



# PCTEST ENGINEERING LABORATORY, INC.

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<http://www.pctestlab.com>



## MEASUREMENT REPORT FCC Part 27 LTE

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

**Date of Testing:**  
Sep. 6 - 15 and Oct. 20, 2011  
**Test Site/Location:**  
PCTEST Lab., Columbia, MD, USA  
**Test Report Serial No.:**  
0Y1109011497.A3L

|                   |                                      |
|-------------------|--------------------------------------|
| <b>FCC ID:</b>    | <b>A3LSCHI515</b>                    |
| <b>APPLICANT:</b> | <b>SAMSUNG ELECTRONICS, CO. LTD.</b> |

**Application Type:** Certification  
**FCC Classification:** PCS Licensed Transmitter Held to Ear (PCE)  
**FCC Rule Part(s):** §2; §27  
**EUT Type:** Portable Handset  
**Model(s):** SCH-I515  
**Tx Frequency Range:** 782MHz (LTE - Band 13)  
**Max. RF Output Power:** 0.049W ERP (16.92 dBm) (QPSK)  
0.046W ERP (16.62 dBm) (16-QAM)  
**Emission Designator(s):** 8M86G7D (QPSK) / 8M95W7D (16-QAM)  
**Test Device Serial No.:** *identical prototype* [S/N: SAR#2, RF#2]

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.



I 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.

**Grant Conditions:** Power output listed is ERP for Part 27.

*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



|   |   |  |   |  |
|---|---|--|---|--|
| <b>FCC ID:</b> A3LSCHI515                   |  | <b>FCC Pt. 27 LTE MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  | <b>Reviewed by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>0Y1109011497.A3L | <b>Test Dates:</b><br>Sep. 6 - 15 and Oct. 20,<br>2011                              | <b>EUT Type:</b><br>Portable Handset                         | Page 1 of 26  |  |

# T A B L E O F C O N T E N T S

|  |    |
|--|----|
| FCC PART 27 MEASUREMENT REPORT.....                          | 3  |
| 1.0 INTRODUCTION .....                                       | 4  |
| 1.1 SCOPE .....  | 4  |
| 1.2 TESTING FACILITY.....                                    | 4  |
| 2.0 PRODUCT INFORMATION.....                                 | 6  |
| 2.1 EQUIPMENT DESCRIPTION .....                              | 6  |
| 2.2 EMI SUPPRESSION DEVICE(S)/MODIFICATIONS .....            | 6  |
| 2.3 LABELING REQUIREMENTS.....                               | 6  |
| 3.0 DESCRIPTION OF TESTS .....                               | 7  |
| 3.1 MEASUREMENT PROCEDURE .....                              | 7  |
| 3.2 OCCUPIED BANDWIDTH EMISSION LIMITS .....                 | 7  |
| 3.3 BLOCK C FREQUENCY RANGE .....                            | 7  |
| 3.4 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL..... | 8  |
| 3.5 RADIATED POWER AND RADIATED SPURIOUS EMISSIONS .....     | 8  |
| 3.6 FREQUENCY STABILITY / TEMPERATURE VARIATION .....        | 8  |
| 4.0 TEST EQUIPMENT CALIBRATION DATA .....                    | 9  |
| 5.0 SAMPLE CALCULATIONS .....                                | 10 |
| 6.0 TEST RESULTS.....  | 11 |
| 6.1 SUMMARY.....   | 11 |
| 6.2 TRANSMITTER CONDUCTED OUTPUT POWER .....                 | 12 |
| 6.3 EFFECTIVE RADIATED POWER OUTPUT DATA .....               | 13 |
| 6.4 LTE RADIATED MEASUREMENTS .....                          | 14 |
| 6.5 LTE RADIATED MEASUREMENTS IN 1559 – 1610MHZ BAND .....   | 15 |
| 6.6 LTE FREQUENCY STABILITY MEASUREMENTS.....                | 16 |
| 7.0 PLOT(S) OF EMISSIONS .....                               | 18 |
| 8.0 CONCLUSION.....  | 26 |

|   |   |  |   |  |
|---|---|--|---|--|
| <b>FCC ID:</b> A3LSCHI515                   |  | <b>FCC Pt. 27 LTE MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  | <b>Reviewed by:</b><br>Quality Manager |
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# MEASUREMENT REPORT

## FCC Part 27



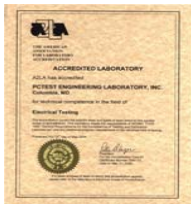
### §2.1033 General Information



**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):** §2; §27  
**BASE MODEL:** SCH-I515  
**FCC ID:** A3LSCHI515  
**FCC CLASSIFICATION:** PCS Licensed Transmitter Held to Ear (PCE)  
**EMISSION DESIGNATOR(S):** 8M86G7D (QPSK) / 8M95W7D (16-QAM)  
**MODULATIONS:** QPSK, 16-QAM (Uplink)  
**FREQUENCY TOLERANCE:** Emission must remain in band  
**Test Device Serial No.:** SAR#2, RF#2     Production     Pre-Production     Engineering  
**DATE(S) OF TEST:** Sep. 6 - 15 and Oct. 20, 2011  
**TEST REPORT S/N:** 0Y1109011497.A3L

### Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab. located 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 (2451A-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 (2451A-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.



|   |   |  |   |  |
|---|---|--|---|--|
| <b>FCC ID:</b> A3LSCHI515                   |  | <b>FCC Pt. 27 LTE MEASUREMENT REPORT<br/>(CERTIFICATION)</b> |  | <b>Reviewed by:</b><br>Quality Manager |
| <b>Test Report S/N:</b><br>0Y1109011497.A3L | <b>Test Dates:</b><br>Sep. 6 - 15 and Oct. 20, 2011                                 | <b>EUT Type:</b><br>Portable Handset                         | Page 3 of 26  |  |

## 1.0 INTRODUCTION



### 1.1 Scope

Measurement and determination of electromagnetic emissions (EME) 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 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity area, the Baltimore-Washington Intern't'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 28, 2009.

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        | Page 4 of 26  |                                 |

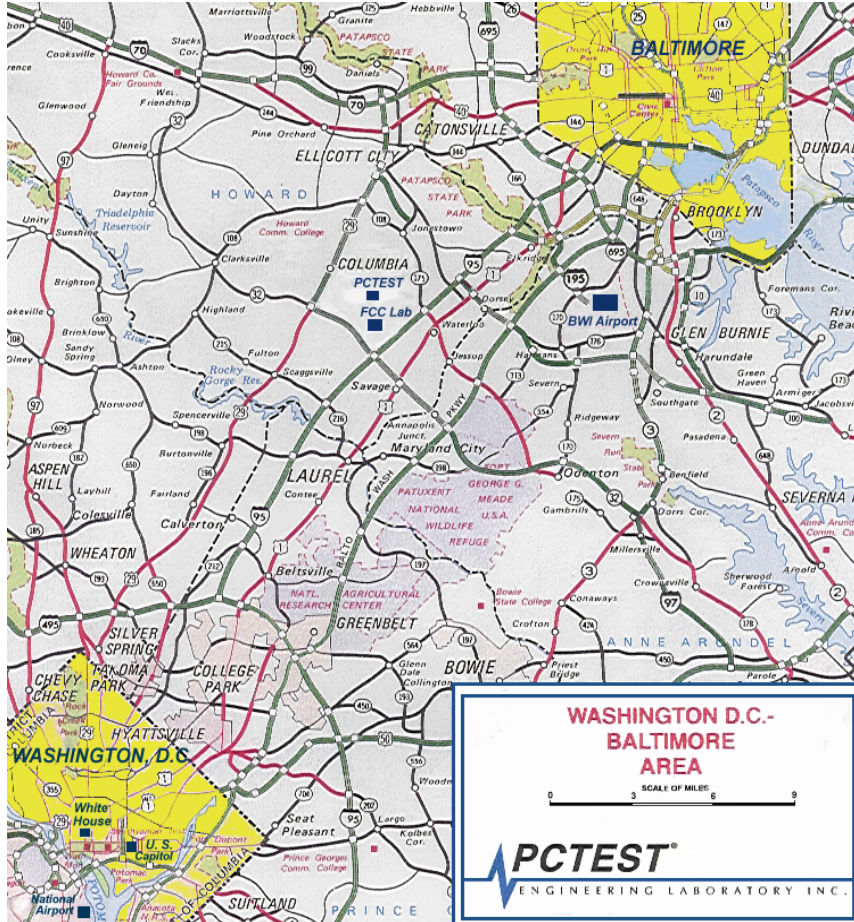


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

|                                      |   |  |                |                                 |
|--------------------------------------|---|--|----------------|---------------------------------|
| FCC ID: A3LSCHI515                   | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC.   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) | <b>SAMSUNG</b> | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |                | Page 5 of 26                    |

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSCHI515**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function. The EUT consisted of the following component(s):

| Trade Name / Base Model   | FCC ID     | Description      |
|---------------------------|------------|------------------|
| Samsung / Model: SCH-I515 | A3LSCHI515 | Portable Handset |

**Table 2-1. EUT Equipment Description**

A CMW500 call box was used to set the EUT to transmit at full power. Each available modulation type (i.e. QPSK, 16-QAM) and RB size/RB offset combination was tested to determine the configuration producing the highest power and the worst case emissions.

### 2.2 EMI Suppression Device(s)/Modifications

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

### 2.3 Labeling Requirements

Per 2.925

The FCC identifier shall be permanently affixed to the equipment and shall be readily visible to the purchaser at the time of purchase.



Per 15.19; Docket 95-19

In addition to this requirement, a device subject to certification shall be labeled as follows:

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

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).

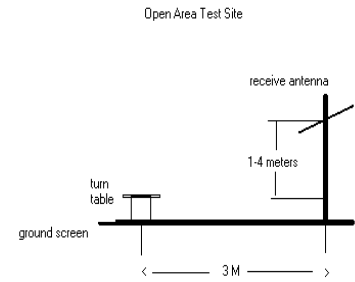
Please see attachment for FCC ID label and label location.

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        | Page 6 of 26  |                                 |

### 3.0 DESCRIPTION OF TESTS

#### 3.1 Measurement Procedure

The radiated spurious measurements were made outdoors at a 3-meter test range (see Figure 3-1). The equipment under test is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. This power level was recorded using a broadband average power meter. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level is recorded with the power meter. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.



**Figure 3-1. Diagram of 3-meter outdoor test range**

**Deviation from Measurement Procedure.....None**

#### 3.2 Occupied Bandwidth Emission Limits



§2.1049, §27.53(l)(6)

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

#### 3.3 Block C Frequency Range

§27.5(b)(3)

Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results do not satisfy the applicable reserve price, the spectrum in the 746-757 MHz and 776-787 MHz bands will instead be made available for assignment at a subsequent auction as follows: (i) Two paired channels of 6 megahertz each available for assignment in Block C1 in the 746-752 MHz and 776-782 MHz bands. (ii) Two paired channels of 5 megahertz each available for assignment in Block C2 in the 752-757 MHz and 782-787 MHz bands.

|                                      |   |  |   |                                 |
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| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
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### 3.4 Spurious and Harmonic Emissions at Antenna Terminal §2.1051, §27.53(c)

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

### 3.5 Radiated Power and Radiated Spurious Emissions §2.1053, §27.53(c)

Spurious and harmonic radiated emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. This level is then measured with a broadband average power meter. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive average power meter reading. This spurious level is recorded with the power meter. For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration. This device was tested under all configurations and the worst case radiated power is reported while transmitting with 1 resource block with an offset of 0 using QPSK modulation.

### 3.6 Frequency Stability / Temperature Variation §2.1055, §27.54



The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

*Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.*

#### Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A sufficient stabilization period at each temperature shall be used prior to each frequency requirement.

|                                      |   |  |   |                                 |
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| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        | Page 8 of 26  |                                 |



## 4.0 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 |
|-------------------|-----------|------------------------------------|------------|--------------|------------|---------------|
| -                 | 263-10dB  | (DC-18GHz) 10 dB Attenuator        | 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           |
| Agilent           | E5515C    | Wireless Communications Test Set   | 10/8/2010  | Annual       | 10/8/2011  | GB46310798    |
| Agilent           | E5515C    | Wireless Communications Test Set   | 10/11/2010 | Annual       | 10/11/2011 | GB46110872    |
| Agilent           | E8267C    | Vector Signal Generator            | 10/11/2010 | Annual       | 10/11/2011 | US42340152    |
| Agilent           | 8648D     | (9kHz-4GHz) Signal Generator       | 10/13/2010 | Annual       | 10/13/2011 | 3613A00315    |
| Agilent           | E4448A    | PSA (3Hz-50GHz) Spectrum Analyzer  | 11/30/2010 | Annual       | 11/30/2011 | US42510244    |
| Agilent           | 8449B     | (1-26.5GHz) Pre-Amplifier          | 2/8/2011   | Annual       | 2/8/2012   | 3008A00985    |
| Agilent           | E5515C    | Wireless Communications Test Set   | 2/8/2011   | Annual       | 2/8/2012   | GB45360985    |
| Agilent           | E4407B    | ESA Spectrum Analyzer              | 4/5/2011   | Annual       | 4/5/2012   | US39210313    |
| Agilent           | 85650A    | Quasi-Peak Adapter                 | 4/7/2011   | Annual       | 4/7/2012   | 3303A01872    |
| Agilent           | 85650A    | Quasi-Peak Adapter                 | 4/7/2011   | Annual       | 4/7/2012   | 2043A00301    |
| Agilent           | 8566B     | (100Hz-22GHz) Spectrum Analyzer    | 4/7/2011   | Annual       | 4/7/2012   | 3638A08713    |
| Agilent           | E8257D    | (250kHz-20GHz) Signal Generator    | 4/8/2011   | Annual       | 4/8/2012   | MY45470194    |
| Agilent           | E5515C    | Wireless Communications Test Set   | 7/6/2011   | Annual       | 7/6/2012   | GB41450275    |
| Agilent           | N9038A    | MXE EMI Receiver                   | 8/5/2011   | Annual       | 8/5/2012   | MY51210133    |
| Anritsu           | ML2495A   | Power Meter                        | 10/13/2010 | Annual       | 10/13/2011 | 941001        |
| Anritsu           | MA2411B   | Pulse Sensor                       | N/A        |              | N/A        | 1027293       |
| Compliance Design | Roberts   | Dipole Set                         | 4/7/2010   | Biennial     | 4/7/2012   | 146           |
| Compliance Design | Roberts   | Dipole Set                         | 4/7/2010   | Biennial     | 4/7/2012   | 147           |
| Emco              | 3115      | Horn Antenna (1-18GHz)             | 10/14/2009 | Biennial     | 10/14/2011 | 9704-5182     |
| Emco              | 3115      | Horn Antenna (1-18GHz)             | 4/8/2010   | Biennial     | 4/8/2012   | 9205-3874     |
| Espec             | ESX-2CA   | Environmental Chamber              | 4/21/2011  | Annual       | 4/21/2012  | 17620         |
| Gigatronics       | 80701A    | (0.05-18GHz) Power Sensor          | 10/11/2010 | Annual       | 10/11/2011 | 1833460       |
| Gigatronics       | 8651A     | Universal Power Meter              | 10/11/2010 | Annual       | 10/11/2011 | 8650319       |
| K & L             | 11SH10    | Band Pass Filter                   | N/A        | Annual       | N/A        | 1300/4000     |
| K & L             | 11SH10    | Band Pass Filter                   | N/A        | Annual       | N/A        | 4000/12000    |
| MiniCircuits      | VHF-1300+ | High Pass Filter                   | N/A        |              | N/A        | 30716         |
| MiniCircuits      | VHF-3100+ | High Pass Filter                   | N/A        |              | N/A        | 30721         |
| Pasternack        | PE2208-6  | Bidirectional Coupler              | N/A        |              | N/A        | N/A           |
| Rohde & Schwarz   | CMU200    | Base Station Simulator             | 11/11/2010 | Annual       | 11/11/2011 | 836371/0079   |
| Rohde & Schwarz   | CMW500    | LTE Radio Communication Tester     | 3/11/2011  | Annual       | 3/11/2012  | 103962        |
| Rohde & Schwarz   | CMU200    | Base Station Simulator             | 4/19/2011  | Annual       | 4/19/2012  | 107826        |
| Rohde & Schwarz   | CMU200    | Base Station Simulator             | 6/1/2011   | Annual       | 6/1/2012   | 833855/0010   |
| Rohde & Schwarz   | CMW500    | LTE Radio Communication Tester     | 8/5/2011   | Annual       | 8/5/2012   | 112347        |
| Rohde & Schwarz   | CMU200    | Base Station Simulator             | N/A        |              |            | 836536/0005   |
| Schwarzbeck       | UHA9105   | Dipole Antenna (400 - 1GHz) Rx     | 9/17/2009  | Biennial     | 9/17/2011  | 9105-2404     |
| Schwarzbeck       | UHA9105   | Dipole Antenna (400 - 1GHz) Tx     | 9/17/2009  | Biennial     | 9/17/2011  | 9105-2403     |
| Sunol             | JB5       | Bi-Log Antenna (30M - 5GHz)        | 9/17/2009  | Biennial     | 9/17/2011  | A051107       |
| Sunol             | DRH-118   | Horn Antenna (1-18 GHz)            | 6/17/2011  | Biennial     | 6/17/2013  | A042511       |
| Sunol             | DRH-118   | Horn Antenna (1 - 18GHz)           | 7/5/2011   | Biennial     | 7/5/2013   | A050307       |

**Table 4-1. Test Equipment**

**Note: No equipment that was used for testing was past its calibration due date.**

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
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## 5.0 SAMPLE CALCULATIONS

### Emission Designator

#### QPSK Modulation

**Emission Designator = 8M62G7D**

LTE BW = 8.62 MHz  
 G = Phase Modulation  
 7 = Quantized/Digital Info  
 D = Amplitude/Angle Modulated

#### 16QAM Modulation



**Emission Designator = 8M45W7D**

LTE BW = 8.45 MHz  
 W = Amplitude/Angle Modulated  
 7 = Quantized/Digital Info  
 D = Combination (Audio/Data)

### Spurious Radiated Emission – LTE Band

#### **Example: Middle Channel LTE Mode 2<sup>nd</sup> Harmonic (1564 MHz)**

The average receive power meter reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the power meter. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm - (-24.80).

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        | Page 10 of 26   |                                 |

## 6.0 TEST RESULTS

### 6.1 Summary



Company Name: Samsung Electronics, Co. Ltd.  
 FCC ID: A3LSCHI515  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 Mode(s): LTE

| FCC Part Section(s)              | Test Description                                 | Test Limit   | Test Condition | Test Result | Reference   |
|----------------------------------|--|--|----------------|-------------|-------------|
| <b>TRANSMITTER MODE (Tx)</b>     |  |  |                |             |             |
| 2.1049                           | Occupied Bandwidth                               | N/A  | CONDUCTED      | PASS        | Section 7.0 |
| 2.1051, 27.53(c)(2), 27.53(c)(4) | Band Edge / Conducted Spurious Emissions (*)     | < 43 + 10log <sub>10</sub> (P[Watts])<br>< 65 + 10log <sub>10</sub> (P[Watts]) in a 6.25kHz bandwidth for emissions in the 763 – 775MHz and 793 – 805MHz bands |                | PASS        | Section 7.0 |
| 2.1046                           | Transmitter Conducted Output Power Measurements  | N/A  |                | N/A         | Section 6.2 |
| 2.1055, 27.54                    | Frequency Stability                              | Fundamental emissions must stay within the allotted band   |                | PASS        | Section 6.6 |
| 27.50(b)(10)                     | Effective Radiated Power                         | < 3 Watts max. ERP   | RADIATED       | PASS        | Section 6.3 |
| 2.1053, 27.53(c)(2) 27.53(c)(4)  | Undesirable Out-of-Band Emissions                | < 43 + 10log <sub>10</sub> (P[Watts]) for all out-of-band emissions  |                | PASS        | Section 6.4 |
| 2.1053, 27.53(f)                 | Undesirable Emissions in the 1559 – 1610MHz band | < -40dBm/MHz EIRP (wideband)<br>< -50dBm EIRP (narrowband)   |                | PASS        | Section 6.5 |

**Table 6-1. Summary of Test Results**

**Notes:**

\* - For out of band conducted spurious emissions (including those at the band edges), the emissions of both QPSK and 16-QAM modulations were investigated. The worst case transmitter emissions are shown in Section 7.0.

|                                      |   |   |   |                                 |
|--------------------------------------|---|---|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT (CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20, 2011  | EUT Type:<br>Portable Handset                     | Page 11 of 26   |                                 |

## 6.2 Transmitter Conducted Output Power

### §2.1046

The **Samsung Portable Handset FCC ID: A3LSCHI515** was connected to a Rohde and Schwarz LTE Radio Communication Tester (Model: CMW500). Conducted powers for the EUT were measured for different combinations of resource block sizes, resource block offsets, and MCS indices and the worst case is reported.

| Frequency | BW     | Modulation | RB Size | RB Offset | Maximum Average Power [dBm] |
|-----------|--------|------------|---------|-----------|-----------------------------|
| 782 MHz   | 10 MHz | QPSK       | 1       | 0         | 22.35                       |
|           |        | 16QAM      | 1       | 0         | 21.55                       |
|           |        | QPSK       | 1       | 49        | 21.95                       |
|           |        | 16QAM      | 1       | 49        | <b>21.20</b>                |
|           |        | QPSK       | 25      | 12        | <b>22.28</b>                |
|           |        | 16QAM      | 25      | 12        | 21.35                       |
|           |        | QPSK       | 50      | 0         | <b>21.98</b>                |
|           |        | 16QAM      | 50      | 0         | 20.91                       |

Table 6-2. Maximum Average Conducted Output Power

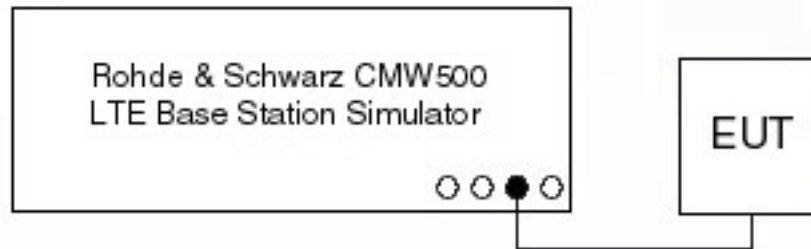




Figure 6-1. Conducted Output Power Test Setup Diagram

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        |   | Page 12 of 26                   |

### 6.3 Effective Radiated Power Output Data

§27.50(b)(10)

| Frequency [MHz] | Modulation | Measured Level [dBm] | Substitute Level [dBm] | Antenna Gain [dBd] | Pol [H/V] | ERP [dBm] | ERP [Watts] | Power Source |
|-----------------|------------|----------------------|------------------------|--------------------|-----------|-----------|-------------|--------------|
| 782.00          | QPSK       | -16.870              | 16.92                  | 0.00               | H         | 16.92     | 0.049       | Battery      |
| 782.00          | 16-QAM     | -17.170              | 16.62                  | 0.00               | H         | 16.62     | 0.046       | Battery      |



**Table 6-3. Effective Radiated Power Output Data**

**NOTES:**

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. Final power measurements are made with a broadband average power meter. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. This level is recorded using the power meter. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

This device was tested under all configurations and the worst case radiated power is reported while transmitting with 1 resource block with an offset of 0 using QPSK modulation. This unit was tested with its standard battery. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case test configuration was found with the EUT in the horizontal setup. The data reported in the table above was measured in this test setup.

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        | Page 13 of 26   |                                 |

## 6.4 LTE Radiated Measurements

### §2.1053, §27.53(c)(2)

#### Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 782.00 MHz  
 MEASURED OUTPUT POWER: 16.920 dBm = 0.049 W  
 MODULATION SIGNAL: QPSK  
 DISTANCE: 3 meters  
 LIMIT:  $43 + 10 \log_{10} (W) =$  29.92 dBc

| FREQUENCY (MHz) | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBi) | SPURIOUS EMISSION LEVEL (dBm) | POL (H/V) | (dBc) |
|-----------------|---------------------------------|-------------------------------|-------------------------------|-----------|-------|
| 2346.00         | -49.11                          | 9.10                          | -40.01                        | H         | 56.9  |
| 3128.00         | -94.02                          | 9.29                          | -84.73                        | H         | 101.6 |
| 3910.00         | -90.52                          | 9.06                          | -81.46                        | H         | 98.4  |
| 4692.00         | -92.58                          | 11.33                         | -81.25                        | H         | 98.2  |



**Table 6-4. Radiated Spurious Data (QPSK Modulation)**

#### NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. Final power measurements are made with a broadband average power meter. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. This spurious level is recorded using the power meter. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested under all configurations and the worst case radiated spurious emissions are reported while transmitting with 1 resource block with an offset of 49 using QPSK modulation. This unit was tested with its standard battery. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case test configuration was found with the EUT in the horizontal setup. The data reported in the table above was measured in this test setup.

|                                      |   |   |   |                                 |
|--------------------------------------|---|---|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT (CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20, 2011  | EUT Type:<br>Portable Handset                     |   | Page 14 of 26                   |

## 6.5 LTE Radiated Measurements in 1559 – 1610MHz Band §2.1053, §27.53(f)

### Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 782.00 MHz  
 MEASURED OUTPUT POWER: 16.920 dBm = 0.049 W  
 MODULATION SIGNAL: QPSK  
 DISTANCE: 3 meters  
 NARROWBAND EMISSION LIMIT: -50 dBm  
 WIDEBAND EMISSION LIMIT: -40 dBm/MHz

| FREQUENCY (MHz) | EMISSION TYPE | LEVEL @ ANTENNA TERMINALS (dBm) | SUBSTITUTE ANTENNA GAIN (dBi) | SPURIOUS EMISSION LEVEL (dBm) | POL (H/V) | MARGIN (dB) |
|-----------------|---------------|---------------------------------|-------------------------------|-------------------------------|-----------|-------------|
| 1561.60         | WIDEBAND      | -53.25                          | 8.50                          | -44.76                        | H         | -4.76       |
| 1577.82         | WIDEBAND      | -51.19                          | 8.52                          | -42.67                        | H         | -2.67       |



**Table 6-5. Radiated Spurious Data**

#### NOTES:

Radiated Spurious Emission Measurements by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a wooden turn table 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. Final power measurements are made with a broadband average power meter. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same spectrum analyzer reading. This spurious level is recorded using the power meter. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration.

This device was tested under all configurations and the worst case radiated spurious emissions are reported while transmitting with 1 resource block with an offset of 49 using QPSK modulation. This unit was tested with its standard battery. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case test configuration was found with the EUT in the horizontal setup. The data reported in the table above was measured in this test setup.

|                                      |   |   |  |   |                                 |               |
|--------------------------------------|---|---|--|---|---------------------------------|---------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT (CERTIFICATION) |  |  | Reviewed by:<br>Quality Manager |               |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20, 2011  | EUT Type:<br>Portable Handset                     |  |   |                                 | Page 15 of 26 |

## 6.6 LTE Frequency Stability Measurements



§2.1055, §27.54

OPERATING FREQUENCY: 782,000,000 Hz

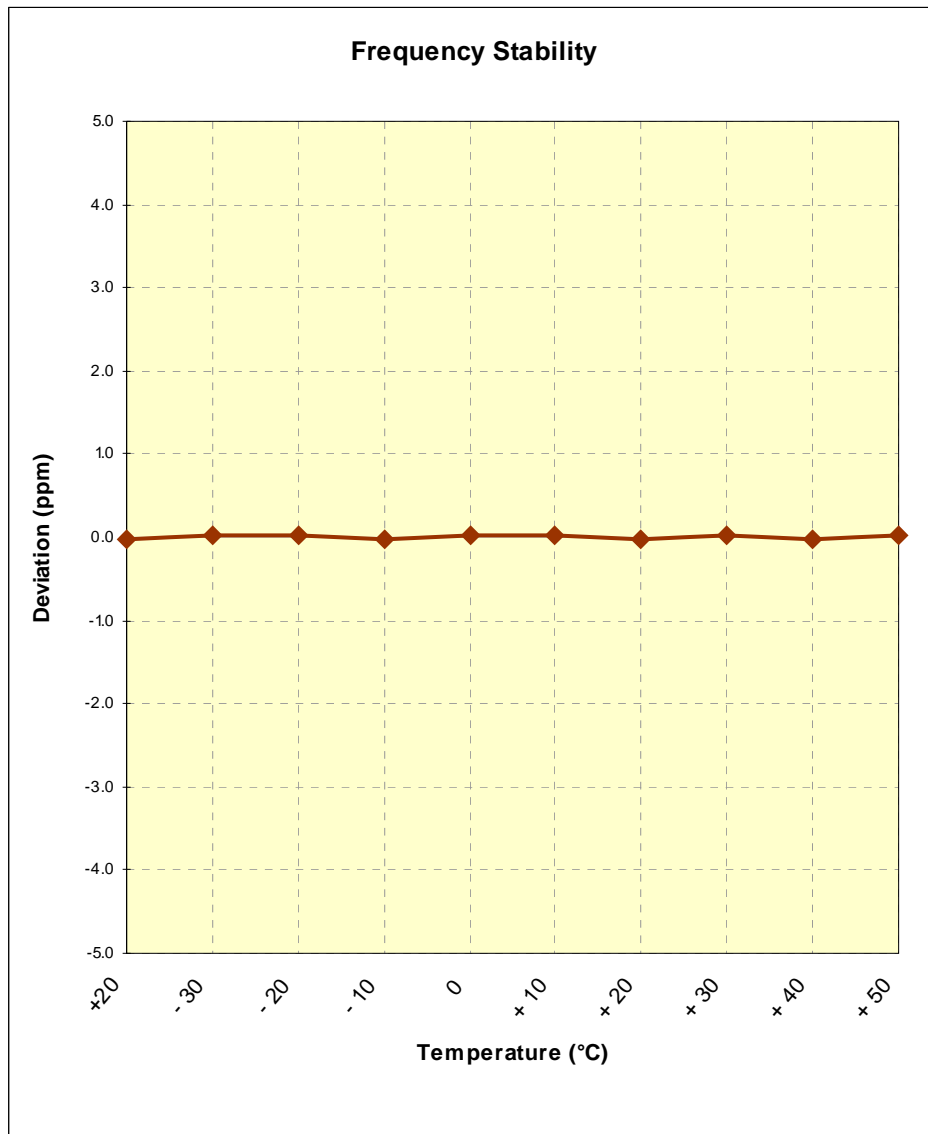
REFERENCE VOLTAGE: 3.7 VDC

| VOLTAGE (%)    | POWER (VDC) | TEMP (°C)  | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|----------------|-------------|------------|----------------|-----------------|---------------|
| 100 %          | 3.70        | + 20 (Ref) | 781,999,980    | -20             | -0.000003     |
| 100 %          |             | - 30       | 782,000,018    | 18              | 0.000002      |
| 100 %          |             | - 20       | 782,000,022    | 22              | 0.000003      |
| 100 %          |             | - 10       | 781,999,979    | -21             | -0.000003     |
| 100 %          |             | 0          | 782,000,023    | 23              | 0.000003      |
| 100 %          |             | + 10       | 782,000,022    | 22              | 0.000003      |
| 100 %          |             | + 20       | 781,999,981    | -19             | -0.000002     |
| 100 %          |             | + 30       | 782,000,018    | 18              | 0.000002      |
| 100 %          |             | + 40       | 781,999,978    | -22             | -0.000003     |
| 100 %          |             | + 50       | 782,000,018    | 18              | 0.000002      |
| 115 %          |             | 4.26       | + 20           | 782,000,017     | 17            |
| BATT. ENDPOINT | 3.40        | + 20       | 782,000,019    | 19              | 0.000002      |



Table 6-6. Frequency Stability Data

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        | Page 16 of 26   |                                 |

**LTE Frequency Stability Measurements (Cont'd)**  
**§2.1055, §27.54**

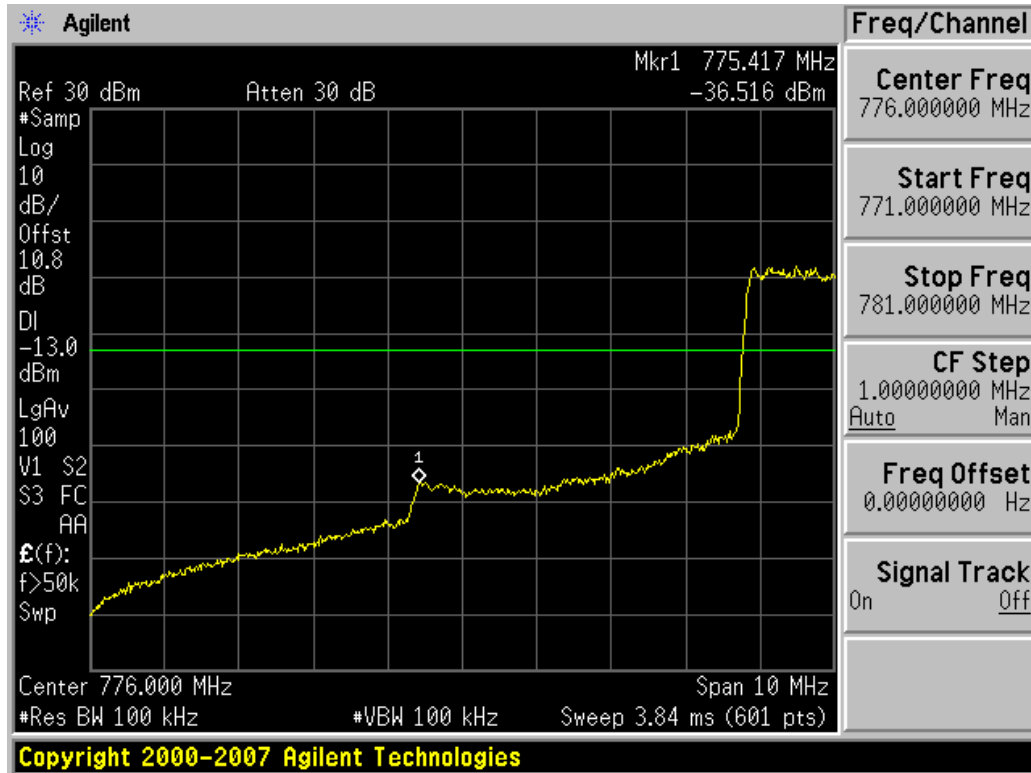


**Figure 6-2. Frequency Stability Graph**

|                                      |   |   |   |                                 |
|--------------------------------------|---|---|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT (CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                     | Page 17 of 26   |                                 |

## 7.0 PLOT(S) OF EMISSIONS

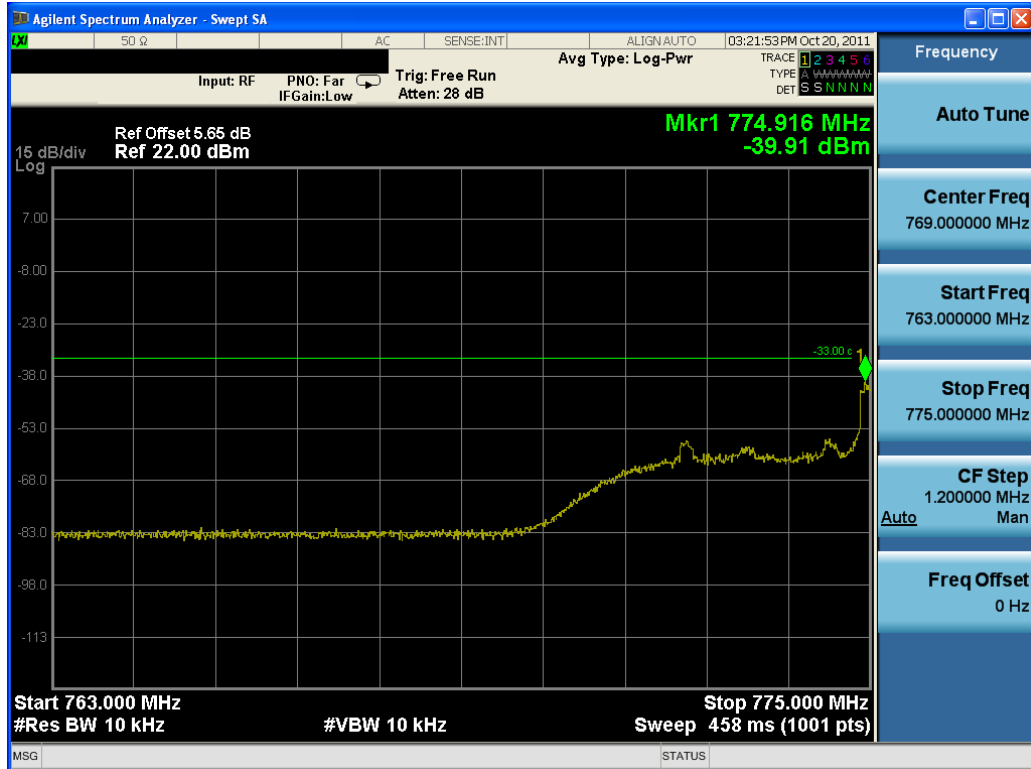
For all plots in Section 7.0 showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit is  $65 + 10\log_{10}(P_{[Watts]}) = -35\text{dBm}$  in a 6.25kHz bandwidth. Since it was not possible to set the resolution bandwidth to 6.25kHz with the available equipment, a bandwidth of 10kHz was used instead to show compliance. By using a 10kHz bandwidth on the spectrum analyzer, the limit was adjusted by  $10\log_{10}(10\text{kHz}/6.25\text{kHz}) = 2.04\text{dB}$ . Thus, the limit shown in all plots in the 763 – 775MHz and 793 – 805MHz bands for all available modulation types was  $-35\text{dBm} + 2.04\text{dB} = -32.96\text{dBm}$ .



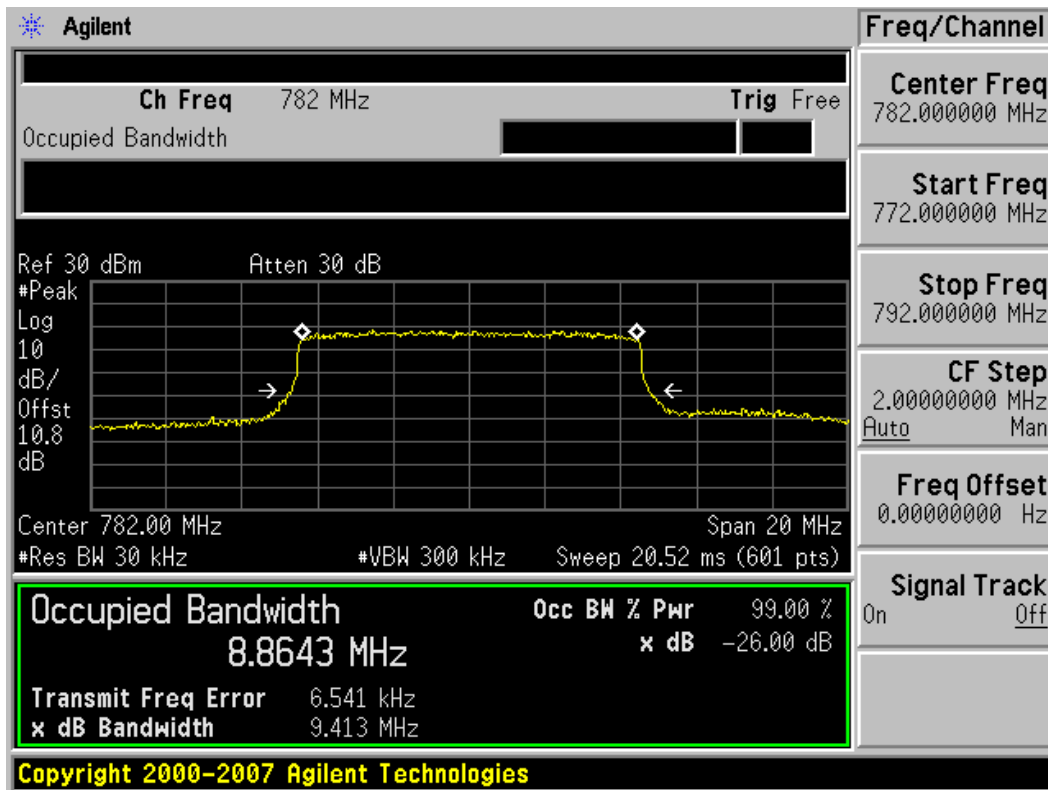
**Plot 7-1. Lower Band Edge Plot (QPSK – RB Size 25, RB Offset 12)**

|                                      |   |  |  |                                 |
|--------------------------------------|---|--|--|---------------------------------|
| FCC ID: A3LSCHI515                   |   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |  | Page 18 of 26                   |



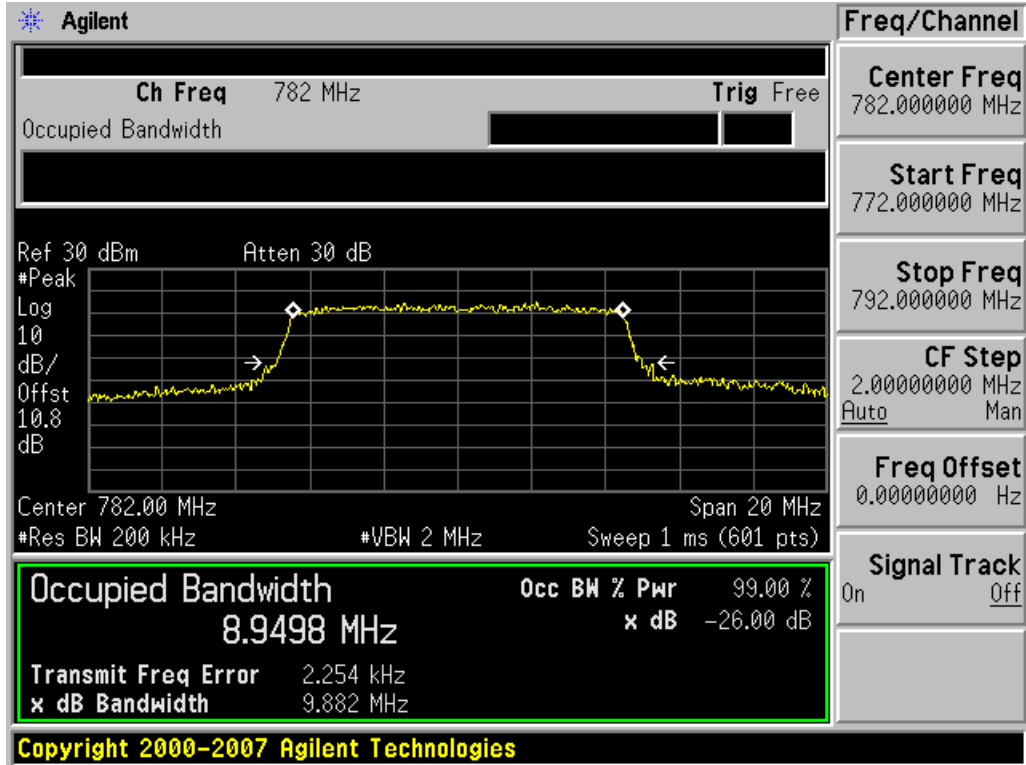


Plot 7-4. Lower Emission Mask (763 – 775MHz) Plot (16-QAM – RB Size 1, Offset 0)

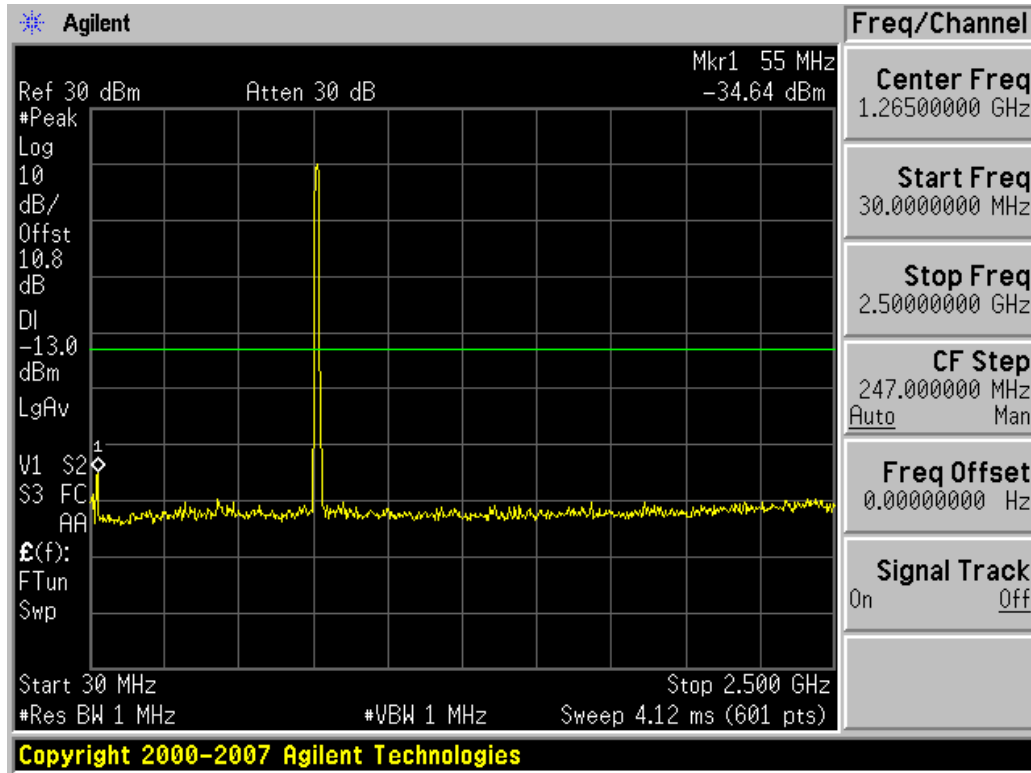


Plot 7-5. Occupied Bandwidth Plot (QPSK – RB Size 50)

|                                      |   |  |                |                                 |
|--------------------------------------|---|--|----------------|---------------------------------|
| FCC ID: A3LSCHI515                   | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC.   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) | <b>SAMSUNG</b> | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |                | Page 20 of 26                   |

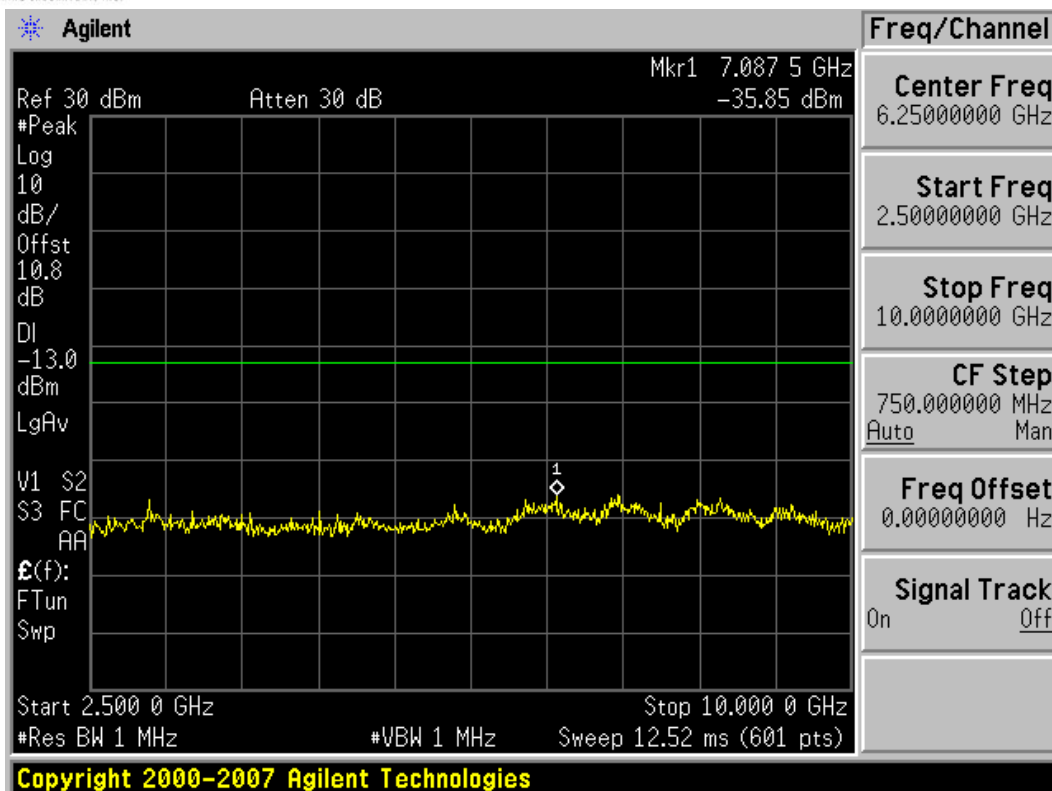


Plot 7-6. Occupied Bandwidth Plot (16-QAM – RB Size 50)



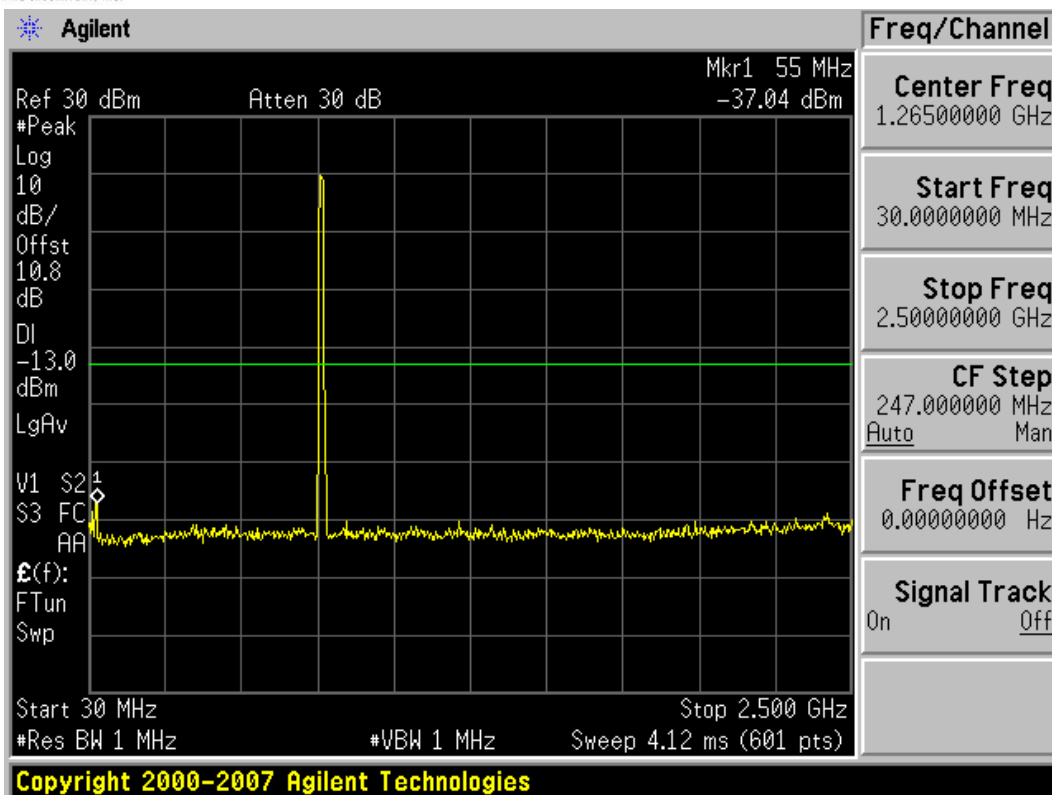
Plot 7-7. Conducted Spurious Plot (QPSK – RB Size 1, RB Offset 0)

|                                      |   |  |                |                                 |
|--------------------------------------|---|--|----------------|---------------------------------|
| FCC ID: A3LSCHI515                   | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC.   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) | <b>SAMSUNG</b> | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |                | Page 21 of 26                   |

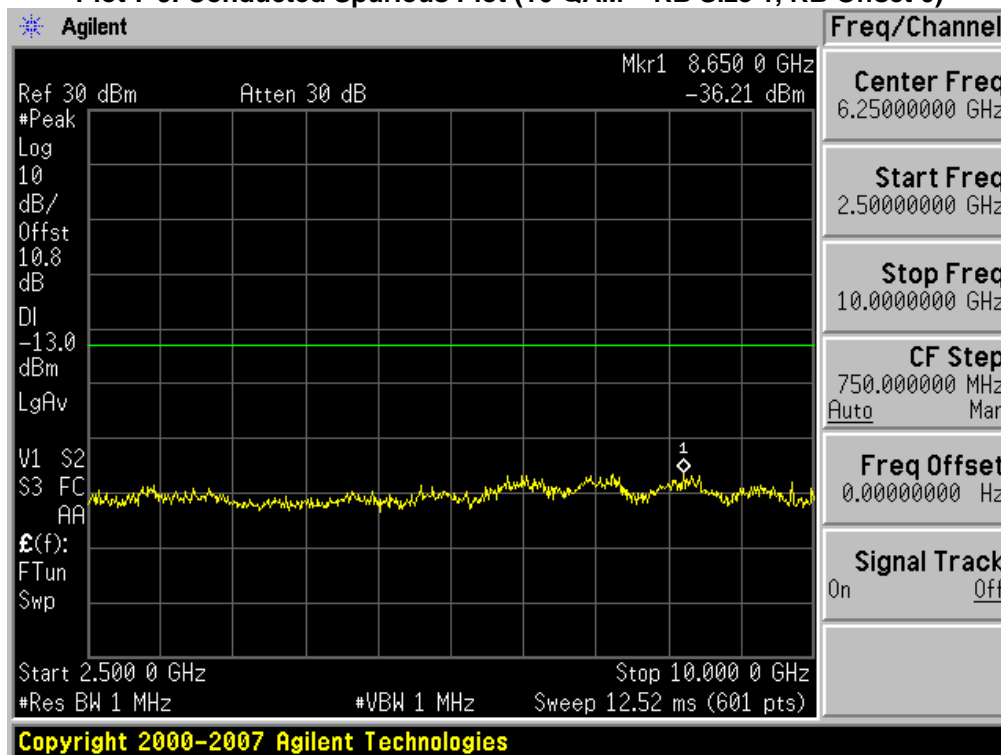


Plot 7-8. Conducted Spurious Plot (QPSK – RB Size 1, RB Offset 0)

|                                      |   |  |  |                                 |
|--------------------------------------|---|--|--|---------------------------------|
| FCC ID: A3LSCHI515                   | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC.   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |  | Page 22 of 26                   |

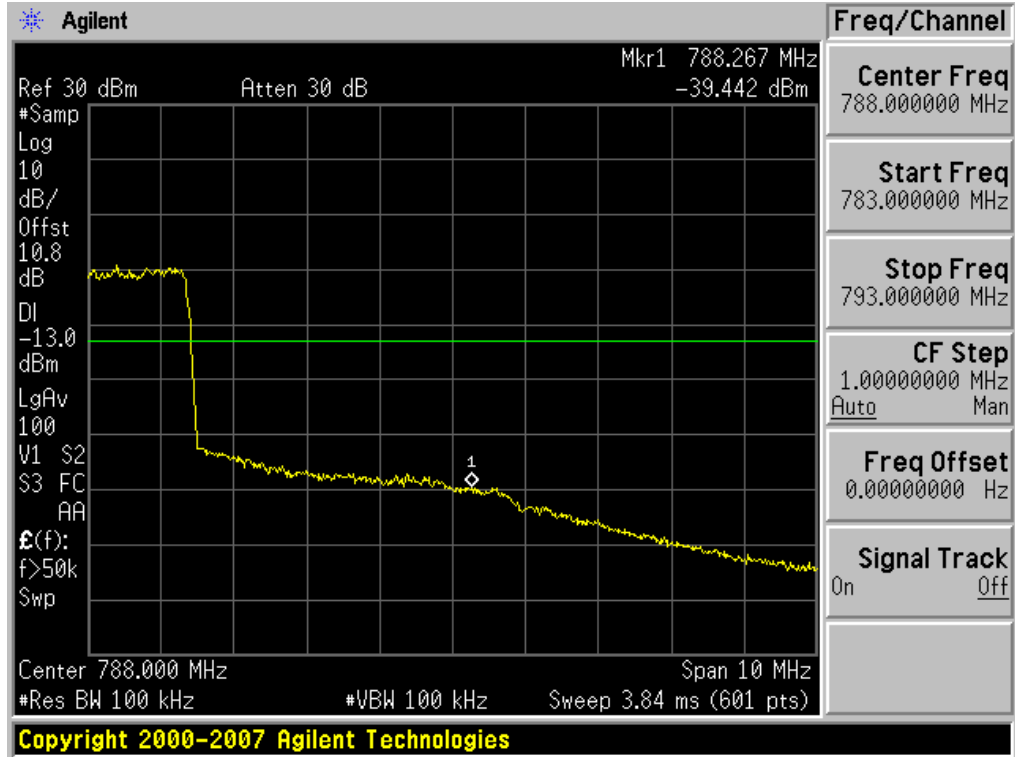


**Plot 7-9. Conducted Spurious Plot (16-QAM – RB Size 1, RB Offset 0)**

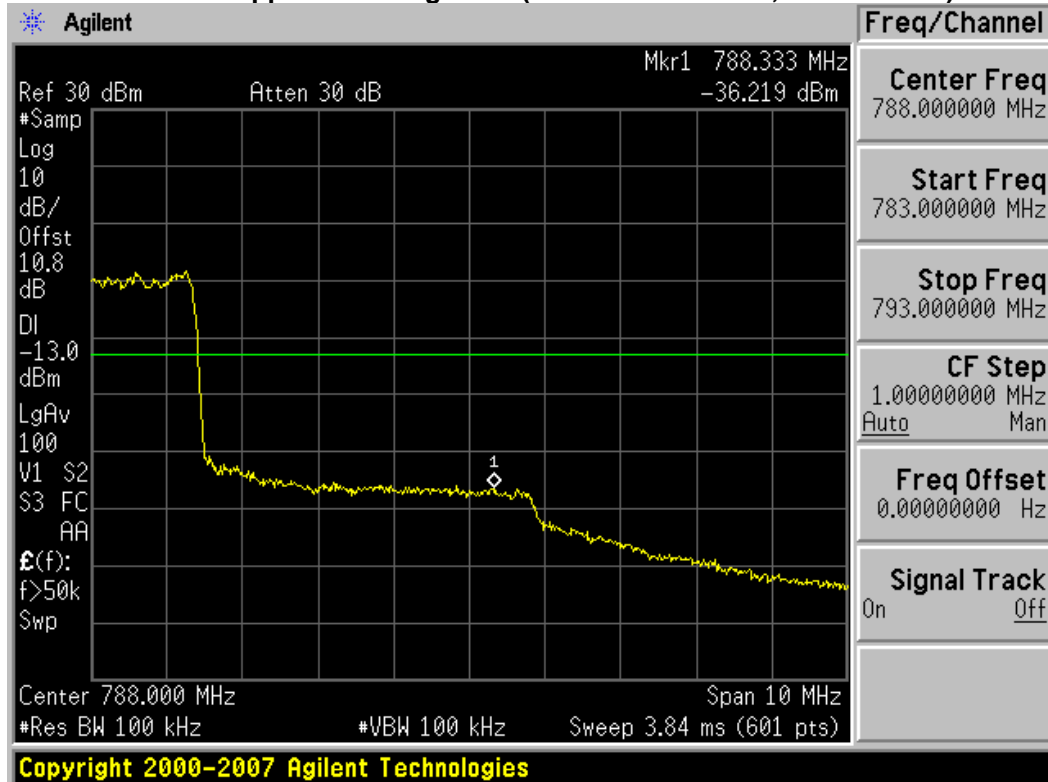


**Plot 7-10. Conducted Spurious Plot (16-QAM – RB Size 1, RB Offset 0)**

|                                      |   |  |                |                                 |
|--------------------------------------|---|--|----------------|---------------------------------|
| FCC ID: A3LSCHI515                   | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC.   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) | <b>SAMSUNG</b> | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |                | Page 23 of 26                   |

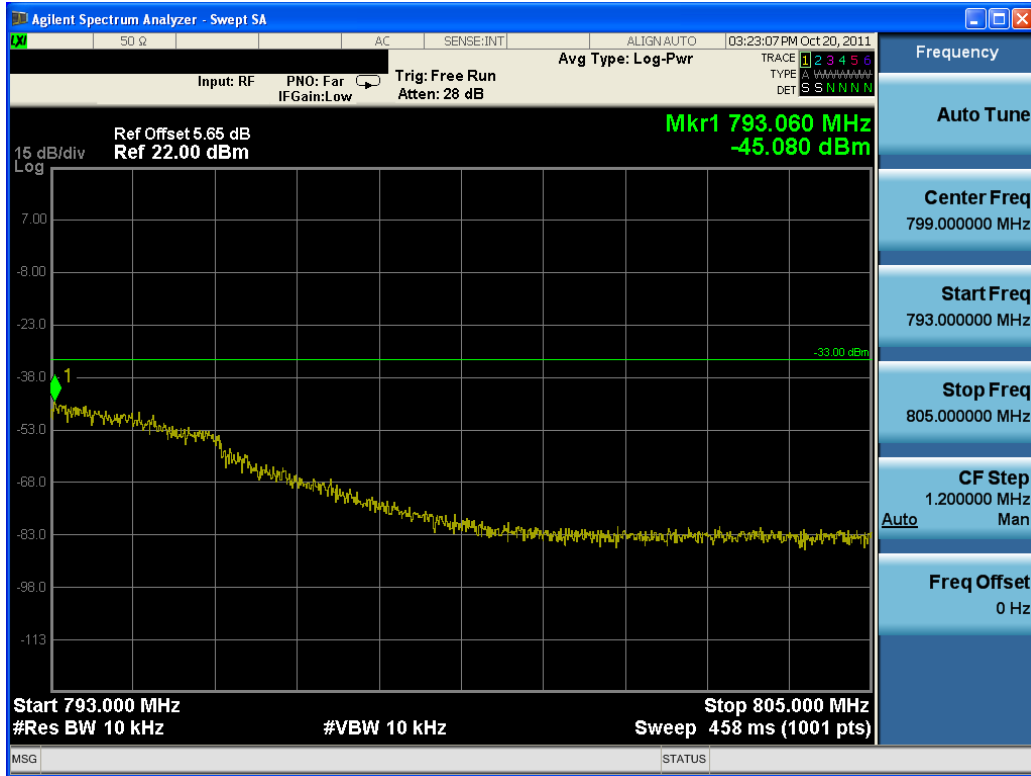


Plot 7-11. Upper Band Edge Plot (QPSK – RB Size 25, RB Offset 12)

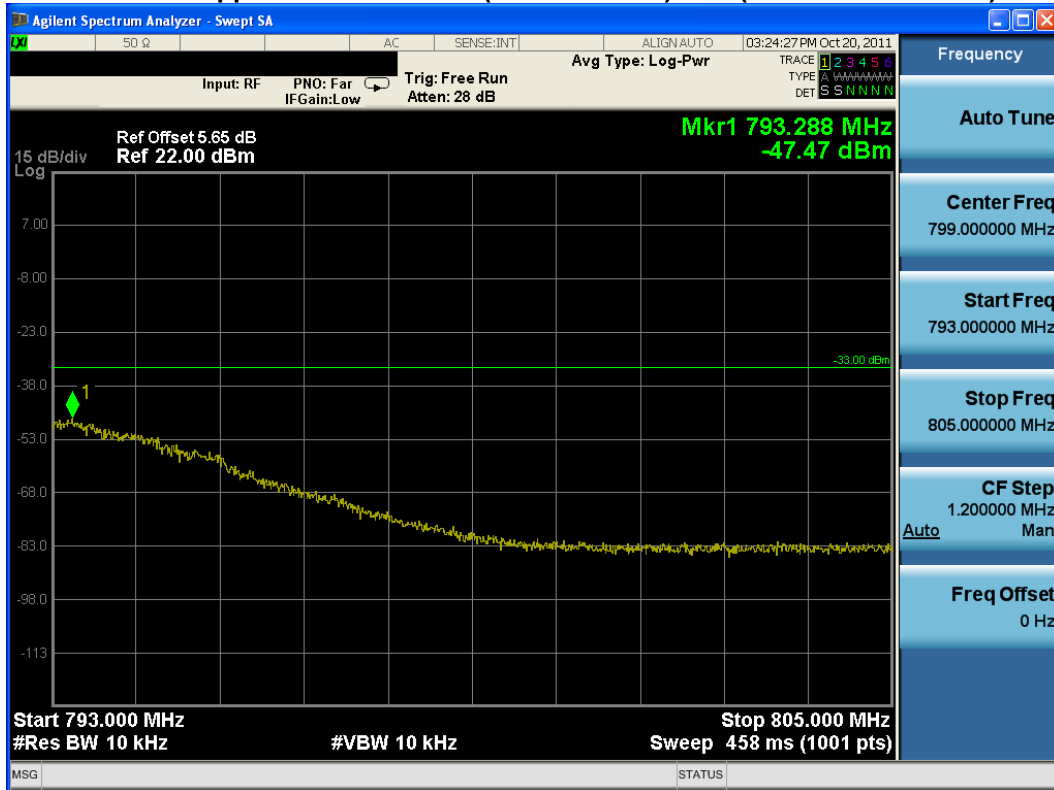


Plot 7-12. Upper Band Edge Plot (16-QAM – RB Size 25, RB Offset 12)

|                                      |   |  |                |                                 |
|--------------------------------------|---|--|----------------|---------------------------------|
| FCC ID: A3LSCHI515                   | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC.   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) | <b>SAMSUNG</b> | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |                | Page 24 of 26                   |



**Plot 7-13. Upper Emission Mask (793 – 805MHz) Plot (QPSK – RB Size 50)**





**Plot 7-14. Upper Emission Mask (793 – 805MHz) Plot (16-QAM – RB Size 50)**

|                                      |   |  |                |                                 |
|--------------------------------------|---|--|----------------|---------------------------------|
| FCC ID: A3LSCHI515                   | <b>PCTEST</b><br>ENGINEERING LABORATORY, INC.   | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) | <b>SAMSUNG</b> | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011 | EUT Type:<br>Portable Handset                        |                | Page 25 of 26                   |

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSCHI515** complies with all the requirements of Parts 2 and 27 of the FCC rules.

|                                      |   |  |   |                                 |
|--------------------------------------|---|--|---|---------------------------------|
| FCC ID: A3LSCHI515                   |  | FCC Pt. 27 LTE MEASUREMENT REPORT<br>(CERTIFICATION) |  | Reviewed by:<br>Quality Manager |
| Test Report S/N:<br>0Y1109011497.A3L | Test Dates:<br>Sep. 6 - 15 and Oct. 20,<br>2011                                     | EUT Type:<br>Portable Handset                        | Page 26 of 26   |                                 |