




TEST REPORT

For Bluetooth-LE

Report No. : **CHEW22120054** Report Verification: 

Project No...... : **SHT2208214102EW**

FCC ID..... : **SS4SF650**

Applicant's name..... : **BLUEBIRD INC.**

Address..... : 3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea

Product Name : **Smart Full Touch Handheld Computer**

Trade Mark : BLUEBIRD

Model No. : SF650

Listed Model(s) : -


Standard : **FCC CFR Title 47 Part 15 Subpart C Section 15.247**

Date of receipt of test sample..... : Nov.15, 2022


Date of testing..... : Nov.16, 2022-Dec.07, 2022

Date of issue..... : Dec.08, 2022

Result..... : **PASS**

Compiled by
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Testing Laboratory Name : **Shenzhen Huatongwei International Inspection Co., Ltd.**

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The test report merely correspond to the test sample.

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1. TEST STANDARDS AND REPORT VERSION

1.1. Test Standards

The tests were performed according to following standards:

- [FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
- [ANSI C63.10:2013](#): American National Standard for Testing Unlicensed Wireless Devices
- [KDB 558074 D01 15.247 Meas Guidance v05r02](#): Guidance for Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating under Section 15.247 of The FCC Rules

1.2. Report version

Revision No.	Date of issue	Description
N/A	2022-12-08	Original

2. TEST DESCRIPTION

Report clause	Test Items	Standard Requirement	Result	Test Engineer
5.1	Antenna Requirement	15.203/15.247(c)	PASS	Xiaoxiao Li
5.2	AC Conducted Emission	15.207	PASS	Dongyang Wu
5.3	Peak Output Power	15.247(b)(3)	PASS	Xiaoxiao Li
5.4	Power Spectral Density	15.247(e)	PASS	Xiaoxiao Li
5.5	6dB Bandwidth	15.247(a)(2)	PASS	Xiaoxiao Li
5.6	99% Occupied Bandwidth	-	PASS ^{*1}	Xiaoxiao Li
5.7	Duty cycle	-	PASS ^{*1}	Xiaoxiao Li
5.8	Conducted Band Edge and Spurious Emission	15.247(d)/15.205	PASS	Xiaoxiao Li
5.9	Radiated Band Edge Emission	15.205/15.209	PASS	Yifan Wang
5.10	Radiated Spurious Emission	15.247(d)/15.205/15.209	PASS	Quanhai Deng

Note:

- The measurement uncertainty is not included in the test result.
- *1: No requirement on standard, only report these test data.

3. SUMMARY

3.1. Client Information

Applicant:	BLUEBIRD INC.
Address:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea
Manufacturer:	BLUEBIRD INC.
Address:	3F, 115, Irwon-ro, Gangnam-gu, Seoul, Republic of Korea
Factory1:	Bluebird Inc.
Address:	SSang-young IT Twin tower-B 7~8F), 531, Dunchon-daero, Jungwon-gu, Seongnam-si, Gyeonggi-do, Korea
Factory2:	TOP INTERCUBE ELECTRONICS VINA CO., LTD
Address:	Lo C1,Ba thien II Industrial park, Thien Ke Ward, Binh Xuyen District,Vinh Phuc Province, Vietnam

3.2. Product Description

Main unit information:	
Product Name:	Smart Full Touch Handheld Computer
Trade Mark:	BLUEBIRD
Model No.:	SF650
Listed Model(s):	-
Power supply:	DC 3.85V from Battery
Hardware version:	V01
Software version:	SF650-AND12-EN-20221119_R1.00-user
Accessory unit information:	
Battery information:	Model: BAT-500001 Type: LI-ION POLYMER BATTERY Rated/Min: 4850mAh, 18.67Wh Typical Capacity: 5000mAh, 19.25Wh Limited Charge Voltage: 4.4V Nominal Voltage: 3.85V
Adapter information:	Model: KSA29B0500200D5 Input: 100-240Va.c., 50/60Hz 0.5A Output: 5.0Vd.c., 2.0A 10.0W

3.3. Radio Specification Description

Bluetooth version:	V5.0
Support function ^{*2} :	BLE
Modulation:	GFSK
Operation frequency:	2402MHz~2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	PIFA Antenna
Antenna gain:	-1.5 dBi

Note:

*2: only show the RF function associated with this report.

3.4. Testing Laboratory Information

Laboratory Name	Shenzhen Huatongwei International Inspection Co., Ltd.	
Laboratory Location	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China	
Connect information:	Phone: 86-755-26715499 E-mail: cs@szhtw.com.cn http://www.szhtw.com.cn	
Qualifications	Type	Accreditation Number
	FCC	762235

4. TEST CONFIGURATION

4.1. Test frequency list

According to section 15.31(m), regards to the operating frequency range over 10 MHz, must select three channels which were tested. The Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, please see the below blue front.

Channel	Frequency (MHz)
00	2402
01	2404
.
19	2440
.
38	2478
39	2480

4.2. Descriptions of Test mode

For RF test items
The engineering test program was provided and enabled to make EUT continuous transmit.
For Radiated spurious emissions:
The engineering test program was provided and enabled to make EUT continuous transmit. The EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data Recorded in the report.

4.3. Test sample information

Test item	HTW sample no.
RF Conducted test items	Please refer to the description in the appendix report
RF Radiated test items	YPHT22082141010
EMI test items	YPHT22082141011

Note:

RF Conducted test items: Peak Output Power, Power Spectral Density, 6dB Bandwidth, 99% Occupied Bandwidth, Duty cycle, Conducted Band Edge and Spurious Emission

RF Radiated test items: Radiated Band Edge Emission, Radiated Spurious Emission

EMI test items: AC Conducted Emission

4.4. Support unit used in test configuration and system

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The following peripheral devices and interface cables were connected during the measurement:

Whether support unit is used?			
✓ No			
Item	Equipment	Trade Name	Model No.
1			
2			

4.5. Testing environmental condition

Type	Requirement	Actual
Temperature:	15~35°C	25°C
Relative Humidity:	25~75%	50%
Air Pressure:	860~1060mbar	1000mbar

4.6. Statement of the measurement uncertainty

No.	Test Items	Measurement Uncertainty
1	AC Conducted Emission	3.21dB
2	Peak Output Power	1.07
3	Power Spectral Density	1.07
4	6dB Bandwidth	0.002%
5	99% Occupied Bandwidth	0.002%
6	Duty cycle	-
7	Conducted Band Edge and Spurious Emission	1.68dB
8	Radiated Band Edge Emission	4.54dB for 30MHz-1GHz 5.10dB for above 1GHz
9	Radiated Spurious Emission	4.54dB for 30MHz-1GHz 5.10dB for above 1GHz

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

4.7. Equipment Used during the Test

● Conducted Emission							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Shielded Room	Albatross projects	HTWE0114	N/A	N/A	2018/09/28	2023/09/27
●	EMI Test Receiver	R&S	HTWE0111	ESCI	101247	2022/08/30	2023/08/29
●	Artificial Mains	SCHWARZBECK	HTWE0113	NNLK 8121	573	2022/08/29	2023/08/28
●	Pulse Limiter	R&S	HTWE0193	ESH3-Z2	101447	2022/08/29	2023/08/28
●	RF Connection Cable	HUBER+SUHNER	HTWE0113-02	ENVIROFLE X_142	EF-NM-BNCM-2M	2022/09/17	2023/09/16
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-6th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0127	SAC-3m-02	C11121	2018/09/30	2023/09/29
●	EMI Test Receiver	R&S	HTWE0099	ESCI	100900	2022/08/30	2023/08/29
●	Loop Antenna	R&S	HTWE0170	HFH2-Z2	100020	2021/04/06	2024/04/05
●	Ultra-Broadband Antenna	SCHWARZBECK	HTWE0123	VULB9163	538	2021/04/06	2024/04/05
●	Pre-Amplifier	SCHWARZBECK	HTWE0295	BBV 9742	N/A	2022/11/04	2023/11/03
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-01	N/A	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0062-02	SUCOFLEX104	501184/4	2022/02/25	2023/02/24
●	Test Software	R&S	N/A	ES-K1	N/A	N/A	N/A

● Radiated emission-7th test site							
Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Semi-Anechoic Chamber	Albatross projects	HTWE0122	SAC-3m-01	C11121	2018/09/27	2023/09/26
●	Spectrum Analyzer	R&S	HTWE0098	FSP40	100597	2022/08/25	2023/08/24
●	Horn Antenna	SCHWARZBECK	HTWE0126	9120D	1011	2020/04/01	2023/03/31
●	Broadband Horn Antenna	SCHWARZBECK	HTWE0103	BBHA9170	BBHA9170472	2020/04/27	2023/04/26
●	Pre-amplifier	CD	HTWE0071	PAP-0102	12004	2022/11/04	2023/11/03
●	Broadband Pre-amplifier	SCHWARZBECK	HTWE0201	BBV 9718	9718-248	2022/02/28	2023/02/27
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-01	6m 18GHz S Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-02	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0119-05	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	RF Connection Cable	HUBER+SUHNER	HTWE0120-04	6m 3GHz RG Serisa	N/A	2022/02/25	2023/02/24
●	Test Software	Audix	N/A	E3	N/A	N/A	N/A

Used	Test Equipment	Manufacturer	Equipment No.	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
●	Signal and spectrum Analyzer	R&S	HTWE0242	FSV40	100048	2022/08/25	2023/08/24
●	Signal & Spectrum Analyzer	R&S	HTWE0262	FSW26	103440	2022/08/25	2023/08/24
●	Spectrum Analyzer	Agilent	HTWE0286	N9020A	MY50510187	2022/08/25	2023/08/24
●	Radio communication tester	R&S	HTWE0287	CMW500	137688-Lv	2022/08/25	2023/08/24
●	Test software	Tonscend	N/A	JS1120	N/A	N/A	N/A

5. TEST CONDITIONS AND RESULTS

5.1. Antenna Requirement

REQUIREMENT

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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, 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.

FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):

(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

TEST RESULT

Passed Not Applicable

The antenna type is a PIFA antenna, the directional gain of the antenna less than 6 dBi, please refer to the below antenna photo.



5.2. AC Conducted Emission

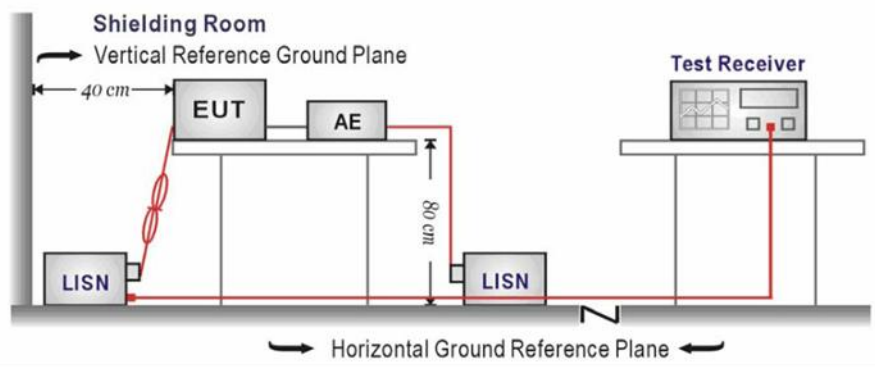
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	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.

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup according to ANSI C63.10 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST MODE

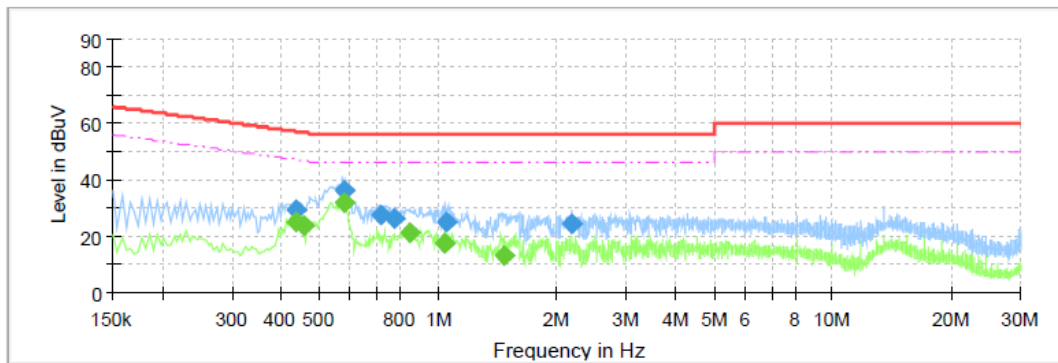
Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

Test Line:

L

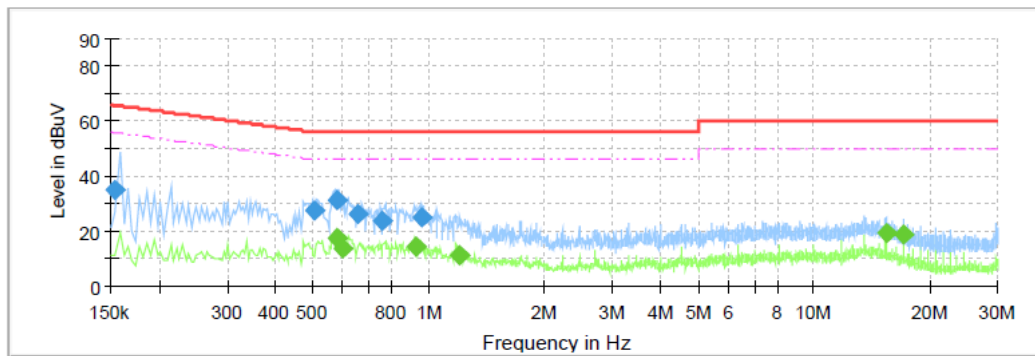


Final Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.435500	---	24.98	47.15	22.17	L1	10.0
0.435500	29.46	---	57.15	27.69	L1	10.0
0.455500	---	24.02	46.77	22.76	L1	10.0
0.575500	---	31.75	46.00	14.25	L1	10.0
0.579500	36.49	---	56.00	19.51	L1	10.0
0.719500	27.29	---	56.00	28.71	L1	10.0
0.775500	26.18	---	56.00	29.82	L1	10.0
0.843500	---	21.14	46.00	24.86	L1	10.0
1.043500	---	17.42	46.00	28.58	L1	10.0
1.051500	25.10	---	56.00	30.90	L1	10.0
1.467500	---	13.06	46.00	32.94	L1	10.0
2.175500	24.26	---	56.00	31.74	L1	10.0

Test Line:

N



Final Result

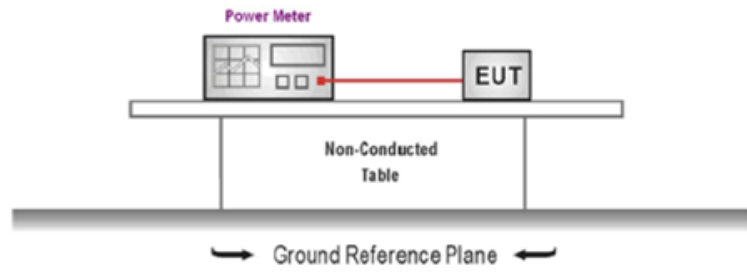
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Corr. (dB)
0.154000	34.76	---	65.78	31.03	N	10.0
0.507500	27.73	---	56.00	28.27	N	10.0
0.579500	---	17.68	46.00	28.32	N	10.0
0.579500	31.04	---	56.00	24.96	N	10.0
0.599500	---	14.02	46.00	31.98	N	10.0
0.651500	25.94	---	56.00	30.06	N	10.0
0.759500	23.72	---	56.00	32.28	N	10.0
0.931500	---	14.23	46.00	31.77	N	10.0
0.955500	24.95	---	56.00	31.05	N	10.0
1.199500	---	10.97	46.00	35.03	N	10.0
15.363500	---	19.23	50.00	30.77	N	10.3
17.167500	---	18.91	50.00	31.09	N	10.4

5.3. Peak Output Power

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (b)(3): 30dBm

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was tested according to ANSI C63.10 and KDB 558074 D01 requirements.
2. The maximum peak conducted output power may be measured using a broadband peak RF power meter.
3. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.
4. Record the measurement data.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

TEST DATA

Please refer to appendix A on the appendix report

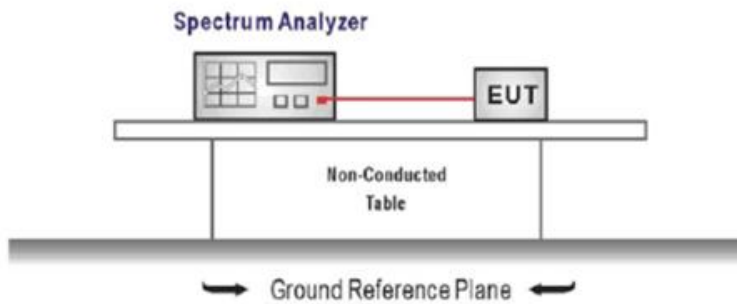
5.4. Power Spectral Density

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (e):

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input,
2. Configure the spectrum analyzer as shown below:
Center frequency=DTS channel center frequency
Span =1.5 times the DTS bandwidth
RBW = 3 kHz ≤ RBW ≤ 100 kHz, VBW ≥ 3 × RBW
Sweep time = auto couple
Detector = peak
Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter wave form on the spectrum analyzer.
4. Use the peak marker function to determine the maximum amplitude level within the RBW.
5. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

TEST DATA

Please refer to appendix B on the appendix report

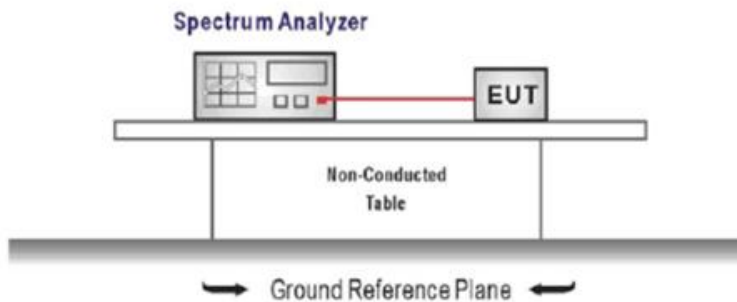
5.5. 6dB bandwidth

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(2):

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
Center Frequency =DTS channel center frequency
Span=2 x DTS bandwidth
RBW = 100 kHz, VBW \geq 3 \times RBW
Sweep time= auto couple
Detector = Peak
Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission, and record the pertinent measurements.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

TEST DATA

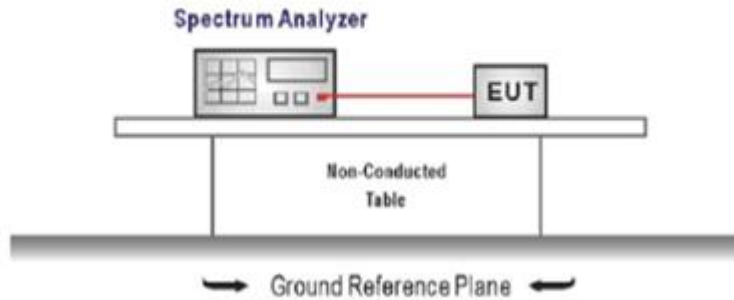
Please refer to appendix C on the appendix report

5.6. 99% Occupied Bandwidth

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).
Center Frequency = channel center frequency
Span $\geq 1.5 \times$ OBW
RBW = 1%~5%OBW
VBW $\geq 3 \times$ RBW
Sweep time = auto couple
Detector = Peak
Trace mode = max hold
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

TEST DATA

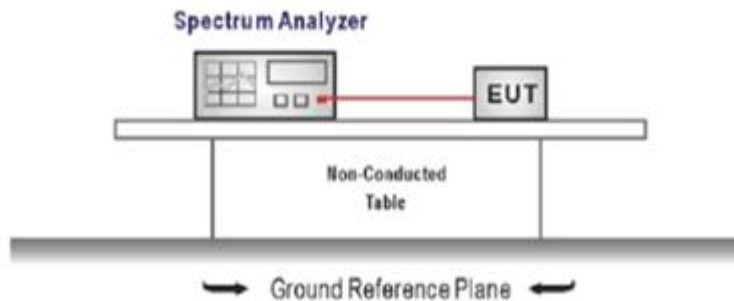
Please refer to appendix D on the appendix report

5.7. Duty Cycle

LIMIT

N/A

TEST CONFIGURATION



TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
Span=zero span, Frequency=centered channel, RBW= 1 MHz, VBW \geq RBW
Sweep=as necessary to capture the entire dwell time,
Detector function = peak, Trigger mode
4. Measure and record the duty cycle data

TEST MODE

Please refer to the clause 4.2

TEST DATA

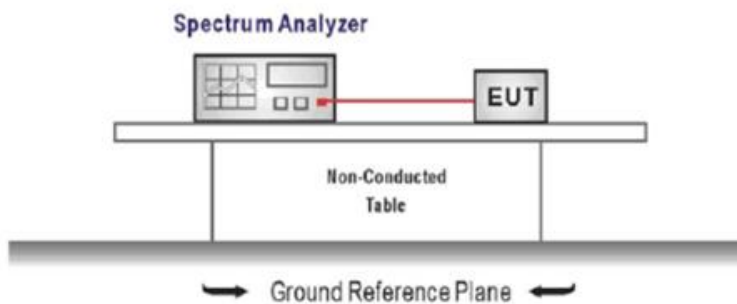
Please refer to appendix E on the appendix report

5.8. Conducted Band edge and Spurious Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION



TEST PROCEDURE

1. Connect the antenna port(s) to the spectrum analyzer input.
2. Emission level measurement
Set the center frequency and span to encompass frequency range to be measured
RBW = 100 kHz, VBW $\geq 3 \times$ RBW
Detector = peak, Sweep time = auto couple, Trace mode = max hold
Allow trace to fully stabilize
Use the peak marker function to determine the maximum amplitude level.
3. Place the radio in continuous transmit mode, allow the trace to stabilize, view the transmitter waveform on the spectrum analyzer.
4. Ensure that the amplitude of all unwanted emission outside of the authorized frequency band excluding restricted frequency bands) are attenuated by at least the minimum requirements specified (at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz). Report the three highest emission relative to the limit.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

TEST DATA

Please refer to appendix F on the appendix report

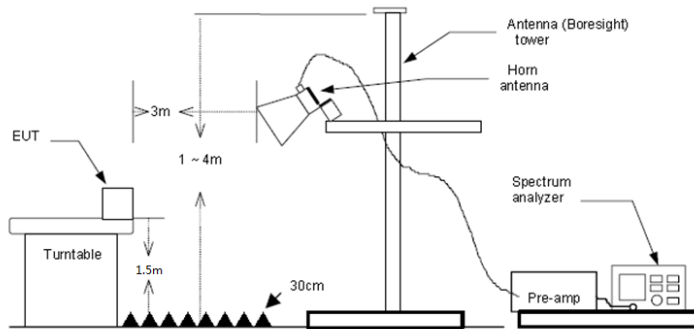
5.9. Radiated Band edge Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 .
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10 on radiated measurement.
5. Use the following spectrum analyzer settings:
 - a) Span shall wide enough to fully capture the emission being measured
 - b) Set RBW=100kHz for <1GHz, VBW=3*RBW, Sweep time=auto, Detector=peak, Trace=max hold
 - c) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement

For average measurement:

 - VBW=10Hz, When duty cycle is no less than 98 percent
 - VBW \geq 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation, so refer to this clause 5.6 duty cycle.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed Not Applicable

Note:

- 1) Level= Reading + Factor; Factor =Antenna Factor+ Cable Loss- Preamp Factor
- 2) Over Limit = Level– Limit
- 3) Average measurement was not performed if peak level is lower than average limit(54 dBuV/m).

Data rate					1Mbps				
Test channel		CH00			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	46.34	27.96	3.89	37.56	40.63	74.00	-33.37	Peak
2	2390.03	46.09	27.72	3.99	37.45	40.35	74.00	-33.65	Peak

Test channel		CH00			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	47.40	27.96	3.89	37.56	41.69	74.00	-32.31	Peak
2	2390.03	45.69	27.72	3.99	37.45	39.95	74.00	-34.05	Peak

Test channel		CH39			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	46.55	27.43	4.03	37.26	40.75	74.00	-33.25	Peak
2	2500.00	46.69	27.40	4.04	37.26	40.87	74.00	-33.13	Peak

Test channel		CH39			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	46.34	27.43	4.03	37.26	40.54	74.00	-33.46	Peak
2	2500.00	46.11	27.40	4.04	37.26	40.29	74.00	-33.71	Peak

Data rate					2Mbps				
Test channel		CH00			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	46.68	27.96	3.89	37.56	40.97	74.00	-33.03	Peak
2	2390.03	46.43	27.72	3.99	37.45	40.69	74.00	-33.31	Peak

Test channel		CH00			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2310.00	46.69	27.96	3.89	37.56	40.98	74.00	-33.02	Peak
2	2390.03	47.22	27.72	3.99	37.45	41.48	74.00	-32.52	Peak

Test channel		CH39			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	48.36	27.43	4.03	37.26	42.56	74.00	-31.44	Peak
2	2500.00	47.71	27.40	4.04	37.26	41.89	74.00	-32.11	Peak

Test channel		CH39			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	2483.50	46.86	27.43	4.03	37.26	41.06	74.00	-32.94	Peak
2	2500.00	46.34	27.40	4.04	37.26	40.52	74.00	-33.48	Peak

5.10. Radiated Spurious Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

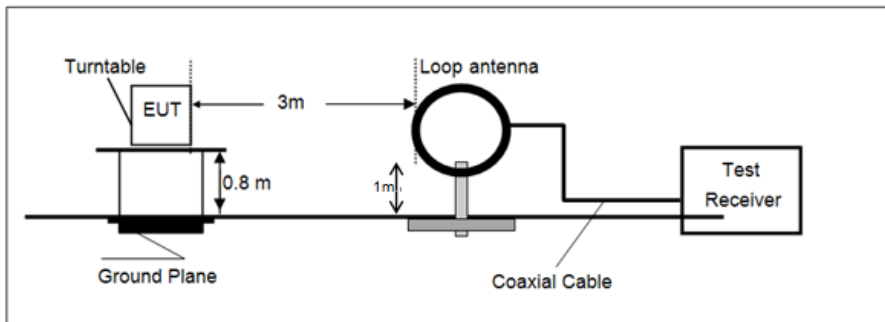
Frequency	Limit (dBuV/m)	Value
0.009 MHz ~0.49 MHz	2400/F(kHz) @300m	Quasi-peak
0.49 MHz ~ 1.705 MHz	24000/F(kHz) @30m	Quasi-peak
1.705 MHz ~30 MHz	30 @30m	Quasi-peak

Note: Limit dBuV/m @3m = Limit dBuV/m @300m + 40*log(300/3)= Limit dBuV/m @300m +80,
 Limit dBuV/m @3m = Limit dBuV/m @30m +40*log(30/3)= Limit dBuV/m @30m + 40.

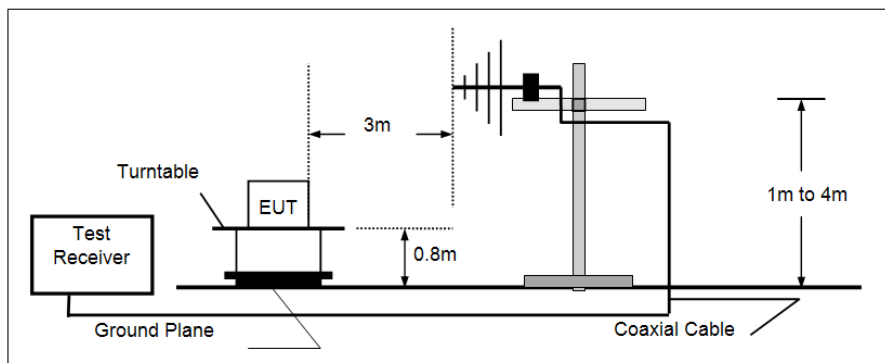
Frequency	Limit (dBuV/m @3m)	Value
30MHz~88MHz	40.00	Quasi-peak
88MHz~216MHz	43.50	Quasi-peak
216MHz~960MHz	46.00	Quasi-peak
960MHz~1GHz	54.00	Quasi-peak
Above 1GHz	54.00	Average
	74.00	Peak

TEST CONFIGURATION

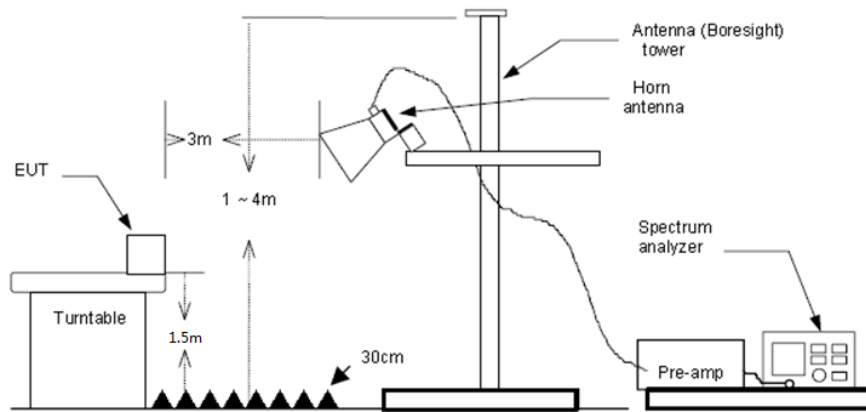
➤ 9 kHz ~ 30 MHz



➤ 30 MHz ~ 1 GHz



➤ Above 1 GHz



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10 .
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was 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.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
 - a) Span shall wide enough to fully capture the emission being measured;
 - b) Below 1 GHz:
 - RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;
 - If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
 - c) Set RBW=1MHz, VBW=3MHz for >1GHz, Sweep time=auto, Detector=peak, Trace=max hold for Peak measurement
 - For average measurement:
 - VBW=10Hz, When duty cycle is no less than 98 percent
 - $VBW \geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation, so refer to this clause 5.6 duty cycle.

TEST MODE

Please refer to the clause 4.2

TEST RESULT

Passed **Not Applicable**

Note:

- 1) Level= Reading + Factor/Transd; Factor/Transd =Antenna Factor+ Cable Loss- Preamp Factor
- 2) Over Limit = Level– Limit
- 3) Average measurement was not performed if peak level is lower than average limit(54 dBuV/m) for above 1GHz.

For 9 kHz ~ 30 MHz

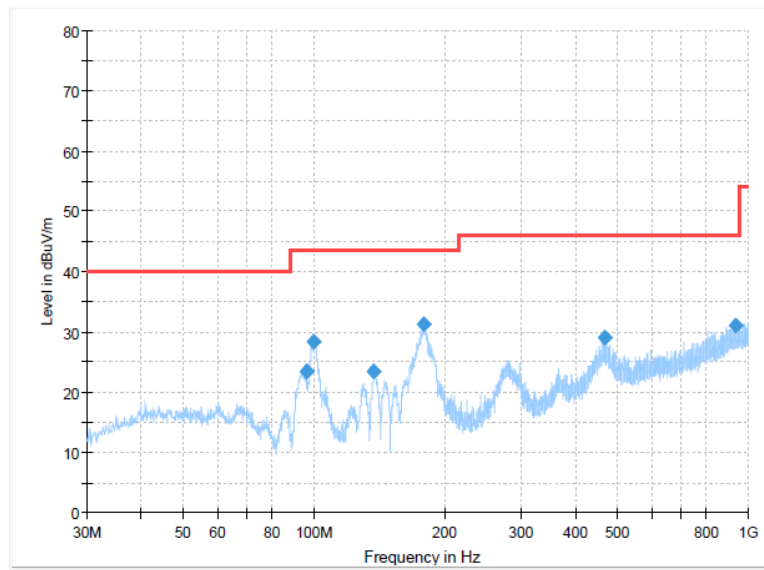
The EUT was pre-scanned this frequency band, found the radiated level 20dB lower than the limit, so don't show data on this report.

For 30 MHz ~ 1000 MHz

Have pre-scan all test channel, found CH39 which it was worst case, so only show the worst case's data on this report.

Polarization:

Horizontal

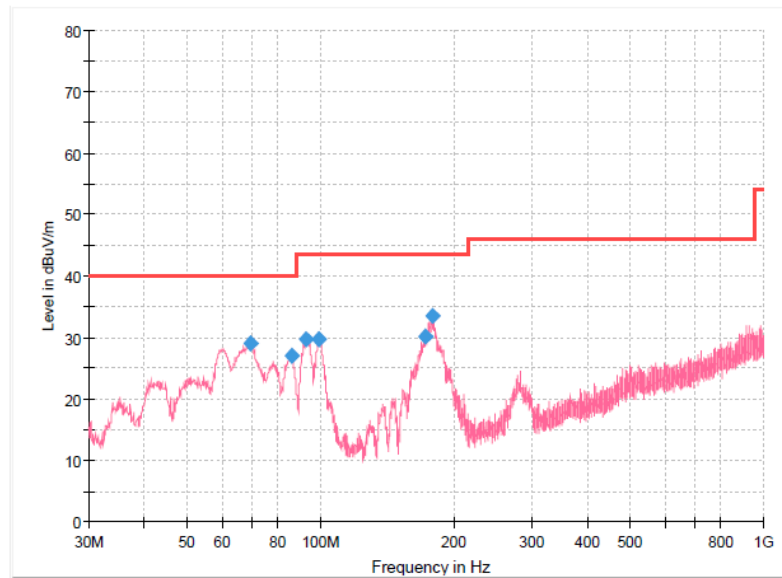


Final Result

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
95.960000	23.50	43.50	20.00	300.0	H	152.0	-11.8
99.840000	28.46	43.50	15.04	300.0	H	122.0	-10.8
137.670000	23.49	43.50	20.01	300.0	H	276.0	-14.5
179.258750	31.39	43.50	12.11	100.0	H	262.0	-12.5
466.863750	29.02	46.00	16.98	100.0	H	31.0	-3.0
935.858750	31.17	46.00	14.83	100.0	H	13.0	6.8

Polarization:

Vertical



Final Result

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
69.770000	29.14	40.00	10.86	100.0	V	180.0	-13.1
86.502500	27.02	40.00	12.98	100.0	V	139.0	-13.7
92.686250	29.62	43.50	13.88	100.0	V	81.0	-12.4
98.991250	29.79	43.50	13.71	100.0	V	121.0	-11.0
173.075000	30.20	43.50	13.30	100.0	V	81.0	-13.0
179.258750	33.60	43.50	9.90	100.0	V	92.0	-12.5

For 1 GHz ~ 25 GHz

Data rate					1Mbps				
Test channel		CH00			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1286.61	39.01	25.97	2.83	36.35	31.46	74.00	-42.54	Peak
2	4785.08	38.38	31.40	5.70	35.36	40.12	74.00	-33.88	Peak
3	7413.73	35.35	36.60	7.31	34.00	45.26	74.00	-28.74	Peak
4	11486.41	34.67	40.86	9.45	36.38	48.60	74.00	-25.40	Peak

Test channel		CH00			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1176.94	41.35	25.51	2.75	36.68	32.93	74.00	-41.07	Peak
2	4014.29	40.28	29.93	5.28	36.31	39.18	74.00	-34.82	Peak
3	7941.19	35.71	36.88	7.57	33.32	46.84	74.00	-27.16	Peak
4	11370.05	35.30	40.54	9.38	36.45	48.77	74.00	-25.23	Peak

Test channel		CH19			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1260.67	40.56	25.92	2.82	36.46	32.84	74.00	-41.16	Peak
2	5034.99	37.51	32.11	5.84	35.34	40.12	74.00	-33.88	Peak
3	7527.83	36.04	36.54	7.40	33.72	46.26	74.00	-27.74	Peak
4	9809.40	36.10	39.58	8.46	36.19	47.95	74.00	-26.05	Peak

Test channel		CH19			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1260.67	39.65	25.92	2.82	36.46	31.93	74.00	-42.07	Peak
2	5009.43	38.49	31.96	5.81	35.27	40.99	74.00	-33.01	Peak
3	7941.19	36.58	36.88	7.57	33.32	47.71	74.00	-26.29	Peak
4	11428.08	35.53	40.68	9.41	36.41	49.21	74.00	-24.79	Peak

Test channel		CH39			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1159.10	40.60	25.44	2.73	36.74	32.03	74.00	-41.97	Peak
2	5151.68	37.39	31.99	5.97	35.44	39.91	74.00	-34.09	Peak
3	7338.62	36.05	36.48	7.30	34.08	45.75	74.00	-28.25	Peak
4	9809.40	36.75	39.58	8.46	36.19	48.60	74.00	-25.40	Peak

Test channel		CH39			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1235.26	40.86	25.81	2.80	36.56	32.91	74.00	-41.09	Peak
2	3561.64	40.45	29.32	4.88	36.83	37.82	74.00	-36.18	Peak
3	5034.99	38.36	32.11	5.84	35.34	40.97	74.00	-33.03	Peak
4	8063.40	36.03	37.20	7.65	33.32	47.56	74.00	-26.44	Peak

Data rate					2Mbps				
Test channel		CH00			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1303.09	39.91	26.02	2.85	36.30	32.48	74.00	-41.52	Peak
2	3561.64	41.46	29.32	4.88	36.83	38.83	74.00	-35.17	Peak
3	5660.47	37.59	31.90	6.46	34.98	40.97	74.00	-33.03	Peak
4	10860.83	35.71	40.48	9.09	36.78	48.50	74.00	-25.50	Peak

Test channel		CH00			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1210.36	40.36	25.66	2.79	36.63	32.18	74.00	-41.82	Peak
2	3436.94	40.94	28.82	4.77	36.59	37.94	74.00	-36.06	Peak
3	4760.78	39.33	31.40	5.69	35.47	40.95	74.00	-33.05	Peak
4	7489.60	37.12	36.60	7.37	33.94	47.15	74.00	-26.85	Peak

Test channel		CH19			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1222.74	39.96	25.74	2.79	36.61	31.88	74.00	-42.12	Peak
2	5047.83	38.21	32.19	5.85	35.37	40.88	74.00	-33.12	Peak
3	7245.81	36.66	36.41	7.26	34.06	46.27	74.00	-27.73	Peak
4	11457.21	35.46	40.77	9.43	36.40	49.26	74.00	-24.74	Peak

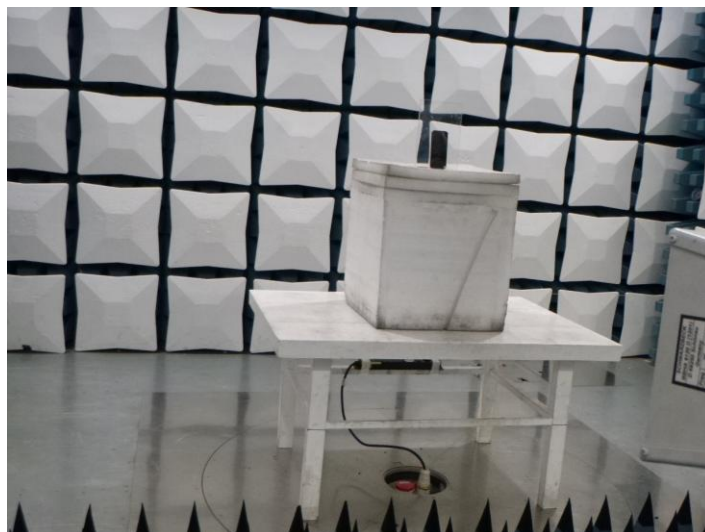
Test channel		CH19			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1210.36	39.96	25.66	2.79	36.63	31.78	74.00	-42.22	Peak
2	3766.79	40.41	29.53	5.03	37.12	37.85	74.00	-36.15	Peak
3	4996.69	39.04	31.87	5.80	35.24	41.47	74.00	-32.53	Peak
4	10750.81	35.97	40.20	9.06	36.88	48.35	74.00	-25.65	Peak

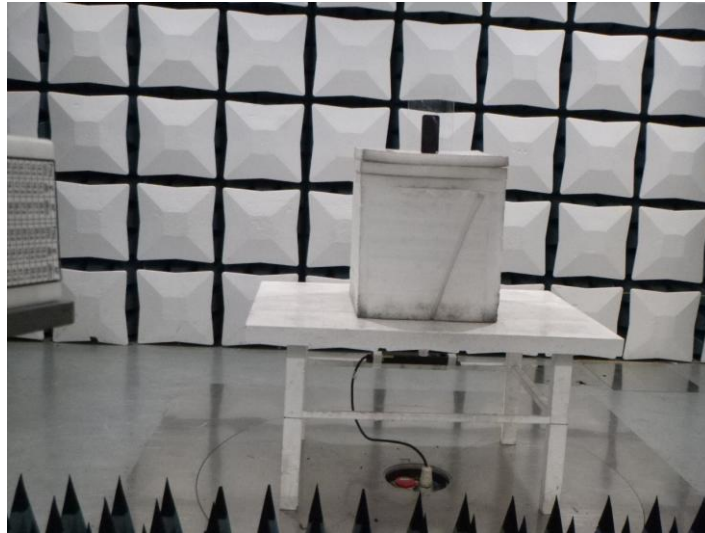
Test channel		CH39			Polarity			Horizontal	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1360.71	39.40	26.26	2.97	36.45	32.18	74.00	-41.82	Peak
2	3143.98	42.29	29.00	4.59	37.21	38.67	74.00	-35.33	Peak
3	7245.81	39.34	36.41	7.26	34.06	48.95	74.00	-25.05	Peak
4	11515.68	35.39	40.85	9.47	36.37	49.34	74.00	-24.66	Peak

Test channel		CH39			Polarity			Vertical	
Mark	Frequency MHz	Reading dBuV/m	Antenna dB	Cable dB	Preamp dB	Level dBuV/m	Limit dBuV/m	Over limit	Remark
1	1207.28	41.17	25.64	2.78	36.64	32.95	74.00	-41.05	Peak
2	3561.64	40.45	29.32	4.88	36.83	37.82	74.00	-36.18	Peak
3	5073.59	37.95	32.20	5.88	35.43	40.60	74.00	-33.40	Peak
4	11370.05	35.17	40.54	9.38	36.45	48.64	74.00	-25.36	Peak

6. TEST SETUP PHOTOS

Radiated Emission





AC Conducted Emission



7. EXTERNAL AND INTERNAL PHOTOS

Refer to the test report No.: CHTEW22120050

8. APPENDIX REPORT

APPENDIX REPORT

Project No.	SHT2208214102EW	Radio Specification	Bluetooth BLE
Test sample No.	YPHT22082141009	Model No.	SF650
Start test date	2022-11-23	Finish date	2022-11-24
Temperature	24.9°C	Humidity	49%
Test Engineer	Xiaoxiao Li	Auditor	Xiaodong Zhuo

Appendix clause	Test item	Result
A	Peak Output Power	PASS
B	Power Spectral Density	PASS
C	6 dB Bandwidth	PASS
D	99% Occupied Bandwidth	PASS
E	Duty cycle	PASS
F	Band edge and Spurious Emissions (conducted)	PASS

Appendix A: Peak Output Power

Test rate	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
1Mbps	00	-3.66	-3.71	≤ 30.00	Pass
	19	-2.22	-2.33		
	39	-2.33	-2.45		
2Mbps	00	-2.45	-2.64	≤ 30.00	Pass
	19	-2.24	-2.42		
	39	-2.29	-2.50		

Test rate:		1Mbps
CH00	<p>Ref Level 10.50 dBm Offset 1.00 dB RBW 2 MHz ATT 20 dB SWI 1.01 ms VBW 5 MHz Mode Auto Sweep Count 500/500 M1[1] -3.66 dBm 2.40205990 GHz CF 2.402 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 23 NOV 2022 09:27:37</p>	
CH19	<p>Ref Level 10.50 dBm Offset 1.00 dB RBW 2 MHz ATT 20 dB SWI 1.01 ms VBW 5 MHz Mode Auto Sweep Count 500/500 M1[1] -2.22 dBm 2.44000500 GHz CF 2.44 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 23 NOV 2022 09:30:10</p>	
CH39	<p>Ref Level 10.50 dBm Offset 1.00 dB RBW 2 MHz ATT 20 dB SWI 1.01 ms VBW 5 MHz Mode Auto Sweep Count 500/500 M1[1] -2.33 dBm 2.47995000 GHz CF 2.48 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz Date: 23 NOV 2022 09:35:25</p>	

Test rate: 2Mbps	
CH00	<p>Ref Level 10.50 dBm Offset 1.00 dB RBW 3 MHz Count 500/500 Att 20 dB SWI 1.01 ms VBW 10 MHz Mode Auto Sweep 1 Frequency Sweep M1[1] -2.45 dBm 2.40213000 GHz CF 2.402 GHz 1001 pts 1.0 MHz/pt Span 10.0 MHz Date: 23 NOV 2022 09:07:37</p>
CH19	<p>Ref Level 10.50 dBm Offset 1.00 dB RBW 3 MHz Count 500/500 Att 20 dB SWI 1.01 ms VBW 10 MHz Mode Auto Sweep 1 Frequency Sweep M1[1] -2.24 dBm 2.44011000 GHz CF 2.44 GHz 1001 pts 1.0 MHz/pt Span 10.0 MHz Date: 23 NOV 2022 09:00:26</p>
CH39	<p>Ref Level 10.50 dBm Offset 1.00 dB RBW 3 MHz Count 500/500 Att 20 dB SWI 1.01 ms VBW 10 MHz Mode Auto Sweep 1 Frequency Sweep M1[1] -2.29 dBm 2.47989000 GHz CF 2.48 GHz 1001 pts 1.0 MHz/pt Span 10.0 MHz Date: 23 NOV 2022 09:02:19</p>

Appendix B: Power Spectral Density

Test rate	Channel	Power Spectral Density(dBm/3KHz)	Limit (dBm/3KHz)	Result
1Mbps	00	-17.45	≤8.00	Pass
	19	-17.16		
	39	-17.34		
2Mbps	00	-20.01	≤8.00	Pass
	19	-19.71		
	39	-19.88		

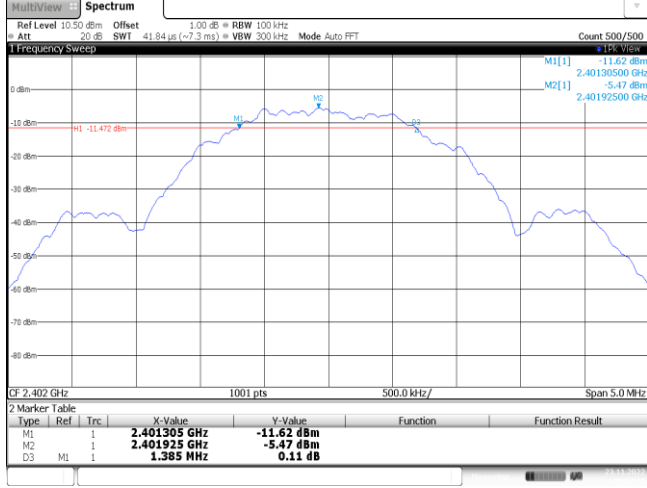
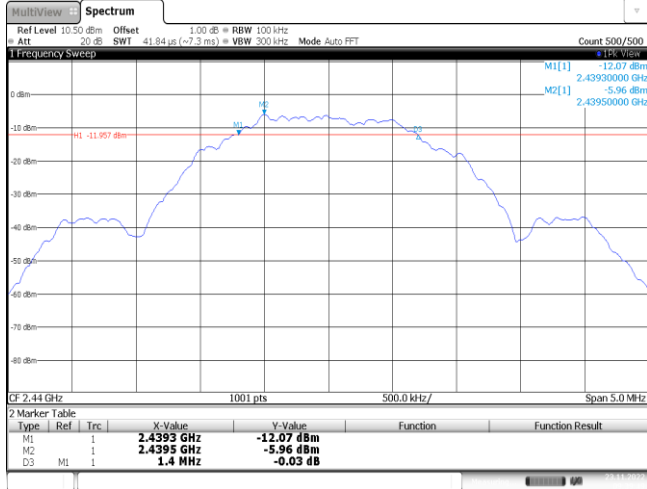
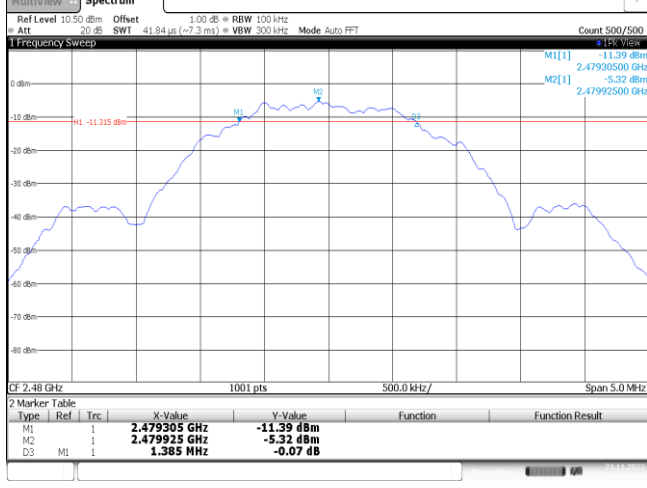
Test rate: 1Mbps	
CH00	<p> Spectrum plot for CH00. The y-axis represents power in dBm, ranging from 0 to -80. The x-axis represents frequency in GHz, ranging from 2.400 to 2.402. The plot shows a noisy signal with a peak at 2.401977000 GHz, labeled M1[1], with a value of -17.45 dBm. The plot parameters include: Ref Level 10.50 dBm, Offset 20 dB, SWF 1.4 ms (→2.2 ms), RBW 3 kHz, VBW 10 kHz, Mode Auto FFT, Count 100/100. The center frequency (CF) is 2.402 GHz, with 1001 points and a 100.0 kHz resolution. The span is 1.0 MHz. Date: 23 NOV 2022 09:28:22. </p>
CH19	<p> Spectrum plot for CH19. The y-axis represents power in dBm, ranging from 0 to -80. The x-axis represents frequency in GHz, ranging from 2.440 to 2.442. The plot shows a noisy signal with a peak at 2.439977000 GHz, labeled M1[1], with a value of -17.16 dBm. The plot parameters include: Ref Level 10.50 dBm, Offset 20 dB, SWF 1.4 ms (→2.2 ms), RBW 3 kHz, VBW 10 kHz, Mode Auto FFT, Count 100/100. The center frequency (CF) is 2.44 GHz, with 1001 points and a 100.0 kHz resolution. The span is 1.0 MHz. Date: 23 NOV 2022 09:33:57. </p>
CH39	<p> Spectrum plot for CH39. The y-axis represents power in dBm, ranging from 0 to -80. The x-axis represents frequency in GHz, ranging from 2.480 to 2.482. The plot shows a noisy signal with a peak at 2.479977000 GHz, labeled M1[1], with a value of -17.34 dBm. The plot parameters include: Ref Level 10.50 dBm, Offset 20 dB, SWF 1.4 ms (→2.2 ms), RBW 3 kHz, VBW 10 kHz, Mode Auto FFT, Count 100/100. The center frequency (CF) is 2.48 GHz, with 1001 points and a 100.0 kHz resolution. The span is 1.0 MHz. Date: 23 NOV 2022 09:36:51. </p>

Test rate: 2Mbps	
CH00	<p>The spectrum plot for CH00 shows a signal centered at 2.402 GHz. The peak level is -20.01 dBm. The plot includes parameters: Ref Level 10.50 dBm, Att -20 dB, SWF 1.4 ms (~15 ms), RBW 3 kHz, YBW 10 kHz, Mode Auto FFT, Count 100/100. The x-axis is labeled 'CF 2.402 GHz' and the y-axis is labeled '0 dBm' to '-80 dBm'. The plot shows a noisy signal with a peak level of -20.01 dBm at 2.40195800 GHz.</p>
CH19	<p>The spectrum plot for CH19 shows a signal centered at 2.44 GHz. The peak level is -19.71 dBm. The plot includes parameters: Ref Level 10.50 dBm, Att -20 dB, SWF 1.4 ms (~15 ms), RBW 3 kHz, YBW 10 kHz, Mode Auto FFT, Count 100/100. The x-axis is labeled 'CF 2.44 GHz' and the y-axis is labeled '0 dBm' to '-80 dBm'. The plot shows a noisy signal with a peak level of -19.71 dBm at 2.43995800 GHz.</p>
CH39	<p>The spectrum plot for CH39 shows a signal centered at 2.48 GHz. The peak level is -19.88 dBm. The plot includes parameters: Ref Level 10.50 dBm, Att -20 dB, SWF 1.4 ms (~15 ms), RBW 3 kHz, YBW 10 kHz, Mode Auto FFT, Count 100/100. The x-axis is labeled 'CF 2.48 GHz' and the y-axis is labeled '0 dBm' to '-80 dBm'. The plot shows a noisy signal with a peak level of -19.88 dBm at 2.47995800 GHz.</p>

Appendix C: 6dB bandwidth

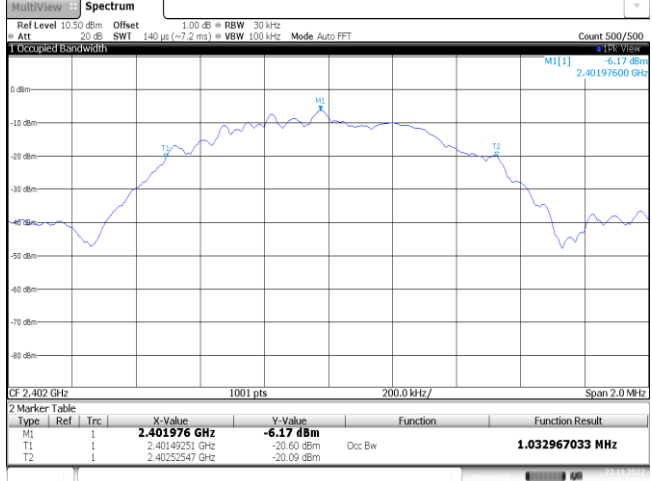


Type	Channel	6dB Bandwidth(kHz)	Limit (kHz)	Result
1Mbps	00	622.00	≥500	Pass
	19	762.00		
	39	764.00		
2Mbps	00	1385.00	≥500	Pass
	19	1400.00		
	39	1385.00		


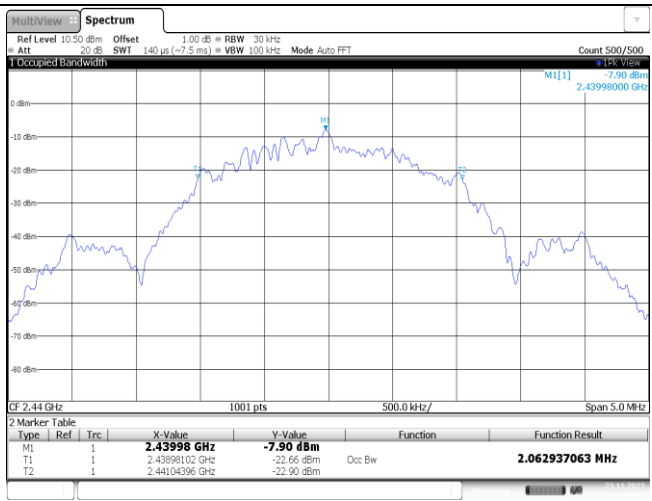
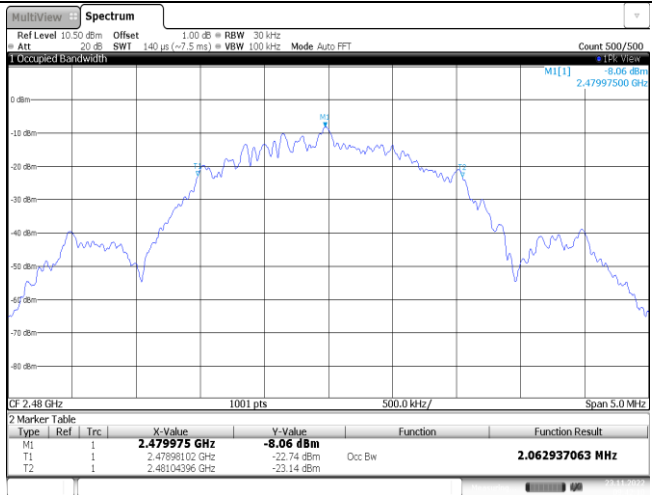
Test rate:		1Mbps																												
CH00	<p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.401628 GHz</td> <td>-10.52 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.401936 GHz</td> <td>-4.42 dBm</td> <td></td> <td></td> </tr> <tr> <td>D3</td> <td>M1</td> <td>1</td> <td>622.0 kHz</td> <td>0.06 dB</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23 NOV 2022 09:26:37</p>		Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.401628 GHz	-10.52 dBm			M2	1		2.401936 GHz	-4.42 dBm			D3	M1	1	622.0 kHz	0.06 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																								
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Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																								
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Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																								
M1	1		2.479608 GHz	-10.17 dBm																										
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Test rate:	2Mbps																												
CH00	 <p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.401305 GHz</td> <td>-11.62 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.401925 GHz</td> <td>-5.47 dBm</td> <td></td> <td></td> </tr> <tr> <td>D3</td> <td>M1</td> <td>1</td> <td>1.385 MHz</td> <td>0.11 dB</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23/NOV/2022 09:07:20</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.401305 GHz	-11.62 dBm			M2	1		2.401925 GHz	-5.47 dBm			D3	M1	1	1.385 MHz	0.11 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
M1	1		2.401305 GHz	-11.62 dBm																									
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CH19	 <p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.4393 GHz</td> <td>-12.07 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4395 GHz</td> <td>-5.96 dBm</td> <td></td> <td></td> </tr> <tr> <td>D3</td> <td>M1</td> <td>1</td> <td>1.4 MHz</td> <td>-0.03 dB</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23/NOV/2022 09:09:49</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.4393 GHz	-12.07 dBm			M2	1		2.4395 GHz	-5.96 dBm			D3	M1	1	1.4 MHz	-0.03 dB		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
M1	1		2.4393 GHz	-12.07 dBm																									
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CH39	 <p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.479305 GHz</td> <td>-11.39 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.479925 GHz</td> <td>-5.32 dBm</td> <td></td> <td></td> </tr> <tr> <td>D3</td> <td>M1</td> <td>1</td> <td>1.385 MHz</td> <td>-0.07 dB</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23/NOV/2022 09:02:01</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.479305 GHz	-11.39 dBm			M2	1		2.479925 GHz	-5.32 dBm			D3	M1	1	1.385 MHz	-0.07 dB		
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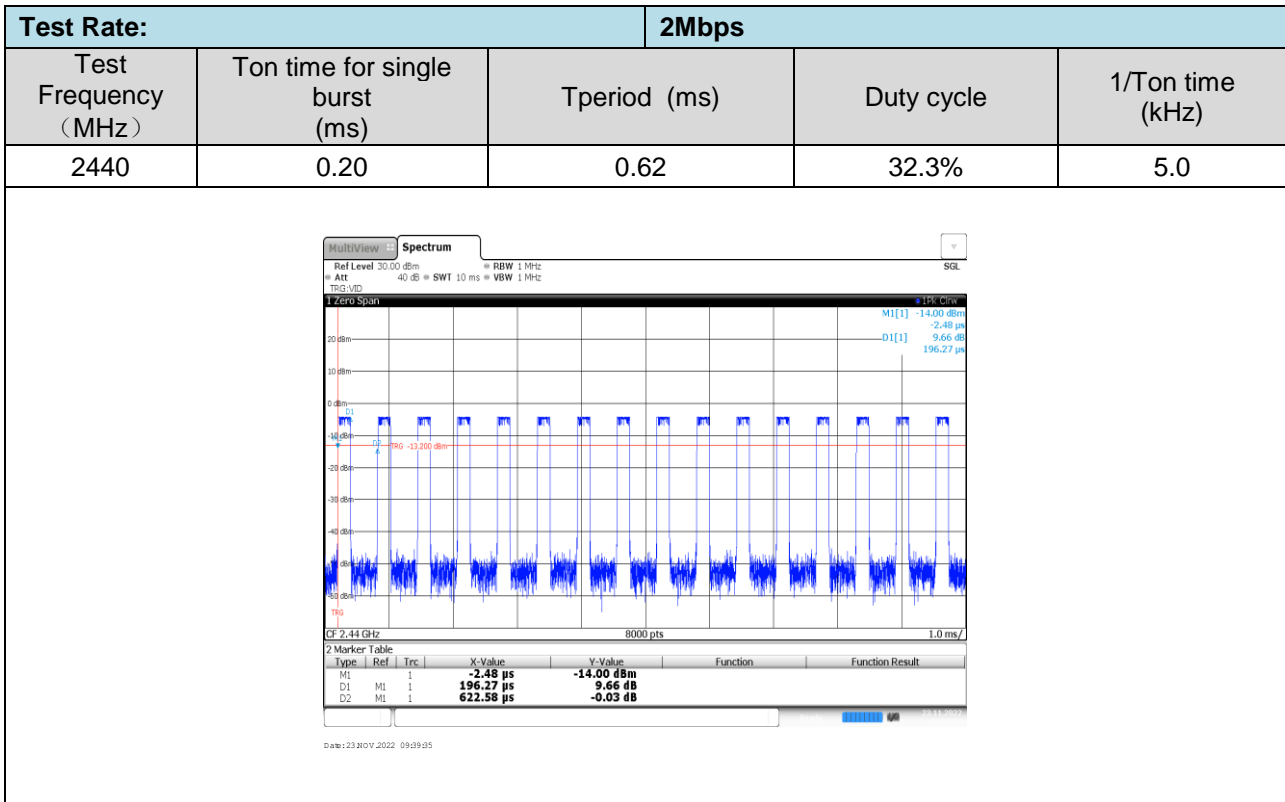
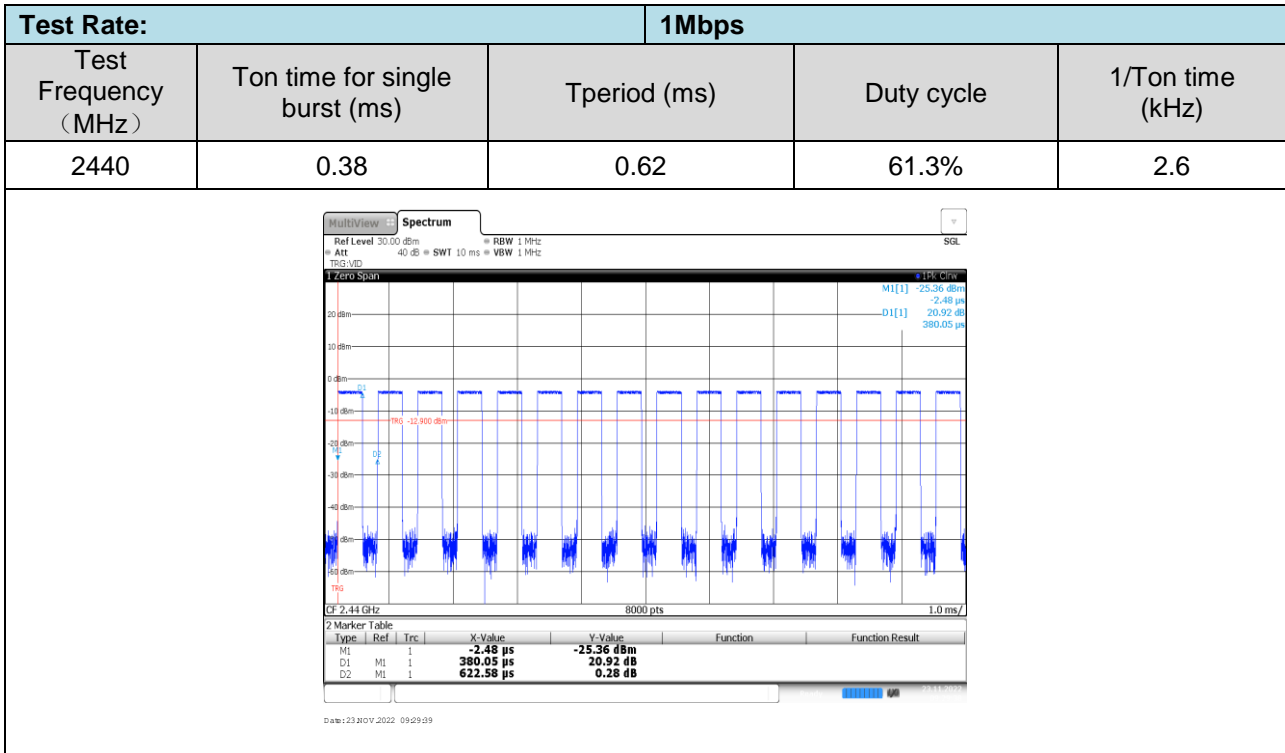
Appendix D: 99% Occupied Bandwidth

Test rate	Channel	99% Occupied Bandwidth(MHz)	Limit (kHz)	Result
1Mbps	00	1.03	-	Pass
	19	1.03		
	39	1.03		
2Mbps	00	2.06	-	Pass
	19	2.06		
	39	2.06		

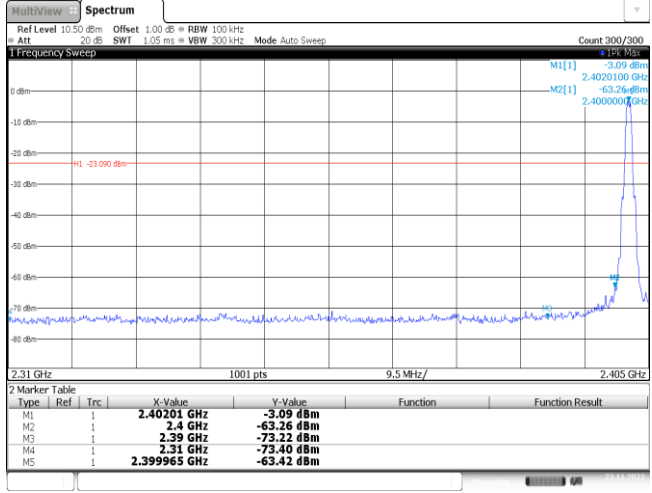
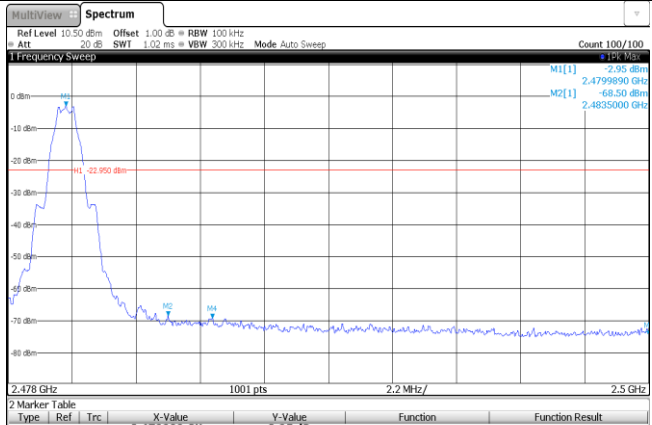
Test rate:	1Mbps																												
<p>CH00</p>	 <p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.401976 GHz</td> <td>-6.17 dBm</td> <td></td> <td></td> </tr> <tr> <td>T1</td> <td>1</td> <td></td> <td>2.40149251 GHz</td> <td>-20.60 dBm</td> <td>Occ Bw</td> <td>1.032967033 MHz</td> </tr> <tr> <td>T2</td> <td>1</td> <td></td> <td>2.40252547 GHz</td> <td>-20.09 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23 NOV 2022 09:27:28</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.401976 GHz	-6.17 dBm			T1	1		2.40149251 GHz	-20.60 dBm	Occ Bw	1.032967033 MHz	T2	1		2.40252547 GHz	-20.09 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
M1	1		2.401976 GHz	-6.17 dBm																									
T1	1		2.40149251 GHz	-20.60 dBm	Occ Bw	1.032967033 MHz																							
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Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
M1	1		2.439974 GHz	-5.85 dBm																									
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<p>CH39</p>	 <p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.479976 GHz</td> <td>-6.05 dBm</td> <td></td> <td></td> </tr> <tr> <td>T1</td> <td>1</td> <td></td> <td>2.47949051 GHz</td> <td>-20.83 dBm</td> <td>Occ Bw</td> <td>1.034965035 MHz</td> </tr> <tr> <td>T2</td> <td>1</td> <td></td> <td>2.48052547 GHz</td> <td>-19.99 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23 NOV 2022 09:55:16</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.479976 GHz	-6.05 dBm			T1	1		2.47949051 GHz	-20.83 dBm	Occ Bw	1.034965035 MHz	T2	1		2.48052547 GHz	-19.99 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
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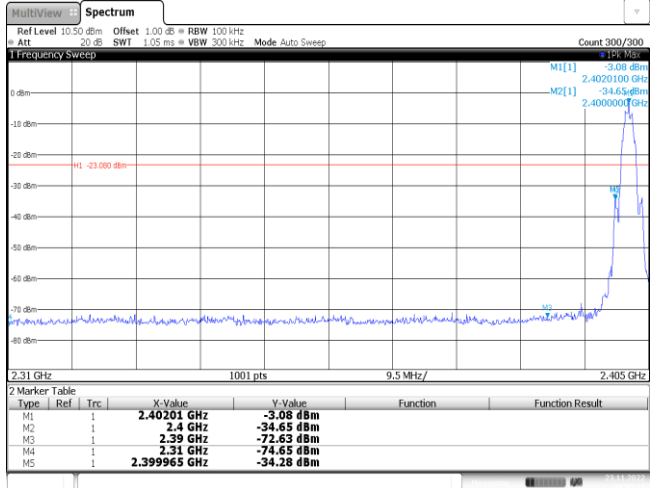
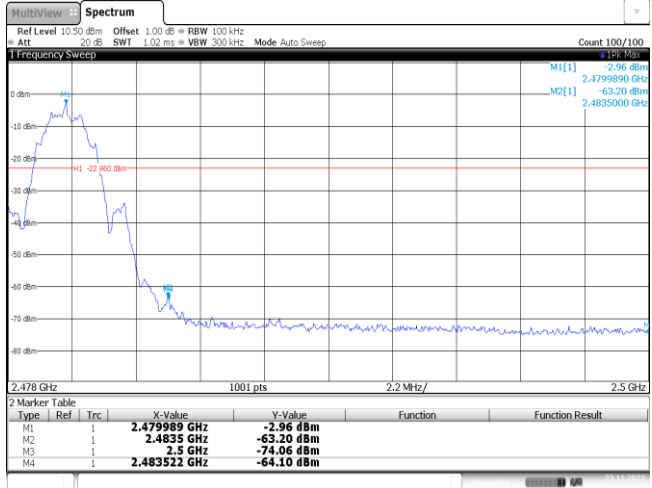
Test rate:	2Mbps																												
<p>CH00</p>	 <p>Ref Level 10.50 dBm Offset 1.00 dB RBW 30 kHz Count 500/500 Att -20 dB SWF 140 μs (~7.5 ms) VBW 100 kHz Mode Auto FFT 1 Occupied Bandwidth M1[1] -8.20 dBm 2.40198000 GHz</p> <p>CF 2.402 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.40198 GHz</td> <td>-8.20 dBm</td> <td></td> <td></td> </tr> <tr> <td>T1</td> <td>1</td> <td></td> <td>2.40098102 GHz</td> <td>-22.95 dBm</td> <td>Occ Bw</td> <td>2.062937063 MHz</td> </tr> <tr> <td>T2</td> <td>1</td> <td></td> <td>2.40304396 GHz</td> <td>-23.11 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23/01/2022 09:07:28</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.40198 GHz	-8.20 dBm			T1	1		2.40098102 GHz	-22.95 dBm	Occ Bw	2.062937063 MHz	T2	1		2.40304396 GHz	-23.11 dBm		
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<p>CH19</p>	 <p>Ref Level 10.50 dBm Offset 1.00 dB RBW 30 kHz Count 500/500 Att -20 dB SWF 140 μs (~7.5 ms) VBW 100 kHz Mode Auto FFT 1 Occupied Bandwidth M1[1] -7.90 dBm 2.43998000 GHz</p> <p>CF 2.44 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.43998 GHz</td> <td>-7.90 dBm</td> <td></td> <td></td> </tr> <tr> <td>T1</td> <td>1</td> <td></td> <td>2.43898102 GHz</td> <td>-22.66 dBm</td> <td>Occ Bw</td> <td>2.062937063 MHz</td> </tr> <tr> <td>T2</td> <td>1</td> <td></td> <td>2.44104396 GHz</td> <td>-22.90 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23/01/2022 09:09:07</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.43998 GHz	-7.90 dBm			T1	1		2.43898102 GHz	-22.66 dBm	Occ Bw	2.062937063 MHz	T2	1		2.44104396 GHz	-22.90 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
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T2	1		2.44104396 GHz	-22.90 dBm																									
<p>CH39</p>	 <p>Ref Level 10.50 dBm Offset 1.00 dB RBW 30 kHz Count 500/500 Att -20 dB SWF 140 μs (~7.5 ms) VBW 100 kHz Mode Auto FFT 1 Occupied Bandwidth M1[1] -8.06 dBm 2.47997500 GHz</p> <p>CF 2.48 GHz 1001 pts 500.0 kHz/ Span 5.0 MHz</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.479975 GHz</td> <td>-8.06 dBm</td> <td></td> <td></td> </tr> <tr> <td>T1</td> <td>1</td> <td></td> <td>2.47898102 GHz</td> <td>-22.74 dBm</td> <td>Occ Bw</td> <td>2.062937063 MHz</td> </tr> <tr> <td>T2</td> <td>1</td> <td></td> <td>2.48104396 GHz</td> <td>-23.14 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23/01/2022 09:02:10</p>	Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.479975 GHz	-8.06 dBm			T1	1		2.47898102 GHz	-22.74 dBm	Occ Bw	2.062937063 MHz	T2	1		2.48104396 GHz	-23.14 dBm		
Type	Ref	Trc	X-Value	Y-Value	Function	Function Result																							
M1	1		2.479975 GHz	-8.06 dBm																									
T1	1		2.47898102 GHz	-22.74 dBm	Occ Bw	2.062937063 MHz																							
T2	1		2.48104396 GHz	-23.14 dBm																									

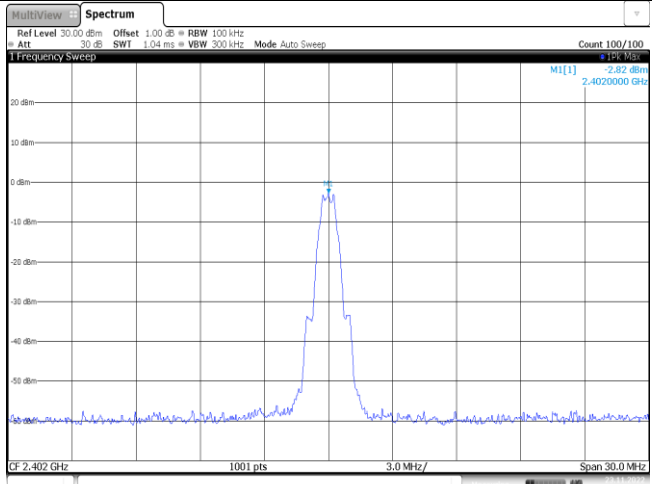
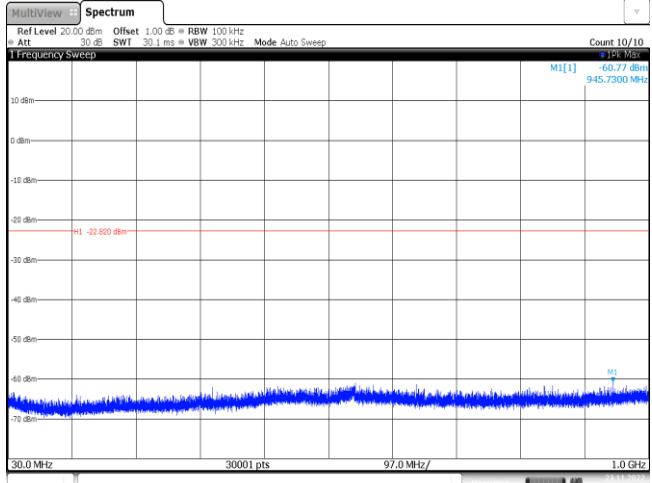
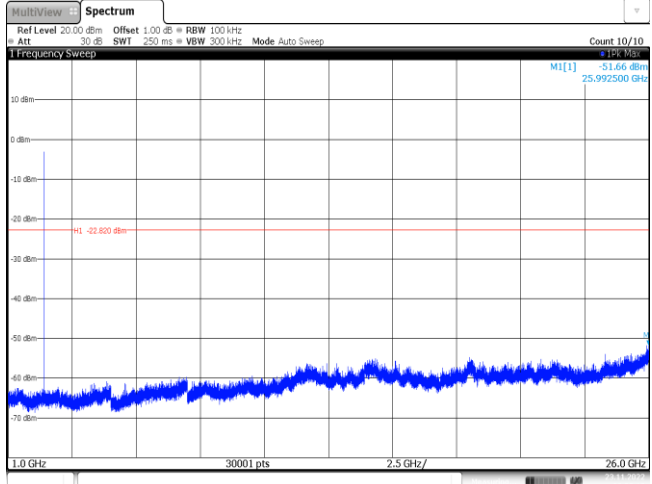
Appendix E: Duty cycle

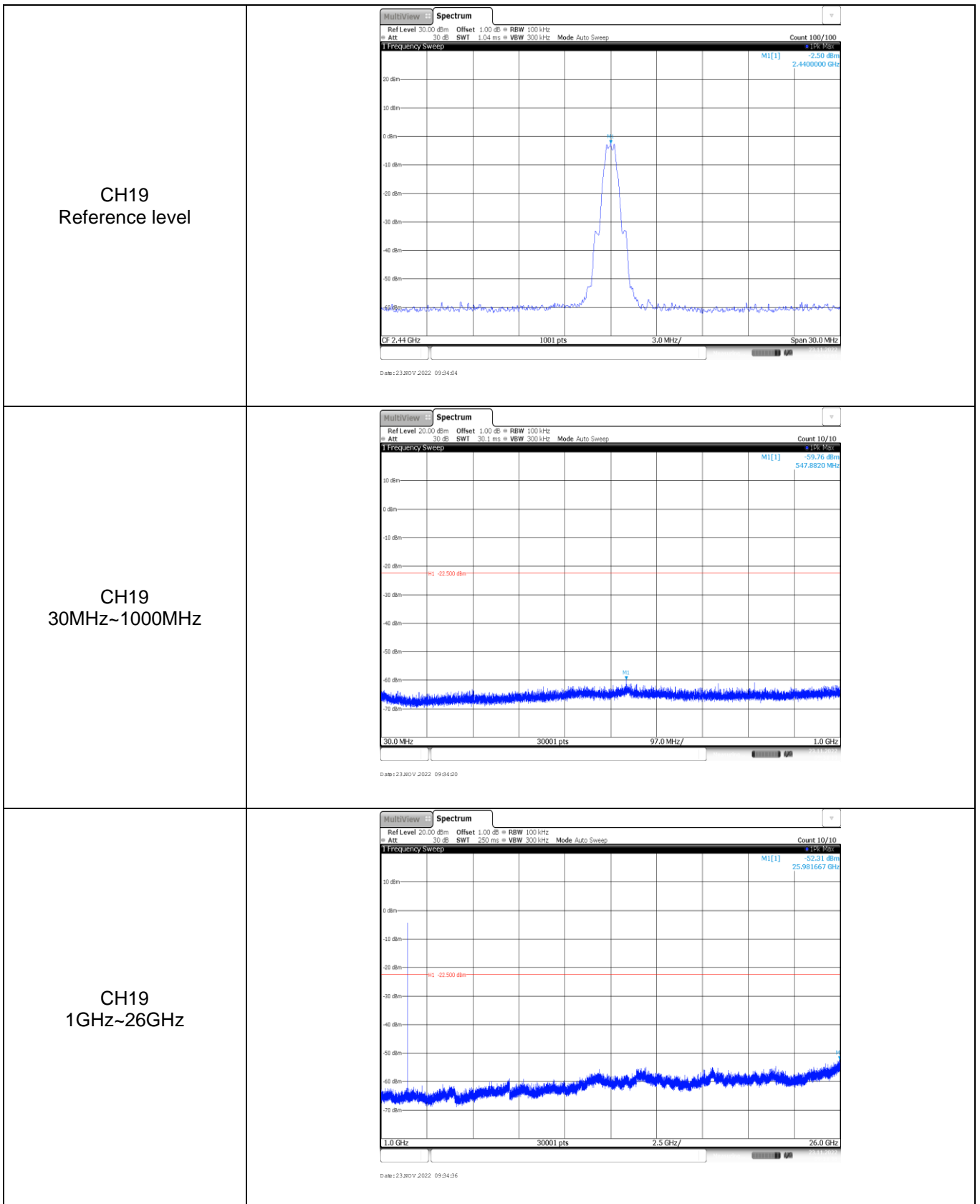


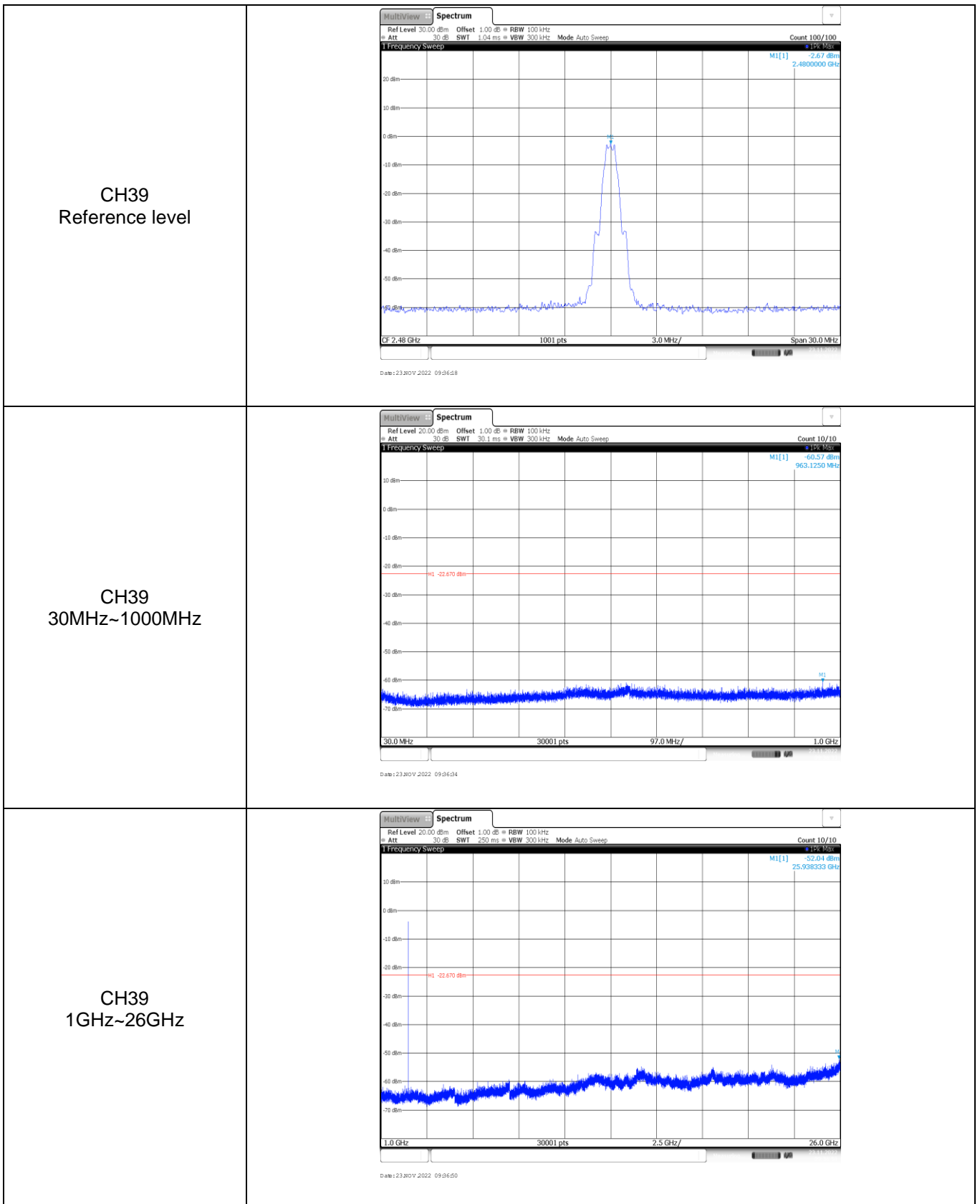
Appendix F: Band edge and Spurious Emissions (conducted)

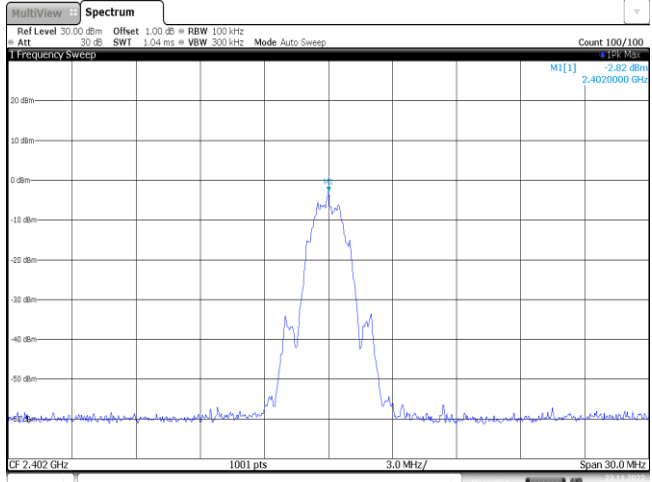
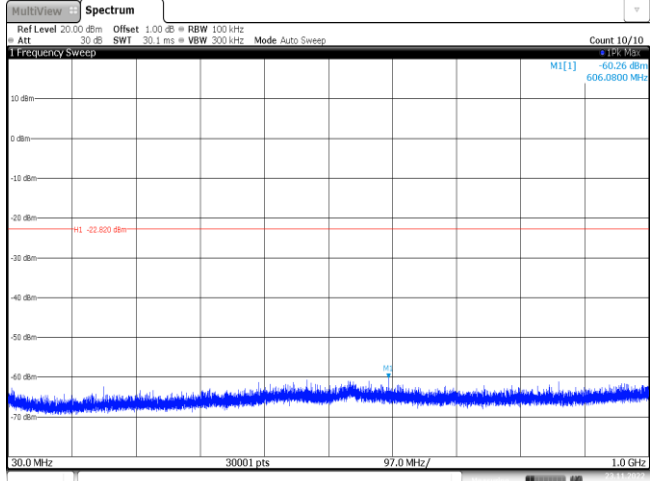
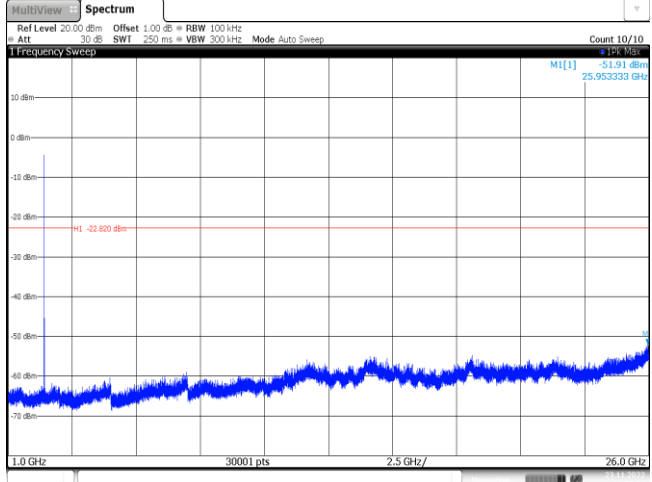
Test Item:	Band edge	Test Rate:	1Mbps																																										
CH00	 <p>2 Marker Table</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Ref</th> <th>Trc</th> <th>X-Value</th> <th>Y-Value</th> <th>Function</th> <th>Function Result</th> </tr> </thead> <tbody> <tr> <td>M1</td> <td>1</td> <td></td> <td>2.40201 GHz</td> <td>-3.09 dBm</td> <td></td> <td></td> </tr> <tr> <td>M2</td> <td>1</td> <td></td> <td>2.4 GHz</td> <td>-63.26 dBm</td> <td></td> <td></td> </tr> <tr> <td>M3</td> <td>1</td> <td></td> <td>2.39 GHz</td> <td>-73.22 dBm</td> <td></td> <td></td> </tr> <tr> <td>M4</td> <td>1</td> <td></td> <td>2.31 GHz</td> <td>-73.40 dBm</td> <td></td> <td></td> </tr> <tr> <td>M5</td> <td>1</td> <td></td> <td>2.399965 GHz</td> <td>-63.42 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Date: 23 NOV 2022 09:28:32</p>			Type	Ref	Trc	X-Value	Y-Value	Function	Function Result	M1	1		2.40201 GHz	-3.09 dBm			M2	1		2.4 GHz	-63.26 dBm			M3	1		2.39 GHz	-73.22 dBm			M4	1		2.31 GHz	-73.40 dBm			M5	1		2.399965 GHz	-63.42 dBm		
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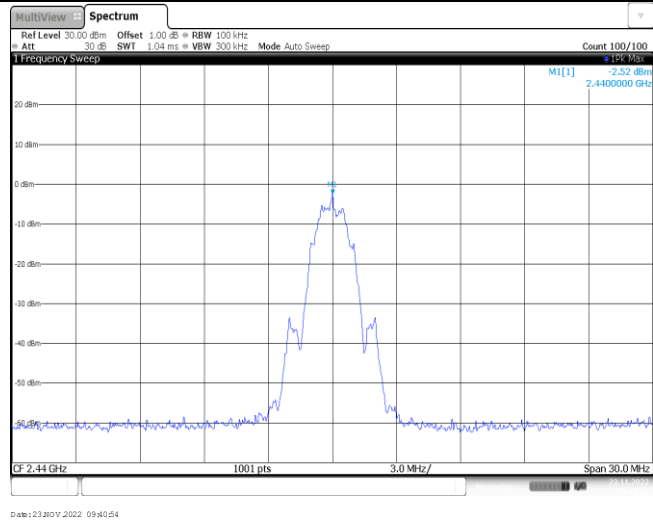
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<p>CH00 30MHz~1000MHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -60.77 dBm 945.7300 MHz h1 -22.800 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 23 NOV 2022 09:28:56</p>		
<p>CH00 1GHz~26GHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 M1[1] -51.66 dBm 25.992500 GHz h1 -22.800 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 23 NOV 2022 09:29:13</p>		



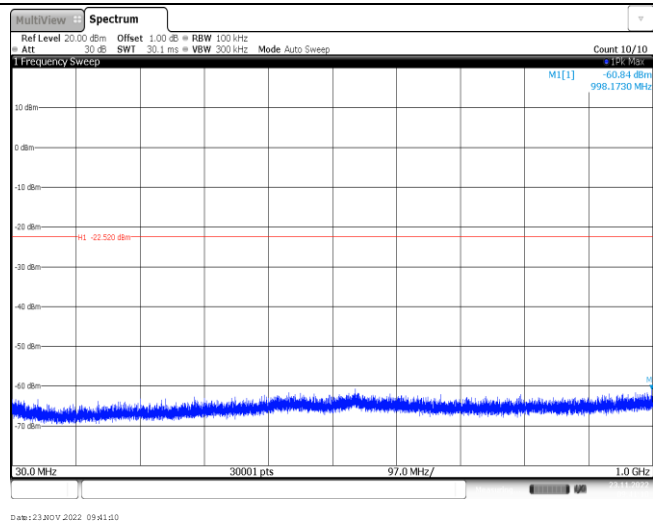


Test Item:	SE	Test Rate:	2Mbps
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<p>CH00 30MHz~1000MHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 30.1 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -60.26 dBm 606.68000 MHz h1 -22.800 dBm 30.0 MHz 30001 pts 97.0 MHz/ 1.0 GHz Date: 23 NOV 2022 09:08:50</p>		
<p>CH00 1GHz~26GHz</p>	 <p>Ref Level 20.00 dBm Offset 1.00 dB RBW 100 kHz Att 30 dB SWI 250 ms VBW 300 kHz Mode Auto Sweep Count 10/10 MI[1] -51.91 dBm 25.9553333 GHz h1 -22.800 dBm 1.0 GHz 30001 pts 2.5 GHz/ 26.0 GHz Date: 23 NOV 2022 09:09:06</p>		

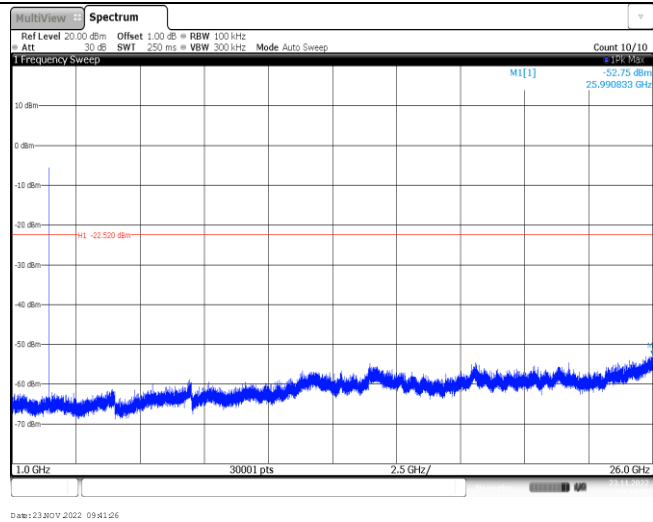
CH19
Reference level

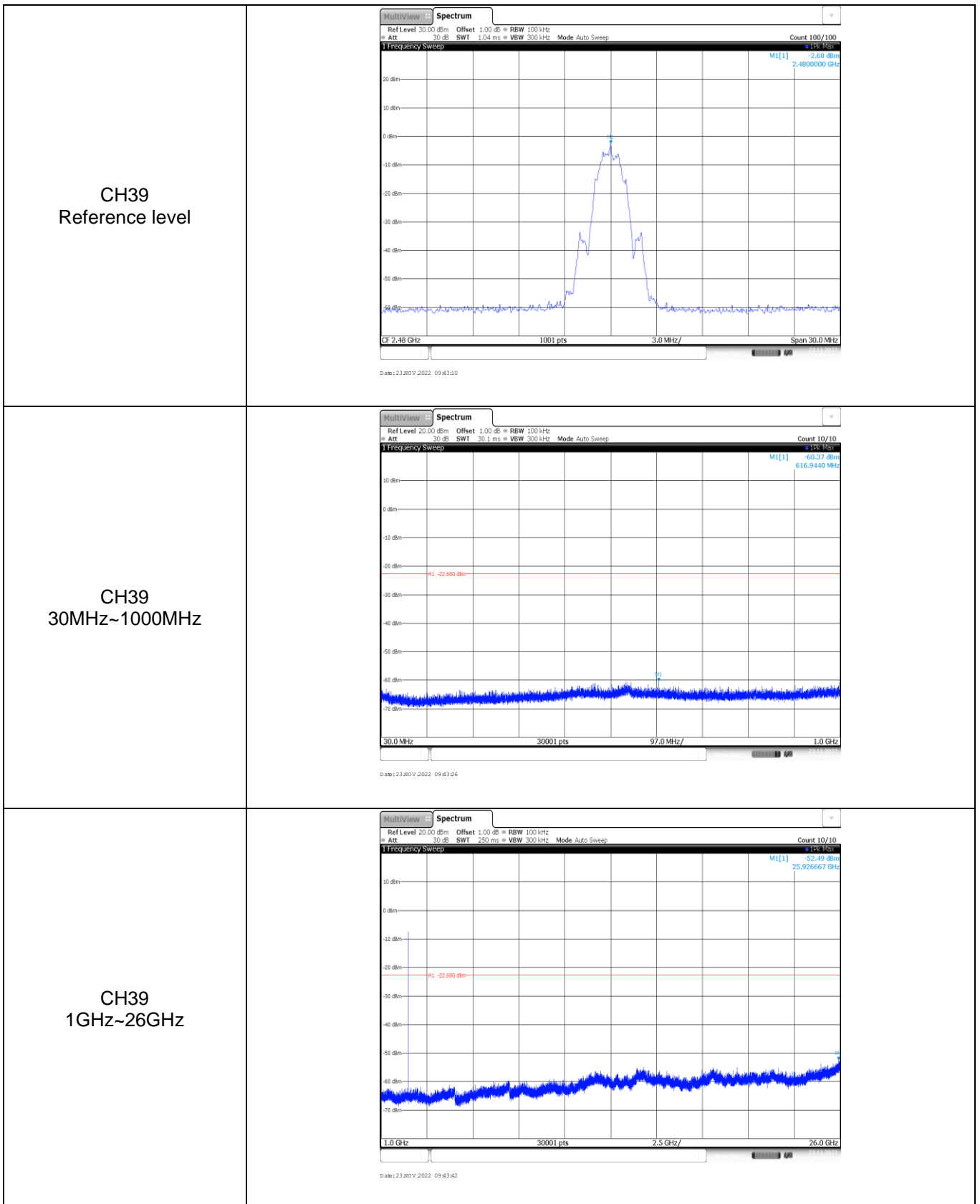


CH19
30MHz~1000MHz



CH19
1GHz~26GHz





-----End of Report-----