RADIO PERFORMANCE TEST REPORT

Test Report No.	**: OT-243-RWD-014**
Reception No.	**: 2402000496**
Applicant	**: AMOSENSE**
Address	**: 19-1BL, 90, 4Sandan 5 gil, Jiksan-eup, Cheonan-Si, Chungcheongnam-Do, South Korea**
Manufacturer	**: AMOSENSE**
Address	**: 19-1BL, 90, 4Sandan 5 gil, Jiksan-eup, Cheonan-Si, Chungcheongnam-Do, South Korea**
Type of Equipment	**: ATOZ R3**
FCC ID.	**: 2AS9T-SB530-SW**
Model Name	**: SB530-SW**
Multiple Model Name	**: N/A**
Serial number	**: N/A**
Total page of Report	**: 59 pages (including this page)**
Date of Incoming	**: January 19, 2024**
Date of issue	**: March 12, 2024**

SUMMARY

The equipment complies with the regulation; ***FCC PART 15 SUBPART E Section 15.407***

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	Reviewed by	Approved by
Su-Min, Yoo / Sr. Engineer	Tae-Ho, Kim / Chief Engineer	Jae-Ho, Lee / Chief Engineer
ONETECH Corp.	ONETECH Corp.	ONETECH Corp.

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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※ Please refer to the Annex section for All test plots

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-243-RWD-014	March 12, 2024	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

Applicant : AMOSENSE

Address : 19-1BL, 90, 4Sandan 5 gil, Jiksan-eup, Cheonan-Si, Chungcheongnam-Do, South Korea

Contact Person : Jaeho Hong / Diretor

Telephone No. : +82-31-277-0598

FCC ID : 2AS9T-SB530-SW

Model Name : SB530-SW

Brand Name : -

Serial Number : N/A

Date : March 12, 2024

EQUIPMENT CLASS	Unlicensed National Information infrastructure(UNII)
E.U.T. DESCRIPTION	ATOZ R3
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 E Section 15.407 789033 D02 General UNII Test Procedures New Rules v02r01
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.

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2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.407(a)	26 dB Bandwidth	PASS
15.407(a)	Maximum Conducted Output Power	Met the Limit / PASS
15.407(a)	Average Power Spectral Density	Met the Limit / PASS
15.407(e)	6 dB Bandwidth	Met the Limit / PASS
15.407(g)	Frequency Stability	Met the Limit / PASS
15.407(b)	Undesirable Emissions	Met the Limit / PASS
15.205, 15.407(b)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Met the Limit / PASS
15.207	AC Conducted Emissions 150 kHz-30 MHz	Met the Limit / PASS
15.407(h)	Dynamic frequency Selection	Met the Limit / 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 E Section 15.407

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

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

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

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3. GENERAL INFORMATION

3.1 Product Description

The AMOSENSE, Model SB530-SW (referred to as the EUT in this report) is a ATOZ R3. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	ATOZ R3	
Temperature Range	-20 °C ~ +60 °C	
OPERATING FREQUENCY	SigFox	902.137 5 MHz ~ 904.662 5 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))
	WLAN 5 150 MHz ~ 5 250 MHz Band	5 180 MHz ~ 5 240 MHz (802.11a)
	WLAN 5 250 MHz ~ 5 350 MHz Band	5 260 MHz ~ 5 320 MHz (802.11a)
	WLAN 5 470 MHz ~ 5 725 MHz Band	5 500 MHz ~ 5 720 MHz (802.11a)
	WLAN 5 725 MHz ~ 5 850 MHz Band	5 745 MHz ~ 5 825 MHz (802.11a)
MODULATION TYPE	SigFox	DBPSK
	Bluetooth LE	GFSK
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)
	WLAN 5 GHz	802.11a: OFDM Modulation(BPSK/QPSK/16QAM/64QAM)

RF OUTPUT POWER	SigFox	18.95 dBm
	Bluetooth LE	-4.61 dBm
	WLAN 2.4 GHz	5.81 dBm(802.11b) 3.00 dBm(802.11g) 2.85 dBm(802.11n_HT20)
	WLAN 5 150 MHz ~ 5 250 MHz Band	3.69 dBm(802.11a)
	WLAN 5 250 MHz ~ 5 350 MHz Band	3.63 dBm(802.11a)
	WLAN 5 470 MHz ~ 5 725 MHz Band	4.64 dBm(802.11a)
	WLAN 5 470 MHz ~ 5 725 MHz Band (Straddle)	3.76 dBm(802.11a)
	WLAN 5 725 MHz ~ 5 850 MHz Band	5.59 dBm(802.11a)
	WLAN 5 725 MHz ~ 5 850 MHz Band (Straddle)	-4.07 dBm(802.11a)
ANTENNA TYPE	Chip Antenna	
ANTENNA GAIN	SigFox	1.06 dBi
	Bluetooth LE	0.13 dBi
	WLAN 2.4 GHz	0.13 dBi
	WLAN 5 150 MHz ~ 5 250 MHz Band	-0.05 dBi
	WLAN 5 250 MHz ~ 5 350 MHz Band	-0.05 dBi
	WLAN 5 470 MHz ~ 5 725 MHz Band	-0.75 dBi
	WLAN 5 725 MHz ~ 5 850 MHz Band	0.00 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		32 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	AMOSENSE	ATOZ R3 Rev10	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
SB530-SW	AMOSENSE	ATOZ R3 (EUT)	-
IdeaPad L340	LENOVO	Notebook PC	EUT
U0181-KV	Dongguan Citiland Electronics Co., Ltd	Adapter	-

5.3 Mode of operation during the test

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

-. Frequency / Channel Operations

		Channel	Frequency
802.11a	Band 1	36	5 180
		44	5 220
		48	5 240
	Band 2A	52	5 260
		60	5 300
		64	5 320
	Band 2C	100	5 500
		116	5 580
		140	5 700
	Straddle	144	5 720
	Band 3	149	5 745
		157	5 785
		165	5 825

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-. UNII 1

Modulation	DATA RATE	OUTPUT POWER[dBm]
802.11 a (Middle Channel)	6 Mbps	3.51
	9 Mbps	3.44
	12 Mbps	3.41
	18 Mbps	3.37
	24 Mbps	3.35
	36 Mbps	3.33
	48 Mbps	3.31
	54 Mbps	3.29

- The worse case data rate for each modulation is determined 6 Mbps for IEEE 802.11a.

- 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.

-. UNII 2A

Modulation	DATA RATE	OUTPUT POWER[dBm]
802.11 a (Middle Channel)	6 Mbps	3.46
	9 Mbps	3.39
	12 Mbps	3.36
	18 Mbps	3.32
	24 Mbps	3.30
	36 Mbps	3.28
	48 Mbps	3.26
	54 Mbps	3.24

- The worse case data rate for each modulation is determined 6 Mbps for IEEE 802.11a.

- 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.

-. UNII 2C

Modulation	DATA RATE	OUTPUT POWER[dBm]
802.11 a (Middle Channel)	6 Mbps	4.50
	9 Mbps	4.49
	12 Mbps	4.47
	18 Mbps	4.46
	24 Mbps	4.44
	36 Mbps	4.43
	48 Mbps	4.37
	54 Mbps	4.33

- The worse case data rate for each modulation is determined 6 Mbps for IEEE 802.11a.

- 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.

-. UNII 3

Modulation	DATA RATE	OUTPUT POWER[dBm]
802.11 a (Middle Channel)	6 Mbps	5.05
	9 Mbps	5.03
	12 Mbps	5.01
	18 Mbps	4.97
	24 Mbps	4.90
	36 Mbps	4.88
	48 Mbps	4.87
	54 Mbps	4.86

- The worse case data rate for each modulation is determined 6 Mbps for IEEE 802.11a.

- 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.

-. Duty Cycle

Band	Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
UNII 1	802.11 a	-	-	100.00	-
UNII 2A	802.11 a	-	-	100.00	-
UNII 2C	802.11 a	-	-	100.00	-
UNII 3	802.11 a	-	-	100.00	-

	Mode	Tx On Time [ms]	Tx Off Time [ms]	Duty Cycle [%]	Correction Factor [dB]
Straddle	802.11 a	-	-	100.00	-

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 a Charging & Transmitting mode. The EUT was connected to USB and the Power of USB was Connected to DC Adaptor. All supporting equipments 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	0.68
Conducted Spurious Emission < 26.5 GHz	1.60
Power Spectral Density	1.55
Line Conducted Disturbance (150 kHz ~ 30 MHz)	2.00
Radiated Disturbance (9 kHz ~ 30 MHz)	4.09
Radiated Disturbance (30 MHz ~ 1 GHz)	3.98
Radiated Disturbance (1 GHz ~ 18 GHz)	5.56
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)
Charging & Transmitting Mode	X

7.2 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

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8. MIMIMUM 26 dB BANDWIDTH

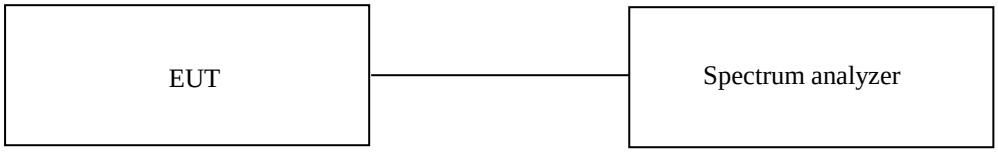
8.1 Operating environment

Temperature : 23 °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 26 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 26 dB.



8.3 Test Date

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8.4 Test data for 802.11a RLAN Mode

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 150 ~ 5 250	Low	5 180.00	19.88
	Middle	5 220.00	19.83
	High	5 240.00	19.93
5 250 ~ 5 350	Low	5 260.00	19.93
	Middle	5 300.00	19.88
	High	5 320.00	19.98
5 470 ~ 5 725	Low	5 500.00	19.88
	Middle	5 580.00	19.93
	High	5 700.00	19.83
5 725 ~ 5 850	Low	5 745.00	19.78
	Middle	5 785.00	19.78
	High	5 825.00	19.98

8.4.1 Test data for Straddle Channel

-. Test Result : Pass

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	26 dB Bandwidth (MHz)
5 470 ~ 5 725	5 720.00	14.94
5 725 ~ 5 850	5 720.00	4.94

9. 6 dB BANDWIDTH

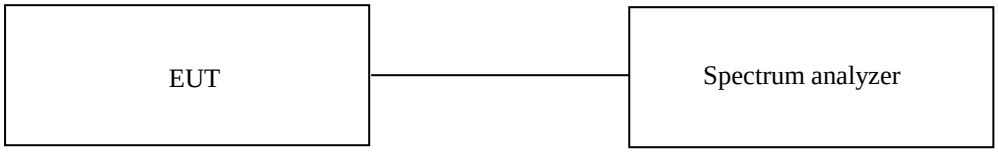
9.1 Operating environment

Temperature : 23 °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 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.



9.3 Test Date

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9.4 Test data for 802.11a RLAN Mode

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 725 ~ 5 850	Low	5 745.00	16.28
	Middle	5 785.00	16.28
	High	5 825.00	16.08

9.4.1 Test data for Straddle Channel

-. Test Result : Pass

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	6 dB Bandwidth (MHz)
5 470 ~ 5 725	5 720.00	13.14
5 725 ~ 5 850	5 720.00	3.14

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10. MAXIMUM CONDUCTED OUTPUT POWER

10.1 Operating environment

Temperature : 23 °C

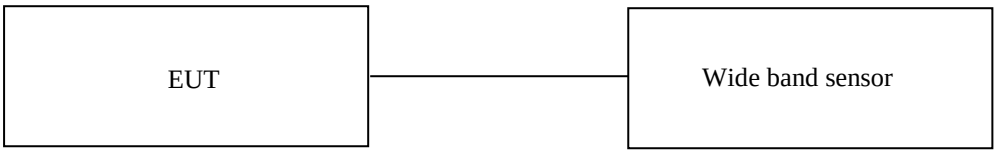
Relative humidity : 46 % R.H.

10.2 Test set-up

The maximum peak output power was measured with the wide band sensor connected to the antenna output of the EUT.

The Wide Band Sensor is measured when the EUT is transmitting at the appropriate center frequency its maximum power control level as described in Section E. 3.(KDB 789033 D02 General UNII Test Procedures New Rules v02r01).

Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.



10.3 Test Date

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10.4 Test data for 802.11a RLAN Mode

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	3.69	24.00	20.31
	Middle	5 220.00	3.51	24.00	20.49
	High	5 240.00	3.42	24.00	20.58
5 250 ~ 5 350	Low	5 260.00	3.63	24.00	20.37
	Middle	5 300.00	3.46	23.98	20.52
	High	5 320.00	3.33	24.00	20.67
5 470 ~ 5 725	Low	5 500.00	4.64	23.98	19.34
	Middle	5 580.00	4.50	24.00	19.50
	High	5 700.00	4.62	23.97	19.35
5 725 ~ 5 850	Low	5 745.00	5.26	30.00	24.74
	Middle	5 785.00	5.05	30.00	24.95
	High	5 825.00	5.59	30.00	24.41

Remark: Margin = Limit – Measured Value (=Power Sensor Reading + Cable Loss)

10.4.1 Test data for Straddle Channel

-. Test Result : Pass

-. Duty Cycle : > 98 %

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
5 470 ~ 5 725	5 720.00	3.76	24.00	20.24
5 725 ~ 5 825	5 720.00	-4.07	30.00	34.07

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11. AVERAGE POWER SPECTRUL DENSITY

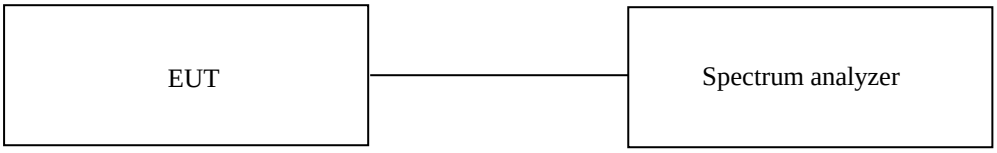
11.1 Operating environment

Temperature : 23 °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 1 MHz, the video bandwidth is set to 3 times the resolution bandwidth. The maximum level form the EUT in 1 MHz bandwidth was measured with above condition.



11.3 Test Date

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11.4 Test data for 802.11a RLAN Mode

-. Operating condition : Highest Output Power Transmitting Mode

-. Test Result : Pass

FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm/MHz)	EIRP (dBm/MHz)	LIMIT (dBm/MHz)	MARGIN (dB)
5 150 ~ 5 250	Low	5 180.00	-7.84	-7.89	11.00	17.89
	Middle	5 220.00	-6.87	-6.92	11.00	16.92
	High	5 240.00	-7.63	-7.68	11.00	17.68
5 250 ~ 5 350	Low	5 260.00	-7.95	-	11.00	18.95
	Middle	5 300.00	-7.08	-	11.00	18.08
	High	5 320.00	-7.04	-	11.00	18.04
5 470 ~ 5 725	Low	5 500.00	-6.09	-	11.00	17.09
	Middle	5 580.00	-6.05	-	11.00	17.05
	High	5 700.00	-6.01	-	11.00	17.01
FREQUENCY RANGE (MHz)	CHANNEL	FREQUENCY (MHz)	MEASURED VALUE (dBm/500kHz)	EIRP (dBm/500kHz)	LIMIT (dBm/500kHz)	MARGIN (dB)
5 725 ~ 5 850	Low	5 745.00	-8.25	-	30.00	38.25
	Middle	5 785.00	-8.39	-	30.00	38.39
	High	5 825.00	-7.93	-	30.00	37.93

Remark: Margin = Limit – EIRP(=Measured Value + Antenna Gain) or
Limit – Measured Value

11.4.1 Test data for Straddle Channel

-. Operating condition : Highest Output Power Transmitting Mode

-. Test Result : Pass

FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	MEASURED VALUE (dBm/MHz)	EIRP (dBm/MHz)	LIMIT (dBm/MHz)	MARGIN (dB)
5 470 ~ 5 725	5 720.00	-5.59	-	11.00	16.59
FREQUENCY RANGE (MHz)	FREQUENCY (MHz)	MEASURED VALUE (dBm/500kHz)	EIRP (dBm/500kHz)	LIMIT (dBm/500kHz)	MARGIN (dB)
5 725 ~ 5 850	5 720.00	-10.92	-	30.00	40.92

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12. FREQUENCY STABILITY WITH TEMPERATURE VARIATION

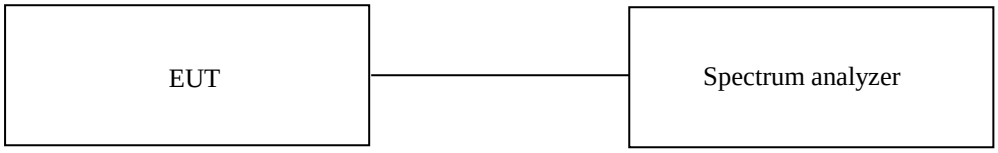
12.1 Operating environment

Temperature : 23 °C

Relative humidity : 46 % R.H.

12.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 min to 30 min after chamber reach the assigned temperature) for EUT to stabilize. Turn on the EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +60 °C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.



12.3 Test Date

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12.4 Test Data for U-NII-1

-. Result : Pass

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (Hz)
-20	5 180 000 000	5 180 012 643	12 643
-10		5 180 018 743	18 743
0		5 180 017 350	17 350
10		5 180 015 471	15 471
20		5 179 998 847	-1 153
30		5 179 992 039	-7 961
40		5 179 988 511	-11 489
50		5 179 991 368	-8 632
60		5 180 007 251	7 251
-20	5 220 000 000	5 220 012 751	12 751
-10		5 220 018 962	18 962
0		5 220 017 647	17 647
10		5 220 015 589	15 589
20		5 219 998 952	-1 048
30		5 219 991 947	-8 053
40		5 219 988 353	-11 647
50		5 219 991 318	-8 682
60		5 220 007 384	7 384
-20	5 240 000 000	5 240 012 668	12 668
-10		5 240 019 066	19 066
0		5 240 017 860	17 860
10		5 240 015 592	15 592
20		5 239 999 152	- 848
30		5 239 992 011	-7 989
40		5 239 988 334	-11 666
50		5 239 991 484	-8 516
60		5 240 007 652	7 652

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10: 2013)

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12.5 Test Data for U-NII-2A

-. Result : Pass

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (Hz)
-20	5 260 000 000	5 260 012 531	12 531
-10		5 260 019 090	19 090
0		5 260 018 130	18 130
10		5 260 015 450	15 450
20		5 259 999 211	- 789
30		5 259 991 674	-8 326
40		5 259 988 192	-11 808
50		5 259 991 428	-8 572
60		5 260 007 378	7 378
-20	5 300 000 000	5 300 012 945	12 945
-10		5 300 019 388	19 388
0		5 300 018 151	18 151
10		5 300 015 659	15 659
20		5 299 999 321	- 679
30		5 299 991 861	-8 139
40		5 299 988 149	-11 851
50		5 299 991 348	-8 652
60		5 300 007 685	7 685
-20	5 320 000 000	5 320 012 916	12 916
-10		5 320 019 376	19 376
0		5 320 018 093	18 093
10		5 320 015 636	15 636
20		5 319 999 037	- 963
30		5 319 991 706	-8 294
40		5 319 987 972	-12 028
50		5 319 991 330	-8 670
60		5 320 007 467	7 467

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10: 2013)

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12.6 Test Data for U-NII-2C

-. Result : Pass

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (Hz)
-20	5 500 000 000	5 500 013 162	13 162
-10		5 500 020 053	20 053
0		5 500 018 711	18 711
10		5 500 016 036	16 036
20		5 499 999 609	- 391
30		5 499 991 518	-8 482
40		5 499 987 493	-12 507
50		5 499 991 304	-8 696
60		5 500 007 264	7 264
-20	5 580 000 000	5 580 013 287	13 287
-10		5 580 020 297	20 297
0		5 580 019 431	19 431
10		5 580 016 195	16 195
20		5 579 999 018	- 982
30		5 579 991 515	-8 485
40		5 579 987 314	-12 686
50		5 579 991 215	-8 785
60		5 580 007 120	7 120
-20	5 700 000 000	5 700 013 561	13 561
-10		5 700 020 720	20 720
0		5 700 019 591	19 591
10		5 700 016 633	16 633
20		5 699 999 118	- 882
30		5 699 991 432	-8 568
40		5 699 986 925	-13 075
50		5 699 991 027	-8 973
60		5 700 007 487	7 487

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10: 2013)

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12.7 Test Data for U-NII-3

-. Result : Pass

Temperature (˚C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	**Frequency Error (Hz)**
-20	5 745 000 000	5 745 013 880	13 880
-10		5 745 020 934	20 934
0		5 745 019 715	19 715
10		5 745 016 657	16 657
20		5 744 999 182	- 818
30		5 744 991 225	-8 775
40		5 744 986 795	-13 205
50		5 744 990 933	-9 067
60		5 745 007 241	7 241
-20	5 785 000 000	5 785 013 563	13 563
-10		5 785 020 977	20 977
0		5 785 020 232	20 232
10		5 785 016 714	16 714
20		5 784 999 085	- 915
30		5 784 991 247	-8 753
40		5 784 986 591	-13 409
50		5 784 990 789	-9 211
60		5 785 006 335	6 335
-20	5 825 000 000	5 825 014 245	14 245
-10		5 825 021 228	21 228
0		5 825 019 824	19 824
10		5 825 016 970	16 970
20		5 824 999 194	- 806
30		5 824 991 240	-8 760
40		5 824 986 544	-13 456
50		5 824 990 881	-9 119
60		5 825 007 326	7 326

Note : While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.(ANSI C63.10: 2013)

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13. FREQUENCY STABILITY WITH VOLTAGE VARIATION

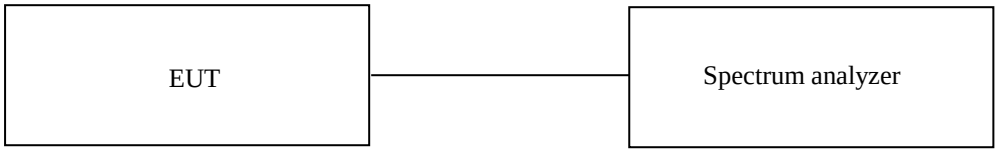
13.1 Operating environment

Temperature : 23 °C

Relative humidity : 46 % R.H.

13.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 110.0 % of the nominal value and then was reduced to 90.0 % of nominal voltage. The output frequency was recorded at each step.



13.3 Test Date

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13.4 Test Data for U-NII-1

-. Result : Pass

Voltage (VDC)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (Hz)
3.70	5 180 000 000	5 180 000 537	537
3.33		5 180 000 423	423
4.07		5 180 000 625	625
3.70	5 220 000 000	5 220 000 638	638
3.33		5 220 000 533	533
4.07		5 220 000 468	468
3.70	5 240 000 000	5 240 000 663	663
3.33		5 240 000 846	846
4.07		5 240 000 593	593

13.5 Test Data for U-NII-2A

-. Result : Pass

Voltage (VDC)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (Hz)
3.70	5 260 000 000	5 260 000 717	717
3.33		5 260 000 853	853
4.07		5 260 000 612	612
3.70	5 300 000 000	5 300 000 716	716
3.33		5 300 000 551	551
4.07		5 300 000 463	463
3.70	5 320 000 000	5 320 000 525	525
3.33		5 320 000 465	465
4.07		5 320 000 682	682

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13.6 Test Data for U-NII-2C

-. Result : Pass

Voltage (VDC)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (Hz)
3.70	5 500 000 000	5 500 000 352	352
3.33		5 500 000 449	449
4.07		5 500 000 532	532
3.70	5 580 000 000	5 580 000 491	491
3.33		5 580 000 381	381
4.07		5 580 000 536	536
3.70	5 700 000 000	5 700 000 376	376
3.33		5 700 000 483	483
4.07		5 700 000 519	519

13.7 Test Data for U-NII-3

-. Result : Pass

Voltage (VDC)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Frequency Error (Hz)
3.70	5 745 000 000	5 745 000 341	341
3.33		5 745 000 406	406
4.07		5 745 000 384	384
3.70	5 785 000 000	5 785 000 268	268
3.33		5 785 000 315	315
4.07		5 785 000 429	429
3.70	5 825 000 000	5 825 000 353	353
3.33		5 825 000 302	302
4.07		5 825 000 467	467

14. RADIATED SPURIOUS EMISSIONS

14.1 Operating environment

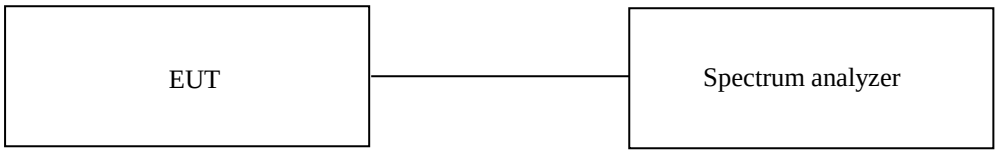
Temperature : 23 °C

Relative humidity : 46 % R.H.

14.2 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 40 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.



14.3 Test Date

January 19, 2024 ~ February 22, 2024

14.4 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.									

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14.5 Test data for 30 MHz ~ 1 000 MHz

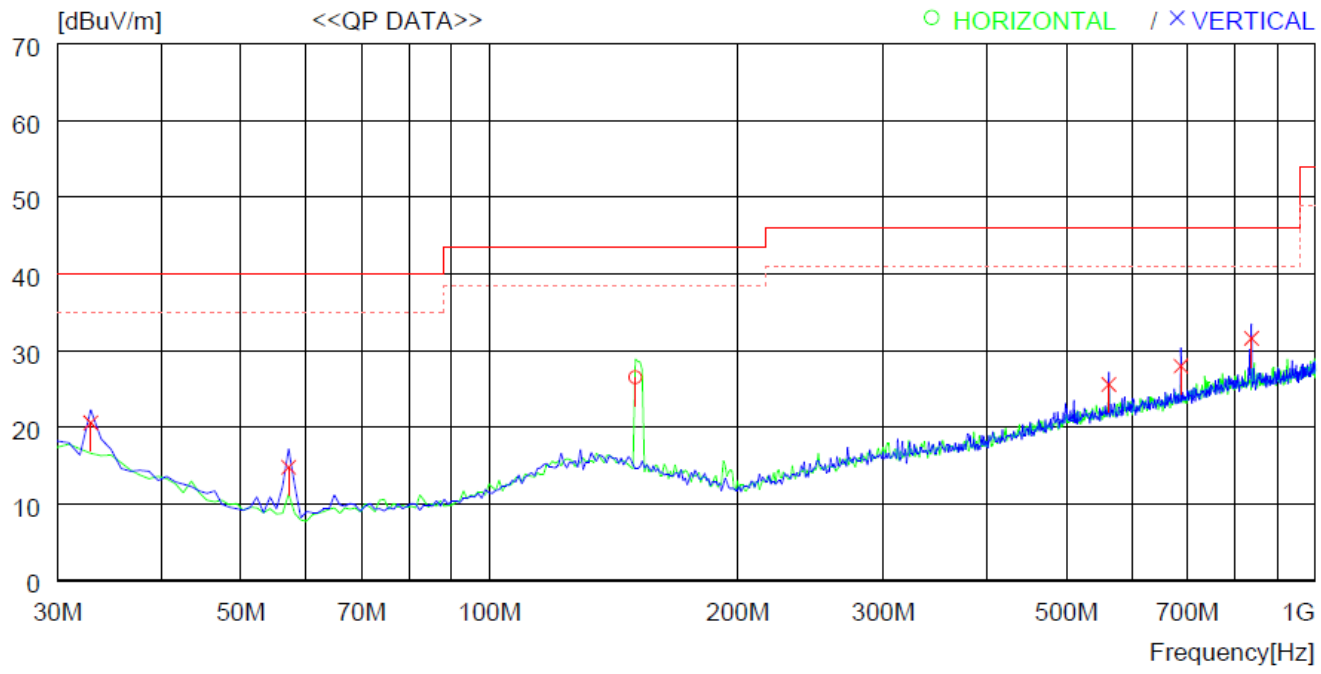
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.247

Result : PASSED

EUT : ATOZ R3

Test mode : Worst case (UNII 3 / a mode / High CH)

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



No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal ------										
1	150.280	38.4	18.4	1.8	32.1	26.5	43.5	17.0	400	157
----- Vertical ------										
2	32.910	31.6	20.2	0.9	32.1	20.6	40.0	19.4	200	359
3	57.160	33.5	12.3	1.1	32.1	14.8	40.0	25.2	200	294
4	562.529	30.5	23.7	3.7	32.3	25.6	46.0	20.4	400	5
5	687.655	31.2	25.2	4.0	32.4	28.0	46.0	18.0	200	359
6	837.031	32.1	27.2	4.5	32.2	31.6	46.0	14.4	200	359

14.6 Test data for Above 1 GHz

14.6.1 Test data for Frequency UNII I

14.6.1.1 Test data for 802.11a RLAN Mode

-. Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 40 GHz

-. Measurement distance : 3 m

-. Duty Cycle : > 98 %

-. Operating mode : Transmitting mode

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										
10 363.36	49.26	Peak	H	39.45	10.01	42.10	-	56.62	68.20	11.58
10 350.41	50.25	Peak	V	39.40	10.01	42.10	-	57.56	68.20	10.64
Test Data for Middle Channel										
10 444.22	50.68	Peak	H	39.87	10.01	42.10	-	58.46	68.20	9.74
10 435.03	51.10	Peak	V	39.81	10.01	42.10	-	58.82	68.20	9.38
Test Data for High Channel										
10 485.00	49.91	Peak	H	39.97	9.80	42.10	-	57.58	68.20	10.62
10 487.23	51.28	Peak	V	39.97	9.80	42.10	-	58.95	68.20	9.25

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

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

14.6.2 Test data for Frequency UNII 2A

14.6.2.1 Test data for 802.11a RLAN Mode

-. Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 40 GHz

-. Measurement distance : 3 m

-. Duty Cycle : > 98 %

-. Operating mode : Transmitting mode

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										
10 517.38	49.88	Peak	H	39.97	9.80	42.10	-	57.55	68.20	10.65
10 514.75	49.89	Peak	V	39.97	9.80	42.10	-	57.56	68.20	10.64
Test Data for Middle Channel										
10 590.73	49.07	Peak	H	39.82	9.88	42.10	-	56.67	74.00	17.33
10 597.96	36.74	Average	H	39.80	9.88	42.10	-	44.32	54.00	9.68
10 607.87	48.78	Peak	V	39.80	9.88	42.10	-	56.36	74.00	17.64
10 591.15	36.43	Average	V	39.82	9.88	42.10	-	44.03	54.00	9.97
Test Data for High Channel										
10 635.49	48.49	Peak	H	39.80	9.88	42.10	-	56.07	74.00	17.93
10 641.54	36.39	Average	H	39.80	9.88	42.10	-	43.97	54.00	10.03
10 639.60	48.77	Peak	V	39.80	9.88	42.10	-	56.35	74.00	17.65
10 641.64	36.46	Average	V	39.80	9.88	42.10	-	44.04	54.00	9.96

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

Margin (dB) = Limits (dBµV/m) - Emission Level (dBµV/m)

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14.6.3 Test data for Frequency UNII 2C

14.6.3.1 Test data for 802.11a RLAN Mode

-. Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 40 GHz

-. Measurement distance : 3 m

-. Duty Cycle : > 98 %

-. Operating mode : Transmitting mode

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										
11 002.66	47.91	Peak	H	40.29	10.03	42.10	-	56.13	74.00	17.87
10 991.25	35.67	Average	H	40.30	10.03	42.10	-	43.90	54.00	10.10
11 005.83	48.20	Peak	V	40.29	10.03	42.10	-	56.42	74.00	17.58
11 005.18	35.65	Average	V	40.29	10.03	42.10	-	43.87	54.00	10.13
Test Data for Middle Channel										
11 157.02	50.55	Peak	H	39.87	9.95	42.07	-	58.30	74.00	15.70
11 156.76	38.34	Average	H	39.87	9.95	42.07	-	46.09	54.00	7.91
11 159.98	50.80	Peak	V	39.86	9.95	42.07	-	58.54	74.00	15.46
11 151.69	38.24	Average	V	39.89	9.95	42.07	-	46.01	54.00	7.99
Test Data for High Channel										
11 396.08	48.89	Peak	H	39.90	9.98	42.02	-	56.75	74.00	17.25
11 393.53	37.01	Average	H	39.90	9.98	42.02	-	44.87	54.00	9.13
11 409.53	49.71	Peak	V	39.92	9.98	42.02	-	57.59	74.00	16.41
11 394.07	36.63	Average	V	39.90	9.98	42.02	-	44.49	54.00	9.51

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

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

14.6.4 Test data for Frequency UNII 3

14.6.4.1 Test data for 802.11a RLAN Mode

-. Resolution bandwidth : 1 MHz and Peak Detector for Peak Mode for the emissions fall in restricted band,
1 MHz and RMS Detector for Average Mode for the emissions fall in restricted band
100 kHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 40 GHz

-. Measurement distance : 3 m

-. Duty Cycle : > 98 %

-. Operating mode : Transmitting mode

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										
11 486.66	48.82	Peak	H	40.15	10.12	42.00	-	57.09	74.00	16.91
11 493.64	36.13	Average	H	40.17	10.12	42.00	-	44.42	54.00	9.58
11 487.20	48.24	Peak	V	40.15	10.12	42.00	-	56.51	74.00	17.49
11 487.66	36.45	Average	V	40.15	10.12	42.00	-	44.72	54.00	9.28
Test Data for Middle Channel										
11 571.32	48.24	Peak	H	40.06	10.14	41.99	-	56.45	74.00	17.55
11 565.05	36.01	Average	H	40.07	10.14	41.99	-	44.23	54.00	9.77
11 571.14	48.36	Peak	V	40.06	10.14	41.99	-	56.57	74.00	17.43
11 564.43	36.01	Average	V	40.07	10.14	41.99	-	44.23	54.00	9.77
Test Data for High Channel										
11 650.42	47.16	Peak	H	39.60	10.17	41.97	-	54.96	74.00	19.04
11 658.45	35.18	Average	H	39.55	10.17	41.97	-	42.93	54.00	11.07
11 650.28	47.21	Peak	V	39.60	10.17	41.97	-	55.01	74.00	18.99
11 658.29	35.21	Average	V	39.55	10.17	41.97	-	42.96	54.00	11.04

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

Margin (dB) = Limits (dBμV/m) - Emission Level (dBμV/m)

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15. RADIATED RESTRICTED BAND EDGE MEASUREMENTS

15.1 Operating environment

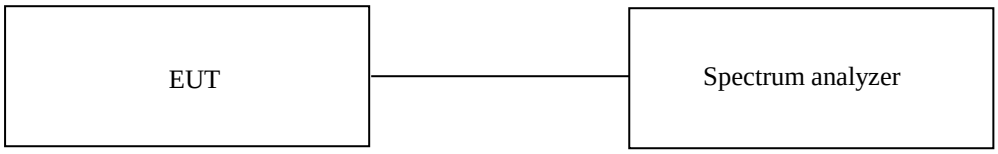
Temperature : 23 °C

Relative humidity : 46 % R.H.

15.2 Test set-up

The radiated emissions measurements were performed on the 3 m, open-field test site. The EUT was placed on a non-conductive turntable above the ground plane.

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.



15.3 Test Date

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15.4 Test data for Frequency UNII I

15.4.1 Test data for 802.11a RLAN Mode

-. 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 : > 98 %

-. 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)
5 072.33	49.85	Peak	H	31.88	6.50	41.79	10.45	-	56.89	74.00	17.11
5 106.97	39.04	Average	H	32.07	6.50	41.78	10.47	-	46.30	54.00	7.70
4 580.50	50.94	Peak	V	30.76	6.18	41.88	10.47	-	56.47	74.00	17.53
4 965.00	38.86	Average	V	31.23	6.32	41.81	10.47	-	45.07	54.00	8.93

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – AMP Gain + ATT + Duty Factor

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15.5 Test data for Frequency UNII 2A

15.5.1 Test data for 802.11a RLAN Mode

-. 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 : > 98 %

-. 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)
5 415.45	49.68	Peak	H	31.59	6.57	41.72	10.47	-	56.59	74.00	17.41
5 414.48	38.29	Average	H	31.59	6.57	41.72	10.47	-	45.20	54.00	8.80
5 443.15	49.92	Peak	V	31.76	6.58	41.71	10.46	-	57.01	74.00	16.99
5 419.93	38.83	Average	V	31.62	6.57	41.72	10.47	-	45.77	54.00	8.23

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – AMP Gain + ATT + Duty Factor

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15.6 Test data for Frequency UNII 2C

15.6.1 Test data for 802.11a RLAN Mode

-. 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 : > 98 %

-. 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)
5 441.93	49.46	Peak	H	31.75	6.58	41.71	10.46	-	56.54	74.00	17.46
5 447.93	38.46	Average	H	31.79	6.58	41.71	10.46	-	45.58	54.00	8.42
5 369.41	49.64	Peak	V	31.44	6.55	41.73	10.48	-	56.38	74.00	17.62
5 446.58	38.68	Average	V	31.78	6.58	41.71	10.46	-	45.79	54.00	8.21

Tabulated test data for Restricted Band

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

Margin (dB) = Limits (dBµV/m) - Total Level (dBµV/m)

Total Level = Reading + Antenna Factor + Cable Loss – AMP Gain + ATT + Duty Factor

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15.7 Test data for Frequency U-NII-3

15.7.1 Test data for 802.11a RLAN Mode

-. 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 : > 98 %

-. 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)
Low Channel											
5 651.07	48.08	Peak	H	31.90	6.79	41.70	10.46	-	55.53	68.99	13.46
5 700.25	48.36	Peak	H	31.90	6.79	41.70	10.46	-	55.81	105.27	49.46
5 720.00	48.13	Peak	H	31.90	6.79	41.70	10.46	-	55.58	110.80	55.22
5 854.84	48.47	Peak	H	32.40	6.83	41.70	10.47	-	56.47	111.17	54.70
5 874.17	48.19	Peak	H	32.50	6.83	41.70	10.47	-	56.29	105.43	49.14
5 924.78	47.10	Peak	H	32.50	6.83	41.70	10.47	-	55.20	68.37	13.17
5 650.17	47.90	Peak	V	31.90	6.79	41.70	10.46	-	55.35	68.33	12.98
5 700.15	48.11	Peak	V	31.90	6.79	41.70	10.46	-	55.56	105.24	49.68
5 720.10	50.30	Peak	V	31.90	6.79	41.70	10.46	-	57.75	111.03	53.28
5 854.84	48.10	Peak	V	32.40	6.83	41.70	10.47	-	56.10	111.15	55.05
5 872.43	47.94	Peak	V	32.50	6.83	41.70	10.47	-	56.04	105.92	49.88
5 924.83	48.39	Peak	V	32.50	6.83	41.70	10.47	-	56.49	68.33	11.84

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High Channel											
5 650.62	47.78	Peak	H	31.90	6.79	41.70	10.46	-	55.23	68.66	13.43
5 700.65	49.31	Peak	H	31.90	6.79	41.70	10.46	-	56.76	105.38	48.62
5 720.07	48.13	Peak	H	31.90	6.79	41.70	10.46	-	55.58	110.96	55.38
5 854.84	49.26	Peak	H	32.40	6.83	41.70	10.47	-	57.26	111.17	53.91
5 872.67	48.78	Peak	H	32.50	6.83	41.70	10.47	-	56.88	105.85	48.97
5 924.98	47.22	Peak	H	32.50	6.83	41.70	10.47	-	55.32	68.22	12.90
5 651.82	47.09	Peak	V	31.90	6.79	41.70	10.46	-	54.54	69.55	15.01
5 703.81	48.89	Peak	V	31.90	6.79	41.70	10.46	-	56.34	106.26	49.92
5 720.08	47.34	Peak	V	31.90	6.79	41.70	10.46	-	54.79	110.97	56.18
5 854.78	47.70	Peak	V	32.40	6.83	41.70	10.47	-	55.70	111.29	55.59
5 872.37	47.84	Peak	V	32.50	6.83	41.70	10.47	-	55.94	105.93	49.99
5 924.33	46.91	Peak	V	32.50	6.83	41.70	10.47	-	55.01	68.70	13.69

Tabulated test data for Restricted Band

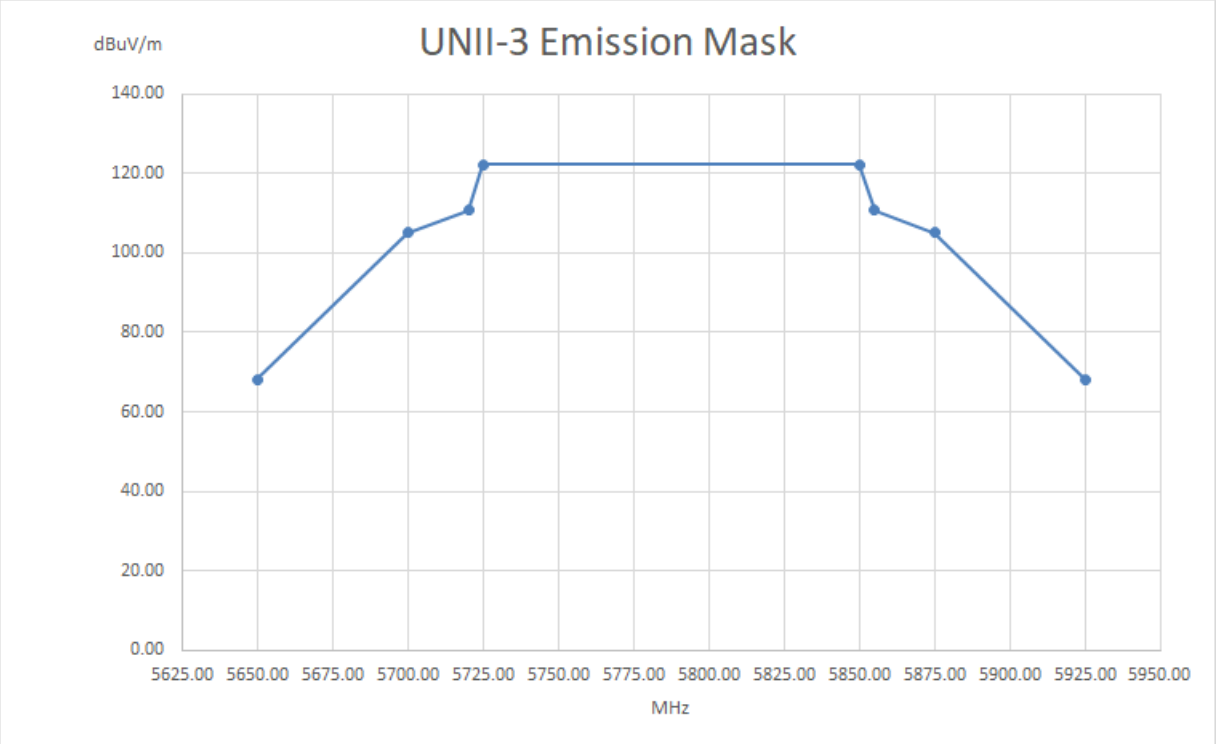
Remark: “H”: Horizontal, “V”: Vertical

Margin (dB) = Limits (dBμV/m) - Total Level (dBμV/m)

Total Level = Reading + Antenna Factor + Cable Loss – AMP Gain + ATT + Duty Factor

15.7.2 U-NII-3 Emission Limits

15.7.2.1 Emission Mask Plots



Remark.

-. Title 47 → Part 15 → Subpart E—UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE DEVICES

§ 15.407 General technical requirements.

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

16. CONDUCTED EMISSION TEST

16.1 Operating environment

Temperature : 23 °C

Relative humidity : 46 % R.H.

16.2 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 μH + 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.

16.3 Test Date

January 19, 2024 ~ February 22, 2024

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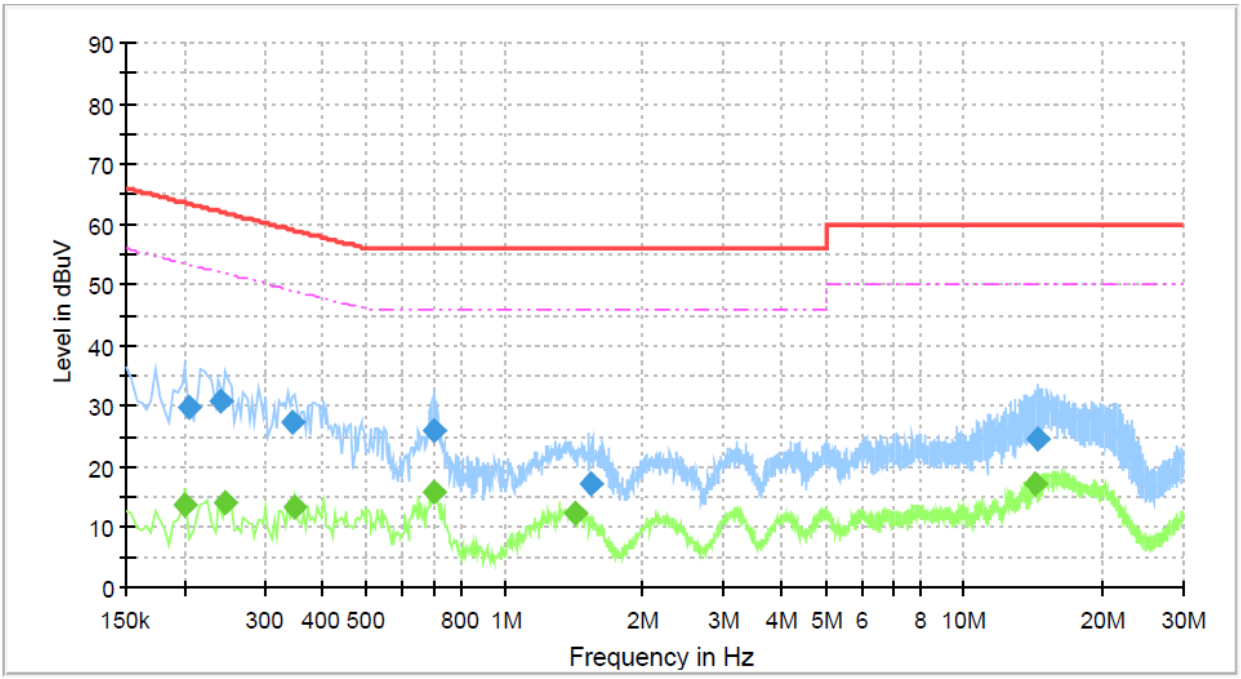
16.4 Test data

-. Resolution bandwidth : 9 kHz

-. Frequency range : 0.15 MHz ~ 30 MHz

-. Test mode : Worst case (UNII 3 / a mode / High CH)

-. Tested Line : HOT LINE



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.202	---	13.80	53.55	39.75	3000.0	9.0	L1	10.22
0.206	29.74	---	63.39	33.64	3000.0	9.0	L1	10.22
0.241	30.80	---	62.04	31.25	3000.0	9.0	L1	10.21
0.246	---	13.93	51.91	37.97	3000.0	9.0	L1	10.21
0.346	27.18	---	59.07	31.89	3000.0	9.0	L1	10.21
0.350	---	13.26	48.97	35.71	3000.0	9.0	L1	10.21
0.703	25.96	---	56.00	30.04	3000.0	9.0	L1	10.24
0.703	---	15.73	46.00	30.27	3000.0	9.0	L1	10.24
1.416	---	12.11	46.00	33.89	3000.0	9.0	L1	10.28
1.535	17.12	---	56.00	38.88	3000.0	9.0	L1	10.29
14.259	---	17.10	50.00	32.90	3000.0	9.0	L1	10.88
14.385	24.52	---	60.00	35.48	3000.0	9.0	L1	10.89

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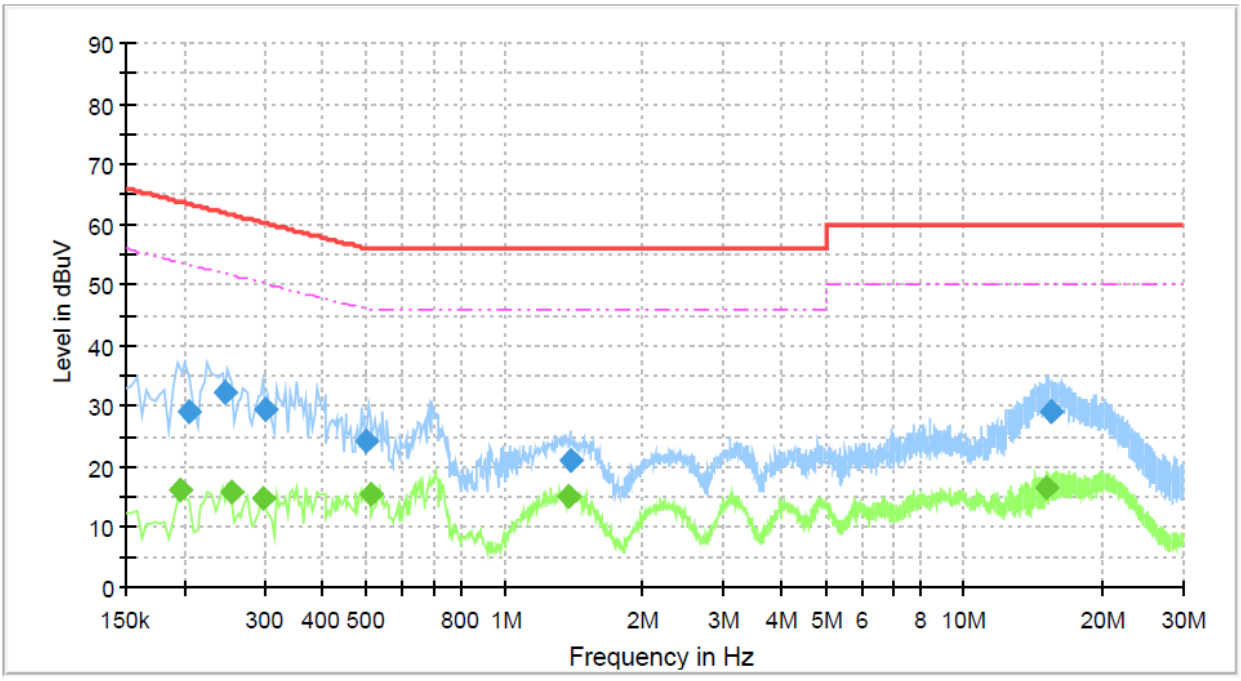
-. Tested Line : NEUTRAL LINE



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.198	---	16.17	53.72	37.54	3000.0	9.0	N	10.24
0.207	28.93	---	63.35	34.41	3000.0	9.0	N	10.24
0.246	32.09	---	61.91	29.82	3000.0	9.0	N	10.22
0.254	---	15.70	51.64	35.94	3000.0	9.0	N	10.22
0.298	---	14.59	50.31	35.72	3000.0	9.0	N	10.21
0.303	29.27	---	60.17	30.90	3000.0	9.0	N	10.21
0.501	24.26	---	56.00	31.74	3000.0	9.0	N	10.22
0.509	---	15.25	46.00	30.75	3000.0	9.0	N	10.22
1.376	---	15.15	46.00	30.85	3000.0	9.0	N	10.28
1.396	20.88	---	56.00	35.12	3000.0	9.0	N	10.28
15.141	---	16.40	50.00	33.60	3000.0	9.0	N	10.94
15.377	28.97	---	60.00	31.04	3000.0	9.0	N	10.95

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.

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17. DYNAMIC FREQUENCY SELECTION (DFS)

17.1 Operating environment

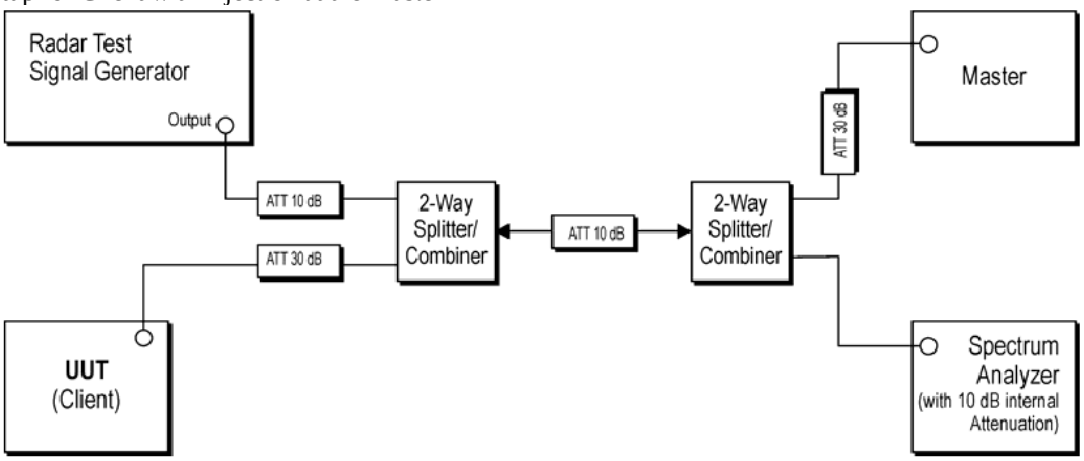
Temperature : 23 °C

Relative humidity : 46 % R.H.

17.2 Test set-ups

The FCC 06-96 and RSS-210 A9.3 describes a conducted test setup. A conducted test setup was user this testing. Figure 1 shows the typical test setup. Each one channel selected between 5 250 MHz and 5 350 MHz, 5 470 MHz and 5 725 MHz is chosen for the testing.

Figure 1. Setup for Client with injection at the Master



The operational behavior and individual DFS requirements that are associated with these modes are as follows:

<Master Devices>

a) The Master Device will use DFS in order to detect Radar Waveforms with received signal strength above the DFS Detection Threshold in the 5 250 – 5 350 MHz and 5 470 – 5 725 MHz bands. DFS is not required in the 5 150 – 5 250 MHz or 5 725 – 5 825 MHz bands.

b) Before initiating a network on a Channel, the Master Device will perform a Channel Availability Check for a specified time duration (Channel Availability Check Time) to ensure that there is no radar system operating on the Channel, using DFS described under subsection a) above.

c) The Master Device initiates a U-NII network by transmitting control signals that will enable other U-NII devices to Associate with the Master Device.

d) During normal operation, the Master Device will monitor the Channel (In-Service Monitoring) to ensure that there is no radar system operating on the Channel, using DFS described under a).

e) If the Master Device has detected a Radar Waveform during In-Service Monitoring as described under d), the Operating Channel of the U-NII network is no longer an Available Channel. The Master Device will instruct all associated Client Device(s) to stop transmitting on this Channel within the Channel Move Time. The transmissions during the Channel Move Time will be limited to the Channel Closing Transmission Time.

f) Once the Master Device has detected a Radar Waveform it will not utilize the Channel for the duration of the Non-Occupancy Period. 3

g) If the Master Device delegates the In-Service Monitoring to a Client Device, then the combination will be tested to the requirements described under d) through f) above.

<Client Devices>

a) A Client Device will not transmit before having received appropriate control signals from a Master Device.

b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.

c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.

d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.

e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.

<Channel Connection Information>

a) Master Devices : RT-AX88U

b) Client(=EUT) Devices : SB530-SW

c) Connect to test channel : See next page for measurement data.

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17.3 DFS Test Signals

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of Pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18	See Note 1	See Note 1
1	1	Test A: 15 unique PRI values randomly selected from the list of 23 PRI values in Table 5a	Roundup $\left\{\left(\frac{1}{360}\right)\cdot\left(\frac{19\cdot 10^6}{PRI_{\mu sec}}\right)\right\}$	60%	30
		Test B: 15 unique PRI values randomly selected within the range of 518-3066 μ sec, with a minimum increment of 1 μ sec, excluding PRI values selected in Test A			
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Table 6 – Long Pulse Radar Test Waveform

Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per *Burst*	Number of *Bursts*	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

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17.4 Technical Requirement Specification

Table 1: Applicability of DFS Requirements Prior to Use of a Channel

Requirement	Operational Mode		
	Master	**Client (without DFS)**	**Client (with DFS)**
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Table 2: Applicability of DFS requirements during normal operation

Requirement	Operational Mode		
	Master	**Client** (without DFS)	**Client** (with DFS)
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

17.5 Test Date

January 19, 2024 ~ February 22, 2024

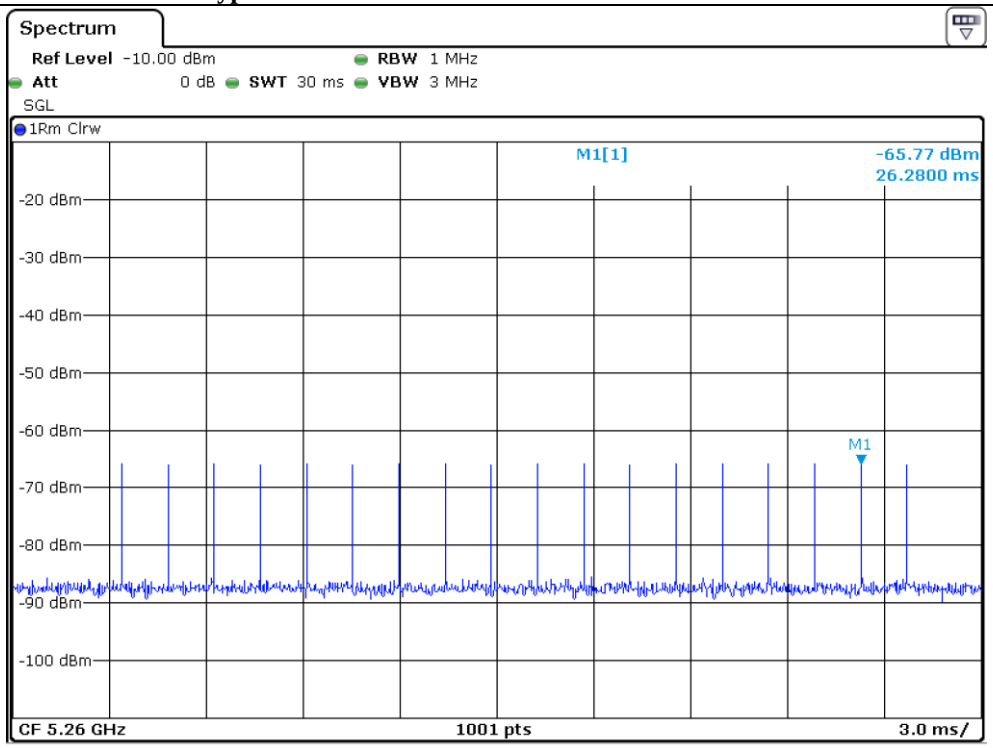
17.6 Test data

Band	Frequency (MHz)	Channel move time(s)		Channel closing transmission time(ms)	
		Measured	Limit	Measured	Limit
UNII 2A	5 260.00	0.80	10.00	6.80	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period.
UNII 2C	5 500.00	0.90		7.65	

Note. Channel closing transmission time: 8 * 0.85 ms = 6.80 ms / 9 * 0.85 ms = 7.65 ms

17.6.1 UNII 2A

17.6.1.1 Plot of Radar waveform type 0



Note: The calibrated conducted DFS detection threshold level is set to -65.77 dBm (-62+1-0.05= -61.05 dBm)

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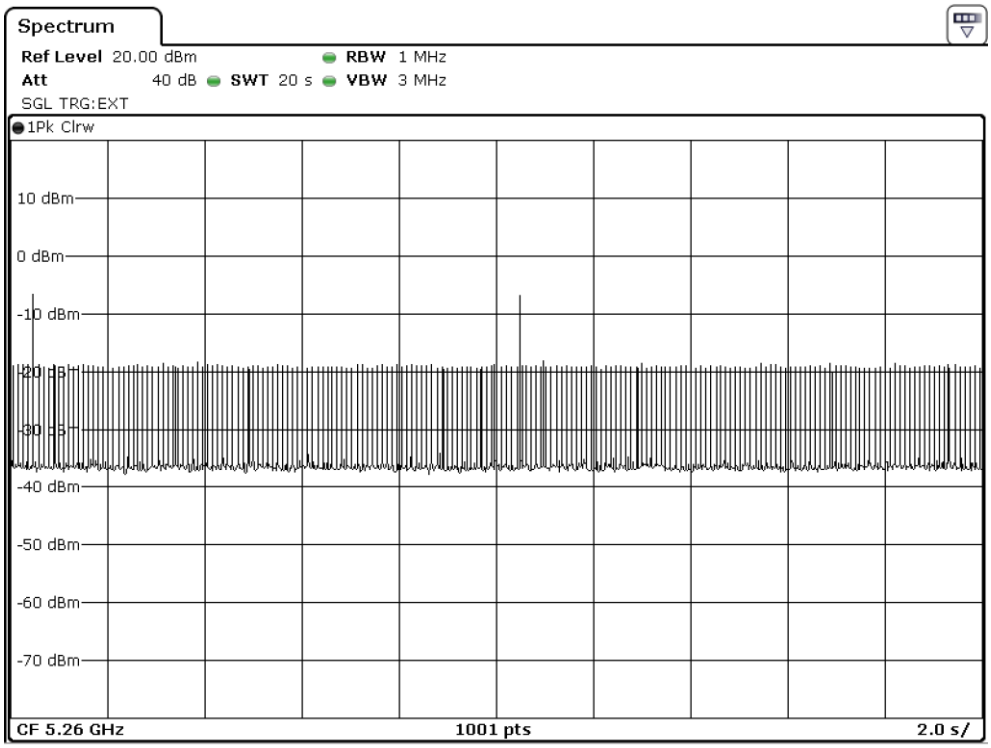
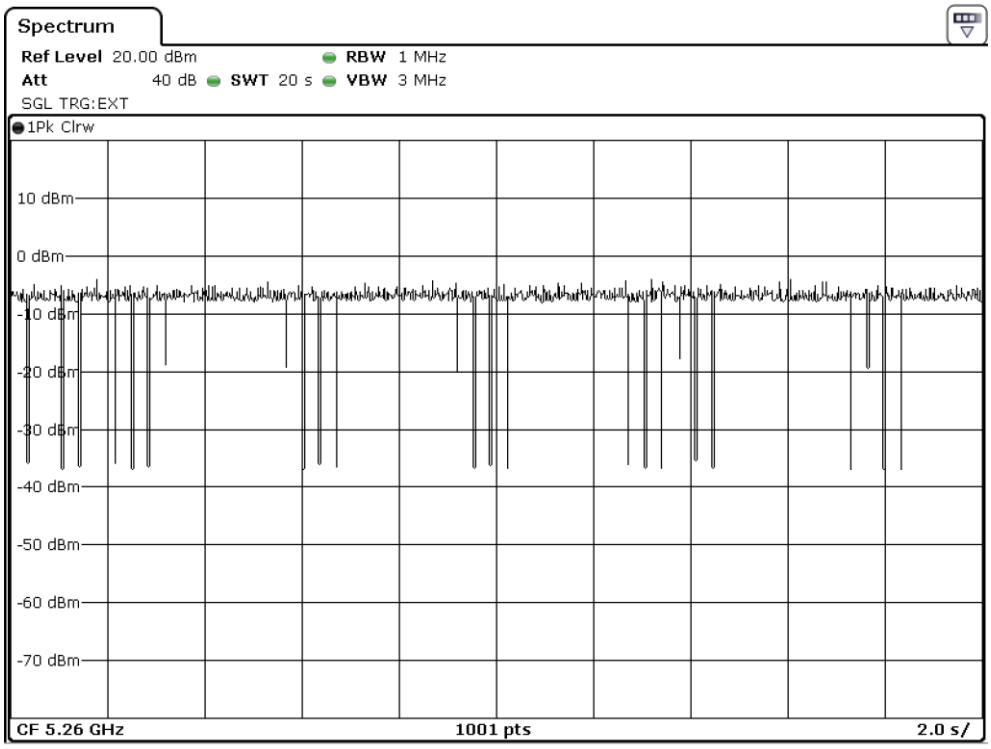
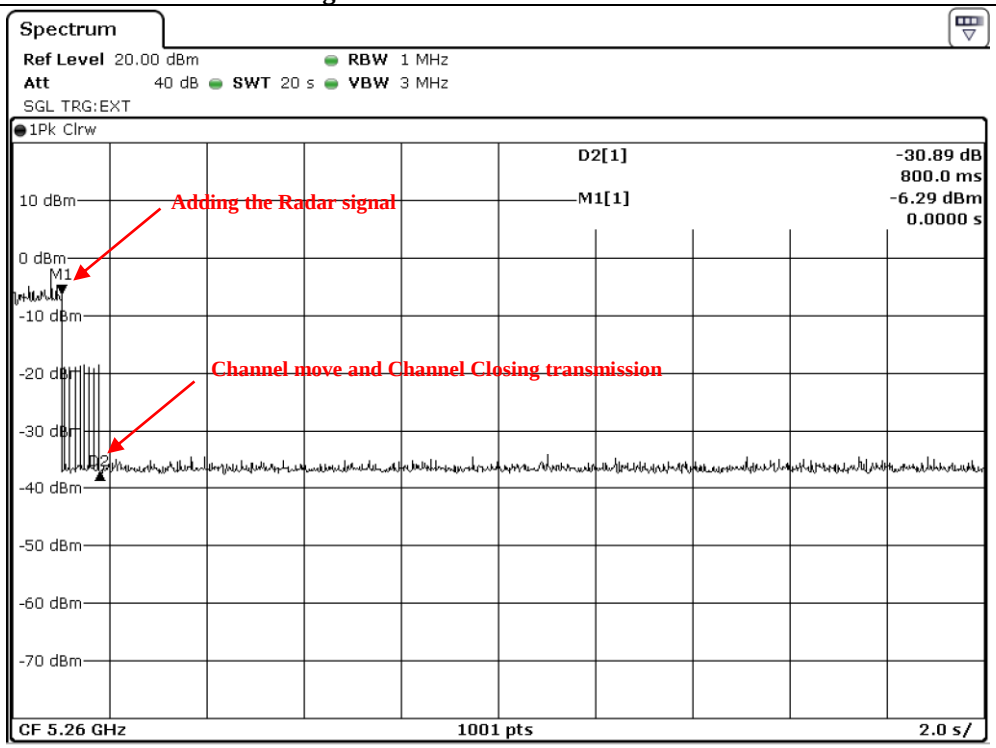
17.6.1.2 No traffic signal(master signal)



17.6.1.3 Client(EUT) Data Traffic Signal



17.6.1.4 Channel move and Channel Closing transmission time



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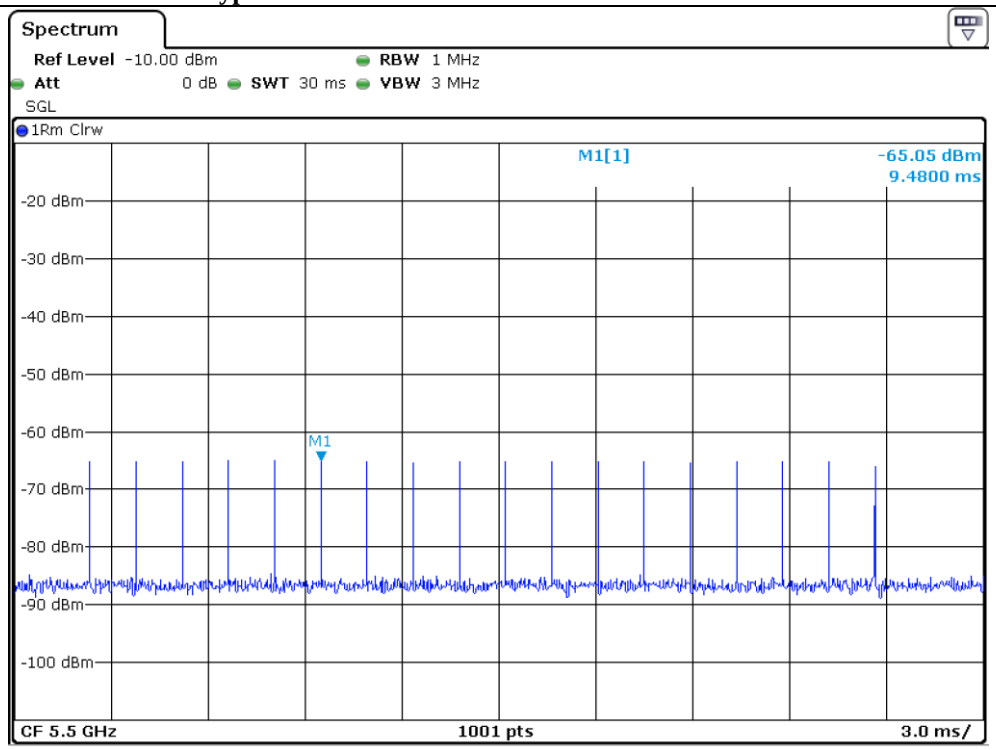
17.6.2 UNII 2C

17.6.2.1 Plot of Radar waveform type 0



Note: The calibrated conducted DFS detection threshold level is set to -65.05 dBm (-62+1-0.75= -61.75 dBm)

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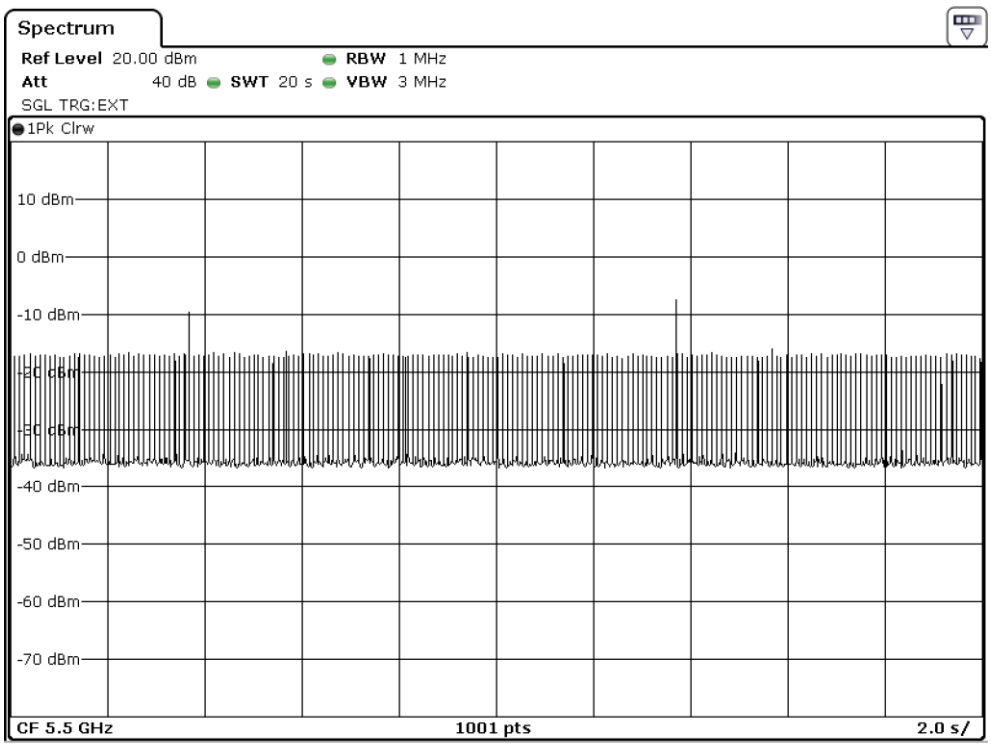
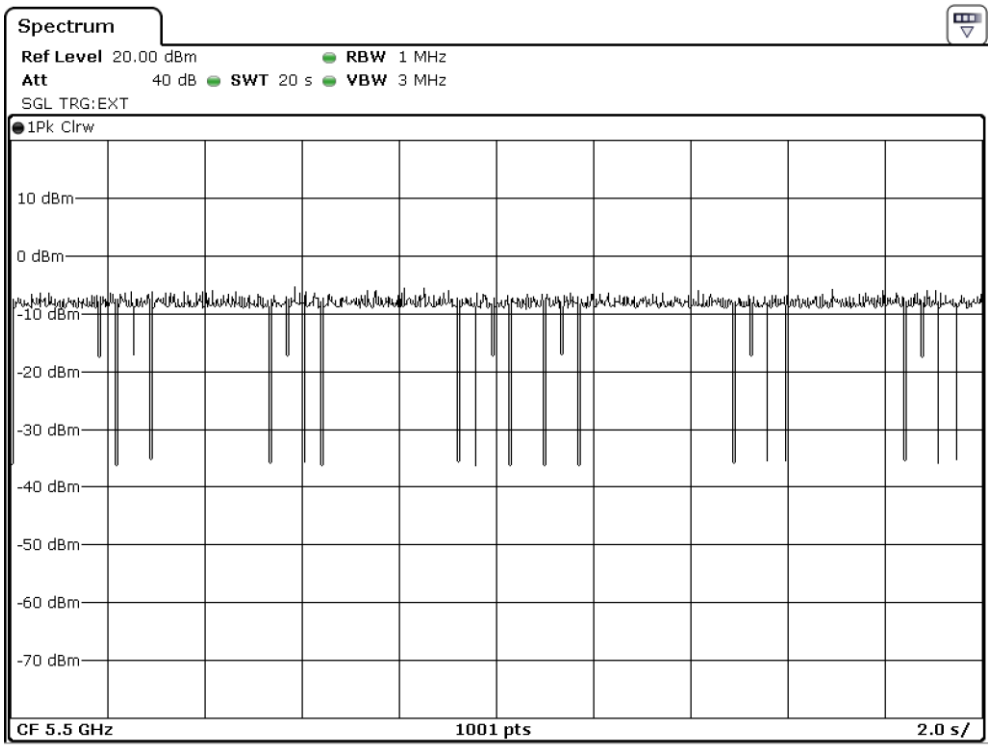
17.6.2.2 No traffic signal(master signal)



17.6.2.3 Client(EUT) Data Traffic Signal



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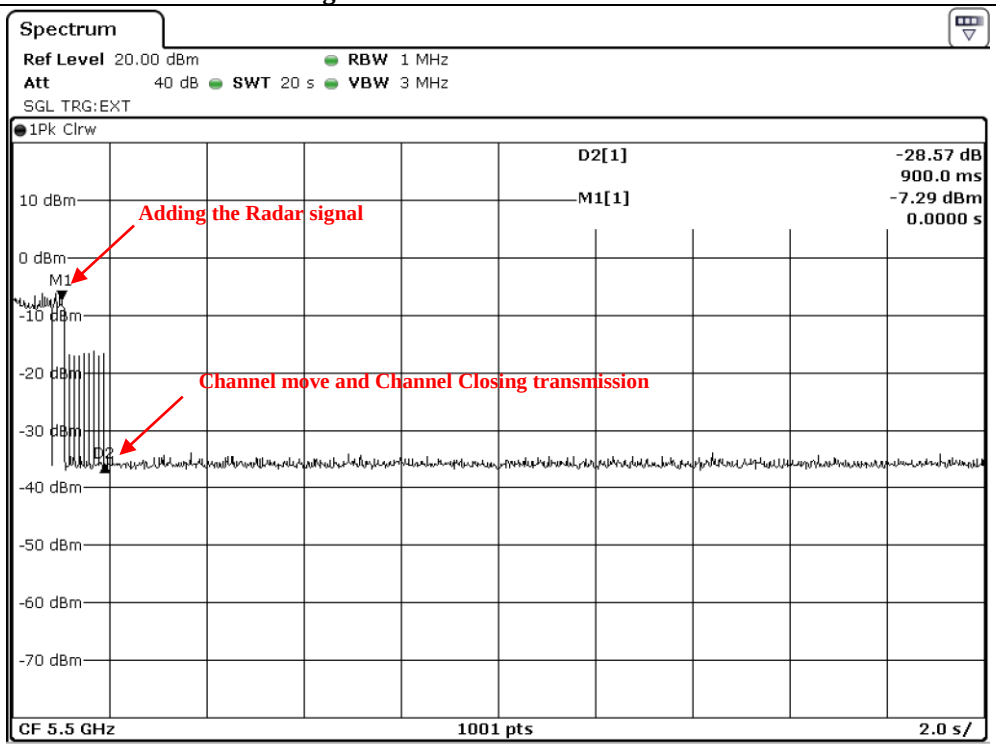
17.6.2.4 Channel move and Channel Closing transmission time



ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

18. LIST OF TEST EQUIPMENT

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)
FSV40-N	Rohde & Schwarz	Signal Analyzer	102196	Jan. 15, 2024 (1Y)
FSV40-N	Rohde & Schwarz	Signal Analyzer	101651	Jan. 15, 2024 (1Y)
H-3005D	FinePower	DC POWER SUPPLY	FP09092008	Jan. 15, 2024 (1Y)
ESR	Rohde & Schwarz	EMI Test Receiver	101470	Jun. 16, 2023 (1Y)
310N	Sonoma Instrument	Pre-Amplifier	312544	Mar. 14, 2023 (1Y)
SCU18	Rohde & Schwarz	Pre-Amplifer	102266	Jul. 11, 2023 (1Y)
SCU40A	Rohde & Schwarz	Pre-Amplifer	100436	Jan. 23, 2024 (1Y)
DT3000	Innco System	Turn Table	DT3000/093	N/A
MA4000-EP	Innco System	Antenna Master	MA4000/332/27030611/L	N/A
CO3000	Innco System	Controller	CO3000/904/37211215/L	N/A
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2022 (2Y)
HLP-2008	TDK	Hybrid Antenna	131316	Mar. 07, 2022 (2Y)
BBHA9120D	Schwarzbeck	Horn Antenna	9120D-1349	Jul. 04, 2023 (1Y)
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 04, 2024 (1Y)
WRCT 890/960-5/40-8SSK	Wainwright Instruments GmbH	Tunable Band Reject Filter	7	Jul. 11, 2023 (1Y)
F-40-10.0-RF	RLC Electronis	High Pass Filter	0427	Jan. 15, 2024 (1Y)
HPF 3GHz	Rohde & Schwarz	High Pass Filter	N/A	Jan. 15, 2024 (1Y)
HPF 1.5GHz	Rohde & Schwarz	High Pass Filter	N/A	Jan. 15, 2024 (1Y)
10 dB Attenuator	Rohde & Schwarz	10 dB Attenuator	14100882-4	Jul. 11, 2023 (1Y)
8493C	HP	6 dB Attenuator	01925	Jul. 11, 2023 (1Y)
ESR 3	Rohde & Schwarz	EMI TEST RECEIVER	102602	Mar. 15, 2023 (1Y)
NSLK8126	Schwarzbeck	LISN	8126404	Mar. 15, 2023 (1Y)
3825/2	EMCO	AMN	9109-1869	Mar. 15, 2023 (1Y)
VTSD 9561-F	Schwarzbeck	PULSE LIMITER	01337	Nov. 23, 2023 (1Y)
QFA1802-26-6-S	Qualwave	6 dB Attenuator	225338	Jan. 17, 2024 (1Y)
QPD2-0-26500-2-S	Qualwave	Divider	22175074	Jan. 17, 2024 (1Y)
QPD2-0-26500-2-S	Qualwave	Divider	22175075	Jan. 17, 2024 (1Y)
8494B	Agilent	Manual Attenuator	MY42143102	Jan. 15, 2024 (1Y)
8495B	Agilent	70dB ATTENUATOR	MY42141151	Jan. 15, 2024 (1Y)
SH-242	ESPEC	Temperature & Humidity Chamber	0093011138	Jan. 16, 2024 (1Y)
NRP-Z81	Rohde & Schwarz	Wideband Power Sensor	104811	Jan. 17, 2024 (1Y)

SMBV100A	Rohde & Schwarz	VECTOR SIGNAL GENERATOR	260423	Jan. 17, 2024 (1Y)
RT-AX88U	ASUS	Router	N/A	N/A

Note. Router(Model : RT-AX88U) Information.

; FCC ID : MSQ-RTAXHP00, IC ID : 3568A-RTAXHP00

Note. This Device not support TPC Function.

All test equipment used is calibrated on a regular basis.

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