



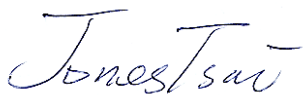
NCC RADIO TEST REPORT

Equipment : Tablet
Brand Name : Zebra
Model Name : ET51AE
Applicant : 台灣斑馬科技股份有限公司
台北市信義區松高路 9 號 13 樓
Manufacturer : Zebra Technologies Corporation
1 Zebra Plaza, Holtsville, NY 11742
Standard : NCC LP0002 (2018-01-10)

The product was received on Jun. 06, 2018, and testing was started from Jun. 20, 2018 and completed on Jan. 11, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in NCC LP0002 (2018-01-10) and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.



Approved by: Jones Tsai

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issue Date
TR891210D	01	Initial issue of report	May 03, 2019

Summary of the Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	LP0002 2.3	AC Power Line Conducted Emissions	Pass	Under limit 6.77 dB at 13.560MHz
3.2	-	20dB Bandwidth	Pass	-
	-	99% Occupied Bandwidth	Pass	-
3.3	LP0002 3.2.1.3	Frequency Stability	Pass	-
3.4	LP0002 3.2.1.2	Field Strength of Fundamental Emissions	Pass	Max level 52.99 dB μ V/m at 13.560 MHz
3.5	LP0002 2.8 3.2.1.2	Radiated Spurious Emissions	Pass	Under limit 10.57 dB at 30.000MHz
3.6	LP0002 2.11	Receiver Radiated Emission	Pass	Under limit 11.28 dB at 30.000 MHz
3.7	LP0002 2.2	Antenna Requirements	Pass	-

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 declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Joseph Lin

Report Producer: Maggie Chiang

1. General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Tablet
Brand Name	Zebra
Model Name	ET51AE
EUT supports Radios application	NFC/GNSS WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	EV1
SW Version	Windows 10
MFD	2018-04-26
EUT Stage	Identical Prototype

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

Specification of Accessories				
Battery	Brand Name	Aava	Model Name	AMME3735

Supported Unit Used in Test Configuration and System				
AC Adapter	Brand Name	PHIHONG	Model Name	AQ18A-59CFA
USB Cable	Brand Name	PHIHONG	Model Name	UES-1001A160-R

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	13.553 ~ 13.567MHz
Channel Number	1
20dBW	2.64 KHz
99%OBW	2.26 KHz
Antenna Type	Loop Antenna
Type of Modulation	ASK

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

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	Sporton Site No.		
	TH03-HY	CO05-HY	03CH07-HY
Test Engineer	Louis Chung	Kai-Chun Chu	Stan Hsieh and Jesse Wang
Temperature	22~24°C	21~25°C	22~24°C
Relative Humidity	53~55%	51~55%	51~53%

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

1.5 Applicable Standards

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

- ♦ NCC LP0002 (2018-01-10)
- ♦ FCC Part 15 Subpart C §15.225
- ♦ ANSI C63.10-2013

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.

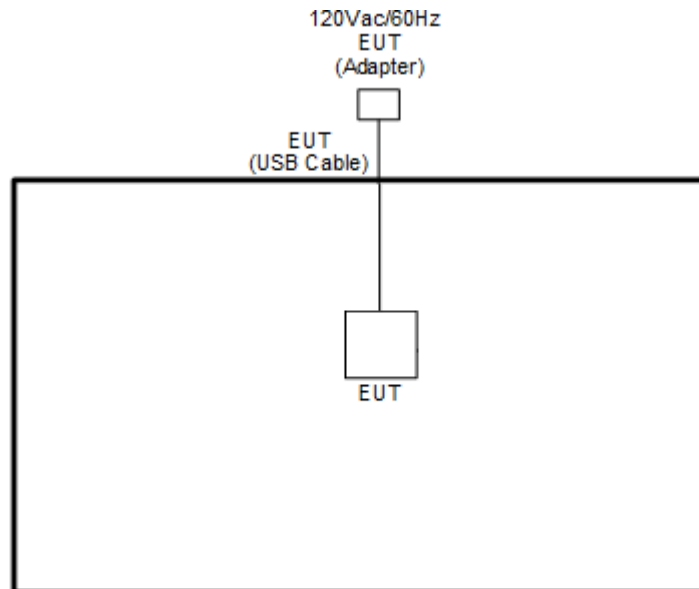
Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

The EUT pre-scanned in four NFC type, A, B, F, V. The worst type (type F) was recorded in this report. Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Y plane as worst plane) from all possible combinations.

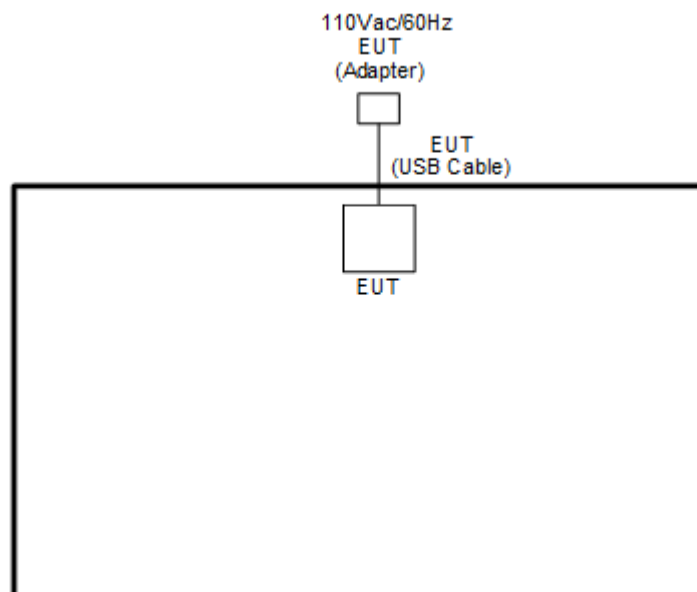
Test Cases	
AC Conducted Emission	Mode 1: WLAN (2.4GHz) Link + Bluetooth Link + USB Cable (Type C) + Adapter + GPS Rx + NFC On
Receiver Radiated Emission	Mode 1: NFC Rx

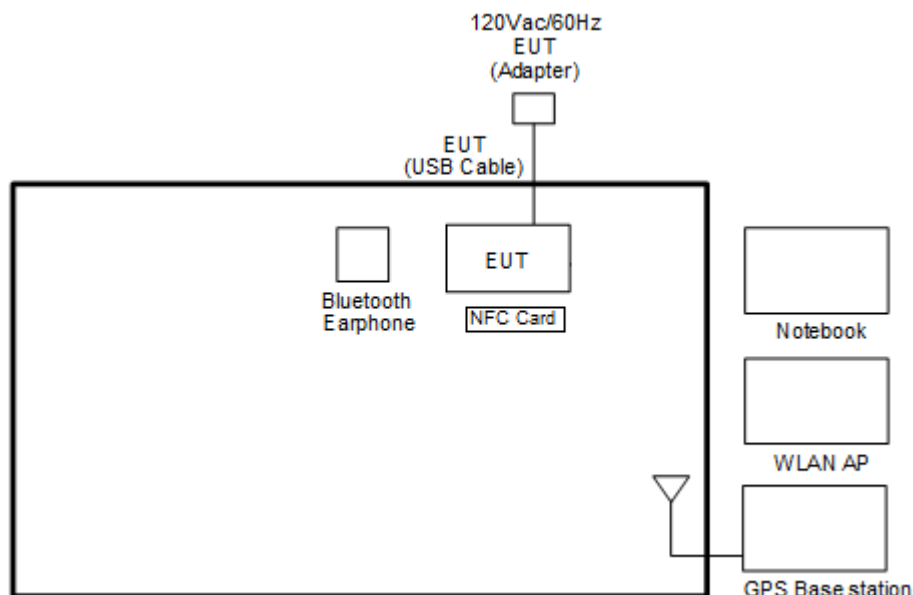
2.2 Connection Diagram of Test System

<Radiated Emission Mode>



<Receiver Radiated Emission Mode>



<AC Conducted Emission Mode>

2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	GPS Station	Pendulum	GSG-54	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
6.	NFC Card	Metro Taipei	Easy Card	N/A	N/A	N/A

2.4 EUT Operation Test Setup

The EUT was programmed to be in continuously transmitting mode.

The ancillary equipment, NFC card, is used to make the EUT (NFC) continuously transmit 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.

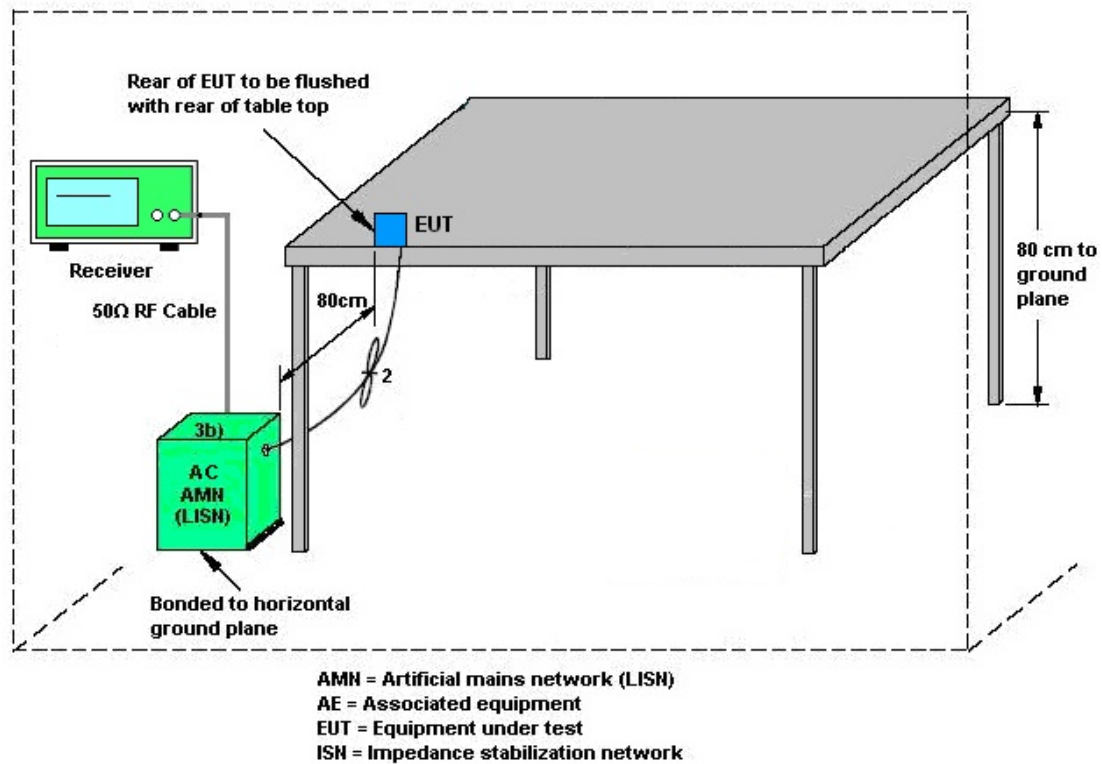
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was 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 should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) 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 20dB and 99% emission bandwidth in the specific band 13.553~13.567MHz.

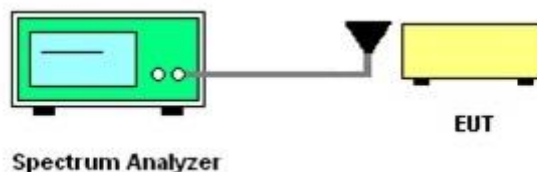
3.2.2 Measuring Instruments

See list of measuring instruments of 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 20dB 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 using a new battery.

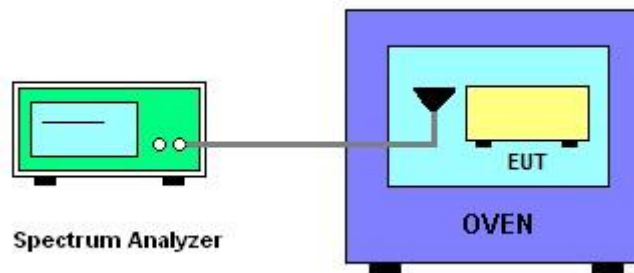
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT.
2. EUT have 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 3.2.1.1			
Description	Compliance with the spectrum mask is tested with RBW set to 9kHz.			
Freq. of Emission (MHz)	Field Strength ($\mu\text{V/m}$) at 30m	Field Strength (dB $\mu\text{V/m}$) at 30m	Field Strength (dB $\mu\text{V/m}$) at 10m	Field Strength (dB $\mu\text{V/m}$) at 3m
13.553~13.567	15848	84.0	103.08	124.0

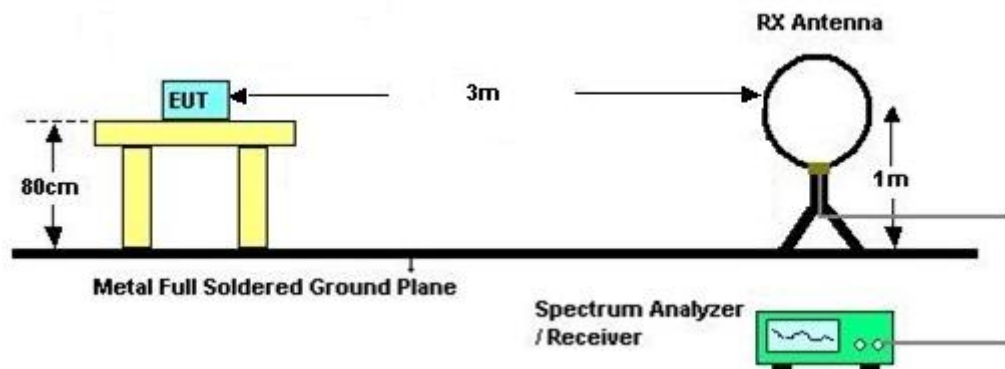
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna was 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 9kHz.
Note: Emission level (dB $\mu\text{V/m}$) = 20 log Emission level ($\mu\text{V/m}$).

3.4.4 Test Setup



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 ($\mu\text{V/m}$)	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

See list of measuring instruments of 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

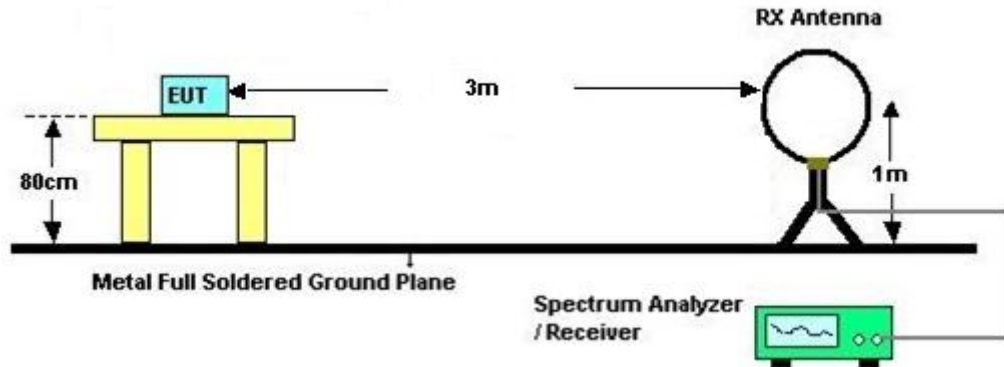
Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

3.5.4 Test Procedures

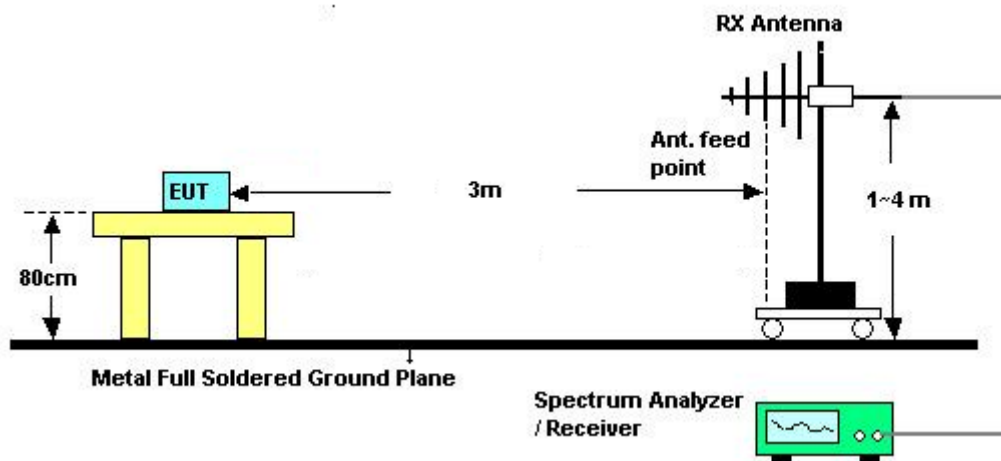
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was 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 was scan (from 1 M to 4 M) and then the turntable was 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 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. Antenna Requirements

3.5.5 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



3.5.6 Test Result of Radiated Emissions Measurement

Please refer to Appendix C

Remark: There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.6 Test of Receiver Radiated Emission Measurement

3.6.1 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

3.6.2 Measuring Instruments

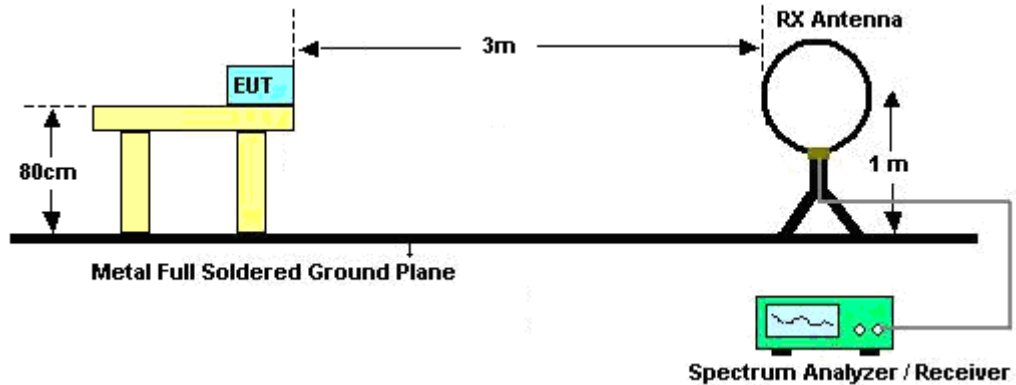
See list of measuring instruments of this test report.

3.6.3 Test Procedures

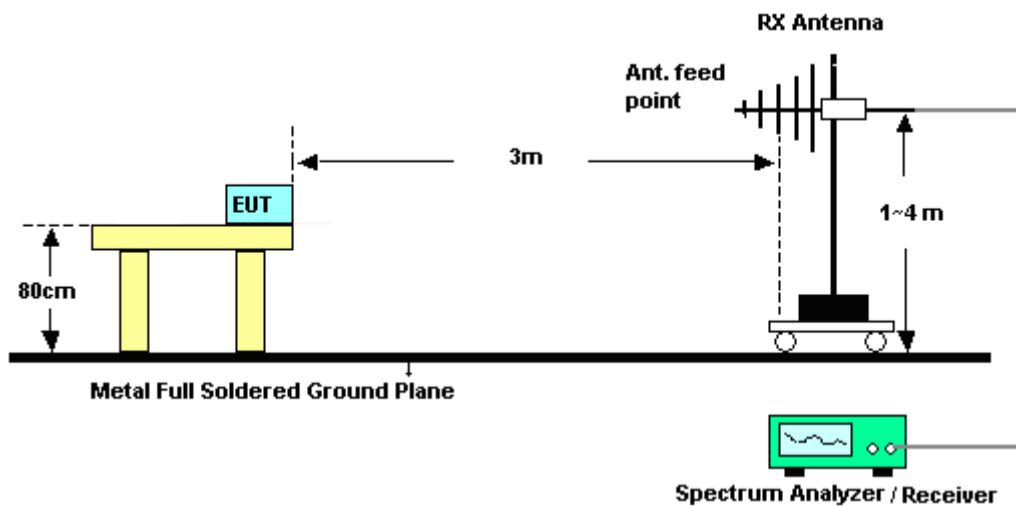
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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

3.6.4 Test Setup

For radiated emissions below 30MHz



For radiated emissions above 30MHz



3.6.5 Test Result of Receiver Radiated Spurious Emission

Please refer to Appendix C

Remark: There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.7 Antenna Requirements

3.7.1 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 LP0002 Section 2.2.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	AC POWER	AFC-500W	F104070011	50Hz~60Hz	Mar. 21, 2018	Jun. 21, 2018	Mar. 20, 2019	Conducted (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101329	9kHz~30GHz	Jun. 26, 2017	Jun. 21, 2018	Jun. 25, 2018	Conducted (TH03-HY)
Temperature Chamber	ESPEC	SU-641	92013721	-30°C ~70°C	Dec. 06, 2017	Jun. 21, 2018	Dec. 05, 2019	Conducted (TH03-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jun. 20, 2018	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	3.6GHz	Dec. 08, 2017	Jun. 20, 2018	Dec. 07, 2018	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 30, 2017	Jun. 20, 2018	Nov. 29, 2018	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jun. 20, 2018	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 03, 2018	Jun. 20, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 03, 2018	Jun. 20, 2018	Jan. 02, 2019	Conduction (CO05-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800N 1D01N-06	35419&03	30MHz to 1GHz	Dec. 18, 2017	Jun. 20, 2018~ Jun. 21, 2018	Dec. 17, 2018	Radiation (03CH07-HY)
Bilog Antenna	TESEQ	CBL 6111D&00800N 1D01N-06	35419&03	30MHz to 1GHz	Dec. 17, 2018	Jan. 11, 2019	Dec. 16, 2019	Radiation (03CH07-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Nov. 10, 2017	Jun. 20, 2018~ Jun. 21, 2018	Nov. 09, 2018	Radiation (03CH07-HY)
Loop Antenna	TESEQ	HLA 6120	31244	9 kHz~30 MHz	May 29, 2018	Jan. 11, 2019	May 28, 2019	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10MHz-1GHz	May 21, 2018	Jun. 20, 2018~ Jan. 11, 2019	May 20, 2019	Radiation (03CH07-HY)
Spectrum Analyzer	Agilent	N9010A	MY53470118	10Hz~44GHz	Apr. 17, 2018	Jun. 20, 2018~ Jan. 11, 2019	Apr. 16, 2019	Radiation (03CH07-HY)
Antenna Mast	Max-Full	MFA520BS	N/A	1m~4m	N/A	Jun. 20, 2018~ Jan. 11, 2019	N/A	Radiation (03CH07-HY)
Turn Table	ChainTek	Chaintek 3000	N/A	0~360 Degree	N/A	Jun. 20, 2018~ Jan. 11, 2019	N/A	Radiation (03CH07-HY)
Software	Audix	E3 6.2009-8-24	RK-001042	N/A	N/A	Jun. 20, 2018~ Jan. 11, 2019	N/A	Radiation (03CH07-HY)
EMI Test Receiver	Agilent	N9038A (MXE)	MY53290053	20Hz to 26.5GHz	Jan. 16, 2018	Jun. 20, 2018~ Jan. 11, 2019	Jan. 15, 2019	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4,M Y28655/4	9KHz~30MHz	Jan. 02, 2018	Jun. 20, 2018~ Jun. 21, 2018	Jan. 01, 2019	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY24971/4,M Y28655/4	9KHz~30MHz	Jan. 01, 2019	Jan. 11, 2019	Dec. 31, 2020	Radiation (03CH07-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY28655/4, MY24971/4, MY15682/4	30MHz~1GHz	Feb. 27, 2018	Jun. 20, 2018~ Jan. 11, 2019	Feb. 26, 2019	Radiation (03CH07-HY)
Filter	Wainwright	WHK20/1000C7 /40SS	SN3	20M High Pass	Nov. 21, 2017	Jun. 20, 2018~ Jun. 21, 2018	Nov. 20, 2018	Radiation (03CH07-HY)
Filter	Wainwright	WHK20/1000C7 /40SS	SN3	20M High Pass	Nov. 02, 2018	Jan. 11, 2019	Nov. 01, 2019	Radiation (03CH07-HY)

5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.2
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Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

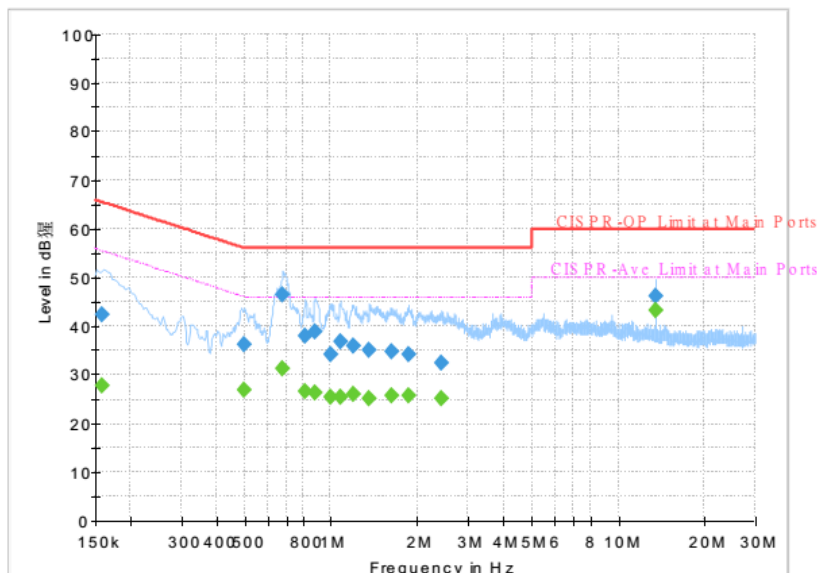
Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	3.4
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.7
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Appendix A. Test Results of Conducted Emission Test

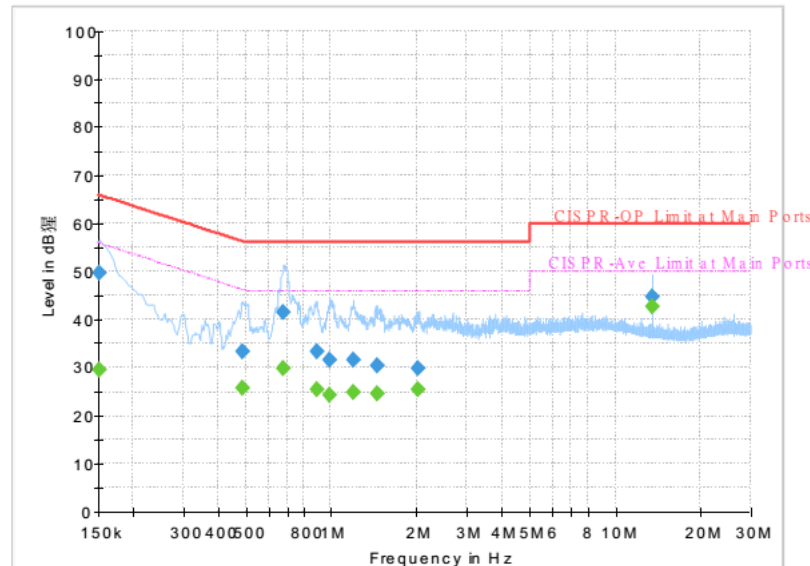
Test Engineer :	Kai-Chun Chu	Temperature :	21~25°C
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	Phase :	Line



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.159000	---	27.73	55.52	27.79	L1	OFF	19.5
0.159000	42.33	---	65.52	23.19	L1	OFF	19.5
0.498750	---	26.78	46.02	19.24	L1	OFF	19.5
0.498750	36.37	---	56.02	19.65	L1	OFF	19.5
0.678750	---	31.34	46.00	14.66	L1	OFF	19.6
0.678750	46.41	---	56.00	9.59	L1	OFF	19.6
0.811500	---	26.47	46.00	19.53	L1	OFF	19.6
0.811500	38.11	---	56.00	17.89	L1	OFF	19.6
0.874500	---	26.43	46.00	19.57	L1	OFF	19.6
0.874500	38.86	---	56.00	17.14	L1	OFF	19.6
0.991500	---	25.31	46.00	20.69	L1	OFF	19.6
0.991500	34.07	---	56.00	21.93	L1	OFF	19.6
1.077000	---	25.55	46.00	20.45	L1	OFF	19.6
1.077000	36.90	---	56.00	19.10	L1	OFF	19.6
1.198500	---	26.13	46.00	19.87	L1	OFF	19.6
1.198500	35.86	---	56.00	20.14	L1	OFF	19.6
1.358250	---	25.24	46.00	20.76	L1	OFF	19.6
1.358250	34.96	---	56.00	21.04	L1	OFF	19.6
1.614750	---	25.81	46.00	20.19	L1	OFF	19.6
1.614750	34.65	---	56.00	21.35	L1	OFF	19.6
1.862250	---	25.59	46.00	20.41	L1	OFF	19.6
1.862250	34.17	---	56.00	21.83	L1	OFF	19.6
2.431500	---	25.17	46.00	20.83	L1	OFF	19.6
2.431500	32.37	---	56.00	23.63	L1	OFF	19.6
13.560000	---	43.23	50.00	6.77	L1	OFF	20.0
13.560000	46.12	---	60.00	13.88	L1	OFF	20.0

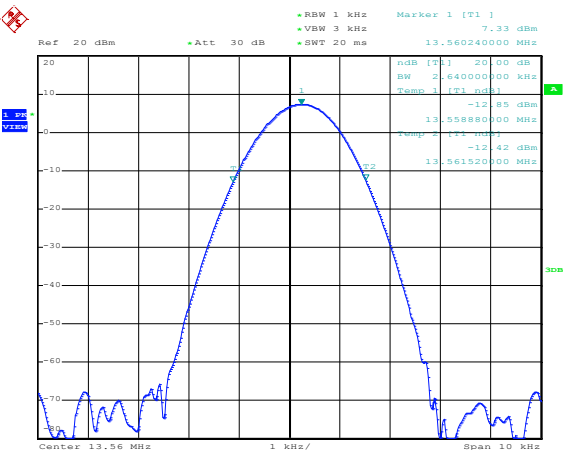
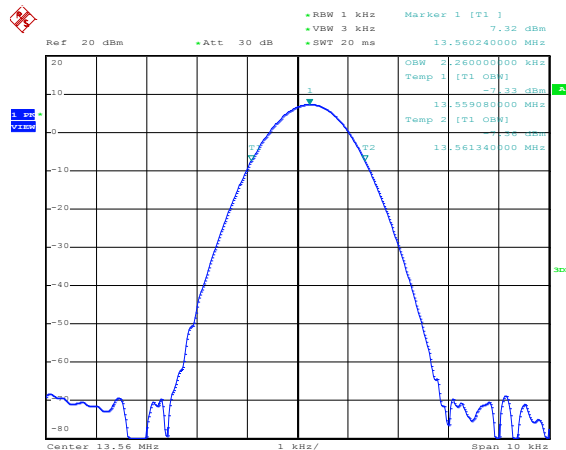
Test Engineer :	Kai-Chun Chu	Temperature :	21~25℃
		Relative Humidity :	51~55%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	29.46	55.88	26.42	N	OFF	19.5
0.152250	49.60	---	65.88	16.28	N	OFF	19.5
0.485250	---	25.59	46.25	20.66	N	OFF	19.5
0.485250	33.42	---	56.25	22.83	N	OFF	19.5
0.676500	---	29.90	46.00	16.10	N	OFF	19.6
0.676500	41.50	---	56.00	14.50	N	OFF	19.6
0.883500	---	25.45	46.00	20.55	N	OFF	19.6
0.883500	33.41	---	56.00	22.59	N	OFF	19.6
0.987000	---	24.32	46.00	21.68	N	OFF	19.6
0.987000	31.47	---	56.00	24.53	N	OFF	19.6
1.189500	---	24.74	46.00	21.26	N	OFF	19.6
1.189500	31.72	---	56.00	24.28	N	OFF	19.6
1.448250	---	24.49	46.00	21.51	N	OFF	19.6
1.448250	30.31	---	56.00	25.69	N	OFF	19.6
2.010750	---	25.29	46.00	20.71	N	OFF	19.6
2.010750	29.73	---	56.00	26.27	N	OFF	19.6
13.560000	---	42.66	50.00	7.34	N	OFF	20.1
13.560000	44.64	---	60.00	15.36	N	OFF	20.1

Appendix B. Test Results of Conducted Test Items

B1. Test Result of 20dB Spectrum Bandwidth

Test mode		NFC Tx		Test Frequency (MHz)	13.56
					
Date: 21.JUN.2018 11:31:53		Date: 21.JUN.2018 11:25:47			
20dB Bandwidth (kHz)		2.64		99% OccupiedBW(kHz)	2.26
Frequency range (MHz)		$f_L > 13.553$		13.55888	Test Result
		$f_H < 13.567$		13.56152	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

B3. Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
120	13.560160	-20	0	13.560210
102	13.560200		2	13.560240
138	13.560200		5	13.560280
			10	13.560300
		-10	0	13.560260
			2	13.560270
			5	13.560270
			10	13.560260
		0	0	13.560280
			2	13.560280
			5	13.560280
			10	13.560280
		10	0	13.560280
			2	13.560280
			5	13.560280
			10	13.560290
		20	0	13.560200
			2	13.560200
			5	13.560200
			10	13.560200
		30	0	13.560160
			2	13.560160
			5	13.560150
			10	13.560160
		40	0	13.560160
			2	13.560160
			5	13.560160
			10	13.560160

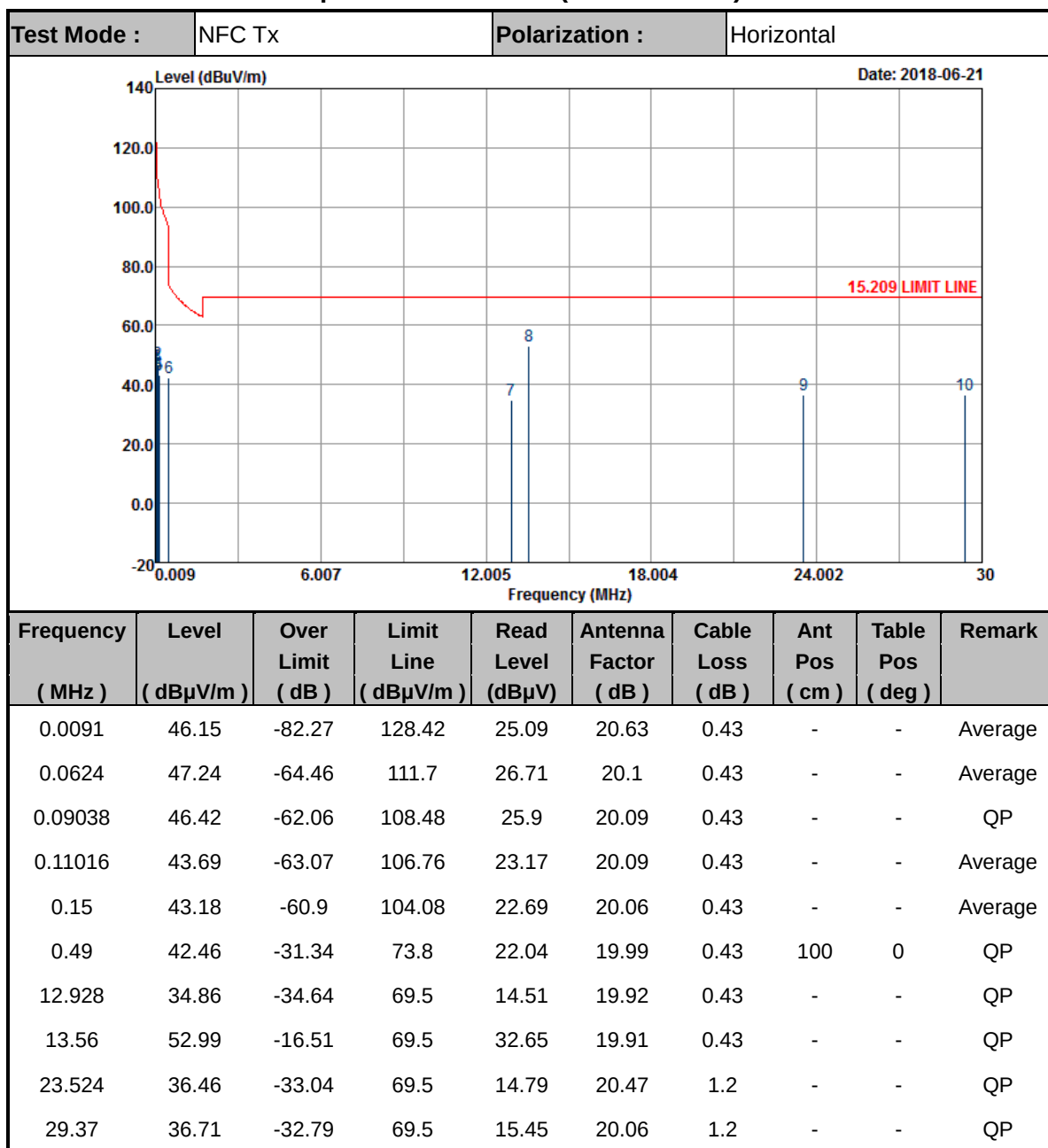


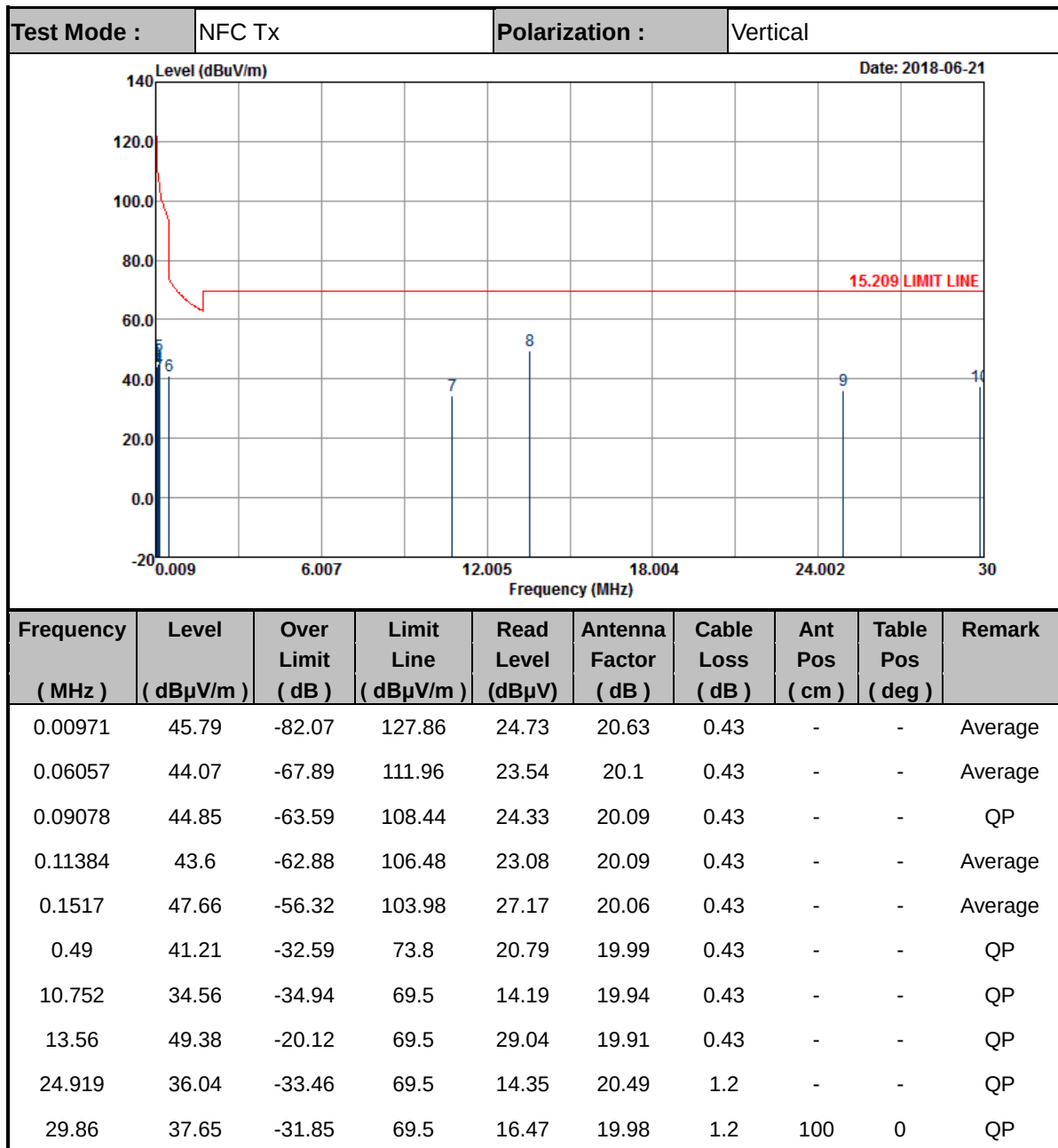
Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (°C)	Time	Measurement Frequency (MHz)
		50	0	13.560160
			2	13.560160
			5	13.560160
			10	13.560160
Max.Deviation (MHz)	0.000200	Max.Deviation (MHz)		0.000300
Max.Deviation (ppm)	14.7493	Max.Deviation (ppm)		22.1239
Limit	FS < ±100 ppm	Limit		FS < ±100 ppm
Test Result	PASS	Test Result		PASS

Appendix C. Test Results of Radiated Test Items

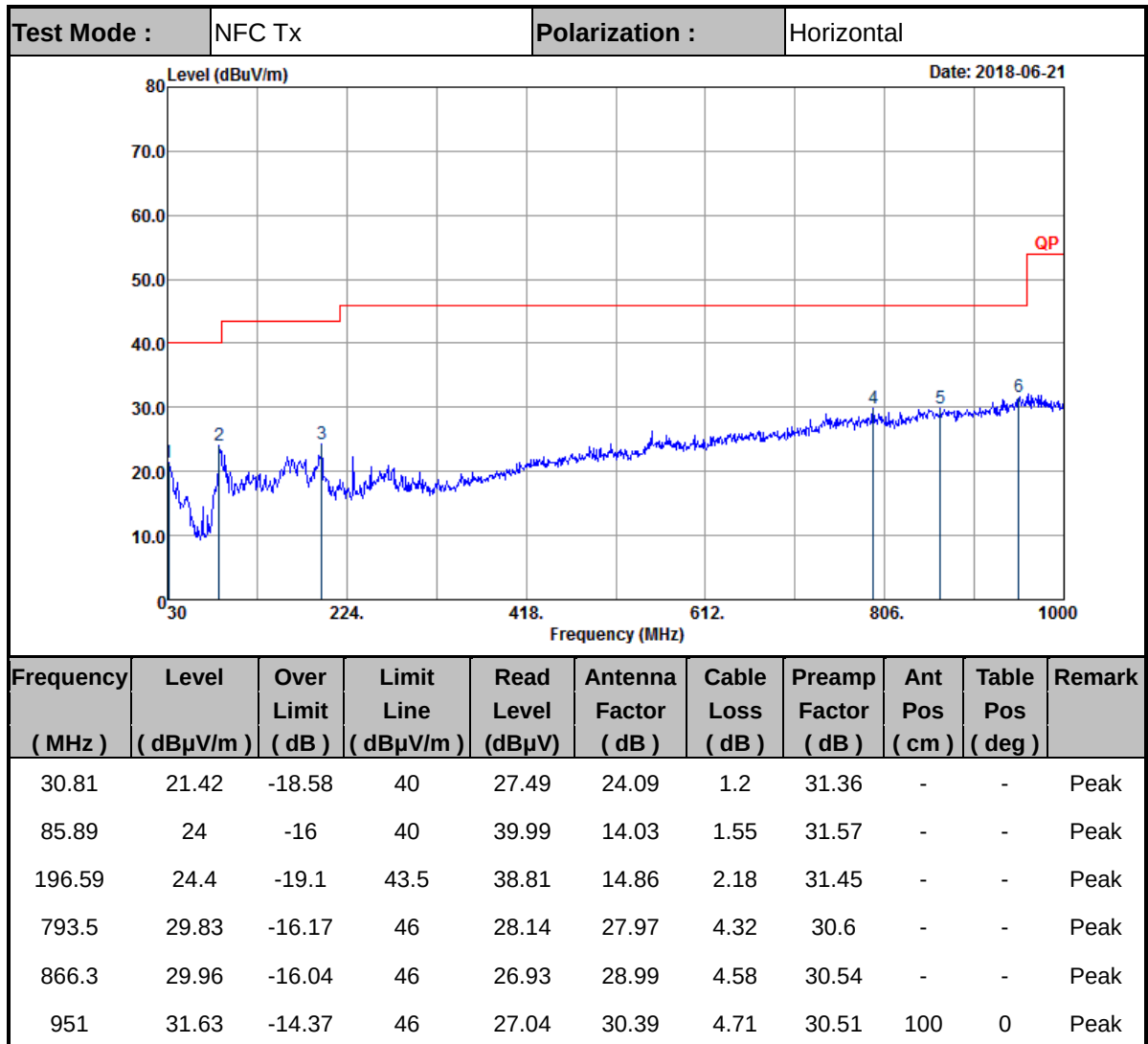
C1. Test Result of Field Strength of Fundamental Emissions

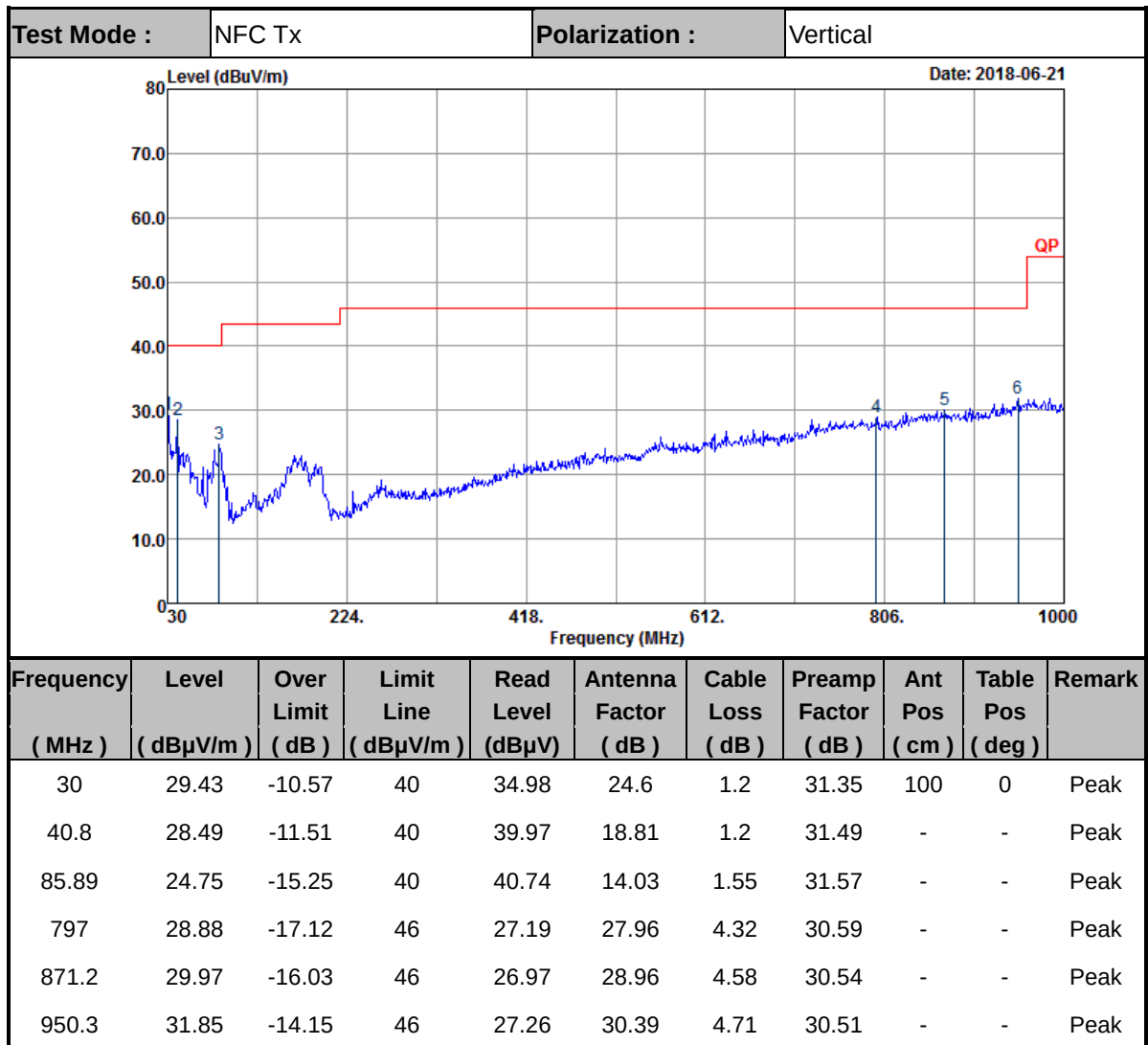
Test Mode :		NFC Tx				Test Frequency (MHz)		13.56	
</									

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


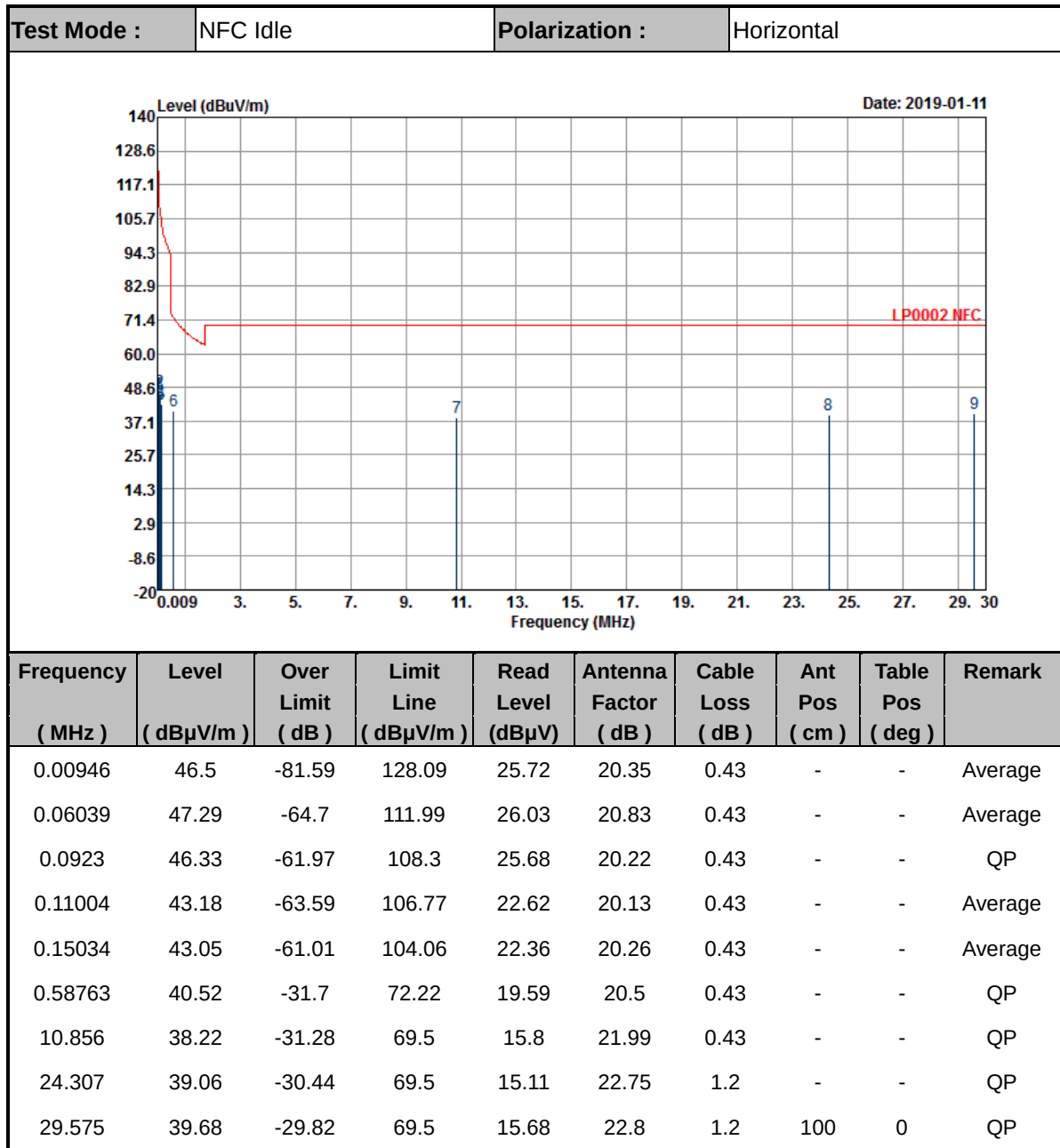

Note:

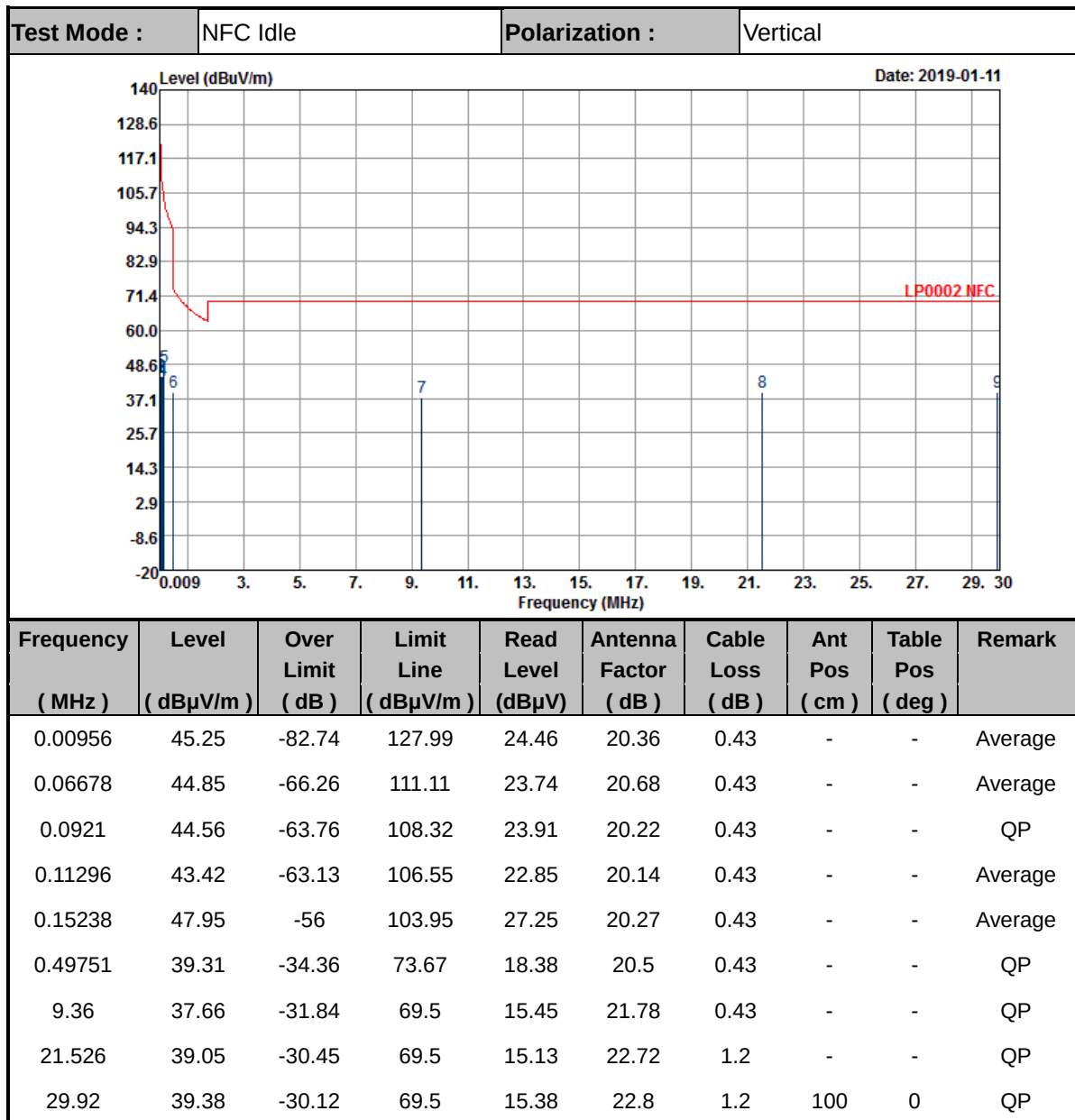
1. 13.56 MHz is fundamental signal which can be ignored.
2. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
3. Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);
4. Limit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

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


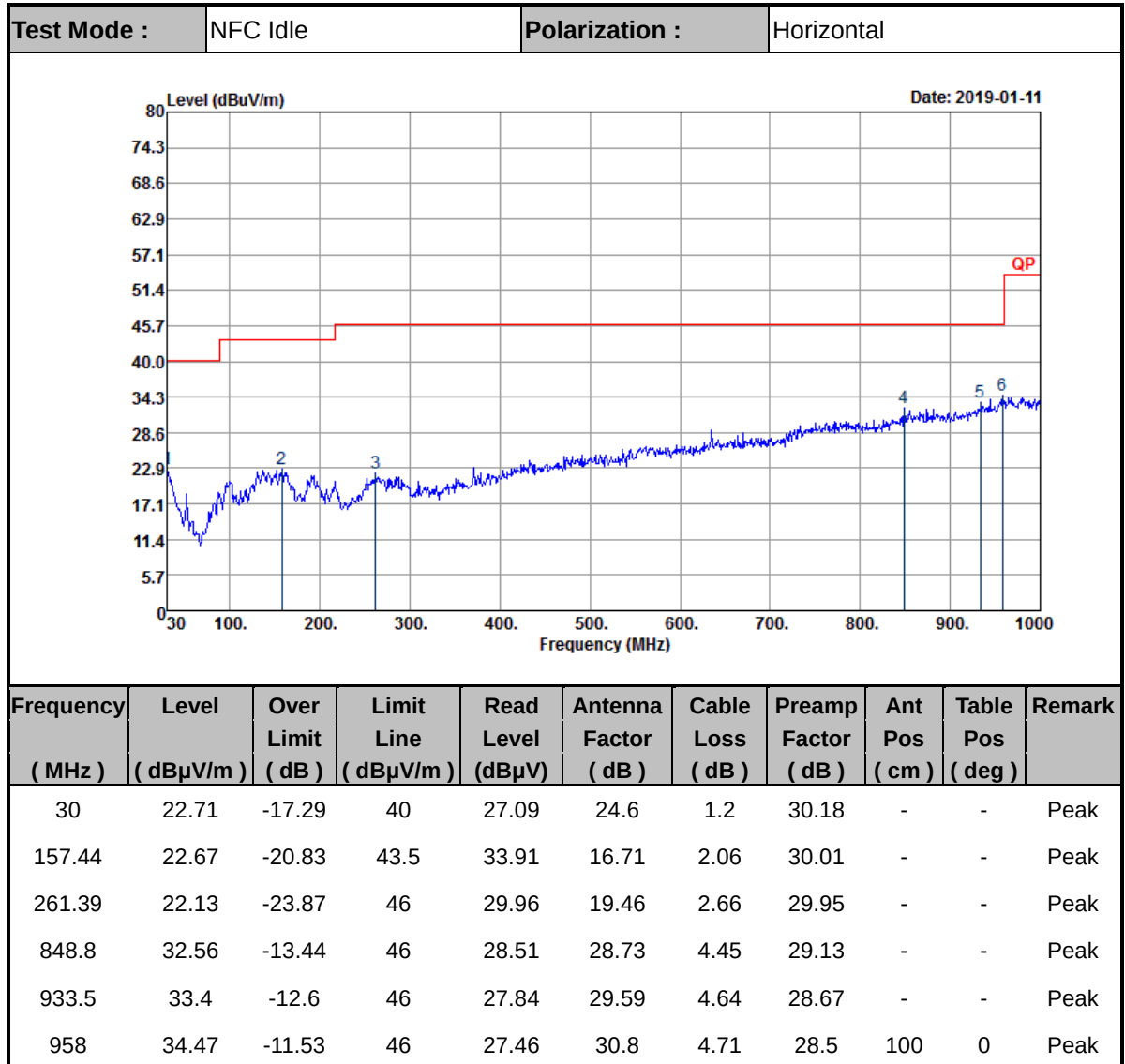

Note:

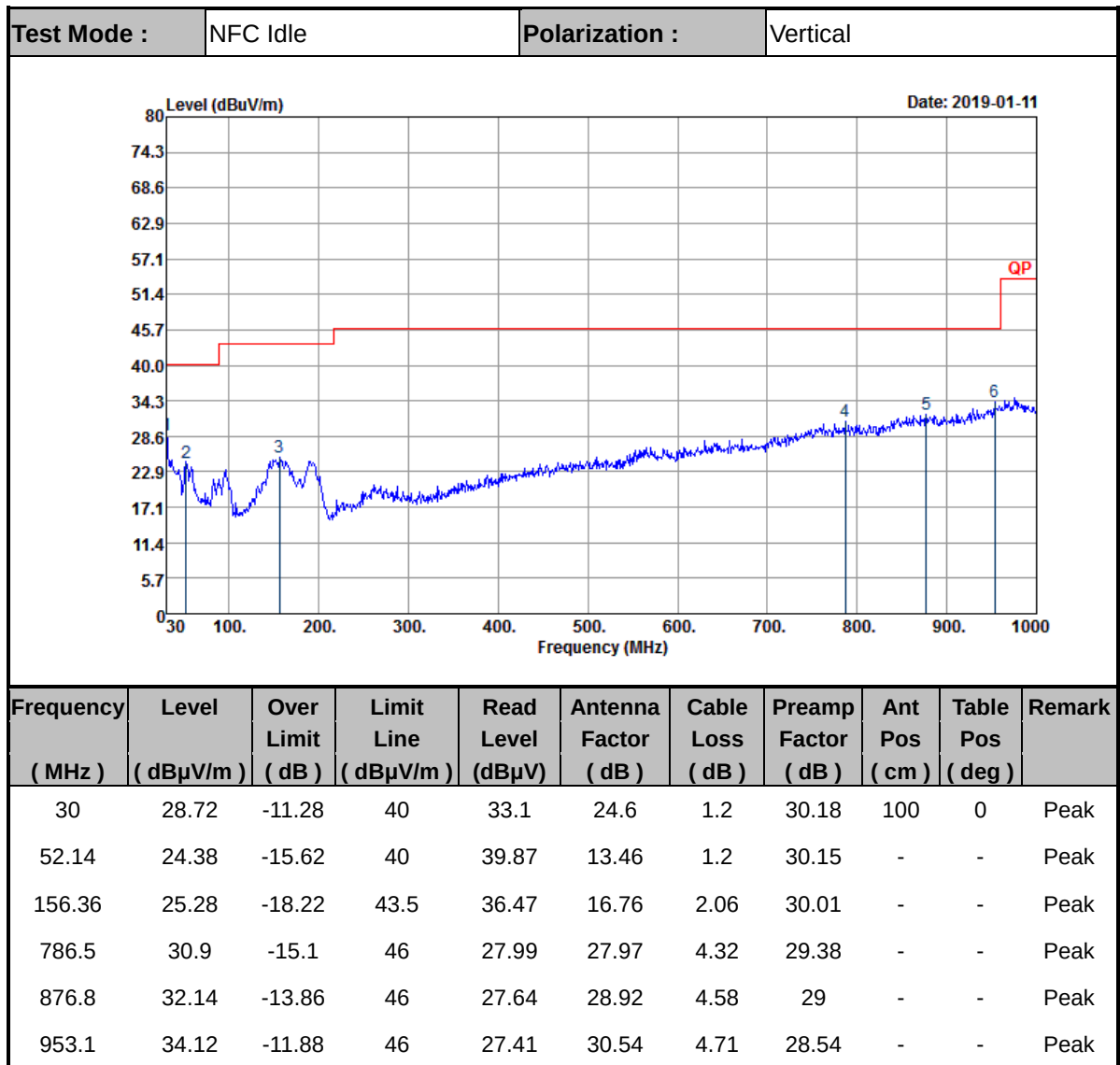
1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.

C4. Results of Receiver Radiated Spurious Emissions (9 kHz~30MHz)



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. Limit line = specific limits (dBμV) + distance extrapolation factor.

C5.Results of Receiver Radiated Spurious Emissions (30MHz~1GHz)



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.