FCC Test Report

Report No.: AGC10516200604FE03

FCC ID	:	2AWM4KLIMCHROMAWL
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	WIRELESS KEYBOARD
BRAND NAME	:	KLIM
MODEL NAME	:	KLIM Chroma WL, KLIM Light V2, KLIM Panther
APPLICANT	:	Marcus Excelsior Limited
DATE OF ISSUE	:	Jun. 29, 2020
STANDARD(S) **TEST PROCEDURE(S)**	:	FCC Part 15 Rules
REPORT VERSION	:	V1.0

Attestation of ***G***lobal ***C***ompliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jun. 29, 2020	Valid	Initial Release

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1. VERIFICATION OF CONFORMITY

Applicant	Marcus Excelsior Limited
Address	2512, Langham Place Office Tower, 8 Mongkok KOWLOON HONG KONG
Manufacturer	Shenzhen WINOMOKO KLIM technology Co., Ltd.
Address	511-514 B building Zhihui Creative building, xihuan road, shajing town, bao an district, shenzhen city, Guangdong province, 518101, China.
Factory	Shenzhen WINOMOKO KLIM technology Co., Ltd.
Address	511-514 B building Zhihui Creative building, xihuan road, shajing town, bao an district, shenzhen city, Guangdong province, 518101, China.
Product Designation	WIRELESS KEYBOARD
Brand Name	KLIM
Test Model	KLIM Chroma WL
Series Model	KLIM Light V2, KLIM Panther
Model Difference	All the same except for the model name, appearance pattern and color
Date of test	Jun. 11, 2020 to Jun. 29, 2020
Deviation	None any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BR/RF

We hereby certify that:
The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.249.

Prepared By	Sky Dong (Project Engineer)	Jun. 29, 2020
Reviewed By	Max Zhang (Reviewer)	Jun. 29, 2020
Approved By	Forrest Lei (Authorized Officer)	Jun. 29, 2020

2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

A major technical description of EUT is described as following

Operation Frequency	2.403GHz ~ 2.480GHz
Maximum field strength	73.43dBuV/m(Average)@3m
Modulation	GFSK
Number of Channels	16
Antenna Gain	2.34dBi
Antenna Designation	PCB Antenna (Met 15.203 Antenna requirement)
Hardware Version	V1.1
Software Version	V1.5
Power Supply	DC 3.7V by battery or DC 5V by PC

2.2. TABLE OF CARRIER FREQUENCY

Frequency Band	Channel Number	Frequency
2400~2483.5MHZ	1	2403MHZ
	2	2407MHZ
	3	2414MHZ
	4	2419MHZ
	5	2422MHZ
	6	2426MHZ
	7	2436MHZ
	8	2439MHZ
	9	2441MHZ
	10	2445MHZ
	11	2453MHZ
	12	2459MHZ
	13	2463MHZ
	14	2466MHZ
	15	2473MHZ
	16	2480MHZ

3. MEASUREMENT UNCERTAINTY

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI.

- Uncertainty of Conducted Emission, Uc = ±3.1 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±4.0 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB

4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel GFSK
2	Middle channel GFSK
3	High channel GFSK

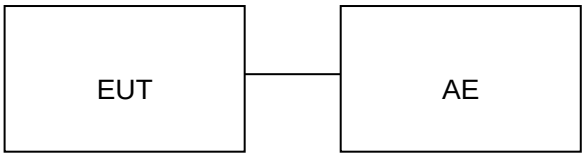
Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
4. The test software is the Non Signaling Test Tool which can set the EUT into the individual test modes.

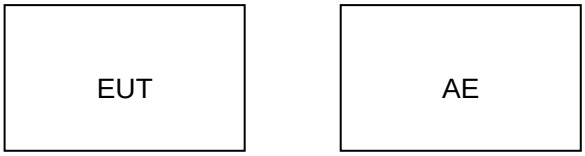
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF EUT SYSTEM

Radiated Emission Configure :



Conducted Emission Configure :



5.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	WIRELESS KEYBOARD	KLIM Chroma WL	2AWM4KLIMCHROMAWL	EUT
2	PC	16301-01	N/A	Accessory
3	PC Adapter	ADC6501TM	N/A	Accessory
4	Type-C Cable	N/A	0.6m unshielded	Accessory

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.249&15.209	Radiated Emission	Compliant
§15.249	Band Edges	Compliant
§15.215	20dB bandwidth	Compliant
§15.207	Conducted Emission	Compliant

6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance(Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	May 15, 2020	May 14, 2022
LISN	R&S	ESH2-Z5	100086	Aug. 26, 2019	Aug. 25, 2020
Test software	R&S	ES-K1 (Ver V1.71)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	May 15, 2020	May 14, 2022
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4G Band Fliter	EM Electronics	2400-2500	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 09, 2019	Sep. 08, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2019	Sep. 20, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00154520	Oct. 26, 2019	Oct. 25, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 16, 2020
ANTENNA	SCHWARZBECK	VULB9168	494	Sep. 20, 2019	Sep. 19, 2021
Test software	FARA	EZ-EMC (Ver RA-03A)	N/A	N/A	N/A

7. RADIATED EMISSION

7.1TEST LIMIT

Standard FCC15.249

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
900-928MHz	50	500
2400-2483.5MHz	50	500
5725-5875MHz	50	500
24.0-24.25GHz	250	2500

Standard FCC 15.209

Frequency (MHz)	Distance Meters	Field Strengths Limit	
		μV/m	dB(μV)/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	---
1.705 ~ 30	30	30	---
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	Other:74.0 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

Remark： (1) Emission level dBμV = 20 log Emission level μV/m

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

7.2. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use minimum resolution bandwidth of 1 MHz. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

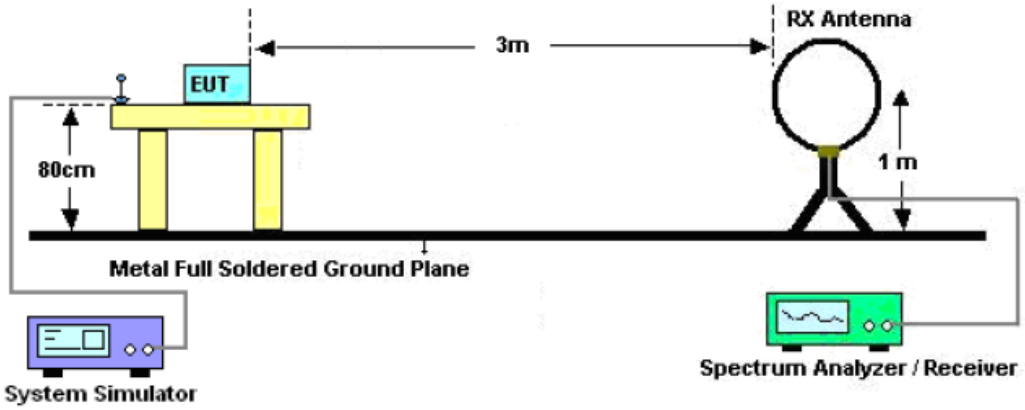
The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz RBW 2.4MHz/ VBW 8MHz for Peak, RBW 2.4MHz/10Hz for Average

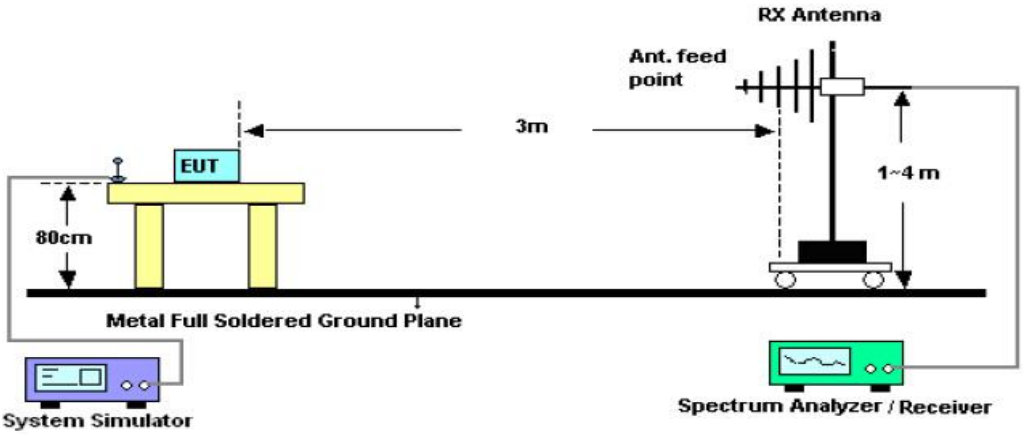
Receiver Parameter	Setting
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

7.3. TEST SETUP

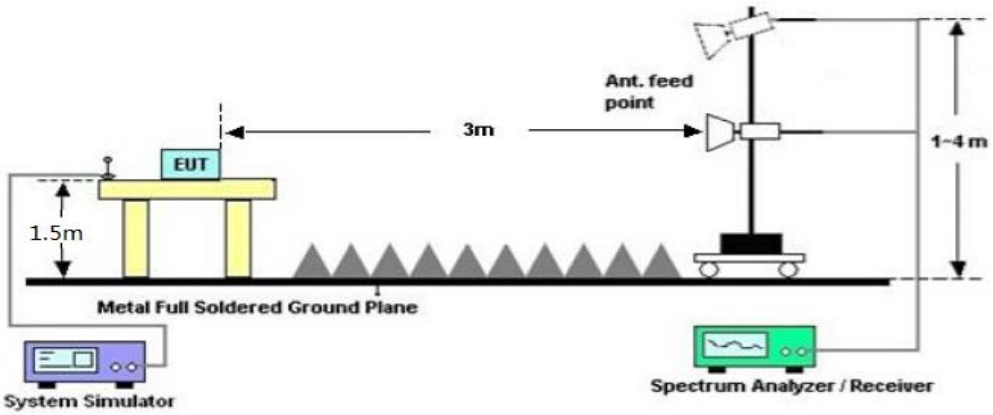
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



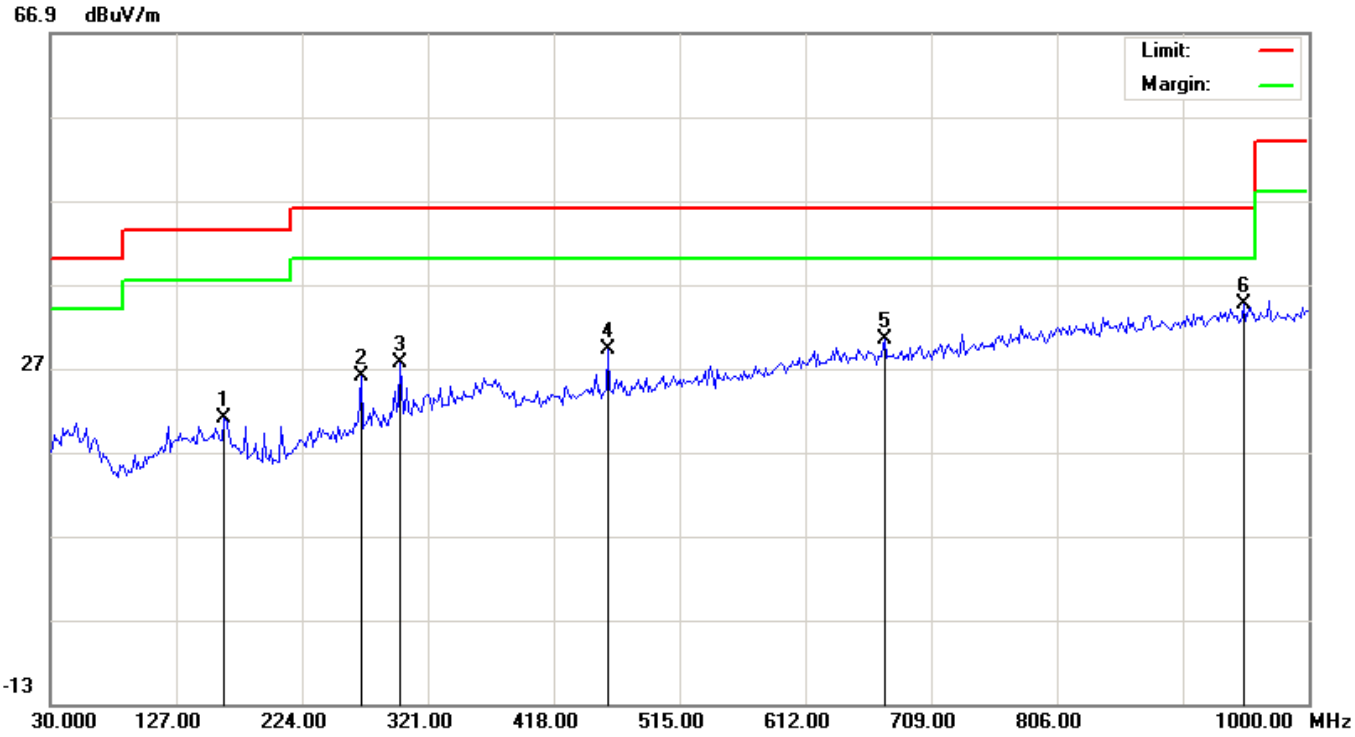
7.4. TEST RESULT

RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

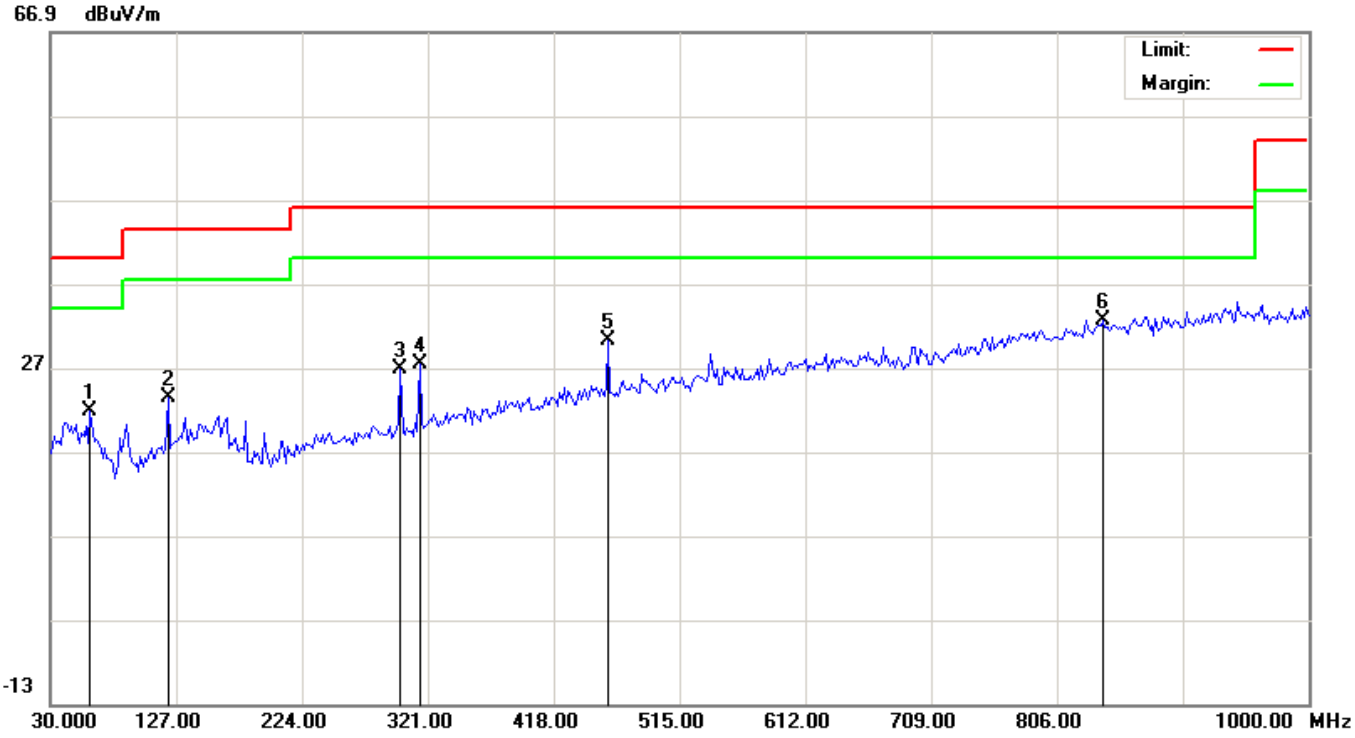
RADIATED EMISSION 30MHz- 1GHZ

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 1	Polarization	Horizontal



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector
	-	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1		164.1833	2.15	18.76	20.91	43.50	-22.59	peak
2		269.2667	6.97	19.07	26.04	46.00	-19.96	peak
3		299.9833	8.11	19.47	27.58	46.00	-18.42	peak
4		460.0333	4.93	24.19	29.12	46.00	-16.88	peak
5		673.4333	2.52	27.83	30.35	46.00	-15.65	peak
6	*	949.8833	2.41	32.13	34.54	46.00	-11.46	peak

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 1	Polarization	Vertical



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1		60.7167	2.98	18.74	21.72	40.00	-18.28	peak
2		120.5333	5.44	18.00	23.44	43.50	-20.06	peak
3		299.9833	7.35	19.47	26.82	46.00	-19.18	peak
4		314.5333	7.43	19.98	27.41	46.00	-18.59	peak
5		460.0333	6.00	24.19	30.19	46.00	-15.81	peak
6	*	841.5667	1.64	30.95	32.59	46.00	-13.41	peak

RESULT: PASS

Note: Factor=Antenna Factor + Cable loss, Margin=Result-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

The mode 1 is the worst case, and only the data of the worst case recorded in this test report.

FIELD STRENGTH OF FUNDAMENTAL

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Modulation	GFSK	Polarization	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2403	100.33	-9.61	90.72	114.00	-23.28	peak
2403	82.74	-9.61	73.13	94.00	-20.87	AVG
2441	100.93	-9.61	91.32	114.00	-22.68	peak
2441	83.04	-9.61	73.43	94.00	-20.57	AVG
2480	100.19	-9.61	90.58	114.00	-23.42	peak
2480	82.93	-9.61	73.32	94.00	-20.68	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Modulation	GFSK	Polarization	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2403	97.61	-9.61	88	114.00	-26.00	peak
2403	81.62	-9.61	72.01	94.00	-21.99	AVG
2441	99.31	-9.61	89.7	114.00	-24.30	peak
2441	80.57	-9.61	70.96	94.00	-23.04	AVG
2480	97.97	-9.61	88.36	114.00	-25.64	peak
2480	81.50	-9.61	71.89	94.00	-22.11	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RADIATED EMISSION ABOVE 1GHZ

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 1	Polarization	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4806	53.92	0.08	54.00	74.00	-20.00	peak
4806	40.31	0.08	40.39	54.00	-13.61	AVG
7209	49.81	2.21	52.02	74.00	-21.98	peak
7209	46.20	2.21	48.41	54.00	-5.59	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 1	Polarization	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4806	53.25	0.08	53.33	74.00	-20.67	peak
4806	39.63	0.08	39.71	54.00	-14.29	AVG
7209	49.62	2.21	51.83	74.00	-22.17	peak
7209	35.85	2.21	38.06	54.00	-15.94	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 2	Polarization	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4884	54.02	0.14	54.16	74.00	-19.84	peak
4884	40.31	0.14	40.45	54.00	-13.55	AVG
7326	47.98	2.36	50.34	74.00	-23.66	peak
7326	33.22	2.36	35.58	54.00	-18.42	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 2	Polarization	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4884	53.10	0.14	60.72	74.00	-13.28	peak
4884	39.65	0.14	47.69	54.00	-6.31	AVG
7326	47.89	2.36	58.04	74.00	-15.96	peak
7326	33.73	2.36	45.05	54.00	-8.95	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 3	Polarization	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960	54.73	0.22	54.95	74.00	-19.05	peak
4960	40.06	0.22	40.28	54.00	-13.72	AVG
7440	49.55	2.64	52.19	74.00	-21.81	peak
7440	36.88	2.64	39.52	54.00	-14.48	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 3	Polarization	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960	54.02	0.22	60.79	74.00	-13.21	peak
4960	39.24	0.22	47.77	54.00	-6.23	AVG
7440	48.73	2.64	56.34	74.00	-17.66	peak
7440	35.48	2.64	44.62	54.00	-9.38	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Note: Other emissions from 8G to 25 GHz are considered as ambient noise. No recording in the test report.
Factor=Antenna Factor + Cable loss - Amplifier gain, Margin=Measurement-Limit.
The “Factor” value can be calculated automatically by software of measurement system.
The GFSK modulation was the worst case and only the data of worst recorded in this report.

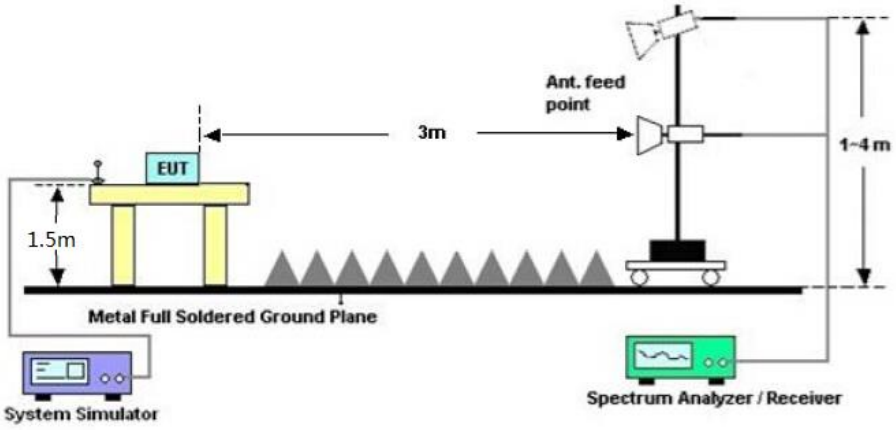
8. BAND EDGE EMISSION

8.1. MEASUREMENT PROCEDURE

1. The EUT operates at transmitting mode. The operate channel is tested to verify the largest transmission and spurious emissions power at the continuous transmission mode.
2. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission: (a) PEAK: RBW=1MHz, VBW=3MHz / Sweep=AUTO
(b) AVERAGE: RBW=1MHz ; VBW=1/on time(1KHz) / Sweep=AUTO
3. Other procedures refer to clause 7.2.

8.2 TEST SETUP

RADIATED EMISSION TEST SETUP



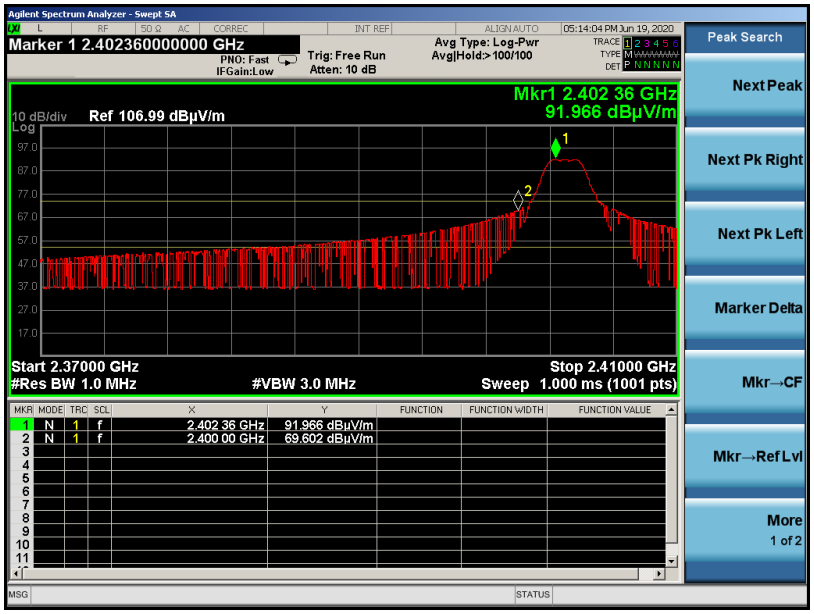
8.3 RADIATED TEST RESULT

Note:

1. Factor=Antenna Factor + Cable loss - Amplifier gain. Field Strength=Factor + Reading level
2. The factor had been edited in the “Input Correction” of the Spectrum Analyzer. So the Amplitude of test plots is equal to Reading level plus the Factor in dB. Use the A dB(μV) to represent the Amplitude. Use the F dB(μV/m) to represent the Field Strength. So A=F.

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 1	Polarization	Horizontal

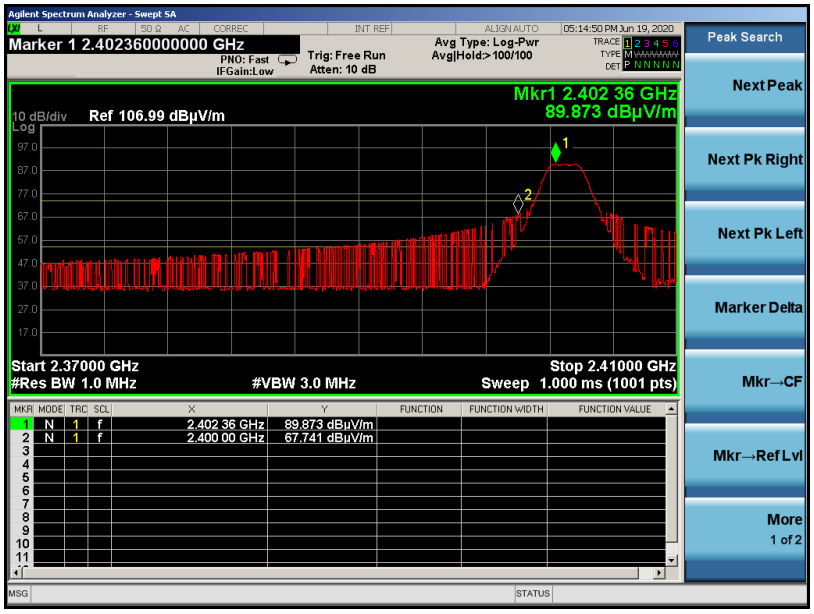
Peak Value



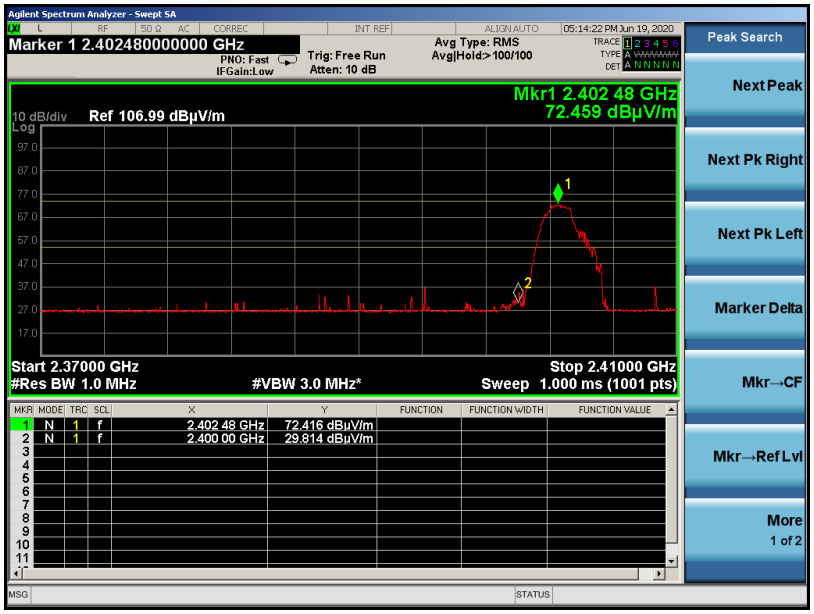
Average Value

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 1	Polarization	Vertical

Peak Value

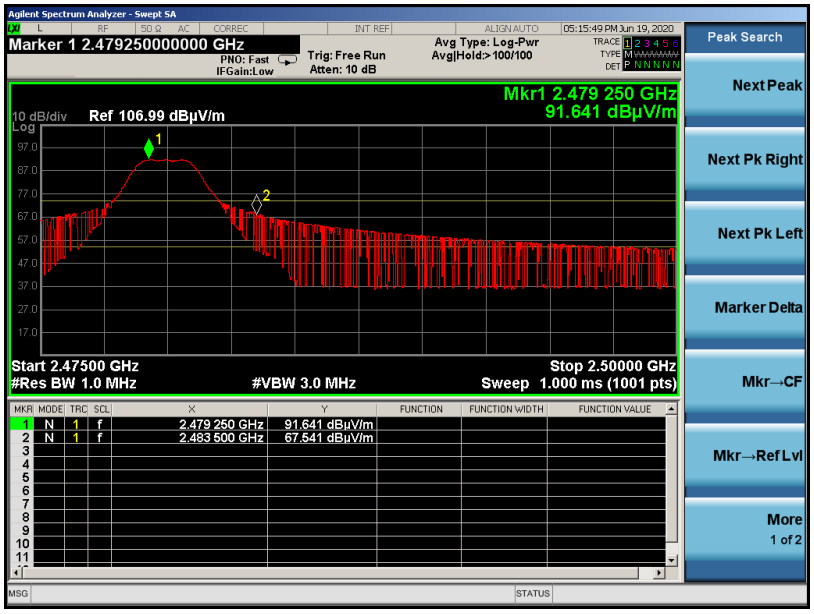


Average Value



EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 3	Polarization	Horizontal

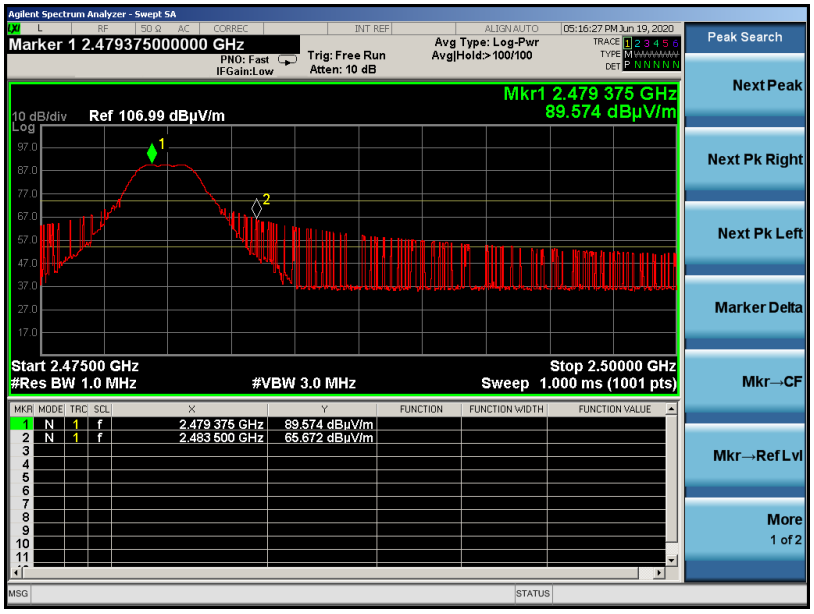
Peak Value



Average Value

EUT	WIRELESS KEYBOARD	Model Name	KLIM Chroma WL
Temperature	20℃	Relative Humidtity	48%
Pressure	1010 hPa	Test Voltage	DC 3.7V
Test Mode	Mode 3	Polarization	Vertical

Peak Value



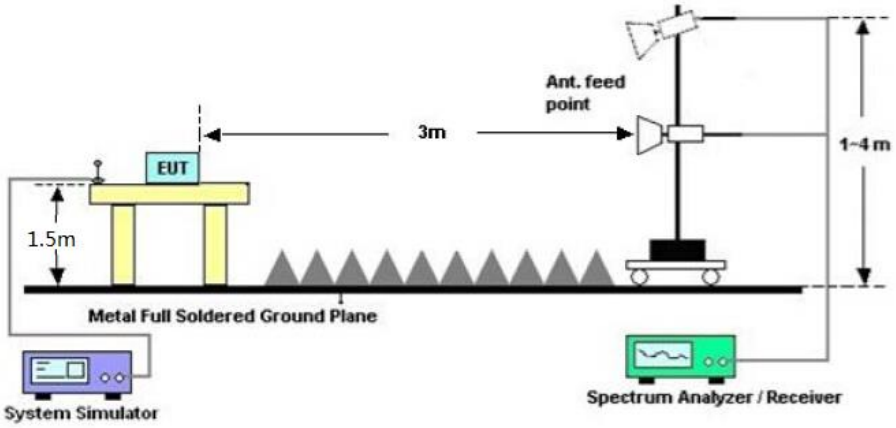
Average Value

9. 20DB BANDWIDTH

9.1. MEASUREMENT PROCEDURE

1. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
2. Set SPA Centre Frequency = Operation Frequency, RBW= 30 KHz, VBW≥3×RBW.
3. Set SPA Trace 1 Max hold, then View.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

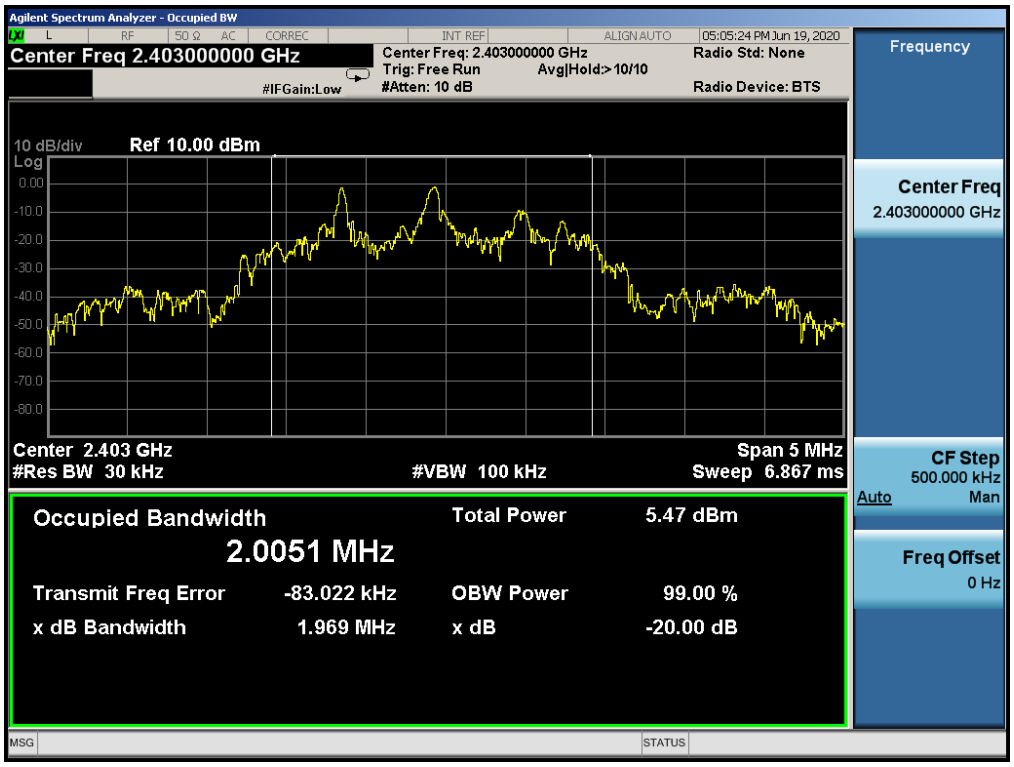


9.3. MEASUREMENT RESULTS

TEST ITEM	20DB BANDWIDTH
TEST MODULATION	GFSK

Test Data (MHz)		Criteria
Low Channel	1.969	PASS
Middle Channel	2.036	PASS
High Channel	1.971	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL

TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

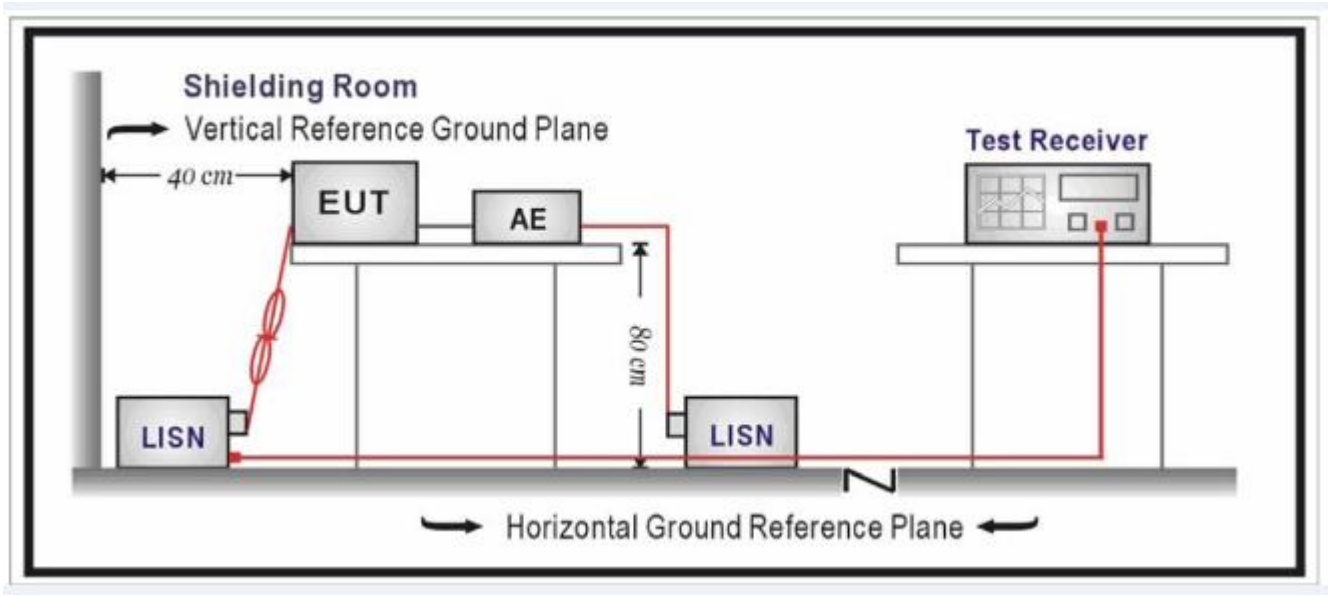
10. FCC LINE CONDUCTED EMISSION TEST

10.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P.(dBuV)	Average(dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note: 1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

10.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



10.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
2. Support equipment, if needed, was placed as per ANSI C63.10-2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013.
4. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power by adapter which received AC120V/60Hzpower by a LISN.
6. The test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

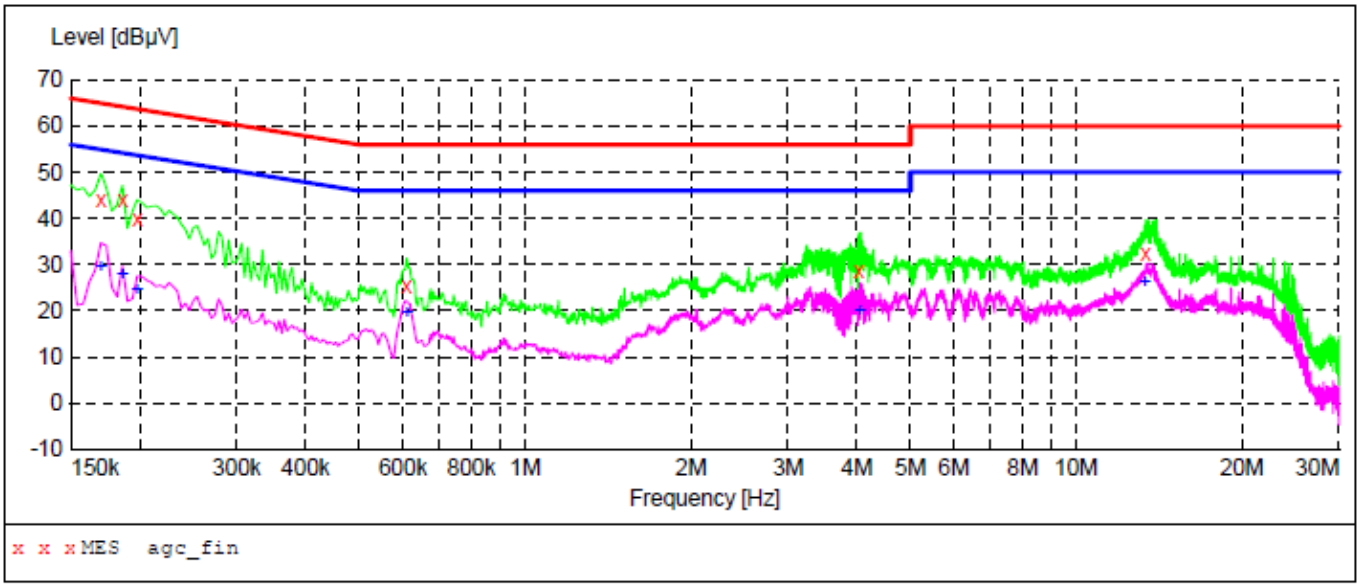
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

10.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less –2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

10.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



MEASUREMENT RESULT: "agc_fin"

2020/6/23 11:19

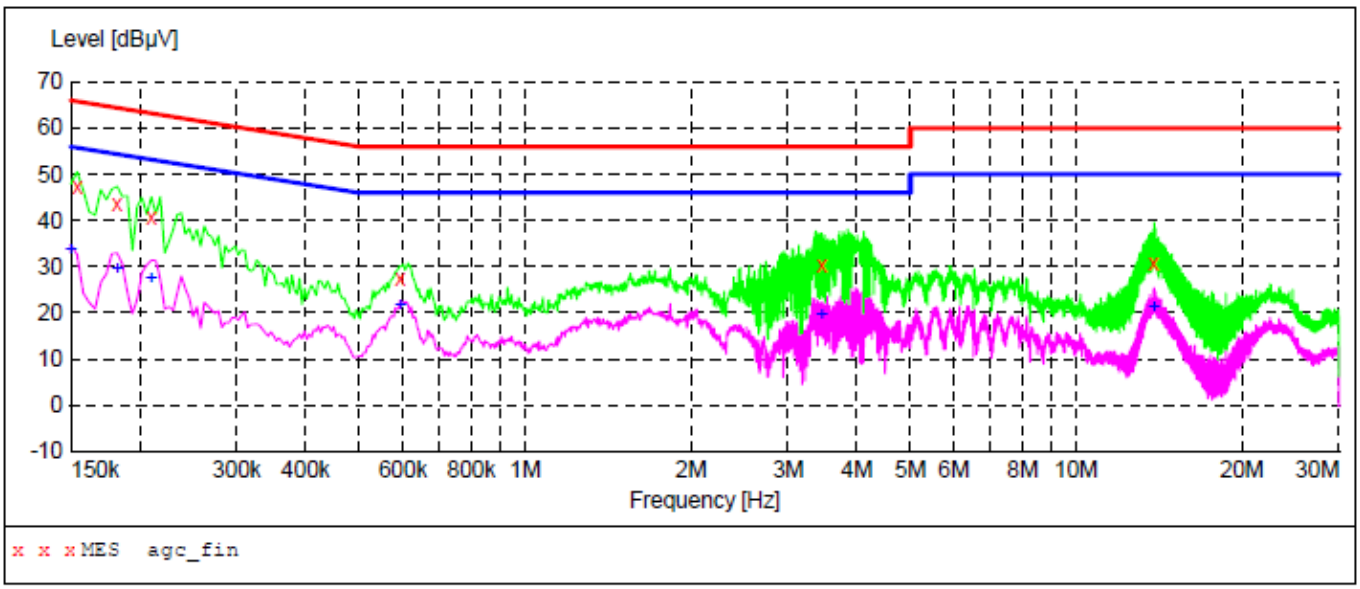
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.170000	43.80	9.3	65	21.2	QP	L1	FLO
0.186000	44.10	9.3	64	20.1	QP	L1	FLO
0.198000	39.70	9.3	64	24.0	QP	L1	FLO
0.610000	25.30	9.3	56	30.7	QP	L1	FLO
4.030000	28.80	9.4	56	27.2	QP	L1	FLO
13.362000	32.40	10.6	60	27.6	QP	L1	FLO

MEASUREMENT RESULT: "agc_fin2"

2020/6/23 11:19

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.170000	29.40	9.3	55	25.6	AV	L1	FLO
0.186000	27.90	9.3	54	26.3	AV	L1	FLO
0.198000	24.50	9.3	54	29.2	AV	L1	FLO
0.610000	19.70	9.3	46	26.3	AV	L1	FLO
4.046000	20.10	9.4	46	25.9	AV	L1	FLO
13.326000	26.30	10.5	50	23.7	AV	L1	FLO

Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "agc_fin"

2020/6/23 11:12

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154000	47.50	9.3	66	18.3	QP	N	FLO
0.182000	43.50	9.3	64	20.9	QP	N	FLO
0.210000	40.80	9.3	63	22.4	QP	N	FLO
0.594000	27.40	9.3	56	28.6	QP	N	FLO
3.450000	30.20	9.4	56	25.8	QP	N	FLO
13.810000	30.60	10.7	60	29.4	QP	N	FLO

MEASUREMENT RESULT: "agc_fin2"

2020/6/23 11:12

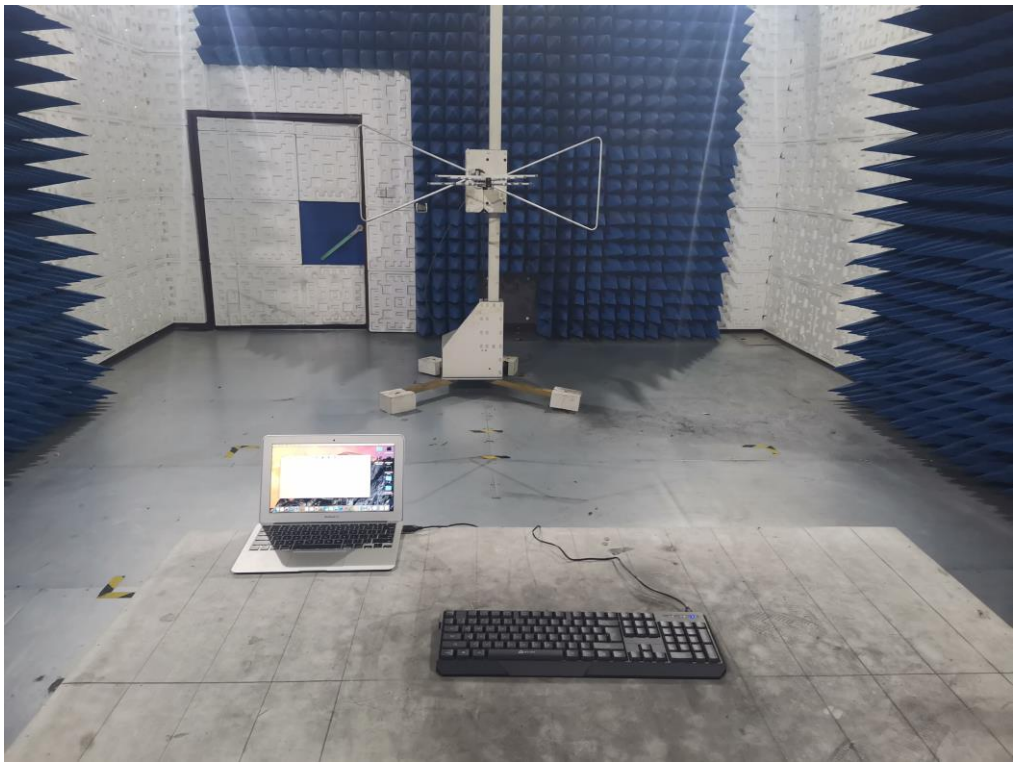
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	33.50	9.3	56	22.5	AV	N	FLO
0.182000	29.30	9.3	54	25.1	AV	N	FLO
0.210000	27.50	9.3	53	25.7	AV	N	FLO
0.594000	21.80	9.3	46	24.2	AV	N	FLO
3.450000	19.70	9.4	46	26.3	AV	N	FLO
13.802000	21.40	10.7	50	28.6	AV	N	FLO

RESULT: PASS

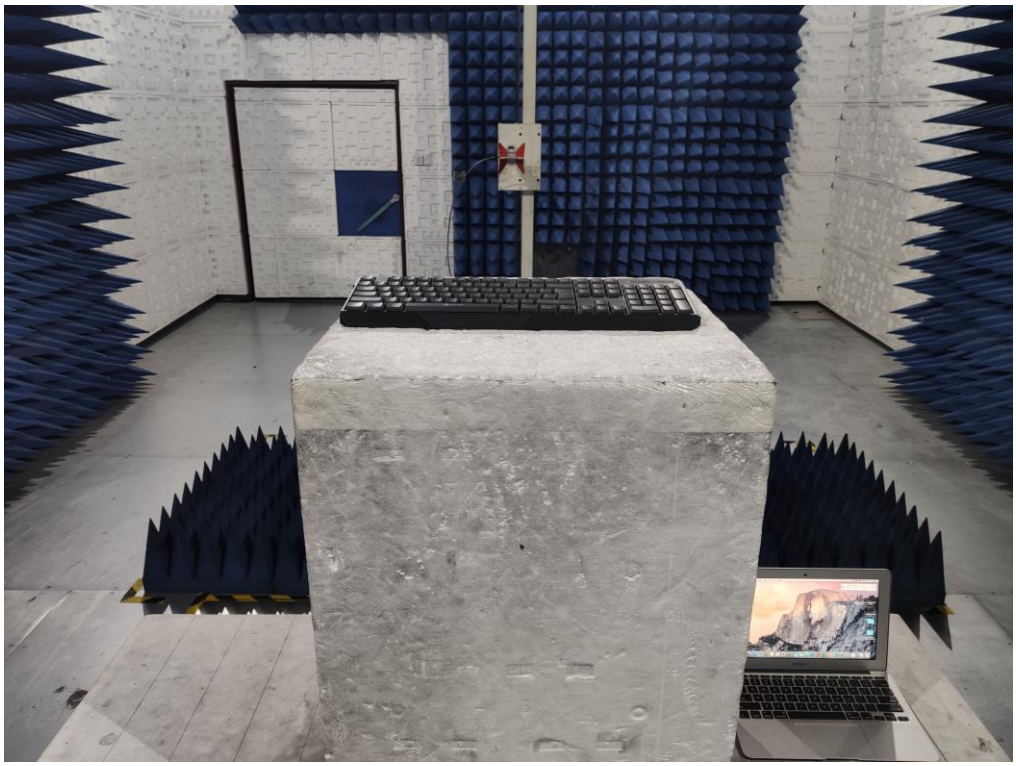
Note: All the test modes had been tested, the mode 1 was the worst case. Only the data of the worst case would be record in this test report.

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

FCC RADIATED EMISSION TEST SETUP BELOW 1GHZ

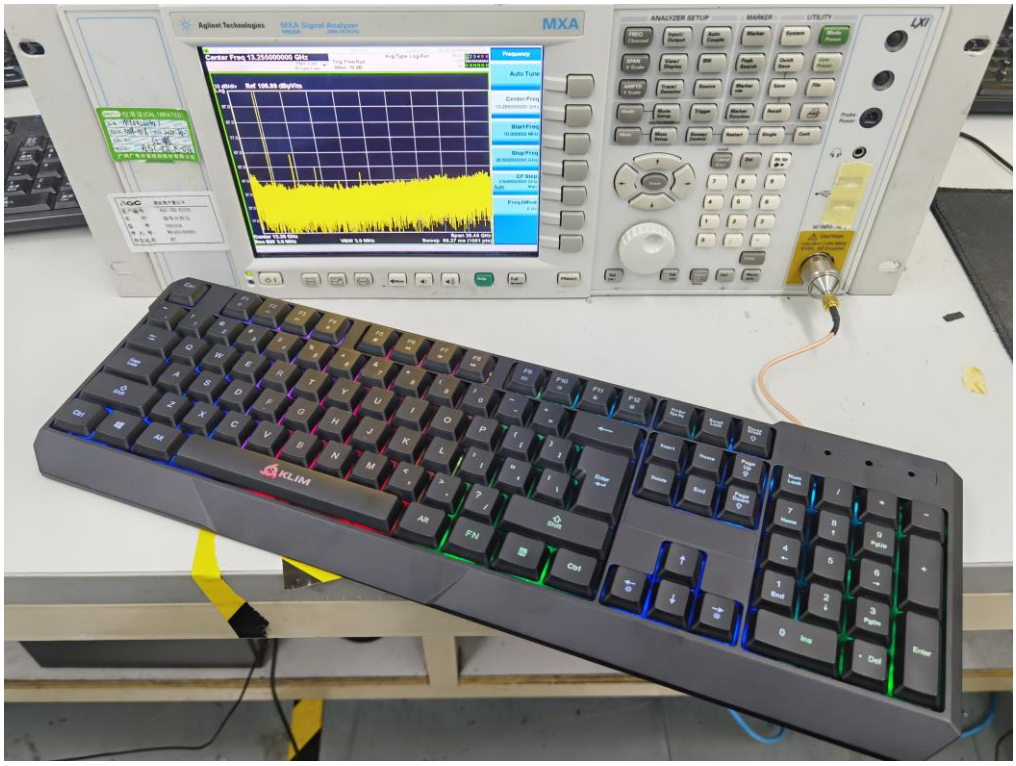


FCC RADIATED EMISSION TEST SETUP ABOVE 1GHZ



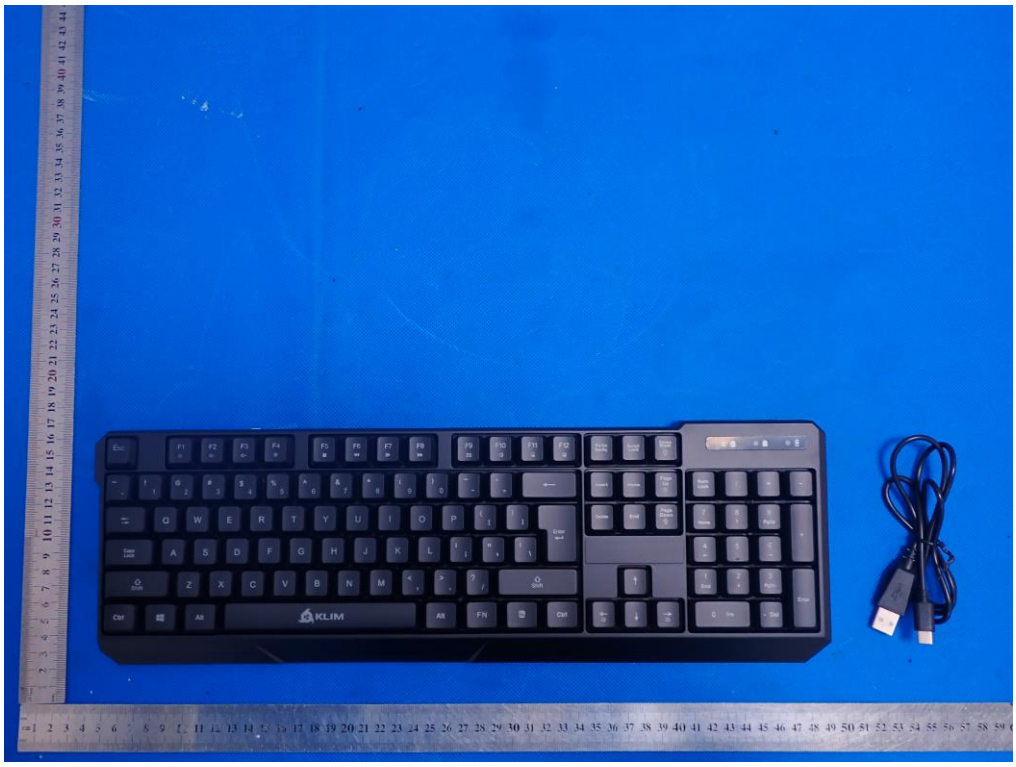
CONDUCTED EMISSION TEST SETUP

CONDUCTED TEST SETUP



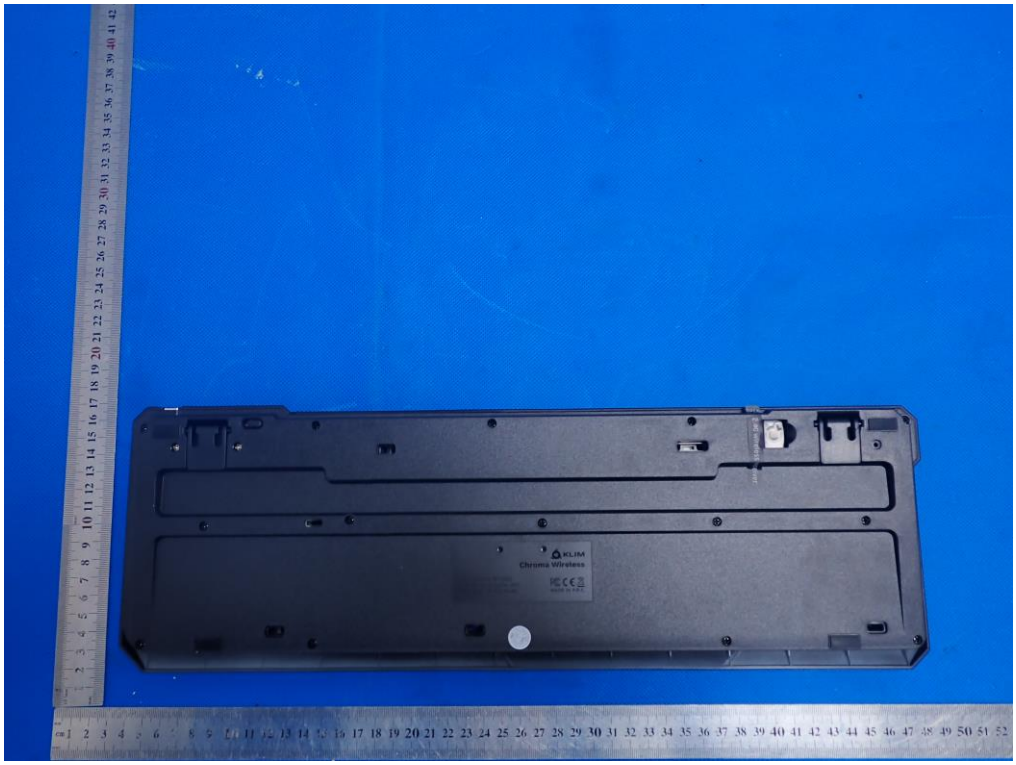
APPENDIX B: PHOTOGRAPHS OF THE EUT

ALL VIEW OF EUT

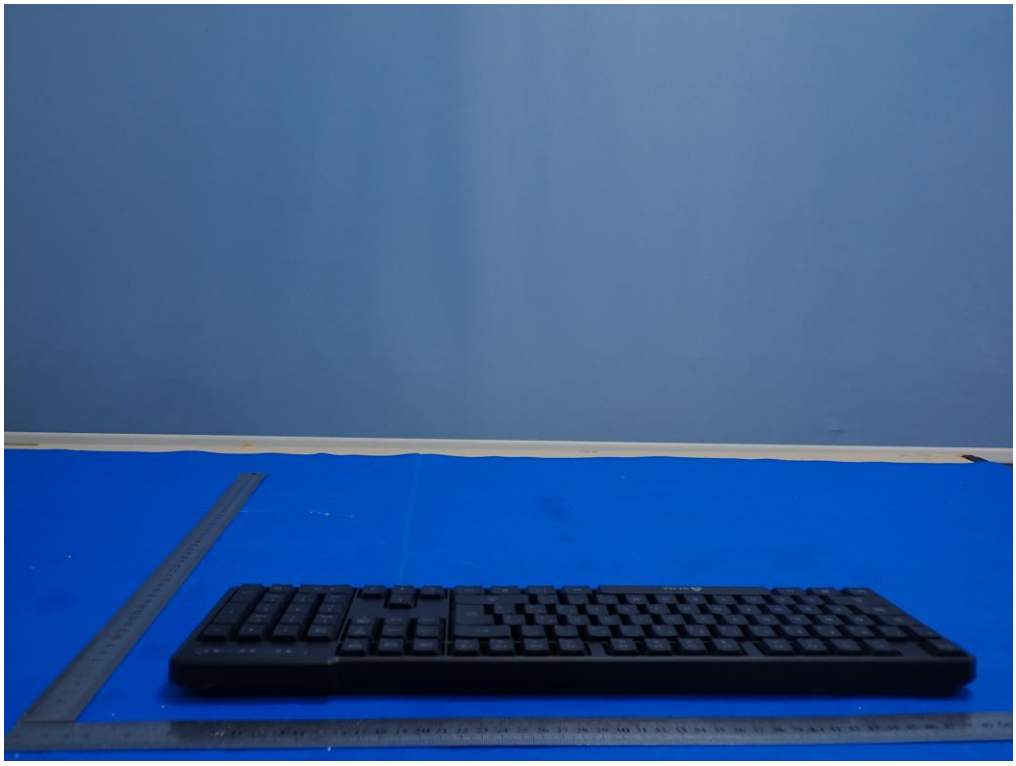


TOP VIEW OF EUT

BOTTOM VIEW OF EUT



FRONT VIEW OF EUT

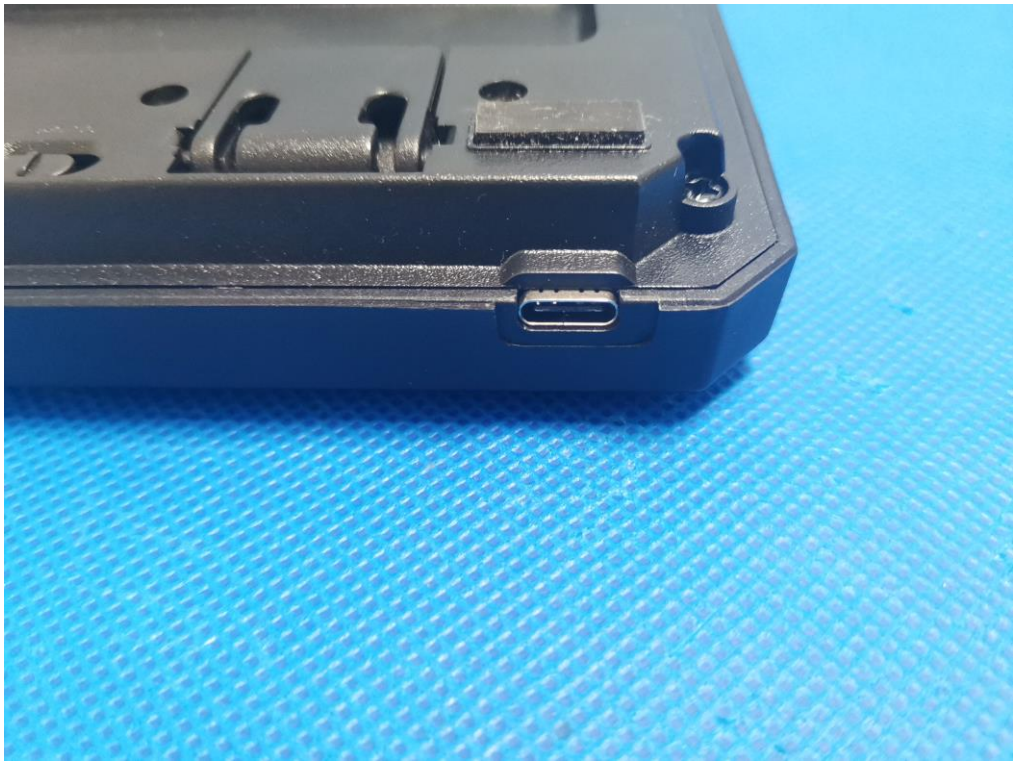


BACK VIEW OF EUT

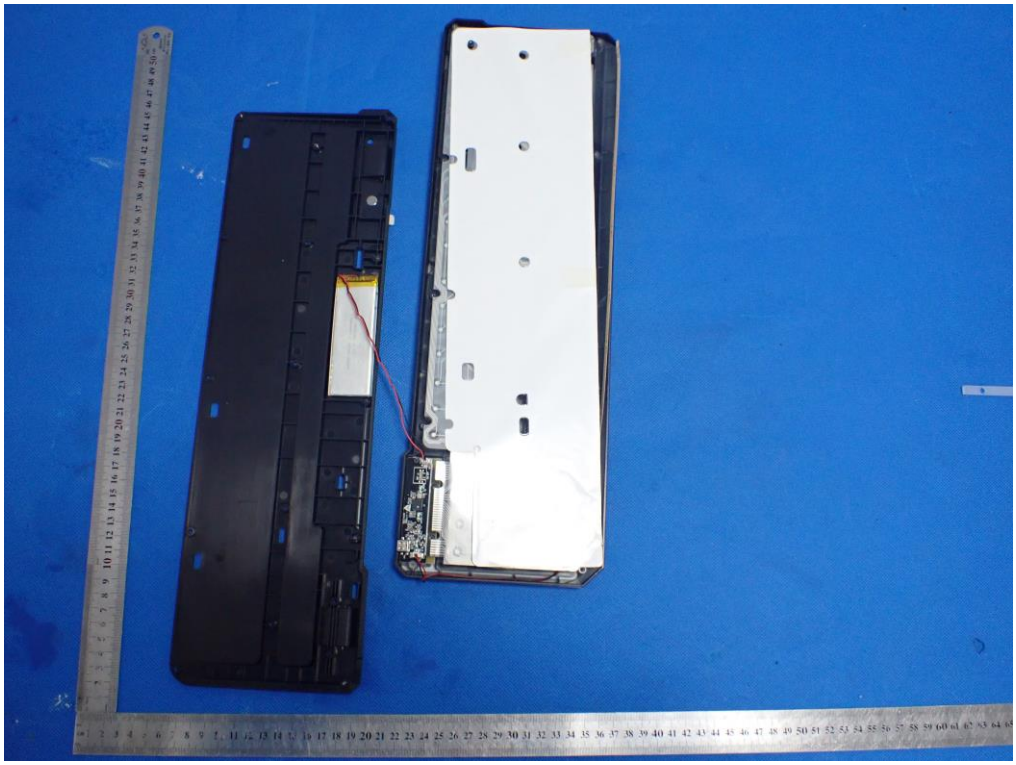
LEFT VIEW OF EUT

RIGHT VIEW OF EUT

VIEW OF EUT(PORT)



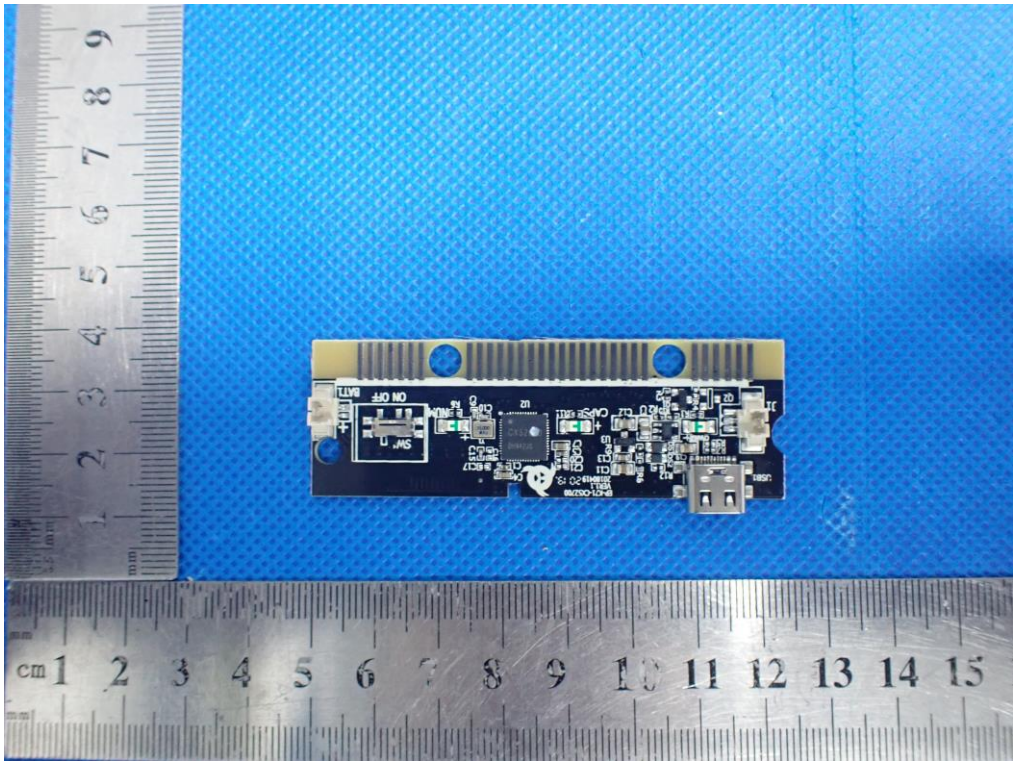
OPEN VIEW OF EUT-1



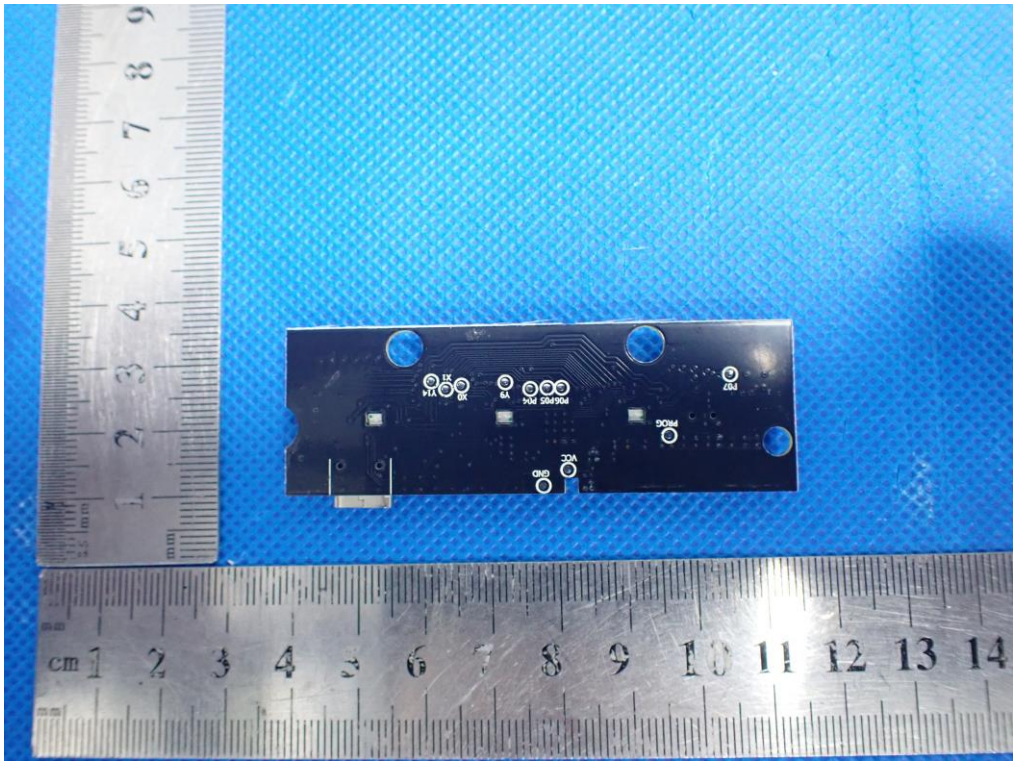
OPEN VIEW OF EUT-2

VIEW OF BATTERY

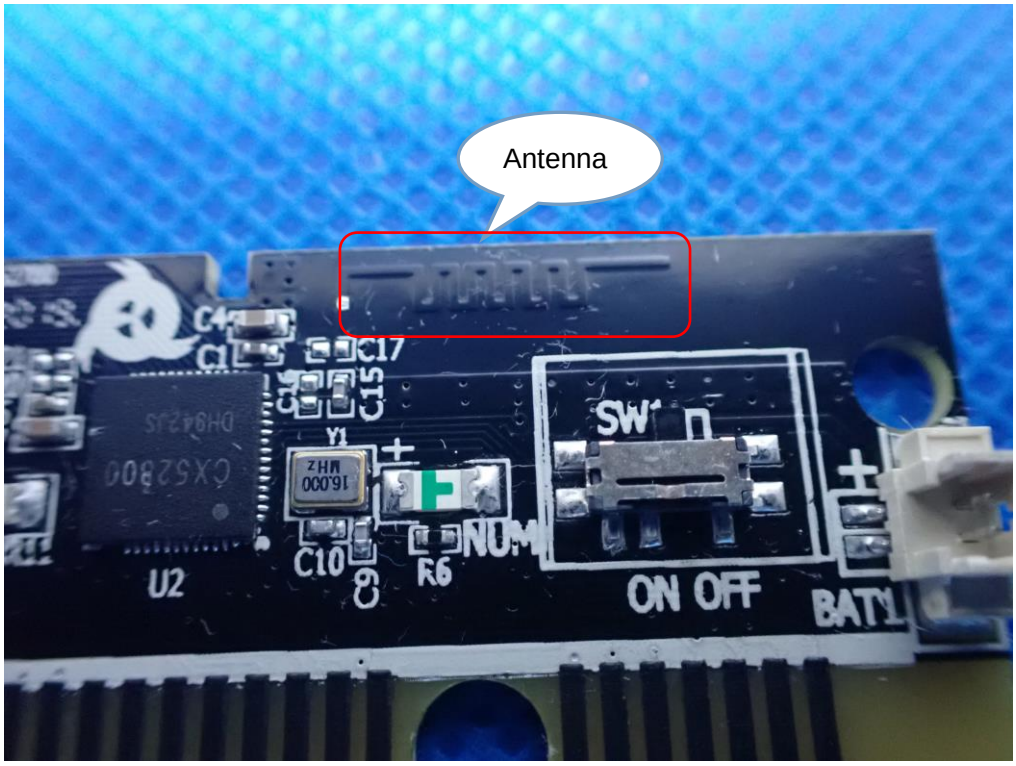
INTERNAL VIEW OF EUT-1



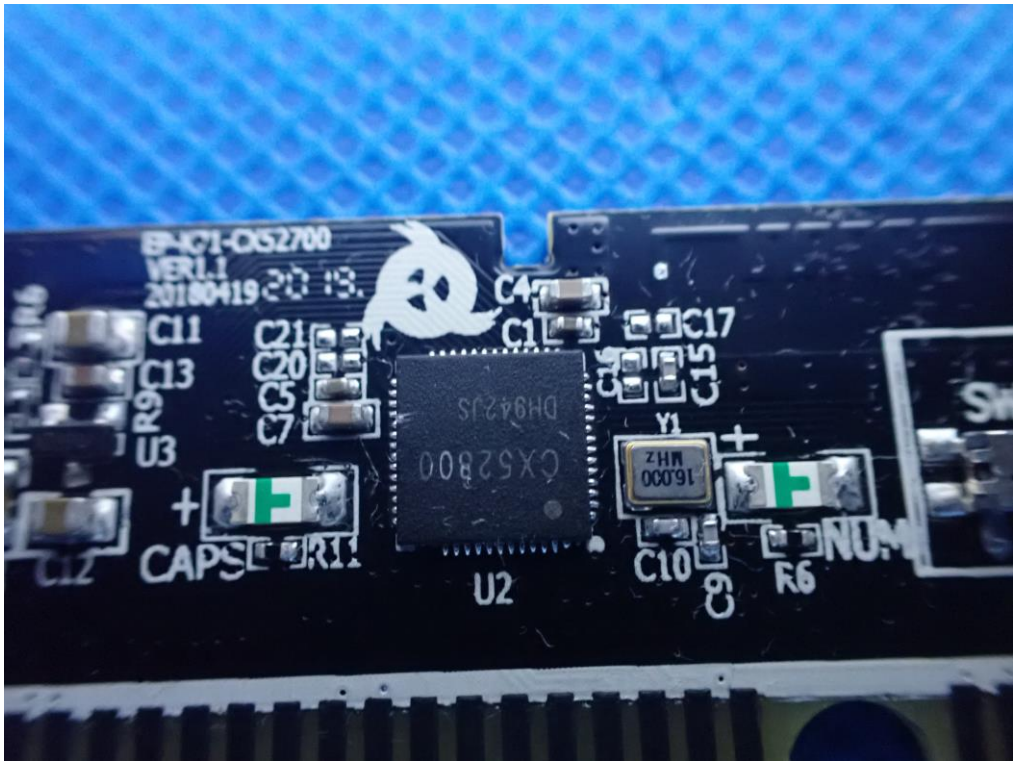
INTERNAL VIEW OF EUT-2



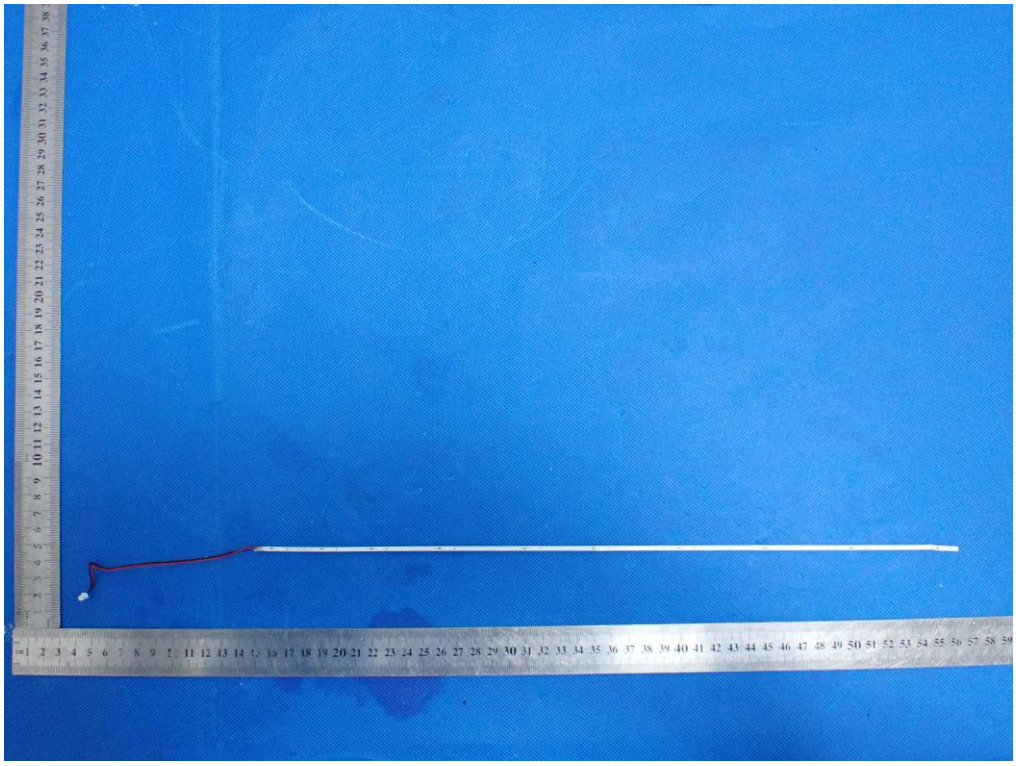
INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5



----END OF REPORT----