

PCTEST ENGINEERING LABORATORY, INC.

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MEASUREMENT REPORT FCC PART 15.247 WLAN 802.11b/g/n

#### **Applicant Name:**

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 10/25/2019 - 01/14/2020 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M1911140188-07.A3L

## FCC ID:

#### A3LSMF700F

APPLICANT:

## Samsung Electronics Co., Ltd.

Application Type: Model: Additional Model(s): EUT Type: Frequency Range: FCC Classification: FCC Rule Part(s): Test Procedure(s): Certification SM-F700F SM-F700F/DS, SCV47 Portable Handset 2412 – 2472MHz Digital Transmission System (DTS) Part 15 Subpart C (15.247) ANSI C63.10-2013, KDB 558074 D01 v05r02, KDB 662911 D01 v02r01, KDB 648474 D03 v01r04

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 and KDB 558074 D01 v05r02. 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: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 1 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 1 of 103
© 2020 PCTEST Engineering Lab	oratory, Inc.	•		V 9.0 02/01/2019

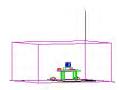


# TABLE OF CONTENTS

1.0	INTRO	DUCT	10N	4
	1.1	Scope		4
	1.2	PCTE	ST Test Location	4
	1.3	Test F	acility / Accreditations	4
2.0	PROD	DUCT II	NFORMATION	5
	2.1	Equipr	nent Description	5
	2.2	Device	Capabilities	5
	2.3	Test C	onfiguration	6
	2.4	EMI S	uppression Device(s)/Modifications	7
3.0	DESC	RIPTIC	DN OF TESTS	8
	3.1	Evalua	tion Procedure	8
	3.2	AC Lin	e Conducted Emissions	8
	3.3	Radiat	ed Emissions	9
	3.4	Enviro	nmental Conditions	9
4.0	ANTE	NNA R	EQUIREMENTS	10
5.0	MEAS	SUREM	ENT UNCERTAINTY	11
6.0	TEST	EQUIF	MENT CALIBRATION DATA	12
7.0	TEST	RESU	LTS	13
	7.1	Summ	ary	13
	7.2	6dB Ba	andwidth Measurement	14
	7.3	Output	Power Measurement	25
	7.4	Power	Spectral Density	29
	7.5	Condu	cted Emissions at the Band Edge	41
	7.6	Condu	cted Spurious Emissions	58
	7.7	Radiat	ed Spurious Emission Measurements – Above 1 GHz	66
		7.7.1	SISO Antenna-1 Radiated Spurious Emission Measurements	.69
		7.7.2	SISO Antenna-2 Radiated Spurious Emission Measurements	.73
		7.7.3	MIMO/CDD Radiated Spurious Emission Measurements	.77
		7.7.4	SISO Antenna-1 Radiated Restricted Band Edge Measurements	.81
			SISO Antenna-2 Radiated Restricted Band Edge Measurements	
			MIMO Radiated Restricted Band Edge Measurements	
	7.8		ed Spurious Emissions Measurements – Below 1GHz	
	7.9		onducted Test Data	
8.0	CONC	CLUSIC	DN1	03

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 2 of 103
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 2 01 103
© 2020 PCTEST Engineering Labora	atory, Inc.			V 9.0 02/01/2019





# **MEASUREMENT REPORT**



			A	NT1			A	VT2			MI	MO	
	Tri Francisco a	Avg Cor	nducted	Peak Co	nducted	Avg Co	nducted	Peak Co	onducted	Avg Cor	nducted	Peak Co	nducted
Mode	Tx Frequency (MHz)	Max. Power (mW)	Max. Power (dBm)										
802.11b	2412 - 2472	155.597	21.92	255.859	24.08	157.036	21.96	263.027	24.20		N	/A	
802.11g	2412 - 2472	157.943	21.99	431.519	26.35	157.580	21.98	461.318	26.64	315.500	24.99	893.305	29.51
802.11n	2412 - 2472	152.405	21.83	429.536	26.33	157.761	21.98	493.174	26.93	310.456	24.92	914.113	29.61
					FUT	Overvie	w						



FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 2 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 3 of 103
© 2020 PCTEST Engineering Lab	poratory, Inc.	•		V 9.0 02/01/2019



## 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 Innovation, Science and Economic Development Canada.

## 1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

#### **1.3** Test Facility / Accreditations Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 4 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 4 of 103
© 2020 PCTEST Engineering Lab	poratory Inc			V 9 0 02/01/2019



## 2.0 **PRODUCT INFORMATION**

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF700F**. The test data contained in this report pertains only to the emissions due to the EUT's WLAN (DTS) transmitter.

Test Device Serial No.: 0532M, 0542M, 0498M

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, ANT+, Wireless Power Transfer

Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	12	2467
6	2437	13	2472
7	2442		

 Table 2-1. Frequency/ Channel Operations

**Note:** The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section 6.0 b) of ANSI C63.10-2013 and KDB 558074 D01 v05r02. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

	Maximum	n Achievable D	uty Cycles	
002 11 14	ada /David		Duty Cycle [%]	
802.11 M	ode/Band	ANT1	ANT2	ΜΙΜΟ
	b	99.1	99.0	N/A
2.4GHz	g	97.5	97.6	98.4
	n	97.5	97.5	95.6

Table 2-2. Measured Duty Cycles
---------------------------------

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga E of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 5 of 103
© 2020 PCTEST Engineering Lab	poratory. Inc.	•		V 9.0 02/01/2019



The device employs MIMO technology. Below are the possible configurations.

	igurationa	SIS	SO	SE	DM	CC	D
WIFI COIII	figurations	ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
	11b	$\checkmark$	$\checkmark$	×	×	×	×
2.4GHz	11g	$\checkmark$	✓	×	×	✓	$\checkmark$
	11n	$\checkmark$	$\checkmark$	✓	$\checkmark$	×	×

Table 2-3. Frequency / Channel Operations
---

 $\checkmark$  = Support ; \* = NOT Support SISO = Single Input Single Output SDM = Spatial Diversity Multiplexing – MIMO function CDD = Cyclic Delay Diversity - 2Tx Function

 Data Rates Supported:
 1Mbps, 2Mbps, 5.5Mbps, 11Mbps (b)

 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps (g)

 6.5/7.2Mbps, 13/14.4Mbps, 19.5/21.7Mbps, 26/28.9Mbps, 39/43.3Mbps, 52/57.8Mbps, 58.5/65Mbps, 65/72.2Mbps (n)

 13/14.4Mbps, 26/28.9Mbps, 39/43.3Mbps, 52/57.8Mbps, 78/86.7Mbps, 104/115.6Mbps, 117/130Mbps, 130/144.4Mbps (MIMO n)

This device supports simultaneous transmission operation, which allows for two SISO channels to operate independent of one another in the 2.4GHz and 5GHz bands simultaneously on each antenna. The following tables show the worst case configurations determined during testing. The data for these configurations is contained in the UNII test report.

**Configuration 1:** ANT1 transmitting in 2.4GHz mode and ANT2 in 5GHz mode

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1	2
Channel	6	157
Operating Frequency (MHz)	2437	5785
Data Rate (Mbps)	1	6.5/7.2
Mode	b	n

Table 2-4. Config-1 (ANT1 2.4GHz & ANT2 5GHz)

### 2.3 Test Configuration

The EUT was tested per the guidance of KDB 558074 D01 v05r02. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing. See Sections 3.2 for AC line conducted emissions test setups, 3.3 for radiated emissions test setups, and 7.2, 7.3, 7.4, 7.5, and 7.6 for antenna port conducted 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 an authorized wireless charging pad (WCP) Model: EP-N5100 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 6 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 6 of 103
© 2020 PCTEST Engineering Lat	poratory Inc			V 9 0 02/01/2019



The EUT is capable of operating in folded closed and unfolded open configurations. The worst-case configuration for radiated emissions was determined from open and closed configurations in X, Y, and Z orientations for horizontal and vertical antenna polarizations. 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/or no modifications were made during testing.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega Z of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 7 of 103
© 2020 PCTEST Engineering Labor	atory, Inc.	•		V 9.0 02/01/2019



## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 558074 D01 v05r02 were used in the measurement of the EUT.

Deviation from measurement procedure.....None

## 3.2 AC Line Conducted Emissions

The line-conducted facility is located inside a 10'x16'x9' shielded enclosure. The shielded enclosure is manufactured by ETS Lindgren RF Enclosures. The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-5. A 1m x 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz,  $50\Omega/50\mu$ H Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. The external power line filter is an ETS Lindgren Model LPRX-4X30 (100dB Attenuation, 14kHz-18GHz) and the two EMI/RFI filters are ETS Lindgren Model LRW-2030-S1 (100dB Minimum Insertion Loss, 14kHz – 10GHz). These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply line(s) will be connected to the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference groundplane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions is used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

Line conducted emissions test results are shown in Section 7.9. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 8 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 8 of 103
© 2020 PCTEST Engineering Labo	ratory Inc	•		V 0 0 02/01/2010



## 3.3 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with 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. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal 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 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.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

### 3.4 Environmental Conditions

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

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 0 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 9 of 103
© 2020 PCTEST Engineering Lab	oratory Inc	•		V 9 0 02/01/2019

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## 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 connections to an external antenna.

#### **Conclusion:**

The EUT unit complies with the requirement of §15.203.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 10 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 10 of 103
© 2020 PCTEST Engineering Lab	oratory Inc			V 9 0 02/01/2019



## 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 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 (±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: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 11 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 11 of 103
© 2020 PCTEST Engineering Lab	poratory. Inc.	•		V 9.0 02/01/2019



## 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 C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	WL25-1	Conducted Cable Set (25GHz)	6/5/2019	Annual	6/5/2020	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	6/3/2019	Annual	6/3/2020	WL25-2
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
Agilent	N9020A	MXA Signal Analyzer	4/20/2019	Annual	4/20/2020	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	5/10/2019	Annual	5/10/2020	441112
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	6/7/2018	Triennial	6/7/2021	9203-2178
Emco	3160-09	Small Horn (18 - 26.5GHz)	8/9/2018	Biennial	8/9/2020	00135427
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	6/18/2018	Biennial	6/18/2020	114451
Keysight Technologies	N9020A	MXA Signal Analyzer	4/29/2019	Annual	4/29/2020	MY54500644
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	6/3/2019	Annual	6/3/2020	NMLC-2
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

FCC ID: A3LSMF700F				Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 12 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 12 of 103
© 2020 PCTEST Engineering Lab	oratory Inc			V 9 0 02/01/2019



## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: <u>Samsung Electronics Co., Lt</u>
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FCC ID: <u>A3LSMF700F</u>

FCC Classification: Digital Transmission System (DTS)

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.247(a)(2)	RSS-247 [5.2]	6dB Bandwidth	> 500kHz		PASS	Section 7.2
15.247(b)(3)	RSS-247 [5.4]	Transmitter Output Power < 1 Watt			PASS	Sections 7.3
15.247(e)	RSS-247 [5.2]	Transmitter Power Spectral Density	2 8dBm / 3kHz Band		PASS	Section 7.4
15.247(d)	RSS-247 [5.5]	Band Edge / Out-of-Band Emissions	≥ 20dBc		PASS	Sections 7.5, 7.6
15.205 15.209	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS-Gen [8.9])	RADIATED	PASS	Sections 7.7, 7.8
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen[8.8])	LINE CONDUCTED	PASS	Section 7.9

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 shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer 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 and attenuators.
- 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 "WLAN Automation," Version 3.5.
- 5) 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 1.3.1.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 12 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 13 of 103
© 2020 PCTEST Engineering Laboratory. Inc.				V 9.0 02/01/2019



#### 7.2 6dB Bandwidth Measurement §15.247(a.2); RSS-247 [5.2]

#### **Test Overview and Limit**

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the transmitter 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 and the worst case configuration results are reported in this section.

#### The minimum permissible 6dB bandwidth is 500 kHz.

#### **Test Procedure Used**

ANSI C63.10-2013 – Section 11.8.2 Option 2 KDB 558074 D01 v05r02 – Section 8.2

#### Test Settings

- 1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
- 2. RBW = 100kHz
- 3. VBW  $\geq$  3 x RBW
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep = auto couple
- 7. The trace was allowed to stabilize

#### 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: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 14 of 103
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### SISO Antenna-1 6 dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	b	1	8.612	0.500
2437	6	b	1	9.091	0.500
2462	11	b	1	9.041	0.500
2412	1	g	6	15.74	0.500
2437	6	g	6	15.66	0.500
2462	11	g	6	15.50	0.500
2412	1	n	6.5/7.2 (MCS0)	16.13	0.500
2437	6	n	6.5/7.2 (MCS0)	16.04	0.500
2462	11	n	6.5/7.2 (MCS0)	15.49	0.500

Table 7-2. Conducted Bandwidth Measurements SISO ANT1



Plot 7-1. 6dB Bandwidth Plot SISO ANT1 (802.11b - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 15 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 15 of 103
© 2020 PCTEST Engineering Labor	V 9.0 02/01/2019			





Plot 7-2. 6dB Bandwidth Plot SISO ANT1 (802.11b - Ch. 6)



Plot 7-3. 6dB Bandwidth Plot SISO ANT1 (802.11b - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 16 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 16 of 103
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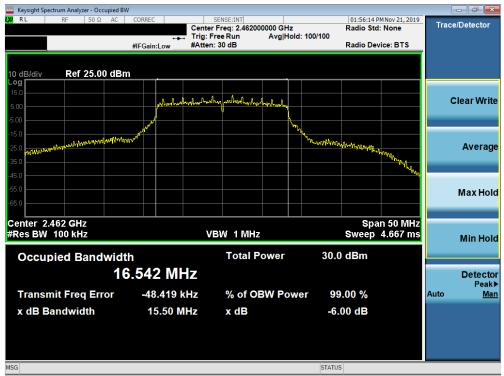




Plot 7-5. 6dB Bandwidth Plot SISO ANT1 (802.11g - Ch. 6)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 17 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 17 of 103
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019			





Plot 7-6. 6dB Bandwidth Plot SISO ANT1 (802.11g - Ch. 11)



Plot 7-7. 6dB Bandwidth Plot SISO ANT1 (802.11n (2.4GHz) – Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 19 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 18 of 103
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019			





Plot 7-8. 6dB Bandwidth Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 6)



Plot 7-9. 6dB Bandwidth Plot SISO ANT1 (802.11n (2.4GHz) – Ch. 11)

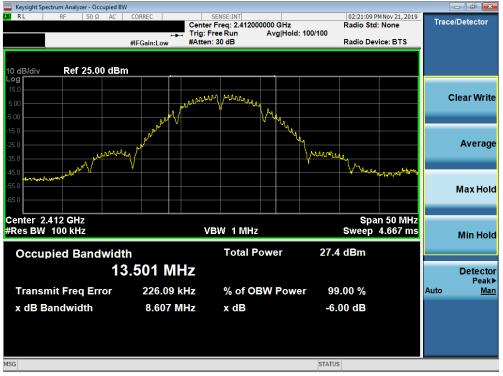
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 10 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset	Page 19 of 103
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019		



### SISO Antenna-2 6 dB Bandwidth Measurements

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]
2412	1	b	1	8.607	0.500
2437	6	b	1	8.603	0.500
2462	11	b	1	8.592	0.500
2412	1	g	6	14.82	0.500
2437	6	g	6	15.74	0.500
2462	11	g	6	15.20	0.500
2412	1	n	6.5/7.2 (MCS0)	16.00	0.500
2437	6	n	6.5/7.2 (MCS0)	16.11	0.500
2462	11	n	6.5/7.2 (MCS0)	16.13	0.500

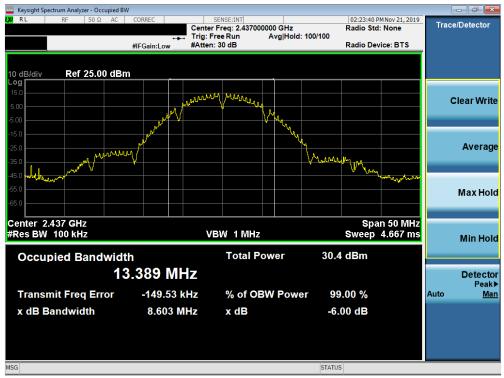
Table 7-3. Conducted Bandwidth Measurements SISO ANT1



Plot 7-10. 6dB Bandwidth Plot SISO ANT1 (802.11b - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 20 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 20 of 103
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Plot 7-12. 6dB Bandwidth Plot SISO ANT1 (802.11b - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 21 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 21 of 103
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019			





Plot 7-13. 6dB Bandwidth Plot SISO ANT1 (802.11g - Ch. 1)



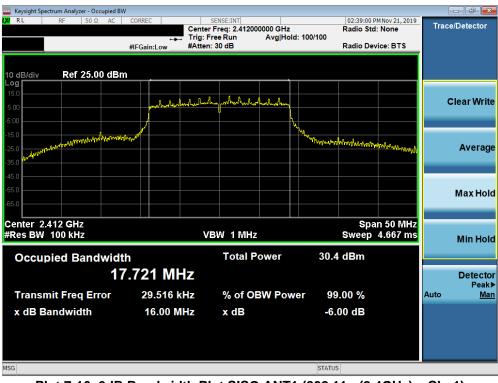
Plot 7-14. 6dB Bandwidth Plot SISO ANT1 (802.11g - Ch. 6)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 22 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 22 of 103
© 2020 PCTEST Engineering Labo	V 9.0 02/01/2019			





Plot 7-15. 6dB Bandwidth Plot SISO ANT1 (802.11g - Ch. 11)



Plot 7-16. 6dB Bandwidth Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 22 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset	Page 23 of 103
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019		





Plot 7-17. 6dB Bandwidth Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 6)



Plot 7-18. 6dB Bandwidth Plot SISO ANT1 (802.11n (2.4GHz) – Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 24 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 24 of 103
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019			



#### 7.3 Output Power Measurement §15.247(b.3); RSS-247 [5.4]

#### **Test Overview and Limits**

A transmitter antenna terminal of EUT is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

#### The maximum permissible conducted output power is 1 Watt.

#### **Test Procedure Used**

ANSI C63.10-2013 – Section 11.9.1.3 PKPM1 Peak Power Method KDB 558074 D01 v05r02 – Section 8.3.1.3 PKPM1 Peak-reading Power Meter Method ANSI C63.10-2013 – Section 11.9.2.3.2 Method AVGPM-G KDB 558074 D01 v05r02 – Section 8.3.2.3 Measurement using a Power Meter (PM) ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique KDB 662911 D01 v02r01 – Section E)1) Measure-and-Sum Technique

#### **Test Settings**

#### Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

#### Method AVGPM-G (Average Power Measurement)

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

#### Test Setup

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



#### Figure 7-2. Test Instrument & Measurement Setup for Power Meter Measurements

#### Test Notes

#### None

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 25 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 25 of 103
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019			



	Freq [MHz]	Channel	Detector	IEEE Transmission Mode				Conducted Power Limit	Conducted Power
				802.11b	802.11g	802.11n	[dBm]	Margin [dB]	
	2412	1	AVG	21.89	16.19	16.11	30.00	-8.11	
			PEAK	24.08	21.19	21.19	30.00	-5.92	
	2417	2	AVG	21.56	21.97	21.73	30.00	-8.03	
			PEAK	23.98	26.30	26.25	30.00	-3.70	
	2437	6	AVG	21.92	21.99	21.83	30.00	-8.02	
N			PEAK	23.71	26.35	26.33	30.00	-3.65	
Ï	2447	8	AVG		21.82	21.67	30.00	-8.18	
2.4GHz			PEAK		26.21	26.14	30.00	-3.79	
4	2452	9	AVG		20.86	20.65	30.00	-9.14	
• •			PEAK		26.11	26.09	30.00	-3.89	
	2457	10	AVG		19.47	19.32	30.00	-10.53	
			PEAK		24.38	24.45	30.00	-5.55	
	2462	11	AVG	21.66	18.49	18.39	30.00	-8.34	
			PEAK	23.98	23.48	23.48	30.00	-6.02	
	2467	12	AVG	20.85	16.10	16.45	30.00	-9.15	
			PEAK	23.22	21.08	21.59	30.00	-6.78	
	2472	13	AVG	15.81	12.65	12.51	30.00	-14.19	
			PEAK	18.04	17.55	17.61	30.00	-11.96	

Table 7-4. Conducted Output Power Measurements SISO ANT1

Freq [MHz]	Channel	Detector	IEEE Transmission Mode		Conducted Power Limit	Conducted Power	
			802.11b	802.11g	802.11n	[dBm]	Margin [dB]
2412	1	AVG	21.67	16.29	16.10	30.00	-8.33
		PEAK	24.05	21.42	21.30	30.00	-5.95
2417	2	AVG	21.51	21.67	21.95	30.00	-8.05
		PEAK	23.88	26.60	26.93	30.00	-3.07
2437	6	AVG	21.96	21.98	21.98	30.00	-8.02
		PEAK	24.20	26.64	25.98	30.00	-3.36
2447	8	AVG		21.77	21.86	30.00	-8.14
		PEAK		26.11	26.15	30.00	-3.85
2452	9	AVG		20.53	20.78	30.00	-9.22
		PEAK		25.13	26.27	30.00	-3.73
2457	10	AVG		19.26	19.11	30.00	-10.74
		PEAK		24.28	24.31	30.00	-5.69
2462	11	AVG	21.69	18.30	18.22	30.00	-8.31
		PEAK	24.05	23.48	23.52	30.00	-5.95
2467	12	AVG	20.84	16.04	16.22	30.00	-9.16
		PEAK	23.29	21.07	21.41	30.00	-6.71
2472	13	AVG	15.51	12.91	12.76	30.00	-14.49
		PEAK	17.81	17.84	17.85	30.00	-12.15
	2412 2417 2417 2437 2447 2447 2452 2452 2457 2462 2462 2462	2412       1         2417       2         2417       2         2437       6         2437       6         2447       8         2452       9         2452       9         2457       10         2462       11         2467       12         2472       13	2412       1       AVG         2412       1       AVG         2417       2       AVG         2417       2       AVG         2417       2       AVG         2437       6       AVG         2437       6       AVG         2437       8       AVG         2437       8       AVG         2447       8       AVG         2447       8       AVG         2452       9       AVG         2452       9       AVG         2452       9       AVG         PEAK       2457       10       AVG         2457       10       AVG         PEAK       2462       11       AVG         2462       11       AVG       PEAK         2467       12       AVG       PEAK         2467       13       AVG       PEAK         2472       13       AVG       PEAK	Freq [MHz]         Channel         Detector           2412         1         AVG         21.67           2412         1         AVG         21.67           2417         2         AVG         21.67           2417         2         AVG         21.51           2417         2         AVG         21.51           2417         2         AVG         21.51           2417         6         AVG         21.96           2437         6         AVG         21.96           2437         6         AVG         21.96           2447         8         AVG         24.20           2447         8         AVG         24.20           2447         8         AVG         24.20           2447         8         AVG         24.20           2457         9         AVG         24.20           2457         10         AVG         21.69           2462         11         AVG         21.69           2462         11         AVG         21.69           2467         12         AVG         20.84           2467         12         AVG <th>Freq [MHz]         Channel         Detector         802.11b         802.11g           2412         1         AVG         21.67         16.29           2412         1         AVG         21.67         16.29           2417         2         AVG         21.67         16.29           2417         2         AVG         21.51         21.42           2417         2         AVG         21.51         21.67           2417         2         AVG         21.51         21.67           2417         2         AVG         21.51         21.67           2417         6         AVG         21.91         21.67           2437         6         AVG         21.96         21.98           2447         8         AVG         24.20         26.64           2447         8         AVG         24.20         26.61           2457         9         AVG         20.53         20.53           2457         10         AVG         19.26         19.26           2462         11         AVG         21.69         18.30           2462         11         AVG         24.05         23.48<th>Freq [MHz]         Channel         Detector           2412         1         AVG         21.67         16.29         16.10           2412         1         AVG         21.67         16.29         16.10           2417         2         AVG         21.51         21.42         21.30           2417         2         AVG         21.51         21.67         21.95           2417         2         AVG         21.51         21.67         21.95           2437         6         AVG         21.96         21.98         21.98           2437         6         AVG         21.96         21.98         21.98           2437         6         AVG         21.96         21.98         21.98           2447         8         AVG         21.97         21.86           2447         8         AVG         20.53         20.78           2452         9         AVG         20.53         20.78           2457         10         AVG         19.26         19.11           2457         10         AVG         21.69         18.30         18.22           2462         11         AVG         21</th><th>Freq [MHz]         Channel         Detector         Itele transmission wode         Power Limit [dBm]           2412         1         AVG         21.67         16.29         16.10         30.00           2417         2         AVG         21.67         16.29         16.10         30.00           2417         2         AVG         21.51         21.42         21.30         30.00           2417         2         AVG         21.51         21.67         21.95         30.00           2417         2         AVG         21.51         21.67         21.95         30.00           2437         6         AVG         21.96         21.98         21.98         30.00           2437         6         AVG         21.96         21.98         30.00           2447         8         AVG         21.77         21.86         30.00           2447         8         AVG         20.53         20.78         30.00           2452         9         AVG         20.53         20.78         30.00           2457         10         AVG         19.26         19.11         30.00           2457         10         AVG         &lt;</th></th>	Freq [MHz]         Channel         Detector         802.11b         802.11g           2412         1         AVG         21.67         16.29           2412         1         AVG         21.67         16.29           2417         2         AVG         21.67         16.29           2417         2         AVG         21.51         21.42           2417         2         AVG         21.51         21.67           2417         2         AVG         21.51         21.67           2417         2         AVG         21.51         21.67           2417         6         AVG         21.91         21.67           2437         6         AVG         21.96         21.98           2447         8         AVG         24.20         26.64           2447         8         AVG         24.20         26.61           2457         9         AVG         20.53         20.53           2457         10         AVG         19.26         19.26           2462         11         AVG         21.69         18.30           2462         11         AVG         24.05         23.48 <th>Freq [MHz]         Channel         Detector           2412         1         AVG         21.67         16.29         16.10           2412         1         AVG         21.67         16.29         16.10           2417         2         AVG         21.51         21.42         21.30           2417         2         AVG         21.51         21.67         21.95           2417         2         AVG         21.51         21.67         21.95           2437         6         AVG         21.96         21.98         21.98           2437         6         AVG         21.96         21.98         21.98           2437         6         AVG         21.96         21.98         21.98           2447         8         AVG         21.97         21.86           2447         8         AVG         20.53         20.78           2452         9         AVG         20.53         20.78           2457         10         AVG         19.26         19.11           2457         10         AVG         21.69         18.30         18.22           2462         11         AVG         21</th> <th>Freq [MHz]         Channel         Detector         Itele transmission wode         Power Limit [dBm]           2412         1         AVG         21.67         16.29         16.10         30.00           2417         2         AVG         21.67         16.29         16.10         30.00           2417         2         AVG         21.51         21.42         21.30         30.00           2417         2         AVG         21.51         21.67         21.95         30.00           2417         2         AVG         21.51         21.67         21.95         30.00           2437         6         AVG         21.96         21.98         21.98         30.00           2437         6         AVG         21.96         21.98         30.00           2447         8         AVG         21.77         21.86         30.00           2447         8         AVG         20.53         20.78         30.00           2452         9         AVG         20.53         20.78         30.00           2457         10         AVG         19.26         19.11         30.00           2457         10         AVG         &lt;</th>	Freq [MHz]         Channel         Detector           2412         1         AVG         21.67         16.29         16.10           2412         1         AVG         21.67         16.29         16.10           2417         2         AVG         21.51         21.42         21.30           2417         2         AVG         21.51         21.67         21.95           2417         2         AVG         21.51         21.67         21.95           2437         6         AVG         21.96         21.98         21.98           2437         6         AVG         21.96         21.98         21.98           2437         6         AVG         21.96         21.98         21.98           2447         8         AVG         21.97         21.86           2447         8         AVG         20.53         20.78           2452         9         AVG         20.53         20.78           2457         10         AVG         19.26         19.11           2457         10         AVG         21.69         18.30         18.22           2462         11         AVG         21	Freq [MHz]         Channel         Detector         Itele transmission wode         Power Limit [dBm]           2412         1         AVG         21.67         16.29         16.10         30.00           2417         2         AVG         21.67         16.29         16.10         30.00           2417         2         AVG         21.51         21.42         21.30         30.00           2417         2         AVG         21.51         21.67         21.95         30.00           2417         2         AVG         21.51         21.67         21.95         30.00           2437         6         AVG         21.96         21.98         21.98         30.00           2437         6         AVG         21.96         21.98         30.00           2447         8         AVG         21.77         21.86         30.00           2447         8         AVG         20.53         20.78         30.00           2452         9         AVG         20.53         20.78         30.00           2457         10         AVG         19.26         19.11         30.00           2457         10         AVG         <

Table 7-5. Conducted Output Power Measurements SISO ANT2

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 26 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 26 of 103	
© 2020 PCTEST Engineering Labor	V 0 0 02/01/2010				



	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit	Conducted Power
				ANT1	ANT2	MIMO	[dBm]	Margin [dB]
	2412	1	AVG	16.11	16.10	19.12	30.00	-10.88
			PEAK	21.19	21.30	24.26	30.00	-5.74
	2417	2	AVG	21.73	21.95	24.85	30.00	-5.15
			PEAK	26.25	26.93	29.61	30.00	-0.39
	2437	6	AVG	21.83	21.98	24.92	30.00	-5.08
N			PEAK	26.33	25.98	29.17	30.00	-0.83
Ï	2447	8	AVG	21.67	21.86	24.78	30.00	-5.22
2.4GHz			PEAK	26.14	26.15	29.16	30.00	-0.84
7	2452	9	AVG	20.65	20.78	23.73	30.00	-6.27
N			PEAK	26.09	26.27	29.19	30.00	-0.81
	2457	10	AVG	19.32	19.11	22.23	30.00	-7.77
			PEAK	24.45	24.31	27.39	30.00	-2.61
	2462	11	AVG	18.39	18.22	21.32	30.00	-8.68
			PEAK	23.48	23.52	26.51	30.00	-3.49
	2467	12	AVG	16.45	16.22	19.35	30.00	-10.65
			PEAK	21.59	21.41	24.51	30.00	-5.49
	2472	13	AVG	12.51	12.76	15.65	30.00	-14.35
			PEAK	17.61	17.85	20.74	30.00	-9.26

Table 7-6. Conducted Output Power Measurements MIMO (802.11n)

	Freq [MHz]	Channel	Detector	Conducted Power [dBm]			Conducted Power Limit	Conducted Power
				ANT1	ANT2	MIMO	[dBm]	Margin [dB]
	2412	1	AVG	16.19	16.29	19.25	30.00	-10.75
			PEAK	21.19	21.42	24.32	30.00	-5.68
	2417	2	AVG	21.97	21.67	24.83	30.00	-5.17
			PEAK	26.3	26.60	29.46	30.00	-0.54
	2437	6	AVG	21.99	21.98	24.99	30.00	-5.01
N			PEAK	26.35	26.64	29.51	30.00	-0.49
2.4GHz	2447	8	AVG	21.82	21.77	24.81	30.00	-5.19
Ū			PEAK	26.21	26.11	29.17	30.00	-0.83
	2452	9	AVG	20.86	20.53	23.71	30.00	-6.29
N			PEAK	26.11	25.13	28.66	30.00	-1.34
	2457	10	AVG	19.47	19.26	22.38	30.00	-7.62
			PEAK	24.38	24.28	27.34	30.00	-2.66
	2462	11	AVG	18.49	18.30	21.41	30.00	-8.59
			PEAK	23.48	23.48	26.49	30.00	-3.51
	2467	12	AVG	16.1	16.04	19.08	30.00	-10.92
			PEAK	21.08	21.07	24.09	30.00	-5.91
	2472	13	AVG	12.65	12.91	15.79	30.00	-14.21
			PEAK	17.55	17.84	20.71	30.00	-9.29

Table 7-7. Conducted Output Power Measurements CDD (802.11g)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 27 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 27 of 103	
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Note:

Per ANSI C63.10-2013 and KDB 662911 D01 v02r01 Section E)1), the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

#### Sample MIMO Calculation:

At 2412MHz the average conducted output power was measured to be 21.98 dBm for Antenna-1 and 24.92 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(21.98 dBm + 24.92 dBm) = (157.76 mW + 310.46 mW) = 468.22 mW = 26.70 dBm

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 20 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	0 Portable Handset		Page 28 of 103
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#### 7.4 Power Spectral Density §15.247(e); RSS-247 [5.2]

#### **Test Overview and Limit**

The peak power density is 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 and the worst case configuration results are reported in this section.

#### The maximum permissible power spectral density is 8 dBm in any 3 kHz band.

#### **Test Procedure Used**

ANSI C63.10-2013 – Section 11.10.2 Method PKPSD KDB 558074 D01 v05r02 – Section 8.4 DTS Maximum Power Spectral Density level in the fundamental emission ANSI C63.10-2013 – Section 14.3.2.2 Measure-and-Sum Technique KDB 662911 D01 v02r01 – Section E)2) Measure-and-Sum Technique

#### **Test Settings**

- 1. Analyzer was set to the center frequency of the DTS channel under investigation
- 2. Span = 1.5 times the DTS channel bandwidth
- 3. RBW = 10kHz
- 4. VBW = 1MHz
- 5. Detector = peak
- 6. Sweep time = auto couple
- 7. Trace mode = max hold
- 8. 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

#### None

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 29 of 103	
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Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	b	1	4.92	8.00	-3.08	Pass
2437	6	b	1	4.79	8.00	-3.21	Pass
2462	11	b	1	5.07	8.00	-2.93	Pass
2412	1	g	6	3.63	8.00	-4.37	Pass
2437	6	g	6	3.12	8.00	-4.88	Pass
2462	11	g	6	-0.76	8.00	-8.76	Pass
2412	1	n	6.5/7.2 (MCS0)	3.19	8.00	-4.81	Pass
2437	6	n	6.5/7.2 (MCS0)	-1.06	8.00	-9.06	Pass
2462	11	n	6.5/7.2 (MCS0)	-0.64	8.00	-8.64	Pass

Table 7-8. Conducted Power Density Measurements SISO ANT1



Plot 7-19. Power Spectral Density Plot SISO ANT1 (802.11b - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 20 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 30 of 103
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019			





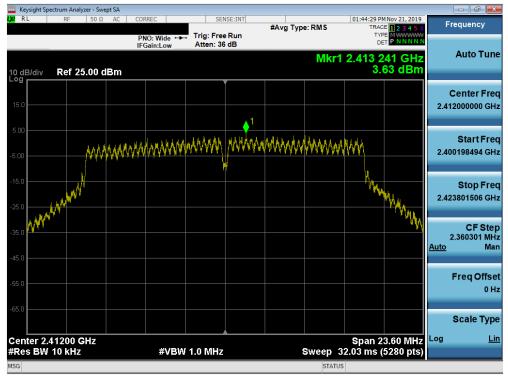
Plot 7-20. Power Spectral Density Plot SISO ANT1 (802.11b - Ch. 6)



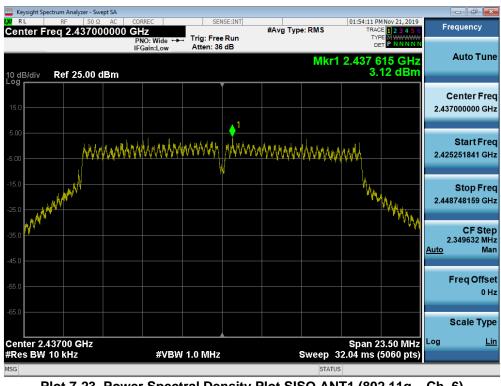
Plot 7-21. Power Spectral Density Plot SISO ANT1 (802.11b - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 21 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 31 of 103
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Plot 7-22. Power Spectral Density Plot SISO ANT1 (802.11g - Ch. 1)



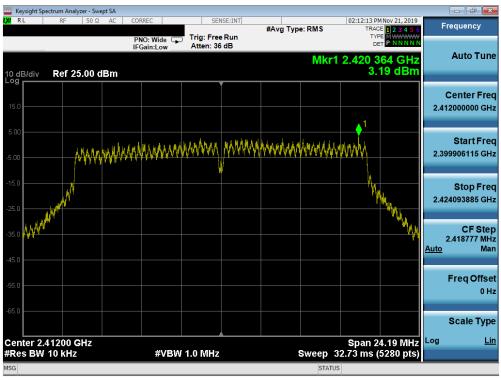


FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 22 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 32 of 103
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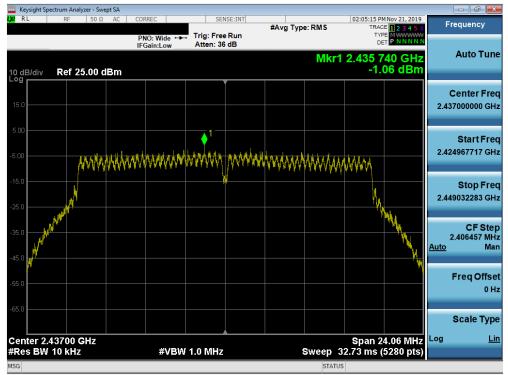
Plot 7-24. Power Spectral Density Plot SISO ANT1 (802.11g - Ch. 11)



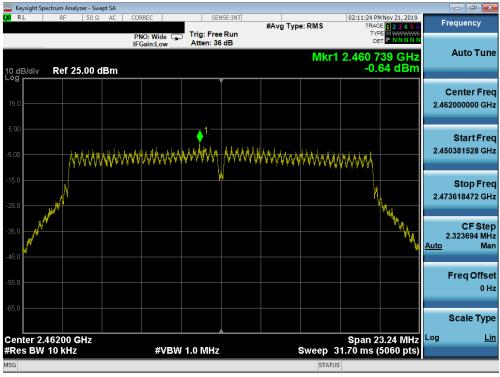
Plot 7-25. Power Spectral Density Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 22 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 33 of 103
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Plot 7-27. Power Spectral Density Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 24 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 34 of 103
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Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	Measured Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	b	1	2.67	8.00	-5.33	Pass
2437	6	b	1	4.95	8.00	-3.05	Pass
2462	11	b	1	4.63	8.00	-3.37	Pass
2412	1	g	6	-0.74	8.00	-8.74	Pass
2437	6	g	6	3.76	8.00	-4.24	Pass
2462	11	g	6	-2.29	8.00	-10.29	Pass
2412	1	n	6.5/7.2 (MCS0)	2.64	8.00	-5.36	Pass
2437	6	n	6.5/7.2 (MCS0)	4.17	8.00	-3.83	Pass
2462	11	n	6.5/7.2 (MCS0)	-1.69	8.00	-9.69	Pass

Table 7-9. Conducted Power Density Measurements SISO ANT2



Plot 7-28. Power Spectral Density Plot SISO ANT2 (802.11b - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 25 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 35 of 103
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019			





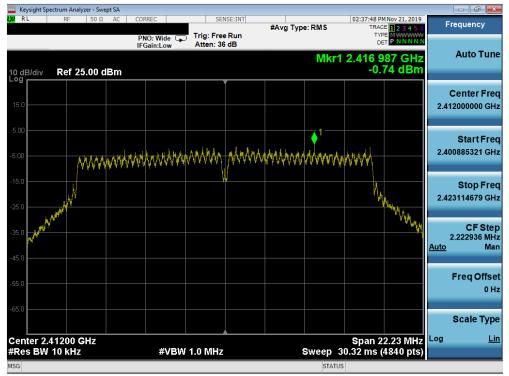
Plot 7-29. Power Spectral Density Plot SISO ANT2 (802.11b - Ch. 6)



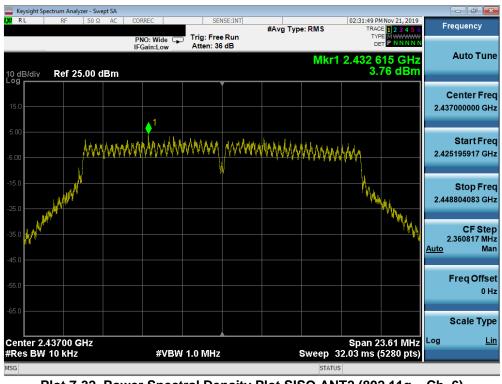


FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 26 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 36 of 103
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Plot 7-31. Power Spectral Density Plot SISO ANT2 (802.11g - Ch. 1)



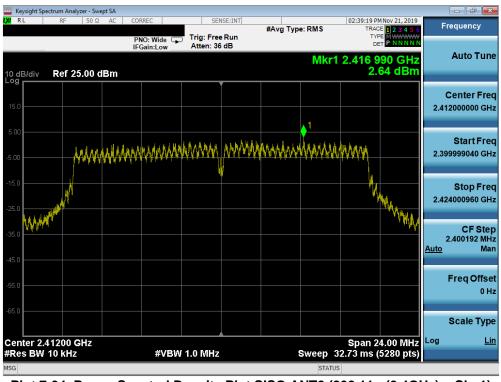


FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 27 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 37 of 103
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	ectrum Analyzer - Sw										
LX/IRL	RF 50 Ω	AC C	ORREC		NSE:INT	#Avg Typ	e: RMS	TRAC	MNov 21, 2019	Fre	equency
10 dB/div Log	Ref 25.00		PNO: Wide  Ģ FGain:Low	Trig: Free Atten: 36			Mkr1	DE 2.466 9	991 GHz 29 dBm		Auto Tune
15.0											enter Freq 000000 GHz
-5.00	MWA	MAN AN	rhwhww	www	//////	WWWW	↓¹ Mwww	WWW			Start Freq 599786 GHz
-15.0	a where we have a second se				¥			- W	м.,	2.473	Stop Freq 400214 GHz
-35.0									WWWWWWW	2. <u>Auto</u>	CF Step 280043 MHz Man
-55.0										F	req Offset 0 Hz
-65.0								0.000.0		S Log	Scale Type <u>Lin</u>
#Res BW	46200 GHz 10 kHz		#VBV	V 1.0 MHz			Sweep (	span 2 31.03 ms (	2.80 MHz 5060 pts)	209	<u> </u>
MSG							STATU				

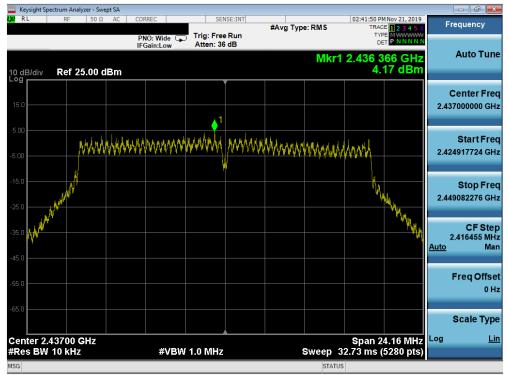
Plot 7-33. Power Spectral Density Plot SISO ANT2 (802.11g - Ch. 11)



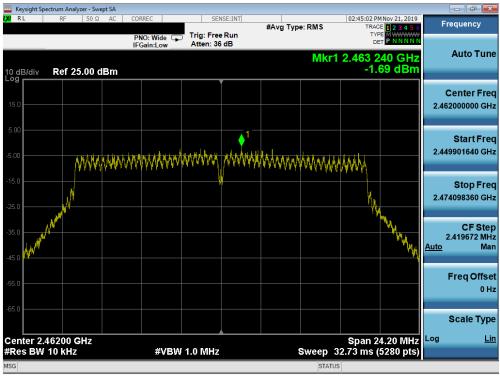
Plot 7-34. Power Spectral Density Plot SISO ANT2 (802.11n (2.4GHz) - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager					
Test Report S/N:	Test Dates:	EUT Type:		Dama 28 of 102					
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 38 of 103					
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Plot 7-36. Power Spectral Density Plot SISO ANT2 (802.11n (2.4GHz) - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 20 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 39 of 103
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### **CDD/MIMO Power Spectral Density Measurements**

Frequency [MHz]	Channel No.	802.11 Mode	Data Rate [Mbps]	ANT 1 Power Spectral Density [dBm]	ANT 2 Power Spectral Density [dBm]	Summed MIMO Power Spectral Density [dBm]	Maximum Permissible Power Density [dBm / 3kHz]	Margin [dB]	Pass / Fail
2412	1	g	6	3.63	-0.74	4.99	8.00	-3.01	Pass
2437	6	g	6	3.12	3.76	6.46	8.00	-1.54	Pass
2462	11	g	6	-0.76	-2.29	1.55	8.00	-6.45	Pass
2412	1	n	6.5/7.2 (MCS0)	3.19	2.64	5.94	8.00	-2.06	Pass
2437	6	n	6.5/7.2 (MCS0)	-1.06	4.17	5.31	8.00	-2.69	Pass
2462	11	n	6.5/7.2 (MCS0)	-0.64	-1.69	1.88	8.00	-6.12	Pass

Table 7-10. CDD/MIMO Conducted Power Density Measurements

#### Note:

Per ANSI C63.10-2013 Section 14.3.2.2 and KDB 662911 D01 v02r01 Section E)2), the power spectral density at Antenna 1 and Antenna 2 were first measured separately as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

#### Sample MIMO Calculation:

At 2412MHz the average conducted power spectral density was measured to be 3.19 dBm for Antenna-1 and 2.64 dBm for Antenna-2.

Antenna 1 + Antenna 2 = MIMO

(3.19 dBm + 2.64 dBm) = (2.08 mW + 1.84 mW) = 3.92 mW = 5.94 dBm

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dame 40 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 40 of 103
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# 7.5 Conducted Emissions at the Band Edge §15.247(d); RSS-247 [5.5]

#### **Test Overview and Limit**

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. For the following out of band conducted spurious emissions plots at the band edge, the EUT was set at a data rate of 1Mbps for "b" mode, 6 Mbps for "g" mode, 6.5/7.2Mbps for "n" mode as these settings produced the worst-case emissions.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure (Section 7.4).

#### **Test Procedure Used**

ANSI C63.10-2013 – Section 11.11.3 KDB 558074 D01 v05r02 – Section 8.7.2

#### **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 = 100kHz
- 4. VBW = 1MHz
- 5. Detector = Peak
- 6. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = max hold
- 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.



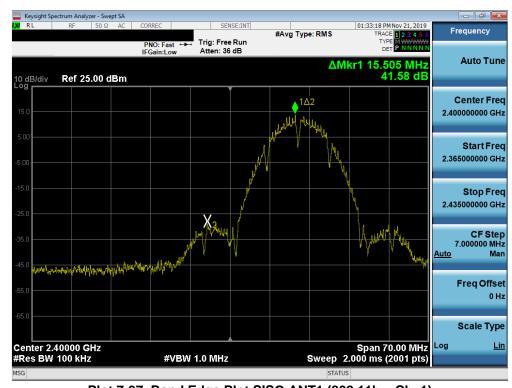
Figure 7-4. Test Instrument & Measurement Setup

#### Test Notes

#### None

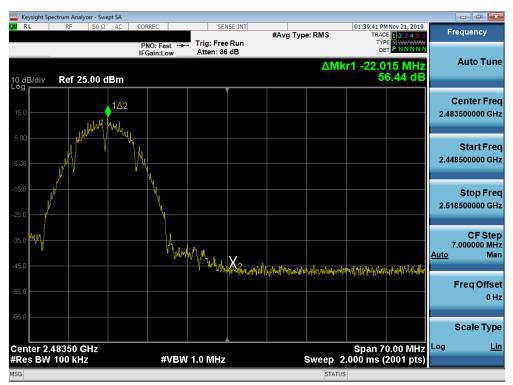
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 41 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 41 of 103
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# SISO Antenna-1 Conducted Emissions at the Band Edge





#### Plot 7-38. Band Edge Plot SISO ANT1 (802.11b - Ch. 11)

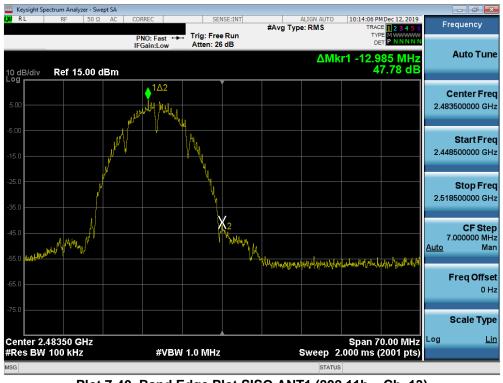
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 42 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 42 of 103
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Plot 7-39. Band Edge Plot SISO ANT1 (802.11b - Ch. 12)



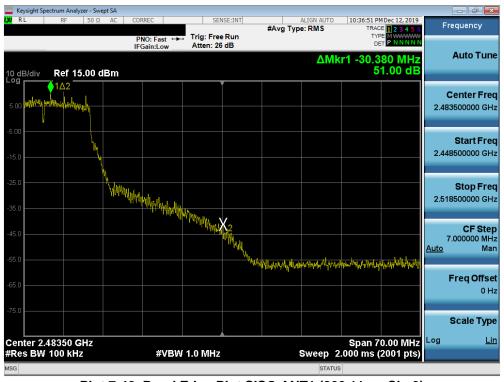
Plot 7-40. Band Edge Plot SISO ANT1 (802.11b - Ch. 13)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager					
Test Report S/N:	Test Dates:	EUT Type:		Dama 42 of 102					
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 43 of 103					
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Keysight Spectrum Analyzer - Swept SA					
X RL RF 50Ω AC	CORREC	SENSE:INT	#Avg Type: RMS	01:45:16 PM Nov 21, 2019 TRACE 1 2 3 4 5 6	Frequency
10 dB/div <b>Ref 25.00 dBm</b>	PNO: Fast ↔ IFGain:Low	Trig: Free Run Atten: 36 dB	ΔΜ	kr1 20.020 MHz 31.10 dB	Auto Tune
15.0			1∆2 مارامراسیا المانین ار	2	Center Freq 2.400000000 GHz
-5.00		physical sectors and the sector sectors and the sector sectors and the sector sectors and the sector sectors and the sectors a			Start Freq 2.365000000 GHz
-15.0	The second s	When the work		Marina and Marina	Stop Freq 2.435000000 GHz
-35.0	diptive after and a second				CF Step 7.000000 MHz <u>Auto</u> Man
-55.0					Freq Offset 0 Hz
65.0 Center 2.40000 GHz	#\/D\\\			Span 70.00 MHz	Scale Type Log <u>Lin</u>
#Res BW 100 kHz	#VBW	1.0 MHz	Sweep 2	2.000 ms (2001 pts)	

Plot 7-41. Band Edge Plot SISO ANT1 (802.11g- Ch. 1)



Plot 7-42. Band Edge Plot SISO ANT1 (802.11g - Ch. 9)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 44 of 103
© 2020 PCTEST Engineering Labo	ratory. Inc.	•		V 9.0 02/01/2019



	ctrum Analyzer		t SA									- 6 2
XI RL	RF 5	50 Ω	AC (	CORREC		SEN	ISE:INT	#Avg Typ	ALIGN AUTO		M Dec 12, 2019 DE 1 2 3 4 5 6	Frequency
				PNO: Fa	ast 🔸	Trig: Free Atten: 26				TY	PE M WWWWW ET P N N N N N	
				IFGain:L	.ow	Atten: 20	ub		AM	kr1 -25 9	70 MHz	Auto Tun
10 dB/div	Ref 15.0	0 dE	3m							5	6.44 dB	
	14	∆2										Center Fre
5.00			-									2.483500000 GH
Marialawal	wither the all in the second	Manhaha	MAN									2.485500000 61
5.00												Start Fre
-15.0			_ <u> </u>									2.448500000 GH
			X									
-25.0												Stop Fre
-35.0				<b>h</b> . 1								2.518500000 GH
-35.0				my	州机	ihan						05.0%
-45.0					- 10 JUA	WILL WAR	X2					CF Ste 7.000000 MH Auto Ma
-55.0							A CONTRACTOR OF A CONTRACT	M. Jana M. A. M.	In the with	womlewithing	hall benerit them	
								a de servici di a da	Alatha da Alata i da	bil harre de ser al silver	And decidence that	Freq Offse
-65.0												0+
-75.0												Scale Typ
Center 2.4		z								Span 7	'0.00 MHz	Log <u>Li</u>
#Res BW 1	100 kHz			#	¢VB₩	1.0 MHz			Sweep :	2.000 ms	(2001 pts)	
ISG									STATU	JS		

Plot 7-43. Band Edge Plot SISO ANT1 (802.11g - Ch. 10)



Plot 7-44. Band Edge Plot SISO ANT1 (802.11g – Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 45 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 45 of 103
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Plot 7-45. Band Edge Plot SISO ANT1 (802.11g - Ch. 12)



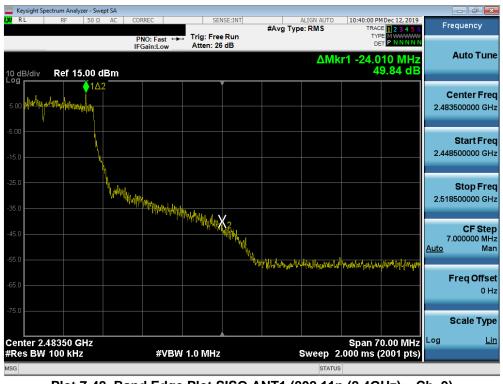
Plot 7-46. Band Edge Plot SISO ANT1 (802.11g – Ch. 13)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 46 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 46 of 103
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	ectrum Analyzer - Swe	ept SA									
LX/RL	RF 50 Ω	AC CO	RREC	SEI	ISE:INT	#Avg Type	: RMS		Nov 21, 2019	Free	quency
10 dB/div	Ref 25.00 d	IF	NO: Fast ↔ Gain:Low	→ Trig: Free Atten: 36			ΔΜ	₀ kr1 15.0	15 MHz 2.74 dB	A	uto Tune
15.0							142 Jaharama hita				enter Freq 00000 GHz
-5.00					priptikalina d		a salawa sa	<b>1</b>			Start Freq 000000 GHz
-15.0				and a ship was	r Ar			h Yanthana	array and		Stop Freq 00000 GHz
-35.0	. Amore and all all	. ANTRANT	Hite and a second s							7.0 <u>Auto</u>	CF Step 00000 MHz Man
-55.0	hundommensundanderti									Fi	eq Offset 0 Hz
-65.0	10000 GHz							Snan 7	0.00 MHz	S Log	cale Type Lin
#Res BW	100 kHz		#VBW	/ 1.0 MHz			Sweep 2	.000 ms (	2001 pts)		
MSG							STATUS				

Plot 7-47. Band Edge Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 1)



Plot 7-48. Band Edge Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 9)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 47 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 47 of 103
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019			



X         RL         RF         50 Ω         AC         CORREC         SENSE:INT         ALIGN AUTO         10:39:24 PMDec 12, 2019         Frequency           PNO: Fast
PNO: Fast → Trig: Free Run IFGain:Low Atten: 26 dB Content Free 5.00
Log         Log         Log         Center Free           5.00         10.2         2.48350000 GH         2.48350000 GH           5.00         5.00         3.415 GH         3.415 GH
5.00 1A2 Center Fre 2.48350000 GF 5.00 Start Fre 2.48550000 CF
Start Fre
-15.0
-25.0 Stop Fre -35.0 Life Wikk m
-55.0
75.0 Scale Typ
Center 2.48350 GHz Span 70.00 MHz Log 4 #Res BW 100 kHz #VBW 1.0 MHz Sweep 2.000 ms (2001 pts)
MSG

Plot 7-49. Band Edge Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 10)



Plot 7-50. Band Edge Plot SISO ANT1 (802.11n (2.4GHz) – Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 49 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 48 of 103
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019			





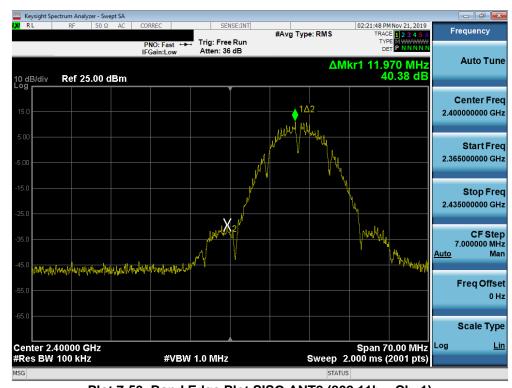
Plot 7-51. Band Edge Plot SISO ANT1 (802.11n (2.4GHz) - Ch. 12)





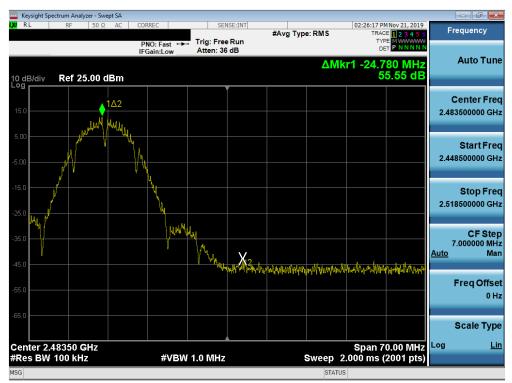
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 40 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 49 of 103	
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### SISO Antenna-2 Conducted Emissions at the Band Edge





#### Plot 7-54. Band Edge Plot SISO ANT2 (802.11b - Ch. 11)

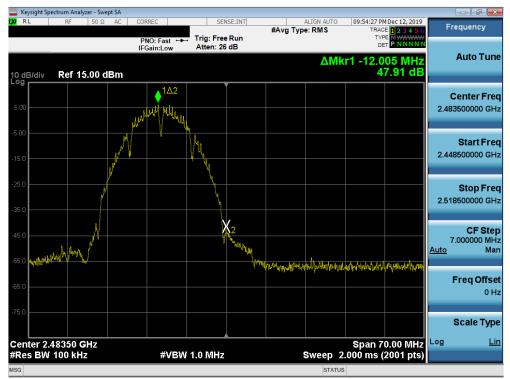
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 50 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 50 of 103
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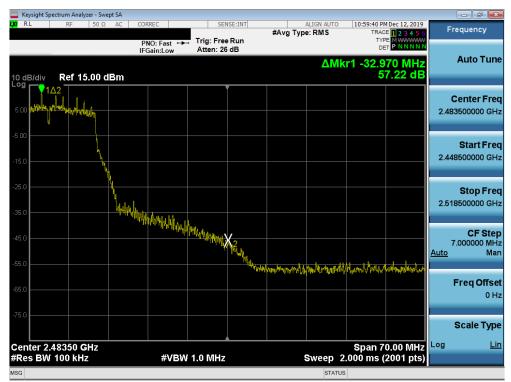
Plot 7-56. Band Edge Plot SISO ANT2 (802.11b - Ch. 13)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 51 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 51 of 103
© 2020 PCTEST Engineering Lat	V 9.0 02/01/2019			









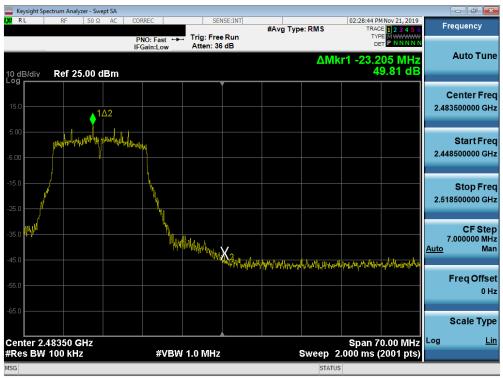
Plot 7-58. Band Edge Plot SISO ANT2 (802.11g - Ch. 9)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dega 52 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 52 of 103	
© 2020 PCTEST Engineering Lat	V 9 0 02/01/2019				



Keysight Spectrum Analyzer - Swe					
<mark>X/</mark> RL RF 50Ω	AC CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	10:58:38 PM Dec 12, 2019 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast IFGain:Low	Trig: Free Run Atten: 26 dB	#Avg Type. Rivis		
10 dB/div Ref 15.00 d	lBm		ΔΜ	(r1 -28.350 MHz 57.75 dB	Auto Tune
-og 5.00 φημική Παντή η Ανάθη Αγγια	entrela				Center Free 2.483500000 GH
.15.0					Start Free 2.448500000 GH
35.0					<b>Stop Fre</b> 2.518500000 GH
45.0	พและหมุโสบ	MM MAN KANA	16		<b>CF Ste</b> 7.000000 MH <u>Auto</u> Ma
65.0			VUNUNUUNUUU	altelahatan Suntur yak Matanan tahar	Freq Offse 0 H
75.0					Scale Typ
Center 2.48350 GHz Res BW 100 kHz	#VB	W 1.0 MHz	Sweep 2	Span 70.00 MHz 2.000 ms (2001 pts)	Log <u>Li</u>
ISG			STATU		





Plot 7-60. Band Edge Plot SISO ANT2 (802.11g - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 52 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 53 of 103
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019			



	pectrum Analyze												- • •
X/RL	RF	50 Ω	AC	CORRE	C	SE	NSE:INT	#Avg Typ	ALIGN AUTO e: RMS		M Dec 12, 2019 DE <b>1 2 3 4 5</b> 6	Fre	quency
				PNO	:Fast ↔ n:Low	Trig: Fre		•		TYP	PE MWWWWW ET PNNNNN		
				II Ou					ΔM	kr1 -17.8	50 MHz		Auto Tune
10 dB/div _og	Ref 15.0	00 d	Bm							4	8.19 dB		
.09				1Δ2								С	enter Fre
5.00			- 7										500000 GH
- 00	٣	<i>hi</i> ddar <sup>y</sup> r	And which have	( WATHING HA	whiphing the								
5.00				Ŷ									Start Fre
15.0					\							2.448	500000 GH
	¥.					k,							
25.0	1					h.							Stop Fre
35.0						<u> </u>						2.518	500000 GH
արկե	L. LOPAL					1 h							
45.0 <b>41 11 1</b>	pyr y					- WHAT	X 2 Milena					7.	CF Ste 000000 MH
55.0							My ha					<u>Auto</u>	Ma
05.0							44	ndrennewijy/u	Nayy White A	adultantilitingati	n waan waar		
65.0												F	reqOffs ∂⊦
													UF
75.0												9	cale Typ
	.48350 GH   100 kHz	z			#\/R\/	/ 1.0 MHz			Sween	Span 7 2.000 ms (	0.00 MHz	Log	L
SG	TOO KHZ				#000				Sweep		2001 pts)		

Plot 7-61. Band Edge Plot SISO ANT2 (802.11g - Ch. 12)



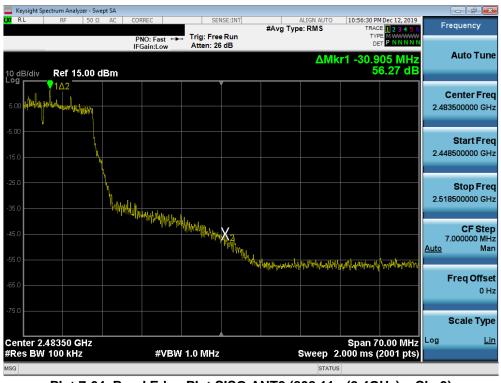
Plot 7-62. Band Edge Plot SISO ANT2 (802.11g - Ch. 13)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 54 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 54 of 103
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	ctrum Analyzer - Swe										
LX/IRL	RF 50 Ω	AC CC	IRREC	SEN	ISE:INT	#Avg Typ	e: RMS		MNov 21, 2019	Fr	equency
10 dB/div Log	Ref 25.00 d	IF	NO: Fast 🔸 Gain:Low	<ul> <li>Trig: Free Atten: 36</li> </ul>			ΔM	DE	90 MHz 6.99 dB		Auto Tune
15.0							1∆2				Center Freq 0000000 GHz
-5.00					previletativ	and the start and the start	handarina handar	M		2.36	Start Freq 5000000 GHz
-15.0										2.43	Stop Freq 5000000 GHz
-35.0			1. Kampur MM	ana	<b>#</b> Í			N <sub>W</sub> hiteenth	MINAMANA	7 <u>Auto</u>	CF Step 7.000000 MHz Man
-55.0	iluvinin jirisevuni	ayti'yiLoʻli koʻdere								· ·	Freq Offset 0 Hz
-65.0	0000 GHz							Snop 7	0.00 MHz	Log	Scale Type Lin
#Res BW			#VBW	/ 1.0 MHz			Sweep 2	span / 2.000 ms (			
MSG							STATU	S			

Plot 7-63. Band Edge Plot SISO ANT2 (802.11n (2.4GHz) - Ch. 1)



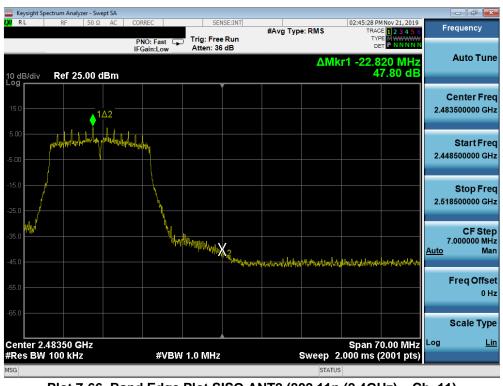
Plot 7-64. Band Edge Plot SISO ANT2 (802.11n (2.4GHz) - Ch. 9)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga EE of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 55 of 103
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Keysight Spectrum Analyzer - Swept SA								
XIRL RF 50Ω AC	CORREC	SEN	SE:INT	#Avg Typ	ALIGN AUTO		Dec 12, 2019	Frequency
	PNO: Fast ↔	Trig: Free				TYP		
	IFGain:Low	Atten: 26	dB					Auto Tune
					ΔΜ	kr1 -26.5	30 MHZ 8.36 dB	
10 dB/div Ref 15.00 dBm							5.30 UB	
		Ĭ						Center Free
5.00								2.483500000 GH
S. When had more the proof magned had any								
-5.00								
								Start Free
-15.0								2.448500000 GH
\ \								
-25.0								Stop Free
	<b>\</b>							2.518500000 GH
-35.0	k. shu i							
	WHY WORNA	MAL.						CF Ster
-45.0		TT TURA	V/					7.000000 MH
	haland llaugh ang		<b>₩</b> 21					<u>Auto</u> Mar
-55.0			" "	mallinda little and a star	(mm.HYwy.#\w	hand have been and the second	whether	
				1 1101 01				Freq Offse
-65.0								. он:
-75.0								Scale Type
								ocure Type
Center 2.48350 GHz						Span 7	0.00 MHz	Log <u>Lir</u>
#Res BW 100 kHz	#VBW	1.0 MHz			Sweep	2.000 ms (	2001 pts)	
MSG					STATU	JS		

Plot 7-65. Band Edge Plot SISO ANT2 (802.11n (2.4GHz) - Ch. 10)



Plot 7-66. Band Edge Plot SISO ANT2 (802.11n (2.4GHz) - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage EC of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 56 of 103
© 2020 PCTEST Engineering Labora	atory, Inc.			V 9.0 02/01/2019



Keysight S	Spectrum Analy	zer - Swe	ept SA										- # <b>*</b>
RL	RF	50 Ω	AC	CORREC		SEI	ISE:INT	#Avg Typ	ALIGN AUTO		M Dec 12, 2019 CE 1 2 3 4 5 6	Fr	equency
	_			PNO: IFGain	ast ↔ Low	. Trig: Free Atten: 26		#Avg typ	e: KIVIS	T			
0 dB/div	Ref 1	i.00 d	Bm						ΔN	lkr1 -16.	240 MHz 47.74 dB		Auto Tun
5.00		www.	wald	1∆2	leg-lag lage								<b>Center Fre</b> 3500000 GH
5.00				¥		ų						2.44	<b>Start Fre</b> 3500000 GH
35.0												2.51	<b>Stop Fre</b> 3500000 GH
45.0 <b>WMW</b>	al <sub>ri</sub> yel yar					No. Hijythythythy	X2					7 <u>Auto</u>	CF Ste .000000 MH Ma
55.0 <u> </u>								Munippin	ation/shuthattle/	, difter the type of type of the type of type	agen allowed and a second s		F <b>req Offs</b> 0 H
75.0													Scale Typ
	2.48350 G V 100 kH				#VBW	1.0 MHz			Sweep	Span 2.000 ms	70.00 MHz (2001 pts)	LUg	<u> </u>
SG									STAT				

Plot 7-67. Band Edge Plot SISO ANT2 (802.11n (2.4GHz) - Ch. 12)





FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo EZ of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 57 of 103
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# 7.6 Conducted Spurious Emissions §15.247(d); RSS-247 [5.5]

#### **Test Overview and Limit**

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. For the following out of band conducted spurious emissions plots, the EUT was investigated in all available data rates for "b", "g" and "n" modes. The worst case spurious emissions for the 2.4GHz band were found while transmitting in "b" mode at 1 Mbps and are shown in the plots below.

The limit for out-of-band spurious emissions at the band edge is 30dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the procedure in Section 11.1 of ANSI C63.10-2013 and KDB 558074 D01 v05r02.

#### Test Procedure Used

ANSI C63.10-2013 – Section 11.11.3 KDB 558074 D01 v05r02 – Section 8.5 ANSI C63.10-2013 – Section 14.3.3 KDB 662911 D01 v02r01 – Section E)3)b)

#### **Test Settings**

- 1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep time = auto couple
- 7. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-5. Test Instrument & Measurement Setup

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 59 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 58 of 103
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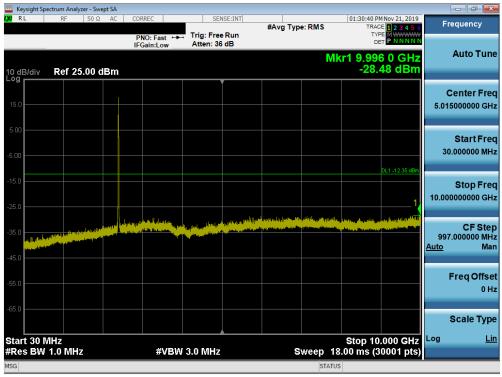
#### Test Notes

- 1. RBW was set to 1MHz rather than 100kHz in order to increase the measurement speed.
- 2. The display line shown in the following plots denotes the limit at 30dB below the fundamental emission level measured in a 100kHz bandwidth. However, since the traces in the following plots are measured with a 1MHz RBW, the display line may not necessarily appear to be 30dB below the level of the fundamental in a 1MHz bandwidth.
- 3. For plots showing conducted spurious emissions near the limit, the frequencies were investigated with a reduced RBW to ensure that no emissions were present.
- 4. The conducted spurious emissions were measured to relative limits. Therefore, in accordance with ANSI C63.10-2013 and KDB 662911 D01 v02r01 Section E)3)b), it was unnecessary to show compliance through the summation of test results of the individual outputs.

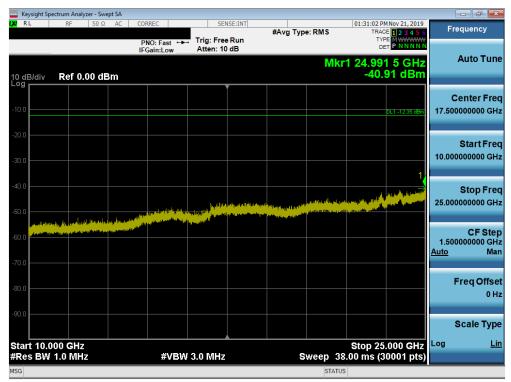
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 50 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 59 of 103
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# **SISO Antenna-1 Conducted Spurious Emission**



Plot 7-69. Conducted Spurious Plot SISO ANT1 (802.11b - Ch. 1)



#### Plot 7-70. Conducted Spurious Plot SISO ANT1 (802.11b - Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 60 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 60 of 103
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	ectrum Analyze										
X/RL	RF	50 Ω AC		REC			#Avg Typ	e: RMS	TE	7 PM Nov 21, 2019 RACE 1 2 3 4 5 6	Frequency
10 dB/div Log	Ref 25.0	00 dBm	IFO	iO: Fast ↔ Sain:Low	Atten: 36			Μ	kr1 10.0 -2	00 0 GHz 8.09 dBm	Auto Tun
15.0											Center Fre 5.015000000 GH
-5.00											Start Free 30.000000 MH
-15.0										DL1 -13.36 dBm	Stop Fre 10.000000000 GH
-35.0		and the state of the			a la parti di Alagui Ingenerati di Alagui	agent pillers of the	n n na san san san san san san san san s			ergen heten de fan de fan de fan de f	CF Stej 997.000000 MH <u>Auto</u> Ma
-55.0											Freq Offse 0 H
-65.0 Start 30 F									Stop '	10.000 GHz	Scale Type Log <u>Li</u>
#Res BW	1.0 MHz			#VBV	/ 3.0 MHz		s		18.00 ms	(30001 pts)	

Plot 7-71. Conducted Spurious Plot SISO ANT1 (802.11b - Ch. 6)



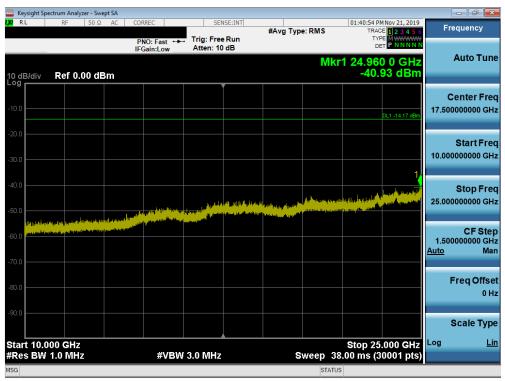
Plot 7-72. Conducted Spurious Plot SISO ANT1 (802.11b - Ch. 6)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 61 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 61 of 103
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019			



	ectrum Analyzer											
LX/IRL	RF	50Ω AC	COF	RREC	SE	NSE:INT	#Avg Typ	e: RMS		MNov 21, 2019	Fre	equency
				NO:Fast ↔ Gain:Low	Atten: 36		• ,,		TYF DE			
10 dB/div Log	Ref 25.0	0 dBm	1					Μ	kr1 9.68 -28.	6 3 GHz 56 dBm		Auto Tune
15.0												enter Freq
											5.015	000000 GHz
5.00												Start Freq 000000 MHz
-5.00										DL1 -14.17 dBm	50.	
-15.0											10.000	Stop Freq
-25.0			L di a i si	alaran ta.		a salaya tiki dar	and the second	full college to all to a	a	ling affire antibation		
abula deferito				tende sei ver net mit ver		and the second difference	an a		ing with a second s	and the second	997. <u>Auto</u>	CF Step 000000 MHz Man
-45.0												req Offset
-55.0												0 Hz
-65.0											S	Scale Type
Start 30 ľ #Res BW				-#\/D\/	V 3.0 MHz					.000 GHz	Log	<u>Lin</u>
#Res DW				#VDV	* <b>3.0 WHZ</b>		5	statu		000 F pts)		

Plot 7-73. Conducted Spurious Plot SISO ANT1 (802.11b - Ch. 11)

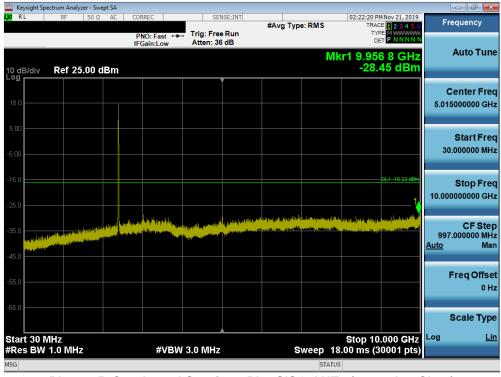


Plot 7-74. Conducted Spurious Plot SISO ANT1 (802.11b - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 62 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 62 of 103	
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# SISO Antenna-2 Conducted Spurious Emissions



Plot 7-75. Conducted Spurious Plot SISO ANT2 (802.11b - Ch. 1)



#### Plot 7-76. Conducted Spurious Plot SISO ANT2 (802.11b – Ch. 1)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 62 of 102		
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 63 of 103	
© 2020 PCTEST Engineering Labo	V 9.0 02/01/2019				



		Analyzer - Sw	ept SA										- F	×
L <mark>XI</mark> RL	RF	50 Ω	AC	COF	RREC			ISE:INT	#Avg Typ	e: RMS		1 PM Nov 21, 2019 RACE 1 2 3 4 5 6	Frequency	
10 dB/div	, Ref	f 25.00 d	1Bm	IFO	NO: Fasi Gain:Lov		Trig: Free Atten: 36				Mkr1 9.9 -2	DET P NNNNN 062 8 GHz 7.84 dBm	Auto Tu	ine
		20.001					,						Center Fr 5.015000000 G	
5.00 -5.00													Start Fr 30.000000 M	
-15.0												DL1 -13.45 dBm	Stop Fr 10.000000000 G	
فالموسطة	a de la constante de la consta			alaan da	and giften pay				n da pagent forstag fyt for an ander Rite pagent for soler soler and ander			an an Stand Contractor	CF St 997.000000 M <u>Auto</u> M	
-45.0													Freq Offs 0	set Hz
-65.0											Stop	10.000 GHz	Scale Ty	/pe Lin
#Res B		ИНz			#\	/BW	3.0 MHz		s	weep	18.00 ms	(30001 pts)		
MSG											ATUS			

Plot 7-77. Conducted Spurious Plot SISO ANT2 (802.11b - Ch. 6)



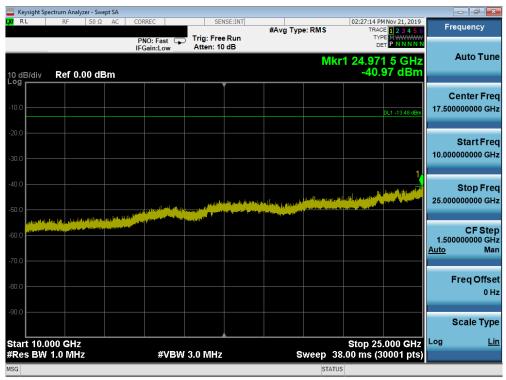
Plot 7-78. Conducted Spurious Plot SISO ANT2 (802.11b - Ch. 6)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 64 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 64 of 103	
© 2020 PCTEST Engineering Labora	V 9.0 02/01/2019				



	ectrum Analy	/zer - Swep	ot SA											- • ×
XI RL	RF	50 Ω	AC	PN	REC NO: Fa: Sain:Lo	st ++-			#Avg Typ	e:RMS	02:26	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P NNNN		quency
10 dB/div	Ref 2	5.00 dl	Bm	IFC	Jann.LC		, and the second				Mkr1 9. -	793 0 GHz 27.77 dBm		Auto Tune
15.0														enter Fred 000000 GHz
-5.00														Start Free 000000 MH
-15.0												DL1 -13.48 dBm		Stop Free
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ISG											ATUS			

Plot 7-79. Conducted Spurious Plot SISO ANT2 (802.11b - Ch. 11)



Plot 7-80. Conducted Spurious Plot SISO ANT2 (802.11b - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 65 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 65 of 103	
© 2020 PCTEST Engineering Lab	V 9.0.02/01/2019				



# 7.7 Radiated Spurious Emission Measurements – Above 1 GHz §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

#### **Test Overview and Limit**

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

# All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-11 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μV/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-11. Radiated Limits

#### **Test Procedures Used**

ANSI C63.10-2013 – Section 6.6.4.3 KDB 558074 D01 v05r02 – Sections 8.6, 8.7

#### Test Settings

#### **Average Field Strength Measurements**

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = power average (RMS)
- 5. Number of measurement points = 1001 (Number of points must be  $\geq 2 \times \text{span/RBW}$ )
- 6. Sweep time = auto
- 7. Trace (RMS) averaging was performed over at least 100 traces

#### Peak Field Strength Measurements

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = peak
- 5. Sweep time = auto couple
- 6. Trace mode = max hold
- 7. Trace was allowed to stabilize

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:			
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 66 of 103	
© 2020 PCTEST Engineering Labor	V 9 0 02/01/2019				



### Test Setup

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

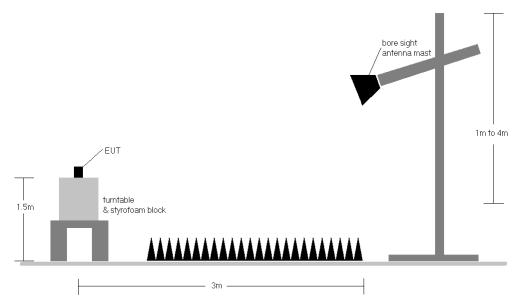


Figure 7-6. Test Instrument & Measurement Setup

#### Test Notes

- The optional test procedures for antenna port conducted measurements of unwanted emissions per the guidance of KDB 558074 D01 v05r02 were not used to evaluate this device for compliance to radiated limits. All radiated spurious emissions levels were measured in a radiated test setup.
- 2. All emissions lying in restricted bands specified in Section 15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-11.
- 3. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
- 4. This unit was tested with its standard battery.
- 5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average and peak measurements were taken using linearly polarized horn antennas. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
- 6. 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.
- 7. Radiated spurious emissions were investigated while operating in MIMO mode, however, it was determined that single antenna operation produced the worst case emissions. Since the emissions

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 67 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 67 of 103
© 2020 PCTEST Engineering Labo	V 9.0 02/01/2019			



produced from MIMO operation were found to be more than 20dB below the limit, the MIMO emissions are not reported.

- 8. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
- 9. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

#### **Sample Calculations**

#### **Determining Spurious Emissions Levels**

- ο Field Strength Level [dB<sub>μ</sub>V/m] = Analyzer Level [dBm] + 107 + AFCL [dB/m]
- AFCL [dB/m] = Antenna Factor [dB/m] + Cable Loss [dB]
- Margin [dB] = Field Strength Level [dBμV/m] Limit [dBμV/m]

#### Radiated Band Edge Measurement Offset

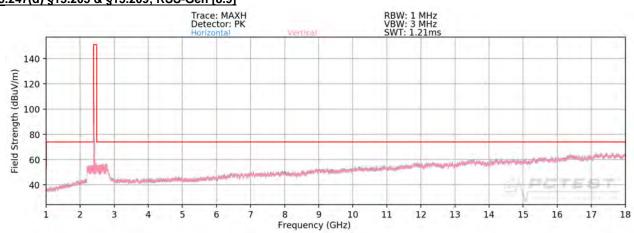
• The amplitude offset shown in the radiated restricted band edge plots in Section 7.7 was calculated using the formula:

Offset (dB) = (Antenna Factor + Cable Loss + Attenuator) – Preamplifier Gain

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dama 00 af 400		
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 68 of 103	
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019				

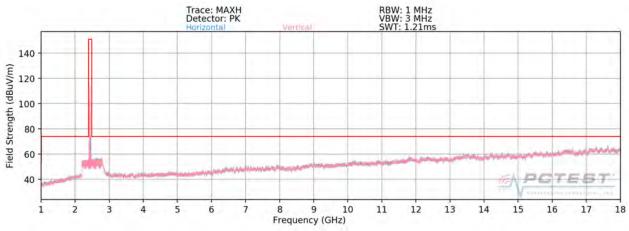
All rights report or assembly of contents thereof, please contact INFO@PCTEST.COM.



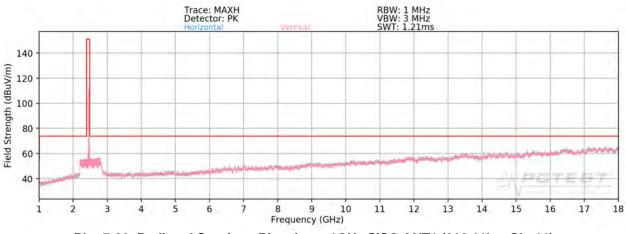


# 7.7.1 SISO Antenna-1 Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]







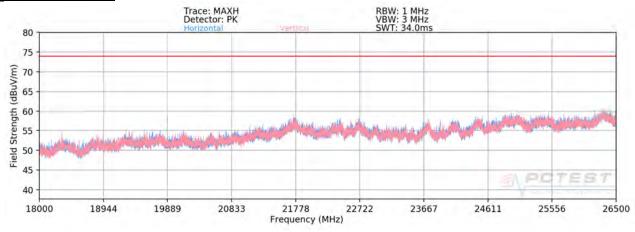




FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 60 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	ortable Handset		Page 69 of 103	
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019				



### SISO Antenna-1 Radiated Spurious Emissions Measurements (Above 18GHz) §15.209; RSS-Gen [8.9]



Plot 7-84. Radiated Spurious Plot above 18GHz SISO ANT1

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 70 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	01/14/2020 Portable Handset		Page 70 of 103
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019			



# SISO Antenna-1 Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

802.11b		
1 Mbps		
3 Meters		
2412MHz		
01		

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	Н	101	301	-75.45	8.41	39.96	53.98	-14.02
4824.00	Peak	н	101	301	-67.92	8.41	47.49	73.98	-26.49
12060.00	Avg	н	-	-	-84.15	20.00	42.85	53.98	-11.13
12060.00	Peak	Н	-	-	-72.85	20.00	54.15	73.98	-19.83

Table 7-12. Radiated Measurements SISO ANT1

Worst Case Mode: Worst Case Transfer Rate: Distance of Measurements: Operating Frequency: Channel:

802.11b
1 Mbps
3 Meters
2437MHz
06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	Н	113	194	-77.49	8.42	37.93	53.98	-16.05
4874.00	Peak	Н	113	194	-69.22	8.42	46.20	73.98	-27.78
7311.00	Avg	н	-	-	-83.02	13.88	37.86	53.98	-16.12
7311.00	Peak	Н	-	-	-72.46	13.88	48.42	73.98	-25.56
12185.00	Avg	н	-	-	-84.34	21.62	44.28	53.98	-9.69
12185.00	Peak	Н	-	-	-73.90	21.62	54.72	73.98	-19.25

Table 7-13. Radiated Measurements SISO ANT1

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 71 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 71 of 103
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019			



802.11b
1 Mbps
3 Meters
2462MHz
11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	Н	100	303	-76.49	8.28	38.79	53.98	-15.19
4924.00	Peak	Н	100	303	-68.50	8.28	46.78	73.98	-27.20
7386.00	Avg	н	-	-	-82.51	13.76	38.25	53.98	-15.73
7386.00	Peak	Н	-	-	-71.46	13.76	49.30	73.98	-24.68
12310.00	Avg	н	-	-	-84.69	21.30	43.61	53.98	-10.37
12310.00	Peak	Н	-	-	-73.50	21.30	54.80	73.98	-19.18

Table 7-14. Radiated Measurements SISO ANT1

Worst Case Mode: Worst Case Transfer Rate: Distance of Measurements: Operating Frequency: Channel:

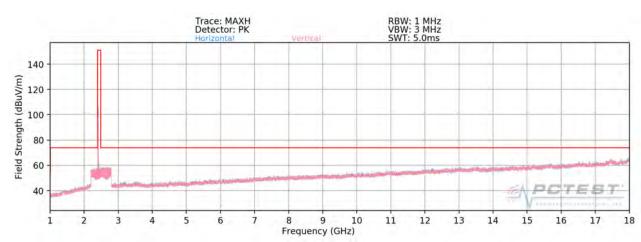
802.11b
1 Mbps
3 Meters
2412MHz
01

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	Н	168	304	-75.87	8.41	39.54	53.98	-14.44
4824.00	Peak	Н	168	304	-69.81	8.41	45.60	73.98	-28.38
12060.00	Avg	Н	-	-	-84.19	20.00	42.81	53.98	-11.17
12060.00	Peak	Н	-	-	-73.30	20.00	53.70	73.98	-20.28

Table 7-15. Radiated Measurements SISO ANT1 with WCP

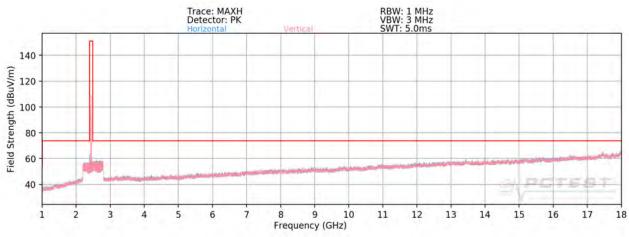
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 72 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	ortable Handset		Page 72 of 103
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019			



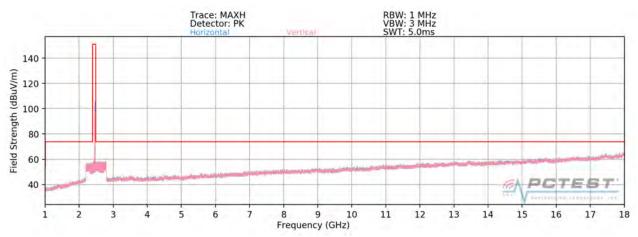


## 7.7.2 SISO Antenna-2 Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]







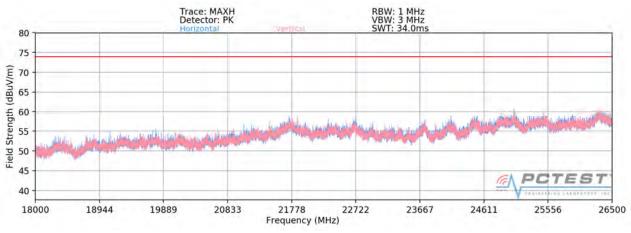


### Plot 7-87. Radiated Spurious Plot above 1GHz SISO ANT2 (802.11b - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dega 72 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 73 of 103	
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### SISO Antenna-2 Radiated Spurious Emissions Measurements (Above 18GHz) §15.209; RSS-Gen [8.9]



Plot 7-88. Radiated Spurious Plot above 18GHz SISO ANT2

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 74 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 74 of 103	
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019				



## SISO Antenna-2 Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2412MHz
Channel:	01

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	н	167	334	-75.17	8.41	40.24	53.98	-13.74
4824.00	Peak	н	167	334	-68.04	8.41	47.37	73.98	-26.61
12060.00	Avg	н	-	-	-84.50	20.00	42.50	53.98	-11.48
12060.00	Peak	н	-	-	-72.99	20.00	54.01	73.98	-19.97

Table 7-16. Radiated Measurements SISO ANT2

Worst Case Mode: Worst Case Transfer Rate: Distance of Measurements: Operating Frequency: Channel:

802.11b
1 Mbps
3 Meters
2437MHz
06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	Н	154	19	-73.90	8.42	41.52	53.98	-12.46
4874.00	Peak	н	154	19	-66.80	8.42	48.62	73.98	-25.36
7311.00	Avg	н	157	58	-81.15	13.88	39.73	53.98	-14.25
7311.00	Peak	н	157	58	-70.80	13.88	50.08	73.98	-23.90
12185.00	Avg	н	-	-	-84.69	21.62	43.93	53.98	-10.04
12185.00	Peak	Н	-	-	-73.89	21.62	54.73	73.98	-19.24

Table 7-17. Radiated Measurements SISO ANT2

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 75 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 75 of 103	
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019				



Worst Case Mode:	802.11b
Worst Case Transfer Rate:	1 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

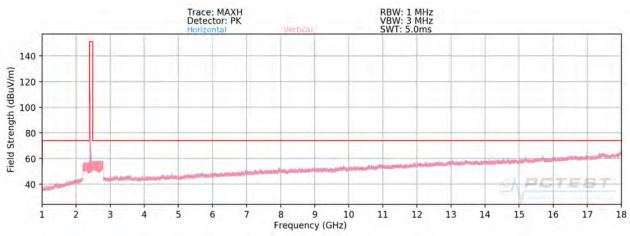
Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	н	178	18	-75.06	8.28	40.22	53.98	-13.76
4924.00	Peak	н	178	18	-67.69	8.28	47.59	73.98	-26.39
7386.00	Avg	н	-	-	-83.06	13.76	37.70	53.98	-16.28
7386.00	Peak	н	-	-	-72.07	13.76	48.69	73.98	-25.29
12310.00	Avg	н	-	-	-84.76	21.30	43.54	53.98	-10.44
12310.00	Peak	н	-	-	-74.03	21.30	54.27	73.98	-19.71

Table 7-18. Radiated Measurements SISO ANT2

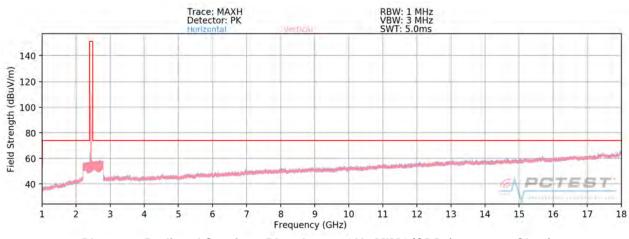
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 76 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 76 of 103	
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019				



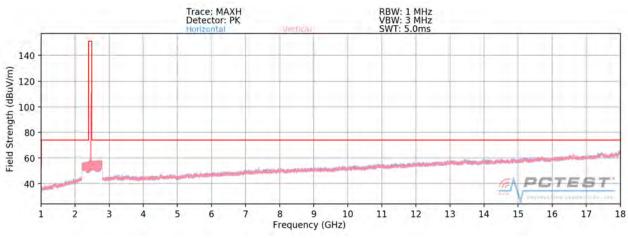
### 7.7.3 MIMO/CDD Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]









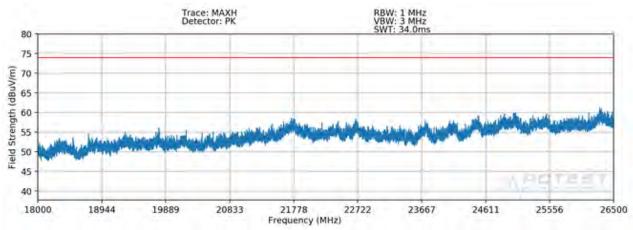


### Plot 7-91. Radiated Spurious Plot above 1GHz MIMO/CDD (802.11g - Ch. 11)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dega 77 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	20 Portable Handset		Page 77 of 103	
© 2020 PCTEST Engineering Labo	V 9 0 02/01/2019				



### MIMO/CDD Radiated Spurious Emissions Measurements (Above 18GHz) §15.209; RSS-Gen [8.9]



Plot 7-92. Radiated Spurious Plot above 18GHz MIMO/CDD

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 70 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 78 of 103	
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019				



### MIMO/CDD Radiated Spurious Emission Measurements §15.247(d) §15.205 & §15.209; RSS-Gen [8.9]

Worst Case Mode:	802.11g		
Worst Case Transfer Rate:	6 Mbps		
Distance of Measurements:	3 Meters		
Operating Frequency:	2412MHz		
Channel:	01		

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4824.00	Avg	Н	157	210	-80.84	8.41	34.57	53.98	-19.41
4824.00	Peak	Н	157	210	-69.63	8.41	45.78	73.98	-28.20
12060.00	Avg	н	-	-	-84.31	20.00	42.69	53.98	-11.29
12060.00	Peak	Н	-	-	-73.10	20.00	53.90	73.98	-20.08

### Table 7-19. Radiated Measurements MIMO/CDD

Worst Case Mode:	802.11g		
Worst Case Transfer Rate:	6 Mbps		
Distance of Measurements:	3 Meters		
Operating Frequency:	2437MHz		
Channel:	06		

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	Н	112	213	-80.36	8.42	35.06	53.98	-18.92
4874.00	Peak	н	112	213	-69.88	8.42	45.54	73.98	-28.44
7311.00	Avg	Н	-	-	-82.76	13.88	38.12	53.98	-15.86
7311.00	Peak	н	-	-	-71.73	13.88	49.15	73.98	-24.83
12185.00	Avg	н	-	-	-84.47	21.62	44.15	53.98	-9.82
12185.00	Peak	Н	-	-	-72.87	21.62	55.75	73.98	-18.22

### Table 7-20. Radiated Measurements MIMO/CDD

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 70 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 79 of 103
© 2020 PCTEST Engineering Lab	V 9.0 02/01/2019			



Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6 Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4924.00	Avg	Н	100	216	-80.23	8.28	35.05	53.98	-18.93
4924.00	Peak	н	100	216	-69.10	8.28	46.18	73.98	-27.80
7386.00	Avg	н	-	-	-83.11	13.76	37.65	53.98	-16.33
7386.00	Peak	н	-	-	-71.38	13.76	49.38	73.98	-24.60
12310.00	Avg	Н	-	-	-84.95	21.30	43.35	53.98	-10.63
12310.00	Peak	Н	-	-	-74.00	21.30	54.30	73.98	-19.68

### Table 7-21. Radiated Measurements MIMO/CDD

Worst Case Mode: Worst Case Transfer Rate: Distance of Measurements: Operating Frequency: Channel:

802.11g
6 Mbps
3 Meters
2437MHz
06

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	Limit [dBµV/m]	Margin [dB]
4874.00	Avg	Н	162	339	-78.00	8.42	37.42	53.98	-16.56
4874.00	Peak	Н	162	339	-69.19	8.42	46.23	73.98	-27.75
7311.00	Avg	Н	-	-	-82.83	13.88	38.05	53.98	-15.93
7311.00	Peak	н	-	-	-71.41	13.88	49.47	73.98	-24.51
12185.00	Avg	Н	-	-	-84.42	21.62	44.20	53.98	-9.77
12185.00	Peak	Н	-	-	-73.37	21.62	55.25	73.98	-18.72

### Table 7-22. Radiated Measurements MIMO/CDD with WCP

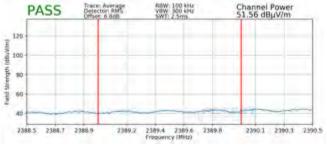
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dama 90 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 80 of 103	
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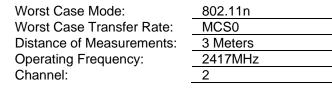
## 7.7.4 SISO Antenna-1 Radiated Restricted Band Edge Measurements §15.205 §15.209; RSS-Gen [8.9]

The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:802.11nWorst Case Transfer Rate:MCS0Distance of Measurements:3 MetersOperating Frequency:2412MHzChannel:1



Plot 7-93. Radiated Restricted Lower Band Edge Measurement SISO ANT1 (Average)

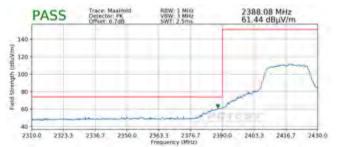




Plot 7-95. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Average)



Plot 7-94. Radiated Restricted Lower Band Edge Measurement SISO ANT1 (Peak)

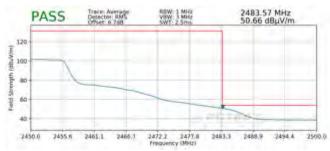


Plot 7-96. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)

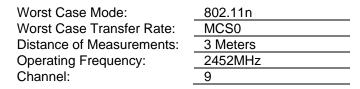
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 91 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 81 of 103	
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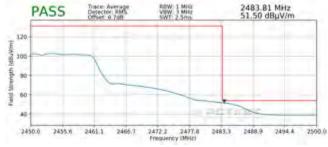


Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2447MHz
Channel:	8

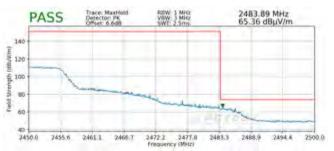


Plot 7-97. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Average)

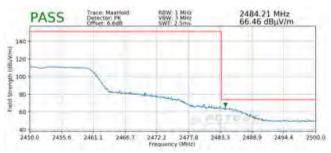




Plot 7-99. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Average)



Plot 7-98. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)



Plot 7-100. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 82 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 82 of 103
				\/ 9 0 02/01/2019

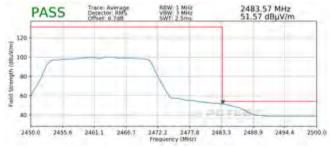


Worst Case Mode:802.11nWorst Case Transfer Rate:MCS0Distance of Measurements:3 MetersOperating Frequency:2457MHzChannel:10





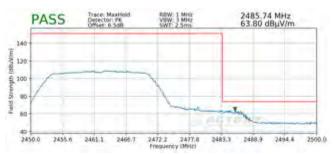
Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2462MHz
Channel:	11



Plot 7-103. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Average)



Plot 7-102. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)

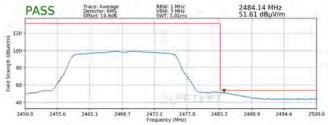


Plot 7-104. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 82 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 83 of 103
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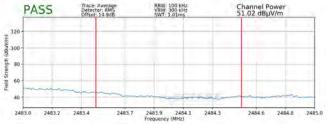


Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2467MHz
Channel:	12

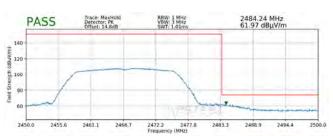


Plot 7-105. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Average)

Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2472MHz
Channel:	13



Plot 7-107. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Average)



Plot 7-106. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)



Plot 7-108. Radiated Restricted Upper Band Edge Measurement SISO ANT1 (Peak)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 94 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 84 of 103
© 2020 PCTEST Engineering Laboratory Inc				V 9 0 02/01/2019



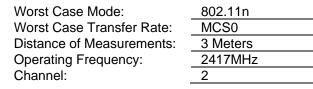
### 7.7.5 SISO Antenna-2 Radiated Restricted Band Edge Measurements §15.205 §15.209; RSS-Gen [8.9]

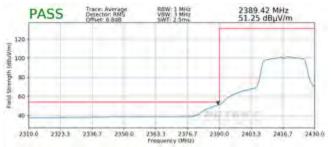
The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.

Worst Case Mode:802.11nWorst Case Transfer Rate:MCS0Distance of Measurements:3 MetersOperating Frequency:2412MHzChannel:1

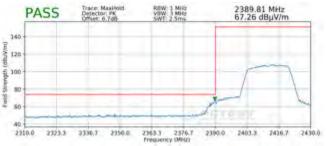


Plot 7-109. Radiated Restricted Lower Band Edge Measurement SISO ANT2 (Average)

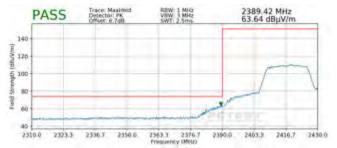




Plot 7-111. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Average)



Plot 7-110. Radiated Restricted Lower Band Edge Measurement SISO ANT2 (Peak)

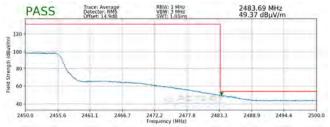


Plot 7-112. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)

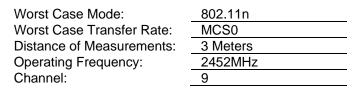
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 05 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 85 of 103
© 2020 PCTEST Engineering Laboratory Inc.			V 9 0 02/01/2019	



Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2447MHz
Channel:	8

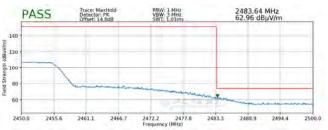


#### Plot 7-113. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Average)

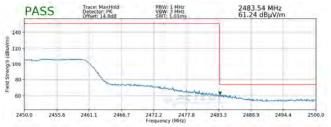




Plot 7-115. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Average)



Plot 7-114. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)

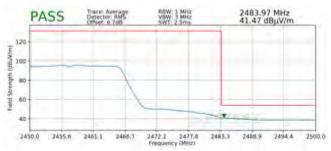


Plot 7-116. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)

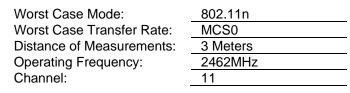
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 96 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 86 of 103
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Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS0
Distance of Measurements:	3 Meters
Operating Frequency:	2457MHz
Channel:	10

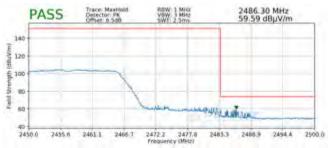


Plot 7-117. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Average)

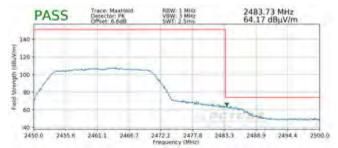




Plot 7-119. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Average)



Plot 7-118. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)

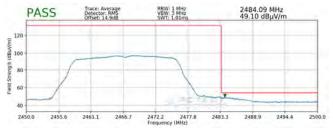


Plot 7-120. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)

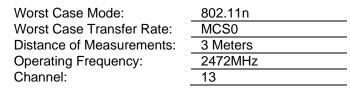
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 97 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 87 of 103
© 2020 PCTEST Engineering Laboratory Inc.			V 9 0 02/01/2019	

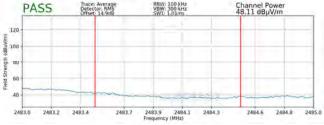


802.11n
MCS0
3 Meters
2457MHz
12

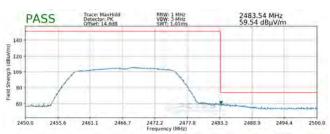








Plot 7-123. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Average)



Plot 7-122. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)



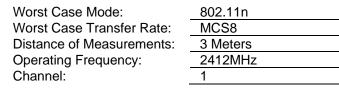
Plot 7-124. Radiated Restricted Upper Band Edge Measurement SISO ANT2 (Peak)

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Test Report S/N:	Test Dates:	EUT Type:		Dage 89 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 88 of 103
© 2020 PCTEST Engineering Labora	V 9 0 02/01/2019			



## 7.7.6 MIMO Radiated Restricted Band Edge Measurements §15.209; RSS-Gen [8.9]

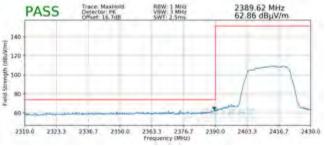
The radiated restricted band edge measurements are measured with an EMI test receiver connected to the receive antenna while the EUT is transmitting.



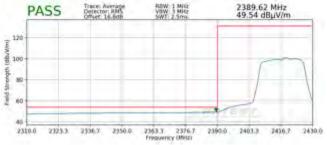


Plot 7-125. Radiated Restricted Lower Band Edge Measurement MIMO (Average)

Worst Case Mode:	802.11g
Worst Case Transfer Rate:	6Mbps
Distance of Measurements:	3 Meters
Operating Frequency:	2417MHz
Channel:	2



Plot 7-126. Radiated Restricted Lower Band Edge Measurement MIMO (Peak)



Plot 7-127. Radiated Restricted Lower Band Edge Measurement MIMO (Average)

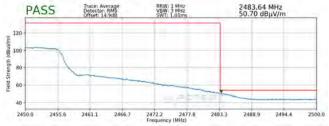


ot 7-128. Radiated Restricted Lower Band Edge Measurement MIMO (Peak)

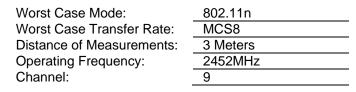
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dege 80 of 102	
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 89 of 103	
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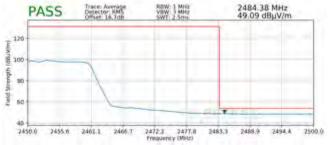


Worst Case Mode:	802.11n
Worst Case Transfer Rate:	MCS8
Distance of Measurements:	3 Meters
Operating Frequency:	2447MHz
Channel:	8

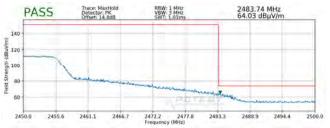




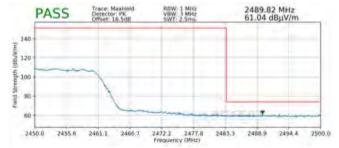




Plot 7-131. Radiated Restricted Upper Band Edge Measurement MIMO (Average)



Plot 7-130. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)

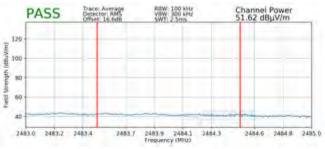


Plot 7-132. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)

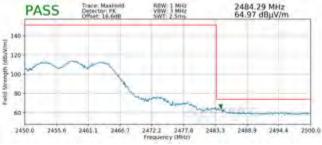
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dago 00 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 90 of 103
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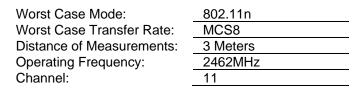
Worst Case Mode:802.11gWorst Case Transfer Rate:6MbpsDistance of Measurements:3 MetersOperating Frequency:2457MHzChannel:10

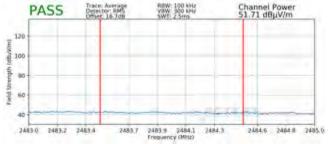




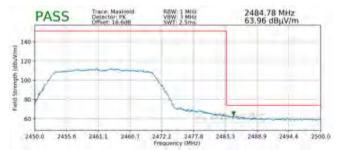


Plot 7-134. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)





Plot 7-135. Radiated Restricted Upper Band Edge Measurement MIMO (Average)



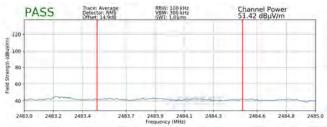
Plot 7-136. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 01 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 91 of 103
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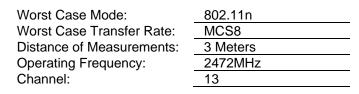


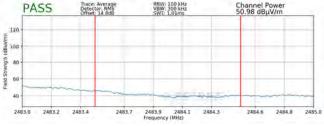
Worst Case Mode: \_\_\_\_\_ Worst Case Transfer Rate: \_\_\_\_ Distance of Measurements: \_\_\_\_\_ Operating Frequency: \_\_\_\_\_ Channel: \_\_\_\_\_

802.11n
MCS8
3 Meters
2467MHz
12

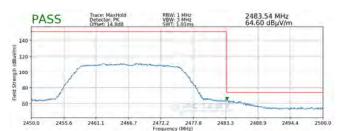


Plot 7-137. Radiated Restricted Upper Band Edge Measurement MIMO (Average)

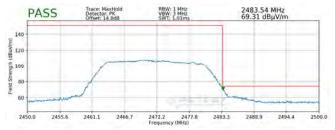




Plot 7-139. Radiated Restricted Upper Band Edge Measurement MIMO (Average)



Plot 7-138. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)



Plot 7-140. Radiated Restricted Upper Band Edge Measurement MIMO (Peak)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 02 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 92 of 103
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### 7.8 Radiated Spurious Emissions Measurements – Below 1GHz §15.209; RSS-Gen [8.9]

### **Test Overview and Limit**

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

# All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 6 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-23 per Section 15.209 and RSS-Gen (8.9).

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

Table 7-23. Radiated Limits

### **Test Procedures Used**

ANSI C63.10-2013

### **Test Settings**

### Quasi-Peak Field Strength Measurements

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 120kHz (for emissions from 30MHz 1GHz)
- 3. Detector = quasi-peak
- 4. Sweep time = auto couple
- 5. Trace mode = max hold
- 6. Trace was allowed to stabilize

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 02 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 93 of 103
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### Test Setup

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

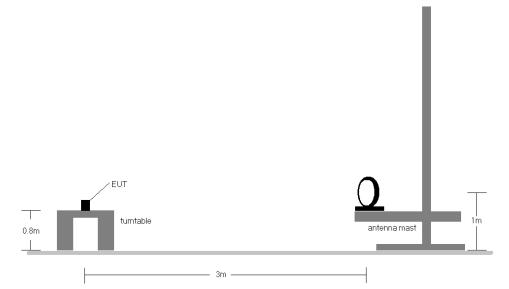
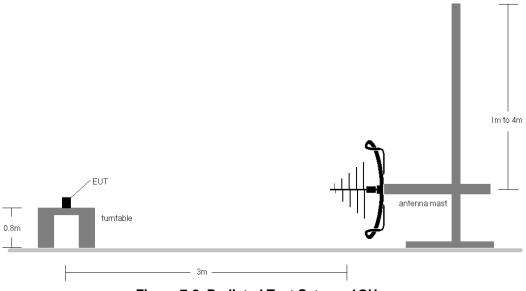
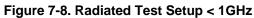


Figure 7-7. Radiated Test Setup < 30Mhz





FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 04 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 94 of 103
© 2020 PCTEST Engineering Lat	V 9.0 02/01/2019			



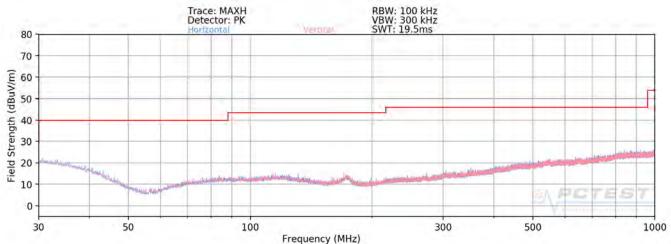
- 1. All emissions lying in restricted bands specified in §15.205 and RSS-Gen(8.10) are below the limit shown in Table 7-23.
- 2. The broadband receive antenna is manipulated through vertical and horizontal polarizations during the tests. The EUT is manipulated through three orthogonal planes.
- 3. This unit was tested with its standard battery.
- 4. The spectrum is investigated using a peak detector and final measurements are recorded using CISPR quasi peak detector. The worst-case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.
- 5. Emissions were measured at a 3 meter test distance.
- 6. Emissions are investigated while operating on the center channel of the mode, band, and modulation that produced the worst case results during the transmitter spurious emissions testing.
- 7. No spurious emissions were detected within 20dB of the limit below 30MHz.
- 8. The results recorded using the broadband antenna is known to correlate with the results obtained by using a tuned dipole with an acceptable degree of accuracy. The VSWR for the measurement antenna was found to be less than 2:1.
- The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. There were no emissions detected in the 30MHz – 1GHz frequency range, as shown in the subsequent plots.

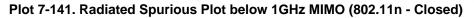
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 05 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 95 of 103
© 2020 PCTEST Engineering Lab	V 9 0 02/01/2019			

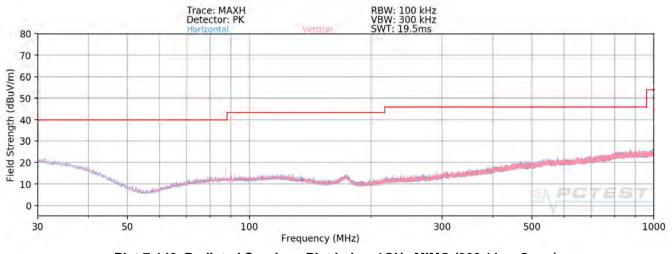
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### MIMO Radiated Spurious Emissions Measurements (Below 1GHz) §15.209; RSS-Gen [8.9]







Plot 7-142. Radiated Spurious Plot below 1GHz MIMO (802.11n - Open)

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 06 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 96 of 103
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### 7.9 Line-Conducted Test Data §15.207; RSS-Gen [8.8]

### Test Overview and Limit

All AC line conducted spurious emissions are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates and modes were investigated for conducted spurious emissions. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.

## All conducted emissions must not exceed the limits shown in the table below, per Section 15.207 and RSS-Gen (8.8).

Frequency of emission (MHz)	Conducted Limit (dBµV)		
	Quasi-peak	Average	
0.15 – 0.5	66 to 56*	56 to 46*	
0.5 – 5	56	46	
5 – 30	60	50	

Table 7-24. Conducted Limits

\*Decreases with the logarithm of the frequency.

### **Test Procedures Used**

ANSI C63.10-2013, Section 6.2

### **Test Settings**

### **Quasi-Peak Field Strength Measurements**

- 1. Analyzer center frequency was set to the frequency of the spurious emission of interest
- 2. RBW = 9kHz (for emissions from 150kHz 30MHz)
- 3. Detector = quasi-peak
- 4. Sweep time = auto couple
- 5. Trace mode = max hold
- 6. Trace was allowed to stabilize

### **Average Field Strength Measurements**

- 1. Analyzer center frequency was set to the frequency of the spurious emission of interest
- 2. RBW = 9kHz (for emissions from 150kHz 30MHz)
- 3. Detector = RMS
- 4. Sweep time = auto couple
- 5. Trace mode = max hold
- 6. Trace was allowed to stabilize

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 07 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 97 of 103
© 2020 PCTEST Engineering Labor	V 9 0 02/01/2019			



### Test Setup

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

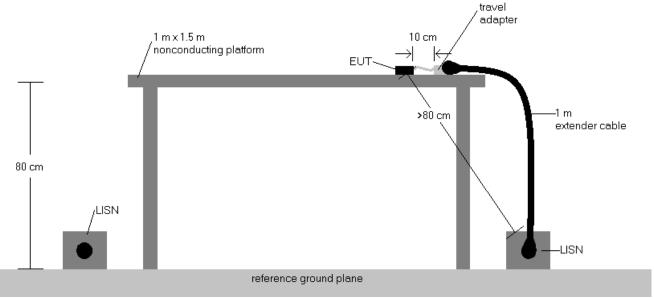


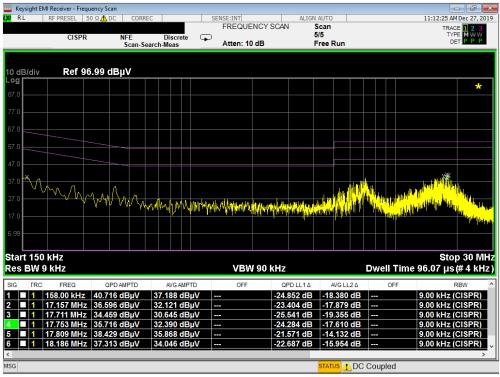
Figure 7-9. Test Instrument & Measurement Setup

### Test Notes

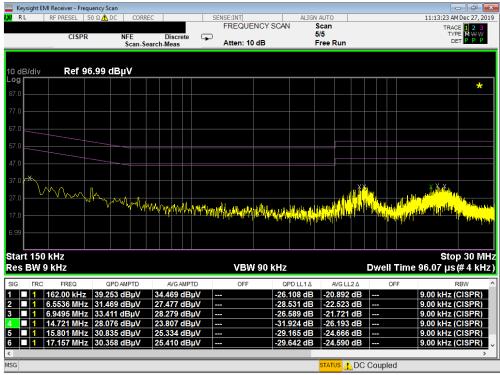
- All modes of operation were investigated and the worst-case emissions are reported using mid channel. The emissions found were not affected by the choice of channel used during testing.
- 2. The limit for an intentional radiator from 150kHz to 30MHz are specified in Part 15.207 and RSS-Gen(8.8).
- 3. Corr. (dB) = Cable loss (dB) + LISN insertion factor (dB)
- 4. QP/AV Level (dB $\mu$ V) = QP/AV Analyzer/Receiver Level (dB $\mu$ V) + Corr. (dB)
- 5. Margin (dB) = QP/AV Limit (dB $\mu$ V) QP/AV Level (dB $\mu$ V)
- 6. Traces shown in plot are made using a peak detector.
- 7. Deviations to the Specifications: None.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 09 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 98 of 103
© 2020 PCTEST Engineering Laboratory. Inc.				V 9.0 02/01/2019





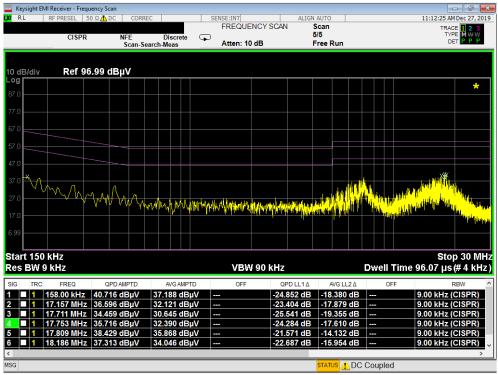




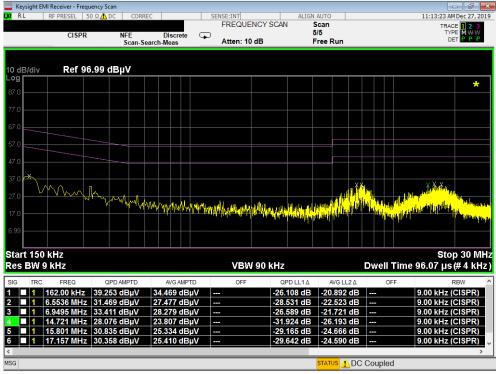
Plot 7-144. Line Conducted Plot with 802.11b (N) - OPEN

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 00 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 99 of 103
© 2020 PCTEST Engineering Laboratory. Inc.				V 9.0 02/01/2019





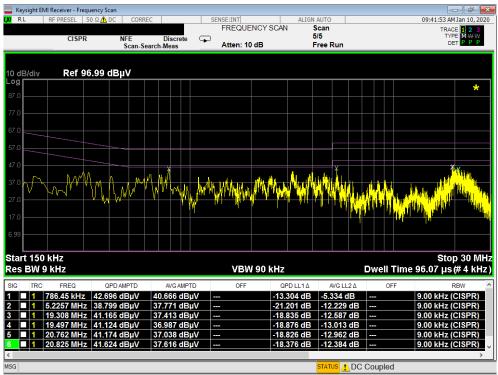




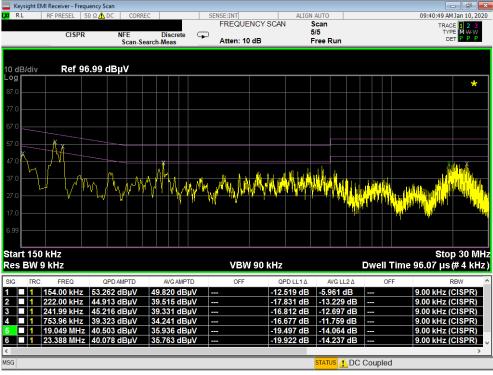
Plot 7-146. Line Conducted Plot with 802.11b (N) - CLOSED

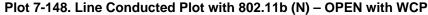
FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 400 at 400
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 100 of 103
© 2020 PCTEST Engineering Laboratory. Inc.				V 9.0 02/01/2019





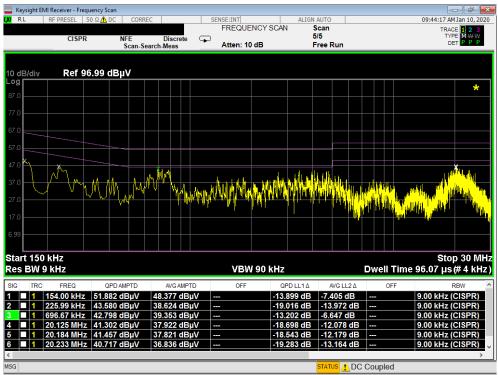
Plot 7-147. Line Conducted Plot with 802.11b (L1) - OPEN with WCP



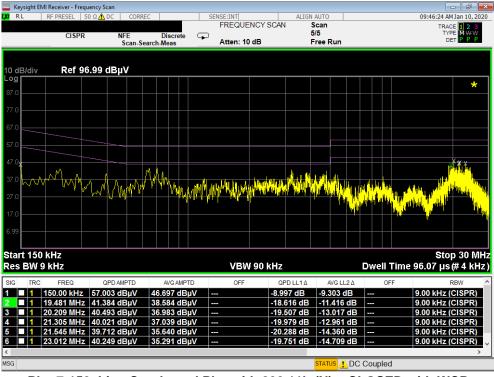


FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 101 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 101 of 103
© 2020 PCTEST Engineering Laboratory, Inc.				V 9.0 02/01/2019





Plot 7-149. Line Conducted Plot with 802.11b (L1) - CLOSED with WCP



Plot 7-150. Line Conducted Plot with 802.11b (N) - CLOSED with WCP

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 102 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 102 of 103
© 2020 PCTEST Engineering Laboratory, Inc.				V 9.0 02/01/2019



### 8.0 CONCLUSION

The data collected relate only the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMF700F** is in compliance with Part 15 Subpart C (15.247) of the FCC Rules.

FCC ID: A3LSMF700F		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 102 of 102
1M1911140188-07.A3L	10/25/2019 - 01/14/2020	Portable Handset		Page 103 of 103
© 2020 PCTEST Engineering Labo	V 9.0 02/01/2019			