FCC Radio Test Report

FCC ID: 2ATYCHMX05

Report No.	:	BTL-FCCP-1-2101T113
Equipment	:	HIPCAM
Model Name	:	Chime Max
Brand Name	:	HIPCAM
Applicant	:	Hipcam Global LLC
Address	:	112 Capitol Trail, Newark, Delaware, 19711 United States
Manufacturer	:	Goldtek Technology Co., Ltd.
Address	:	16F., No.166, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)
Radio Function	:	Lora (Hybrid)
FCC Rule Part(s)	:	FCC Part15, Subpart C (15.247)
Measurement Procedure(s)	:	ANSI C63.10-2013
Date of Receipt	:	2021/2/2
Date of Test	:	2021/2/2 ~ 2021/3/19
Issued Date	:	2021/4/29

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

Prepared by : Peter Chen, Engineer

Approved by : Scott Hsu , Manager

BTL Inc.
No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan
Tel: +886-2-2657-3299 Fax: +886-2-2657-3331 Web: www.newbtl.com

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.

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REVISON HISTORY

Report No.	Version	Description	Issued Date
BTL-FCCP-1-2101T113	R00	Original Report.	2021/4/9
BTL-FCCP-1-2101T113	R01	Revised report to address TCB's comments.	2021/4/29

1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

FCC Part 15, Subpart C (15.247)				
Standard(s) Section	**Description**	**Test Result**	**Judgement**	**Remark**
15.207	AC Power Line Conducted Emissions	APPENDIX A	Pass	------
15.209 15.247(d)	Radiated Emissions	APPENDIX B APPENDIX C	Pass	------
15.247(a)(1)(i)	Number of Hopping Channel	APPENDIX D	Pass	------
15.247(f)	Average Time of Occupancy (Dwell Time)	APPENDIX E	Pass	------
15.247(a)(1)	Hopping Channel Separation	APPENDIX F	Pass	------
15.247(a)(1)(i)	20dB 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(f)	Power Spectral Density	APPENDIX J	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 facilities used to collect the test data in this report:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
The test sites and facilities are covered under FCC RN: 674415 and DN: TW0659.

☒ C05 ☐ CB08 ☐ CB11 ☒ CB15 ☐ CB16
☒ SR05

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **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)
CB15	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)
Number of Hopping Channel	0.00
Average Time of Occupancy (Dwell Time)	1.20
Hopping Channel Separation	1.20
20dB Bandwidth	1.13
Output Power	1.06
Antenna conducted Spurious Emission	1.14
Conducted Band edges	1.13
Power Spectral Density	1.20

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	21 °C, 70 %	AC 120V	Vincent Lee
Radiated emissions below 1 GHz	21 °C, 68 %	AC 120V	Jay Kao
Radiated emissions above 1 GHz	21 °C, 68 %	AC 120V	Jay Kao
Number of Hopping Frequency	22 °C, 52 %	AC 120V	Vincent Lee
Average Time of Occupancy(Dwell Time)	22 °C, 52 %	AC 120V	Vincent Lee
Hopping Channel Separation	22 °C, 52 %	AC 120V	Vincent Lee
20dB Bandwidth	22 °C, 52 %	AC 120V	Vincent Lee
Output Power	22 °C, 52 %	AC 120V	Vincent Lee
Antenna conducted Spurious Emission	22 °C, 52 %	AC 120V	Vincent Lee
Power Spectral Density	22 °C, 52 %	AC 120V	Vincent Lee

1.4 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

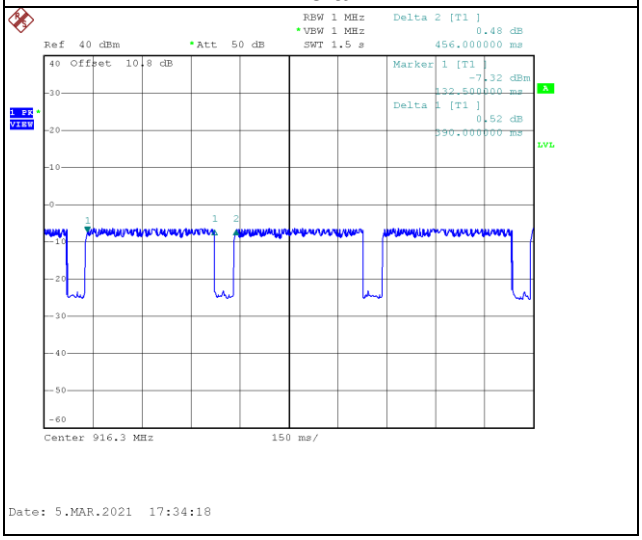
Test Software	Ampak RFTestTool v7.0			
Modulation Mode	916.3 MHz	917.3 MHz	918.3 MHz	Data Rate
FSK	DEF	DEF	DEF	-

1.5 DUTY CYCLE

If duty cycle is ≥ 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)
Lora	390.000	1	390.000	456.000	85.53%	0.68

Lora



2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

Equipment	HIPCAM
Model Name	Chime Max
Brand Name	HIPCAM
Model Difference	N/A
Power Source	AC Mains.
Power Rating	I/P: 100-240V~ 50/60Hz O/P: 24Vdc 0.5A 12W
Products Covered	1 * Power Cable 1 * US plug 1 * UK plug 1 * EU plug 1 * AU plug
Operation Frequency	916.3 MHz ~ 918.3 MHz
Modulation Type	FSK
Modulation Technology	FHSS
Output Power Max.	17.41 dBm (0.0551 W)
Test Model	Chime Max
Sample Status	Engineering Sample
EUT Modification(s)	N/A

NOTE:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

(2) Channel List:

Channel	Frequency (MHz)
01	916.3
02	917.3
03	918.3

(3) Table for Filed Antenna:

Ant.	Manufacture	Model name	Type	Connector	Frequency Range (MHz)	Gain (dBi)
1	awan ADVANCED WIRELESS & ANTENNA INC.	Chip Antenna	Chip	N/A	902-928	0.79

2.2 TEST MODES

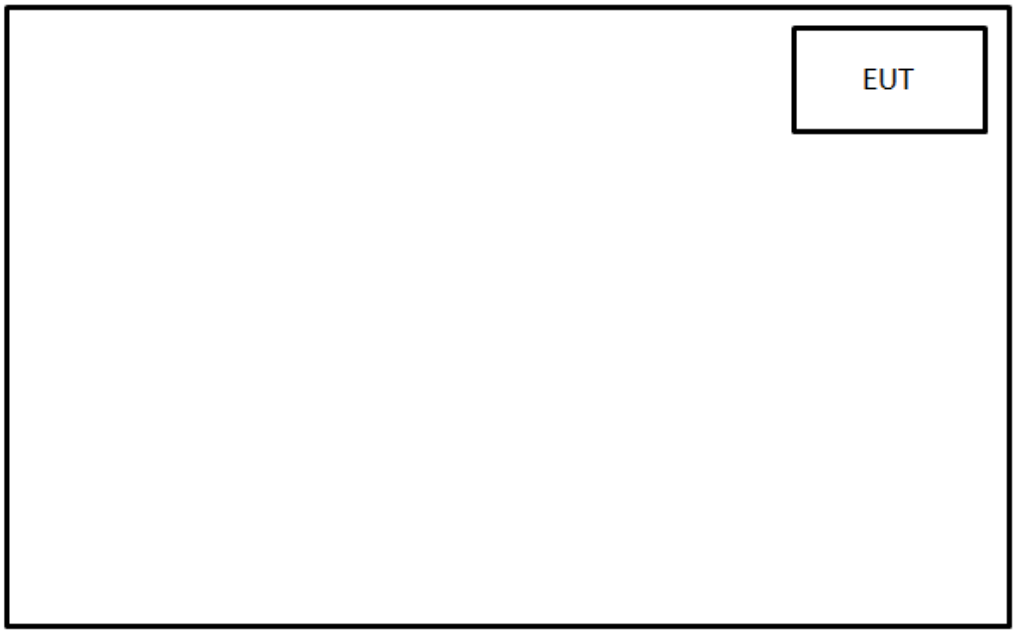
Test Items	Test mode	Channel	Note
AC power line conducted emissions	Normal/Idle	-	-
Transmitter Radiated Emissions (below 1GHz)	Lora	01	-
Transmitter Radiated Emissions (above 1GHz)	Lora	01/03	Harmonic
Number of Hopping Frequency	Lora	01~03	-
Average Time of Occupancy(Dwell Time)	Lora	01/02/03	-
Hopping Channel Separation	Lora	01/03	-
20dB Bandwidth	Lora	01/02/03	-
Output Power	Lora	01/02/03	-
Antenna conducted Spurious Emission	Lora	01/02/03	-
Power Spectral Density	Lora	01/02/03	-

NOTE:
(1) All X, Y and Z axes are evaluated, but only the worst case (Y axis) is recorded.
(2) There were no emissions found below 30 MHz within 20 dB of the limit.
(3) All voltage are evaluated, the AC 120V is the worst and recorded as below test data.

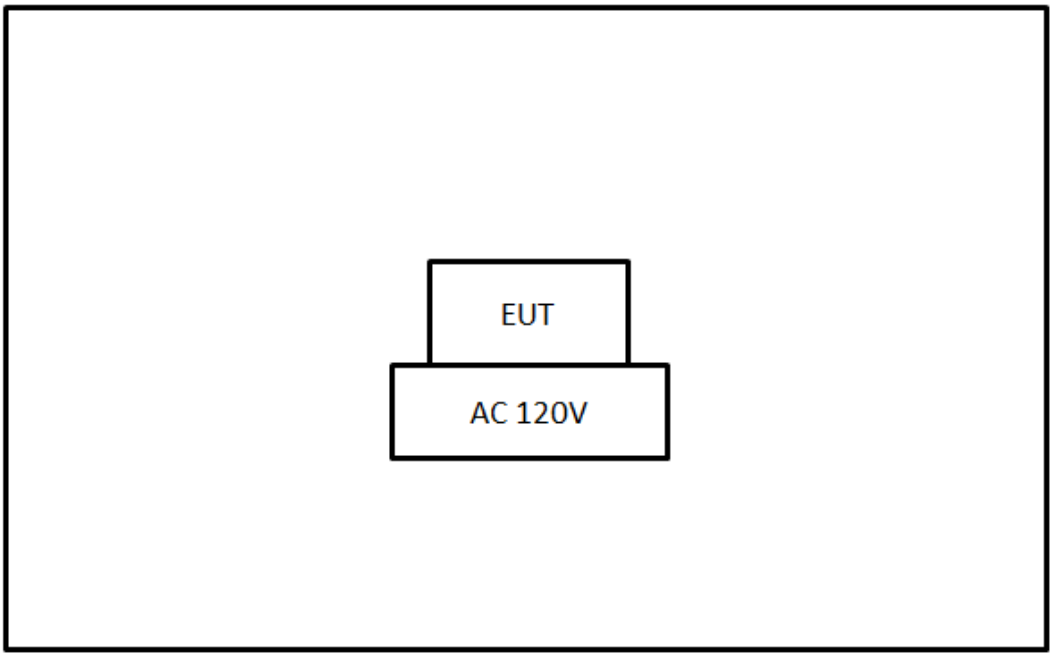
2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

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

AC power line conducted emissions



Radiated Emissions



2.4 SUPPORT UNITS

Item	Equipment	Brand	Model No.	Series No.	Remarks
-	-	-	-	-	-

Item	Shielded	Ferrite Core	Length	Cable Type	Remarks
-	-	-	-	-	-

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

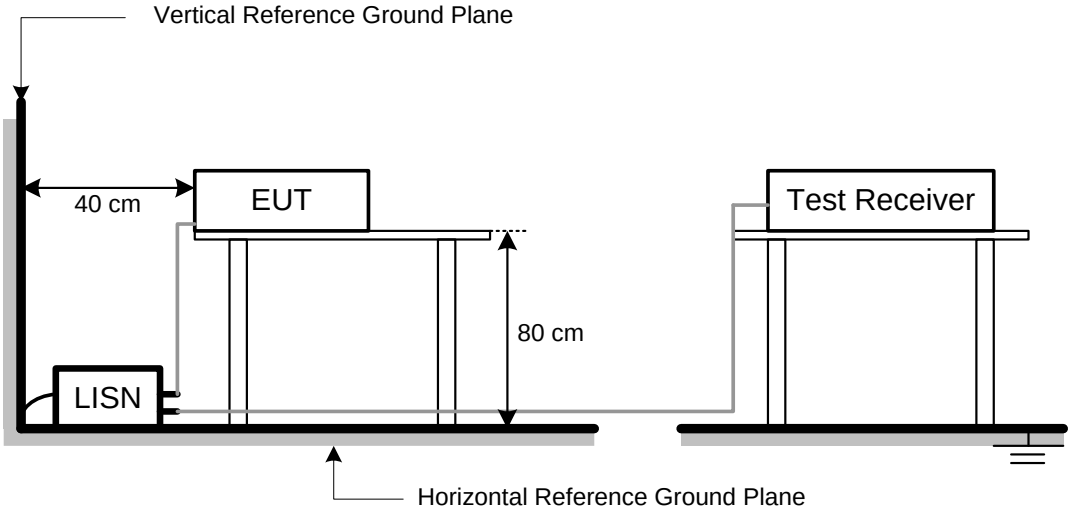
a. The EUT was placed 0.8 m above the horizontal ground plane with the EUT being connected to the power mains through a line impedance stabilization network (LISN).
All other support equipment were powered from an additional LISN(s).
The LISN provides 50 Ohm/50uH of impedance for the measuring instrument.
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 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

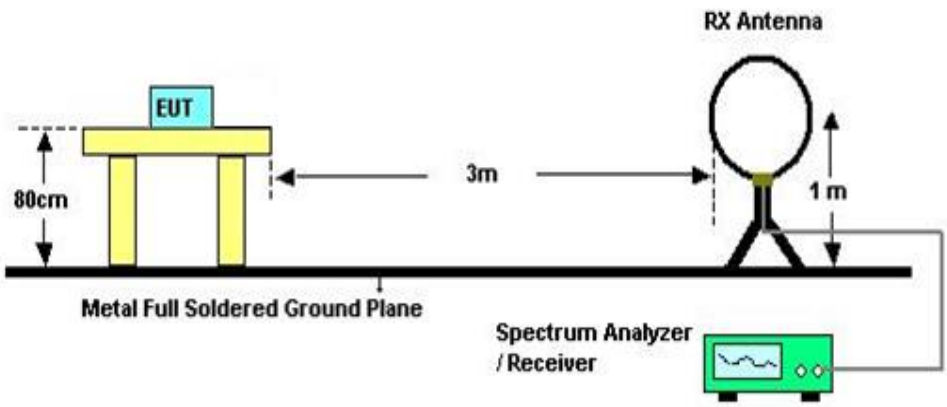
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
b. The measuring distance 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)
c. 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.
d. 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).
e. 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.
f. 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.
g. 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)
h. 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)
i. For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

4.3 DEVIATION FROM TEST STANDARD

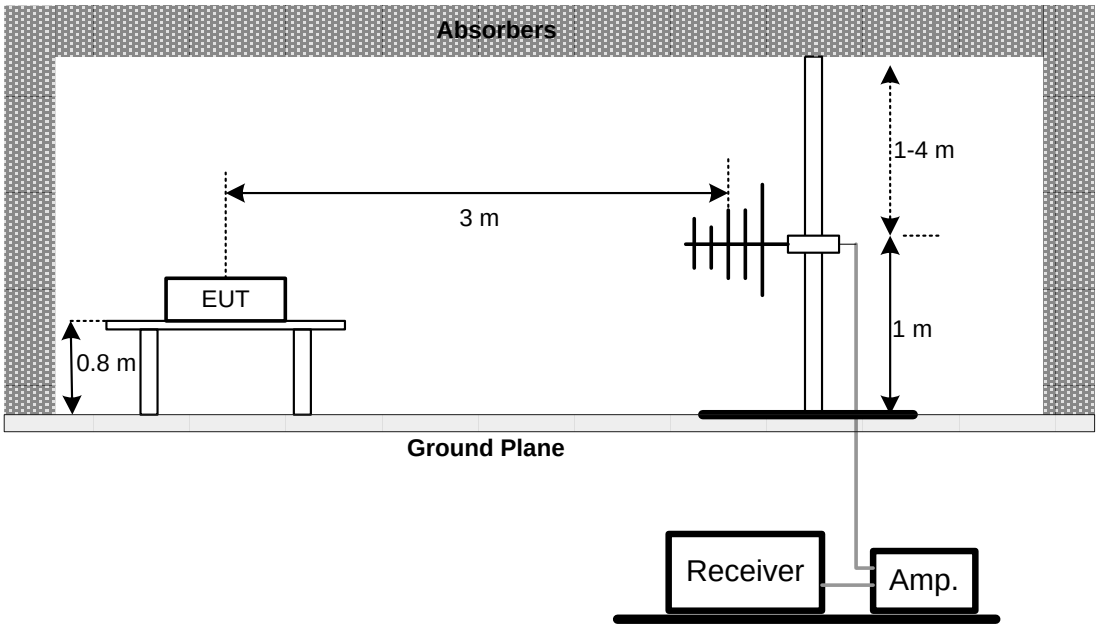
No deviation.

4.4 TEST SETUP

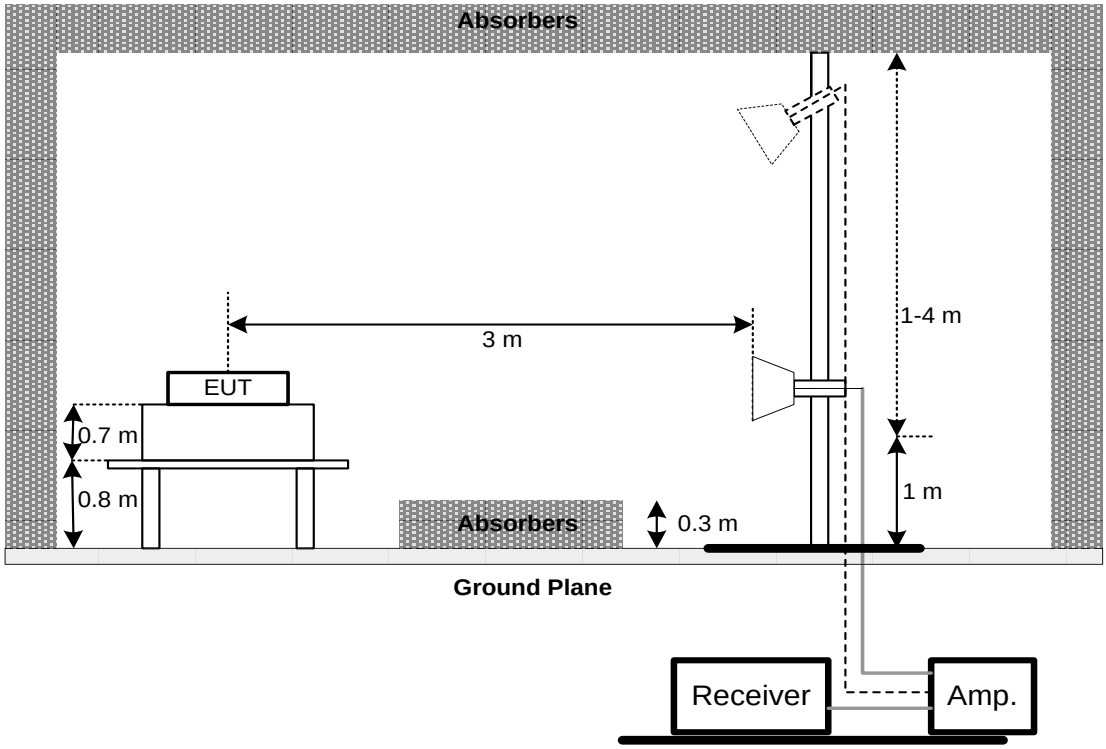
9 kHz to 30 MHz



30 MHz to 1 GHz



Above 1 GHz



4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

4.6 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX B.

4.7 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 LIMIT

☐ N ≥ 50, 20 dB bandwidth of the hopping channel is less than 250 kHz
☐ N ≥ 25, 20 dB bandwidth of the hopping channel is 250 kHz or greater
☒ Hybrid mode, No minimum number of hopping channels associated with hybrid system.
N: Number of Hopping Frequencies

5.2 TEST PROCEDURE

a. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Pf eak Trace max hold.
b. Allow trace to stabilize.

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 (DWELL TIME)

6.1 LIMIT

☐ ≤ 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz
☐ ≤ 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater
☒ Hybrid mode ,an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

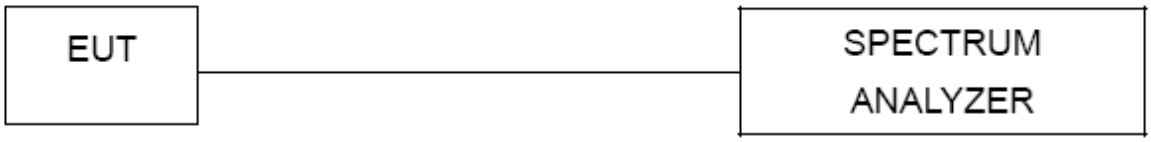
6.2 TEST PROCEDURE

a. Set RBW=100kHz, VBW=300kHz, Sweep time=6.4s / 500ms, Detector=Peak, Span=0Hz, Trace max hold.
b. Measure and record the burst on time.

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 3.5 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 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.

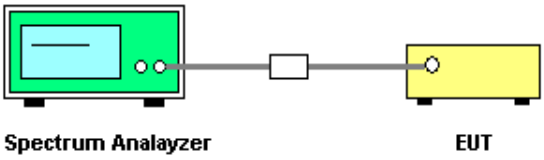
7.2 TEST PROCEDURE

The test procedures are followed to clause 7.8.2 of ANSI C63.10.

7.3 DEVIATION FROM STANDARD

No deviation.

7.4 TEST SETUP



7.5 TEST RESULTS

Please refer to the APPENDIX F.

8 20 dB BANDWIDTH TEST

8.1 LIMIT

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

8.2 TEST PROCEDURE

a. Set RBW=3kHz, VBW=10kHz, Sweep time=Auto, Detector=Peak Trace max hold.
b. Allow trace to stabilize.
c. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

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 3.5 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 LIMIT

☒ 1 Watt, systems using digital modulation
☐ 1 Watt, frequency hopping systems employing at least 50 hopping channels
☐ 0.25 Watt, frequency hopping systems employing less than 50 hopping channels, but at least 25 hopping channels

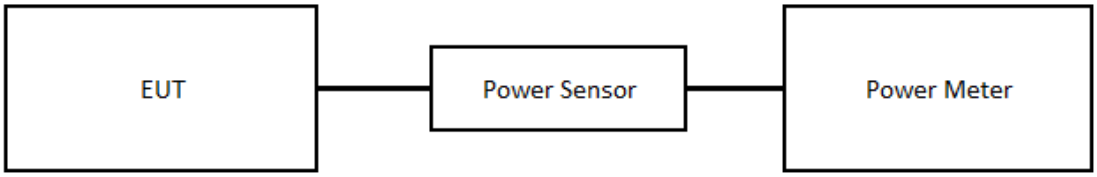
9.2 TEST PROCEDURE

a. A wideband power meter is used for power measurement. Bandwidth of power senor and meter is 50MHz
b. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power

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 3.5 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 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.

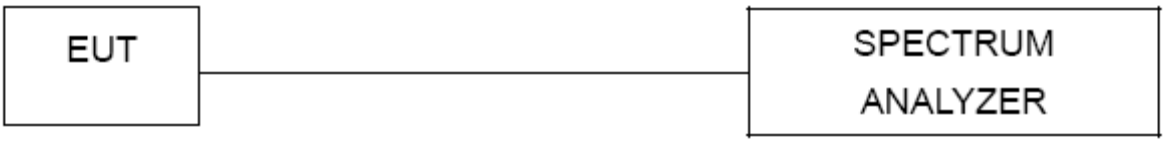
10.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
b. Spectrum Setting: RBW= 100KHz, VBW=100KHz, Sweep time = Auto.
c. 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 3.5 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 POWER SPECTRAL DENSITY TEST

11.1 LIMIT

Power spectral density shall not be greater than 8 dBm in any 3 kHz band. This item is for Hybrid mode.

11.2 TEST PROCEDURE

☐ Maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit.

a. Set the RBW = 3kHz, VBW = 10kHz.
b. Detector = Peak, Sweep time = auto couple.
c. Trace mode = max hold, allow trace to fully stabilize.
d. Use the peak marker function to determine the maximum amplitude level.

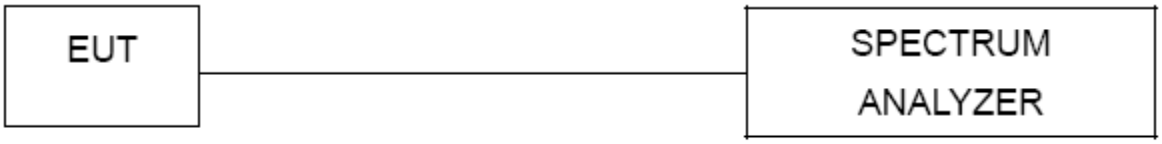
☒ Maximum (average) conducted output power was used to demonstrate compliance to the fundamental output power limit.

a. Set the RBW = 3kHz, VBW = 10 kHz.
b. Detector = RMS, Sweep time = auto couple.
c. Employ trace averaging (RMS) mode over a minimum of 100 traces.
d. Use the peak marker function to determine the maximum amplitude level.

11.3 DEVIATION FROM STANDARD

No deviation.

11.4 TEST SETUP



11.5 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.

11.6 TEST RESULTS

Please refer to the APPENDIX J.

12 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	101050	2020/6/11	2021/6/10
2	Test Cable	EMCI	EMC400-BM-BM-5000	170501	2020/6/8	2021/6/7
3	EMI Test Receiver	R&S	ESCI	100080	2020/6/15	2021/6/14
4	Measurement Software	EZ	EZ_EMC (Version NB-03A1-01)	N/A	N/A	N/A

Radiated Emissions						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Preamplifier	EMCI	EMC02325B	980217	2020/4/10	2021/4/9
2	Preamplifier	EMCI	EMC012645B	980267	2020/4/10	2021/4/9
3	Test Cable	EMCI	EMC-SM-SM-1000	180809	2020/4/10	2021/4/9
4	Test Cable	EMCI	EMC104-SM-SM-3000	151205	2020/4/10	2021/4/9
5	Test Cable	EMCI	EMC-SM-SM-7000	180408	2020/4/10	2021/4/9
6	MXE EMI Receiver	Agilent	N9038A	MY554200087	2020/6/10	2021/6/9
7	Signal Analyzer	Agilent	N9010A	MY56480554	2020/8/25	2021/8/24
8	Horn Ant	SCHWARZBECK	BBHA 9120D	9120D-1342	2020/6/12	2021/6/11
9	Trilog-Broadband Antenna	Schwarzbeck	VULB 9168	VULB 9168-352	2020/7/24	2021/7/23
10	5dB Attenuator	EMCI	EMCI-N-6-05	AT-N0625	2020/7/24	2021/7/23
11	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	2020/6/15	2021/6/14

Average Time of Occupancy(Dwell Time)						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2020/6/15	2021/6/14

Hopping Channel Separation						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2020/6/15	2021/6/14

20dB Bandwidth						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Spectrum Analyzer	R&S	FSP 40	100129	2020/6/15	2021/6/14

Output Power						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated Date	Calibrated Until
1	Power Meter	Anritsu	ML2495A	1128008	2020/6/11	2021/6/10
2	Power Sensor	Anritsu	MA2411B	1126001	2020/6/11	2021/6/10

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	2020/6/15	2021/6/14

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

13 EUT TEST PHOTO

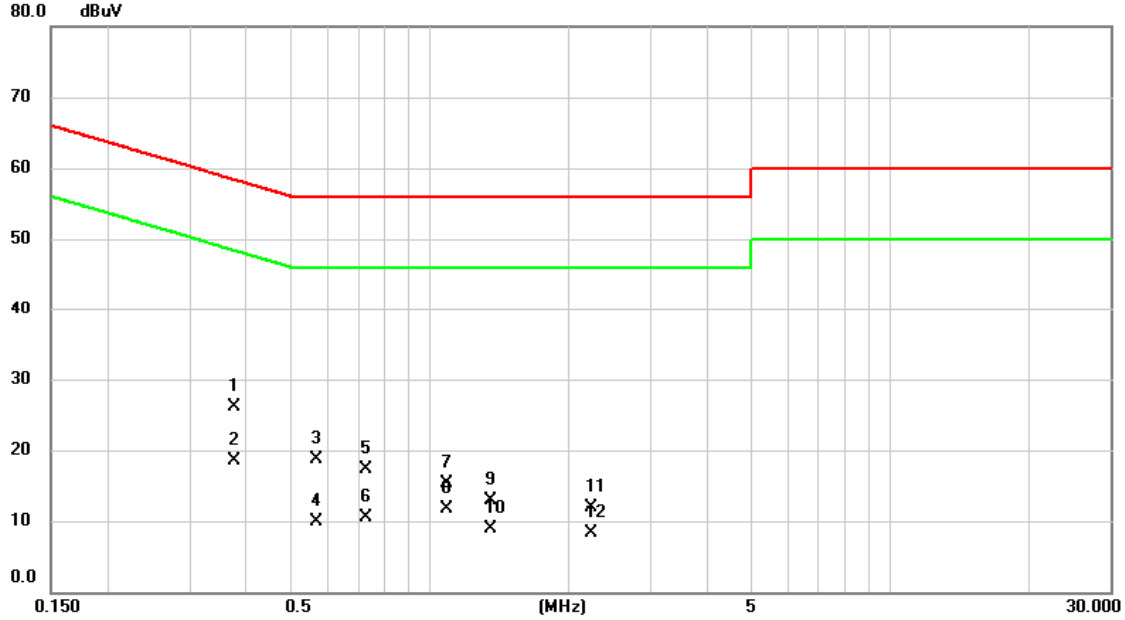
Please refer to document Appendix No.: TP-2101T113-FCCP-1 (APPENDIX-TEST PHOTOS).

14 EUT PHOTOS

Please refer to document Appendix No.: EP-2101T113-1 (APPENDIX-EUT PHOTOS).

APPENDIX A AC POWER LINE CONDUCTED EMISSIONS

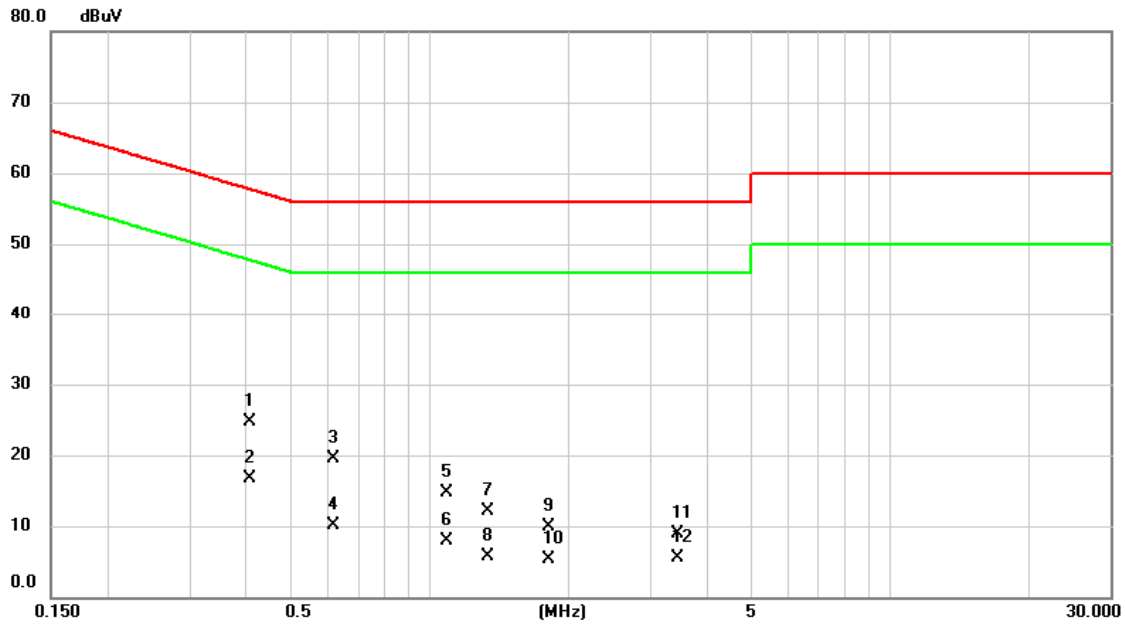
Test Mode	Normal	Tested Date	2021/3/12
Test Frequency	-	Phase	Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.3772	16.36	9.68	26.04	58.34	-32.30	QP	
2	*	0.3772	8.81	9.68	18.49	48.34	-29.85	AVG	
3		0.5684	9.06	9.68	18.74	56.00	-37.26	QP	
4		0.5684	0.24	9.68	9.92	46.00	-36.08	AVG	
5		0.7260	7.69	9.68	17.37	56.00	-38.63	QP	
6		0.7260	0.78	9.68	10.46	46.00	-35.54	AVG	
7		1.0860	5.65	9.69	15.34	56.00	-40.66	QP	
8		1.0860	2.04	9.69	11.73	46.00	-34.27	AVG	
9		1.3515	3.18	9.70	12.88	56.00	-43.12	QP	
10		1.3515	-0.72	9.70	8.98	46.00	-37.02	AVG	
11		2.2312	2.17	9.74	11.91	56.00	-44.09	QP	
12		2.2312	-1.34	9.74	8.40	46.00	-37.60	AVG	

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

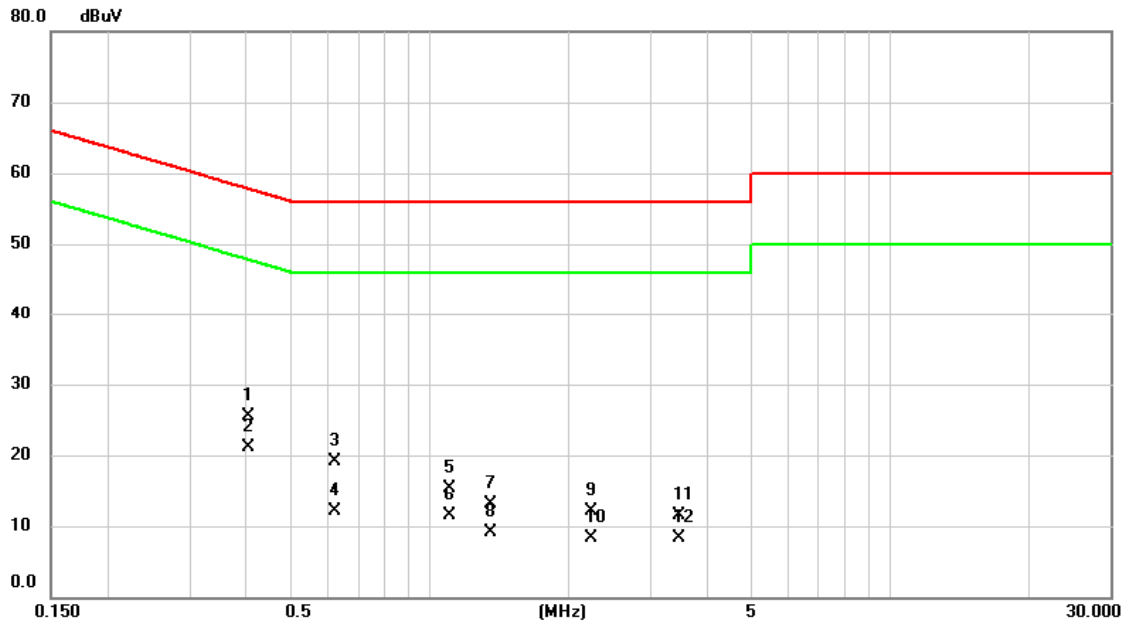
Test Mode	Normal	Tested Date	2021/3/12
Test Frequency	-	Phase	Neutral



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4065	15.01	9.68	24.69	57.72	-33.03	QP	
2	*	0.4065	6.94	9.68	16.62	47.72	-31.10	AVG	
3		0.6180	9.92	9.68	19.60	56.00	-36.40	QP	
4		0.6180	0.41	9.68	10.09	46.00	-35.91	AVG	
5		1.0905	5.10	9.69	14.79	56.00	-41.21	QP	
6		1.0905	-1.87	9.69	7.82	46.00	-38.18	AVG	
7		1.3402	2.36	9.70	12.06	56.00	-43.94	QP	
8		1.3402	-4.04	9.70	5.66	46.00	-40.34	AVG	
9		1.8128	0.18	9.73	9.91	56.00	-46.09	QP	
10		1.8128	-4.49	9.73	5.24	46.00	-40.76	AVG	
11		3.4530	-0.81	9.77	8.96	56.00	-47.04	QP	
12		3.4530	-4.23	9.77	5.54	46.00	-40.46	AVG	

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

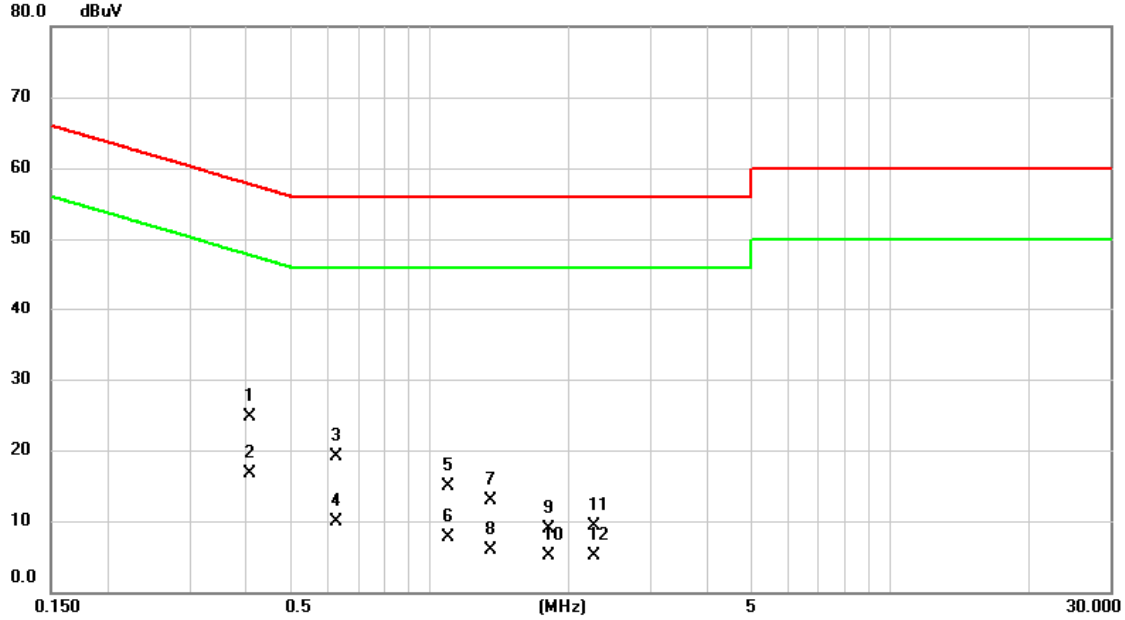
Test Mode	Idle	Tested Date	2021/3/12
Test Frequency	-	Phase	Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4042	15.80	9.68	25.48	57.77	-32.29	QP	
2	*	0.4042	11.42	9.68	21.10	47.77	-26.67	AVG	
3		0.6247	9.37	9.68	19.05	56.00	-36.95	QP	
4		0.6247	2.51	9.68	12.19	46.00	-33.81	AVG	
5		1.1017	5.60	9.69	15.29	56.00	-40.71	QP	
6		1.1017	1.75	9.69	11.44	46.00	-34.56	AVG	
7		1.3538	3.35	9.70	13.05	56.00	-42.95	QP	
8		1.3538	-0.68	9.70	9.02	46.00	-36.98	AVG	
9		2.2313	2.39	9.74	12.13	56.00	-43.87	QP	
10		2.2313	-1.34	9.74	8.40	46.00	-37.60	AVG	
11		3.4710	1.79	9.77	11.56	56.00	-44.44	QP	
12		3.4710	-1.54	9.77	8.23	46.00	-37.77	AVG	

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

Test Mode	Idle	Tested Date	2021/3/12
Test Frequency	-	Phase	Neutral

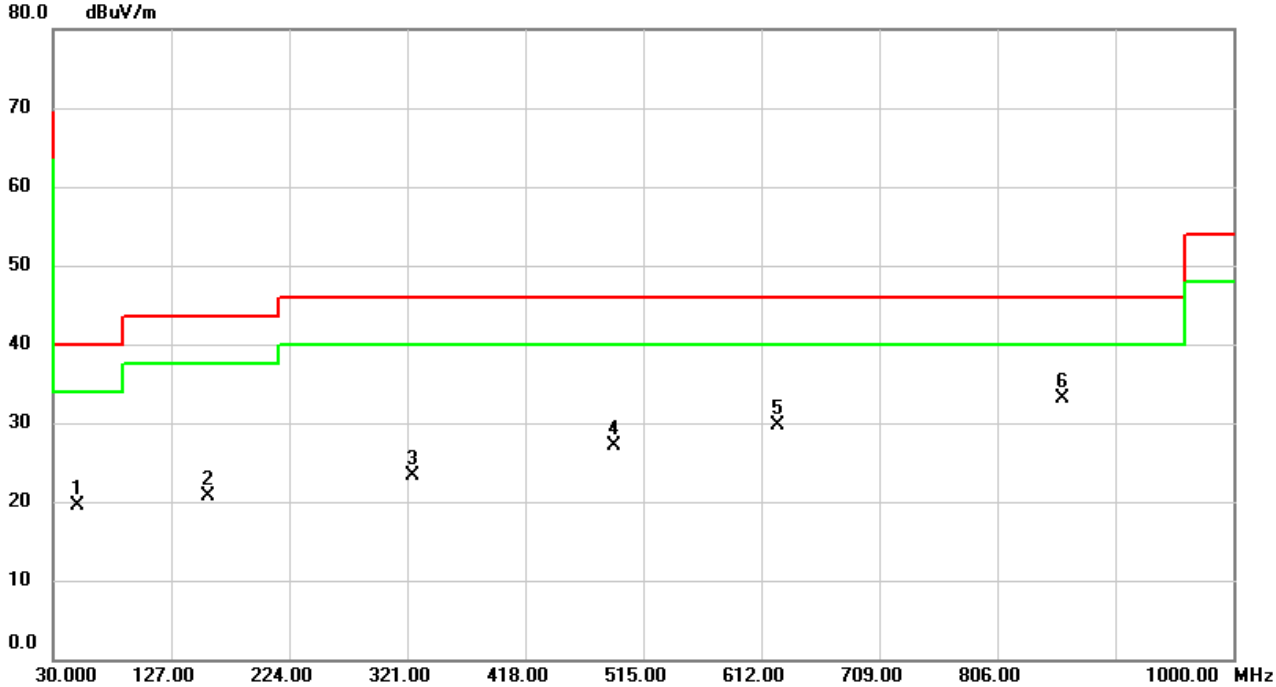


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4065	15.01	9.68	24.69	57.72	-33.03	QP	
2	*	0.4065	6.93	9.68	16.61	47.72	-31.11	AVG	
3		0.6292	9.49	9.68	19.17	56.00	-36.83	QP	
4		0.6292	0.29	9.68	9.97	46.00	-36.03	AVG	
5		1.0927	5.17	9.69	14.86	56.00	-41.14	QP	
6		1.0927	-2.04	9.69	7.65	46.00	-38.35	AVG	
7		1.3515	3.18	9.70	12.88	56.00	-43.12	QP	
8		1.3515	-3.88	9.70	5.82	46.00	-40.18	AVG	
9		1.8083	-0.78	9.73	8.95	56.00	-47.05	QP	
10		1.8083	-4.53	9.73	5.20	46.00	-40.80	AVG	
11		2.2718	-0.44	9.74	9.30	56.00	-46.70	QP	
12		2.2718	-4.64	9.74	5.10	46.00	-40.90	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

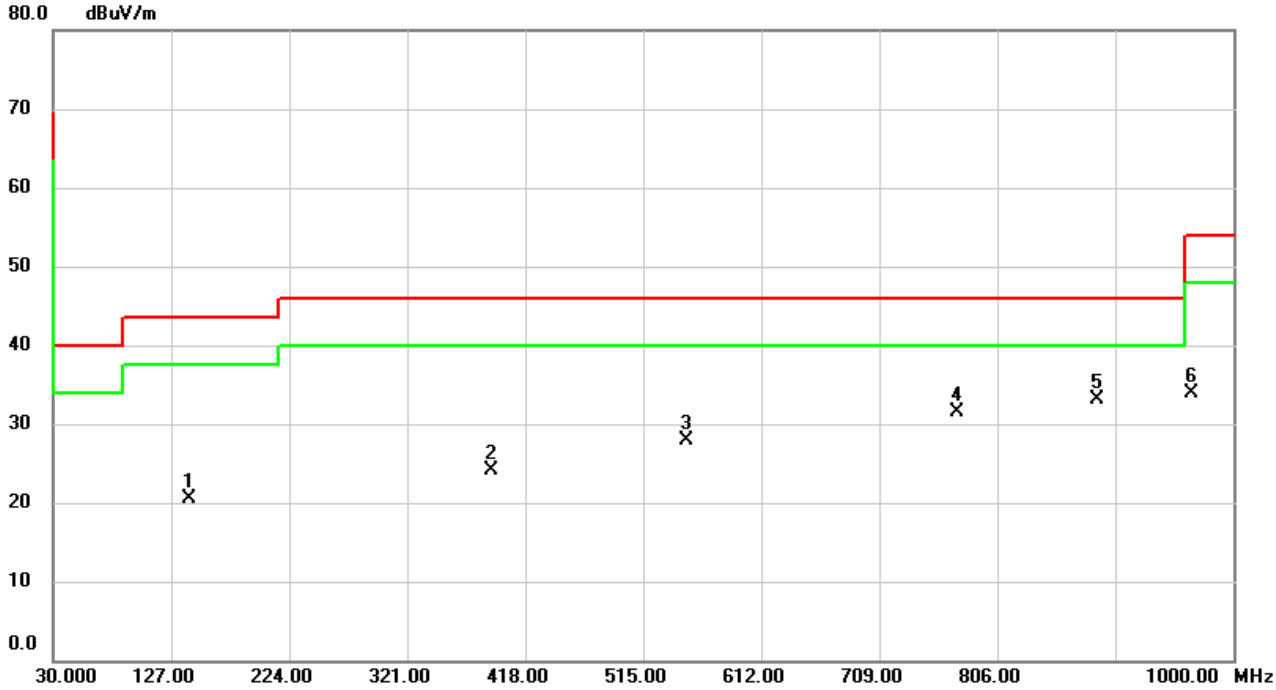
Test Mode	Lora	Test Date	2021/3/8
Test Frequency	916.3MHz	Polarization	Vertical
Temp	21°C	Hum.	68%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		50.3700	27.49	-8.05	19.44	40.00	-20.56	peak	
2		157.0700	28.99	-8.32	20.67	43.50	-22.83	peak	
3		324.8800	29.99	-6.75	23.24	46.00	-22.76	peak	
4		490.7500	29.94	-2.93	27.01	46.00	-18.99	peak	
5		625.5800	29.97	-0.28	29.69	46.00	-16.31	peak	
6	*	859.3500	29.48	3.55	33.03	46.00	-12.97	peak	

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

Test Mode	Lora	Test Date	2021/3/8
Test Frequency	916.3MHz	Polarization	Horizontal
Temp	21°C	Hum.	68%

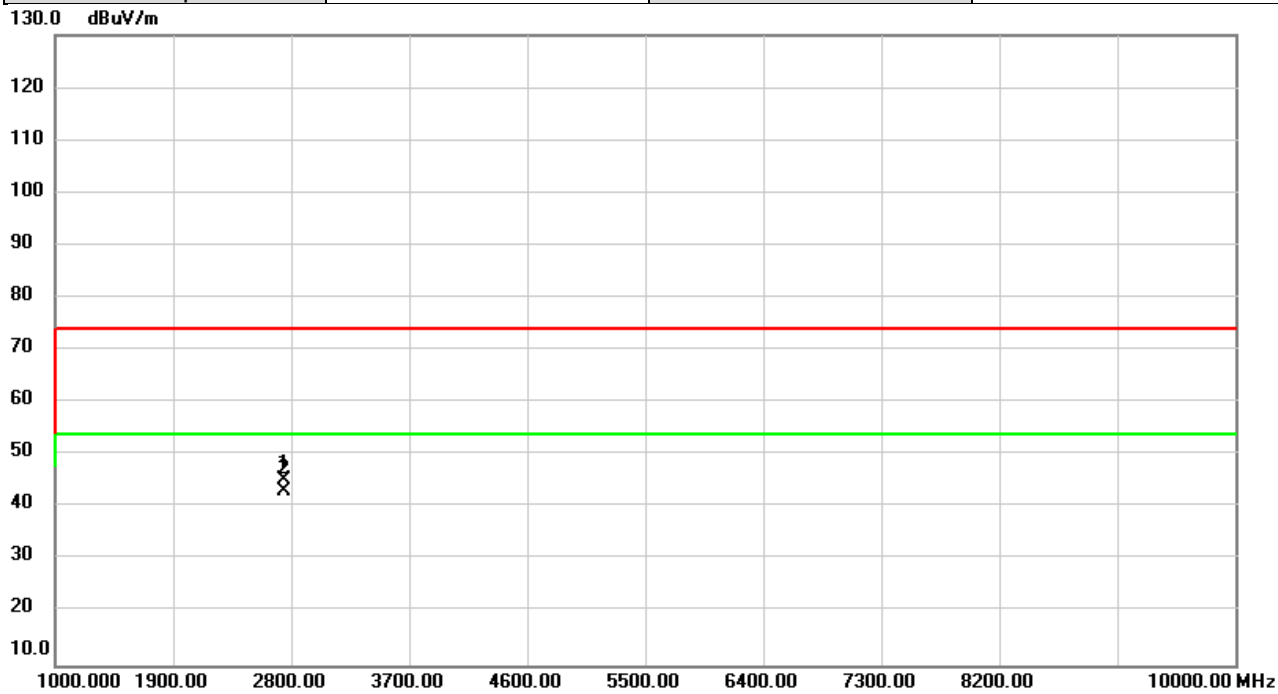


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		141.5500	29.04	-8.60	20.44	43.50	-23.06	peak	
2		389.8700	29.11	-5.09	24.02	46.00	-21.98	peak	
3		550.8900	29.67	-1.76	27.91	46.00	-18.09	peak	
4		773.0200	29.24	2.22	31.46	46.00	-14.54	peak	
5	*	888.4500	29.11	3.98	33.09	46.00	-12.91	peak	
6		966.0500	28.64	5.27	33.91	54.00	-20.09	peak	

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

APPENDIX C RADIATED EMISSIONS - ABOVE 1 GHZ

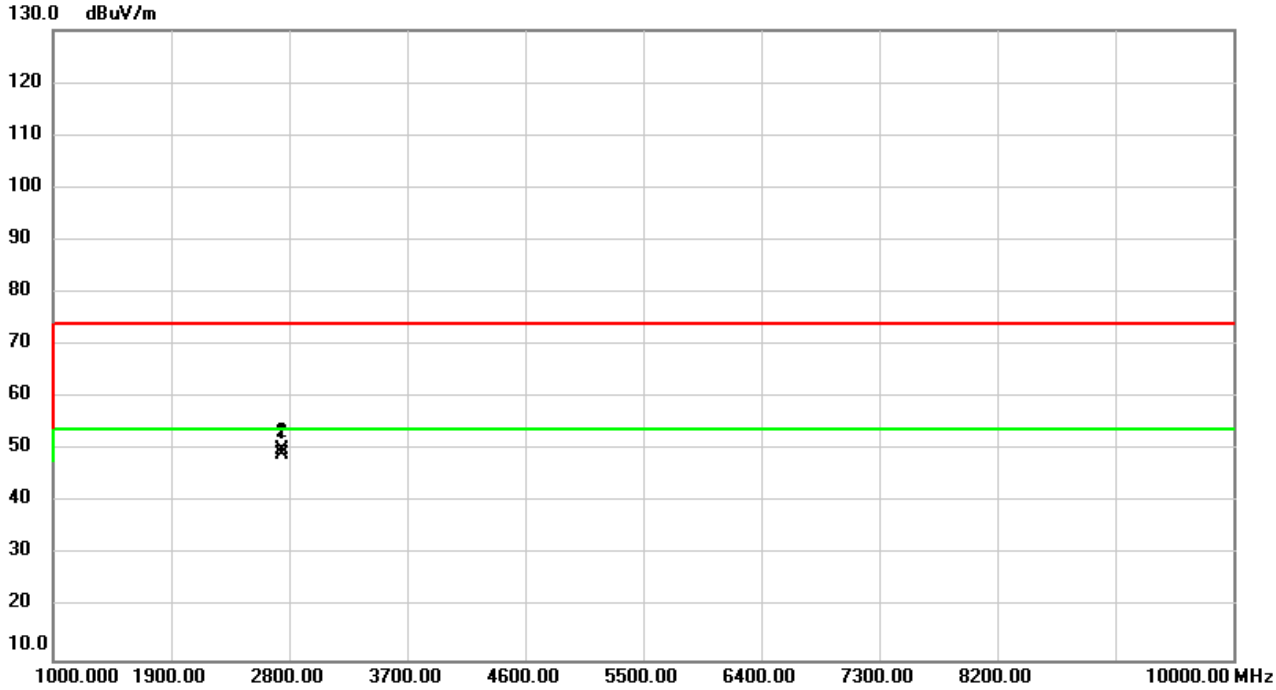
Test Mode	Lora	Test Date	2021/3/8
Test Frequency	916.3MHz	Polarization	Vertical
Temp	21°C	Hum.	68%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2749.000	59.22	-13.90	45.32	74.00	-28.68	peak	
2	*	2749.000	56.91	-13.90	43.01	54.00	-10.99	AVG	

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

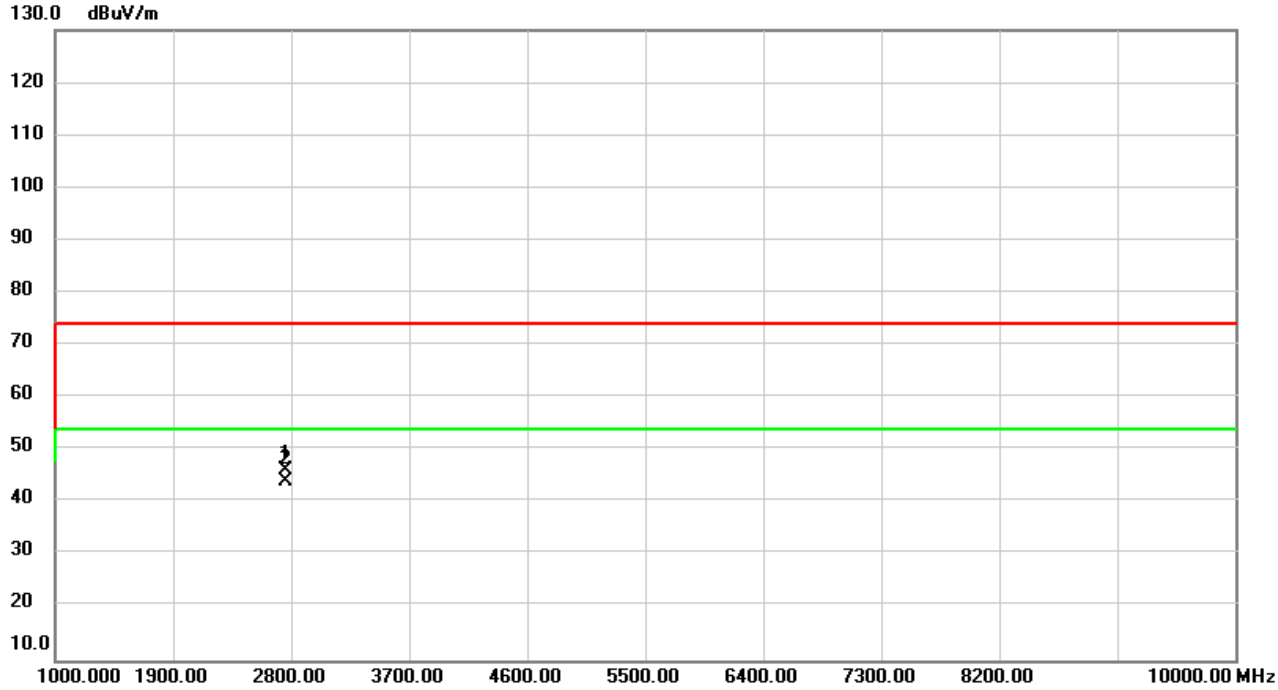
Test Mode	Lora	Test Date	2021/3/8
Test Frequency	916.3MHz	Polarization	Horizontal
Temp	21°C	Hum.	68%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2749.000	63.95	-13.90	50.05	74.00	-23.95	peak	
2	*	2749.000	62.91	-13.90	49.01	54.00	-4.99	AVG	

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

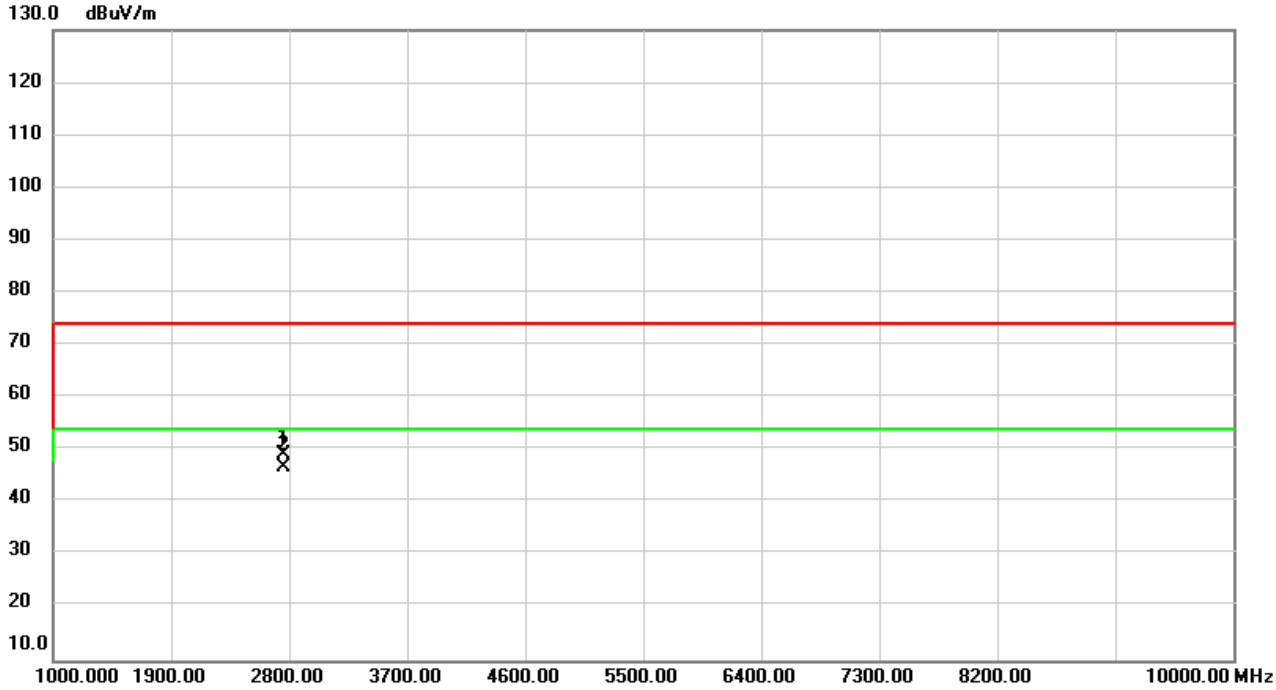
Test Mode	Lora	Test Date	2021/3/8
Test Frequency	918.3MHz	Polarization	Vertical
Temp	21°C	Hum.	68%



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2755.000	60.07	-13.87	46.20	74.00	-27.80	peak	
2	*	2755.000	57.92	-13.87	44.05	54.00	-9.95	AVG	

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

Test Mode	Lora	Test Date	2021/3/8
Test Frequency	918.3MHz	Polarization	Horizontal
Temp	21°C	Hum.	68%

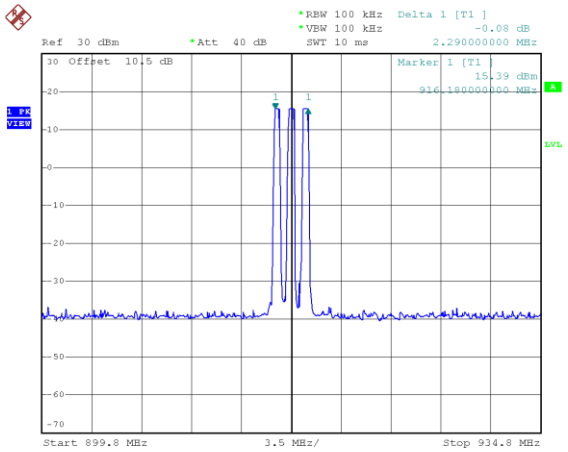


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	Comment
1		2755.000	62.92	-13.87	49.05	74.00	-24.95	peak	
2	*	2755.000	60.50	-13.87	46.63	54.00	-7.37	AVG	

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

APPENDIX D NUMBER OF HOPPING CHANNEL

Test Mode	Lora



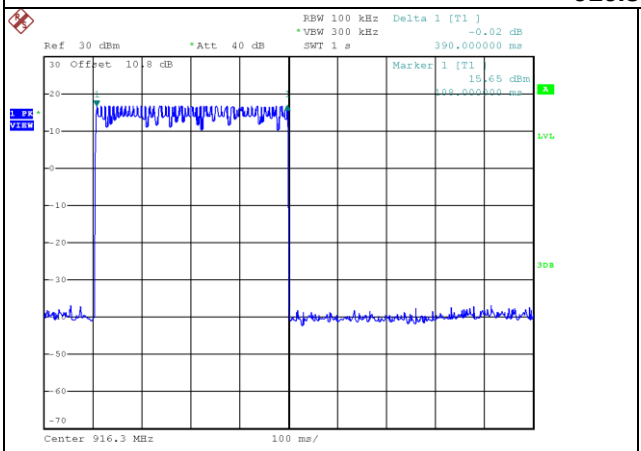
Date: 18.MAR.2021 19:24:34

APPENDIX E AVERAGE TIME OF OCCUPANCY (DWELL TIME)

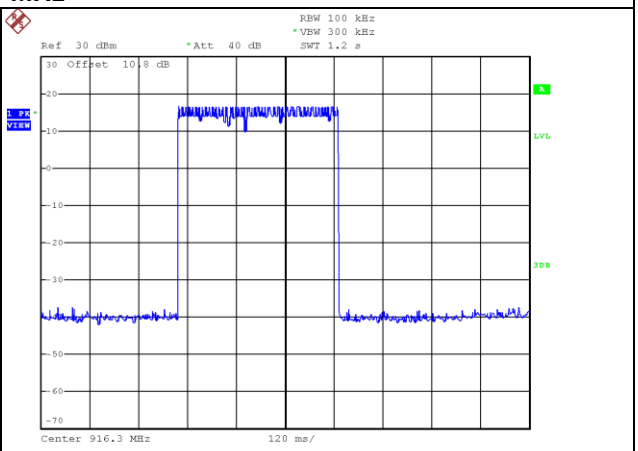
Test Mode :	Lora

Frequency (MHz)	Pulse Duration (s)	Dwell Time (s)	Limits (s)	Test Result
916.3 MHz	0.3900	0.3900	0.4000	Pass
917.3 MHz	0.3900	0.3900	0.4000	Pass
918.3 MHz	0.3900	0.3900	0.4000	Pass

916.3 MHz

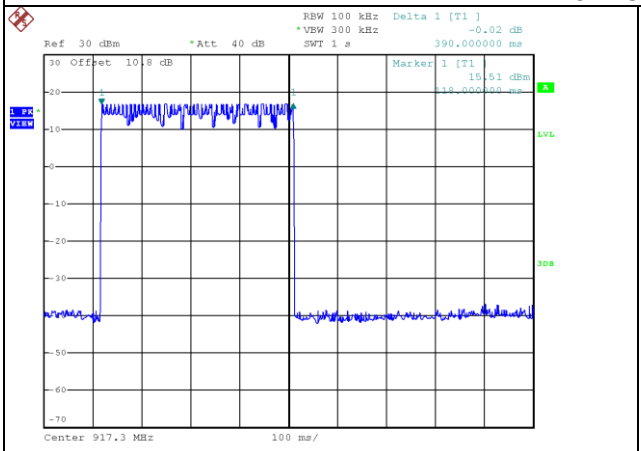


Date: 24.FEB.2021 14:25:22

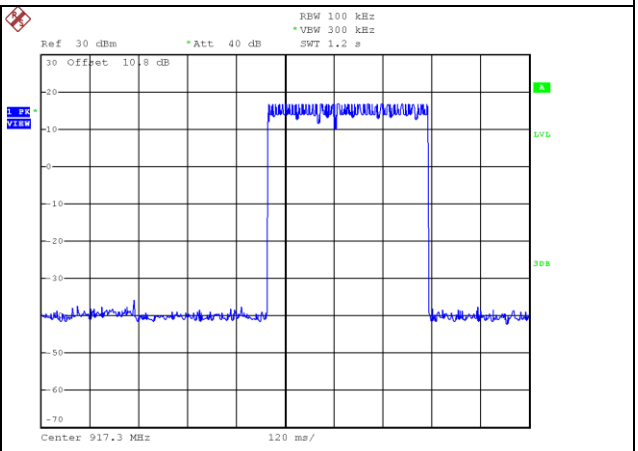


Date: 24.FEB.2021 14:23:57

917.3 MHz

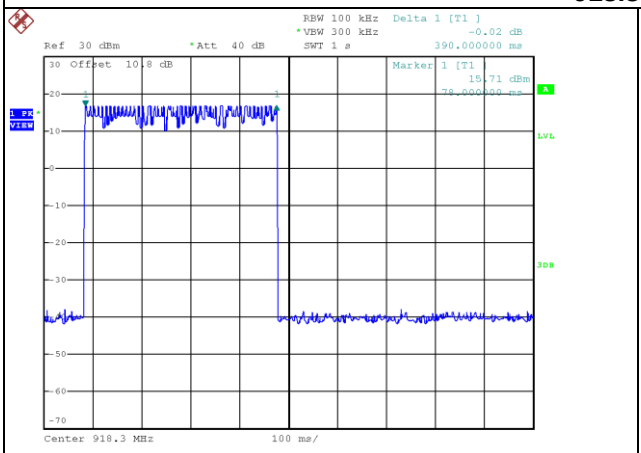


Date: 24.FEB.2021 14:26:29



Date: 24.FEB.2021 14:28:16

918.3 MHz



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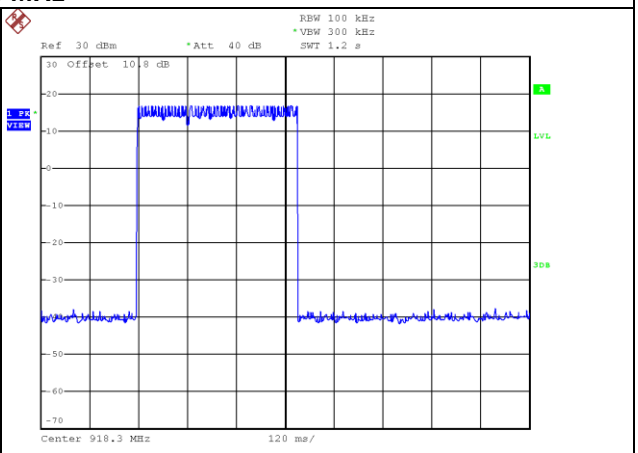


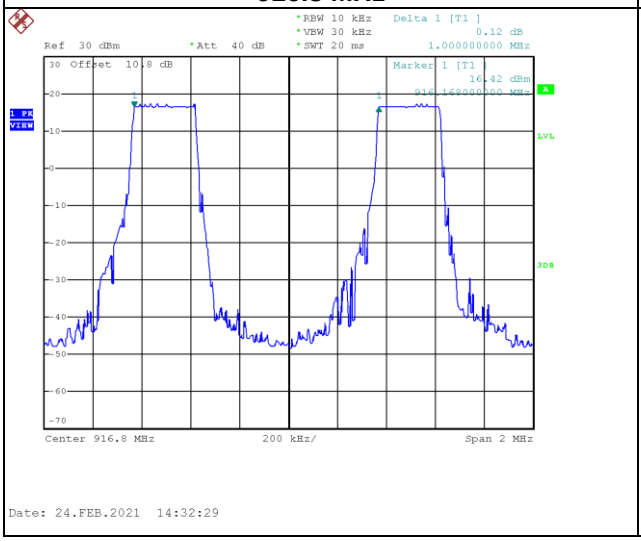
Date: 24.FEB.2021 14:27:48

APPENDIX F HOPPING CHANNEL SEPARATION MEASUREMENT

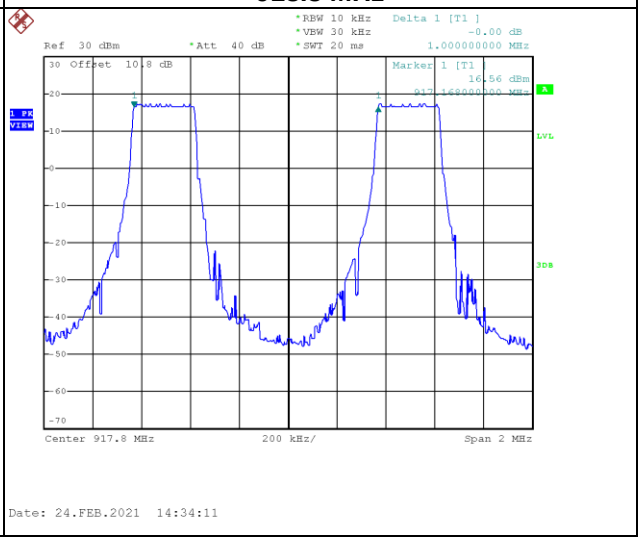
Test Mode :	Lora

Frequency (MHz)	Channel Separation (MHz)	Min. Limit (MHz)	Test Result
916.3	1.000	0.269	Pass
918.3	1.000	0.273	Pass

916.3 MHz



918.3 MHz



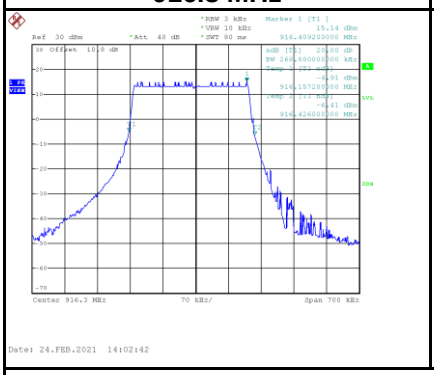
APPENDIX G 20dB BANDWIDTH

Test Mode :	Lora

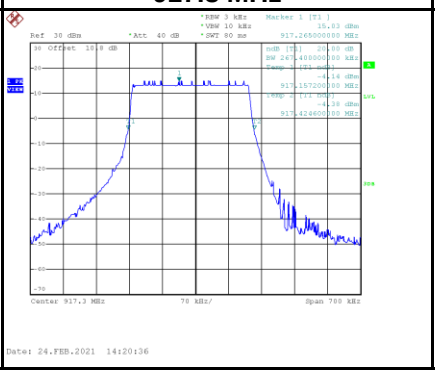
Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW	Max. Limit (kHz)	Test Result
916.3	0.269	0.249	500	Pass
917.3	0.267	0.249	500	Pass
918.3	0.273	0.249	500	Pass

20dB Bandwidth

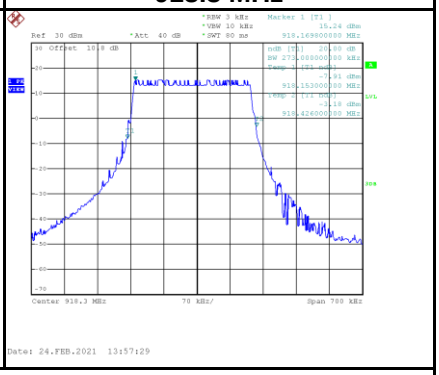
916.3 MHz



917.3 MHz

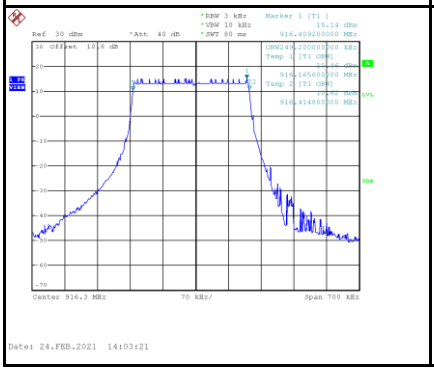


918.3 MHz

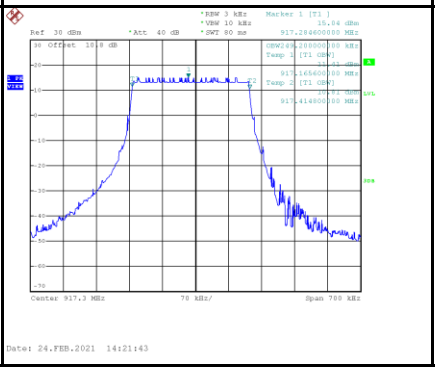


99% Occupied BW

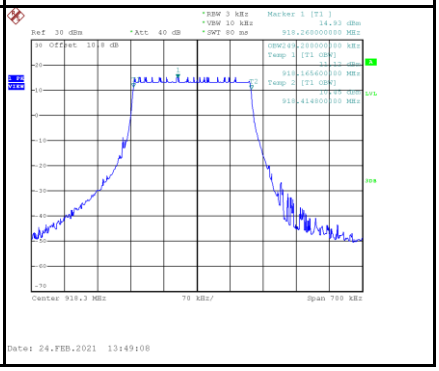
916.3 MHz



917.3 MHz



918.3 MHz



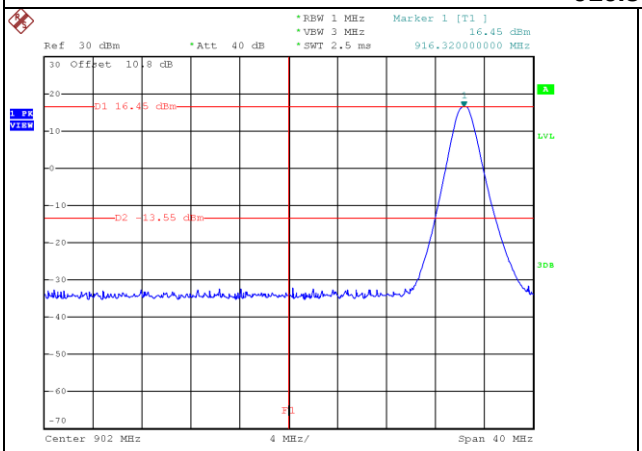
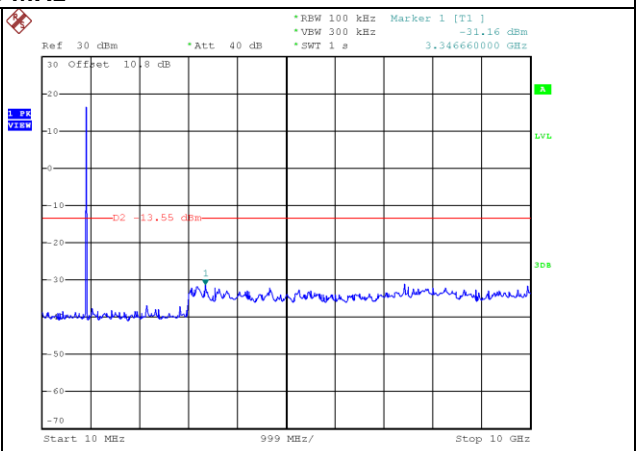
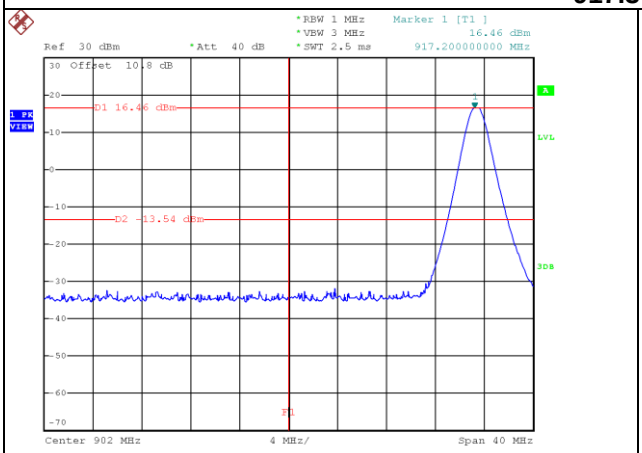
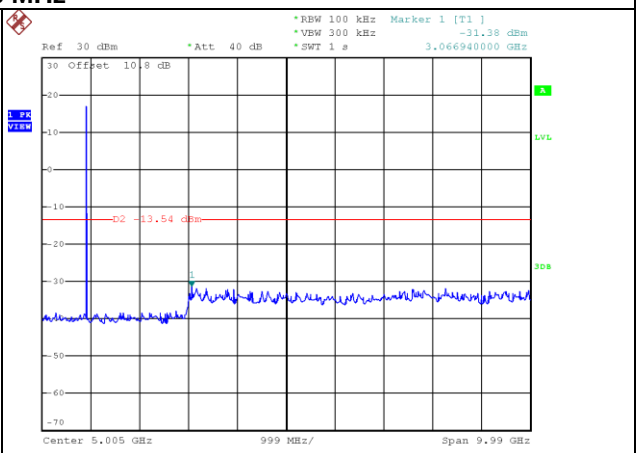
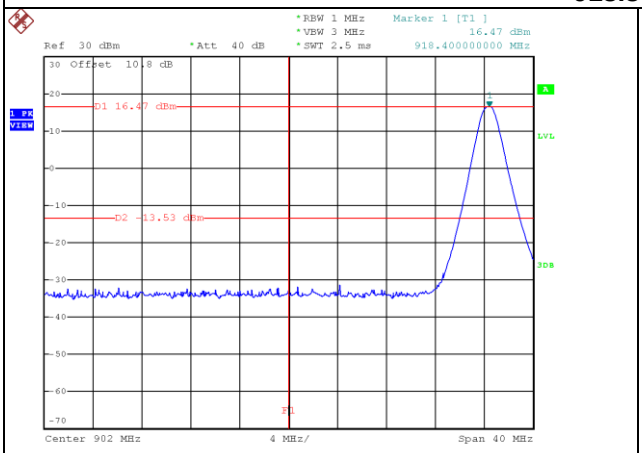
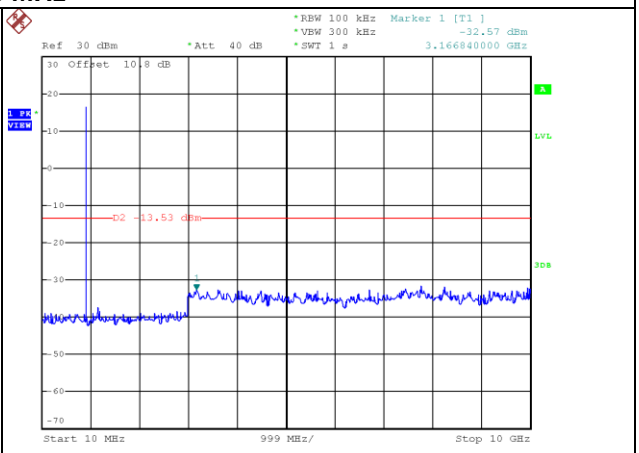
APPENDIX H OUTPUT POWER

Test Mode :	Lora	Tested Date	2021/2/23

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (W)	Max. Limit (dBm)	Max. Limit (W)	Test Result
916.3	17.35	0.0543	30.00	1.0000	Pass
917.3	17.41	0.0551	30.00	1.0000	Pass
918.3	17.34	0.0542	30.00	1.0000	Pass

APPENDIX I ANTENNA CONDUCTED SPURIOUS EMISSION

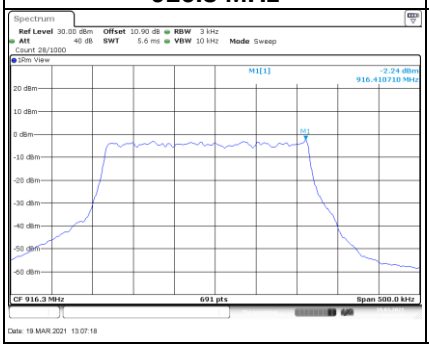
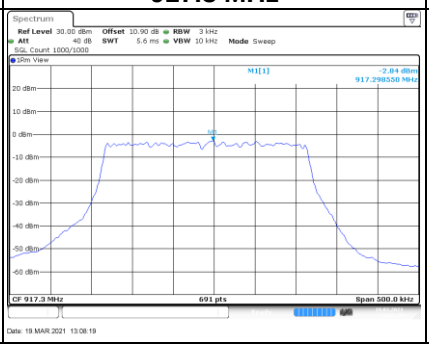
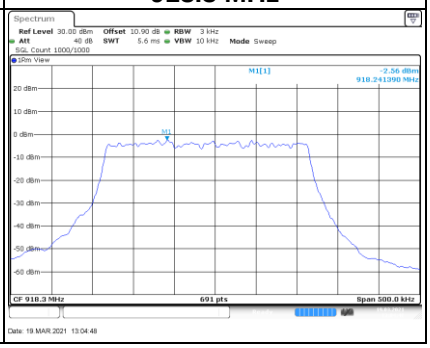
Test Mode	Lora

Band edge	10 Harmonics
916.3 MHz	
	
Date: 24.FEB.2021 14:05:44	Date: 24.FEB.2021 14:07:32
917.3 MHz	
	
Date: 24.FEB.2021 14:16:48	Date: 24.FEB.2021 16:31:45
918.3 MHz	
	
Date: 24.FEB.2021 13:52:47	Date: 24.FEB.2021 13:55:24

APPENDIX J POWER SPECTRAL DENSITY TEST

Test Mode :	Lora

Frequency (MHz)	Power Density (dBm/3kHz)	Power Density With Duty Factor	Max. Limit (dBm/3kHz)	Test Result
916.3	-2.24	-1.56	8	Pass
917.3	-2.84	-2.16	8	Pass
918.3	-2.56	-1.88	8	Pass

916.3 MHz	917.3 MHz	918.3 MHz
		

End of Test Report