Oracle America, Inc

RF TEST REPORT

Report Type:
FCC Part 15.225 & RSS-210 RF report

Model:
MICROS Workstation 8

REPORT NUMBER:
220801344SHA-002

ISSUE DATE:
Oct 2, 2022

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 220801344SHA-002

Applicant	:	Oracle America, Inc 500 Oracle Parkway Redwood City, CA 94065 US
Manufacturer	:	Oracle America, Inc 500 Oracle Parkway Redwood City, CA 94065 US
Factory	:	GES Manufacturing Services (M) SDN BHD Plo 34 Fasa 2, Kawasan Perindustrian, Senai 81400, Johor, Malaysia
FCC ID	:	A4HWS8
IC	:	9870A-WS8

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2020): Radio Frequency Devices (Subpart C)

RSS-210 (Issue 9): Licence-Exempt Radio Apparatus: Category I Equipment

RSS-Gen (Issue 5): General Requirements for Compliance of Radio Apparatus

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
Project Engineer Stephanie Zhang	Reviewer Wakeyou Wang

Content

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Revision History

Report No.	Version	Description	Issued Date
220801344SHA-002	Rev. 01	Initial issue of report	Oct 2, 2022

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Measurement result summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Fundamental emission	15.225(a) (b) (c)	RSS-210 Annex B.6(a) (b) (c)	Pass
Spurious emission	15.225(d)	RSS-210 Annex B.6(d)	Pass
Frequency stability	15.225(e)	RSS-210 Annex B.6(e)	Pass
Conducted emissions	15.207	RSS-GEN Clause 8.8	Pass
99% and 20dB Bandwidth	15.215(c)	RSS-GEN Clause 6.7	Pass
Antenna requirement	15.203	-	Pass

Notes: 1: NA =Not Applicable
2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

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1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Workstation
Type/Model:	MICROS Workstation 8
Description of EUT:	There is one model only. The RF function is assessed in this report. The device supports 802.11a/b/g/n/ac, Bluetooth and RFID functions. Among this report only 13.56MHz RFID was assessed.
Rating:	DC 15V, 2A
Category of EUT:	Class A
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	Sep 10, 2022
Date of test:	Sep 10, 2022 – Sep 29, 2022

1.2 Technical Specification

Frequency Range:	13.56MHz ~ 13.56 MHz

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN1175
	IC Registration Lab Registration code No.: 2042B-1
	VCCI Registration Lab Registration No.: R-4243, G-845, C-4723, T-2252
	NVLAP Accreditation Lab NVLAP LAB CODE: 200849-0
	A2LA Accreditation Lab Certificate Number: 3309.02

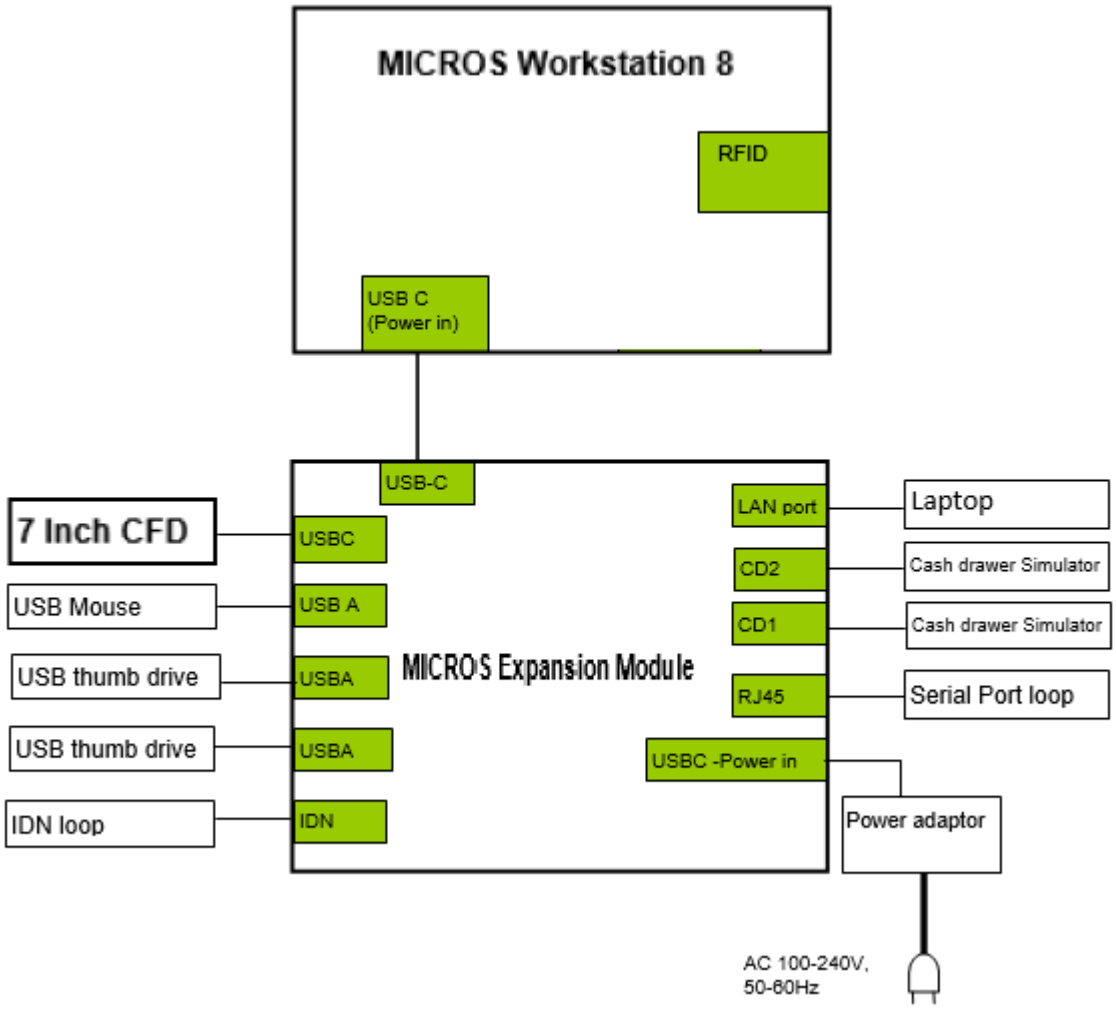
2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2020)
RSS-210 (Issue 9)
RSS-Gen (Issue 5)
ANSI C63.10 (2013)

2.2 Mode of operation during the test

While testing, the internal modulation and continuously transmission was applied.
The test was conducted with test setup as below.



2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No	Description	Band and Model	Others
1	Customer Display	Oracle / 7 Inch CFD	/
2	I/O Hub	Oracle / MICROS Expansion Module	/
3	Cash driver simulator	/	/
4	USB mouse	DELL / MS116p	/
5	USB drive	SanDisk / BL201126210Z	/
6	Laptop	DELL / Latitude E5470	/
7	AC/DC adapter	FSP / FSP065-A1BR3	Power input: 100-240VAC, 1.7A, 50-60Hz

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	20°C	54% RH
Power line conducted emission	20°C	54% RH

2.6 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2022-12-9
☐	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2022-12-9
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2022-11-9
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2022-10-19
☒	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC6402	2023-1-17
☒	Pre-amplifier	tonscend	tap01018050	EC 6432-1	2022-12-26
☒	Horn antenna	tonscend	bha9120d	EC 6432-2	2023-1-9
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2023-07-08
☒	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2023-04-23
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2023-03-14
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2023-03-14
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2023-03-14
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2023-1-20
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2023-03-14
☐	Mobile Test System	Litepoint	Iqxel	EC 5176	2023-01-11
☐	Test Receiver	R&S	ESCI 7	EC 4501	2022-12-9
☒	Climate chamber	GWS	MT3065	EC 6021	2023-03-06
☐	Universal Radio Communication Tester	R&S	CMW500	Ec6209	2023-1-20
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2023-01-11
☐	Shielded room	Zhongyu	-	EC 2839	2023-01-11

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☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-08-22
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2023-03-24
☐	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2023-03-08
☒	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2023-01-03
☐	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5844	2023-03-8
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2023-07-21

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Frequency	Expanded Uncertainty (k=2)
Conducted emission at mains ports	9kHz ~ 150kHz	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.90 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 dB

3 Fundamental Emission

Test result: **Pass**

3.1 Limit

Frequencies (MHz)	Limit at 30m (dBuV/m)	Limit at 3m (dBuV/m)
13.110 – 13.410	40.50	80.50
13.410 – 13.553	50.50	90.50
13.553 – 13.567	84.00	124.00
13.567 – 13.710	50.50	90.50
13.710 – 14.010	40.50	80.50

3.2 Measurement Procedure

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) Both X and Y axes 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) The test-receiver system was set to PK Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

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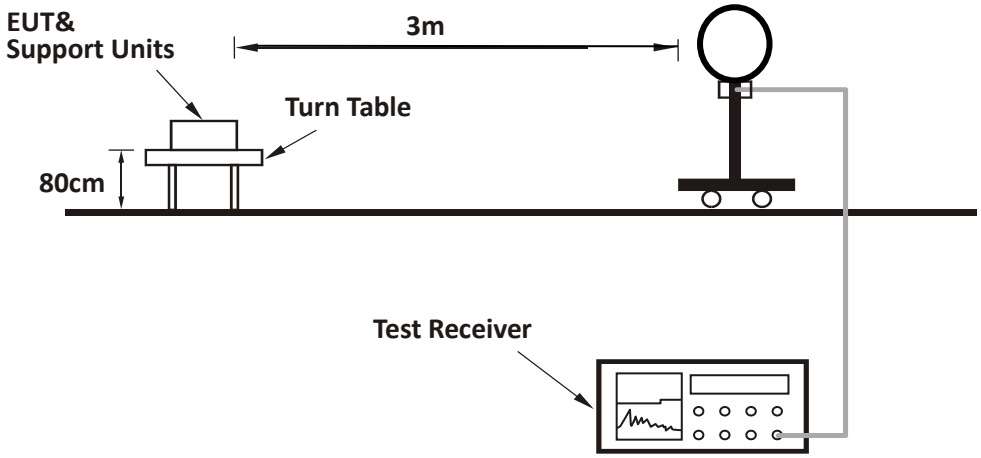
3.3 Test Configuration



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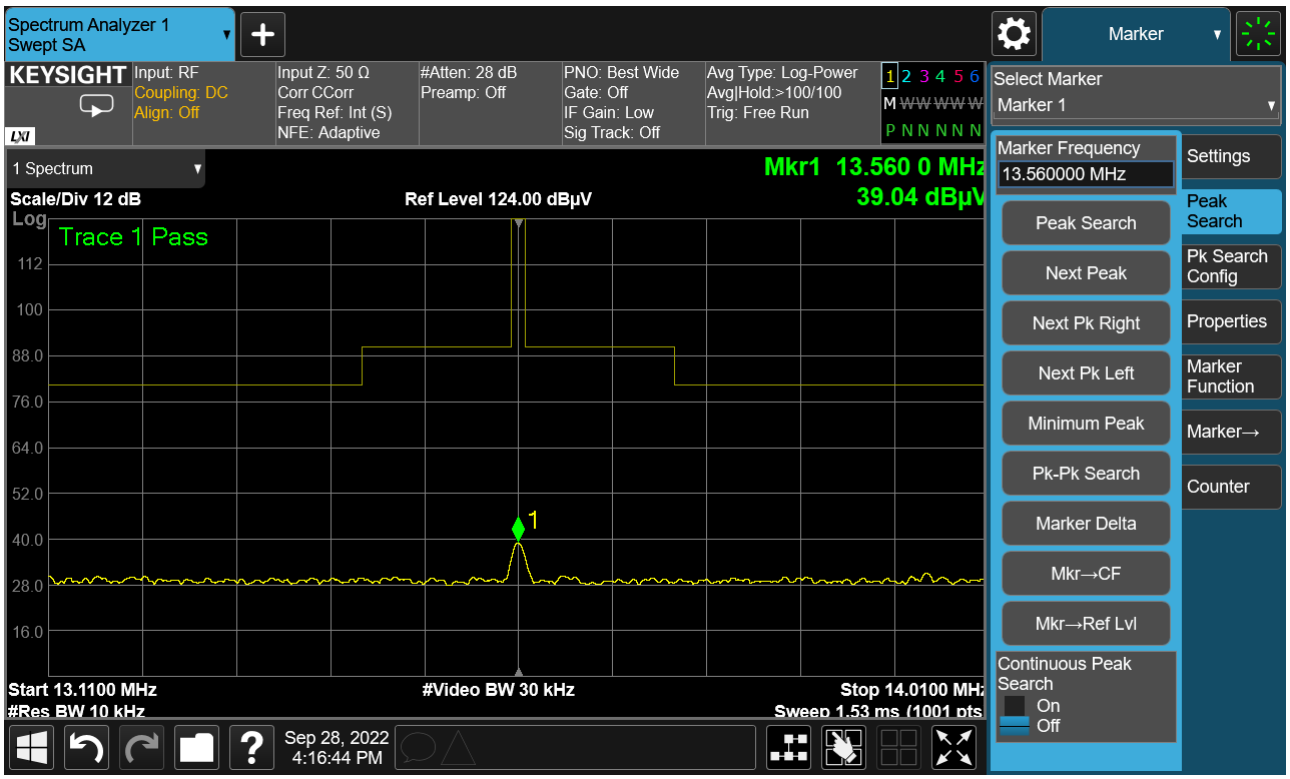
3.4 Test Results of Fundamental Emissions



Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector
X	13.56	39.00	11.20	124.00	85.00	PK
Y	13.56	37.60	11.20	124.00	86.40	PK
Z	13.56	31.80	11.20	124.00	92.20	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

4 Spurious Emission

Test result: **Pass**

4.1 Limit

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

4.2 Measurement Procedure

For Radiated emission below 30MHz:

f) 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.

g) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

h) Both X and Y axes of the antenna are set to make the measurement.

i) 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.

j) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 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) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

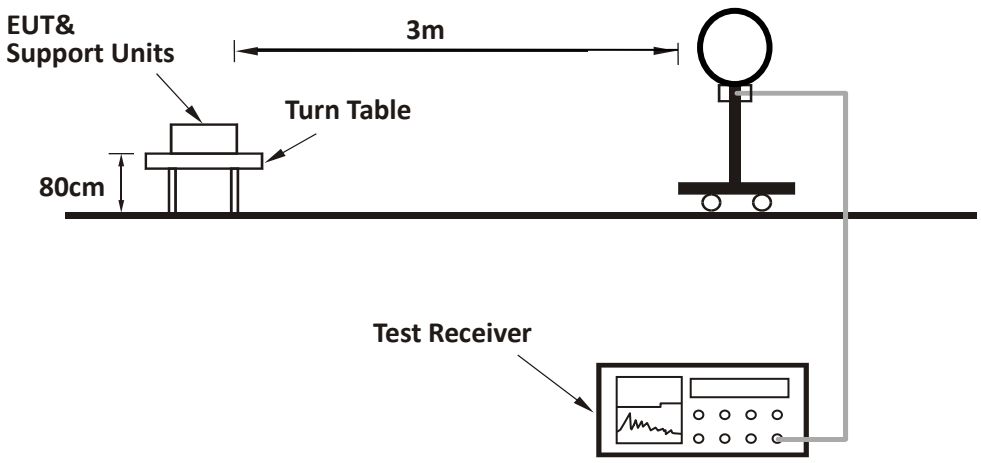
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

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. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. All modes of operation were evaluated and the worst-case emissions were reported

4.3 Test Configuration

For Radiated emission below 30MHz:



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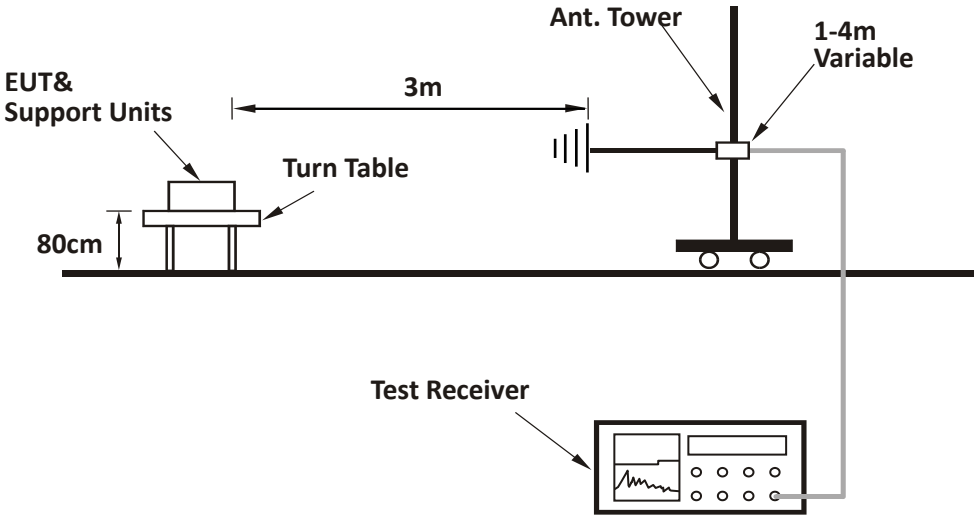
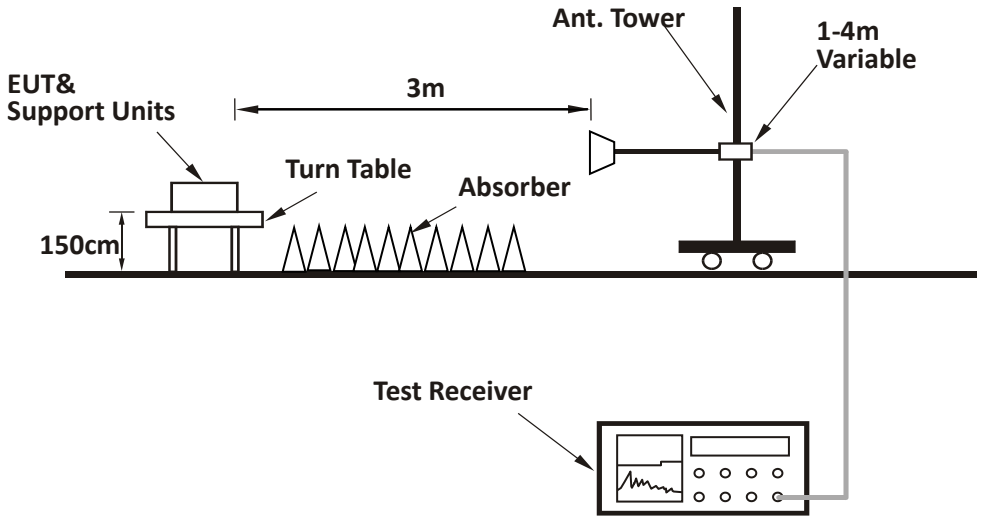
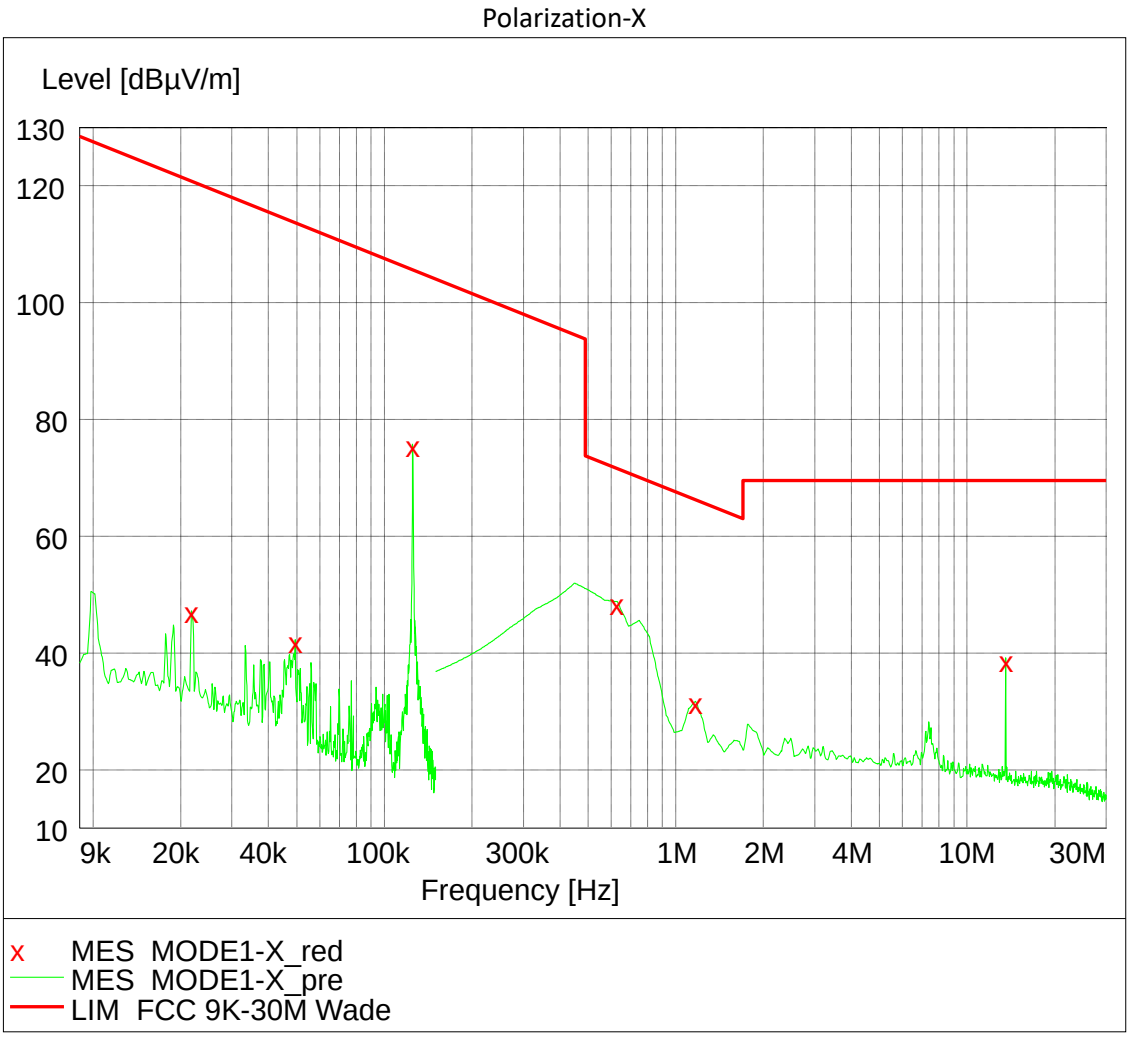
For Radiated emission 30MHz to 1GHz:



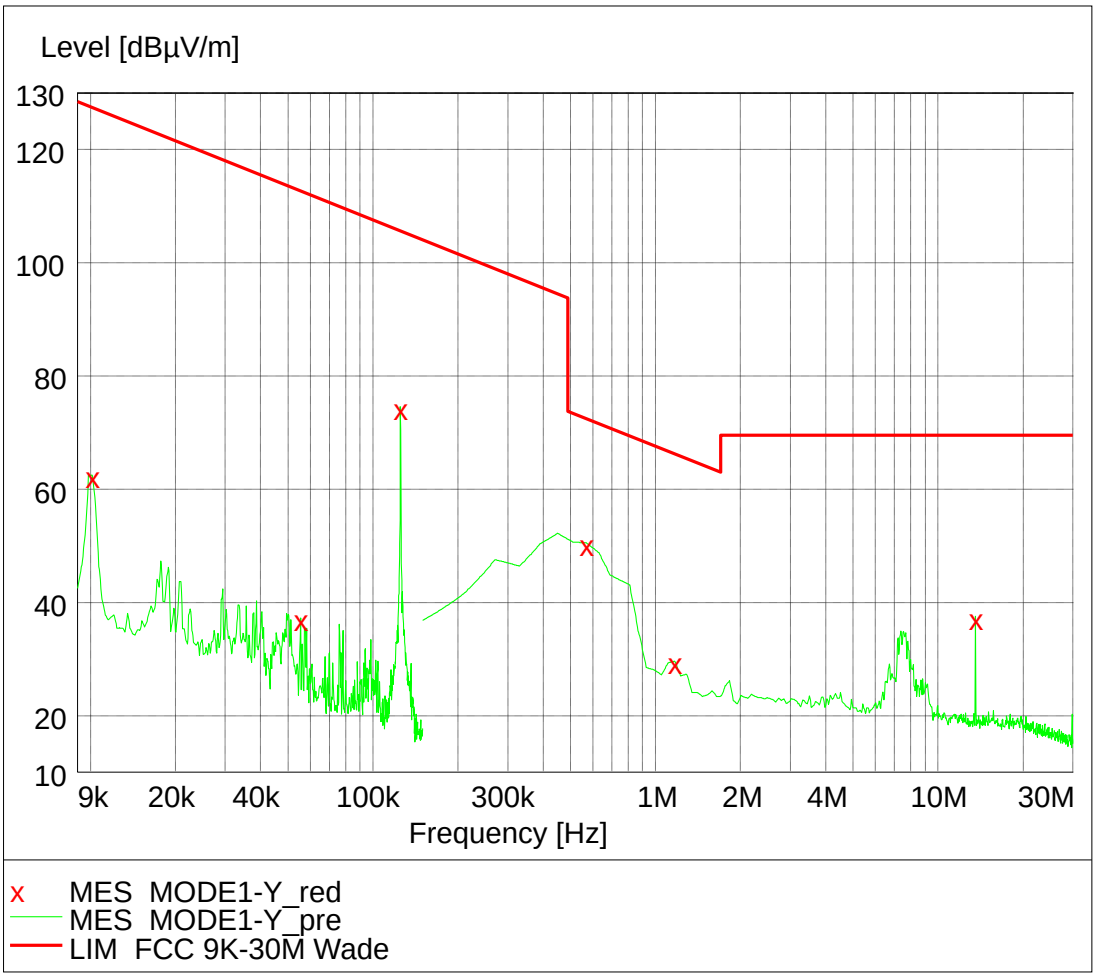
For Radiated emission above 1GHz:



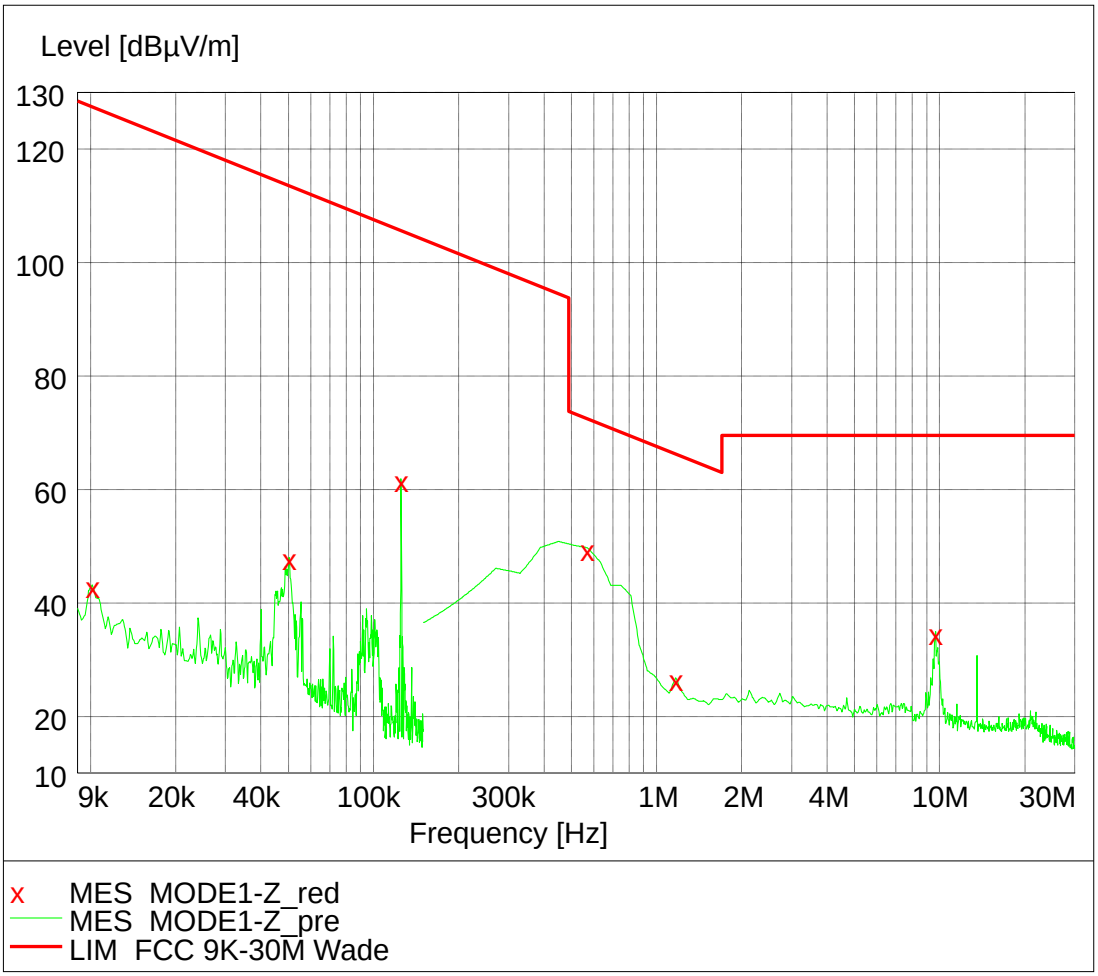
4.4 Test Results of Radiated Emissions



Polarization-Y



Polarization-Z



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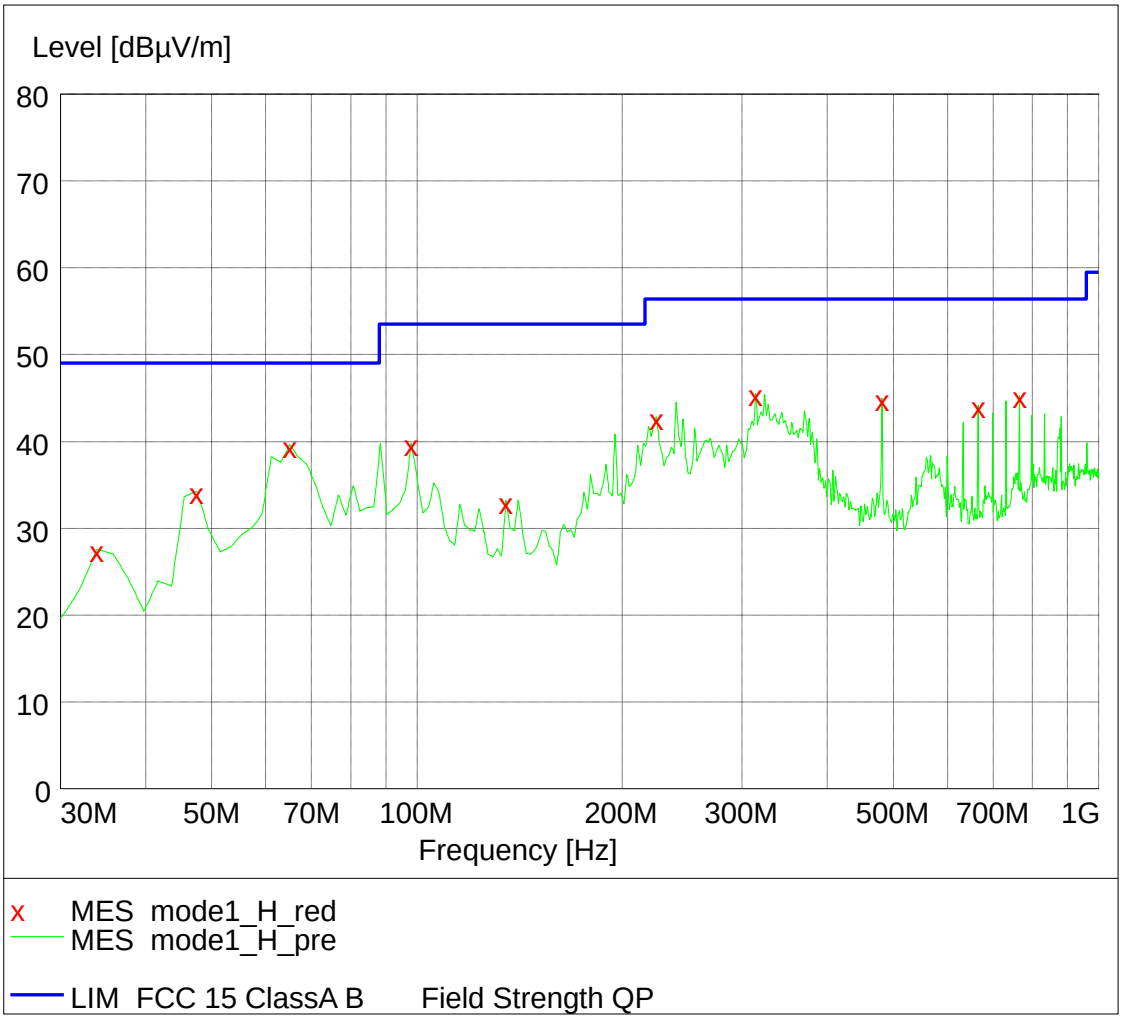
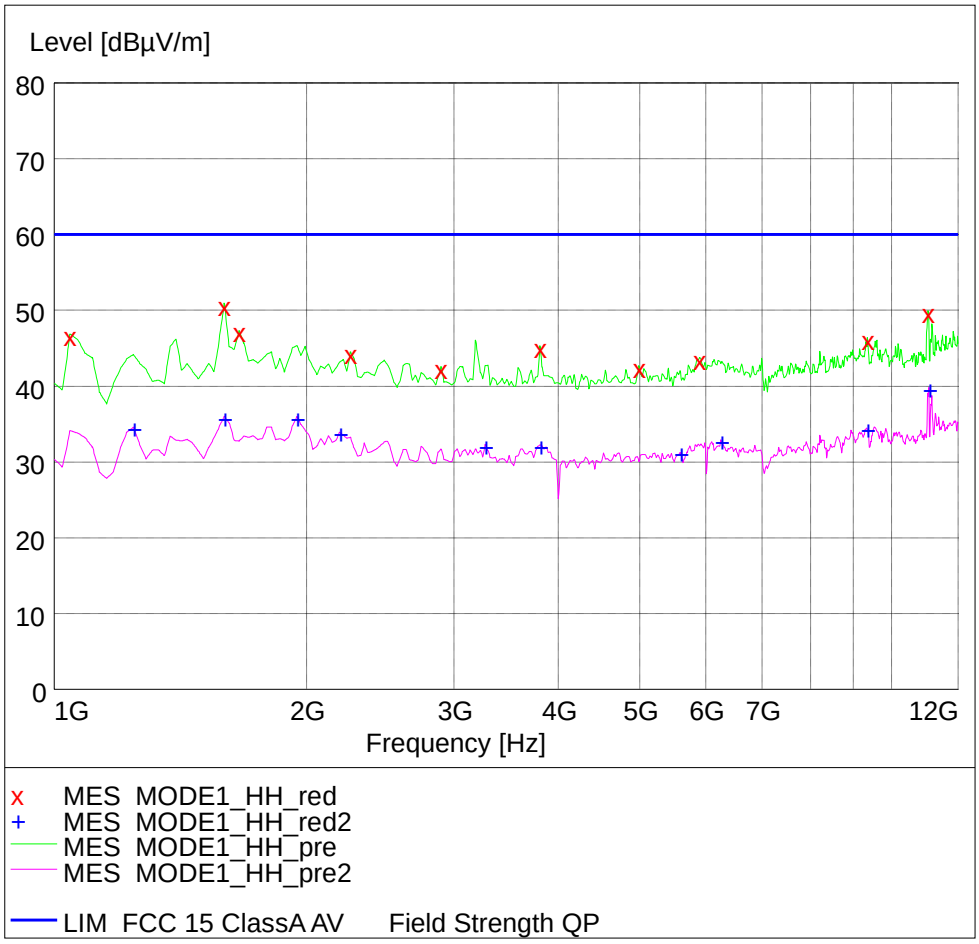
Polarization-H




Level [dBµV/m]
80
70
60
50
40
30
20
10
0
1G
2G
3G
4G
5G
6G
7G
12G
Frequency [Hz]
MES MODE1_HH_red
MES MODE1_HH_red2
MES MODE1_HH_pre
MES MODE1_HH_pre2
LIM FCC 15 ClassA AV
Field Strength QP

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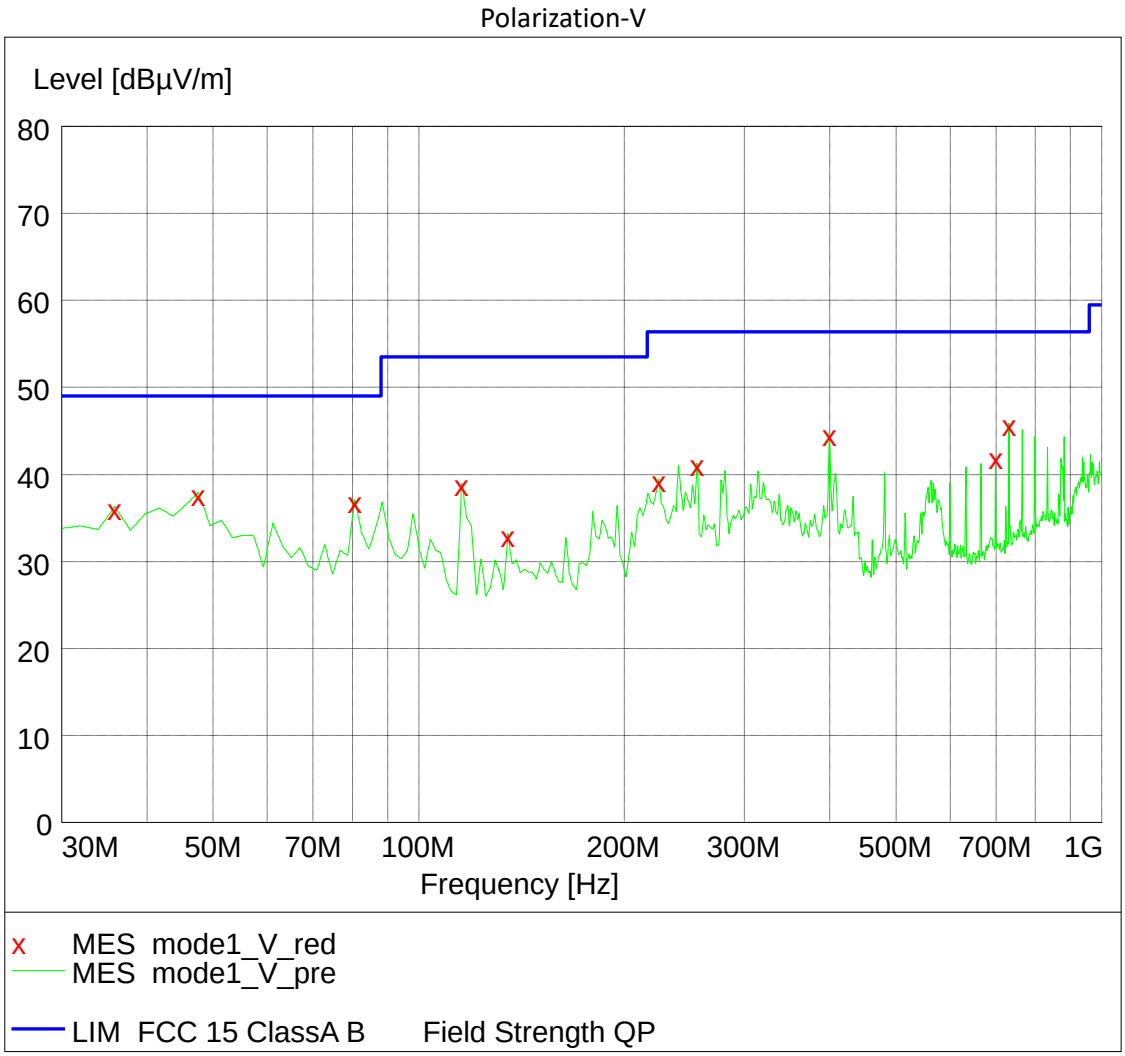
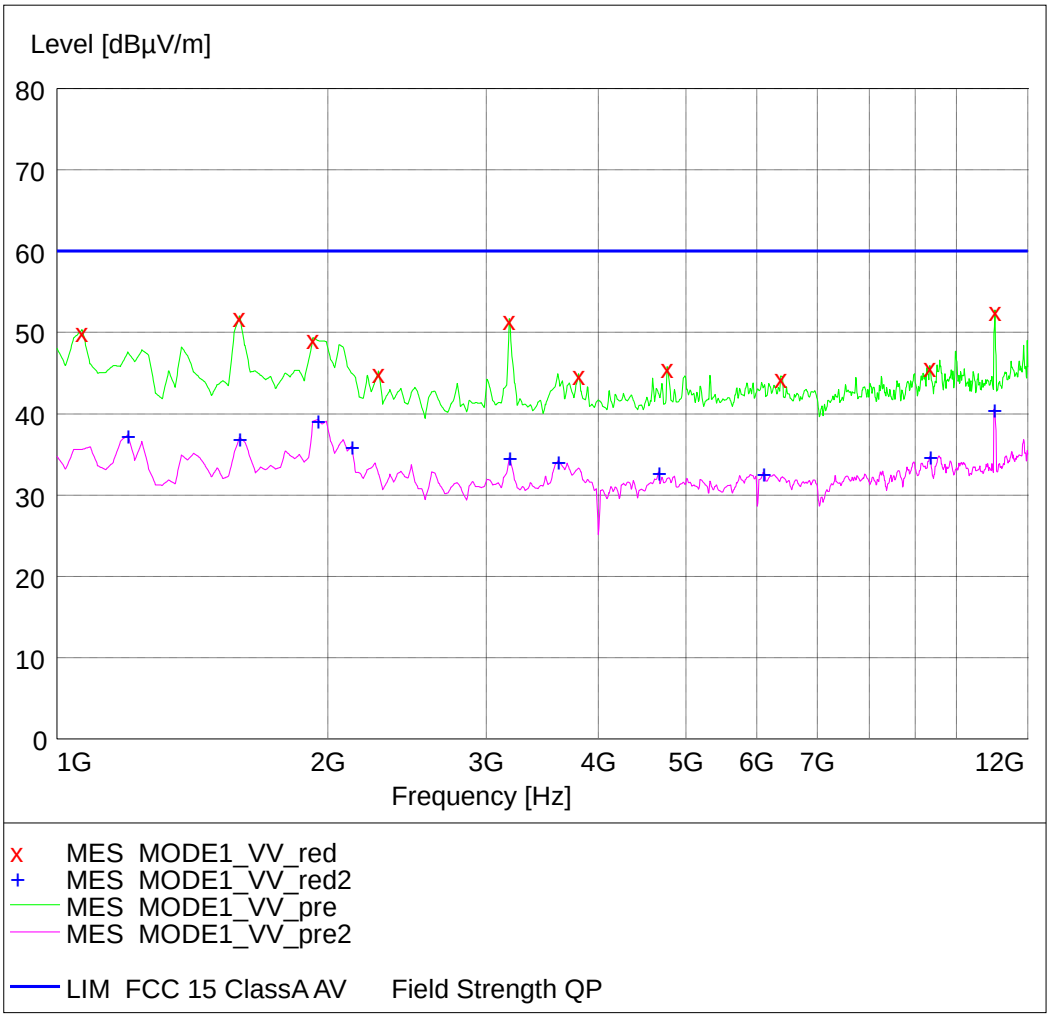

Polarization-V
Level [dBµV/m]
80
70
60
50
40
30
20
10
0
30M
50M
70M
100M
200M
300M
500M
700M
1G
Frequency [Hz]
x MES mode1_V_red
MES mode1_V_pre
LIM FCC 15 ClassA B Field Strength QP


Level [dBµV/m]
80
70
60
50
40
30
20
10
0
1G
2G
3G
4G
5G
6G
7G
12G
Frequency [Hz]
MES MODE1_VV_red
MES MODE1_VV_red2
MES MODE1_VV_pre
MES MODE1_VV_pre2
LIM FCC 15 ClassA AV
Field Strength QP

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Test data below 30MHz (RFID 125kHz and 13.56MHz transmit simultaneously, while the fundamental emission of 125kHz was not assessed in this report):

Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector	Remark
Y	0.569	50.50	10.60	72.50	22.00	PK	Spurious
X	0.629	48.80	10.60	71.60	22.80	PK	Spurious
X	1.167	31.70	11.60	66.26	34.56	PK	Spurious
Y	7.328	34.20	11.60	69.50	35.30	PK	Spurious
Z	9.661	34.90	11.90	69.50	34.60	PK	Spurious

Test data higher than 30MHz:

Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector
H	313.81	45.50	15.50	56.40	10.90	PK
H	480.98	45.00	19.70	56.40	11.40	PK
H	665.65	44.20	23.10	56.40	12.20	PK
H	764.79	45.30	24.80	56.40	11.10	PK
H	1595.19	50.90	-6.80	79.50	28.60	PK
H	1595.19	36.00	-6.80	59.50	23.50	AV
V	399.34	44.80	17.50	56.40	11.60	PK
V	731.74	45.90	24.20	56.40	10.50	PK
V	3182.36	51.70	-0.50	79.50	27.80	PK
V	3182.36	34.70	-0.50	59.50	24.80	AV
V	11030.06	52.80	13.30	79.50	26.70	PK
V	11030.06	40.60	13.30	59.50	18.90	AV

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

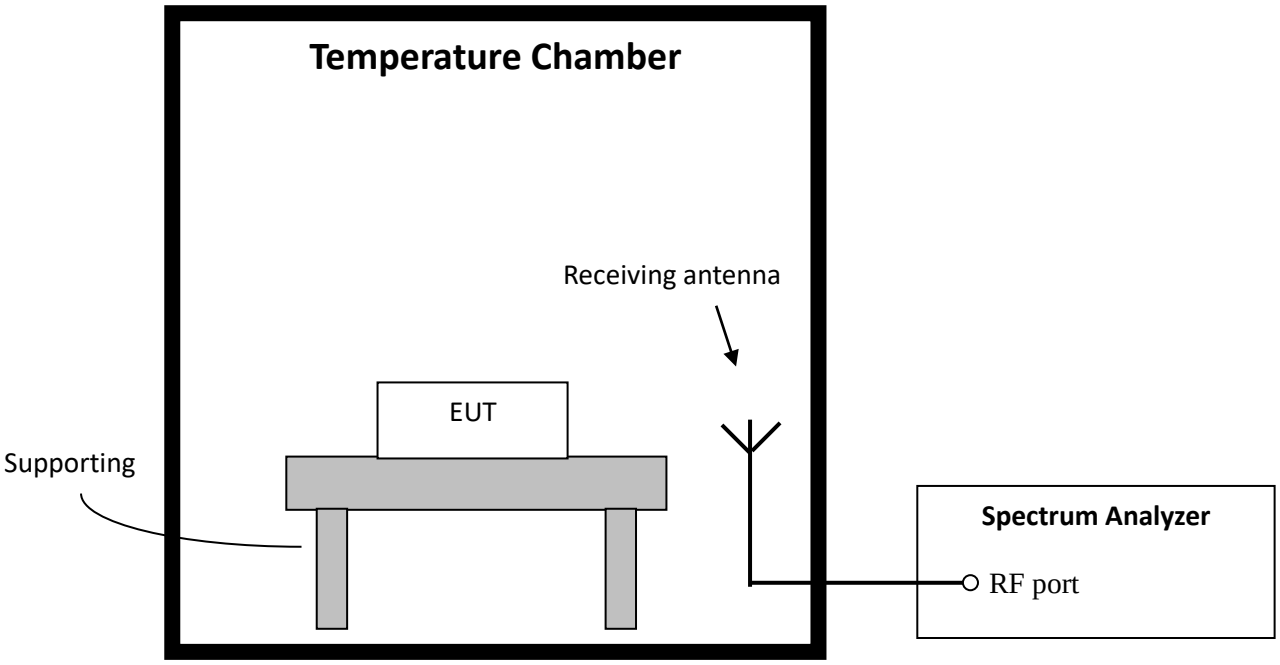
5 Frequency Stability (Temperature Variation)

Test result: PASS

5.1 Test limit

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.

5.2 Test Configuration



5.3 Test procedure and test setup

Test Procedure as per ANSI 63.10 clause 6.8.1.

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5.4 Test protocol

Voltage (V)	Temp (ºC)	Freq measured (MHz)	Freq nominal (MHz)	Tolerance (%)	Limit (%)
15	-20	13.560	13.560	0	0.01
	-10	13.559		0.007	
	0	13.560		0	
	10	13.560		0	
	20	13.560		0	
	30	13.560		0	
	40	13.560		0	
	50	13.559		0.007	

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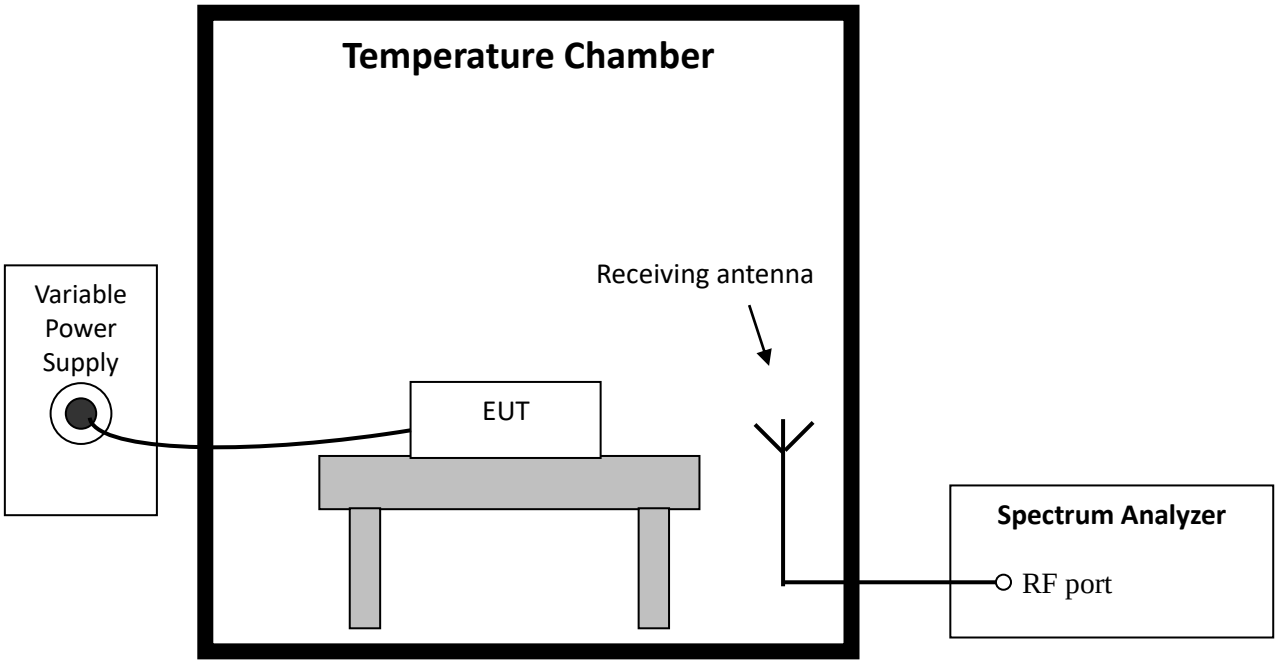
6 Frequency Stability (Voltage Variation)

Test result: PASS

6.1 Test limit

The frequency tolerance of the carrier signal shall be maintained within ±0.01% for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

6.2 Test Configuration



6.3 Test procedure and test setup

Test Procedure as per ANSI 63.10 clause 6.8.2.

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6.4 Test protocol

Temp (ºC)	Voltage (V)	Freq Measured (MHz)	Freq nominal (MHz)	Tolerance (%)	Limit (%)
20	120	13.560	13.560	0	0.01
	102	13.560		0	
	138	13.559		0.007	
Note: here the voltage is on the input port of the AC/DC Adapter.					

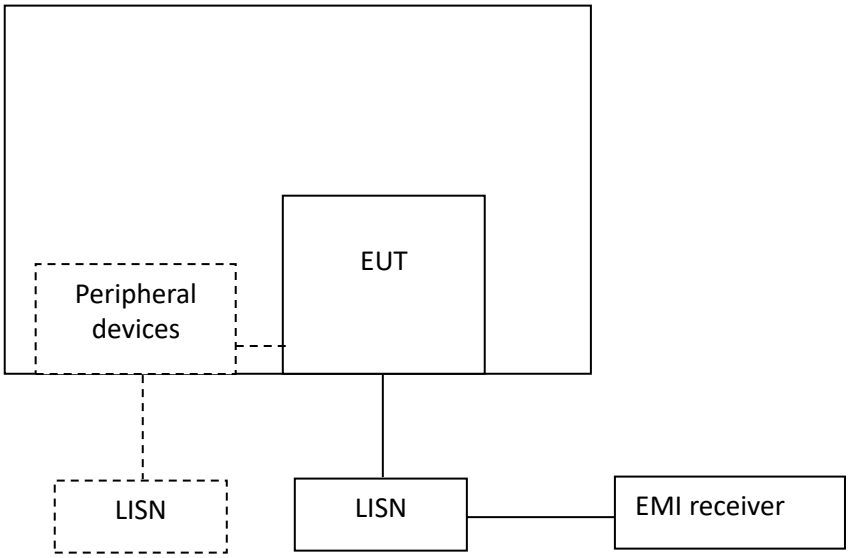
7 Conducted emissions

Test result: **Pass**

7.1 Limit

Frequency of Emission (MHz)	Conducted Emissions Limit (dBuV)	
	QP	AV
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
* Decreases with the logarithm of the frequency.		

7.2 Test Configuration



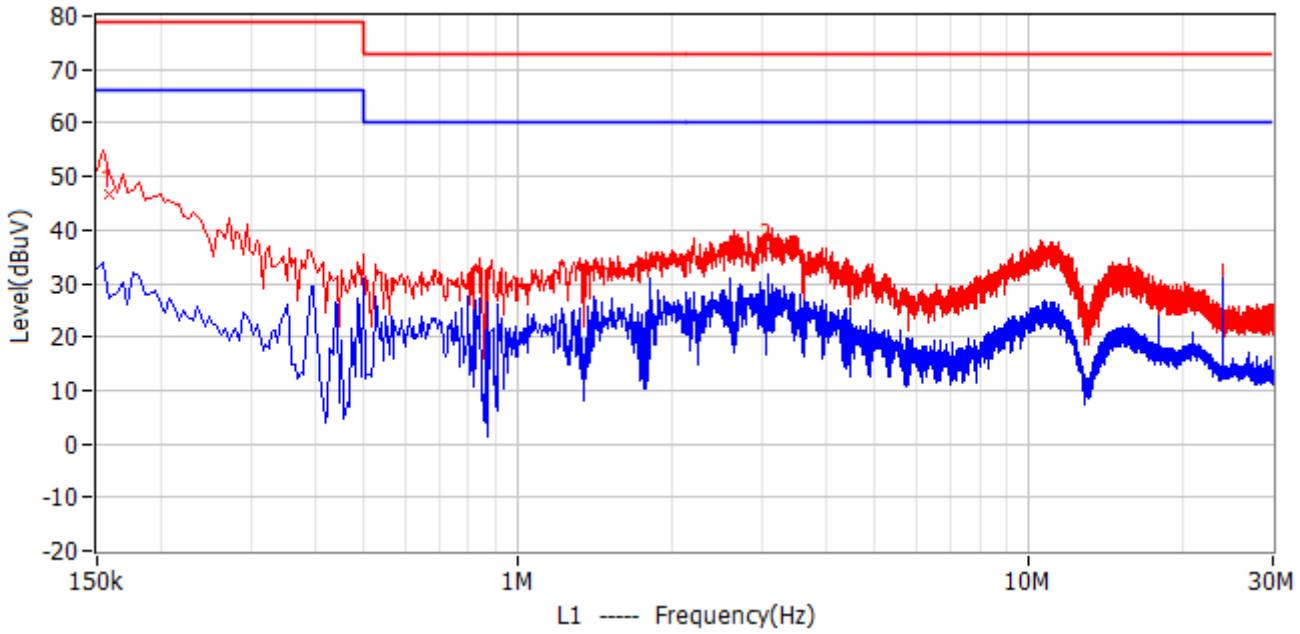
7.3 Measurement Procedure

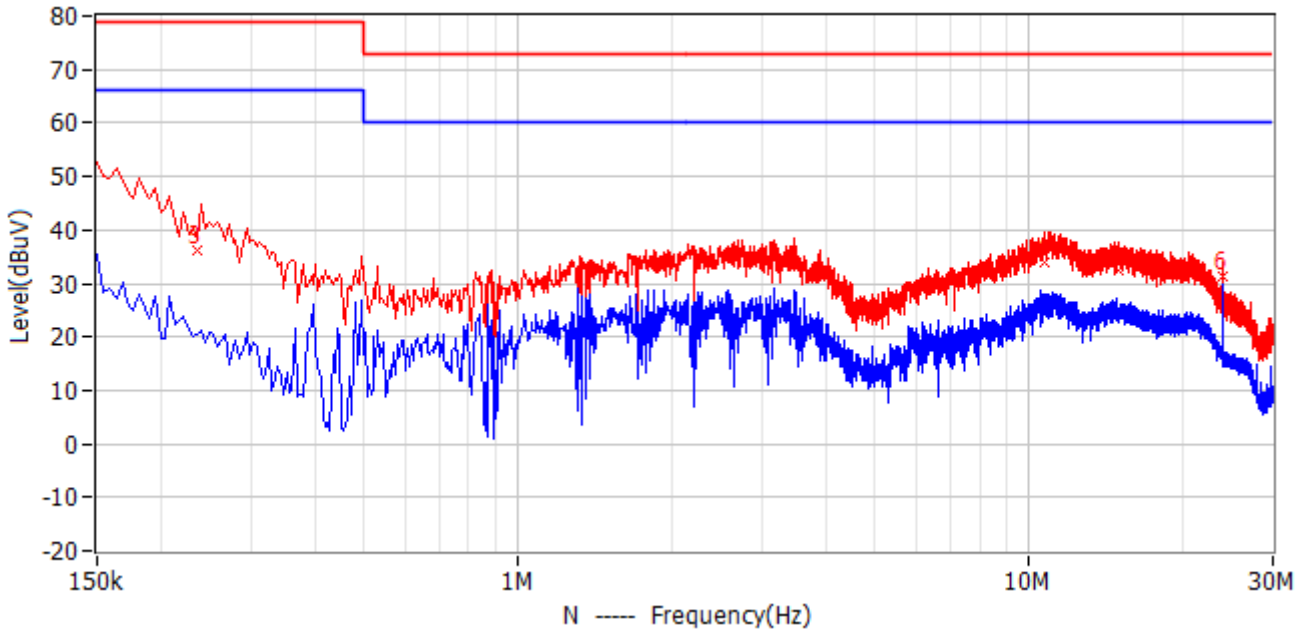
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

7.4 Test Results of Conducted Emissions





TEST REPORT

No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Reading dBuV	Factor dB	Detector	Phase
1	159.000kHz	79.0	46.6	-32.4	40.4	6.2	QP	L1
2	3.089MHz	73.0	36.5	-36.5	30.3	6.2	QP	L1
3	235.500kHz	79.0	36.3	-42.7	30.1	6.2	QP	N
4	10.752MHz	73.0	34.0	-39.0	27.6	6.4	QP	N
5	14.978MHz	73.0	32.5	-40.5	26.0	6.5	QP	N
6	23.843MHz	73.0	31.4	-41.6	24.9	6.5	QP	N

Remark: 1. Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Level = Reading + Factor
3. QP = Level - Limit
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

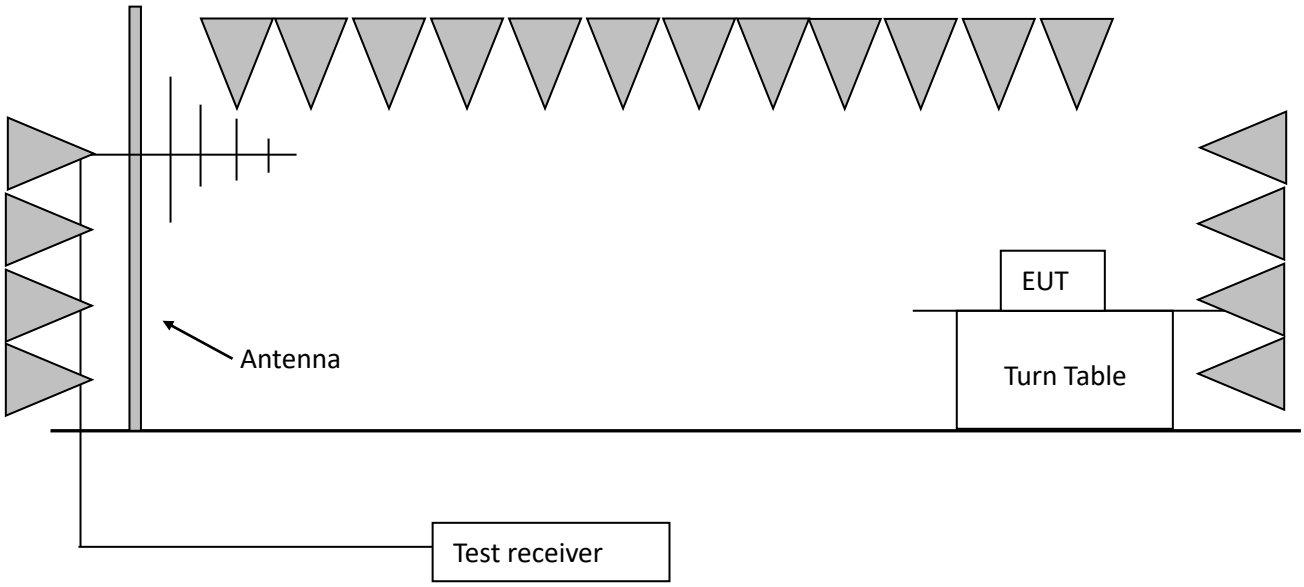
8 99% and 20dB Bandwidth

Test result: Pass

8.1 Limit

The 20dB bandwidth should be fallen in the allocated operating frequency range.
No limit for 99% bandwidth.

8.2 Test configuration



TEST REPORT

8.3 Test procedure and test set up

The measurement was applied in a 3m semi-anechoic chamber.

The center of the loop antenna shall be 1 m above the horizontal metal ground plane.

The following procedure shall be used for measuring (99 %) power bandwidth:

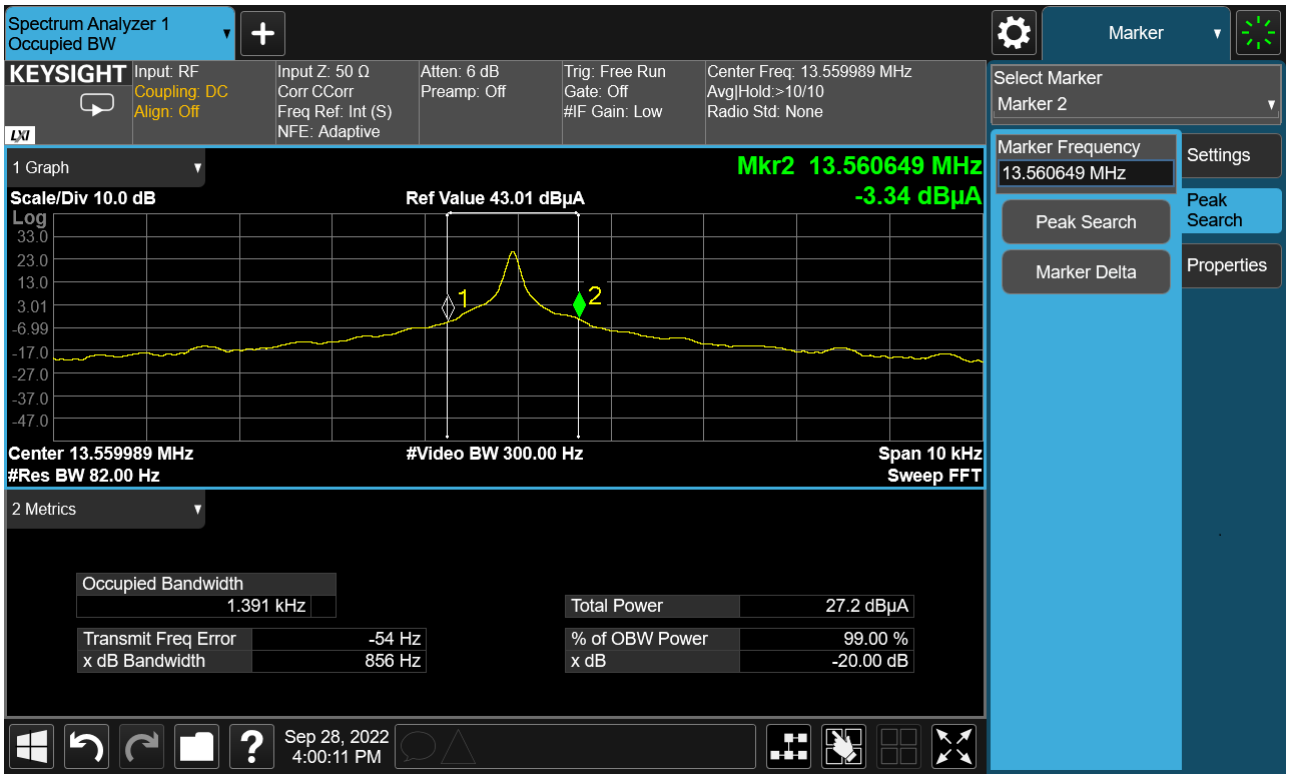
1. Set center frequency to the nominal EUT channel center frequency.
2. Set RBW = 1 % to 5 % of the OBW
3. Set VBW ≥ 3 · RBW
4. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
5. Use the 99 % power bandwidth function of the instrument (if available).
6. the 20dB bandwidth is also measured with the same setting.

Total Quality. Assured.

TEST REPORT

8.4 Test protocol

	Lower point (MHz)	Higher point (MHz)	Bandwidth (kHz)	Allocated bandwidth (MHz)
99% Bandwidth	13.5592	13.5606	1.391	/
20dB Bandwidth	13.5595	13.5603	0.856	13.553 ~ 13.567



9 Antenna requirement

Requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result:
EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

********** END **********