FCC RADIO TEST REPORT

FCC ID	:	UZ7TCX010
Equipment	:	Touch Computer
Brand Name	:	Zebra
Model Name	:	TCX010
Marketing Name	:	Zebra Technologies Corporation 3 Overlook Point, Lincolnshire, IL 60069 USA
Applicant	:	Zebra Technologies Corporation 3 Overlook Point, Lincolnshire, IL 60069 USA
Manufacturer	:	UZ7TCX010
Standard	:	FCC Part 15 Subpart C §15.247

The product was received on Oct. 03, 2025 and testing was performed from Oct. 30, 2025 to Dec. 06, 2025. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. EMC & Wireless Communications Laboratory
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

Table of Contents

History of this test report **3**
Summary of Test Result **4**
1 General Description **5**
1.1 Product Feature of Equipment Under Test 5
1.2 Product Specification of Equipment Under Test 7
1.3 Modification of EUT 7
1.4 Testing Location 8
1.5 Applicable Standards 8
2 Test Configuration of Equipment Under Test **9**
2.1 Carrier Frequency Channel 9
2.2 Test Mode 10
2.3 Connection Diagram of Test System 11
2.4 Support Unit used in test configuration and system 12
2.5 EUT Operation Test Setup 12
2.6 Measurement Results Explanation Example 12
3 Test Result **13**
3.1 Number of Channel Measurement 13
3.2 Hopping Channel Separation Measurement 14
3.3 Dwell Time Measurement 15
3.4 20dB and 99% Bandwidth Measurement 16
3.5 Output Power Measurement 17
3.6 Conducted Band Edges Measurement 18
3.7 Conducted Spurious Emission Measurement 19
3.8 Radiated Band Edges and Spurious Emission Measurement 20
3.9 AC Conducted Emission Measurement 24
3.10 Antenna Requirements 26
4 List of Measuring Equipment **27**
5 Measurement Uncertainty **29**
Appendix A. Conducted Test Results
Appendix B. AC Conducted Emission Test Result
Appendix C. Radiated Spurious Emission Test Result
Appendix D. Duty Cycle Plots
Appendix E. Setup Photographs

History of this test report

Report No.	Version	Description	Issue Date
FR571515-01J	01	Initial issue of report	Dec. 15, 2025
FR571515-01J	02	Revise Product Specification of Equipment Under Test, Appendix A1, Appendix C and Appendix D This report is an updated version, replacing the report issued on Dec. 15, 2025.	Jan. 22, 2026

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(1)	Number of Channels	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	Pass	-
3.4	2.1049	99% Occupied Bandwidth	Pass	-
3.5	15.247(b)(1) 15.247(b)(4)	Peak Output Power	Pass	-
3.6	15.247(d)	Conducted Band Edges	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	15.02 dB under the limit at 2483.59 MHz
3.9	15.207	AC Conducted Emission	Pass	6.54 dB under the limit at 0.16 MHz
3.10	15.203	Antenna Requirement	Pass	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Wei Chen

Report Producer: Aya Yang

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Touch Computer
Brand Name	Zebra
Model Name	TCX010
FCC ID	UZ7TCX010
EUT supports Radios application	NFC/UHF RFID WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 WLAN 11be ETH20/ ETH 40/ ETH 80/ ETH 160/ ETH 320 Bluetooth BR/EDR/LE
SW Version	eris_A15_userdebug_GMS_RelKey_2025-10-07-205955_main_SE
FW Version	eris_A15_userdebug_GMS_RelKey_2025-10-07-205955_main_SE
MFD	30-Sep-25
EUT Stage	Identical Prototype

Remark: The EUT's information above is declared by manufacturer.

<Sample list>

	Scanner	Camera	Bumper
Sample 1	SE4730	Main	w/o
Sample 2	SE4780	Main+Indirect Time-of-Flight	w/o
Sample 3	SE4780	Main+Ultra wide Camera	w/o
Sample 4	SE4730	Main+Indirect Time-of-Flight	w/o
Sample 5	SE4730	Main+Ultra wide Camera	w/o
Sample 6	SE4730	Main	w/
Sample 7	SE4780	Main+Indirect Time-of-Flight	w/
Sample 8	SE4780	Main+Ultra wide Camera	w/
Sample 9	SE4730	Main+Indirect Time-of-Flight	w/
Sample 10	SE4730	Main+Ultra wide Camera	w/

Specification of Accessories				
AC Adapter 1 (TYPE C Wall Charger 1)	**Brand Name**	Zebra	**Model Name**	SAWA-102-22520A
AC Adapter 2 (TYPE A Wall Charger 2)	**Brand Name**	Zebra	**Model Name**	SAWA-65-20005A
Trigger Handle 1	**Brand Name**	Zebra	**Part Number**	TRG-TC5A-ELEC-01
Trigger Handle 2	**Brand Name**	Zebra	**Part Number**	TRG-TC7A-ELEC-01
Trigger Handle 3	**Brand Name**	Zebra	**Part Number**	TRG-TC5AB-ELEC-01
Arm Mount 1	**Brand Name**	Zebra	**Part Number**	SG-TC5A-WMADP1-01
Arm Mount 2	**Brand Name**	Zebra	**Part Number**	SG-TC5A-WMADP2-01
Soft Holster	**Brand Name**	Zebra	**Part Number**	SG-NGTC5TC7-HLSTR-01
Rugged boot	**Brand Name**	Zebra	**Part Number**	SG-TC5AEXO-01
Earphone 1 (Wired headset USB-C)	**Brand Name**	Zebra	**Part Number**	HDST-USBC-PTT1-01
Earphone 2 (3.5mm PTT Headset)	**Brand Name**	Zebra	**Part Number**	HDST-35MM-PTT1-01
Earphone 3 （Rugged Headset）	**Brand Name**	Zebra	**Part Number**	HS2100-OTH
Battery	**Brand Name**	Zebra	**Model Name**	BT-000535-0020
3.5mm to 3.5mm audio connector	**Brand Name**	Zebra	**Part Number**	CBL-HS2100-3MS1-01
USB Cable 1 USB-C to C Cable	**Brand Name**	Zebra	**Part Number**	CBL-EC5X-USBC3A-01
USB Cable 2 USB-A to C Cable	**Brand Name**	Zebra	**Part Number**	CBL-TC5X-USBC2A-01

1.2 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Number of Channels	75
Carrier Frequency of Each Channel	2404+n*1 MHz; n=2~76
Maximum Output Power to Antenna	**<Class 1>** Bluetooth- CS ASK (1Mbps): 12.70 dBm / 0.0186 W Bluetooth- CS ASK (2Mbps): 12.90 dBm / 0.0195 W **<Class 2>** **<Ant. 6>** Bluetooth- CS ASK (1Mbps): 2.48 dBm / 0.0018 W **<Ant. 7>** Bluetooth- CS ASK (1Mbps): 3.34 dBm / 0.0022 W
99% Occupied Bandwidth	**<Class 1>** 0.210 MHz for 1Mbps 0.210 MHz for 2Mbps
Antenna Type / Gain	**<Ant. 6>:** PIFA with gain 2.30 dBi **<Ant. 7>:** PIFA with gain 1.67 dBi
Type of Modulation	Bluetooth LE CS: ASK

Remark:

1. The SISO mode conducted power is covered by MIMO mode per chain, so only the MIMO mode is tested.
2. The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

The test location is accredited based on TAF code 1190 and 3786 designated by NCC (National Communication Commission).

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)

FCC designation No.: TW1190 and TW3786

Note:

1.The test site complies with ANSI C63.4 2014 requirement.

2.The Conducted test item subcontracted to Sporton International Inc. Wensan Laboratory. (TAF Code: 3786)

1.5 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- FCC Part 15 Subpart C §15.247
- ANSI C63.10-2020

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.

2. The TAF code is not including all the FCC KDB listed without accreditation.

3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	-	-	27	2429	54	2456
	-	-	28	2430	55	2457
	2	2404	29	2431	56	2458
	3	2405	30	2432	57	2459
	4	2406	31	2433	58	2460
	5	2407	32	2434	59	2461
	6	2408	33	2435	60	2462
	7	2409	34	2436	61	2463
	8	2410	35	2437	62	2464
	9	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12	2414	39	2441	66	2468
	13	2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	-	-
	24	2426	51	2453	-	-
	25	2427	52	2454	-	-
	26	2428	53	2455	-	-

2.2 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst plane, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.

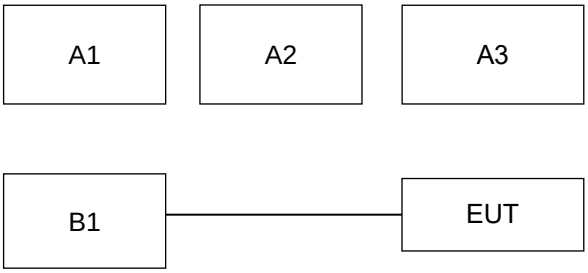
b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

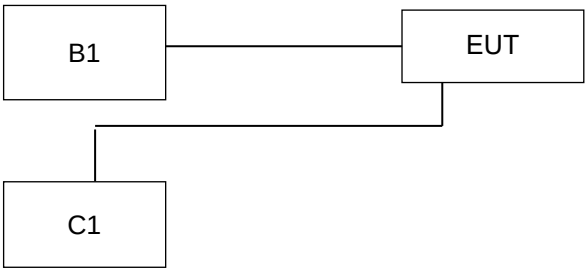
Summary table of Test Cases		
Test Item	**Data Rate / Modulation**	
Conducted Test Cases	**Bluetooth LE 1Mbps CS ASK**	**Bluetooth LE 2Mbps CS ASK**
	Mode 1: CH02_2404 MHz Mode 2: CH38_2440 MHz Mode 3: CH76_2478 MHz	Mode 4: CH02_2404 MHz Mode 5: CH38_2440 MHz Mode 6: CH76_2478 MHz
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN (2.4GHz) Link + USB TYPE-A to TYPE-C cable (Charging with Adapter) for Sample 1	

Remark:
1. For Radiated Test Cases, the worst mode data rate 1Mbps was reported only since the highest RF output power in the preliminary tests. The conducted spurious emissions and conducted band edge measurement for other data rates were not worse than 1Mbps, and no other significantly frequencies found in conducted spurious emission.
2. For Radiated Test Cases, the tests were performed with Sample 1.
3. The detailed Radiated test modes are shown in Appendix C.

2.3 Connection Diagram of Test System



Conduction Test Setup									
No.	Wireless Station	Connection Type	Test Mode						
			1	-	-	-	-	-	-
A1	BT Earphone	Bluetooth	X	-	-	-	-	-	-
A2	AP router	WiFi	X	-	-	-	-	-	-
A3	Notebook	WiFi	X	-	-	-	-	-	-
No.	Power Source	Connection Type	1	-	-	-	-	-	-
B1	AC : 120V/60Hz	AC Power Cable	X	-	-	-	-	-	-



Radiation Tx Test Setup			
No.	Power Source	Connection Type	Test Mode
			Tx
B1	AC : 120V/60Hz	USB Cable e	X
No.	Setup Peripherals	Connection Type	Tx
C1	Adapter	USB to Type C	X

2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Jlab Jbund Mini	2AHYV	N/A	N/A	N/A
2.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded,1.8m
3.	Notebook	Dell	Latitude 3420	FCC DoC	N/A	AC I/P：Unshielded, 1.2m DC O/P：Shielded, 1.8m

2.5 EUT Operation Test Setup

The RF test items, utility "QRCT v4.1 Version 4.0.170.1" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

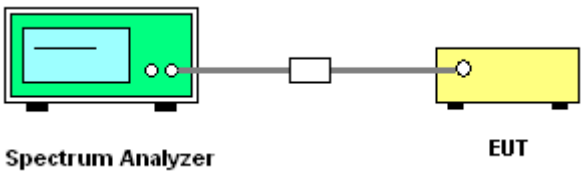
3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.3 Test Procedure

1. The testing follows ANSI C63.10 clause 7.8.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300 kHz; VBW ≥ RBW; Sweep = No faster than coupled (auto) time; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

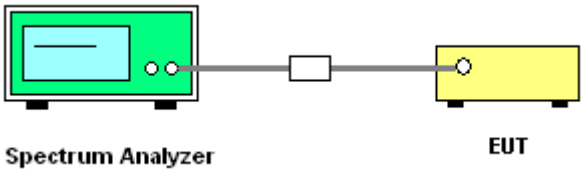
3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

1. The testing follows ANSI C63.10 clause 7.8.2.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels;
   RBW = 300 kHz; VBW ≥ RBW; Sweep = No faster than coupled (auto) time; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

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.

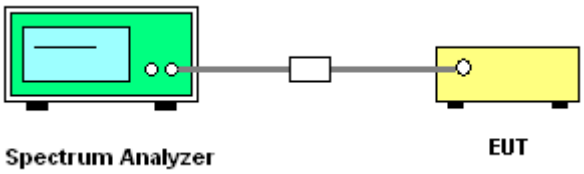
3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.3.3 Test Procedures

1. The testing follows ANSI C63.10 clause 7.8.4.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

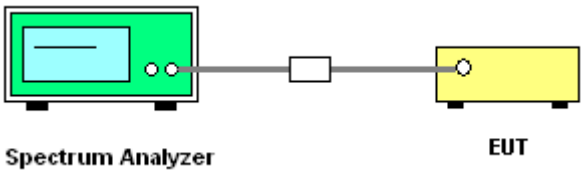
3.4.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10 clause 6.9.2 and 6.9.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Use the following spectrum analyzer settings for 20 dB Bandwidth measurement.
   Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 20 dB bandwidth, VBW ≥ 3 * RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
   RBW ≥ 1-5% of the 99% bandwidth, VBW ≥ 3 * RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup



3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.

3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

3.5 Output Power Measurement

3.5.1 Limit of Output Power

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi.

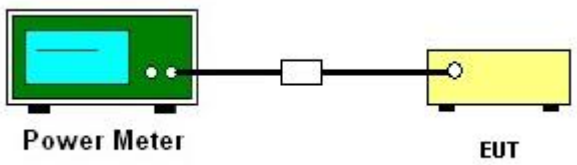
3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.5.3 Test Procedures

1. The testing follows ANSI C63.10 clause 7.8.5.
2. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.5.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

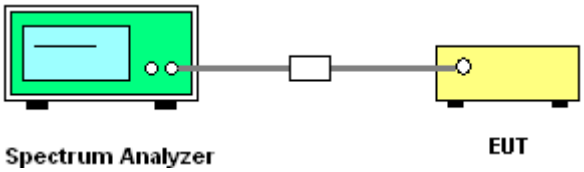
3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.6.3 Test Procedures

1. The testing follows ANSI C63.10 clause 6.10.
2. Set the maximum power setting and enable the EUT to transmit continuously.
3. Set RBW = 100 kHz, VBW = 300 kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2 and 3.
5. Measure and record the results in the test report.

3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

Please refer to Appendix A.

3.6.6 Test Result of Conducted Hopping Mode Band Edges

Please refer to Appendix A.

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

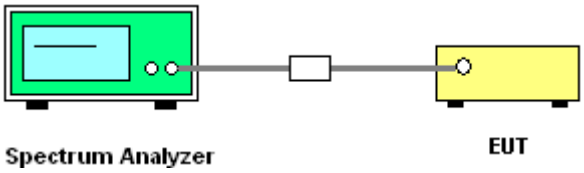
3.7.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.7.3 Test Procedure

1. The testing follows ANSI C63.10 clause 7.8.7.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurious must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

Please refer to Appendix A.

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics / spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.8.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

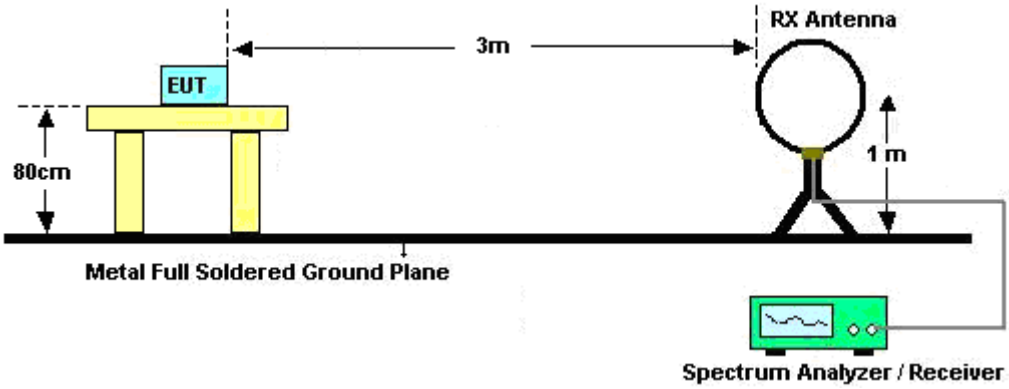
3.8.3 Test Procedures

1. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT is arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 100 kHz for f < 1 GHz, RBW = 1 MHz for f>1 GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log (Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
8. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".

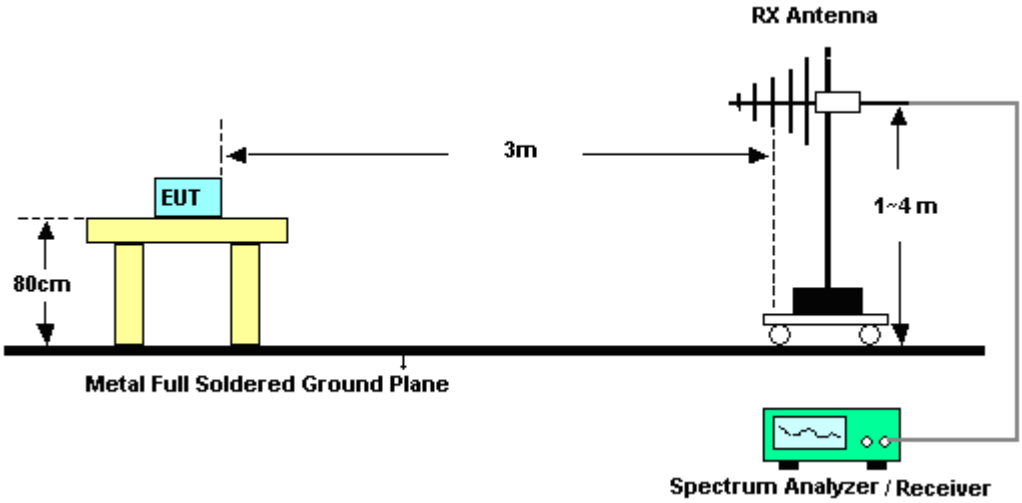
Note: The average levels are calculated from the peak level corrected with duty cycle correction factor (-57.08dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

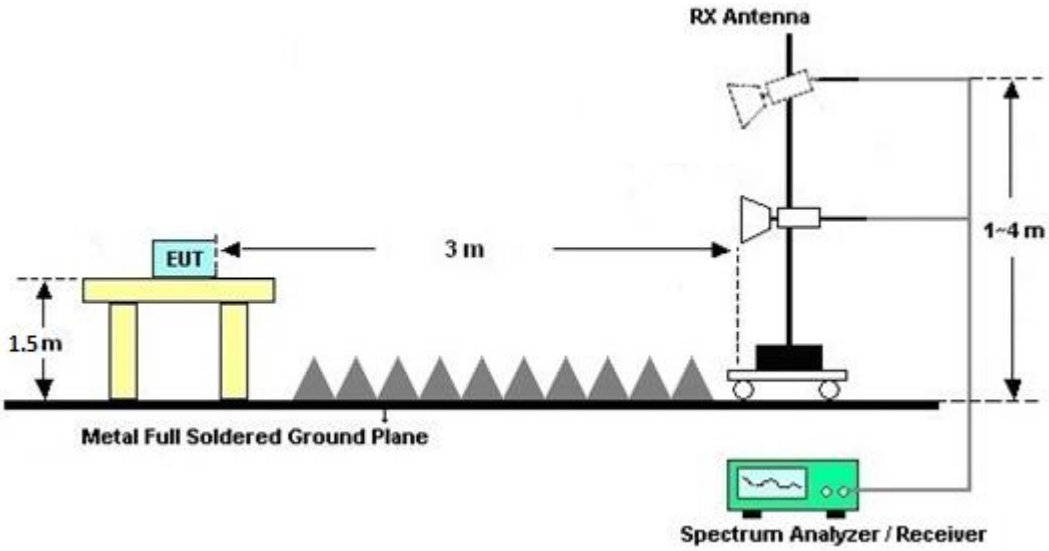
For radiated test below 30MHz



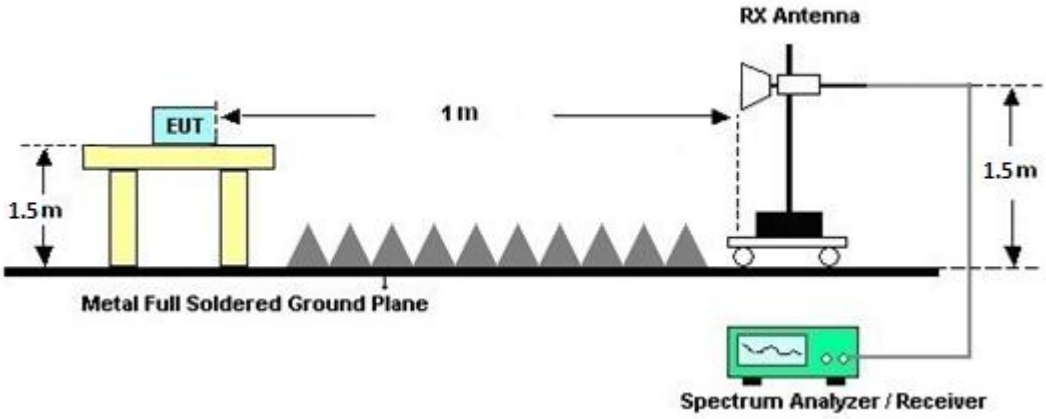
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site **v01r01**, and the result comes out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.8.7 Duty Cycle

Please refer to Appendix D.

3.8.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment 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.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

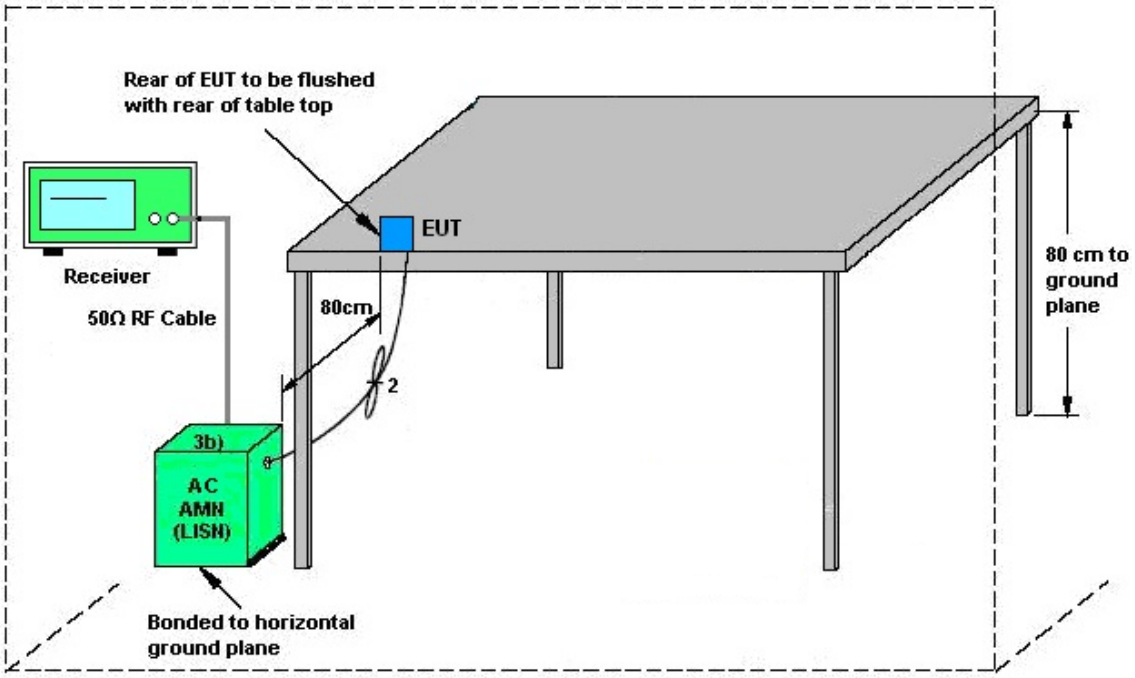
3.9.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.9.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.10 Antenna Requirements

3.10.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

3.10.2 Antenna Anti-Replacement Construction

Antenna permanently attached.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	TECPEL	DTM-303A	TP224371	N/A	Jun. 16, 2025	Nov. 05. 2025~ Dec. 06.2025	Jun. 15, 2026	Conducted (TH05-HY)
Power Meter	Agilent	E4416A	GB41292344	N/A	Jun. 13, 2025	Nov. 05. 2025~ Dec. 06.2025	Jun. 12, 2026	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US40441548	50MHz~18GHz	Jun. 13, 2025	Nov. 05. 2025~ Dec. 06.2025	Jun. 12, 2026	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 29, 2025	Nov. 05. 2025~ Dec. 06.2025	Aug. 28, 2026	Conducted (TH05-HY)
Switch Control Mainframe	E-Instument	ETF-1405-0	EC1900157 (BOX6)	N/A	Feb. 10, 2025	Nov. 05. 2025~ Dec. 06.2025	Feb. 09, 2026	Conducted (TH05-HY)
Software	Sporton	BTWIFI_Final_version_240513	N/A	Conducted Other Test Item	N/A	Nov. 05. 2025~ Dec. 06.2025	N/A	Conducted (TH05-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz~26.5GHz	Jan. 23, 2025	Oct. 30, 2025~ Dec. 06, 2025	Jan. 22, 2026	Radiation (03CH07-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 21, 2025	Oct. 30, 2025~ Dec. 06, 2025	Apr. 20, 2026	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Mar. 06, 2025	Oct. 30, 2025~ Dec. 06, 2025	Mar. 05, 2026	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-00101800-30-10P	1590075	1GHz~18GHz	Apr. 18, 2025	Oct. 30, 2025~ Dec. 06, 2025	Apr. 17, 2026	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Sep. 30, 2025	Oct. 30, 2025~ Dec. 06, 2025	Sep. 29, 2026	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Mar. 22, 2025	Oct. 30, 2025~ Dec. 06, 2025	Mar. 21, 2026	Radiation (03CH07-HY)
Preamplifier	EMEC	EM18G40G	0600789	18-40GHz	Aug. 08, 2025	Oct. 30, 2025~ Dec. 06, 2025	Aug. 07, 2026	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9030A	MY52350276	3Hz~44GHz	Mar. 28, 2025	Oct. 30, 2025~ Dec. 06, 2025	Mar. 27, 2026	Radiation (03CH07-HY)
Double Ridged Guide Horn Antenna	ETS-Lindgren	3117	00075962	1GHz ~ 18GHz	Nov. 28, 2024	Oct. 30, 2025~ Dec. 06, 2025	Nov. 27, 2025	Radiation (03CH07-HY)
Double Ridged Guide Horn Antenna	ETS-Lindgren	3117	00066584	1GHz~18GHz	Dec. 20, 2024	Oct. 30, 2025~ Dec. 06, 2025	Dec. 19, 2025	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4 MY15682/4	30MHz to 18GHz	Feb. 20, 2025	Oct. 30, 2025~ Dec. 06, 2025	Feb. 19, 2026	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4 MY24971/4	9kHz to 30MHz	Feb. 20, 2025	Oct. 30, 2025~ Dec. 06, 2025	Feb. 19, 2026	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 126	532078/126E	30MHz~18GHz	Sep. 13, 2025	Oct. 30, 2025~ Dec. 06, 2025	Sep. 12, 2026	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2858/2	18GHz~40GHz	Feb. 20, 2025	Oct. 30, 2025~ Dec. 06, 2025	Feb. 19, 2026	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	801606/2	9KHz ~ 40GHz	Apr. 23, 2025	Oct. 30, 2025~ Dec. 06, 2025	Apr. 22, 2026	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Oct. 30, 2025~ Dec. 06, 2025	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Oct. 30, 2025~ Dec. 06, 2025	N/A	Radiation (03CH07-HY)
Antenna Mast	MF	MF-7802	N/A	Control Turn table	N/A	Oct. 30, 2025~ Dec. 06, 2025	N/A	Radiation (03CH07-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Oct. 30, 2025~ Dec. 06, 2025	N/A	Radiation (03CH07-HY)
Attenuator	HONOVA	5910 SMA-50-005-19-NE	ATT-36	30MHz~18GHz	Feb. 11, 2025	Oct. 30, 2025~ Dec. 06, 2025	Feb. 10, 2026	Radiation (03CH07-HY)
Software	Audix	E3	RK-002396	N/A	N/A	Oct. 30, 2025~ Dec. 06, 2025	N/A	Radiation (03CH07-HY)
USB Data Logger	TECPEL	TR-32	HE17XB2495	N/A	Feb. 24, 2025	Oct. 30, 2025~ Dec. 06, 2025	Feb. 23, 2026	Radiation (03CH07-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	00991	18GHz-40GHz	May. 29, 2025	Oct. 30, 2025~ Dec. 06, 2025	May. 28, 2026	Radiation (03CH07-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 14, 2025	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	N/A	Dec. 10, 2024	Nov. 14, 2025	Dec. 09, 2025	Conduction (CO05-HY)
Hygrometer	TECPEL	DTM-303A	TP210031	N/A	Jun. 26, 2025	Nov. 14, 2025	Jun. 25, 2026	Conduction (CO05-HY)
Two-Line V-Network	Rohde & Schwarz	ENV216	100081	N/A	Jul. 25, 2025	Nov. 14, 2025	Jul. 24, 2026	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Nov. 14, 2025	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Jul. 29, 2025	Nov. 14, 2025	Jul. 28, 2026	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	MQT24082501	N/A	Oct. 14, 2025	Nov. 14, 2025	Oct. 13, 2026	Conduction (CO05-HY)

5 Measurement Uncertainty

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.7 dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.3 dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.7 dB

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.5 dB

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.9 dB

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Junyu Jhou / Hank Hsu	Temperature:	21~25	°C
Test Date:	2025/11/5~12/6	Relative Humidity:	51~54	%

<Class 1>

TEST RESULTS DATA
20dB and 99% Occupied Bandwidth and Hopping Channel Separation

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
ASK	1Mbps	2	02	2404	0.079	0.210	1.003	0.0525	Pass
ASK	1Mbps	2	38	2440	0.094	0.201	1.007	0.0629	Pass
ASK	1Mbps	2	76	2478	0.094	0.203	1.007	0.0629	Pass
ASK	2Mbps	2	02	2404	0.093	0.210	0.994	0.0623	Pass
ASK	2Mbps	2	38	2440	0.094	0.205	0.990	0.0624	Pass
ASK	2Mbps	2	76	2478	0.094	0.205	1.007	0.0628	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time (hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
ASK	72	670.000	0.05	0.03	0.4	Pass

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
ASK 1M	02	2	**12.70**	20.97	Pass
	38	2	12.60	20.97	Pass
	76	2	12.10	20.97	Pass
ASK 2M	02	2	12.70	20.97	Pass
	38	2	**12.90**	20.97	Pass
	76	2	11.10	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
ASK 1M	02	1	11.40	11.33
	38	1	**11.70**	11.33
	76	1	11.00	11.33
ASK 2M	02	1	11.30	11.38
	38	1	**11.80**	11.38
	76	1	10.00	11.38

TEST RESULTS DATA
Number of Hopping Frequency

Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
72	20	> 15	Pass

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Hank Hsu	Temperature:	21~25	°C
Test Date:	2025/11/28	Relative Humidity:	51~54	%

<Class 2>
<ANT 6>

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
ASK	02	1	1.87	20.97	Pass
	38	1	**2.48**	20.97	Pass
	76	1	0.69	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)	Duty Factor (dB)
ASK	02	1	0.77	11.15	8.00
	38	1	**1.39**	11.15	
	76	1	-0.55	11.15	

<Class 2>
<ANT 7>

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
ASK	02	1	3.31	20.97	Pass
	38	1	**3.34**	20.97	Pass
	76	1	3.06	20.97	Pass

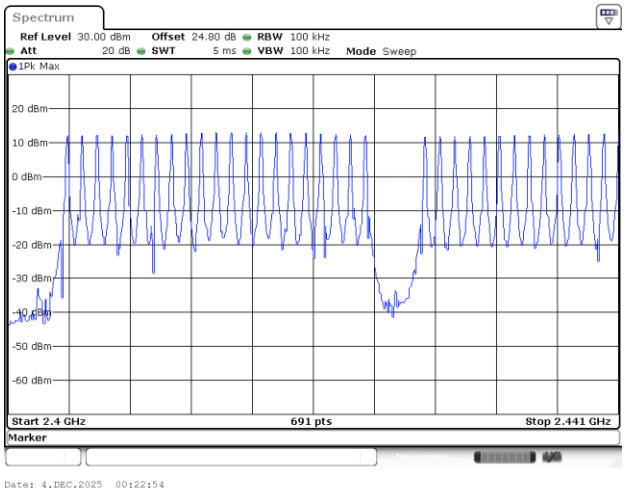
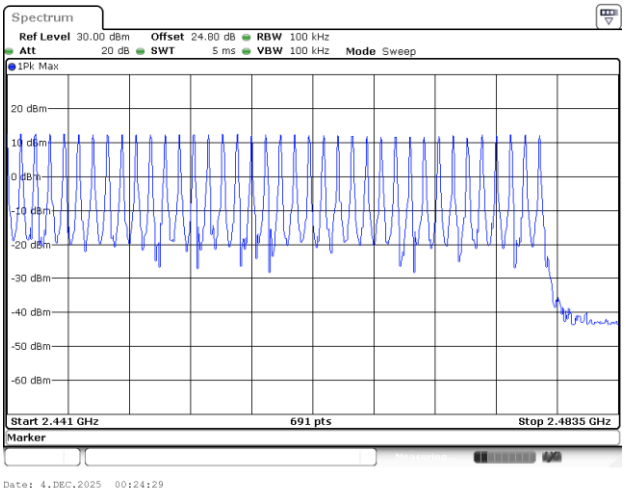
TEST RESULTS DATA
Average Power Table
(Reporting Only)

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)	Duty Factor (dB)
ASK	02	1	2.38	11.21	8.00
	38	1	**2.43**	11.21	
	76	1	2.12	11.21	

Number of TX = 2, Ant. 7 (Measured)

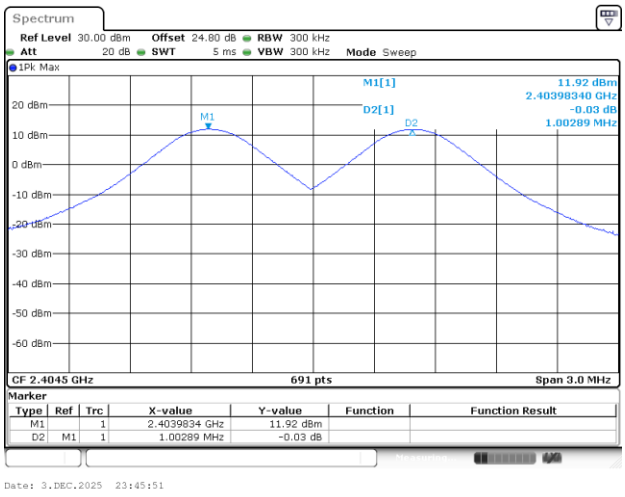
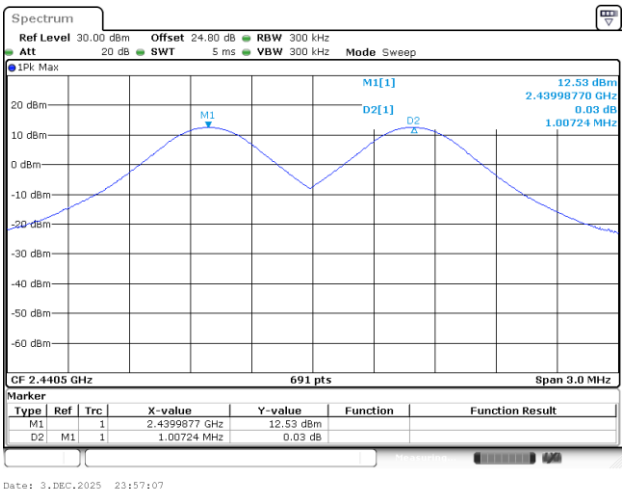
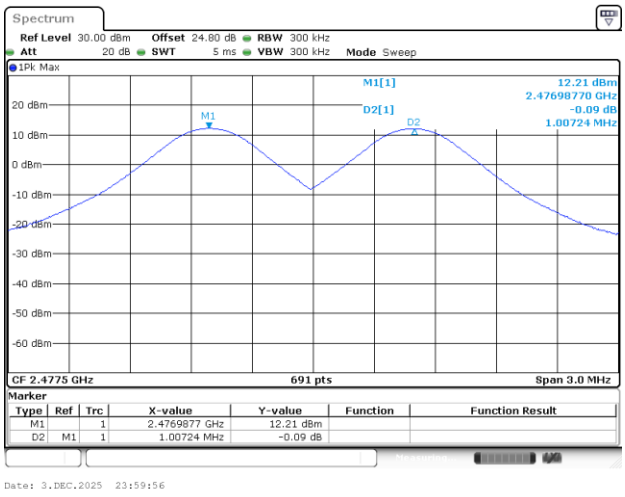
Number of Hopping Frequency

<1Mbps>

Number of Hopping Channel Plot	
Channel 02 - 38	**Channel 38 - 76**
	

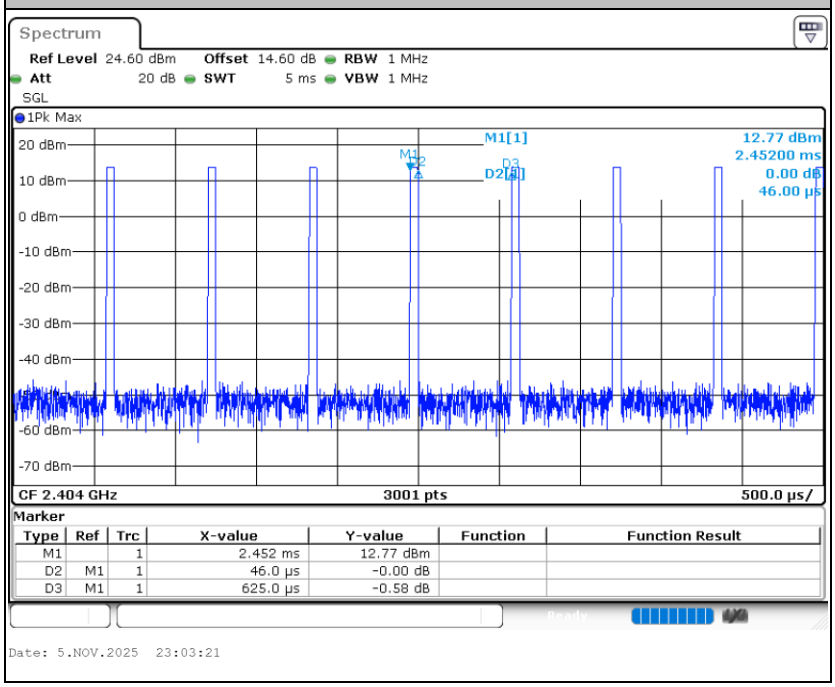
Hopping Channel Separation

<1Mbps>

Channel Separation Plot on Channel 02 - 03	Channel Separation Plot on Channel 38 - 39
	
Channel Separation Plot on Channel 75 - 76	
	

Dwell Time

Package Transfer Time Plot

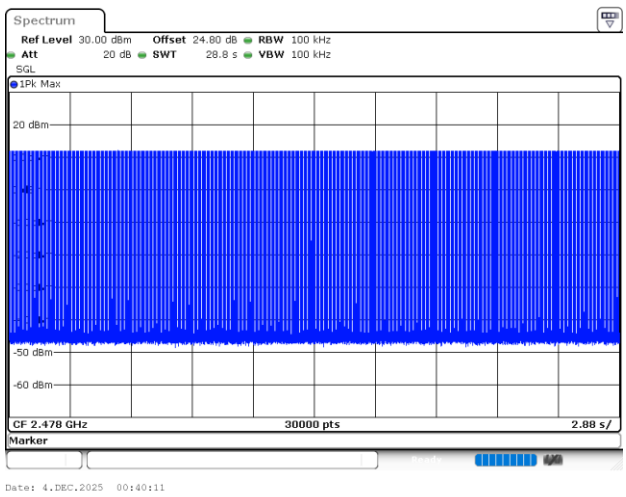
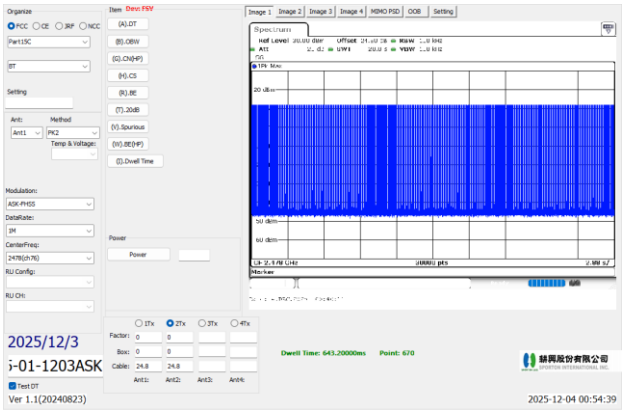


Remark:

1. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

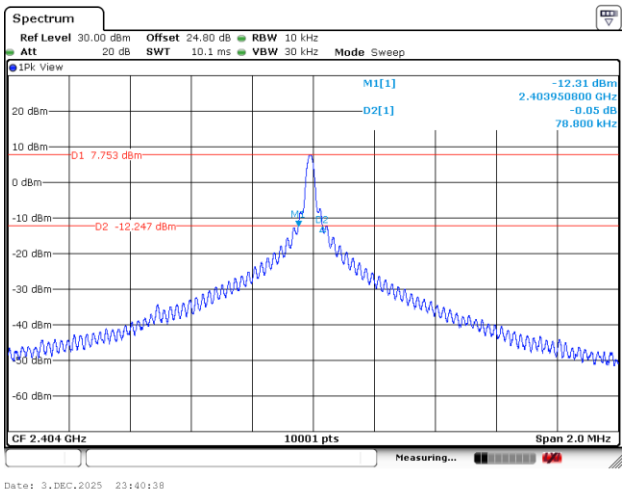
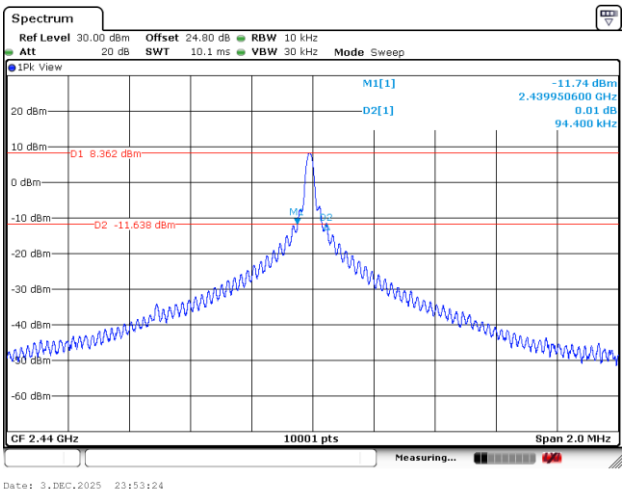
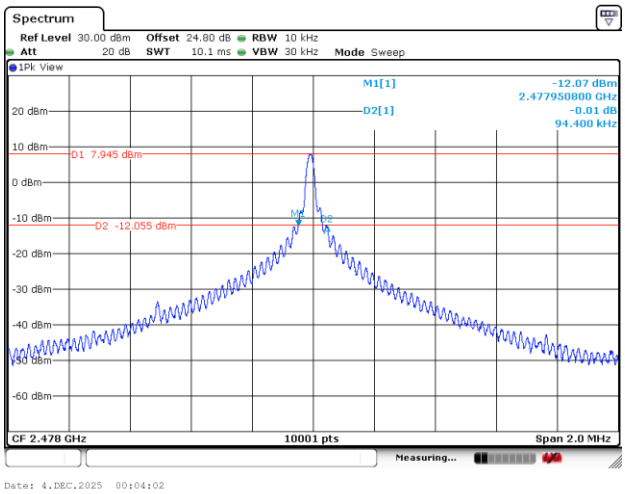
= 1817 x 0.045 ms = 0.082 sec

2. The observation Occupancy time is hopping channel 72 channels x 400ms = 28.8sec using sweep point 30,000. This shows that 1ms per on-time contains 1 hop. The total hops is finally counted via computer analysis.

Dwell time Plot in Channel 76	On-time hop count 670
	

20dB Bandwidth

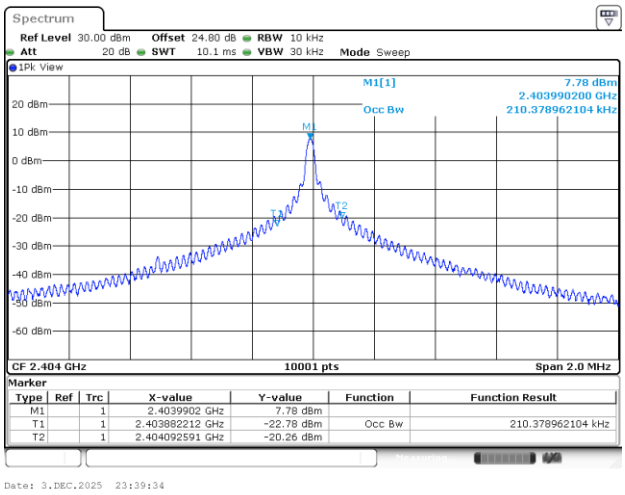
<1Mbps>

20 dB Bandwidth Plot in Channel 02	20 dB Bandwidth Plot in Channel 38
	
20 dB Bandwidth Plot in Channel 76	
	

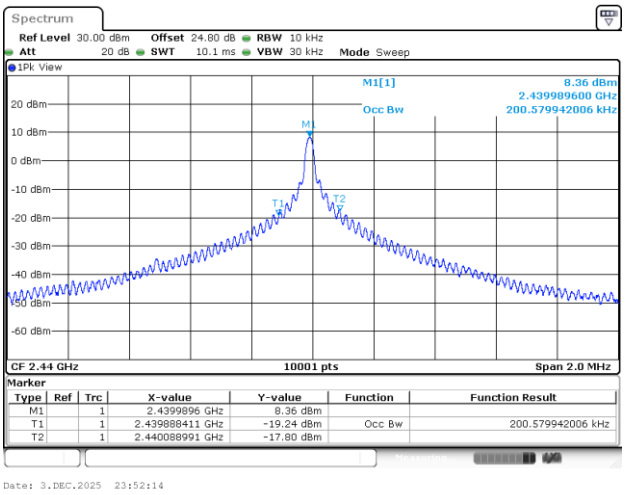
99% Occupied Bandwidth

<1Mbps>

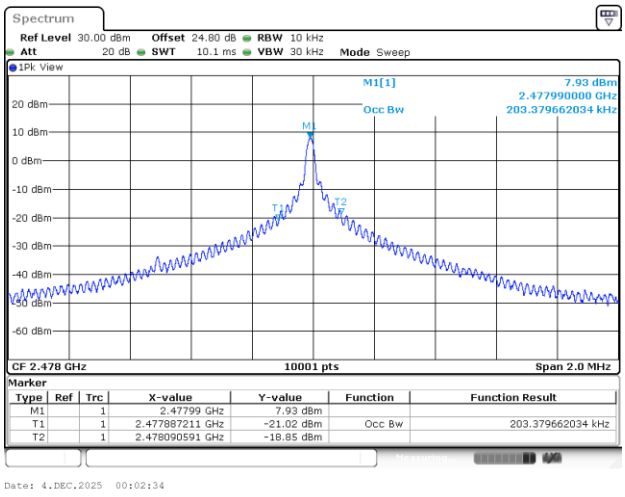
99% Occupied Bandwidth on Channel 02



99% Occupied Bandwidth on Channel 38

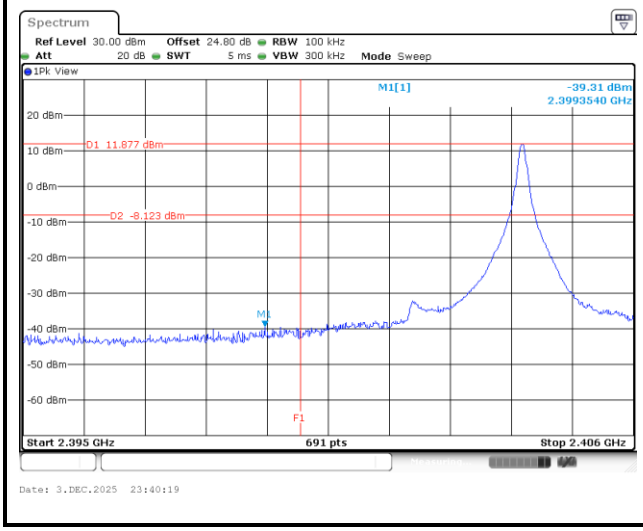
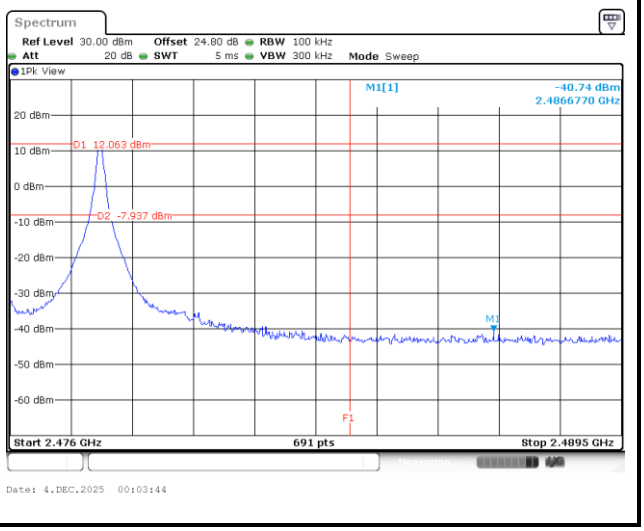


99% Occupied Bandwidth on Channel 76



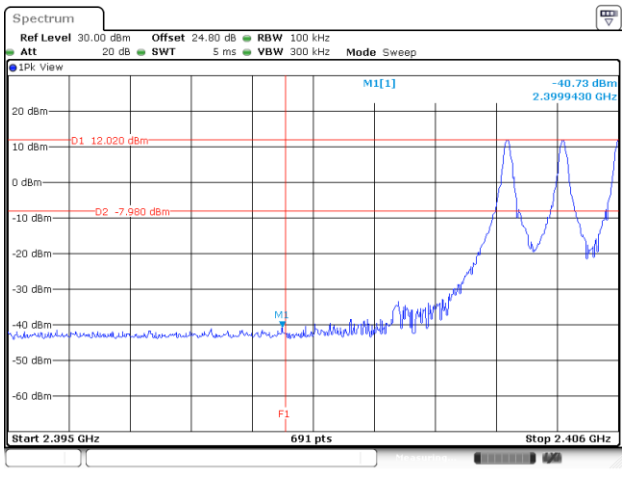
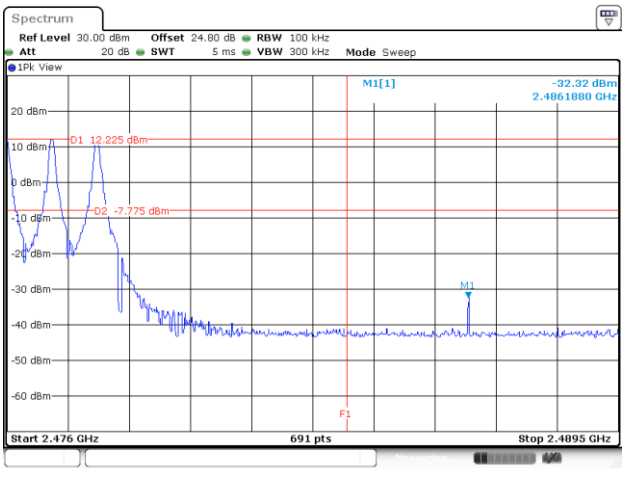
Band Edges

<1Mbps>

Low Band Edge Plot on Channel 02	High Band Edge Plot on Channel 76
	

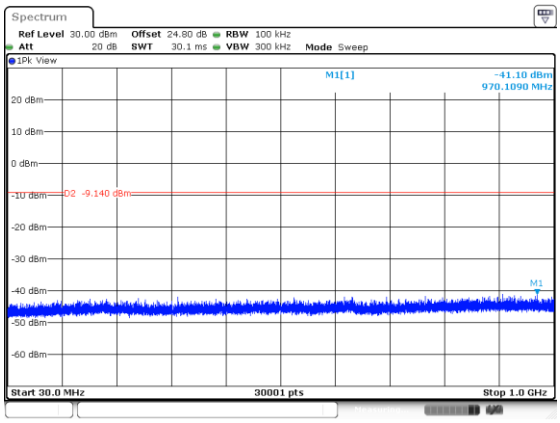
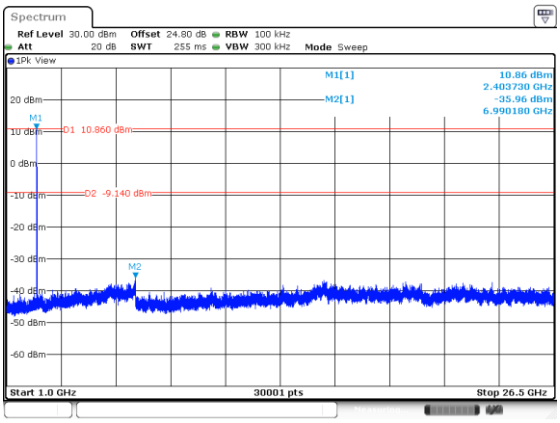
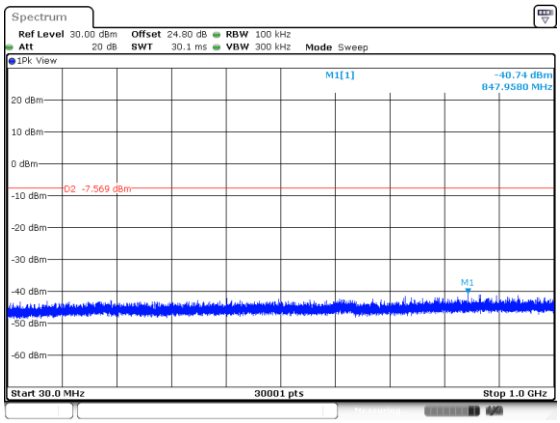
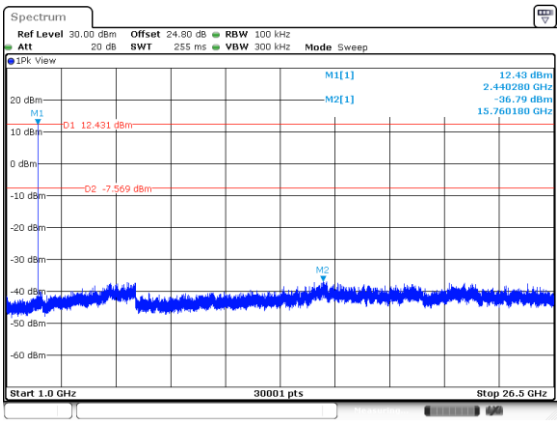
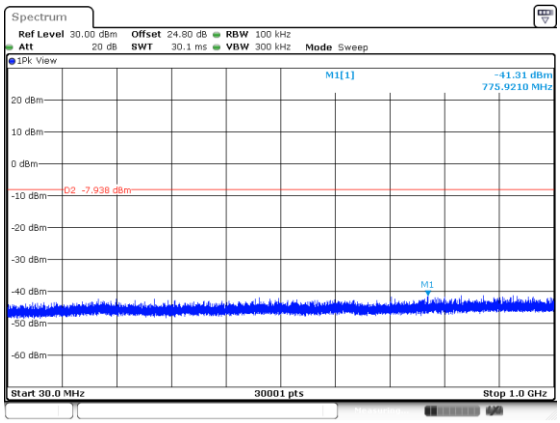
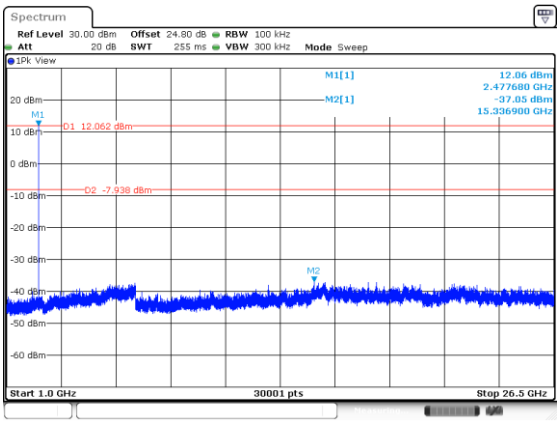
Hopping Mode Band Edges

<1Mbps>

Hopping Mode Low Band Edge Plot	Hopping Mode High Band Edge Plot
	

Conducted Spurious Emission

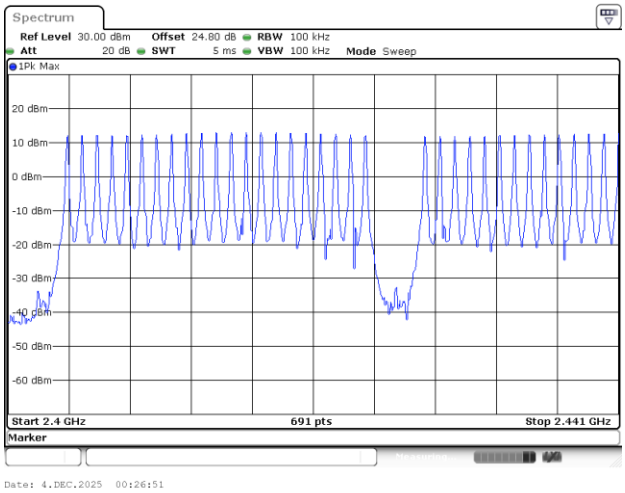
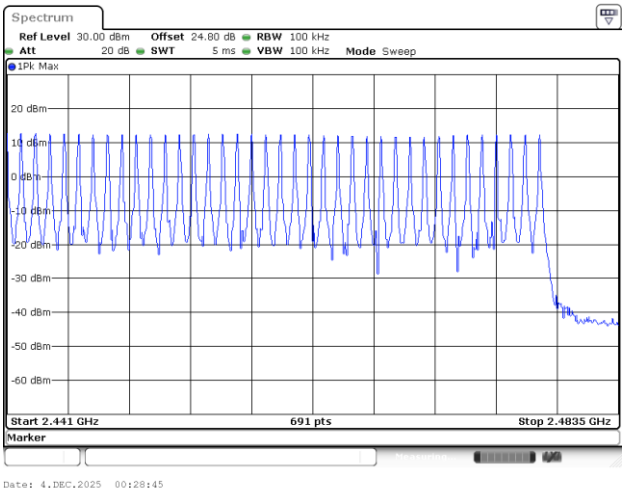
<1Mbps>

CSE Plot on Low Ch between 30MHz ~ 1 GHz	CSE Plot on Low Ch between 1GHz ~ 26.5GHz
	
CSE Plot on Mid. Ch between 30MHz ~ 1 GHz	**CSE Plot on Mid. Ch between 1GHz ~ 26.5GHz**
	
CSE Plot on High Ch between 30MHz ~ 1 GHz	**CSE Plot on High Ch between 1GHz ~ 26.5GHz**
	

Number of TX = 2, Ant. 6 (Measured)

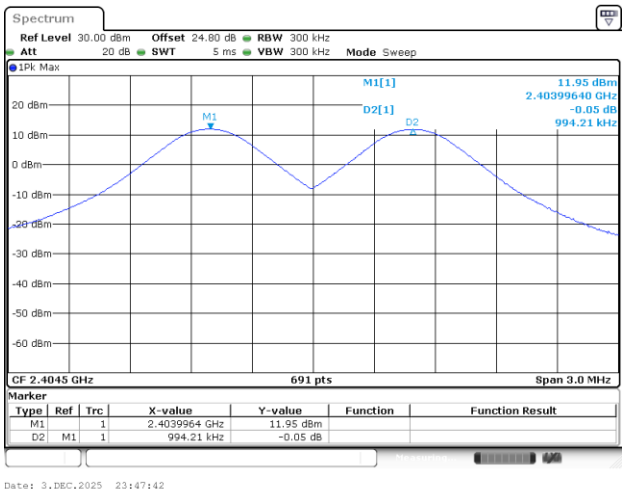
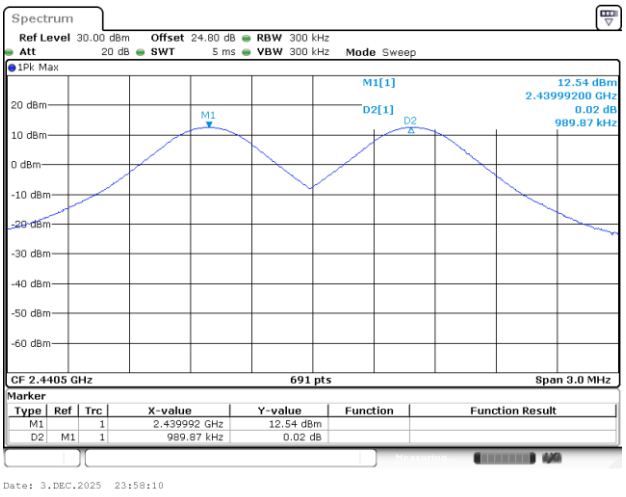
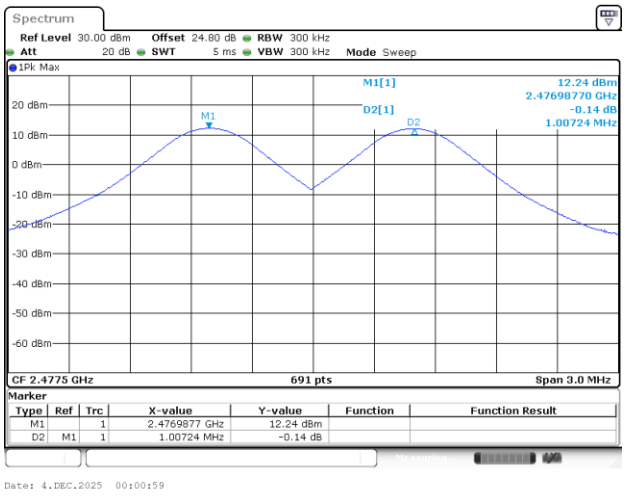
Number of Hopping Frequency

<1Mbps>

Number of Hopping Channel Plot	
Channel 02 - 38	**Channel 38 - 76**
	

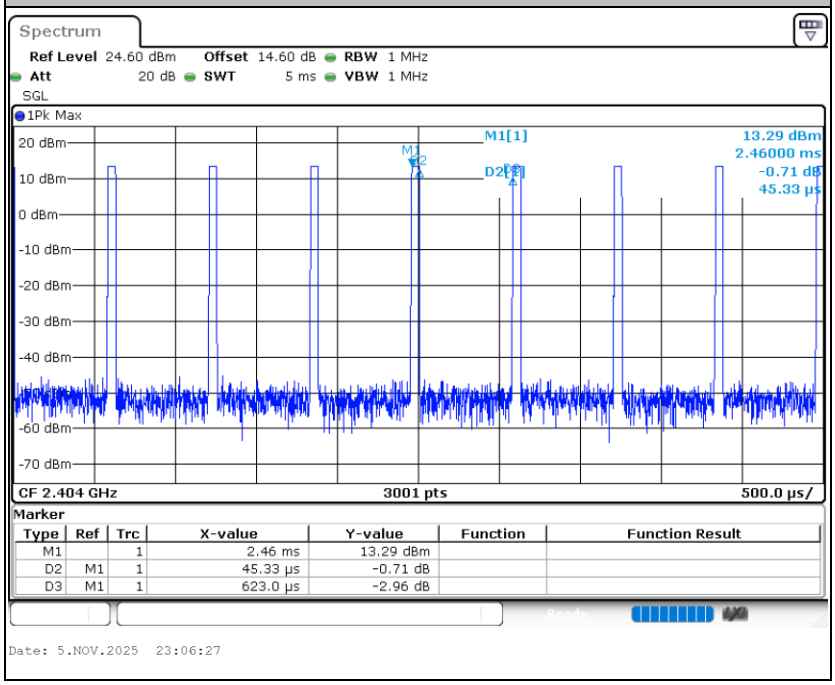
Hopping Channel Separation

<1Mbps>

Channel Separation Plot on Channel 02 - 03	Channel Separation Plot on Channel 38 - 39
	
Channel Separation Plot on Channel 75 - 76	
	

Dwell Time

Package Transfer Time Plot

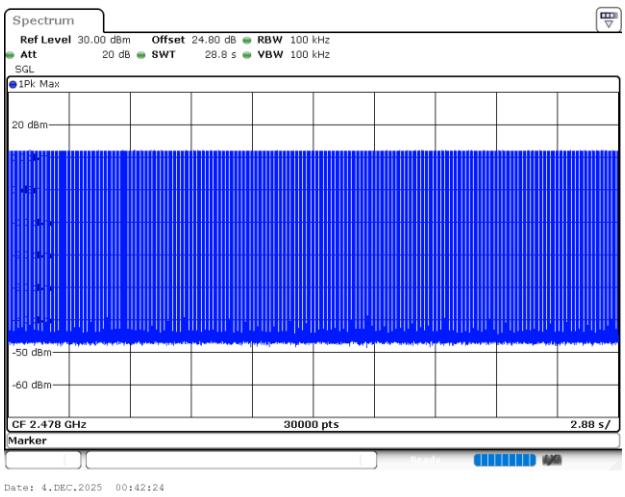
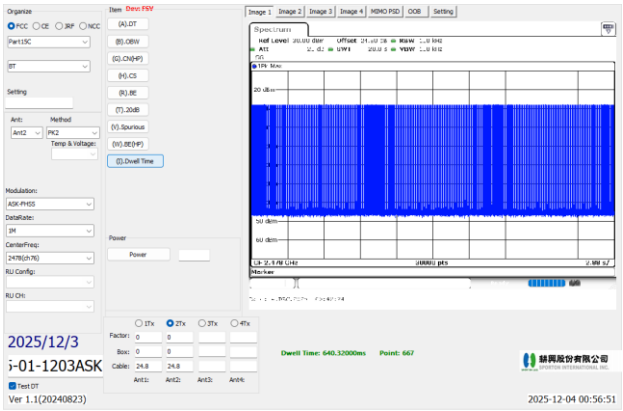


Remark:

3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

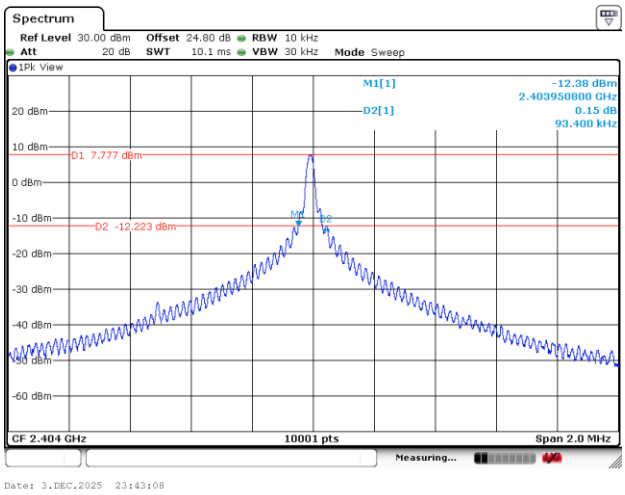
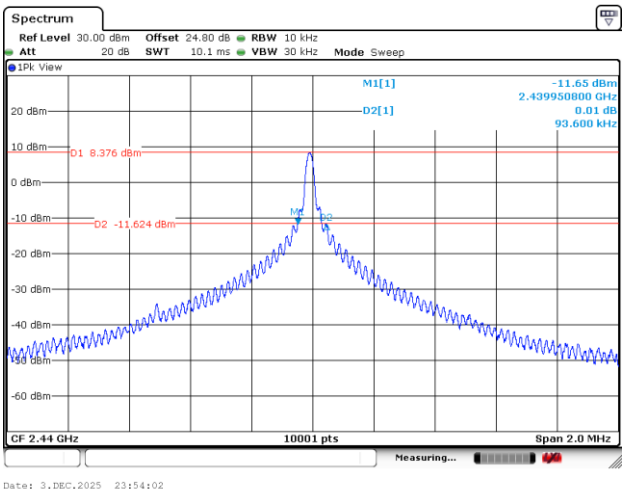
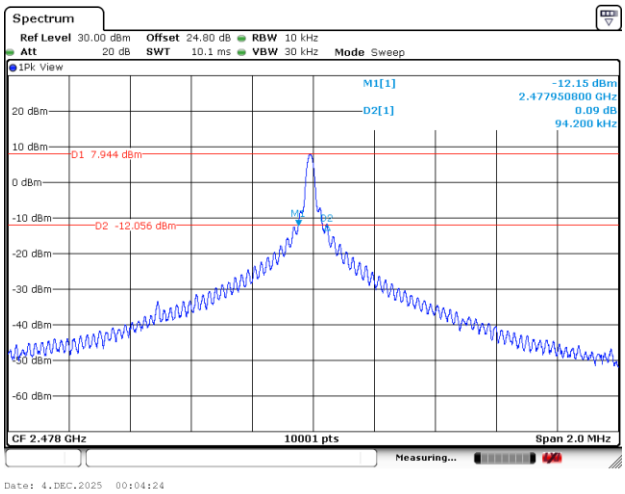
= 1817 x 0.045 ms = 0.082 sec

4. The observation Occupancy time is hopping channel 72 channels x 400ms = 28.8sec using sweep point 30,000. This shows that 1ms per on-time contains 1 hop. The total hops is finally counted via computer analysis.

Dwell time Plot in Channel 76	On-time hop count 667
	

20dB Bandwidth

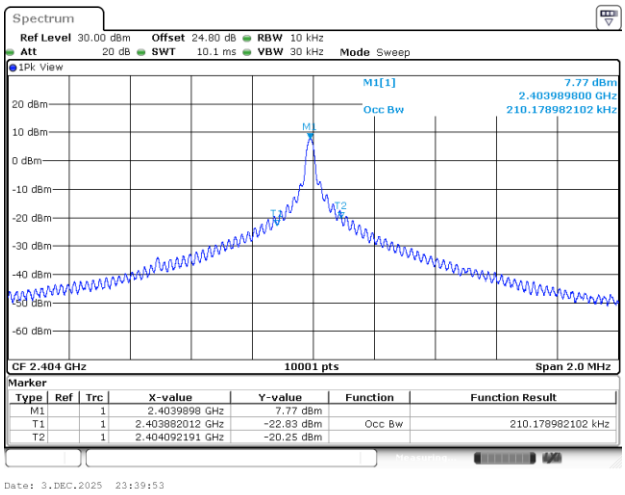
<1Mbps>

20 dB Bandwidth Plot in Channel 02	20 dB Bandwidth Plot in Channel 38
	
20 dB Bandwidth Plot in Channel 76	
	

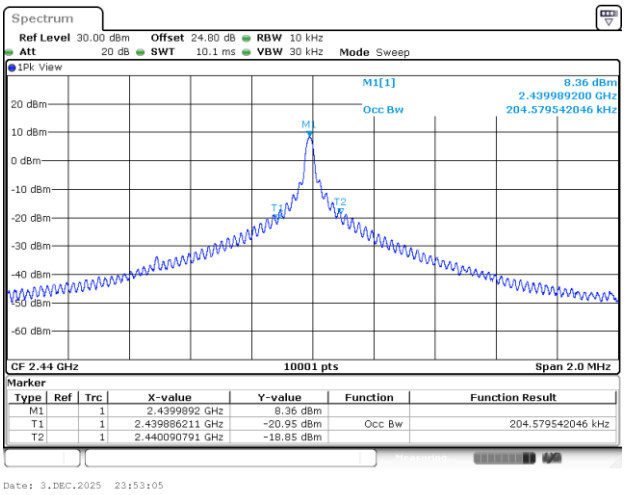
99% Occupied Bandwidth

<1Mbps>

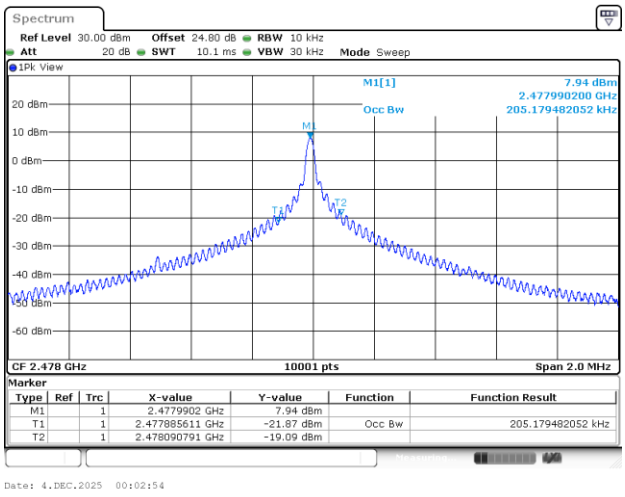
99% Occupied Bandwidth on Channel 02



99% Occupied Bandwidth on Channel 38

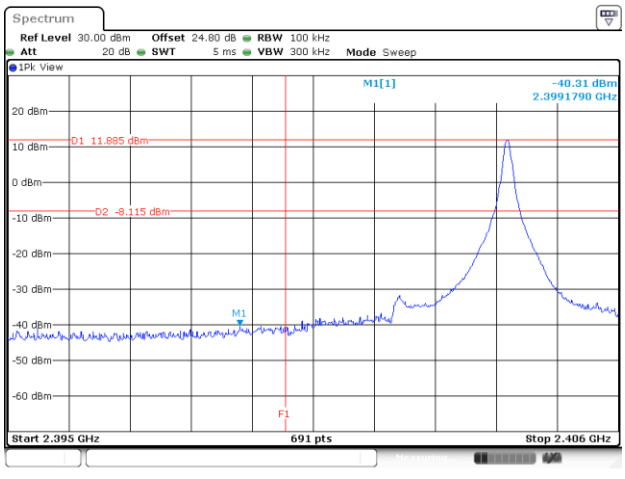
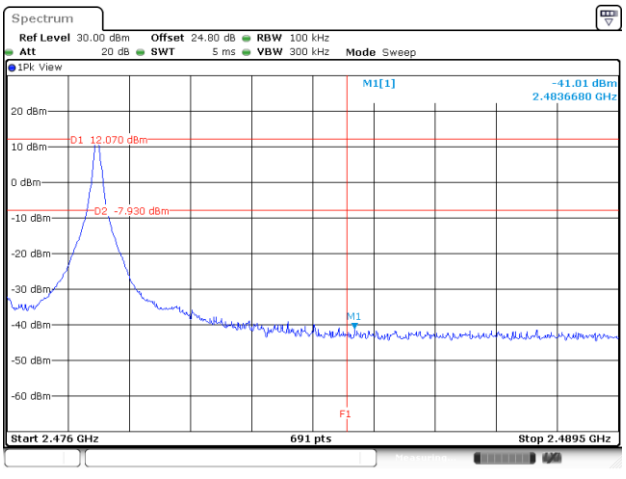


99% Occupied Bandwidth on Channel 76



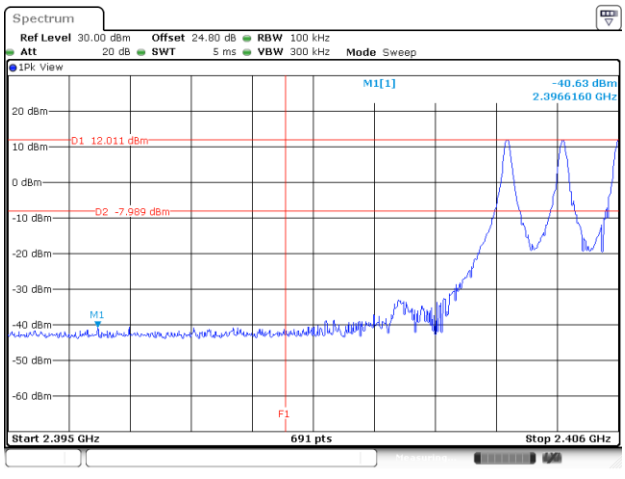
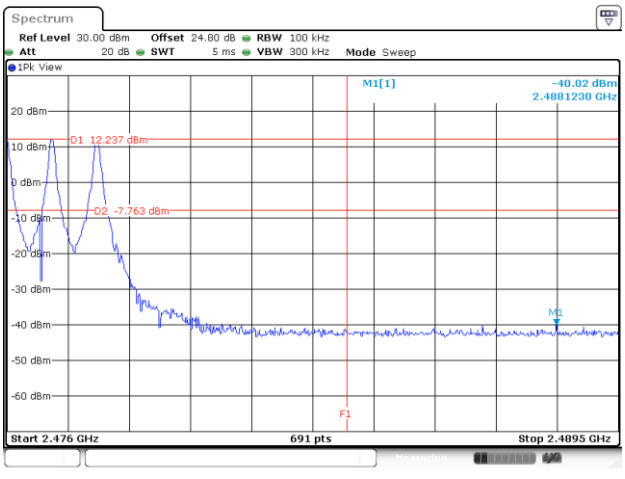
Band Edges

<1Mbps>

Low Band Edge Plot on Channel 02	High Band Edge Plot on Channel 76
	

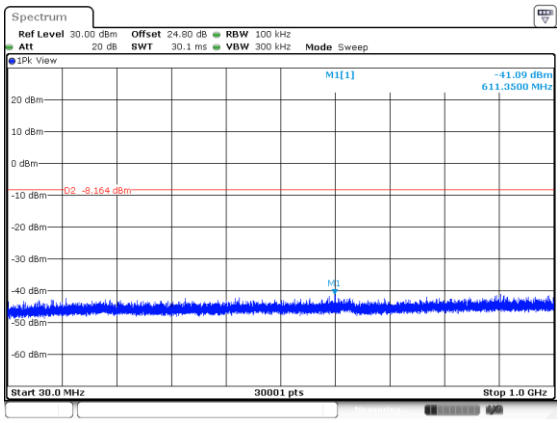
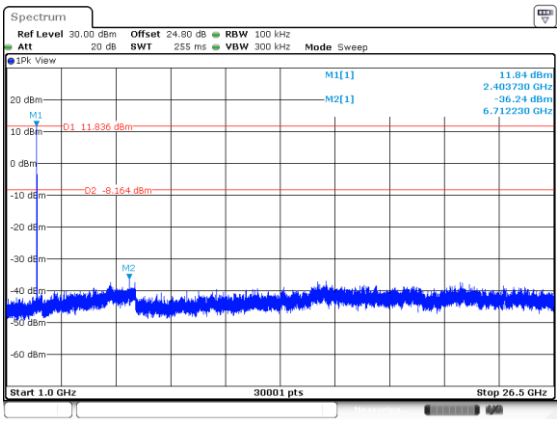
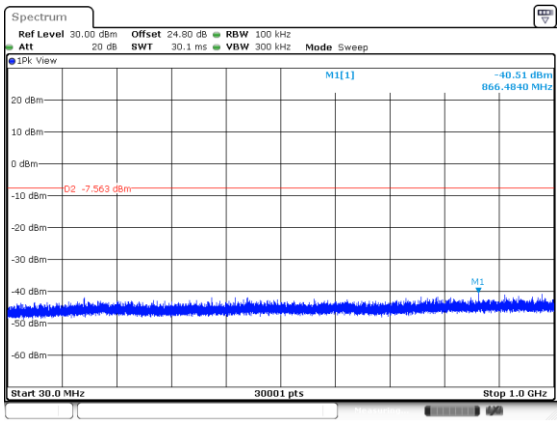
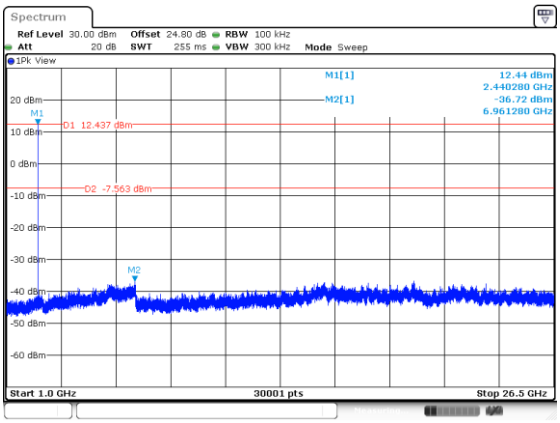
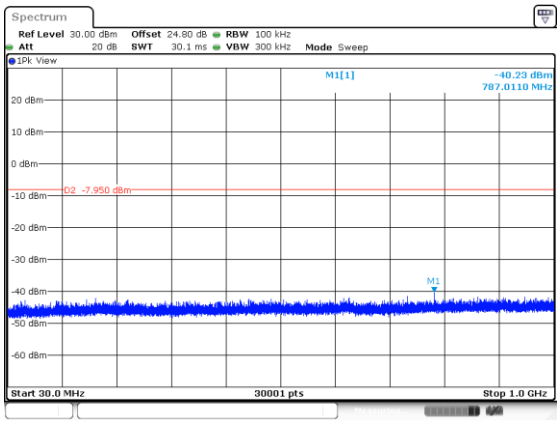
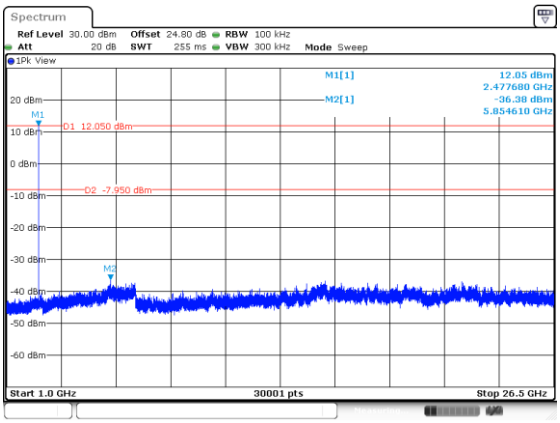
Hopping Mode Band Edges

<1Mbps>

Hopping Mode Low Band Edge Plot	Hopping Mode High Band Edge Plot
	

Conducted Spurious Emission

<1Mbps>

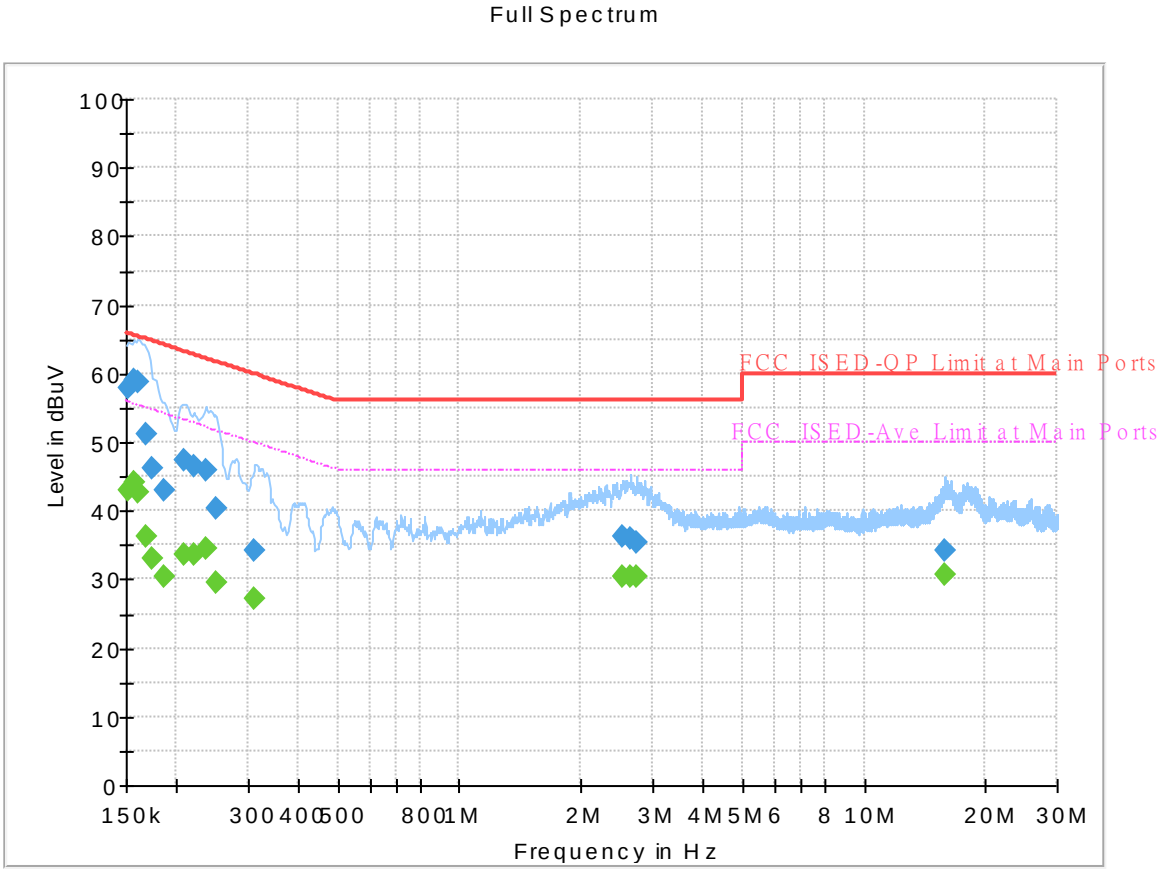
CSE Plot on Low Ch between 30MHz ~ 1 GHz	CSE Plot on Low Ch between 1GHz ~ 26.5GHz
	
CSE Plot on Mid. Ch between 30MHz ~ 1 GHz	**CSE Plot on Mid. Ch between 1GHz ~ 26.5GHz**
	
CSE Plot on High Ch between 30MHz ~ 1 GHz	**CSE Plot on High Ch between 1GHz ~ 26.5GHz**
	

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Brian Chen	**Temperature :**	23~26℃
		Relative Humidity :	45~55%

EUT Information

Report NO :	571515-01
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line



Final_Result

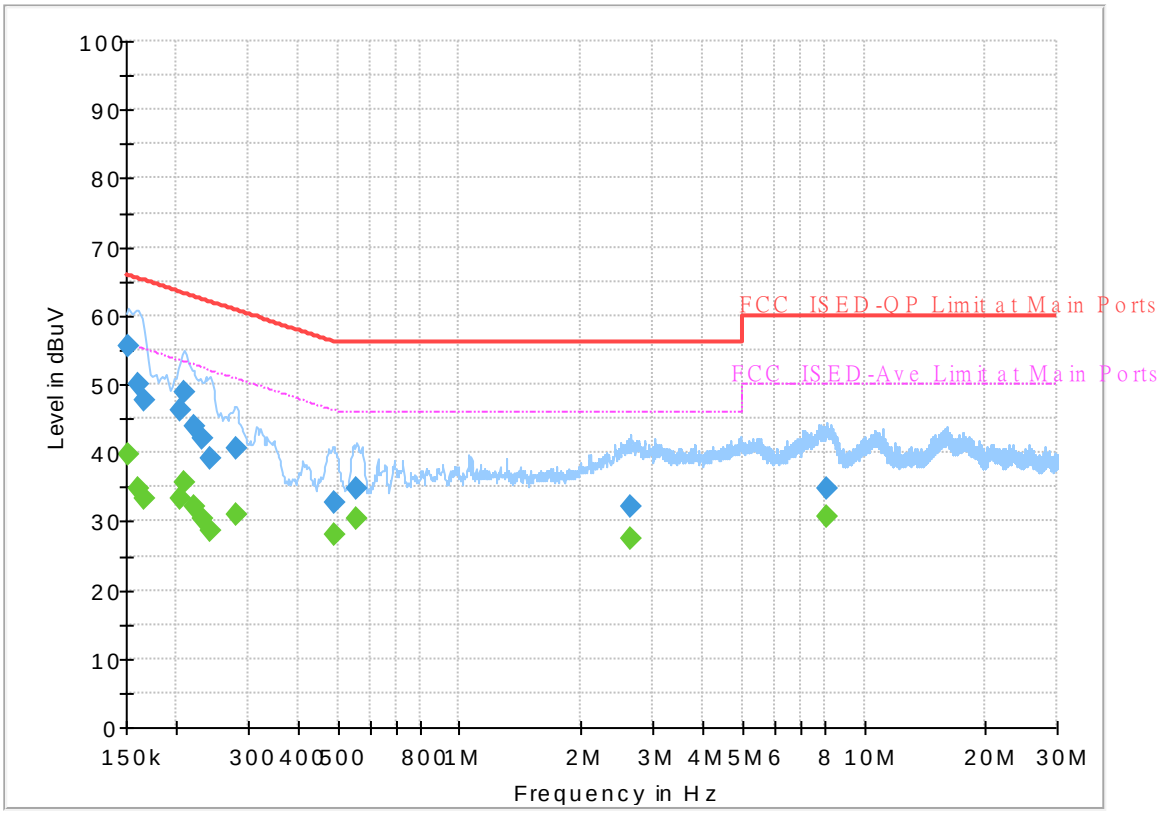
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	42.95	55.88	12.93	L1	OFF	19.8
0.152250	57.86	---	65.88	8.02	L1	OFF	19.8
0.156750	---	44.25	55.63	11.38	L1	OFF	19.8
0.156750	59.09	---	65.63	6.54	L1	OFF	19.8
0.161250	---	42.76	55.40	12.64	L1	OFF	19.8
0.161250	58.69	---	65.40	6.71	L1	OFF	19.8
0.168000	---	36.34	55.06	18.72	L1	OFF	19.8
0.168000	51.15	---	65.06	13.91	L1	OFF	19.8
0.174750	---	32.94	54.73	21.79	L1	OFF	19.8
0.174750	46.27	---	64.73	18.46	L1	OFF	19.8
0.186000	---	30.40	54.21	23.81	L1	OFF	19.8
0.186000	43.08	---	64.21	21.13	L1	OFF	19.8
0.208500	---	33.61	53.27	19.66	L1	OFF	19.8
0.208500	47.43	---	63.27	15.84	L1	OFF	19.8
0.219750	---	33.58	52.83	19.25	L1	OFF	19.8
0.219750	46.47	---	62.83	16.36	L1	OFF	19.8
0.235500	---	34.37	52.25	17.88	L1	OFF	19.8
0.235500	46.01	---	62.25	16.24	L1	OFF	19.8
0.251250	---	29.67	51.72	22.05	L1	OFF	19.8
0.251250	40.36	---	61.72	21.36	L1	OFF	19.8
0.312000	---	27.10	49.92	22.82	L1	OFF	19.8

0.312000	34.23	---	59.92	25.69	L1	OFF	19.8
2.519250	---	30.51	46.00	15.49	L1	OFF	19.9
2.519250	36.20	---	56.00	19.80	L1	OFF	19.9
2.647500	---	30.44	46.00	15.56	L1	OFF	19.9
2.647500	35.85	---	56.00	20.15	L1	OFF	19.9
2.742000	---	30.46	46.00	15.54	L1	OFF	20.0
2.742000	35.42	---	56.00	20.58	L1	OFF	20.0
15.882000	---	30.70	50.00	19.30	L1	OFF	20.6
15.882000	34.32	---	60.00	25.68	L1	OFF	20.6

EUT Information

Report NO :	571515-01
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	39.75	55.88	16.13	N	OFF	19.8
0.152250	55.53	---	65.88	10.35	N	OFF	19.8
0.161250	---	34.92	55.40	20.48	N	OFF	19.8
0.161250	50.05	---	65.40	15.35	N	OFF	19.8
0.165750	---	33.22	55.17	21.95	N	OFF	19.8
0.165750	47.53	---	65.17	17.64	N	OFF	19.8
0.204000	---	33.38	53.45	20.07	N	OFF	19.8
0.204000	46.16	---	63.45	17.29	N	OFF	19.8
0.208500	---	35.56	53.27	17.71	N	OFF	19.8
0.208500	48.89	---	63.27	14.38	N	OFF	19.8
0.219750	---	32.24	52.83	20.59	N	OFF	19.8
0.219750	43.79	---	62.83	19.04	N	OFF	19.8
0.231000	---	30.28	52.41	22.13	N	OFF	19.8
0.231000	42.03	---	62.41	20.38	N	OFF	19.8
0.242250	---	28.64	52.02	23.38	N	OFF	19.8
0.242250	39.29	---	62.02	22.73	N	OFF	19.8
0.280500	---	31.11	50.80	19.69	N	OFF	19.8
0.280500	40.65	---	60.80	20.15	N	OFF	19.8
0.489750	---	28.09	46.17	18.08	N	OFF	19.8
0.489750	32.78	---	56.17	23.39	N	OFF	19.8
0.557250	---	30.50	46.00	15.50	N	OFF	19.8

0.557250	**34.84**	**---**	**56.00**	**21.16**	**N**	**OFF**	**19.8**
2.654250	**---**	**27.42**	**46.00**	**18.58**	**N**	**OFF**	**19.9**
2.654250	**32.25**	**---**	**56.00**	**23.75**	**N**	**OFF**	**19.9**
8.094750	**---**	**30.82**	**50.00**	**19.18**	**N**	**OFF**	**20.4**
8.094750	**34.90**	**---**	**60.00**	**25.10**	**N**	**OFF**	**20.4**

Appendix C. Radiated Spurious Emission Test Data

Test Engineer :	Jesse Wang, Stan Hsieh, Ken Wu	**Temperature :**	20.8~28.1°C
		Relative Humidity :	54.6~66.8%

Note symbol

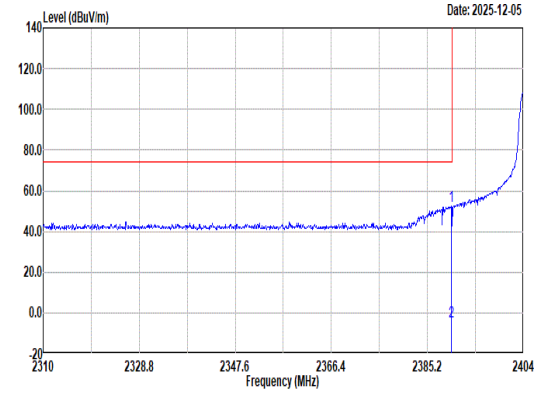
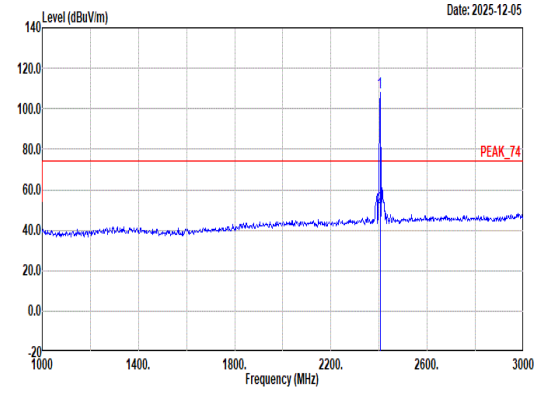
-L	**Low channel location**
-R	**High channel location**

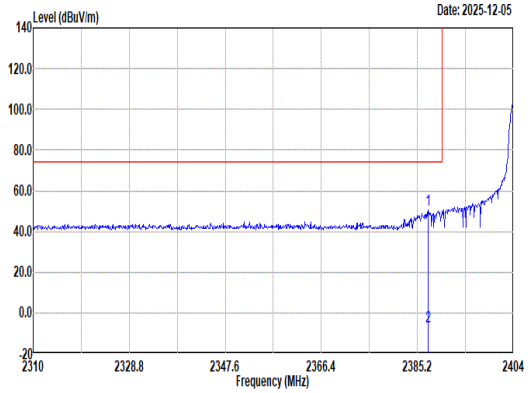
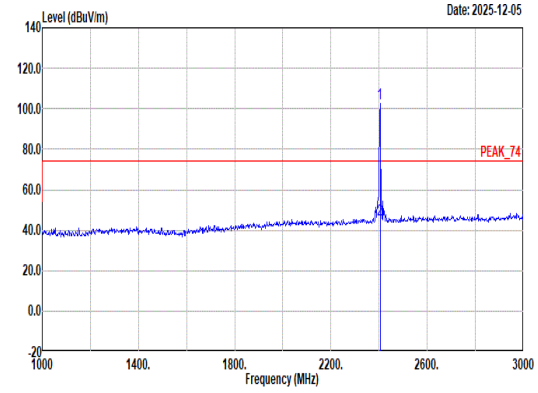
C1.Radiated Spurious Emission Test Modes

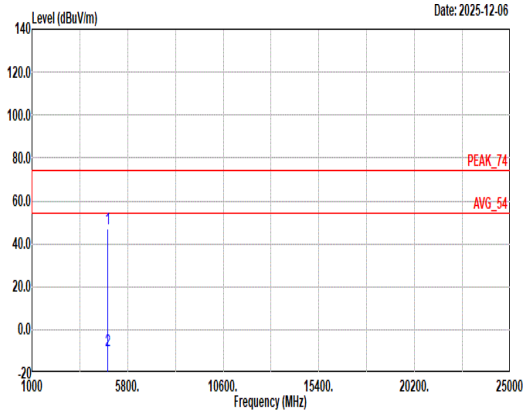
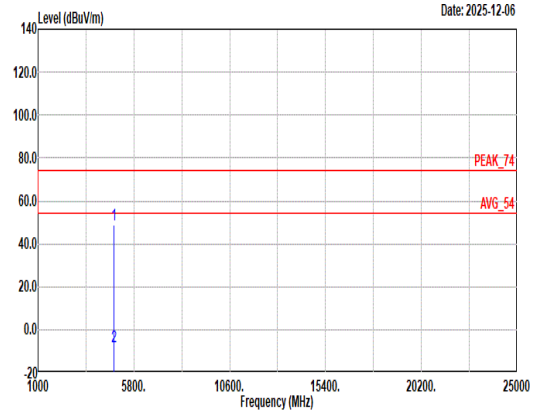
Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 36	2400-2483.5	7+6	BLE CS_ASK	02	2404	1Mbps	-	-
Mode 37	2400-2483.5	7+6	BLE CS_ASK	38	2440	1Mbps	-	-
Mode 38	2400-2483.5	7+6	BLE CS_ASK	76	2478	1Mbps	-	-

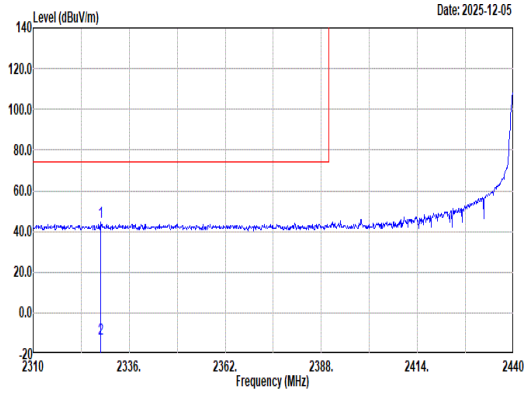
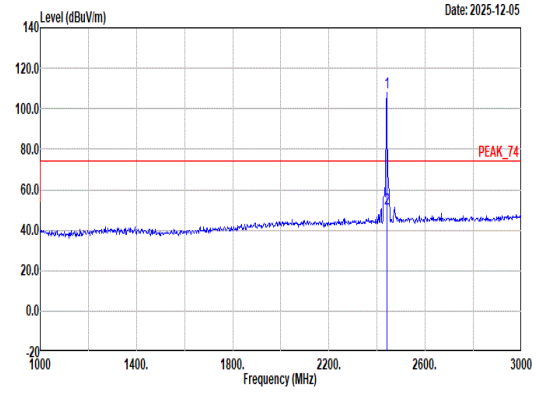
C2.Summary of each worse mode

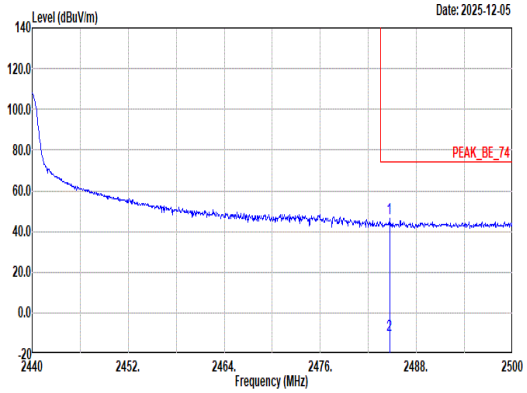
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	RU	Remark
36	BLE CS_ASK	02	2389.90	52.59	74.00	-21.41	H	Peak	Pass	-	Band Edge
	BLE CS_ASK	02	4808.00	48.95	74.00	-25.05	V	Peak	Pass	-	Harmonic
37	BLE CS_ASK	38	2484.64	46.38	74.00	-27.62	H	Peak	Pass	-	Band Edge
	BLE CS_ASK	38	4880.00	49.76	74.00	-24.24	V	Peak	Pass	-	Harmonic
38	BLE CS_ASK	76	2483.59	58.98	74.00	-15.02	H	Peak	Pass	-	Band Edge
	BLE CS_ASK	76	4956.00	50.61	74.00	-23.39	H	Peak	Pass	-	Harmonic

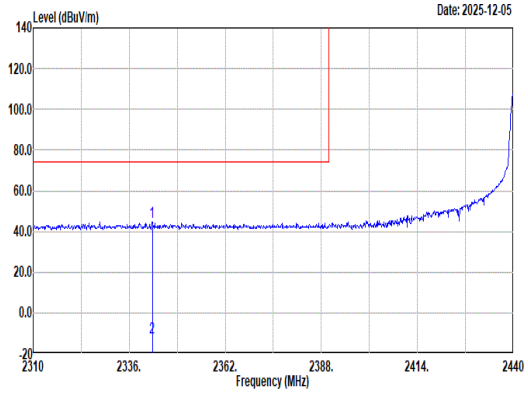
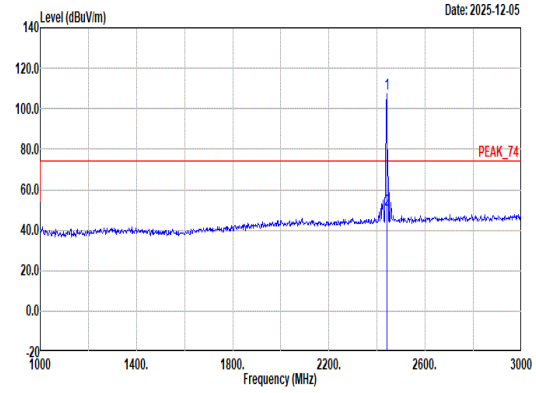
Mode	36	
	Band Edge	
	2400-2483.5_BLE CS_ASK_CH02_2404MHz	
ANT	7+6	
Pol.	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2389.90 52.59 74.00 -21.41 46.80 32.10 8.36 34.67 0.00 312 0 Peak 2 2389.90 -4.49 54.00 -58.49 -- -- -- -- -- -- -- AVERAGE	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2404.00 108.26 ------ ------ 102.50 32.04 8.39 34.67 0.00 312 0 Peak 2 2404.00 51.18 ------ ------ -- -- -- -- -- -- -- Average

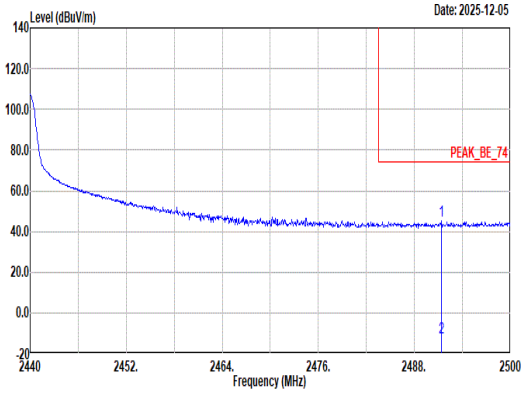
Mode	36	
	Band Edge	
	2400-2483.5_BLE CS_ASK_CH02_2404MHz	
ANT	7+6	
Pol.	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2387.36 50.66 74.00 -23.34 44.87 32.10 8.36 34.67 0.00 319 324 Peak 2 2387.36 -6.42 54.00 -60.42 -- -- -- -- -- -- -- AVERAGE	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2404.00 102.53 ------ ------ 96.77 32.04 8.39 34.67 0.00 319 324 Peak 2 2404.00 45.45 ------ ------ -- -- -- -- -- -- -- Average

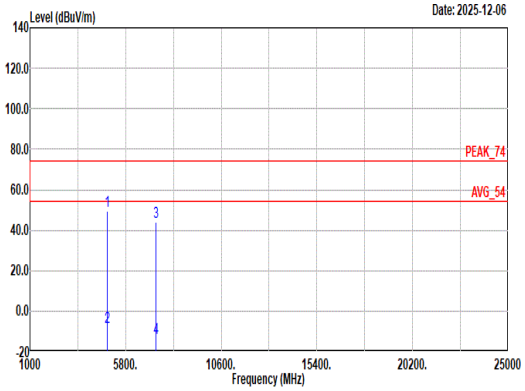
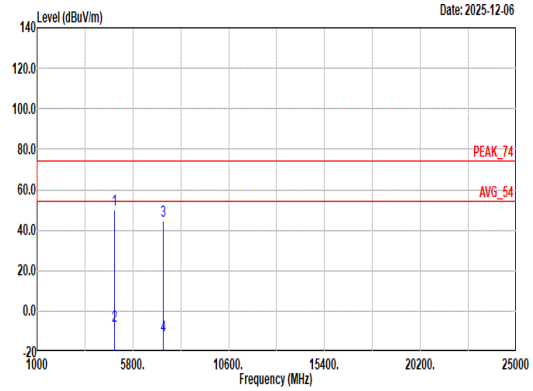
Mode	36	
	Harmonic	
	2400-2483.5_BLE CS_ASK_CH02_2404MHz	
ANT	7+6	
Pol.	Horizontal	Vertical
Peak Avg	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 HORIZONTAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4808.00 47.10 74.00 -26.90 58.14 34.38 11.93 58.40 1.05 -- -- Peak 2 4808.00 -9.98 54.00 -63.98 -- -- -- -- -- -- -- Average	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 VERTICAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4808.00 48.95 74.00 -25.05 59.99 34.38 11.93 58.40 1.05 -- -- Peak 2 4808.00 -8.13 54.00 -62.13 -- -- -- -- -- -- -- Average

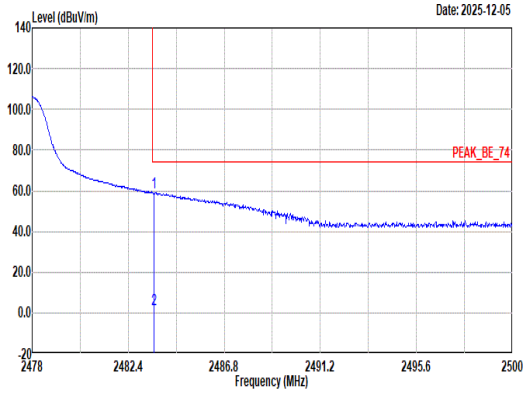
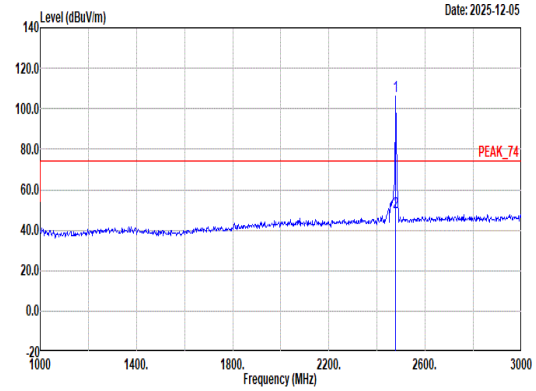
Mode	37	
	Band Edge - L	
	2400-2483.5_BLE CS_ASK_CH38_2440MHz	
ANT	7+6	
Pol.	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2328.33 44.45 74.00 -29.55 38.78 32.08 8.25 34.66 0.00 335 0 Peak 2 2328.33 -12.63 54.00 -66.63 -- -- -- -- -- -- -- AVERAGE	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2440.00 107.81 ------ ------ 102.03 32.00 8.45 34.67 0.00 335 0 Peak 2 2440.00 50.73 ------ ------ -- -- -- -- -- -- -- Average

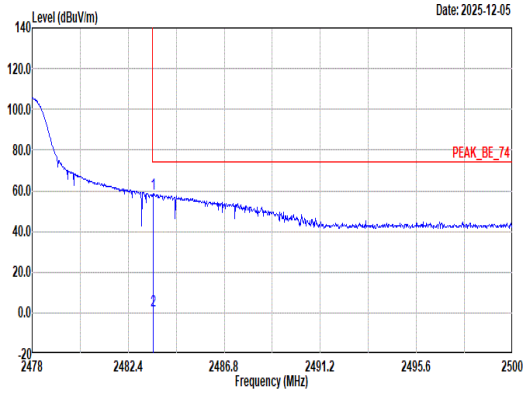
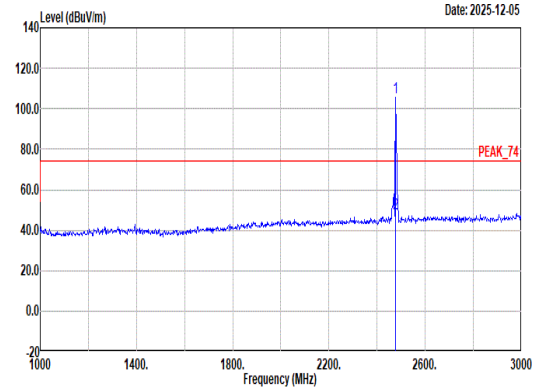
Mode	37	
	Band Edge - R	
	2400-2483.5_BLE CS_ASK_CH38_2440MHz	
ANT	7+6	
Pol.	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2484.64 46.38 74.00 -27.62 40.29 32.25 8.52 34.68 0.00 335 0 Peak 2 2484.64 -10.70 54.00 -64.70 -- -- -- -- -- -- -- AVERAGE	Blank

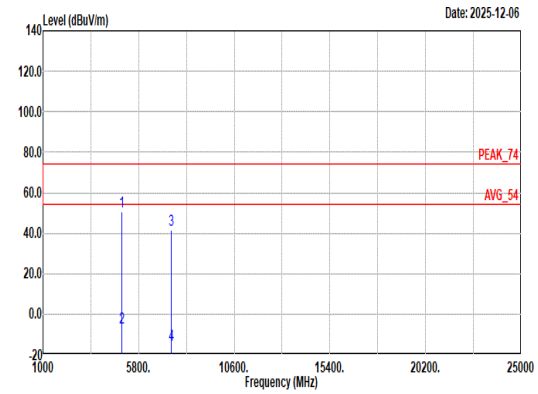
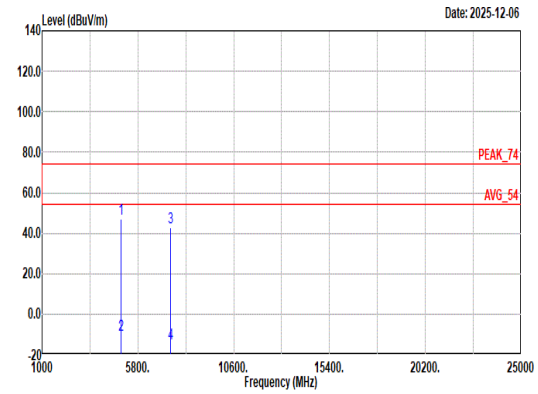
Mode	37	
	Band Edge - L	
	2400-2483.5_BLE CS_ASK_CH38_2440MHz	
ANT	7+6	
Pol.	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2342.24 44.76 74.00 -29.24 39.05 32.10 8.27 34.66 0.00 343 333 Peak 2 2342.24 -12.32 54.00 -66.32 -- -- -- -- -- -- -- AVERAGE	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2440.00 107.10 ------ ------ 101.32 32.00 8.45 34.67 0.00 343 333 Peak 2 2440.00 50.02 ------ ------ -- -- -- -- -- -- -- Average

Mode	37	
	Band Edge - R	
	2400-2483.5_BLE CS_ASK_CH38_2440MHz	
ANT	7+6	
Pol.	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2491.42 45.22 74.00 -28.78 39.06 32.31 8.53 34.68 0.00 343 333 Peak 2 2491.42 -11.86 54.00 -65.86 -- -- -- -- -- -- -- AVERAGE	Blank

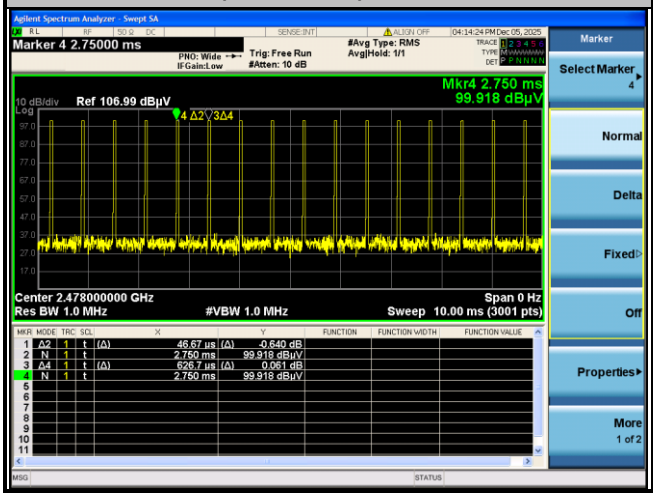
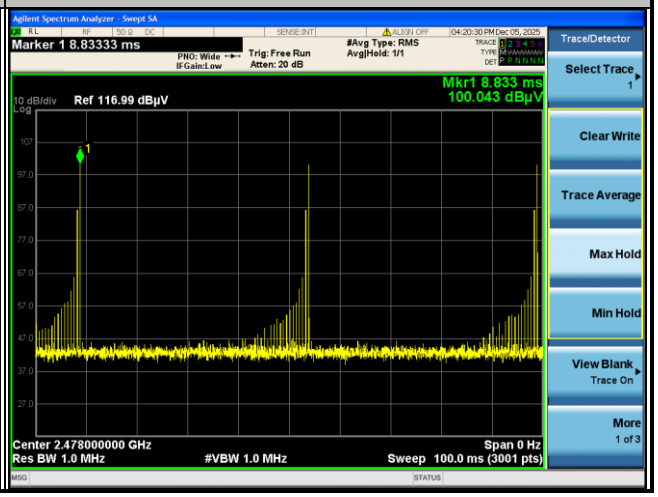
Mode	37	
	Harmonic	
	2400-2483.5_BLE CS_ASK_CH38_2440MHz	
ANT	7+6	
Pol.	Horizontal	Vertical
Peak Avg	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 HORIZONTAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4880.00 49.35 74.00 -24.65 60.28 34.30 12.03 58.25 0.99 -- -- Peak 2 4880.00 -7.73 54.00 -61.73 -- -- -- -- -- -- -- Average 3 7320.00 43.99 74.00 -30.01 50.17 35.66 14.70 57.70 1.16 -- -- Peak 4 7320.00 -13.09 54.00 -67.09 -- -- -- -- -- -- -- Average	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 VERTICAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4880.00 49.76 74.00 -24.24 60.69 34.30 12.03 58.25 0.99 -- -- Peak 2 4880.00 -7.32 54.00 -61.32 -- -- -- -- -- -- -- Average 3 7320.00 44.64 74.00 -29.36 50.82 35.66 14.70 57.70 1.16 -- -- Peak 4 7320.00 -12.44 54.00 -66.44 -- -- -- -- -- -- -- Average

Mode	38	
	Band Edge	
	2400-2483.5_BLE CS_ASK_CH76_2478MHz	
ANT	7+6	
Pol.	Horizontal	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.59 58.98 74.00 -15.02 52.90 32.24 8.52 34.68 0.00 173 0 Peak 2 2483.59 1.90 54.00 -52.10 -- -- -- -- -- -- -- AVERAGE	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2478.00 106.13 ------ ------ 100.08 32.22 8.51 34.68 0.00 173 0 Peak 2 2478.00 49.05 ------ ------ -- -- -- -- -- -- -- Average

Mode	38	
	Band Edge	
	2400-2483.5_BLE CS_ASK_CH76_2478MHz	
ANT	7+6	
Pol.	Vertical	Fundamental
Peak	 Site : 03CH07-HY Condition: PEAK_BE_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.54 58.28 74.00 -15.72 52.20 32.24 8.52 34.68 0.00 368 339 Peak 2 2483.54 1.20 54.00 -52.80 -- -- -- -- -- -- -- AVERAGE	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2478.00 105.42 ------ ------ 99.37 32.22 8.51 34.68 0.00 368 339 Peak 2 2478.00 48.34 ------ ------ -- -- -- -- -- -- -- Average

Mode	38	
	Harmonic	
	2400-2483.5_BLE CS_ASK_CH76_2478MHz	
ANT	7+6	
Pol.	Horizontal	Vertical
Peak Avg	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 HORIZONTAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark 1 4956.00 50.61 74.00 -23.39 61.33 34.31 12.13 58.09 0.93 -- -- Peak 2 4956.00 -6.47 54.00 -60.47 -- -- -- -- -- -- -- Average 3 7434.00 41.84 74.00 -32.16 48.05 35.70 14.87 57.90 1.12 -- -- Peak 4 7434.00 -15.24 54.00 -69.24 -- -- -- -- -- -- -- Average	 Site : 03CH07-HY Condition: PEAK_74 3m HF_ANT_00066584 VERTICAL Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark 1 4956.00 46.96 74.00 -27.04 57.68 34.31 12.13 58.09 0.93 -- -- Peak 2 4956.00 -10.12 54.00 -64.12 -- -- -- -- -- -- -- Average 3 7434.00 42.73 74.00 -31.27 48.94 35.70 14.87 57.90 1.12 -- -- Peak 4 7434.00 -14.35 54.00 -68.35 -- -- -- -- -- -- -- Average

Appendix D. Duty Cycle Plots

ASK on time (One Pulse) Plot on Channel 38	on time (Count Pulses) Plot on Channel 38
	

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 0.14 / 100 = 0.28 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -57.08 Db
3. **ASK** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

0.14 ms x 20 channels = 2.8 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 2.8 ms] = 2 hops

Thus, the maximum possible ON time:

0.14 ms x 2 = 0.28 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(0.28 ms/100 ms) = -57.08 dB