FCC Test Report

FCC ID	:	**2ABVMG141U**
Applicant	:	HK ELECHOUSE ELECTRONICS TECHNOLOGY CO., LIMITED RM 1101, 11/F, SAN TOI BLDG, 139 CONNAUGHT RD CENTRAL, HONG KONG
Sample Description		
Product Name	:	**GO2NFC141U NFC Reader**
Model No.	:	G141U
Serial No.	:	N/A
Trademark	:	ELECHOUSE
Receipt Date	:	2014-02-10
Test Date	:	2014-02-10 to 2014-02-14
Issue Date	:	2014-02-14
Test Standard(s)	:	**FCC CFR Title 47 Part 15 Subpart C Section 15.225**
Conclusions	:	**PASSED***
		*In the configuration tested, the EUT complied with the standards specified above.

Test/Witness Engineer : Jason Deng

Approved & Authorized : Winkey Wang

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

Contents

1. General Information

1.1. Client Information

Applicant	:	HK ELECHOUSE ELECTRONICS TECHNOLOGY CO., LIMITED
Address	:	RM 1101, 11/F, SAN TOI BLDG, 139 CONNAUGHT RD CENTRAL, HONG KONG
Manufacturer	:	HK ELECHOUSE ELECTRONICS TECHNOLOGY CO., LIMITED
Address	:	RM 1101, 11/F, SAN TOI BLDG, 139 CONNAUGHT RD CENTRAL, HONG KONG

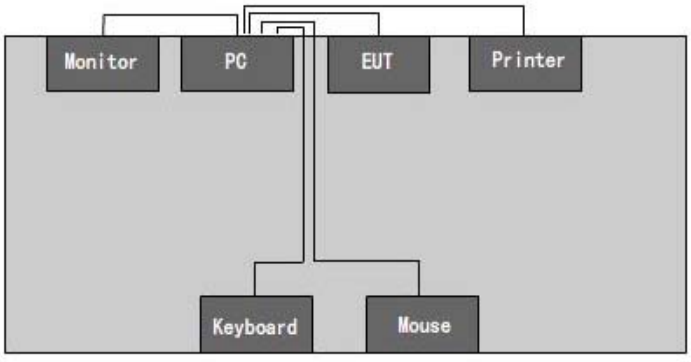
1.2. General Description of EUT (Equipment Under Test)

Product Name	:	GO2NFC141U NFC Reader	
Models No.	:	G141U	
Serial No.	:	N/A	
Trademark	:	ELECHOUSE	
Product Description	:	Operation Frequency:	13.56MHz
		Transfer Rate:	424Kbits/s
		Modulation Type:	ASK
		Antenna Type:	Integral PCB Antenna
		Antenna Gain:	0 dBi
Power Supply	:	USB DC 5V from PC	

Note:

(1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

1.3. Block Diagram Showing The Configuration of System Tested



1.4. Description of Support Units

Name	Model	Serial Number	Manufacturer
Printer	HP1020	CNCJ410726	HP
LCD Monitor	G205HV	10306738385	ACER
PC	ASPIREM1830	PTSF90C00305005CAC3000	ACER
Keyboard	SK-9625	KBUSB1580500037E0100	ACER
Mouse	MS.11200.014	M-UAY-ACR2	ACER

1.5. External I/O Cable

Cable Description	Length(m)	From/ Port	To
Shielding Detachable USB Cable	1.5	Host PC	Mouse
Shielding Detachable K/B Cable	1.5	Host PC	Keyboard
Shielding Detachable serial Cable	1.5	Host PC	Printer
Shielding Detachable VGA Cable	1.5	Host PC	LCD Monitor
Unshielding Detachable USB Cable	1.0	EUT	Host PC

1.6. Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

Test Mode	Description
Reading tags mode	Keep the EUT connected with PC in reading tags mode

Remark: The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

1.7. Test Instruments List

Item	Test Equipment	Manufacturer	Model No.	Cal. Date	Cal. Due date
1	Bilog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	May 25, 2013	May 24, 2014
2	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	May 30, 2013	May 29, 2014
3	Coaxial Cable	N/A	N/A	Apr. 01, 2013	Mar. 31, 2014
4	Coaxial Cable	N/A	N/A	Apr. 01, 2013	Mar. 31, 2014
5	Coaxial cable	N/A	N/A	Apr. 01, 2013	Mar. 31, 2014
6	Coaxial Cable	N/A	N/A	Apr. 01, 2013	Mar. 31, 2014
7	Coaxial Cable	N/A	N/A	Apr. 01, 2013	Mar. 31, 2014
8	Amplifier (10kHz-1.3GHz)	HP	8447D	Apr. 01, 2013	Mar. 31, 2014
9	Amplifier (1GHz-18GHz)	Compliance Direction Systems Inc.	PAP-1G18	Jun. 09, 2013	Jun. 08, 2014
10	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	Apr. 01, 2013	Mar. 31, 2014
11	Horn Antenna	ETS-LINDGREN	3160	Mar. 30, 2013	Mar. 29, 2014
12	Positioning Controller	UC	UC3000	N/A	N/A
13	Spectrum analyzer 9kHz-30GHz	Rohde & Schwarz	FSP	May 29, 2013	May 28, 2014
14	EMI Test Receiver	Rohde & Schwarz	ESPI	Apr. 01, 2013	Mar. 31, 2014
15	Loop antenna	Laplace instrument	RF300	May 25, 2013	May 24,, 2014
16	Universal radio communication tester	Rhode & Schwarz	CMU200	May 29, 2013	May 28, 2014
17	Signal Analyzer	Rohde & Schwarz	FSIQ3	May 29, 2013	May 28, 2014

1.8. Laboratory Location

Shenzhen Certification Technology Service Co., Ltd.
Address: 2F, Building B, East Area of Nanchang Second Industrial Zone, Gushu 2nd Road, Bao'an District, Shenzhen 518126, P.R. China

At the time of testing, the Laboratory is accredited. It is listed in the United States of American Federal Communications Commission (FCC), and the registration number is 197647.
Tel:86-755-86375552 Fax: 86-755-26736857

2. Test Summary

Standard Section	Test Item	Judgment
15.207	Conducted Emission	PASSED
15.225	Radiated Emission	PASSED
15.215	Occupied Bandwidth	PASSED
15.225	Frequency Stability	PASSED
Remark: "N/A" is an abbreviation for Not Applicable.		

3. Antenna Requirement

3.1. Standard Requirement

3.1.1 Test standard

FCC Part15 Section 15.203

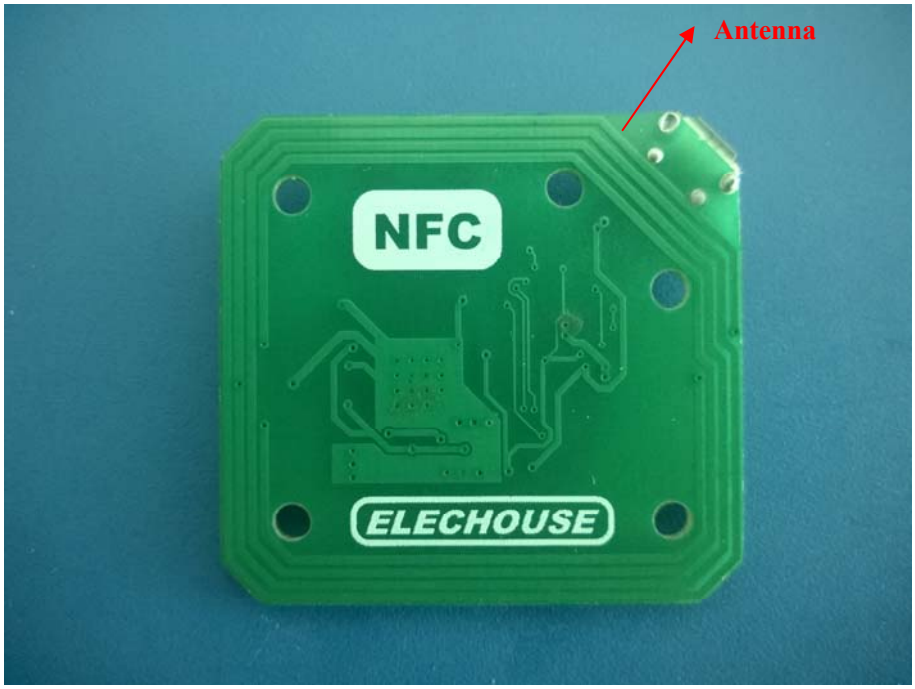
3.1.2 Requirement

15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

3.2. Antenna Connected Construction

The antenna is an integral antenna which permanently attached, and the best case gain of the antenna is 0 dBi. It complies with the standard requirement.



4. Conducted Emission Test

4.1. Test Standard and Limit

4.1.1 Test Standard

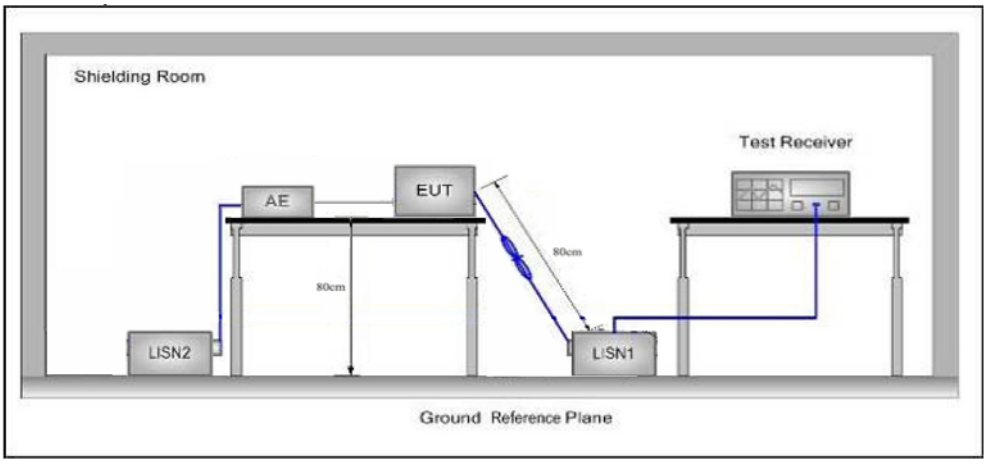
FCC Part15 Section 15.207

4.1.2 Test Limit

Conducted Emission Test Limit

Frequency	Maximum RF Line Voltage (dBμV)	
	Quasi-peak Level	Average Level
150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
500kHz~5MHz	56	46
5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequencies.		

4.2. Test Setup



4.3. Test Procedure

1) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50μH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

2) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal

ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

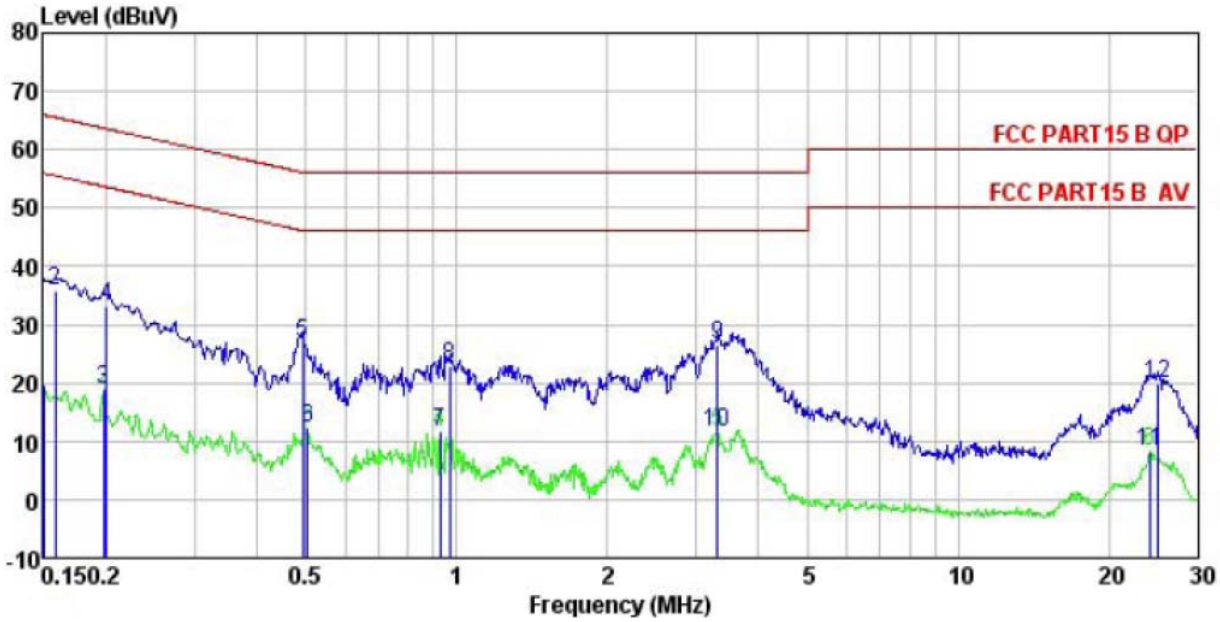
The Test Receiver setup: RBW=9kHz, VBW=30kHz, Sweep time= auto

4.4. Test Data

Please to see the following pages

Conducted Emission Test Data

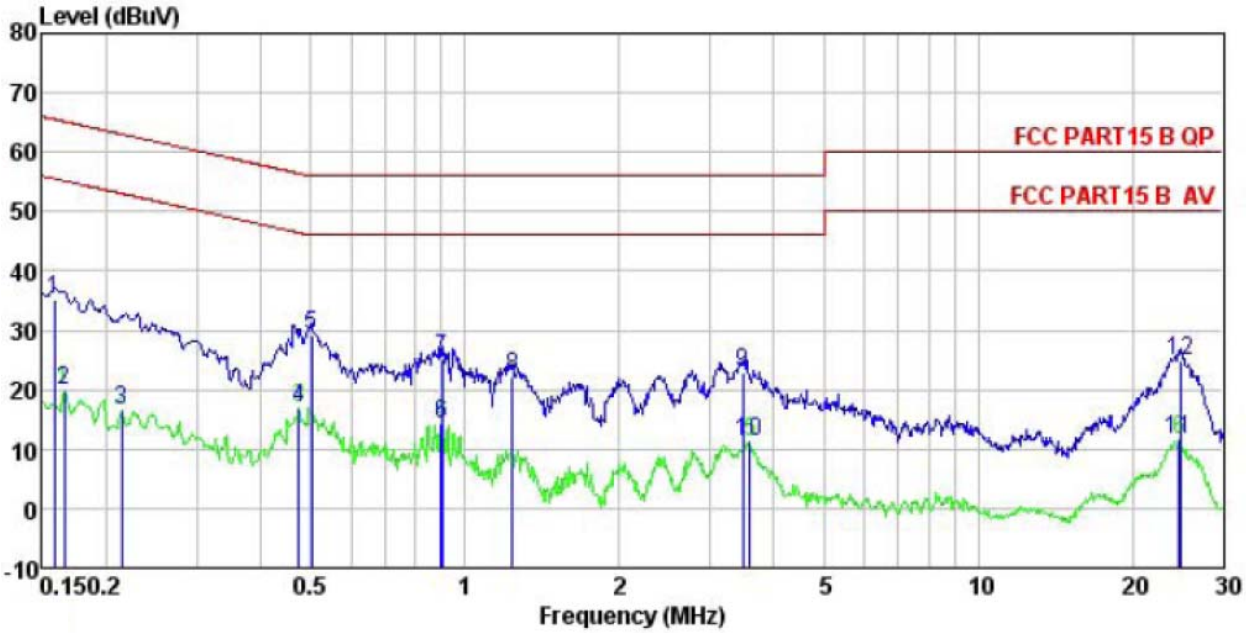
EUT:	GO2NFC141U NFC Reader M/N: G141U
Operating Condition:	Connected with PC in reading tags mode
Test Site:	Shielded room
Operator:	Jason
Test Specification:	AC120V/60Hz
Polarization:	Line
Note	Tem:25℃ Hum:50%



	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.150	8.55	0.27	10.78	19.60	56.00	-36.40	Average
2	0.158	24.79	0.27	10.78	35.84	65.56	-29.72	QP
3	0.198	7.78	0.28	10.76	18.82	53.71	-34.89	Average
4	0.201	22.14	0.28	10.76	33.18	63.58	-30.40	QP
5	0.494	15.87	0.29	10.76	26.92	56.10	-29.18	QP
6	0.505	1.04	0.29	10.76	12.09	46.00	-33.91	Average
7	0.928	0.66	0.24	10.85	11.75	46.00	-34.25	Average
8	0.968	11.76	0.25	10.86	22.87	56.00	-33.13	QP
9	3.310	15.47	0.27	10.91	26.65	56.00	-29.35	QP
10	3.310	0.31	0.27	10.91	11.49	46.00	-34.51	Average
11	24.142	-3.21	0.49	10.88	8.16	50.00	-41.84	Average
12	25.055	8.45	0.52	10.87	19.84	60.00	-40.16	QP

Conducted Emission Test Data

EUT:	GO2NFC141U NFC Reader M/N: G141U
Operating Condition:	Connected with PC in reading tags mode
Test Site:	Shielded room
Operator:	Jason
Test Specification:	AC 120V/60Hz
Polarization:	Neutral
Note	Tem:25℃ Hum:50%



	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.158	24.15	0.25	10.78	35.18	65.56	-30.38	QP
2	0.166	8.78	0.25	10.77	19.80	55.16	-35.36	Average
3	0.214	5.54	0.25	10.76	16.55	53.05	-36.50	Average
4	0.474	5.86	0.28	10.75	16.89	46.45	-29.56	Average
5	0.502	18.20	0.29	10.76	29.25	56.00	-26.75	QP
6	0.899	3.27	0.21	10.84	14.32	46.00	-31.68	Average
7	0.904	14.06	0.21	10.84	25.11	56.00	-30.89	QP
8	1.236	11.19	0.24	10.90	22.33	56.00	-33.67	QP
9	3.472	11.81	0.29	10.91	23.01	56.00	-32.99	QP
10	3.584	0.01	0.29	10.90	11.20	46.00	-34.80	Average
11	24.659	0.19	0.52	10.87	11.58	50.00	-38.42	Average
12	24.790	13.39	0.52	10.87	24.78	60.00	-35.22	QP

5. 20dB Occupy Bandwidth Test

5.1. Test Standard and Limit

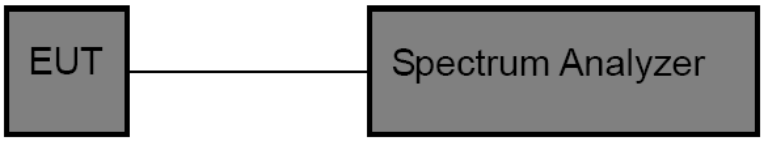
5.1.1 Test Standard

FCC Part15 C Section 15.215(c)

5.1.2 Test Limit

15.215(c): Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

5.2. Test Setup

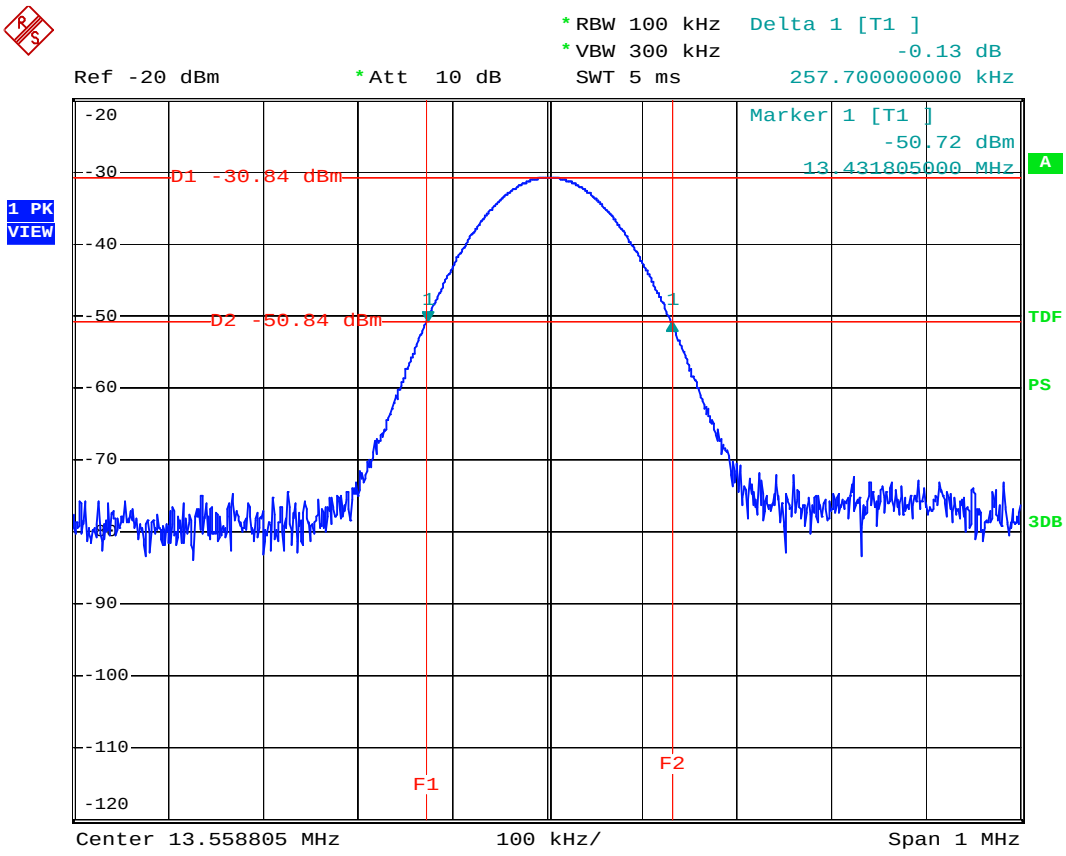


5.3. Test Procedure

The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector. Record the 20 dB bandwidth of the carrier.
The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector. The vertical Scale is set to 10dB per division. The horizontal scale is set to 20 kHz
per division. Read the down 20dB bandwidth of the carrier.
Set the spectrum analyzer: RBW = 100 kHz, VBW = 300 kHz
Sweep = auto; Detector Function = Peak. Trace = Max Hold.
Mark the peak frequency and -20dB points bandwidth.

5.4. Test Data

Remark: Test plot as follows



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6. Radiated Emission

6.1. Test Standard and Limit

6.1.1 Test Standard

FCC Part15 C Section 15.225

6.1.2 Test Limit

The field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

15.225(a): The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters. i.e. 124.0 dBμV/m @ 3 m.

15.225(b): Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters. i.e. 90.5dBμV/m @ 3 m.

15.225(c): Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters. i.e. 80.5dBμV/m @ 3 m.

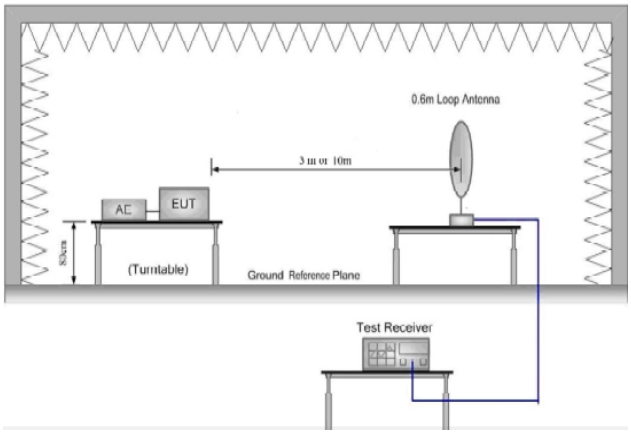
15.225(d): The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209

Out of band emissions shall not exceed:

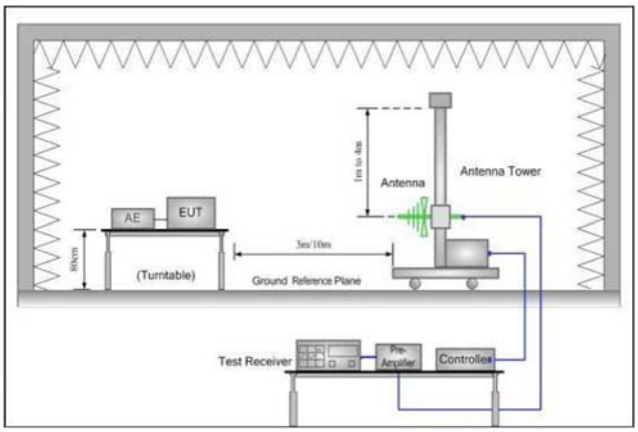
Frequency Range	**Limit (dBμV/m)**	
	At 3m Distance	
1.705MHz~30.0MHz	69.5	Quasi-peak
30MHz~88MHz	40	Quasi-peak
88MHz~216MHz	43.5	Quasi-peak
216MHz~960MHz	46	Quasi-peak
Above 960MHz	54	Quasi-peak
Remark: 1. The lower limit shall apply at the transition frequency.		

6.2. Test Setup

9 kHz to 30 MHz



30 MHz to 1 GHz



6.3. Test Procedure

1) 9 kHz to 30 MHz emissions:

For testing performed with the loop antenna. The center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specied distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane.

2) 30 MHz to 1 GHz emissions:

For testing performed with the bi-log type antenna. The measurement is performed with the EUT rotated 360º, the antenna height scaned between 1m and 4m, and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarizations.

Detector Peak for pre-scan

Test Receiver Test Setup	Detector		
	9 kHz-150 kHz	150 kHz-30 MHz	30 MHz-1000 MHz
RBW	200 Hz	9 kHz	120 kHz
VBW	≥RBW	≥RBW	≥RBW
Sweep	Auto	Auto	Auto
Detector function	QP	QP	QP
Trace	Max hold	Max hold	Max hold

6.4. Test Data

Radiated Emission Test Data (9 kHz to 30 MHz)

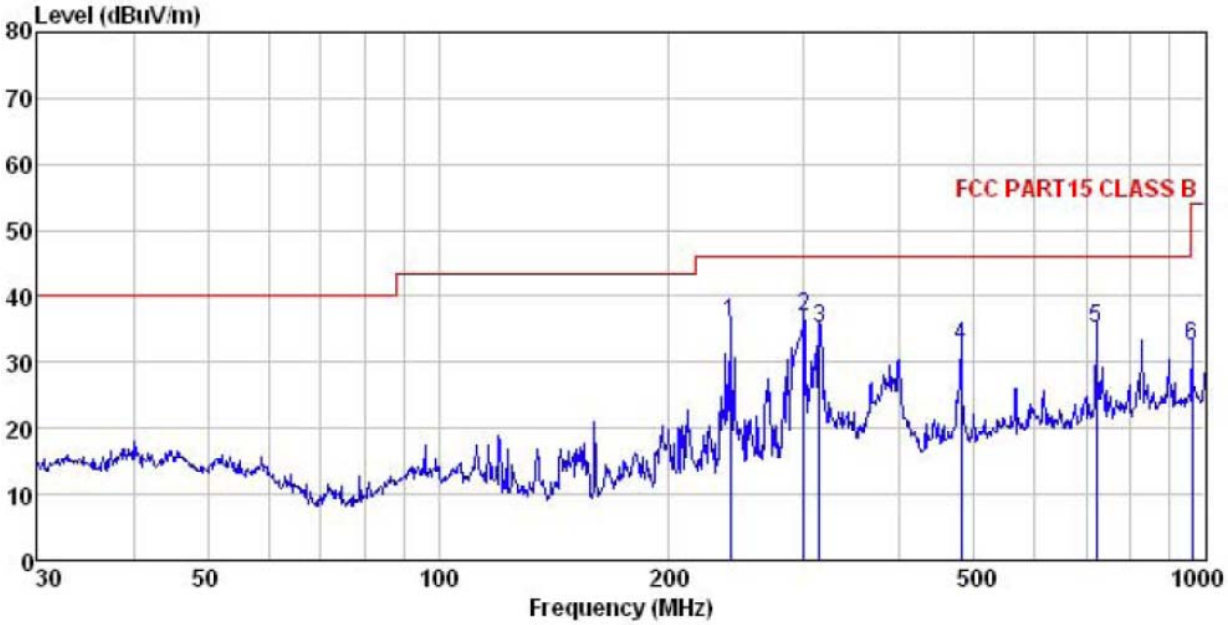
Frequency (MHz)	Read Level (dBuV)	Correction Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Level
0.0956	50.62	37.54	88.16	122.26	-34.10	V	PEAK
0.1445	47.03	33.93	80.96	118.73	-37.77	V	PEAK
0.2070	43.27	31.65	74.92	114.22	-39.30	V	PEAK
0.2511	43.26	30.17	73.43	111.04	-37.61	V	PEAK
0.2727	42.30	29.78	72.08	109.48	-37.40	V	PEAK
0.3521	39.08	28.33	67.41	103.75	-36.34	V	PEAK
1.2277	32.80	17.66	50.46	67.22	-16.76	V	PEAK
3.6377	23.42	9.25	32.67	69.50	-36.83	V	PEAK
6.6379	25.91	6.97	32.88	69.50	-36.62	V	PEAK
13.5600	40.48	5.73	46.21	124.00	-77.79	V	PEAK
17.5074	9.49	5.47	14.96	69.50	-54.54	V	PEAK
22.9176	21.38	5.44	26.82	69.50	-42.68	V	PEAK
0.2166	44.08	31.32	75.40	113.53	-38.13	H	PEAK
0.2583	44.35	30.04	74.39	110.52	-36.13	H	PEAK
0.2824	40.77	29.60	70.37	108.78	-38.41	H	PEAK
0.3393	40.02	28.57	68.59	104.67	-36.08	H	PEAK
0.3673	40.13	28.06	68.19	102.65	-34.46	H	PEAK
0.3986	39.90	27.49	67.39	100.40	-33.01	H	PEAK
1.2277	36.70	17.66	54.36	67.22	-12.86	H	PEAK
3.6869	23.60	9.17	32.77	69.50	-36.73	H	PEAK
6.5887	23.95	6.98	30.93	69.50	-38.57	H	PEAK
13.5600	36.72	5.73	42.45	69.50	-124.00	H	PEAK
12.4907	16.01	5.87	21.88	69.50	-47.62	H	PEAK
22.1307	17.05	5.43	22.48	69.50	-47.02	H	PEAK

Remark:

1. Final Level = Read Level + Correction Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Radiated Emission Test Data (30 MHz to 1000 MHz)

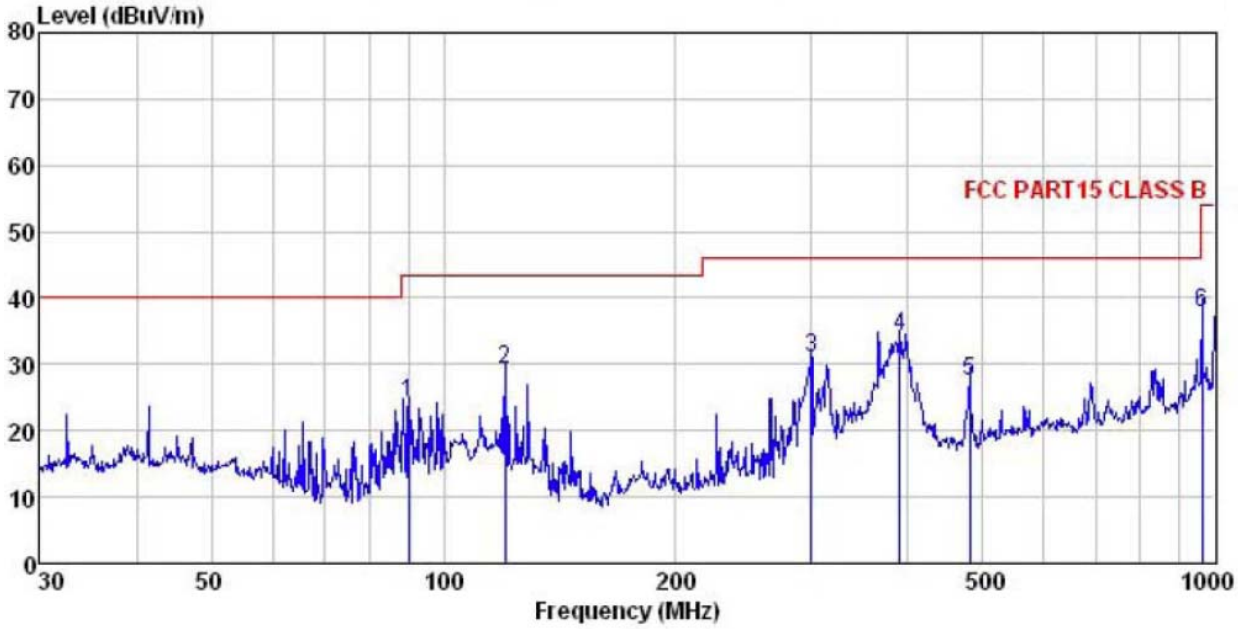
EUT:	GO2NFC141U NFC Reader M/N: G141U
Operating Condition:	connected with PC in reading tags mode
Test Site:	3m chamber
Operator:	Jason
Test Specification:	AC120V/60Hz
Polarization:	Horizontal
Note	Tem:23℃ Hum:50%



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	239.987	50.62	12.09	2.82	29.64	35.89	46.00	-10.11	QP
2	299.316	50.32	13.03	2.94	29.43	36.86	46.00	-9.14	QP
3	314.377	48.29	13.26	2.98	29.51	35.02	46.00	-10.98	QP
4	480.528	43.37	16.07	3.46	30.52	32.38	46.00	-13.62	QP
5	721.726	42.21	19.10	4.26	30.55	35.02	46.00	-10.98	QP
6	962.162	36.53	21.49	4.27	29.90	32.39	54.00	-21.61	QP

Radiated Emission Test Data (30 MHz to 1000 MHz)

EUT:	GO2NFC141U NFC Reader M/N: G141U
Operating Condition:	connected with PC in reading tags mode
Test Site:	3m chamber
Operator:	Jason
Test Specification:	AC120V/60Hz
Polarization:	Vertical
Note	Tem:23℃ Hum:50%



	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	90.220	40.15	11.99	2.03	30.07	24.10	43.50	-19.40	QP
2	120.277	46.25	10.38	2.17	29.69	29.11	43.50	-14.39	QP
3	299.316	44.60	13.03	2.94	29.43	31.14	46.00	-14.86	QP
4	390.723	46.10	14.87	3.08	29.86	34.19	46.00	-11.81	QP
5	480.528	38.58	16.07	3.46	30.52	27.59	46.00	-18.41	QP
6	962.162	42.01	21.49	4.27	29.90	37.87	54.00	-16.13	QP

7. Frequency Stability

7.1. Test Standard and Limit

7.1.1 Test Standard

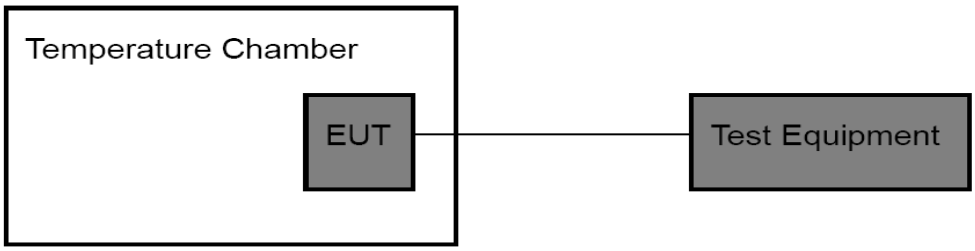
FCC Part15 C Section 15.225(e)

7.1.2 Test Limit

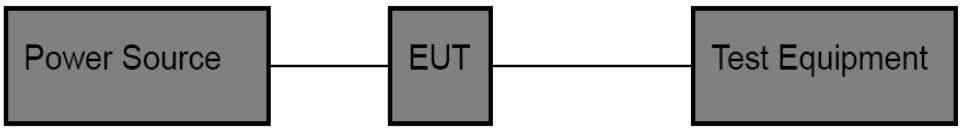
15.225(e): The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

7.2. Test Setup

For Temperature Test:



For Voltage Test:



7.3. Test Procedure

(1) The EUT was turn-up.

(2) With all power removed, the temperature was decreased to -20°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

(3) The temperature tests were performed for the worst case.

(4) Variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C. The maximum frequency change was recorded.

7.4. Test Data

Operating Frequency: 13.5588 MHz,

Limit: total emission within +/- 1.35558kHz(+/- 0.01% of the operating frequency)

Frequency stability vs. temperature		
Environment Temperature (°C)	Measured Frequency (MHz)	Frequency Measure with Time Elapsed Total emission within kHz
50	13.5586	-0.0002
40	13.5591	0.0003
30	13..5587	-0.0001
20	13.5586	-0.0002
10	13.5600	0.0002
0	13.5589	0.0001
-10	13.5600	0.0002
-20	13.5589	0.0001

Frequency stability vs.input voltage		
Power Supplied (Vdc)	Measured Frequency (MHz)	Frequency Measure with Time Elapsed Total emission within kHz
4.25Vdc	13.5591	0.0003
5.0Vdc	13.5588	0.0000
5.75Vdc	13.5589	0.0001