



Test report No. : 4790218754-US-R2-V0
Page : 1 of 39
Issued date : 2022/7/15
FCC ID : 2APLE18300417

RADIO TEST REPORT

Product : Security Hub
Model Name : SH1001
FCC ID : 2APLE18300417
Test Regulation : FCC 47 CFR Part 15 Subpart C (Section 15.225)
Received Date : 2022/3/31
Test Date : 2022/3/31 ~ 2022/5/25
Issued Date : 2022/7/15

Applicant : Arlo Technologies Inc
2200 Faraday Avenue, Suite 150, Carlsbad, CA 92008, USA

Issued By : Underwriters Laboratories Taiwan Co., Ltd.
Building B and Building E, No. 372-7, Sec. 4, Zhongxing
Rd., Zhudong Township, Hsinchu County, Taiwan



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Doc No: 17-EM-F0875 / 5.0



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1. Attestation of Test Results

APPLICANT: Arlo Technologies Inc
 2200 Faraday Avenue, Suite 150, Carlsbad, CA 92008, USA

MANUFACTURER: Funing Precision Component co., Ltd
 Lot B, Que vo Industrial Zone.Nam Son Ward, Bac Ninh city, Bac Ninh province, Viet Nam

EUT DESCRIPTION: Security Hub

BRAND: Arlo

MODEL: SH1001

SAMPLE STAGE: Engineering Verification Test sample

DATE of TESTED: 2022/3/31 ~ 2022/5/25

APPLICABLE STANDARDS	
STANDARD	Test Results
FCC 47 CFR PART 15 Subpart C (Section 15.225)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Cindy Hsin
 Project Handler

Date : 2022/7/15

Approved and Authorized By:

Eric Lee
 Senior Laboratory Engineer

Date : 2022/7/15

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2. Summary of Test Results

FCC Clause	Test Item	Result
15.203	Antenna requirement	PASS
15.207	AC Power Conducted Emission	PASS
15.215 (c)	20dB Bandwidth	PASS
15.225 (a)	The field strength of any emissions within the band 13.553-13.567 MHz	PASS
15.225 (b)	The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	PASS
15.225 (c)	The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	PASS
15.225 (d)	The field strength of any emissions appearing outside of the 13.110-14.010 MHz band	PASS
15.225 (e)	The frequency tolerance	PASS

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3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB174176 D01 Line Conducted FAQ v01r01, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

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5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	± 3.1 dB
RF Conducted	9 kHz - 40GHz	± 1.9 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	± 1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	± 5.4 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	± 4.7 dB

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6. Equipment under Test

6.1. Description of EUT

Product	Security Hub
Brand Name	Arlo
Model Name	SH1001
Operating Frequency	13.56 MHz
Modulation	ASK
Normal Voltage	5Vdc from Adapter / 3.6Vdc from Battery
S/N	AB5U217LA00D0
Sample ID	Conducted Test: 4835381 Radiated Test: 4835380
Maximum Field Strength (dBuV/m)	20.9 dBuV/m

Note:

1. The EUT contains following accessory devices:

Product	Brand	Model	Description
AC Adapter	PIE	AD2158	Input: 100-240V, 50/60Hz, 0.3A Output: 5.0V, 2A
AC Adapter	CWT	2AEA010	Input: 100-240V, 50/60Hz, 0.3A Output: 5.0V, 2A
USB Cable	Nienyi	322-50018-01	Length: 2.5 m

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer specification or user manual.

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6.2. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Radiated Spurious Emission	966-2	20~26°C/ 50~70%RH	120Vac/ 60Hz	2022/03/31~ 2022/05/20	Rex Chen
AC power Line Conducted Emission	SR1	20~26°C/ 50~70%RH	120Vac/ 60Hz	2022/05/25~ 2022/05/25	Rex Chen

FCC Test Firm Registration Number: 498077

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6.3. Channel List

1 channels are provided to this EUT:

Channel	Frequency (MHz)
1	13.56

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Maximum Gain (dBi)
1	Chain (0)	N/A	N/A	Coil	-

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer specification or user manual.

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6.5. Test Mode Applicability and Tested Channel Detail

- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Z plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Z plane.
- For all items, investigation was done on two power adapters (AD2185 and 2AEA010BA3B). The AD2185 is the worst case, therefore testing was performed on this model only.
- Type V and Type F have the same modulation, the only difference between of them is the data rate. After evaluation, Type V is the worst case, all tests are represented by Type V.
- Since Type A has the largest field strength, AC power line conducted emission and frequency stability are carried out according to the mode.
- For below 30MHz Radiated Emission Measurement, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

Test item	Mode	Modulation	Data Rate	Test Channel
Radiated Spurious Emission	Type A	100%, ASK	106 kbit/s	1
	Type B	10%, ASK	106 kbit/s	1
	Type V	8 - 30%, ASK	26.5 kbit/s	1
20dB Bandwidth	Type A	100%, ASK	106 kbit/s	1
	Type B	10%, ASK	106 kbit/s	1
	Type V	8 - 30%, ASK	26.5 kbit/s	1
AC Power Line Conducted Emission	Type A	100%, ASK	106 kbit/s	1
Frequency Stability	Type A	100%, ASK	106 kbit/s	1

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7. Test Equipment

Test Equipment List					
Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Expired date
Spectrum Analyzer	Keysight	N9010A	MY56070827	2021/11/9	2022/11/8
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2021/12/10	2022/12/9
Loop Antenna	ETS lindgren	6502	00213440	2021/12/23	2022/12/22
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2022/2/8	2023/2/7
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2021/6/8	2022/6/7
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/12/3	2022/12/2
Temperature & Humidity Test Chamber	GIANT FORCE	GTH-150- 40-CP-AR	MAA1701-010	2022/3/11	2023/3/10
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2021/11/15	2022/11/14
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2021/8/30	2022/8/29
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2021/8/26	2022/8/25
Cables	TITAN	CFD200	T0732ACFD2 0020A300-1	2022/3/16	2023/3/15

UL Software		
Description	Name	Version
Radiated measurement	e3	6.191211 (V6)
AC power Line Conducted Emission	EZ_EMG	UL-3A1.2

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8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	USB Adapter	PIE	AD2158	NA	Supplied by client
B	Test Tool	NA	NA	NA	Supplied by client
C	Laptop	DELL	Latitude E5470	3JFKWF2	Provided by Lab

I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	FPC cable	NA	NA	0.2	Supplied by client
2	Micro USB Cable	WONDER	WA-W07UA	1.44	Provided by Lab

Test Setup

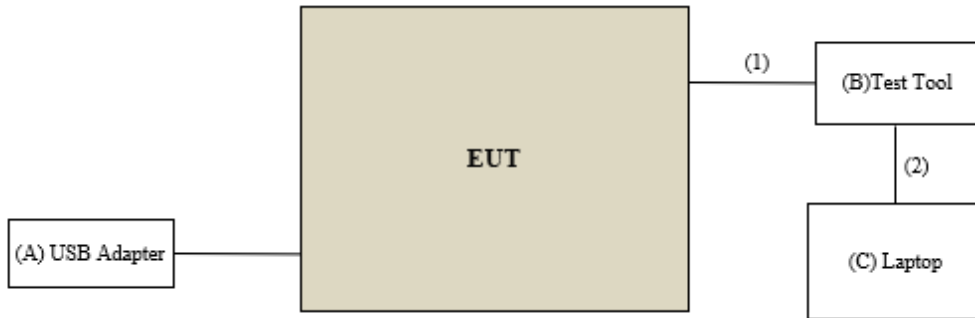
Controlled using a bespoke application -Typing RF command by terminal tool(Tera Term_Version 4.92) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

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Setup Diagram for Test



Under Table

Remote Site

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9. Test Result

9.1. Radiated Spurious Emission

Requirements

- (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 as below table:

Frequencies (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

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.
4. The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

$$\begin{aligned} 13.56\text{MHz} &= 15848\text{uV/m @}30\text{m} = 84\text{dBuV/m @}30\text{m} = 84+20\log(30/3)^2 @3\text{m} \\ &= 124\text{dBuV/m} \end{aligned}$$

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Test Procedures

[For 9 kHz ~ 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported.

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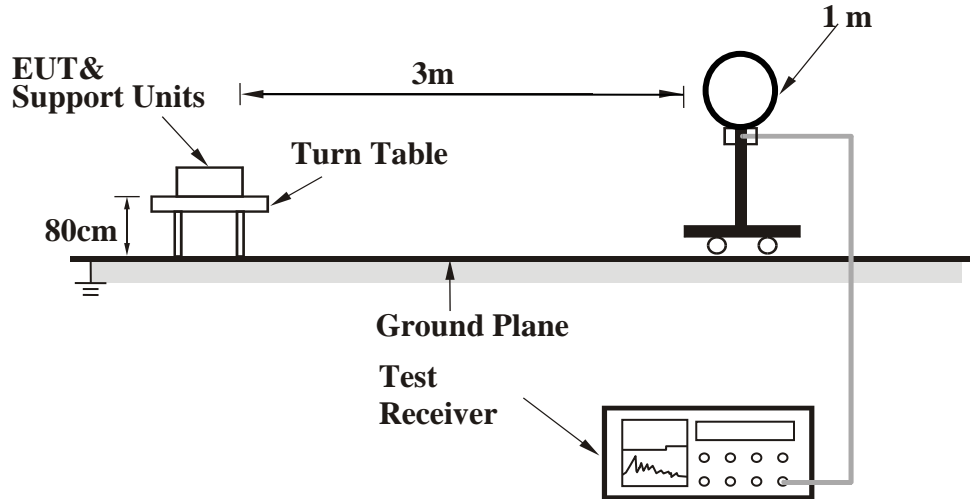
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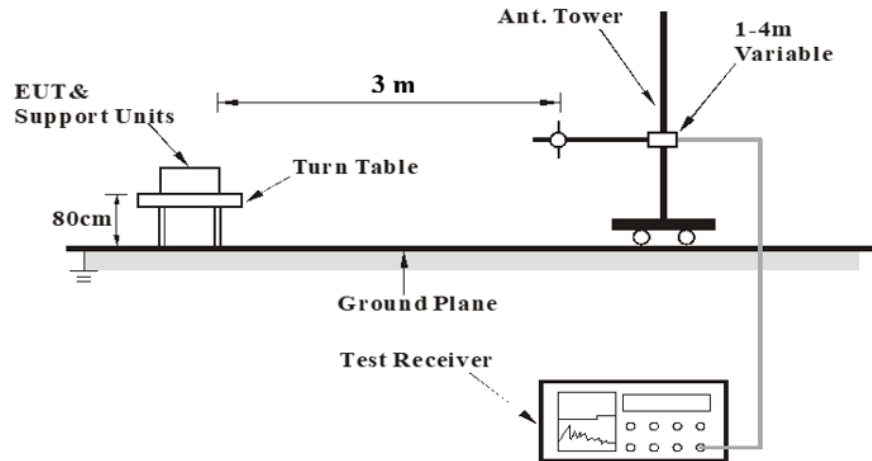
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Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



For the actual test configuration, please refer to the Setup Configurations.

Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

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Test Data

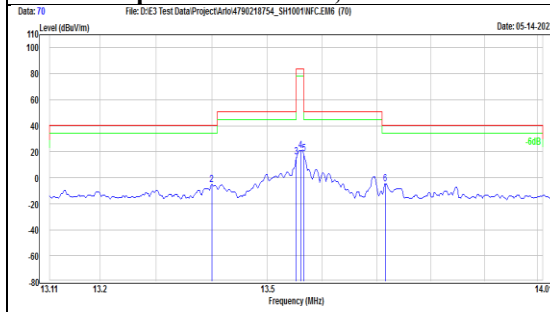
Type A

13.11 MHz ~ 14.01 MHz

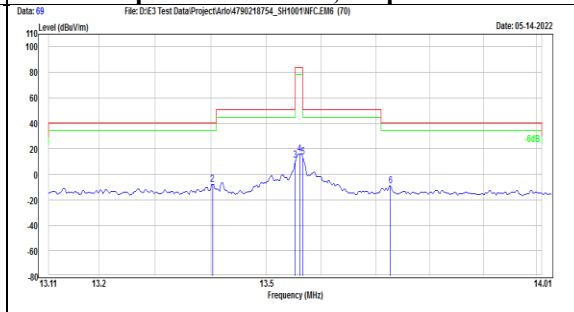
Mode	NFC Type A	Channel	1
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Polarization	Notation	Frequency (MHz)	Reading (dBUV)	Correct (dB/m)	Result (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Remark
Parallel		12.717	15.3	-26.77	-11.47	29.54	-41.01	PK
		13.399	21.47	-26.85	-5.38	40.51	-45.89	PK
		13.553	42.8	-26.87	15.93	50.47	-34.54	PK
		13.561	47.77	-26.87	20.9	84	-63.1	Carrier
		13.567	45.38	-26.87	18.51	50.47	-31.96	PK
		13.717	22.28	-26.89	-4.61	40.51	-45.12	PK
		14.039	15.29	-26.93	-11.64	29.54	-41.18	PK
Perpendicular		12.697	15.24	-26.77	-11.53	29.54	-41.07	PK
		13.403	19.13	-26.85	-7.72	40.51	-48.23	PK
		13.553	37.97	-26.87	11.1	50.47	-39.37	PK
		13.561	42.96	-26.87	16.09	84	-67.91	Carrier
		13.567	40.62	-26.87	13.75	50.47	-36.72	PK
		13.728	17.7	-26.89	-9.19	40.51	-49.7	PK
		14.135	15.08	-26.94	-11.86	29.54	-41.4	PK

1_Type A, NFC (Ch 1)
 Radiated Spurious Emission, Parallel



1_Type A, NFC (Ch 1)
 Radiated Spurious Emission, Perpendicular



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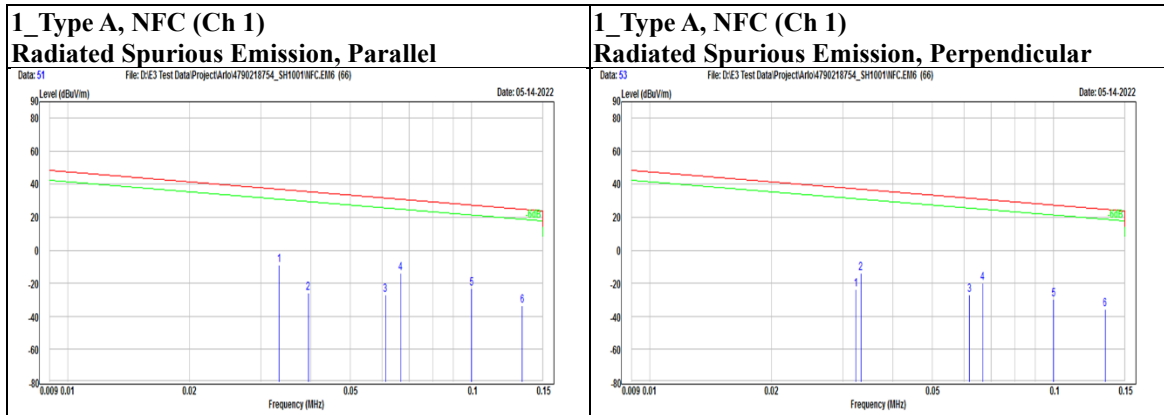
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9 kHz ~ 150 kHz

Mode	NFC Type A	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		0.03339	57.21	-66.14	-8.93	37.13	-46.06	PK
		0.03942	40.47	-66.42	-25.95	35.69	-61.64	PK
		0.06114	40.41	-67.22	-26.81	31.88	-58.69	PK
		0.06671	53.5	-67.37	-13.87	31.12	-44.99	PK
		0.10003	44.84	-68.13	-23.29	27.6	-50.89	PK
		0.13328	34.52	-67.95	-33.43	25.11	-58.54	PK
Perpendicular		0.03237	42.41	-66.08	-23.67	37.4	-61.07	PK
		0.0333	52.23	-66.13	-13.9	37.16	-51.06	PK
		0.06183	40.53	-67.24	-26.71	31.78	-58.49	PK
		0.06671	47.64	-67.37	-19.73	31.12	-50.85	PK
		0.10003	38.24	-68.13	-29.89	27.6	-57.49	PK
		0.13403	32.44	-67.95	-35.51	25.06	-60.57	PK



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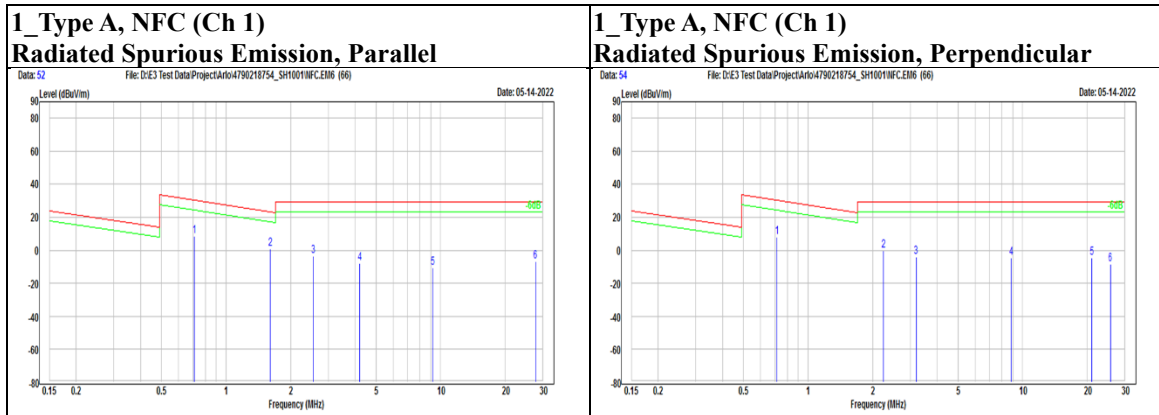
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0.15 MHz ~30 MHz

Mode	NFC Type A	Channel	0
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		0.71219	35.66	-27.36	8.3	30.55	-22.25	PK
		1.61	28.18	-27.32	0.86	23.47	-22.61	PK
		2.554	23.8	-27.34	-3.54	29.54	-33.08	PK
		4.202	19.98	-27.61	-7.63	29.54	-37.17	PK
		9.204	15.89	-26.55	-10.66	29.54	-40.2	PK
		27.708	22.11	-28.88	-6.77	29.54	-36.31	PK
Perpendicular		0.71597	35.5	-27.36	8.14	30.51	-22.37	PK
		2.249	26.91	-27.34	-0.43	29.54	-29.97	PK
		3.19	23.21	-27.38	-4.17	29.54	-33.71	PK
		8.869	22.14	-26.63	-4.49	29.54	-34.03	PK
		21.035	23.27	-27.7	-4.43	29.54	-33.97	PK
		25.727	20	-28.57	-8.57	29.54	-38.11	PK



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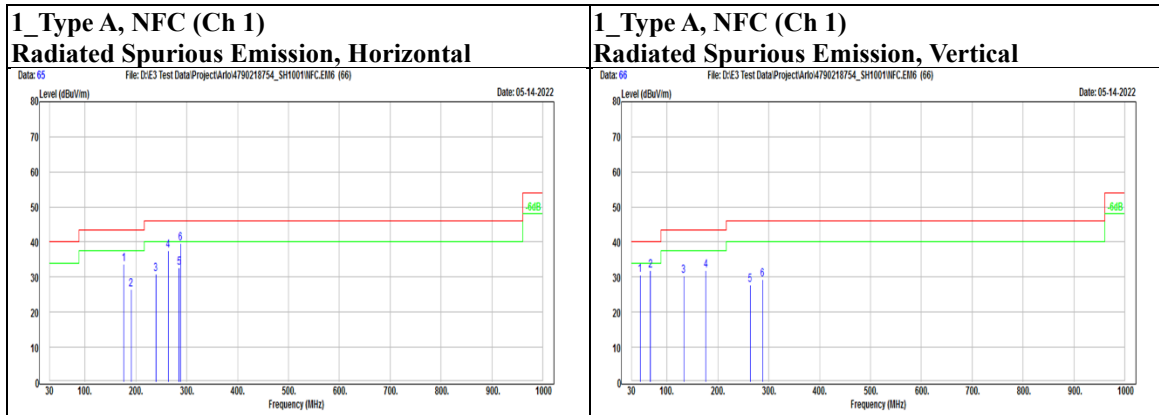
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30 MHz~1 GHz

Mode	NFC Type A	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		176.47	45.87	-12.14	33.73	43.5	-9.77	PK
		191.02	39.66	-13.2	26.46	43.5	-17.04	PK
		239.52	43.14	-12.16	30.98	46	-15.02	PK
		263.77	48.7	-11.27	37.43	46	-8.57	PK
		285.11	43.16	-10.46	32.7	46	-13.3	PK
		288.02	49.9	-10.39	39.51	46	-6.49	PK
Vertical		47.46	41.85	-11.27	30.58	40	-9.42	PK
		67.83	45.51	-13.53	31.98	40	-8.02	PK
		132.82	43.31	-12.95	30.36	43.5	-13.14	PK
		176.47	44.03	-12.14	31.89	43.5	-11.61	PK
		263.77	39	-11.27	27.73	46	-18.27	PK
		288.02	39.66	-10.39	29.27	46	-16.73	PK



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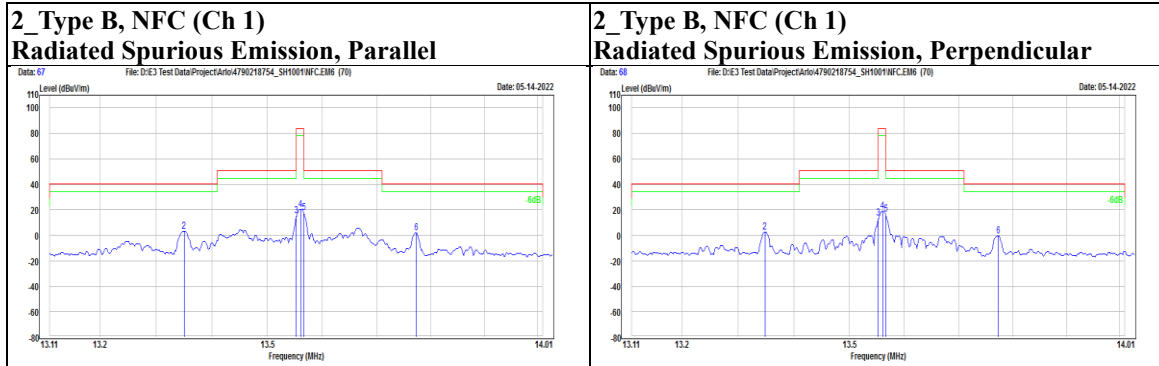


Type B

13.11 MHz ~ 14.01 MHz

Mode	NFC Type B	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		12.712	19.76	-26.77	-7.01	29.54	-36.55	PK
		13.35	30.05	-26.84	3.21	40.51	-37.3	PK
		13.553	42.33	-26.87	15.46	50.47	-35.01	PK
		13.561	47.26	-26.87	20.39	84	-63.61	Carrier
		13.567	44.89	-26.87	18.02	50.47	-32.45	PK
		13.773	28.67	-26.9	1.77	40.51	-38.74	PK
Perpendicular		14.408	20.29	-26.96	-6.67	29.54	-36.21	PK
		12.925	18.52	-26.79	-8.27	29.54	-37.81	PK
		13.348	29.29	-26.84	2.45	40.51	-38.06	PK
		13.553	40.59	-26.87	13.72	50.47	-36.75	PK
		13.561	45.63	-26.87	18.76	84	-65.24	Carrier
		13.567	43.29	-26.87	16.42	50.47	-34.05	PK
	13.773	26.62	-26.9	-0.28	40.51	-40.79	PK	
	14.094	14.73	-26.93	-12.2	29.54	-41.74	PK	



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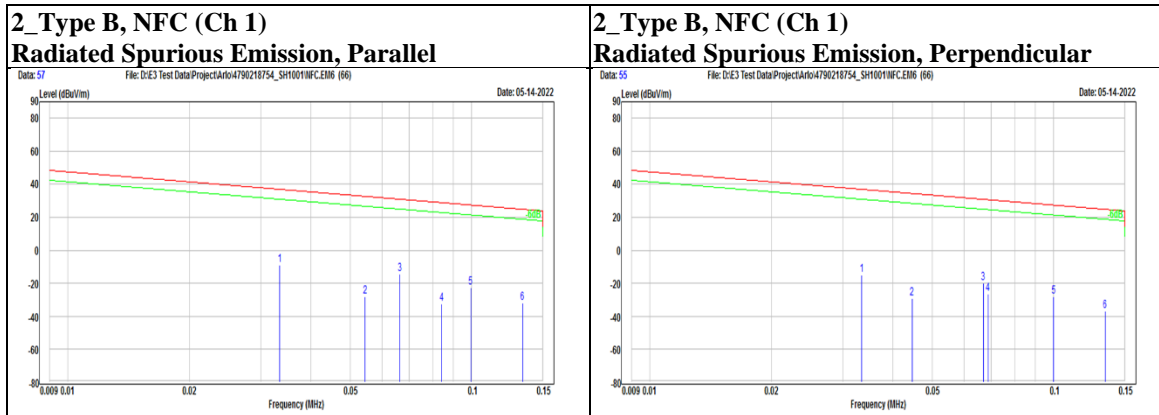
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9 kHz ~ 150 kHz

Mode	NFC Type B	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		0.03348	57.22	-66.14	-8.92	37.11	-46.03	PK
		0.05448	38.99	-67	-28.01	32.88	-60.89	PK
		0.06634	53.18	-67.36	-14.18	31.17	-45.35	PK
		0.08426	35.34	-67.82	-32.48	29.09	-61.57	PK
		0.09947	45.42	-68.12	-22.7	27.65	-50.35	PK
		0.13366	35.85	-67.95	-32.1	25.08	-57.18	PK
Perpendicular		0.03348	51.07	-66.14	-15.07	37.11	-52.18	PK
		0.04461	37.7	-66.64	-28.94	34.61	-63.55	PK
		0.0669	47.25	-67.38	-20.13	31.09	-51.22	PK
		0.06881	41.11	-67.43	-26.32	30.85	-57.17	PK
		0.10003	40.08	-68.13	-28.05	27.6	-55.65	PK
		0.13403	30.89	-67.95	-37.06	25.06	-62.12	PK



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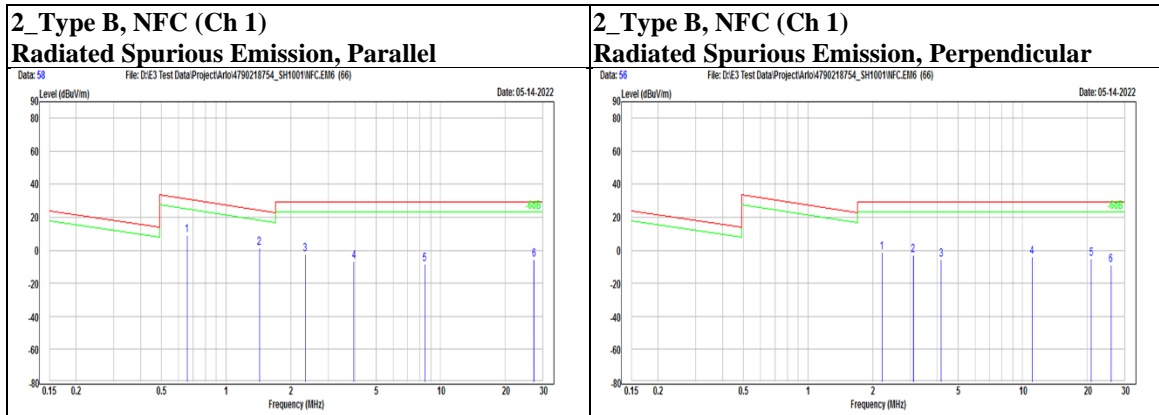
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0.15 MHz ~30 MHz

Mode	NFC Type B	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		0.65778	36.62	-27.38	9.24	31.24	-22	PK
		1.433	28.82	-27.3	1.52	24.48	-22.96	PK
		2.346	25.04	-27.35	-2.31	29.54	-31.85	PK
		3.943	20.95	-27.56	-6.61	29.54	-36.15	PK
		8.456	18.43	-26.72	-8.29	29.54	-37.83	PK
		27.271	23.08	-28.81	-5.73	29.54	-35.27	PK
Perpendicular		2.213	26.18	-27.34	-1.16	29.54	-30.7	PK
		3.09	24.49	-27.35	-2.86	29.54	-32.4	PK
		4.18	21.82	-27.6	-5.78	29.54	-35.32	PK
		11.08	22.58	-26.55	-3.97	29.54	-33.51	PK
		20.924	22.71	-27.67	-4.96	29.54	-34.5	PK
		25.864	19.85	-28.59	-8.74	29.54	-38.28	PK



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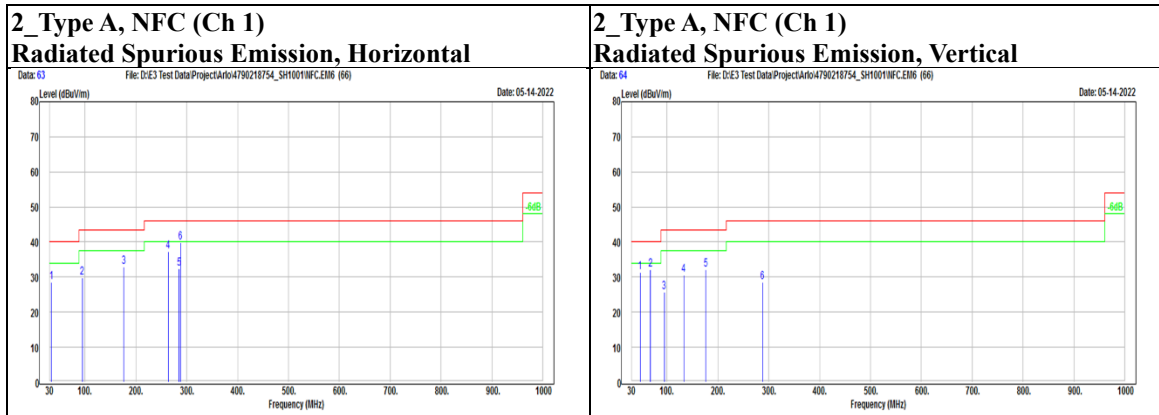
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30 MHz~1 GHz

Mode	NFC Type B	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		33.88	40.74	-12.26	28.48	40	-11.52	PK
		94.99	47	-17.27	29.73	43.5	-13.77	PK
		176.47	45.02	-12.14	32.88	43.5	-10.62	PK
		263.77	48.6	-11.27	37.33	46	-8.67	PK
		285.11	42.91	-10.46	32.45	46	-13.55	PK
		288.02	50.21	-10.39	39.82	46	-6.18	PK
Vertical		47.46	42.7	-11.27	31.43	40	-8.57	PK
		67.83	45.72	-13.53	32.19	40	-7.81	PK
		94.99	42.93	-17.27	25.66	43.5	-17.84	PK
		132.82	43.62	-12.95	30.67	43.5	-12.83	PK
		176.47	44.31	-12.14	32.17	43.5	-11.33	PK
		288.02	39.01	-10.39	28.62	46	-17.38	PK



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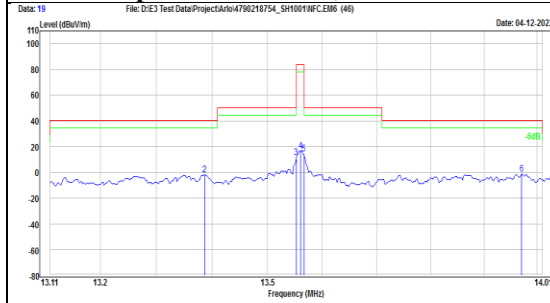
Type V

13.11 MHz ~ 14.01 MHz

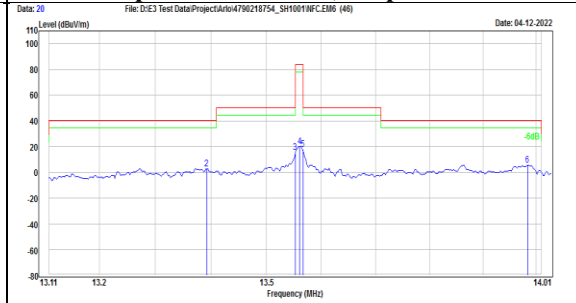
Mode	NFC Type V	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		12.908	21.68	-26.79	-5.11	29.54	-34.65	PK
		13.387	24.9	-26.85	-1.95	40.51	-42.46	PK
		13.553	38.44	-26.87	11.57	50.47	-38.9	PK
		13.561	43.56	-26.87	16.69	84	-67.31	Carrier
		13.567	41.19	-26.87	14.32	50.47	-36.15	PK
		13.971	25.68	-26.92	-1.24	40.51	-41.75	PK
Perpendicular		14.337	27.86	-26.96	0.9	29.54	-28.64	PK
		12.917	26.4	-26.79	-0.39	29.54	-29.93	PK
		13.392	29.83	-26.85	2.98	40.51	-37.53	PK
		13.553	42.38	-26.87	15.51	50.47	-34.96	PK
		13.561	46.92	-26.87	20.05	84	-63.95	Carrier
		13.567	44.86	-26.87	17.99	50.47	-32.48	PK
	13.984	32.9	-26.92	5.98	40.51	-34.53	PK	
	14.328	31.72	-26.95	4.77	29.54	-24.77	PK	

3_Type V, NFC (Ch 1)
 Radiated Spurious Emission, Parallel



3_Type V, NFC (Ch 1)
 Radiated Spurious Emission, Perpendicular



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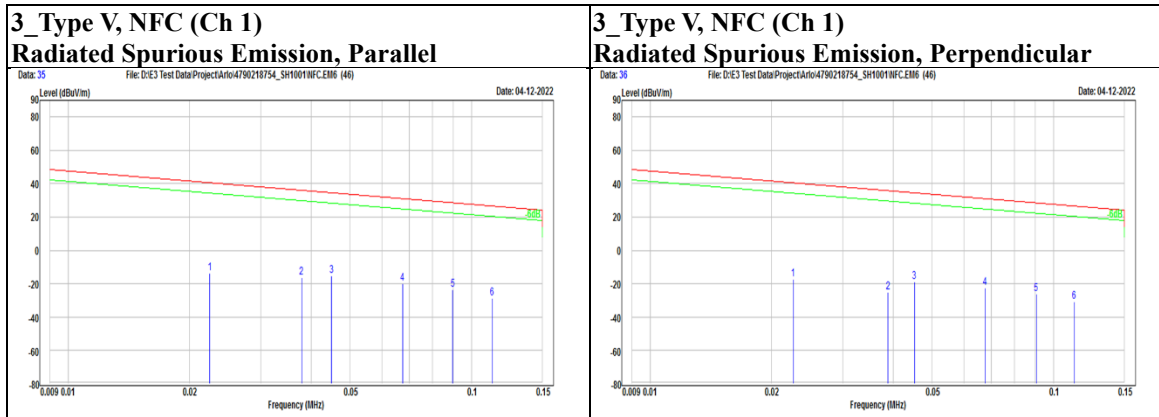
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9 kHz~150 kHz

Mode	NFC Type V	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		0.02246	51.37	-65.03	-13.66	40.58	-54.24	PK
		0.0379	49.95	-66.35	-16.4	36.03	-52.43	PK
		0.04499	51.37	-66.65	-15.28	34.54	-49.82	PK
		0.06747	47.5	-67.39	-19.89	31.02	-50.91	PK
		0.08989	44.66	-67.94	-23.28	28.53	-51.81	PK
		0.11258	39.14	-68.07	-28.93	26.57	-55.5	PK
Perpendicular		0.02265	48	-65.05	-17.05	40.5	-57.55	PK
		0.03887	41.24	-66.4	-25.16	35.81	-60.97	PK
		0.04525	47.59	-66.66	-19.07	34.49	-53.56	PK
		0.06766	44.9	-67.4	-22.5	31	-53.5	PK
		0.09065	41.85	-67.96	-26.11	28.45	-54.56	PK
		0.11258	37.37	-68.07	-30.7	26.57	-57.27	PK



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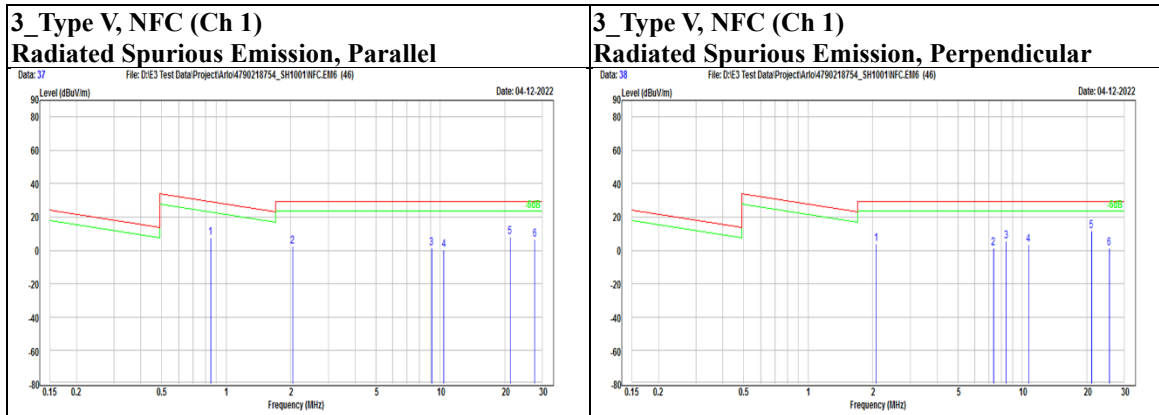
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0.15 MHz ~30 MHz

Mode	NFC Type V	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Parallel		0.84826	35.14	-27.31	7.83	29.03	-21.2	PK
		2.044	29.75	-27.34	2.41	29.54	-27.13	PK
		9.107	27.85	-26.57	1.28	29.54	-28.26	PK
		10.397	26.88	-26.45	0.43	29.54	-29.11	PK
		21.147	35.72	-27.72	8	29.54	-21.54	PK
		27.562	35.21	-28.86	6.35	29.54	-23.19	PK
Perpendicular		2.077	31.48	-27.33	4.15	29.54	-25.39	PK
		7.329	28.61	-27	1.61	29.54	-27.93	PK
		8.412	32.22	-26.73	5.49	29.54	-24.05	PK
		10.676	30.03	-26.49	3.54	29.54	-26	PK
		21.035	39.5	-27.7	11.8	29.54	-17.74	PK
		25.456	29.88	-28.52	1.36	29.54	-28.18	PK



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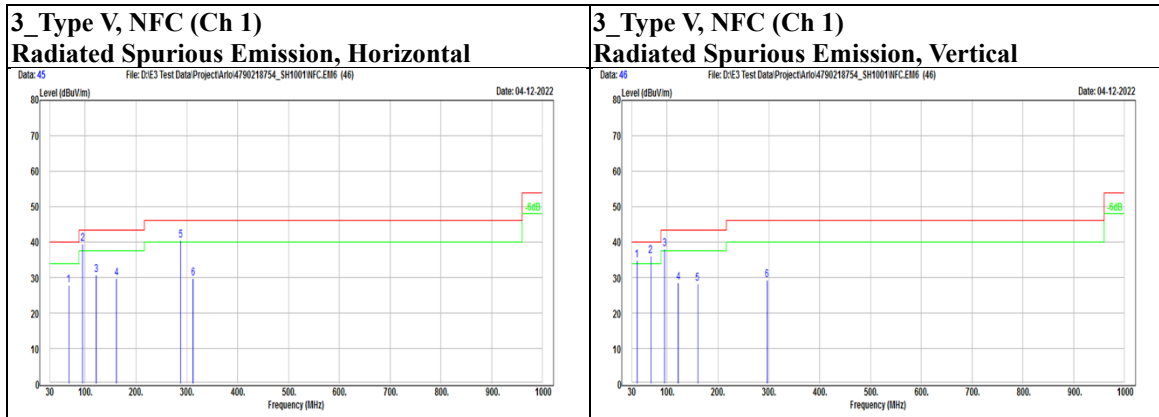
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30 MHz~1 GHz

Mode	NFC Type V	Channel	1
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Polarization	Notation	Frequency	Reading	Correct	Result	Limit	Margin	Remark
		(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
Horizontal		67.83	41.26	-13.53	27.73	40	-12.27	PK
		94.99	56.82	-17.27	39.55	43.5	-3.95	PK
		122.15	45.03	-14.22	30.81	43.5	-12.69	PK
		161.92	40.87	-11.2	29.67	43.5	-13.83	PK
		288.02	50.97	-10.39	40.58	46	-5.42	PK
		312.27	39.37	-9.7	29.67	46	-16.33	PK
Vertical		40.67	46.62	-11.86	34.76	40	-5.24	PK
		67.83	49.72	-13.53	36.19	40	-3.81	PK
		94.99	55.42	-17.27	38.15	43.5	-5.35	PK
		122.15	42.74	-14.22	28.52	43.5	-14.98	PK
		159.98	39.36	-11.11	28.25	43.5	-15.25	PK
		296.75	39.45	-10.13	29.32	46	-16.68	PK



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9.2. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

Test Procedures

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:

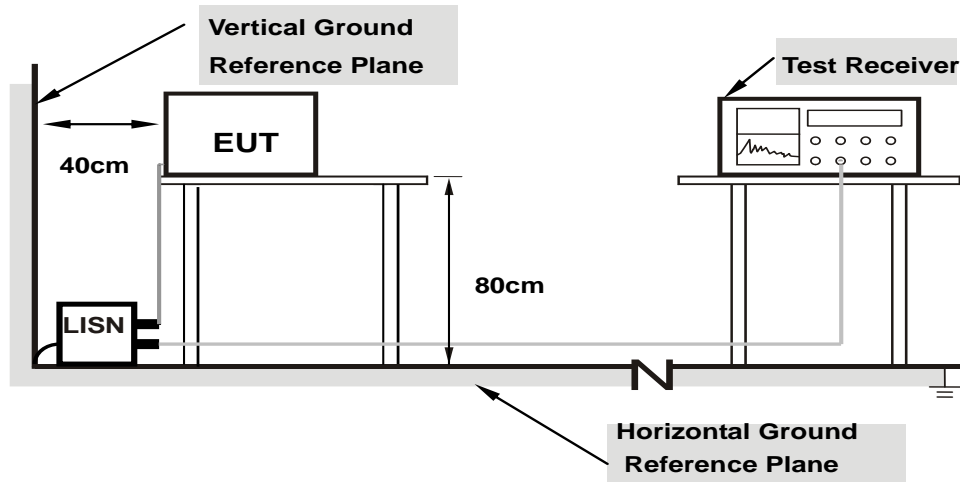
1. The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported, the other emission levels were low against the limit.
3. Test data of Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB).
4. Test data of Margin(dB) = Result value (dBuV) - Limit value (dBuV).
5. Test data of Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).

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Test Setup



Note: 1.Support units were connected to second LISN.

For the actual test configuration, please refer to the Setup Configurations.

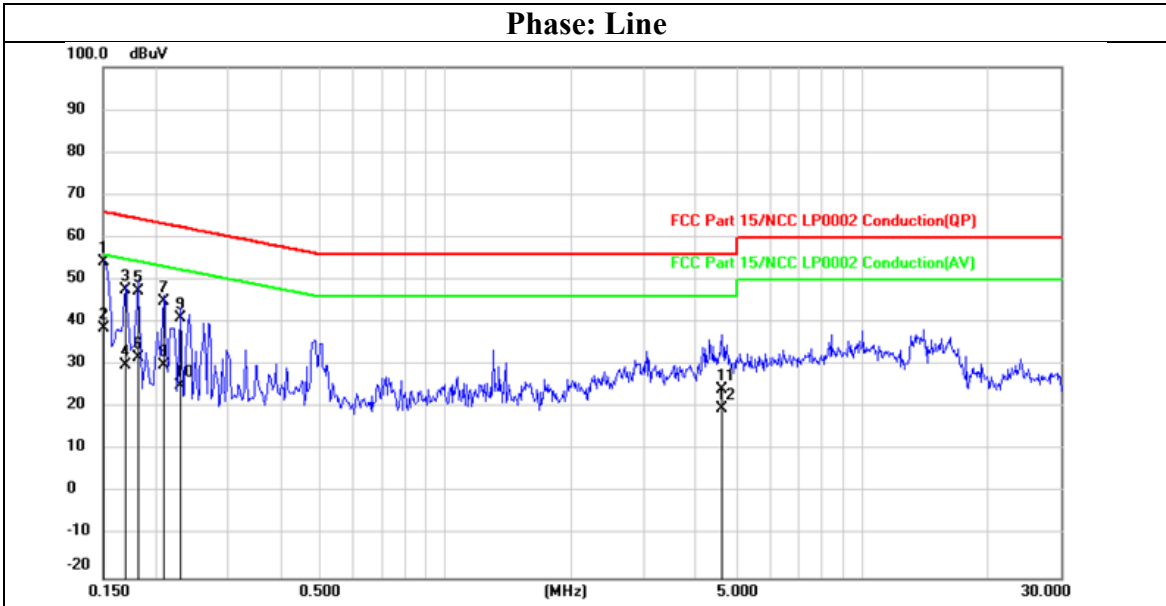
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Test Data

Mode	Type A	Channel	1
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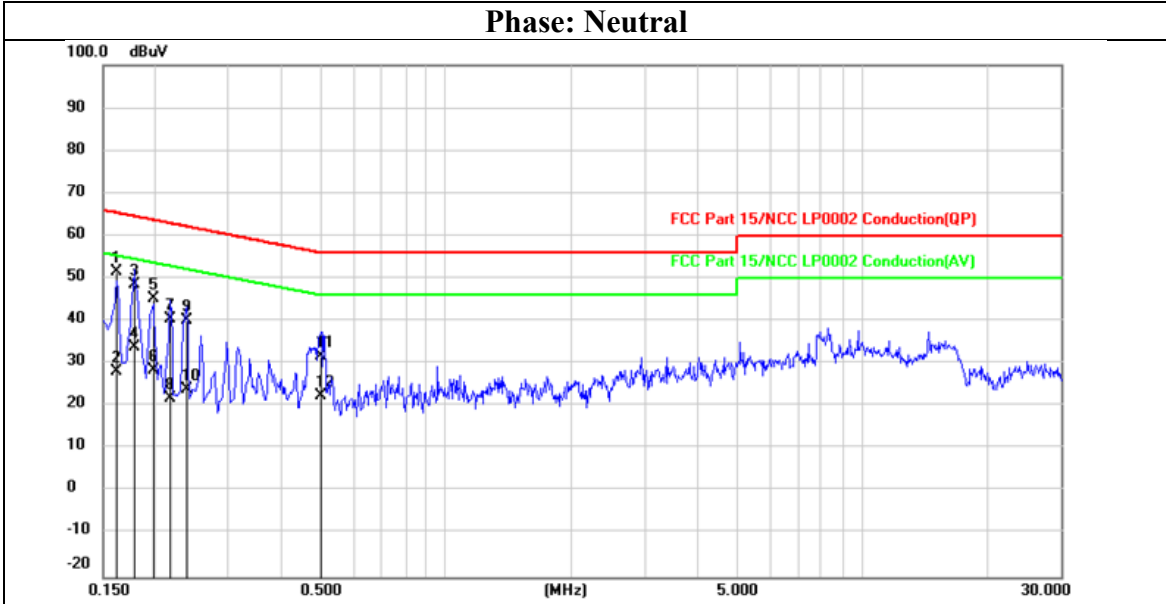
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1500	34.72	19.51	54.23	66.00	-11.77	QP
2	0.1500	19.13	19.51	38.64	56.00	-17.36	AVG
3	0.1700	28.06	19.51	47.57	64.96	-17.39	QP
4	0.1700	10.45	19.51	29.96	54.96	-25.00	AVG
5	0.1819	27.80	19.51	47.31	64.40	-17.09	QP
6	0.1819	12.10	19.51	31.61	54.40	-22.79	AVG
7	0.2100	25.34	19.51	44.85	63.21	-18.36	QP
8	0.2100	10.38	19.51	29.89	53.21	-23.32	AVG
9	0.2300	21.40	19.51	40.91	62.45	-21.54	QP
10	0.2300	5.59	19.51	25.10	52.45	-27.35	AVG
11	4.6180	4.56	19.60	24.16	56.00	-31.84	QP
12	4.6180	0.06	19.60	19.66	46.00	-26.34	AVG

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Mode	Type A	Channel	1
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1620	32.14	19.51	51.65	65.36	-13.71	QP
2	0.1620	8.54	19.51	28.05	55.36	-27.31	AVG
3	0.1780	29.07	19.51	48.58	64.58	-16.00	QP
4	0.1780	14.41	19.51	33.92	54.58	-20.66	AVG
5	0.1980	25.61	19.51	45.12	63.69	-18.57	QP
6	0.1980	8.99	19.51	28.50	53.69	-25.19	AVG
7	0.2180	20.89	19.51	40.40	62.89	-22.49	QP
8	0.2180	2.47	19.51	21.98	52.89	-30.91	AVG
9	0.2380	20.50	19.51	40.01	62.17	-22.16	QP
10	0.2380	4.46	19.51	23.97	52.17	-28.20	AVG
11	0.5020	12.22	19.52	31.74	56.00	-24.26	QP
12	0.5020	3.03	19.52	22.55	46.00	-23.45	AVG

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9.3. 20dB Bandwidth

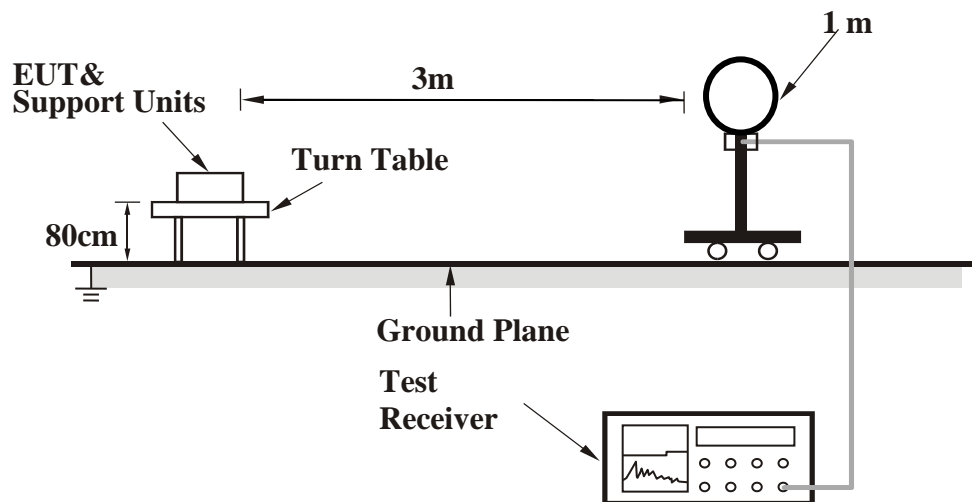
Requirements

The 20 dB bandwidth shall be specified in operating frequency band.

Test Procedures

- The testing follows the guidelines in ANSI C63.10-2013.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

Test Setup



For the actual test configuration, please refer to the Setup Configurations.

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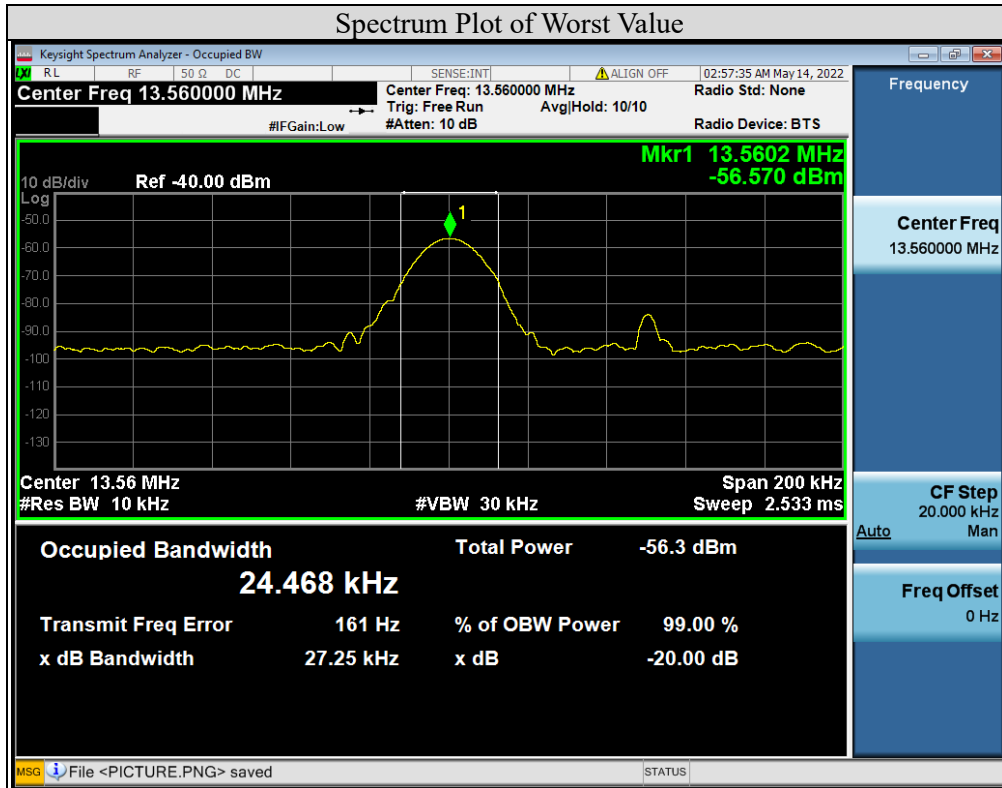
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Test Data

Type A

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	13.56	0.0245



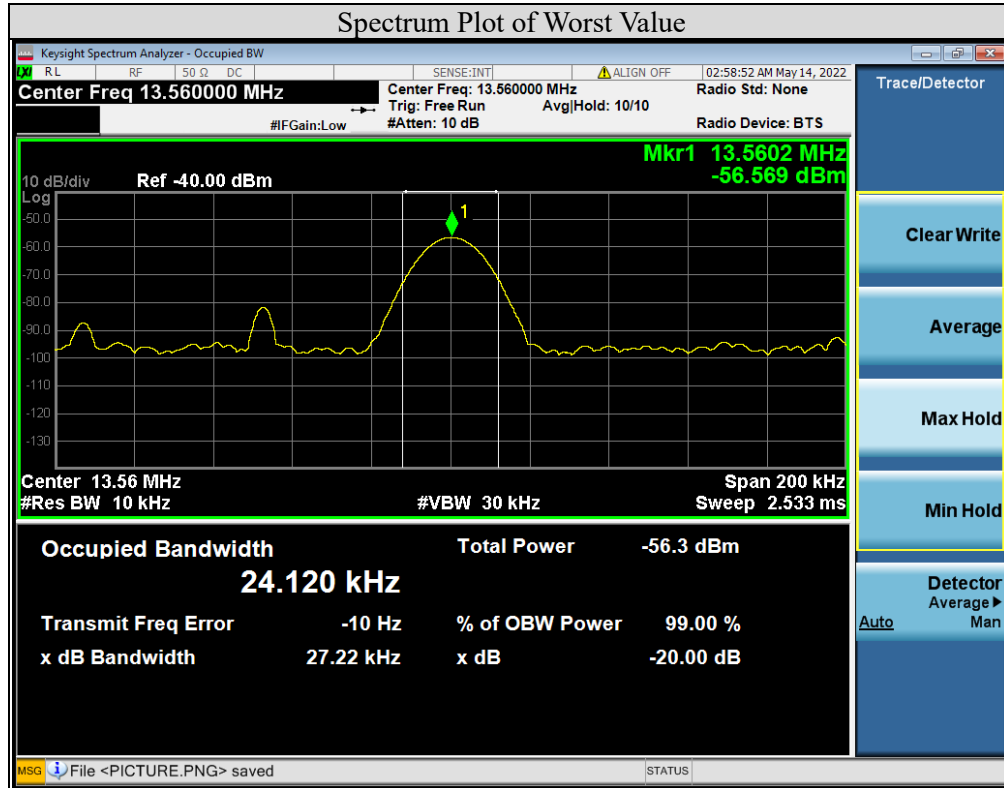
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Type B

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	13.56	0.0241



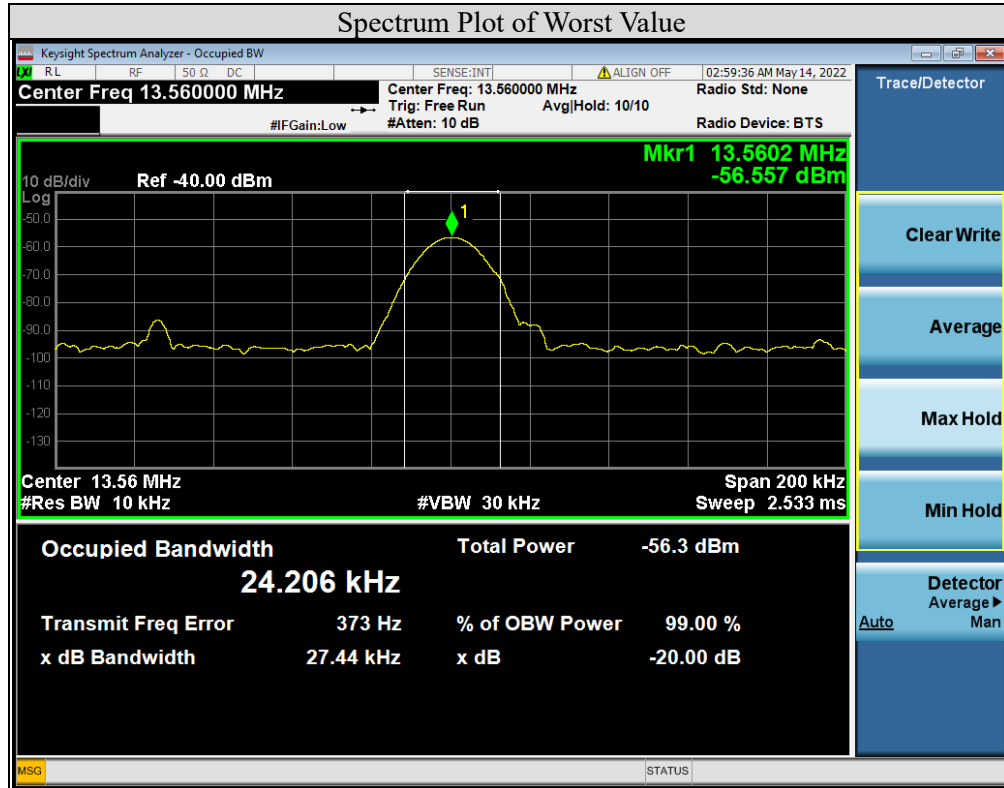
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Type V

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	13.56	0.0242



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9.4. Frequency Stability

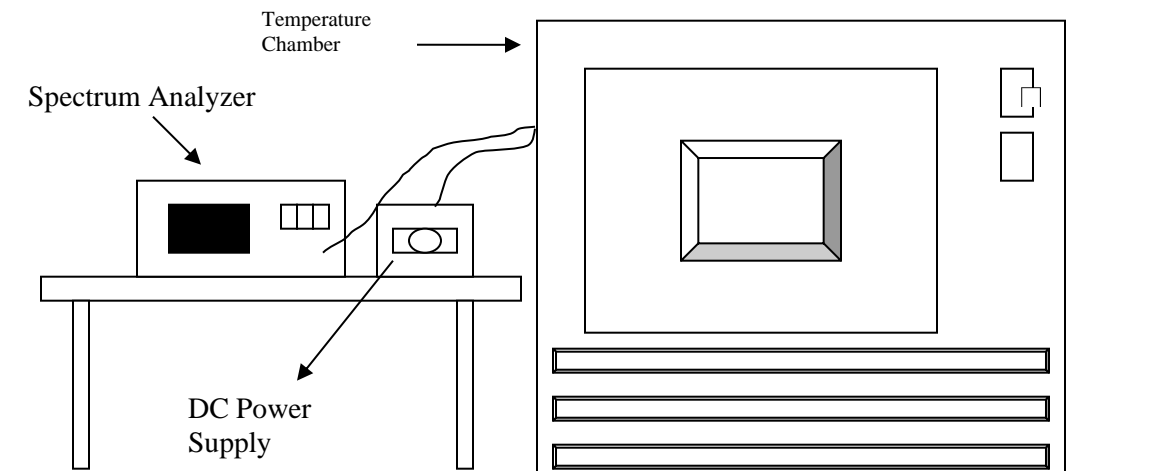
Requirements

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.

Test Procedures

- a. The EUT was placed inside the environmental test chamber and powered by nominal DC voltage.
- b. Turned the EUT on and coupled its output to a spectrum analyzer.
- c. Turned the EUT off and set the chamber to the highest temperature specified.
- d. Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.
- e. Repeated step 2 and 3 with the temperature chamber set to the lowest temperature.
- f. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

Test Setup



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Test Data

Frequency Stability Versus Temp.									
TEMP. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
50	5	13.55996	-0.00029	13.55995	-0.00037	13.55996	-0.00029	13.55996	-0.00029
40	5	13.56003	0.00022	13.56004	0.00029	13.56004	0.00029	13.56004	0.00029
30	5	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037	13.56005	0.00037
20	5	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022
10	5	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022	13.56004	0.00029
0	5	13.56	0.00000	13.56	0.00000	13.56	0.00000	13.56	0.00000
-10	5	13.55999	-0.00007	13.55999	-0.00007	13.55999	-0.00007	13.55999	-0.00007
-20	5	13.55998	-0.00015	13.55998	-0.00015	13.55999	-0.00007	13.55997	-0.00022
TEMP. (°C)	Power Supply (Vdc)	0 Minute		2 Minute		5 Minute		10 Minute	
		Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)	Measured Frequency (MHz)	Freq. Drift (ppm)
20	5.75	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022
20	5	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022
20	4.25	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022	13.56003	0.00022

END OF REPORT

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