



# PCTEST ENGINEERING LABORATORY, INC.

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## MEASUREMENT REPORT FCC Part 22 & 90

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


**Date of Testing:**  
3/13 - 3/24/2017  
**Test Site/Location:**  
PCTEST Lab., Columbia, MD, USA  
**Test Report Serial No.:**  
1M1703100103-03.A3L

<b>FCC ID:</b>	<b>A3LSMG950N</b>
<b>APPLICANT:</b>	<b>SAMSUNG ELECTRONICS CO., LTD.</b>



**Applicant Type:** Class II Permissive Change  
**FCC Classification:** PCS Licensed Transmitter Held to Ear (PCE)  
**FCC Rule Part:** §2.1049, §22(H), §90.691  
**Test Procedure(s):** KDB 971168 D01 v02r02, ANSI/TIA-603-D-2010, KDB 648474 D03 v01r04  
**EUT Type:** Portable Handset  
**Model:** SM-G950N  
**Test Device Serial No.:** *identical prototype* [S/N: E3D12, E3D02]  
**Class II Permissive Change:** See FCC change document  
**Original Grant Date:** 3/10/2017

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

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



  
 Randy Ortanez  
 President

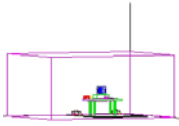


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## FCC Part 22 & 90

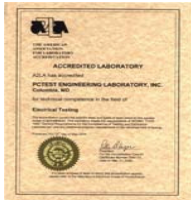


### §2.1033 General Information



**APPLICANT:** Samsung Electronics Co., Ltd.  
**APPLICANT ADDRESS:** 129, Samsung-ro,  
 Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea  
**TEST SITE:** PCTEST ENGINEERING LABORATORY, INC.  
**TEST SITE ADDRESS:** 7185 Oakland Mills Road, Columbia, MD 21045 USA  
**BASE MODEL:** SM-G950N  
**FCC CLASSIFICATION:** PCS Licensed Transmitter Held to Ear (PCE)  
**MODE:** LTE  
**FREQUENCY TOLERANCE:** ±0.00025 % (2.5 ppm)  
**Test Device Serial No.:** E3D12, E3D02       Production     Pre-Production     Engineering  
**DATE(S) OF TEST:** 3/13 - 3/24/2017  
**TEST REPORT S/N:** 1M1703100103-03.A3L

### Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab. located in Columbia, MD 21046, U.S.A.



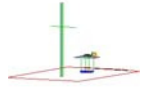
- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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## FCC Part 22 & 90



Mode	Tx Frequency (MHz)	Measurement	Max. Power (W)	Max. Power (dBm)	Modulation
LTE Band 26	814.7 - 821.5	ERP	0.082	19.12	QPSK
LTE Band 26	814.7 - 821.5	ERP	0.066	18.22	16-QAM

**EUT Overview**

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# 1.0 INTRODUCTION

## 1.1 Scope

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

## 1.2 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Intern't'l (BWI) airport, the city of Baltimore and the Washington, DC area. (See Figure 1-1).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2014 on January 22, 2015.

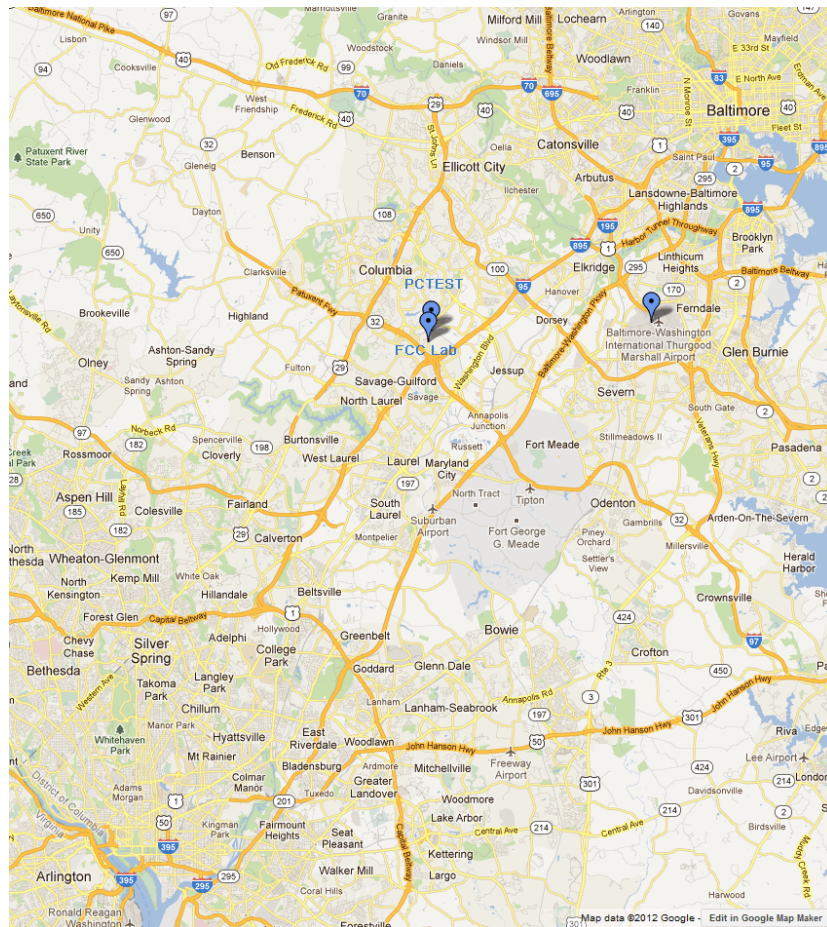




Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG950N**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part .691.

### 2.2 Device Capabilities

This device contains the following capabilities:

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



### 2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-D-2010 and KDB 971168 D01 v02r02. See Section 6.0 of this test report for a description of the radiated tests.

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

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

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

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

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

### 3.2 Radiated Power and Radiated Spurious Emissions

**§2.1053, §90.635, §90.691**

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 72.4cm high PVC support structure is placed on top of the turntable. A 3” (~7.6cm) sheet of high density polystyrene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v02r02.



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

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

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

The calculated  $P_d$  levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of  $43 + 10\log_{10}(\text{Power [Watts]})$  specified in 90.691.



For fundamental radiated power measurements, the guidance of KDB 971168 D01 v02r02 is used to record the EUT power level that is subsequently matched via the aforementioned substitution method given in ANSI/TIA-603-D-2010.

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## 4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement data shown herein meets or exceeds the  $U_{CISPR}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

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## 5.0 TEST EQUIPMENT CALIBRATION DATA



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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	7/11/2016	Annual	7/11/2017	RE1
-	LTx3	Licensed Transmitter Cable Set	10/12/2016	Annual	10/12/2017	LTx3
Agilent	N9038A	MXE EMI Receiver	4/21/2016	Annual	4/21/2017	MY51210133
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	7/6/2016	Annual	7/6/2017	441119
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	7/11/2016	Annual	7/11/2017	441128
Emco	3115	Horn Antenna (1-18GHz)	3/10/2016	Biennial	3/10/2018	9704-5182
Emco	6502	Active Loop Antenna (10k - 30 MHz)	8/9/2016	Biennial	8/9/2018	2936
Espec	ESX-2CA	Environmental Chamber	4/4/2016	Annual	4/4/2017	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	4/26/2016	Biennial	4/26/2018	128337
K & L	13SH10-1000/U1000	N Type High Pass Filter	7/6/2016	Annual	7/6/2017	13SH10-1000/U1000-1
K & L	13SH10-1000/U1000	N Type High Pass Filter	7/11/2016	Annual	7/11/2017	13SH10-1000/U1000-2
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	4/4/2016	Annual	4/4/2017	11401010036
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	PWR-SENS-4RMS	USB Power Sensor	4/4/2016	Annual	4/4/2017	11210140001
Mini-Circuits	TVA-11-422	RF Power Amp	N/A			QA1303002
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
PCTEST	-	EMC Switch System	7/11/2016	Annual	7/11/2017	NM1
PCTEST	-	EMC Switch System	7/6/2016	Annual	7/6/2017	NM2
Rhode & Schwarz	TS-PR18	Pre-Amplifier	7/6/2016	Annual	7/6/2017	101622
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	7/11/2016	Annual	7/11/2017	100071
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	5/16/2016	Annual	5/16/2017	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/15/2016	Annual	7/15/2017	100348
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	3/30/2016	Biennial	3/30/2018	9105-2404
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
Sunol	DRH-118	Horn Antenna (1-18GHz)	7/30/2015	Biennial	7/30/2017	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107

**Table 5-1. Test Equipment**

**Notes:**

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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## 6.0 TEST RESULTS

### 6.1 Summary



Company Name: Samsung Electronics Co., Ltd.  
 FCC ID: A3LSMG950N  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 Band: LTE Band 26

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
22.913(a.2)	Effective Radiated Power (Band 26)	< 7 Watts max. ERP	RADIATED	PASS	Section 6.2
2.1053 90.691	Radiated Spurious Emissions	> 43 + log <sub>10</sub> (P[Watts]) for all out-of-band emissions except > 50 + 10log <sub>10</sub> (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge		PASS	Section 6.3

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

**Note:**

All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.

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## 6.2 Radiated Power (ERP)

### §22.913(a.2)

#### Test Overview

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



#### Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.2.1

ANSI/TIA-603-D-2010 – Section 2.2.17

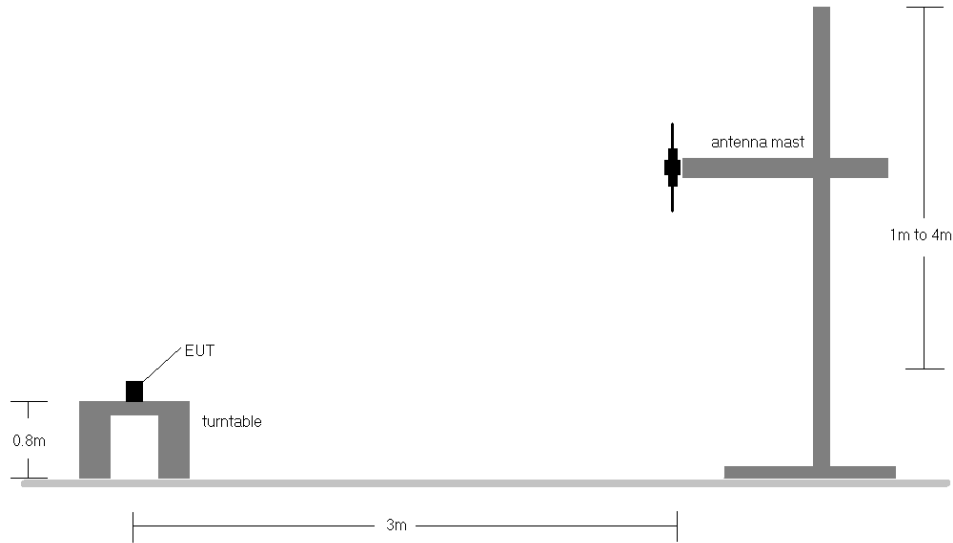
#### Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $\geq$  2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

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## Test Setup

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





**Figure 6-1. Radiated Test Setup <1GHz**

## Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) ERP measurement data is provided only for LTE mode operation using 15MHz bandwidth since a portion this channel operates under FCC Part 22(H).

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
821.50	15	QPSK	H	214	270	1 / 0	13.77	5.35	19.12	38.45	-19.33
821.50	15	16-QAM	H	214	270	1 / 0	12.87	5.35	18.22	38.45	-20.23
821.50	15	QPSK	V	260	47	1 / 0	11.78	5.35	17.13	38.45	-21.32
821.50	15 (WCP)	QPSK	H	202	266	1 / 0	13.56	5.35	18.91	38.45	-19.54

**Table 6-1. ERP Data (Band 26)**

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## 6.3 Radiated Spurious Emissions Measurements

§2.1053 §90.691

### Test Overview

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



### Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-D-2010 – Section 2.2.12

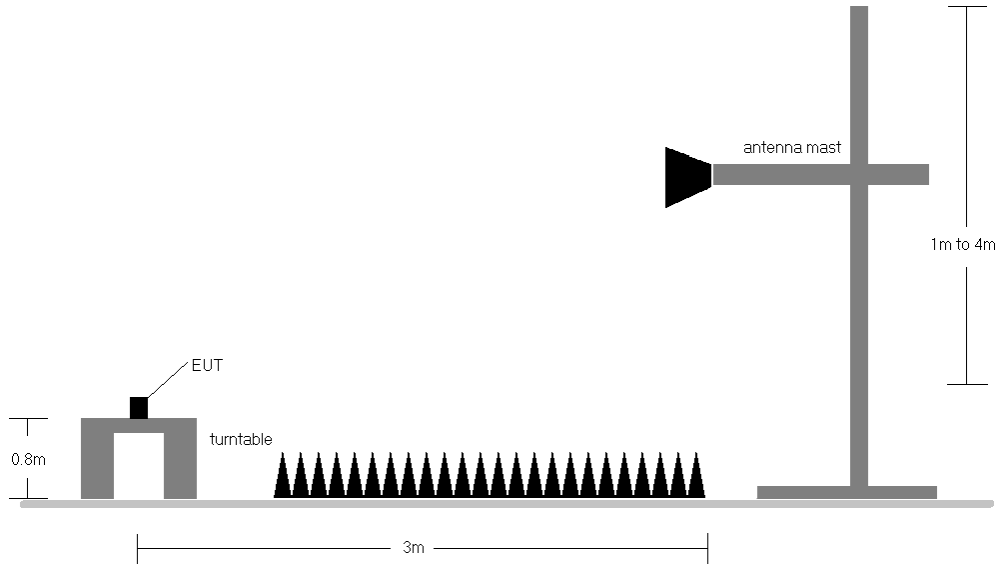
### Test Settings

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

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**Test Setup**



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



**Figure 6-2. Test Instrument & Measurement Setup**

**Test Notes**

1. This unit was tested with its standard battery.
2. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
3. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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OPERATING FREQUENCY: 823.30 MHz  
 CHANNEL: 26783  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT: -13.00 dBm



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1646.60	H	-	-	-68.90	6.69	-62.20	-49.2
2469.90	H	-	-	-66.56	7.50	-59.07	-46.1
3293.20	H	-	-	-62.89	7.36	-55.53	-42.5

**Table 6-2. Radiated Spurious Data (Ch. 26783)**

OPERATING FREQUENCY: 823.30 MHz  
 CHANNEL: 26783  
 MODULATION SIGNAL: QPSK  
 BANDWIDTH: 1.4 MHz  
 DISTANCE: 3 meters  
 LIMIT: -13.00 dBm



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1646.60	H	-	-	-65.09	6.31	-58.78	-45.8
2469.90	H	-	-	-63.59	6.85	-56.74	-43.7
3293.20	H	-	-	-61.77	7.12	-54.64	-41.6

**Table 6-3. Radiated Spurious Data with WCP (Ch. 26783)**

FCC ID: A3LSMG950N		Part 22(H) & 90 LTE MEASUREMENT REPORT CLASS II PERMISSIVE CHANGE			Approved by: Quality Manager
Test Report S/N: 1M1703100103-03.A3L	Test Dates: 3/13 - 3/24/2017	EUT Type: Portable Handset		Page 15 of 16	

## 7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG950N** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.

FCC ID: A3LSMG950N		<b>Part 22(H) &amp; 90 LTE MEASUREMENT REPORT CLASS II PERMISSIVE CHANGE</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1703100103-03.A3L	<b>Test Dates:</b> 3/13 - 3/24/2017	<b>EUT Type:</b> Portable Handset	Page 16 of 16	