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 22, 24 / RSS-132, RSS-133
4. Test Method	: ANSI C63.4-2009
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

Tae-Seung Song
ICT Infrastructure
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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
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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
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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: **YY3-14244G**, Model Number: **NAUTIZ X4**
IC Number & Model Number		IC Number: **11695A-14244G**, Model Number: **14244-GSM**
Antenna Type		Internal Antenna
Type of Transmitter		GSM/GPRS/EDGE850/1900, WCDMA850/1900
SKUs	NX4-1DGN-0-E	BT, WiFi, GSM, UMTS, GPS, Camera, 1D scanner, Numeric Key
	NX4-2DGN-0-E	BT, WiFi, GSM, UMTS, GPS, Camera, 2D scanner, Numeric Key (**Test sample**)
	NX4-2DGQ-0-E	BT, WiFi, GSM, UMTS, GPS, Camera, 2D scanner, Qwerty Key
Tx Frequency		824.2 – 848.8 MHz (GSM850) 826.4 – 846.6 MHz (WCDMA850) 1850.2 – 1909.8 MHz (GSM1900) 1852.4 – 1907.6 MHz (WCDMA1900)
Antenna Gain		GSM850/UMTS850: -1.2 dBi, GSM1900/UMTS1900 : 0.9 dBi
Battery		Li-ion, 3.7 V (4000 mAh)
Date(s) tested		2014.02.10 ~ 2014.06.09
RF Module certificate info. GSM/UMTS		FCC ID: QIPPHS8-P Name of Grantee: Cinterion Wireless Modules GmbH Report Reference No:. 10_phs8_p_mde_cinte_1108_fccd 10_phs8_p_mde_cinte_1108_fcce IC Certificate Number: 7830A-PHS8P Report Reference No:. 13_phs8_p_mde_cinte_1108_icb 13_phs8_p_mde_cinte_1108_icc

3. SUMMARY OF TEST RESULTS

The following table represents the list of measurements required under the FCC CFR47 Part 22, 24 & IC RSS-132,133

FCC Rules	IC Rules	Test Items	Results
22.913(a), 24.232(c)	RSS-132 5.4, RSS-133 6.4	ERP & EIRP	Pass
22.917, 24.238	RSS-132 5.5, RSS-133 6.5	Radiated Spurious Emissions	Pass
15.207	RSS-Gen 7.2.4	AC Line Conducted Emission	Pass
-	RSS-Gen 4.10	Receiver Spurious Emissions	Pass

*refer to the SAR report for conducted powers.

Note:
-Conducted test items are not performed according to reduced test plan.
-The GSM/WCDMA module reports is used for FCC certification.
-So only the radiated emission test items are performed.

4. Measurement & Results

4.1. Effective Radiated Power

4.1.1. Test Procedure

The radiated and spurious measurements were made Fully-anechoic chamber at a 3-meter test range. The EUT was placed on the rotating device at 1.5m and at a distance of 3-meters from the receive antenna. The rotating device which can rotate horizontal axis was mounted on the turn unit to facilitate rotation around a vertical axis. The measurement was made for each horizontal/vertical position combination with receive antenna horizontally polarized. This measurement was repeated with receive antenna vertically polarized. The substitution antenna will replace the EUT antenna it the same position and in vertical polarization. The frequency of the signal generator shall be set to the frequencies that were measured on the EUT. The signal generator, output level, shall be adjusted until an equal or a known related level to what was measured from the EUT is obtained in the spectrum analyzer. This level was recorded. For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.

All modes of operation were investigated, and the worst-case results are reported.

4.1.2. Limit

FCC 22.913(b) : The Effective Radiated Power (ERP) of mobile transmitters must not exceed 7 Watts.
FCC 24.232(b) : The equivalent Isotropic Radiated Power (EIRP) must not exceed 2 Watts.

4.1.3. ERP Sample Calculation

Frequency(MHz)	Measured Level [dBm]	Substitude Level(dBm)	Ant Gain (dBd)	Cable Loss (dB)	Polarization [H/V]	ERP [dBm]
824.2	-22.17	31.01	-0.48	1.05	H	32.54

ERP = Substitute Level (dBm) - Ant. Gain – Cable Loss
= 31.01 – (– 0.48) + 1.05 = 30.42

4.1.4. Test Results

• GSM 850 Test Data

Frequency (MHz)	Measured Level [dBm]	Substitude Level(dBm)	Ant Gain (dBd)	Cable Loss (dB)	Polarization [H/V]	ERP [dBm]
824.2	-27.65	28.05	-0.48	1.05	H	29.58
836.6	-26.36	28.16	-0.54	1.09	H	29.79
848.8	-25.36	28.86	-0.62	1.11	H	30.59
848.8 (EDGE 251ch)	-37.02	18.68	-0.62	1.11	H	20.41

• GSM 1900 Test Data

Frequency (MHz)	Measured Level [dBm]	Substitude Level(dBm)	Ant Gain (dBd)	Cable Loss (dB)	Polarization [H/V]	EIRP [dBm]
1850.2	-29.87	30.85	4.00	1.58	H	28.43
1880.0	-31.14	29.69	4.06	1.62	H	27.25
1909.8	-31.50	29.47	4.07	1.65	H	27.05
1909.8 (EDGE 512)	-39.55	21.17	4.00	1.58	H	18.75

• WCDMA 850 Test Data

Frequency (MHz)	Measured Level [dBm]	Substitude Level(dBm)	Ant Gain (dBd)	Cable Loss (dB)	Polarization [H/V]	ERP [dBm]
826.6	-34.41	22.09	-0.48	1.05	H	23.62
835.0	-33.50	22.02	-0.54	1.09	H	23.65
846.4	-33.83	21.37	-0.62	1.11	H	23.10

• WCDMA1900 Test Data

Frequency (MHz)	Measured Level [dBm]	Substitude Level(dBm)	Ant Gain (dBd)	Cable Loss (dB)	Polarization [H/V]	EIRP [dBm]
1852.4	-36.48	24.23	4.01	1.56	H	21.78
1880.0	-37.74	23.09	4.06	1.62	H	20.65
1907.6	-37.59	23.24	4.08	1.64	H	20.80

NOTES:
This device was tested under all configurations and the highest power is reported. Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4.2. Radiated Spurious Emissions

4.2.1. Radiated Spurious Emissions (GSM850)

FCC 22.917(a) & 24.238(a) : The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

- Measured Output Power : 30.59 dBm = 0.908 W
- Mode : GSM850
- Distance : 3 meters
- LIMIT : 43+ 10log10 (W) : 43.59 dBc

Frequency (MHz)	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	E.R.P [dBm]	Polarization [H/V]	dBc
Operating Frequency : 824.2 MHz (128CH)					
1648.4	-53.97	7.66	-46.31	H	76.90
2472.6	-57.80	10.78	-47.02	H	77.61
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 836.6 MHz (190CH)					
1673.2	-52.77	7.70	-45.07	H	75.66
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 848.8 MHz (251CH)					
1697.6	-54.48	8.02	-45.46	H	76.05
2546.4	-52.04	10.98	-41.06	H	71.65
-	-	-	-	-	-
-	-	-	-	-	-

4.2.2. Radiated Spurious Emissions (GSM1900)

FCC 22.917(a) & 24.238(a) : The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

- Measured Output Power : 28.43 dBm = 0.697 W
- Mode : GSM1900
- Distance : 3 meters
- LIMIT : 43+ 10log10 (W) : 41.43 dBc

Frequency (MHz)	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	E.R.P [dBm]	Polarization [H/V]	dBc
Operating Frequency : 1850.2 MHz (512CH)					
3700.5	-57.35	12.02	-45.33	V	73.76
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 1880.0 MHz (661CH)					
3759.0	-53.33	12.23	-41.10	V	69.53
5640.8	-53.71	12.59	-42.12-	H	70.55
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 1909.8 MHz (810CH)					
3819.0	-48.81	12.29	-36.52	V	64.95
5729.3	-57.08	12.60	-44.48	H	72.91
-	-	-	-	-	-
-	-	-	-	-	-

4.2.3. Radiated Spurious Emissions (WCDMA850)

FCC 22.917(a) & 24.238(a) : The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

- Measured Output Power : 23.65 dBm = 0.232 W
- Mode : WCDMA850
- Distance : 3 meters
- LIMIT : 43+ 10log10 (W) : 36.65 dBc

Frequency (MHz)	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	E.R.P [dBm]	Polarization [H/V]	dBc
Operating Frequency : 826.4 MHz (4132CH)					
1650.8	-72.05	7.66	-64.02	H	87.67
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 836.6 MHz (4183CH)					
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 846.6 MHz (4233CH)					
1691.6	-68.29	8.02	-60.27	H	83.92
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

4.2.4. Radiated Spurious Emissions (WCDMA1900)

FCC 22.917(a) & 24.238(a) : The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10log(P) dB.

- Measured Output Power : 21.78dBm = 0.151 W
- Mode : WCDMA1900
- Distance : 3 meters
- LIMIT : 43+ 10log10 (W) : 34.78 dBc

Frequency (MHz)	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	E.R.P [dBm]	Polarization [H/V]	dBc
Operating Frequency : 1852.4 MHz (9262CH)					
3706.4	-63.51	12.09	-51.42	V	73.20
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 1880.0 MHz (9400CH)					
3758.4	-66.38	12.23	-54.15	V	75.93
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Operating Frequency : 1907.6 MHz (9538CH)					
3816.8	-65.53	12.35	-53.18	V	74.96
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

4.3. Receiver Spurious Emission

4.3.1. Results (Worst case configuration, 30 MHz ~ 1 GHz)

Test Mode : GSM850/1900, WCDMA850/1900

Frequency (MHz)	Antenna Pol.	Reading level	Correction factor	Level Corrected	Limit	Margin	Remark	Plane X/Y/Z
-	-	-	-	-	-	-	-	-

* Note: No emission levels higher than the ambient noise level are detected.

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

Note 1. Measurement was done over the frequency range from 30 MHz to 1 GHz. 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.
2. Testing is include the rotation of the EUT through three orthogonal axes to determine the maximum emission.
3. Any emission values below more than 20dB are not recorded.

Remark 1. Noise floor of 30 ~ 1000 MHz : <20 dBuV at 3m distance
2. Noise floor of 1000 ~ 5000 MHz : <40 dBuV at 3m distance
3. Noise floor of 5000 ~ 25000 MHz : <45 dBuV at 3m distance

4.3.2. Results (Worst case configuration, 1 GHz ~ 25 GHz)

Test Mode : GSM850/1900, WCDMA850/1900

Frequency (MHz)	Antenna Pol.	Reading level	Correction factor	Level Corrected	Limit	Margin	Remark	Plane X/Y/Z
-	-	-	-	-	-	-	-	-

* Note: No emission levels higher than the ambient noise level are detected.

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

Note
1. Measurement was done over the frequency range from 1GHz to 10th harmonic. 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.
2. Pre-amplifier was used in the range between 1 ~ 25 GHz.
3. Test results include the rotation of the EUT through three orthogonal axes to determine the maximum emission.
4. If the peak measured values are lower than average limits, average measurements are not performed.
5. Any emission values below more than 20 dB are not recorded.

Remark
1. Noise floor of 30 ~ 1000 MHz : <20 dBuV at 3m distance
2. Noise floor of 1000 ~ 5000 MHz : <40 dBuV at 3m distance
3. Noise floor of 5000 ~ 25000 MHz : <50 dBuV 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

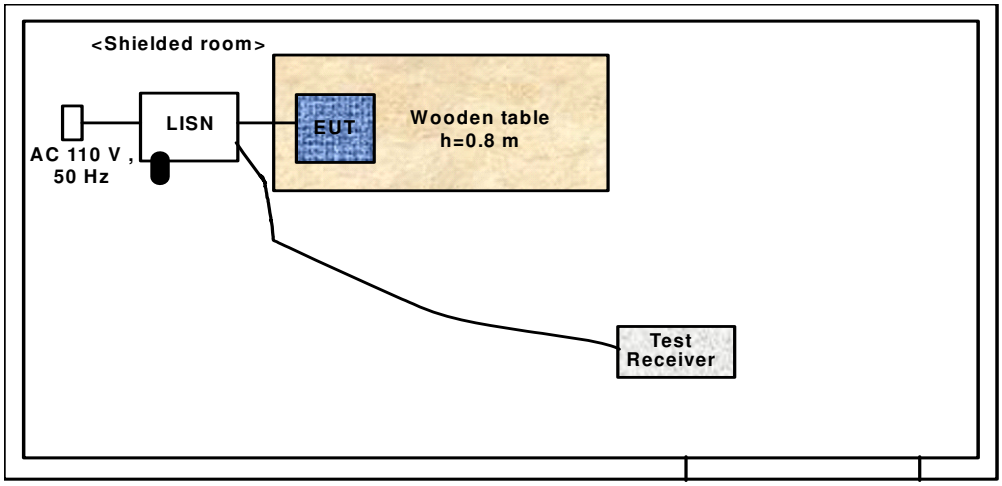
The emission level measured in decibels above one microvolt (dBμV) was converted into microvolt (μV) as shown in following sample calculation.

For example :

Measured Value at		0.1545 MHz	44.6 dBμV @ Q-Peak mode
+	Correct factor *		9.9 dB
=	Conducted Emission		54.5 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

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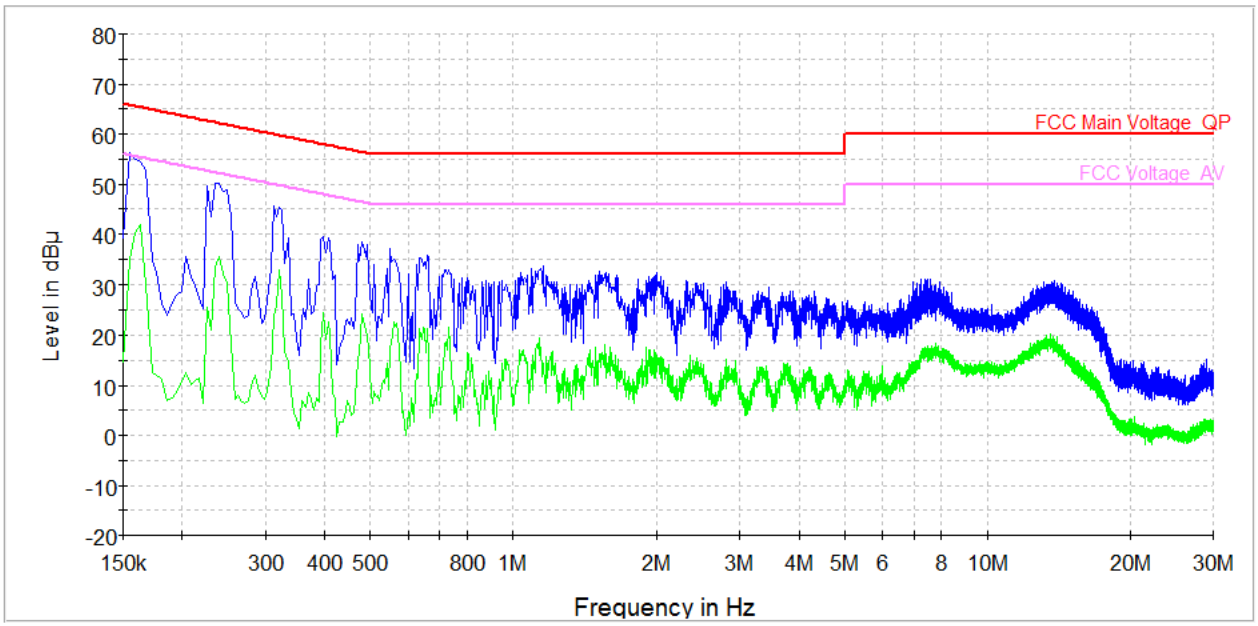

Final Result 1(L1-Quasi-Peak)

Frequency (MHz)	Quasi Peak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.154500	54.5	1000.0	9.000	L1	9.9	11.3	65.8	
0.235500	47.8	1000.0	9.000	L1	9.8	14.5	62.3	
0.550500	33.7	1000.0	9.000	L1	10.0	22.3	56.0	
0.658500	30.1	1000.0	9.000	L1	9.9	25.9	56.0	
6.981000	21.9	1000.0	9.000	L1	9.8	38.1	60.0	

Final Result 2(L1-Average)

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.163500	11.8	1000.0	9.000	N	10.0	43.4	55.2	
0.240000	10.8	1000.0	9.000	N	9.7	41.2	52.0	
0.559500	8.9	1000.0	9.000	N	10.0	37.1	46.0	
0.730500	17.7	1000.0	9.000	N	9.9	28.3	46.0	
7.377000	15.7	1000.0	9.000	N	9.8	34.3	50.0	

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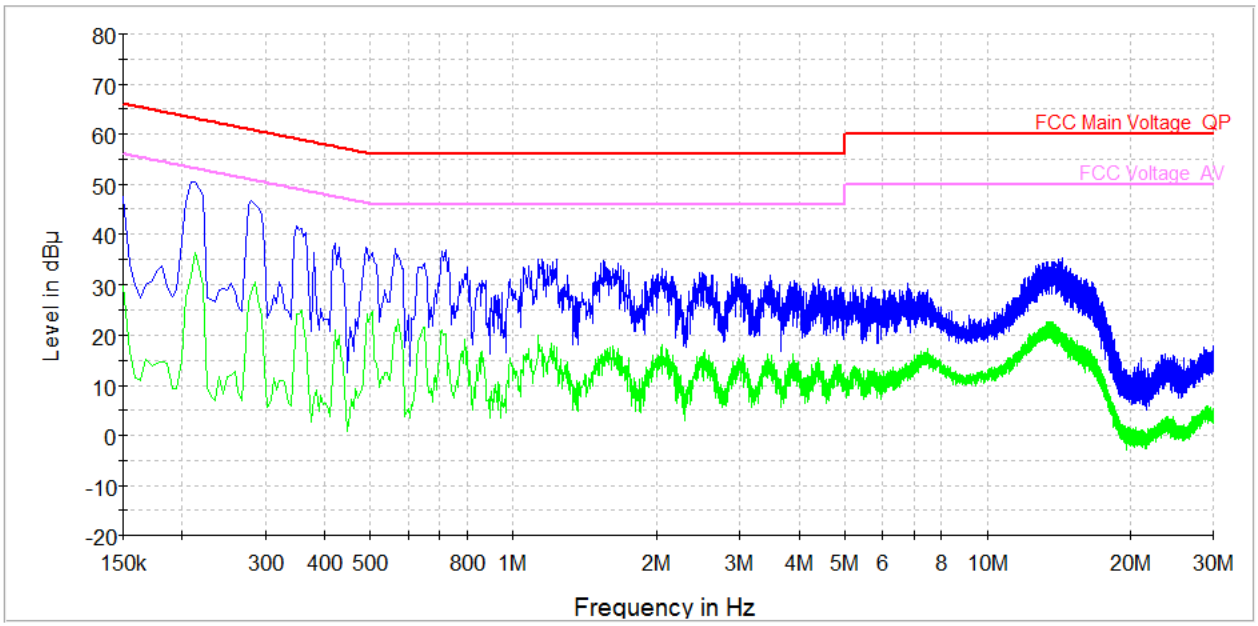

Final Result 1(N-Quasi-Peak)

Frequency (MHz)	Quasi Peak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.213000	49.3	1000.0	9.000	N	9.9	13.7	63.0	
0.280500	44.9	1000.0	9.000	N	9.8	15.9	60.8	
0.564000	34.9	1000.0	9.000	N	10.0	21.1	56.0	
0.721500	33.3	1000.0	9.000	N	10.0	22.7	56.0	
6.774000	21.9	1000.0	9.000	N	9.9	38.1	60.0	

Final Result 2(N-Average)

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.213000	34.8	1000.0	9.000	N	9.9	18.2	53.0	
0.285000	27.0	1000.0	9.000	N	9.8	23.6	50.6	
0.505500	11.2	1000.0	9.000	N	10.0	34.8	46.0	
7.426500	14.3	1000.0	9.000	N	9.9	35.7	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	04-24-2015
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
24	Double Ridge Wave Guide	ETS-Lindgren	3115	9012-3595	10-21-2014
25	Double Ridge Wave Guide	ETS-Lindgren	3115	00125694	10-21-2014
26	Universal Radio Communication tester	R&S	CMU200	111356	01-15-2015
27	Spectrum Analyzer	R&S	FSP30	100229	02-03-2015
28	Pre-Amplifier	R&S	SCU18	1337144	02-03-2015
29	Sleeve Dipole	ETS-Lindgren	3126-880	00052703	01-03-2016
30	Sleeve Dipole	ETS-Lindgren	3126-1845	00055096	01-29-2016