



FCC RF Test Report

(NFC)

Report No.: JYTSZ-R12-2301586

Applicant: Voxx Electronics Corporation

Address of Applicant: 2365 Pontiac Road, Auburn Hills, Michigan 48326 - USA

Equipment Under Test (EUT)

Product Name: AW26

Model No.: 2401Y, 2402Y

Trade Mark: N/A

FCC ID: EZS2401Y

Applicable Standards: FCC CFR Title 47 Part 15C (§15.225)

Date of Sample Receipt: 16 Nov., 2023

Date of Test: 17 Nov., to 30 Nov., 2023

Date of Report Issue: 01 Dec., 2023

Test Result: PASS

Tested by:

Liwei Ding
Project Engineer

Date:

01 Dec., 2023

Reviewed by:

Hetao Chang
Senior Engineer

Date:

01 Dec., 2023

Approved by:

James Wei
Manager

Date:

01 Dec., 2023

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

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1 Version

Version No.	Date	Description
00	01 Dec., 2023	Original

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3 General Information

3.1 Client Information

Applicant:	Voxx Electronics Corporation
Address:	2365 Pontiac Road, Auburn Hills, Michigan 48326 - USA
Manufacturer:	Nutek Coropration
Address:	no. 167, Lane 235, Bauchiau Rd, Xindian District, New Taeipi City 23145, Taiwan
Factory:	Voxx Automotive Corporation
Address:	2351 J. Lawson Blvd, Orlando, FL 32824 - USA

3.2 General Description of E.U.T.

Product Name:	AW26
Model No.:	2401Y, 2402Y
Operation Frequency:	13.56MHz
Channel Numbers:	1
Modulation Type:	ASK
Antenna Type:	Loop Antenna
Power Supply:	DC 12V
Remark:	Model No.: 2401Y, 2402Y were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being model name and appearance.
Test Sample Condition:	The test samples were provided in good working order with no visible defects.

3.3 Test Mode and Environment

Test Mode:	
Transmitting mode:	Keep the EUT in transmitting mode with modulation
Remark: Pre-scan The EUT was placed on three different polar directions tested: i.e. X axis, Y axis, Z axis, and found Y axis was worse case, so the report only reflects the worse axis tested data.	
Operating Environment:	
Temperature:	15°C ~ 35°C
Humidity:	20 % ~ 75 % RH
Atmospheric Pressure:	1008 mbar
Voltage:	Nominal: 12Vdc, Extreme: Low 10.2Vdc, High 13.8Vdc
Test Engineer:	Lucas Ding(Conducted measurement) Robin Gu(Radiated measurement)

3.4 Description of Test Auxiliary Equipment

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
Keysight	DC power supply	E3642A	MY60296194	DoC

3.5 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
Radiated Emission (9kHz ~ 30MHz) (3m SAC)	3.3 dB
Radiated Emission (30MHz ~ 200MHz) (3m SAC)	4.6 dB
Radiated Emission (200MHz ~ 1000MHz) (3m SAC)	5.8 dB
Radiated Emission (1GHz ~ 6GHz) (3m SAC)	4.5 dB
Radiated Emission (6GHz ~ 18GHz) (3m SAC)	4.7 dB
Radiated Emission (30MHz ~ 200MHz) (10m SAC)	4.3 dB
Radiated Emission (200MHz ~ 1000MHz) (10m SAC)	4.3 dB
Note: All the measurement uncertainty value were shown with a coverage k=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.	

3.6 Additions to, Deviations, or Exclusions From the Method

No

3.7 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC - Designation No.: CN1211**

JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551.

● **ISED – CAB identifier.: CN0021**

The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

● **CNAS - Registration No.: CNAS L15527**

JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527.

● **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

3.8 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd.

Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China.

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info-JYTee@lets.com, Website: <http://jyt.lets.com>

3.9 Test Instruments List

Radiated Emission(3m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	WXJ001-1	04-14-2021	04-13-2024
Loop Antenna	Schwarzbeck	FMZB 1519 B	WXJ002-4	02-09-2023	02-08-2024
BiConiLog Antenna	Schwarzbeck	VULB9163	WXJ002	02-09-2023	02-08-2024
Pre-amplifier (30MHz ~ 1GHz)	Schwarzbeck	BBV9743B	WXJ001-2	01-10-2023	01-09-2024
EMI Test Receiver	Rohde & Schwarz	ESRP7	WXJ003-1	01-11-2023	01-10-2024
Coaxial Cable (9kHz ~ 30MHz)	JYT	JYT3M-1G-BB-5M	WXG001-6	01-18-2023	01-17-2024
Coaxial Cable (30MHz ~ 1GHz)	JYTSZ	JYT3M-1G-NN-8M	WXG001-4	01-18-2023	01-17-2024
Band Reject Filter Group	Tonscend	JS0806-F	WXJ089	N/A	
Test Software	Tonscend	TS+	Version: 3.0.0.1		
EMI Test Software	AUDIX	E3	Version: 6.110919b		

Radiated Emission(10m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
10m SAC	ETS	RFSD-100-F/A	WXJ090	04-28-2021	04-27-2024
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-1	01-17-2023	01-16-2024
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-2	01-10-2023	01-09-2024
EMI Test Receiver	R&S	ESR 3	WXJ090-3	01-10-2023	01-09-2024
EMI Test Receiver	R&S	ESR 3	WXJ090-4	01-11-2023	01-09-2024
Low Pre-amplifier	Bost	LNA 0920N	WXJ090-6	01-10-2023	01-09-2024
Low Pre-amplifier	Bost	LNA 0920N	WXJ090-7	01-10-2023	01-09-2024
Cable	Bost	JYT10M-1G-NN-10M	WXG002-7	01-18-2023	01-17-2024
Cable	Bost	JYT10M-1G-NN-10M	WXG002-8	01-18-2023	01-17-2024
Test Software	R&S	EMC32	Version: 10.50.40		

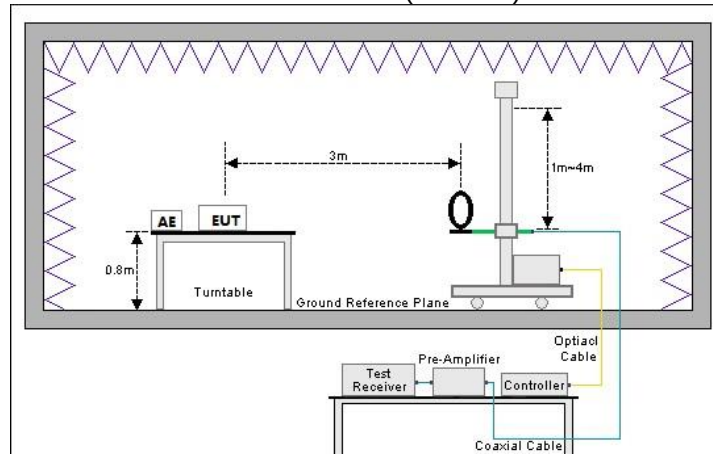
Conducted Method:					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
Spectrum Analyzer	Keysight	N9020A	WXJ094	09-25-2023	09-24-2024

4 Measurement Setup and Procedure

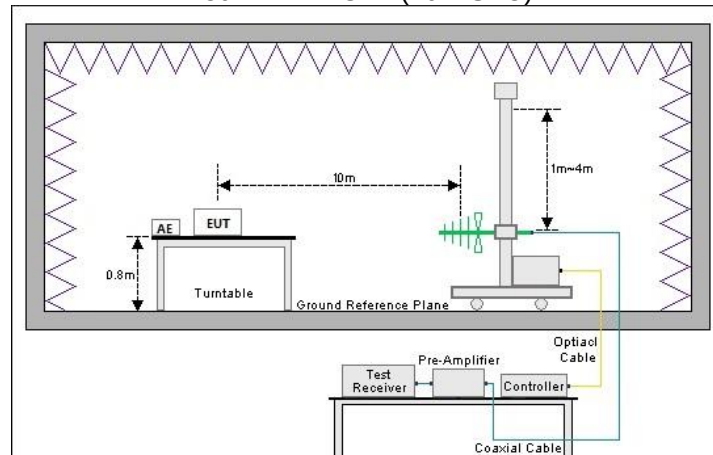
4.1 Test Setup

1) Radiated emission measurement:

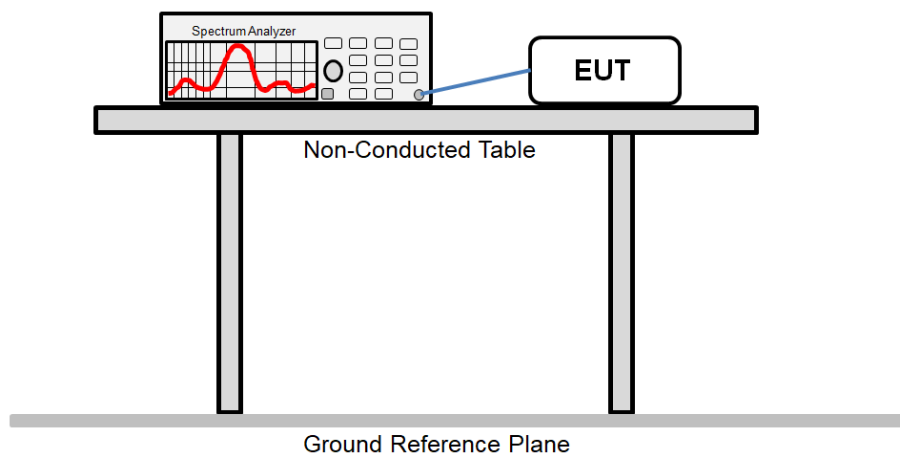
9kHz ~ 30 MHz (3m SAC)



30 MHz ~ 1GHz (10m SAC)



Conducted test method:



4.2 Test Procedure

Test method	Test step
Radiated emission	1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 10 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 10 m. 2. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.
Conducted test method	1. The antenna port of EUT was connected to the RF port of the spectrum analyzer through an RF cable. 2. The EUT is keeping in continuous transmission mode and tested in all modulation modes. 3. The test data is saved by the screenshot function of the spectrum analyzer.

5 Test Results

5.1 Summary

5.1.1 Clause and Data Summary

Test items	Standard clause	Test data	Result
Antenna Requirement	15.203	See Section 5.2	Pass
AC Power Line Conducted Emission	15.207	N/A	N/A
20dB Bandwidth	15.215(c)	See Section 5.3	Pass
Field Strength of Fundamental	15.225 (a)(b)(c)	See Section 5.4	Pass
Field Strength of Spurious Emissions	15.209 15.225 (d)	See Section 5.5	Pass
Frequency Tolerance	15.225 (e)	See Section 5.6	Pass
Remark: 1. Pass: The EUT complies with the essential requirements in the standard. 2. N/A: Not Applicable.			
Test Method:	ANSI C63.4-2014 ANSI C63.10-2013		

5.1.2 Test Limit

Items	Limit																								
20dB Bandwidth	N/A																								
Field Strength of Fundamental	(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. (d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.																								
Field Strength of Spurious Emissions	<table><tr><th>Frequency (MHz)</th><th>Field strength (microvolts/meter)</th><th>Measurement distance (meters)</th></tr><tr><td>0.009 – 0.490</td><td>2400/F(kHz)</td><td>300</td></tr><tr><td>0.490 – 1.705</td><td>24000/F(kHz)</td><td>30</td></tr><tr><td>1.705 – 30.0</td><td>30</td><td>30</td></tr><tr><td>30 – 88</td><td>100**</td><td>3</td></tr><tr><td>88 – 216</td><td>150**</td><td>3</td></tr><tr><td>216 – 960</td><td>200**</td><td>3</td></tr><tr><td>Above 960</td><td>500</td><td>3</td></tr></table> ** 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.	Frequency (MHz)	Field strength (microvolts/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
Frequency (MHz)	Field strength (microvolts/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																							
Frequency Tolerance	The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of ?20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.																								

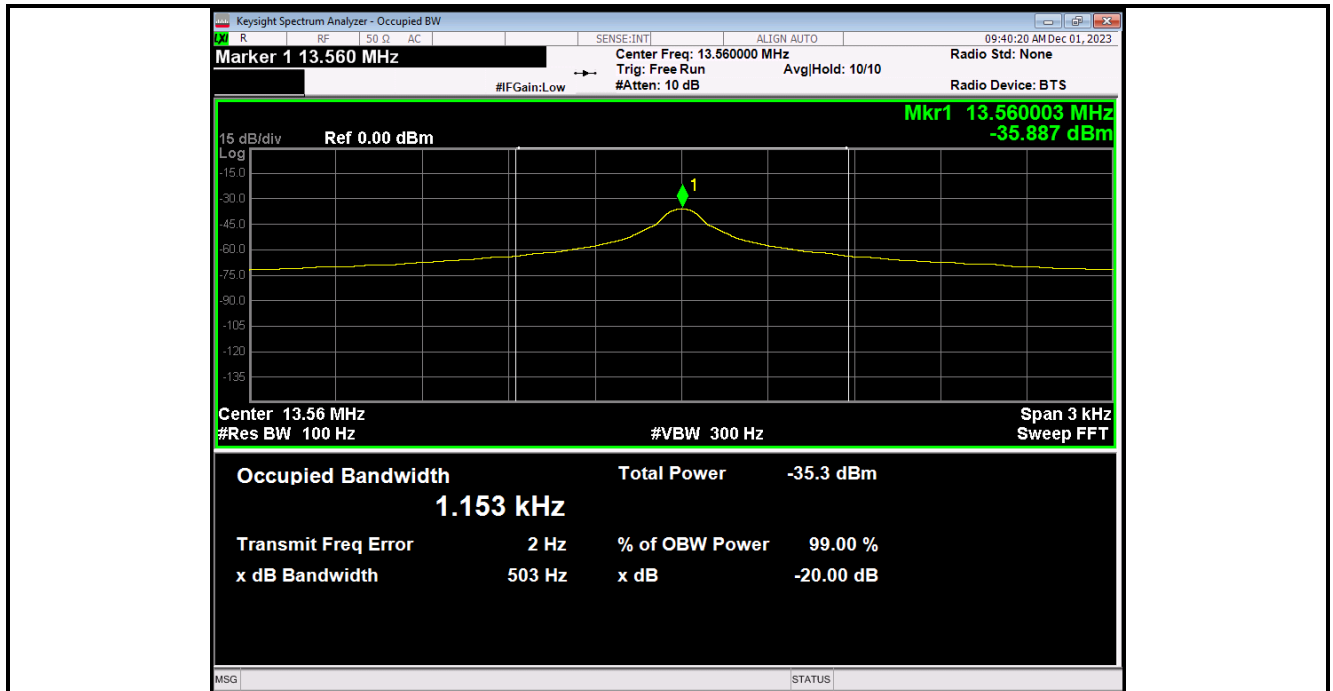
5.2 Antenna Requirement

Standard requirement:	FCC Part15 C Section 15.203
15.203 requirement:	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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.
E.U.T Antenna:	The EUT make use of a Loop Antenna antenna.

5.3 20dB Bandwidth

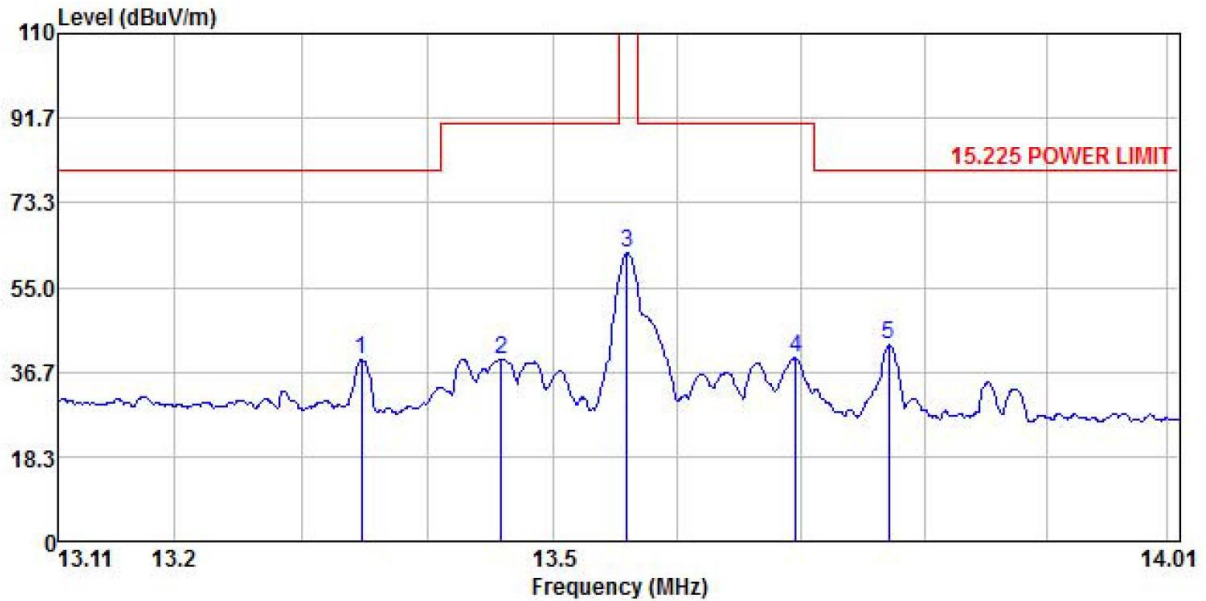
20dB bandwidth (kHz)	Limit (kHz)	Results
0.503	11.2	Passed
Note: For 13.56MHz, permitted Band is 14 kHz, so the Limit is 11.2 kHz.		

Test plot as follows:



5.4 Field Strength of Fundamental

Product Name:	AW26	Product Model:	2401Y
Test By:	Robin	Test mode:	NFC Tx mode
Test Voltage:	DC 12V	Polarization:	Coxial

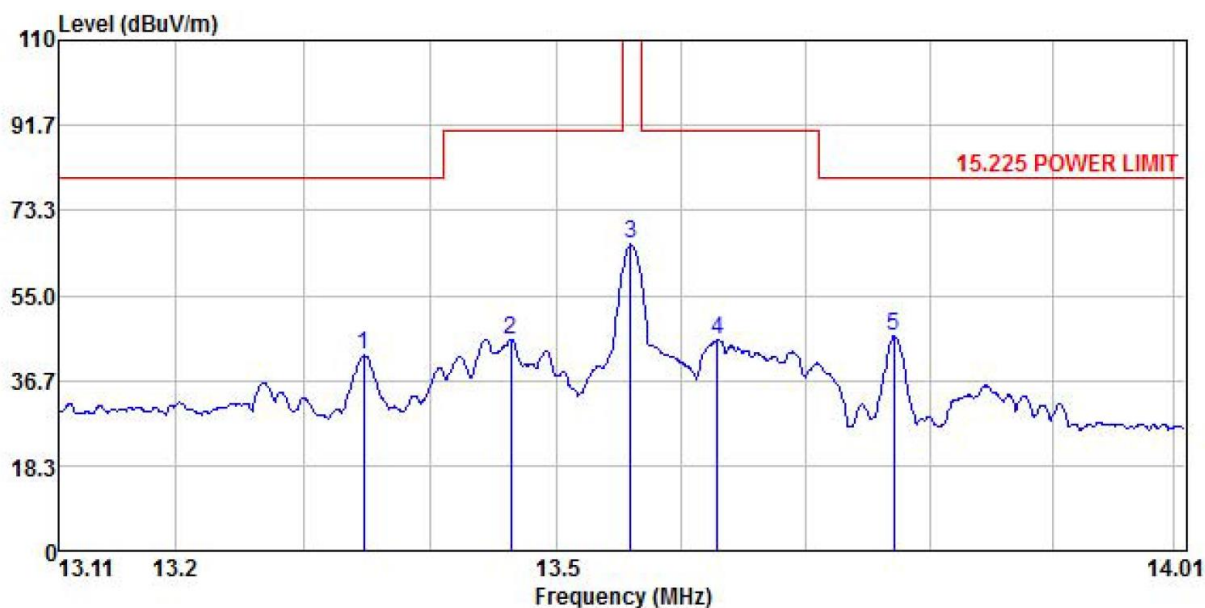


	Freq	Read	Antenna	Cable	Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	dBuV/m	dBuV/m	Limit	Remark
		dBuV	dB/m	dB	dB			dB	
1	13.347	19.27	19.63	0.40	0.00	39.30	80.50	-41.20	Peak
2	13.458	19.45	19.61	0.41	0.00	39.47	90.50	-51.03	Peak
3	13.559	42.41	19.59	0.41	0.00	62.41	124.00	-61.59	Peak
4	13.695	19.84	19.57	0.42	0.00	39.83	90.50	-50.67	Peak
5	13.771	22.46	19.54	0.43	0.00	42.43	80.50	-38.07	Peak

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

Product Name:	AW26	Product Model:	2401Y
Test By:	Robin	Test mode:	NFC Tx mode
Test Voltage:	DC 12V	Polarization:	Coplanar



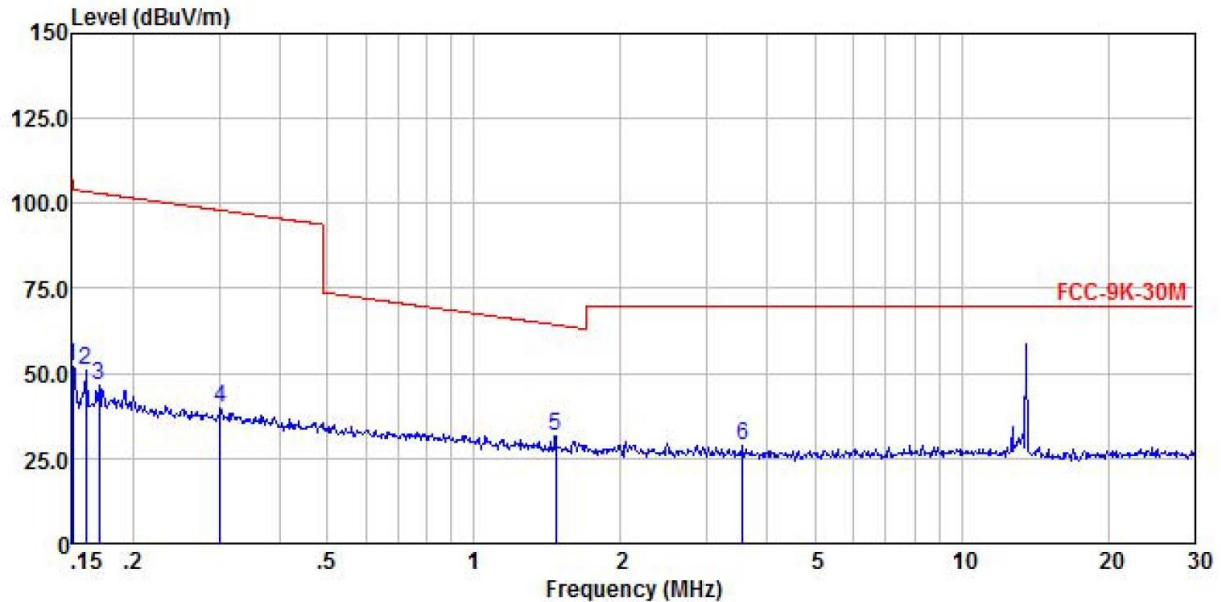
	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	13.347	22.05	19.63	0.40	0.00	42.08	80.50	-38.42	Peak
2	13.464	25.63	19.61	0.41	0.00	45.65	90.50	-44.85	Peak
3	13.559	46.03	19.59	0.41	0.00	66.03	124.00	-57.97	Peak
4	13.628	25.40	19.57	0.42	0.00	45.39	90.50	-45.11	Peak
5	13.771	26.38	19.54	0.43	0.00	46.35	80.50	-34.15	Peak

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

5.5 Field Strength of Spurious Emissions

Product Name:	AW26	Product Model:	2401Y
Test By:	Robin	Test mode:	NFC Tx mode
Test Frequency:	150 kHz – 30 MHz	Polarization:	Coxial
Test Voltage:	DC 12V		

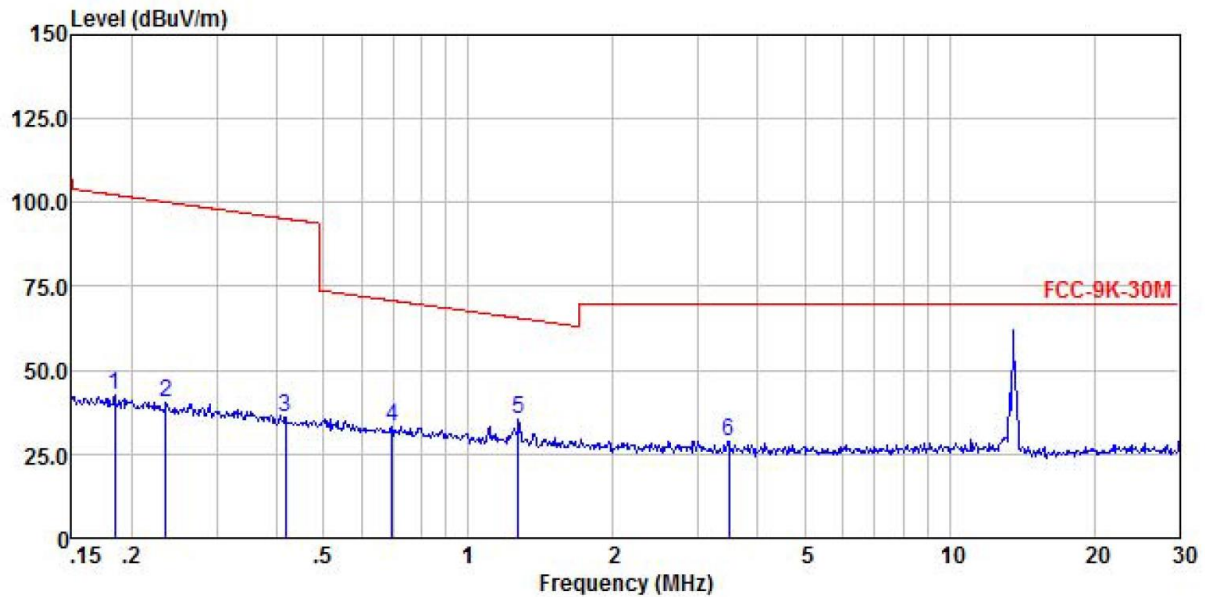


	Freq	ReadAntenna	Cable Preamp	Level	Limit	Over	Remark
	MHz	Level	Factor	Loss Factor	Line	Limit	
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	0.150	31.72	20.20	0.03	0.00	51.95	104.10
2	0.160	30.92	20.23	0.03	0.00	51.18	103.55
3	0.170	26.37	20.26	0.03	0.00	46.66	102.99
4	0.302	19.41	20.55	0.06	0.00	40.02	98.02
5	1.472	11.15	20.47	0.17	0.00	31.79	64.27
6	3.565	8.47	20.30	0.24	0.00	29.01	69.50

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of 9 kHz~150 kHz are background noise and very lower than the limit, so not show in test report.

Product Name:	AW26	Product Model:	2401Y
Test By:	Robin	Test mode:	NFC Tx mode
Test Frequency:	150 kHz – 30 MHz	Polarization:	Coplanar
Test Voltage:	DC 12V		



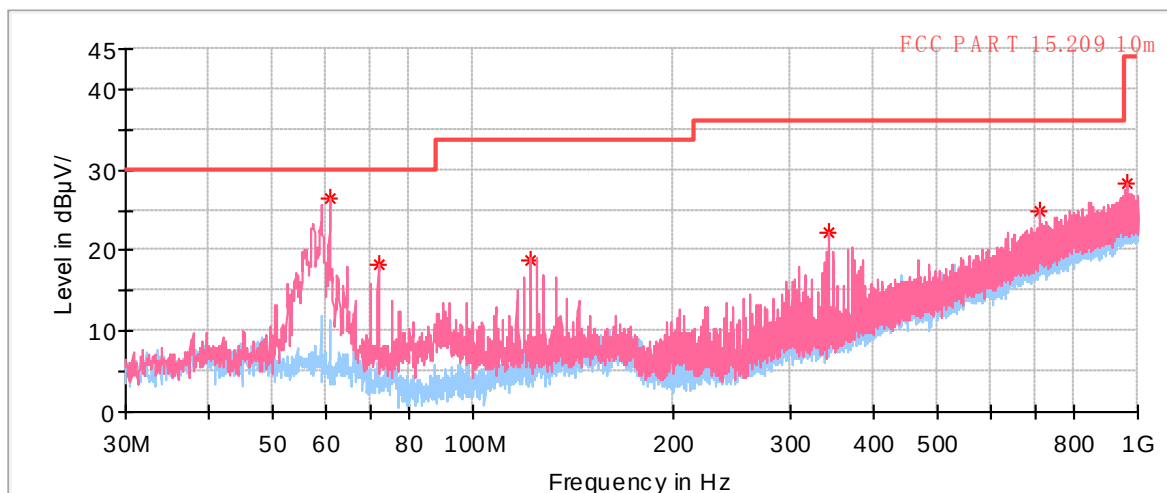
	Freq	ReadAntenna	Cable	Preamp	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Line	Limit
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m
1	0.184	22.17	20.30	0.04	0.00	42.51	102.30
2	0.235	20.14	20.42	0.05	0.00	40.61	100.18
3	0.417	15.04	20.71	0.06	0.00	35.81	95.20
4	0.694	12.48	20.66	0.10	0.00	33.24	70.79
5	1.269	14.77	20.48	0.17	0.00	35.42	65.56
6	3.472	8.34	20.31	0.24	0.00	28.89	69.50

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of 9 kHz~150 kHz are background noise and very lower than the limit, so not show in test report.

Product Name:	AW26	Product Model:	2401Y
Test By:	Asher	Test mode:	NFC Tx mode
Test Frequency:	30 MHz – 1000 MHz	Polarization:	Vertical & Horizontal
Test Voltage:	DC 12V		

Full Spectrum



* Critical_Freqs PK+ — FCC PART 15.209 10m ◆ Final_Result QPK
— Preview Result 1H-PK+ — Preview Result 1V-PK+

Critical_Freqs

Frequency (MHz)	MaxPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
60.846000	26.48	30.00	3.52	100.0	V	307.0	-17.2	9:34:28 - 2023/11/29
72.001000	18.24	30.00	11.76	100.0	V	196.0	-18.9	9:34:52 - 2023/11/29
121.859000	18.92	33.50	14.58	100.0	V	83.0	-17.4	9:34:34 - 2023/11/29
343.164500	22.36	36.00	13.64	100.0	V	196.0	-14.1	9:34:38 - 2023/11/29
710.455000	24.84	36.00	11.16	100.0	V	262.0	-4.0	9:34:43 - 2023/11/29
961.345500	28.36	44.00	15.64	100.0	V	237.0	0.2	9:34:40 - 2023/11/29

Remark:

1. Level = Reading + Factor(Antenna Factor + Cable Loss – Preamplifier Factor).

5.6 Frequency Tolerance

Frequency Stability V.S. Temperature Measurement:

Voltage (Vdc)	Temperature (°C)	Frequency Tolerance (kHz)	Frequency Error (%)	Limit (%)	Results
12.0	-20	0.001	0.0000	±0.01	Pass
	-10	0.001	0.0000	±0.01	Pass
	0	0.039	0.0003	±0.01	Pass
	+10	0.015	0.0001	±0.01	Pass
	+20	0.001	0.0000	±0.01	Pass
	+30	-0.001	0.0000	±0.01	Pass
	+40	0.001	0.0000	±0.01	Pass
	+50	-0.002	0.0000	±0.01	Pass

Frequency Stability V.S. Voltage Measurement:

Temperature (°C)	Voltage (Vdc)	Frequency Tolerance (kHz)	Frequency Error (%)	Limit (%)	Results
25.0	10.2	-0.002	0.0000	±0.01	Pass
	12.0	0.013	0.0001	±0.01	Pass
	13.8	0.015	0.0001	±0.01	Pass

-----End of report-----