



TEST REPORT

Report Reference No	TRE1703021301	R/C.....: 25512
FCC ID	2ALJN-CL-M706	
Applicant's name	Shenzhen Cardlan Technology Co.,Ltd	
Address	3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China	
Manufacturer.....	Shenzhen Cardlan Technology Co.,Ltd	
Address.....	3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China	
Test item description	Card Reader Writer	
Trade Mark.....	-	
Model/Type reference	CL-M706	
Listed Model(s).....	-	
Standard.....	FCC CFR Title 47 Part 15 Subpart C Section 15.225	
Date of receipt of test sample.....	Mar. 22, 2017	
Date of testing.....	Mar. 22, 2017 - Apr. 12, 2017	
Date of issue.....	Apr. 12, 2017	
Result	PASS	

Compiled by (position+printed name+signature) ..:	File administrators Becky Liang	
Supervised by (position+printed name+signature) ..:	Project Engineer Lion Cai	
Approved by (position+printed name+signature) ..:	RF Manager Hans Hu	

Testing Laboratory Name.....	Shenzhen Huatongwei International Inspection Co., Ltd.
Address	1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

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1. Test standards and Report version

1.1. Applicable Standards

The tests were performed according to following standards:

[FCC Rules Part 15.225](#): Operation within the band 13.110-14.010 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

1.2. Report version

Version No.	Date of issue	Description
00	Apr. 12, 2017	Original

2. Test Description

ReportSection	Test Item	FCC Rule	Result
4.1	Antenna requirement	15.203	Pass
4.2	Line Conducted Emission (AC Main)	15.207	Pass
4.3	20dB Bandwidth	15.215	Pass
4.4	Radiated Emissions& Field Strength of Fundamental Emissions	15.225(a)(b)(c)(d)/15.209	Pass
4.5	Frequency Stability	15.225e	Pass

Remark: The measurement uncertainty is not included in the test result.

3. SUMMARY

3.1. Client Information

Applicant:	Shenzhen Cardlan Technology Co.,Ltd
Address:	3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China
Manufacturer:	Shenzhen Cardlan Technology Co.,Ltd
Address:	3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China

3.2. Product Description

Name of EUT:	Card Reader Writer
Trade Mark:	-
Model No.:	CL-M706
Listed Model(s):	-
Power supply:	DC 5V
Adapter information:	-
NFC	
Modulation:	FSK
Operation frequency:	13.56MHz
Channel number:	1
Antenna type:	Integral Antenna

3.3. Operation state

◆ Test mode

For RF test items:

The engineering test program was provided and enabled to make EUT continuous transmit

For AC power line conducted emissions:

The EUT was set to connect with the NFC under large package sizes transmission.

3.4. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

	Length (m) :	/
	Shield :	/
	Detachable :	/
	Manufacturer :	/
	Model No. :	/

3.5. Modifications

No modifications were implemented to meet testing criteria.

4. **TEST ENVIRONMENT**

4.1. **Address of the test laboratory**

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China
Phone: 86-755-26748019 Fax: 86-755-26748089

4.2. **Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

A2LA-Lab Cert. No.: 3902.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until April 30, 2017.

FCC-Registration No.: 317478

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

IC-Registration No.: 5377B

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

4.3. Equipments Used during the Test

Conducted Emission (AC Main)					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Artificial Mains	Rohde&Schwarz	ESH2-Z5	100028	2016/11/13
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	100038	2016/11/13
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2016/11/13
4	EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A

Radiated Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	2016/11/13
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2016/11/13
3	EMI TEST Software	Audix	E3	N/A	N/A
4	TURNTABLE	ETS	2088	2149	N/A
5	ANTENNA MAST	ETS	2075	2346	N/A
6	EMI TEST Software	Rohde&Schwarz	ESK1	N/A	N/A
7	HORNANTENNA	ShwarzBeck	9120D	1011	2016/11/13
8	Amplifier	Sonoma	310N	E009-13	2016/11/13
9	JS amplifier	Rohde&Schwarz	JS4-00101800-28-5A	F201504	2016/11/13
10	High pass filter	Compliance Direction systems	BSU-6	34202	2016/11/13
11	HORNANTENNA	ShwarzBeck	9120D	1012	2016/11/13
12	Amplifier	Compliance Direction systems	PAP1-4060	120	2016/11/13
13	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2016/11/13
14	TURNTABLE	MATURO	TT2.0	----	N/A
15	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A

Conducted test					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2016/11/13

The Cal.Interval was one year.

4.4. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15~35°C
Relative Humidity:	30~60 %
Air Pressure:	950~1050mba

4.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 2" and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	1.60 dB	(1)
Radiated spurious emission 9KHz-40 GHz	2.20 dB	(1)
Conducted Emission 9KHz-30MHz	3.39 dB	(1)
Radiated Emission 30~1000MHz	4.24 dB	(1)
Occupied Bandwidth	-----	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

5. TEST CONDITIONS AND RESULTS

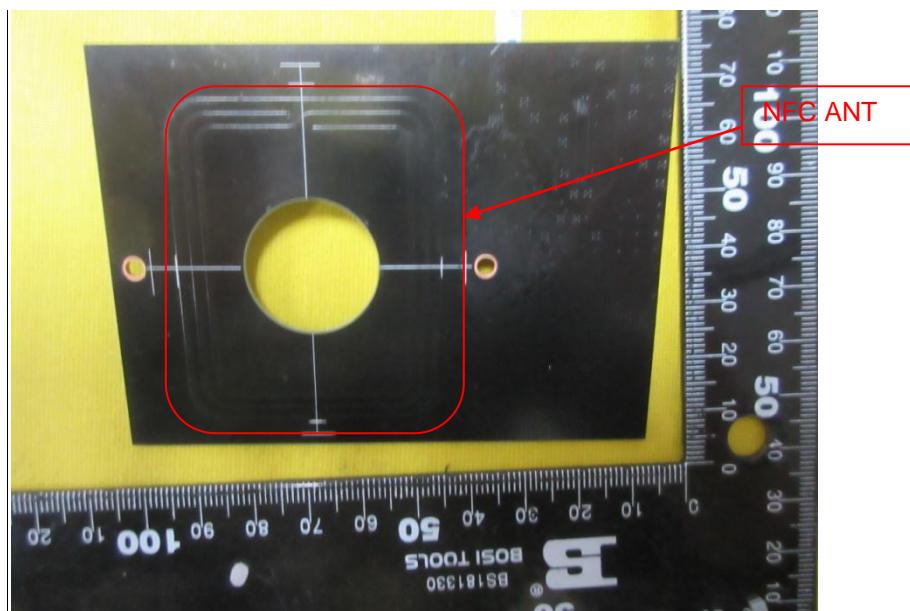
5.1. Antenna requirement

Requirement

FCC CFR Title 47 Part 15 Subpart C Section 15.203:

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.

Test Result:



5.2. Conducted Emission (AC Main)

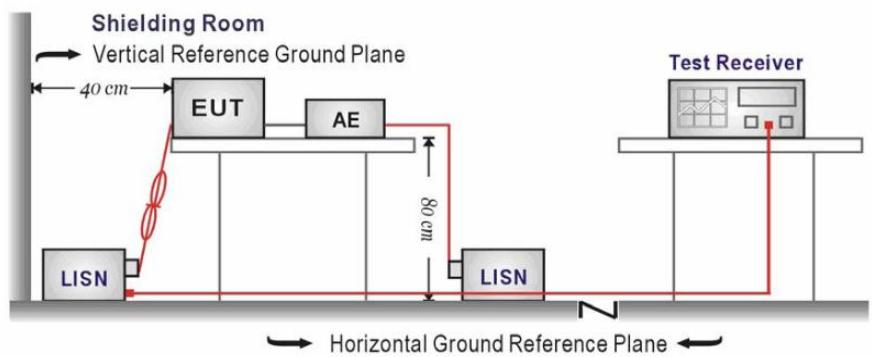
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	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.

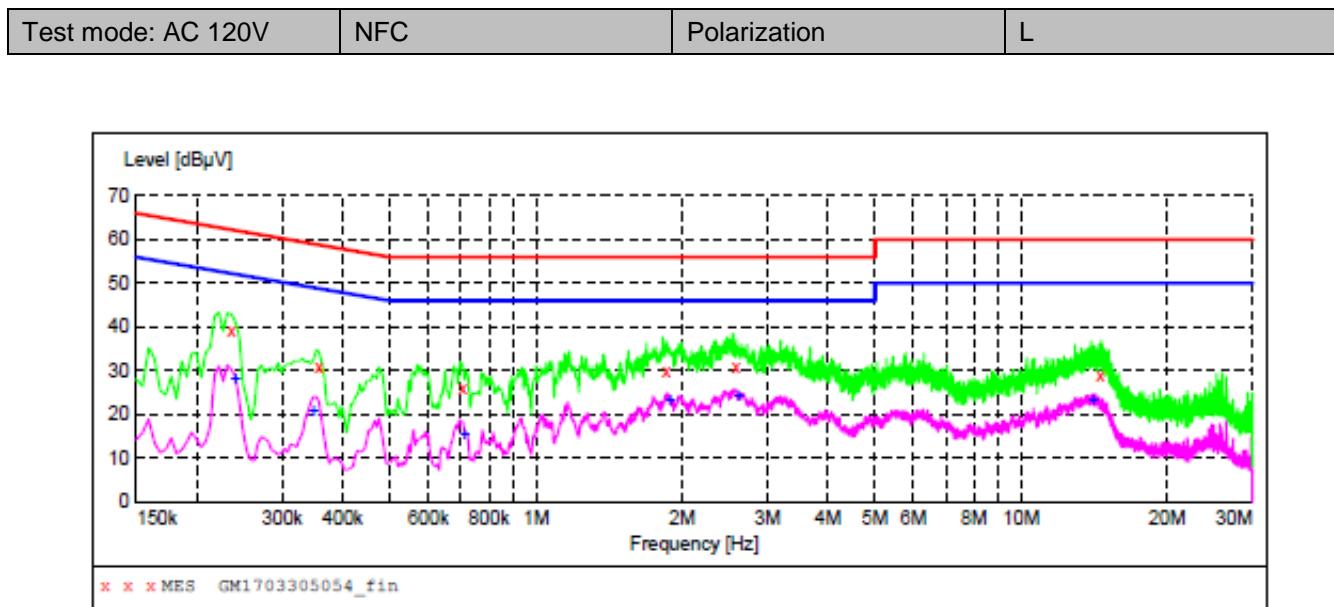
TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

TEST RESULTS


MEASUREMENT RESULT: "GM1703305054_fin"

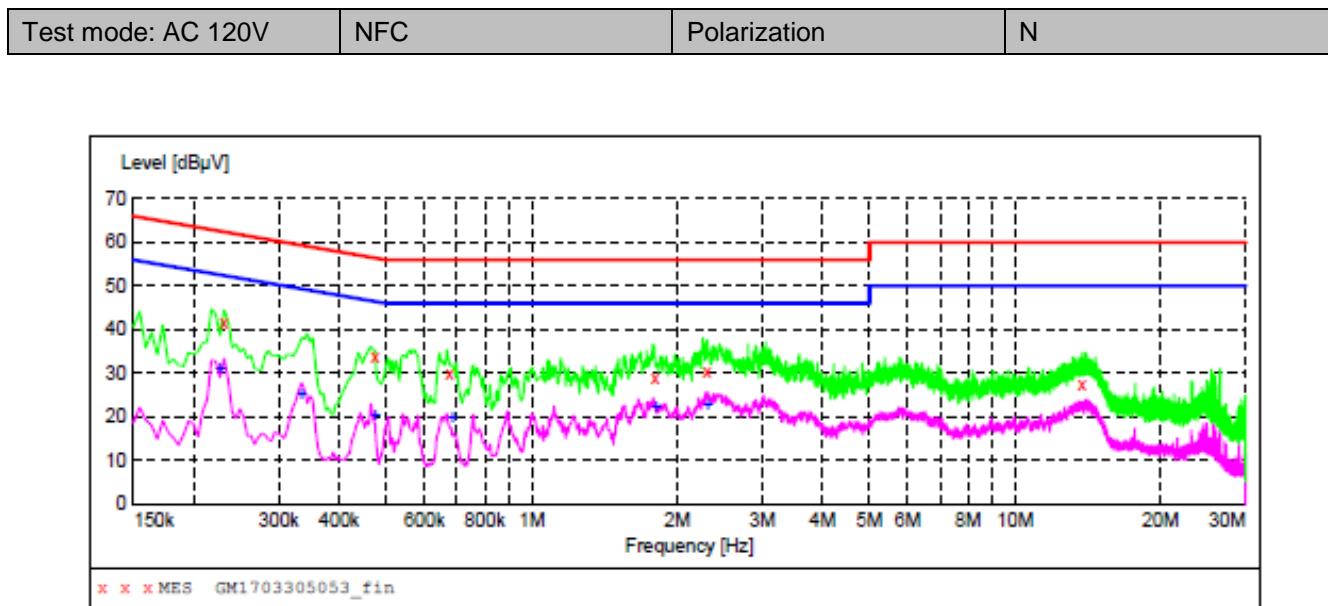
3/30/2017 4:25PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.235500	39.40	10.3	62	22.9	QP	L1	GND
0.357000	30.80	10.2	59	28.0	QP	L1	GND
0.708000	26.20	10.2	56	29.8	QP	L1	GND
1.860000	29.80	10.2	56	26.2	QP	L1	GND
2.589000	31.00	10.2	56	25.0	QP	L1	GND
14.599500	28.80	10.5	60	31.2	QP	L1	GND

MEASUREMENT RESULT: "GM1703305054_fin2"

3/30/2017 4:25PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.240000	28.70	10.3	52	23.4	AV	L1	GND
0.348000	21.20	10.2	49	27.8	AV	L1	GND
0.712500	15.90	10.2	46	30.1	AV	L1	GND
1.891500	23.50	10.2	46	22.5	AV	L1	GND
2.616000	24.60	10.2	46	21.4	AV	L1	GND
14.068500	23.50	10.5	50	26.5	AV	L1	GND


MEASUREMENT RESULT: "GM1703305053_fin"

3/30/2017 4:22PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.231000	41.50	10.3	62	20.9	QP	N	GND
0.474000	33.90	10.2	56	22.5	QP	N	GND
0.676500	30.10	10.2	56	25.9	QP	N	GND
1.801500	29.00	10.2	56	27.0	QP	N	GND
2.305500	30.60	10.2	56	25.4	QP	N	GND
13.762500	27.70	10.5	60	32.3	QP	N	GND

MEASUREMENT RESULT: "GM1703305053_fin2"

3/30/2017 4:22PM

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Detector	Line	PE
0.226500	31.50	10.3	53	21.1	AV	N	GND
0.334500	25.60	10.2	49	23.7	AV	N	GND
0.474000	20.90	10.2	46	25.5	AV	N	GND
0.685500	20.10	10.2	46	25.9	AV	N	GND
1.806000	22.80	10.2	46	23.2	AV	N	GND
2.310000	23.20	10.2	46	22.8	AV	N	GND

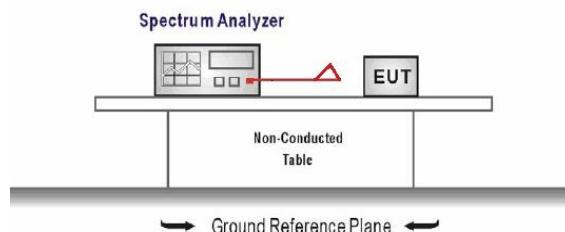
Remark: Transd=Cable loss+ PULSE LIMITER factor+ ARTIFICIAL MAINS factor; Margin= Limit -Level

5.3. 20dB bandwidth

LIMIT

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

TEST CONFIGURATION



TEST PROCEDURE

Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

Set the spectrum analyzer center frequency to the EUT nominal center frequency

RBW = 1 kHz, VBW $\geq 3 \times$ RBW

Sweep time= auto couple

Detector = Peak

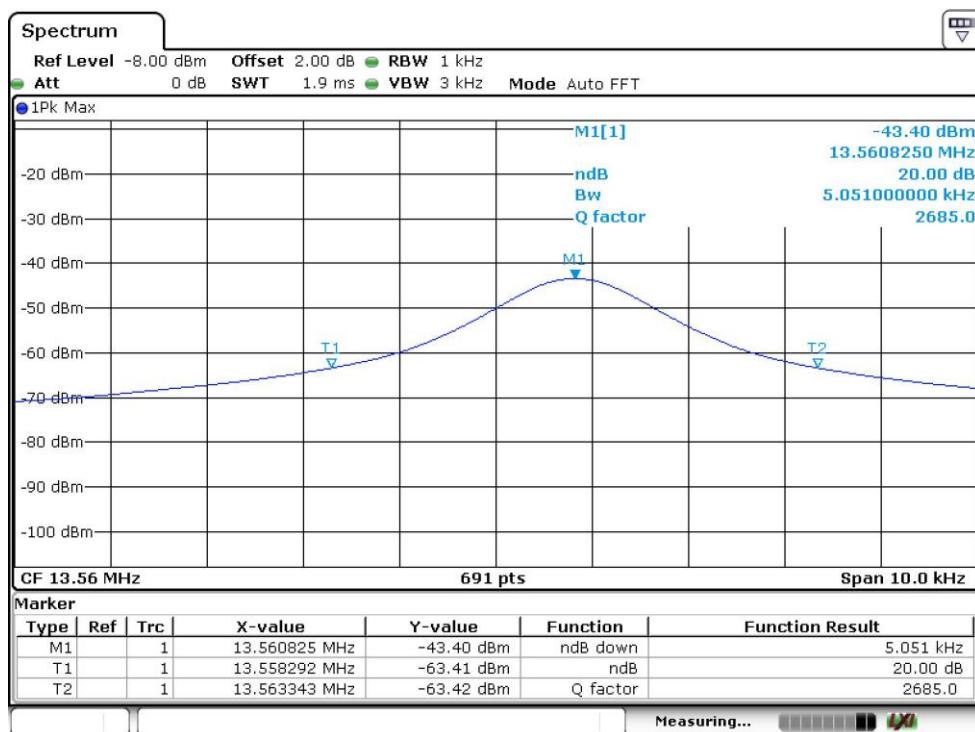
Trace mode = max hold

Measured the spectrum width with power higher than 20dB below carrier .

TEST RESULTS

Frequency	20dB Bandwidth(KHz)
13.56MHz	5.05

Test plot as follows:



5.4. Radiated Emission

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

Frequency	Limit (uV/m)	Measurement Distance(meters)
0.009MHz-0.490MHz	2400/F(kHz)	300
0.490MHz-1.705MHz	24000/F(kHz)	30
1.705MHz-30MHz	30	30
30MHz-88MHz	100	3
88MHz-216MHz	150	3
216MHz- 960MHz	200	3
Above 960MHz	500	3

FCC CFR Title 47 Part 15 Subpart C Section 15.225

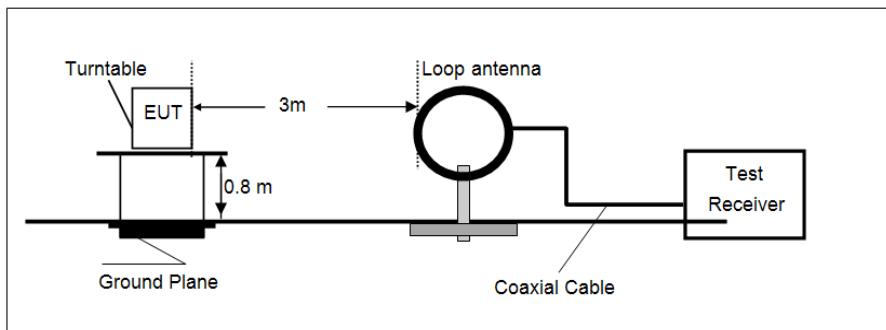
Field Strength of Fundamental Emissions Limit			
Frequency	Field Strength (μ V/m)@30m	Field Strength (dB μ V/m)@30m	Field Strength (dB μ V/m)@3m
1.705MHz-13.110MHz	30	29.5	69.5
13.110MHz-13.410MHz	106	40.5	80.5
13.410MHz-13.553MHz	334	50.5	90.5
13.553MHz-13.567MHz	15848	84	124.0
13.567MHz-13.710MHz	334	50.5	90.5
13.710MHz-14.010MHz	106	40.5	80.5
14.010MHz-30MHz	30	29.5	69.5

$$\text{dB}\mu\text{V/m} = 20\log(\mu\text{V/m})$$

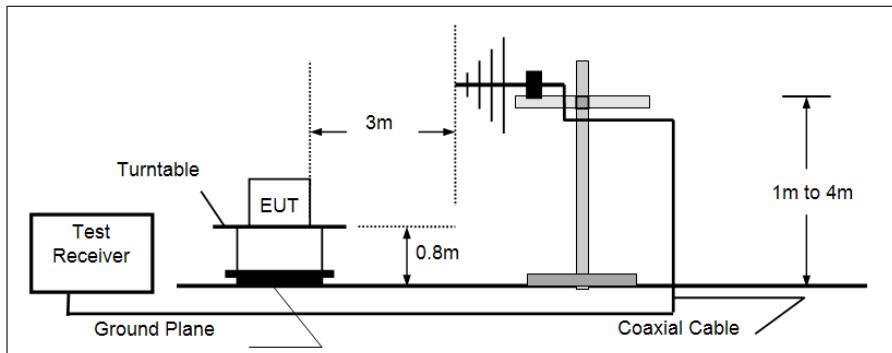
$$3\text{m Limit(dB}\mu\text{V/m)} = 10\text{m Limit(dB}\mu\text{V/m)} + 40\log(10/3)$$

TEST CONFIGURATION

- 9KHz ~30MHz



- 30MHz ~ 1GHz



TEST PROCEDURE

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 for below 30MHz, and 100kHz for 30MHz-1000MHz..

Note: Emission level (dB μ V/m) = 20 log Emission level (μ V/m).

TEST RESULTS

All Measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded (X).

Radiated Emission Measurement data:

Frequency MHz	Level dB μ V/m	Transd dB	Limit (dB μ V/m @3m)	Margin dB	Det.	Result
0.03	43.61	22.15	118.06	-74.45	QP	Pass
0.05	34.58	22.15	113.63	-79.05	QP	Pass
0.28	30.15	22.22	98.66	-68.51	QP	Pass
1.02	30.47	22.22	67.43	-36.96	QP	Pass
5.61	30.26	22.32	69.50	-39.24	QP	Pass
21.39	30.38	22.47	69.50	-39.12	QP	Pass

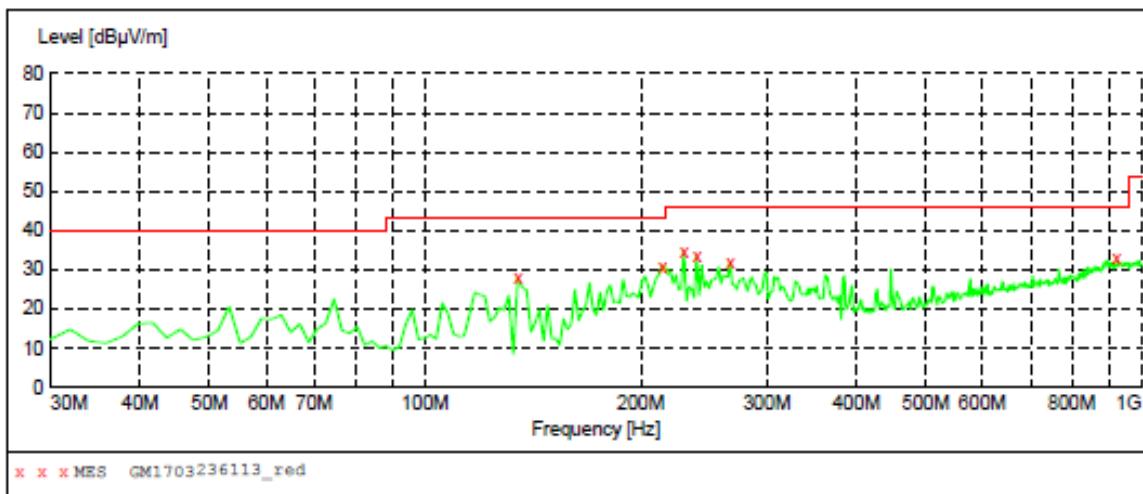
1. Level = Receiver Read level + Transd
2. Transd = Antenna Factor + Cable Loss

Field Strength of Fundamental Emissions , etc Measurement data:

Mea.Frequency MHz	Test result (dB μ V/m@3m)	Limit (dB μ V/m @3m)	Margin dB	Det.	Result
13.349	47.24	69.50	-22.26	QP	Pass
13.485	46.69	69.50	-22.81	QP	Pass
13.581	46.92	69.50	-22.58	QP	Pass
13.56	85.47	124.00	-38.53	QP	Pass
13.658	46.91	69.50	-22.59	QP	Pass
13.773	46.75	69.50	-22.75	QP	Pass

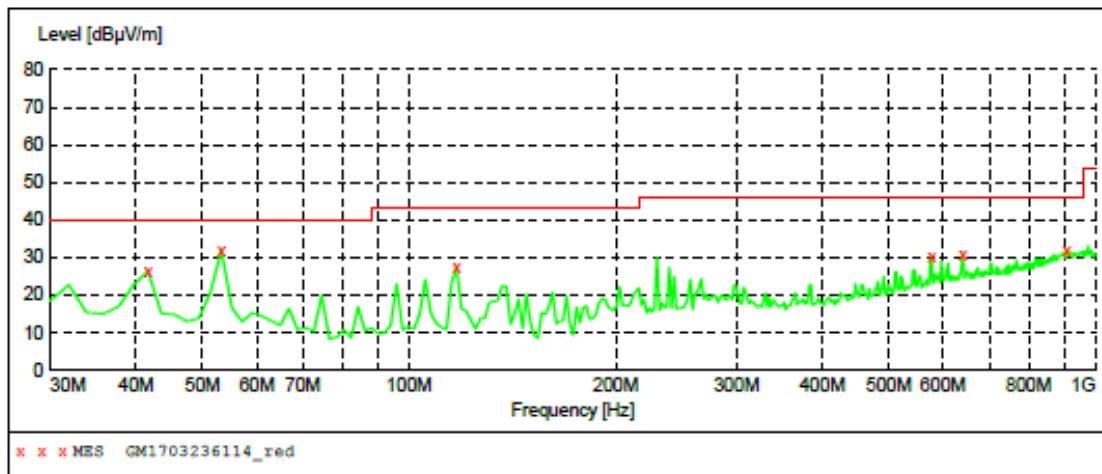
Radiated Emission Measurement data:

30MHz ~ 1GHz

**MEASUREMENT RESULT: "GM1703236113_red"**

3/23/2017 7:30PM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
134.760000	27.90	-19.9	43.5	15.6	QP	300.0	31.00	HORIZONTAL
214.300000	30.80	-15.5	43.5	12.7	QP	100.0	72.00	HORIZONTAL
229.820000	34.70	-15.0	46.0	11.3	QP	100.0	289.00	HORIZONTAL
239.520000	33.50	-14.6	46.0	12.5	QP	100.0	311.00	HORIZONTAL
266.680000	31.90	-13.8	46.0	14.1	QP	100.0	83.00	HORIZONTAL
924.340000	32.80	1.4	46.0	13.2	QP	100.0	132.00	HORIZONTAL

**MEASUREMENT RESULT: "GM1703236114_red"**

3/23/2017 7:33PM

Frequency MHz	Level dB μ V/m	Transd dB	Limit dB μ V/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.640000	26.50	-16.8	40.0	13.5	QP	100.0	341.00	VERTICAL
53.280000	31.90	-16.5	40.0	8.1	QP	100.0	318.00	VERTICAL
117.300000	27.50	-18.2	43.5	16.0	QP	100.0	341.00	VERTICAL
577.080000	30.40	-5.4	46.0	15.6	QP	100.0	0.00	VERTICAL
641.100000	30.90	-4.1	46.0	15.1	QP	100.0	0.00	VERTICAL
908.820000	32.00	1.2	46.0	14.0	QP	100.0	354.00	VERTICAL

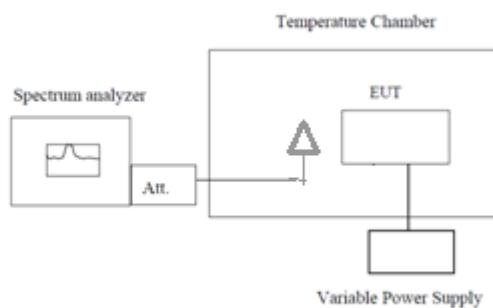
Remark: Transd=Cable loss+ Antenna factor; Pre-amplifier; Margin=Limit –Level

5.5. Frequency stability

LIMIT

2.5ppm

TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

TEST PROCEDURE

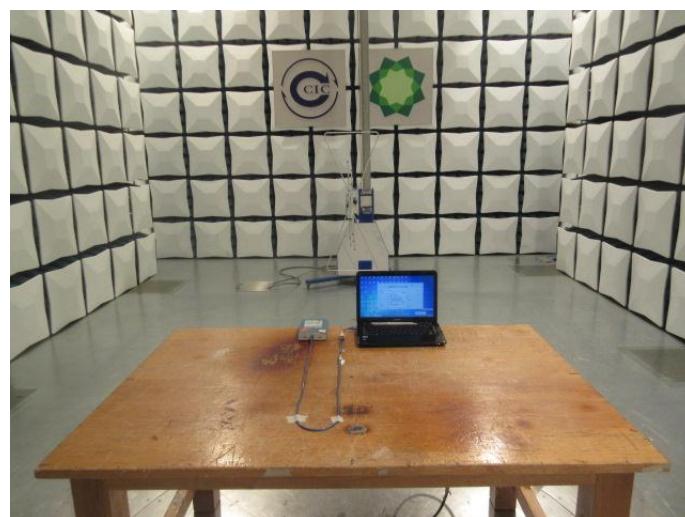
1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

TEST RESULTS

NFC 13.56MHz						
Voltage(%)	Power(VDC)	TEMP(°C)	Meas.Freq.(MHz)	Freq.Dev(Hz)	Deviation(ppm)	Limit(ppm)
100%	5.00	-30	13.560825	825	60.8407	-100> Deviation >100
100%		-20	13.560823	823	60.6932	
100%		-10	13.560759	759	55.9735	
100%		0	13.560858	858	63.2743	
100%		10	13.560813	813	59.9558	
100%		20	13.560814	814	60.0295	
100%		30	13.560825	825	60.8407	
100%		40	13.560843	843	62.1681	
100%		50	13.560816	816	60.1770	
Low Battery power	4.25	20	13.560814	814	60.0295	
High Battery power	5.75	20	13.560858	858	63.2743	

6. Test Setup Photos of the EUT

Radiated Emission



Conducted Emission (PC Charge)

