

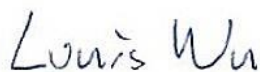


NCC RADIO TEST REPORT

Equipment : Mobile Cellular Phone
Brand Name : Motorola
Model Name : XT2201-1
Applicant : Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago, IL60654 USA
Manufacturer : Motorola Mobility LLC
222 W, Merchandise Mart Plaza, Chicago, IL60654 USA
Standard : NCC LP0002 (2020-07-01)

The product was received on Nov. 09, 2021 and testing was performed from Nov. 26, 2021 to Dec. 18, 2021. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures NCC LP0002 (2020-07-01) 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. Wensan Laboratory, the test report shall not be reproduced except in full.



Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan



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History of this test report

Report No.	Version	Description	Issue Date
TR1O1903-02D	01	Initial issue of report	Jan. 19, 2022
TR1O1903-02D	02	Revise accessory information	Jan. 27, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	LP0002 3.3	AC Power Line Conducted Emissions	Pass	13.41 dB under the limit at 2.842MHz
3.2	-	20dB Spectrum Bandwidth	Pass	-
	-	99% OBW Spectrum Bandwidth	Reporting only	-
3.3	LP0002 4.2.1.3	Frequency Stability	Pass	-
3.4	LP0002 4.2.1.1	Field Strength of Fundamental Emissions	Pass	<Sample 1>: Max level 18.49 dB μ V/m at 13.560 MHz <Sample 2>: Max level 17.09 dB μ V/m at 13.560 MHz
3.5	LP0002 3.6 4.2.1.2	Radiated Spurious Emissions	Pass	<Sample 1>: 6.48 dB under the limit at 49.400MHz <Sample 2>: 7.91 dB under the limit at 42.610MHz
3.6	LP0002 3.2	Antenna Requirements	Pass	-
Annex A	LP0002 3.9	Receiver Radiated Emission	Pass	Please refer to Annex A

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

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: Keven Cheng

Report Producer: Celery Wei

1. General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2201-1
Sample 1	1st source (refer to the PED)
Sample 2	2nd source (refer to the PED)
IMEI Code	Conducted : <Sample 1>: IMEI 1: 355871980021591 IMEI 2: 355871980021609 <Sample 2>: IMEI 1: 355871980038918 IMEI 2: 355871980038926 Conduction : <Sample 1>: IMEI 1: 355871980021575 IMEI 2: 355871980021583 <Sample 2>: IMEI 1: 355871980027671 IMEI 2: 355871980027689 Radiation : <Sample 1>: IMEI 1: 355871980021591 IMEI 2: 355871980021609 <Sample 2>: IMEI 1: 355871980038850 IMEI 2: 355871980038868
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/5G NR/ Galileo/Glonass/GPS/SBAS/NFC/WPC/WPT WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE
HW Version	DVT2
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer.

Specification of Accessory		
AC Adapter 1	Brand Name	Motorola
	Model Name	MC-681
	Manufacturer	Salom
AC Adapter 2	Brand Name	Motorola
	Model Name	MC-681
	Manufacturer	Chenyang
Battery	Brand Name	Motorola
	Model Name	NA50
Earphone 1	Brand Name	Motorola
	Model Name	MD211 (SH38D20195)
Earphone 2	Brand Name	Motorola
	Model Name	MD211 (SH38D39180)
USB Cable	Brand Name	Motorola
	Model Name	SC18D24968
OceanBlue	Brand Name	ThinkReality A3 AR Glasses
	Model Name	A3
OceanBlue Industrial Kit-Y Cable	Brand Name	ThinkReality A3 Industrial Kit-Y Cable
	Model Name	A3 Y Cable

1.2 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Frequency	13.56MHz
Channel Number	1
20dBW	<Sample 1>:2.64 kHz <Sample 2>:2.64 kHz
99%OBW	<Sample 1>: 2.24 kHz <Sample 2>: 2.24 kHz
Type of Modulation	ASK

Antenna Information				
NFC Antenna	Brand Name	Moto	Peak gain	N/A
	Model Name	ANT9	Type	Loop Antenna

Remark:

1. The detail internal, external and transmit antenna photo please refer to Sporton report no.: EP1O1903-02.
2. The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory		
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855		
Test Site No.	Sporton Site No.		
	TH05-HY	CO07-HY	03CH11-HY
Test Engineer	Oscar Chi	Tom Lee	James Chiu
Temperature	22~24°C	23~26°C	20.1~21.6°C
Relative Humidity	53~55%	45~55%	53.4~67.3%

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

FCC designation No.: TW3786

1.5 Applicable Standards

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

- ♦ NCC LP0002 (2020-07-01)
- ♦ 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 NFC test is performed with app "Taginfo" installed in the mobile phone. It can enable continuous transmission with type A/B/F/V tag respectively.

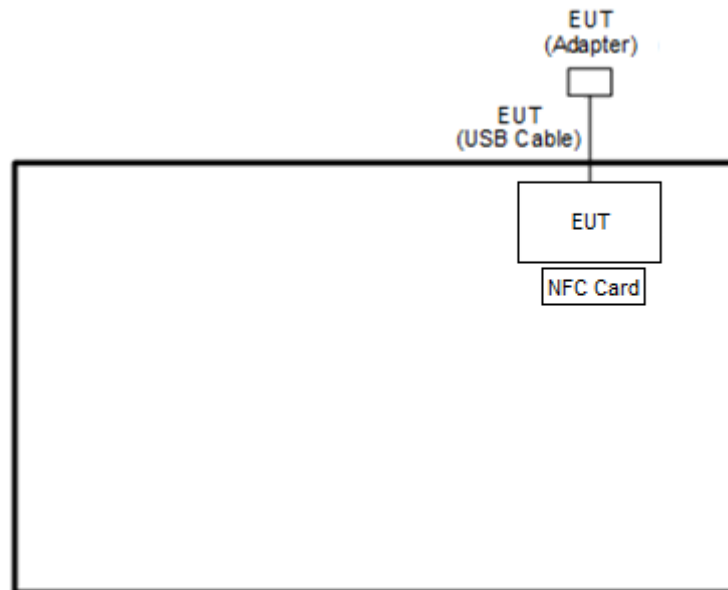
The EUT pre-scanned in reader mode with NFC tag (four NFC type A, B, F, V) and without reading tag. Based on the highest field strength of fundamental and spurious emissions, the worst case type (type F) was recorded in this report.

The measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find Z plane as worst plane.

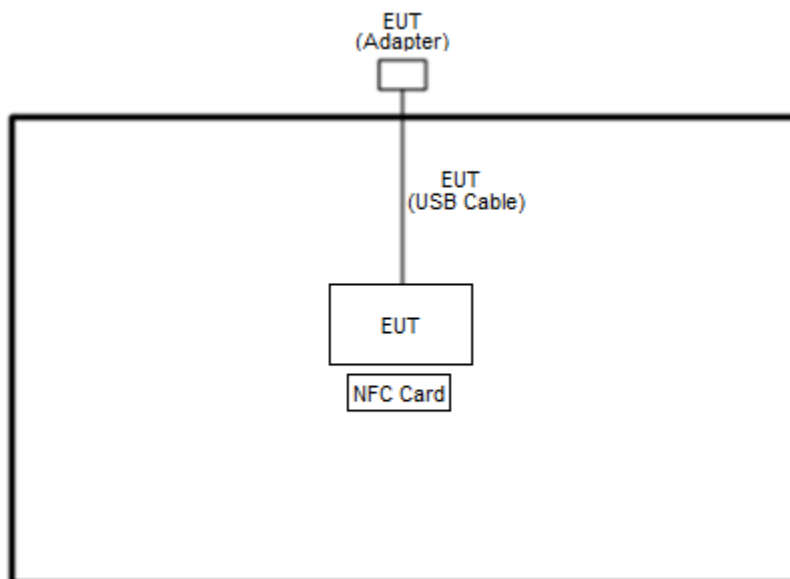
Test Cases	
AC Conducted Emission	Mode 1: NFC Link + USB Cable (Charging from Adapter 1) for Sample 1 Mode 2: NFC Link + USB Cable (Charging from Adapter 1) for Sample 2
Remark: 1. The worst case of Conducted Emission is mode 1; only the test data of it was reported. 2. For Radiated Test Cases, the tests were performed with Adapter 1. 3. For radiation spurious emission, after the test voltage (120Vac/60Hz and 110Vac/60Hz) is verified by lab, the test data can conform to the test requirements of NCC rule.	

2.2 Connection Diagram of Test System

<AC Conducted Emission Mode>



<NFC Tx Mode>



2.3 Table for Supporting Units

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	NFC Card	N/A	N/A	N/A	N/A	N/A

Remark: Applicant has ensured support unit would not be attached with the product on the market, support unit is provided by lab for testing.

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 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.

For terminal test result, the testing follows FCC KDB 174176.

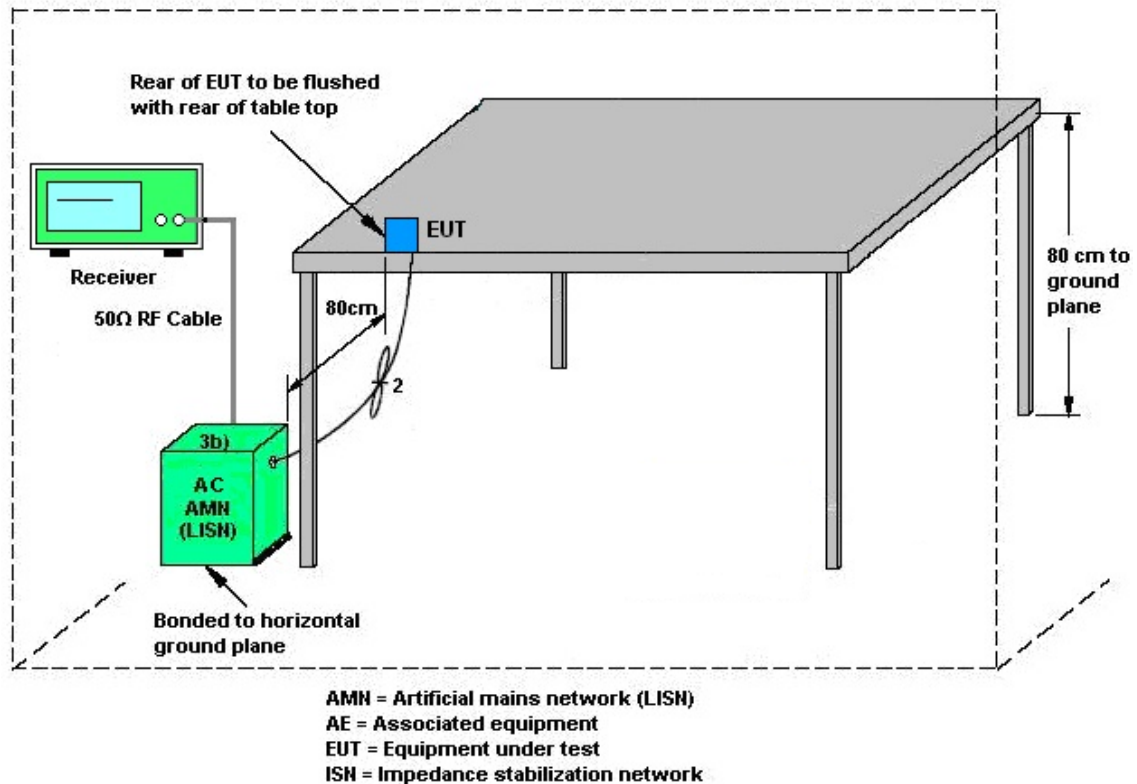
3.1.2 Measuring Instruments

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.

Note:

(1) with antenna

Remark: 13.560MHz is the NFC RF fundamental signal.

(2) with dummy load

Remark: Only the fundamental NFC signal needs to be retested per C63.4.

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.

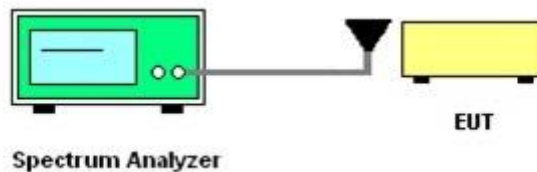
3.2.2 Measuring Instruments

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 Conducted 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.

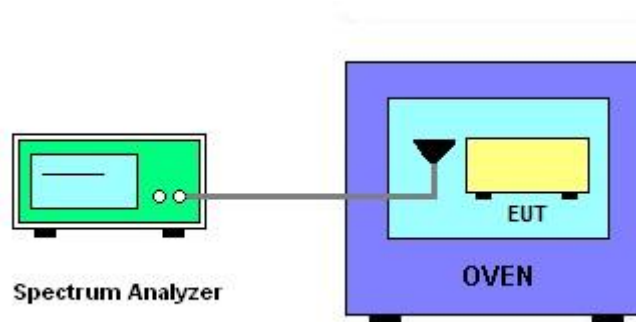
3.3.2 Measuring Instruments

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 ± 100 ppm.
6. Extreme temperature rule is -20°C~50°C.

3.3.4 Test Setup



3.3.5 Test Result of Conducted Test Items

Please refer to Appendix B.

3.4 Field Strength of Fundamental Emissions and Mask Measurement

3.4.1 Limit

Rules and specifications	NCC LP0002 4.2.1.1			
Description	Compliance with the spectrum mask is tested with RBW set to 9kHz.			
Freq. of Emission (MHz)	Field Strength (μ V/m) at 30m	Field Strength (dB μ V/m) at 30m	Field Strength (dB μ V/m) at 10m	Field Strength (dB μ V/m) at 3m
13.553~13.567	15848	84.0	103.08	124.0

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 = $40 \log (\text{specific distance} / \text{test distance})$ (dB)

3.4.2 Measuring Instruments

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

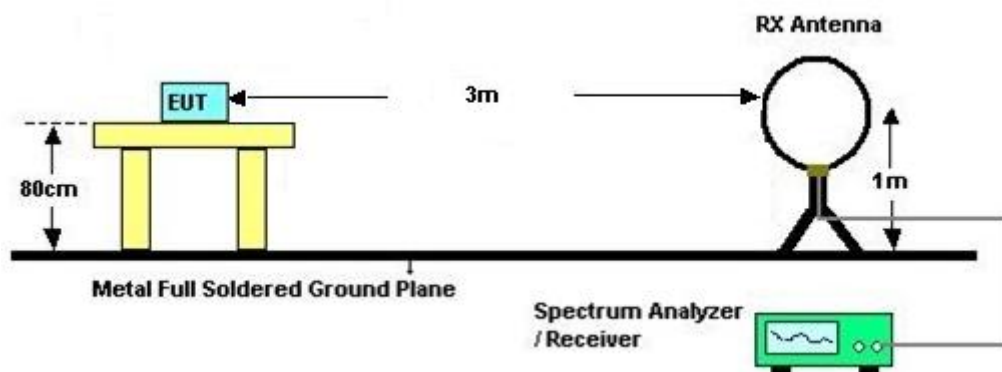
3.4.3 Test Procedures

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 μ V/m) = 20 log Emission level (μ 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 (μ V/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

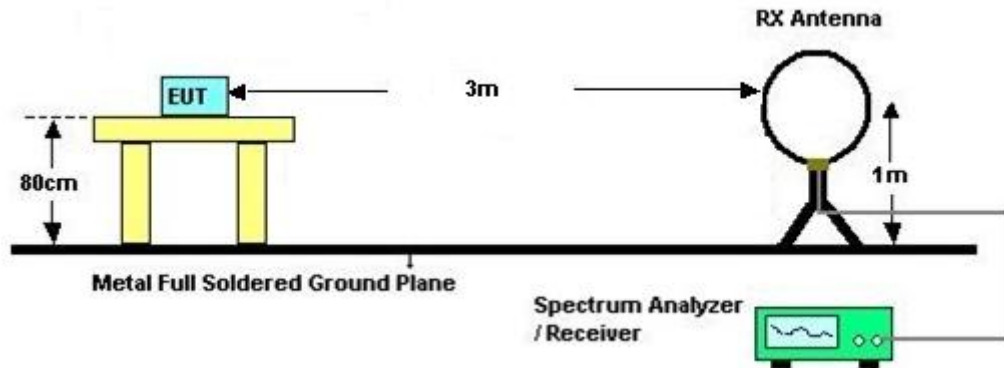
Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

3.5.4 Test Procedures

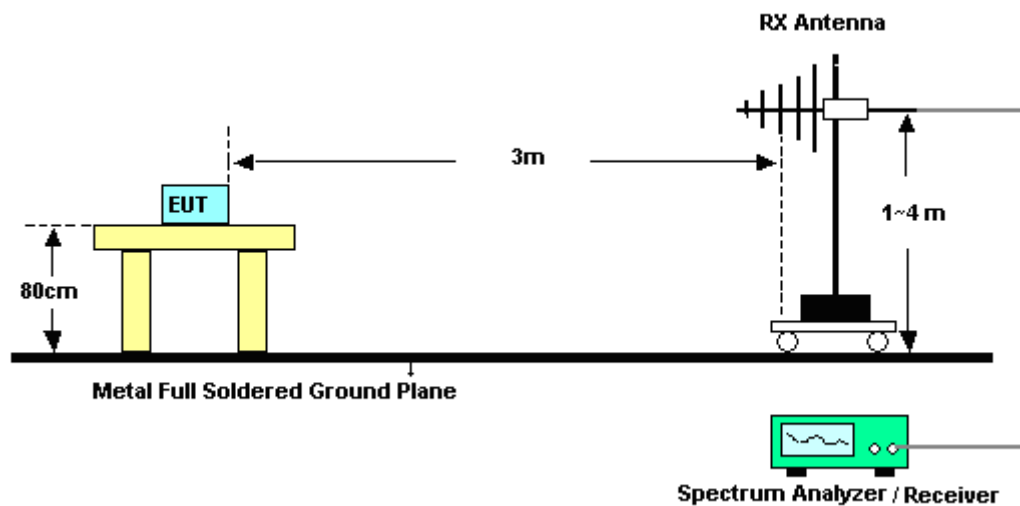
1. Configure the EUT according to ANSI C63.10. The EUT is placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower is placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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.

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 LP0002 Section 3.2.

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
5kVA AC Power Source	TESEQ	NSG 1007	1521A01677	N/A	Jun. 08, 2021	Nov. 26, 2021~ Dec. 20, 2021	Jun. 07, 2022	Conducted (TH05-HY)
Hygrometer	Testo	608-H1	34893241	N/A	Mar. 01, 2021	Nov. 26, 2021~ Dec. 20, 2021	Feb. 28, 2022	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101329	9kHz~30GHz	Sep. 30, 2021	Nov. 26, 2021~ Dec. 20, 2021	Sep. 29, 2022	Conducted (TH05-HY)
Temperature & Humidity Cabinet Chamber	ESPEC	LHU-113	1012005860	-20℃~85℃	Jan. 18, 2021	Nov. 26, 2021~ Dec. 20, 2021	Jan. 17, 2022	Conducted (TH05-HY)
Coupling loop antenna	EMCI	LF R 400	N/A	100KHz~50MHz	N/A	Dec. 20, 2021	N/A	Conducted (TH05-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	N/A	Dec. 10, 2021	N/A	Conduction (CO07-HY)
Two-Line V-Network	TESEQ	NNB 51	45051	N/A	Feb. 01, 2021	Dec. 10, 2021	Jan. 31, 2022	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESC17	100724	9kHz~7GHz	Feb. 18, 2021	Dec. 10, 2021	Feb. 17, 2022	Conduction (CO07-HY)
Hygrometer	TECPEL	DTM-303B	TP200728	N/A	Mar. 09, 2021	Dec. 10, 2021	Mar. 08, 2022	Conduction (CO07-HY)
Amplifier	SONOMA	310N	363440	9kHz~1GHz	Dec 28, 2020	Dec. 17, 2021~ Dec. 18, 2021	Dec 27, 2021	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 07, 2021	Dec. 17, 2021~ Dec. 18, 2021	Sep. 06, 2022	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 15, 2021	Dec. 17, 2021~ Dec. 18, 2021	Oct. 14, 2022	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102 , SUCOFLEX 104	811852/4,MY 2859/2,MY98 37/4PE	30MHz~18GHz	Nov. 15, 2021	Dec. 17, 2021~ Dec. 18, 2021	Nov. 14, 2022	Radiation (03CH11-HY)
Filter	Wainwright	WHK20/1000C 7/40SS	SN2	20MHz High Pass Filter	Sep. 13, 2021	Dec. 17, 2021~ Dec. 18, 2021	Sep. 12, 2022	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Dec. 17, 2021~ Dec. 18, 2021	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Dec. 17, 2021~ Dec. 18, 2021	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Dec. 17, 2021~ Dec. 18, 2021	N/A	Radiation (03CH11-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Dec. 17, 2021~ Dec. 18, 2021	N/A	Radiation (03CH11-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	20MHz~8.4GHz	Jul. 15, 2021	Dec. 17, 2021~ Dec. 18, 2021	Jul. 14, 2022	Radiation (03CH11-HY)

5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.3 dB
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Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	3.7 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	5.8 dB
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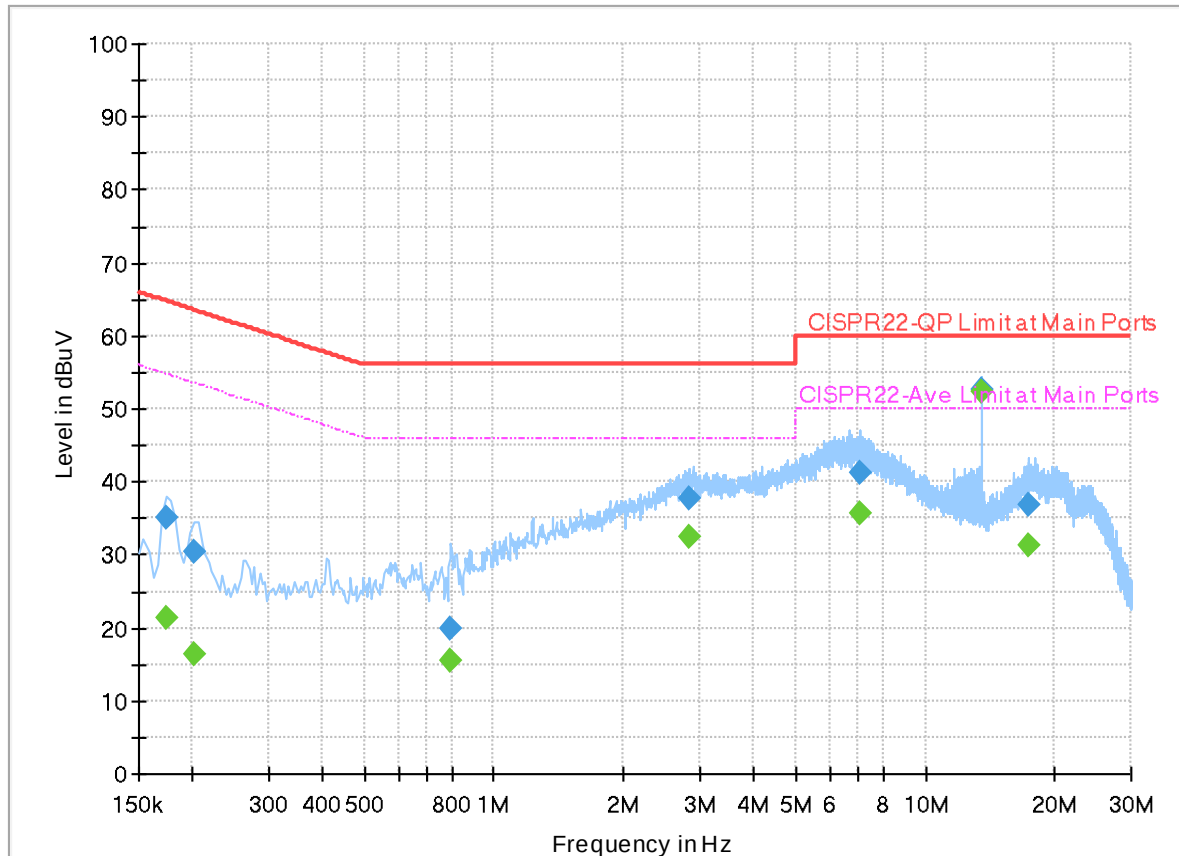
Appendix A. Test Results of Conducted Emission Test

Test Engineer :	Tom Lee	Temperature :	23~26℃
		Relative Humidity :	45~55%

Original EUT Information

Report NO : 1O1903-02
 Test Mode : Mode 1
 Test Voltage : 110Vac/60Hz
 Phase : Line

Full Spectrum



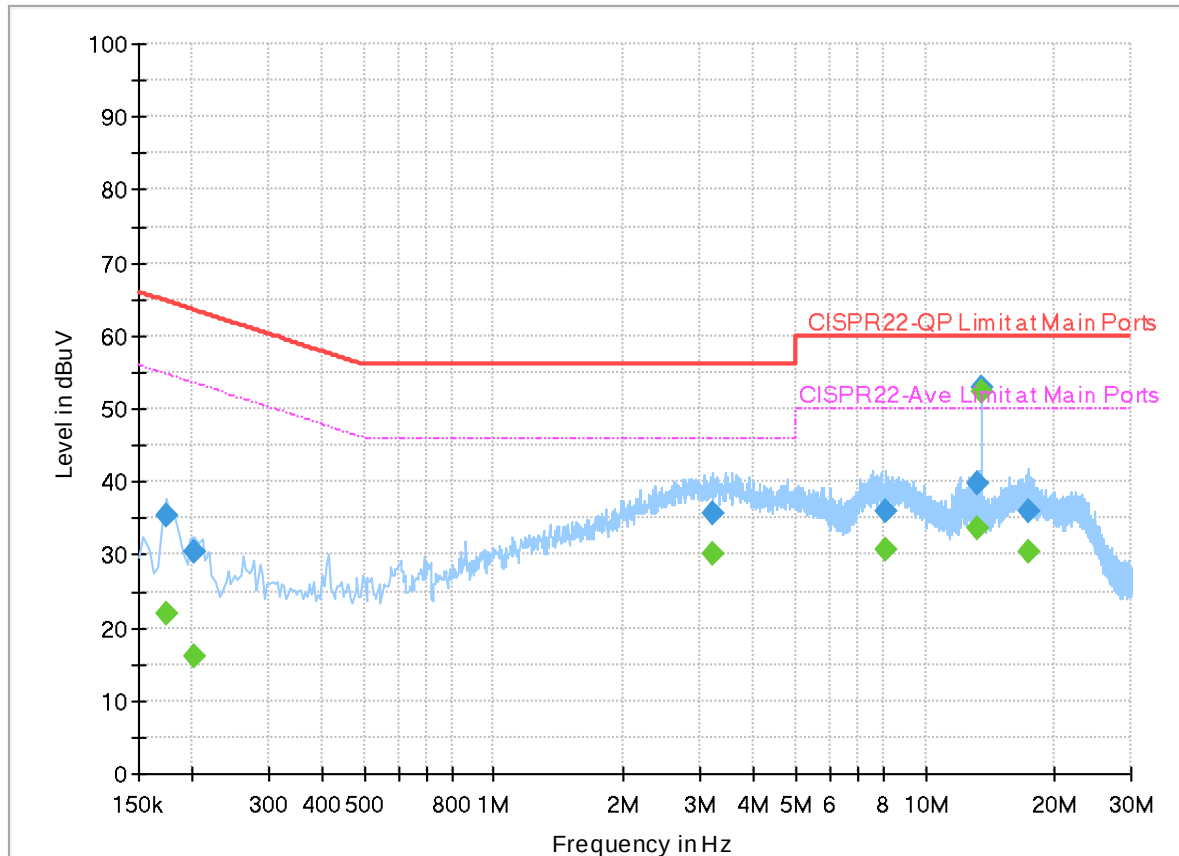
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.174000	---	21.48	54.77	33.29	L1	OFF	20.1
0.174000	35.15	---	64.77	29.62	L1	OFF	20.1
0.202000	---	16.52	53.53	37.01	L1	OFF	20.0
0.202000	30.51	---	63.53	33.02	L1	OFF	20.0
0.794000	---	15.41	46.00	30.59	L1	OFF	20.0
0.794000	19.91	---	56.00	36.09	L1	OFF	20.0
2.842000	---	32.59	46.00	13.41	L1	OFF	20.1
2.842000	37.84	---	56.00	18.16	L1	OFF	20.1
7.050000	---	35.73	50.00	14.27	L1	OFF	20.2
7.050000	41.14	---	60.00	18.86	L1	OFF	20.2
13.560000	---	52.28	50.00	-2.28	L1	OFF	20.3
13.560000	52.77	---	60.00	7.23	L1	OFF	20.3
17.346000	---	31.28	50.00	18.72	L1	OFF	20.3
17.346000	36.71	---	60.00	23.29	L1	OFF	20.3

EUT Information

Report NO : 1O1903-02
 Test Mode : Mode 1
 Test Voltage : 110Vac/60Hz
 Phase : Neutral

Full Spectrum



Final Result

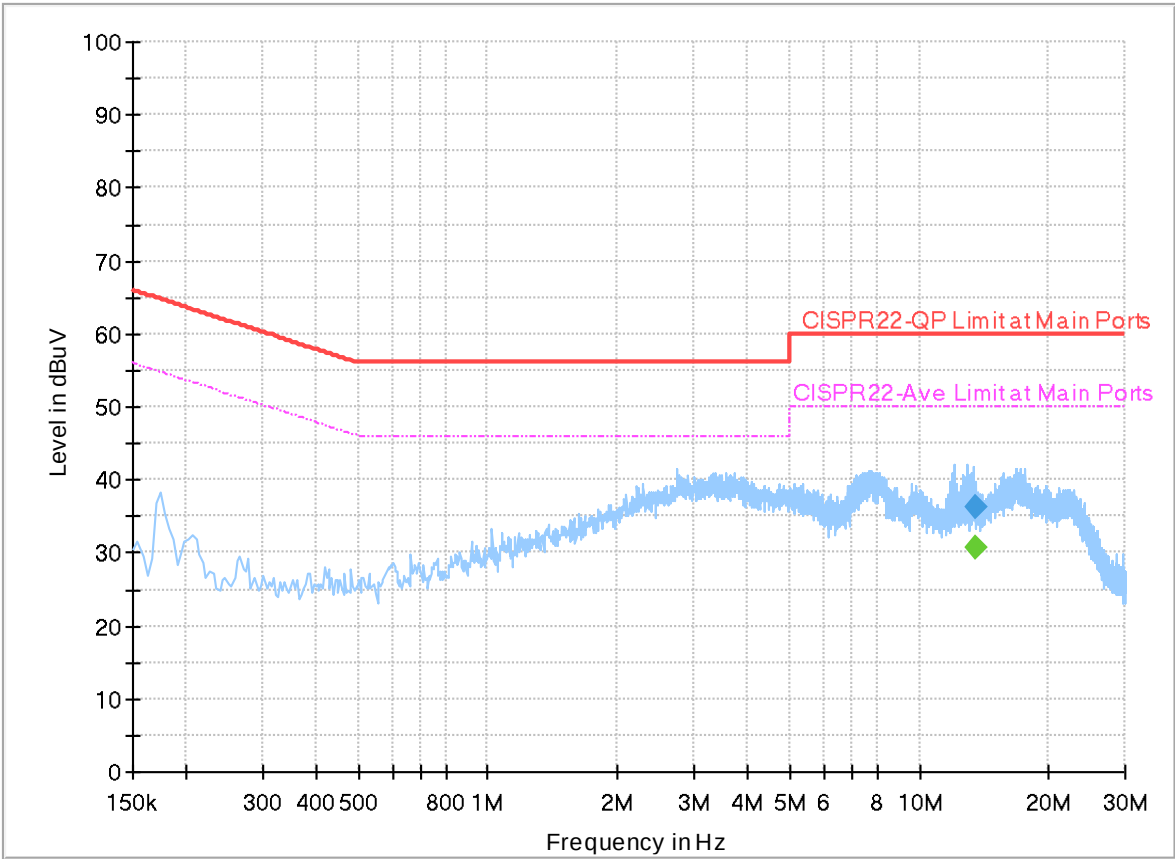
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.174000	---	21.90	54.77	32.87	N	OFF	20.1
0.174000	35.45	---	64.77	29.32	N	OFF	20.1
0.202000	---	16.05	53.53	37.48	N	OFF	20.0
0.202000	30.36	---	63.53	33.17	N	OFF	20.0
3.202000	---	30.24	46.00	15.76	N	OFF	20.1
3.202000	35.58	---	56.00	20.42	N	OFF	20.1
8.058000	---	30.58	50.00	19.42	N	OFF	20.2
8.058000	35.94	---	60.00	24.06	N	OFF	20.2
13.238000	---	33.54	50.00	16.46	N	OFF	20.2
13.238000	39.71	---	60.00	20.29	N	OFF	20.2
13.560000	---	52.30	50.00	-2.30	N	OFF	20.3
13.560000	52.79	---	60.00	7.21	N	OFF	20.3
17.454000	---	30.33	50.00	19.67	N	OFF	20.3
17.454000	35.84	---	60.00	24.16	N	OFF	20.3

Terminal
EUT Information

Report NO :
Test Mode :
Test Voltage :
Phase :

1O1903-02
Mode 1
110Vac/60Hz
Line

Full Spectrum



Final_Result

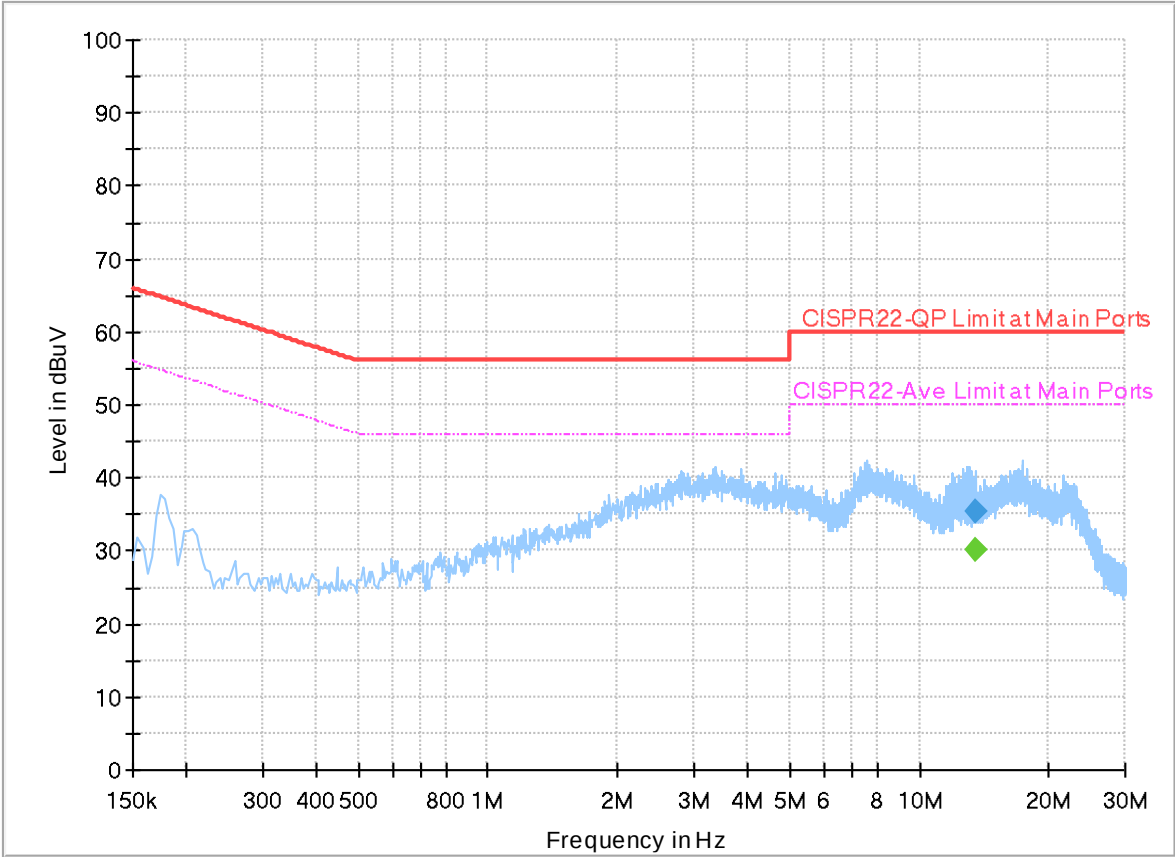
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.560000	---	30.77	50.00	19.23	L1	OFF	20.3
13.560000	36.14	---	60.00	23.86	L1	OFF	20.3

EUT Information

Report NO :
Test Mode :
Test Voltage :
Phase :

1O1903-02
Mode 1
110Vac/60Hz
Neutral

Full Spectrum



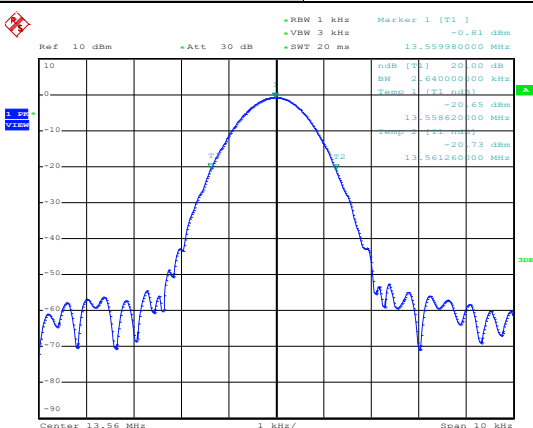
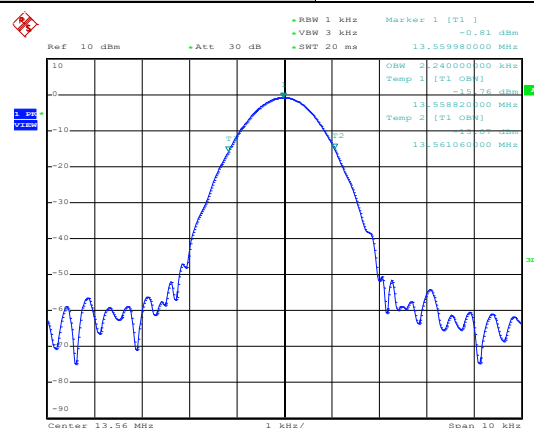
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.560000	---	30.25	50.00	19.75	N	OFF	20.3
13.560000	35.48	---	60.00	24.52	N	OFF	20.3

Appendix B. Test Results of Conducted Test Items

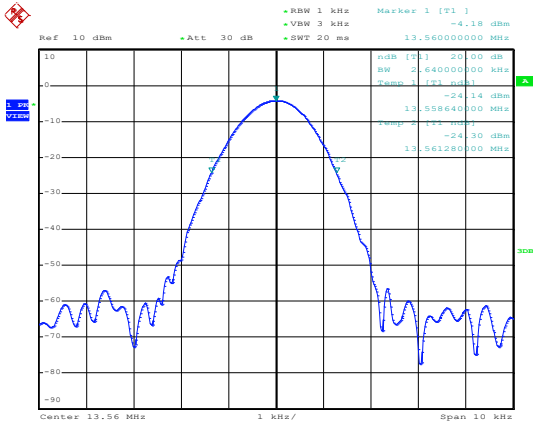
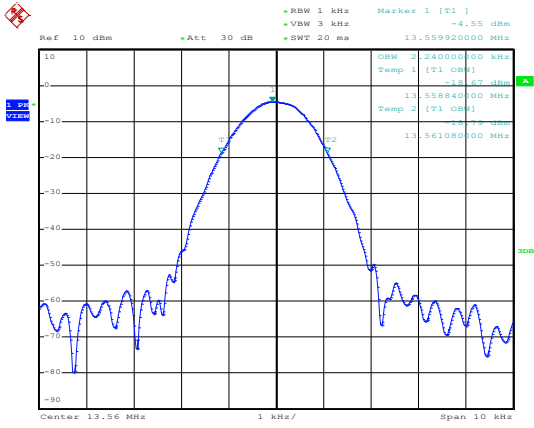
B1. Test Result of 20dB Spectrum Bandwidth

<Sample 1>

Test mode		Test Frequency (MHz)	
NFC Tx		13.56	
 Ref: 10 dBm, Att: 30 dB, RBW: 1 kHz, VSW: 3 kHz, SWT: 20 ms, Marker 1 [T1]: -0.81 dBm, 13.55980000 MHz, 20.00 dB, 2.64000000 kHz, Temp 1 [T1 Off]: -20.65 dBm, 13.55862000 MHz, Temp 2 [T1 Off]: -20.73 dBm, 13.56126000 MHz. Center 13.56 MHz, 1 kHz, Span 10 kHz Date: 26.NOV.2021 16:06:14		 Ref: 10 dBm, Att: 30 dB, RBW: 1 kHz, VSW: 3 kHz, SWT: 20 ms, Marker 1 [T1]: -0.81 dBm, 13.55980000 MHz, 20.00 dB, 2.24000000 kHz, Temp 1 [T1 Off]: -15.76 dBm, 13.55862000 MHz, Temp 2 [T1 Off]: -15.89 dBm, 13.56126000 MHz. Center 13.56 MHz, 1 kHz, Span 10 kHz Date: 26.NOV.2021 16:05:46	
20dB Bandwidth (kHz)	2.640	99% OccupiedBW(kHz)	2.240
Frequency range (MHz)	$f_L > 13.553$	13.55862	Test Result
	$f_H < 13.567$	13.56126	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		Test Frequency (MHz)	
NFC Tx		13.56	
 Ref: 10 dBm Att: 30 dB RBW: 1 kHz VBW: 3 kHz SWT: 20 ms Marker 1 [T1] -4.18 dBm 13.56000000 MHz ndb [T1] 20.00 dBm SW 2.64000000 kHz Temp 1 [T1] -24.14 dBm 13.55864000 MHz Temp 2 [T1] -24.30 dBm 13.56128000 MHz Center 13.56 MHz 1 kHz/ Span 10 kHz Date: 20.DEC.2021 13:56:21		 Ref: 10 dBm Att: 30 dB RBW: 1 kHz VBW: 3 kHz SWT: 20 ms Marker 1 [T1] -4.53 dBm 13.55992000 MHz OSW 2.24000000 kHz Temp 1 [T1] -15.67 dBm 13.55864000 MHz Temp 2 [T1] -16.19 dBm 13.56108000 MHz Center 13.56 MHz 1 kHz/ Span 10 kHz Date: 20.DEC.2021 13:55:22	
20dB Bandwidth (kHz)	2.640	99% OccupiedBW(kHz)	2.240
Frequency range (MHz)	$f_L > 13.553$	13.55864	Test Result
	$f_H < 13.567$	13.56128	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.

B2. Test Result of Frequency Stability
<Sample 1>

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
110	13.559940	-20	0	13.560030
93.5	13.559940		2	13.560020
126.5	13.559940		5	13.560040
			10	13.560020
		-10	0	13.560000
			2	13.560000
			5	13.560020
			10	13.560000
		0	0	13.559980
			2	13.559980
			5	13.559980
			10	13.559980
		10	0	13.559960
			2	13.559960
			5	13.559960
			10	13.559960
		20	0	13.559930
			2	13.559940
			5	13.559930
			10	13.559960
		30	0	13.559920
			2	13.559900
			5	13.559920
			10	13.559920
		40	0	13.559930
			2	13.559910
			5	13.559920
			10	13.559920



Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
		50	0	13.559940
			2	13.559940
			5	13.559930
			10	13.559920
Max.Deviation (MHz)	-0.000060	Max.Deviation (MHz)		-0.000100
Max.Deviation (ppm)	-4.4248	Max.Deviation (ppm)		-7.3746
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 (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
110	13.559960	-20	0	13.560060
93.5	13.559960		2	13.560060
126.5	13.559960		5	13.560060
			10	13.560040
		-10	0	13.560040
			2	13.560030
			5	13.560040
			10	13.560040
		0	0	13.560020
			2	13.560010
			5	13.560020
			10	13.560020
		10	0	13.559980
			2	13.560000
			5	13.559990
			10	13.560000
		20	0	13.559960
			2	13.559970
			5	13.559960
			10	13.559960
		30	0	13.559940
			2	13.559920
			5	13.559930
			10	13.559940
		40	0	13.559920
			2	13.559920
			5	13.559920
			10	13.559920

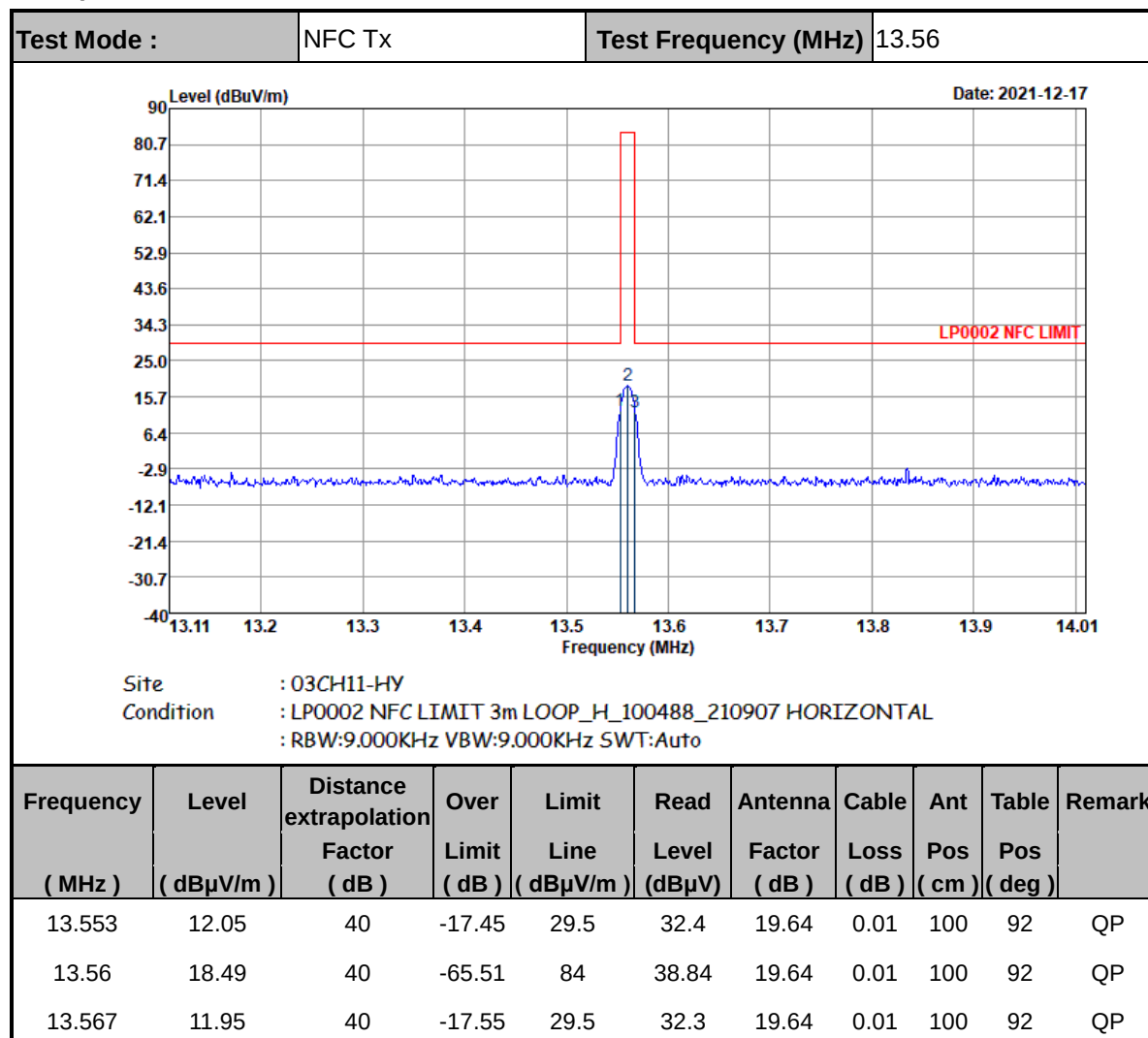


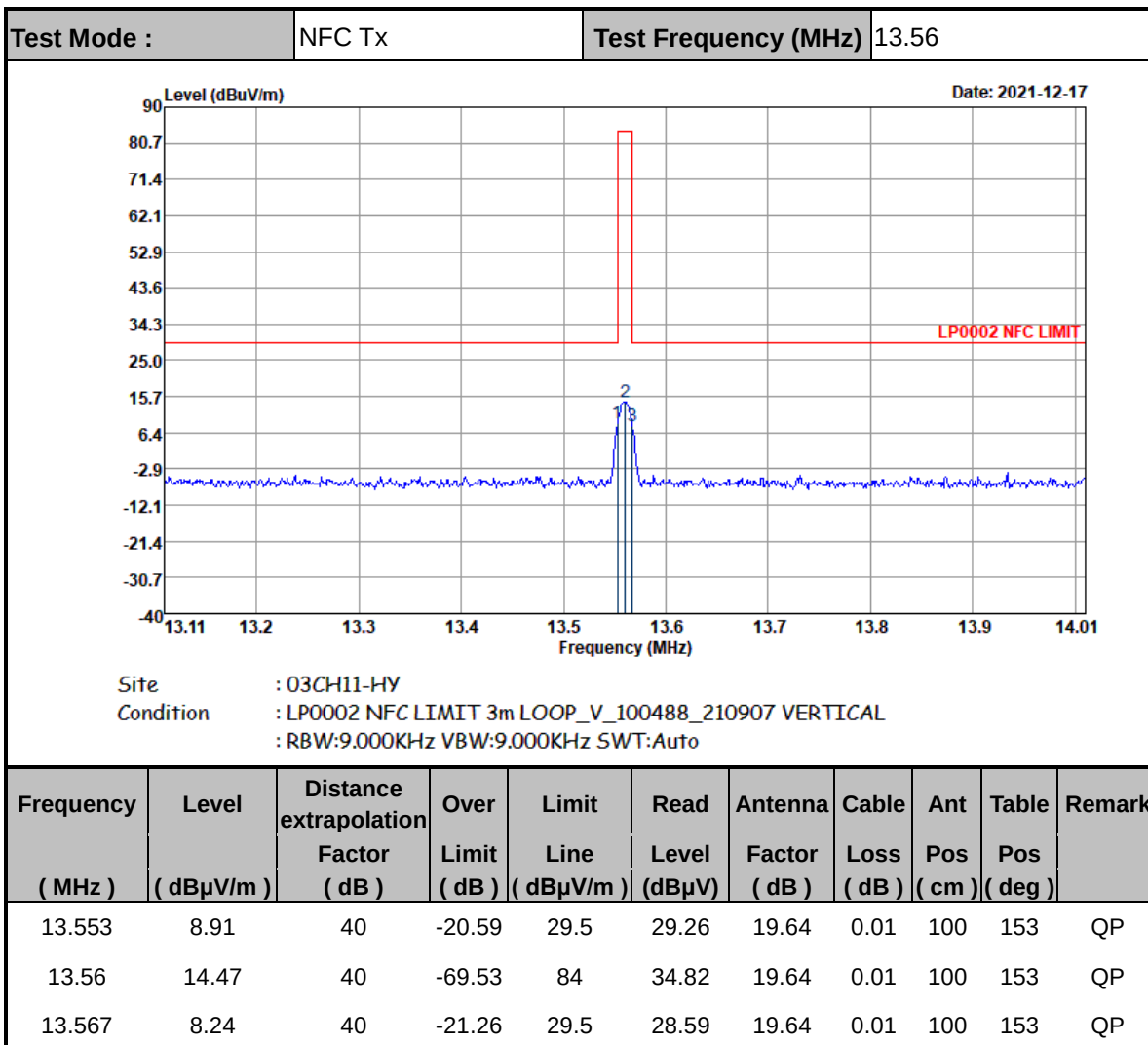
Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
		50	0	13.559950
			2	13.559940
			5	13.559930
			10	13.559940
Max.Deviation (MHz)	-0.000040	Max.Deviation (MHz)		-0.000080
Max.Deviation (ppm)	-2.9499	Max.Deviation (ppm)		-5.8997
Limit	FS < ±100 ppm	Limit		FS < ±100 ppm
Test Result	PASS	Test Result		PASS

Appendix C. Test Results of Radiated Test Items

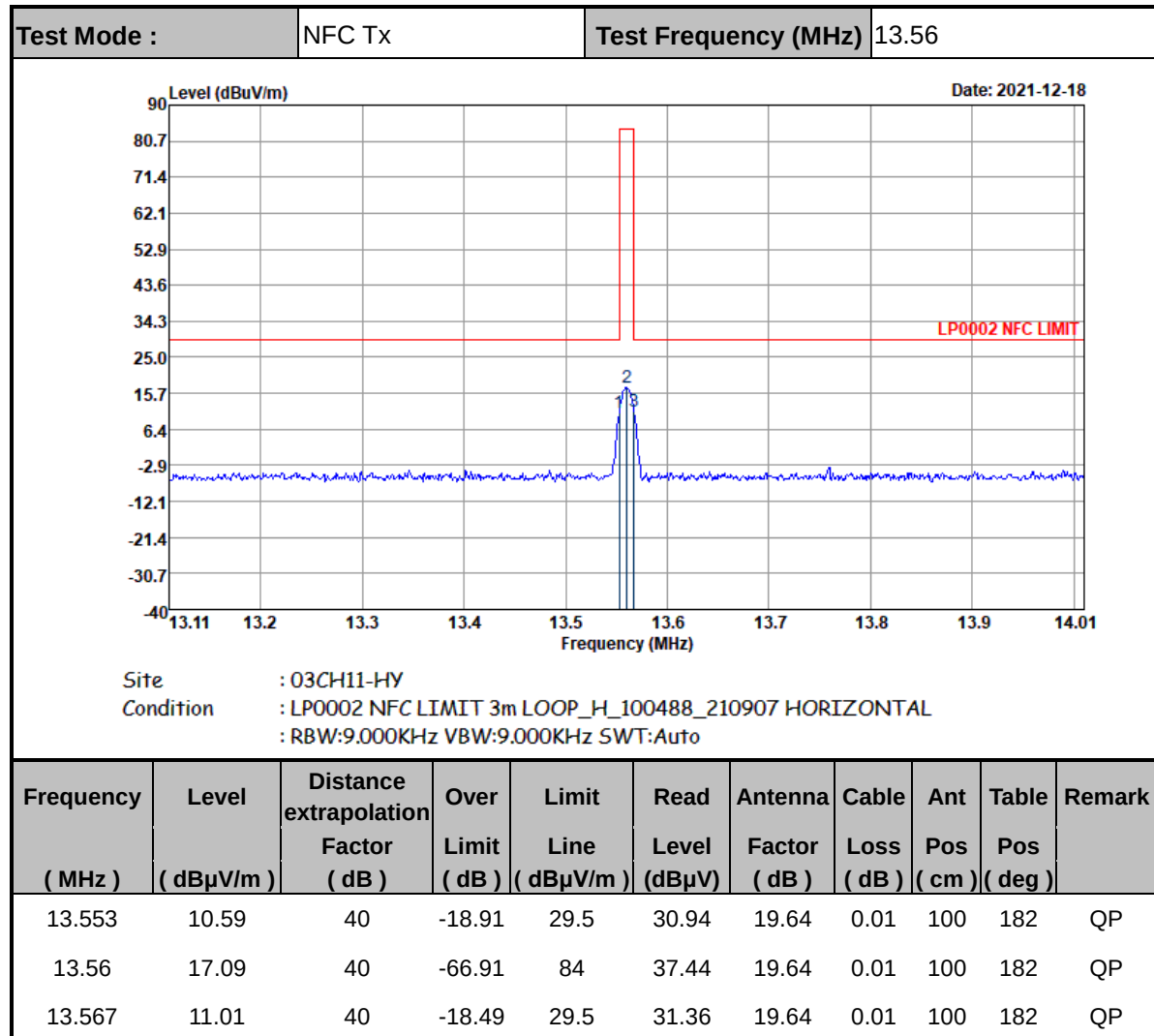
C1. Test Result of Field Strength of Fundamental Emissions

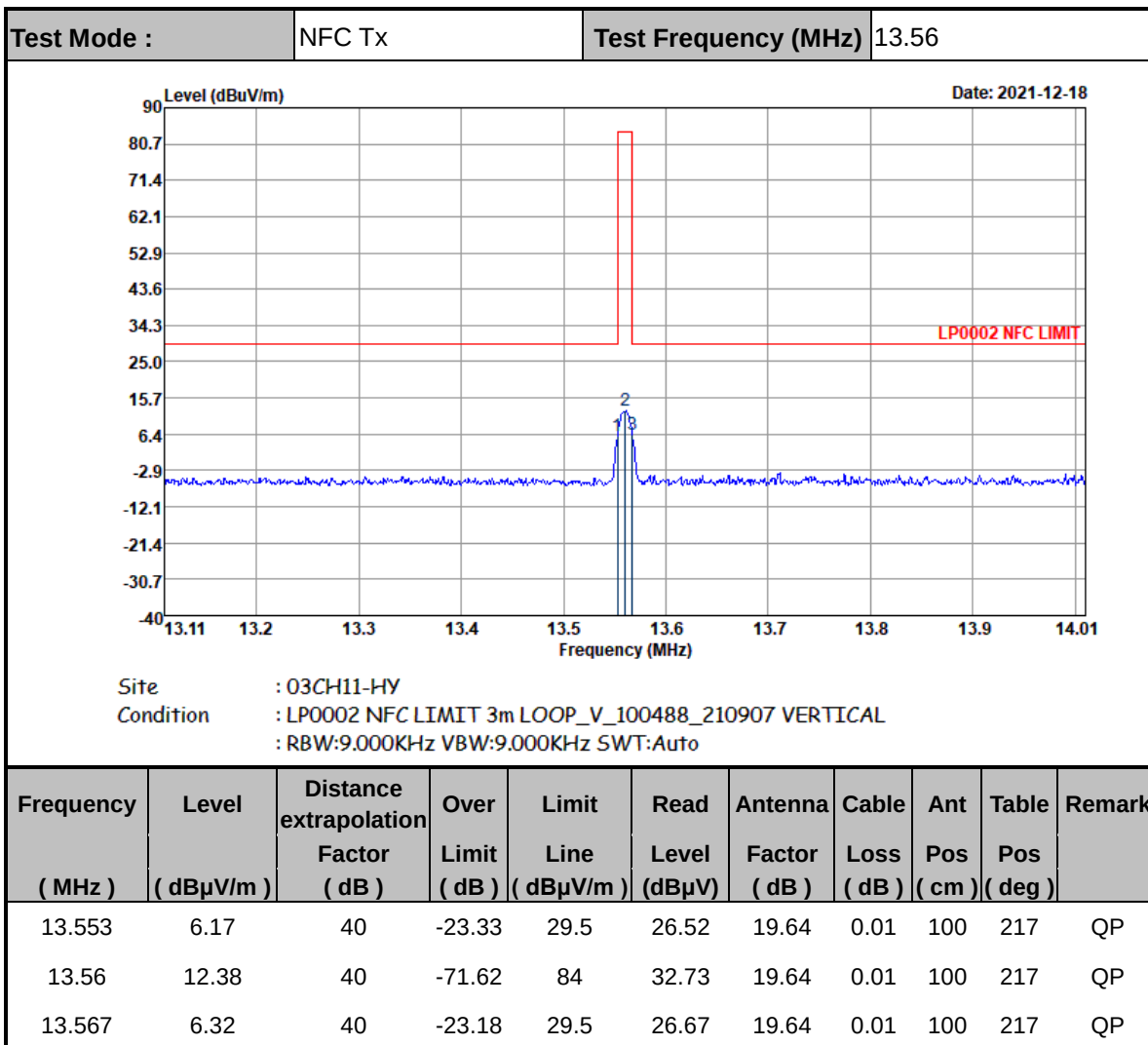
<Sample 1>



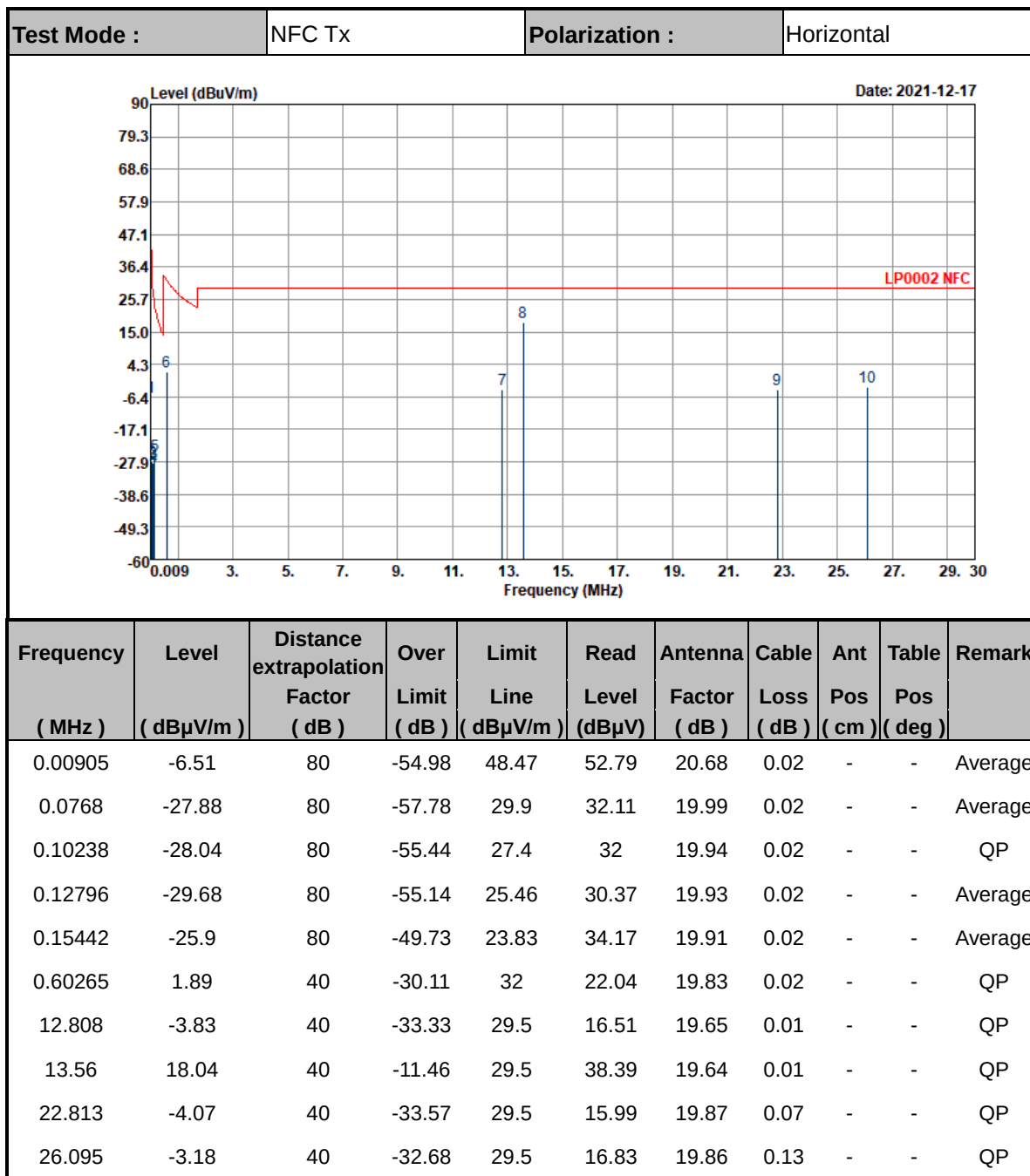

Note :

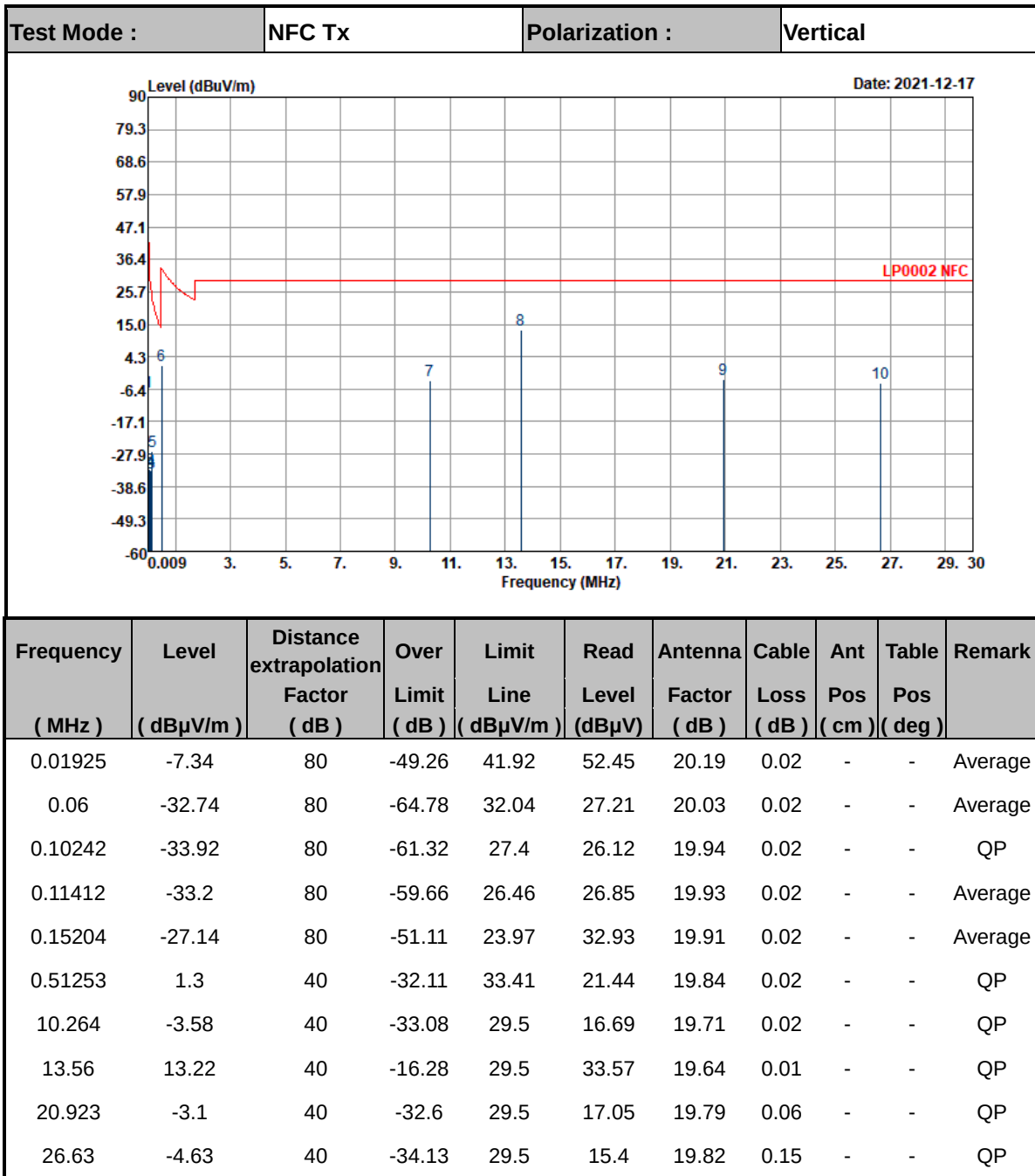
1. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
2. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.

<Sample 2>


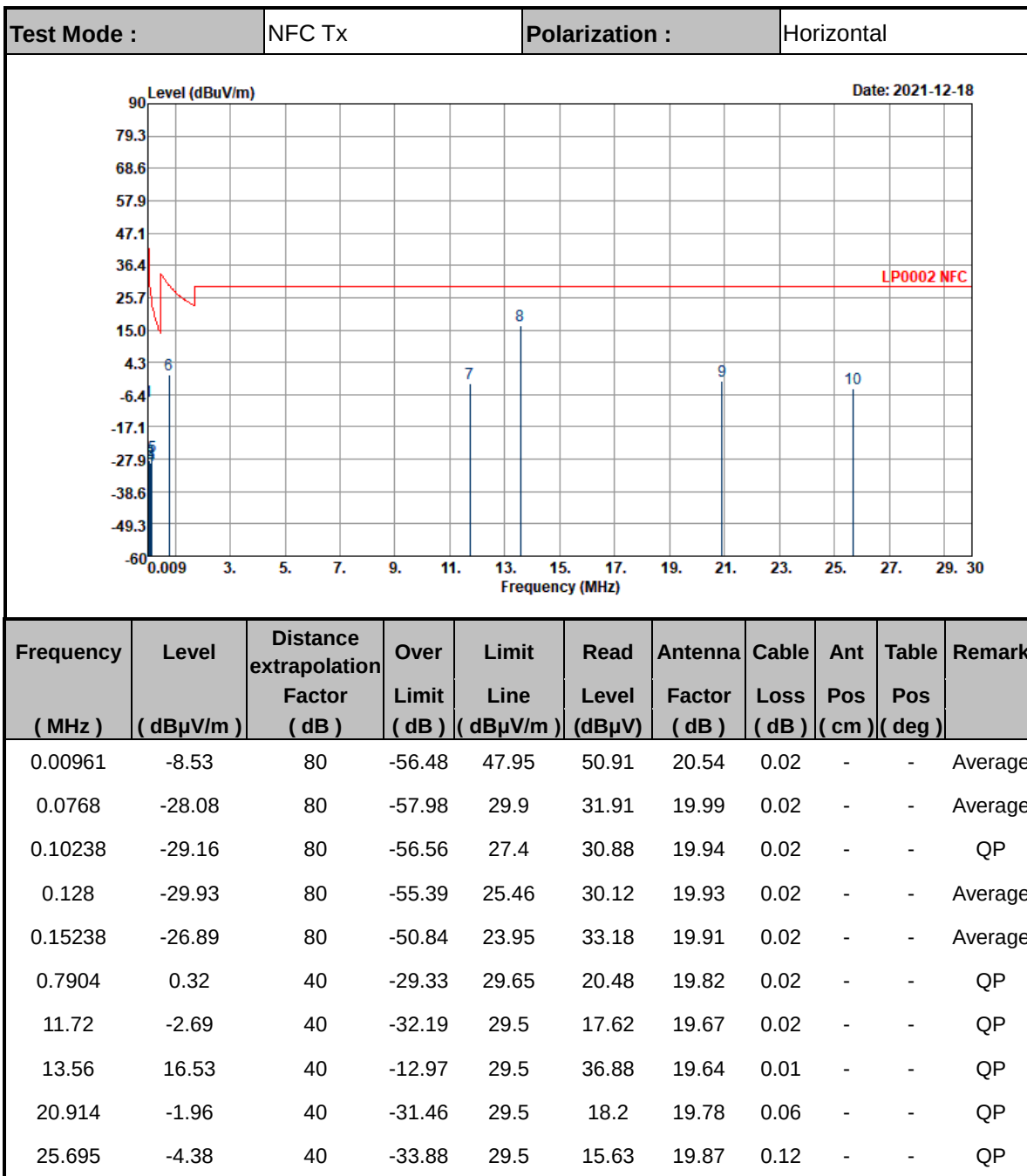

Note :

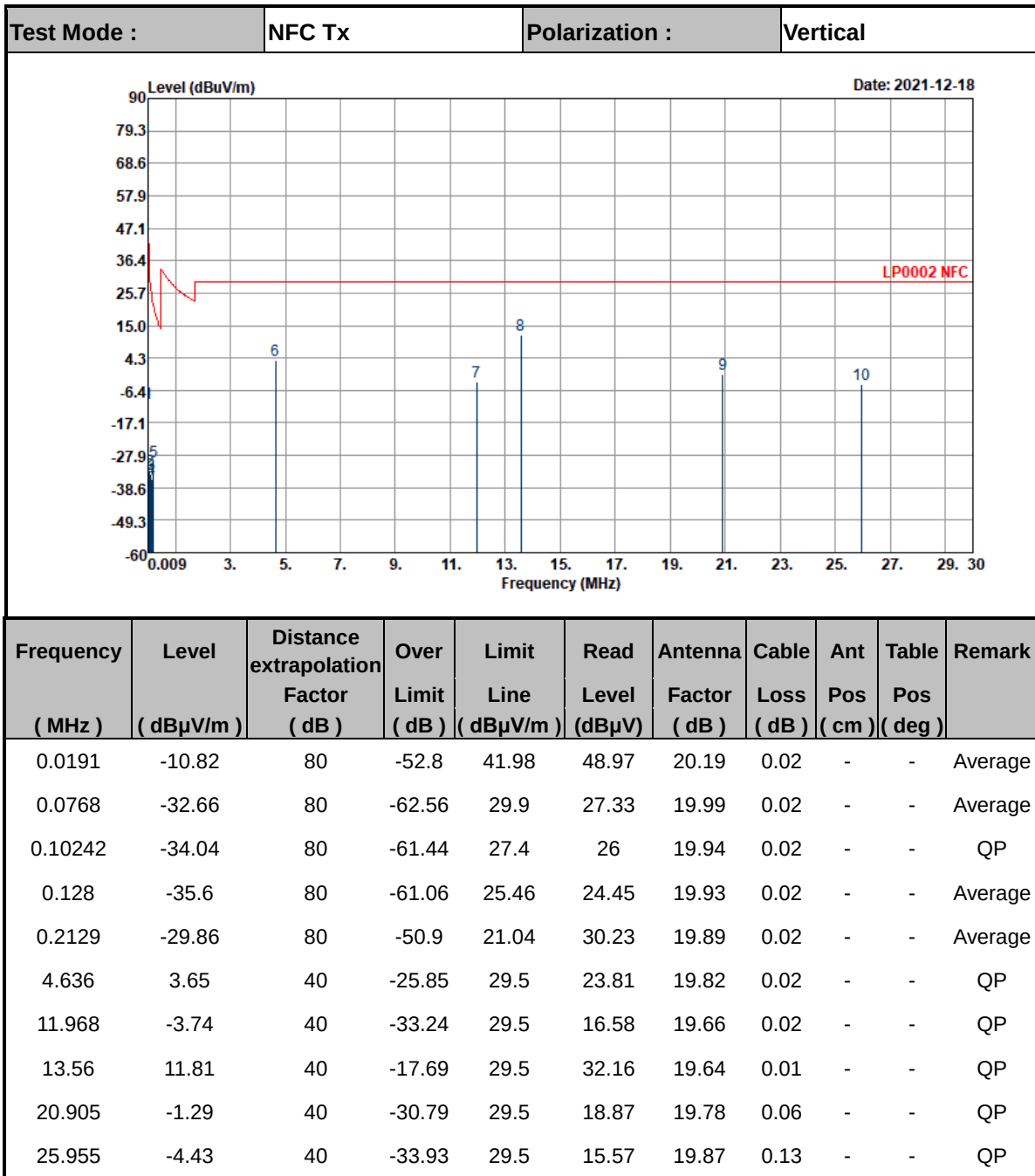
1. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
2. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.

C2. Results of Radiated Spurious Emissions (9 kHz~30MHz)
<Sample 1>


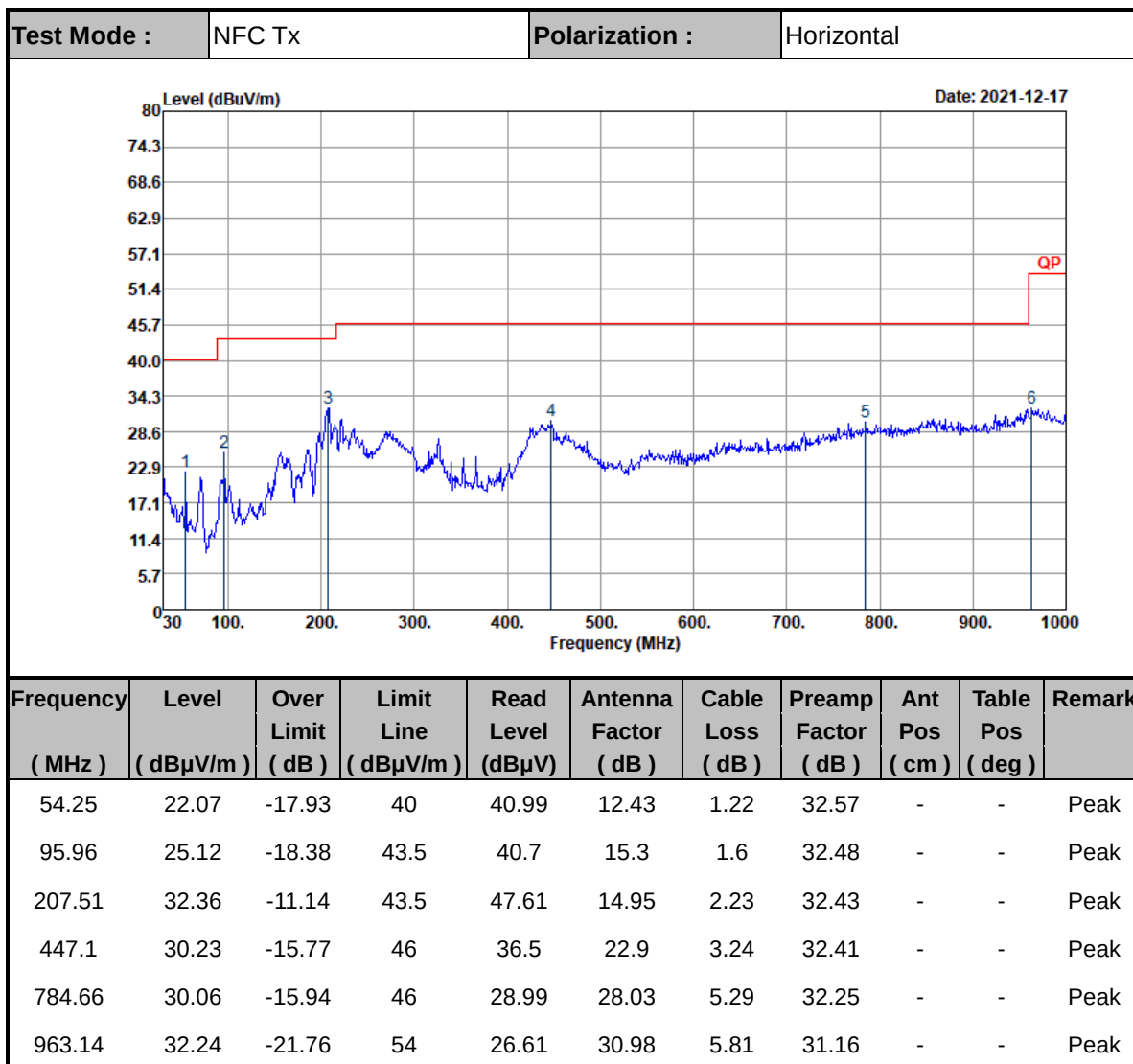

Note :

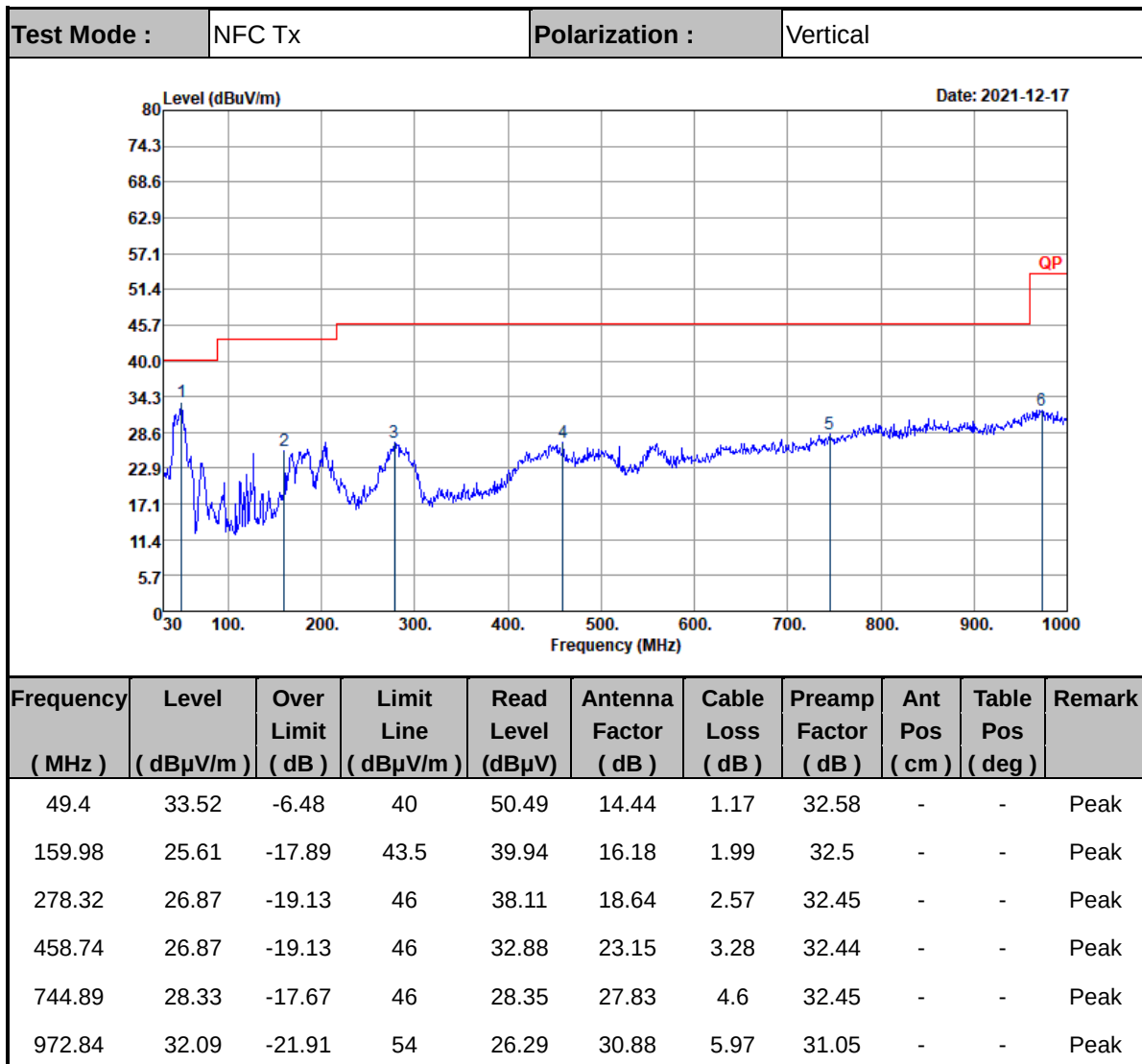
1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB)
3. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation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

<Sample 2>


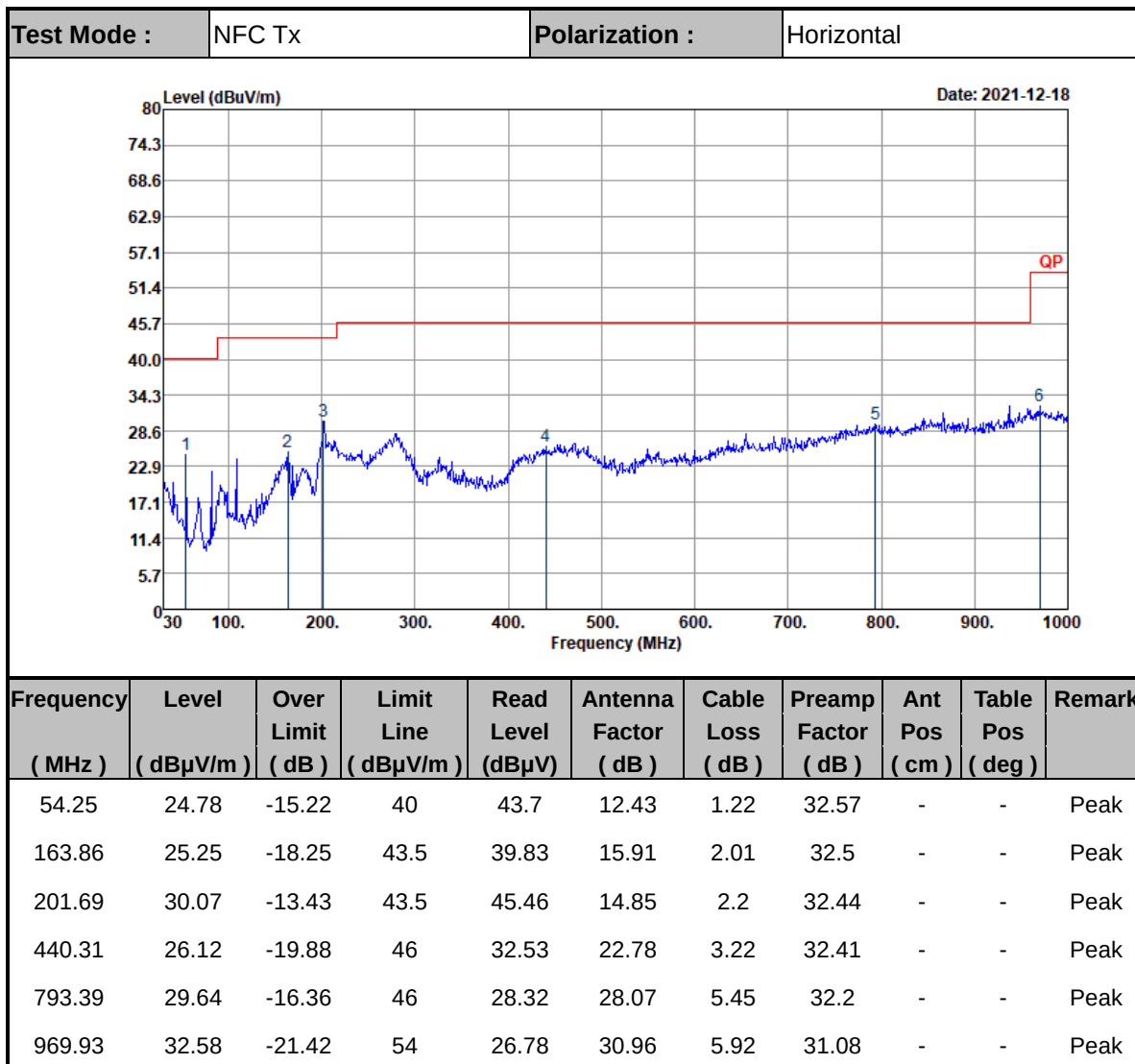

Note :

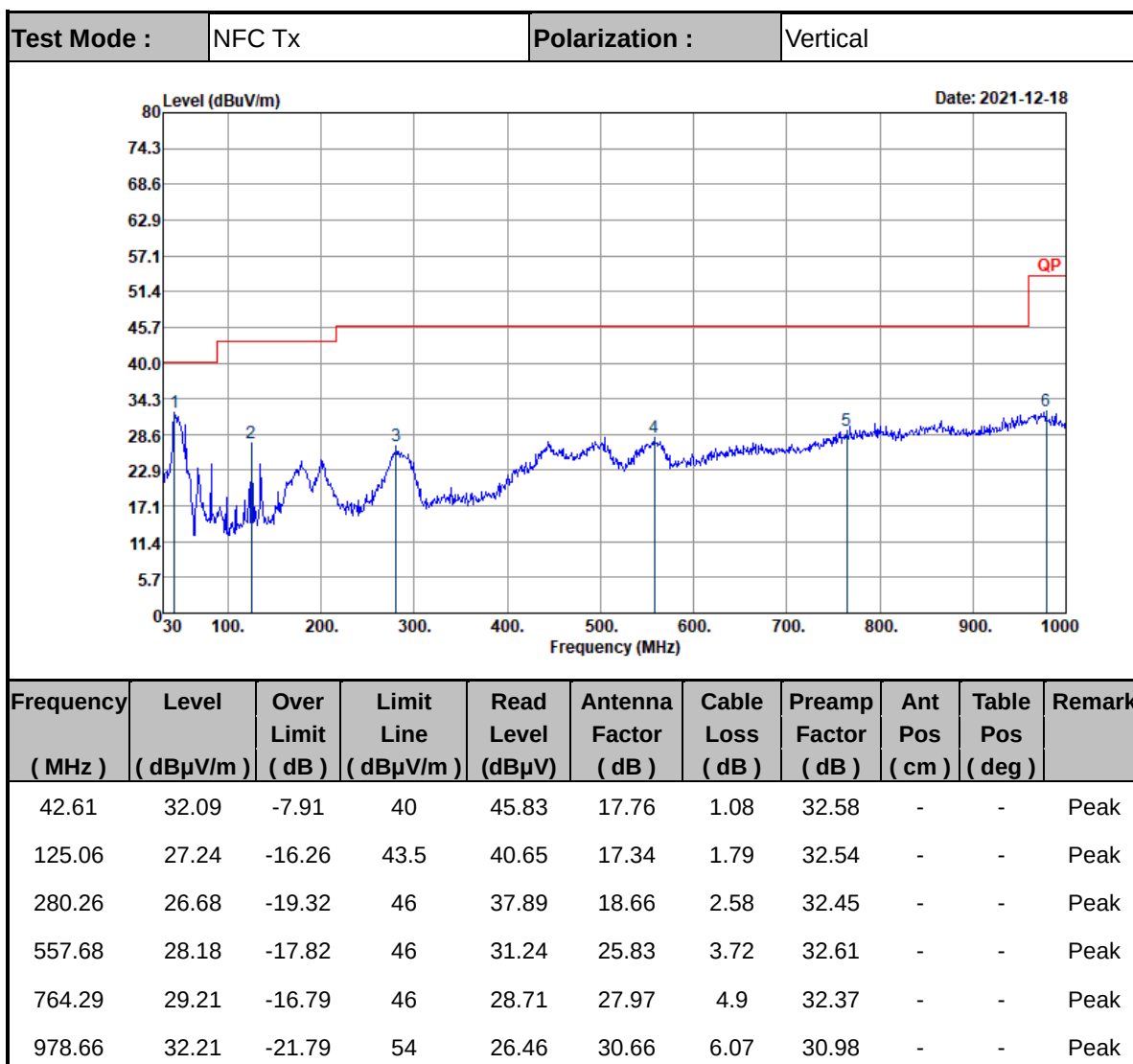
1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
3. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.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



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.

Annex. A Receiver Radiated Emission Measurement

A.1 Limit of Receiver Radiated Emission

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

A.2 Measuring Instruments

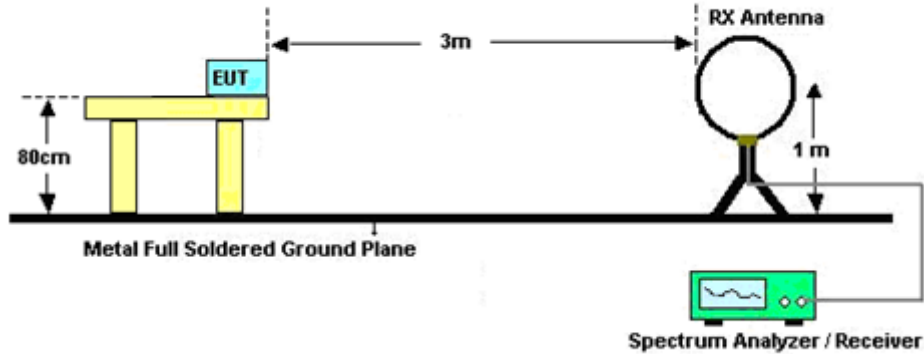
See list of measuring equipment of this test report.

A.3 Test Procedures

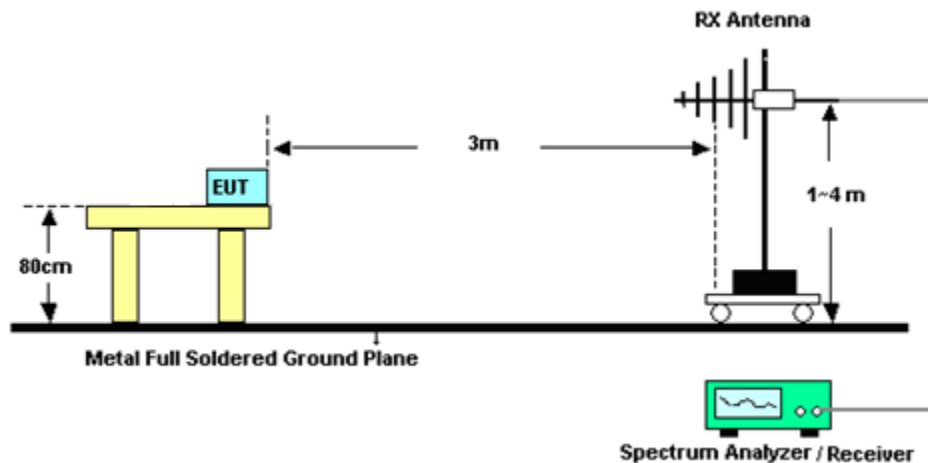
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBμV/m) = 20 log Emission level (μV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

A.4 Test Setup

For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz

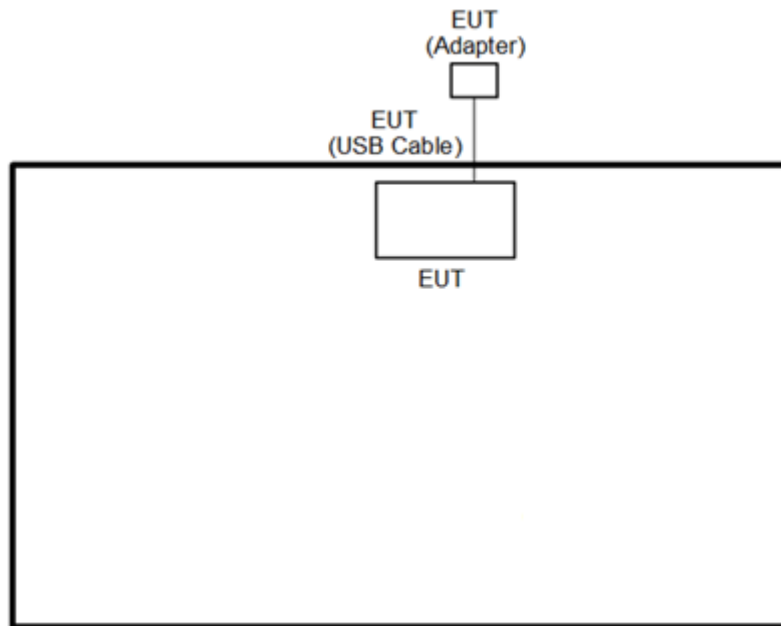


A.5 Test Result of Receiver Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per NCC LP0002 section 6.13 was not reported.

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.

A.6 Connection Diagram of Test System



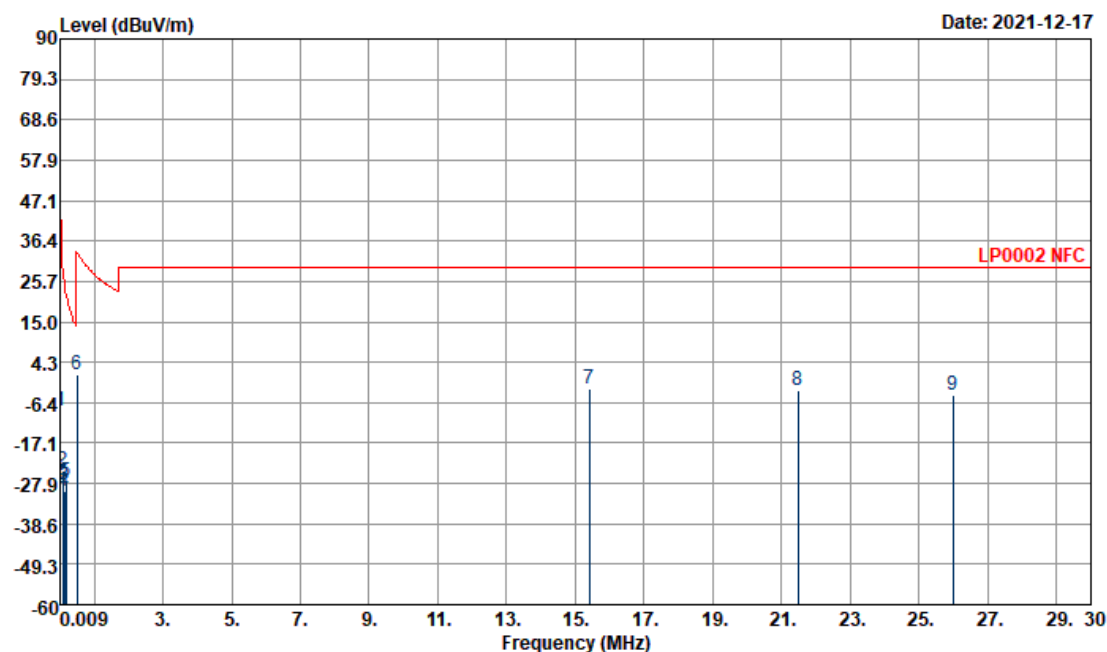
A.7 Test Result Results of Receiver Radiated Spurious Emissions

Test Engineer :	James Chiu	Temperature :	20.6~21.6°C
		Relative Humidity :	53.4~67.3%
Frequency :	49.400 MHz	Margin :	Under 6.86 dB

<Sample 1>

<For 9 kHz ~ 30 MHz>

Test Mode :	NFC Rx	Polarization :	Horizontal
--------------------	--------	-----------------------	------------

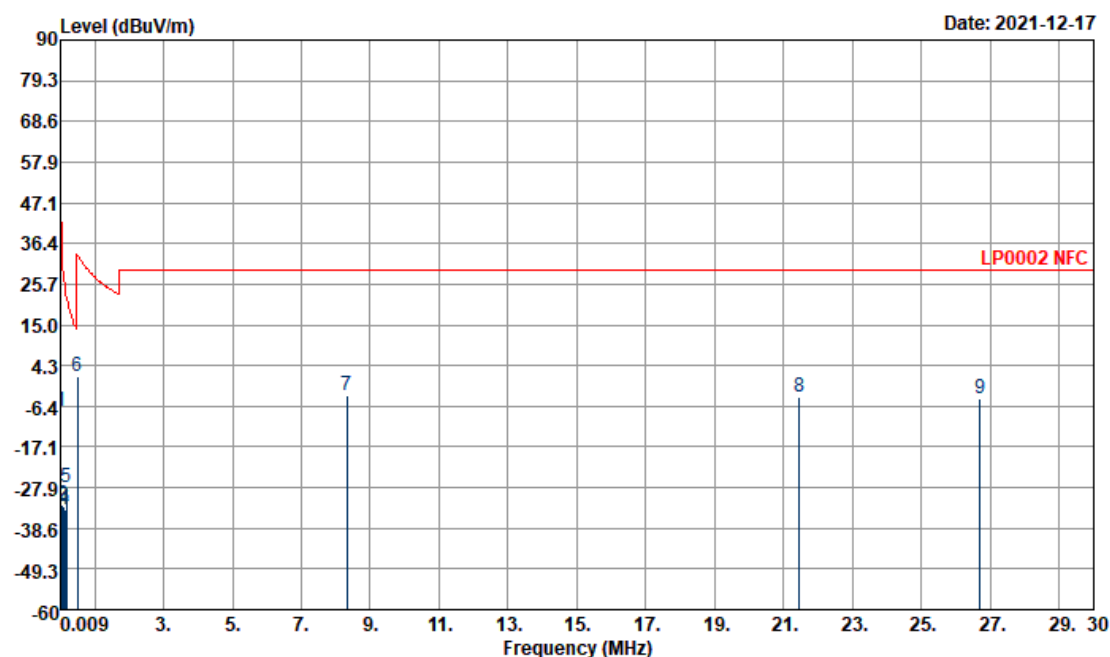


Site : 03CH11-HY

Condition : LP0002 NFC 3m LOOP_H_100488_210907 HORIZONTAL

Frequency (MHz)	Level (dBuV/m)	Distance extrapolation Factor (dB)	Over Limit (dB)	Limit Line (dBuV/m)	Read Level (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.00966	-8.65	80	-56.55	47.9	50.8	20.53	0.02	-	-	Average
0.08829	-24.69	80	-53.38	28.69	35.33	19.96	0.02	-	-	Average
0.10238	-28.34	80	-55.74	27.4	31.7	19.94	0.02	-	-	QP
0.12796	-29.91	80	-55.37	25.46	30.14	19.93	0.02	-	-	Average
0.18026	-27.26	80	-49.75	22.49	32.82	19.9	0.02	-	-	Average
0.51253	1.18	40	-32.23	33.41	21.32	19.84	0.02	-	-	QP
15.416	-2.9	40	-32.4	29.5	17.47	19.62	0.01	-	-	QP
21.49	-3.05	40	-32.55	29.5	17.07	19.82	0.06	-	-	QP
25.985	-4.23	40	-33.73	29.5	15.77	19.87	0.13	-	-	QP

Test Mode :	NFC Rx	Polarization :	Vertical
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Site : 03CH11-HY

Condition : LP0002 NFC 3m LOOP_V_100488_210907 VERTICAL

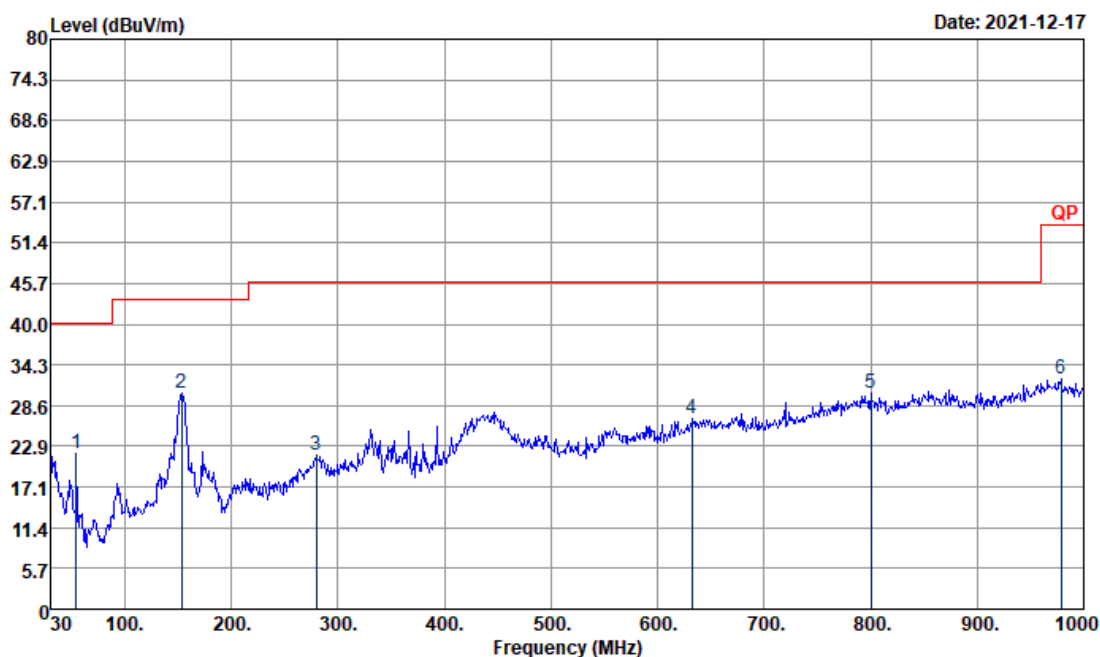
Frequency (MHz)	Level (dBμV/m)	Distance extrapolation Factor (dB)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.01925	-7.81	80	-49.73	41.92	51.98	20.19	0.02	-	-	Average
0.0768	-32.27	80	-62.17	29.9	27.72	19.99	0.02	-	-	Average
0.1024	-32.81	80	-60.21	27.4	27.23	19.94	0.02	-	-	QP
0.12796	-33.78	80	-59.24	25.46	26.27	19.93	0.02	-	-	Average
0.18026	-27.96	80	-50.45	22.49	32.12	19.9	0.02	-	-	Average
0.50502	1.36	40	-32.18	33.54	21.5	19.84	0.02	-	-	QP
8.328	-3.53	40	-33.03	29.5	16.68	19.77	0.02	-	-	QP
21.454	-4.16	40	-33.66	29.5	15.96	19.82	0.06	-	-	QP
26.69	-4.42	40	-33.92	29.5	15.62	19.81	0.15	-	-	QP

Note:

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

<For 30 MHz ~ 1 GHz>

Test Mode :	NFC Rx	Polarization :	Horizontal
--------------------	--------	-----------------------	------------

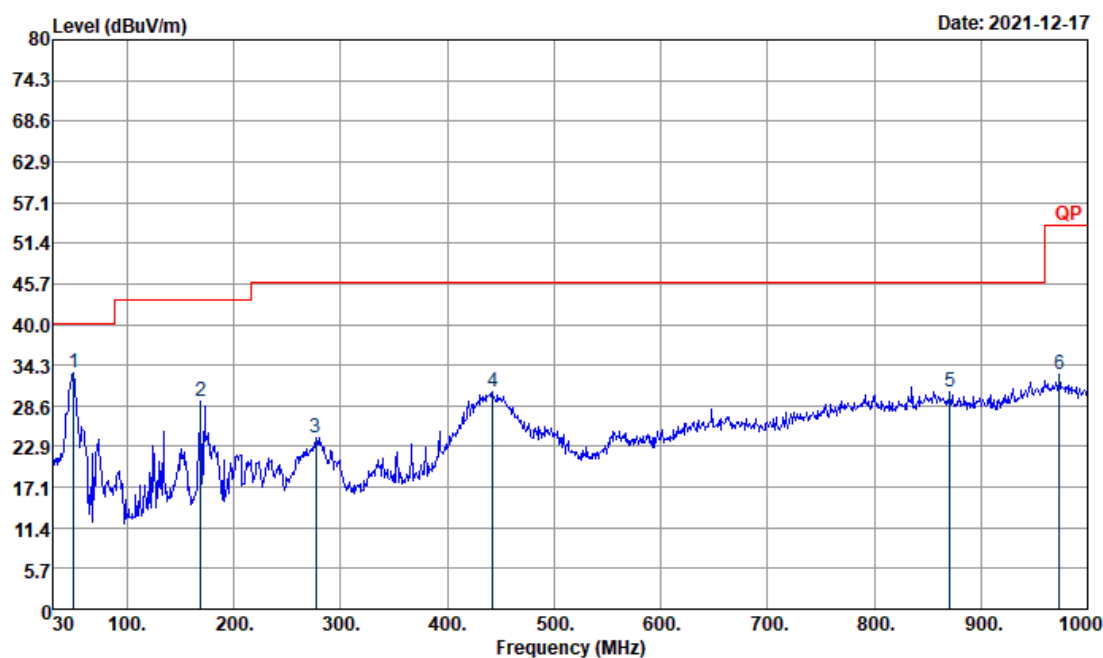


Site : 03CH11-HY

Condition : QP 3m BI-LOG 35414-211009 HORIZONTAL

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
54.25	21.95	-18.05	40	40.87	12.43	1.22	32.57	-	-	Peak
153.19	30.3	-13.2	43.5	44.15	16.7	1.95	32.5	-	-	Peak
279.29	21.59	-24.41	46	32.82	18.65	2.57	32.45	-	-	Peak
632.37	26.69	-19.31	46	28.44	26.22	4.42	32.39	-	-	Peak
800.18	30.29	-15.71	46	28.74	28.13	5.58	32.16	-	-	Peak
978.66	32.27	-21.73	54	26.52	30.66	6.07	30.98	-	-	Peak

Test Mode :	NFC Rx	Polarization :	Vertical
--------------------	--------	-----------------------	----------



Site : 03CH11-HY
Condition : QP 3m BI-LOG 35414-211009 VERTICAL

Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
49.4	33.14	-6.86	40	50.11	14.44	1.17	32.58	-	-	Peak
168.71	29.1	-14.4	43.5	44.04	15.51	2.04	32.49	-	-	Peak
276.38	24.09	-21.91	46	35.35	18.63	2.56	32.45	-	-	Peak
442.25	30.54	-15.46	46	36.91	22.82	3.22	32.41	-	-	Peak
870.99	30.58	-15.42	46	27.55	29.09	5.72	31.78	-	-	Peak
973.81	32.94	-21.06	54	27.14	30.85	5.99	31.04	-	-	Peak

Note:

- The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
- Emission level (dBμV/m) = 20 log Emission level (μV/m).
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

—THE END—