PCTEST ENGINEERING LABORATORY, INC.
6660-B Dobbin Road, Columbia, MD 21045 USA
Tel. 410.290.6652 / Fax 410.290.6554
http://www.pctestlab.com

CERTIFICATE OF COMPLIANCE
FCC Part 15B Certification

Applicant Name:
Samsung Electronics, Co. Ltd.
18600 Broadwick St.
Rancho Dominguez, CA 90220
United States

Date of Testing:
January 2, 2008
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0712311439.A3L

FCC ID:	**A3LSGHI458**
APPLICANT:	**Samsung Electronics, Co. Ltd.**

EUT Type:	PCS GSM/EDGE Phone with Bluetooth
Model(s):	SGH-i458
FCC Rule Part(s):	FCC Part 15 Subpart B
FCC Classification:	FCC Class B Digital Device (JBP)
Test Procedure:	ANSI C63.4-2003

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 C63.4-2003 (See Test Report). These measurements were performed with no deviation from the standards.

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. PCTEST certifies that no party to this application has been denied the 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

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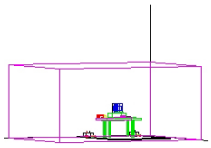
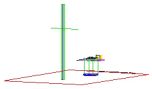


MEASUREMENT REPORT
FCC Part 15B – Unintentional Radiators



§ 2.1033 General Information

APPLICANT:	Samsung Electronics, Co. Ltd.
APPLICANT ADDRESS:	18600 Broadwick St.
	Rancho Dominguez, CA 90220
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	6660-B Dobbin Road, Columbia, MD 21045 USA
FCC RULE PART(S):	FCC Part 15 Subpart B
FCC ID:	A3LSGHI458
Test Device Serial No.:	FE-232-C ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION:	FCC Class B Digital Device (JBP)
DATE(S) OF TEST:	January 2, 2008

Test Methodology

Both conducted and radiated measurements were taken using the methods and procedures described in ANSI C63.4-2003. 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 21045, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) 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 (IC 2451).
- 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 (IC-2451) test laboratory with the site description on file at Industry Canada.

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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.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity are, 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 in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 on January 27, 2006 and Industry Canada.

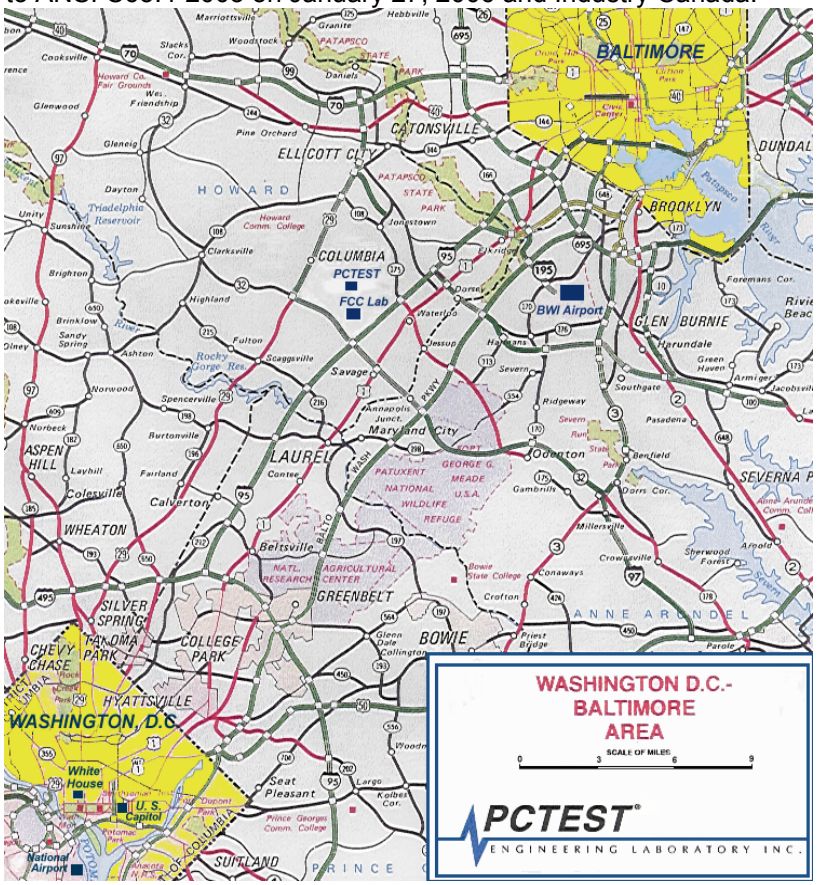

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung PCS GSM/EDGE Phone with Bluetooth FCC ID: A3LSGHI458**. The test data contained in this report pertains only to the emissions due to the digital circuitry of the EUT.

Manufacturer / Base Model	FCC ID	Description
Samsung / Model: SGH-i458	A3LSGHI458	PCS GSM/EDGE Phone with Bluetooth

Table 2-1. EUT Equipment Description

2.2 Operation Mode

The Samsung PCS GSM/EDGE Phone with Bluetooth FCC ID: A3LSGHI458 was tested with a NOTEBOOK connected via USB interface port. For more information please see Section 7.0 for test data and Sections 9.0 and 10.0 for the test setup photographs.

2.3 EMI Suppression Device(s)/Modifications

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

2.4 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(b)(2).

Please see attachment for FCC ID label and label location.

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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 C63.4-2003) was used in the measurement of the **Samsung PCS GSM/EDGE Phone with Bluetooth FCC ID: A3LSGHI458.**

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

3.2 Conducted Emissions

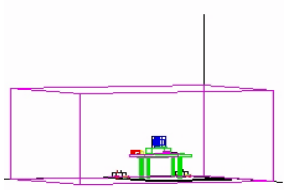

Figure 3-1. Shielded Enclosure Line-Conducted Test Facility

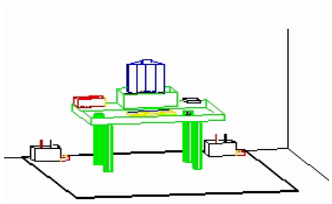

Figure 3-2. Line Conducted Emission Test Set-Up

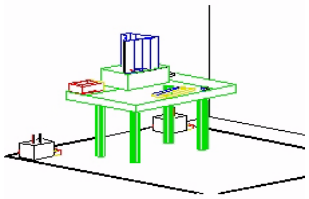

Figure 3-3. Wooden Table & Bonded LISNs

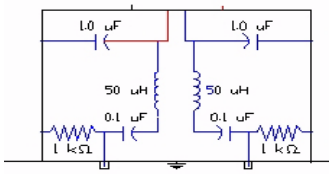

Figure 3-4. LISN Schematic Diagram

The line-conducted facility is located inside a 16'x20'x10' shielded enclosure, manufactured by Ray Proof Series 81 (*see Figure 3-1*). 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 1.5m away from the sidewall of the shielded room (*see Figure 3-2*). Solar Electronics and EMCO Model 3725/2 (10kHz-30MHz) 50Ω/50μH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room (*see Figure 3-3).* The EUT is powered from the Solar LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by a high-current high-insertion loss Ray Proof power line filter (100dB 14Hz-10GHz). The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with an inner diameter of ½". 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 Solar LISN. The LISN schematic diagram is shown (*see Figure 3-4*). All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion). 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 to determine the frequency producing the maximum EME from the EUT.

The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to CISPR quasi-peak and average mode. The bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in the test setup photographs. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator.

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3.3 Radiated Emissions

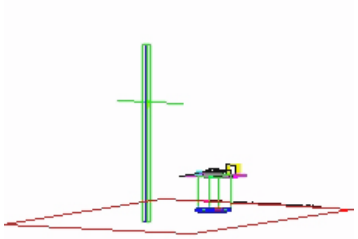

Figure 3-5. 3-Meter Test Site

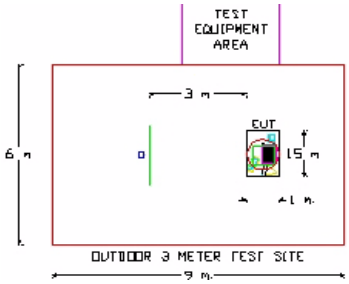

Figure 3-6. Dimensions of Outdoor Test Site

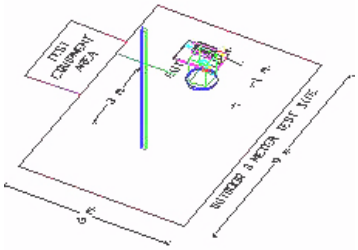

Figure 3-7. Turntable and System Setup

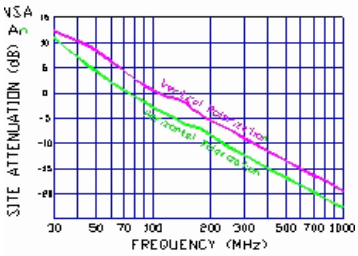

Figure 3-8. Normalized Site Attenuation Curves (H&V)

Preliminary measurements were made indoors at 1-meter using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, and turntable azimuth with respect to the antenna was noted for each frequency found. The spectrum was scanned from 30 to 200 MHz using a bi-conical antenna and from 200 to 1000 MHz using a log-spiral antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using Roberts™ Dipole antennas or horn antennas (*see Figure 3-5*). The test equipment was placed on a wooden and plastic bench situated on a 1.5m x 2m area adjacent to the measurement area (*see Figure 3-6*). 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 detector function was set to CISPR quasi-peak mode and the bandwidth of the spectrum analyzer was set to 100kHz for frequencies below 1GHz or 1MHz for frequencies above 1GHz. Above 1GHz the detector function was set to average mode (RBW = 1MHz, VBW = 10Hz).

The half-wave dipole antenna was tuned to the frequency found during preliminary radiated measurements. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1 x 1.5 meter table (*see Figure 3-7*). The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The turntable containing the system was rotated 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 exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in the test setup photographs. Each EME reported was calibrated using the Agilent E8257D (250kHz – 20GHz) PSG Signal Generator. The Theoretical Normalized Site Attenuation Curves for both horizontal and vertical polarization are shown in Figure 3-8.

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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

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5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model / Equipment	Calibration Date	Cal Interval	Calibration Due	Serial No.
Agilent	E4407B ESA Spectrum Analyzer	04/29/07	Annual	04/28/08	US39210313
Agilent	E8257D (250kHz-20GHz) Signal Generator	03/08/07	Annual	03/07/08	MY45470194
Agilent	HP 8449B (1-26.5GHz) Pre-Amplifier	12/13/07	Annual	12/12/08	3008A00985
Agilent	HP 11713A Attenuation/Switch Driver	12/13/07	Annual	12/12/08	N/A
Agilent	HP 8566B Opt. 462 Impulse Bandwidth	12/13/07	Annual	12/12/08	3701A22204
EMCO	Dipole Pair	09/21/06	Biennial	09/20/08	23951
SOLAR	8012-50 LISN (2)	11/08/07	Biennial	11/07/09	0313233, 0310234
Pasternack	PE7000-6 6 dB Attenuator	N/A		N/A	N/A
-	No.165 (30MHz - 1000MHz) RG58 Coax Cable	N/A		N/A	N/A
-	No.166 (1000-26500MHz) Microwave RF Cable	N/A		N/A	N/A
-	No.167 (100kHz - 100MHz) RG58 Coax Cable	N/A		N/A	N/A
Sunol	JB5 Bi-Log 3m Antenna (>1GHz)	05/25/07	Biennial	05/24/09	A051107

Table 5-1. Annual Test Equipment Calibration Schedule

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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).

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7.0 TEST DATA

7.1 Summary

Test Date(s): January 2, 2008

Test Engineer:

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 USB Data Link Cable	Model: 1.2m	APCBS10BBE Shielded USB Cable	S/N:	DW1PB08AS G
2	Panasonic Toughbook #2 w/ Panasonic AC Adapter	FCC ID: Model: 2.0m 2.0m	ACJ9TGCF-513 CF-AA1683A Unshielded AC power cord Unshielded DC power cord with ferrite bead on notebook end	S/N: S/N:	7ATYA28277R 1683AM306Y01583D
3	Dynex USB PC Camera	Model: 2.07m	DX-WC101 (DoC) Shielded USB Cable	S/N:	122D05AC
4	Zoom Modem	FCC ID: 1.8m 1.2m	BDNV34MINI-EXT Unshielded DC power cord Shielded serial cable	S/N:	3117M4X40211

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

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7.3 Radiated Measurement Data

§15.109; RSS-Gen (6(a))

Frequency [MHz]	Level [dBm]	AFCL [dB]	Pol [H/V]	Height [m]	Azimuth [degrees]	Field Strength [dBμV/m]	Field Strength [μV/m]	Margin [dB]
47.85	-88.72	10.59	V	2.4	204	28.88	27.78	-11.12
55.84	-93.35	10.04	V	2.3	2	23.70	15.30	-16.30
187.59	-96.09	14.85	V	2.7	269	25.76	19.41	-17.76
193.54	-92.24	14.89	H	1.3	357	29.65	30.38	-13.87
250.10	-94.33	14.29	V	2.1	205	26.96	22.28	-19.06
284.00	-98.49	15.90	H	1.5	114	24.41	16.61	-21.61

Table 7-2. Radiated Measurements at 3-meters

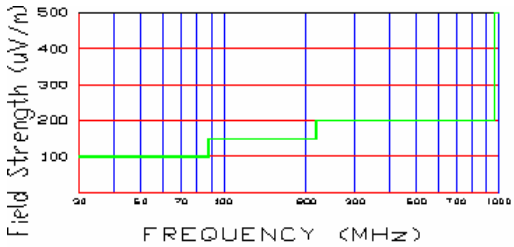

Figure 7-1. 3 Meter Limits

NOTES:

1. All modes of operation were investigated and the worst-case emissions are reported.
2. Radiated Emissions were measured from 30MHz – 2000MHz.
3. The radiated limits are shown on Figure 7-1. Above 960MHz the limit is 500μV/m.

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1. All readings are calibrated by Agilent E8257D (250kHz – 20GHz) PSG Signal Generator with accuracy traceable to the National Institute of Standards and Technology (NIST).
2. AFCL = Antenna Factor (Roberts dipole) and Cable Loss (30 ft. RG58C/U).
3. Measurements made using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used with a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

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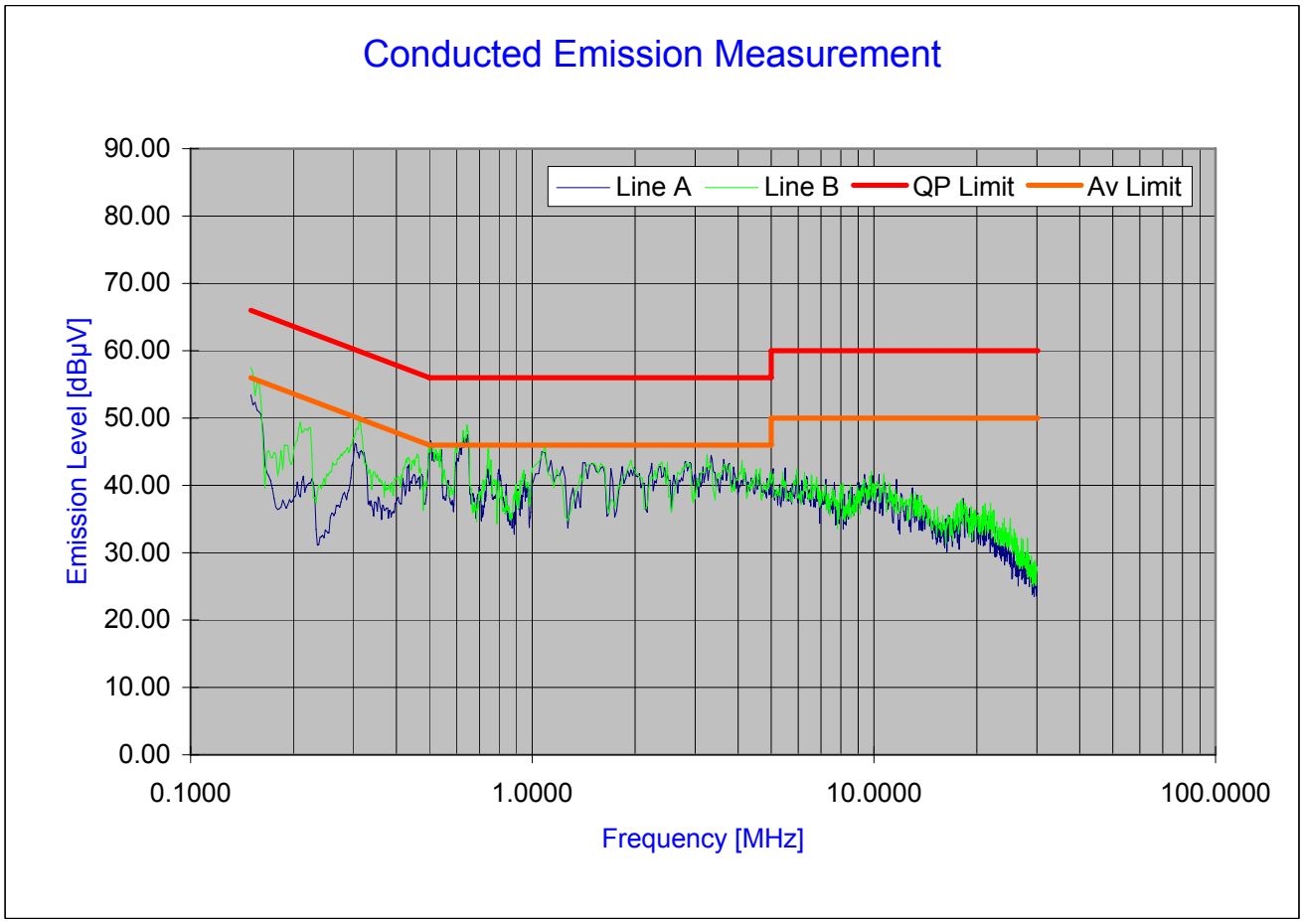
7.4 Line Conducted Measurement Data

§15.107; RSS-Gen (7.2.2)

PCTEST Engineering Laboratory Inc.

Company : Samsung Electronics
Model Number : SGH-i458
FCC ID Code : A3LSGHI458
Standard : FCC Part 15B class B

Power Source : AC120V/60Hz
Tested Date : 01/02/2008
Note : Tested with USB Data Link Cable Model: APCBS10BBE



Ver.1.1 ©PCTEST 2006.08

Plot 7-1. Line-Conducted Test Plot

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. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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Line Conducted Measurement Data (Cont'd)

§15.107; RSS-Gen (7.2.2)

No.	Line	Frequency [MHz]	QP [dBµV]	Limit [dBµV]	Margin [dB]	Average [dBµV]	Limit [dBµV]	Margin [dB]
1	A	0.500	40.61	56.00	-15.39	27.13	46.00	-18.87
2	A	0.506	40.08	56.00	-15.92	25.22	46.00	-20.78
3	A	0.538	40.58	56.00	-15.42	22.07	46.00	-23.93
4	A	0.616	39.64	56.00	-16.36	20.69	46.00	-25.31
5	A	0.619	33.60	56.00	-22.40	20.77	46.00	-25.23
6	A	0.627	33.46	56.00	-22.54	20.77	46.00	-25.23
7	A	0.642	34.98	56.00	-21.02	20.42	46.00	-25.58
8	A	1.073	32.65	56.00	-23.35	19.22	46.00	-26.78
9	A	3.335	34.35	56.00	-21.65	19.92	46.00	-26.08
10	A	3.638	34.53	56.00	-21.47	20.24	46.00	-25.76
11	B	0.151	48.09	66.00	-17.91	23.96	56.00	-32.04
12	B	0.311	42.48	59.86	-17.38	31.50	49.86	-18.36
13	B	0.497	42.16	56.00	-13.84	28.90	46.00	-17.10
14	B	0.604	41.39	56.00	-14.61	26.42	46.00	-19.58
15	B	0.618	41.16	56.00	-14.84	24.69	46.00	-21.31
16	B	0.631	41.59	56.00	-14.41	24.26	46.00	-21.74
17	B	0.646	44.37	56.00	-11.63	22.96	46.00	-23.04
18	B	0.649	41.30	56.00	-14.70	20.42	46.00	-25.58
19	B	0.750	35.10	56.00	-20.90	19.85	46.00	-26.15
20	B	1.093	36.94	56.00	-19.06	23.37	46.00	-22.63

Table 7-3. Line-Conducted Test Data

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. Line A = Phase; Line B = Neutral
4. Traces shown in plot are made using a peak detector.
5. Deviations to the Specifications: None.

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung PCS GSM/EDGE Phone with Bluetooth FCC ID: A3LSGHI458** has been tested to comply with the requirements specified in §15.107 and §15.109 of the FCC Rules.

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