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PART 22 MEASUREMENT REPORT

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

Date of Testing:
10/14/2021 - 11/10/2021
Test Report Issue Date:
12/17/2021
Test Site/Location:
PCTEST Lab. Yongin-Si, Gyeonggi-do, South Korea
Test Report Serial No.:
1M2109290114-27.A3L

FCC ID:	**A3LSMS901E**
Applicant Name:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-S901E/DS
Additional Model(s):	SM-S901E
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	22
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, 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 §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.

Prepared by

Reviewed by

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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	824.2 - 848.8	0.542	27.34	0.889	29.49	243KGXW
EDGE	N/A	8-PSK	824.2 - 848.8	0.157	21.97	0.258	24.12	238KG7W
WCDMA	N/A	Spread Spectrum	826.4 - 846.6	0.073	18.62	0.119	20.77	4M16F9W
LTE Band 26/5	15MHz (Band 26 only)	QPSK	831.5 - 841.5	0.079	18.96	0.129	21.11	13M6G7D
		16QAM	831.5 - 841.5	0.062	17.95	0.102	20.10	13M5W7D
	10 MHz	QPSK	829.0 - 844.0	0.081	19.08	0.133	21.23	9M04G7D
		16QAM	829.0 - 844.0	0.067	18.24	0.109	20.39	9M03W7D
	5 MHz	QPSK	826.5 - 846.5	0.082	19.14	0.135	21.29	4M54G7D
		16QAM	826.5 - 846.5	0.066	18.22	0.109	20.37	4M56W7D
	3 MHz	QPSK	825.5 - 847.5	0.081	19.06	0.132	21.21	2M72G7D
		16QAM	825.5 - 847.5	0.067	18.24	0.109	20.39	2M73W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.081	19.09	0.133	21.24	1M11G7D
		16QAM	824.7 - 848.3	0.067	18.25	0.110	20.40	1M11W7D

EUT Overview

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 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. 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 Yongin-si, Gyeonggi-do, 16954, South Korea.

- PCTEST is an ISO 17025-2017 accredited test facility under the National Voluntary Laboratory Accreditation Program (NVLAP) with Certificate number 600143-0 for Specific Absorption Rate (SAR), 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 (26168) test laboratory with the site description on file with ISED.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID:A3LSMS901E**. 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 22.

Test Device Serial No.: 0403M, 0419M, 0842M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions 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 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.

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Measurement Guidance for Certification of Licensed Digital Transmitters" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure……..None

3.2 Radiated Power and Radiated Spurious 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. 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. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

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.

For radiated power measurements, substitution method is used per the guidance of ANSI/TIA-603-E-2016. A half-wave dipole is 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:

$$P_{d\,[dBm]} = P_{g\,[dBm]} - \text{cable loss}_{\,[dB]} + \text{antenna gain}_{\,[dBd/dBi]};$$

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 $P_{g\,[dBm]}$ – cable loss $_{[dB]}$.

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And

$$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$ where D is the measurement distance in meters.

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 414788 D01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI/TIA-603-E-2016.

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 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	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

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 C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E5515C	WIRELESS COMMUNICATION TEST SET	2/19/2021	Annual	2/18/2022	MY50262130
Agilent	N9030A	PXA Signal Analyzer	7/6/2021	Annual	7/5/2022	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	7/7/2021	Annual	7/6/2022	6201300731
Anritsu	MA24106A	USB Power Sensor	7/7/2021	Annual	7/6/2022	1244512
Espec	SH-242	Environmental Chamber	9/15/2021	Annual	9/14/2022	93011064
ETS Lindgren	3110C	Biconical Antenna	7/9/2020	Biennial	7/8/2022	00211248
ETS Lindgren	3110C	Biconical Antenna	7/9/2020	Biennial	7/8/2022	00211250
Fairview Microwave	FM2CP1122-10	Coupler	7/7/2021	Annual	7/6/2022	1946
Keysight Technologies	N9030B	MXA Signal Analyzer	5/11/2021	Annual	5/10/2022	MY57142018
Mini Circuits	ZUDC10-83-S+	Coupler	9/15/2021	Annual	9/14/2022	2111
Mini-Circuits	BW-N10W5+	Attenuator	7/6/2021	Annual	7/5/2022	1607
Mini-Circuits	BW-N10W5+	Attenuator	7/6/2021	Annual	7/5/2022	1607
Rohde & Schwarz	TS-PR18	Preamplifier	7/8/2021	Annual	7/7/2022	102141
Rohde & Schwarz	SMBV100B	Signal Generator	11/4/2021	Annual	11/3/2022	101568
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	7/6/2021	Annual	7/5/2022	116851
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/19/2021	Annual	2/18/2022	131453
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/19/2021	Annual	2/18/2022	131454
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/19/2021	Annual	2/18/2022	150117
Rohde & Schwarz	ESW	EMI Test Receiver	7/6/2021	Annual	7/5/2022	101761
Rohde & Schwarz	FSW43	Signal & Spectrum Analyzer	9/15/2021	Annual	9/14/2022	101250
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/19/2021	Annual	2/18/2022	102131
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	3/29/2021	Annual	3/28/2022	102151
Schwarzbeck	UHA9105	Dipole Antenna	7/9/2020	Biennial	7/8/2022	91052522
Sunol	DRH-118	Horn Antenna	7/14/2021	Biennial	7/13/2023	A102416-1
Sunol	DRH-118	Horn Antenna	1/12/2021	Biennial	1/11/2023	A060215

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.

6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW
GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

EDGE Emission Designator

Emission Designator = 250KG7W
EDGE BW = 250 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

WCDMA Emission Designator

Emission Designator = 4M16F9W
WCDMA BW = 4.16 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 8M62G7D
LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D
LTE BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive 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 3700.40 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm – (-24.80) = 50.3 dBc.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMS901E

FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)

Mode(s): GSM/GPRS/WCDMA/LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power	2.1046	RSS-132(5.4)	N/A	PASS	See RF Exposure Report
	Occupied Bandwidth	2.1049	RSS-Gen(6.7)	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	RSS-132(5.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.3, 7.4
	Frequency Stability	2.1055, 22.355	RSS-132(5.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	RSS-132(5.4)	< 7 Watts max. ERP	PASS	Section 7.6
	Radiated Spurious Emissions	2.1053, 22.917(a)	RSS-132(5.5)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

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 were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT 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, attenuators, and couplers.
4) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST EMC Software Tool v1.0.

7.2 Occupied Bandwidth

Test Overview

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. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

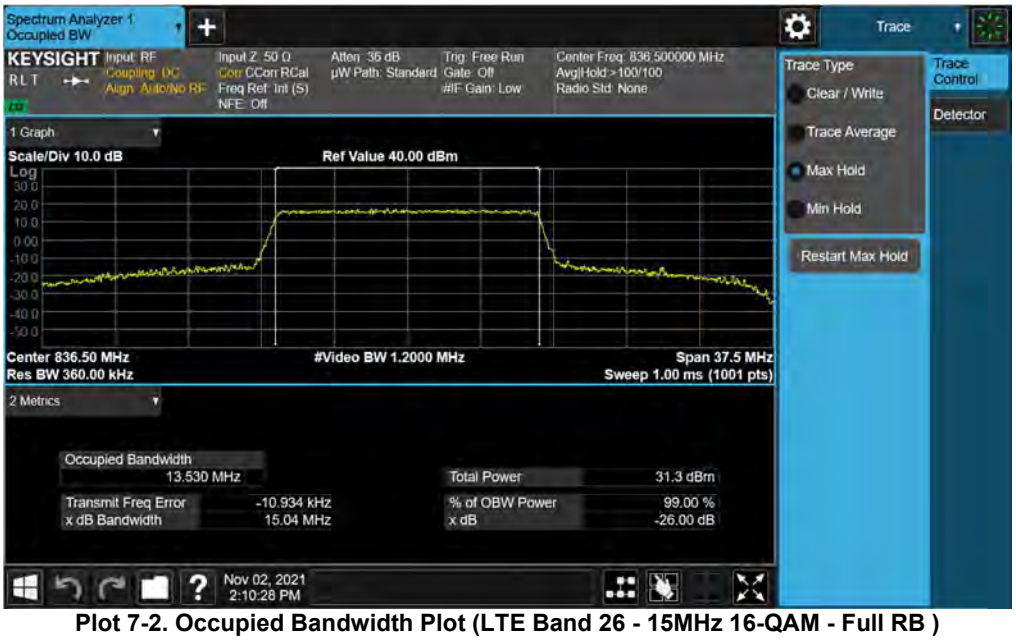
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB)

Plot 7-3. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz QPSK - Full RB)

Plot 7-4. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 16-QAM - Full RB)

Plot 7-5. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz QPSK - Full RB)

Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB)

Plot 7-7. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz QPSK - Full RB)

Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB)

Plot 7-9. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz QPSK - Full RB)

Plot 7-10. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 16-QAM - Full RB)

Plot 7-11. Occupied Bandwidth Plot (GPRS, Ch. 190)

Plot 7-12. Occupied Bandwidth Plot (EDGE, Ch. 190)

WCDMA Cell

Plot 7-13. Occupied Bandwidth Plot (WCDMA, Ch. 4183)

7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. 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 maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 log$_{10}$(P$_{[Watts]}$), where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

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

Per Part 22 and RSS-132, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Plot 7-14. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK – 1 RB - Low Channel)

Plot 7-15. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Low Channel)

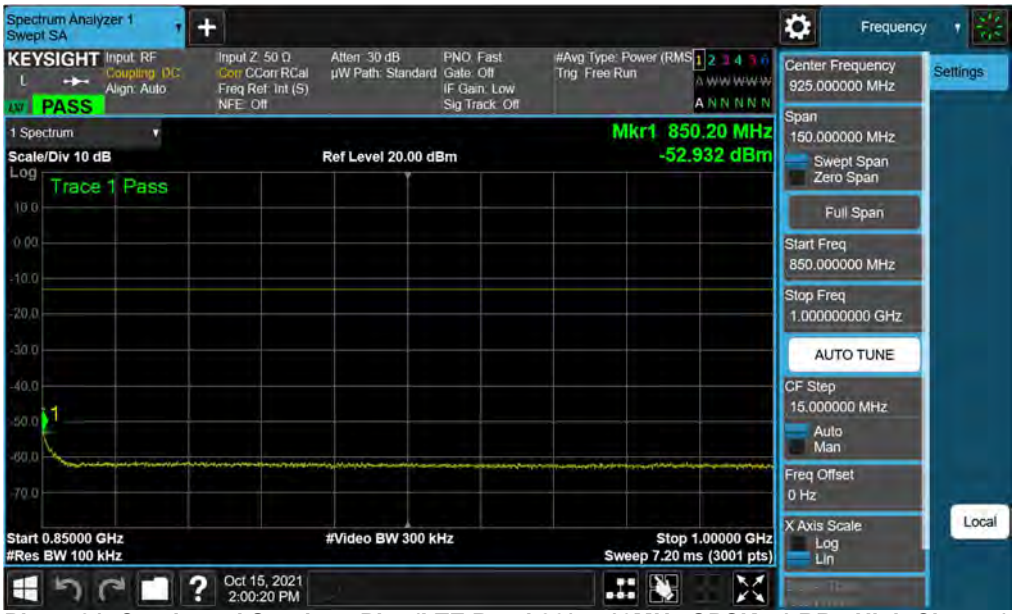
Plot 7-16. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Low Channel)

Plot 7-17. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channe)

Plot 7-18. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channel)

Plot 7-19. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channe)

Plot 7-20. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channe)



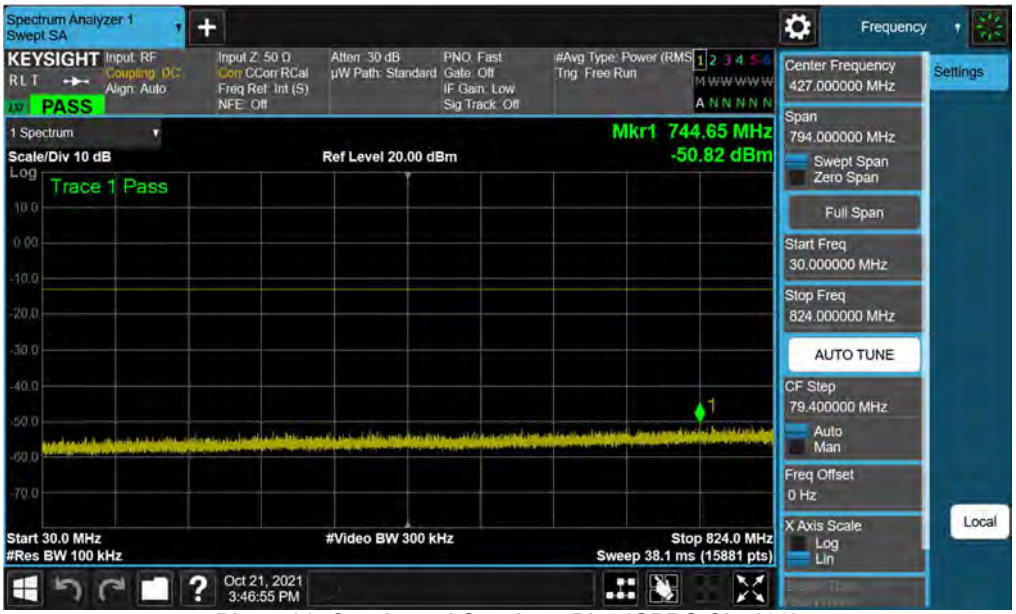
Plot 7-21. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channe)

Plot 7-22. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channe)

Plot 7-23. Conducted Spurious Plot (GPRS Ch. 128)

Plot 7-24. Conducted Spurious Plot (GPRS Ch. 128)

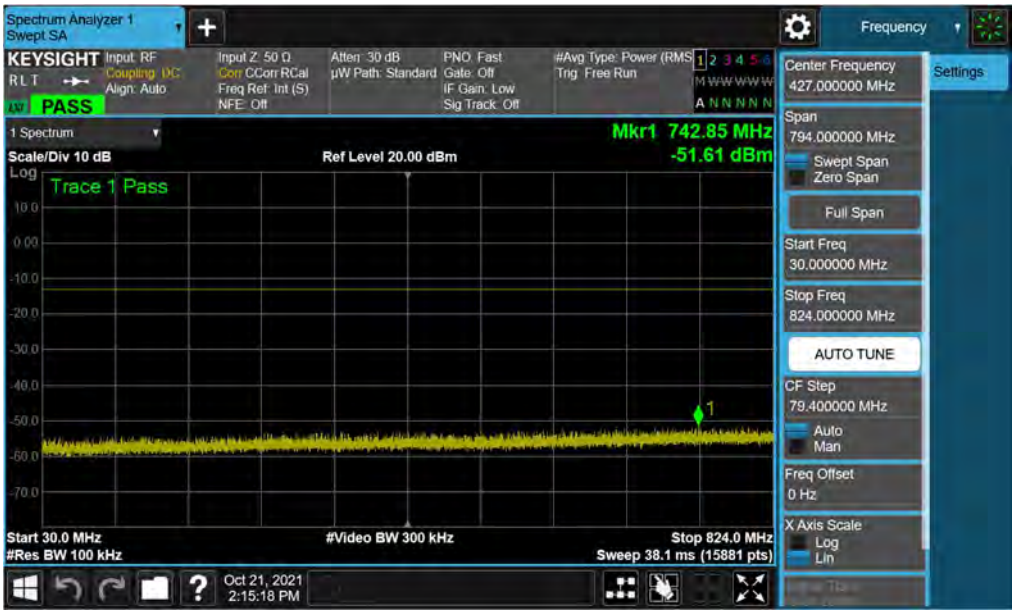
Plot 7-25. Conducted Spurious Plot (GPRS Ch. 128)



Plot 7-26. Conducted Spurious Plot (GPRS Ch. 190)

Plot 7-27. Conducted Spurious Plot (GPRS Ch. 190)

Plot 7-28. Conducted Spurious Plot (GPRS Ch. 190)



Plot 7-29. Conducted Spurious Plot (GPRS Ch. 251)

Plot 7-30. Conducted Spurious Plot (GPRS Ch. 251)

Plot 7-31. Conducted Spurious Plot (GPRS Ch. 251)

WCDMA Cell

Plot 7-32. Conducted Spurious Plot (WCDMA Ch. 4132)

Plot 7-33. Conducted Spurious Plot (WCDMA Ch. 4132)

Plot 7-34. Conducted Spurious Plot (WCDMA Ch. 4132)

Plot 7-35. Conducted Spurious Plot (WCDMA Ch. 4183)

Plot 7-36. Conducted Spurious Plot (WCDMA Ch. 4183)

Plot 7-37. Conducted Spurious Plot (WCDMA Ch. 4183)

Plot 7-38. Conducted Spurious Plot (WCDMA Ch. 4233)

Plot 7-39. Conducted Spurious Plot (WCDMA Ch. 4233)

Plot 7-40. Conducted Spurious Plot (WCDMA Ch. 4233)

7.4 Band Edge Emissions at Antenna Terminal

Test Overview

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 maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 log$_{10}$(P$_{[Watts]}$), where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

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 ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
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 7-3. Test Instrument & Measurement Setup

Test Notes

Per 22.917(b) and RSS-132(5.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

LTE Band 26/5

Plot 7-41. Lower Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB)

Plot 7-42. Upper Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB)

Plot 7-43. Lower Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB)

Plot 7-44. Upper Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB)

Plot 7-45. Lower Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB)

Plot 7-46. Upper Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB)

Plot 7-47. Lower Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB)

Plot 7-48. Upper Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB)

Plot 7-49. Lower Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)

Plot 7-50. Upper Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB)

Plot 7-51. Lower Band Edge Plot (GPRS Cell – Ch. 128)

Plot 7-52. Upper Band Edge Plot (GPRS Cell – Ch. 251)

WCDMA Cell

Plot 7-53. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)

Plot 7-54. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

7.5 Radiated Power (ERP)

Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 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 RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – 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. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 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". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

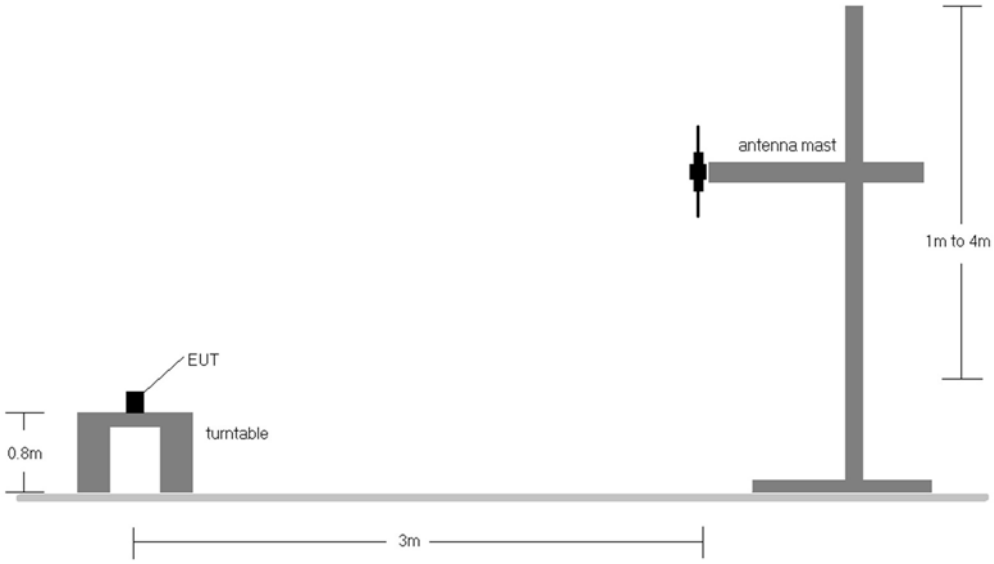


Figure 7-4. Radiated Test Setup <1GHz

Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.

2) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.

3) 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.

4) This unit was tested with its standard battery.

5) 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.

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
15MHz (Band 26 only)	QPSK	831.5	V	132	262	1.29	1 / 37	19.36	18.50	0.071	38.45	-19.95	20.65	0.116	40.61	-19.96
	QPSK	836.5	V	128	232	1.31	1 / 74	19.65	18.81	0.076	38.45	-19.64	20.96	0.125	40.61	-19.65
	QPSK	841.5	V	134	230	1.33	1 / 37	19.78	**18.96**	0.079	38.45	-19.49	**21.11**	0.129	40.61	-19.49
	16-QAM	836.5	V	128	232	1.31	1 / 74	18.79	17.95	0.062	38.45	-20.50	20.10	0.102	40.61	-20.51
10 MHz	QPSK	829.0	V	132	262	1.27	1 / 49	19.62	18.74	0.075	38.45	-19.71	20.89	0.123	40.61	-19.71
	QPSK	836.5	V	128	232	1.31	1 / 49	19.92	**19.08**	0.081	38.45	-19.37	**21.23**	0.133	40.61	-19.38
	QPSK	844.0	V	134	230	1.35	1 / 25	19.84	19.04	0.080	38.45	-19.41	21.19	0.131	40.61	-19.42
	16-QAM	836.5	V	128	232	1.31	1 / 49	19.08	18.24	0.067	38.45	-20.21	20.39	0.109	40.61	-20.22
5 MHz	QPSK	826.5	V	132	262	1.26	1 / 12	19.59	18.70	0.074	38.45	-19.75	20.85	0.122	40.61	-19.75
	QPSK	836.5	V	128	232	1.31	1 / 12	19.73	18.89	0.077	38.45	-19.56	21.04	0.127	40.61	-19.57
	QPSK	846.5	V	134	230	1.36	1 / 12	19.93	**19.14**	0.082	38.45	-19.31	**21.29**	0.135	40.61	-19.32
	16-QAM	846.5	V	134	230	1.36	1 / 12	19.01	18.22	0.066	38.45	-20.23	20.37	0.109	40.61	-20.24
3 MHz	QPSK	825.5	V	132	262	1.26	1 / 14	19.53	18.64	0.073	38.45	-19.81	20.79	0.120	40.61	-19.82
	QPSK	836.5	V	128	232	1.31	1 / 7	19.79	18.95	0.079	38.45	-19.50	21.10	0.129	40.61	-19.51
	QPSK	847.5	V	134	230	1.36	1 / 7	19.85	**19.06**	0.081	38.45	-19.39	**21.21**	0.132	40.61	-19.39
	16-QAM	847.5	V	134	230	1.36	1 / 7	19.03	18.24	0.067	38.45	-20.21	20.39	0.109	40.61	-20.21
1.4 MHz	QPSK	824.7	V	132	262	1.25	1 / 3	19.33	18.43	0.070	38.45	-20.02	20.58	0.114	40.61	-20.02
	QPSK	836.5	V	128	232	1.31	1 / 5	19.66	18.82	0.076	38.45	-19.63	20.97	0.125	40.61	-19.64
	QPSK	848.3	V	134	230	1.37	1 / 3	19.87	**19.09**	0.081	38.45	-19.36	**21.24**	0.133	40.61	-19.37
	16-QAM	848.3	V	134	230	1.37	1 / 3	19.03	18.25	0.067	38.45	-20.20	20.40	0.110	40.61	-20.21
5 MHz	QPSK (Opposite Pol.)	846.5	H	374	284	1.36	1 / 5	17.09	16.30	0.043	38.45	-22.15	18.45	0.070	40.61	-22.16
	QPSK (WCP)	846.5	V	127	282	1.36	1 / 0	14.91	14.12	0.026	38.45	-24.33	16.27	0.042	40.61	-24.34

Table 7-2. ERP Data (LTE Band 26/5)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.20	GPRS850	V	146	247	27.28	1.25	26.38	0.435	38.45	-12.07	28.53	0.713	40.61	-12.08
836.60	GPRS850	V	139	225	28.18	1.31	**27.34**	**0.542**	38.45	-11.11	**29.49**	**0.889**	40.61	-11.12
848.80	GPRS850	V	141	242	28.09	1.37	27.31	0.538	38.45	-11.14	29.46	0.883	40.61	-11.15
836.60	GPRS850	H	375	287	25.97	1.31	25.13	0.326	38.45	-13.32	27.28	0.535	40.61	-13.33
836.60	EDGE850	V	139	225	22.81	1.31	**21.97**	0.157	38.45	-16.48	**24.12**	**0.258**	40.61	-16.49
836.60	GPRS850 (WCP)	V	138	274	22.21	1.31	21.37	0.137	38.45	-17.08	23.52	0.225	40.61	-17.09

Table 7-3. ERP Data (GPRS Cell)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	V	142	251	18.07	1.26	17.18	0.052	38.45	-21.27	19.33	0.086	40.61	-21.28
836.60	WCDMA850	V	135	249	19.19	1.31	18.35	0.068	38.45	-20.10	20.50	0.112	40.61	-20.11
846.60	WCDMA850	V	136	248	19.41	1.36	**18.62**	**0.073**	38.45	-19.83	**20.77**	**0.119**	40.61	-19.84
846.60	WCDMA850	H	396	278	15.75	1.36	14.96	0.031	38.45	-23.49	17.11	0.051	40.61	-23.50
846.60	WCDMA850 (WCP)	V	136	274	14.58	1.36	13.79	0.024	38.45	-24.66	15.94	0.039	40.61	-24.67

Table 7-4. ERP Data (WCDMA Cell)

7.6 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 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 v03r01 – Section 5.8

Test Settings

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

Test Setup

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

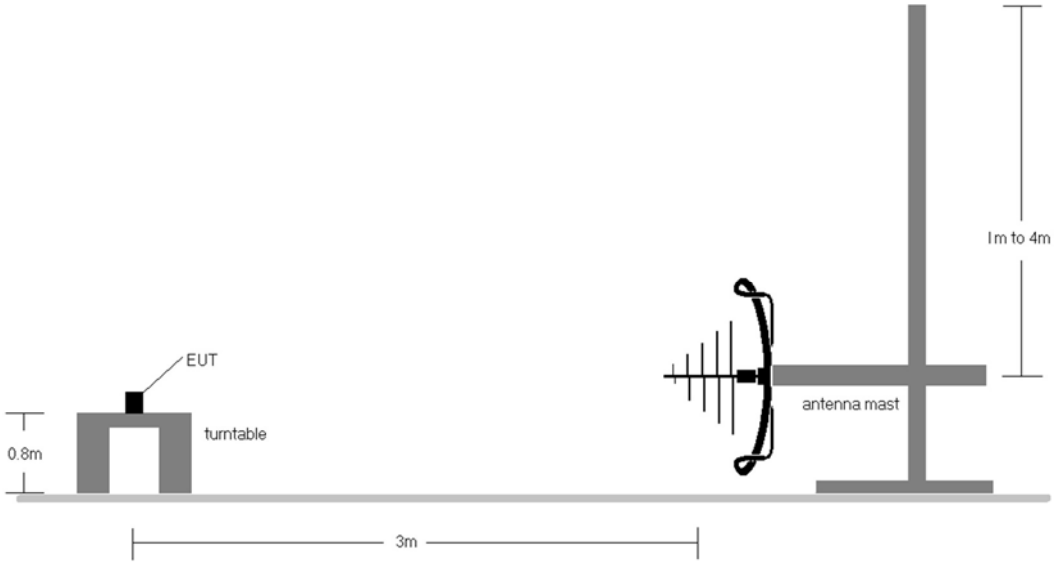


Figure 7-5. Test Instrument & Measurement Setup < 1GHz

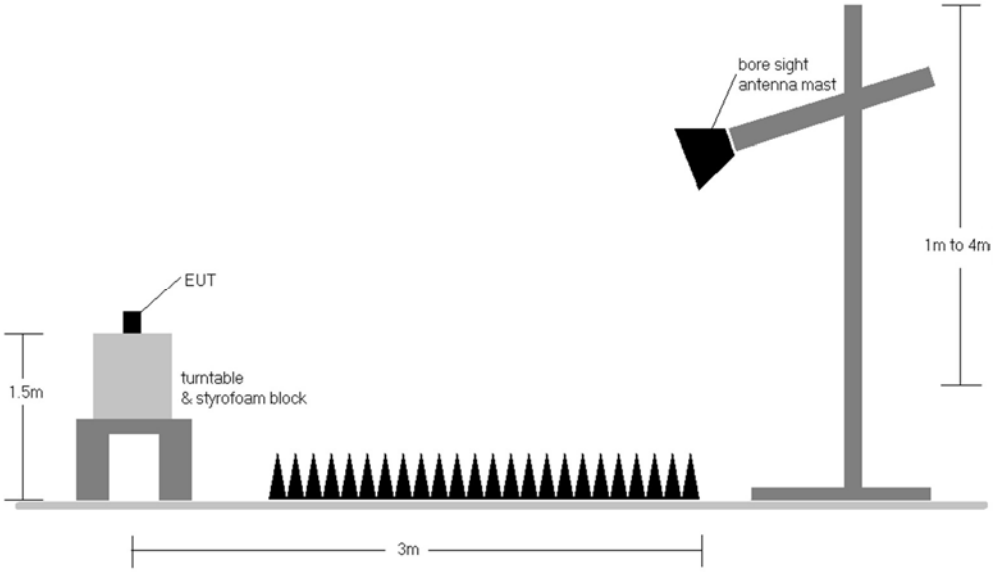


Figure 7-6. Test Instrument & Measurement Setup >1 GHz

Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
   b) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   d) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.

3) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".

4) 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.

5) This unit was tested with its standard battery.

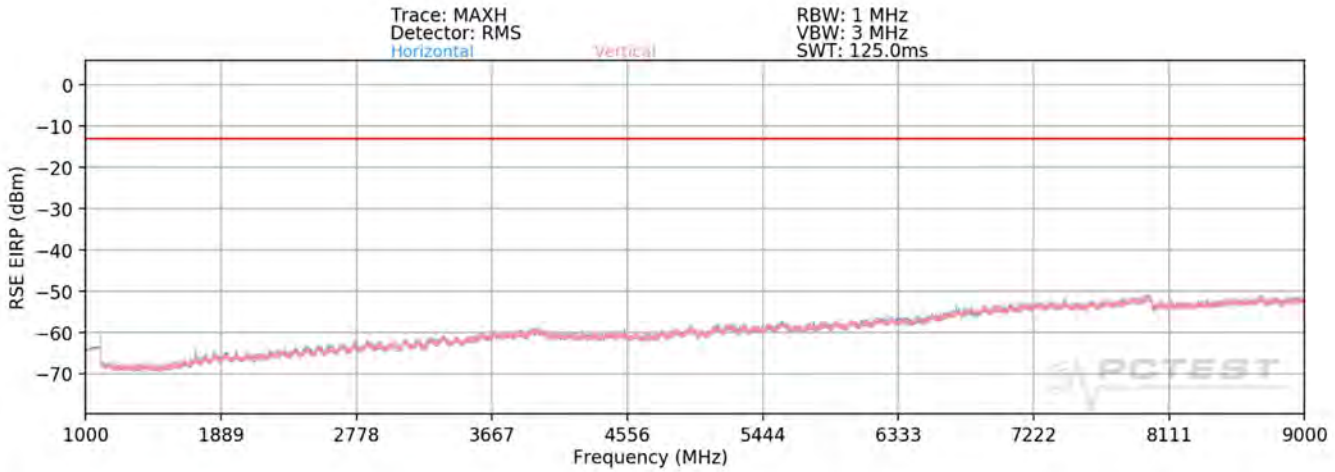
6) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

7) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

8) 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.

9) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

LTE Band 26/5



Plot 7-55. Radiated Spurious Plot (LTE Band 26/5)

Bandwidth (MHz):	5
Frequency (MHz):	826.5
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1653.00	H	143	46	-74.97	-7.50	24.53	-70.72	-13.00	-57.72
2479.50	H	-	-	-77.04	-4.17	25.79	-69.47	-13.00	-56.47
3306.00	H	-	-	-77.60	-0.87	28.53	-66.73	-13.00	-53.73
4132.50	H	-	-	-77.97	0.98	30.01	-65.24	-13.00	-52.24
4959.00	H	-	-	-77.46	1.74	31.28	-63.98	-13.00	-50.98
5785.50	H	-	-	-78.87	3.89	32.02	-63.24	-13.00	-50.24

Table 7-5. Radiated Spurious Data (LTE Band 26/5 – Low Channel)

Bandwidth (MHz):	5
Frequency (MHz):	836.5
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.00	H	114	68	-75.41	-7.32	24.27	-70.99	-13.00	-57.99
2509.50	H	-	-	-75.59	-3.98	27.43	-67.83	-13.00	-54.83
3346.00	H	-	-	-76.39	-0.69	29.92	-65.34	-13.00	-52.34
4182.50	H	-	-	-76.88	0.53	30.65	-64.61	-13.00	-51.61
5019.00	H	-	-	-77.55	1.37	30.82	-64.44	-13.00	-51.44
5855.50	H	-	-	-78.94	4.81	32.87	-62.39	-13.00	-49.39

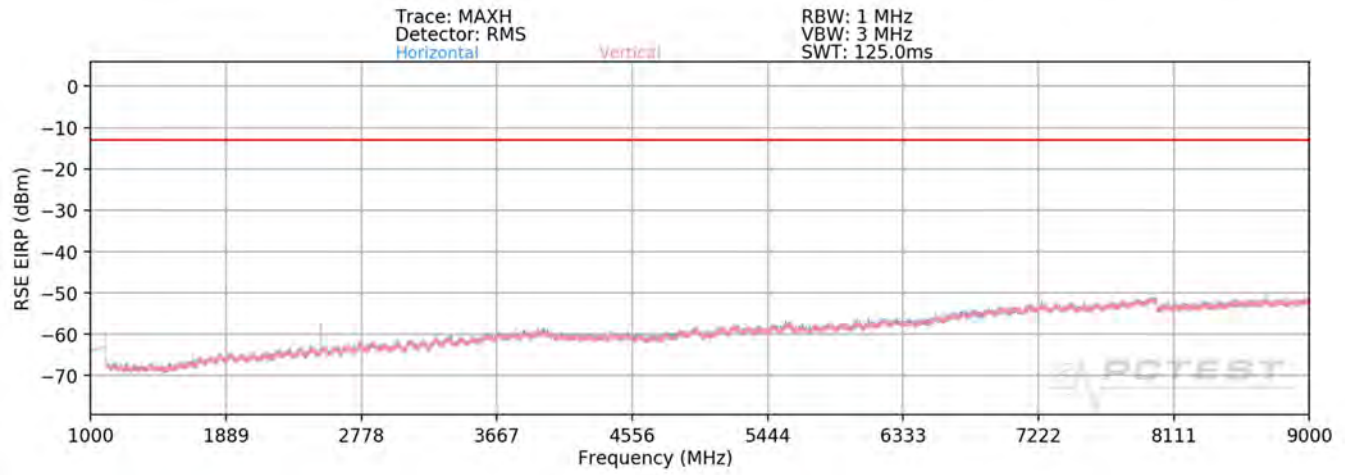
Table 7-6. Radiated Spurious Data (LTE Band 26/5 – Mid Channel)

Bandwidth (MHz):	5
Frequency (MHz):	846.5
RB / Offset:	1 / 25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1693.00	H	166	82	-75.44	-7.08	24.48	-70.78	-13.00	-57.78
2539.50	H	-	-	-75.88	-4.02	27.10	-68.15	-13.00	-55.15
3386.00	H	-	-	-77.55	-0.80	28.65	-66.61	-13.00	-53.61
4232.50	H	-	-	-77.34	0.43	30.09	-65.16	-13.00	-52.16
5079.00	H	-	-	-77.96	1.77	30.81	-64.44	-13.00	-51.44
5925.50	H	-	-	-78.52	4.93	33.41	-61.85	-13.00	-48.85

Table 7-7. Radiated Spurious Data (LTE Band 26/5 – High Channel)

GSM/GPRS Cell



Plot 7-56. Radiated Spurious Plot (GPRS Cell)

Mode:	GPRS 1 Tx Slot
Channel:	128
Frequency (MHz):	824.2

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1648.40	V	147	223	-65.70	-7.51	33.79	-61.47	-13.00	-48.47
2472.60	V	104	253	-61.17	-4.19	41.64	-53.61	-13.00	-40.61
3296.80	V	-	-	-68.27	-0.88	37.85	-57.41	-13.00	-44.41
4121.00	V	-	-	-68.61	0.79	39.18	-56.08	-13.00	-43.08
4945.20	V	-	-	-68.95	1.60	39.65	-55.61	-13.00	-42.61
5769.40	V	-	-	-70.15	4.00	40.85	-54.41	-13.00	-41.41

Table 7-8. Radiated Spurious Data (GPRS Cell – Low Channel)

Mode:	GPRS 1 Tx Slot
Channel:	190
Frequency (MHz):	836.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.20	V	101	231	-66.84	-7.32	32.84	-62.42	-13.00	-49.42
2509.80	V	100	259	-62.56	-3.98	40.46	-54.80	-13.00	-41.80
3346.40	V	-	-	-66.97	-0.69	39.34	-55.92	-13.00	-42.92
4183.00	V	-	-	-67.91	0.52	39.61	-55.64	-13.00	-42.64
5019.60	V	-	-	-68.08	1.38	40.30	-54.96	-13.00	-41.96
5856.20	V	-	-	-70.70	4.81	41.11	-54.15	-13.00	-41.15

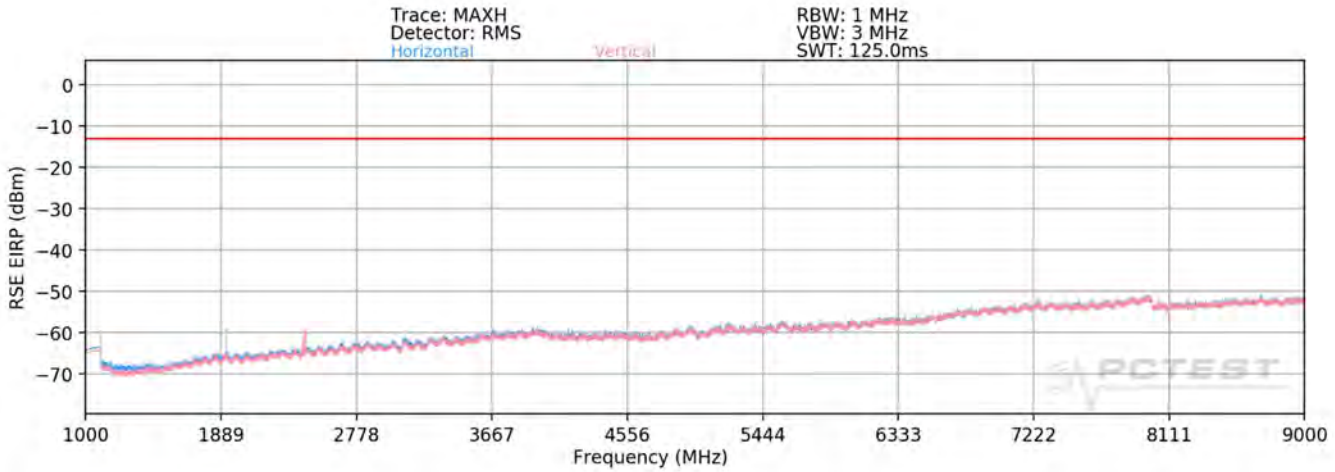
Table 7-9. Radiated Spurious Data (GPRS Cell – Mid Channel)

Mode:	GPRS 1 Tx Slot
Channel:	251
Frequency (MHz):	848.8

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1697.60	V	147	243	-67.31	-7.03	32.66	-62.60	-13.00	-49.60
2546.40	V	123	266	-64.44	-4.11	38.45	-56.81	-13.00	-43.81
3395.20	V	-	-	-68.70	-0.98	37.32	-57.94	-13.00	-44.94
4244.00	V	-	-	-68.88	0.41	38.53	-56.73	-13.00	-43.73
5092.80	V	-	-	-69.42	2.30	39.88	-55.38	-13.00	-42.38
5941.60	V	-	-	-70.04	4.69	41.65	-53.61	-13.00	-40.61

Table 7-10. Radiated Spurious Data (GPRS Cell – High Channel)

WCDMA Cell



Plot 7-57. Radiated Spurious Plot (WCDMA Cell)

Mode:	WCDMA RMC
Channel:	4132
Frequency (MHz):	826.4

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1652.80	V	-	-	-67.25	-7.50	32.25	-63.00	-13.00	-50.00
2479.20	V	-	-	-66.93	-4.17	35.90	-59.36	-13.00	-46.36
3305.60	V	-	-	-69.22	-0.87	36.91	-58.35	-13.00	-45.35
4132.00	V	-	-	-69.20	0.97	38.77	-56.49	-13.00	-43.49
4958.40	V	-	-	-69.15	1.73	39.58	-55.67	-13.00	-42.67
5784.80	V	-	-	-70.29	3.90	40.61	-54.65	-13.00	-41.65

Table 7-11. Radiated Spurious Data (WCDMA Cell – Low Channel)

Mode:	WCDMA RMC
Channel:	4183
Frequency (MHz):	836.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.20	V	-	-	-66.70	-7.32	32.98	-62.28	-13.00	-49.28
2509.80	V	-	-	-68.07	-3.98	34.95	-60.31	-13.00	-47.31
3346.40	V	-	-	-67.23	-0.69	39.08	-56.18	-13.00	-43.18
4183.00	V	-	-	-68.61	0.52	38.91	-56.34	-13.00	-43.34
5019.60	V	-	-	-69.26	1.38	39.12	-56.14	-13.00	-43.14
5856.20	V	-	-	-70.77	4.81	41.04	-54.22	-13.00	-41.22

Table 7-12. Radiated Spurious Data (WCDMA Cell – Mid Channel)

Mode:	WCDMA RMC
Channel:	4233
Frequency (MHz):	846.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1693.20	V	-	-	-67.39	-7.08	32.53	-62.73	-13.00	-49.73
2539.80	V	-	-	-66.94	-4.02	36.04	-59.22	-13.00	-46.22
3386.40	V	-	-	-69.56	-0.81	36.63	-58.62	-13.00	-45.62
4233.00	V	-	-	-69.14	0.43	38.29	-56.96	-13.00	-43.96
5079.60	V	-	-	-69.97	1.78	38.81	-56.45	-13.00	-43.45
5926.20	V	-	-	-70.14	4.92	41.78	-53.48	-13.00	-40.48

Table 7-13. Radiated Spurious Data (WCDMA Cell – High Channel)

7.7 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22 and RSS-132, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

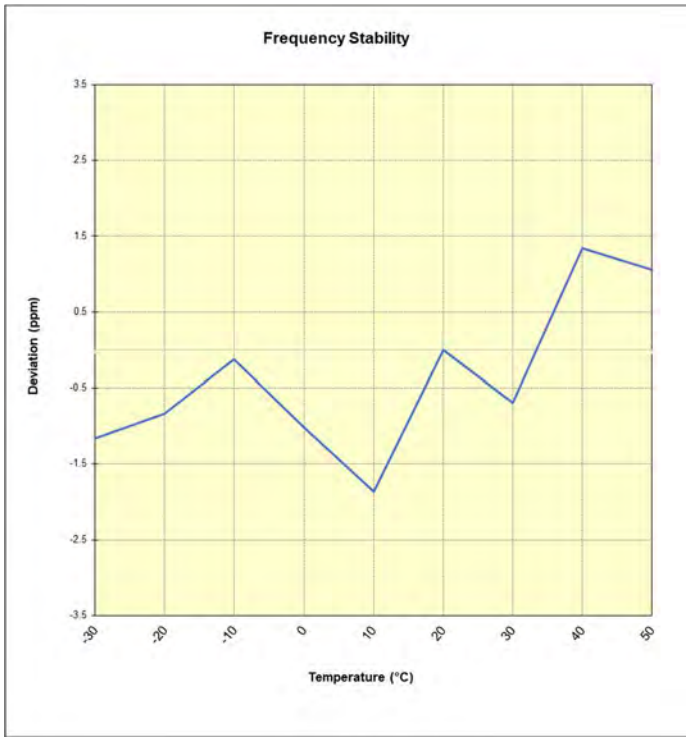
Test Notes

None

LTE Band 26	
Operating Frequency (Hz):	836,500,000
Ref. Voltage (VDC):	4.39
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.39	- 30	836,489,629	-974	-0.0001164
		- 20	836,489,907	-696	-0.0000832
		- 10	836,490,497	-106	-0.0000127
		0	836,489,750	-853	-0.0001020
		+ 10	836,489,046	-1,557	-0.0001861
		+ 20 (Ref)	836,490,603	0	0.0000000
		+ 30	836,490,023	-580	-0.0000693
		+ 40	836,491,721	1,118	0.0001337
		+ 50	836,491,490	887	0.0001060
Battery Endpoint	3.85	+ 20	836,490,756	153	0.0000183

Table 7-14. LTE Band 26/5 Frequency Stability Data

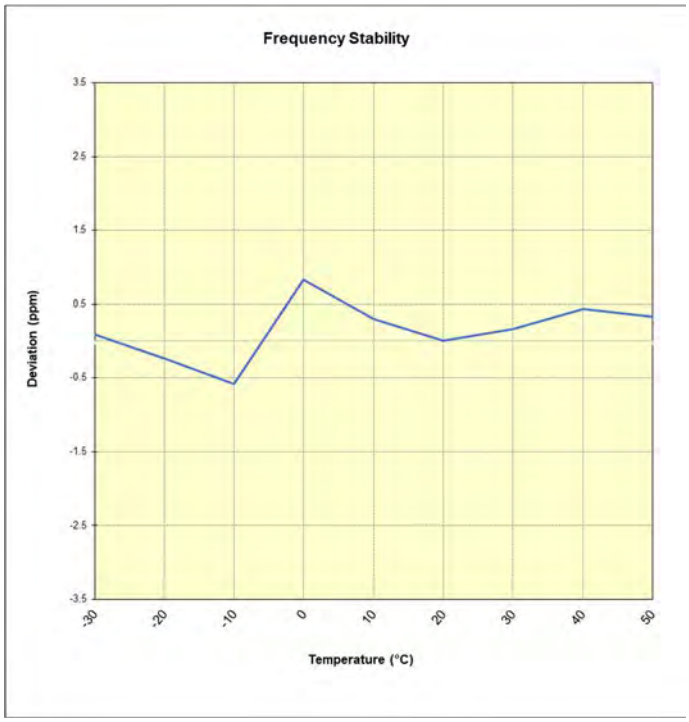


Plot 7-58. LTE Band 26/5 Frequency Stability Chart

GSM/GPRS Cellular	
Operating Frequency (Hz):	836,600,000
Ref. Voltage (VDC):	4.39
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.39	- 30	836,599,950	73	0.0000087
		- 20	836,599,678	-199	-0.0000238
		- 10	836,599,393	-484	-0.0000579
		0	836,600,573	696	0.0000832
		+ 10	836,600,123	246	0.0000294
		+ 20 (Ref)	836,599,877	0	0.0000000
		+ 30	836,600,009	132	0.0000158
		+ 40	836,600,237	360	0.0000430
		+ 50	836,600,151	274	0.0000327
Battery Endpoint	3.85	+ 20	836,600,957	1,080	0.0001291

Table 7-15. GSM/GPRS Cell Frequency Stability Data



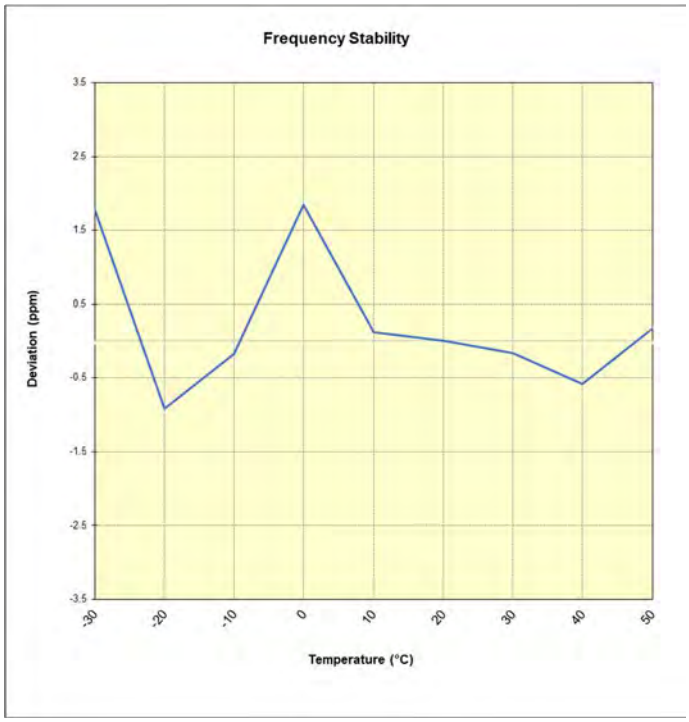
Plot 7-59. GSM/GPRS Cell Frequency Stability Chart

WCDMA Cell

WCDMA Cellular	
Operating Frequency (Hz):	836,600,000
Ref. Voltage (VDC):	4.39
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.39	- 30	836,602,653	1,480	0.0001769
		- 20	836,600,410	-763	-0.0000912
		- 10	836,601,031	-142	-0.0000170
		0	836,602,720	1,547	0.0001849
		+ 10	836,601,276	103	0.0000123
		+ 20 (Ref)	836,601,173	0	0.0000000
		+ 30	836,601,039	-134	-0.0000160
		+ 40	836,600,689	-484	-0.0000579
		+ 50	836,601,318	145	0.0000173
Battery Endpoint	3.85	+ 20	836,600,377	-796	-0.0000951

Table 7-16. WCDMA Cell Frequency Stability Data



Plot 7-60. WCDMA Cell Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Samsung **Portable Handset FCC ID: A3LSMS901E** complies with all the requirements of Part 22 of the FCC rules.