



# TEST REPORT

Report Reference No. .... : **TRE1605009207** R/C.....: 36262  
FCC ID..... : **YY3-14242**  
Applicant's name..... : **Handheld Group AB**  
Address..... : Kinnegatan 17, 53133, Lidköping, Sweden  
Manufacturer..... : Handheld Group AB  
Address..... : Kinnegatan 17, 53133, Lidköping, Sweden  
Test item description ..... : **Rugged Mobile PDA**  
Trade Mark ..... : Handheld  
Model/Type reference..... : NAUTIZ X2  
Listed Model(s) ..... : -  
Standard ..... : **FCC CFR Title 47 Part 15 Subpart C Section 15.225**  
Date of receipt of test sample..... : May.19, 2016  
Date of testing..... : May.20, 2016 ~ Jun.14, 2016  
Date of issue..... : Jun.15, 2016  
Result..... : **PASS**

Compiled by  
( position+printedname+signature)... : File administrators Candy Liu

Candy Liu

Supervised by  
( position+printed name+signature)... : Project Engineer Lion Cai

Lion Cai

Approved by  
( position+printed name+signature)... : RF Manager Hans Hu

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. APPLICABLE STANDARDS AND TEST DESCRIPTION

### 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. 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	2.1049	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.

## 2. SUMMARY

### 2.1. Client Information

Applicant:	Handheld Group AB
Address:	Kinnegatan 17, 53133, Lidköping, Sweden
Manufacturer:	Handheld Group AB
Address:	Kinnegatan 17, 53133, Lidköping, Sweden

### 2.2. Product Description

Name of EUT	Rugged Mobile PDA
Trade Mark:	Handheld
Model No.:	NAUTIZ X2
Listed Model(s):	-
IMEI 1:	869881011800052
Power supply:	DC 3.7V From internal battery
Adapter information1:	Model:FJ-SW1260502000UN Input:AC 100-240V 50/60Hz 0.4A Max Output: 5Vd.c., 2000mA
Adapter information2:	Model:FJ-SW1202000N Input:AC 100-240V 50/60Hz 0.6A Max Output: 12Vd.c., 2000mA
<b>NFC</b>	
Modulation:	FSK
Operation frequency:	13.56MHz
Channel number:	1
Antenna type:	Internal Antenna
Antenna gain:	0.0dBi

### 2.3. Operation state

#### ◆ Test mode

For RF test items:

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

For AC power line conducted emissions:

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

### 2.4. 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. :	/

### 2.5. Modifications

No modifications were implemented to meet testing criteria.

### **3. TEST ENVIRONMENT**

#### **3.1. 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

#### **3.2. 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 December 31, 2016.

##### **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.: 5377A&5377B**

The 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. 5377A on Dec. 31, 2013, valid time is until Dec. 31, 2016.

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.

##### **VCCI**

The 3m Semi-

anechoic chamber (12.2m×7.95m×6.7m) of Shenzhen Huatongwei International Inspection Co., Ltd.

has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2484. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 29, 2015.

Radiated disturbance above 1GHz measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2013. Valid time is until Dec. 23, 2016.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2012. Valid time is until Dec. 19, 2015.

Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2013. Valid time is until May 06, 2016.

##### **DNV**

Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2016.

### 3.3. 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	2015/11/02
2	EMI Test Receiver	Rohde&Schwarz	ESCI3	100038	2015/11/02
3	Pulse Limiter	Rohde&Schwarz	ESHSZ2	100044	2015/11/02
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	2015/11/02
2	EMI TEST RECEIVER	Rohde&Schwarz	ESI 26	100009	2015/11/02
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	2015/11/02
8	Amplifer	Sonoma	310N	E009-13	2015/11/02
9	JS amplifer	Rohde&Schwarz	JS4-00101800-28-5A	F201504	2015/11/02
10	High pass filter	Compliance Direction systems	BSU-6	34202	2015/11/02
11	HORNANTENNA	ShwarzBeck	9120D	1012	2015/11/02
12	Amplifer	Compliance Direction systems	PAP1-4060	120	2015/11/02
13	Loop Antenna	Rohde&Schwarz	HFH2-Z2	100020	2015/11/02
14	TURNTABLE	MATURO	TT2.0	----	N/A
15	ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A

Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission					
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal
1	Spectrum Analyzer	Rohde&Schwarz	FSP	1164.4391.40	2015/11/02

The Cal.Interval was one year

### 3.4. 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

### 3.5. 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 according 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 according 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  $k=1.96$ .



## 4. TEST CONDITIONS AND RESULTS

### 4.1. Antenna requirement

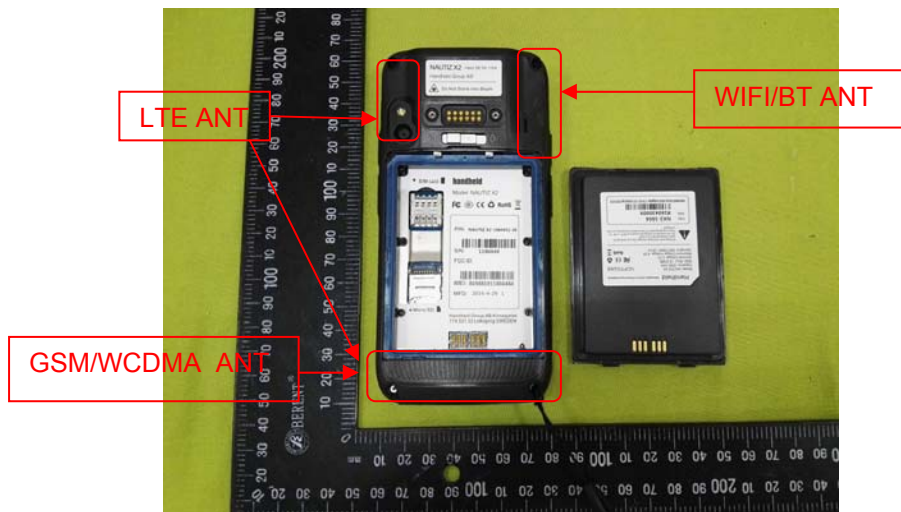
#### Requirement

##### **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:

The antenna is integral antenna, the best case gain of the antenna is 0.0dBi



## 4.2. Conducted Emission (AC Main)

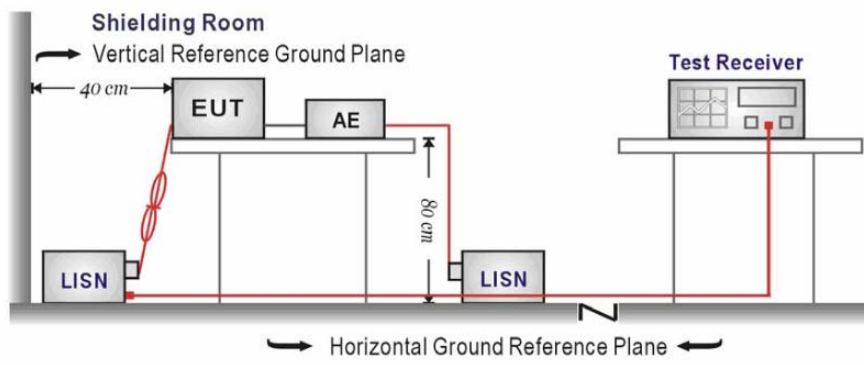
### LIMIT

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 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz.

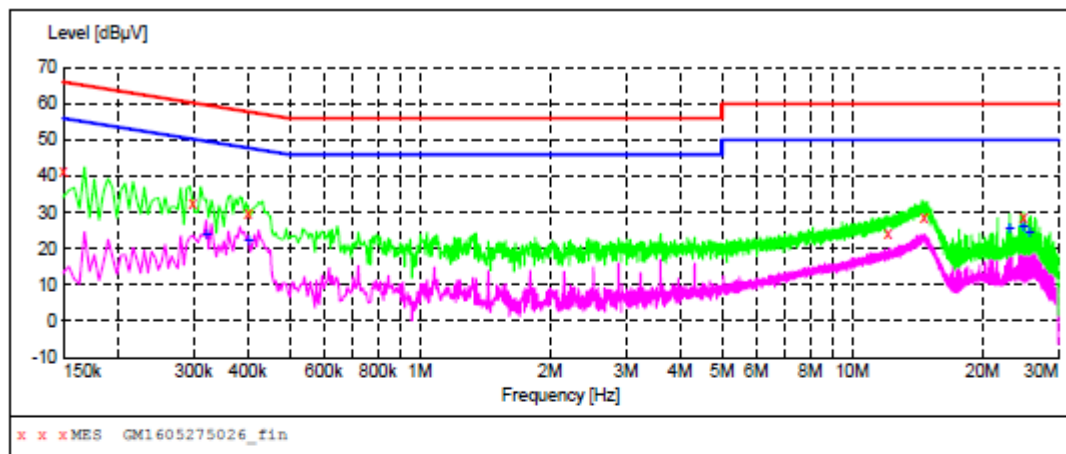
### TEST RESULTS

Test mode:AC 120V

NFC

Polarization

L

**MEASUREMENT RESULT: "GM1605275026\_fin"**

5/27/2016 2:25PM

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.150000	41.50	10.3	66	24.5	QP	L1	GND
0.298500	32.80	10.2	60	27.5	QP	L1	GND
0.402000	29.70	10.2	58	28.1	QP	L1	GND
12.102000	24.50	10.8	60	35.5	QP	L1	GND
14.698500	28.80	10.8	60	31.2	QP	L1	GND
24.900000	28.60	11.0	60	31.4	QP	L1	GND

**MEASUREMENT RESULT: "GM1605275026\_fin2"**

5/27/2016 2:25PM

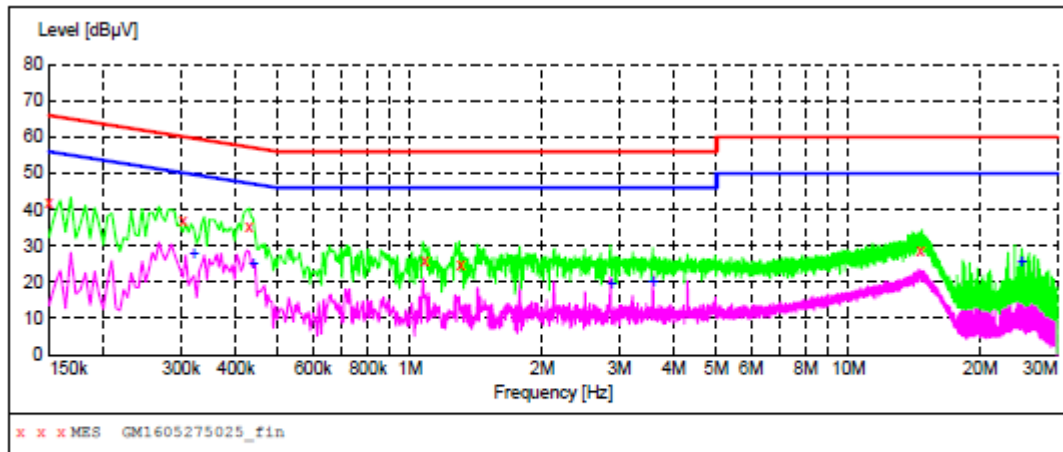
Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.321000	24.20	10.2	50	25.5	AV	L1	GND
0.402000	22.50	10.2	48	25.3	AV	L1	GND
23.127000	25.70	11.0	50	24.3	AV	L1	GND
24.900000	26.40	11.0	50	23.6	AV	L1	GND
25.692000	24.60	11.0	50	25.4	AV	L1	GND

Test mode: AC 120V

NFC

Polarization

N

**MEASUREMENT RESULT: "GM1605275025\_fin"**

5/27/2016 2:22PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	42.00	10.3	66	24.0	QP	N	GND
0.303000	36.90	10.2	60	23.3	QP	N	GND
0.429000	35.50	10.2	57	21.8	QP	N	GND
1.077000	25.70	10.2	56	30.3	QP	N	GND
1.302000	24.80	10.2	56	31.2	QP	N	GND
14.608500	28.80	10.8	60	31.2	QP	N	GND

**MEASUREMENT RESULT: "GM1605275025\_fin2"**

5/27/2016 2:22PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.321000	28.20	10.2	50	21.5	AV	N	GND
0.438000	25.30	10.2	47	21.8	AV	N	GND
2.881500	19.90	10.3	46	26.1	AV	N	GND
3.601500	20.60	10.3	46	25.4	AV	N	GND
24.900000	26.20	11.0	50	23.8	AV	N	GND

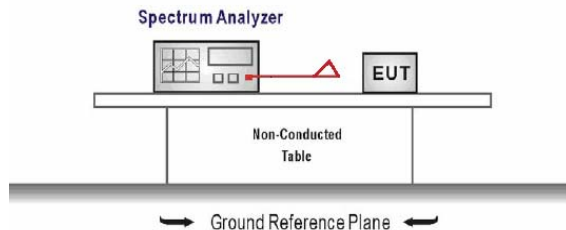
Remark: Transd=Cable lose+ PULSE LIMITER factor+ ARTIFICIAL MAINS factor; Margin= Limit -Level

### 4.3. 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*

$$RBW = 1 \text{ kHz}, VBW \geq 3 \times RBW$$

*Sweep time= auto couple*

*Detector = Peak*

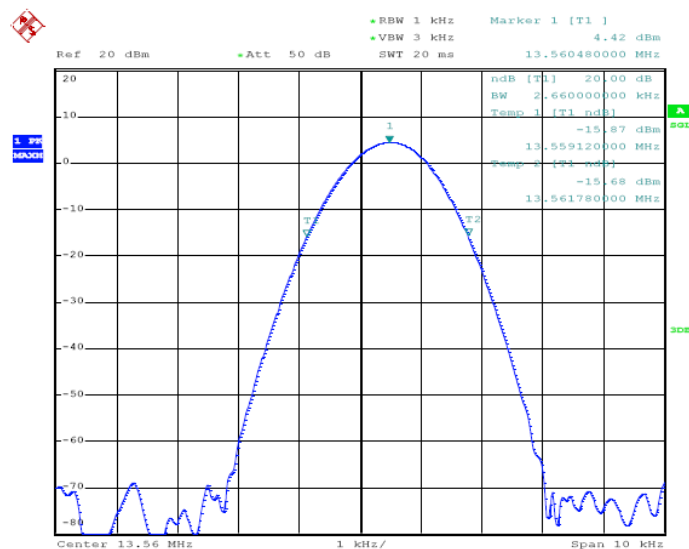
Trace mode = max hold

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

## TEST RESULTS

Frequency	20dB Bandwidth(KHz)
13.56MHz	2.66

Test plot as follows:



#### 4.4. Radiated Emission & Field Strength of Fundamental Emissions

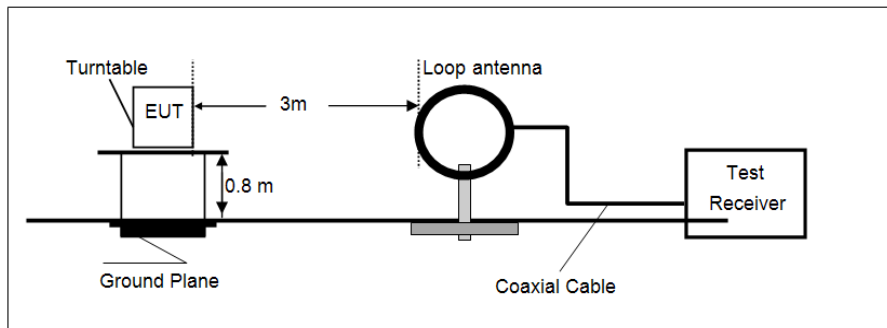
##### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

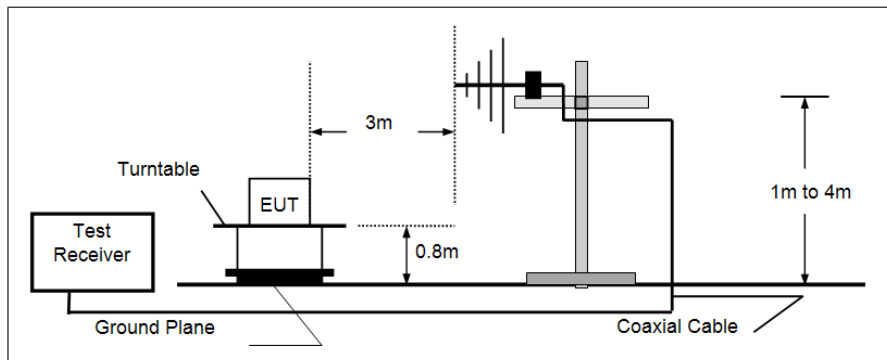
Frequency	Limit (uV/m)	Measurement Distance(meters)
0.009MHz-0.490MHz	2400/F(kHz)	300
0.490MHz-1.705MHz	24000/F(kHz)	30
1.705MHz-30MHz	30	30
30MHz-88MHz	100	3
88MHz-216MHz	150	3
216MHz- 960MHz	200	3
Above 960MHz	500	3

##### 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 $\mu$ V/m) = 20 log Emission level ( $\mu$ 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:**

<i>Frequency MHz</i>	<i>Level dB<math>\mu</math>V/m</i>	<i>Transd dB</i>	<i>Limit (dB<math>\mu</math>V/m @3m)</i>	<i>Margin dB</i>	<i>Det.</i>	<i>Result</i>
0.01	37.73	20.04	127.11	-89.38	Quasi	Pass
0.56	42.49	20.09	73.41	-30.92	Quasi	Pass
4.85	40.98	20.17	69.54	-28.56	Quasi	Pass
27.52	32.45	20.52	69.54	-37.07	Quasi	Pass

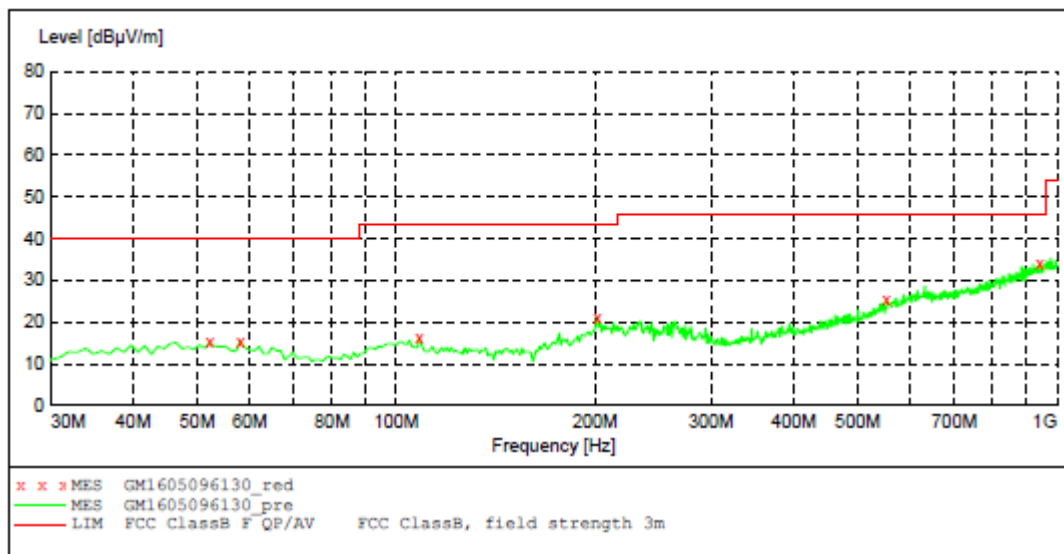
1. Level =Receiver Read level+ Transd

2. Transd=Antenna Factor+Cable Loss

#### **Field Strength of Fundamental Emissions Measurement data:**

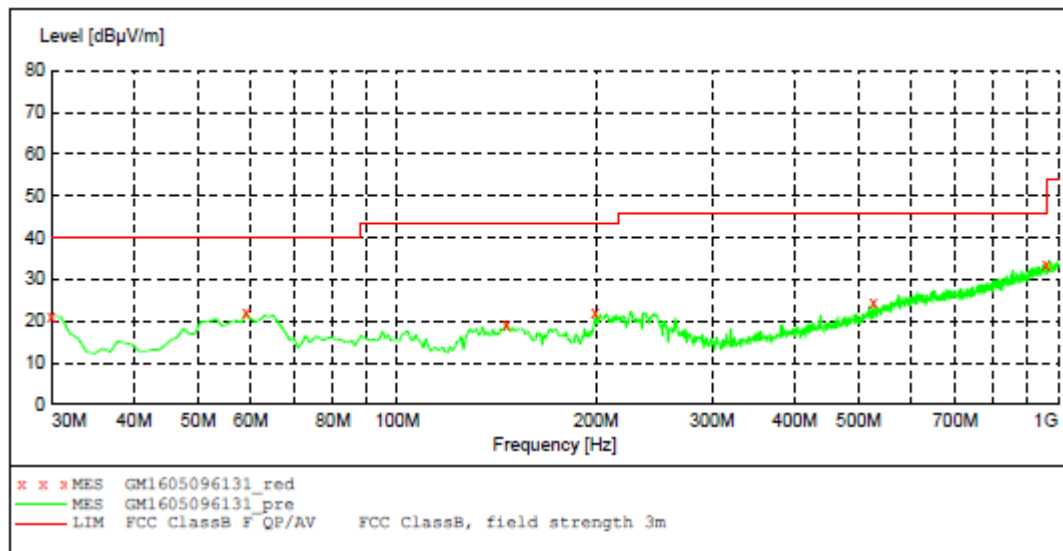
<i>Frequency MHz</i>	<i>Mea.Frequency MHz</i>	<i>Test result (dB<math>\mu</math>V/m@3m)</i>	<i>Limit (dB<math>\mu</math>V/m @3m)</i>	<i>Margin dB</i>	<i>Det.</i>	<i>Result</i>
13.110~13.410	13.400	48.52	80.50	-31.98	Quasi	Pass
13.410~13.553	13.551	64.35	90.5	-26.15	Quasi	Pass
13.553~13.567	13.560	96.72	124.00	-27.28	Quasi	Pass
13.567~13.710	13.568	62.54	90.50	-27.96	Quasi	Pass
13.710~14.010	13.710	69.76	85.50	-15.74	Quasi	Pass

## ■ 30MHz ~ 1GHz

**MEASUREMENT RESULT: "GM1605096130\_red"**

5/9/2016 10:12PM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
52.310000	15.20	-14.4	40.0	24.8	QP	100.0	360.00	HORIZONTAL
58.130000	15.50	-14.8	40.0	24.5	QP	100.0	169.00	HORIZONTAL
108.570000	16.10	-15.0	43.5	27.4	QP	300.0	3.00	HORIZONTAL
201.690000	21.10	-13.7	43.5	22.4	QP	300.0	55.00	HORIZONTAL
552.830000	25.40	-4.7	46.0	20.6	QP	100.0	227.00	HORIZONTAL
943.740000	33.90	3.6	46.0	12.1	QP	100.0	81.00	HORIZONTAL

**MEASUREMENT RESULT: "GM1605096131\_red"**

5/9/2016 10:15PM

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	21.10	-16.8	40.0	18.9	QP	100.0	209.00	VERTICAL
59.100000	22.00	-14.8	40.0	18.0	QP	100.0	195.00	VERTICAL
146.400000	19.40	-18.0	43.5	24.1	QP	100.0	223.00	VERTICAL
199.750000	21.90	-13.6	43.5	21.6	QP	100.0	81.00	VERTICAL
526.640000	24.60	-6.0	46.0	21.4	QP	100.0	37.00	VERTICAL
959.260000	33.50	3.9	46.0	12.5	QP	100.0	359.00	VERTICAL

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

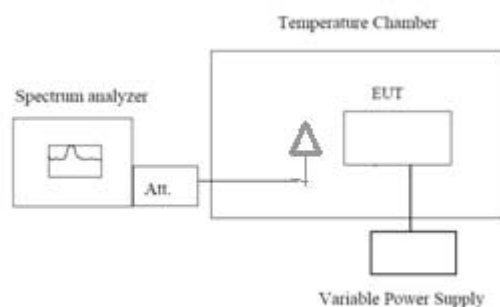


## 4.5. Frequency stability

### LIMIT

2.5ppm

### TEST CONFIGURATION



Note : Measurement setup for testing on Antenna connector

### TEST PROCEDURE

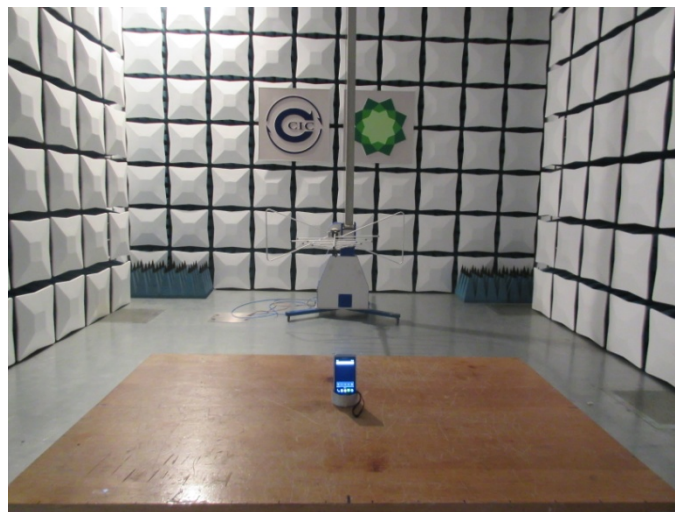
1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain 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%	3.70	-30	13.560480	480	35.39823	-100> Deviation >100
100%		-20	13.560470	470	34.66077	
100%		-10	13.560490	490	36.13569	
100%		0	13.560480	480	35.39823	
100%		+10	13.560450	450	33.18584	
100%		+20	13.560470	470	34.66077	
100%		+30	13.560490	490	36.13569	
100%		+40	13.560450	450	33.18584	
100%		+50	13.560490	490	36.13569	
Low Battery power	3.50	+20	13.560440	440	32.44838	-100> Deviation >100
High Battery power	4.20	+20	13.560490	490	36.13569	

## 5. Test Setup Photos of the EUT

### Radiated Emission



### Conducted Emission (AC Mains)



## **6. External and Internal Photos of the EUT**

*Reference to Test Report TRE1605009201*

.....End of Report.....