FCC Test Report

Report No.: AGC01612200102FE02

FCC ID	:	2AR8X-MH670AWD
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	MH670 Dongle
BRAND NAME	:	COOLER MASTER
MODEL NAME	:	MH-670-AWD
APPLICANT	:	Cooler Master Technology Inc.
DATE OF ISSUE	:	Jan. 17, 2020
STANDARD(S)	:	FCC Part 15.247
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 17, 2020	Valid	Initial Release

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1. VERIFICATION OF COMPLIANCE

Applicant	Cooler Master Technology Inc.
Address	8F., No788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City 23586,Taiwan
Manufacturer	GUANGDONG TAKSTAR ELECTRONIC CO., LTD.
Address	DINGGANG, NO.5 TEAM, XIALIAO VILLAGE, LONGXI TOWN, BOLUO COUNTY, HUIZHOU CITY
Factory	Cooler Master Technology Inc.
Address	8F., No788-1, Zhongzheng Rd., Zhonghe Dist., New Taipei City 23586,Taiwan
Product Designation	MH670 Dongle
Brand Name	COOLER MASTER
Test Model	MH-670-AWD
Date of test	Jan. 02, 2020~Jan. 17, 2020
Deviation	No any deviation from the test method.
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BLE/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 part 15.247.

Prepared By	Donjon Huang (Project Engineer)	Jan. 17, 2020
Reviewed By	Max Zhang (Reviewer)	Jan. 17, 2020
Approved By	Forrest Lei (Authorized Officer)	Jan. 17, 2020

2.GENERAL INFORMATION

2.1PRODUCT DESCRIPTION

The EUT is designed as a “MH670 Dongle ”. It is designed by way of utilizing the GFSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.40335 GHz to 2.47935GHz
RF Output Power	2.997dBm(Max)
Modulation	GFSK
Number of channels	39 Channel
Antenna Designation	Two Ceramic Antenna which cannot support MIMO (Comply with requirements of the FCC part 15.203)
Antenna Gain	0.4dBi
Hardware Version	V0.3
Software Version	V0.6
Power Supply	DC 5V by PC

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2.40335~2.47935GHz	1	2.40335GHz
	2	2.40535GHz
	3	2.40735GHz
	4	2.40935GHz
	5	2.41135GHz
	6	2.41335GHz
	7	2.41535GHz
	8	2.41735GHz
	9	2.41935GHz
	10	2.42135GHz
	11	2.42335GHz
	12	2.42535GHz
	13	2.42735GHz
	14	2.42935GHz

	15	2.43135GHz
	16	2.43335GHz
	17	2.43535GHz
	18	2.43735GHz
	19	2.43935GHz
	20	2.44135GHz
	21	2.44335GHz
	22	2.44535GHz
	23	2.44735GHz
	24	2.44935GHz
	25	2.45135GHz
	26	2.45335GHz
	27	2.45535GHz
	28	2.45735GHz
	29	2.45935GHz
	30	2.46135GHz
	31	2.46335GHz
	32	2.46535GHz
	33	2.46735GHz
	34	2.46935GHz
	35	2.47135GHz
	36	2.47335GHz
	37	2.47535GHz
	38	2.47735GHz
	39	2.47935GHz

2.3 RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: 2AR8X-MH670AWD** filing to comply with the FCC Part 15.247 requirements.

2.4TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.5 SPECIAL ACCESSORIES

Refer to section 2.2.

2.6 EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

3. MEASUREMENT UNCERTAINTY

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

- Uncertainty of Conducted Emission, Uc = ±3.2 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±3.9 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, Uc = ±0.8dB
- Uncertainty of RF power density, conducted, Uc = ±2.6dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %

4. DESCRIPTION OF TEST MODES

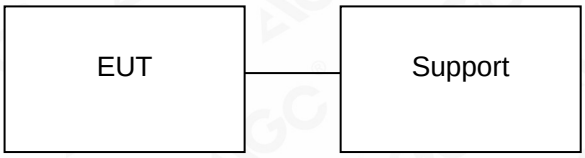
NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX

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. EUT connects the computer through the serial port tool (USB TO TTL), and then enters the test mode through the test software **VMI debug v1.1.6.56.**

5. SYSTEM TEST CONFIGURATION

5.1 CONFIGURATION OF TESTED SYSTEM



5.2 EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	MH670 gaming headphones	MH-670-AWD	2AR8X-MH670AWD	EUT
2	PC	161301-01	N/A	Support
3	Adapter	XIAOMI	DC 20V	Support

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(3)	Peak Output Power	Compliant
15.247 (a)(2)	6 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.247 (e)	Maximum Conducted Output Power Density	Compliant
15.209	Radiated Emission	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	Jun. 12, 2019	Jun. 11, 2020
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	Jun. 12, 2019	Jun. 11, 2020
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 12, 2019	Dec. 11, 2020
2.4GHz Fliter	EM Electronics	2400-2500MHz	N/A	Feb. 27, 2019	Feb. 26, 2020
Attenuator	ZHINAN	E-002	N/A	Aug. 26, 2019	Aug. 25, 2020
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 09, 2019	Sep. 08, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	Jun. 14, 2018	Jun. 13, 2020
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May. 26, 2018	May. 25, 2020
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Oct. 15, 2019	Oct. 14, 2020
ANTENNA	SCHWARZBECK	VULB9168	494	Jan. 09, 2019	Jan. 08, 2021
Test software	Tonscend	JS32-RE	N/A	N/A	N/A

7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

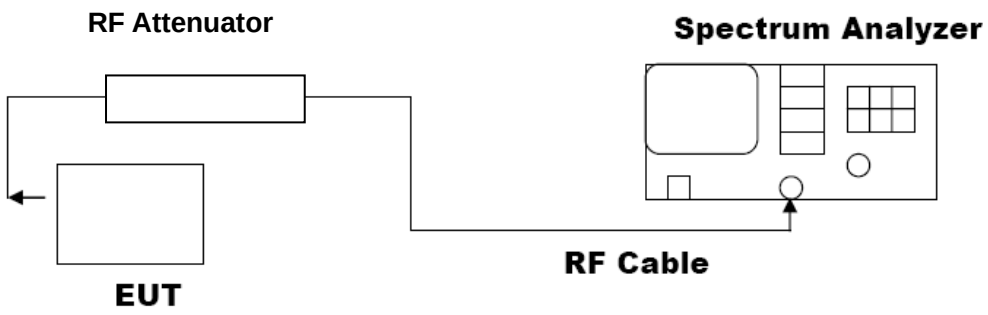
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. RBW≥DTS bandwidth
3. VBW≥3*RBW.
4. SPAN≥VBW.
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

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

PEAK POWER TEST SETUP



7.3. LIMITS AND MEASUREMENT RESULT

Antenna 1

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Pass or Fail**
2.40335	2.997	30	Pass
2.44135	2.673	30	Pass
2.47935	2.058	30	Pass

CH1

CH20


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.441515000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:39:53 PM Jan 14, 2020
Mkr1 2.441 515 GHz
2.673 dBm
10 dB/div
Log
Ref 20.00 dBm
Center 2.441350 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 6.000 MHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

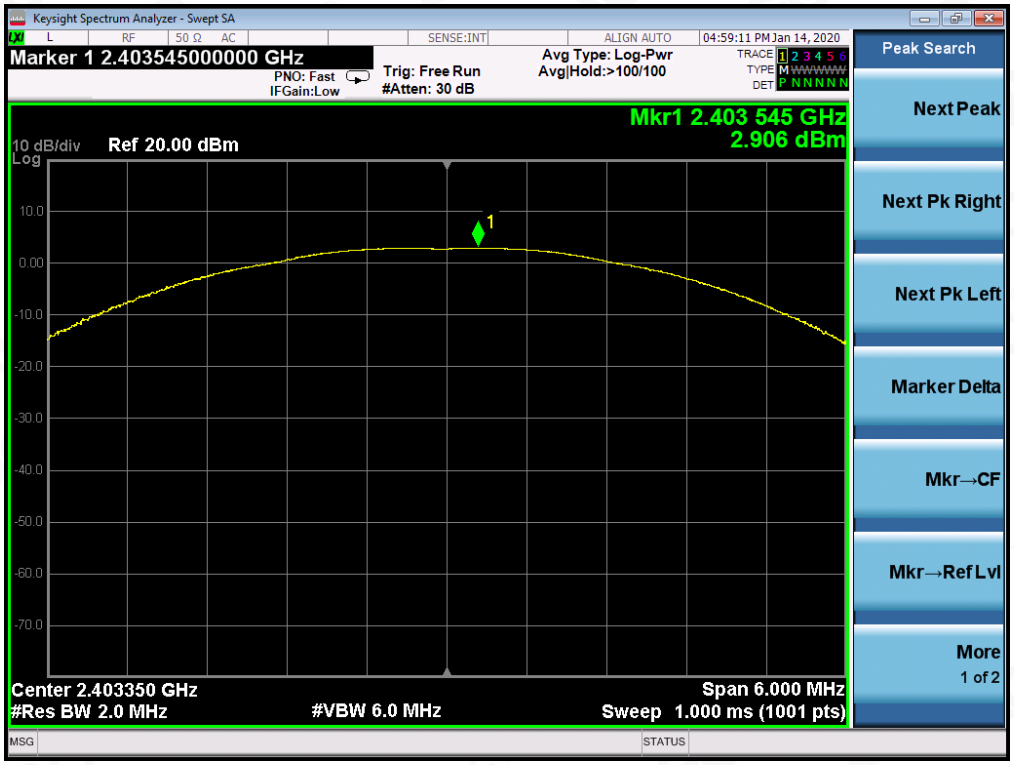
CH39


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.479550000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:41:15 PM Jan 14, 2020
Mkr1 2.479 550 GHz
2.058 dBm
10 dB/div
Log
Ref 20.00 dBm
Center 2.479350 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 6.000 MHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

Antenna 2

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Pass or Fail**
2.40335	2.906	30	Pass
2.44135	2.617	30	Pass
2.47935	2.024	30	Pass

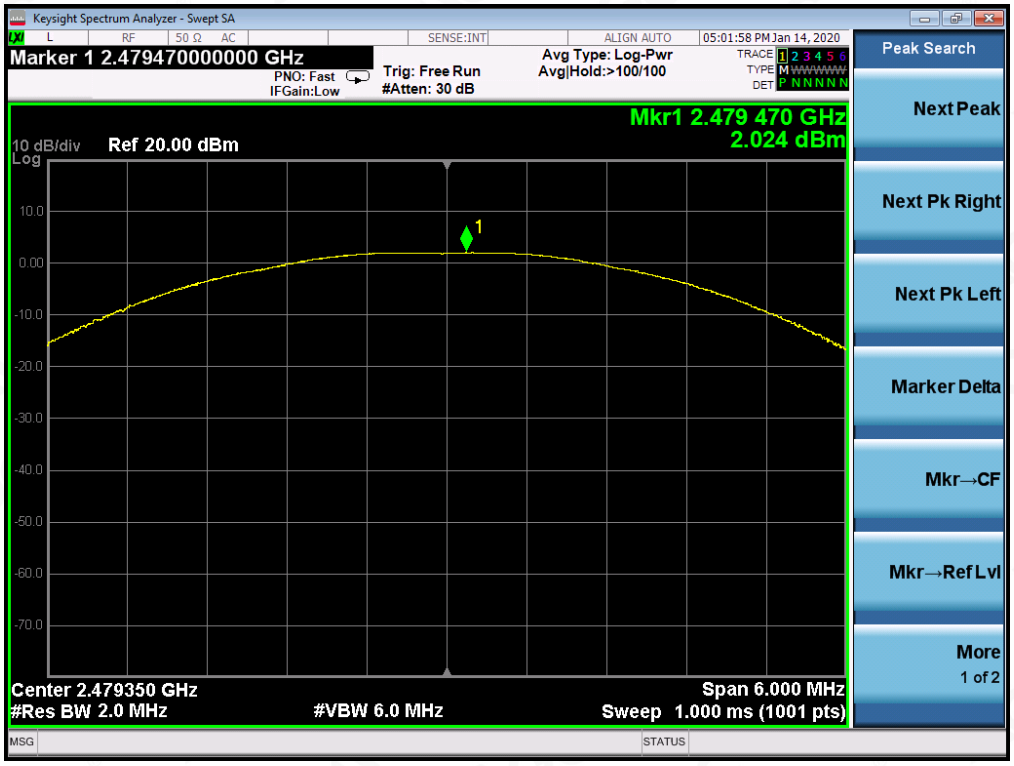
CH1



CH20


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.441525000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:00:36 PM Jan 14, 2020
Mkr1 2.441 525 GHz
2.617 dBm
10 dB/div
Log
Ref 20.00 dBm
Center 2.441350 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 6.000 MHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

CH39


Keysight Spectrum Analyzer - Swept SA
Marker 1 2.479470000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
05:01:58 PM Jan 14, 2020
Mkr1 2.479 470 GHz
2.024 dBm
10 dB/div
Log
Ref 20.00 dBm
Center 2.479350 GHz
#Res BW 2.0 MHz
#VBW 6.0 MHz
Span 6.000 MHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

8. 6 DB BANDWIDTH

8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz, VBW≥3×RBW.
4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

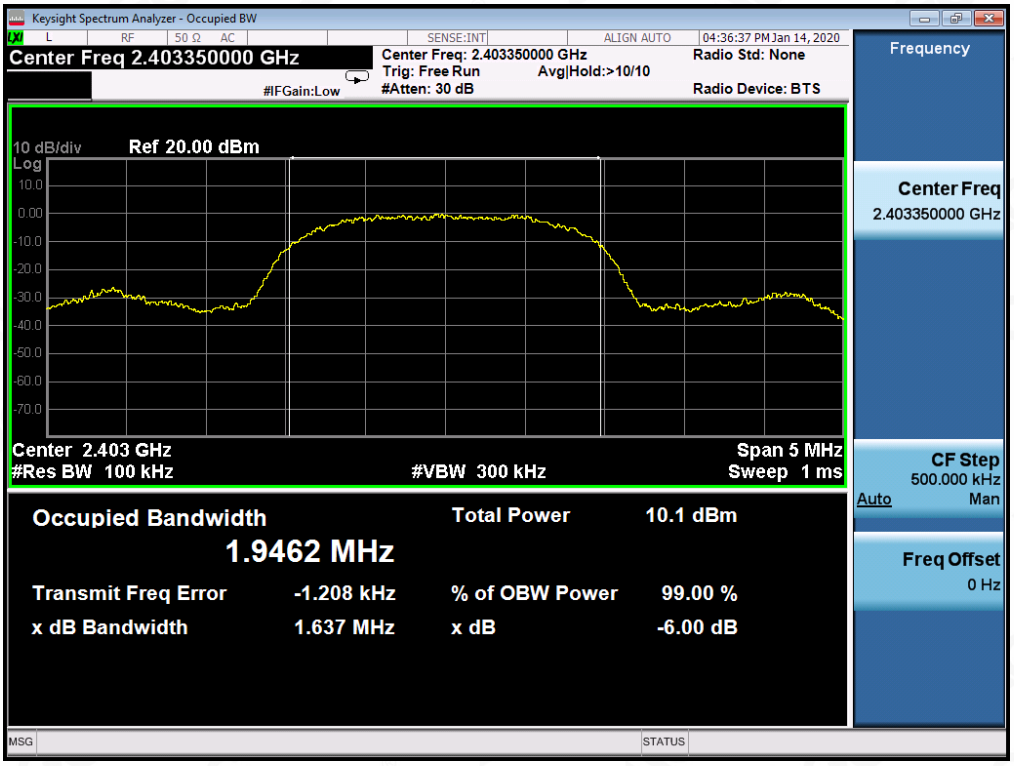
8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

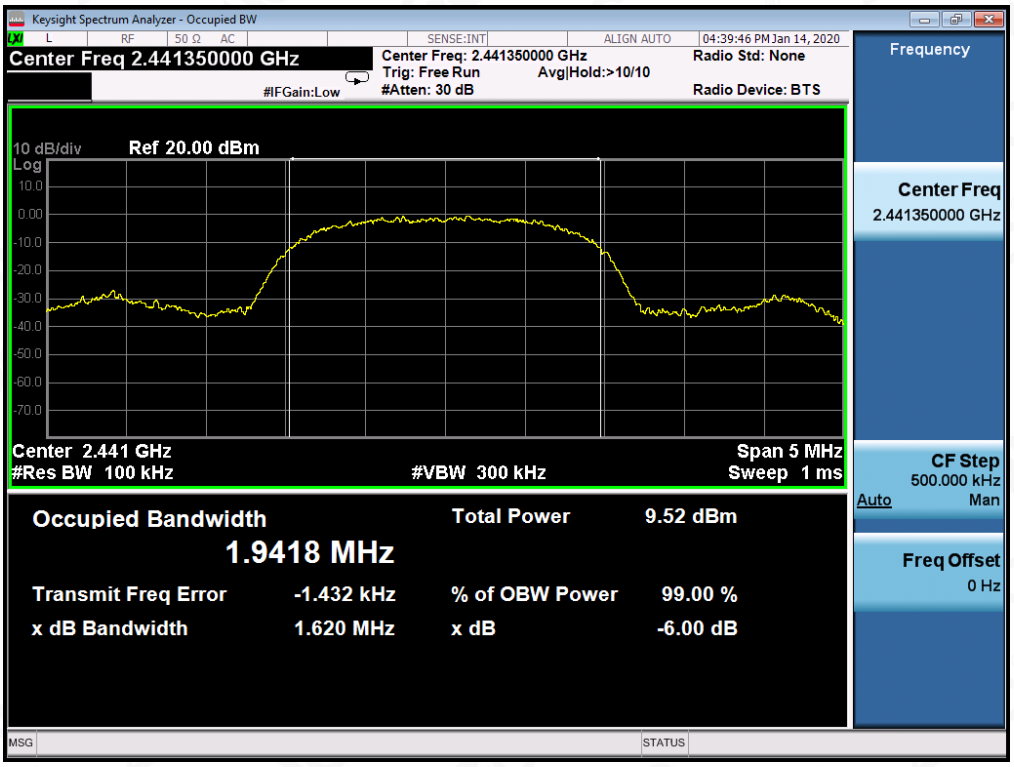
8.3. LIMITS AND MEASUREMENT RESULTS

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	Applicable Limits		
	Test Data (MHz)		Criteria
>500KHZ	Low Channel	1.637	PASS
	Middle Channel	1.620	PASS
	High Channel	1.593	PASS

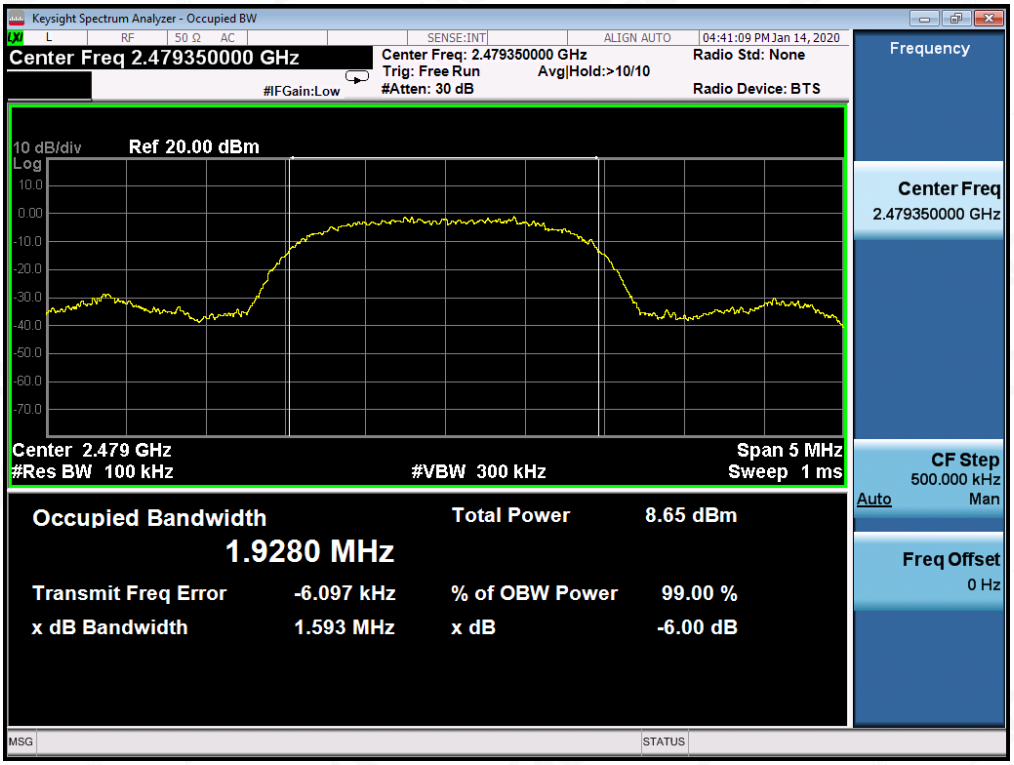
TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



Note: All modes of both antennas were tested, and the report only showed the worst data for the worst antenna (Antenna 1).

9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

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

The same as described in section 7.2.

9.3. MEASUREMENT EQUIPMENT USED

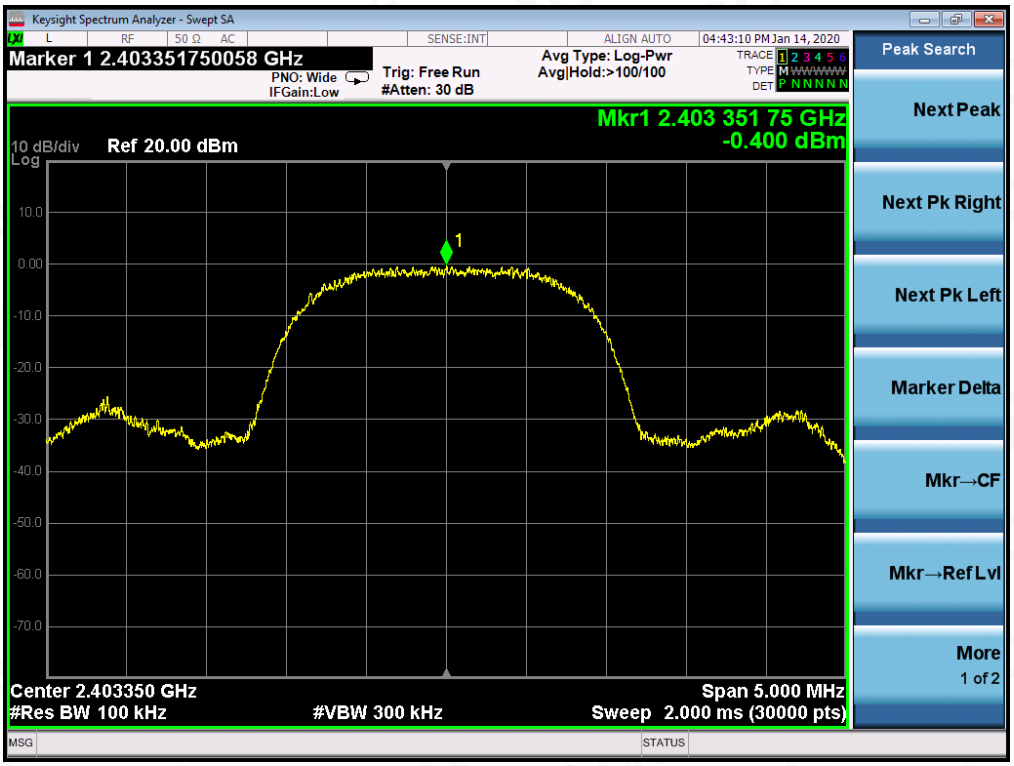
The same as described in section 6.

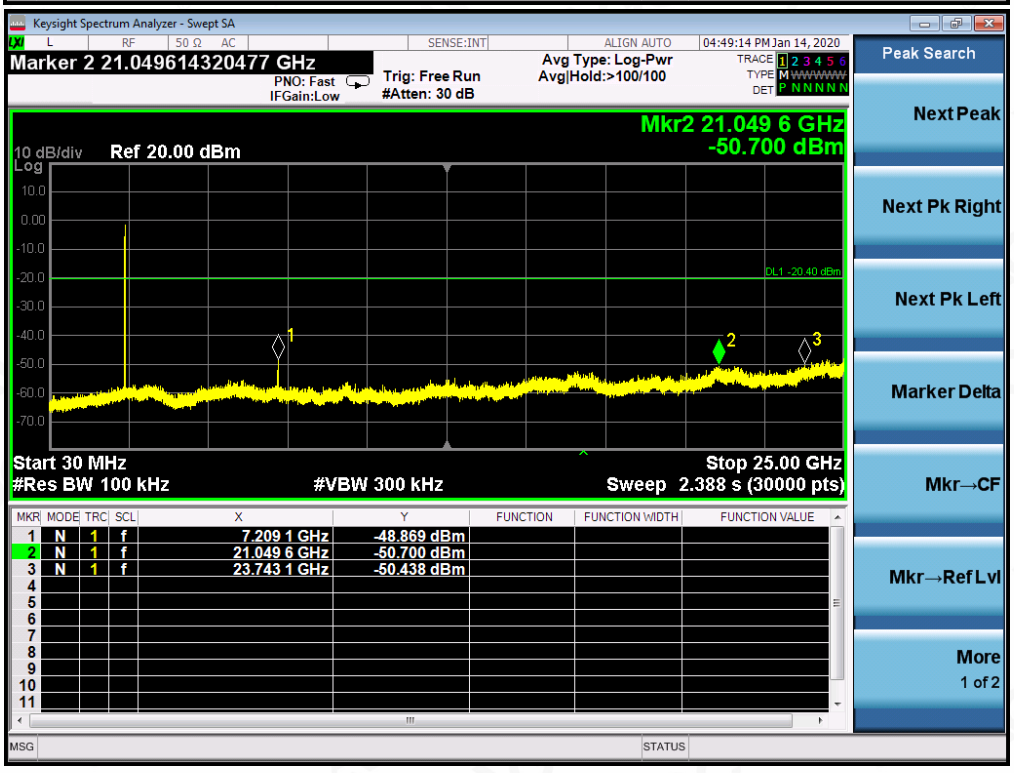
9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	**Measurement Result**	
	Test Data	**Criteria**
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the reference level	PASS PASS

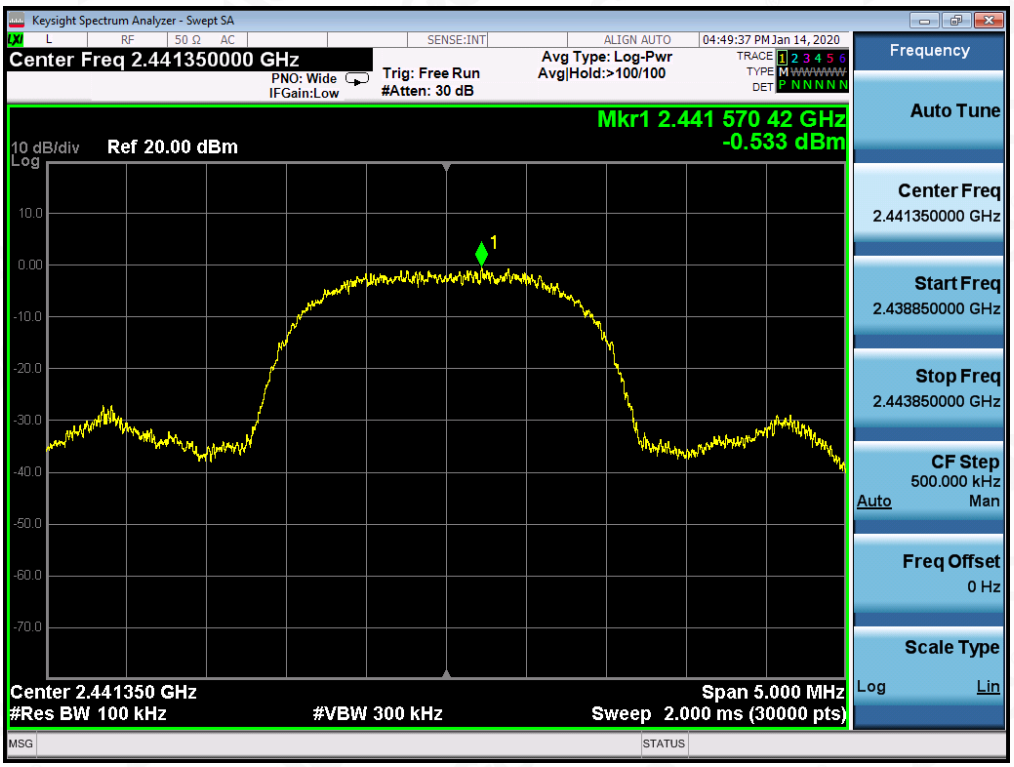
TEST RESULT FOR ENTIRE FREQUENCY RANGE

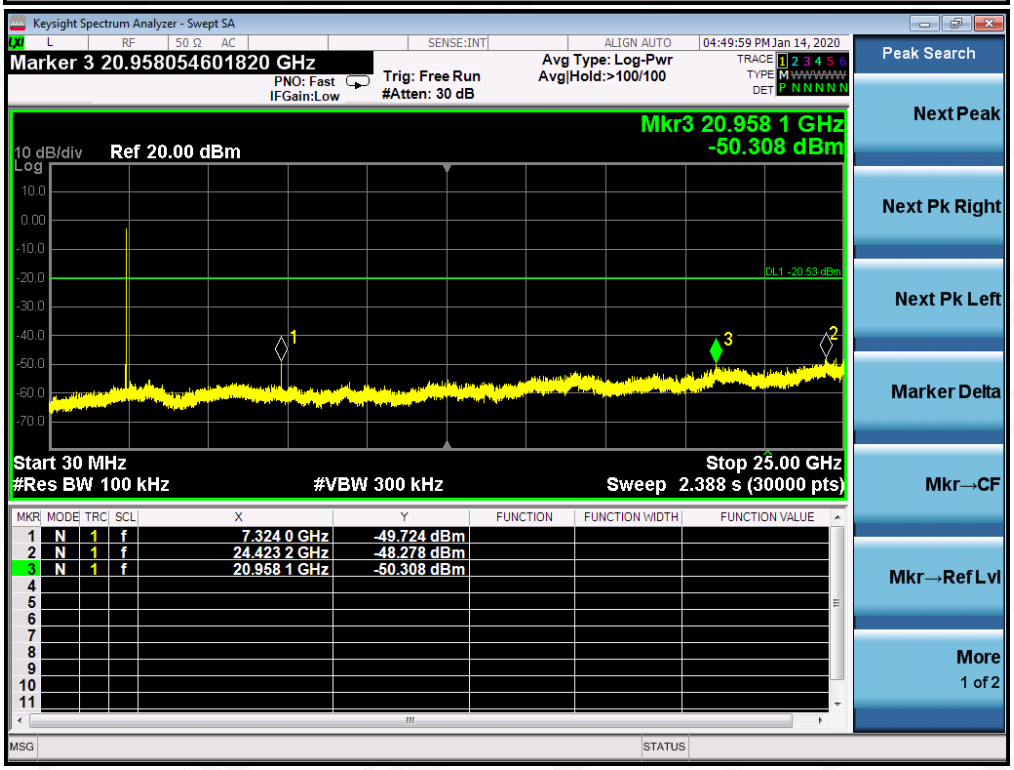
GFSK MODULATION IN LOW CHANNEL



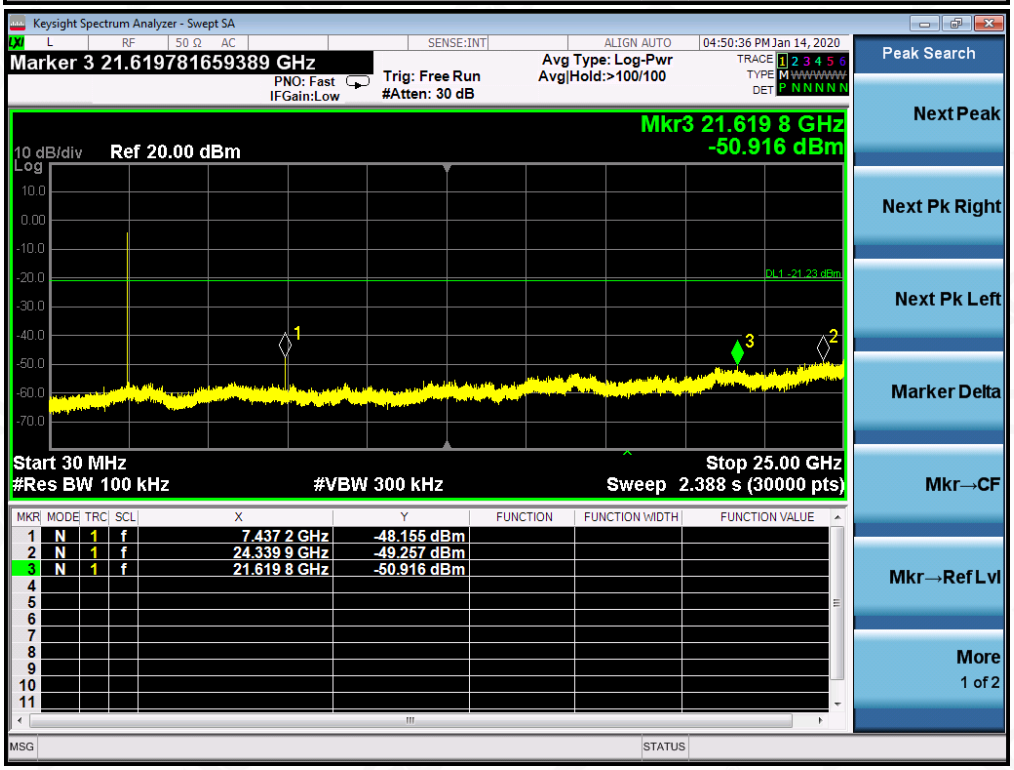


GFSK MODULATION IN MIDDLE CHANNEL





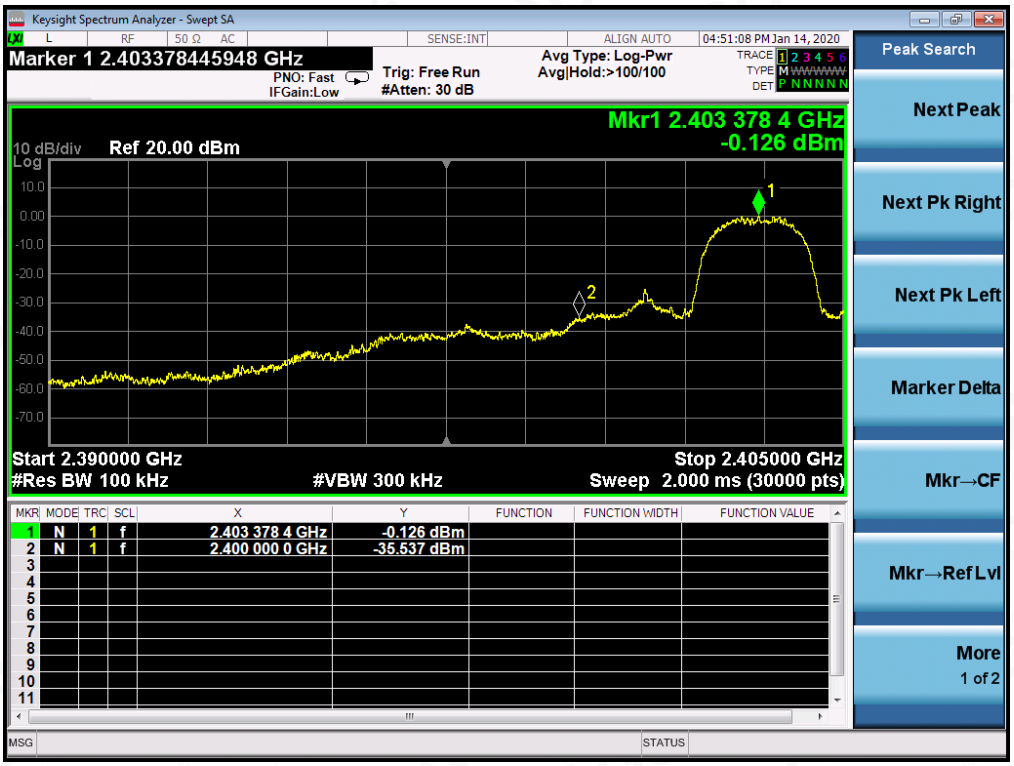
GFSK MODULATION IN HIGH CHANNEL



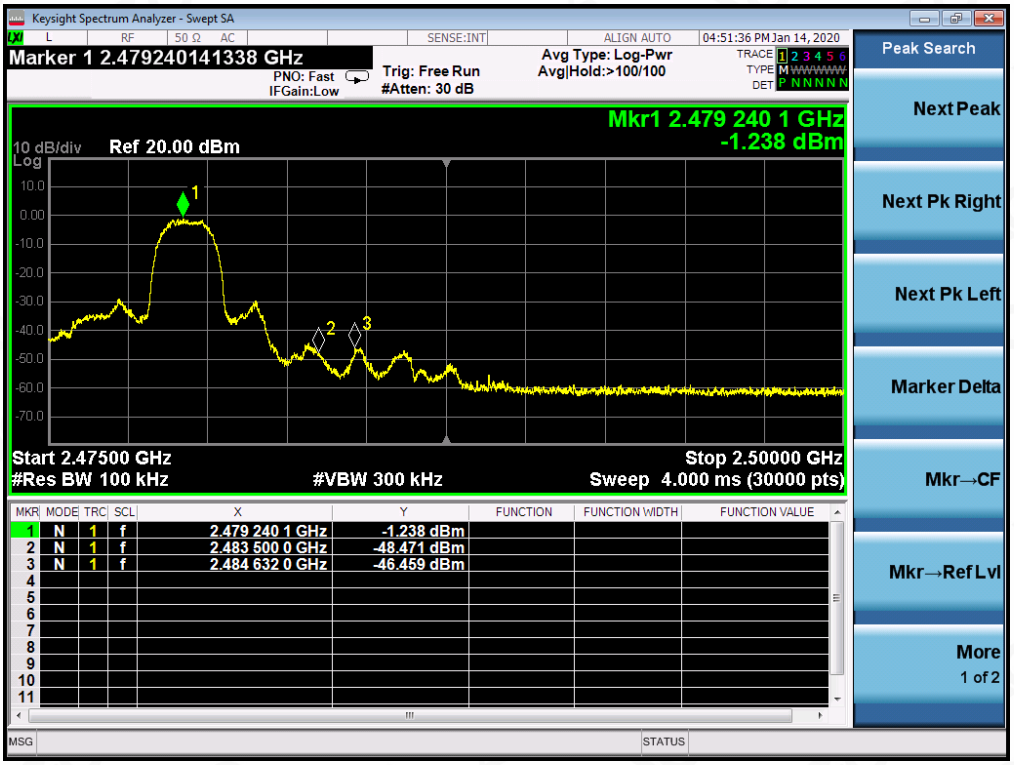
Note:
1. The peak emissions without marker on the above plots are fundamental wave and need not to compare with the limit.
2. All modes of both antennas were tested, and the report only showed the worst data for the worst antenna(Antenna 1).

TEST RESULT FOR BAND EDGE

GFSK MODULATION IN LOW CHANNEL



GFSK MODULATION IN HIGH CHANNEL



Note: All modes of both antennas were tested, and the report only showed the worst data for the worst antenna (Antenna 1).

10. MAXIMUM CONDUCTED OUTPUT POWER SPECTRAL DENSITY

10.1 MEASUREMENT PROCEDURE

(1). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator

(2). Set the EUT Work on the top, the middle and the bottom operation frequency individually.

(3). Set SPA Trace 1 Max hold, then View.

Note: The method of PKPSD in the KDB 558074 item 10.2 was used in this testing.

10.2 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

Refer To Section 7.2.

10.3 MEASUREMENT EQUIPMENT USED

Refer To Section 6.

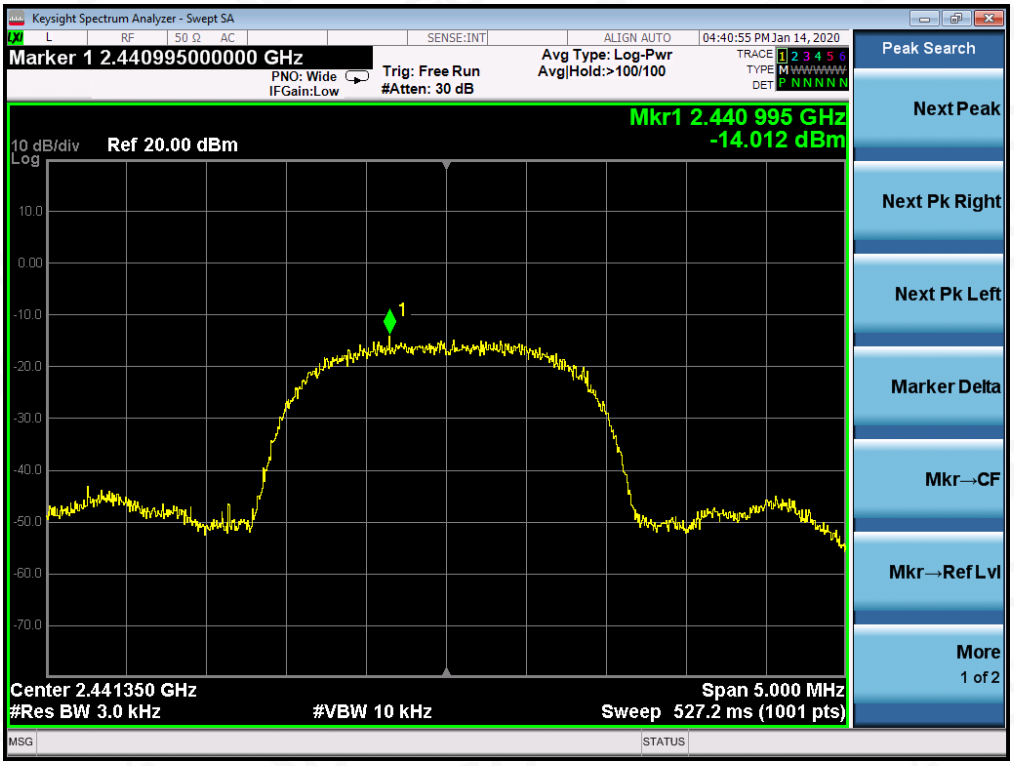
10.4 LIMITS AND MEASUREMENT RESULT

Antenna 1

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-13.093	8	Pass
Middle Channel	-14.012	8	Pass
High Channel	-14.771	8	Pass

TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL

TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



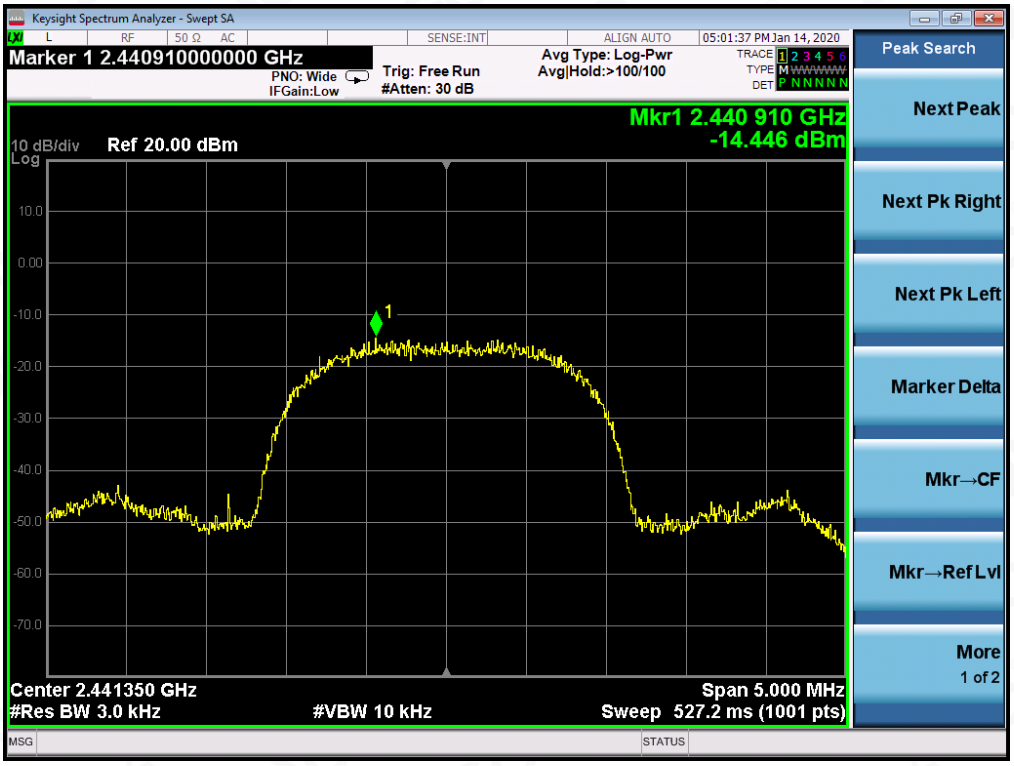
TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

Antenna 2

Channel No.	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
Low Channel	-13.741	8	Pass
Middle Channel	-14.446	8	Pass
High Channel	-14.937	8	Pass

TEST PLOT OF SPECTRAL DENSITY FOR LOW CHANNEL

TEST PLOT OF SPECTRAL DENSITY FOR MIDDLE CHANNEL



TEST PLOT OF SPECTRAL DENSITY FOR HIGH CHANNEL

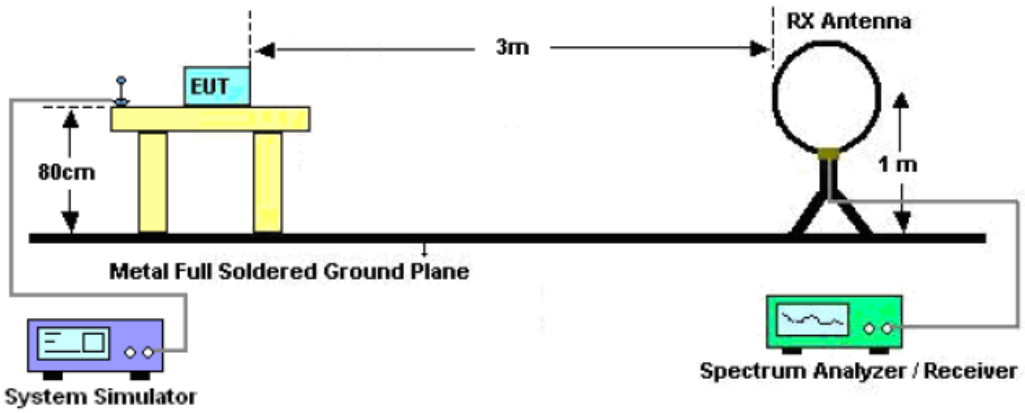
11. RADIATED EMISSION

11.1. MEASUREMENT PROCEDURE

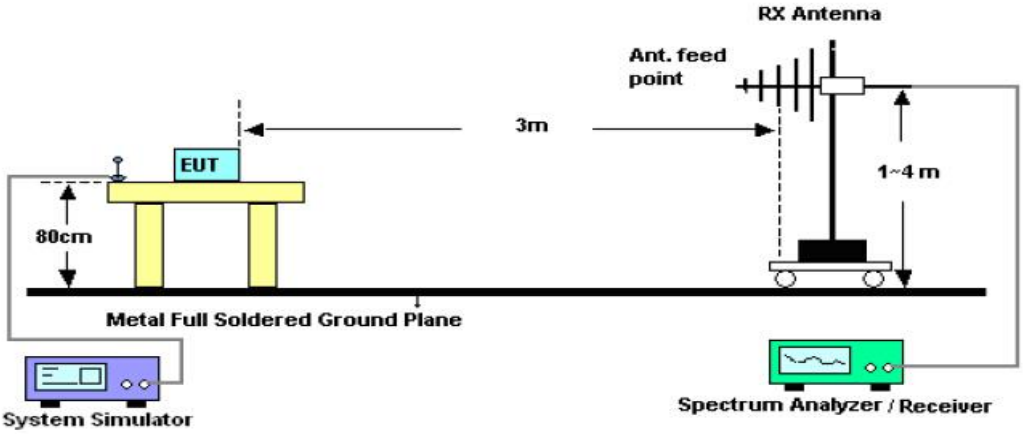
1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated 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 1MHz RBW and 3MHz VBW for peak reading. 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.

11.2. TEST SETUP

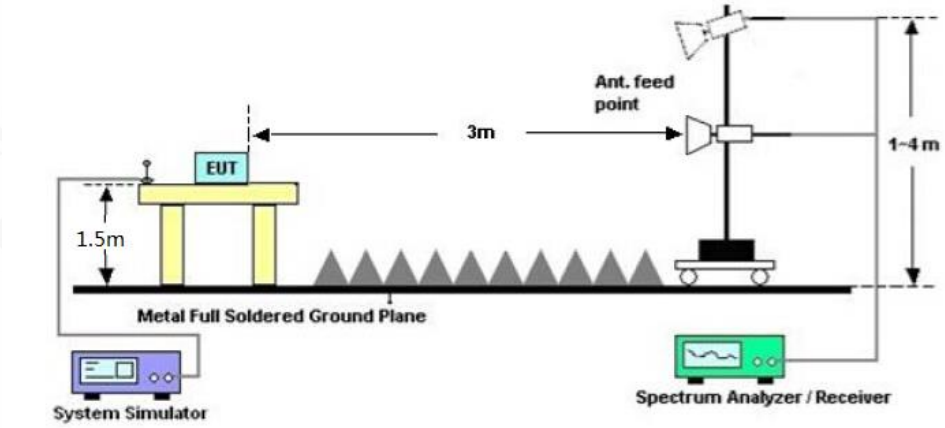
Radiated Emission Test-Setup Frequency Below 30MHz



RADIATED EMISSION TEST SETUP 30MHz-1000MHz



RADIATED EMISSION TEST SETUP ABOVE 1000MHz



11.3. LIMITS AND MEASUREMENT RESULT

15.209 Limit in the below table has to be followed

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: All modes were tested For restricted band radiated emission,
the test records reported below are the worst result compared to other modes.

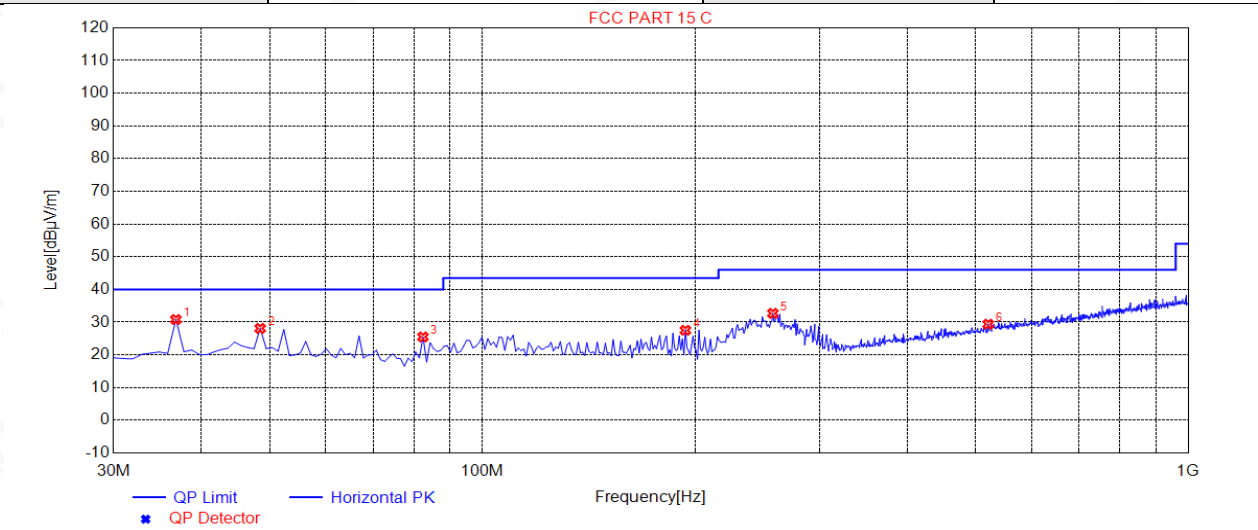
11.4. TEST RESULT

RADIATED EMISSION BELOW 30MHZ

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

RADIATED EMISSION BELOW 1GHZ

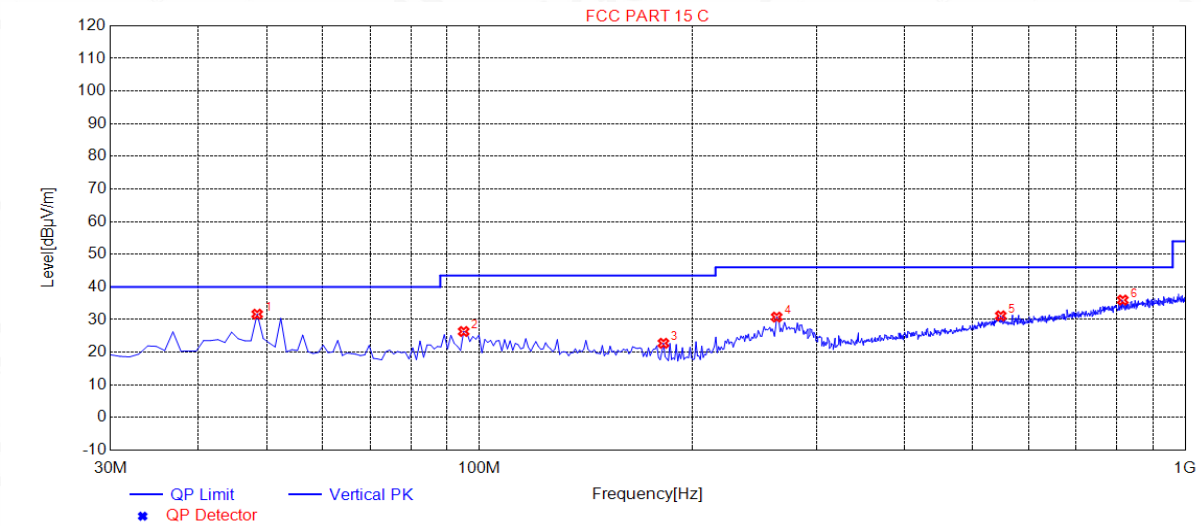
EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	36.7900	30.82	14.16	40.00	9.18	150	73	Horizontal
2	48.4300	28.10	14.71	40.00	11.90	150	34	Horizontal
3	82.3800	25.49	10.17	40.00	14.51	150	34	Horizontal
4	193.9300	27.53	12.34	43.50	15.97	150	308	Horizontal
5	257.9500	32.70	14.58	46.00	13.30	150	91	Horizontal
6	520.8200	29.39	22.62	46.00	16.61	150	130	Horizontal

RESULT: PASS

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	48.4300	31.67	14.71	40.00	8.33	150	328	Vertical
2	94.9900	26.36	10.82	43.50	17.14	150	206	Vertical
3	182.2900	22.75	12.88	43.50	20.75	150	226	Vertical
4	263.7700	30.77	14.88	46.00	15.23	150	221	Vertical
5	547.9800	31.16	23.22	46.00	14.84	150	188	Vertical
6	815.7000	35.98	28.76	46.00	10.02	150	62	Vertical

RESULT: PASS
Note:
1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.
2. All test modes had been tested. The mode 1 is the worst case and recorded in the report.
3. All modes of both antennas were tested, and the report only showed the worst data for the worst antenna (Antenna 1).

RADIATED EMISSION ABOVE 1GHZ

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4806.700	48.45	0.08	48.53	74	-25.47	peak
4806.700	39.16	0.08	39.24	54	-14.76	AVG
7210.050	44.17	2.21	46.38	74	-27.62	peak
7210.050	40.26	2.21	42.47	54	-11.53	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4806.700	46.25	0.08	46.33	74	-27.67	peak
4806.700	39.63	0.08	39.71	54	-14.29	AVG
7210.050	41.77	2.21	43.98	74	-30.02	peak
7210.050	40.25	2.21	42.46	54	-11.54	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.700	48.25	0.14	48.39	74	-25.61	peak
4882.700	39.44	0.14	39.58	54	-14.42	AVG
7324.050	45.28	2.36	47.64	74	-26.36	peak
7324.050	39.14	2.36	41.5	54	-12.5	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 2	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4882.700	46.18	0.14	46.32	74	-27.68	peak
4882.700	38.59	0.14	38.73	54	-15.27	AVG
7324.050	43.33	2.36	45.69	74	-28.31	peak
7324.050	39.17	2.36	41.53	54	-12.47	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4958.700	47.26	0.22	47.48	74	-26.52	peak
4958.700	41.11	0.22	41.33	54	-12.67	AVG
7438.050	43.53	2.64	46.17	74	-27.83	peak
7438.050	40.22	2.64	42.86	54	-11.14	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Value Type
4958.700	45.69	0.22	45.91	74	-28.09	peak
4958.700	41.77	0.22	41.99	54	-12.01	AVG
7438.050	42.53	2.64	45.17	74	-28.83	peak
7438.050	38.46	2.64	41.1	54	-12.9	AVG
Remark:						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

RESULT: PASS

Note:

1.Other emissions from 1G to 25 GHz are considered as ambient noise. No recording in the test report.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

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

2. All modes of both antennas were tested, and the report only showed the worst data for the worst antenna (Antenna 1).

TEST RESULT FOR RESTRICTED BANDS REQUIREMENTS

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Horizontal

PK

AV

RESULT: PASS

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 1	Antenna	Vertical

PK

AV

RESULT: PASS

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Horizontal

PK

AV

RESULT: PASS

EUT	MH670 Dongle	Model Name	MH-670-AWD
Temperature	25° C	Relative Humidity	55.4%
Pressure	960hPa	Test Voltage	Normal Voltage
Test Mode	Mode 3	Antenna	Vertical

PK

AV

RESULT: PASS

Note: All modes of both antennas were tested, and the report only showed the worst data for the worst antenna (Antenna 1)

12. FCC LINE CONDUCTED EMISSION TEST

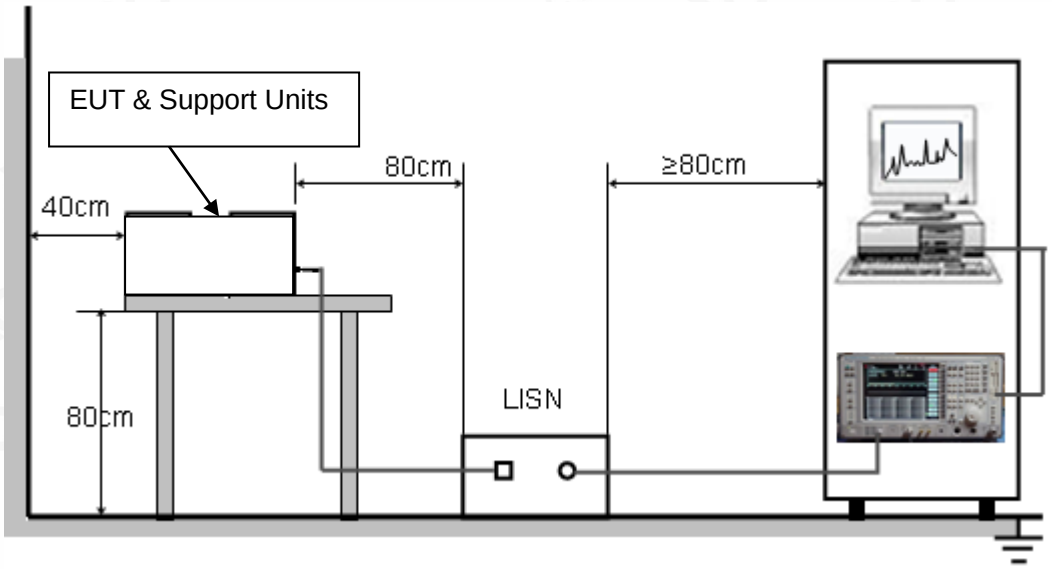
12.1. LIMITS OF LINE CONDUCTED EMISSION TEST

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.

12.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



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 equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received DC charging voltage by PC which received AC120V/60Hz power 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.

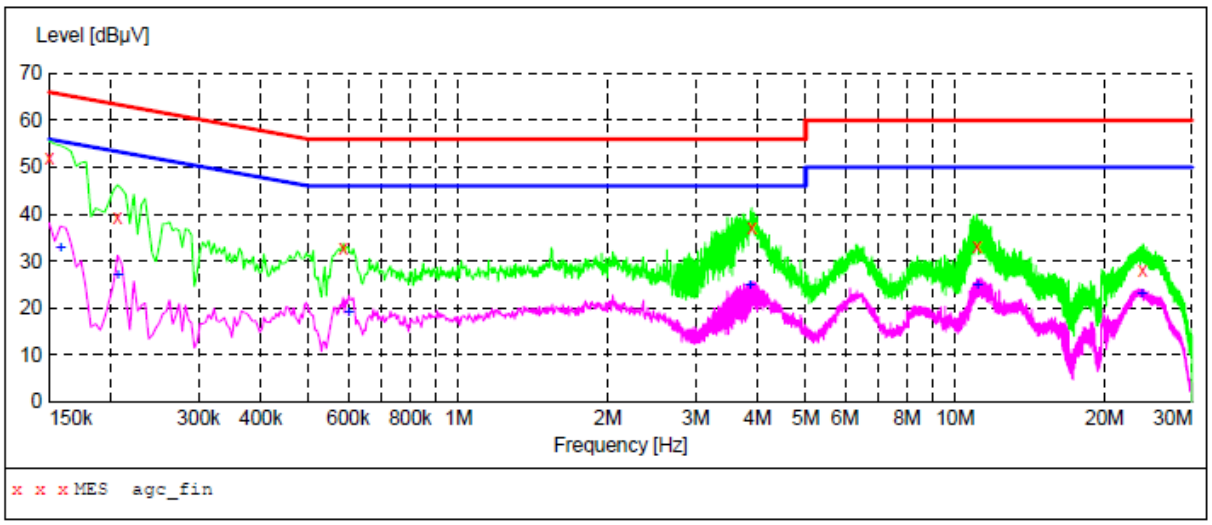
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

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. TEST RESULT OF LINE CONDUCTED EMISSION TEST

Line Conducted Emission Test Line 1-L



MEASUREMENT RESULT: "agc_fin"

2020/1/10 1:21

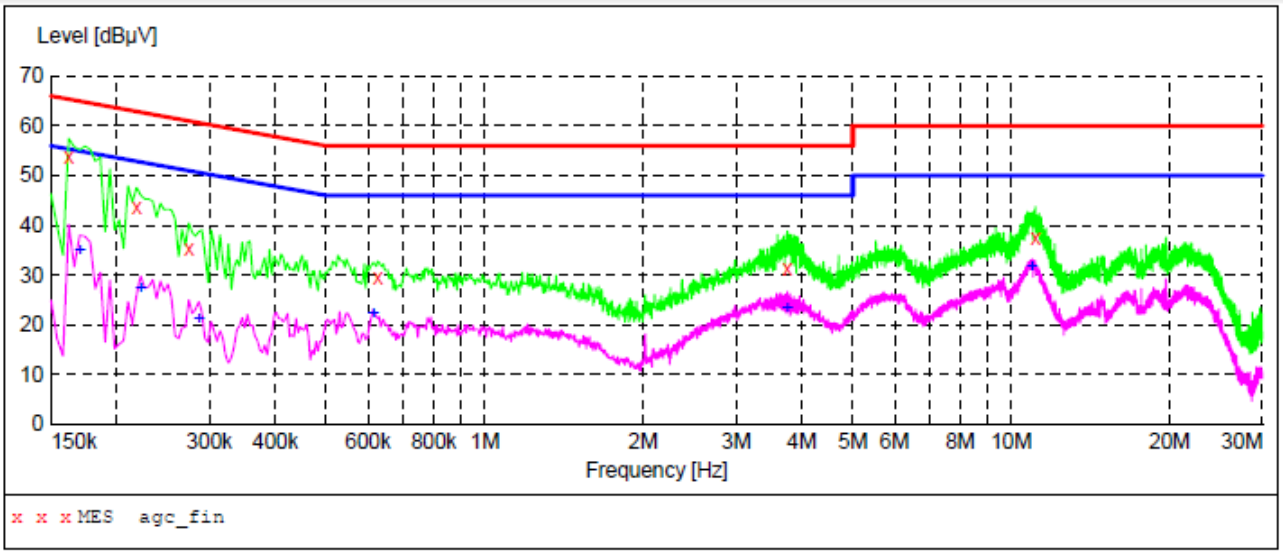
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	51.90	11.3	66	14.1	QP	L1	FLO
0.206000	39.40	11.3	63	24.0	QP	L1	FLO
0.586000	32.90	11.3	56	23.1	QP	L1	FLO
3.894000	37.00	11.4	56	19.0	QP	L1	FLO
11.062000	33.20	11.7	60	26.8	QP	L1	FLO
23.862000	28.00	12.5	60	32.0	QP	L1	FLO

MEASUREMENT RESULT: "agc_fin2"

2020/1/10 1:20

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.158000	32.60	11.3	56	23.0	AV	L1	FLO
0.206000	26.80	11.3	53	26.6	AV	L1	FLO
0.602000	18.80	11.3	46	27.2	AV	L1	FLO
3.862000	24.90	11.4	46	21.1	AV	L1	FLO
11.090000	24.80	11.7	50	25.2	AV	L1	FLO
23.734000	22.80	12.5	50	27.2	AV	L1	FLO

Line Conducted Emission Test Line 2-N



MEASUREMENT RESULT: "agc_fin"

2020/1/10 1:16

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.162000	53.80	11.3	65	11.6	QP	N	FLO
0.218000	43.80	11.3	63	19.1	QP	N	FLO
0.274000	35.30	11.3	61	25.7	QP	N	FLO
0.626000	29.30	11.3	56	26.7	QP	N	FLO
3.754000	31.30	11.4	56	24.7	QP	N	FLO
11.114000	37.30	11.7	60	22.7	QP	N	FLO

MEASUREMENT RESULT: "agc_fin2"

2020/1/10 1:16

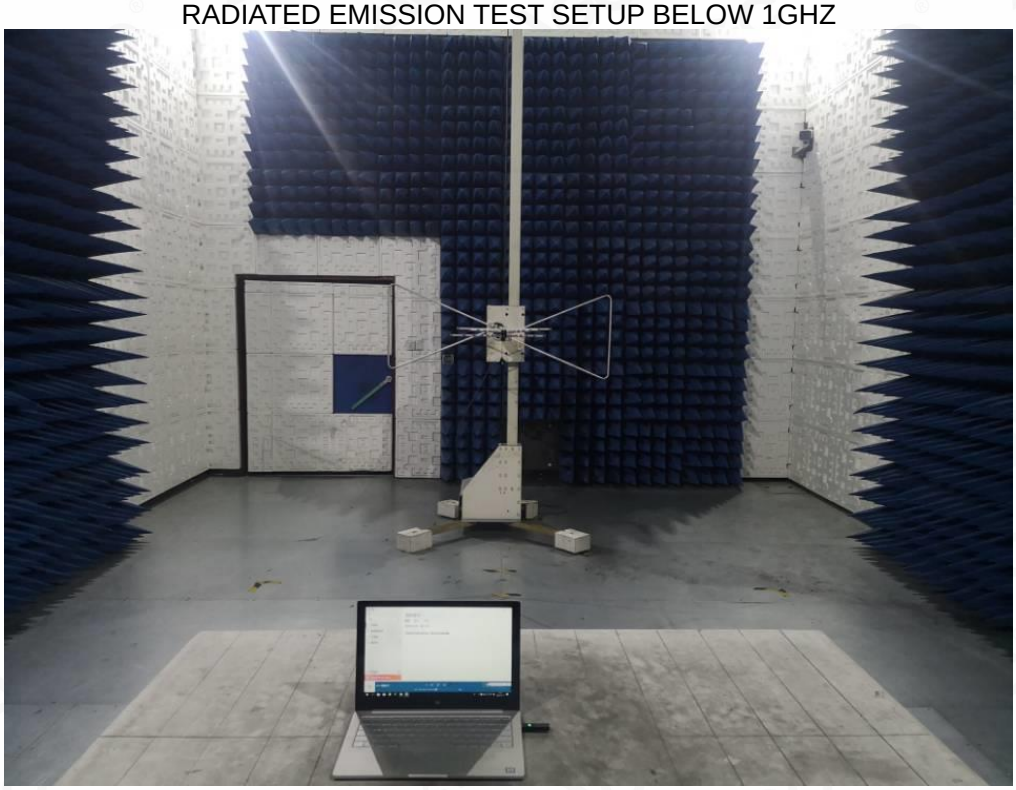
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.170000	35.00	11.3	55	20.0	AV	N	FLO
0.222000	27.40	11.3	53	25.3	AV	N	FLO
0.286000	21.10	11.3	51	29.5	AV	N	FLO
0.614000	22.10	11.3	46	23.9	AV	N	FLO
3.754000	23.50	11.4	46	22.5	AV	N	FLO
10.938000	31.70	11.7	50	18.3	AV	N	FLO

RESULT: PASS

Note: All modes of both antennas were tested, and the report only showed the worst data for the worst antenna (Antenna 1)

APPENDIX A: PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST SETUP BELOW 1GHZ

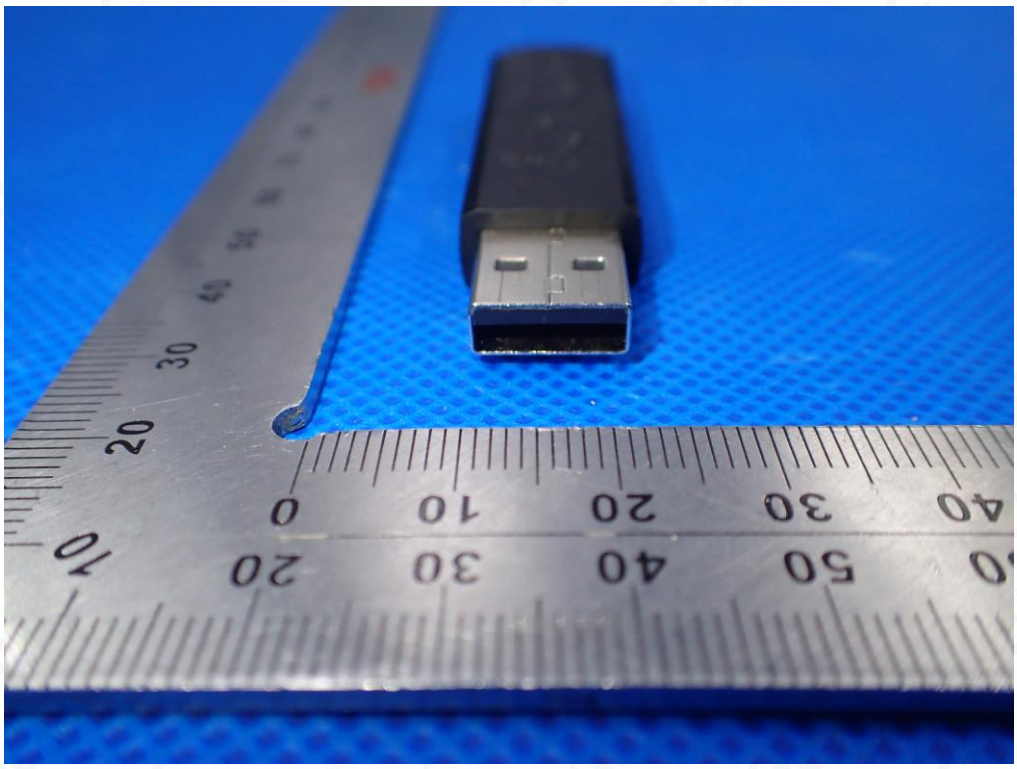


RADIATED EMISSION TEST SETUP ABOVE 1GHZ

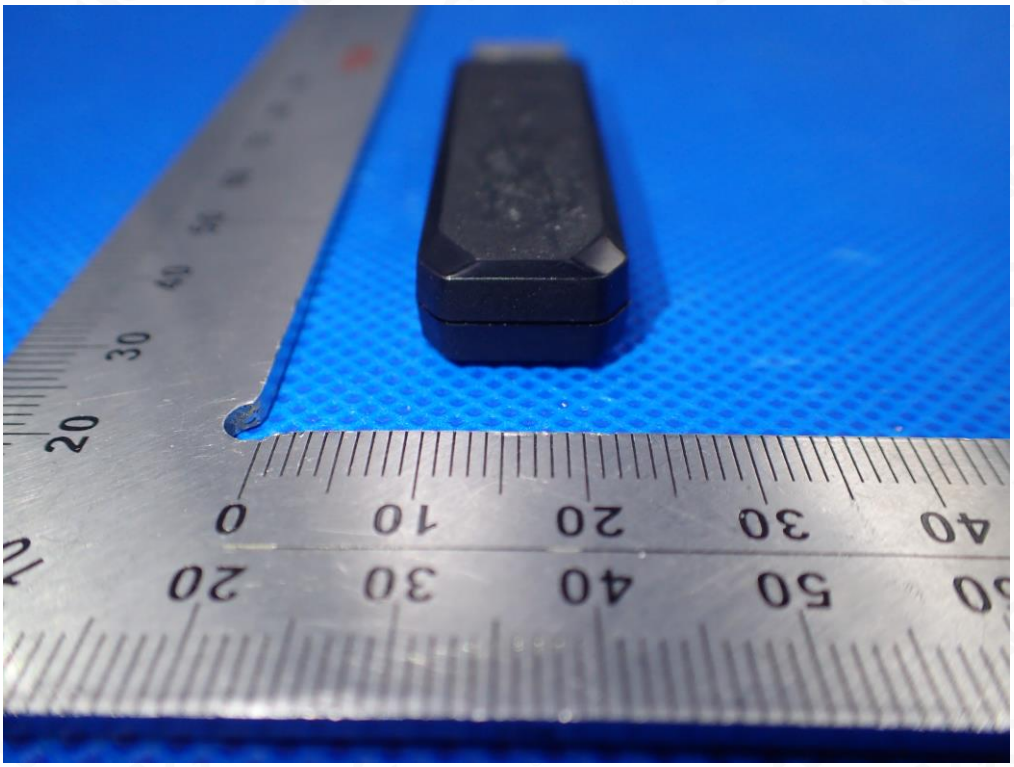
CONDUCTED EMISSION TEST SETUP

APPENDIX B: PHOTOGRAPHS OF EUT

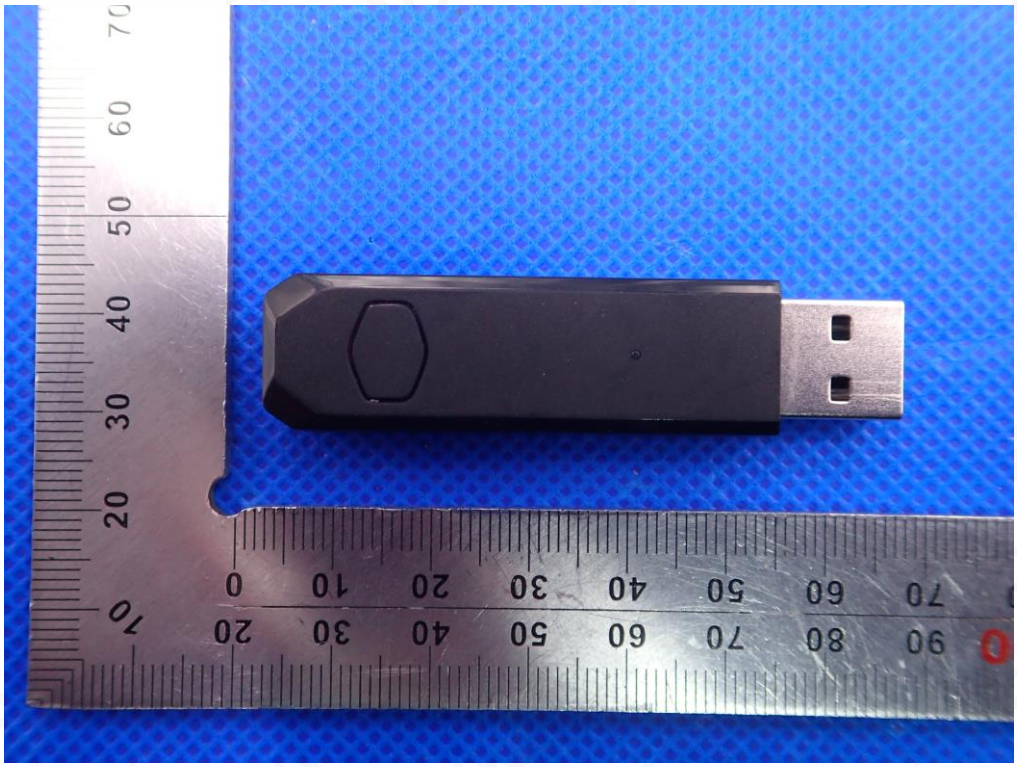
TOP VIEW OF EUT



BOTTOM VIEW OF EUT

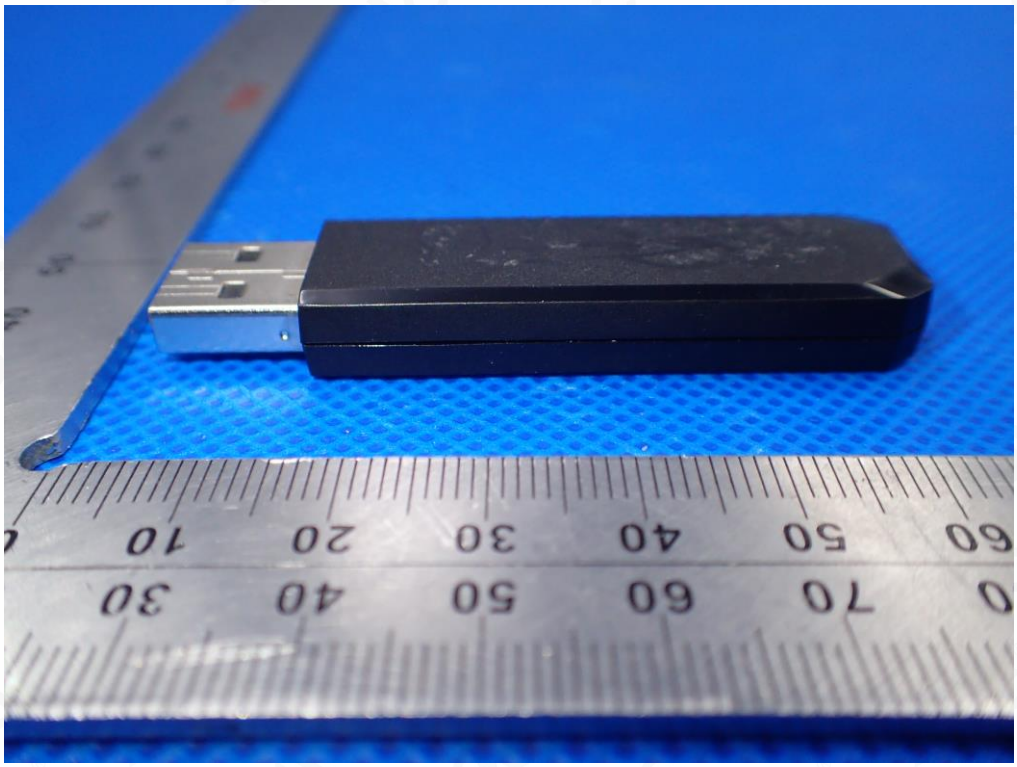


FRONT VIEW OF EUT

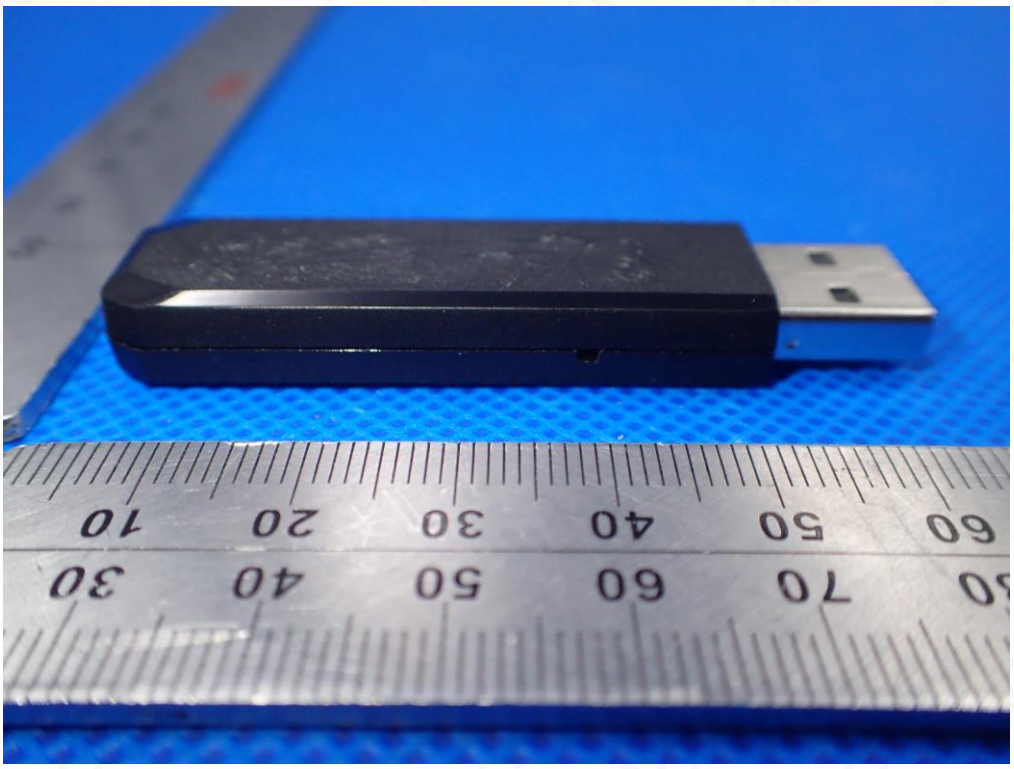


BACK VIEW OF EUT

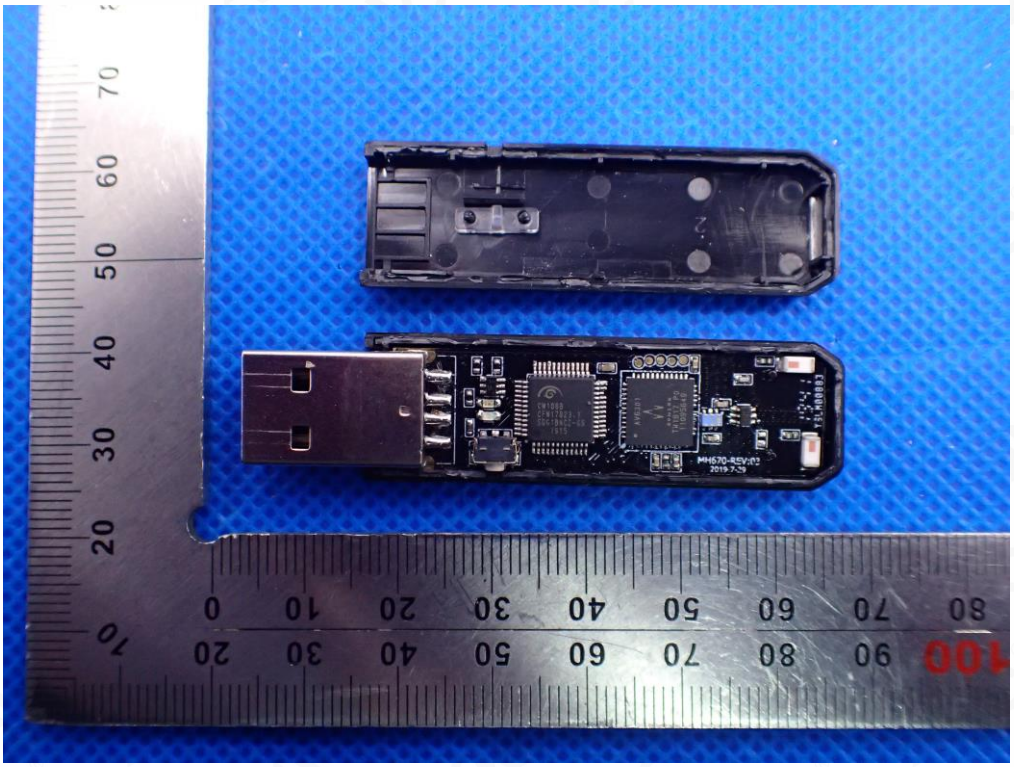
LEFT VIEW OF EUT



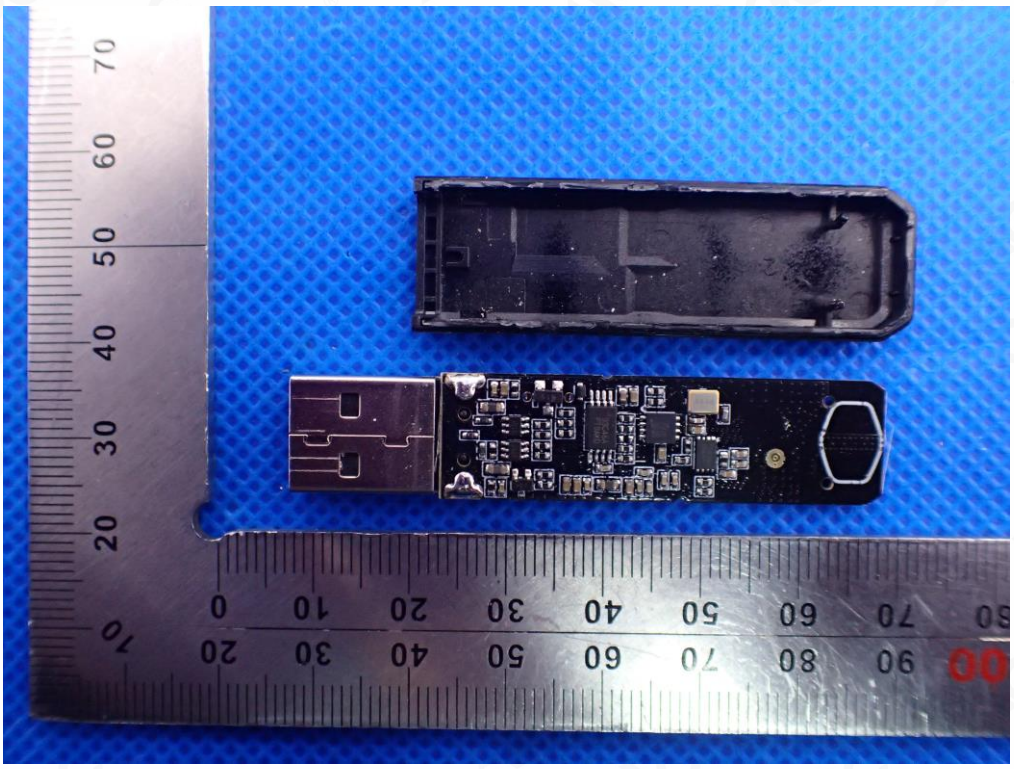
RIGHT VIEW OF EUT



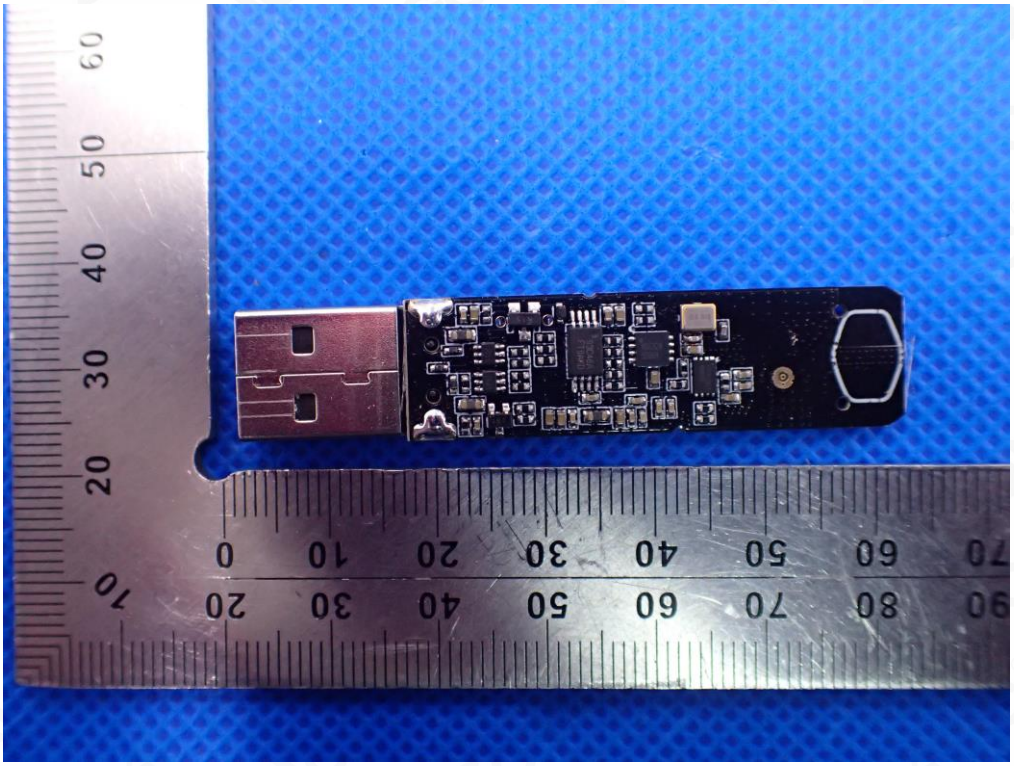
OPEN VIEW OF EUT



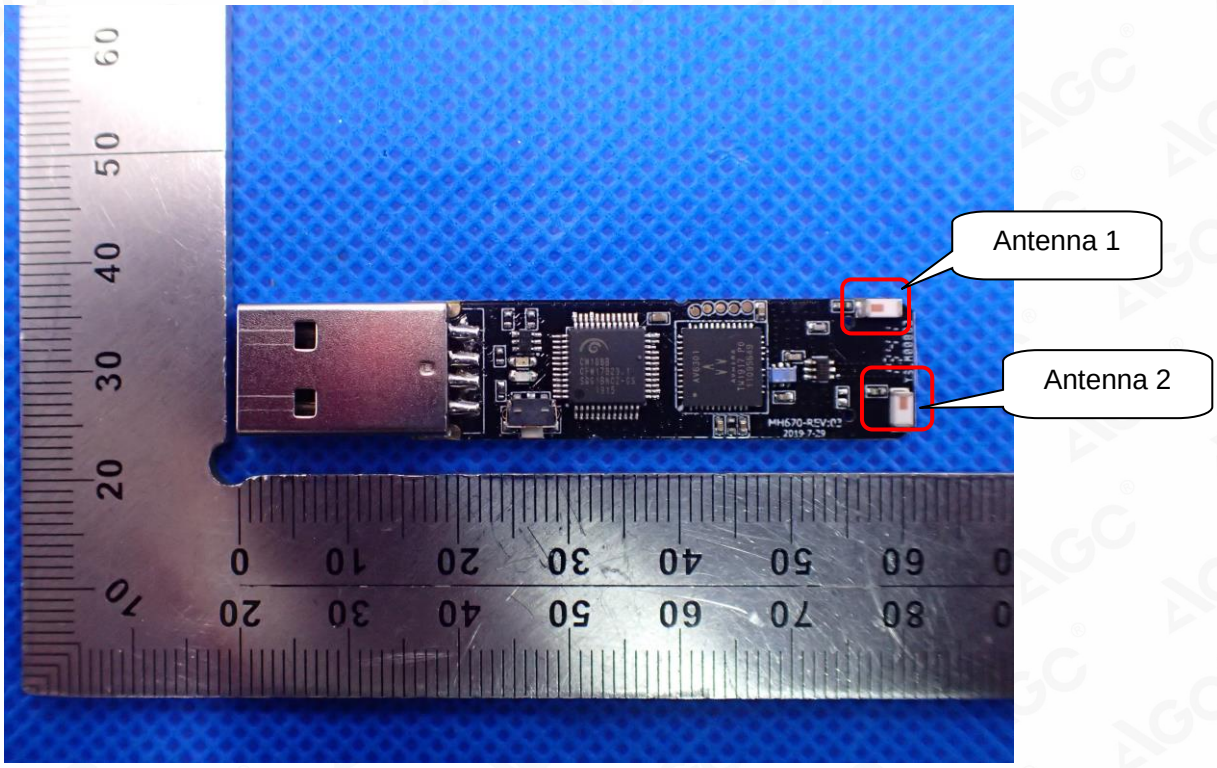
BATTERY VIEW OF EUT



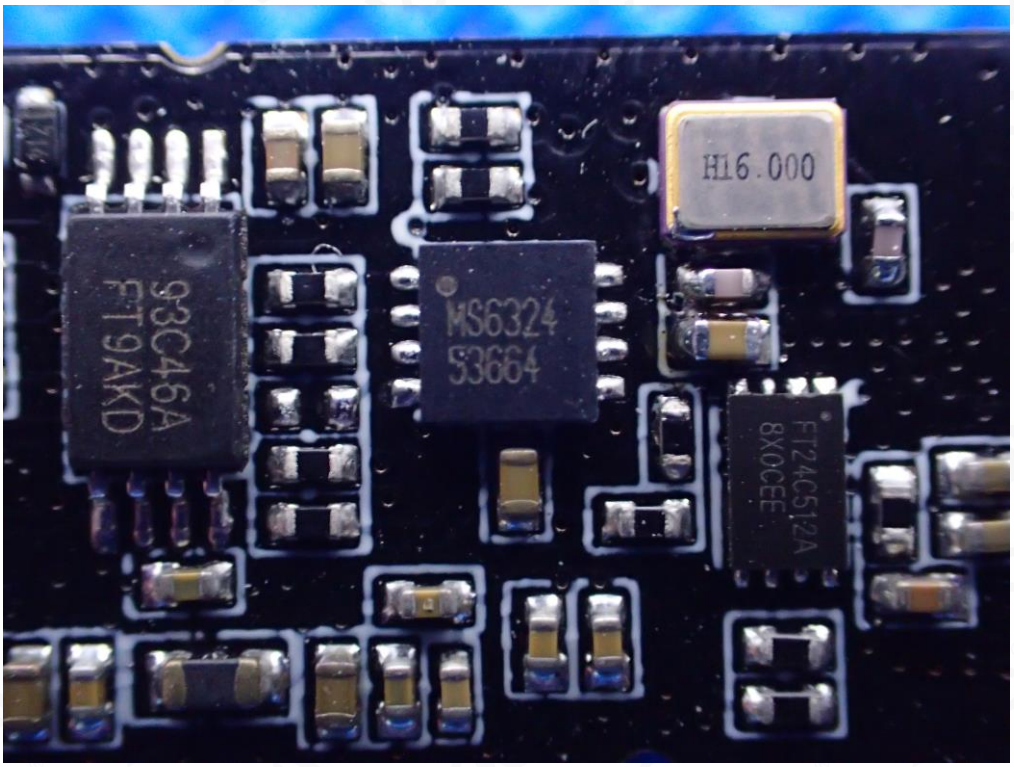
INTERNAL VIEW OF EUT-1



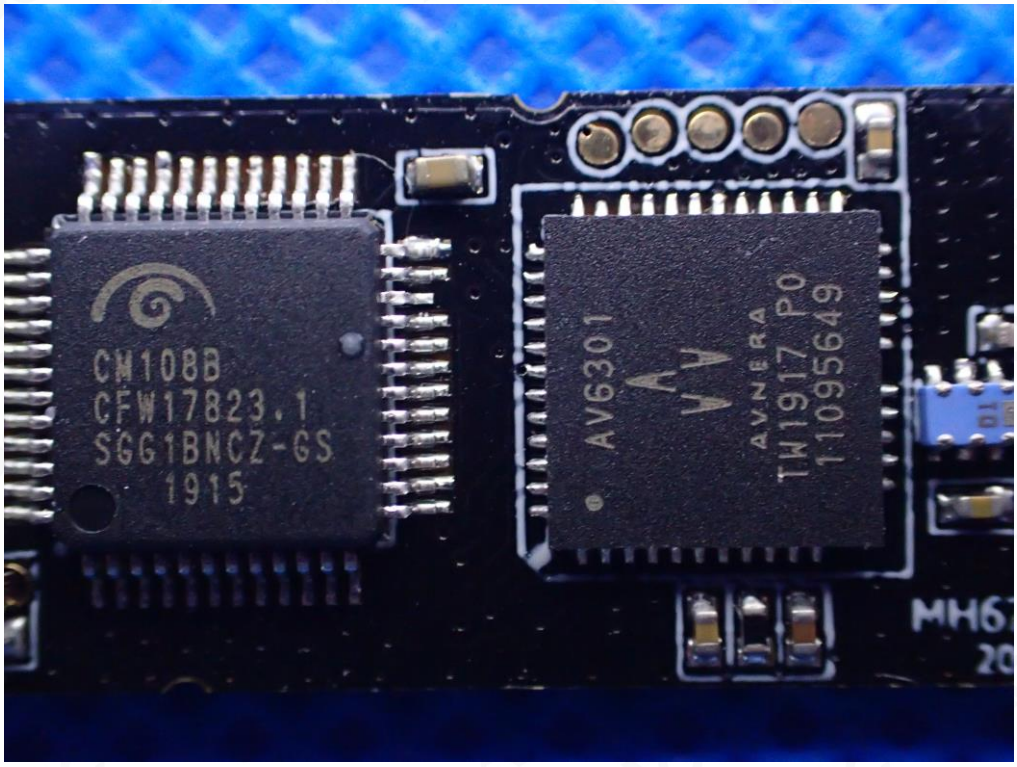
INTERNAL VIEW OF EUT-2



INTERNAL VIEW OF EUT-3



INTERNAL VIEW OF EUT-4



----END OF REPORT----