TEST REPORT

1. Applicant

Name : Handheld Group AB

Address : Kinnegatan 17A S-531 33 Lidköping, Sweden

2. Products

Name : Mobile Computer

Model : NAUTIZ X4

Manufacturer : POINTMOBILE CO.,LTD

3. Test Standard : FCC CFR 47 Part 15C, section 15.225 / RSS-210 A2.6

4. Test Method : ANSI C63.4-2003

5. Test Results : Positive

6. Date of Application : January 16, 2014

7. Date of Issue : June 20, 2014

Tested by

Jong-gon Ban
ICT Infrastructure
Technology Center
Senior Engineer

Approved by

T. S. Song

Tae-Seung Song
ICT Infrastructure
Technology Center
Manager

Korea Testing Laboratory

Test Report revision History

Revision	Date	Comments
00	2014-06-20	Initial Version

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1. Administrative Information

1.1. Applicant (Client)

Company Name	Handheld Group AB
Address	Kinnegatan 17A S-531 33 Lidköping, Sweden
Contact Person	
Name	Jerker Hellstrom
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Phone	+46(0)510-54 7170

1.2. Manufacturer Data (only if different from Appicant)

Company Name	POINTMOBILE CO.,LTD
Address	Gasan-dong, B-9F Kabul Great Valley 32, Digital-ro9-gil, Geumcheon-gu, Seoul, Korea
Contact Person	
Name	Chloe Kim
E-mail	chloe.kim@pointmobile.co.kr
Phone	+82 70 7090 2642

1.3. Testing Laboratory Data

The following list shows all places and laboratories involved for test result generation.

Company Name	Korea Testing Laboratory
Address	723 Haean-ro, Sangnok-Gu, Ansan-Si, Gyeounggi-Do, 426-901 KOREA
Contact Person	
Name	Jong-gon Ban
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2.EUT Information

2.1. General Description of the EUT

The following section lists all specifications of EUT (Equipment Under Test) involved in test. Additionally, KTL has received sufficient documentation from the client and/or manufacturer to perform the tests

General Information		
FCC ID & Model Number		FCC ID: **YY3-14244R**, Model Number: **NAUTIZ X4**
IC Number & Model Number		IC Number: **11695A-14244R**, Model Number: **14244-GSM-R**
Antenna Type		Internal Antenna
SKUs	NX4-2DGQ-R-E	BT, WiFi, GSM, UMTS, RFID, GPS, Camera, 2D scanner, Qwerty Key
	NX4-2DGN-R-E	BT, WiFi, GSM, UMTS, RFID, GPS, Camera, 2D scanner, Numeric Key
Antenna Type		Internal Antenna
Frequency Range		13.56 MHz
Field Stregth		55.3 dBuV/m@3m
Battery		Li-ion, 3.7 V (4000 mAh)
Date(s) tested		2014.01.28 ~ 2014.02.21

3. SUMMARY OF TEST RESULTS

The following table represents the list of measurements required under the FCC CFR47 Part 15.225 & RSS-210 A2.6.

FCC Rules	IC Rules	Test Items	Results	Remarks
15.225(a)	RSS-210 A2.6 (a)	Electric Field Strength –Fundamental Emission	Pass	-
15.225(b)(c)(d)	RSS-210 A2.6 (b)(c)(d)	Electric Field Strength- Outside the Band	Pass	-
15.225/15.209	RSS-210 A2.6 (a)	Electric Field Strength-Spurious Emission	Pass	-
15.225(e)	RSS-210 A2.6	Frequency Tolerance	Pass	-
15.207	RSS-Gen 7.2.4	AC Line Conducted Emission	Pass	-
-	Gen 4.10	Receiver Spurious Emissions	Pass	

4. Measurement & Results

4.1. Occupied Bandwidth (20dB/99%)

4.1.1. Test Procedure

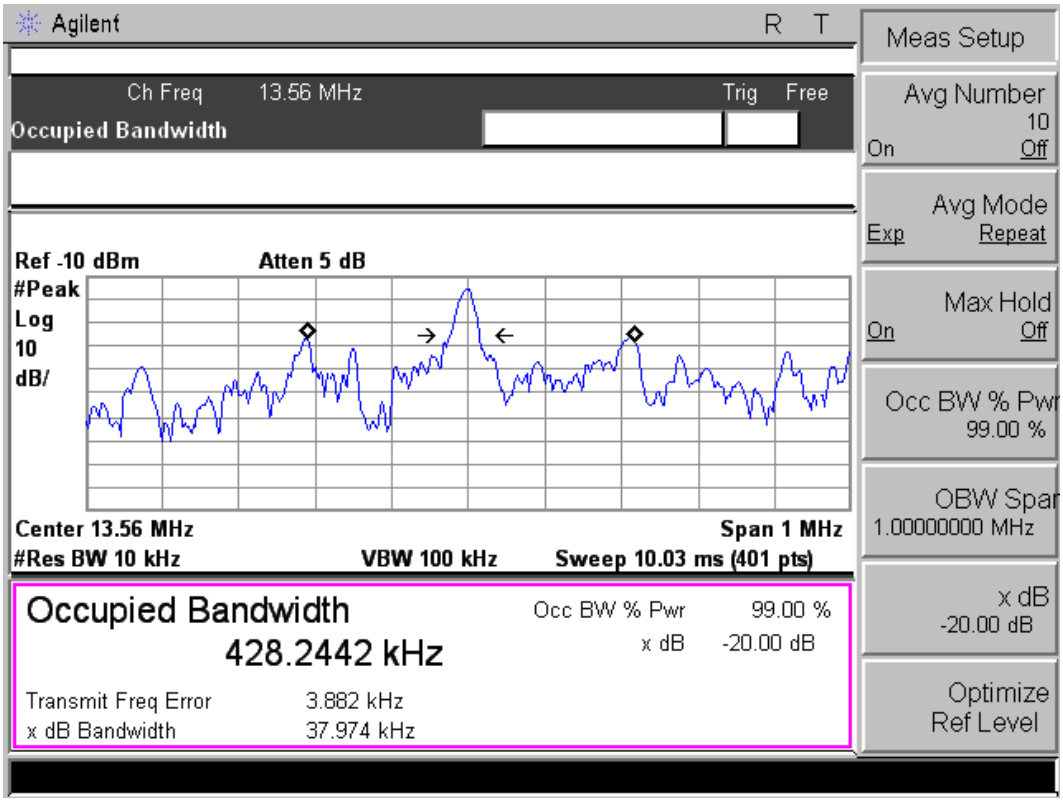
Measurement procedures were implemented according to the method of ANSI C63.4: 2003 13.1.7 “Occupied bandwidth measurements” and Annex H.6 “Occupied bandwidth measurements”.

The spectrum analyzer RBW was set as follows and VBW the video bandwidth shall be set to a value at least three times greater than the RBW.

The occupied band measurement function was used of the spectrum analyzer.

4.1.2. Test Results

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
13.56	37.97	428.2



4.2. Frequency Stability

4.2.1. Test Procedure

Measurement procedures were implemented according to the test method of ANSI C63.4: 2003 Annex H5.

Place the de-energized EUT in the temperature test chamber. Supply the EUT with nominal ac voltage, or install a new or fully charged battery in the EUT. An antenna was connected to the antenna output connector of the EUT if possible.

The frequency counter was connected to the measurement antenna with a suitable length of coaxial cable. The environmental chamber set to the highest temperature specified in applicable regulation. Allow sufficient time for the temperature of the chamber to stabilize.

Turn the EUT on and measure the EUT operating frequency at startup, and two, five, and ten minutes after startup.

The measurements were performed that the temperature chamber set to reduce the lowest temperature specified in applicable regulation.

4.2.2. Limits

Test items	Variation ranges	Limit
Temperature variations	-20℃ to +50℃	+/- 0.01%
Power supply Voltage variations	85% to 115%	+/- 0.01%

4.2.3. Test Results

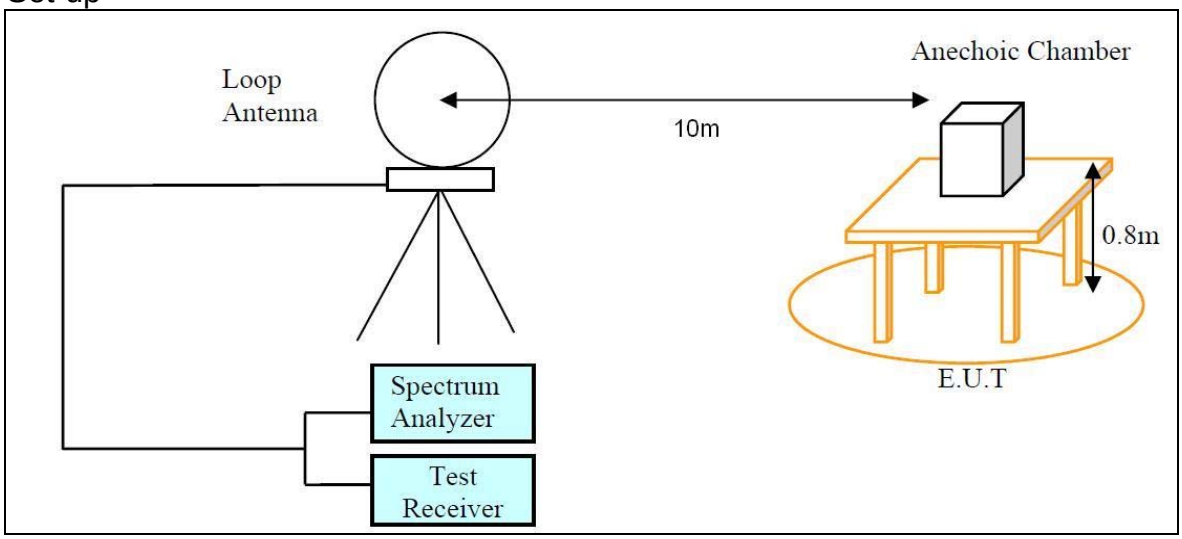
Temperatures (℃)	Voltage (VDC)	Measured Frequency (MHz)	Deviation (Hz)
+50	3.7	13.559510	-490
+40	3.7	13.559539	-461
+30	3.7	13.559541	-459
+20	3.7	13.559519	-481
+10	3.7	13.559501	-499
0	3.7	13.559521	-479
-10	3.7	13.559537	-463
-20	3.7	13.559609	-391
+20	3.55	13.559560	-440
+20	4.255	13.559575	-425

*The lowest extreme voltage for the EUT is 3.55VDC.d

4.3. Electric Field Strength

4.3.1. Test Procedure (9kHz to 30MHz)

Test Set-up



Test Procedure

The EUT was placed on a non-conductive table located on a large open test site.
The loop antenna was placed at a location 3m from the EUT. Radiated emissions were measured with the loop antenna both parallel and perpendicular to the plane of the EUT loop antenna.

The limit is converted from microvolts/meters to decibel microvolts/meter. Sample calculation:
Corrected Amplitude = Raw Amplitude(dBuV/m) + ACF (dB) + Cable loss (dB) – Distance correction factor

The spectrum analyzer is set to:
Frequency Range = 9 kHz ~ 1GHz
-RBW = 9kHz for (9kHz ~ 30MHz), 120kHz (30MHz ~ 1GHz)
-Trace Mode = max hold
-Detector Mode = peak / Quasi-peak
-Sweep Time = auto

4.3.2.Requirements : 15.209, 15.225

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Distance (Meters)
0.009 -0.490	2400F(kHz)uV/m	300
0.490 -1.705	24000F(kHz)uV/m	30
1.705 - 30	30uV/m	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200**	3
above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Operation within the band 13.110 – 14.010 MHz

(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.

(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.

(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.

(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.

4.3.3. Test Results

13.553 MHz – 13.567 MHz							
Frequency (MHz)	Ant. Pol. H/V	Reading Level (dBμV/m)	Correction Factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Distance
13.56	V	44.5	10.8	55.3	104	48.7	@3m
13.56	H	31.9	10.8	42.7	104	61.3	@3m

13.410 MHz – 13.553 MHz & 13.567 MHz – 13.710							
Frequency (MHz)	Ant. Pol. H/V	Reading Level (dBμV/m)	Correction Factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Distance
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

13.110 MHz – 13.410 MHz & 13.710 MHz – 14.010 MHz							
Frequency (MHz)	Ant. Pol. H/V	Reading Level (dBμV/m)	Correction Factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Distance
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-

9 kHz - 1 GHz							
Frequency (MHz)	Ant. Pol. H/V	Reading Level (dBμV/m)	Correction Factor (dB)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measurement Distance
27.12	V	18.0	8.4	26.4	49.5	23.1	@3m
27.12	H	22.1	8.4	30.5	49.5	19.0	@3m
40.68	V	36.0	-17.8	18.2	40.0	21.8	@3m
627.42	V	22.9	-6.7	16.2	46.0	29.8	@3m

Level Corrected = Reading level + Correction factor (dB/m)
Corrected factor = Antenna factor + Cable loss – Pre-amplifier (when using a pre-amplifier)

Note:
1. Measurement was done over the frequency range from 9 kHz to 30MHz. The EUT was rotated and the antenna was changed to Horizontal and Vertical polarization for maximum response
2. Measurement was done over the frequency range from 30 MHz to 1000 MHz. The EUT was rotated and the antenna was changed to a range of height of from 1 m to 4 m above the ground plane for maximum response.
3. Pre-amplifier was used in the range between 30 ~ 1000 MHz.

Remark: Noise floor of 30 ~ 1000 MHz : <20 dBμV at 3m distance

4.4. AC Conducted Emissions

4.4.1. Test Procedure

Conducted emission measurements on the EUT were performed by "AC Power Line Conducted Emissions Testing" procedure as per ANSI C63.4. The EUT was set up on a wooden table 0.8 meters height, 1.0 by 1.5 meters in size, placed in the shielded enclosed with a side of wall of which constituted a vertical conducting surface of 2.2 m x 3.1 m in size to maintain 40 cm from the rear of EUT

LISN(Line Impedance Stabilization Network, ROHDE & SCHWARZ, ESH3-Z5, 50 ohm / 50 μH) was installed and electrically boned to the conducting ground plane. The EUT was connected to the LISN using a typical power adapter.
One of two 50 ohm output terminals of the LISN was connected to the EMI Receiver (ROHDE & SCHWARZ, ESCI, 9 kHz to 3 GHz) and the other was terminated in 50 ohms. Measurements were again performed after interchanging such a connection oppositely.
The frequency range from 150 kHz to 30 MHz was examined and the remarkable frequencies were measured with Quasi-peak and Average values using the EMI receiver instrument (ROHDE & SCHWARZ, ESI, 9 kHz to 3 GHz ; Detector Function ; CISPR Quasi-Peak & Average). The 6 dB bandwidth of the Receiver was set to 9 kHz

The position of connecting cables of the EUT was changed to find the worst case configuration during measurements. The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

4.4.2. Limits

Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency (MHz)	Conducted Limits (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.

4.4.3. Sample calculation

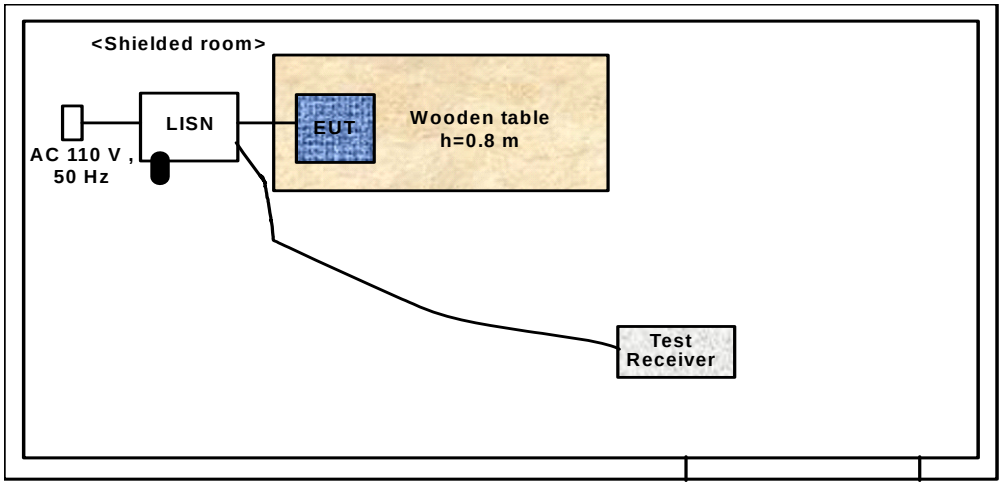
The emission level measured in decibels above one microvolt (dBμV) was converted into microvolt (μV) as shown in following sample calculation.

For example :

Measured Value at	0.1860 MHz	47.6 dBμV @ Q-Peak mode
+ Correct factor *		10.0 dB
= Conducted Emission		57.6 dBμV

* Correct factor is adding RF cable loss and Attenuation

4.4.4. Photograph for the test configuration



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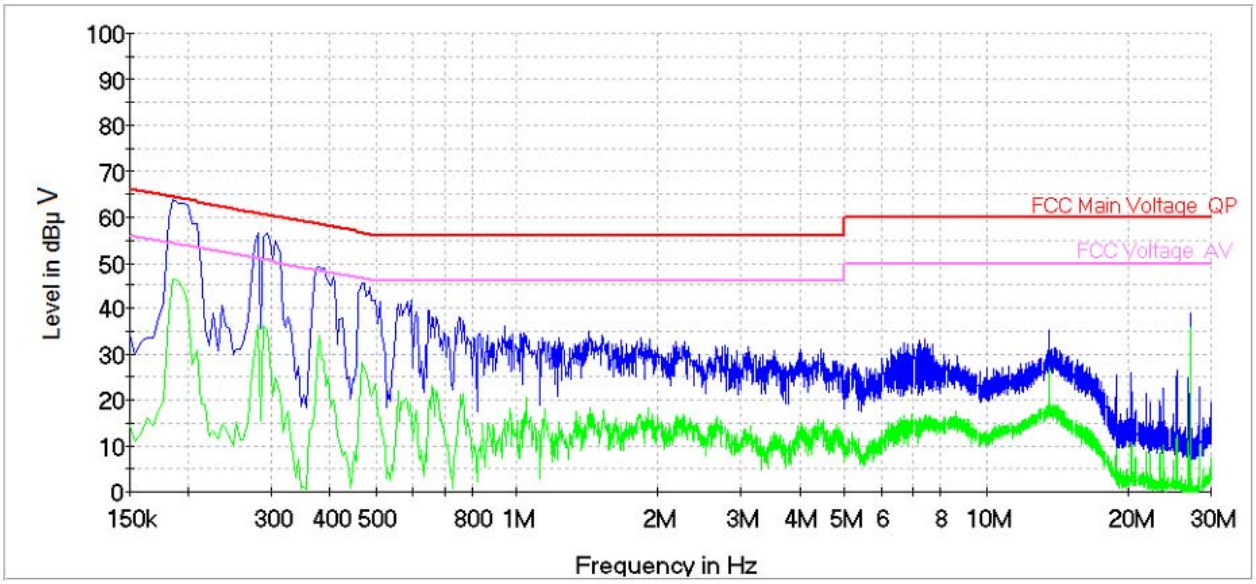
4.4.5.Test Results

<L1>



Final Result 1(L1-Quasi-Peak)

Frequency (MHz)	Quasi Peak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.186000	57.6	1000.0	9.000	L1	10.0	6.6	64.2	-
0.280500	51.2	1000.0	9.000	L1	9.8	9.6	60.8	-
0.379500	44.3	1000.0	9.000	L1	9.9	14	58.3	-
0.469500	39.5	1000.0	9.000	L1	10.0	17	56.5	-
0.595500	33.1	1000.0	9.000	L1	10.0	22.9	56.0	-
27.118500	37.4	1000.0	9.000	L1	10.0	22.6	60.0	-

Final Result 2(L1-Average)

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.186000	43.2	1000.0	9.000	L1	10.0	10.9	54.1	-
0.280500	35.7	1000.0	9.000	L1	9.8	15.1	50.8	-
0.379500	24.6	1000.0	9.000	L1	9.9	23.7	48.3	-
0.469500	22.8	1000.0	9.000	L1	10.0	23.8	46.6	-
0.663000	20.2	1000.0	9.000	L1	9.9	25.8	46.0	-
27.118500	35.7	1000.0	9.000	L1	10.0	14.3	50.0	-

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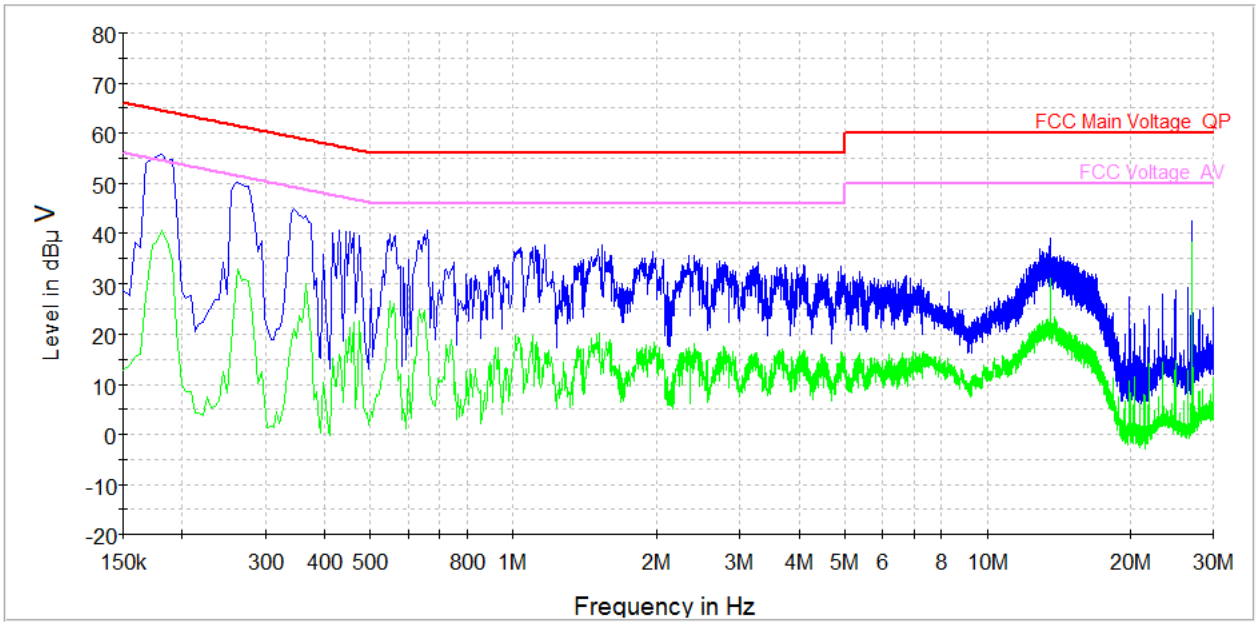

Final Result 1(N-Quasi-Peak)

Frequency (MHz)	Quasi Peak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.181500	53.3	1000.0	9.000	N	9.9	35.5	64.4	-
0.258000	48.1	1000.0	9.000	N	9.8	39.3	61.4	-
0.343500	41.8	1000.0	9.000	N	10.0	29.6	59.1	-
0.658500	31.6	1000.0	9.000	N	9.8	27.4	56.0	-
1.531500	29.7	1000.0	9.000	N	9.9	32.0	56.0	-
27.118500	42.0	1000.0	9.000	N	10.0	29.7	60.0	-

Final Result 2(N-Average)

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.181500	22.0	1000.0	9.000	N	10.0	32.4	54.4	-
0.262500	17.8	1000.0	9.000	N	9.8	33.5	51.3	-
0.366000	11.1	1000.0	9.000	N	10.0	37.4	48.5	-
0.550500	9.4	1000.0	9.000	N	10.0	36.6	46.0	-
27.118500	39.1	1000.0	9.000	N	10.2	10.9	50.0	-

5. TEST EQUIPMENTS

No.	Equipment	Manufacturer	Model	S/N	Calibration Due date
1	Spectrum Analyzer	Agilent	E4407B	US41443316	03-11-2015
2	Synthesized Sweeper	HP	83620A	3250A01653	03-03-2015
3	Digital RF Signal Generator	Agilent	E4438C	US41460859	02-18-2015
4	Signal Generator	R&S	SMIQ O3	DE22348	02-14-2015
5	PSA Series Spectrum Analyzer	Agilent	E4448A	US44300484	02-19-2015
6	DC Power Supply	Agilent	E4356A	MY41000296	02-11-2015
7	DC Power Supply	Agilent	E3645A	MY40000851	02-11-2015
8	AC Power Supply	Agilent	6811B	MY41000446	02-07-2015
9	Oscilloscope	Agilent	DSO6054A	MY44001104	01-22-2015
10	Directional Coupler	Agilent	87300C	MY44300126	03-04-2015
11	Directional Coupler	Agilent	773D	MY28390213	03-04-2015
12	VHF Attenuator	HP	355D	2522A45959	03-04-2015
13	Coaxial Attenuator	Weinschel	56-20	N8527	03-04-2015
14	Coaxial Attenuator	Agilent	8491B	50109	03-04-2015
15	Power Divider	HP	11636A	09084	03-07-2015
16	Power Spliter	HP	11667A	21063	03-04-2015
17	Temp/Humidity Chamber	ESPEC	SH-641	92007482	01-14-2015
18	Function/Arbitrary Waveform Generator	Agilent	33250A	MY40015758	05-20-2014
19	EMI Receiver	R&S	ESIB26	100280	03-12-2015
20	Pre-Amplifier	HP	83017A	MY39500982	02-19-2015
21	Pre-Amplifier	SONA INSTRUMENT	310	284609	01-08-2015
22	Biconi-Log Antenna	Schwarzbeck	VULB9168	9168-181	05-14-2015
23	Double Ridge Wave Guide	ETS-Lindgren	3115	9012-3595	10-21-2014
24	Active Loop Antenna	EMCO	6502	9011-2541	10/18/2015