



# FCC RADIO TEST REPORT

**FCC ID** : E2K-DWRFID2202  
**Equipment** : RFID 13.56MHz Wireless Module  
**Brand Name** : DELL  
**Model Name** : DWRFID2202  
**Applicant** : Dell Inc.  
One Dell Way, Round Rock, TX 78682, USA  
**Manufacturer** : Dell Inc.  
One Dell Way, Round Rock, TX 78682, USA  
**Standard** : FCC Part 15 Subpart C §15.225

The product was received on Dec. 28, 2022 and testing was performed from Jan. 09, 2023 to Feb. 03, 2023. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Louis Wu

**Sporton International Inc. EMC & Wireless Communications Laboratory**  
No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)



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### History of this test report

Report No.	Version	Description	Issue Date
FR2D2607-02	01	Initial issue of report	Feb. 06, 2023



## Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.207	AC Power Line Conducted Emissions	Pass	1.10 dB under the limit at 0.683 MHz
3.2	15.215(c)	20dB Spectrum Bandwidth	Pass	-
	2.1049	99% OBW Spectrum Bandwidth	Reporting only	-
3.3	15.225(e)	Frequency Stability	Pass	-
3.4	15.225(a)(b)(c)	Field Strength of Fundamental Emissions	Pass	<p>&lt;Sample 1&gt; Max level 5.97 dBμV/m at 13.560 MHz</p> <p>&lt;Sample 2&gt; Max level 6.38 dBμV/m at 13.560 MHz</p>
3.5	15.225(d) 15.209	Radiated Spurious Emissions	Pass	<p>&lt;Sample 1&gt; 7.83 dB under the limit at 58.080 MHz</p> <p>&lt;Sample 2&gt; 2.65 dB under the limit at 304.200 MHz</p>
3.6	15.203	Antenna Requirements	Pass	-

**Declaration of Conformity:**

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
- The measurement uncertainty please refer to report "Uncertainty of Evaluation".

**Comments and Explanations:**

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Sheng Kuo

Report Producer: Dewi Huang



# 1. General Description

## 1.1 Product Feature of Equipment Under Test

NFC

Product Feature	
Sample 1	EUT with Host 1
Sample 2	EUT with Host 2

The product was installed into Portable Computer (Brand Name: DELL, Model Name: P123F, P123F001) during test, and the host information was recorded in the following table.

Host Information	
Host 1	Host with Hong-Bo Antenna
Host 2	Host with Speed Antenna

Antenna Information				
NFC Antenna	Manufacturer	Hong-Bo	Type	Loop
	Manufacturer	Speed	Type	Loop

**Remark:** The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.

## 1.2 Modification of EUT

No modifications made to the EUT during the testing.



### 1.3 Testing Location

<b>Test Site</b>	Sporton International Inc. EMC & Wireless Communications Laboratory		
<b>Test Site Location</b>	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		
	TH03-HY	CO05-HY	03CH07-HY
<b>Test Engineer</b>	Hank Chen	Calvin Wang	Jesse Wang and Ken Wu
<b>Temperature</b>	22~24 °C	23~26 °C	19~25.5 °C
<b>Relative Humidity</b>	53~55 %	45~55 %	59.2~ 59.9 %

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190

### 1.4 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.225
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ ANSI C63.10-2013

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.



## 2. Test Configuration of Equipment Under Test

### 2.1 Descriptions of Test Mode

Investigation has been done on all the possible configurations.

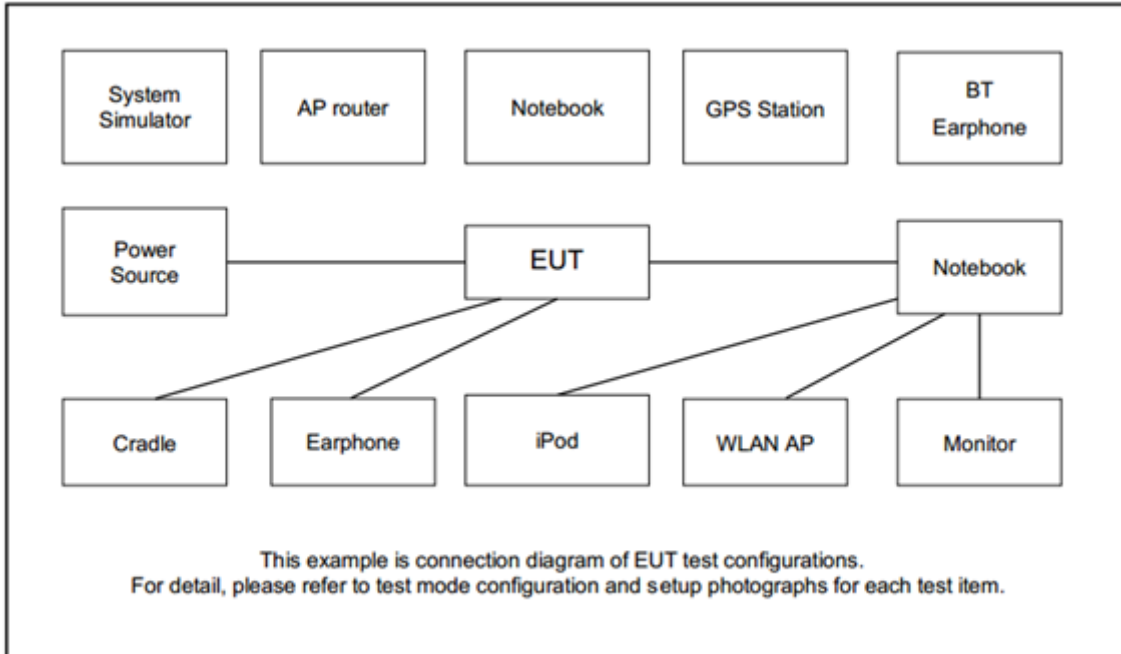
The following table is a list of the test modes shown in this test report.

Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

The EUT pre-scanned in reader mode with NFC tag (four NFC type A, B, F, V) and without reading tag. Based on the highest field strength of fundamental and spurious emissions, the worst case type (type F) was recorded in this report.

Test Cases	
<b>AC Conducted Emission</b>	Mode 1: NFC Tx + Adapter for Sample 1 Mode 2: NFC Tx + Adapter for Sample 2
<b>Remark:</b> The worst case of Conducted Emission is mode 2; only the test data of it was reported.	

## 2.2 Connection Diagram of Test System



## 2.3 Table for Supporting Units

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	iPod Earphone	Apple	N/A	Verification	Unshielded, 1.0 m	N/A
2.	NFC Card	N/A	N/A	N/A	N/A	N/A
3.	LCD MONITOR	ASUS	PB27UQ	FCC DoC	Shielded, 1.6m	Unshielded,1.8m
4.	Adapter	DELL	LA165PM210	N/A	N/A	Unshielded,1.8m

## 2.4 EUT Operation Test Setup

The EUT is programmed to be in continuously transmitting mode.

The ancillary equipment, NFC card, is used to make the EUT (NFC) continuously transmitting signal (Power Level: Default) at 13.56MHz and is placed around 0 cm gap to the EUT.





### 3. Test Results

#### 3.1 AC Power Line Conducted Emissions Measurement

##### 3.1.1 Limit of AC Conducted Emission

For equipment 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.

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ 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.

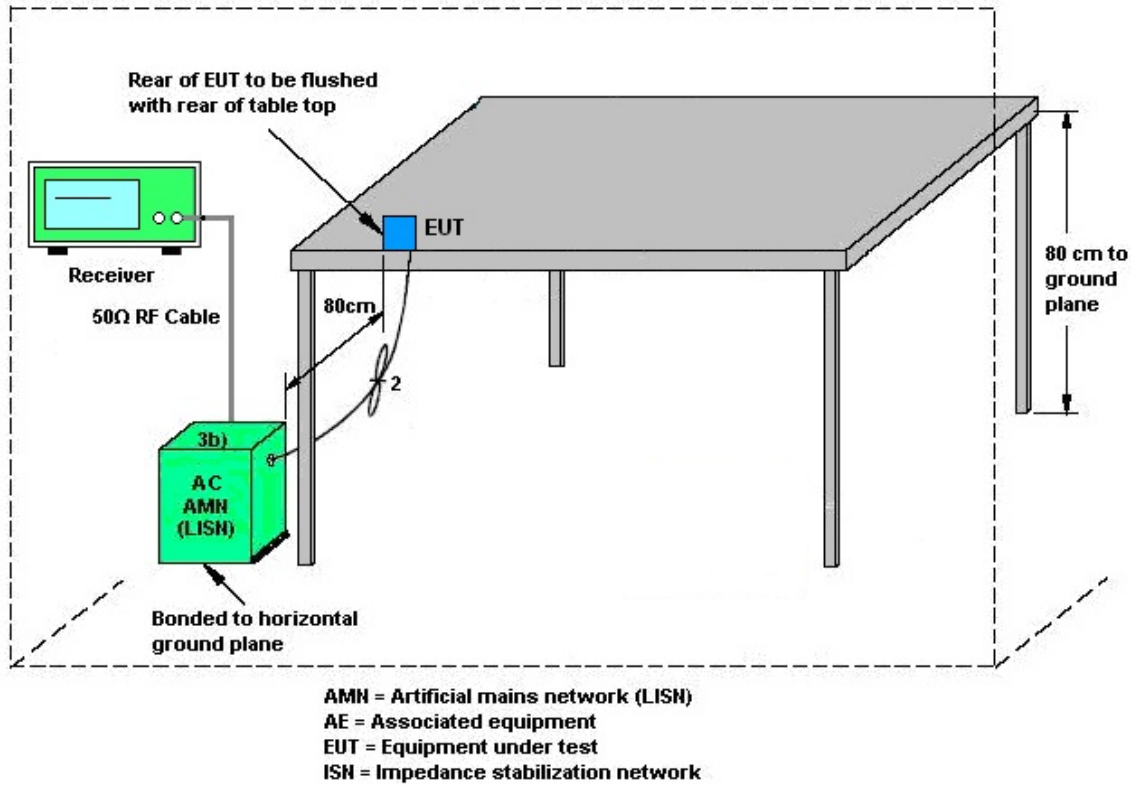
##### 3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

##### 3.1.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.1.4 Test setup



### 3.1.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

## 3.2 20dB and 99% OBW Spectrum Bandwidth Measurement

### 3.2.1 Limit

Intentional radiators must be designed to ensure that the 20 dB and 99% emission bandwidth in the specific band 13.553~13.567 MHz.

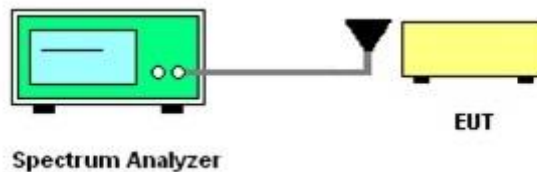
### 3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.2.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max Hold Mode.
2. The resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20 dB below carrier.
4. Measured the 99% OBW.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Near Field Test Items

Please refer to Appendix B.

### 3.3 Frequency Stability Measurement

#### 3.3.1 Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (100ppm) 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 by using a new battery.

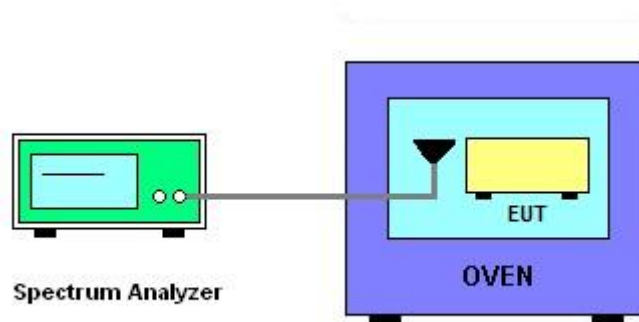
#### 3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

#### 3.3.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT.
2. EUT has transmitted signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire emissions bandwidth.
4. Set RBW = 1 kHz, VBW = 3 kHz with peak detector and maxhold settings.
5. The  $f_c$  is declaring of channel frequency. Then the frequency error formula is  $(f_c - f) / f_c \times 10^6$  ppm and the limit is less than  $\pm 100$ ppm.
6. Extreme temperature rule is -20°C~50°C.

#### 3.3.4 Test Setup



#### 3.3.5 Test Result of Near Field Test Items

Please refer to Appendix B.



### 3.4 Field Strength of Fundamental Emissions and Mask Measurement

#### 3.4.1 Limit

Rules and specifications	FCC CFR 47 Part 15 section 15.225			
Description	Compliance with the spectrum mask is tested with RBW set to 9kHz.			
Freq. of Emission (MHz)	Field Strength (μV/m) at 30m	Field Strength (dBμV/m) at 30m	Field Strength (dBμV/m) at 10m	Field Strength (dBμV/m) at 3m
1.705~13.110	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	84.0	103.08	124.0
13.567~13.710	334	50.5	69.58	90.5
13.710~14.010	106	40.5	59.58	80.5
14.010~30.000	30	29.5	48.58	69.5

**Remark:**

1. The field strength test result is in 3m test distance, follow test rules the test data use distance extrapolation factor and reported in this report at 30m test result.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

#### 3.4.2 Measuring Instruments

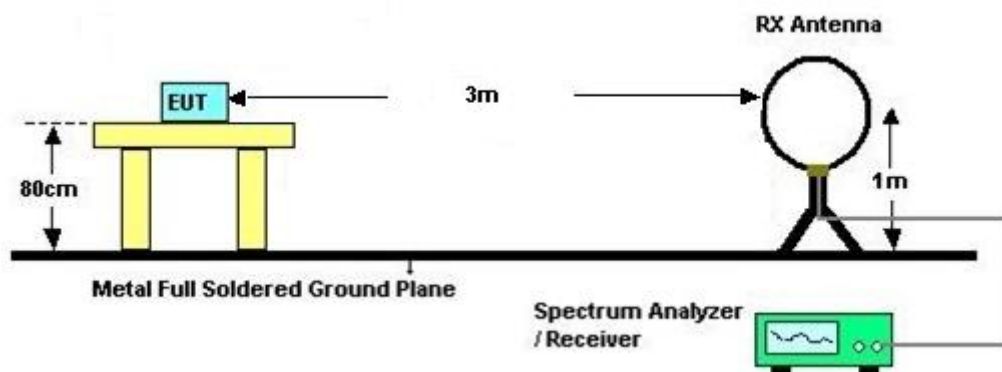
Please refer to the measuring equipment list in this test report.

### 3.4.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT is placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower is placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable is rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna is fixed at one meter above ground to find the maximum emissions field strength.
4. For Fundamental emissions, use the receiver to measure QP reading.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
6. Compliance with the spectrum mask is tested with RBW set to 9 kHz.  
Note: Emission level (dB $\mu$ V/m) = 20 log Emission level ( $\mu$ V/m).

### 3.4.4 Test Setup

For radiated test below 30MHz



### 3.4.5 Test Result of Field Strength of Fundamental Emissions and Mask

Please refer to Appendix C.



### 3.5 Radiated Emissions Measurement

#### 3.5.1 Limit

The field strength of any emissions which appear outside of 13.110 ~14.010MHz band shall not exceed the general radiated emissions limits.

Frequencies (MHz)	Field Strength (µV/m)	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

#### 3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

#### 3.5.3 Measuring Instrument Setting

The following table is the setting of receiver:

Receiver Parameter	Setting
Attenuation	Auto
Frequency Range: 9kHz~150kHz	RBW 200Hz for QP
Frequency Range: 150kHz~30MHz	RBW 9kHz for QP
Frequency Range: 30MHz~1000MHz	RBW 120kHz for Peak

**Note:** The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.



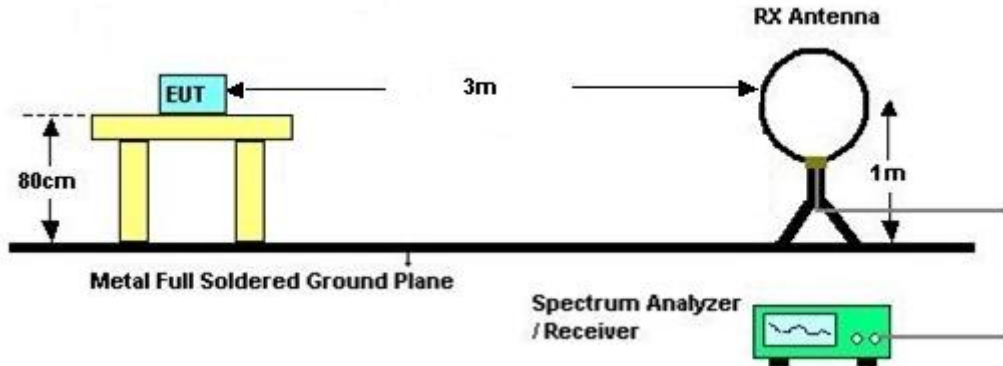
### 3.5.4 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT is placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower is placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable is rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna is varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower is scanned (from 1 M to 4 M) and then the turntable is rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
7. In case the emission is lower than 30 MHz, loop antenna has to be used for measurement and the recorded data shall be QP measured by receiver.
8. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-“.

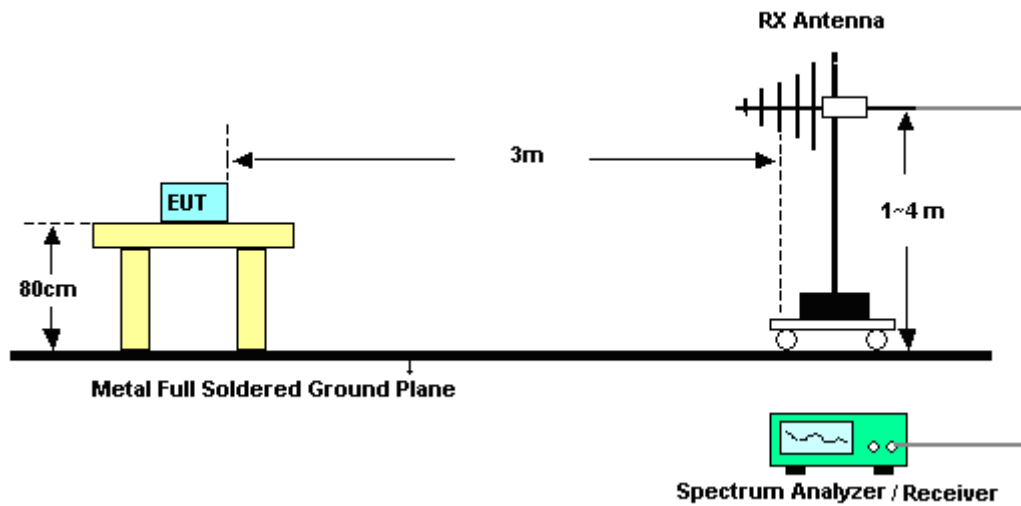


### 3.5.5 Test Setup

For radiated test below 30MHz



For radiated test above 30MHz



### 3.5.6 Test Result of Radiated Emissions Measurement

Please refer to Appendix C.

**Remark:** There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.



## **3.6 Antenna Requirements**

### **3.6.1 Standard Applicable**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

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 rule.

### **3.6.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.



### 4. List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	TECEPEL	DTM-303B	TP210073	N/A	Mar. 18, 2022	Jan. 13, 2023	Mar. 17, 2023	Near Field (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101329	9kHz~30GHz	Sep. 27, 2022	Jan. 13, 2023	Sep. 26, 2023	Near Field (TH03-HY)
Thermal Chamber	ESPEC	SH-641	92013720	-40°C ~90°C	Sep. 07, 2022	Jan. 13, 2023	Sep. 06, 2023	Near Field (TH03-HY)
Programmable Power Supply	GW Instek	PSS-2005	EL890001	1V~20V 0.5A~4A	Sep. 29, 2022	Jan. 13, 2023	Sep. 28, 2023	Near Field (TH03-HY)
Nearby field probe	LANGER EMV-TECHNIK	LF-U5	02-559	100 kHz up to 50 MHz	Apr. 04, 2022	Jan. 13, 2023	Apr. 03, 2023	Near Field (TH03-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00800N1D01N-06	35419 & 03	30MHz~1GHz	Apr. 24, 2022	Jan. 14, 2023~ Jan. 16, 2023	Apr. 23, 2023	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz~1GHz	Oct. 03, 2022	Jan. 14, 2023~ Jan. 16, 2023	Oct. 02, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY15682/4	30MHz to 18GHz	Feb. 23, 2022	Jan. 14, 2023~ Jan. 16, 2023	Feb. 22, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4	9kHz to 18GHz	Feb. 23, 2022	Jan. 14, 2023~ Jan. 16, 2023	Feb. 22, 2023	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4	9kHz to 18GHz	Feb. 23, 2022	Jan. 14, 2023~ Jan. 16, 2023	Feb. 22, 2023	Radiation (03CH07-HY)
Controller	EMEC	EM1000	N/A	Control Ant Mast	N/A	Jan. 14, 2023~ Jan. 16, 2023	N/A	Radiation (03CH07-HY)
Controller	MF	MF-7802	N/A	Control Turn table	N/A	Jan. 14, 2023~ Jan. 16, 2023	N/A	Radiation (03CH07-HY)
Antenna Mast	EMEC	AM-BS-4500E	N/A	Boresight mast 1M~4M	N/A	Jan. 14, 2023~ Jan. 16, 2023	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Jan. 14, 2023~ Jan. 16, 2023	N/A	Radiation (03CH07-HY)
Software	Audix	E3	N/A	N/A	N/A	Jan. 14, 2023~ Jan. 16, 2023	N/A	Radiation (03CH07-HY)
USB Data Logger	TECEPEL	TR-32	HE17XB2495	N/A	Mar. 07, 2022	Jan. 14, 2023~ Jan. 16, 2023	Mar. 06, 2023	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 20, 2022	Jan. 14, 2023~ Jan. 16, 2023	Sep. 19, 2023	Radiation (03CH07-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY57290111	3Hz~26.5GHz	Dec. 15, 2022	Jan. 14, 2023~ Jan. 16, 2023	Dec. 14, 2023	Radiation (03CH07-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jan. 09, 2023	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 01, 2022	Jan. 09, 2023	Nov. 30, 2023	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 17, 2022	Jan. 09, 2023	Nov. 16, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 01, 2022	Jan. 09, 2023	Nov. 30, 2023	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 17, 2022	Jan. 09, 2023	Nov. 16, 2023	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Jan. 09, 2023	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-FN	00691	N/A	Aug. 01, 2022	Jan. 09, 2023	Jul. 31, 2023	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	260260	N/A	Dec. 29, 2022	Jan. 09, 2023	Dec. 28, 2023	Conduction (CO05-HY)



## 5. Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.5 dB
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### Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	3.80 dB
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### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ )	6.50 dB
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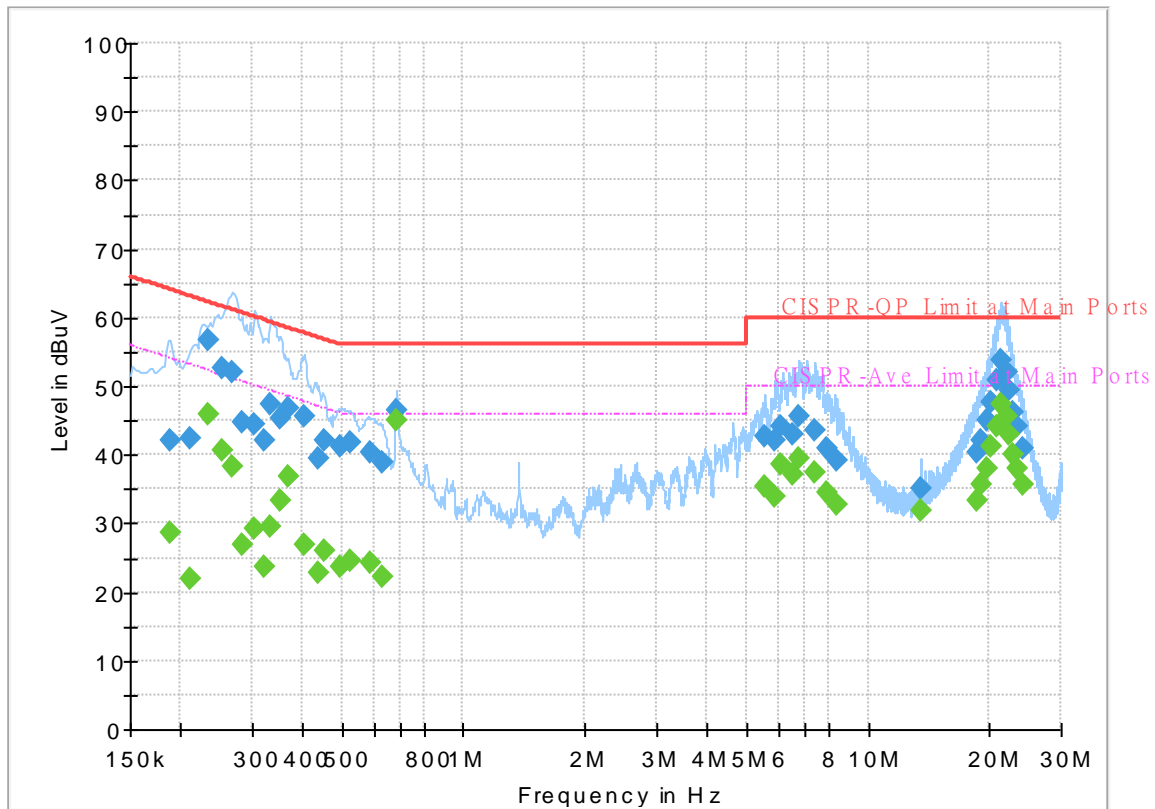
## Appendix A. Test Results of Conducted Emission Test

Test Engineer :	Calvin Wang	Temperature :	23~26°C
		Relative Humidity :	45~55%

# EUT Information

Report NO : 2D2607-02  
 Test Mode : Mode 2  
 Test Voltage : 120Vac/60Hz  
 Phase : Line

Full Spectrum



## Final\_Result

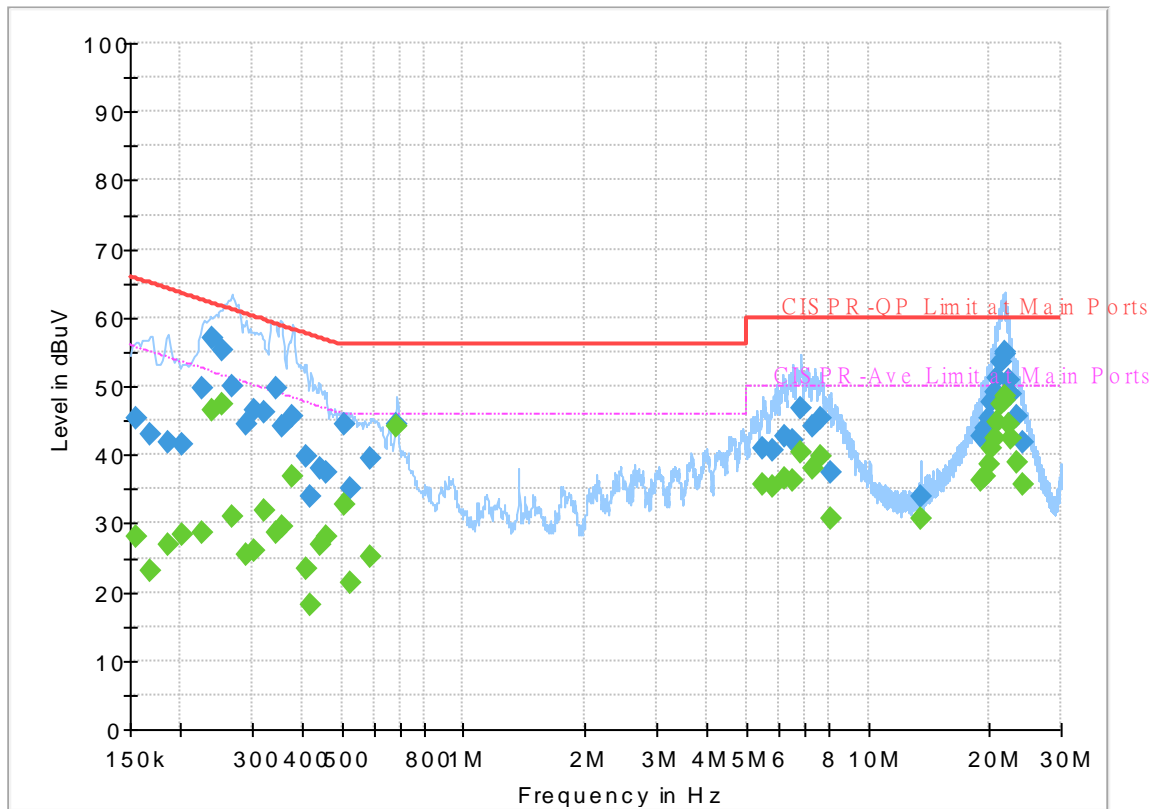
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.188250	---	28.65	54.11	25.46	L1	OFF	19.8
0.188250	42.03	---	64.11	22.08	L1	OFF	19.8
0.210750	---	21.95	53.18	31.23	L1	OFF	19.8
0.210750	42.54	---	63.18	20.64	L1	OFF	19.8
0.233250	---	45.88	52.33	6.45	L1	OFF	19.8
0.233250	56.60	---	62.33	5.73	L1	OFF	19.8
0.253500	---	40.78	51.64	10.86	L1	OFF	19.8
0.253500	52.72	---	61.64	8.92	L1	OFF	19.8
0.269250	---	38.32	51.14	12.82	L1	OFF	19.8
0.269250	52.18	---	61.14	8.96	L1	OFF	19.8
0.282750	---	26.94	50.74	23.80	L1	OFF	19.8
0.282750	44.81	---	60.74	15.93	L1	OFF	19.8
0.305250	---	29.28	50.10	20.82	L1	OFF	19.8
0.305250	44.45	---	60.10	15.65	L1	OFF	19.8
0.321000	---	23.68	49.68	26.00	L1	OFF	19.8
0.321000	42.19	---	59.68	17.49	L1	OFF	19.8
0.334500	---	29.59	49.34	19.75	L1	OFF	19.8
0.334500	47.32	---	59.34	12.02	L1	OFF	19.8
0.352500	---	33.33	48.90	15.57	L1	OFF	19.8
0.352500	45.39	---	58.90	13.51	L1	OFF	19.8
0.368250	---	36.96	48.54	11.58	L1	OFF	19.8

0.368250	46.87	---	58.54	11.67	L1	OFF	19.8
0.404250	---	27.02	47.77	20.75	L1	OFF	19.8
0.404250	45.54	---	57.77	12.23	L1	OFF	19.8
0.438000	---	22.71	47.10	24.39	L1	OFF	19.8
0.438000	39.58	---	57.10	17.52	L1	OFF	19.8
0.453750	---	26.15	46.81	20.66	L1	OFF	19.8
0.453750	42.03	---	56.81	14.78	L1	OFF	19.8
0.498750	---	23.78	46.02	22.24	L1	OFF	19.8
0.498750	41.22	---	56.02	14.80	L1	OFF	19.8
0.525750	---	24.43	46.00	21.57	L1	OFF	19.8
0.525750	41.72	---	56.00	14.28	L1	OFF	19.8
0.591000	---	24.15	46.00	21.85	L1	OFF	19.8
0.591000	40.21	---	56.00	15.79	L1	OFF	19.8
0.629250	---	22.25	46.00	23.75	L1	OFF	19.8
0.629250	38.79	---	56.00	17.21	L1	OFF	19.8
0.683250	---	44.90	46.00	1.10	L1	OFF	19.8
0.683250	46.64	---	56.00	9.36	L1	OFF	19.8
5.570250	---	35.43	50.00	14.57	L1	OFF	19.9
5.570250	42.64	---	60.00	17.36	L1	OFF	19.9
5.907750	---	33.97	50.00	16.03	L1	OFF	19.9
5.907750	42.10	---	60.00	17.90	L1	OFF	19.9
6.117000	---	38.65	50.00	11.35	L1	OFF	19.9
6.117000	44.23	---	60.00	15.77	L1	OFF	19.9
6.504000	---	37.16	50.00	12.84	L1	OFF	19.9
6.504000	43.01	---	60.00	16.99	L1	OFF	19.9
6.778500	---	39.55	50.00	10.45	L1	OFF	19.9
6.778500	45.67	---	60.00	14.33	L1	OFF	19.9
7.410750	---	37.48	50.00	12.52	L1	OFF	19.9
7.410750	43.46	---	60.00	16.54	L1	OFF	19.9
7.890000	---	34.57	50.00	15.43	L1	OFF	20.0
7.890000	40.86	---	60.00	19.14	L1	OFF	20.0
8.358000	---	32.83	50.00	17.17	L1	OFF	20.0
8.358000	39.04	---	60.00	20.96	L1	OFF	20.0
13.560000	---	31.95	50.00	18.05	L1	OFF	20.0
13.560000	35.18	---	60.00	24.82	L1	OFF	20.0
18.647250	---	33.32	50.00	16.68	L1	OFF	20.0
18.647250	40.23	---	60.00	19.77	L1	OFF	20.0
19.061250	---	35.62	50.00	14.38	L1	OFF	20.0
19.061250	42.21	---	60.00	17.79	L1	OFF	20.0
19.617000	---	38.02	50.00	11.98	L1	OFF	20.0
19.617000	45.09	---	60.00	14.91	L1	OFF	20.0
20.238000	---	41.21	50.00	8.79	L1	OFF	20.0
20.238000	47.66	---	60.00	12.34	L1	OFF	20.0
20.746500	---	44.14	50.00	5.86	L1	OFF	20.0
20.746500	50.87	---	60.00	9.13	L1	OFF	20.0
21.349500	---	47.37	50.00	2.63	L1	OFF	20.0
21.349500	53.90	---	60.00	6.10	L1	OFF	20.0
21.939000	---	45.57	50.00	4.43	L1	OFF	20.0
21.939000	51.98	---	60.00	8.02	L1	OFF	20.0
22.330500	---	42.99	50.00	7.01	L1	OFF	20.0
22.330500	49.32	---	60.00	10.68	L1	OFF	20.0
22.823250	---	40.01	50.00	9.99	L1	OFF	20.0
22.823250	46.19	---	60.00	13.81	L1	OFF	20.0
23.379000	---	37.97	50.00	12.03	L1	OFF	20.0
23.379000	44.05	---	60.00	15.95	L1	OFF	20.0
24.036000	---	35.53	50.00	14.47	L1	OFF	20.0
24.036000	41.07	---	60.00	18.93	L1	OFF	20.0

# EUT Information

Report NO : 2D2607-02  
 Test Mode : Mode 2  
 Test Voltage : 120Vac/60Hz  
 Phase : Neutral

Full Spectrum



## Final\_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154500	---	28.19	55.75	27.56	N	OFF	19.8
0.154500	45.45	---	65.75	20.30	N	OFF	19.8
0.168000	---	23.13	55.06	31.93	N	OFF	19.8
0.168000	42.85	---	65.06	22.21	N	OFF	19.8
0.186000	---	26.99	54.21	27.22	N	OFF	19.8
0.186000	41.91	---	64.21	22.30	N	OFF	19.8
0.201750	---	28.28	53.54	25.26	N	OFF	19.8
0.201750	41.61	---	63.54	21.93	N	OFF	19.8
0.226500	---	28.69	52.58	23.89	N	OFF	19.8
0.226500	49.75	---	62.58	12.83	N	OFF	19.8
0.240000	---	46.54	52.10	5.56	N	OFF	19.8
0.240000	57.01	---	62.10	5.09	N	OFF	19.8
0.253500	---	47.43	51.64	4.21	N	OFF	19.8
0.253500	55.38	---	61.64	6.26	N	OFF	19.8
0.267000	---	30.94	51.21	20.27	N	OFF	19.8
0.267000	49.91	---	61.21	11.30	N	OFF	19.8
0.291750	---	25.45	50.47	25.02	N	OFF	19.8
0.291750	44.35	---	60.47	16.12	N	OFF	19.8
0.305250	---	26.15	50.10	23.95	N	OFF	19.8
0.305250	46.38	---	60.10	13.72	N	OFF	19.8
0.323250	---	32.00	49.62	17.62	N	OFF	19.8



0.323250	46.07	---	59.62	13.55	N	OFF	19.8
0.343500	---	28.56	49.12	20.56	N	OFF	19.8
0.343500	49.78	---	59.12	9.34	N	OFF	19.8
0.354750	---	29.42	48.85	19.43	N	OFF	19.8
0.354750	44.28	---	58.85	14.57	N	OFF	19.8
0.379500	---	36.86	48.29	11.43	N	OFF	19.8
0.379500	45.60	---	58.29	12.69	N	OFF	19.8
0.408750	---	23.28	47.67	24.39	N	OFF	19.8
0.408750	39.76	---	57.67	17.91	N	OFF	19.8
0.420000	---	18.08	47.45	29.37	N	OFF	19.8
0.420000	34.05	---	57.45	23.40	N	OFF	19.8
0.442500	---	26.88	47.02	20.14	N	OFF	19.8
0.442500	37.91	---	57.02	19.11	N	OFF	19.8
0.458250	---	28.12	46.72	18.60	N	OFF	19.8
0.458250	37.39	---	56.72	19.33	N	OFF	19.8
0.505500	---	32.83	46.00	13.17	N	OFF	19.8
0.505500	44.42	---	56.00	11.58	N	OFF	19.8
0.528000	---	21.35	46.00	24.65	N	OFF	19.8
0.528000	35.04	---	56.00	20.96	N	OFF	19.8
0.586500	---	25.05	46.00	20.95	N	OFF	19.8
0.586500	39.62	---	56.00	16.38	N	OFF	19.8
0.685500	---	44.13	46.00	1.87	N	OFF	19.8
0.685500	44.41	---	56.00	11.59	N	OFF	19.8
5.509500	---	35.57	50.00	14.43	N	OFF	19.9
5.509500	41.05	---	60.00	18.95	N	OFF	19.9
5.786250	---	35.28	50.00	14.72	N	OFF	19.9
5.786250	40.72	---	60.00	19.28	N	OFF	19.9
6.220500	---	36.49	50.00	13.51	N	OFF	19.9
6.220500	42.74	---	60.00	17.26	N	OFF	19.9
6.551250	---	36.22	50.00	13.78	N	OFF	19.9
6.551250	41.97	---	60.00	18.03	N	OFF	19.9
6.834750	---	40.22	50.00	9.78	N	OFF	19.9
6.834750	46.72	---	60.00	13.28	N	OFF	19.9
7.320750	---	38.15	50.00	11.85	N	OFF	19.9
7.320750	44.20	---	60.00	15.80	N	OFF	19.9
7.656000	---	39.78	50.00	10.22	N	OFF	20.0
7.656000	45.29	---	60.00	14.71	N	OFF	20.0
8.101500	---	30.71	50.00	19.29	N	OFF	20.0
8.101500	37.47	---	60.00	22.53	N	OFF	20.0
13.560000	---	30.65	50.00	19.35	N	OFF	20.1
13.560000	34.06	---	60.00	25.94	N	OFF	20.1
19.090500	---	36.37	50.00	13.63	N	OFF	20.1
19.090500	42.80	---	60.00	17.20	N	OFF	20.1
19.549500	---	36.87	50.00	13.13	N	OFF	20.1
19.549500	44.00	---	60.00	16.00	N	OFF	20.1
19.900500	---	38.69	50.00	11.31	N	OFF	20.1
19.900500	45.20	---	60.00	14.80	N	OFF	20.1
20.222250	---	41.05	50.00	8.95	N	OFF	20.2
20.222250	47.52	---	60.00	12.48	N	OFF	20.2
20.523750	---	42.34	50.00	7.66	N	OFF	20.2
20.523750	49.04	---	60.00	10.96	N	OFF	20.2
20.850000	---	44.72	50.00	5.28	N	OFF	20.2
20.850000	51.22	---	60.00	8.78	N	OFF	20.2
21.205500	---	47.27	50.00	2.73	N	OFF	20.2
21.205500	53.62	---	60.00	6.38	N	OFF	20.2
21.698250	---	48.47	50.00	1.53	N	OFF	20.2
21.698250	54.88	---	60.00	5.12	N	OFF	20.2
21.799500	---	48.09	50.00	1.91	N	OFF	20.2
21.799500	54.56	---	60.00	5.44	N	OFF	20.2
22.263000	---	44.31	50.00	5.69	N	OFF	20.2
22.263000	50.98	---	60.00	9.02	N	OFF	20.2
22.560000	---	42.27	50.00	7.73	N	OFF	20.2
22.560000	48.93	---	60.00	11.07	N	OFF	20.2
23.244000	---	39.01	50.00	10.99	N	OFF	20.2
23.244000	45.64	---	60.00	14.36	N	OFF	20.2
24.083250	---	35.63	50.00	14.37	N	OFF	20.2
24.083250	41.77	---	60.00	18.23	N	OFF	20.2



# Appendix B. Test Results of Near Field Test Items

## B1. Test Result of 20dB Spectrum Bandwidth

<Sample 1>

Test mode	NFC Tx	Test Frequency (MHz)	13.56
20dB Bandwidth (kHz)	2.620	99% OccupiedBW(kHz)	2.220
Frequency range (MHz)	$f_L > 13.553$	13.55858	Test Result
	$f_H < 13.567$	13.56120	Complies

**Remark:** 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.



<Sample 2>

Test mode	NFC Tx	Test Frequency (MHz)	13.56
Date: 2.FEB.2023 15:55:01		Date: 2.FEB.2023 15:48:43	
<b>20dB Bandwidth (kHz)</b>	2.640	<b>99% OccupiedBW(kHz)</b>	2.240
<b>Frequency range (MHz)</b>	$f_L > 13.553$	13.55866	<b>Test Result</b>
	$f_H < 13.567$	13.56130	

**Remark:** 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.



B2. Test Result of Frequency Stability

<Sample 1>

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vdc)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
11.55	13.559890	<b>-20</b>	0	13.559880
9.8	13.559890		2	13.559880
13.2	13.559890		5	13.559780
			10	13.559780
		<b>-10</b>	0	13.559910
			2	13.559910
			5	13.559900
			10	13.559900
		<b>0</b>	0	13.559910
			2	13.559920
			5	13.559920
			10	13.559920
		<b>10</b>	0	13.559900
			2	13.559900
			5	13.559910
			10	13.559900
		<b>20</b>	0	13.559880
			2	13.559900
			5	13.559780
			10	13.559780
		<b>30</b>	0	13.559820
			2	13.559830
			5	13.559820
			10	13.559830
		<b>40</b>	0	13.559950
			2	13.559820
			5	13.559820
			10	13.559820



Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vdc)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
		50	0	13.559820
			2	13.559830
			5	13.559840
			10	13.559840
Max.Deviation (MHz)	-0.000110	Max.Deviation (MHz)		-0.000220
Max.Deviation (ppm)	-8.1121	Max.Deviation (ppm)		-16.2242
Limit	FS < ±100 ppm	Limit		FS < ±100 ppm
Test Result	PASS	Test Result		PASS



<Sample 2>

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vdc)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
11.55	13.559980	<b>-20</b>	0	13.559980
9.8	13.559980		2	13.559980
13.2	13.559983		5	13.559980
			10	13.559980
		<b>-10</b>	0	13.559957
			2	13.560000
			5	13.560000
			10	13.560000
		<b>0</b>	0	13.560000
			2	13.560020
			5	13.560000
			10	13.560010
		<b>10</b>	0	13.560000
			2	13.560000
			5	13.560000
			10	13.560000
		<b>20</b>	0	13.559980
			2	13.559980
			5	13.559980
			10	13.559980
		<b>30</b>	0	13.559980
			2	13.559980
			5	13.559980
			10	13.559980
		<b>40</b>	0	13.559980
			2	13.559960
			5	13.559980
			10	13.559980



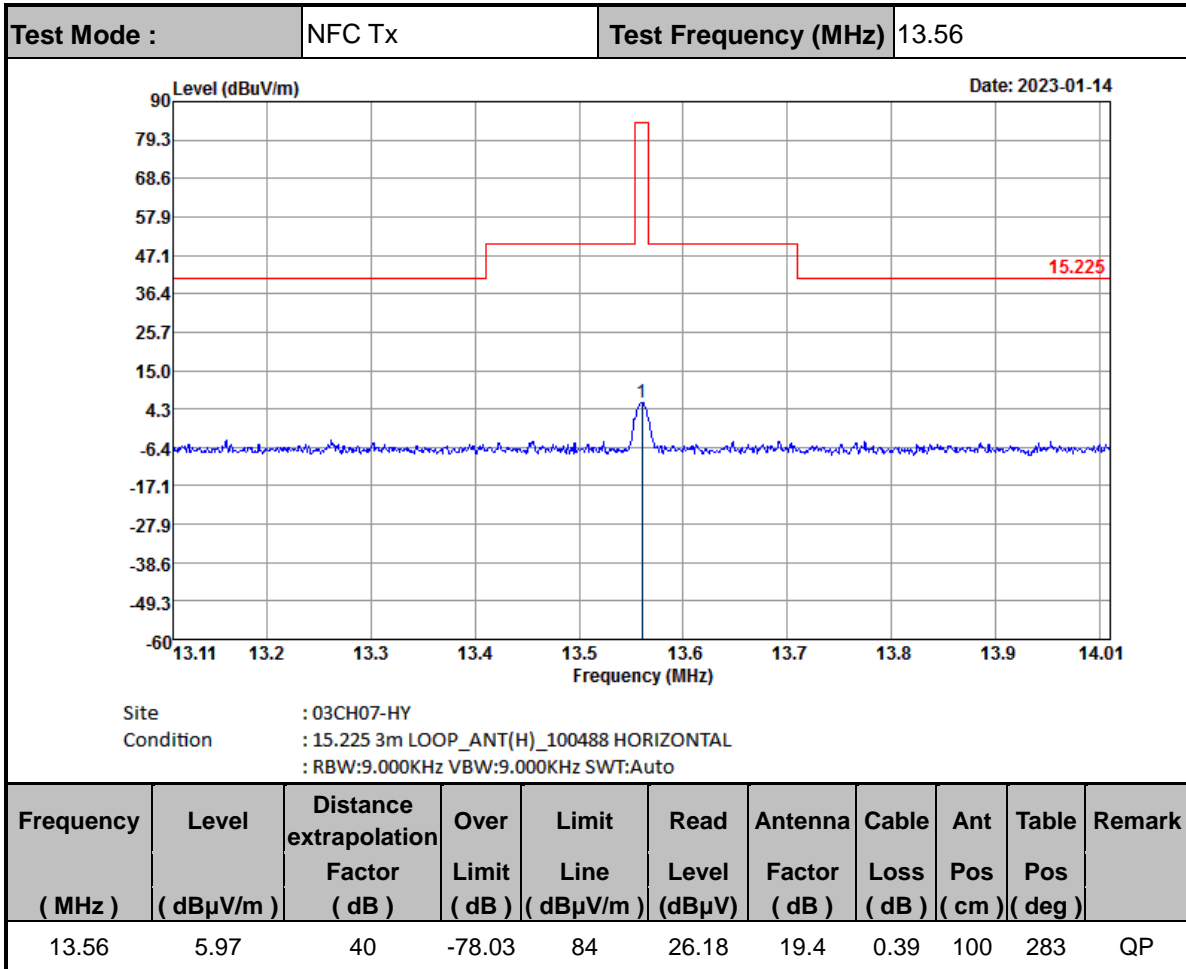
Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vdc)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
		50	0	13.559970
			2	13.559960
			5	13.559960
			10	13.559970
Max.Deviation (MHz)	-0.000020	Max.Deviation (MHz)		-0.000043
Max.Deviation (ppm)	-1.4749	Max.Deviation (ppm)		-3.1711
Limit	FS < ±100 ppm	Limit		FS < ±100 ppm
Test Result	PASS	Test Result		PASS



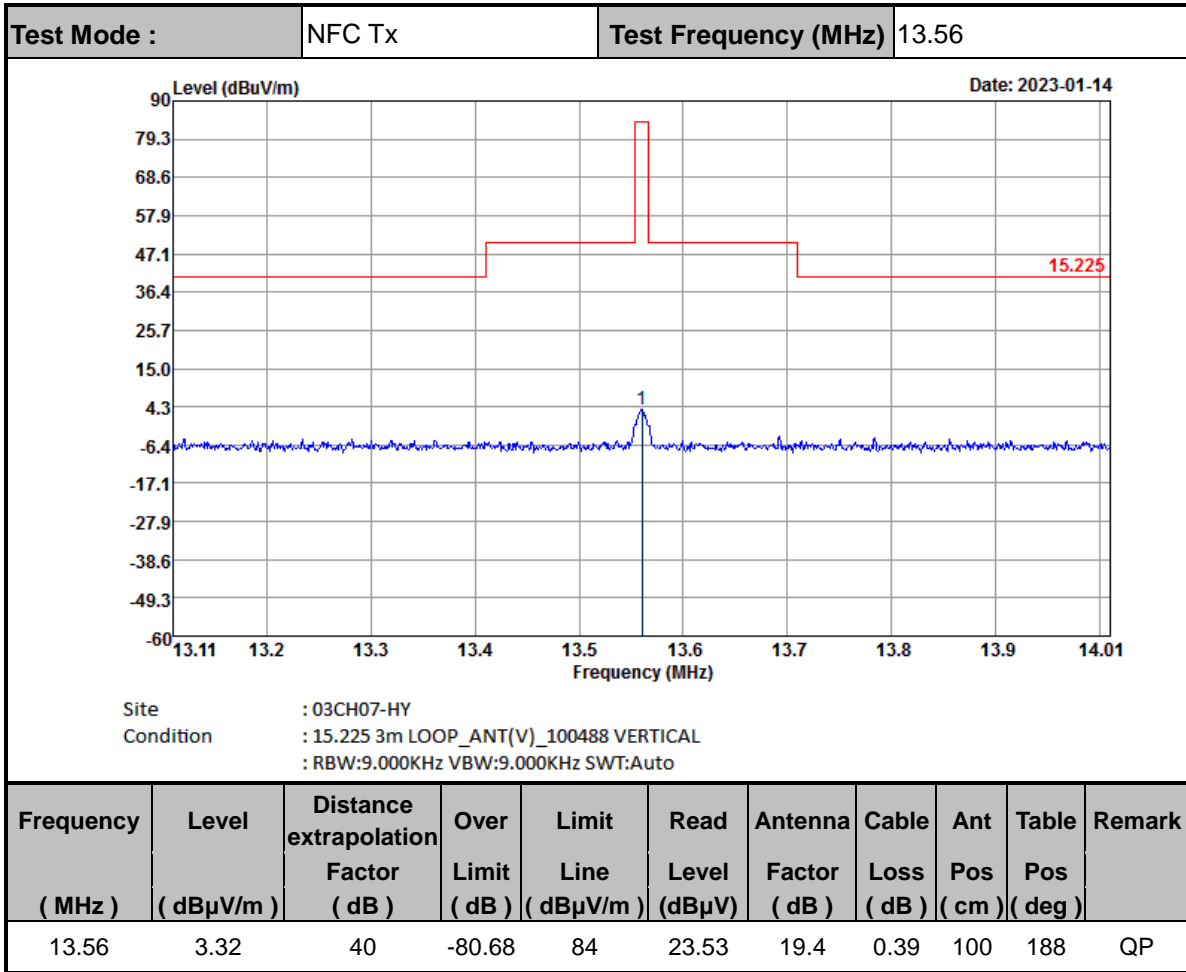
## Appendix C. Test Results of Radiated Test Items

### C1. Test Result of Field Strength of Fundamental Emissions

<Sample 1>





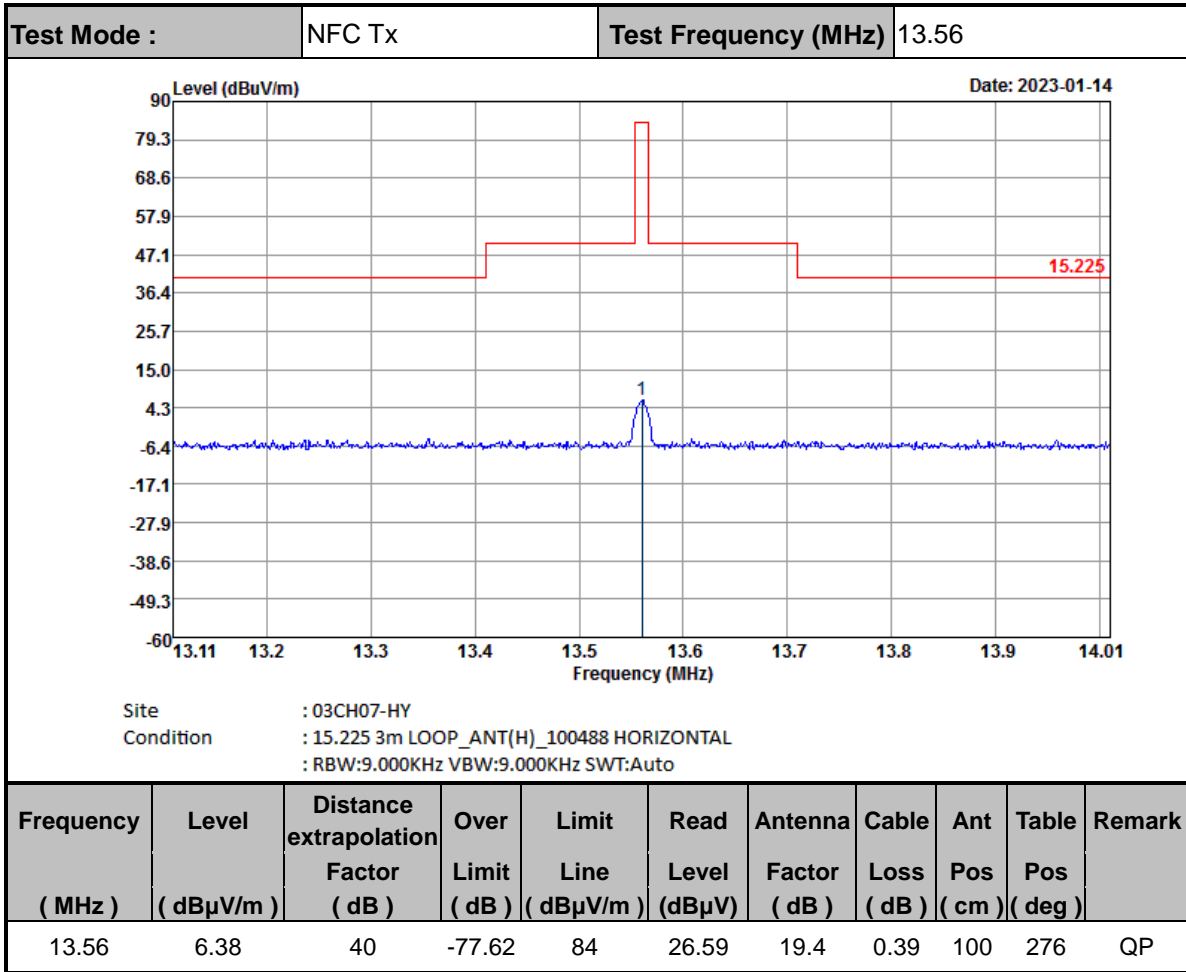


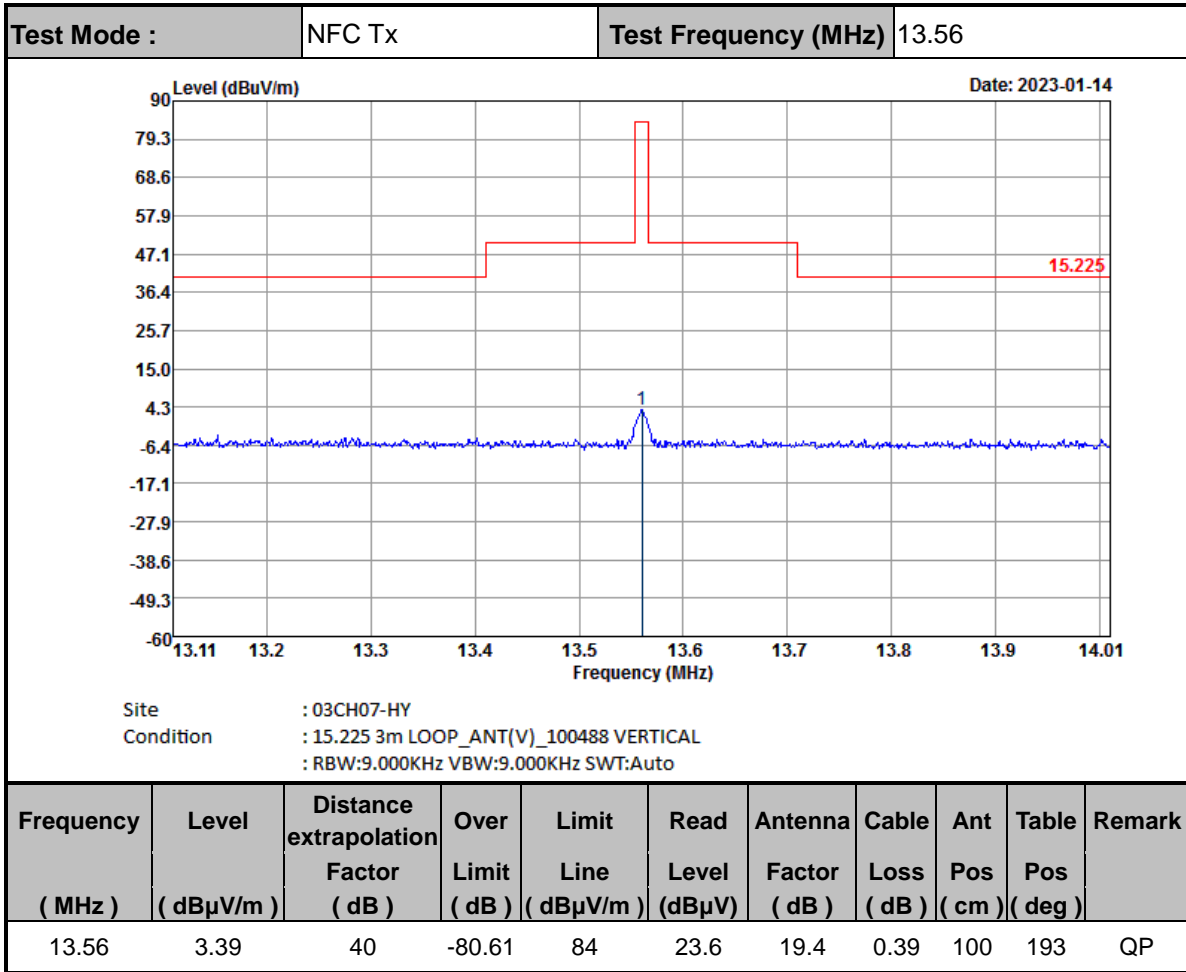
**Note :**

1. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
2. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.



<Sample 2>



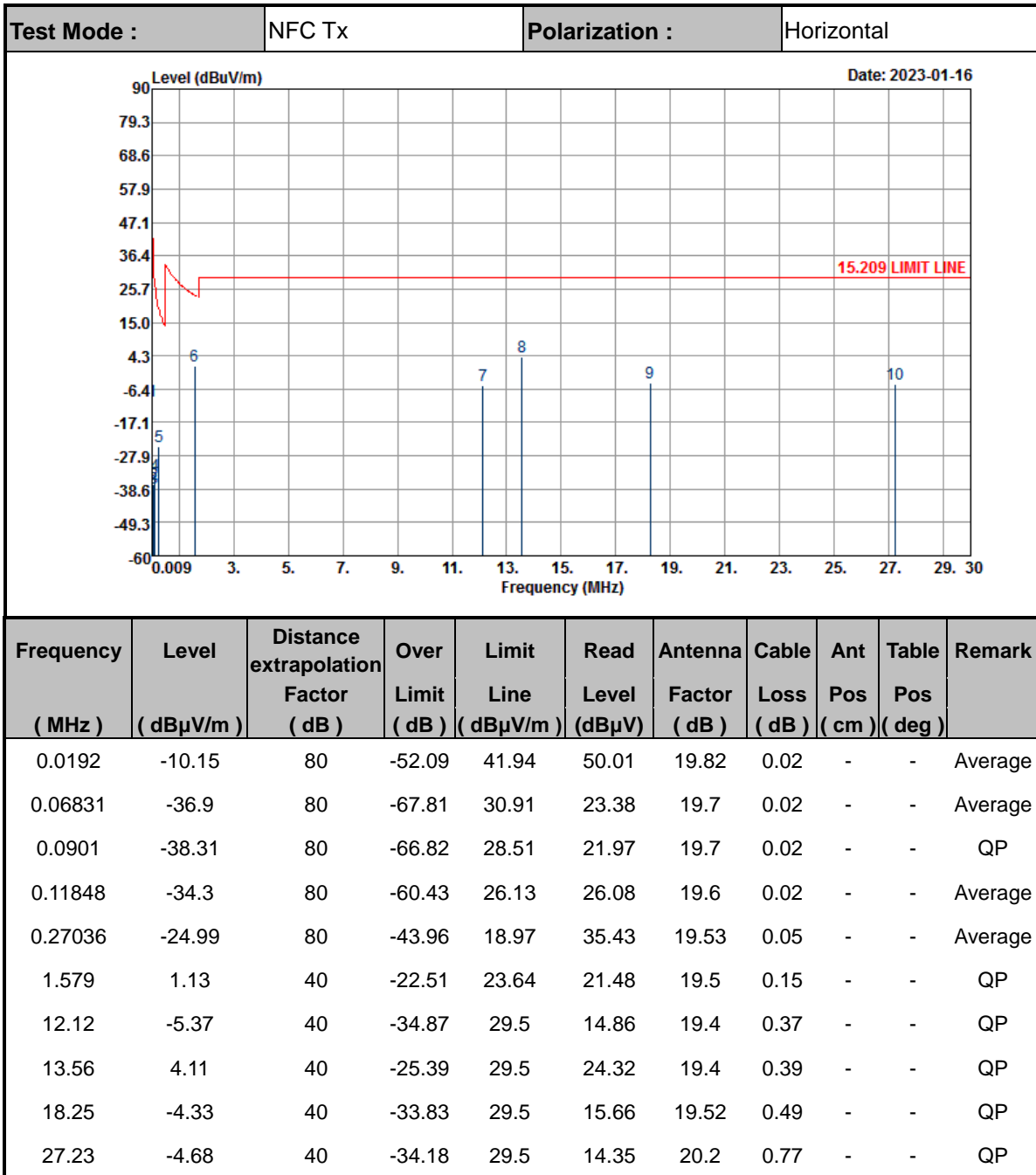


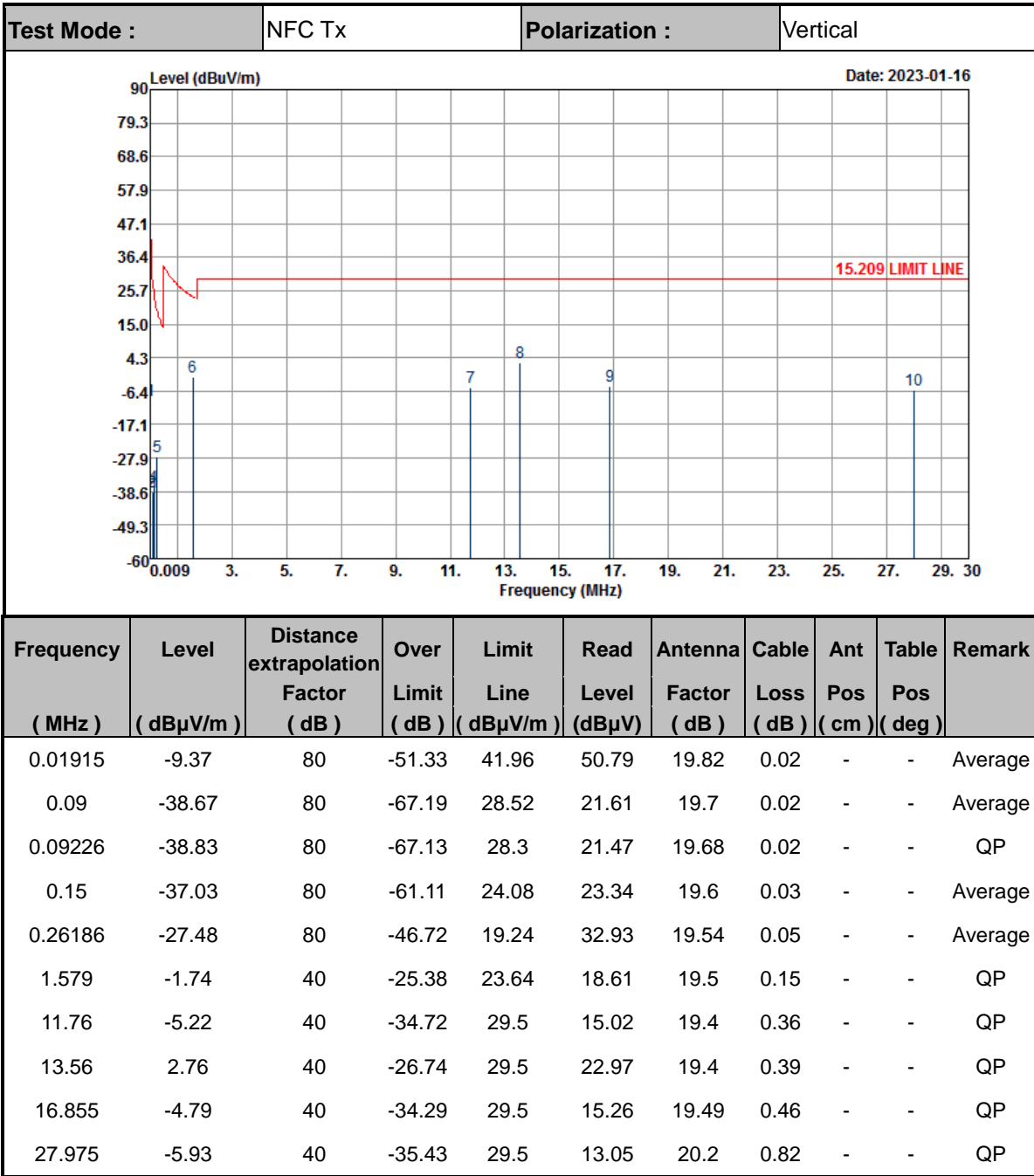
**Note :**

1. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
2. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.

C2. Results of Radiated Spurious Emissions (9 kHz~30MHz)

<Sample 1>





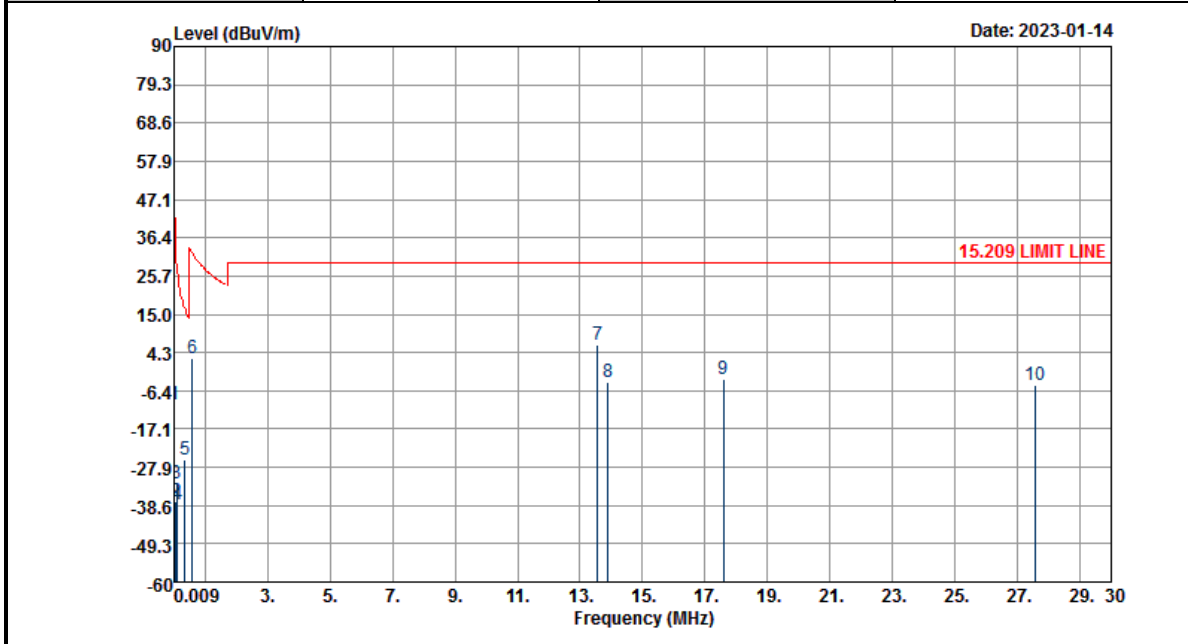
**Note :**

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
3. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.
4. 13.56 MHz is fundamental signal which can be ignored



<Sample 2>

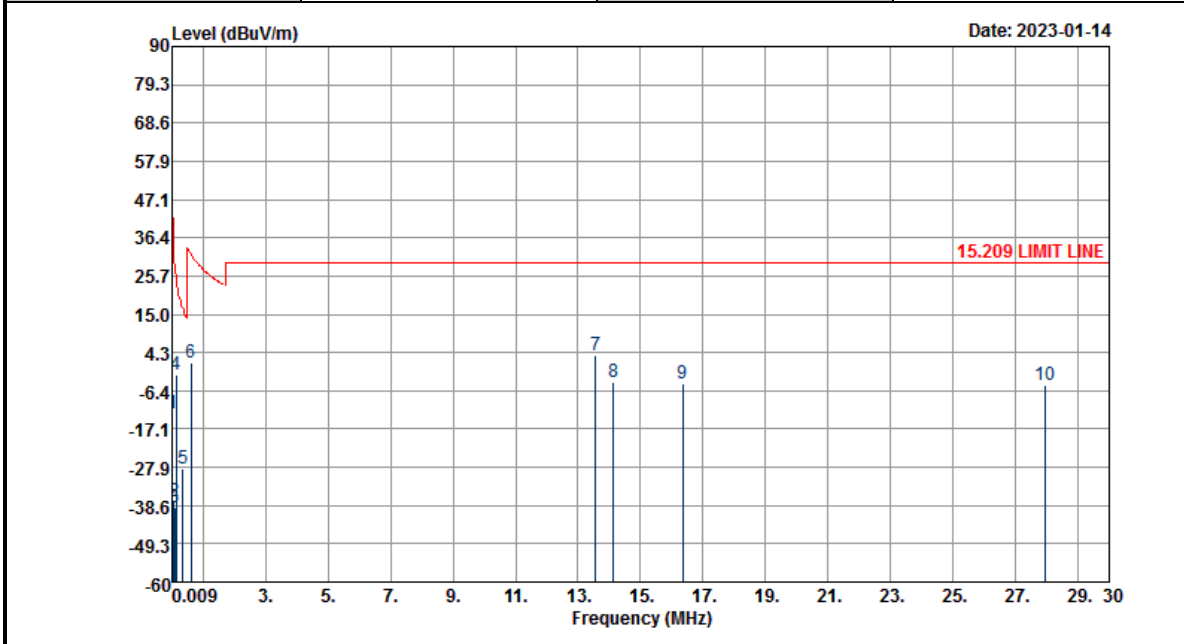
Test Mode :	NFC Tx	Polarization :	Horizontal
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Frequency ( MHz )	Level ( dBμV/m )	Distance extrapolation Factor ( dB )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
0.01915	-10.34	80	-52.3	41.96	49.82	19.82	0.02	-	-	Average
0.06753	-37.3	80	-68.31	31.01	22.98	19.7	0.02	-	-	Average
0.10108	-32.38	80	-59.89	27.51	28	19.6	0.02	-	-	QP
0.11688	-38.29	80	-64.54	26.25	22.09	19.6	0.02	-	-	Average
0.35672	-25.6	80	-42.16	16.56	34.84	19.5	0.06	-	-	Average
0.60265	2.69	40	-29.31	32	23.1	19.5	0.09	-	-	QP
13.56	6.38	40	-23.12	29.5	26.59	19.4	0.39	-	-	QP
13.888	-4.11	40	-33.61	29.5	16.09	19.4	0.4	-	-	QP
17.602	-3.2	40	-32.7	29.5	16.82	19.5	0.48	-	-	QP
27.56	-4.74	40	-34.24	29.5	14.27	20.2	0.79	-	-	QP



Test Mode :	NFC Tx	Polarization :	Vertical
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Frequency ( MHz )	Level ( dBμV/m )	Distance extrapolation Factor ( dB )	Over Limit ( dB )	Limit Line ( dBμV/m )	Read Level ( dBμV )	Antenna Factor ( dB )	Cable Loss ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
0.0192	-12.65	80	-54.59	41.94	47.51	19.82	0.02	-	-	Average
0.06015	-37.25	80	-69.27	32.02	23.03	19.7	0.02	-	-	Average
0.09012	-39.25	80	-67.76	28.51	21.03	19.7	0.02	-	-	QP
0.14996	-1.95	80	-26.03	24.08	18.42	19.6	0.03	-	-	Average
0.34856	-28.16	80	-44.92	16.76	32.28	19.5	0.06	-	-	Average
0.61016	1.3	40	-30.6	31.9	21.71	19.5	0.09	-	-	QP
13.56	3.39	40	-26.11	29.5	23.6	19.4	0.39	-	-	QP
14.136	-4.07	40	-33.57	29.5	16.13	19.4	0.4	-	-	QP
16.351	-4.4	40	-33.9	29.5	15.71	19.44	0.45	-	-	QP
27.94	-4.86	40	-34.36	29.5	14.12	20.2	0.82	-	-	QP

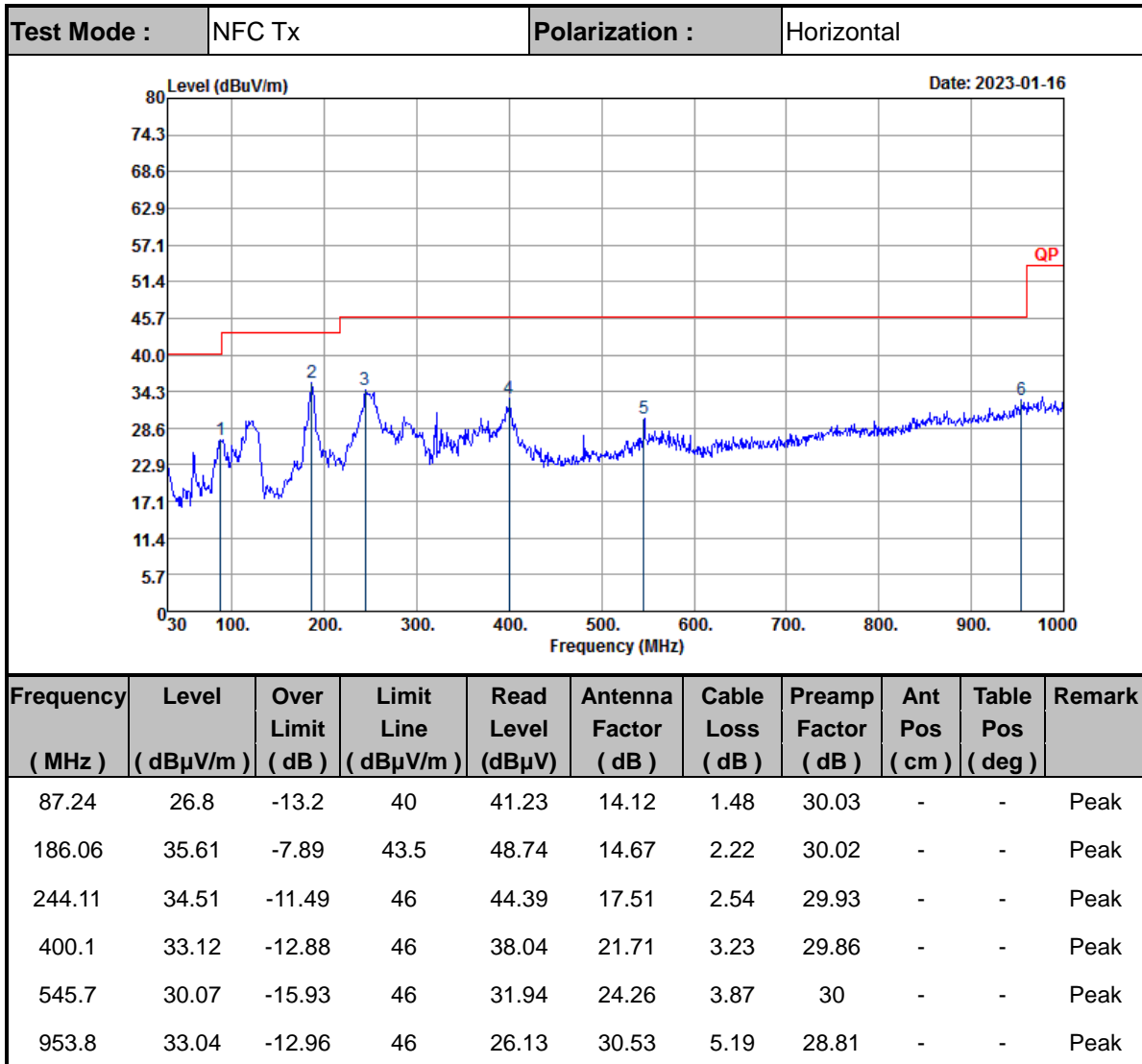
**Note :**

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
3. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.
4. 13.56 MHz is fundamental signal which can be ignored

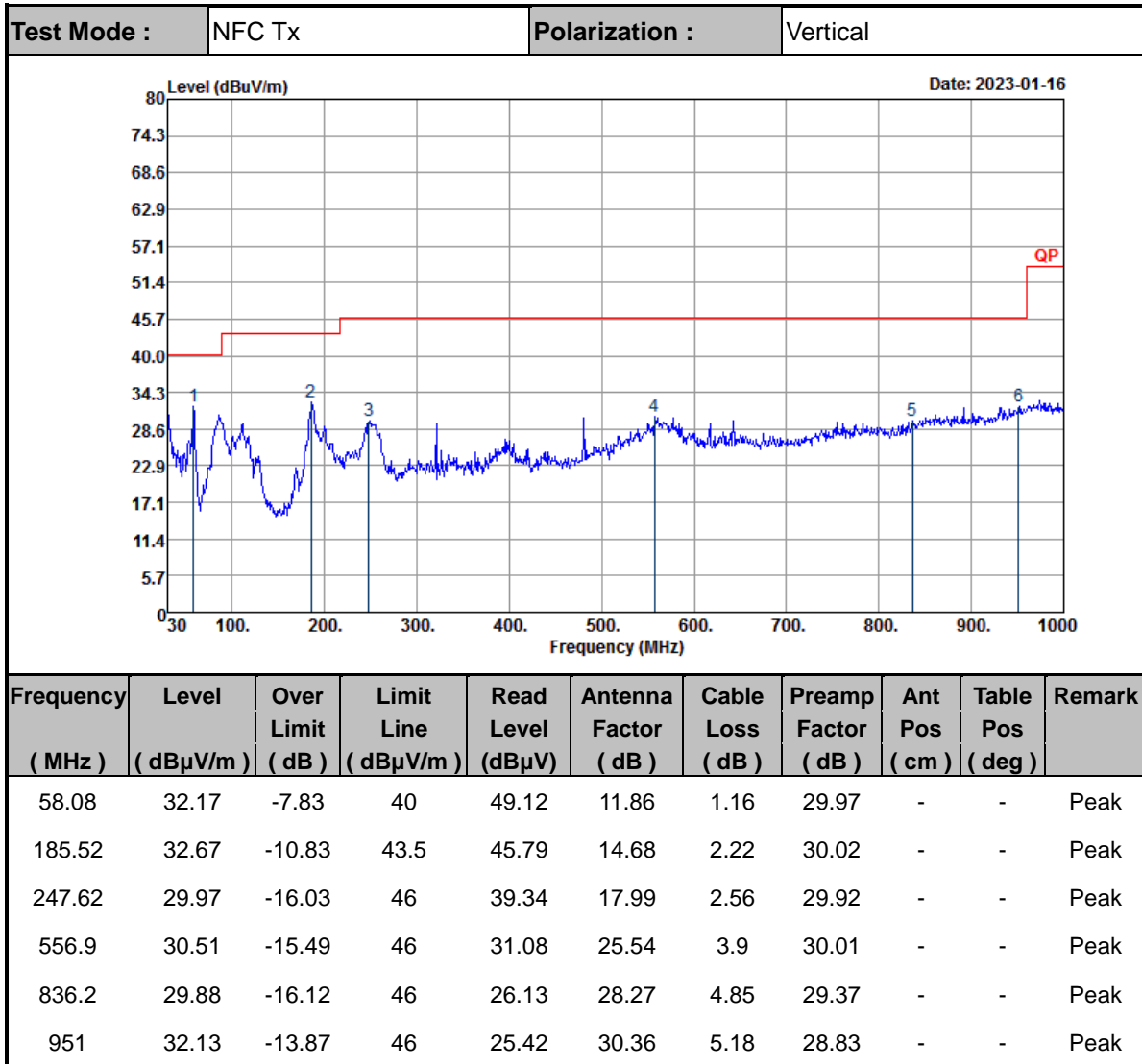


C3. Results of Radiated Spurious Emissions (30MHz~1GHz)

<Sample 1>







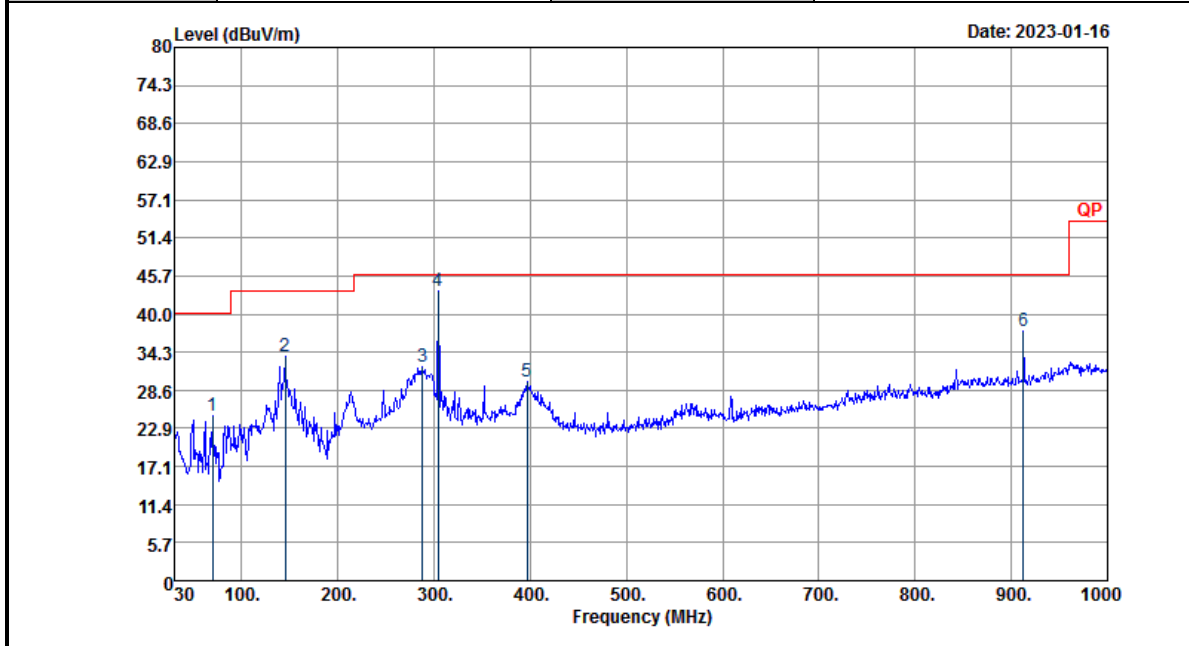
**Note:**

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.
4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

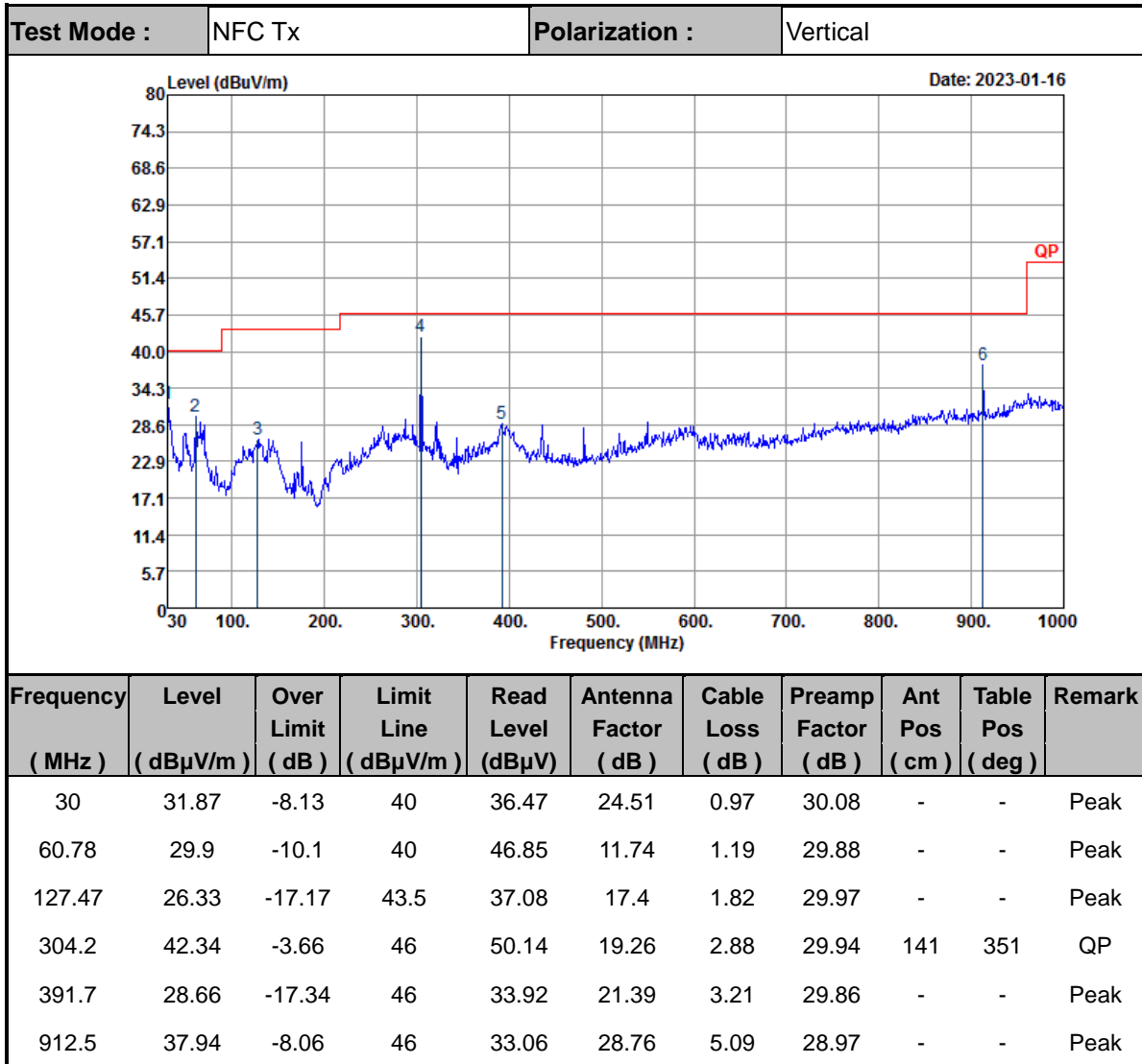


<Sample 2>

<b>Test Mode :</b>	NFC Tx	<b>Polarization :</b>	Horizontal
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Frequency ( MHz )	Level ( dB $\mu$ V/m )	Over Limit ( dB )	Limit Line ( dB $\mu$ V/m )	Read Level ( dB $\mu$ V )	Antenna Factor ( dB )	Cable Loss ( dB )	Preamp Factor ( dB )	Ant Pos ( cm )	Table Pos ( deg )	Remark
69.42	24.63	-15.37	40	41.07	12.17	1.26	29.87	-	-	Peak
145.56	33.74	-9.76	43.5	44.59	17.18	1.93	29.96	-	-	Peak
287.58	32.02	-13.98	46	40.17	19	2.79	29.94	-	-	Peak
304.2	43.35	-2.65	46	51.15	19.26	2.88	29.94	100	339	QP
396.6	29.78	-16.22	46	34.86	21.56	3.22	29.86	-	-	Peak
912.5	37.33	-8.67	46	32.45	28.76	5.09	28.97	-	-	Peak



**Note:**

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.
4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.