RADIO TEST REPORT

Product	:	AP20 AutoPole
Model Name	:	AP20
Series Model	:	AP20 T
FCC ID	:	RFD-AP20T
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.225)
Received Date	:	2024/12/3
Test Date	:	2025/1/9 ~ 2025/1/16
Issued Date	:	2025/7/1
Applicant	:	Leica Geosystems AG Heinrich Wild Strasse, 9435 Heerbrugg, Switzerland
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building A, B and E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

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REVISION HISTORY

Original Test Report No.: 4791505014A-US-R1-V1

Revision	Test report No.	Date	Page revised	Contents
Original	4791505014A-US-R1-V0	2025/5/6	-	Initial issue
V1	4791505014A-US-R1-V1	2025/7/1	28	Add note

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1. Attestation of Test Results

APPLICANT:	Leica Geosystems AG Heinrich Wild Strasse, 9435 Heerbrugg, Switzerland
MANUFACTURER:	Leica Geosystems Pte Ltd 2 Woodlands Sector 1, #01-10 Woodlands Spectrum, Singapore 738068
EUT DESCRIPTION:	AP20 AutoPole
BRAND:	Leica Geosystems
MODEL:	AP20
SERIES MODEL:	AP20 T
SAMPLE STAGE:	Mass-Production
DATE of TESTED:	2025/1/9 ~ 2025/1/16

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:

Sally Lu Date : 2025/7/1
Project Handler

Approved and Authorized By:

Eric Lee Date : 2025/7/1
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 A, B and 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, Simple acceptance (Section 3.1.4 of IEC 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	3.1 dB
RF Conducted	9 kHz - 40GHz	2.3 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	3.2 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	6.1 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	5.1 dB

6. Equipment under Test

6.1. Description of EUT

Product	AP20 AutoPole
Brand Name	Leica Geosystems
Model Name	AP20
Series Model	AP20 T
Normal Voltage	5Vdc from Host 7.2Vdc from Battery

Operating Frequency	13.56MHz
Modulation	ASK
Transfer Rate	Up to 106 kbit/s
Maximum Field Strength	24.61 dBuV/m
Sample ID	Conducted Test:7899112
	Radiated Test:7899110

Note:

1. The measured field strength was extrapolated to distance from 3 meters to 30 meters, using the formula that converted to the field strength varies as the inverse distance square. (40dB per decade of distance for below 30MHz)
   Example:
   13.56MHz = 24.61 dBuV/m @30m
   = $24.61 + 20\log(30/3)^2$ dBuV/m @3m
   = 64.61 dBuV/m @3m

2. The models difference as below:
   - Electronically identical, use the same module of NINAB301.
   - AP20 T disables the Target ID function (Search and lock onto the target by verifying a specify ID on the fly.), which is available in AP20.

3. The EUT could be supplied with rechargeable battery as the following table:

Brand	Model	Description
Leica Geosystems AG	GEB321	7.4Vdc, 3.35Ah

4. 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. Channel List

1 channel is provided for ASK mode:

Channel	Frequency (MHz)
1	13.56

6.3. Test Condition

Test Item	Test Site No.	Environmental	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	24℃/ 66%RH	5Vdc	2025/01/09	Eric Peng
Radiated Spurious Emission	966-2	22~26℃/ 62~68%RH	5Vdc	2025/01/09~ 2025/01/16	Eric Peng
AC power Line Conducted Emission	SR1	23℃/ 62%RH	120Vac/ 60Hz	2025/01/16	Eric Peng

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).

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Frequency Range	Brand Name	Model Name	Maximum Gain (dBi)	Ant. Type	Connector Type
BT	Chain0	2402MHz ~ 2480MHz	uBlox	NINA-B301	3.5	Dipole	R-SMA
NFC	Chain0	13.56MHz	NXP	CLRC66303HN	N/A	PCB	N/A

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

Test Item	Modulation Type	Available Channel	Test Channel
Radiated Emissions (Above 1GHz)	ASK	1	1
Radiated Emissions (Below 1GHz)	ASK	1	1
AC Power Line Conducted Emission	ASK	1	1

- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that X-Y plane was worst-case. Therefore, all final radiated testing was performed with the EUT in X-Y plane.
- The EUT is power by rechargeable battery. after pre-scan battery capacity at 0%, 50% and 100% , the worst case was found in the 100%. Therefore only the test data of the 100% of battery capacity was recorded in this report.
- The EUT has 2 types of power source: 7.2Vdc from battery (Model:GEB321) and 5Vdc from Host above types was pre-tested radiated emission, the worst case was found in the 5Vdc from Host , and therefore only the test data was recorded in this report.

7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2024/3/29	2025/3/28
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2024/12/24	2025/12/23
Loop Antenna	ETS lindgren	6502	00213440	2024/12/11	2025/12/10
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2024/12/30	2025/12/29
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2024/11/27	2025/11/26
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2024/12/18	2025/12/17
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2024/5/28	2025/5/27
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2024/1/23	2025/1/22
				2025/1/13	2026/1/12
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2024/4/16	2025/4/15
Cables (9k-18 GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2024/11/22	2025/11/21
Cables (18-40GHz)	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2024/11/22	2025/11/21

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Antenna Port Conducted Measurement					
Signal Analyzer	Rohde & Schwarz	FSVA3044	101281	2024/3/18	2025/3/17
Signal Analyzer	Rohde & Schwarz	FSV40	101490	2024/7/1	2025/6/30
Attenuator	EMCI	EMC-40ATK2W10	17002	2024/11/13	2025/11/12
USB Power Sensor	Anritsu	MA24408A	12031	2024/7/13	2025/7/12
Temperature &Humidity Test Chamber	GIANT FORCE	GTH-150- 40-CP-AR	MAA1701-010	2024/3/6	2025/3/5
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2024/10/1	2025/9/30
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2024/5/14	2025/5/13
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2024/8/29	2025/8/28
Cables	TITAN	CFD200	T0732ACFD 20020A300-2	2024/5/14	2025/5/13

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

Tx Mode

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	DELL	Latitude E5470	5M2MWF2	Provide by Lab
B	Battery	Leica Geosystems AG	GEB321	21122	Supplied by Client

I/O Cables

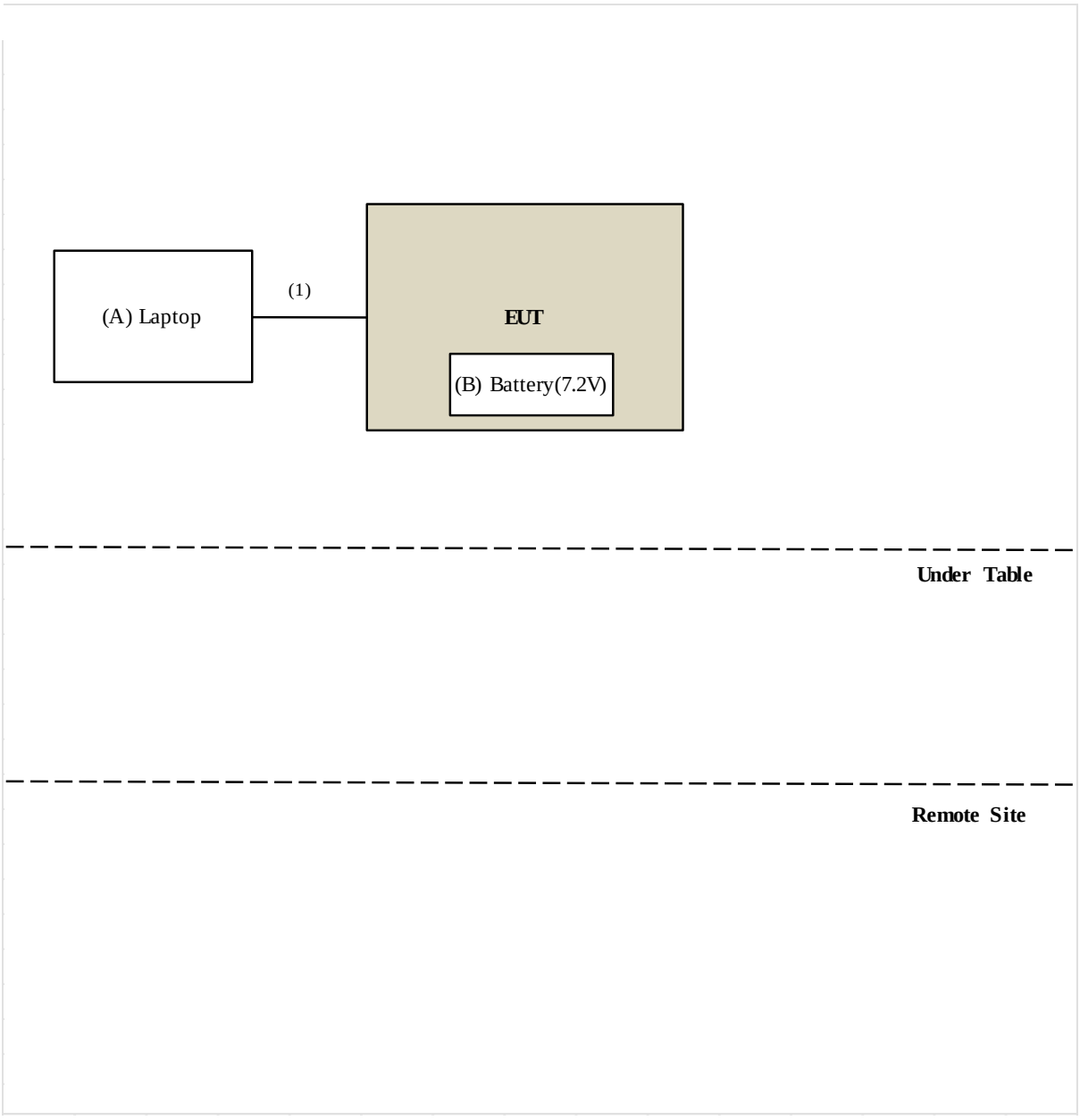
ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	USB Type C	Jellico	GS-20	1.2	Provide by Lab

Test Setup

Controlled using a bespoke application (BLE&NFC : Windows command prompt) 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

Tx 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.
2. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB) - DCF(dB)
3. DCF = Distance Correction Factor, for Frequency below 30MHz, 40dB per decade of distance.
4. Example for DCF below 0.49MHz, Test result of distance was extrapolated from 3 meters to 300 meters, DCF = $20\log(300/3)^2$ = 80 dB.
5. Example for DCF between 0.49MHz to 30MHz, Test result of distance was extrapolated from 3 meters to 30 meters, DCF = $20\log(30/3)^2$ = 40 dB.
6. Test data of Result value (dBuV/m) = Reading value (dBuV) + Correction Factor (dB/m).
7. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
8. Test data of Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).

[For above 30 MHz]

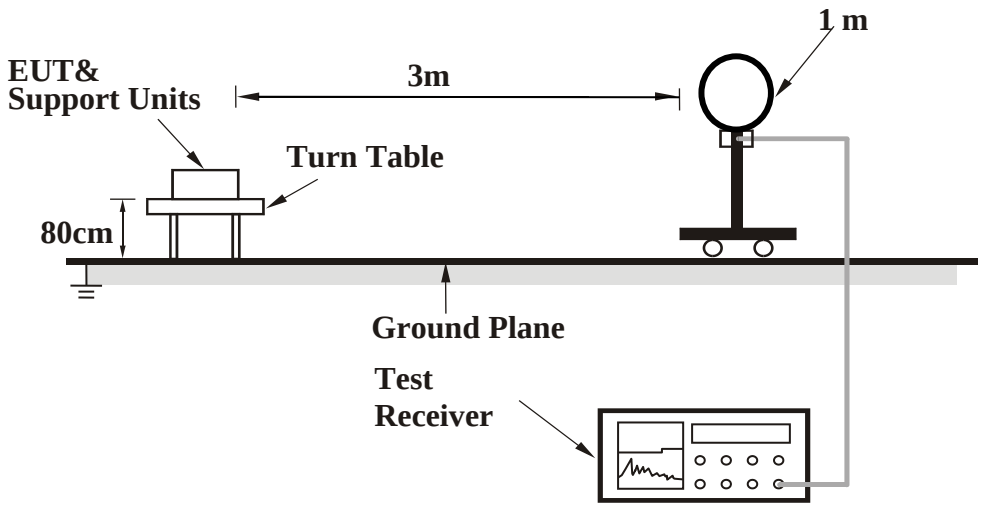
a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was 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:

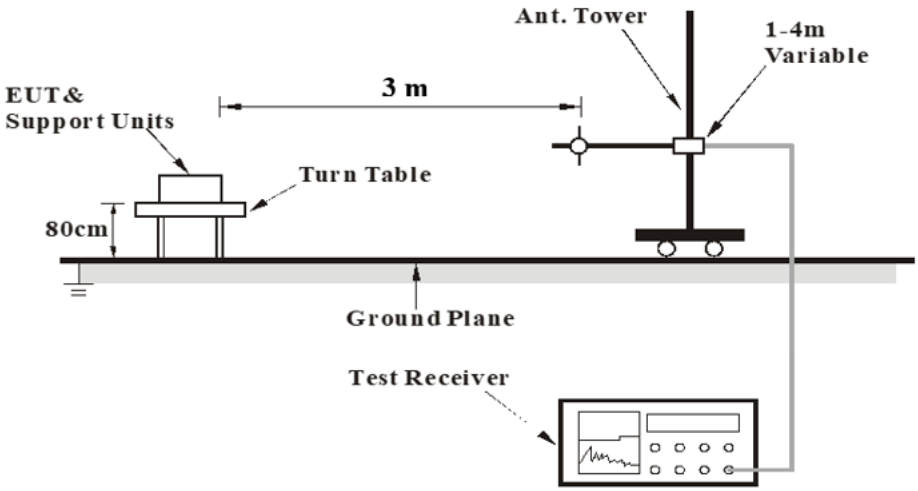
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported.
3. Test data of Result value (dBuV/m) = Reading value (dBuV) + Correction Factor (dB/m).
4. Test data of Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
5. Test data of Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) - Preamp Factor (dB).

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.

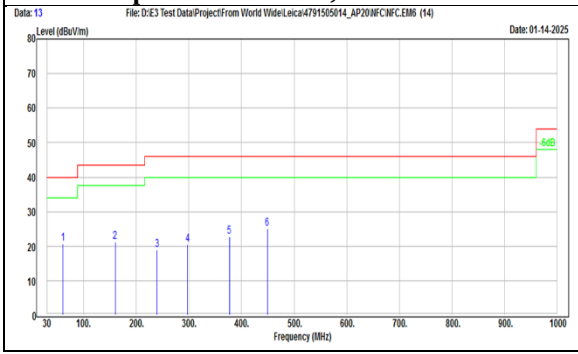
Test Data

Below 1 GHz

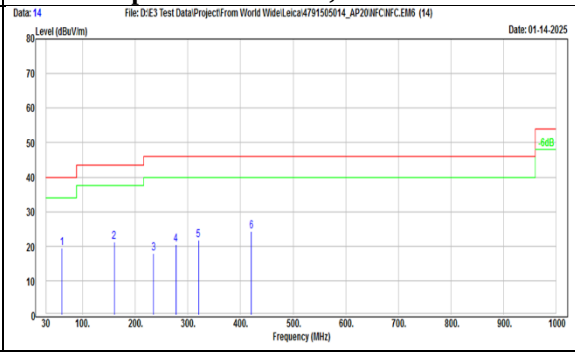
Mode	NFC-Type A	Channel	1

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Horizontal		61.04	32.75	-12.05	20.7	40	-19.3	PK
		159.98	32.79	-11.47	21.32	43.5	-22.18	PK
		239.52	31.61	-12.7	18.91	46	-27.09	PK
		297.72	30.83	-10.49	20.34	46	-25.66	PK
		377.26	30.82	-8.16	22.66	46	-23.34	PK
		449.04	30.98	-5.86	25.12	46	-20.88	PK
Vertical		61.04	31.45	-12.05	19.4	40	-20.6	PK
		159.98	32.74	-11.47	21.27	43.5	-22.23	PK
		234.67	31.23	-13.27	17.96	46	-28.04	PK
		277.35	31.61	-11.12	20.49	46	-25.51	PK
		320.03	31.63	-9.82	21.81	46	-24.19	PK
		420.91	31.17	-6.94	24.23	46	-21.77	PK

TX, NFC-Type A (Ch 1)
Radiated Spurious Emission, Horizontal



TX, NFC-Type A (Ch 1)
Radiated Spurious Emission, Vertical

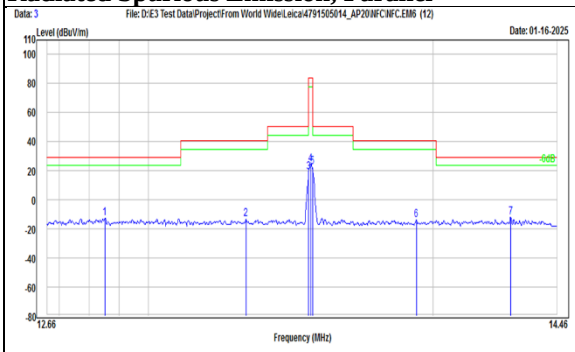


Below 30MHz

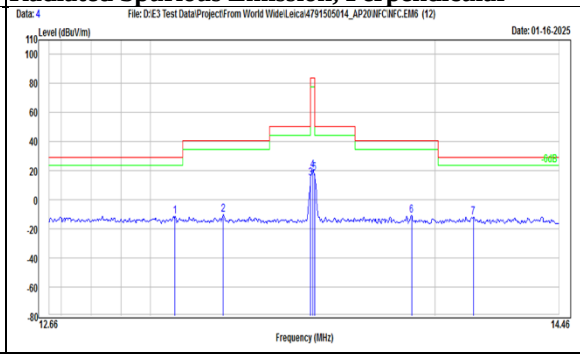
Mode	Fundamental NFC-Type A	Channel	1

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		12.853	14.28	-27.16	-12.88	29.54	-42.42	PK
		13.334	13.87	-27.29	-13.42	40.51	-53.93	PK
		13.553	46.43	-27.36	19.07	50.47	-31.4	PK
		13.561	51.97	-27.36	24.61	84	-59.39	PK
		13.567	49.91	-27.36	22.55	50.47	-27.92	PK
		13.939	13.68	-27.46	-13.78	40.51	-54.29	PK
		14.286	15.35	-27.47	-12.12	29.54	-41.66	PK
Perpendicular		13.083	16.08	-27.23	-11.15	29.54	-40.69	PK
		13.249	16.97	-27.27	-10.3	40.51	-50.81	PK
		13.553	42.23	-27.36	14.87	50.47	-35.6	PK
		13.561	47.72	-27.36	20.36	84	-63.64	PK
		13.567	45.72	-27.36	18.36	50.47	-32.11	PK
		13.915	16.62	-27.46	-10.84	40.51	-51.35	PK
		14.141	15.75	-27.48	-11.73	29.54	-41.27	PK

TX, Fundamental NFC-Type A (Ch 1)
Radiated Spurious Emission, Parallel



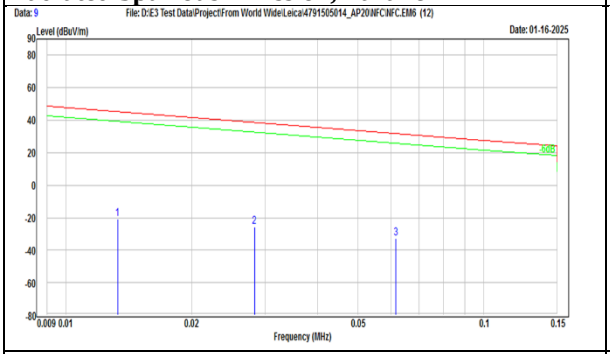
TX, Fundamental NFC-Type A (Ch 1)
Radiated Spurious Emission, Perpendicular



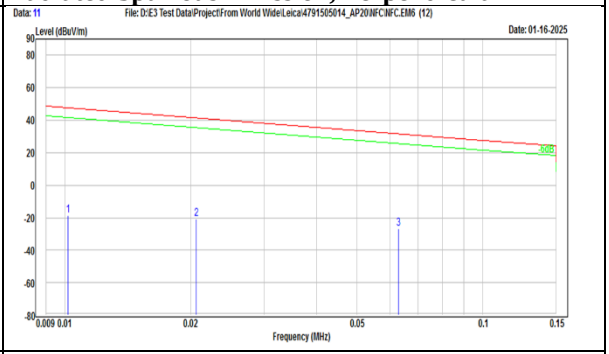
Mode	NFC-Type A	Channel	1

Polarization	Notation	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
Parallel		0.01331	43.02	-63.84	-20.82	45.12	-65.94	PK
		0.02828	40.04	-65.98	-25.94	38.57	-64.51	PK
		0.06166	35.61	-68.15	-32.54	31.8	-64.34	PK
		0.21967	41.86	-67.81	-25.95	20.77	-46.72	PK
		0.65778	35.43	-27.74	7.69	31.24	-23.55	PK
		2.155	27	-28.01	-1.01	29.54	-30.55	PK
Perpendicular		0.01019	44.35	-63.22	-18.87	47.44	-66.31	PK
		0.02064	44.33	-64.89	-20.56	41.31	-61.87	PK
		0.06288	41.25	-68.14	-26.89	31.63	-58.52	PK
		0.16501	47.56	-67.96	-20.4	23.25	-43.65	PK
		0.65778	35.73	-27.74	7.99	31.24	-23.25	PK
		21.035	18.47	-27.75	-9.28	29.54	-38.82	PK

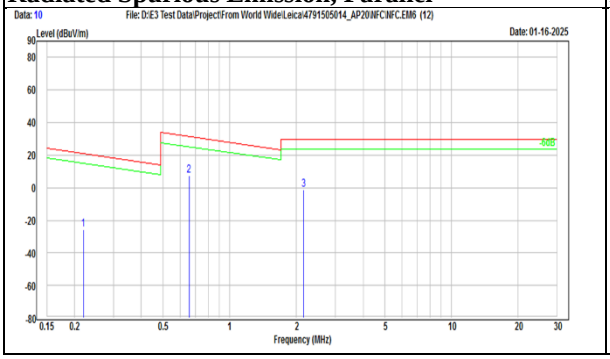
TX, NFC-Type A (Ch 1)
Radiated Spurious Emission, Parallel



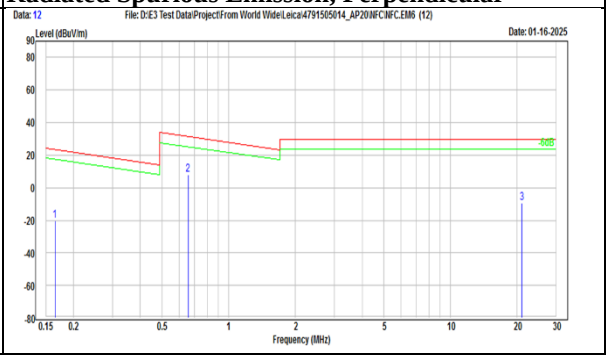
TX, NFC-Type A (Ch 1)
Radiated Spurious Emission, Perpendicular



TX, NFC-Type A (Ch 1)
Radiated Spurious Emission, Parallel



TX, NFC-Type A (Ch 1)
Radiated Spurious Emission, Perpendicular



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.

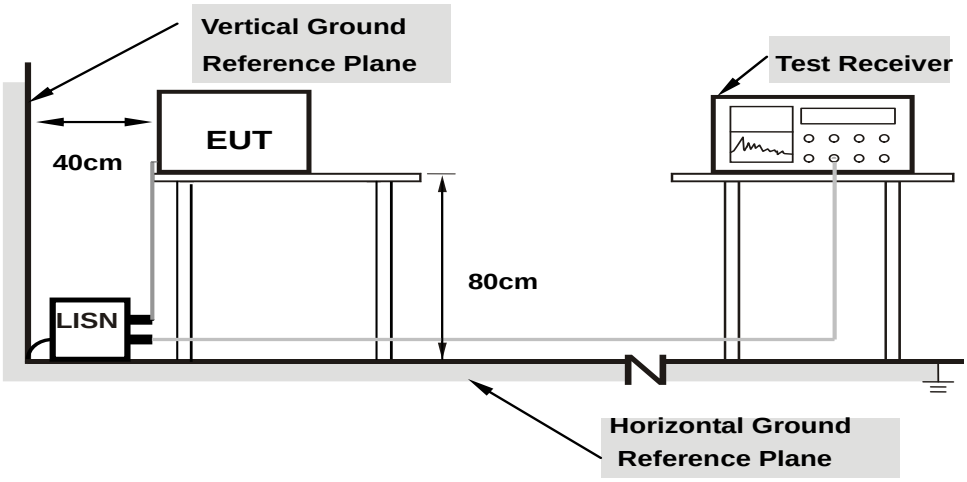
Test Procedures

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



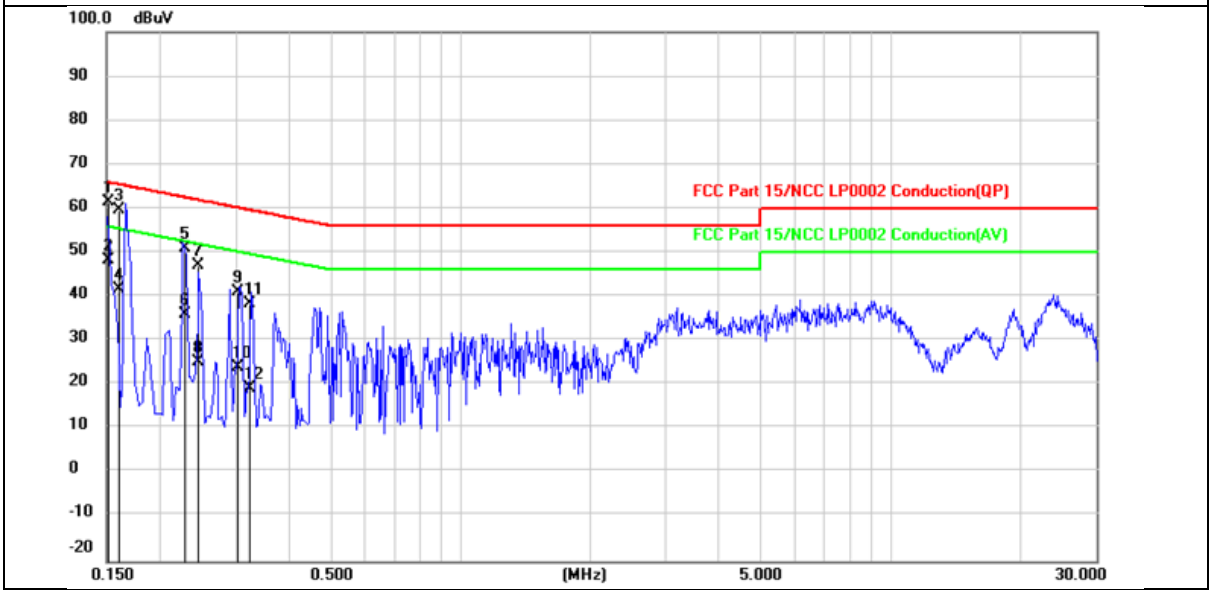
Note: 1.Support units were connected to second LISN.

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

Test Data

Mode	NFC_TX13.56	Channel	1

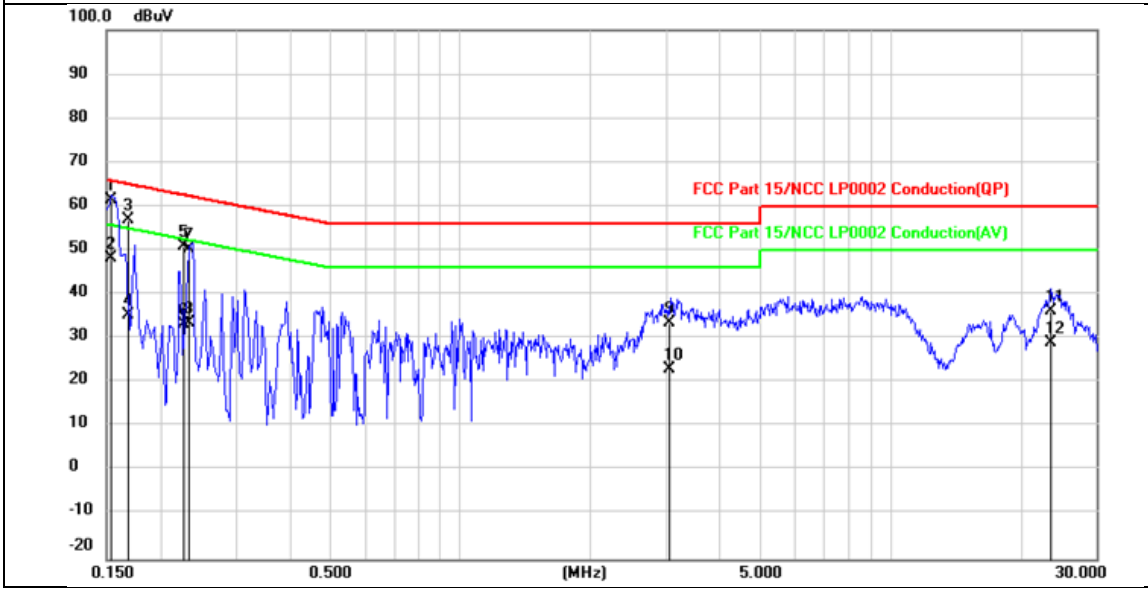
Phase: Line



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1516	51.40	9.96	61.36	65.91	-4.55	QP
2	0.1516	38.17	9.96	48.13	55.91	-7.78	AVG
3	0.1619	49.69	9.96	59.65	65.37	-5.72	QP
4	0.1619	31.80	9.96	41.76	55.37	-13.61	AVG
5	0.2283	40.87	9.96	50.83	62.51	-11.68	QP
6	0.2283	25.89	9.96	35.85	52.51	-16.66	AVG
7	0.2454	37.05	9.96	47.01	61.91	-14.90	QP
8	0.2454	15.27	9.96	25.23	51.91	-26.68	AVG
9	0.3013	31.17	9.95	41.12	60.21	-19.09	QP
10	0.3013	14.13	9.95	24.08	50.21	-26.13	AVG
11	0.3218	28.35	9.95	38.30	59.66	-21.36	QP
12	0.3218	9.09	9.95	19.04	49.66	-30.62	AVG

Mode	NFC_TX13.56	Channel	1

Phase: Neutral



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1537	51.63	9.96	61.59	65.80	-4.21	QP
2	0.1537	38.42	9.96	48.38	55.80	-7.42	AVG
3	0.1692	47.12	9.96	57.08	65.00	-7.92	QP
4	0.1692	25.26	9.96	35.22	55.00	-19.78	AVG
5	0.2263	41.05	9.95	51.00	62.58	-11.58	QP
6	0.2263	23.44	9.95	33.39	52.58	-19.19	AVG
7	0.2338	40.41	9.95	50.36	62.31	-11.95	QP
8	0.2338	23.56	9.95	33.51	52.31	-18.80	AVG
9	3.0307	23.46	10.05	33.51	56.00	-22.49	QP
10	3.0307	13.13	10.05	23.18	46.00	-22.82	AVG
11	23.6445	25.45	10.68	36.13	60.00	-23.87	QP
12	23.6445	18.31	10.68	28.99	50.00	-21.01	AVG

9.3. 20dB Bandwidth

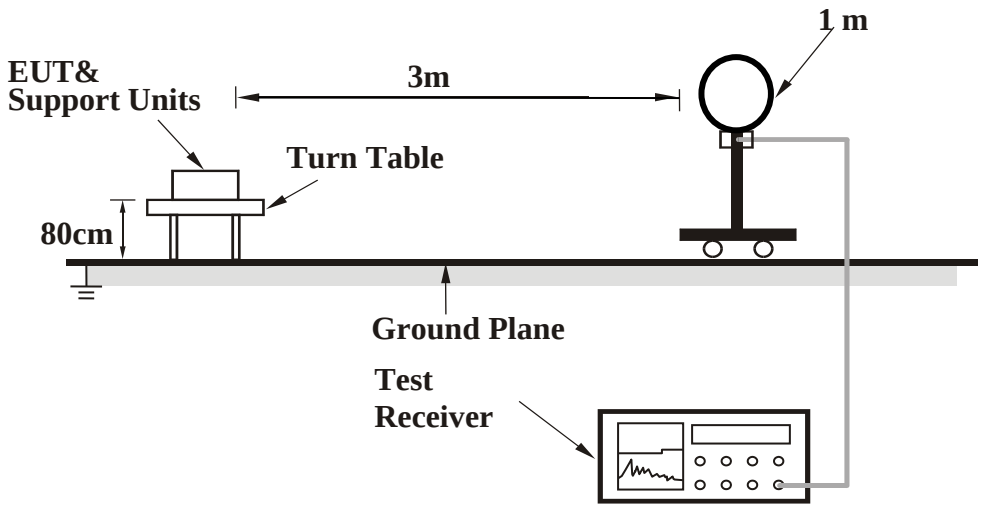
Requirements

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

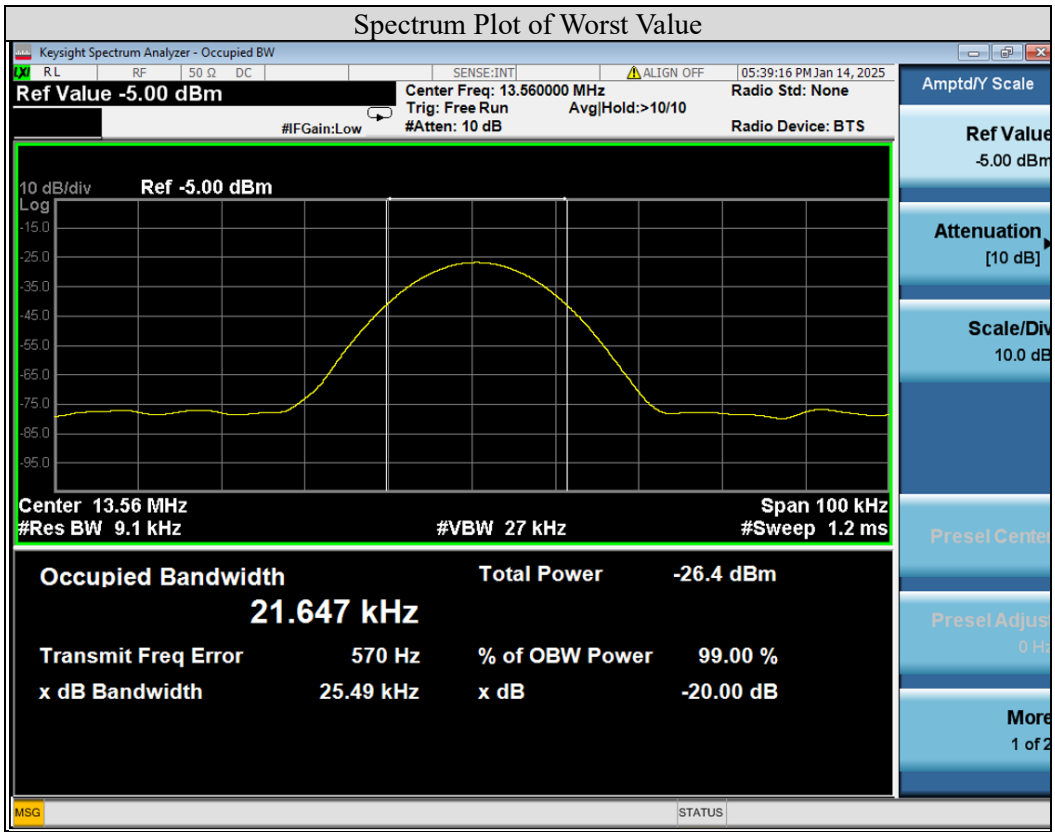


For the actual test configuration, please refer to the Setup Configurations.

Test Data

Channel	Frequency (MHz)	20dB Bandwidth (kHz)
1	13.56	21.647

Spectrum Plot of Worst Value



Note: For CW signals, sometimes EBW may vary with RBW. We use a more stringent setting value to account for this variation.

9.4. Frequency Stability

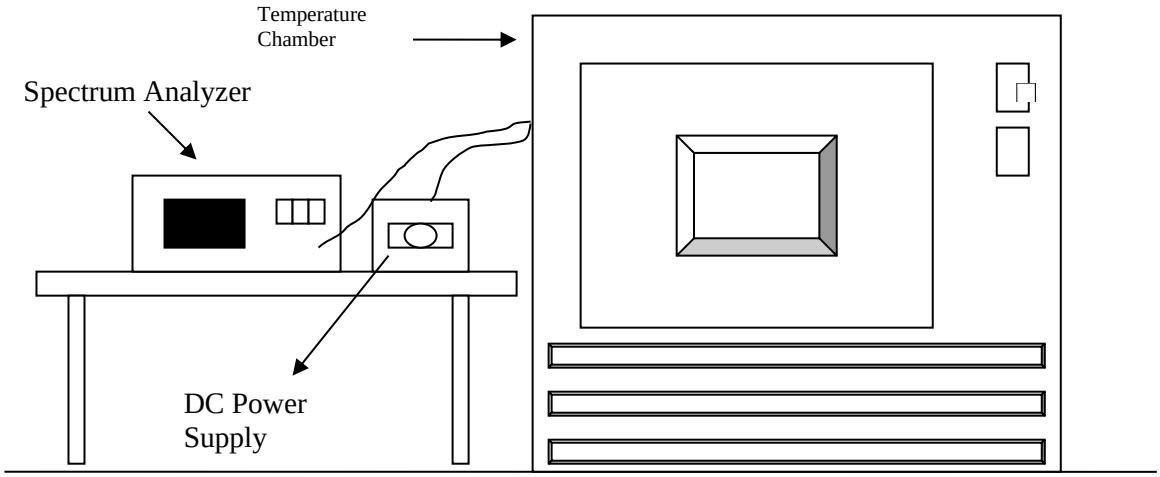
Requirements

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



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	7.2	13.56004	0.00030	13.56004	0.00030	13.56003	0.00022	13.56003	0.00022
40	7.2	13.56001	0.00007	13.56	0.00000	13.56	0.00000	13.56	0.00000
30	7.2	13.56	0.00000	13.55999	-0.00007	13.55999	-0.00007	13.55999	-0.00007
20	7.2	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015
10	7.2	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022	13.55997	-0.00022
0	7.2	13.55997	-0.00022	13.55996	-0.00030	13.55995	-0.00037	13.55994	-0.00044
-10	7.2	13.55992	-0.00059	13.55992	-0.00059	13.55991	-0.00066	13.55991	-0.00066
-20	7.2	13.5599	-0.00074	13.5599	-0.00074	13.5599	-0.00074	13.55989	-0.00081
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	8.28	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015
20	7.2	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015
20	6.12	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015	13.55998	-0.00015

END OF REPORT