

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

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

Date of Testing:

11/18 - 11/27/2015

Test Site/Location:

PCTEST Lab., Columbia, MD, USA

Test Report Serial No.:

0Y1511181970.A3L

FCC ID : A3LSMT377A**APPLICANT:** SAMSUNG ELECTRONICS CO., LTD.**Application Type:**

Class II Permissive Change

FCC Classification:

PCS Licensed Transmitter (PCB)

FCC Rule Part(s):

§2; §27

Test Procedure(s):

ANSI/TIA-603-C-2004, KDB 971168 D01 v02r02

EUT Type:

Portable Tablet

Model(s):

SM-T377A

Test Device Serial No.:

identical prototype [S/N: 353608070024214]

Class II Permissive Change:

Please see FCC change document

Original Grant Date:

9/30/2015

Mode	Tx Frequency (MHz)	Modulation	EIRP	
			Max. Power (W)	Max. Power (dBm)
LTE Band 30	2307.5 - 2312.5	QPSK	0.050	16.97
LTE Band 30	2307.5 - 2312.5	16QAM	0.039	15.92
LTE Band 30	2310	QPSK	0.029	14.67
LTE Band 30	2310	16QAM	0.023	13.66

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.

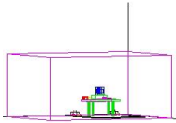

Randy Ortanez
President

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

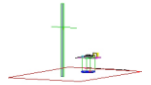
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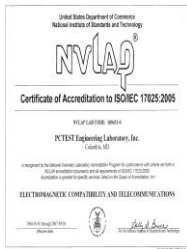
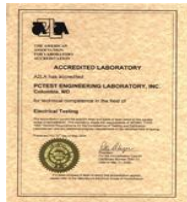


§2.1033 General Information

APPLICANT: Samsung Electronics Co., Ltd.
APPLICANT ADDRESS: 129, Samsung-ro,
 Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
TEST SITE: PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS: 7185 Oakland Mills Road, Columbia, MD 21045 USA
FCC RULE PART(S): §2; §27
BASE MODEL: SM-T377A
FCC ID: A3LSMT377A
FCC CLASSIFICATION: PCS Licensed Transmitter (PCB)
FREQUENCY TOLERANCE: $\pm 0.00025\%$ (2.5 ppm)
Test Device Serial No.: 353608070024214 ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST: 11/18 - 11/27/2015
TEST REPORT S/N: 0Y1511181970.A3L

Test Facility / Accreditations

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



- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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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.

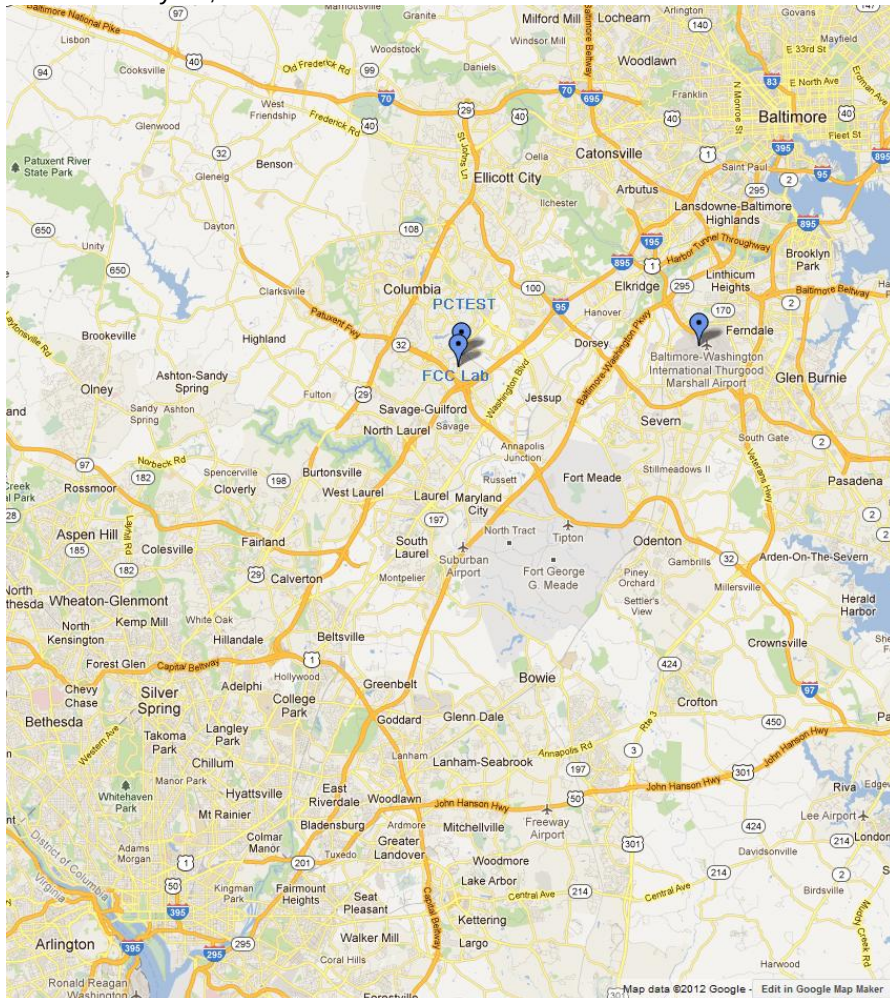


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Tablet FCC ID: A3LSMT377A**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

2.2 Device Capabilities

This device contains the following capabilities:

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

2.3 Test Configuration

The Samsung Portable Tablet FCC ID: A3LSMT377A was tested per the guidance of ANSI/TIA-603-C-2004 and KDB 971168 D01 v02r02. See Section 7.0 of this test report for a description of the radiated emissions tests.

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 Measurement Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-C-2004) 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 **Samsung Portable Tablet FCC ID: A3LSMT377A**.

3.2 WCS – Mobile/Base Frequency Blocks

§27.5(a)

The following frequencies are available for WCS in the 2305-2320 MHz and 2345-2360 MHz bands:

BLOCK 1: 2305-2310 and 2350-2355 MHz (A)

BLOCK 2: 2310-2315 and 2355-236 MHz (B)

BLOCK 3: 2315-2320 MHz (C)

BLOCK 4: 2345-2350 MHz (D)

3.3 Radiated Power and Radiated Spurious Emissions

§2.1053 §27.53(a.4)

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 Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz 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 below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A ¾” (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

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

Per the guidance of ANSI/TIA-603-C-2004, 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

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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 $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

For Band 30, the calculated P_d levels are compared to the absolute spurious emission limit of -40dBm which is equivalent to the required minimum attenuation of $70 + 10\log_{10}(\text{Power [Watts]})$.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement 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)
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).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	4/28/2015	Annual	4/28/2016	RE1
Agilent	8447D	Broadband Amplifier	6/12/2015	Annual	6/12/2016	2443A01900
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/24/2015	Annual	3/24/2016	MY52350166
Emco	6502	Active Loop Antenna (10k - 30 MHz)	6/24/2014	Biennial	6/24/2016	267
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/8/2014	Biennial	4/8/2016	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2014	Biennial	3/12/2016	128337
K & L	11SH10-3075/U18000	High Pass Filter	12/1/2014	Annual	12/1/2015	4
Mini-Circuits	SSG-4000HP	USB Synthesized Signal Generator	N/A			11208010032
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	3/11/2015	Annual	3/11/2016	11401010036
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	N/A			103962
Rhode & Schwarz	TS-PR18	Pre-Amplifier	3/5/2015	Annual	3/5/2016	101622
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	3/12/2015	Annual	3/12/2016	100342
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/28/2014	Biennial	1/28/2016	A051107

Table 5-1. Test Equipment

Notes:

1. 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 SAMPLE CALCULATIONS

Spurious Radiated Emission – LTE Band

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

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMT377A
 FCC Classification: PCS Licensed Transmitter (PCB)
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Result	Reference
<u>TRANSMITTER MODE (TX)</u>					
27.50(a.3)	Equivalent Isotropic Radiated Power (Band 30)	< 0.25 Watts max. EIRP	RADIATED	PASS	Section 7.2
2.1053	Undesirable Emissions	> $43 + 10\log_{10}(P[\text{Watts}])$ for all out-of-band emissions		PASS	Section 7.3
27.53(a)	Undesirable Emissions (Band 30)	> $70 + 10\log_{10}(P[\text{Watts}])$		PASS	Section 7.3

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.

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7.2 Radiated Power (EIRP)

§24.232(c.2) §27.50(a.3)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating above 1GHz are performed using vertically polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.2.1

ANSI/TIA-603-C-2004 – 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 $\geq 3 \times$ RBW
4. Span = 1.5 times the OBW
5. No. of sweep points $\geq 2 \times$ span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
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.

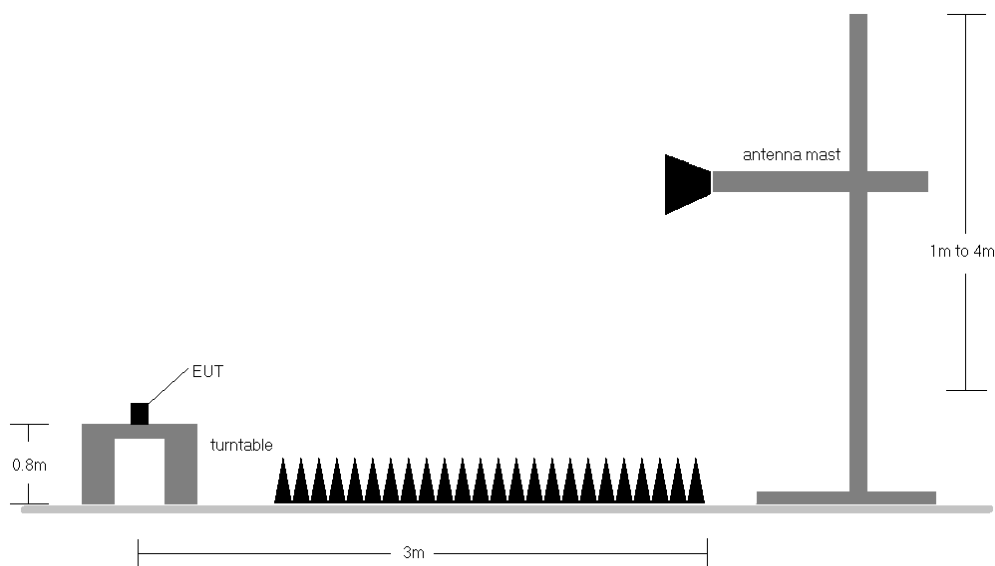


Figure 7-1. Radiated Test Setup >1GHz

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.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2307.50	5	QPSK	V	3.83	216	1 / 24	8.39	8.00	16.39	23.98	-7.59
2310.00	5	QPSK	V	2.92	213	1 / 0	8.85	8.00	16.85	23.98	-7.13
2312.50	5	QPSK	V	3.50	200	1 / 24	8.97	8.00	16.97	23.98	-7.01
2307.50	5	16-QAM	V	3.83	216	1 / 24	7.38	8.00	15.38	23.98	-8.60
2310.00	5	16-QAM	V	2.92	213	1 / 0	7.87	8.00	15.87	23.98	-8.11
2312.50	5	16-QAM	V	3.50	200	1 / 24	7.92	8.00	15.92	23.98	-8.06
2310.00	10	QPSK	V	3.97	45	1 / 0	6.67	8.00	14.67	23.98	-9.31
2310.00	10	16-QAM	V	3.97	45	1 / 0	5.66	8.00	13.66	23.98	-10.32

Table 7-2. Radiated Power Data (Band 30)

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7.3 Radiated Spurious Emissions Measurements

§2.1053 §27.53(a.4)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 – Section 5.8

ANSI/TIA-603-C-2004 – 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 = Peak
6. Trace mode = max hold
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.

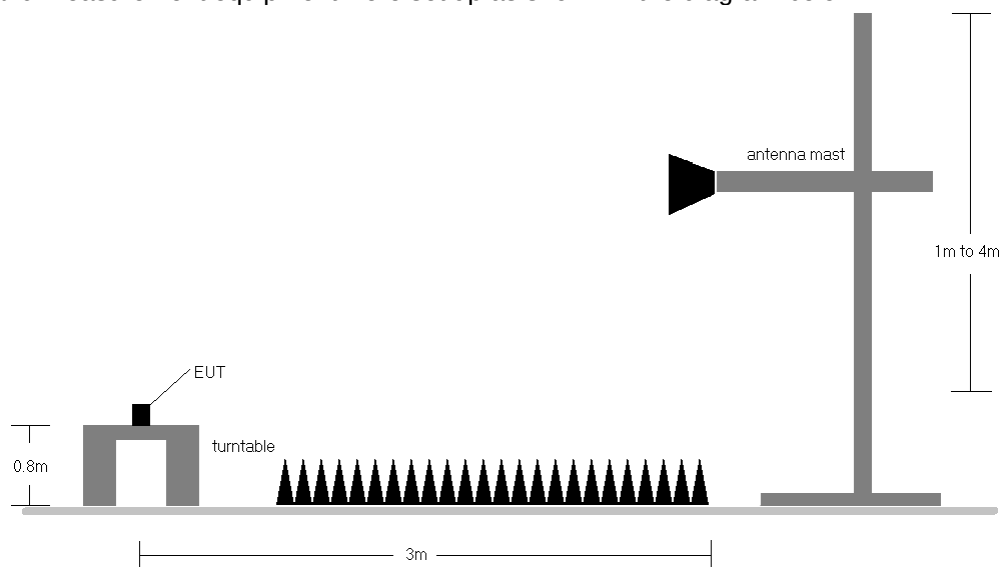


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

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

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OPERATING FREQUENCY: 2307.50 MHz
 CHANNEL: 27685
 MEASURED OUTPUT POWER: 16.39 dBm = 0.044 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $70 + 10 \log_{10} (W) =$ 56.39 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
4615.00	H	3	185	-63.21	9.51	-53.69	70.1
6922.50	H	3	302	-58.00	11.48	-46.52	62.9
9230.00	H	3	352	-56.27	13.22	-43.05	59.4
11537.50	H	3	112	-60.30	13.34	-46.97	63.4

Table 7-3. Radiated Spurious Data (Band 30 – Low Channel)

OPERATING FREQUENCY: 2310.00 MHz
 CHANNEL: 27710
 MEASURED OUTPUT POWER: 16.85 dBm = 0.048 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $70 + 10 \log_{10} (W) =$ 56.85 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
4620.00	H	2	231	-62.64	9.52	-53.12	70.0
6930.00	H	2	201	-57.00	11.49	-45.52	62.4
9240.00	H	1	44	-56.25	13.22	-43.04	59.9
11550.00	H	1	191	-60.22	13.33	-46.89	63.7
13860.00	H	3	57	-61.89	14.56	-47.33	64.2

Table 7-4. Radiated Spurious Data (Band 30 – Mid Channel)

FCC ID: A3LSMT377A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1511181970.A3L	Test Dates: 11/18 - 11/27/2015	EUT Type: Portable Tablet		Page 16 of 18

OPERATING FREQUENCY: 2312.50 MHz
 CHANNEL: 27735
 MEASURED OUTPUT POWER: 16.97 dBm = 0.050 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 5.0 MHz
 DISTANCE: 3 meters
 LIMIT: $70 + 10 \log_{10} (W) =$ 56.97 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
4625.00	H	2	230	-61.10	9.53	-51.57	68.5
6937.50	H	2	207	-58.58	11.49	-47.09	64.1
9250.00	H	1	60	-56.47	13.22	-43.25	60.2
11562.50	H	1	200	-61.68	13.33	-48.35	65.3

Table 7-5. Radiated Spurious Data (Band 30 – High Channel)

FCC ID: A3LSMT377A	 FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		 Reviewed by: Quality Manager
Test Report S/N: 0Y1511181970.A3L	Test Dates: 11/18 - 11/27/2015	EUT Type: Portable Tablet	
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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Tablet FCC ID: A3LSMT377A** complies with all the requirements of Part 27 of the FCC rules for LTE operation only.

FCC ID: A3LSMT377A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1511181970.A3L	Test Dates: 11/18 - 11/27/2015	EUT Type: Portable Tablet		Page 18 of 18