Testing Laboratory 3787

RADIO TEST REPORT

FCC ID	:	RAXWN9711
Equipment	:	Wireless LAN Network Module
Brand Name	:	Arcadyan
Model Name	:	WN9711BTAAC-YA
Applicant	:	Arcadyan Technology Corporation No.8, Sec.2, Guangfu Rd.,Hsinchu, 30071 Taiwan
Manufacturer	:	Arcadyan Technology Corporation No.8, Sec.2, Guangfu Rd.,Hsinchu, 30071 Taiwan
Standard	:	47 CFR FCC Part 15.247

The product was received on Jun. 05, 2017, and testing was started from Dec. 18, 2018 and completed on Dec. 16, 2021. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR770523-11AA	01	Initial issue of report	Jan. 25, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
1.1.2	15.203	Antenna Requirement	PASS	-
3.1	15.247(d)	Emissions in Restricted Frequency Bands	PASS	-
Reference to Sporton Project No.: 770523-05				

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen
Report Producer: Penny Kao

1 General Description

1.1 Information

1.1.1 RF General Information

Frequency Range (MHz)	IEEE Std. 802.11	Ch. Frequency (MHz)	Channel Number
2400-2483.5	b, g, n (HT20)	2412-2462	1-11 [11]
2400-2483.5	n (HT40)	2422-2452	3-9 [7]

Band	Mode	BWch (MHz)	Nant
2.4-2.4835GHz	802.11b	20	1TX
2.4-2.4835GHz	802.11g	20	1TX
2.4-2.4835GHz	802.11n HT20	20	1TX
2.4-2.4835GHz	802.11n HT40	40	1TX

Note:
- 11b mode uses a combination of DSSS-DBPSK, DQPSK, CCK modulation.
- 11g, HT20 and HT40 use a combination of OFDM-BPSK, QPSK, 16QAM, 64QAM modulation.
- BWch is the nominal channel bandwidth.

1.1.2 Antenna Information

Set	Ant.	Brand	Model Name	Type	Connector	Gain (dBi)		Cable Length (mm)
						2.4GHz	5GHz	
1	1	ACON	AEMEE-10000	Dipole	Reversed-SMA	3.24	4.54	Note 1
	2		AEMEE-10000	Dipole	Reversed-SMA	3.24	4.54	
Set	Ant.	Brand	Model Name	Type	Connector	Gain (dBi)		Cable Length (mm)
						2.4GHz	5GHz	
2	3	ACON	AEP6P-100009 (Black)	PIFA	I-PEX	3.15	3.15	300
	4		AEP6P-100010 (Gray)	PIFA	I-PEX	2.30	3.15	400
3	5	Walsin Technology Corporation	RFMTA370615IMLB302 (Black)	PIFA	I-PEX	3.10	4.32	150
	6		RFMTA270710IM5B301 (Gray)	PIFA	I-PEX	-	4.26	99
4	7	Walsin Technology Corporation	RFMTA370620IMLB302 (Black)	PIFA	I-PEX	2.39	3.91	206
	8		RFMTA270718IM5B301 (Gray)	PIFA	I-PEX	-	2.89	180
5	9	WNC	81XCBA15.G01(Black)	PIFA	I-PEX	2.49	3.91	400
	10		81XCBA15.G02(Gray)	PIFA	I-PEX	-	1.86	400
6	11	WNC	81XCBA15.G03(Black)	PIFA	I-PEX	1.96	2.52	300
	12		81XCBA15.G04(Gray)	PIFA	I-PEX	-	4.18	250
7	13	Walsin Technology Corporation	RFMTA370629IMLB301(Black)	PIFA	I-PEX	3.01	3.99	290
	14		RFMTA270726IM5B301(Gray)	PIFA	I-PEX	-	3.62	260

Note 1:

Dipole Cable	Brand	Model Name	Cable Length (mm)	Cable Loss (dB)		True Gain (dBi)	
				2.4GHz / BT	5GHz	2.4GHz / BT	5GHz
1	ACON	AEC8P-1000000 (Gray) AEC8P-1000001 (Black)	30	0.08	0.12	3.16	4.42
2	ACON	AEC8P-1000002 (Gray) AEC8P-1000003 (Black)	50	0.13	0.19	3.11	4.35

Dipole Cable	Brand	Model Name	Cable Length (mm)	Cable Loss (dB)		True Gain (dBi)	
				2.4GHz / BT	5GHz	2.4GHz / BT	5GHz
3	ACON	AEC8P-1000004 (Gray) AEC8P-1000005 (Black)	70	0.19	0.27	3.05	4.27
4	ACON	AEC8P-1000006 (Gray) AEC8P-1000007 (Black)	90	0.24	0.35	3.00	4.19
5	ACON	AEC8P-1000008 (Gray) AEC8P-1000009 (Black)	120	0.32	0.46	2.92	4.08
6	ACON	AEC8P-1000010 (Gray) AEC8P-1000011 (Black)	160	0.43	0.62	2.81	3.92
7	ACON	AEC8P-1000012 (Gray) AEC8P-1000013 (Black)	200	0.54	0.77	2.70	3.77
8	ACON	AEC8P-1000014 (Gray) AEC8P-1000015 (Black)	240	0.64	0.93	2.60	3.61
9	ACON	AEC8P-1000016 (Gray) AEC8P-1000017 (Black)	280	0.75	1.08	2.49	3.46
10	ACON	AEC8P-1000018 (Gray) AEC8P-1000019 (Black)	320	0.86	1.24	2.38	3.30
11	ACON	AEC8P-1000020 (Gray) AEC8P-1000021 (Black)	360	0.96	1.39	2.28	3.15
12	ACON	AEC8P-1000022 (Gray) AEC8P-1000023 (Black)	400	1.07	1.54	2.17	3.00
13	ACON	AEC8P-1000024 (Gray) AEC8P-1000025 (Black)	450	1.21	1.74	2.03	2.80
14	ACON	AEC8P-1000026 (Gray) AEC8P-1000027 (Black)	500	1.34	1.93	1.90	2.61

Note 2: 1. The EUT has two radios.

Radio 1 supports WLAN 2.4GHz, WLAN 5GHz and Bluetooth function, Radio 2 supports WLAN 5GHz function only.

Radio 1 collocate with Black antenna cable, Radio 2 collocate with Gray antenna cable.

2. The EUT has two type antennas, and there are two antennas for each set.

Dipole Antenna collocate with 14 set cable selling, only the higher gain antenna “cable 1” was tested and recorded in the report for SKU1.

Dipole Antenna collocate with 14 set cable selling, only the higher gain antenna “cable 14” was tested and recorded in the report for SKU 2.

PIFA Antenna collocate with 6 set selling, the antennas “set 7” were tested and recorded in report.

For Radio 1 (WLAN 2.4GHz, WLAN 5GHz and Bluetooth):

For IEEE 802.11a/b/g/n/ac mode (1TX/1RX):

Dipole Antenna: Only Ant. 1 (Port 1) can be used as transmitting/receiving antenna.

PIFA Antenna: Only Ant. 3 (Port 1) can be used as transmitting/receiving antenna.

For Radio 2 (WLAN 5GHz):

For IEEE 802.11a/n/ac mode (1TX/1RX):

Dipole Antenna: Only Ant. 2 (Port 1) can be used as transmitting/receiving antenna.

PIFA Antenna: Only Ant. 6 (Port 1) can be used as transmitting/receiving antenna.

1.1.3 EUT Operational Condition

EUT Power Type	From host system			
Beamforming Function	☐	With beamforming	☒	Without beamforming
Function	☒	Point-to-multipoint	☐	Point-to-point
Test Software Version	MTool_3.0.0.3.exe			

1.1.4 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FR770523-03AA

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
1. Adding second source DDR and Flash for SKU 1, please refer to section 1.1.6 for detail information. 2. Adding the SKU 2, please refer to section 1.1.5 for detail information.	Radiated Emissions below 1GHz test.
3. Adding 1 set of same type PIFA antenna (set 7) with lower gain than the original report, and the set 7 antenna is not the smallest gain antenna for SKU 1.	After evaluating, it does not need to re-test.

1.1.5 Table for SKU Information

SKU	Radio 1 (WLAN 2.4GHz, WLAN 5GHz and Bluetooth)	Radio 2 (WLAN 5GHz)	Antennas	Remark
1	V	V	1~14	There is no change in hardware or in existing RF relevant portion between these two SKUs.
2	V	Disable	1,13	

Note: The above information was declared by manufacturer.

1.1.6 Table for DDR and Flash Detail Information for SKU 1

SKU	Source	Item	Arcadyan P/N	Brand	Model Name	Capacity
1	Main	DDR	109100303400J	SAMSUNG	K4B2G1646F-BYK0	256MB
		Flash	107100262600J	TOSHIBA	TC58NVG1S3HTAI0	256MB
	Second	DDR	109100305500J	SAMSUNG	K4B4G1646E-BYMA	512MB
		Flash	107100267000J	TOSHIBA	TH58NVG2S3HTAI0	512MB

Note : The above information was declared by manufacturer

1.2 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15.247
- ANSI C63.10-2013

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 558074 D01 v05r02
- FCC KDB 414788 D01 v01r01

1.3 Testing Location Information

Testing Location Information	
Test Lab.：Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) TEL: 886-3-656-9065 FAX: 886-3-656-9085 Test site Designation No. TW3787 with FCC. Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment	Test Date
Radiated (Mode 1)	03CH01-CB	RJ Huang	22°C / 54%	Dec. 18, 2018
Radiated (Mode 2~3)	03CH05-CB	Eason Chen	24-25.1 °C / 56-59%	Dec. 16, 2021

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

For Radiated Mode 1 test

Test Items	Uncertainty	Remark
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%

For Radiated Mode 2~3 test

Test Items	Uncertainty	Remark
Radiated Emission (30MHz ~ 1,000MHz)	5.5 dB	Confidence levels of 95%

2 Test Configuration of EUT

2.1 The Worst Case Measurement Configuration

The Worst Case Mode for Following Conformance Tests	
Tests Item	Emissions in Restricted Frequency Bands
Test Condition	Radiated measurement If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type.
Operating Mode < 1GHz	Normal Link
According to the original test report, EUT in Z axis AP Mode - Radio 1 (2.4GHz+Bluetooth)+ Radio 2 (5GHz) has been evaluated to be the worst case. So the measurement will follow this same test configuration.	
1	EUT-SKU 1 in Z axis AP Mode (second source) - Radio 1 (2.4GHz+Bluetooth)+ Radio 2 (5GHz) with Dipole antenna set 1 + cable 1
2	EUT-SKU 2 in Z axis AP Mode - Radio 1 (2.4GHz+Bluetooth) with PIFA antenna set 7 ANT. 13
3	EUT-SKU 2 in Z axis AP Mode - Radio 1 (2.4GHz+Bluetooth) with Dipole antenna set 1 Ant. 1 + cable 14
Mode 1 generated the worst test result, so it was recorded in this report.	

2.2 EUT Operation during Test

During the test, the EUT operation to normal function.

2.3 Accessories

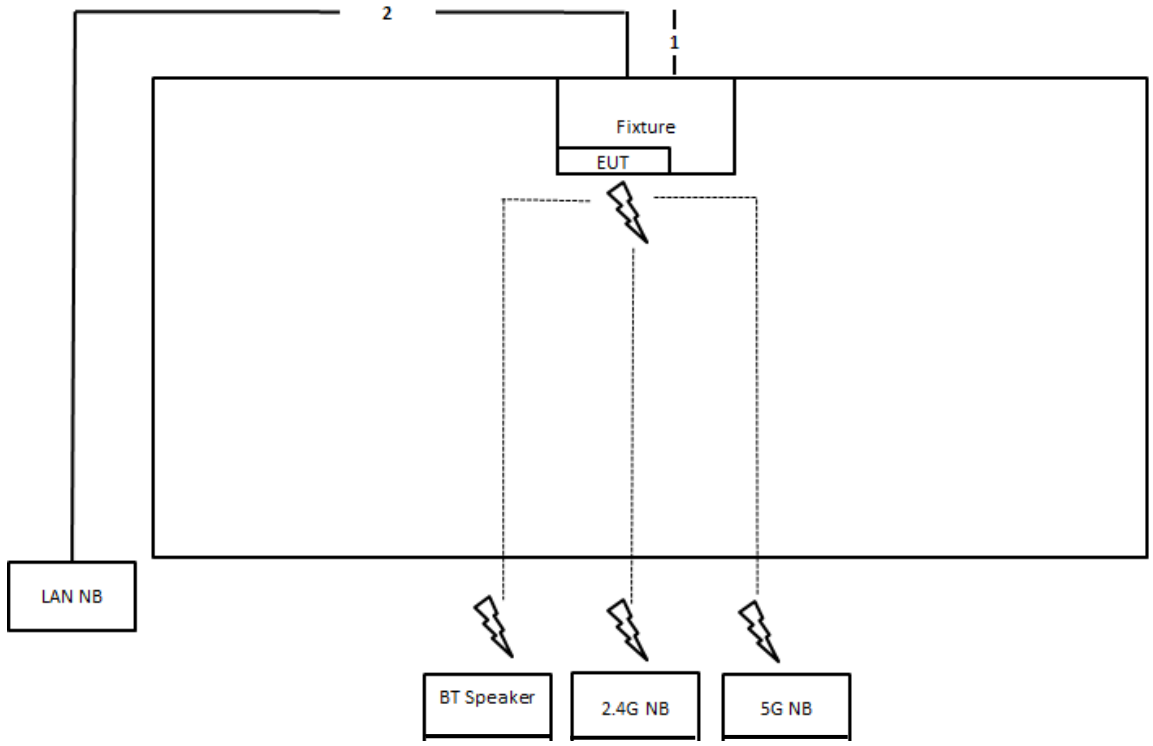
N/A

2.4 Support Equipment

Support Equipment				
No.	**Equipment**	**Brand Name**	**Model Name**	**FCC ID**
1	LAN NB	DELL	E4300	N/A
2	Bluetooth Speaker	Samsung	SM-J200Y	N/A
3	2.4G NB	DELL	E4300	N/A
4	5G NB	DELL	E4300	N/A
5	Test Fixture	Arcadyan	WN9711BTAAC Test jig	N/A

2.5 Test Setup Diagram

Test Setup Diagram - Radiated Test



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	RJ-45 cable	No	10m

3 Transmitter Test Result

3.1 Emissions in Restricted Frequency Bands

3.1.1 Emissions in Restricted Frequency Bands Limit

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

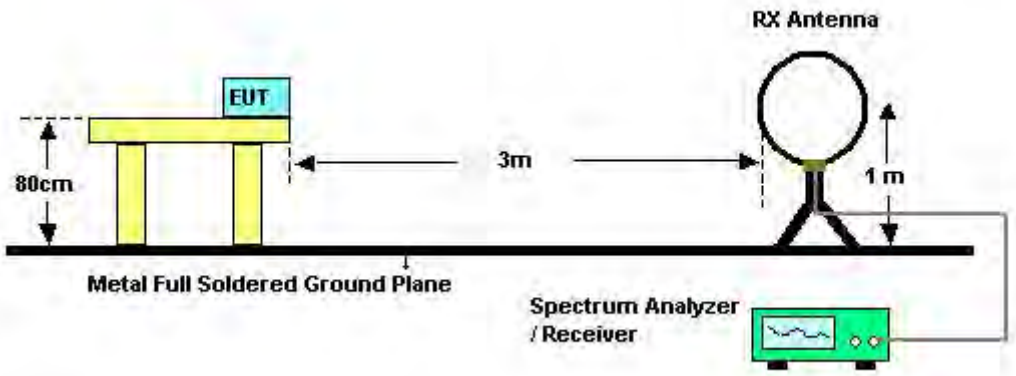
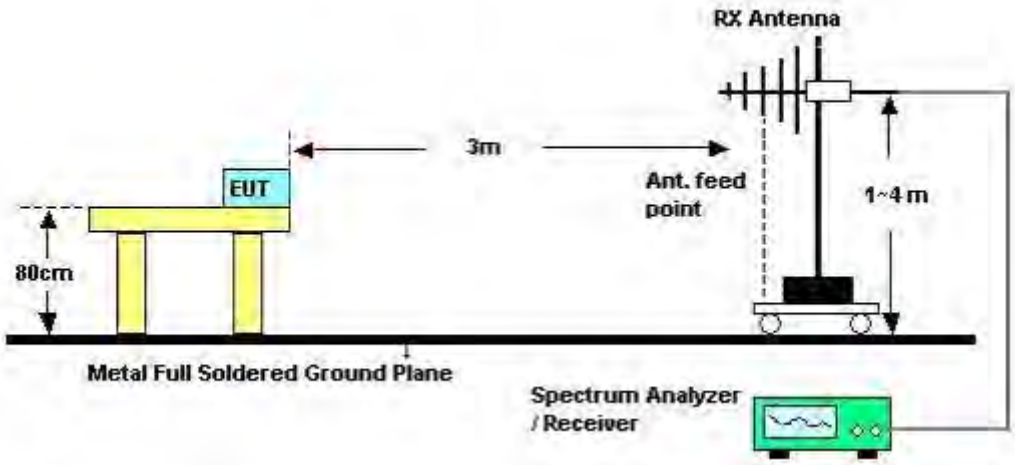
3.1.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.1.3 Test Procedures

Test Method			
▪ The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor].			
▪ Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band.			
▪ For the transmitter unwanted emissions shall be measured using following options below:			
	▪ Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands.		
		☐	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle ≥98%).
		☐	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor).
		☒	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T).
		☐	Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time.
		☐	Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions.
		☒	Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit.
▪ For the transmitter band-edge emissions shall be measured using following options below:			
	▪ Refer as FCC KDB 558074 clause 8.7 & C63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below.		
	▪ Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements.		
	▪ Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz).		
	▪ For conducted unwanted emissions into restricted bands (absolute emission limits). Devices with multiple transmit chains using options given below: (1) Measure and sum the spectra across the outputs or (2) Measure and add 10 log(N) dB		
	▪ For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred.		

3.1.4 Test Setup

Transmitter Radiated Emissions
9kHz ~30MHz

30MHz~1GHz


3.1.5 Measurement Results Calculation

The measured Level is calculated using:
Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

3.1.6 Emissions in Restricted Frequency Bands (Below 30MHz)

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.
All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10th harmonic or 40 GHz, whichever is appropriate.

3.1.7 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix A

4 Test Equipment and Calibration Data

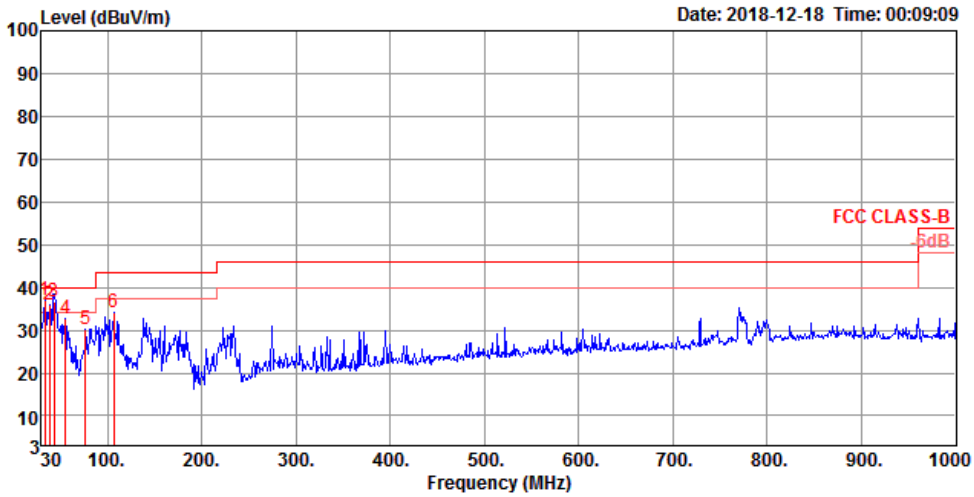
Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Spectrum anal yzer	R&S	FSP40	100080	9kHz~40GHz	Oct. 03, 2018	Oct. 02, 2019	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS	100359	9kHz ~ 2.75GHz	Jul. 03, 2018	Jul. 02, 2019	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 08, 2018	Oct. 07, 2019	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-l0-7	-	N.C.R.	N.C.R.	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 14, 2021	Apr. 13, 2022	Radiation (03CH05-CB)
3m Semi Anechoic Chamber NSA	TDK	SAC-3M	03CH05-CB	30 MHz ~ 1 GHz	Aug. 09, 2021	Aug. 08, 2022	Radiation (03CH05-CB)
Bilog Antenna with 6dB Attenuator	TESEQ & EMCI	CBL 6112D & N-6-06	35236 & AT-N0610	30MHz ~ 2GHz	Mar. 26, 2021	Mar. 25, 2022	Radiation (03CH05-CB)
Pre-Amplifier	EMCI	EMC330N	980331	20MHz ~ 3GHz	Apr. 27, 2021	Apr. 26, 2022	Radiation (03CH05-CB)
Signal Analyzer	R&S	FSV40	101903	9kHz ~ 40GHz	Mar. 22, 2021	Mar. 21, 2022	Radiation (03CH05-CB)
EMI Test Receiver	R&S	ESCS	826547/017	9kHz ~ 2.75GHz	Jun. 21, 2021	Jun. 20, 2022	Radiation (03CH05-CB)
RF Cable-low	Woken	RG402	Low Cable-04+23	30MHz~1GHz	Oct. 13, 2021	Oct. 12, 2022	Radiation (03CH05-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (03CH05-CB)

Note: Calibration Interval of instruments listed above is one year.

NCR means Non-Calibration required.

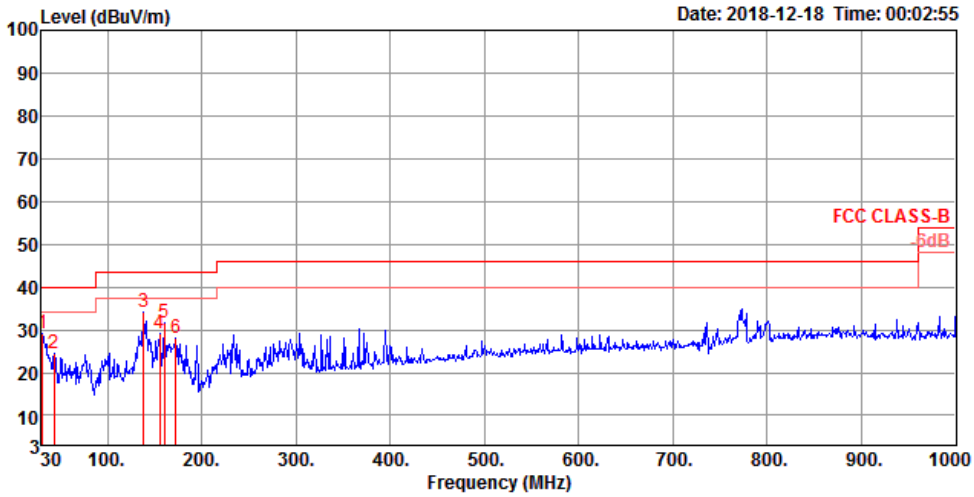
Test Mode	Mode 1	Frequency Range	30 MHz to 1,000 MHz

Vertical 30 MHz to 1,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	33.88	36.92	40.00	-3.08	44.33	0.74	23.39	31.54	100	356	Peak	VERTICAL
2	38.73	35.83	40.00	-4.17	46.15	0.81	20.51	31.64	100	10	Peak	VERTICAL
3	43.58	36.81	40.00	-3.19	49.80	0.88	17.82	31.69	100	2	QP	VERTICAL
4	55.22	32.74	40.00	-7.26	49.99	0.92	13.62	31.79	125	359	Peak	VERTICAL
5	76.56	30.11	40.00	-9.89	47.76	1.14	13.06	31.85	125	173	Peak	VERTICAL
6	106.63	33.97	43.50	-9.53	46.65	1.34	17.85	31.87	100	7	Peak	VERTICAL

Horizontal 30 MHz to 1,000 MHz



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.97	28.97	40.00	-11.03	34.63	0.69	25.11	31.46	125	146	Peak	HORIZONTAL
2	43.58	24.64	40.00	-15.36	37.63	0.88	17.82	31.69	150	74	Peak	HORIZONTAL
3	138.64	34.03	43.50	-9.47	46.54	1.51	17.87	31.89	200	160	Peak	HORIZONTAL
4	155.13	29.04	43.50	-14.46	42.67	1.58	16.68	31.89	200	267	Peak	HORIZONTAL
5	159.98	31.49	43.50	-12.01	45.28	1.60	16.50	31.89	125	232	Peak	HORIZONTAL
6	172.59	28.13	43.50	-15.37	42.48	1.68	15.88	31.91	150	253	Peak	HORIZONTAL