

RADIO PERFORMANCE TEST REPORT

Test Report No. : OT-24O-RWD-026
Reception No. : 2408002643
Applicant : NTT Sonority Inc.
Address : 3-20-2, Nishishinjuku, Shinjuku-ku, Tokyo, 163-1432, Japan
Manufacturer : KH Electron Phils. Corp.
Address : 5416 Claro M. Recto Highway, Clark Freeport Zone, Pampanga, Philippine
Type of Equipment : wireless on-ear speakers
FCC ID. : 2A58O-MBN002
Model Name : MBN002
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 25 pages (including this page)
Date of Incoming : August 20, 2024
Date of issue : October 15, 2024

SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.





Tested by
 Myeong-Hwa, Jang / Senior Project Engineer
 ONETECH Corp.

Reviewed by
 Tae-Ho, Kim / Chief Engineer
 ONETECH Corp.

Approved by
 Jae-Ho, Lee / Chief Engineer
 ONETECH Corp.

CONTENTS

	Page
1. VERIFICATION OF COMPLIANCE	5
2. TEST SUMMARY	6
2.1 TEST ITEMS AND RESULTS	6
2.2 ADDITIONS, DEVIATIONS, EXCLUSIONS FROM STANDARDS	6
2.3 RELATED SUBMITTAL(S) / GRANT(S)	6
2.4 PURPOSE OF THE TEST	6
2.5 TEST METHODOLOGY	6
2.6 TEST FACILITY	6
3. GENERAL INFORMATION	7
3.1 PRODUCT DESCRIPTION	7
3.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT	7
4. EUT MODIFICATIONS	7
5. SYSTEM TEST CONFIGURATION	8
5.1 JUSTIFICATION	8
5.2 PERIPHERAL EQUIPMENT	8
5.3 MODE OF OPERATION DURING THE TEST	8
5.4 CONFIGURATION OF TEST SYSTEM	9
5.5 ANTENNA REQUIREMENT	9
6. MEASUREMENT UNCERTAINTY	9
7. PRELIMINARY TEST	10
7.1 AC POWER LINE CONDUCTED EMISSIONS TESTS	10
7.2 GENERAL RADIATED EMISSIONS TESTS	10
8. MINIMUM 6 dB BANDWIDTH	11
8.1 OPERATING ENVIRONMENT	11
8.2 TEST SET-UP	11
8.3 TEST DATE	11
8.4 TEST DATA FOR 1 MBPS	11
8.5 TEST DATA FOR 2 MBPS	11
9. MAXIMUM PEAK OUTPUT POWER	12
9.1 OPERATING ENVIRONMENT	12
9.2 TEST SET-UP	12
9.3 TEST DATE	12

9.4 TEST DATA FOR 1 MBPS	12
9.5 TEST DATA FOR 2 MBPS	12
10. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND	13
10.1 OPERATING ENVIRONMENT	13
10.2 TEST SET-UP FOR CONDUCTED MEASUREMENT	13
10.3 TEST SET-UP FOR RADIATED MEASUREMENT.....	13
10.4 TEST DATE	13
10.5 TEST DATA FOR CONDUCTED EMISSION	13
10.6 TEST DATA FOR RADIATED EMISSION.....	14
10.6.1 Radiated Emission which fall in the Restricted Band.....	14
10.6.2 Spurious & Harmonic Radiated Emission.....	16
11. PEAK POWER SPECTRAL DENSITY	18
11.1 OPERATING ENVIRONMENT	18
11.2 TEST SET-UP	18
11.3 TEST DATE	18
11.4 TEST DATA FOR 1 MBPS	18
11.5 TEST DATA FOR 2 MBPS	18
12. RADIATED EMISSION TEST	19
12.1 OPERATING ENVIRONMENT	19
12.2 TEST SET-UP	19
12.3 TEST DATE	19
12.4 TEST DATA FOR 30 MHz ~ 1 000 MHz	20
12.5 TEST DATA FOR BELOW 30 MHz	21
12.6 TEST DATA FOR ABOVE 1 GHz	21
13. CONDUCTED EMISSION TEST.....	22
13.1 OPERATING ENVIRONMENT	22
13.2 TEST SET-UP	22
13.3 TEST DATE	22
13.4 TEST DATA.....	23
14. LIST OF TEST EQUIPMENT	25

※ Please refer to the Annex section for All test plots

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-24O-RWD-026	October 15, 2024	Initial Release	All

1. VERIFICATION OF COMPLIANCE

Applicant : NTT Sonority Inc.

Address : 3-20-2, Nishishinjuku, Shinjuku-ku, Tokyo, 163-1432, Japan

Contact Person : Akira Nakagawa / General Manager

Telephone No. : +81-80-8231-5126

FCC ID : 2A58O-MBN002

Model Name : MBN002

Brand Name : N/A

Serial Number : N/A

Date : October 15, 2024

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	wireless on-ear speakers
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.247.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-20122/ C-14617/ G-10666/ T-11842

-. Lab Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

ISED (Innovation, Science and Economic Development Canada) – Registration No. Site# 3736A-3

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The NTT Sonority Inc., Model MBN002 (referred to as the EUT in this report) is a wireless on-ear speakers. The product specification described herein was obtained from product data sheet or user's manual.

Device Type	wireless on-ear speakers		
Temperature Range	0 °C ~ 45 °C		
OPERATING FREQUENCY	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	Bluetooth	2 402 MHz ~ 2 480 MHz	
MODULATION TYPE	Bluetooth LE	GFSK for 1 Mbps, 2 Mbps	
	Bluetooth	GFSK for 1Mbps, $\pi/4$ -DQPSK for 2Mbps, 8-DPSK for 3Mbps	
RF OUTPUT POWER	Bluetooth LE	1 Mbps	4.19 dBm
		2 Mbps	4.69 dBm
	Bluetooth	1 Mbps	4.41 dBm
		2 Mbps	7.37 dBm
		3 Mbps	7.89 dBm
ANTENNA TYPE	Chip Antenna		
ANTENNA GAIN	1.77 dBi		
List of each Osc. or crystal Freq.(Freq. $\geq$ 1 MHz)	40 MHz		

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	KH Electron Phils. Corp.	03PB001-0399-01	N/A

5.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
MBN002	KH Electron Phils. Corp.	wireless on-ear speakers (EUT)	
HP ProBook 450 G7	HP	Notebook PC	EUT
TPN-LA15	Lite-On Technology Corp.	AC Adapter	

5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis, but the worst data was recorded in this report.

-. Frequency / Channel Operations

Channel	Frequency
0	2 402
19	2 440
39	2 480

-. Duty Cycle

Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Bluetooth LE [1 Mbps]	0.395	0.230	63.14	2.00
Bluetooth LE [2 Mbps]	0.209	0.416	33.46	4.75

Note – Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) * 100

Correction Factor : 10 * Log(1 / (Duty Cycle / 100))

5.4 Configuration of Test System

- Line Conducted Test:** The EUT was tested in the Transmitting mode. All supporting equipment were connected to another LISN. Preliminary Power line Conducted Emission test was performed by using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions.
- Radiated Emission Test:** Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meter Semi Anechoic Chamber.
- The turntable was rotated through 360 degrees and the EUT was tested by positioned three orthogonal planes to obtain the highest reading on the field strength meter. Once maximum reading was determined, the search antenna was raised and lowered in both vertical and horizontal polarization.

5.5 Antenna Requirement

For intentional device, according to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction:

The antenna of the EUT is a Chip Antenna on the main board in the EUT, so no consideration of replacement by the user.

6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence.

The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Output Power	0.90
Conducted Spurious Emission < 26.5 GHz	1.26
Power Spectral Density	1.20
Line Conducted Disturbance (150 kHz ~ 30 MHz)	2.00
Radiated Disturbance (9 kHz ~ 30 MHz)	3.30
Radiated Disturbance (30 MHz ~ 1 GHz)	4.42
Radiated Disturbance (1 GHz ~ 18 GHz)	5.10
Radiated Disturbance (18 GHz ~ 40 GHz)	5.65

7. PRELIMINARY TEST

7.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

8.2 General Radiated Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

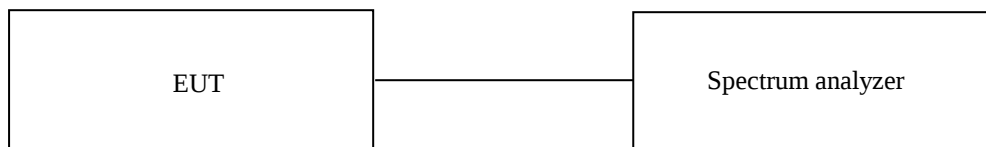
8. MINIMUM 6 dB BANDWIDTH

8.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



8.3 Test Date

August 23, 2024 ~ September 24, 2024

8.4 Test data for 1 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	659.20	500.00	159.20
Middle	2 440.00	654.34	500.00	154.34
High	2 480.00	659.46	500.00	159.46

Remark. Margin = Measured Value - Limit

8.5 Test data for 2 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	1 118.98	500.00	618.98
Middle	2 440.00	1 098.75	500.00	598.75
High	2 480.00	1 118.72	500.00	618.72

Remark. Margin = Measured Value – Limit

9. MAXIMUM PEAK OUTPUT POWER

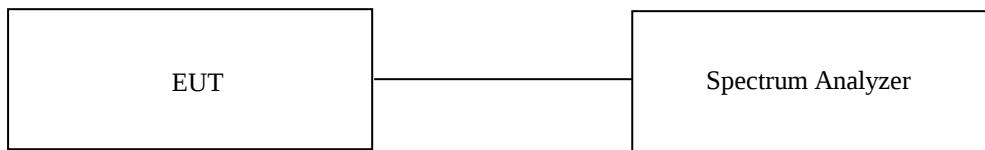
9.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

9.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $\geq$ DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



9.3 Test Date

August 23, 2024 ~ September 24, 2024

9.4 Test data for 1 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	3.80	30.00	26.20
MIDDLE	2 440.00	3.87	30.00	26.13
HIGH	2 480.00	4.19	30.00	25.81

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

9.5 Test data for 2 Mbps

-. Test Result : Pass

CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
LOW	2 402.00	4.28	30.00	25.72
MIDDLE	2 440.00	4.35	30.00	25.65
HIGH	2 480.00	4.69	30.00	25.31

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)

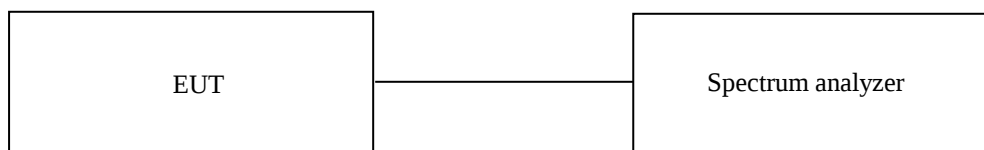
10. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

10.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

10.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.



10.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for horizontal and vertical polarization of the receiving antenna.

10.4 Test Date

August 23, 2024 ~ September 24, 2024

10.5 Test data for conducted emission

For Test data for conducted emission, please refer to the Annex.

10.6 Test data for radiated emission

10.6.1 Radiated Emission which fall in the Restricted Band

10.6.1.1 Test data for 1 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 63.14 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	ATT (dB)	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel											
2 356.000	52.58	Peak	H	27.68	4.61	41.74	-	-	43.13	74.00	30.87
2 339.273	40.95	Average	H	27.74	4.65	41.74	-	2.00	33.60	54.00	20.40
2 367.764	53.64	Peak	V	27.63	4.62	41.74	-	-	44.15	74.00	29.85
2 333.666	40.91	Average	V	27.77	4.67	41.74	-	2.00	33.61	54.00	20.39
Test Data for High Channel											
2 487.522	52.91	Peak	H	27.40	4.86	41.73	-	-	43.44	74.00	30.56
2 483.526	41.33	Average	H	27.40	4.83	41.73	-	2.00	33.83	54.00	20.17
2 496.733	52.75	Peak	V	27.40	4.91	41.73	-	-	43.33	74.00	30.67
2 484.565	40.99	Average	V	27.40	4.83	41.73	-	2.00	33.49	54.00	20.51

Tabulated test data for Restricted Band

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{ATT} + \text{Duty Factor}$$

10.6.1.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Measurement distance : 3 m
- Duty Cycle : 33.46 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	ATT (dB)	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel											
2 389.910	54.92	Peak	H	27.54	4.65	41.74	-	-	45.37	74.00	28.63
2 359.860	40.93	Average	H	27.66	4.63	41.74	-	4.75	36.23	54.00	17.77
2 351.770	52.54	Peak	V	27.69	4.62	41.74	-	-	43.11	74.00	30.89
2 384.220	40.93	Average	V	27.56	4.65	41.74	-	4.75	36.15	54.00	17.85
Test Data for High Channel											
2 486.760	63.49	Peak	H	27.40	4.88	41.73	-	-	54.04	74.00	19.96
2 483.570	41.31	Average	H	27.40	4.83	41.73	-	4.75	36.56	54.00	17.44
2 486.520	53.10	Peak	V	27.40	4.83	41.73	-	-	43.60	74.00	30.40
2 487.600	41.07	Average	V	27.40	4.88	41.73	-	4.75	36.37	54.00	17.63

Tabulated test data for Restricted Band

Remark: “H”: Horizontal, “V”: Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{ATT} + \text{Duty Factor}$$

10.6.2 Spurious & Harmonic Radiated Emission

10.6.2.1 Test data for 1 Mbps

- . Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- . Video bandwidth : 3 MHz for Peak and Average Mode
- . Frequency range : 1 GHz ~ 26.5 GHz
- . Measurement distance : 3 m
- . Duty Cycle : 63.14 %
- . Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 804.609	59.32	Peak	H	31.20	9.71	46.18	-	54.05	74.00	19.95
4 804.025	51.37	Average	H	31.20	9.71	46.18	2.00	48.10	54.00	5.90
4 804.559	57.19	Peak	V	31.20	9.71	46.18	-	51.92	74.00	22.08
4 804.195	49.34	Average	V	31.20	9.71	46.18	2.00	46.07	54.00	7.93
Test Data for Middle Channel										
4 880.145	55.41	Peak	H	31.26	9.78	46.15	-	50.30	74.00	23.70
4 879.985	46.33	Average	H	31.26	9.78	46.15	2.00	43.22	54.00	10.78
4 879.536	54.30	Peak	V	31.26	9.78	46.15	-	49.19	74.00	24.81
4 879.905	45.62	Average	V	31.26	9.78	46.15	2.00	42.51	54.00	11.49
Test Data for High Channel										
4 959.555	57.21	Peak	H	31.54	9.90	46.12	-	52.53	74.00	21.47
4 959.990	50.09	Average	H	31.54	9.90	46.12	2.00	47.41	54.00	6.59
4 960.435	55.55	Peak	V	31.54	9.90	46.12	-	50.87	74.00	23.13
4 960.010	47.19	Average	V	31.54	9.90	46.12	2.00	44.51	54.00	9.49

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dBμV/m)} - \text{Total Level (dBμV/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

10.6.2.2 Test data for 2 Mbps

- Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,
1 MHz for Peak Mode for the emissions outside restricted band
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Duty Cycle : 33.46 %
- Result : PASSED

Frequency (MHz)	Reading (dBμV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	Duty Factor (dB)	Total (dBμV/m)	Limits (dBμV/m)	Margin (dB)
Test Data for Low Channel										
4 803.171	59.46	Peak	H	31.20	9.71	46.18	-	54.19	74.00	19.81
4 804.010	47.87	Average	H	31.20	9.71	46.18	4.75	47.35	54.00	6.65
4 804.919	56.37	Peak	V	31.20	9.71	46.18	-	51.10	74.00	22.90
4 803.201	44.53	Average	V	31.20	9.71	46.18	4.75	44.01	54.00	9.99
Test Data for Middle Channel										
4 880.010	55.24	Peak	H	31.26	9.78	46.15	-	50.13	74.00	23.87
4 879.550	43.73	Average	H	31.26	9.78	46.15	4.75	43.37	54.00	10.63
4 881.289	54.23	Peak	V	31.26	9.79	46.15	-	49.13	74.00	24.87
4 879.920	43.03	Average	V	31.26	9.78	46.15	4.75	42.67	54.00	11.33
Test Data for High Channel										
4 959.990	57.48	Peak	H	31.54	9.90	46.12	-	52.80	74.00	21.20
4 959.371	46.50	Average	H	31.54	9.90	46.12	4.75	46.57	54.00	7.43
4 961.189	55.57	Peak	V	31.54	9.90	46.12	-	50.89	74.00	23.11
4 959.231	43.17	Average	V	31.54	9.90	46.12	4.75	43.24	54.00	10.76

Remark: "H": Horizontal, "V": Vertical

$$\text{Margin (dB)} = \text{Limits (dB}\mu\text{V/m)} - \text{Total Level (dB}\mu\text{V/m)}$$

$$\text{Total Level} = \text{Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{AMP Gain} + \text{Duty Factor}$$

11. PEAK POWER SPECTRAL DENSITY

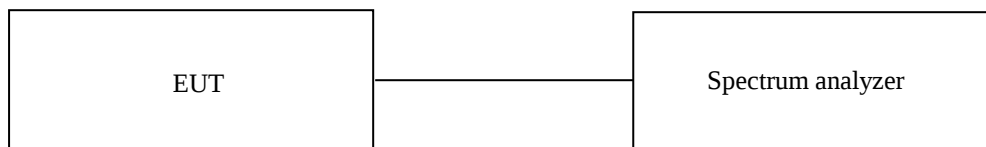
11.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

11.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$, the video bandwidth is set to 3 times the resolution bandwidth.



11.3 Test Date

August 23, 2024 ~ September 24, 2024

11.4 Test data for 1 Mbps

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-11.66	8.00	19.66
Middle	2 440.00	-10.79	8.00	18.79
High	2 480.00	-11.96	8.00	19.96

Remark. Margin = Limit – Measured value

11.5 Test data for 2 Mbps

-. Test Result : Pass

-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-13.20	8.00	21.20
Middle	2 440.00	-13.51	8.00	21.51
High	2 480.00	-13.71	8.00	21.71

Remark. Margin = Limit – Measured value

12. RADIATED EMISSION TEST

12.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

12.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

12.3 Test Date

August 23, 2024 ~ September 24, 2024

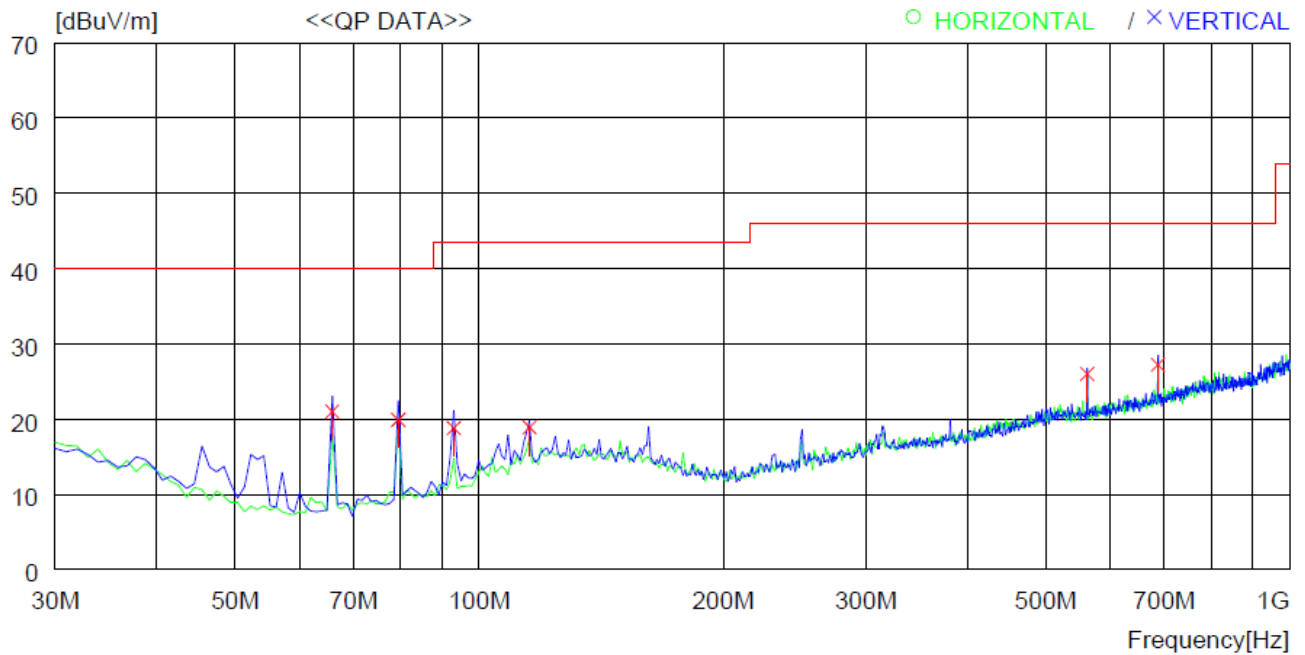
12.4 Test data for 30 MHz ~ 1 000 MHz

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : wireless on-ear speakers

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Vertical -----										
1	65.890	39.4	12.7	1.0	32.1	21.0	40.0	19.0	100	305
2	79.470	37.3	13.4	1.2	32.0	19.9	40.0	20.1	100	247
3	93.050	35.2	14.3	1.3	32.0	18.8	43.5	24.7	100	0
4	115.360	31.6	18.0	1.4	32.1	18.9	43.5	24.6	100	229
5	562.529	31.4	23.8	3.1	32.3	26.0	46.0	20.0	300	0
6	687.655	30.8	25.4	3.4	32.4	27.2	46.0	18.8	100	0

12.5 Test data for Below 30 MHz

- Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)
- Frequency range : 9 kHz ~ 30 MHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

12.6 Test data for above 1 GHz

- Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode
1 MHz and RMS Detector for Average Mode
- Video bandwidth : 3 MHz for Peak and Average Mode
- Frequency range : 1 GHz ~ 26.5 GHz
- Measurement distance : 3 m
- Operating mode : Transmitting mode

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

13. CONDUCTED EMISSION TEST

13.1 Operating environment

Temperature : 25 °C
Relative humidity : 46 % R.H.

13.2 Test set-up

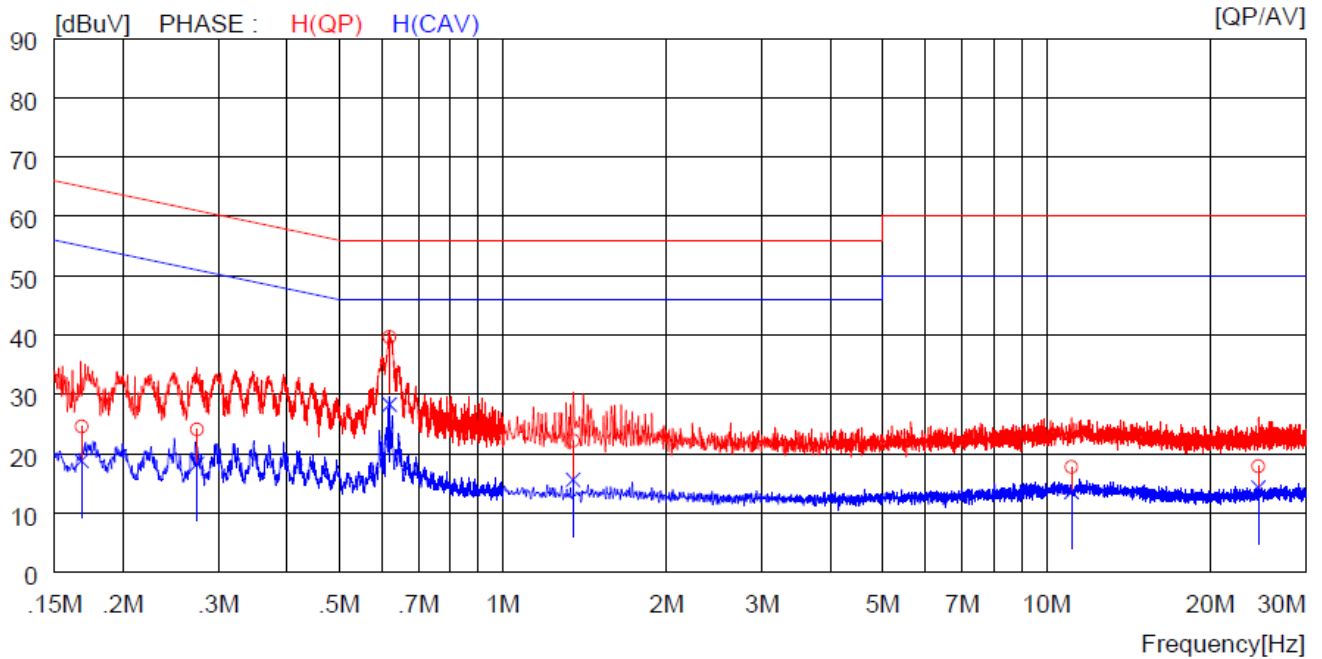
The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

13.3 Test Date

August 23, 2024 ~ September 24, 2024

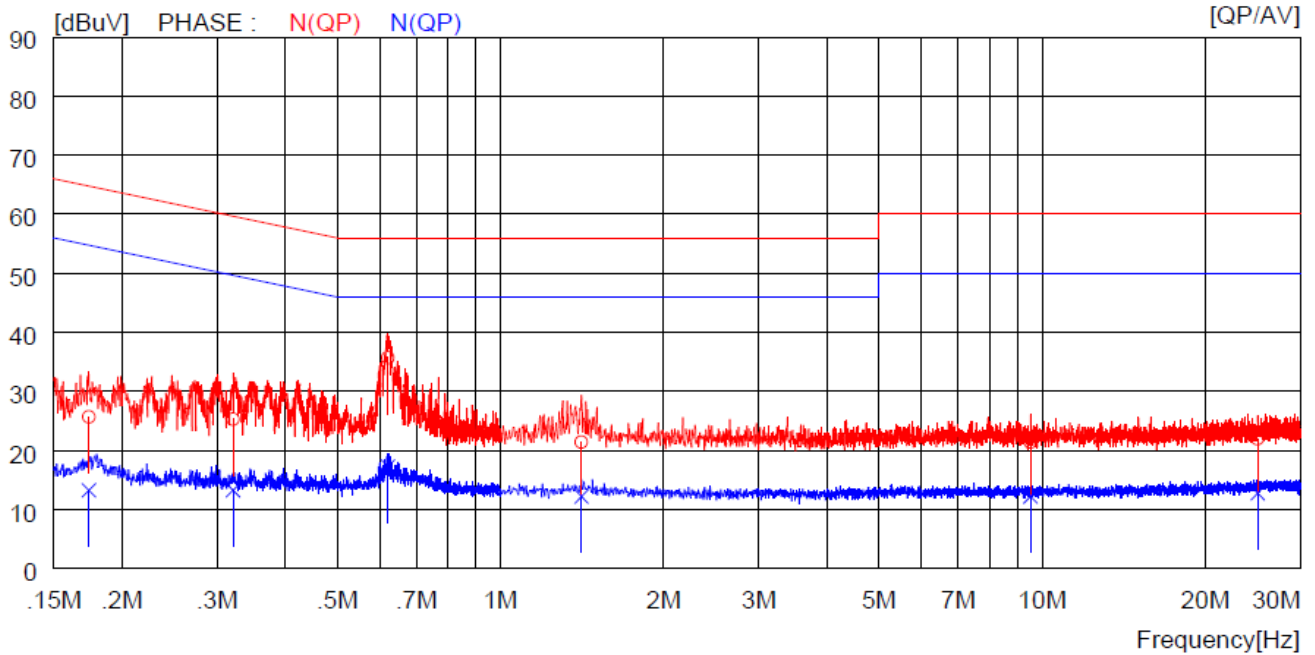
13.4 Test data

- Resolution bandwidth : 9 kHz
- Frequency range : 0.15 MHz ~ 30 MHz
- Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16800	14.5	----	10.1	24.6	----	65.1	----	40.5	----	H (QP)
2	0.27400	14.1	----	10.0	24.1	----	61.0	----	36.9	----	H (QP)
3	0.61900	29.6	----	10.1	39.7	----	56.0	----	16.3	----	H (QP)
4	1.34800	12.1	----	10.1	22.2	----	56.0	----	33.8	----	H (QP)
5	11.12000	7.4	----	10.4	17.8	----	60.0	----	42.2	----	H (QP)
6	24.55000	7.1	----	10.8	17.9	----	60.0	----	42.1	----	H (QP)
7	0.16800	----	8.7	10.1	----	18.8	----	55.1	----	36.3	H (CAV)
8	0.27400	----	8.3	10.0	----	18.3	----	51.0	----	32.7	H (CAV)
9	0.61900	----	18.2	10.1	----	28.3	----	46.0	----	17.7	H (CAV)
10	1.34800	----	5.5	10.1	----	15.6	----	46.0	----	30.4	H (CAV)
11	11.12000	----	3.2	10.4	----	13.6	----	50.0	----	36.4	H (CAV)
12	24.55000	----	3.5	10.8	----	14.3	----	50.0	----	35.7	H (CAV)

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C. FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.17400	15.6	----	10.1	25.7	----	64.8	----	39.1	----	N (QP)
2	0.32100	15.3	----	10.0	25.3	----	59.7	----	34.4	----	N (QP)
3	0.62000	25.6	----	10.1	35.7	----	56.0	----	20.3	----	N (QP)
4	1.41200	11.3	----	10.1	21.4	----	56.0	----	34.6	----	N (QP)
5	9.52000	11.1	----	10.3	21.4	----	60.0	----	38.6	----	N (QP)
6	25.00000	11.2	----	10.8	22.0	----	60.0	----	38.0	----	N (QP)
7	0.17400	----	3.2	10.1	----	13.3	----	54.8	----	41.5	N (CAV)
8	0.32100	----	3.3	10.0	----	13.3	----	49.7	----	36.4	N (CAV)
9	0.62000	----	7.2	10.1	----	17.3	----	46.0	----	28.7	N (CAV)
10	1.41200	----	2.1	10.1	----	12.2	----	46.0	----	33.8	N (CAV)
11	9.52000	----	1.9	10.3	----	12.2	----	50.0	----	37.8	N (CAV)
12	25.00000	----	2.0	10.8	----	12.8	----	50.0	----	37.2	N (CAV)

Remark: Margin (dB) = Limit – Level (Result)

The emission level in above table is included the transducer factor that means insertion loss (LISN), cable loss and attenuator.

14. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV30	Rohde & Schwarz	Signal Analyzer	101199	Jan. 15, 2024 (1Y)
ESR3	Rohde & Schwarz	EMI Test Receiver	102602	Mar. 11, 2024 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 16, 2023 (1Y)
SCU18	Rohde & Schwarz	Pre-Amplifier	102266	Jul. 04, 2024 (1Y)
SCU18	Rohde & Schwarz	Pre-Amplifier	102209	Oct. 11, 2023 (1Y)
SCU40A	Rohde & Schwarz	Pre-Amplifier	100436	Jan. 23, 2024 (1Y)
DT2000-2t	Innco System	Turn Table	N/A	N/A
MA-4640-XPET	Innco System	Antenna Master	MA4640/652/43100318/P	N/A
CO3000	Innco System	Controller	1026/40960617/P	N/A
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 20, 2024 (2Y)
HLP-2008	TDK	Hybrid Antenna	131316	Mar. 09, 2024 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1349	Jul. 02, 2024 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 04, 2024 (1Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter	N/A	Jan. 15, 2024 (1Y)
ESCI	Rohde & Schwarz	EMI TEST RECEIVER	101012	Sep. 26, 2023 (1Y)
NSLK8128	Schwarzbeck	AMN	8128216	Mar. 12, 2024 (1Y)
ESH3-Z2	Rohde & Schwarz	PULSE LIMITER	100655	Mar. 12, 2024 (1Y)