RADIO TEST REPORT

Product	:	Arlo Essential 2 Video Doorbell
Model Name	:	AVD4001
Series Model	:	AVD3001
FCC ID	:	2APLE18300424
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.225)
Received Date	:	2023/4/7
Test Date	:	2023/5/2 ~ 2023/5/23
Issued Date	:	2023/6/13
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

Testing Laboratory
3398

REVISION HISTORY

Original Test Report No.: 4790808610-US-R2-V0

Revision	Test report No.	Date	Page revised	Contents
Original	4790808610-US-R2-V0	2023/6/13	-	Initial issue

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1. Attestation of Test Results

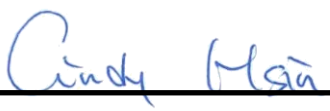
APPLICANT:	Arlo Technologies Inc 2200 Faraday Avenue, Suite 150, Carlsbad, CA 92008, USA
MANUFACTURER:	Alpha Networks Vietnam Company Limited Lot CN03, Dong Van 4 Industrial Part, Dai Cuong Commune, Kim Bang District, Ha Nam Province, Vietnam
EUT DESCRIPTION:	Arlo Essential 2 Video Doorbell
BRAND:	Arlo
MODEL:	AVD4001
SERIES MODEL:	AVD3001
SAMPLE STAGE:	Design Verification Test sample
DATE of TESTED:	2023/5/2 ~ 2023/5/23

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 Date : 2023/6/13
Project Handler

Approved and Authorized By:

Eric Lee Date : 2023/6/13
Senior Laboratory Engineer

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

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.

5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 4.3.4 of ISO Guide 115) 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.

Determining compliance based on the results of the compliance measurement, not considering measurement instrumentation uncertainty.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	±2.9 dB
RF Conducted	9 kHz - 40GHz	±2.4 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	±1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	±5.8 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	±4.8 dB

6. Equipment under Test

6.1. Description of EUT

Product	Arlo Essential 2 Video Doorbell
Brand Name	Arlo
Model Name	AVD4001
Series Model	AVD3001
Operating Frequency	13.56 MHz
Modulation	ASK
Normal Voltage	5Vdc from host 3.69Vdc from battery 16.5Vac from adapter
Sample ID	Conducted Test: 6029690 Radiated Test: 6029690
Maximum Field Strength (dBuV/m)	24.78 dBuV/m

Note:

1. The models difference table as below:

Model	Main Board (PCBA Board)	LED Board (PCBA board)	Image Sensor (2K/FHD)	LED (IR)
AVD4001	PCB layout and circuit is the same except for image sensor	PCB layout and circuit is the same except for IR LED quantity	2K 2560 x 1440 Image Sensor : PixArt PS5420 (1:1)	YOI YC-1F1NI 4M FIXED I-LENS 3G3P W/ICR +XD-W04020GD32 (PS5420)
AVD3001			FHD 1920 x 1080 Image Sensor : PixArt PS5270 (1:1)	YOI YC-1F6NI 2M FIXED I-LENS 2G4P W/ICR +XD-W04020GD21 (PS5270)

2. The EUT contains following accessory devices:

Product	Brand	Model	Description
USB Cable	Network Giant	A220053	Length: 1 m
Battery	Arlo	A-17	3.69Vdc, 17.45Wh

3. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual, the laboratory shall not be held responsible.

6.2. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Radiated Spurious Emission	966-2	21~24℃/ 61~69%RH	120Vac/ 60Hz	2023/05/02~ 2023/05/15	WaterNil Guan
AC power Line Conducted Emission	SR1	22~24℃/ 64~69%RH	120Vac/ 60Hz	2023/05/22~ 2023/05/23	WaterNil Guan

FCC Test Firm Registration Number: 498077

Sample Calculation:

Radiated Spurious Emission:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBuV/m) = Reading Value (dBuV) + Correction Factor (dB/m).
  Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).
  Example: Result Value (34.5dBuV/m) = Reading Value (40.1dBm) + Antenna Factor (18.7dB/m) + Cable Loss (4.2dB) - Preamp Factor (28.5dB).

AC power Line Conducted Emission:

- Where relevant, the follow sample calculation is provided:
  Result Value (dBuV) = Reading Value (dBuV) + Correction Factor (dB).
  Correction Factor (dB) = Insertion loss(dB) + Cable loss(dB).
  Example: Result Value (53.7dBuV) = Reading Value (35.1dBuV) + Insertion loss(18.1dB) + Cable loss(0.5dB).

6.3. Channel List

1 channel is 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's specification or user's manual, the laboratory shall not be held responsible..

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.
- The EUT has four power source: 3.69Vdc from battery(Model: A-17), 5Vdc from adapter(Model: 2AEA010BA3B), 5Vdc from host(Model: Latitude E5470) and 16.5Vac from adapter(Model: AA-162A4G), above three types was pre-tested, the worst case was found in the 5Vdc from host. Therefore only the test data of the 5Vdc from host(Model: Latitude E5470) was recorded in this report.
- Type V has the same modulation and characteristics as Type F. Type V was evaluated to have poorer characteristics, so only mode Type V was evaluated and the test results were recorded in the report.
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- For below 30MHz testing, 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.
- For below 1 GHz radiated emission and AC power line conducted emission have performed all modes of operation were investigated and the worst-case emissions are reported.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Item	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions	NFC Type A	13.56MHz	13.56MHz	106 kbit/s
	NFC Type B	13.56MHz	13.56MHz	106 kbit/s
	NFC Type V	13.56MHz	13.56MHz	26.5 kbit/s
AC Power Line Conducted Emission	NFC Type V	13.56MHz	13.56MHz	26.5 kbit/s

7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Spectrum Analyzer	Keysight	N9010A	MY56070827	2023/4/7	2024/4/6
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2022/12/13	2023/12/12
Loop Antenna	ETS lindgren	6502	00213440	2023/1/4	2024/1/3
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2023/2/13	2024/2/12
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2022/6/7	2023/6/6
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2022/12/1	2023/11/30
Temperature &Humidity Test Chamber	GIANT FORCE	GTH-150- 40-CP-AR	MAA1701-010	2023/3/8	2024/3/7
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2022/11/10	2023/11/9
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2022/8/29	2023/8/28
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2022/8/30	2023/8/29
Cables	TITAN	CFD200	T0732ACFD2 0020A300-3	2023/4/19	2024/4/18

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

8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	DELL	Latitude E5470	CXSKWF2	Provided by Lab

I/O Cables

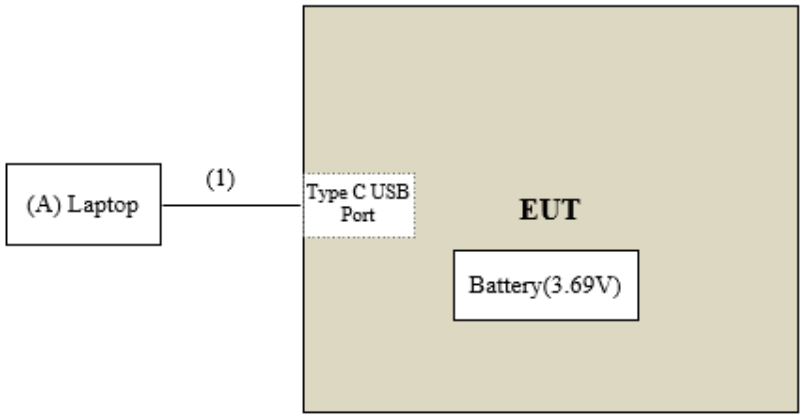
ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	USB Cable	Network Giant	A220053	1	Provided by Client

Test Setup

Controlled using a bespoke application (Typing RF commands by terminal tool (TeraTerm 4.75)) 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.

Setup Diagram for Test

Test Mode & Charge Mode :



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.

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.

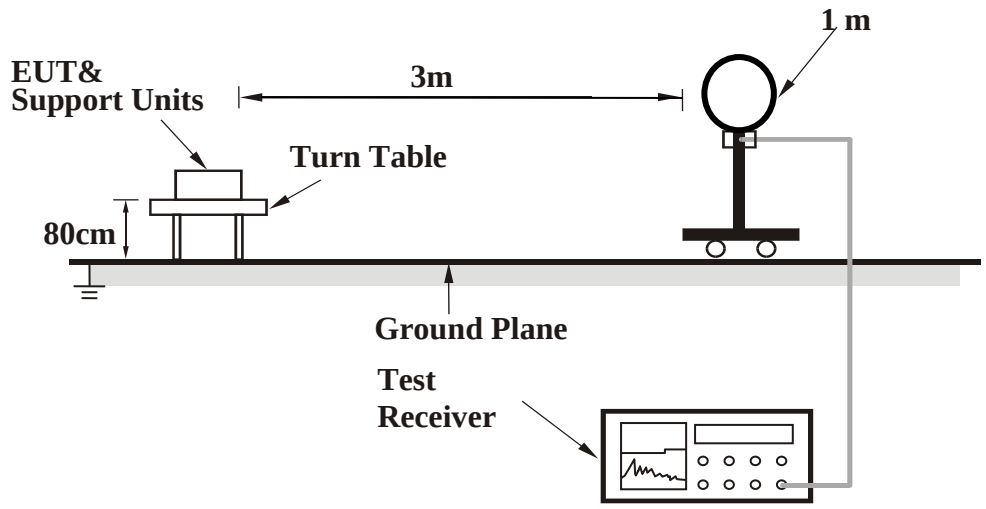
[For above 30 MHz]

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.

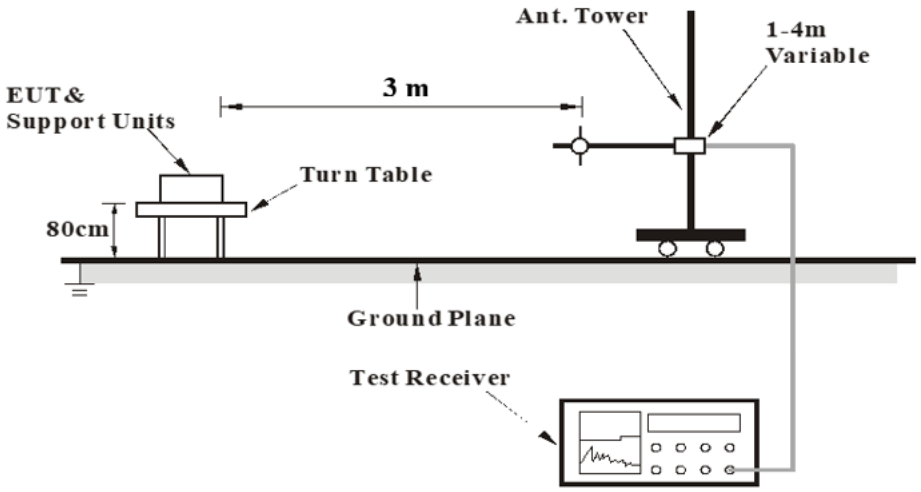
Note:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported.

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.

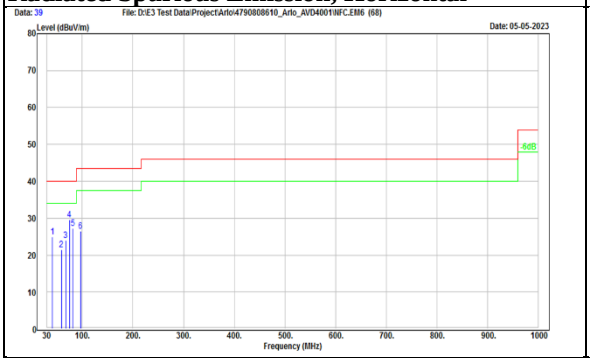
Test Data

Below 1 GHz

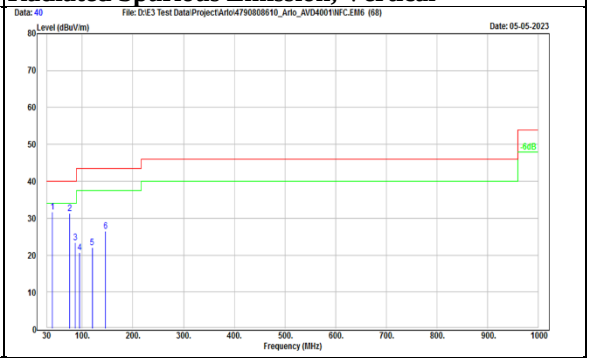
Mode	NFC-Type A	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		41.64	38.06	-13.22	24.84	40	-15.16	PK
		59.1	33.5	-12.01	21.49	40	-18.51	PK
		67.83	37.27	-13.24	24.03	40	-15.97	PK
		74.62	44.44	-14.85	29.59	40	-10.41	PK
		81.41	43.92	-16.58	27.34	40	-12.66	PK
		96.93	43.49	-17.04	26.45	43.5	-17.05	PK
Vertical		41.64	44.86	-13.22	31.64	40	-8.36	PK
		75.59	46.39	-15.01	31.38	40	-8.62	PK
		86.26	41.14	-17.8	23.34	40	-16.66	PK
		94.99	38.12	-17.53	20.59	43.5	-22.91	PK
		120.21	36.36	-14.36	22	43.5	-21.5	PK
		146.4	38.45	-12.07	26.38	43.5	-17.12	PK

TX, NFC-Type A (Ch 0)
Radiated Spurious Emission, Horizontal



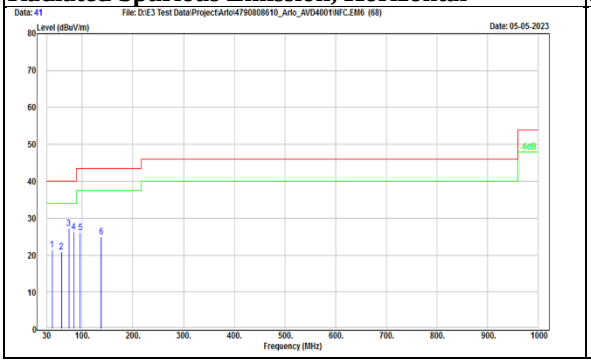
TX, NFC-Type A (Ch 0)
Radiated Spurious Emission, Vertical



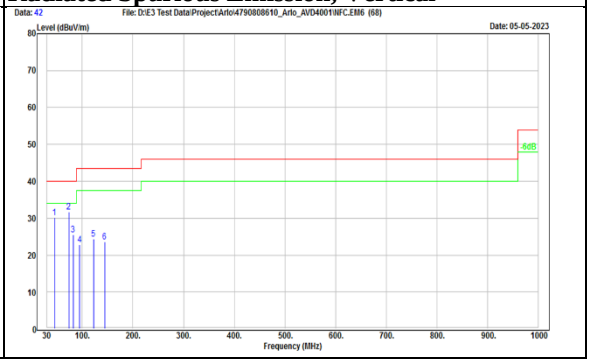
Mode	NFC-Type B	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		40.67	34.97	-13.51	21.46	40	-18.54	PK
		59.1	32.97	-12.01	20.96	40	-19.04	PK
		73.65	41.88	-14.69	27.19	40	-12.81	PK
		83.35	43.4	-17.06	26.34	40	-13.66	PK
		95.96	43.29	-17.15	26.14	43.5	-17.36	PK
		137.67	37.85	-13	24.85	43.5	-18.65	PK
Vertical		45.52	42.46	-12.3	30.16	40	-9.84	PK
		73.65	46.31	-14.69	31.62	40	-8.38	PK
		82.38	42.24	-16.74	25.5	40	-14.5	PK
		94.99	40.29	-17.53	22.76	43.5	-20.74	PK
		122.15	38.62	-14.28	24.34	43.5	-19.16	PK
		144.46	35.86	-12.26	23.6	43.5	-19.9	PK

TX, NFC-Type B (Ch 0)
Radiated Spurious Emission, Horizontal



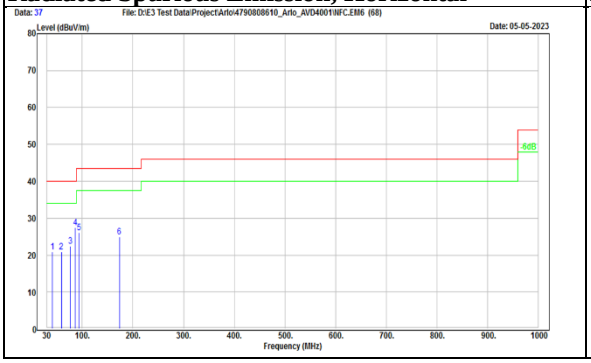
TX, NFC-Type B (Ch 0)
Radiated Spurious Emission, Vertical



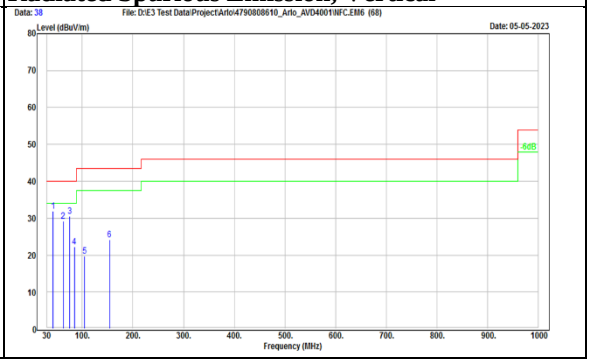
Mode	NFC-Type V	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		41.64	34.16	-13.22	20.94	40	-19.06	PK
		59.1	32.85	-12.01	20.84	40	-19.16	PK
		76.56	37.63	-15.19	22.44	40	-17.56	PK
		86.26	45.15	-17.8	27.35	40	-12.65	PK
		94.02	43.48	-17.42	26.06	43.5	-17.44	PK
		173.56	37.21	-12.25	24.96	43.5	-18.54	PK
Vertical		42.61	44.61	-12.8	31.81	40	-8.19	PK
		62.98	41.77	-12.58	29.19	40	-10.81	PK
		75.59	45.57	-15.01	30.56	40	-9.44	PK
		84.32	39.47	-17.33	22.14	40	-17.86	PK
		104.69	35.21	-15.51	19.7	43.5	-23.8	PK
		154.16	36.02	-11.88	24.14	43.5	-19.36	PK

TX, NFC-Type V (Ch 0)
Radiated Spurious Emission, Horizontal



TX, NFC-Type V (Ch 0)
Radiated Spurious Emission, Vertical

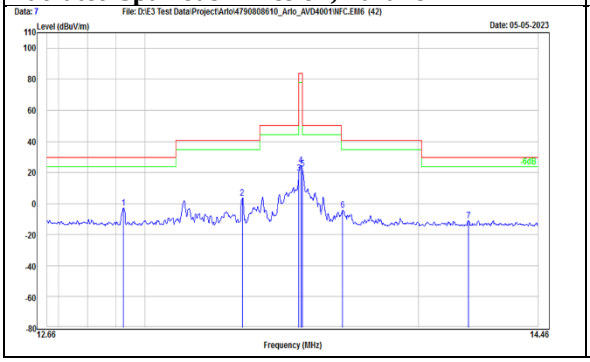


Below 30MHz

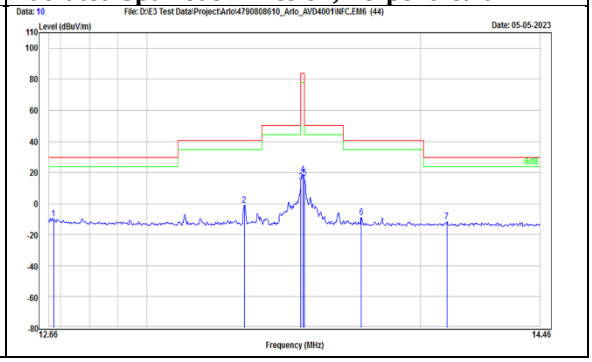
Mode	Fundamental NFC-Type A	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		12.925	24.21	-27.12	-2.91	29.54	-32.45	PK
		13.348	30.79	-27.17	3.62	40.51	-36.89	PK
		13.553	46.83	-27.2	19.63	50.47	-30.84	PK
		13.561	51.96	-27.19	24.77	84	-59.23	PK
		13.567	49.56	-27.19	22.37	50.47	-28.1	PK
		13.715	22.78	-27.21	-4.43	40.51	-44.94	PK
		14.19	16.15	-27.27	-11.12	29.54	-40.66	PK
Perpendicular		12.677	17.44	-27.08	-9.64	29.54	-39.18	PK
		13.348	26.11	-27.17	-1.06	40.51	-41.57	PK
		13.553	41.13	-27.2	13.93	50.47	-36.54	PK
		13.561	45.77	-27.19	18.58	84	-65.42	PK
		13.567	43.39	-27.19	16.2	50.47	-34.27	PK
		13.777	18.18	-27.22	-9.04	40.51	-49.55	PK
		14.099	15.49	-27.26	-11.77	29.54	-41.31	PK

TX, Fundamental NFC-Type A (Ch 0)
Radiated Spurious Emission, Parallel



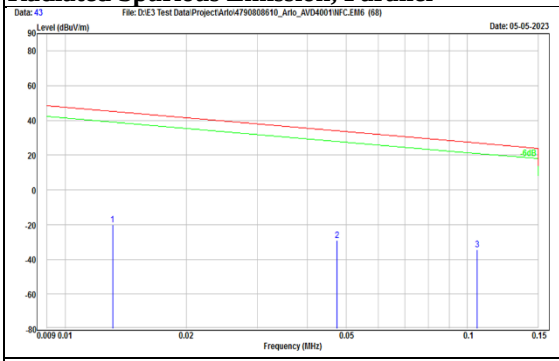
TX, Fundamental NFC-Type A (Ch 0)
Radiated Spurious Emission, Perpendicular



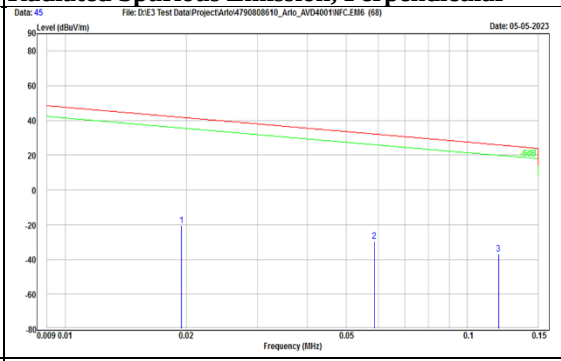
Mode	NFC-Type A	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		0.01312	43.58	-63.52	-19.94	45.24	-65.18	PK
		0.04746	37.91	-67.03	-29.12	34.07	-63.19	PK
		0.10582	33.57	-68.14	-34.57	27.11	-61.68	PK
		0.28478	42	-67.85	-25.85	18.51	-44.36	PK
		0.74302	36.81	-27.78	9.03	30.18	-21.15	PK
		2.448	30.59	-27.73	2.86	29.54	-26.68	PK
Perpendicular		0.01945	44.39	-64.76	-20.37	41.82	-62.19	PK
		0.05878	37.91	-67.34	-29.43	32.22	-61.65	PK
		0.11943	31.31	-68.11	-36.8	26.06	-62.86	PK
		0.23409	42.92	-67.92	-25	20.22	-45.22	PK
		1.027	32.51	-27.75	4.76	27.38	-22.62	PK
		2.321	27.09	-27.74	-0.65	29.54	-30.19	PK

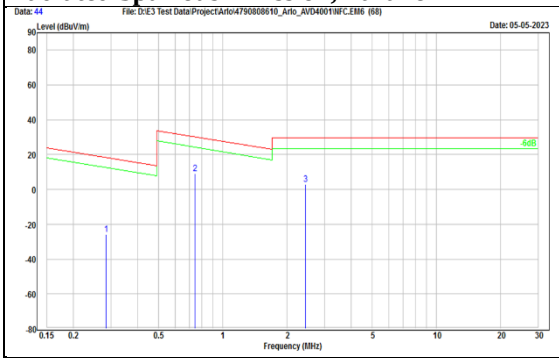
TX, NFC-Type A (Ch 0)
Radiated Spurious Emission, Parallel



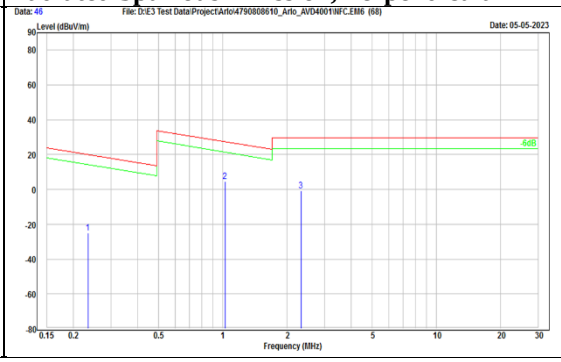
TX, NFC-Type A (Ch 0)
Radiated Spurious Emission, Perpendicular



TX, NFC-Type A (Ch 0)
Radiated Spurious Emission, Parallel



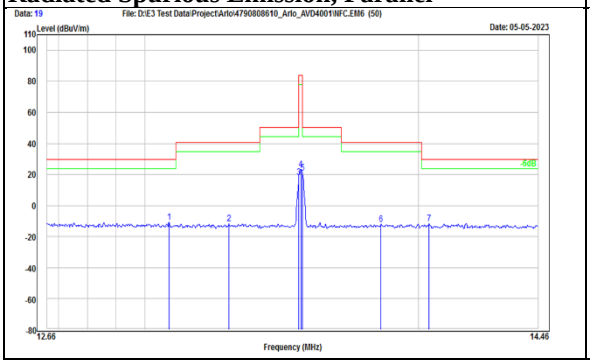
TX, NFC-Type A (Ch 0)
Radiated Spurious Emission, Perpendicular



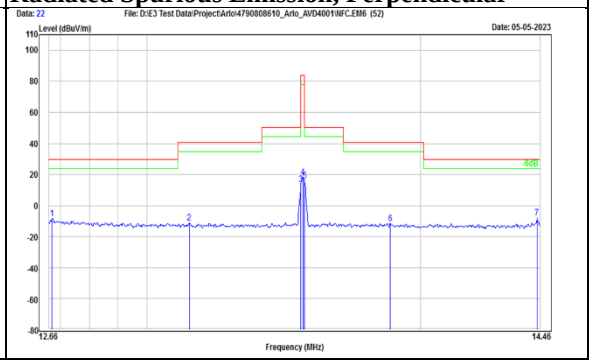
Mode	Fundamental NFC-Type B	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		13.086	16.26	-27.13	-10.87	29.54	-40.41	PK
		13.3	15.57	-27.16	-11.59	40.51	-52.1	PK
		13.553	45.58	-27.2	18.38	50.47	-32.09	PK
		13.561	50.61	-27.19	23.42	84	-60.58	PK
		13.567	48.24	-27.19	21.05	50.47	-29.42	PK
		13.858	15.04	-27.23	-12.19	40.51	-52.7	PK
		14.039	15.63	-27.26	-11.63	29.54	-41.17	PK
Perpendicular		12.672	18.79	-27.08	-8.29	29.54	-37.83	PK
		13.151	16.03	-27.14	-11.11	40.51	-51.62	PK
		13.553	40.65	-27.2	13.45	50.47	-37.02	PK
		13.561	45.59	-27.19	18.4	84	-65.6	PK
		13.567	43.26	-27.19	16.07	50.47	-34.4	PK
		13.885	15.84	-27.24	-11.4	40.51	-51.91	PK
		14.447	19.38	-27.3	-7.92	29.54	-37.46	PK

TX, Fundamental NFC-Type B (Ch 0)
Radiated Spurious Emission, Parallel



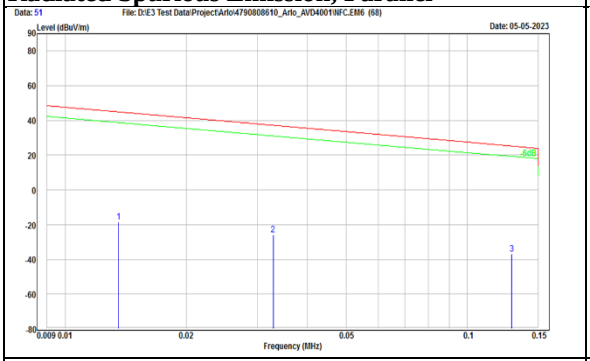
TX, Fundamental NFC-Type B (Ch 0)
Radiated Spurious Emission, Perpendicular



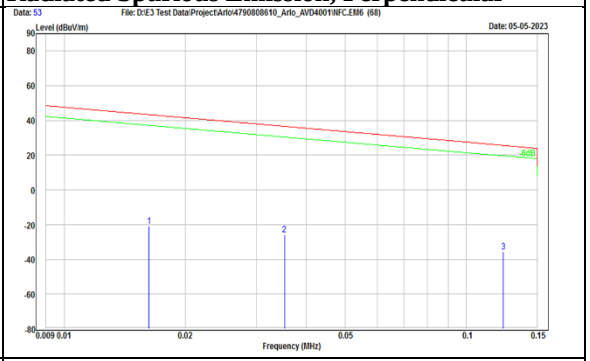
Mode	NFC-Type B	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		0.01357	45.17	-63.62	-18.45	44.95	-63.4	PK
		0.03292	40.48	-66.36	-25.88	37.25	-63.13	PK
		0.12886	30.95	-68.01	-37.06	25.4	-62.46	PK
		0.22201	42.55	-67.93	-25.38	20.68	-46.06	PK
		0.62715	36.81	-27.79	9.02	31.66	-22.64	PK
		2.285	29.32	-27.75	1.57	29.54	-27.97	PK
Perpendicular		0.01625	43.2	-64.19	-20.99	43.39	-64.38	PK
		0.03532	40.66	-66.49	-25.83	36.64	-62.47	PK
		0.12353	32.36	-68.07	-35.71	25.77	-61.48	PK
		0.20505	42.56	-67.95	-25.39	21.37	-46.76	PK
		1.021	30.6	-27.75	2.85	27.42	-24.57	PK
		2.237	30.36	-27.74	2.62	29.54	-26.92	PK

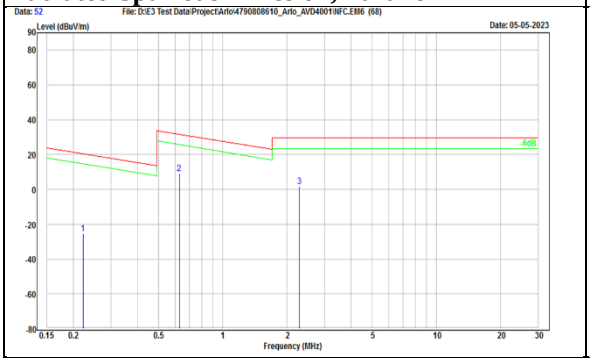
TX, NFC-Type B (Ch 0)
Radiated Spurious Emission, Parallel



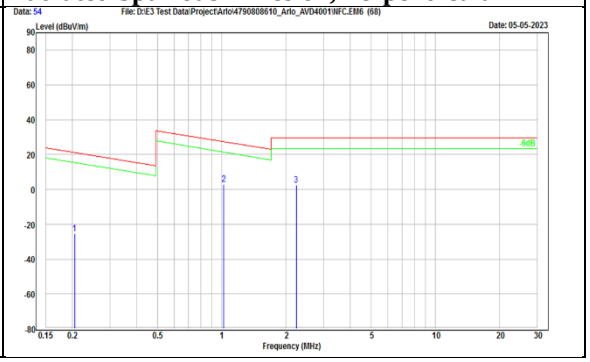
TX, NFC-Type B (Ch 0)
Radiated Spurious Emission, Perpendicular



TX, NFC-Type B (Ch 0)
Radiated Spurious Emission, Parallel



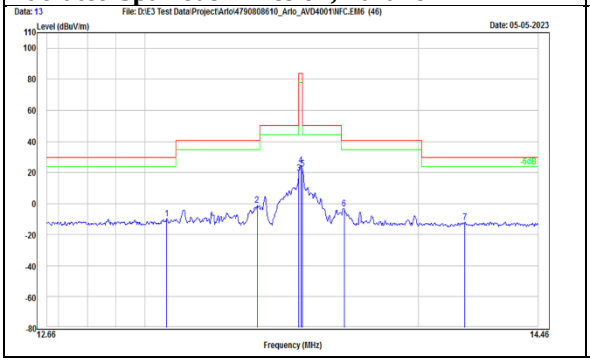
TX, NFC-Type B (Ch 0)
Radiated Spurious Emission, Perpendicular



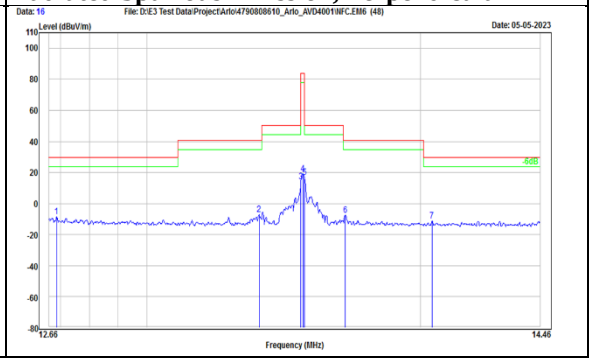
Mode	Fundamental NFC-Type V	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		13.077	17.19	-27.13	-9.94	29.54	-39.48	PK
		13.401	25.93	-27.18	-1.25	40.51	-41.76	PK
		13.553	46.95	-27.2	19.75	50.47	-30.72	PK
		13.561	51.97	-27.19	24.78	84	-59.22	PK
		13.567	49.7	-27.19	22.51	50.47	-27.96	PK
		13.72	23.91	-27.21	-3.3	40.51	-43.81	PK
		14.176	15.33	-27.26	-11.93	29.54	-41.47	PK
Perpendicular		12.687	18.64	-27.09	-8.45	29.54	-37.99	PK
		13.401	20.01	-27.18	-7.17	40.51	-47.68	PK
		13.553	41.27	-27.2	14.07	50.47	-36.4	PK
		13.561	46.35	-27.19	19.16	84	-64.84	PK
		13.567	43.95	-27.19	16.76	50.47	-33.71	PK
		13.717	19.79	-27.21	-7.42	40.51	-47.93	PK
		14.043	16.17	-27.26	-11.09	29.54	-40.63	PK

TX, Fundamental NFC-Type V (Ch 0)
Radiated Spurious Emission, Parallel



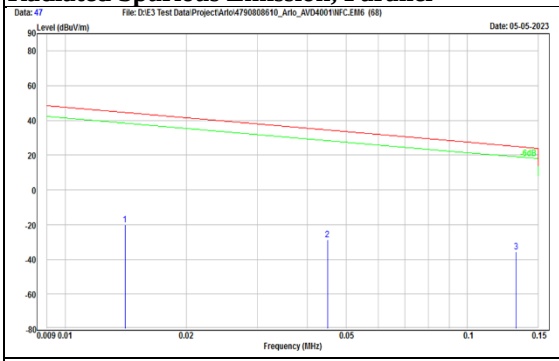
TX, Fundamental NFC-Type V (Ch 0)
Radiated Spurious Emission, Perpendicular



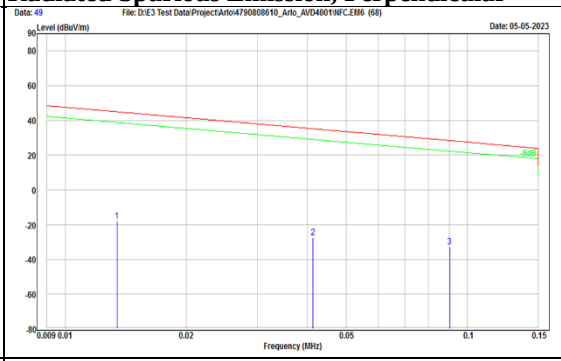
Mode	NFC-Type V	Channel	0

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		0.01408	43.5	-63.74	-20.24	44.63	-64.87	PK
		0.04487	38.19	-66.93	-28.74	34.56	-63.3	PK
		0.13216	32.14	-67.99	-35.85	25.18	-61.03	PK
		0.20505	43.32	-67.95	-24.63	21.37	-46	PK
		0.74302	36.98	-27.78	9.2	30.18	-20.98	PK
		2.461	29.46	-27.73	1.73	29.54	-27.81	PK
Perpendicular		0.01346	45.56	-63.6	-18.04	45.02	-63.06	PK
		0.04135	39.34	-66.78	-27.44	35.27	-62.71	PK
		0.0904	35.07	-68.01	-32.94	28.48	-61.42	PK
		0.24945	42.36	-67.89	-25.53	19.66	-45.19	PK
		0.63383	37.68	-27.79	9.89	31.56	-21.67	PK
		2.409	29.59	-27.74	1.85	29.54	-27.69	PK

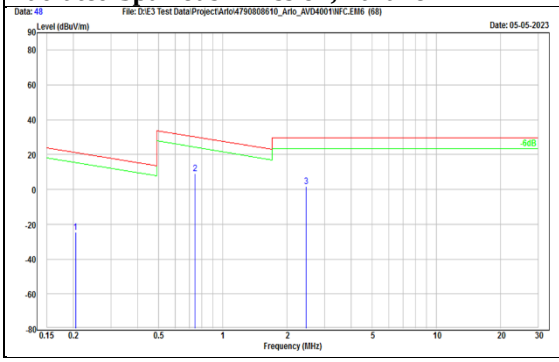
TX, NFC-Type V (Ch 0)
Radiated Spurious Emission, Parallel



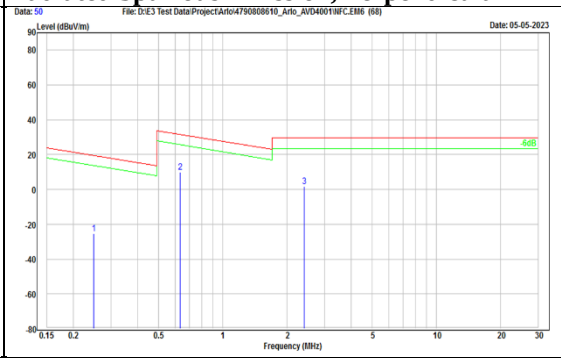
TX, NFC-Type V (Ch 0)
Radiated Spurious Emission, Perpendicular



TX, NFC-Type V (Ch 0)
Radiated Spurious Emission, Parallel



TX, NFC-Type V (Ch 0)
Radiated Spurious Emission, Perpendicular



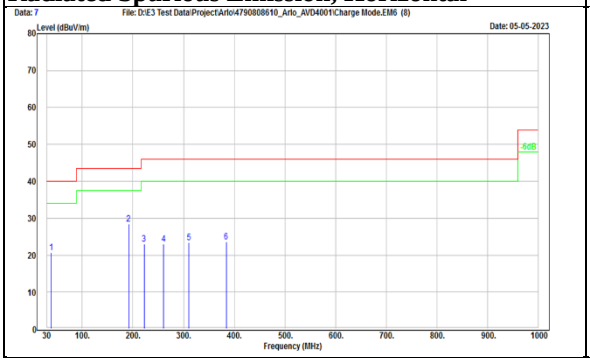
Charge Mode

Below 1 GHz

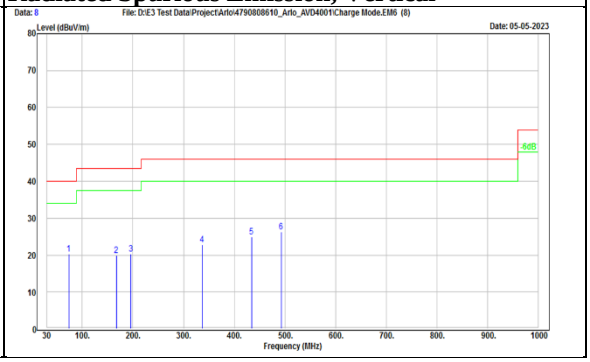
Mode	Charge Mode (Laptop)	Channel	N/A

Polarization	Notation @	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		38.73	34.74	-13.97	20.77	40	-19.23	PK
		191.99	42.89	-14.47	28.42	43.5	-15.08	PK
		222.06	37.26	-14.29	22.97	46	-23.03	PK
		260.86	35.09	-12.02	23.07	46	-22.93	PK
		310.33	33.73	-10.4	23.33	46	-22.67	PK
		384.05	31.62	-8.11	23.51	46	-22.49	PK
Vertical		73.65	34.89	-14.69	20.2	40	-19.8	PK
		167.74	31.84	-11.86	19.98	43.5	-23.52	PK
		195.87	34.93	-14.64	20.29	43.5	-23.21	PK
		336.52	32.26	-9.47	22.79	46	-23.21	PK
		434.49	31.57	-6.61	24.96	46	-21.04	PK
		492.69	31.55	-5.24	26.31	46	-19.69	PK

Charge Mode, Charge Mode (Laptop) (N/A)
Radiated Spurious Emission, Horizontal



Charge Mode, Charge Mode (Laptop) (N/A)
Radiated Spurious Emission, Vertical



9.2. AC Power Line Conducted Emission

Requirements

Frequency (MHz)	Conducted limit (dBμV)	
	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.

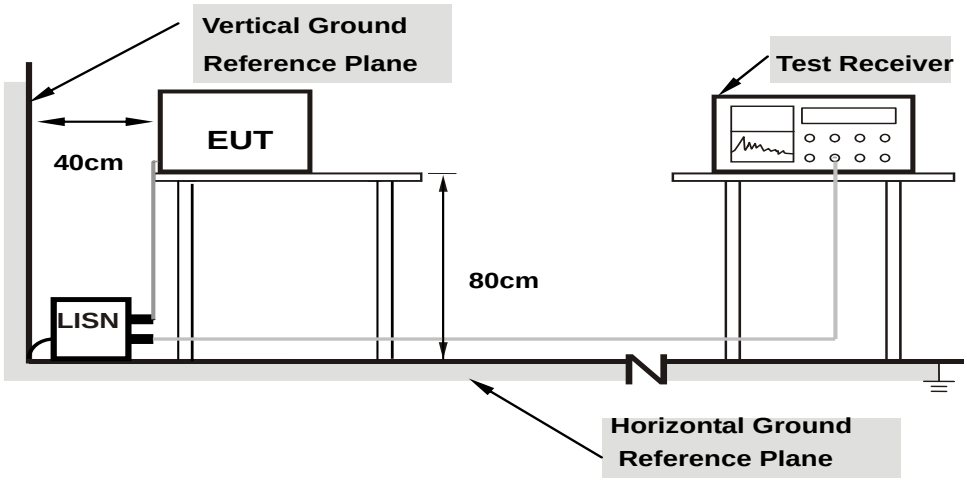
b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

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).

Test Setup



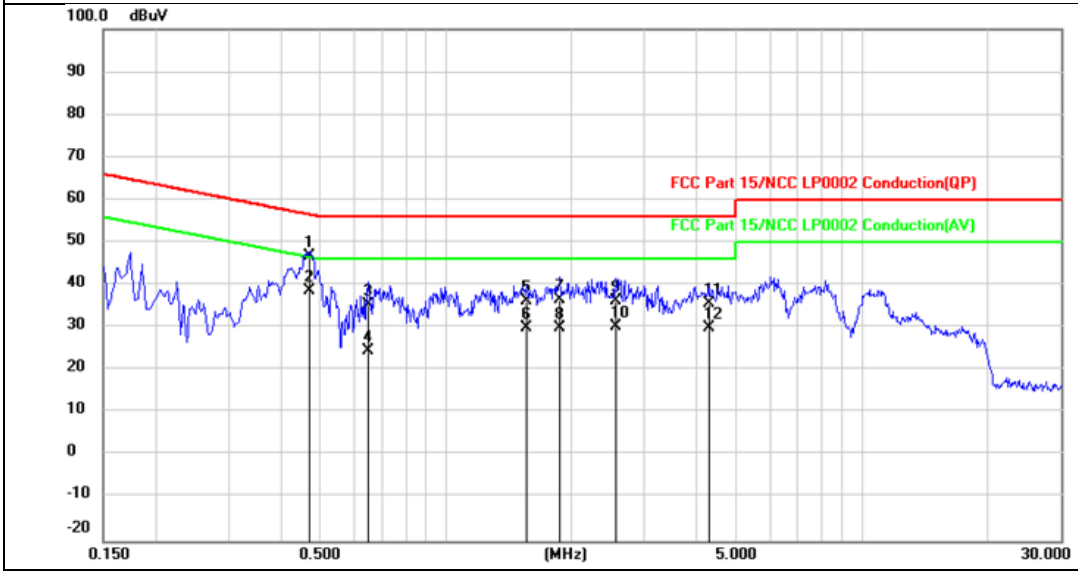
Note: 1.Support units were connected to second LISN.

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

Test Data

Mode	NFC-Type V	Channel	0

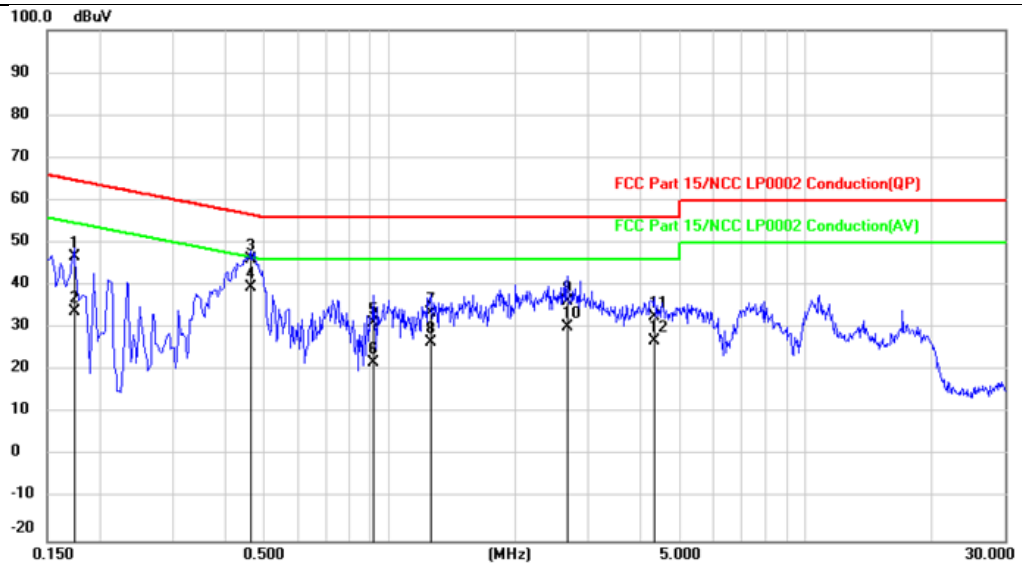
Phase: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4700	36.77	9.96	46.73	56.51	-9.78	QP
2	0.4700	28.65	9.96	38.61	46.51	-7.90	AVG
3	0.6500	25.42	9.96	35.38	56.00	-20.62	QP
4	0.6500	14.71	9.96	24.67	46.00	-21.33	AVG
5	1.5620	26.18	10.00	36.18	56.00	-19.82	QP
6	1.5620	19.95	10.00	29.95	46.00	-16.05	AVG
7	1.8780	26.41	10.01	36.42	56.00	-19.58	QP
8	1.8780	20.07	10.01	30.08	46.00	-15.92	AVG
9	2.5540	26.23	10.03	36.26	56.00	-19.74	QP
10	2.5540	20.11	10.03	30.14	46.00	-15.86	AVG
11	4.2700	25.50	10.09	35.59	56.00	-20.41	QP
12	4.2700	19.95	10.09	30.04	46.00	-15.96	AVG

Mode	NFC-Type V	Channel	0

Phase: Neutral

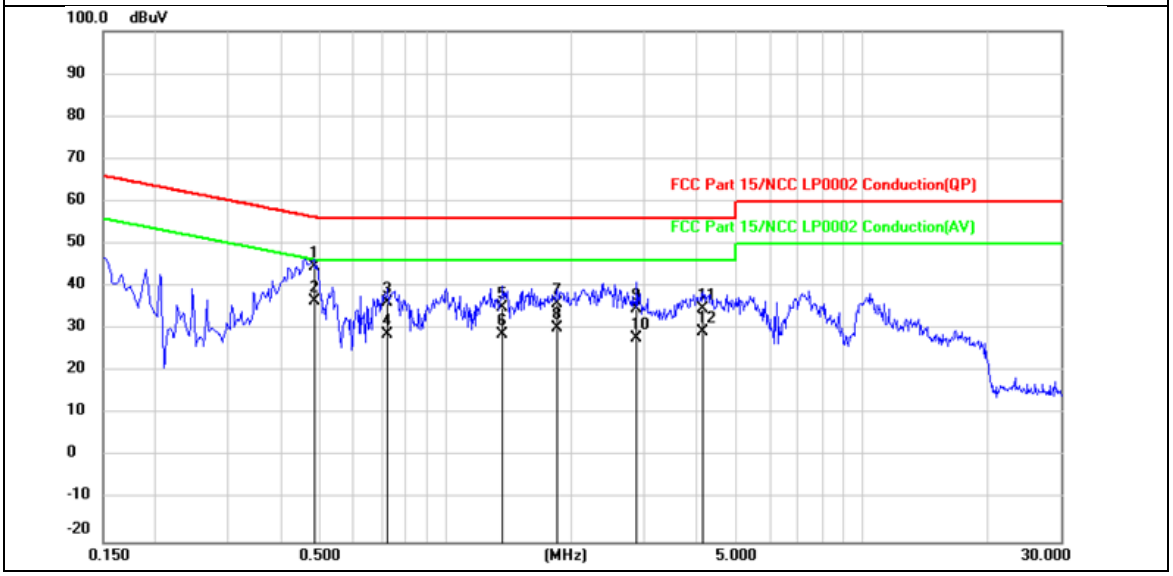


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1740	36.72	9.95	46.67	64.77	-18.10	QP
2	0.1740	23.78	9.95	33.73	54.77	-21.04	AVG
3	0.4620	36.24	9.95	46.19	56.66	-10.47	QP
4	0.4620	29.64	9.95	39.59	46.66	-7.07	AVG
5	0.9100	21.09	9.97	31.06	56.00	-24.94	QP
6	0.9100	11.89	9.97	21.86	46.00	-24.14	AVG
7	1.2500	23.70	9.97	33.67	56.00	-22.33	QP
8	1.2500	16.78	9.97	26.75	46.00	-19.25	AVG
9	2.6660	26.32	10.02	36.34	56.00	-19.66	QP
10	2.6660	20.21	10.02	30.23	46.00	-15.77	AVG
11	4.3180	22.51	10.09	32.60	56.00	-23.40	QP
12	4.3180	16.79	10.09	26.88	46.00	-19.12	AVG

Charge Mode

Mode	Charge Mode (Laptop)	Channel	N/A

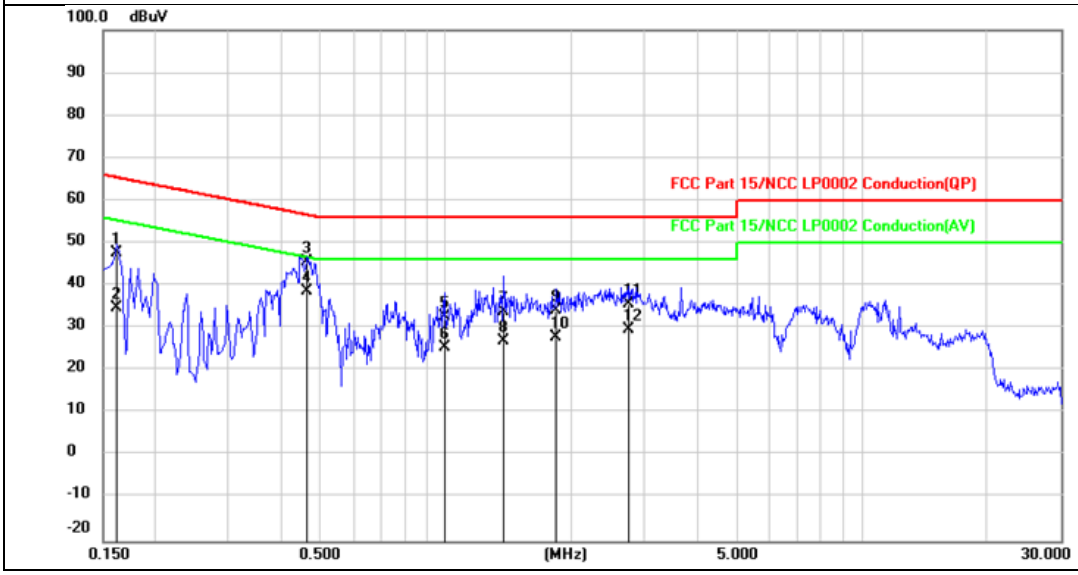
Phase: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4820	34.84	9.96	44.80	56.30	-11.50	QP
2	0.4820	26.51	9.96	36.47	46.30	-9.83	AVG
3	0.7260	26.24	9.97	36.21	56.00	-19.79	QP
4	0.7260	18.78	9.97	28.75	46.00	-17.25	AVG
5	1.3700	24.91	10.00	34.91	56.00	-21.09	QP
6	1.3700	18.78	10.00	28.78	46.00	-17.22	AVG
7	1.8500	25.94	10.01	35.95	56.00	-20.05	QP
8	1.8500	20.14	10.01	30.15	46.00	-15.85	AVG
9	2.8699	24.63	10.04	34.67	56.00	-21.33	QP
10	2.8699	17.94	10.04	27.98	46.00	-18.02	AVG
11	4.1420	24.71	10.08	34.79	56.00	-21.21	QP
12	4.1420	19.18	10.08	29.26	46.00	-16.74	AVG

Mode	Charge Mode (Laptop)	Channel	N/A

Phase: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1620	37.60	9.95	47.55	65.36	-17.81	QP
2	0.1620	24.87	9.95	34.82	55.36	-20.54	AVG
3	0.4660	35.63	9.95	45.58	56.58	-11.00	QP
4	0.4660	28.81	9.95	38.76	46.58	-7.82	AVG
5	0.9940	22.54	9.97	32.51	56.00	-23.49	QP
6	0.9940	15.62	9.97	25.59	46.00	-20.41	AVG
7	1.3740	23.86	9.99	33.85	56.00	-22.15	QP
8	1.3740	16.98	9.99	26.97	46.00	-19.03	AVG
9	1.8420	24.05	10.00	34.05	56.00	-21.95	QP
10	1.8420	17.80	10.00	27.80	46.00	-18.20	AVG
11	2.7620	25.54	10.03	35.57	56.00	-20.43	QP
12	2.7620	19.57	10.03	29.60	46.00	-16.40	AVG

9.3. 20dB Bandwidth

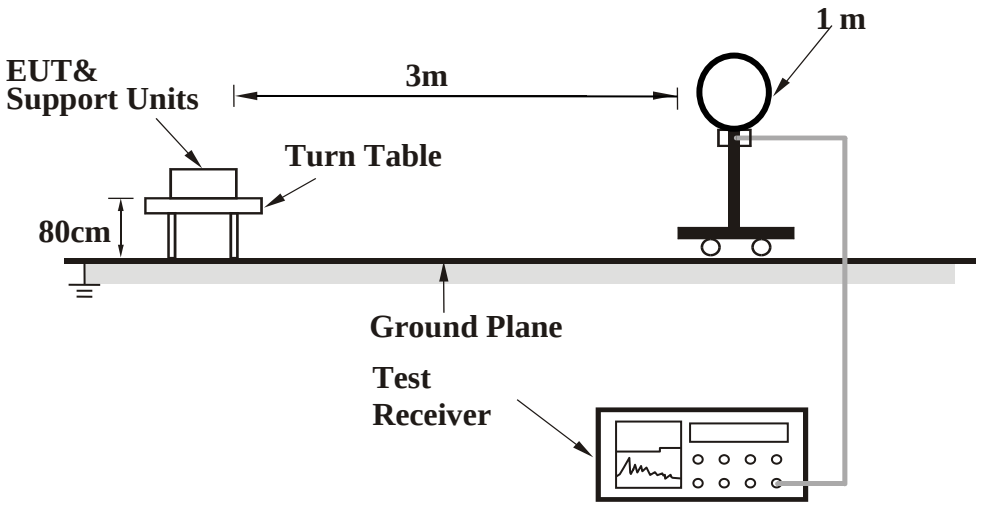
Requirements

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

Test Procedures

a. The testing follows the guidelines in ANSI C63.10-2013.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room.
c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
d. 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. 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



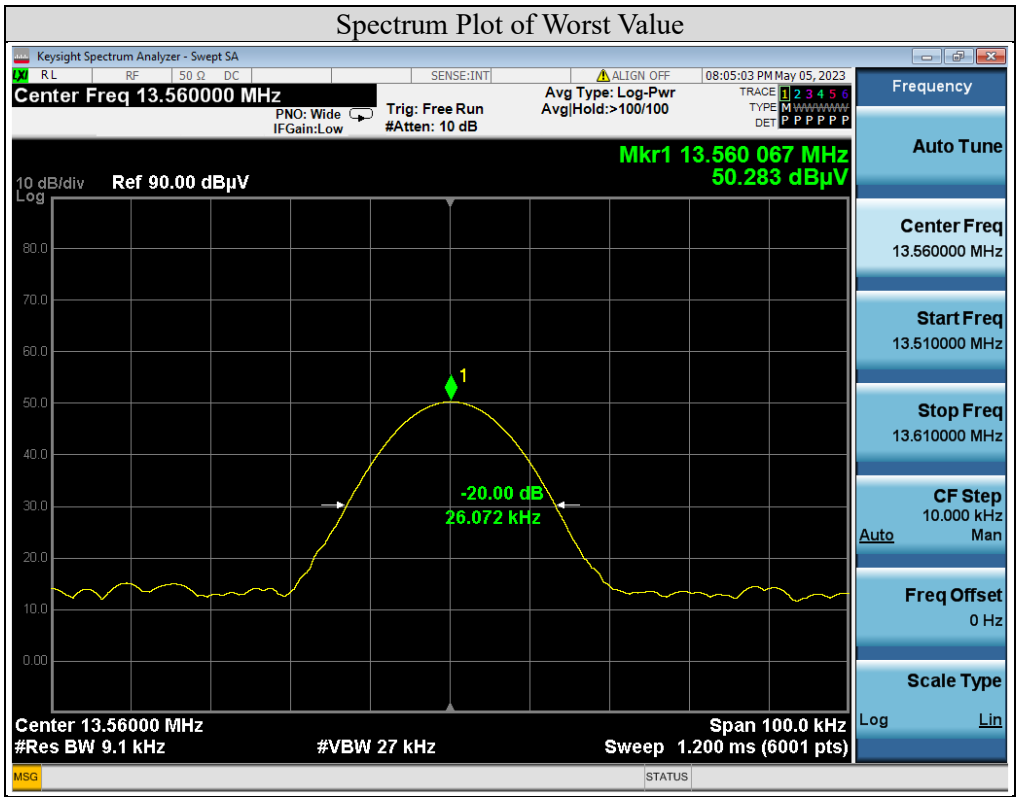
For the actual test configuration, please refer to the Setup Configurations.

Test Data

Type A

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	13.56	0.0261

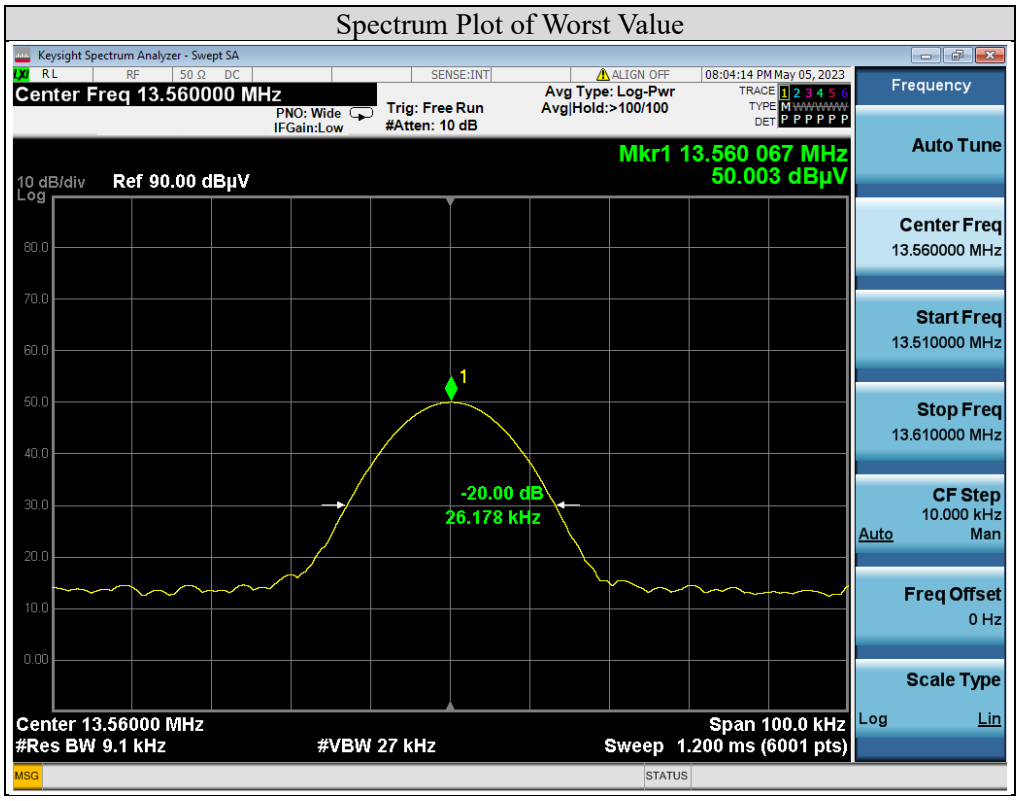
Spectrum Plot of Worst Value



Type B

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	13.56	0.0262

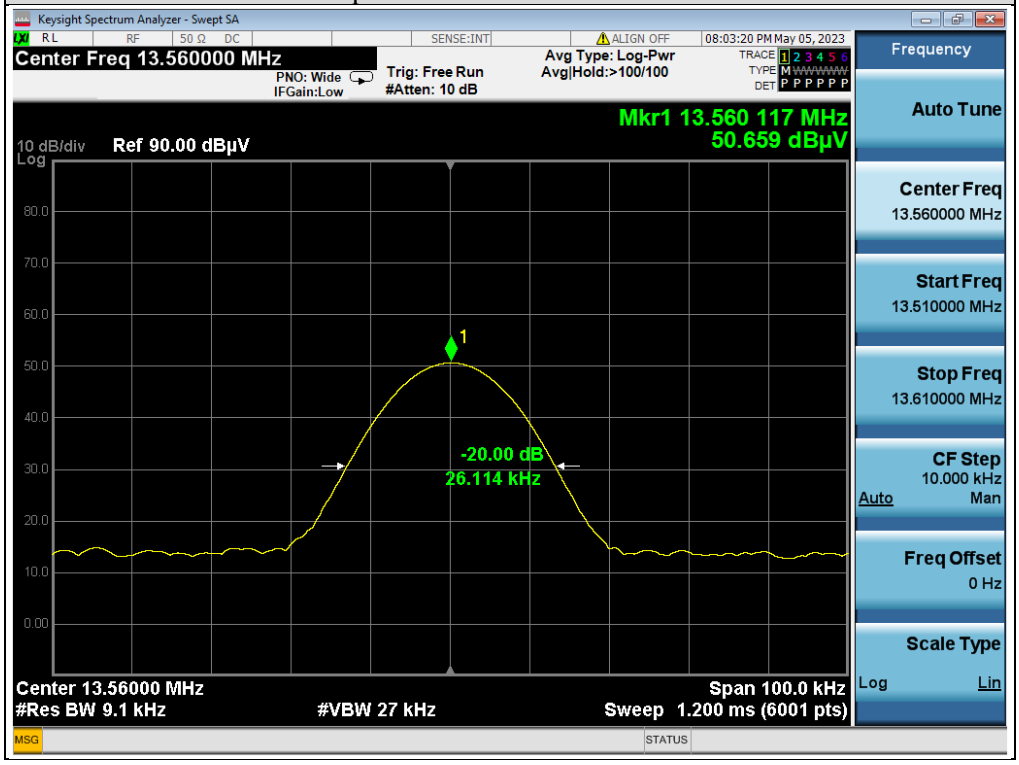
Spectrum Plot of Worst Value



Type V

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
1	13.56	0.0261

Spectrum Plot of Worst Value



9.4. Frequency Stability

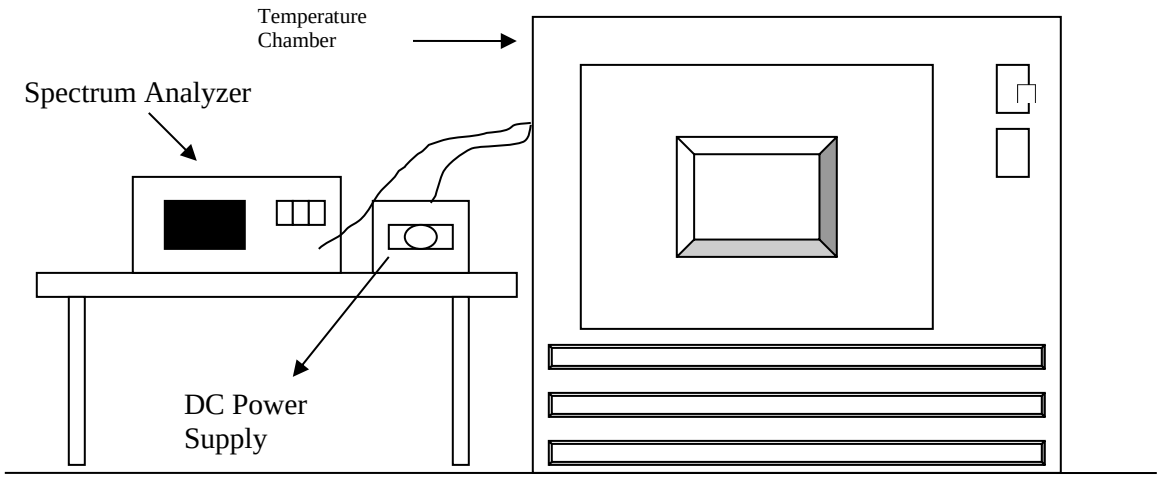
Requirements

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 AC 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



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)
45	5	13.56002	1.47	13.56001	0.74	13.56002	1.47	13.56003	2.21
40	5	13.56002	1.47	13.56002	1.47	13.56002	1.47	13.56002	1.47
30	5	13.55997	-2.21	13.55997	-2.21	13.55997	-2.21	13.55997	-2.21
20	5	13.55998	-1.47	13.55997	-2.21	13.55998	-1.47	13.55997	-2.21
10	5	13.56004	2.95	13.56004	2.95	13.56004	2.95	13.56003	2.21
0	5	13.55996	-2.95	13.55996	-2.95	13.55996	-2.95	13.55996	-2.95
-10	5	13.56003	2.21	13.56002	1.47	13.55997	-2.21	13.55998	-1.47
-20	5	13.56001	0.74	13.55997	-2.21	13.55996	-2.95	13.55997	-2.21
TEMP. (°C)	Power Supply (Vac)	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	4.25	13.55998	-1.47	13.55997	-2.21	13.55998	-1.47	13.55997	-2.21
20	5	13.55998	-1.47	13.55997	-2.21	13.55998	-1.47	13.55997	-2.21
20	5.75	13.55998	-1.47	13.55997	-2.21	13.55998	-1.47	13.55997	-2.21

END OF REPORT