

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : OT-199-RWD-047

AGR No. : A195A-069

Applicant : BBB Inc.

Address : 28, Yatap-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea

Manufacturer : BBB Inc.

Address : 28, Yatap-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea

Type of Equipment : Immunoassay Analyzer

FCC ID : 2AKGP-MB100

Model Name : MB-100

Multiple Model Name : N/A

Serial number : N/A

Total page of Report : 22 pages (including this page)

Date of Incoming : May 13, 2019

Date of Issuing : September 24, 2019

SUMMARY

The equipment complies with the requirements of **FCC CFR 47 PART 15 SUBPART C Section 15.225**

This test report contains only the result of a single test of the sample supplied for the examination.

It is not a general valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Ha-Ram Lee / Assistant Manager
ONETECH Corp.

Approved by:



Jae-Ho Lee / Chief Engineer
ONETECH Corp.

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REVISION HISTORY

Issued Report No.	Issued Date	Revisions	Effect Section
OT-199-RWD-047	September 24, 2019	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

Applicant : BBB Inc.
Address : 28, Yatap-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Contact Person : Jaekyu Choi / CEO
Telephone No. : +82-2-565-9653
FCC ID : 2AKGP-MB100
Model Name : MB-100
Brand Name : -
Serial Number : N/A
Date : September 24, 2019

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	Immunoassay Analyzer
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC CFR47 Part 15 Subpart C Section 15.225
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	3 m Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.225 (a),(b),(c)	The field strength of any emissions	Met the Limit / PASS
15.225 (e)	Frequency stability with temperature & voltage variation	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	Met the Limit / PASS
15.203	Antenna Requirement	Met requirement / PASS

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.225.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. GENERAL INFORMATION

3.1 Product Description

The BBB Inc., Model MB-100 (referred to as the EUT in this report) is a Immunoassay Analyzer, Product specification information described herein was obtained from product data sheet or user's manual.

Device Type	Immunoassay Analyzer		
Operating Frequency	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	WLAN	2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))	
	2.4 GHz Band	2 422 MHz ~ 2 452 MHz (802.11n(HT40))	
	NFC	13.56 MHz	
RF Output Power	Bluetooth LE	-6.78 dBm	
	WLAN	802.11b (13.13 dBm) 802.11g (10.67 dBm)	
	2.4 GHz Band	802.11n(HT20) (11.01 dBm) 802.11n(HT40) (10.81 dBm)	
	NFC		
Number of Channel	Bluetooth LE	40 Channels	
	WLAN	11 Channels	
	2.4 GHz Band		
	NFC	1 Channel	
Modulation Type	Bluetooth LE	DSSS Modulation(GFSK)	
	WLAN	DSSS Modulation(DBPSK/DQPSK/CCK)	
	2.4 GHz Band	OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
	NFC	ASK	
Antenna Type	Bluetooth LE	FPC Antenna	
	WLAN		
	2.4 GHz Band		
	NFC	PCB Antenna	
Antenna Gain	Bluetooth LE	1.74 dBi	
	WLAN		
	2.4 GHz Band		
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	32.768kHz		
Rated Supply Voltage	DC 3.8 V		

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

4. EUT MODIFICATIONS

-. None

5. SYSTEM TEST CONFIGURATION

5.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	N/A	-
Sub Board	N/A	N/A	-
NFC Board	N/A	N/A	
Module Board	N/A	N/A	-
Display	N/A	N/A	
Main Battery	N/A	N/A	
Sub Battery	N/A	N/A	-

5.2 Peripheral equipment

-None

5.3 Mode of operation during the test

-. The EUT has NFC, program was used for making continuous transmission mode during the test.

To get a maximum radiated emission levels from the EUT, the EUT was moved throughout the XY, XZ, and YZ planes and the worst case is “XY” axis, but the worst data was recorded in this test report.

5.4 Equipment Modifications

-. None

5.5 Configuration of Test System

Radiated Emission Test : Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 10 m Semi Anechoic Chamber.

For frequencies from 150 kHz to 30 MHz measurements were made of the magnetic H field. The measuring antenna is an electrically screened loop antenna.

The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

5.6 Antenna Requirement

For intentional device, according to section 15.203, 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.

Antenna Construction:

The transmitter antenna of the EUT is a PCB antenna so there is no consideration of replacement by the user.

6. PRELIMINARY TEST

6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Charging mode	X

6.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	X

7. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

7.1 RADIATED EMISSION TEST

7.1.1 Operation frequency band: 13.553 ~ 13.567 MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 47 % R.H. Temperature: 24 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter Operation within the band 1.705-30.0 MHz.
 Result : PASSED

EUT : Immunoassay Analyzer Date: September 04, 2019

Operating Condition : Transmitting Mode

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Distance : 3 m

Radiated Emission		Ant	Correction Factors		Total	FCC	
Freq. (MHz)	Amplitude (dBμV)	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.56	15.64	H	19.98	1.09	36.71	124	87.29
13.56	9.53	V	19.98	1.09	30.6	124	93.4

Remark. The EUT was tested at 3 m, so conversion factor was included at above limit.



Tested by: Yu-Seog Sim / Assistant Manager

7.1.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz

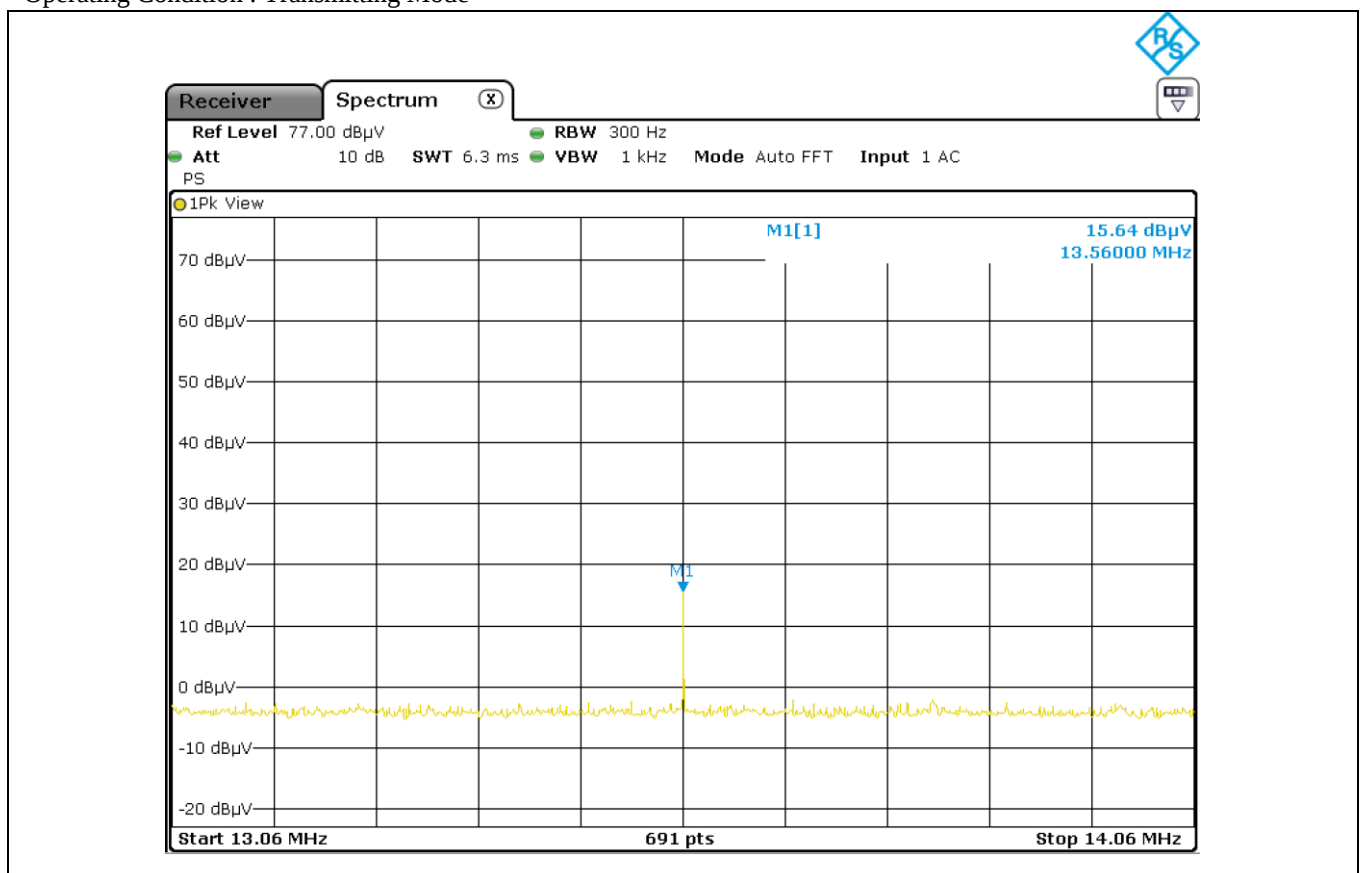
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 47 % R.H. Temperature: 24 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter Operation within the band 1.705-30.0 MHz.
 Result : PASSED

EUT : Immunoassay Analyzer

Date: September 04, 2019

Operating Condition : Transmitting Mode



7.2 SPURIOUS EMISSION TEST

7.2.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 47 % R.H. Temperature: 24 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter Operation within the band 1.705-30.0 MHz.
 Frequency Range : 9 kHz ~ 30 MHz
 Result : PASSED

EUT : Immunoassay Analyzer Date: September 04, 2019

Operating Condition : Transmitting Mode

Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Any emissions were not observed from the EUT.									



Tested by: Yu-Seog Sim / Assistant Manager

7.2.2 Spurious Radiated Emission below 1 GHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

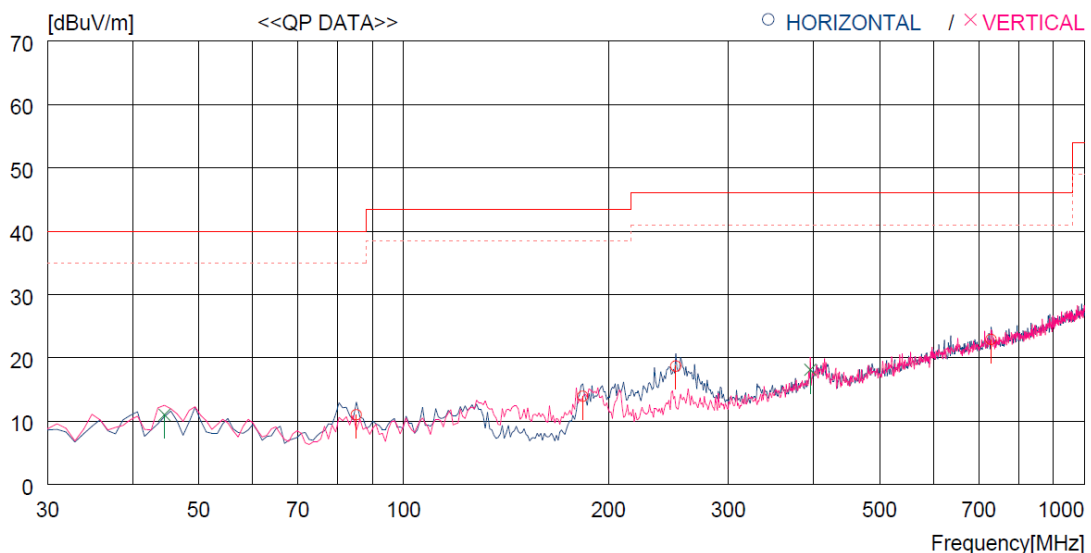
Humidity Level : 47 % R.H. Temperature: 24 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter Operation within the band 1.705-30.0 MHz.
 Frequency range : 30 MHz ~ 1 000 MHz
 Result : PASSED

EUT : Immunoassay Analyzer

Date: September 09, 2019

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]</								

7.3 20 dB BANDWIDTH

7.3.1 Operating environment

Temperature : 24 °C
Relative humidity : 47 % R.H.

7.3.2 Test set-up

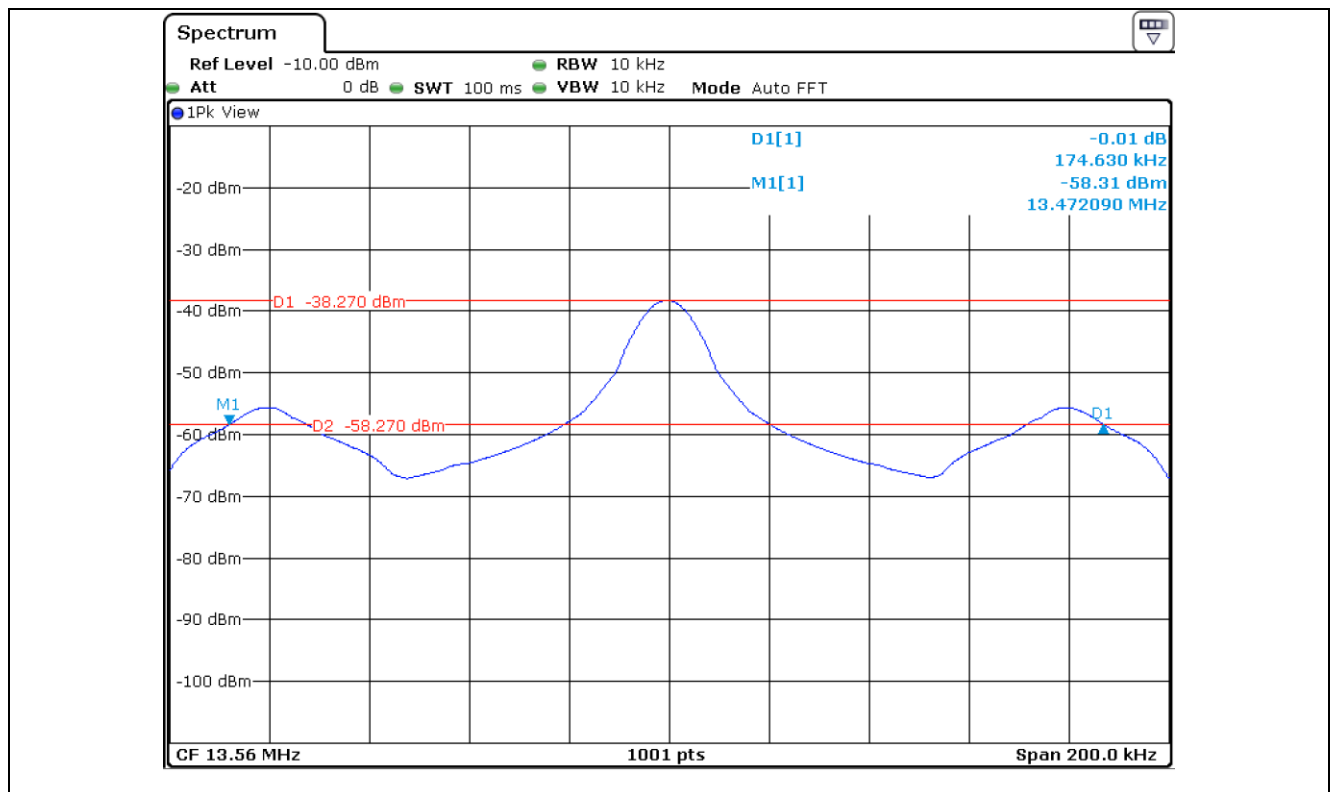
The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



7.3.3 Test data

- . Test Date : September 04, 2019
- . Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Operating Freq. (MHz)	Measured Value (kHz)	Assigned Operating Frequency Band (kHz)	Result
13.56	174.63	900	PASS



Tested by: Yu-Seog Sim / Assistant Manager

7.4 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

7.4.1 Operating environment

Temperature : 24 °C
Relative humidity : 47 % R.H.

7.4.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +50°C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.

7.4.3 Test data

-. Test Date : September 04, 2019

-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13 560 000	13 560 112	112	± 1 356.00
-10		13 560 097	97	
0		13 560 075	75	
10		13 560 068	68	
20		13 560 051	51	
30		13 560 048	48	
40		13 560		

7.5 FREQUENCY STABILITY WITH VOLTAGE VARIATION

7.5.1 Operating environment

Temperature : 24 °C
Relative humidity : 47 % R.H.

7.5.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.

7.5.3 Test data

-. Test Date : September 04, 2019
-. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
4.37(115 %)	13 560 000	13 560 056	56	± 1 356.00
3.80(100 %)		13 560 048	48	
3.23(85 %)		13 560 078	78	



Tested by: Yu-Seog Sim / Assistant Manager

8. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses.

+	Meter reading	(dB μ V)
-	Amplifier Gain	(dB)
+	Cable Loss	(dB)
-	Antenna Factor	(dB/m)
=	Corrected Result	(dB μ V/m)

Margin (dB)

	Specification Limit	(dB μ V/m)
-	Corrected Result	(dB μ V/m)
=	dB Relative to Spec	($\pm$ dB)

9. CONDUCTED EMISSION TEST

9.1 Operating environment

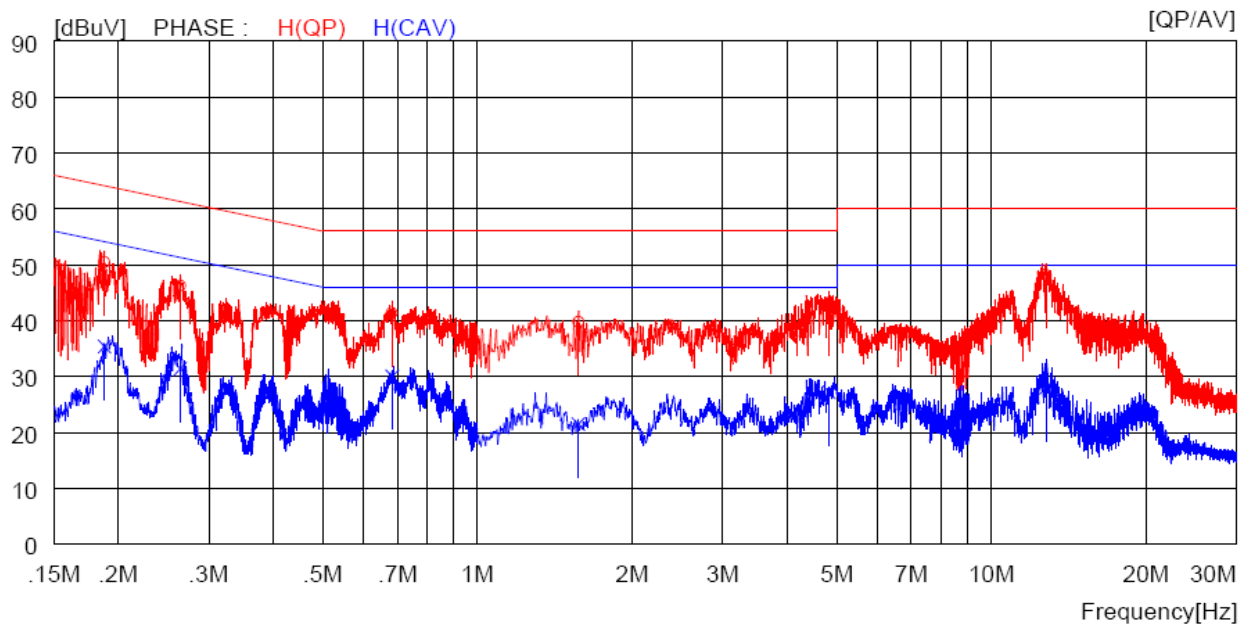
Temperature : 24 °C
Relative humidity : 45 % R.H

9.2 Test set-up

The EUT was placed on a wooden table, 0.8 m height above the floor. Power was fed to the EUT through a 50 Ω / 50 μ H + 5 Ω Artificial Mains Network (AMN). The ground plane was electrically bonded to the reference ground system and all power lines were filtered from ambient.

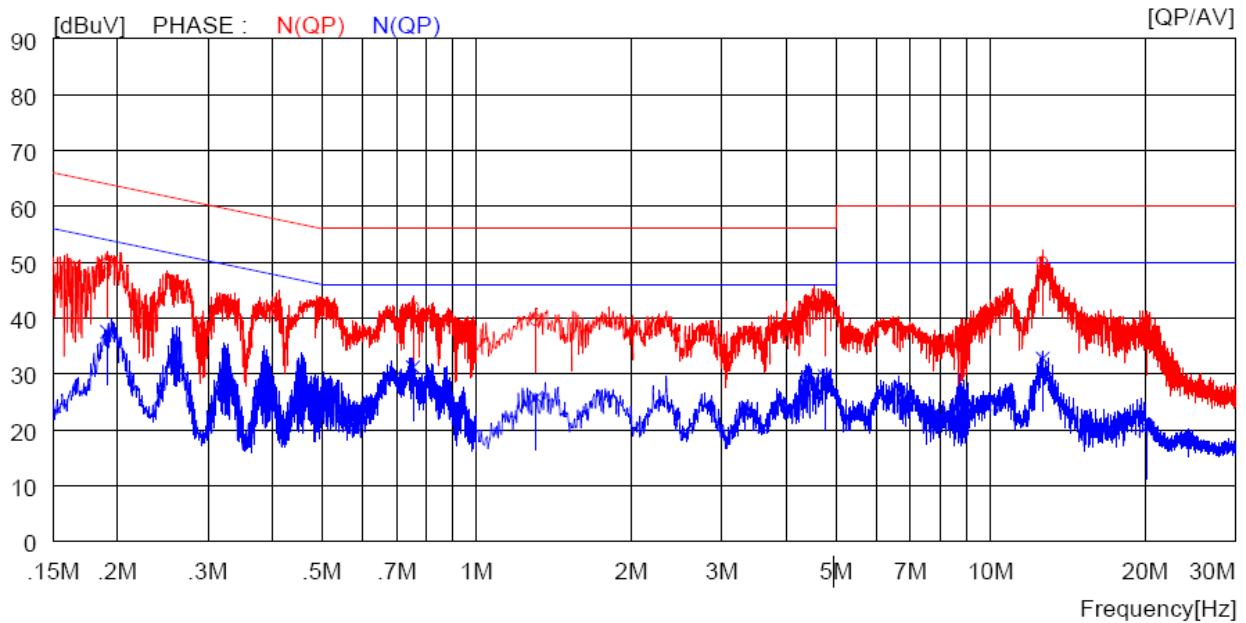
9.3 Test data

- . Test Date : September 03, 2019
- . Resolution bandwidth : 9 kHz
- . Frequency range : 0.15 MHz ~ 30 MHz
- . Tested Line : HOT LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.18800	40.4	----	10.1	50.5	----	64.1	----	13.6		

-. Tested Line : NEUTRAL LINE



NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.19100	39.7	----	10.1	49.8	----	64.0	----	14.2	----	N (QP)
2	0.75300	31.8	----	10.1	41.9	----	56.0	----	14.1	----	N (QP)
3	1.30400	29.6	----	10.1	39.7	----	56.0	----	16.3	----	

10. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESCI	101012	Oct. 22, 2018	One Year	☐
2.		R/S	ESR	101470	Oct. 22, 2018	One Year	☒
3.	Spectrum analyzer	R/S	FSV30	101200	Jul. 24, 2019	One Year	☒
4.	Amplifier	Sonoma Instrument	310N	312544	Mar. 18, 2019	One Year	☒
5.	Amplifier	Sonoma Instrument	310N	312545	Mar. 18, 2019	One Year	☐
6.	BBV 9718 B	Schwarzbeck	Broadband Preamplifier	009	Mar. 18, 2019	One Year	☒
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	Jun. 05, 2018	Two Year	☒
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 09, 2018	Two Year	☐
9.	Controller	Innco System	CO3000	CO3000/904/ 37211215/L	N/A	N/A	☒