

TEST REPORT

Product Name : Doorbell
Brand Mark : TeckNet or TECKNET
Model No. : TK-WD004
FCC ID : 2AK8Q-TKWD004
Report Number : BLA-EMC-202108-A2002
Date of Sample Receipt : 2021/8/4
Date of Test : 2021/8/4 to 2021/8/25
Date of Issue : 2021/8/25
Test Standard : 47 CFR Part 15, Subpart C 15.231
Test Result : Pass

Prepared for:

Shenzhen Unichain Technology Co., Ltd
201, 2nd Floor, Building C, Shanhai Commercial Plaza, Huangjunshan
District, Bantian Street, Longgang District, Shenzhen, China

Prepared by:

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Date:

2021/8/25



REPORT REVISE RECORD

Version No.	Date	Description
00	2021/8/25	Original

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1 TEST SUMMARY

Test item	Test Requirement	Test Method	Class/Severity	Result
Radiated Emissions	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.231(b)	Pass
Field Strength of the Fundamental Signal (15.231(b))	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.5	47 CFR Part 15, Subpart C 15.231(b)	Pass
Dwell Time (15.231(a))	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 7.8.4	47 CFR Part 15, Subpart C 15.231(a)	Pass
20dB Bandwidth	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.231(c)	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.231	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	N/A
Antenna Requirement	47 CFR Part 15, Subpart C 15.231	N/A	47 CFR Part 15, Subpart C 15.203	Pass

2 GENERAL INFORMATION

Applicant	Shenzhen Unichain Technology Co., Ltd
Address	201, 2nd Floor, Building C, Shanhai Commercial Plaza, Huangjunshan District, Bantian Street, Longgang District, Shenzhen, China
Manufacturer	Shenzhen Unichain Technology Co., Ltd
Address	201, 2nd Floor, Building C, Shanhai Commercial Plaza, Huangjunshan District, Bantian Street, Longgang District, Shenzhen, China
Factory	Shenzhen Unichain Technology Co., Ltd
Address	201, 2nd Floor, Building C, Shanhai Commercial Plaza, Huangjunshan District, Bantian Street, Longgang District, Shenzhen, China
Product Name	Doorbell
Test Model No.	TK-WD004

3 GENERAL DESCRIPTION OF E.U.T.

Hardware Version	NA
Software Version	NA
Operation Frequency:	433.92MHz
Channel numbers:	1
Modulation type:	ASK
Antenna Type:	Internal antenna
Antenna gain:	0dBi(Provided by customer)
Power supply:	DC 3.0V

4 TEST ENVIRONMENT

Environment	Temperature	Voltage
Normal	25°C	DC3.0V

5 TEST MODE

TEST MODE	TEST MODE DESCRIPTION
Transmitting mode	Keep the EUT in continuously transmitting mode with modulation.
Remark: Full battery is used during all test except ac conducted emission.	

6 MEASUREMENT UNCERTAINTY

Parameter	Expanded Uncertainty (Confidence of 95%)
Radiated Emission(9kHz-30MHz)	±4.34dB
Radiated Emission(30Mz-1000MHz)	±4.24dB
Radiated Emission(1GHz-18GHz)	±4.68dB
AC Power Line Conducted Emission(150kHz-30MHz)	±3.45dB

7 DESCRIPTION OF SUPPORT UNIT

Device Type	Manufacturer	Model Name	Serial No.	Remark
--	--	--	--	--

Note:

“--” means no any support device during testing.

8 LABORATORY LOCATION

All tests were performed at:

BlueAsia of Technical Services(Shenzhen) Co., Ltd.

Building C, No. 107, Shihuan Road, Shiyao Sub-District, Baoan District, Shenzhen, Guangdong Province, China

Telephone: TEL: +86-755-28682673 FAX: +86-755-28682673

No tests were sub-contracted.

9 TEST INSTRUMENTS LIST

Test Equipment Of Radiated Emissions					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25
Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Field Strength of the Fundamental Signal (15.231(b))					
Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Chamber	SKET	966	N/A	2020/11/10	2023/11/9
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Receiver	R&S	ESR7	101199	2020/10/12	2021/10/11
broadband Antenna	Schwarzbeck	VULB9168	00836 P:00227	2020/9/26	2022/9/25
Horn Antenna	Schwarzbeck	9120D	01892 P:00331	2020/9/26	2022/9/25

Amplifier	SKET	PA-000318G-45	N/A	2020/10/16	2021/10/15
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A
Loop antenna	SCHNARZBECK	FMZB1519B	00102	2020/9/26	2022/9/25
Controller	SKET	N/A	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-02	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-03	N/A	N/A	N/A
Coaxial Cable	BlueAsia	BLA-XC-01	N/A	N/A	N/A

Test Equipment Of Dwell Time (15.231(a))

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of 20dB Bandwidth

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Spectrum	R&S	FSP40	100817	2020/10/12	2021/10/11
Spectrum	Agilent	N9020A	MY49100060	2020/10/12	2021/10/11
Signal Generator	Agilent	N5182A	MY49060650	2020/10/12	2021/10/11
Signal Generator	Agilent	E8257D	MY44320250	2020/10/12	2021/10/11

Test Equipment Of Conducted Emissions at AC Power Line (150kHz-30MHz)

Equipment	Manufacturer	Model	S/N	Cal.Date	Cal.Due
Shield room	SKET	833	N/A	2020/11/25	2023/11/24
Receiver	R&S	ESPI3	101082	2020/10/12	2021/10/11

LISN	R&S	ENV216	3560.6550.15	2020/10/12	2021/10/11
LISN	AT	AT166-2	AKK1806000003	2020/10/12	2021/10/11
EMI software	EZ	EZ-EMC	EEMC-3A1	N/A	N/A

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10 RADIATED EMISSIONS

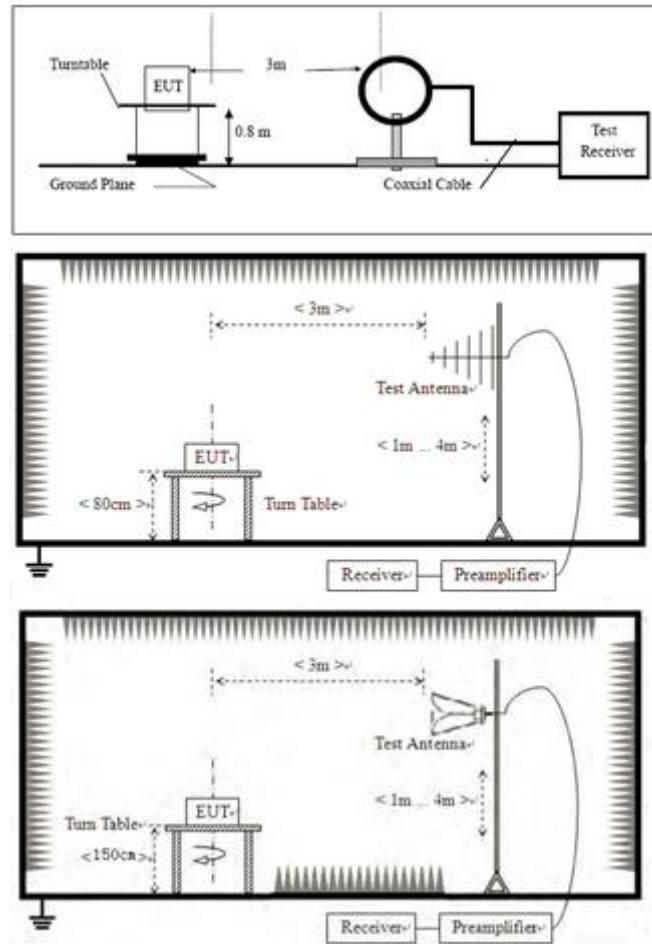
Test Standard	47 CFR Part 15, Subpart C 15.231
Test Method	ANSI C63.10 (2013) Section 6.4&6.5&6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25°C
Humidity	52%

10.1 LIMITS

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

10.2 BLOCK DIAGRAM OF TEST SETUP



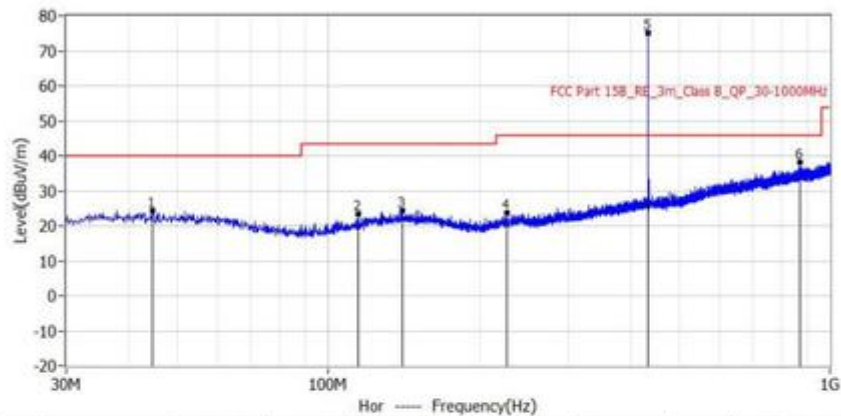
10.3 PROCEDURE

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

10.4 TEST DATA

[Test mode:TX mode][Polarity: Horizontal]

Test Lab: BlueAsia EMC Lab (RE #1)	Project: BLA-EMC-202108-A20
EUT: Doorbell	Test Engineer:
M/N: TK-WD004	Temperature:
S/N:TX	Humidity:
Test Mode: TX mode	Test Voltage:
Note:	Test Data: 2021-08-25 10:00:29

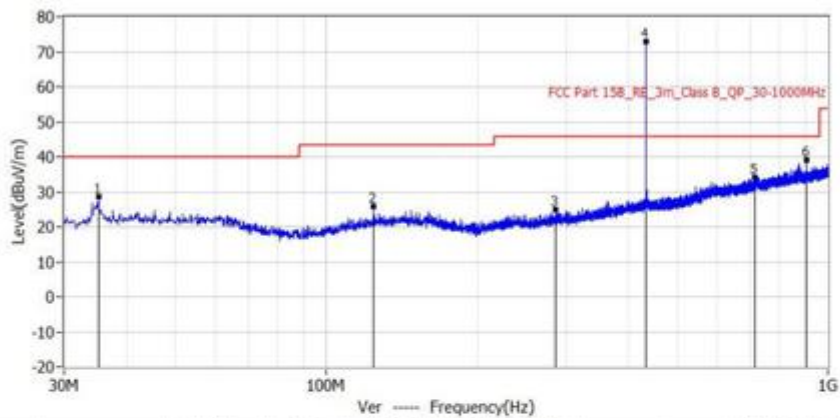


No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	44.550MHz	40.0	24.4	-15.6	0.4	24.0	PK	Hor	100.0	357.0
2*	114.390MHz	43.5	23.5	-20.0	1.4	22.1	PK	Hor	100.0	61.0
3*	140.216MHz	43.5	24.3	-19.2	0.6	23.7	PK	Hor	100.0	314.0
4*	226.546MHz	46.0	23.6	-22.4	1.5	22.1	PK	Hor	100.0	149.0
5*	433.884MHz	46.0	75.1	29.1	47.4	27.7	PK	Hor	100.0	254.0
6*	870.990MHz	46.0	38.2	-7.8	3.5	34.7	PK	Hor	100.0	330.0

Test Result: Pass

[Test mode:TX mode][Polarity: Vertical]

Test Lab: BlueAsia EMC Lab (RE #1)	Project: BLA-EMC-202108-A20
EUT: Doorbell	Test Engineer:
M/N: TK-WD004	Temperature:
S/N:	Humidity:
Test Mode: TX mode	Test Voltage:
Note:	Test Data: 2021-08-25 10:01:56



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1*	35.093MHz	40.0	28.6	-11.4	5.0	23.6	PK	Ver	100.0	24.0
2*	124.211MHz	43.5	25.8	-17.7	2.9	22.9	PK	Ver	100.0	141.0
3*	286.444MHz	46.0	24.9	-21.1	1.2	23.7	PK	Ver	100.0	117.0
4*	433.884MHz	46.0	72.8	26.8	45.1	27.7	PK	Ver	100.0	113.0
5*	713.365MHz	46.0	34.1	-11.9	1.9	32.2	PK	Ver	100.0	5.0
6*	903.728MHz	46.0	39.0	-7.0	4.0	35.0	PK	Ver	100.0	220.0

Test Result: Pass

[Test mode:TX mode][Polarity: Horizontal]



*:Maximum data x:Over limit !:over margin

(Reference Only)

Test Result: Pass

[Test mode:TX mode][Polarity: Vertical]



Test Result: Pass

11 FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL (15.231(B))

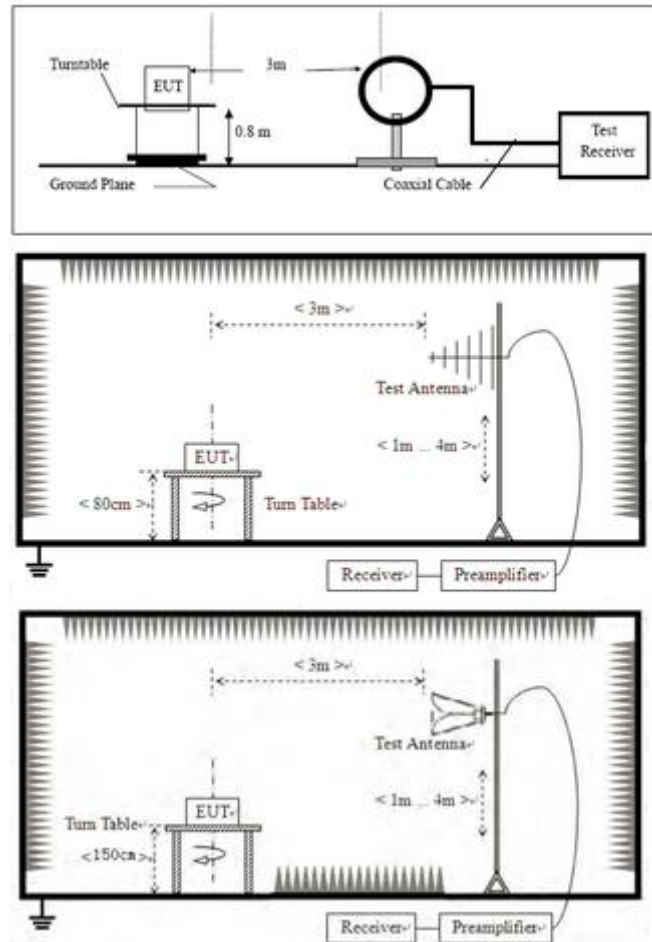
Test Standard	47 CFR Part 15, Subpart C 15.231
Test Method	ANSI C63.10 (2013) Section 6.5
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25°C
Humidity	52%

11.1 LIMITS

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of spurious emissions(microvolts/meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750	125 to 375
174-260	3750	375
260-470	3750 to 12500	375 to 1250
Above 470	12500	1250

Remark: the emission limit is based on measurement instrumentation employing an average detector at a distance of 3 meters. The frequencies above 1000MHz are based on average limits. 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.

11.2 BLOCK DIAGRAM OF TEST SETUP



11.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. 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 from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

h. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.
Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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11.4 TEST DATA

(Below 1G)

Peak value						
Frequency (MHz)	Read Level (dBuV)	Correct Facor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	47.4	27.7	75.1	100.80	-25.7	Horizontal
433.92	45.1	27.7	72.8	100.80	-28.0	Vertical
870.99	3.5	34.7	38.2	80.80	-42.6	Horizontal
903.73	4.0	35.0	39.0	80.80	-41.8	Vertical
Average value						
Frequency (MHz)	Peak value	Duty cycle factor	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
433.92	75.1	-8.2	66.9	80.80	-13.9	Horizontal
433.92	72.8	-8.2	67.6	80.80	-13.4	Vertical
870.99	38.2	-8.2	30.0	60.80	-30.8	Horizontal
903.73	39.0	-8.2	30.8	60.80	-30.0	Vertical
Calculate Formula:	Average value = Peak value + Duty Cycle Factor					
	Duty cycle factor = 20log(Duty cycle)					
	T period =26.80(ms)					
	Duty cycle =38.73%					
	Duty cycle factor = 20log(Duty cycle) = -8.2					

Remark:

1. Final Level = Receiver Read level + Correct factor
2. Correct factor = Antenna Factor + Cable Loss – Preamplifier Factor
3. Average value = Peak value + Duty Cycle Factor

(Above 1G)

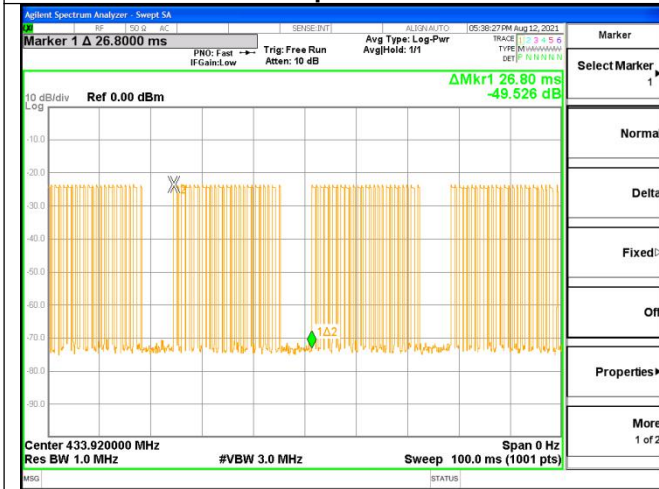
Horizontal							
No.	Frequency (MHz)	Peak Result (dBuV/m)	Duty cycle factor	Average Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
1	2605.000	57.51	-8.2	49.31	60.8	-11.49	Pass
2	3475.000	54.38	-8.2	46.18	60.8	-14.62	Pass
3	3905.000	59.68	-8.2	51.48	60.8	-9.32	Pass

Vertical							
No.	Frequency (MHz)	Peak Result (dBuV/m)	Duty cycle factor	Average Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Result
1	3040.000	50.25	-8.2	42.05	60.8	-18.75	Pass
2	3410.000	49.79	-8.2	41.59	60.8	-19.21	Pass
3	3780.000	54.88	-8.2	46.68	60.8	-14.12	Pass

Remark:

1. Final Level = Receiver Read level + Correct factor
2. Correct factor = Antenna Factor + Cable Loss – Preamplifier Factor
3. Average value = Peak value + Duty Cycle Factor

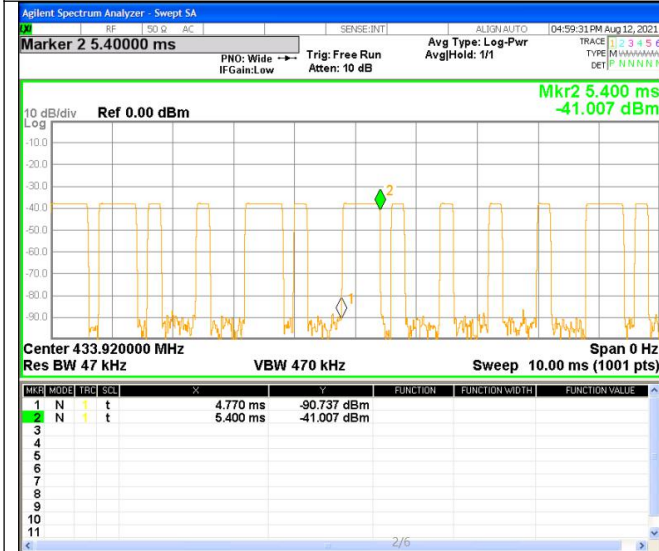
T period



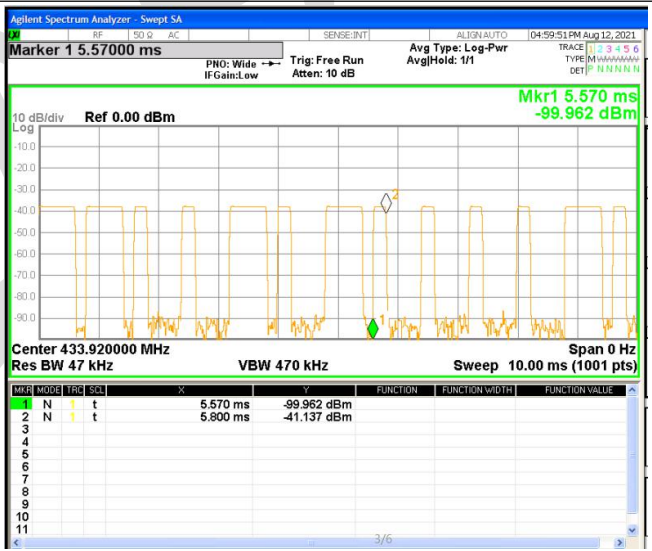
T period-1



T on time slot-1:



T on time slot-2:



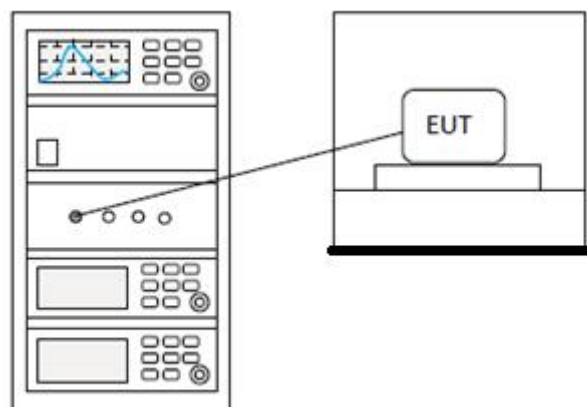
12 DWELL TIME (15.231(A1))

Test Standard	47 CFR Part 15, Subpart C 15.231
Test Method	ANSI C63.10 (2013) Section 7.8.4
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25°C
Humidity	52%

12.1 LIMITS

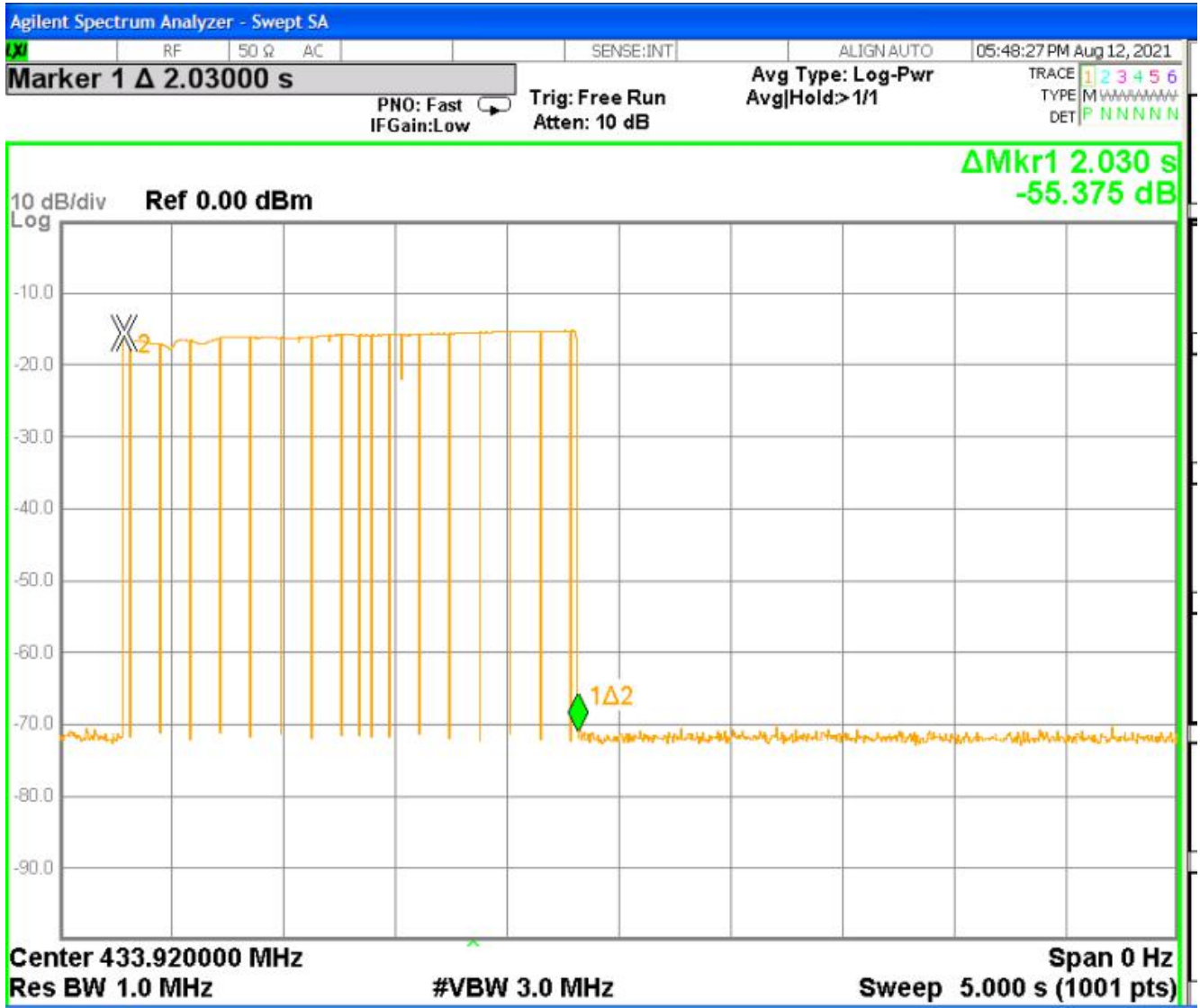
Device type	Limit
Manually operated transmitter	The switch automatically deactivate the transmitter within not more than 5 seconds of being released
Automatically activated transmitter	Cease transmission within 5 seconds after activation
Periodic transmissions to determine system integrity of transmitters used in security or safety applications	The total transmission time does not exceed 2 seconds per hour

12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 TEST DATA

Duration time (second)	Limit (second)	Result
2.03	<5.0	Pass



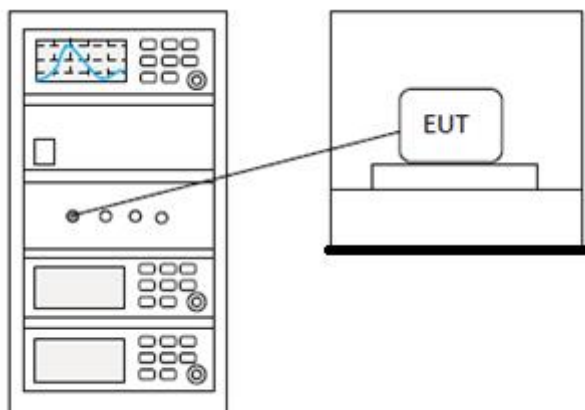
13 20DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.231
Test Method	ANSI C63.10 (2013) Section 6.9
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Sven
Temperature	25°C
Humidity	52%

13.1 LIMITS

Frequency range(MHz)	Limit
70-900	No wider than 0.25% of the center frequency
Above 900	No wider than 0.5% of the center frequency

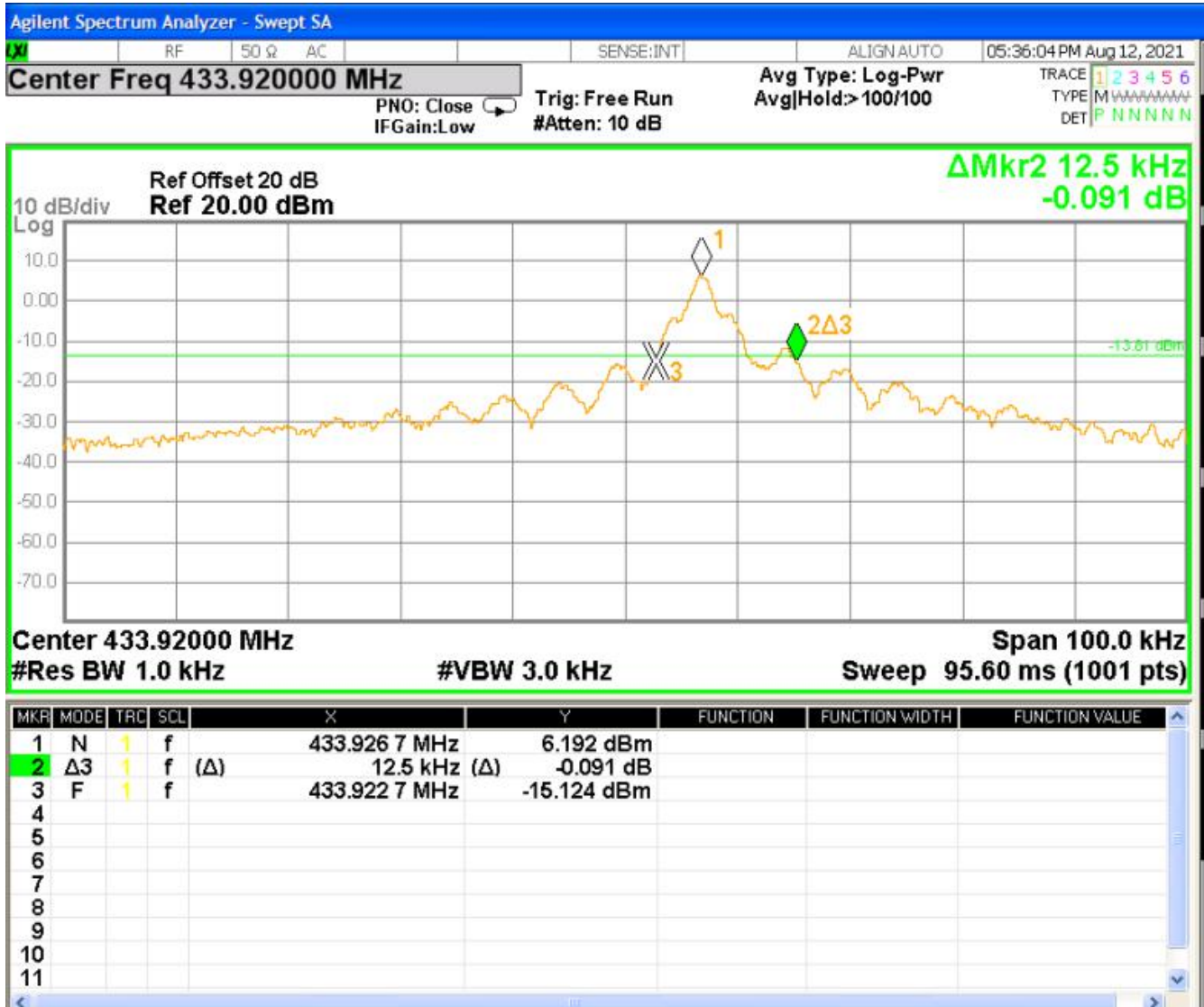
13.2 BLOCK DIAGRAM OF TEST SETUP



13.3 TEST DATA

20dB bandwidth (MHz)	Limit (MHz)	Results
0.0125	1.0848	Passed

Note: Limit= Fundamental frequency×0.25%=433.92×0.25%=1.0848MHz



14 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.231
Test Method	N/A

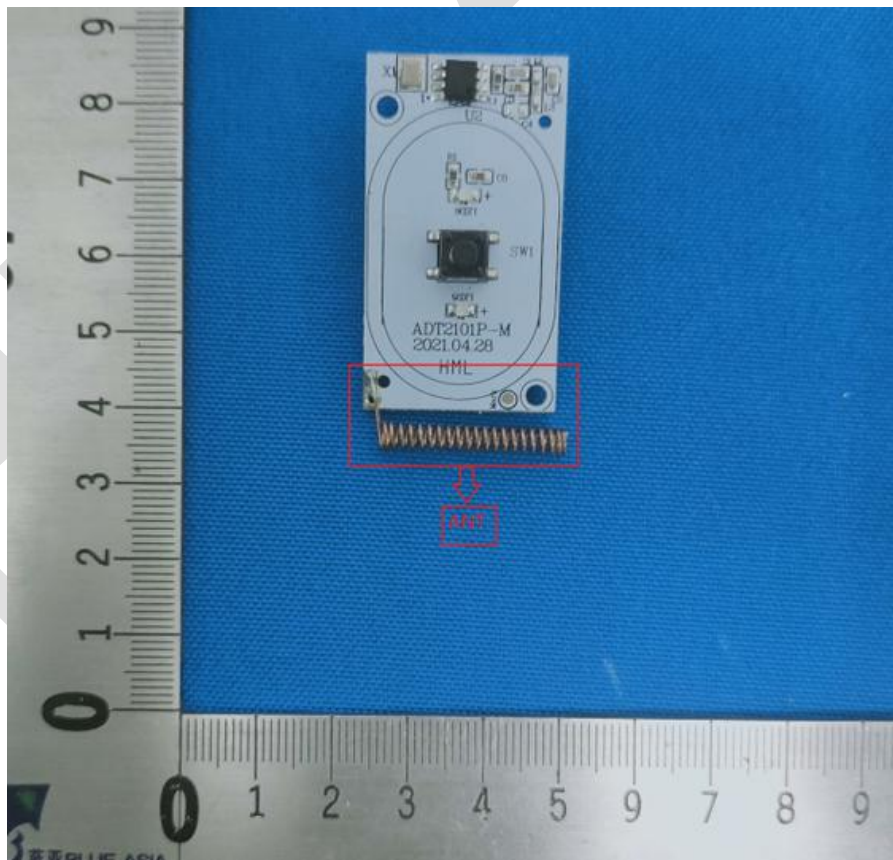
14.1 CONCLUSION

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

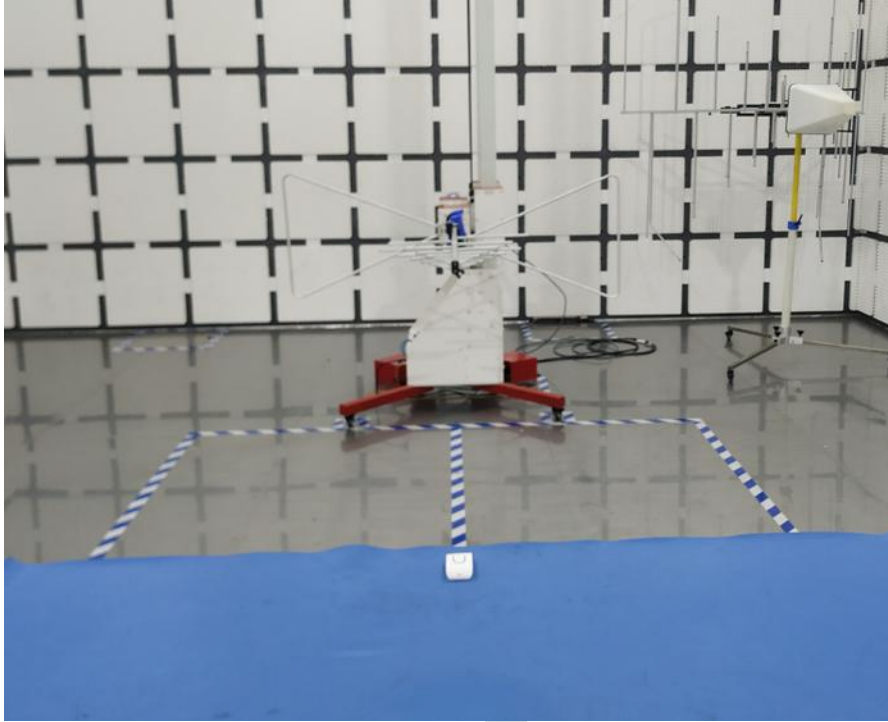
EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.



APPENDIX A: PHOTOGRAPHS OF TEST SETUP

Radiated Emissions



APPENDIX B: PHOTOGRAPHS OF EUT

(Reference to the test report NO.BLA-EMC-202108-A2001)

----END OF REPORT----

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