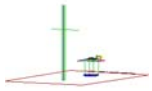
PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctestlab.com



# 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:**
02/16-03/09/2015
**Test Site/Location:**
PCTEST Lab, Columbia, MD, USA
**Test Report Serial No.:**
0Y1503240648.A3L

| | |
|---|---|
| **FCC ID:** | **A3L404SC** |
| **APPLICANT:** | **Samsung Electronics Co., Ltd.** |

| | |
|---|---|
| **Application Type:** | Certification |
| **Model(s):** | 404SC |
| **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

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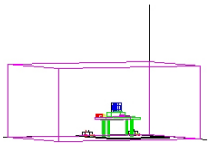


# MEASUREMENT REPORT
## FCC Part 15.225

## § 2.1033 General Information

| | |
|---|---|
| **APPLICANT:** | Samsung Electronics Co., Ltd. |
| **APPLICANT ADDRESS:** | 129, Samsung-ro, Maetan dong,<br>Yeongtong-gu, Suwon-si<br>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:** | 404SC |
| **FCC ID:** | A3L404SC |
| **FCC CLASSIFICATION:** | Low Power Communications Device Transmitter (DXX) |
| **Test Device Serial No.:** | 1C129, 1C4E6, 1C0C3, 1C0C4 ☐ Production ☒ Pre-Production ☐ Engineering |
| **DATE(S) OF TEST:** | 02/16-03/09/2015 |
| **TEST REPORT S/N:** | 0Y1503240648.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.

# 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.

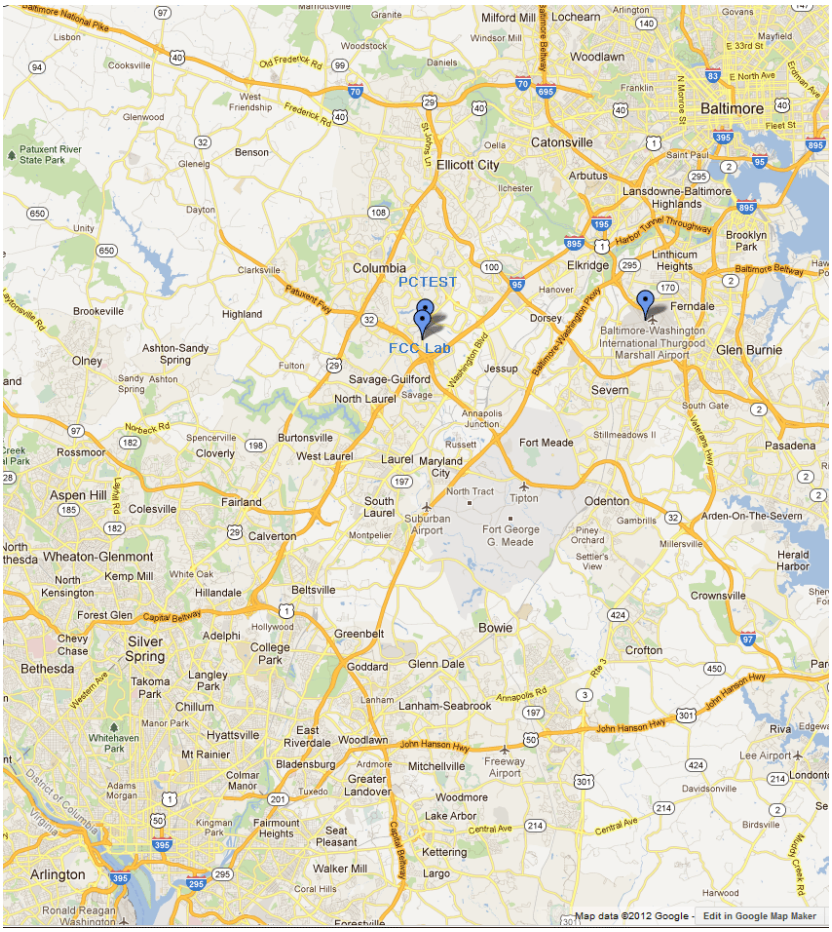



**Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area**

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3L404SC**. 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:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, ANT+

**Note:** The circuitry for this device is electrically identical to a device bearing the FCC ID: A3LSC04G. Thus, the data found within this report, excluding occupied bandwidth was taken from the A3LSC04G.

## 2.3 Test Configuration

The Samsung Portable Handset FCC ID: A3L404SC 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 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.

# 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: A3L404SC.**

**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.

## 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).

# 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: A3L404SC** unit complies with the requirement of §15.203.

# 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

# 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) | 3/25/2014 | Annual | 3/25/2015 | N/A |
| Agilent | 8447D | Broadband Amplifier | 6/2/2014 | Annual | 6/2/2015 | 1937A03348 |
| Agilent | 8447D | Broadband Amplifier | 5/30/2014 | Annual | 5/30/2015 | 2443A01900 |
| Agilent | N9020A | MXA Signal Analyzer | 10/27/2014 | Annual | 10/27/2015 | US46470561 |
| Agilent | N9030A | PXA Signal Analyzer (44GHz) | 5/8/2014 | Annual | 5/8/2015 | MY52350166 |
| Agilent | N9038A | MXE EMI Receiver | 3/3/2014 | Annual | 3/3/2015 | MY51210133 |
| Com-Power | AL-130 | 9kHz - 30MHz Loop Antenna | 6/26/2013 | Biennial | 6/26/2015 | 121034 |
| Espec | ESX-2CA | Environmental Chamber | 4/16/2014 | Annual | 4/16/2015 | 17620 |
| 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) | 3/27/2014 | Annual | 3/27/2015 | 100342 |
| Seekonk | NC-100 | Torque Wrench (8" lb) | 4/16/2014 | Biennial | 4/16/2016 | N/A |
| Solar Electronics | 8012-50-R-24-BNC | Line Impedance Stabilization Network | 6/20/2013 | Biennial | 6/20/2015 | 310233 |
| Sunol | JB5 | Bi-Log Antenna (30M - 5GHz) | 1/28/2014 | Biennial | 1/28/2016 | A051107 |
| VWR | 62344-734 | Thermometer with Clock | 2/20/2014 | Biennial | 2/20/2016 | 140140336 |

**Table 6-1. Annual Test Equipment Calibration Schedule**

**Note:**

For equipment listed above that has a calibration due 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.

# 7.0 TEST DATA

## 7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3L404SC

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<br>13.553 – 13.567 MHz<br><br>334µV/m @ 30m<br>13.410 – 13.553 MHz<br>13.567 – 13.710 MHz<br><br>106µV/m @ 30m<br>13.110 – 13.410 MHz<br>13.710 – 14.010 MHz | | PASS | Section 7.4 |
| 15.225 (d)<br>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 | LINE CONDUCTED | PASS | Section 7.6 |
| **RECEIVER MODE (Rx) / DIGITAL DEVICE** | | | | | |
| 15.107 | AC Conducted Emissions 150kHz – 30MHz | < FCC 15.107 limits or | LINE CONDUCTED | PASS | Part 15B Test Report |

**Table 7-1. Summary of Test Results**

**Note:**

This unit was tested with its standard battery.

## 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 | 430kHz | 429kHz |

**Table 7-2. 20dB Bandwidth Measurement**

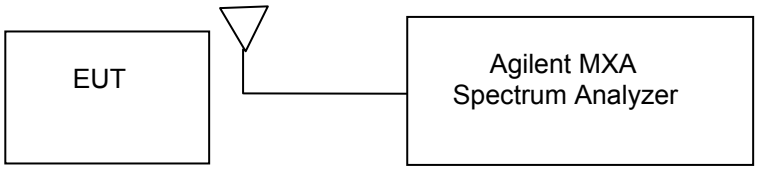



**Figure 7-1. Test Instrument & Measurement Setup**


**Figure 7-2. 20dB Bandwidth Plot**


**Figure 7-3. 20dB Bandwidth Plot with WCP**

## 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) | 13,560,232 | 232 | 0.0017109 |
| 100 % | | - 30 | 13,560,074 | 74 | 0.0005457 |
| 100 % | | - 20 | 13,559,705 | -295 | -0.0021755 |
| 100 % | | - 10 | 13,559,760 | -240 | -0.0017699 |
| 100 % | | 0 | 13,560,159 | 159 | 0.0011726 |
| 100 % | | + 10 | 13,560,415 | 415 | 0.0030605 |
| 100 % | | + 20 | 13,560,366 | 366 | 0.0026991 |
| 100 % | | + 30 | 13,559,878 | -122 | -0.0008997 |
| 100 % | | + 40 | 13,560,095 | 95 | 0.0007006 |
| 100 % | | + 50 | 13,560,051 | 51 | 0.0003761 |
| BATT. ENDPOINT | 3.45 | + 20 | 13,559,936 | -64 | -0.0004720 |

**Table 7-3. Frequency Stability Test Data**

# Frequency Stability Test Data

**§15.225**

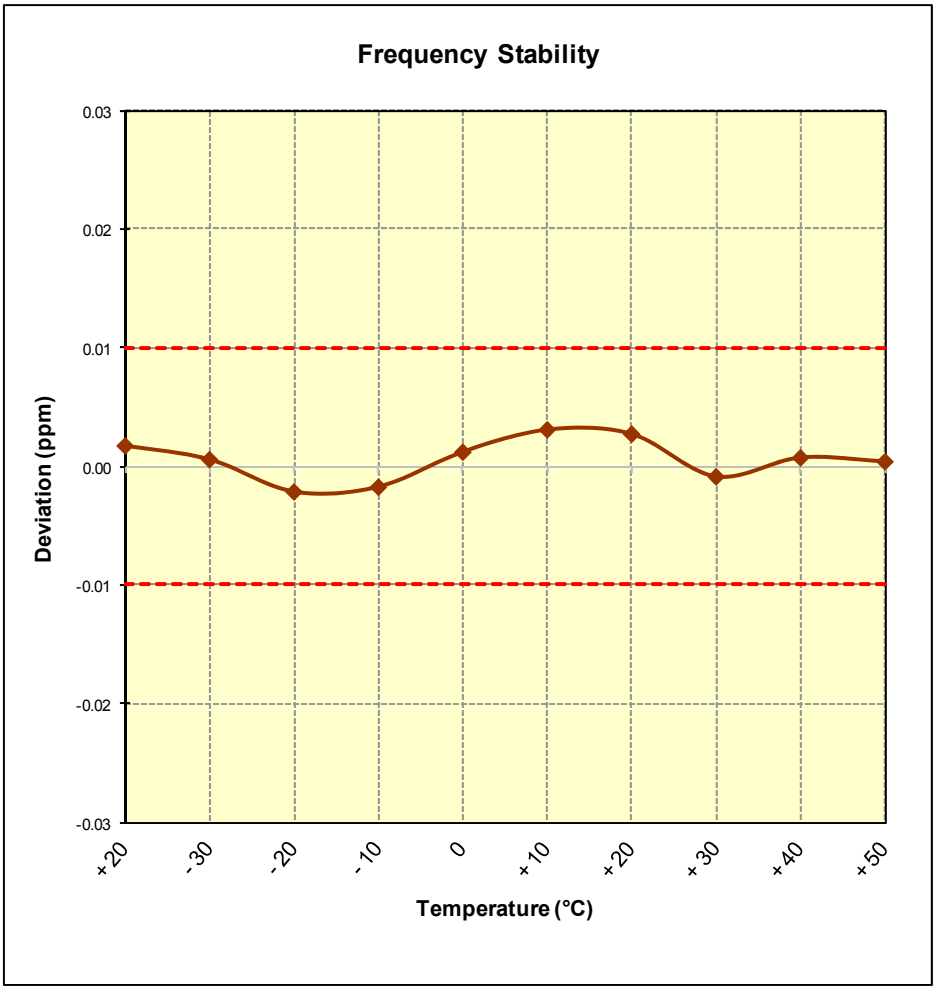



**Figure 7-4. Frequency Stability Plot**

## 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] |
|---|---|---|---|---|---|---|---|---|
| 13.252 | Y | -92.37 | 14.37 | 29.00 | -11.00 | 106.00 | 40.51 | -51.50 |
| 13.348 | Y | -92.35 | 14.37 | 29.02 | -10.98 | 106.00 | 40.51 | -51.49 |
| 13.459 | Y | -91.05 | 14.37 | 30.32 | -9.68 | 334.00 | 50.47 | -60.16 |
| 13.560 | Y | -76.51 | 14.36 | 44.85 | 4.85 | 15848.00 | 84.00 | -79.15 |
| 13.658 | Y | -91.92 | 14.36 | 29.44 | -10.56 | 334.00 | 50.47 | -61.03 |
| 13.770 | Y | -92.76 | 14.36 | 28.60 | -11.40 | 106.00 | 40.51 | -51.91 |
| 13.863 | Y | -83.63 | 14.36 | 37.73 | -2.27 | 106.00 | 40.51 | -42.78 |

**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 $_{[dB\mu V/m]}$

## 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 $_{[dB\mu V/m]}$

## 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 | Y | -94.23 | 12.94 | 25.71 | 69.54 | -43.84 |
| 40.68 | V | -110.97 | 14.41 | 10.44 | 40.00 | -29.56 |
| 54.24 | V | -114.47 | 8.52 | 1.05 | 40.00 | -38.95 |
| 67.80 | V | -105.80 | 8.72 | 9.93 | 40.00 | -30.07 |
| 81.36 | V | -114.24 | 8.48 | 1.25 | 40.00 | -38.75 |
| 94.92 | V | -99.14 | 9.91 | 17.77 | 43.52 | -25.75 |
| 108.48 | V | -117.08 | 13.17 | 3.10 | 43.52 | -40.43 |

**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 10$^{th}$ harmonic and the worst-case emissions are reported.

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

## 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 | Y | -94.36 | 12.94 | 25.58 | 69.54 | -43.97 |
| 40.68 | H | 28.62 | 14.41 | 10.22 | 40.00 | -29.78 |
| 54.24 | H | 28.35 | 8.52 | 0.79 | 40.00 | -39.21 |
| 67.80 | H | 28.15 | 8.72 | 10.46 | 40.00 | -29.54 |
| 81.36 | H | 28.02 | 8.48 | 0.94 | 40.00 | -39.06 |
| 94.92 | H | 27.89 | 9.91 | 17.34 | 43.52 | -26.18 |
| 108.48 | H | 27.86 | 13.17 | 3.37 | 43.52 | -40.16 |

**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.

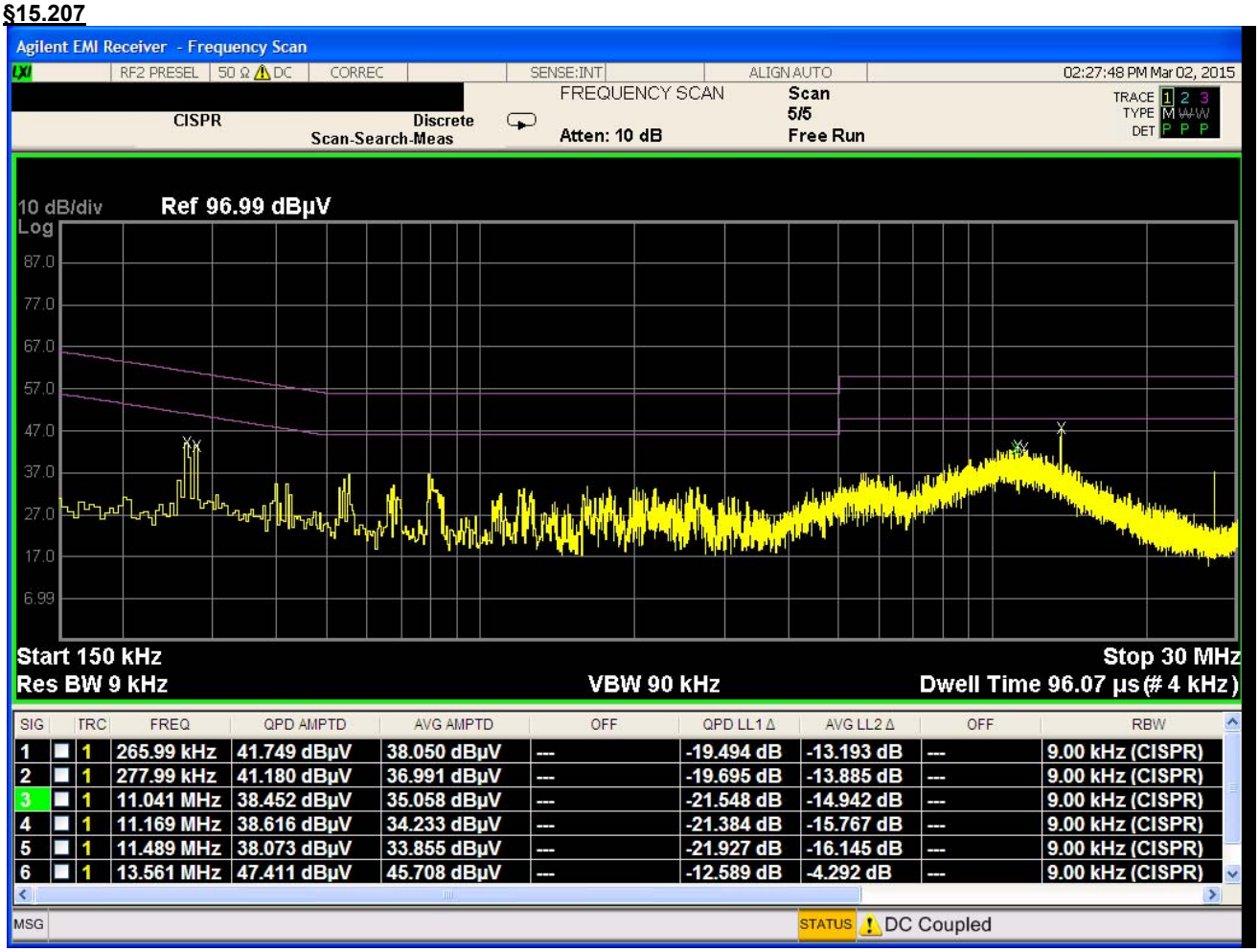
3. The EUT was positioned in three orthogonal planes to determine the orientation resulting in the worst case emissions.

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

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

## 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 | 265.99 kHz | 41.749 dBµV | 38.050 dBµV | --- | -19.494 dB | -13.193 dB | --- | 9.00 kHz (CISPR) |
| 2 | 1 | 277.99 kHz | 41.180 dBµV | 36.991 dBµV | --- | -19.695 dB | -13.885 dB | --- | 9.00 kHz (CISPR) |
| 3 | 1 | 11.041 MHz | 38.452 dBµV | 35.058 dBµV | --- | -21.548 dB | -14.942 dB | --- | 9.00 kHz (CISPR) |
| 4 | 1 | 11.169 MHz | 38.616 dBµV | 34.233 dBµV | --- | -21.384 dB | -15.767 dB | --- | 9.00 kHz (CISPR) |
| 5 | 1 | 11.489 MHz | 38.073 dBµV | 33.855 dBµV | --- | -21.927 dB | -16.145 dB | --- | 9.00 kHz (CISPR) |
| 6 | 1 | 13.561 MHz | 47.411 dBµV | 45.708 dBµV | --- | -12.589 dB | -4.292 dB | --- | 9.00 kHz (CISPR) |

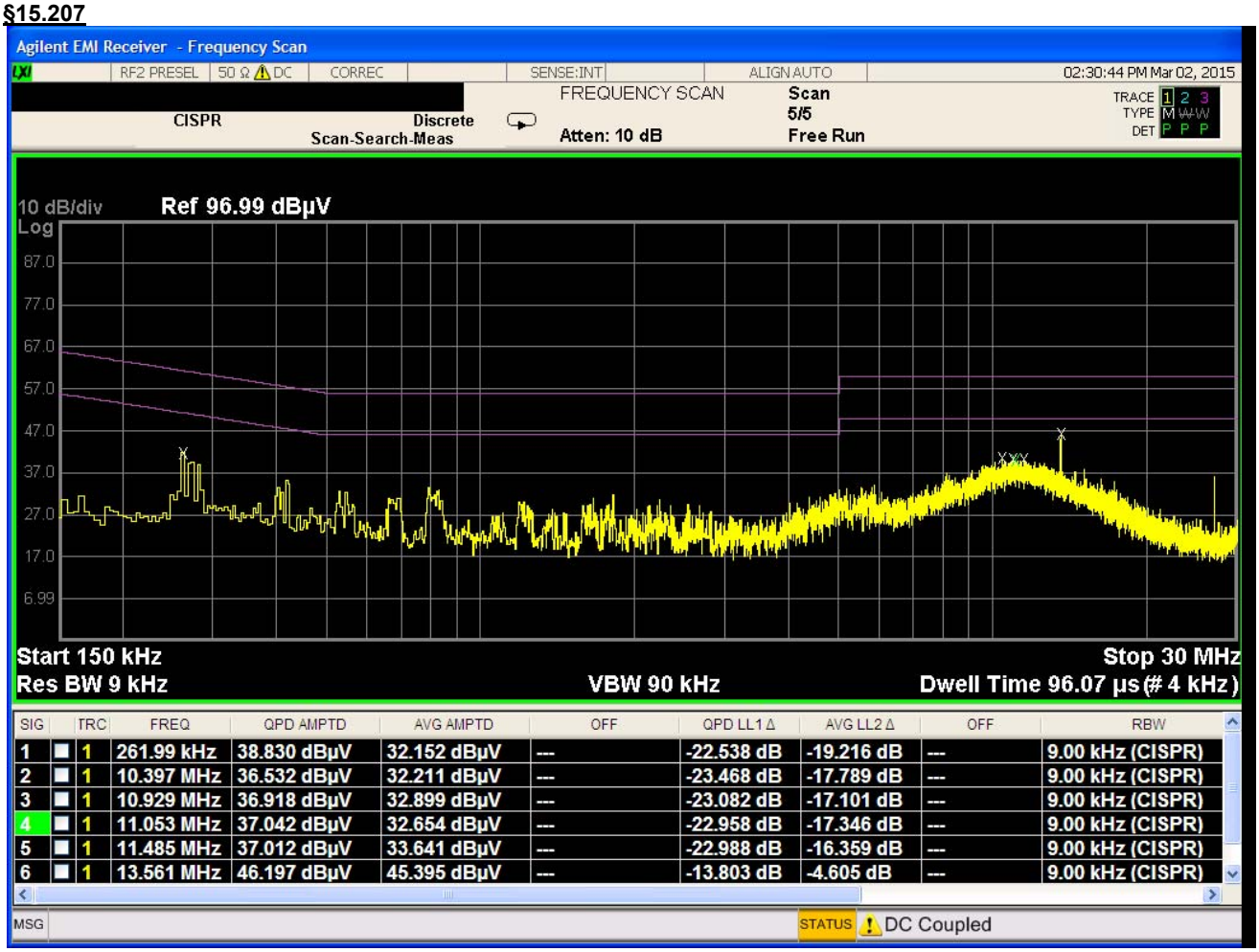
**Plot 7-1. Line-Conducted Test Plot (L1)**

**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.

# Line Conducted Measurement Data

**§15.207**




**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.

# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3L404SC** has been tested to show compliance with the requirements specified in §15.225 of the FCC Rules.