FCC Part 15 EMI TEST REPORT

of

E.U.T. : Wall Remote FAN SPEED CONTROL

FCC ID : CHQ9050TB4

MODEL : UC9050TB Series

Test Series Model : UC9051GTB4

Series Model : UC9050TB4 , UC9050GTB4 ,UC9051TB4 , UC9050TBD4 , UC9050GTBD4 ,UC9051TBD4 , UC9051GTBD4

Working Frequency:433.92 MHz

for

APPLICANT : RHINE ELECTRONIC CO., LTD

ADDRESS : No.29, Fengli Rd., Tanzi Dist., Taichung City 427, Taiwan (R.O.C.)

Test Performed by

Taiwan Testing and Certification Center
NO. 34. LIN 5, DINGFU VIL., LINKOU DIST., NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.
TEL : (02)26023052 Fax : (02)26010910
http://www.etc.org.tw ; e-mail: emc@etc.org.tw

Report Number : 19-12-RBF-008-01

TEST REPORT CERTIFICATION

Applicant	:	RHINE ELECTRONIC CO., LTD No.29, Fengli Rd., Tanzi Dist., Taichung City 427, Taiwan (R.O.C.)
Manufacturer	:	1. RHINE ELECTRONIC CO., LTD 2. KAM SHING ELECTRONIC CO., LTD 1 No.29, Fengli Rd., Tanzi Dist., Taichung City 427, Taiwan (R.O.C.) 2. THE YOUTH LNDUSTRIAL ADMINISTRATION PARK, CHENJIANG TOWN,HUICHENG DISTRICT,HUIZHOU CITY, GUANGDONG,CHINA
Description of EUT	:	
a) Type of EUT	:	Wall Remote FAN SPEED CONTROL
b) Trade Name	:	RHINE
c) Model	:	UC9050TB Series
d) Test Series Model	:	UC9051GTB4
e) Series Model	:	UC9050TB4 , UC9050GTB4 ,UC9051TB4 , UC9050TBD4 , UC9050GTBD4 ,UC9051TBD4 , UC9051GTBD4
f) FCC ID	:	CHQ9050TB4
g) Working Frequency	:	433.92 MHz
h) Power Supply	:	12Vdc (23AE 12V)

Regulation Applied : FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT; The data shown in this report were made in accordance with the procedures given in ANSI C63.10-2013 and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note : 1. The results of the testing report relate only to the items tested.
2. The testing report shall not be reproduced except in full, without the written approval of ETC.

Summary of Tests

Test	Results
Radiated Emission	**Pass**
Bandwidth of Emision	**Pass**
Conducted Emission	**N/A**

Date Test Item Received	:	*12/13/2019*
Date Test Campaign Completed	:	*6/4/2021*
Date of Issue	:	*8/3/2021*

Test Engineer : Kazuma Ho

(Kazuma Ho, Engineer)

Approve & Authorized : Vincent Chang

Vincent Chang, Supervisor
EMC Dept. II of ELECTRONICS TESTING CENTER, TAIWAN

Table of Contents Page

1. GENERAL INFORMATION 5

1.1 Product Description 5
1.2 Characteristics of Device: 5
1.3 Test Methodology 5
1.4 Test Facility 5

2. DEFINITION AND LIMITS 6

2.1 Definition 6
2.2 Restricted Bands of Operation 6
2.3 Limitation 6
2.4 Labeling Requirement 8
2.5 User Information 8

3 SYSTEM TEST CONFIGURATION 10

3.1 Justification 10
3.2 Devices for Tested System 10

4. RADIATED EMISSION MEASUREMENT 11

4.1 Applicable Standard 11
4.2 Measurement Procedure 11
4.3 Test Data 14
4.4 Field Strength Calculation 19
4.5 Activate Time 19
4.6 Calculation of Duty Factor 20
4.7 Radiated Test Equipment 22
4.8 Measuring Instrument Setup 22
4.9 Radiated Measurement Photos 23

5. BANDWIDTH OF EMISSION 25

5.1 Applicable Standard Plot Graphic of Bandwidth 25
5.2 Bandwidth Test Equipment 25
5.3 Plot Graphic of Bandwidth 25

6. CONDUCTED EMISSION MEASUREMENT 26

6.1 Description 26

7 ANTENNA REQUIREMENT 27

7.1 Standard Applicable 27
7.2 Standard Applicable 27
7.3 Antenna Construction 27

1. GENERAL INFORMATION

1.1 Product Description

a) Type of EUT	:	Wall Remote FAN SPEED CONTROL
b) Trade Name	:	RHINE
c) Model	:	UC9050TB Series
d) Test Series Model	:	UC9051GTB4
e) Series Model	:	UC9050TB4 , UC9050GTB4 ,UC9051TB4 ,UC9050TBD4, UC9050GTBD4 ,UC9051TBD4 ,UC9051GTBD4
f) FCC ID	:	CHQ9050TB4
g) Working Frequency	:	433.92 MHz
h) Power Supply	:	12Vdc (23AE 12V)

1.2 Characteristics of Device:

1.The transmission is powered by 12V battery
2.Fan 6 Speed control and reverse
3.Light control
4.Frequency：433.92MHz+-150KHz
5.Modulation : ASK
6.The remote control address with a combination 16BIT, 8BIT the function code.
7.The models with a switch, you can switch the fan power

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10-2013.
The equipment under test was operated continuously in its normal operating mode for the purpose of the measurements. In order to secure the continuous operation of the device under test, rewiring in the circuit was done by the manufacturer so as to affect its intended operation.
The receiving antenna polarized horizontally was varied from 1 to 4 meters and the wooden turntable was rotated through 360 degrees to obtain the highest reading on the field strength meter or on the display of the spectrum analyzer. And also, each emission was to be maximized by changing the orientation of the equipment under test.
In order to determining the average value during one pulse train of the radiated power generated from the equipment under test, the encoded wave form in the time domain was used.

Measurement Software

Software	Version	Note
e3	Version 6.100618f	Radiated Emission Test
e3	Version 6.100421	Conducted Emission Test

1.4 Test Facility

Location of the Test site: No.34, Lin 5, Dingfu Vil., Linkou Dist., New Taipei City, Taiwan 24442, R.O.C.

Designation Number: TW2628.

2. DEFINITION AND LIMITS

2.1 Definition

Intentional radiator:
A device that intentionally generates and emits radio frequency energy by radiation or induction.

2.2 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.495 - 0.505 **	16.69475 - 16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425 - 16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475 - 156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3360-4400	Above 38.6
13.36-13.41			

Remark "**" : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz

2.3 Limitation

(1) Conducted Emission Limits:

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on
the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency MHz	**Quasi Peak dBμV**	**Average dBμV**
0.15 - 0.5	66-56*	56-46*
0.5 - 5.0	56	46
5.0 - 30.0	60	50

● Decreases with the logarithm of the frequency

(2) Radiated Emission Limits :

According to 15.231(a), Periodic operation in the band 40.66-40.70 MHz and above 70 MHz, except as shown in paragraph 15.231(e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Frequency Band (MHz)	Field strength of Fundamental (uV/m)	Field strength of Spurious (uV/m)
40.66-40.70	2250	225
70-130	1250	125
130-174	*1,250 to 3,750	*125 to 375
174-260	3750	375
260-470	*3,750 to 12,500	*375 to 1250
Above 470	12500	1250

* Linear interpolations.

According to 15.231(e), Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) and may be employed for any type of operation, including operation prohibited in paragraph (a), provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this Section, except the field strength table in paragraph (b) is replaced by the following:

Frequency Band (MHz)	Field strength of Fundamental (uV/m)	Field strength of Spurious (uV/m)
40.66-40.70	1,000	100
70-130	500	50
130-174	*500 to 1,500	*50 to 150
174-260	1,500	150
260-470	*1,500 to 5,000	*150 to 500
Above 470	5,000	500

* Linear interpolations

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209,as following table:

Other Frequencies (MHz)	Field Strength of Fundamental V/meter	dB V/meter
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

(3) Limit of transmission time

According to 15.231(a),

1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

According to 15.231(e), devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

2.4 Labeling Requirement

The device shall bear the following statement in a conspicuous location on the device :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.5 User Information

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

2.6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz ~ 30MHz	±3.34dB (Mains)(LISN)
Radiated emissions	9kHz ~ 30MHz	±4.22dB
Radiated emissions	30MHz ~ 1GHz	±4.2dB (30MHz≦f≦300MHz)
		±4.44dB (300MHz＜f≦1GHz)
	Above 1GHz	±4.44dB (1GHz≦f≦18GHz)
		±3.02dB (18GHz≦f≦40GHz)
Frequencies Tolerance	9kHz ~ 40GHz	$\pm 4.04\times10^{-8}$
Occupied Bandwidth	9kHz ~ 40GHz	±5%

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

The test result(s) does not consider the uncertainty of measurement when the test standard(s) and/or test method which refer by the labs has the limit or judgments for the test result(s).

3 SYSTEM TEST CONFIGURATION

3.1 Justification

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

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

3.2 Devices for Tested System

EUT & accessories.

Device	Manufacture	Model.	Description
Wall Remote FAN SPEED CONTROL*	1. RHINE ELECTRONIC CO., LTD 2. KAM SHING ELECTRONIC CO., LTD	UC9051GTB4	---

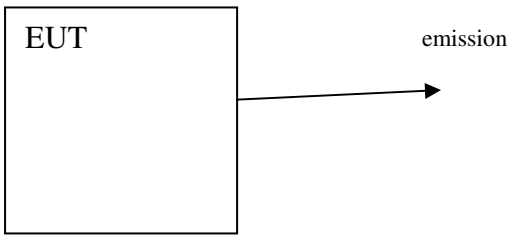
Remark "*" means equipment under test.

The EUT connected with the following peripheral devices.

Device	Manufacture	Model	Description
---	---	---	---

3.3 Configuration of Tested System

Mode 1(Operation):



4. RADIATED EMISSION MEASUREMENT

4.1 Applicable Standard

For periodic operation intentional radiator, the radiated emission shall comply with § 15.231(b).

4.2 Measurement Procedure

A. Preliminary Measurement For Portable Devices

For portable devices, the following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

B. Final Measurement

1. Setup the configuration per figure 1 and 2 for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ° to 360 ° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

5. Repeat step 4 until all frequencies need to be measured were complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

7. Check the three frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worse case and record the result.

Figure 1a : Frequencies measured below 1 GHz configuration(above 30MHz)

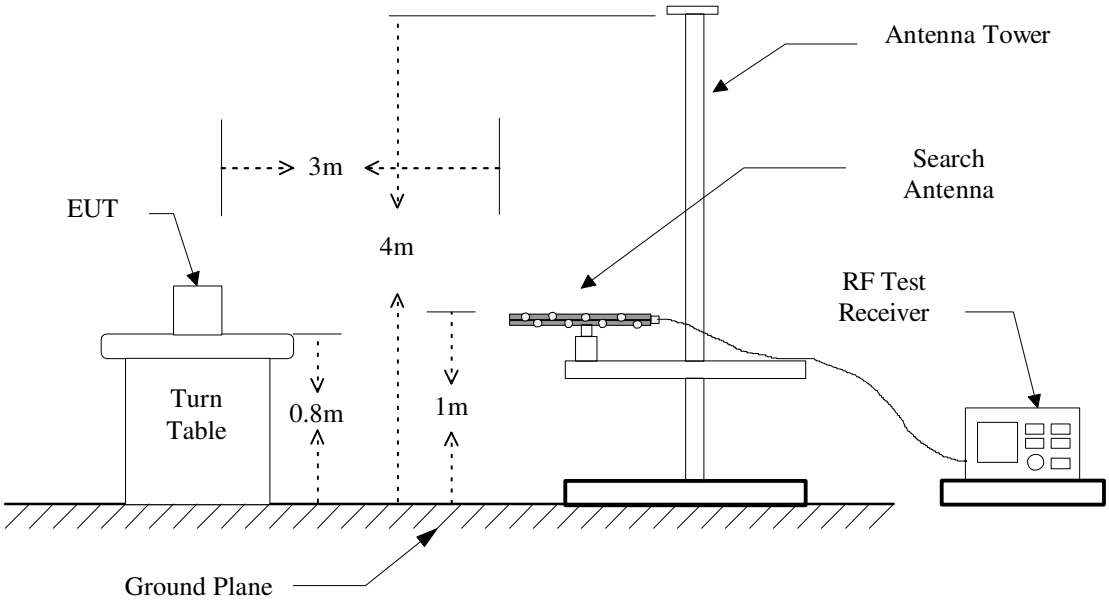


Figure 1b : Frequencies measured below 1 GHz configuration(below 30MHz)

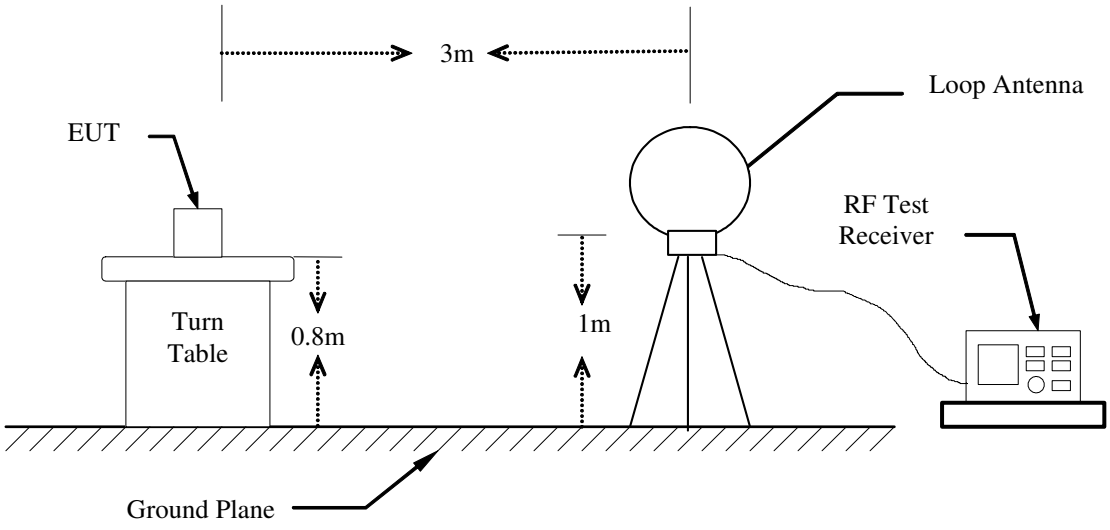
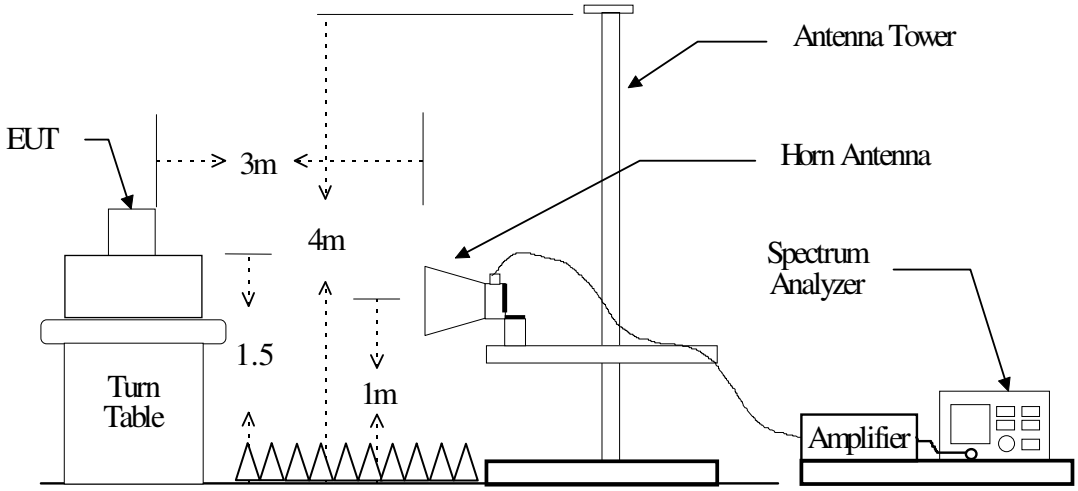
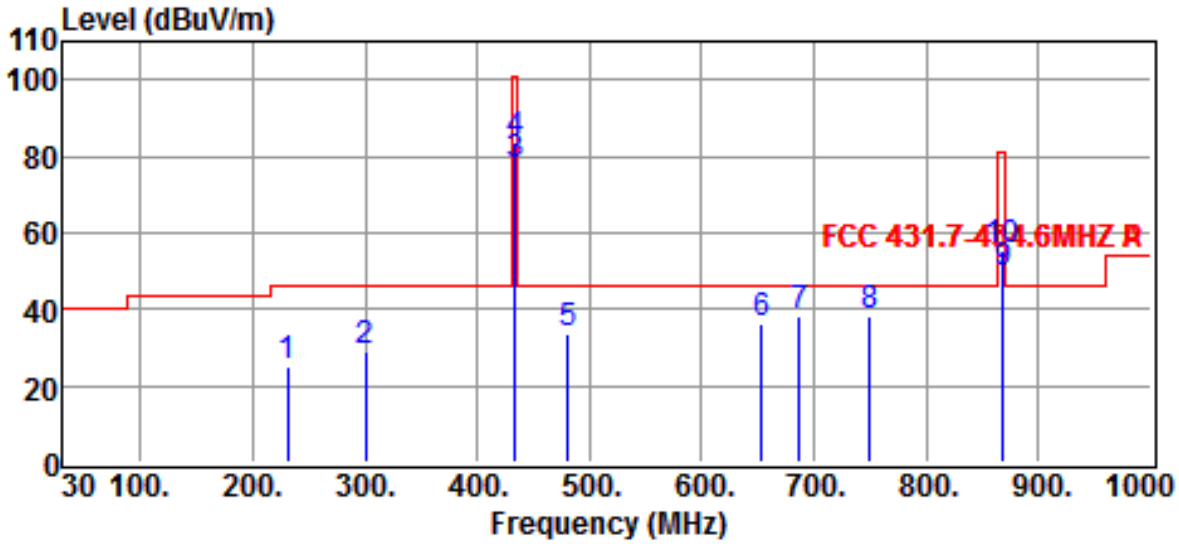


Figure 2 : Frequencies measured above 1 GHz configuration



4.3 Test Data

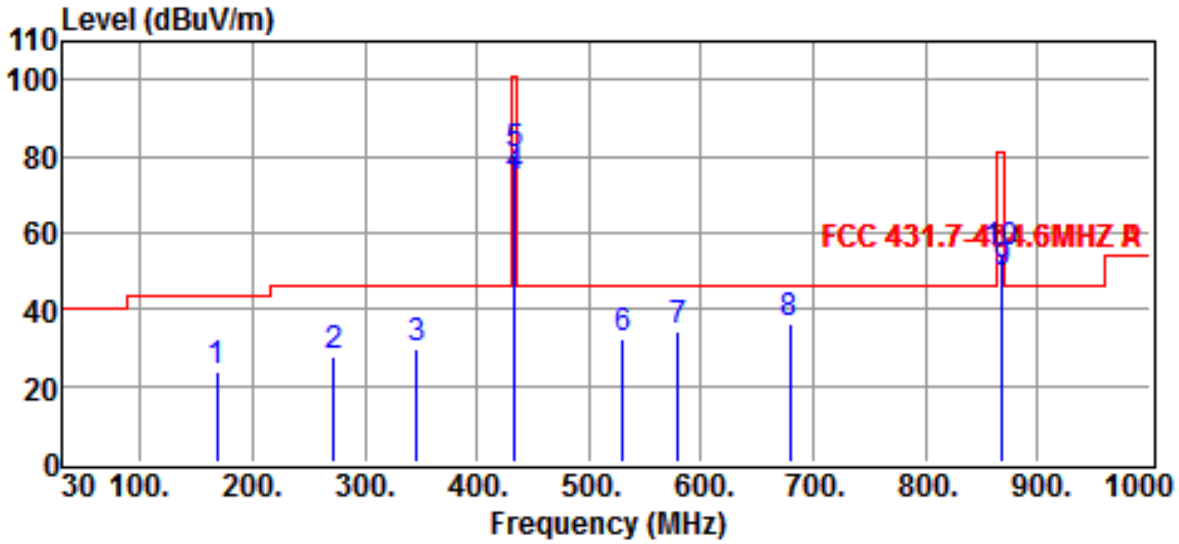
A. 30MHz ~ 1GHz



Site	:Chamber #2	Date	:2021-06-04
Limit	:FCC 431.7-434.6MHZ P	Ant. Pol.	:HORIZONTAL
EUT	:Wall Remote FAN SPEED CONTROL		
Model	:UC9051GTB4		
Power Rating	:12Vdc Battery	Temp.	:25˚C
Engineer	:Kazuma Ho	Humi.	:78 %
Test Mode	:Mode 1-Operation		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	230.8200	32.09	-7.00	25.09	46.00	-20.91	QP
	300.5800	32.09	-3.08	29.01	46.00	-16.99	QP
*	433.9870	---	---	77.99	80.80	-2.81	Average
	433.9870	84.44	-0.65	83.79	100.80	-17.01	Peak
	481.0100	33.57	0.16	33.73	46.00	-12.27	QP
	653.6400	32.77	3.47	36.24	46.00	-9.76	QP
	687.4800	34.54	3.77	38.31	46.00	-7.69	QP
	749.5400	33.65	4.51	38.16	46.00	-7.84	QP
	867.9740	---	---	49.68	60.80	-11.12	Average
	867.9740	48.41	7.07	55.48	80.80	-25.32	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor (-5.8)
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

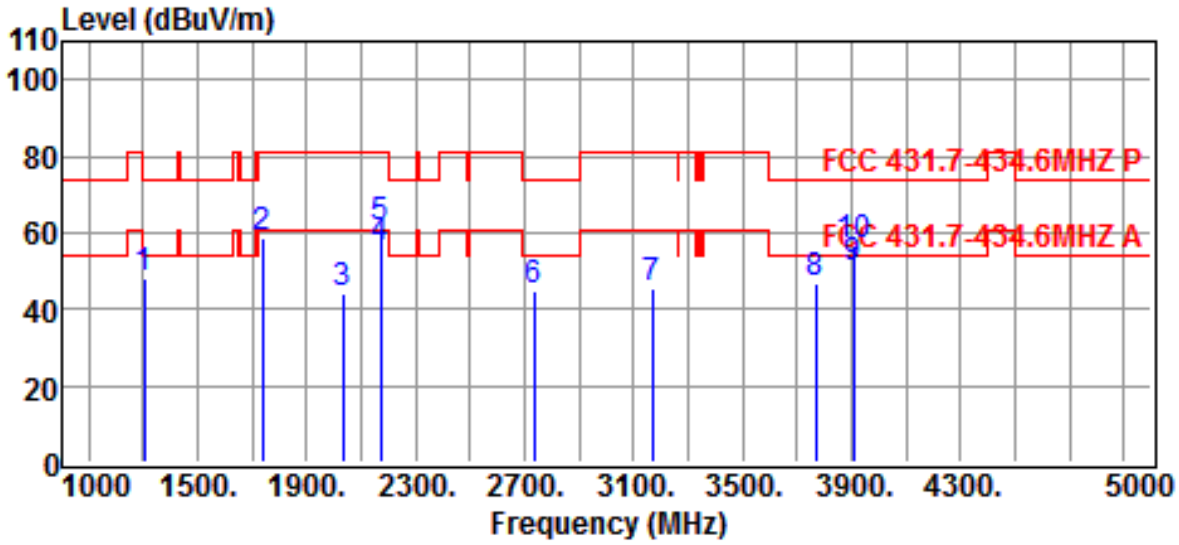


Site	:Chamber #2	Date	:2021-06-04
Limit	:FCC 431.7-434.6MHZ P	Ant. Pol.	:VERTICAL
EUT	:Wall Remote FAN SPEED CONTROL		
Model	:UC9051GTB4		
Power Rating	:12Vdc Battery	Temp.	:25˚C
Engineer	:Kazuma Ho	Humi.	:78 %
Test Mode	:Mode 1-Operation		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	168.5500	31.93	-8.09	23.84	43.50	-19.66	QP
	272.4400	31.87	-4.49	27.38	46.00	-18.62	QP
	345.9700	31.96	-2.41	29.55	46.00	-16.45	QP
*	433.9870	---	---	74.35	80.80	-6.45	Average
	433.9870	80.80	-0.65	80.15	100.80	-20.65	Peak
	530.4400	31.72	0.73	32.45	46.00	-13.55	QP
	579.0300	32.85	1.40	34.25	46.00	-11.75	QP
	678.5500	31.99	4.07	36.06	46.00	-9.94	QP
	867.9740	---	---	49.11	60.80	-11.69	Average
	867.9740	47.84	7.07	54.91	80.80	-25.89	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor (-5.8)
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

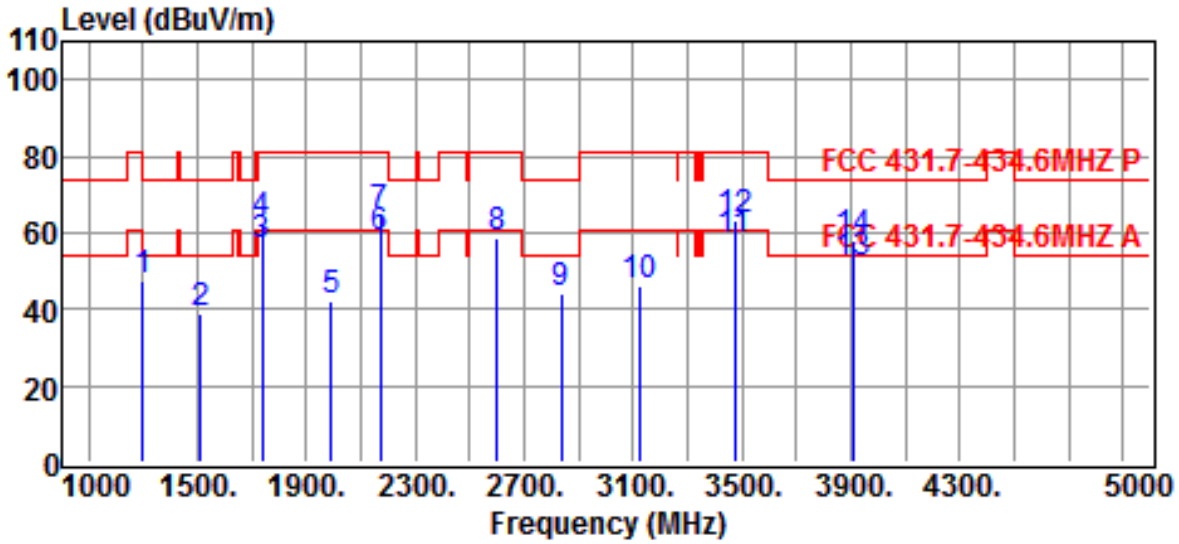
B. Above 1GHz



Site	:Chamber #2	Date	:2021-06-04
Limit	:FCC 431.7-434.6MHZ P	Ant. Pol.	:HORIZONTAL
EUT	:Wall Remote FAN SPEED CONTROL		
Model	:UC9051GTB4		
Power Rating	:12Vdc Battery	Temp.	:25˚C
Engineer	:Kazuma Ho	Humi.	:78 %
Test Mode	:Mode 1-Operation		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	1300.5430	54.75	-6.60	48.15	74.00	-25.85	Peak
	1735.5970	62.90	-4.41	58.49	80.80	-22.31	Peak
	2033.0000	45.20	-1.12	44.08	80.80	-36.72	Peak
	2169.9350	---	---	55.78	60.80	-5.02	Average
	2169.9350	62.90	-1.32	61.58	80.80	-19.22	Peak
	2734.0000	44.51	0.51	45.02	74.00	-28.98	Peak
	3168.0000	42.35	3.06	45.41	80.80	-35.39	Peak
	3769.0000	43.52	3.06	46.58	74.00	-27.42	Peak
*	3905.8830	---	---	50.97	54.00	-3.03	Average
	3905.8830	53.57	3.20	56.77	74.00	-17.23	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor (-5.8)
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.



Site	:Chamber #2	Date	:2021-06-04
Limit	:FCC 431.7-434.6MHZ P	Ant. Pol.	:VERTICAL
EUT	:Wall Remote FAN SPEED CONTROL		
Model	:UC9051GTB4		
Power Rating	:12Vdc Battery	Temp.	:25˚C
Engineer	:Kazuma Ho	Humi.	:78 %
Test Mode	:Mode 1-Operation		

	Freq MHz	Reading dBuV	Correction Factor dB/m	Result dBuV/m	Limits dBuV/m	Over limit dB	Detector
	1300.1250	53.77	-6.61	47.16	74.00	-26.84	Peak
	1509.0000	45.20	-6.34	38.86	74.00	-35.14	Peak
	1735.9480	---	---	56.89	60.80	-3.91	Average
	1735.9480	67.10	-4.41	62.69	80.80	-18.11	Peak
	1993.0000	43.48	-1.39	42.09	80.80	-38.71	Peak
*	2169.9350	---	---	58.78	60.80	-2.02	Average
	2169.9350	65.90	-1.32	64.58	80.80	-16.22	Peak
	2602.1560	58.10	0.24	58.34	80.80	-22.46	Peak
	2837.0000	43.76	0.70	44.46	74.00	-29.54	Peak
	3121.0000	43.90	1.96	45.86	80.80	-34.94	Peak
	3471.8960	---	---	57.64	60.80	-3.16	Average
	3471.8960	61.46	1.98	63.44	80.80	-17.36	Peak
	3905.8830	---	---	51.92	54.00	-2.08	Average
	3905.8830	54.52	3.20	57.72	74.00	-16.28	Peak

Note :
1. Result = Reading + Correction Factor
2. Average Result = Peak Result + Duty Factor (-5.8)
3. Correction Factor = Antenna Factor + Cable Loss - Amplifier Gain (if any)
4. The margin value=Limit - Result
5. Above 1Ghz : Peak measurements are compared to the average limit - as peak measurements are below the average limit, they also comply with the peak limit.
6. ” * ” mean this data is the worst emission level.

C. Emission frequencies below 30MHz (9kHz - 30MHz)

According to exploratory test no any obvious emission were detected from 9kHz to 30MHz. All emissions were greater than 20 dB below the limit. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

4.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

where

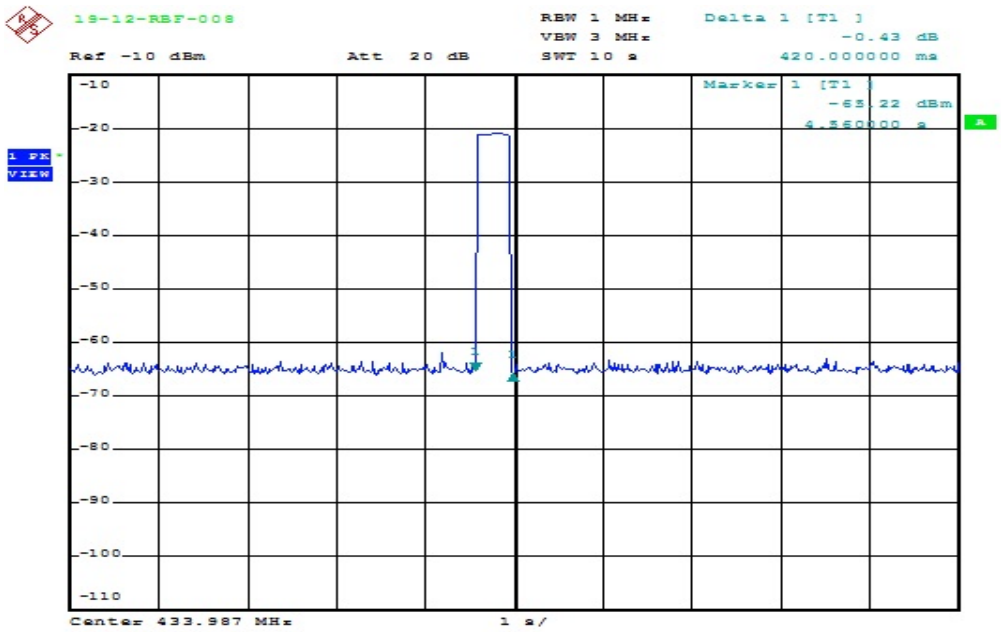
Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any) And the average value is

Average = Peak Value + Duty Factor

Note : If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

4.5 Activate Time

This EUT is operated by manually, and Activate Time is less than 5 second after being released.



Date: 26.MAY.2021 16:25:25

4.6 Calculation of Duty Factor

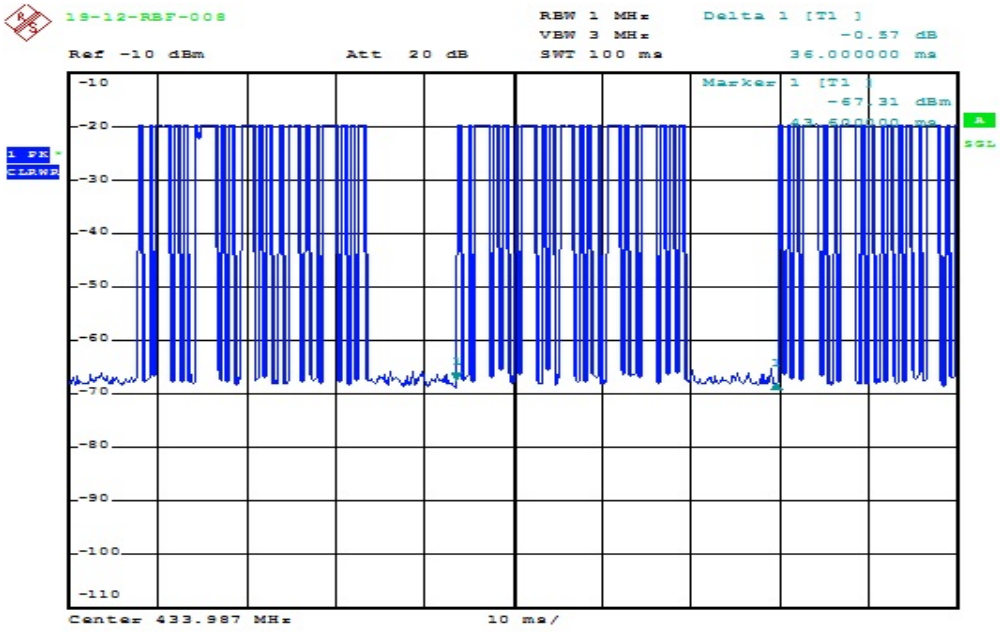
The duty factor is calculated with following formula :

$$20\log\frac{Total\ Duty}{Period\ of\ Pulse\ Train}$$

Test Data: 2021/5/26 Temp: 26 °C Hum: 47 %

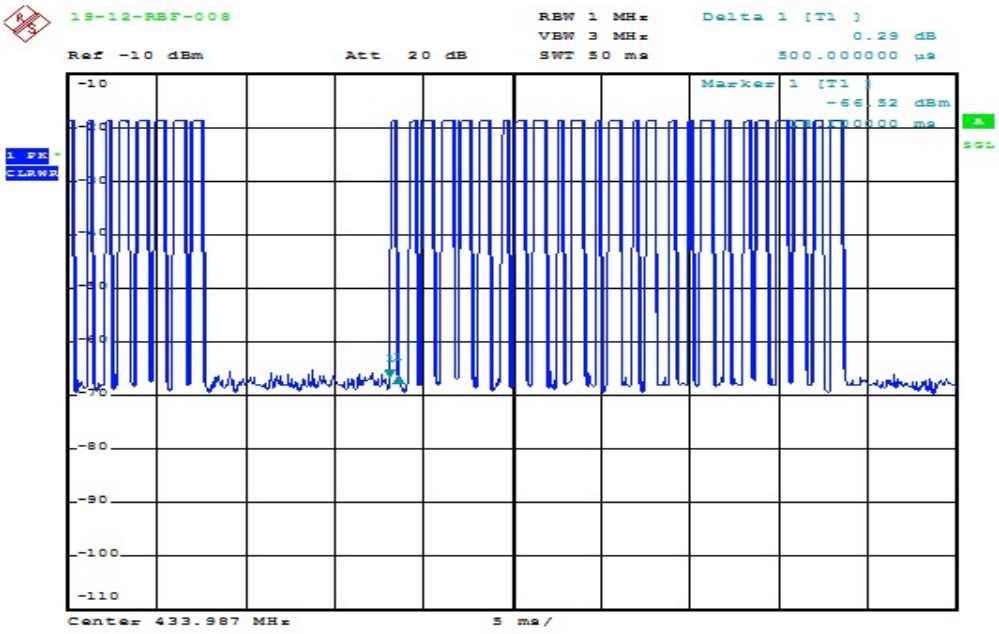
$$\text{Duty Factor} = 20\log\frac{(0.5ms*10)+(0.9ms*15)}{36ms} = -5.8\ dB$$

Period of Pulse Train

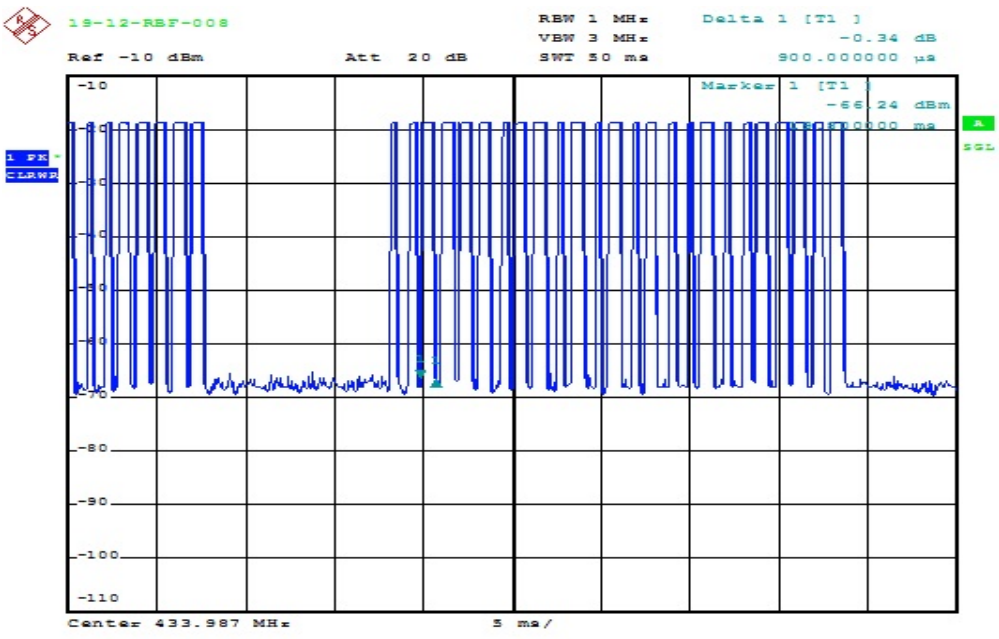


Date: 26.MAY.2021 16:24:40

Detail of a single pulse train



Date: 26.MAY.2021 16:29:07



Date: 26.MAY.2021 16:29:51

4.7 Radiated Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESU40 (13054416-001)	2021/03/25	2022/03/24
LOOP Antenna	EMCO	6512	2020/10/19	2021/10/18
Bi-Log Antenna	ETC & JYE BAO	MCTD 2786 & FAT-NM5NF5T3G2W6	2020/07/31	2021/07/30
Horn Antenna	ETS-Lindgren	3117	2021/03/16	2022/03/15
Amplifier	HP	8447D (13040711-001)	2020/10/06	2021/10/05
Amplifier	HP	8449B (13052901-001)	2020/10/06	2021/10/05

4.8 Measuring Instrument Setup

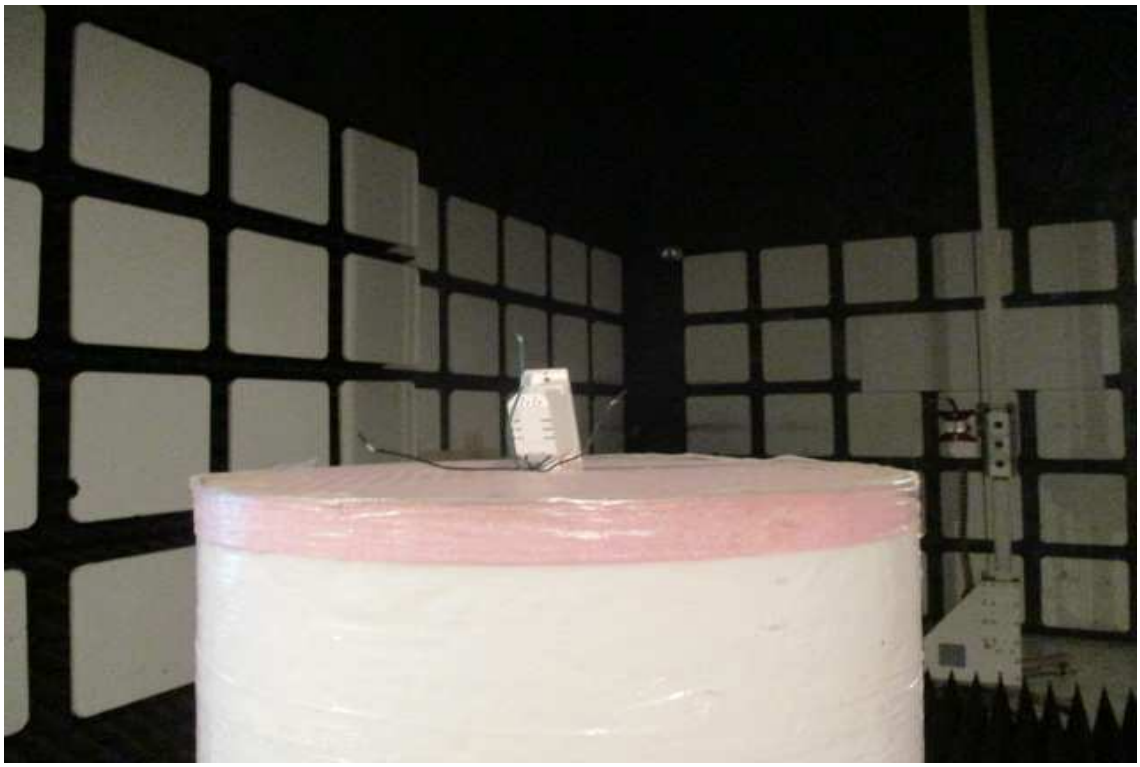
Explanation of measuring instrument setup in frequency band measured is as following :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	N/A
	Spectrum Analyzer	Peak	100 kHz	100 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

4.9 Radiated Measurement Photos

(30~1000MHz)

(Above 1GHz)



5. BANDWIDTH OF EMISSION

5.1 Applicable Standard Plot Graphic of Bandwidth

Per FCC rule §15.231(c), the permitted emission bandwidth is no wider than 0.25%of the center frequency for devices operating above 70 MHz and below 900 MHz.

5.2 Bandwidth Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	R&S	FSP40	2020/06/30	2021/06/29

5.3 Plot Graphic of Bandwidth

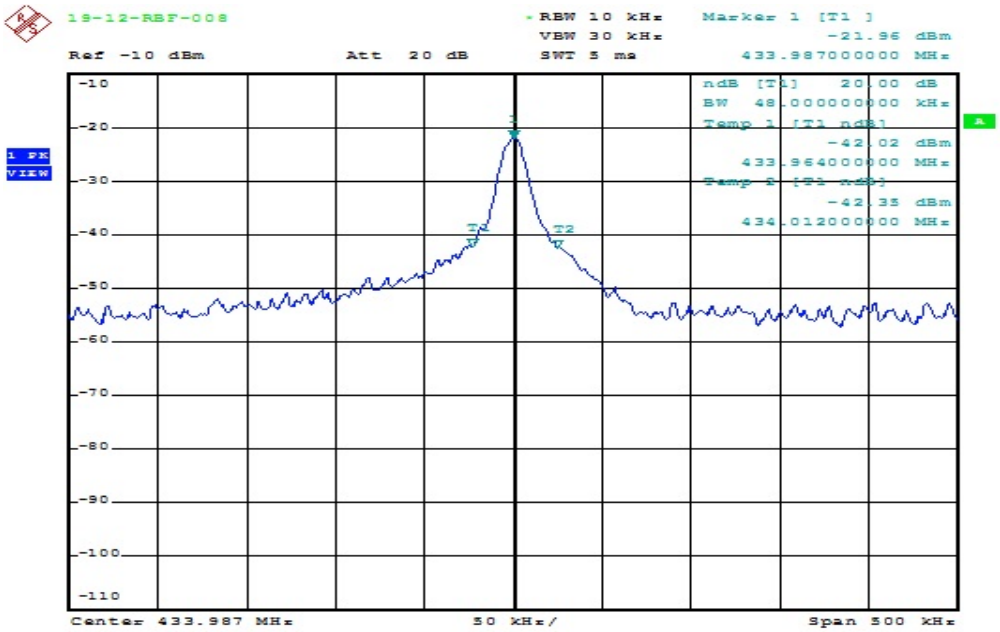
The emission bandwidth limit is:

Test Data: 2021/5/26 Temp: 26 °C Hum: 47 %

433.987 MHz x 0.25%= 1084.968 kHz

20 dB bandwidth = 48 kHz

Test Result: 48 kHz < 1084.968 kHz



Date: 26.MAY.2021 16:26:16

6. CONDUCTED EMISSION MEASUREMENT

6.1 Description

This EUT is excused from investigation of conducted emission, for it is powered by DC battery only.

According to §15.207 (d), measurements to demonstrate compliance with

the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

7 ANTENNA REQUIREMENT

7.1 Standard Applicable

7.2 Standard Applicable

According to §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.

7.3 Antenna Construction

The antenna is permanently integrated on RF Board, no consideration of replacement. Please see photos submitted in Exhibit B.