

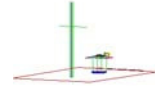


PCTEST ENGINEERING LABORATORY, INC.

7185 Oakland Mills Road, Columbia, MD 21046 USA

Tel. 410.290.6652 / Fax 410.290.6654

<http://www.pctestlab.com>



MEASUREMENT REPORT FCC PART 15.249 ANT+

Applicant Name:

Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:

4/12 - 4/24/2017

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M1703080095-09.A3L

FCC ID:

A3LSMG9500

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Class II Permissive Change

Model:

SM-G9500

EUT Type:

Portable Handset

Frequency Range:

2402 – 2480MHz

FCC Classification:

Low Power Communications Device Transmitter (DXX)

FCC Rule Part(s):

Part 15 Subpart C (15.249)

Test Procedure(s):

ANSI C63.10-2013, KDB 648474 D03 v01r04

Class II Permissive Change:

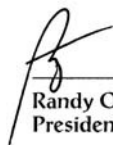
Please see FCC change document

Original Grant Date:

3/10/2017

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 ANSI C63.10-2013. 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: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 1 of 18

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V 6.3

03/24/2017

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

FCC PART 15.249 MEASUREMENT REPORT	3
1.0 INTRODUCTION	4
1.1 Scope	4
1.2 PCTEST Test Location	4
2.0 PRODUCT INFORMATION	5
2.1 Equipment Description	5
2.2 Device Capabilities	5
2.3 Test Configuration	5
2.4 EMI Suppression Device(s)/Modifications	5
3.0 DESCRIPTION OF TESTS	6
3.1 Evaluation Procedure	6
3.2 Radiated Emissions	6
3.3 Environmental Conditions	6
4.0 ANTENNA REQUIREMENTS	7
5.0 MEASUREMENT UNCERTAINTY	8
6.0 TEST EQUIPMENT CALIBRATION DATA	9
7.0 TEST RESULTS	10
7.1 Summary	10
7.2 Radiated Spurious Emission Measurements	11
7.3 Radiated Restricted Band Edge Measurements	14
8.0 CONCLUSION	18

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 2 of 18



MEASUREMENT REPORT

FCC Part 15.249



§ 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 21046 USA
FCC RULE PART(S): Part 15 Subpart C (15.249)
MODEL: SM-G9500
FCC ID: A3LSMG9500
Test Device Serial No.: 50966, 22248 ☐ Production ☒ Pre-Production ☐ Engineering
FCC CLASSIFICATION: Low Power Communications Device Transmitter (DXX)
DATE(S) OF TEST: 4/12 - 4/24/2017
TEST REPORT S/N: 1M1703080095-09.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: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 3 of 18

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2 PCTEST Test Location

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington 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.

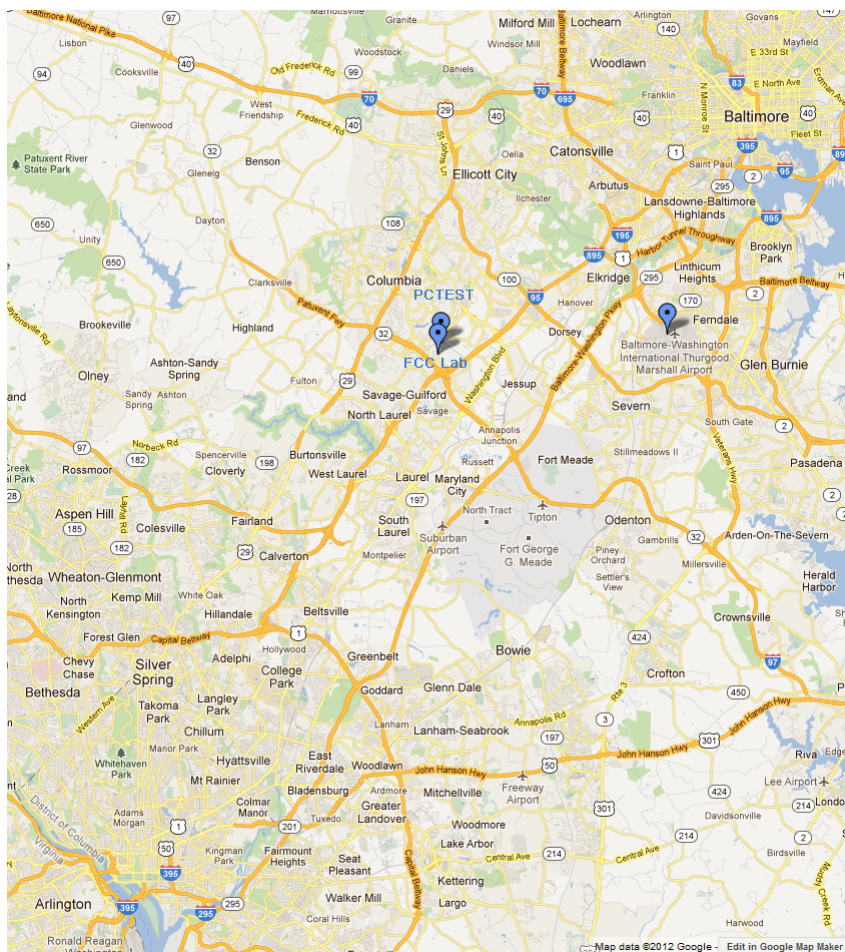


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

FCC ID: A3LSMG9500	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 4 of 18

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V 6.3
03/24/2017

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG9500**. The test data contained in this report pertains only to the emissions due to the EUT's ANT+ transmitter.

2.2 Device Capabilities

This device contains the following capabilities:

850 CDMA/EvDO Rev0/A (BC0), 850/1900 GSM/GPRS/EDGE, 850/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, ANT+

Ch.	Frequency (MHz)
00	2402
:	:
39	2440
:	:
78	2480

Table 2-1. Frequency/ Channel Operations

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.10-2013. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing. See Section 3.2 for radiated emissions test setups.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on a certified wireless charging pad (WCP) while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.4 EMI Suppression Device(s)/Modifications

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

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 5 of 18

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedure described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) was used in the measurement of the EUT.

Deviation from measurement procedure.....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. A raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. 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. 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. For measurements above 1GHz, a high density expanded polystyrene block is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

3.3 Environmental Conditions

The temperature is controlled within range of 15°C to 35°C. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 6 of 18

4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

- The antennas of the EUT are **permanently attached**.
- There are no provisions for connection to an external antenna.

Conclusion:

The EUT complies with the requirement of §15.203.

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 7 of 18

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement data shown herein 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
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 8 of 18

6.0 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
-	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
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	8/23/2016	Biennial	8/23/2018	135427
Huber+Suhner	Sucoflex 102A	40GHz Radiated Cable	4/26/2016	Annual	4/26/2017	251425001
PCTEST	-	EMC Switch System	7/11/2016	Annual	7/11/2017	NM1
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	7/27/2016	Annual	7/27/2017	103200
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	5/7/2016	Annual	5/7/2017	100040
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 9 of 18

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMG9500
 Method/System: Low Power Communications Device Transmitter (DXX)
 Number of Channels: 79

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.249(a)(e)	Fundamental Field Strength Level	< 50 mV/m	Radiated	PASS	Section 7.2
15.249(a)(e)	Harmonic Field Strength Level	< 500 μ V/m		PASS	Section 7.2
15.205, 15.209, 15.249(d)(e)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< 15.209 limits or 50dB below the level of the fundamental		PASS	Sections 7.2, 7.3

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.1.5.

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 10 of 18

7.2 Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e)

Frequency	Field Strength [$\mu\text{V/m}$]	Measured Distance [Meters]
0.009 – 0.490 MHz	2400/F (kHz)	300
0.490 – 1.705 MHz	24000/F (kHz)	30
1.705 – 30.00 MHz	30	30
30.00 – 88.00 MHz	100	3
88.00 – 216.0 MHz	150	3
216.0 – 960.0 MHz	200	3
Above 960.0 MHz	500	3

Table 7-2. Radiated Limits

Test Setup

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

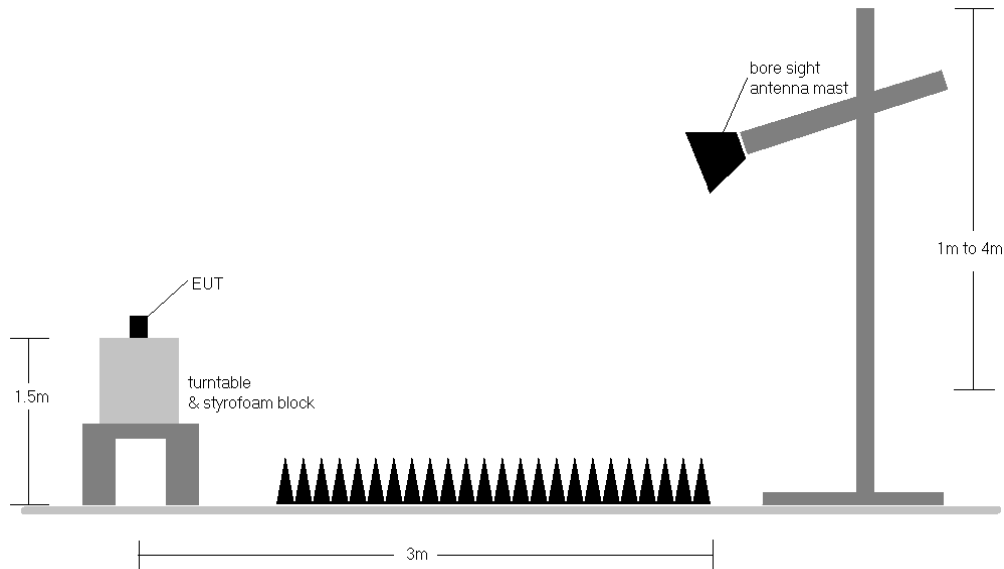


Figure 7-1. Radiated Test Setup

FCC ID: A3LSMG9500	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 11 of 18

Sample Calculation

- Avg. Field Strength Level $_{[dB\mu V/m]} = \text{Analyzer Level }_{[dBm]} + 107 + \text{AFCL }_{[dB/m]} + \text{Duty Cycle Correction }_{[dB]}$
- Pk. Field Strength Level $_{[dB\mu V/m]} = \text{Analyzer Level }_{[dBm]} + 107 + \text{AFCL }_{[dB/m]}$
- $\text{AFCL }_{[dB/m]} = \text{Antenna Factor }_{[dB/m]} + \text{Cable Loss }_{[dB]}$
- $\text{Margin }_{[dB]} = \text{Field Strength Level }_{[dB\mu V/m]} - \text{Limit }_{[dB\mu V/m]}$

Test Notes

1. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. There were no non-harmonic emissions detected whose levels were within 20dB of the applicable limits so only harmonic emissions data is shown in this section.
2. All emissions lying in restricted bands specified in §15.205 are below the limit shown in Table 7-2. Per 15.249(d), the radiated emissions limits from 15.209 were used since they were less than the limit of 50dB of attenuation from the measured fundamental field strength level.
3. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz.
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. This unit was tested with its standard battery.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
7. Based on proposed EUT changes in this C2PC filing, the only emissions reported are those found to be the worst-case emissions from preliminary scans.

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 12 of 18

Radiated Spurious Emission Measurements

\$15.205 \$15.209 \$15.249 (d)(e)

Worst Case Mode: ANT+ (non-hopping)
 Measurement Distance: 3 Meters
 Operating Frequency: 2441MHz
 Channel: 19

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4882.00	Peak	H	-	-	-57.92	1.31	50.39	-46.42	3.97	53.98	-50.01
4882.00	Peak	H	-	-	-57.92	1.31	50.39	0.00	50.39	73.98	-23.59
7323.00	Peak	H	-	-	-58.88	9.84	57.96	-46.42	11.54	53.98	-42.44
7323.00	Peak	H	-	-	-58.88	9.84	57.96	0.00	57.96	73.98	-16.02
12205.00	Peak	H	-	-	-60.48	16.59	63.11	-46.42	16.69	53.98	-37.29
12205.00	Peak	H	-	-	-60.48	16.59	63.11	0.00	63.11	73.98	-10.87

Table 7-3. Radiated Measurements

Worst Case Mode: ANT+ (non-hopping)
 Measurement Distance: 3 Meters
 Operating Frequency: 2441MHz
 Channel: 19

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4882.00	Peak	H	-	-	-58.17	1.31	50.14	-46.42	3.72	53.98	-50.26
4882.00	Peak	H	-	-	-58.17	1.31	50.14	0.00	50.14	73.98	-23.84
7323.00	Peak	H	-	-	-58.86	9.84	57.98	-46.42	11.56	53.98	-42.42
7323.00	Peak	H	-	-	-58.86	9.84	57.98	0.00	57.98	73.98	-16.00
12205.00	Peak	H	-	-	-59.61	16.59	63.98	-46.42	17.56	53.98	-36.42
12205.00	Peak	H	-	-	-59.61	16.59	63.98	0.00	63.98	73.98	-10.00

Table 7-4. Radiated Measurements with WCP

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 13 of 18

7.3 Radiated Restricted Band Edge Measurements

\$15.205 \$15.209 \$15.249 (d)

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting. Two different amplitude offsets were used depending on whether peak or average measurements were measured. The average measurements use a duty cycle correction factor (DCCF).

The amplitude offset shown in the following plots for average measurements was calculated using the formula:

$$\text{Offset (dB)} = (\text{Antenna Factor} + \text{Cable Loss}) - \text{Preamplifier Gain} + \text{DCCF}$$

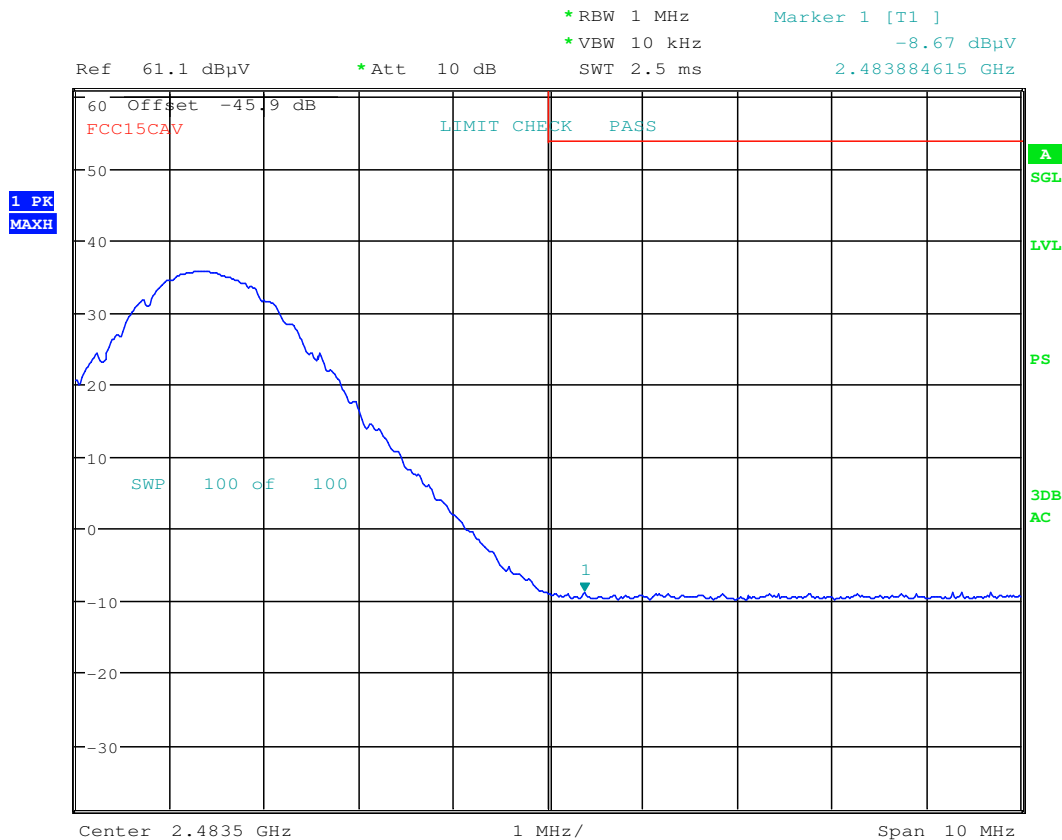
Worst Case Mode: ANT+ (non-hopping)

Measurement Distance: 3 Meters

Operating Frequency: 2480MHz

Back Cover: Standard

Channel: 78



Date: 18.APR.2017 19:38:11

Plot 7-1. Radiated Restricted Upper Band Edge Measurement (Average)

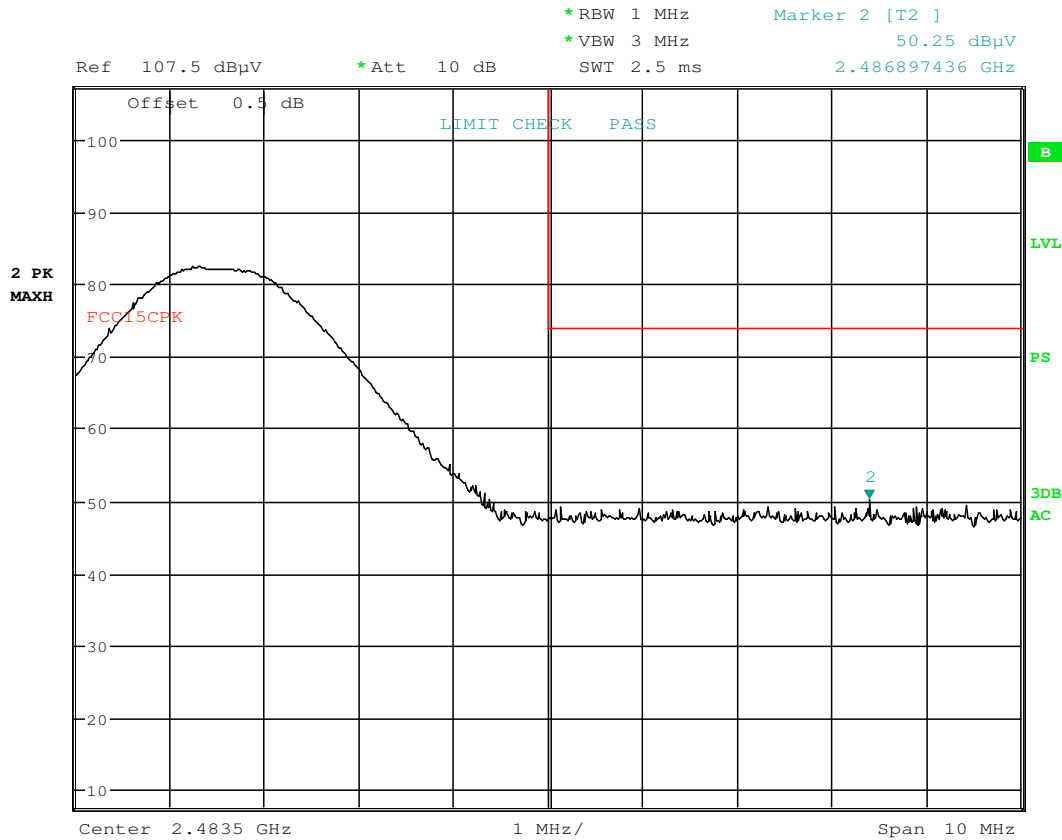
FCC ID: A3LSMG9500	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 14 of 18

Radiated Restricted Band Edge Measurements

§15.205 §15.209 §15.249 (d)

The amplitude offset shown in the following plots for peak measurements was calculated using the formula:

$$\text{Offset (dB)} = (\text{Antenna Factor} + \text{Cable Loss}) - \text{Preamplifier Gain}$$



Date: 18.APR.2017 19:38:54

Plot 7-2. Radiated Restricted Upper Band Edge Measurement (Peak)

FCC ID: A3LSMG9500	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 15 of 18

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V 6.3

03/24/2017

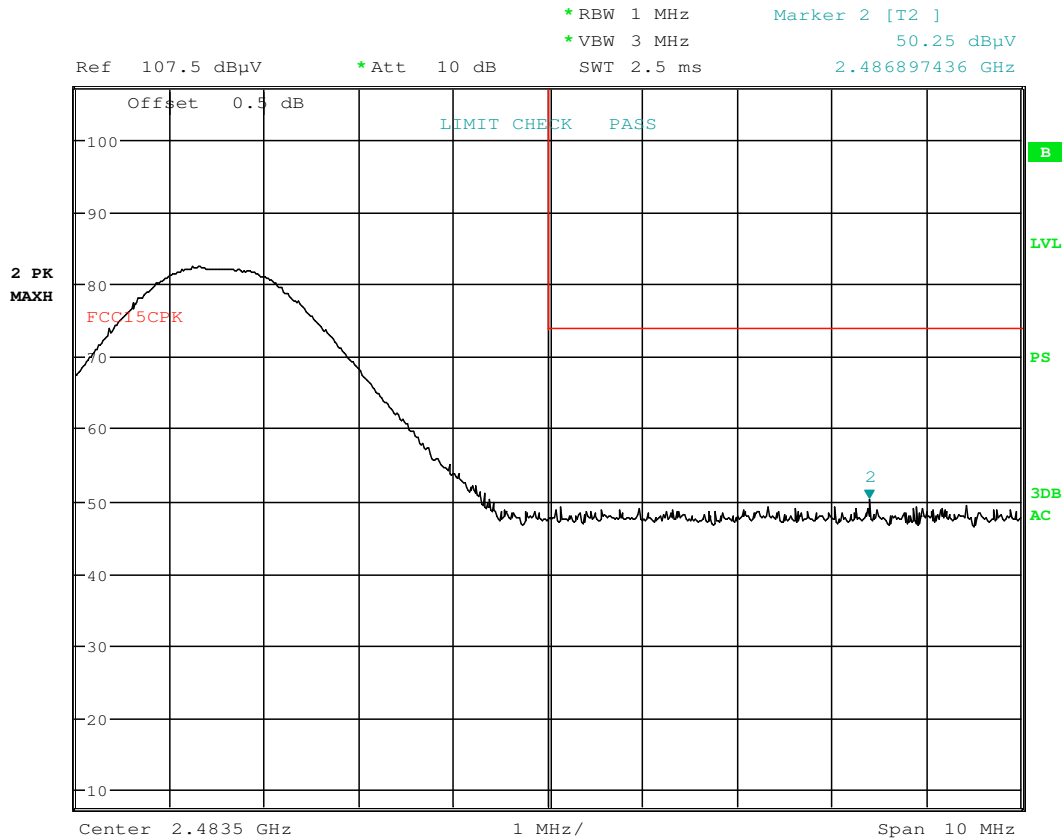
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Radiated Restricted Band Edge Measurements

§15.205 §15.209 §15.249 (d)

The amplitude offset shown in the following plots for peak measurements was calculated using the formula:

$$\text{Offset (dB)} = (\text{Antenna Factor} + \text{Cable Loss}) - \text{Preamplifier Gain}$$



Date: 18.APR.2017 19:38:54

Plot 7-4. Radiated Restricted Upper Band Edge Measurement with WCP (Peak)

FCC ID: A3LSMG9500	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 17 of 18

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V 6.3

03/24/2017

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG9500** is in compliance with Part 15 Subpart C (15.249) of the FCC Rules.

FCC ID: A3LSMG9500		FCC Pt. 15.249 ANT+ TEST REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M1703080095-09.A3L	Test Dates: 4/12 - 4/24/2017	EUT Type: Portable Handset		Page 18 of 18