



BUREAU
VERITAS

RF Test Report

13.56 MHz RFID

Report No. : FCCCPXY-WAY-P25030026R1
Customer : INFAC ELECS CO., LTD.
Address : 53, Saneop-ro 155beon-gil, Gwonseon-gu, Suwon-si
Gyeonggi-do South Korea
Use of Report : Certification
Model Name : NH2 DHS NFC
Additional model : NH2 DHS NFC-L
FCC ID : 2A93T-NH2-DHS-NFC
Date of Test : 2025.03.10 to 2025.03.27
Test Method Used : FCC 47 CFR PART 15 Subpart C (Section §15.225)
ANSI C63.10-2013
Testing Environment : Refer to the Test Condition

Test Result : ☒ Pass ☐ Fail

ISSUED BY: BV CPS ADT Korea Ltd., EMC/RF Laboratory

ADDRESS: Innoplex 1st complex No.2 B303, No.2 B304, 306,
Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do,
Republic of Korea

TEST LOCATION: HeungAn-daero 49, DongAn-gu, Anyang-si,
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Tested by

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(Signature)

Technical Manager

Name : Donghwa SHIN

(Signature)

2025. 04. 24

BV CPS ADT Korea Ltd.

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RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
FCCCPXY-WAY-P25030026	Original release	2025.04.22
FCCCPXY-WAY-P25030026R1	Update Remark of Radiated Spurious Emission	2025.04.24

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1 Summary of Test Results

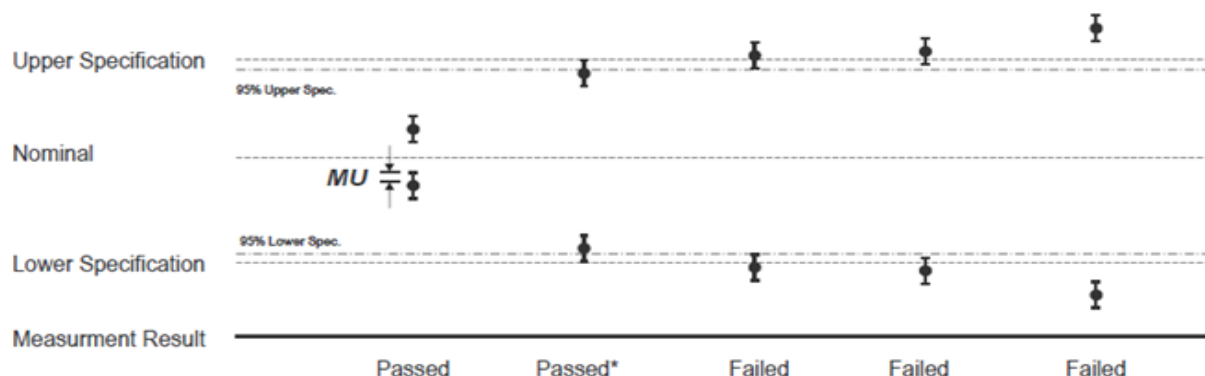
The EUT has been tested according to the following specifications

Applied Standard : FCC Part 15, Subpart C 15.225					
FCC Part Section(s)	Test Description	Limit	Test Condition	Test Result	Reference
15.225(a)	In-Band Emissions	15.848 $\mu\text{V/m}$ @ 30 m 13.553 – 13.567 MHz	Radiated	PASS	Section 3.2
15.225(b)	In-Band Emissions	334 $\mu\text{V/m}$ @ 30 m 13.410 – 13.553 MHz 13.567 – 13.710 MHz		PASS	Section 3.2
15.225(c)	In-Band Emissions	106 $\mu\text{V/m}$ @ 30 m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		PASS	Section 3.2
15.225(d)	Out-of Band Emissions	Emissions outside of the specified band (13.110-14.010 MHz) must meet the radiated limits detailed in 15.209		PASS	Section 3.2
15.225(e)	The frequency tolerance	± 0.01 % of operating frequency	Conducted	PASS	Section 3.3
15.215(c)	20 dB Bandwidth	-		PASS	Section 3.4
15.207	AC Conducted Emissions (150 kHz – 30 MHz)	< FCC 15.207 limits	AC Line Conducted	NA ^{Note3)}	Section 3.5
15.203	Antenna Requirement	FCC 15.203	-	PASS	Section 3.1

NOTES

- 1) The general test methods used to test on this devices are ANSI C63.10.
- 2) Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 3) As this product is only using DC power, AC conducted emission test has not been performed.

1.1 Decision Rules for Statement of Conformity



QUA-52 Decision Rule(QA Document) was applied.

Step 1) : Reference Check, Daily Check, Peripheral device Check

Step 2) : Re-test Procedure (Repeat the test maximum 3 times, Different Test Engineer)

- 1) If the original test results are subject to retesting and the judgement is unclear, the retest is carried out.
- 2) If the result of the first retest is the same as the initial test, the judgement is made based on the value.
- 3) If the result of the first retest differ from the results of the initial test, the second re-test is carried out.
- 4) After completion of the second retest, the average of the three test results is determined as the final result. However, if the deviation of the three test values is more than 5 % of the reference value, the technical manager should review the reproducibility of the test from the beginning.

1.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2

Measurement Items	Frequency Range	Expanded Uncertainty $U = kU_c (k = 2)$
Radiated Spurious Emissions	9 kHz – 30 MHz	2.06
	30 MHz – 1 GHz	4.28
	1 GHz – 18 GHz	5.40
	18 GHz – 26.5 GHz	5.08
Measurement Items		Expanded Uncertainty $U = kU_c (k = 2)$
Conducted	Maximum Output Power	1.20
	Spurious Emissions	1.36

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

2 General Information

2.1 General Description of EUT

Equipment Class	Low Power Communication Device Transmitter (DXX)
Product name	NH2 Vehicle project Door Handle Sensor Module
FCC ID	2A93T-NH2-DHS-NFC
Model	NH2 DHS NFC
Additional model name	NH2 DHS NFC-L
Power Supply	DC 12 V
Modulation Type	ASK
Operating Frequency	13.56 MHz
Antenna Type	FPCB Loop Antenna
Antenna Gain	-
H/W Version	1.00
S/W Version	2551

NOTE 1: For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

NOTE 2: For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

2.2 Tested sample and Tested companion device information

Type	Model	Note
Test sample	NH2 DHS NFC	S/N: Engineering Sample

2.3 Description of Test Mode

The EUT has been tested with all modes of operating conditions to determine the worst case emission characteristics.

Test Mode		Tested Frequency (MHz)
TM 1	RFID	13.56

Note: A test was performed for each voltage.

2.4 INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

2.5 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.6 General Description of Applied Standards

Generally the tests were performed according to the specifications of the standard, it must comply with the requirements of the following standards.

FCC CFR 47 Part 15, Subpart C (§15.225)
ANSI C63.10-2013

All test items in this test report have been performed and recorded as per the above standards.

2.7 Test Equipment

Test Equipment is traceable to the National Institute of Standards and Technology (NIST). Measurement antenna used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
DC Power Supply	Keysight	U8002A	MY59020015	2025-11-11
Spectrum Analyzer	R&S	FSW50	101403	2025-11-11
Temperature & Humidity Chamber	Espec	PL-2J	15015910	2025-05-21
Signal Generator	R&S	SMB100A	MY41006053	2025-05-21
Active Loop Antenna	R&S	HFH2-Z2E	100881	2027-02-06
Trilog Antenna (with 6 dB ATT.)	Schwarzbeck	VULB 9163	01199	2026-08-01
EMI Test Receiver	R&S	ESW8	101170	2025-11-19
EMI Test Receiver	R&S	ESW44	101812	2025-11-19
Signal Conditioning Unit	R&S	SCU08F2	8400015	2025-11-18

3 Test Results

3.1 Antenna Requirement

Except from §15.203 of the FCC Rules/Regulations:

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 the section.

- The antenna(s) of the EUT are Permanently attached.
- There are no provisions for connection to an external antenna.

Result

The EUT complies with the requirement of §15.203

3.2 Spurious Emission, Band edge and Restricted Bands

3.2.1 Regulation

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in [§ 15.209](#).

§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 (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

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$
Limit Line (dBuV/m) = $20 \log \text{Emission level (uV/m)} + \text{Distance extrapolation factor}$
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

3.2.2 Test Procedure

Spurious Radiated Emissions

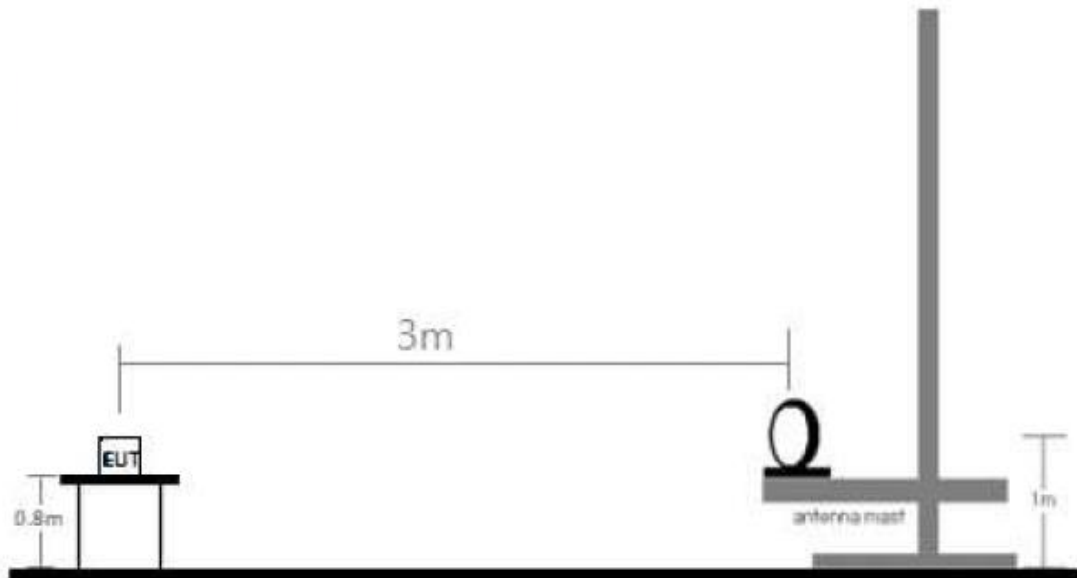
1. The preliminary radiated measurement were performed to determine the frequency producing the maximum emissions in an semi-anechoic chamber at a distance of 3 meters.
2. The EUT was placed on the top of the 0.8-meter height, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, and from 30 to 1000 MHz using the Bi-Log antenna, and from 1000 MHz to 26500 MHz using the horn antenna.
4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 x 4 meter in an semi-anechoic chamber. The EUT was tested at a distance 3 meters.
5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.
6. The 0.8 m height is for below 1 GHz testing, and 1.5 m is for above 1GHz testing.

- Procedure for unwanted emissions measurements below 1 000 MHz

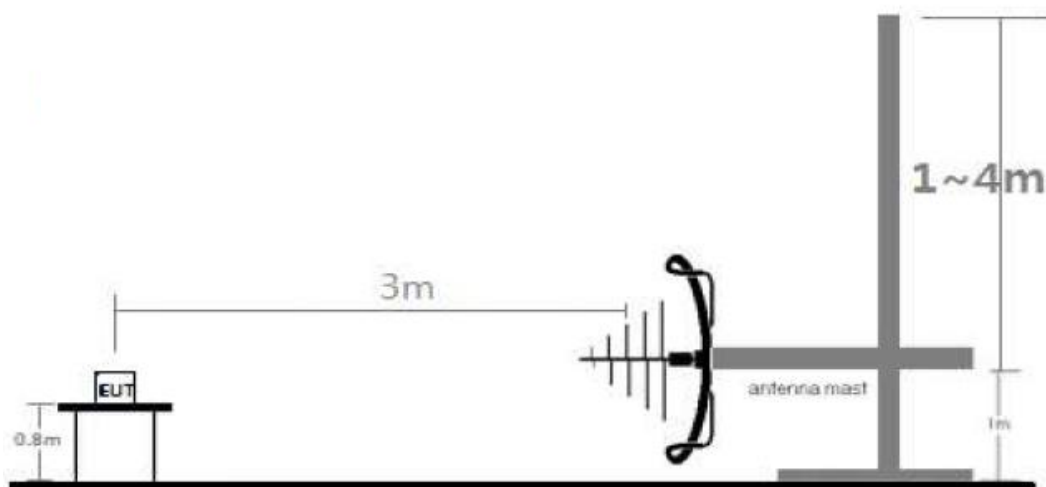
The procedure for unwanted emissions measurements below 1 000 MHz is as follows:

- a) Follow the requirements in 12.7.4.
- b) Compliance shall be determined using CISPR quasi-peak detection; however, peak detection is permitted as an alternative to quasi-peak detection.

3.2.3 Test Setup



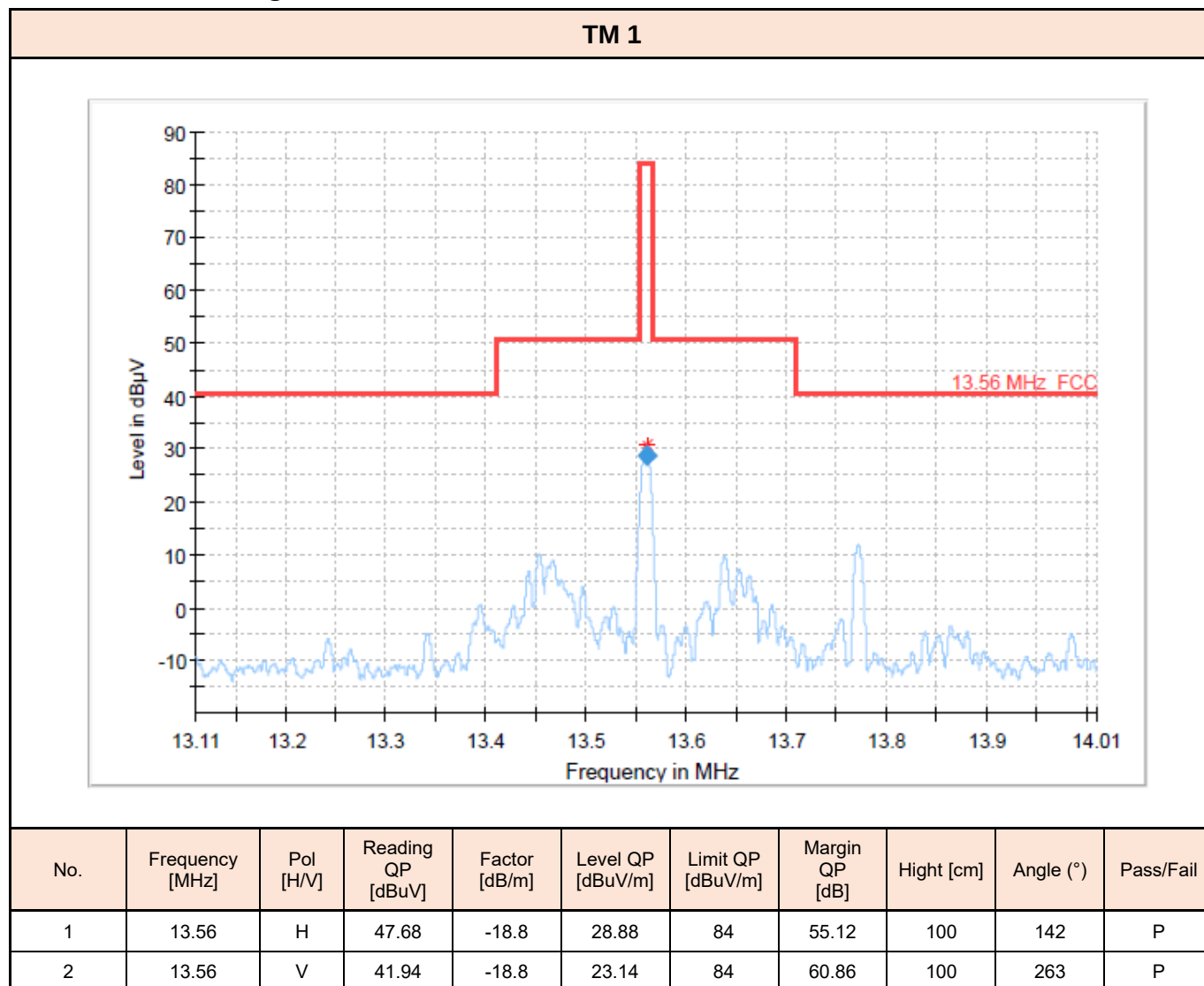
[Radiated Emission Test Setup Below 30 MHz]



[Radiated Emission Test Setup Below 1 GHz]

3.2.4 Test Result of Radiated Spurious Emission

3.2.4.1 Field strength of Fundamental Emissions

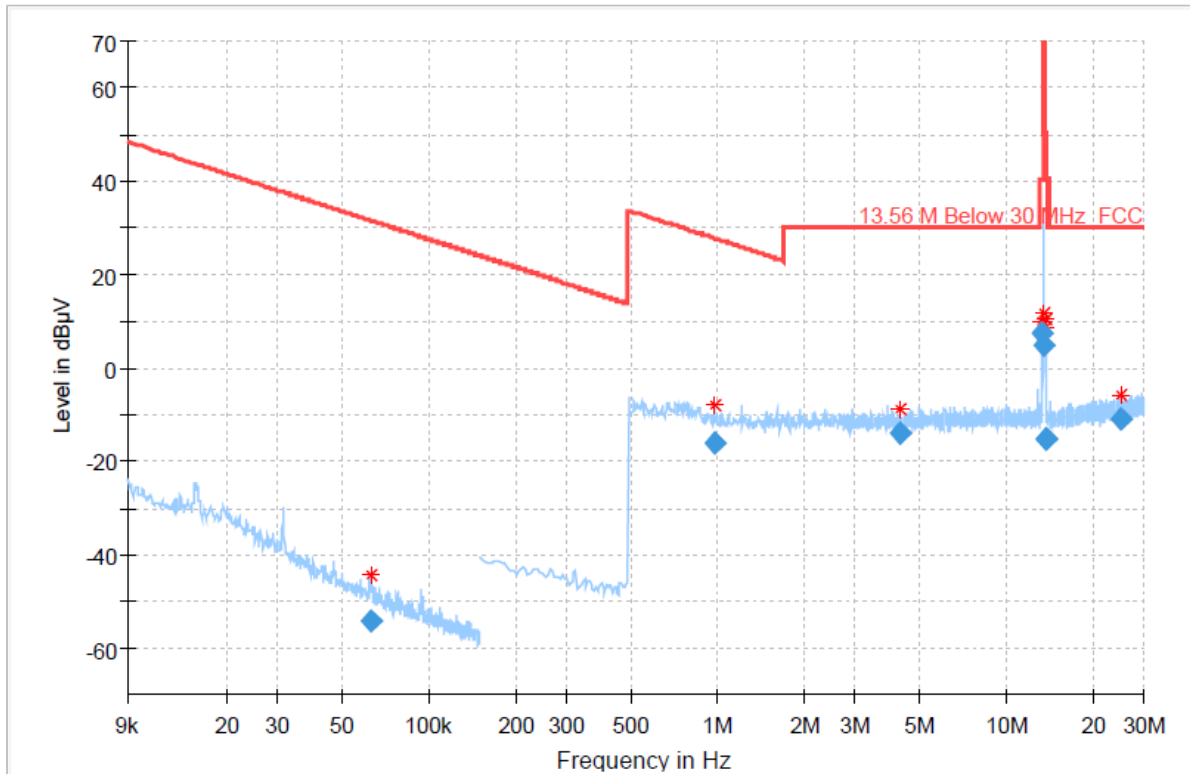


Remarks

1. Measurement Distance: 3 m
2. Factor(dB) = Antenna Factor(dB/m)+Amp.(dB)+Cable Loss(dB)+Distance Factor(dB)
3. Margin QP(dB) = Limit QP(dBμV/m) - Level QP((dBμV/m)
4. We tested three kind of Antenna Pol (Parallel, Perpendicular, Ground parallel) and reported worst case antenna Pol.

3.2.4.2 Radiated Emissions (Below 30 MHz)

TM 1

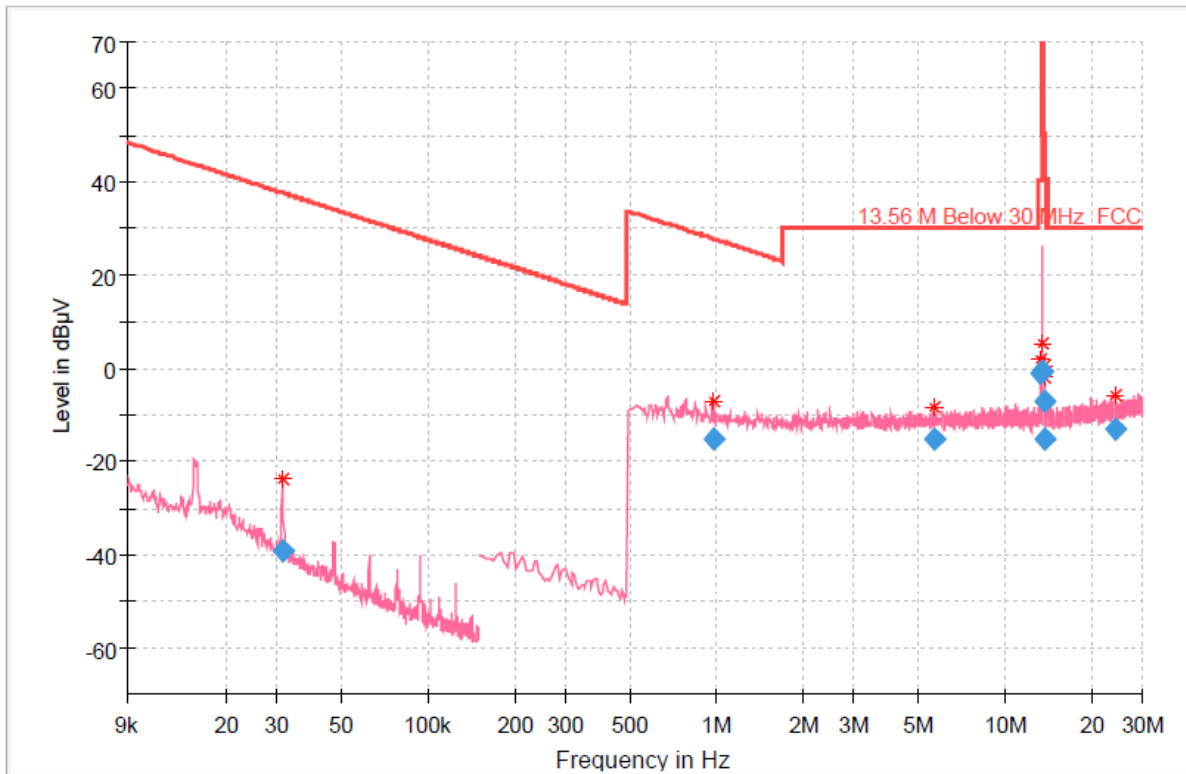


No.	Frequency [MHz]	Pol [H/V]	Reading QP [dBuV]	Factor [dB/m]	Level QP [dBuV/m]	Limit QP [dBuV/m]	Margin QP [dB]	Hight [cm]	Angle (°)	Pass/Fail
1	0.062	H	5.51	-59.6	-54.09	31.68	85.77	100	3	P
2	0.976	H	3.61	-19.6	-15.99	27.82	43.81	100	166	P
3	4.296	H	5.33	-19.2	-13.87	30.00	43.87	100	351	P
4	13.349	H	26.46	-18.8	7.66	40.50	32.84	100	184	P
5	13.452	H	23.60	-18.8	4.80	50.50	45.70	100	204	P
6	13.666	H	3.79	-18.8	-15.01	50.50	65.51	100	312	P
7	13.769	H	3.67	-18.8	-15.13	40.50	55.63	100	312	P
8	24.995	H	5.89	-16.9	-11.01	30.00	41.01	100	78	P

Remarks

1. Measurement Distance: 3 m
2. Factor(dB) = Antenna Factor(dB/m)+Amp.(dB)+Cable Loss(dB)+Distance Factor(dB)
3. Margin QP(dB) = Limit QP(dBuV/m) - Level QP((dBuV/m)
4. We tested three kind of Antenna Pol (Parallel, Perpendicular, Ground parallel) and reported worst case antenna Pol.

TM 1



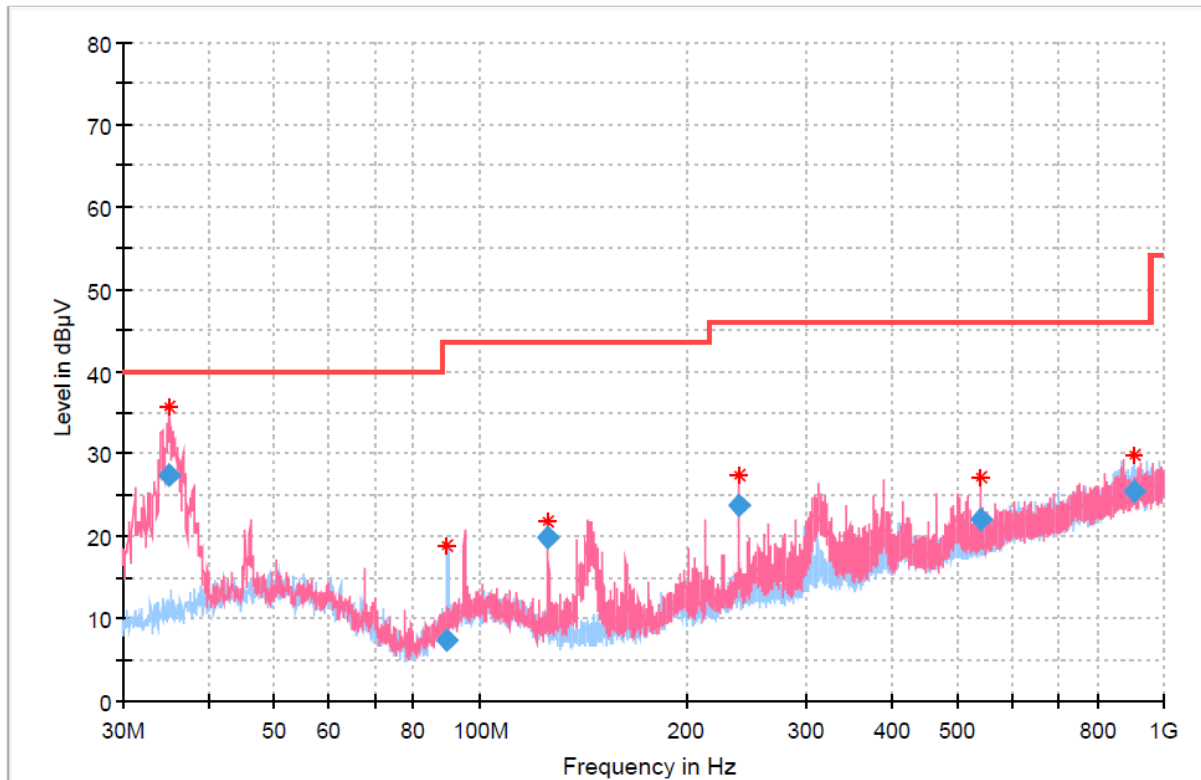
No.	Frequency [MHz]	Pol [H/V]	Reading QP [dBμV]	Factor [dB/m]	Level QP [dBμV/m]	Limit QP [dBμV/m]	Margin QP [dB]	Hight [cm]	Angle (°)	Pass/Fail
1	0.031	V	20.61	-59.6	-38.99	37.71	76.70	100	353	P
2	0.971	V	4.20	-19.6	-15.40	27.86	43.26	100	242	P
3	5.724	V	3.91	-19.0	-15.09	30.00	45.09	100	24	P
4	13.349	V	17.79	-18.8	-1.01	40.50	41.51	100	192	P
5	13.452	V	18.16	-18.8	-0.64	50.50	51.14	100	192	P
6	13.662	V	11.69	-18.8	-7.11	50.50	57.61	100	12	P
7	13.774	V	3.73	-18.8	-15.07	40.50	55.57	100	216	P
8	24.049	V	4.10	-17.0	-12.90	30.00	42.90	100	54	P

Remarks

1. Measurement Distance: 3 m
2. Factor(dB) = Antenna Factor(dB/m)+Amp.(dB)+Cable Loss(dB)+Distance Factor(dB)
3. Margin QP(dB) = Limit QP(dBμV/m) - Level QP(dBμV/m)
4. We tested three kind of Antenna Pol (Parallel, Perpendicular, Ground parallel) and reported worst case antenna Pol.

3.2.4.3 Radiated Emissions (Below 1 GHz)

TM 1



No.	Frequency [MHz]	Pol [H/V]	Reading QP [dBμV]	Factor [dB/m]	Level QP [dBμV/m]	Limit QP [dBμV/m]	Margin QP [dB]	Hight [cm]	Angle (°)	Pass/Fail
1	35.093	V	49.88	-22.5	27.38	40.00	12.62	100	263	P
2	89.558	H	31.39	-24.1	7.29	43.50	36.21	100	267	P
3	125.788	V	44.86	-25.1	19.76	43.50	23.74	100	123	P
4	238.890	V	44.65	-20.8	23.85	46.00	22.15	100	292	P
5	540.366	V	35.93	-14.0	21.93	46.00	24.07	100	74	P
6	904.552	H	34.30	-8.9	25.40	46.00	20.60	100	256	P

Remarks

1. Quasi Peak(dBμV/m) = Quasi Peak Reading Value(dBμV/m) + Correction Factor(dB)
2. Correction Factor(dB) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin(dB) = (Quasi Peak) Limit (dBμV/m) – (Quasi Peak) Result (dBμV/m)

3.3 Frequency Stability

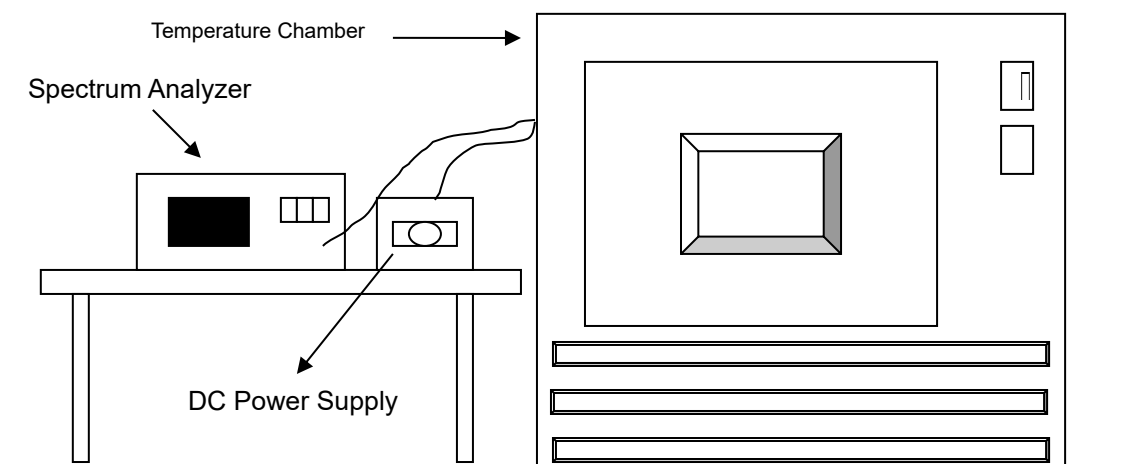
3.3.1 Regulation

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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.

3.3.2 Test Procedure

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turned the EUT on and coupled its output to a spectrum analyzer.
- Turned the EUT off and set the chamber to the highest temperature specified.
- Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.
- Repeat step d with every 10 degrees reduction until the lowest temperature achieved.
- The test chamber was allowed to stabilize at $+20$ degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.

3.3.3 Test Setup



3.3.4 Test Result

Temperature [°C]	Power [Vdc]	Frquency [MHz]	Freq. Dev. [Hz]	Deviation [%]
50	12.00	13.560 260	-260	-0.001 92
40		13.560 300	-300	-0.002 21
30		13.560 410	-410	-0.003 02
20		13.560 400	-400	-0.002 95
10		13.560 420	-420	-0.003 10
0		13.560 529	-529	-0.003 90
-10		13.560 509	-509	-0.003 75
-20		13.560 440	-440	-0.003 24
20	13.80	13.560 320	-320	-0.002 36
	10.20	13.560 290	-290	-0.002 14

3.4 20 dB Bandwidth

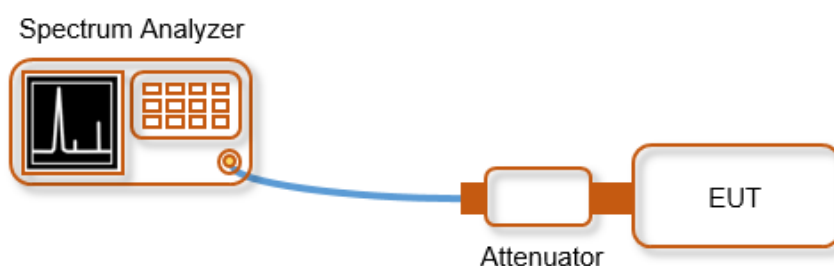
3.4.1 Regulation

The 20dB bandwidth shall be specified in operating frequency band.

3.4.2 Test Procedure

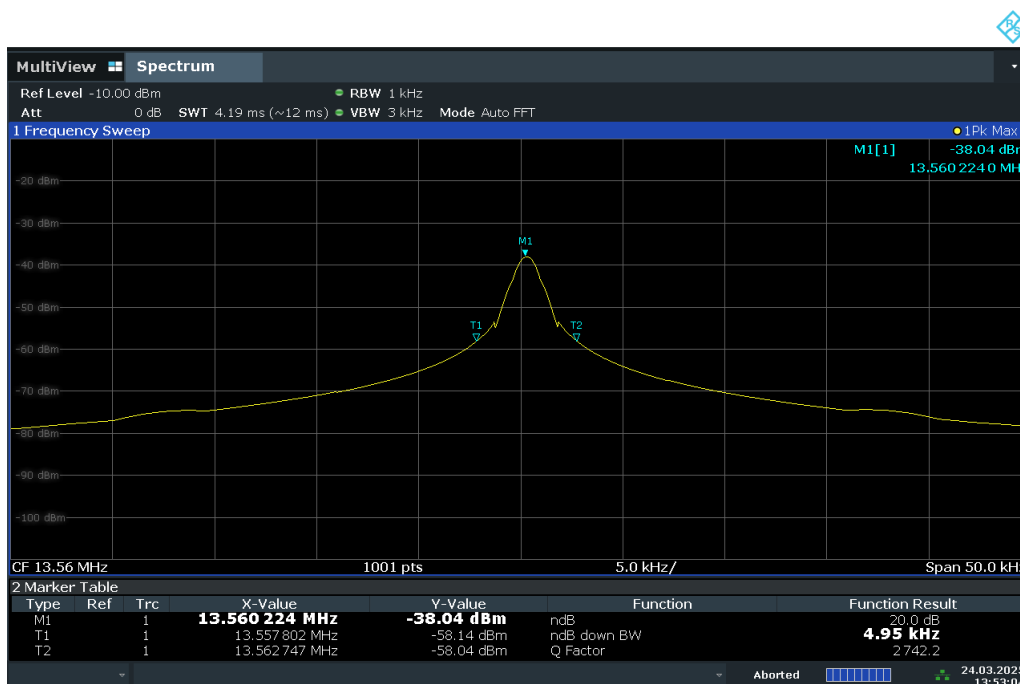
The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

3.4.3 Test Setup



3.4.4 Test Result

Frequency [MHz]	20 dB Bandwidth [kHz]
13.56	4.95



3.5 AC Conducted Emissions (150 kHz to 30 MHz)

3.5.1 Regulation

§15.207(a) : Except as shown in paragraphs (b) and (c) of this section, 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 or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

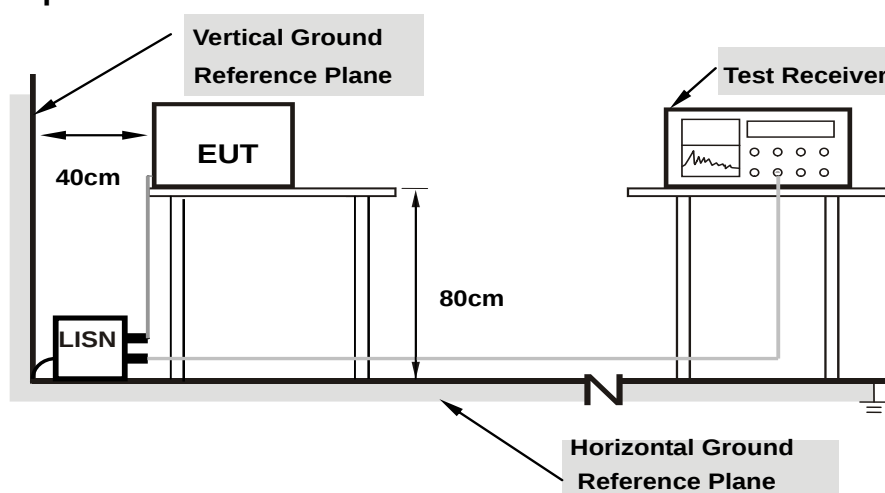
* Decreases with the logarithm of the frequency.

3.5.2 Test Procedure

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm / 50 μ H of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

Remark : The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

3.5.3 Test Setup



3.5.4 Test Result

- N/A

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services Korea. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

Test Firm Name : BV CPS ADT Korea Ltd.

Address : Innoplex 1st complex No.2 B303, No.2 B304, 306, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Republic of Korea

FCC

Designation Number : KR0158

Test Firm Registration Number : 666061

ISED

Designation Number : KR0158

Test Firm Registration Number : 25944

If you have any comments, please feel free to contact us at the following:

Email: minkyong.kim@bureauveritas.com

Web Site: www.bureauveritas.co.kr/cps/eaw

The address and road map of all our labs can be found in our web site also.

- End of report -