



Report No.: TW2307015E

Applicant: Tianchang Haobai Electronics Limited

Product: 433 Remote Control

Model No.: HB-N4076, YQ-N4077-19, N-4079, 002-G1, A5TBmini, YT01, A5B, HB-RF3689-433

Trademark: Haobai

Test Standards: FCC Part 15 Subpart C, Paragraph 15.231

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.4&FCC Part 15 Subpart C, Paragraph 15.231 for the evaluation of electromagnetic compatibility

Approved By

Terry Tang

Terry Tang

Manager

Dated: July 22, 2023

Results appearing herein relate only to the sample tested

The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China

Tel (755) 83448688, Fax (755) 83442996, E-Mail:info@timeway-lab.com



Special Statement:

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

CAB identifier: CN0033

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Test Report Conclusion

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1.0 General Details

1.1 Test Lab Details

Name: SHENZHEN TIMEWAY TESTING LABORATORIES.
Address: Zone C, 1st Floor, Block B, Jun Xiang Da Building, Zhongshan Park Road West, Tong Le Village, Nanshan District, Shenzhen, China
Telephone: +86 755 83448688
Fax: +86 755 83442996
Site on File with the Federal Communications Commission – United States
Registration Number: 744189
For 3m Anechoic Chamber

1.2 Applicant Details

Applicant: Tianchang Haobai Electronics Limited
Address: Weier Road, Jinji Town, Tianchang City, Anhui Province, China
Telephone: --
Fax: --

1.3 Description of EUT

Product: 433 Remote Control
Manufacturer: Tianchang Haobai Electronics Limited
Address: Weier Road, Jinji Town, Tianchang City, Anhui Province, China
Trademark: Haobai
Model Number: HB-N4076
Additional Model Name: YQ-N4077-19, N-4079, 002-G1, A5TBmini, YT01, A5B, HB-RF3689-433
Additional Trademark: N/A
Rating: DC3.0V, 20mA, 1pc CR2032 button battery
Operation Frequency: 433.92MHz
Modulation Type: OOK
Hardware Version: 9567 V1.0
Software Version: RF007-V1.3
Serial No.: 8051577996008
Antenna Designation: PCB Antenna with Gain 0.8dBi (Get from the antenna specification)

1.4 Submitted Sample: 2 Samples

1.5 Test Duration

2023-07-03 to 2023-07-22

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1.6 Test Uncertainty

Conducted Emissions Uncertainty =3.6dB

Radiated Emissions below 1GHz Uncertainty =4.7dB

Radiated Emissions above 1GHz Uncertainty =6.0dB

Conducted Power Uncertainty =6.0dB

Occupied Channel Bandwidth Uncertainty =5%

Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer

The sample tested by Andy Xing

Print Name: Andy Xing

2.0 Test Equipment					
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2023-07-14	2024-07-13
LISN	R&S	EZH3-Z5	100294	2023-07-14	2024-07-13
LISN	R&S	EZH3-Z5	100253	2023-07-14	2024-07-13
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2023-07-14	2024-07-13
Loop Antenna	EMCO	6507	00078608	2022-07-18	2025-07-17
Spectrum	R&S	FSIQ26	100292	2023-07-14	2024-07-13
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2022-07-18	2025-07-17
Horn Antenna	R&S	BBHA 9120D	9120D-631	2022-07-18	2024-07-17
Power meter	Anritsu	ML2487A	6K00003613	2023-07-14	2024-07-13
Power sensor	Anritsu	MA2491A	32263	2023-07-14	2024-07-13
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2022-07-18	2025-07-17
9*6*6 Anechoic	--	--	N/A	2022-07-26	2025-07-25
EMI Test Receiver	RS	ESVB	826156/011	2023-07-14	2024-07-13
EMI Test Receiver	RS	ESCS 30	834115/006	2023-07-14	2024-07-13
Spectrum	HP/Agilent	E4407B	MY50441392	2023-07-14	2024-07-13
Spectrum	RS	FSP	1164.4391.38	2023-07-14	2024-07-13
RF Cable	Zhengdi	ZT26-NJ-NJ-8M/FA	--	2023-07-14	2024-07-13
RF Cable	Zhengdi	7m	--	2023-07-14	2024-07-13
Pre-Amplifier	Schwarebeck	BBV9743	#218	2023-07-14	2024-07-13
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2023-07-14	2024-07-13
LISN	SCHAFFNER	NNB42	00012	2023-07-14	2024-07-13

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2.2 Automation Test Software

For Conducted Emission Test

Name	Version
EZ-EMC	Ver.EMC-CON 3A1.1

For Radiated Emissions

Name	Version
EMI Test Software BL410-EV18.91	V18.905
EMI Test Software BL410-EV18.806 High Frequency	V18.06

3.0 Technical Details

3.1 Summary of test results

The EUT has been tested according to the following specifications:				
Standard	Test Type	Result	Notes	
FCC Part 15, Paragraph 15.203	Antenna requirements	Pass	Compliant	
FCC Part 15, Paragraph 15.207	Conducted Emission Test	N/A	N/A	
FCC Part 15, Paragraph 15.209	General Requirement	Pass	Compliant	
FCC Part 15, Paragraph 15.231 (b)	Radiated Emission Test	Pass	Compliant	
FCC Part 15, Paragraph 15.231 (c)	20dB Bandwidth Testing	Pass	Compliant	
FCC Part 15, Paragraph 15.231 (a1)	Deactivate Testing	Pass	Compliant	

3.2 Test Standards

FCC Part 15 Subpart C, Paragraph 15.231 , ANSI C63.4 :2014 and ANSI C63.10 :2013

4.0 EUT Modification

No modification by SHENZHEN TIMEWAY TESTING LABORATORIES

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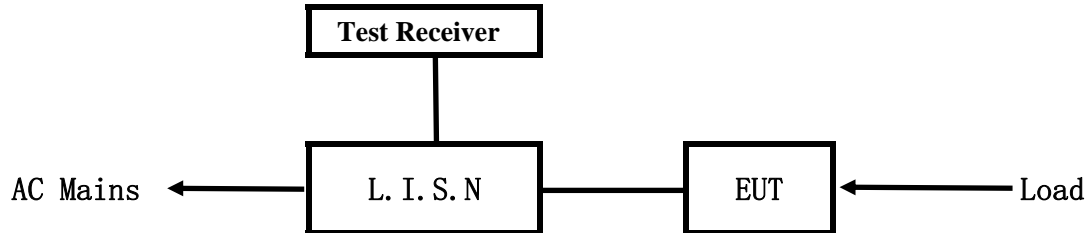
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5.0 Power Line Conducted Emission Test

5.1 Schematics of the test



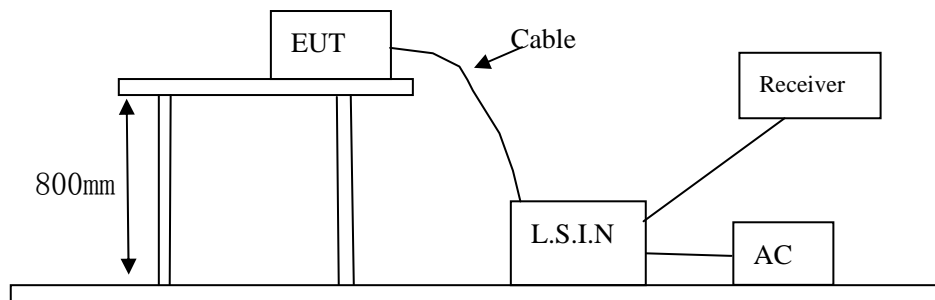
EUT: Equipment Under Test

5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.10-2013. The Frequency spectrum from 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.10-2013.

Test Voltage: N/A

Block diagram of Test setup



5.3 Configuration of the EUT

The EUT was configured according to ANSI C63.10-2013. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model	FCC ID
433 Remote Control	Tianchang Haobai Electronics Limited	HB-N4076, YQ-N4077-19, N-4079, 002-G1, A5TBmini, YT01, A5B, HB-RF3689-433	2BBZB-HBH4077

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable
N/A				

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5.4 EUT Operating Condition

Operating condition is according to ANSI C63.10-2013.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Limits (dB μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

N/A

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz. (The average detector is necessary when the Quasi-peak emission level beyond the average Limit.)

Note: Due to CR2032 Button Battery operation, this test item not applicable.

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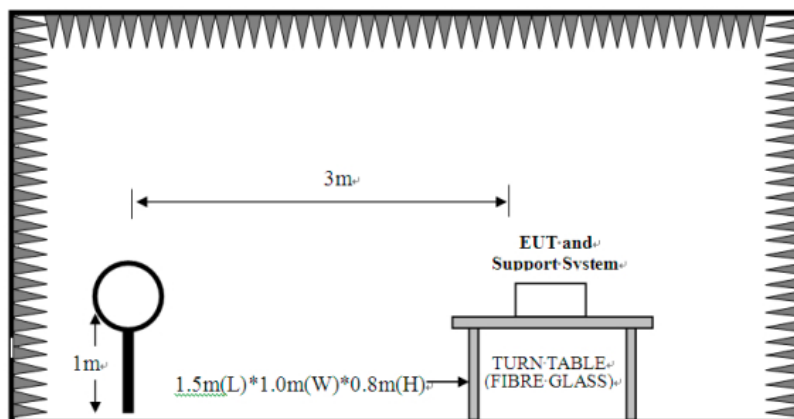
6 Radiated Emission Test

6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.10-2013. The radiated test was performed at TIMEWAY EMC Laboratory. This site is on file with the FCC laboratory division, Registration No.744189
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.10-2013.
- (3) The frequency spectrum from 30 MHz to 5 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz. Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
- (6) The antenna polarization: Vertical polarization and Horizontal polarization.

Block diagram of Test setup

For radiated emissions from 9kHz to 30MHz



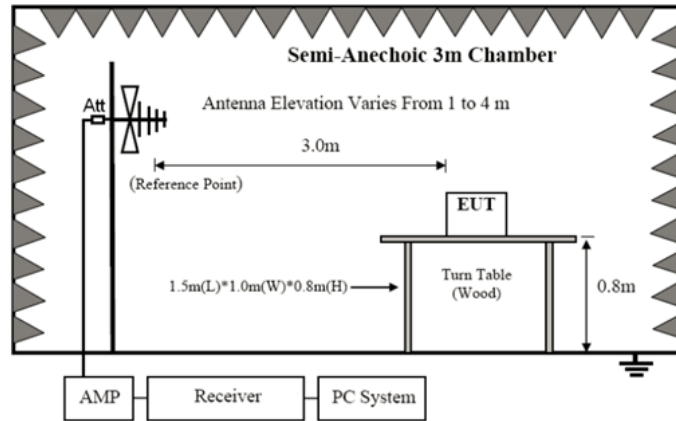
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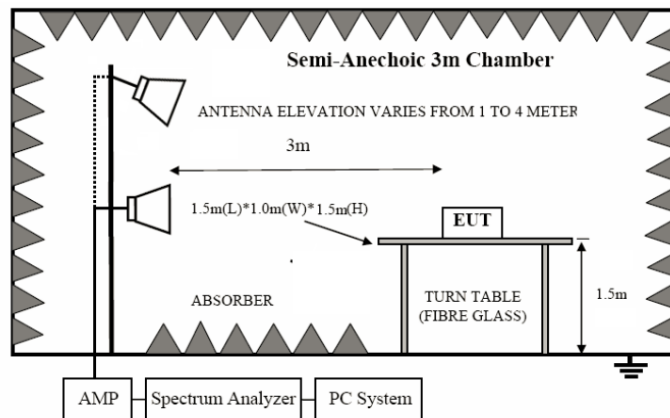
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For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



6.2 Configuration of the EUT
Same as section 5.3 of this report

6.3 EUT Operating Condition
Same as section 5.4 of this report.

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6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

A FCC Part 15 Subpart C Paragraph 15.231(a) Limit

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious Emission	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	2250	67.04	225	47.04
70-130	1250	61.94	125	41.94
130-174	1250-3750	61.94-71.48	125-375	41.94-51.48
174-260	3750	71.48	375	51.48
260-470	3750-12500	71.48-81.94	375-1250	51.48-61.94
Above 470	12500	81.94	1250	61.94

- Note:
1. RF Field Strength (dBuV) = 20 log RF Voltage (uV)
 - 2.Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
 3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.
 - 4.Linear interpolations for frequency ranges 130-174MHz and 260-470MHz
 - 5.the above field strength limits are specified at a distance of 3-meters and the tighter limits apply at the band edges
 6. New batteries were installed in the equipment under test for radiated emission testing.
 7. This is a handheld device. The radiated emissions should be tested under 3-axes position (Lying, Side, and Stand), After pre-test. It was found that the worse radiated emission was get at the lying position.

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B. Frequencies in restricted band are compiled to limit on Paragraph 15.209.

Frequency Range (MHz)	Distance (m)	Field strength (dB μ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
1. RF Voltage (dBuV) = 20 log RF Voltage (μ V)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT
 4. All scanning using PK detector. And the final emission level was get using QP detector for frequency range from 30-1000MHz.As to 1G-5G, the final emission level got using PK detector. And Average = peak(dBuV/m) – duty cycle(dB)

6.5 Test result

A Fundamental and Harmonics Radiated emission data

Product:	433 Remote Control	Test Mode:	Keep Transmitting
Test Item:	Fundamental Radiated Emission and Spurious Emission Data	Temperature:	25°C
Test Voltage:	DC3.0V	Humidity:	56%
Test Result:	Pass		
Frequency (MHz)	Emission PK/AV (dBuV/m)	Horizontal / Vertical	Limits PK/AV (dBuV/m)
433.92	78.88 (PK)/ 69.98 (AV)	H	100.8/80.6
433.92	72.57 (PK)/ 63.67 (AV)	V	100.8/80.6
867.84	56.91 (PK)/ 48.01 (AV)	H	80.8/60.6
867.84	57.98 (PK)/ 49.08 (AV)	V	80.8/60.6
1301.76	47.82 (PK)/ 38.92 (AV)	H	74/54
1301.76	49.38 (PK)/ 40.48 (AV)	V	74/54
1735.68	38.36 (PK)/ 29.46 (AV)	H	80.8/60.6
1735.68	48.63 (PK)/ 39.73 (AV)	V	80.8/60.6
2169.6	50.03 (PK)/ 41.13 (AV)	H	80.8/60.6
2169.6	50.82 (PK)/ 41.92 (AV)	V	80.8/60.6
2603.52	43.16 (PK)/ 34.26 (AV)	H	80.8/60.6
2603.52	41.01 (PK)/ 32.11 (AV)	V	80.8/60.6
3037.44	--	H	80.8/60.6
3037.44	48.33 (PK)/ 39.43 (AV)	V	80.8/60.6
3471.36	--	H	80.8/60.6

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3471.36	--	V	80.8/60.6
3905.28	--	H/V	74/54
4339.2	--	H	74/54
4339.2	--	V	74/54

Note: H=Horizontal, V=Vertical, AV=PK- | duty cycle factor | =PK -8.90

B. General Radiated Emission Data

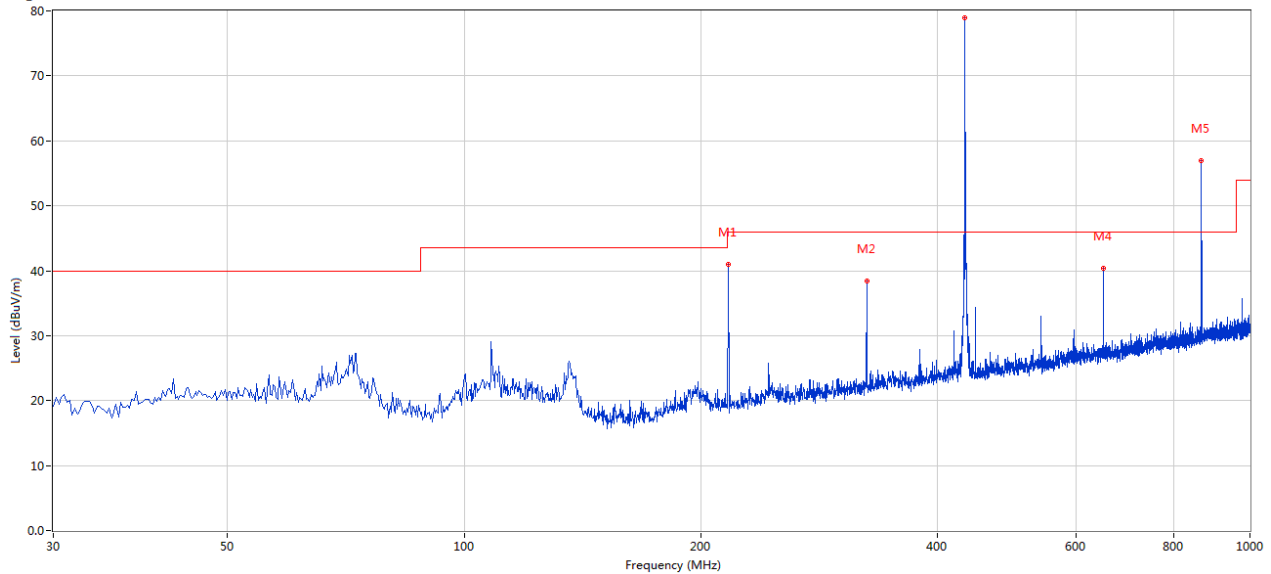
Radiated Emission In Horizontal (30MHz----1000MHz)

EUT set Condition: Keep Transmitting

Results: Pass

Please refer to following diagram for individual

FCC_FCC Part 15C Class B 30MHz-1GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	216.921	40.98	-13.51	46.0	5.02	Peak	102.00	100	Horizontal	Pass
2	325.291	38.42	-10.39	46.0	7.58	Peak	65.00	100	Horizontal	Pass
3	433.904	78.88	-8.03	46.0	-32.88	Peak	76.00	100	Horizontal	N/A
4	650.887	40.34	-4.70	46.0	5.66	Peak	76.00	100	Horizontal	Pass
5	867.871	56.91	-2.31	46.0	-10.91	Peak	102.00	100	Horizontal	N/A

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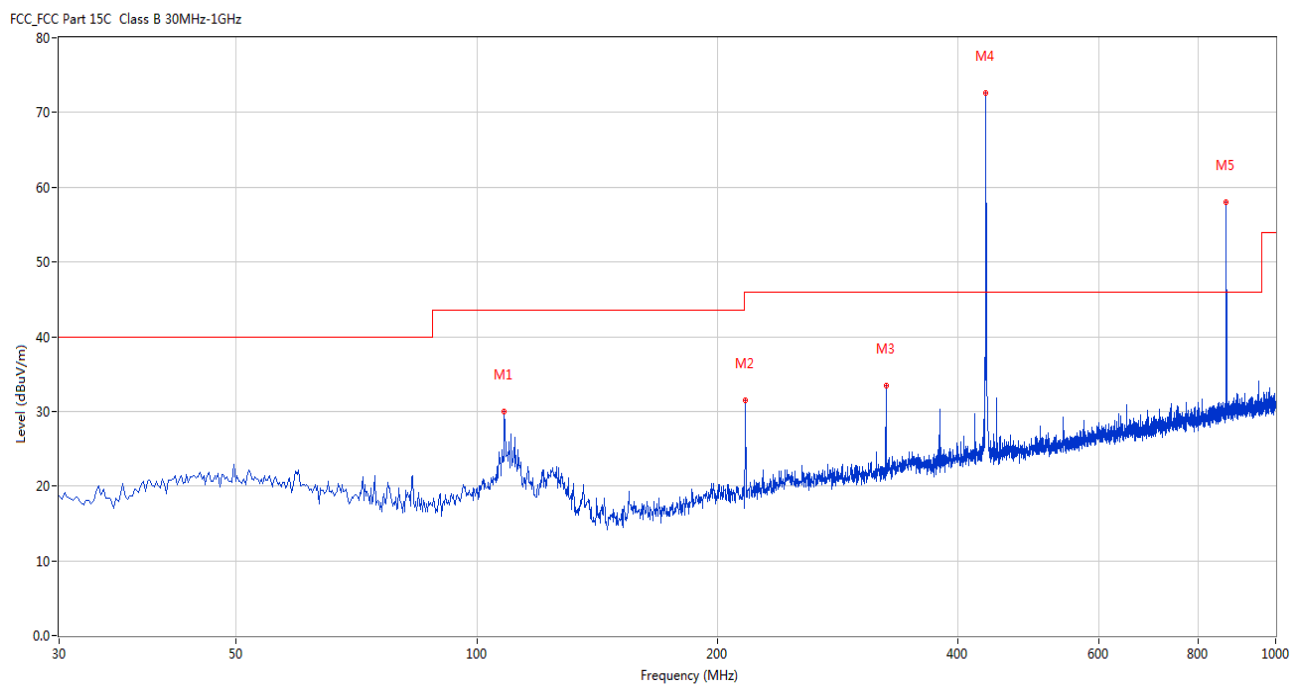
B. General Radiated Emission Data

Radiated Emission In Vertical (30MHz----1000MHz)

EUT set Condition: Keep Transmitting

Results: Pass

Please refer to following diagram for individual



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	108.308	29.92	-13.43	43.5	13.58	Peak	280.00	100	Vertical	Pass
2	216.921	31.48	-13.51	46.0	14.52	Peak	286.00	100	Vertical	Pass
3	325.291	33.44	-10.39	46.0	12.56	Peak	299.00	100	Vertical	Pass
4	433.904	72.57	-8.03	46.0	-26.57	Peak	266.00	100	Vertical	N/A
5	867.871	57.98	-2.31	46.0	-11.98	Peak	280.00	100	Vertical	N/A

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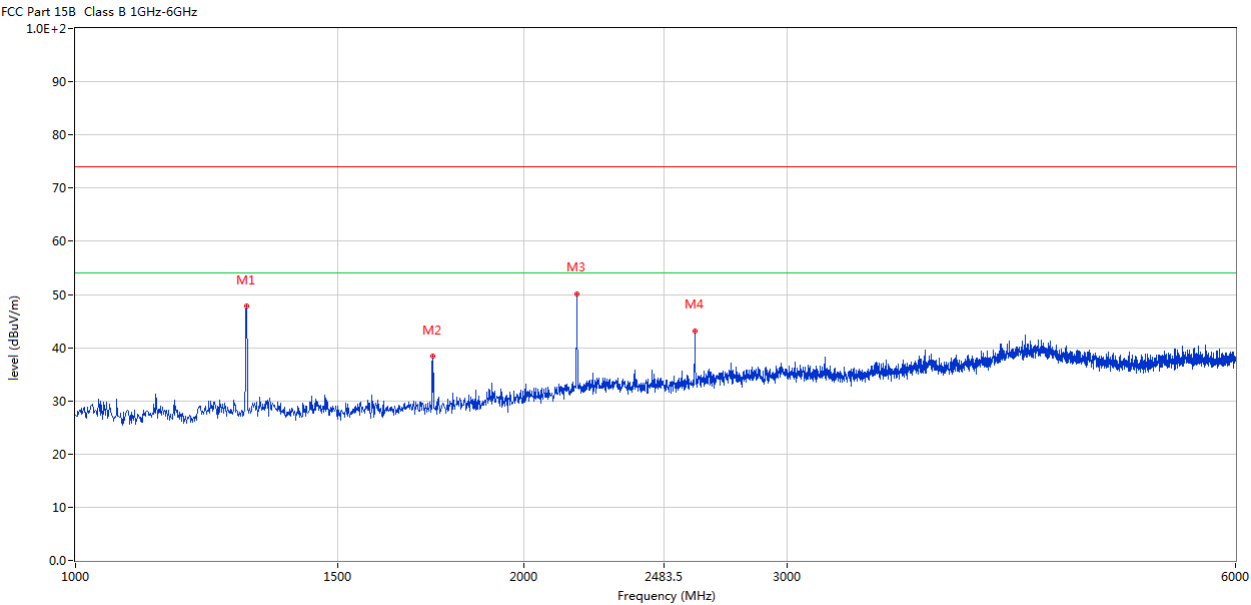
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Test Plot above 1G

Horizontal



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1302.424	47.82	-8.24	74.0	-26.18	Peak	35.00	100	Horizontal	Pass
2	1736.066	38.36	-7.28	74.0	-35.64	Peak	35.00	100	Horizontal	Pass
3	2169.708	50.03	-3.55	74.0	-23.97	Peak	0.00	100	Horizontal	Pass
4	2603.349	43.16	-3.31	74.0	-30.84	Peak	70.00	100	Horizontal	Pass

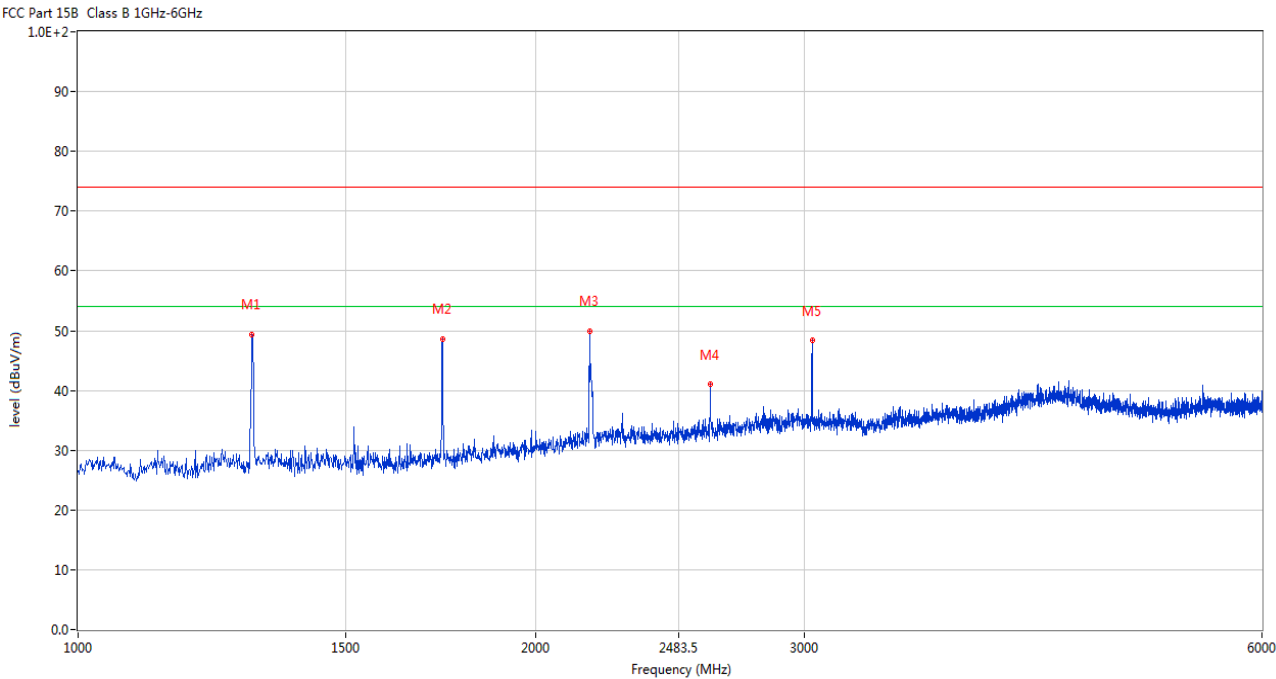
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Vertical



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1301.175	49.38	-8.24	74.0	-24.62	Peak	344.00	100	Vertical	Pass
2	1736.066	48.63	-7.28	74.0	-25.37	Peak	330.00	100	Vertical	Pass
3	2169.708	50.82	-3.55	74.0	-23.18	Peak	325.00	100	Vertical	Pass
4	2603.349	41.01	-3.31	74.0	-32.99	Peak	360.00	100	Vertical	Pass
5	3036.991	48.33	-2.48	74.0	-25.67	Peak	360.00	100	Vertical	Pass

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7.0 20dB Bandwidth Testing

7.1 Requirement

Per 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

7.2 Test Procedure

With the EUT's antenna attached, the EUT's 20dB Bandwidth power was received by the test antenna which was connected to the spectrum analyzer with the START and STOP frequencies set to the EUT's operation band.

7.3 Test Data

Frequency (MHz)	20dB Bandwidth Emission (kHz)	Limit (kHz)	Result
433.92	172.3	1084.8	Pass

Limit=Frequency x 0.25%=433.92x 0.25%=1084.8kHz

Refer to attached plots:



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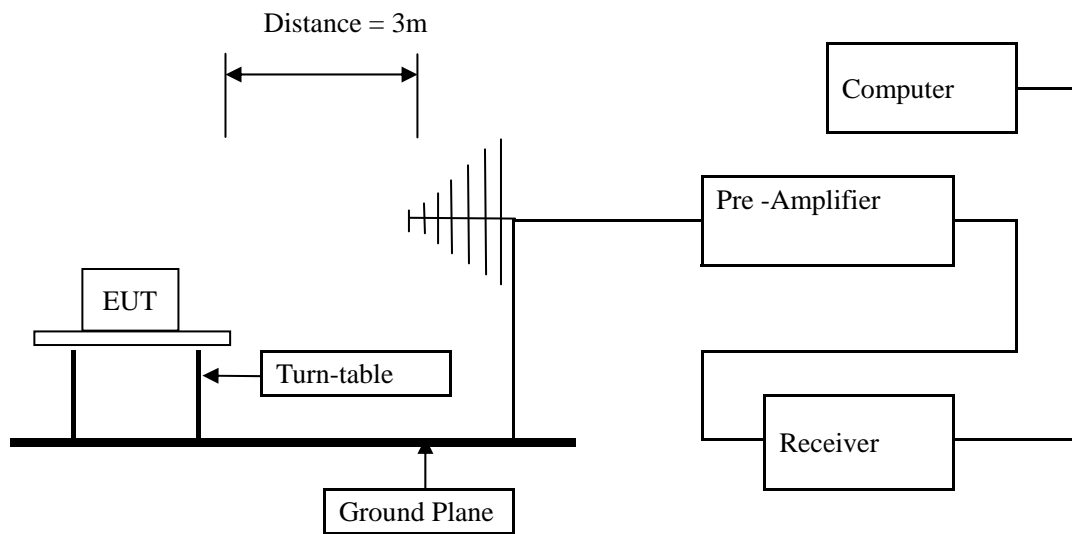
8.0 Deactivate Test

8.1 Requirement

Per 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.

8.2 Radiated Test Setup



For the actual test configuration, please refer to the related items – Photos of Testing

The deactivation test was performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.231(e) limits.

8.3 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

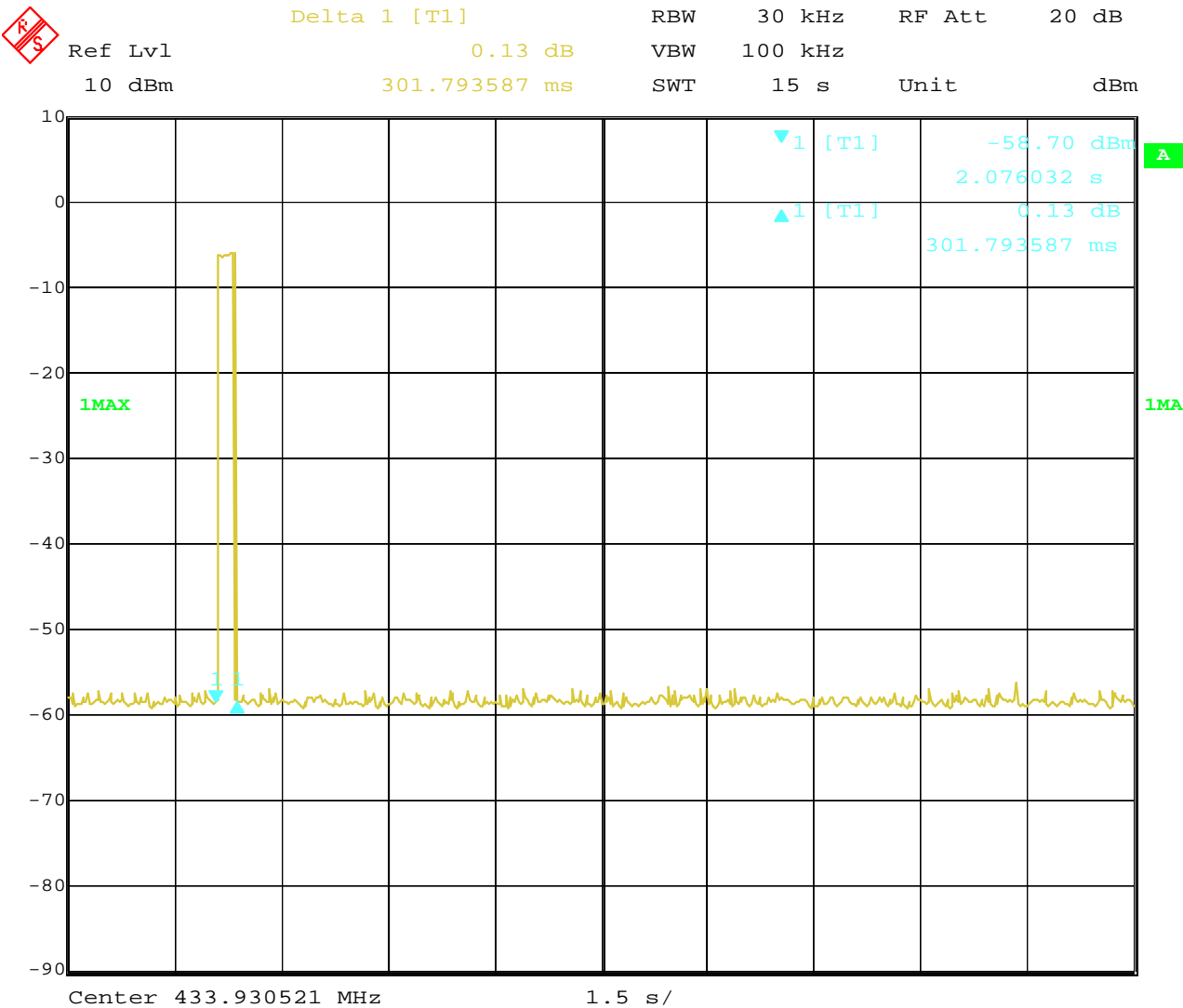
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8.4 Test Data
Refer to attached plots:



Date: 14.JUL.2023 16:13:43

8.5 Test result

Pass

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9.0 Duty Cycle

9.1 Limit

No dedicated limit specified in the Rules

9.2 Test Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW = VBW=1000kHz, Span=0Hz, Adjust Sweep=100ms.
5. Repeat above procedures until all frequency measured were complete.

9.3 Test Data

Base on the worst case

$$T_p = 51.784\text{ms}$$

$$T_{on1} = 1.192 \times 11 = 13.112 \text{ (ms)}$$

$$T_{on2} = 0.391 \times 14 = 5.474 \text{ (ms)}$$

$$\text{Duty cycle} = T_{on}/T_p = 18.586/51.784 = 0.3589 = 35.89\%$$

$$\text{Duty cycle factor} = 20 * \log (\text{duty cycle}) = 20 * \log (0.3589) = -8.90\text{dB}$$

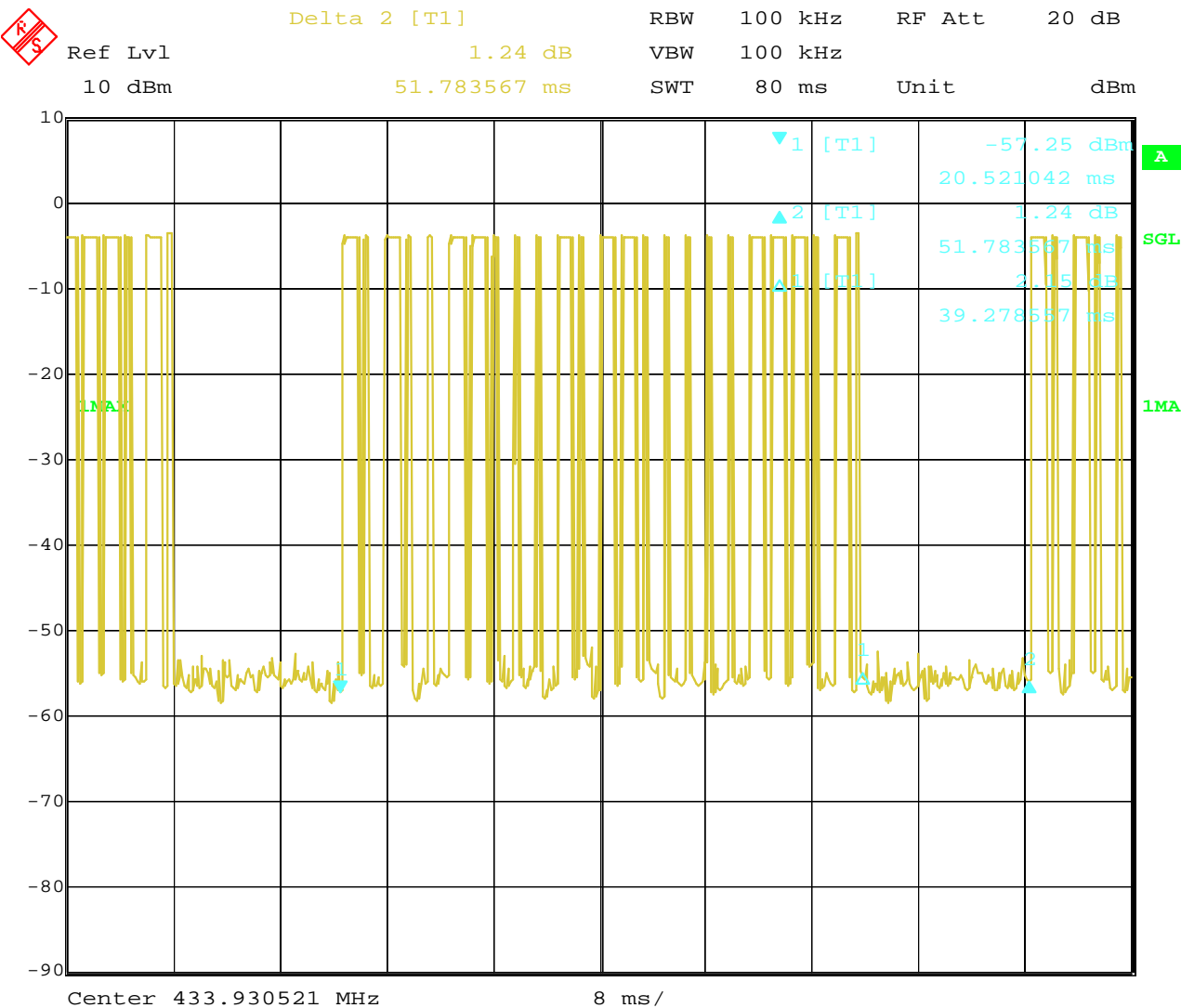
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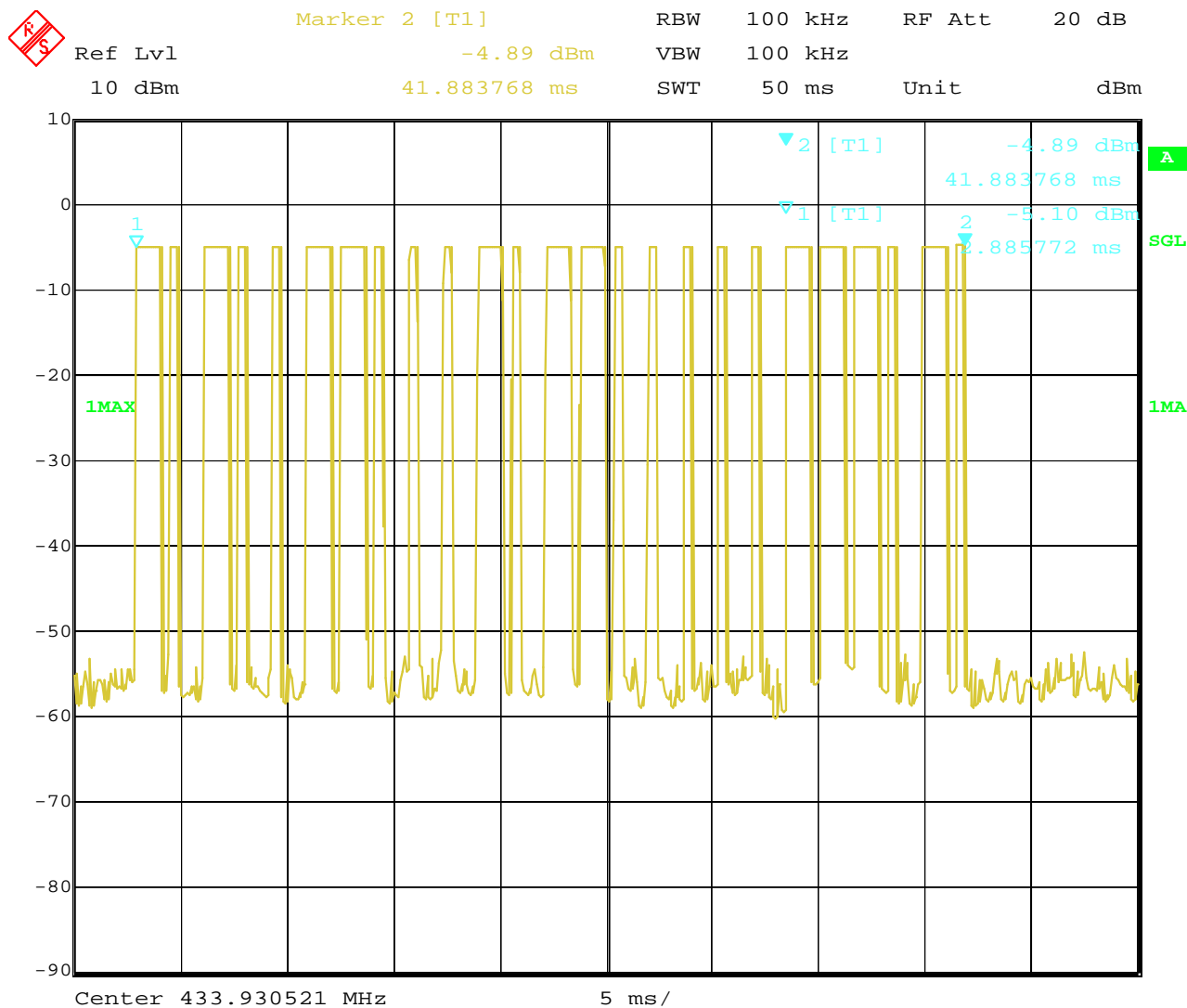


Testing Plots:



Date: 14.JUL.2023 16:09:47

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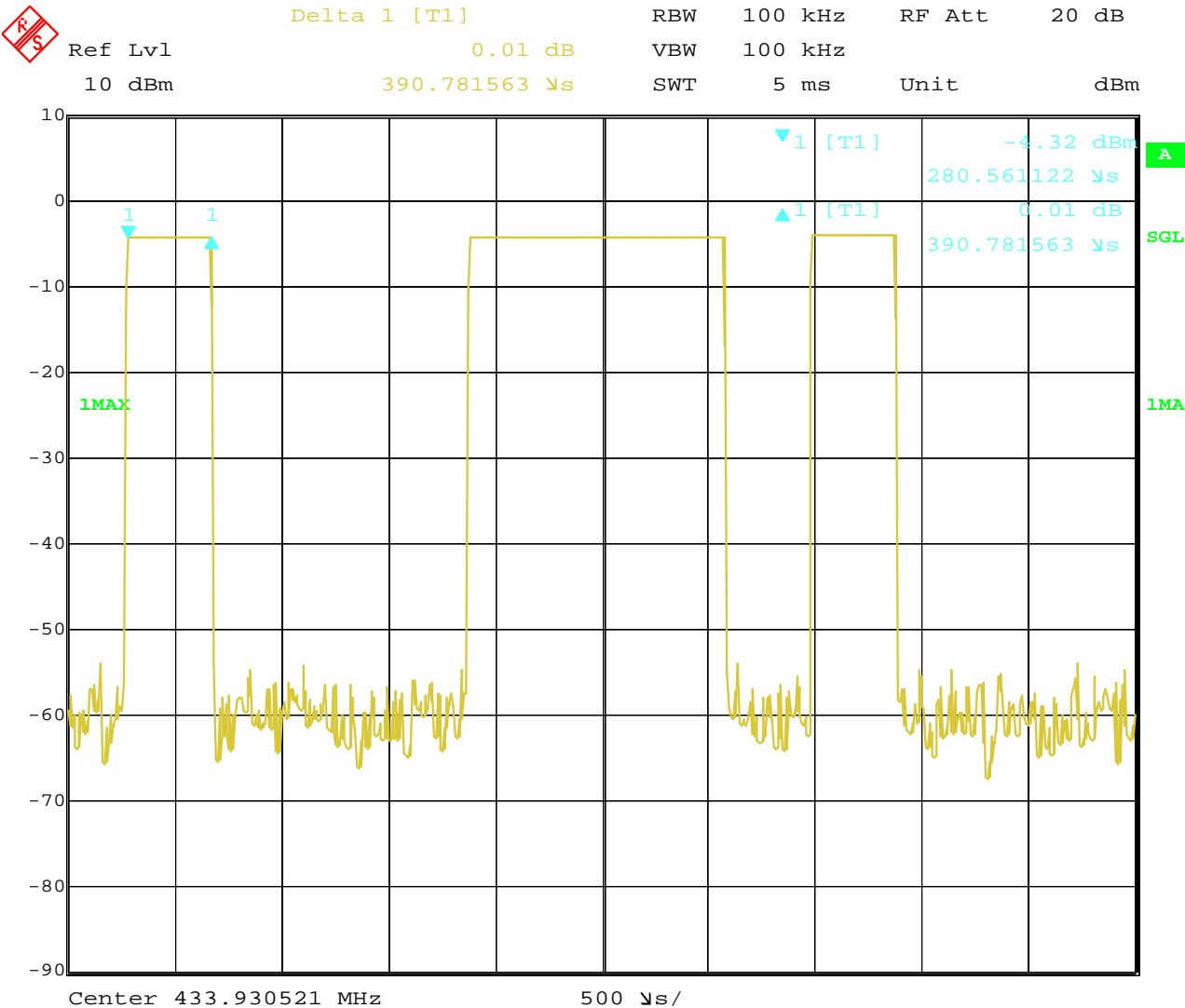


Date: 14.JUL.2023 16:10:49

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T_{on1}



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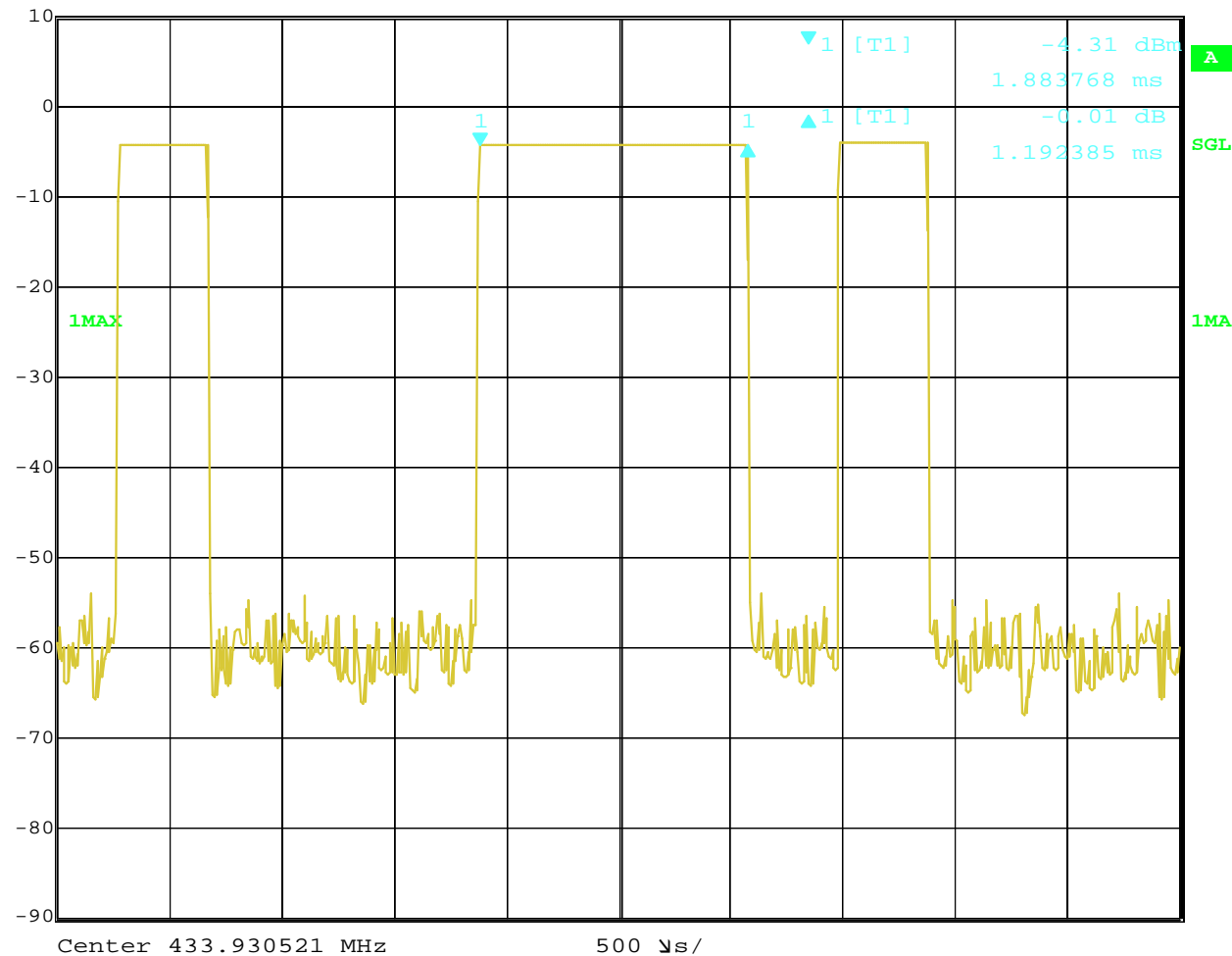
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T_{on2}



Delta 1 [T1]	RBW	100 kHz	RF Att	20 dB
Ref Lvl	-0.01 dB	VBW	100 kHz	
10 dBm	1.192385 ms	SWT	5 ms	Unit dBm



Date: 14.JUL.2023 16:12:11

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10.0 Antenna Requirement

10.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

10.2 Antenna Connected constructions

The antenna is PCB Antenna which is built-in. The antenna gain is 0.8dBi. So it meets the requirement of 15.203

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11.0 FCC ID Label

FCC ID: 2BBZB-HBH4077

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Mark Location:



FCC Label Location

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12.0. Photo of testing

12.1 Conducted test View—N/A

12.2 Radiated emission test view



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Outside View



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Inside View



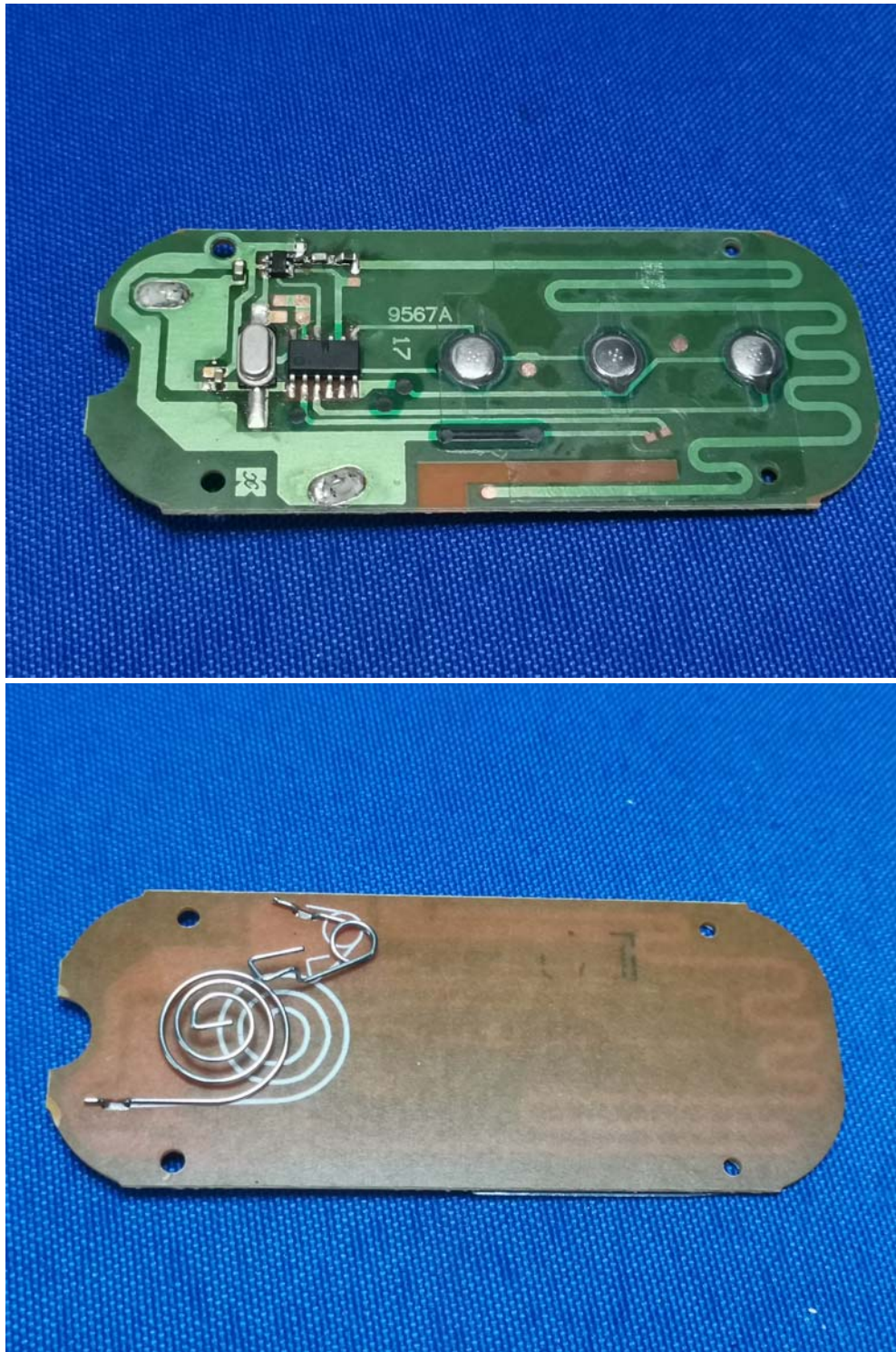
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Inside View



-End of the report-

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