

Plot 7-13. Conducted Spurious Plot (LTE Band 26 - 5MHz QPSK – Full RB - High Channel)

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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  $43 + 10 \log_{10}(P_{[Watts]})$ , 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  $\geq$  1% of the emission bandwidth
4. VBW  $\geq$  3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq$  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**

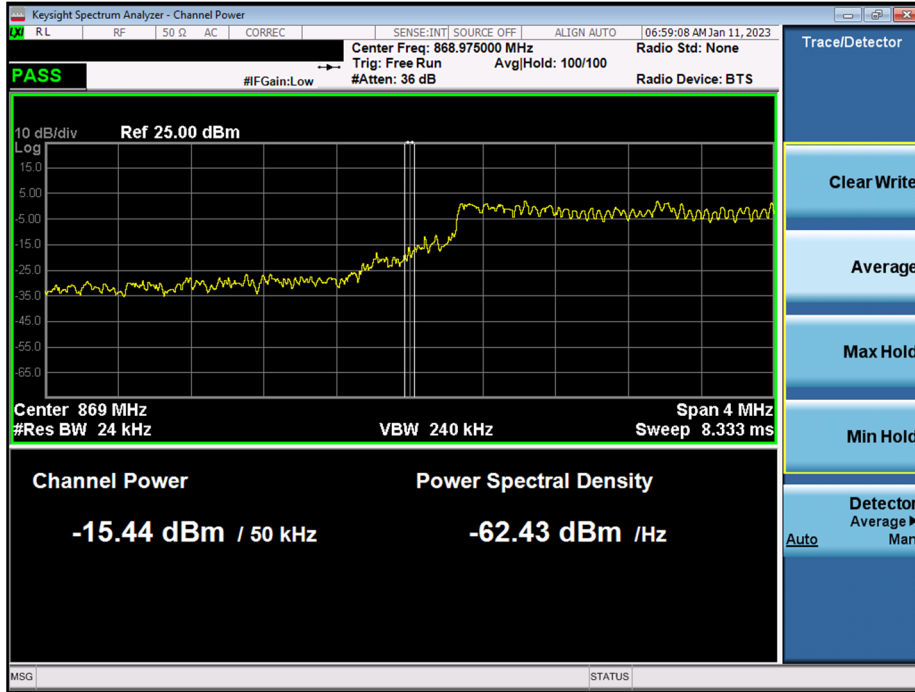
### Test Notes

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.

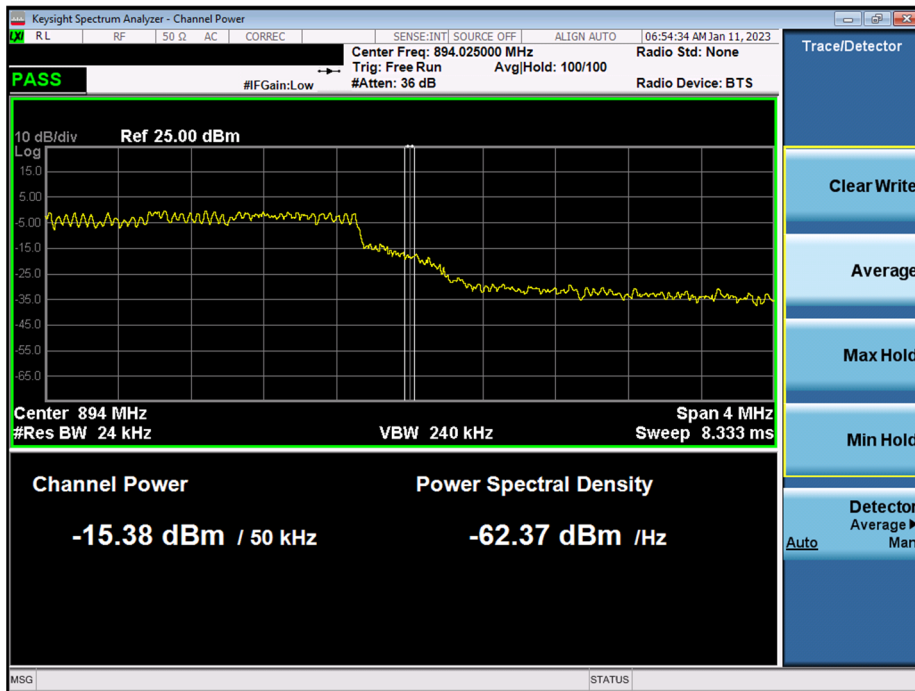
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# LTE Band 26



Plot 7-14. Lower Band Edge Plot (LTE Band 26 - 5MHz QPSK – Full RB)



Plot 7-15. Upper Band Edge Plot (LTE Band 26 - 5MHz QPSK – Full RB)

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## 7.6 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

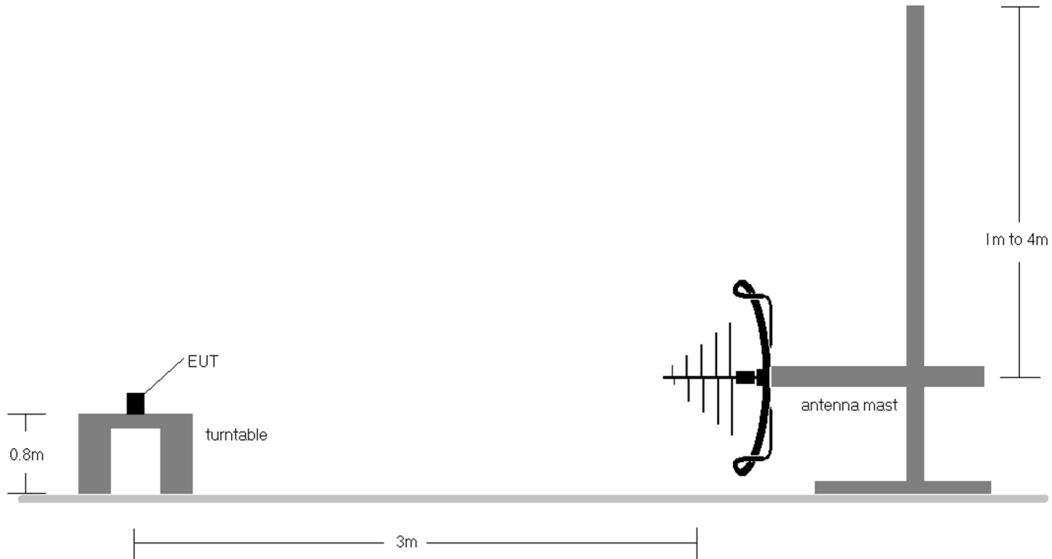
1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq$  3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq$  2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

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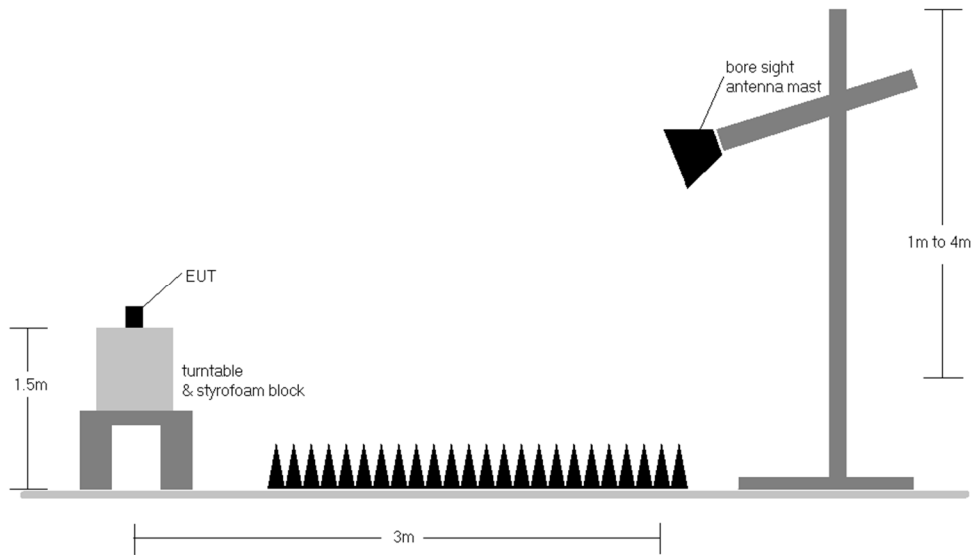
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**Test Setup**


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



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




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

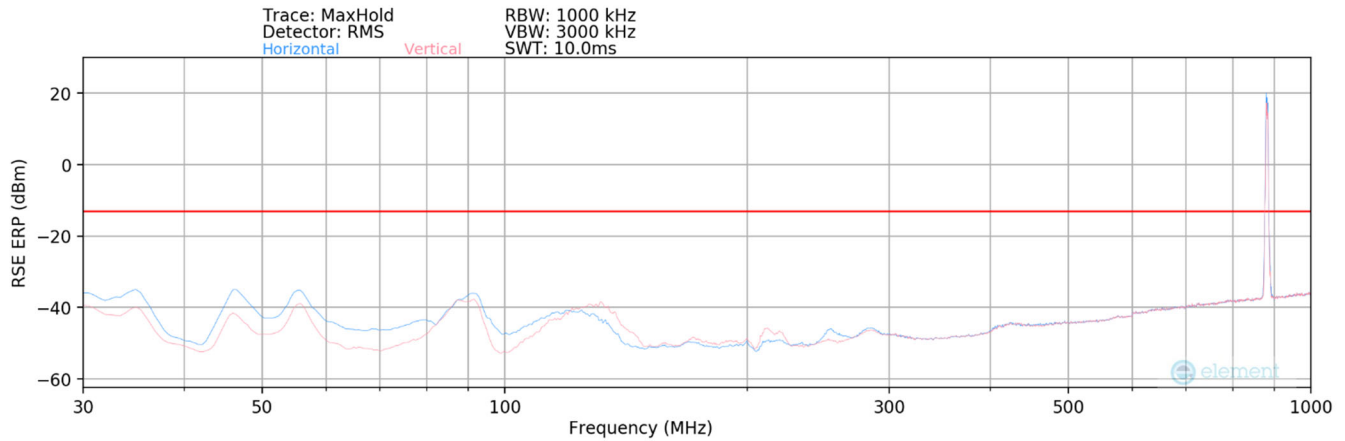
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**Test Notes**

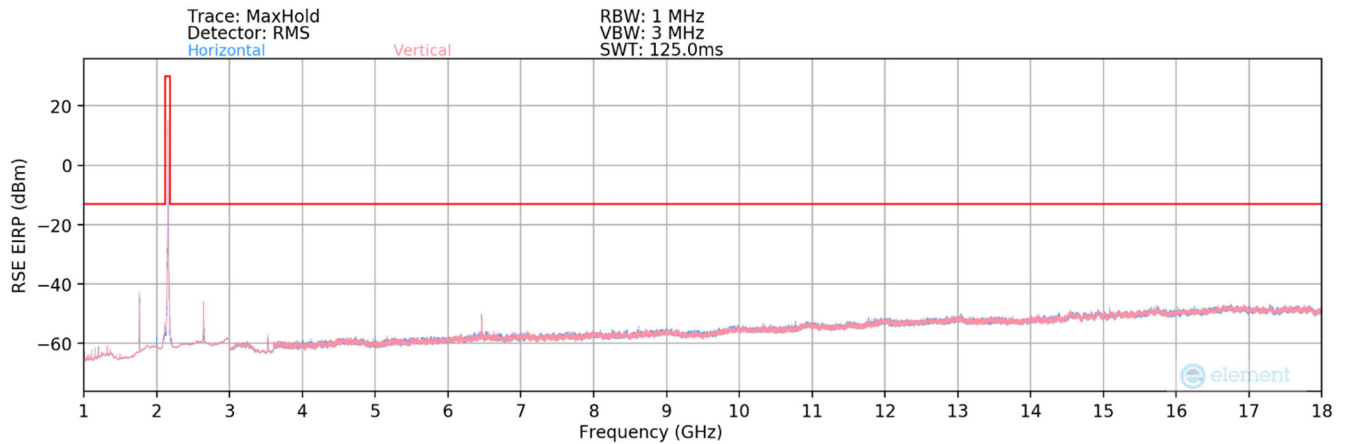
- 1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
  - a)  $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
  - b)  $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$ ; where D is the measurement distance in meters.
- 2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 3) The radiated spurious emissions data is taken in the worst-case configuration which is with LTE Band 26 operating simultaneously with another supported LTE band as shown in this section.
- 4) This unit was tested with an external 12 VDC power source
- 5) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 6) 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.
- 7) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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## LTE Band 26 – LTE Band 66



**Plot 7-16. Radiated Spurious Plot (LTE Band 26 – LTE Band 66)- Below 1GHz**



**Plot 7-17. Radiated Spurious Plot (LTE Band 26 – LTE Band 66)- 1-18GHz**

<b>Bandwidth (MHz):</b>	5 & 5
<b>Frequency (MHz):</b>	864 & 2155 MHz
<b>Detector / Trace Mode:</b>	RMS / Average
<b>RBW / VBW:</b>	1MHz / 3MHz

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]
392.00	V	-	-	-88.56	23.33	41.77	-53.49	-13.00	-40.49
1760.00	V	142	45	-54.32	-2.45	50.23	-45.03	-13.00	-32.03
2642.30	V	254	208	-64.12	1.41	44.29	-50.97	-13.00	-37.97
3446.00	V	-	-	-74.99	2.62	34.63	-60.63	-13.00	-47.63
4737.00	V	-	-	-76.01	3.67	34.66	-60.59	-13.00	-47.59
6460.00	H	156	302	-69.39	6.91	44.52	-50.74	-13.00	-37.74

**Table 7-3. Radiated Spurious Data (LTE Band 26 – 66- Mid Channel)**

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## 7.7 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

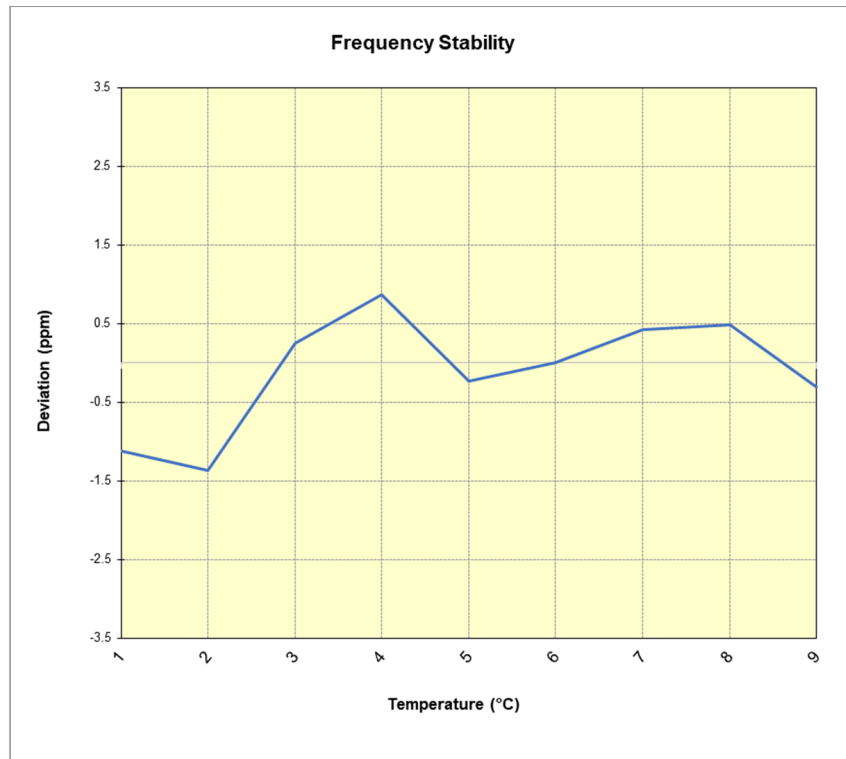
None

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LTE Band 26					
Operating Frequency (Hz):		881,500,000			
Ref. Voltage (VDC):		12.00			
Deviation Limit:		± 0.00025% or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	12.00	- 30	881,499,231	-986	-0.0001119
		- 20	881,499,012	-1,205	-0.0001367
		- 10	881,500,440	223	0.0000253
		0	881,500,982	765	0.0000868
		+ 10	881,500,013	-204	-0.0000231
		+ 20 (Ref)	881,500,217	0	0.0000000
		+ 30	881,500,588	371	0.0000421
		+ 40	881,500,648	431	0.0000489
85%	10.20	+ 20	881,498,423	-1,794	-0.0002035
115%	13.80	+ 20	881,498,951	-1,266	-0.0001436

Table 7-4. LTE Band 26 Frequency Stability Data




Plot 7-18. LTE Band 26 Frequency Stability Chart

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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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