Radiated emission above 1GHz

EUT	Bluetooth Headset	**Model Name**	KH54
Temperature	25°C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 7	**Antenna**	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	44.86	0.08	44.94	74	-29.06	peak
4804.000	37.59	0.08	37.67	54	-16.33	AVG
7206.000	40.42	2.21	42.63	74	-31.37	peak
7206.000	32.37	2.21	34.58	54	-19.42	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Headset	**Model Name**	KH54
Temperature	25°C	**Relative Humidity**	55.4%
Pressure	960hPa	**Test Voltage**	Normal Voltage
Test Mode	Mode 7	**Antenna**	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4804.000	43.56	0.08	43.64	74	-30.36	peak
4804.000	36.38	0.08	36.46	54	-17.54	AVG
7206.000	40.47	2.21	42.68	74	-31.32	peak
7206.000	31.45	2.21	33.66	54	-20.34	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 8	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	45.45	0.14	45.59	74	-28.41	peak
4882.000	38.59	0.14	38.73	54	-15.27	AVG
7323.000	41.36	2.36	43.72	74	-30.28	peak
7323.000	34.35	2.36	36.71	54	-17.29	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 8	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.000	45.39	0.14	45.53	74	-28.47	peak
4882.000	37.26	0.14	37.4	54	-16.6	AVG
7323.000	40.57	2.36	42.93	74	-31.07	peak
7323.000	33.51	2.36	35.87	54	-18.13	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	46.95	0.22	47.17	74	-26.83	peak
4960.000	38.74	0.22	38.96	54	-15.04	AVG
7440.000	41.62	2.64	44.26	74	-29.74	peak
7440.000	32.53	2.64	35.17	54	-18.83	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25°C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4960.000	46.62	0.22	46.84	74	-27.16	peak
4960.000	38.78	0.22	39	54	-15	AVG
7440.000	40.36	2.64	43	74	-31	peak
7440.000	31.42	2.64	34.06	54	-19.94	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.

Factor = Antenna Factor + Cable loss - Amplifier gain, Margin=Level-Limit.

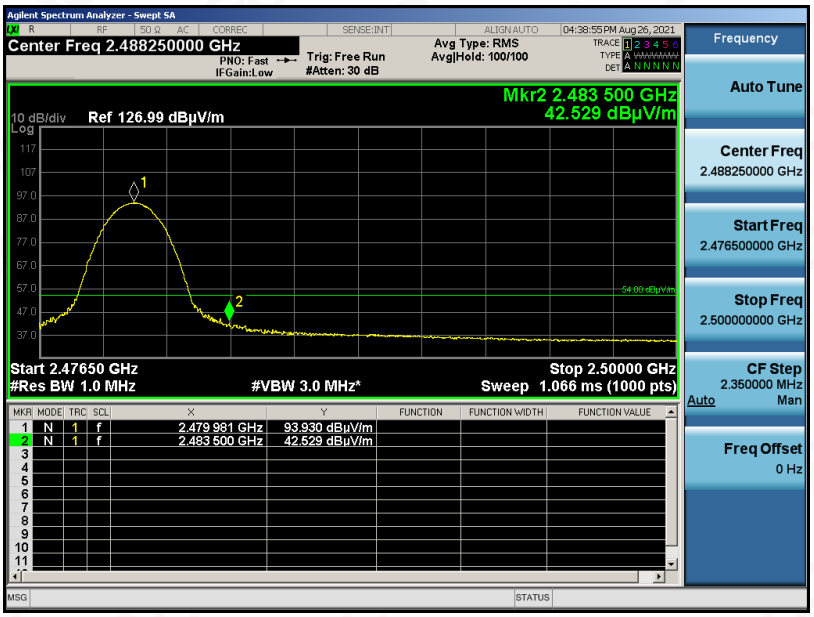
The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been tested. The 8DPSK modulation is the worst case and recorded in the report.

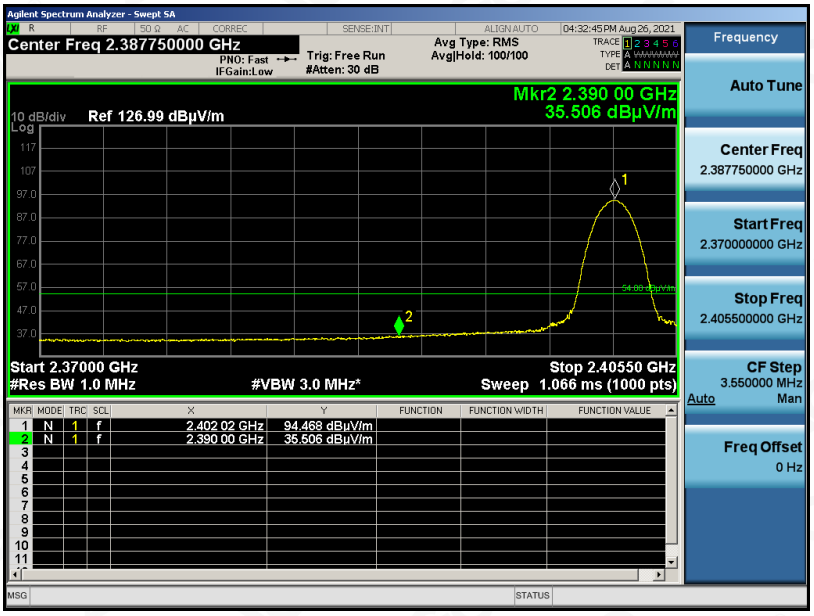
Test result for band edge emission at restricted bands

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Horizontal

Test Graph for Peak Measurement



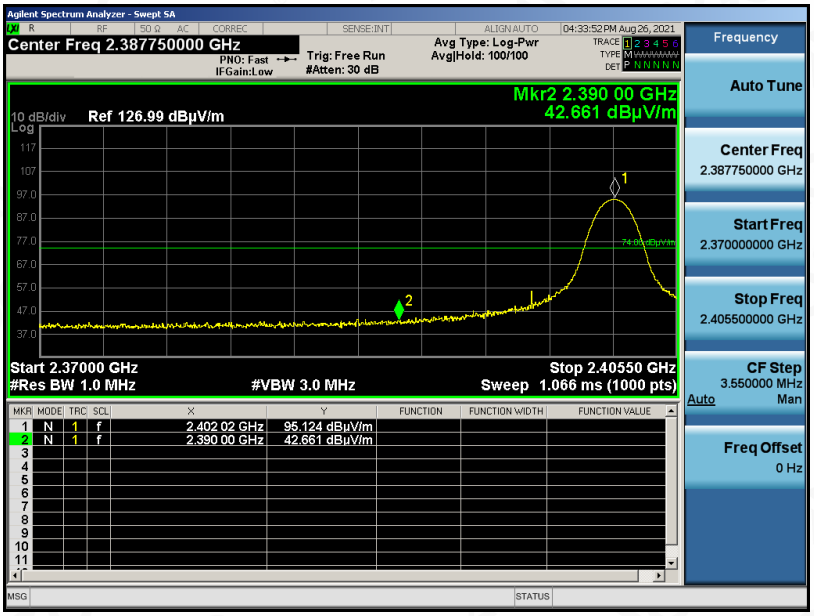
Test Graph for Average Measurement



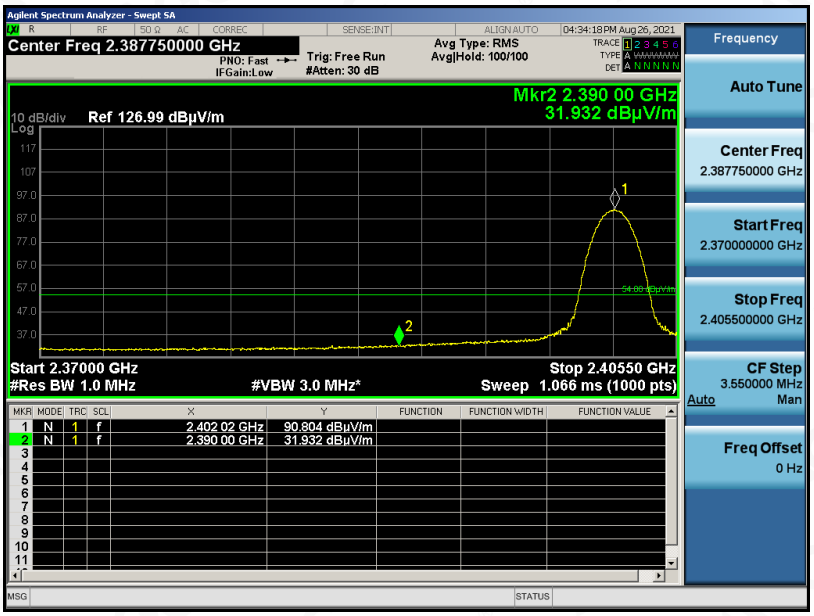
RESULT: PASS

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 7	Antenna	Vertical

Test Graph for Peak Measurement



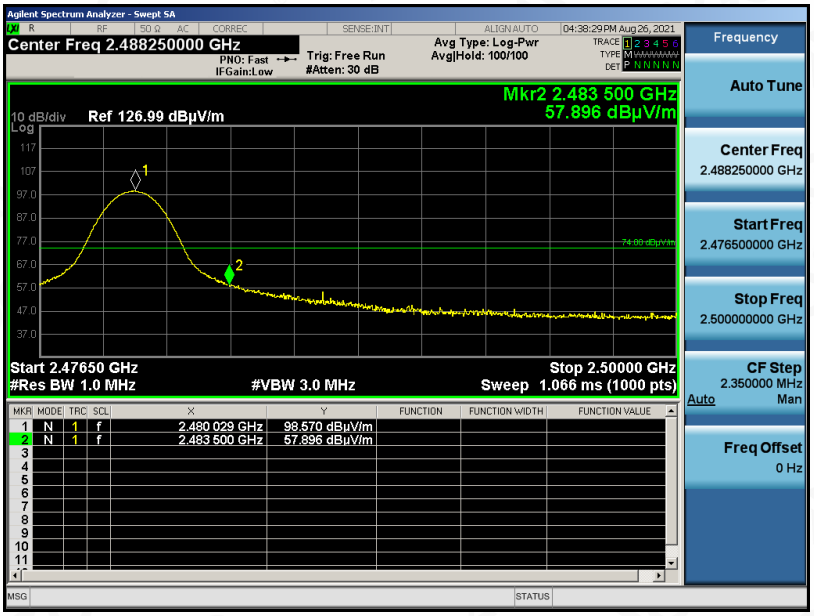
Test Graph for Average Measurement



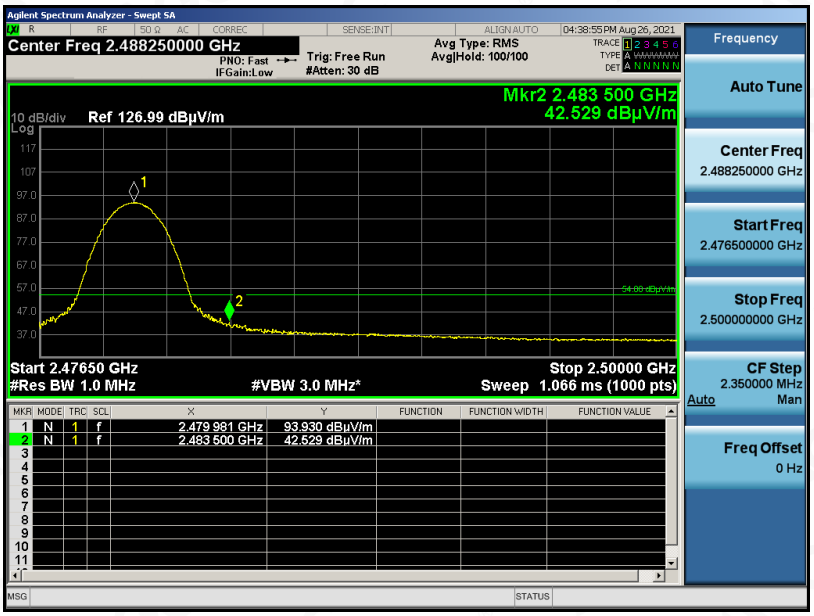
RESULT: PASS

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Horizontal

Test Graph for Peak Measurement



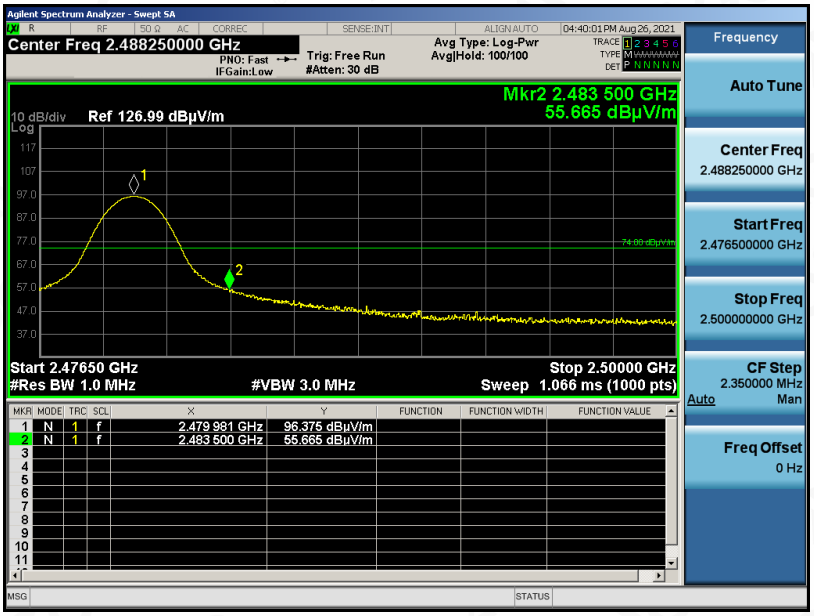
Test Graph for Average Measurement



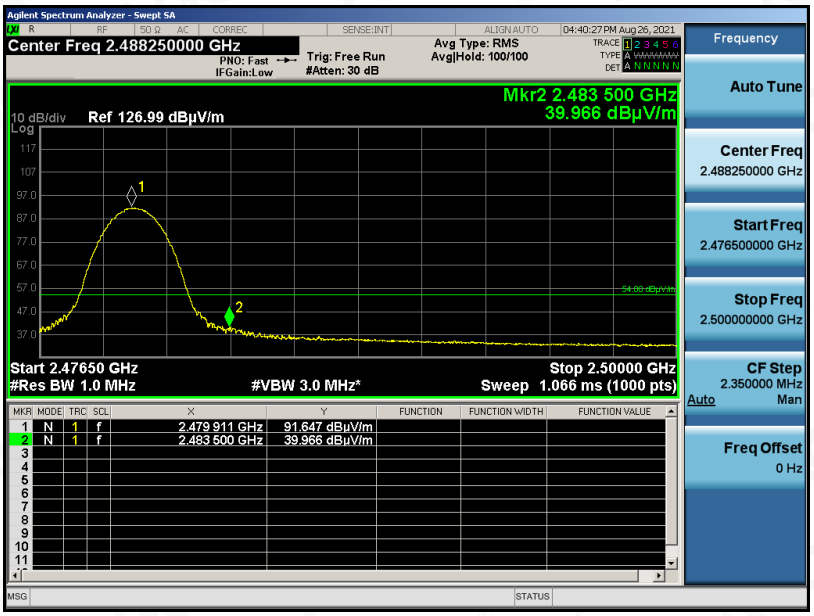
RESULT: PASS

EUT	Bluetooth Headset	Model Name	KH54
Temperature	25℃	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 9	Antenna	Vertical

Test Graph for Peak Measurement



Test Graph for Average Measurement



RESULT: PASS

Note: The factor had been edited in the “Input Correction” of the Spectrum Analyzer. The 8DPSK modulation is the worst case and recorded in the report.

11. NUMBER OF HOPPING FREQUENCY

11.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW ≥ RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.
4. Allow the trace to stabilize.

11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

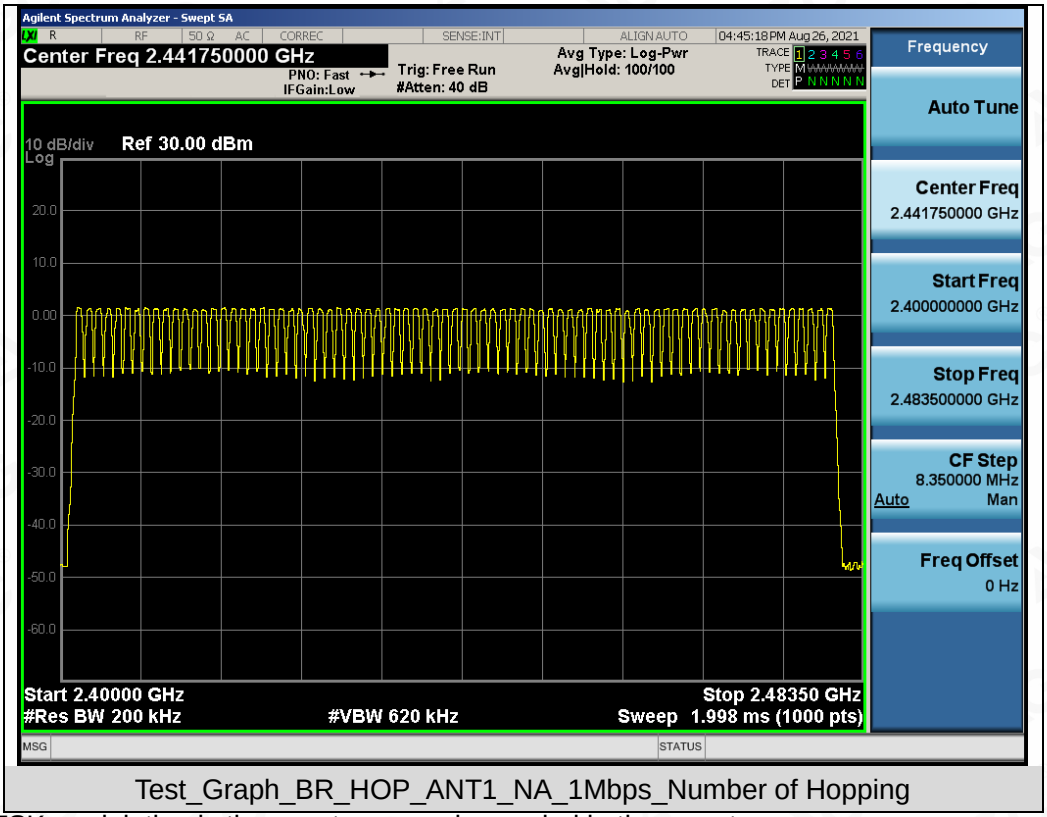
11.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

11.4. LIMITS AND MEASUREMENT RESULT

Test Data of Number of Hopping Frequency			
Test Mode	Number of Hopping Frequency	Limits	Pass or Fail
GFSK Hopping	79	>=15	Pass

Test Graphs of Number of Hopping Frequency



Test_Graph_BR_HOP_ANT1_NA_1Mbps_Number of Hopping

Note: The GFSK modulation is the worst case and recorded in the report.

12. TIME OF OCCUPANCY (DWELL TIME)

12.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
1. Span: Zero span, centered on a hopping channel.
2. RBW shall be≤channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel.
3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
4. Detector function: Peak. Trace: Max hold.
5. Use the marker-delta function to determine the transmit time per hop.
6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:
(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer) × (period specified in the requirements / analyzer sweep time)
7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

12.3. MEASUREMENT EQUIPMENT USED

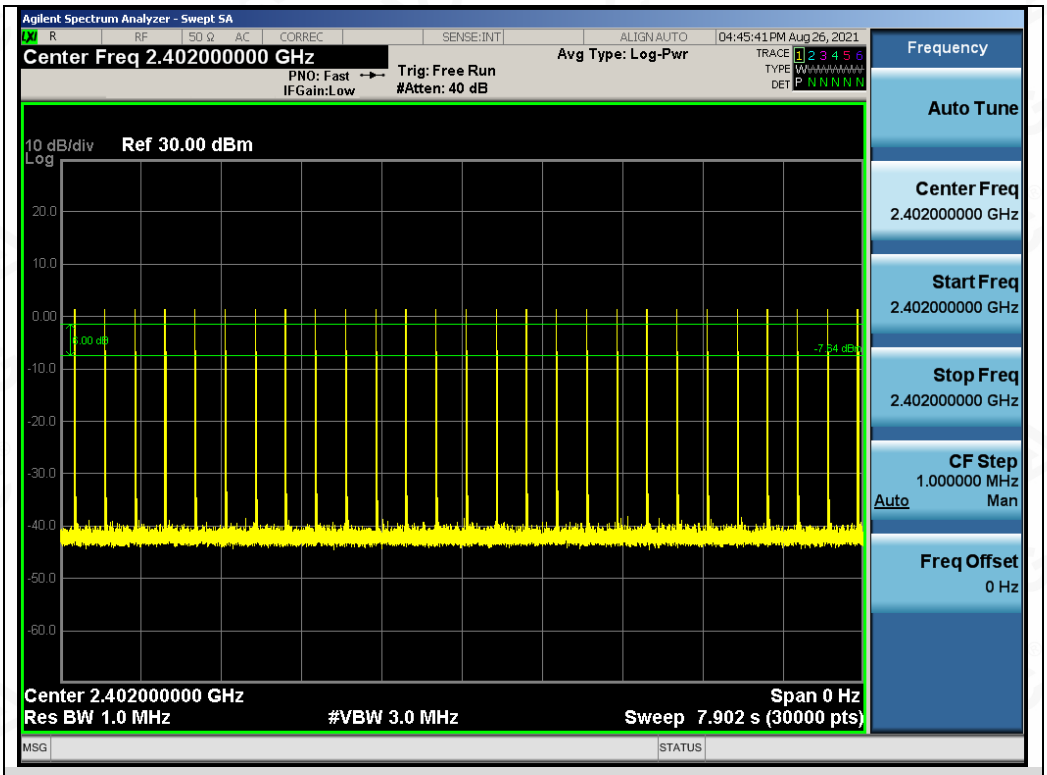
The same as described in section 6

12.4. LIMITS AND MEASUREMENT RESULT

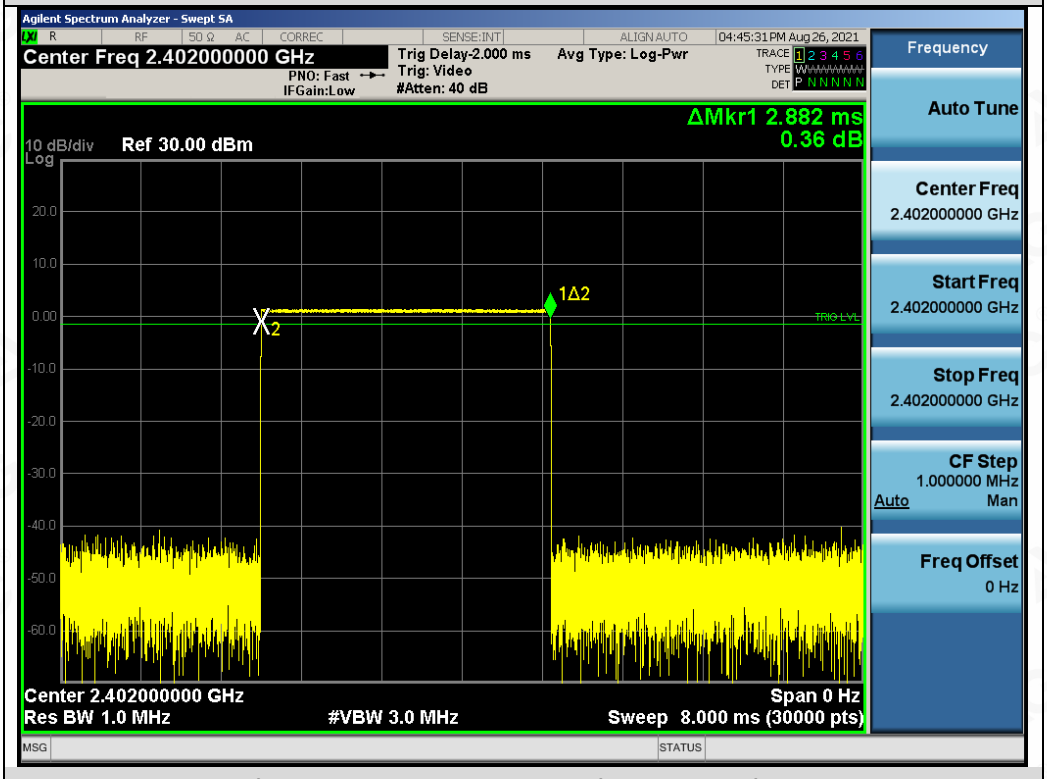
Test Data of Dwell Time					
Channel	Time of Pulse for DH5 (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)	Pass or Fail
2402	2.882	27.0*4	311.256	400	Pass
2441	2.882	27.0*4	311.256	400	Pass
2480	2.882	27.0*4	311.256	400	Pass

Note: The GFSK modulation is the worst case and recorded in the report.

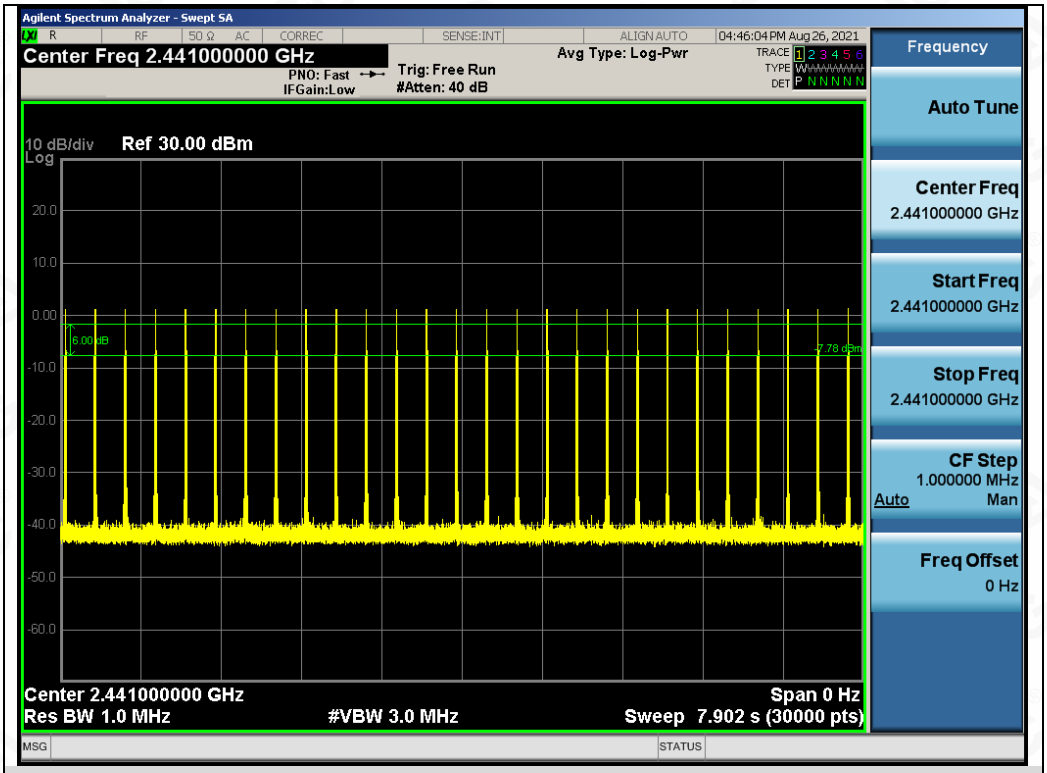
Test Graphs of Dwell Time



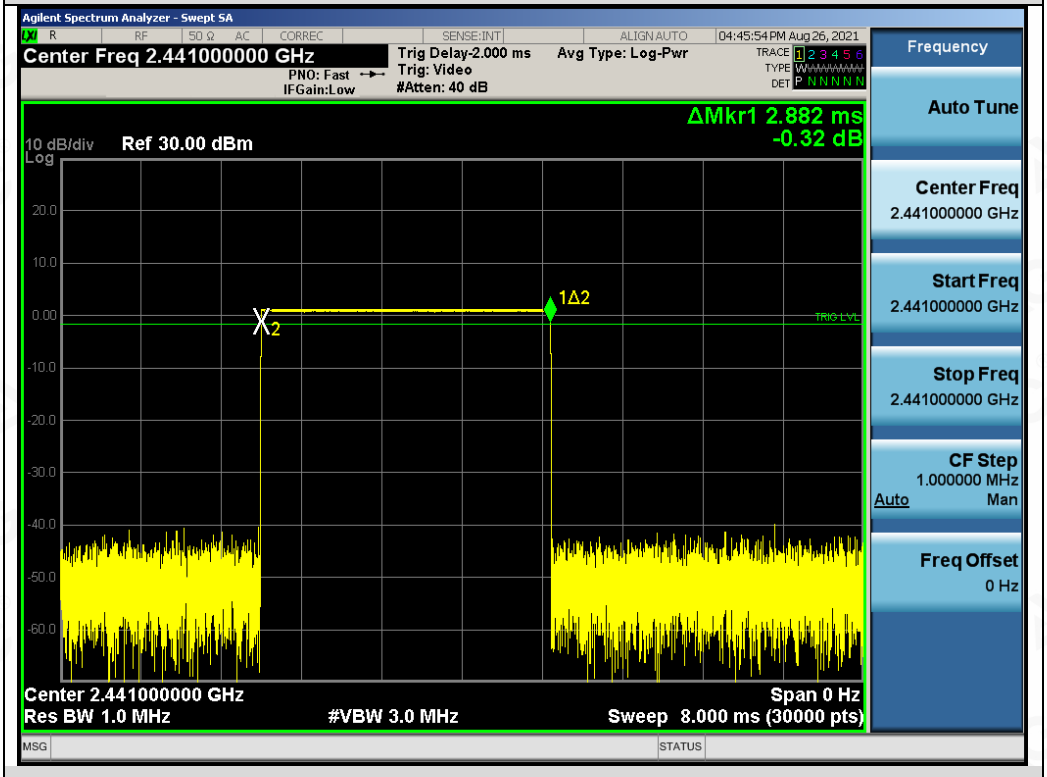
Test_Graph_BR_HOP_ANT1_NA_1Mbps_2402_Number of Busrt



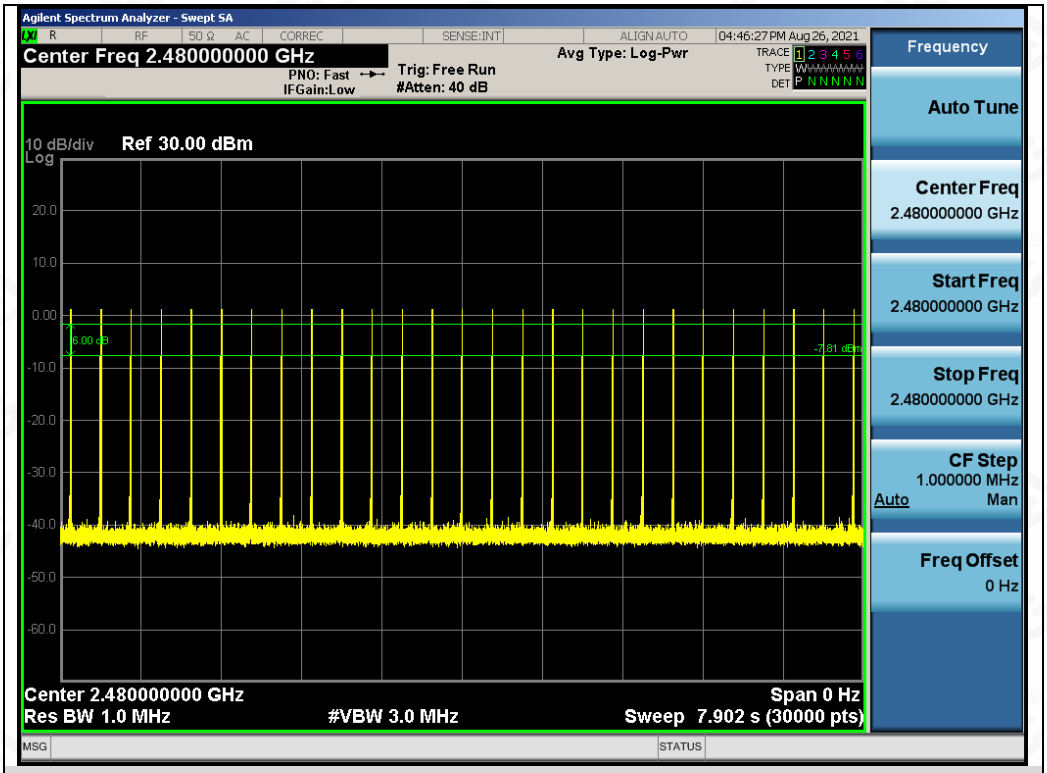
Test_Graph_BR_HOP_ANT1_NA_1Mbps_2402_Time per Burst



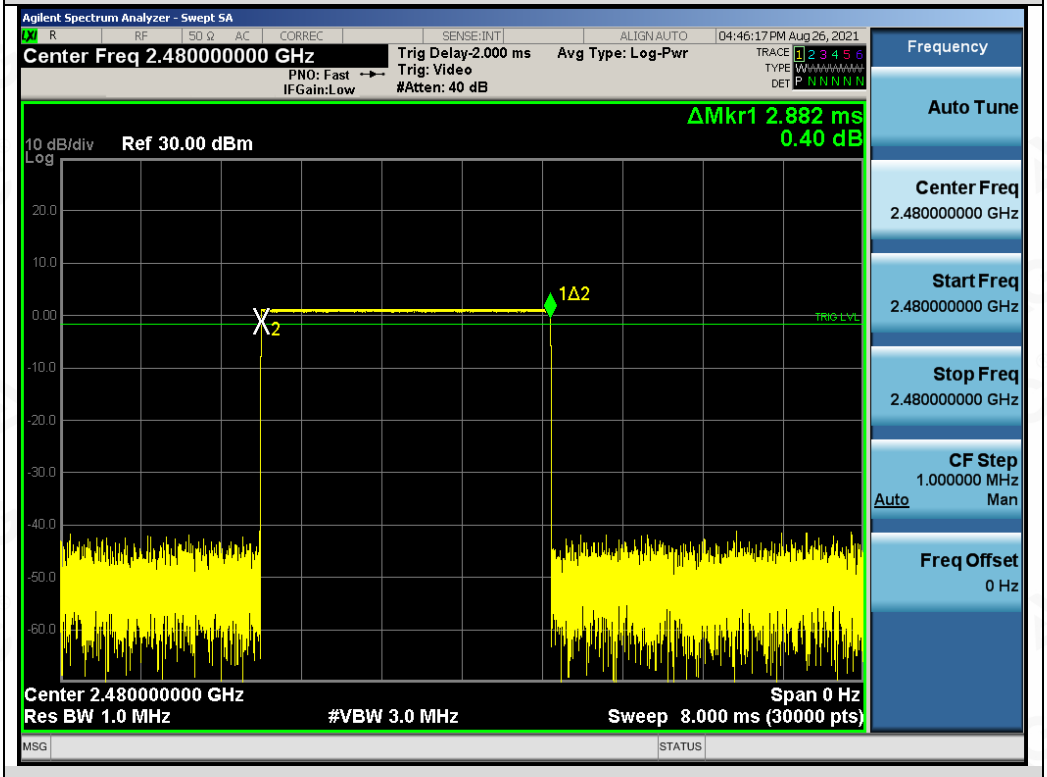
Test_Graph_BR_HOP_ANT1_NA_1Mbps_2441_Number of Busrt



Test_Graph_BR_HOP_ANT1_NA_1Mbps_2441_Time per Burst



Test_Graph_BR_HOP_ANT1_NA_1Mbps_2480_Number of Busrt



Test_Graph_BR_HOP_ANT1_NA_1Mbps_2480_Time per Burst

13. FREQUENCY SEPARATION

13.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:
1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. Video (or average) bandwidth (VBW) ≥ RBW.
4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize.
Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

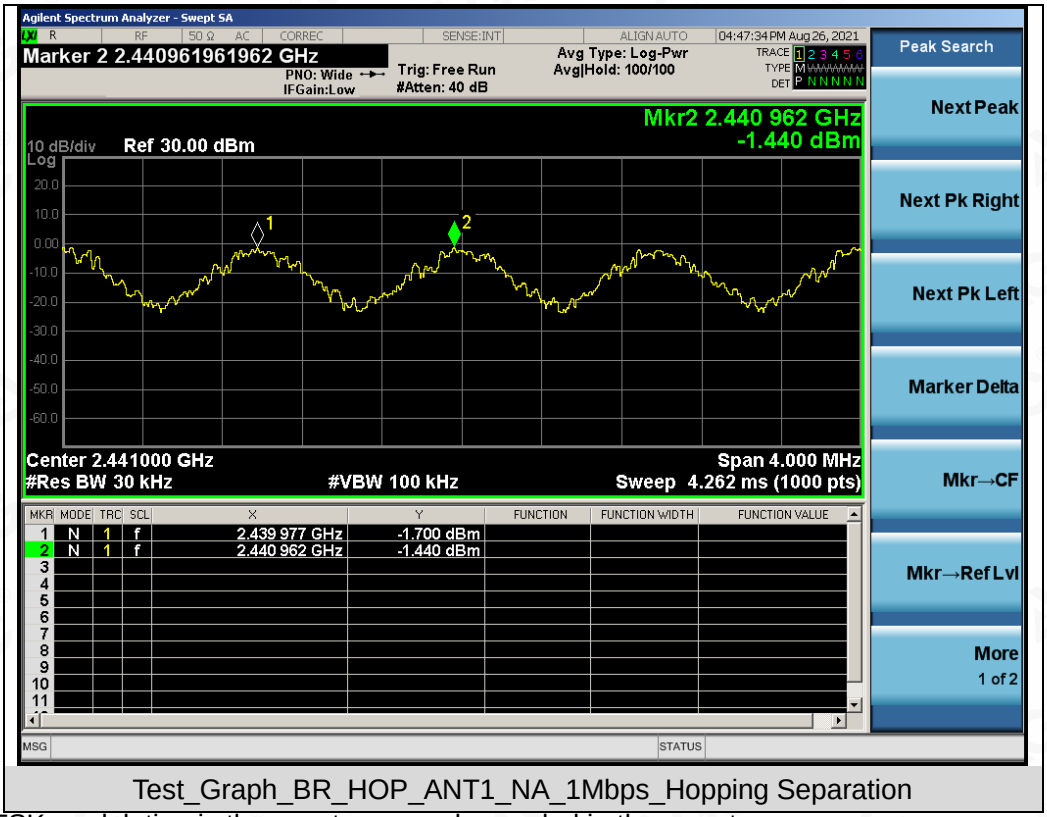
13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

13.4. LIMITS AND MEASUREMENT RESULT

Test Data of Frequency Separation			
Test Mode	Channel Separation (MHz)	Limits	Pass or Fail
GFSK Hopping	0.985	>= 2/3 -20dB BW	Pass

Test Graphs of Number of Hopping Frequency



Test_Graph_BR_HOP_ANT1_NA_1Mbps_Hopping Separation

Note: The GFSK modulation is the worst case and recorded in the report.

14. LINE CONDUCTED EMISSION TEST

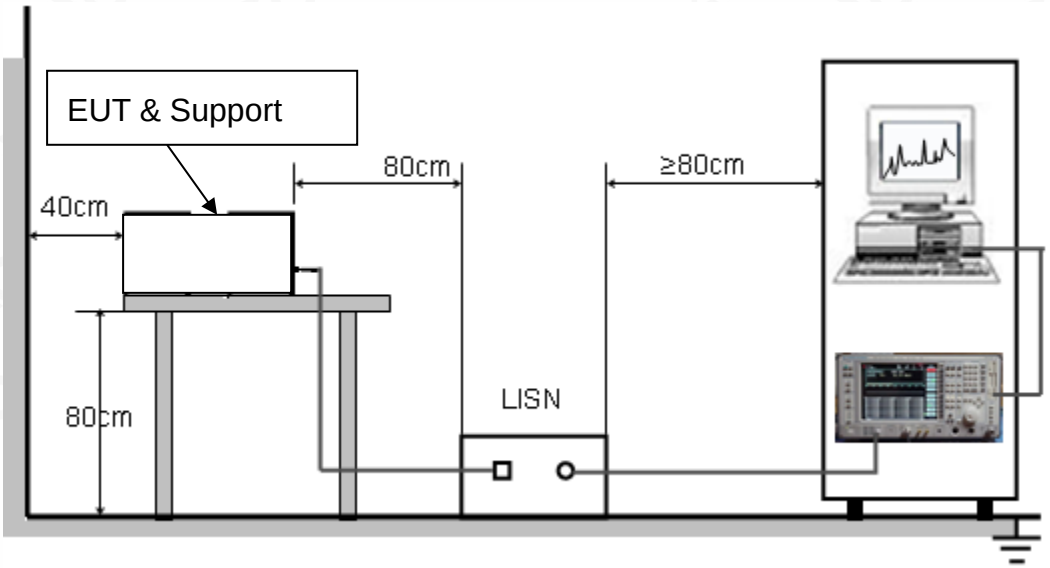
14.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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.

14.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



14.3. 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.

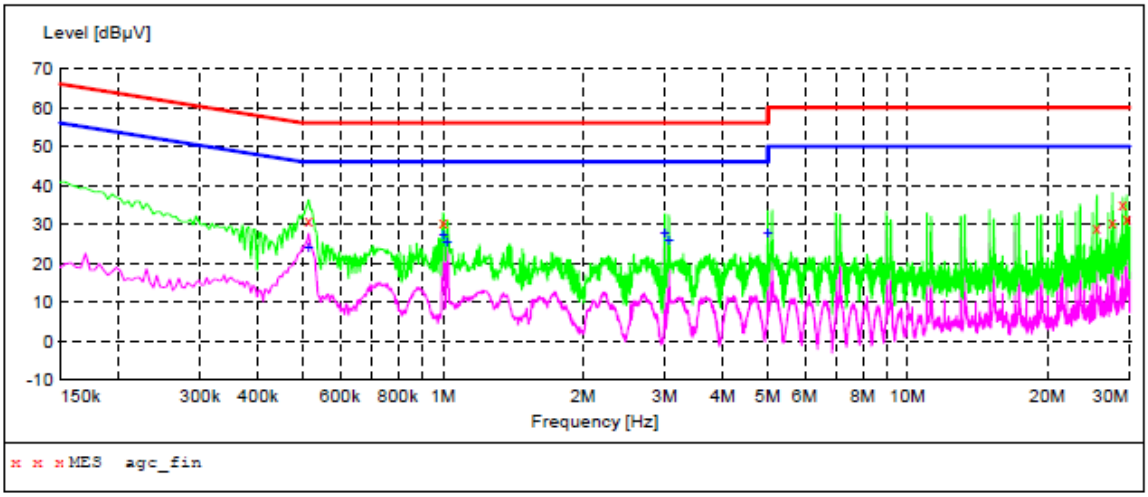
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

14.4. 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.

14.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



MEASUREMENT RESULT: "agc_fin"

2021/8/25 21:12

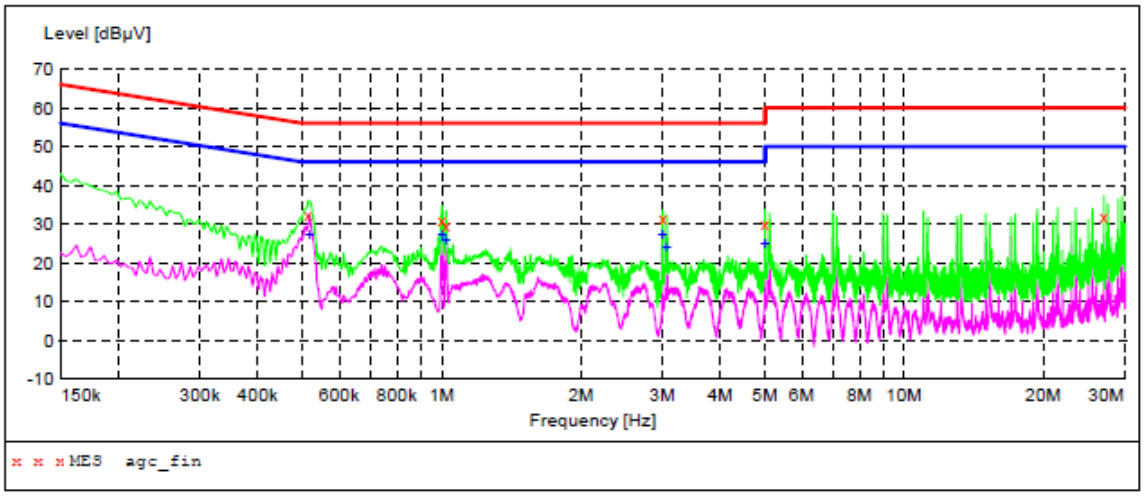
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.514000	30.80	5.4	56	25.2	QP	L1	GND
1.002000	30.60	5.4	56	25.4	QP	L1	GND
25.530000	29.30	9.2	60	30.7	QP	L1	GND
27.558000	30.50	9.4	60	29.5	QP	L1	GND
28.998000	35.30	9.5	60	24.7	QP	L1	GND
29.602000	31.50	9.5	60	28.5	QP	L1	GND

MEASUREMENT RESULT: "agc_fin2"

2021/8/25 21:12

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.514000	24.20	5.4	46	21.8	AV	L1	GND
1.002000	27.20	5.4	46	18.8	AV	L1	GND
1.022000	25.50	5.5	46	20.5	AV	L1	GND
3.002000	27.90	6.5	46	18.1	AV	L1	GND
3.062000	25.80	6.5	46	20.2	AV	L1	GND
4.998000	27.70	6.6	46	18.3	AV	L1	GND

Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "agc_fin"

2021/8/25 21:09

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.514000	32.40	5.4	56	23.6	QP	N	GND
1.002000	30.90	5.4	56	25.1	QP	N	GND
1.022000	29.40	5.5	56	26.6	QP	N	GND
3.002000	31.30	6.5	56	24.7	QP	N	GND
4.998000	30.10	6.6	56	25.9	QP	N	GND
27.002000	32.00	9.3	60	28.0	QP	N	GND

MEASUREMENT RESULT: "agc_fin2"

2021/8/25 21:09

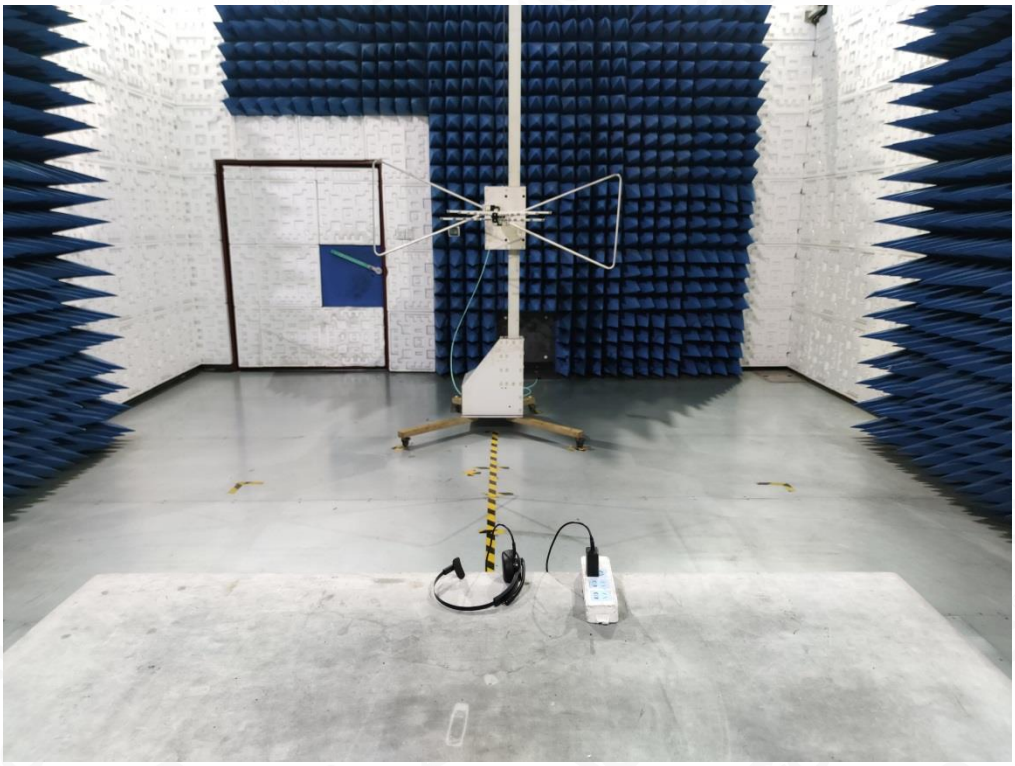
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.518000	27.20	5.4	46	18.8	AV	N	GND
1.002000	27.40	5.4	46	18.6	AV	N	GND
1.022000	25.90	5.5	46	20.1	AV	N	GND
3.002000	27.20	6.5	46	18.8	AV	N	GND
3.066000	24.00	6.5	46	22.0	AV	N	GND
4.998000	25.00	6.6	46	21.0	AV	N	GND

RESULT: PASS

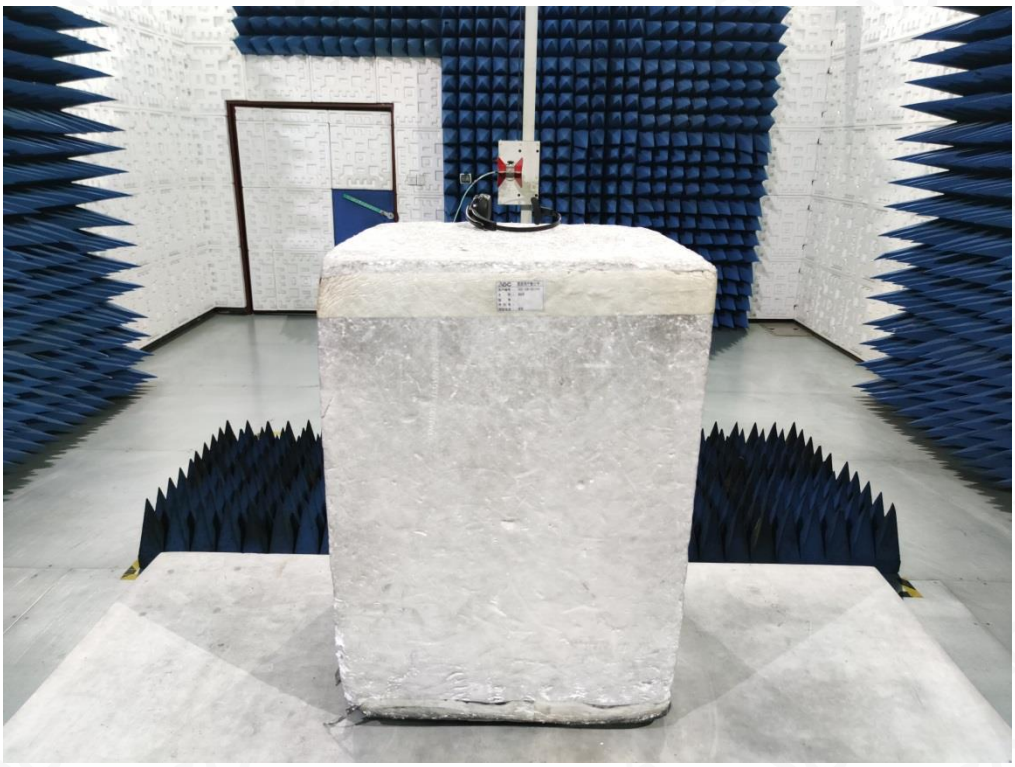
Note: All the test modes had been tested, the mode 7 was the worst case. Only the data of the worst case would be record in this test report.

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHz

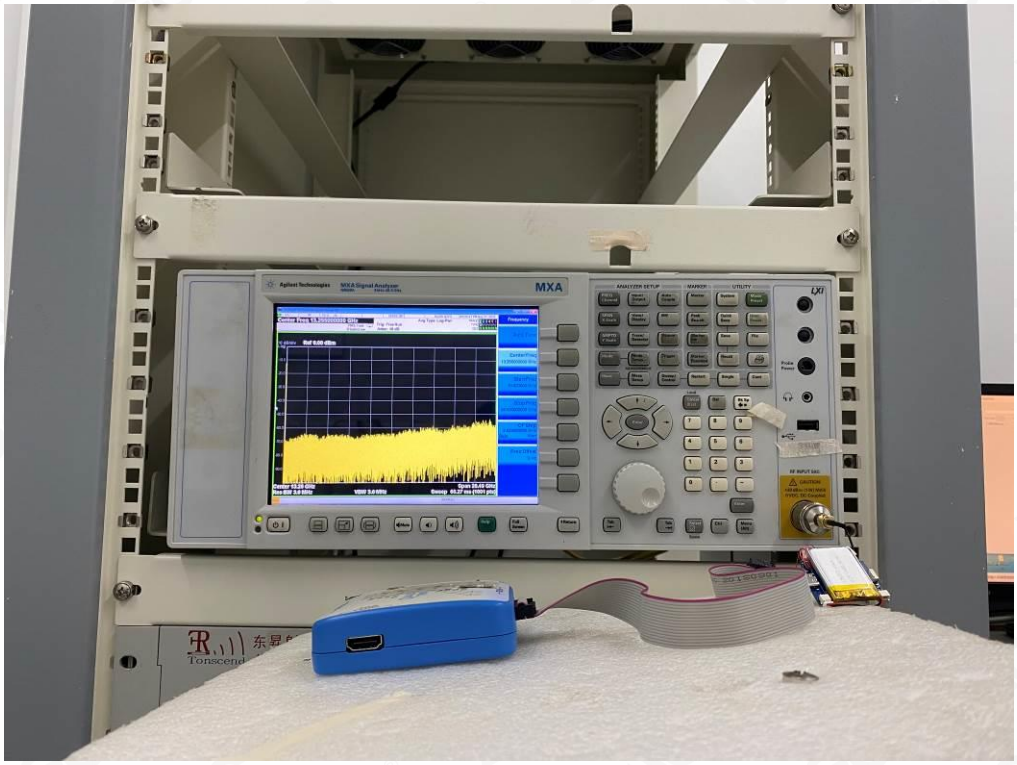


RADIATED EMISSION TEST SETUP ABOVE 1GHz



CONDUCTED EMISSION TEST SETUP

CONDUCTED TEST SETUP



APPENDIX B: PHOTOGRAPHS OF EUT

WHOLE VIEW OF EUT

TOP VIEW OF EUT

BOTTOM VIEW OF EUT

FRONT VIEW OF EUT

BACK VIEW OF EUT

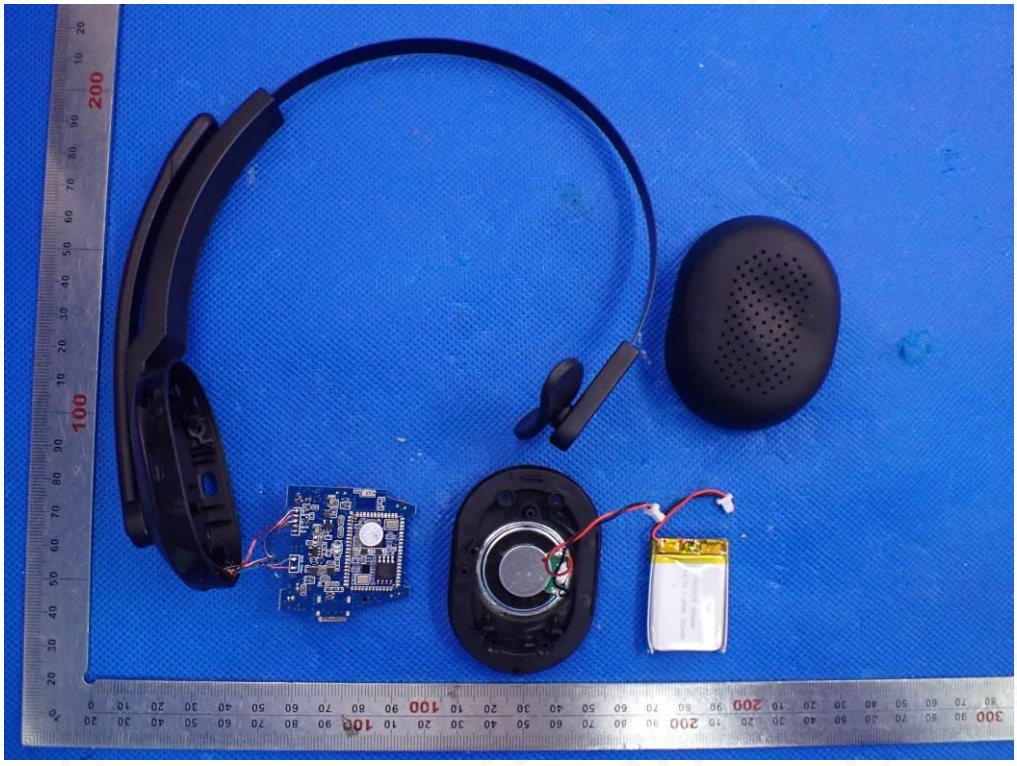
LEFT VIEW OF EUT

RIGHT VIEW OF EUT

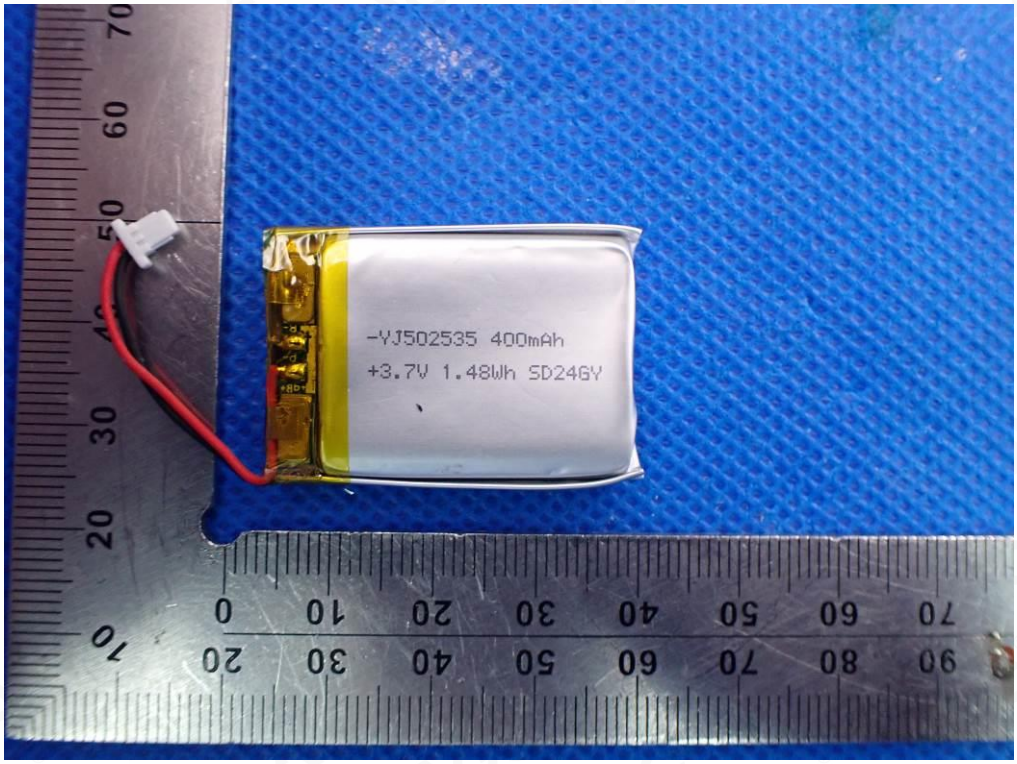
VIEW OF EUT(PORT)-1

VIEW OF EUT(PORT)-2

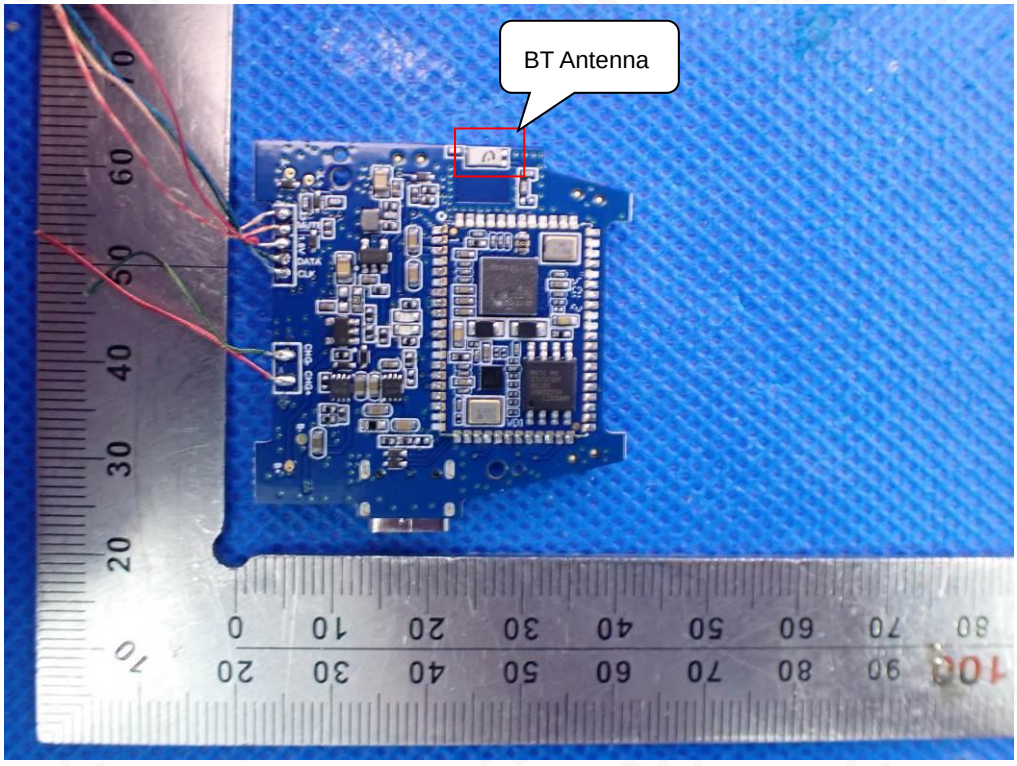
OPEN VIEW OF EUT



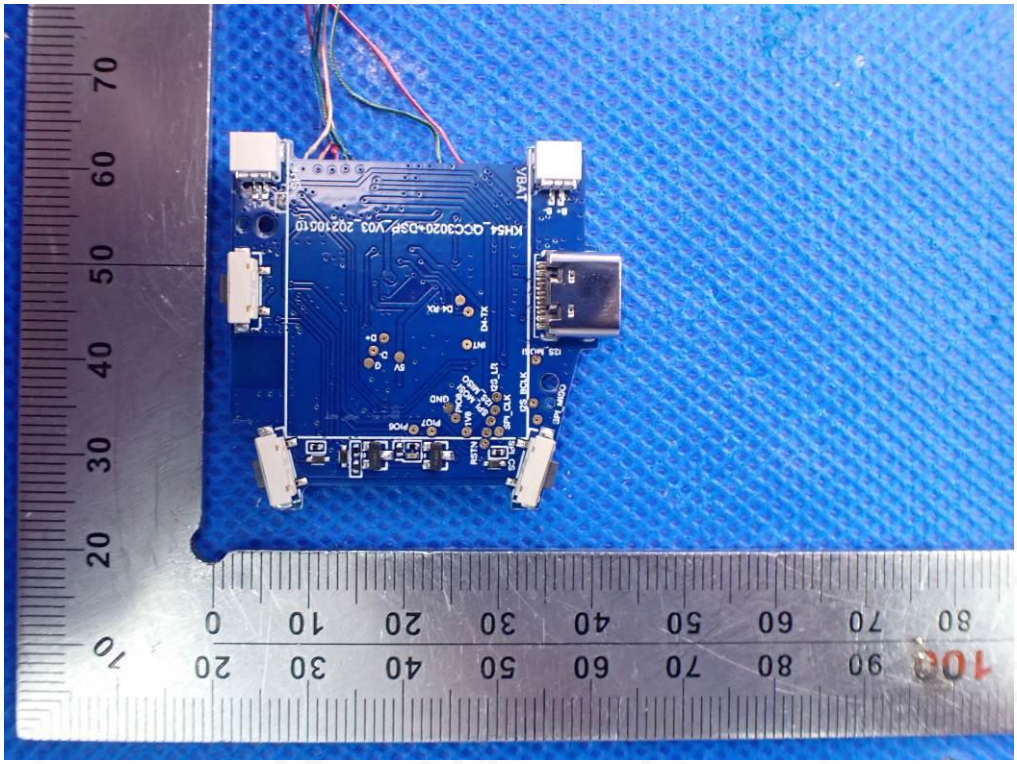
VIEW OF BATTERY



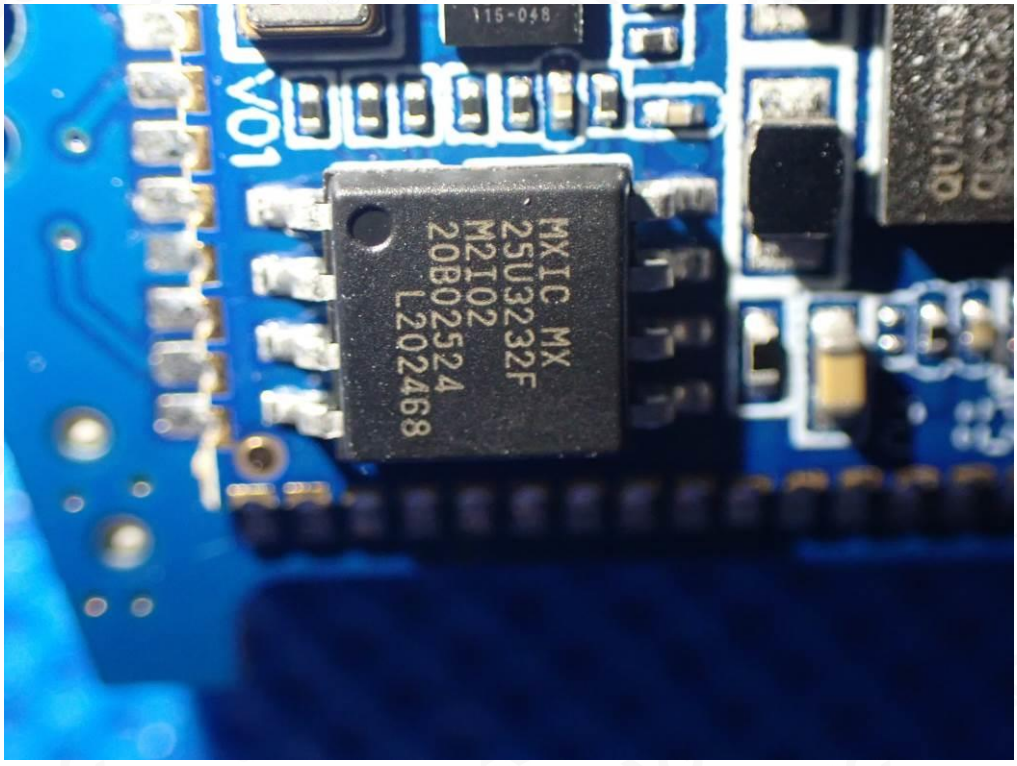
INTERNAL VIEW OF EUT-1



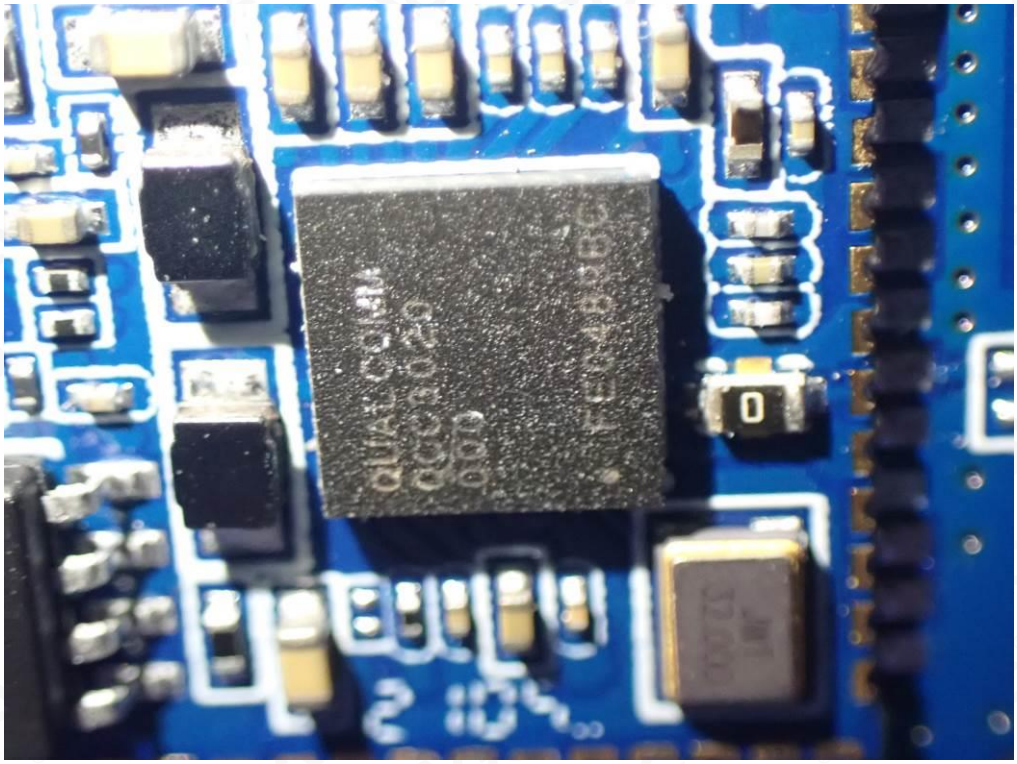
INTERNAL VIEW OF EUT-2



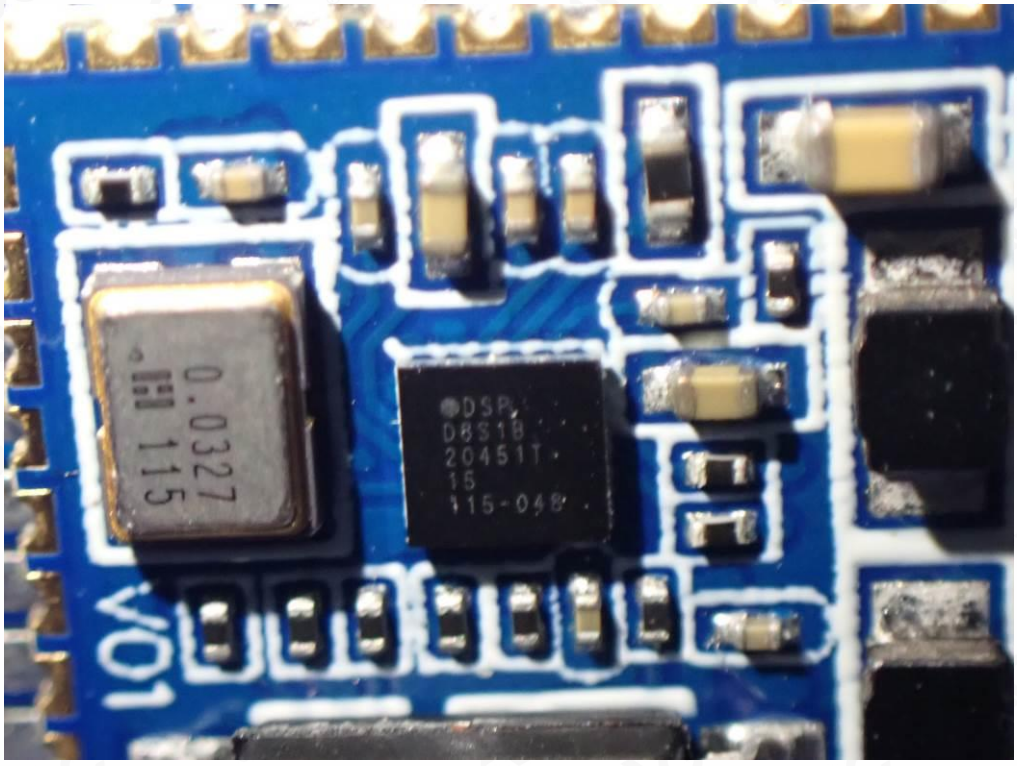
INTERNAL VIEW OF EUT-3



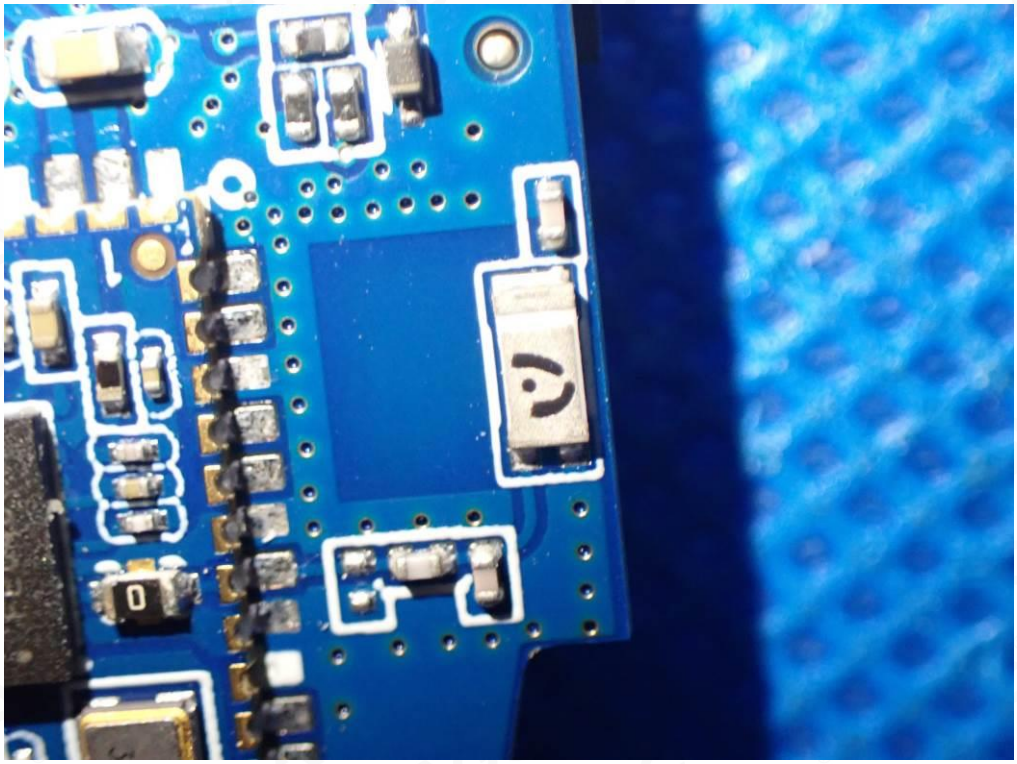
INTERNAL VIEW OF EUT-4



INTERNAL VIEW OF EUT-5

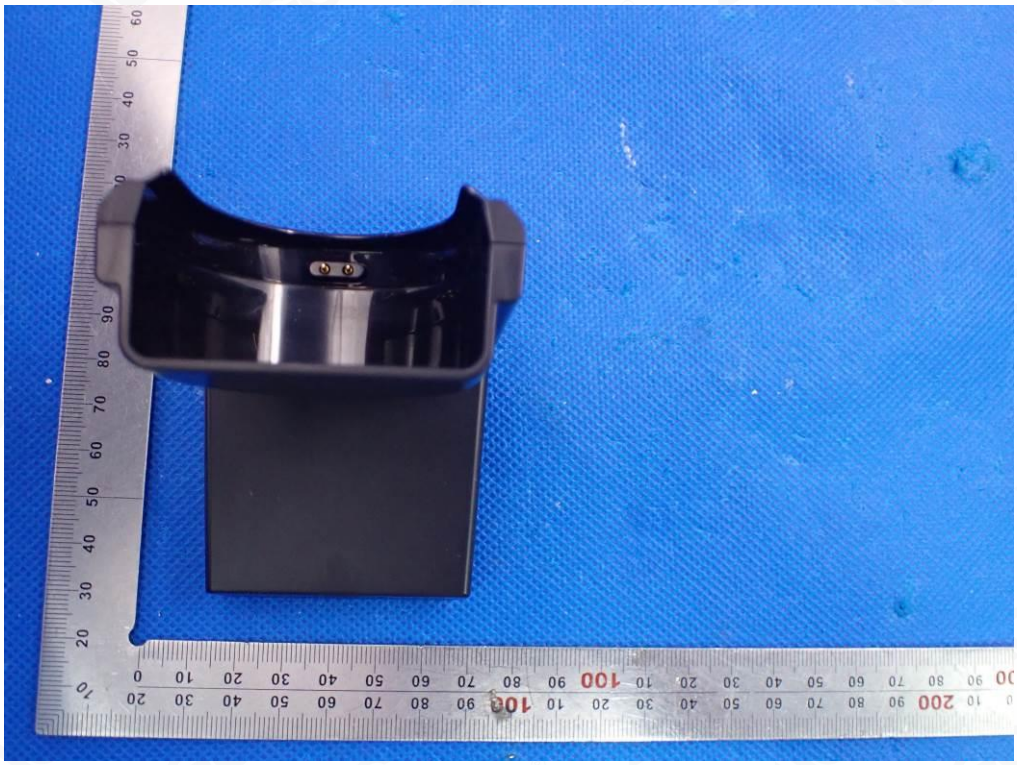


INTERNAL VIEW OF EUT-6

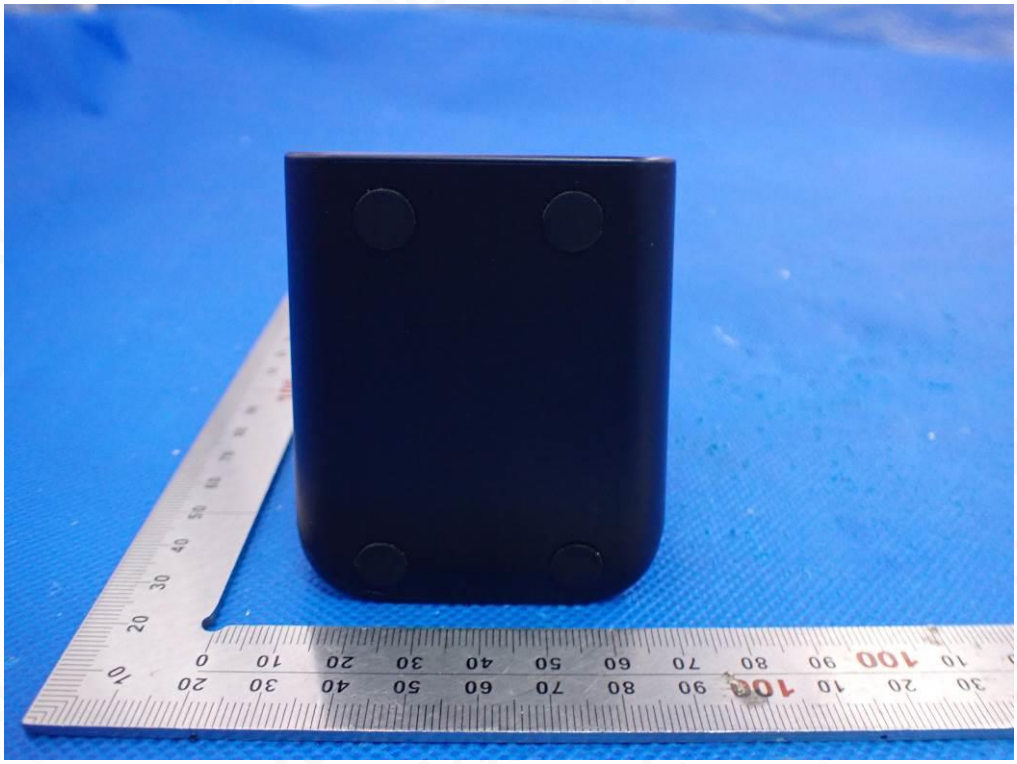


Charging Dock

TOP VIEW OF EUT



BOTTOM VIEW OF EUT



FRONT VIEW OF EUT