TCT 通测检测 TESTING CENTRE TECHNOLOGY

TEST REPORT

FCC ID: 2AOLX-MIOM1

Product: MIO Educational Robot

Model No.: Mio M-1

Additional Model No.: Mio M-xxx
"x" stands for letters A-Z to describe the shape of the appearance or stands for numbers 0-9 to describe the size of the appearance

Trade Mark: MIO

Report No.: TCT171130E013

Issued Date: Dec. 14, 2017

Issued for:

Harbin ZhiQu Technology Co., Ltd.
Suite 212, HIT National University Science Park, No.434, Postal Street, Harbin, Heilongjiang, China

Issued By:

Shenzhen Tongce Testing Lab.
1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China
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Hotline: 400-6611-140 Tel: 86-755-27673339 Fax: 86-755-27673332 http://www.tct-lab.com

1. Test Certification

Product:	MIO Educational Robot
Model No.:	Mio M-1
Additional Model:	Mio M-xxx "x" stands for letters A-Z to describe the shape of the appearance or stands for numbers 0-9 to describe the size of the appearance
Trade Mark:	MIO
Applicant:	Harbin ZhiQu Technology Co., Ltd.
Address:	Suite 212, HIT National University Science Park, No.434, Postal Street, Harbin, Heilongjiang, China
Manufacturer:	Harbin ZhiQu Technology Co., Ltd.
Address:	Suite 212, HIT National University Science Park, No.434, Postal Street, Harbin, Heilongjiang, China
Date of Test:	Dec. 07, 2017 - Dec. 14, 2017
Applicable Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.249

The above equipment has been tested by Shenzhen Tongce Testing Lab. and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Tested By:	Beryl Zhao	***Date:***	***Dec. 07, 2017***
	Beryl Zhao		
Reviewed By:	Joe Zhou	***Date:***	***Dec. 13, 2017***
	Joe Zhou		
Approved By:	Tomsin	***Date:***	***Dec. 14, 2017***
	Tomsin		

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2. Test Result Summary

Requirement	CFR 47 Section	Result
Antenna Requirement	§15.203	PASS
AC Power Line Conducted Emission	§15.207	PASS
Field Strength of Fundamental	§15.249 (a)	PASS
Spurious Emissions	§2.1053 §15.249 (a) (d)/ §15.209	PASS
Band Edge	§2.1053 §15.249 (d)/ §15.205	PASS
20dB Occupied Bandwidth	§2.1049 §15.215 (c)	PASS

Note:

1. Pass: Test item meets the requirement.

2. Fail: Test item does not meet the requirement.

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

4. The test result judgment is decided by the limit of test standard.

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3. EUT Description

Product:	MIO Educational Robot
Model No.:	Mio M-1
Additional Model:	Mio M-xxx "x" stands for letters A-Z to describe the shape of the appearance or stands for numbers 0-9 to describe the size of the appearance
Trade Mark:	MIO
Operation Frequency:	2402MHz - 2480MHz
Number of Channel:	40
Modulation Technology:	GFSK
Antenna Type:	PCB antenna
Antenna Gain:	0dBi (Declared by Applicant)
Power Supply:	DC3.7V From Battery or DC5V 1A form Adapter with AC 120V/60Hz
Remark:	All above models are identical in the same PCB layout, interior structure and electrical circuits. The differences are color and model name for commercial purpose.

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Operation Frequency each of channel

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2402MHz	10	2422MHz	20	2442MHz	30	2462MHz
1	2404MHz	11	2424MHz	21	2444MHz	31	2464MHz
…	…	…	…	…	…	…	…
8	2418MHz	18	2438MHz	28	2458MHz	38	2478MHz
9	2420MHz	19	2440MHz	29	2460MHz	39	2480MHz
Remark: Channel 0, 19 & 39 have been tested.							

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2402MHz
The middle channel	2440MHz
The Highest channel	2480MHz

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4. Genera Information

4.1. Test Environment and Mode

Operating Environment:	
Temperature:	25.0 °C
Humidity:	54 % RH
Atmospheric Pressure:	1010 mbar
Test Mode:	
Engineering mode:	Keep the EUT in continuous transmitting by select channel

The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

Axis	X	Y	Z
Field Strength(dBuV/m)	87.56	88.93	86.27

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4.2. Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Equipment	Model No.	Serial No.	FCC ID	Trade Name
/	/	/	/	/

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

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5. Facilities and Accreditations

5.1. Facilities

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

- FCC - Registration No.: 645098

  Shenzhen Tongce Testing Lab

  The 3m Semi-anechoic chamber has been registered and fully described in a report with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files.

- IC - Registration No.: 10668A-1

  The 3m Semi-anechoic chamber of Shenzhen TCT Testing Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing

5.2. Location

Shenzhen Tongce Testing Lab

Address: 1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Baoan District, Shenzhen, Guangdong, China

TEL: +86-755-27673339

5.3. Measurement Uncertainty

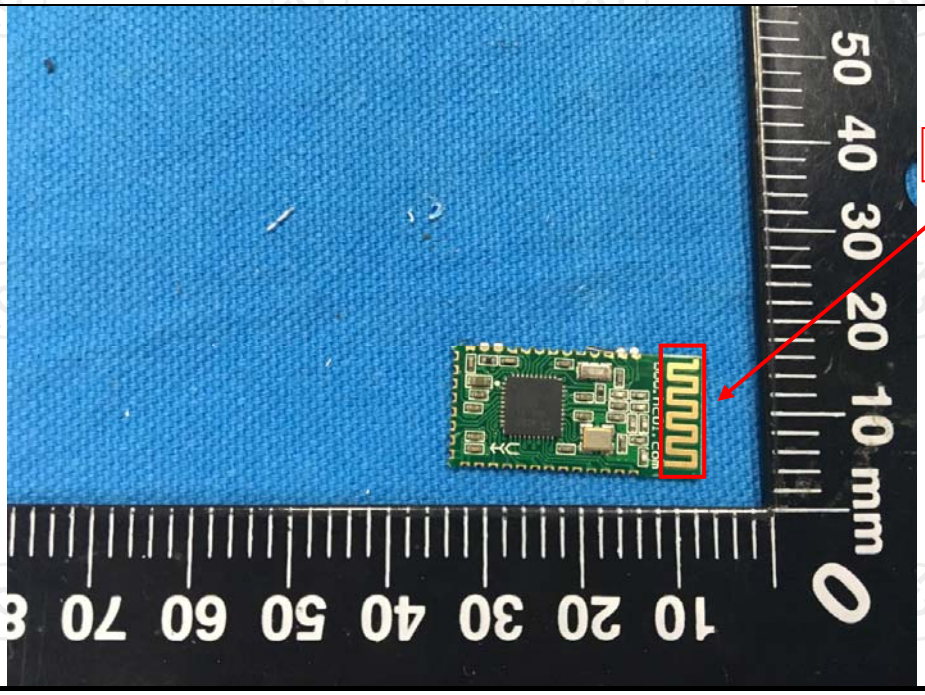
The reported uncertainty of measurement y ± U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95 %.

No.	Item	MU
1	Conducted Emission	±2.56dB
2	RF power, conducted	±0.12dB
3	Spurious emissions, conducted	±0.11dB
4	All emissions, radiated(<1GHz)	±3.92dB
5	All emissions, radiated(>1GHz)	±4.28dB
6	Temperature	±0.1°C
7	Humidity	±1.0%

6. Test Results and Measurement Data

6.1. Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 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 a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.	
E.U.T Antenna:	
The EUT antenna is PCB antenna which permanently attached, and the best case gain of the antenna is 0dBi.	



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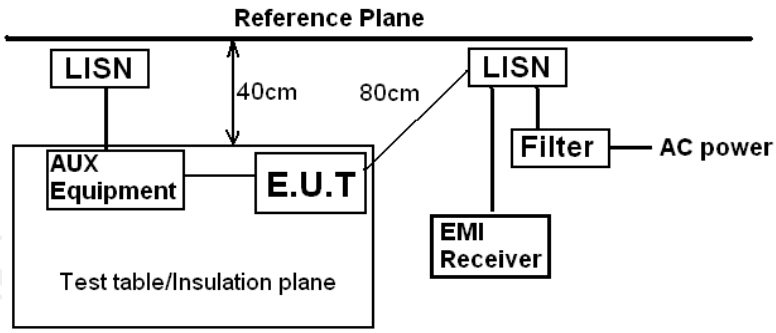
6.2.Conducted Emission

6.2.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>150 kHz to 30 MHz</td></tr>
<tr><td>Receiver setup:</td><td>RBW=9 kHz, VBW=30 kHz, Sweep time=auto</td></tr>
<tr><td>Limits:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
</td></tr>
<tr><td>Test Setup:</td><td> 

Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Mode:</td><td>Transmitting mode with modulation</td></tr>
<tr><td>Test Procedure:</td><td>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.
2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).
3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</td></tr>
<tr><td>Test Result:</td><td>Pass</td></tr>
</table>

6.2.2. Test Instruments

Conducted Emission Shielding Room Test Site (843)				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	R&S	ESPI	101401	Jun. 12, 2018
LISN	Schwarzbeck	NSLK 8126	8126453	Sep. 27, 2018
Coax cable (9KHz-30MHz)	TCT	CE-05	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

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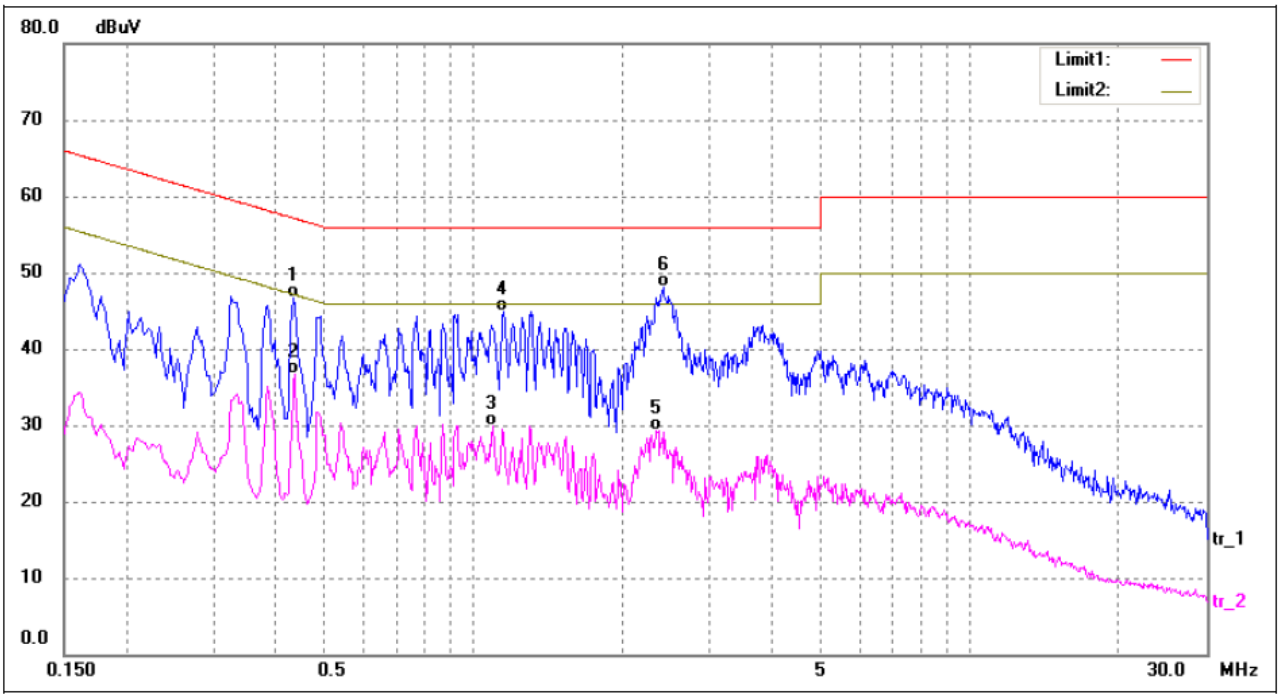
6.2.3. Test data

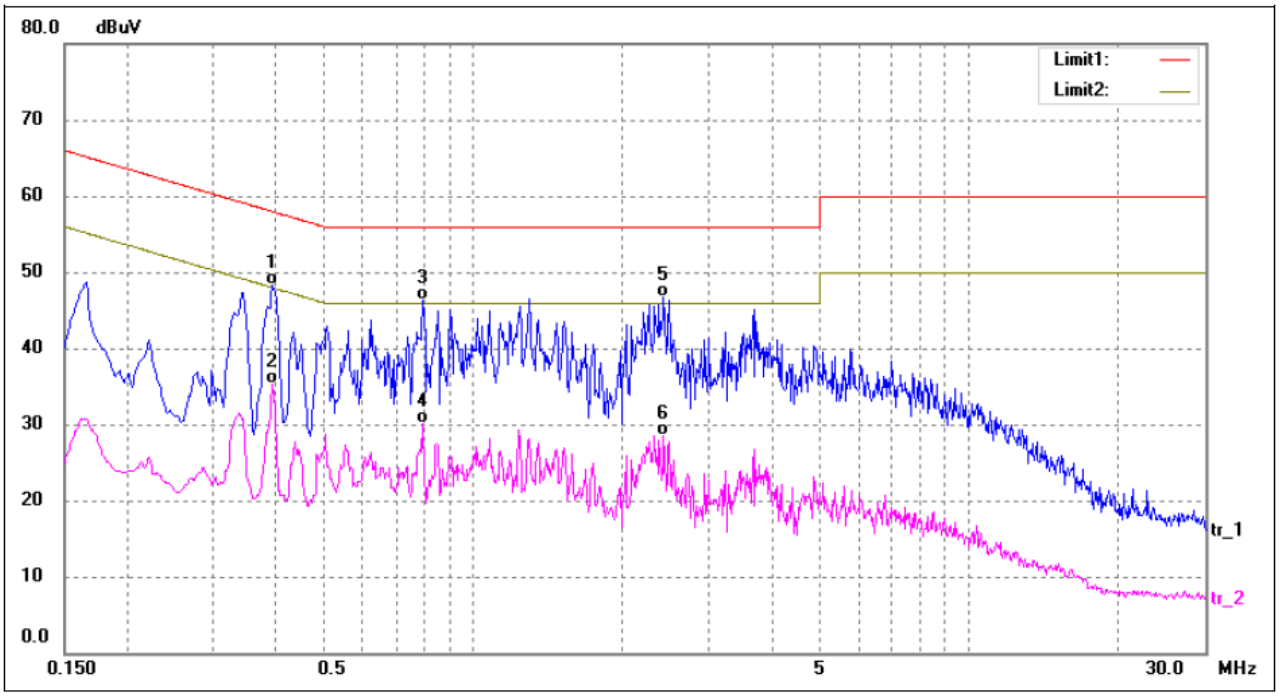
Please refer to following diagram for individual

Conducted Emission on Line Terminal of the power line (150 kHz to 30MHz)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.4340	36.82	9.80	46.62	57.18	-10.56	QP
2	0.4380	26.88	9.80	36.68	47.10	-10.42	AVG
3	1.0940	20.12	9.76	29.88	46.00	-16.12	AVG
4	1.1540	35.19	9.76	44.95	56.00	-11.05	QP
5	2.3380	19.60	9.73	29.33	46.00	-16.67	AVG
6*	2.4140	38.29	9.72	48.01	56.00	-7.99	QP

Conducted Emission on Neutral Terminal of the power line (150 kHz to 30MHz)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.3940	38.44	9.80	48.24	57.98	-9.74	QP
2	0.3940	25.43	9.80	35.23	47.98	-12.75	AVG
3	0.7940	36.44	9.78	46.22	56.00	-9.78	QP
4	0.7940	20.35	9.78	30.13	46.00	-15.87	AVG
5*	2.4340	36.92	9.72	46.64	56.00	-9.36	QP
6	2.4340	18.79	9.72	28.51	46.00	-17.49	AVG

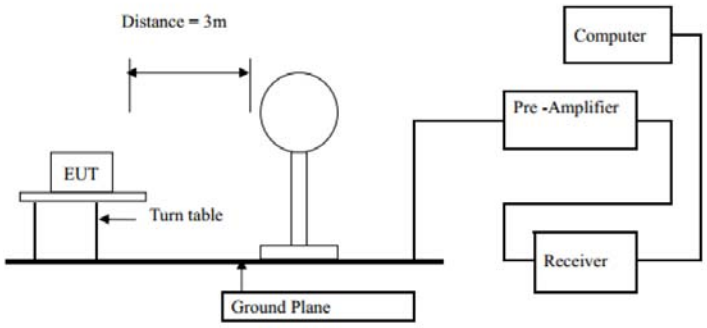
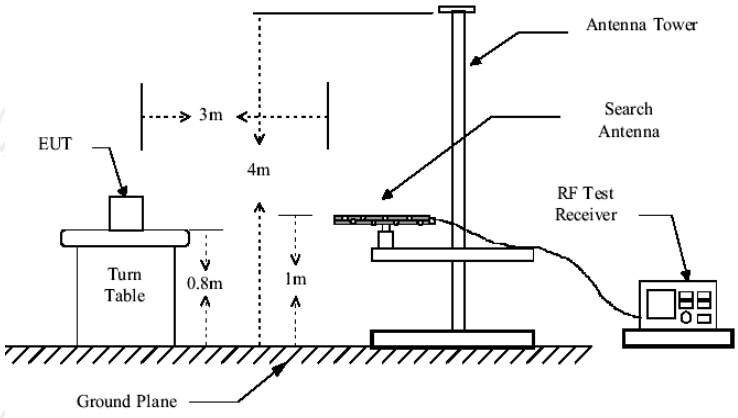
Notes:

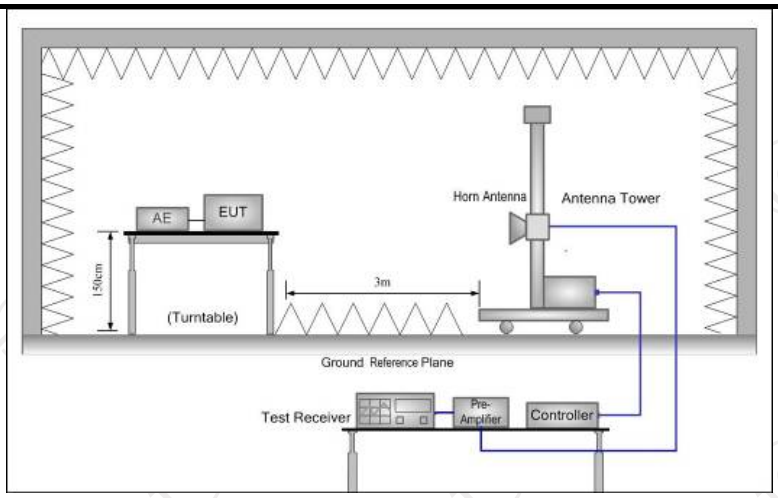
1. *An initial pre-scan was performed on the line and neutral lines with peak detector.*
2. *Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.*
3. *Final Level =Receiver Read level + LISN Factor + Cable Loss*
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

6.3. Radiated Emission Measurement

6.3.1. Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209/ Part 2 J Section 2.1053</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10:2013</td></tr>
<tr><td>Frequency Range:</td><td>9 kHz to 25 GHz</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Receiver Setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>9kHz- 150kHz</td><td>Quasi-peak</td><td>200Hz</td><td>1kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>150kHz-30MHz</td><td>Quasi-peak</td><td>9kHz</td><td>30kHz</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>120kHz</td><td>300kHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit(Field strength of the fundamental signal):</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td rowspan="2">2400MHz-2483.5MHz</td><td>94.00</td><td>Average Value</td></tr>
<tr><td>114.00</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit(Spurious Emissions):</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>0.009-0.490</td><td>2400/F(KHz)</td><td>Quasi-peak Value</td></tr>
<tr><td>0.490-1.705</td><td>24000/F(KHz)</td><td>Quasi-peak Value</td></tr>
<tr><td>1.705-30</td><td>30</td><td>Quasi-peak Value</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Limit (band edge) :</td><td>Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.</td></tr>
<tr><td>Test Procedure:</td><td>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber in below 1GHz, 1.5m above the ground in above 1GHz. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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</td></tr>
</table>

	the measurement. 4. 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. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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.
Test setup:	For radiated emissions below 30MHz  30MHz to 1GHz  Above 1GHz (The diagram below shows the test setup that is utilized to make the measurements for emission from 1GHz to the tenth harmonic of the highest fundamental frequency or to 40GHz emissions, whichever is lower.)

	
Test results:	PASS

6.3.2. Test Instruments

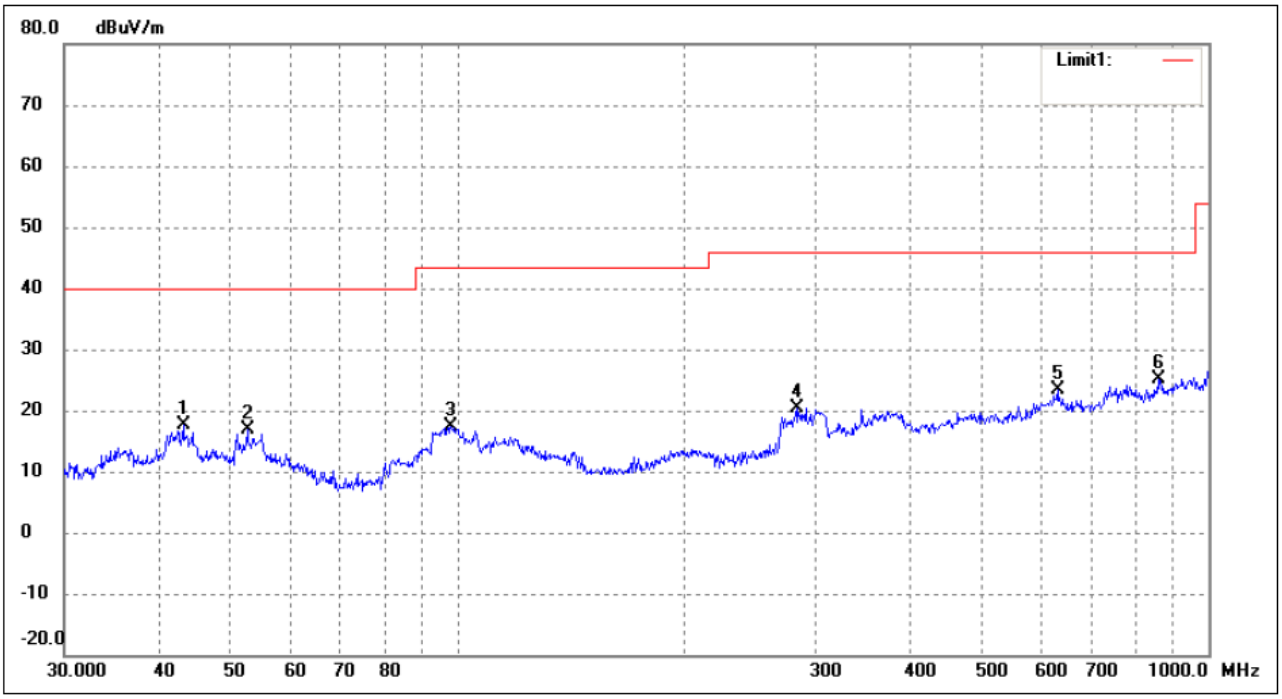
Radiated Emission Test Site (966)				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Test Receiver	ROHDE&SCHWARZ	ESVD	100008	Sep. 27, 2018
Spectrum Analyzer	ROHDE&SCHWARZ	FSQ	200061	Sep. 27, 2018
Pre-amplifier	EM Electronics Corporation CO.,LTD	EM30265	07032613	Sep. 27, 2018
Pre-amplifier	HP	8447D	2727A05017	Sep. 27, 2018
Loop antenna	ZHINAN	ZN30900A	12024	Sep. 27, 2018
Broadband Antenna	Schwarzbeck	VULB9163	340	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBHA 9120D	631	Sep. 27, 2018
Horn Antenna	Schwarzbeck	BBH 9170	582	Jun. 07, 2018
Antenna Mast	Keleto	CC-A-4M	N/A	N/A
Coax cable (9KHz-1GHz)	TCT	RE-low-01	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-02	N/A	Sep. 27, 2018
Coax cable (9KHz-1GHz)	TCT	RE-low-03	N/A	Sep. 27, 2018
Coax cable (9KHz-40GHz)	TCT	RE-high-04	N/A	Sep. 27, 2018
EMI Test Software	Shurple Technology	EZ-EMC	N/A	N/A

Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.3.3. Test Data

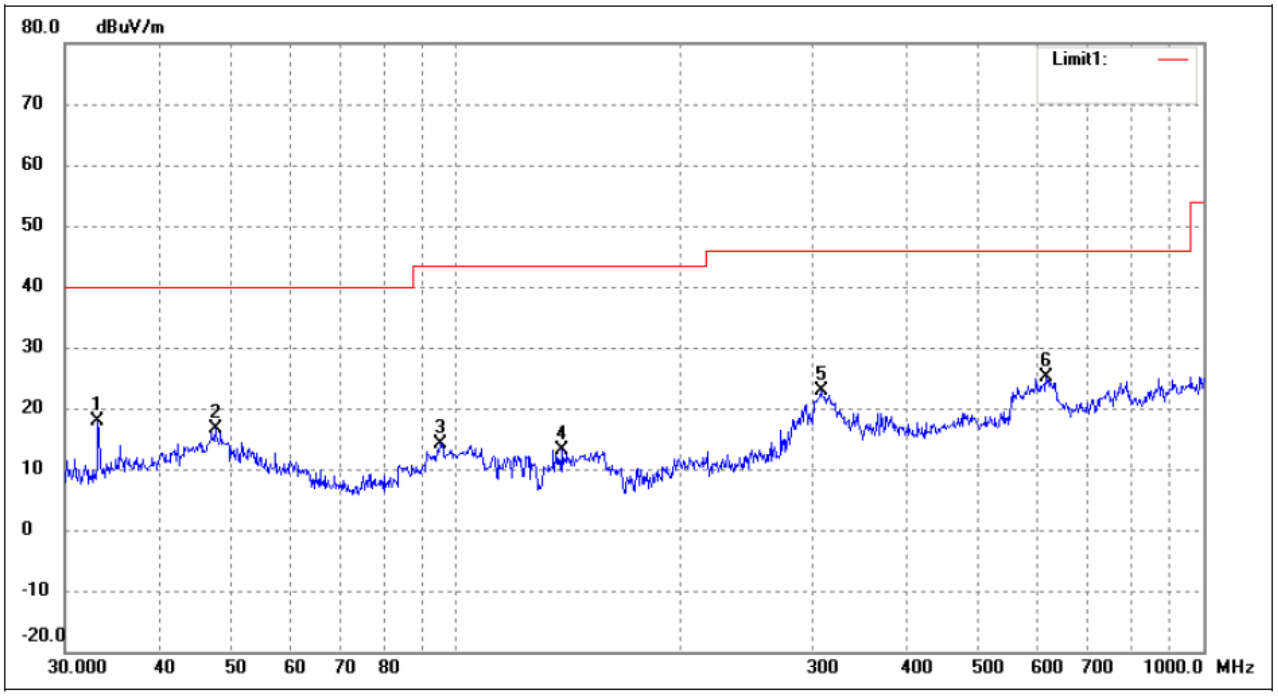
Below 1GHz

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	43.2017	25.57	-7.87	17.70	40.00	-22.30	272	100	QP
2	52.5753	25.44	-8.65	16.79	40.00	-23.21	94	100	QP
3	98.1419	28.54	-11.28	17.26	43.50	-26.24	182	100	QP
4	282.9852	26.45	-6.04	20.41	46.00	-25.59	101	100	QP
5	629.4772	22.29	0.99	23.28	46.00	-22.72	340	100	QP
6	857.0247	22.41	2.78	25.19	46.00	-20.81	328	100	QP

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	33.2112	27.34	-9.50	17.84	40.00	-22.16	313	100	QP
2	47.6586	24.77	-8.17	16.60	40.00	-23.40	203	100	QP
3	95.4270	25.99	-11.83	14.16	43.50	-29.34	64	100	QP
4	138.3873	25.61	-12.46	13.15	43.50	-30.35	224	100	QP
5	307.8313	28.01	-5.24	22.77	46.00	-23.23	66	100	QP
6	616.3718	24.03	0.99	25.02	46.00	-20.98	217	100	QP

Remark：
(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results:

CH Low (2402MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2402.00	111.29	-5.84	105.45	114.00	-8.55	peak
2402.00	86.34	-5.84	80.50	94.00	-13.50	AVG
4804.00	57.21	-3.64	53.57	74.00	-20.43	peak
4804.00	45.74	-3.64	42.10	54.00	-11.90	AVG
7206.00	55.66	-0.95	54.71	74.00	-19.29	peak
7206.00	41.08	-0.95	40.13	54.00	-13.87	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2402	110.53	-5.84	104.69	114	-9.31	peak
2402	85.75	-5.84	79.91	94	-14.09	AVG
4804	56.48	-3.64	52.84	74	-21.16	peak
4804	44.16	-3.64	40.52	54	-13.48	AVG
7206	54.72	-0.95	53.77	74	-20.23	peak
7206	40.39	-0.95	39.44	54	-14.56	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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CH Middle (2440MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2440	110.05	-5.71	104.34	114	-9.66	peak
2440	85.62	-5.71	79.91	94	-14.09	AVG
4880	55.47	-3.51	51.96	74	-22.04	peak
4880	44.14	-3.51	40.63	54	-13.37	AVG
7320	53.29	-0.82	52.47	74	-21.53	peak
7320	40.73	-0.82	39.91	54	-14.09	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2440	109.85	-5.71	104.14	114	-9.86	peak
2440	85.27	-5.71	79.56	94	-14.44	AVG
4880	54.03	-3.51	50.52	74	-23.48	peak
4880	44.18	-3.51	40.67	54	-13.33	AVG
7320	52.76	-0.82	51.94	74	-22.06	peak
7320	39.69	-0.82	38.87	54	-15.13	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

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CH High (2480MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480	108.89	-5.65	103.24	114	-10.76	peak
2480	84.73	-5.65	79.08	94	-14.92	AVG
4960	54.18	-3.43	50.75	74	-23.25	peak
4960	44.62	-3.43	41.19	54	-12.81	AVG
7440	52.45	-0.75	51.7	74	-22.3	peak
7440	39.11	-0.75	38.36	54	-15.64	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480	108.24	-5.65	102.59	114	-11.41	peak
2480	82.31	-5.65	76.66	94	-17.34	AVG
4960	53.06	-3.43	49.63	74	-24.37	peak
4960	41.72	-3.43	38.29	54	-15.71	AVG
7440	51.48	-0.75	50.73	74	-23.27	peak
7440	38.15	-0.75	37.4	54	-16.6	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark：
(1) Measuring frequencies from 1 GHz to the 25 GHz。
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) 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.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

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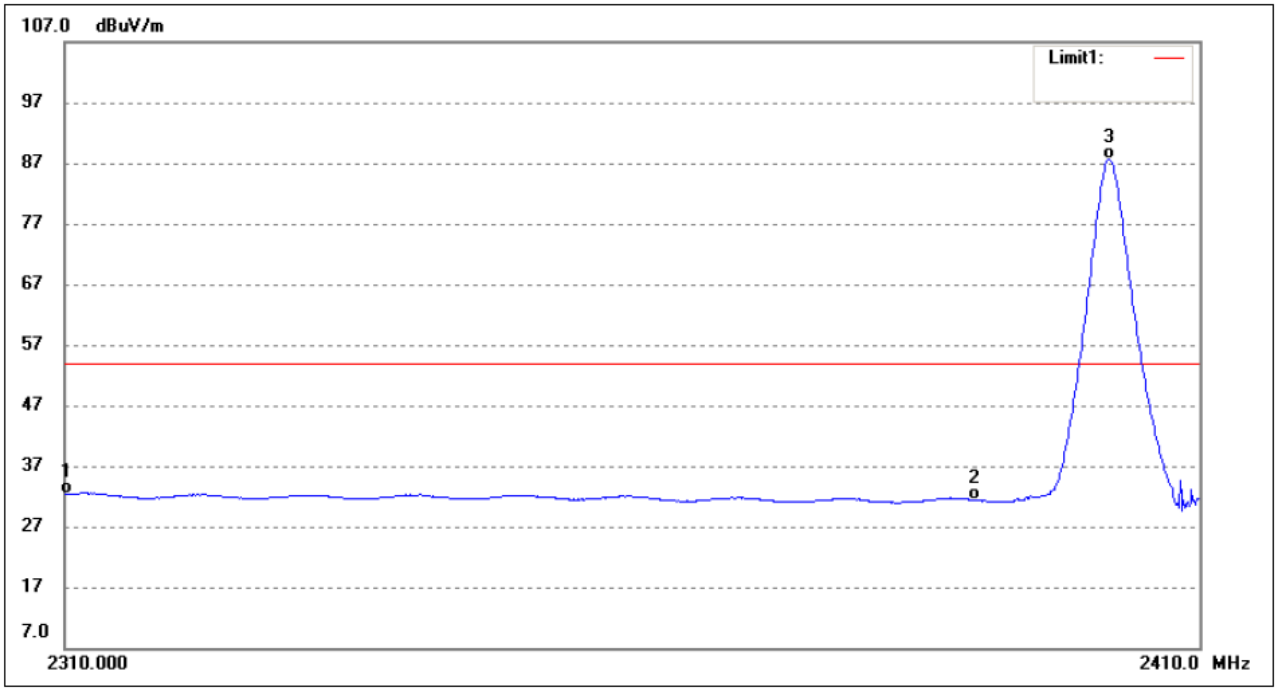
BAND EDGE

Radiated Band Edge Test:

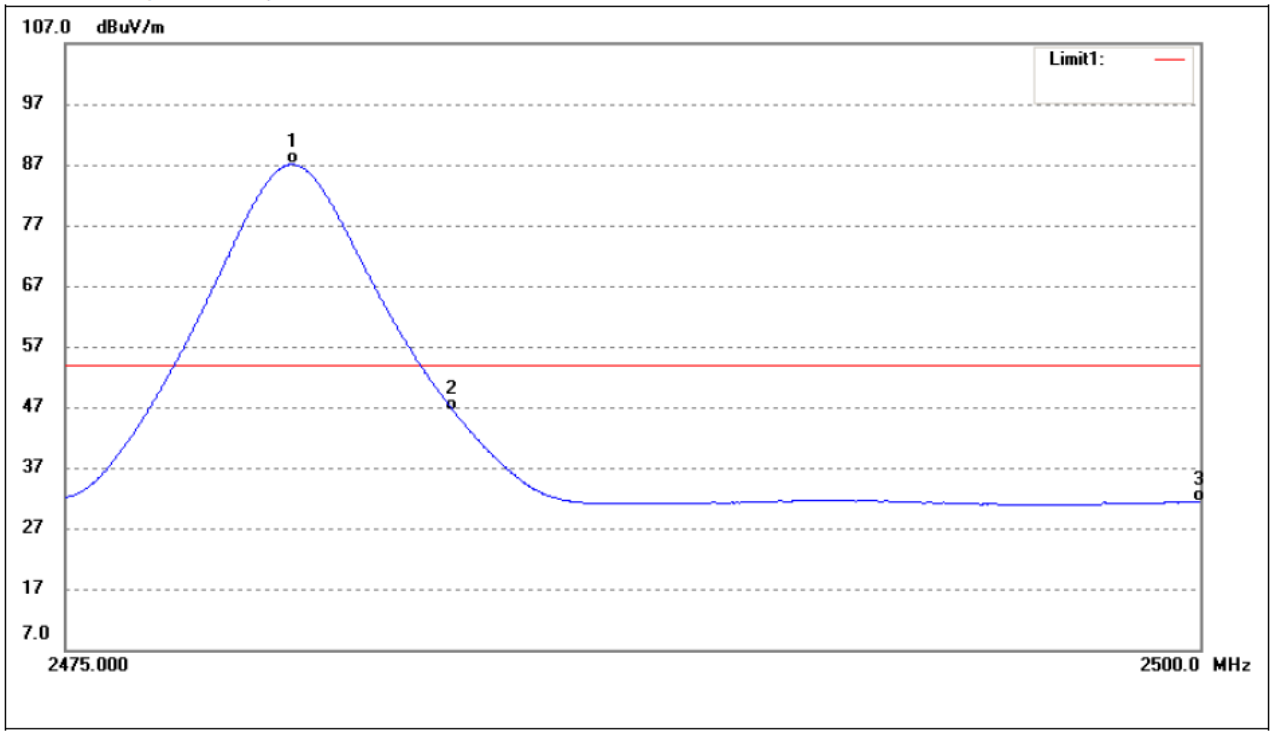
Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	Factor(dB)	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	38.69	-6.38	32.31	54.00	-21.69	Average Detector
	2310.000	49.36	-6.38	42.98	74.00	-31.02	Peak Detector
2	2390.000	38.57	-7.26	31.31	54.00	-22.69	Average Detector
	2390.000	50.32	-7.26	43.06	74.00	-30.94	Peak Detector
3	2401.843	95.14	-7.39	87.75	/	/	Average Detector
	2401.945	100.07	-7.39	92.68	/	/	Peak Detector

Operation Mode: TX CH High (2480MHz)
Horizontal (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2479.980	94.39	-7.28	87.11	/	/	Average Detector
	2480.204	99.29	-7.28	92.01	/	/	Peak Detector
2	2483.500	53.66	-7.28	46.38	54.00	-7.62	Average Detector
	2483.500	61.26	-7.28	53.98	74.00	-20.02	Peak Detector
3	2500.000	38.68	-7.25	31.43	54.00	-22.57	Average Detector
	2500.000	50.84	-7.25	43.59	74.00	-30.41	Peak Detector

6.4.20dB Occupied Bandwidth

6.4.1. Test Specification

Test Requirement:	FCC Part15 C Section 15.215(c)/ Part 2 J Section 2.1049
Test Method:	ANSI C63.10: 2013
Limit:	N/A
	1. According to the follow Test-setup, keep the relative position between the artificial antenna and the EUT. 2. Set to the maximum power setting and enable the EUT transmit continuously. 3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW≥1% of the 20 dB bandwidth; VBW≥RBW; Sweep = auto; Detector function = peak; Trace = max hold. 4. Measure and record the results in the test report.
Test setup:	
Test Mode:	Transmitting mode with modulation
Test results:	PASS

6.4.2. Test Instruments

RF Test Room				
Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
Spectrum Analyzer	Agilent	N9020A	MY49100060	Sep. 27, 2018

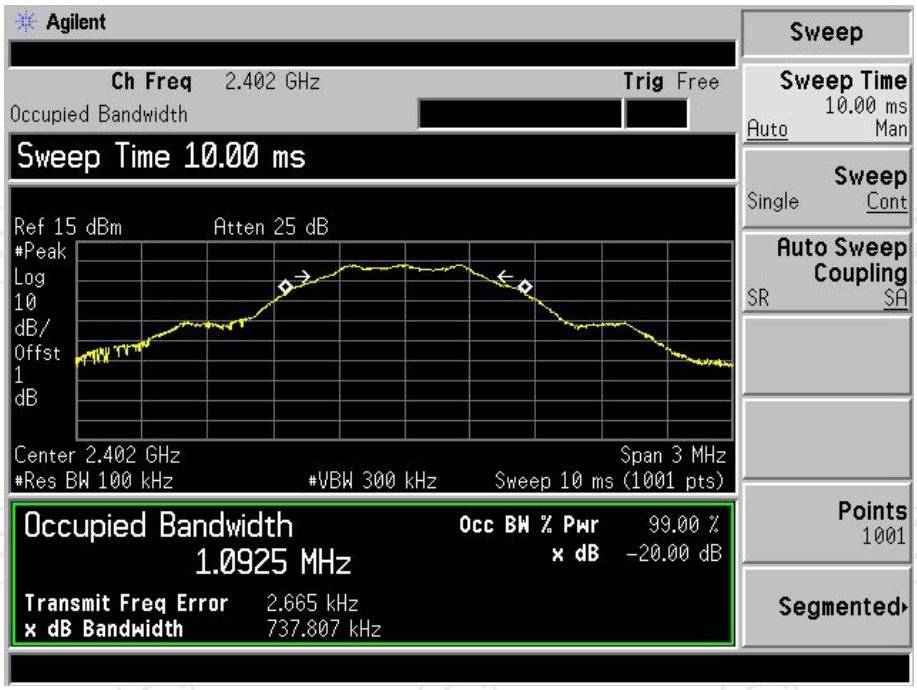
Note: *The calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).*

6.4.3. Test data

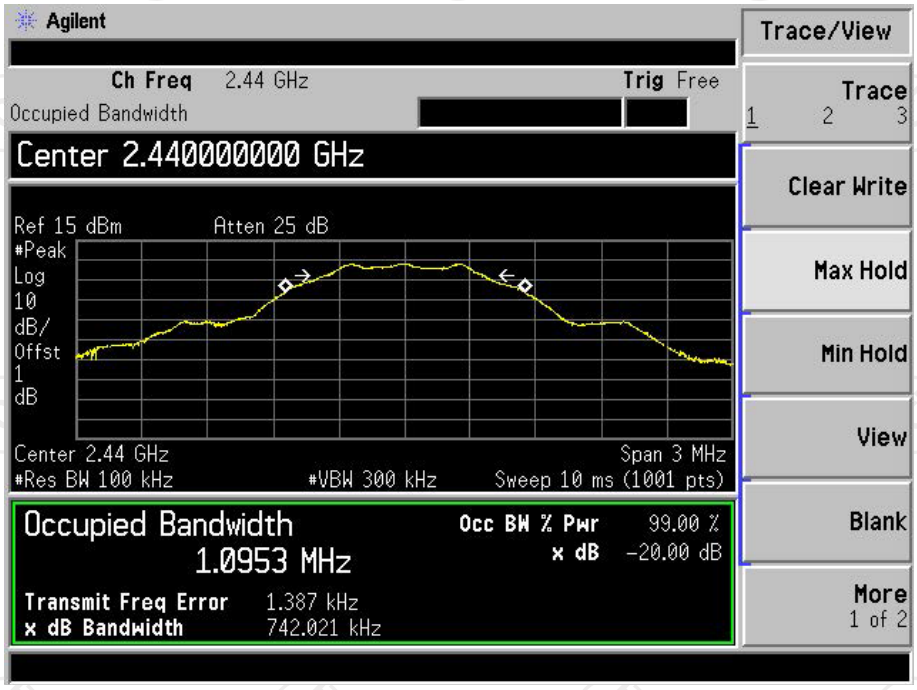
Test Channel	20dB Occupy Bandwidth (kHz)	Limit	Conclusion
Lowest	737.807	---	PASS
Middle	742.021	---	PASS
Highest	735.496	---	PASS

Test plots as follows:

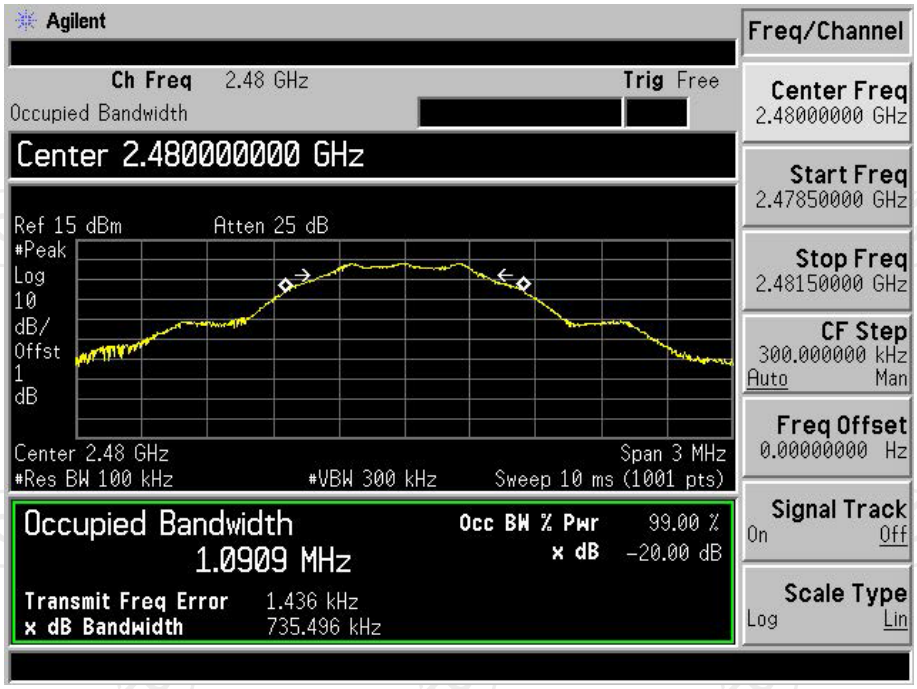
Lowest channel



Middle channel

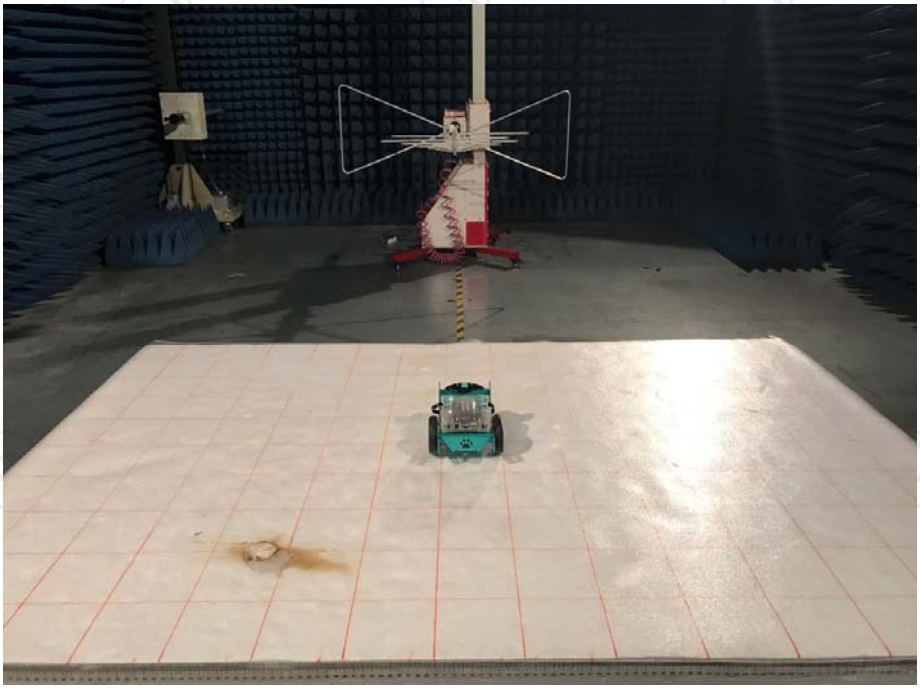


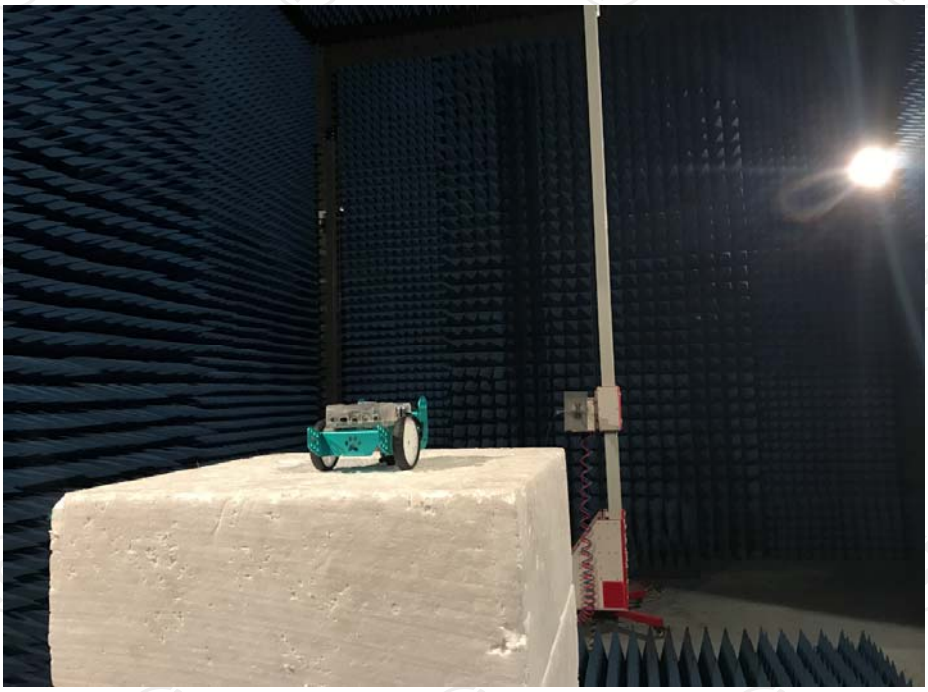
Highest channel



Appendix A: Photographs of Test Setup

Product: MIO Educational Robot
Model: Mio M-1
Radiated Emission





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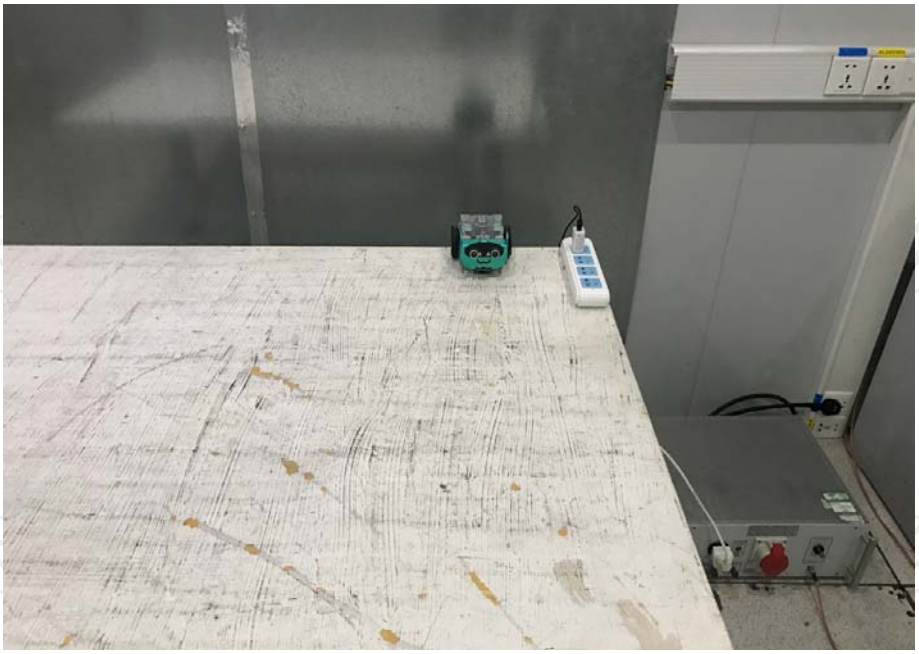
Conducted Emission

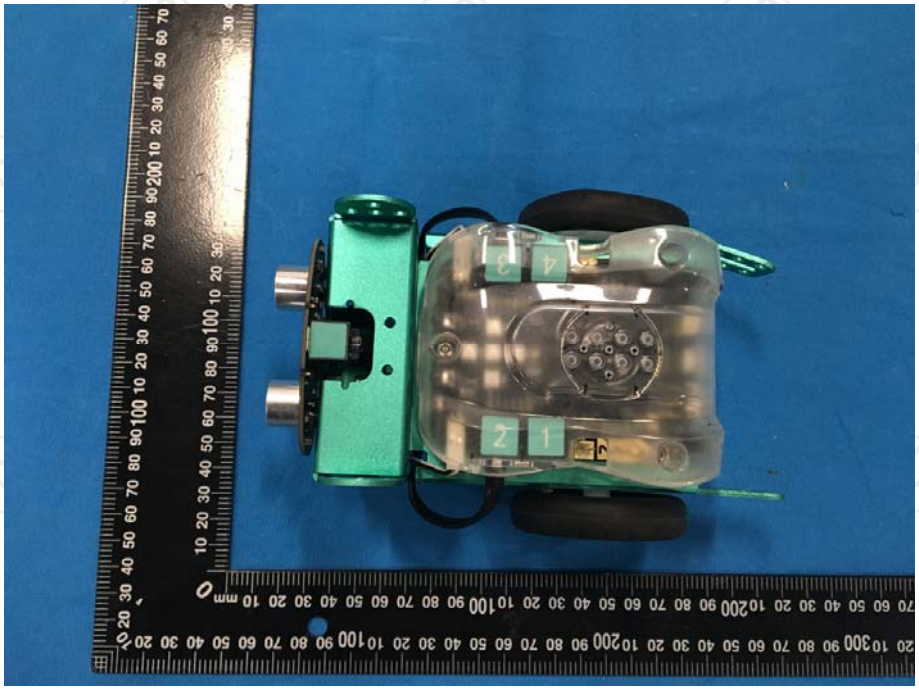


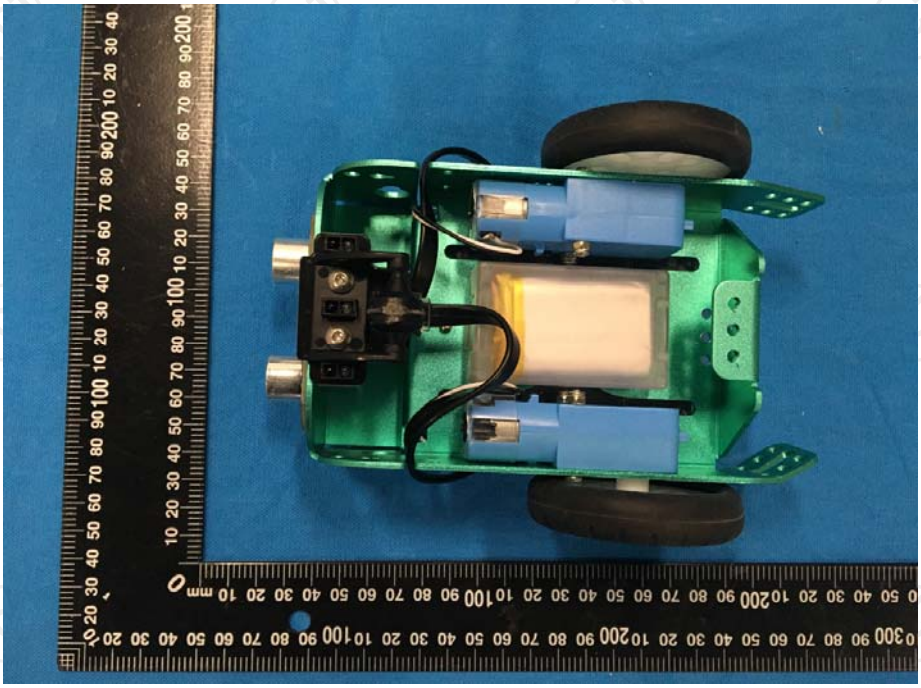
Appendix B: Photographs of EUT

Product: MIO Educational Robot

Model: Mio M-1

External Photos





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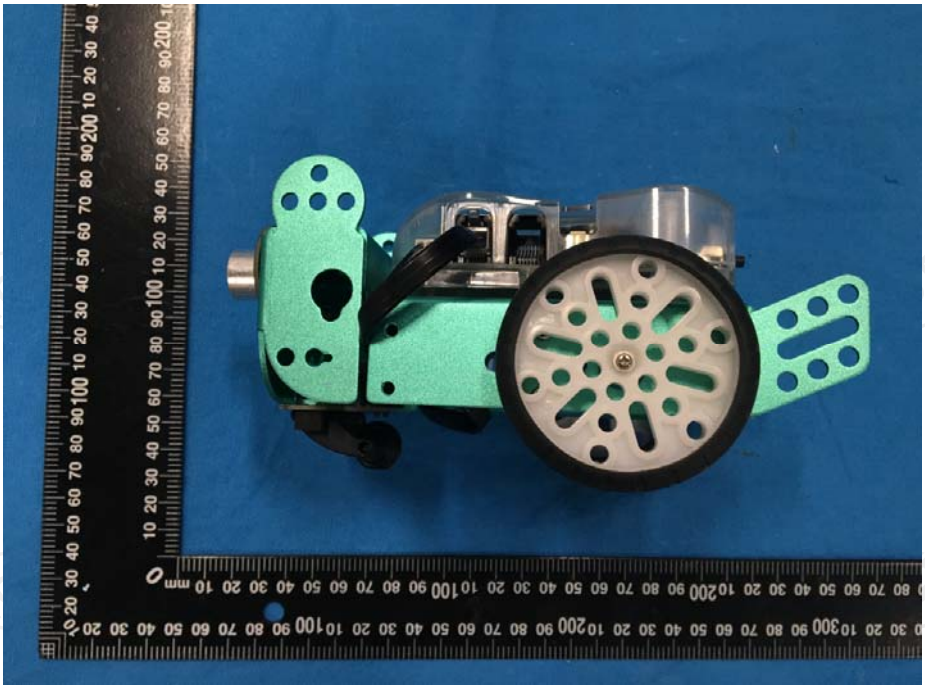

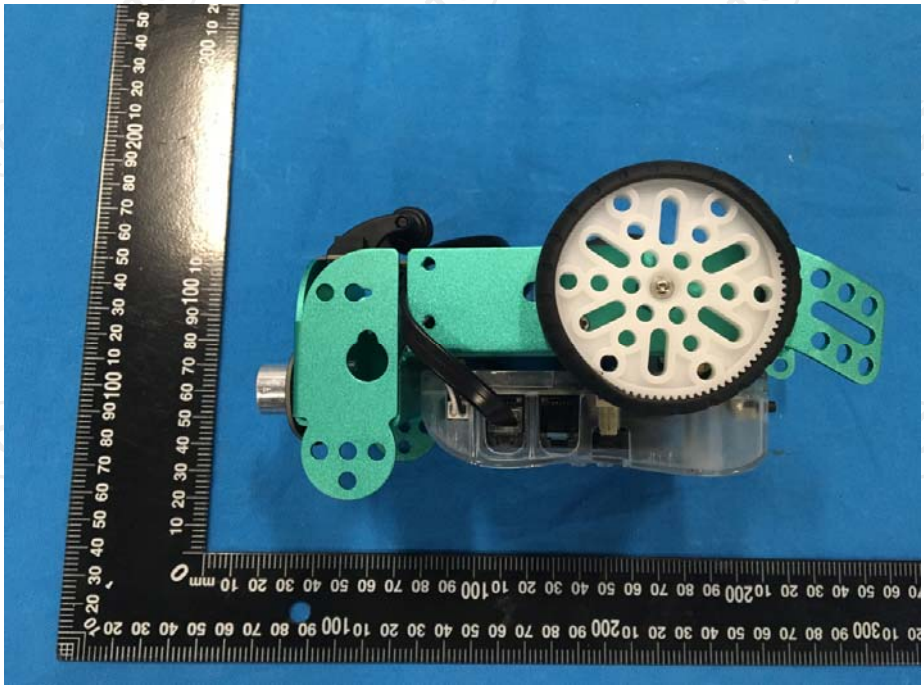

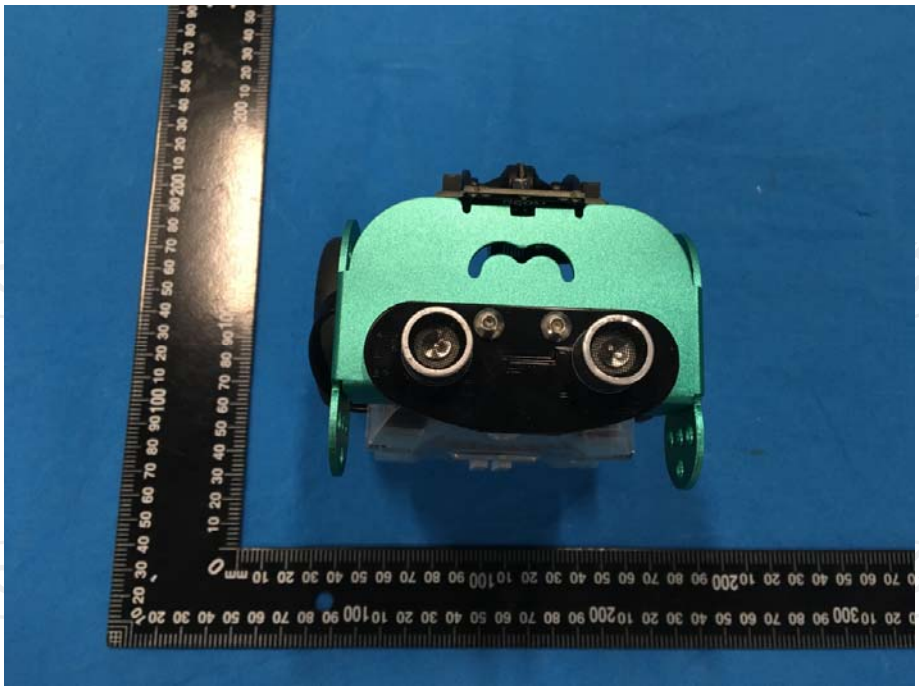

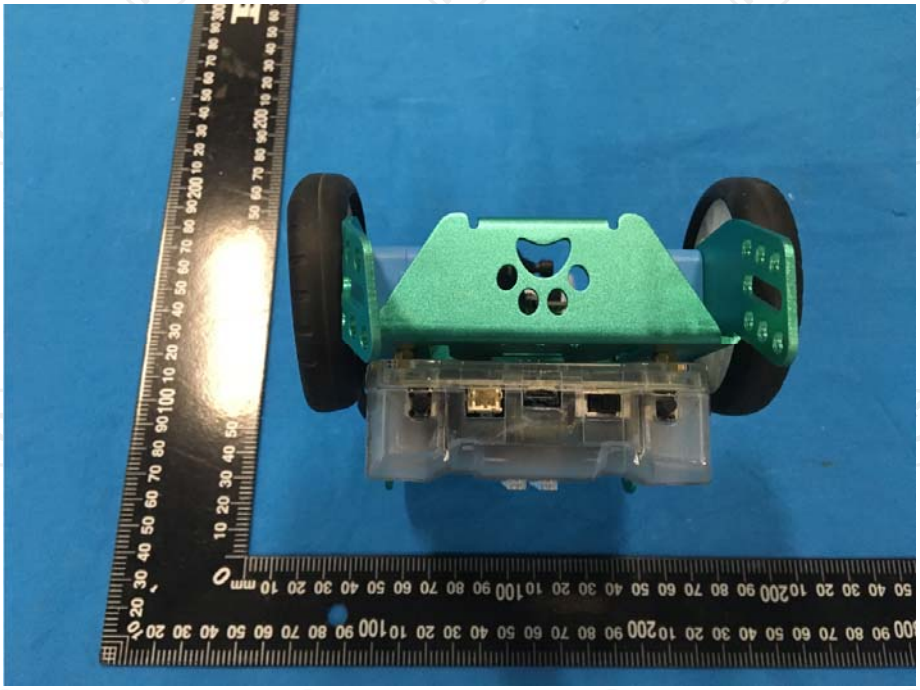

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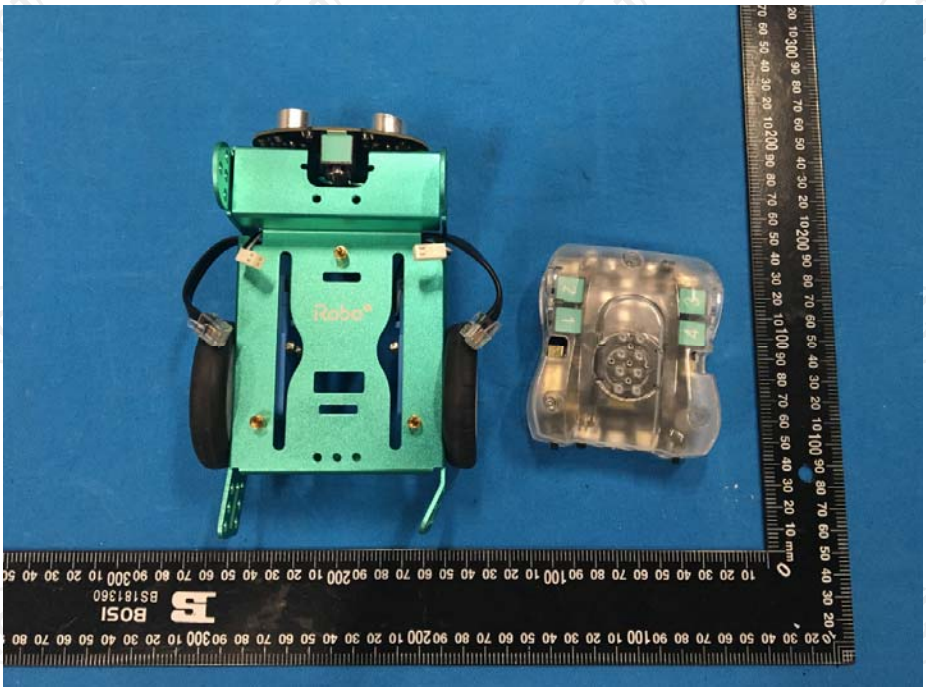
Appendix B: Photographs of EUT

Product: MIO Educational Robot

Model: Mio M-1

Internal Photos



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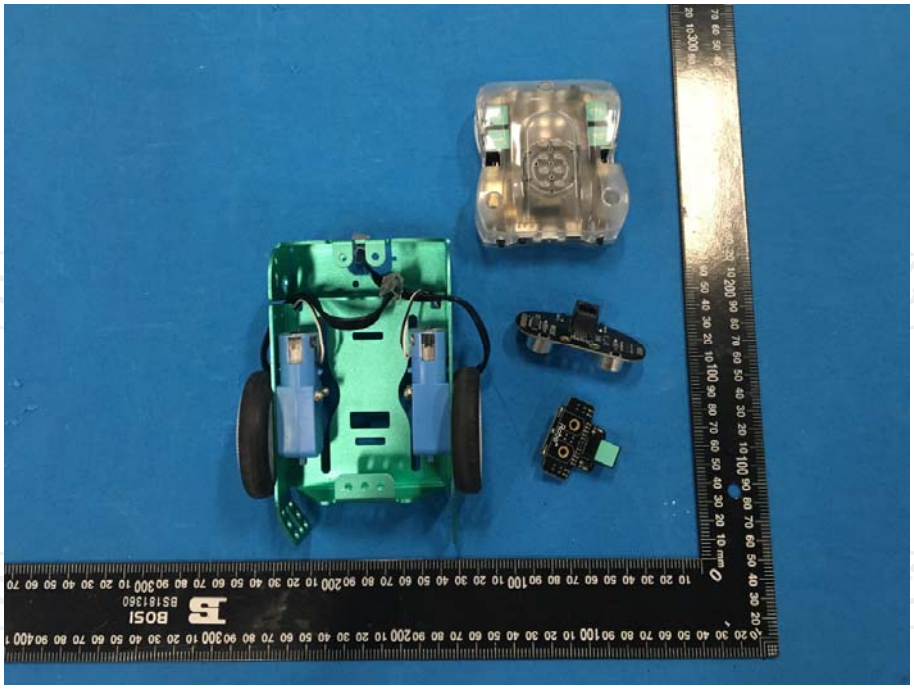

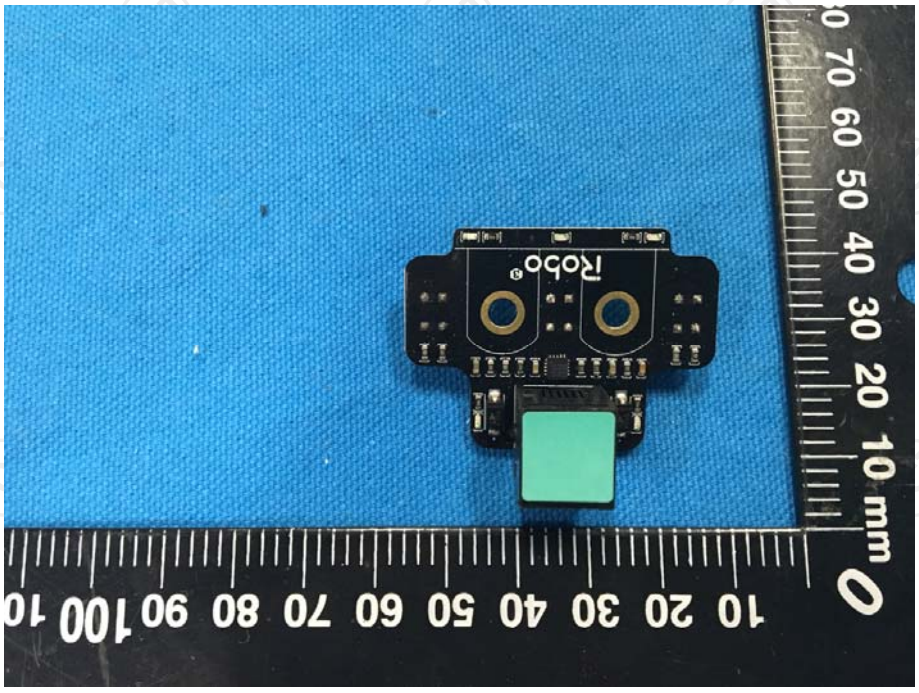

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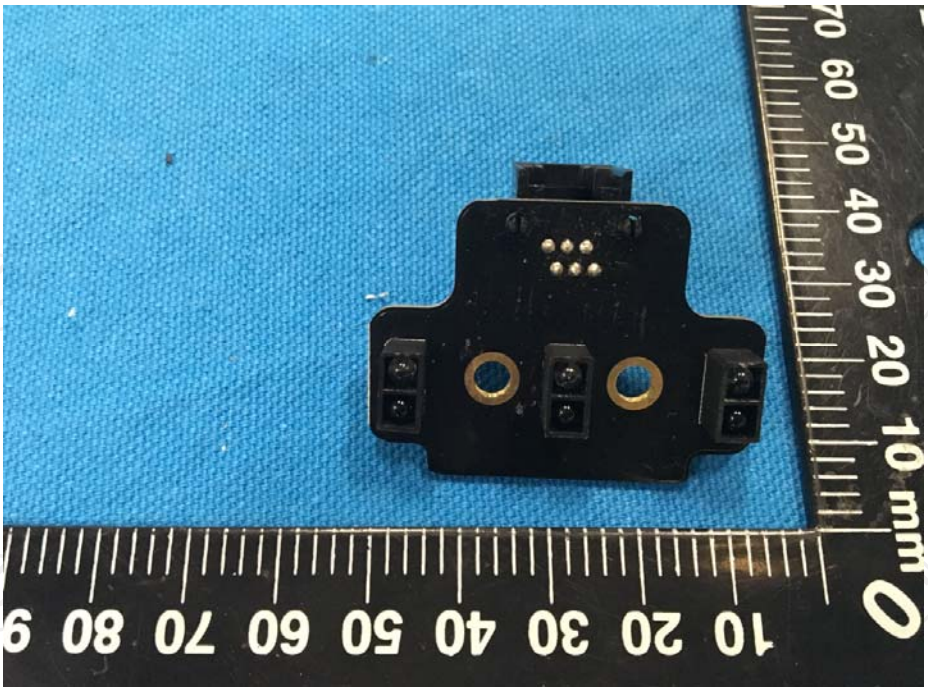
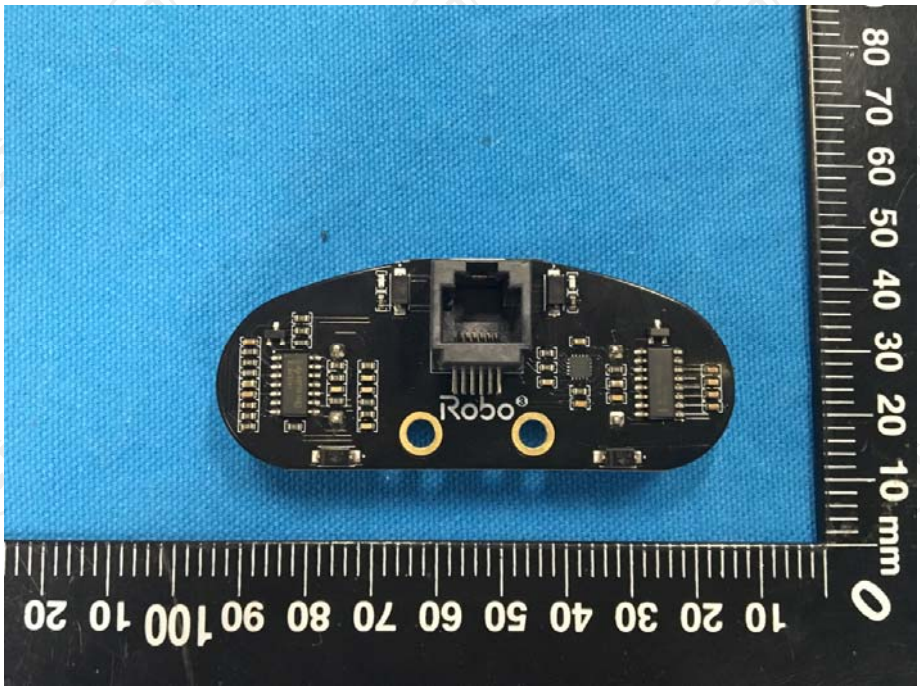
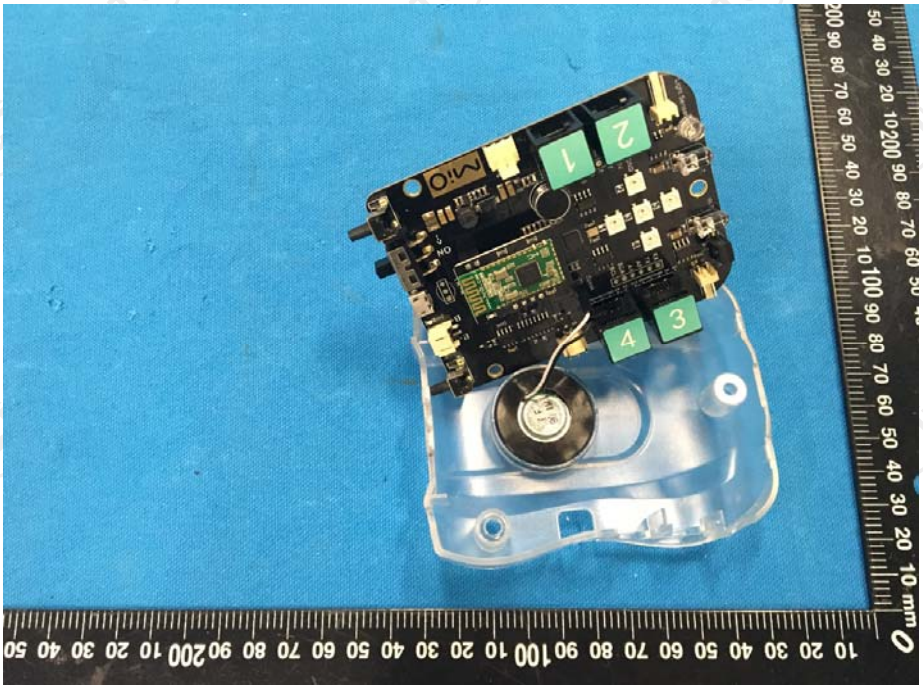
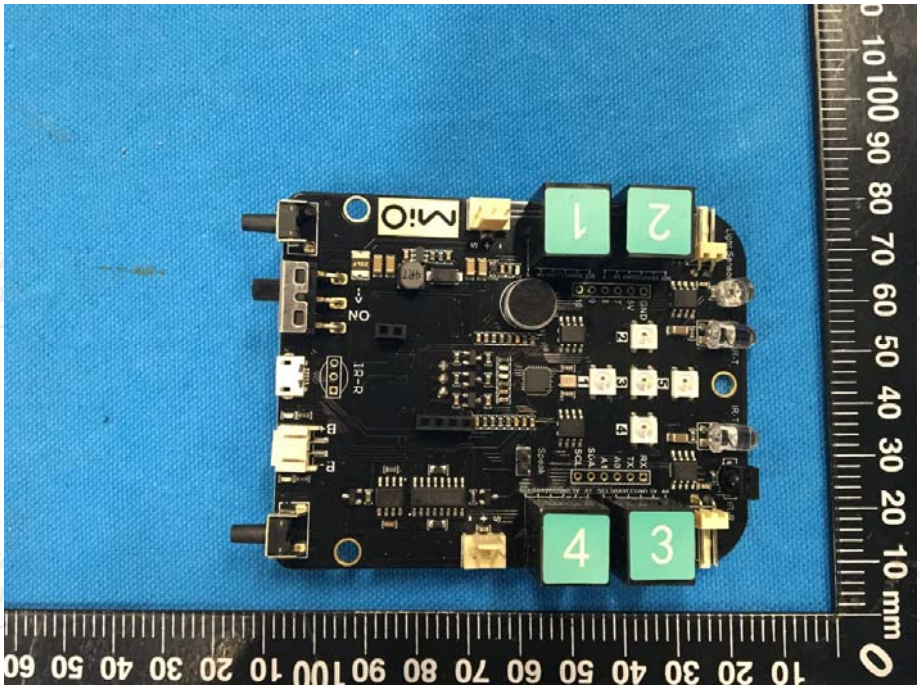
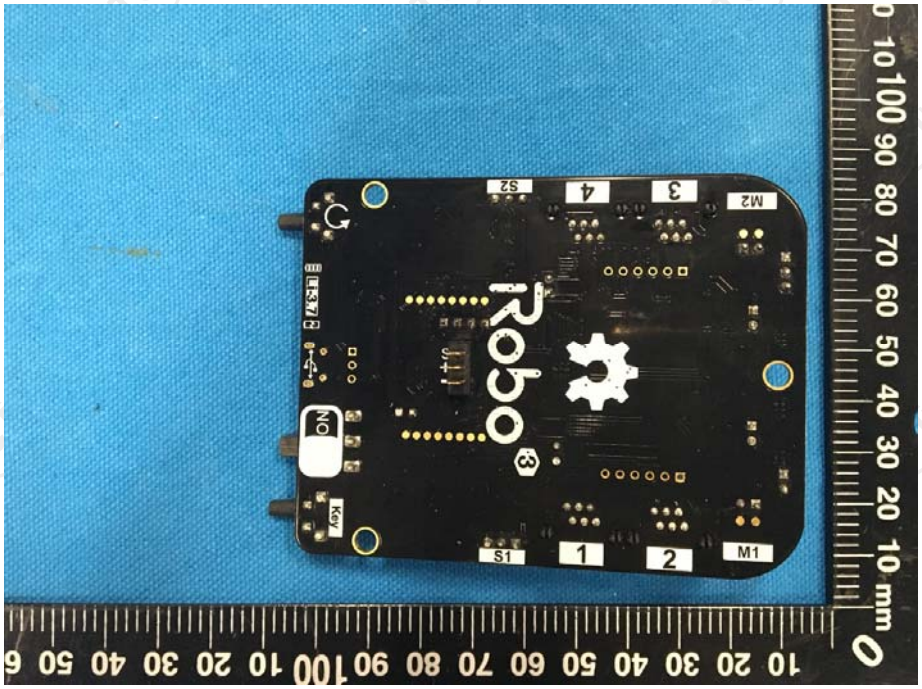
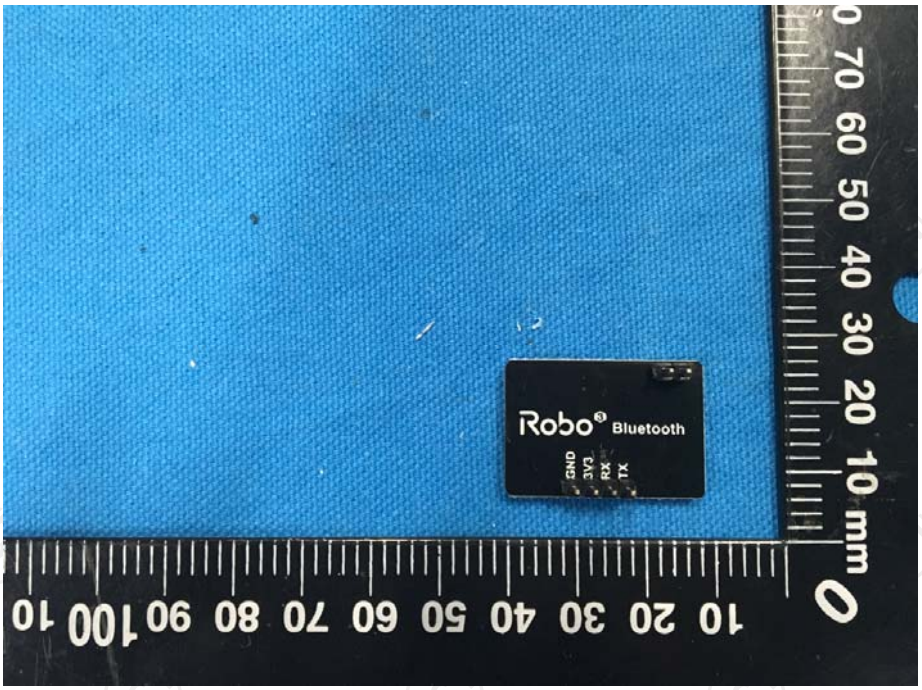


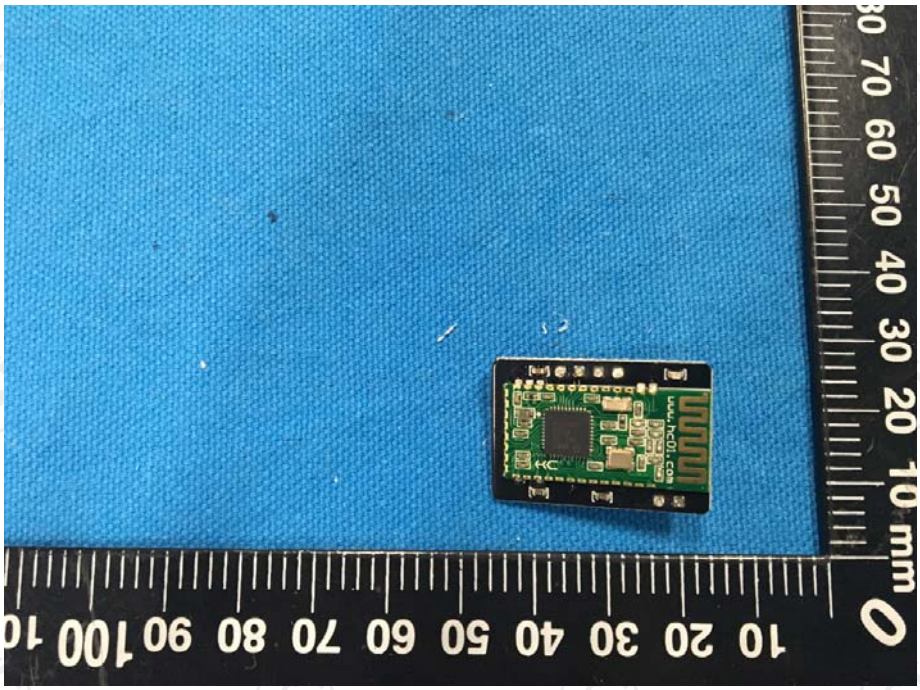

Robo




1
2
4
3
mm


Robo
ON
S1
S2
M1
M2
mm





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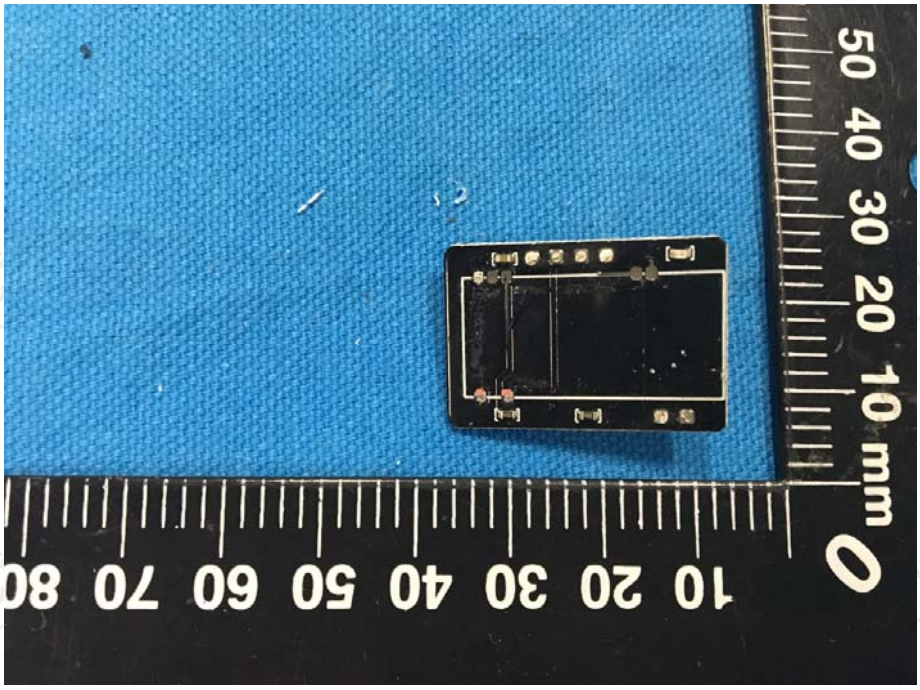
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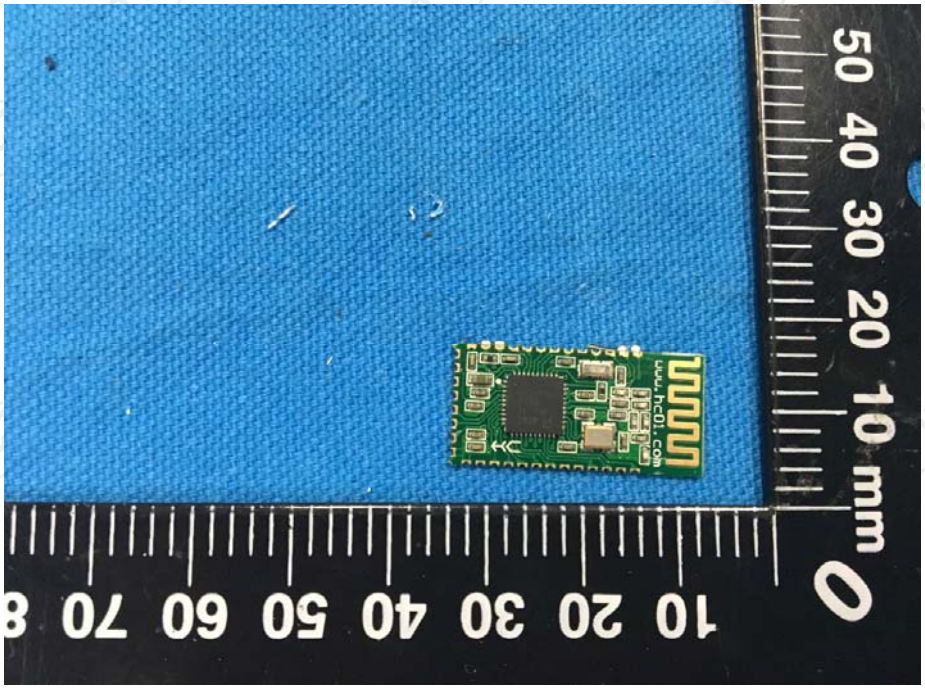
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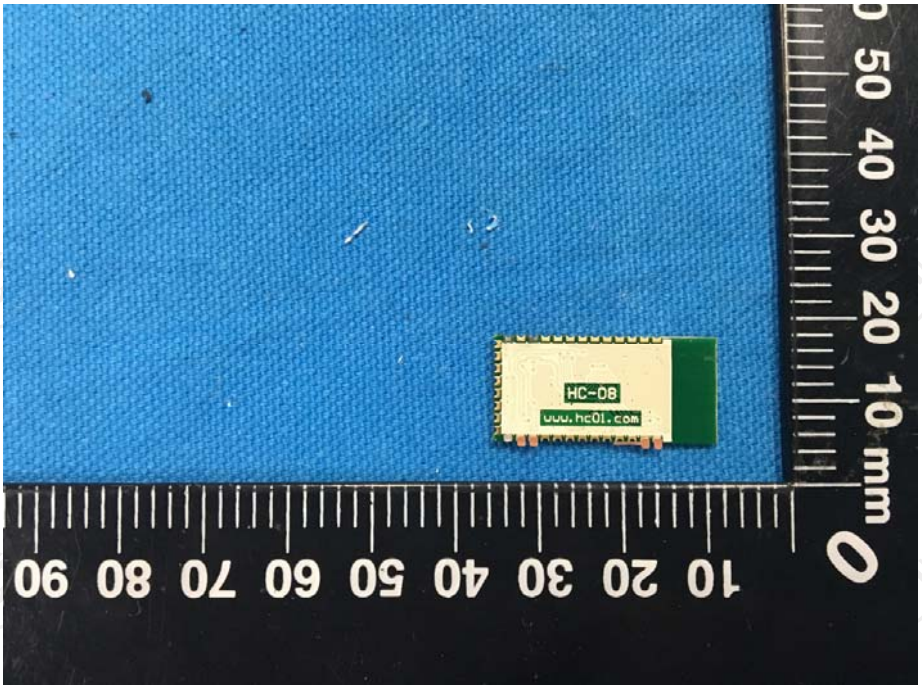

*****END OF REPORT*****

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