

# EMC Test Report

**Project Number: 3562408**

**Report Number: 3562408EMC01**

**Revision Level: 1**

**Client: Continental**

**Equipment Under Test: Wireless Modem Module**

**Model: CASAN**


**FCC Rule Parts: Part 2, Part 27**

**Industry Canada: RSS-139, Issue 2, RSS-130 Issue 1**


**Report issued on: 03 October 2014**

**Test Result: Compliant**

Tested by:

  
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Reviewed by:

  
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David Schramm, EMC Manager

**Remarks:**

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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## Table of Contents

<b>1</b>	<b>SUMMARY OF TEST RESULTS.....</b>	<b>4</b>
1.1	MODIFICATIONS REQUIRED TO COMPLIANCE.....	4
<b>2</b>	<b>GENERAL INFORMATION.....</b>	<b>5</b>
2.1	CLIENT INFORMATION.....	5
2.2	TEST LABORATORY.....	5
2.3	GENERAL INFORMATION OF EUT.....	5
2.4	OPERATING MODES AND CONDITIONS.....	5
<b>3</b>	<b>RF OUTPUT POWER.....</b>	<b>6</b>
3.1	TEST RESULT.....	6
3.2	TEST METHOD.....	6
3.3	TEST SITE.....	6
3.4	TEST EQUIPMENT.....	6
3.5	TEST DATA - LTE BAND 4.....	7
3.6	TEST DATA - LTE BAND 13.....	11
<b>4</b>	<b>PEAK TO AVERAGE RATIO.....</b>	<b>13</b>
4.1	TEST RESULT.....	13
4.2	TEST METHOD.....	13
4.3	TEST SITE.....	13
4.4	TEST EQUIPMENT.....	13
4.5	TEST DATA.....	14
<b>5</b>	<b>OCCUPIED BANDWIDTH.....</b>	<b>16</b>
5.1	TEST RESULT.....	16
5.2	TEST METHOD.....	16
5.3	TEST SITE.....	16
5.4	TEST EQUIPMENT.....	16
5.5	TEST DATA.....	17
<b>6</b>	<b>BAND EDGE AND CONDUCTED SPURIOUS EMISSIONS.....</b>	<b>25</b>
6.1	TEST RESULT.....	25
6.2	TEST METHOD.....	25
6.3	TEST SITE.....	25
6.4	TEST EQUIPMENT.....	25
6.5	TEST DATA - BAND EDGE.....	26
6.6	TEST DATA - CONDUCTED SPURIOUS EMISSIONS.....	30
<b>7</b>	<b>EFFECTIVE RADIATED POWER.....</b>	<b>32</b>
7.2	TEST SITE.....	32
7.3	TEST EQUIPMENT.....	32
7.4	TEST DATA.....	32
<b>8</b>	<b>RADIATED SPURIOUS EMISSIONS.....</b>	<b>33</b>
8.1	TEST RESULT.....	33
8.2	TEST METHOD.....	33
8.3	TEST SITE.....	33
8.4	TEST EQUIPMENT.....	34
8.5	TEST DATA.....	35
8.6	TEST PLOTS.....	35
<b>9</b>	<b>FREQUENCY STABILITY.....</b>	<b>47</b>



9.1 TEST RESULT..... 47

9.2 TEST METHOD..... 47

9.3 TEST SITE..... 47

9.4 TEST EQUIPMENT..... 47

9.5 TEST DATA..... 48

**10 REVISION HISTORY..... 50**

## 1 Summary of Test Results

Reference Sections	Test Description	Test Limit	Test Condition	Test Result
<b>Transmit Mode Testing</b>				
2.1046	Conducted Output Power	N/A	Conducted	Pass
27.50(d)(5) RSS-139 6.4	Peak-to-Average Ratio	<13 dB		Pass
2.1049 RSS-GEN(4.6.1) RSS-139(2.3)	Occupied Bandwidth	N/A		Reported
2.1051 27.53(c)(2) 27.53(h) RSS-139(6.5.1)	Band Edge / Conducted Spurious Emissions	< 43 +10log <sub>10</sub> (P <sub>[Watts]</sub> ) at band edge and for all out of band emissions		Pass
27.55(b)(10)	Effective Radiated Power	< 3 Watts max ERP	Radiated	Pass
RSS-130 4.4	Effective Radiated Power	< 5 Watts max ERP		Pass
27.50(d)(4) RSS-139 6.4	Effective Isotropic Radiated Power	< 1 Watts max EIRP		Pass
2.1053 27.53(c)(2) 27.53(h) RSS-139 6.5.1	Radiated Spurious Emissions	< 43 +10log <sub>10</sub> (P <sub>[Watts]</sub> ) at band edge and for all out of band emissions		Pass
2.1055 27.5(b) 27.5(h) 27.54 RSS-139 6.3	Frequency Stability	<2.5 ppm		Pass

### 1.1 Modifications Required to Compliance

None

## 2 General Information

### 2.1 Client Information

Name: Continental Automotive System, Inc.  
Address: 21440 West Lake Cook Road  
City, State, Zip, Country: Deer Park, IL 60010, USA

### 2.2 Test Laboratory

Name: SGS North America, Inc.  
Address: 620 Old Peachtree Road NW, Suite 100  
City, State, Zip, Country: Suwanee, GA 30024, USA

### 2.3 General Information of EUT

Type of Product: Wireless Modem Module  
Model Number: CASAN  
FCC ID: LHJ-CASAN  
MEID Number: A1000102030405  
  
Rated Voltage: 10.2 – 13.8 Vdc,  
Test Voltage: 12 Vdc,  
Tx Frequency Range: 776 - 787 MHz (LTE Band 13)  
1710 – 1755 MHz (LTE Band 4)  
FCC Classification: PCS Licensed Transmitter PCB  
Type: Pre Production

Sample Received Date: 24 July 2014  
Dates of testing: 13 Aug - 28 Aug 2014

### 2.4 Operating Modes and Conditions

The EUT was exercised by connecting a CMW communications tester to the device. The CMW was used to control signaling and channel during testing.

### 3 RF Output Power

#### 3.1 Test Result

Test Description	Basic Standards	Test Result
RF Output Power	FCC Part 2.1046	Compliant

#### 3.2 Test Method

The EUT was directly connected to a Radio Communication Tester (CMW 500) and a radio link was established. The output power of the EUT was set to maximum value by using the maximum power setting on the CMW. The output power was measured using the CMW internal measurement functions.

#### 3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.2 °C

Relative Humidity: 44.6 %

Atmospheric Pressure: 97.8 kPa

#### 3.4 Test Equipment

Test Date: 13 August 2014

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
CMW500 WIDEBAND	CMW500	ROHDE & SCHWARZ	B094874	6-Dec-2015

- Based on manufacturer's specifications, the CMW-500 is on a 3 year calibration cycle.

### 3.5 Test Data - LTE Band 4

Maximum power: 23.26 dBm

Channel	Frequency	Bandwidth		#RB / Pos	Power, dBm
@ULCH: 19957	1710.0	1.4 MHz	QPSK	1 (RB_Pos: 0)	23.23
@ULCH: 19957	1710.0	1.4 MHz	QPSK	1 (RB_Pos: 3)	23.17
@ULCH: 19957	1710.0	1.4 MHz	QPSK	1 (RB_Pos: 5)	23.19
@ULCH: 19957	1710.0	1.4 MHz	QPSK	3 (RB_Pos: 1)	23.24
@ULCH: 19957	1710.0	1.4 MHz	QPSK	6 (RB_Pos: 0)	22.22
@ULCH: 19957	1710.0	1.4 MHz	Q16	1 (RB_Pos: 0)	22.13
@ULCH: 19957	1710.0	1.4 MHz	Q16	1 (RB_Pos: 3)	22.13
@ULCH: 19957	1710.0	1.4 MHz	Q16	1 (RB_Pos: 5)	22.18
@ULCH: 19957	1710.0	1.4 MHz	Q16	3 (RB_Pos: 1)	22.07
@ULCH: 19957	1710.0	1.4 MHz	Q16	6 (RB_Pos: 0)	21.21
@ULCH: 20175	1732.5	1.4 MHz	QPSK	1 (RB_Pos: 0)	23.18
@ULCH: 20175	1732.5	1.4 MHz	QPSK	1 (RB_Pos: 3)	23.07
@ULCH: 20175	1732.5	1.4 MHz	QPSK	1 (RB_Pos: 5)	23.09
@ULCH: 20175	1732.5	1.4 MHz	QPSK	3 (RB_Pos: 1)	23.17
@ULCH: 20175	1732.5	1.4 MHz	QPSK	6 (RB_Pos: 0)	22.19
@ULCH: 20175	1732.5	1.4 MHz	Q16	1 (RB_Pos: 0)	21.72
@ULCH: 20175	1732.5	1.4 MHz	Q16	1 (RB_Pos: 3)	21.69
@ULCH: 20175	1732.5	1.4 MHz	Q16	1 (RB_Pos: 5)	21.75
@ULCH: 20175	1732.5	1.4 MHz	Q16	3 (RB_Pos: 1)	22.01
@ULCH: 20175	1732.5	1.4 MHz	Q16	6 (RB_Pos: 0)	21.16
@ULCH: 20393	1754.3	1.4 MHz	QPSK	1 (RB_Pos: 0)	23.05
@ULCH: 20393	1754.3	1.4 MHz	QPSK	1 (RB_Pos: 3)	23.06
@ULCH: 20393	1754.3	1.4 MHz	QPSK	1 (RB_Pos: 5)	23.04
@ULCH: 20393	1754.3	1.4 MHz	QPSK	3 (RB_Pos: 1)	23.1
@ULCH: 20393	1754.3	1.4 MHz	QPSK	6 (RB_Pos: 0)	22.07
@ULCH: 20393	1754.3	1.4 MHz	Q16	1 (RB_Pos: 0)	22.05
@ULCH: 20393	1754.3	1.4 MHz	Q16	1 (RB_Pos: 3)	21.96
@ULCH: 20393	1754.3	1.4 MHz	Q16	1 (RB_Pos: 5)	22.02
@ULCH: 20393	1754.3	1.4 MHz	Q16	3 (RB_Pos: 1)	22.11
@ULCH: 20393	1754.3	1.4 MHz	Q16	6 (RB_Pos: 0)	21.08
@ULCH: 19965	1711.5	3.0 MHz	QPSK	1 (RB_Pos: 0)	23.14
@ULCH: 19965	1711.5	3.0 MHz	QPSK	1 (RB_Pos: 6)	23.03
@ULCH: 19965	1711.5	3.0 MHz	QPSK	1 (RB_Pos: 14)	23.07
@ULCH: 19965	1711.5	3.0 MHz	QPSK	8 (RB_Pos: 3)	22.21
@ULCH: 19965	1711.5	3.0 MHz	QPSK	15 (RB_Pos: 0)	22.14
@ULCH: 19965	1711.5	3.0 MHz	Q16	1 (RB_Pos: 0)	22.1
@ULCH: 19965	1711.5	3.0 MHz	Q16	1 (RB_Pos: 6)	21.94
@ULCH: 19965	1711.5	3.0 MHz	Q16	1 (RB_Pos: 14)	22.14

Channel	Frequency	Bandwidth		#RB / Pos	Power, dBm
@ULCH: 19965	1711.5	3.0 MHz	Q16	8 (RB_Pos: 3)	21.21
@ULCH: 19965	1711.5	3.0 MHz	QPSK	15 (RB_Pos: 0)	22.13
@ULCH: 20175	1732.5	3.0 MHz	QPSK	1 (RB_Pos: 0)	22.99
@ULCH: 20175	1732.5	3.0 MHz	QPSK	1 (RB_Pos: 6)	22.99
@ULCH: 20175	1732.5	3.0 MHz	QPSK	1 (RB_Pos: 14)	22.96
@ULCH: 20175	1732.5	3.0 MHz	QPSK	8 (RB_Pos: 3)	22.08
@ULCH: 20175	1732.5	3.0 MHz	QPSK	15 (RB_Pos: 0)	22.05
@ULCH: 20175	1732.5	3.0 MHz	Q16	1 (RB_Pos: 0)	22.03
@ULCH: 20175	1732.5	3.0 MHz	Q16	1 (RB_Pos: 6)	22.05
@ULCH: 20175	1732.5	3.0 MHz	Q16	1 (RB_Pos: 14)	21.97
@ULCH: 20175	1732.5	3.0 MHz	Q16	8 (RB_Pos: 3)	21.07
@ULCH: 20175	1732.5	3.0 MHz	QPSK	15 (RB_Pos: 0)	22.04
@ULCH: 20385	1753.5	3.0 MHz	QPSK	1 (RB_Pos: 0)	23.04
@ULCH: 20385	1753.5	3.0 MHz	QPSK	1 (RB_Pos: 6)	23.06
@ULCH: 20385	1753.5	3.0 MHz	QPSK	1 (RB_Pos: 14)	22.96
@ULCH: 20385	1753.5	3.0 MHz	QPSK	8 (RB_Pos: 3)	22.09
@ULCH: 20385	1753.5	3.0 MHz	QPSK	15 (RB_Pos: 0)	22.1
@ULCH: 20385	1753.5	3.0 MHz	Q16	1 (RB_Pos: 0)	22.08
@ULCH: 20385	1753.5	3.0 MHz	Q16	1 (RB_Pos: 6)	22.05
@ULCH: 20385	1753.5	3.0 MHz	Q16	1 (RB_Pos: 14)	21.98
@ULCH: 20385	1753.5	3.0 MHz	Q16	8 (RB_Pos: 3)	21.14
@ULCH: 20385	1753.5	3.0 MHz	QPSK	15 (RB_Pos: 0)	21.99
@ULCH: 19975	1712.5	5.0 MHz	QPSK	1 (RB_Pos: 0)	23.19
@ULCH: 19975	1712.5	5.0 MHz	QPSK	1 (RB_Pos: 12)	23.15
@ULCH: 19975	1712.5	5.0 MHz	QPSK	1 (RB_Pos: 24)	23.08
@ULCH: 19975	1712.5	5.0 MHz	QPSK	12 (RB_Pos: 6)	22.12
@ULCH: 19975	1712.5	5.0 MHz	QPSK	25 (RB_Pos: 0)	22.08
@ULCH: 19975	1712.5	5.0 MHz	Q16	1 (RB_Pos: 0)	22.19
@ULCH: 19975	1712.5	5.0 MHz	Q16	1 (RB_Pos: 12)	22.13
@ULCH: 19975	1712.5	5.0 MHz	Q16	1 (RB_Pos: 24)	22.17
@ULCH: 19975	1712.5	5.0 MHz	Q16	12 (RB_Pos: 6)	21.22
@ULCH: 19975	1712.5	5.0 MHz	Q16	25 (RB_Pos: 0)	21.13
@ULCH: 20175	1732.5	5.0 MHz	QPSK	1 (RB_Pos: 0)	23.09
@ULCH: 20175	1732.5	5.0 MHz	QPSK	1 (RB_Pos: 12)	23.07
@ULCH: 20175	1732.5	5.0 MHz	QPSK	1 (RB_Pos: 24)	22.99
@ULCH: 20175	1732.5	5.0 MHz	QPSK	12 (RB_Pos: 6)	22.11
@ULCH: 20175	1732.5	5.0 MHz	QPSK	25 (RB_Pos: 0)	21.98
@ULCH: 20175	1732.5	5.0 MHz	Q16	1 (RB_Pos: 0)	22.13
@ULCH: 20175	1732.5	5.0 MHz	Q16	1 (RB_Pos: 12)	22.1
@ULCH: 20175	1732.5	5.0 MHz	Q16	1 (RB_Pos: 24)	22.02
@ULCH: 20175	1732.5	5.0 MHz	Q16	12 (RB_Pos: 6)	21.1



Channel	Frequency	Bandwidth		#RB / Pos	Power, dBm
@ULCH: 20175	1732.5	5.0 MHz	Q16	25 (RB_Pos: 0)	20.93
@ULCH: 20375	1752.5	5.0 MHz	QPSK	1 (RB_Pos: 0)	23.09
@ULCH: 20375	1752.5	5.0 MHz	QPSK	1 (RB_Pos: 12)	23.08
@ULCH: 20375	1752.5	5.0 MHz	QPSK	1 (RB_Pos: 24)	23
@ULCH: 20375	1752.5	5.0 MHz	QPSK	12 (RB_Pos: 6)	22.09
@ULCH: 20375	1752.5	5.0 MHz	QPSK	25 (RB_Pos: 0)	21.93
@ULCH: 20375	1752.5	5.0 MHz	Q16	1 (RB_Pos: 0)	22.35
@ULCH: 20375	1752.5	5.0 MHz	Q16	1 (RB_Pos: 12)	22.3
@ULCH: 20375	1752.5	5.0 MHz	Q16	1 (RB_Pos: 24)	22.23
@ULCH: 20375	1752.5	5.0 MHz	Q16	12 (RB_Pos: 6)	21.05
@ULCH: 20375	1752.5	5.0 MHz	Q16	25 (RB_Pos: 0)	20.9
@ULCH: 20000	1715.0	10 MHz	QPSK	1 (RB_Pos: 0)	23.14
@ULCH: 20000	1715.0	10 MHz	QPSK	1 (RB_Pos: 25)	23.1
@ULCH: 20000	1715.0	10 MHz	QPSK	1 (RB_Pos: 49)	23.08
@ULCH: 20000	1715.0	10 MHz	QPSK	25 (RB_Pos: 11)	22.05
@ULCH: 20000	1715.0	10 MHz	QPSK	50 (RB_Pos: 0)	21.98
@ULCH: 20000	1715.0	10 MHz	Q16	1 (RB_Pos: 0)	22.04
@ULCH: 20000	1715.0	10 MHz	Q16	1 (RB_Pos: 25)	22.06
@ULCH: 20000	1715.0	10 MHz	Q16	1 (RB_Pos: 49)	22.04
@ULCH: 20000	1715.0	10 MHz	Q16	25 (RB_Pos: 12)	21.09
@ULCH: 20000	1715.0	10 MHz	Q16	50 (RB_Pos: 0)	20.9
@ULCH: 20175	1732.5	10 MHz	QPSK	1 (RB_Pos: 0)	23.15
@ULCH: 20175	1732.5	10 MHz	QPSK	1 (RB_Pos: 25)	23.02
@ULCH: 20175	1732.5	10 MHz	QPSK	1 (RB_Pos: 49)	23.02
@ULCH: 20175	1732.5	10 MHz	QPSK	25 (RB_Pos: 11)	21.96
@ULCH: 20175	1732.5	10 MHz	QPSK	50 (RB_Pos: 0)	21.9
@ULCH: 20175	1732.5	10 MHz	Q16	1 (RB_Pos: 0)	22.12
@ULCH: 20175	1732.5	10 MHz	Q16	1 (RB_Pos: 25)	22.01
@ULCH: 20175	1732.5	10 MHz	Q16	1 (RB_Pos: 49)	22.01
@ULCH: 20175	1732.5	10 MHz	Q16	25 (RB_Pos: 12)	20.95
@ULCH: 20175	1732.5	10 MHz	Q16	50 (RB_Pos: 0)	20.76
@ULCH: 20350	1750.0	10 MHz	QPSK	1 (RB_Pos: 0)	23.08
@ULCH: 20350	1750.0	10 MHz	QPSK	1 (RB_Pos: 25)	23.04
@ULCH: 20350	1750.0	10 MHz	QPSK	1 (RB_Pos: 49)	22.93
@ULCH: 20350	1750.0	10 MHz	QPSK	25 (RB_Pos: 11)	22.01
@ULCH: 20350	1750.0	10 MHz	QPSK	50 (RB_Pos: 0)	21.89
@ULCH: 20350	1750.0	10 MHz	Q16	1 (RB_Pos: 0)	22.04
@ULCH: 20350	1750.0	10 MHz	Q16	1 (RB_Pos: 25)	22.05
@ULCH: 20350	1750.0	10 MHz	Q16	1 (RB_Pos: 49)	21.95
@ULCH: 20350	1750.0	10 MHz	Q16	25 (RB_Pos: 12)	21.09
@ULCH: 20350	1750.0	10 MHz	Q16	50 (RB_Pos: 0)	20.85

Channel	Frequency	Bandwidth		#RB / Pos	Power, dBm
@ULCH: 20025	1717.5	15 MHz	QPSK	1 (RB_Pos: 0)	23.05
@ULCH: 20025	1717.5	15 MHz	QPSK	1 (RB_Pos: 37)	23.15
@ULCH: 20025	1717.5	15 MHz	QPSK	1 (RB_Pos: 74)	23.08
@ULCH: 20025	1717.5	15 MHz	QPSK	36 (RB_Pos: 20)	22.05
@ULCH: 20025	1717.5	15 MHz	QPSK	75 (RB_Pos: 0)	21.94
@ULCH: 20025	1717.5	15 MHz	Q16	1 (RB_Pos: 0)	22.01
@ULCH: 20025	1717.5	15 MHz	Q16	1 (RB_Pos: 37)	22.13
@ULCH: 20025	1717.5	15 MHz	Q16	1 (RB_Pos: 74)	22.01
@ULCH: 20025	1717.5	15 MHz	Q16	36 (RB_Pos: 20)	21.08
@ULCH: 20025	1717.5	15 MHz	Q16	75 (RB_Pos: 0)	20.89
@ULCH: 20175	1732.5	15 MHz	QPSK	1 (RB_Pos: 0)	23.09
@ULCH: 20175	1732.5	15 MHz	QPSK	1 (RB_Pos: 37)	23.02
@ULCH: 20175	1732.5	15 MHz	QPSK	1 (RB_Pos: 74)	23.04
@ULCH: 20175	1732.5	15 MHz	QPSK	36 (RB_Pos: 20)	21.84
@ULCH: 20175	1732.5	15 MHz	QPSK	75 (RB_Pos: 0)	21.75
@ULCH: 20175	1732.5	15 MHz	Q16	1 (RB_Pos: 0)	22.07
@ULCH: 20175	1732.5	15 MHz	Q16	1 (RB_Pos: 37)	21.95
@ULCH: 20175	1732.5	15 MHz	Q16	1 (RB_Pos: 74)	21.97
@ULCH: 20175	1732.5	15 MHz	Q16	36 (RB_Pos: 20)	20.94
@ULCH: 20175	1732.5	15 MHz	Q16	75 (RB_Pos: 0)	20.79
@ULCH: 20325	1747.5	15 MHz	QPSK	1 (RB_Pos: 0)	23.05
@ULCH: 20325	1747.5	15 MHz	QPSK	1 (RB_Pos: 37)	23.13
@ULCH: 20325	1747.5	15 MHz	QPSK	1 (RB_Pos: 74)	22.94
@ULCH: 20325	1747.5	15 MHz	QPSK	36 (RB_Pos: 20)	21.94
@ULCH: 20325	1747.5	15 MHz	QPSK	75 (RB_Pos: 0)	21.84
@ULCH: 20325	1747.5	15 MHz	Q16	1 (RB_Pos: 0)	21.96
@ULCH: 20325	1747.5	15 MHz	Q16	1 (RB_Pos: 37)	22.03
@ULCH: 20325	1747.5	15 MHz	Q16	1 (RB_Pos: 74)	21.86
@ULCH: 20325	1747.5	15 MHz	Q16	36 (RB_Pos: 20)	21.04
@ULCH: 20325	1747.5	15 MHz	Q16	75 (RB_Pos: 0)	20.84
@ULCH: 20050	1720.0	20 MHz	QPSK	1 (RB_Pos: 0)	23.2
@ULCH: 20050	1720.0	20 MHz	QPSK	1 (RB_Pos: 50)	23.2
@ULCH: 20050	1720.0	20 MHz	QPSK	1 (RB_Pos: 99)	23.26
@ULCH: 20050	1720.0	20 MHz	QPSK	50 (RB_Pos: 25)	22.04
@ULCH: 20050	1720.0	20 MHz	QPSK	100 (RB_Pos: 0)	22.04
@ULCH: 20050	1720.0	20 MHz	QPSK	1 (RB_Pos: 0)	23.24
@ULCH: 20050	1720.0	20 MHz	QPSK	1 (RB_Pos: 50)	23.22
@ULCH: 20050	1720.0	20 MHz	QPSK	1 (RB_Pos: 99)	23.25
@ULCH: 20050	1720.0	20 MHz	Q16	50 (RB_Pos: 25)	20.97
@ULCH: 20050	1720.0	20 MHz	QPSK	100 (RB_Pos: 0)	21.99
@ULCH: 20175	1732.5	20 MHz	QPSK	1 (RB_Pos: 0)	23.21

Channel	Frequency	Bandwidth		#RB / Pos	Power, dBm
@ULCH: 20175	1732.5	20 MHz	QPSK	1 (RB_Pos: 50)	23.05
@ULCH: 20175	1732.5	20 MHz	QPSK	1 (RB_Pos: 99)	23.08
@ULCH: 20175	1732.5	20 MHz	QPSK	50 (RB_Pos: 25)	21.89
@ULCH: 20175	1732.5	20 MHz	QPSK	100 (RB_Pos: 0)	21.88
@ULCH: 20175	1732.5	20 MHz	QPSK	1 (RB_Pos: 0)	23.2
@ULCH: 20175	1732.5	20 MHz	QPSK	1 (RB_Pos: 50)	22.99
@ULCH: 20175	1732.5	20 MHz	QPSK	1 (RB_Pos: 99)	23.06
@ULCH: 20175	1732.5	20 MHz	Q16	50 (RB_Pos: 25)	20.85
@ULCH: 20175	1732.5	20 MHz	QPSK	100 (RB_Pos: 0)	21.81
@ULCH: 20300	1745.0	20 MHz	QPSK	1 (RB_Pos: 0)	23.11
@ULCH: 20300	1745.0	20 MHz	QPSK	1 (RB_Pos: 50)	23.09
@ULCH: 20300	1745.0	20 MHz	QPSK	1 (RB_Pos: 99)	22.99
@ULCH: 20300	1745.0	20 MHz	QPSK	50 (RB_Pos: 25)	21.97
@ULCH: 20300	1745.0	20 MHz	QPSK	100 (RB_Pos: 0)	21.94
@ULCH: 20300	1745.0	20 MHz	QPSK	1 (RB_Pos: 0)	23.09
@ULCH: 20300	1745.0	20 MHz	QPSK	1 (RB_Pos: 50)	23.13
@ULCH: 20300	1745.0	20 MHz	QPSK	1 (RB_Pos: 99)	23
@ULCH: 20300	1745.0	20 MHz	Q16	50 (RB_Pos: 25)	20.92
@ULCH: 20300	1745.0	20 MHz	QPSK	100 (RB_Pos: 0)	21.84

### 3.6 Test Data - LTE Band 13

Maximum power: 23.7 dBm

Channel	Frequency	Bandwidth	Modulation	#RB / Pos	Power, dBm
23205	779.5	5.0 MHz	QPSK	1 (RB_Pos: 0)	23.33
23205	779.5	5.0 MHz	QPSK	1 (RB_Pos: 12)	23.4
23205	779.5	5.0 MHz	QPSK	1 (RB_Pos: 24)	23.39
23205	779.5	5.0 MHz	QPSK	12 (RB_Pos: 6)	22.23
23205	779.5	5.0 MHz	QPSK	25 (RB_Pos: 0)	22.12
23205	779.5	5.0 MHz	Q16	1 (RB_Pos: 0)	22.38
23205	779.5	5.0 MHz	Q16	1 (RB_Pos: 12)	22.41
23205	779.5	5.0 MHz	Q16	1 (RB_Pos: 24)	22.39
23205	779.5	5.0 MHz	Q16	12 (RB_Pos: 6)	21.41
23205	779.5	5.0 MHz	Q16	25 (RB_Pos: 0)	21.1
23230	782.0	5.0 MHz	QPSK	1 (RB_Pos: 0)	23.34
23230	782.0	5.0 MHz	QPSK	1 (RB_Pos: 12)	23.37
23230	782.0	5.0 MHz	QPSK	1 (RB_Pos: 24)	23.45
23230	782.0	5.0 MHz	QPSK	12 (RB_Pos: 6)	22.4
23230	782.0	5.0 MHz	QPSK	25 (RB_Pos: 0)	22.32
23230	782.0	5.0 MHz	Q16	1 (RB_Pos: 0)	22.57
23230	782.0	5.0 MHz	Q16	1 (RB_Pos: 12)	22.64

Channel	Frequency	Bandwidth	Modulation	#RB / Pos	Power, dBm
23230	782.0	5.0 MHz	Q16	1 (RB_Pos: 24)	22.83
23230	782.0	5.0 MHz	Q16	12 (RB_Pos: 6)	21.4
23230	782.0	5.0 MHz	Q16	25 (RB_Pos: 0)	21.26
23255	784.5	5.0 MHz	QPSK	1 (RB_Pos: 0)	23.41
23255	784.5	5.0 MHz	QPSK	1 (RB_Pos: 12)	23.46
23255	784.5	5.0 MHz	QPSK	1 (RB_Pos: 24)	23.7
23255	784.5	5.0 MHz	QPSK	12 (RB_Pos: 6)	22.56
23255	784.5	5.0 MHz	QPSK	25 (RB_Pos: 0)	22.32
23255	784.5	5.0 MHz	Q16	1 (RB_Pos: 0)	22.4
23255	784.5	5.0 MHz	Q16	1 (RB_Pos: 12)	22.52
23255	784.5	5.0 MHz	Q16	1 (RB_Pos: 24)	22.71
23255	784.5	5.0 MHz	Q16	12 (RB_Pos: 6)	21.65
23255	784.5	5.0 MHz	Q16	25 (RB_Pos: 0)	21.43
23230	782.0	10 MHz	QPSK	1 (RB_Pos: 0)	23.28
23230	782.0	10 MHz	QPSK	1 (RB_Pos: 25)	23.39
23230	782.0	10 MHz	QPSK	1 (RB_Pos: 49)	23.59
23230	782.0	10 MHz	QPSK	25 (RB_Pos: 11)	22.31
23230	782.0	10 MHz	QPSK	50 (RB_Pos: 0)	22.14
23230	782.0	10 MHz	Q16	1 (RB_Pos: 0)	22.29
23230	782.0	10 MHz	Q16	1 (RB_Pos: 25)	22.34
23230	782.0	10 MHz	Q16	1 (RB_Pos: 49)	22.54
23230	782.0	10 MHz	Q16	25 (RB_Pos: 12)	21.37
23230	782.0	10 MHz	Q16	50 (RB_Pos: 0)	21.12

## 4 Peak to Average Ratio

### 4.1 Test Result

Test Description	Basic Standards	Test Result
Peak to Average Ratio	27.50(d)(5) RSS-139 6.4	Pass

### 4.2 Test Method

KDB document 971168 D01 Power Meas License Digital Systems v02r01 was used to determine peak-to-average ratio. For the LTE measurements, Clause 5.7.1 was used which defined the measurement method using the CCDF function of the spectrum analyzer.

### 4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.0 °C  
 Relative Humidity: 46.9 %  
 Atmospheric Pressure: 98.2 kPa

### 4.4 Test Equipment

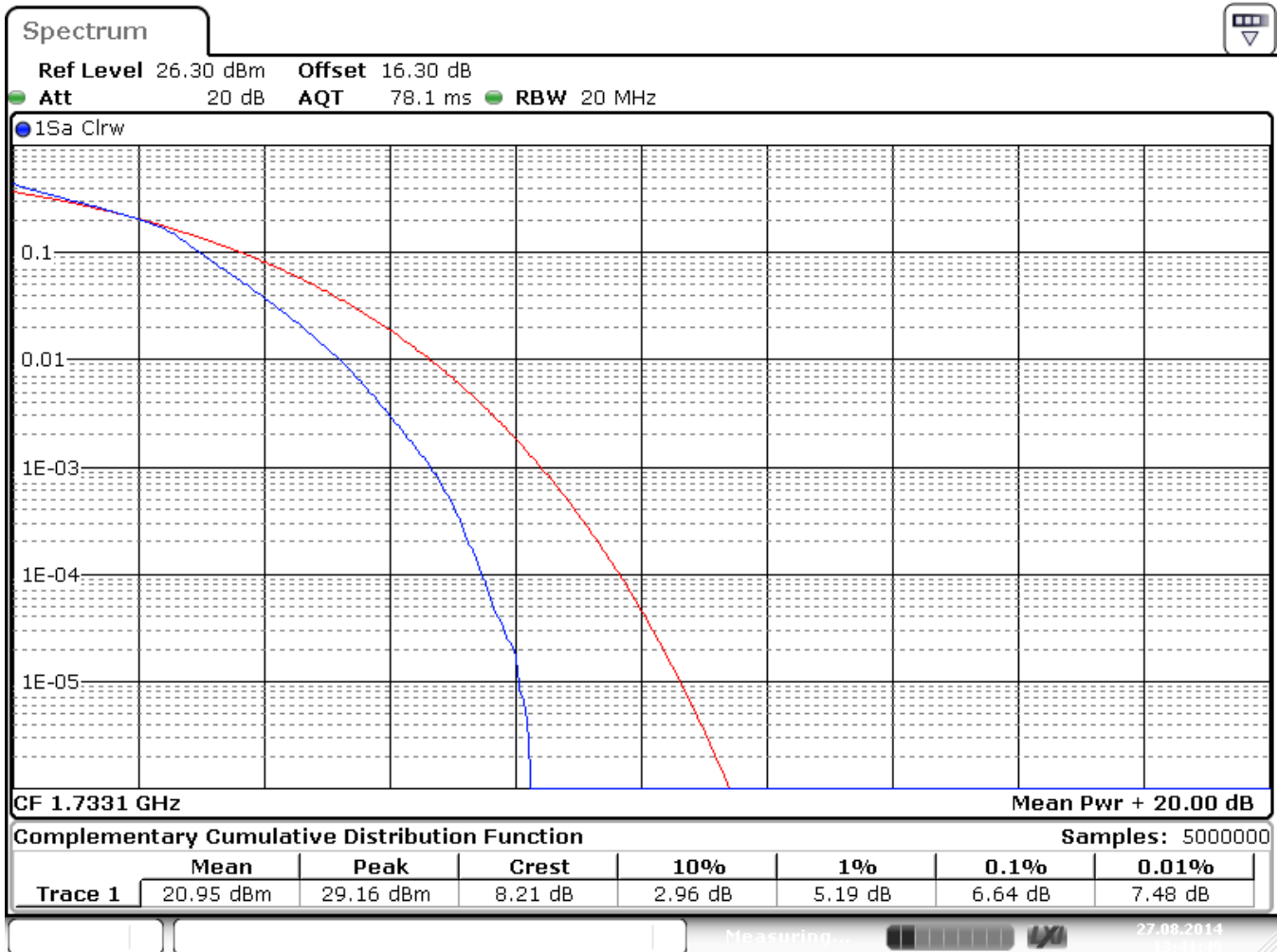
Test Date: 27 August 2014

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	28-Sep-2014
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B079788	17-Oct-2015
POWER SPLITTER	ZFRSC-183-S+	MINI-CIRCUITS	B101743	8-Aug-2015

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 3 year calibration cycle.

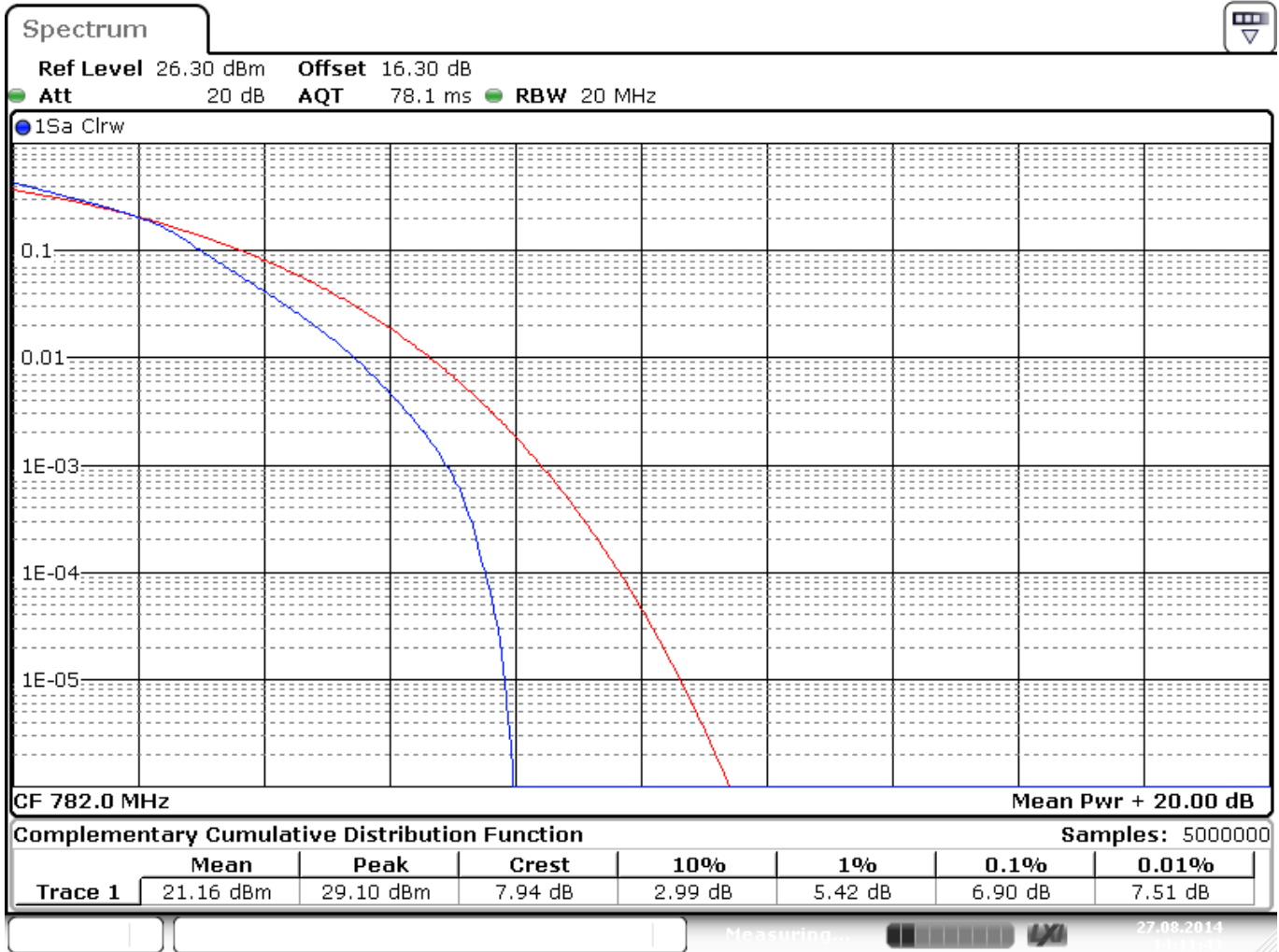
### 4.5 Test Data

LTE Band 4 (worst case)  
3 MHz, 15RB, 16QAM



Date: 27.AUG.2014 13:41:49

LTE Band 13 (worst case)  
5 MHz, 25 RB, 16QAM



Date: 27.AUG.2014 14:11:43

## 5 Occupied Bandwidth

### 5.1 Test Result

Test Description	Basic Standards	Test Result
Occupied Bandwidth	2.1049 RSS-GEN(4.6.1) RSS-139(2.3)	Reported

### 5.2 Test Method

The occupied bandwidth is the frequency bandwidth such that below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power by a given emission. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sample detector shall be used since a peak detector may produce a wider than actual bandwidth.

A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester. The occupied bandwidth was measured using spectrum analyzer's occupied bandwidth measurement. RBW was set to 100 kHz on spectrum analyzer.

The bandwidth of 99% power can be read on spectrum analyzer.

The measurement was conducted at the center channel of each band. All resource blocks and both QPSK and QUAM16 were explored. Worst-case results for each modulation are reported.

### 5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.5 °C  
Relative Humidity: 46.9 %  
Atmospheric Pressure: 97.9 kPa

### 5.4 Test Equipment

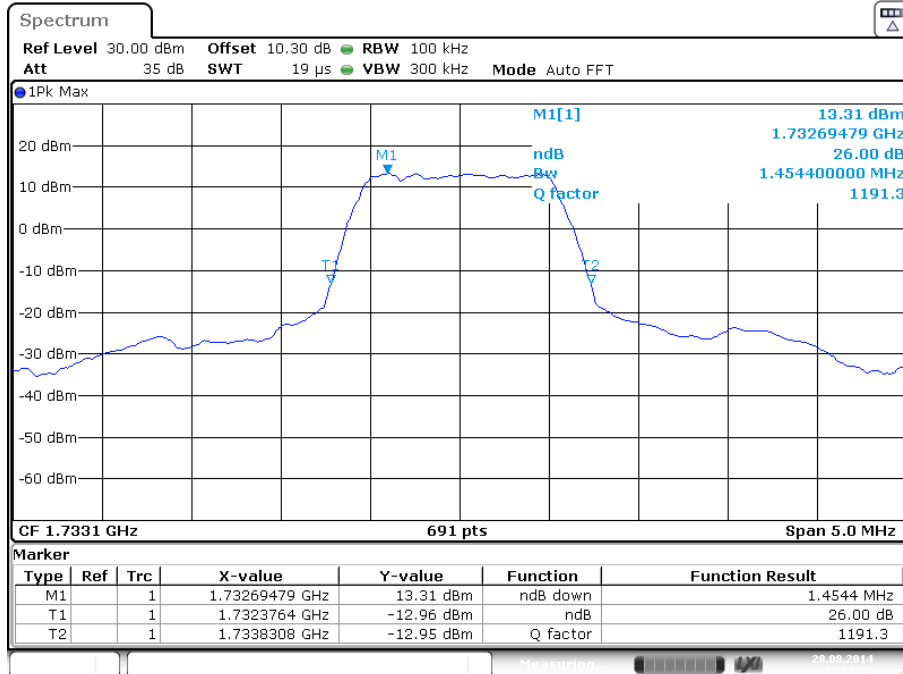
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	28-Sep-2014
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B079788	17-Oct-2015
POWER SPLITTER	ZFRSC-183-S+	MINI-CIRCUITS	B101743	8-Aug-2015

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 3 year calibration cycle.



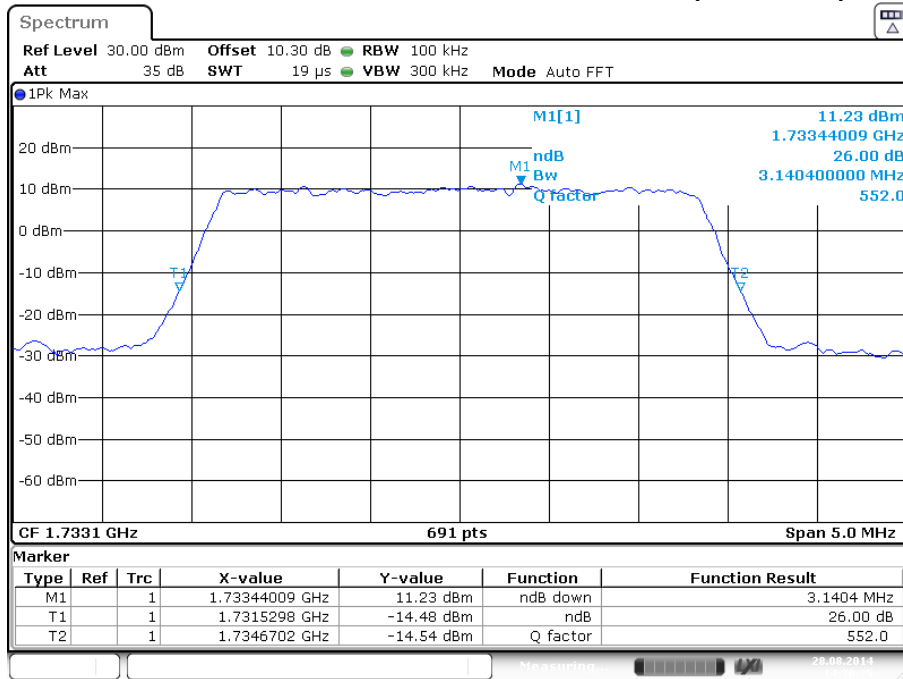
### 5.5 Test Data

**Occupied Bandwidth: :@ULCH: 20175, BW: 1.4 MHz ,  
ULPower: 23dBm; ; UL\_MOD\_RB: QPSK, 6 (RB\_Pos:0)**



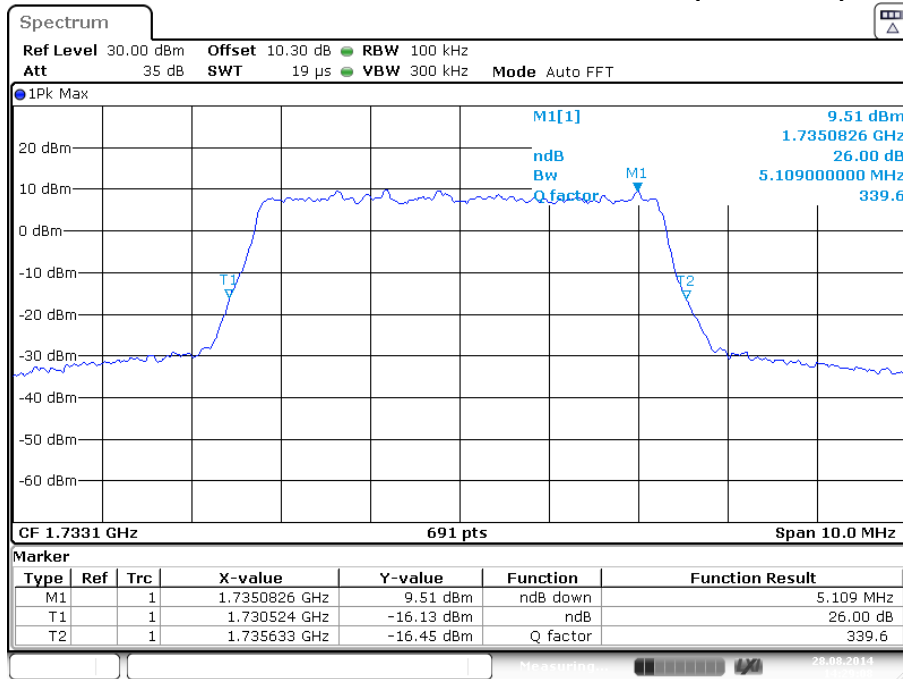
Date: 28.AUG.2014 14:55:21

**Occupied Bandwidth: :@ULCH: 20175, BW: 3.0 MHz ,  
ULPower: 23dBm; ; UL\_MOD\_RB: QPSK, 15 (RB\_Pos:0)**



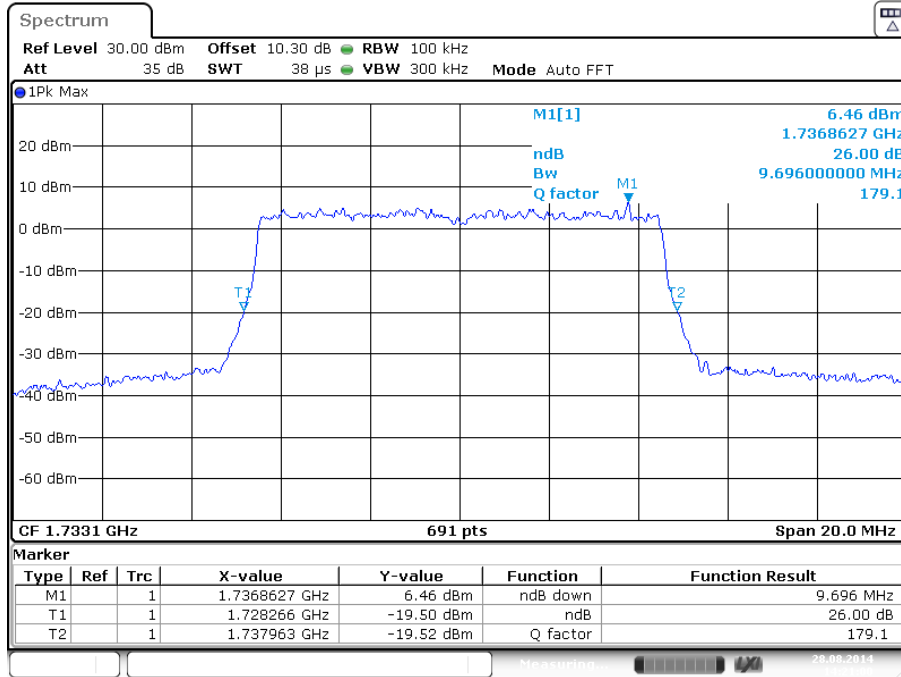
Date: 28.AUG.2014 14:30:25

**Occupied Bandwidth: :@ULCH: 20175, BW: 5.0 MHz ,  
ULPower: 23dBm; ; UL\_MOD\_RB: QPSK, 25 (RB\_Pos:0)**



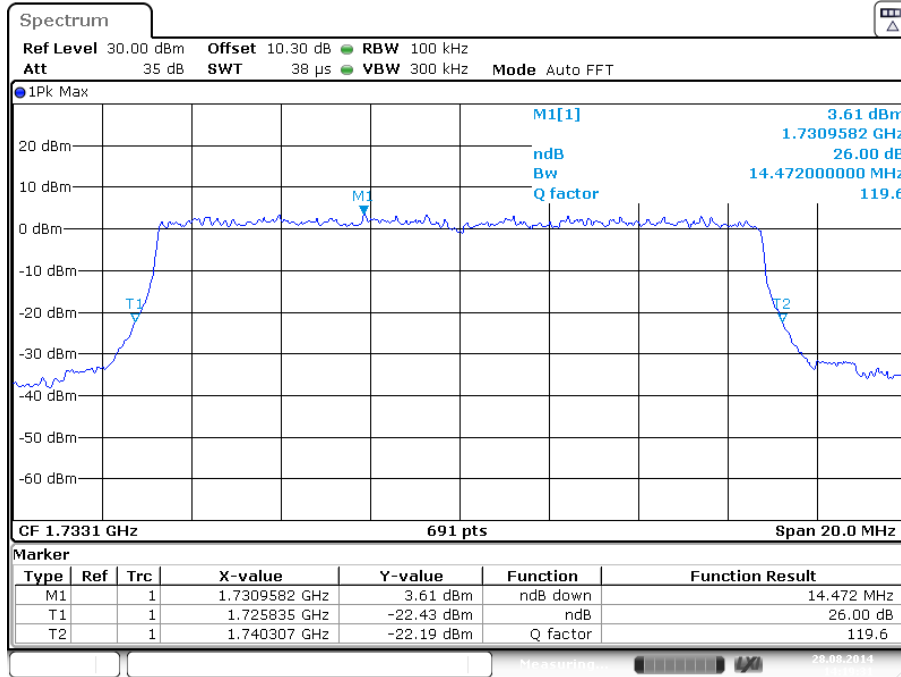
Date: 28.AUG.2014 14:29:08

**Occupied Bandwidth: :@ULCH: 20175, BW: 10 MHz , ULPower: 23dBm ; ; UL\_MOD\_RB: Q16, 50 (RB\_Pos:0)**



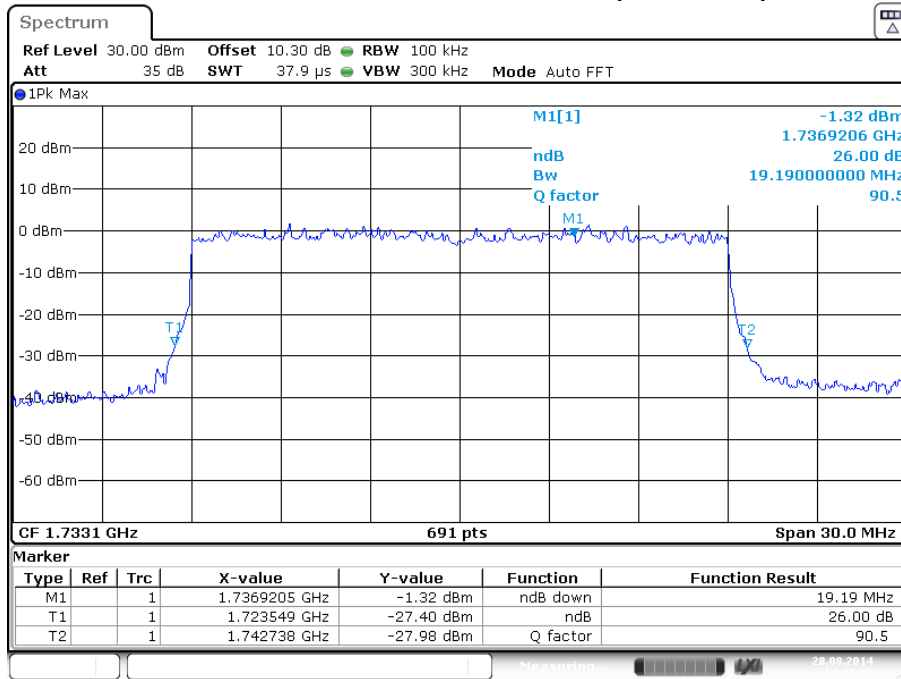
Date: 28.AUG.2014 14:21:00

**Occupied Bandwidth: :@ULCH: 20175, BW: 15 MHz , ULPower: 23dBm; ; UL\_MOD\_RB: Q16, 75 (RB\_Pos:0)**



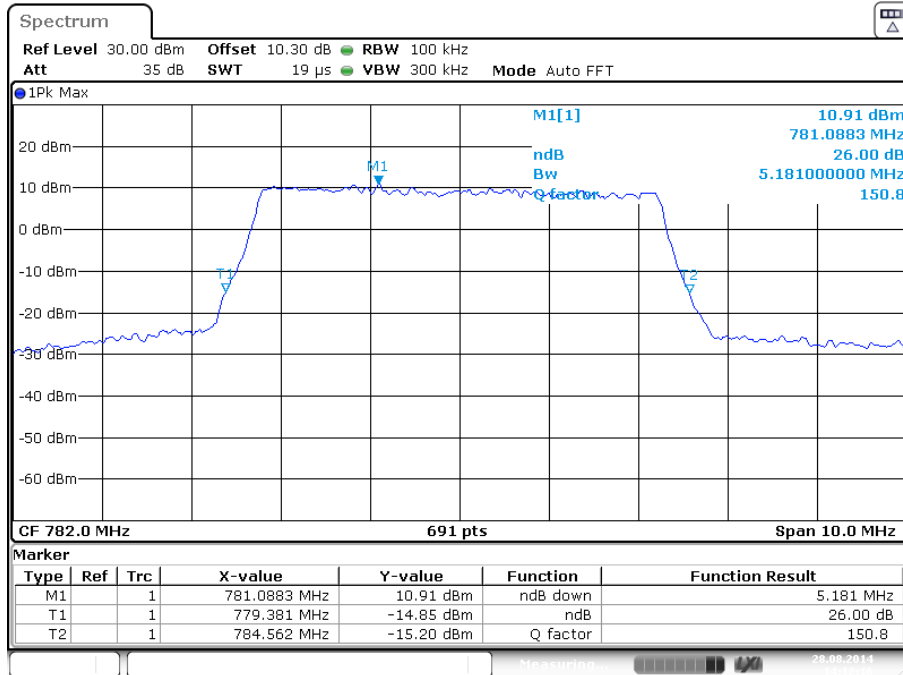
Date: 28.AUG.2014 14:19:31

**Occupied Bandwidth: :@ULCH: 20175, BW: 20 MHz , ULPower: 23dBm; ; UL\_MOD\_RB: Q16, 100 (RB\_Pos:0)**



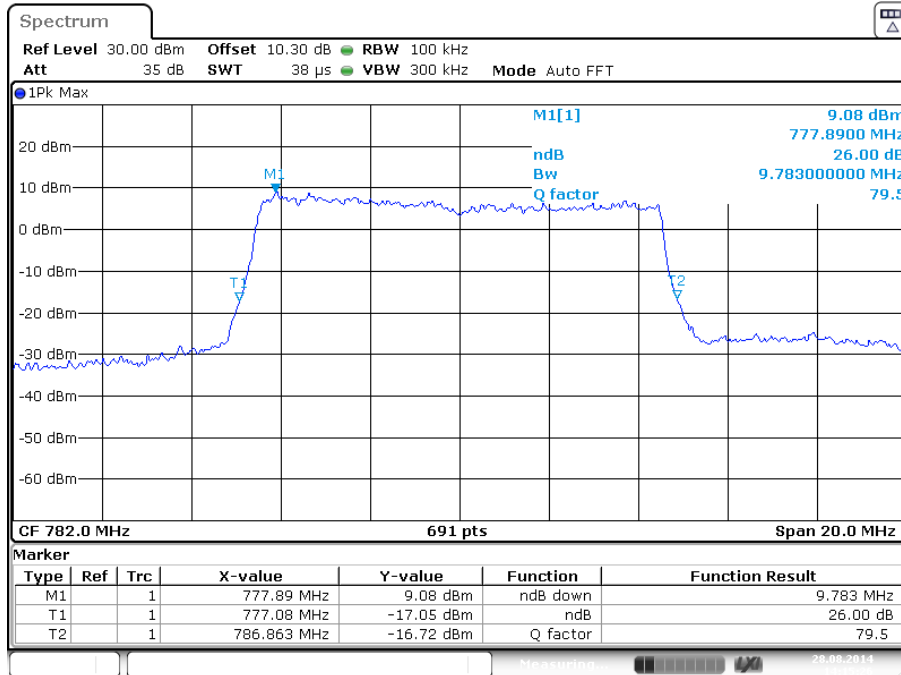
Date: 28.AUG.2014 14:17:38

**Occupied Bandwidth: :@ULCH: 23230, BW: 5 MHz , ULPower: 23dBm; ; UL\_MOD\_RB: QPSK, 25 (RB\_Pos:0)**



Date: 28.AUG.2014 14:12:16

**Occupied Bandwidth: :@ULCH: 23230, BW: 10 MHz , ULPower: 23dBm; ; UL\_MOD\_RB: QPSK, 50 (RB\_Pos:0)**



Date: 28.AUG.2014 14:15:26



## 6 Band Edge and Conducted Spurious Emissions

### 6.1 Test Result

Test Description	Basic Standards	Test Result
Conducted spurious emissions and Band Edge	2.1051 27.53(c)(2) 27.53(h) RSS-139(6.5.1)	Pass

### 6.2 Test Method

The levels of the carrier and the various conducted spurious and harmonics frequencies are measured by means of a calibrated spectrum analyzer. The emissions spectrum emanating from the EUT transmit antenna port is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. Compliance is based on the use of a spectrum analyzer employing a resolution bandwidth of 1 MHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of a least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emissions 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 emissions are attenuated at least 26 dB below the transmitter power.

### 6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.8 °C  
Relative Humidity: 45.2 %  
Atmospheric Pressure: 97.8 kPa

### 6.4 Test Equipment

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	28-Jul-2015
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	ROHDE & SCHWARZ	B079788	17-Oct-2015
POWER SPLITTER	ZFRSC-183-S+	MINI-CIRCUITS	B101743	8-Aug-2015

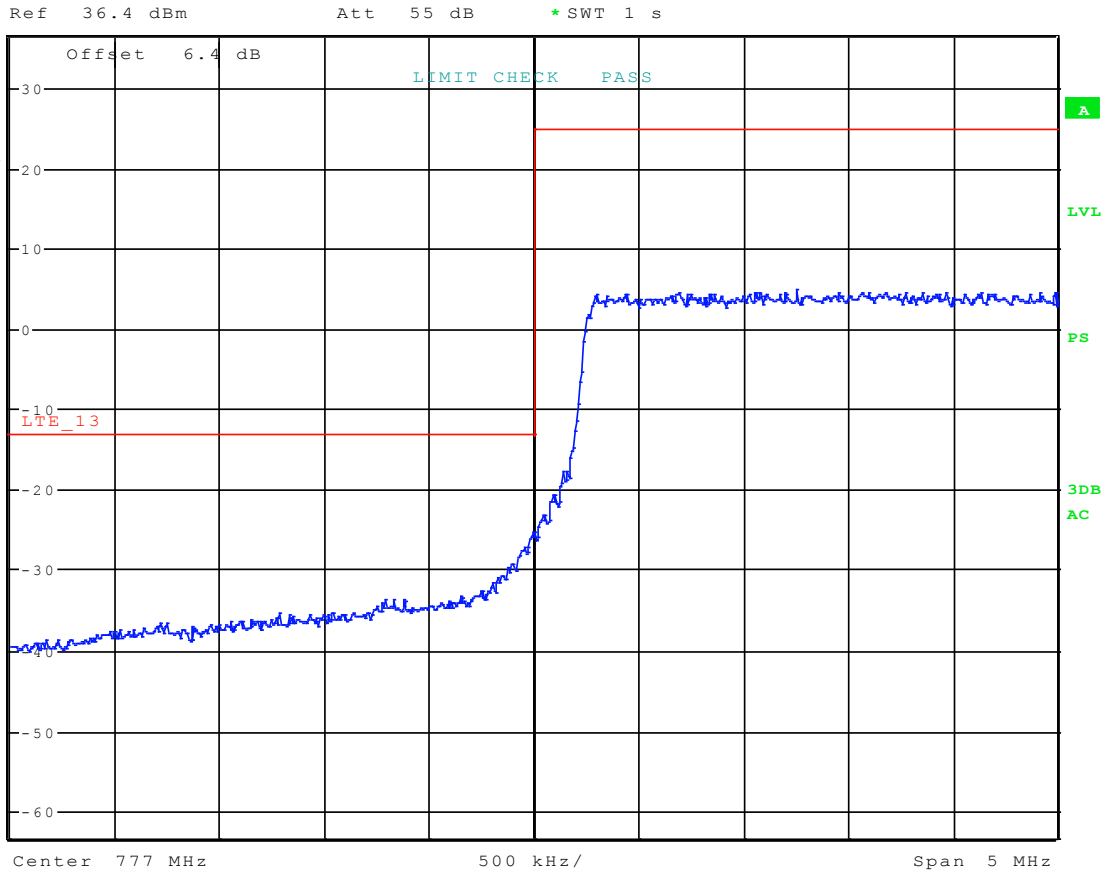
- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 3 year calibration cycle.

### 6.5 Test Data - Band Edge

LTE Band 13, QPSK modulation, 25 RB, Low Channel (5205UL / 23205DL)



\* RBW 50 kHz  
 \* VBW 300 kHz  
 \* SWT 1 s



Date: 15.AUG.2014 16:00:23

## LTE Band 13, QPSK modulation, 25 RB, High Channel (5255DL / 23255UL)

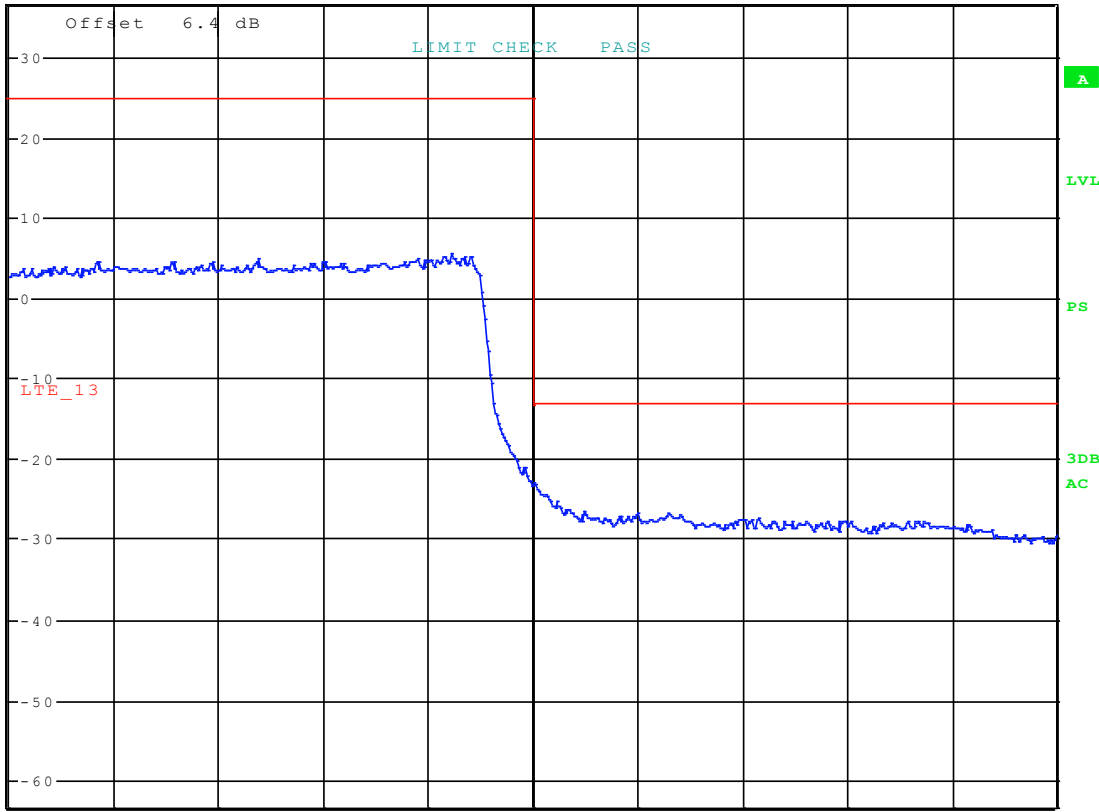


\* RBW 50 kHz  
 \* VBW 300 kHz  
 \* SWT 1 s

Ref 36.4 dBm

Att 55 dB

1 RM  
 VIEW



Date: 15.AUG.2014 16:05:28

## LTE Band 4, QPSK modulation, 15 RB, Low Channel (1965DL / 19965UL)

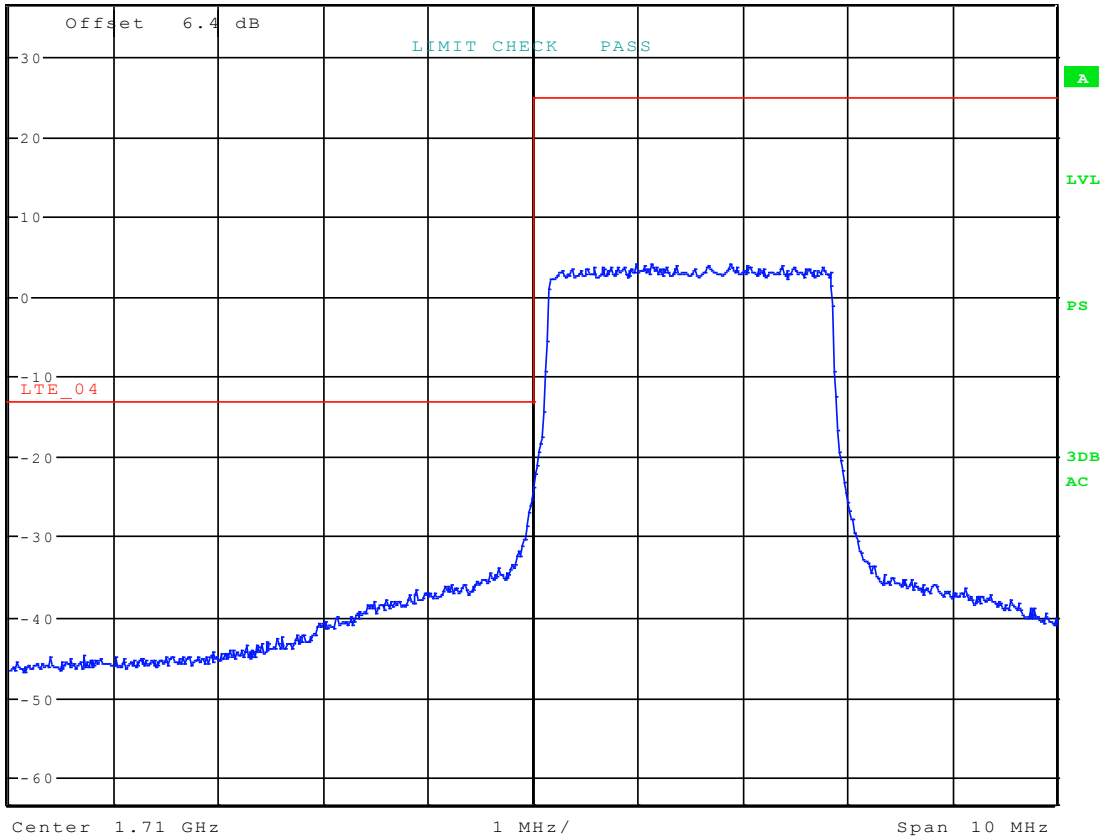


\* RBW 30 kHz  
 VBW 300 kHz  
 \* SWT 1 s

Ref 36.4 dBm

Att 55 dB

1 RM  
 VIEW



Date: 18.AUG.2014 10:08:49

## LTE Band 4, QPSK modulation, 15 RB, High Channel (2385DL / 20385UL)

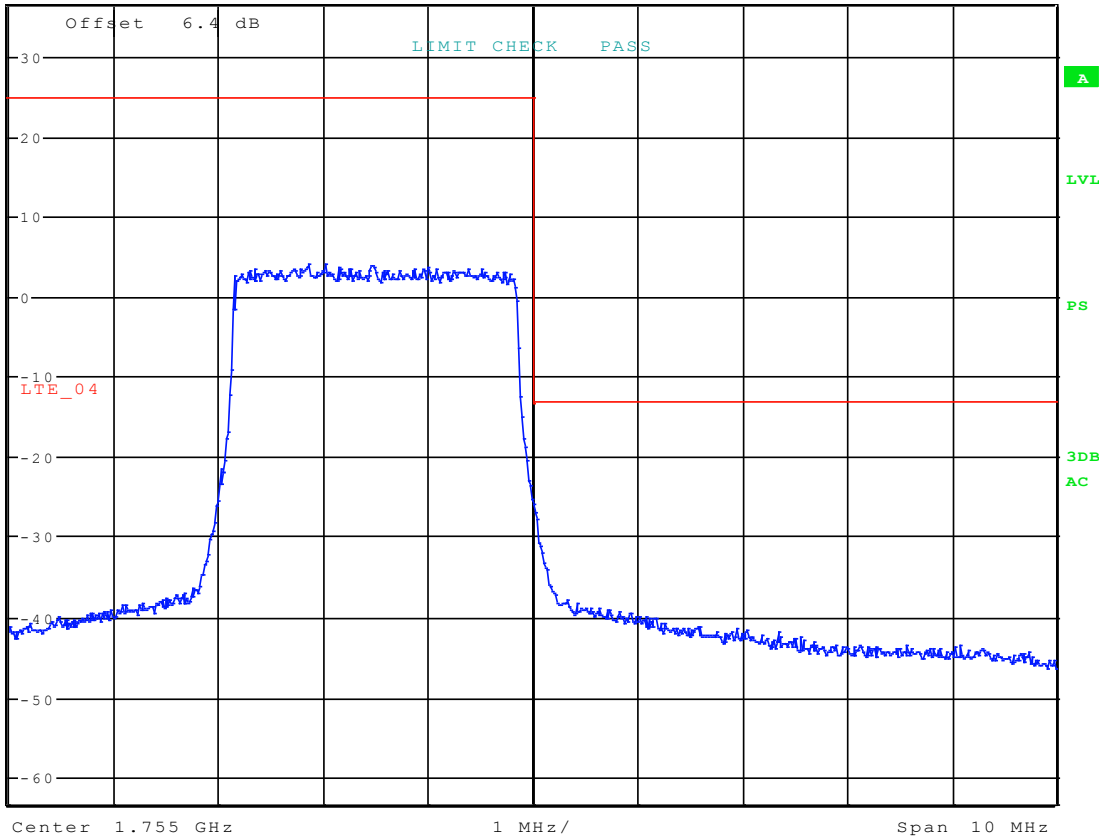


\* RBW 30 kHz  
 VBW 300 kHz  
 \* SWT 1 s

Ref 36.4 dBm

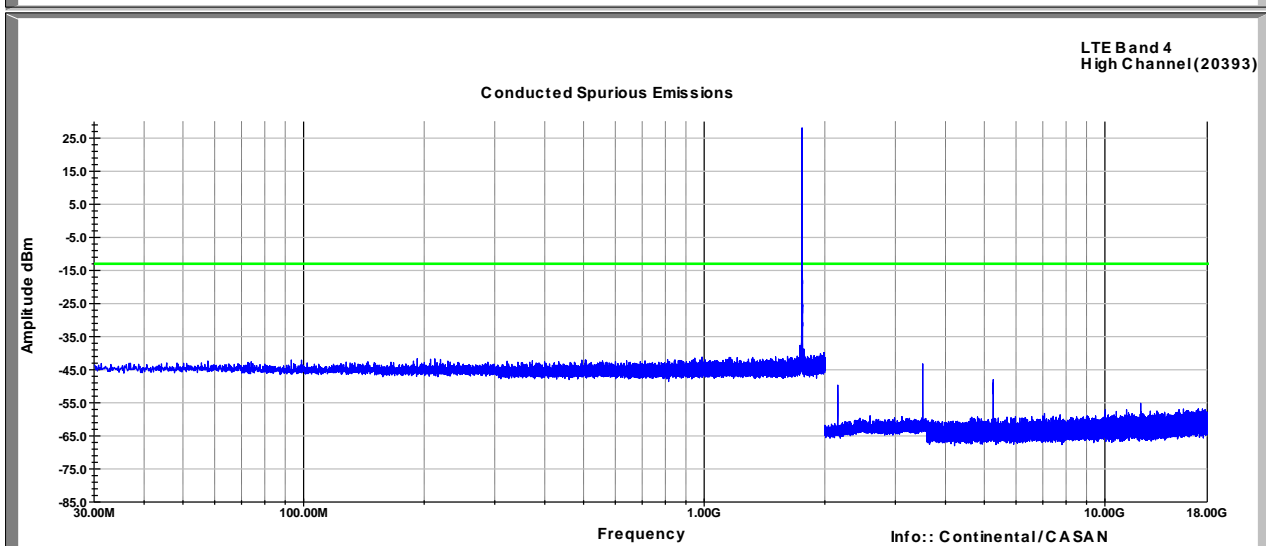
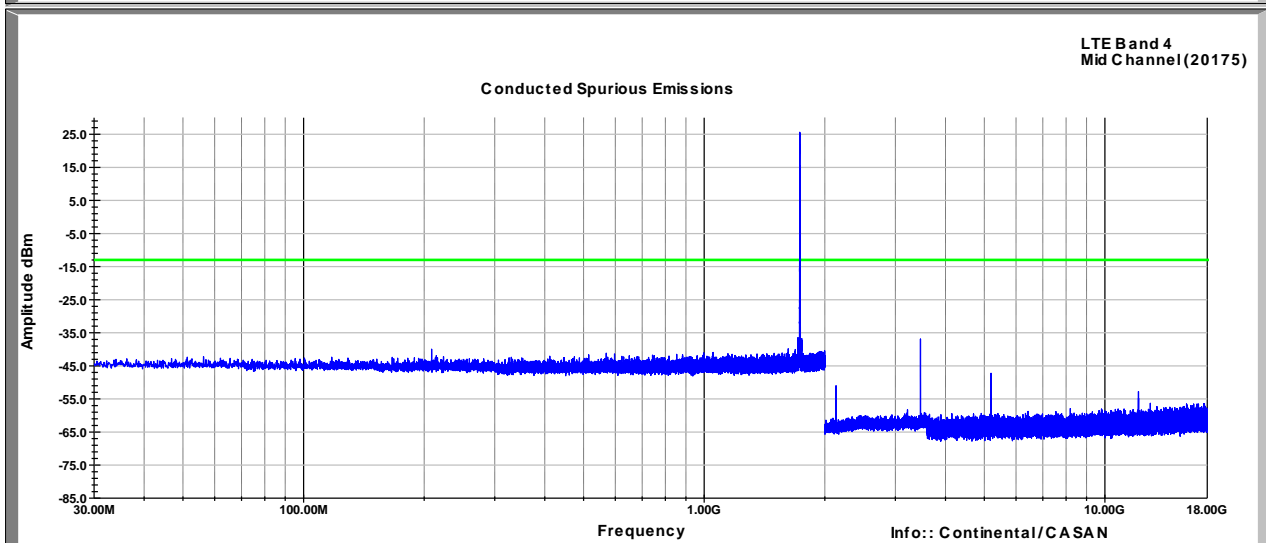
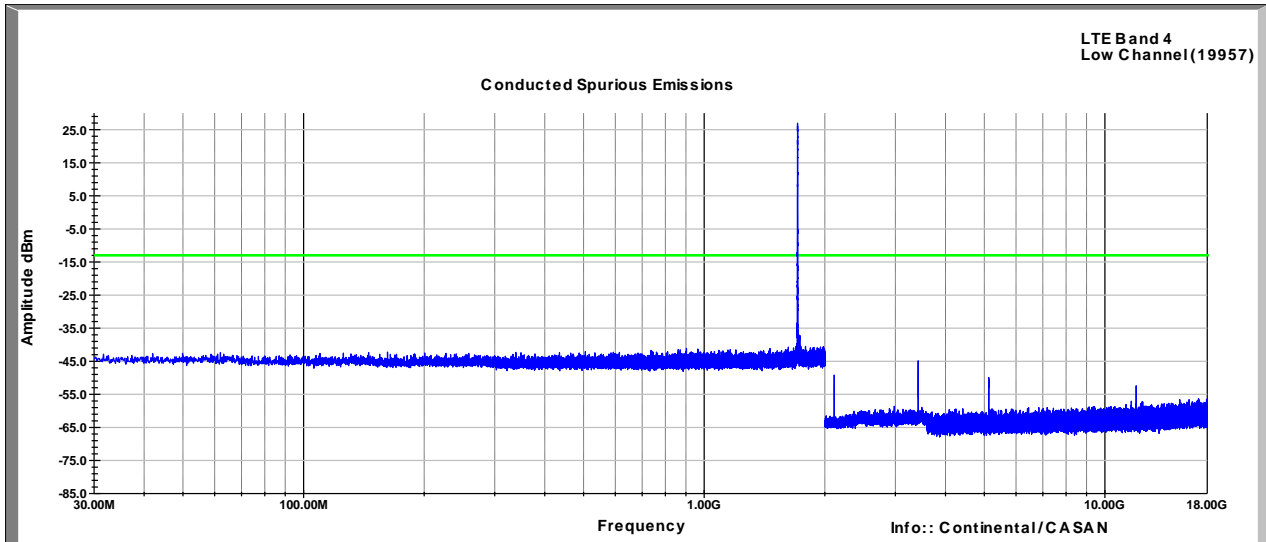
Att 55 dB

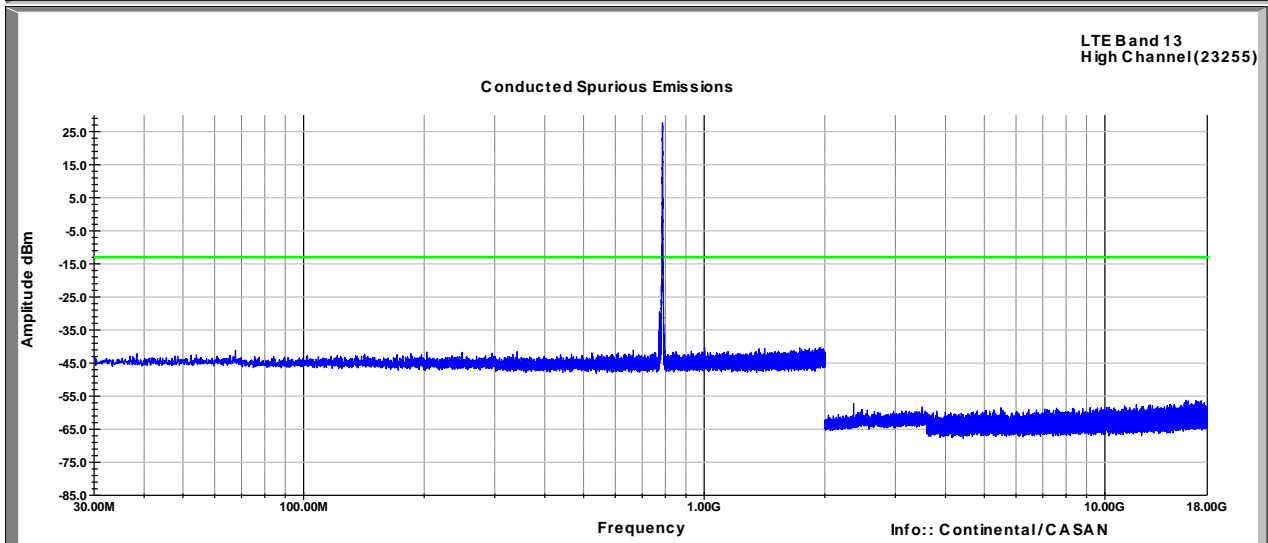
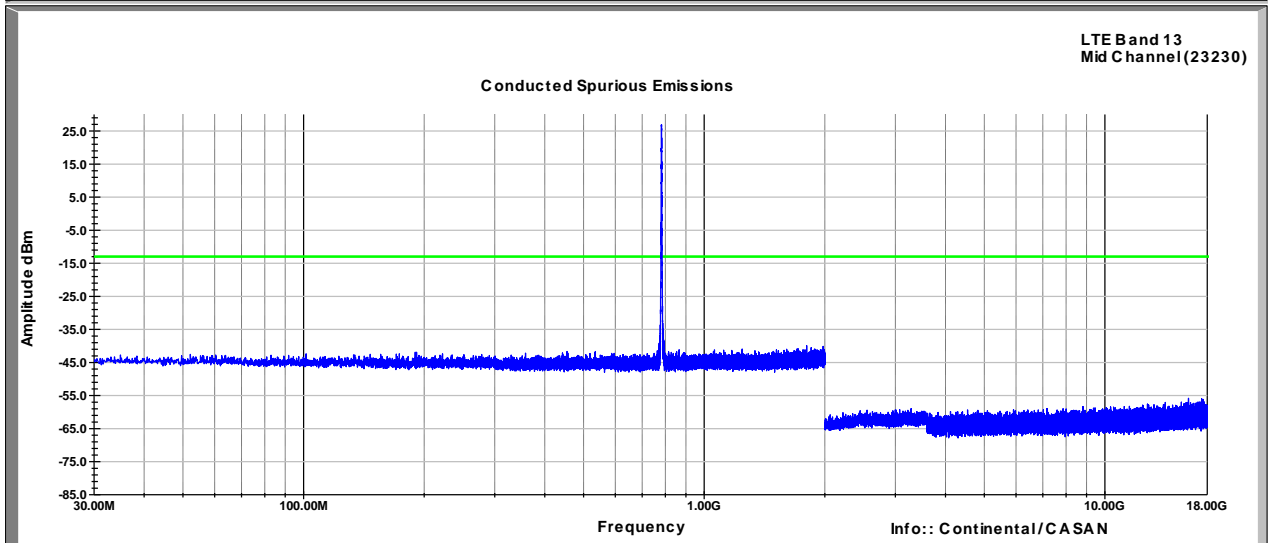
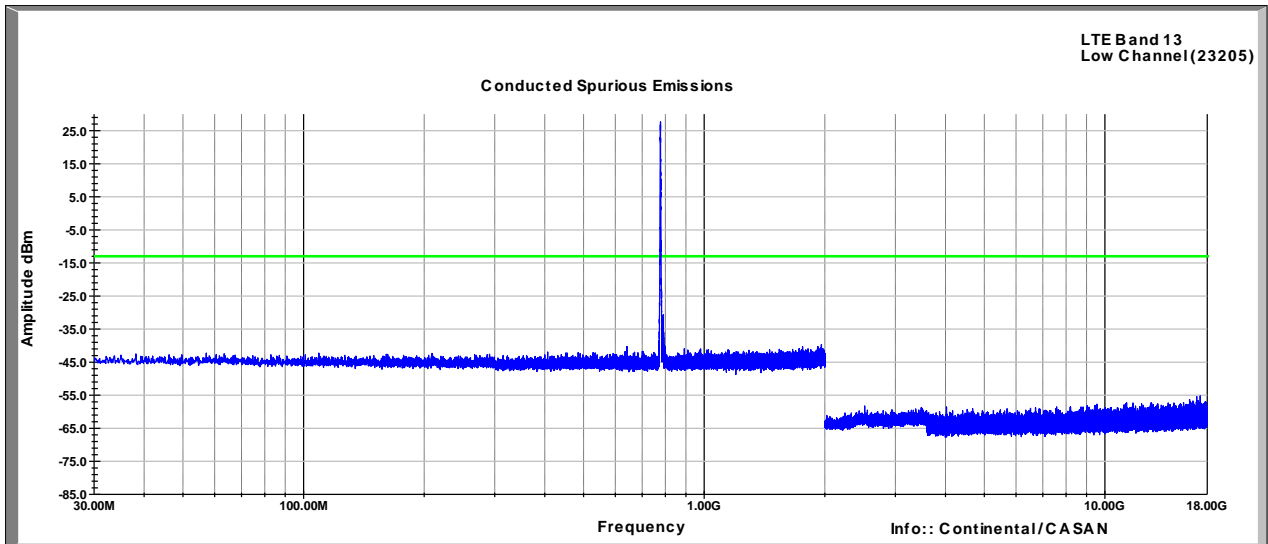
1 RM  
 VIEW



Date: 18.AUG.2014 10:09:27

### 6.6 Test Data - Conducted Spurious Emissions





## 7 Effective Radiated Power

### 7.1.1 Test Result

Test Description	Basic Standards	Test Result
Effective Radiated Power	FCC Part 27.55(b)(10) RSS-130 4.4	Pass
Effective Isotropic Radiated Power	27.50(d)(4) RSS-139 6.4	Pass

### 7.1.2 Test Method

Because the CASAN device is provided with a coaxial port but no antenna, ERP/EIRP measurements were taken by measuring the conducted output power and defining the maximum gain antenna that may be used while maintaining compliance with the applicable limits.

### 7.2 Test Site

SGS EMC Laboratory, Suwanee, GA

### 7.3 Test Equipment

None

### 7.4 Test Data

Mode	Band	Max Power dBm	Antenna Gain dBd/dBi	Cable Loss, dB	ERP/EIRP		ERP/EIRP		Result	
					Limit, dBm		Limit, dBm			
					FCC	IC	FCC	IC	FCC	IC
LTE	Band 13	25	6	1	30	34.8	37	PASS	PASS	
LTE	Band 4	25	6	1	30	30	30	PASS	PASS	

Note: Antenna gain was determined from maximum gain while still meeting the RF exposure requirements for simultaneous transmissions.



## 8 Radiated Spurious Emissions

### 8.1 Test Result

Test Description	Basic Standards	Test Result
Radiated Spurious Emissions	2.1053 27.53(c)(2) 27.53(h) RSS-139 6.5.1 ANSI/TIA-603-C-2004	Pass

### 8.2 Test Method

The levels are 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. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. Compliance is based on the use of a spectrum analyzer employing a resolution bandwidth of 1 MHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of a least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emissions 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 emissions are attenuated at least 26 dB below the transmitter power.

The EUT was manipulated through each of its three orthogonal axes with the measurement oriented in both vertical and horizontal polarizations.

A radio link was established between EUT and Radio Communications Tester. The output power of the EUT was set to maximum value by using the maximum power setting on the Radio Communications Tester.

The measurements were performed at the low, middle, and high channels.

### 8.3 Test Site

SGS 3m Chamber, Suwanee, GA

#### Environmental Conditions

Temperature: 23.6 °C  
Relative Humidity: 50.5 %  
Atmospheric Pressure: 97.4 kPa

## 8.4 Test Equipment

Test Date: 18-Aug-2014

Tester: FL

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	28-Jul-2015
ANTENNA, BILOG	JB6	SUNOL	B079689	22-Aug-2014
DRG HORN (MEDIUM)	3117	ETS-LINDGREN	B079699	10-Apr-2015
DESKTOP AMPLIFIER 1-18 GHZ	NSP1800-25-HG	MITEQ	B085930	12-Mar-2015
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079711	4-Aug-2015
RF CABLE - 7000MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079712	4-Aug-2015
RF CABLE - 7500MM (10KHZ - 18GHZ)	SF106	HUBER&SUHNER	B079713	4-Aug-2015
RF CABLE	SF106	HUBER&SUHNER	B085892	5-Aug-2015
COAXIAL CABLE	1134	GORE	B094785	5-Aug-2015

- Unless otherwise noted, equipment is on a 1 year calibration cycle.

### 8.5 Test Data

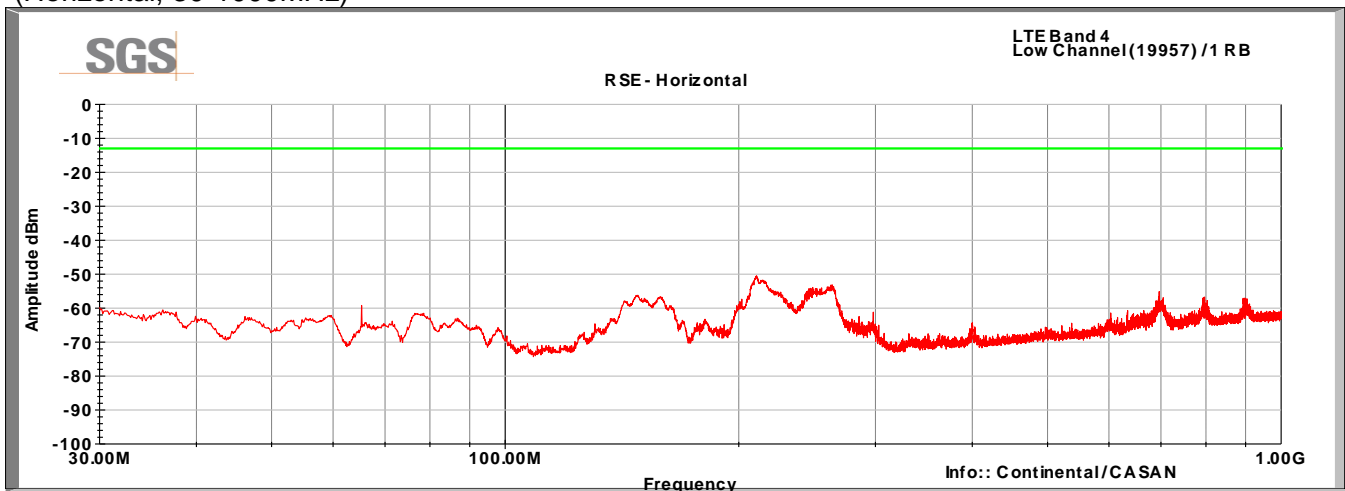
There were no other emissions within 20 dB of the limit.

### 8.6 Test Plots

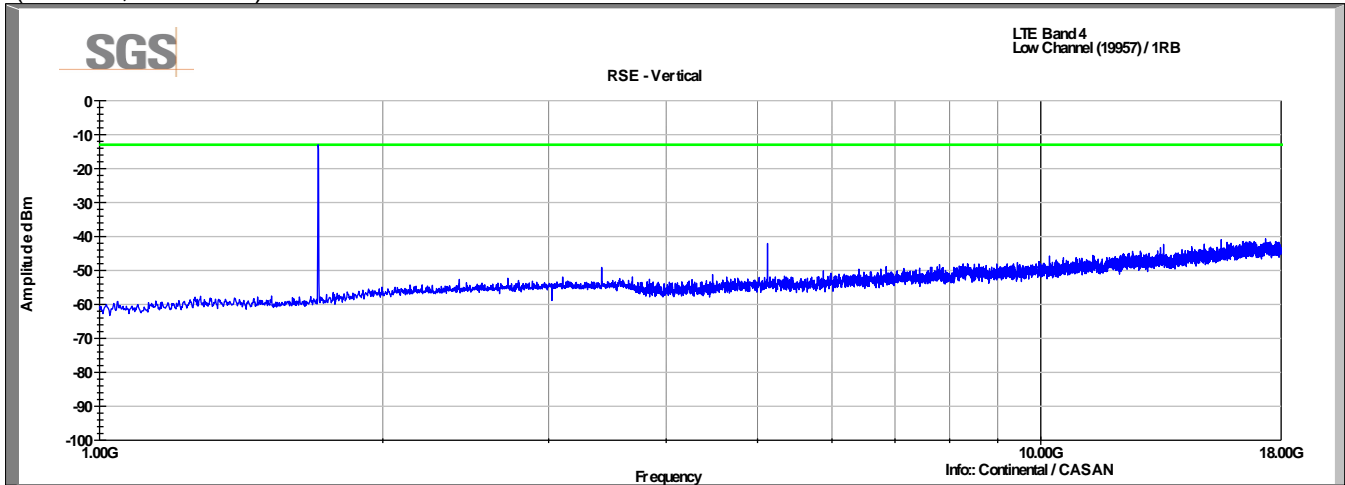
Band 4 – Low Channel  
(Vertical, 30-1000MHz)



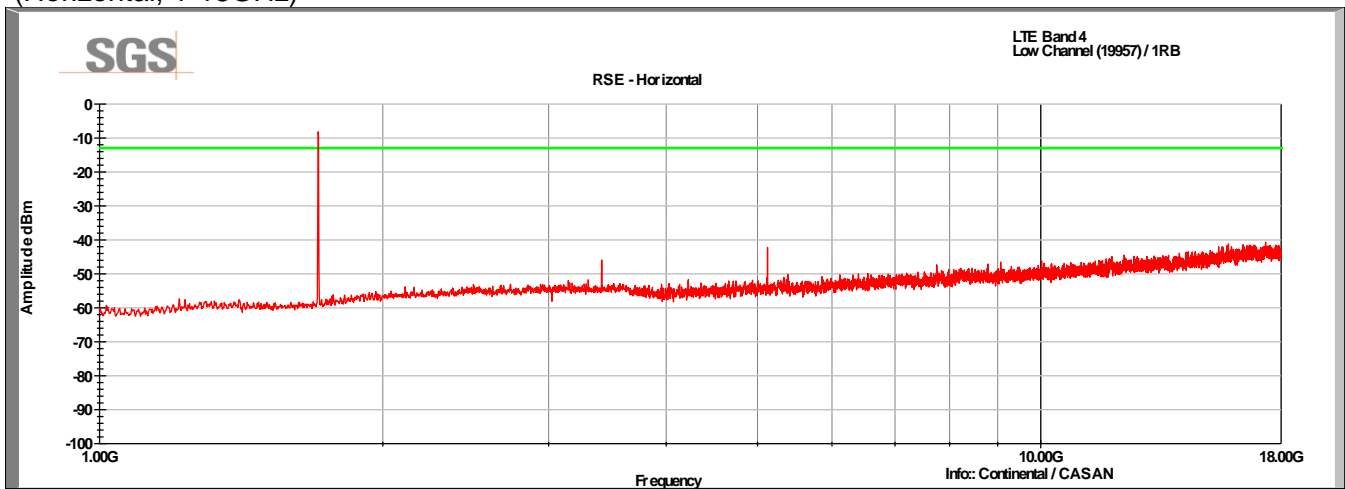
(Horizontal, 30-1000MHz)



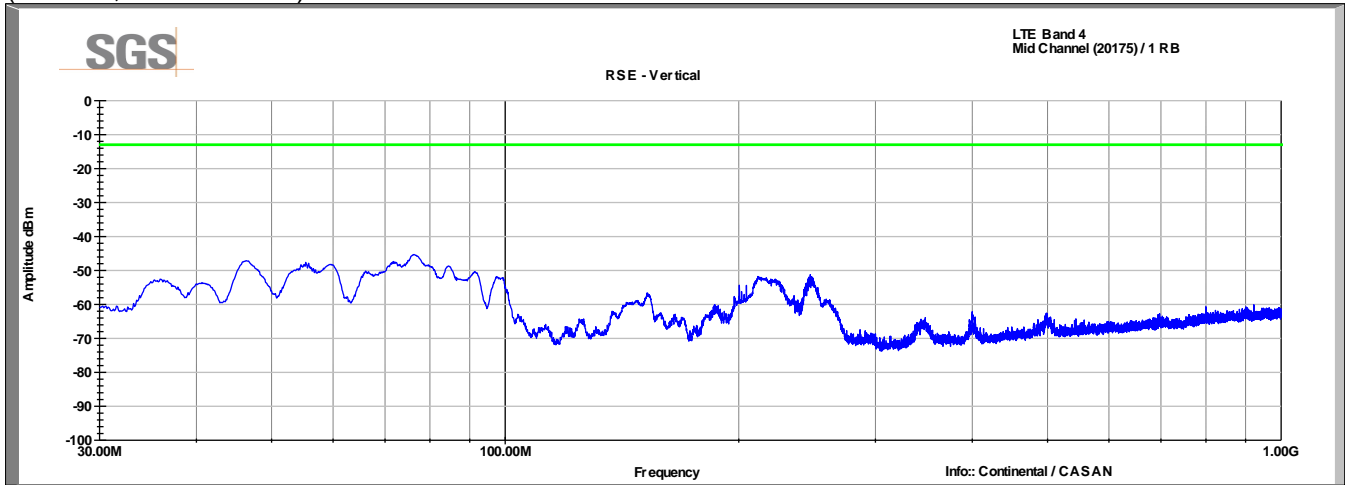
### Band 4 – Low Channel (Vertical, 1-18GHz)



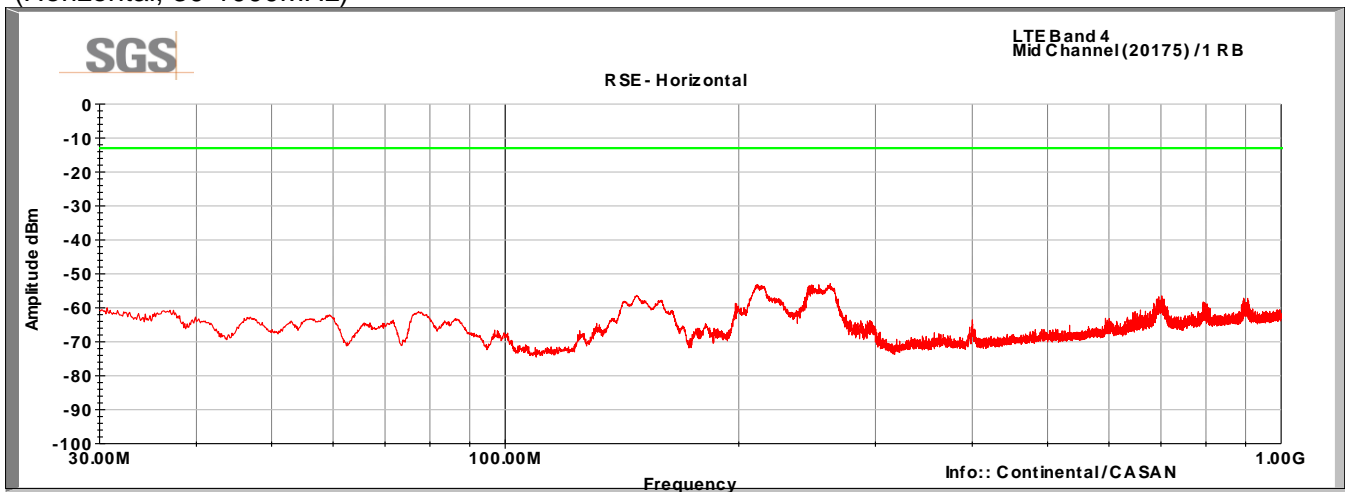
### (Horizontal, 1-18GHz)



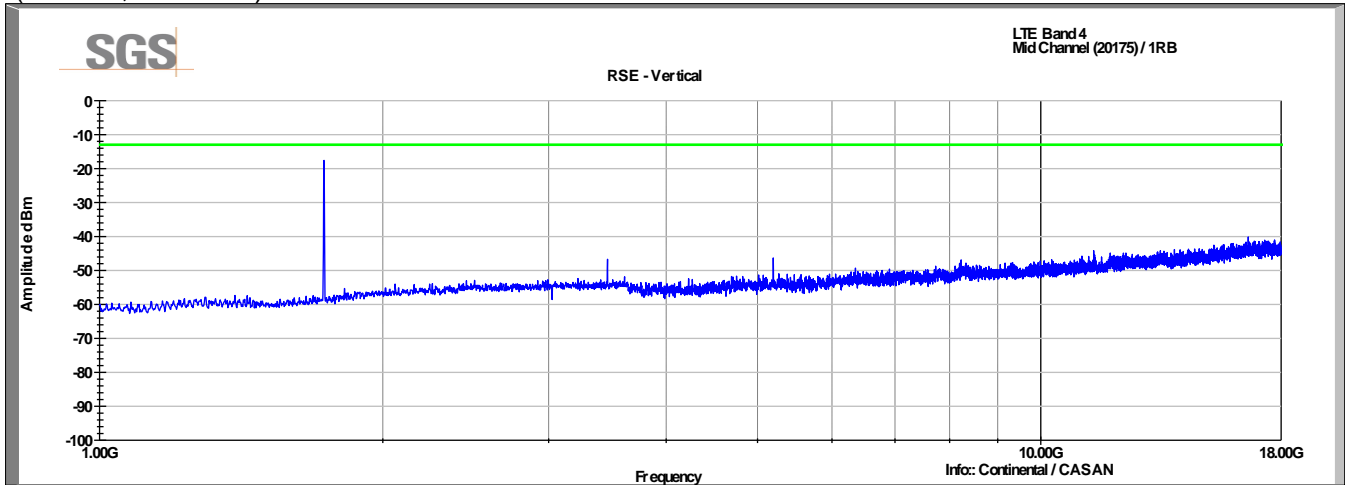
### Band 4 – Mid Channel (Vertical, 30-1000MHz)



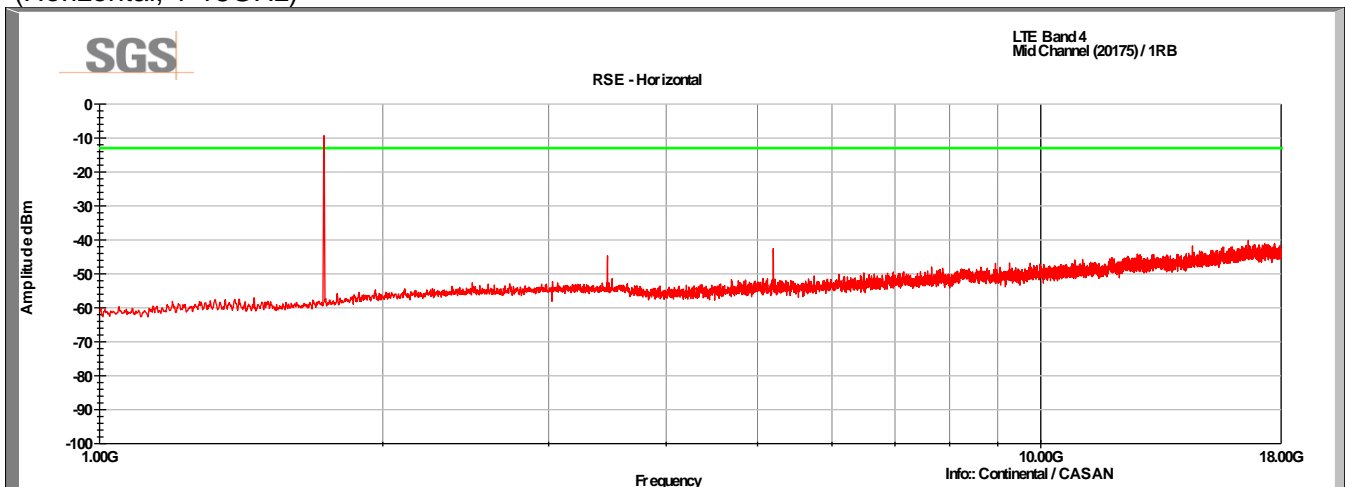
### (Horizontal, 30-1000MHz)



Band 4 – Mid Channel  
(Vertical, 1-18GHz)



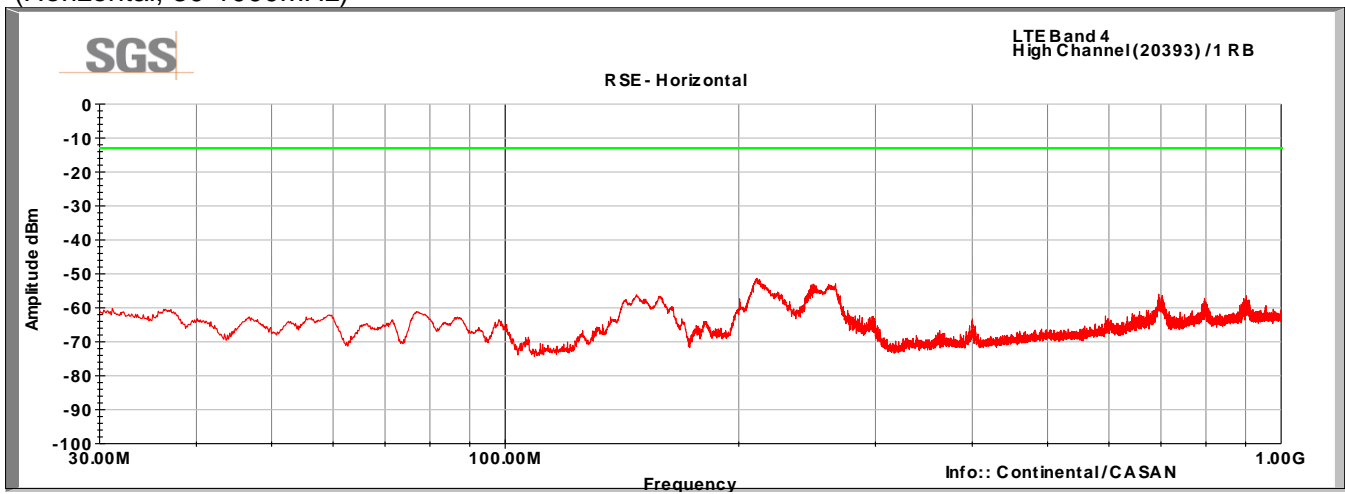
(Horizontal, 1-18GHz)



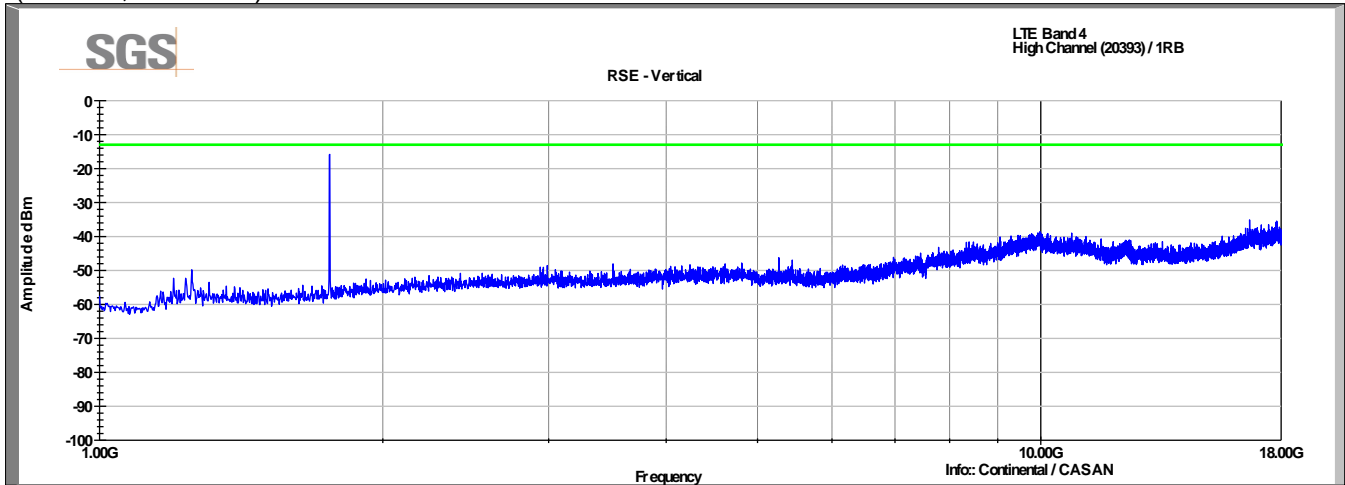
Band 4 – High Channel  
(Vertical, 30-1000MHz)



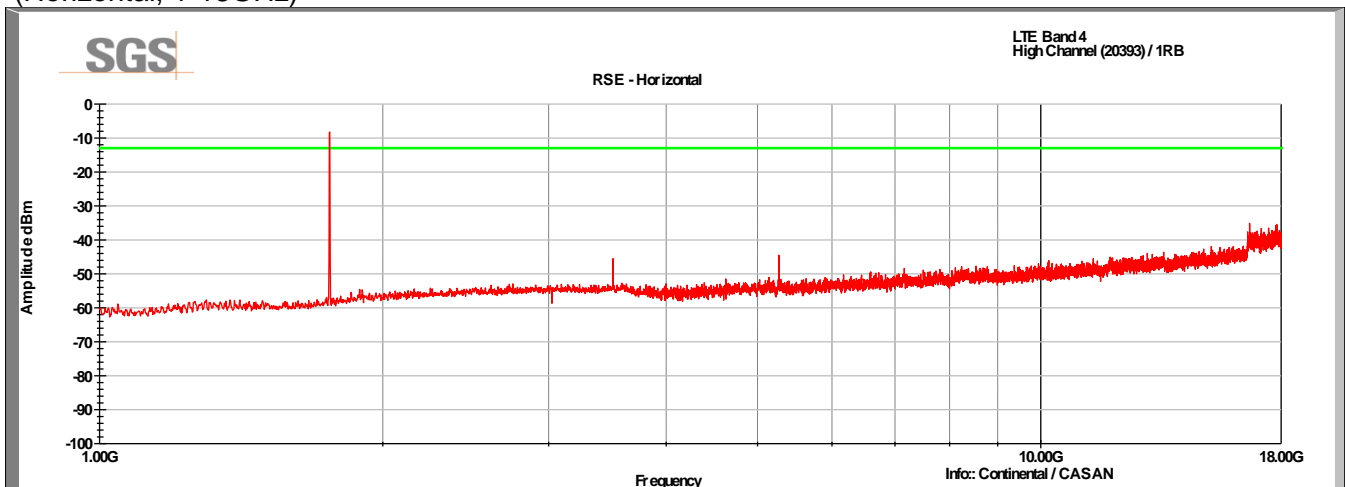
(Horizontal, 30-1000MHz)



Band 4 – High Channel  
(Vertical, 1-18GHz)

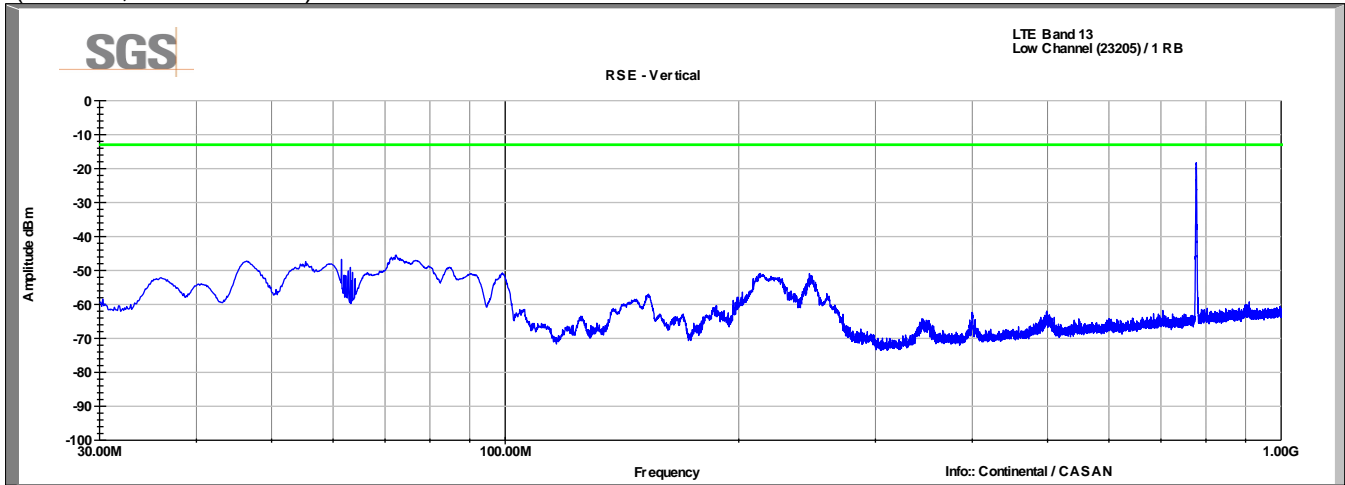


(Horizontal, 1-18GHz)

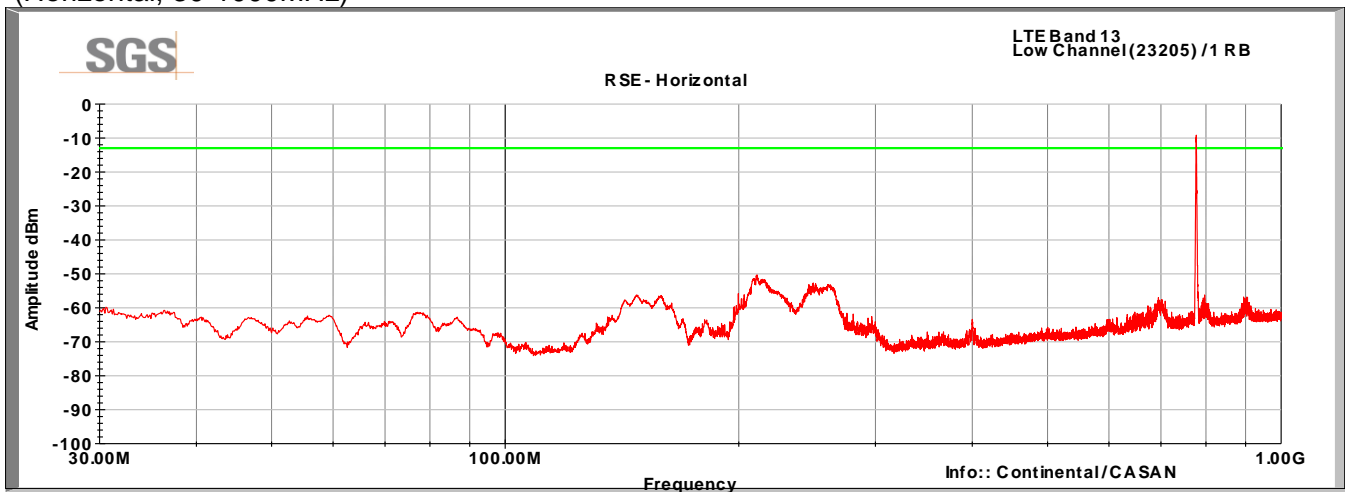




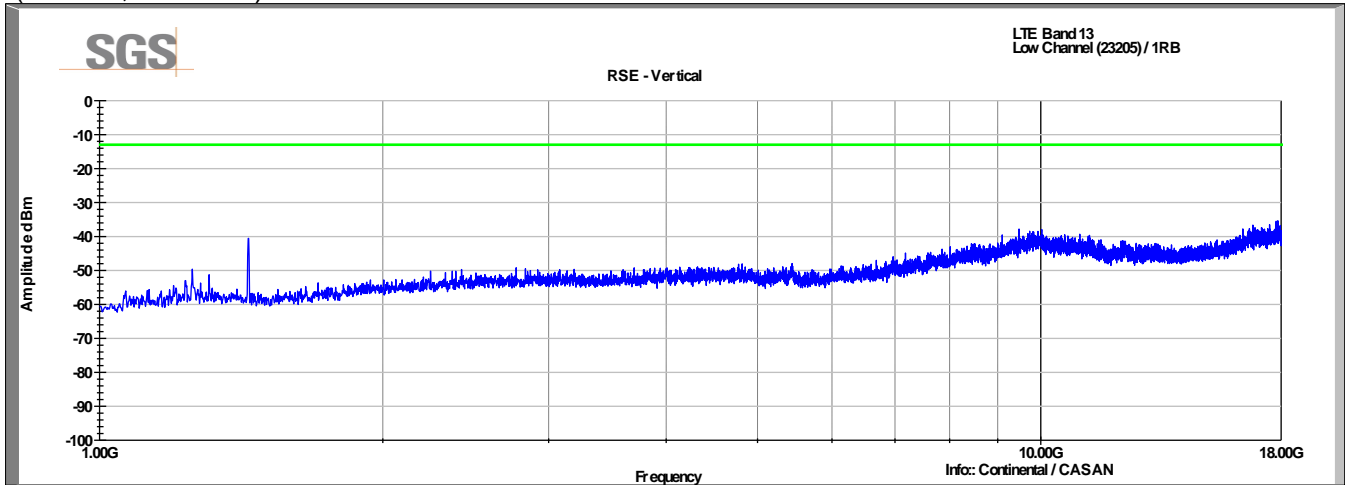
### Band 13 – Low Channel (Vertical, 30-1000MHz)



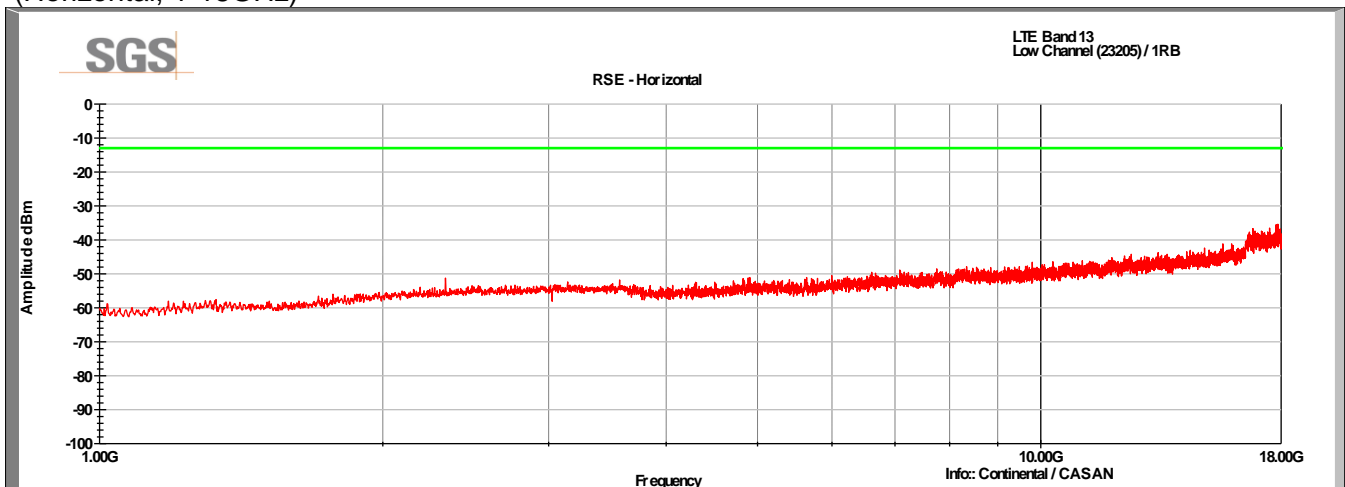
### (Horizontal, 30-1000MHz)



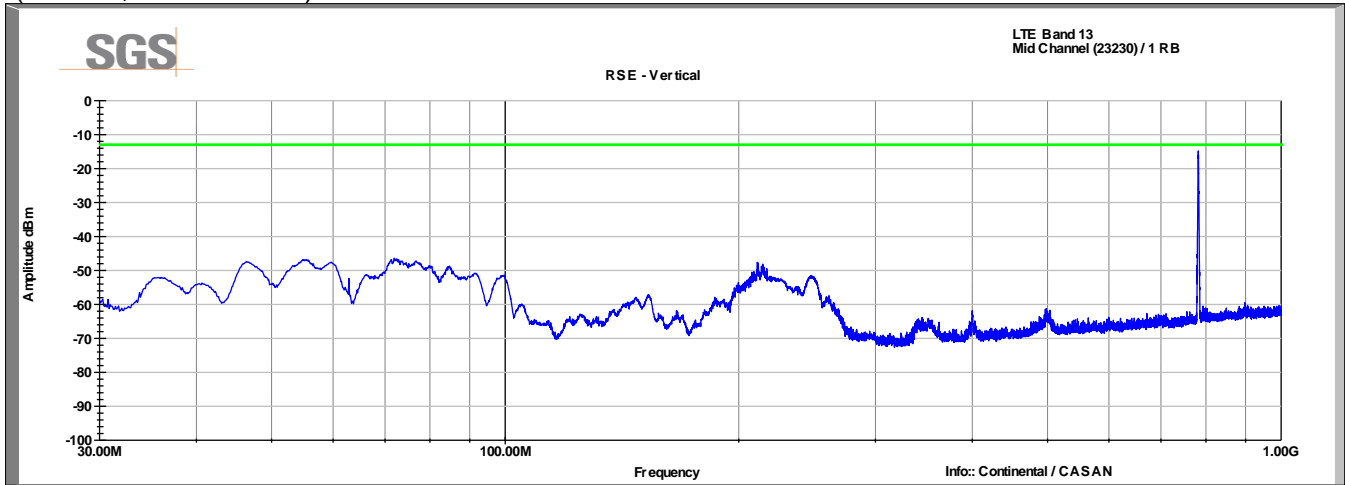
Band 13 – Low Channel  
(Vertical, 1-18GHz)



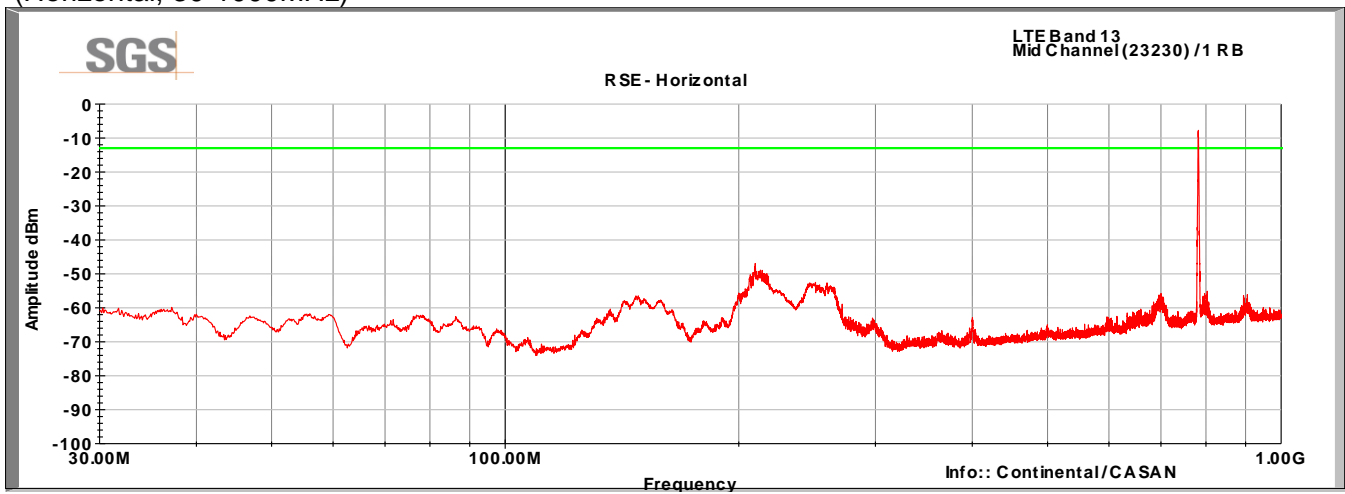
(Horizontal, 1-18GHz)



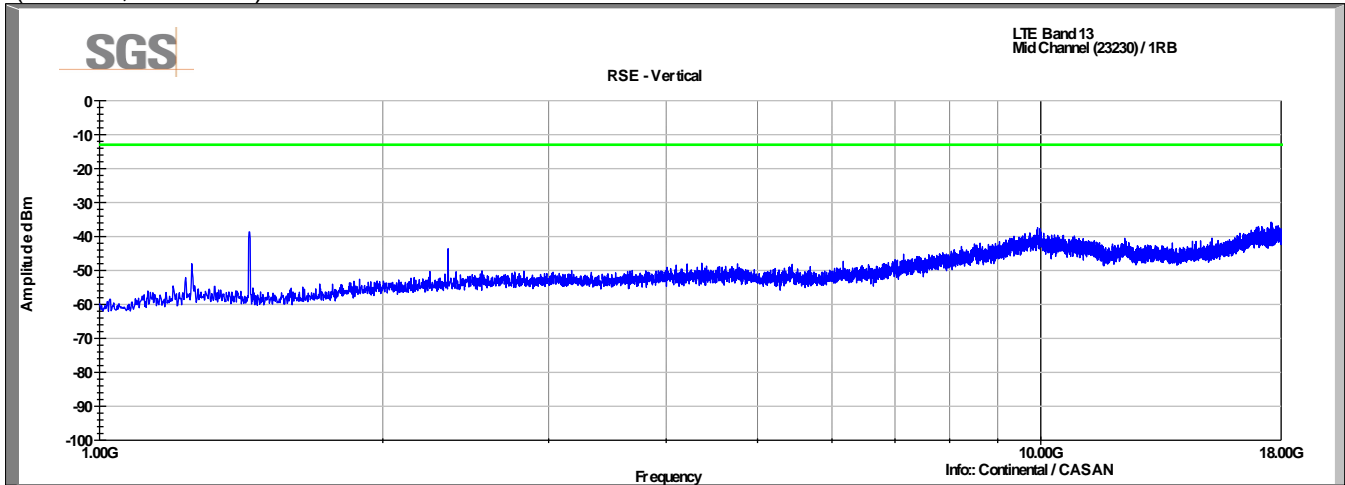
Band 13 – Mid Channel  
(Vertical, 30-1000MHz)



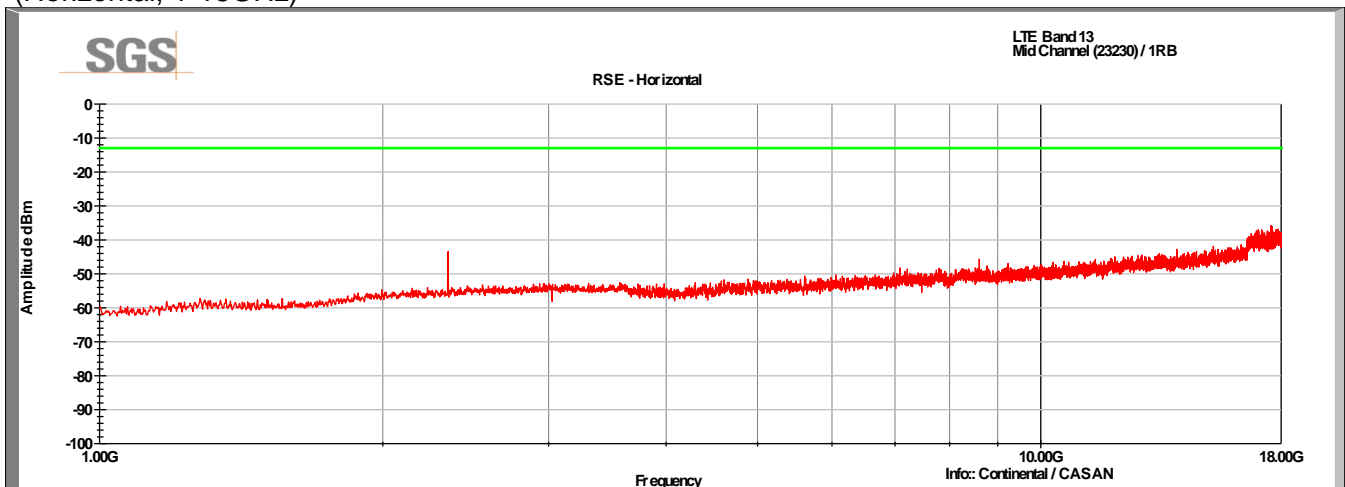
(Horizontal, 30-1000MHz)



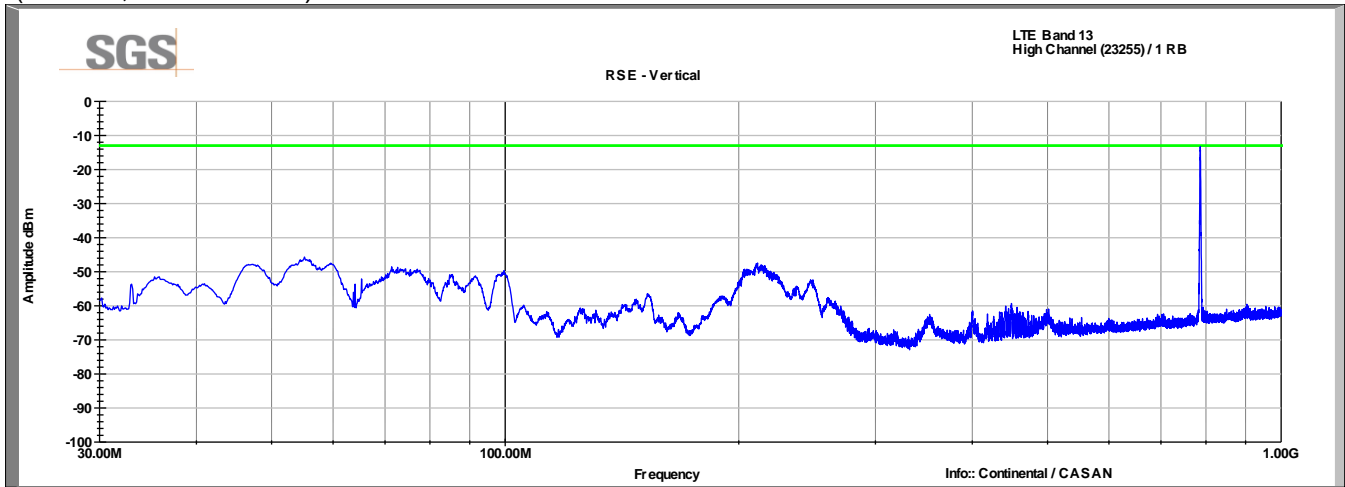
### Band 13 – Mid Channel (Vertical, 1-18GHz)



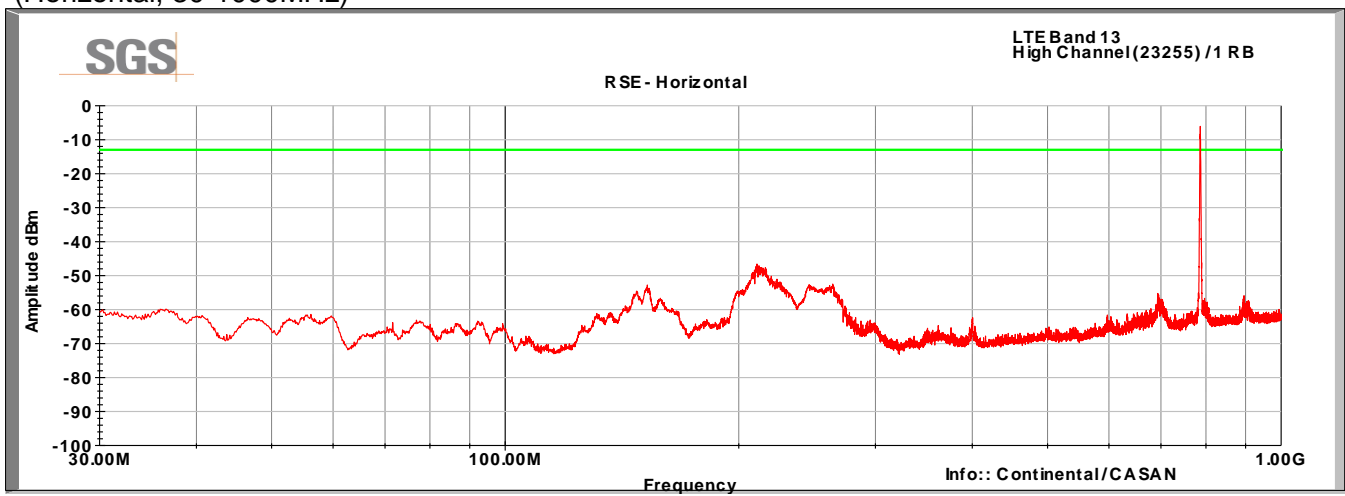
### (Horizontal, 1-18GHz)



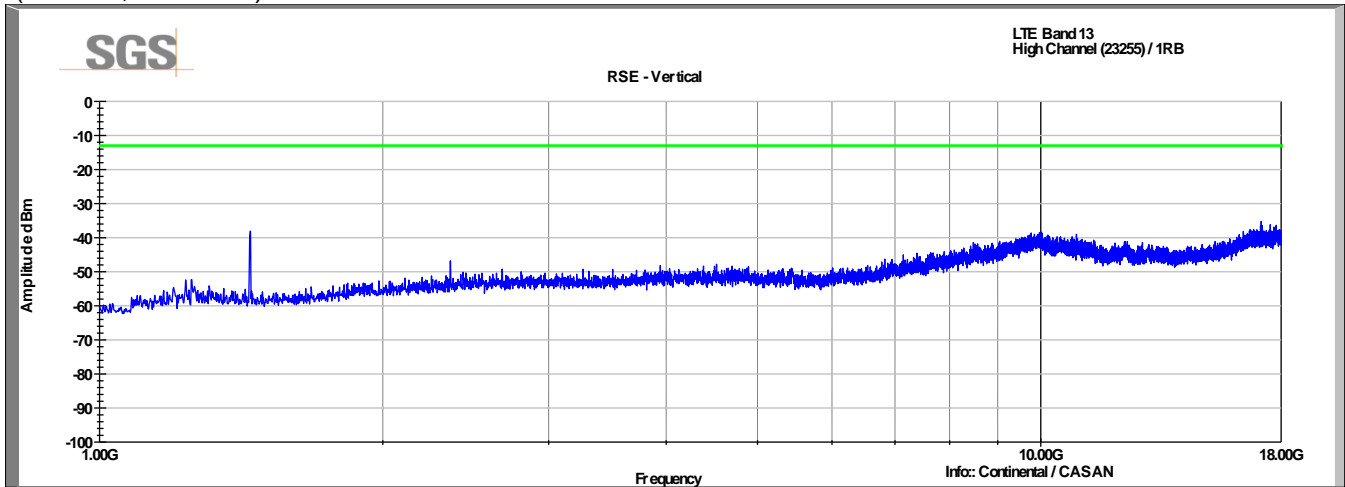
### Band 13 – High Channel (Vertical, 30-1000MHz)



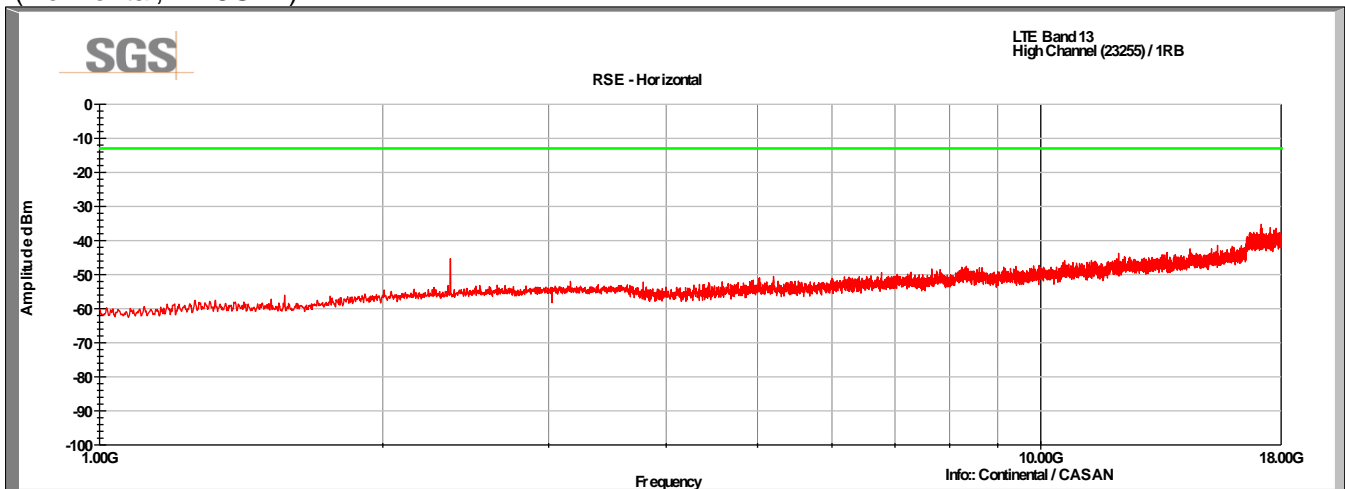
### (Horizontal, 30-1000MHz)



## Band 13 – High Channel (Vertical, 1-18GHz)



## (Horizontal, 1-18GHz)



## 9 Frequency Stability

### 9.1 Test Result

Test Description	Basic Standards	Test Result
Frequency Stability	2.1055 27.5(b) 27.5(h) 27.54 RSS-139 6.3	Pass

### 9.2 Test Method

The EUT was placed inside the Environmental Chamber and was left inside chamber to stabilize to set temperature for minimum of thirty minutes before any measurements were made. The EUT was tested at Band 4 channel 20175 and Band 13 channel 23230.

### 9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

### 9.4 Test Equipment

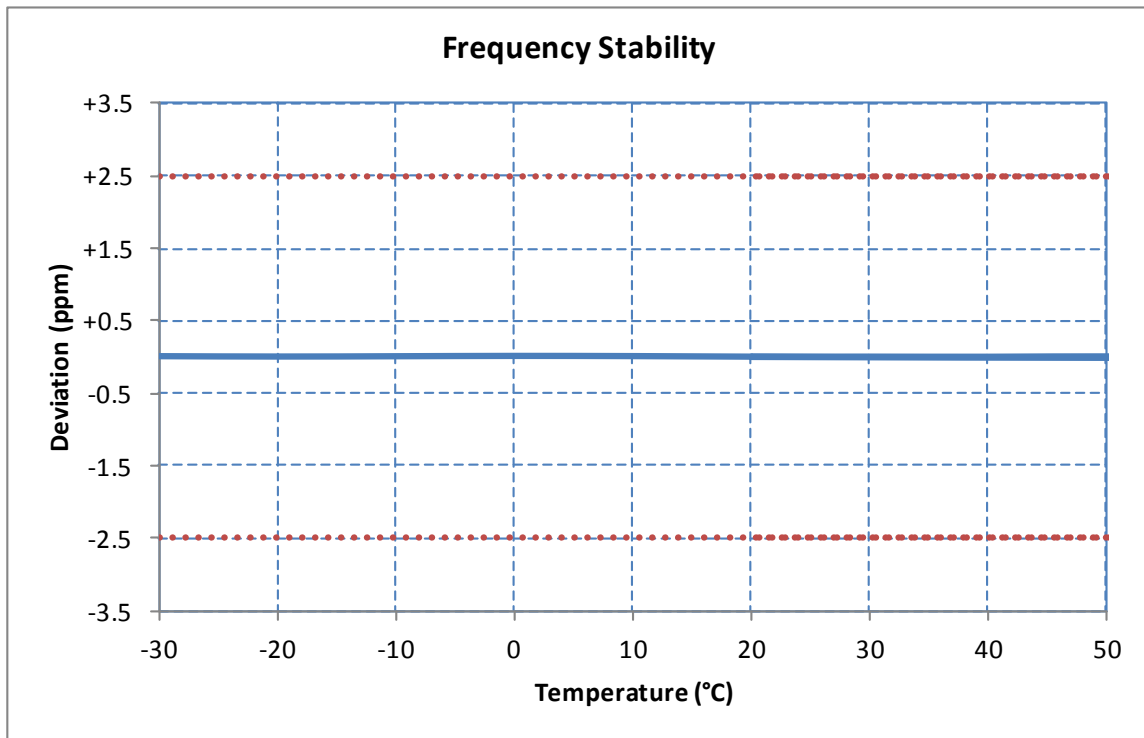
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
CMW500 WIDEBAND RADIO COMMUNICATIONS TESTER	CMW500	ROHDE & SCHWARZ	B085757	29-Oct-2014
ENVIRONMENTAL CHAMBER	SM-16-8200	THERMOTRON	B079728	5-Aug-2015

- Unless otherwise noted, equipment is on a 1 year calibration cycle.
- Based on manufacturer's specifications, the CMW-500 is on a 3 year calibration cycle.

### 9.5 Test Data

#### Band 4, Channel 20175

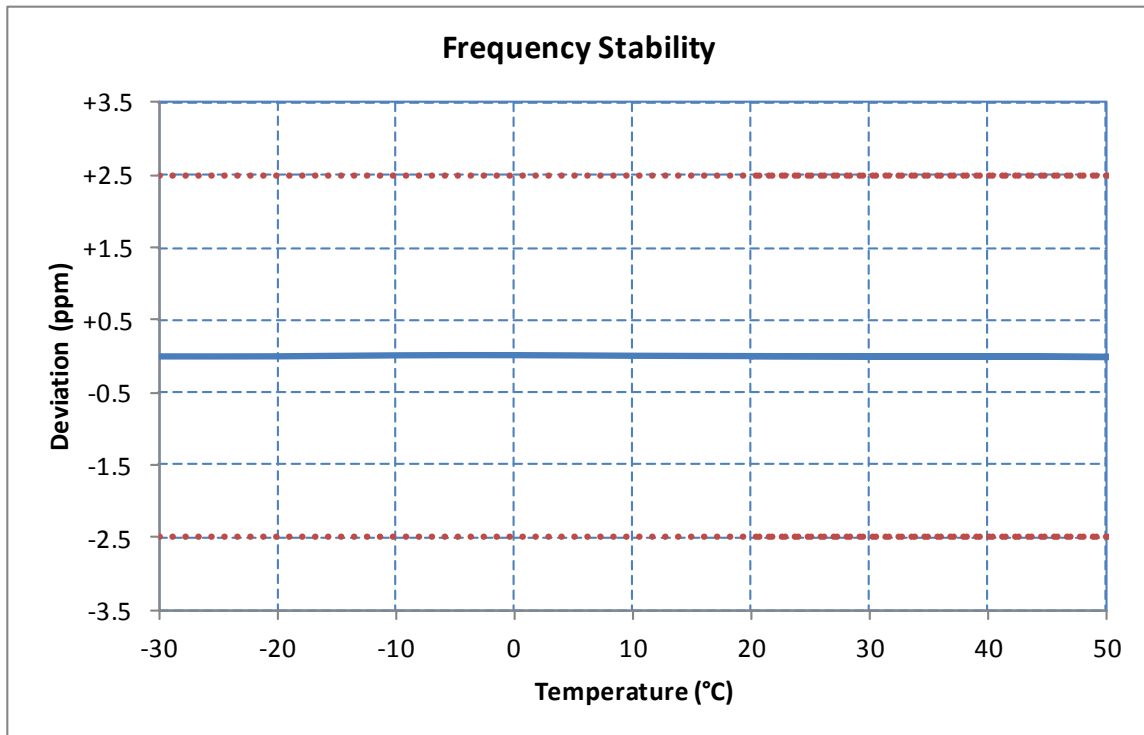
Voltage %	Power V <sub>DC</sub>	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	12.00	+20 (Ref)	1,732,500,000	+0	+0.00	+0.000000
100%	12.00	-30	1,732,500,003	+3	+0.00	+0.000000
100%	12.00	-20	1,732,500,002	+2	+0.00	+0.000000
100%	12.00	-10	1,732,500,003	+3	+0.00	+0.000000
100%	12.00	0	1,732,500,004	+4	+0.00	+0.000000
100%	12.00	+10	1,732,500,003	+3	+0.00	+0.000000
100%	12.00	+20	1,732,500,002	+2	+0.00	+0.000000
100%	12.00	+30	1,732,500,002	+2	+0.00	+0.000000
100%	12.00	+40	1,732,500,002	+2	+0.00	+0.000000
100%	12.00	+50	1,732,500,002	+2	+0.00	+0.000000
100%	12.00	+55	1,732,499,999	-1	-0.00	-0.000000
100%	13.80	+20	1,732,500,001	+1	+0.00	+0.000000
100%	10.20	+20	1,732,500,001	+1	+0.00	+0.000000





Band 13, Channel 23230 (782.0MHz)

Voltage %	Power V <sub>DC</sub>	Temp °C	Frequency Hz	Freq Dev Hz	Freq Dev ppm	Deviation %
100%	12.00	+20 (Ref)	782,000,000	+0	+0.00	+0.000000
100%	12.00	-30	781,999,999	-1	-0.00	-0.000000
100%	12.00	-20	781,999,999	-1	-0.00	-0.000000
100%	12.00	-10	782,000,002	+2	+0.00	+0.000000
100%	12.00	0	782,000,002	+2	+0.00	+0.000000
100%	12.00	+10	782,000,001	+1	+0.00	+0.000000
100%	12.00	+20	782,000,000	-0	-0.00	-0.000000
100%	12.00	+30	781,999,999	-1	-0.00	-0.000000
100%	12.00	+40	781,999,999	-1	-0.00	-0.000000
100%	12.00	+50	781,999,997	-3	-0.00	-0.000000
100%	12.00	+55	781,999,998	-2	-0.00	-0.000000
100%	13.80	+20	782,000,000	-0	-0.00	-0.000000
100%	10.20	+20	781,999,999	-1	-0.00	-0.000000



## 10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	11 Sept 2014
1	<ul style="list-style-type: none"> <li>- ANSI/TIA-603-C-2004 reference added to page 33</li> <li>- Added frequency column to power tables, pages 7-12</li> <li>- Added test equipment calibration cycle info to pages 6, 13, 16, 25, 34, 47</li> </ul>	03 October 2014