

FCC&ISED RF TEST REPORT

No. 170902294SHA-001

Applicant : Muuselabs NV
Rue du Tocsin 12, 1000 Brussels, Belgium

Manufacturing site : Hansong (Nanjing) Technology Ltd.
8th Kangping Road, Jiangning Economy and Technology
Development Zone, Nanjing, 211106, China.

Product Name : Speaker/Toy

Type/Model : J1000

TEST RESULT : PASS

SUMMARY

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

47CFR Part 15 (2016): Radio Frequency Devices (Subpart C)

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

RSS-210 Issue 9 (August 2016): Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

RSS-Gen Issue 4 (November 2014): General Requirements for Compliance of Radio Apparatus

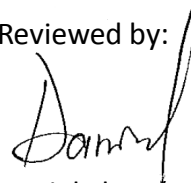
Date of issue: December 5, 2017

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1 GENERAL INFORMATION

1.1 Description of Client

Applicant : Muuselabs NV
Rue du Tocsin 12, 1000 Brussels, Belgium
Name of contact : Mr Theodore Marescaux
Tel : +32 495 89 07 74
Fax : /
Manufacturing site : Hansong (Nanjing) Technology Ltd.
8th Kangping Road, Jiangning Economy and Technology
Development Zone, Nanjing, 211106, China.

1.2 Identification of the EUT

Product Name : Speaker/Toy
Type/model : J1000
FCC ID : 2ANI9-MN01A
IC : 23121-MN01A

1.3 Technical Specification

Description of EUT : The EUT is a wireless speaker contains several NFC Tag toy, it supports WIFI, Bluetooth and NFC Reader function, and there have only one model, we test it and listed the NFC results in this report.

Rating : 5V DC 1A

Operation Frequency : 13.553 ~ 13.567 MHz

Range

Nominal Working : 13.56 MHz

Frequency

Channel number : 1

Type of Modulation : ASK

Antenna Type : Fixed Internal Loop Antenna

Port identification : Micro USB charging port *1, Headphones Jack Out * 1

EUT type : ☒ Table top ☐ Floor standing

Sample received date : October 16, 2017

Date of test : October 16, 2017 to October 27, 2017

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2016)
ANSI C63.10 (2013)
RSS-210 Issue 9 (August 2016)
RSS-Gen Issue 4 (November 2014)

2.2 Mode of operation during the test

Within this test report, EUT was tested with modulation and tested under its rating voltage and frequency.

The EUT is a handheld device, so three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

The EUT was set to continuously transmit at 13.56MHz. This was performed using manufacturer software loaded on the PC to allow for continuous transmission.

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.	Name	Band and Model	Description
1	Laptop computer	DELL T7670	100-240V AC, 50/60Hz

2.5 Instrument list

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2018-10-18
☒	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2018-01-25
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2018-05-30
☒	Horn antenna	R&S	HF 906	EC 3049	2018-09-22
☒	Horn antenna	ETS	3117	EC 4792-1	2018-08-23
☒	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
☒	Pre-amplifier	R&S	Pre-amp 18	EC5881	2018-06-19
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2018-09-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2018-09-10
☒	Power sensor	Agilent	U2021XA	EC 5338-1	2018-03-03
☒	Vector Signal Generator	Agilent	N5182B	EC 5175	2018-03-06
☒	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2018-03-03
☒	Mobile Test System	Litepoint	lqxl	EC 5176	2018-01-11
☒	Test Receiver	R&S	ESCI 7	EC 4501	2018-02-23
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3323	2018-06-14
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2018-04-09
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3325	2018-03-23
☒	Pressure meter	YM3	Shanghai Mengde	EC 3320	2018-06-28

2.6 Test Summary

This report applies to tested sample only. The test results have been compared directly with the limits, and the measurement uncertainty is recorded. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
20dB Bandwidth&99% Bandwidth	15.215(c) 2.1049	RSS-GEN Issue 4 Clause 6.6	Pass
Fundamental Field Strength and Emission Mask	15.205 & 15.225(a) (b) (c)	RSS-210 Issue 9 Annex B.6	Pass
Emission outside the frequency band	15.225(d) /15.209	RSS-Gen Issue 4 Clause 8.9	Pass
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 8.8	NA
Frequency Stability	15.225(e)	RSS-Gen Issue 4 Clause 8.11	Tested
Antenna Requirement	15.203	RSS-Gen Issue 4 Clause 6.7&8.3	Pass

Notes: 1: NA =Not Applicable

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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.

Test item	Measurement uncertainty
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Emission outside the frequency band	$\pm 2.89\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$
Temperature	$< \pm 1\text{ }^{\circ}\text{C}$
Humidity	$< \pm 5\%$
DC Power Voltage	$< \pm 3\%$

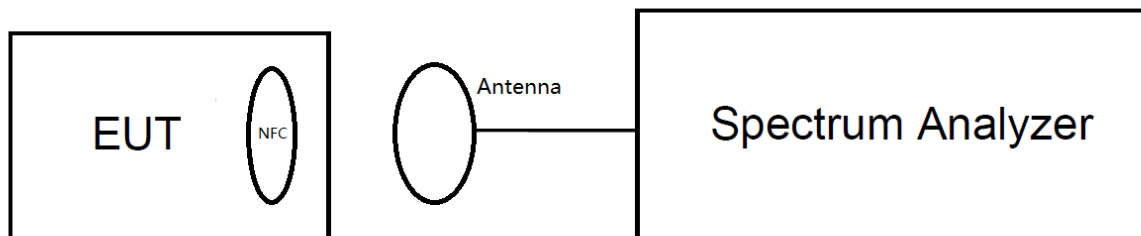
3 20dB Bandwidth & 99% Bandwidth

Test result: Pass

3.1 Limit

The bandwidth at 20dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequency.

3.2 Test Configuration



3.3 Test Procedure and test setup

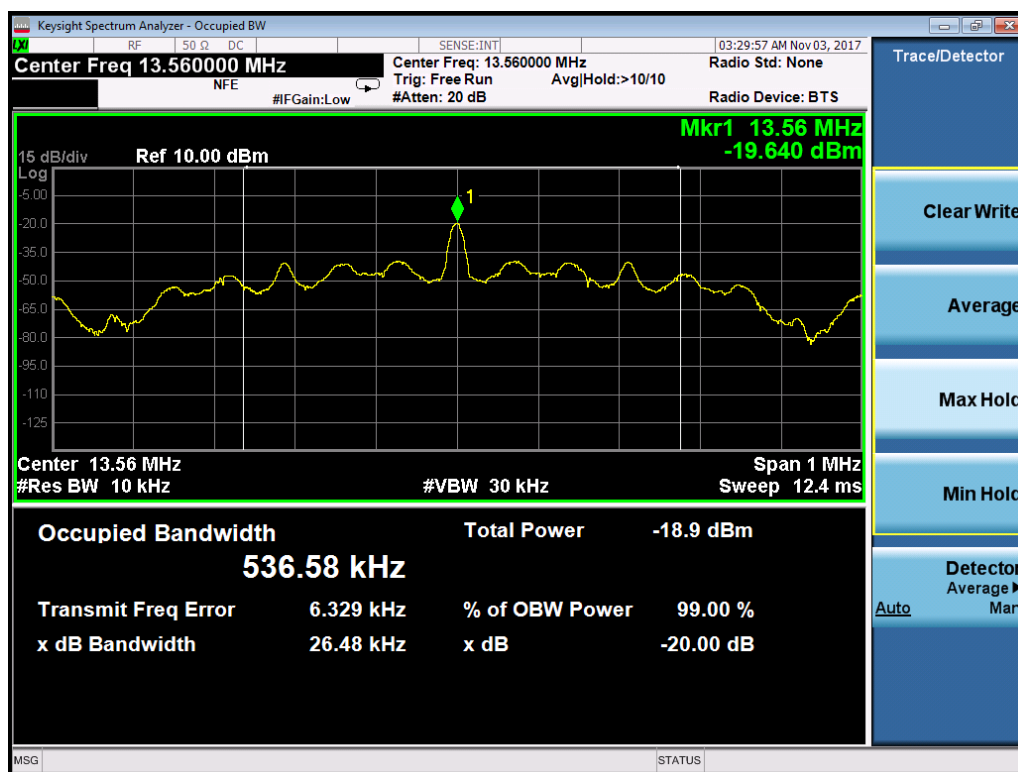
1. Spectrum analyzer frequency is set to the nominal EUT channel center frequency.
2. $RBW = 1 \sim 5\% \text{ OBW}$, $VBW \geq 3 \times RBW$
3. Reference level set to keep signal from exceeding maximum input mixer level for linear operation.
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. Using the Instrument function to determine the “-20dB down amplitude”.

3.4 Test Protocol

Temperature: 25 °C
Relative Humidity: 55 %

Frequency (MHz)	20dB Bandwidth (KHz)	99% Bandwidth (KHz)
13.56	26.48	536.58

Test Plots:



4 FUNDAMENTAL FIELD STRENGTH AND EMISSION MASK

Test result: Pass

4.1 Test limit

All in-band emissions appearing in a restricted band as specified in Section 15.225 of the Title 47 CFR must not exceed the limits shown below:

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measured Distance (Meters)
13.553-13.567 MHz	15.848	30
13.410-13.553 MHz and 13.567-13.710 MHz	343	30
13.110-13.410 MHz	106	30

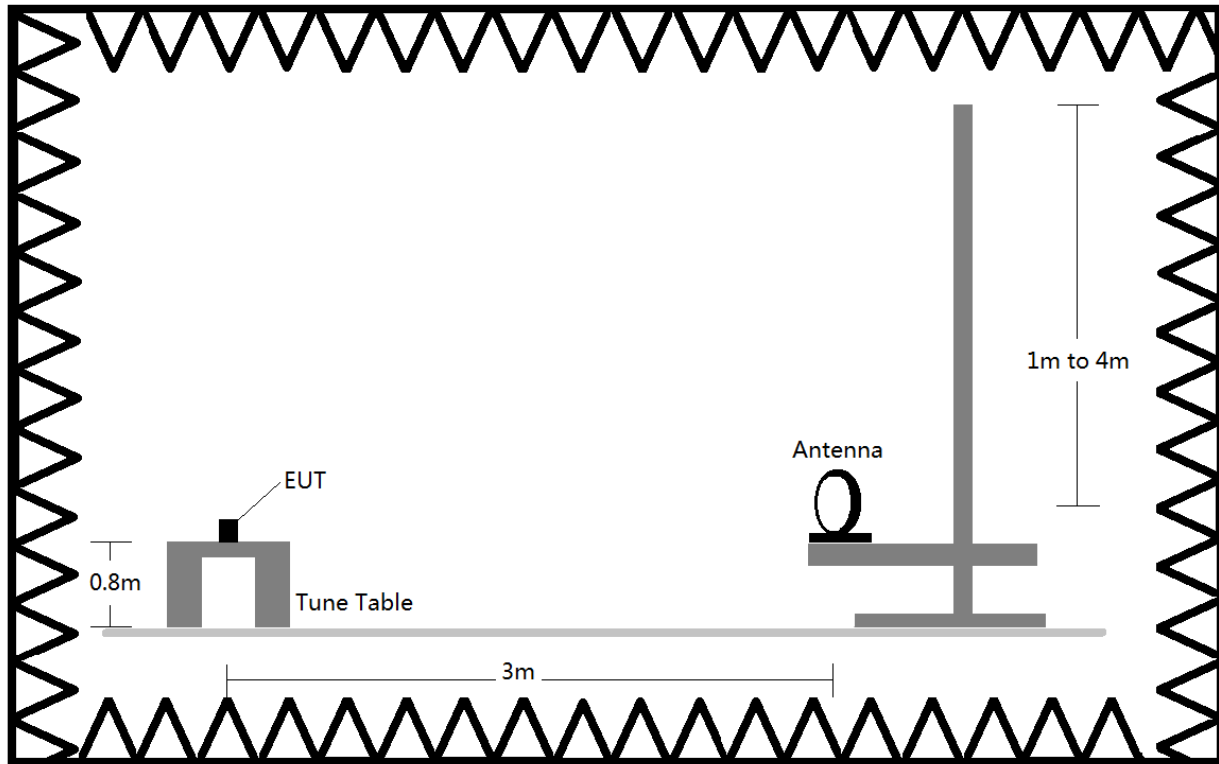
Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level ($\text{dB}\mu\text{V/m}$) = $20 \log$ Emission level ($\mu\text{V/m}$).
3. For Below 30MHz, the measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

Field strength limit for 13.56MHz = 15848 $\mu\text{V/m}$ at 30m
 = 84 $\text{dB}\mu\text{V/m}$ at 30m
 = 84 $\text{dB}\mu\text{V/m}$ + $40\log(30/3)$ dB at 3m
 = 124 $\text{dB}\mu\text{V/m}$ at 3m

4.2 Test Configuration



4.3 Test procedure and test setup

The EUT was tested from 13.110 – 14.010 MHz. All in-band radiated spurious emissions are measured with a spectrum analyzer connected to a loop antenna while the EUT is operating at appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded.

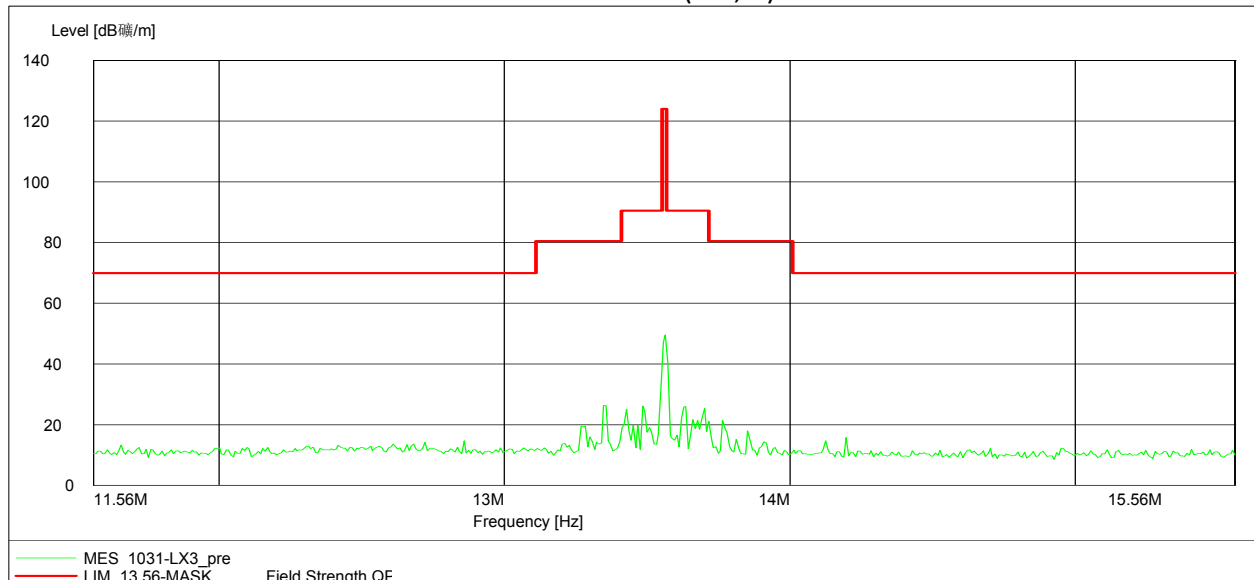
1. RBW = 10kHz,
2. VBW $\geq 3 \times$ RBW,
3. Detector = peak,
4. Sweep time = auto couple,
5. Trace mode = max hold,
6. Trace was allowed to stabilize.

4.4 Test Protocol

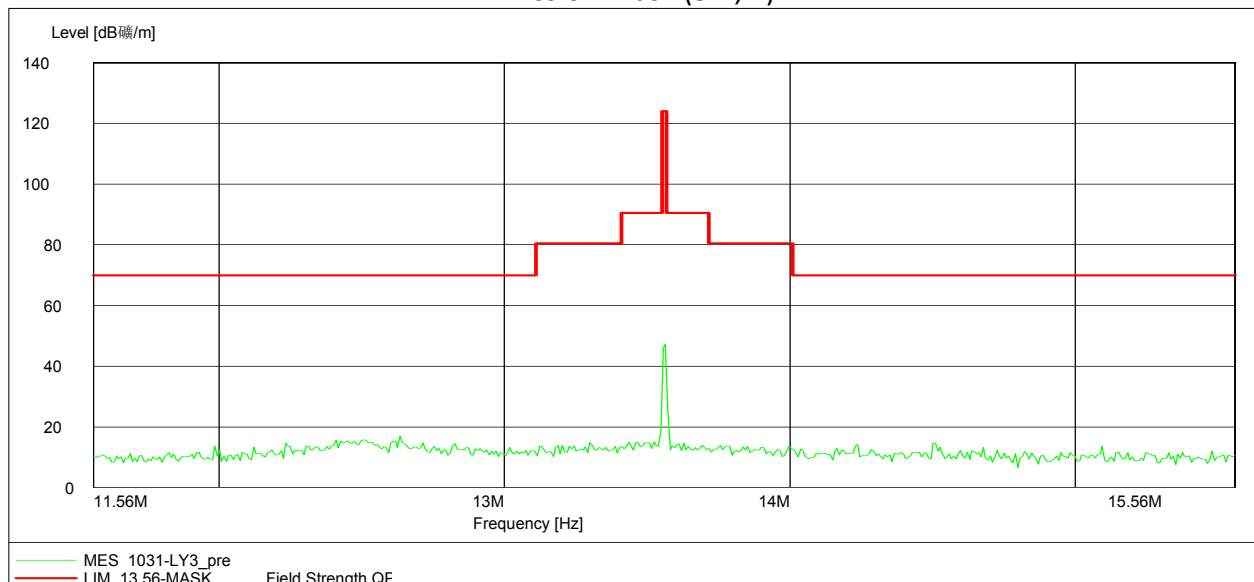
Temperature: 25 °C

Relative Humidity: 55 %

Emission Mask (3m, X)



Emission Mask (3m, Y)



Test data:

Frequency (MHz)	Result (dB μ V/m) (3m)	Limit (dB μ V/m) (3m)	Polarization
13.56	49.4	124	X
13.56	46.2	124	Y

5 Emission outside the frequency band

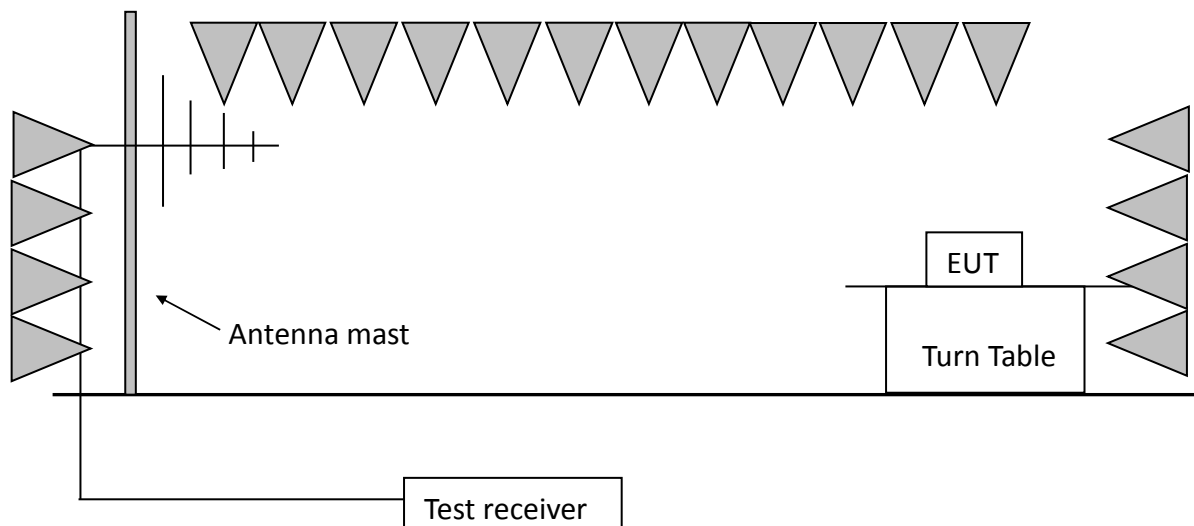
Test result: Pass

5.1 Test limit

The radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) shown as below:

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

5.2 Test Configuration



Note: This test configuration is used for above 30MHz, when measure the result of below 30MHz please refer section 4.2 test configuration.

5.3 Test procedure and test setup

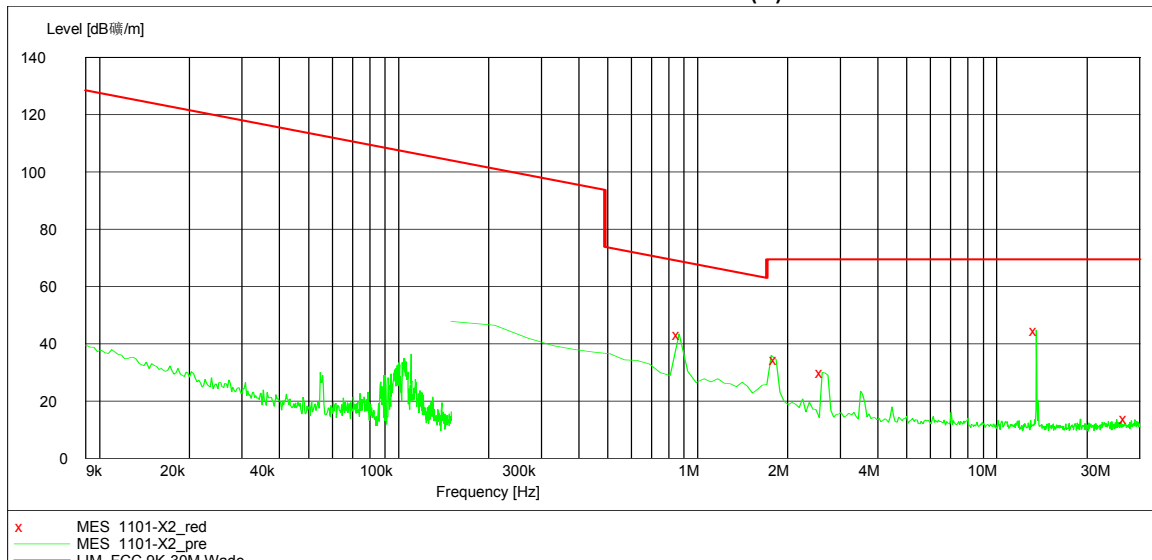
1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The antenna height 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.
4. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotating table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
7. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest, RBW = 9kHz for emissions below 30MHz and 100kHz for emissions between 30MHz and 1GHz. VBW $\geq 3 \times$ RBW, Detector = peak, Sweep time = auto couple, Trace mode = max hold, Trace was allowed to stabilize
8. The radiation measurements are performed in X, Y, Z axis positioning. And found the Y axis positioning which it is worse case, only the test worst case mode is recorded in the report.

5.4 Test Protocol

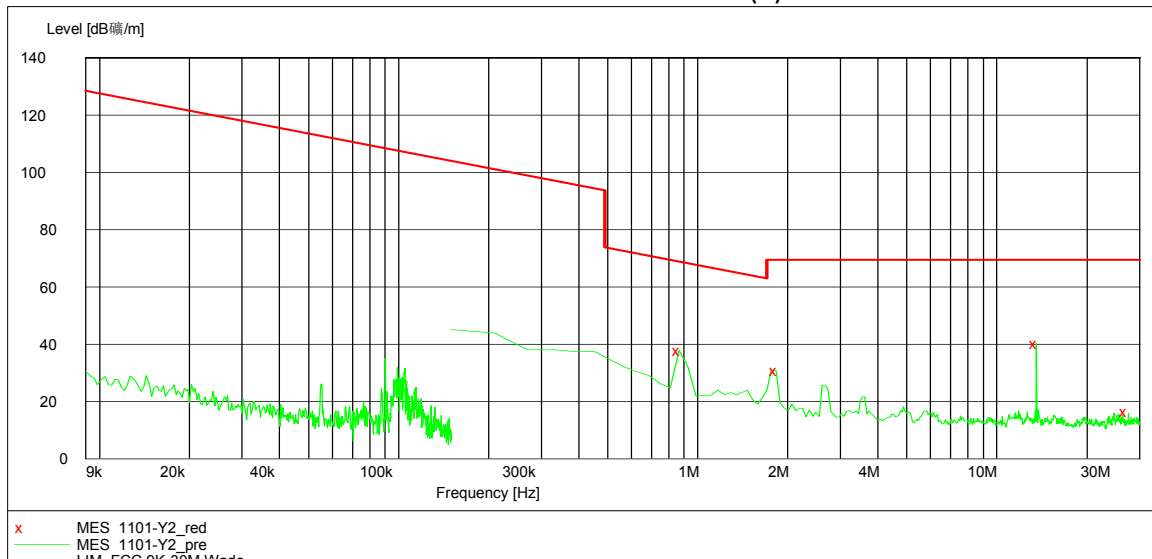
Temperature: 25 °C

Relative Humidity: 55 %

9 KHz ~ 30 MHz at 3 meters (X)



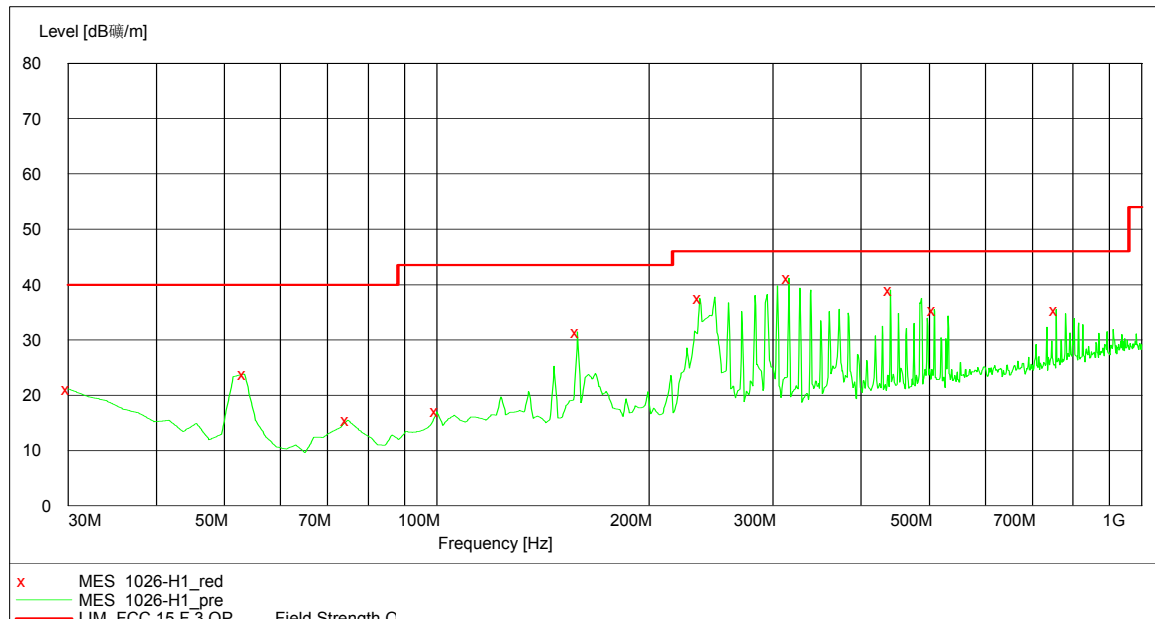
9 KHz ~ 30 MHz at 3 meters (Y)



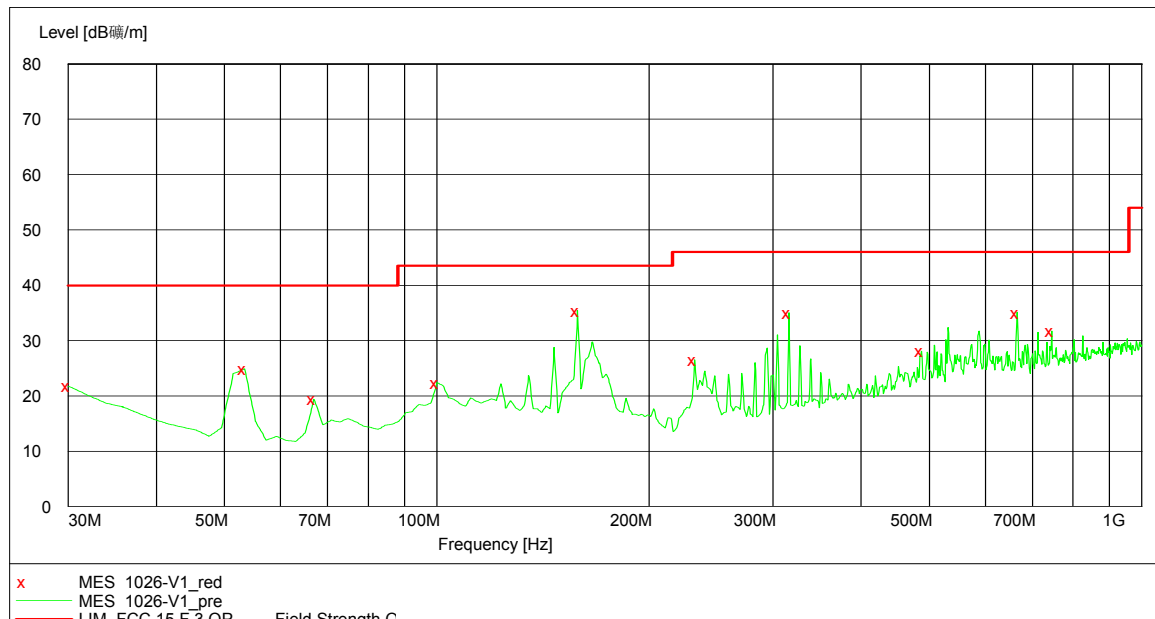
Frequency (MHz)	Polarization	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)
27.12	X	11.1	5.40	16.50	69.50
27.12	Y	9.9	5.40	15.30	69.50

The worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



Test data 30MHz~1GHz:

Polarization	Frequency (MHz)	Measured level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
H	30.00	21.1	40.0	18.9	PK
	53.33	23.8	40.0	16.2	PK
	74.71	15.5	40.0	24.5	PK
	99.98	17.0	43.5	26.5	PK
	158.30	31.4	43.5	12.1	PK
	236.05	37.5	46.0	8.5	PK
	315.75	41.1	46.0	4.9	PK
	440.16	39.0	46.0	7.0	PK
	508.20	35.5	46.0	10.5	PK
	757.01	35.5	46.0	10.5	PK
V	30.00	21.7	40.0	18.3	PK
	53.33	24.9	40.0	15.1	PK
	66.93	19.4	40.0	20.6	PK
	99.98	22.4	43.5	21.1	PK
	158.30	35.4	43.5	8.1	PK
	232.16	26.5	46.0	19.5	PK
	315.75	35.0	46.0	11.0	PK
	486.81	28.1	46.0	17.9	PK
	665.65	35.1	46.0	10.9	PK
	745.35	31.7	46.0	14.3	PK

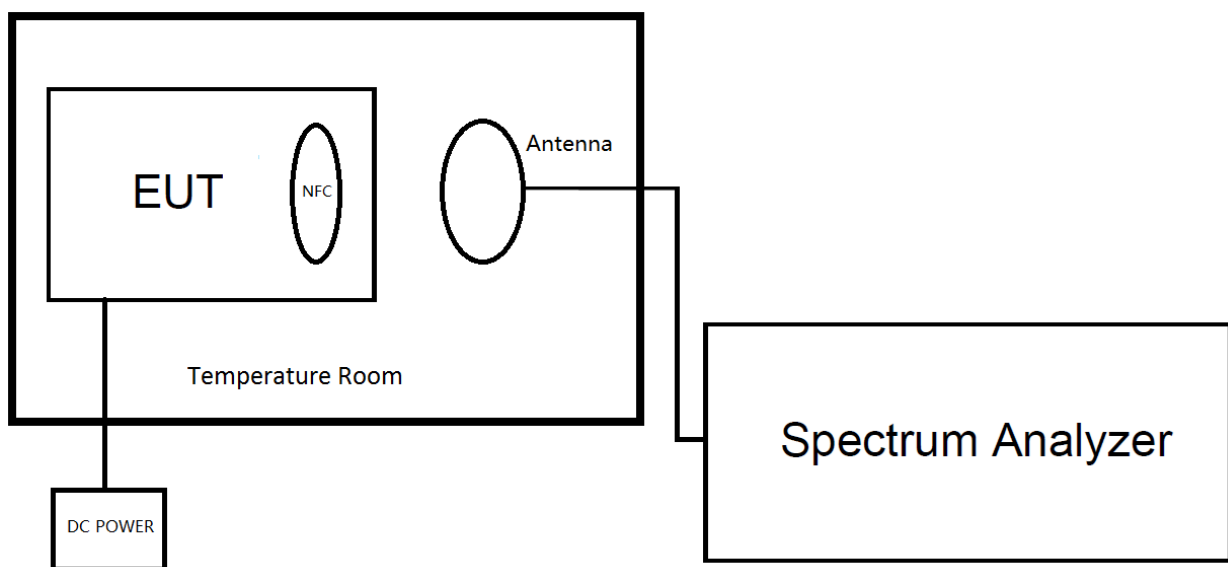
6 Frequency Stability

Test result: Pass

6.1 Limit

For Part 15.225, the frequency stability of the transmitter shall be maintained within $\pm 0.01\%$ of the center frequency.

6.2 Test Configuration



6.3 Test Procedure and test setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -20°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

6.4 Test Protocol

Voltage	Temperature (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)	Limit
V-normal	+ 20 (Ref)	13,559,751	-249	-0.0018363	± 0.01 %
	- 30	13,559,883	-117	-0.0008628	
	- 20	13,559,842	-158	-0.0011652	
	- 10	13,559,807	-193	-0.0014233	
	0	13,560,221	221	0.0016298	
	+ 10	13,560,050	50	0.0003687	
	+ 20	13,559,691	-309	-0.0022788	
	+ 30	13,559,902	-98	-0.0007227	
	+ 40	13,560,118	118	0.0008702	
	+ 50	13,559,721	-279	-0.0020575	
V-low	+ 20	13,560,017	17	0.0001254	

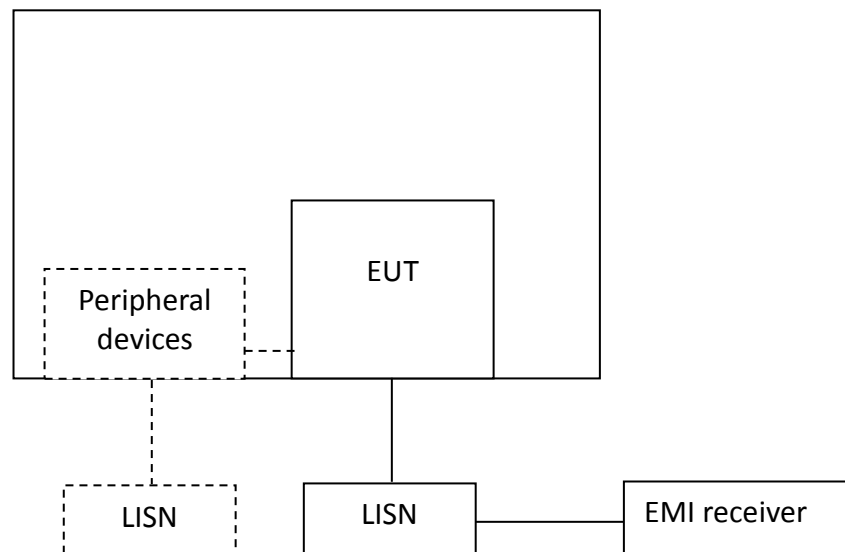
7 Power line conducted emission

Test result: NA

7.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

7.2 Test configuration



☐ For table top equipment, wooden support is 0.8m height table

☐ For floor standing equipment, wooden support is 0.1m height rack.

7.3 Test procedure and test set up

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 protocol

Temperature:	°C
Relative Humidity:	%

8 Antenna 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

The EUT used permanently attached antenna, so fulfill these requirements.