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 15B

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu
Suwon-city, Gyeonggi-do, 443-803
Republic of Korea

Date of Testing:
7/25/2013
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1307261448.A3L

FCC ID:	**A3LGTI9506**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
EUT Type:	Portable Handset
Model(s):	GT-I9506
FCC Rule Part(s):	FCC Part 15 Subpart B
FCC Classification:	FCC Class B Digital Device (JBP)
Test Procedure:	ANSI C63.4-2009

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and has been tested in accordance with the measurement procedures specified in ANSI C63.4-2009 (See Test Report). The results shown herein are also deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003. 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. PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President

NVLAP Lab Code 100431-0

© 2013 PCTEST Engineering Laboratory, Inc.

TABLE OF CONTENTS

FCC Class B 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

2.5 LABELING REQUIREMENTS 5

3.0 DESCRIPTION OF TEST 6

3.1 EVALUATION PROCEDURE 6

3.2 AC LINE CONDUCTED EMISSIONS 6

3.3 RADIATED EMISSIONS 7

4.0 SAMPLE CALCULATIONS 8

4.1 CONDUCTED EMISSION MEASUREMENT SAMPLE CALCULATION 8

4.2 RADIATED EMISSION MEASUREMENT SAMPLE CALCULATION 8

5.0 TEST EQUIPMENT CALIBRATION DATA 9

6.0 ENVIRONMENTAL CONDITIONS 10

7.0 TEST DATA 11

7.1 SUMMARY 11

7.2 TEST SUPPORT EQUIPMENT 11

7.3 RADIATED MEASUREMENT DATA 12

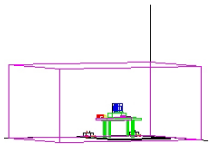
7.4 LINE CONDUCTED MEASUREMENT DATA 13

8.0 CONCLUSION 15

9.0 TEST SETUP PHOTOGRAPHS 16

10.0 EUT PHOTOGRAPHS 19

© 2013 PCTEST Engineering Laboratory, Inc.



MEASUREMENT REPORT
FCC Part 15B – Unintentional Radiators

§ 2.1033 General Information

APPLICANT:	Samsung Electronics Co., Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Yeongtong-gu
	Suwon-city, Gyeonggi-do, 443-803
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21046 USA
FCC RULE PART(S):	FCC Part 15 Subpart B
FCC ID:	A3LGTI9506
Test Device Serial No.:	FK-197-E ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION:	FCC Class B Digital Device (JBP)
DATE(S) OF TEST:	7/25/2013

Test Methodology

Both conducted and radiated measurements were taken using the methods and procedures described in ANSI C63.4-2009. Radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility / NVLAP Accreditation

Conducted and radiated tests were performed at PCTEST Engineering Lab 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 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP) in EMC, Telecommunication, and FCC for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. (NVLAP Lab code: 100431-0).
- 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.

© 2013 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.

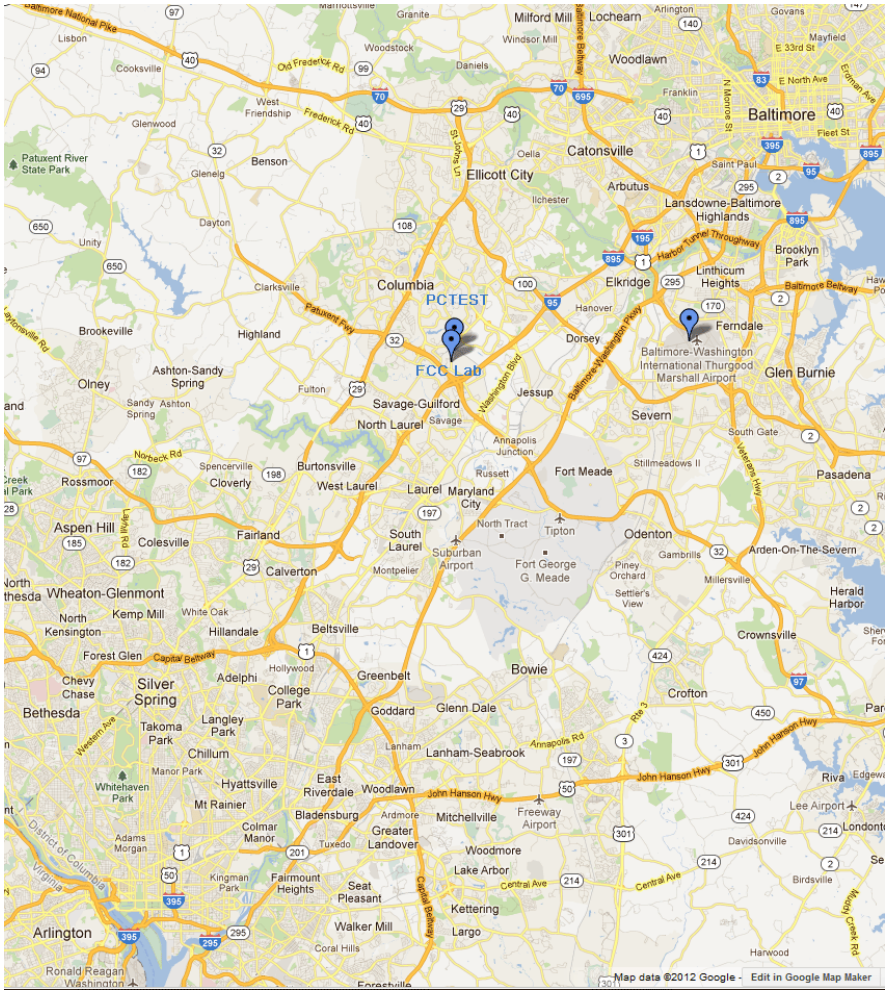


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

© 2013 PCTEST Engineering Laboratory, Inc.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LGTI9506**. The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT.

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1900 WCDMA/HSPA, Band 5 LTE with 5MHz and 10MHz BW, 802.11a/b/g/n/ac WLAN (DTS/NII), Bluetooth (1x,EDR, LE), NFC

2.3 Test Configuration

The Samsung Portable Handset FCC ID: A3LGTI9506 was tested with a laptop PC connected via USB interface port. The EUT was exercised during testing by means of software installed on the PC. Since the EUT is a peripheral device, the host PC was populated with another USB device and an additional peripheral device with a non-USB interface, as shown in Table 7-2, thus satisfying the minimum system requirement of two different I/O interfaces. All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.4-2009 and manipulated to obtain worst case emissions.

For more information please see Section 7.0 for test data and Sections 9.0 and 10.0 for the test setup photographs.

2.4 EMI Suppression Device(s)/Modifications

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

2.5 Labeling Requirements

Per 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(a)(5).

Please see attachment for FCC ID label and label location.

© 2013 PCTEST Engineering Laboratory, Inc.

3.0 DESCRIPTION OF TEST

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2009) was used in the measurement of the **Samsung Portable Handset FCC ID: A3LGTI9506.**

Note:

No deviations from the specified test procedure.

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 7.4. Automated test software was used to perform the AC line conducted emissions testing. Automated measurement software utilized is Rohde & Schwarz EMC32, Version 8.51.0.

© 2013 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. 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 varying: the mode of operation or resolution, clock or data rate, scrolling H pattern to the EUT and/or support equipment, and changing the polarity of the receive antenna, whichever produced the worst-case emissions. To record the final measurements, the analyzer detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 120kHz for frequencies below 1GHz or 1MHz for frequencies above 1GHz. For average measurements above 1GHz, the analyzer was set to peak detector with a reduced VBW setting (RBW = 1MHz, VBW = 10Hz).

© 2013 PCTEST Engineering Laboratory, Inc.

4.0 SAMPLE CALCULATIONS

4.1 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**

4.2 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

© 2013 PCTEST Engineering Laboratory, Inc.

5.0 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)	3/29/2013	Annual	3/29/2014	N/A
Agilent	8447D	Broadband Amplifier	5/31/2013	Annual	5/31/2014	2443A01900
Rohde & Schwarz	ESU26	EMI Test Receiver	2/25/2013	Annual	2/25/2014	100342
Solar Electronics	8012-50-R-24-BNC	LISN	6/20/2013	Biennial	6/20/2015	310233
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/26/2012	Biennial	1/26/2014	A051107
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	7/24/2013	Biennial	7/24/2015	125518
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	5/31/2013	Annual	5/31/2014	100071

Table 5-1. Annual Test Equipment Calibration Schedule

© 2013 PCTEST Engineering Laboratory, Inc.

6.0 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 controlled within the range 86-106kPa (860-1060mbar).

© 2013 PCTEST Engineering Laboratory, Inc.

7.0 TEST DATA

7.1 Summary

Test Date(s): 7/25/2013

Test Engineer: Michael Lal

FCC Part 15 Section	Description	Result
15.107	Conducted Emissions	PASS
15.109	Radiated Emissions	PASS

Table 7-1. Summary of Test Results

7.2 Test Support Equipment

1	Samsung Data Link Cable	Model:	N/A	S/N:	N/A
		1.0 m	Shielded USB Cable		
2	Dell Notebook PC #1	Model:	Vostro 3555 (DoC)	A/N:	PCT80759
	w/ Dell AC Adapter	Model:	PA-1600-06D2	S/N:	CN-0928G4-71615-1CE-3447-A01
		0.85m	Unshielded AC power cord		
		1.80m	Unshielded DC power cord with ferrite bead on notebook end		
3	Dynex USB PC Camera	Model:	DX-WC101 (DoC)	S/N:	122D05AC
		2.07m	Shielded USB Cable		
4	Insignia 19" LCD Monitor	Model:	NS-L19Q-10A (DoC)	S/N:	V1297JA025798
		1.92m	Unshielded AC power cord		
5	HDMI Cable	Model	Monoprice 3871 HDMI cable with ferrite core	S/N	HH-28F-03E
		.94 m			

Table 7-2. Test Support Equipment Used

Note: See test setup photographs for actual system test setup.

© 2013 PCTEST Engineering Laboratory, Inc.

7.3 Radiated Measurement Data

§15.109; RSS-Gen (6(a))

Frequency [MHz]	Level [dBm]	AFCL [dB/m]	Pol [H/V]	Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
65.75	-86.21	10.24	H	31.03	40.00	-8.97
82.85	-89.16	10.87	H	28.72	40.00	-11.28
171.46	-89.24	14.06	H	31.81	43.52	-11.71
255.40	-81.05	14.01	H	39.95	46.02	-6.07
300.50	-91.51	15.92	H	31.41	46.02	-14.61
342.45	-91.94	17.01	H	32.06	46.02	-13.96

Table 7-3. Radiated Measurements at 3-meters

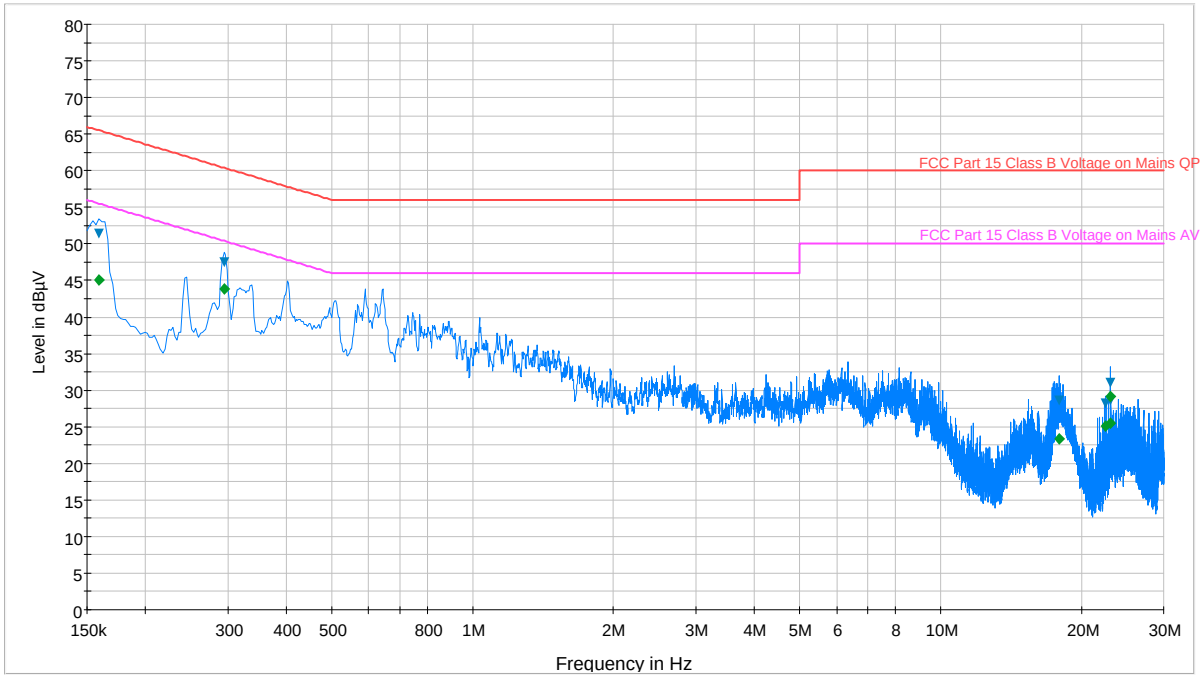
NOTES:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. Radiated emissions were measured from 30MHz – 6000MHz to ensure that the provisions of 15.33(b)(1) are satisfied with respect to the upper frequency scanning range.
3. The radiated limits for unintentional radiators at a distance of 3 meters are used in the table above, as specified in 15.109(a).
4. All readings are calibrated by a signal generator with accuracy traceable to the National Institute of Standards and Technology (NIST).
5. AFCL (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB)
6. Level (dBμV/m) = Analyzer Reading (dBm) + AFCL (dB/m) + 107
7. Margin (dB) = Field strength (dBμV/m) – Limit (dBμV/m)
8. Measurements are made using a CISPR quasi-peak detector with a 100kHz resolution bandwidth. Above 1GHz, peak measurements are made using a peak detector with a resolution bandwidth of 1MHz and a video bandwidth of 3MHz and average measurements are made with a peak detector using a resolution bandwidth of 1MHz and a video bandwidth of 10Hz.
9. Calibrated linearly polarized broadband and horn antennas were used for measurements below and above 1GHz, respectively. For measurements made below 1GHz, the results recorded using the broadband antenna are known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy.
10. Calibrated low-loss microwaves cables and broadband amplifiers are used.

© 2013 PCTEST Engineering Laboratory, Inc.

7.4 Line Conducted Measurement Data

§15.107; RSS-Gen (7.2.2)



Plot 7-1. Line Conducted Plot (L1)

Frequency	Line	Corr.	QuasiPeak	Limit	Margin	Average	Limit	Margin
MHz		dB	dBµV	dBµV	dB	dBµV	dBµV	dB
0.159	L1	0.0	51.40	65.50	14.10	45.10	55.50	10.40
0.294	L1	0.1	47.50	60.40	12.90	43.80	50.40	6.60
17.952	L1	1.1	28.60	60.00	31.40	23.40	50.00	26.60
22.580	L1	1.5	28.20	60.00	31.80	25.10	50.00	24.90
23.069	L1	1.5	28.60	60.00	31.40	25.50	50.00	24.50
23.129	L1	1.5	31.00	60.00	29.00	29.10	50.00	20.90

Table 7-4. Line Conducted Data (L1)

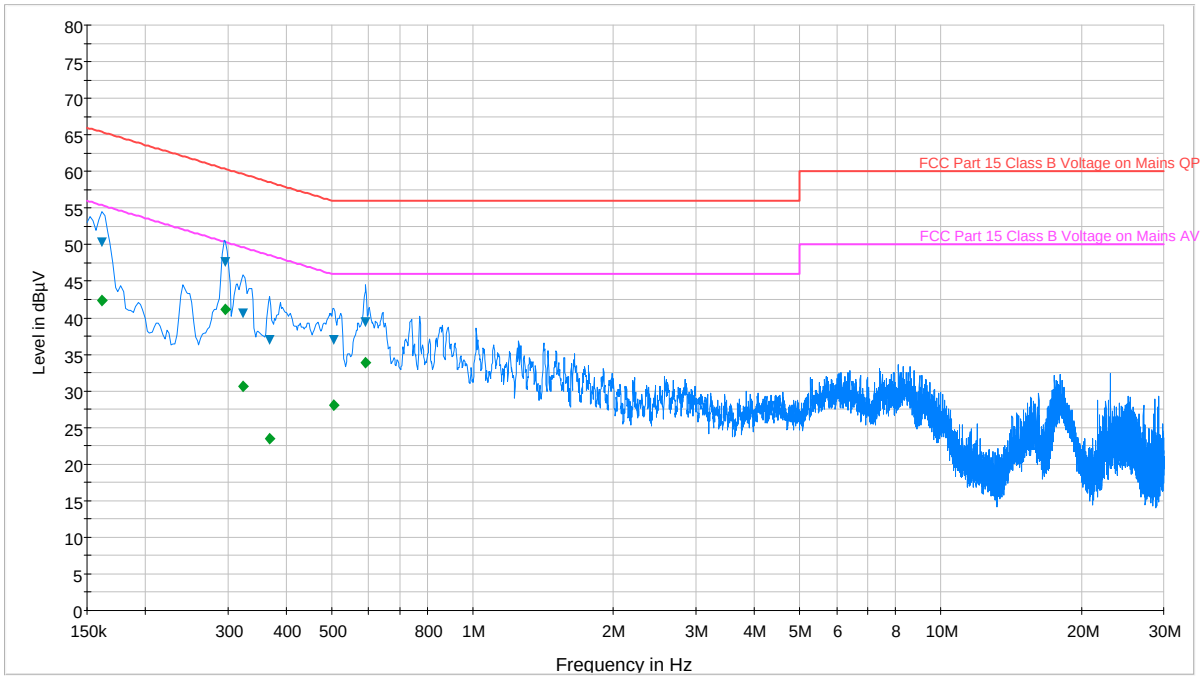
Notes:

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 15.107 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Reading (dBµV) + Factor (dB)
6. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

© 2013 PCTEST Engineering Laboratory, Inc.

Line Conducted Measurement Data (Cont'd)

§15.107; RSS-Gen (7.2.2)



Plot 7-2. Line Conducted Plot (LN)

Frequency	Line	Corr.	QuasiPeak	Limit	Margin	Average	Limit	Margin
MHz		dB	dBµV	dBµV	dB	dBµV	dBµV	dB
0.161	N	0.0	50.40	65.40	15.00	42.40	55.40	13.00
0.296	N	0.1	47.60	60.30	12.70	41.10	50.30	9.20
0.323	N	0.1	40.60	59.60	19.00	30.60	49.60	19.00
0.368	N	0.1	36.90	58.50	21.60	23.40	48.50	25.10
0.506	N	0.0	36.90	56.00	19.10	28.00	46.00	18.00
0.591	N	0.1	39.30	56.00	16.70	33.90	46.00	12.10

Table 7-5. Line Conducted Data (LN)

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 15.107 of the Title 47 CFR.
3. L1 = Phase; N = Neutral
4. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
5. QP/AV Level (dBµV) = QP/AV Reading (dBµV) + Factor (dB)
6. Margin (dB) = QP/AV Limit (dBµV) – QP/AV Level (dBµV)
7. Traces shown in plot are made using a peak detector.
8. Deviations to the Specifications: None.

© 2013 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: A3LGTI9506** has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC Rules and Industry Canada Standard ICES-003.

© 2013 PCTEST Engineering Laboratory, Inc.