



MEASUREMENT REPORT FCC PART 15.249 ANT+

Applicant Name:

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

Date of Testing:

3/12 - 5/1/2020

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M2003090034-13.A3L

FCC ID:

A3LSMG981V

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-G981V

EUT Type:

Portable Handset

Frequency Range:

2402 – 2480MHz

FCC Classification:

Low Power Communications Device Transmitter (DXX)

FCC Rule Part(s):

Part 15 Subpart C (15.249)

Test Procedure(s):

ANSI C63.10-2013, KDB 648474 D03 v01r04

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Randy Ortanez
President



FCC ID: A3LSMG981V	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset	Page 1 of 23

TABLE OF CONTENTS

1.0	INTRODUCTION	3
1.1	Scope	3
1.2	PCTEST Test Location.....	3
1.3	Test Facility / Accreditations.....	3
2.0	PRODUCT INFORMATION.....	4
2.1	Equipment Description	4
2.2	Device Capabilities	4
2.3	Test Configuration	4
2.4	EMI Suppression Device(s)/Modifications	4
3.0	DESCRIPTION OF TESTS	5
3.1	Evaluation Procedure	5
3.2	AC Line Conducted Emissions	5
3.3	Radiated Emissions.....	6
3.4	Environmental Conditions.....	6
4.0	ANTENNA REQUIREMENTS	7
5.0	MEASUREMENT UNCERTAINTY	8
6.0	TEST EQUIPMENT CALIBRATION DATA	9
7.0	TEST RESULTS.....	10
7.1	Summary	10
7.2	Occupied Bandwidth Measurement.....	11
7.3	Duty Cycle Calculation	12
7.4	Fundamental Field Strength Level Measurement.....	14
7.5	Radiated Spurious Emission Measurements.....	15
7.6	Radiated Restricted Band Edge Measurements.....	19
7.7	Line Conducted Measurement Data	20
8.0	CONCLUSION.....	23

FCC ID: A3LSMG981V	 PCTEST [®] Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 2 of 23

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 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 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 ISSED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISSED.

FCC ID: A3LSMG981V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset	Page 3 of 23	

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG981V**. The test data contained in this report pertains only to the emissions due to the EUT's ANT+ transmitter.

Test Device Serial No.: 6793M, 0469M, 6531M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1), 850/1900 GSM/GPRS/EDGE, 850/1900, WCDMA/HSPA, Multi-band LTE, 5G NR (n5, n66, n2, n260, n261), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, ANT+, Wireless Power Transfer

Ch.	Frequency (MHz)
00	2402
:	:
39	2441
:	:
78	2480

Table 2-1. Frequency/ Channel Operations

2.3 Test Configuration

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

2.4 EMI Suppression Device(s)/Modifications

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

FCC ID: A3LSMG981V	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 4 of 23

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from measurement procedure.....None

3.2 AC Line Conducted Emissions

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

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

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The spectrum was scanned from 150kHz to 30MHz with a spectrum analyzer. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 10kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. 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 7.7. The EMI Receiver mode of the Agilent MXE was used to perform AC line conducted emissions testing.

FCC ID: A3LSMG981V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 5 of 23

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: A3LSMG981V	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset	Page 6 of 23	

4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:

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

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

Conclusion:

The EUT complies with the requirement of §15.203.

FCC ID: A3LSMG981V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 7 of 23

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 ($\pm$ dB)
Conducted Bench Top Measurements	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: A3LSMG981V	 MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset	Page 8 of 23

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)	10/30/2019	Annual	10/30/2020	WL25-1
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
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
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: A3LSMG981V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset	Page 9 of 23	

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMG981V
 Method/System: Low Power Communications Device Transmitter (DXX)
 Number of Channels: 79

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	RSS-Gen [6.6]	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.35(c)	N/A	Duty Cycle Calculation	N/A	RADIATED	N/A	Section 7.3
15.249(a)(e)	RSS-210 [B.10]	Fundamental Field Strength Level	< 50 mV/m		PASS	Section 7.4
15.249(a)(e)	RSS-210 [B.10]	Harmonic Field Strength Level	< 500 μ V/m		PASS	Section 7.5
15.205, 15.209, 15.249(d)(e)	RSS-Gen [8.9]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< 15.209 limits or 50dB below the level of the fundamental (RSS-Gen [8.9])		PASS	Sections 7.5, 7.6
15.207	RSS-Gen [8.8]	AC Conducted Emissions 150kHz – 30MHz	< FCC 15.207 limits (RSS-Gen [8.8])	LINE CONDUCTED	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "Chamber Automation," Version 1.3.1.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.

FCC ID: A3LSMG981V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset	Page 10 of 23	

7.2 Occupied Bandwidth Measurement

§2.1049; RSS-Gen (6.6)

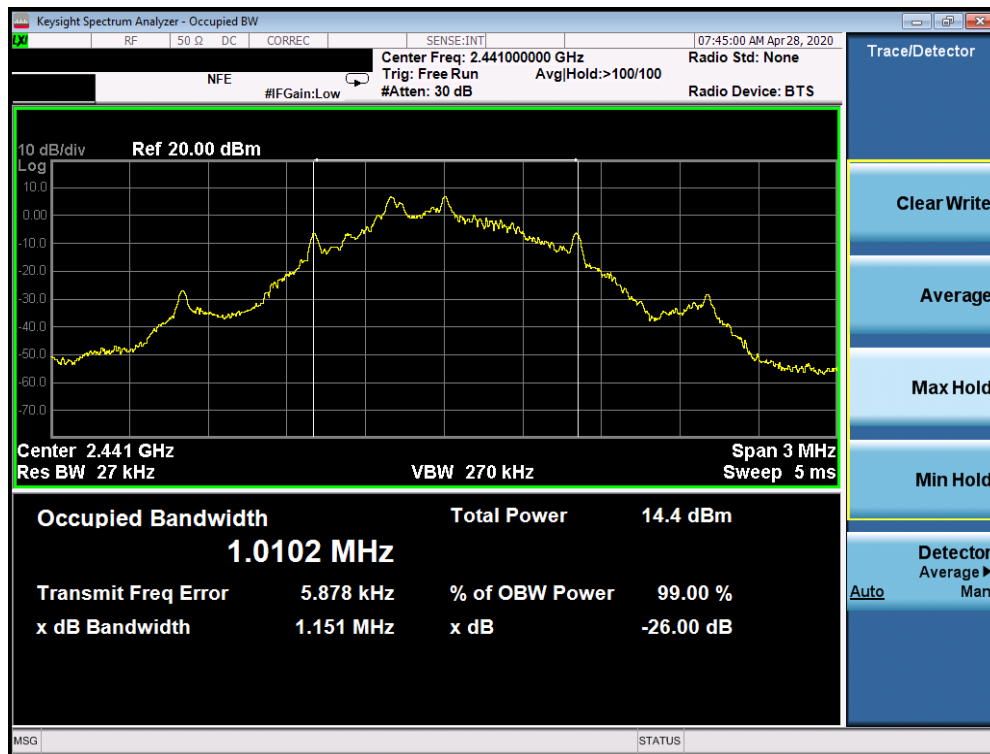
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The spectrum analyzers' "occupied bandwidth" measurement function was used to record the occupied bandwidth.

Frequency [MHz]	Channel No.	Operating Mode	Measured Bandwidth [kHz]
2441	39	ANT+ (non-hop)	1010.2

Table 7-2. Occupied Bandwidth Measurement



Figure 7-1. Test Instrument & Measurement Setup



Plot 7-1. Occupied Bandwidth Plot (ANT+ – Ch. 39)

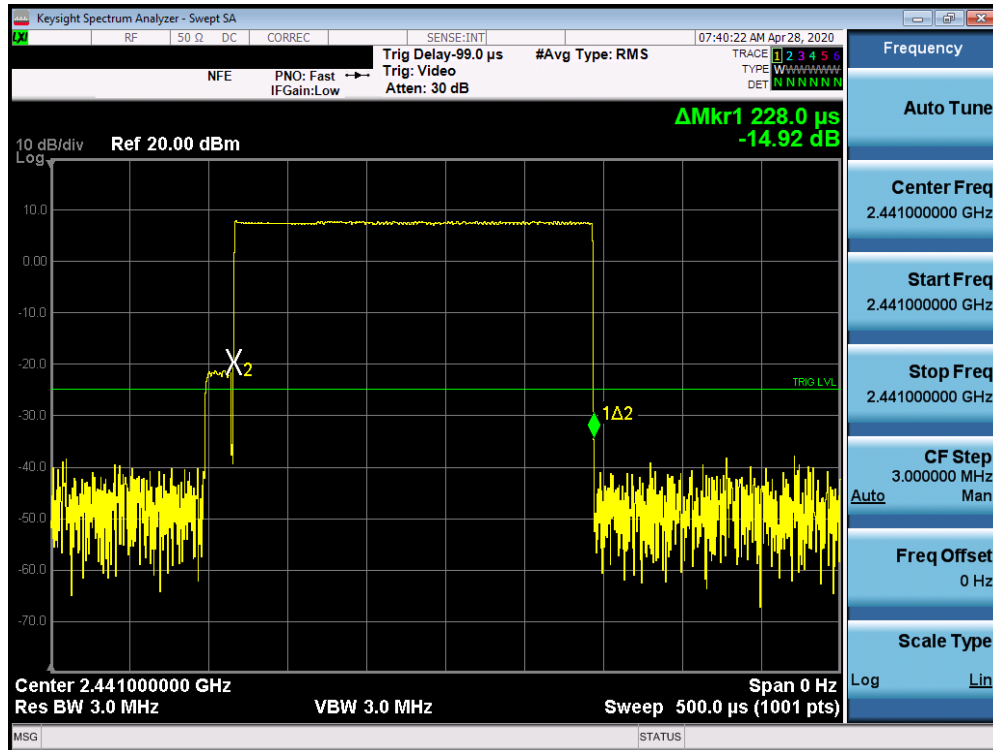
FCC ID: A3LSMG981V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 11 of 23

7.3 Duty Cycle Calculation

§15.35(c)

Per FCC Part 15.35(c), an average radiated field strength can be determined by applying a duty cycle correction factor to a measured peak radiated field strength level. The duty cycle correction factor is determined based on the worst case operation over a 100ms time period on any given channel. Two plots are included below to determine the appropriate duty cycle correction factor.

In Plot 7-2 below, it is shown that the pulse width for one transmission burst of the ANT+ transmitter while operating in non-hopping mode is 228.0µs.



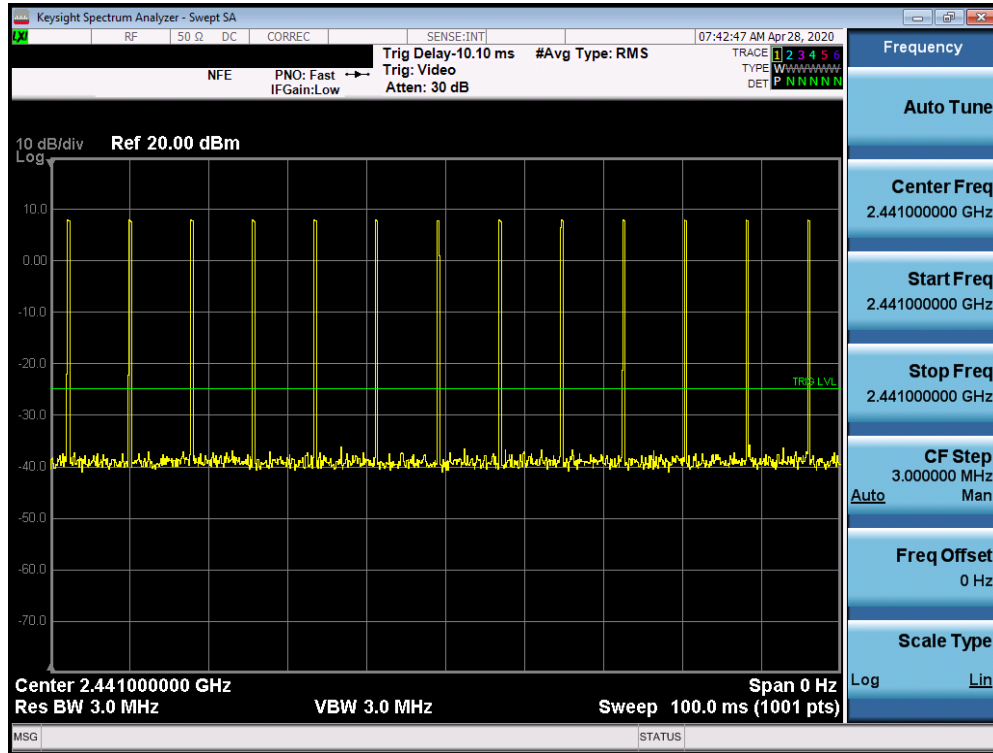
Plot 7-2. Pulse Width Measurement

FCC ID: A3LSMG981V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 12 of 23

Duty Cycle Calculation

§15.35(c)

In Plot 7-3 below, a video trigger is used to determine the maximum number of times the transmitter operates at maximum power over a 100ms period.



Plot 7-3. Worst Case 100ms Operation

Since it is determined that the transmitter burst appears a maximum of 13 times over a 100ms window with a pulse width of 228.0μs, then the appropriate duty cycle correction factor is determined from the following formula, based on 15.35(c):

$$\begin{aligned} \text{DCCF} &= 20\log_{10} (\text{number of hits} \times (\text{worst case 100ms operation} / 100\text{ms})) \\ &= 20\log_{10} (13 \times (0.2280\text{ms}/100\text{ms})) = -30.56\text{dB} \end{aligned}$$

DCCF = -30.56dB

FCC ID: A3LSMG981V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 13 of 23

7.4 Fundamental Field Strength Level Measurement

§15.249(a)(e); RSS-210 (B.10)

Measurement is made while the EUT is operating in non-hopping transmission mode. The field strengths shown below were measured using a spectrum analyzer. Peak field strength measurements are performed in the analyzers' swept spectrum mode using a peak detector with RBW = 3MHz and VBW ≥ RBW. Average field strength data is determined by applying the duty cycle correction factor (DCCF) found in Section 7.3 to the measured peak field strength values.

The maximum permissible average field strength level is 50mV/m (93.98dBμV/m). The maximum permissible peak field strength level is 500mV/m (113.98 dBμV/m).

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
2402.00	Peak	H	239	353	-19.69	13.59	100.90	-30.56	70.34	93.98	-23.64
2402.00	Peak	H	239	353	-19.69	13.59	100.90	0.00	100.90	113.98	-13.08
2441.00	Peak	H	112	357	-18.40	14.32	102.92	-30.56	72.36	93.98	-21.62
2441.00	Peak	H	112	357	-18.40	14.32	102.92	0.00	102.92	113.98	-11.06
2480.00	Peak	H	183	359	-20.09	14.85	101.76	-30.56	71.20	93.98	-22.78
2480.00	Peak	H	183	359	-20.09	14.85	101.76	0.00	101.76	113.98	-12.22

Table 7-3. Field Strength Measurements

FCC ID: A3LSMG981V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 14 of 23

7.5 Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e); RSS-210 (B.10), 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 7-4. Radiated Limits

Test Setup

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

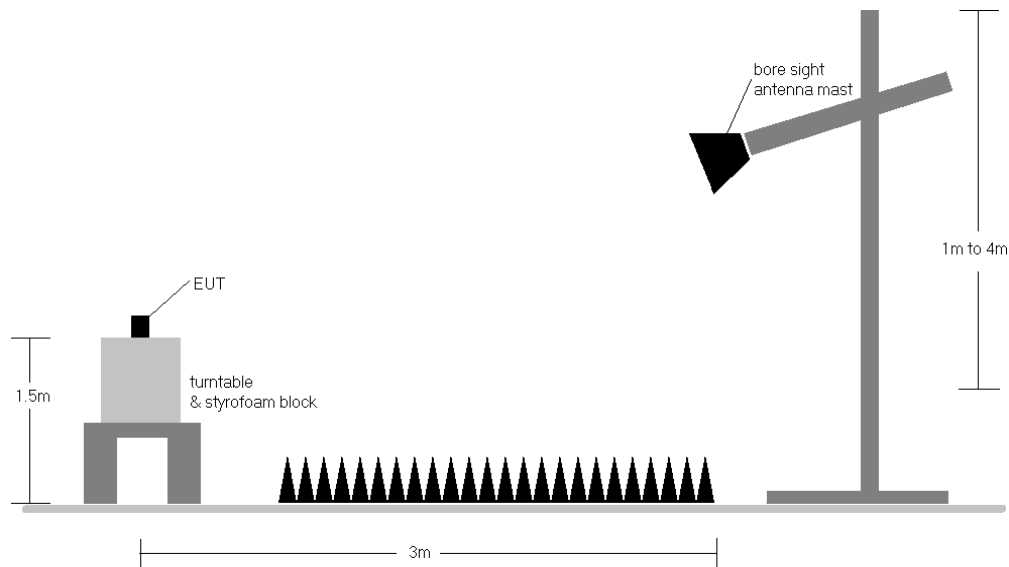


Figure 7-2. Radiated Test Setup

FCC ID: A3LSMG981V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 15 of 23

Sample Calculation

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

Test Notes

1. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported. There were no non-harmonic emissions detected whose levels were within 20dB of the applicable limits so only harmonic emissions data is shown in this section.
2. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-4. Per 15.249(d) and RSS-210 (B.10), the radiated emissions limits from 15.209 and RSS-Gen Section 8.10 were used since they were less than the limit of 50dB of attenuation from the measured fundamental field strength level.
3. Peak measurements > 1GHz using RBW = 1MHz and VBW = 3MHz.
4. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
5. This unit was tested with its standard battery.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: A3LSMG981V	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset	Page 16 of 23	

Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e); RSS-210 (B.10), RSS-Gen (8.9)

Worst Case Mode: ANT+ (non-hopping)
 Measurement Distance: 3 Meters
 Operating Frequency: 2402MHz
 Channel: 00

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4804.00	Peak	H	-	-	-69.58	7.89	45.31	-30.56	14.75	53.98	-39.23
4804.00	Peak	H	-	-	-69.58	7.89	45.31	0.00	45.31	73.98	-28.67
12010.00	Peak	H	-	-	-72.57	20.86	55.29	-30.56	24.73	53.98	-29.25
12010.00	Peak	H	-	-	-72.57	20.86	55.29	0.00	55.29	73.98	-18.69

Table 7-5. Radiated Measurements

Worst Case Mode: ANT+ (non-hopping)
 Measurement Distance: 3 Meters
 Operating Frequency: 2441MHz
 Channel: 39

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4882.00	Peak	H	-	-	-69.56	8.12	45.56	-30.56	15.00	53.98	-38.98
4882.00	Peak	H	-	-	-69.56	8.12	45.56	0.00	45.56	73.98	-28.42
7323.00	Peak	H	-	-	-70.87	11.34	47.47	-30.56	16.91	53.98	-37.07
7323.00	Peak	H	-	-	-70.87	11.34	47.47	0.00	47.47	73.98	-26.51
12205.00	Peak	H	-	-	-72.72	20.18	54.46	-30.56	23.90	53.98	-30.08
12205.00	Peak	H	-	-	-72.72	20.18	54.46	0.00	54.46	73.98	-19.52

Table 7-6. Radiated Measurements

FCC ID: A3LSMG981V	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 17 of 23

Radiated Spurious Emission Measurements

§15.205 §15.209 §15.249 (d)(e); RSS-210 (B.10), RSS-Gen (8.9)

Worst Case Mode: ANT+ (non-hopping)
 Measurement Distance: 3 Meters
 Operating Frequency: 2480MHz
 Channel: 78

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	Duty Cycle Correction [dB]	Corrected Field Strength [dBμV/m]	Limit [dBμV/m]	Margin [dB]
4960.00	Peak	H	-	-	-69.36	8.11	45.75	-30.56	15.19	53.98	-38.79
4960.00	Peak	H	-	-	-69.36	8.11	45.75	0.00	45.75	73.98	-28.23
7440.00	Peak	H	-	-	-71.22	11.76	47.54	-30.56	16.98	53.98	-37.00
7440.00	Peak	H	-	-	-71.22	11.76	47.54	0.00	47.54	73.98	-26.44
12400.00	Peak	H	-	-	-72.45	20.45	55.00	-30.56	24.44	53.98	-29.54
12400.00	Peak	H	-	-	-72.45	20.45	55.00	0.00	55.00	73.98	-18.98

Table 7-7. Radiated Measurements

FCC ID: A3LSMG981V	 PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 18 of 23

7.6 Radiated Restricted Band Edge Measurements

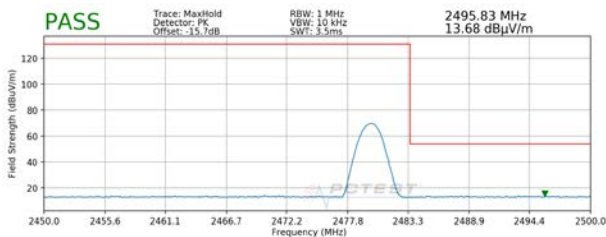
§15.205 §15.209 §15.249 (d); RSS-210 (B.10), RSS-Gen (8.9)

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

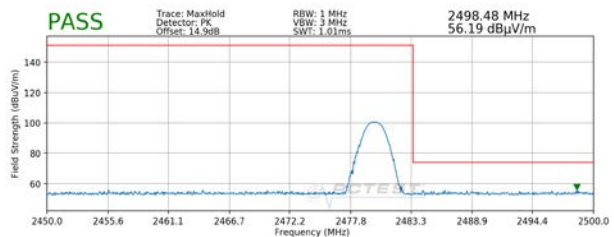
The amplitude offset shown in the following plots for average measurements was calculated using the formula:

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

Worst Case Mode:	ANT+ (non-hopping)
Measurement Distance:	3 Meters
Operating Frequency:	2480MHz
Back Cover	Standard
Channel:	78



Plot 7-4. Radiated Restricted Upper Band Edge Measurement (Average)



Plot 7-5. Radiated Restricted Upper Band Edge Measurement (Peak)

FCC ID: A3LSMG981V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 19 of 23

7.7 Line Conducted Measurement 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 §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 7-8. 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: A3LSMG981V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 20 of 23

Test Setup

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

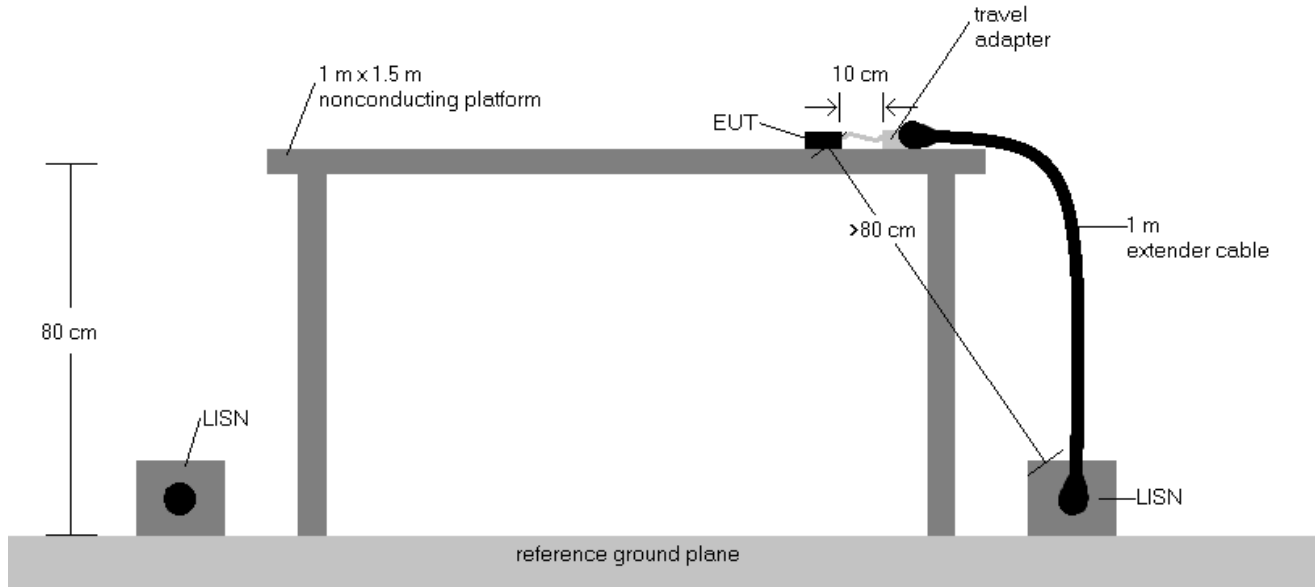
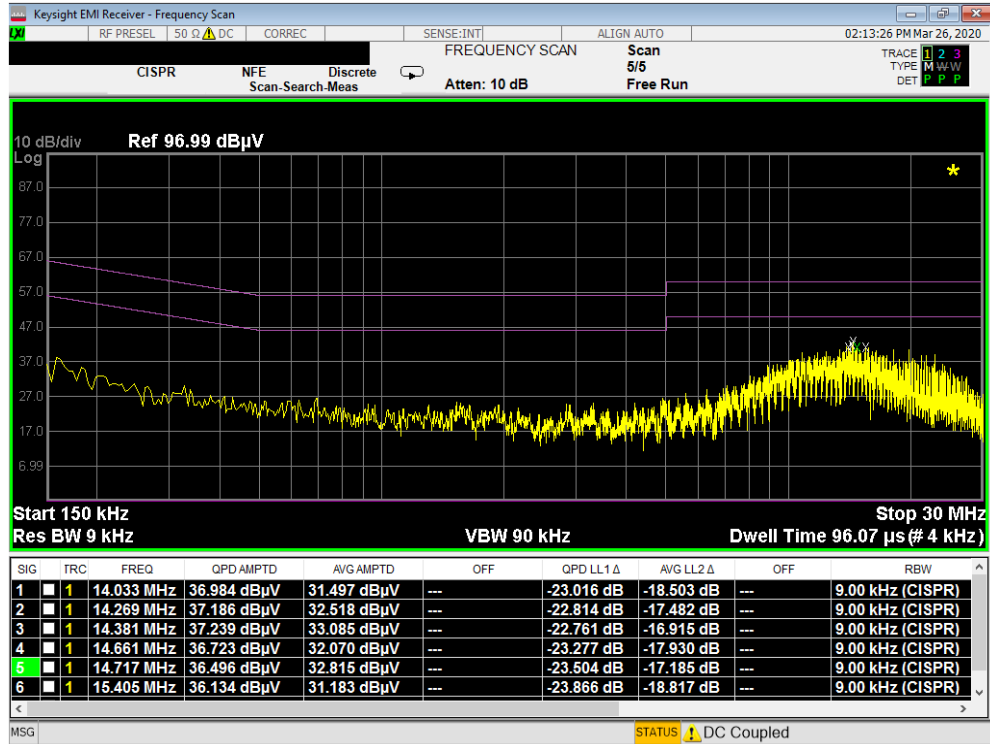


Figure 7-3. Test Instrument & Measurement Setup

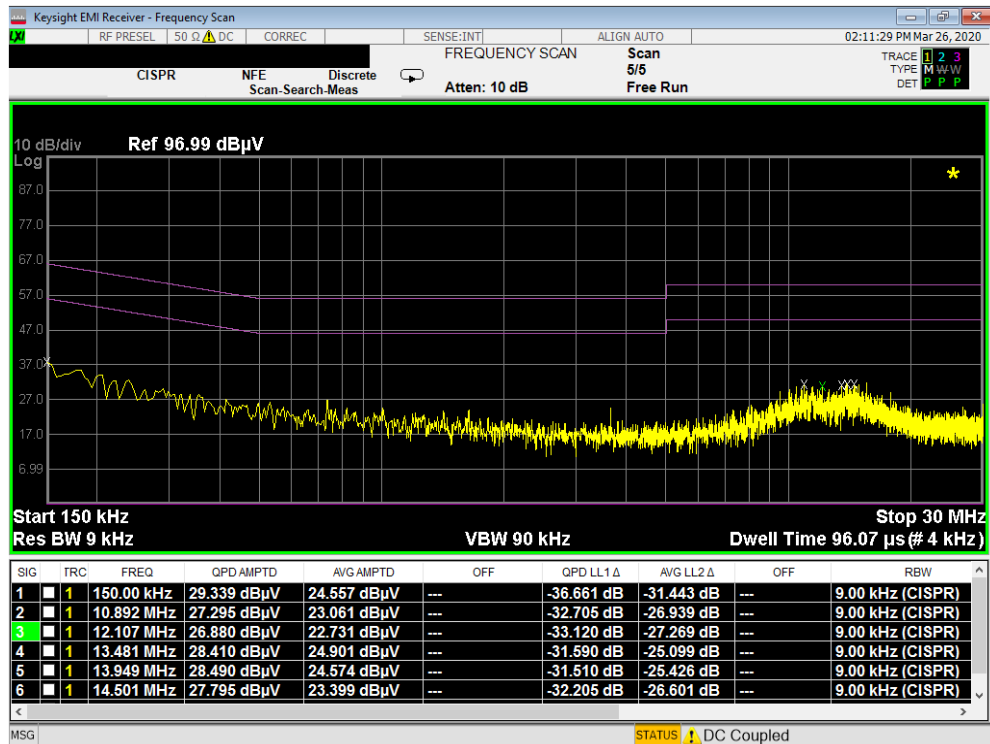
Test Notes

1. 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 15.207 and RSS-Gen (8.8).
3. $\text{Corr. (dB)} = \text{Cable loss (dB)} + \text{LISN insertion factor (dB)}$
4. $\text{QP/AV Level (dB}\mu\text{V)} = \text{QP/AV Analyzer/Receiver Level (dB}\mu\text{V)} + \text{Corr. (dB)}$
5. $\text{Margin (dB)} = \text{QP/AV Limit (dB}\mu\text{V)} - \text{QP/AV Level (dB}\mu\text{V)}$
6. Traces shown in plot are made using a peak detector.
7. Deviations to the Specifications: None.

FCC ID: A3LSMG981V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 21 of 23



Plot 7-6. Line-Conducted Test Plot (L1)



Plot 7-7. Line-Conducted Test Plot (N)

FCC ID: A3LSMG981V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 22 of 23

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG981V** is in compliance with Part 15 Subpart C (15.249) of the FCC Rules.

FCC ID: A3LSMG981V	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2003090034-13.A3L	Test Dates: 3/12 - 5/1/2020	EUT Type: Portable Handset		Page 23 of 23