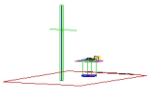
PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctestlab.com



MEASUREMENT REPORT
FCC Part 15.225 NFC

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro, Maetan dong,
Yeongtong-gu, Suwon-si
Gyeonggi-do 443-742, Korea

Date of Testing:
6/4 - 6/30/2015
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1506191294.A3L

FCC ID:	**A3LSMN920X**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model(s):	SM-N920X
EUT Type:	Portable Handset
Frequency:	13.56MHz
FCC Classification:	Low Power Communications Device Transmitter (DXX)
FCC Rule Part(s):	FCC Part 15 Subpart C (15.225)
Test Procedure(s):	ANSI C63.10-2009, KDB 648474 D03 v01r02

The device bearing the FCC Identifier specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and has been tested in accordance with the measurement procedures specified in ANSI C63.10-2009 (See Test Report). These measurements were performed with no deviation from the standards. Test results reported herein relate only to the item(s) tested.

I authorize and attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

NVLAP accreditation does not constitute any product endorsement by NVLAP or any agency of the United States Government. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Randy Ortanez
President

NVLAP
Lab Code 100431-0

© 2015 PCTEST Engineering Laboratory, Inc.

TABLE OF CONTENTS

FCC Part 15.225 MEASUREMENT REPORT 3

1.0 INTRODUCTION 4

1.1 SCOPE 4

1.2 PCTEST TEST LOCATION 4

2.0 PRODUCT INFORMATION 5

2.1 EQUIPMENT DESCRIPTION 5

2.2 DEVICE CAPABILITIES 5

2.3 TEST CONFIGURATION 5

2.4 EMI SUPPRESSION DEVICE(S)/MODIFICATIONS 5

3.0 DESCRIPTION OF TEST 6

3.1 EVALUATION PROCEDURE 6

3.2 AC LINE CONDUCTED EMISSIONS 6

3.3 RADIATED EMISSIONS 7

3.4 ENVIRONMENTAL CONDITIONS 7

4.0 ANTENNA REQUIREMENTS 8

5.0 SAMPLE CALCULATIONS 9

5.1 CONDUCTED EMISSION MEASUREMENT SAMPLE CALCULATION 9

5.2 RADIATED EMISSION MEASUREMENT SAMPLE CALCULATION 9

6.0 TEST EQUIPMENT CALIBRATION DATA 10

7.0 TEST DATA 11

7.1 SUMMARY 11

7.2 20DB BANDWIDTH MEASUREMENT 12

7.3 FREQUENCY STABILITY TEST DATA 14

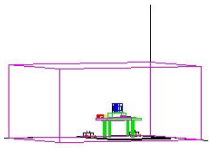
7.4 IN-BAND RADIATED SPURIOUS EMISSION MEASUREMENTS 16

7.5 RADIATED SPURIOUS EMISSION MEASUREMENTS, OUT-OF-BAND 17

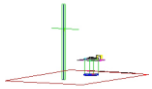
7.6 LINE CONDUCTED MEASUREMENT DATA 20

8.0 CONCLUSION 22

© 2015 PCTEST Engineering Laboratory, Inc.



MEASUREMENT REPORT
FCC Part 15.225



§ 2.1033 General Information

APPLICANT:	Samsung Electronics Co., Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Maetan dong, Yeongtong-gu, Suwon-si Gyeonggi-do 443-742, Korea
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	Part 15 Subpart C (15.225)
BASE MODEL:	SM-N920X
FCC ID:	A3LSMN920X
FCC CLASSIFICATION:	Low Power Communications Device Transmitter (DXX)
Test Device Serial No.:	7CEEA (SM-N920F) ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	6/4 - 6/30/2015
TEST REPORT S/N:	0Y1506191294.A3L

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.

- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

© 2015 PCTEST Engineering Laboratory, Inc.

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (*See* **Figure 1-1**).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on February 15, 2012.

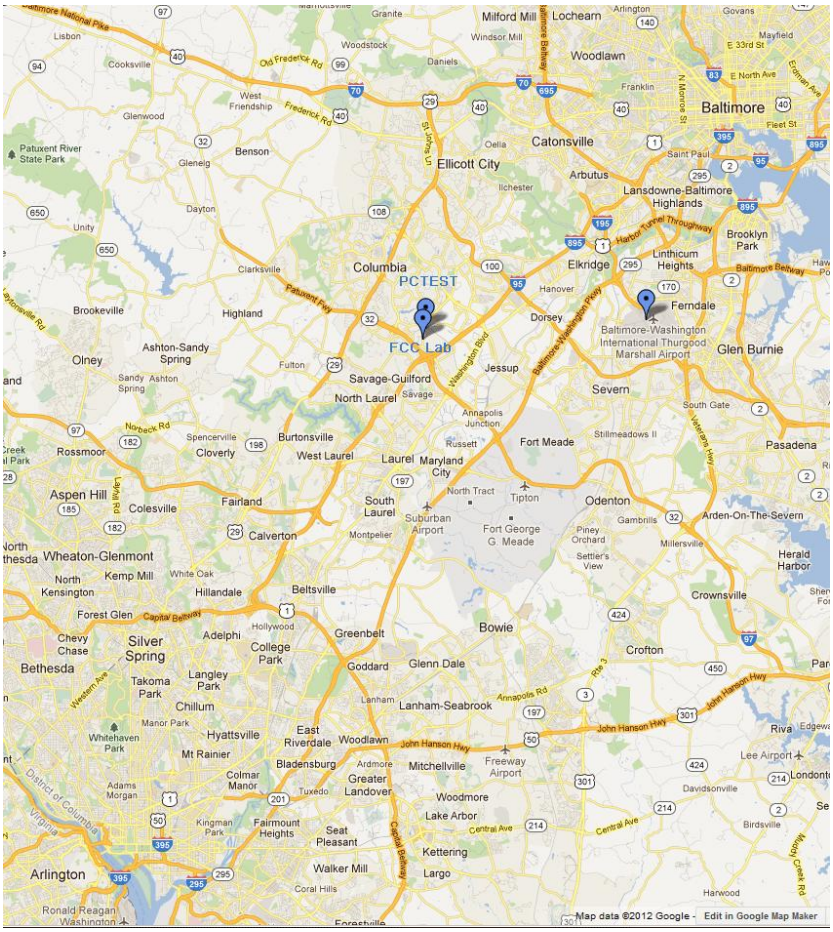


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

© 2015 PCTEST Engineering Laboratory, Inc.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMN920X**. The test data contained in this report pertains only to the emissions due to the NFC transmitter of the EUT.

2.2 Device Capabilities

This device contains the following capabilities:

802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, ANT+

2.3 Test Configuration

The Samsung Portable Handset FCC ID: A3LSMN920X was set to continuously transmit at 13.56MHz. This was performed using manufacturer software loaded on the phone and a passive RFID tag to allow for continuous transmission. This device was tested in accordance with the guidance of ANSI C63.10-2009. See Sections 3.2 and 3.3 of this test report for a description of the AC line conducted emissions and radiated emissions test setups, respectively.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r02. Additional radiated spurious emission measurements were performed with the EUT lying flat on a certified wireless charging pad (WCP) while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

© 2015 PCTEST Engineering Laboratory, Inc.

3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2009) was used in the measurement of the **Samsung Portable Handset FCC ID: A3LSMN920X.**

Deviation from measurement procedure…….....None

3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or resolution, clock or data exchange speed, scrolling H pattern to the EUT and/or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.6. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

© 2015 PCTEST Engineering Laboratory, Inc.

3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A ¾" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

3.4 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

© 2015 PCTEST Engineering Laboratory, Inc.

4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 shall be considered sufficient to comply with the provisions of this section."

- The antenna of the Samsung Portable Handset are **permanently attached.**
- This unit was tested with its standard battery.

Conclusion:

The **Samsung Portable Handset FCC ID: A3LSMN920X** unit complies with the requirement of §15.203.

© 2015 PCTEST Engineering Laboratory, Inc.

5.0 SAMPLE CALCULATIONS

5.1 Conducted Emission Measurement Sample Calculation

@ 20.3 MHz

Class B limit	**= 60.0 dBμV (Quasi-peak limit)**
Reading	= - 57.8 dBm (calibrated quasi-peak level)
Convert to dbμV	= - 57.8 + 107 = 49.2 dBμV
Margin	= 49.2 - 60.0 = - 10.8 dB
	= **10.8 dB below limit**

5.2 Radiated Emission Measurement Sample Calculation

@ 66.7 MHz

Class B limit	**= 100 μV/m = 40.0 dBμV/m**
Reading	= - 76.0 dBm (calibrated level)
Convert to dbμV	= - 76.0 + 107 = 31.0 dBμV
Antenna Factor + Cable Loss	= 5.8 dB/m
Total	= 36.8 dBμV/m
Margin	= 36.8 - 40.0 = - 3.2 dB
	= **3.2 dB below limit**

Note:

Level [dBμV] = 20 log $_{10}$ (Level [μV/m])

Level [dBμV] = Level [dBm] + 107

© 2015 PCTEST Engineering Laboratory, Inc.

6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	10/24/2014	Annual	10/24/2015	N/A
Agilent	8447D	Broadband Amplifier	6/12/2015	Annual	6/12/2016	2443A01900
Agilent	N9038A	MXE EMI Receiver	3/24/2015	Annual	3/24/2016	MY51210133
Emco	6502	Active Loop Antenna (10k - 30 MHz)	6/24/2014	Biennial	6/24/2016	267
Espec	ESX-2CA	Environmental Chamber	3/17/2015	Annual	3/17/2016	17620
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	11/11/2014	Biennial	11/11/2016	114451
Pasternack	NMLC-1	Line Conducted Emissions Cable (NM)	10/17/2014	Annual	10/17/2015	N/A
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	3/12/2015	Annual	3/12/2016	100342
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/28/2014	Biennial	1/28/2016	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

© 2015 PCTEST Engineering Laboratory, Inc.

7.0 TEST DATA

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMN920X

FCC Classification: Low Power Communications Device Transmitter (DXX)

Frequencies Examined: 13.56MHz

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
TRANSMITTER MODE (Tx)					
2.1049	20 dB Bandwidth	N/A	RADIATED	PASS	Section 7.2
15.225 (a)(b)(c)	In-Band Emissions	15,848µV/m @ 30m 13.553 – 13.567 MHz 334µV/m @ 30m 13.410 – 13.553 MHz 13.567 – 13.710 MHz 106µV/m @ 30m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		PASS	Section 7.4
15.225 (d) 15.209	Out-of-Band Emissions	Emissions outside of the specified band (13.110 – 14.010 MHz) must meet the radiated limits detailed in 15.209		PASS	Section 7.5
15.225 (e)	Frequency Stability Tolerance	± 0.01% of Operating Frequency	Temperature Chamber	PASS	Section 7.3
15.207	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits or < RSS-Gen table 2 limits	LINE CONDUCTED	PASS	Section 7.6
RECEIVER MODE (Rx) / DIGITAL DEVICE					
15.107	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.107 limits or < RSS-Gen table 2 limits	LINE CONDUCTED	PASS	Part 15B Test Report

Table 7-1. Summary of Test Results

Note:

This unit was tested with its standard battery.

© 2015 PCTEST Engineering Laboratory, Inc.

7.2 20dB Bandwidth Measurement

§2.1049

The 20dB bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

Frequency	20dB Bandwidth	20dB Bandwidth with WCP
13.56MHz	28 kHz	502 kHz

Table 7-2. 20dB Bandwidth Measurement

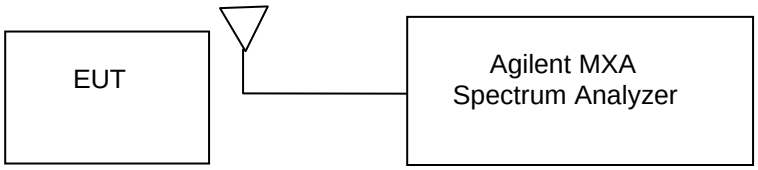


Figure 7-1. Test Instrument & Measurement Setup

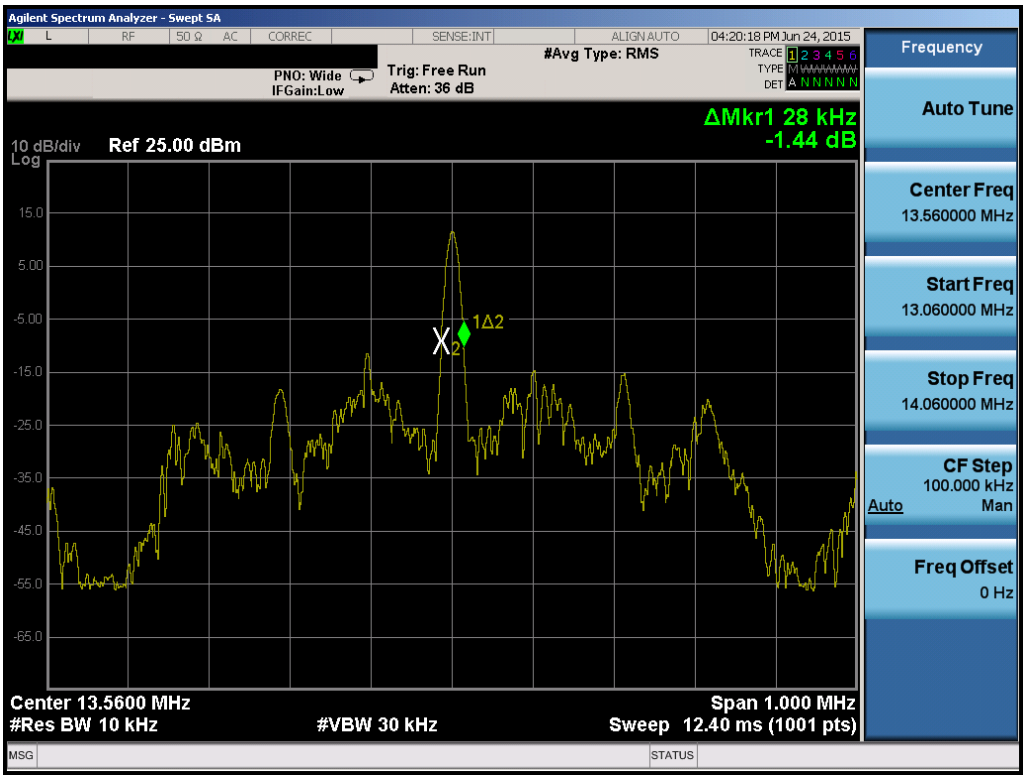


Figure 7-2. 20dB Bandwidth Plot

© 2015 PCTEST Engineering Laboratory, Inc.

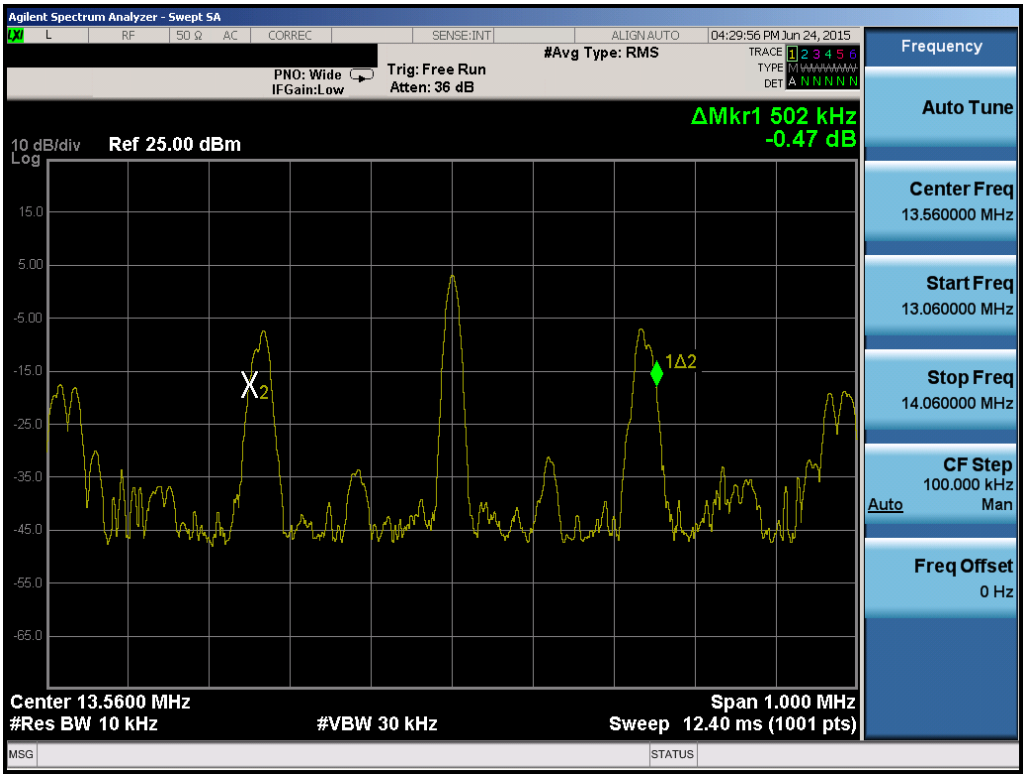


Figure 7-3. 20dB Bandwidth Plot with WCP

© 2015 PCTEST Engineering Laboratory, Inc.

7.3 Frequency Stability Test Data

§15.225

Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of −20 degrees to +50 degrees C at normal supply voltage.

OPERATING FREQUENCY: 13,560,000 Hz

REFERENCE VOLTAGE: 3.85 VDC

DEVIATION LIMIT: ± 0.01 % = 1356Hz

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	13,560,110	110	0.0008112
100 %		- 30	13,559,931	-69	-0.0005088
100 %		- 20	13,559,732	-268	-0.0019764
100 %		- 10	13,559,995	-5	-0.0000369
100 %		0	13,560,102	102	0.0007522
100 %		+ 10	13,559,983	-17	-0.0001254
100 %		+ 20	13,560,118	118	0.0008702
100 %		+ 30	13,560,058	58	0.0004277
100 %		+ 40	13,559,970	-30	-0.0002212
100 %		+ 50	13,560,013	13	0.0000959
BATT. ENDPOINT	3.40	+ 20	13,560,095	95	0.0007006

Table 7-3. Frequency Stability Test Data

© 2015 PCTEST Engineering Laboratory, Inc.

Frequency Stability Test Data

§15.225

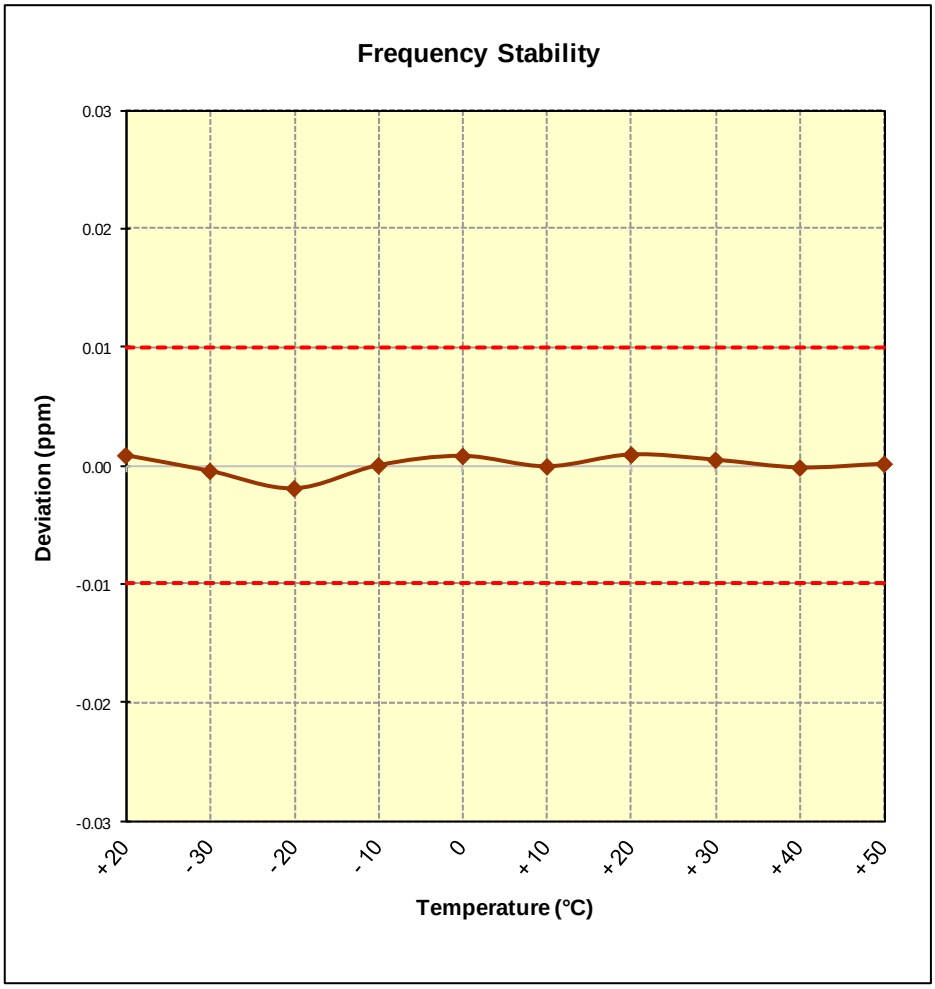


Figure 7-4. Frequency Stability Plot

© 2015 PCTEST Engineering Laboratory, Inc.

7.4 In-Band Radiated Spurious Emission Measurements

§15.225(a)(b)(c)

Radiated emission testing was performed in the band 13.110 – 14.010 MHz.

Frequency: 13.56MHz

Measurement Distance: 3 Meters

Frequency [MHz]	Antenna Position	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBµV/m]	30m Field Strength [dBµV/m]	Limit [µV/m]	Limit [dBµV/m]	Margin [dB]
13.243	X	-90.05	14.28	31.23	-8.77	106.00	40.51	-49.28
13.347	X	-85.41	14.28	35.87	-4.13	106.00	40.51	-44.64
13.445	X	-86.71	14.27	34.56	-5.44	334.00	50.47	-55.91
13.560	X	-67.72	14.27	53.55	13.55	15848.00	84.00	-70.45
13.667	X	-80.64	14.27	40.63	0.63	334.00	50.47	-49.84
13.772	X	-84.39	14.27	36.88	-3.12	106.00	40.51	-43.63
13.882	X	-91.90	14.27	29.37	-10.63	106.00	40.51	-51.14

Table 7-4. In-Band Radiated Measurements

NOTES:

1. 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.
2. The EUT was positioned in three orthogonal planes to determine the orientation resulting in the worst case emissions.
3. Measurements were performed at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)(2). Extrapolation Factor = $20 \log_{10}(30/3)^2$ = 40dB.
4. The spectrum was investigated from 9kHz up to 30MHz using the loop antenna. Only the emissions shown in the table above were found to be significant.
5. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector.
6. Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
7. AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$
8. Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

© 2015 PCTEST Engineering Laboratory, Inc.

7.5 Radiated Spurious Emission Measurements, Out-of-Band

§15.209 §15.225(d)

The EUT was tested from 9kHz up to the 1GHz excluding the band 13.110 – 14.010 MHz. All measurements up to 960MHz were recorded with a spectrum analyzer employing a quasi-peak detector. All out-of-band emissions must not exceed the limits shown in Table 7-5 per Section 15.209. A loop antenna was used to investigate emissions below 30MHz.

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-5. Radiated Limits – Out of band

Sample Calculation

- Field Strength Level $_{[dB\mu V/m]}$ = Analyzer Level $_{[dBm]}$ + 107 + AFCL $_{[dB/m]}$
- AFCL $_{[dB/m]}$ = Antenna Factor $_{[dB/m]}$ + Cable Loss $_{[dB]}$
- Margin $_{[dB]}$ = Field Strength Level $_{[dB\mu V/m]}$ – Limit $_{[dB\mu V/m]}$

© 2015 PCTEST Engineering Laboratory, Inc.

Radiated Spurious Emission Measurements, Out-of-Band

§15.209 §15.225(d)

Tx Frequency 13.56MHz

Measurement Distance: 3 Meters

Frequency [MHz]	Ant. Pol. [H/V]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
27.12	V	-94.68	12.95	25.27	69.54	-44.27
40.68	V	-104.29	14.43	17.15	40.00	-22.85
67.80	V	-105.24	8.75	10.51	40.00	-29.49
176.28	V	-104.10	12.26	15.16	43.52	-28.36
203.40	V	-102.48	13.49	18.01	43.52	-25.51
230.52	V	-102.38	13.07	17.69	46.02	-28.33

Table 7-6. Radiated Measurements

NOTES:

1. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector for emissions below 960MHz.

2. Both Vertical and Horizontal polarities of the receive antenna were evaluated with the worst case emissions being reported. Below 30MHz the loop antenna was positioned in 3 orthogonal planes (X front, Y side, Z top) to determine the orientation resulting in the worst case emissions.

3. The EUT was positioned in three orthogonal planes to determine the orientation resulting in the worst case emissions.

4. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.

5. No spurious emissions levels were found to be greater than the level of the fundamental.

© 2015 PCTEST Engineering Laboratory, Inc.

Radiated Spurious Emission Measurements, Out-of-Band with WCP
§15.209 §15.225(d)

Tx Frequency 13.56MHz

Measurement Distance: 3 Meters

Frequency [MHz]	Ant. Pol. [H/V]	Level [dBm]	AFCL [dB/m]	3m Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
27.12	X	-94.76	12.95	25.19	69.54	-44.35
40.68	H	-90.11	14.43	31.33	40.00	-8.67
176.28	H	-100.45	12.26	18.81	43.52	-24.71
189.84	H	-100.97	12.17	18.20	43.52	-25.33
203.40	H	-100.07	13.49	20.42	43.52	-23.10
216.96	H	-95.93	12.48	23.55	46.02	-22.47
230.52	H	-99.07	13.07	21.00	46.02	-25.02

Table 7-7. Radiated Measurements with WCP

NOTES:

1. All measurements were recorded using a spectrum analyzer employing a quasi-peak detector for emissions below 960MHz.

2. Both Vertical and Horizontal polarities of the receive antenna were evaluated with the worst case emissions being reported. Below 30MHz the loop antenna was positioned in 3 orthogonal planes (X front, Y side, Z top) to determine the orientation resulting in the worst case emissions.

3. The EUT was positioned in three orthogonal planes to determine the orientation resulting in the worst case emissions.

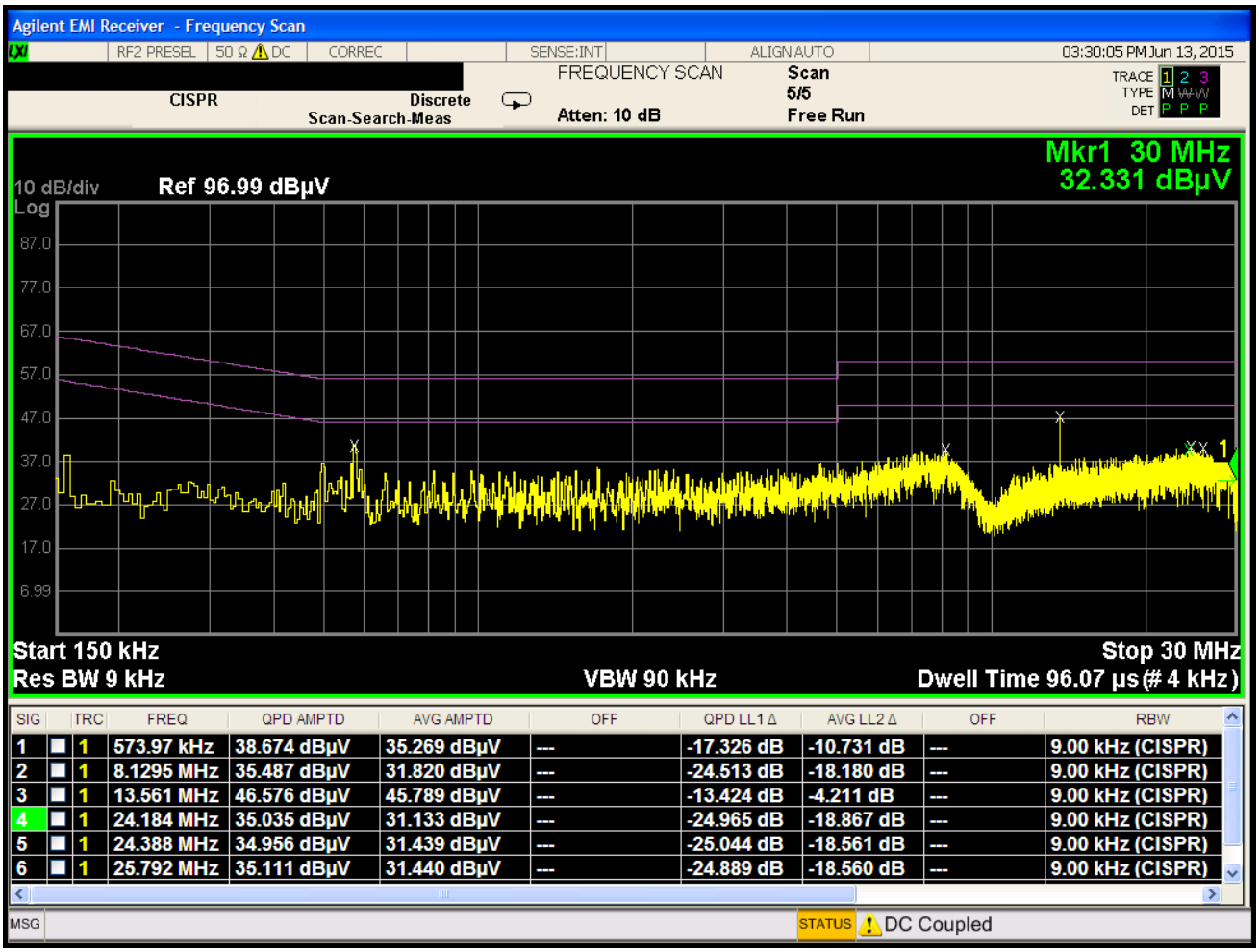
4. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.

5. No spurious emissions levels were found to be greater than the level of the fundamental.

© 2015 PCTEST Engineering Laboratory, Inc.

7.6 Line Conducted Measurement Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	573.97 kHz	38.674 dBµV	35.269 dBµV	---	-17.326 dB	-10.731 dB	---	9.00 kHz (CISPR)
2	■	1	8.1295 MHz	35.487 dBµV	31.820 dBµV	---	-24.513 dB	-18.180 dB	---	9.00 kHz (CISPR)
3	■	1	13.561 MHz	46.576 dBµV	45.789 dBµV	---	-13.424 dB	-4.211 dB	---	9.00 kHz (CISPR)
4	■	1	24.184 MHz	35.035 dBµV	31.133 dBµV	---	-24.965 dB	-18.867 dB	---	9.00 kHz (CISPR)
5	■	1	24.388 MHz	34.956 dBµV	31.439 dBµV	---	-25.044 dB	-18.561 dB	---	9.00 kHz (CISPR)
6	■	1	25.792 MHz	35.111 dBµV	31.440 dBµV	---	-24.889 dB	-18.560 dB	---	9.00 kHz (CISPR)

Plot 7-1. Line-Conducted Test Plot (L1)

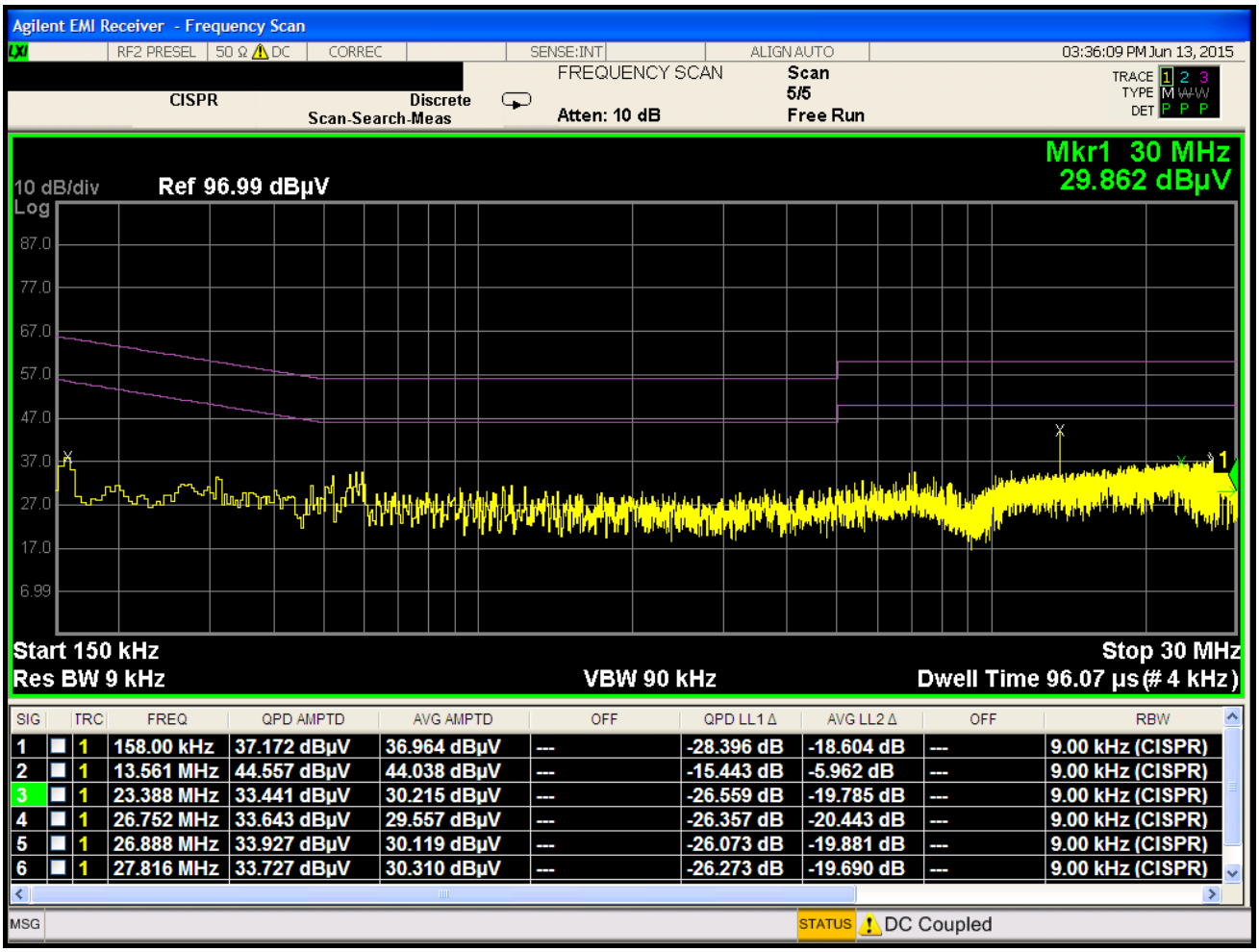
Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBµV) - QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

© 2015 PCTEST Engineering Laboratory, Inc.

Line Conducted Measurement Data

§15.207



SIG		TRC	FREQ	QPD AMPTD	AVG AMPTD	OFF	QPD LL1 Δ	AVG LL2 Δ	OFF	RBW
1	■	1	158.00 kHz	37.172 dBµV	36.964 dBµV	---	-28.396 dB	-18.604 dB	---	9.00 kHz (CISPR)
2	■	1	13.561 MHz	44.557 dBµV	44.038 dBµV	---	-15.443 dB	-5.962 dB	---	9.00 kHz (CISPR)
3	■	1	23.388 MHz	33.441 dBµV	30.215 dBµV	---	-26.559 dB	-19.785 dB	---	9.00 kHz (CISPR)
4	■	1	26.752 MHz	33.643 dBµV	29.557 dBµV	---	-26.357 dB	-20.443 dB	---	9.00 kHz (CISPR)
5	■	1	26.888 MHz	33.927 dBµV	30.119 dBµV	---	-26.073 dB	-19.881 dB	---	9.00 kHz (CISPR)
6	■	1	27.816 MHz	33.727 dBµV	30.310 dBµV	---	-26.273 dB	-19.690 dB	---	9.00 kHz (CISPR)

Plot 7-2. Line-Conducted Test Plot (N)

Notes:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. The limit for Class B device(s) from 150kHz to 30MHz are specified in Section 15.207 of the Title 47 CFR.
3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
4. QP/AV Level (dBµV) = QP/AV Analyzer/Receiver Level (dBµV) + Corr. (dB)
5. Margin (dB) = QP/AV Limit (dBµV) - QP/AV Level (dBµV)
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

© 2015 PCTEST Engineering Laboratory, Inc.

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMN920X** has been tested to show compliance with the requirements specified in §15.225 of the FCC Rules.

© 2015 PCTEST Engineering Laboratory, Inc.