

# Test Report

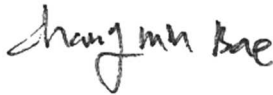
**Report No. : FCC2024-00009**

Company : LG Electronics USA, Inc.  
 Representative : William, Cho  
 Address : 111 Sylvan Ave, North Building, Englewood Cliffs, New Jersey, United States

1. Product Name : Bluetooth Earbud  
 -Model Name: TONE-FP8
2. Use of Report : Class II Permissive Change
3. FCC ID : ZNFTONEFP8
4. IC ID : 2703C-TONEFP8
4. Date of Receipt : 2024-04-01
5. Date of test : 2024-04-01 ~ 2024-04-23
6. Test Method : 47CFR Part15 Subpart C §15.247, RSS-GEN Issue 5 and RSS-247 Issue 3
7. Test Result : PASS

**Tested by :** Chang Min, Bae

**Approved by :** Sung Ryul, Kim




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2024. 04. 23.



## Korea Testing Certification institute

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## 1. General Information

### 1.1. Summary

Testing Laboratory	Korea Testing Certification
Testing location / address	22 Heungan-daero 27 beon-gil, Gunpo-si, Gyeonggi-Do, 15809, Republic of Korea
FCC Applicant	LG Electronics USA, Inc.
FCC Address of Applicant	111 Sylvan Ave, North Building, Englewood Cliffs, New Jersey, United States
FCC Contact Person of Applicant	Dae-Woong, Kim
FCC Phone Number of Applicant	201-266-2215
IC Applicant	LG ELECTRONICS INC
IC Address of Applicant	60-39, Gasan-Dong, Gumchon-Gu, Seoul, Korea
IC Contact Person of Applicant	Dong-yun, Hyun
IC Phone Number of Applicant	82-2-2033-1108
Brand Name	LG
Manufacturer	LG Electronics Inc.
Address of Manufacture	222 LG-ro Jinwi-myeon, Pyeongtaek-si, Gyeonggi-do, Korea
Product Name	Bluetooth Earbud
Model Name	TONE-FP8
Variants Model	TONE-FP8W, TONE-FP8E
Power Supply	DC 3.7 V
Frequency Range	2 402 MHz ~ 2 480 MHz
Modulation	Bluetooth (GFSK, $\pi/4$ DQPSK, 8DPSK) Bluetooth Low Energy (GFSK)



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Number of Channels	40 channels
Operation Temperature	0 °C ~ 40 °C
Antenna Type / Antenna Gain	FPCB Antenna / 0.05 dBi (Left Earbud) FPCB Antenna / 1.09 dBi (Right Earbud)
Hardware Version	Ver 1.1
Software Version	Ver 1.0



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## 1.2. Test Information

### 1.2.1 Supporting Equipment Used During Test

Use	Manufacturer	Model	Comments
EUT	LG Electronics USA, Inc.	TONE-FP8	-
AE	Samsung Electronics Vietnam Co., Ltd.	NT950XDB	Laptop

Supplementary information

EUT = Equipment Under Test, AE = Auxiliary / Associated Equipment, SIM = Simulator (Not Subjected to Test)

### 1.2.2 Report revision History

Issue date	Report No.	Reason for issue
2024-04-23	FCC2024-00009	First issued.



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## 1.3. Result Summary

FCC Standard Section	IC Standard Section	Requirement – Test Standard : FCC Part 15 Subpart C, RSS-247 Issue 3	Result / Comments
15.209, 15.247(d)	RSS-247, 5.5	Transmitter Radiated Spurious Emissions	Complied with requirement
15.207	RSS-GEN 8.8	AC Power Line Conducted Emission	N/A <sup>1)</sup>

Note;

1) the EUT is operated by DC battery.

- All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and KDB 558074 D01 15.247 Meas Guidance V05r02.



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## 1.4. List of Test Equipment

Test Equipment Used					
Equipment	Model	Manufacturer	Serial Number	Last Cal. Date	Cal. Due Date
EMI Test Receiver	N9030A	Agilent	MY54170518	24/05/2023	24/05/2024
Turn Table	DT3000-3t	Innco Systems	-	-	-
Antenna Mast	MA4640-XP-ET-0800	Innco Systems	-	-	-
Loop Antenna	HFH2-Z2E	ROHDE & SCHWARZ	100982	18/07/2022	18/07/2024
Bilog Antenna	VULB9168	Schwarzbeck	01044	14/07/2022	14/07/2024
Horn Antenna	HF907	ROHDE & SCHWARZ	102641	21/03/2024	21/03/2025
Horn Antenna	QSH-SL-18-26-s-20	STEATITE ANTENNA	17871	22/03/2024	22/03/2025
Pre Amplifier	310	SONOMA	340215	26/12/2023	26/12/2024
Pre Amplifier	SCU-18F	ROHDE & SCHWARZ	180041	20/03/2024	20/03/2025
Pre Amplifier	SCU-26D	ROHDE & SCHWARZ	2030827	20/03/2024	20/03/2025
Spectrum Analyzer	FSV30	ROHDE & SCHWARZ	103924	28/04/2023	28/04/2024
High Pass Filter	DBHF050320 1800A	dbwave	17091300009	12/07/2023	12/07/2024



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## 1.5. Measurement uncertainty

Parameter	Uncertainty	
Radiated Emission, 9 kHz to 30 MHz	H	$\pm 3.58$ dB
	V	$\pm 3.58$ dB
Radiated Emission, below 1 GHz	H	$\pm 3.94$ dB
	V	$\pm 3.72$ dB
Radiated Emission, above 1 GHz	H	$\pm 4.78$ dB
	V	$\pm 4.72$ dB

Note;

-This uncertainty represents an expanded uncertainty expressed at approximately 95% confidence level using a coverage factor of k=2.





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## 1.6. Differences

Model name	Differences	tested
TONE-FP8	Basic Model	v
TONE-FP8W	This model is identical to the basic model except for the Color (White) and model name.	
TONE-FP8E	This model is identical to the basic model except for the Color (Beige) and model name.	

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## 2. Spurious Emissions, Restricted Band Edges

### 2.1. Limit

47 CFR Part 15

Section § 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Section § 15.209(a)

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (Meters)
0.009-0.490	2 400/F(kHz)	300
0.490-1.705	24 000/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

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.



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RSS-247 Issue3, 5.5

in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen Issue 5, 8.9, except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

**Table 5 – General Field Strength Limits at frequencies above 30 MHz**

Frequency (MHz)	Field Strength ( $\mu V/m$ at 3 m)
30-88	100
88-216	150
216-960	200
Above 960	500

**Table 6 – General Field Strength Limits at frequencies below 30 MHz**

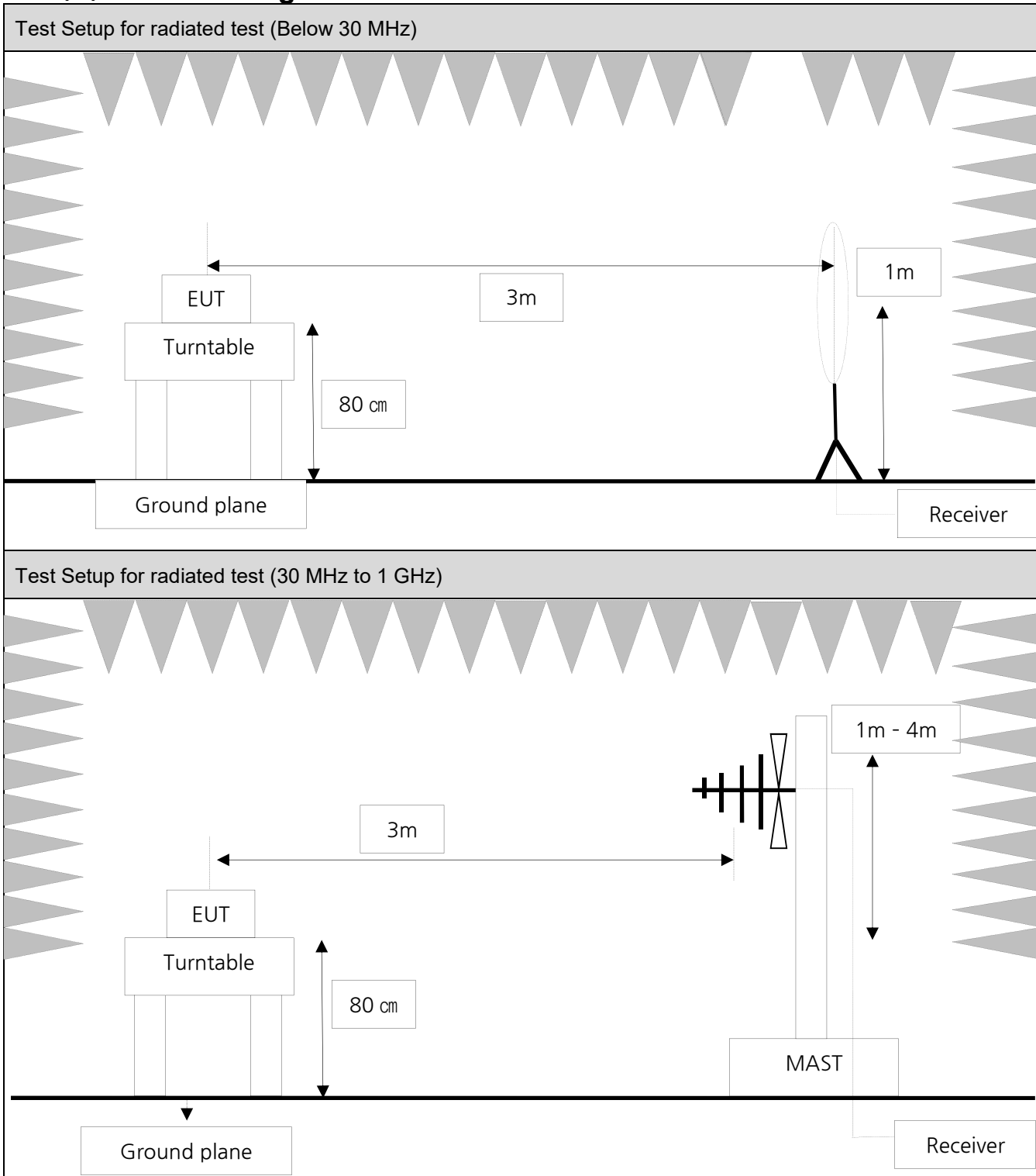
Frequency	Magnetic Field Strength (H-Field) ( $\mu A/m$ )	Measurement Distance (meters)
9-490 kHz <sup>1</sup>	6.37/F (F in kHz)	300
490-1 705 kHz	63.7/F (F in kHz)	30
1.705-30 MHz	0.08	30

**Note<sup>1</sup>:** The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

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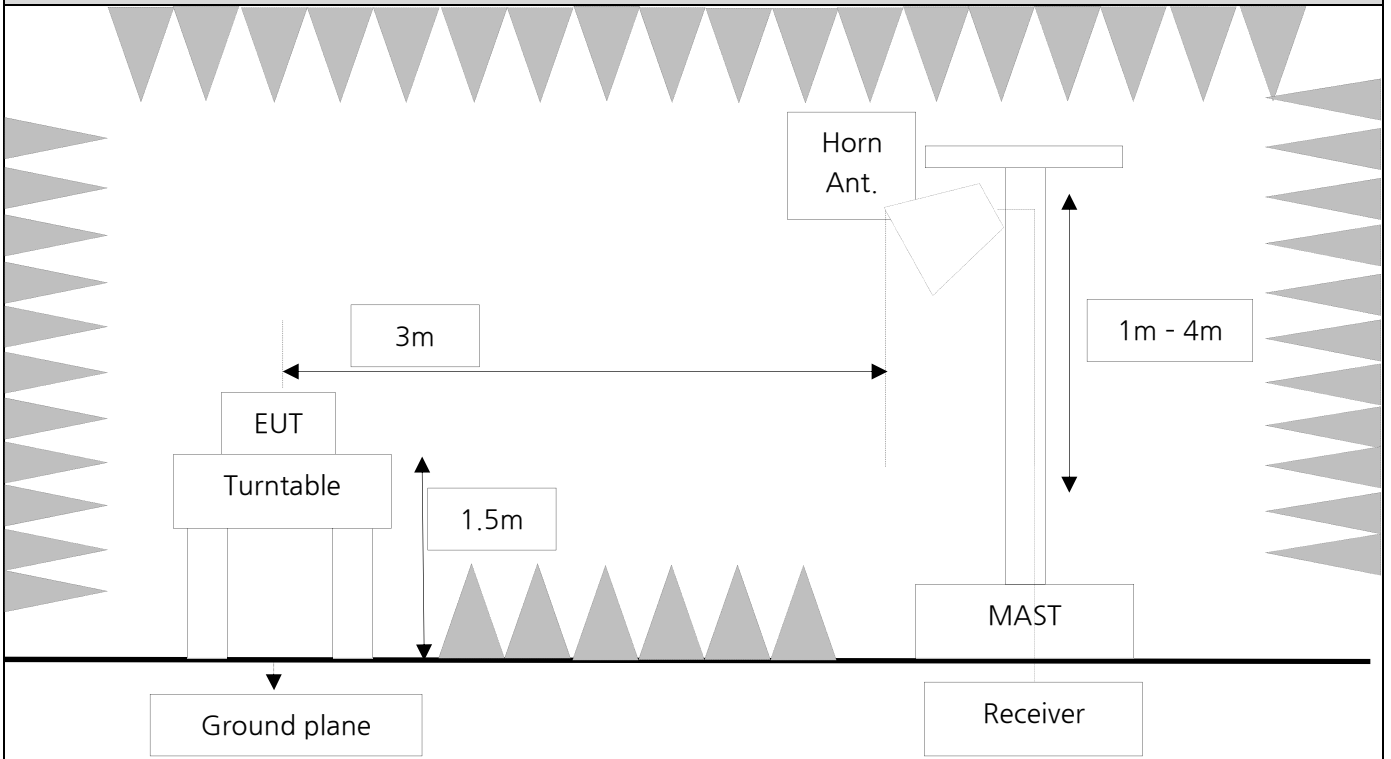
## 2.2. Test Configuration



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## Test Setup for radiated test (Above 1 GHz)



## Test Setup for Conducted test



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## 2.3. Test Procedure

Radiated emissions from the EUT were measured according to the dictates in ANSI C63.10-2013.
<b>Test Procedure of Radiated emissions(Below 30 MHz)</b>
<ol style="list-style-type: none"> <li>1. The EUT was placed on a non-conductive rotating table 0.8 meters above the ground at semi-anechoic chamber.</li> <li>2. The loop antenna was placed at a location 3 m from the EUT.</li> <li>3. The loop antenna is fixed at 1 meter above the ground.</li> <li>4. Find Worst condition on the X-axis, Y-axis, and Z-axis of EUT.</li> <li>5. Both horizontal and vertical polarization of the antenna are set to make the measurement.</li> <li>6. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.</li> </ol> <ul style="list-style-type: none"> <li>. Spectrum Setting</li> <li>- Frequency Range = 9 kHz ~ 30 MHz</li> <li>- Detector = Peak</li> <li>- Trace = Maxhold</li> <li>- RBW = 9 kHz</li> <li>- VBW ≥ 3 x RBW</li> <li>- Allow sweeps to continue until the trace stabilizes.</li> </ul>
<p>Correction Factor for measurement distance at 3m(0.009 MHz – 0.490 MHz) = <math>40\log(3\text{ m}/300\text{ m}) = - 80\text{ dB}</math>            Correction Factor for measurement distance at 3m (0.490 MHz – 30 MHz) = <math>40\log(3\text{ m}/30\text{ m}) = - 40\text{ dB}</math>            Actual value = Measured Value + Antenna Factor + Cable Loss + Correction Factor(Distance Factor)</p>
<b>Test Procedure of Radiated emissions(Below 1 GHz)</b>
<ol style="list-style-type: none"> <li>1. The EUT was placed on a non-conductive rotating table 0.8 meters above the ground at semi-anechoic chamber.</li> <li>2. Find Worst condition on the X-axis, Y-axis, and Z-axis of EUT.</li> <li>3. There is a bi-log antenna and a horn antenna, its height are varied from 1m to 4m to determine the maximum value of the field strength.</li> <li>4. Both horizontal and vertical polarization of the antenna are set to make the measurement.</li> <li>5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.</li> </ol> <p>(1) Measurement Type(Peak):</p> <ul style="list-style-type: none"> <li>- Measured Frequency Range : 30 MHz – 1 GHz</li> <li>- Detector = Peak</li> <li>- Trace = Maxhold</li> <li>- RBW = 100 kHz</li> <li>- VBW ≥ 3 x RBW</li> </ul> <p>(2) Measurement Type(Quasi-peak):</p> <ul style="list-style-type: none"> <li>- Measured Frequency Range : 30 MHz – 1 GHz</li> <li>- Detector = Quasi-Peak</li> <li>- RBW = 120 kHz</li> </ul>
Actual value = Measured Value + Antenna Factor + Cable Loss



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## Test Procedure of Radiated emissions(Above 1 GHz)

1. The EUT was placed on a non-conductive rotating table 1.5 meters above the ground at semi-anechoic chamber.
2. Find Worst condition on the X-axis, Y-axis, and Z-axis of EUT.
3. There is a horn antenna, its height is varied from 1m to 4m to determine the maximum value of the field strength.
4. Both horizontal and vertical polarization of the antenna are set to make the measurement.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)

(1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW ≥ 3 x RBW
- Allow sweeps to continue until the trace stabilizes.

(2) Measurement Type(Average):

- Duty cycle < 98 %, duty cycle variations are less than ±2 %
- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (i.e., RMS)
- RBW = 1 MHz
- VBW ≥ 3 x RBW
- Sweep time = auto.
- Trace mode = perform a trace average of at least 100 traces.
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

6. Distance extrapolation factor =  $20\log(\text{test distance} / \text{specific distance})$  (dB)

Actual value(Peak) = Measured Value + Antenna Factor + Cable Loss + distance extrapolation factor

Actual value(Average) = Measured Value + Antenna Factor + Cable Loss + distance extrapolation factor + duty cycle factor

Note;

If the peak detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.



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## Test Procedure for Radiated Restricted Band Edge

1. The EUT was placed on a non-conductive rotating table 1.5 meters above the ground at semi-anechoic chamber.
2. Find Worst condition on the X-axis, Y-axis, and Z-axis of EUT.
3. There is a horn antenna, its height is varied from 1m to 4m to determine the maximum value of the field strength.
4. Both horizontal and vertical polarization of the antenna are set to make the measurement.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.

Spectrum Setting (Method 8.6 in KDB 558074 v05r02, Procedure 11.12 in ANSI 63.10-2013)

(1) Measurement Type(Peak):

- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW ≥ 3 x RBW

(2) Measurement Type(Average):

- Duty cycle < 98 %, duty cycle variations are less than ±2 %
- Measured Frequency Range : 2310 MHz ~ 2390 MHz/ 2483.5 MHz ~ 2500 MHz
- Detector = RMS
- Averaging type = power (i.e., RMS)
- RBW = 1 MHz
- VBW ≥ 3 x RBW
- Sweep time = auto.
- Trace mode = perform a trace average of at least 100 traces.
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle.

6. Distance extrapolation factor =  $20\log(\text{test distance} / \text{specific distance})$  (dB)

Actual value(Peak) = Measured Value + Antenna Factor + Cable Loss + distance extrapolation factor

Actual value(Average) = Measured Value + Antenna Factor + Cable Loss + distance extrapolation factor + duty cycle factor

Note;

If the peak detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.



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## 2.4. Test Results

Ambient Temp.	(22 ± 1) °C
Relative Humidity	(43 ± 5) % R.H.
Test Result	PASS (Refer to below)

<b>Note;</b> - Actual Value(dBuV/m) = Measured Value(dBuV) + Correction Factors(dB/m). - The Actual Value using the peak detector does not include the duty factor. - The measured of emissions are not reporting much lower than the limits by over 20 dB. - Margin Value = Emission level – Limit Value.	
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**-Left Earbud**

Frequency Range : 9 kHz ~ 30 MHz

**- Left Earbud, Bluetooth Low Energy 1M PHY (GFSK)**

Radiated Emission results								
Measured Frequency (MHz)	Measured Value (dBuV)	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
9 kHz ~ 30 MHz have been tested and test data more than 20 dB margin. No Radiated Spurious Emissions Found								
<b>Note;</b> - The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.								



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Frequency Range : 30 MHz ~ 1 GHz

- Left Earbud, Bluetooth Low Energy 1M PHY (GFSK)

Radiated Emission results								
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	(Antenna Factor + Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.698	37.00	Peak	V	-8.30	-	28.70	40.00	11.30
49.885	35.40	Peak	V	-6.70	-	28.70	40.00	11.30
66.618	36.10	Peak	H	-8.00	-	28.10	40.00	11.90
79.955	41.10	Peak	V	-11.50	-	29.60	40.00	10.40
146.885	31.90	Peak	V	-6.30	-	25.60	43.50	17.90
322.213	28.70	Peak	H	-4.20	-	24.50	46.00	21.50

Note;

-The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.

-Among other frequencies, the worst results were reported (**1M PHY, 2402 MHz**).

Frequency Range : 1 GHz ~ 25 GHz

- Left Earbud, Bluetooth Low Energy 1M PHY (GFSK) 2 402 MHz

Radiated restricted band edge results									
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 378.72	44.55	Peak	H	31.53	-24.60	-	51.48	74.00	22.52
2 351.82	34.75	Average	H	31.43	-24.67	0.69	42.20	54.00	11.80



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### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 812.61	37.36	Peak	H	37.27	-19.38	-	55.25	74.00	18.75
4 812.29	26.71	Average	H	37.27	-19.38	0.69	45.29	54.00	8.71

### - Left Earbud, Bluetooth Low Energy 1M PHY (GFSK) 2 440 MHz

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 885.51	37.04	Peak	H	37.49	-19.27	-	55.26	74.00	18.74
4 870.99	26.57	Average	H	37.46	-19.29	0.69	45.43	54.00	8.57

### - Left Earbud, Bluetooth Low Energy 1M PHY (GFSK) 2 480 MHz

#### Radiated restricted band edge results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.84	53.32	Peak	H	32.02	-24.34	-	61.00	74.00	13.00
2 484.04	36.66	Average	H	32.02	-24.34	0.69	45.03	54.00	8.97

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 961.58	37.50	Peak	H	37.62	-19.14	-	55.98	74.00	18.02
4 963.36	26.53	Average	H	37.62	-19.14	0.69	45.70	54.00	8.30



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Frequency Range : 9 kHz ~ 30 MHz

- Left Earbud, Bluetooth Low Energy 2M PHY (GFSK)

Radiated Emission results								
Measured Frequency (MHz)	Measured Value (dBuV)	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
<p>9 kHz ~ 30 MHz have been tested and test data more than 20 dB margin. No Radiated Spurious Emissions Found</p>								
<p>Note; - The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.</p>								



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Frequency Range : 30 MHz ~ 1 GHz

- Left Earbud, Bluetooth Low Energy 2M PHY (GFSK)

Radiated Emission results								
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	(Antenna Factor + Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.455	37.00	Peak	V	-8.20	-	28.80	40.00	11.20
66.618	36.00	Peak	H	-8.00	-	28.00	40.00	12.00
79.955	40.70	Peak	V	-11.50	-	29.20	40.00	10.80
146.885	31.40	Peak	V	-6.30	-	25.10	43.50	18.40
165.800	29.80	Peak	V	-6.60	-	23.20	43.50	20.30
815.943	30.40	Peak	H	7.40	-	37.80	46.00	8.20

Note;

- The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.
- Among other frequencies, the worst results were reported (**2M PHY, 2402 MHz**).

Frequency Range : 1 GHz ~ 25 GHz

- Left Earbud, Bluetooth Low Energy 2M PHY (GFSK) 2 402 MHz

Radiated restricted band edge results									
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 345.13	45.77	Peak	H	31.41	-24.68	-	52.50	74.00	21.50
2 368.53	34.74	Average	H	31.49	-24.63	2.42	44.02	54.00	9.98



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### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 809.21	37.86	Peak	H	37.26	-19.39	-	55.73	74.00	18.27
4 806.18	26.53	Average	H	37.24	-19.39	2.42	46.80	54.00	7.20

### - Left Earbud, Bluetooth Low Energy 2M PHY (GFSK) 2 440 MHz

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 875.70	37.61	Peak	H	37.47	-19.29	-	55.79	74.00	18.21
4 872.15	26.61	Average	H	37.46	-19.29	2.42	47.20	54.00	6.80

### - Left Earbud, Bluetooth Low Energy 2M PHY (GFSK) 2 480 MHz

#### Radiated restricted band edge results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.50	54.17	Peak	H	32.02	-24.34	-	61.85	74.00	12.15
2 483.50	42.30	Average	H	32.02	-24.34	2.42	52.40	54.00	1.60

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 963.84	37.37	Peak	H	37.62	-19.14	-	55.85	74.00	18.15
4 958.82	26.28	Average	H	37.62	-19.14	2.42	47.18	54.00	6.82



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# Test Report

Report No. : FCC2024-00009

-Right Earbud

Frequency Range : 9 kHz ~ 30 MHz

- Right Earbud, Bluetooth Low Energy 1M PHY (GFSK)

Radiated Emission results								
Measured Frequency (MHz)	Measured Value (dBuV)	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
<p>9 kHz ~ 30 MHz have been tested and test data more than 20 dB margin. No Radiated Spurious Emissions Found</p>								
<p>Note; - The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.</p>								



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# Test Report

Report No. : FCC2024-00009

Frequency Range : 30 MHz ~ 1 GHz

- Right Earbud, Bluetooth Low Energy 1M PHY (GFSK)

Radiated Emission results								
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	(Antenna Factor + Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.698	37.70	Peak	V	-8.30	-	29.40	40.00	10.60
48.915	32.70	Peak	V	-6.90	-	25.80	40.00	14.20
58.979	33.10	Peak	V	-7.20	-	25.90	40.00	14.10
66.618	36.00	Peak	H	-8.00	-	28.00	40.00	12.00
79.955	41.40	Peak	V	-11.50	-	29.90	40.00	10.10
146.643	31.20	Peak	V	-6.30	-	24.90	43.50	18.60

Note;

-The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.

-Among other frequencies, the worst results were reported (**1M PHY, 2402 MHz**).

Frequency Range : 1 GHz ~ 25 GHz

- Right Earbud, Bluetooth Low Energy 1M PHY (GFSK) 2 402 MHz

Radiated restricted band edge results									
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 351.50	45.42	Peak	H	31.43	-24.67	-	52.18	74.00	21.82
2 316.16	34.66	Average	H	31.35	-24.75	0.69	41.95	54.00	12.05





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# Test Report

Report No. : FCC2024-00009

### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 799.86	37.52	Peak	H	37.22	-19.40	-	55.34	74.00	18.66
4 809.85	26.64	Average	H	37.26	-19.39	0.69	45.20	54.00	8.80

### - Right Earbud, Bluetooth Low Energy 1M PHY (GFSK) 2 402 MHz

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 887.21	38.19	Peak	H	37.49	-19.27	-	56.41	74.00	17.59
4 883.06	26.60	Average	H	37.49	-19.28	0.69	45.50	54.00	8.50

### - Right Earbud, Bluetooth Low Energy 1M PHY (GFSK) 2 402 MHz

#### Radiated restricted band edge results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.59	52.27	Peak	H	32.02	-24.34	-	59.95	74.00	14.05
2 483.91	35.22	Average	H	32.02	-24.34	0.69	43.59	54.00	10.41

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 957.76	36.60	Peak	H	37.62	-19.15	-	55.07	74.00	18.93
4 965.23	26.39	Average	H	37.62	-19.13	0.69	45.57	54.00	8.43



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# Test Report

Report No. : FCC2024-00009

Frequency Range : 9 kHz ~ 30 MHz

- Right Earbud, Bluetooth Low Energy 2M PHY (GFSK)

### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
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9 kHz ~ 30 MHz have been tested and test data more than 20 dB margin.  
No Radiated Spurious Emissions Found

Note;

- The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.



Korea Testing Certification institute

# Test Report

Report No. : FCC2024-00009

Frequency Range : 30 MHz ~ 1 GHz

- Right Earbud, Bluetooth Low Energy 2M PHY (GFSK)

Radiated Emission results								
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	(Antenna Factor + Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
31.698	39.20	Peak	V	-8.30	-	30.90	40.00	9.10
66.618	34.30	Peak	V	-8.00	-	26.30	40.00	13.70
79.955	41.80	Peak	V	-11.50	-	30.30	40.00	9.70
118.634	30.90	Peak	V	-9.40	-	21.50	43.50	22.00
148.461	31.50	Peak	V	-6.30	-	25.20	43.50	18.30
431.216	30.40	Peak	V	-1.10	-	29.30	46.00	16.70

Note;

-The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.

-Among other frequencies, the worst results were reported (**2M PHY, 2402 MHz**).

Frequency Range : 1 GHz ~ 25 GHz

- Right Earbud, Bluetooth Low Energy 2M PHY (GFSK) 2 402 MHz

Radiated restricted band edge results									
Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss ) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 347.84	45.71	Peak	H	31.42	-24.68	-	52.45	74.00	21.55
2 319.34	34.59	Average	H	31.36	-24.74	2.42	43.63	54.00	10.37



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# Test Report

Report No. : FCC2024-00009

### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 805.56	37.72	Peak	H	37.24	-19.39	-	55.57	74.00	18.43
4 812.19	26.58	Average	H	37.27	-19.38	2.42	46.89	54.00	7.11

### - Right Earbud, Bluetooth Low Energy 2M PHY (GFSK) 2 440 MHz

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 886.03	37.70	Peak	H	37.49	-19.27	-	55.92	74.00	18.08
4 887.83	26.50	Average	H	37.50	-19.27	2.42	47.15	54.00	6.85

### - Right Earbud, Bluetooth Low Energy 2M PHY (GFSK) 2 480 MHz

#### Radiated restricted band edge results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2 483.50	52.54	Peak	H	32.02	-24.34	-	60.22	74.00	13.78
2 483.50	39.40	Average	H	32.02	-24.34	2.42	49.50	54.00	4.50

#### Radiated Emission results

Measured Frequency (MHz)	Measured Value (dBuV)	Detector	Antenna Polarization (H/V)	Antenna Factor (dB)	(Amp + Cable Loss) (dB)	Duty Factor (dB)	Actual Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4 966.41	37.40	Peak	H	37.62	-19.13	-	55.89	74.00	18.11
4 966.43	26.46	Average	H	37.62	-19.13	2.42	47.37	54.00	6.63



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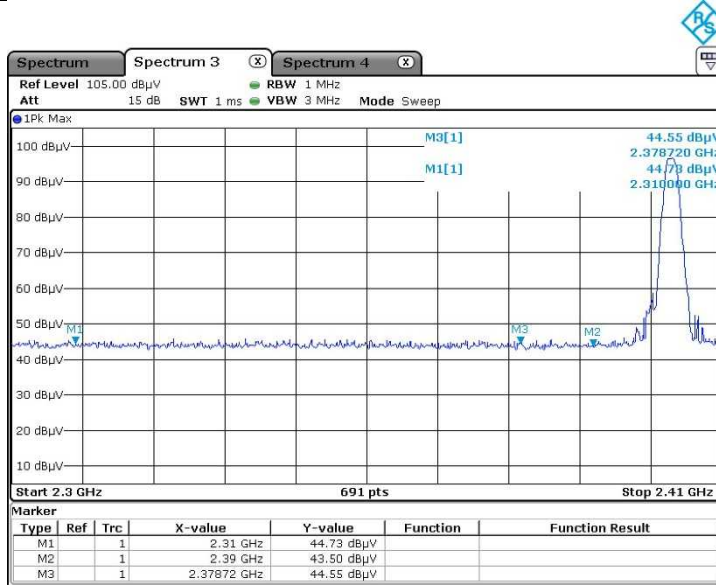
# Test Report

Report No. : FCC2024-00009

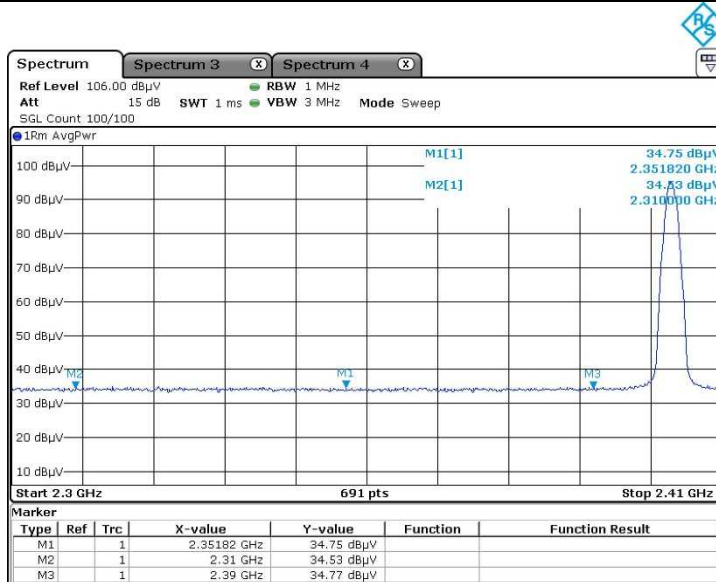
## Plots of Radiated Emission

- Test Plot for Left Earbud 1M PHY

### Radiated restricted band edge plot - 2 402 MHz (Peak)



### Radiated restricted band edge plot - 2 402 MHz (Average)



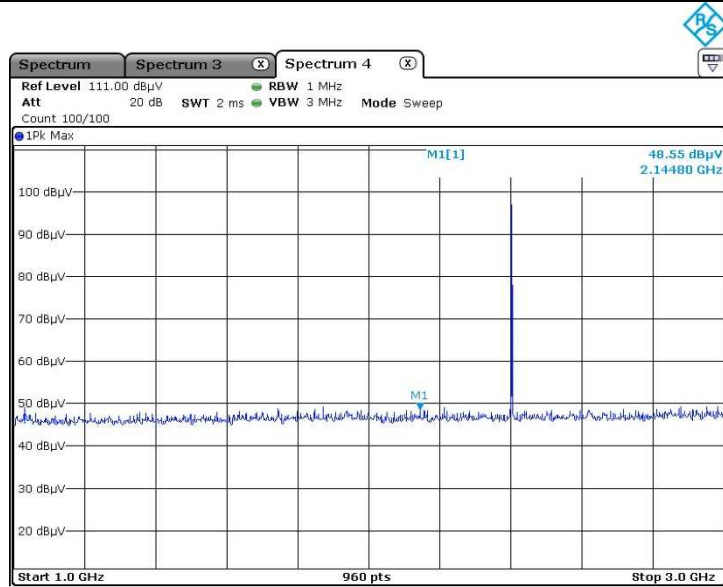


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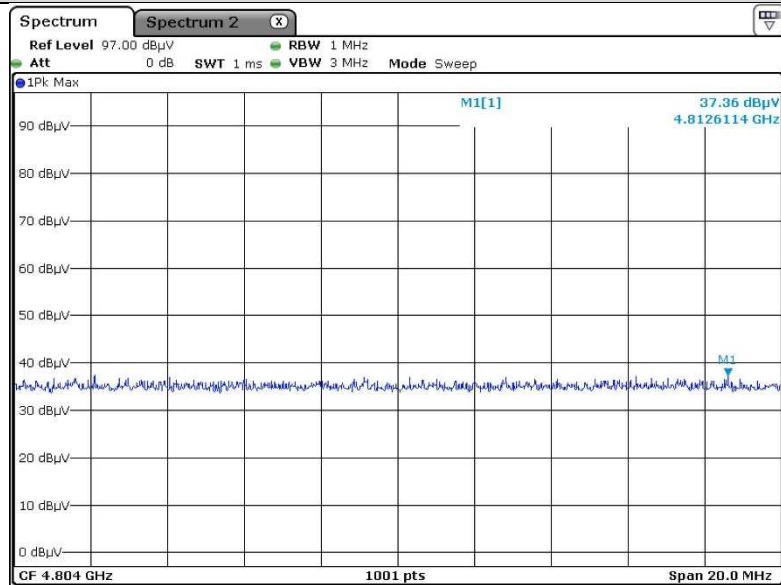
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 1 GHz - 3 GHz - 2 402 MHz



## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Peak)



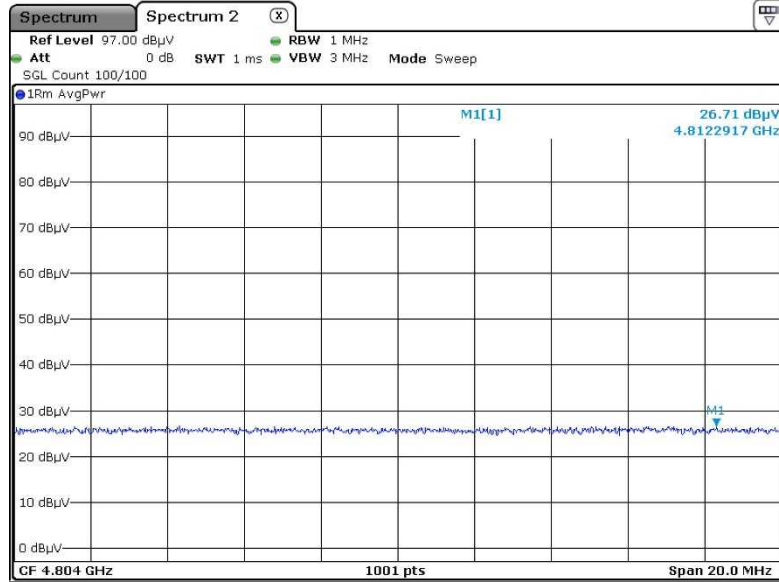


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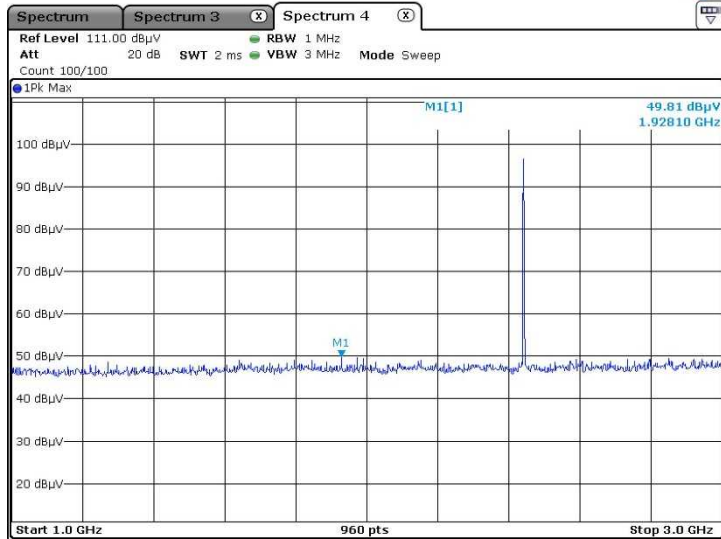
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 1 GHz - 3 GHz - 2 440 MHz



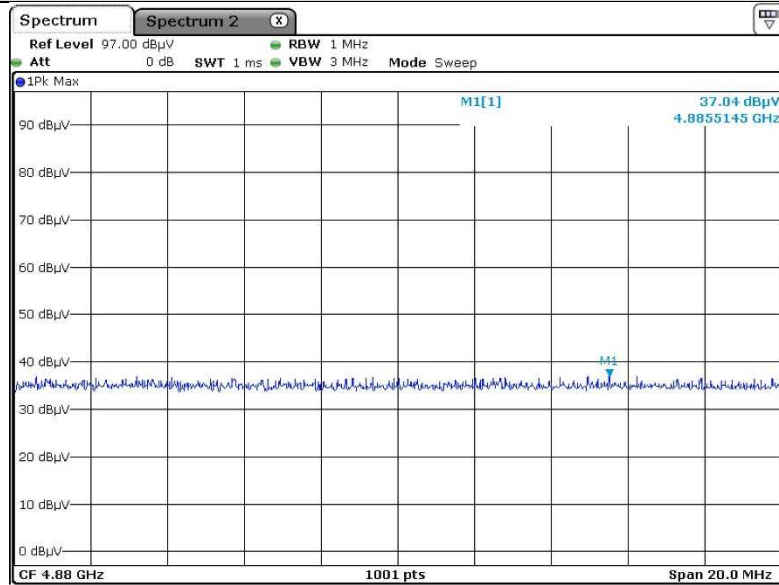


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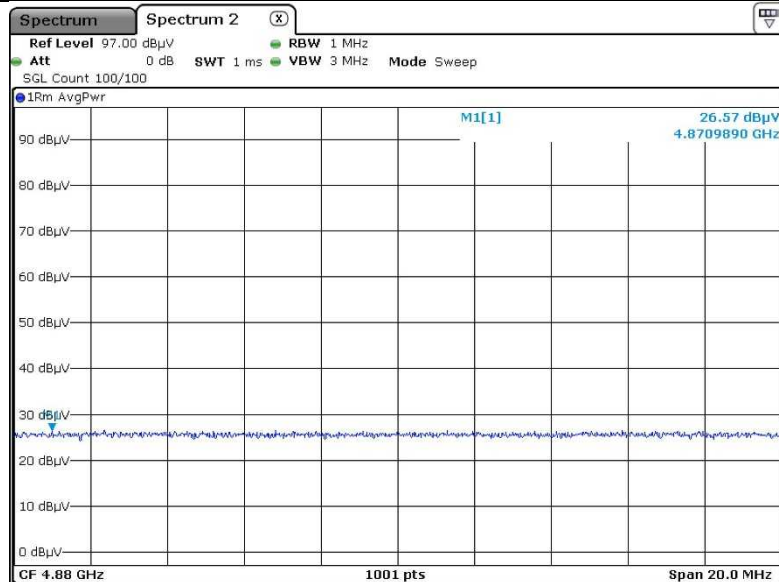
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Peak)



## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Average)





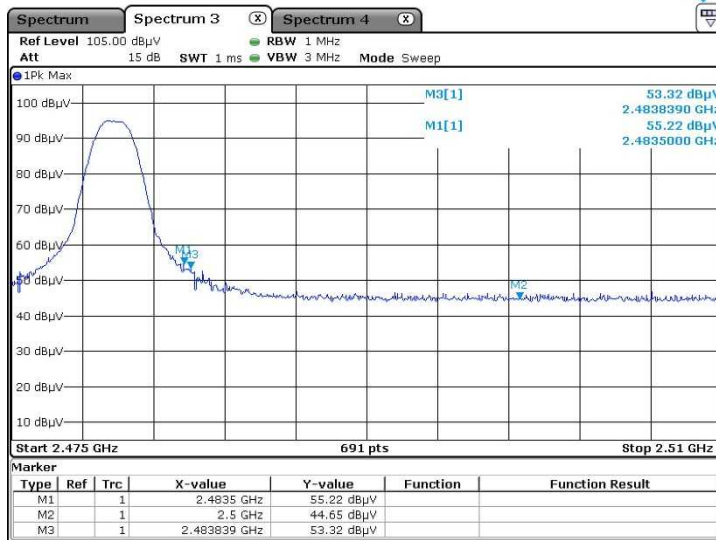


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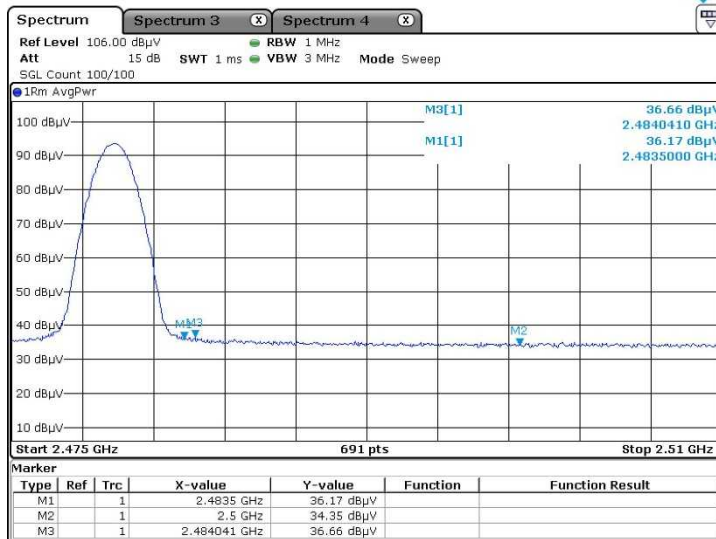
# Test Report

Report No. : FCC2024-00009

## Radiated restricted band edge plot - 2 480 MHz (Peak)



## Radiated restricted band edge plot - 2 480 MHz (Average)



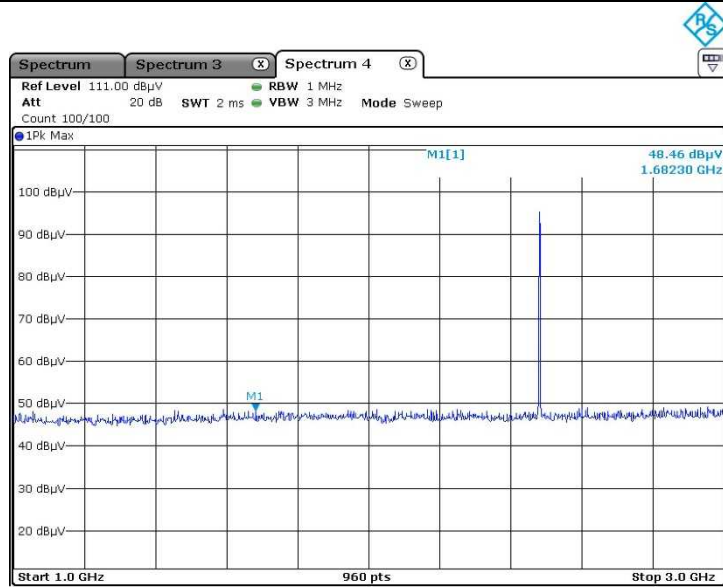


Korea Testing Certification institute

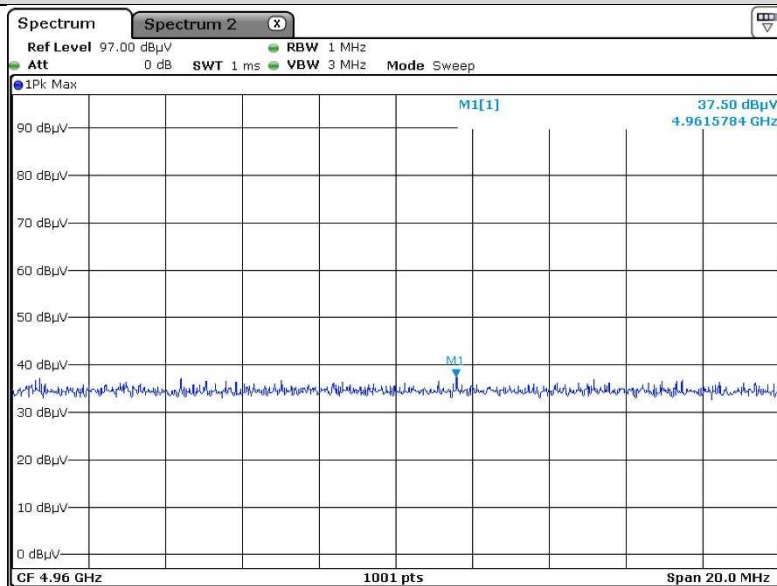
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 1 GHz - 3 GHz - 2 480 MHz



## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Peak)



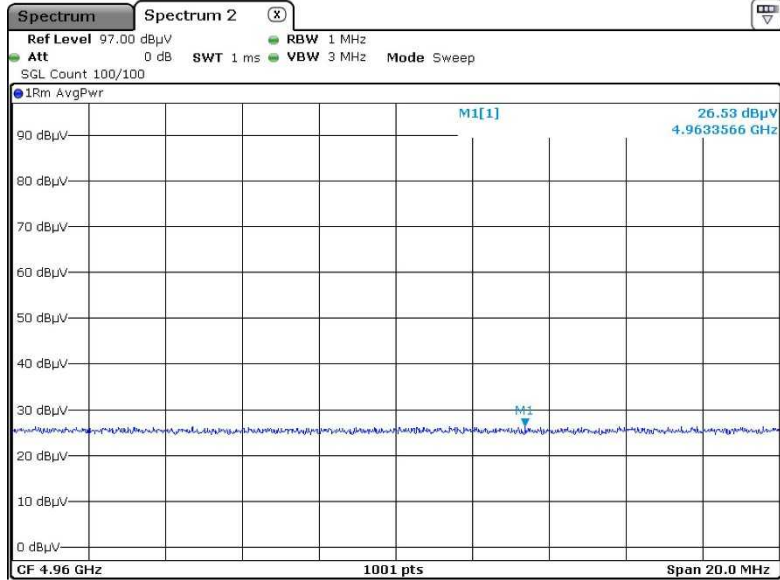


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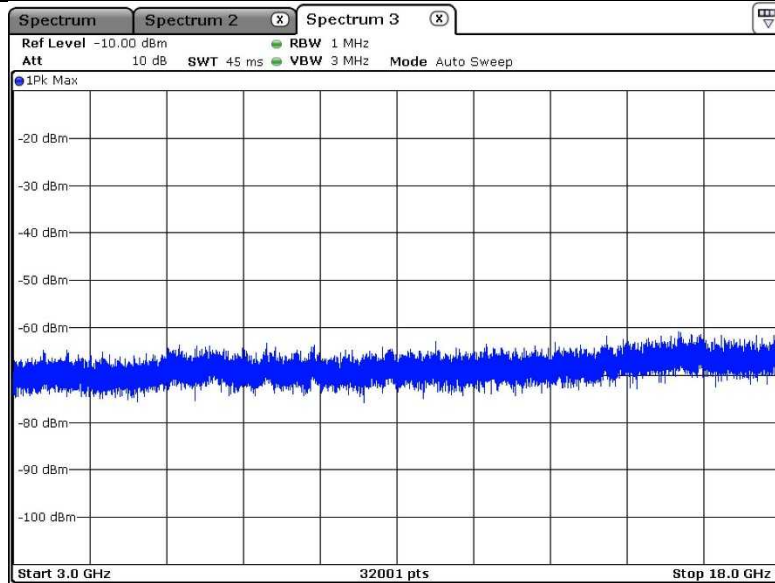
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 3 GHz - 18 GHz



-The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.  
 -The worst plot for attached above. (1M PHY, 2 402 MHz).

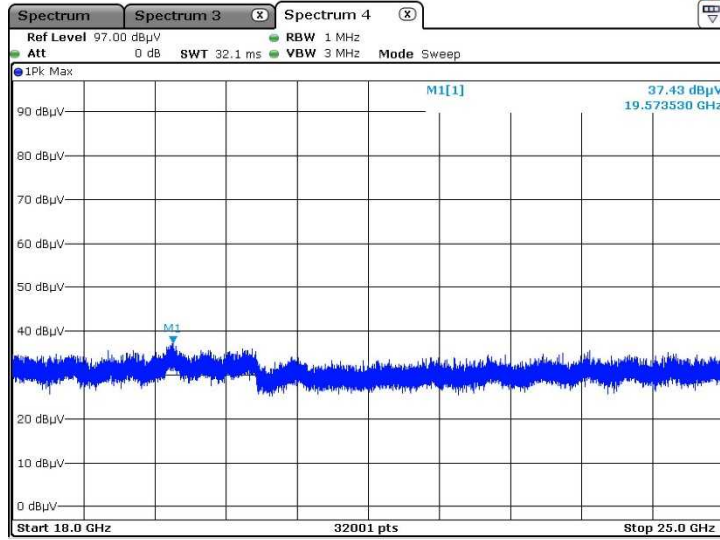


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# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 18 GHz - 25 GHz



- The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.
- The worst plot for attached above. (**1M PHY, 2 402 MHz**).



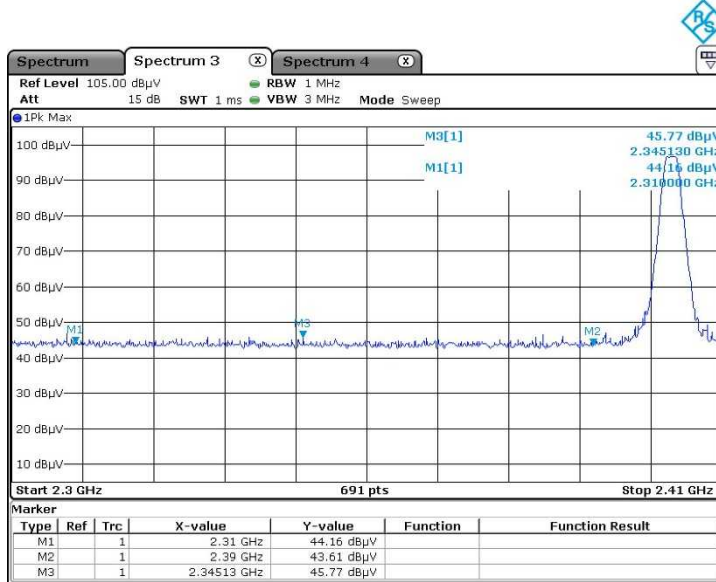
Korea Testing Certification institute

# Test Report

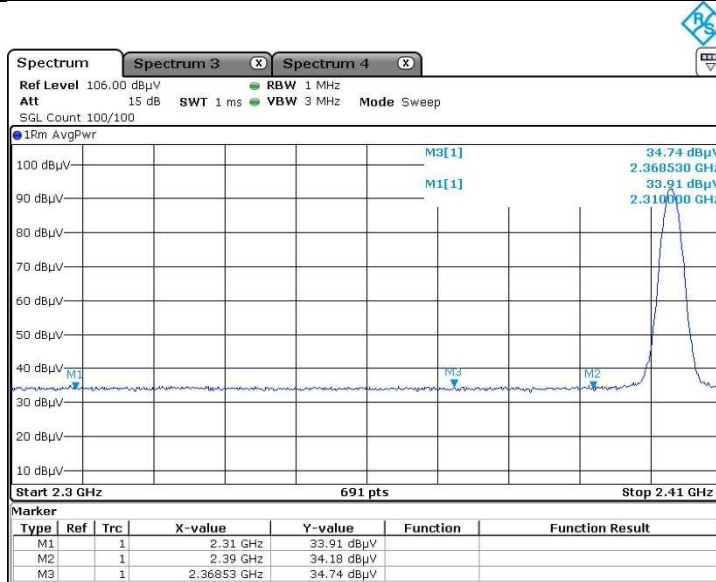
Report No. : FCC2024-00009

- Test Plot for Left Earbud 2M PHY

## Radiated restricted band edge plot - 2 402 MHz (Peak)



## Radiated restricted band edge plot - 2 402 MHz (Average)



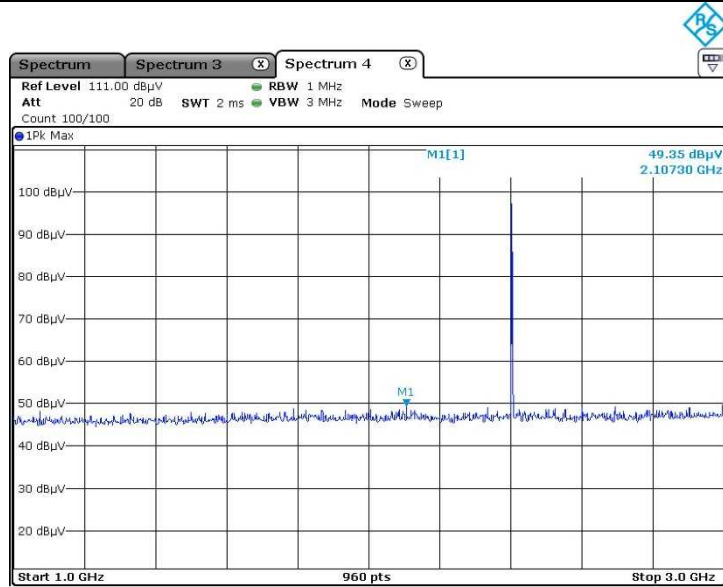


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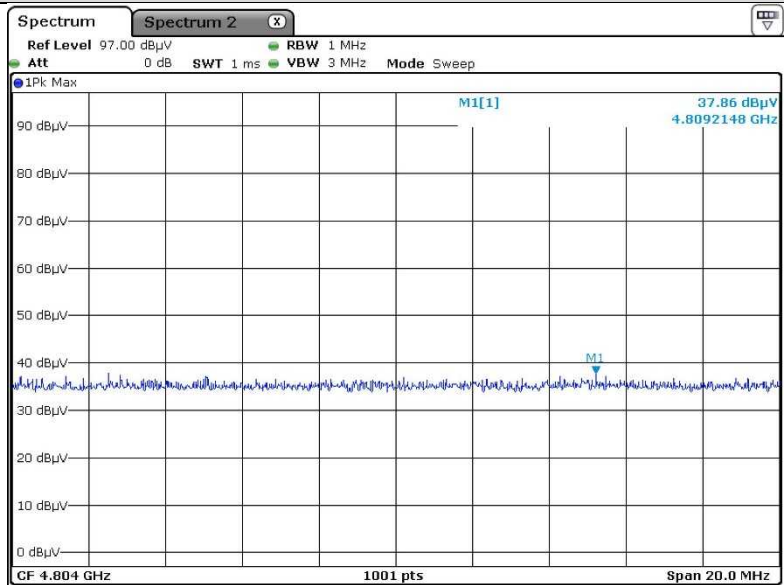
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 1 GHz - 3 GHz - 2 402 MHz



## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Peak)



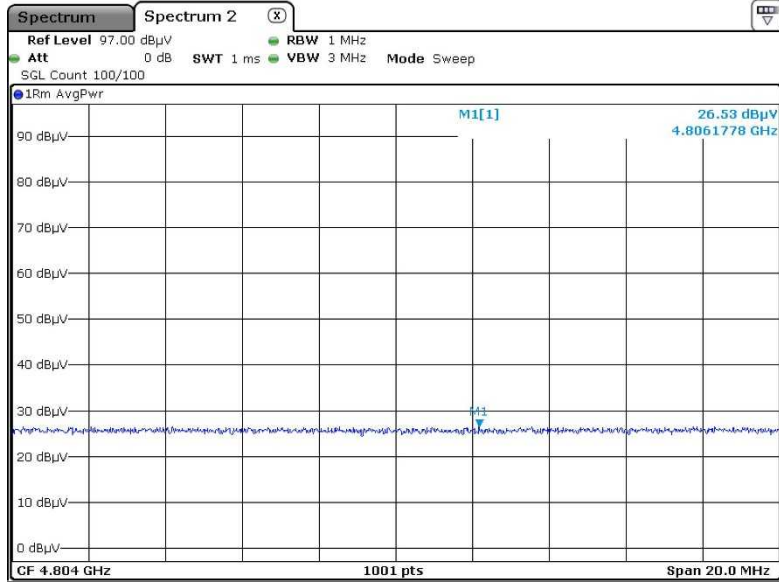


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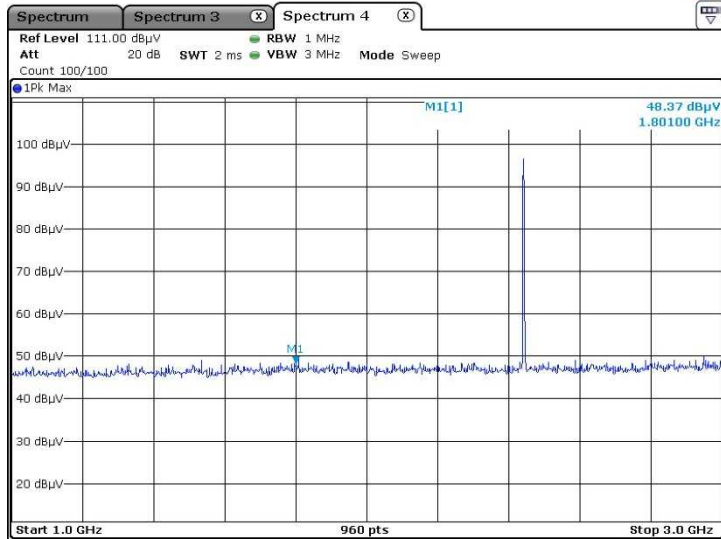
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 1 GHz - 3 GHz - 2 440 MHz



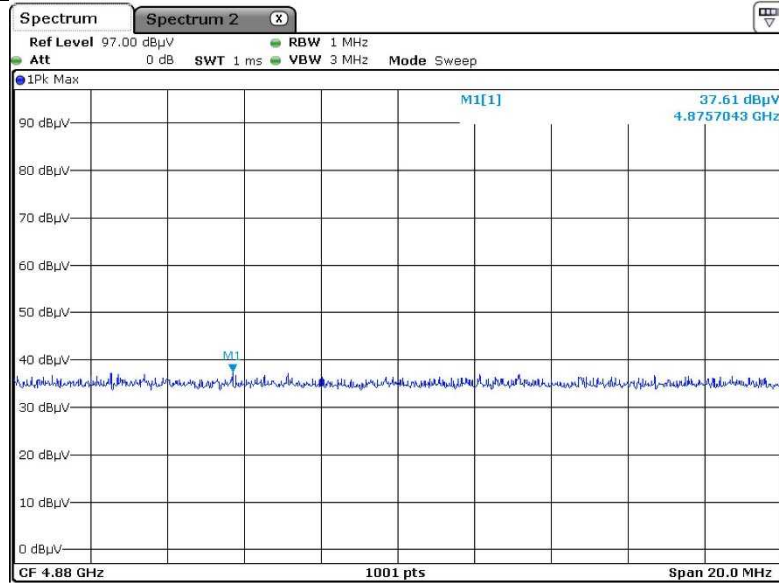


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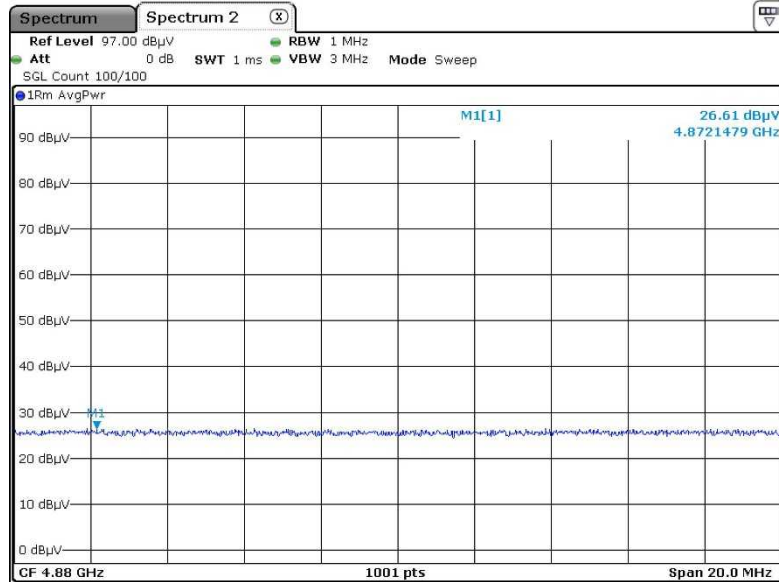
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Peak)



## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Average)





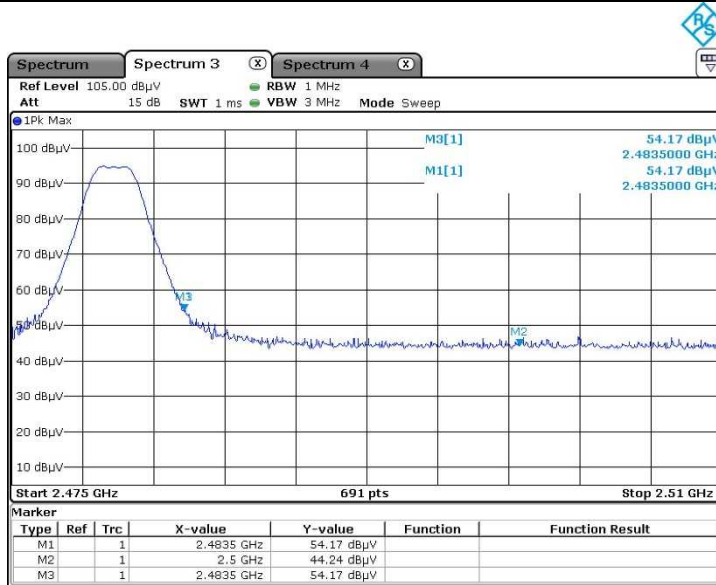


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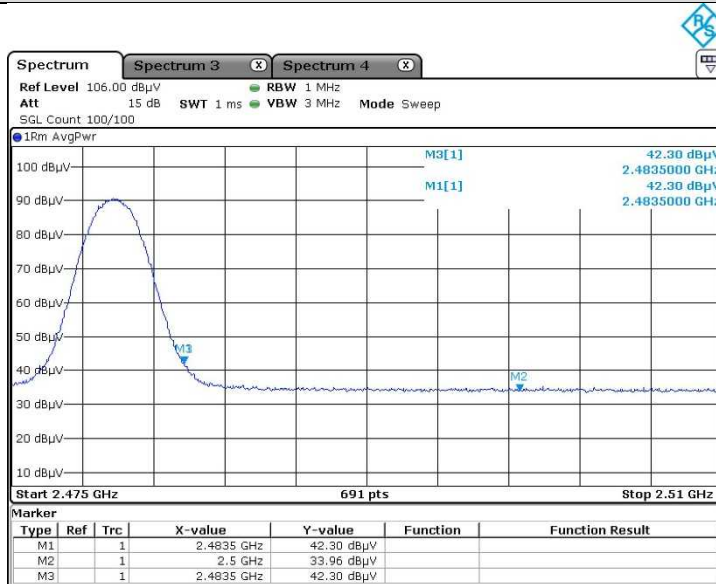
# Test Report

Report No. : FCC2024-00009

## Radiated restricted band edge plot - 2 480 MHz (Peak)



## Radiated restricted band edge plot - 2 480 MHz (Average)



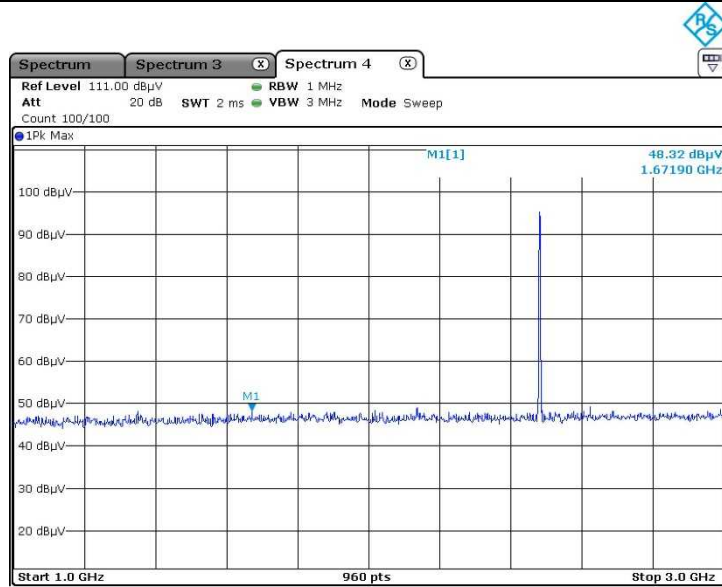


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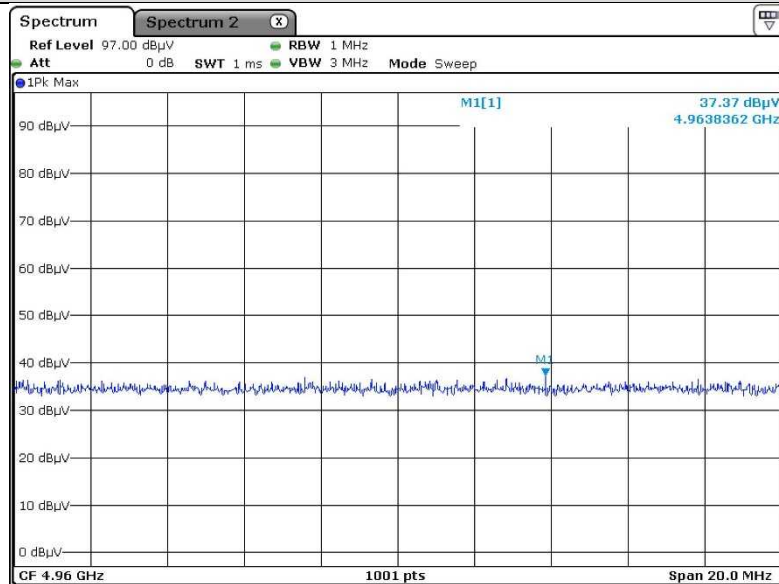
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 1 GHz - 3 GHz - 2 480 MHz



## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Peak)



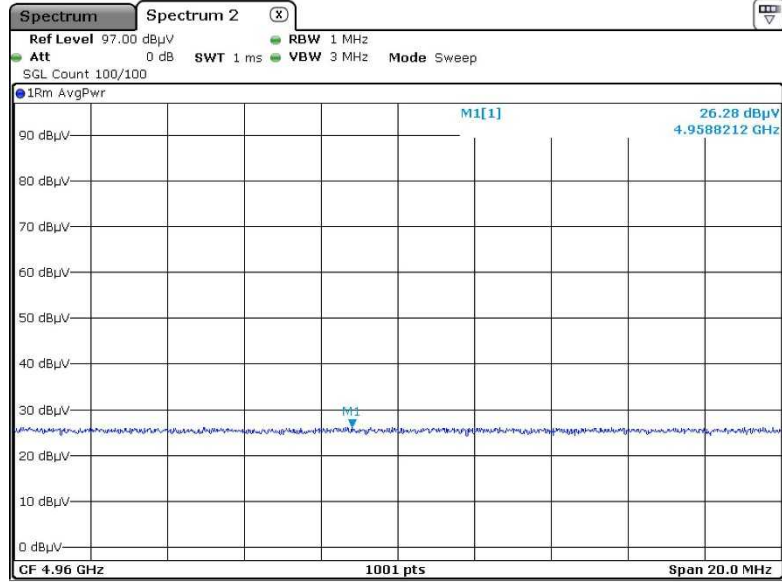


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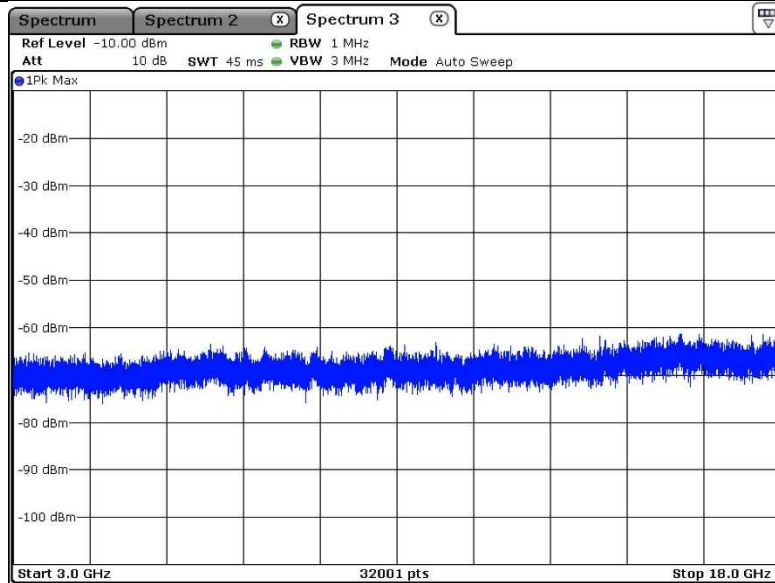
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 3 GHz - 18 GHz



-The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.  
 -The worst plot for attached above. (2M PHY, 2 402 MHz).

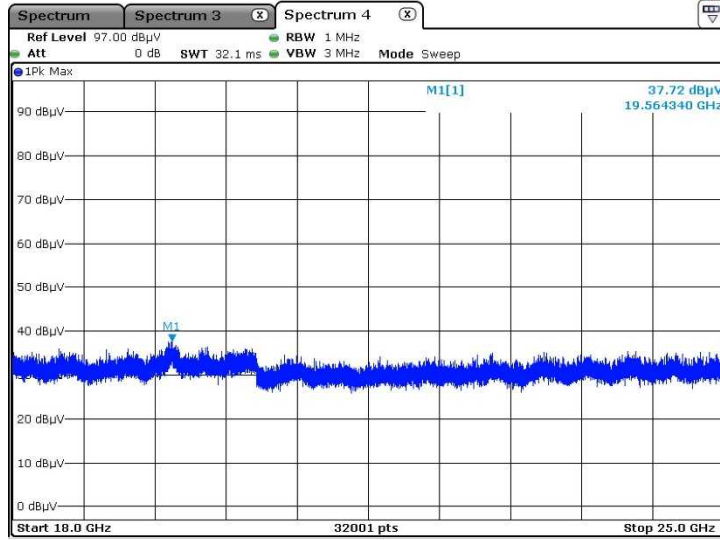


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# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 18 GHz - 25 GHz



- The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.
- The worst plot for attached above. (2M PHY, 2 402 MHz).



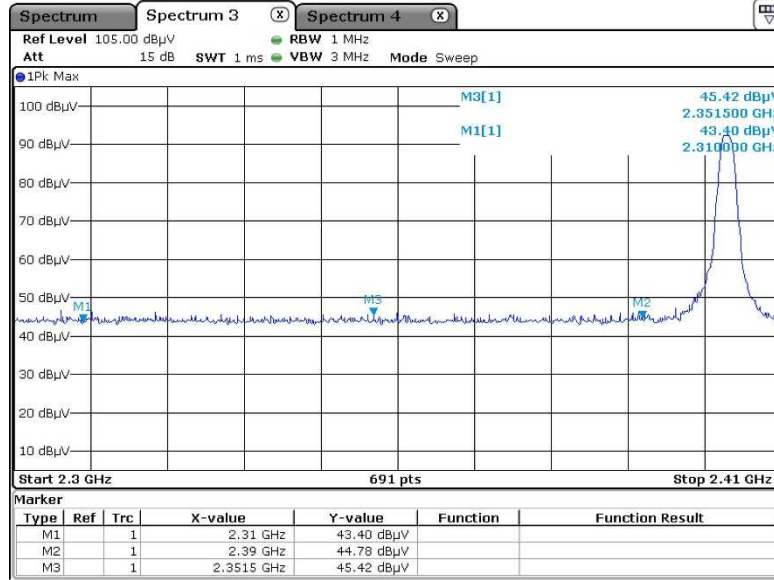
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# Test Report

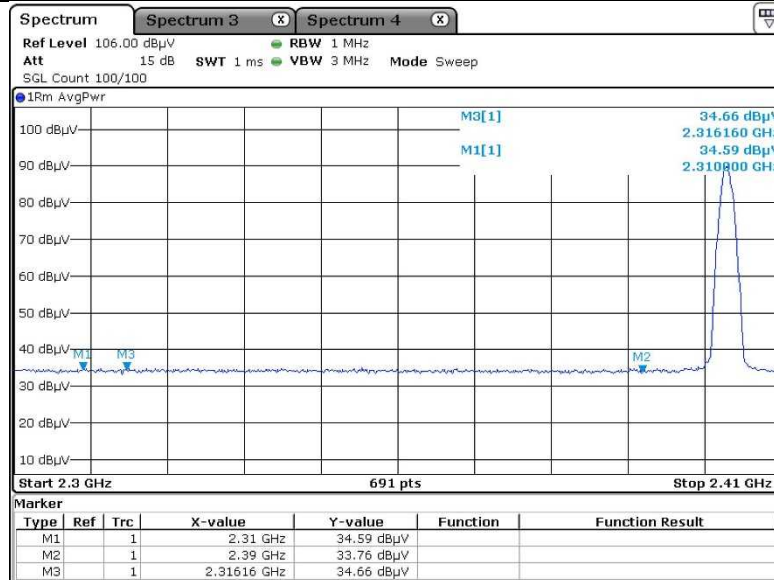
Report No. : FCC2024-00009

- Test Plot for Right Earbud 1M PHY

## Radiated restricted band edge plot - 2 402 MHz (Peak)



## Radiated restricted band edge plot - 2 402 MHz (Average)



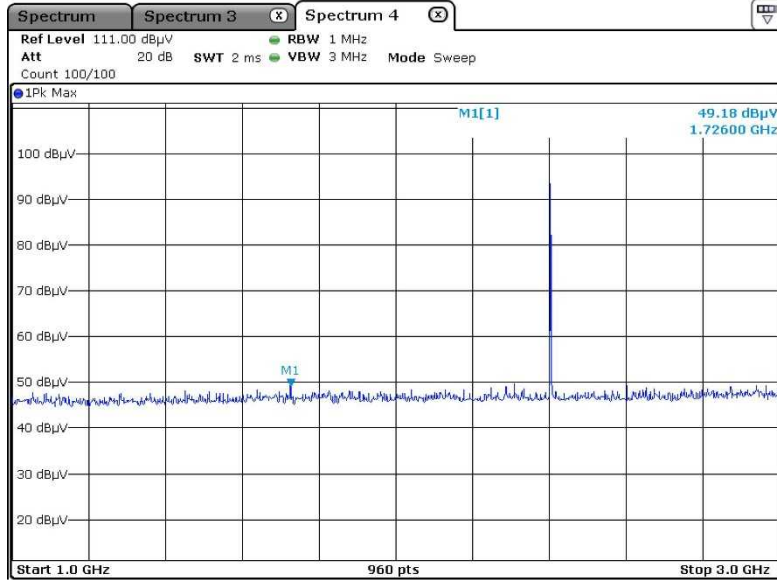


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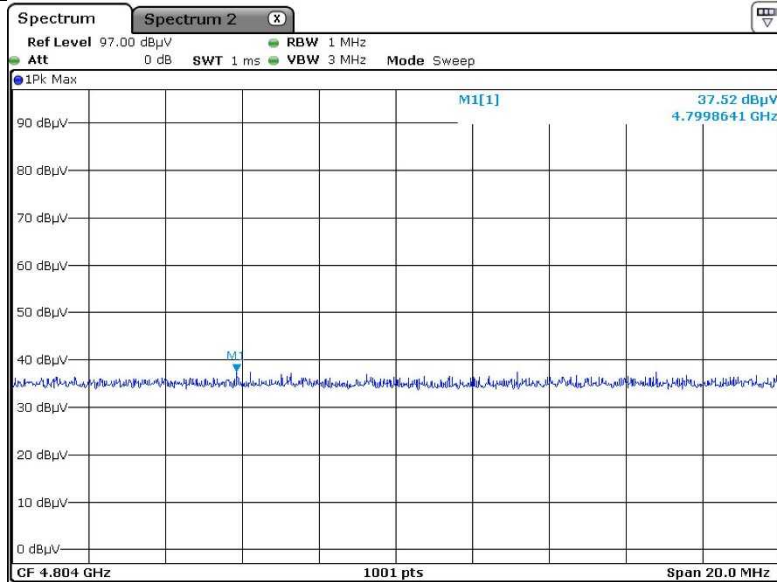
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 1 GHz - 3 GHz - 2 402 MHz



## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Peak)





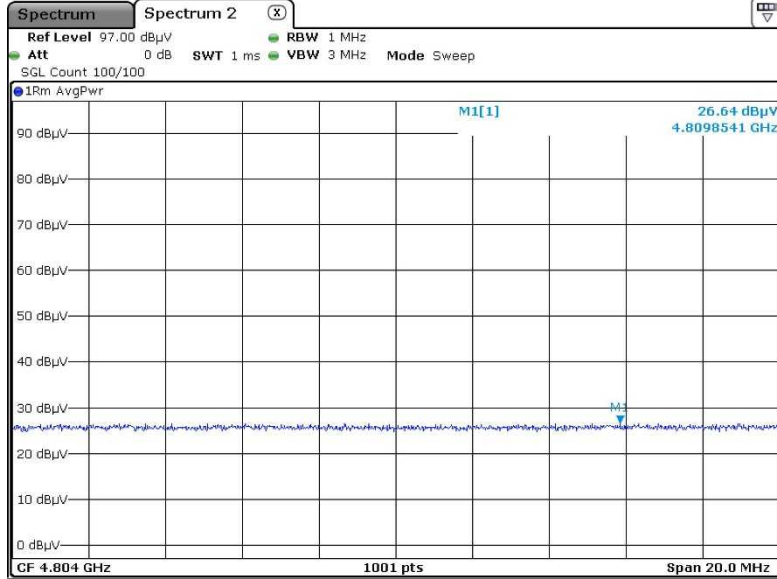
Korea Testing Certification institute

# Test Report

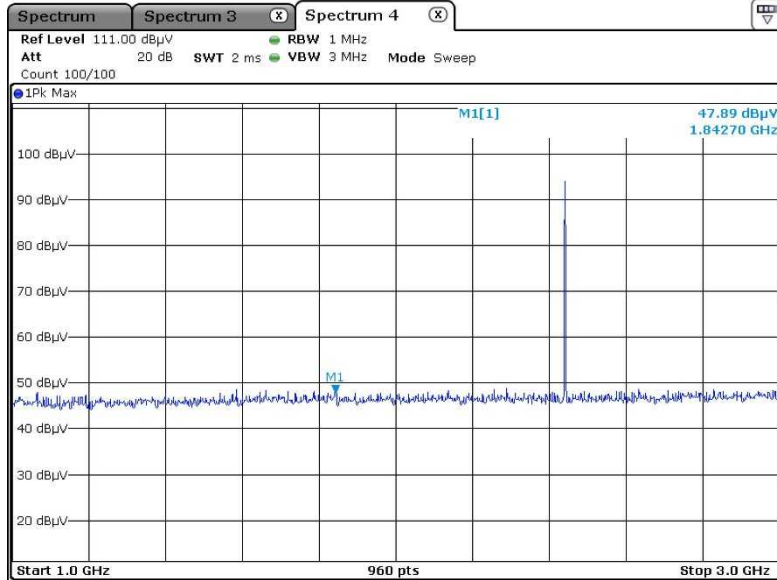
Create the Future with Trust Global Reliable Partner KTC Create the Future with Trust Global Reliable Partner

Report No. : FCC2024-00009

## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 1 GHz - 3 GHz - 2 440 MHz



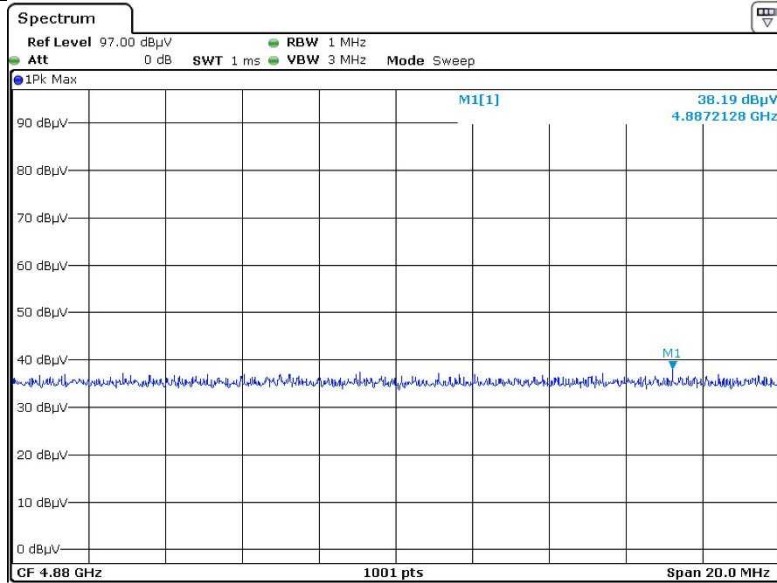


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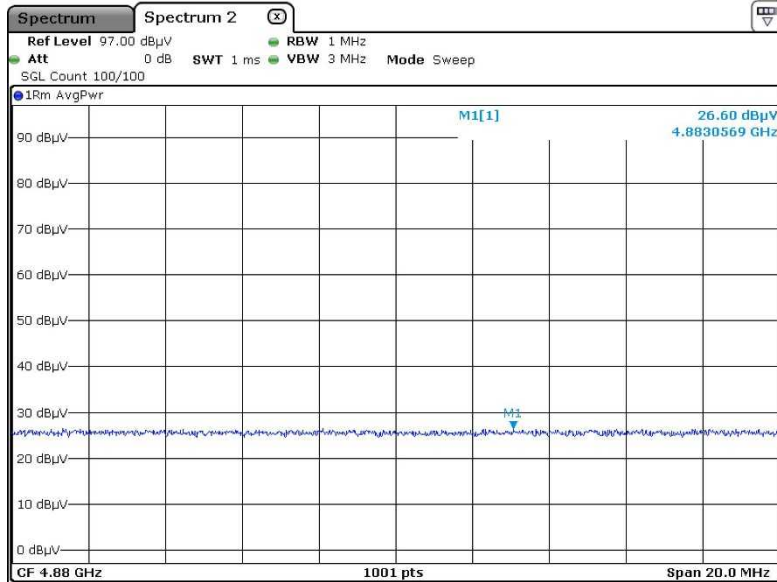
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Peak)



## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Average)





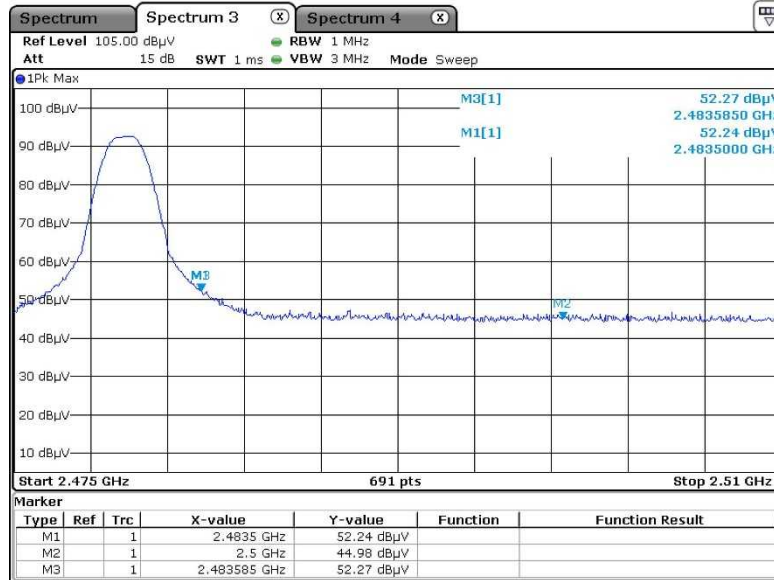


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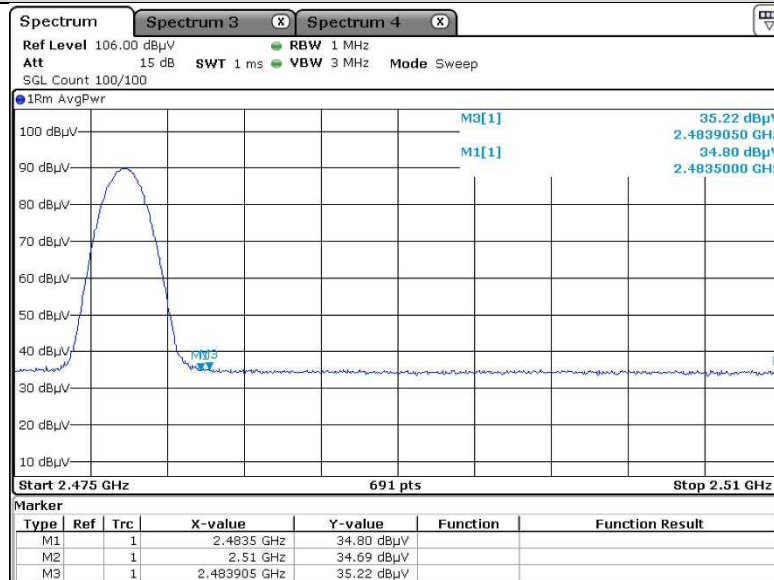
# Test Report

Report No. : FCC2024-00009

## Radiated restricted band edge plot - 2 480 MHz (Peak)



## Radiated restricted band edge plot - 2 480 MHz (Average)



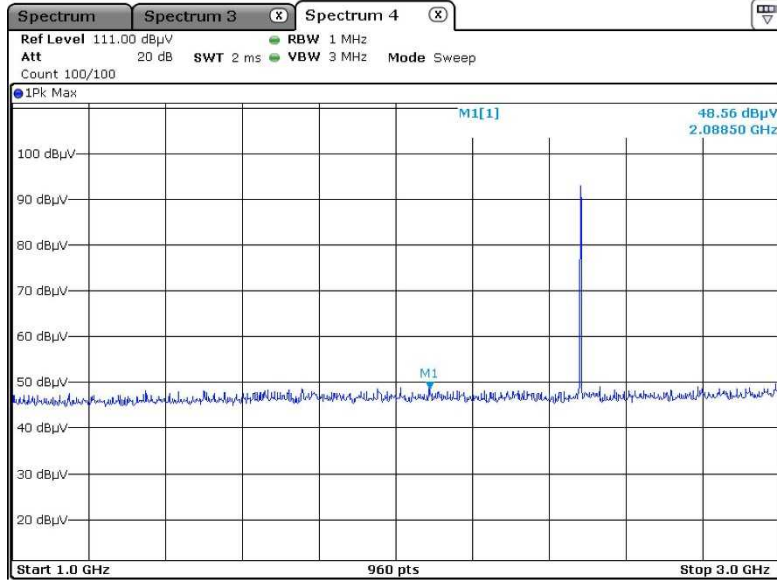


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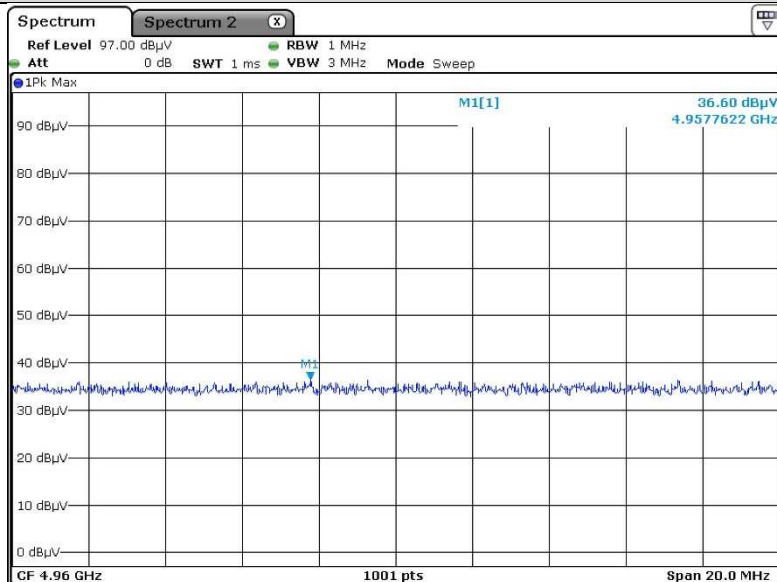
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 1 GHz - 3 GHz - 2 480 MHz



## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Peak)



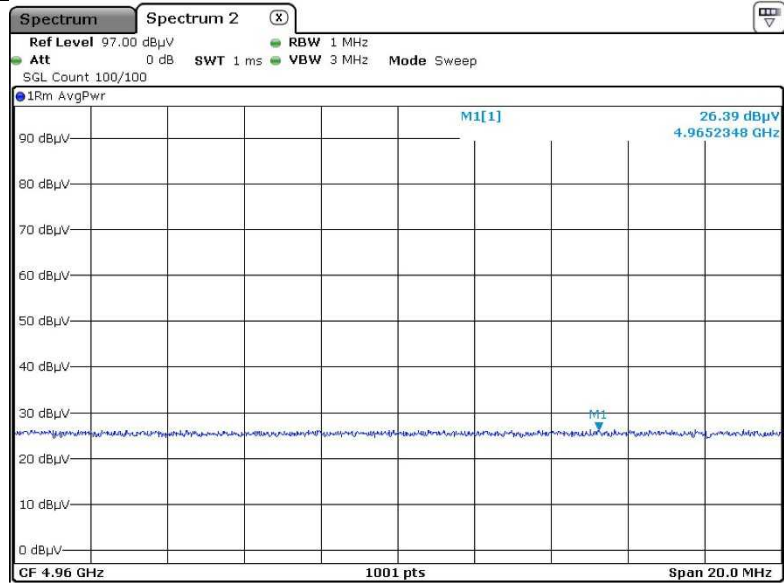


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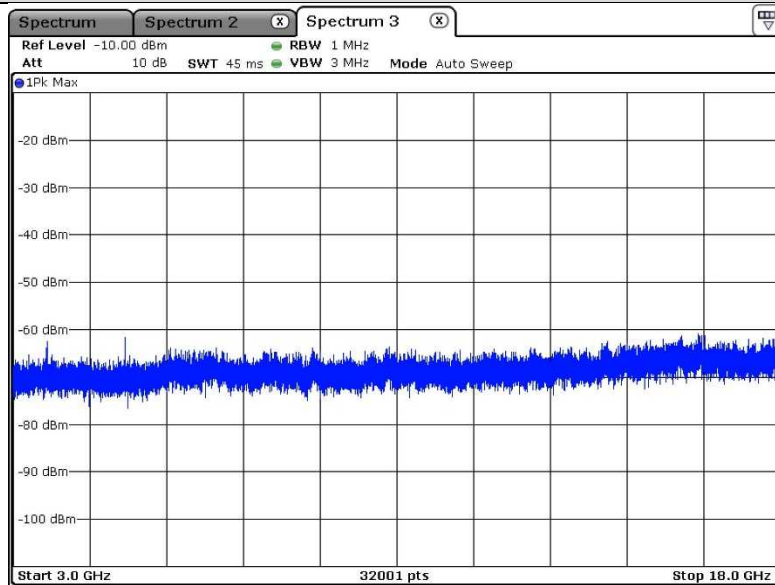
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 3 GHz - 18 GHz



-The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.  
 -The worst plot for attached above. (1M PHY, 2 402 MHz).

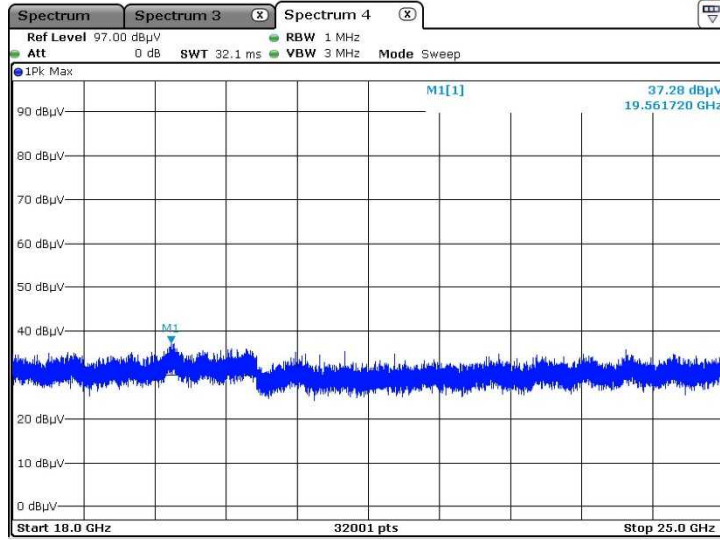


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# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 18 GHz - 25 GHz



- The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.
- The worst plot for attached above. (**1M PHY, 2 402 MHz**).



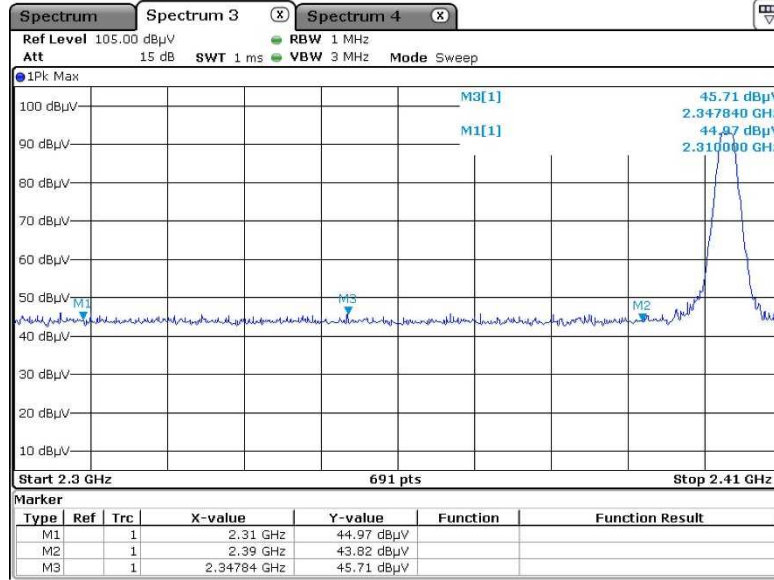
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# Test Report

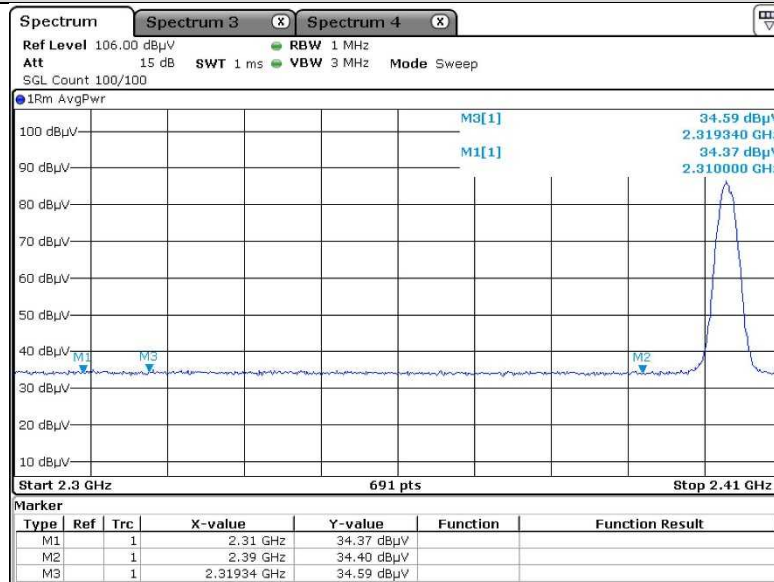
Report No. : FCC2024-00009

- Test Plot for Right Earbud 2M PHY

## Radiated restricted band edge plot - 2 402 MHz (Peak)



## Radiated restricted band edge plot - 2 402 MHz (Average)



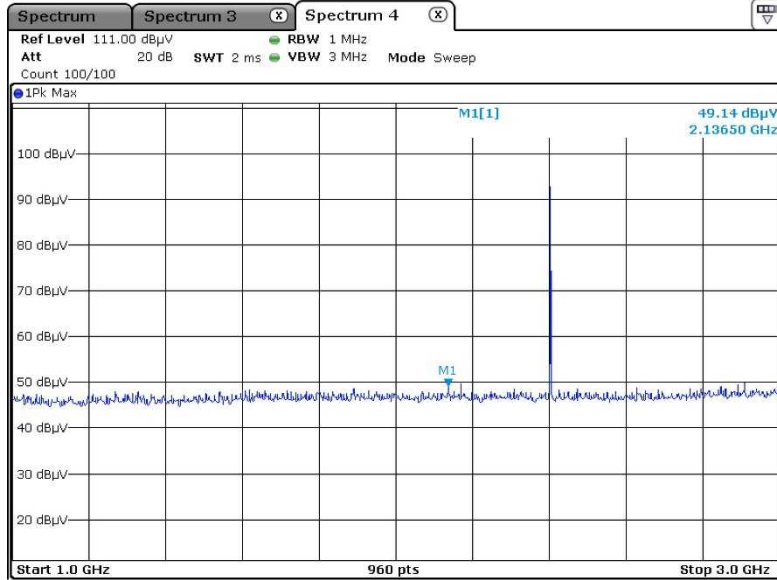


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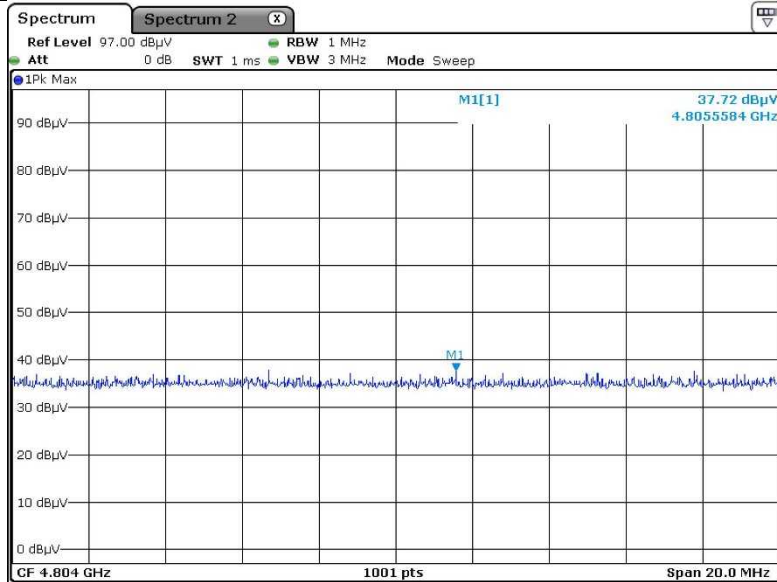
# Test Report

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## Radiated Emissions 1 GHz - 3 GHz - 2 402 MHz



## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Peak)





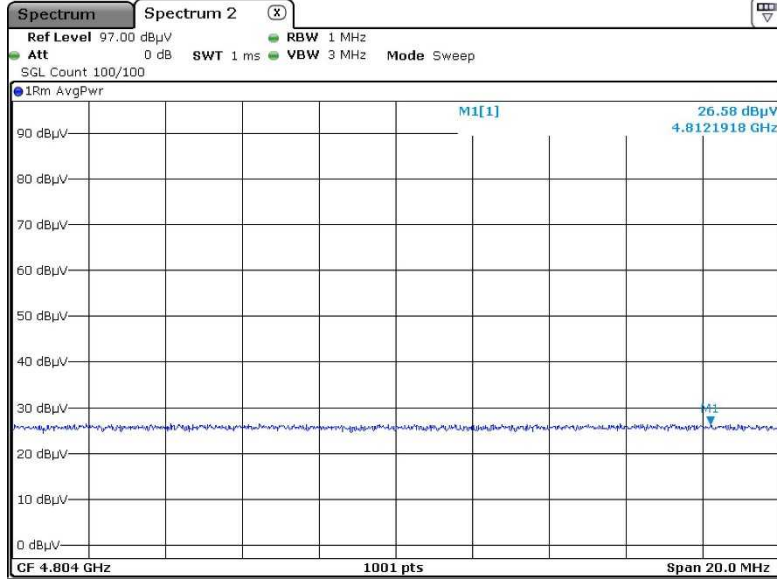
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# Test Report

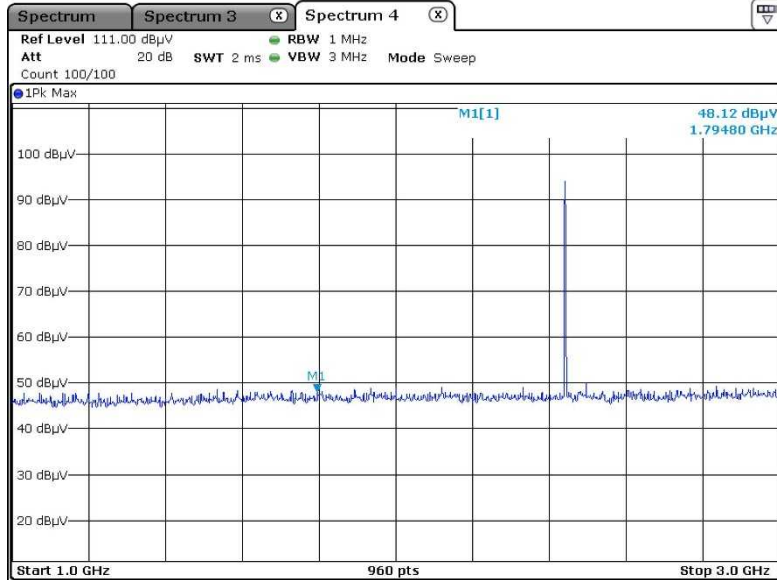
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## Radiated Emissions - 2 402 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 1 GHz - 3 GHz - 2 440 MHz



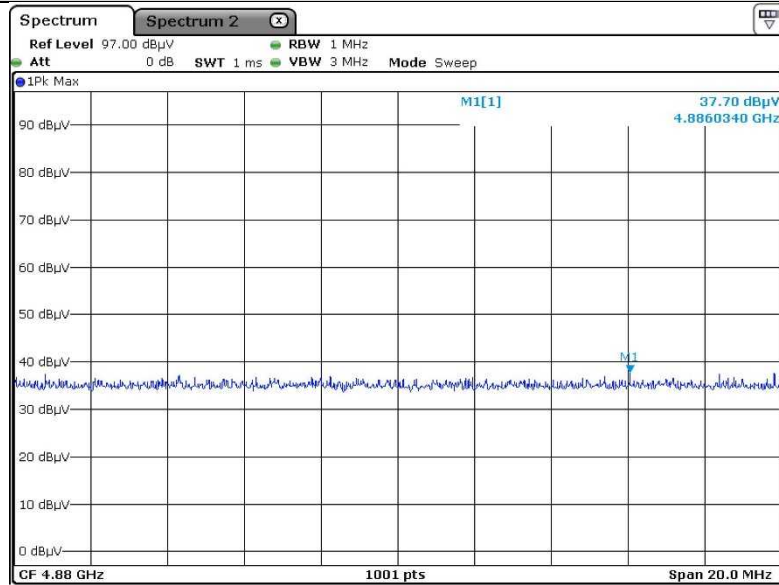


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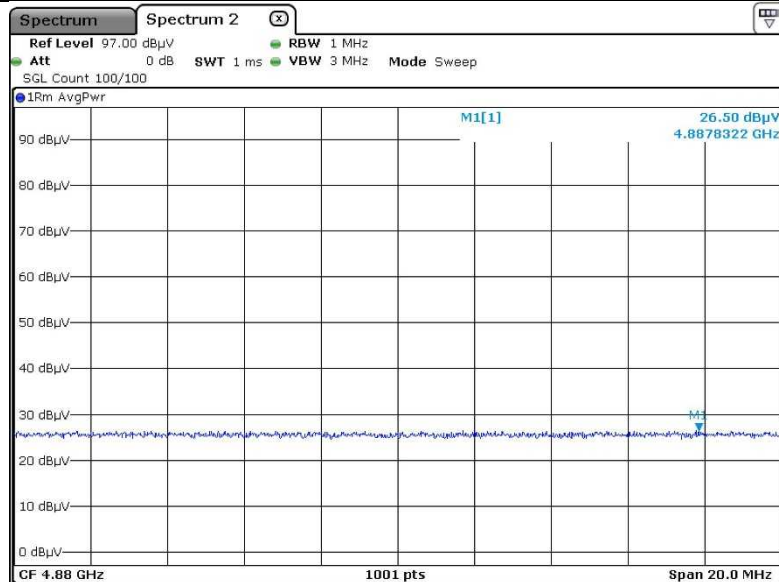
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Peak)



## Radiated Emissions - 2 440 MHz (2<sup>nd</sup> Harmonic) (Average)





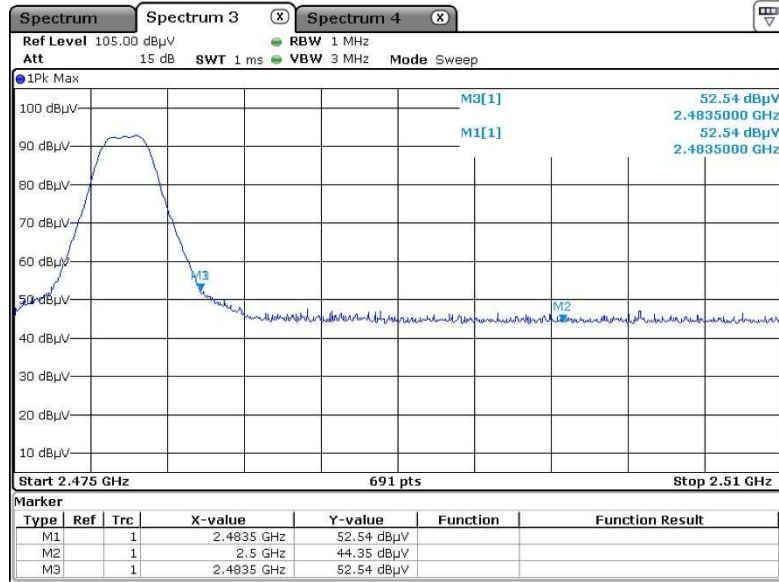


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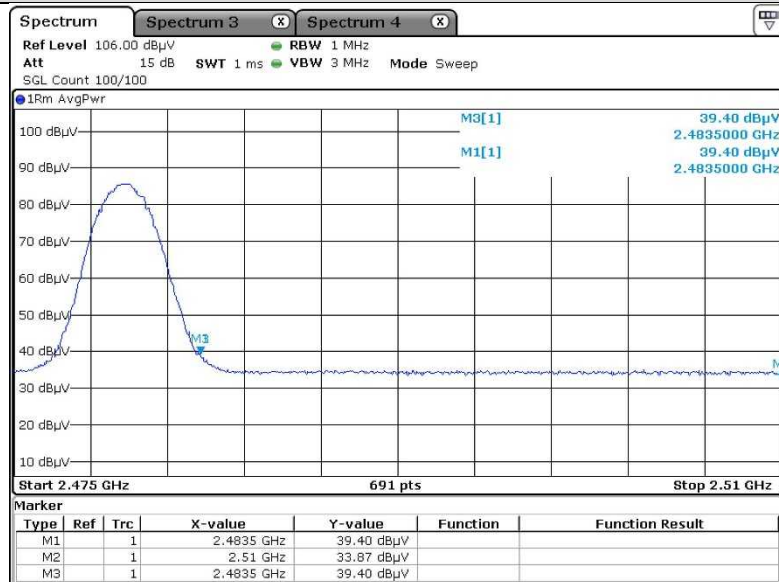
# Test Report

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## Radiated restricted band edge plot - 2 480 MHz (Peak)



## Radiated restricted band edge plot - 2 480 MHz (Average)



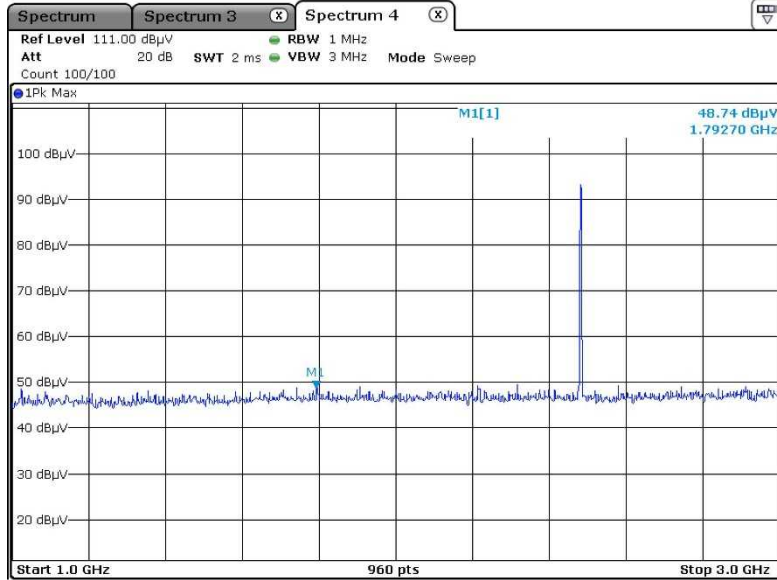


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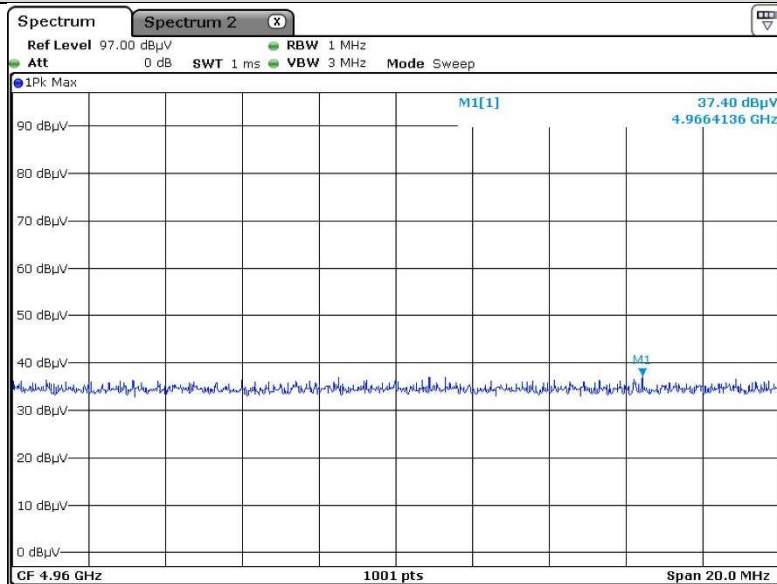
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions 1 GHz - 3 GHz - 2 480 MHz



## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Peak)



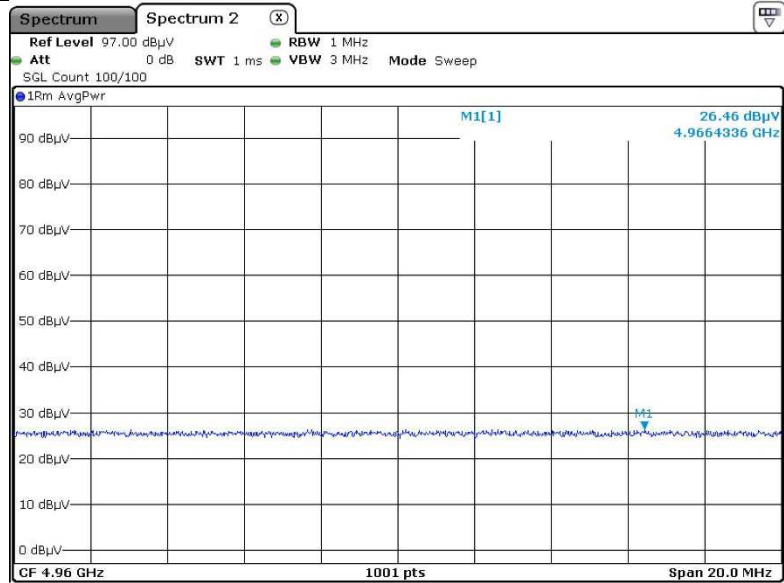


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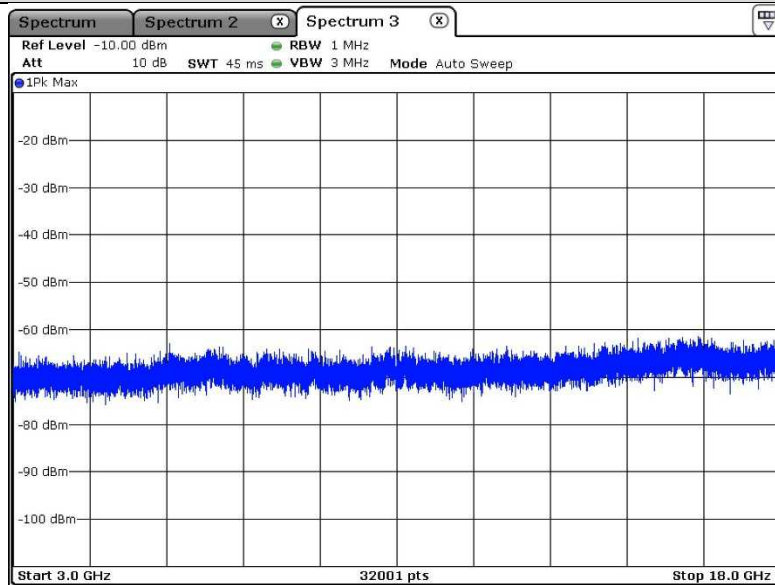
# Test Report

Report No. : FCC2024-00009

## Radiated Emissions - 2 480 MHz (2<sup>nd</sup> Harmonic) (Average)



## Radiated Emissions 3 GHz - 18 GHz



-The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.  
 -The worst plot for attached above. (2M PHY, 2 402 MHz).

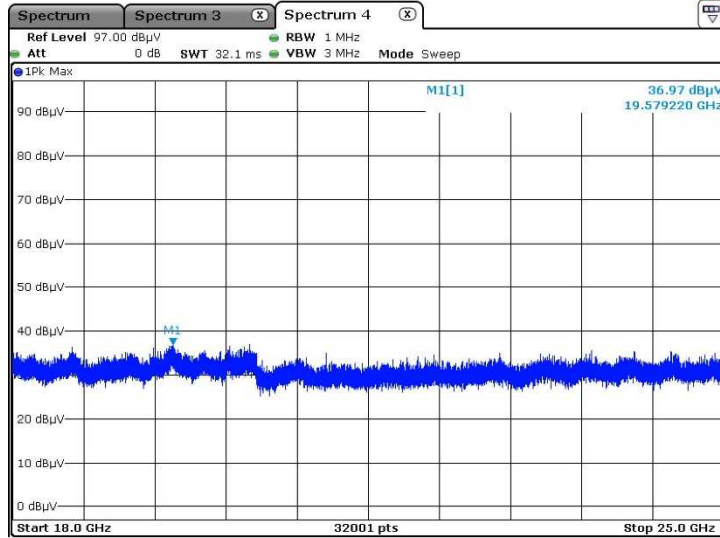


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# Test Report

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## Radiated Emissions 18 GHz - 25 GHz



- The results of the emissions at frequencies(2 402 MHz, 2 440 MHz, 2 480 MHz) were almost the same.
- The worst plot for attached above. (2M PHY, 2 402 MHz).

- End of the Test Report -