TEST REPORT

Reference No.	:	WTZ21F03017057W
FCC ID	:	2AZGO-SL-F01
Applicant	:	Zhongshan Simple Lighting Co., Ltd.
Address	:	2nd Floor, Building 1, No.1 Henglong Road, Guzhen Town, Zhongshan City, Guangdong, China
Manufacturer	:	The same as above
Address	:	The same as above
Product Name	:	Magic Color Touch Remote
Model No.	:	TCH-RFRC
Standards	:	FCC CFR47 Part 15 Subpart C (Section 15.231):2019
Date of Receipt sample	:	2021-03-30
Date of Test	:	2021-05-06
Date of Issue	:	2021-05-26
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

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Danny Zhou / Manager

1 Revision History

Test Report No.	Date of Issue	Description	Status
WTZ21F03017057W	2021-05-26	Original	Valid

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3 General Information

3.1 General Description of E.U.T

Product Name ..... : Magic Color Touch Remote

Model No. ..... : TCH-RFRC

Model Description ..... : ---

Rated Voltage..... : Battery 3V (2*AAA)

Battery Capacity ..... : ---

Power Adapter ..... : ---

3.2 Technical Characteristics of EUT

Frequency Range ..... : 433.92MHz

Max. Field Strength ..... : 87.78dBuV/m (at 3m distance)

Modulation ..... : ASK

Type of Antenna ..... : Reverse Threads External Antenna

Antenna Gain ..... : 0dBi

Lowest Oscillation..... : 26MHz

3.3 Standards Applicable for Testing

The tests were performed according to following standards:

FCC Rules Part 15.231	Periodic operation in the band 40.66–40.70 MHz and above 70 MHz.
558074 D01 15.247 Meas Guidance v05r02	Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, And Hybrid System Devices Operating Under Section 15.247 Of The FCC Rules
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.4 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 21895-1**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration IC number:21895-1, Nov. 14, 2016.

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. 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 820106, August 16, 2018

- **FCC – Designation No.: CN5034**

Waltek Testing Group (Foshan) Co., Ltd. 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. Designation No. CN5034.

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.
This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

3.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

3.6 Abnormalities from Standard Conditions

None.

4 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List

Test Mode	Description	Remark
TM1	Transmitting	With modulation(433.92MHz)

Test Conditions

Temperature:	22~25℃
Relative Humidity:	50~55%
Atmospheric pressure:	101.9kPa

5 Equipment Used during Test

5.1 Equipment List

Conducted Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal Date**	**Cal Due Date**
1.	EMI Test Receiver	RS	ESCI	101178	2021-01-09	2022-01-08
2.	LISN	RS	ENV216	101215	2021-01-09	2022-01-08
3.	Cable	HUBER+SUHNER	CBL2-NN-3M	223NN322	2021-01-09	2022-01-08
4.	Test Software	FARATRONIC	EZ-EMC CON-03A1	-	-	-
3m Semi-anechoic Chamber for Radiation Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	RS	ESR7	101566	2021-01-09	2022-01-08
2.	EMC Analyzer	Agilent	N9020A	MY48011796	2021-01-09	2022-01-08
3.	Active Loop Antenna	SCHWARZBECK	FMZB1519B	00004	2021-01-09	2022-01-08
4.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9162	9162-117	2021-01-09	2022-01-08
5.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	2021-01-09	2022-01-08
6.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2021-01-09	2022-01-08
7.	Amplifier	Lunar E M	LNA1G18-40	20160501002	2021-01-09	2022-01-08
8.	Coaxial Cable (below 1GHz)	H+S	CBL3-NN-12+3 m	214NN320	2021-01-09	2022-01-08
9.	Coaxial Cable (above 1GHz)	Times-Micorwave	CBL5-NN	-	2021-01-09	2022-01-08
10.	Test Software	FARATRONIC	EZ-EMC RA-03A1-1	-	-	-
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	Spectrum Analyzer	Agilent	N9020A	MY48011796	2021-01-09	2022-01-08
2.	Spectrum Analyzer	R&S	FSP40	100501	2021-01-09	2022-01-08
3.	Vector Signal Generator	Agilent	N5182A	MY50141533	2021-01-09	2022-01-08
4.	Analog Signal Generator	Agilent	N5181A	MY48180720	2021-01-09	2022-01-08
5.	Environmental Chamber	KSON	THS-D4C-100	5244K	2021-01-09	2022-01-08
6.	RF Control Unit	CHANGCHUANG	JS0806-2	-	2021-01-09	2022-01-08

5.2 Special Accessories and Auxiliary Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.
1.	/	/	/	/

5.3 Measurement Uncertainty

Parameter	Uncertainty
RF Output Power	±0.95dB
Occupied Bandwidth	±1.5%
Conducted Spurious Emission	±2.7dB
Conducted Emission	±2.7dB
Transmitter Spurious Emission	±3.8dB (for 25MHz-1GHz)
	±5.0dB (for 1GHz-18GHz)

6 Summary of Test Result

Test Items	FCC Rules	Result
Antenna Requirement	§15.203	Compliant
Restricted Band of Operation	§15.205	Compliant
Conducted Emissions	§15.207(a)	N/A
Radiated Spurious Emissions	§15.209	Compliant
Deactivation Testing	§15.231(a)	Compliant
Radiated Emissions	§15.231(b)	Compliant
20dB Bandwidth Testing	§15.231(c)	Compliant

Remark:

Pass Test item meets the requirement

Fail Test item does not meet the requirement

N/A Test case does not apply to the test object

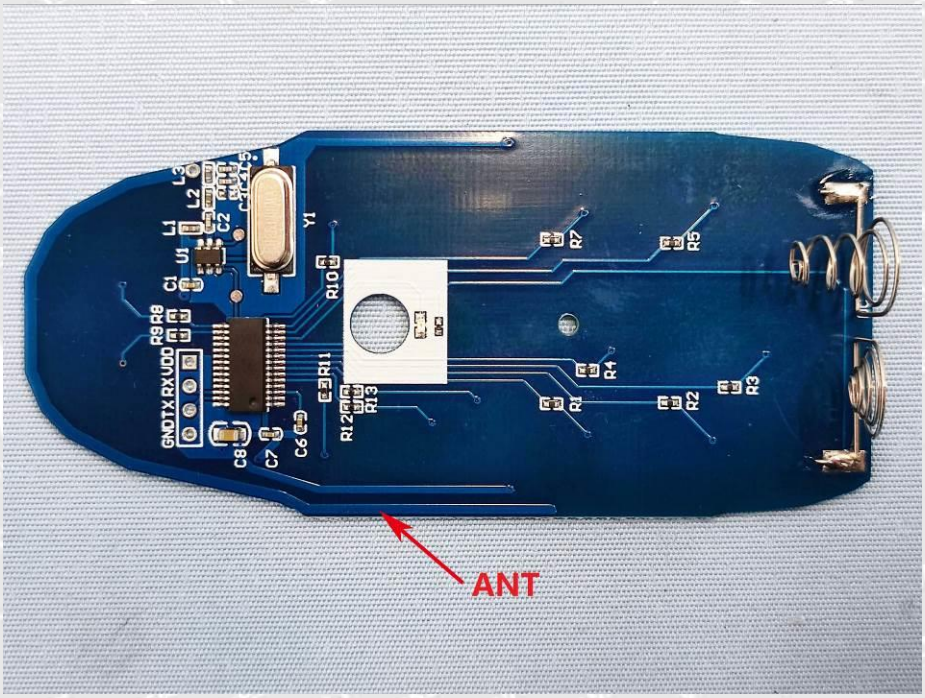
6.1 Antenna Requirement

6.1.1 Standard Applicable

According to FCC Part 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. 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.

6.1.2 Evaluation Information

The EUT has a PCB Printed Antenna, the gain is 0 dBi, fulfil the requirement of this section.



6.2 Radiated Spurious Emissions

6.2.1 Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

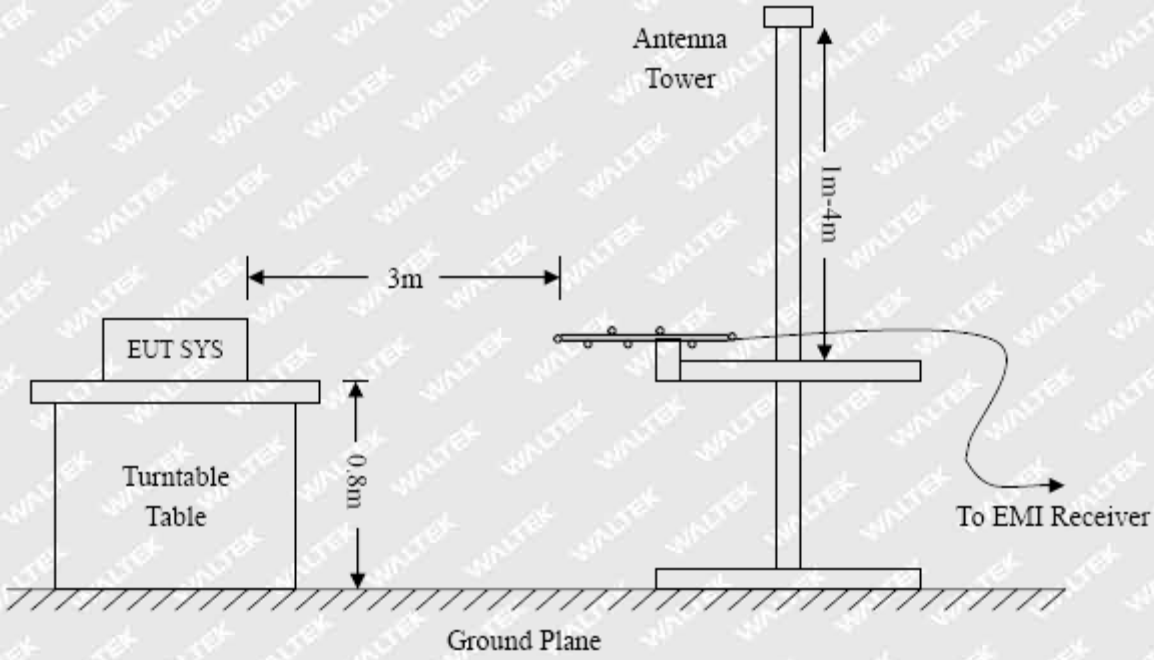
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

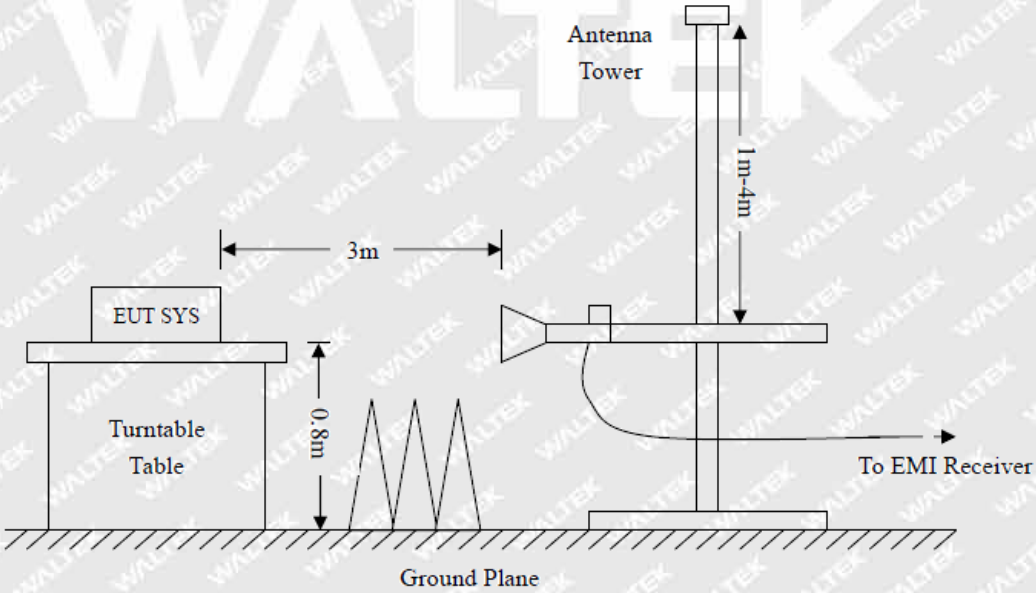
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

6.2.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.





6.2.3 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading +Ant.Loss +Cab. Loss – Ampl.Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB V means the emission is 6dB V below the maximum limit. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – FCC Part 15C Limit

6.2.4 Test Results

Test Frequency : 30MHz ~ 5GHz

Lower channel: 433.92MHz

Frequency	Receiver Reading (PK)	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude (PK)	FCC Part 15.231/15.209/205	
			Height	Polar			Limit	Margin
(MHz)	(dBμV)	Degree	(m)	(H/V)	(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
433.91	57.10	204	1.7	H	18.93	76.03	100.82	-24.79
433.91	68.85	269	1.5	V	18.93	87.78	100.82	-13.04
867.91	4.69	320	1.5	H	26.98	31.67	80.82	-49.15
867.91	14.25	300	1.8	V	26.98	41.23	80.82	-39.59
3037.20	16.58	267	1.1	H	34.25	50.83	74	-23.17
3037.20	14.84	120	1.5	V	34.25	49.09	74	-24.91
4098.00	11.80	109	1.6	H	37.00	48.80	74	-25.20
4098.00	12.62	100	1.6	V	37.00	49.62	74	-24.38

AV = Peak +20Log$_{10}$(duty cycle) =PK+(-10.53) [refer to section 6.5 for more detail]

Frequency	PK	RX Antenna Polar	Duty cycle Factor	Calculated AV	FCC Part 15.231/209/205	
					Limit	Margin
(MHz)	(dBμV/m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
433.91	76.03	H	-10.53	65.50	80.82	-15.32
433.91	87.78	V	-10.53	77.25	80.82	-3.57
867.91	31.67	H	-10.53	21.14	60.82	-39.68
867.91	41.23	V	-10.53	30.70	60.82	-30.12
3037.20	50.83	H	-10.53	40.30	74	-33.70
3037.20	49.09	V	-10.53	38.56	74	-35.44

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 6th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The fundamental frequency is 433.92MHz, so the fundamental and spurious emissions radiated limit base on the the operating frequency 433.92MHz.

6.3 20dB Bandwidth

6.3.1 Standard Applicable

According to FCC Part 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.

6.3.2 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.

6.3.3 Test Result

Test Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Result
433.92MHz	4.404	1084.8	Pass

Limit = Fundamental Frequency X 0.25% = 433.92 MHz X 0.25% = 1084 kHz

Test Plots:

20dB Bandwidth Test Plot

6.4 Transmission Time

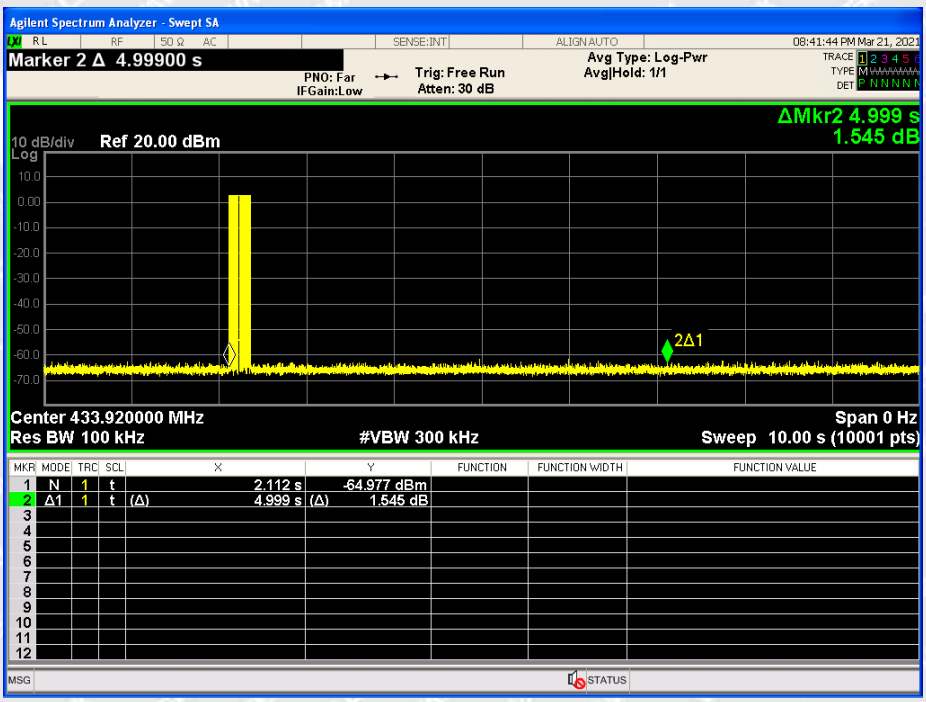
6.4.1 Standard Applicable

According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:
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.

6.4.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

6.4.3 Test Result



6.5 Duty Cycle

6.5.1 Standard Applicable

According to FCC Part 15.231 (b)(2) and 15.35 (c), For pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

6.5.2 Test Procedure

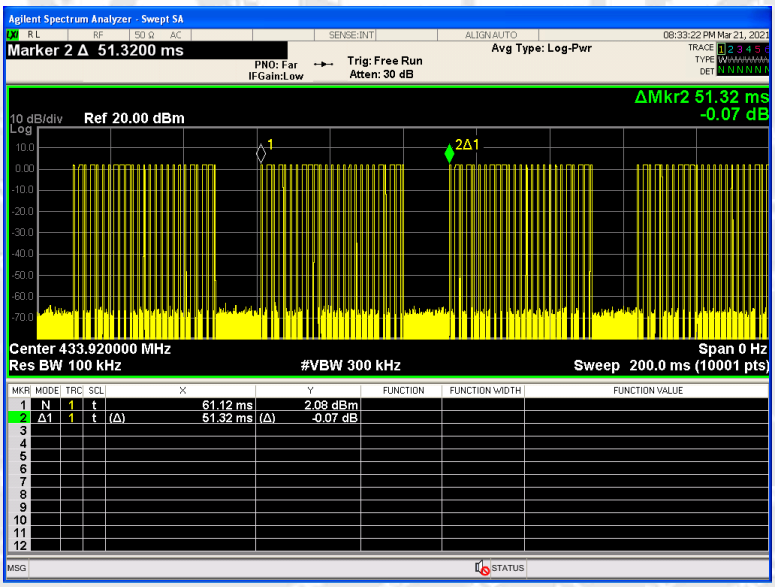
With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

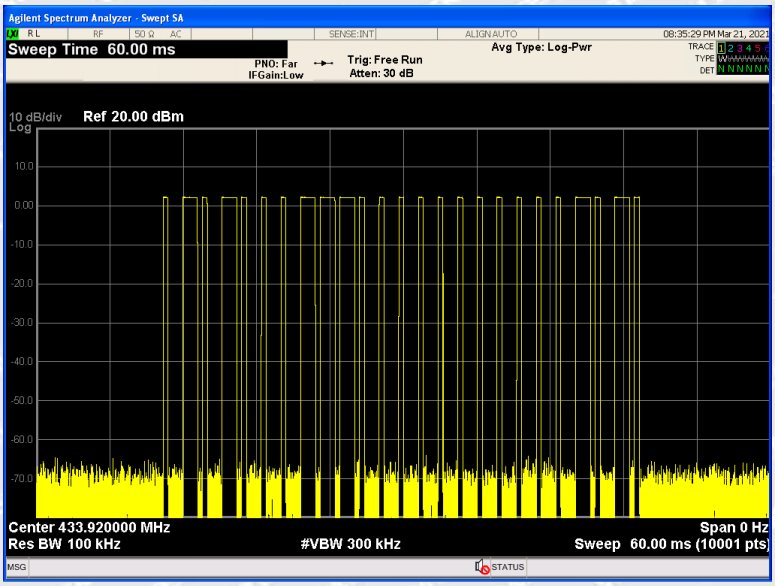
6.5.3 Test Result

Total transmission time(ms)	0.387*18+1.186*7=15.268
Length of a complete transmission period(ms)	51.32
Duty Cycle(%)	29.75
Duty Cycle Correction Factor(dB)	-10.53

Remark: Duty Cycle Factor=20*log(Duty Cycle)

Test Plots:

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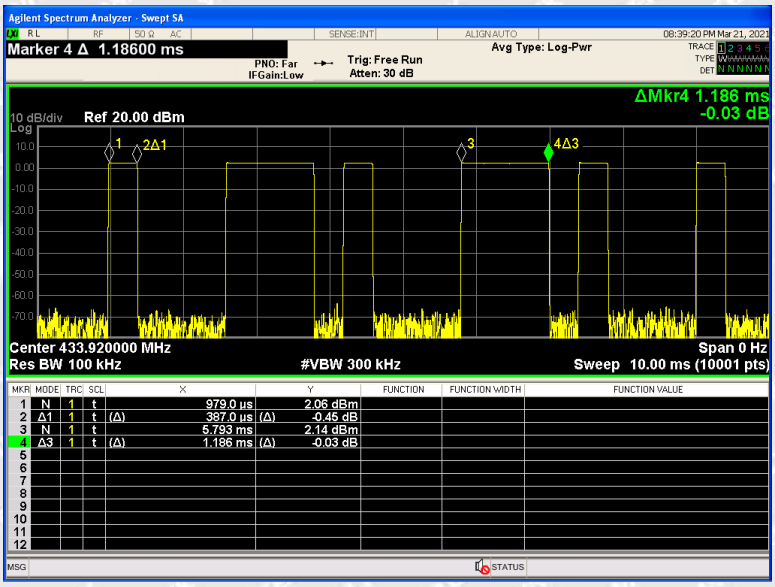
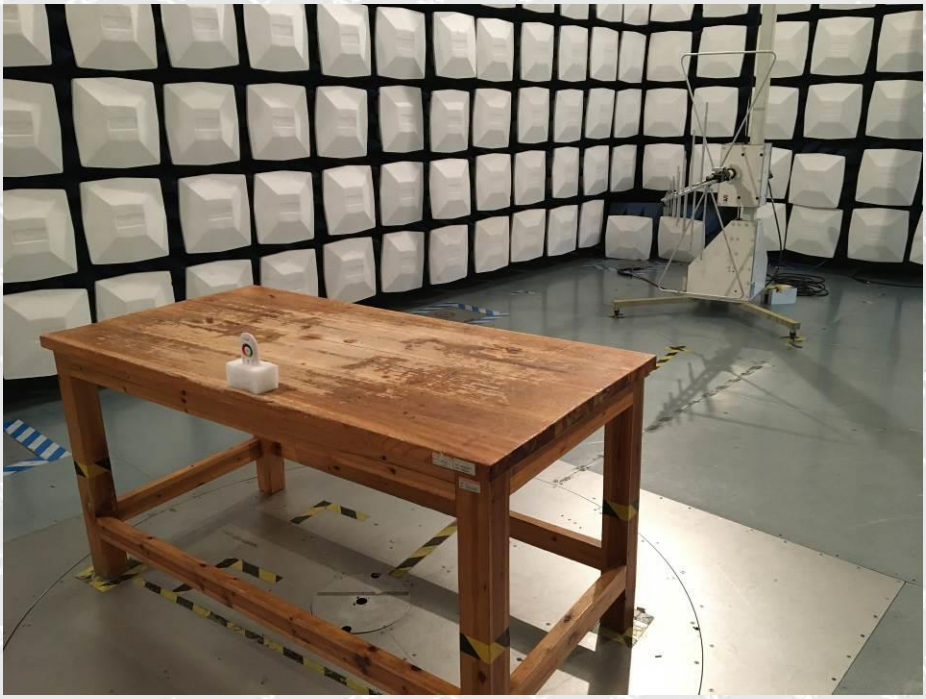
Sweep Time 60.00 ms
PNO: Far
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
08:35:29 PM Mar 21, 2021
10 dB/div
Ref 20.00 dBm
Log
Center 433.920000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 60.00 ms (10001 pts)


Agilent Spectrum Analyzer - Swept SA
Marker 4 Δ 1.18600 ms
PNO: Far
IFGain:Low
Trig: Free Run
Atten: 30 dB
Avg Type: Log-Pwr
08:39:20 PM Mar 21, 2021
ΔMkr4 1.186 ms
-0.03 dB
10 dB/div
Ref 20.00 dBm
Log
1
2Δ1
3
4Δ3
Center 433.920000 MHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 10.00 ms (10001 pts)
MKR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE
1 N 1 t 979.0 us 2.06 dBm
2 Δ1 1 t (Δ) 387.0 us (Δ) -0.45 dB
3 N 1 t 5.793 ms 2.14 dBm
4 Δ3 1 t (Δ) 1.186 ms (Δ) -0.03 dB

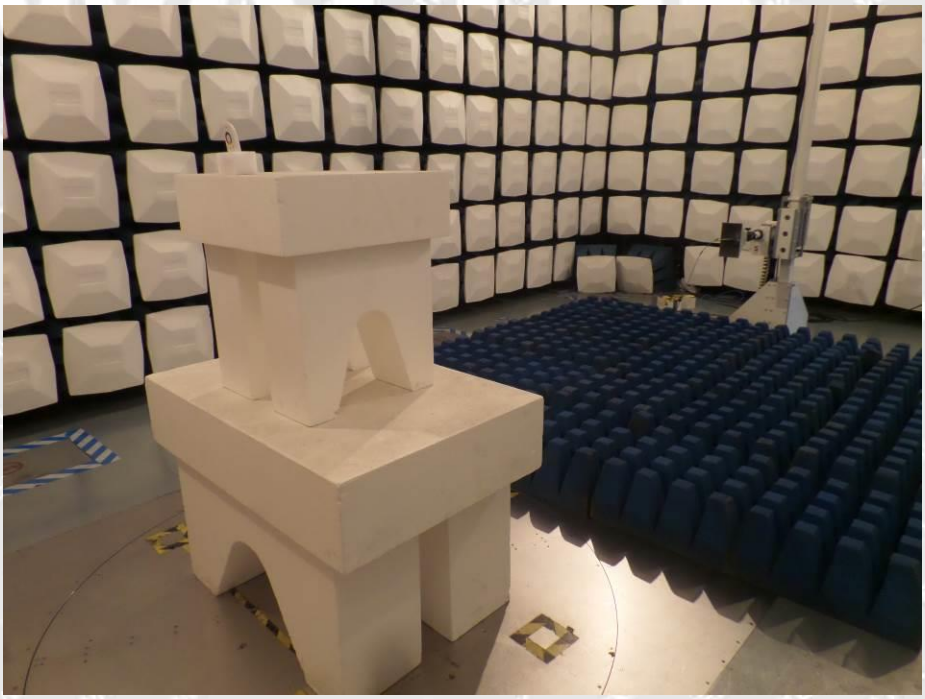
7 Photographs Test Setup

7.1 Photographs - Radiated Emission Test Setup

30MHz-1GHz



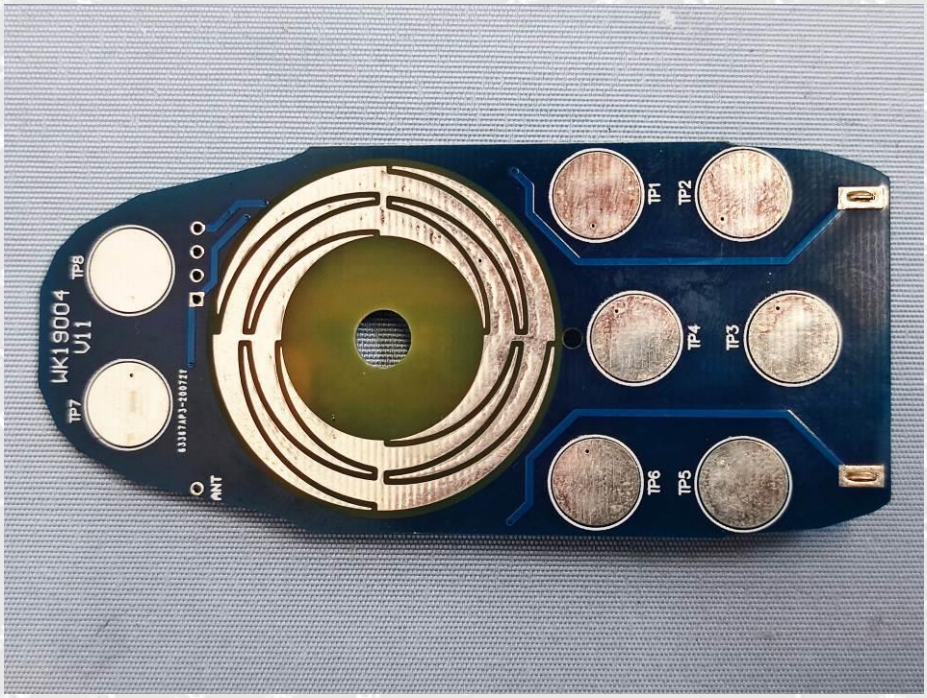
Above 1GHz



8 Photographs - Constructional Details

8.1 EUT - External Photos

8.2 EUT - Internal Photos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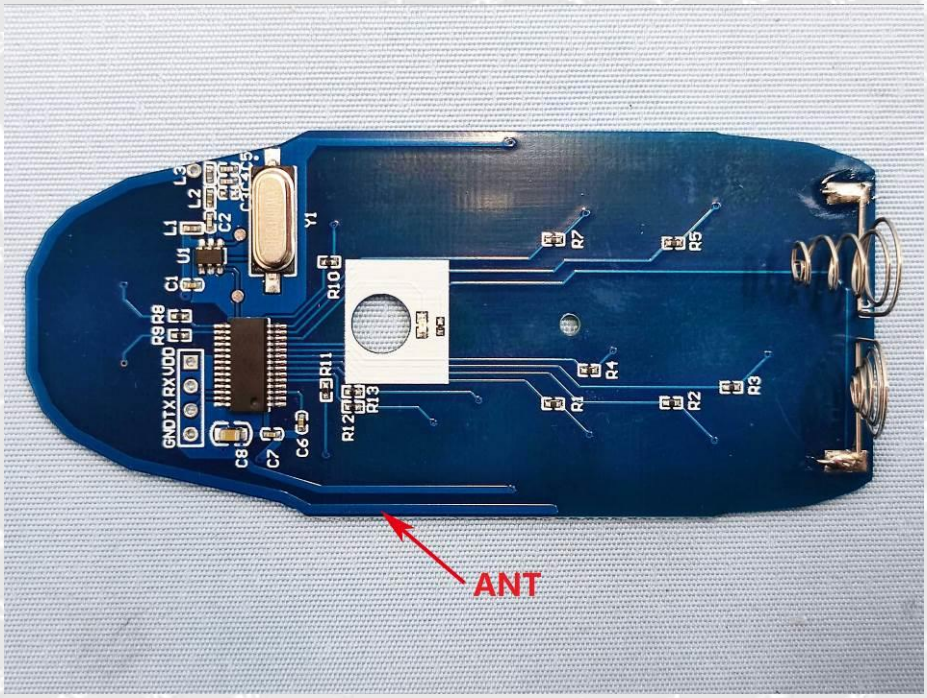
U11
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
ANT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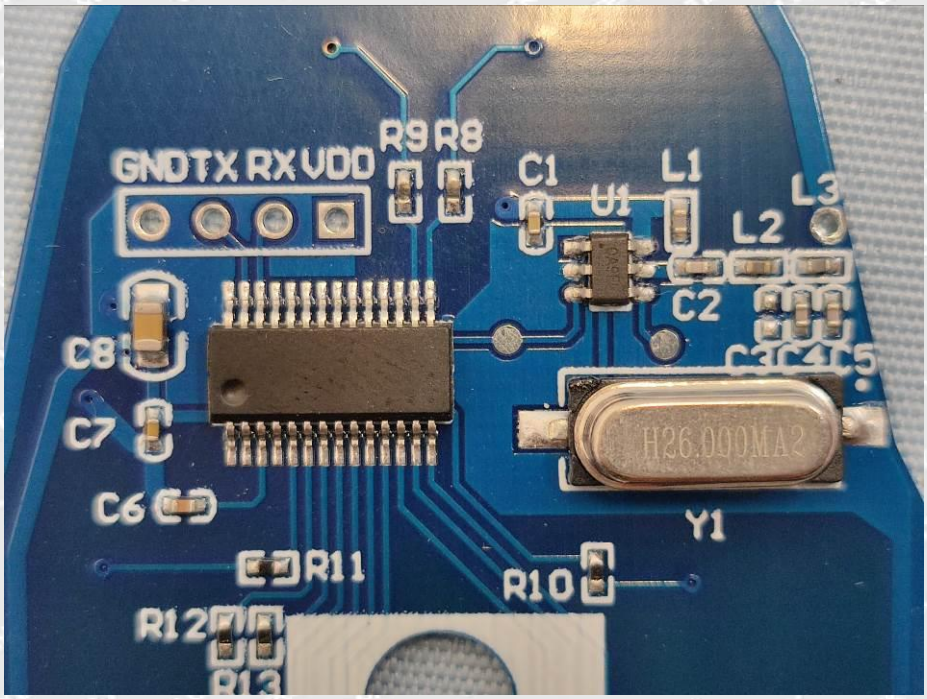

======End of Report======