RF TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

Fetal&Maternal Monitor

ISSUED TO
Edan Instruments, Inc

#15 Jinhui Road, Jinsha Community, Kengzi Sub-District, Pingshan District, 518122 Shenzhen P.R.China

Report No.:	BL-SZ2040038-402
EUT Name:	Fetal&Maternal Monitor
Model Name:	F15 Air (refer section 2.4)
Brand Name:	EDAN
Test Standard:	47 CFR Part 15 Subpart C (refer section 3.1)
FCC ID:	SMQF15EDAN
Test Conclusion:	Pass
Test Date:	Apr. 02, 2020 ~ Mar. 28, 2022
Date of Issue:	Apr. 07, 2022

Tested by: Xiong Chong
Date Apr. 07, 2022

Approved by: Liao Wanming
(Technical Director)
Date Apr. 07, 2022

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Revision History

Version	Issue Date	Revisions Content
Rev. 01	Oct. 27, 2021	Initial Issue
Rev. 02	Apr. 07, 2022	Updated all tests Updated Product Type

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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science & Technology Park, Shahe West Road, Nanshan District, Shenzhen, Guangdong Province, China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science & Technology Park, Shahe West Road, Nanshan District, Shenzhen, Guangdong Province, China
Description	All measurement facilities used to collect the measurement data are located at Block B, 1/F, Baisha Science & Technology Park, Shahe West Road, Nanshan District, Shenzhen, Guangdong Province, China.

1.3 Laboratory Condition

Ambient Temperature	20℃ to 25℃
Ambient Relative Humidity	45% to 55%
Ambient Pressure	100 kPa to 102 kPa

1.4 Announce

(1) The test report reference to the report template version v6.3.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Edan Instruments, Inc
Address	#15 Jinhui Road, Jinsha Community, Kengzi Sub-District, Pingshan District, 518122 Shenzhen P.R.China

2.2 Manufacturer Information

Manufacturer	Edan Instruments, Inc
Address	#15 Jinhui Road, Jinsha Community, Kengzi Sub-District, Pingshan District, 518122 Shenzhen P.R.China

2.3 Factory Information

Factory	Edan Instruments, Inc
Address	#15 Jinhui Road, Jinsha Community, Kengzi Sub-District, Pingshan District, 518122 Shenzhen P.R.China

2.4 General Description for Equipment under Test (EUT)

EUT Name	Fetal&Maternal Monitor
Model Name Under Test	F15 Air
Series Model Name	F15, F15 Air
Description of Model name differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in model name.
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Technical Information

Network and Wireless connectivity	WIFI 802.11b, Qi, NFC

The requirement for the following technical information of the EUT was tested in this report:

Modulation Type	ASK
Product Type	☒ Mobile ☐ Portable ☐ Fix Location
Frequency Range	13.56 MHz
Receiver Categorization	3
Number of channel	1
Tested Channel	1
Antenna Type	Coil Antenna

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C	Miscellaneous Wireless Communications Services
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	Pass Note 1
2	Emissions Bandwidth	15.215	ANNEX A.1	Pass
3	Field Strength of Fundamental Emissions	15.225(a)	ANNEX A.2	Pass
4	Radiated Emissions	15.225(d) 15.209	ANNEX A.3	Pass
5	Frequency Stability	15.225(e)	ANNEX A.4	Pass
6	Conducted Emission	15.207	ANNEX A.5	Pass

Note 1: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.
Note 2: The EUT has three coil antennas, and four configurations were tested for EUT, as follow:
Coil-1: EUT + Power + Probe#1
Coil-2: EUT + Power + Probe#2
Coil-3: EUT + Power + Probe#3
Simultaneous (Coil-1 + Coil-2 + Coil-3): EUT + Power + Probe#1 + Probe#2 + Probe#3.

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	4.28 dB
Radiated emissions (9 kHz-30 MHz)	3.22 dB
Radiated emissions (30 MHz-1 GHz)-10m	4.80 dB
Radiated emissions (30 MHz-1 GHz)-3m	4.76 dB
Radiated emissions (1 GHz-18 GHz)-3m	4.88 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

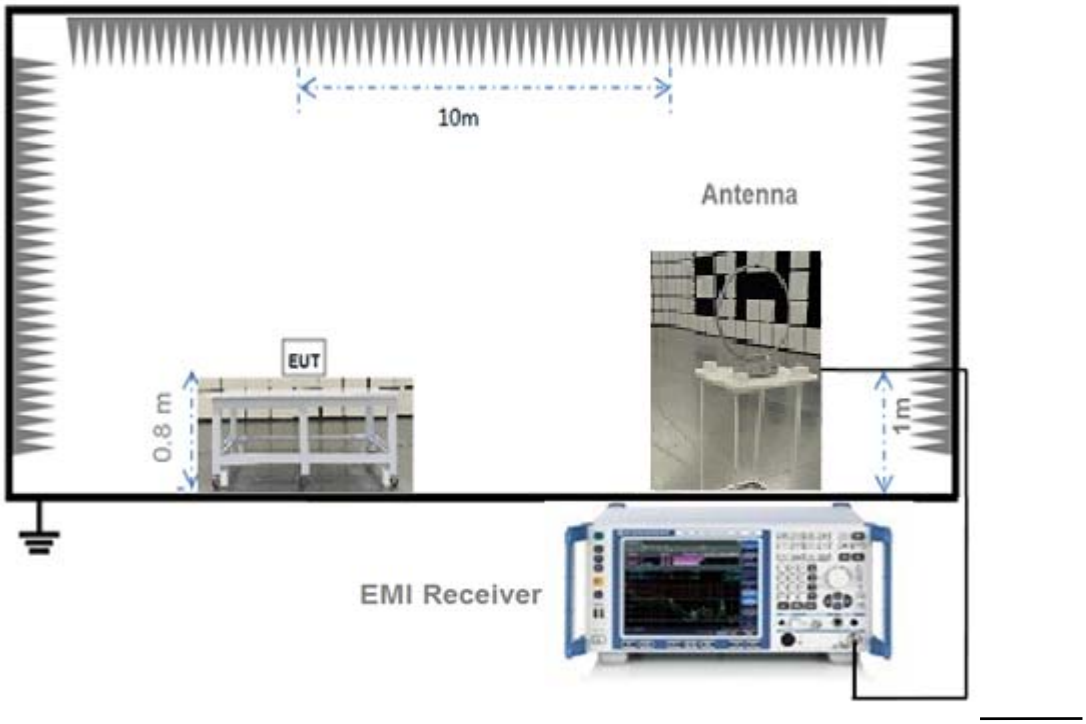
Relative Humidity	45% to 55%	
Atmospheric Pressure	100 kPa to 102 kPa	
Temperature	NT (Normal Temperature)	+22℃ to +25℃
Working Voltage of the EUT	NV (Normal Voltage)	10.8 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2021.10.10	2022.10.09
LISN	SCHWARZBECK	NSLK 8127	8127-687	2021.06.08	2022.06.07
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2021.06.04	2022.06.03
Temperature Chamber	AHK	SP20	1412	2021.11.30	2022.11.29
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2021.04.16	2024.04.15
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2021.08.20	2024.08.19
Anechoic Chamber	EMC TECHNOLOGY LTD	20.1m*11.6m*7.35m	N/A	2021.08.15	2024.08.14
Shielded Enclosure	YiHeng Electronic Co., Ltd	3.5m*3.1m*2.8m	N/A	2022.02.19	2025.02.18
Test Software	BALUN	BL410_E	V19.918	--	--

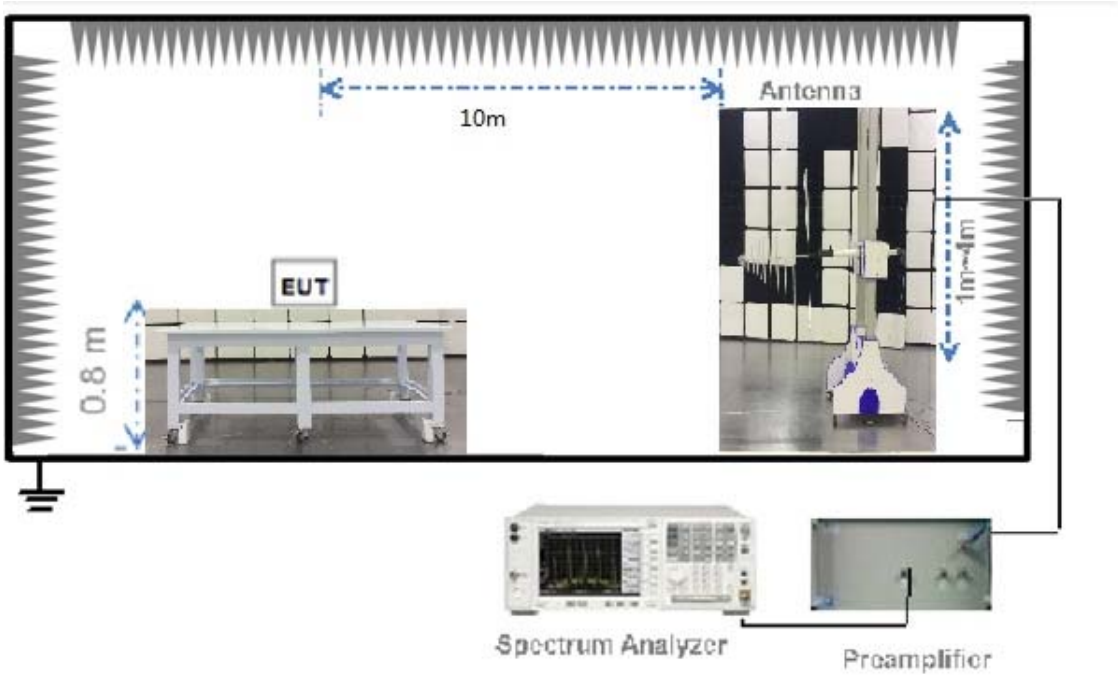
4.3 Description of Test Setup

4.3.1 For Radiated Test (Below 30 MHz)



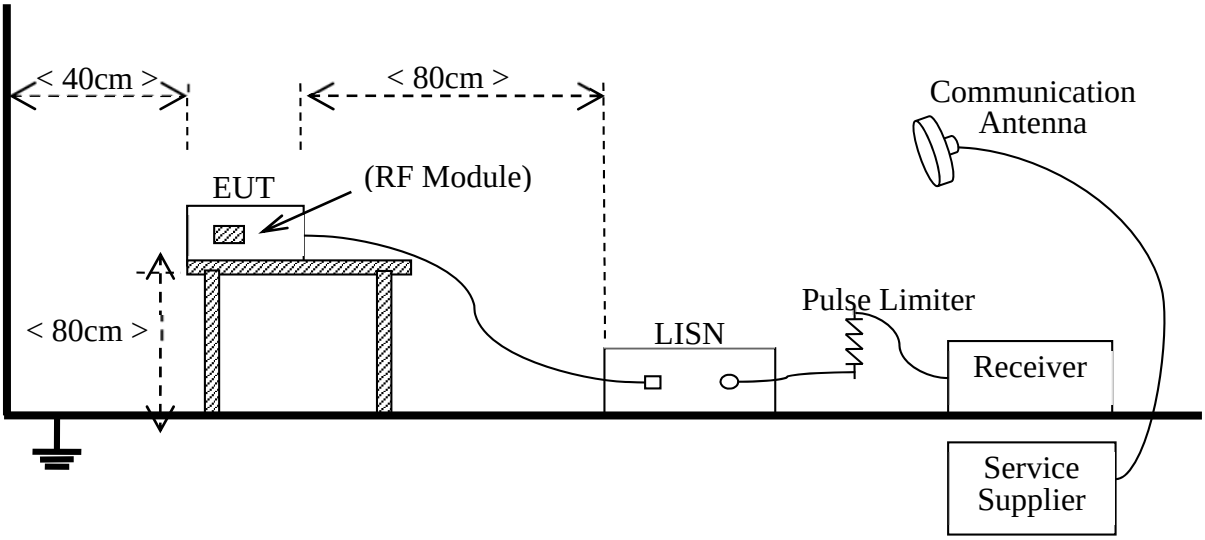
(Diagram 1)

4.3.2 For Radiated Test (30 MHz-1 GHz)



(Diagram 2)

4.3.3 For AC Power Supply Port Test



(Diagram 3)

5 TEST ITEMS

5.1 Antenna Requirements

5.1.1 Relevant Standards

FCC §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. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

RSS-Gen 6.8
The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.
The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:
This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

5.1.2 Antenna Anti-Replacement Construction

The Antenna Anti-Replacement as following method:

Protected Method	Description
The antenna is embedded in the product.	An embedded-in antenna design is used.

Reference Documents	Item
Photo	Please refer EUT internal photos.

5.2 Emission Bandwidth

5.2.1 Definition

15.215(c);

Intentional radiators operating under the alternative provisions to the general emission limits must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

RSS-Gen 6.7

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the “x dB bandwidth” is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

5.2.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

The 20dB bandwidth is measured with a spectrum analyzer connected via a receiver antenna placed near the EUT

while the EUT is operating in transmission mode.

Use the following spectrum analyzer settings:

Span = between 2 and 5 times the OBW

RBW = 1%~5% of the OBW

Sweep = auto

Detector function = peak

Trace = max hold

5.2.4 Test Result

Please refer to ANNEX A.1

5.3 Field Strength of Fundamental Emissions and Radiated Emissions

5.3.1 Limit

FCC §15.225(a), (b), (c); RSS-210 B.6

According to FCC section 15.225, for <30 MHz, Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the center of the loop. The measuring bandwidth was set to 10 KHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT)

There was no detected Restricted bands and Radiated suprious emission below 30MHz. The 30m limit was converted to 3m Limit using square factor(x) as it was found by measurements as follows; 3 m Limit(dBuV/m) = 20log(X)+40log(30/3)= 20log(15848)+40log(30/3) = 124dBuV

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency range (MHz)	Field Strength@30m		Field Strength@10m	Field Strength@3m
	μV/m	dBμV/m	dBμV/m	dBμV/m
Below 13.110	30	29.5	48.58	69.5
13.110 ~ 13.410	106	40.5	59.58	80.5
13.410 ~ 13.553	334	50.5	69.58	90.5
13.553 ~13.567	15848	84	103.08	124
13.567 ~ 13.710	334	50.5	69.58	90.5
13.710 ~14.010	106	40.5	59.58	80.5
Above 14.010	30	29.5	48.58	69.5

NOTE:

1. Field Strength (dBμV/m) = 20*log[Field Strength (μV/m)].
2. In the emission tables above, the tighter limit applies at the band edges.

FCC §15.225(d)

According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (μV/m)
0.009 - 0.490	2400/F(kHz)
0.490 - 1.705	24000/F(kHz)
1.705 - 30.0	30
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

Note:

1. For Above 1000 MHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

2. For above 1000 MHz, limit field strength of harmonics: 54dBuV/m@3m (AV) and 74dBuV/m@3m (PK).

5.3.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.3.3 Test Procedure

The measurement frequency range is from 9 kHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented. The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

5.3.4 Test Result

Please refer to ANNEX A.2

NOTE**:**

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain (dB)

3. Over limit = Results – Limit.

5.4 Frequency Tolerance

5.4.1 Limit

FCC §15.225(e)

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. For battery operated equipment, the equipment tests shall be performed using a new battery.

RSS-210 B.6

(a) at the temperatures of -30°C (-22°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage; and

(b) at the temperature of +20° C (+68° F) and at ±15% of the manufacturer's rated supply voltage.

If the frequency stability limits are only met within a temperature range that is smaller than the -30° C to +50° C range specified in (a), the frequency stability requirement will be deemed to be met if the transmitter is automatically prevented from operating outside this smaller temperature range and if the published operating characteristics for the equipment are revised to reflect this restricted temperature range.

5.4.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.4.3 Test Procedure

1. The test is performed in a Temperature Chamber.
2. The EUT is configured as MS + DC Power Supply.

5.4.4 Test Result

Please refer to ANNEX A.4.

5.5 Conducted Emission

5.5.1 Limit

FCC §15.207; RSS-Gen

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50μH/50Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5.5.2 Test Setup

See section 4.1.1 for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.5.4 Test Result

Please refer to ANNEX A.5.

NOTE:

1. Results (dBuV/m) = Reading (dBuV) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor = Insertion loss + Cable loss

3. Over limit = Results – Limit.

ANNEX A TEST RESULT

A.1 Emission Bandwidth

Note: Because the measured signal is CW adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

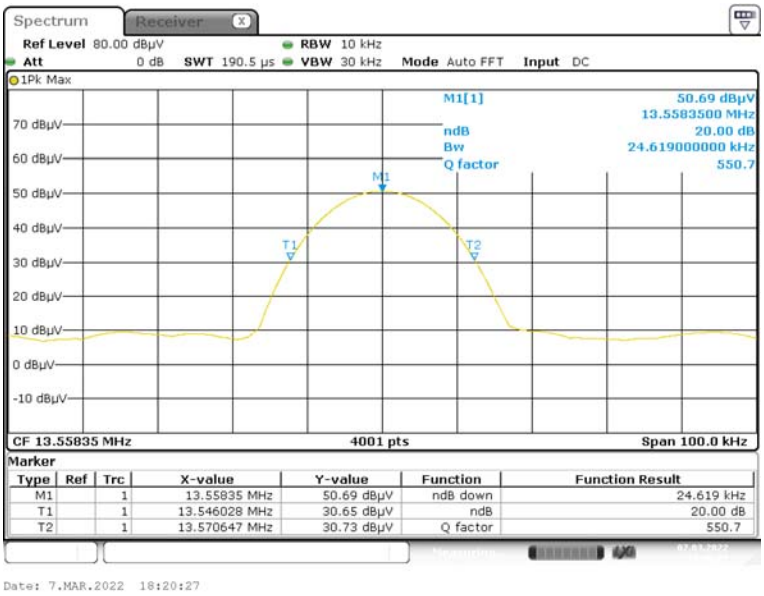
Coil-1

Test Data

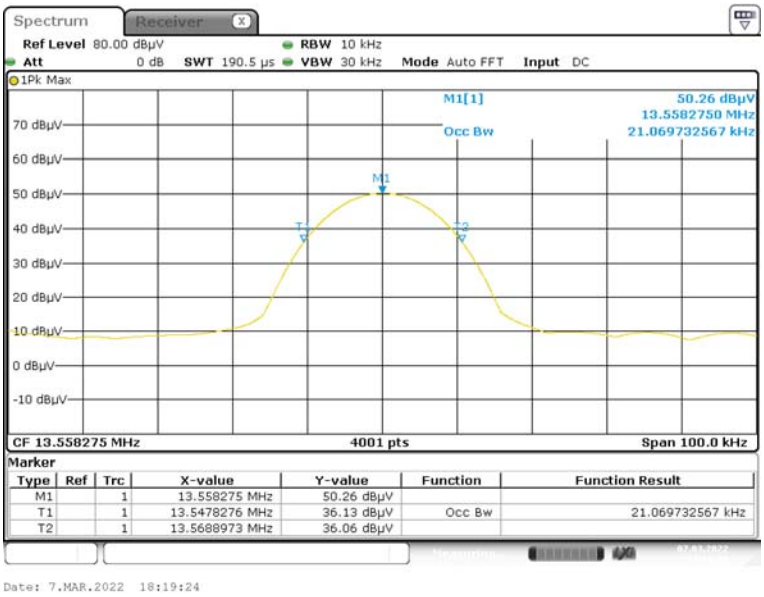
Frequency (MHz)	Emission Bandwidth (20dB down) (kHz)	Occupied Bandwidth (99%) (kHz)
13.56	24.619	21.070

Test Plots

Emission Bandwidth



99% Occupied Bandwidth



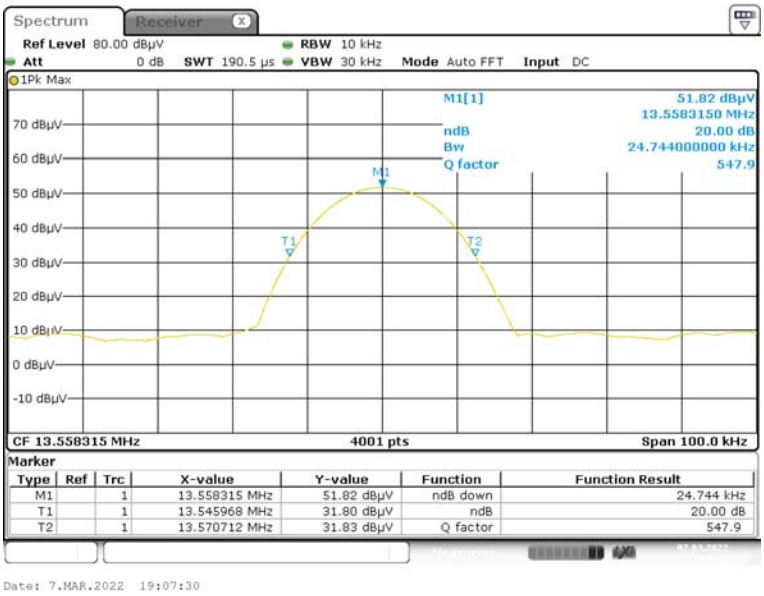
Coil-2

Test Data

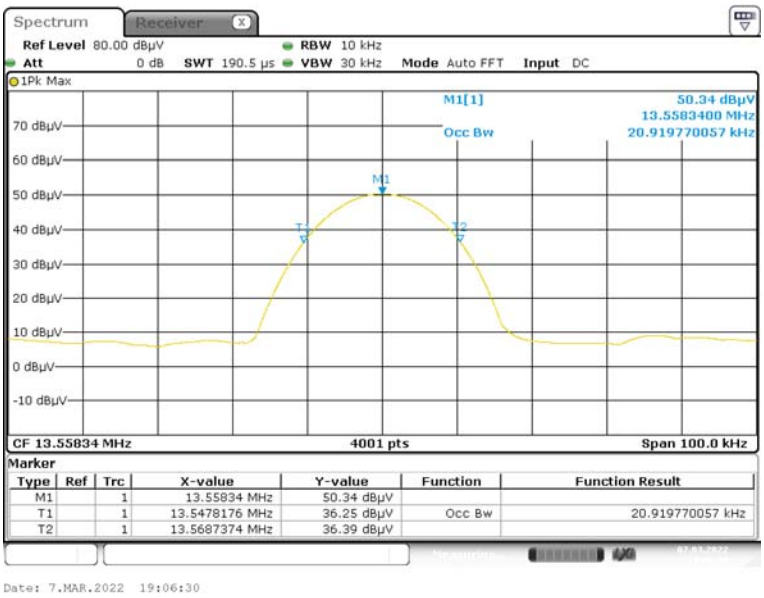
Frequency (MHz)	Emission Bandwidth (20dB down) (kHz)	Occupied Bandwidth (99%) (kHz)
13.56	24.744	20.920

Test Plots

Emission Bandwidth



99% Occupied Bandwidth



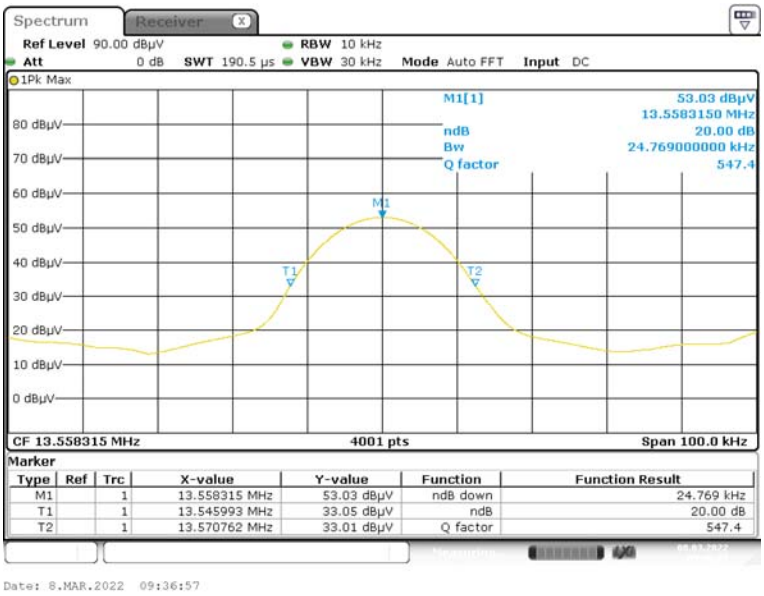
Coil-3

Test Data

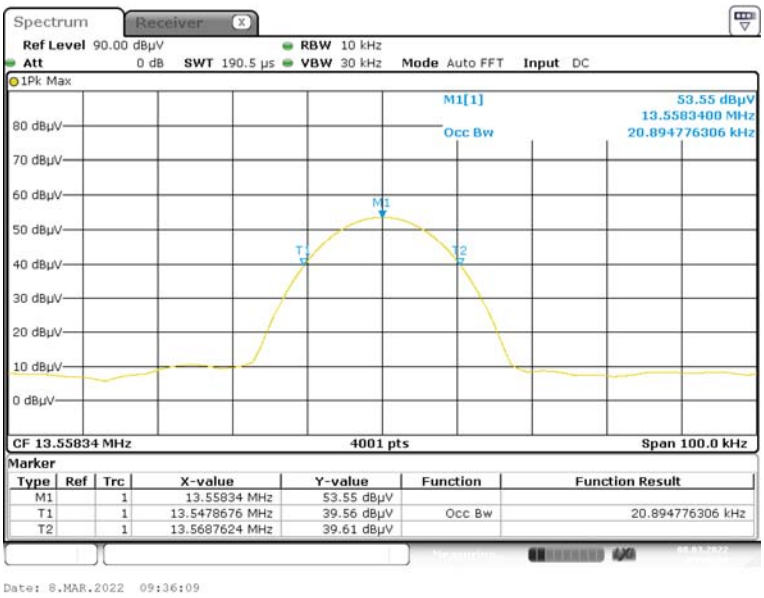
Frequency (MHz)	Emission Bandwidth (20dB down) (kHz)	Occupied Bandwidth (99%) (kHz)
13.56	24.769	20.895

Test Plots

Emission Bandwidth



99% Occupied Bandwidth



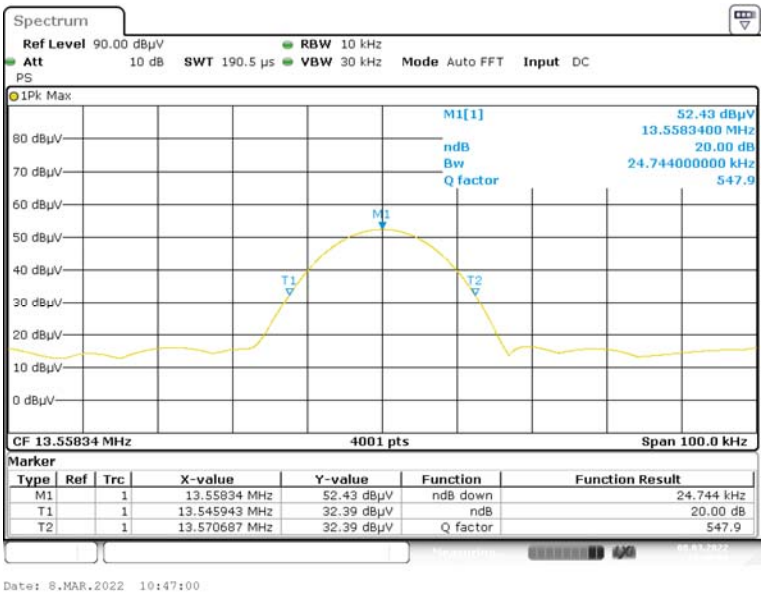
Simultaneous(Coil-1+Coil-2+Coil-3)

Test Data

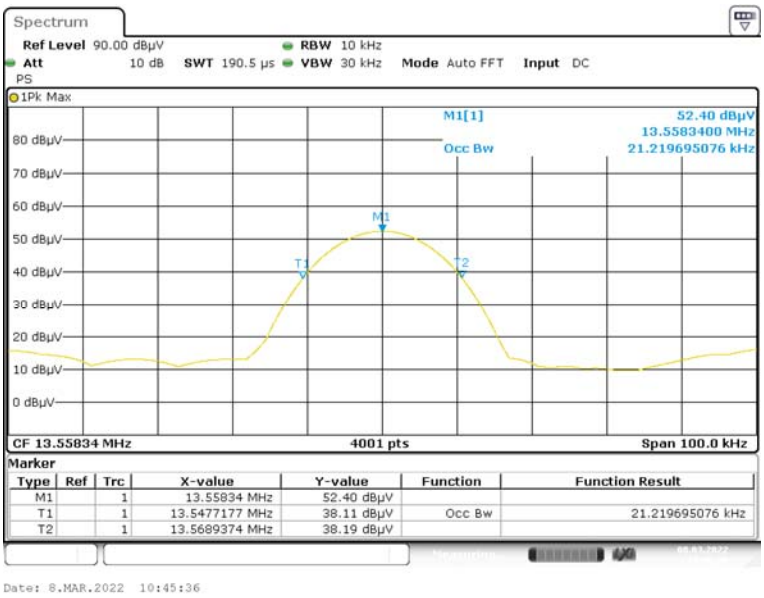
Frequency (MHz)	Emission Bandwidth (20dB down) (kHz)	Occupied Bandwidth (99%) (kHz)
13.56	24.744	21.220

Test Plots

Emission Bandwidth



99% Occupied Bandwidth



A.2 Field Strength of Fundamental Emissions

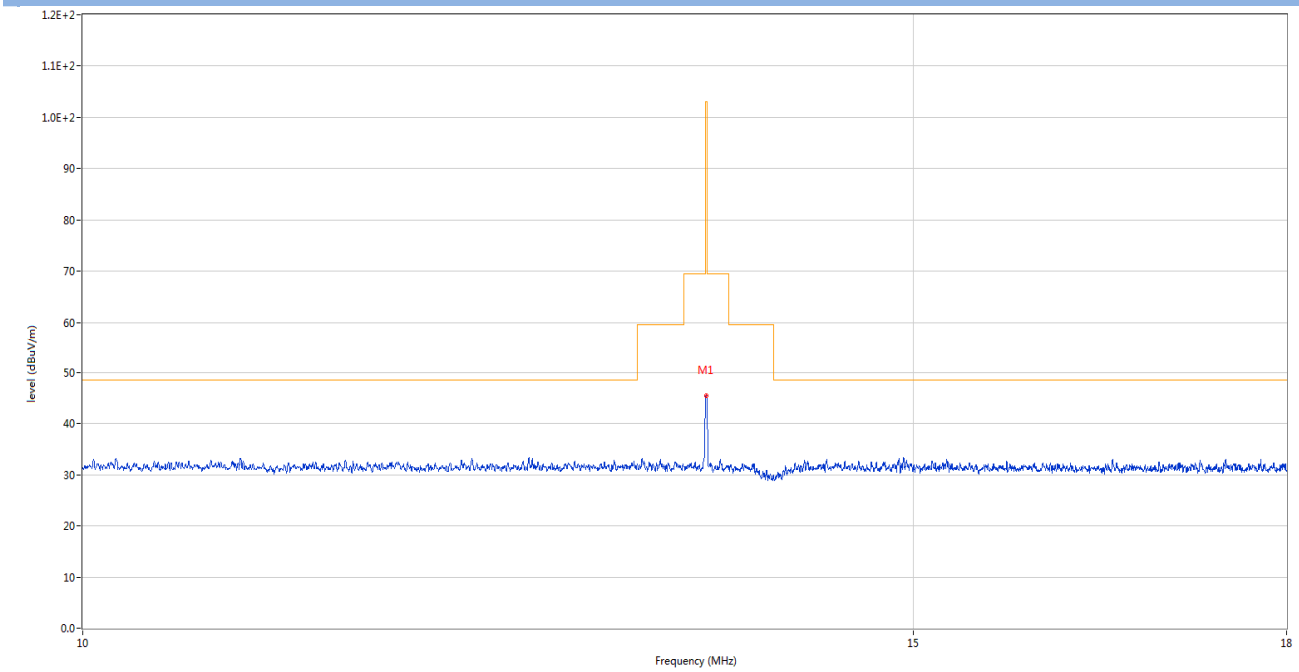
Coil-1

Test Data

Field Strength of Fundamental Emissions Value					
Frequency (MHz)	Detector	Field Strength (dBuV/m)	Limit @10m (dBuV/m)	Antenna	Margin (dB)
13.558	PEAK	45.56	103.0	Loop	57.44

Test Plot

ANT-V



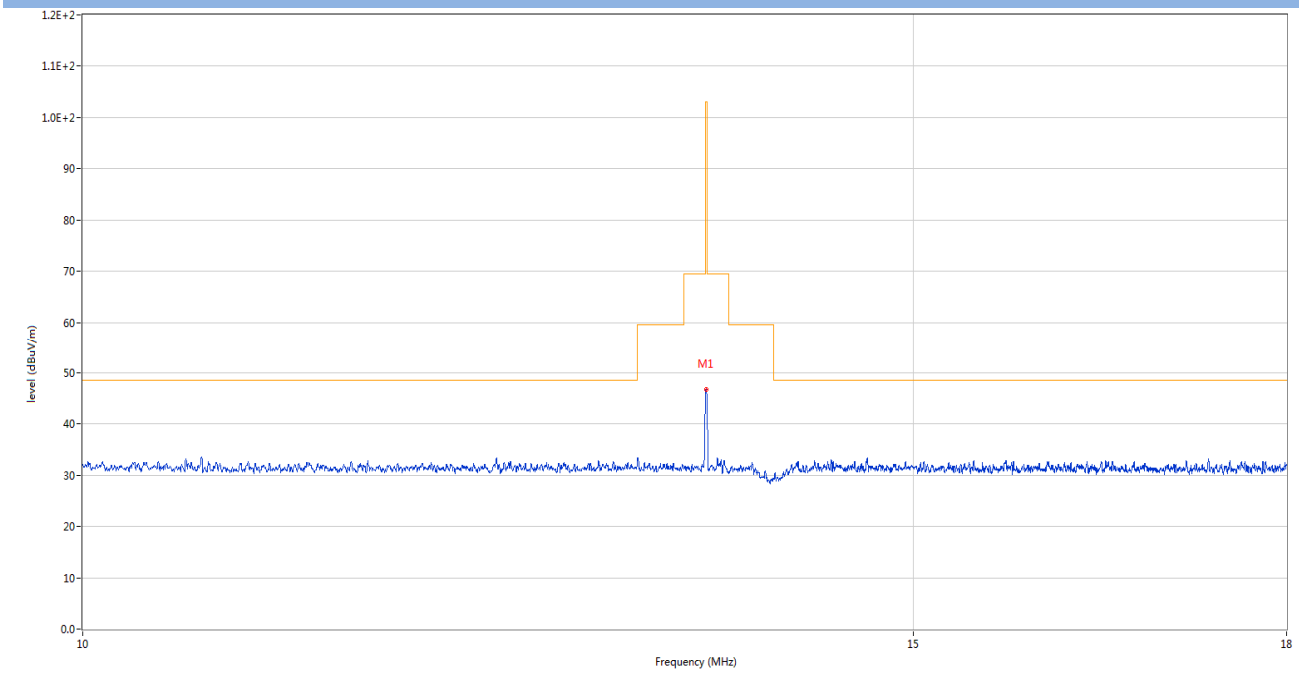
Coil-2

Test Data

Field Strength of Fundamental Emissions Value					
Frequency (MHz)	Detector	Field Strength (dBuV/m)	Limit @10m (dBuV/m)	Antenna	Margin (dB)
13.558	PEAK	46.76	103.0	Loop	56.24

Test Plot

ANT-V



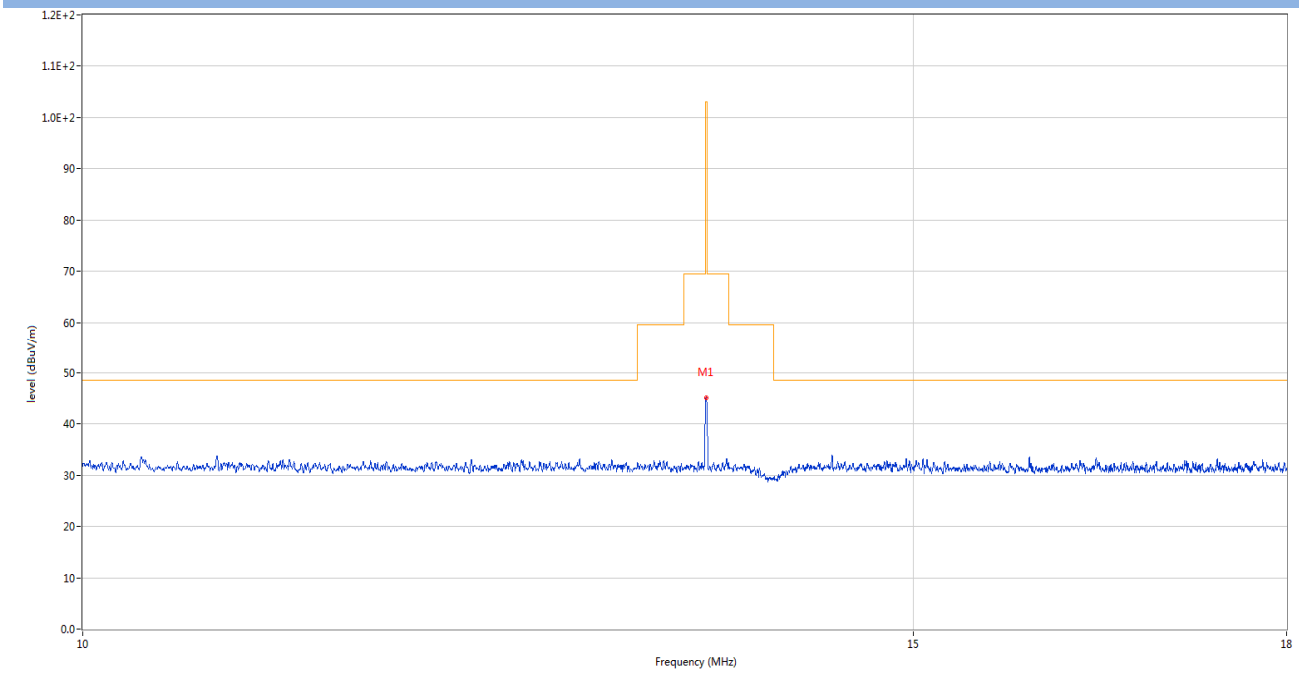
Coil-3

Test Data

Field Strength of Fundamental Emissions Value					
Frequency (MHz)	Detector	Field Strength (dBuV/m)	Limit @10m (dBuV/m)	Antenna	Margin (dB)
13.558	PEAK	20.86	103.0	Loop	57.90

Test Plot

ANT-V



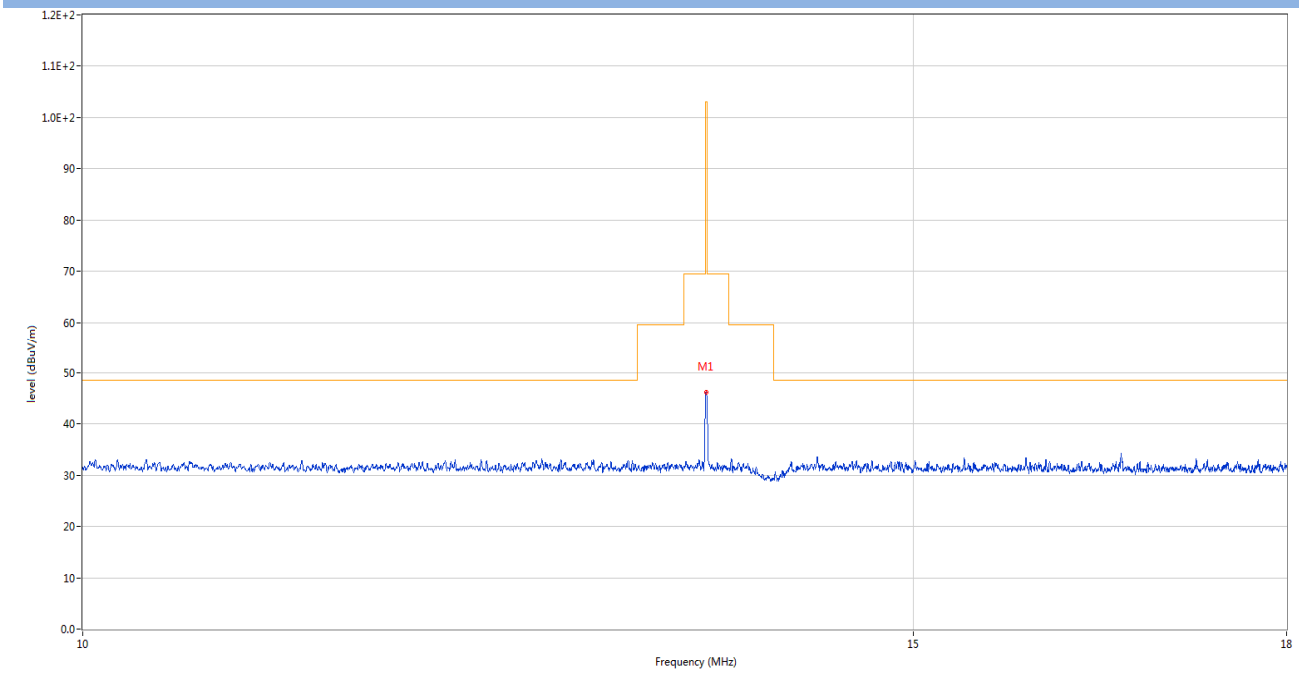
Simultaneous(Coil-1+Coil-2+Coil-3)

Test Data

Field Strength of Fundamental Emissions Value					
Frequency (MHz)	Detector	Field Strength (dBuV/m)	Limit @10m (dBuV/m)	Antenna	Margin (dB)
13.558	PEAK	46.18	103.0	Loop	56.82

Test Plot

ANT-V



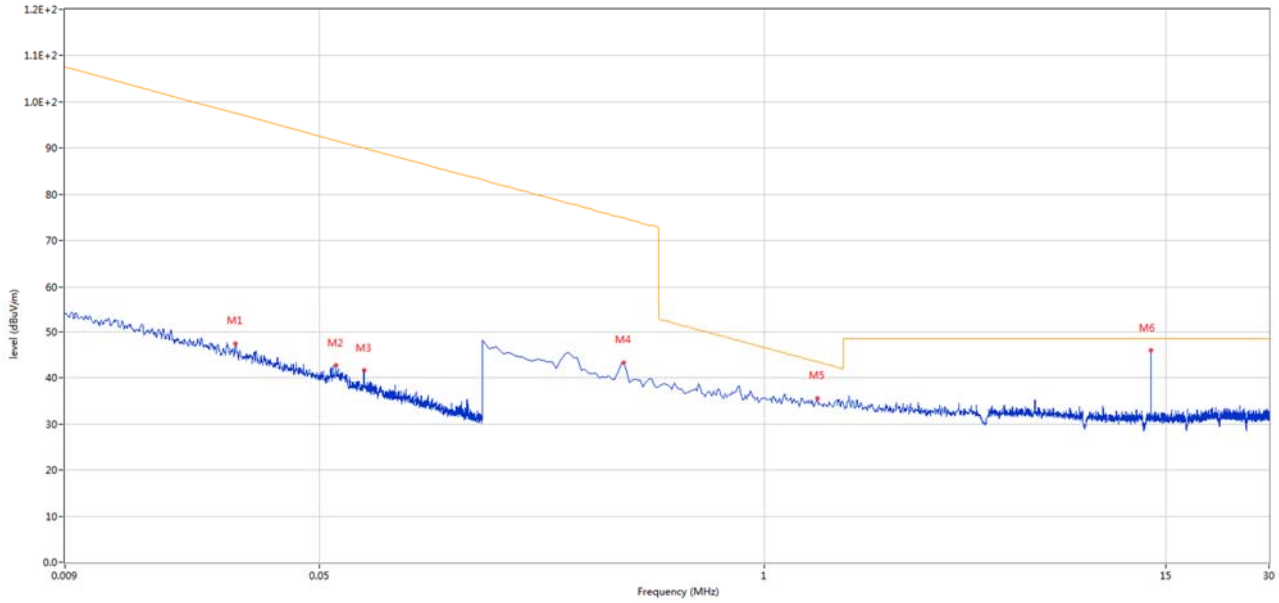
A.3 Radiated Emissions

Note: This frequency which near 13.56 MHz with circle should be ignored because they are NFC carrier frequency.

The Data and Plots (9 kHz ~ 30 MHz)(at 10m chamber)

Coil-1

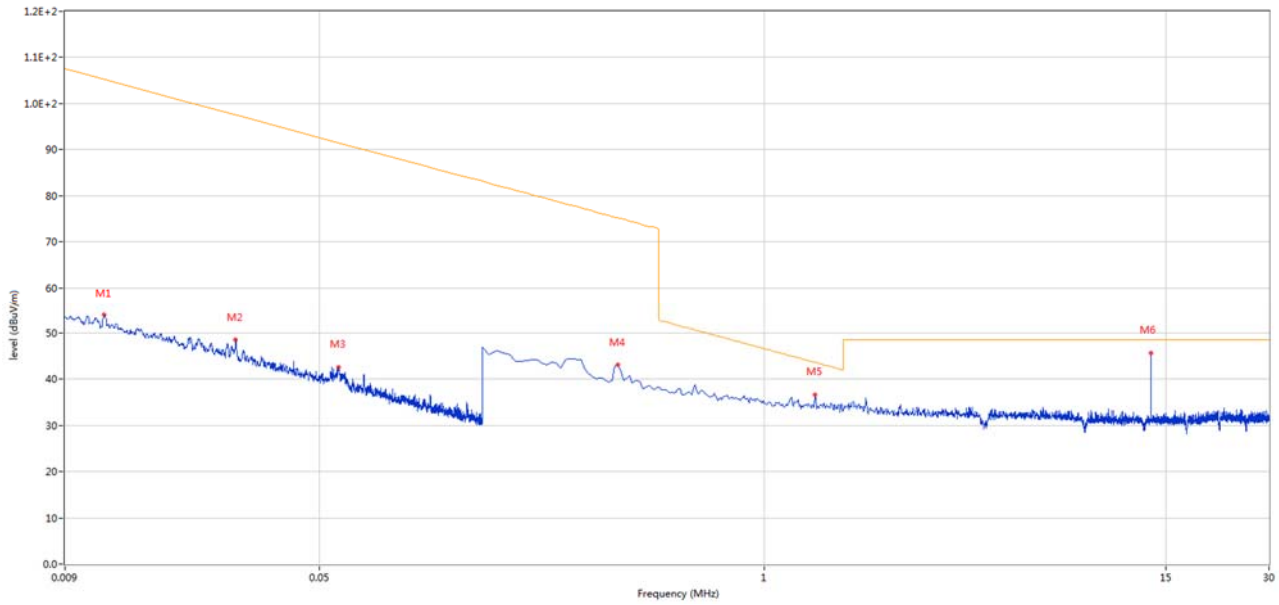
Below 30 MHz, ANT-Loop



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.028	47.47	20.15	97.6	-50.13	Peak	132.00	100	Vertical	Pass
2	0.056	42.71	20.20	91.6	-48.89	Peak	167.00	100	Vertical	Pass
3	0.068	41.77	20.18	90.0	-48.23	Peak	274.00	100	Vertical	Pass
4	0.389	43.28	20.18	74.8	-31.52	Peak	334.00	100	Vertical	Pass
5	1.434	35.55	20.52	43.5	-7.95	Peak	360.00	100	Vertical	Pass
6	13.560	46.20	20.86	48.5	-2.30	Peak	350.00	100	Vertical	N/A

Coil-2

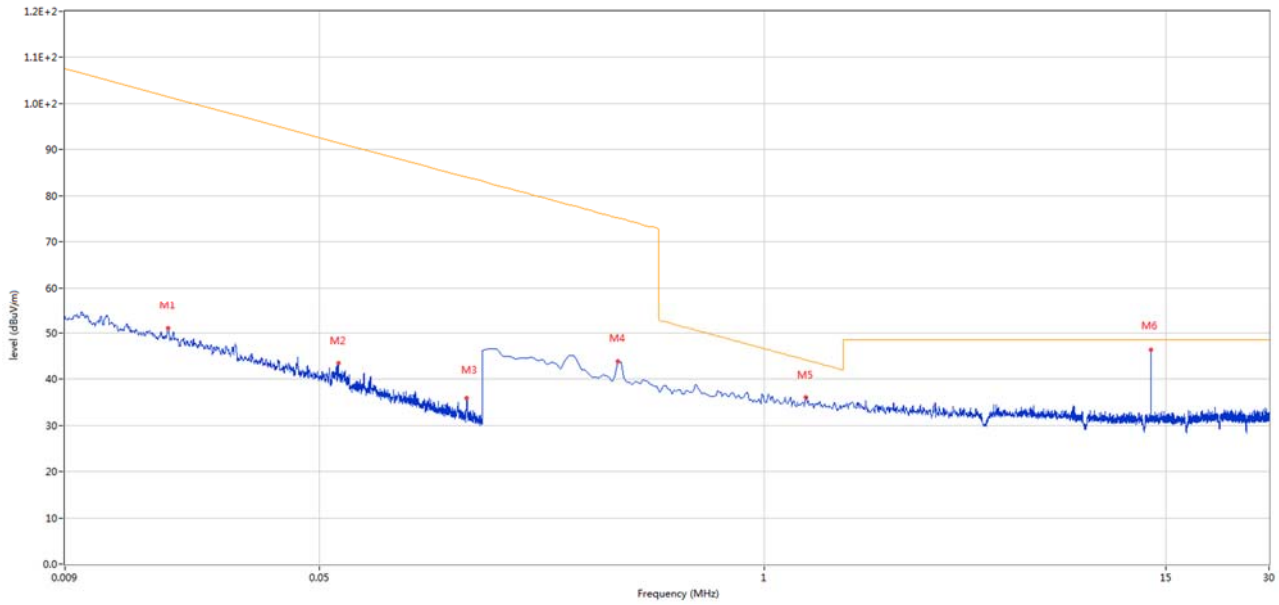
Below 30 MHz, ANT-Loop



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.012	53.42	20.01	105.2	-51.78	Peak	290.00	100	Vertical	Pass
2	0.028	47.98	20.15	97.6	-49.62	Peak	356.00	100	Vertical	Pass
3	0.057	42.39	20.20	91.5	-49.11	Peak	157.00	100	Vertical	Pass
4	0.374	43.07	20.17	75.1	-32.03	Peak	10.00	100	Vertical	Pass
5	1.411	36.67	20.52	43.6	-6.93	Peak	327.00	100	Vertical	Pass
6	13.560	46.61	20.86	48.5	-1.89	Peak	35.00	100	Vertical	N/A

Coil-3

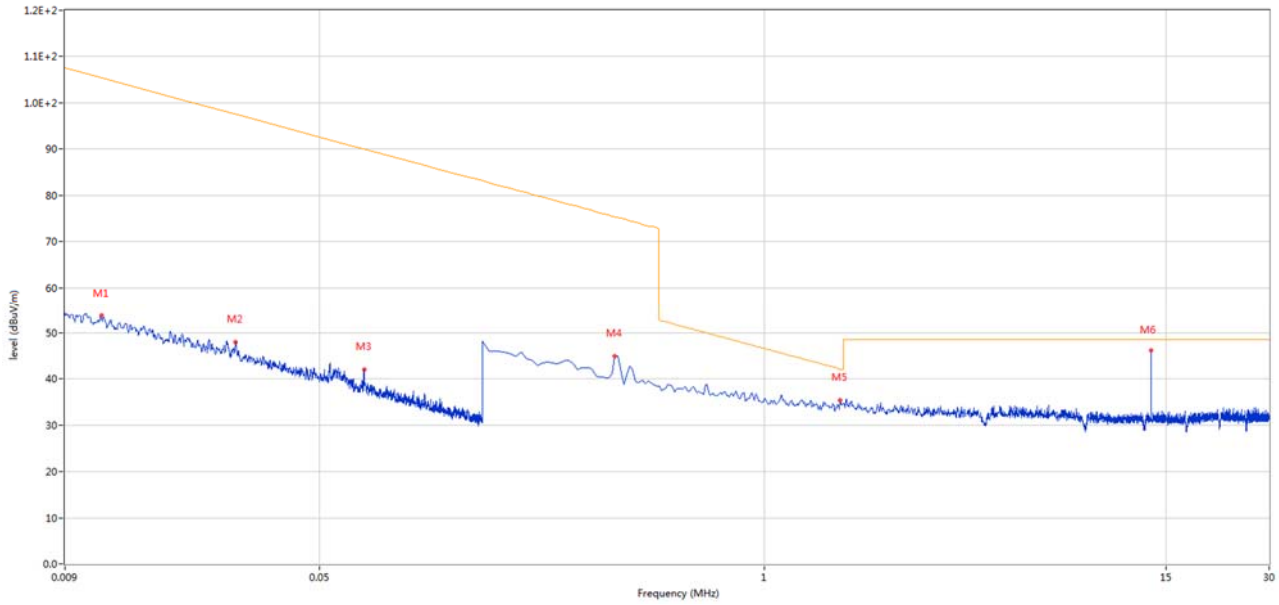
Below 30 MHz, ANT-Loop



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.018	50.96	20.14	101.5	-50.54	Peak	53.00	100	Vertical	Pass
2	0.057	43.22	20.20	91.5	-48.28	Peak	300.00	100	Vertical	Pass
3	0.135	35.31	20.14	84.0	-48.69	Peak	317.00	100	Vertical	Pass
4	0.374	43.86	20.17	75.1	-31.24	Peak	350.00	100	Vertical	Pass
5	1.322	36.01	20.51	44.2	-8.19	Peak	122.00	100	Vertical	Pass
6	13.560	47.23	20.86	48.5	-1.27	Peak	16.00	100	Vertical	N/A

Simultaneous(Coil-1+Coil-2+Coil-3)

Below 30 MHz, ANT-Loop

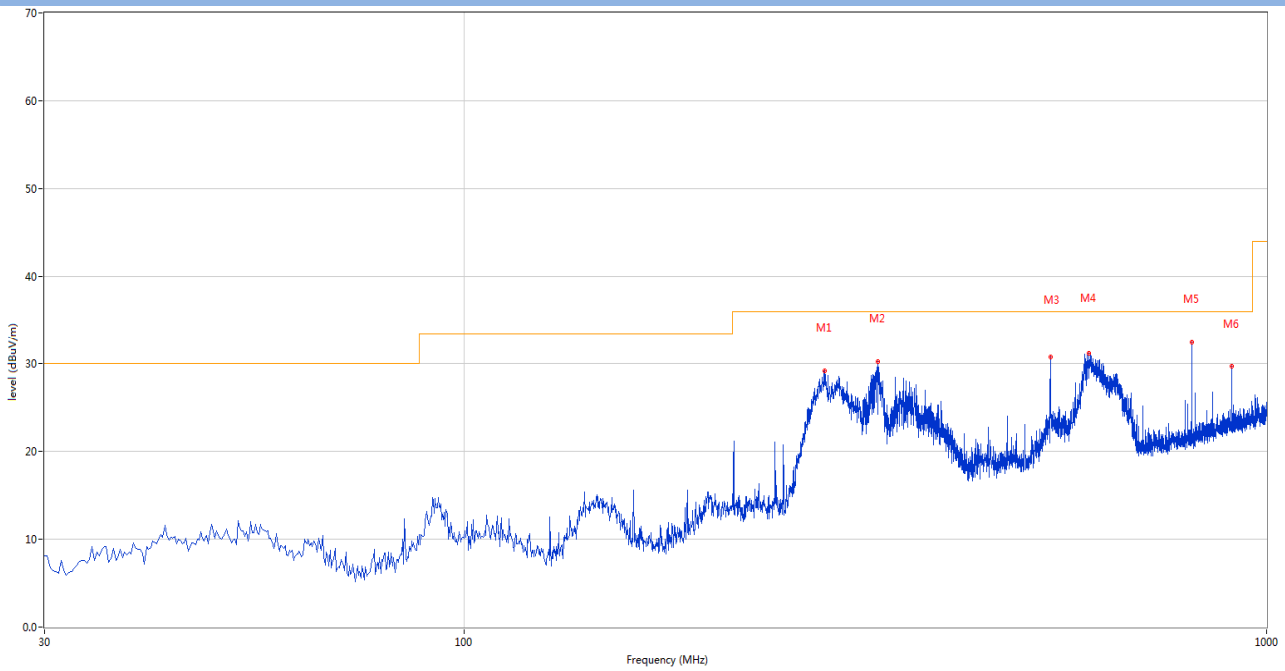


No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	0.011	53.79	20.01	105.4	-51.61	Peak	52.00	100	Vertical	Pass
2	0.028	47.89	20.15	97.6	-49.71	Peak	307.00	100	Vertical	Pass
3	0.068	42.12	20.18	90.0	-47.88	Peak	78.00	100	Vertical	Pass
4	0.366	44.90	20.16	75.3	-30.40	Peak	4.00	100	Vertical	Pass
5	1.665	35.37	20.46	42.1	-6.73	Peak	336.00	100	Vertical	Pass
6	13.553	47.15	20.86	48.5	-1.35	Peak	177.00	100	Vertical	N/A

Test Data and Plots (30 MHz ~ 10th Harmonic)

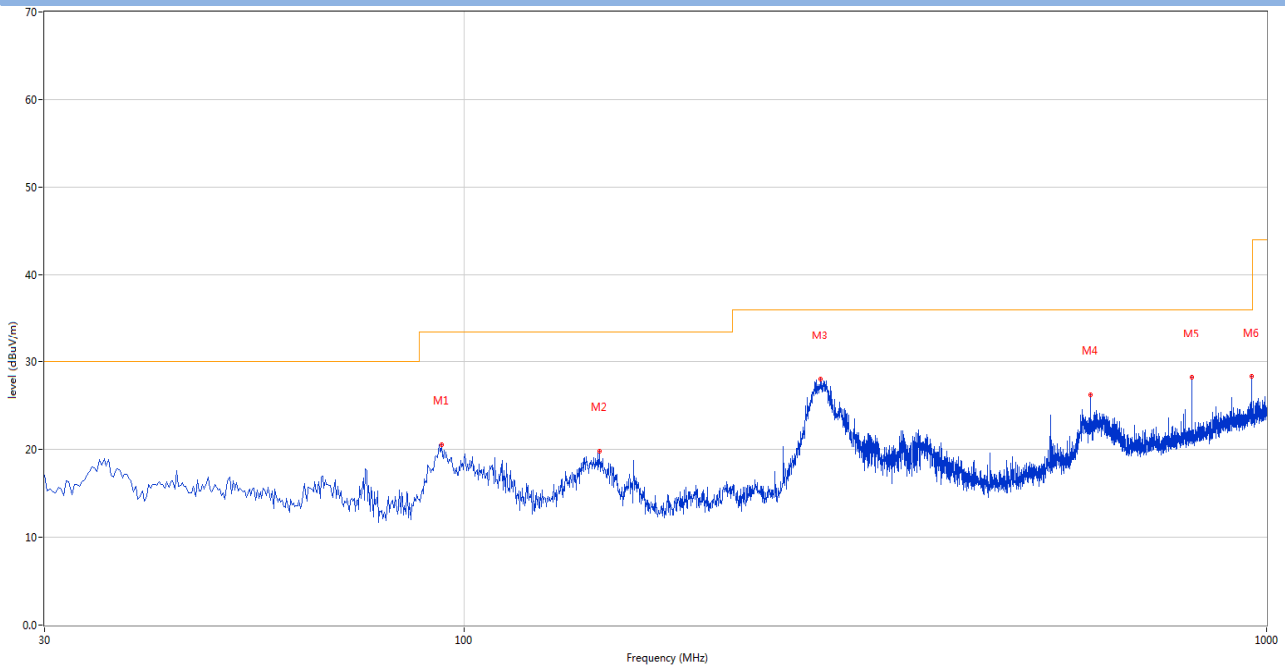
Coil-1

30 MHz to 1 GHz, ANT-H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	281.652	29.14	-25.55	36.0	-6.86	Peak	235.00	200	Horizontal	Pass
2	327.473	30.23	-24.25	36.0	-5.77	Peak	154.00	200	Horizontal	Pass
3	537.426	30.73	-19.64	36.0	-5.27	Peak	297.00	100	Horizontal	Pass
4	599.733	31.20	-17.71	36.0	-4.80	Peak	251.00	100	Horizontal	Pass
5	806.291	32.44	-14.58	36.0	-3.56	Peak	322.00	100	Horizontal	Pass
6	904.964	29.63	-12.72	36.0	-6.37	Peak	236.00	100	Horizontal	Pass

30 MHz to 1 GHz, ANT-V



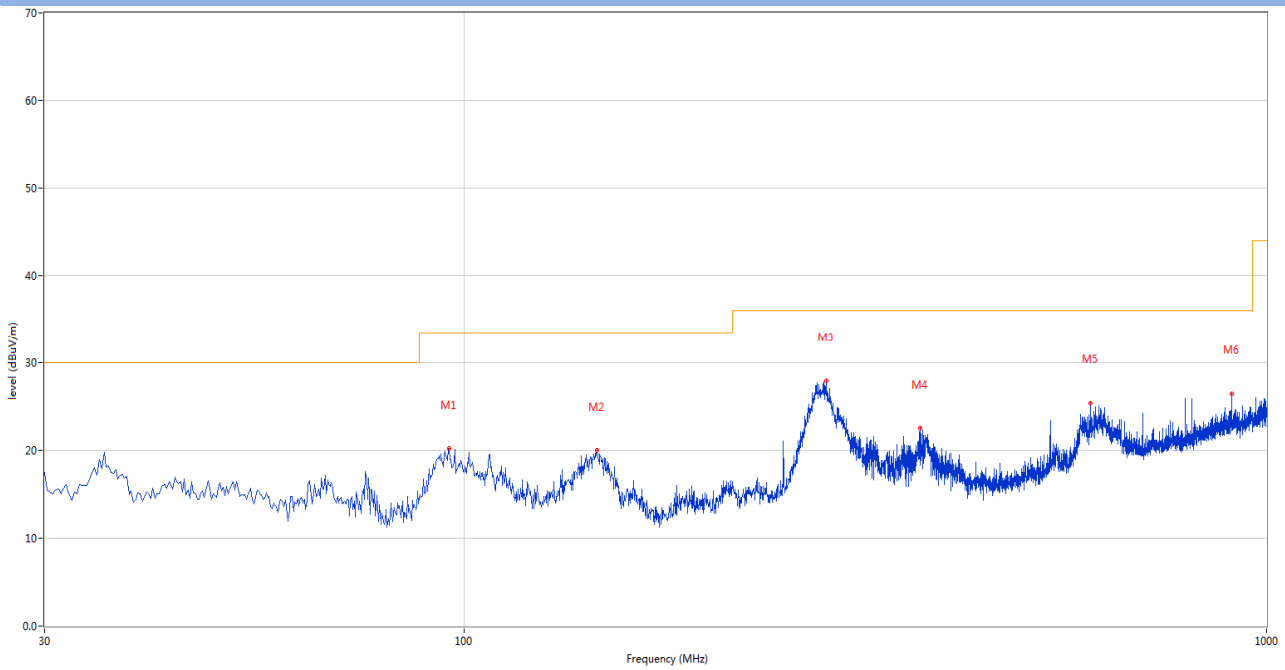
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	93.762	20.55	-28.95	33.5	-12.95	Peak	35.00	100	Vertical	Pass
2	147.583	19.81	-31.50	33.5	-13.69	Peak	221.00	100	Vertical	Pass
3	278.258	28.03	-25.59	36.0	-7.97	Peak	176.00	100	Vertical	Pass
4	603.369	26.25	-17.66	36.0	-9.75	Peak	230.00	200	Vertical	Pass
5	806.291	28.22	-14.58	36.0	-7.78	Peak	124.00	200	Vertical	Pass
6	958.300	28.35	-12.12	36.0	-7.65	Peak	94.00	200	Vertical	Pass

Coil-2

30 MHz to 1 GHz, ANT-H

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	279.713	29.51	-25.61	36.0	-6.49	Peak	235.00	200	Horizontal	Pass
2	326.988	29.44	-24.27	36.0	-6.56	Peak	154.00	200	Horizontal	Pass
3	363.354	28.44	-23.35	36.0	-7.56	Peak	159.00	200	Horizontal	Pass
4	537.426	30.97	-19.64	36.0	-5.03	Peak	280.00	200	Horizontal	Pass
5	603.369	31.40	-17.66	36.0	-4.60	Peak	240.00	200	Horizontal	Pass
6	806.291	30.55	-14.58	36.0	-5.45	Peak	45.00	100	Horizontal	Pass

30 MHz to 1 GHz, ANT-V



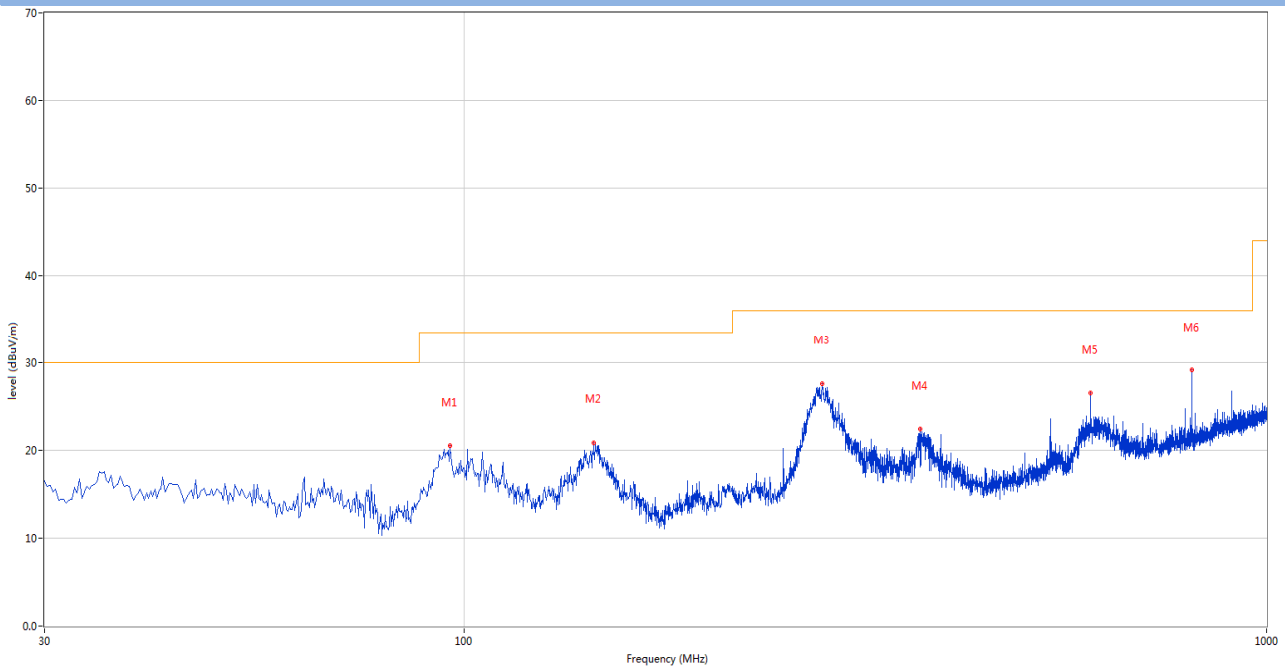
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	95.701	20.18	-28.56	33.5	-13.32	Peak	360.00	100	Vertical	Pass
2	146.371	19.96	-31.50	33.5	-13.54	Peak	231.00	100	Vertical	Pass
3	282.379	27.90	-25.50	36.0	-8.10	Peak	171.00	100	Vertical	Pass
4	370.385	22.48	-23.40	36.0	-13.52	Peak	186.00	100	Vertical	Pass
5	603.369	25.42	-17.66	36.0	-10.58	Peak	161.00	100	Vertical	Pass
6	905.206	26.47	-12.73	36.0	-9.53	Peak	280.00	200	Vertical	Pass

Coil-3

30 MHz to 1 GHz, ANT-H

No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	291.835	28.42	-25.24	36.0	-7.58	Peak	255.00	200	Horizontal	Pass
2	327.231	29.97	-24.25	36.0	-6.03	Peak	179.00	200	Horizontal	Pass
3	361.657	28.47	-23.41	36.0	-7.53	Peak	174.00	200	Horizontal	Pass
4	537.668	30.45	-19.63	36.0	-5.55	Peak	275.00	200	Horizontal	Pass
5	619.128	31.04	-17.58	36.0	-4.96	Peak	246.00	100	Horizontal	Pass
6	806.291	29.60	-14.58	36.0	-6.40	Peak	266.00	100	Horizontal	Pass

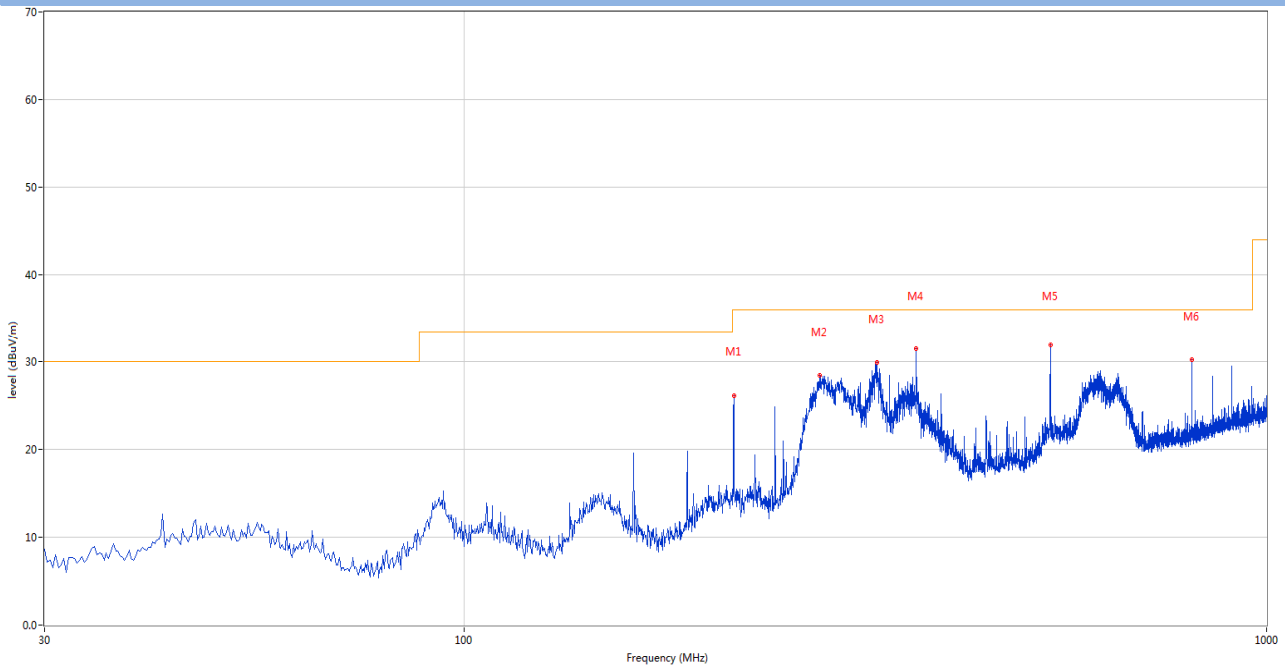
30 MHz to 1 GHz, ANT-V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	95.944	20.50	-28.53	33.5	-13.00	Peak	352.00	100	Vertical	Pass
2	145.159	20.84	-31.56	33.5	-12.66	Peak	206.00	100	Vertical	Pass
3	279.470	27.60	-25.61	36.0	-8.40	Peak	140.00	100	Vertical	Pass
4	369.900	22.40	-23.44	36.0	-13.60	Peak	181.00	100	Vertical	Pass
5	603.369	26.52	-17.66	36.0	-9.48	Peak	90.00	100	Vertical	Pass
6	806.291	29.13	-14.58	36.0	-6.87	Peak	270.00	200	Vertical	Pass

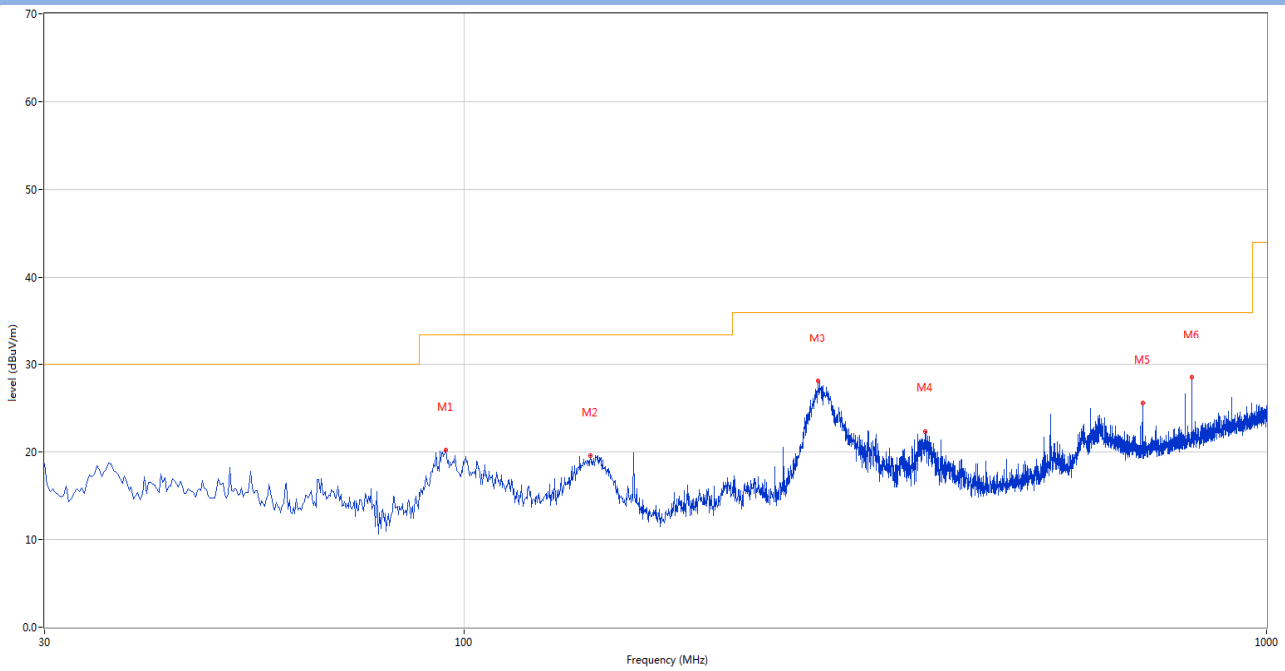
Simultaneous(Coil-1+Coil-2+Coil-3)

30 MHz to 1 GHz, ANT-H



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	216.921	26.15	-27.82	36.0	-9.85	Peak	240.00	200	Horizontal	Pass
2	277.046	28.44	-25.65	36.0	-7.56	Peak	235.00	200	Horizontal	Pass
3	327.231	29.94	-24.25	36.0	-6.06	Peak	159.00	200	Horizontal	Pass
4	366.021	31.52	-23.48	36.0	-4.48	Peak	174.00	200	Horizontal	Pass
5	537.426	31.86	-19.64	36.0	-4.14	Peak	285.00	200	Horizontal	Pass
6	806.291	30.22	-14.58	36.0	-5.78	Peak	231.00	100	Horizontal	Pass

30 MHz to 1 GHz, ANT-V



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Over Limit (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	94.974	20.17	-28.71	33.5	-13.33	Peak	360.00	200	Vertical	Pass
2	143.704	19.56	-31.61	33.5	-13.94	Peak	206.00	100	Vertical	Pass
3	276.076	28.07	-25.70	36.0	-7.93	Peak	146.00	100	Vertical	Pass
4	375.234	22.36	-23.16	36.0	-13.64	Peak	0.00	100	Vertical	Pass
5	700.345	25.57	-16.31	36.0	-10.43	Peak	144.00	200	Vertical	Pass
6	806.291	28.49	-14.58	36.0	-7.51	Peak	114.00	200	Vertical	Pass

A.4 Frequency Stability

Note 1: Because the 85%(9.18V) and 115% (12.42V)of the rated supply voltage value exceeds the cut-off voltage upper(12.6V) and lower(10V) limit of the manufacturer, the cut-off voltage of EUT is test here.

Note 2: The operating temperature range of the EUT is 0°C to 40°C.

Coil-1

OPERATING FREQUENCY:	13558350 Hz
REFERENCE VOLTAGE:	10.8 V
DEVIATION LIMIT:	±0.01%

VOLTAGE (%)	Test Conditions		Frequency (MHz)	Deviation (%)	Verdict
	Power (VDC)	Temperature (°C)			
100	10.8	+20°C(Ref)	13.558275	-0.000553	Pass
100		-30	13.558361	0.000083	
100		-20	13.557481	-0.006410	
100		-10	13.559446	0.008080	
100		0	13.558611	0.001928	
100		+10	13.558286	-0.000472	
100		+20	13.558905	0.004097	
100		+25	13.559595	0.009182	
100		+30	13.557333	-0.007504	
100		+40	13.557080	-0.009370	
100		+50	13.558144	-0.001519	
MIN(Battery End Point, 85)	10	+20	13.558106	-0.001800	
MAX(Battery End Point, 115)	12.42	+20	13.559289	0.006925	

Coil-2

OPERATING FREQUENCY:	13558315 Hz
REFERENCE VOLTAGE:	10.8 V
DEVIATION LIMIT:	±0.01%

VOLTAGE (%)	Test Conditions		Frequency (MHz)	Deviation (%)	Verdict
	Power (VDC)	Temperature (°C)			
100	10.8	+20°C(Ref)	13.558340	0.000184	Pass
100		-30	13.558983	0.004927	
100		-20	13.559617	0.009604	
100		-10	13.558119	-0.001447	
100		0	13.557686	-0.004640	
100		+10	13.559614	0.009583	
100		+20	13.557141	-0.008661	
100		+25	13.559209	0.006597	
100		+30	13.557800	-0.003796	
100		+40	13.557174	-0.008415	
100		+50	13.559077	0.005624	
MIN(Battery End Point, 85)	10	+20	13.557538	-0.005733	
MAX(Battery End Point, 115)	12.42	+20	13.557697	-0.004559	

Coil-3

OPERATING FREQUENCY:	13558315 Hz
REFERENCE VOLTAGE:	10.8 V
DEVIATION LIMIT:	±0.01%

VOLTAGE (%)	Test Conditions		Frequency (MHz)	Deviation (%)	Verdict
	Power (VDC)	Temperature (°C)			
100	10.8	+20°C(Ref)	13.558340	0.000184	Pass
100		-30	13.557823	-0.003628	
100		-20	13.559000	0.005051	
100		-10	13.558051	-0.001949	
100		0	13.559057	0.005472	
100		+10	13.557679	-0.004690	
100		+20	13.557025	-0.009513	
100		+25	13.558707	0.002890	
100		+30	13.558718	0.002974	
100		+40	13.557087	-0.009060	
100		+50	13.558092	-0.001642	
MIN(Battery End Point, 85)	10	+20	13.557067	-0.009206	
MAX(Battery End Point, 115)	12.42	+20	13.557311	-0.007407	

Simultaneous(Coil-1+Coil-2+Coil-3)

OPERATING FREQUENCY:	13558340 Hz
REFERENCE VOLTAGE:	10.8 V
DEVIATION LIMIT:	±0.01%

VOLTAGE (%)	Test Conditions		Frequency (MHz)	Deviation (%)	Verdict
	Power (VDC)	Temperature (°C)			
100	10.8	+20°C(Ref)	13.558340	0.000000	Pass
100		-30	13.557076	-0.009326	
100		-20	13.557239	-0.008121	
100		-10	13.557528	-0.005989	
100		0	13.558498	0.001164	
100		+10	13.557204	-0.008378	
100		+20	13.558031	-0.002280	
100		+25	13.558708	0.002713	
100		+30	13.557595	-0.005497	
100		+40	13.557987	-0.002604	
100		+50	13.558048	-0.002151	
MIN(Battery End Point, 85)	10	+20	13.558426	0.000633	
MAX(Battery End Point, 115)	12.42	+20	13.558130	-0.001551	

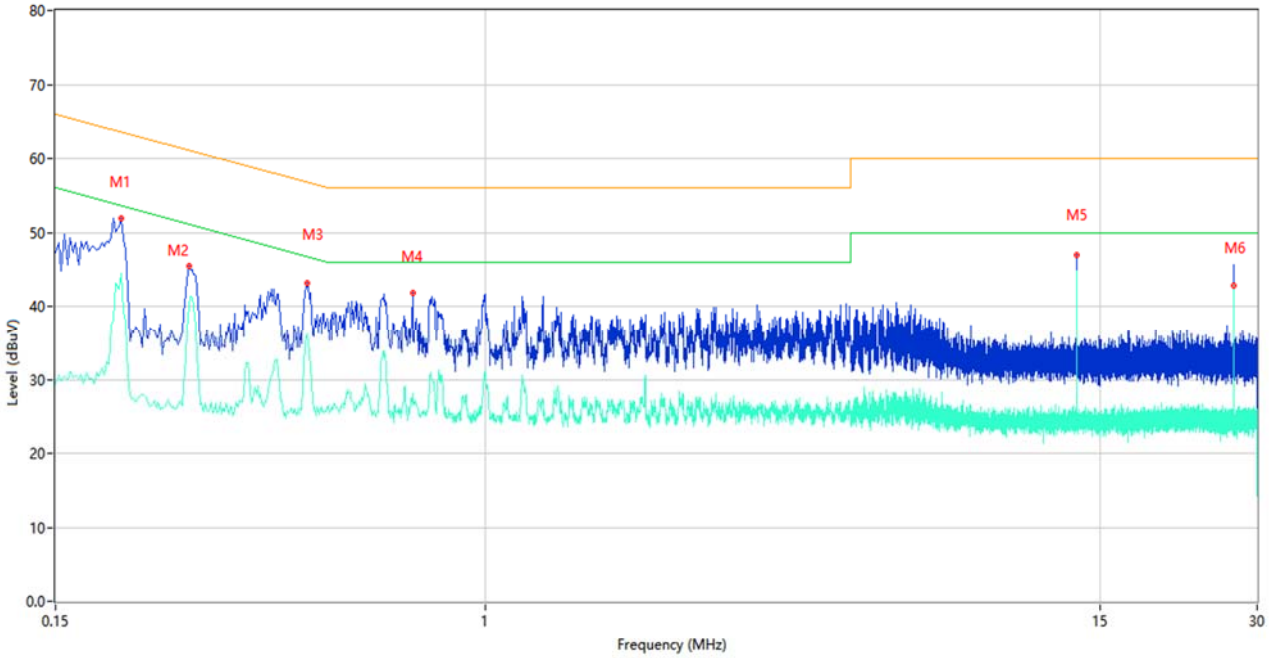
A.5 Conducted Emissions

Note: This frequency which near 13.56 MHz with circle should be ignored because they are NFC carrier frequency.

Test Data and Plots

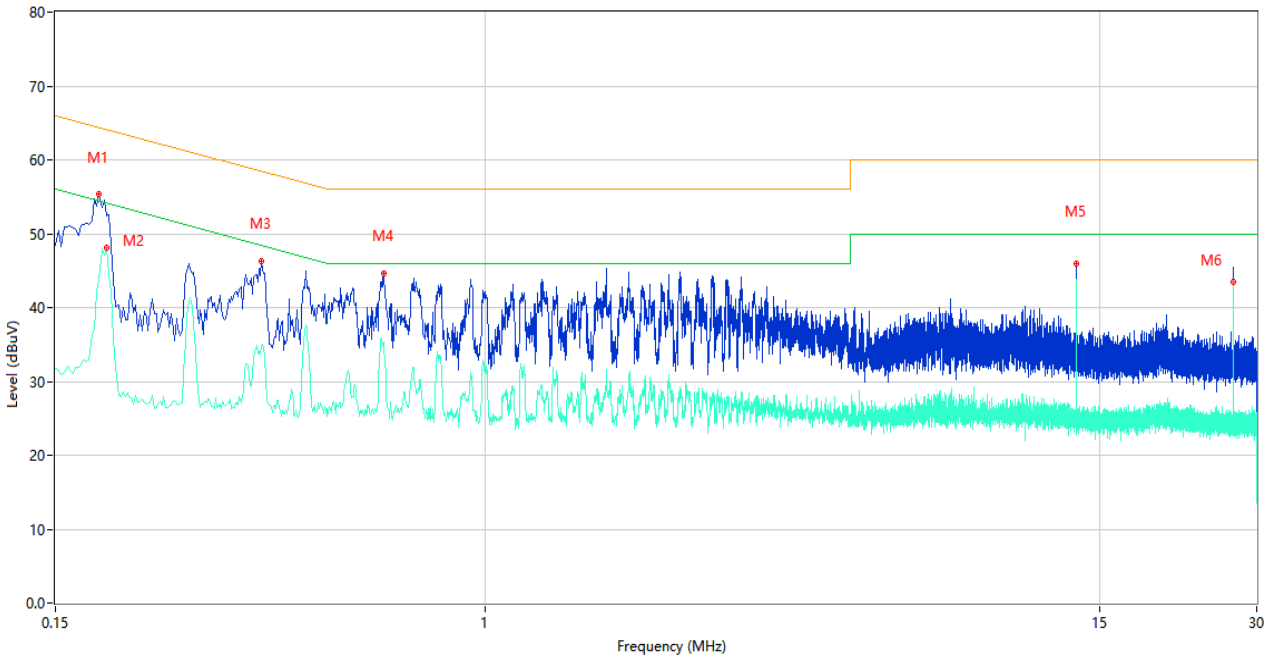
Coil-1

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.200	51.93	10.96	63.61	-11.68	Peak	L	Pass
1**	0.200	44.53	10.96	53.61	-9.08	AV	L	Pass
2	0.270	45.38	10.90	61.12	-15.74	Peak	L	Pass
2**	0.270	40.06	10.90	51.12	-11.06	AV	L	Pass
3	0.454	43.10	10.91	56.80	-13.70	Peak	L	Pass
3**	0.454	36.25	10.91	46.80	-10.55	AV	L	Pass
4	0.724	41.78	10.82	56.00	-14.22	Peak	L	Pass
4**	0.724	28.12	10.82	46.00	-17.88	AV	L	Pass
5	13.558	46.95	10.68	60.00	-13.05	Peak	L	N/A
5**	13.558	45.04	10.68	50.00	-4.96	AV	L	N/A
6	27.116	45.65	10.54	60.00	-14.35	Peak	L	Pass
6**	27.116	42.84	10.54	50.00	-7.16	AV	L	Pass

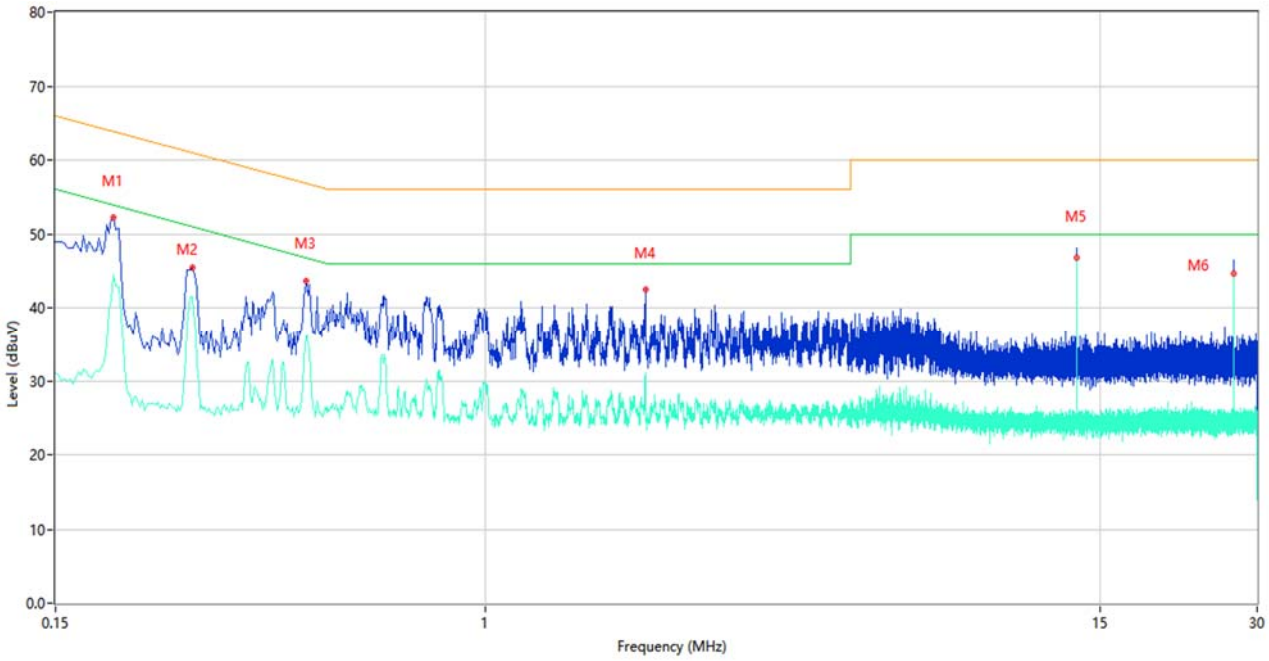
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.182	55.34	10.97	64.39	-9.05	Peak	N	Pass
1**	0.182	43.82	10.97	54.39	-10.57	AV	N	Pass
2	0.188	52.47	10.97	64.12	-11.65	Peak	N	Pass
2**	0.188	48.05	10.97	54.12	-6.07	AV	N	Pass
3	0.372	46.34	10.89	58.46	-12.12	Peak	N	Pass
3**	0.372	34.72	10.89	48.46	-13.74	AV	N	Pass
4	0.640	44.68	10.86	56.00	-11.32	Peak	N	Pass
4**	0.640	34.28	10.86	46.00	-11.72	AV	N	Pass
5	13.558	45.96	10.68	60.00	-14.04	Peak	N	N/A
5**	13.558	43.86	10.68	50.00	-6.14	AV	N	N/A
6	27.116	45.47	10.54	60.00	-14.53	Peak	N	Pass
6**	27.116	43.41	10.54	50.00	-6.59	AV	N	Pass

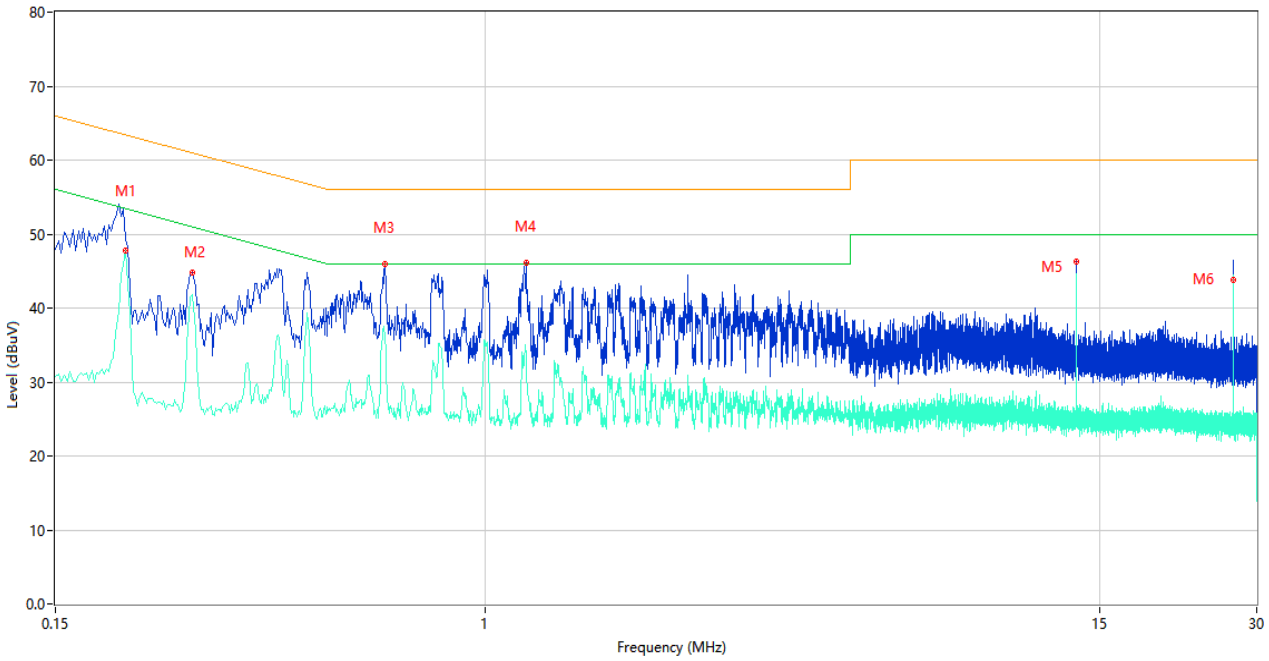
Coil-2

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.194	52.25	10.96	63.86	-11.61	Peak	L	Pass
1**	0.194	44.44	10.96	53.86	-9.42	AV	L	Pass
2	0.274	45.49	10.90	61.00	-15.51	Peak	L	Pass
2**	0.274	41.49	10.90	51.00	-9.51	AV	L	Pass
3	0.452	43.70	10.91	56.84	-13.14	Peak	L	Pass
3**	0.452	35.80	10.91	46.84	-11.04	AV	L	Pass
4	2.020	42.52	10.75	56.00	-13.48	Peak	L	Pass
4**	2.020	31.10	10.75	46.00	-14.90	AV	L	Pass
5	13.560	48.01	10.68	60.00	-11.99	Peak	L	N/A
5**	13.560	46.72	10.68	50.00	-3.28	AV	L	N/A
6	27.118	46.08	10.54	60.00	-13.92	Peak	L	Pass
6**	27.118	44.64	10.54	50.00	-5.36	AV	L	Pass

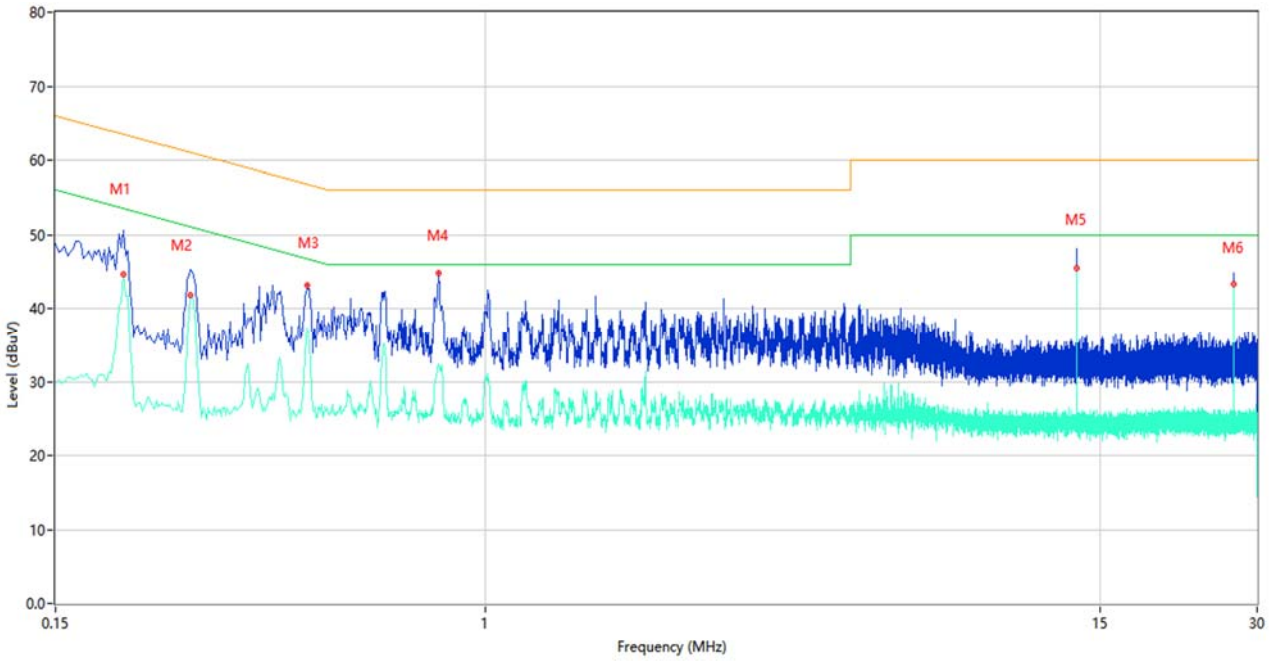
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.204	49.28	10.95	63.45	-14.17	Peak	N	Pass
1**	0.204	47.71	10.95	53.45	-5.74	AV	N	Pass
2	0.274	44.85	10.90	61.00	-16.15	Peak	N	Pass
2**	0.274	41.81	10.90	51.00	-9.19	AV	N	Pass
3	0.642	45.95	10.86	56.00	-10.05	Peak	N	Pass
3**	0.642	36.52	10.86	46.00	-9.48	AV	N	Pass
4	1.196	46.17	10.71	56.00	-9.83	Peak	N	Pass
4**	1.196	34.22	10.71	46.00	-11.78	AV	N	Pass
5	13.558	46.30	10.68	60.00	-13.70	Peak	N	N/A
5**	13.558	44.61	10.68	50.00	-5.39	AV	N	N/A
6	27.116	46.42	10.54	60.00	-13.58	Peak	N	Pass
6**	27.116	43.78	10.54	50.00	-6.22	AV	N	Pass

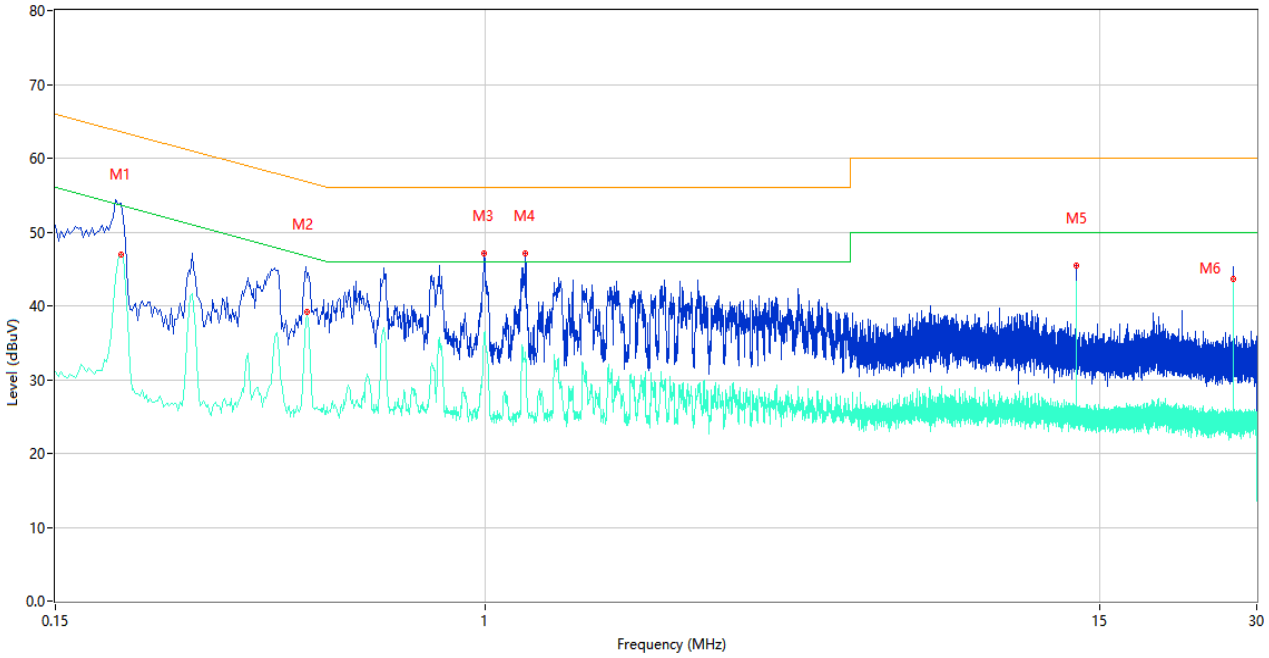
Coil-3

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.202	50.66	10.96	63.53	-12.87	Peak	L	Pass
1**	0.202	44.65	10.96	53.53	-8.88	AV	L	Pass
2	0.272	45.31	10.90	61.06	-15.75	Peak	L	Pass
2**	0.272	41.86	10.90	51.06	-9.20	AV	L	Pass
3	0.456	43.19	10.91	56.77	-13.58	Peak	L	Pass
3**	0.456	37.34	10.91	46.77	-9.43	AV	L	Pass
4	0.814	44.84	10.78	56.00	-11.16	Peak	L	Pass
4**	0.814	32.40	10.78	46.00	-13.60	AV	L	Pass
5	13.558	47.76	10.68	60.00	-12.24	Peak	L	N/A
5**	13.558	45.54	10.68	50.00	-4.46	AV	L	N/A
6	27.118	44.64	10.54	60.00	-15.36	Peak	L	Pass
6**	27.118	43.37	10.54	50.00	-6.63	AV	L	Pass

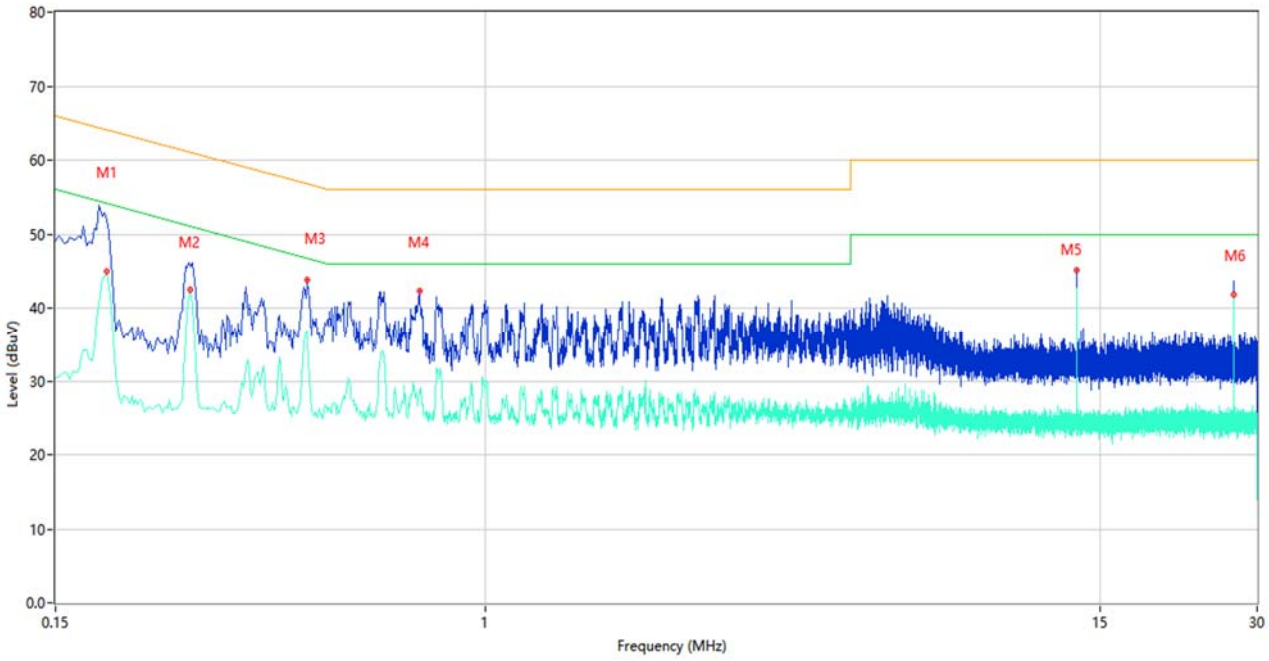
PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.200	53.87	10.96	63.61	-9.74	Peak	N	Pass
1**	0.200	46.97	10.96	53.61	-6.64	AV	N	Pass
2	0.454	43.78	10.91	56.80	-13.02	Peak	N	Pass
2**	0.454	39.16	10.91	46.80	-7.64	AV	N	Pass
3	0.994	47.05	10.70	56.00	-8.95	Peak	N	Pass
3**	0.994	36.31	10.70	46.00	-9.69	AV	N	Pass
4	1.194	47.17	10.71	56.00	-8.83	Peak	N	Pass
4**	1.194	33.68	10.71	46.00	-12.32	AV	N	Pass
5	13.558	45.41	10.68	60.00	-14.59	Peak	N	N/A
5**	13.558	43.34	10.68	50.00	-6.66	AV	N	N/A
6	27.118	45.34	10.54	60.00	-14.66	Peak	N	Pass
6**	27.118	43.62	10.54	50.00	-6.38	AV	N	Pass

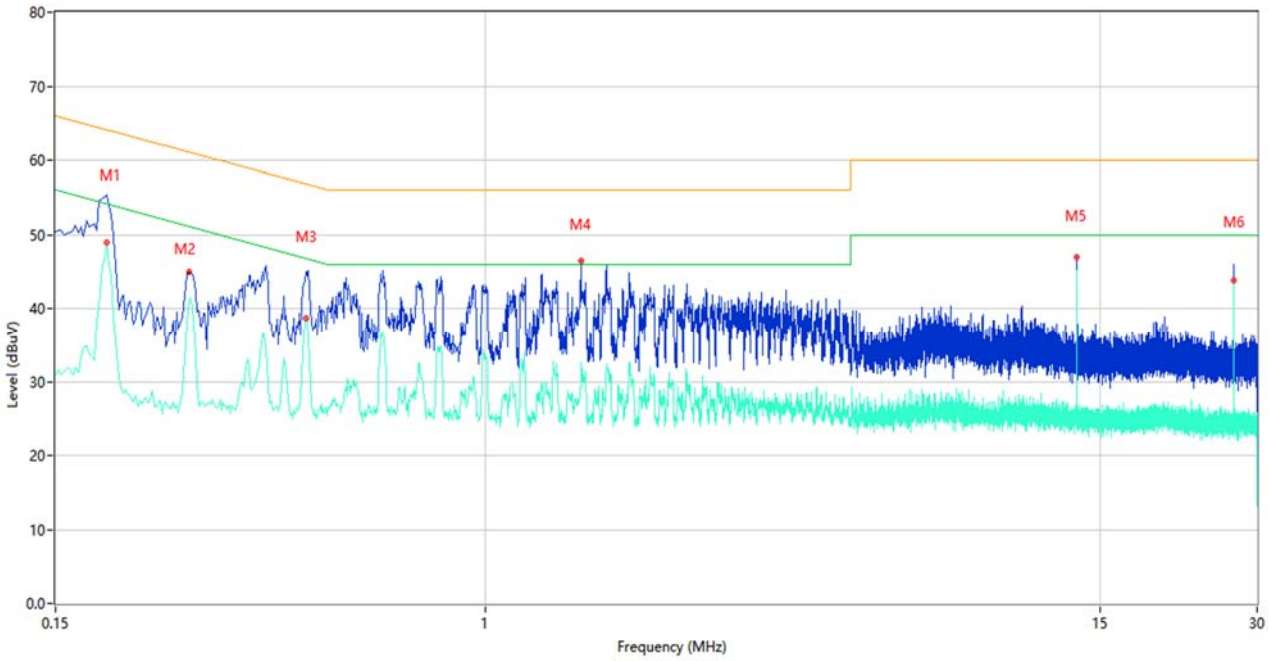
Simultaneous(Coil-1+Coil-2+Coil-3)

PHASE L



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.188	51.84	10.97	64.12	-12.28	Peak	L	Pass
1**	0.188	44.93	10.97	54.12	-9.19	AV	L	Pass
2	0.272	45.57	10.90	61.06	-15.49	Peak	L	Pass
2**	0.272	42.40	10.90	51.06	-8.66	AV	L	Pass
3	0.454	43.88	10.91	56.80	-12.92	Peak	L	Pass
3**	0.454	36.78	10.91	46.80	-10.02	AV	L	Pass
4	0.746	42.32	10.81	56.00	-13.68	Peak	L	Pass
4**	0.746	28.51	10.81	46.00	-17.49	AV	L	Pass
5	13.560	45.17	10.68	60.00	-14.83	Peak	L	N/A
5**	13.560	42.61	10.68	50.00	-7.39	AV	L	N/A
6	27.116	43.05	10.54	60.00	-16.95	Peak	L	Pass
6**	27.116	41.86	10.54	50.00	-8.14	AV	L	Pass

PHASE N



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.188	55.37	10.97	64.12	-8.75	Peak	N	Pass
1**	0.188	48.89	10.97	54.12	-5.23	AV	N	Pass
2	0.270	44.98	10.90	61.12	-16.14	Peak	N	Pass
2**	0.270	40.86	10.90	51.12	-10.26	AV	N	Pass
3	0.452	44.91	10.91	56.84	-11.93	Peak	N	Pass
3**	0.452	38.63	10.91	46.84	-8.21	AV	N	Pass
4	1.522	46.45	10.73	56.00	-9.55	Peak	N	Pass
4**	1.522	30.94	10.73	46.00	-15.06	AV	N	Pass
5	13.562	47.84	10.68	60.00	-12.16	Peak	N	N/A
5**	13.562	45.38	10.68	50.00	-4.62	AV	N	N/A
6	27.114	46.31	10.54	60.00	-13.69	Peak	N	Pass
6**	27.114	44.45	10.54	50.00	-5.55	AV	N	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2040038-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2040038-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2040038-AI.PDF”.

--END OF REPORT--