FCC RADIO TEST REPORT

FCC ID	:	**UZ7TC26BK**
Equipment	:	**Touch computer**
Brand Name	:	**Zebra**
Model Name	:	**TC26BK**
Applicant	:	**Zebra Technologies Corporation** **1 Zebra Plaza, Holtsville, NY 11742**
Manufacturer	:	**Zebra Technologies Corporation** **1 Zebra Plaza, Holtsville, NY 11742**
Standard	:	**FCC Part 15 Subpart C §15.225**

The product was received on Mar. 24, 2020 and testing was started from Mar. 27, 2020 and completed on Apr. 24, 2020. 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 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.

Louis Wu

Reviewed by: Louis Wu

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR010316D	01	Initial issue of report	Apr. 30, 2020
FR010316D	02	1. Revise FW Version 2. Revise specification of accessories table	May 06, 2020

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	Under limit 19.82 dB at 0.250MHz
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	Max level 27.24 dBμV/m at 13.560 MHz
3.5	15.225(d) 15.209	Radiated Spurious Emissions	Pass	Under limit 4.93 dB at 42.610MHz
3.6	15.203	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: Wii Chang

Report Producer: Cindy Liu

1. General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Touch computer
Brand Name	Zebra
Model Name	TC26BK
FCC ID	UZ7TC26BK
Sample 1	Single-WAN, WLAN, GMS, SE4710, NFC, 3GB/32GB, Rear camera and Front camera, 2-pin connector
Sample 2	Single-WAN, WLAN, GMS, No Scanner, NFC, 3GB/32GB, Rear camera and Front camera, No back connector
EUT supports Radios application	GSM/EGPRS/WCDMA/HSPA/LTE/NFC/GNSS WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
HW Version	EV1.7
SW Version	Android version 10
OS Version	FUSION_QA_2_1.0.0.008_Q
FW Version	Zebra/TC26PA/TC26:10/03-09-09.00-QN-U00-PRD/Nabe03091333:userdebug/test-keys
MFD	22FEB20
EUT Stage	Engineering sample

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

Specification of Accessories				
AC Adapter	**Brand Name**	Zebra	**Part Number**	PWR-WUA5V12W0US
Battery 1	**Brand Name**	Zebra	**Part Number**	BT-000409-00
Battery 2	**Brand Name**	Zebra	**Part Number**	BT-000409-50
Battery 3	**Brand Name**	Zebra	**Part Number**	BT-000411-08
USB Cable 1 (TypeA plug to TypeC plug)	**Brand Name**	Zebra	**Part Number**	CBL-TC5X-USBC2A-01
USB Cable 2 (Type A plug to Type C plug)	**Brand Name**	Zebra	**Part Number**	CBL-TC2Y-USBC90A-01
Headset 3.5mm type with PTT/micassy	**Brand Name**	Zebra	**Part Number**	HDST-35MM-PTVP-01
Adapter Cable PTT headset (3.5mm to 3.5mm)	**Brand Name**	Zebra	**Part Number**	CBL-TC51-HDST35-01
Snap on Trigger handle	**Brand Name**	Zebra	**Part Number**	TRG-TC2Y-SNP1-01
Belt Holster	**Brand Name**	Zebra	**Part Number**	SG-TC2Y-HLSTR1-01
Wearable Arm Mount	**Brand Name**	Zebra	**Part Number**	SG-TC2Y-ARMNT-01

Supported Unit Used in Test Configuration and System				
Type C to 3.5mm headset adaptor	**Brand Name**	Google	**Part Number**	Pixel-2-2XL

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	2.24 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

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory	
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
Test Engineer	Louis Chung	Howard Huang
Temperature	22~24°C	21~25°C
Relative Humidity	53~55%	42~50%

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

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	03CH11-HY
Test Engineer	Cookie Ku
Temperature	18.7~20.6°C
Relative Humidity	65.3~69.8%

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

FCC designation No.: TW1190 and TW0007

1.5 Applicable Standards

According to the specifications of 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

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.

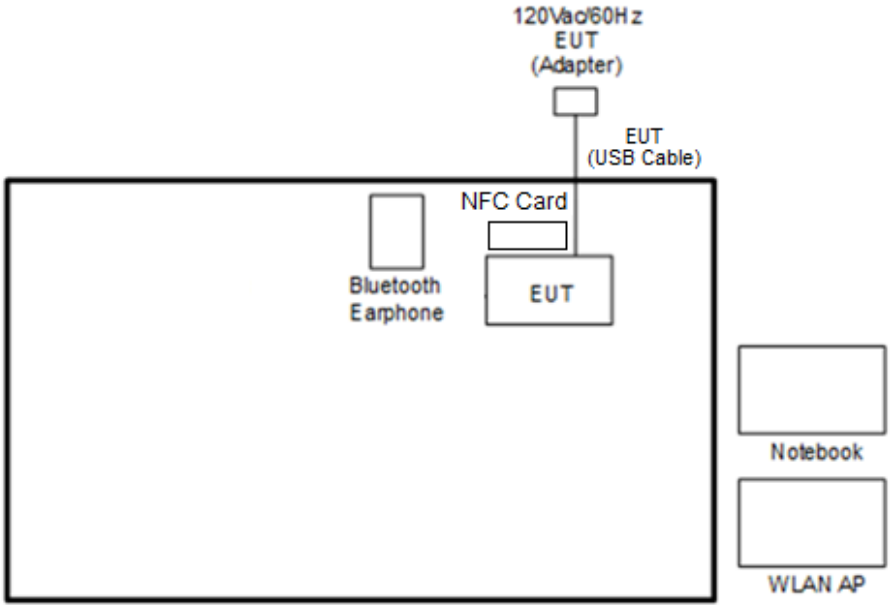
Test Items	
AC Power Line Conducted Emissions	Field Strength of Fundamental Emissions
20dB Spectrum Bandwidth	Frequency Stability
Radiated Emissions 9kHz~30MHz	Radiated Emissions 30MHz~1GHz

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 and Accessory in three orthogonal panels to determine the final configuration (Z plane with Adapter as worst plane) from all possible combinations.

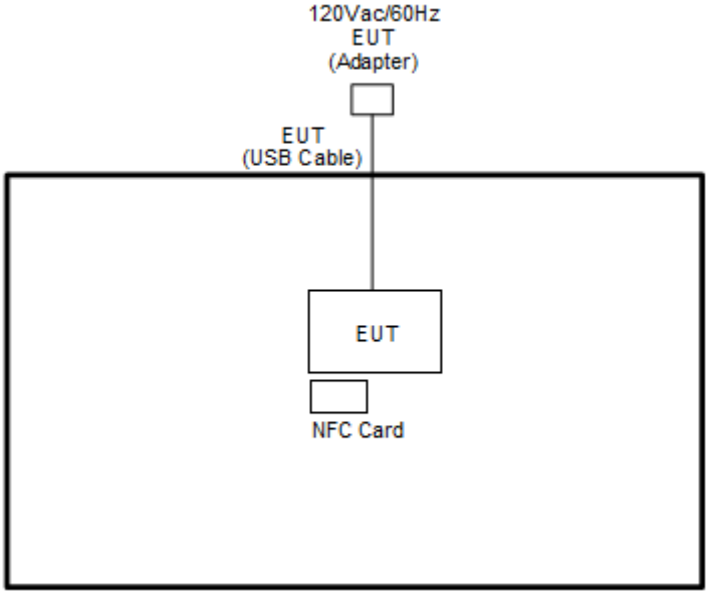
Test Cases	
AC Conducted Emission	Mode 1 : WLAN (2.4GHz) Link + Bluetooth Link + NFC Link + USB cable 1 (Charging from AC adapter) + Battery 1
Remark: For Radiated Test Cases, the tests were performed with Battery 1, USB Cable 1 and Sample 1	

2.2 Connection Diagram of Test System

<AC Conducted Emission Mode>



<Radiated Emission Mode>



2.3 Table for Supporting Units

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
2.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P：Unshielded, 1.2m DC O/P：Shielded, 1.8m
5.	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 3 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 (dBμV)	
	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.

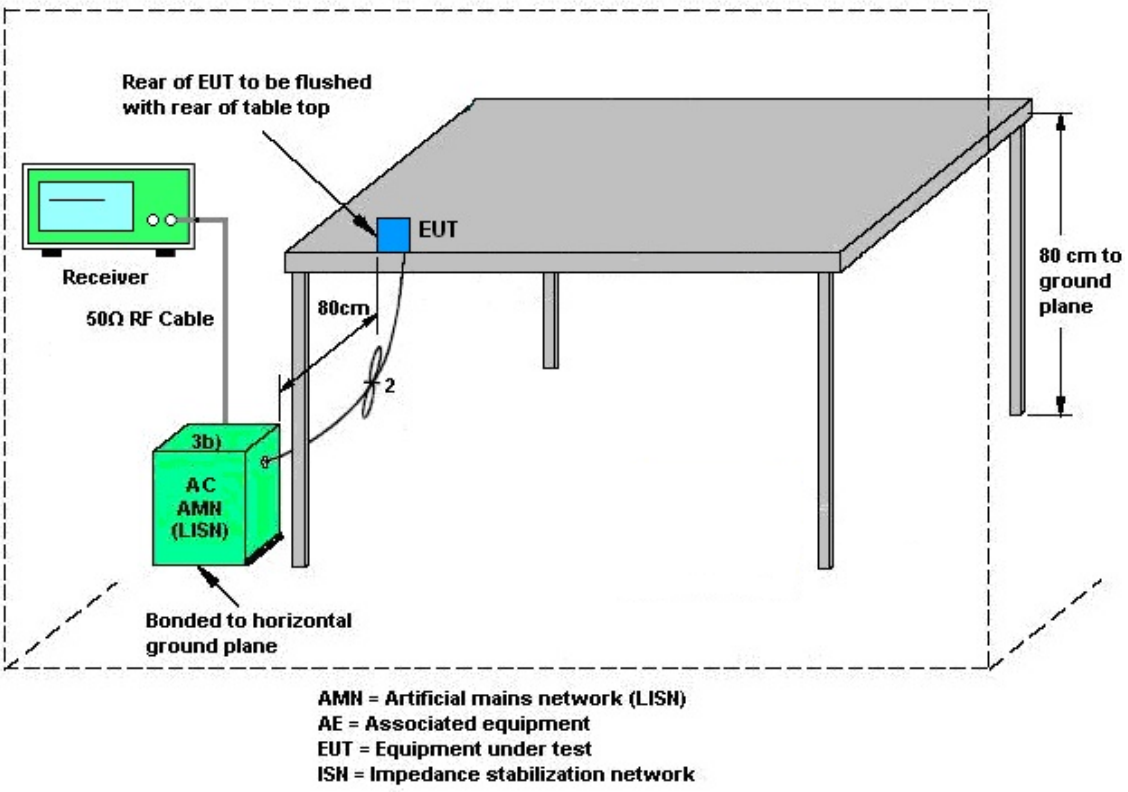
3.1.2 Measuring Instruments

See list of measuring equipment 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



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

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 20dB and 99% emission bandwidth in the specific band 13.553~13.567MHz.

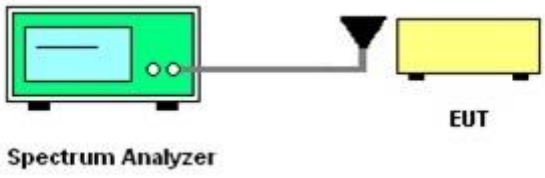
3.2.2 Measuring Instruments

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.

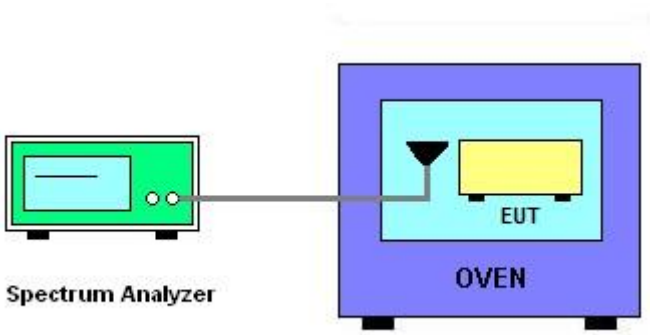
3.3.2 Measuring Instruments

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 fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±100ppm.
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	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

3.4.2 Measuring Instruments

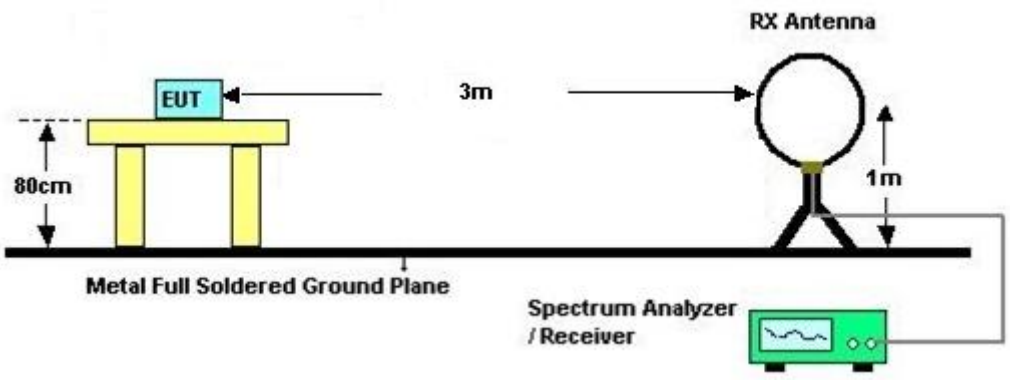
See list of measuring instruments of this test report.

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 (dBμV/m) = 20 log Emission level (μV/m).

3.4.4 Test Setup

For radiated emissions 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

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

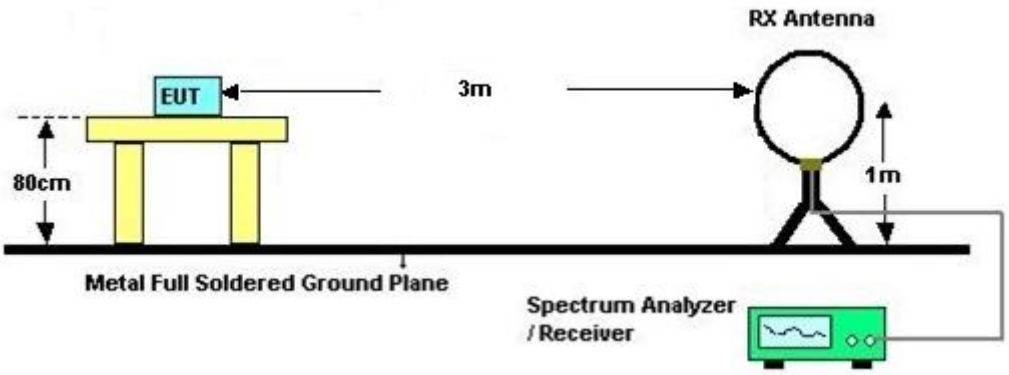
Note: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

3.5.4 Test Procedures

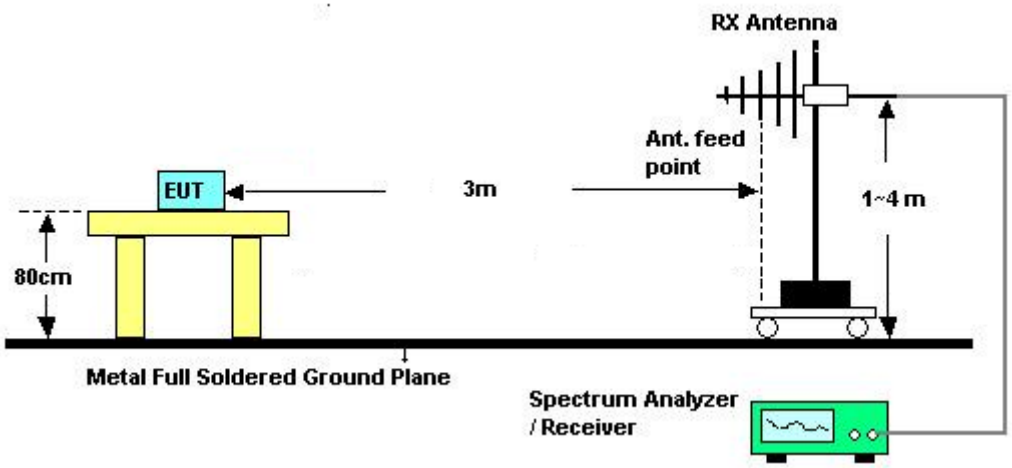
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

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 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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	AC POWER	AFC-500W	F104070011	50Hz~60Hz	Apr. 09, 2020	Apr. 24, 2020	Apr. 08, 2021	Conducted (TH02-HY)
Hygrometer	Testo	608-H1	34893241	N/A	Mar. 26, 2020	Apr. 24, 2020	Mar. 25, 2021	Conducted (TH03-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101329	9kHz~30GHz	Sep. 04, 2019	Apr. 24, 2020	Sep. 03, 2020	Conducted (TH03-HY)
Temperature Chamber	ESPEC	SU-641	92013721	-30℃~70℃	Nov. 26, 2019	Apr. 24, 2020	Nov. 25, 2020	Conducted (TH03-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Mar. 27, 2020	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Nov. 15, 2019	Mar. 27, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Nov. 07, 2019	Mar. 27, 2020	Nov. 06, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Nov. 20, 2019	Mar. 27, 2020	Nov. 19, 2020	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100081	9kHz~30MHz	Nov. 15, 2019	Mar. 27, 2020	Nov. 14, 2020	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Mar. 27, 2020	N/A	Conduction (CO05-HY)
LF Cable	HUBER + SUHNER	RG-214/U	LF01	N/A	Jan. 02, 2020	Mar. 27, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100851	N/A	Jan. 02, 2020	Mar. 27, 2020	Jan. 01, 2021	Conduction (CO05-HY)
Software	Audix	E3 6.2009-8-24	RK-001053	N/A	N/A	Mar. 31, 2020~ Apr. 06, 2020	N/A	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187312	9kHz~1GHz	Dec. 03, 2019	Mar. 31, 2020~ Apr. 06, 2020	Dec. 02, 2020	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz~1GHz	Oct. 12, 2019	Mar. 31, 2020~ Apr. 06, 2020	Oct. 11, 2020	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Jan. 09, 2020	Mar. 31, 2020~ Apr. 06, 2020	Jan. 08, 2021	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	N/A	Mar. 31, 2020~ Apr. 06, 2020	N/A	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	N/A	Mar. 31, 2020~ Apr. 06, 2020	N/A	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	N/A	Mar. 31, 2020~ Apr. 06, 2020	N/A	Radiation (03CH11-HY)
EMI Test Receiver	Agilent	N9038A(MXE)	MY54130085	20MHz~8.4GHz	Nov. 01, 2019	Mar. 31, 2020~ Apr. 06, 2020	Oct. 31, 2020	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY54200486	10Hz~44GHz	Oct. 28, 2019	Mar. 31, 2020~ Apr. 06, 2020	Oct. 27, 2020	Radiation (03CH11-HY)
Filter	Wainwright	WHK20/1000C7/40SS	SN2	20M High Pass	Sep. 15, 2019	Mar. 31, 2020~ Apr. 06, 2020	Sep. 14, 2020	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz-30MHz	Mar. 12, 2020	Mar. 31, 2020~ Apr. 06, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	30M-18G	Mar. 12, 2020	Mar. 31, 2020~ Apr. 06, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	MY2859/2	30MHz-40GHz	Mar. 12, 2020	Mar. 31, 2020~ Apr. 06, 2020	Mar. 11, 2021	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTN-303B	TP140325	N/A	Nov. 07, 2019	Mar. 31, 2020~ Apr. 06, 2020	Nov. 06, 2020	Radiation (03CH11-HY)
Hygrometer	TECPEL	DTN-303B	TP161237	N/A	Oct. 25, 2019	Mar. 31, 2020~ Apr. 06, 2020	Oct. 24, 2020	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 = 2Uc(y))	**2.30**

Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.12**

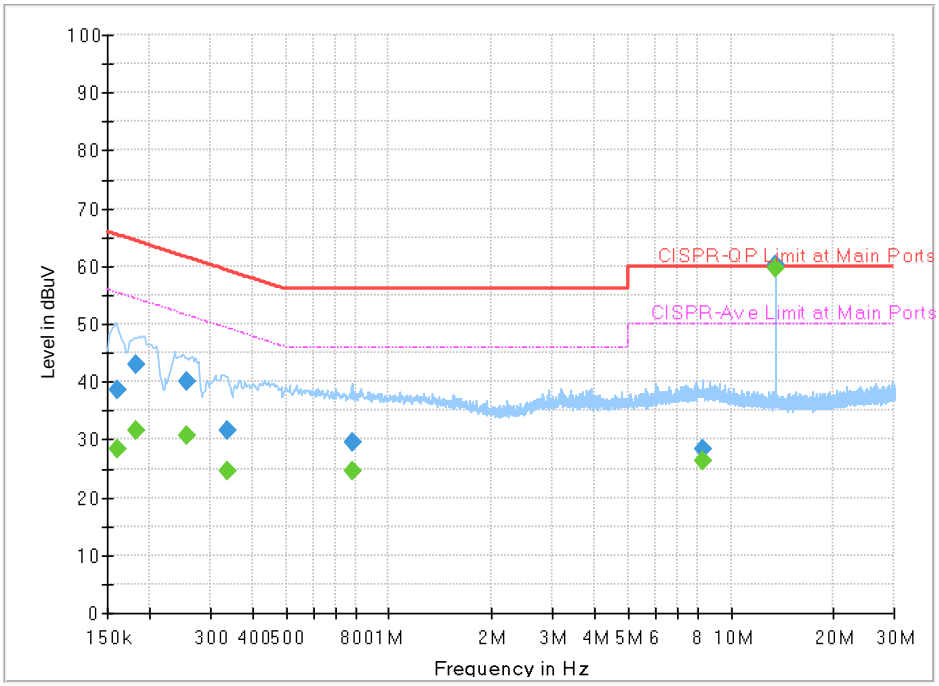
Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.20**

Appendix A. Test Results of Conducted Emission Test

<Original Test Result>

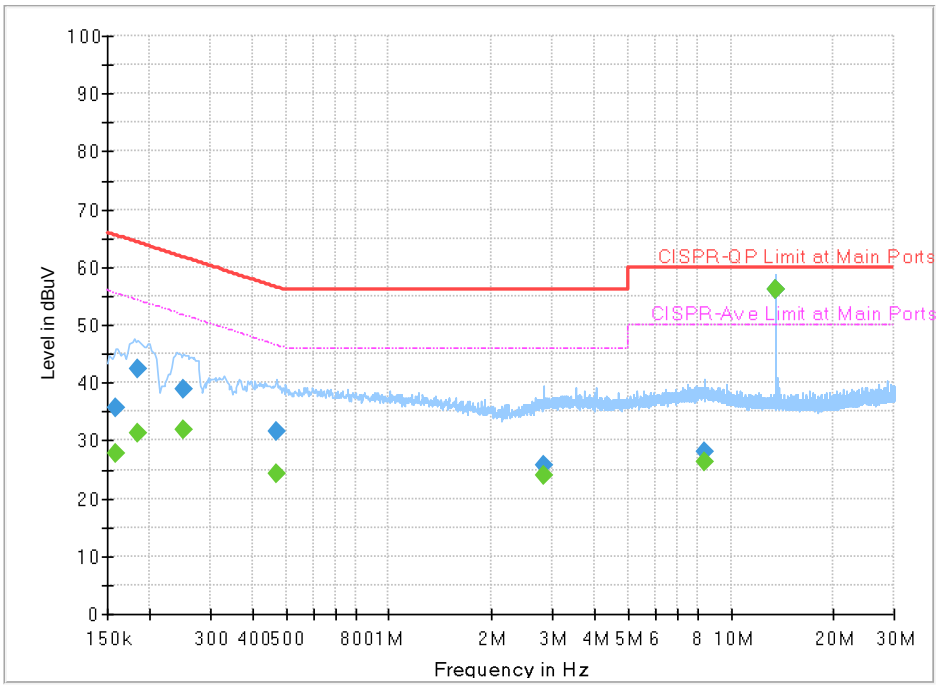
Test Engineer :	Howard Huang	**Temperature :**	21~25℃
		Relative Humidity :	42~50%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.161520	38.73	---	65.39	26.66	L1	OFF	19.6
0.161520	---	28.51	55.39	26.88	L1	OFF	19.6
0.181500	43.06	---	64.42	21.36	L1	OFF	19.6
0.181500	---	31.53	54.42	22.89	L1	OFF	19.6
0.255750	40.10	---	61.57	21.47	L1	OFF	19.6
0.255750	---	30.58	51.57	20.99	L1	OFF	19.6
0.336570	31.62	---	59.29	27.67	L1	OFF	19.6
0.336570	---	24.42	49.29	24.87	L1	OFF	19.6
0.784500	29.39	---	56.00	26.61	L1	OFF	19.6
0.784500	---	24.63	46.00	21.37	L1	OFF	19.6
8.250000	28.23	---	60.00	31.77	L1	OFF	20.0
8.250000	---	26.36	50.00	23.64	L1	OFF	20.0
13.560000	---	59.74	50.00	-9.74	L1	OFF	20.2
13.560000	60.24	---	60.00	-0.24	L1	OFF	20.2

Test Engineer :	Howard Huang	Temperature :	21~25℃
		Relative Humidity :	42~50%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral

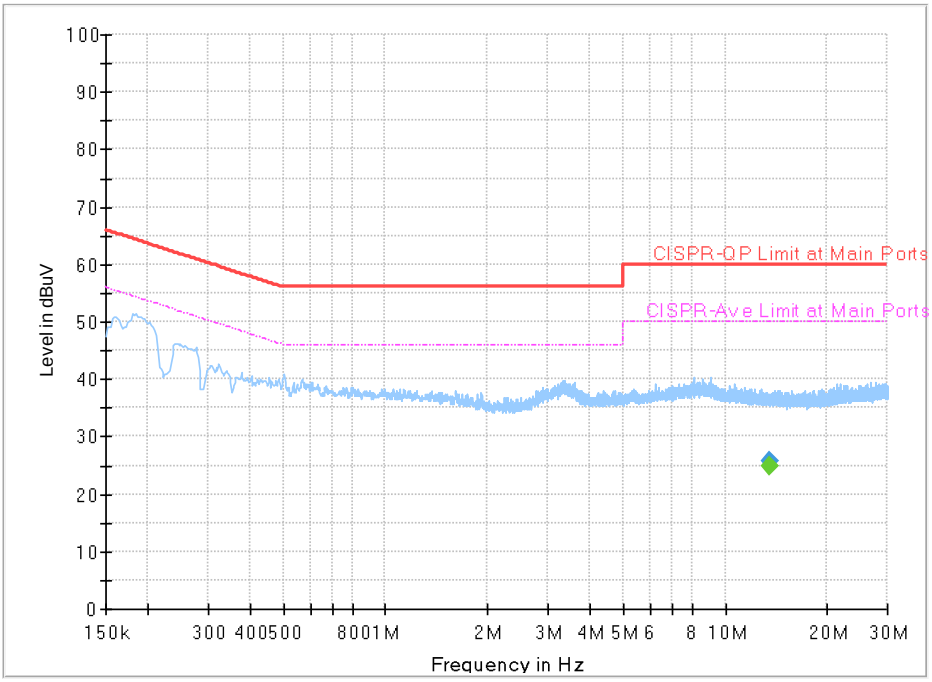


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.159180	---	27.92	55.51	27.59	N	OFF	19.6
0.159180	35.53	---	65.51	29.98	N	OFF	19.6
0.183750	---	31.22	54.31	23.09	N	OFF	19.6
0.183750	42.41	---	64.31	21.90	N	OFF	19.6
0.250260	---	31.93	51.75	19.82	N	OFF	19.6
0.250260	38.87	---	61.75	22.88	N	OFF	19.6
0.469230	---	24.38	46.53	22.15	N	OFF	19.6
0.469230	31.56	---	56.53	24.97	N	OFF	19.6
2.847660	---	24.09	46.00	21.91	N	OFF	19.7
2.847660	25.73	---	56.00	30.27	N	OFF	19.7
8.340000	---	26.30	50.00	23.70	N	OFF	20.0
8.340000	28.21	---	60.00	31.79	N	OFF	20.0
13.560000	---	56.08	50.00	-6.08	N	OFF	20.2
13.560000	56.28	---	60.00	3.72	N	OFF	20.2

<Terminal Test Result>

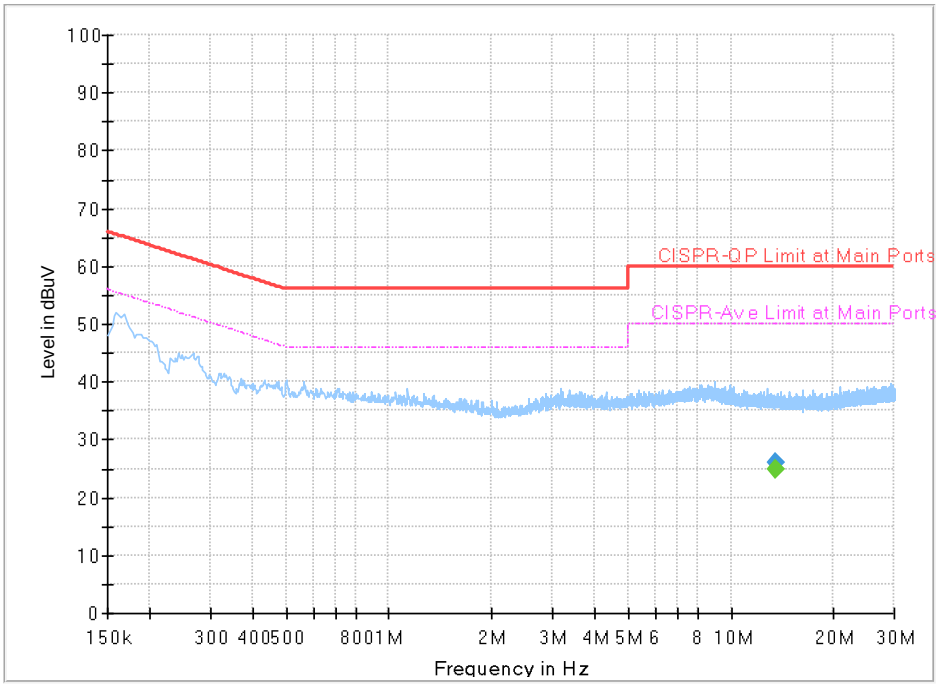
Test Engineer :	Howard Huang	**Temperature :**	21~25℃
		Relative Humidity :	42~50%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.557840	---	24.79	50.00	25.21	L1	OFF	20.2
13.557840	25.82	---	60.00	34.18	L1	OFF	20.2

Test Engineer :	Howard Huang	**Temperature :**	21~25℃
		Relative Humidity :	42~50%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral

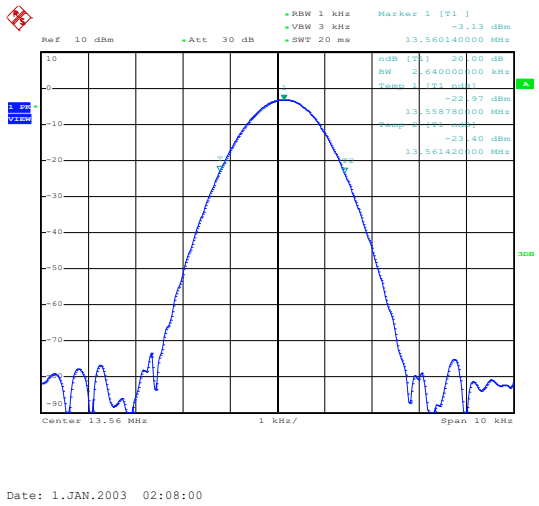
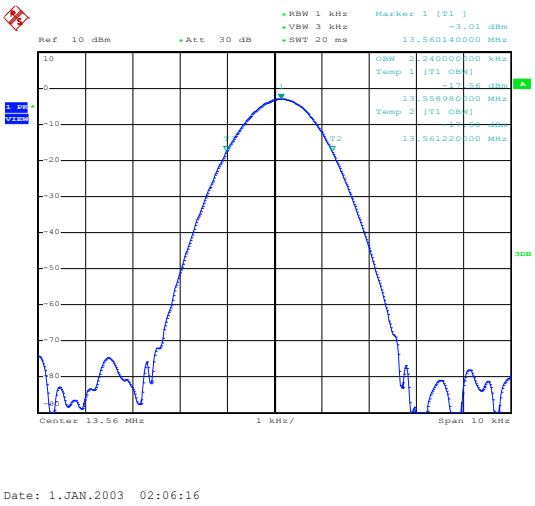


Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
13.555500	---	24.83	50.00	25.17	N	OFF	20.2
13.555500	26.10	---	60.00	33.90	N	OFF	20.2

Appendix B. Test Results of Conducted Test Items

B1. Test Result of 20dB Spectrum Bandwidth

Test mode	NFC Tx	Test Frequency (MHz)	13.56
			
20dB Bandwidth (kHz)	2.64	**99% OccupiedBW(kHz)**	2.24
Frequency range (MHz)	**f_L > 13.553**	13.55878	**Test Result**
	f_H < 13.567	13.56142	**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

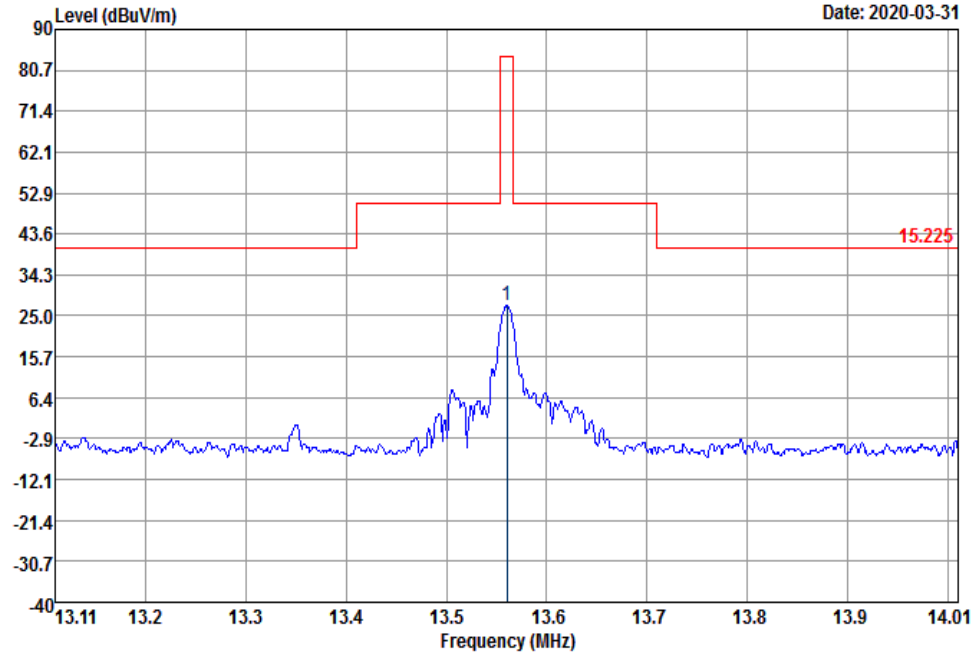
Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vac)	Measurement Frequency (MHz)	Temperature (℃)	Time	Measurement Frequency (MHz)
120	13.560100	**-20**	**0**	13.560100
102	13.560100		**2**	13.560100
138	13.560100		**5**	13.560100
			10	13.560100
		-10	**0**	13.560100
			2	13.560120
			5	13.560120
			10	13.560130
		0	**0**	13.560140
			2	13.560140
			5	13.560140
			10	13.560140
		10	**0**	13.560140
			2	13.560140
			5	13.560140
			10	13.560140
		20	**0**	13.560100
			2	13.560100
			5	13.560090
			10	13.560080
		30	**0**	13.560100
			2	13.560090
			5	13.560100
			10	13.560090
		40	**0**	13.560090
			2	13.560090
			5	13.560080
			10	13.560080

Voltage vs. Frequency Stability		Temperature vs. Frequency Stability		
Voltage (Vac)	**Measurement Frequency (MHz)**	**Temperature (℃)**	**Time**	**Measurement Frequency (MHz)**
		50	**0**	13.560080
			2	13.560080
			5	13.560080
			10	13.560080
Max.Deviation (MHz)	0.000100	**Max.Deviation (MHz)**		0.000140
Max.Deviation (ppm)	7.3746	**Max.Deviation (ppm)**		10.3245
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

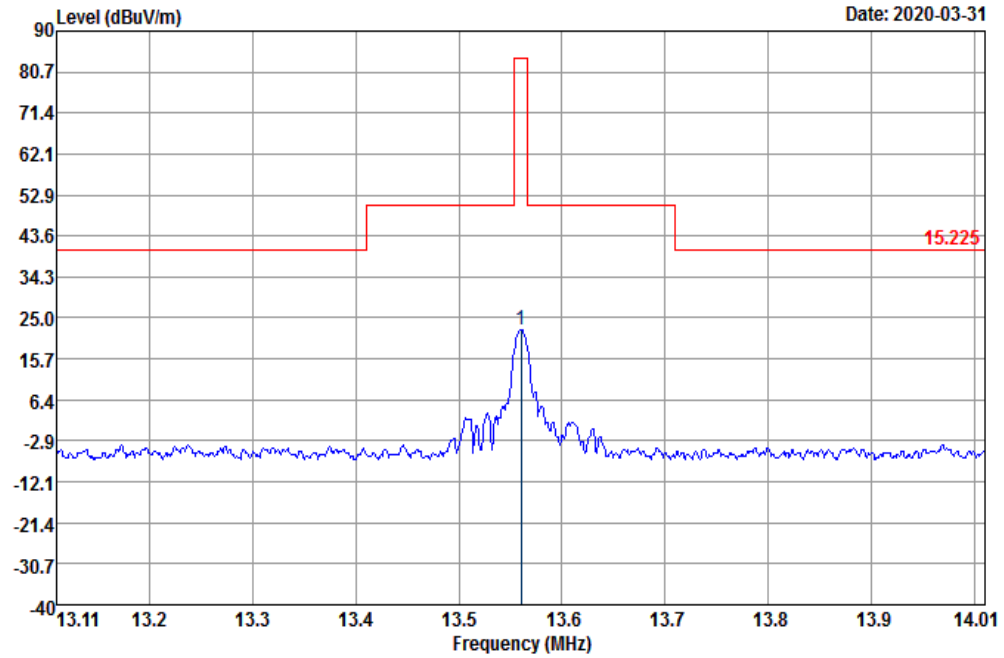
C2. Test Mode :	NFC Tx	Test Frequency (MHz)	13.56



Site : 03CH11-HY
Condition : 15.225 3m LOOP_ANT(H)_100488 HORIZONTAL
: RBW:9.000KHz VBW:9.000KHz SWT:Auto
Project : 010316

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
13.56	27.24	40	-56.76	84	46.52	20.58	0.14	100	0	QP

Test Mode :	NFC Tx	Test Frequency (MHz)	13.56

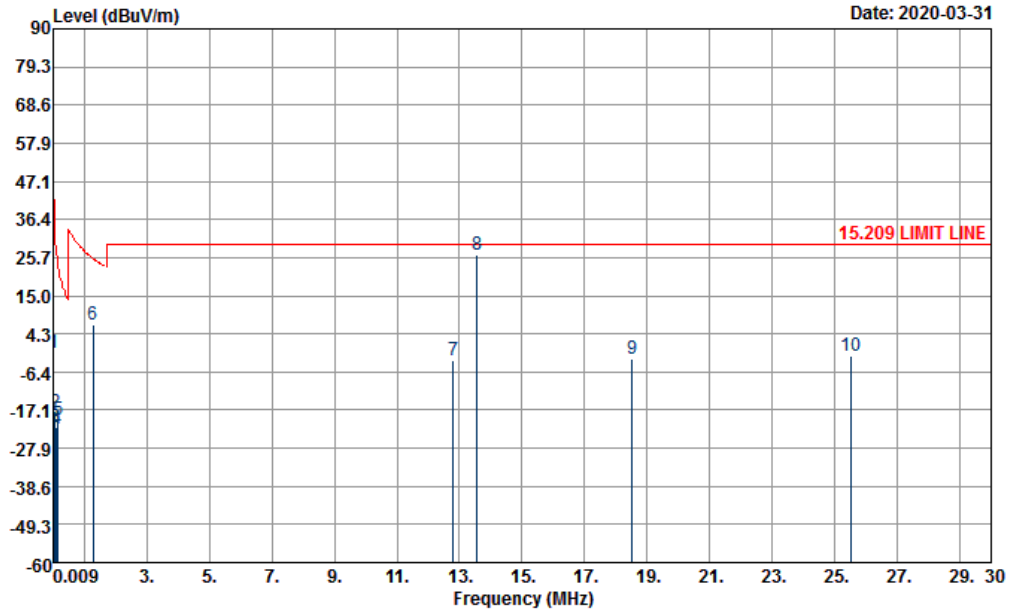


Site : 03CH11-HY
Condition : 15.225 3m LOOP_ANT(V)_100488 VERTICAL
: RBW:9.000KHz VBW:9.000KHz SWT:Auto
Project : 010316

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
13.56	22.36	40	-61.64	84	41.64	20.58	0.14	100	277	QP

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

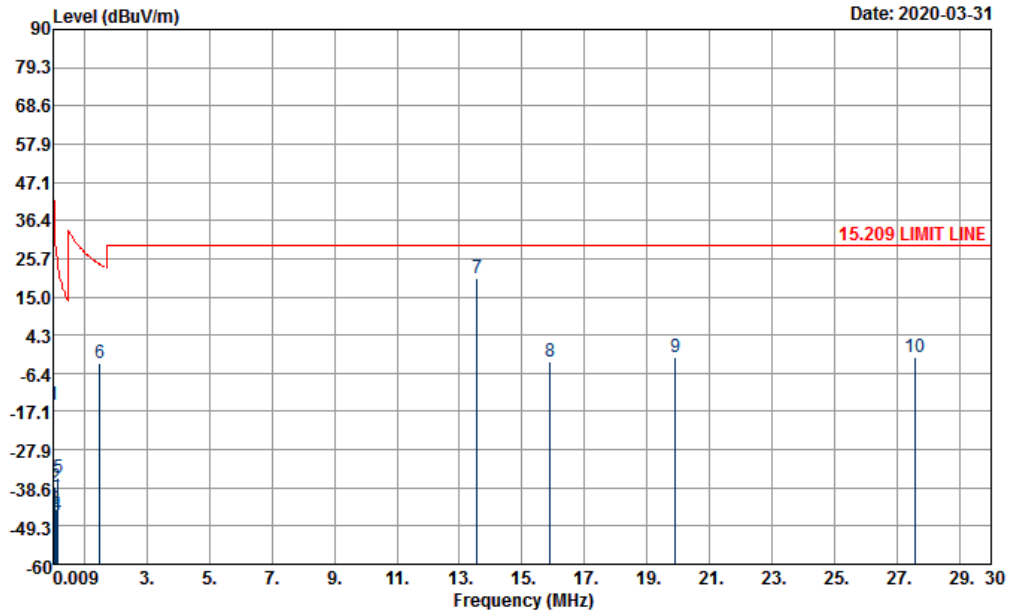
Test Mode :	NFC Tx	Polarization :	Horizontal



Site : 03CH11-HY
Condition : 15.209 LIMIT LINE 3m LOOP_ANT(H)_100488 HORIZONTAL
Project : 010316

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	-0.95	80	-42.87	41.92	59.91	19.13	0.01	-	-	Average
0.06249	-17.74	80	-49.43	31.69	43.27	18.98	0.01	-	-	Average
0.0938	-21.97	80	-50.13	28.16	39.36	18.66	0.01	-	-	QP
0.14068	-22.4	80	-47.04	24.64	38.99	18.6	0.01	-	-	Average
0.15646	-19.74	80	-43.46	23.72	41.65	18.6	0.01	-	-	Average
1.279	6.68	40	-18.79	25.47	28.07	18.6	0.01	100	0	QP
12.808	-3.06	40	-32.56	29.5	16.28	20.52	0.14	-	-	QP
13.56	26.31	40	-3.19	29.5	45.59	20.58	0.14	-	-	QP
18.52	-2.82	40	-32.32	29.5	16.04	20.98	0.16	-	-	QP
25.515	-1.82	40	-31.32	29.5	16.78	21.21	0.19	-	-	QP

Test Mode :	NFC Tx	Polarization :	Vertical



Site : 03CH11-HY
Condition : 15.209 LIMIT LINE 3m LOOP_ANT(V)_100488 VERTICAL
Project : 010316

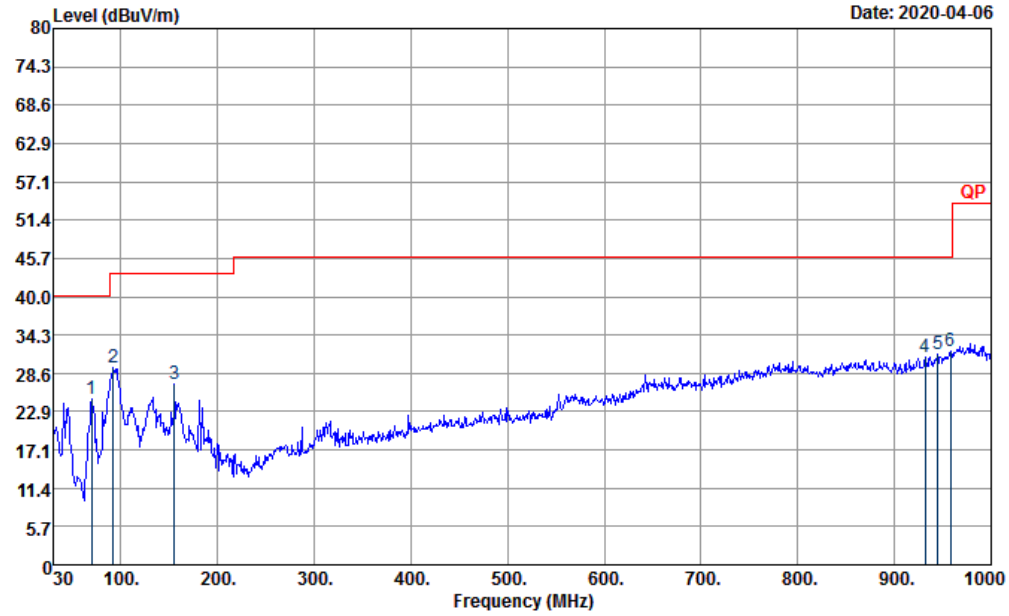
Frequency (MHz)	Level (dBµV/m)	Distance extrapolation Factor (dB)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
0.01925	-15.09	80	-57.01	41.92	45.77	19.13	0.01	-	-	Average
0.06252	-38.28	80	-69.96	31.68	22.74	18.97	0.01	-	-	Average
0.09374	-44.72	80	-72.89	28.17	16.61	18.66	0.01	-	-	QP
0.14068	-46.2	80	-70.84	24.64	15.19	18.6	0.01	-	-	Average
0.15272	-35.8	80	-59.73	23.93	25.59	18.6	0.01	-	-	Average
1.504	-3.67	40	-27.73	24.06	17.72	18.6	0.01	100	0	QP
13.56	20.17	40	-9.33	29.5	39.45	20.58	0.14	-	-	QP
15.896	-3.16	40	-32.66	29.5	15.92	20.77	0.15	-	-	QP
19.906	-1.94	40	-31.44	29.5	16.8	21.09	0.17	-	-	QP
27.57	-2.02	40	-31.52	29.5	16.53	21.25	0.2	-	-	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. Limit line = specific limits (dBµV) + distance extrapolation factor
4. 13.56 MHz is fundamental signal which can be ignored

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

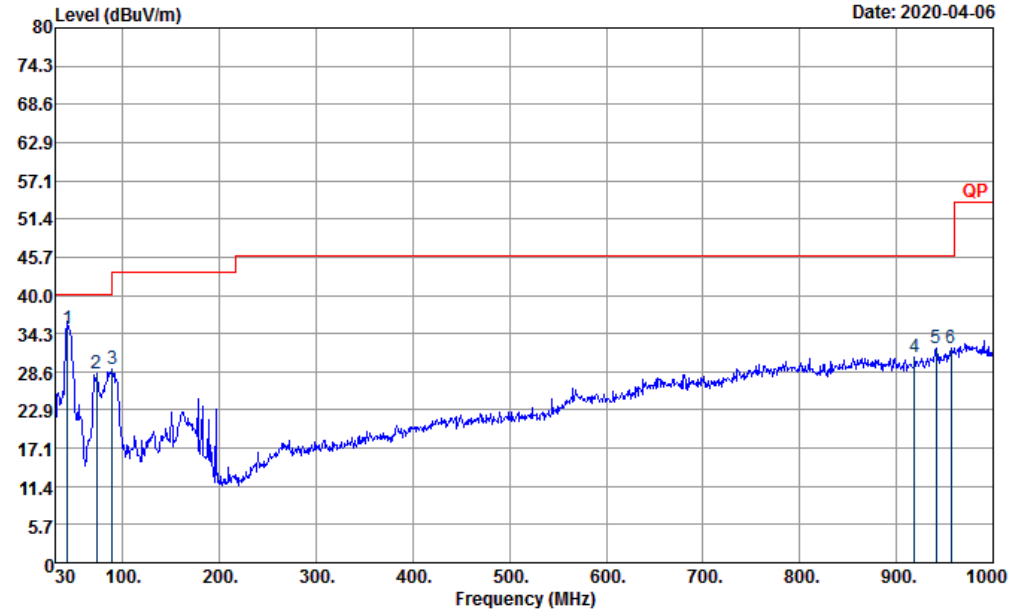
Test Mode :	NFC Tx	Polarization :	Horizontal



Site : 03CH11-HY
Condition : QP 3m BI-LOG 6111D-LF_ETC HORIZONTAL
Project : 010316

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
69.77	24.76	-15.24	40	43.93	12.04	1.27	32.48	-	-	Peak
92.08	29.34	-14.16	43.5	45.48	14.78	1.49	32.41	100	0	Peak
155.13	27.06	-16.44	43.5	41.3	16.41	1.85	32.5	-	-	Peak
932.1	31.09	-14.91	46	27.98	29.22	5.2	31.31	-	-	Peak
944.71	31.45	-14.55	46	27.52	29.8	5.27	31.14	-	-	Peak
958.29	31.76	-14.24	46	26.71	30.57	5.44	30.96	-	-	Peak

Test Mode :	NFC Tx	Polarization :	Vertical



Site : 03CH11-HY
Condition : QP 3m BI-LOG 6111D-LF_ETC VERTICAL
Project : 010316

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
42.61	35.07	-4.93	40	48.64	17.91	1.01	32.49	100	277	QP
72.68	28.28	-11.72	40	47.26	12.18	1.31	32.47	-	-	Peak
89.17	28.91	-14.59	43.5	45.53	14.32	1.47	32.41	-	-	Peak
918.52	30.84	-15.16	46	28.25	28.95	5.13	31.49	-	-	Peak
940.83	32.12	-13.88	46	28.49	29.57	5.25	31.19	-	-	Peak
956.35	32.03	-13.97	46	27.17	30.44	5.41	30.99	-	-	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.