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Report No.: CQASZ161001311E
Report Version: V01

MEASUREMENT REPORT

Test Report

Applicant: SHENZHEN QILI INDUSTRIAL CO., LTD.

Address of Applicant: 7/F, Nanshan Building, 7 Langshan Road, Hi-Tech Industrial Park (North), Nanshan District, Shenzhen, China

Manufacturer: SHENZHEN QILI INDUSTRIAL CO., LTD.

Address of Manufacturer: 7/F, Nanshan Building, 7 Langshan Road, Hi-Tech Industrial Park (North), Nanshan District, Shenzhen, China

Equipment Under Test (EUT):

Product: Teaching transmitter

Model No.: QDC-TX01

Brand Name: QDC

FCC ID: 2AKDQ-QDC-TX01

Standards: 47 CFR Part 74, Subpart H

Date of Test: 2016-10-24 to 2016-12-27

Date of Issue: 2016-12-27

Test Result : PASS*

Reviewed By:

(Aaron Ma)

Approved By:

(Owen Zhou)



* In the configuration tested, the EUT complied with the standards specified above.

2 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ161001311E	Rev.01	Initial report	2016-12-27

3 Test Summary

Test Item	Test Requirement	Standard Paragraph	Result
Carrier Radiated Power	FCC Part 2.1046	FCC Part 74.861 e) 1) 54–72, 76–88 & 174– 216MHz bands, 50 mW 470–608 and 614–806 MHz bands, 250 mW	PASS
Modulation Deviation	FCC Part 2.1047	FCC Part 74.861 e) 3) Within 75kHz	PASS
Frequency Stability	FCC Part 2.1055	FCC Part 74.861 e) 4) <0.005% 50 ppm	PASS
Operating Bandwidth	FCC Part 2.1049 c)	FCC Part 74.861 e) 5) Within 200kHz	PASS
Unwanted Radiation	FCC Part 2.1049 c)	FCC Part 74.861 e) 6) within the mask	PASS
Radiated Spurious Emission	FCC Part 2.1053	FCC Part 74.861 d) 3) < 43+10lgP(W) dB	PASS
Electromagnetic Fields	447498 D01 General RF Exposure Guidance v06	< 27mW	PASS
Conducted Spurious Emission	FCC Part 2.1053	<-13dBm	PASS

Remark:

♣ The EUT has 4 channels, which is located in the range 215.0125MHz~215.4375MHz.
Only test result of a sample in channels 215.2875 MHz were recorded in this report.

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5 General Information

5.1 Client Information

Applicant:	SHENZHEN QILI INDUSTRIAL CO., LTD.
Address of Applicant:	7/F, Nanshan Building, 7 Langshan Road, Hi-Tech Industrial Park (North), Nanshan District, Shenzhen, China
Manufacturer:	SHENZHEN QILI INDUSTRIAL CO., LTD.
Address of Manufacturer:	7/F, Nanshan Building, 7 Langshan Road, Hi-Tech Industrial Park (North), Nanshan District, Shenzhen, China

5.2 General Description of EUT

Product Name:	Teaching transmitter
Model No.:	QDC-TX01
Trade Mark:	QDC
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	215.0125MHz~215.4375MHz
Modulation Type:	FM
Number of Channel:	4
Emission Designator:	20K0F3E
Frequency deviation:	8.4 kHz
Sample Type:	Portable production
Main Function:	Wireless microphone system with an associated receiver for transmitting voice.
Antenna Type:	External Antenna
Antenna Gain:	-4.0dBi
Power Supply:	Lithium ion battery : DC3.7V 780mA (Charged by USB DC5V)

Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	215.0125MHz	02	215.1125MHz	03	215.2875MHz	04	215.4375MHz

Note:

In section 15.31(m), regards to the operating frequency range less 1 MHz, the middle frequency of channel were selected to perform the test, and the selected channel see below:

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1 MHz or less	1	Middle.
1 to 10 MHz	2	1 near top and 1 near bottom.
More than 10 MHz	3	1 near top, 1 near middle and 1 near bottom.

Channel	Frequency
The middle channel (CH03)	215.2875MHz

5.3 Test Environment

Operating Environment:	
Temperature:	25.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1010mbar
Test Mode:	Set the middle frequency keep transmitting of the EUT.

5.4 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.	Remark	FCC Certification
AC/DC Adapter	HCSD	HCSD-288D50100	Provided by lab	DOC

5.5 Test Location

All tests were performed at:

Shenzhen Tongce Testing Lab,

1F, Leinuo Watch Building, Fuyong Town, Baoan Dist, Shenzhen, China

5.6 Test Facility

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

FCC – Registration No.: 572331

Shenzhen Tongce Testing Lab 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 572331

5.7 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Tongce Testing Lab** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for **TCT** laboratory is reported:

Test	Range	Uncertainty	Notes
Radiated Emission	Below 1GHz	$\pm 3.92\text{dB}$	(1)
Radiated Emission	Above 1GHz	$\pm 4.28\text{dB}$	(1)
Conducted Disturbance	0.15~30MHz	$\pm 2.56\text{dB}$	(1)

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

5.8 Standards Applicable for Testing

The standard used was FCC PART 74H,

The EUT belongs to licensed low power auxiliary devices

5.9 Equipment List

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date
1	ESPI Test Receiver	R&S	ESVD	100008	2017/08/11
2	Spectrum Analyzer	R&S	FSEM	848597/001	2017/08/11
3	Spectrum Analyzer	Agilent	N9020A	MY49100060	2017/08/12
4	Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	2017/08/11
5	Pre-amplifier	HP	8447D	2727A05017	2017/08/11
6	Loop antenna	ZHINAN	ZN30900A	12024	2017/08/13
	Broadband Antenna	Schwarzbeck	VULB9163	340	2017/08/13
7	Bilog Antenna	R&S	HL562	100365	2017/08/13
8	Horn Antenna	Schwarzbeck	BBHA 9120D	631	2017/08/13
9	Horn Antenna	R&S	HF906	361188	2017/08/13
10	Antenna Mast	CCS	CC-A-4M	N/A	N/A
11	Coaxial cable	TCT	RE-low-01	N/A	2017/08/11
12	Coaxial cable	TCT	RE-high-02	N/A	2017/08/11
15	Spectrum Analyzer	R&S	FSU	200054	2017/08/11
16	Antenna Connector	TCT	RFC-01	N/A	2017/08/12
17	RF cable(9KHz~40GHz)	TCT	RE-06	N/A	2017/08/12
18	RF Generator	R&S	SME06	829683/005	2017/08/11
19	Audio Analyzer	Rohde & Schwarz	UPL	1036	2017/08/11
20	D.C. Power Supply	Agilent	E3610A	MY40020474	2017/08/13
21	Noise Generator	Ningbo Zhongce	DF1681	0146	2017/08/11
22	Temperature Chamber	Auchno	OJN-9606	1178	2017/08/13
23	Temperature/Humidity Meter	VICTOR	VC330	9140394	2017/08/16
24	Multimeter	fluke	15B	96710318	2017/08/16
25	LISN	R&S	NSLK 8126	8126453	2017/08/16

Note:

The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

6 Test results and Measurement Data

6.1 Carrier Radiated Power & Radiated Spurious Emission

Test Requirement:	FCC CFR 47 Part 74.861 e) 1) & d) 3)
Test Method:	EIA/TIA 603-C:2004 section 2.2, FCC CFR 47 Part 2.1047 & 1053
Measurement Distance:	3m (Semi-Anechoic Chamber)
Test Requirement:	(d) For low power auxiliary stations operating in the bands other than those allocated for TV broadcasting, the following technical requirements are imposed. (3) The occupied bandwidth shall not be greater than that necessary for satisfactory transmission and, in any event, an emission appearing on any discrete frequency outside the authorized band shall be attenuated, at least, $43+10 \log 10$ (mean output power, in watts) dB below the mean output power of the transmitting unit. (e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply: (1) The power of the measured unmodulated carrier power at the output of the transmitter power amplifier (antenna input power) may not exceed the following: (i) 54–72, 76–88, and 174–216 MHz bands—50 mW (ii) 470–608 and 614–806 MHz bands—250 mW
Test Procedure:	1) The procedure used was EIA/TIA 603-C:2004. The receiver was scanned from 30MHz to 3.0GHz. When an emission was found, the table was rotated to produce the maximum signal strength. An initial pre-scan was performed for in peak detection mode using the receiver. The EUT was measured for both the Horizontal and Vertical polarities and performed a pre-test three orthogonal planes. 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows: Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor 3) An initial pre-scan was performed in the 3m chamber using the spectrum analyzer in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bilog antenna with 2 orthogonal polarities, remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the Carrier Radiated Power and spurious emissions were measured by the substitution.
Test Setup:	

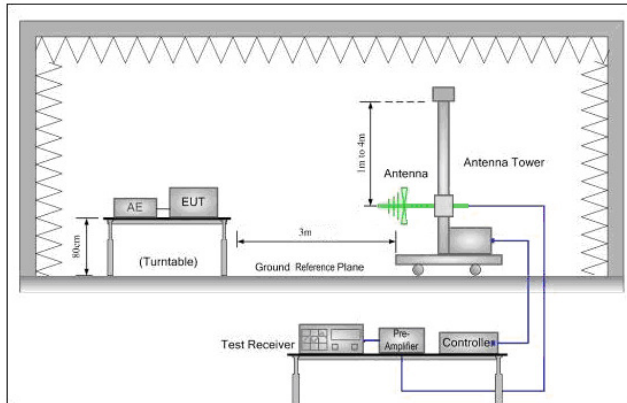


Figure 1. 30MHz to 1GHz

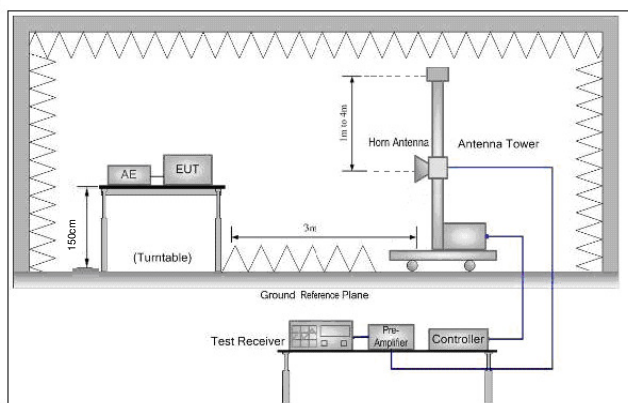


Figure 2. Above 1 GHz

Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

Test Result:

Carrier Frequency (MHz)	Factual Level dBm (mW)	Limit in 74.861 e) 1)
215.2875MHz	13.12dBm(i.e. 20.51 mW)	17 dBm (i.e. 50 mW)

Remark: The Factual Level is ERP value.

Radiated spurious emissions:

Middle channel: 215.2875MHz

Spurious Emission Frequency (MHz)	Factual Level Horizontal (dBm)	Limit (dBm)	Margin (dB)
191.64	-73.87	-13	60.87
432.01	-43.52	-13	30.52
648.66	-33.62	-13	20.62
855.04	-55.40	-13	42.40

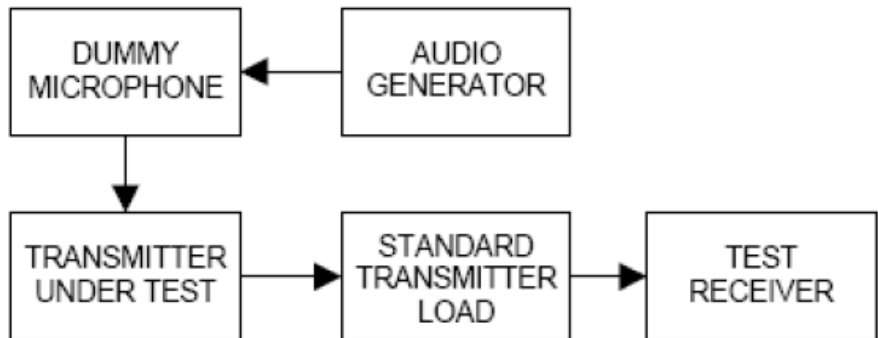
Spurious Emission Frequency (MHz)	Factual Level Vertical (dBm)	Limit (dBm)	Margin (dB)
193.15	-78.15	-13	65.15
433.05	-69.01	-13	56.01
647.97	-53.70	-13	40.70
857.04	-57.94	-13	44.94

Remark:

- 1) The Factual Level is ERP value.
- 2) The peak emission of other frequency in rang from 30MHz up to 10 times carrier were 30dB lower than the limit, hence no data was recorded in the report.

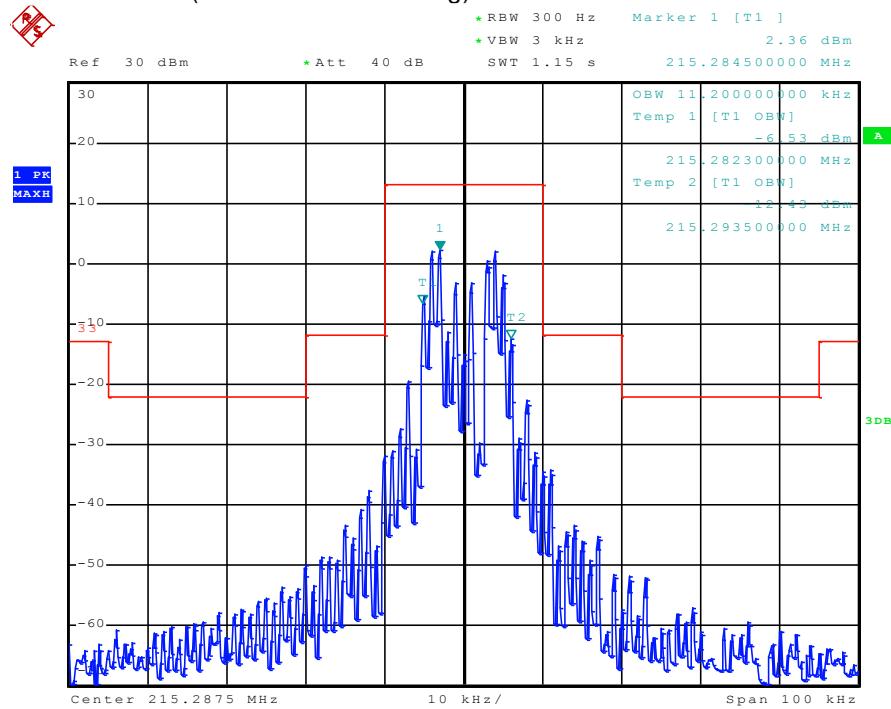
TEST RESULTS: The unit does meet the FCC requirements.

6.2 Occupied Bandwidth & Conducted spurious Emission

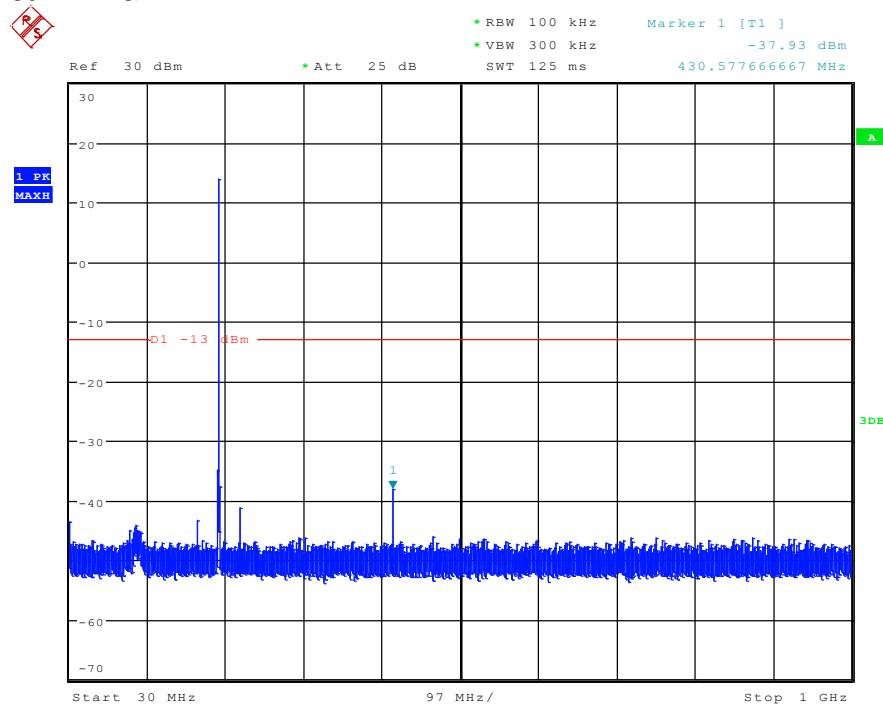
Test Requirement:	FCC CFR 47 Part 74.e) 5) & 6)
Test Method:	FCC CFR 47 Part 2.1049
Requirements:	(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply: (5) The operating bandwidth shall not exceed 200 kHz. (6) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule: (i) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25dB; (ii) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35dB; (iii) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\log_{10}$ (mean output power in watts) dB.
Test Setup:	 <pre> graph LR AG[AUDIO GENERATOR] --> DM[DUMMY MICROPHONE] DM --> T[TRANSMITTER UNDER TEST] T --> STL[STANDARD TRANSMITTER LOAD] STL --> TR[TEST RECEIVER] </pre>
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

Channel	Frequency(MHz)	99%OBW(KHz)
Mid	215.2875	11.20

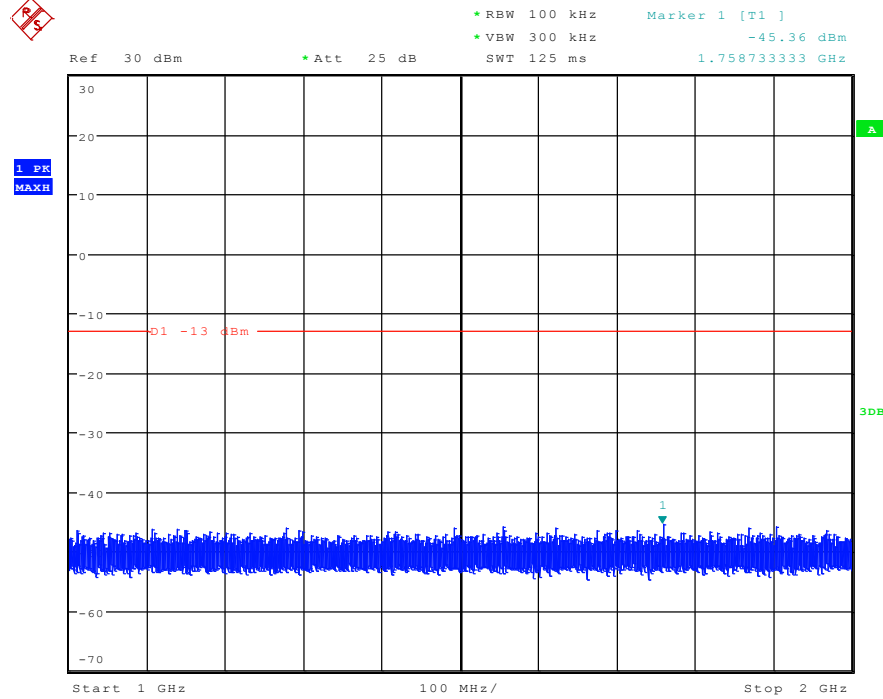
Emission Mask(With 1KHz modulating)



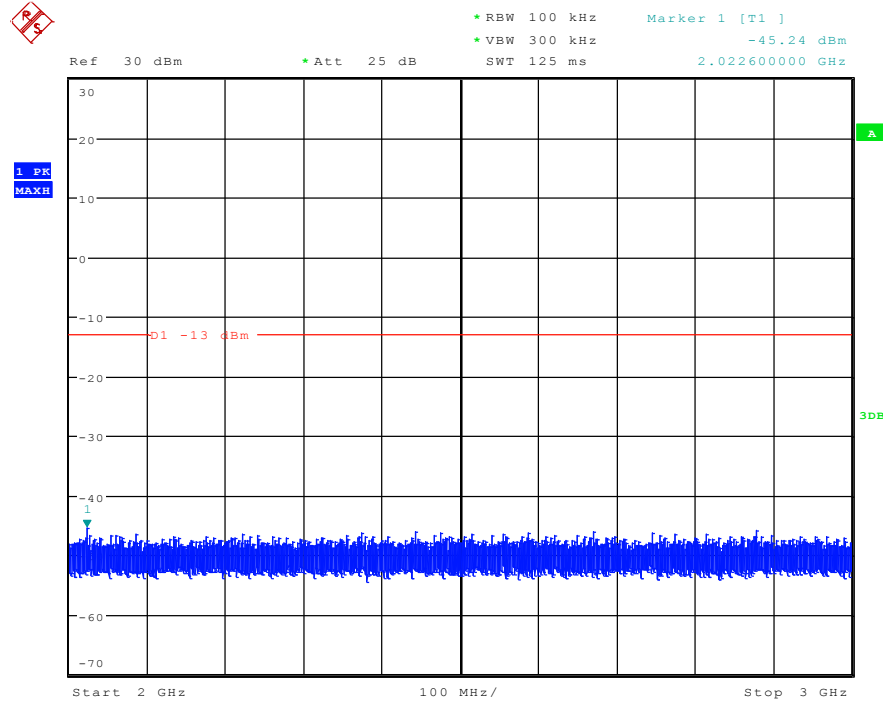
Conducted spurious Emission: 30MHz-1GHz:



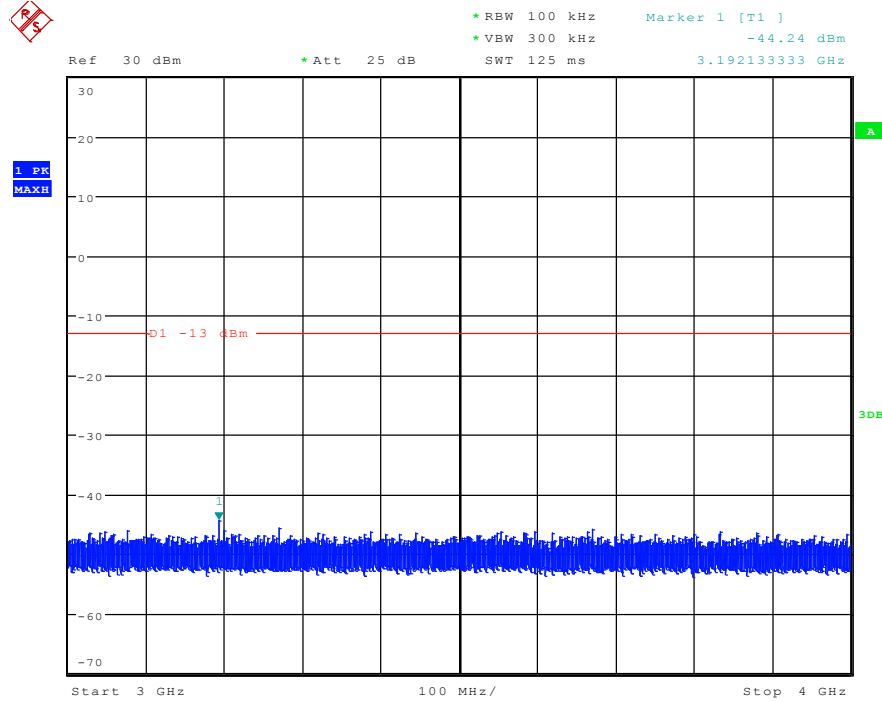
1GHz-2GHz:



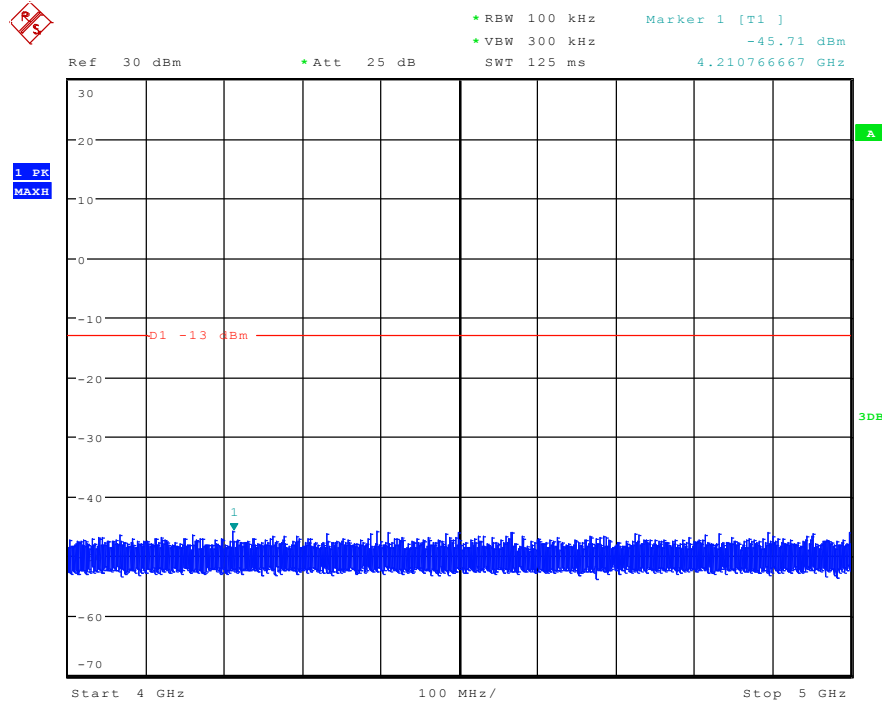
2GHz-3GHz:



3GHz-4GHz:



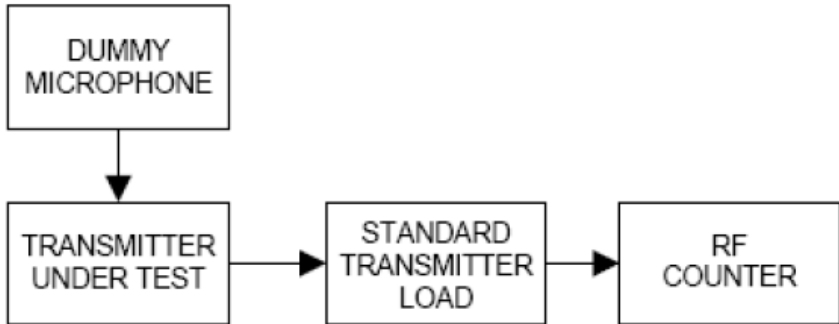
4GHz-5GHz:



Note: The peak emission of other frequency in rang from 30MHz up to 10 times carrier were 30dB lower than the limit, hence no data was recorded in the report.

Test results: The unit does meet the FCC requirements.

6.3 Frequency Stability

Test Requirement:	FCC CFR 47 Part 74.e) 4)
Test Method:	FCC CFR 47 Part 2.1055
Requirements:	+/-50 ppm (e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply: (4) The frequency tolerance of the transmitter shall be 0.005 percent.
Test Procedure:	Frequency stability versus Environmental Temperature The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. The EUT was placed inside the temperature chamber. After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter. Frequency Stability versus Input Voltage At room temperature ($25 \pm 5^{\circ}\text{C}$), an external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115%, 100% and 85% of the nominal operating input voltage. For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.
Test Setup:	 <pre> graph TD A[DUMMY MICROPHONE] --> B[TRANSMITTER UNDER TEST] B --> C[STANDARD TRANSMITTER LOAD] C --> D[RF COUNTER] </pre>
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

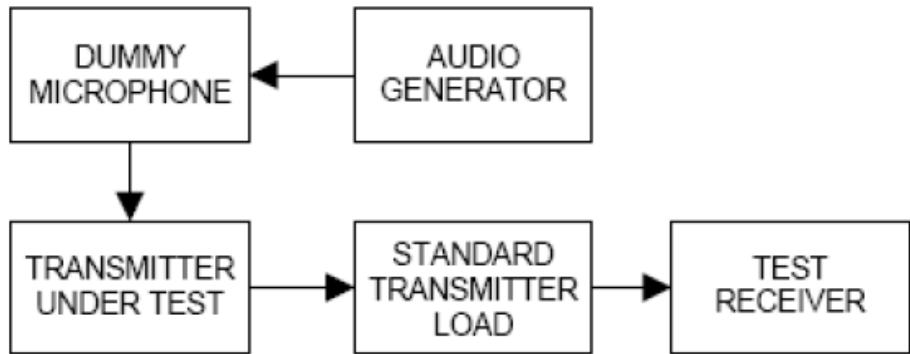
Test Result:

Assigned Frequency: 215.2875MHz		
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within +/- 10.764 kHz
50	3.7	1.79
40	3.7	1.37
30	3.7	0.52
20	3.7	0.14
10	3.7	0.26
0	3.7	0.33
-10	3.7	0.26
-20	3.7	0.15
-30	3.7	0.93
Environment Temperature (°C)	Power Supplied (Vdc)	Frequency Measure with Time Elapsed Total emission within Max +/- 10.764kHz
25	4.2	0.25
25	3.7	0.16
25	3.2	0.13

Battery end point: 3.2Vdc

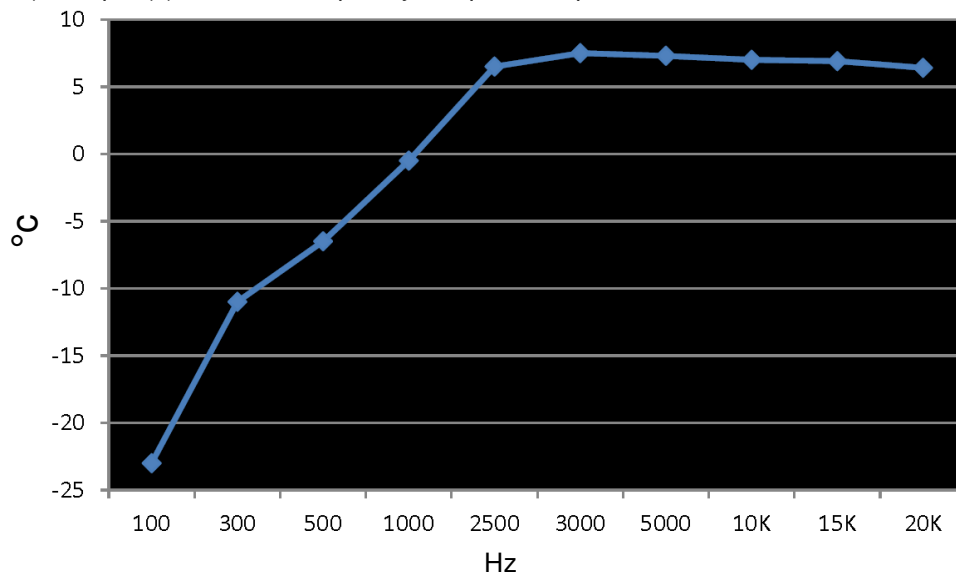
The results: The unit does meet the FCC requirements.

6.4 Modulation Characteristics

Test Requirement:	FCC CFR 47 Part 74.e) 3)
Test Method:	FCC CFR 47 Part 2.1047
Requirements:	(e) For low power auxiliary stations operating in the bands allocated for TV broadcasting, the following technical requirements apply: (3) Any form of modulation may be used. A maximum deviation of ± 75 kHz is permitted when frequency modulation is employed.
Test Procedure:	Audio Frequency Response 1) The RF output of the transceiver was connected to the input of FSP with FM deviation module through sufficient attenuation so as not to overload the meter or distort the reading. An audio signal generator was connected to the audio input of microphone. 2) The audio signal input level was adjusted to obtain 20% of the maximum rated system deviation at 1 kHz, and recorded as DEV REF . With the audio signal generator level unchanged, set the generator frequency between 100 to 5000 Hz. The transmitter deviations (DEV FREQ) were measured and the audio frequency response was calculated as $20\log_{10} [\text{DEV FREQ} / \text{DEV REF}]$ Modulation Limiting 1) Adjust the transmitter per the manufacturer's procedure for full rated system deviation. 2) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤ 0.25 Hz to $\geq 15,000$ Hz. Turn the de-emphasis function off. 3) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation. 4) Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum). 5) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level. 6) With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 100 to 5000 Hz and observe the steady-state deviation. Record the maximum deviation.
Test Setup:	 <pre> graph LR AG[AUDIO GENERATOR] --> DM[DUMMY MICROPHONE] DM --> T[TRANSMITTER UNDER TEST] T --> S[STANDARD TRANSMITTER LOAD] S --> TR[TEST RECEIVER] </pre>
Instruments Used:	Refer to section 5.10 for details.
Test Results:	Pass

Modulation Characteristics measurement:

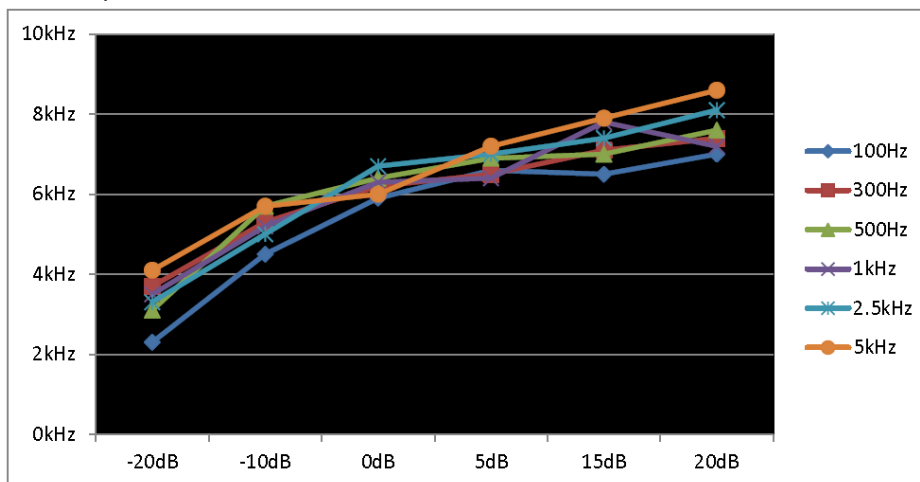
1) The plot(s) of Audio Frequency Response is presented hereinafter as reference.



Note: 0dB=10mV at 1kHz (20% of the maximum rated system deviation).

2) Test at five different modulating frequencies (100Hz, 300Hz, 500Hz, 1KHz, 2.5kHz, 5kHz), the output level of the audio generator was varied up to 1V and the FM deviation level was recorded.

Positive peak deviation



Mid channel: 215.2875MHz

Modulation(dB)		-20	-10	0	5	15	20
100Hz	KHz	2.3	4.5	5.9	6.6	6.5	7
300Hz	KHz	3.7	5.3	6.2	6.5	7.1	7.4
500Hz	KHz	3.1	5.7	6.4	6.9	7	7.6
1000Hz	KHz	3.5	5.2	6.3	6.4	7.8	7.2
2500Hz	KHz	3.3	5	6.7	7	7.4	8.1
5000Hz	KHz	4.1	5.7	6	7.2	7.9	8.4

Maximum Deviation:

Reading:	8.4KHz
45Limit:	± 75KHz

6.5 Electromagnetic Fields

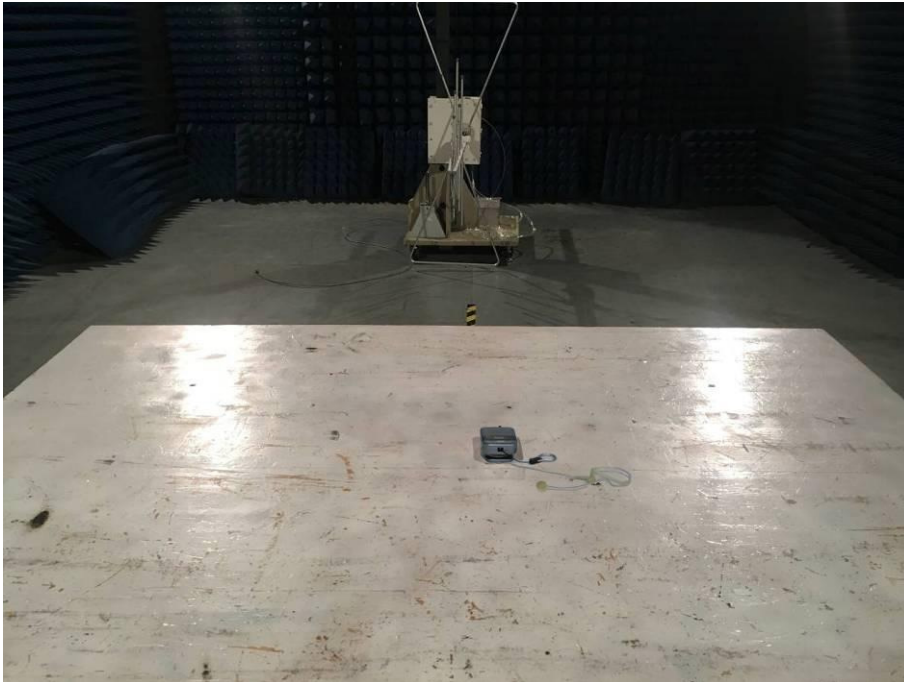
Test Requirement:	FCC KDB Publication 447498
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The minimum distance for the EUT is <5mm, since maximum peak output power of the transmitter is 20.51 mW (13.12dBm) < 27mW, hence the EUTs are excluded from SAR evaluation according to FCC KDB publication 447498 D01: General RF Exposure Guidance v06.

7 Photographs - EUT Test Setup

7.1 Radiated Spurious Emission

Below 1GHz:



Above 1GHz:



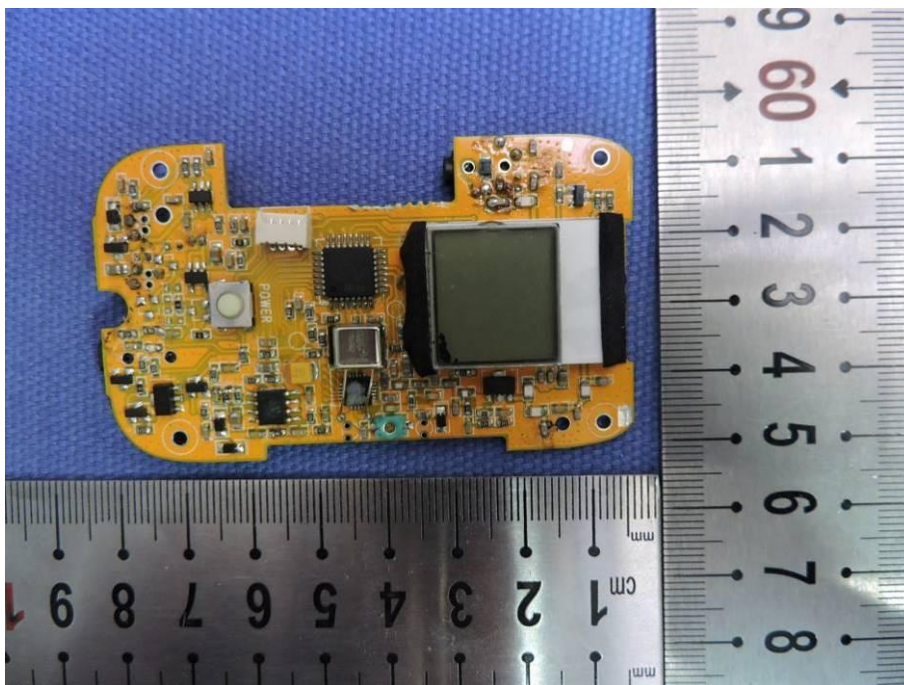
8 Photographs - EUT Constructional Details

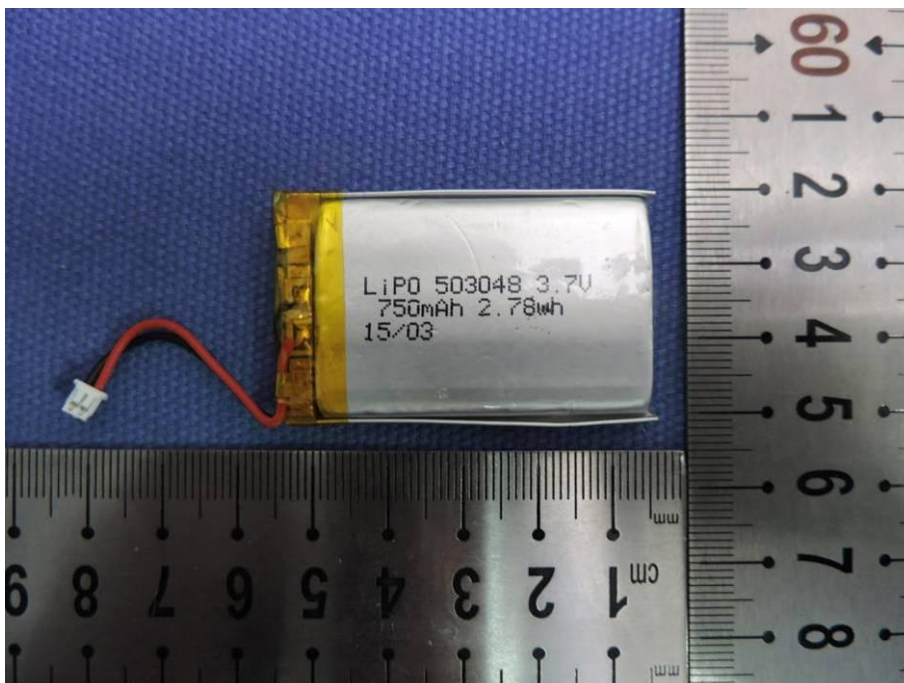
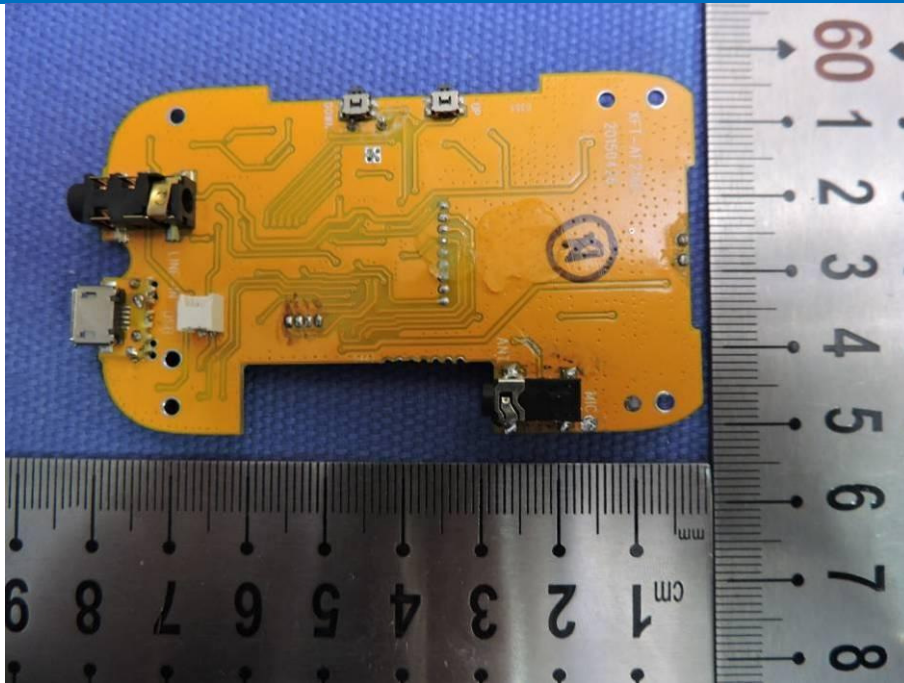


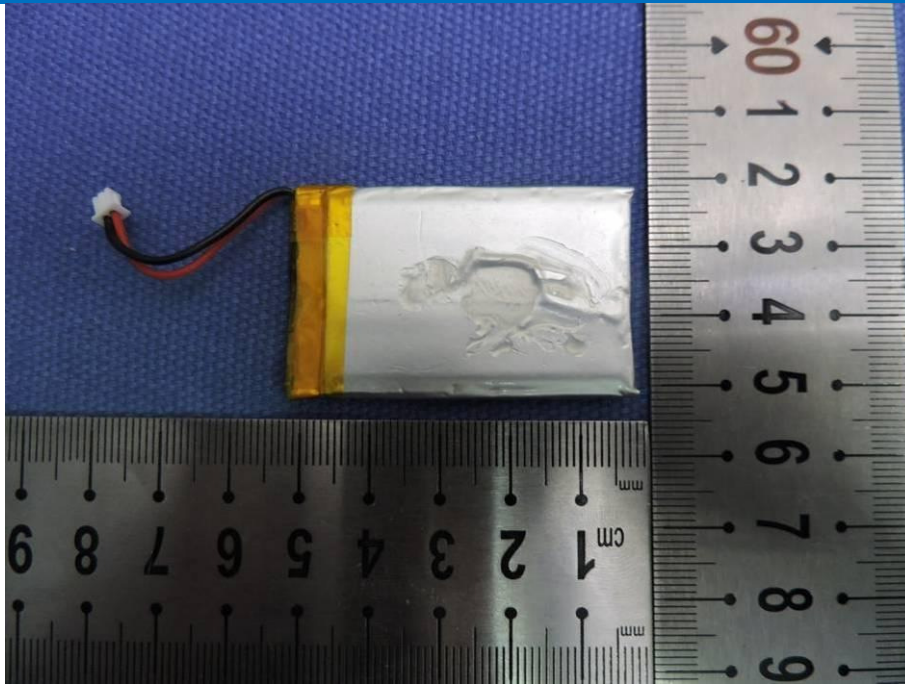












END OF THE REPORT