

FCC Radio Test Report

FCC ID: HBW1595

Report No. : BTL-FCCP-5-2303T057
Equipment : Smart Video Intercom - L
Model Name : CAPXLV2
Brand Name : Liftmaster
Applicant : Chamberlain Group LLC, The
Address : 300 Windsor Dr, Oak Brook, Illinois, United States, 60523

Radio Function : RFID UHF (902-928 MHz)

FCC Rule Part(s) : FCC CFR Title 47, Part 15, Subpart C (15.247)
Measurement Procedure(s) : ANSI C63.10-2013

Date of Receipt : 2023/3/20
Date of Test : 2023/6/15 ~ 2023/8/24
Issued Date : 2023/9/28

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

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Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

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BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

CONTENTS

REVISION HISTORY	5
1 SUMMARY OF TEST RESULTS	6
1.1 TEST FACILITY	7
1.2 MEASUREMENT UNCERTAINTY	7
1.3 TEST ENVIRONMENT CONDITIONS	8
1.4 DUTY CYCLE	8
2 GENERAL INFORMATION	9
2.1 DESCRIPTION OF EUT	9
2.2 TEST MODES	10
2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	11
2.4 SUPPORT UNITS	13
3 AC POWER LINE CONDUCTED EMISSIONS TEST	14
3.1 LIMIT	14
3.2 TEST PROCEDURE	14
3.3 DEVIATION FROM TEST STANDARD	14
3.4 TEST SETUP	15
3.5 TEST RESULT	15
4 RADIATED EMISSIONS TEST	16
4.1 LIMIT	16
4.2 TEST PROCEDURE	17
4.3 DEVIATION FROM TEST STANDARD	17
4.4 TEST SETUP	17
4.5 EUT OPERATING CONDITIONS	18
4.6 TEST RESULT – BELOW 30 MHZ	19
4.7 TEST RESULT – 30 MHZ TO 1 GHZ	19
4.8 TEST RESULT – ABOVE 1 GHZ	19
5 NUMBER OF HOPPING CHANNEL	20
5.1 APPLIED PROCEDURES	20
5.2 TEST PROCEDURE	20
5.3 DEVIATION FROM STANDARD	20
5.4 TEST SETUP	20
5.5 EUT OPERATION CONDITIONS	20
5.6 TEST RESULTS	20
6 AVERAGE TIME OF OCCUPANCY	21
6.1 APPLIED PROCEDURES / LIMIT	21
6.2 TEST PROCEDURE	21
6.3 DEVIATION FROM STANDARD	21
6.4 TEST SETUP	21
6.5 EUT OPERATION CONDITIONS	21
6.6 TEST RESULTS	21
7 HOPPING CHANNEL SEPARATION MEASUREMENT	22
7.1 APPLIED PROCEDURES / LIMIT	22
7.2 TEST PROCEDURE	22
7.3 DEVIATION FROM STANDARD	22
7.4 TEST SETUP	22
7.5 TEST RESULTS	22
8 BANDWIDTH TEST	23

8.1	APPLIED PROCEDURES	23
8.2	TEST PROCEDURE	23
8.3	DEVIATION FROM STANDARD	23
8.4	TEST SETUP	23
8.5	EUT OPERATION CONDITIONS	23
8.6	TEST RESULTS	23
9	OUTPUT POWER TEST	24
9.1	APPLIED PROCEDURES / LIMIT	24
9.2	TEST PROCEDURE	24
9.3	DEVIATION FROM STANDARD	24
9.4	TEST SETUP	24
9.5	EUT OPERATION CONDITIONS	24
9.6	TEST RESULTS	24
10	ANTENNA CONDUCTED SPURIOUS EMISSION	25
10.1	APPLIED PROCEDURES / LIMIT	25
10.2	TEST PROCEDURE	25
10.3	DEVIATION FROM STANDARD	25
10.4	TEST SETUP	25
10.5	EUT OPERATION CONDITIONS	25
10.6	TEST RESULTS	25
11	LIST OF MEASURING EQUIPMENTS	26
12	EUT TEST PHOTO	28
13	EUT PHOTOS	28
APPENDIX A	AC POWER LINE CONDUCTED EMISSIONS	29
APPENDIX B	RADIATED EMISSIONS - 30 MHZ TO 1 GHZ	34
APPENDIX C	RADIATED EMISSIONS - ABOVE 1 GHZ	37
APPENDIX D	NUMBER OF HOPPING CHANNEL	44
APPENDIX E	AVERAGE TIME OF OCCUPANCY	46
APPENDIX F	HOPPING CHANNEL SEPARATION MEASUREMENT	48
APPENDIX G	BANDWIDTH	50
APPENDIX H	OUTPUT POWER	52
APPENDIX I	ANTENNA CONDUCTED SPURIOUS EMISSION	54

REVISION HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-5-2303T057	R00	Original Report.	2023/9/13	Invalid
BTL-FCCP-5-2303T057	R01	Revised report to address TCB's comments.	2023/9/28	Valid

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

Standard(s) Section	Description	Test Result	Judgement	Remark
15.207	AC Power Line Conducted Emissions	APPENDIX A	Pass	-----
15.205 15.209 15.247(d)	Radiated Emissions	APPENDIX B APPENDIX C	Pass	-----
15.247 (a)(1)(i)	Number of Hopping Frequency	APPENDIX D	Pass	-----
15.247 (a)(1)(iii)	Average Time of Occupancy	APPENDIX E	Pass	-----
15.247 (a)(1)(i)	Hopping Channel Separation	APPENDIX F	Pass	-----
15.247 (a)(1)(i)	Bandwidth	APPENDIX G	Pass	-----
15.247 (b)(2)	Output Power	APPENDIX H	Pass	-----
15.247(d)	Antenna conducted Spurious Emission	APPENDIX I	Pass	-----
15.247 (a)(1)(i)	Dwell Time	APPENDIX E	Pass	-----
15.203	Antenna Requirement	-----	Pass	-----

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report.
- (2) The report format version is TP.1.1.1.

1.1 TEST FACILITY

The test locations stated below are under the TAF Accreditation Number 0659.

The test location(s) used to collect the test data in this report are:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)

☒ C05 ☐ CB08 ☐ CB11 ☒ SR10 ☐ SR11

No. 72, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)

☐ C06 ☒ CB21 ☐ CB22

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately **95 %**. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2 U_{CISPR} requirement.

A. AC power line conducted emissions test:

Test Site	Method	Measurement Frequency Range	U (dB)
C05	CISPR	150 kHz ~ 30 MHz	3.44

B. Radiated emissions test :

Test Site	Measurement Frequency Range	U (dB)
CB21	0.03 GHz ~ 0.2 GHz	4.17
	0.2 GHz ~ 1 GHz	4.72
	1 GHz ~ 6 GHz	5.21
	6 GHz ~ 18 GHz	5.51
	18 GHz ~ 26 GHz	3.69
	26 GHz ~ 40 GHz	4.23

C. Conducted test :

Test Item	U (dB)
Occupied Bandwidth	0.5338
Output power	0.3659
Conducted Spurious emissions	0.5416
Conducted Band edges	0.5348
Dwell time	0.6606
Channel separation	0.6606
Channel numbers	0.6606

NOTE:

Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

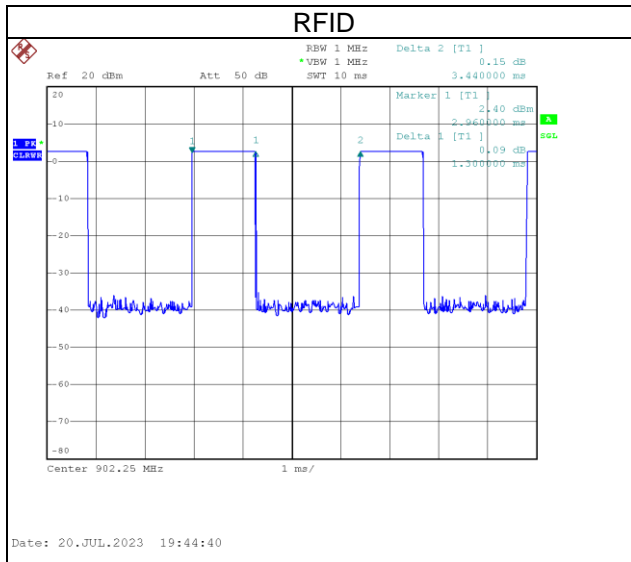
1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Environment Condition	Test Voltage	Tested by
AC Power Line Conducted Emissions	22 °C, 54 %	AC 120V	Cora Lin
Radiated emissions below 1 GHz	Refer to data	AC 120V	Mark Wang
Radiated emissions above 1 GHz	Refer to data	AC 120V	Mark Wang
Number of Hopping Frequency	23.7 °C, 48 %	AC 120V	Jay Tien
Average Time of Occupancy	23.7 °C, 48 %	AC 120V	Jay Tien
Hopping Channel Separation	23.7 °C, 48 %	AC 120V	Jay Tien
Bandwidth	23.7 °C, 48 %	AC 120V	Jay Tien
Output Power	23.7 °C, 48 %	AC 120V	Jay Tien
Antenna conducted Spurious Emission	23.7 °C, 48 %	AC 120V	Jay Tien
Dwell Time	23.7 °C, 48 %	AC 120V	Jay Tien

1.4 DUTY CYCLE

If duty cycle is $\geq 98\%$, duty factor is not required.

If duty cycle is $< 98\%$, duty factor shall be considered.



Remark	Delta 1			Delta 2	On Time/Period	10 log(1/Duty Cycle)
Mode	ON (ms)	Numbers (ON)	On Time (B) (ms)	Period (ON+OFF) (ms)	Duty Cycle (%)	Duty Factor (dB)
RFID	1.300	1	1.300	3.440	37.79%	4.23

2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	Smart Video Intercom - L
Model Name	CAPXLV2
Brand Name	Liftmaster
Model Difference	N/A
Power Source	1. DC voltage supplied from AC/DC adapter. 2. DC voltage supplied from PoE.
Power Rating	1. I/P: 100-240V~ 50/60Hz 1.5A O/P: 24.0V---3.0A, 72.0W 2. DC 48V
Products Covered	1 * Adapter: Shenzhen GEAO Technology Co Ltd / QX72W240300D3
Operation Band	902 MHz ~ 928 MHz
Operation Frequency	902.25 MHz ~ 926.75 MHz
Modulation Technology	FHSS
Output Power Max.	13.60 dBm (0.0229 W)
Operating Software	N/A
Test Model	CAPXLV2
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:

(1) The above EUT information is declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

(2) Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	902.25	13	908.75	26	915.25	39	921.75
1	902.75	14	909.25	27	915.75	40	922.25
2	903.25	15	909.75	28	916.25	41	922.75
3	903.75	16	910.25	29	916.75	42	923.25
4	904.25	17	910.75	30	917.25	43	923.75
5	904.75	18	911.25	31	917.75	44	924.25
6	905.25	19	911.75	32	918.25	45	924.75
7	905.75	20	912.25	33	918.75	46	925.25
8	906.25	21	912.75	34	919.25	47	925.75
9	906.75	22	913.25	35	919.75	48	926.25
10	907.25	23	913.75	36	920.25	49	926.75
11	907.75	24	914.25	37	920.75		
12	908.25	25	914.75	38	921.25		

(3) Table for Filed Antenna:

Antenna	Manufacture	Part No.	Type	Connector	Gain (dBi)
External antenna	Radiation Technology, Inc.	C0289-ANG0002	Passive Antenna	F TYPE STRAIGHT PLUG	-0.23

(4) The above Antenna information are derived from the antenna data sheet provided by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.2 TEST MODES

Test Items	Test mode	Channel	Note
AC power line conducted emissions	Normal/Idle	-	-
Transmitter Radiated Emissions (below 1GHz)	TX_ISM	0	-
Transmitter Radiated Emissions (above 1GHz)	TX_ISM	0/25/49	-
Number of Hopping Frequency	TX	0~49	-
Average Time of Occupancy	TX	0/25/49	-
Hopping Channel Separation	TX	0/25/49	-
Bandwidth	TX	0/25/49	-
Output Power	TX	0/25/49	-
Antenna conducted Spurious Emission	TX	0/49	-
Dwell Time	TX	0/25/49	-

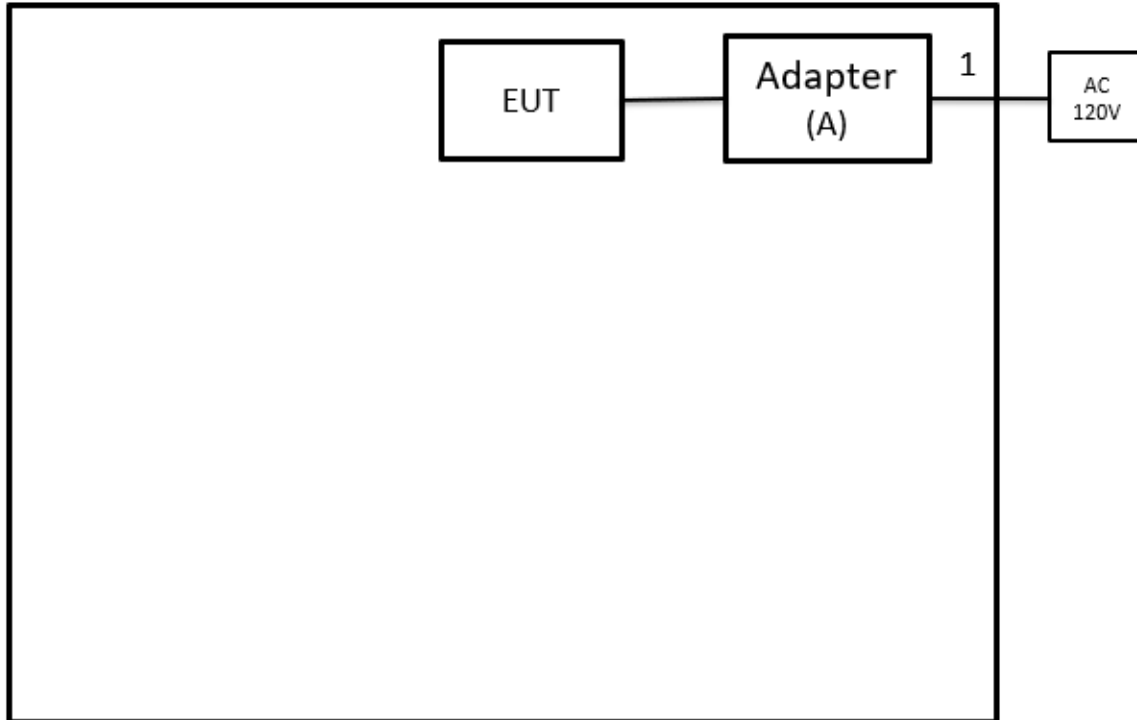
NOTE:

- (1) The Radiated emissions test was verified based on the worst conducted power and Bandwidth test results reported in the original report.
- (2) All X, Y and Z axes are evaluated, but only the worst case (X axis) is recorded.
- (3) For AC Power line conducted emissions and transmitter radiated emissions (below 1GHz), POE mode and adapter mode are evaluated, adapter mode is found to be the worst case and used for final test.
- (4) For AC Power line conducted emissions and transmitter radiated emissions (below 1GHz), both POE mode and adapter mode are evaluated. For the other test item, only adapter mode is used.

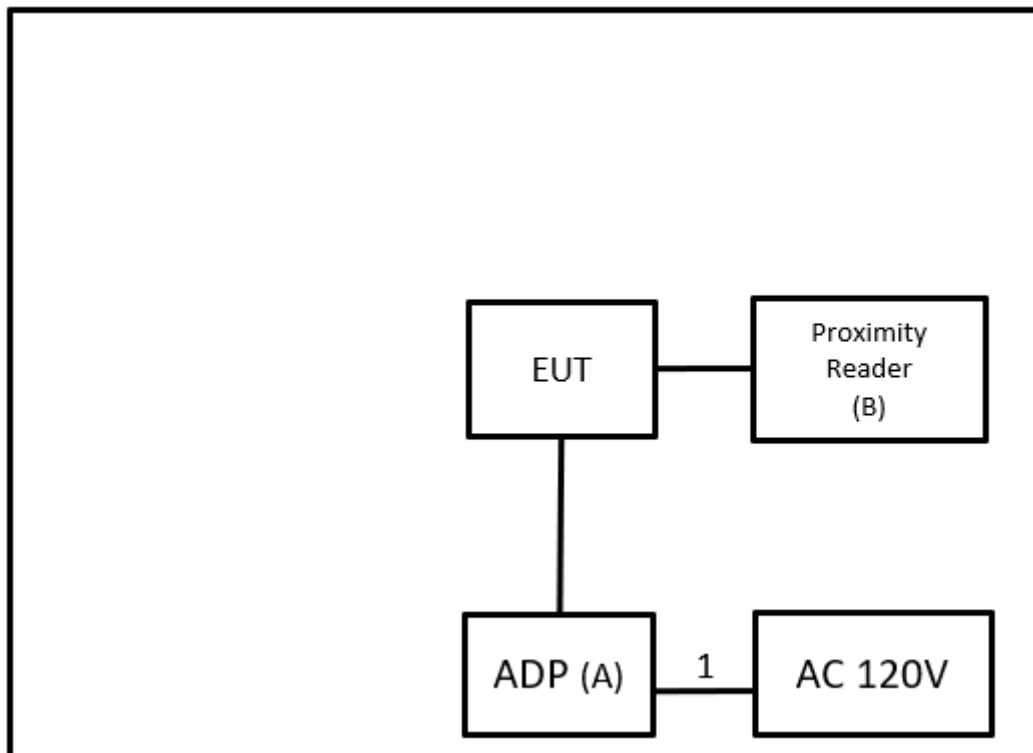
2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.

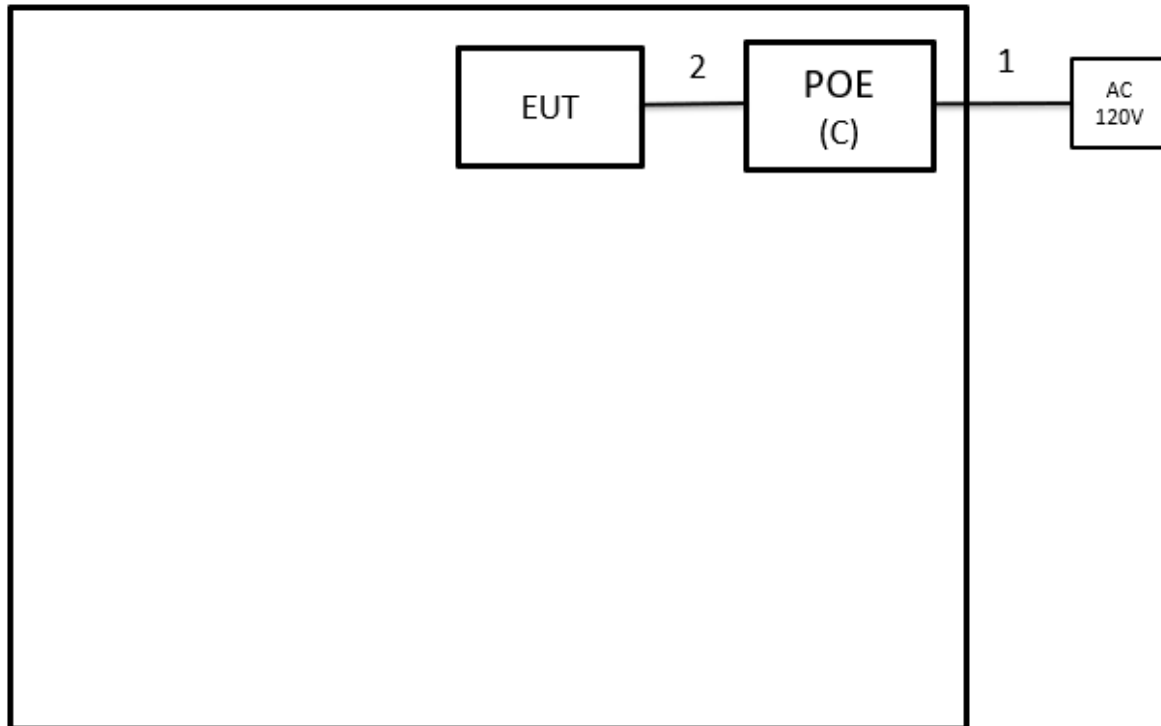
Adapter Mode
AC power line conducted emissions



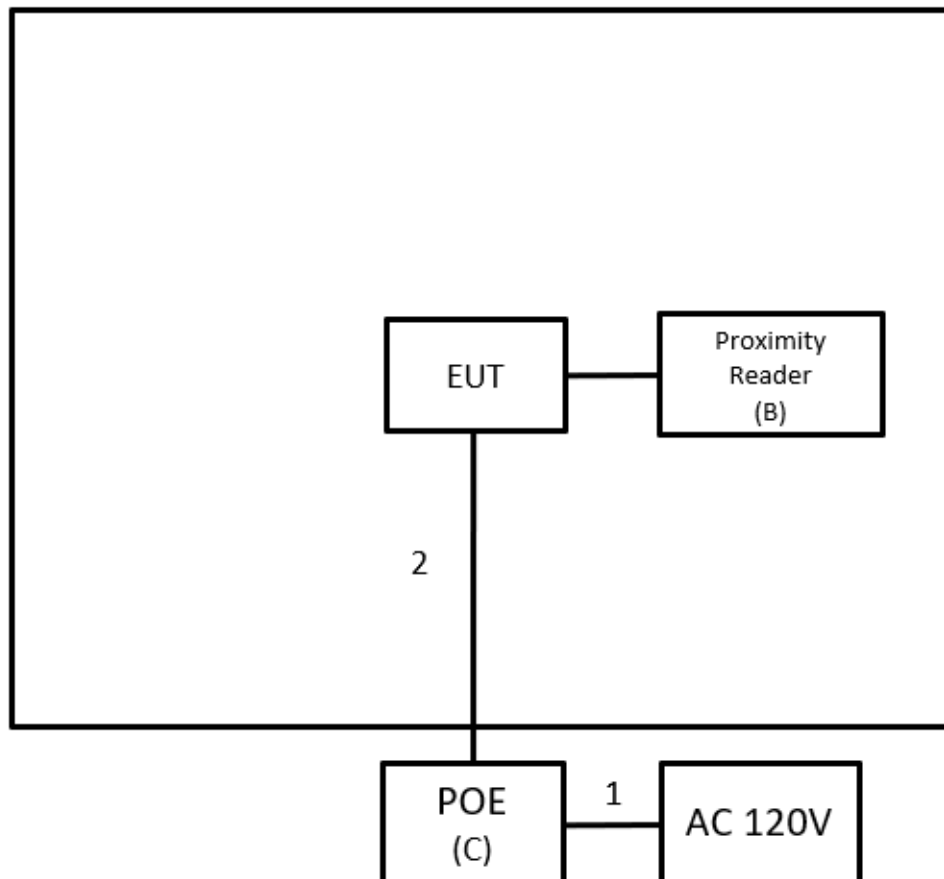
Radiated Emissions



POE Mode
AC power line conducted emissions



Radiated Emissions (below 1GHz)



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
A	Adapter	Shenzhen GEAO Technology Co Ltd	QX72W240300D3	N/A	Supplied by test requester.
B	Proximity Reader	AWID	SR-2400	N/A	Supplied by test requester.
C	POE	HUAWEI	PoE35-54A	N/A	Furnished by test lab.

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
1	No	No	1.1m	Power Cord	Supplied by test requester.
2	No	No	10m	RJ45 Cable	Furnished by test lab.

3 AC POWER LINE CONDUCTED EMISSIONS TEST

3.1 LIMIT

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56 *	56 - 46 *
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor (if use)
 Margin Level = Measurement Value – Limit Value
 Calculation example:

Reading Level		Correct Factor		Measurement Value
38.22	+	3.45	=	41.67

Measurement Value		Limit Value		Margin Level
41.67	-	60	=	-18.33

The following table is the setting of the receiver.

Receiver Parameter	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 m above the horizontal ground plane with the EUT being connected to the power mains through a line impedance stabilization network (LISN).
 All other support equipment were powered from an additional LISN(s).
 The LISN provides 50 Ohm/50uH of impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle to keep the cable above 40 cm.
- c. Excess I/O cables that are not connected to a peripheral shall be bundled in the center.
 The end of the cable will be terminated, using the correct terminating impedance.
 The overall length shall not exceed 1 m.
- d. The LISN is spaced at least 80 cm from the nearest part of the EUT chassis.
- e. For the actual test configuration, please refer to the related Item - EUT TEST PHOTO.

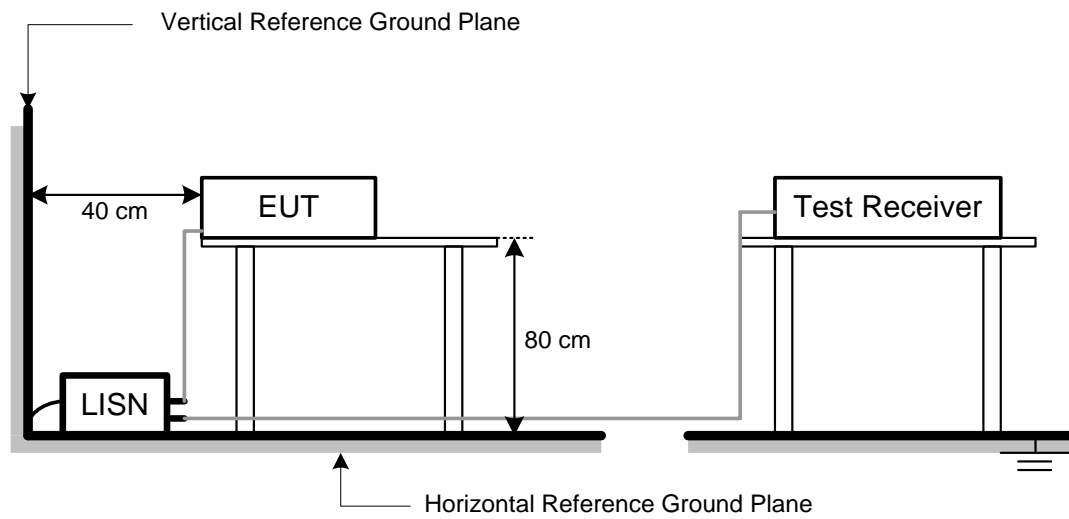
NOTE:

- (1) In the results, each reading is marked as Peak, QP or AVG per the detector used.
 BW=9 kHz (6 dB Bandwidth)
- (2) All readings are Peak unless otherwise stated QP or AVG in column of Note. Both the QP and the AVG readings must be less than the limit for compliance.

3.3 DEVIATION FROM TEST STANDARD

No deviation.

3.4 TEST SETUP



3.5 TEST RESULT

Please refer to the APPENDIX A.

4 RADIATED EMISSIONS TEST

4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205, then the 15.209 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

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
960~1000	500	3

LIMITS OF RADIATED EMISSIONS MEASUREMENT (Above 1000 MHz)

Frequency (MHz)	Radiated Emissions (dBuV/m)		Measurement Distance (meters)
	Peak	Average	
Above 1000	74	54	3

NOTE:

- (1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:

Measurement Value = Reading Level + Correct Factor

Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)

Margin Level = Measurement Value - Limit Value

Calculation example:

Reading Level		Correct Factor		Measurement Value
35.45	+	-11.37	=	24.08

Measurement Value		Limit Value		Margin Level
24.08	-	40	=	-15.92

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 1/T for Average

Spectrum Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9KHz~90KHz for PK/AVG detector
Start ~ Stop Frequency	90KHz~110KHz for QP detector
Start ~ Stop Frequency	110KHz~490KHz for PK/AVG detector
Start ~ Stop Frequency	490KHz~30MHz for QP detector
Start ~ Stop Frequency	30MHz~1000MHz for QP detector

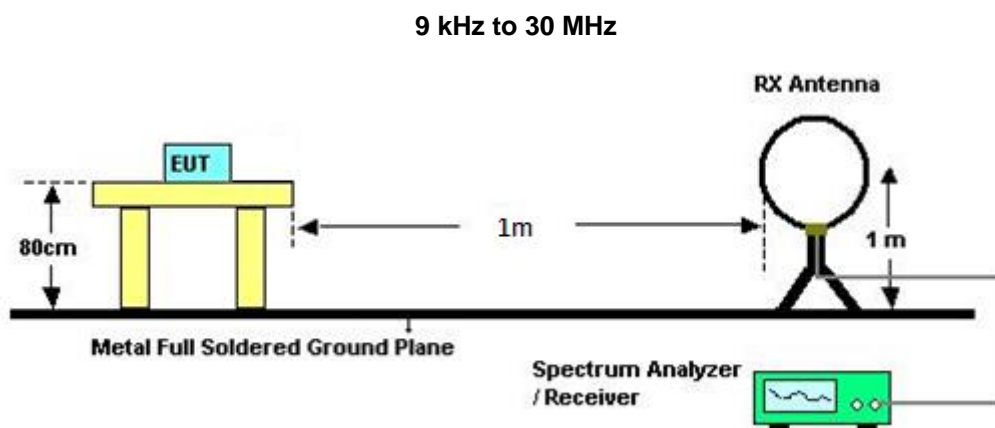
4.2 TEST PROCEDURE

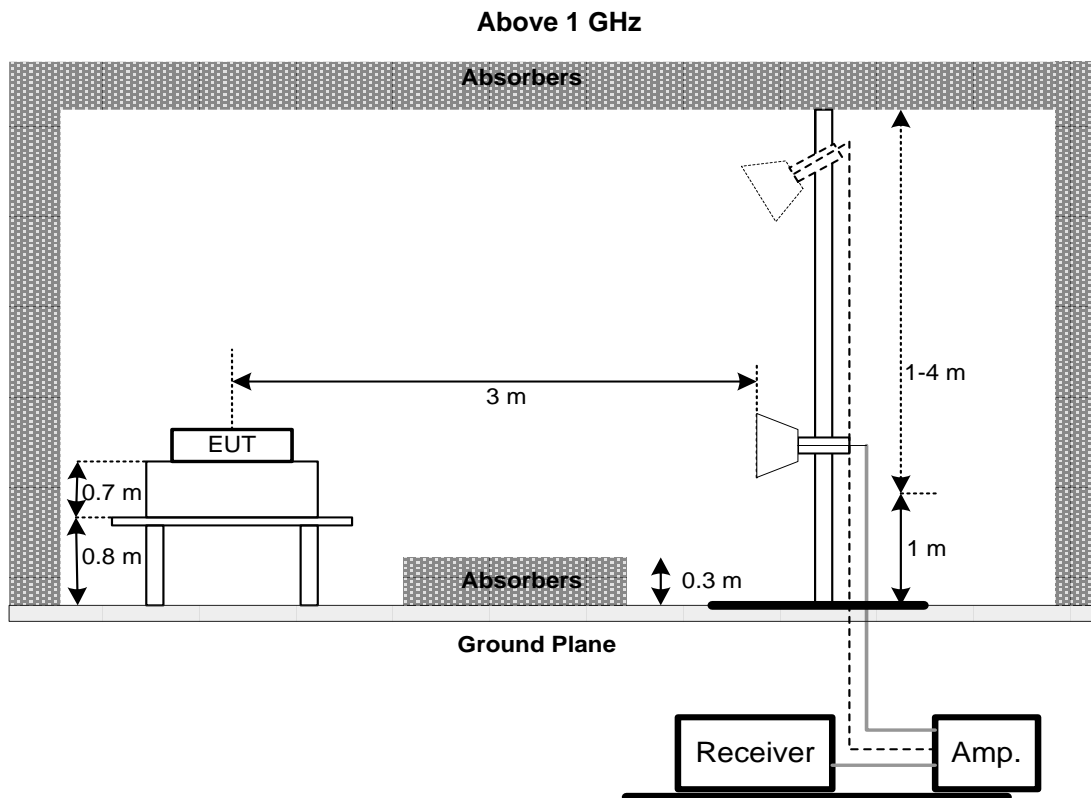
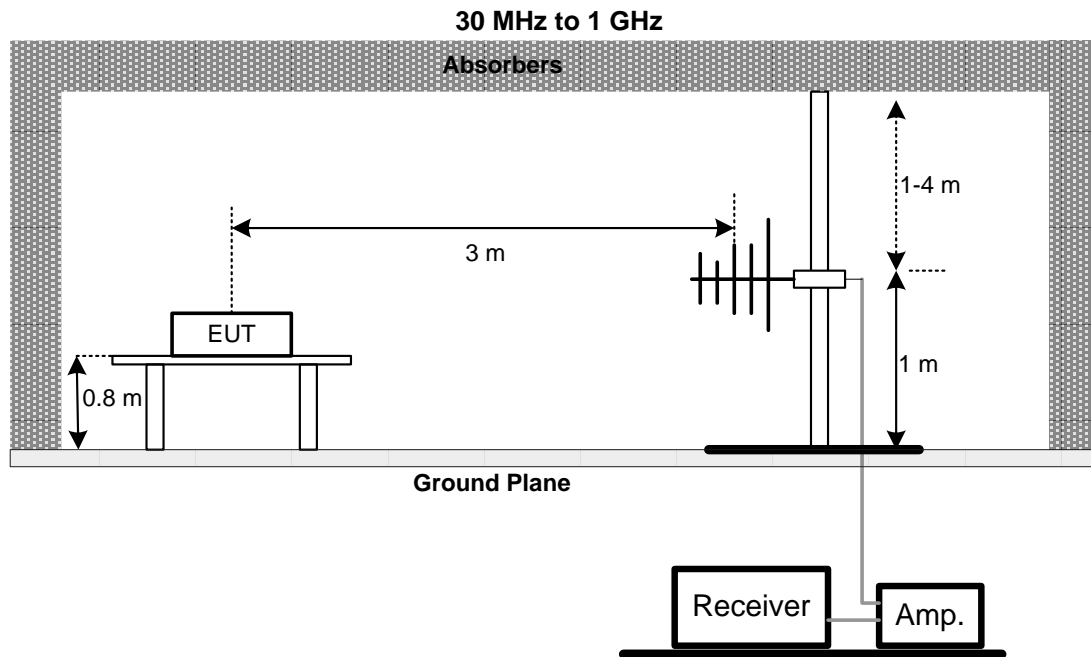
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

4.3 DEVIATION FROM TEST STANDARD

No deviation.

4.4 TEST SETUP





4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT – BELOW 30 MHZ

There were no emissions found below 30 MHz within 20 dB of the limit.

4.7 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX B.

4.8 TEST RESULT – ABOVE 1 GHZ

Please refer to the APPENDIX C.

NOTE:

- (1) No limit: This is fundamental signal, the judgment is not applicable.
For fundamental signal judgment was referred to Peak output test.

5 NUMBER OF HOPPING CHANNEL

5.1 APPLIED PROCEDURES

Section	Test Item	Frequency Range (MHz)	Result
15.247(a)(1)(i)	Number of Hopping Channel	902-928	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating Frequency Range
RBW	100 KHz
VBW	100 KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting: RBW=100KHz, VBW=100KHz, Sweep time = Auto.

5.3 DEVIATION FROM STANDARD

No deviation.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Please refer to the APPENDIX D.

6 AVERAGE TIME OF OCCUPANCY

6.1 APPLIED PROCEDURES / LIMIT

Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(1)(i)	Average Time of Occupancy	0.4sec	902-928	PASS

6.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyzer
- Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is more than once pulse time.
- Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.
- AFH: Packet permit maximum $416/16/15 = 1.733$ hops per second in each channel(12 time slots Tx, 4 time slots Stop). So, the dwell time is the time duration of the pulse times $1.733 \times 6 = 10.4$ within 6 seconds.

6.3 DEVIATION FROM STANDARD

No deviation.

6.4 TEST SETUP



6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

Please refer to the APPENDIX E.

7 HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 APPLIED PROCEDURES / LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	10 kHz
VBW	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

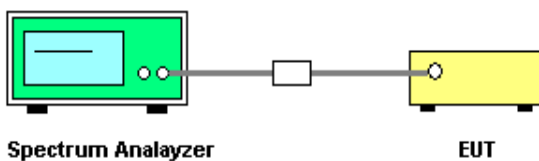
7.2 TEST PROCEDURE

- The EUT must have its hopping function enabled
- Span = wide enough to capture the peaks of two adjacent channels
Resolution (or IF) Bandwidth (RBW) \geq 1% of the span
Video (or Average) Bandwidth (VBW) \geq RBW
Sweep = Auto
Detector function = Peak
Trace = Max Hold

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 TEST RESULTS

Please refer to the APPENDIX F.

8 BANDWIDTH TEST

8.1 APPLIED PROCEDURES

If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Section	Test Item	Frequency Range (MHz)
15.247(a)(1)(i)	Bandwidth	902-928

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RBW	3 kHz (20dB Bandwidth)
VBW	10 kHz (20dB Bandwidth)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting: RBW= 3 kHz, VBW=10 kHz, Sweep Time = Auto.

8.3 DEVIATION FROM STANDARD

No deviation.

8.4 TEST SETUP



8.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 unless otherwise a special operating condition is specified in the follows during the testing.

8.6 TEST RESULTS

Please refer to the APPENDIX G.

9 OUTPUT POWER TEST

9.1 APPLIED PROCEDURES / LIMIT

Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(2)	Peak Output Power	1 Watt or 30dBm (hopping channel ≥ 50) 0.25 Watt or 23.98dBm (25 \leq hopping channels < 50)	902-928	PASS

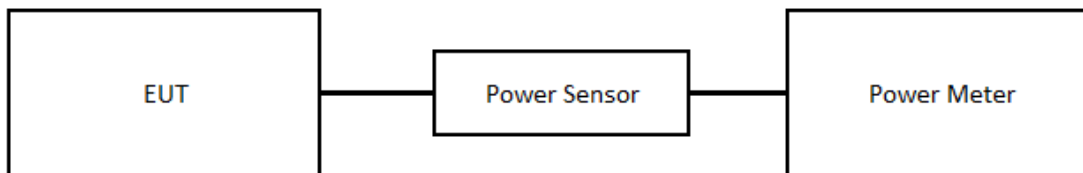
9.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting: RBW= 3MHz, VBW= 3MHz, Sweep time = Auto.

9.3 DEVIATION FROM STANDARD

No deviation.

9.4 TEST SETUP



9.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 unless otherwise a special operating condition is specified in the follows during the testing.

9.6 TEST RESULTS

Please refer to the APPENDIX H.

10 ANTENNA CONDUCTED SPURIOUS EMISSION

10.1 APPLIED PROCEDURES / LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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, provided that the transmitter demonstrates compliance with the peak conducted power limits.

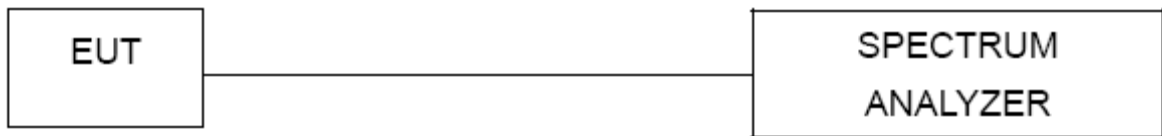
10.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting: RBW= 100 kHz, VBW=100 kHz, Sweep time = Auto.
- Offset=antenna gain+cable loss

10.3 DEVIATION FROM STANDARD

No deviation.

10.4 TEST SETUP



10.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 unless otherwise a special operating condition is specified in the follows during the testing.

10.6 TEST RESULTS

Please refer to the APPENDIX I.

11 LIST OF MEASURING EQUIPMENTS

AC Power Line Conducted Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	TWO-LINE V-NETWORK	R&S	ENV216	101521	2022/9/28	2023/9/27
2	Test Cable	EMCI	EMCRG58-BM-B M-9000	220331	2023/3/30	2024/3/29
3	EMI Test Receiver	R&S	ESR 7	101433	2022/11/16	2023/11/15
4	Measurement Software	EZ	EZ EMC (Version NB-03A1-01)	N/A	N/A	N/A

Radiated Emissions - 30 MHz to 1 GHz						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC330N	980850	2022/9/19	2023/9/18
2	Test Cable	EMCI	EMC104-SM-SM-1000	180810	2023/7/10	2024/7/9
3	Test Cable	EMCI	EMC104-SM-SM-3000	220322	2023/3/14	2024/3/13
4	Test Cable	EMCI	EMC104-SM-SM-7000	220324	2023/3/14	2024/3/13
5	EXA Signal Analyzer	keysight	N9020B	MY57120120	2023/2/24	2024/2/23
6	Log-bicon Antenna	Schwarzbeck	VULB9168	1369	2023/5/9	2024/5/8
7	6dB Attenuator	EMCI	EMCI-N-6-06	AT-06001	2023/5/9	2024/5/8
8	Measurement Software	EZ	EZ EMC (Version NB-03A1-01)	N/A	N/A	N/A

Radiated Emissions - Above 1 GHz						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC330N	980850	2022/9/19	2023/9/18
2	Preamplifier	EMCI	EMC118A45SE	980819	2023/3/7	2024/3/6
3	Preamplifier	EMCI	EMC001340	980579	2022/9/30	2023/9/29
4	Test Cable	EMCI	EMC104-SM-SM-1000	180810	2023/7/10	2024/7/9
5	Test Cable	EMCI	EMC104-SM-SM-3000	220322	2023/3/14	2024/3/13
6	Test Cable	EMCI	EMC104-SM-SM-7000	220324	2023/3/14	2024/3/13
7	EXA Signal Analyzer	keysight	N9020B	MY57120120	2023/2/24	2024/2/23
8	Loop Ant	Electro-Metrics	EMCI-LPA600	291	2022/9/19	2023/9/18
9	Horn Antenna	RFSPIN	DRH18-E	211202A18EN	2023/5/12	2024/5/11
10	Log-bicon Antenna	Schwarzbeck	VULB9168	1369	2023/5/9	2024/5/8
11	6dB Attenuator	EMCI	EMCI-N-6-06	AT-06001	2023/5/9	2024/5/8
12	Measurement Software	EZ	EZ EMC (Version NB-03A1-01)	N/A	N/A	N/A

Number of Hopping Frequency						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2022/10/7	2023/10/6

Average Time of Occupancy						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2022/10/7	2023/10/6

Hopping Channel Separation						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2022/10/7	2023/10/6

Bandwidth						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2022/10/7	2023/10/6

Output Power						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Power Meter	Keysight	8990B	MY51000517	2023/3/15	2024/3/14
2	Power Sensor	Keysight	N1923A	MY58310005	2023/3/15	2024/3/14

Antenna conducted Spurious Emission						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2022/10/7	2023/10/6

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.
All calibration period of equipment list is one year.

12 EUT TEST PHOTO

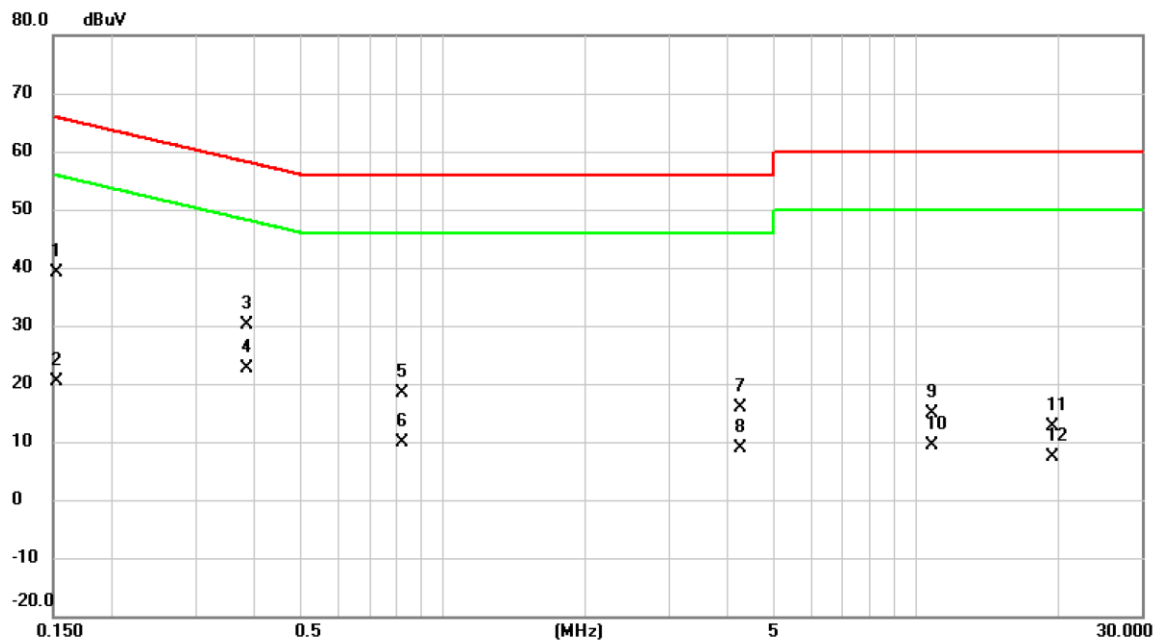
Please refer to document Appendix No.: TP-2303T057-FCCP-1 (APPENDIX-TEST PHOTOS).

13 EUT PHOTOS

Please refer to document Appendix No.: EP-2303T057-2 (APPENDIX-EUT PHOTOS).

APPENDIX A AC POWER LINE CONDUCTED EMISSIONS

Test Mode	Normal	Tested Date	2023/6/15
Test Frequency	-	Phase	Line

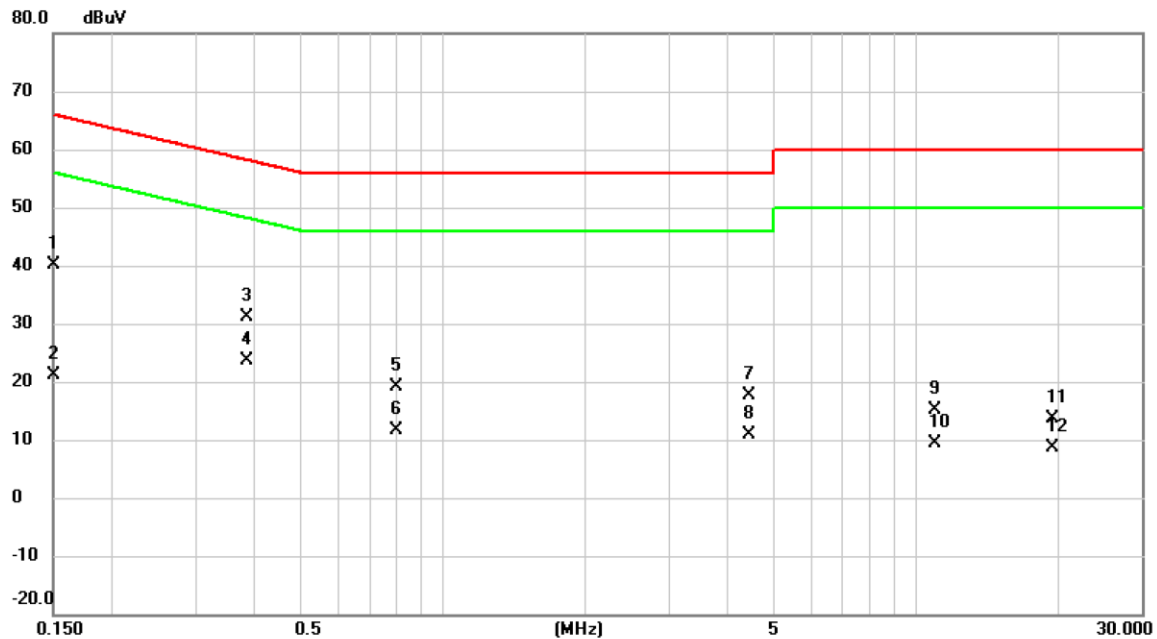


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1522	39.08	0.04	39.12	65.88	-26.76	QP	
2		0.1522	20.30	0.04	20.34	55.88	-35.54	AVG	
3		0.3840	30.19	0.02	30.21	58.19	-27.98	QP	
4	*	0.3840	22.51	0.02	22.53	48.19	-25.66	AVG	
5		0.8205	18.43	0.01	18.44	56.00	-37.56	QP	
6		0.8205	9.86	0.01	9.87	46.00	-36.13	AVG	
7		4.2585	15.94	0.05	15.99	56.00	-40.01	QP	
8		4.2585	8.89	0.05	8.94	46.00	-37.06	AVG	
9		10.8195	14.85	0.12	14.97	60.00	-45.03	QP	
10		10.8195	9.32	0.12	9.44	50.00	-40.56	AVG	
11		19.4888	12.53	0.18	12.71	60.00	-47.29	QP	
12		19.4888	7.17	0.18	7.35	50.00	-42.65	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	Normal	Tested Date	2023/6/15
Test Frequency	-	Phase	Neutral

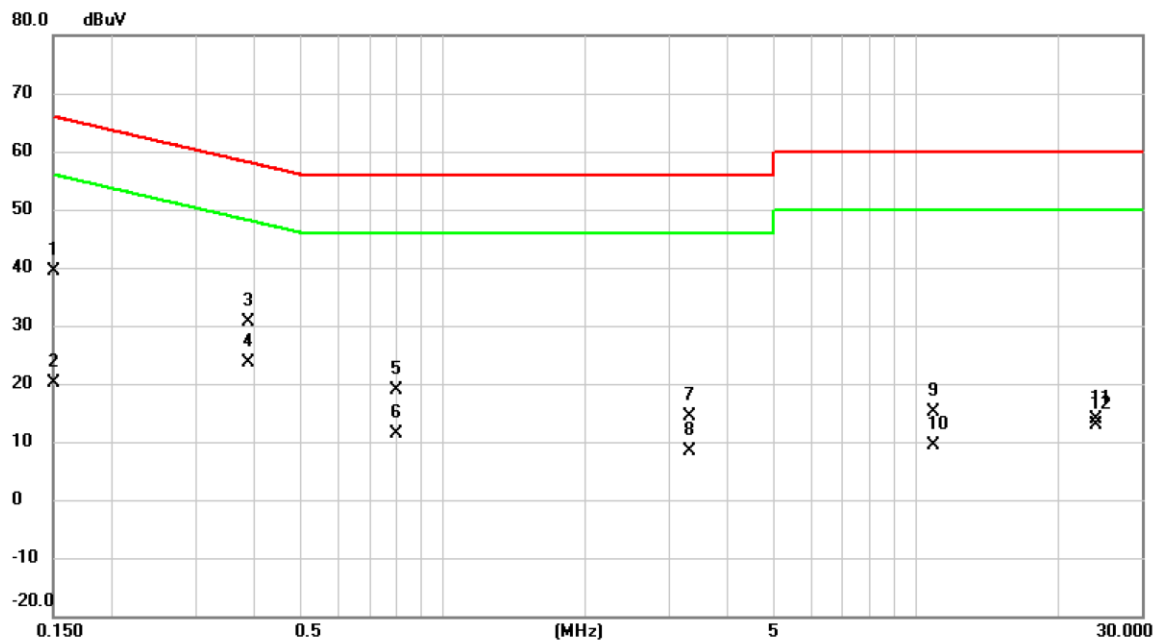


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1500	40.05	0.04	40.09	66.00	-25.91	QP	
2		0.1500	21.16	0.04	21.20	56.00	-34.80	AVG	
3		0.3862	31.07	0.02	31.09	58.15	-27.06	QP	
4	*	0.3862	23.66	0.02	23.68	48.15	-24.47	AVG	
5		0.7980	19.12	0.01	19.13	56.00	-36.87	QP	
6		0.7980	11.53	0.01	11.54	46.00	-34.46	AVG	
7		4.4340	17.69	0.05	17.74	56.00	-38.26	QP	
8		4.4340	10.85	0.05	10.90	46.00	-35.10	AVG	
9		10.9748	15.08	0.13	15.21	60.00	-44.79	QP	
10		10.9748	9.33	0.13	9.46	50.00	-40.54	AVG	
11		19.4190	13.51	0.18	13.69	60.00	-46.31	QP	
12		19.4190	8.54	0.18	8.72	50.00	-41.28	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	Idle	Tested Date	2023/6/15
Test Frequency	-	Phase	Line

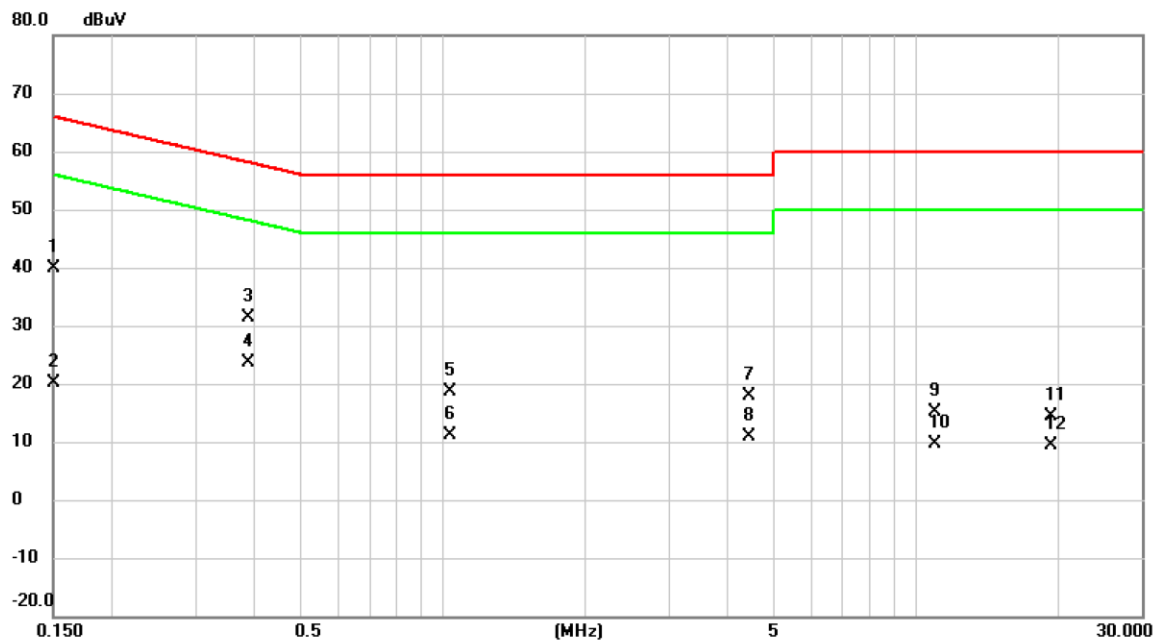


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1500	39.38	0.04	39.42	66.00	-26.58	QP	
2		0.1500	20.07	0.04	20.11	56.00	-35.89	AVG	
3		0.3885	30.56	0.02	30.58	58.10	-27.52	QP	
4	*	0.3885	23.59	0.02	23.61	48.10	-24.49	AVG	
5		0.7957	18.75	0.01	18.76	56.00	-37.24	QP	
6		0.7957	11.26	0.01	11.27	46.00	-34.73	AVG	
7		3.3203	14.42	0.05	14.47	56.00	-41.53	QP	
8		3.3203	8.35	0.05	8.40	46.00	-37.60	AVG	
9		10.9073	15.07	0.13	15.20	60.00	-44.80	QP	
10		10.9073	9.34	0.13	9.47	50.00	-40.53	AVG	
11		24.0540	13.62	0.23	13.85	60.00	-46.15	QP	
12		24.0540	12.69	0.23	12.92	50.00	-37.08	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	Idle	Tested Date	2023/6/15
Test Frequency	-	Phase	Neutral



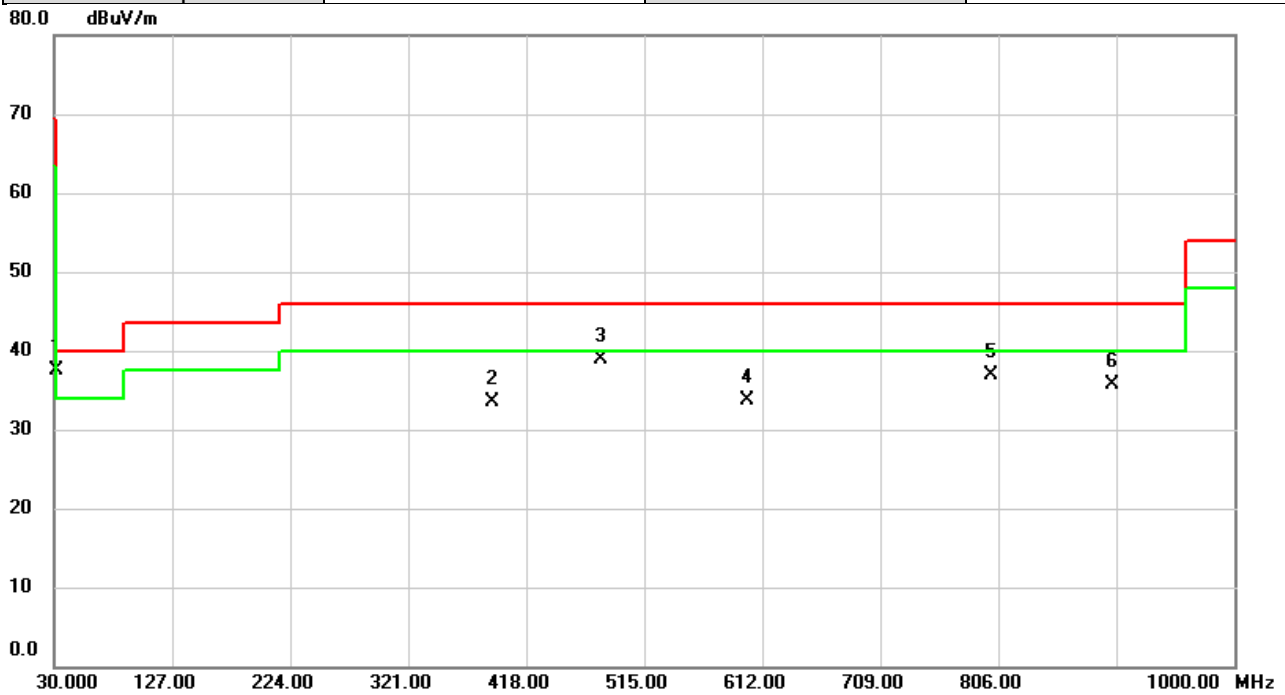
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.1500	39.83	0.04	39.87	66.00	-26.13	QP	
2		0.1500	20.19	0.04	20.23	56.00	-35.77	AVG	
3		0.3885	31.26	0.02	31.28	58.10	-26.82	QP	
4	*	0.3885	23.49	0.02	23.51	48.10	-24.59	AVG	
5		1.0387	18.51	0.01	18.52	56.00	-37.48	QP	
6		1.0387	11.15	0.01	11.16	46.00	-34.84	AVG	
7		4.4385	17.73	0.05	17.78	56.00	-38.22	QP	
8		4.4385	10.87	0.05	10.92	46.00	-35.08	AVG	
9		10.9703	14.89	0.13	15.02	60.00	-44.98	QP	
10		10.9703	9.50	0.13	9.63	50.00	-40.37	AVG	
11		19.2930	14.32	0.18	14.50	60.00	-45.50	QP	
12		19.2930	9.24	0.18	9.42	50.00	-40.58	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

APPENDIX B RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

Test Mode	TX_ISM	Test Date	2023/8/24
Test Frequency	926.75MHz	Polarization	Vertical
Temp	25°C	Hum.	57%

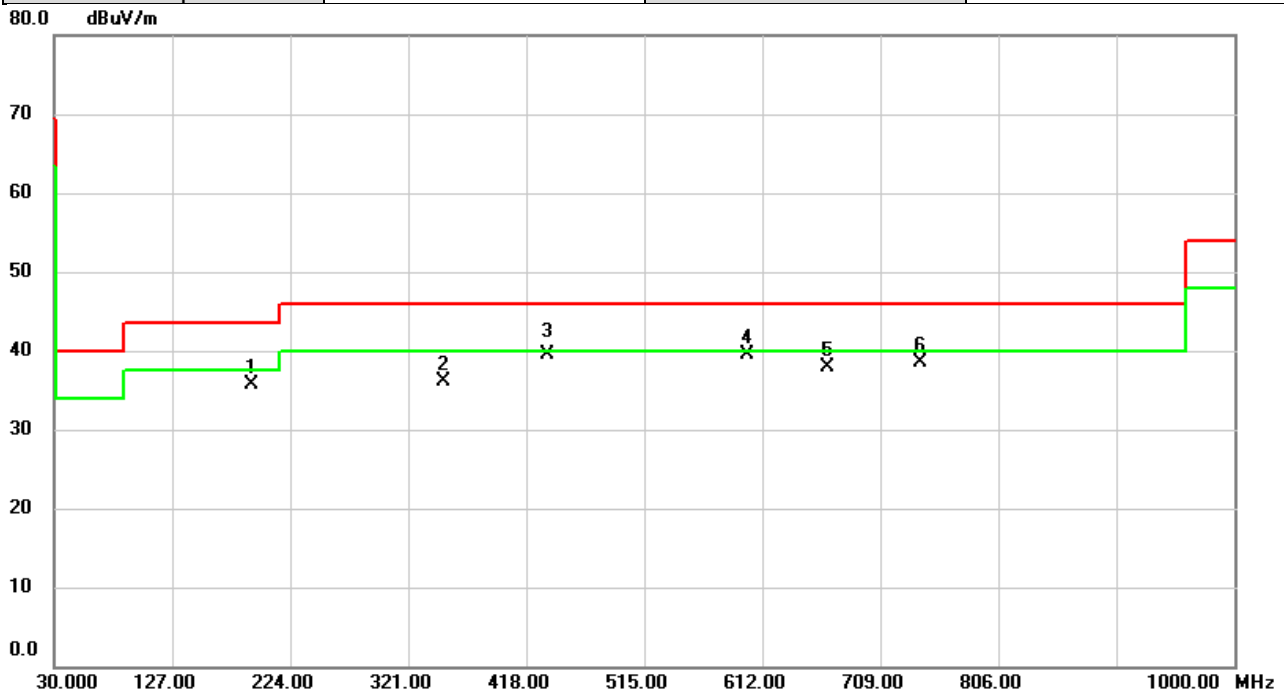


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	32.0693	50.47	-12.95	37.52	40.00	-2.48	QP	
2		390.5490	42.39	-8.85	33.54	46.00	-12.46	QP	
3		479.9830	45.55	-6.57	38.98	46.00	-7.02	QP	
4		600.0043	37.64	-3.86	33.78	46.00	-12.22	QP	
5		799.8242	37.76	-0.79	36.97	46.00	-9.03	QP	
6		899.7990	35.07	0.54	35.61	46.00	-10.39	QP	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX_ISM	Test Date	2023/8/24
Test Frequency	926.75MHz	Polarization	Horizontal
Temp	25°C	Hum.	57%



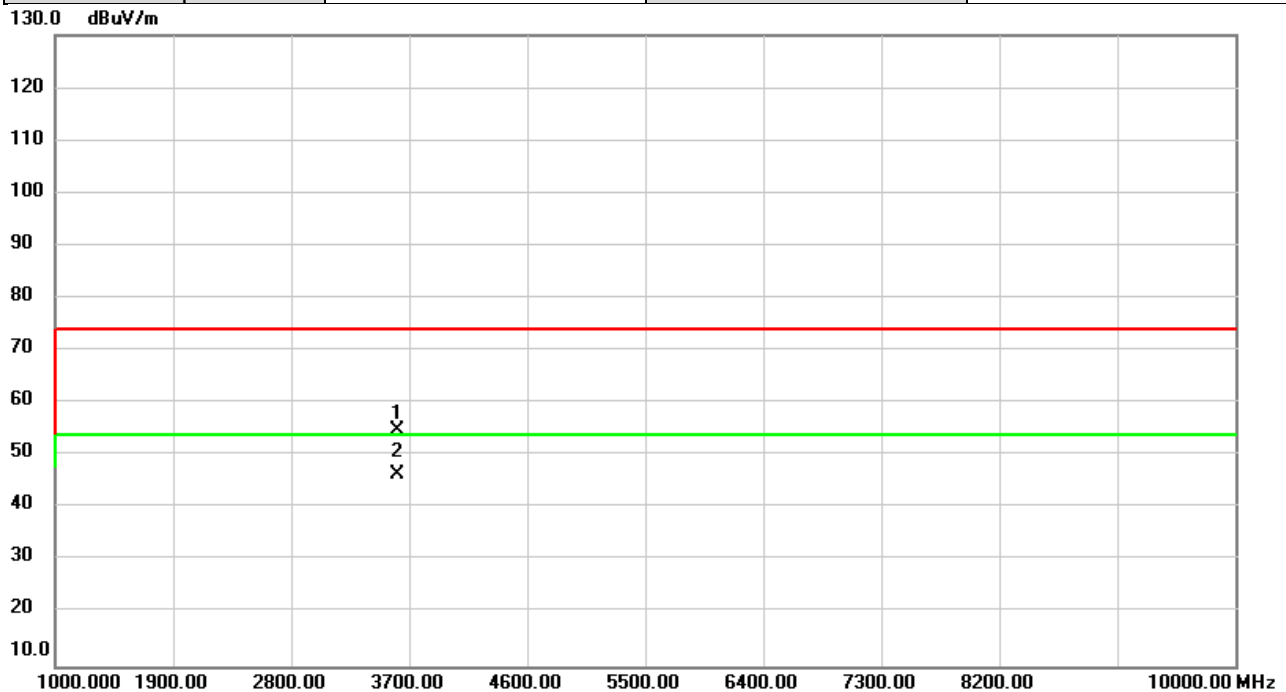
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		192.8953	50.41	-14.64	35.77	43.50	-7.73	peak	
2		350.0030	46.30	-10.12	36.18	46.00	-9.82	peak	
3	*	435.2660	47.02	-7.51	39.51	46.00	-6.49	QP	
4		599.9720	43.34	-3.86	39.48	46.00	-6.52	peak	
5		666.0936	40.72	-2.90	37.82	46.00	-8.18	peak	
6		741.4626	40.06	-1.55	38.51	46.00	-7.49	peak	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

APPENDIX C RADIATED EMISSIONS - ABOVE 1 GHZ

Test Mode	TX_ISM	Test Date	2023/7/24
Test Frequency	902.25MHz	Polarization	Vertical
Temp	29°C	Hum.	57%

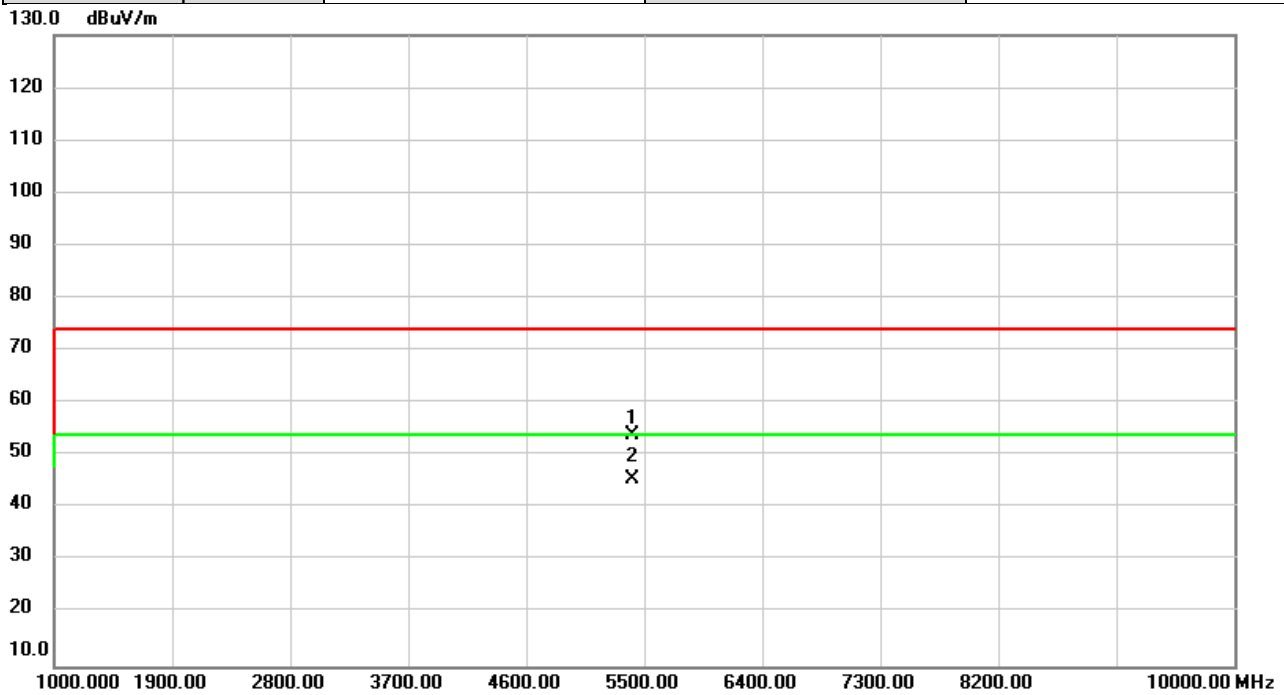


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		3608.800	57.04	-2.22	54.82	74.00	-19.18	peak	
2	*	3608.800	54.82	-8.40	46.42	54.00	-7.58	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX_ISM	Test Date	2023/7/24
Test Frequency	902.25MHz	Polarization	Horizontal
Temp	29°C	Hum.	57%

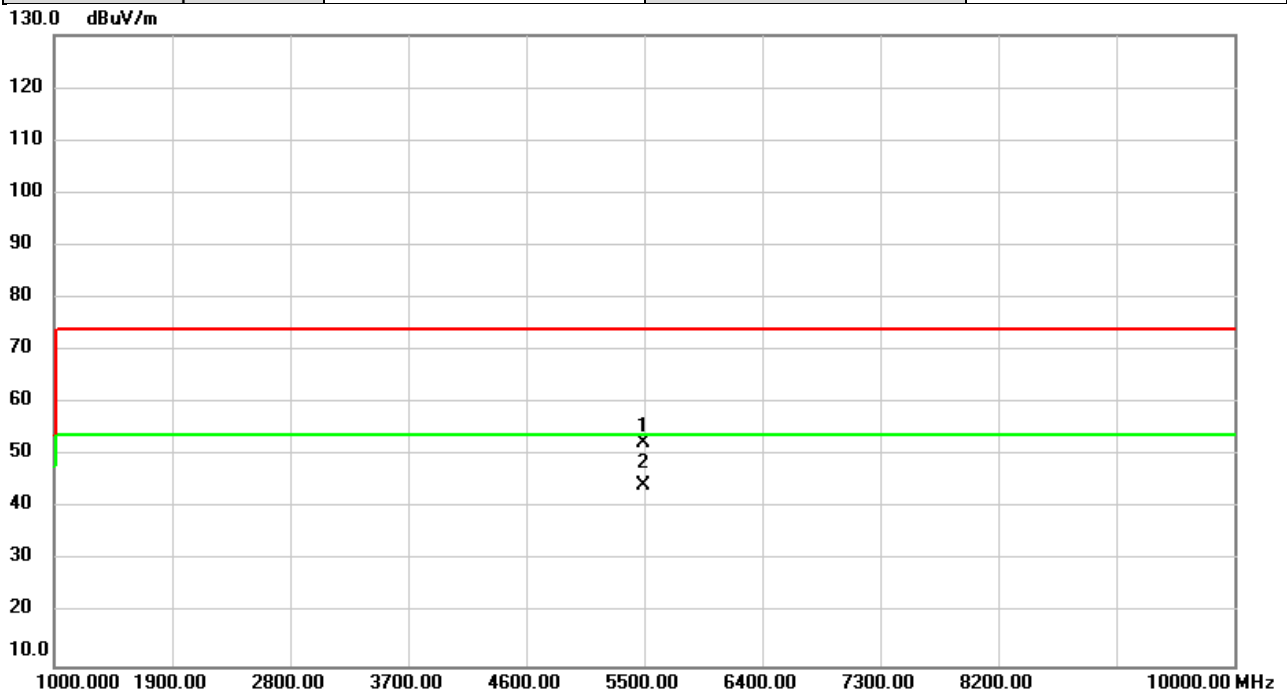


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Comment
1		5413.160	52.76	1.23	53.99	74.00	-20.01	peak	
2	*	5413.600	53.99	-8.40	45.59	54.00	-8.41	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX_ISM	Test Date	2023/7/24
Test Frequency	914.75MHz	Polarization	Vertical
Temp	29°C	Hum.	57%

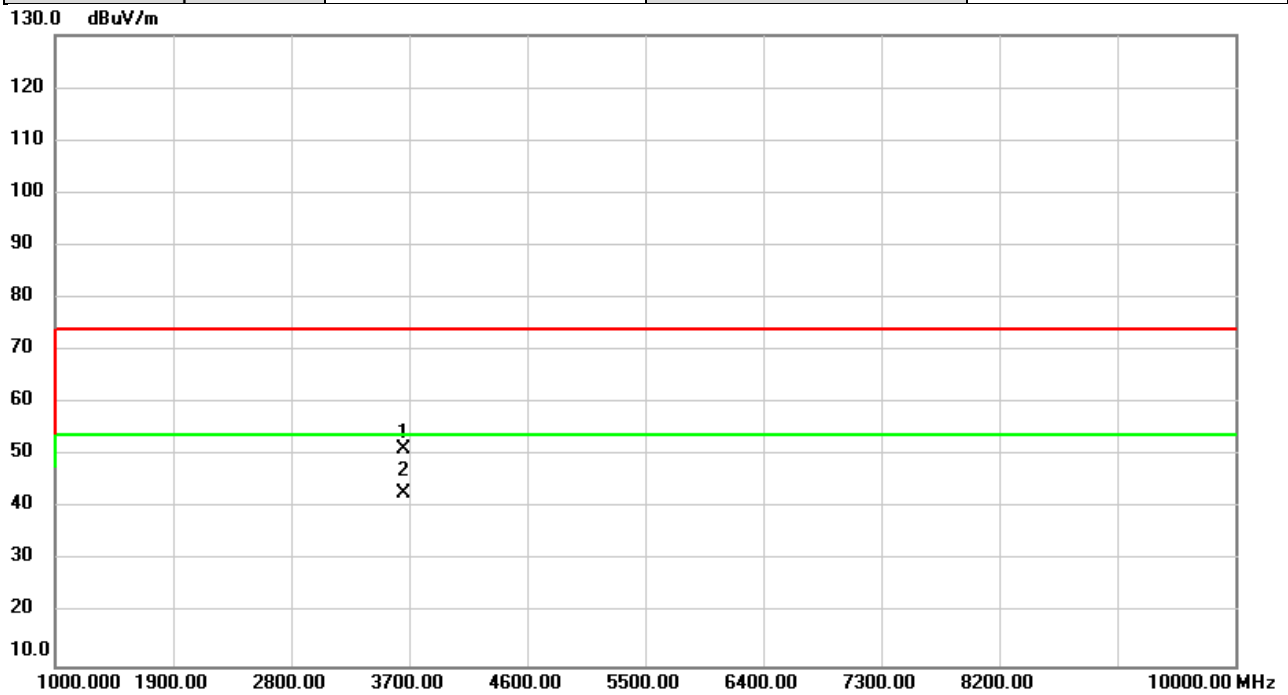


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		5488.900	51.36	1.24	52.60	74.00	-21.40	peak	
2	*	5488.900	52.60	-8.40	44.20	54.00	-9.80	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX_ISM	Test Date	2023/7/24
Test Frequency	914.75MHz	Polarization	Horizontal
Temp	29°C	Hum.	57%

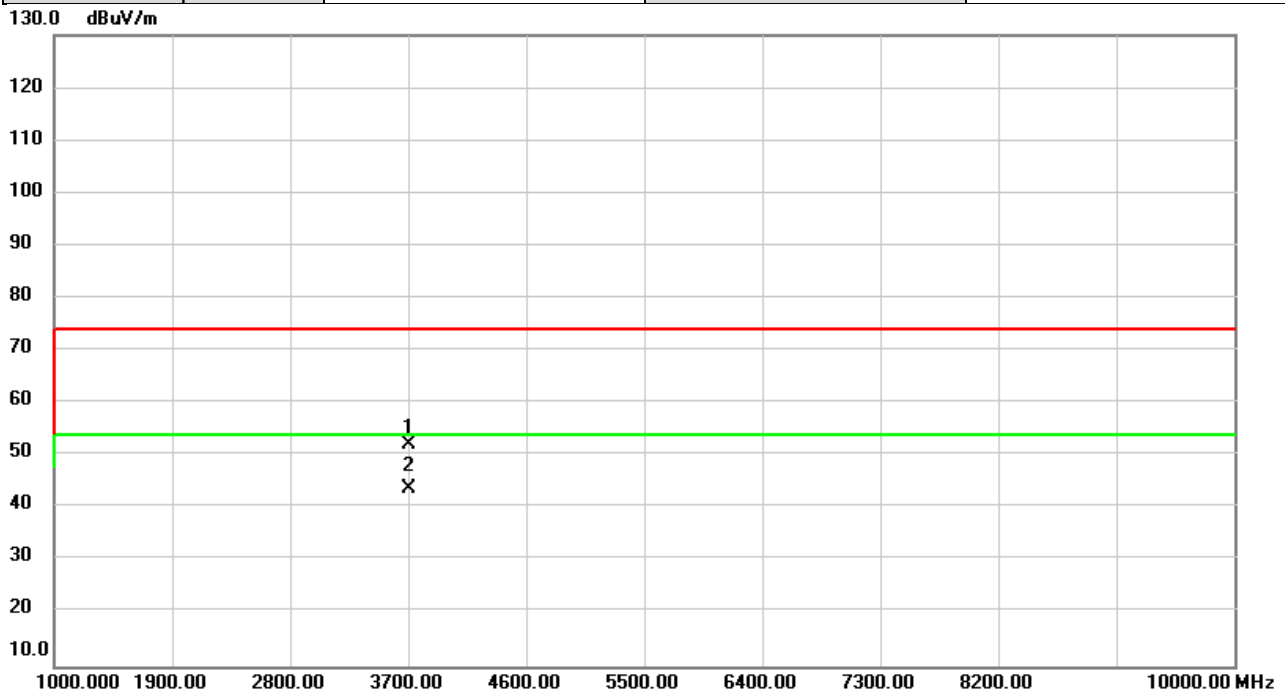


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		3658.900	53.25	-2.12	51.13	74.00	-22.87	peak	
2	*	3658.900	51.13	-8.40	42.73	54.00	-11.27	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX_ISM	Test Date	2023/7/24
Test Frequency	926.75MHz	Polarization	Vertical
Temp	29°C	Hum.	57%

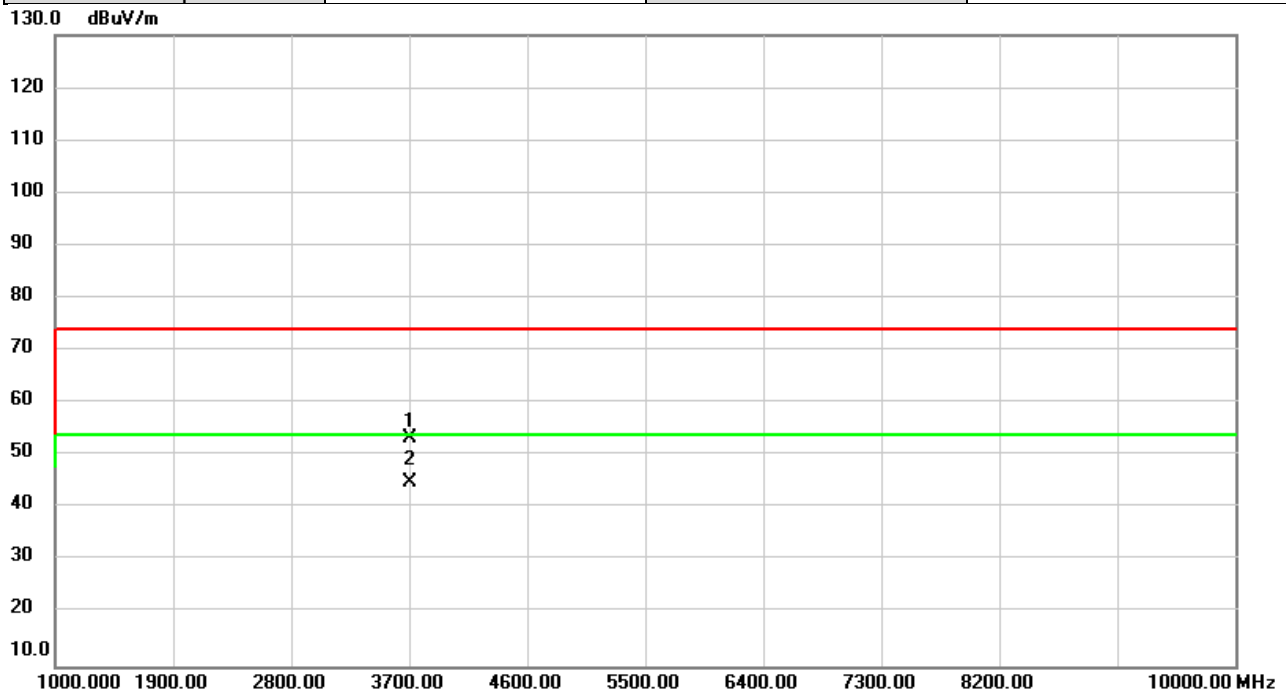


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		3707.200	54.06	-2.02	52.04	74.00	-21.96	peak	
2	*	3707.200	52.04	-8.40	43.64	54.00	-10.36	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

Test Mode	TX_ISM	Test Date	2023/7/24
Test Frequency	926.75MHz	Polarization	Horizontal
Temp	29°C	Hum.	57%



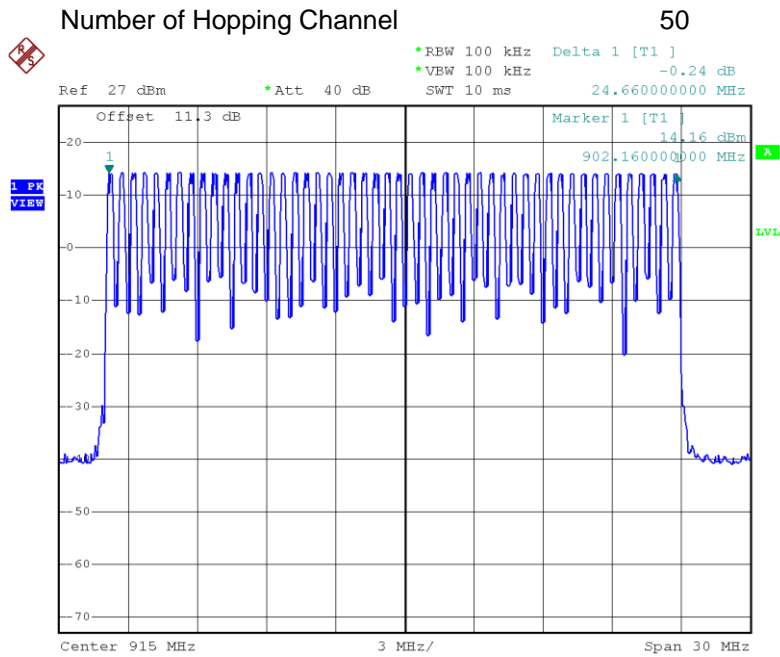
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		3706.900	55.38	-2.02	53.36	74.00	-20.64	peak	
2	*	3706.900	53.36	-8.40	44.96	54.00	-9.04	AVG	

REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

APPENDIX D NUMBER OF HOPPING CHANNEL

Test Mode	TX
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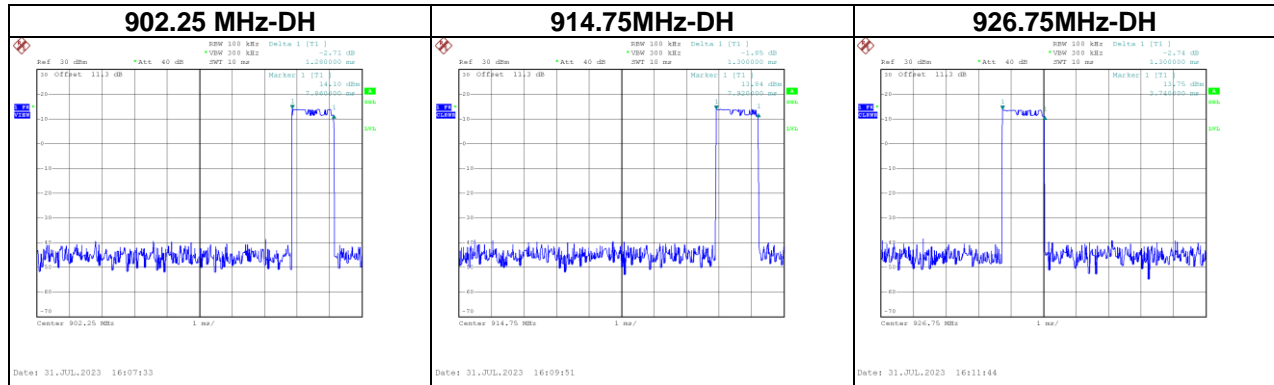


Date: 14.JUL.2023 14:50:26

APPENDIX E AVERAGE TIME OF OCCUPANCY

Test Mode : TX

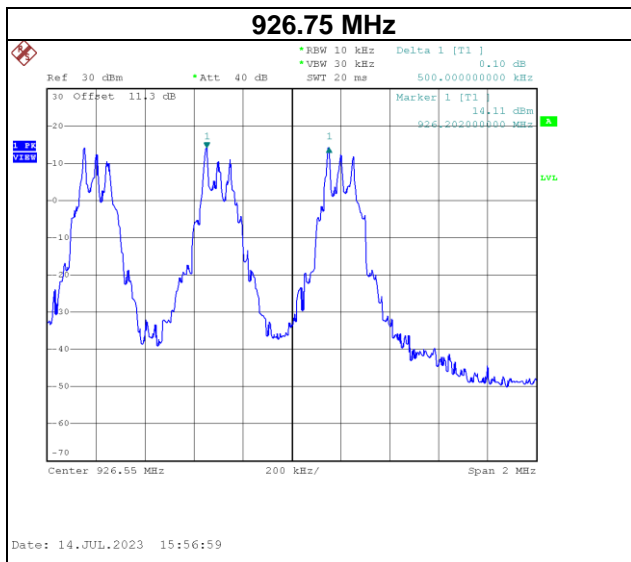
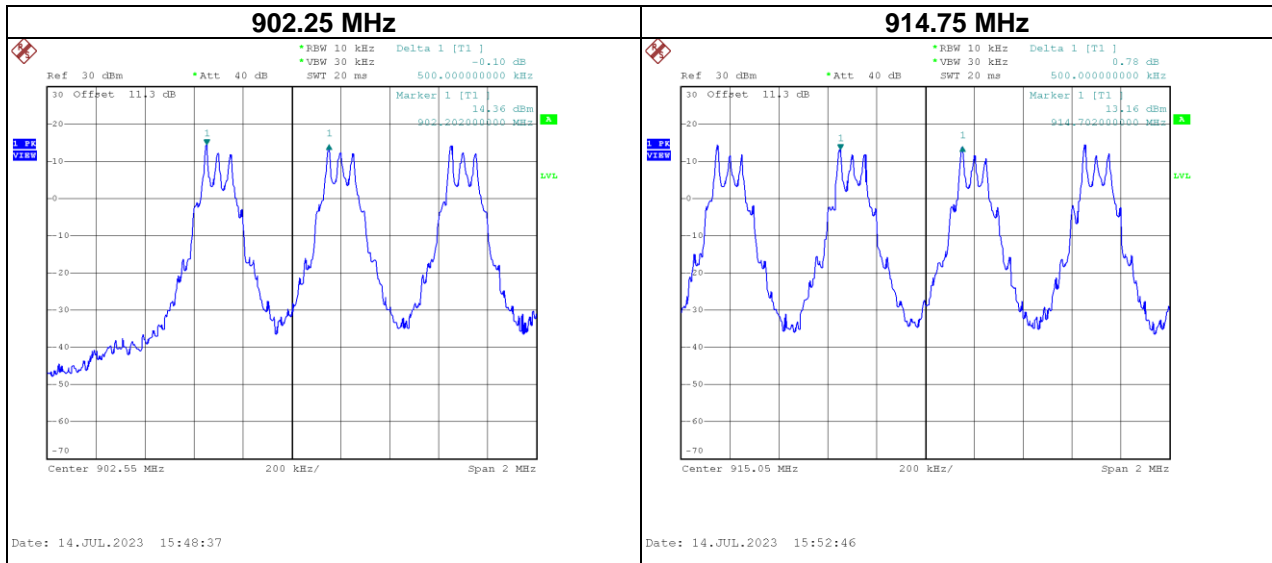
Frequency (MHz)	Pulse Duration (s)	Dwell Time (s)	Limits (s)	Test Result
902.25	1.2800	0.00006	0.4000	Pass
914.75	1.3000	0.00007	0.4000	Pass
926.75	1.3000	0.00007	0.4000	Pass



APPENDIX F HOPPING CHANNEL SEPARATION MEASUREMENT

Test Mode : Hopping on _TX

Frequency (MHz)	Channel Separation (MHz)	20dB Bandwidth (MHz)	Test Result
902.25	0.500	0.196	Pass
914.75	0.500	0.196	Pass
926.75	0.500	0.196	Pass

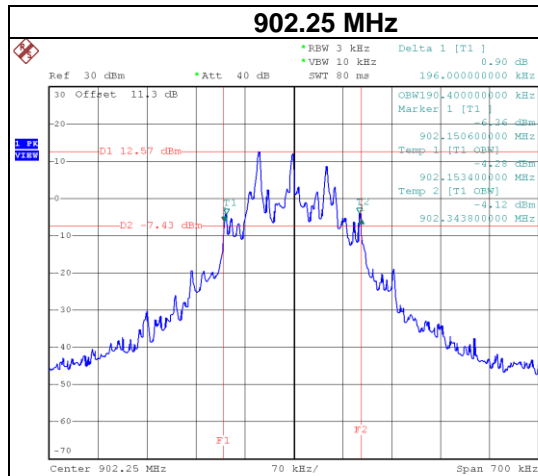


-

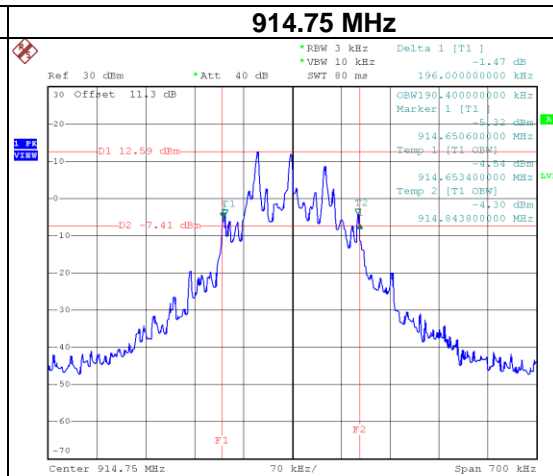
APPENDIX G BANDWIDTH

Test Mode :	TX
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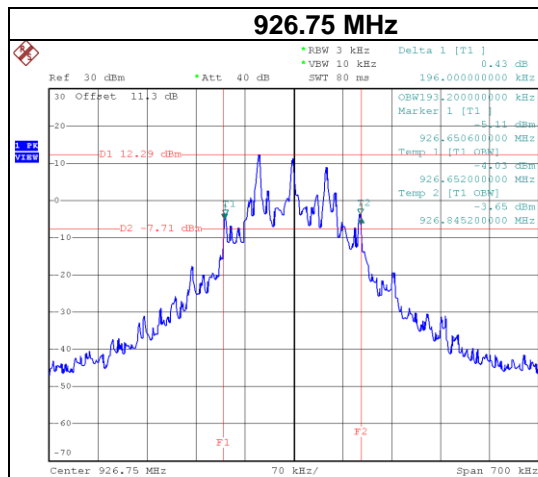
Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW (MHz)	Max. Limit (MHz)	Test Result
902.25	0.196	0.190	0.250	Pass
914.75	0.196	0.190	0.250	Pass
926.75	0.196	0.193	0.250	Pass



Date: 31.JUL.2023 15:31:23



Date: 31.JUL.2023 15:44:50



Date: 31.JUL.2023 15:48:16

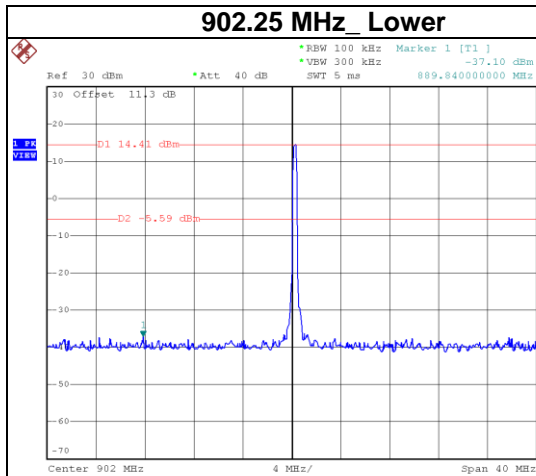
APPENDIX H OUTPUT POWER

Test Mode :	TX	Tested Date	2022/7/31
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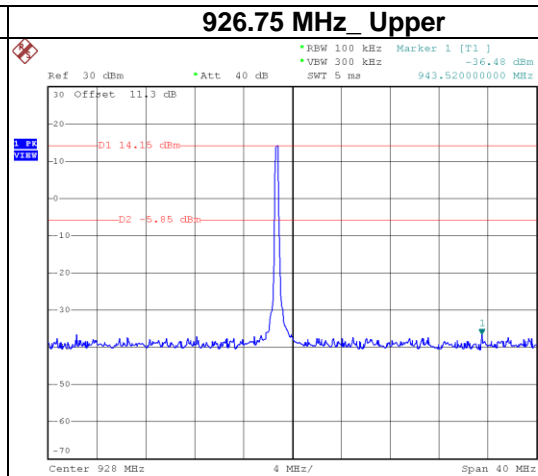
Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
902.25	13.60	0.0229	30.00	1.0000	Pass
914.75	13.58	0.0228	30.00	1.0000	Pass
926.75	13.48	0.0223	30.00	1.0000	Pass

APPENDIX I ANTENNA CONDUCTED SPURIOUS EMISSION

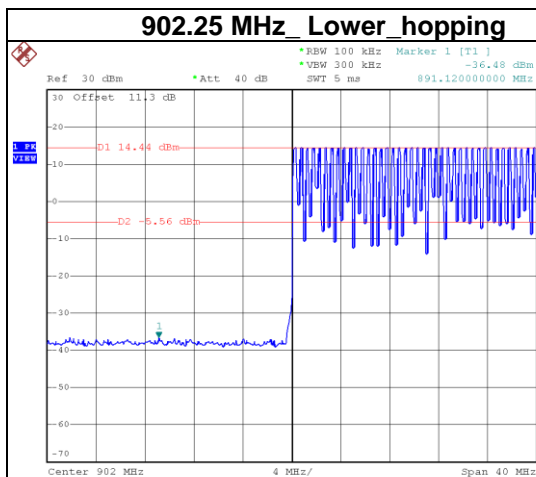
Test Mode TX



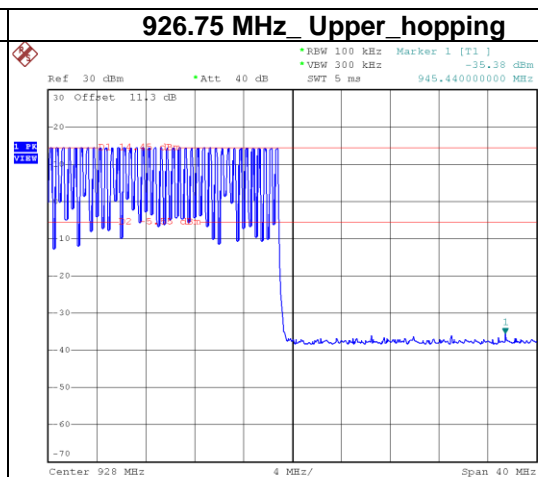
Date: 31.JUL.2023 16:29:40



Date: 31.JUL.2023 16:33:16

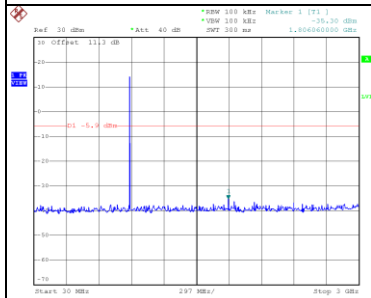


Date: 31.JUL.2023 16:21:02

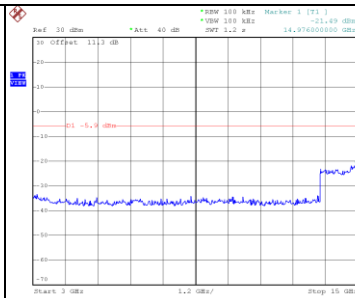


Date: 31.JUL.2023 16:27:05

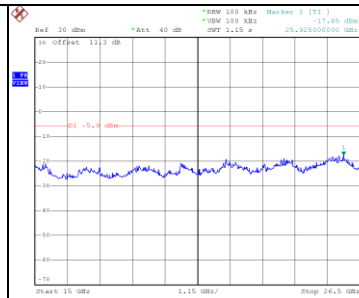
902.25 MHz – 10th Harmonics



Date: 31.JUL.2023 15:21:07

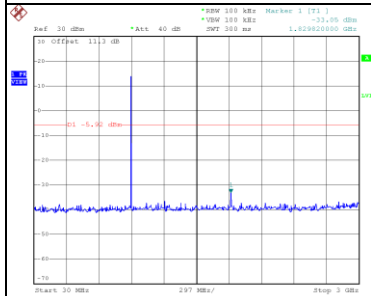


Date: 31.JUL.2023 15:22:02

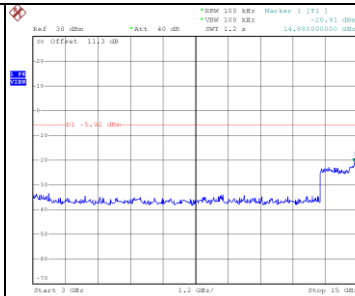


Date: 31.JUL.2023 15:22:45

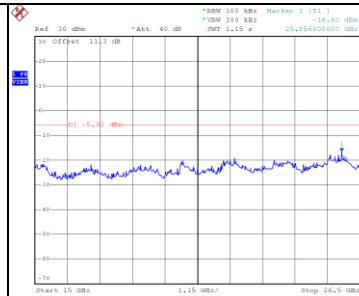
914.75 MHz – 10th Harmonics



Date: 31.JUL.2023 15:38:39

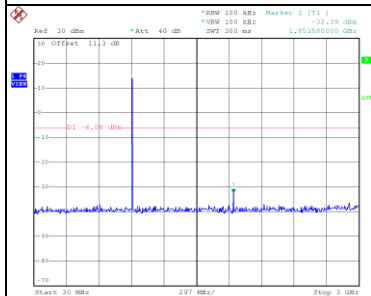


Date: 31.JUL.2023 15:39:27

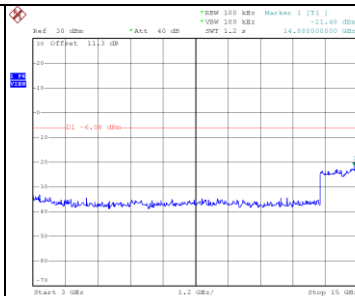


Date: 31.JUL.2023 15:40:19

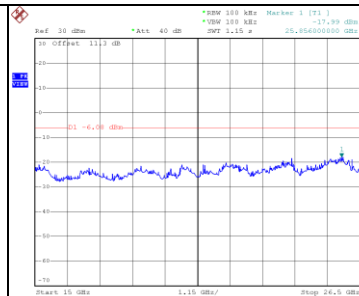
926.75 MHz – 10th Harmonics



Date: 31.JUL.2023 15:54:27



Date: 31.JUL.2023 15:55:15



Date: 31.JUL.2023 15:56:07

End of Test Report