

**MEASUREMENT REPORT**
FCC Part 22 & 27 LTE**Applicant Name:**

Samsung Electronics Co., Ltd.

129, Samsung-ro,

Yeongtong-gu, Suwon-si

Gyeonggi-do, 16677, Korea

Date of Testing:

5/1 - 5/9/2017

Test Site/Location:

PCTEST Lab., Columbia, MD, USA

Test Report Serial No.:

1M1705010159-03.A3L

FCC ID : **A3LSMJ3308****APPLICANT:** **SAMSUNG ELECTRONICS CO., LTD.****Application Type:**

Certification

FCC Classification:

PCS Licensed Transmitter Held to Ear (PCE)

FCC Rule Part(s):

§2; §22; §27

Test Procedure(s):

ANSI/TIA-603-D-2010, KDB 971168 D01 v02r02

EUT Type:

Portable Handset

Model:

SM-J3308

Additional Model(s):

SM-J3300

Test Device Serial No.:*identical prototype* [S/N: 26364, 26307, 23882, 24054]

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.

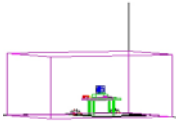

Randy Ortanez
President

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 1 of 56

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

FCC PART 22 & 27 MEASUREMENT REPORT	3
1.0 INTRODUCTION	5
1.1 Scope.....	5
1.2 Testing Facility	5
2.0 PRODUCT INFORMATION.....	6
2.1 Equipment Description	6
2.2 Device Capabilities	6
2.3 Test Configuration.....	6
2.4 EMI Suppression Device(s)/Modifications.....	6
3.0 DESCRIPTION OF TESTS	7
3.1 Measurement Procedure.....	7
3.2 Cellular - Base Frequency Blocks	7
3.3 Cellular - Mobile Frequency Blocks.....	7
3.4 BRS/EBS Frequency Block.....	7
3.5 Radiated Power and Radiated Spurious Emissions.....	8
4.0 MEASUREMENT UNCERTAINTY	9
5.0 TEST EQUIPMENT CALIBRATION DATA	10
6.0 SAMPLE CALCULATIONS	11
7.0 TEST RESULTS.....	12
7.1 Summary.....	12
7.2 Occupied Bandwidth	13
7.3 Spurious and Harmonic Emissions at Antenna Terminal	22
7.4 Band Edge Emissions at Antenna Terminal.....	32
7.5 Radiated Power (ERP/EIRP)	42
7.6 Radiated Spurious Emissions Measurements.....	46
7.7 Frequency Stability / Temperature Variation	51
8.0 CONCLUSION.....	56

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 2 of 56	



MEASUREMENT REPORT

FCC Part 22 & 27

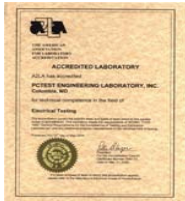


§2.1033 General Information

APPLICANT: Samsung Electronics Co., Ltd.
APPLICANT ADDRESS: 129, Samsung-ro,
 Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
TEST SITE: PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS: 7185 Oakland Mills Road, Columbia, MD 21045 USA
FCC RULE PART(S): §2; §22; §27
BASE MODEL: SM-J3308
FCC ID: A3LSMJ3308
FCC CLASSIFICATION: PCS Licensed Transmitter Held to Ear (PCE)
FREQUENCY TOLERANCE: $\pm 0.00025\%$ (2.5 ppm)
Test Device Serial No.: 26364, 26307, 23882, 24054 ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST: 5/1 - 5/9/2017
TEST REPORT S/N: 1M1705010159-03.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.

FCC ID: A3LSMJ3308	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		 Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 3 of 56



MEASUREMENT REPORT

FCC Part 22 & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP/EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 5	22H	824.7 - 848.3	0.066	18.17	1M11G7D	QPSK
LTE Band 5	22H	824.7 - 848.3	0.043	16.29	1M12W7D	16QAM
LTE Band 5	22H	825.5 - 847.5	0.067	18.28	2M73G7D	QPSK
LTE Band 5	22H	825.5 - 847.5	0.043	16.38	2M73W7D	16QAM
LTE Band 5	22H	826.5 - 846.5	0.087	19.38	4M53G7D	QPSK
LTE Band 5	22H	826.5 - 846.5	0.051	17.07	4M52W7D	16QAM
LTE Band 5	22H	829 - 844	0.101	20.04	8M97G7D	QPSK
LTE Band 5	22H	829 - 844	0.057	17.55	8M97W7D	16QAM
LTE Band 41	27	2557.5 - 2652.5	0.094	19.72	4M50G7D	QPSK
LTE Band 41	27	2557.5 - 2652.5	0.070	18.43	4M49W7D	16QAM
LTE Band 41	27	2560 - 2650	0.083	19.18	8M99G7D	QPSK
LTE Band 41	27	2560 - 2650	0.073	18.66	8M94W7D	16QAM
LTE Band 41	27	2562.5 - 2647.5	0.095	19.80	13M4G7D	QPSK
LTE Band 41	27	2562.5 - 2647.5	0.069	18.36	13M4W7D	16QAM
LTE Band 41	27	2565 - 2645	0.084	19.26	17M9G7D	QPSK
LTE Band 41	27	2565 - 2645	0.066	18.16	17M9W7D	16QAM

EUT Overview

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 4 of 56	

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 and the Industry Canada Certification and Engineering Bureau.

1.2 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, 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 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 C63.4-2014 on January 22, 2015.

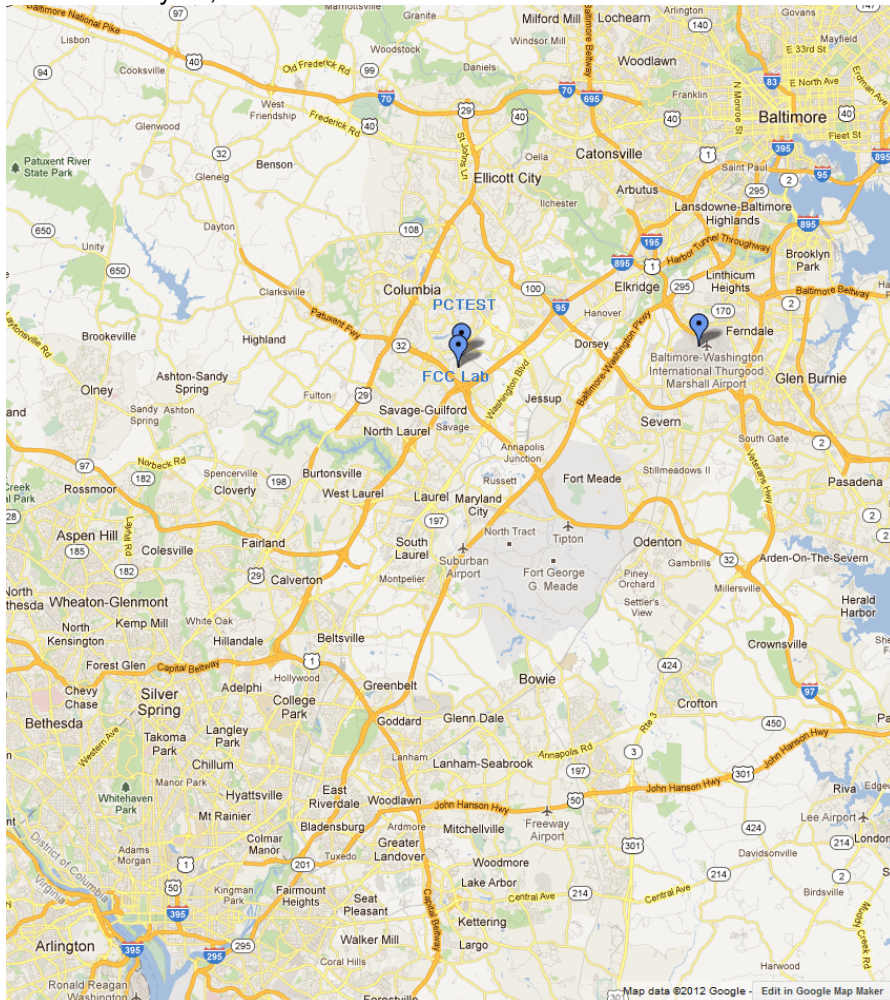


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

FCC ID: A3LSMJ3308	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 5 of 56

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMJ3308**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

2.2 Device Capabilities

This device contains the following capabilities:

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

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-D-2010 and KDB 971168 D01 v02r02. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 EMI Suppression Device(s)/Modifications

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

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 6 of 56	

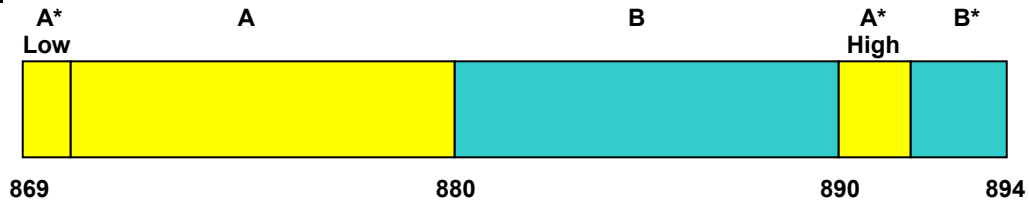
3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-D-2010) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168 D01 v02r02) were used in the measurement of the EUT.

3.2 Cellular - Base Frequency Blocks

§22.905



BLOCK 1: 869 – 880 MHz (A* Low + A)

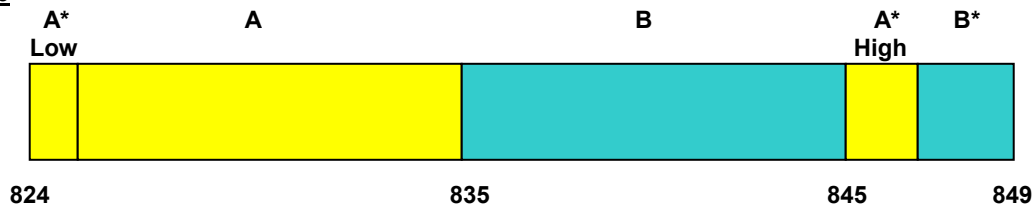
BLOCK 2: 880 – 890 MHz (B)

BLOCK 3: 890 – 891.5 MHz (A* High)

BLOCK 4: 891.5 – 894 MHz (B*)

3.3 Cellular - Mobile Frequency Blocks

§22.905



BLOCK 1: 824 – 835 MHz (A* Low + A)

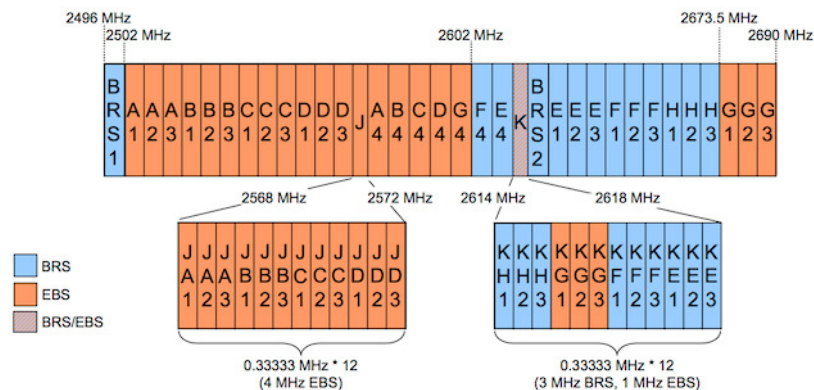
BLOCK 2: 835 – 845 MHz (B)

BLOCK 3: 845 – 846.5 MHz (A* High)

BLOCK 4: 846.5 – 849 MHz (B*)

3.4 BRS/EBS Frequency Block

§27.5



FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 7 of 56

3.5 Radiated Power and Radiated Spurious Emissions

§2.1053 §22.913(a.2) §22.917(a) §27.53(m)

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 Figure 5.7 of Clause 5 in ANSI C63.4-2014. 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 above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table 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 72.4cm high PVC support structure is placed on top of the turntable. A 3" (~7.6cm) sheet of high density polystyrene 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.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v02r02.

Per the guidance of ANSI/TIA-603-D-2010, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10\log_{10}(\text{Power}_{\text{[Watts]}})$. For Band 41, the calculated P_d levels are compared to the absolute spurious emission limit of -25dBm which is equivalent to the required minimum attenuation of $55 + 10\log_{10}(\text{Power}_{\text{[Watts]}})$.

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset			Page 8 of 56

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 9 of 56

5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2006.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTX3	Licensed Transmitter Cable Set	7/12/2016	Annual	7/12/2017	LTX3
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	7/11/2016	Annual	7/11/2017	RE1
Agilent	N9020A	MXA Signal Analyzer	10/28/2016	Annual	10/28/2017	US46470561
Emco	6502	Active Loop Antenna (10k - 30 MHz)	8/9/2016	Biennial	8/9/2018	2936
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
Espec	ESX-2CA	Environmental Chamber	4/11/2017	Annual	4/11/2018	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/26/2016	Biennial	4/26/2018	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	4/26/2016	Biennial	4/26/2018	128337
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	8/23/2016	Biennial	8/23/2018	135427
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	3/24/2017	Annual	3/24/2018	11401010036
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
PCTEST	-	EMC Switch System	7/11/2016	Annual	7/11/2017	NM1
PCTEST	-	EMC Switch System	7/6/2016	Annual	7/6/2017	NM2
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	7/27/2016	Annual	7/27/2017	103200
Rohde & Schwarz	CMW500	Radio Communication Tester	10/20/2016	Annual	10/20/2017	100976
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/15/2016	Annual	7/15/2017	100348
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	5/7/2016	Annual	5/7/2017	100040
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	11/18/2015	Biennial	11/18/2017	91052523RX
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 5-1. Test Equipment

Notes:

1. For equipment listed above that has a calibration date or 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.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 10 of 56	

6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

16QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer 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 spectrum analyzer. 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: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 11 of 56

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMJ3308
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a)	Out of Band Emissions	$> 43 + 10\log_{10} (P[\text{Watts}])$ at Band Edge and for all out-of-band emissions		PASS	Section 7.3, 7.4
27.53(m)	Out of Band Emissions	$> 43 + 10\log_{10} (P[\text{Watts}])$ at channel edges and $> 55 + 10\log_{10} (P[\text{Watts}])$ at 5.5MHz away and beyond channel edges		PASS	Section 7.3, 7.4
2.1046	Transmitter Conducted Output Power	N/A		PASS	See RF Exposure Report
2.1055. 22.355 27.54	Frequency Stability	< 2.5 ppm (Part 22) and fundamental emissions stay within authorized frequency block (Part 27)		PASS	Section 7.7
22.913(a.2)	Effective Radiated Power (Band 5)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.5
27.50(h.2)	Equivalent Isotropic Radiated Power (Band 41)	< 2 Watts max. EIRP		PASS	Section 7.5
2.1053 22.917(a)	Undesirable Emissions	$> 43 + 10\log_{10} (P[\text{Watts}])$ for all out-of-band emissions		PASS	Section 7.6
27.53(m)	Undesirable Emissions	$> 43 + 10\log_{10} (P[\text{Watts}])$ at channel edges $> 55 + 10\log_{10} (P[\text{Watts}])$ at 5.5MHz away and beyond channel edges		PASS	Section 7.6

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots (Sections 7.2, 7.3, 7.4) were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version 4.5.

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 12 of 56	

7.2 Occupied Bandwidth

§2.1049

Test Overview

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. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v02r02 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

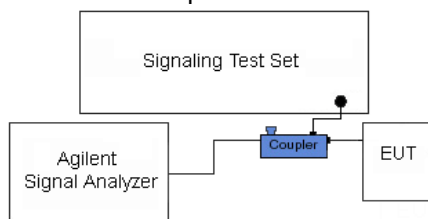
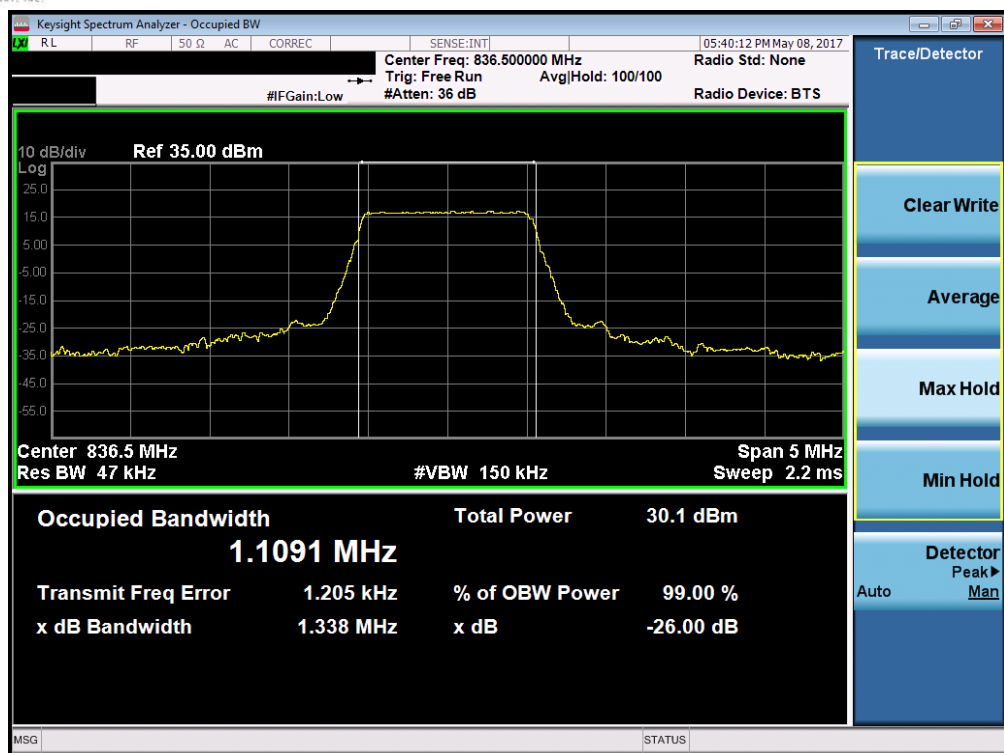


Figure 7-1. Test Instrument & Measurement Setup

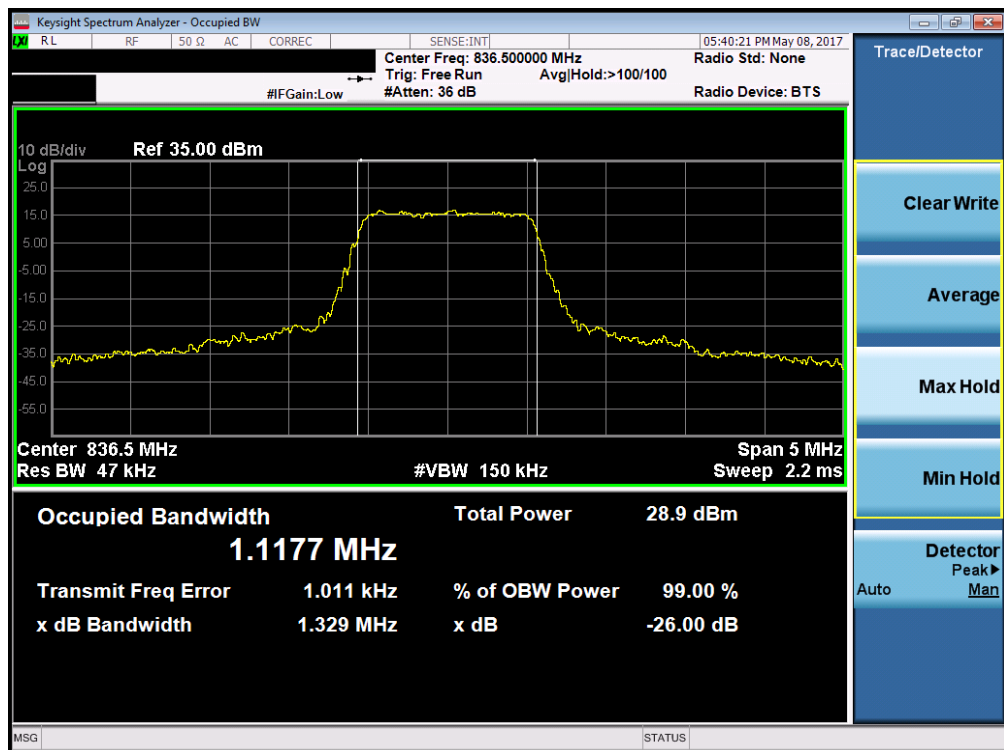
Test Notes

None.

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 13 of 56	

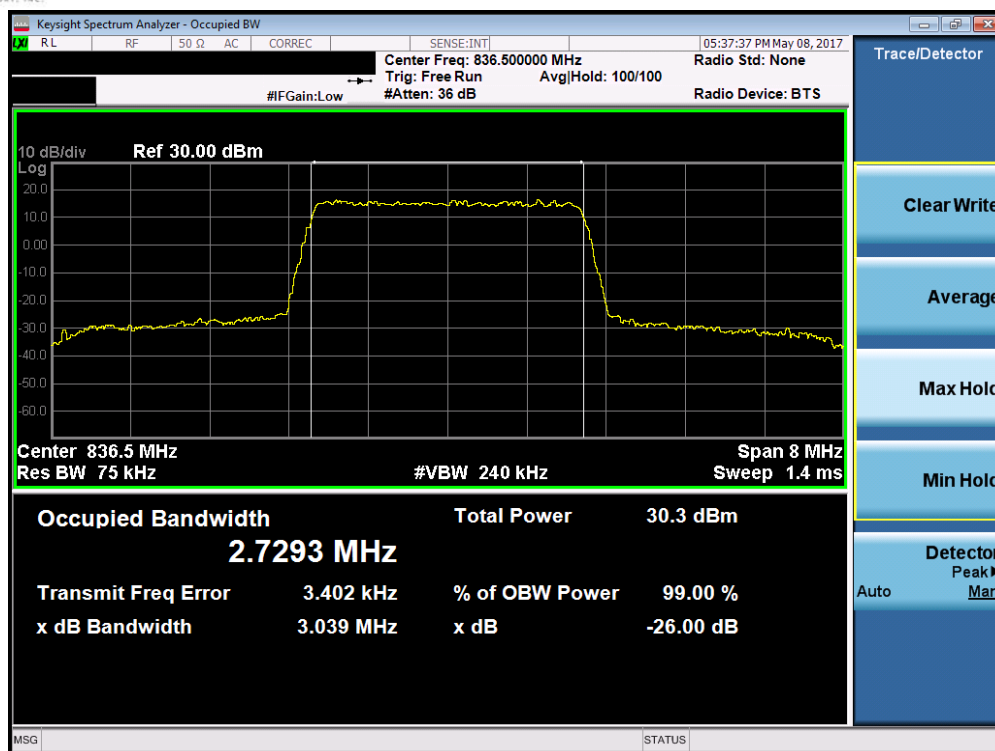


Plot 7-1. Occupied Bandwidth Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

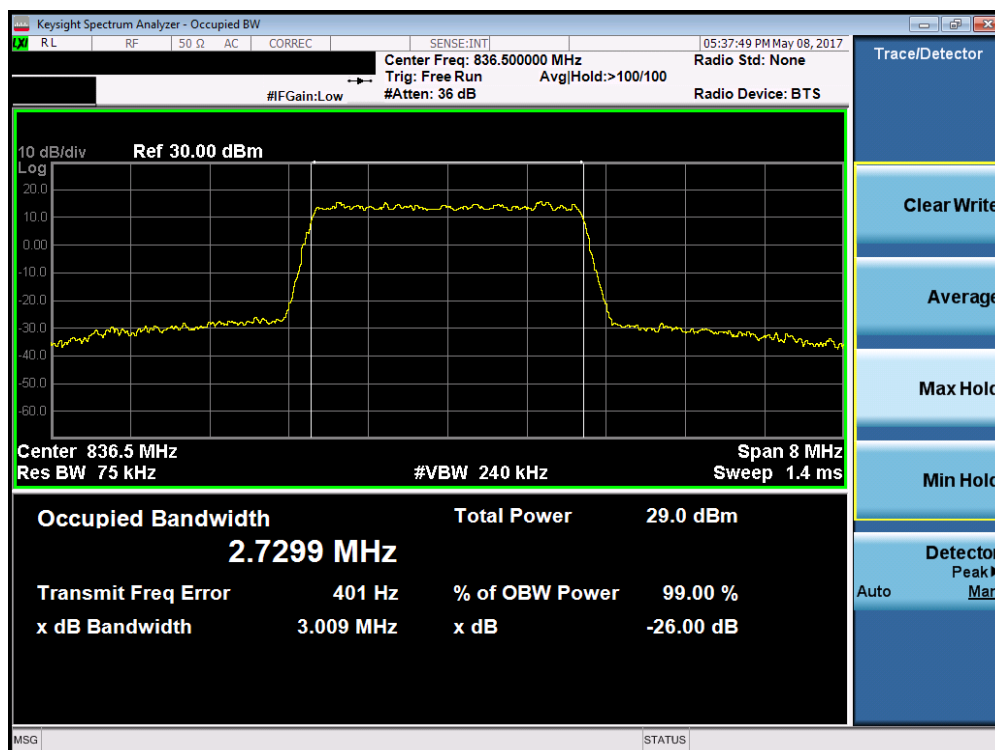


Plot 7-2. Occupied Bandwidth Plot (Band 5 – 1.4MHz 16-QAM – RB Size 6)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 14 of 56

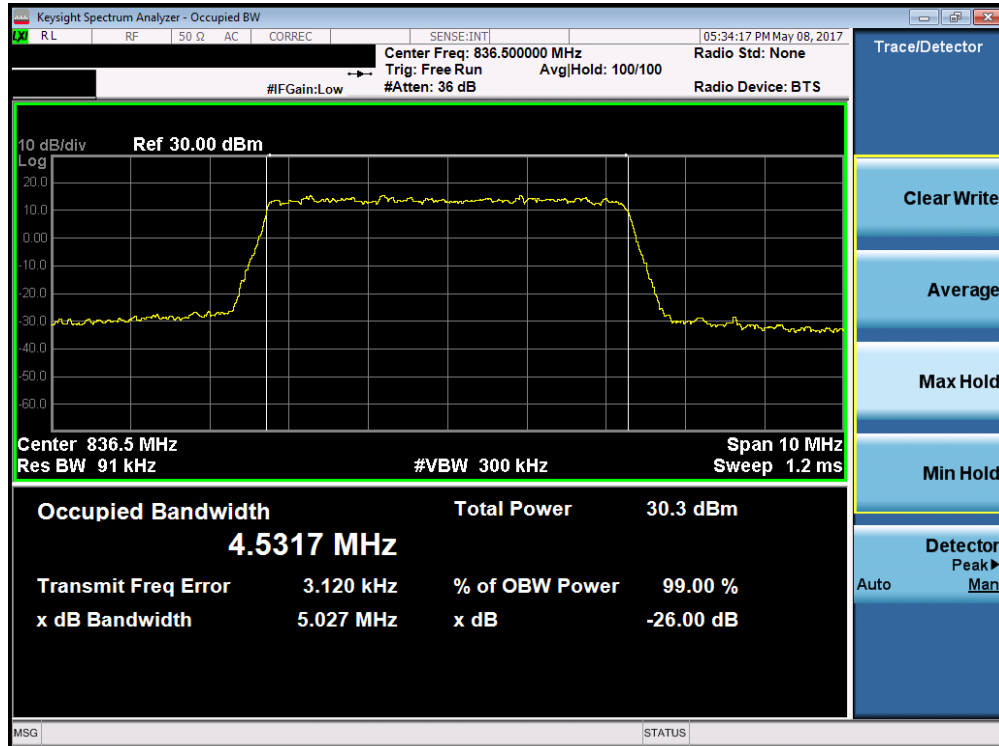


Plot 7-3. Occupied Bandwidth Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

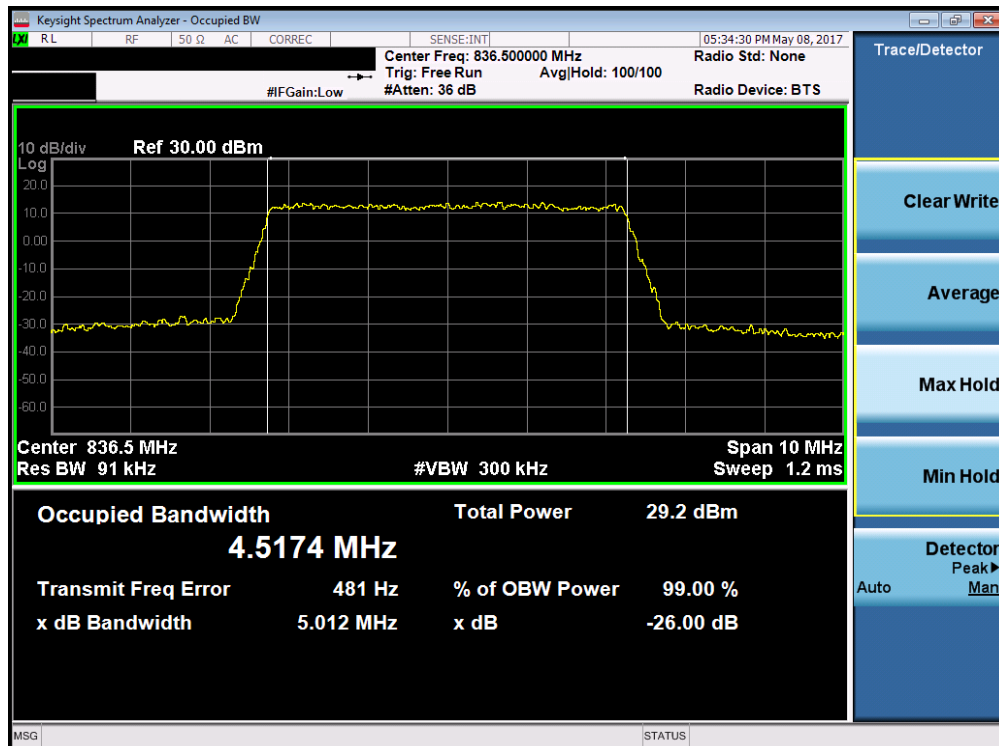


Plot 7-4. Occupied Bandwidth Plot (Band 5 – 3.0MHz 16-QAM – RB Size 15)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 15 of 56

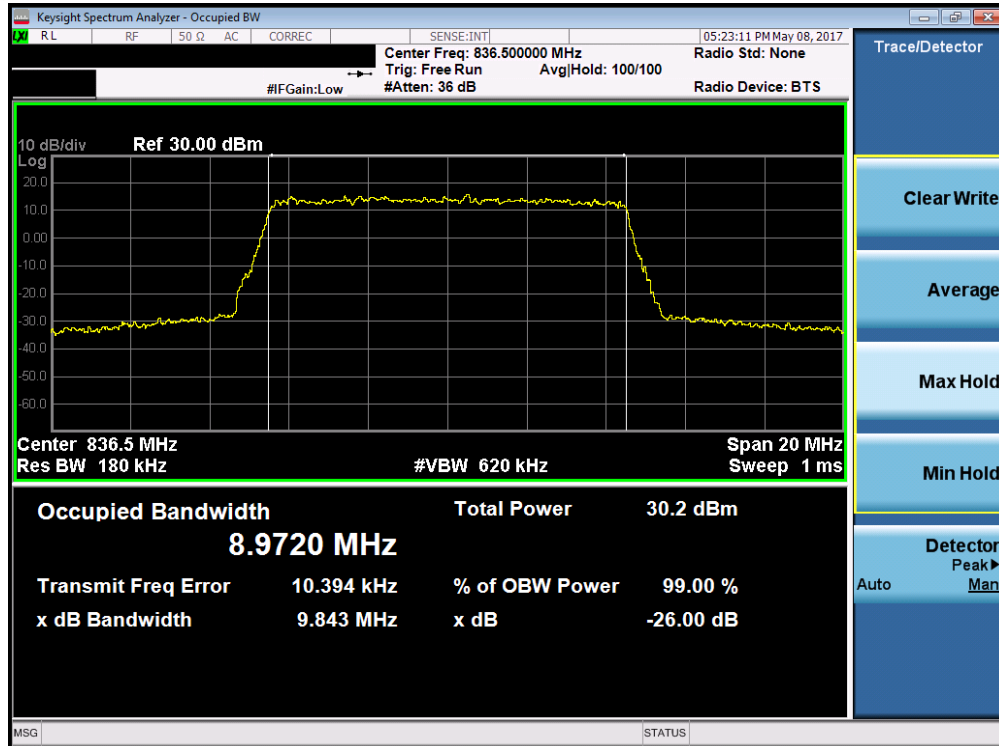


Plot 7-5. Occupied Bandwidth Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

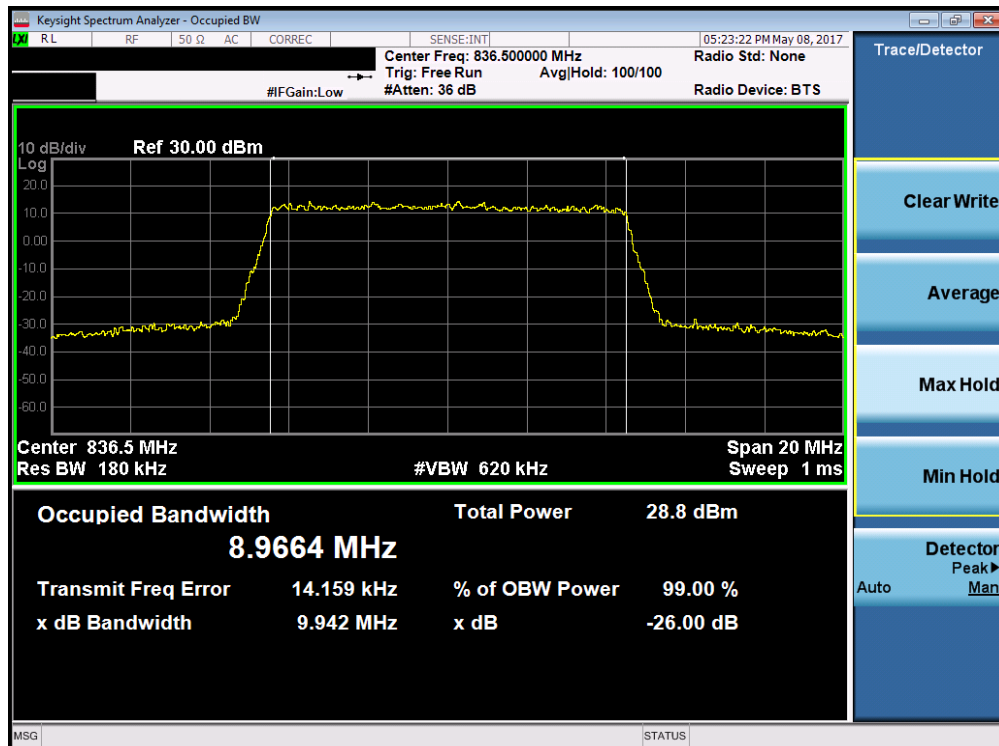


Plot 7-6. Occupied Bandwidth Plot (Band 5 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 16 of 56

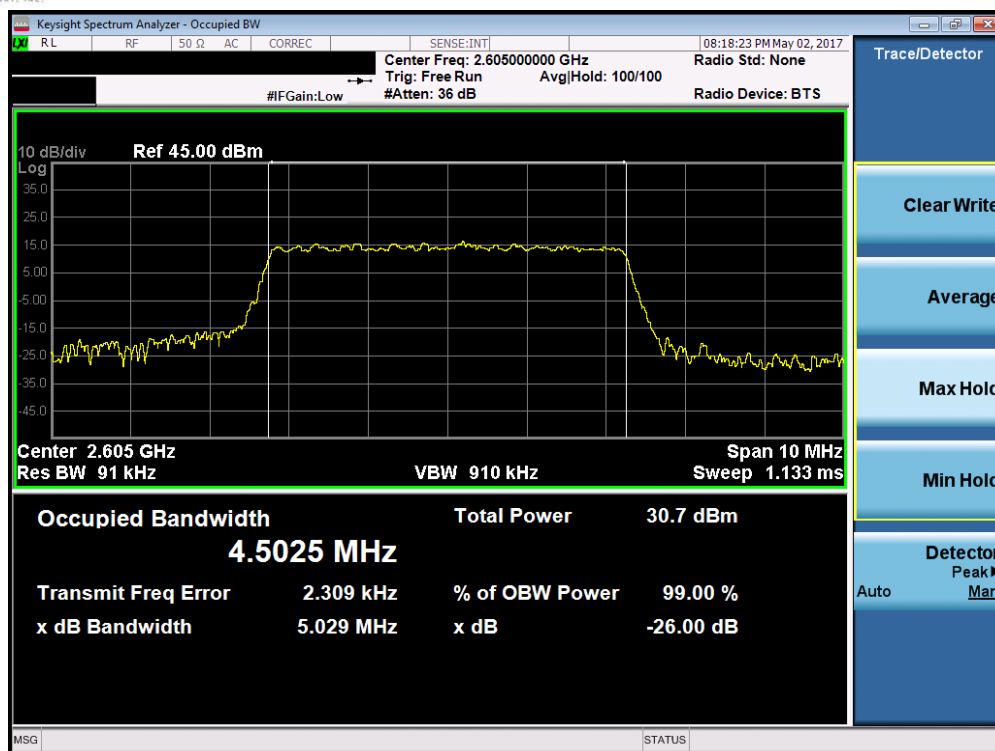


Plot 7-7. Occupied Bandwidth Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

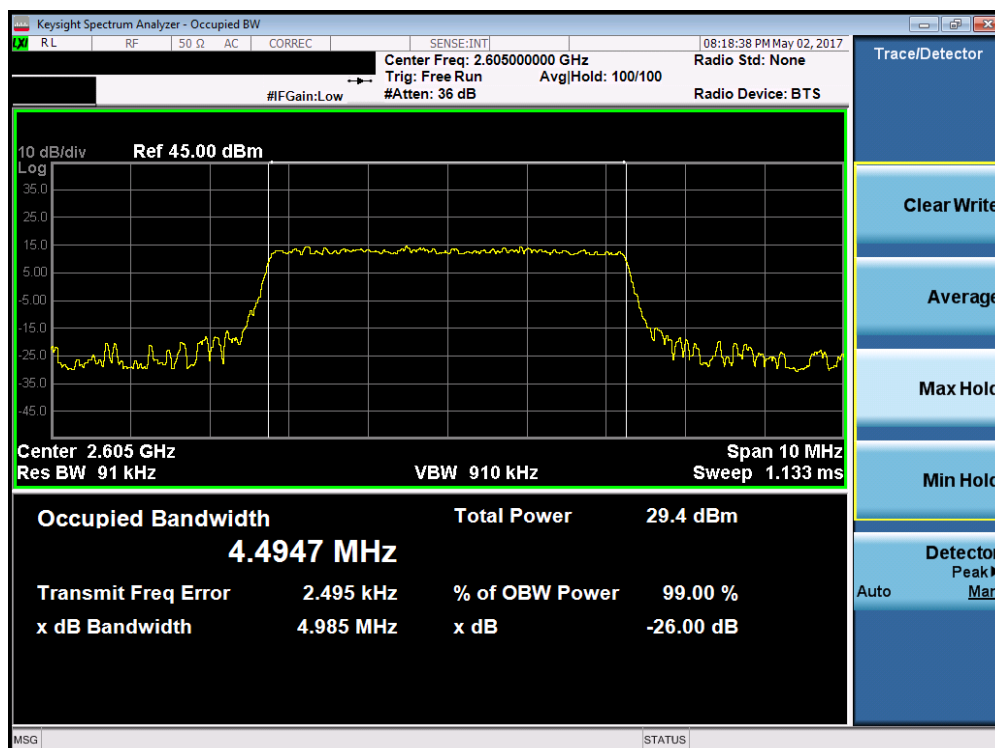


Plot 7-8. Occupied Bandwidth Plot (Band 5 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 17 of 56

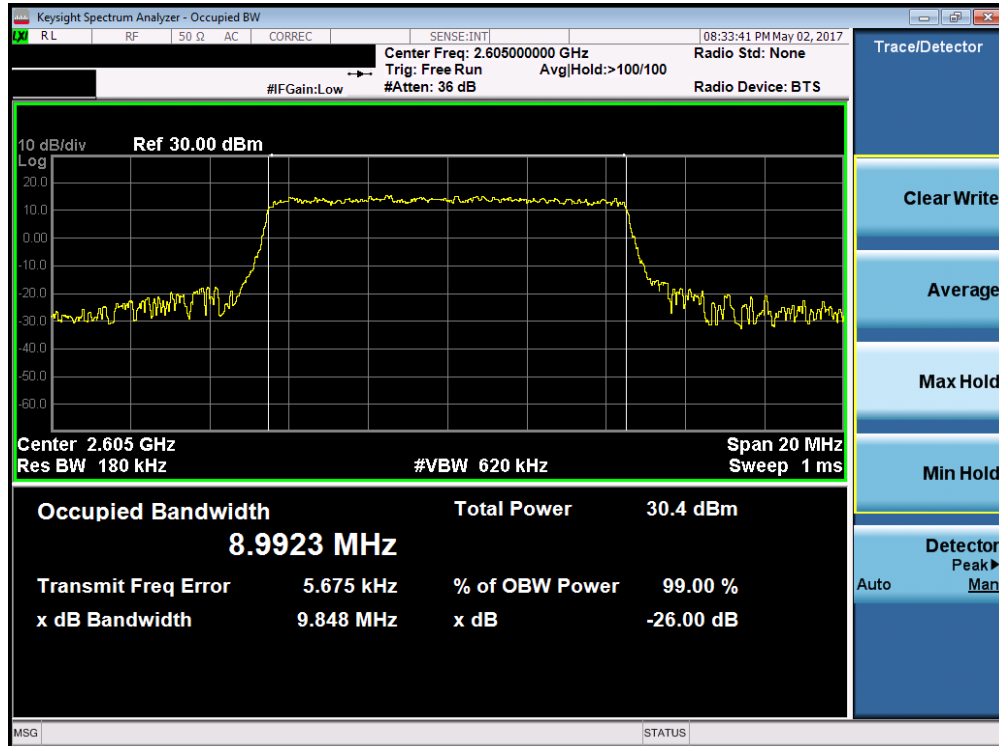


Plot 7-9. Occupied Bandwidth Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

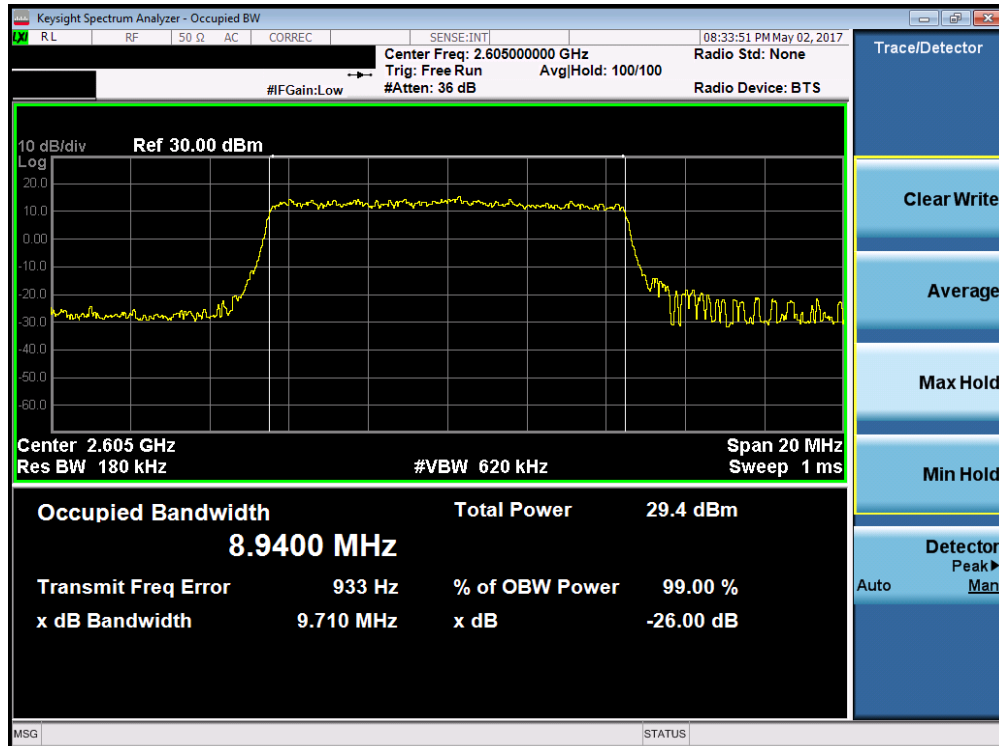


Plot 7-10. Occupied Bandwidth Plot (Band 41 – 5.0MHz 16-QAM – RB Size 25)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 18 of 56

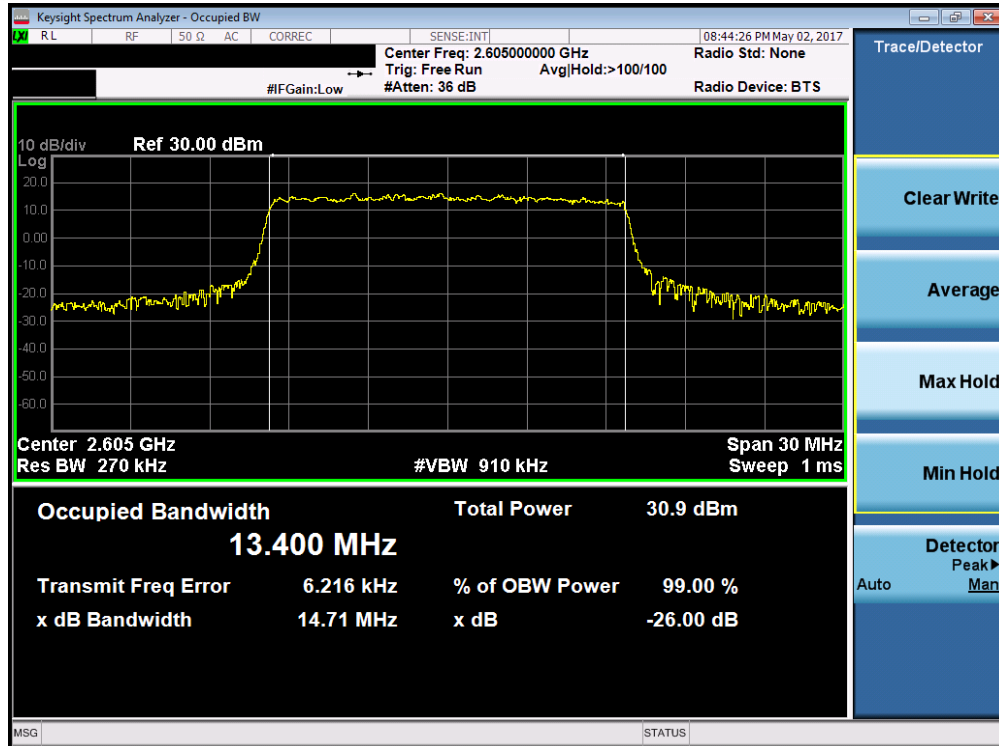


Plot 7-11. Occupied Bandwidth Plot (Band 41 – 10.0MHz QPSK – RB Size 50)

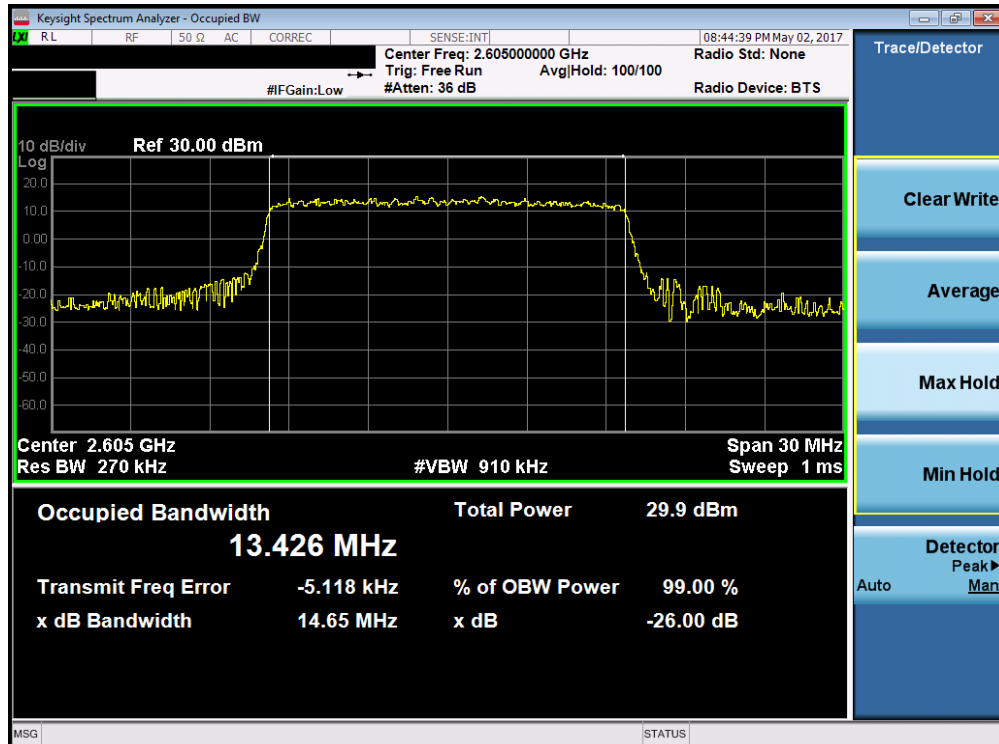


Plot 7-12. Occupied Bandwidth Plot (Band 41 – 10.0MHz 16-QAM – RB Size 50)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 19 of 56

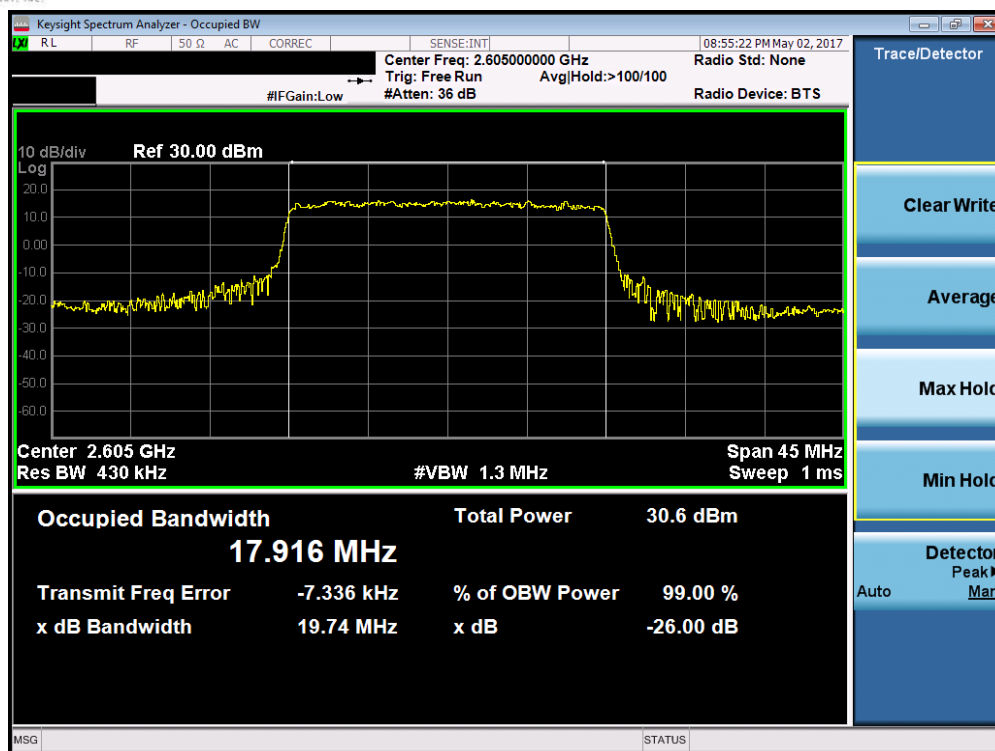


Plot 7-13. Occupied Bandwidth Plot (Band 41 – 15.0MHz QPSK – RB Size 75)

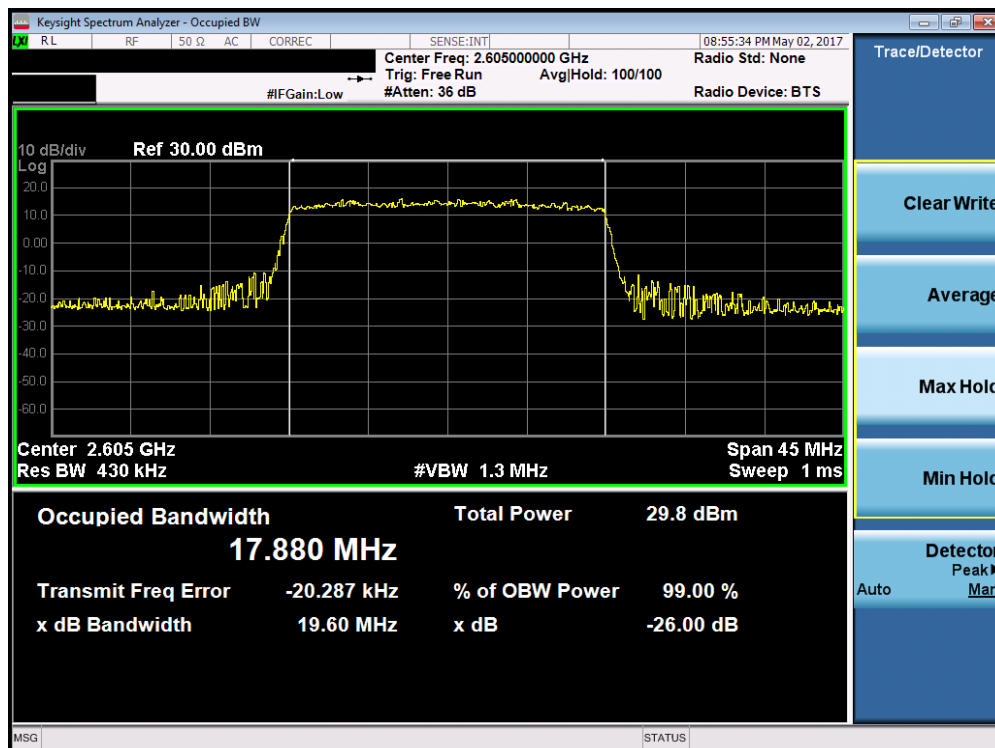


Plot 7-14. Occupied Bandwidth Plot (Band 41 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 20 of 56



Plot 7-15. Occupied Bandwidth Plot (Band 41 – 20.0MHz QPSK – RB Size 100)



Plot 7-16. Occupied Bandwidth Plot (Band 41 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 21 of 56

7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §22.917(a) §27.53(m)

Test Overview

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 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

For Band 41, the minimum permissible attenuation level of any spurious emission is $55 + \log_{10}(P_{[Watts]})$.

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v02r02 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

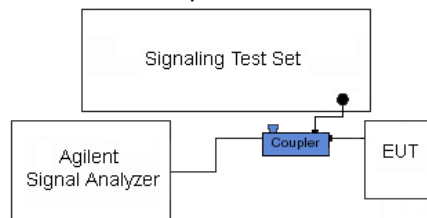
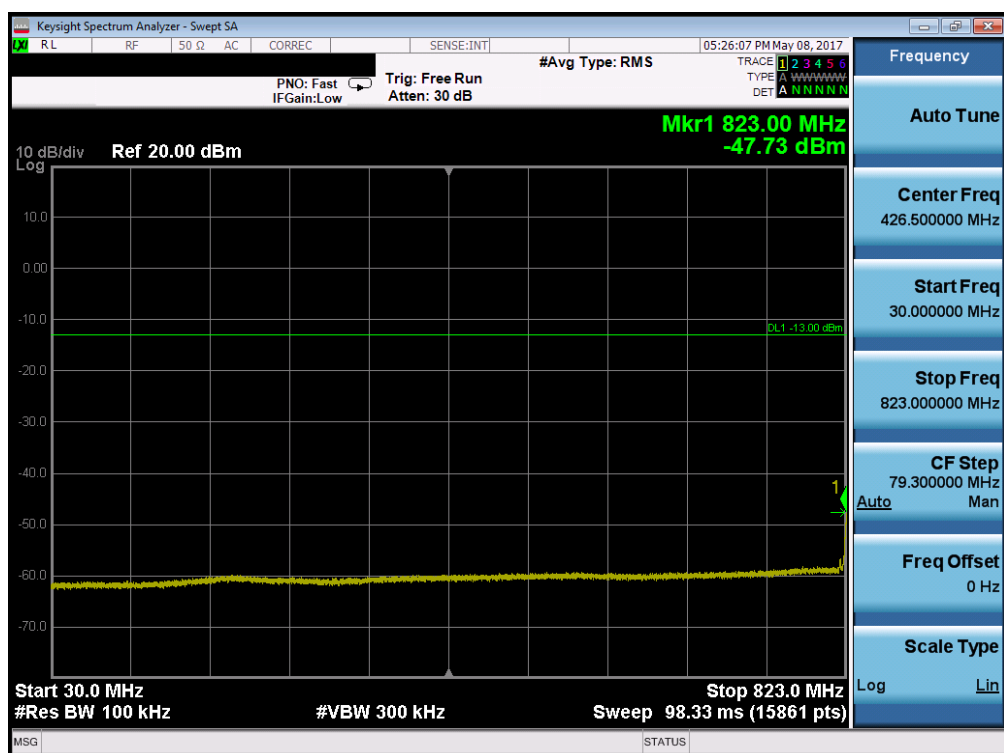


Figure 7-2. Test Instrument & Measurement Setup

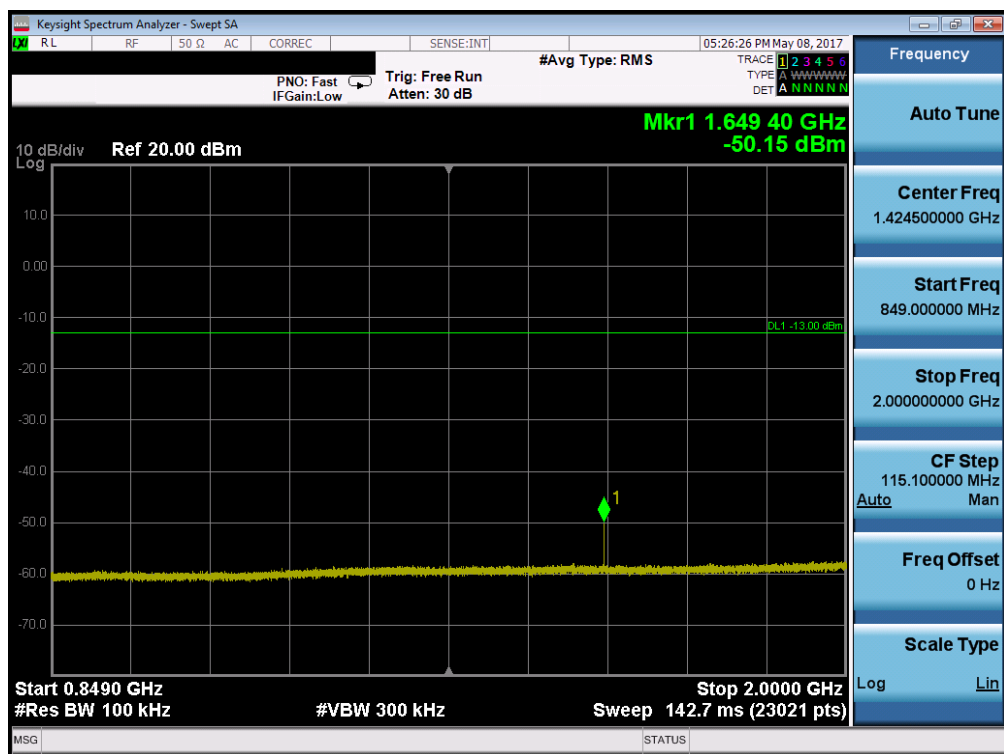
Test Notes

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. 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.

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 22 of 56

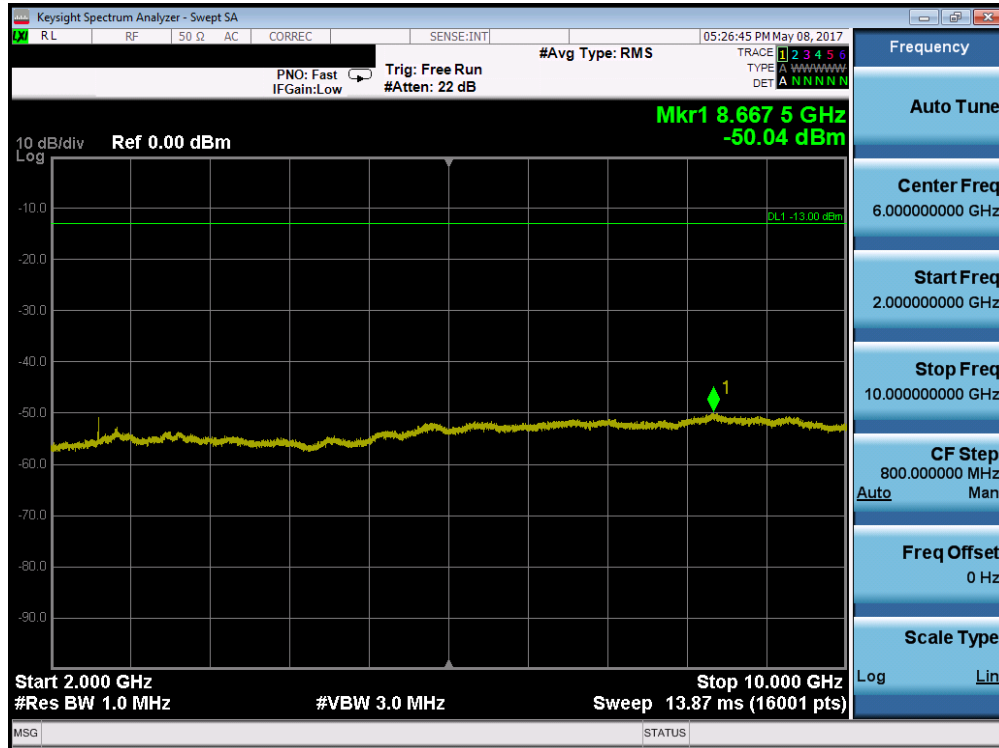


Plot 7-17. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0– Low Channel)

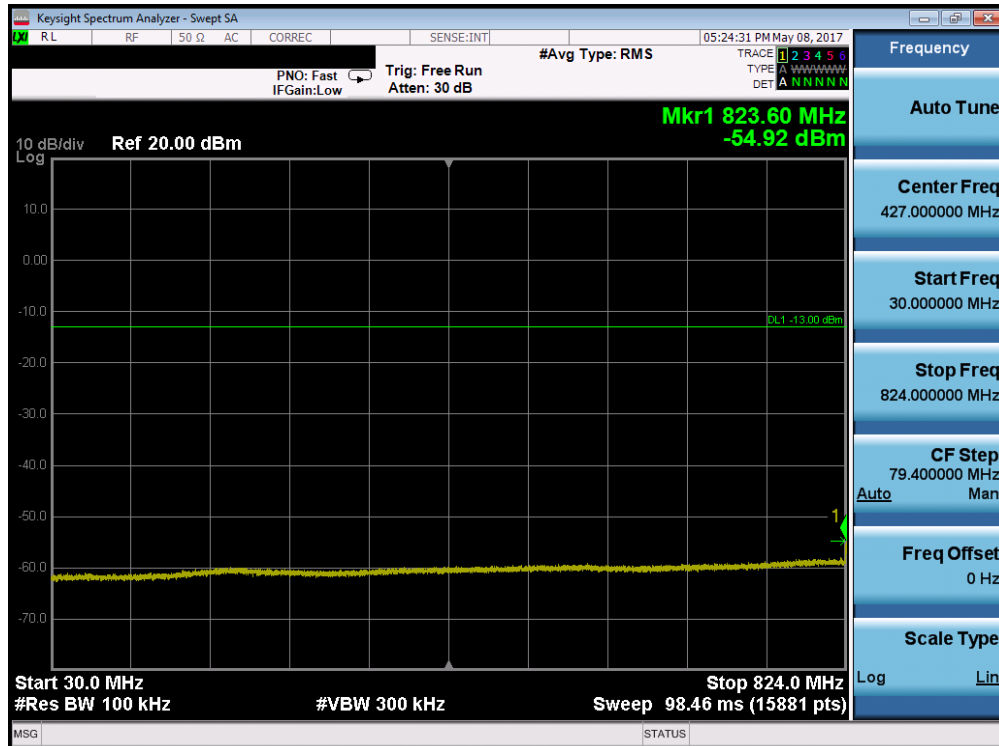


Plot 7-18. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 23 of 56

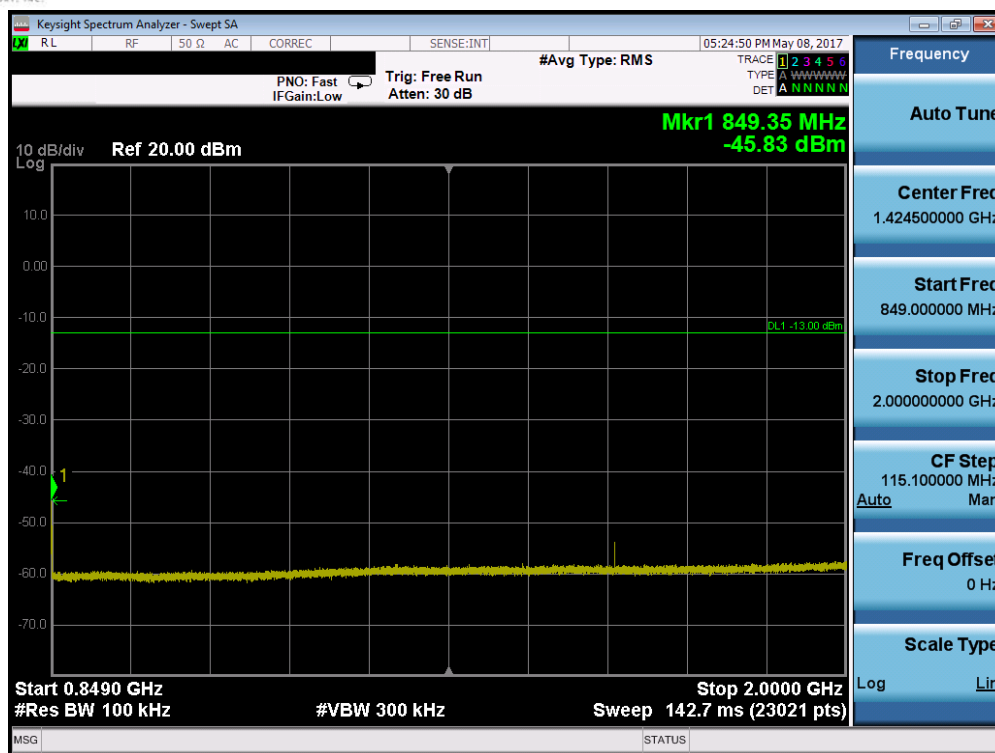


Plot 7-19. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

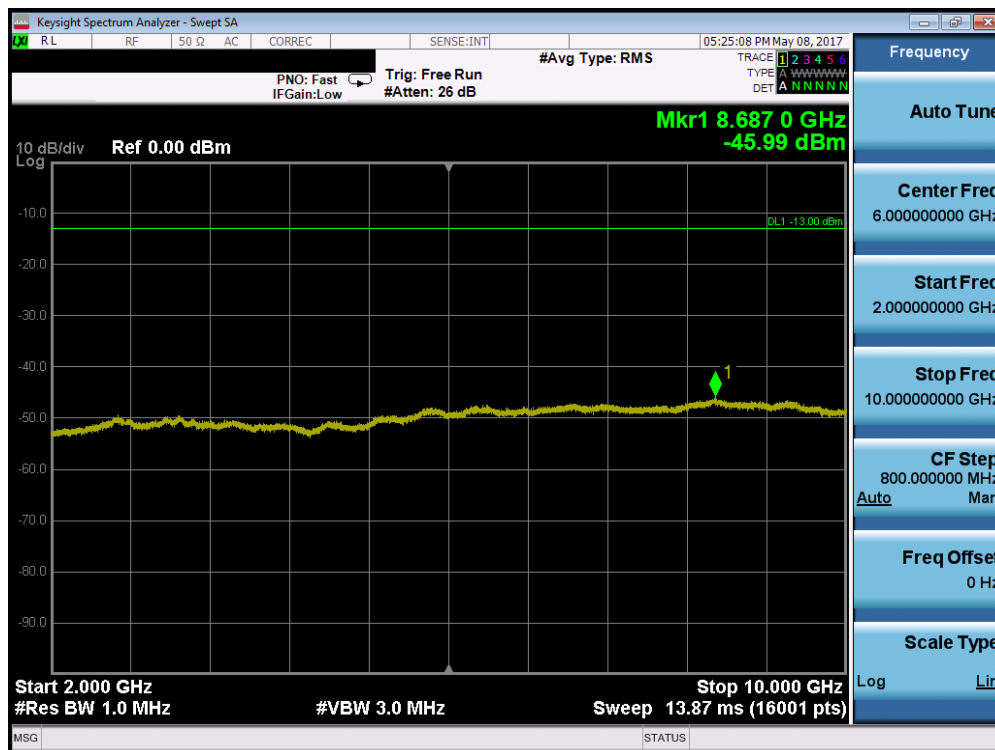


Plot 7-20. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 24 of 56

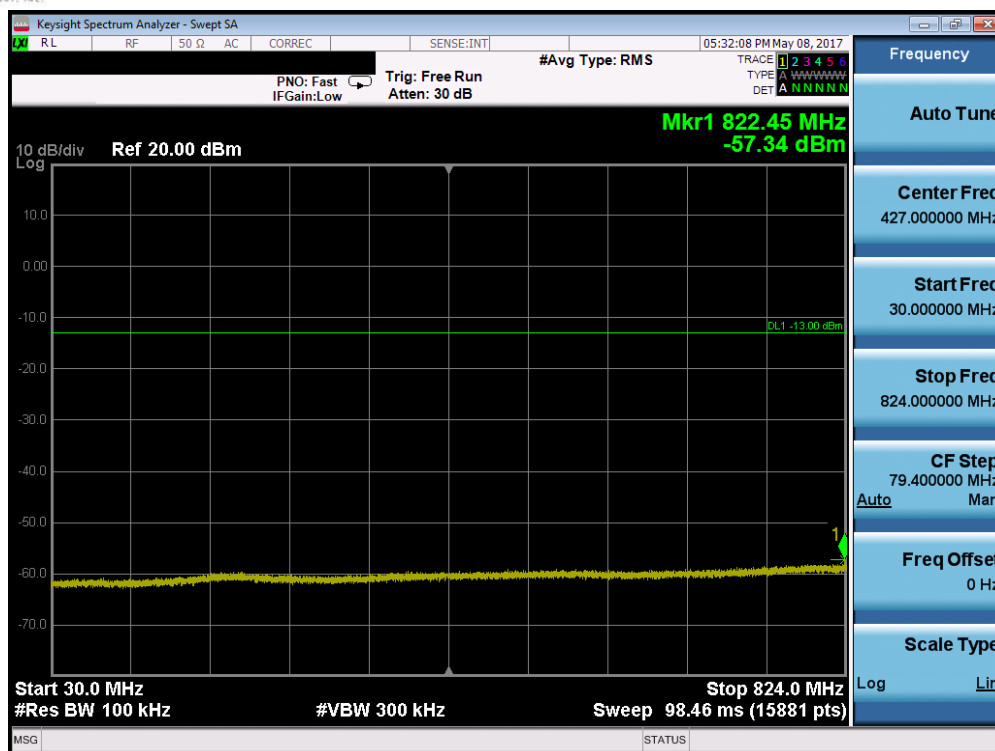


Plot 7-21. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

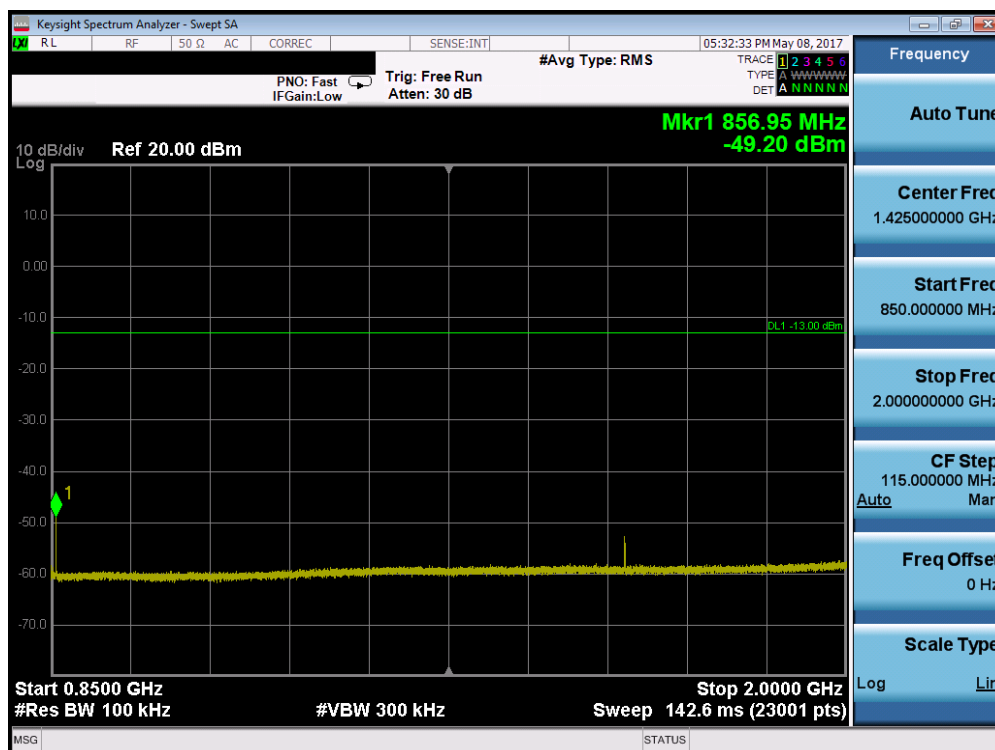


Plot 7-22. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 25 of 56

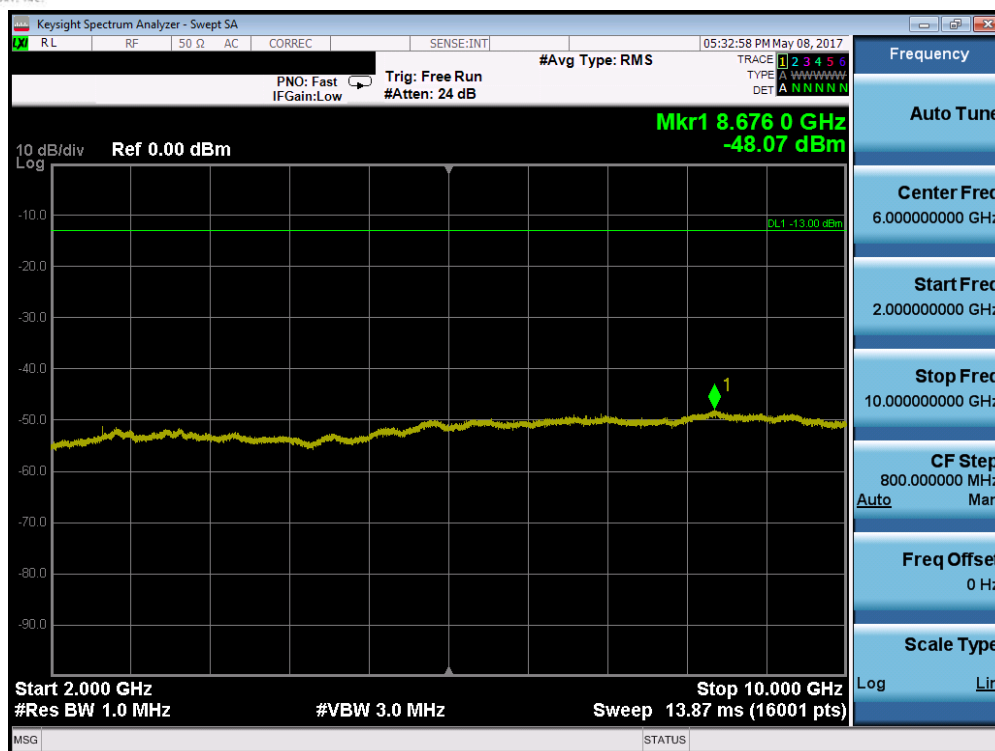


Plot 7-23. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

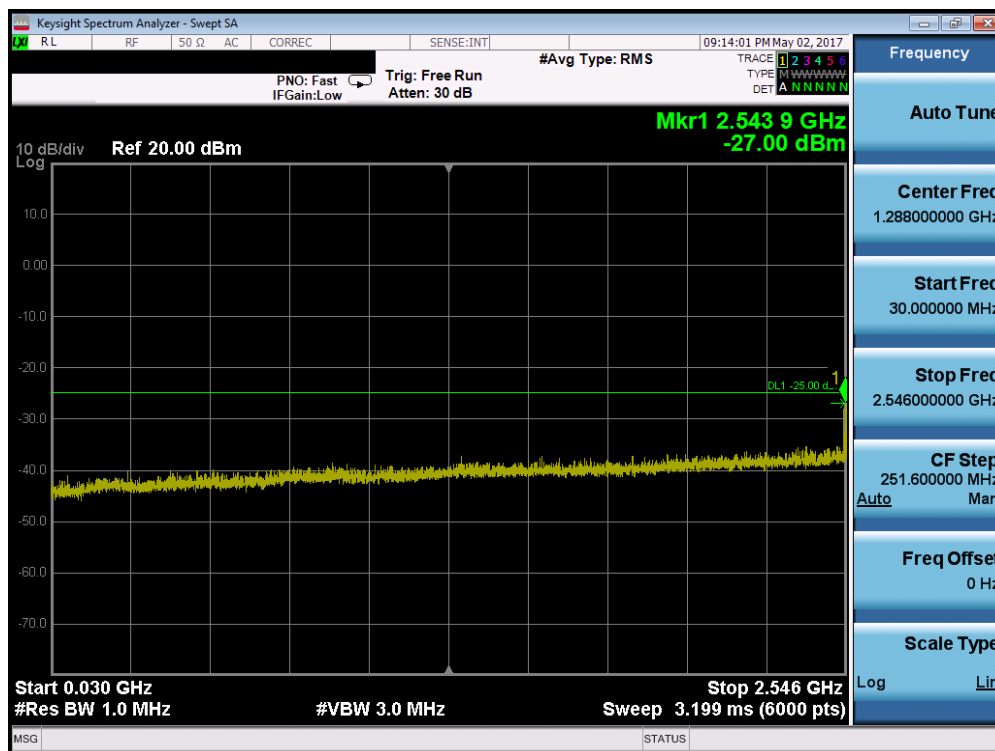


Plot 7-24. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 26 of 56

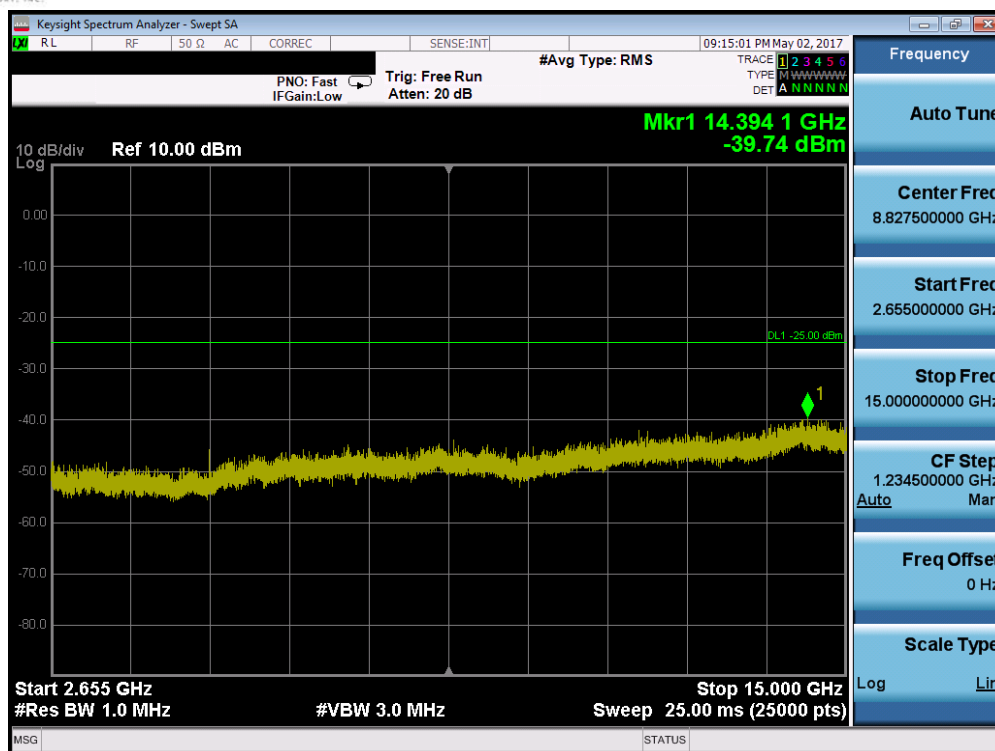


Plot 7-25. Conducted Spurious Plot (Band 5 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

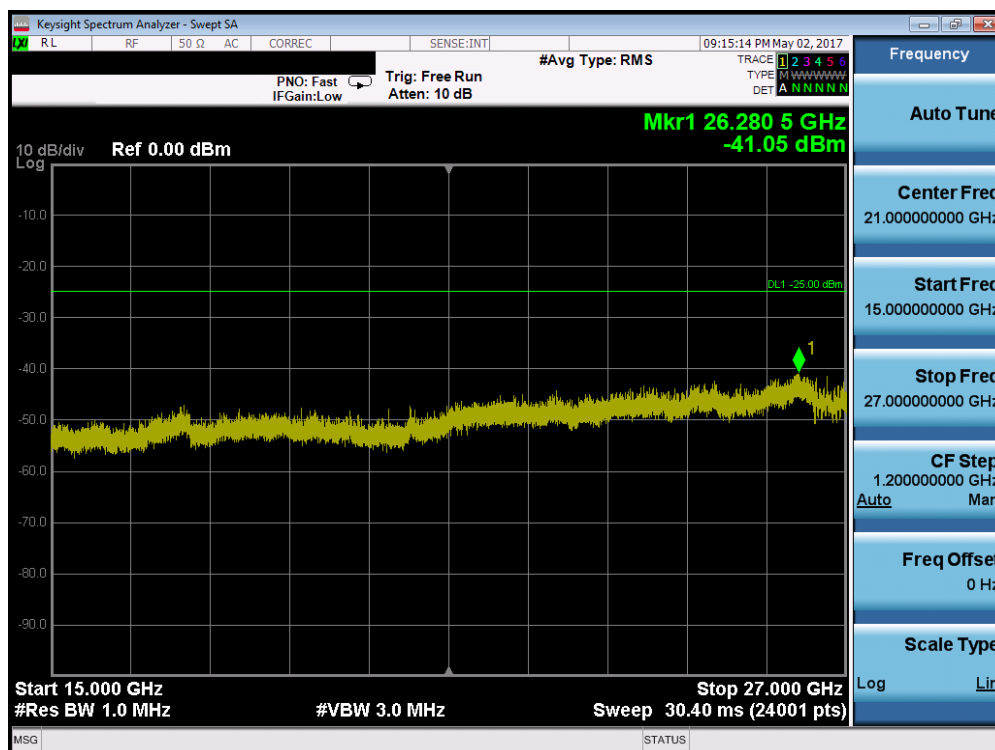


Plot 7-26. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0– Low Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 27 of 56

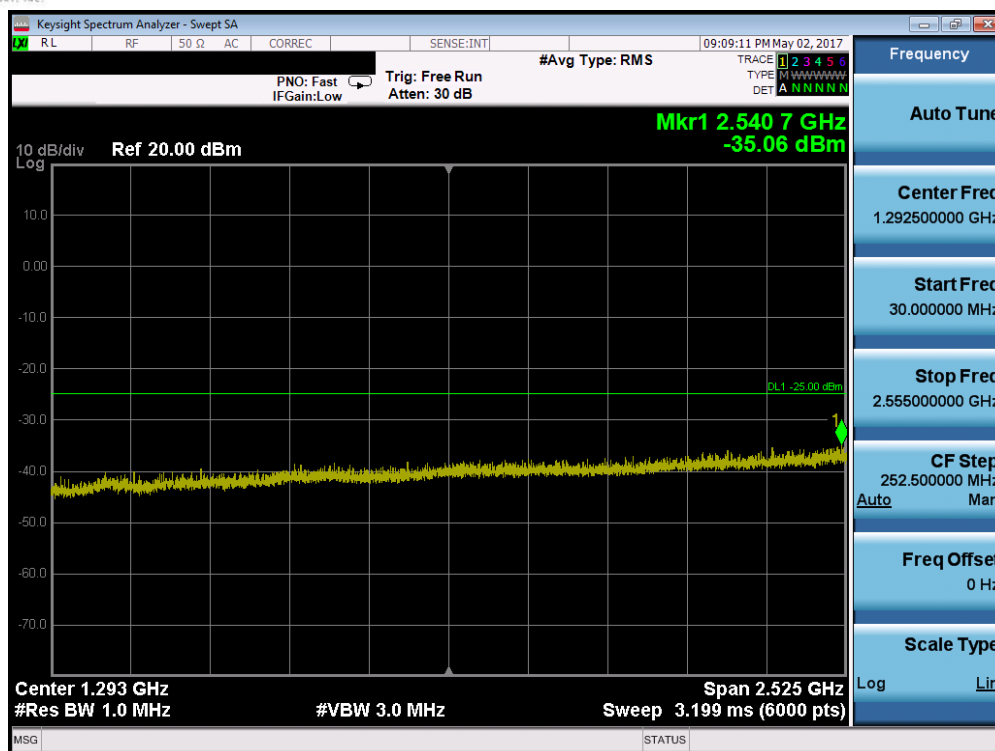


Plot 7-27. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

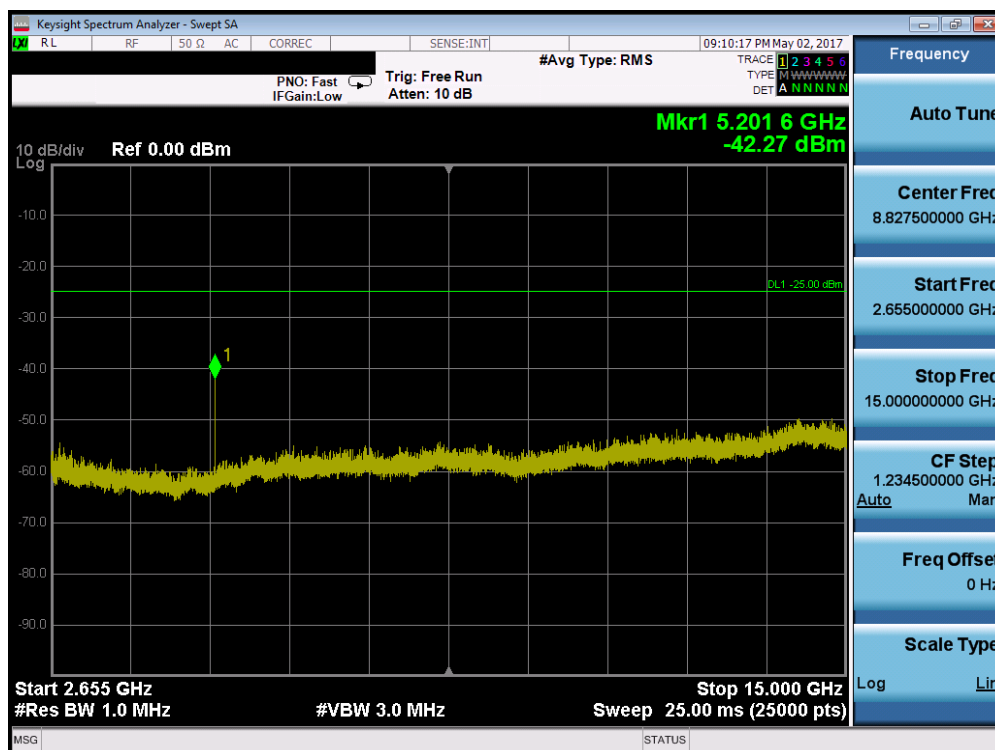


Plot 7-28. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 28 of 56

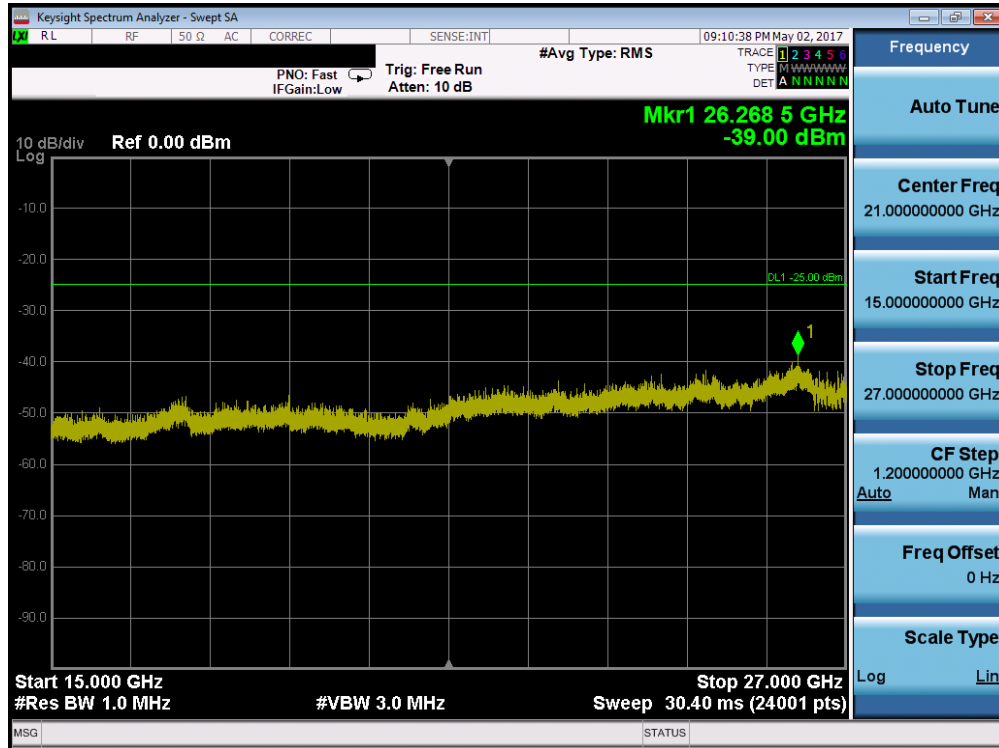


Plot 7-29. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

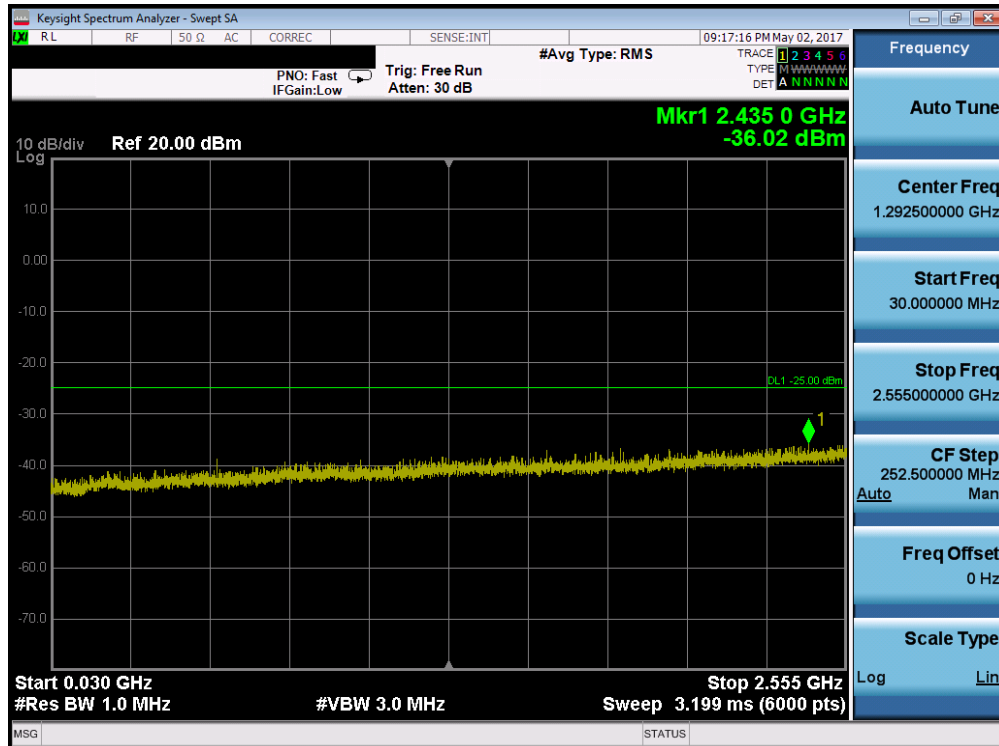


Plot 7-30. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 29 of 56

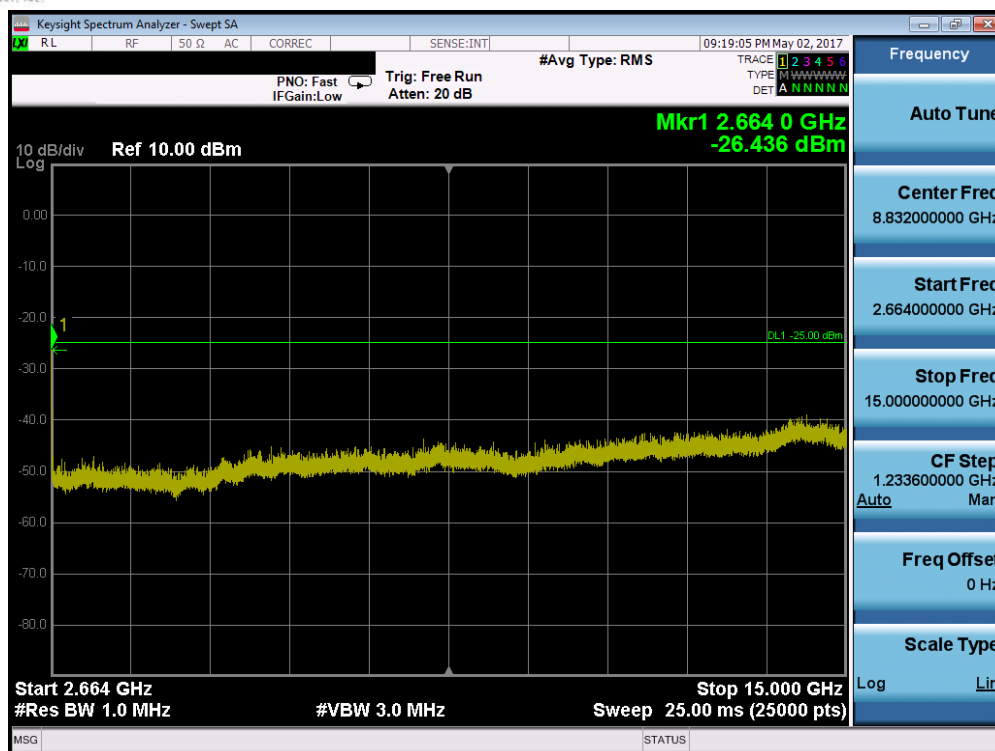


Plot 7-31. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

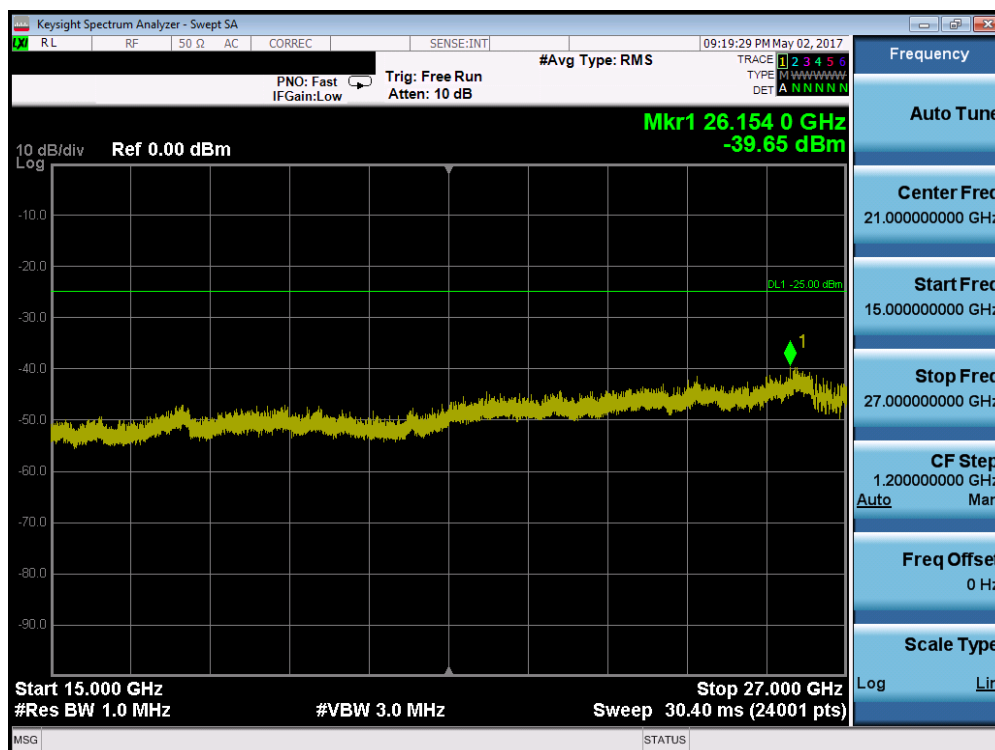


Plot 7-32. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 30 of 56



Plot 7-33. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 7-34. Conducted Spurious Plot (Band 41 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 31 of 56

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §22.917(a) §27.53(m)

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level for Band 41 is as noted in the Test Notes on the following page.

The minimum permissible attenuation level of any spurious emission is $43 + \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v02r02 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW $\geq 1\%$ of the emission bandwidth
4. VBW $\geq 3 \times$ RBW
5. Detector = RMS
6. Number of sweep points $\geq 2 \times$ Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

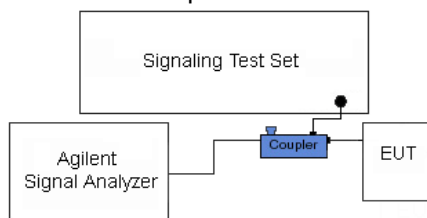


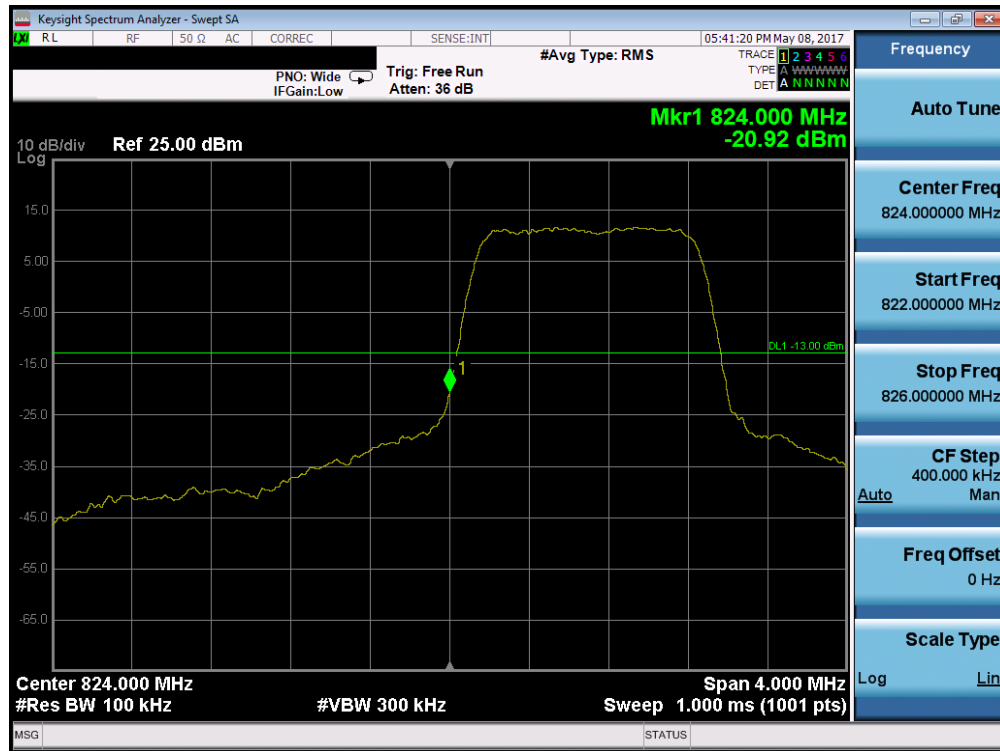
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

Per 22.917(b) 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 to demonstrate compliance with the out-of-band emissions limit. 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.

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 32 of 56	

Per 27.53(m) for operations in the BRS/EBS bands, the attenuation factor shall be not less than $40 + 10 \log(P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log(P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log(P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth. In addition, the attenuation factor shall not be less than $43 + 10 \log(P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log(P)$ dB at or below 2490.5 MHz.

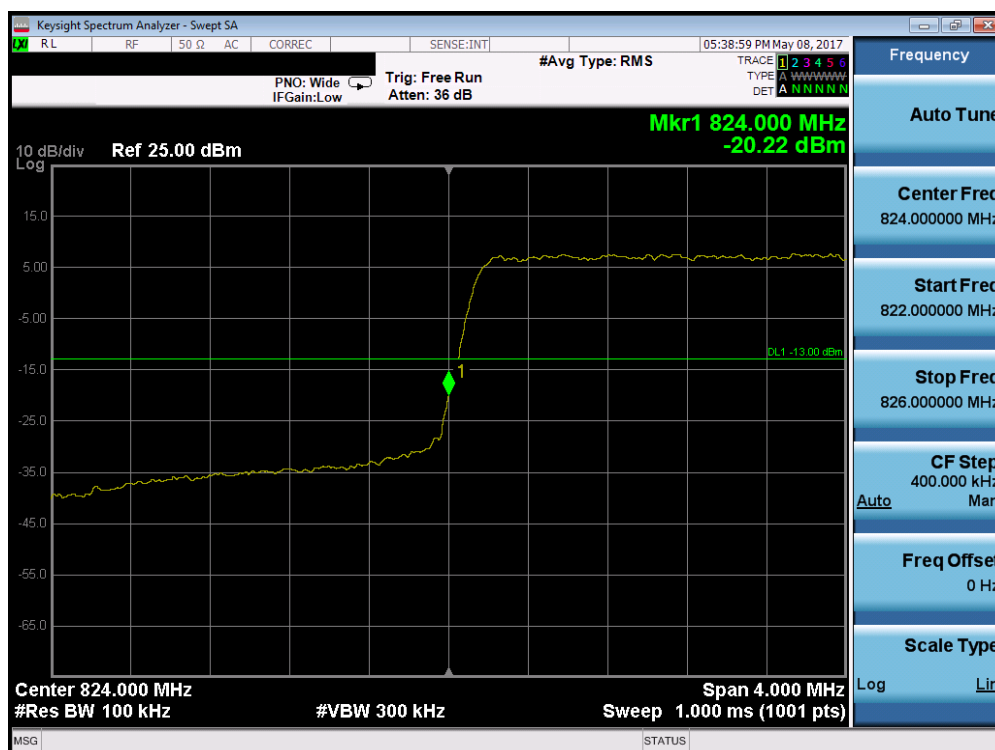


Plot 7-35. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 33 of 56



Plot 7-36. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

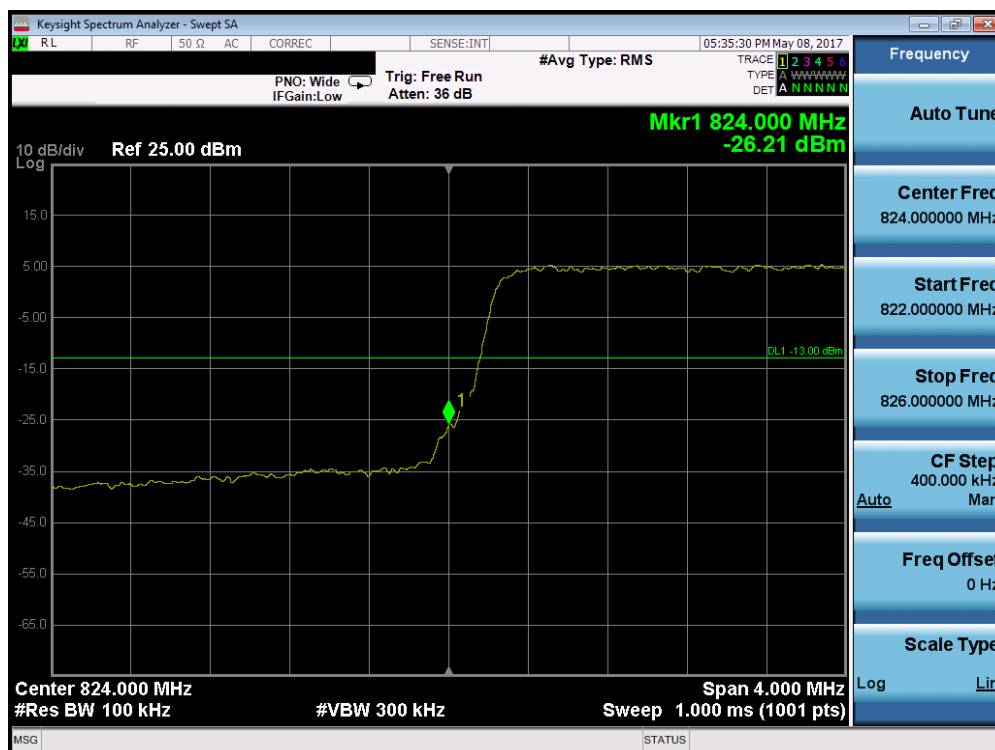


Plot 7-37. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 34 of 56



Plot 7-38. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

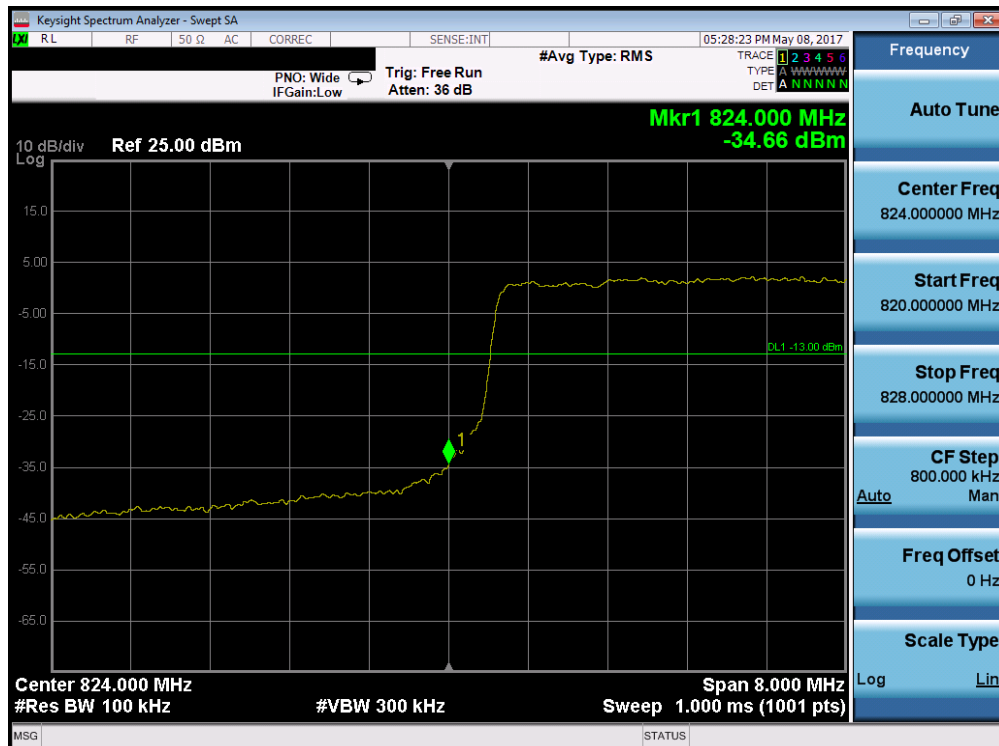


Plot 7-39. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 35 of 56

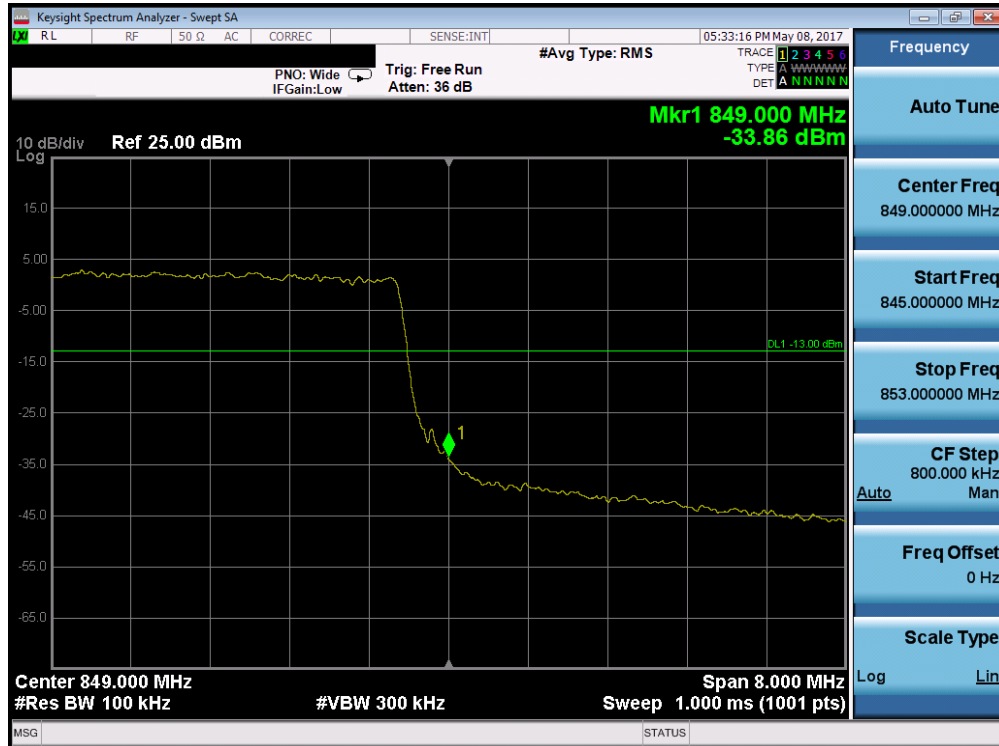


Plot 7-40. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

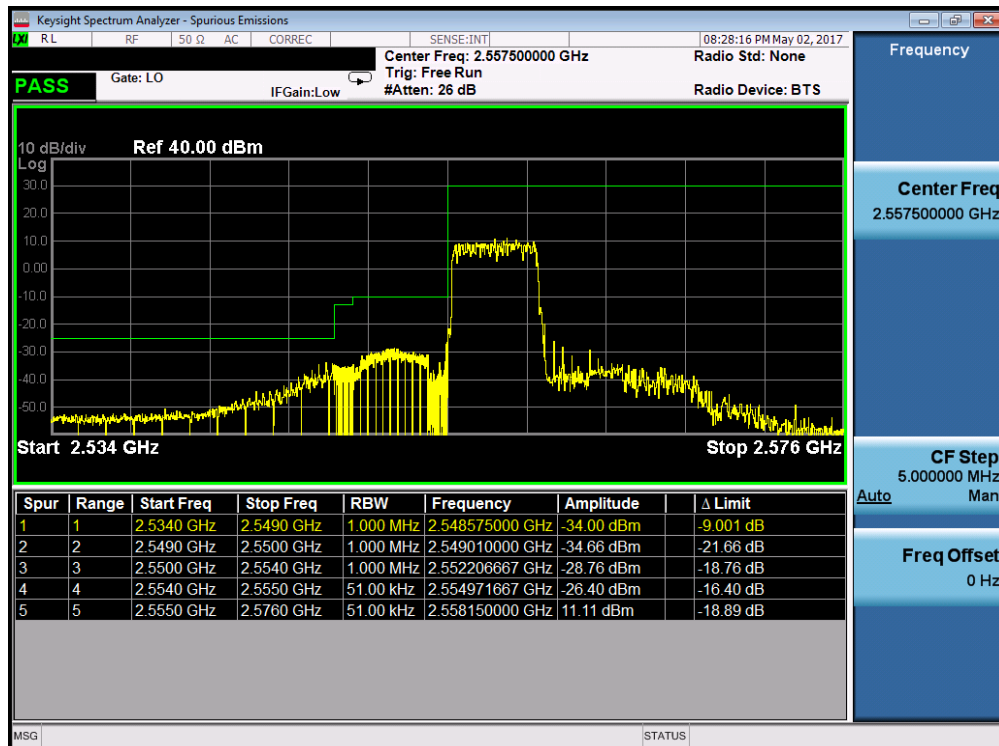


Plot 7-41. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 36 of 56

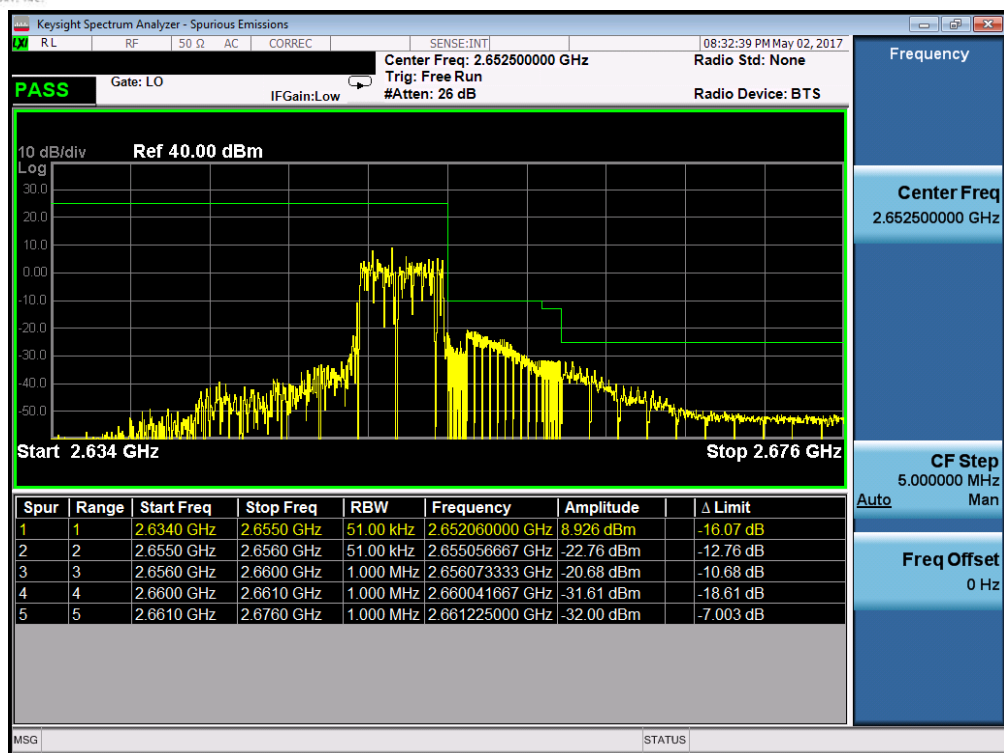


Plot 7-42. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

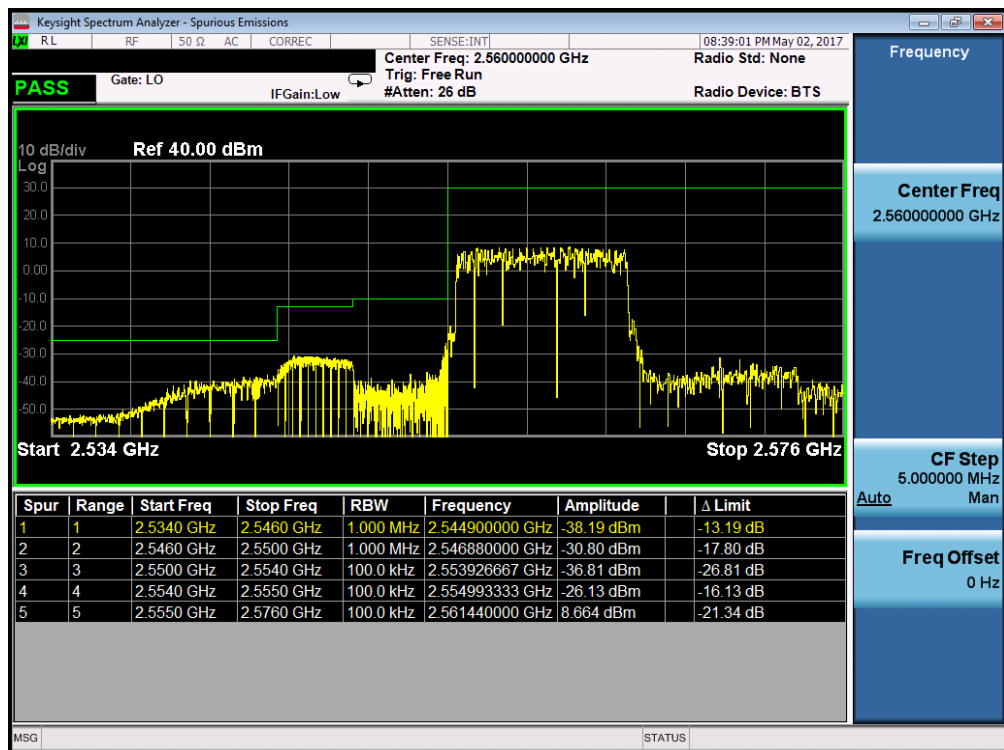


Plot 7-43. Lower ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

FCC ID: A3LSMJ3308	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 37 of 56

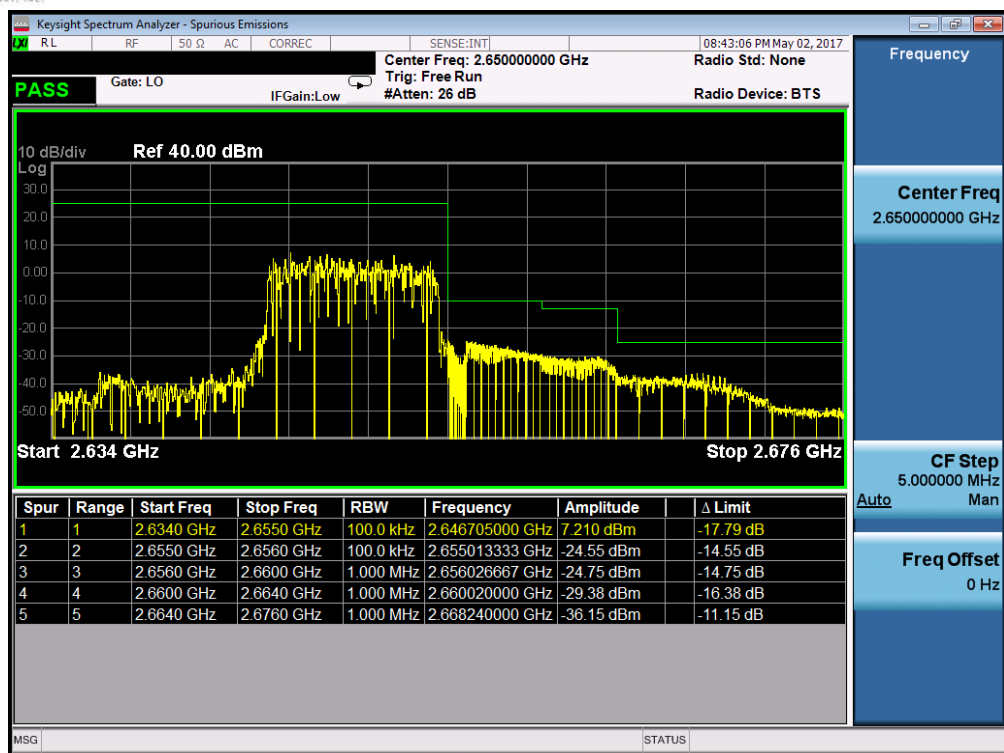


Plot 7-44. Upper ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

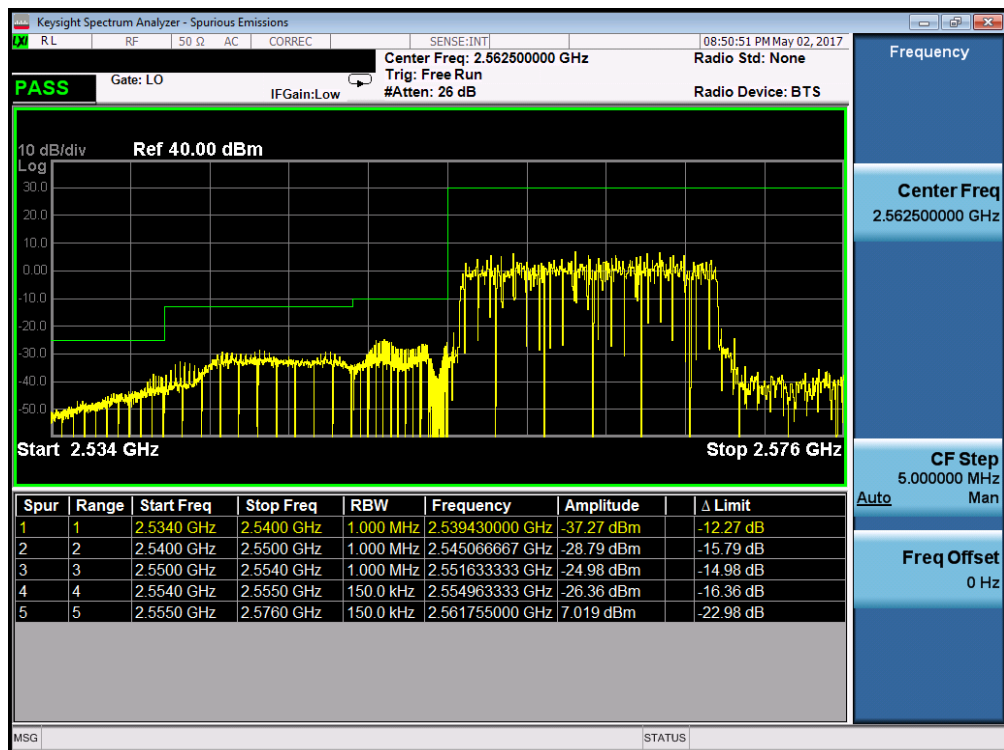


Plot 7-45. Lower ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 38 of 56	

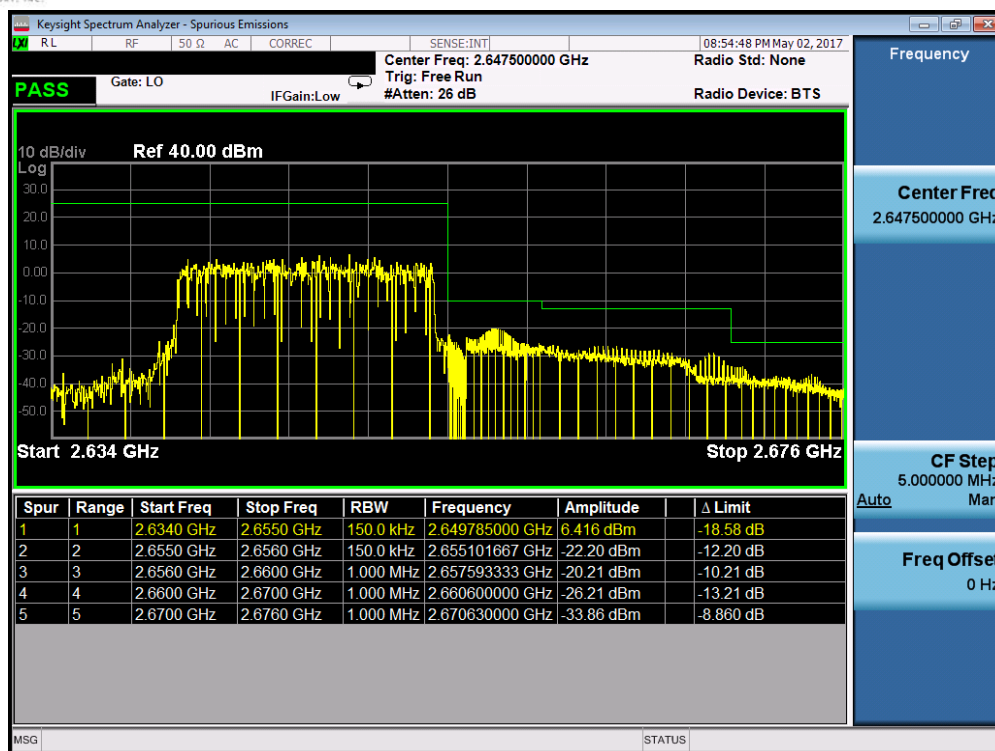


Plot 7-46. Upper ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)

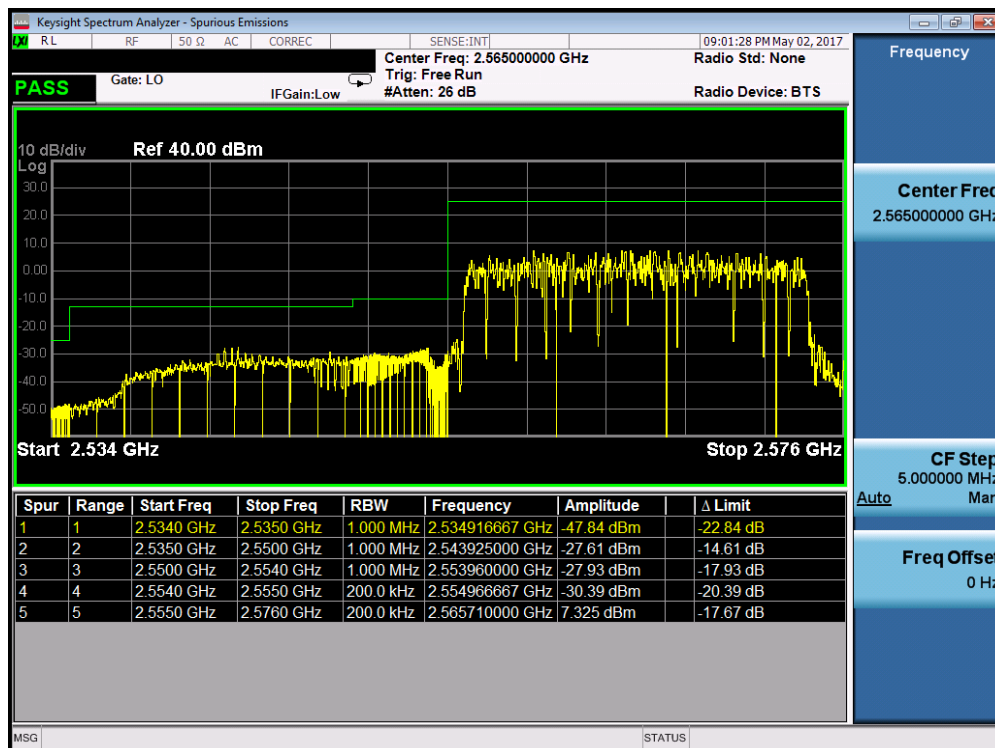


Plot 7-47. Lower ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 39 of 56	

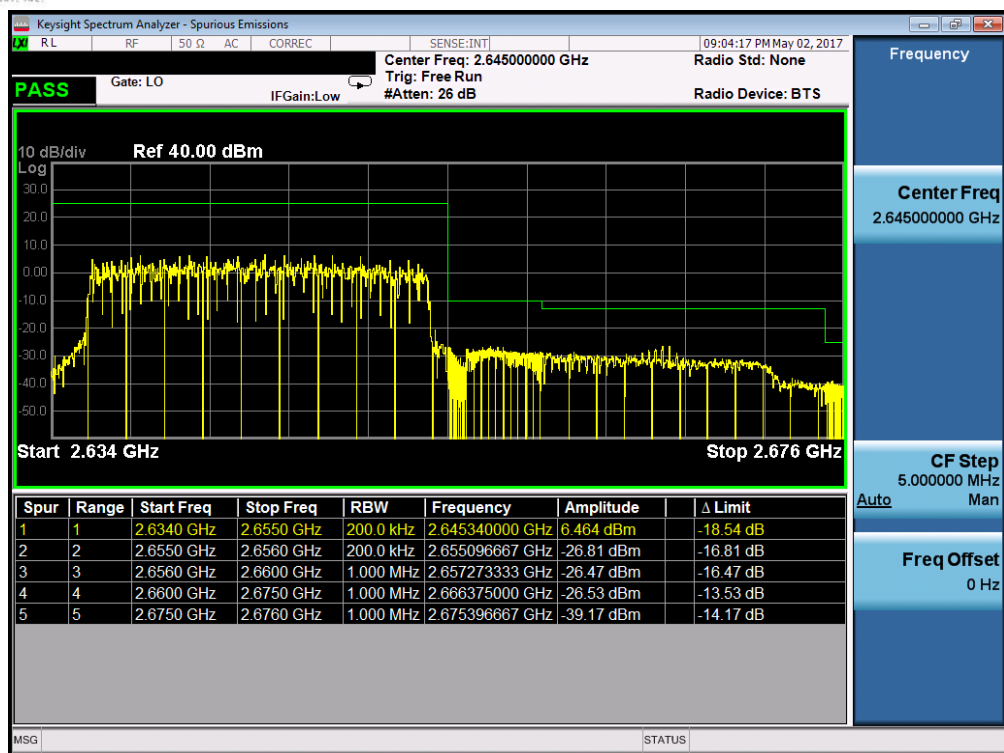


Plot 7-48. Upper ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Plot 7-49. Lower ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

FCC ID: A3LSMJ3308			FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 40 of 56	



Plot 7-50. Upper ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

FCC ID: A3LSMJ3308	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 41 of 56

7.5 Radiated Power (ERP/EIRP)

§22.913(a.2) §27.50(h.2)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW $\geq 3 \times$ RBW
4. Span = 1.5 times the OBW
5. No. of sweep points $\geq 2 \times$ span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 42 of 56	

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

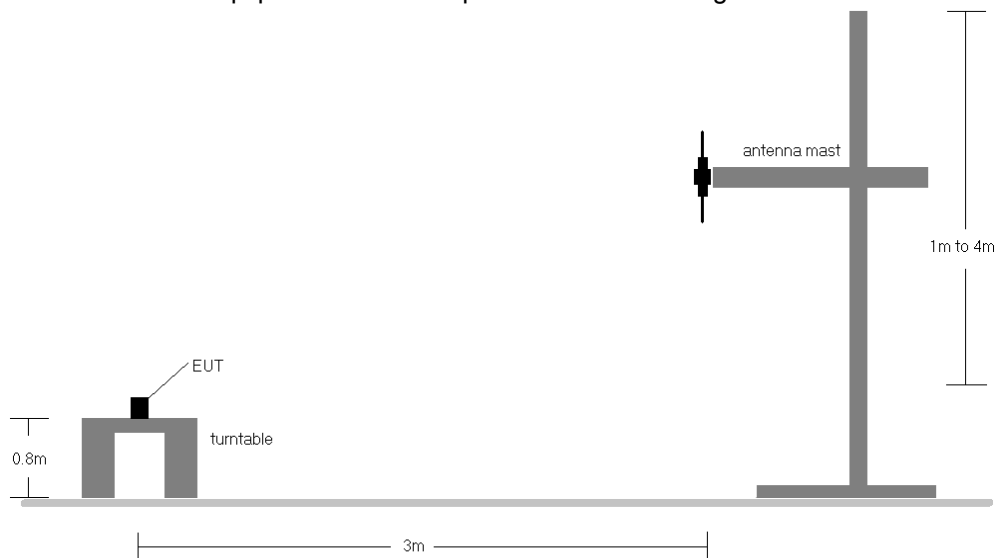


Figure 7-4. Radiated Test Setup <1GHz

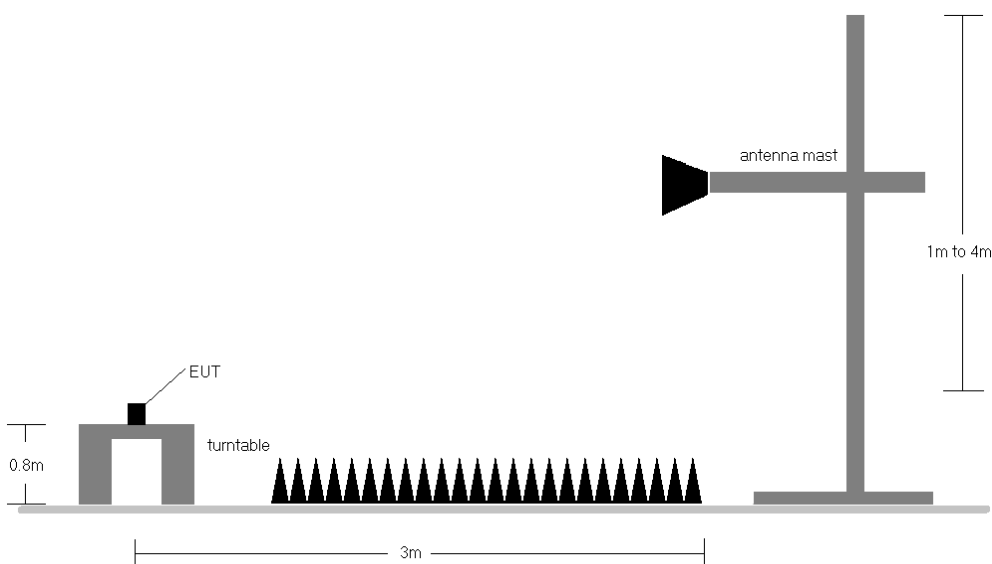


Figure 7-5. Radiated Test Setup >1GHz

Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 43 of 56

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	H	115	234	1 / 5	12.66	5.51	18.17	38.45	-20.28
836.50	1.4	QPSK	H	100	99	1 / 5	11.91	5.14	17.05	38.45	-21.40
848.30	1.4	QPSK	H	353	98	1 / 0	13.02	4.68	17.70	38.45	-20.75
824.70	1.4	16-QAM	H	115	234	1 / 5	10.78	5.51	16.29	38.45	-22.16
825.50	3	QPSK	H	111	250	1 / 0	12.76	5.52	18.28	38.45	-20.17
836.50	3	QPSK	H	213	244	1 / 0	12.74	5.14	17.88	38.45	-20.57
847.50	3	QPSK	H	103	255	1 / 0	13.04	4.67	17.71	38.45	-20.74
825.50	3	16-QAM	H	111	250	1 / 0	10.86	5.52	16.38	38.45	-22.07
826.50	5	QPSK	H	110	241	1 / 0	13.87	5.51	19.38	38.45	-19.07
836.50	5	QPSK	H	210	101	1 / 0	14.19	5.14	19.33	38.45	-19.12
846.50	5	QPSK	H	355	103	1 / 24	13.96	4.66	18.62	38.45	-19.83
826.50	5	16-QAM	H	110	241	1 / 0	11.56	5.51	17.07	38.45	-21.38
829.00	10	QPSK	H	208	99	1 / 49	14.55	5.49	20.04	38.45	-18.41
836.50	10	QPSK	H	211	98	1 / 0	14.44	5.14	19.58	38.45	-18.87
844.00	10	QPSK	H	207	235	1 / 49	14.81	4.70	19.51	38.45	-18.94
836.50	10	16-QAM	H	211	98	1 / 49	12.41	5.14	17.55	38.45	-20.90
829.00	10	QPSK	V	129	50	1 / 74	12.77	5.49	18.26	38.45	-20.19

Table 7-2. ERP Data (Band 5)

FCC ID: A3LSMJ3308	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION) 			Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 44 of 56

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2557.50	5	QPSK	H	101	270	1 / 0	10.04	8.42	18.46	33.01	-14.55
2605.00	5	QPSK	H	101	263	1 / 24	11.07	8.65	19.72	33.01	-13.29
2652.50	5	QPSK	H	101	261	1 / 0	11.09	8.44	19.53	33.01	-13.48
2652.50	5	16-QAM	H	101	261	1 / 0	9.99	8.44	18.43	33.01	-14.58
2560.00	10	QPSK	H	199	95	1 / 49	9.23	8.41	17.64	33.01	-15.37
2605.00	10	QPSK	H	121	41	1 / 49	7.08	8.65	15.73	33.01	-17.28
2650.00	10	QPSK	H	120	211	1 / 49	10.73	8.45	19.18	33.01	-13.83
2650.00	10	16-QAM	H	120	211	1 / 49	10.21	8.45	18.66	33.01	-14.35
2562.50	15	QPSK	H	101	264	1 / 0	10.81	8.42	19.23	33.01	-13.78
2605.00	15	QPSK	H	120	38	1 / 74	10.28	8.65	18.93	33.01	-14.08
2647.50	15	QPSK	H	101	264	1 / 74	11.34	8.46	19.80	33.01	-13.21
2647.50	15	16-QAM	H	101	264	1 / 74	9.90	8.46	18.36	33.01	-14.65
2565.00	20	QPSK	H	103	263	1 / 99	10.53	8.42	18.95	33.01	-14.06
2605.00	20	QPSK	H	122	261	1 / 0	8.83	8.65	17.48	33.01	-15.53
2645.00	20	QPSK	H	100	263	1 / 0	10.80	8.46	19.26	33.01	-13.75
2565.00	20	16-QAM	H	103	263	1 / 99	9.74	8.42	18.16	33.01	-14.85
2647.50	15	QPSK	V	161	233	1 / 0	9.16	8.46	17.62	33.01	-15.39

Table 7-3. EIRP Data (Band 41)

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 45 of 56

7.6 Radiated Spurious Emissions Measurements

\$2.1053 \$22.917(a) \$27.53(m)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 46 of 56	

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

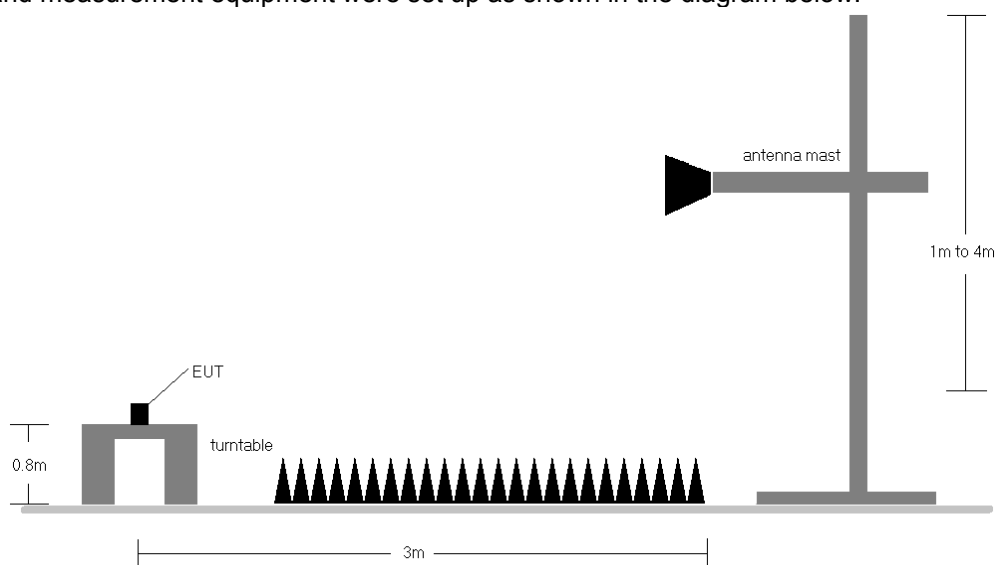


Figure 7-6. Test Instrument & Measurement Setup

Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: A3LSMJ3308	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 47 of 56

OPERATING FREQUENCY: 829.00 MHz
 CHANNEL: 20450
 MEASURED OUTPUT POWER: 20.04 dBm = 0.101 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 33.04 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1658.00	H	117	130	-59.80	6.26	-53.54	73.6
2487.00	H	196	151	-71.21	6.84	-64.37	84.4
3316.00	H	-	-	-68.92	7.17	-61.75	81.8

Table 7-4. Radiated Spurious Data (Band 5 – Low Channel)

OPERATING FREQUENCY: 836.50 MHz
 CHANNEL: 20525
 MEASURED OUTPUT POWER: 19.58 dBm = 0.091 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10} (W) =$ 32.58 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1673.00	H	118	117	-63.29	6.21	-57.08	76.7
2509.50	H	301	360	-71.59	6.86	-64.73	84.3
3346.00	H	-	-	-69.74	7.26	-62.47	82.1

Table 7-5. Radiated Spurious Data (Band 5 – Mid Channel)

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 48 of 56

OPERATING FREQUENCY: 844.00 MHz
 CHANNEL: 20600
 MEASURED OUTPUT POWER: 19.51 dBm = 0.089 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 10.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 32.51 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1688.00	H	115	137	-61.88	6.15	-55.73	75.2
2532.00	H	116	144	-71.51	6.93	-64.58	84.1
3376.00	H	-	-	-69.23	7.35	-61.88	81.4

Table 7-6. Radiated Spurious Data (Band 5 – High Channel)

OPERATING FREQUENCY: 2562.50 MHz
 CHANNEL: 40315
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 15.0 MHz
 DISTANCE: 3 meters
 LIMIT: -25.00 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5125.00	H	213	196	-64.05	10.94	-53.11	-28.1
7687.50	H	-	-	-57.27	11.54	-45.73	-20.7

Table 7-7. Radiated Spurious Data (Band 41 – Low Channel)

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 49 of 56

OPERATING FREQUENCY: 2605.00 MHz
 CHANNEL: 40740
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 15.0 MHz
 DISTANCE: 3 meters
 LIMIT: -25.00 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5210.00	H	110	292	-63.84	10.83	-53.01	-28.0
7815.00	H	-	-	-57.62	11.59	-46.03	-21.0

Table 7-8. Radiated Spurious Data (Band 41 – Mid Channel)

OPERATING FREQUENCY: 2647.50 MHz
 CHANNEL: 41165
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 15.0 MHz
 DISTANCE: 3 meters
 LIMIT: -25.00 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5295.00	H	167	196	-64.59	11.01	-53.58	-28.6
7942.50	H	-	-	-57.33	11.51	-45.82	-20.8

Table 7-9. Radiated Spurious Data (Band 41 – High Channel)

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 50 of 56

7.7 Frequency Stability / Temperature Variation

\$2.1055 \$22.355 \$27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-D-2010. 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.

For Part 22, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency. For Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-D-2010

Test Settings

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 fifteen minutes 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 period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 51 of 56	

© 2017 PCTEST Engineering Laboratory, Inc.

V 6.3

03/24/2017

© 2017 PCTEST Engineering Laboratory, Inc. All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTESTLAB.COM.

Band 5 Frequency Stability Measurements

§2.1055 §22.355

OPERATING FREQUENCY: 836,500,000 Hz

CHANNEL: 20525

REFERENCE VOLTAGE: 3.85 VDC

DEVIATION LIMIT: ± 0.00025 % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,499,956	-44	-0.0000053
100 %		- 30	836,499,808	-192	-0.0000230
100 %		- 20	836,499,857	-143	-0.0000171
100 %		- 10	836,499,964	-36	-0.0000043
100 %		0	836,499,804	-196	-0.0000234
100 %		+ 10	836,499,887	-113	-0.0000136
100 %		+ 20	836,499,859	-141	-0.0000169
100 %		+ 30	836,499,945	-55	-0.0000066
100 %		+ 40	836,499,874	-126	-0.0000151
100 %		+ 50	836,499,984	-16	-0.0000020
BATT. ENDPOINT	3.45	+ 20	836,499,968	-32	-0.0000038

Table 7-10. Frequency Stability Data (Band 5)

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 52 of 56	

Band 5 Frequency Stability Measurements

§2.1055 §22.355

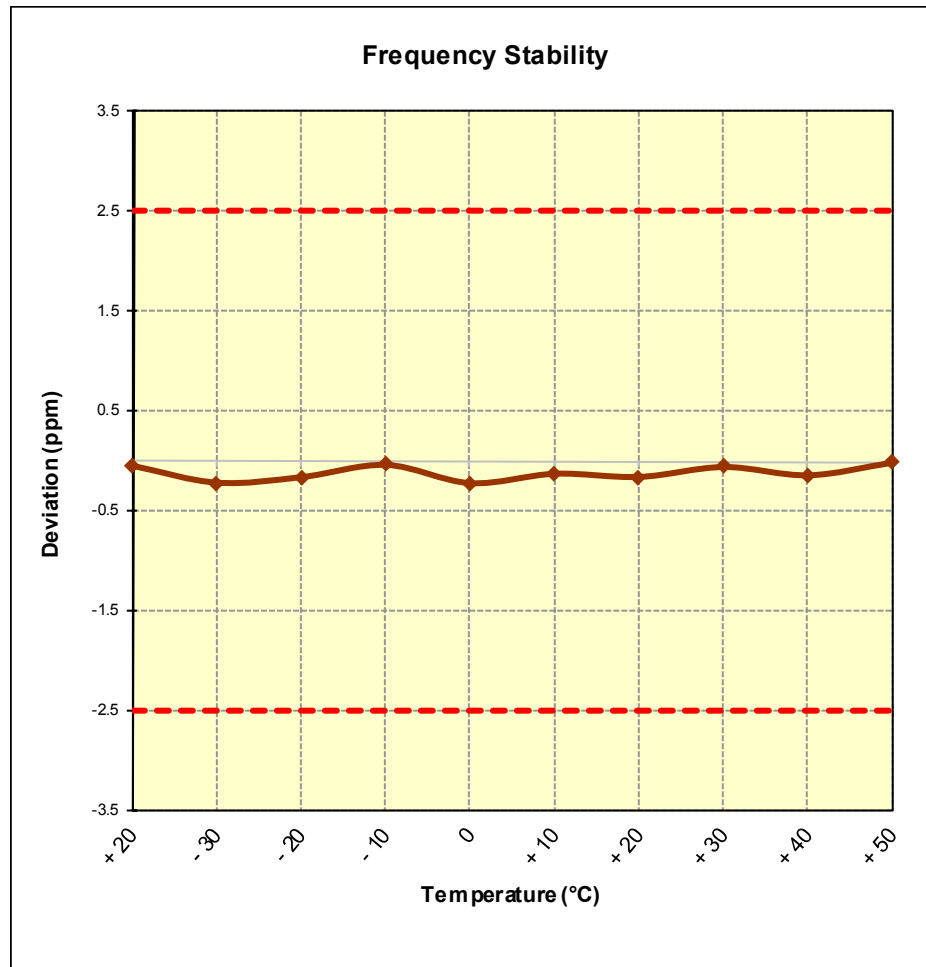


Figure 7-7. Frequency Stability Graph (Band 5)

FCC ID: A3LSMJ3308	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		 Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	

© 2017 PCTEST Engineering Laboratory, Inc.

V 6.3
03/24/2017

© 2017 PCTEST Engineering Laboratory, Inc. All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTESTLAB.COM.

Band 41 Frequency Stability Measurements

\$2.1055 \$27.54

OPERATING FREQUENCY: 2,605,000,000 Hz
 CHANNEL: 40740
 REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,604,999,991	-9	-0.0000003
100 %		- 30	2,604,999,843	-157	-0.0000060
100 %		- 20	2,604,999,832	-168	-0.0000064
100 %		- 10	2,604,999,935	-65	-0.0000025
100 %		0	2,604,999,939	-61	-0.0000023
100 %		+ 10	2,604,999,838	-162	-0.0000062
100 %		+ 20	2,604,999,826	-174	-0.0000067
100 %		+ 30	2,604,999,808	-192	-0.0000074
100 %		+ 40	2,604,999,809	-191	-0.0000073
100 %		+ 50	2,604,999,876	-124	-0.0000048
BATT. ENDPOINT	3.45	+ 20	2,604,999,925	-75	-0.0000029

Table 7-11. Frequency Stability Data (Band 41)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	Page 54 of 56	

Band 41 Frequency Stability Measurements

§2.1055 §27.54

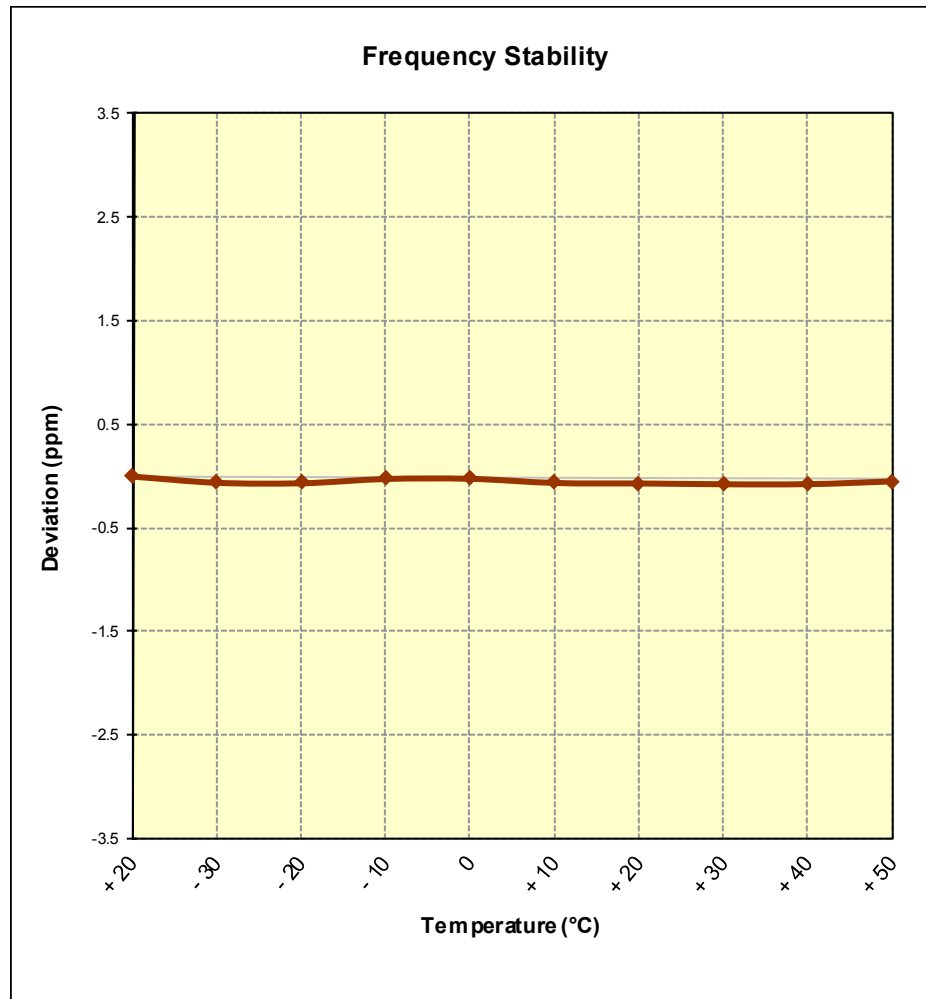


Figure 7-8. Frequency Stability Graph (Band 41)

FCC ID: A3LSMJ3308	 FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		 Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset	

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMJ3308** complies with all the requirements of Parts 22 & 27 of the FCC rules for LTE operation only.

FCC ID: A3LSMJ3308		FCC Pt. 22 & 27 LTE MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1705010159-03.A3L	Test Dates: 5/1 - 5/9/2017	EUT Type: Portable Handset		Page 56 of 56