TEST REPORT

Product	:	Testo Control Unit
Trade mark	:	testo
Model/Type reference	:	0480 0069
Serial Number	:	N/A
Report Number	:	EED32K00112101
FCC ID	:	WAF-04800069
Date of Issue	:	Aug. 13, 2018
Test Standards	:	47 CFR Part 15 Subpart C
Test result	:	PASS

Prepared for:

Testo SE & Co. KGaA
Testo-Strasse 1, Lenzkirch 79853, Germany

Prepared by:

Centre Testing International Group Co., Ltd.
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Tested by:	Tom chen (Test Project)	Compiled by:	Max liang (Project Engineer)
Reviewed by:	Kevin yang (Reviewer)	Approved by:	Sheek Luo (Lab supervisor)
Date:	Aug. 13, 2018		Check No.:3096309230

CENTRE TESTING INTERNATIONAL GROUP CO.,LTD. Report Seal

2 Version

Version No.	Date	Description
00	Aug. 13, 2018	Original

3 Test Summary

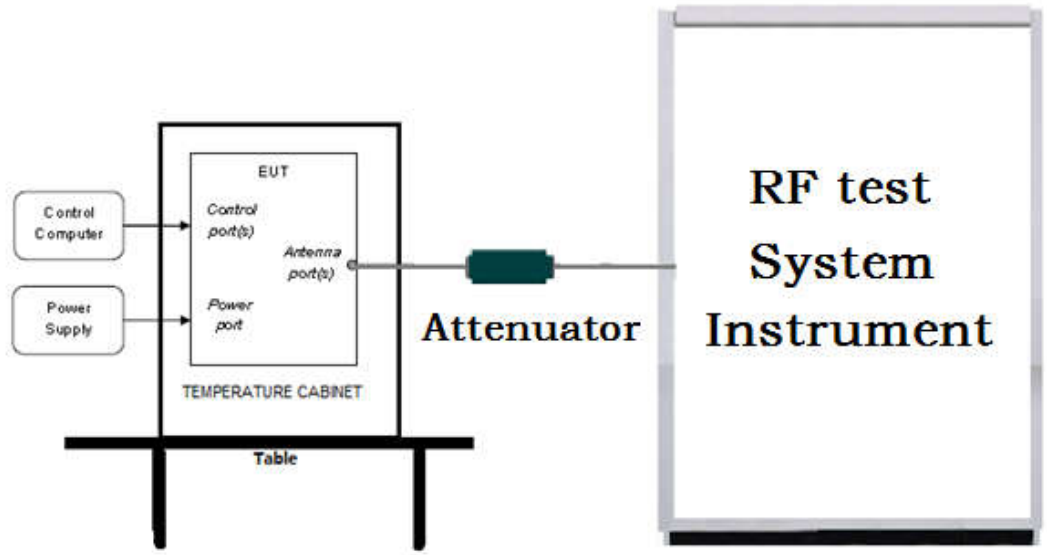
Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15Subpart C Section 15.207	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
6dB Occupied Bandwidth	47 CFR Part 15Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Power Spectral Density	47 CFR Part 15Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
RF Conducted Spurious Emissions	47 CFR Part 15Subpart C Section 15.247(d)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Radiated Spurious Emissions	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Remark: Test according to ANSI C63.4-2014 & ANSI C63.10-2013.			

4 Content

5 Test Requirement

5.1 Test setup

5.1.1 For Conducted test setup



5.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

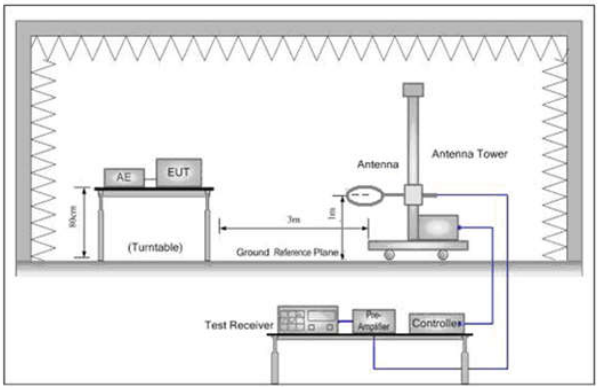


Figure 1. Below 30MHz

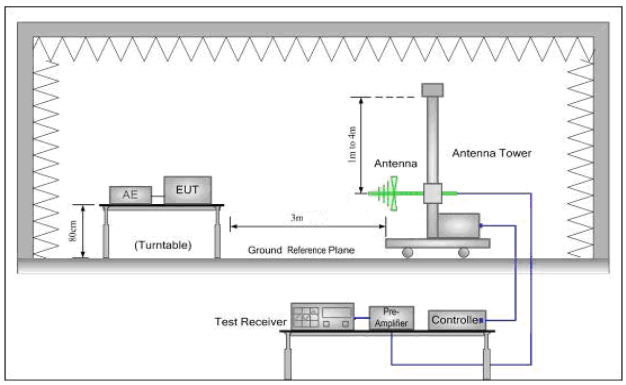


Figure 2. 30MHz to 1GHz

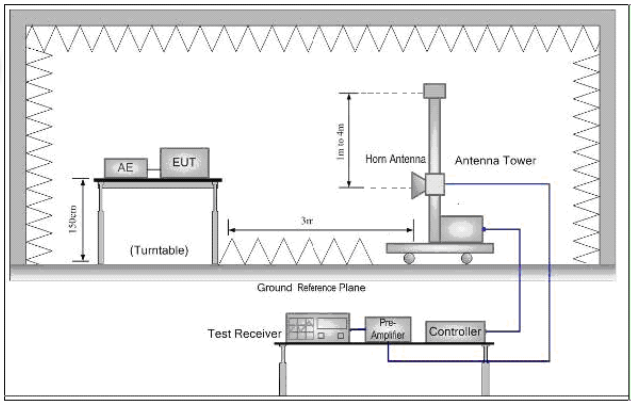
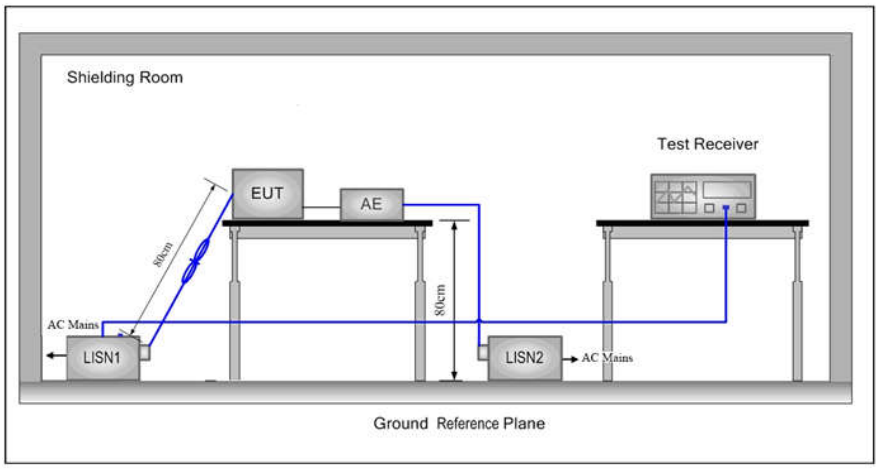


Figure 3. Above 1GHz

5.1.3 For Conducted Emissions test setup

Conducted Emissions setup



5.2 Test Environment

Operating Environment:	
Temperature:	23.1 °C
Humidity:	45% RH
Atmospheric Pressure:	1010mbar

5.3 Test Condition

Test channel:

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
GFSK	2402MHz ~2480 MHz	Channel 1	Channel 20	Channel 40
		2402MHz	2440MHz	2480MHz
TX mode:	The EUT transmitted the continuous signal at the specific channel(s).			

6 General Information

6.1 Client Information

Applicant:	Testo SE & Co. KGaA
Address of Applicant:	Testo-Strasse 1, Lenzkirch 79853, Germany
Manufacturer:	Shenzhen Phonemax Technology Co., Ltd.
Address of Manufacturer:	5F, East block, LaoBing Building, Xingye Road, Xixiang, Bao'an District, Shenzhen
Factory:	Shenzhen Newsun Technology Co., Ltd
Address of Factory:	5F, Block A1, Zhongtai Information Industrial Park, No. 2 Dezheng Road, Shilong Community, Shiyan Street, Bao`an District, Shenzhen

6.2 General Description of EUT

Product Name:	Testo Control Unit	
Model No.(EUT):	0480 0069	
Trade mark:	testo	
EUT Supports Radios application:	BT: 4.0 BT Dual mode, 2402MHz to 2480MHz WiFi: IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz IEEE 802.11n(HT40): 2422MHz to 2452MHz GPS: 1559MHz to 1610MHz	
Power Supply:	Adapter	Model: 0554 1104 Input: 100-240V~50/60Hz, 0.2A Output: 5.0V⎓1.0A
	Battery	Rechargeable Li-ion Battery 3.8V, 2150mAh, 8.17Wh
USB cable:	200cm(shielded)	

6.3 Product Specification subjective to this standard

Operation Frequency:	2402MHz~2480MHz
Bluetooth Version:	4.0
Modulation Technique:	DSSS
Modulation Type:	GFSK
Number of Channel:	40
Antenna Type and Gain:	Antenna Type: MONOPOLE Antenna Gain: 2.3dBi
Test Voltage:	AC 120V, 60Hz
Firmware version:	3.18.19(manufacturer declare)
Hardware version:	V1.2(manufacturer declare)
Sample Received Date:	May 11, 2018
Sample tested Date:	May 11, 2018 to Aug. 13, 2018

6.4 Description of Support Units

The EUT has been tested independently.

6.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd.
Hongwei Industrial Zone, Bao'an 70 District, Shenzhen, Guangdong, China 518101
Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385
No tests were sub-contracted.
FCC Designation No.: CN1164

6.6 Deviation from Standards

None.

6.7 Abnormalities from Standard Conditions

None.

6.8 Other Information Requested by the Customer

None.

6.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.31dB (30MHz-1GHz)
		0.57dB (1GHz-18GHz)
3	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-12.75GHz)
4	Conduction emission	3.6dB (9kHz to 150kHz)
		3.2dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	2.8%
7	DC power voltages	0.025%

7 Equipment List

Conducted disturbance Test					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Receiver	R&S	ESCI	100435	05-26-2017 05-25-2018	05-25-2018 05-24-2019
Temperature/ Humidity Indicator	Belida	TT-512	A19	01-24-2018	01-23-2019
LISN	R&S	ENV216	100098	05-11-2018	05-10-2019

RF Conducted test					
Equipment	**Manufacturer**	**Mode No.**	**Serial Number**	**Cal. Date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
Signal Generator	Keysight	E8257D	MY53401106	03-13-2018	03-12-2019
Spectrum Analyzer	Keysight	N9010A	MY54510339	03-13-2018	03-12-2019
Signal Generator	Keysight	N5182B	MY53051549	03-13-2018	03-12-2019
High-pass filter	Sinoscite	FL3CX03WG18 NM12-0398-002	---	01-10-2018	01-09-2019
power meter & power sensor	R&S	OSP120	101374	04-11-2018	04-10-2019
RF control unit	JS Tonscend	JS0806-2	2015860006	03-13-2018	03-12-2019

3M Semi/full-anechoic Chamber					
Equipment	**Manufacturer**	**Model No.**	**Serial Number**	**Cal. date (mm-dd-yyyy)**	**Cal. Due date (mm-dd-yyyy)**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06-04-2016	06-03-2019
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	9163-484	06-05-2018	06-04-2019
Preamplifier	JS Tonscend	EMC051845SE	980380	01-19-2018	01-18-2019
Horn Antenna	ETS-LINDGREN	3117	00057407	07-20-2015 07-18-2018	07-18-2018 07-16-2021
Loop Antenna	ETS	6502	00071730	06-22-2017	06-21-2019
Spectrum Analyzer	R&S	FSP40	100416	05-11-2018	05-10-2019
Receiver	R&S	ESCI	100435	05-26-2018 05-25-2018	05-25-2018 05-24-2019
LISN	schwarzbeck	NNBM8125	81251547	05-11-2018	05-10-2019
LISN	schwarzbeck	NNBM8125	81251548	05-11-2018	05-10-2019
Signal Generator	Agilent	E4438C	MY45095744	03-13-2018	03-12-2019
Signal Generator	Keysight	E8257D	MY53401106	03-13-2018	03-12-2019
Temperature/ Humidity Indicator	TAYLOR	1451	1905	05-02-2018	05-01-2019
Communication test set	Agilent	E5515C	GB47050534	03-16-2018	03-15-2019
Cable line	Fulai(7M)	SF106	5219/6A	01-10-2018	01-09-2019
Cable line	Fulai(6M)	SF106	5220/6A	01-10-2018	01-09-2019
Cable line	Fulai(3M)	SF106	5216/6A	01-10-2018	01-09-2019
Cable line	Fulai(3M)	SF106	5217/6A	01-10-2018	01-09-2019
Communication test set	R&S	CMW500	152394	03-16-2018	03-15-2019
High-pass filter	Sinoscite	FL3CX03WG18NM1 2-0398-002	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX01CA09CL12 -0395-001	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX01CA08CL12 -0393-001	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX02CA04CL12 -0396-002	---	01-10-2018	01-09-2019
band rejection filter	Sinoscite	FL5CX02CA03CL12 -0394-001	---	01-10-2018	01-09-2019

8 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC Part15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicesed Wireless Devices

Test Results List:

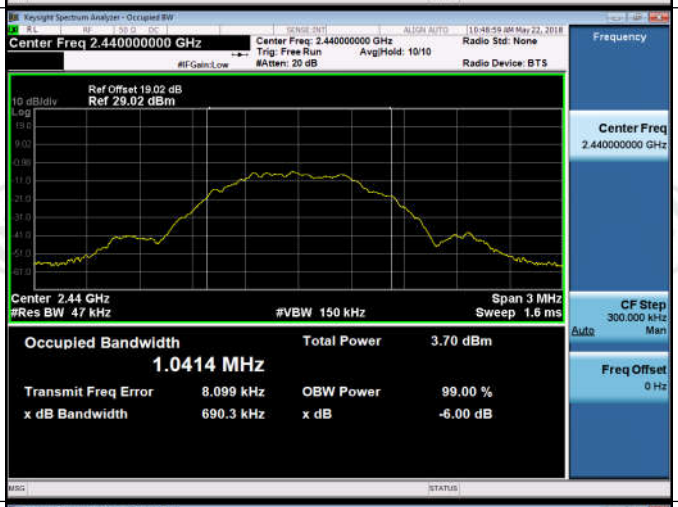
Test Requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (a)(2)	ANSI C63.10	6dB Occupied Bandwidth	PASS	Appendix A)
Part15C Section 15.247 (b)(3)	ANSI C63.10	Conducted Peak Output Power	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI C63.10	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI C63.10	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI C63.10	Power Spectral Density	PASS	Appendix E)
Part15C Section 15.203/15.247 (c)	ANSI C63.10	Antenna Requirement	PASS	Appendix F)
Part15C Section 15.207	ANSI C63.10	AC Power Line Conducted Emission	PASS	Appendix G)
Part15C Section 15.205/15.209	ANSI C63.10	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix H)
Part15C Section 15.205/15.209	ANSI C63.10	Radiated Spurious Emissions	PASS	Appendix I)

Appendix A): 6dB Occupied Bandwidth

Test Result

Mode	Channel	6dB Bandwidth [MHz]	99% OBW[MHz]	Verdict	Remark
BLE	LCH	0.6929	1.0393	PASS	Peak detector
BLE	MCH	0.6903	1.0414	PASS	
BLE	HCH	0.6880	1.0407	PASS	

Test Graphs

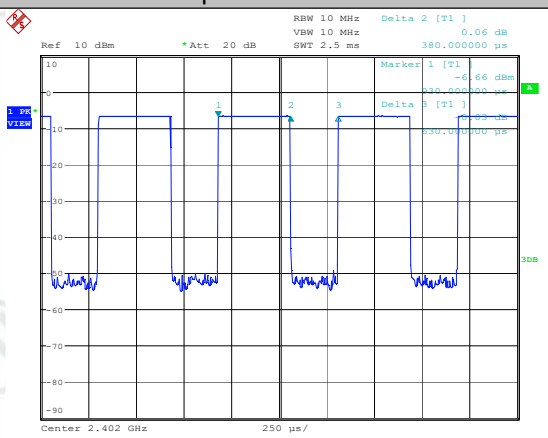
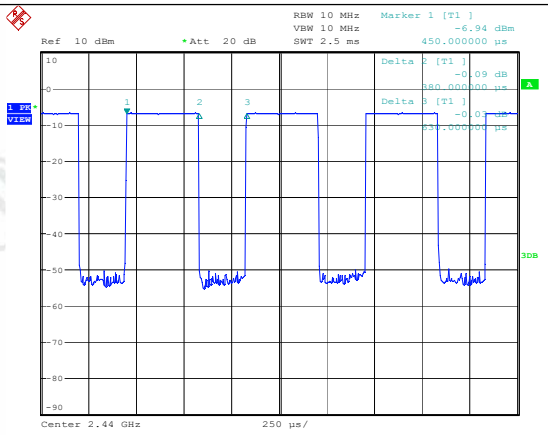
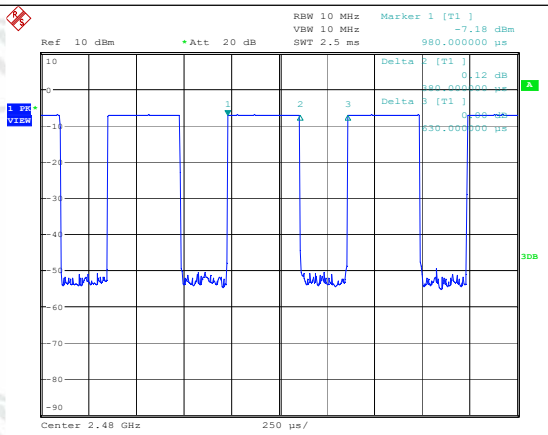
Graphs		
LCH		
MCH		
HCH		

Appendix B): Conducted Peak Output Power

Duty Cycle

Mode	Channel	Duty Cycle[%]	Verdict
BLE	LCH	60.32	PASS
BLE	MCH	60.32	PASS
BLE	HCH	60.32	PASS

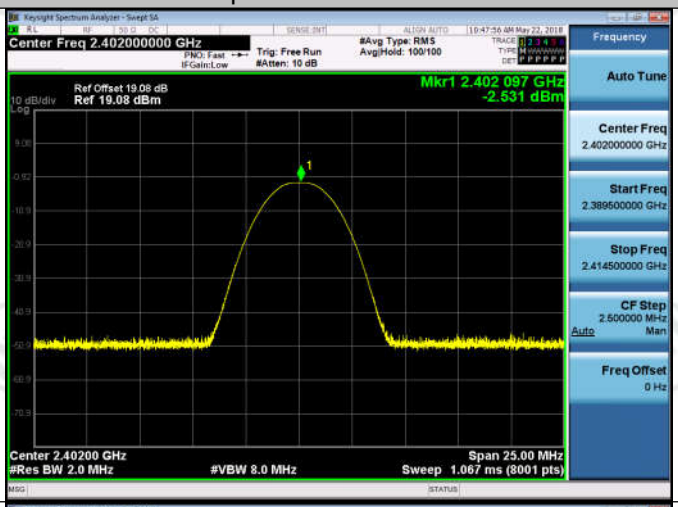
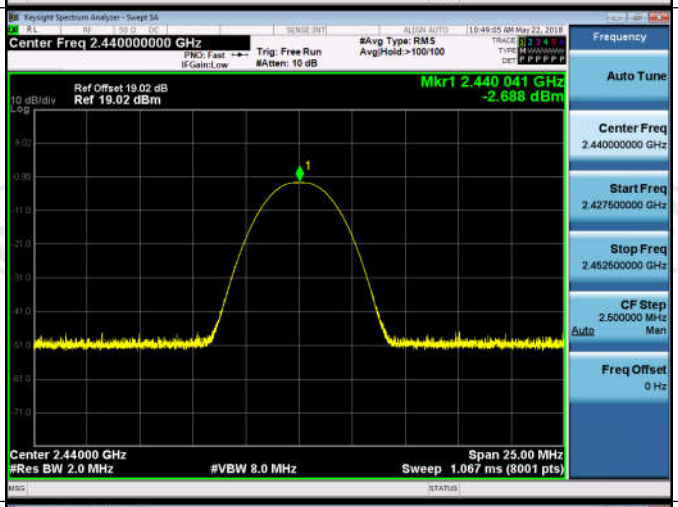
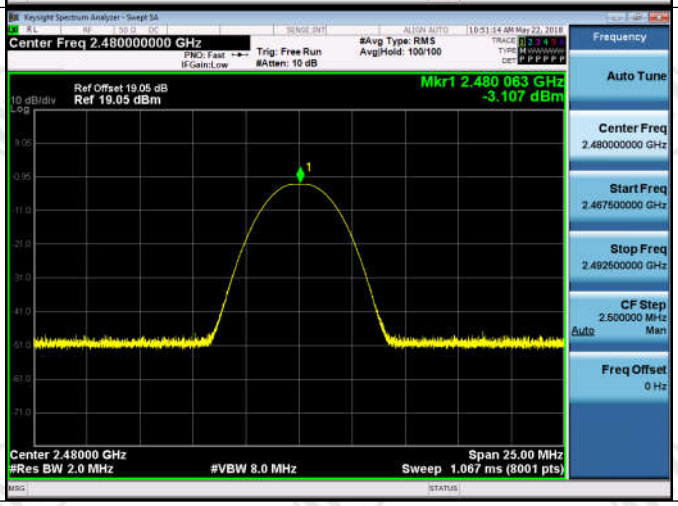
Duty Cycle Test Graph

Graphs	
LCH	
MCH	
HCH	

Test Result

Mode	Channel	Conduct Peak Power[dBm]	Av.Power [dBm]	Verdict
BLE	LCH	-2.531	-6.922	PASS
BLE	MCH	-2.688	-7.079	PASS
BLE	HCH	-3.107	-7.498	PASS

Test Graphs

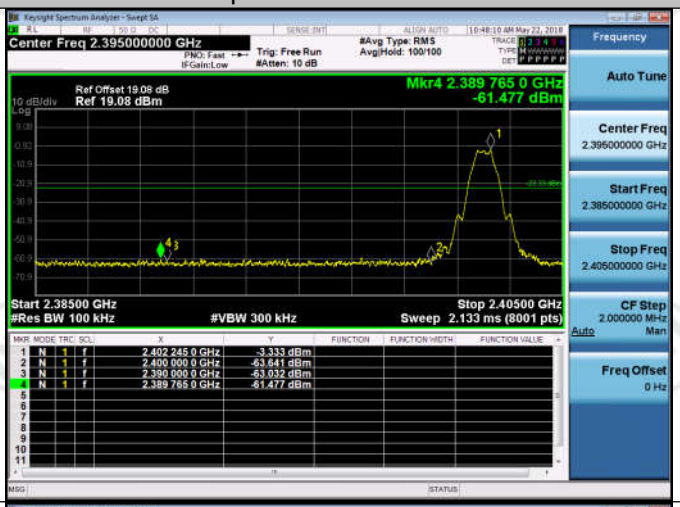
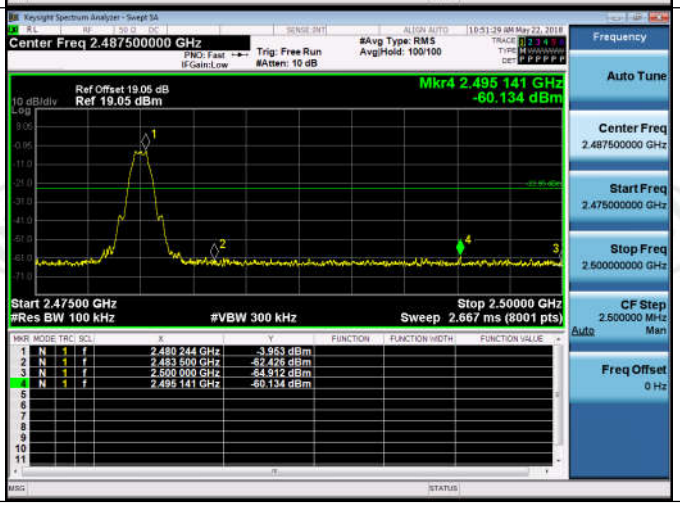
Graphs		
LCH		
MCH		
HCH		

Appendix C): Band-edge for RF Conducted Emissions

Result Table

Mode	Channel	Carrier Power[dBm]	Max.Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	LCH	-3.333	-61.477	-23.33	PASS
BLE	HCH	-3.953	-60.134	-23.95	PASS

Test Graphs

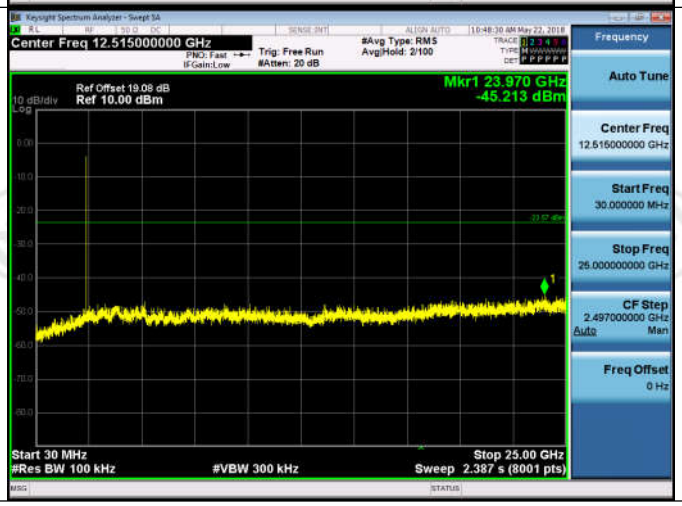
Graphs			
LCH			
HCH			

Appendix D): RF Conducted Spurious Emissions

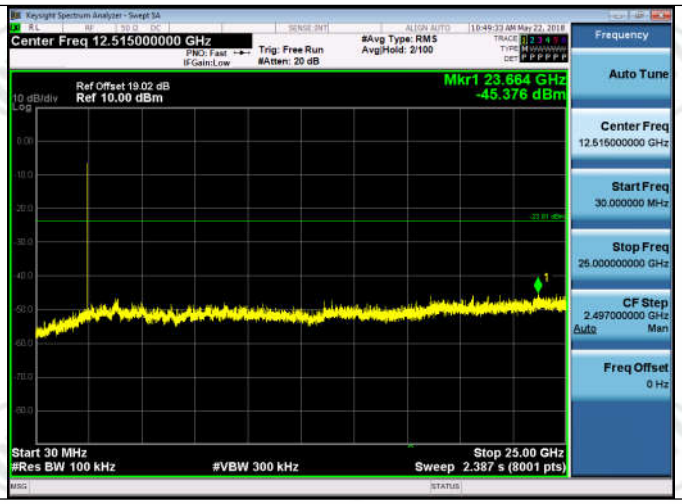
Result Table

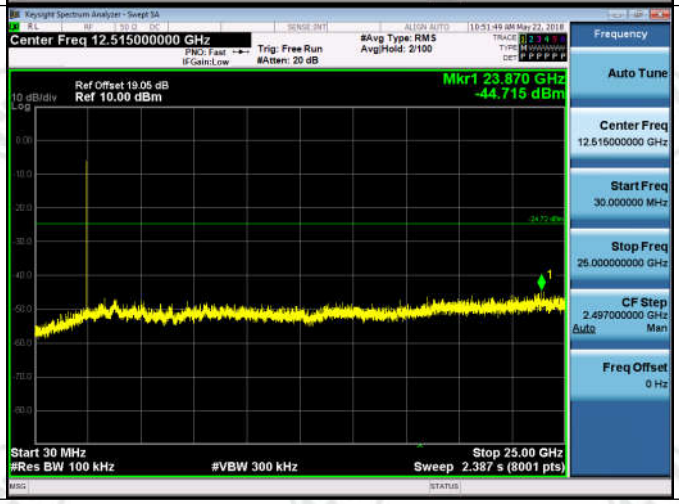
Mode	Channel	Pref [dBm]	Puw[dBm]	Verdict
BLE	LCH	-3.57	<Limit	PASS
BLE	MCH	-3.807	<Limit	PASS
BLE	HCH	-4.723	<Limit	PASS

Test Graphs

BLE_LCH_Graphs		
Pref/BLE/LCH		
Puw/BLE/LCH		

BLE_MCH_Graphs		
Pref/BLE/MCH		

Puw/BLE/MCH	

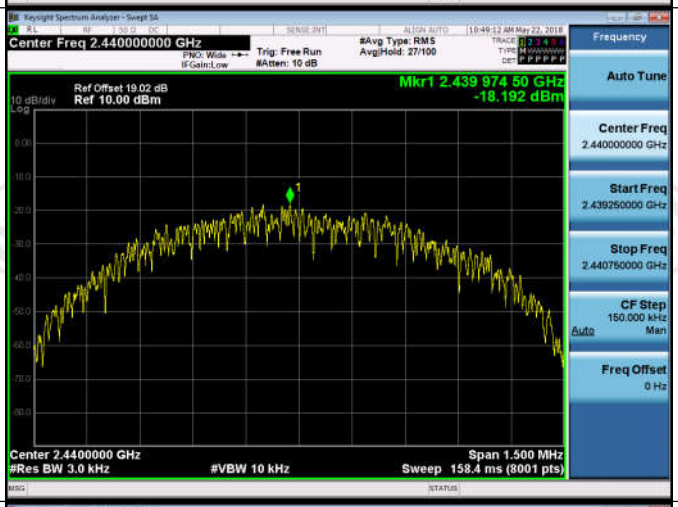
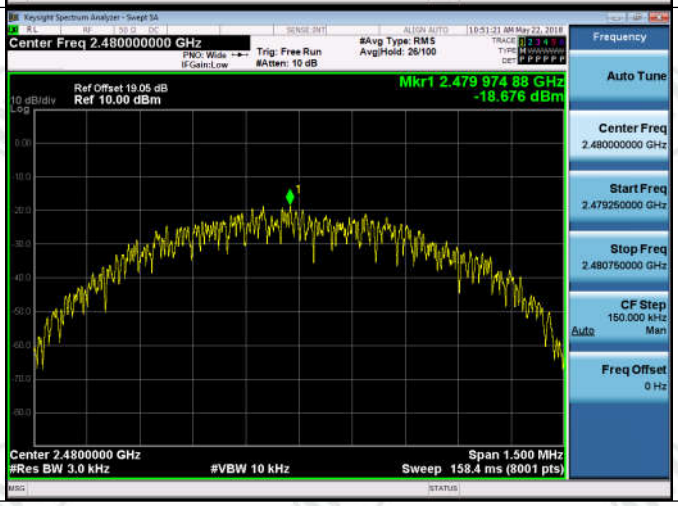
BLE_HCH_Graphs	
Pref/BLE/HCH	
Puw/BLE/HCH	

Appendix E): Power Spectral Density

Result Table

Mode	Channel	PSD [[dBm/3kHz]	Limit [dBm/3kHz]	Verdict
BLE	LCH	-18.021	8	PASS
BLE	MCH	-18.192	8	PASS
BLE	HCH	-18.676	8	PASS

Test Graphs

Graphs		
LCH		
MCH		
HCH		

Appendix F): Antenna Requirement

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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is MONOPOLE and no consideration of replacement. The best case gain of the antenna is 2.3dBi.

Appendix G): AC Power Line Conducted Emission

Test Procedure:	Test frequency range :150KHz-30MHz 1)The mains terminal disturbance voltage test was conducted in a shielded room. 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded. 3)The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. 5) 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 on conducted measurement.
Limit:	

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

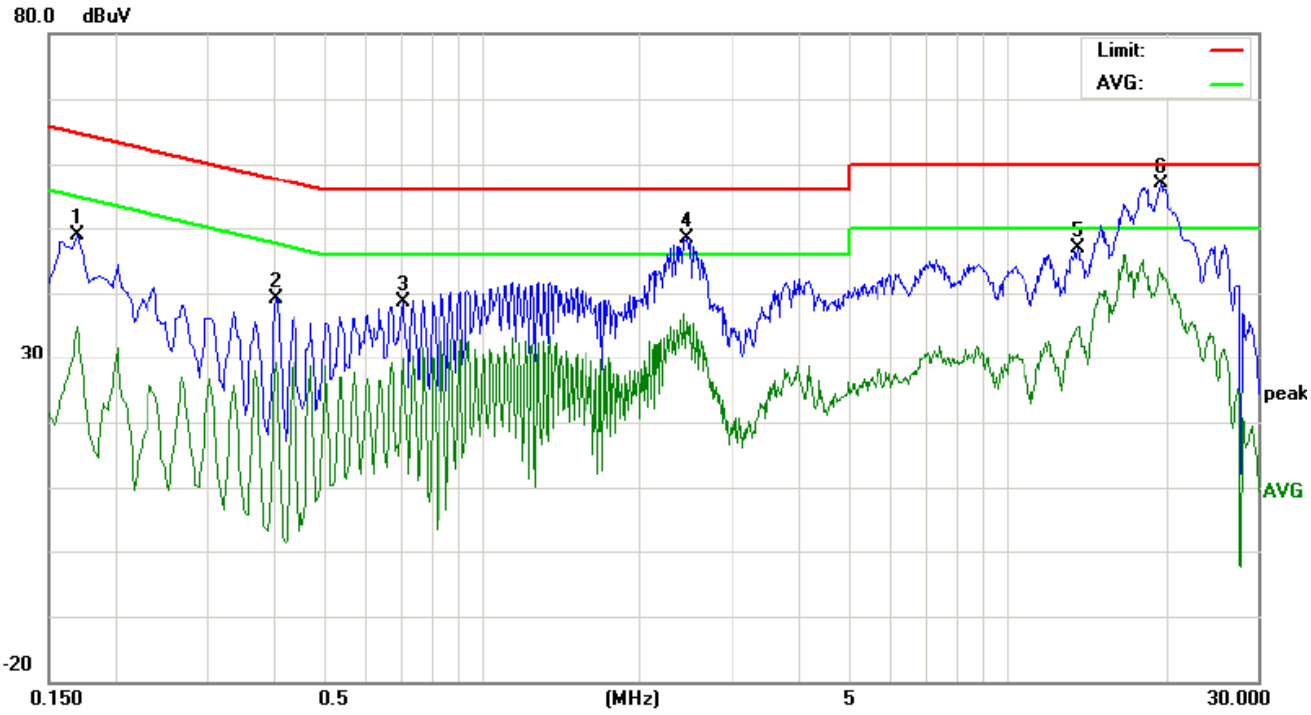
NOTE : The lower limit is applicable at the transition frequency

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

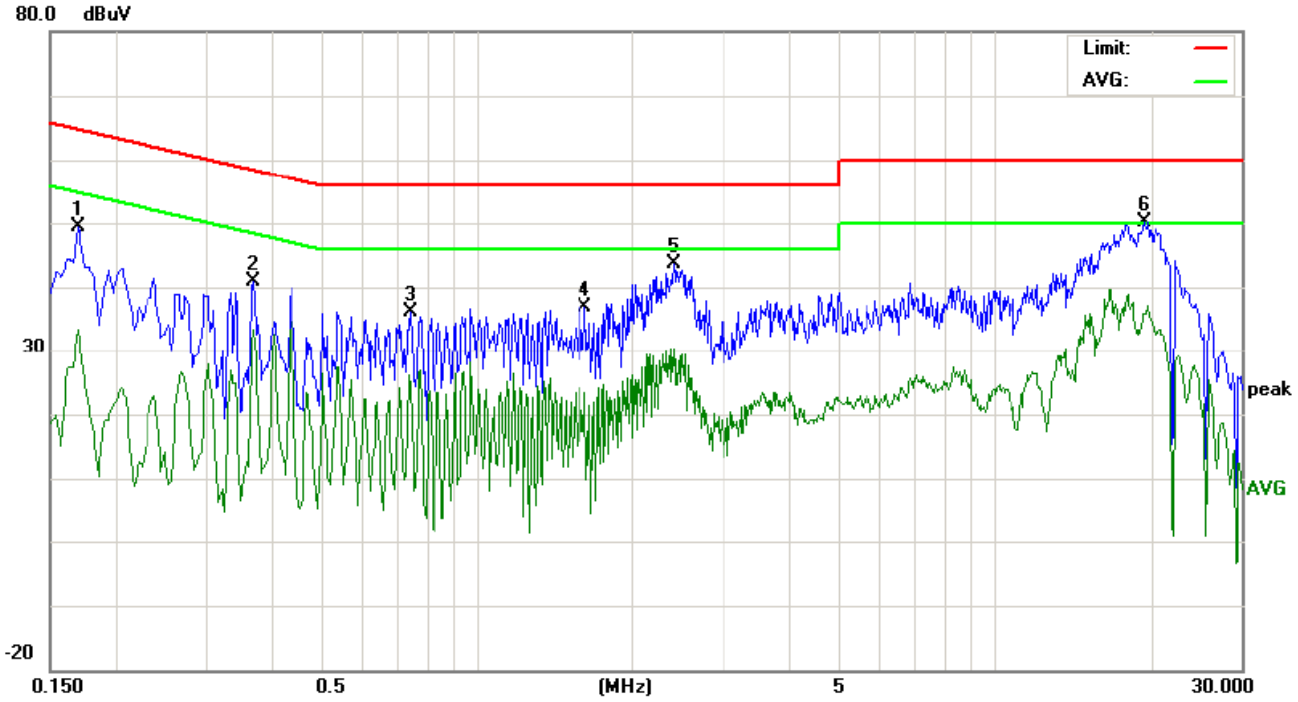
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1700	39.20	36.08	25.11	9.74	48.94	45.82	34.85	64.96	54.96	-19.14	-20.11	P	
2	0.4060	29.50	26.42	19.46	9.75	39.25	36.17	29.21	57.73	47.73	-21.56	-18.52	P	
3	0.7060	28.83	26.43	20.22	9.75	38.58	36.18	29.97	56.00	46.00	-19.82	-16.03	P	
4	2.4539	38.72	35.10	26.03	9.70	48.42	44.80	35.73	56.00	46.00	-11.20	-10.27	P	
5	13.6900	36.93	33.76	24.91	9.95	46.88	43.71	34.86	60.00	50.00	-16.29	-15.14	P	
6	19.5740	46.93	44.53	32.75	10.06	56.99	54.59	42.81	60.00	50.00	-5.41	-7.19	P	

Neutral line:



No.	Freq.	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)			
	MHz	Peak	QP	AVG	dB	peak	QP	AVG	QP	AVG	QP	AVG	P/F	Comment
1	0.1700	39.52	36.43	23.54	9.74	49.26	46.17	33.28	64.96	54.96	-18.79	-21.68	P	
2	0.3700	31.13	28.74	23.57	9.76	40.89	38.50	33.33	58.50	48.50	-20.00	-15.17	P	
3	0.7460	26.44	23.48	14.96	9.75	36.19	33.23	24.71	56.00	46.00	-22.77	-21.29	P	
4	1.6220	27.13	24.85	13.70	9.72	36.85	34.57	23.42	56.00	46.00	-21.43	-22.58	P	
5	2.3980	34.02	30.48	20.71	9.71	43.73	40.19	30.42	56.00	46.00	-15.81	-15.58	P	
6	19.4460	40.18	37.41	25.86	10.05	50.23	47.46	35.91	60.00	50.00	-12.54	-14.09	P	

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

Appendix H): Restricted bands around fundamental frequency (Radiated)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. 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 the measurement.
d. 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 was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel

Above 1GHz test procedure as below:

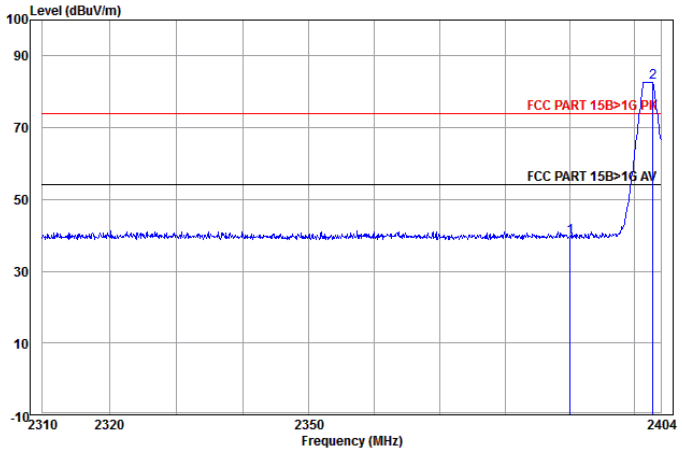
g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. . Test the EUT in the lowest channel , the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

Frequency	Limit (dBμV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

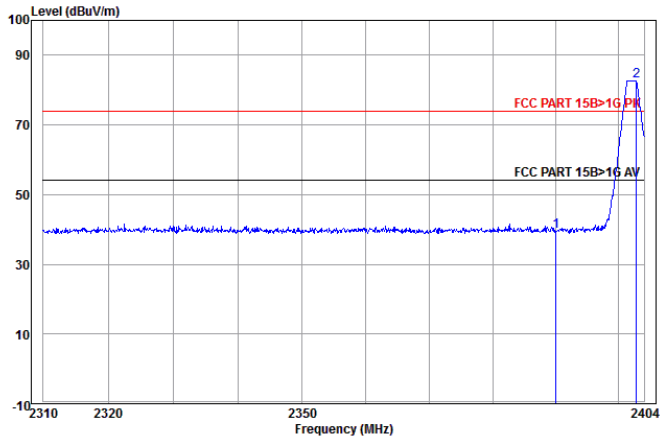
Test plot as follows:

Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Horizontal	Remark: Peak



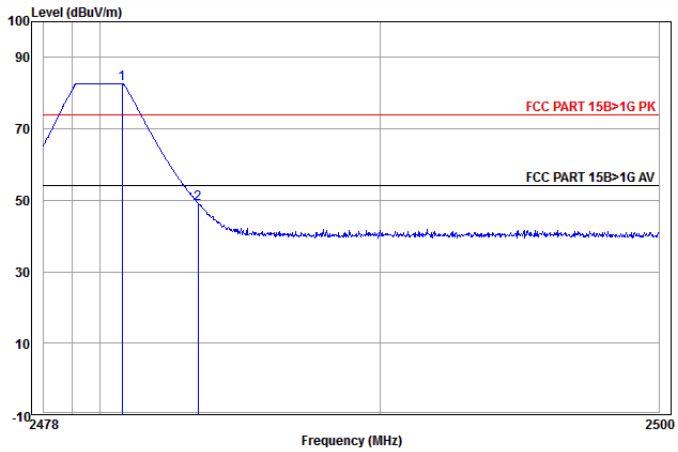
	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	3.07	44.03	47.81	39.38	74.00	-34.62	Horizontal	Peak
2 pp	2402.754	32.56	3.08	44.04	90.99	82.59	74.00	8.59	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2402MHz	Test channel: Lowest	Polarization: Vertical	Remark: Peak



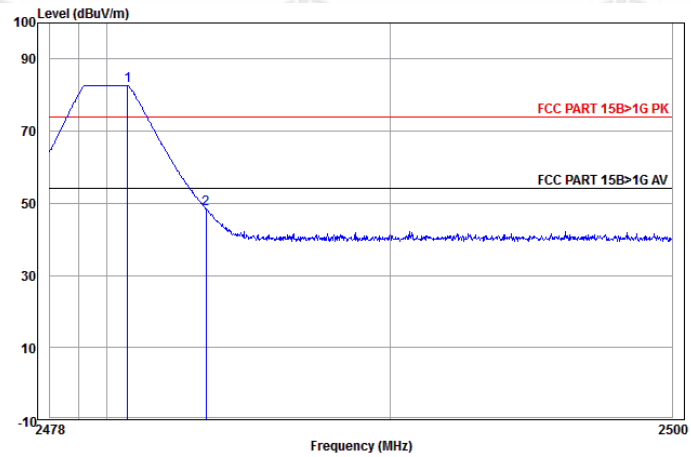
	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1	2390.000	32.53	3.07	44.03	47.93	39.50	74.00	-34.50	Vertical	Peak
2 pp	2402.754	32.56	3.08	44.04	90.99	82.59	74.00	8.59	Vertical	Peak

Worse case mode:	GFSK		
Frequency: 2480MHz	Test channel: Highest	Polarization: Horizontal	Remark: Peak



	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.783	32.71	3.12	44.14	91.00	82.69	74.00	8.69	Horizontal	Peak
2	2483.500	32.71	3.12	44.14	57.49	49.18	74.00	-24.82	Horizontal	Peak

Worse case mode:	GFSK		
Frequency: 2480MHz	Test channel: Highest	Polarization: Vertical	Remark: Peak



	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB		
1 pp	2480.739	32.71	3.12	44.14	91.00	82.69	74.00	8.69	Vertical	Peak
2	2483.500	32.71	3.12	44.14	56.82	48.51	74.00	-25.49	Vertical	Peak

Note:

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 -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

Appendix I): Radiated Spurious Emissions

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

Test Procedure:

Below 1GHz test procedure as below:

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, whichwas mounted on the top of a variable-height antenna tower.
c. 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 the measurement.
d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. 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.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
j. Repeat above procedures until all frequencies measured was complete.

Limit:

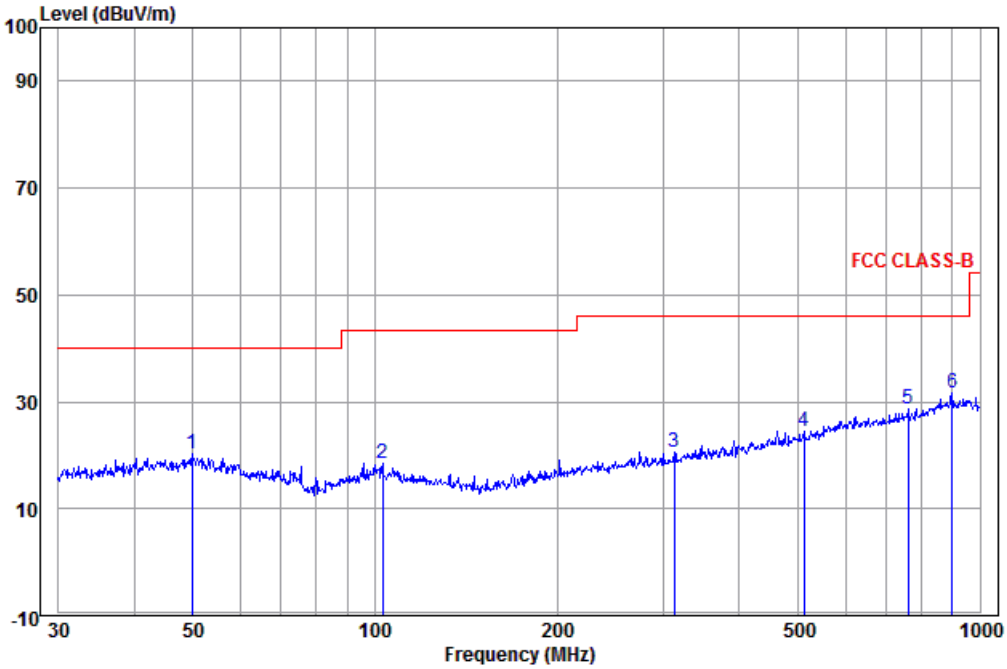
Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Radiated Spurious Emissions test Data:

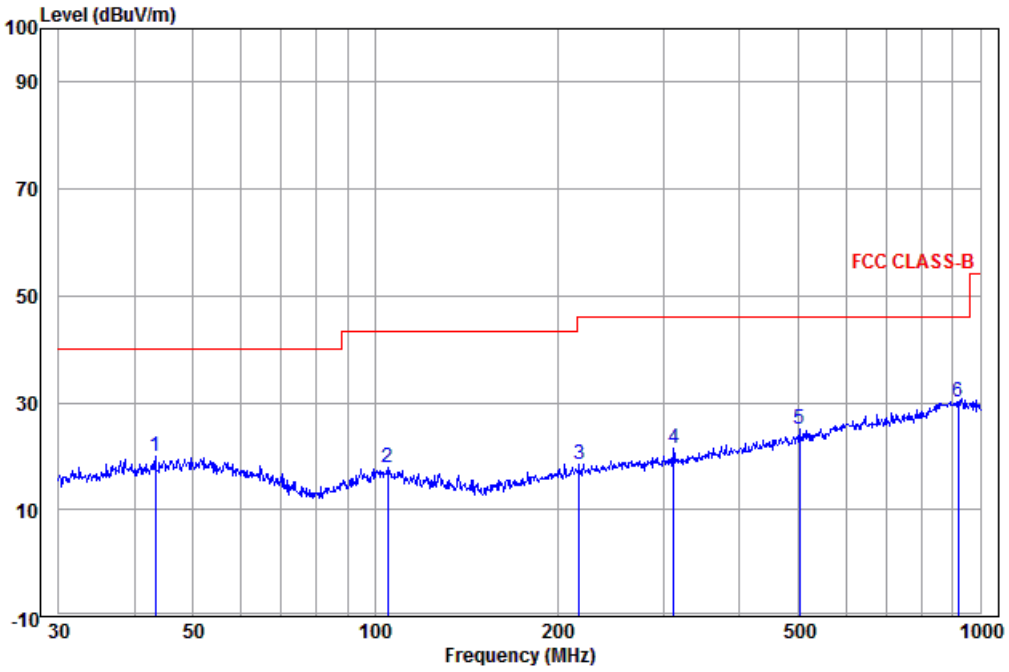
Radiated Emission below 1GHz

30MHz~1GHz (QP)		
Test mode:	Transmitting	Vertical



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	49.881	14.59	0.11	5.46	20.16	40.00	-19.84	Vertical	QP
2	103.080	12.22	0.59	5.79	18.60	43.50	-24.90	Vertical	QP
3	312.179	13.66	1.13	5.91	20.70	46.00	-25.30	Vertical	QP
4	511.835	17.12	1.52	5.81	24.45	46.00	-21.55	Vertical	QP
5	760.704	19.57	2.50	6.55	28.62	46.00	-17.38	Vertical	QP
6 pp	900.147	22.10	2.49	6.96	31.55	46.00	-14.45	Vertical	QP

Test mode:	Transmitting	Horizontal



	Freq	Ant Factor	Cable Loss	Read Level	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB		
1	43.353	14.09	0.07	5.78	19.94	40.00	-20.06	Horizontal	QP
2	104.903	12.06	0.59	5.35	18.00	43.50	-25.50	Horizontal	QP
3	217.544	11.91	1.19	5.40	18.50	46.00	-27.50	Horizontal	QP
4	311.087	13.64	1.13	6.64	21.41	46.00	-24.59	Horizontal	QP
5	502.940	16.96	1.52	6.68	25.16	46.00	-20.84	Horizontal	QP
6 pp	919.287	22.06	2.44	5.73	30.23	46.00	-15.77	Horizontal	QP

Transmitter Emission above 1GHz

Worse case mode:		GFSK		Test channel:		Lowest	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1276.818	30.41	1.98	44.28	48.81	36.92	74.00	-37.08	Pass	H
1777.646	31.36	2.61	43.70	49.10	39.37	74.00	-34.63	Pass	H
4804.000	34.69	5.98	44.60	48.02	44.09	74.00	-29.91	Pass	H
6017.064	35.91	7.44	44.50	49.26	48.11	74.00	-25.89	Pass	H
7206.000	36.42	6.97	44.77	48.87	47.49	74.00	-26.51	Pass	H
9608.000	37.88	6.98	45.58	46.86	46.14	74.00	-27.86	Pass	H
1188.980	30.20	1.84	44.40	47.82	35.46	74.00	-38.54	Pass	V
1502.732	30.88	2.29	43.99	48.74	37.92	74.00	-36.08	Pass	V
4804.000	34.69	5.98	44.60	48.44	44.51	74.00	-29.49	Pass	V
5850.919	35.79	7.29	44.51	49.64	48.21	74.00	-25.79	Pass	V
7206.000	36.42	6.97	44.77	47.83	46.45	74.00	-27.55	Pass	V
9608.000	37.88	6.98	45.58	46.49	45.77	74.00	-28.23	Pass	V

Worse case mode:		GFSK		Test channel:		Middle	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1289.885	30.43	2.00	44.26	48.81	36.98	74.00	-37.02	Pass	H
1545.405	30.96	2.35	43.95	49.13	38.49	74.00	-35.51	Pass	H
4880.000	34.85	6.13	44.60	49.14	45.52	74.00	-28.48	Pass	H
6001.768	35.90	7.44	44.50	49.32	48.16	74.00	-25.84	Pass	H
7320.000	36.43	6.85	44.87	46.89	45.30	74.00	-28.70	Pass	H
9760.000	38.05	7.12	45.55	45.90	45.52	74.00	-28.48	Pass	H
1062.998	29.88	1.63	44.59	49.15	36.07	74.00	-37.93	Pass	V
1410.080	30.69	2.17	44.11	49.14	37.89	74.00	-36.11	Pass	V
4880.000	34.85	6.13	44.60	48.57	44.95	74.00	-29.05	Pass	V
6017.064	35.91	7.44	44.50	48.91	47.76	74.00	-26.24	Pass	V
7320.000	36.43	6.85	44.87	46.45	44.86	74.00	-29.14	Pass	V
9760.000	38.05	7.12	45.55	47.13	46.75	74.00	-27.25	Pass	V

Worse case mode:		GFSK		Test channel:		Highest	Remark: Peak		
Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Result	Antenna Polaxis
1293.173	30.44	2.00	44.25	49.16	37.35	74.00	-36.65	Pass	H
2102.853	31.93	2.90	43.65	48.59	39.77	74.00	-34.23	Pass	H
4960.000	35.02	6.29	44.60	47.11	43.82	74.00	-30.18	Pass	H
6611.326	36.21	7.28	44.56	49.00	47.93	74.00	-26.07	Pass	H
7440.000	36.45	6.73	44.97	47.48	45.69	74.00	-28.31	Pass	H
9920.000	38.22	7.26	45.52	46.96	46.92	74.00	-27.08	Pass	H
1192.011	30.21	1.85	44.40	49.32	36.98	74.00	-37.02	Pass	V
1651.146	31.15	2.47	43.83	48.18	37.97	74.00	-36.03	Pass	V
4960.000	35.02	6.29	44.60	46.99	43.70	74.00	-30.30	Pass	V
6032.401	35.92	7.43	44.50	48.97	47.82	74.00	-26.18	Pass	V
7440.000	36.45	6.73	44.97	46.89	45.10	74.00	-28.90	Pass	V
9920.000	38.22	7.26	45.52	46.63	46.59	74.00	-27.41	Pass	V

Note:

1) 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 -Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

PHOTOGRAPHS OF TEST SETUP

Test model No.: 0480 0069

Radiated spurious emission Test Setup-1(9K-30M)

Radiated spurious emission Test Setup-2(30M-1G)

Radiated spurious emission Test Setup-3(Above 1GHz)

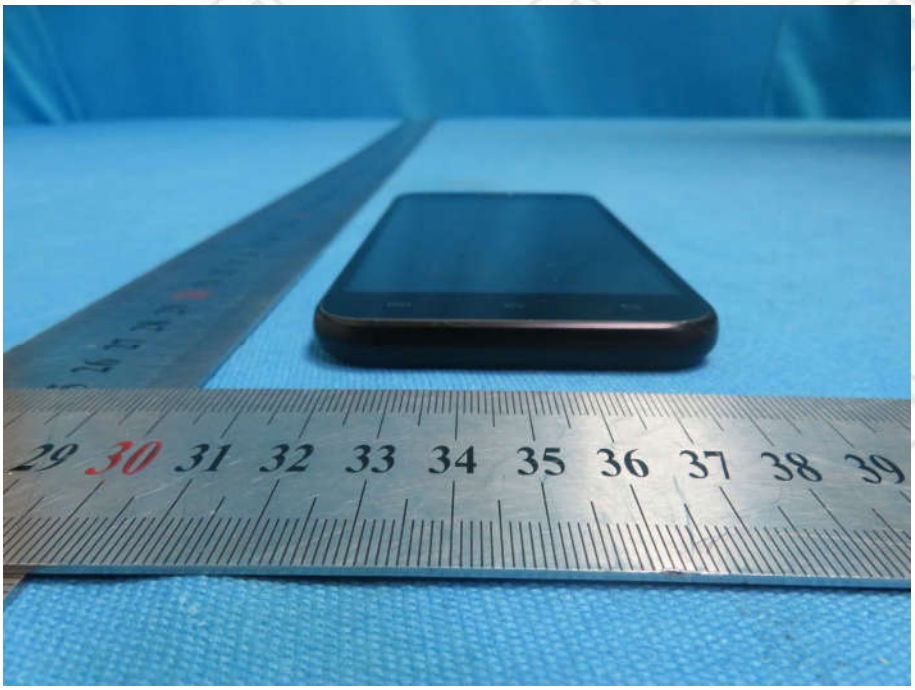
Conducted Emissions Test Setup

PHOTOGRAPHS OF EUT Constructional Details

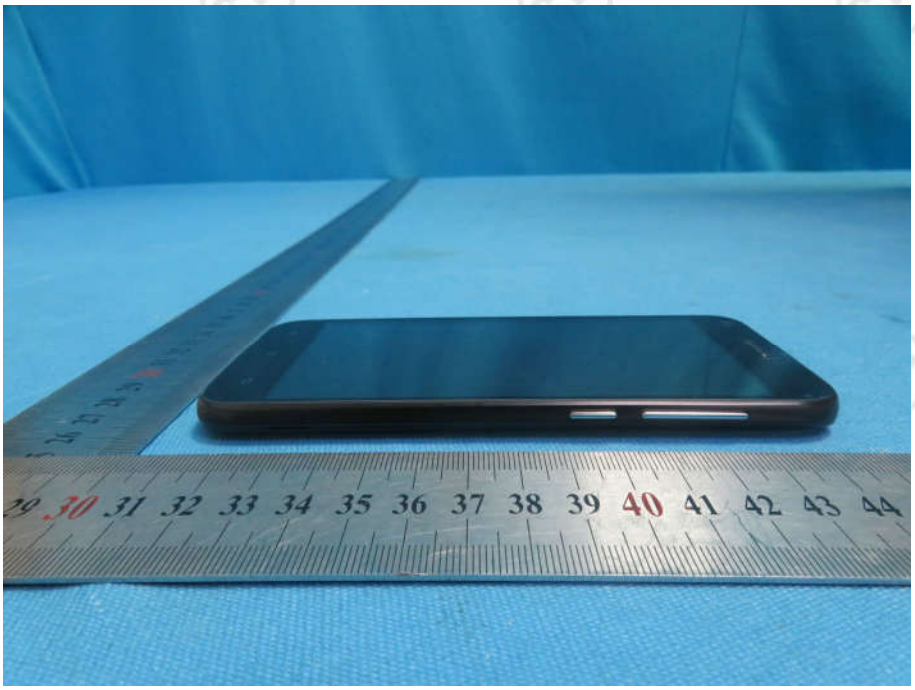
Test model No.: 0480 0069

View of Product-1

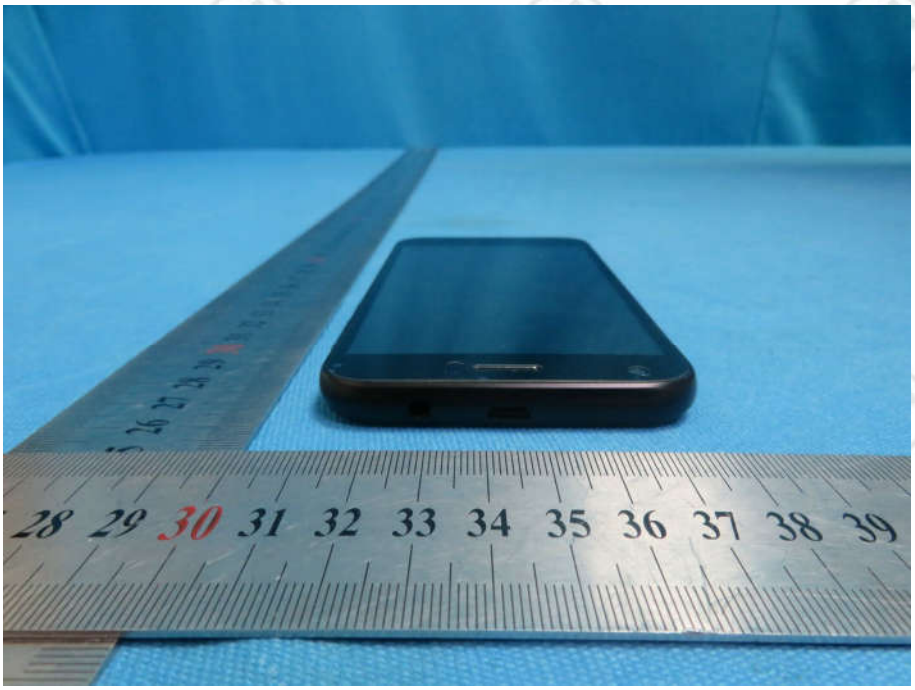
View of Product-2



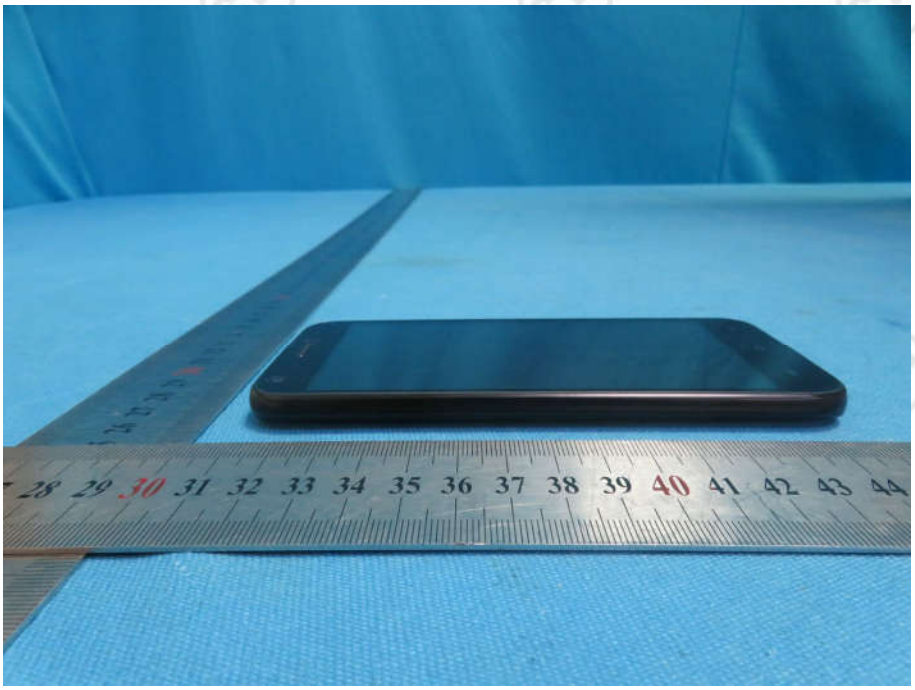
View of Product-3



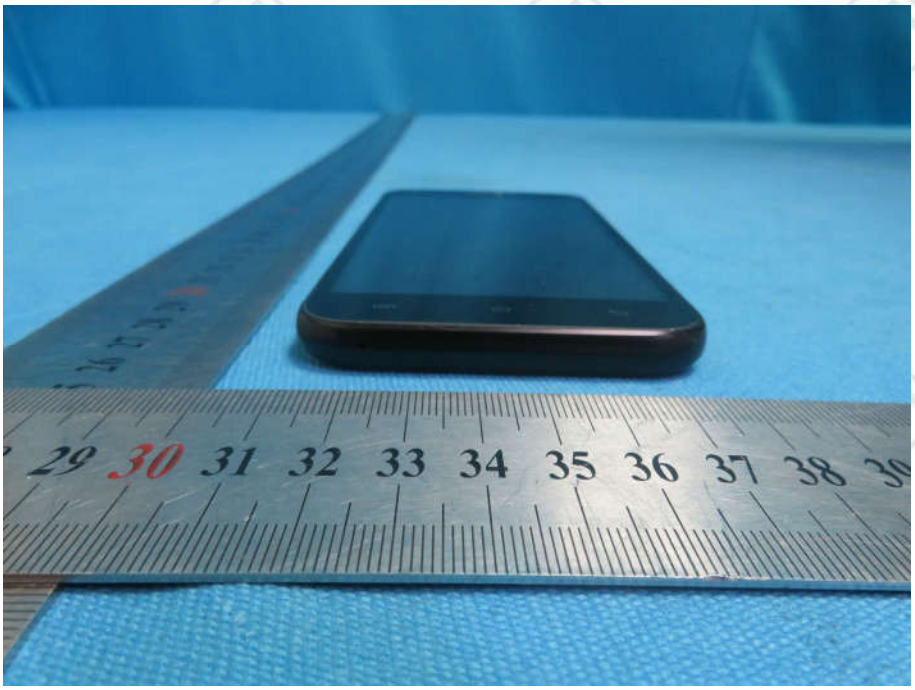
View of Product-4



View of Product-5



View of Product-6



View of Product-7

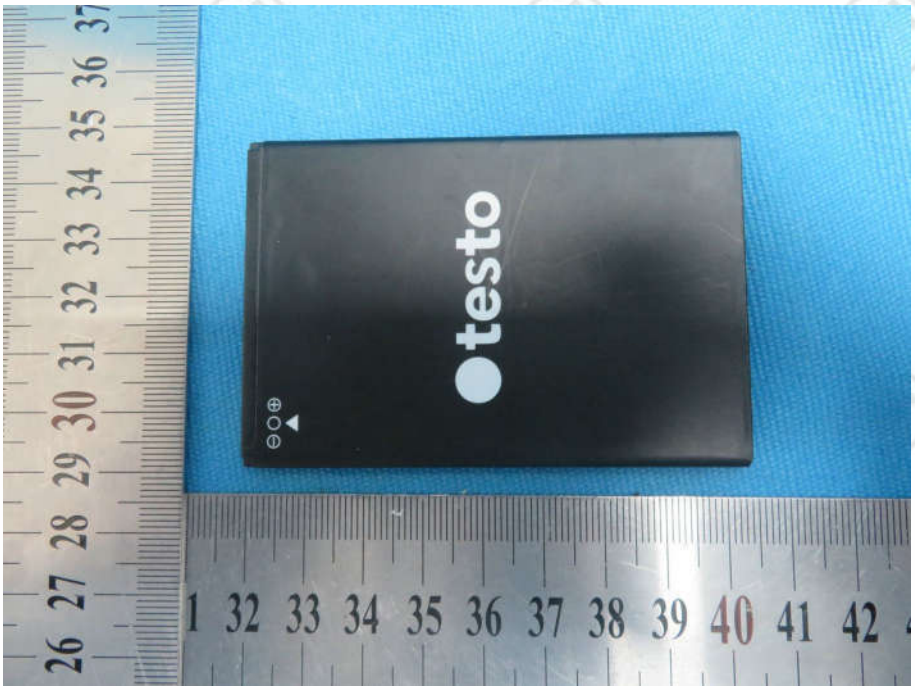
View of Product-8

View of Product-9

View of Product-10

View of Product-11

View of Product-12

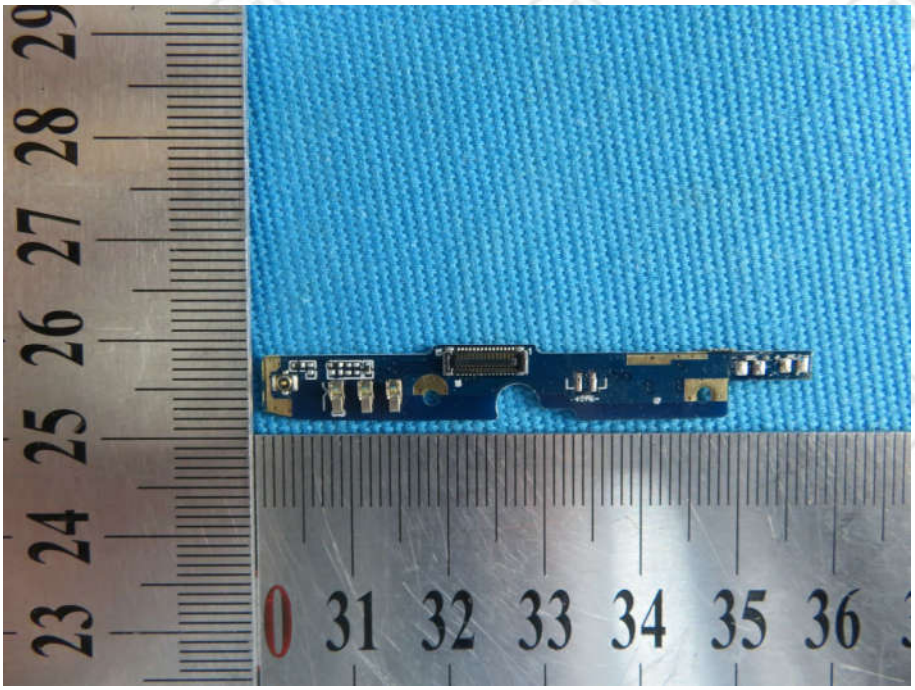


View of Product-13

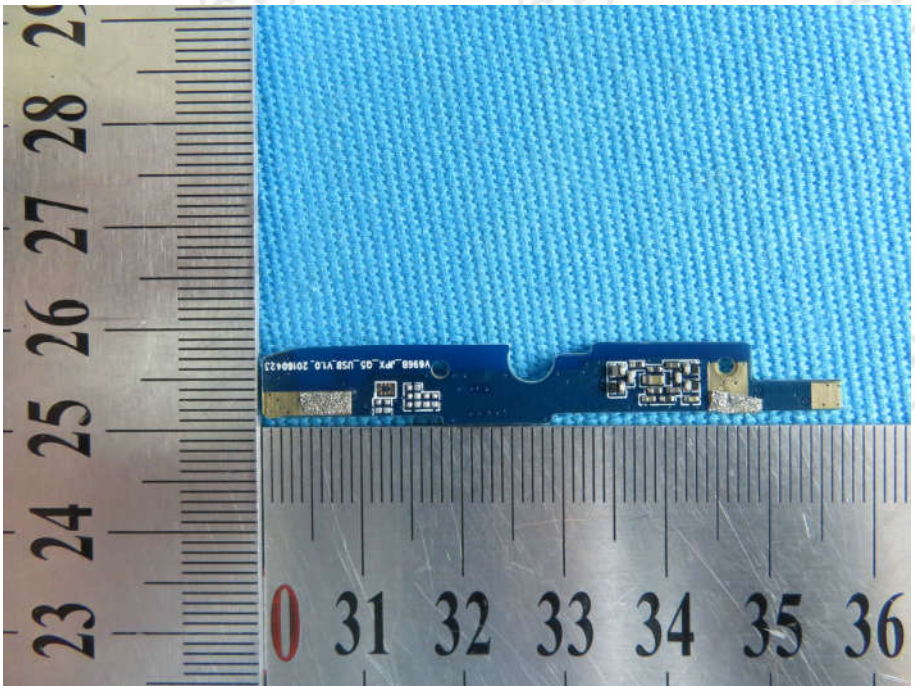
View of Product-14

View of Product-15

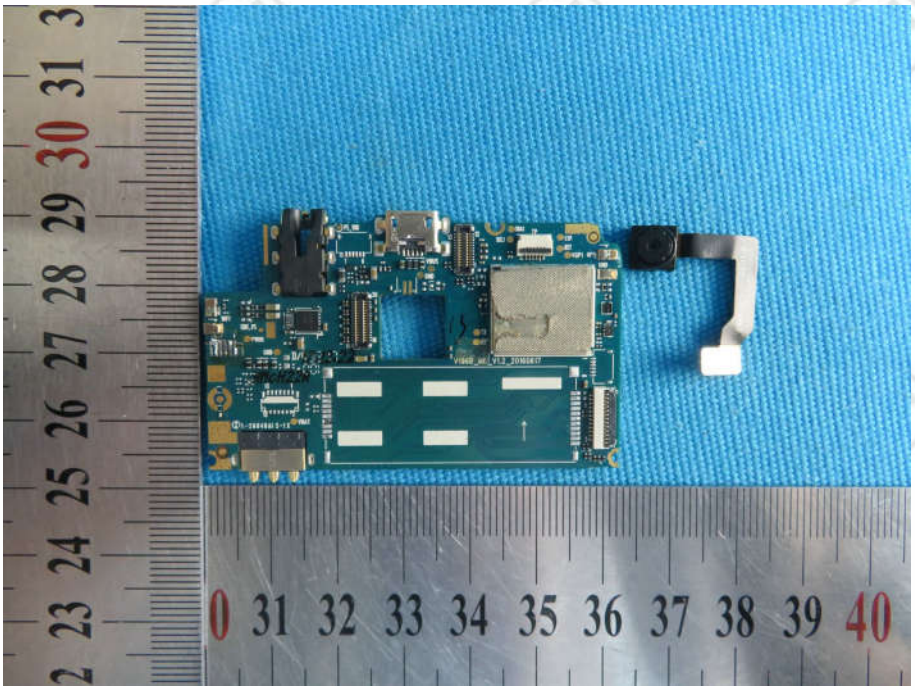
View of Product-16



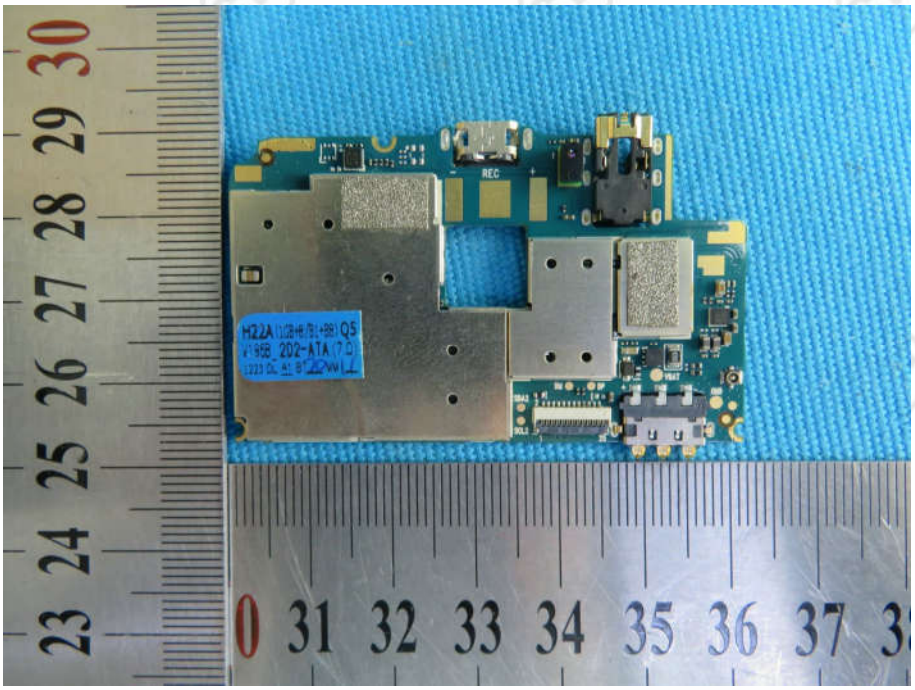
View of Product-17



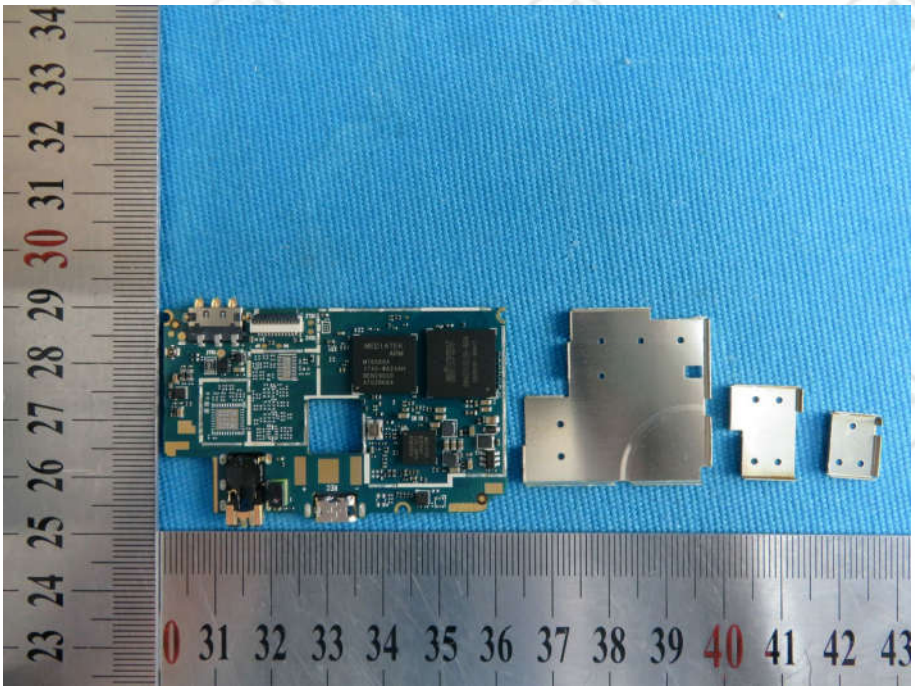
View of Product-18



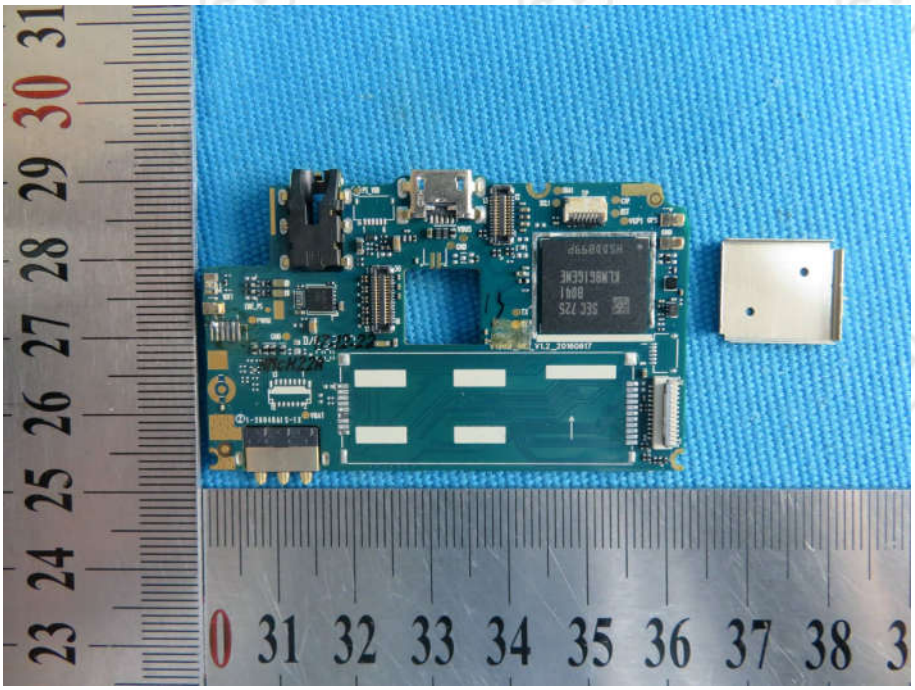
View of Product-19



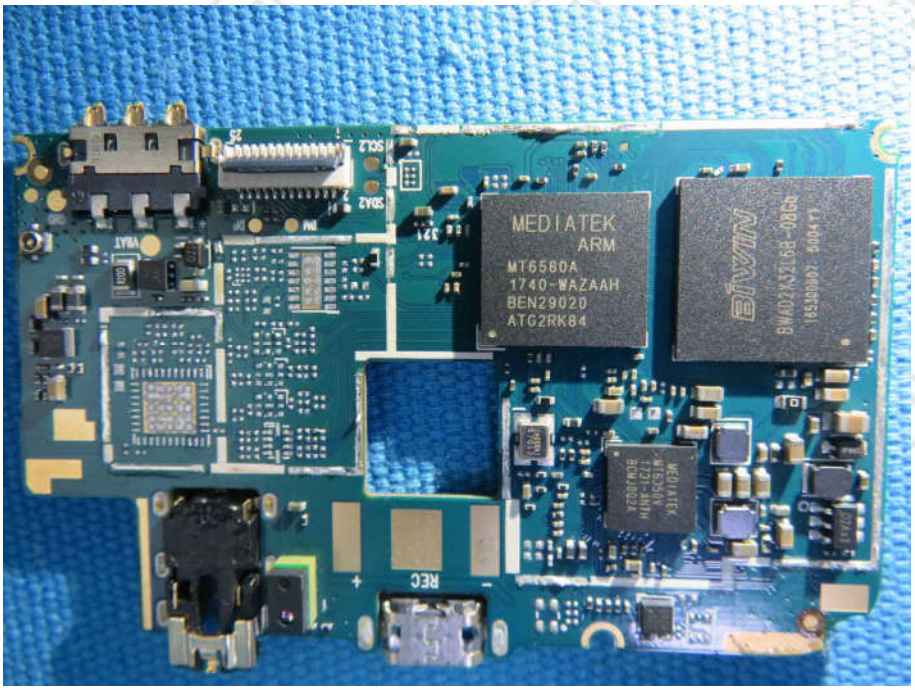
View of Product-20



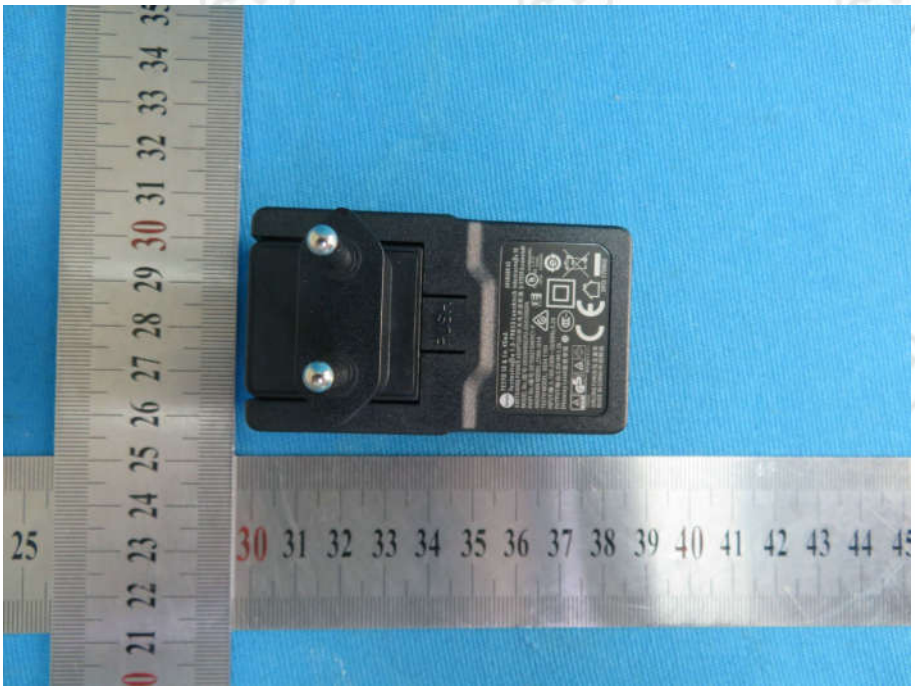
View of Product-21



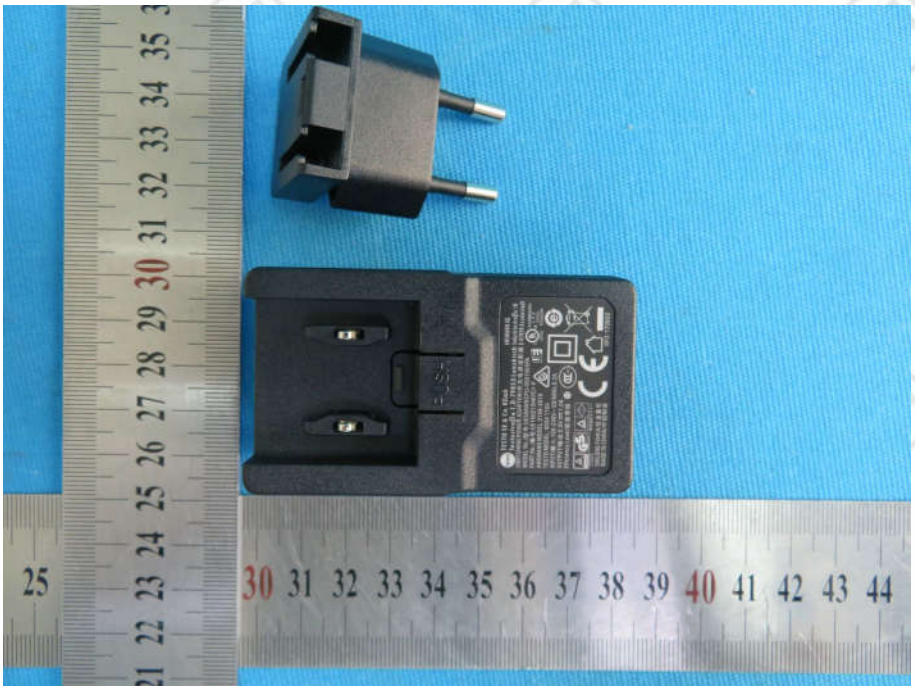
View of Product-22



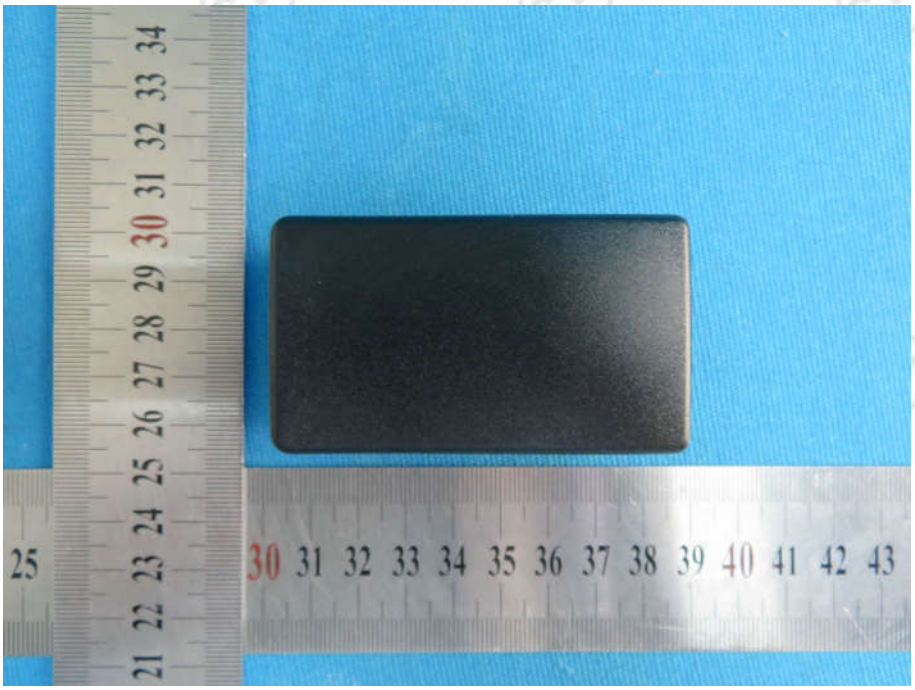
View of Product-23



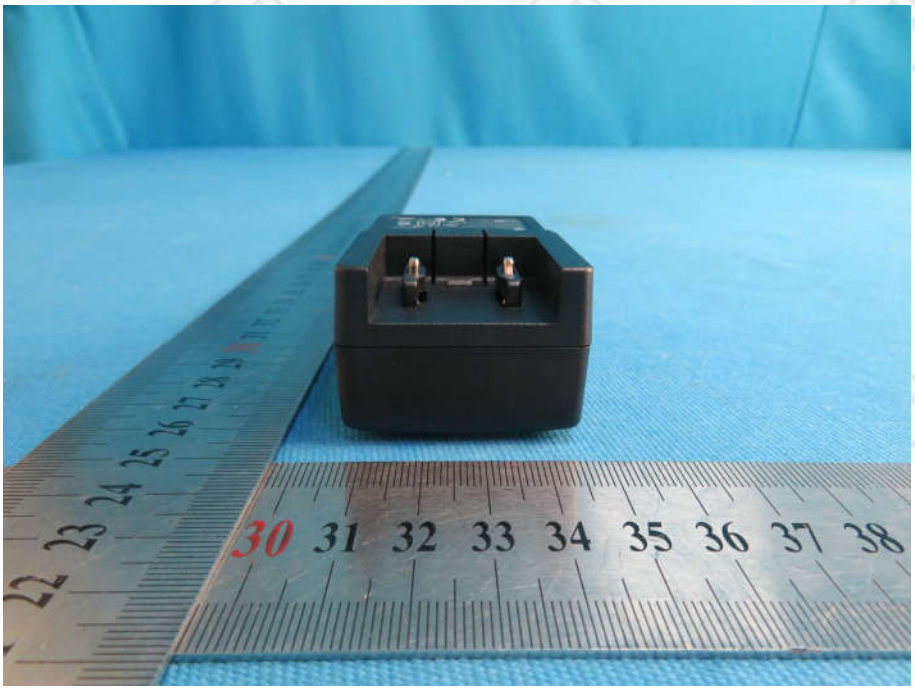
View of Product-24



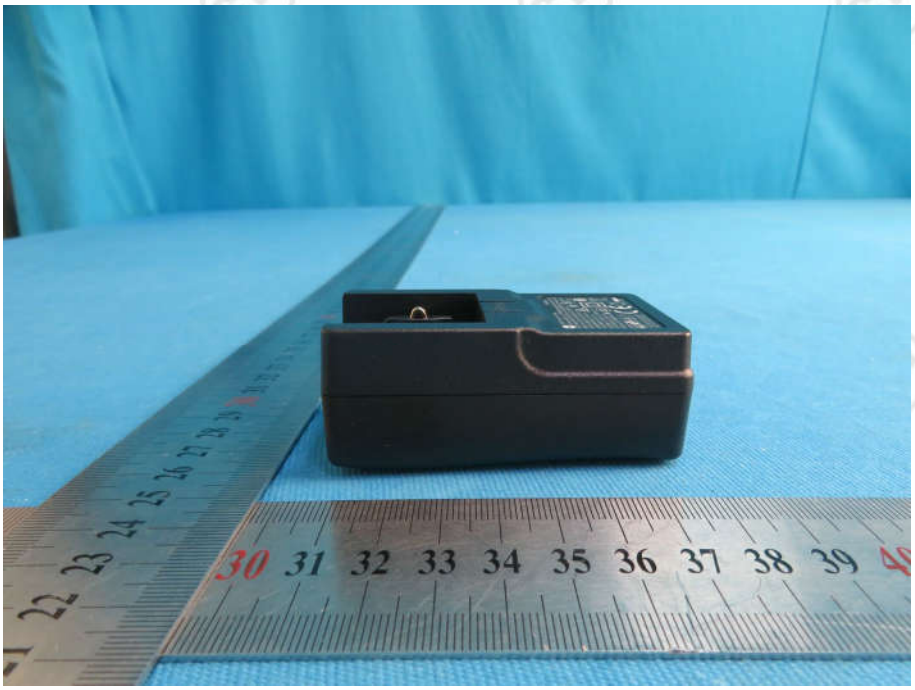
View of Product-25



View of Product-26



View of Product-27

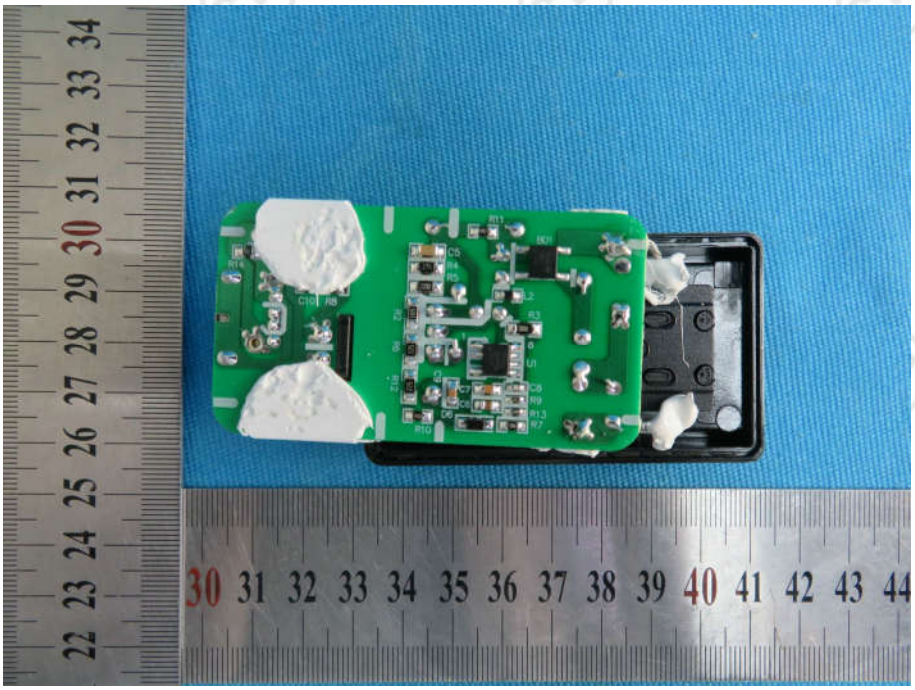


View of Product-28

View of Product-29

View of Product-30

View of Product-31



View of Product-32

*** End of Report ***