

FCC- TEST REPORT

Report Number : **68.910.19.0016.01** Date of Issue: April 25, 2019

Model : **DC510**

Product Type : Shake Sensor

Applicant : NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD.

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Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices : 17

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park,
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FCC Registration Number: 514049

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3 Description of the Equipment Under Test

Product:	Shake Sensor
Model no./HVIN:	DC510
FCC ID:	VYY51001
Rating:	3VDC(Supplied by 2×1.5V Batteries)
RF Transmission Frequency:	433.92MHz
Modulation:	ASK
Antenna Type:	PCB ring Antenna
Antenna Gain:	1.0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Shake Sensor operated at 433.92MHz

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2017 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to ANSI C63.10-2013.

5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart C				
Test Condition		Pages	Test Site	Test Result
§15.207	Conducted emission AC power port	N/A	N/A	Not Applicable
§15.205, §15.209, 15.35 (c)§15.231(b)	Radiated Emission, 30MHz to 4.5GHz	10	Site 1	Pass
§15.231(c)	Bandwidth Measurement	13	Site 1	Pass
§15.231(a)(1)	Deactivation Time	14	Site 1	Pass
§15.203	Antenna requirement	--	See Note 2	Pass

Note 1: N/A=Not Applicable.

Note 2: The EUT uses an PCB ring Antenna, which gain is 1.0dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: VYY51001 complies with Section 15.205, 15.209, 15.231 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment Under Test

n - **Fulfills** the general approval requirements.

o - **Does not** fulfill the general approval requirements.

Sample Received Date: March 21, 2019

Testing Start Date: March 21, 2019

Testing End Date: April 8, 2019

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

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EMC Test Engineer

7 Systems test configuration

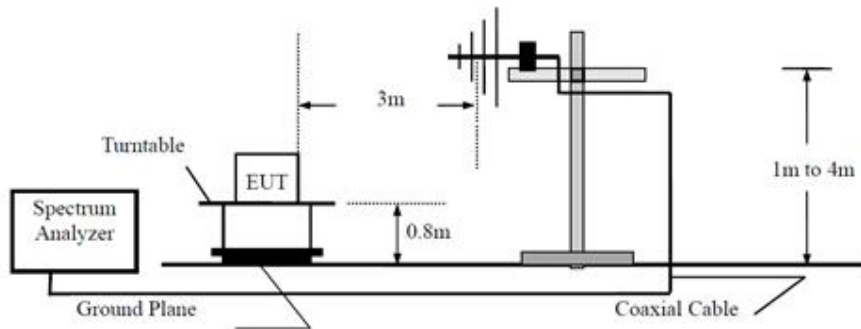
Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
--	--	--	--

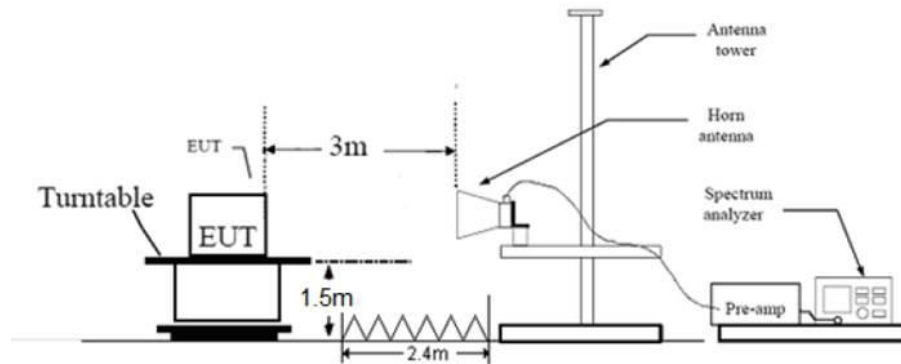
8 Test Setups

8.1 Radiated test setups

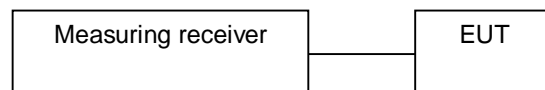
Below 1GHz



Above 1GHz



8.2 Conducted RF test setups



9 Test Methodology

9.1 Radiated Emission

Test Method

1. The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meters chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
4. The height of antenna 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.
5. 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
6. Use the following spectrum analyzer settings According to C63.10:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for $f < 1$ GHz; VBW RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.
 For average measurement:
 VBW = 10 Hz, when duty cycle is no less than 98 percent.
 VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
7. Repeat above procedures until all frequencies measured were complete.

Limit

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 3,370 *	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

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

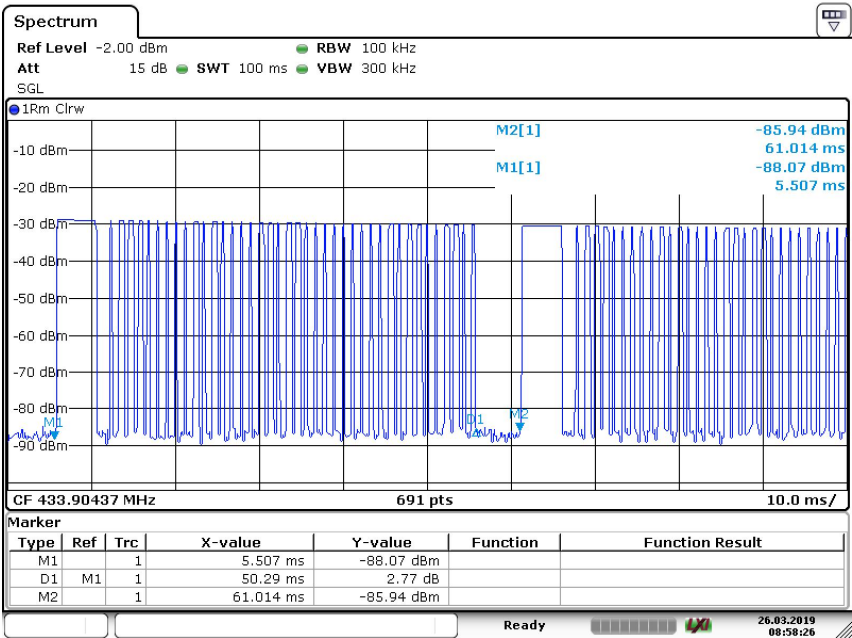
Radiated Emissions								
Value	Emissions Frequency MHz	E-Field Polarity	Field at 3m dBμV/m	Average Factor dB	Net Field at 3m dBμV/m	Limit dBμV/m	Margin	Emission Type
Below 1GHz								
PK	433.925	H	82.66	0.00	82.62	100.83	18.21	Fundamental
AV	433.925	H	82.66	-6.49	76.17	80.83	4.66	Fundamental
PK	433.925	V	61.83	0.00	61.83	100.83	39.00	Fundamental
AV	433.925	V	61.83	-6.49	55.34	80.83	25.49	Fundamental
PK	867.850	H	56.82	0.00	51.39	80.83	29.44	Spurious
AV	867.850	H	56.82	-6.49	50.33	60.83	10.5	Spurious
PK	867.850	V	36	0.00	34.76	80.83	46.07	Spurious
AV	867.850	V	36	-6.49	29.51	60.83	31.32	Spurious
Above 1GHz								
PK	1301.78	H	33.3	0.00	33.3	74	40.7	Spurious
AV	1301.78	H	33.3	-6.49	26.81	54	27.19	Spurious
PK	1301.78	V	33.69	0.00	33.69	74	40.31	Spurious
AV	1301.78	V	33.69	-6.49	27.2	54	26.8	Spurious

Remark:

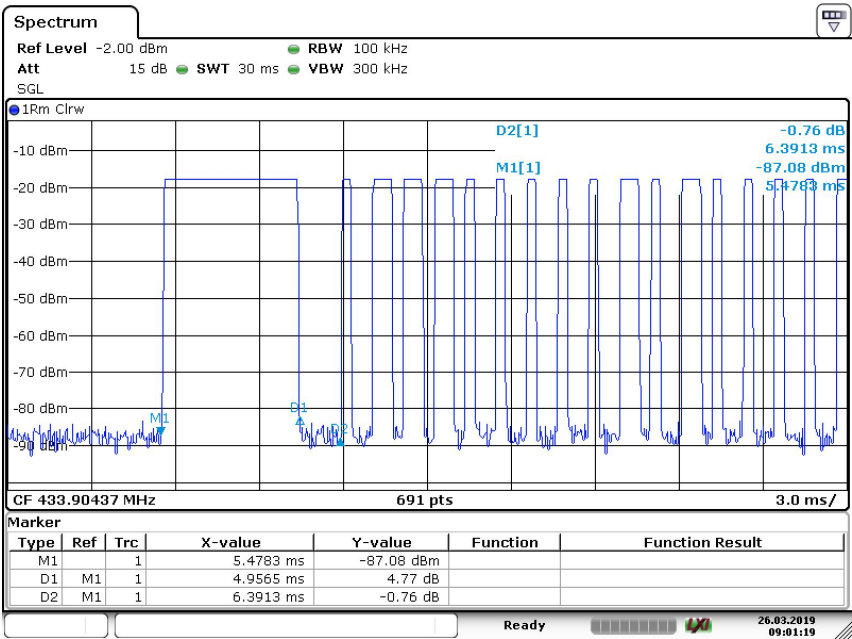
- 1: AV Emission Level= PK Emission Level+20log(dutycycle)
- 2: Data of measurement within this frequency range shown "—" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.
- 3: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- 4: Corrected Amplitude = Read level + Corrector factor
 Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
 Below 1GHz: Corrector factor = Antenna Factor + Cable Loss

Duty Cycle = $[(4.9565 \times 2) + (0.7826 \times 24) + (0.4058 \times 46)] \text{ms} / 100 \text{ (ms)} = 47.36\%$

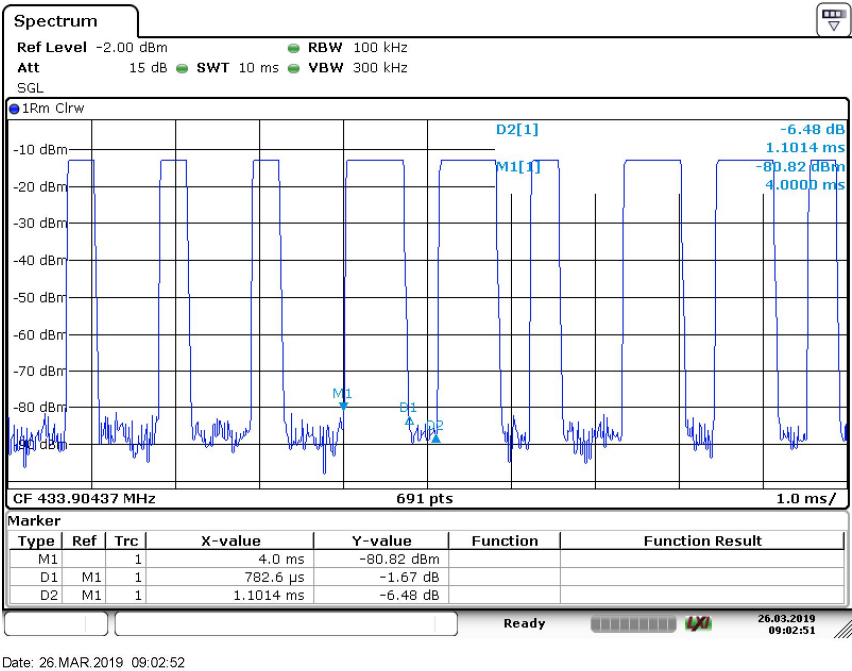
Duty Cycle Factor = $20 \log (\text{Duty Cycle}) = -6.49$



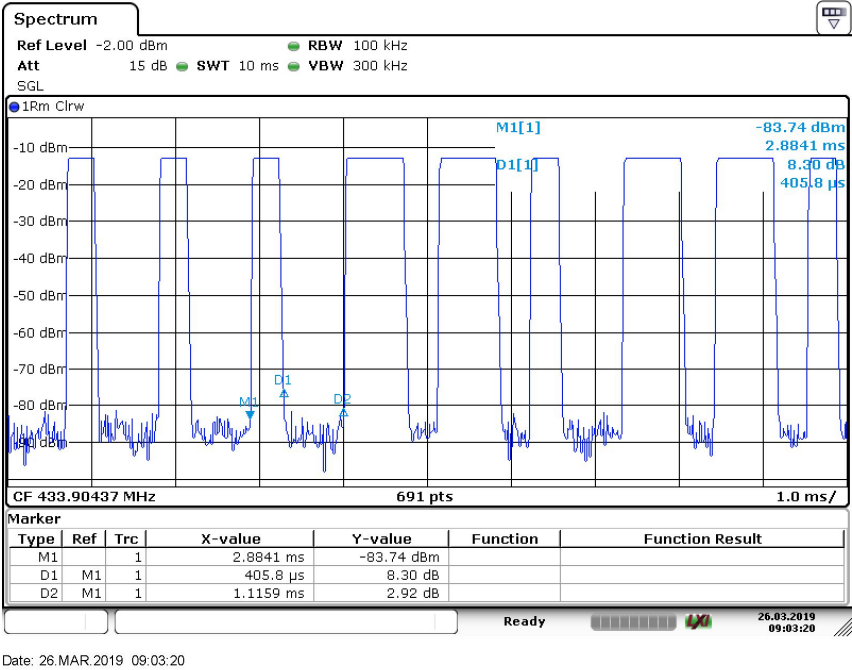
Date: 26.MAR.2019 08:58:25



Date: 26.MAR.2019 09:01:19



Date: 26.MAR.2019 09:02:52



Date: 26.MAR.2019 09:03:20

9.2 Bandwidth Measurement

Test Method

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Use the following test receiver settings:
Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel
RBW > the 20dB bandwidth of the emission being measured, VBW ≥ RBW,
Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth. Record the results.
5. Repeat above procedures until all frequencies measured were complete.

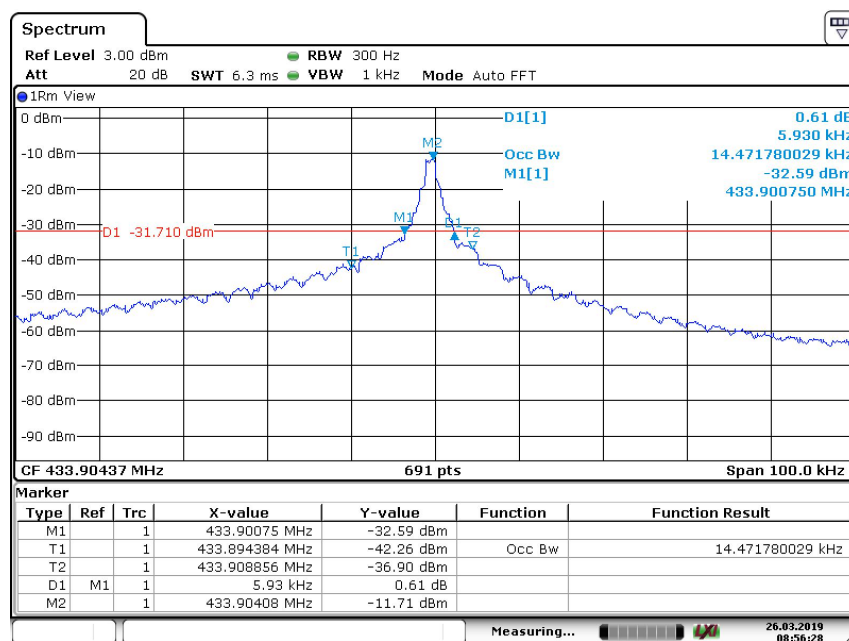
Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

The limit for the EUT = 0.25% * 433.91 MHz = 1084 kHz

Test Result

Channel	20dB Bandwidth (KHz)	99% bandwidth (KHz)	Limit (KHz)
1	14.47	5.93KHz	1084



Date: 26.MAR.2019 08:56:28

9.3 Deactivation Time

Test Method

1. The RF output of EUT was connected to the test receiver by RF cable. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT in transmitting mode.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW=120 KHz, VBW=1MHz, Span=0Hz.
5. Repeat above procedures until all frequency measured was complete.

Limit

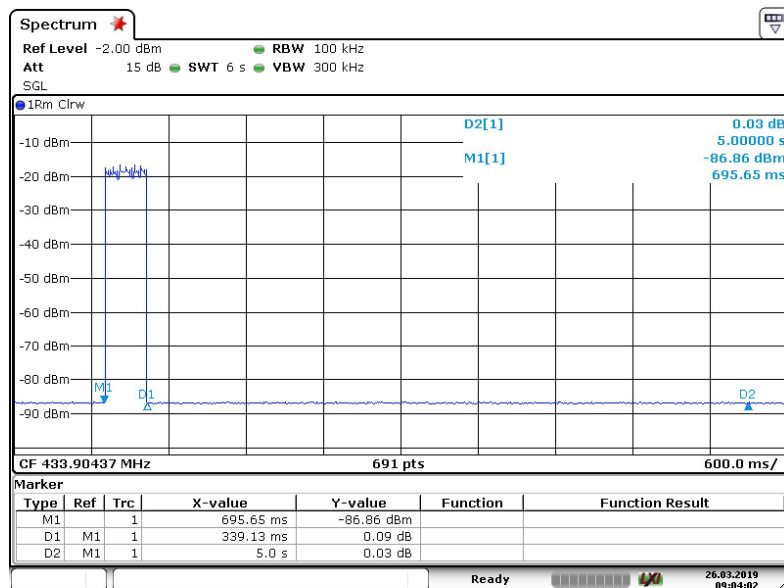
According to FCC Part 15.231 (a), the transmitter shall be complied the following requirements:
(√) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

(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.

Test Result

Channel	Frequency	Deactivation Time	Result
1	433.925MHz	695.65ms	Pass



Date: 26.MAR.2019 09:04:03

10 Test Equipment List

List of Test Instruments

RF Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	101031	2019-7-6

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2019-7-6
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2019-6-28
Horn Antenna	Rohde & Schwarz	HF907	102294	2019-6-28
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2019-7-6
Signal Generator	Rohde & Schwarz	SMY01	839369/005	2019-7-6
Attenuator	Agilent	8491A	MY39264334	2019-7-6
3m Semi-anechoic chamber	TDK	9X6X6	----	2020-7-7

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.80dB; Vertical: 4.87dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.59dB; Vertical: 4.58dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.05dB; Vertical: 5.04dB;
RF test	RF Power Conducted: 1.16dB Frequency test involved: 0.6×10 ⁻⁷ or 1%