12. AC LINE CONDUCTED EMISSION TEST

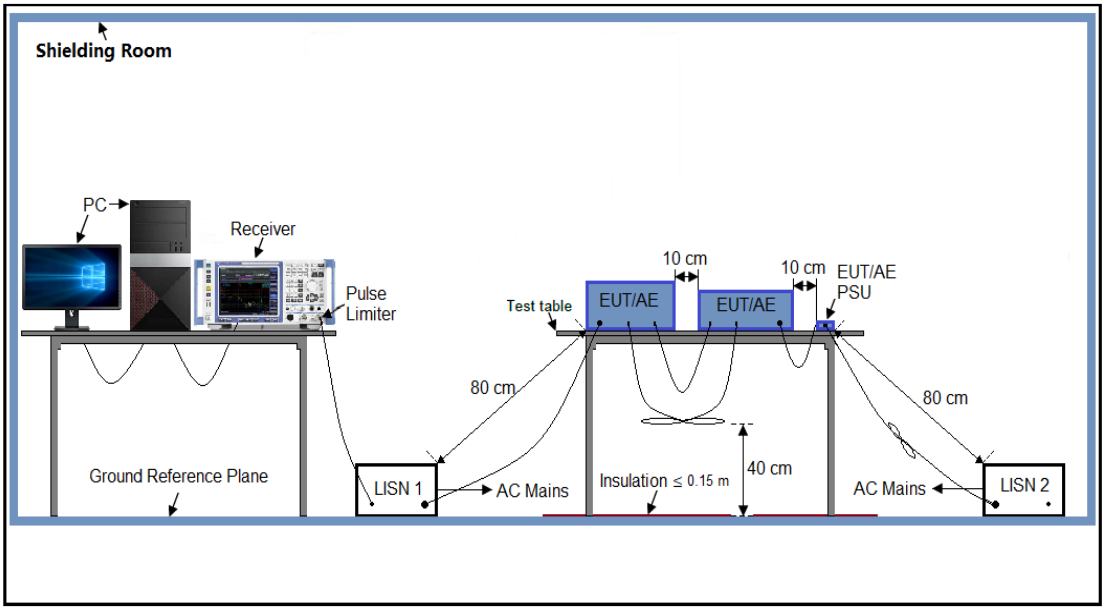
12.1 LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P. (dBμV)	Average (dBμV)
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.

12.2 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)



12.3 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 (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.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4. All support equipment received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from 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.

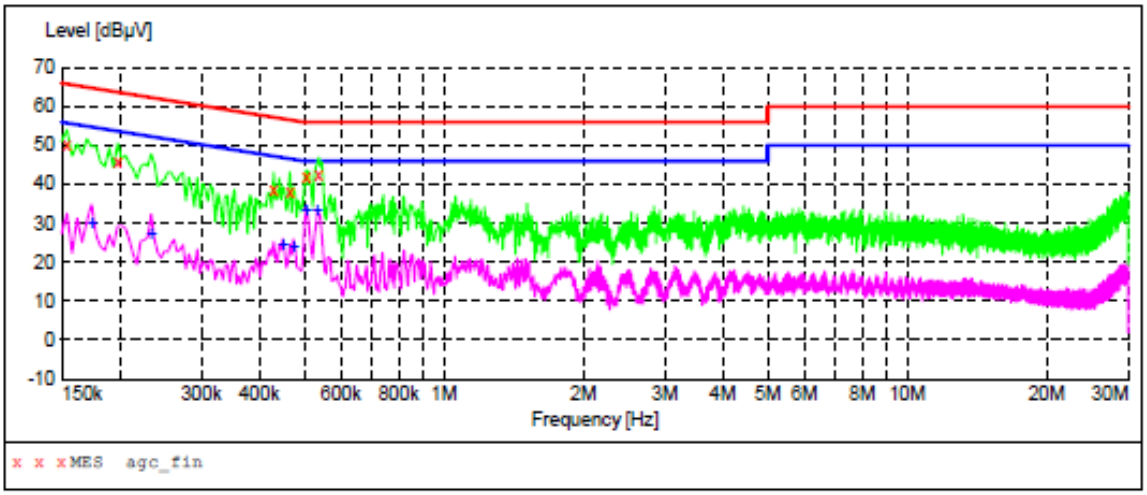
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

12.4 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.

12.5 MEASUREMENT RESULTS

LINE CONDUCTED EMISSION TEST			
Test Mode	Mode 4	LISN line	Neutral Side



MEASUREMENT RESULT: "agc_fin"

2021/4/27 19:19

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.154000	50.10	12.4	66	15.7	QP	L1	GND
0.198000	45.90	12.4	64	17.8	QP	L1	GND
0.430000	38.40	12.4	57	18.9	QP	L1	GND
0.466000	38.20	12.4	57	18.4	QP	L1	GND
0.506000	42.00	12.4	56	14.0	QP	L1	GND
0.538000	42.50	12.4	56	13.5	QP	L1	GND

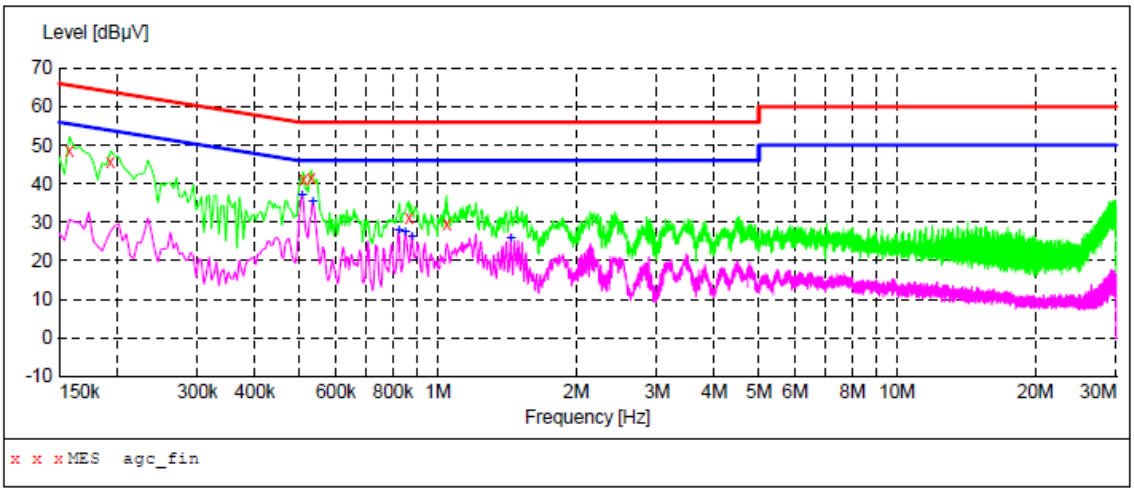
MEASUREMENT RESULT: "agc_fin2"

2021/4/27 19:19

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.174000	30.10	12.4	55	24.7	AV	L1	GND
0.234000	27.50	12.4	52	24.8	AV	L1	GND
0.450000	24.80	12.4	47	22.1	AV	L1	GND
0.474000	24.00	12.4	46	22.4	AV	L1	GND
0.506000	33.80	12.4	46	12.2	AV	L1	GND
0.534000	33.40	12.4	46	12.6	AV	L1	GND

RESULT: PASS

LINE CONDUCTED EMISSION TEST			
Test Mode	Mode 4	LISN line	Hot Side



MEASUREMENT RESULT: "agc_fin"

2021/4/27 0:11

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.158000	48.70	12.4	66	16.9	QP	N	GND
0.194000	45.60	12.4	64	18.3	QP	N	GND
0.510000	41.20	12.4	56	14.8	QP	N	GND
0.530000	41.50	12.4	56	14.5	QP	N	GND
0.866000	31.20	12.4	56	24.8	QP	N	GND
1.046000	29.50	12.4	56	26.5	QP	N	GND

MEASUREMENT RESULT: "agc_fin2"

2021/4/27 0:11

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.506000	37.00	12.4	46	9.0	AV	N	GND
0.534000	35.20	12.4	46	10.8	AV	N	GND
0.822000	27.70	12.4	46	18.3	AV	N	GND
0.850000	27.40	12.4	46	18.6	AV	N	GND
0.878000	26.30	12.4	46	19.7	AV	N	GND
1.442000	25.80	12.5	46	20.2	AV	N	GND

RESULT: PASS

13. CARRIER FREQUENCY STABILITY

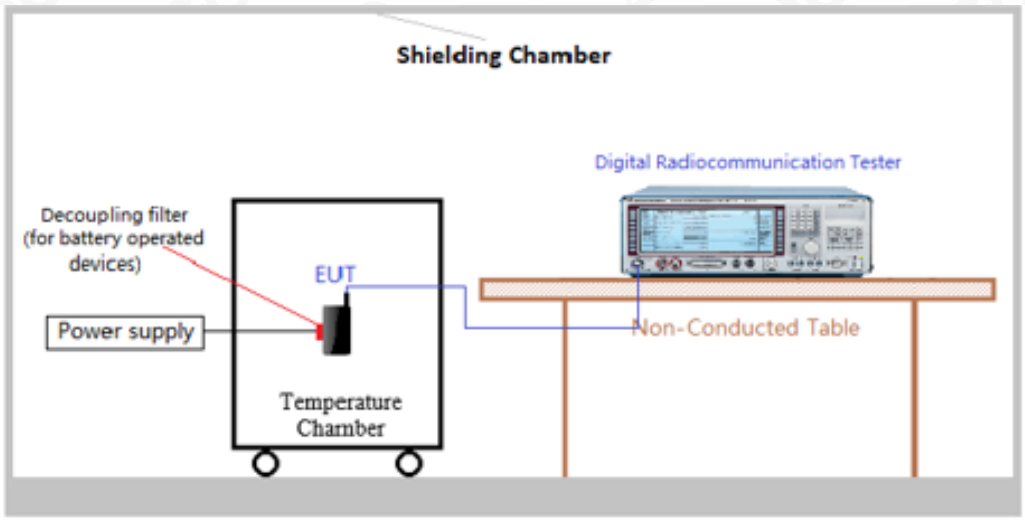
13.1 PROVISIONS APPLICABLE

Please refer to FCC 47 CFR Part 15.319(c) &15.319(e) for specification details：
The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ±10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of -20° to + 50 °C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.

13.2 MEASUREMENT PROCEDURE

The testing follows the ANSI C63.17-2013 Section 6.2.1

13.3 MEASUREMENT SETUP (BLOCK DIAGRAM OF CONFIGURATION)



13.4 MEASUREMENT RESULT

Carrier Frequency Stability over Time at Nominal Temperature:

Average Mean Carrier Frequency (MHz)	Max. Diff. (kHz)	Min. Diff. (kHz)	Max Dev. (ppm)	Limit (ppm)
1924.992658	-3.3	-1.2	1.1	±10

Note 1: Max Dev. (ppm) = [(Max. Diff. - Min. Diff.) / Average Mean Carrier Freq.]*10^6

Carrier Frequency Stability over Time at over Voltage:

Voltage (V)	Measured Carrier Frequency (MHz)	Difference (kHz)	Deviation (ppm)	Limit (ppm)
3.7V	1924.9927	0.7	0.4	±10
3.145V	1924.9949	2.9	1.5	
4.255V	1924.9936	1.6	0.8	

Note 1: Difference (kHz) = Measured Carrier Freq. - Carrier Freq.

Note 2: Deviation (ppm) = [Difference (kHz) / Carrier Freq.] x 10^6

Carrier Frequency Stability over Temperature:

Temperature (°C)	Measured Carrier Frequency (MHz)	Difference (kHz)	Deviation (ppm)	Limit (ppm)
T = +20°C	1924.9928	Ref	Ref	±10
T = -20°C	1924.9956	2.8	1.5	
T = +50°C	1924.9962	3.4	1.8	

Note 1: Set the Measured Carrier Frequency (MHz) T = +20°C as Ref Level

Note 2: Difference (kHz) = Measured Carrier Freq. T = -20°C - Measured Carrier Freq. T = +20°C

or Measured Carrier Freq. T = +50°C - Measured Carrier Freq. T = +20°C

Note 3: Deviation (ppm) = [Difference (kHz) / Carrier Freq.] x 10^6.

14. SPECIFIC REQUIREMENTS FOR UPCS DEVICE

14.1 MONITORING TIME REQUIREMENTS

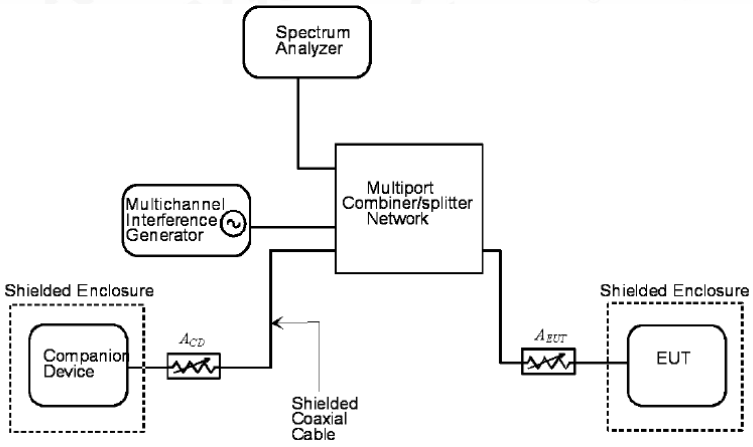
According to the requirements of FCC Part 15.323(c)(1) as follows:

Immediately prior to initiating transmission, devices must monitor the combined time and spectrum window in which they intend to transmit. For a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.

14.1.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 7.3.4, 7.5

14.1.2 MEASUREMENT SETUP



13.1.2 MEASUREMENT RESULT

Initial transmit channel and Interferer level	Final transmit Channel	Results
Apply the interference on f1 at level TU+UM, and no interference on f2. Initiate transmission and verify thetransmission on f2.	f2	Pass
Apply the interference on f2 at level TU+UM, at the same time, no interference on f1. After about 20ms, initiate transmission and verify the transmission on f1.	f1	Pass

14.2 LOWEST MONITORING THRESHOLD REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(2) as follows:

The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

14.2.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 7.3.1

14.2.2 MEASUREMENT RESULT

Not Applicable

14.3 ACKNOWLEDGEMENTS AND TRANSMISSION DURATION REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(3)(4) as follows:

Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease.

Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.

14.3.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 8.2.1& 8.2.2.

14.3.2 MEASUREMENT RESULT

Test ref. to ANSI C63.17 clause 8.2.1	Observation	Verdict
Initial transmission without acknowledgements	Not applicable for EUT that transmits control and signaling information	N/A
Transmission time after loss of acknowledgements	10.0	Pass

Test ref. to ANSI C63.17 clause 8.2.2	Observation	Verdict
Transmission duration on same time and frequency window	Only for initiating device that controls which time slot is used	N/A

14.4 LEAST INTERFERED CHANNEL (LIC) SELECTION REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(5) as follows:

Occupation of the same combined time and spectrum windows by a device or group of cooperating devices If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed.

Calculation of monitoring threshold limits for isochroous devices:

Lowest threshold: TL = -174+10Log10B + Mu + P_{MAX}-P_{EUT}(dBm)

Upper threshold: TU = -174+10Log10B + Mu + P_{MAX}-P_{EUT}(dBm)

Where: B=Emission bandwidth (Hz)

Mu=dB the threshold may exceed thermal noise (30 for TL& 50 for TU)

P_{MAX}=5*Log10B-10(dBm)

P_{EUT}=Transmitted power (dBm)

Monitor Threshold	B (MHz)	M_U (dB)	P_{MAX} (dBm)	P_{EUT} (dBm)	Threshold (dBm)
TL	1.1843	30	25.37	9.52	-57.42
TU	1.1843	50	25.37	9.52	-37.42

The EUT must not transmit until the interference level is less than or equal to: Measured Threshold Level ≤TU

Where: TU=Upper threshold level

14.4.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 7.3.2& 7.3.3& 7.3.4.

14.4.2 MEASUREMENT RESULT

Monitor threshold	Measured Threshold Level	Limit (dBm)
Lowest Threshold (dBm)	N/A	-57.42
Upper Threshold (dBm)	N/A	-37.42

Note: N/A Not applicable - EUT which supports at least of 40 duplex system access channels and implements Least Interfered Channel (LIC) algorithm is permitted to use an upper monitoring threshold.

14.5 RANDOM WAITING REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(6) as follows:

If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same window after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

14.5.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 8.1.3.

14.5.2 MEASUREMENT RESULT

Not Applicable

The manufacturer declares that this provision is not utilized by the EUT.

14.6 MONITORING BANDWIDTH REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(7) as follows:

The monitoring system bandwidth must be equal to or greater than the occupied bandwidth of the intended transmission. Note: Testing of the monitoring system bandwidth is not required if the designed bandwidth from the manufacturer is available and given in the test report.

The maximum reaction time of the monitor shall be less than 50*SQRT{1.25/EBW or OBW[MHz]} μs for signals at the applicable threshold level but shall not be required to be less than 50μs.

If a signal of 6 dB or more above the threshold level is detected, the maximum reaction time shall be 35*SQRT{1.25/EBW or OBW[MHz]} μs but shall not be required to be less than 35μs.

14.6.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 7.5.

14.6.2 MEASUREMENT RESULT

Test Equation (μs)	EBW (MHz)	Pulse width(μs)	Limit (us)	Result
50 $(1.25/B)^{1/2}$	1.1843	43.37	50	Pass
35 $(1.25/B)^{1/2}$	1.1843	30.36	35	Pass

14.7 MONITORING ANTENNA REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(8)(9) as follows:

The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

14.7.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 paragraph 4.

14.7.2 MEASUREMENT RESULT

The antenna of the EUT used for transmission is the same interior antenna that used for monitoring.

14.8 DUAL ACCESS CRITERIA CHECK REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(10) as follows:

A device initiating a communication (hereafter called an initiating device) may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows.

If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window.

If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting in the receive time and spectrum window monitored by the initiating device.

14.8.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 8.3.1&8.3.2.

14.8.2 MEASUREMENT RESULT

EUT that do NOT implements the LIC procedure:

Test ref. to ANSI C63.17 clause 8.3.1	Observation	Verdict
b) EUT is restricted to a single carrier *f1* for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Interference at level T_L+ U_M on all timeslots except one receive slot where interference is at least 10 dB below TL	No connection possible	N/A
e) f) Interference at level T_L+ U_M on all timeslots except one transmit slot where interference is at least 10 dB below T_L	No connection possible	N/A

EUTs that implements the LIC procedure:

Test ref. to ANSI C63.17 clause 8.3.1	Observation	Verdict
b) EUT is restricted to a single carrier *f1* for TDMA systems. The Test is Pass if EUT can transmit	EUT can transmit	Pass
c) d) Transmission on interference-free receive time/spectrum window	Connected on the target Rx window and its duplex mate.	Pass
e) f) Transmission on interference-free transmit time/spectrum window	Connected on the target Tx window and its duplex mate.	Pass

14.9 ALTERNATIVE MONITORING INTERVAL FOR CO-LOCATED DEVICES REQUIREMENTS

According to the requirements of FCC Part 15.323(c)(11) as follows:

An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within 1 m) transmitter of the same system, may monitor the portions of the time and spectrum window in which they are to receive over a period of at least 10 ms.

The monitored time and spectrum window must total at least 50% of the 10 ms frame interval and the monitored spectrum must be within 1.25 MHz of the centre frequency of channel(s) already occupied by that device or co-located cooperating devices.

If the access criteria are met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

14.9.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 8.4.

14.9.2 MEASUREMENT RESULT

The manufacturer declares that this provision is not utilized by the EUT.

14.10 FRAME REPETITION STABILITY AND PERIOD AND JITTER

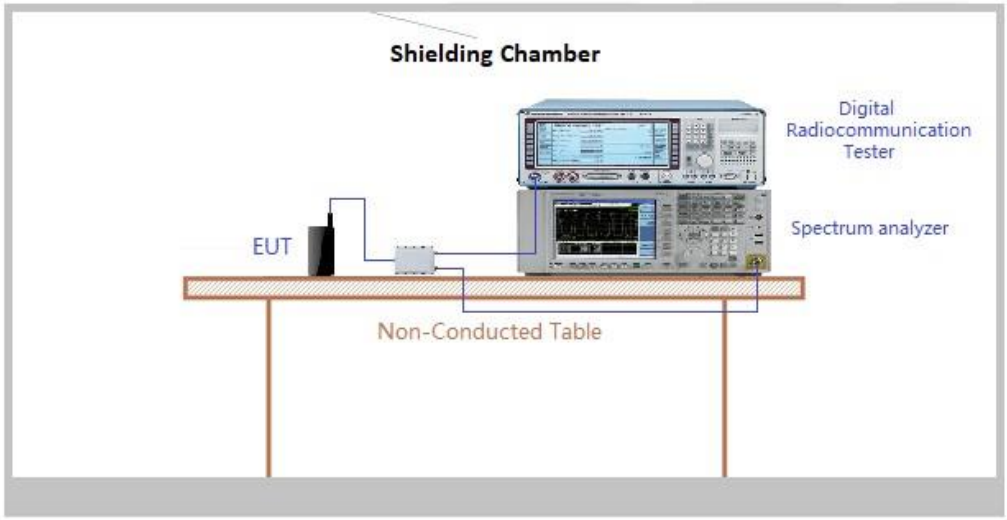
According to the requirements of FCC Part 15.323(c)(13) as follows:

The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this band shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm. The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

14.10.1 MEASUREMENT PROCEDURE

For detailed test methods, please refer to ANSI C63.17-2013 Clause 6.2.2&6.2.3

14.10.2 MEASUREMENT SETUP

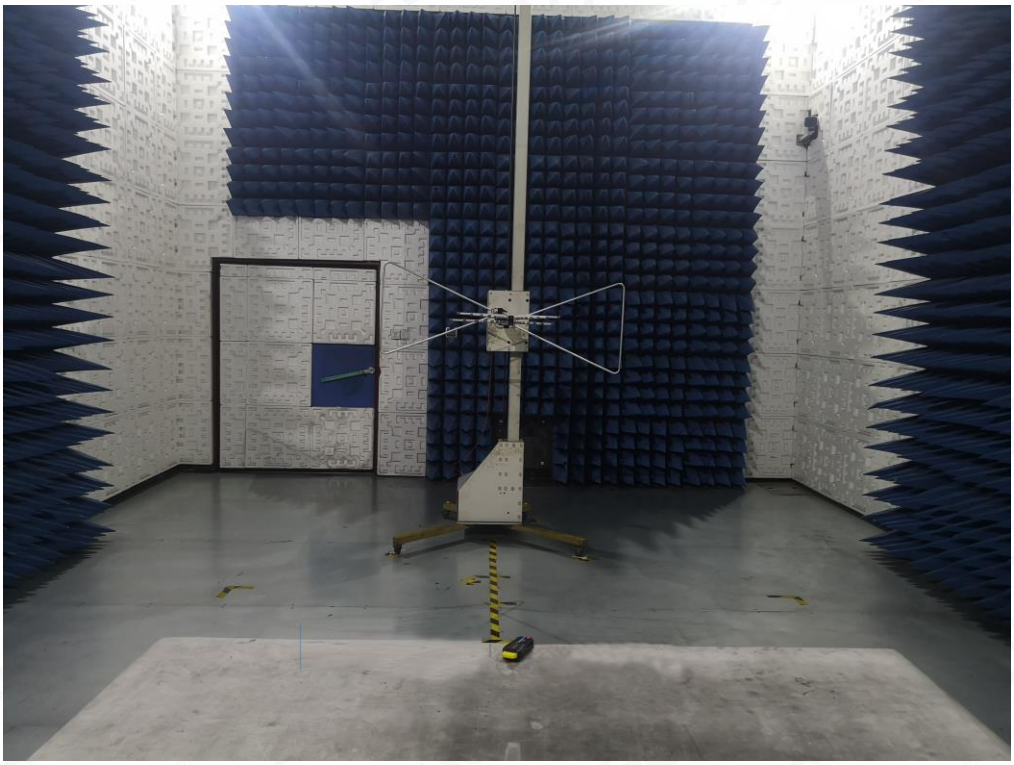


14.10.3 MEASUREMENT RESULT

Carrier Frequency (MHz)	Frame Jitter (us)					Limit of Δ
	min	mean	max	Δmin	Δmax	
1924.992	-0.76	0	0.89	-0.76	0.89	±25

APPENDIX I: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP



RADIATED EMISSION ABOVE 1G TEST SETUP

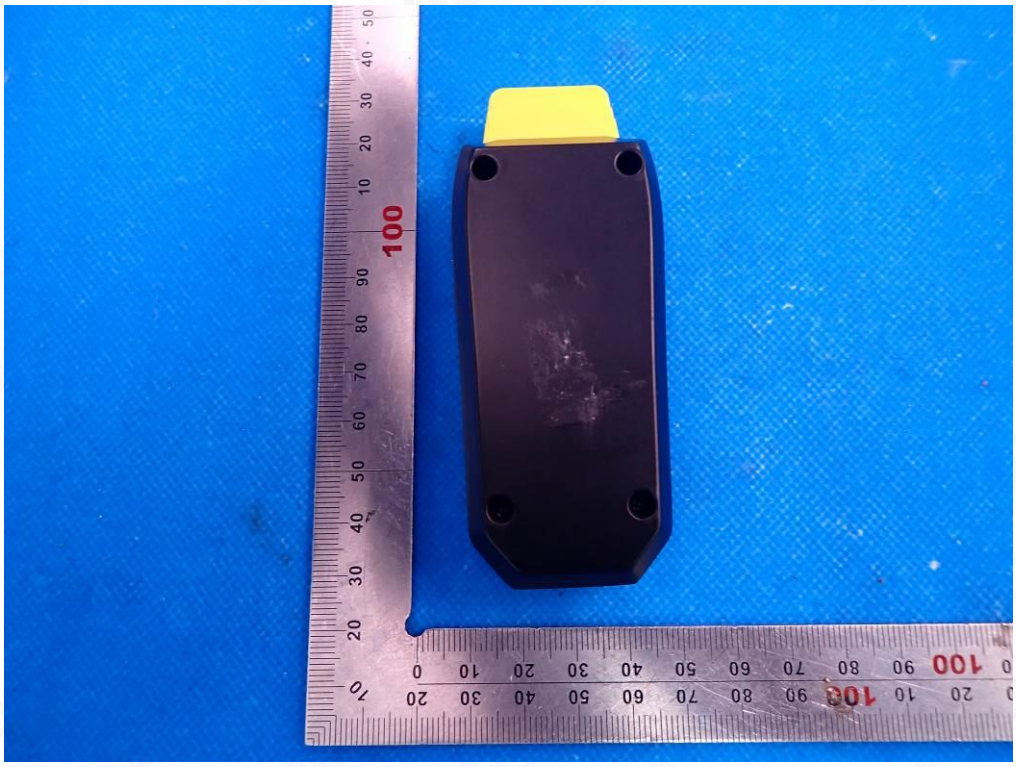
CONDUCTED TEST SETUP

APPENDIX II: PHOTOGRAPHS OF TEST EUT

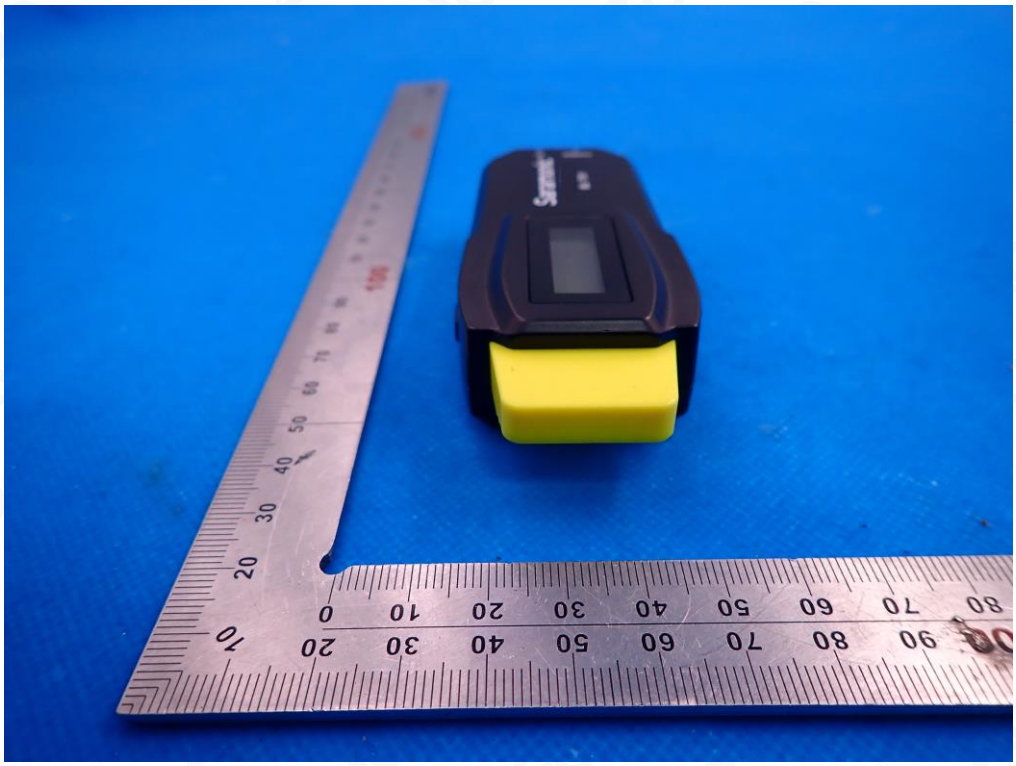
ALL VIEW-1 OF EUT

OUTSIDE VIEW-1 OF EUT

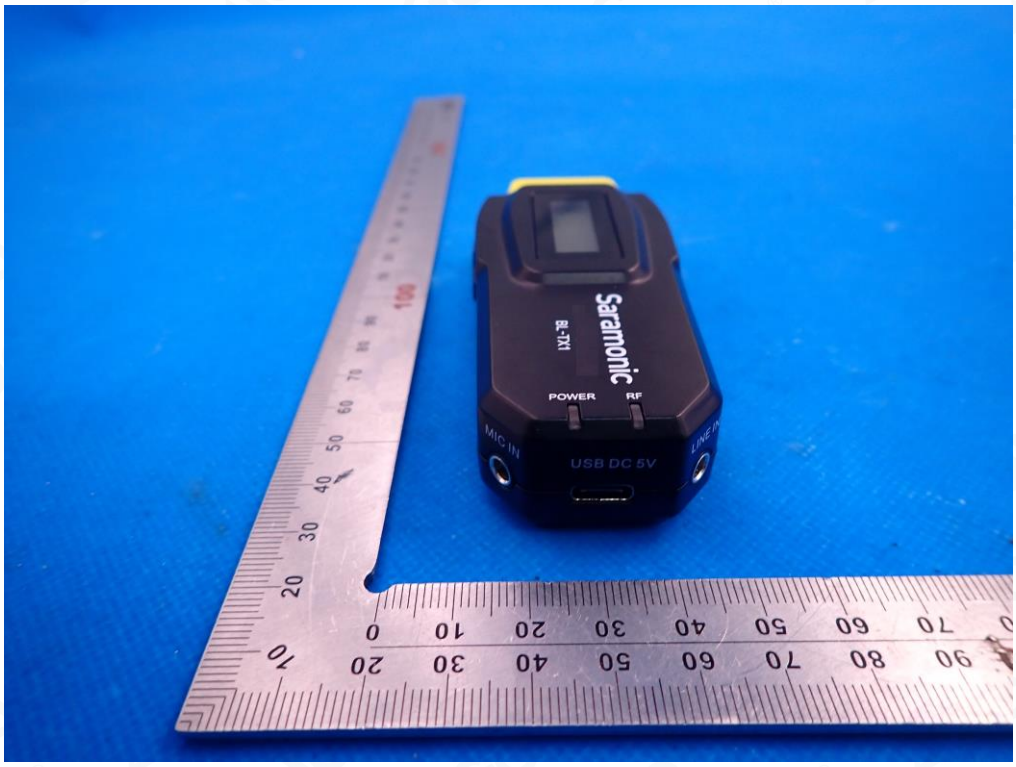
OUTSIDE VIEW-2 OF EUT



OUTSIDE VIEW-3 OF EUT



OUTSIDE VIEW-4 OF EUT



OUTSIDE VIEW-5 OF EUT

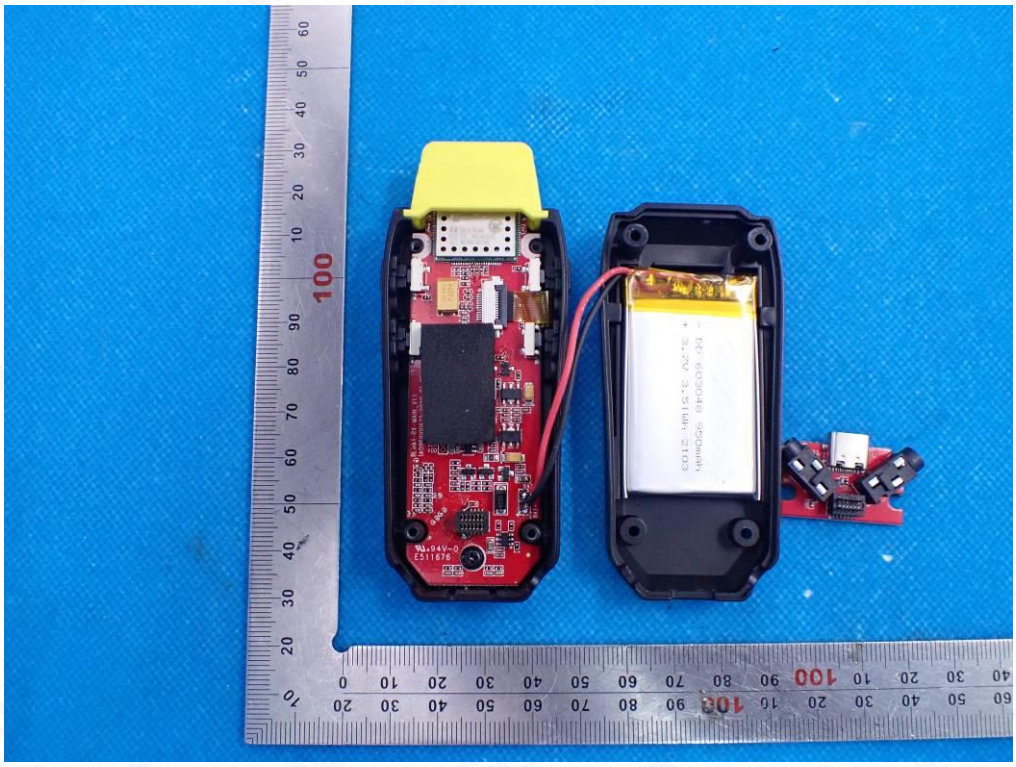
OUTSIDE VIEW-6 OF EUT

PORT VIEW-1 OF EUT

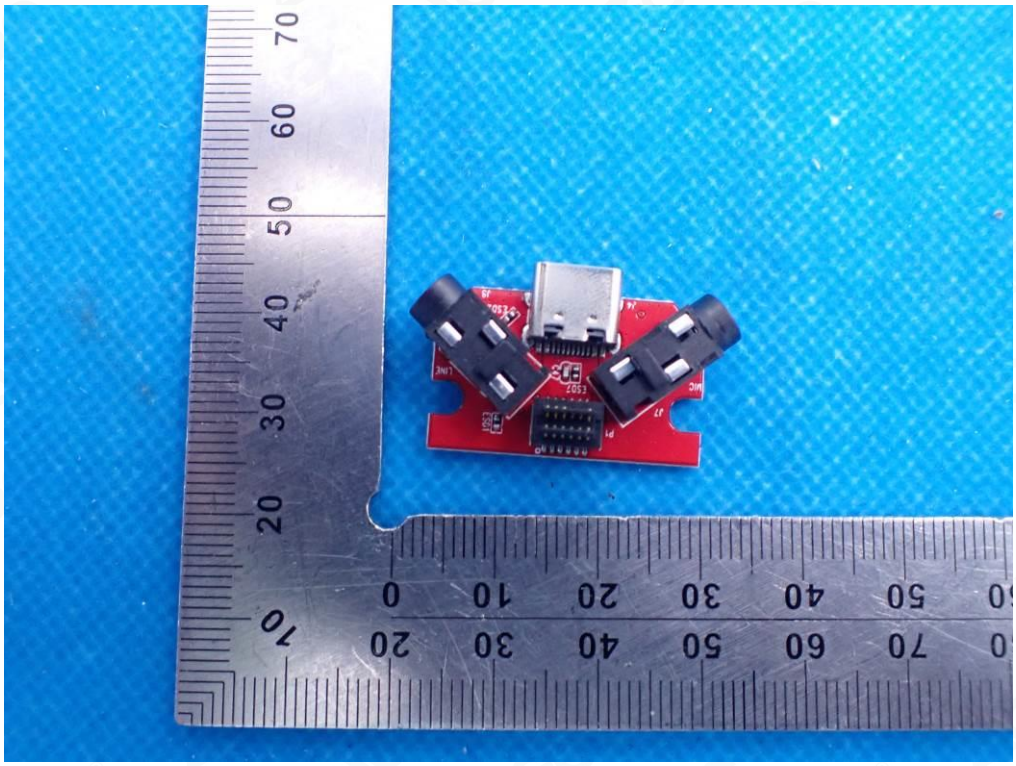
PORT VIEW-2 OF EUT

PORT VIEW-3 OF EUT

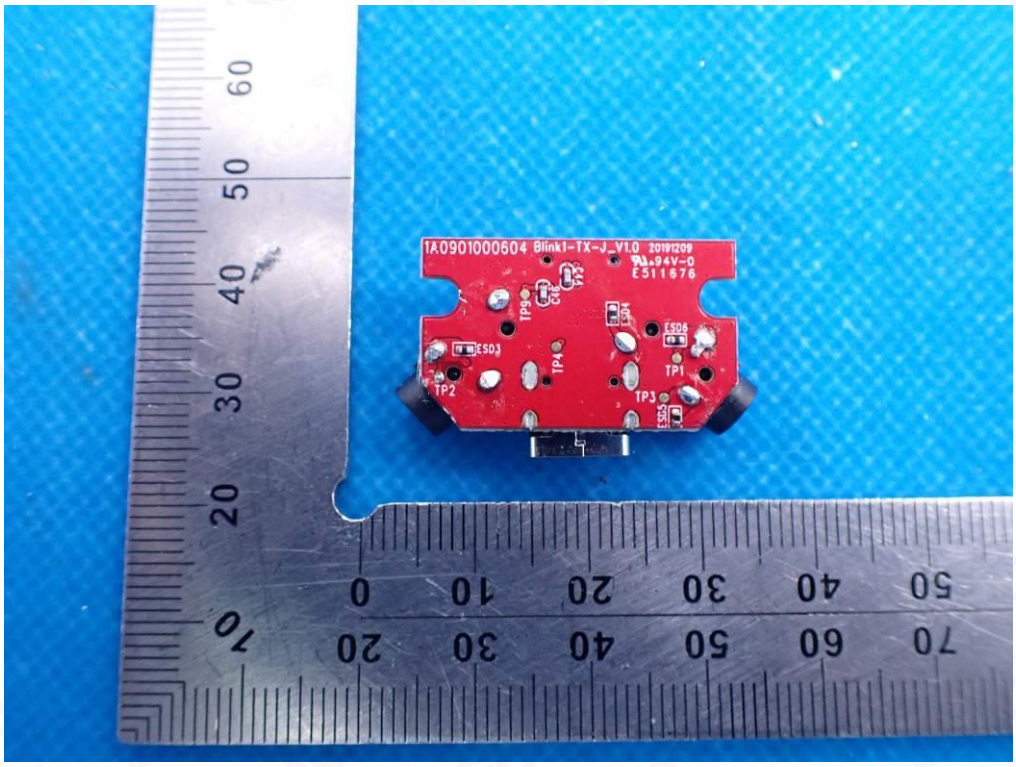
OPEN VIEW OF EUT



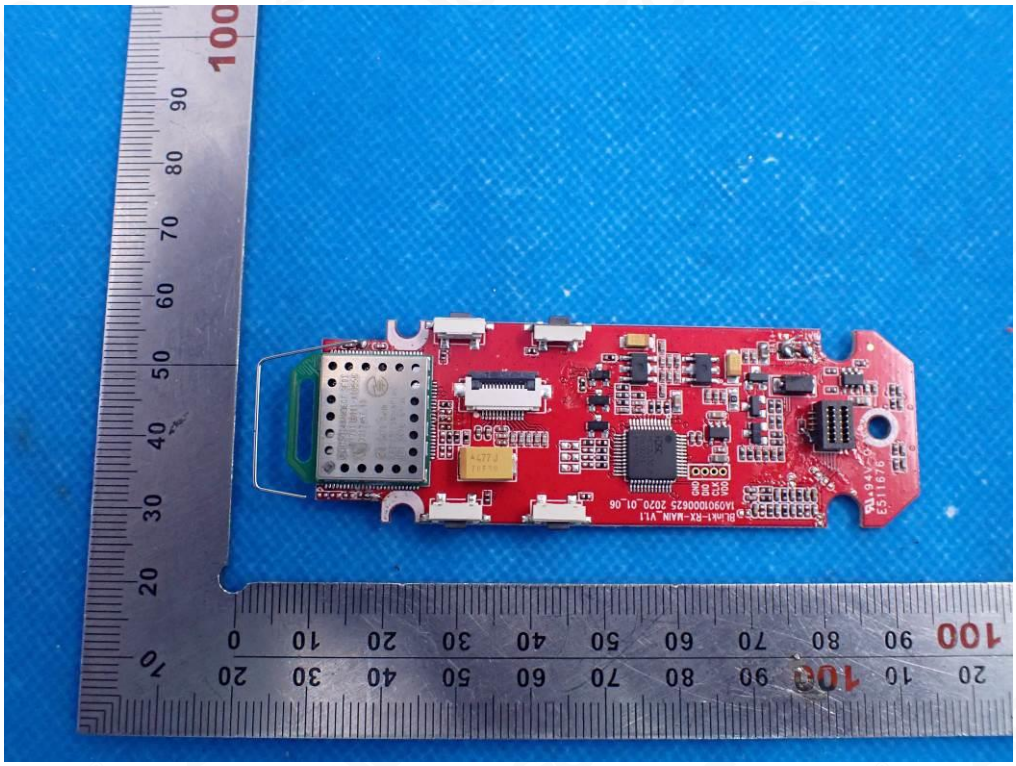
INTERNAL VIEW-1 OF EUT



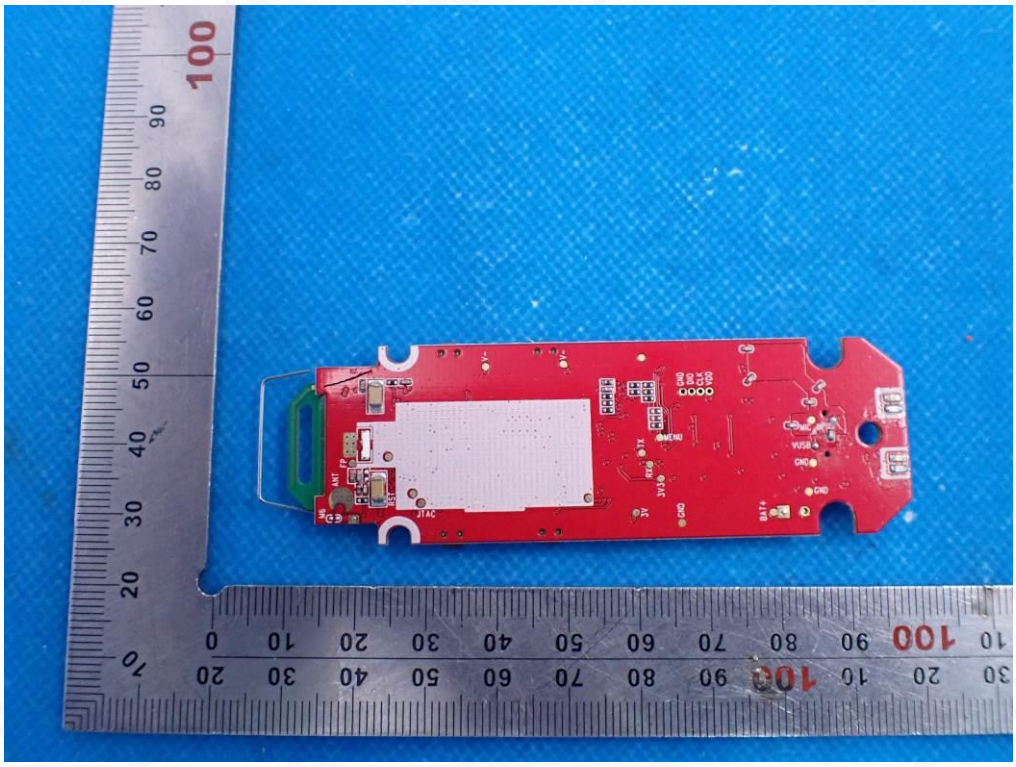
INTERNAL VIEW-2 OF EUT



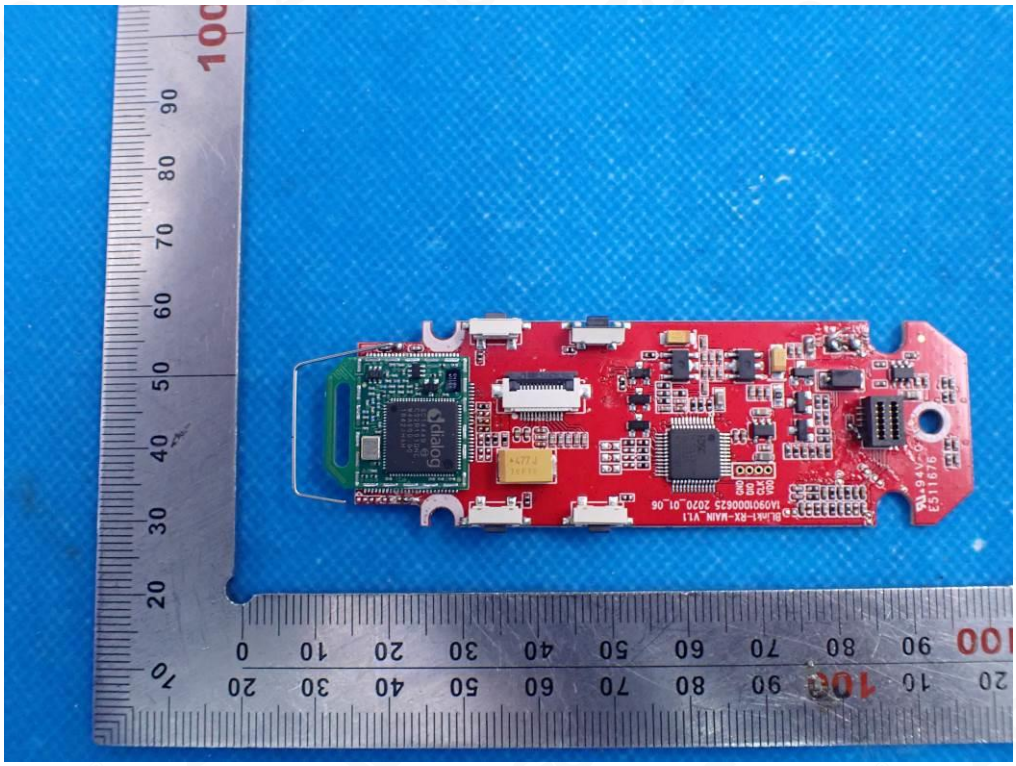
INTERNAL VIEW-3 OF EUT



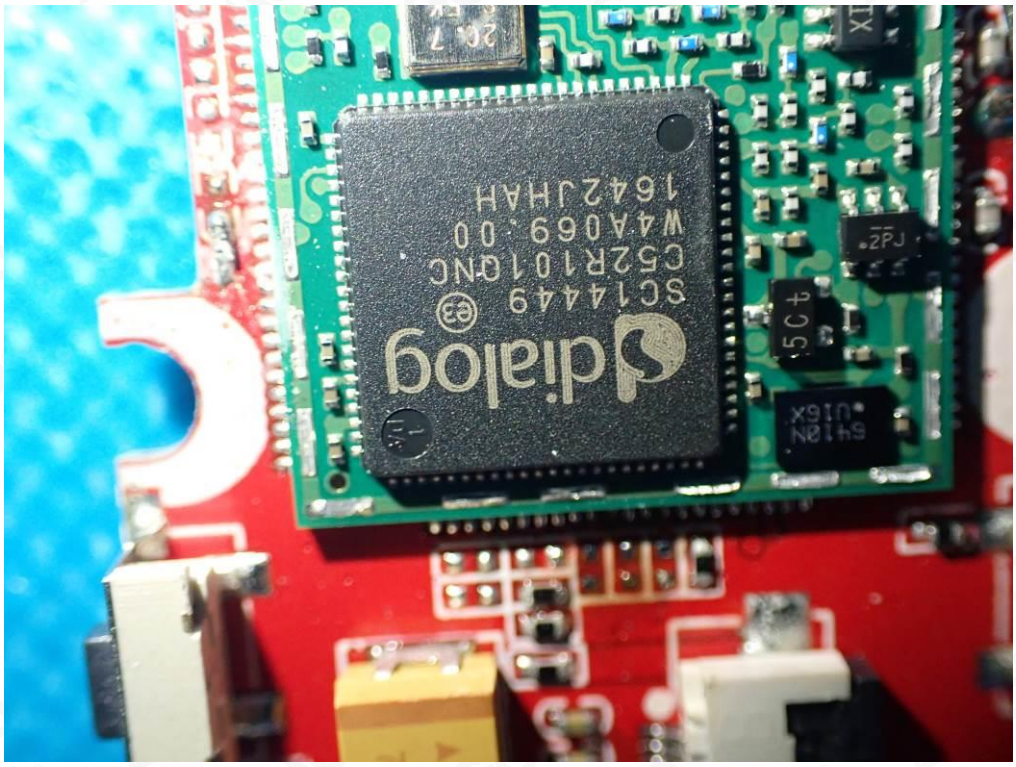
INTERNAL VIEW-4 OF EUT



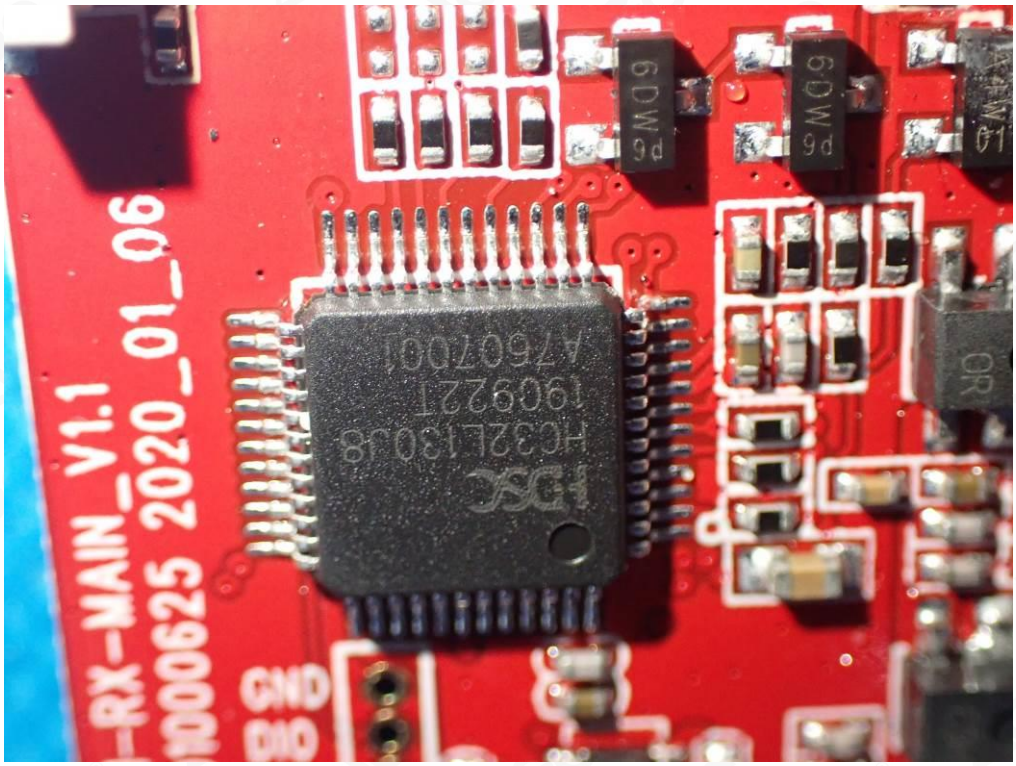
INTERNAL VIEW-5 OF EUT



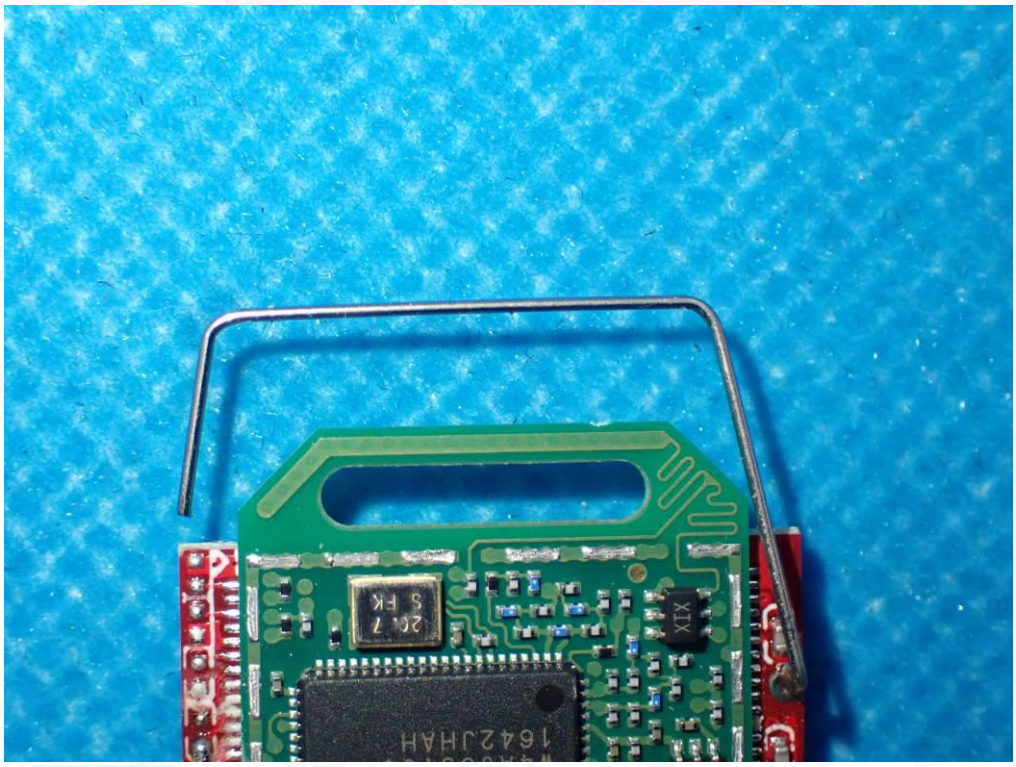
INTERNAL VIEW-6 OF EUT



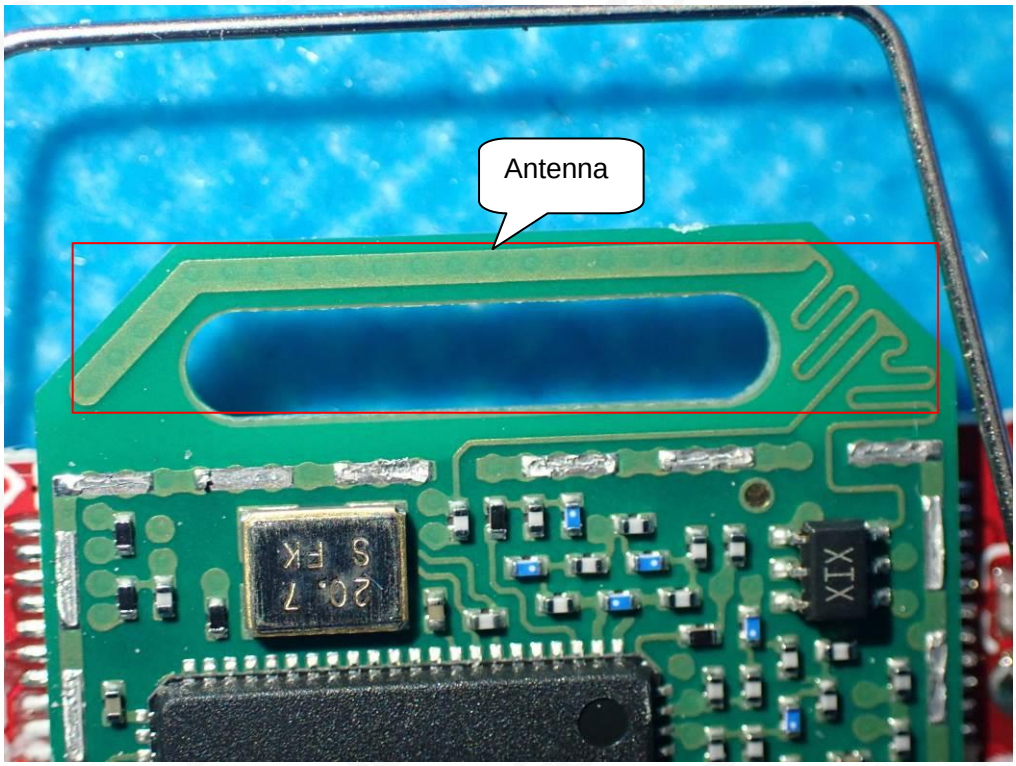
INTERNAL VIEW-7 OF EUT



INTERNAL VIEW-8 OF EUT



INTERNAL VIEW-9 OF EUT



VIEW OF BATTERY

-----END OF REPORT-----

Conditions of Issuance of Test Reports

1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").

2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.

3.The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.

4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.

5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.

6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.

7.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.

8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.

9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.