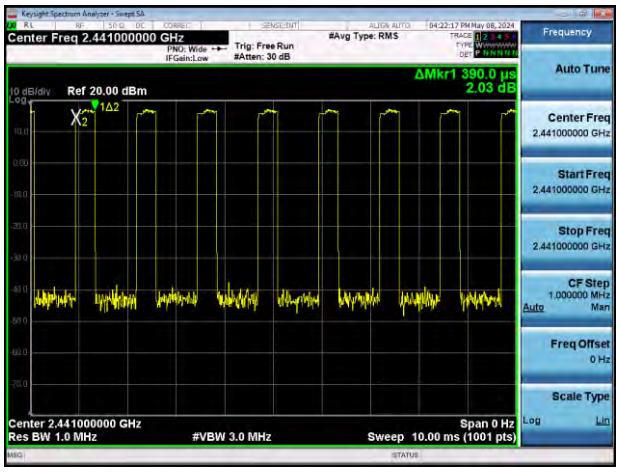
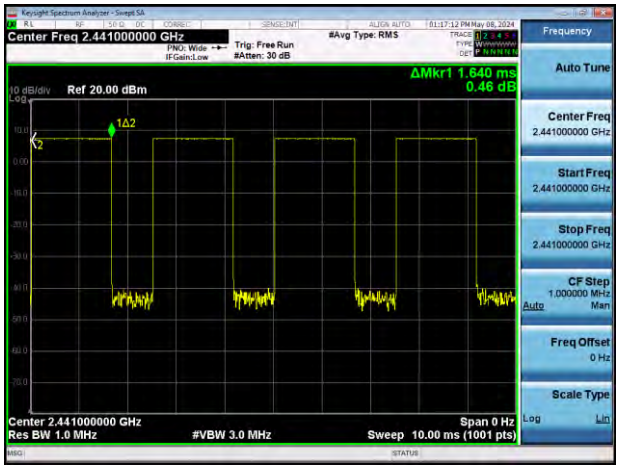
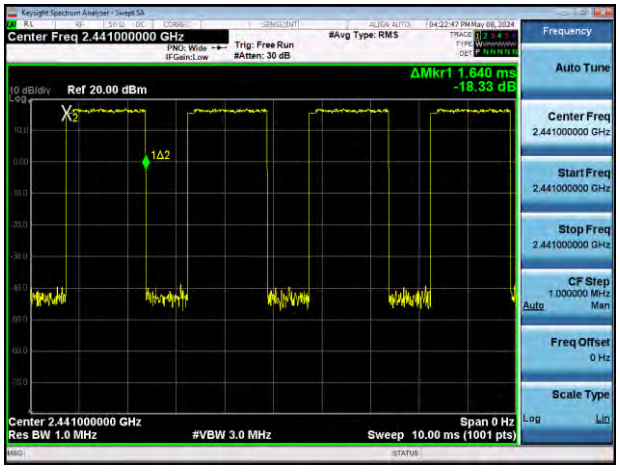
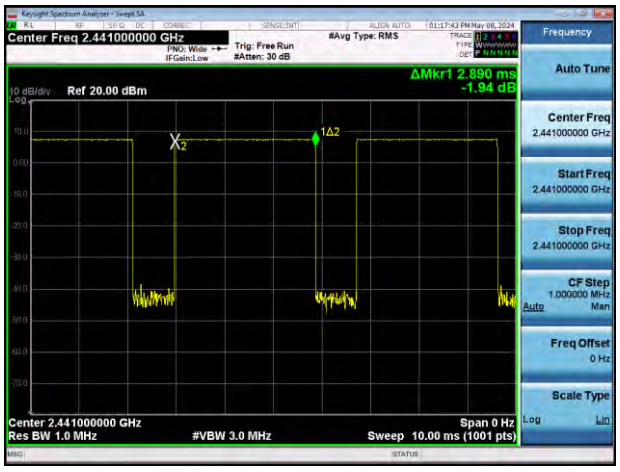
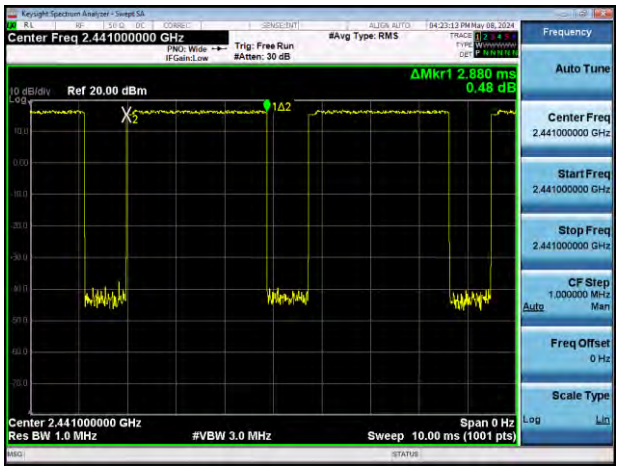
Max permitted DH1 packet : 1600 / 79 / 2 = 10.12 hops/sec in each channel.
Number of hops within 31.6 seconds = 10.12 hops/sec x 31.6 sec = 320 hops

Max permitted DH3 packet : 1600 / 79 / 4 = 5.06 hops/sec in each channel.
Number of hops within 31.6 seconds = 5.06 hops/sec x 31.6 sec = 160 hops

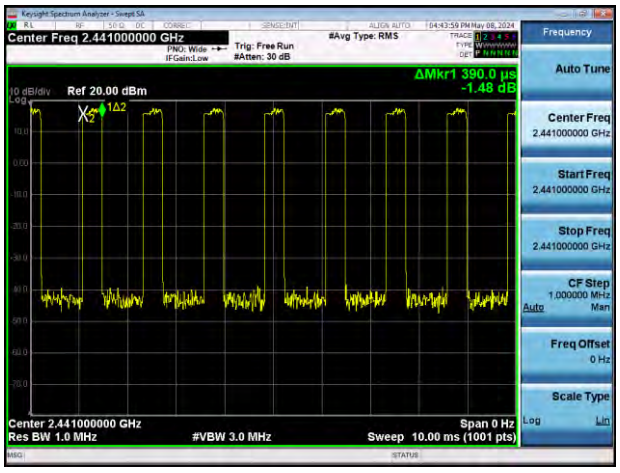
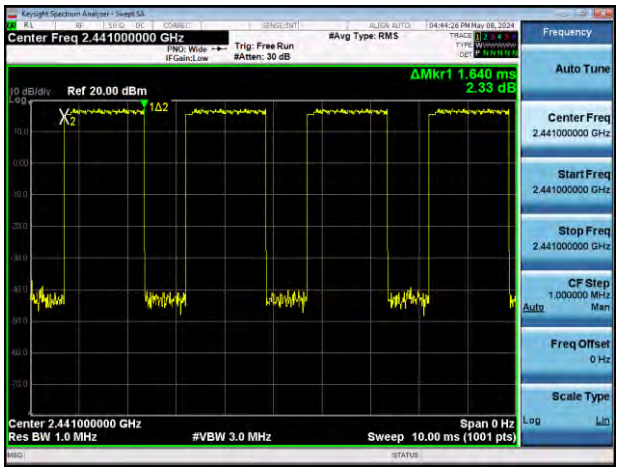
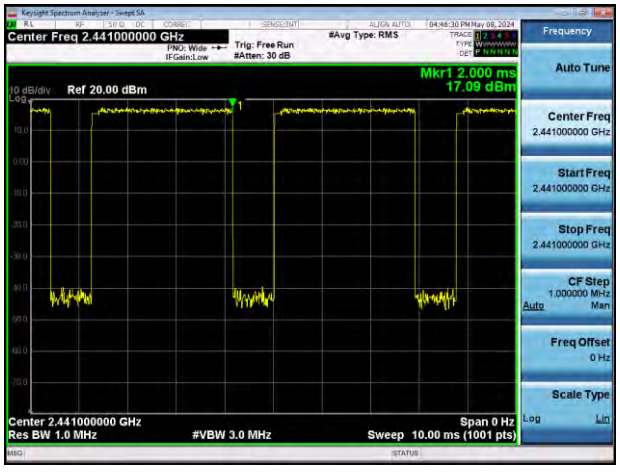
Max permitted DH5 packet : 1600 / 79 / 6 = 3.37 hops/sec in each channel.
Number of hops within 31.6 seconds = 3.37 hops/sec x 31.6 sec = 106.6 hops

Time of Occupancy (Dwell Time) = Pulse Time x Number of Hops within 31.6 seconds.

▣ TEST PLOTS

BR (GFSK) : 1-DH1	EDR (π/4-DQPSK) : 2-DH1
	
BR (GFSK) : 1-DH3	**EDR (π/4-DQPSK) : 2-DH3**
	
BR (GFSK) : 1-DH5	**EDR (π/4-DQPSK) : 2-DH5**
	

▣ TEST PLOTS

EDR (8DPSK) : 3-DH1	EDR (8DPSK) : 3-DH3
	
EDR (8DPSK) : 3-DH5	
	

9.6. CONDUCTED BAND EDGE & SPURIOUS EMISSIONS

Out of Band Emissions at the Band Edge : Non-Hopping Mode

Mode	Frequency [MHz]	Channel	Position	Measured Level [dBc]	Limit [dBc]	Result
BR (GFSK)	2 402	0	Low	60.287	20	Compliant
	2 480	78	High	63.150	20	Compliant
EDR (π/4-DQPSK)	2 402	0	Low	57.288	20	Compliant
	2 480	78	High	60.822	20	Compliant
EDR (8DPSK)	2 402	0	Low	58.037	20	Compliant
	2 480	78	High	60.817	20	Compliant

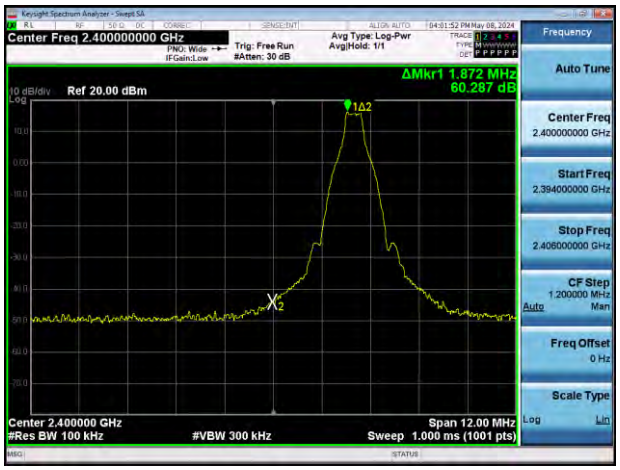
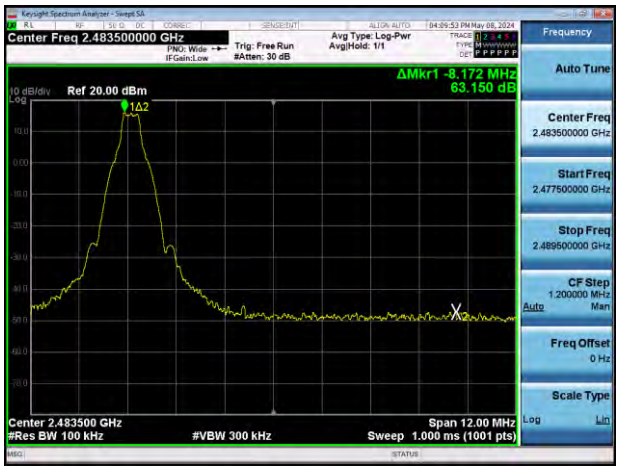
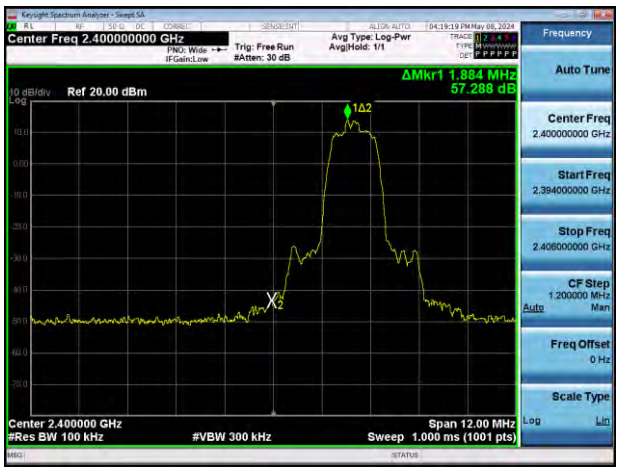
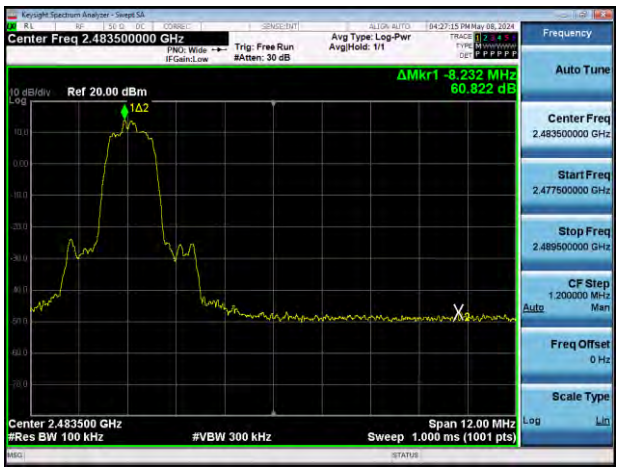
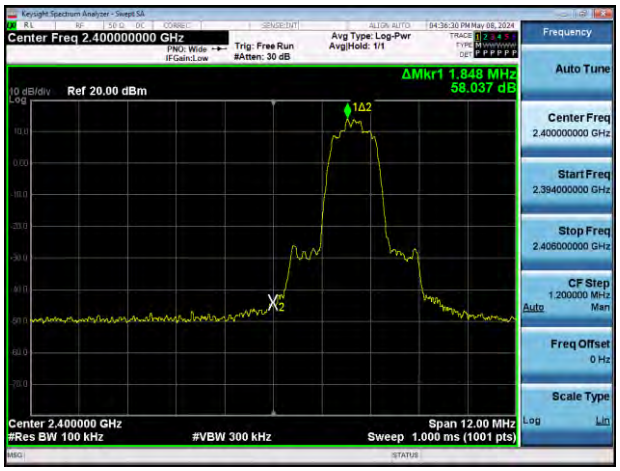
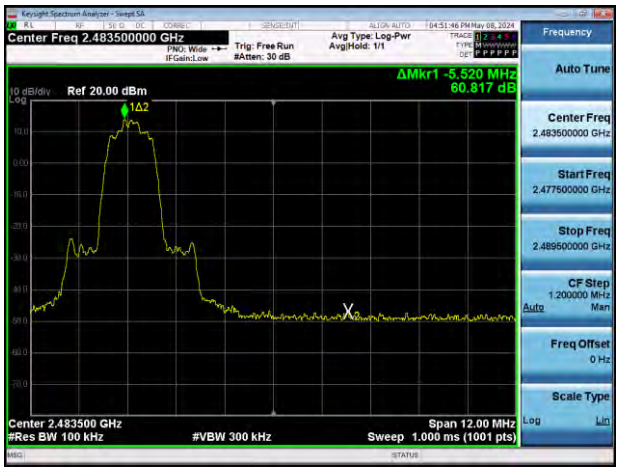
Out of Band Emissions at the Band Edge : Hopping Mode

Mode	Frequency [MHz]	Channel	Position	Measured Level [dBc]	Limit [dBc]	Result
BR (GFSK)	2 402	0	Low	46.596	20	Compliant
	2 480	78	High	47.613	20	Compliant
EDR (π/4-DQPSK)	2 402	0	Low	58.948	20	Compliant
	2 480	78	High	60.401	20	Compliant
EDR (8DPSK)	2 402	0	Low	60.914	20	Compliant
	2 480	78	High	61.389	20	Compliant

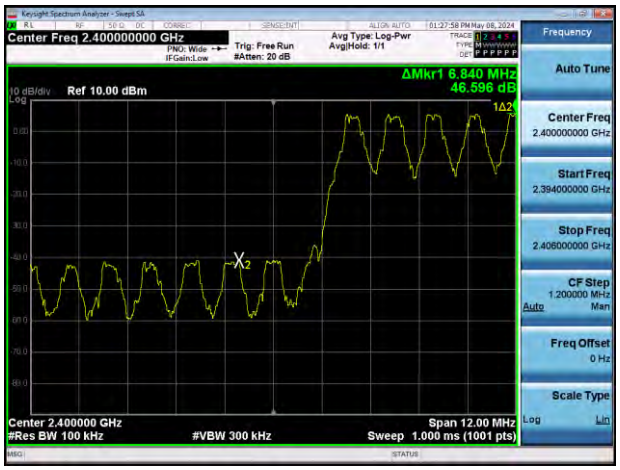
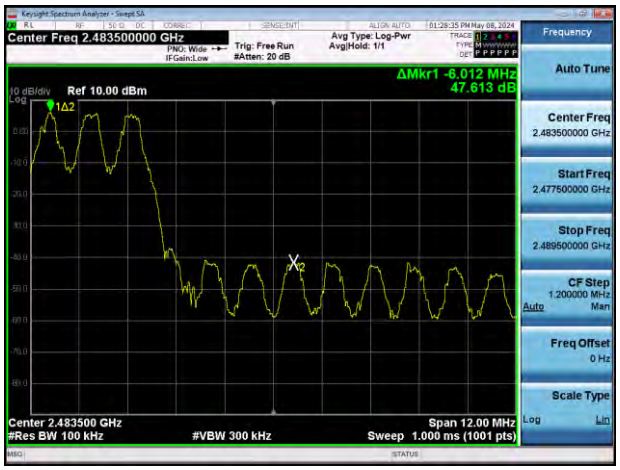
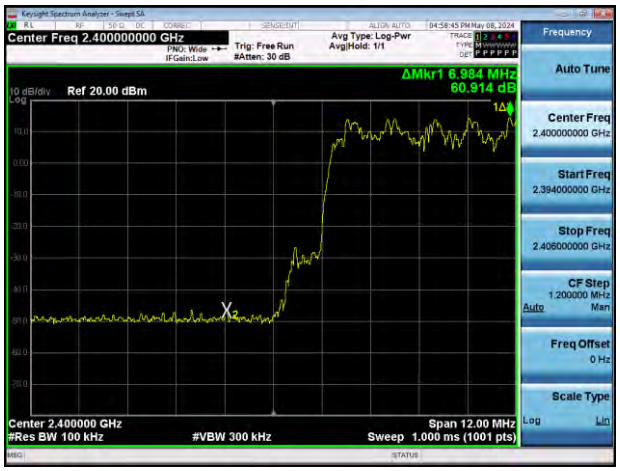
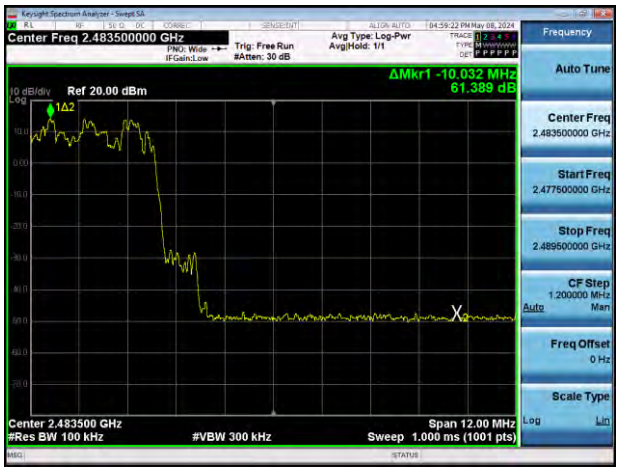
Conducted Spurious Emissions

Mode	Frequency [MHz]	Channel	Position	Measured Level [dBc]	Limit [dBc]	Result
BR (GFSK)	2 402	0	Low	61.466	20	Compliant
	2 441	39	Middle	63.229	20	Compliant
	2 480	78	High	60.936	20	Compliant
EDR (π/4-DQPSK)	2 402	0	Low	59.258	20	Compliant
	2 441	39	Middle	60.506	20	Compliant
	2 480	78	High	59.354	20	Compliant
EDR (8DPSK)	2 402	0	Low	59.167	20	Compliant
	2 441	39	Middle	61.018	20	Compliant
	2 480	78	High	58.377	20	Compliant

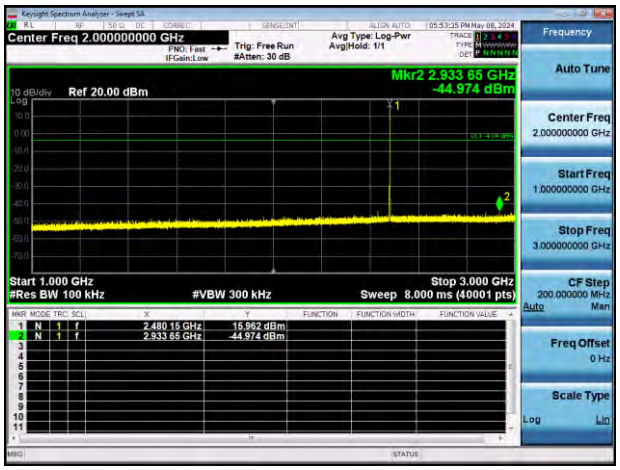
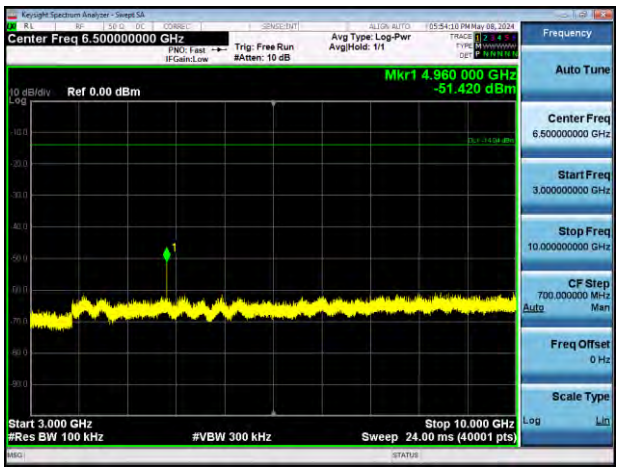
▣ TEST PLOTS

Non-Hopping Mode	
BR (GFSK) : Band Edge (CH0)	**BR (GFSK) : Band Edge (CH78)**
	
EDR (π/4-DQPSK) : Band Edge (CH0)	**EDR (π/4-DQPSK) : Band Edge (CH78)**
	
EDR (8DPSK) : Band Edge (CH0)	**EDR (8DPSK) : Band Edge (CH78)**
	

▣ TEST PLOTS

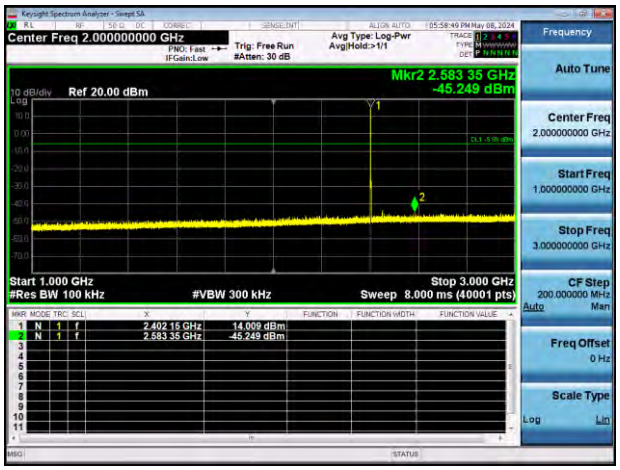
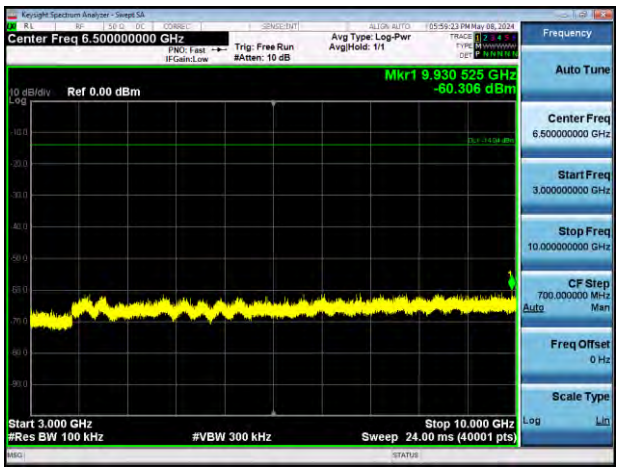
Hopping Mode	
BR (GFSK) : Band Edge (CH0)	**BR (GFSK) : Band Edge (CH78)**
	
EDR (π/4-DQPSK) : Band Edge (CH0)	**EDR (π/4-DQPSK) : Band Edge (CH78)**
	
EDR (8DPSK) : Band Edge (CH0)	**EDR (8DPSK) : Band Edge (CH78)**
	

▣ TEST PLOTS

BR (GFSK) : Conducted Spurious Emission (CH39)	
30 MHz – 1 GHz	**1 GHz – 3 GHz**
	
3 MHz – 10 GHz	**10 GHz – 25 GHz**
	

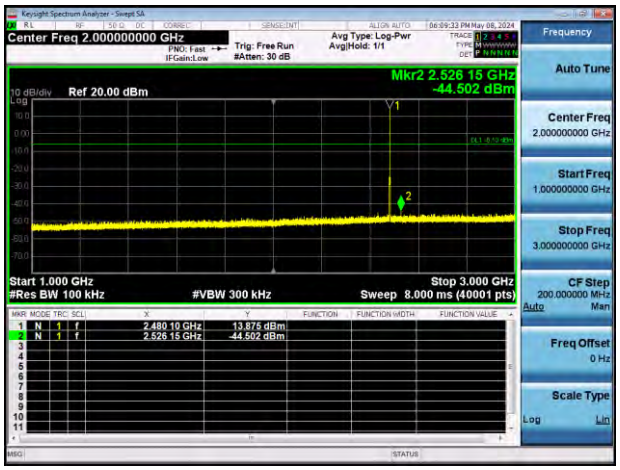
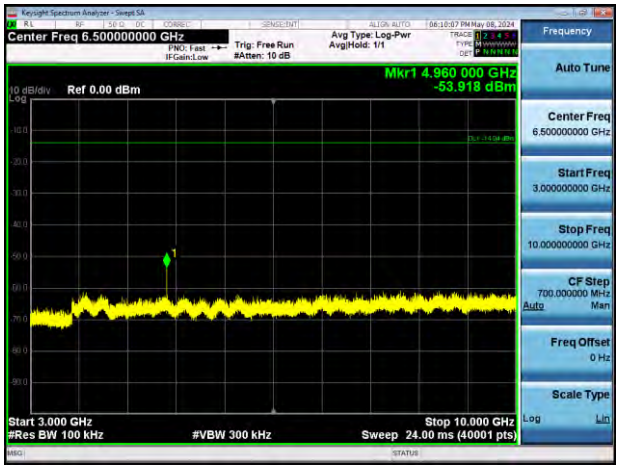
Note(s) :
The worst-case plots are included in this report.

▣ TEST PLOTS

EDR (π/4-DQPSK) : Conducted Spurious Emission (CH0)	
30 MHz – 1 GHz	**1 GHz – 3 GHz**
	
3 MHz – 10 GHz	**10 GHz – 25 GHz**
	

Note(s) :
The worst-case plots are included in this report.

▣ TEST PLOTS

EDR (8DPSK) : Conducted Spurious Emission (CH39)	
30 MHz – 1 GHz	**1 GHz – 3 GHz**
	
3 MHz – 10 GHz	**10 GHz – 25 GHz**
	

Note(s) :
The worst-case plots are included in this report.

9.7. RADIATED SPURIOUS EMISSIONS

Frequency Range : Below 1 GHz

Test Mode EDR (8DPSK) : TX mode

Operating Frequency CH 0 : 2402 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. [1] (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Test Mode EDR (8DPSK) : TX mode

Operating Frequency CH 39 : 2441 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. [1] (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Test Mode EDR (8DPSK) : TX mode

Operating Frequency CH 78 : 2480 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. [1] (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Note(s) :

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain.

Frequency Range : Above 1 GHz

Test Mode BR (GFSK) : TX mode
Operating Frequency CH 0 : 2402 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. 1) (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Test Mode BR (GFSK) : TX mode
Operating Frequency CH 39 : 2441 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. 1) (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Test Mode BR (GFSK) : TX mode
Operating Frequency CH 78 : 2480 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. 1) (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Test Mode EDR (8DPSK) : TX mode
Operating Frequency CH 0 : 2402 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. 1) (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Test Mode EDR (8DPSK) : TX mode
Operating Frequency CH 39 : 2441 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. 1) (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

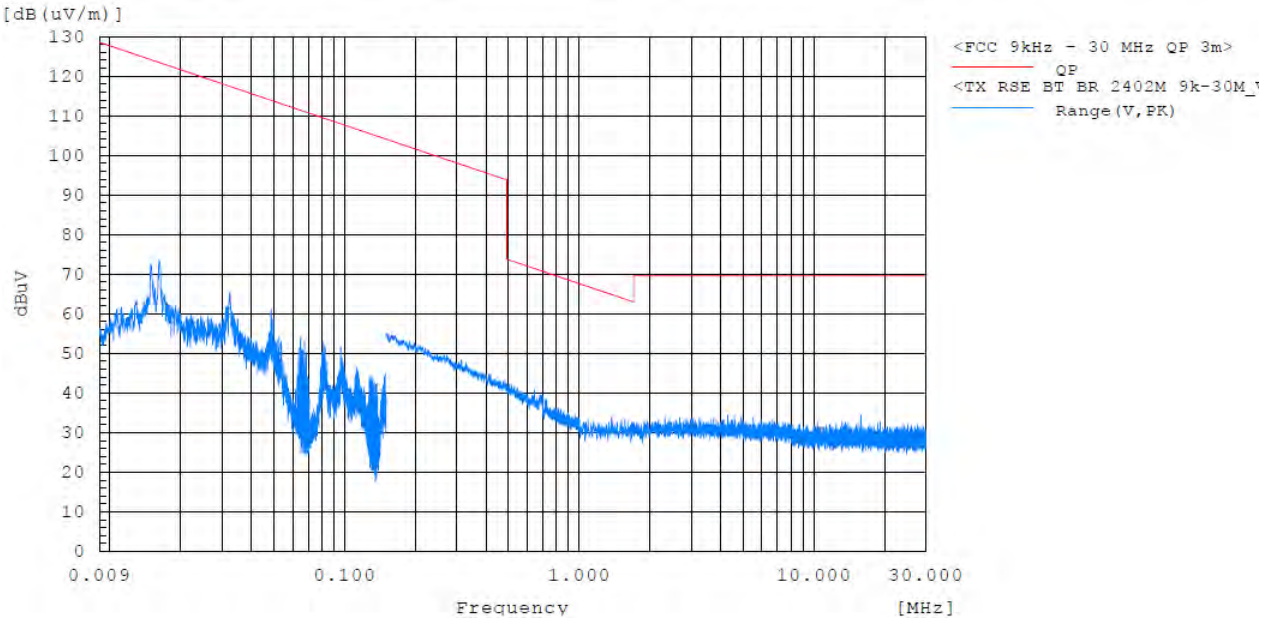
Test Mode EDR (8DPSK) : TX mode
Operating Frequency CH 78 : 2480 MHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. 1) (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

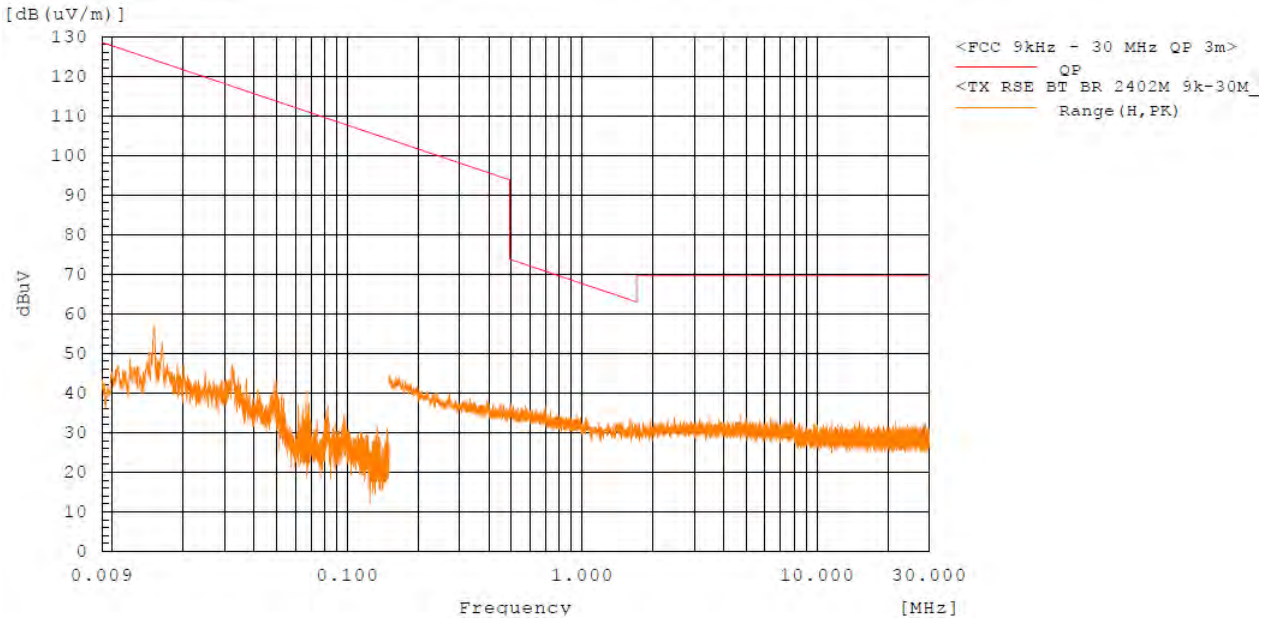
Note(s) :
1. Correction Factor = Antenna Factor + Cable loss + Preamplifier Gain
2. AV Level related to the fundamental signal

▣ TEST PLOTS

Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position 90°) : BR (CH 0)



Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position 180°) : BR (CH 0)

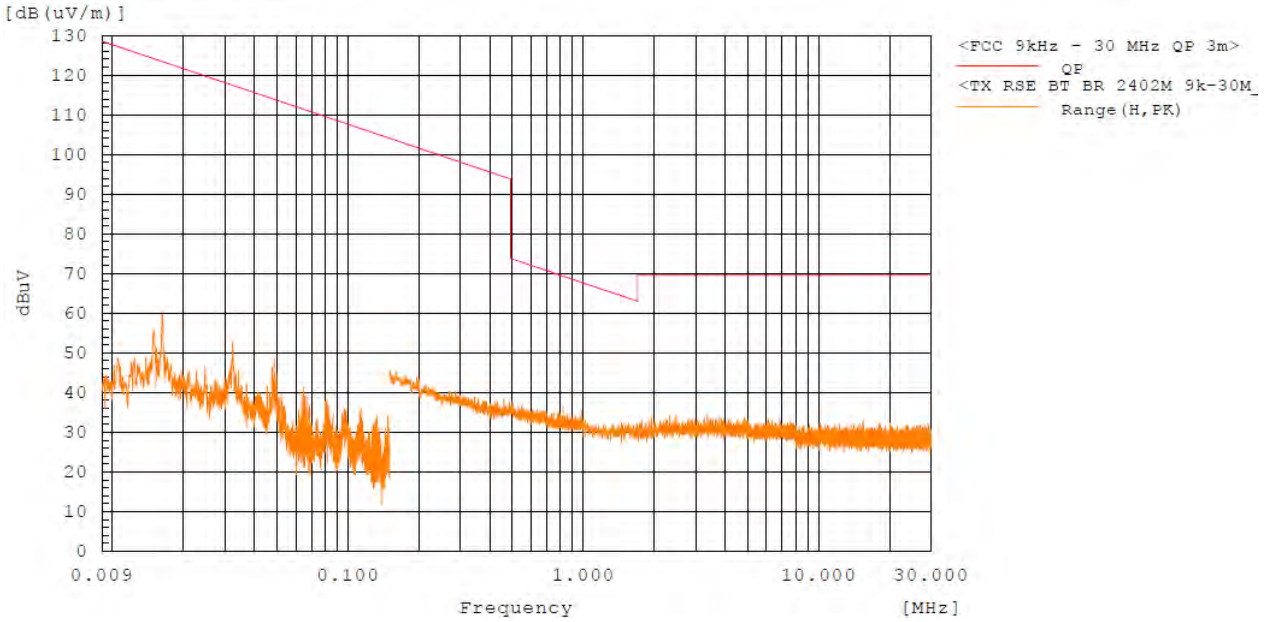


Note:

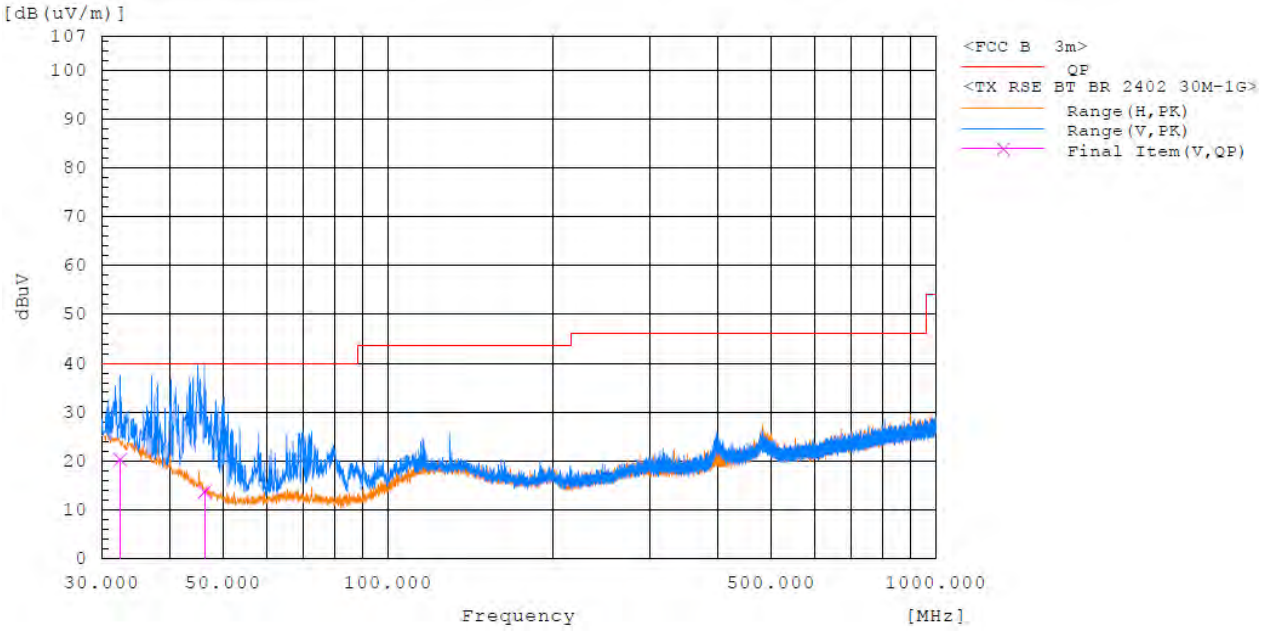
1. There were no major peaks and representative plots are included in this report
2. The plots include all used factor values for cables, antenna, preamplifier, etc.

▣ TEST PLOTS

Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position Bent over) : BR (CH 0)



Radiated Spurious Emission 30 MHz – 1 GHz : BR (CH 0)

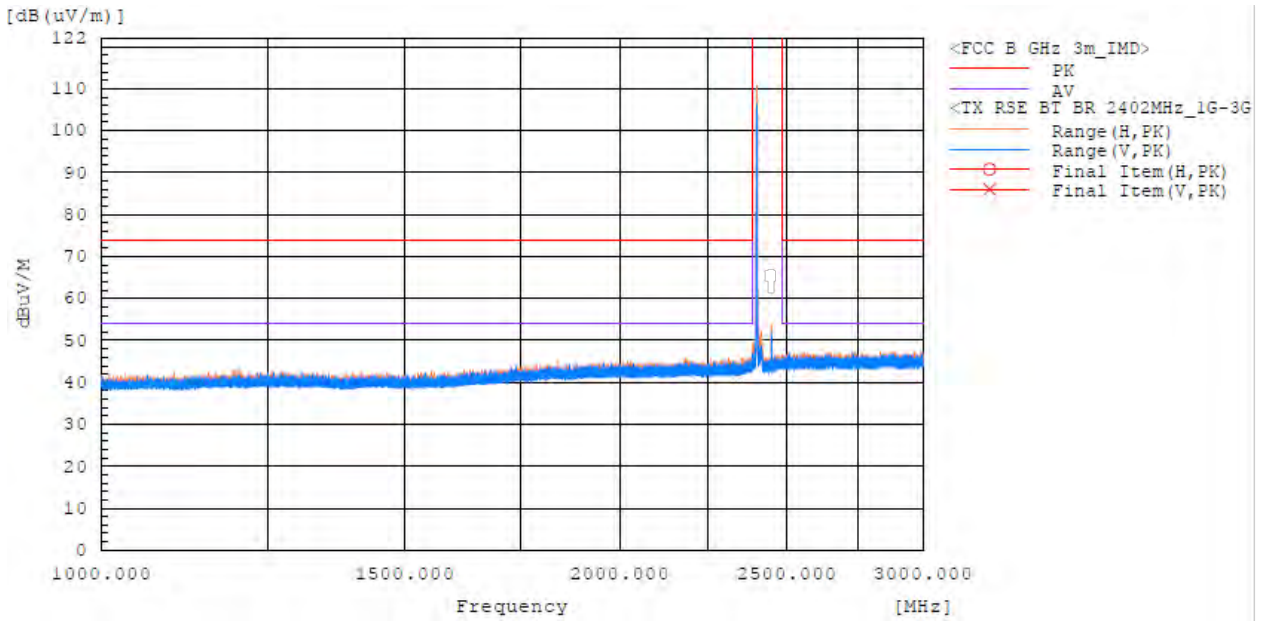


Note:

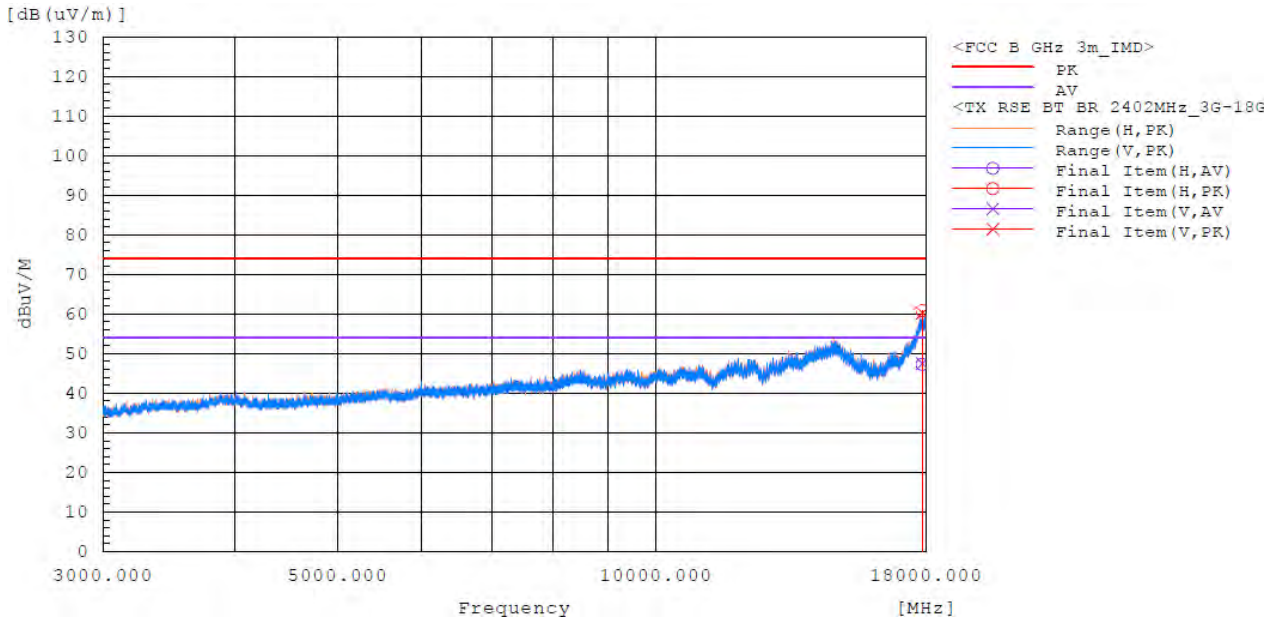
1. There were no major peaks and representative plots are included in this report
2. The plots include all used factor values for cables, antenna, preamplifier, etc.

▣ TEST PLOTS

Radiated Spurious Emission 1 GHz – 3 GHz : BR (CH 0)



Radiated Spurious Emission 3 GHz – 18 GHz : BR (CH 0)

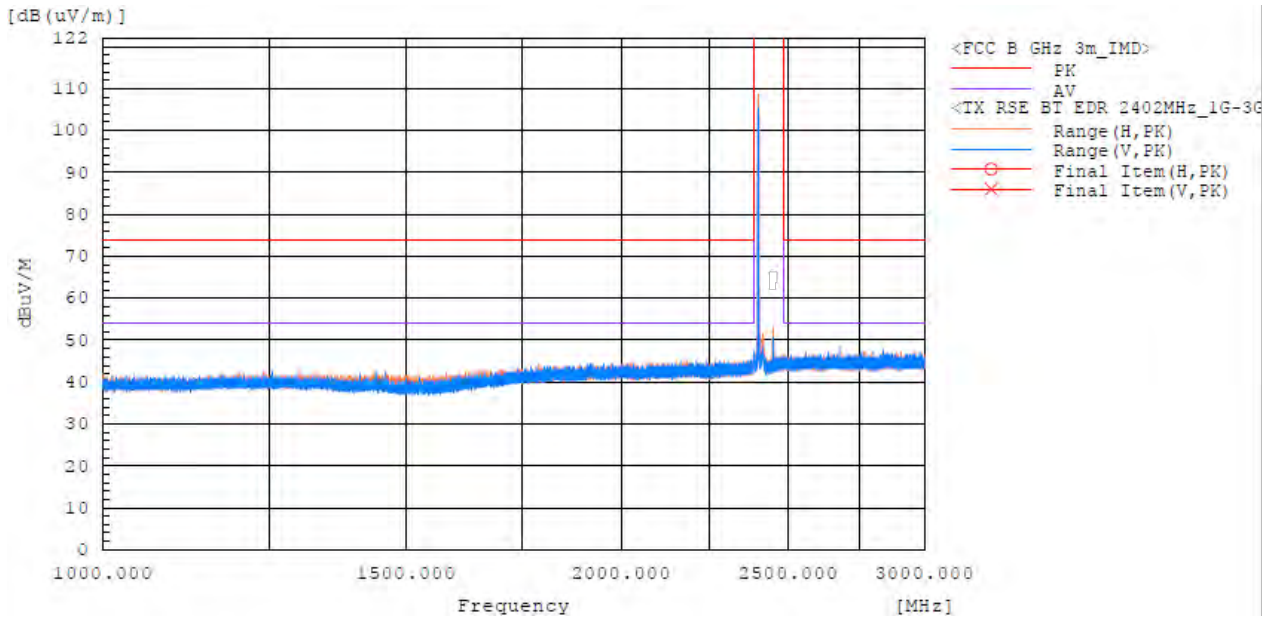


Note:

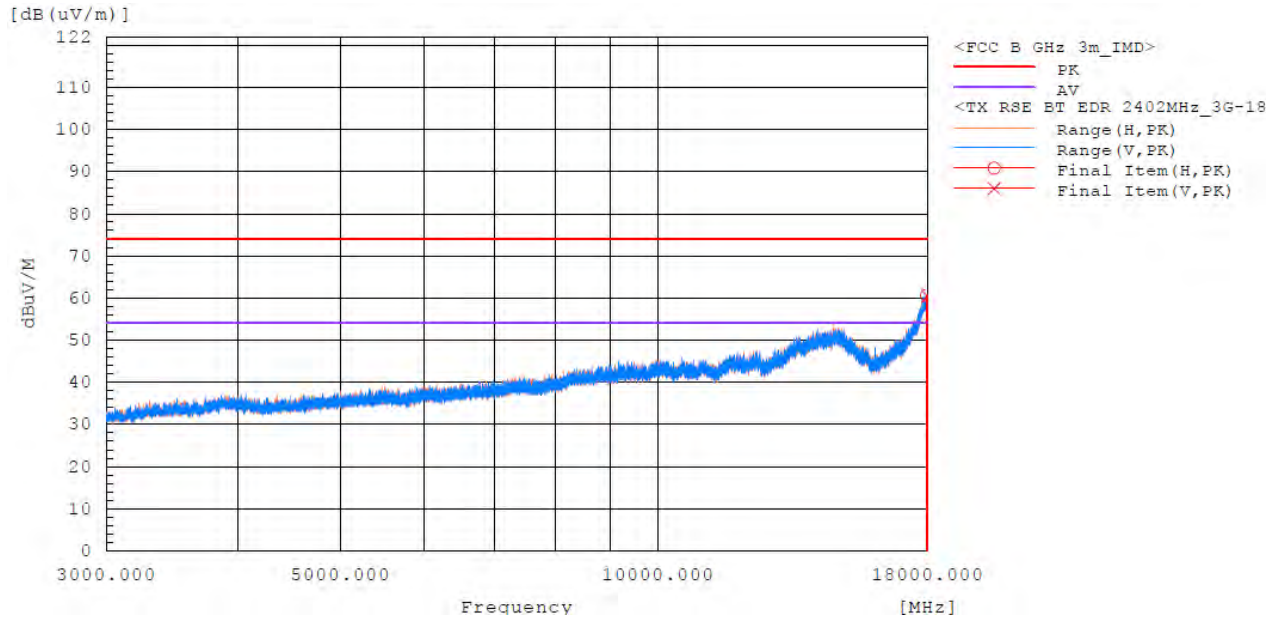
1. There were no major peaks and representative plots are included in this report
2. The plots include all used factor values for cables, antenna, preamplifier, etc.

▣ TEST PLOTS

Radiated Spurious Emission 1 GHz – 3 GHz : EDR (CH 0)



Radiated Spurious Emission 3 GHz – 18 GHz : EDR (CH 0)

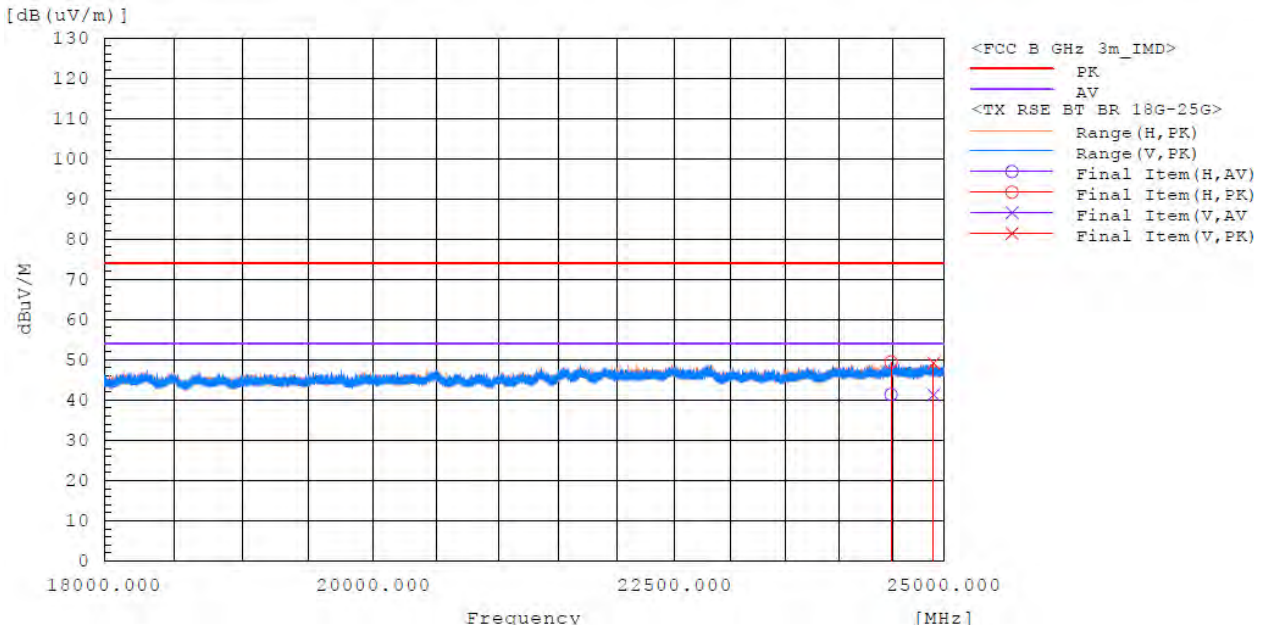


Note:

1. There were no major peaks and representative plots are included in this report
2. The plots include all used factor values for cables, antenna, preamplifier, etc.

TEST PLOTS

Radiated Spurious Emission 18 GHz – 25 GHz : BR (CH 0)



Note:

1. There were no major peaks and representative plots are included in this report
2. The plots include all used factor values for cables, antenna, preamplifier, etc.

9.8. RADIATED RESTRICTED BAND EDGES

Test Mode	BR (GFSK) : TX mode
Operating Frequency	2402 MHz
Channel No.	CH 0

Frequency (MHz)	Polarization	Reading (dBuV)	Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	Corr.[1)]	Duty	AV	PK	AV	PK	AV	PK
2387.463	H	50.2	-5.5	-24.8	19.9	44.7	54	74	34.1	29.3
2389.972	V	49.9	-5.5	-24.8	19.6	44.4	54	74	34.4	29.6

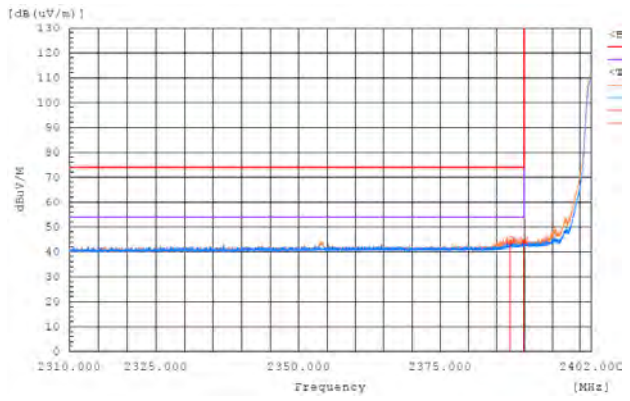
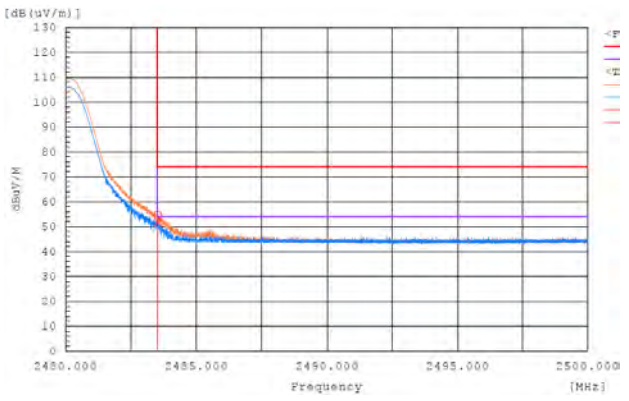
Test Mode	BR (GFSK) : TX mode
Operating Frequency	2480 MHz
Channel No.	CH 78

Frequency (MHz)	Polarization	Reading (dBuV)	Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	Corr.[1)]	Duty	AV	PK	AV	PK	AV	PK
2483.516	H	55.1	-0.3	-24.8	30.0	54.8	54	74	24.0	19.2
2483.527	V	52.1	-0.3	-24.8	27.0	51.8	54	74	27.0	22.2

Note(s) :

1. Correction Factor: Antenna Factor + Cable loss
2. AV Level = Measured Power(dBm) + Correction Factor(dB) + Duty Cycle Correction Factor(dB).
   The worst-case duty cycle correction factor for 1-DH5 = 20 log (2 x 2.89 ms / 100 ms) = -24.8 dB.

▣ TEST PLOTS

Radiated Band Edges (CH 0)	Radiated Band Edges (CH 78)
	

Test Mode	EDR (8DPSK) : TX mode
Operating Frequency	2402 MHz
Channel No.	CH 0

Frequency (MHz)	Polarization	Reading (dBuV)	Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	Corr.[1)]	Duty	AV	PK	AV	PK	AV	PK
2389.907	V	46.2	-1.0	-24.8	20.4	45.2	54	74	33.6	28.8
2389.988	H	46.4	-1.0	-24.8	20.6	45.4	54	74	33.4	28.6

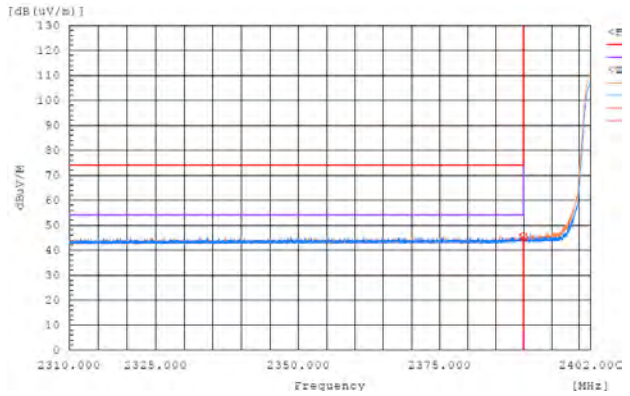
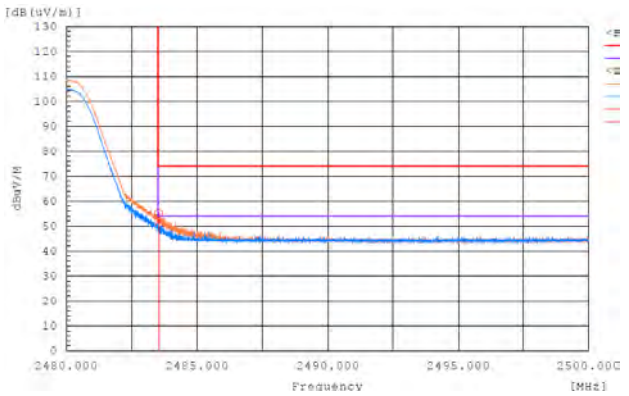
Test Mode	EDR (8DPSK) : TX mode
Operating Frequency	2480 MHz
Channel No.	CH 78

Frequency (MHz)	Polarization	Reading (dBuV)	Factor (dB)		Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
		PK	Corr.[1)]	Duty	AV	PK	AV	PK	AV	PK
2483.528	H	55.4	-0.3	-24.8	30.3	55.1	54	74	23.7	18.9
2483.542	V	52.3	-0.3	-24.8	27.2	52.0	54	74	26.8	22.0

Note(s) :

1. Correction Factor: Antenna Factor + Cable loss
2. AV Level = Measured Power(dBm) + Correction Factor(dB) + Duty Cycle Correction Factor(dB).
   The worst-case duty cycle correction factor for 1-DH5 = 20 log (2 x 2.89 ms / 100 ms) = -24.8 dB.

▣ TEST PLOTS

Radiated Band Edges (CH 0)	Radiated Band Edges (CH 78)
	

9.9. RECEIVER SPURIOUS EMISSION

Test Mode	BR (GFSK) : TX mode
Operating Frequency	2402 MHz
Channel No.	CH 0

Frequency Range : Below 1 GHz

Frequency (MHz)	Polarization	Reading (dBuV)	Corr. [1)] (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Frequency Range : Above 1 GHz

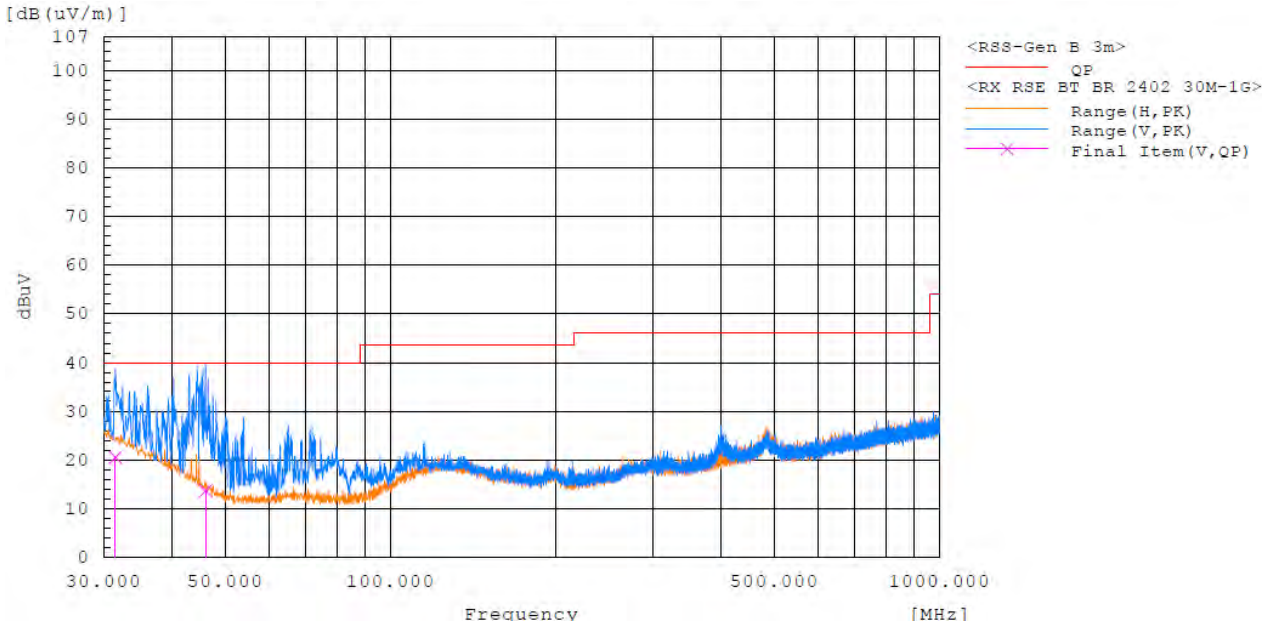
Frequency (MHz)	Polarization	Reading (dBuV)	Corr. [1)] (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Measurement Type
No major peaks found							

Notes:

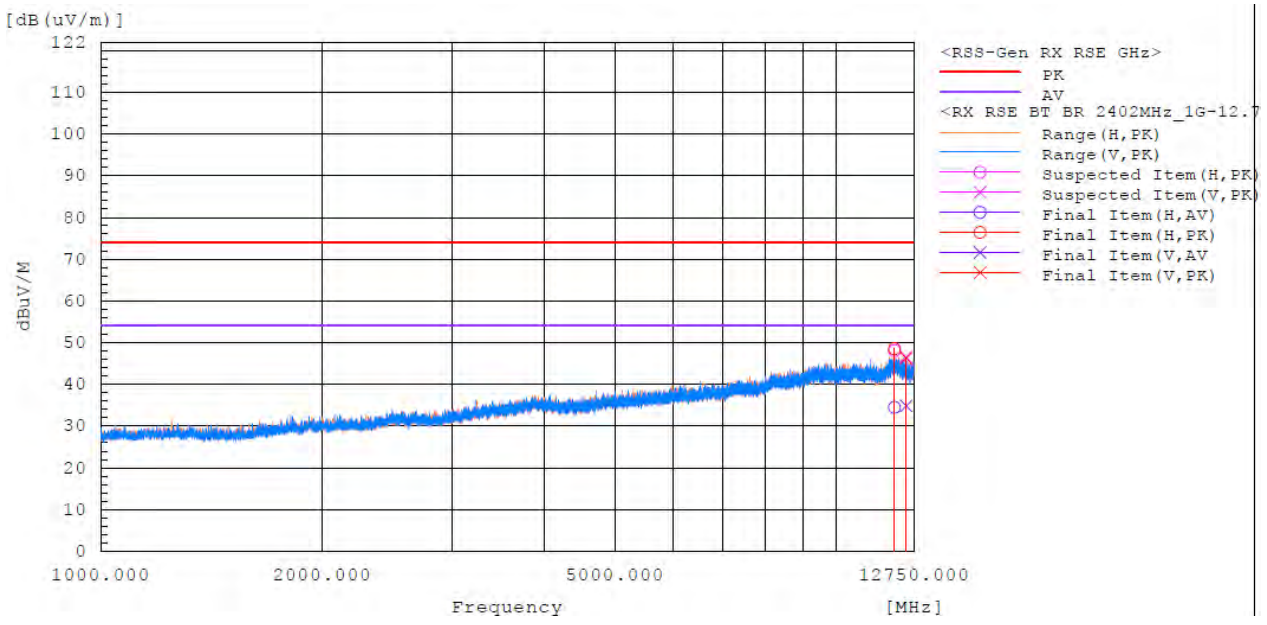
1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain
2. The test was conducted in BT BR mode, which is a worst-case mode.

▣ TEST PLOTS

Receiver Spurious Emission below 1 GHz : BR (CH 0)



Receiver Spurious Emission above 1 GHz : BR (CH 0)



Note:

1. There were no major peaks and representative plots are included in this report
2. The plots include all used factor values for cables, antenna, preamplifier, etc.

9.10. POWERLINE CONDUCTED EMISSIONS

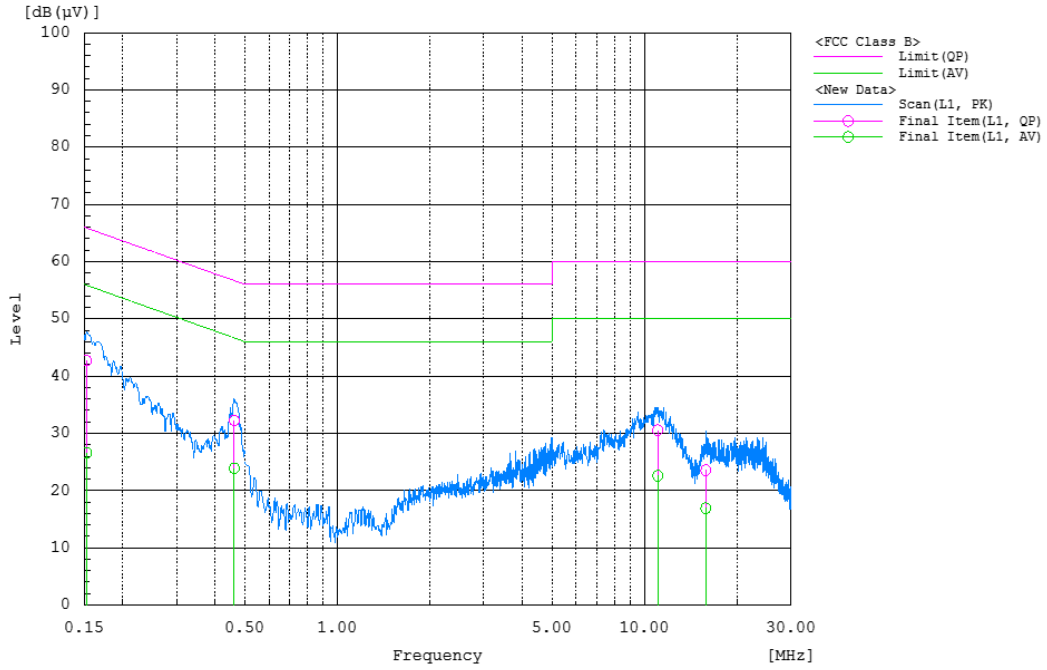
Frequency (MHz)	Line	Reading (dBµV)		Corr. [1)] (dB)	Level (dBµV)		Limit (dBµV)		Margin (dB)	
		QP	CAV		QP	CAV	QP	CAV	QP	CAV
0.152	L1	32.1	16.0	10.6	42.7	26.6	65.9	55.9	23.2	29.3
0.461	L1	22.4	14.0	9.9	32.3	23.9	56.7	46.7	24.4	22.8
11.046	L1	20.6	12.6	10.0	30.6	22.6	60	50	29.4	27.4
15.823	L1	13.5	6.8	10.1	23.6	16.9	60	50	36.4	33.1

Frequency (MHz)	Line	Reading (dBµV)		Corr. [1)] (dB)	Level (dBµV)		Limit (dBµV)		Margin (dB)	
		QP	CAV		QP	CAV	QP	CAV	QP	CAV
0.153	N	31.9	16.0	10.6	42.5	26.6	65.9	55.9	23.4	29.3
0.467	N	22.8	15.8	9.9	32.7	25.7	56.6	46.6	23.9	20.9
10.687	N	20.2	12.5	10.0	30.2	22.5	60	50	29.8	27.5
23.129	N	12.3	6.5	10.2	22.5	16.7	60	50	37.5	33.3

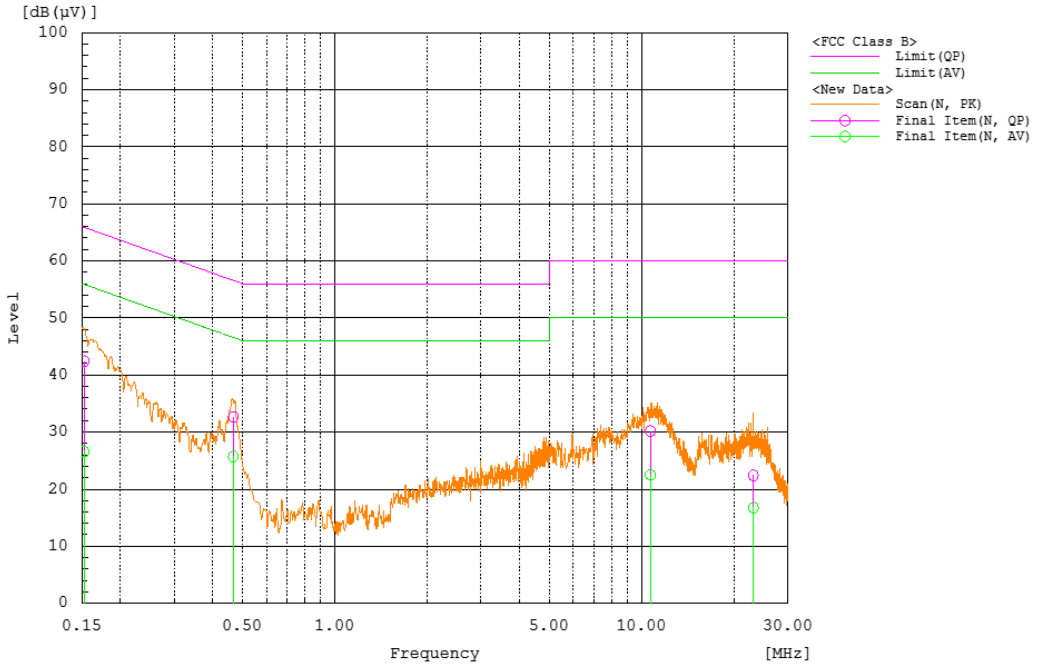
Note :
1. Quasi-peak(Final Result) = Reading Value + Correction Factor

▣ TEST PLOTS

AC Line Conducted Emission (L1)



AC Line Conducted Emission (N)



10. LIST OF TEST EQUIPMENT

No.	Instrument	Model No.	Calibration Due (mm/dd/yy)	Manufacture	Serial No.
☒	Signal Analyzer (20 Hz ~ 40.0 GHz)	ESU40	12/01/2024	Rohde & Schwarz	100529
☒	Signal Analyzer (1 Hz ~ 40.0 GHz)	ESW44	10/24/2024	Rohde & Schwarz	102015
☒	Signal Analyzer (3 Hz ~ 50 GHz)	N9030A	06/30/2024	Keysight	MY53311083
☐	Attenuator (20 dB, DC ~ 26.5 GHz)	8493C 20 dB	02/16/2025	KEYSIGHT	89401
☒	Attenuator (10 dB, DC ~ 26.5 GHz)	8493C 10 dB	09/05/2024	KEYSIGHT	89576
☒	Loop Antenna (0.009 ~ 30 MHz)	HLA 6121	09/12/2025	TESEQ	43964
☒	BI-LOG Antenna (30 MHz ~ 6 GHz)	JB6	03/06/2025	Sunol	A060916
☒	LNA (30 MHz ~ 1GHz)	PAM-103	05/03/2025	Com-Power	18020254
☒	Horn Antenna (1 GHz ~ 18 GHz)	DRH-118	01/03/2025	Sunol	A061616
☒	LNA (1 GHz ~ 18 GHz)	PAM-118A	03/13/2025	Com-Power	18040074
☒	Horn Antenna (18 GHz ~ 40 GHz)	DRH-1840	01/20/2025	Sunol	17121
☒	LNA (18 GHz ~ 40 GHz)	CBL18405045-01	01/05/2025	CERNEX, Inc.	27973
☒	High Pass Filter	WHK10-2520-3000-18000-40EF	11/20/2024	Wainwright	9
☒	EMI Test Receiver	ESR3	12/14/2024	Rohde & Schwarz	102363
☒	LISN	ENV216	10/23/2024	Rohde & Schwarz	101550

Note(s) :

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.

ANNEX A. TEST SETUP PHOTOS

The setup photos are provided as a separate document.

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ANNEX B. PHOTOGRAPHS OF EUT

B.1. EXTERNAL PHOTOS

The external photos are provided as a separate document.

B.2. INTERNAL PHOTOS

The internal photos are provided as a separate document.

END OF TEST REPORT

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