

**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:

08/14 - 08/27/2024 **Test Report Issue Date:** 1/16/2025 **Test Site/Location:** Element lab., Columbia, MD, USA **Test Report Serial No.:** 1M2407310061-01.2A93U

# FCC ID:

Applicant Name:

## 2A93U-55041-402

Centum Research & Technology S.L

Application Type: Model: EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s): Class II Permissive Change: Original Grant Date:

Class II Permissive Change Lifeseeker Mini S10 Geolocation System PCS Licensed Transmitter (PCB) 22 ANSI C63.26-2015 Adding additional 2G/3G bands and modes of operation 03/02/2023

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



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				RP	EI	RP	
Mode	Modulation	Tx Frequency Range [MHz]	Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	Emission Designator
GSM/GPRS	GMSK	869.2 - 893.8	0.146	21.64	0.239	23.79	239KGXW
WCDMA	Spread Spectrum	871.4 - 891.6	0.133	21.24	0.218	23.39	4M38F9W

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# **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**

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

### 1.3 Test Facility / Accreditations

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

- 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 Agreement.

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# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Centum Geolocation System FCC ID: 2A93U-55041-402**. 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.

Per FCC §22.925, this device will not transmit on Band 26 if installed in an aircraft that is airborne.

Test Device Serial No.: 213014

## 2.2 Device Capabilities

This device was tested for the following capabilities:

UMTS Bands: 2, 4/10, 5/26, 12, 13 and GSM Bands: 850 and 1900

## 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.

RF was generated by a test tool provided by the manufacturer.

### 2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version 2.1 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.

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# 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:

 $E_{[Db\mu V/m]} =$  Measured amplitude level<sub>[dBm]</sub> + 107 + Cable Loss<sub>[Db]</sub> + Antenna Factor<sub>[Db/m]</sub> And EIRP<sub>[dBm]</sub> = E<sub>[DbuV/m]</sub> + 20logD - 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.

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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 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

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# 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP2	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	AP2
-	ETS	EMC Cable and Switch System	4/2/2024	Annual	4/2/2025	ETS
-	WL25-3	Conducted Cable Set (25GHz)	4/2/2024	Annual	4/2/2025	WL25-3
-	WL40-1	WLAN Cable Set (40GHz)	4/2/2024	Annual	4/2/2025	WL40-1
Keysight Technologies	N9020A	MXA Signal Analyzer	4/11/2024	Annual	4/11/2025	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	4/9/2024	Annual	4/9/2025	MY52350166
Emco	3115	Horn Antenna (1-18GHz)	6/7/2024	Biennial	6/7/2026	9704-5182
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	8/30/2022	Biennial	8/30/2024	A051107
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Keysight Technologies	N9038A	MXE EMI Receiver	8/30/2023	Annual	8/30/2024	MY51210133
		Table 5-1. Test Equipmer	nt			

### Notes:

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

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# 6.0 SAMPLE CALCULATIONS

## **GSM Emission Designator**

### Emission Designator = 250KGXW

 $\begin{array}{l} \text{GSM BW} = 250 \text{ kHz} \\ \text{G} = \text{Phase Modulation} \\ \text{X} = \text{Cases not otherwise covered} \\ \text{W} = \text{Combination (Audio/Data)} \end{array}$ 

## **UMTS Emission Designator**

## Emission Designator = 4M16F9W

UMTS BW = 4.16 MHz F = Frequency Modulation 9 = Composite Digital Info W = Combination (Audio/Data)

## **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.

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# 7.0 TEST RESULTS

### 7.1 Summary

Company Name:	Centum Research & Technology S.L
FCC ID:	<u>2A93U-55041-402</u>
FCC Classification:	PCS Licensed Transmitter (PCB)
Mode(s):	<u>GSM/GPRS/UMTS</u>

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
	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
JCTE	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
CONDUCTED	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
U U	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.
- 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.

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## 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. Power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
- 2. Span = 2 3 times the OBW
- 3. RBW = 1 5% of the expected OBW
- 4. VBW  $\geq$  3 x RBW
- 5. No. of sweep points > 2 x span / RBW
- 6. Sweep time = auto-couple
- 7. Detector = RMS
- 8. Trigger is set to "free run" for signals with continuous operation.
- 9. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
- 10. Trace mode = trace averaging (RMS) over 100 sweeps
- 11. The trace was allowed to stabilize.

#### Test Setup

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





### Test Notes

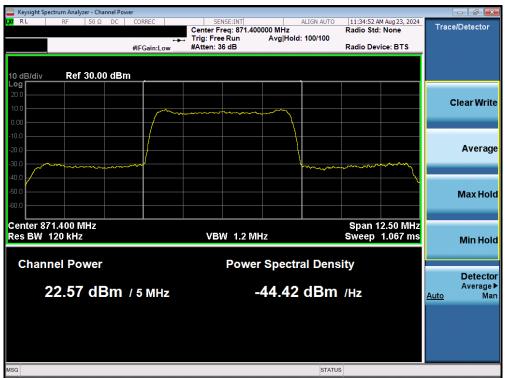
None

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Channel	Frequency [MHz]	Conducted Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	EIRP [Watts]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
4357	871.4	22.57	0.82	23.39	0.218	21.24	0.133	38.45	-17.21
4408	881.6	21.87	0.82	22.69	0.186	20.54	0.113	38.45	-17.91
4458	891.6	21.37	0.82	22.19	0.165	20.04	0.101	38.45	-18.42

 Table 7-2. Transmitter Conducted Output Power/ Effective Radiated Power (UMTS 850)

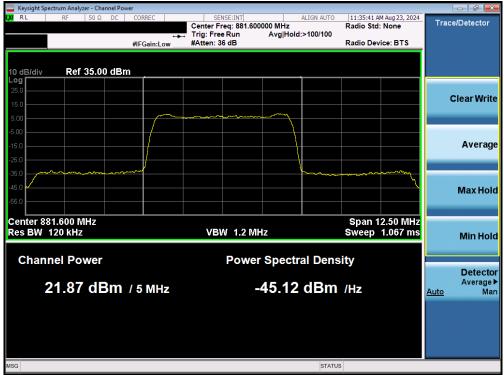


Plot 7-1. Conducted Power Output Data (UMTS 850 - Low Channel)

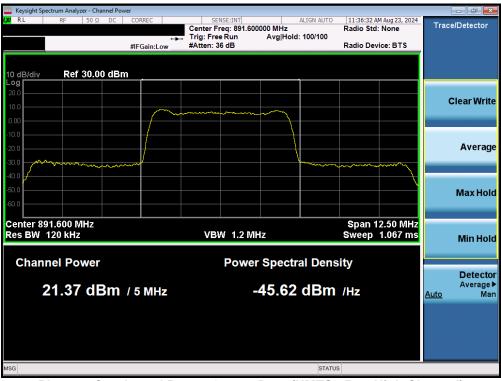
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Plot 7-2. Conducted Power Output Data (UMTS 850 – Mid Channel)



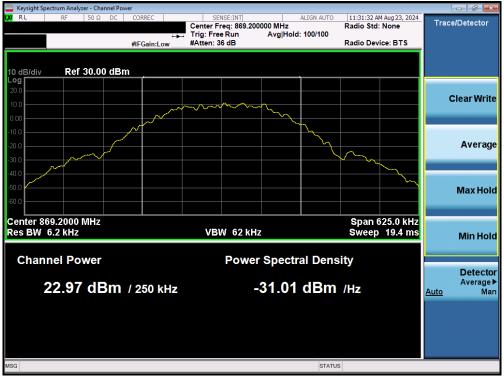
Plot 7-3. Conducted Power Output Data (UMTS 850 – High Channel)

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Channel	Frequency [MHz]	Conducted Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	EIRP [Watts]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
128	869.2	22.97	0.82	23.79	0.240	21.64	0.146	38.45	-16.81
190	881.6	22.39	0.82	23.21	0.209	21.06	0.128	38.45	-17.39
251	893.8	21.64	0.82	22.46	0.176	20.31	0.107	38.45	-18.14

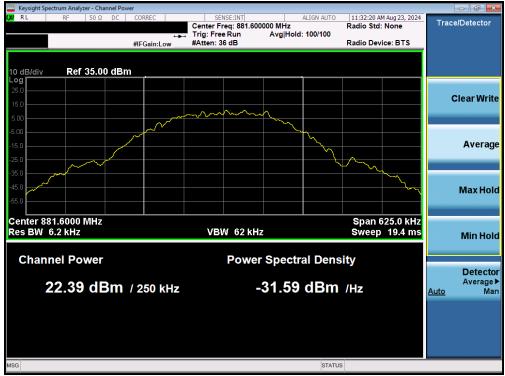
Table 7-3. Transmitter Conducted Output Power/ Effective Radiated Power (GSM 850)



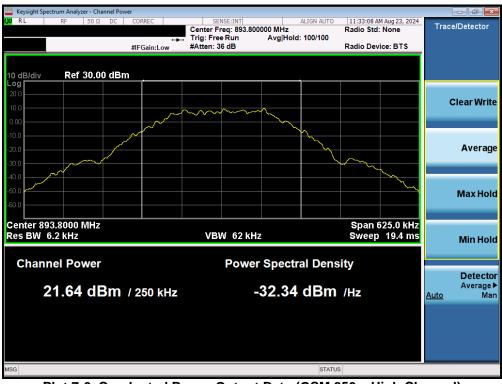
Plot 7-4. Conducted Power Output Data (GSM 850 – Low Channel)

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



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

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# 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  $\geq$  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

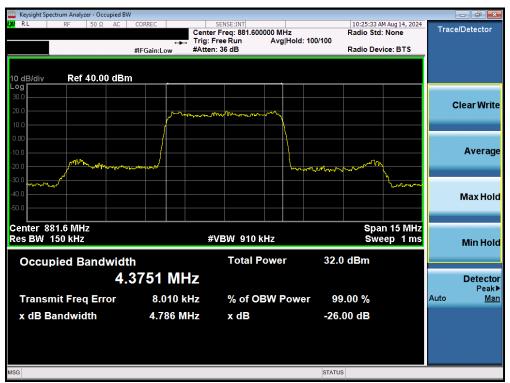
None.

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



Plot 7-8. Occupied Bandwidth Plot (UMTS, Ch. 4408)

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# 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 10<sup>th</sup> 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. RBW = 1MHz
- 2. VBW >  $3 \times RBW$
- 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

### Test Setup

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

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1-1611			
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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.

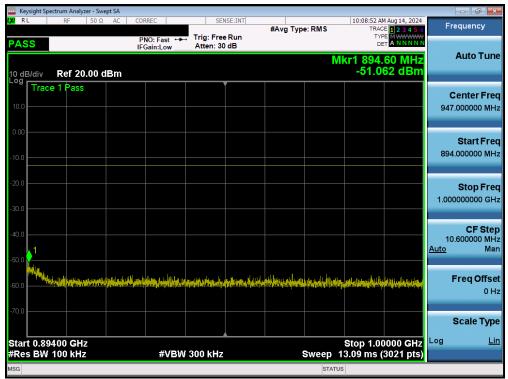
FCC ID: 2A93U-55041-402		PART 22 MEASUREMENT REPORT	Approved by: Technical Manager
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# **GSM/GPRS** Cell

	ght Spectru													
X/RL		RF	<u>50 Ω</u>	AC	CORREC	C	SE	NSE:INT	#Avg Typ	e: RMS	TRA	M Aug 14, 2024	F	requency
PASS						Fast 🛶	Trig: Fre Atten: 3				TY	PE MWWWWW ET A N N N N N		
	<u> </u>				IFGair	n:Low	Atten. 5	U GB			/kr1 868			Auto Tune
10 dB/c	div 5	{ef 20	b 00.	Bm						IN IN	-46.1	40 dBm		
Loa 🗕	Frace 1													
	indee i													Center Fred
10.0													449	9.000000 MHz
0.00														
0.00														Start Freq
-10.0													30	0.000000 MHz
-20.0														Stop Freq
													86	3.000000 MHz
-30.0														
														CF Step
-40.0												1	8	3.800000 MH;
													<u>Auto</u>	Mar
-50.0												1		
-60.0	unoshijila,	damp lash	<u>ela/an</u> i	and Alashin	any ported of	March Hitter	and the second	C. Harden C. Street	ann fallgerigerigerigerige	nite with the	Ruth Largersteine	And the state of t		Freq Offset
-00.0	d hadlested	a di sinahi	- and the state		Aldered a stars	ata bata ka pada pada bita	ه يعجم إرابيكاروماليه	A set in the second	in think the second	n a hanna an	delly houstke a postability of	- Station - Station		0 Hz
-70.0														
														Scale Type
	30.0 M										Stop	60 0 MU-	Log	Lir
	30.0 M BW 10					#VBW	300 kHz		s	weep	stop a 103.6 ms (1	68.0 MHz 5861 pts)		
WSG										STAT				
_	_	_	_	_	_								_	

Plot 7-9. Conducted Spurious Plot (GPRS Ch. 128)



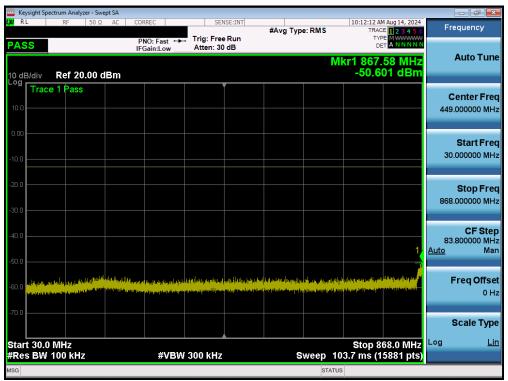
Plot 7-10. Conducted Spurious Plot (GPRS Ch. 128)

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ASS PRO: Fast + Trig: Free Run Atten: 40 dB PRO: Fast + Trig: Free Run Atten: 40 dB Mikr1 3.4000 0 GHz -32.512 dBm Center Free 5.50000000 GH Center Free 5.5000000 GH Center Free 5.50000		trum Analyzer - Sv								- F	×
Ass if Gaini, Low Atten: 40 dB if Gaini, Low Atten: 40 dB	LXI RL	RF 50 \$	AC CO	RREC		 #Avg Typ	e: RMS	TRAC	E 1 2 3 4 5 6	Frequency	
Og       Trace 1 Pass       Center Free         90       1       1       1         00       1       1       1         00       1       1       1         00       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1         10       1       1       1       1         10       1       1       1       1       1         10       1       1       1       1       1       1         10       1       1       1       1       1       1       1	PASS						M	DE	O O GHz	Auto T	une
Trace 1 Pass Center Free 5.50000000 GH Center Free 5.50000000 GH Start Free 1.00000000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.000000 GH CF Step 900.00000 GH CF Step 900.000000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.000000 GH CF Step 900.00000 GH CF Step 900.000000 GH CF Step 900.00000 GH CF Step 900.0000 GH CF Step 900.00000 GH CF Step 900.0000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.00000 GH CF Step 900.0000 GH CF Step 900.0000 GH CF Step 900.0000 GH CF Step 900.0000 GH CF Step 900.0000 GH CF Step 900.000 GH CF Step	10 dB/div Log	Ref 29.00	dBm					-32.5	12 dBm		
Image: Start Free       Start Free         Image: Start Free       Image: Start Free	19.0	1 Pass									
00       1.00000000 GH         10       1.000000000 GH         10       1.000000000 GH </td <td>9.00</td> <td></td>	9.00										
Stop Free Stop Free 10 10 10 10 10 10 10 10 10 10	-1.00										
10       1	-11.0									Stop F	red
to 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	34.0										
1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	-31.0		<b>↓</b> <sup>1</sup>								
10 10 10 10 10 10 10 10 10 10 10 10 10 1	Carlo Alexandre	and an instanting of the		A CONTRACTOR OF AN					rad Celan pr		
10 10 to Hz Scale Тури tart 1.000 GHz Liog Li	-41.0 -41.0	A COLORING CONTRACTOR		a li likita ang pangangan ng kalangan ng kalangan ng pangangan ng pangangan ng pangangan ng pangangang ng pang Ng pangangang ng pangangang ng pangang ng pang					and the second difference		
10 Scale Type tart 1.000 GHz Stop 10.000 GHz	-51.0										
tart 1.000 GHz Scale Type											0 H
	-61.0									Scale T	уре
Res BW 1.0 MHZ #VBW 3.0 MHZ Sweep 15.60 ms (18001 pts)								Stop 10	.000 GHz	Log	Lir
g status	#Res BW 1	.0 WIHZ		#VBW	3.0 WHZ	S		_	8001 pts)		

Plot 7-11. Conducted Spurious Plot (GPRS Ch. 128)



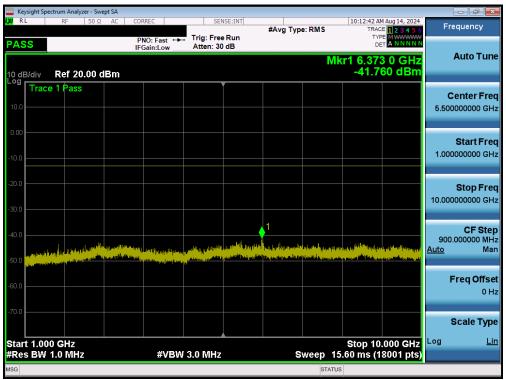
Plot 7-12. Conducted Spurious Plot (GPRS Ch. 190)

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🔤 Keysight Sp	ectrum Analyz	er - Swep	ot SA									- 0	
XI RL	RF	50 Ω	AC	CORREC			NSE:INT	#Avg Typ	e: RMS	TRAC	M Aug 14, 2024	Freq	uency
PASS				PNO: I IFGain:	Fast ↔ Low	Atten: 30							
10 dB/div	Ref 20	.00 dl	Bm						N	lkr1 895. -52.9	93 MHz 36 dBm	A	uto Tune
<sup>_og</sup> Trac	e 1 Pass											Ce	nter Fre
10.0												947.00	00000 MH
0.00												s	start Fre
-10.0												894.00	00000 MH
20.0												s	Stop Fre
.30.0													00000 GH
40.0													CF Ste
50.0												10.60 <u>Auto</u>	00000 MH Ma
and a	h an	Kiloni ta d		والم ومعاولة	الدرور وقارعان	المتريد أمرا الم	ور اللغط ويقتر و	يەر يەرىغ ار ياسىسىيە يەر			ta dibina kla kana	Fr	eq Offse
	فالشعراني ورجر تقل	A A A A A A A A A A A A A A A A A A A	and an iso	A A A A A A A A A A A A A A A A A A A	di di piti			Thing Milling and an	halitetteller.	an ann an tha an baile an baile an th			0 H
70.0												Sc	ale Typ
start 0.89 Res BW					#\/D\M	300 kHz		1	Swoon	Stop 1.00 13.09 ms (	0000 GHz	Log	L
SG SG						500 KH2			Sweep	_	soz i pisj		

Plot 7-13. Conducted Spurious Plot (GPRS Ch. 190)



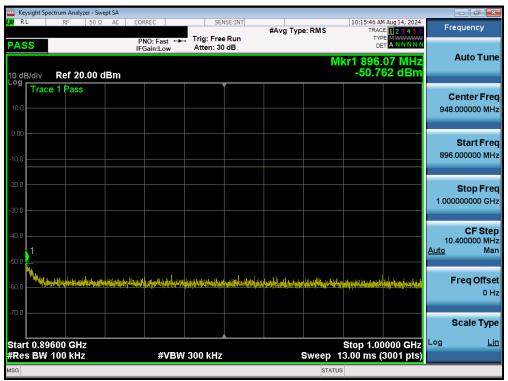
Plot 7-14. Conducted Spurious Plot (GPRS Ch. 190)

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Keysight Spectrum Ana							
K RL RF	50 Ω AC CO	RREC	SENSE	Type: RMS		Aug 14, 2024	Frequency
PASS		NO: Fast ↔ Gain:Low	Trig: Free R Atten: 30 di				
				N	lkr1 861.	77 MHz	Auto Tune
10 dB/div Ref 2	0.00 dBm				-50.71	l6 dBm	
Trace 1 Pas	S		Ĭ				Center Freq
10.0							449.000000 MHz
0.00							
0.00							Start Freq
-10.0							30.000000 MHz
-20.0							Stop Freq
-30.0							868.000000 MHz
							05.04
-40.0							CF Step 83.800000 MHz
-50.0						1	<u>Auto</u> Man
-60.0 dimental di paratra di	and the standard of the standa		entinen op an her ber Gin om big som filtere	andar para para tanàna dia 1970. Any amin'ny faritr'ona dia mampika dia	an felana gana felana ang kanang kanang Kang kang kang kang kang kang kang kang k	undination and in the	Freq Offset 0 Hz
							0112
-70.0							Scale Type
							Log Lin
Start 30.0 MHz #Res BW 100 kH	z	#VBW 3	00 kHz	Sweep_1	Stop 86 03.7 ms (1	70.0 WII 12	
MSG				STAT			

Plot 7-15. Conducted Spurious Plot (GPRS Ch. 251)



Plot 7-16. Conducted Spurious Plot (GPRS Ch. 251)

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	ectrum Analy		ot SA										
X/RL	RF	50 Ω	AC	CORREC		SEN	ISE:INT	#Avg Typ	e: RMS		M Aug 14, 2024	Fr	equency
PASS				PNO: F IFGain:L	ast ⊶⊶ .ow	Trig: Free Atten: 30		0,1		TYI Di			
10 dB/div	Ref 20	0.00 di	Bm						Μ	kr1 3.10 -42.2	7 0 GHz 72 dBm		Auto Tun
10.0 Trac	e 1 Pass												<b>enter Fre</b>
10.0												1.000	Start Fre 0000000 G⊦
20.0												10.000	<b>Stop Fre</b> 0000000 G⊦
40.0	THE PARTY OF				and the second second	and the second			<ul> <li>A second second fit</li> </ul>	ng (gang palat) (taga at	A shift of the second	900 <u>Auto</u>	CF Ste .000000 M⊦ Ma
60.0												•	F <b>req Offs</b> 0 ⊦
70.0												Log	Scale Typ
Start 1.00 Res BW		z		;	¢νΒ₩	3.0 MHz		s	weep 1	Stop 10 5.60 ms (1	.000 GHz 8001 pts)	LUg	L
SG									STATU				

Plot 7-17. Conducted Spurious Plot (GPRS Ch. 251)

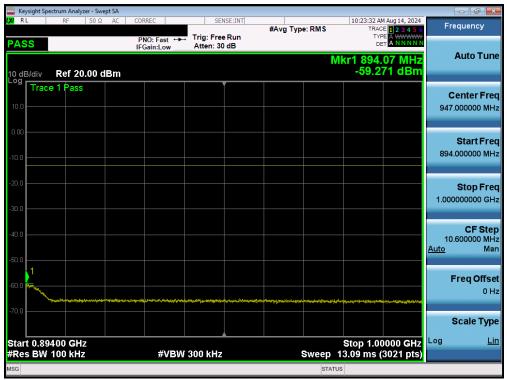
FCC ID: 2A93U-55041-402		PART 22 MEASUREMENT REPORT					
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# UMTS Cell

🔤 Keysight Spe											
X/RL	RF	50 Ω	AC	CORREC		SENSE:INT	#Avg Typ	e: RMS	TRA	AM Aug 14, 2024 CE 1 2 3 4 5 6	Frequency
PASS				PNO: Fast IFGain:Low		g: Free Run ten: 30 dB	0 ,1		T) E		
10 dB/div	Ref 20	.00 di	Bm					Ν	/kr1 865 -32.6	.78 MHz 602 dBm	Auto Tun
Log Trace	e 1 Pass					Ĭ					Center Fre
10.0											449.000000 MH
0.00											
-10.0											Start Fre 30.000000 MH
-10.0											
-20.0											Stop Fre
-30.0										<u> </u>	868.000000 MH
40.0											CF Ste
											83.800000 MH <u>Auto</u> Ma
-50.0										Ń	
-60.0											Freq Offse 0 H
70.0											
											Scale Typ
Start 30.0					DW 200				Stop 8	368.0 MHz	Log <u>Li</u>
#Res BW	TUU KH2			#V	BW 300	KAZ	S	weep 1		15861 pts)	

Plot 7-18. Conducted Spurious Plot (UMTS Ch. 4357)



Plot 7-19. Conducted Spurious Plot (UMTS Ch. 4357)

FCC ID: 2A93U-55041-402		PART 22 MEASUREMENT REPORT				
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	ectrum Analy.												
X/RL	RF	50 Ω	AC	CORREC		SEI	NSE:INT	#Avg Typ	e: RMS		AM Aug 14, 2024 CE 1 2 3 4 5 6	Fre	quency
PASS				PNO: F	ast ↔ _ow	Trig: Fre Atten: 30		• ,,		T	PE A WWWWW ET A N N N N N		
10 dB/div Log	Ref 20	0.00 d	Bm						Μ	kr1 1.74 -50.4	3 5 GHz 165 dBm		Auto Tune
10.0 Trace	e 1 Pass												enter Fred 000000 GH:
-10.0													Start Free 000000 GH
-20.0													<b>Stop Fre</b> 000000 GH
-40.0	<b>↓</b> 1											900. <u>Auto</u>	CF Stej 000000 MH Ma
60.0												F	r <b>eq Offs</b> e 0 H
-70.0 Start 1.00										Dton 4		S	Scale Type
start 1.00 #Res BW		z		;	#VBW	3.0 MHz		s	weep 1	5.60 ms (	0.000 GHz 18001 pts)		
MSG									STATU	JS			

Plot 7-20. Conducted Spurious Plot (UMTS Ch. 4357)



Plot 7-21. Conducted Spurious Plot (UMTS Ch. 4408)

FCC ID: 2A93U-55041-402		PART 22 MEASUREMENT REPORT					
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	ctrum Analyz												
XI RL	RF	50 Ω	AC	CORREC			SE:INT	#Avg Typ	e: RMS	TRAC	H Aug 14, 2024	Fre	quency
PASS				PNO: F	ast ↔→ .ow	Atten: 30							
10 dB/div	Ref 20	.00 dE	3m						N	1kr1 894. -51.2	46 MHz 44 dBm		Auto Tun
.og	e 1 Pass											с	enter Fre
10.0													000000 MH
D.00													
10.0													Start Fre
20.0												1 000	Stop Fre
80.0												1.000	
40.0												10.	CF Ste 500000 MI
50.0												<u>Auto</u>	Ma
50.0												F	req Offs
×.	·	nalestandere	harbautzere	utilitation and	A proprietation	t getat Lapolantique	والوارجة والمتراجع والمعرومة والمعرومة والم	مويني ورو المرور مورو و مورو المرور و مورو و مورو و مورو المرور و مورو و مورو و مورو و مورو و مورو و مورو و مو	an international sector	ang the manager	eren and an		0 H
70.0												s	cale Typ
tart 0.89 Res BW					#\/D\4/	300 kHz			Curoon	Stop 1.00 13.09 ms (	)000 GHz	Log	L
	TOU KHZ				#VEW	JUU KHZ			Sweep		5021 pts)		

Plot 7-22. Conducted Spurious Plot (UMTS Ch. 4408)



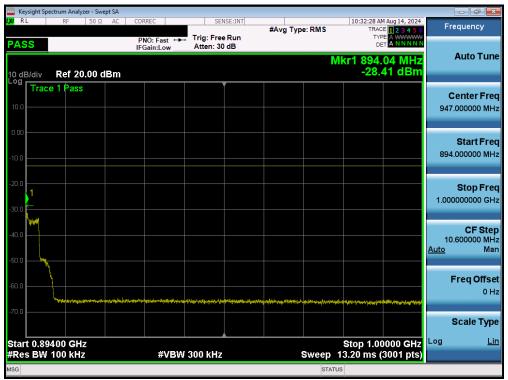
Plot 7-23. Conducted Spurious Plot (UMTS Ch. 4408)

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Keysight Spectrum Analy										7 ×
LXU RL RF	50 Ω AC 0	CORREC	SEN	SE:INT	#Avg Type	e: RMS	TRAC	Aug 14, 2024	Frequen	су
PASS		PNO: Fast ↔ IFGain:Low	Trig: Free Atten: 30				TYP DE		Auto	Tune
10 dB/div Ref 20	0.00 dBm					IVI	kr1 865. -58.2	31 MHZ 77 dBm		
Trace 1 Pass	3		Ì						Center	r Freq
10.0									449.00000	0 MHz
0.00									Start	tFreq
-10.0									30.00000	0 MHz
-20.0									Stop	Freq
-30.0									868.00000	0 MHz
-40.0									CF 83.80000	Step
-50.0									<u>Auto</u>	Man
-60.0								1	Freq C	
			an dipanta katina							0 Hz
-70.0									Scale	Туре
Start 30.0 MHz #Res BW 100 kH	Z	#VBW	300 kHz		s	weep <u>1</u> (	Stop 80 )3.7 ms (1	58.0 MHz 5881 pts)	Log	Lin
MSG						STATUS				

Plot 7-24. Conducted Spurious Plot (UMTS Ch. 4458)



Plot 7-25. Conducted Spurious Plot (UMTS Ch. 4458)

FCC ID: 2A93U-55041-402		PART 22 MEASUREMENT REPORT					
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	ectrum Analy:												
RL	RF	50 Ω	AC	CORREC		SE	NSE:INT	#Avg Typ	e: RMS		M Aug 14, 2024	Fre	quency
PASS				PNO: F IFGain:	ast ↔ _ow	Trig: Fre Atten: 30				TY D			
0 dB/div	Ref 20	.00 d	Bm						Mł	r1 5.81 -50.7	8 0 GHz '82 dBm		Auto Tun
og Trace	e 1 Pass												enter Fre 000000 G⊦
10.0													<b>Start Fre</b> 000000 G⊦
20.0													<b>Stop Fre</b> 000000 G⊦
10.0							<b>↓</b> 1					900.0 <u>Auto</u>	CF Ste 000000 MH Ma
60.0						~~~~						F	req Offs 0 H
70.0													cale Typ
itart 1.00 Res BW		2			#VBW	3.0 MHz		S	weep <u>15</u>	Stop 10 .60 ms (*	).000 GHz 18001 pts)	Log	Ľ
SG									STATUS				

Plot 7-26. Conducted Spurious Plot (UMTS Ch. 4458)

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# 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<sub>10</sub>(P<sub>[Watts]</sub>), 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  $\geq$  1% of the emission bandwidth
- 4. VBW  $\geq$  3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
- 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

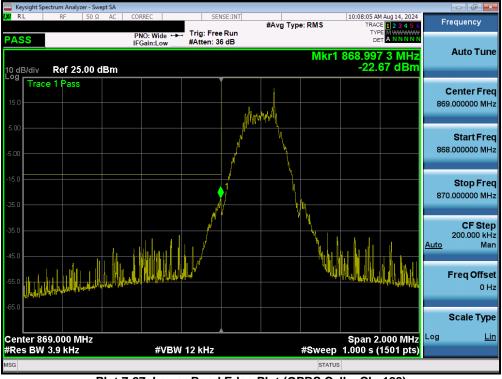
### **Test Notes**

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.

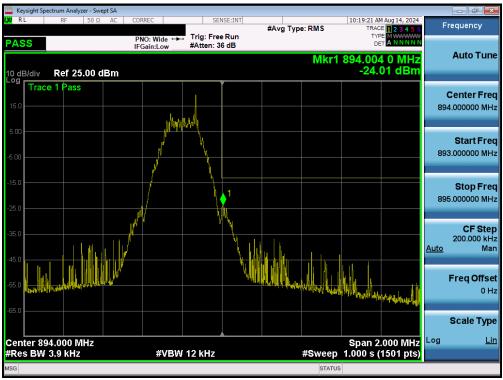
FCC ID: 2A93U-55041-402		PART 22 MEASUREMENT REPORT					
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# **GSM/GPRS Cell**



Plot 7-27. Lower Band Edge Plot (GPRS Cell – Ch. 128)



Plot 7-28. Upper Band Edge Plot (GPRS Cell – Ch. 251)

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# UMTS Cell

Keysight Spectrum Analyzer										
XIRL RF S	50Ω AC CO	RREC	SEN	ISE:INT	#Avg Typ			Aug 14, 2024	Frequ	Jency
PASS		NO: Fast 🔸	Trig: Free				TYP			
PA55	IF	Gain:Low	#Atten: 36	5 dB					Δ1	ito Tune
						Mkr	1 868.9	85 MHz 79 dBm	~	
10 dB/div Ref 25.0	IU dBm						-21.	rə ubm		
Trace 1 Pass									Cer	nter Fred
15.0									869.00	0000 мна
5.00				m	my mmm	m	1			=
										tart Fred 0000 MH;
-5.00				{			1		861.50	
				1						
-15.0									S	top Fred
				1					876.50	0000 MH;
-25.0										
-35.0	M	4 mm	have a second				hun.	mm		CF Step
-35.0			-0.202							0000 мні
-45.0									Auto	Mar
-40.0 mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm	man									
-55.0									Fre	eq Offse
										0 H:
-65.0										
									Sc	ale Type
0							0	5 00 MIL	Log	Lir
Center 869.000 MH #Res BW 100 kHz	Z	#VRM	300 kHz			Sween 1	Span 1 867 ms (	5.00 MHz 1001 pts)	239	<u></u>
MSG		<i></i>	000 1112			STATUS		roo i pio)		
100	Diet 7.20							4257)		

Plot 7-29. Lower Band Edge Plot (UMTS Cell – Ch. 4357)



Plot 7-30. Upper Band Edge Plot (UMTS Cell – Ch. 4458)

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# 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.



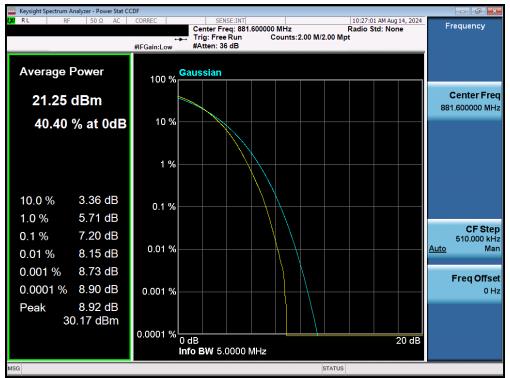
Figure 7-5. Test Instrument & Measurement Setup

### Test Notes

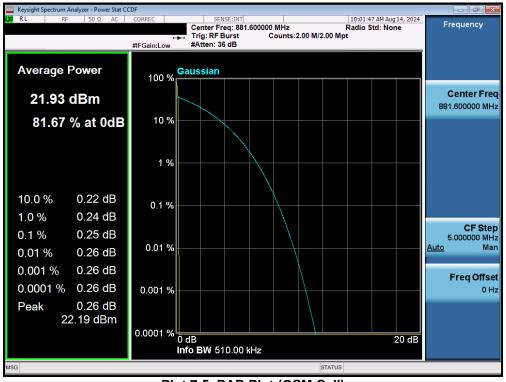
None.

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### Plot 7-5. PAR Plot (GSM Cell)

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## 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 an external antenna. 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  $\geq$  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

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

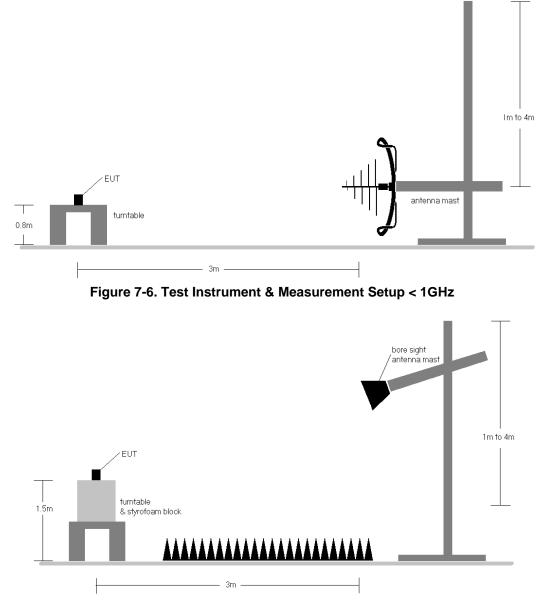


Figure 7-7. Test Instrument & Measurement Setup > 1GHz

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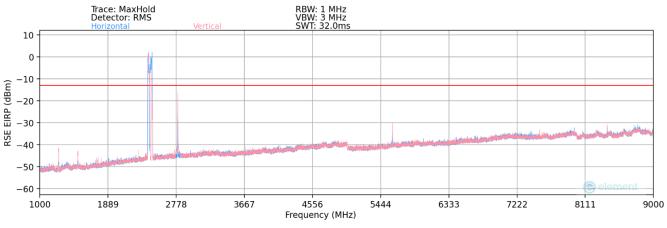
### Test Notes

- 1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
  - a)  $E(dB\mu V/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m) b) EIRP (dBm) = E(dB\mu V/m) + 20logD 104.8; where D is the measurement distance in meters.$
- 2) This unit was tested while powered by a 12VDC power supply.
- 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.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 6) This unit has a WLAN Transmitter that was enabled during testing.

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# **GSM/GPRS** Cell





Mode:	GPRS 1 Tx Slot
Channel:	128
Frequency (MHz):	869.2

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]
1738.40	V	139	304	-62.56	0.23	44.67	-50.59	-13.00	-37.59
2607.60	V	138	301	-67.55	4.26	43.71	-51.55	-13.00	-38.55
3476.80	V	-	-	-68.68	6.83	45.15	-50.11	-13.00	-37.11
4346.00	V	-	-	-68.72	8.66	46.94	-48.32	-13.00	-35.32
5215.20	V	-	-	-70.18	10.47	47.29	-47.97	-13.00	-34.97

Table 7-6. Radiated Spurious Data (GPRS Cell – Low Channel)

Mode:	GPRS 1 Tx Slot
Channel:	190
Frequency (MHz):	881.6

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]
1763.20	V	151	311	-57.42	0.36	49.94	-45.31	-13.00	-32.31
2644.80	V	144	308	-56.66	4.60	54.94	-40.32	-13.00	-27.32
3526.40	V	150	305	-67.04	6.80	46.76	-48.49	-13.00	-35.49
4408.00	V	-	-	-69.14	9.36	47.22	-48.03	-13.00	-35.03
5289.60	V	-	-	-69.88	10.95	48.07	-47.19	-13.00	-34.19
6171.20	V	-	-	-69.69	12.59	49.90	-45.36	-13.00	-32.36

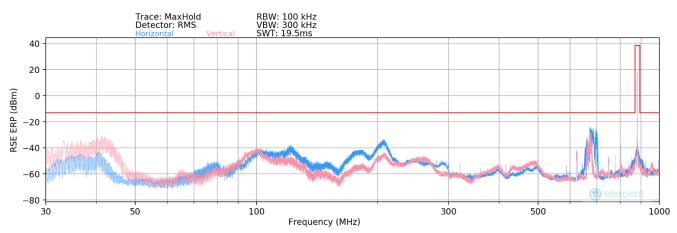
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Mode:	GPRS 1 Tx Slot
Channel:	251
Frequency (MHz):	893.8

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]
1787.60	V	134	308	-48.01	0.23	59.22	-36.04	-13.00	-23.04
2681.40	V	133	310	-35.19	4.68	76.49	-18.77	-13.00	-5.77
3575.20	V	133	311	-62.31	7.03	51.72	-43.54	-13.00	-30.54
4469.00	V	135	310	-66.85	8.65	48.80	-46.45	-13.00	-33.45
5362.80	V	135	310	-69.62	10.88	48.26	-47.00	-13.00	-34.00
6256.60	V	-	-	-70.01	12.72	49.71	-45.54	-13.00	-32.54
7150.40	V	-	-	-70.20	15.16	51.96	-43.30	-13.00	-30.30
8044.20	V	-	-	-71.62	16.03	51.41	-43.85	-13.00	-30.85

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





Mode:	GPRS 1 Tx Slot					
Channel:		251				
Frequency (MHz):		893.8				
			Turntable			

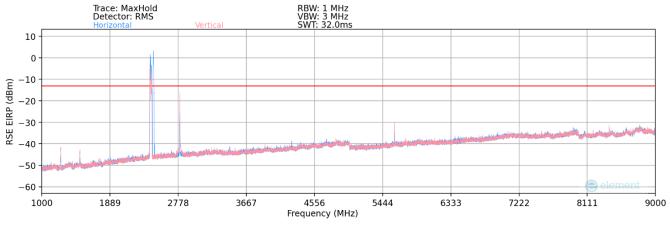
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
320.00	V	150	268	-58.60	-10.67	37.73	-59.68	-13.00	-46.68
360.00	V	150	268	-59.67	-10.19	37.14	-60.27	-13.00	-47.27
815.00	V	150	41	-60.91	-2.01	44.08	-53.33	-13.00	-40.33
839.00	V	150	41	-65.79	-1.41	39.80	-57.60	-13.00	-44.60
		Table 7 0	Dedicted	C	Data /C		۱ <u> </u>		

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

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# UMTS Cell





Mode:					
Channel:		4357			
Frequency (MHz):		871.4			

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]
1742.80	V	128	183	-57.72	0.27	49.55	-45.71	-13.00	-32.71
2614.20	V	128	189	-63.88	4.27	47.39	-47.87	-13.00	-34.87
3485.60	V	-	-	-68.33	6.88	45.55	-49.71	-13.00	-36.71
4357.00	V	-	-	-68.93	8.85	46.92	-48.34	-13.00	-35.34
5228.40	V	-	-	-70.30	10.45	47.15	-48.11	-13.00	-35.11

Table 7-10. Radiated Spurious Data (UMTS Cell – Low Channel)

Mode:	WCDMA RMC
Channel:	4408
Frequency (MHz):	881.6

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]
1763.20	V	119	358	-53.93	0.36	53.43	-41.82	-13.00	-28.82
2644.80	V	118	358	-44.04	4.60	67.56	-27.70	-13.00	-14.70
3526.40	V	-	-	-69.04	6.80	44.76	-50.49	-13.00	-37.49
4408.00	V	-	-	-68.54	9.36	47.82	-47.43	-13.00	-34.43
5289.60	V	-	-	-70.51	10.95	47.44	-47.82	-13.00	-34.82

Table 7-11. Radiated Spurious Data (UMTS Cell – Mid Channel)

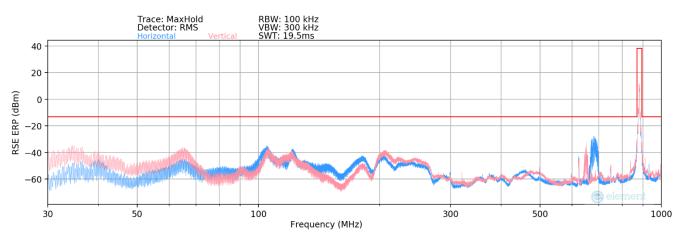
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Mode:	WCDMA RMC
Channel:	4458
Frequency (MHz):	891.6

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]
1783.20	V	144	311	-45.56	0.29	61.73	-33.53	-13.00	-20.53
2674.80	V	144	311	-32.59	4.58	78.99	-16.27	-13.00	-3.27
3566.40	V	143	309	-65.57	6.89	48.32	-46.94	-13.00	-33.94
4458.00	V	-	-	-68.02	8.77	47.75	-47.50	-13.00	-34.50
5349.60	V	-	-	-70.14	10.95	47.81	-47.45	-13.00	-34.45
6241.20	V	-	-	-70.63	12.71	49.08	-46.18	-13.00	-33.18

Table 7-12. Radiated Spurious Data (UMTS Cell – High Channel)





Frequency [MHz]	Ant. Pol.	Antenna	Turntable Azimuth	Analyzer
Frequency (MHz):				
Channel:		4408		
Mode:		WCDMA RMC		

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]
322.00	V	250	114	-60.98	-10.57	35.45	-61.96	-13.00	-48.96
600.00	V	250	247	-68.26	-4.60	34.14	-63.27	-13.00	-50.27
622.00	V	250	7	-61.65	-4.77	40.58	-56.83	-13.00	-43.83

Table 7-13. Radiated Spurious Data (UMTS Cell)

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# 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:

- 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, the frequency stability of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  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

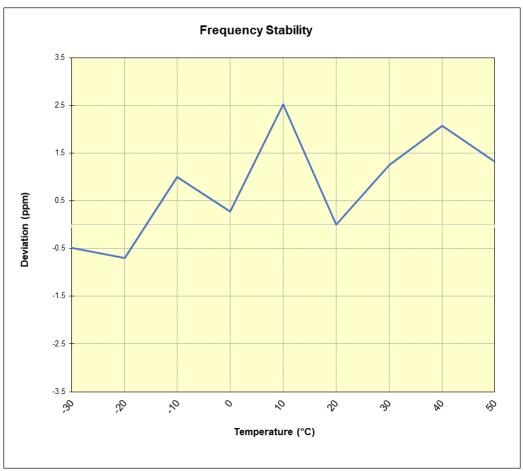
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# **GSM/GPRS** Cellular

	Operating F	requency (Hz):	881,60					
	Ref.	Voltage (VDC):	12.	.00				
		Deviation Limit:	± 0.00025%	or 2.5 ppm				
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)			
	12.00	- 30	881,610,816	-424	-0.0000481			
		- 20	881,610,623	-617	-0.0000700			
		- 10	881,612,121	881	0.0000999			
		0	881,611,485	245	0.0000278			
100 %		+ 10	881,613,463	2,223	0.0002522			
		+ 20 (Ref)	881,611,240	0	0.0000000			
		+ 30	881,612,343	1,103	0.0001251			
		+ 40	881,613,067	1,827	0.0002072			
		+ 50	881,612,406	1,166	0.0001323			

Table 7-14. GSM 850 Frequency Stability Data



## Plot 7-35. GSM 850 Frequency Stability Chart

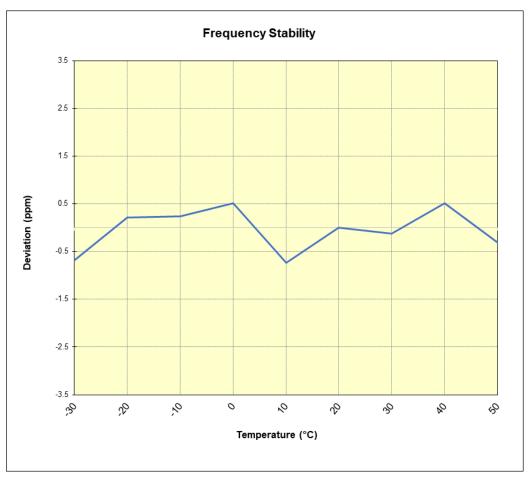
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# WCDMA Cellular

	Operating F	Frequency (Hz):	881,60					
	Ref.	Voltage (VDC):	12.	.00				
		Deviation Limit:	± 0.00025%	o or 2.5 ppm				
					-			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)			
	12.00	- 30	881,520,156	-601	-0.0000682			
		- 20	881,520,947	190	0.0000216			
		- 10	881,520,964	207	0.0000235			
		0	881,521,212	455	0.0000516			
100 %		+ 10	881,520,109	-648	-0.0000735			
		+ 20 (Ref)	881,520,757	0	0.0000000			
		+ 30	881,520,644	-113	-0.0000128			
		+ 40	881,521,211	454	0.0000515			
		+ 50	881,520,484	-273	-0.0000310			

Table 7-15. UMTS 850 Frequency Stability Data



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# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Centum Geolocation System FCC ID: 2A93U-55041-402** complies with all the requirements of Part 22 of the FCC rules.

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