ELEMENT WASHINGTON DC LLC
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PART 22 MEASUREMENT REPORT

Applicant Name:
Centum Research & Technology S.L
Fonte das Abelleiras S/N
Edificio Citexvi
36310 Vigo (Spain)

Date of Testing:
04/22 - 06/17/2025
Test Report Issue Date:
07/21/2025
Test Site/Location:
Element Lab., Columbia, MD, USA
Test Report Serial No.:
1M2505200051-01.2A93U

FCC ID:	**2A93U-58530**
APPLICANT:	**Centum Research & Technology S.L**

Application Type:	Certification
Model:	Lifeseeker SAR S10
EUT Type:	Geolocation System
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part:	22
Test Procedure(s):	ANSI C63.26-2015

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.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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PART 22 MEASUREMENT REPORT

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	N/A	GMSK	871.6 - 891.6	0.222	23.47	256KGXW
WCDMA	N/A	Spread Spectrum	868.4 - 882.0	0.188	22.75	4M42F9W
LTE Band 26/5	5 MHz	QPSK	866 - 884.5	0.548	27.39	5M96G7D

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 Element Test Location

Measurements were conducted at the Element laboratory(ies) indicated in Section 1.3 below. All measurement facilities are compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A. ("MD")

- Element Washington DC LLC is an ISO 17025-2017 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.

- Element Washington DC LLC 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).

- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Centum Geolocation System FCC ID: 2A93U-58530**. 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.: 213028

2.2 Device Capabilities

This device contains the following capabilities:

LTE Bands 26/5, 25/2, 12, 13, 66/4 (with 5MHz operation only),
UMTS 850, UMTS 1900, UMTS B12, UMTS B13, GSM 850, and GSM1900

LTE operation only supports QPSK modulation.

This device supports simultaneous operation from both output ports, although each port will always operate on a different band. Conducted powers were investigated on both ports and determined to be equivalent so full testing was performed on one port.

This device also contains an integrated 2.4GHz/5GHz WiFi module with FCC ID: RYK-WPEQ256ACNI. In this integration, only the 2.4GHz WiFi capability is used.

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

Some channels at the band edges were reduced on this device in order to achieve band edge compliance. The full range of operation for this device is shown throughout the data sections of this report.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version 009 installed on the EUT.

2.5 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 "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) were used in the measurement of the EUT.

Deviation from Measurement Procedure……..……..None

3.2 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 spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. 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 v01r01.

Radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

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	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

Table 4-1. Measurement Uncertainty Budget – MD

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
-	AP2-001	EMC Cable and Switch System	2/25/2025	Annual	2/25/2026	AP2-001
-	ETS-001	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-001
EMCO	3115	Horn Antenna (1-18GHz)	9/6/2024	Biennial	9/6/2026	9704-5182
-	LTx4	Licensed Transmitter Cable Set	2/25/2025	Annual	2/25/2026	LTx4
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/19/2024	Annual	9/19/2025	MY57141001
Keysight Technologies	N9038A	MXE EMI Receiver	9/16/2024	Annual	9/16/2025	MY51210133
Espec	ESX-2CA	Environmental Chamber	11/20/2024	Biennial	11/20/2026	17620
Sunol Sciences	JB5	Bi-Log Antenna (30M-5GHz)	9/11/2024	Biennial	9/11/2026	A051107

Table 5-1. Test Equipment Calibration Table – MD

Component	Serial Number
MiniCircuits Cable CBL-0.5M-SMNM+	47261
Micro-Coax Utiflex Cable UFB311A-Q-3346-50U50U MFR 64639	231978-001
Micro-Coax Utiflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-002
MegaPhase Cable NC29-N1N1-324	19046401 001
MegaPhase Flex Cable 10511-1	15044701-006
Micro-Coas Utiflex Cable UFB311A-Q-3446-50U50U MFR 64639	231978-002
Micro-Coas Utiflex Cable UFB311A-1-0629-50U50U MFR 64639	231986-001
Micro-Coas Utiflex Cable UFB142A-0-0659-50U50U MFR 64639	232069-001
Rohde & Schwarz SF Unit	102138

Table 5-2. AP2-001 EMC Cable and Switch System Components

Component	Serial Number
Pasternak Cable RG214/U	111815
Sucoflex Cable 106A	246420-001
Rohde & Schwarz SF Unit	102134

Table 5-3. ETS-001 EMC Cable and Switch System Components

Component	Serial Number
Keysight Directional Coupler 87300C	55300518
MCL 6dB Attenuator BW K62W44+	2013
MegaPhase Cable TM40-K1K1-36	19026201 002

Table 5-4. LTx4 Conducted Cable Set Components

6.0 SAMPLE EMISSION DESIGNATORS

GSM Emission Designator

Emission Designator = 250KGXW
GSM BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
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

7.0 TEST RESULTS

7.1 Summary

Company Name: Centum Research & Technology S.L

FCC ID: 2A93U-58530

FCC Classification: PCS Licensed Transmitter (PCB)

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

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Effective Radiated Power	22.913(a)(5)	< 7 Watts max. ERP	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	N/A	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 22.355	The carrier frequency of the transmitter must be maintained within the 2.5ppm	PASS	Section 7.8
RADIATED	Radiated Spurious Emissions	2.1053, 22.917(a)	> 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 EMC Software Tool v1.2.2.

7.2 Transmitter Conducted Output Power / Effective Radiated Power

Test Overview

All emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2.4.4.1

Test Settings

1. Span = 2x to 3x the OBW
2. RBW = 1% to 5% of the OBW
3. VBW ≥ 3 x RBW
4. Number of measurement points per sweep = 1,001
5. Sweep time = auto couple
6. Detector = RMS
7. Trace mode = trace average for burst emissions, trigger and gate settings were applied
8. Output power was measured using the analyzers built-in Channel Power function using the above settings while setting the integration BW approximately equal to the OBW of the signal
9. The trace was allowed to stabilize

Test Setup

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

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

2. In the following tables, the ERP is determined by subtracting 2.15dB from the calculated EIRP value.

3. During installing and normal usage, this device will use a long cable with at least 10dB of attenuation, as declared by the manufacturer. This 10dB attenuation is included to demonstrate compliance with the ERP requirements on the following page.

Bandwidth	Modulation	Channel	Frequency [MHz]	Conducted Power [dBm]	Ant Gain [dBi]	Cable Loss [dBm]	Adjusted Ant Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
5 MHz	QPSK	8760	866.0	37.04	1.90	10.00	-8.10	26.79	0.48	38.45	-11.66
		8915	881.5	37.41	1.90	10.00	-8.10	27.16	0.52	38.45	-11.29
		8945	884.5	37.64	1.90	10.00	-8.10	27.39	0.55	38.45	-11.06

Table 7-2. Transmitter Conducted Output Power/ Effective Radiated Power (LTE Band 26/5)

Plot 7-1. Conducted Power Output Data (LTE Band 26/5 – Low Channel)

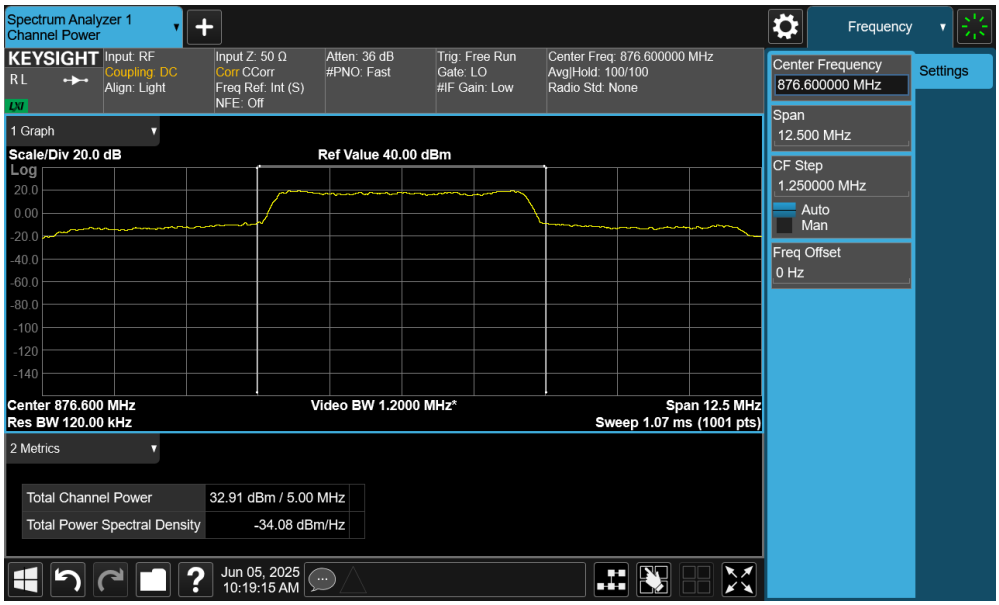
Plot 7-2. Conducted Power Output Data (LTE Band 26/5 – Mid Channel)

Plot 7-3. Conducted Power Output Data (LTE Band 26/5 – High Channel)

Mode	Channel	Frequency [MHz]	Conducted Power [dBm]	Ant Gain [dBi]	Cable Loss [dBm]	Adjusted Ant Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
WCDMA 850	5797	868.4	32.58	1.90	10.00	-8.10	22.33	0.17	38.45	-16.12
	5838	876.6	32.91	1.90	10.00	-8.10	22.66	0.18	38.45	-15.79
	5865	882.0	33.00	1.90	10.00	-8.10	22.75	0.19	38.45	-15.70

Table 7-3. Transmitter Conducted Output Power/ Effective Radiated Power (WCDMA 850)

Plot 7-4. Conducted Power Output Data (WCDMA 850 – Low Channel)

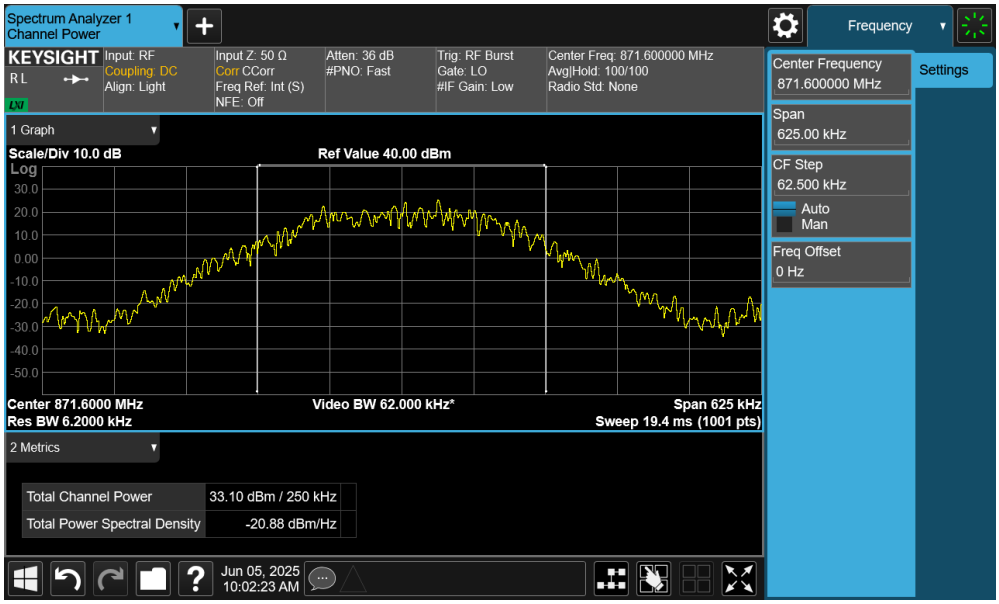


Plot 7-5. Conducted Power Output Data (WCDMA 850 – Mid Channel)

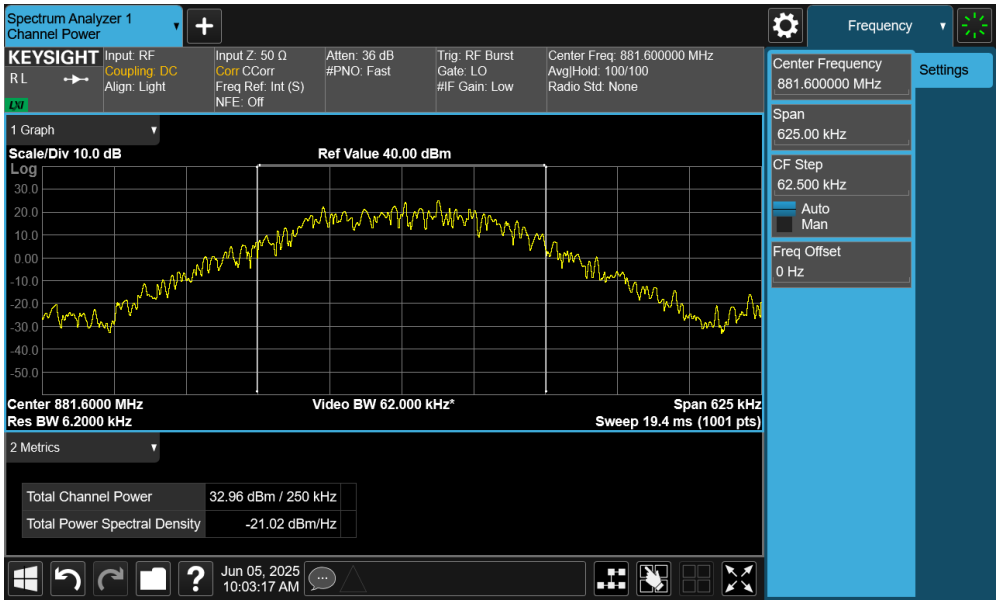
Plot 7-6. Conducted Power Output Data (WCDMA 850 – High Channel)

Mode	Channel	Frequency [MHz]	Conducted Power [dBm]	Ant Gain [dBi]	Cable Loss [dBm]	Adjusted Ant Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
GSM 850	140	871.6	33.10	1.90	10.00	-8.10	22.85	0.19	38.45	-15.60
	190	881.6	32.96	1.90	10.00	-8.10	22.71	0.19	38.45	-15.74
	240	891.6	33.72	1.90	10.00	-8.10	23.47	0.22	38.45	-14.98

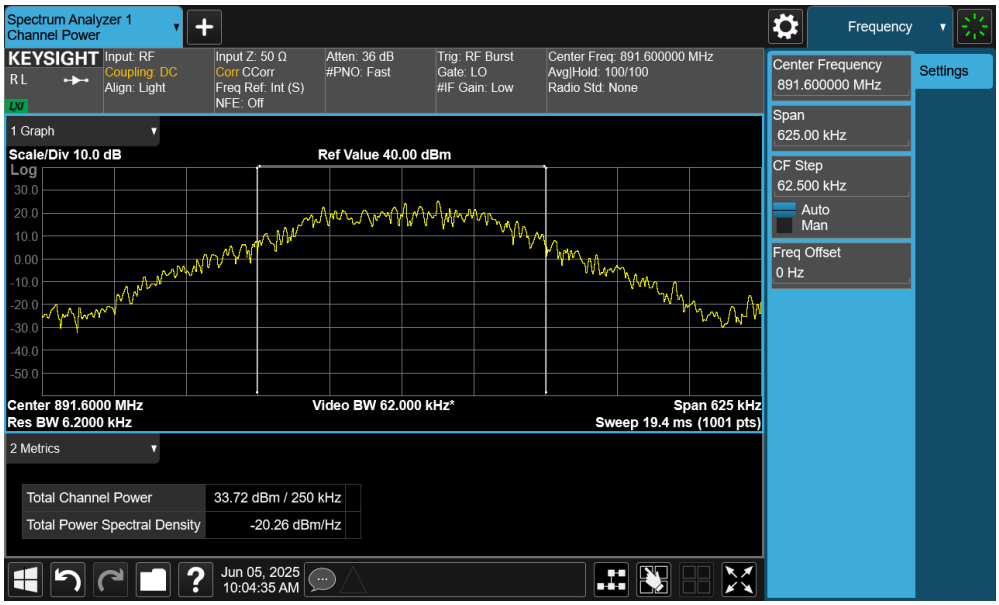
Table 7-4. Transmitter Conducted Output Power/ Effective Radiated Power (GSM 850)



Plot 7-7. Conducted Power Output Data (GSM 850 – Low Channel)



Plot 7-8. Conducted Power Output Data (GSM 850 – Mid Channel)



Plot 7-9. Conducted Power Output Data (GSM 850 – High Channel)

7.3 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

ANSI C63.26-2015 – Section 5.4.4

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

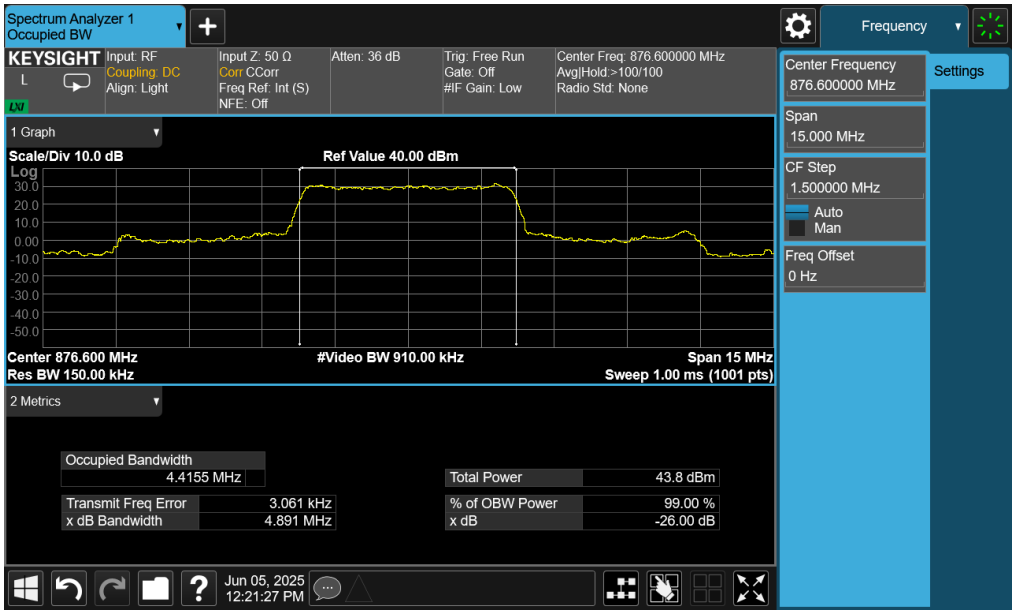
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None.

Plot 7-10. Occupied Bandwidth Plot (LTE Band 26/5)



Plot 7-11. Occupied Bandwidth Plot (WCDMA 850)

Plot 7-12. Occupied Bandwidth Plot (GSM 850)

7.4 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

ANSI C63.26-2015 – Section 5.7.4

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

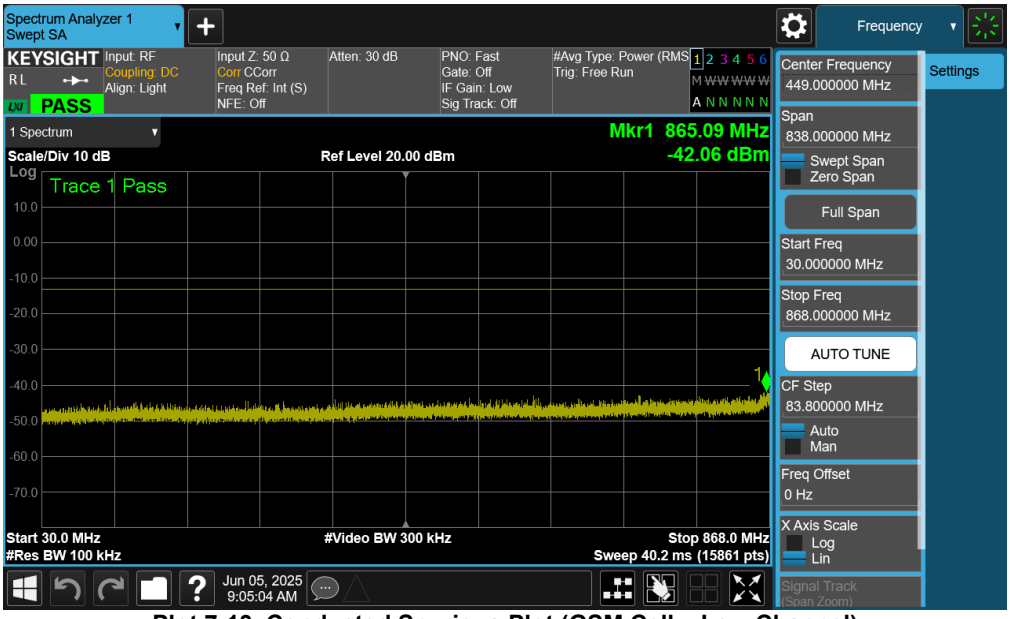
The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-3. Test Instrument & Measurement Setup

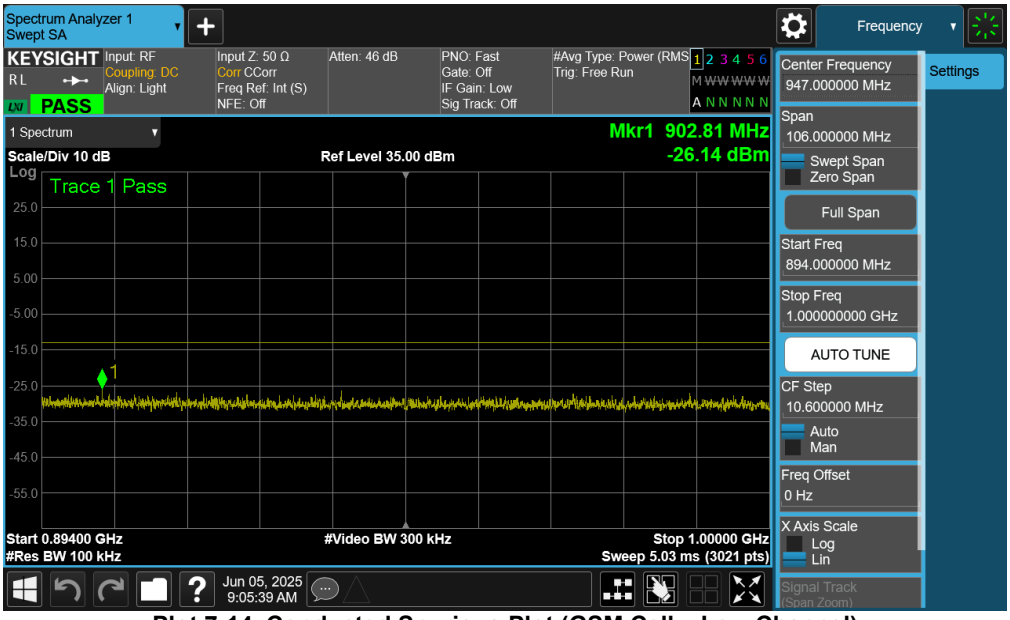
Test Notes

Per Part 22, 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.

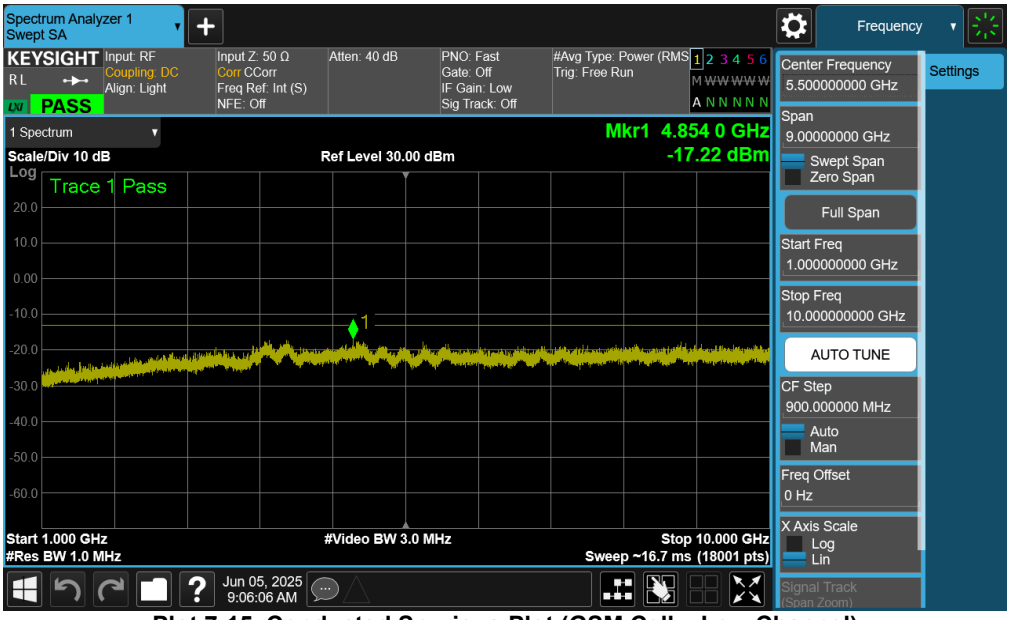
GSM/GPRS Cell



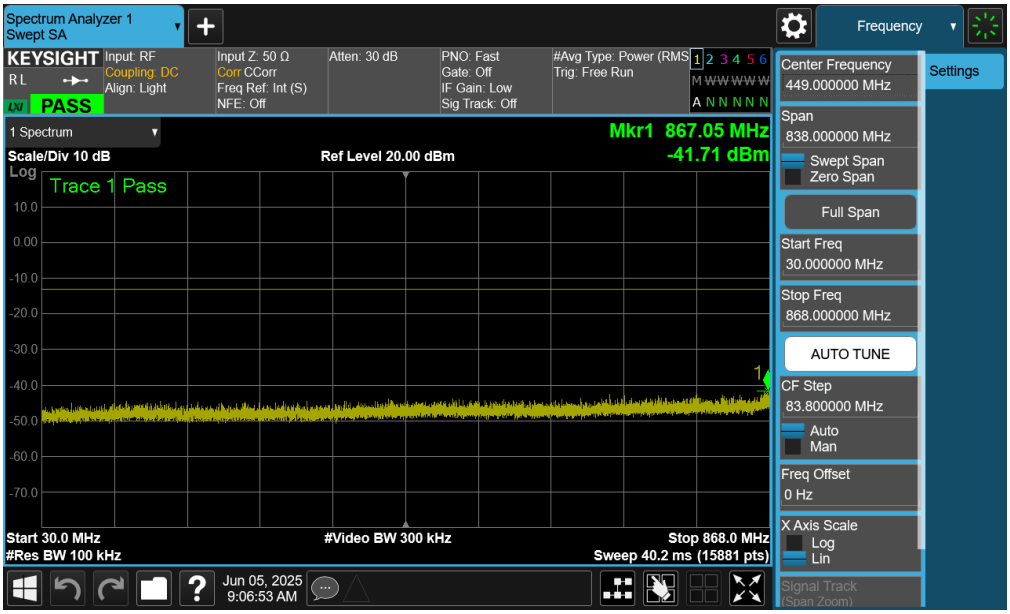
Plot 7-13. Conducted Spurious Plot (GSM Cell – Low Channel)



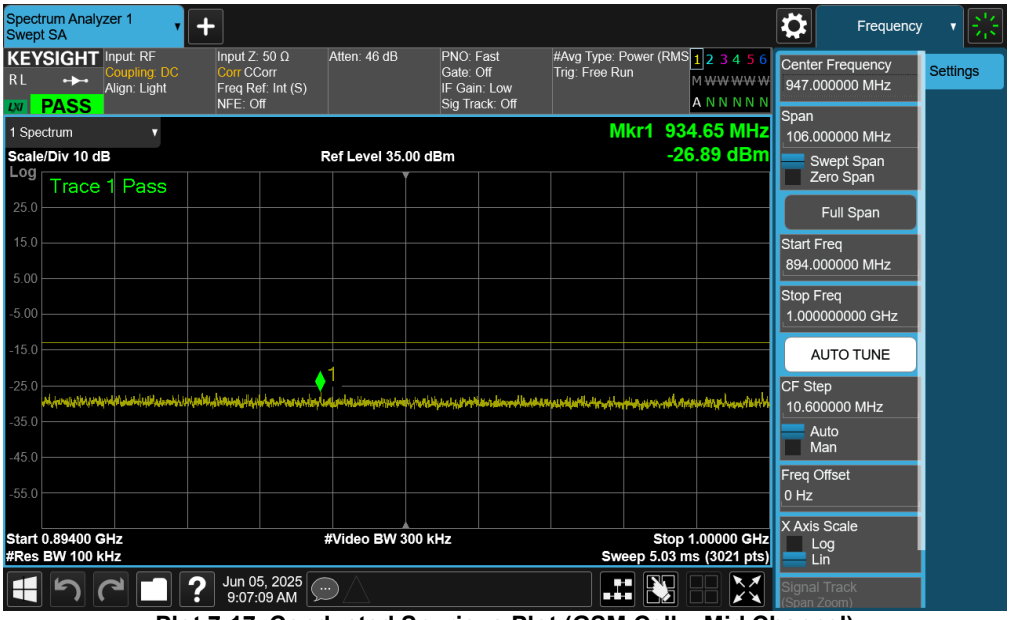
Plot 7-14. Conducted Spurious Plot (GSM Cell – Low Channel)



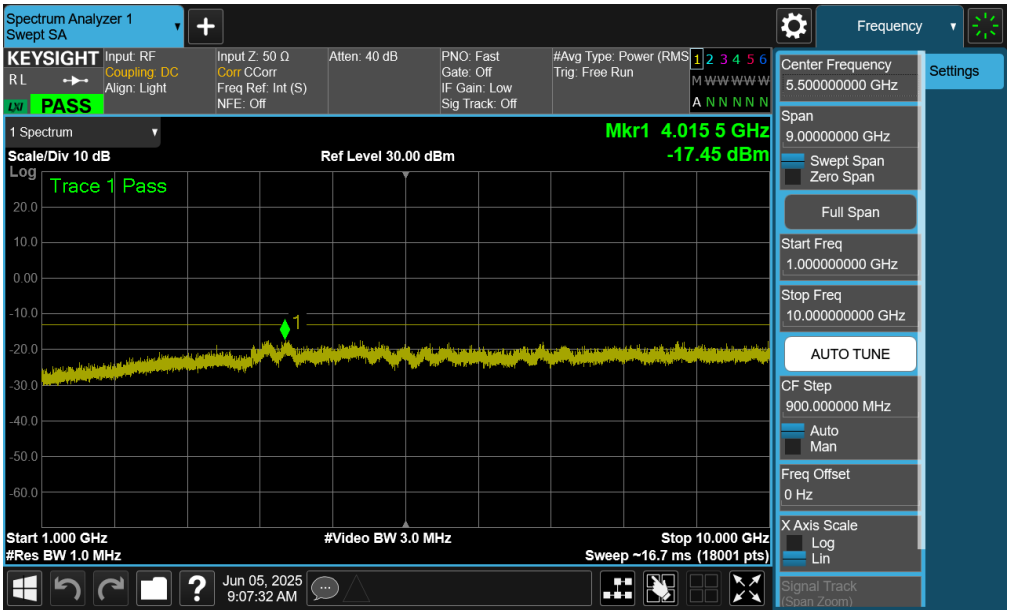
Plot 7-15. Conducted Spurious Plot (GSM Cell – Low Channel)



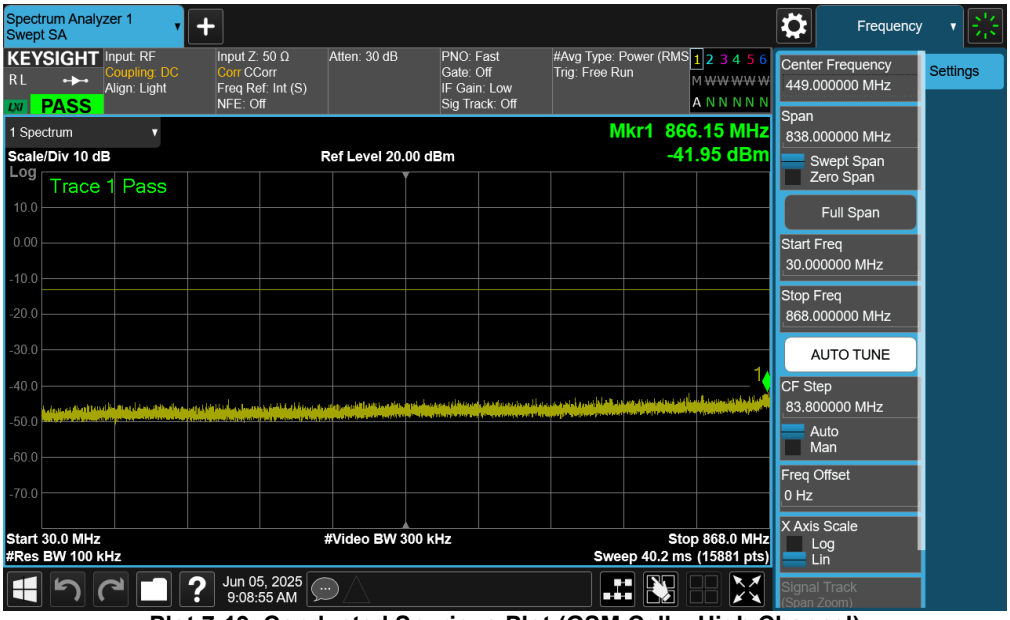
Plot 7-16. Conducted Spurious Plot (GSM Cell – Mid Channel)



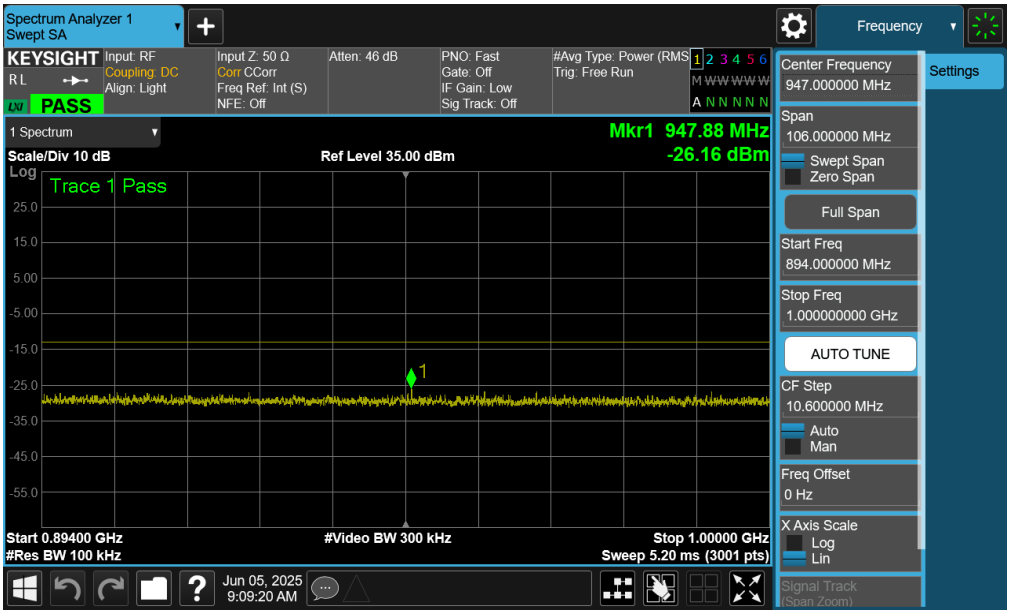
Plot 7-17. Conducted Spurious Plot (GSM Cell – Mid Channel)



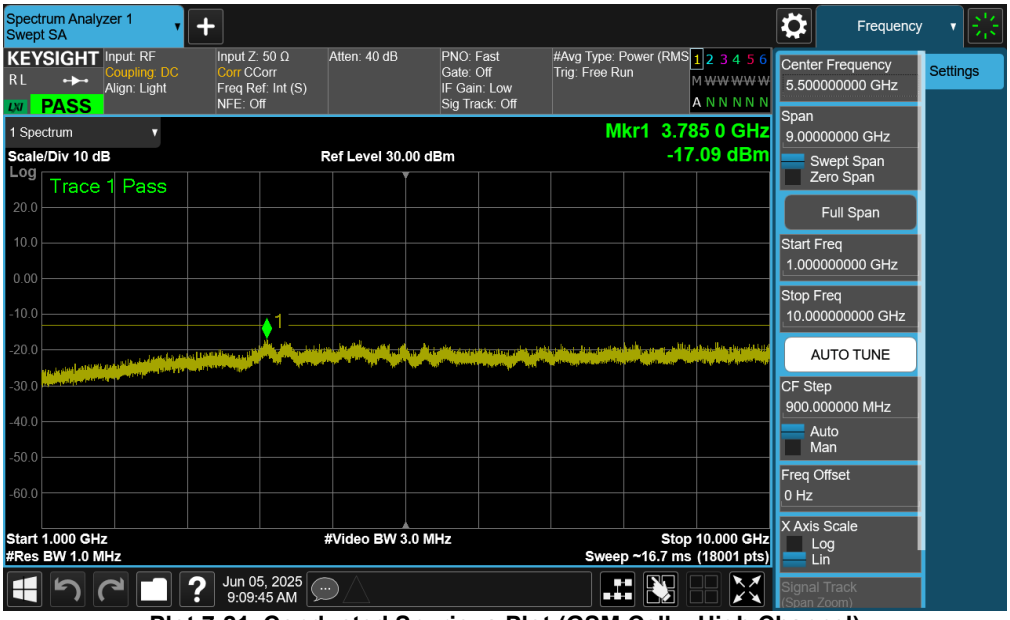
Plot 7-18. Conducted Spurious Plot (GSM Cell – Mid Channel)



Plot 7-19. Conducted Spurious Plot (GSM Cell – High Channel)

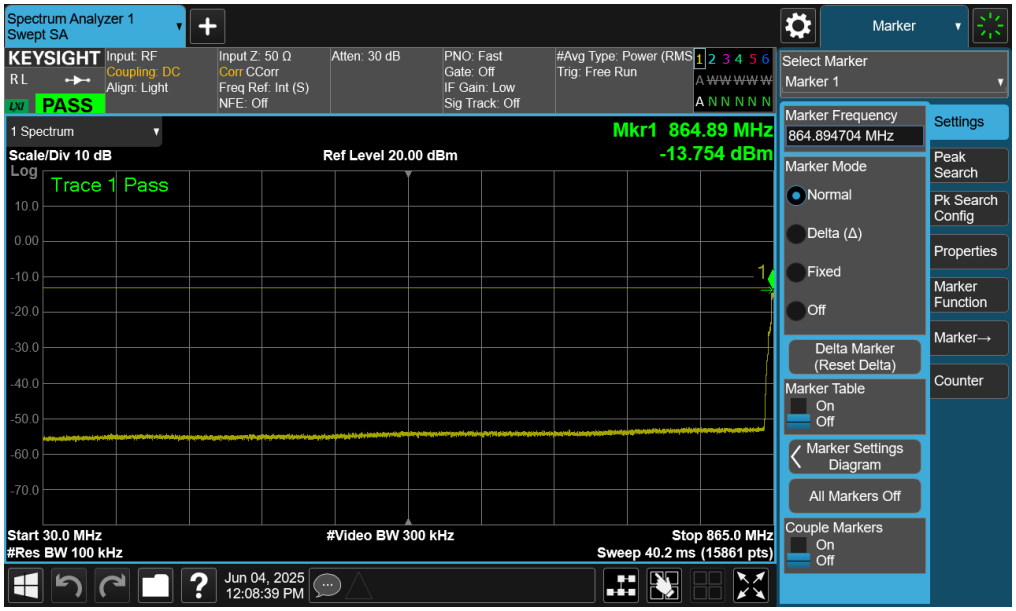


Plot 7-20. Conducted Spurious Plot (GSM Cell – High Channel)



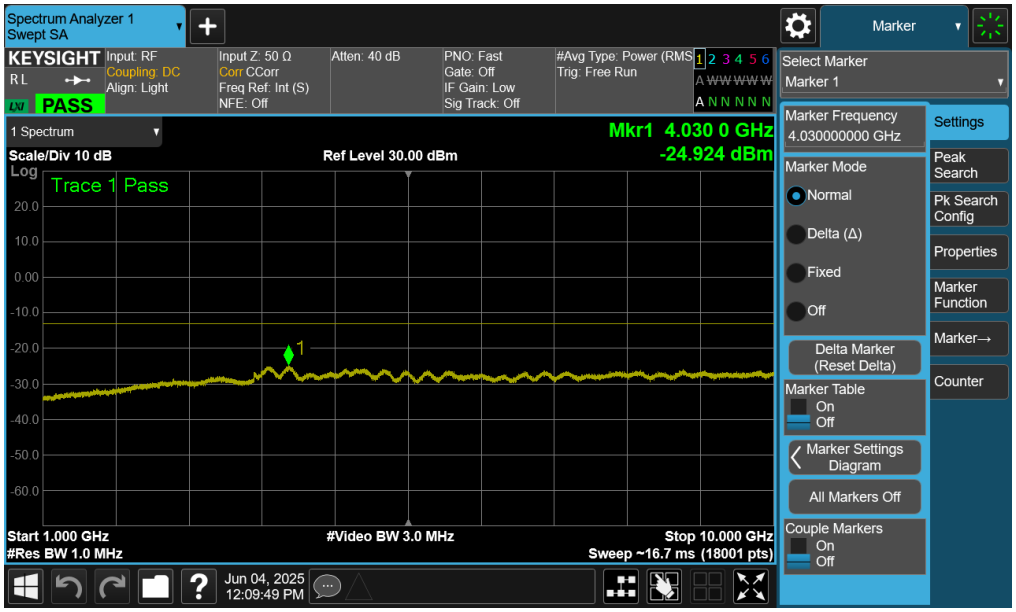
Plot 7-21. Conducted Spurious Plot (GSM Cell – High Channel)

WCDMA Cell

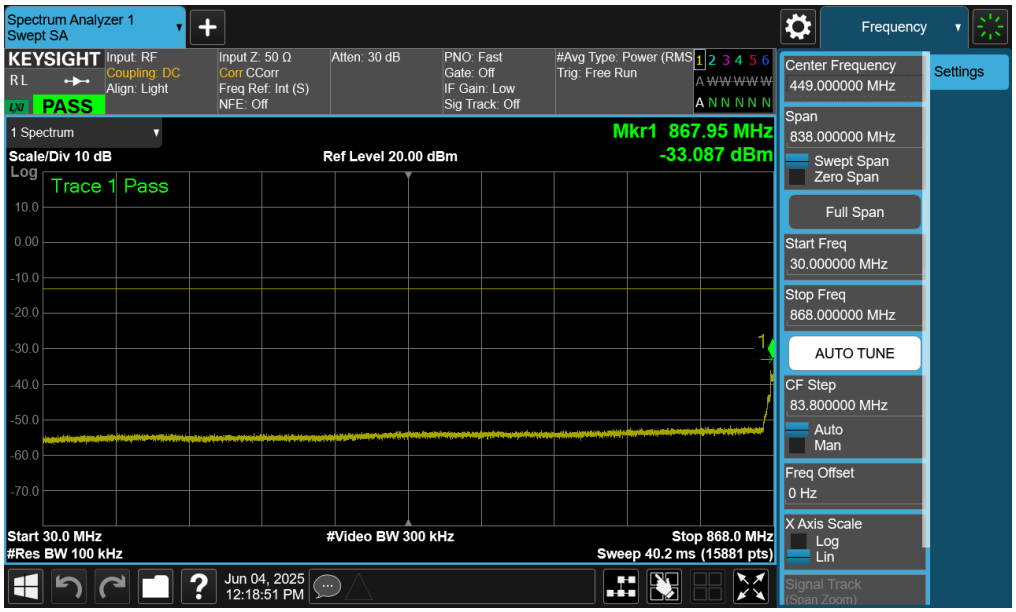


Plot 7-22. Conducted Spurious Plot (WCDMA Cell – Low Channel)

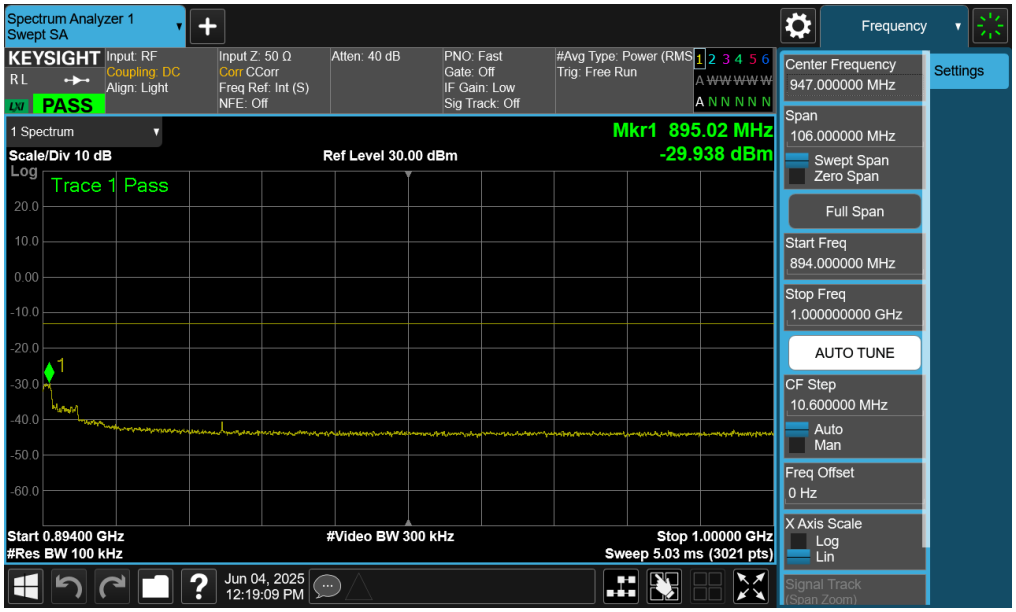
Plot 7-23. Conducted Spurious Plot (WCDMA Cell – Low Channel)



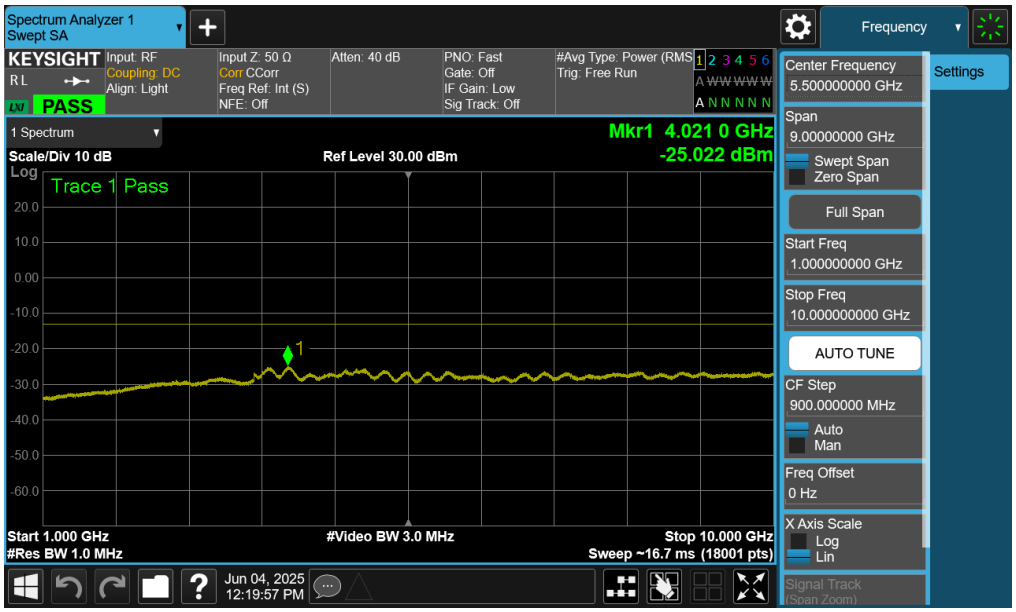
Plot 7-24. Conducted Spurious Plot (WCDMA Cell – Low Channel)



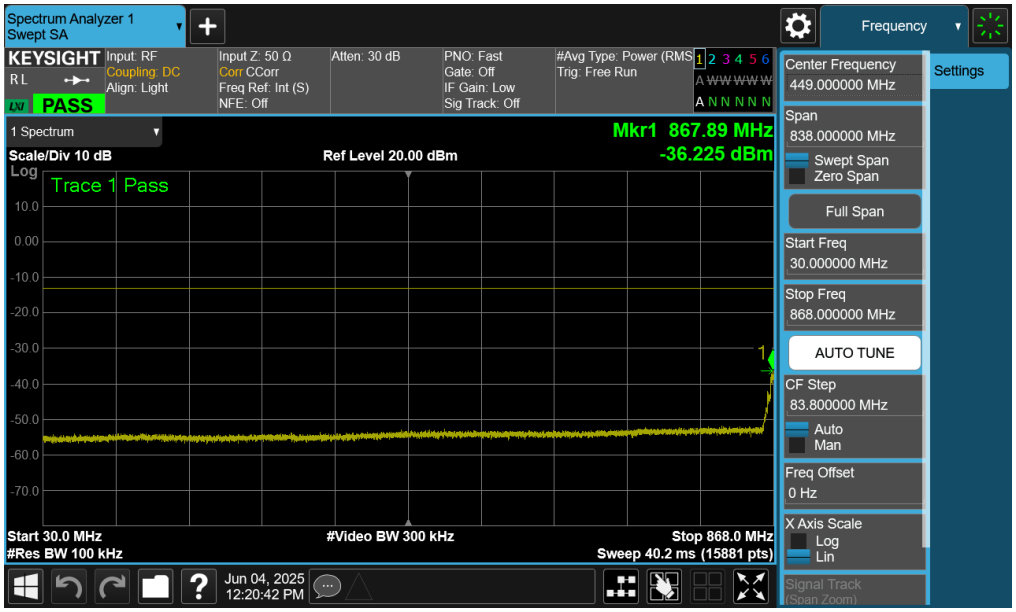
Plot 7-25. Conducted Spurious Plot (WCDMA Cell – Mid Channel)



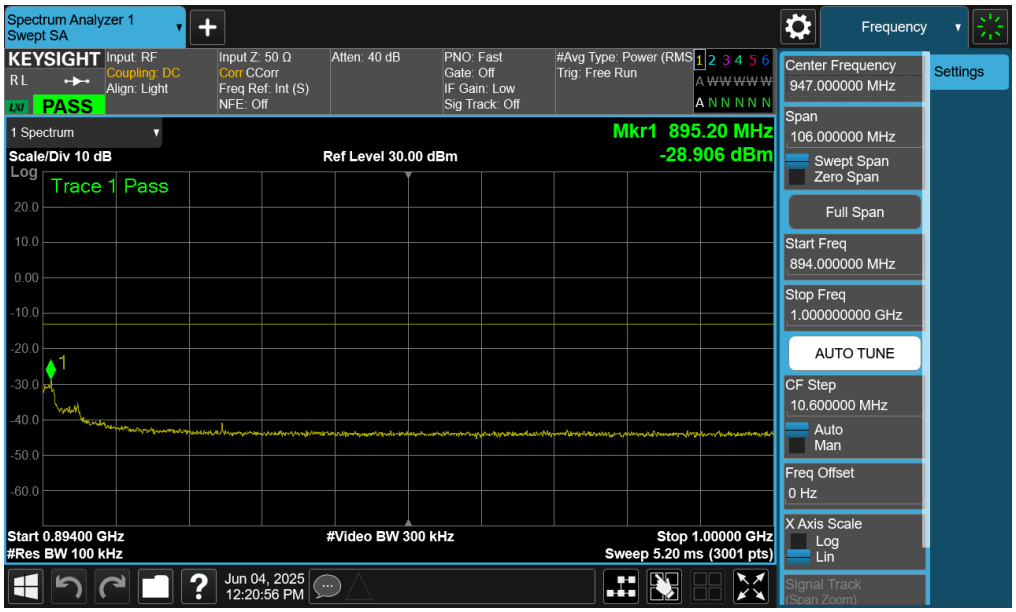
Plot 7-26. Conducted Spurious Plot (WCDMA Cell – Mid Channel)



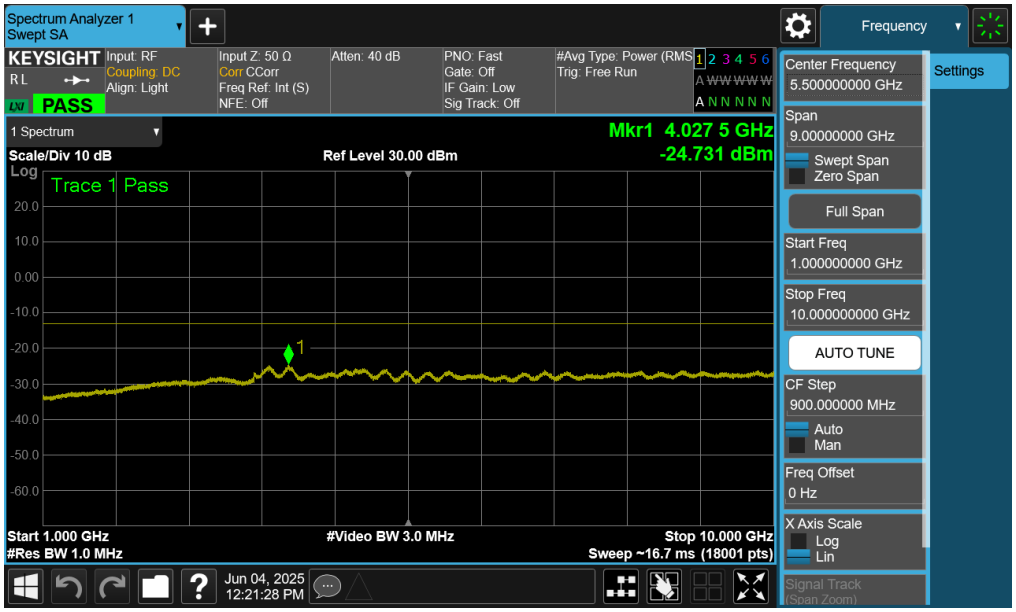
Plot 7-27. Conducted Spurious Plot (WCDMA Cell – Mid Channel)



Plot 7-28. Conducted Spurious Plot (WCDMA Cell – High Channel)



Plot 7-29. Conducted Spurious Plot (WCDMA Cell – High Channel)



Plot 7-30. Conducted Spurious Plot (WCDMA Cell – High Channel)

7.5 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

ANSI C63.26-2015 – Section 5.7.3

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 7-4. Test Instrument & Measurement Setup

Test Notes

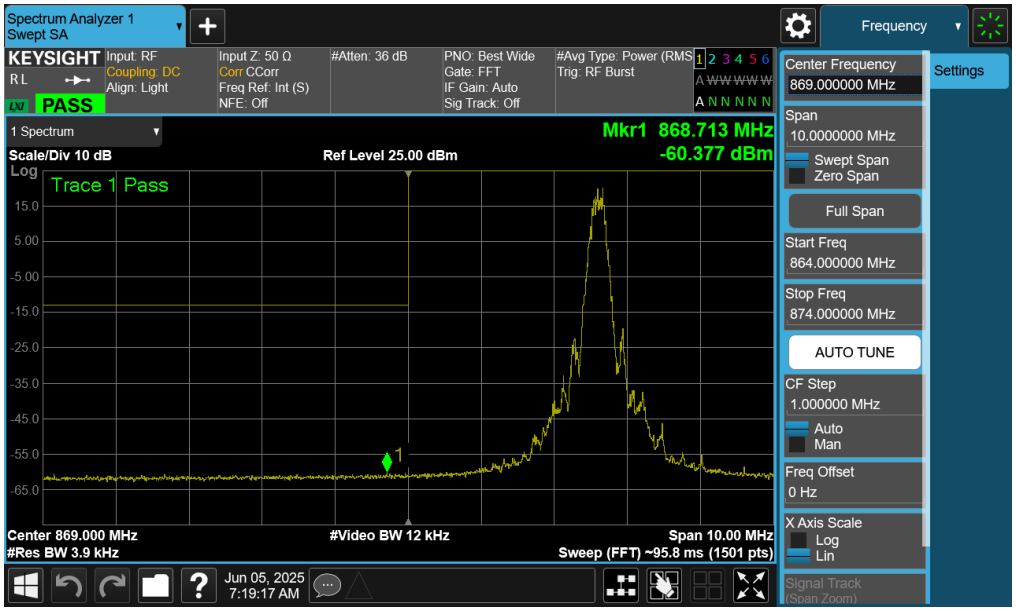
1. Per 22.917(b), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission 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

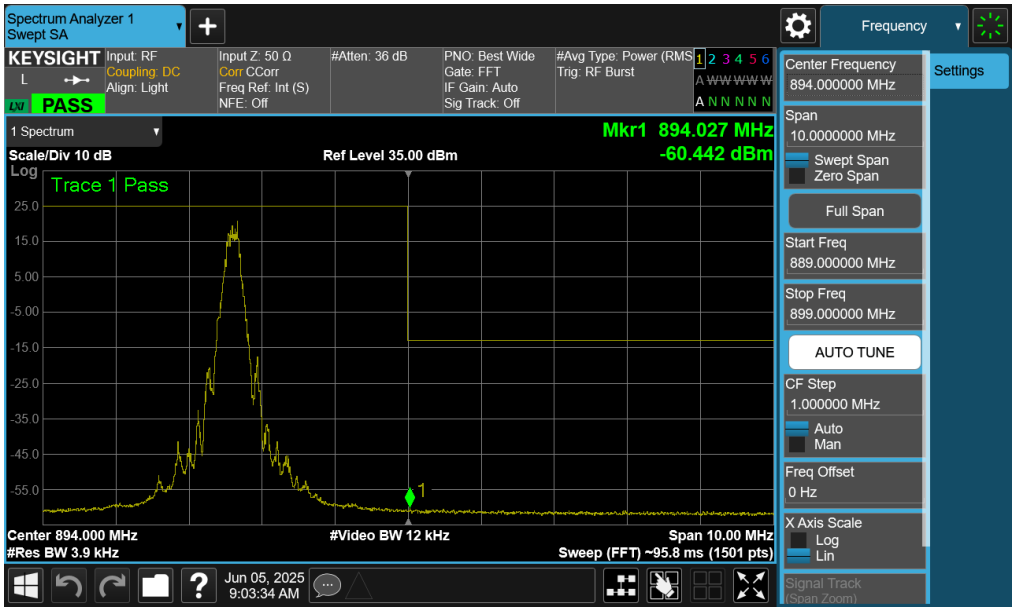
Plot 7-31. Lower Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB)

Plot 7-32. Upper Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB)

GSM/GPRS Cell

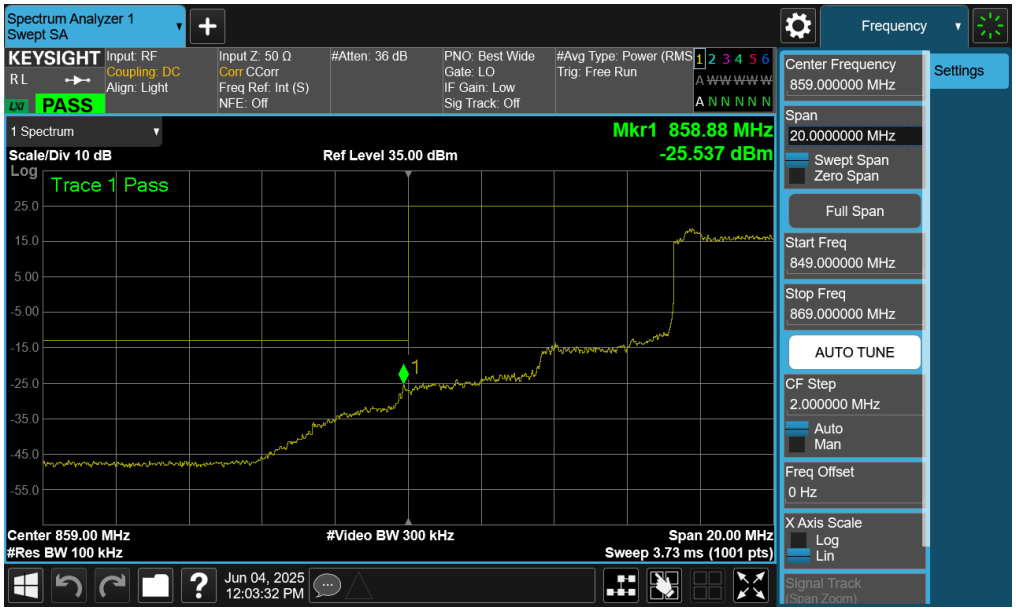


Plot 7-33. Lower Band Edge Plot (GPRS Cell – Ch. 140)



Plot 7-34. Upper Band Edge Plot (GPRS Cell – Ch. 240)

WCDMA Cell



Plot 7-35. Lower Band Edge Plot (WCDMA Cell – Ch. 5797)

Plot 7-36. Upper Band Edge Plot (WCDMA Cell – Ch. 5865)

7.6 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2.3.4

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

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

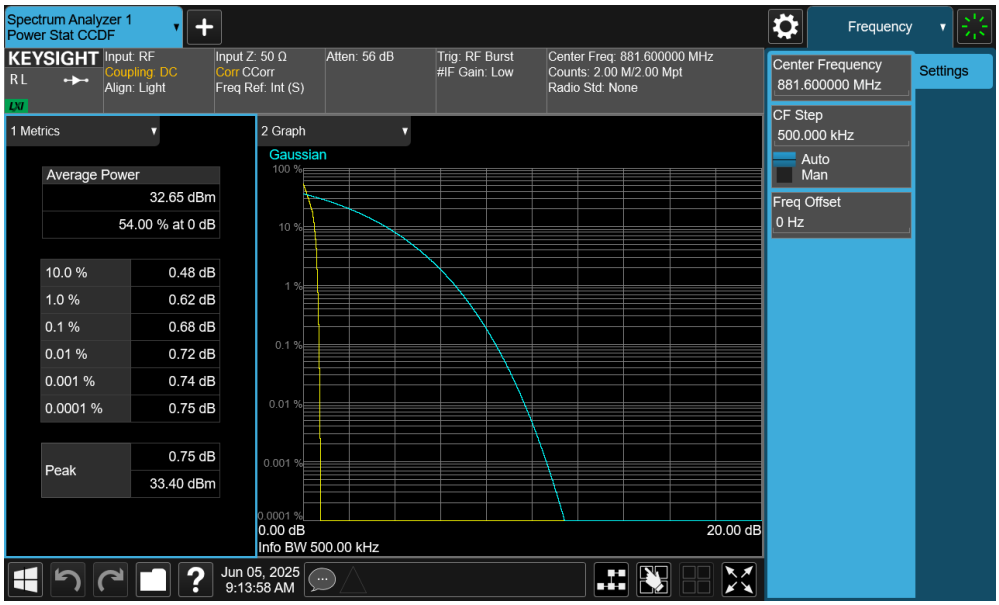
Figure 7-5. Test Instrument & Measurement Setup

Test Notes

None.

Plot 7-37. PAR Plot (LTE Band 26/5)

Plot 7-38. PAR Plot (WCDMA Cell)



Plot 7-39. PAR Plot (GSM Cell)

7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into a 50 ohm termination. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

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.

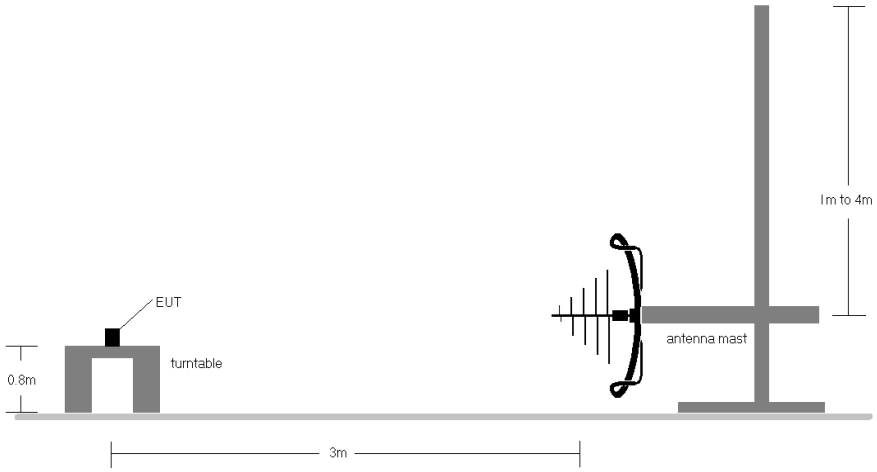


Figure 7-6. Test Instrument & Measurement Setup < 1GHz

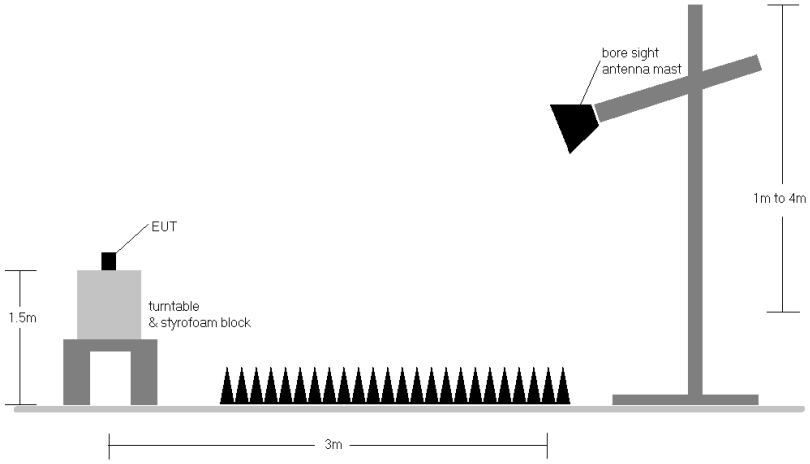


Figure 7-7. Test Instrument & Measurement Setup > 1GHz

Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2) This unit was tested while powered by a DC power supply.

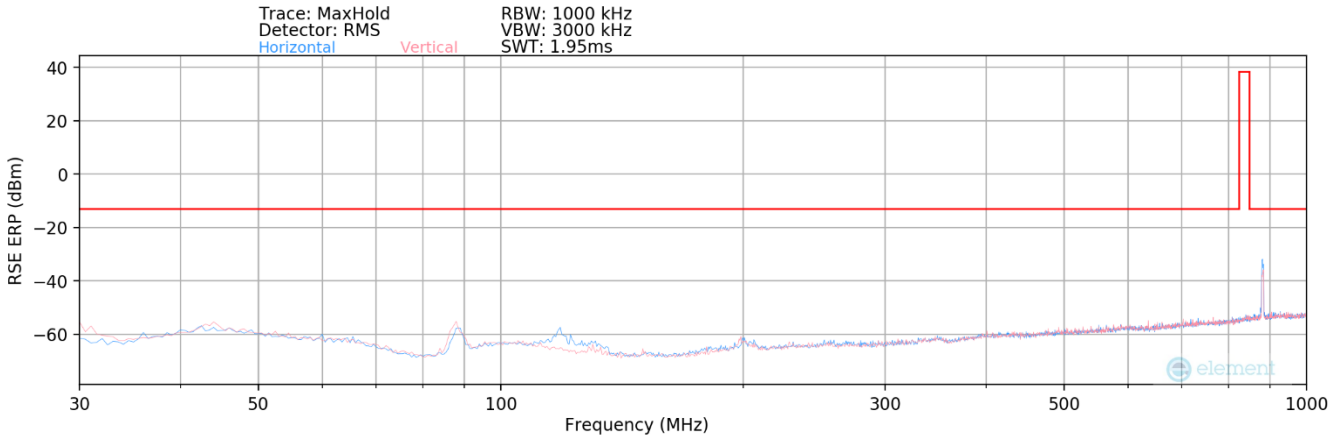
3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The transmitting bands operating under the provisions of Part 22 (i.e. UMTS B26, LTE B26/5, and GSM850) were all tested on the main port while the second RF port was transmitting on a different mode/band. The 2.4GHz WiFi was also actively transmitting during the emissions scans found in this section.

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.

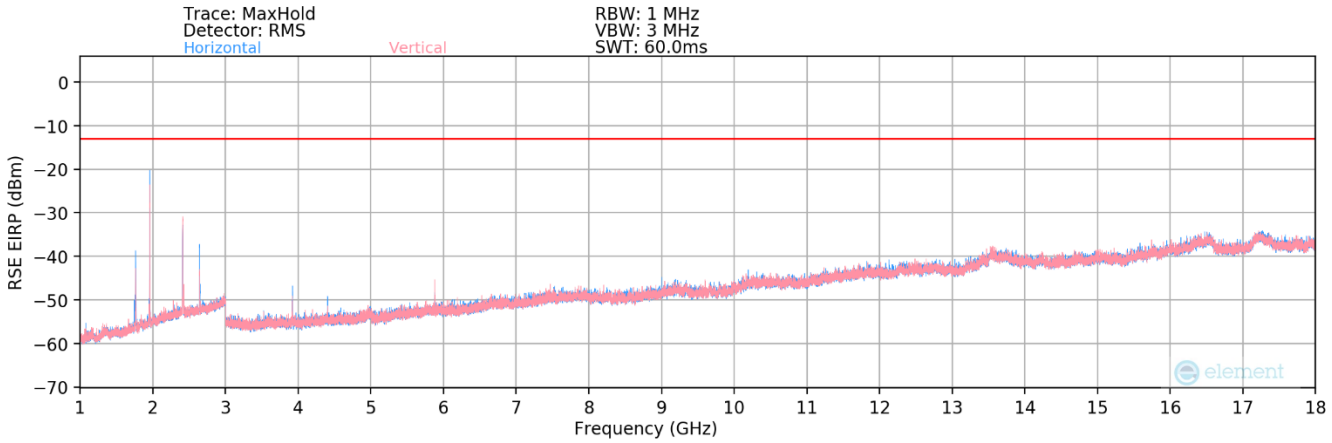
5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

6) The 2.4GHz WiFi transmitter was active during licensed radiated emissions measurements.

UMTS B26 + UMTS B2 + WIFI



Plot 7-40. Radiated Spurious Plot (UMTS B26 + UMTS B2 + WIFI) - Below 1GHz



Plot 7-41. Radiated Spurious Plot (UMTS B26 + UMTS B2 + WIFI) - Above 1GHz

Mode:	UMTS B26 + UMTS B2 + WIFI
Channel:	5838 / 9800 / 1
Frequency (MHz):	876.6 / 1960 / 2412

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
87.00	H	-	-	-91.29	-16.74	-1.03	-98.44	-13.00	-85.44
118.00	H	-	-	-91.35	-15.10	0.55	-96.86	-13.00	-83.86
451.00	H	-	-	-89.60	-8.14	9.26	-88.15	-13.00	-75.15

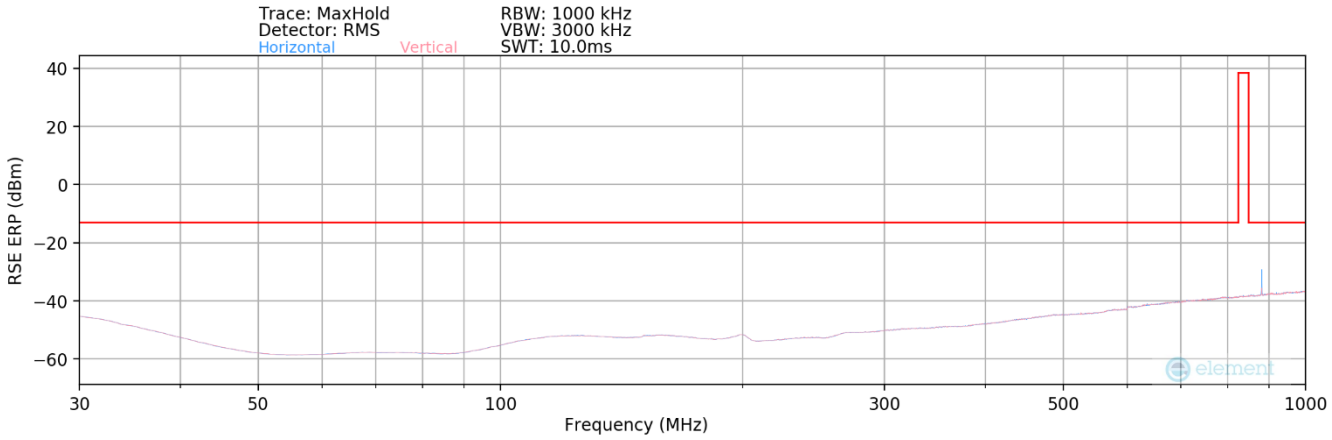
Table 7-5. Radiated Spurious Data (UMTS B26 + UMTS B2 + WIFI)

Mode:	UMTS B26 + UMTS B2 + WIFI
Channel:	5838 / 9800 / 1
Frequency (MHz):	876.6 / 1960 / 2412

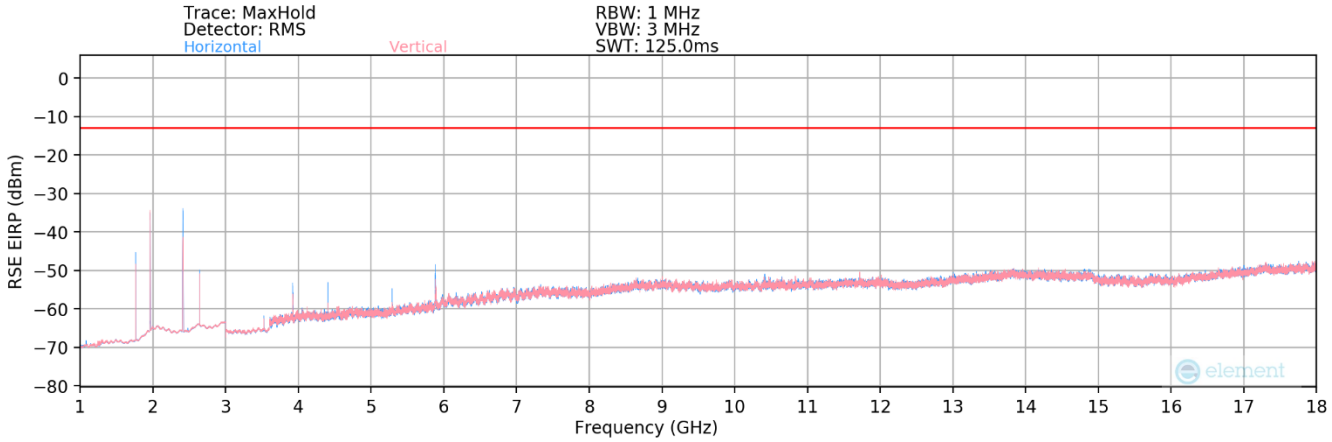
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1763.20	H	128	119	-56.92	0.42	50.50	-44.76	-13.00	-31.76
2644.00	H	192	132	-62.02	4.61	49.59	-45.67	-13.00	-32.67
3923.00	H	126	181	-72.32	8.14	42.82	-52.44	-13.00	-39.44
7263.00	H	-	-	-82.78	14.96	39.18	-56.08	-13.00	-43.08
7840.00	H	-	-	-82.12	16.13	41.01	-54.25	-13.00	-41.25
8146.00	H	-	-	-82.55	15.73	40.18	-55.07	-13.00	-42.07

Table 7-6. Radiated Spurious Data (UMTS B26 + UMTS B2 + WIFI)

GSM850 + LTE B2/25 + WIFI



Plot 7-42. Radiated Spurious Plot (GSM850 + LTE B2/25 + WIFI) - Below 1GHz



Plot 7-43. Radiated Spurious Plot (GSM850 + LTE B2/25 + WIFI) - Above 1GHz

Mode:	GSM850 + LTE B2/25 + WIFI
Channel:	190 / 8365 / 1
Frequency (MHz):	881.6 / 1962.5 / 2412

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
198.00	H	-	-	-109.24	19.97	17.73	-79.68	-13.00	-66.68
450.00	H	-	-	-108.59	24.72	23.13	-74.27	-13.00	-61.27
682.00	H	-	-	-108.28	28.30	27.02	-70.38	-13.00	-57.38

Table 7-7. Radiated Spurious Data (GSM850 + LTE B2/25 + WIFI)

Mode:	GSM850 + LTE B2/25 + WIFI
Channel:	190 / 8365 / 1
Frequency (MHz):	881.6 / 1962.5 / 2412

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]
1763.00	H	164	60	-51.23	-6.60	49.17	-46.08	-13.00	-33.08
2644.00	H	160	145	-56.64	-2.50	47.86	-47.39	-13.00	-34.39
4408.00	H	227	198	-64.80	2.02	44.22	-51.04	-13.00	-38.04
7236.00	H	-	-	-78.98	9.11	37.13	-58.13	-13.00	-45.13
7850.00	H	-	-	-79.39	9.36	36.97	-58.29	-13.00	-45.29
9812.00	H	-	-	-80.63	11.93	38.30	-56.96	-13.00	-43.96

Table 7-8. Radiated Spurious Data (GSM850 + LTE B2/25 + WIFI)

7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

7.) **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, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

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

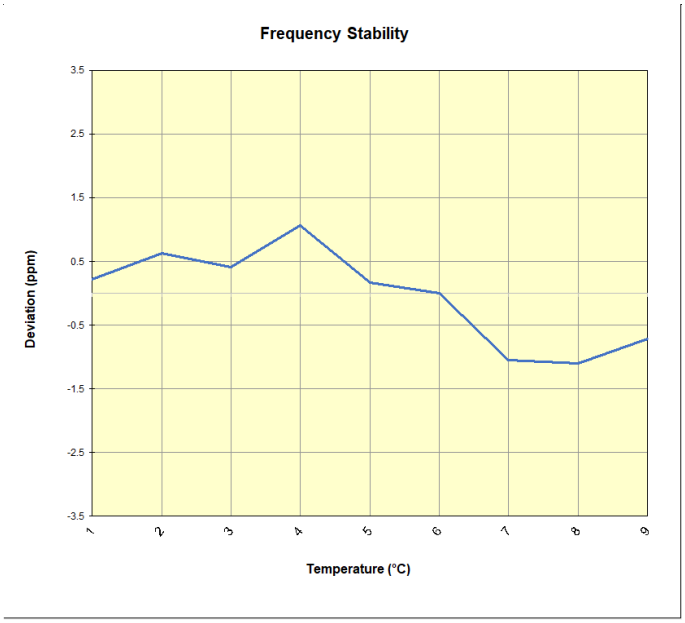
None

LTE Band 26/5

Operating Frequency (Hz):	881,500,000
Ref. Voltage (VDC):	28
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	28	- 30	881,525,149	195	0.0000221
		- 20	881,525,511	557	0.0000632
		- 10	881,525,317	363	0.0000412
		0	881,525,892	938	0.0001064
		+ 10	881,525,105	151	0.0000171
		+ 20 (Ref)	881,524,954	0	0.0000000
		+ 30	881,524,024	-930	-0.0001055
		+ 40	881,523,986	-968	-0.0001098
		+ 50	881,524,324	-630	-0.0000715
85 %	23.80	+ 20	881,524,275	-679	-0.0000770
110 %	32.20	+ 20	881,524,598	-356	-0.0000404

Table 7-9. LTE Band 26/5 Frequency Stability Data



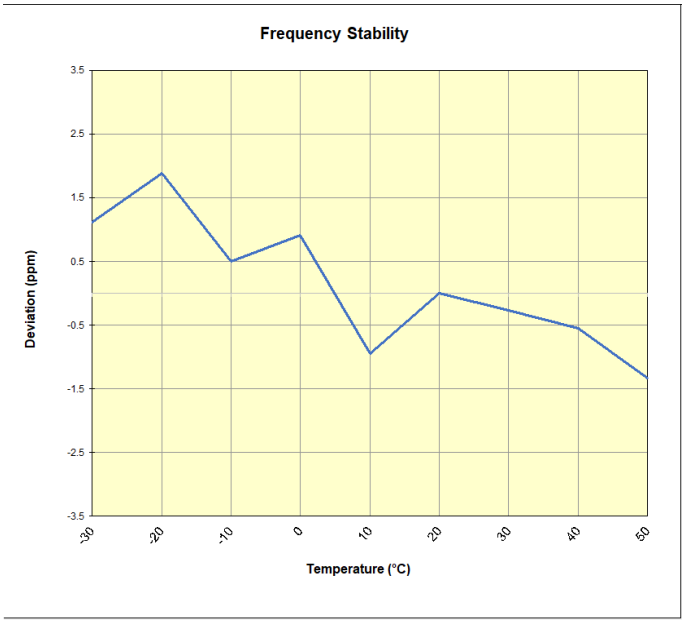
Plot 7-44. LTE Band 26/5 Frequency Stability Chart

GSM/GPRS Cellular

Operating Frequency (Hz):	881,600,000
Ref. Voltage (VDC):	28
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	28	- 30	881,592,861	984	0.0001116
		- 20	881,593,537	1,660	0.0001883
		- 10	881,592,315	438	0.0000497
		0	881,592,676	799	0.0000906
		+ 10	881,591,047	-830	-0.0000941
		+ 20 (Ref)	881,591,877	0	0.0000000
		+ 30	881,591,644	-233	-0.0000264
		+ 40	881,591,395	-482	-0.0000547
		+ 50	881,590,700	-1,177	-0.0001335
85 %	23.80	+ 20	881,591,418	-459	-0.0000521
110 %	32.20	+ 20	881,590,608	-1,269	-0.0001439

Table 7-10. GSM/GPRS Cell Frequency Stability Data



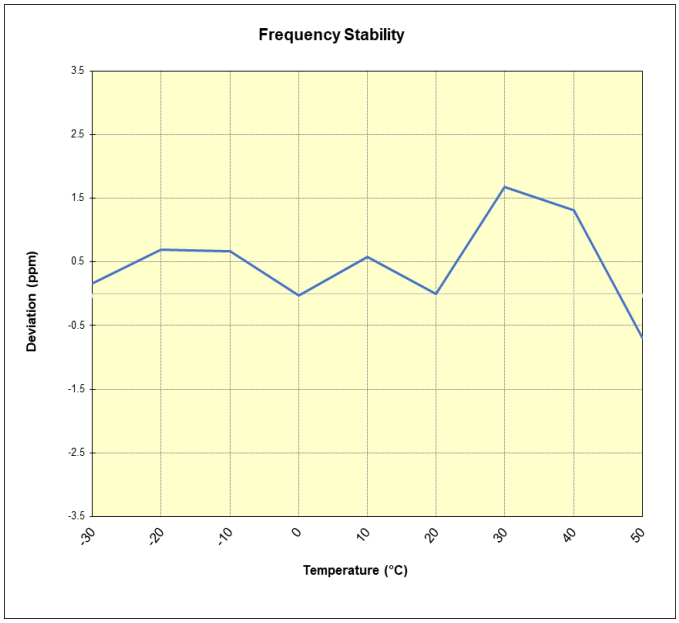
Plot 7-45. GSM/GPRS Cell Frequency Stability Chart

WCDMA Cellular

Operating Frequency (Hz):	876,600,000
Ref. Voltage (VDC):	28
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	28	- 30	876,621,506	139	0.0000159
		- 20	876,621,971	604	0.0000689
		- 10	876,621,956	589	0.0000672
		0	876,621,344	-23	-0.0000026
		+ 10	876,621,877	510	0.0000582
		+ 20 (Ref)	876,621,367	0	0.0000000
		+ 30	876,622,842	1,475	0.0001683
		+ 40	876,622,518	1,151	0.0001313
		+ 50	876,620,757	-610	-0.0000696
85 %	23.80	+ 20	876,620,060	-1,307	-0.0001491
110 %	32.20	+ 20	876,620,536	-831	-0.0000948

Table 7-11. WCDMA Cell Frequency Stability Data



Plot 7-46. WCDMA Cell Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Centum Geolocation System FCC ID: 2A93U-58530** complies with all the requirements of Part 22 of the FCC rules.