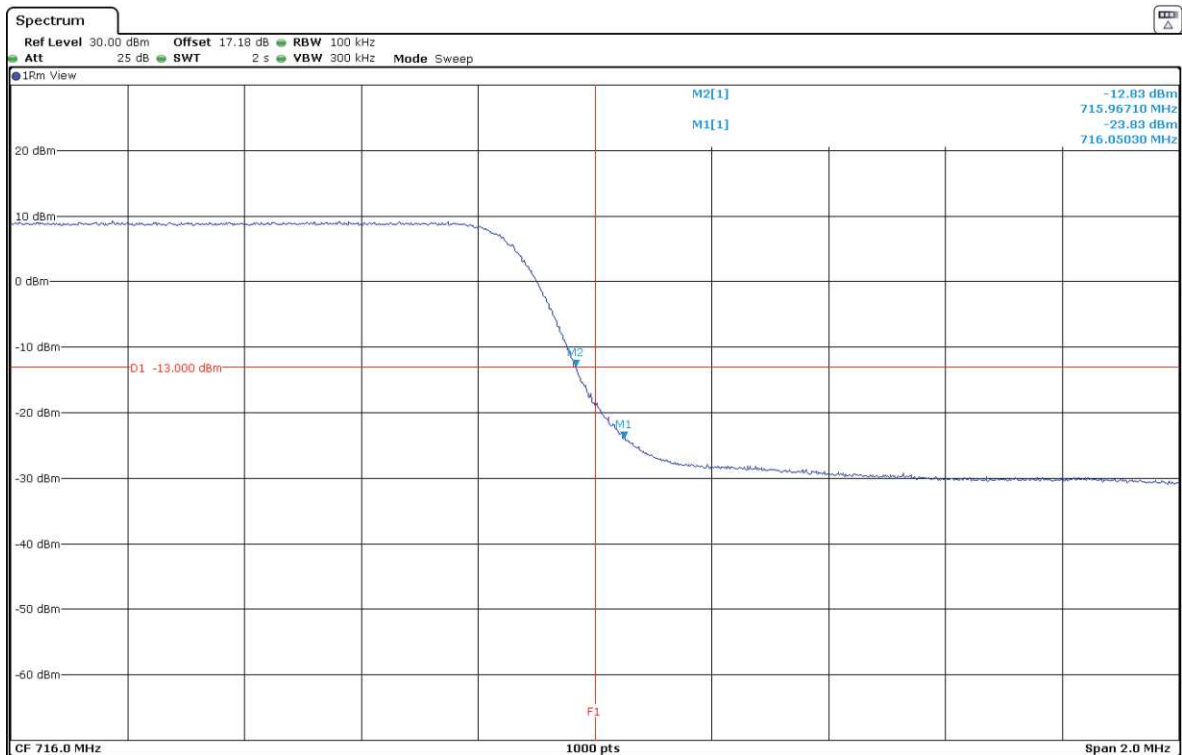
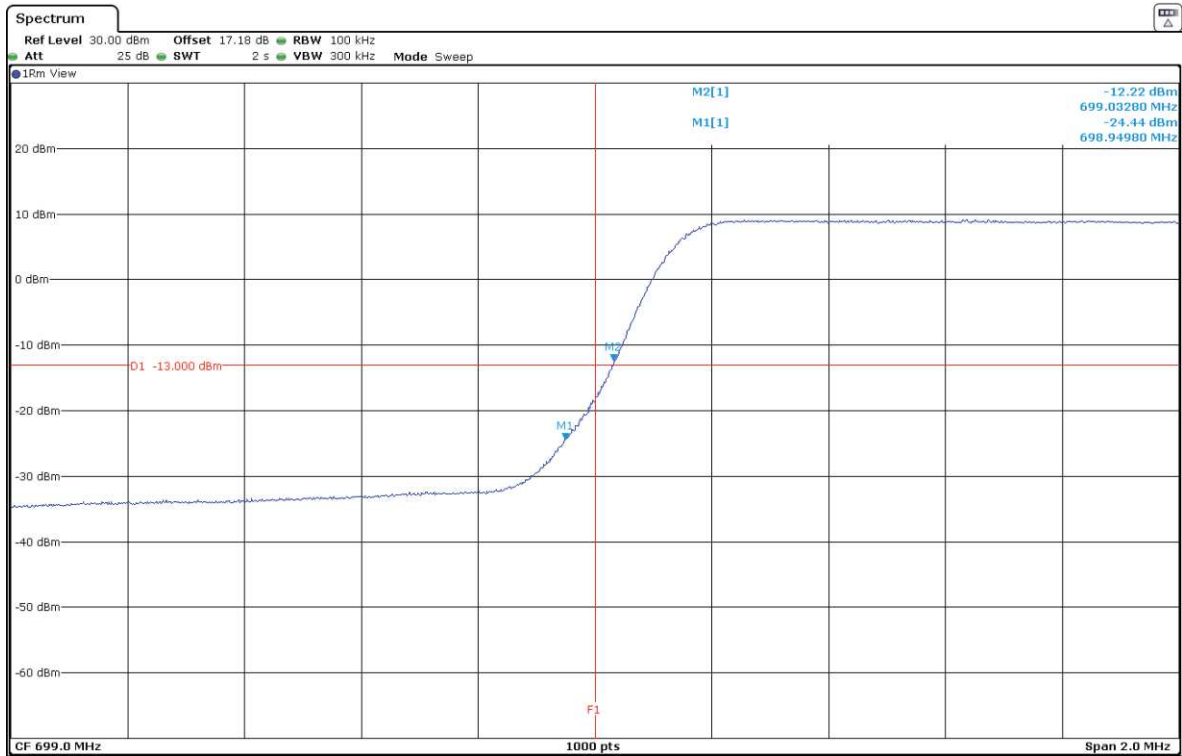
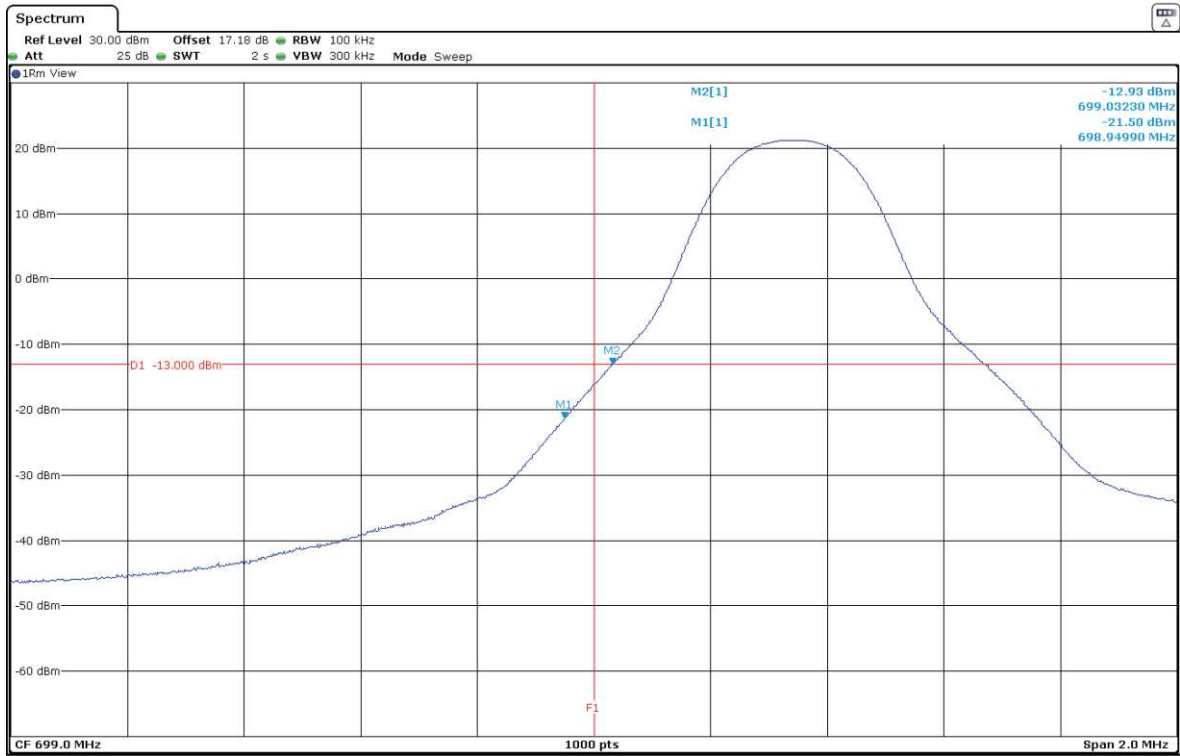


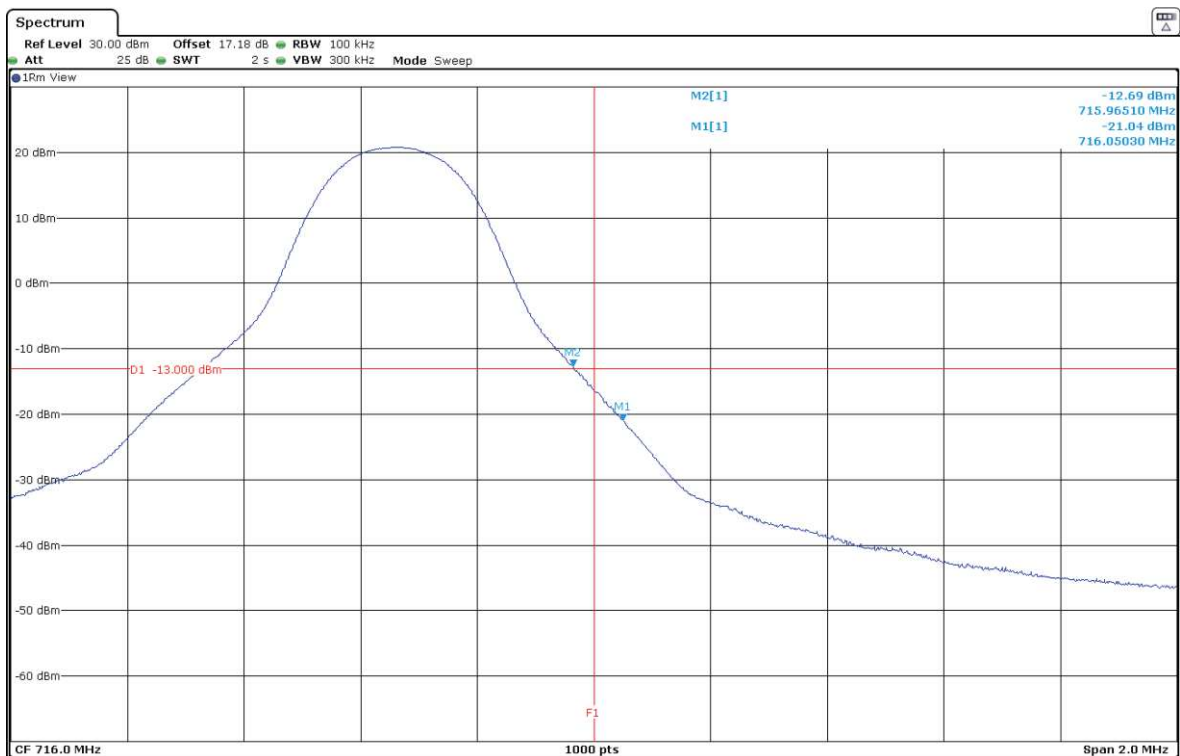
LTE Band 12. QPSK MODULATION. BW=3 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:



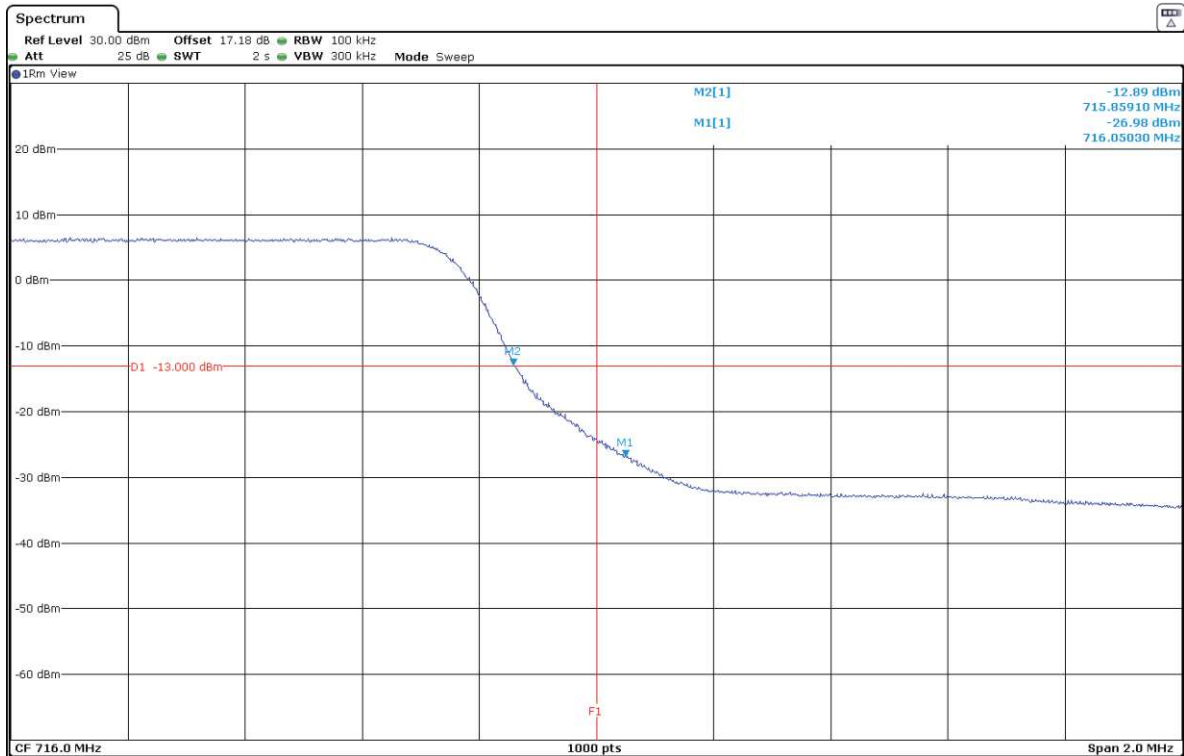
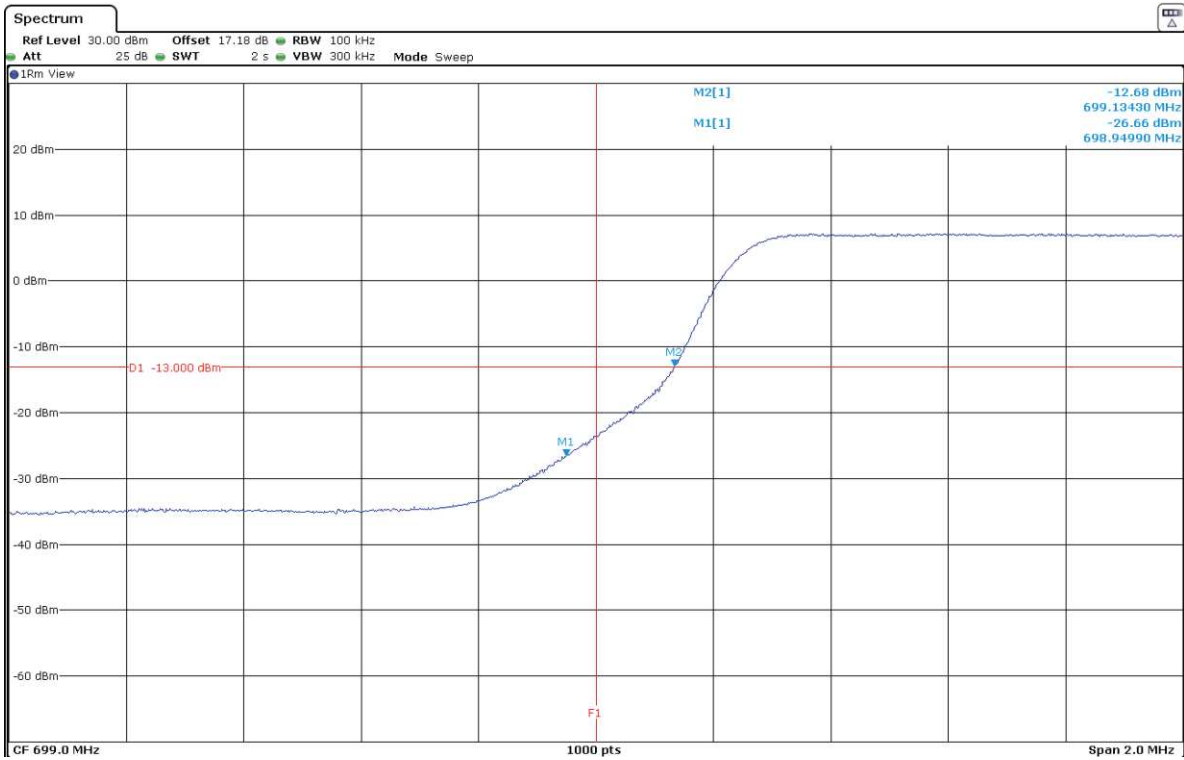
LTE Band 12. QPSK MODULATION. BW=5 MHz. RB=1. Offset=0. Lowest Block Edge:



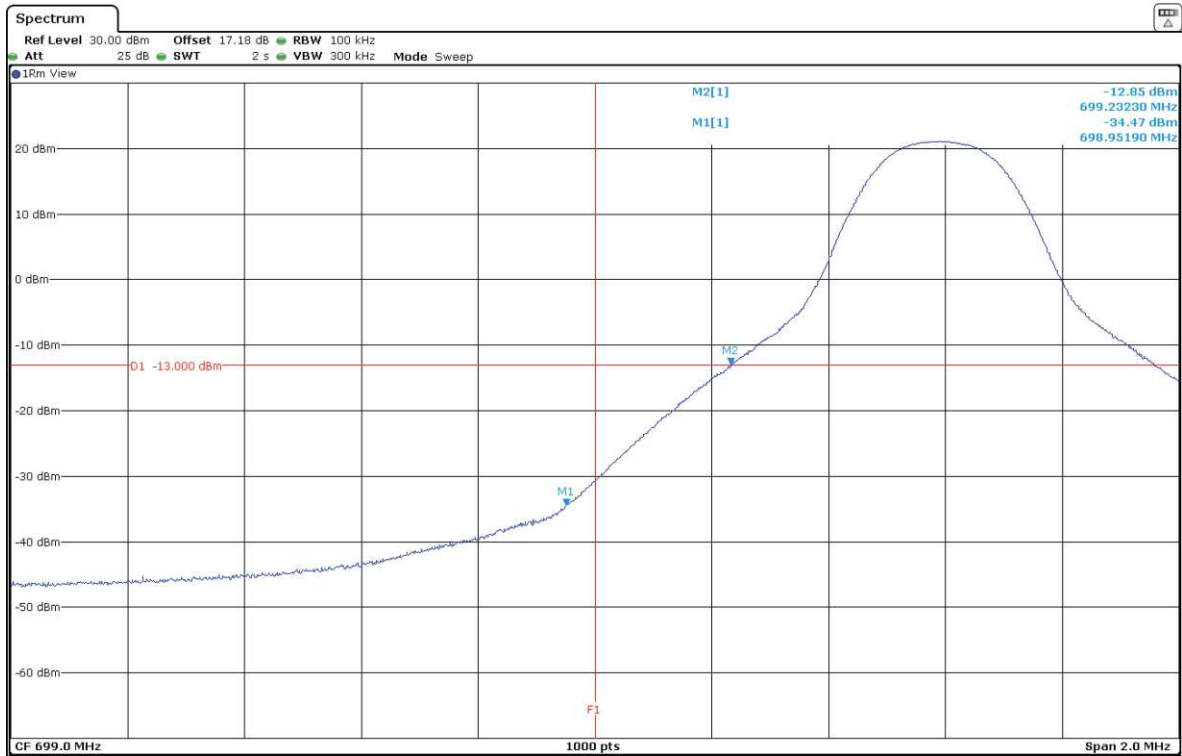
LTE Band 12. QPSK MODULATION. BW=5 MHz. RB=1. Offset=Max. Highest Block Edge:



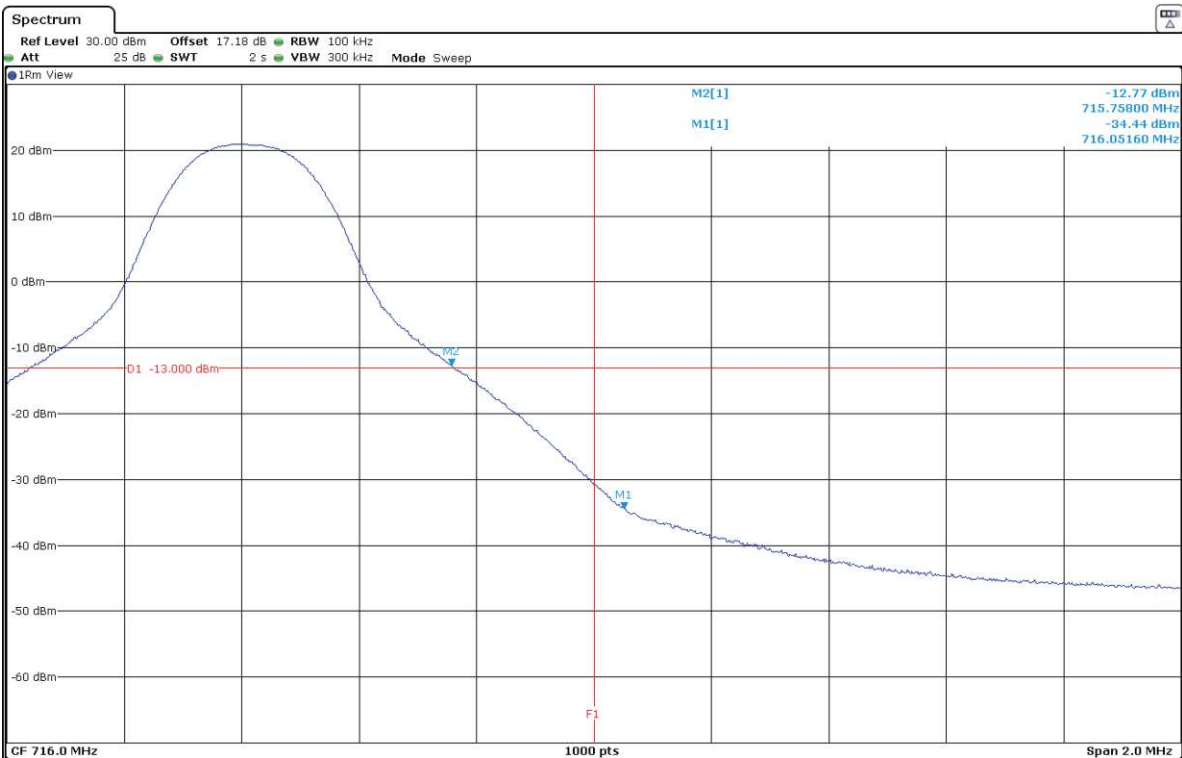
**LTE Band 12. QPSK MODULATION. BW=5 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:**



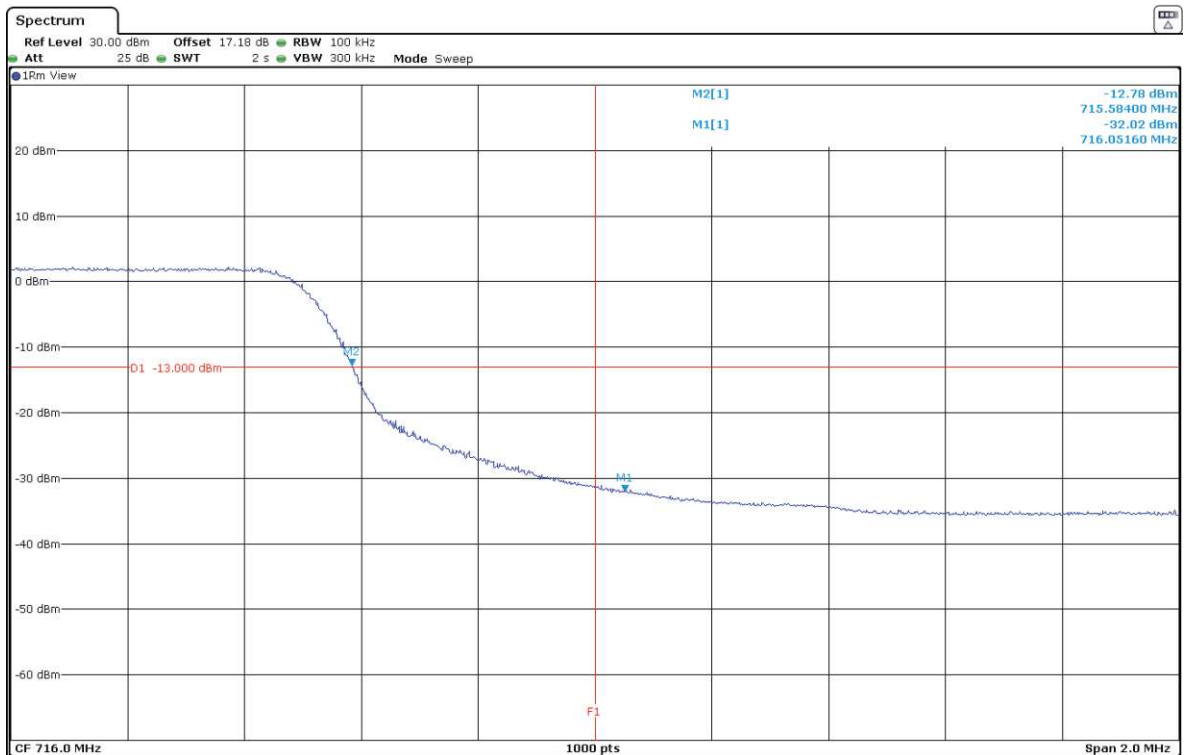
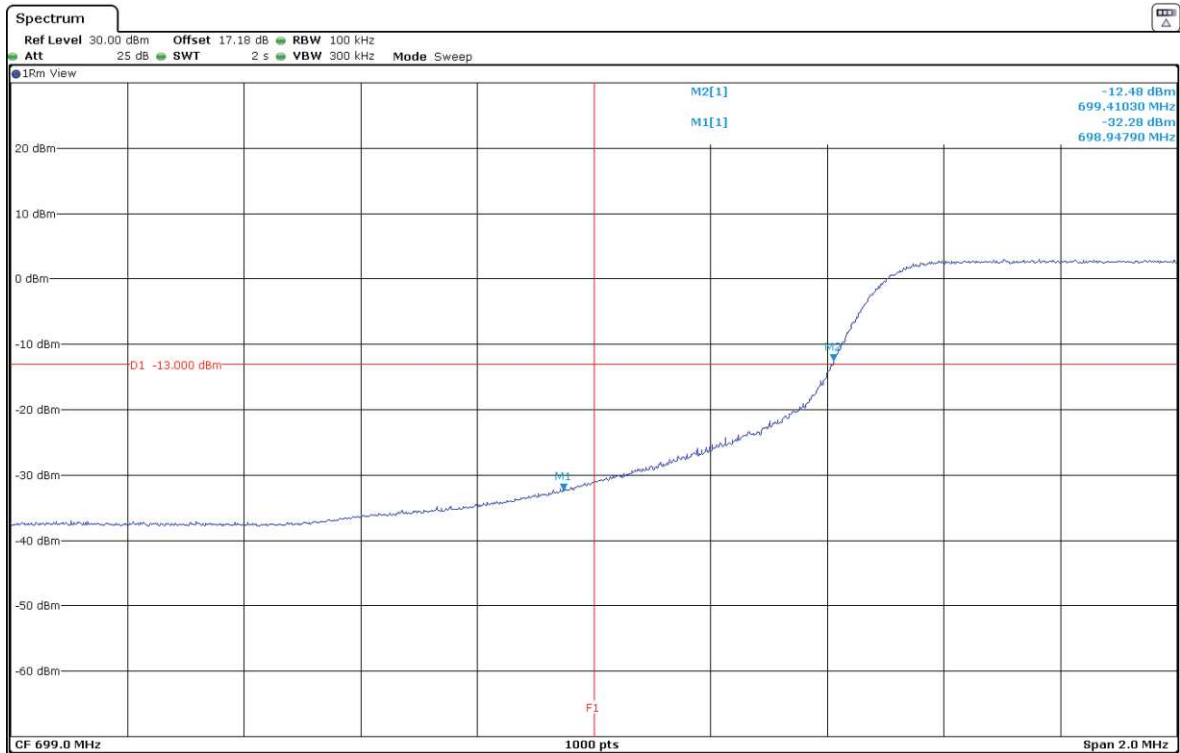
LTE Band 12. QPSK MODULATION. BW=10 MHz. RB=1. Offset=0. Lowest Block Edge:



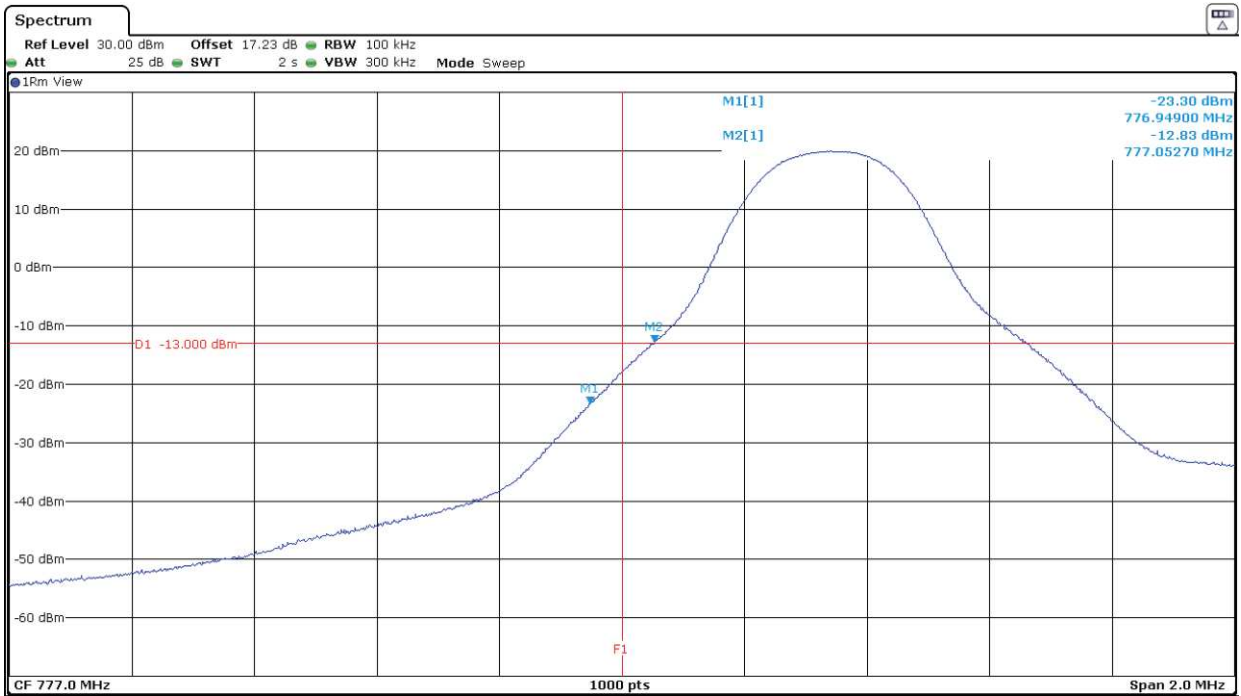
LTE Band 12. QPSK MODULATION. BW=10 MHz. RB=1. Offset=Max. Highest Block Edge:



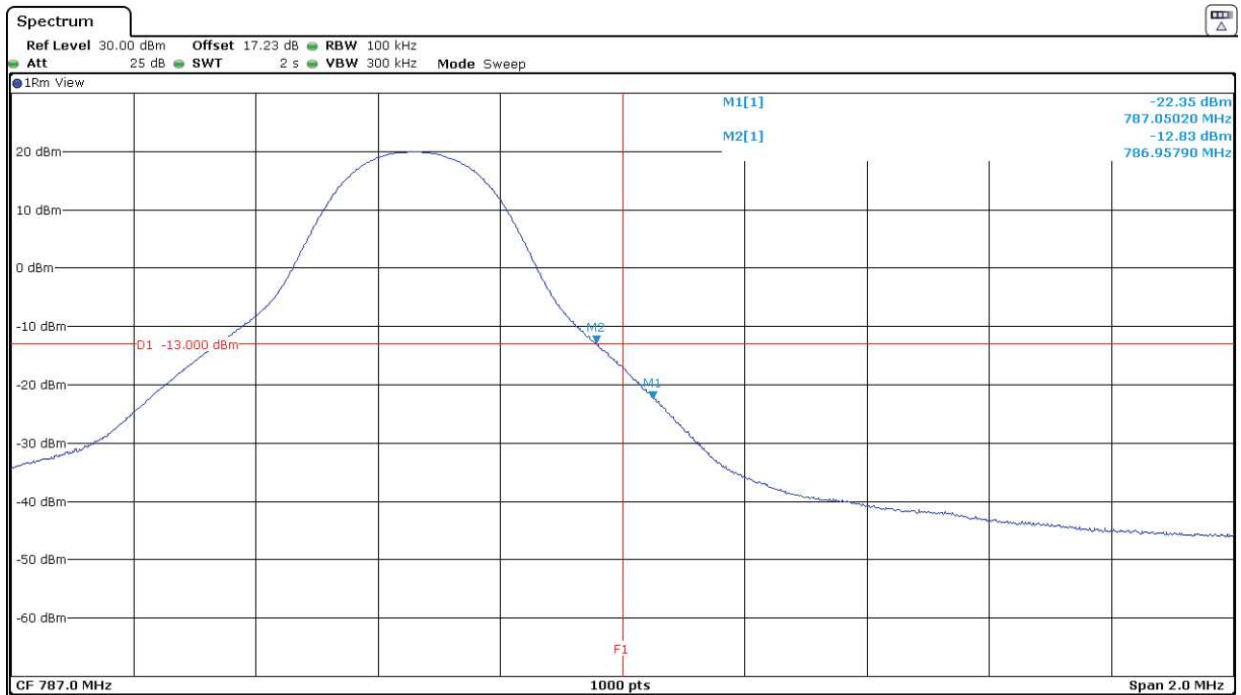
LTE Band 12. QPSK MODULATION. BW=10 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:



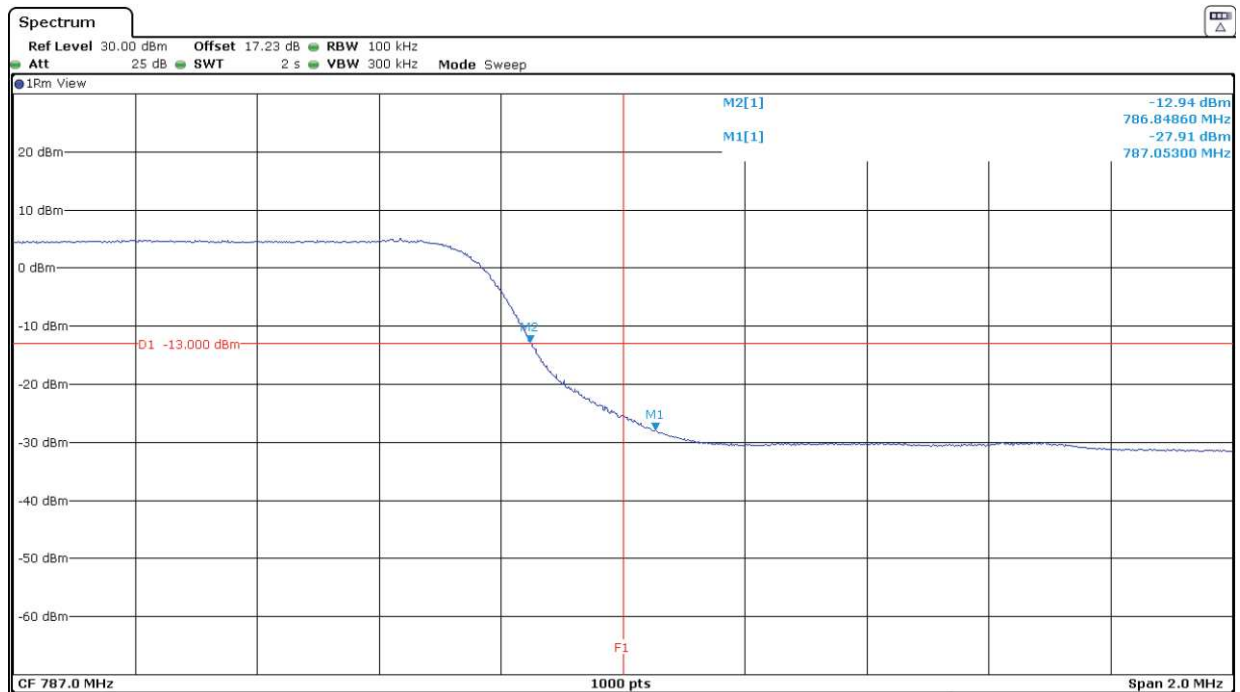
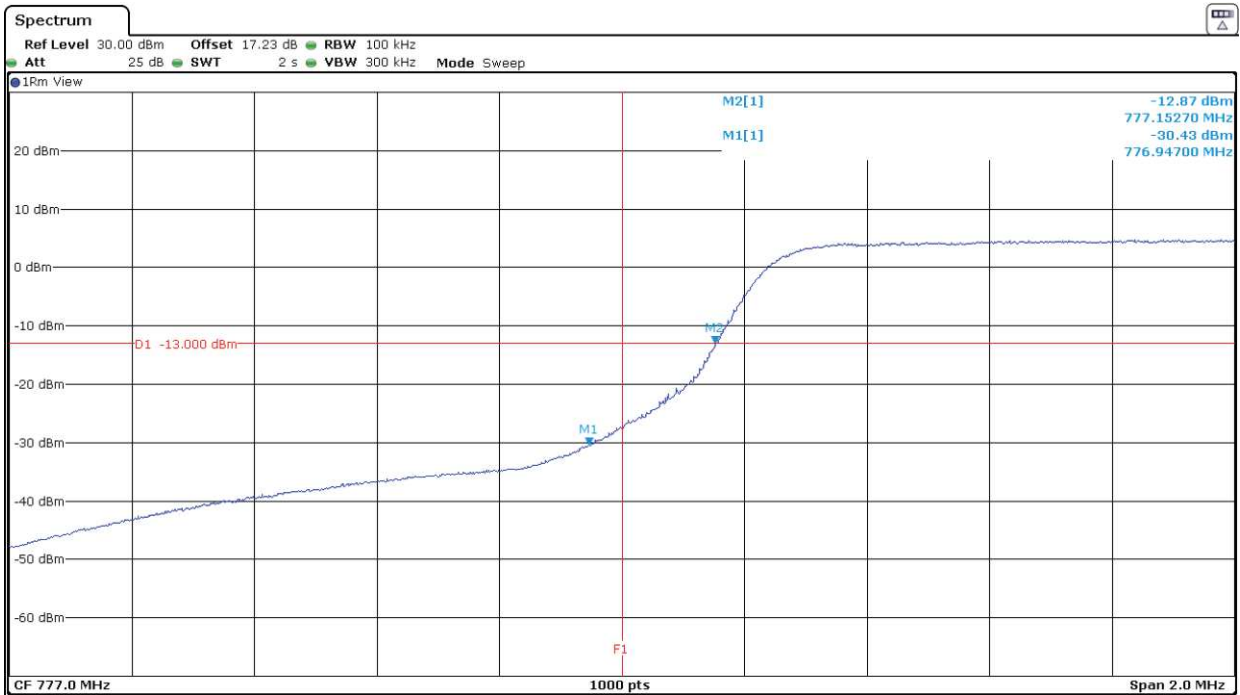
LTE Band 13. QPSK MODULATION. BW=5 MHz. RB=1. Offset=0. Lowest Block Edge:



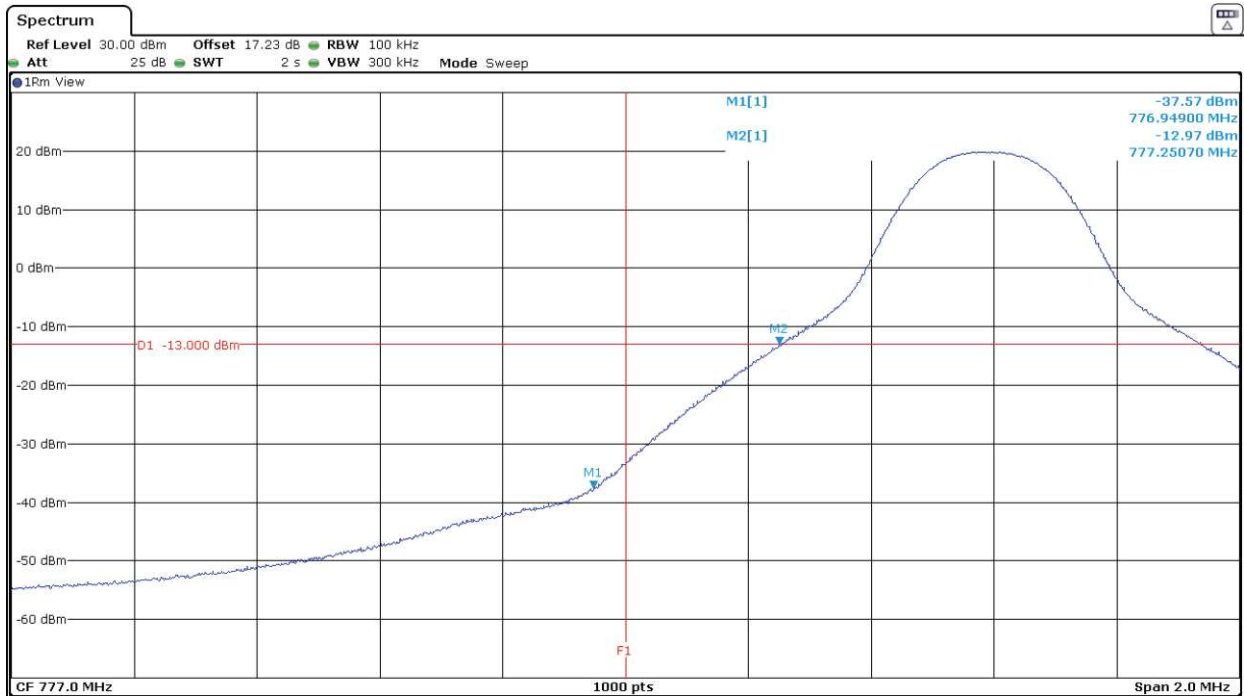
LTE Band 13. QPSK MODULATION. BW=5 MHz. RB=1. Offset=Max. Highest Block Edge:



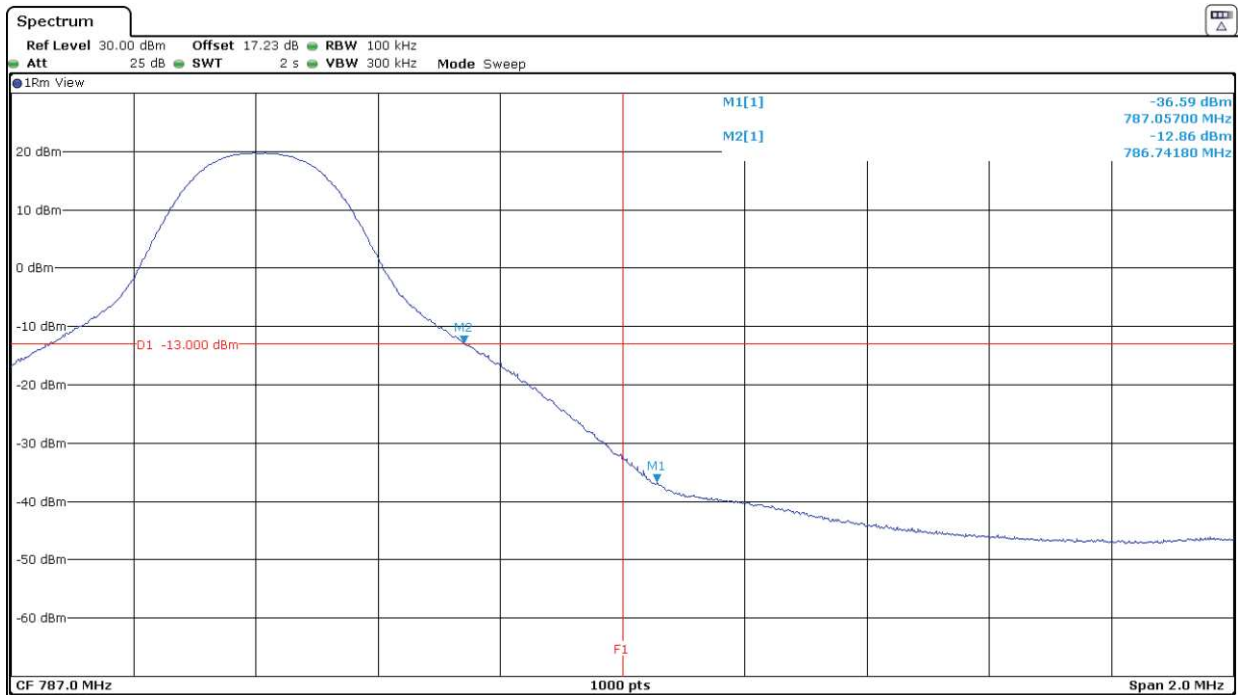
LTE Band 13. QPSK MODULATION. BW=5 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:



LTE Band 13. QPSK MODULATION. BW=10 MHz. RB=1. Offset=0. Lowest Block Edge:

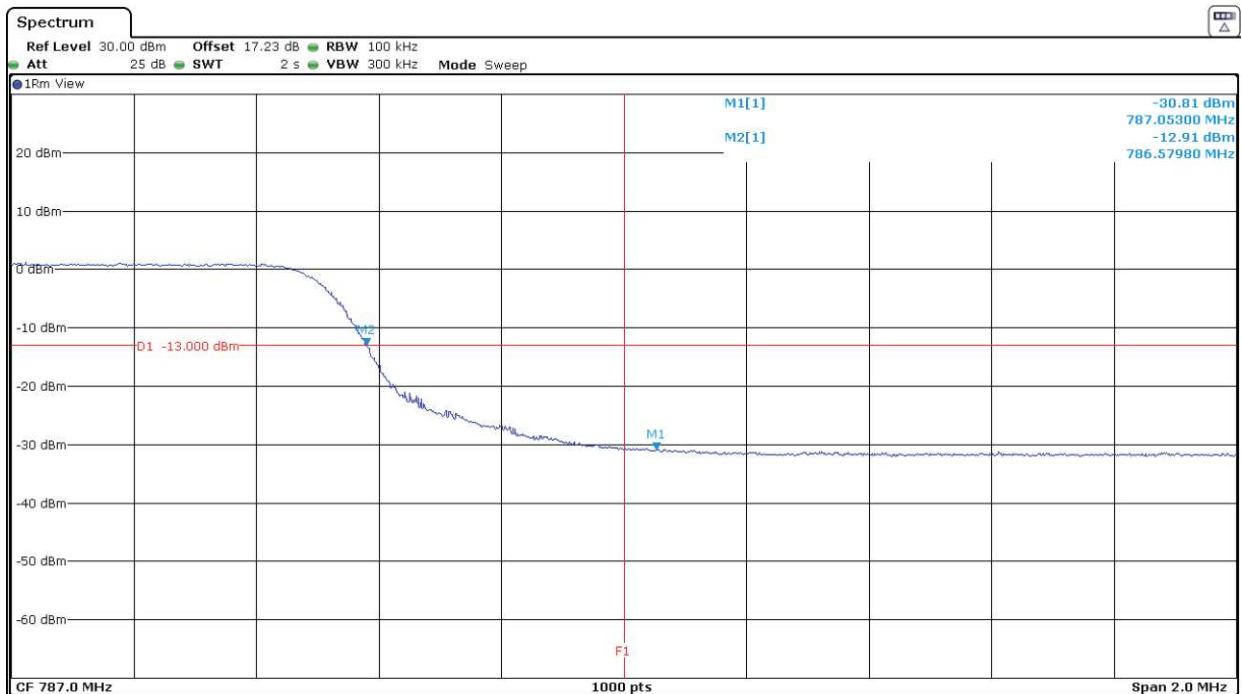
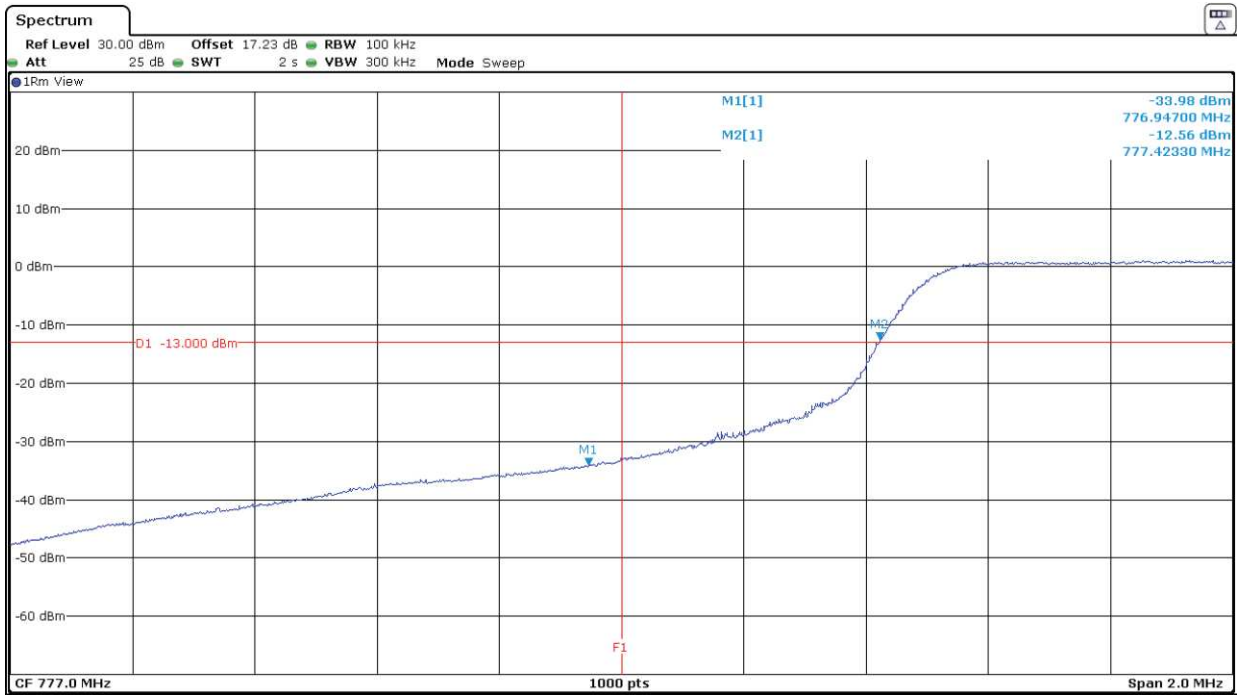


LTE Band 13. QPSK MODULATION. BW=10 MHz. RB=1. Offset=Max. Highest Block Edge:





LTE Band 13. QPSK MODULATION. BW=10 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:



## Radiated emissions

### SPECIFICATION:

#### **1. LTE Band 66 and 3G Band IV.** FCC §2.1053 & §27.53 (h) / RSS-139 Issue 3 Clause 6.6.

##### FCC §27.53 (h):

(h) Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  dB.

##### RSS-139 Clause 6.6:

i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least  $43 + 10 \log_{10} p$  (watts) dB.

ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least  $43 + 10 \log_{10} P$  (watts) dB.

##### LTE Band 66 MEASUREMENT LIMIT:

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43 + 10 \log(P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log(P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

#### **2. LTE Band 7.** FCC §2.1053 & §27.53 (m) (4) / RSS-199 Issue 3 Clause 4.5 (b).

##### FCC §27.53 (m) (4)

(m) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts in accordance with the standards below. If a licensee has multiple contiguous channels, out-of-band emissions shall be measured from the upper and lower edges of the contiguous channels.

(4) For mobile digital stations, the attenuation factor shall be not less than  $40 + 10 \log(P)$  dB on all frequencies between the channel edge and 5 megahertz from the channel edge,  $43 + 10 \log(P)$  dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and  $55 + 10 \log(P)$  dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than  $43 + 10 \log(P)$  dB on all frequencies between 2490.5 MHz and 2496 MHz and  $55 + 10 \log(P)$  dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

## RSS-199 Clause 4.5 (b)

4.5. In the 1 MHz band immediately outside and adjacent to the channel edge, the unwanted emission power shall be measured with a resolution bandwidth of at least 1% of the occupied bandwidth for base station and fixed subscriber equipment, and 2% for mobile subscriber equipment. Beyond the 1 MHz band, a resolution bandwidth of 1 MHz shall be used. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full required measurement bandwidth of 1 MHz, or 1% or 2% of the occupied bandwidth, as applicable.

Equipment shall comply with the following unwanted emission limits:

(b) for mobile subscriber equipment, the power of any unwanted emissions measured as above shall be attenuated (in dB) below the transmitter power, P (dBW), by at least:

40 + 10 log<sub>10</sub> p from the channel edges to 5 MHz away

43 + 10 log<sub>10</sub> p between 5 MHz and X MHz from the channel edges, and

55 + 10 log<sub>10</sub> p at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than 43 + 10 log<sub>10</sub> p on all frequencies between 2490.5 MHz and 2496 MHz, and 55 + 10 log<sub>10</sub> p at or below 2490.5 MHz.

In (b), p is the transmitter power measured in watts and X is 6 MHz or the equipment occupied bandwidth, whichever is greater.

### LTE Band 7 MEASUREMENT LIMIT:

At P<sub>o</sub> transmitting power, the specified minimum attenuation becomes 43+10 log (P<sub>o</sub>), and the level in dBm relative P<sub>o</sub> becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

## 3.LTE Band 12. FCC §2.1053 & §27.53 (g) / RSS-130 Issue 2 Clause 4.7.1.

### FCC §27.53 (g):

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

### RSS-130 Issue 2 Clause 4.7.1:

4.7.1. The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log<sub>10</sub> p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

### LTE Band 12 MEASUREMENT LIMIT:

At P<sub>o</sub> transmitting power, the specified minimum attenuation becomes 43+10 log (P<sub>o</sub>), and the level in dBm relative P<sub>o</sub> becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

#### 4. LTE Band 13. FCC §2.1053 & §27.53 (c) (2) (4) & (f) / RSS-130 Issue 2 Clause 4.6.1.

FCC §27.53 (c) (2) (4) & (f):

(c) (2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10 \log (P)$  dB.

(c) (4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than  $65 + 10 \log (P)$  dB in a 6.25 kHz band segment, for mobile and portable stations.

(f) For operations in the 746-758 MHz, 775-788 MHz, and 805-806 MHz bands, emissions in the band 1559-1610 MHz shall be limited to  $-70$  dBW ( $-40$  dBm)/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and  $-80$  dBW ( $-50$  dBm) EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

RSS-130 Issue 2 Clause 4.7.1:

4.7.1. The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least  $43 + 10 \log_{10} p$  (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.

LTE Band 13 MEASUREMENT LIMIT:

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $43 + 10 \log (P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = -13 \text{ dBm}$$

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $65 + 10 \log (P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [65 + 10 \log (P_o \text{ in mwatts}) - 30] = -35 \text{ dBm}$$

#### METHOD:

The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a 1 meter high non-conductive stand at a 3 meter distance from the measuring antenna.

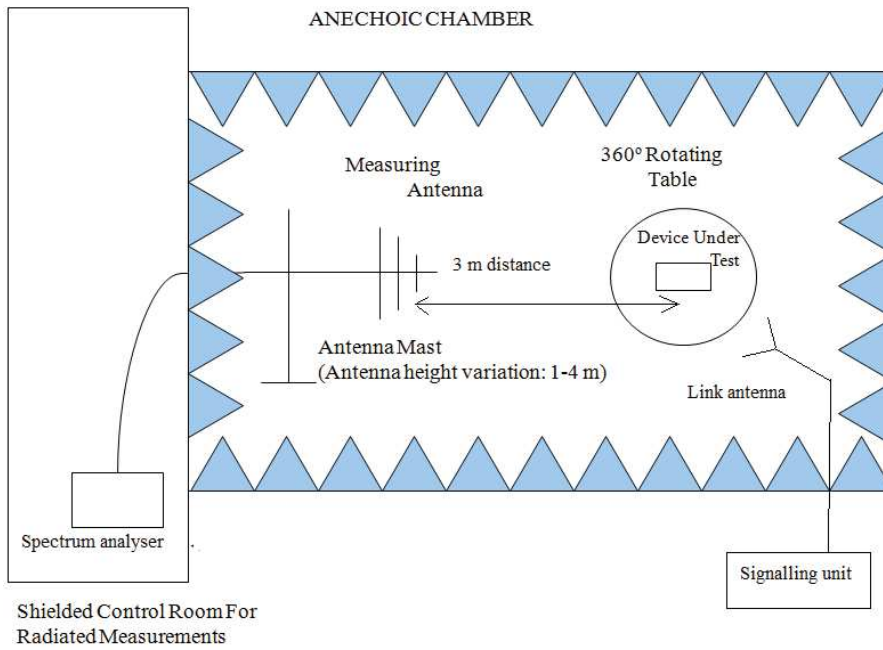
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum field strength (dB $\mu$ V/m) is measured and recorded.

The maximum field strength (dB $\mu$ V/m) of each detected emission at less than 20 dB respect to the limit is converted to an equivalent EIRP level (dBm) according to ANSI C63.26 with the formula:

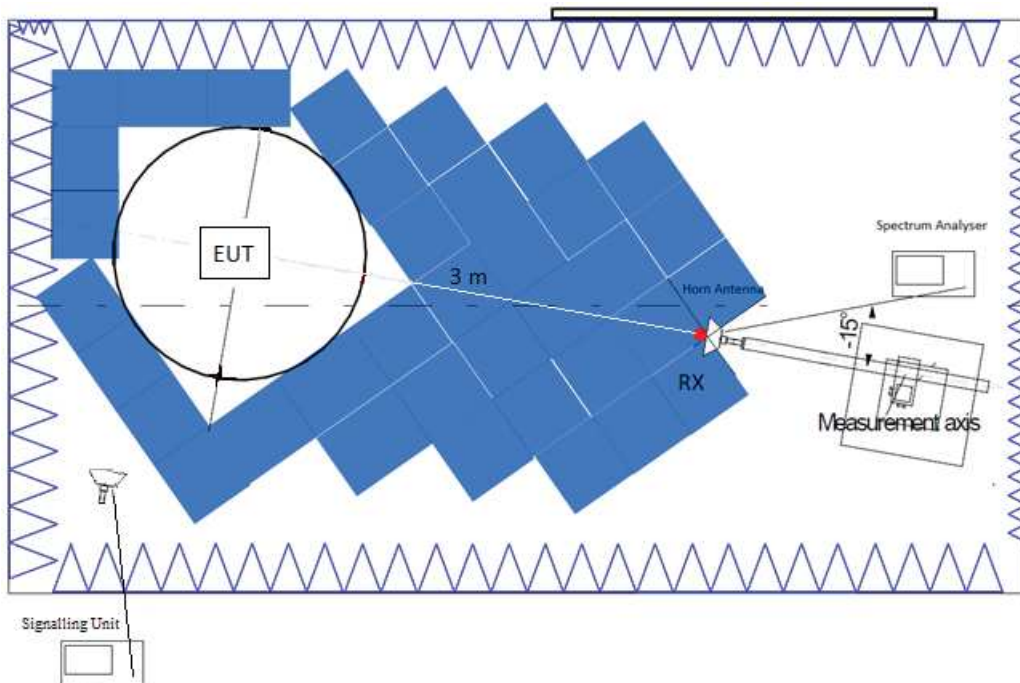
$EIRP \text{ (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20\log(D) - 104.8$ ; where D is the measurement distance (in the far field region) in m. D = 3 m

**TEST SETUP:**

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



RESULTS:

**3G Band IV:**

WCDMA and HSUPA Modulations:

A preliminary scan determined the WCDMA modulation as the worst case. The following tables and plots show the results for WCDMA modulation.

Antenna:

A preliminary scan determined the Tel1 antenna as the worst case. The following tables and plots show the results for Tel1 antenna.

**- Lowest Channel:**

**Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

**Frequency range 1 - 26 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

**- Middle Channel:**

**Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

**Frequency range 1 - 26 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

**- Highest Channel:**

**Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

**Frequency range 1 - 26 GHz**

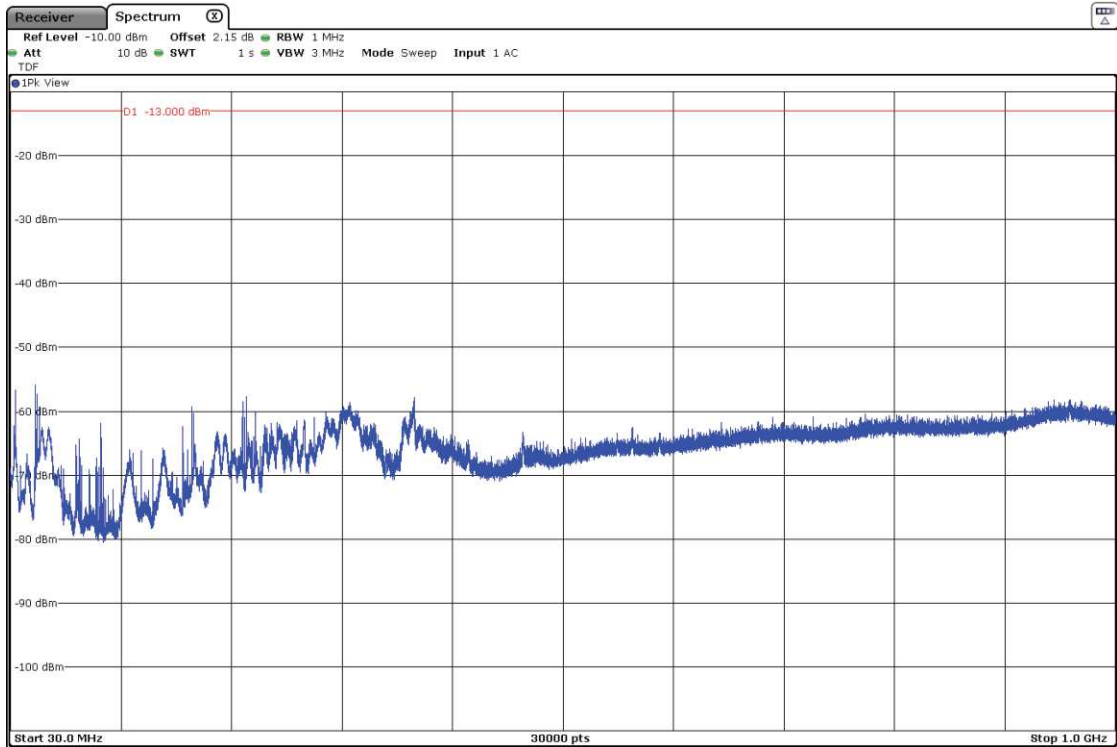
No spurious frequencies detected at less than 20 dB below the limit.

Measurement uncertainty (dB)	<±5.08 for f < 1GHz <±5.13 for f ≥ 1 GHz up to 18 GHz
------------------------------	--

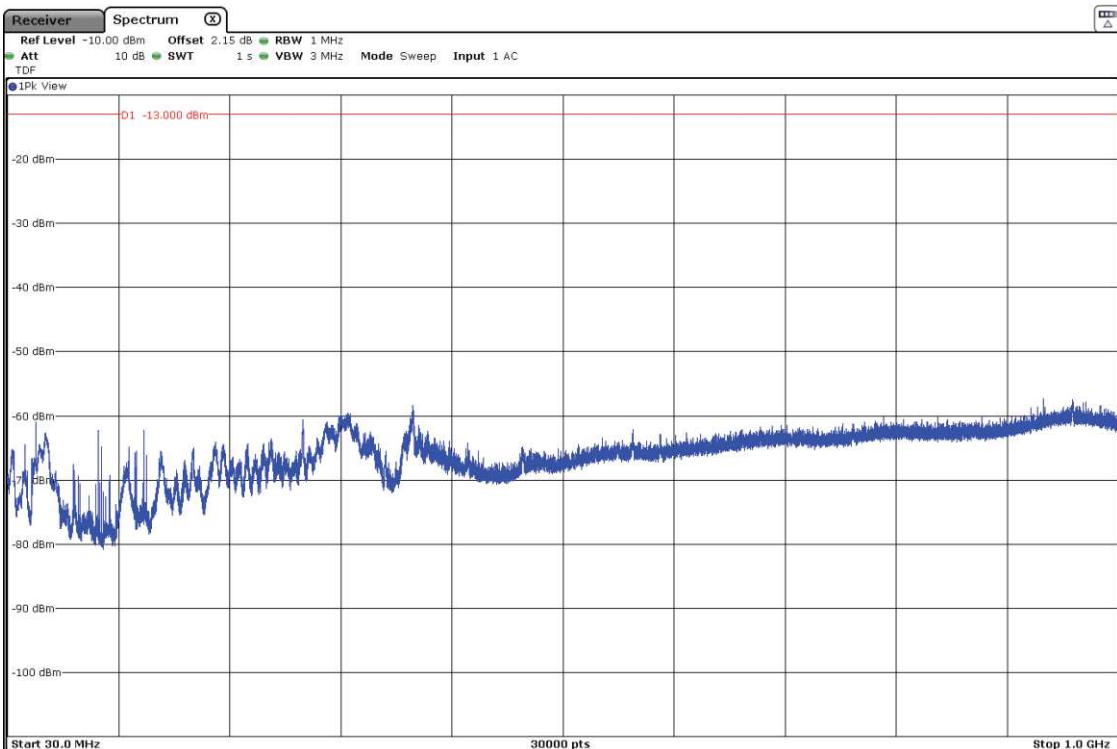
Verdict: PASS

## FREQUENCY RANGE 30 MHz - 1 GHz

- Lowest Channel:

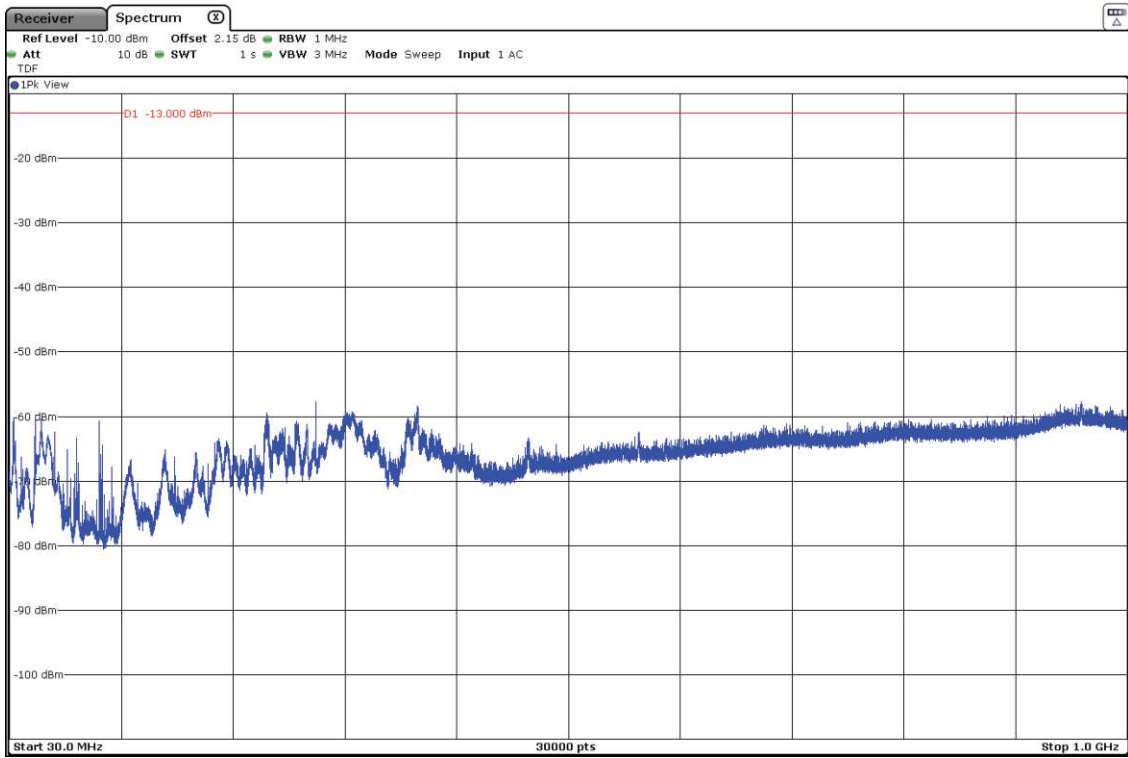


- Middle Channel:





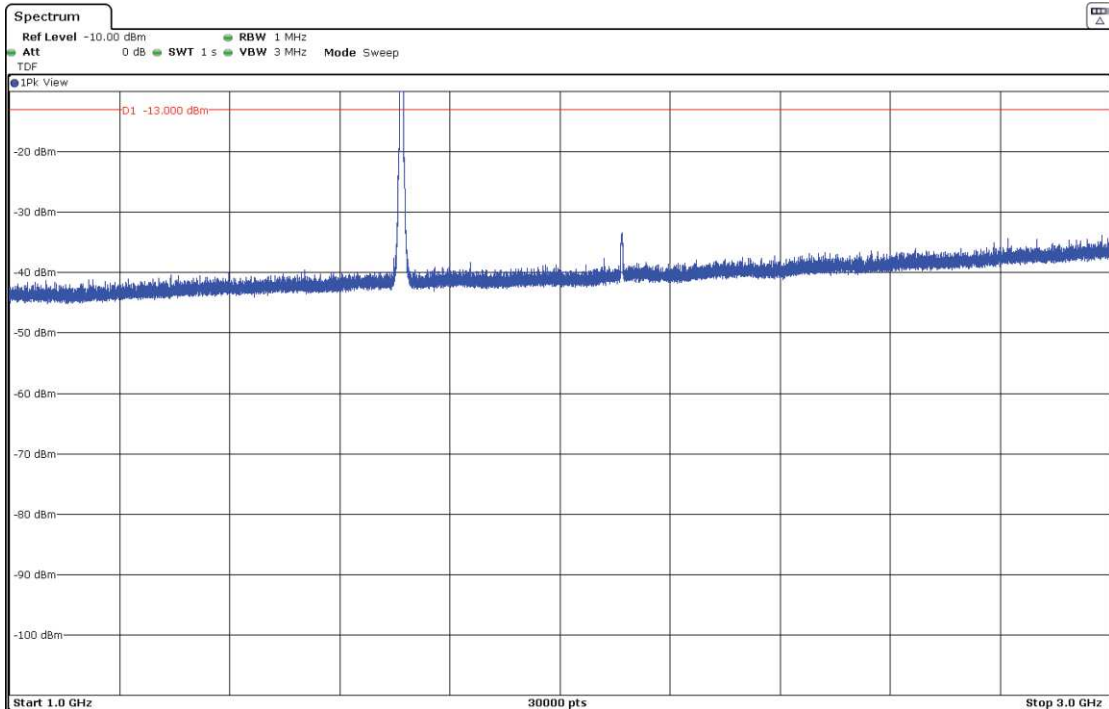
- Highest Channel:





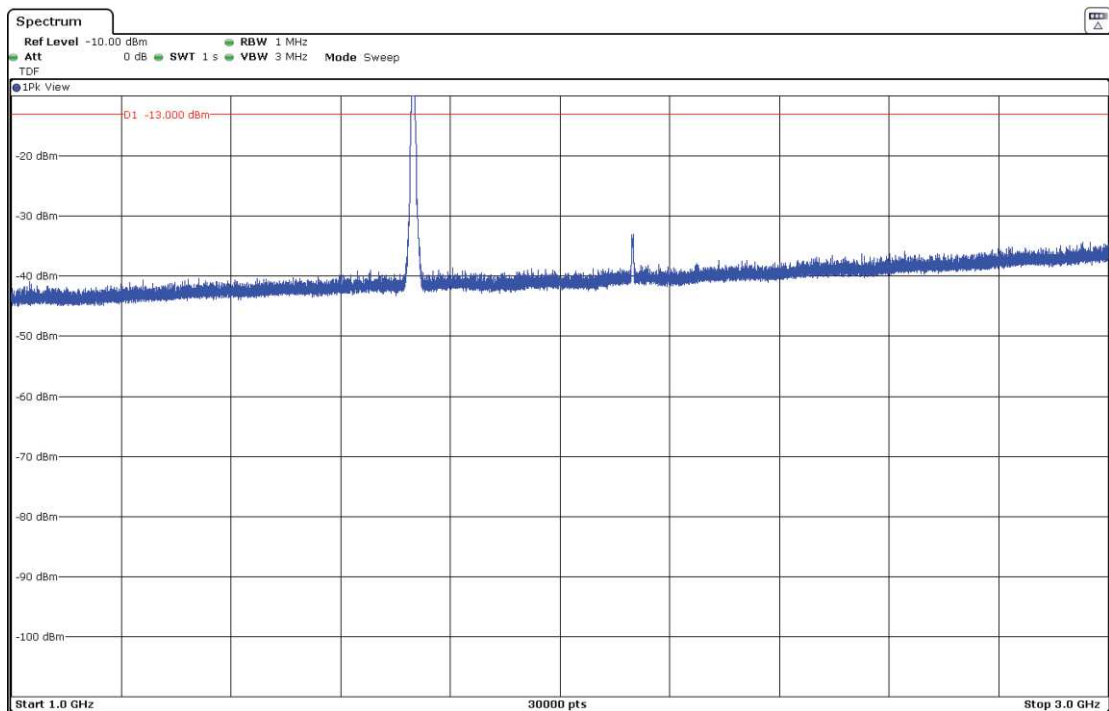
### FREQUENCY RANGE 1 - 3 GHz

- Lowest Channel:



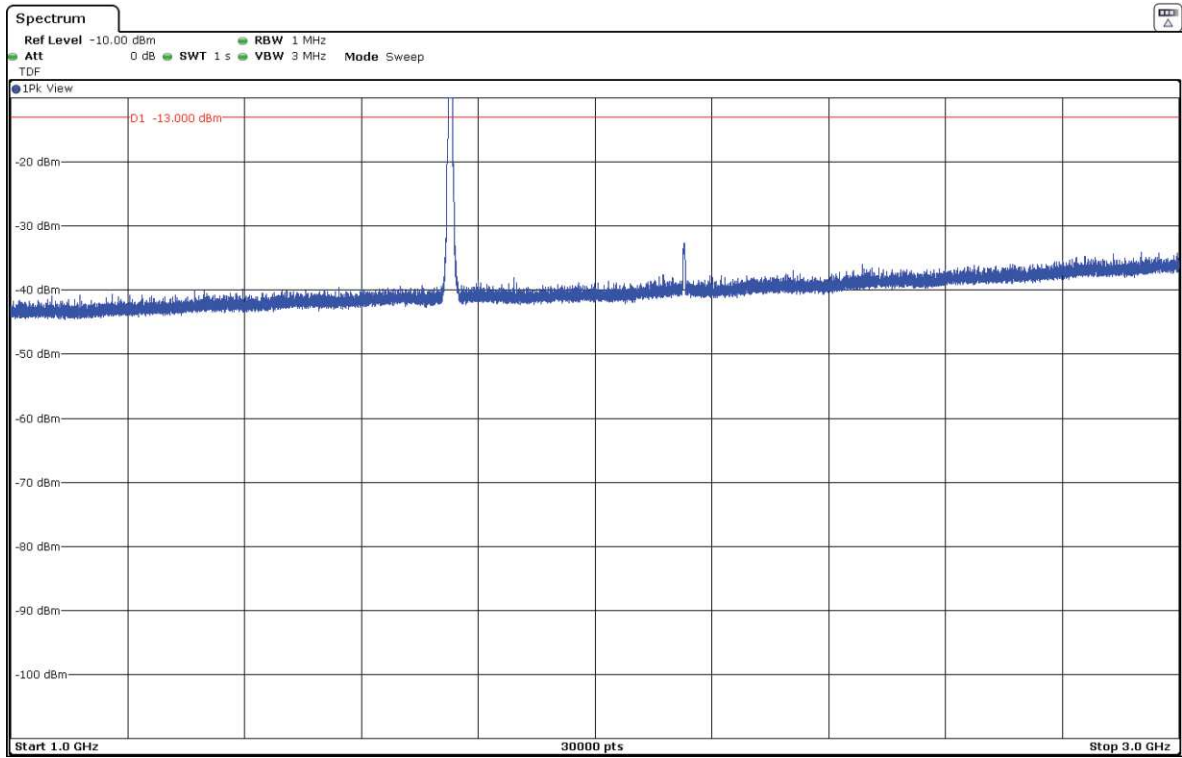
The peak above the limit is the 3G Band IV carrier frequency (1712.4 MHz).

- Middle Channel:



The peak above the limit is the 3G Band IV carrier frequency (1732.5MHz).

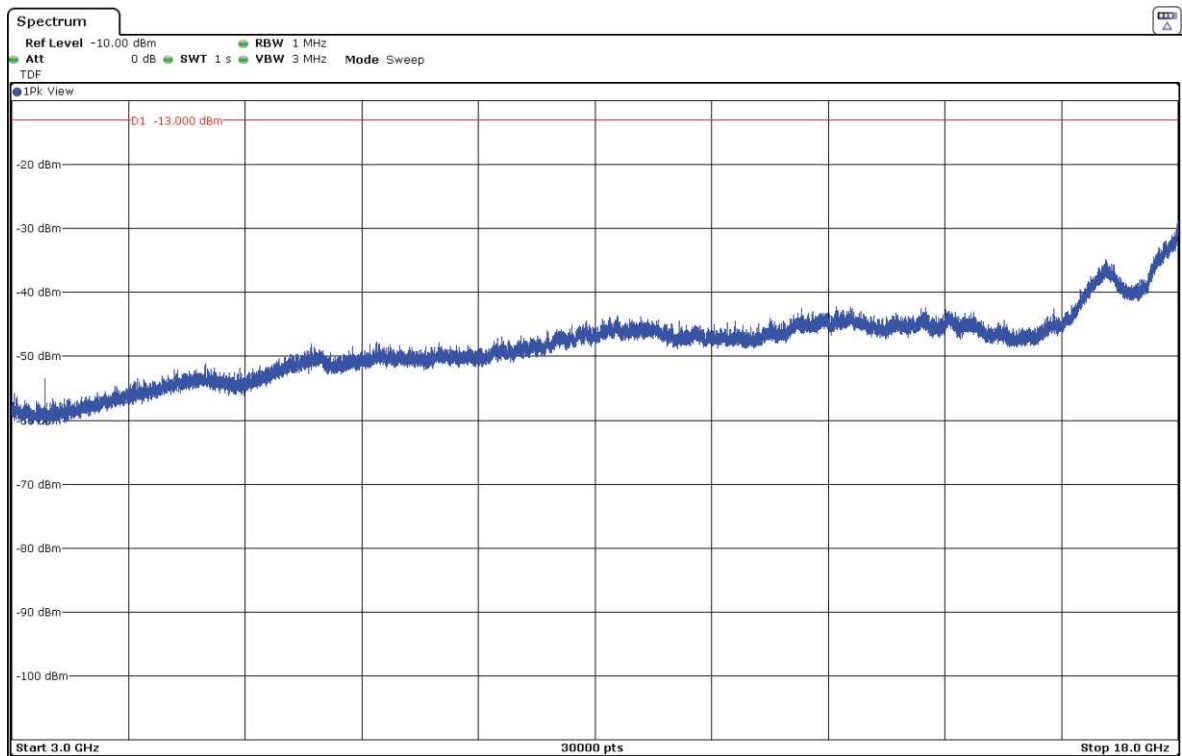
- Highest Channel:



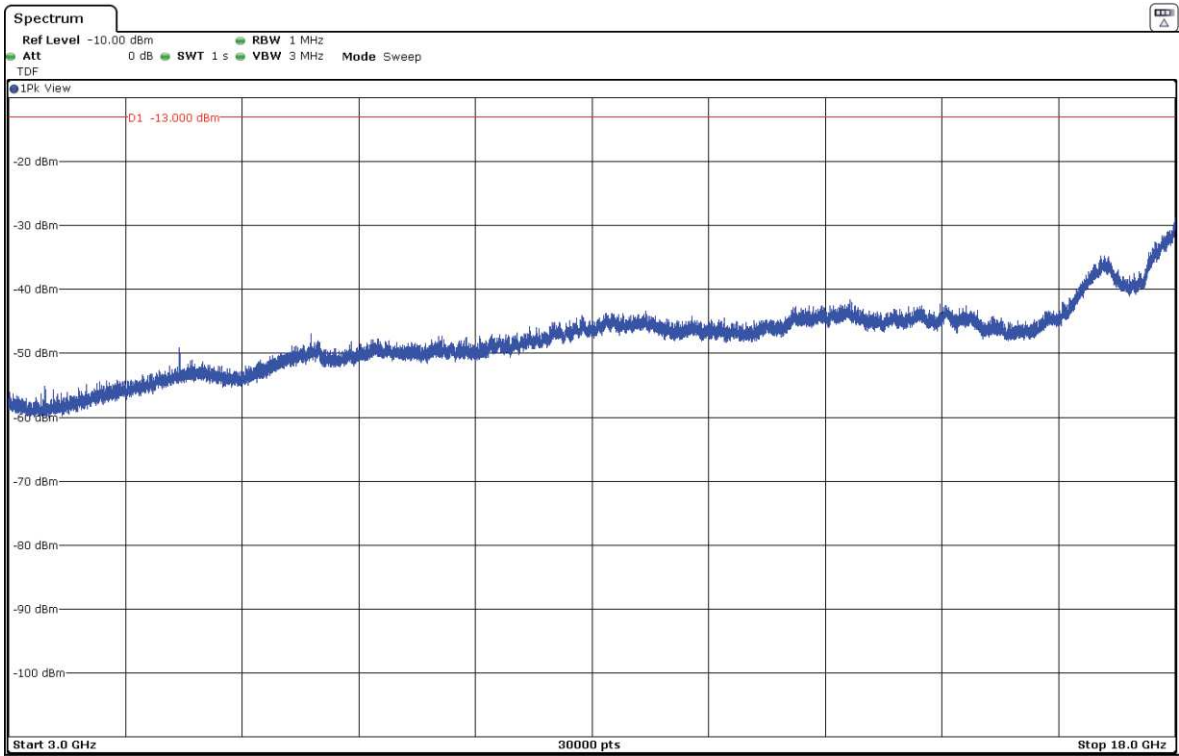
The peak above the limit is the 3G Band IV carrier frequency (1752.6 MHz).

### FREQUENCY RANGE 3 – 18 GHz

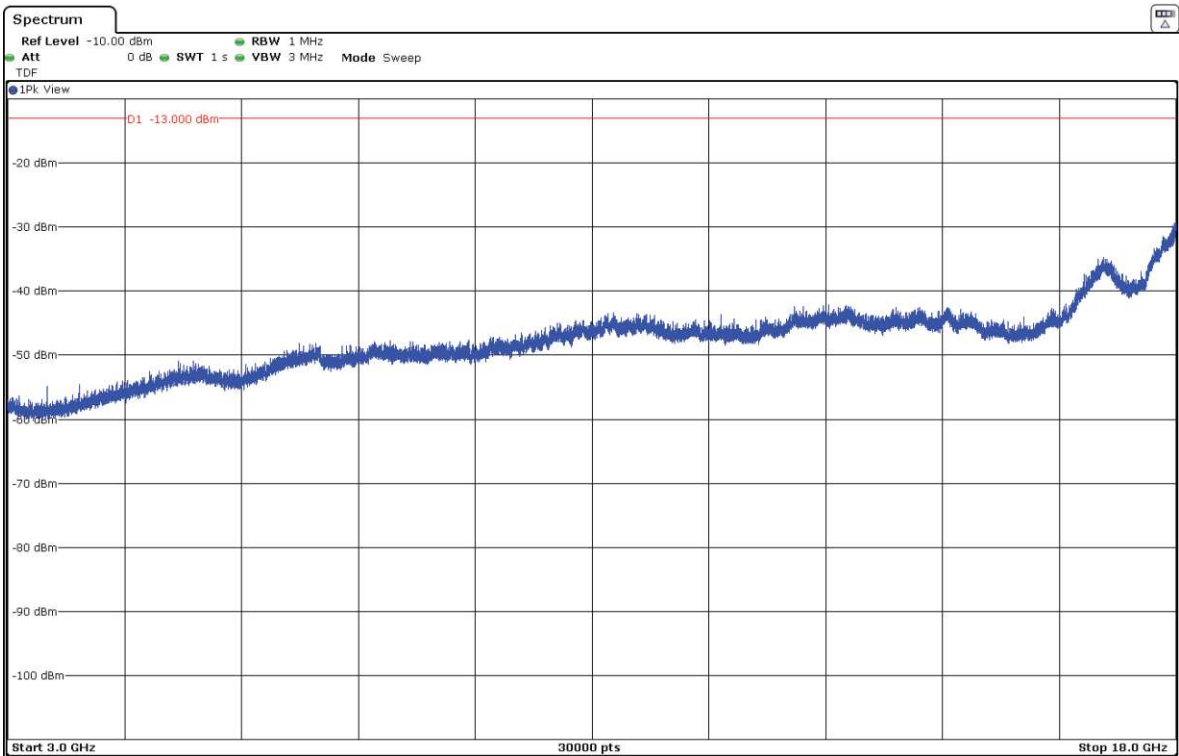
- Lowest Channel:



- Middle Channel:



- Highest Channel:



## **LTE Band 4:**

QPSK and 16QAM Modulations:

A preliminary scan determined the QPSK modulation, BW=10 MHz, RB=1, Offset=49 as the worst case. The following tables and plots show the results for QPSK modulation, BW=10 MHz, RB=1, Offset=49.

Antenna:

A preliminary scan determined the Tel1 antenna as the worst case. The following tables and plots show the results for Tel1 antenna.

### **- Lowest Channel:**

#### **Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

#### **Frequency range 1 - 18 GHz**

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization	Measurement Uncertainty (dB)
3438.75	Peak	-32.06	V	<± 3.70
5158.25	Peak	-27.19	V	<± 3.70

### **- Middle Channel:**

#### **Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

#### **Frequency range 1 - 18 GHz**

Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
3473.75	Peak	-27.55	V
5210.25	Peak	-21.09	V

**- Highest Channel:**

**Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

**Frequency range 1 - 18 GHz**

Spurious frequencies detected at less than 20 dB below the limit:

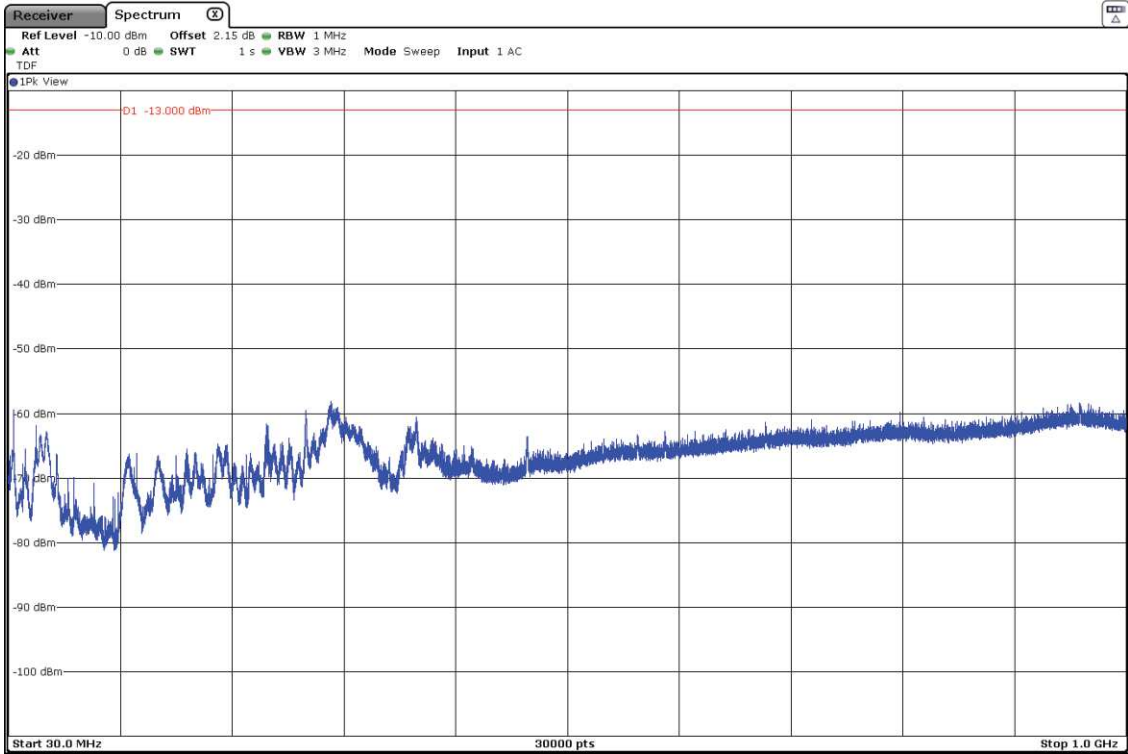
Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
3508.75	Peak	-31.43	V
5263.25	Peak	-25.13	V

Measurement uncertainty (dB)	<±5.08 for f < 1GHz <±5.13 for f ≥ 1 GHz up to 18 GHz
------------------------------	--

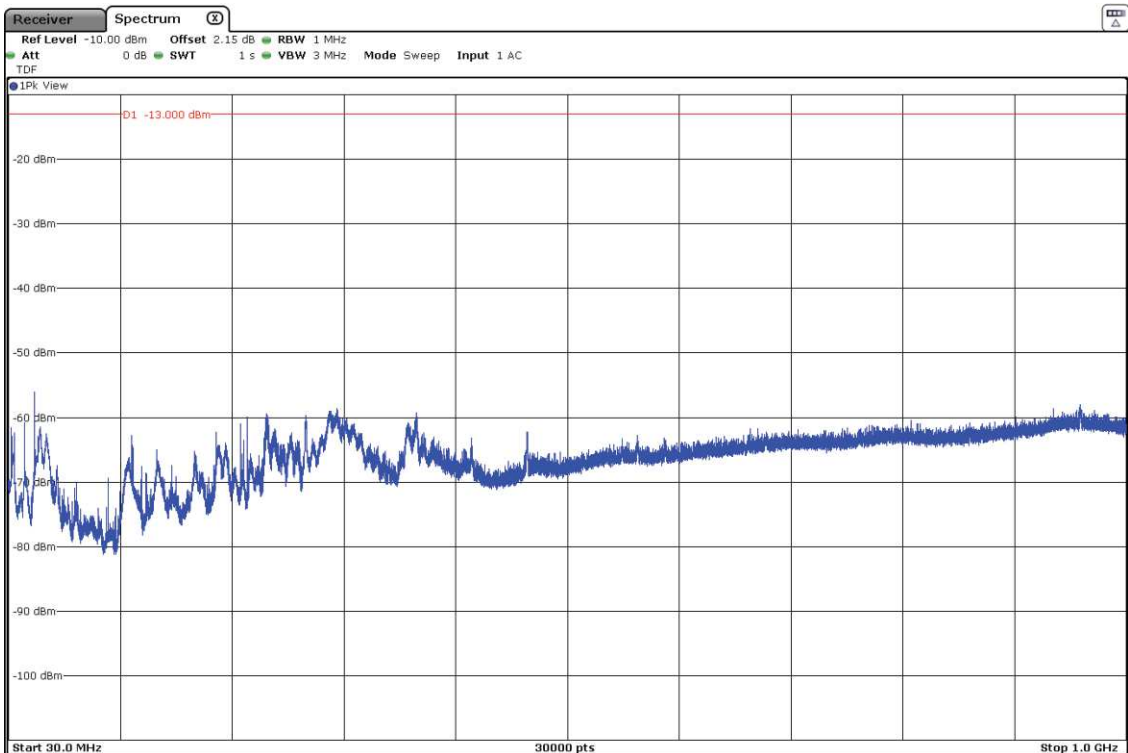
Verdict: PASS

## FREQUENCY RANGE 30 MHz - 1 GHz

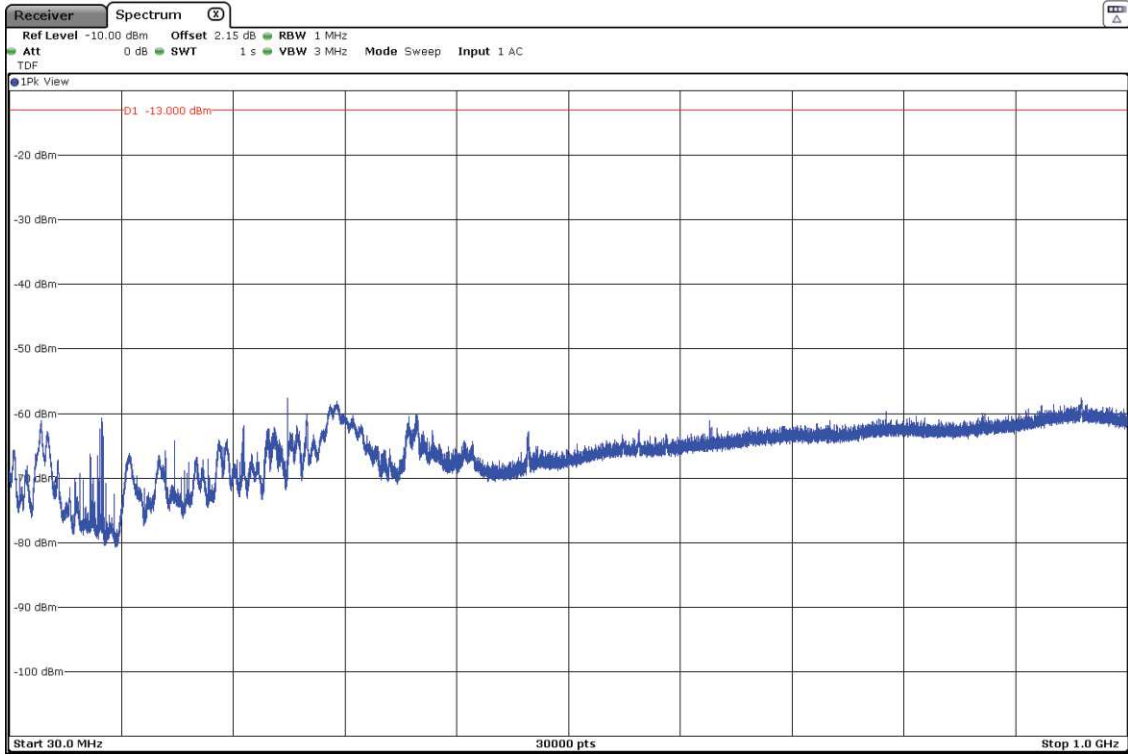
- Lowest Channel:



- Middle Channel:

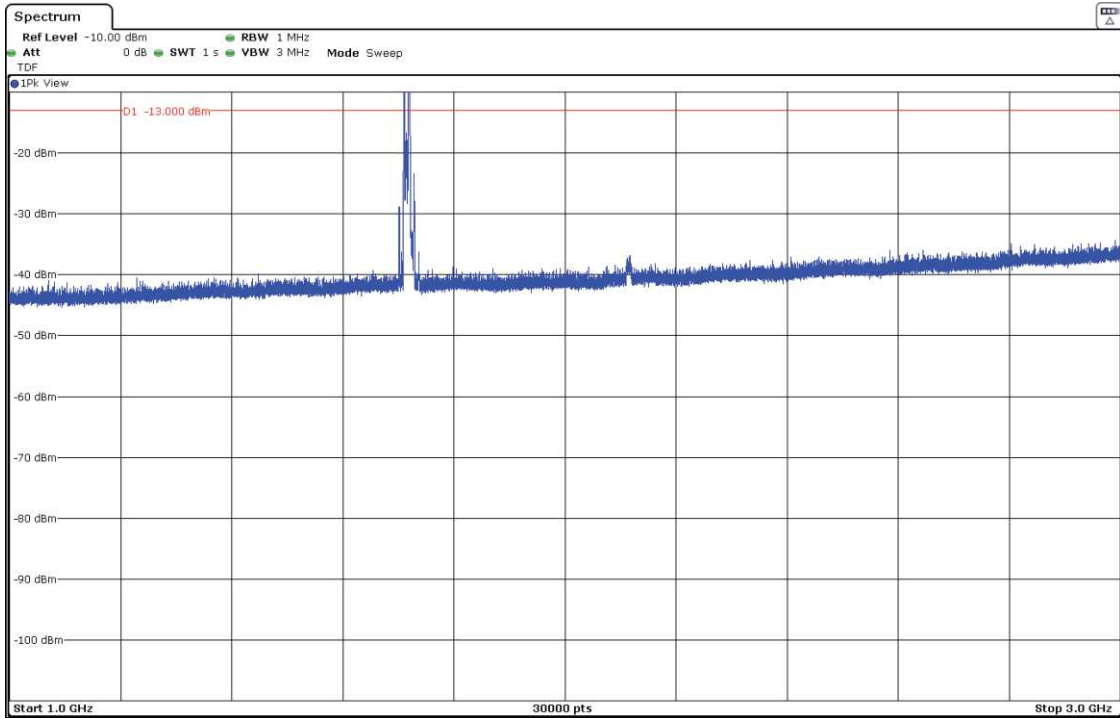


- Highest Channel:



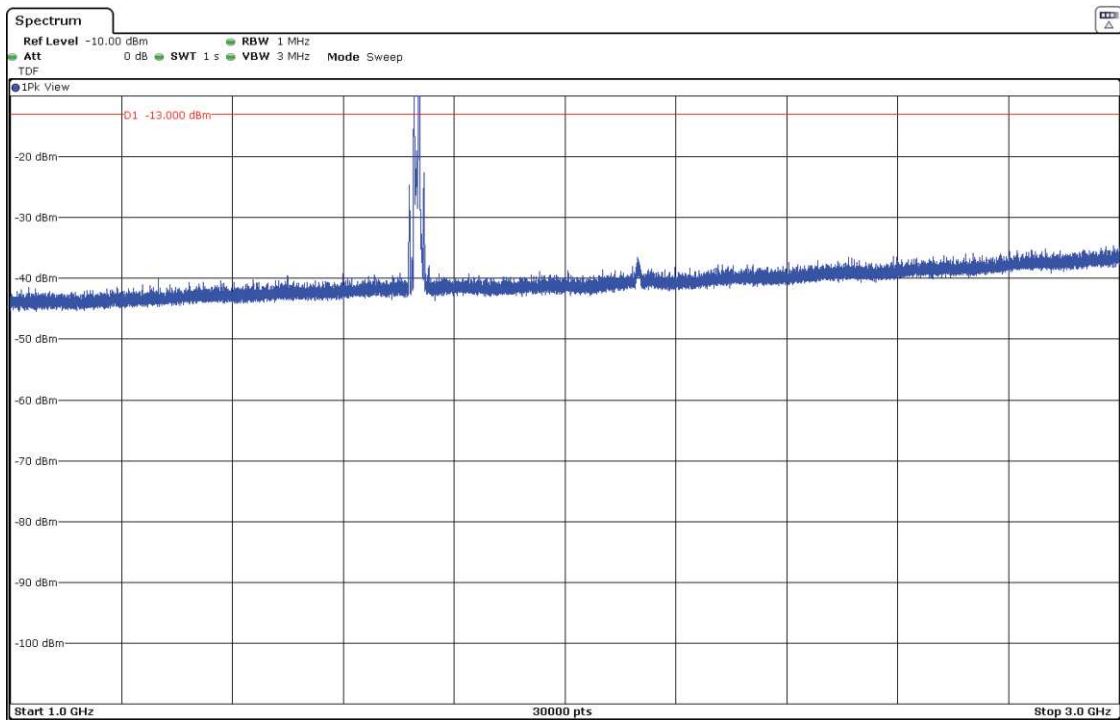
### FREQUENCY RANGE 1 - 3 GHz

- Lowest Channel:



The peak above the limit is the LTE Band 4 carrier frequency (1715 MHz).

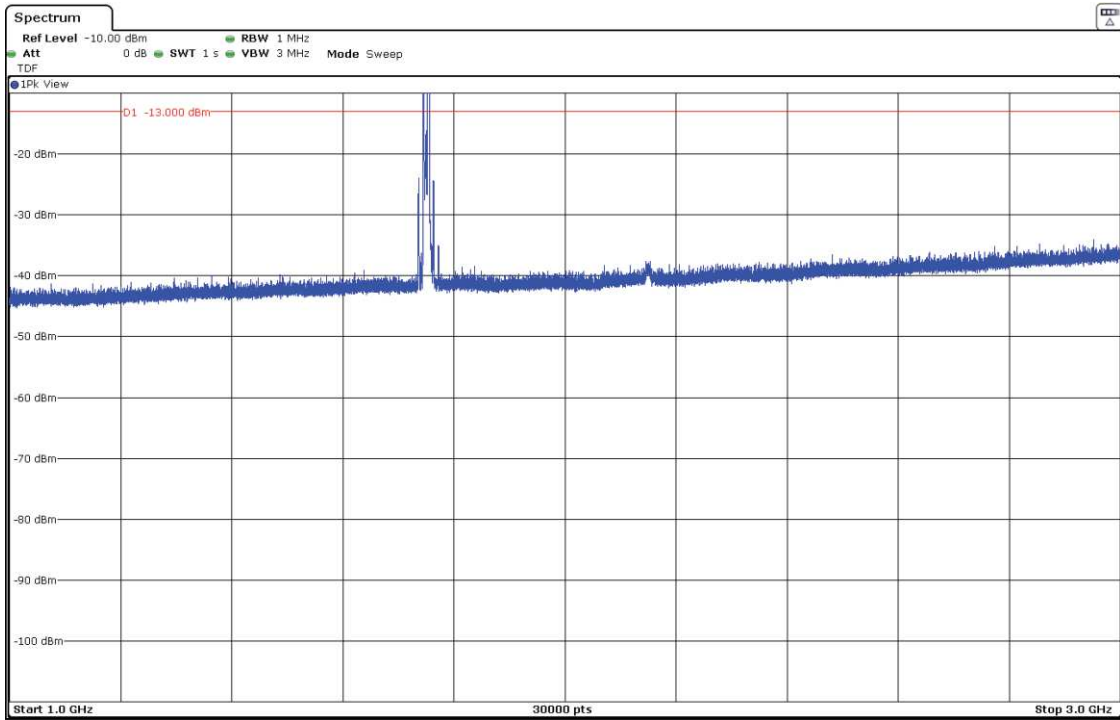
- Middle Channel:



The peak above the limit is the LTE Band 4 carrier frequency (1732.5 MHz).



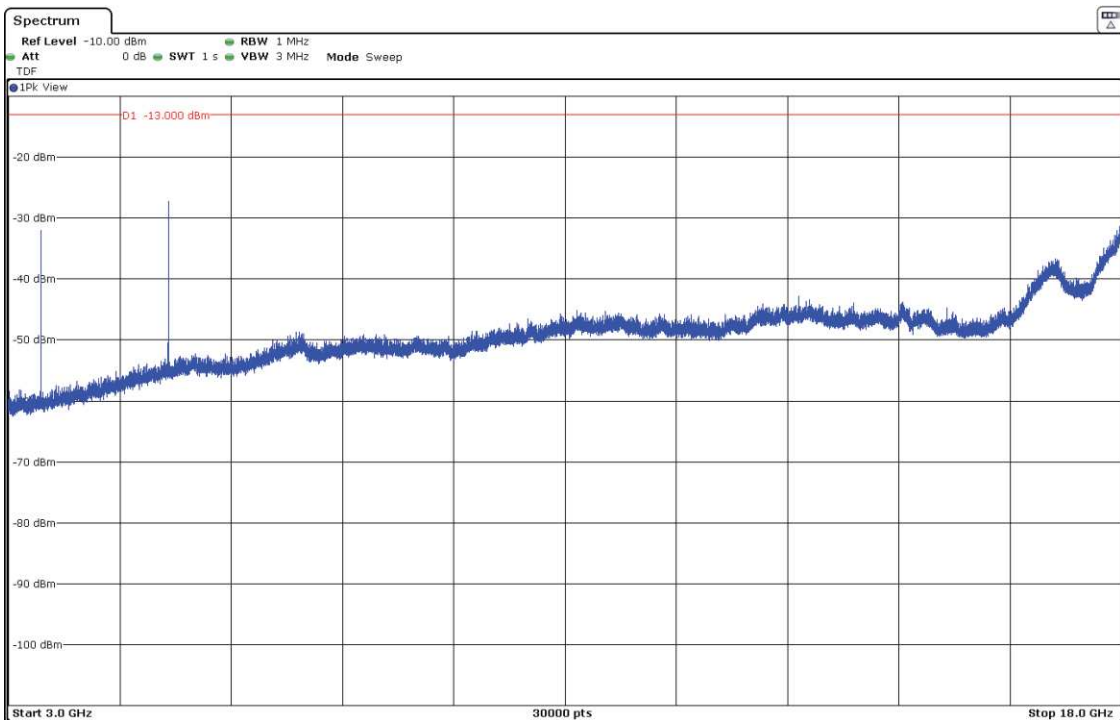
- Highest Channel:



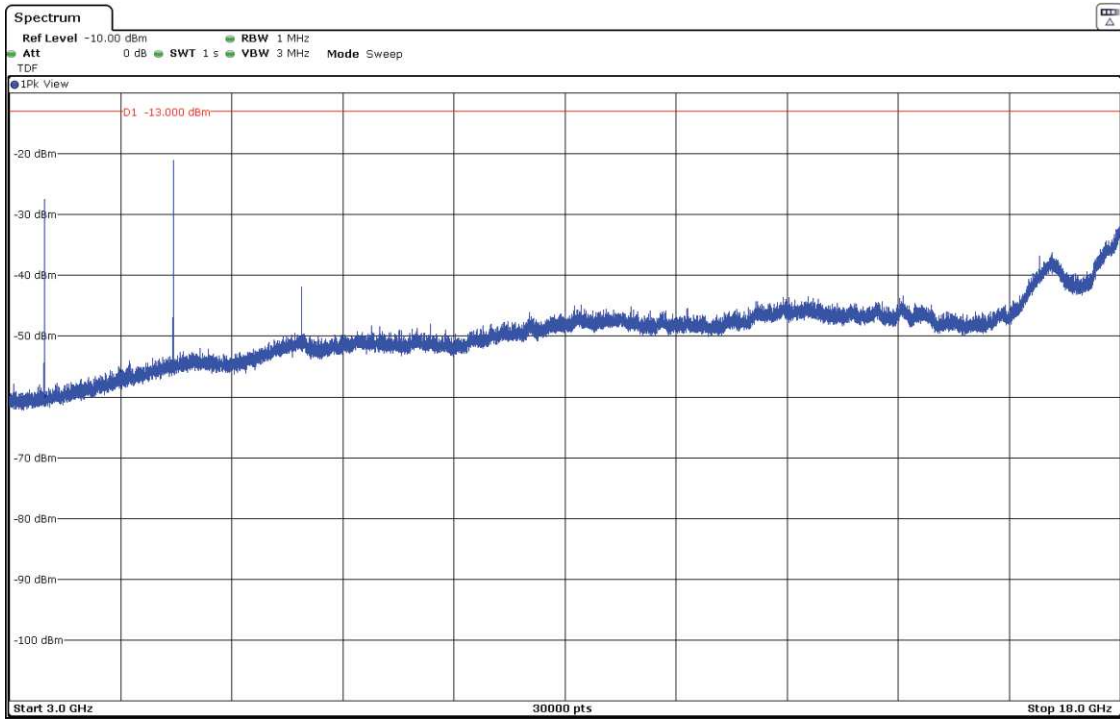
The peak above the limit is the LTE Band 4 carrier frequency (1750 MHz).

### FREQUENCY RANGE 3 – 18 GHz

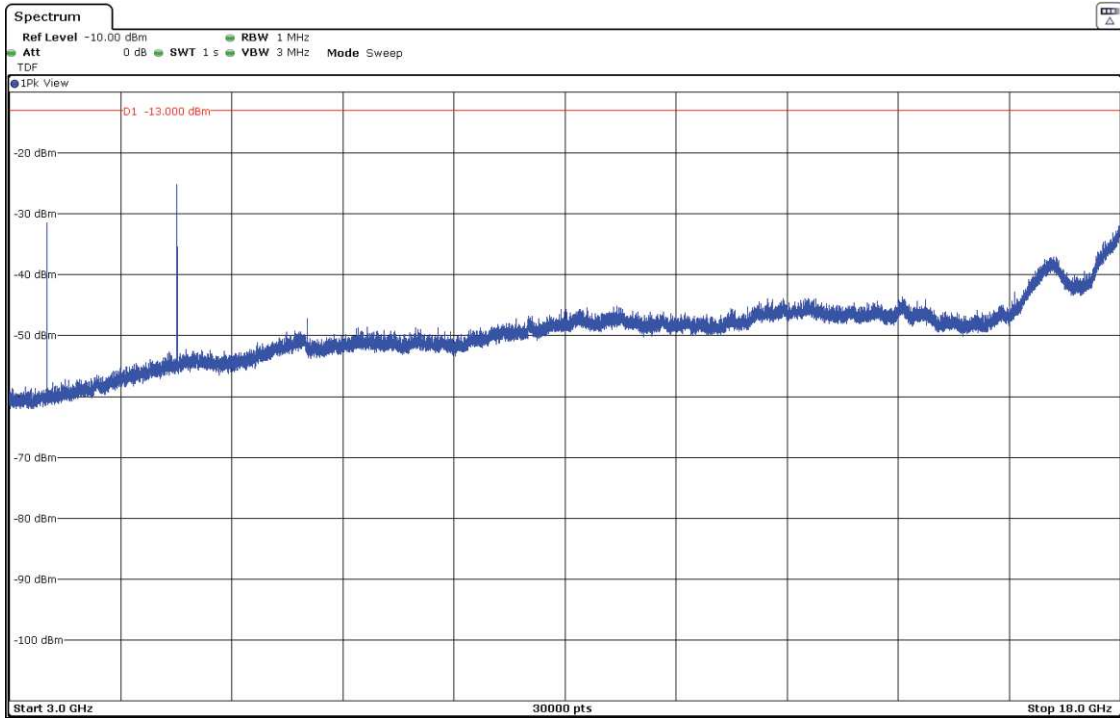
- Lowest Channel:



- Middle Channel:



- Highest Channel:



## **LTE Band 7:**

QPSK and 16QAM Modulations:

A preliminary scan determined the QPSK modulation, BW=20 MHz, RB=1, Offset=0 as the worst case. The following tables and plots show the results for QPSK modulation, BW=20 MHz, RB=1, Offset=0.

Antenna:

A preliminary scan determined the Tel1 antenna as the worst case. The following tables and plots show the results for Tel1 antenna.

### **- Lowest Channel:**

#### **Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

#### **Frequency range 1 - 26 GHz**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
5002.23	Peak	-37.69	V
7503.57	Peak	-43.97	V

#### **Frequency range 2490.5 – 2496 MHz**

No spurious frequencies detected at less than 20 dB below the limit.

### **- Middle Channel:**

#### **Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

#### **Frequency range 1 - 26 GHz**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
5052.63	Peak	-27.65	V
7578.23	Peak	-30.24	V

#### **Frequency range 2490.5 – 2496 MHz**

No spurious frequencies detected at less than 20 dB below the limit.

**- Highest Channel:**

**Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

**Frequency range 1 - 26 GHz**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
5102.57	Peak	-42.24	V

**Frequency range 2490.5 – 2496 MHz**

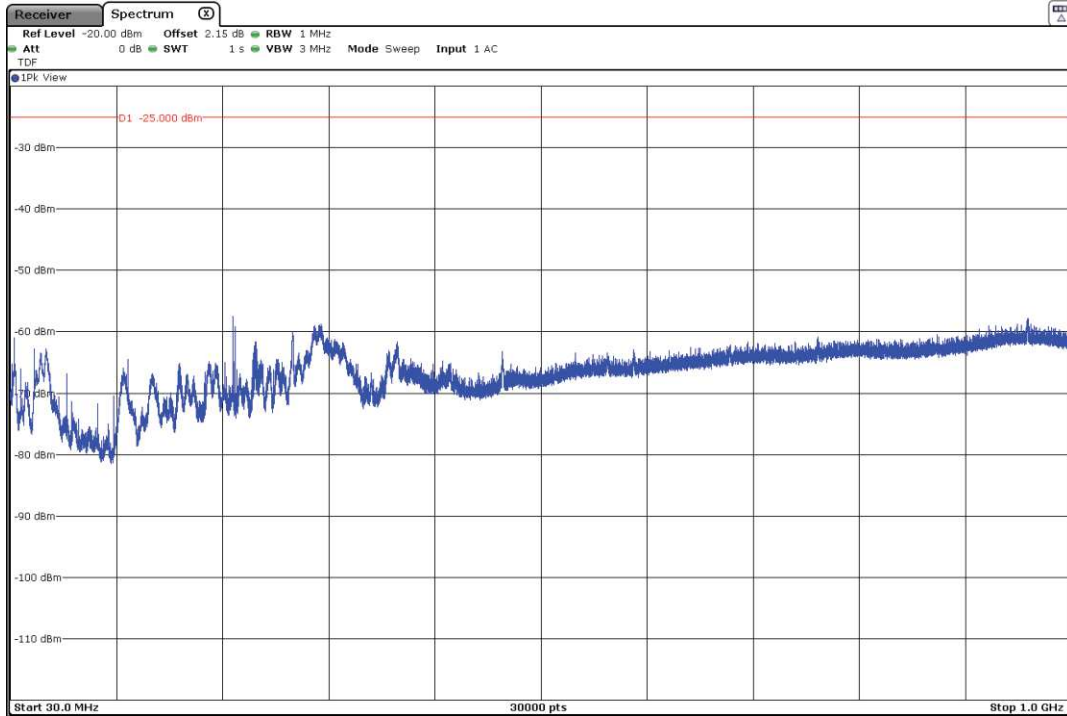
No spurious frequencies detected at less than 20 dB below the limit.

Measurement uncertainty (dB)	<±5.08 for f < 1GHz <±5.13 for f ≥ 1 GHz up to 18 GHz <±4.82 for f ≥ 18 GHz up to 26 GHz
------------------------------	--

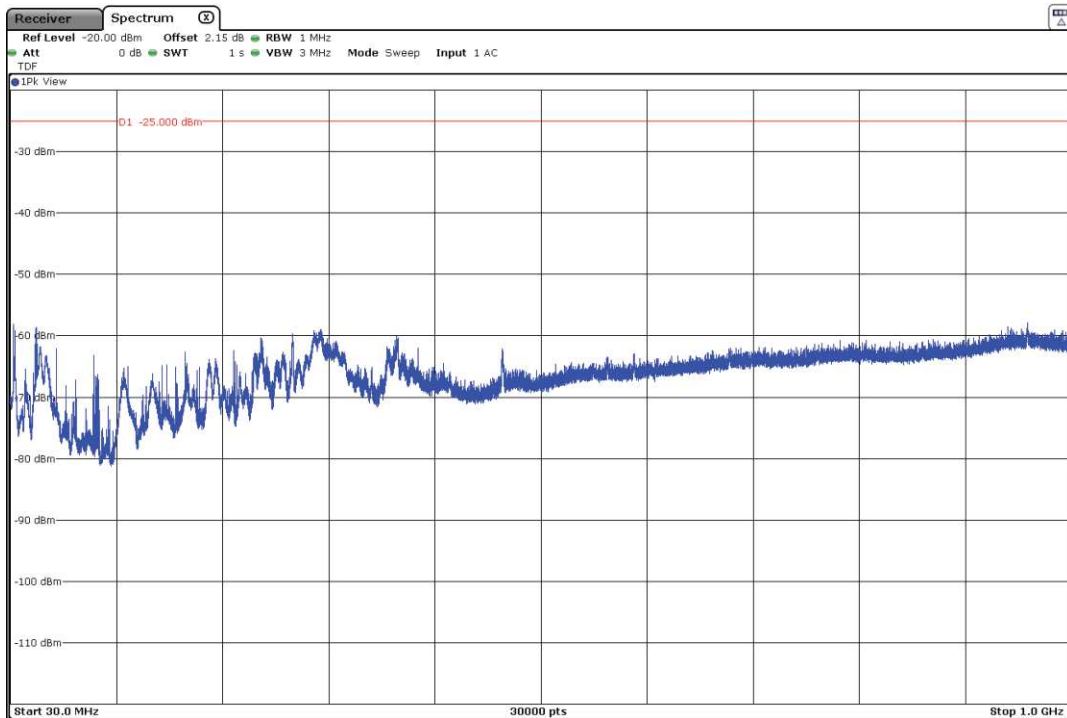
Verdict: PASS

## FREQUENCY RANGE 30 MHz - 1 GHz

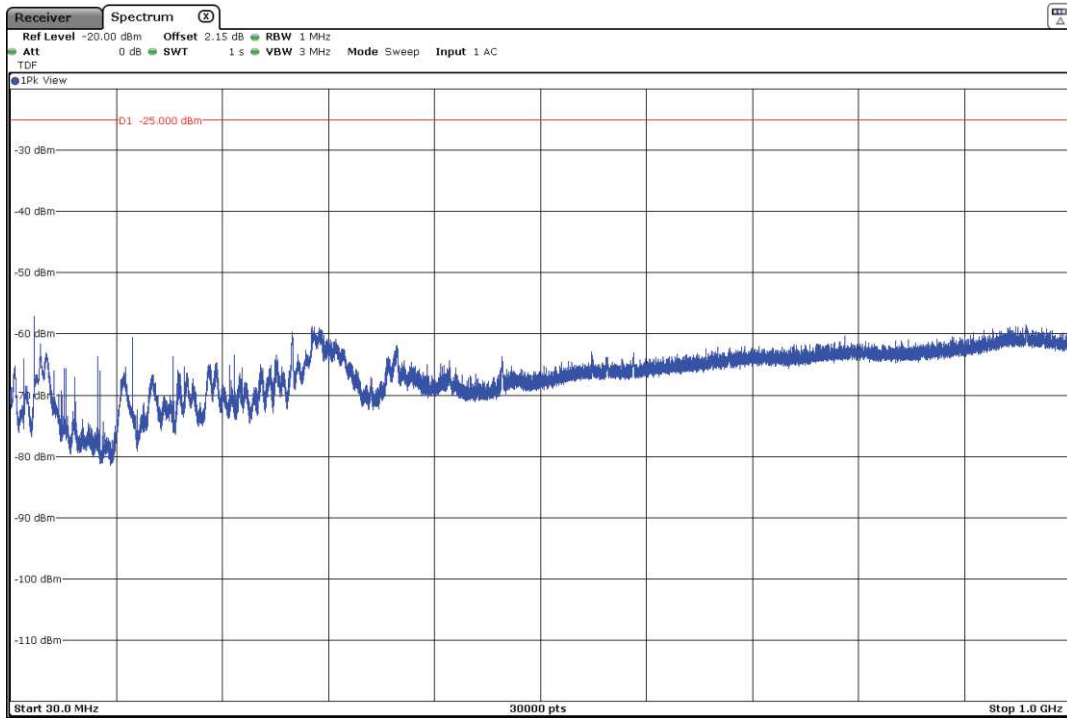
- Lowest Channel:



- Middle Channel:

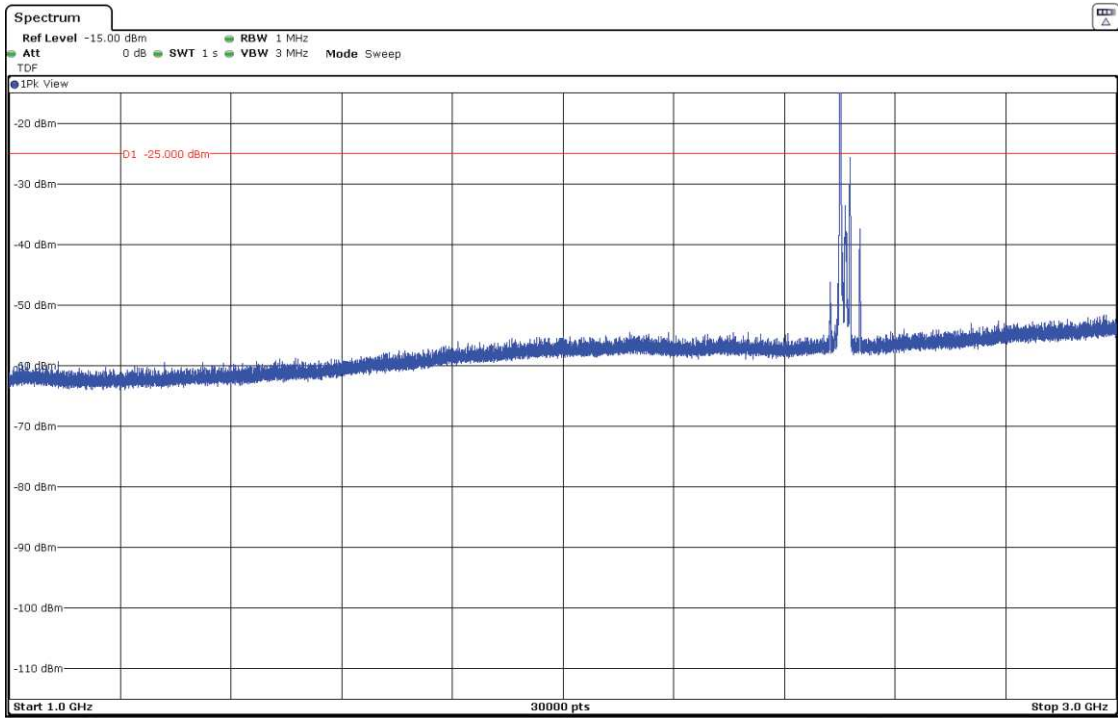


- Highest Channel:



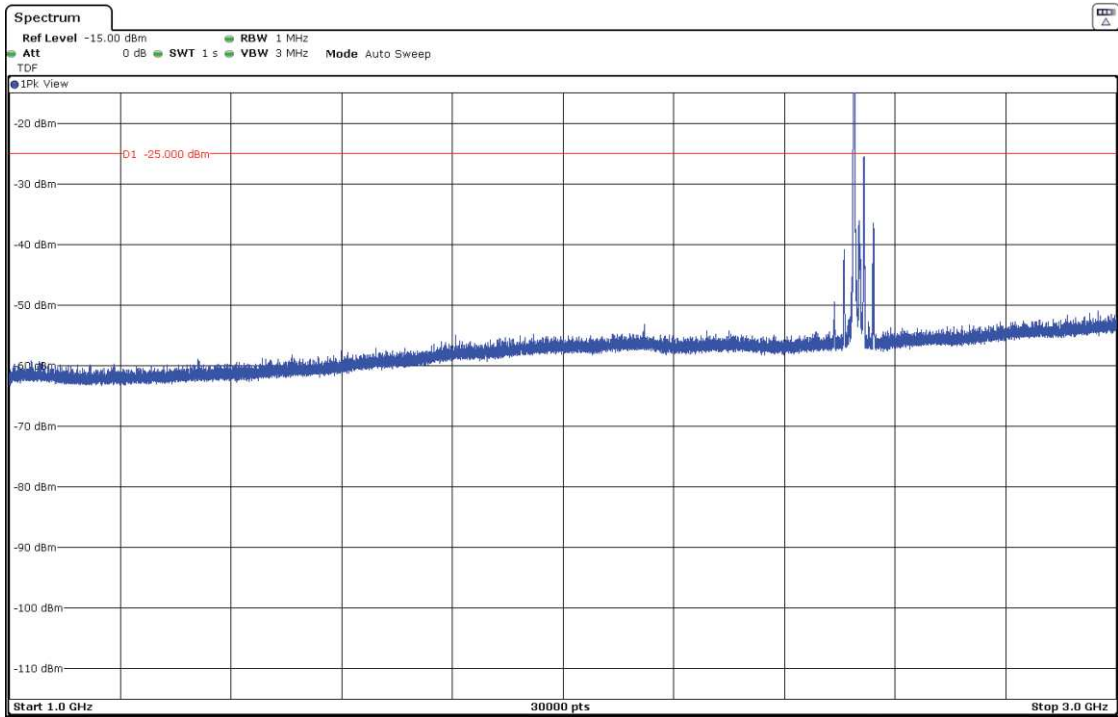
### FREQUENCY RANGE 1 - 3 GHz

- Lowest Channel:



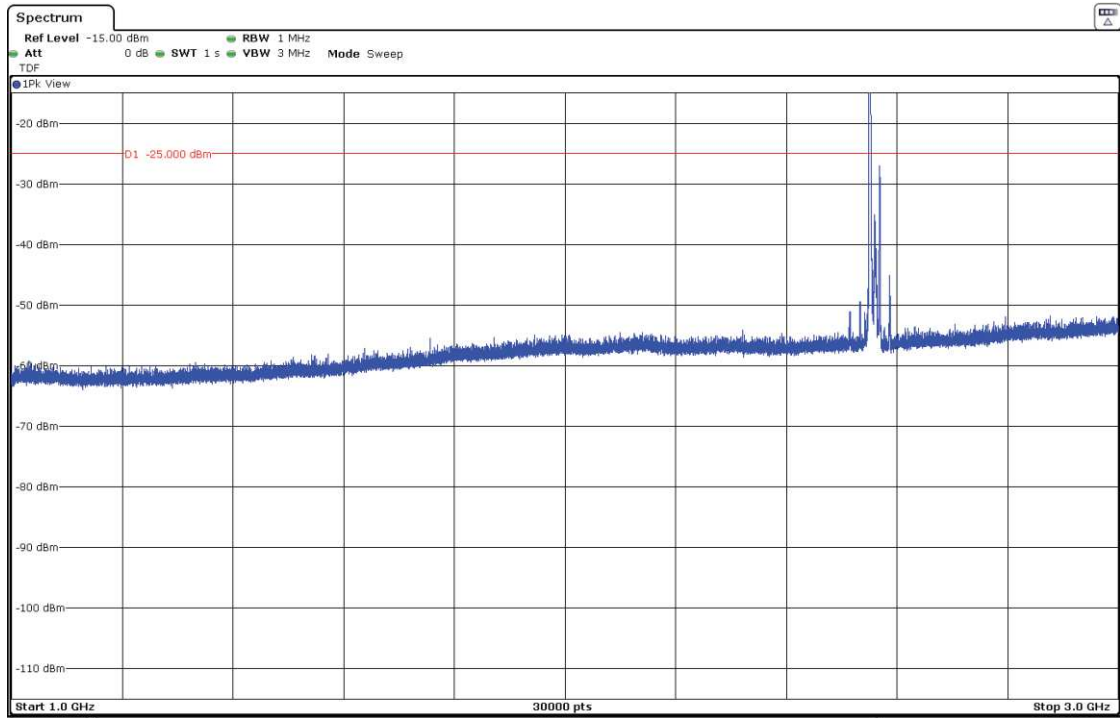
The peak above the limit is the LTE Band 7 carrier frequency (2510 MHz)

- Middle Channel:



The peak above the limit is the LTE Band 7 carrier frequency (2535 MHz)

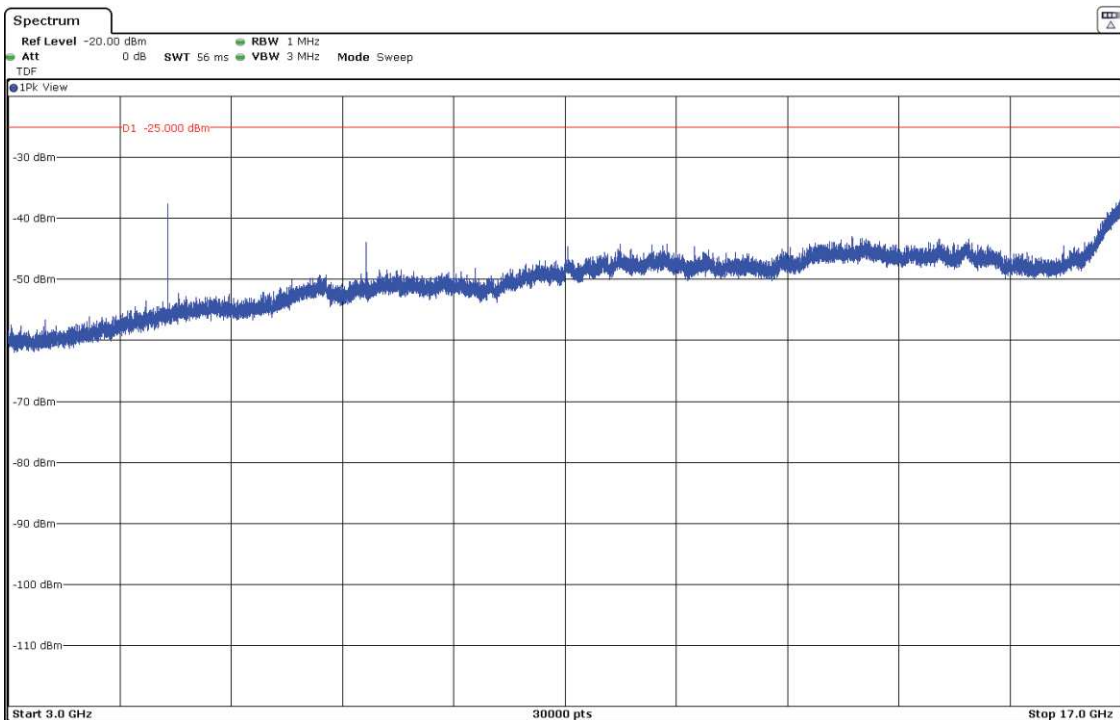
- Highest Channel:



The peak above the limit is the LTE Band 7 carrier frequency (2560 MHz).

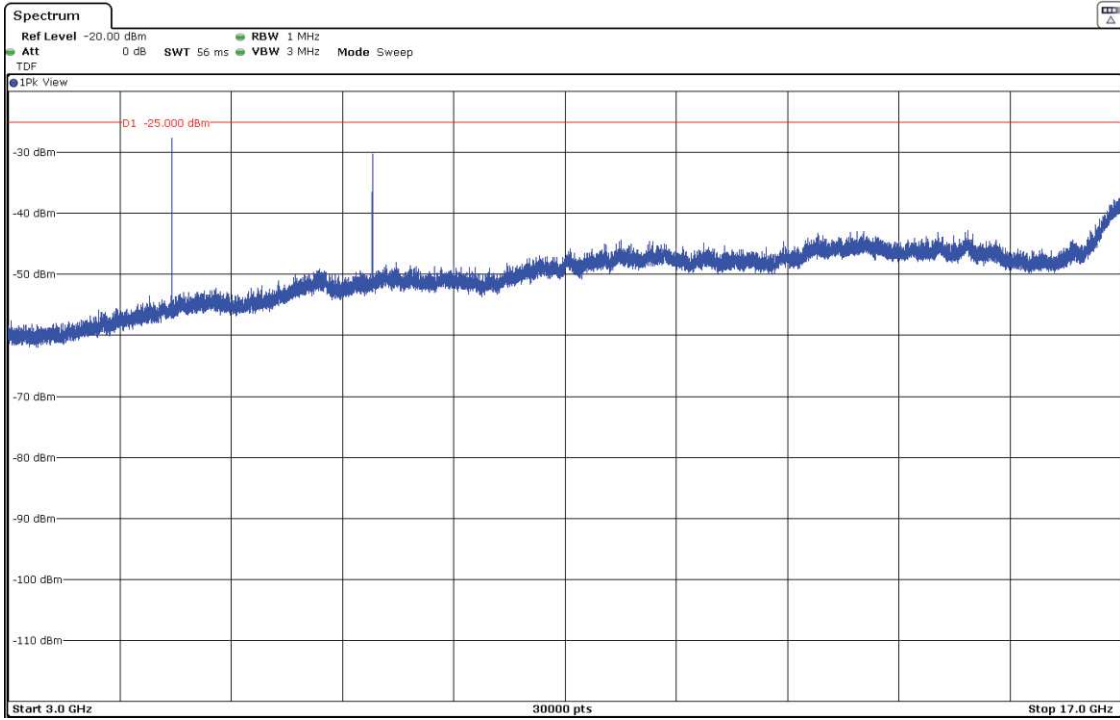
### FREQUENCY RANGE 3 – 17 GHz

- Lowest Channel:

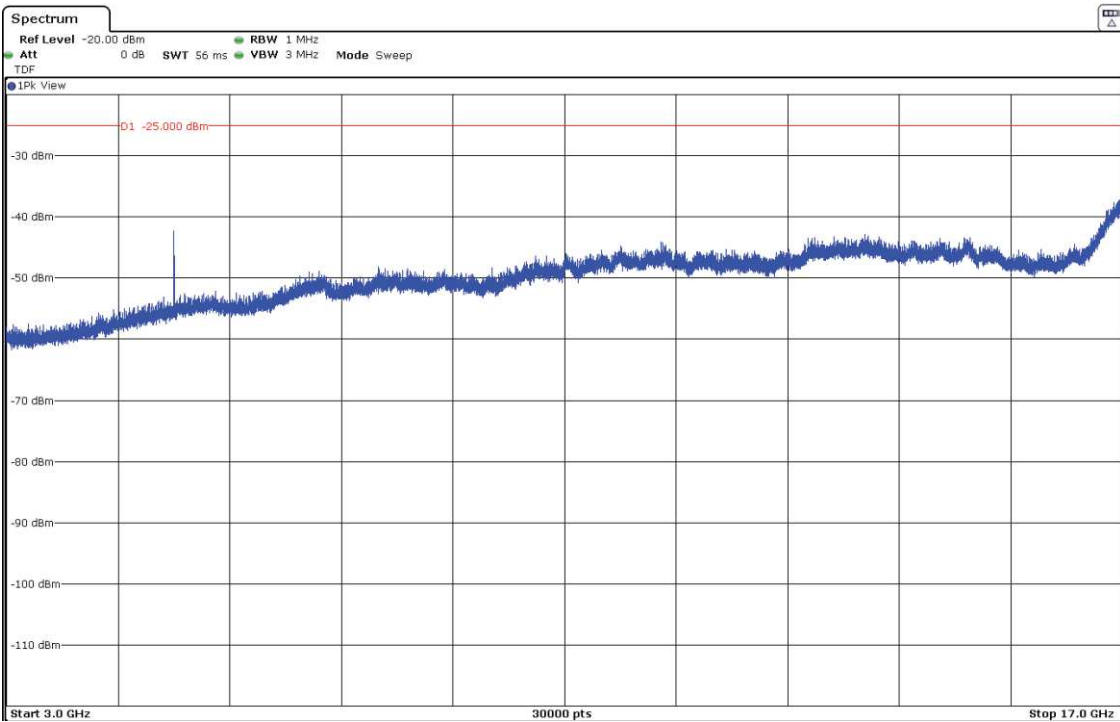




- Middle Channel:

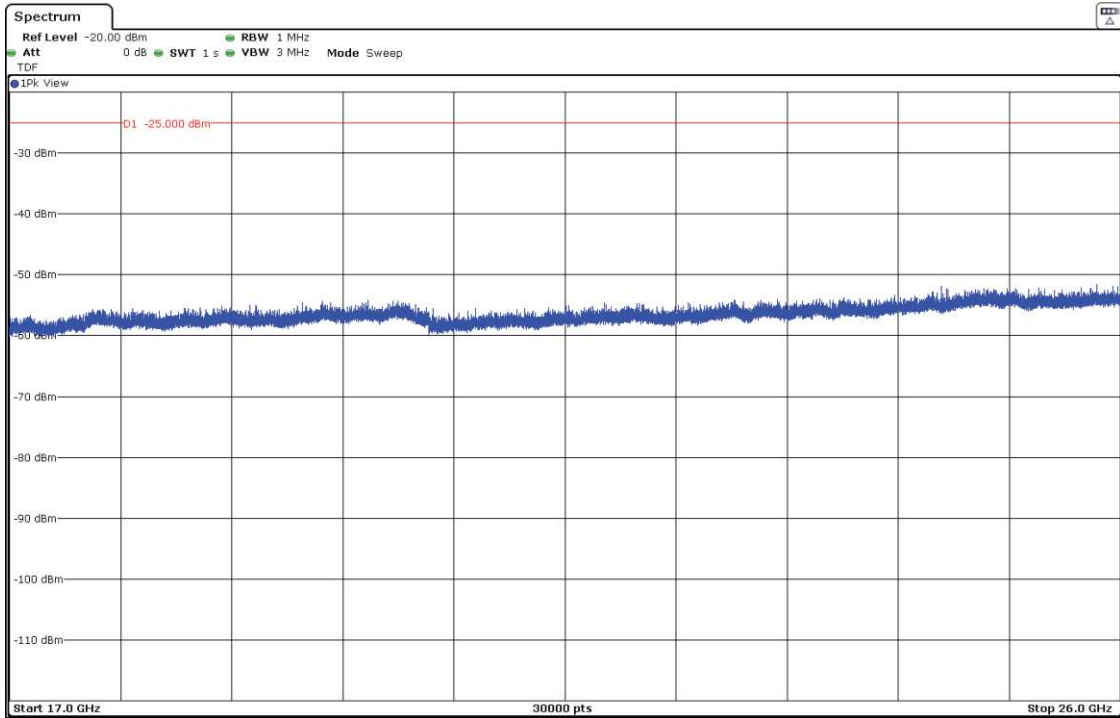


- Highest Channel:

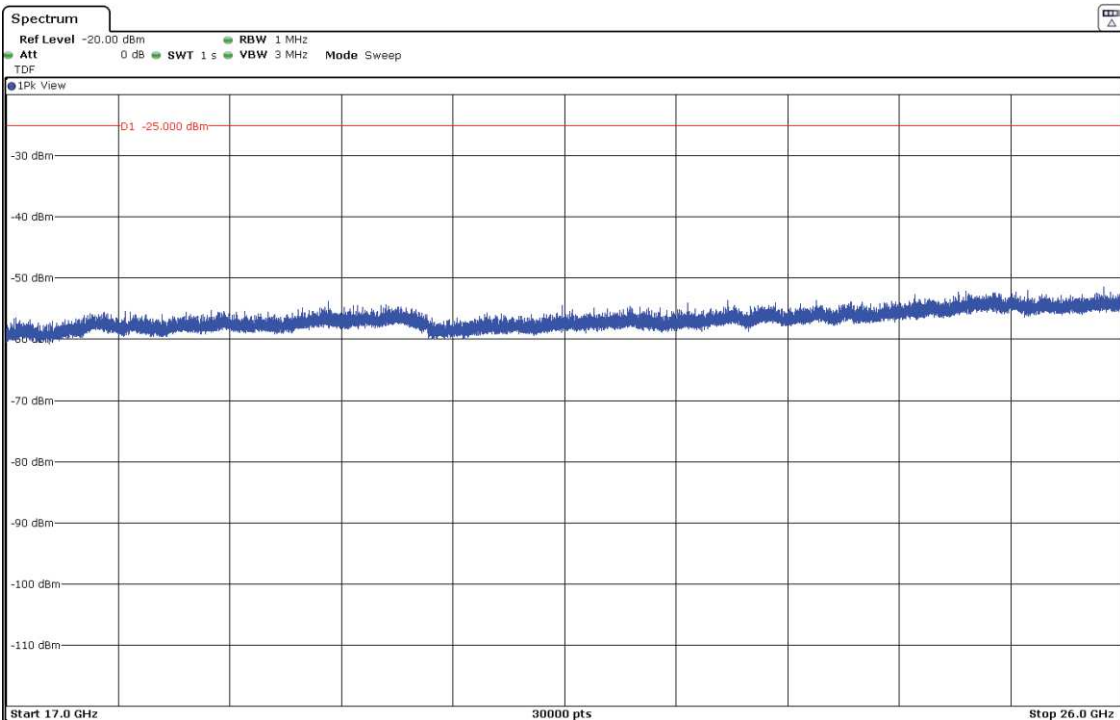


### FREQUENCY RANGE 17 - 26 GHz

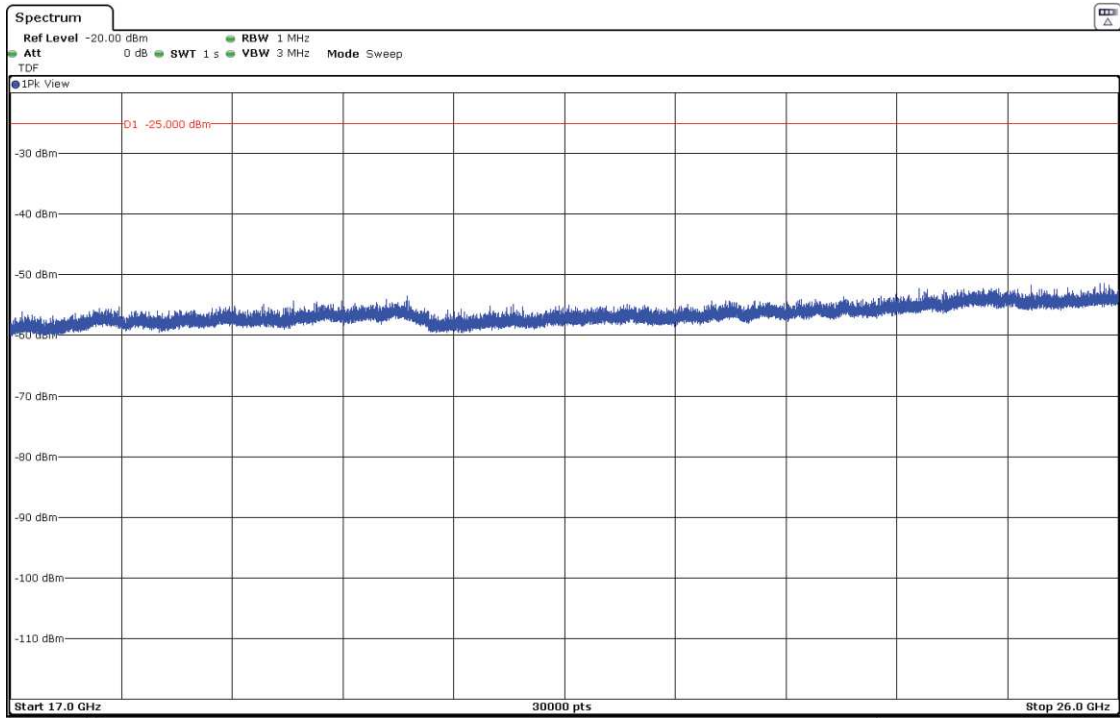
- Lowest Channel:



- Middle Channel:

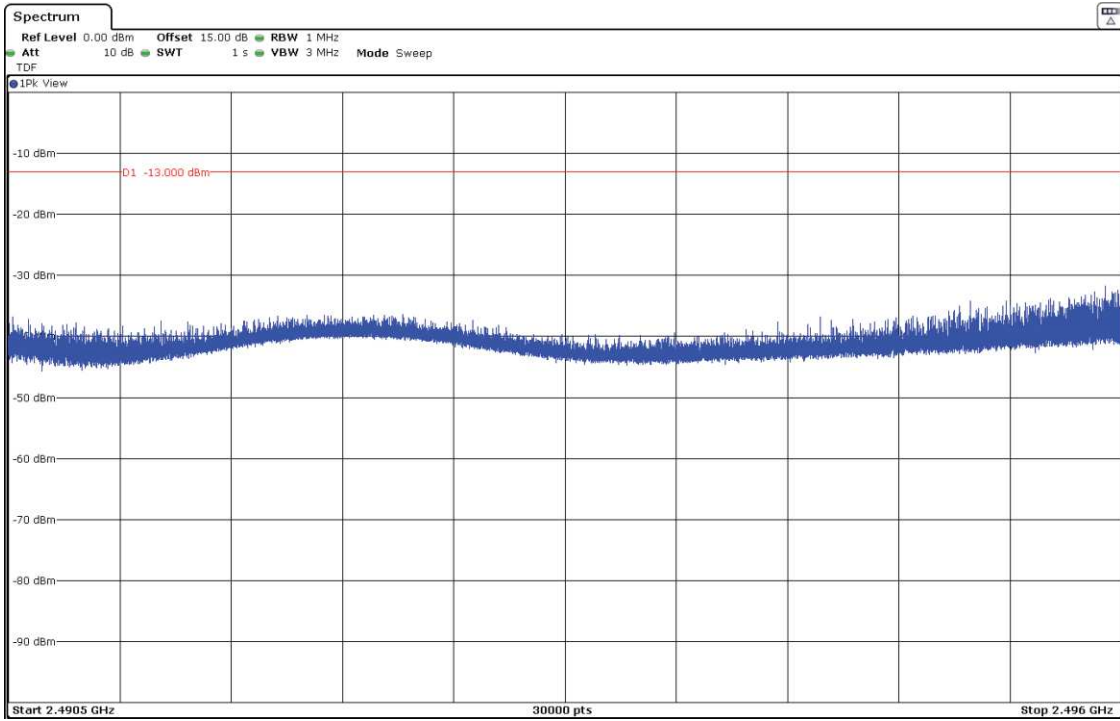


- Highest Channel:

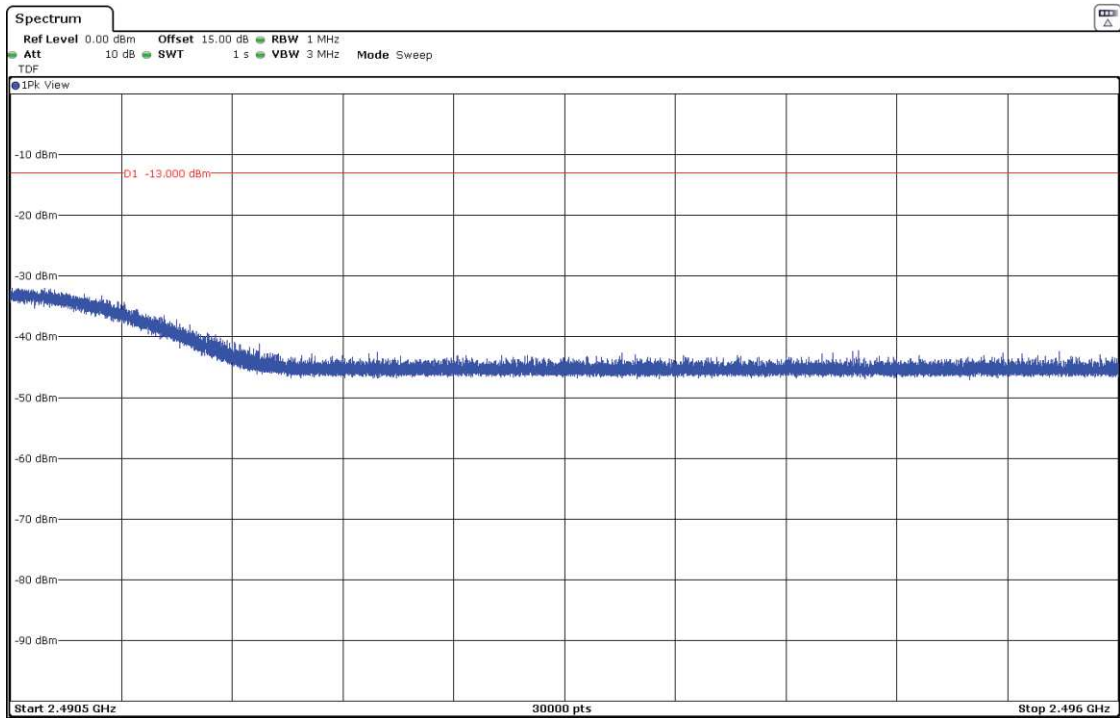


### FREQUENCY RANGE 2490.5 - 2496 MHz

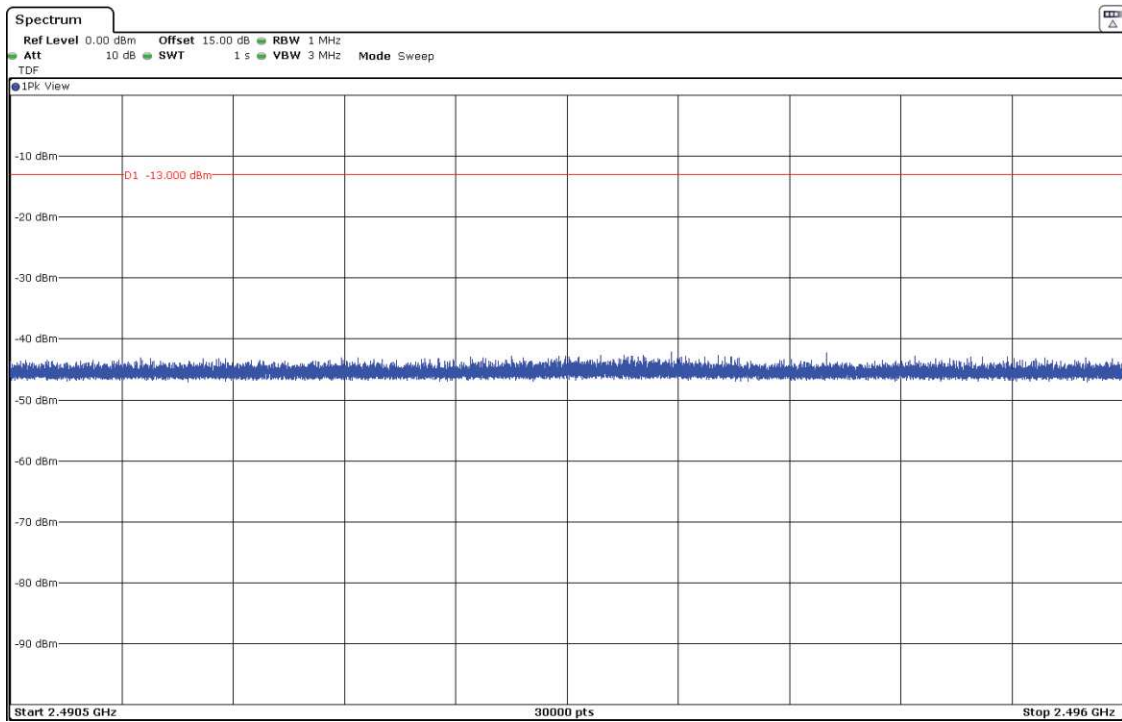
- Lowest Channel:



- Middle Channel:



- Highest Channel:



## **LTE Band 12:**

QPSK and 16QAM Modulations:

A preliminary scan determined the 16QAM modulation, BW=1.4 MHz, RB=1, Offset=5 as the worst case. The following tables and plots show the results for 16QAM modulation, BW=1.4 MHz, RB=1, Offset=5.

Antenna:

A preliminary scan determined the Tel1 antenna as the worst case. The following tables and plots show the results for Tel1 antenna.

### **- Lowest Channel:**

#### **Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

#### **Frequency range 1 - 8 GHz**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
1400.52	Peak	-29.88	V

### **- Middle Channel:**

#### **Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

#### **Frequency range 1 - 8 GHz**

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
1416.15	Peak	-16.47	V

### **- Highest Channel:**

#### **Frequency range 30 MHz - 1 GHz**

No spurious frequencies detected at less than 20 dB below the limit.

#### **Frequency range 1 - 8 GHz**

Spurious frequencies at less than 20 dB below the limit:

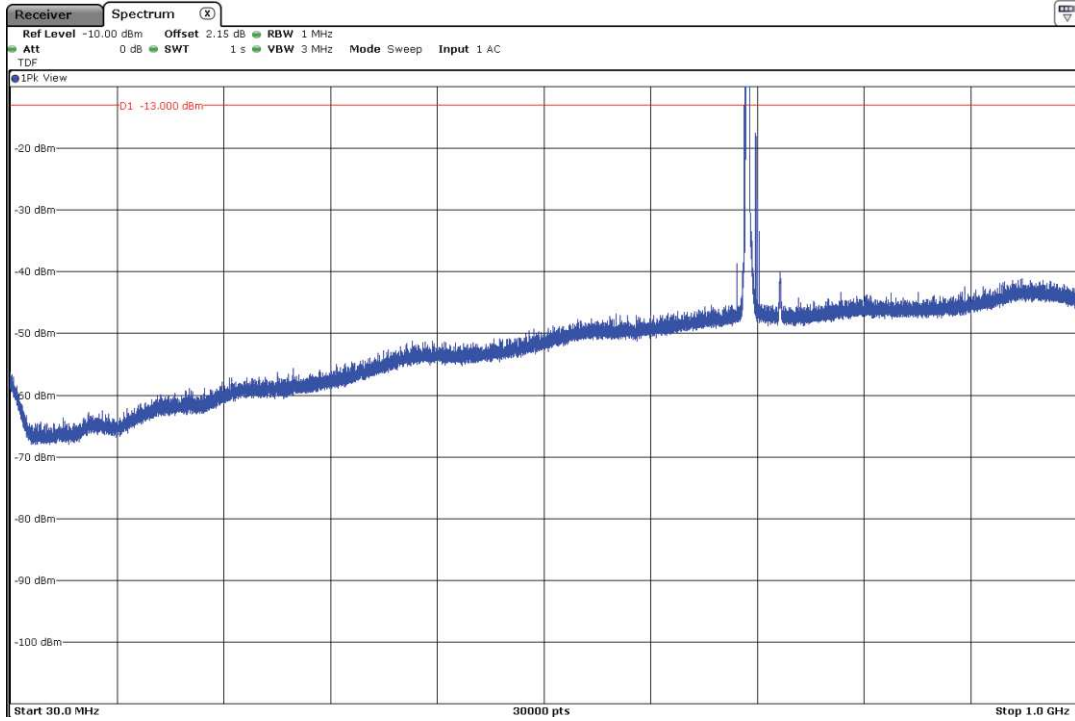
Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
1431.78	Peak	-15.63	V
2147.65	Peak	-31.12	V

Measurement uncertainty (dB)	<±4.86 for f < 1GHz <±5.13 for f ≥ 1 GHz up to 8 GHz
------------------------------	---

Verdict: PASS

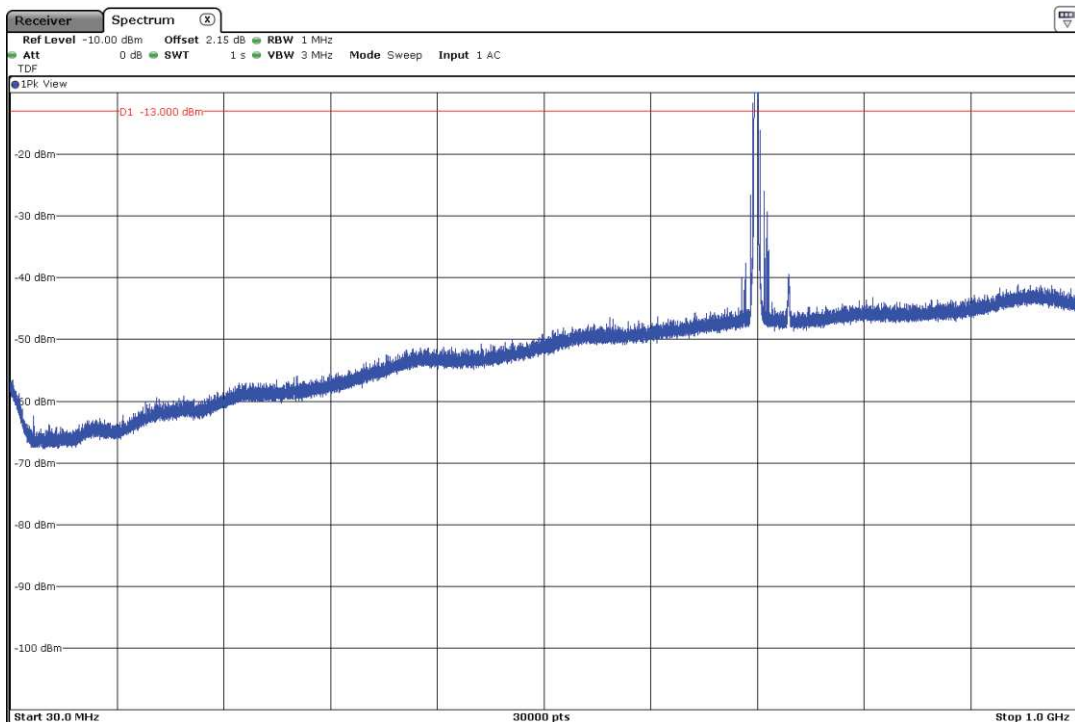
### FREQUENCY RANGE 30 MHz - 1 GHz

- Lowest Channel:



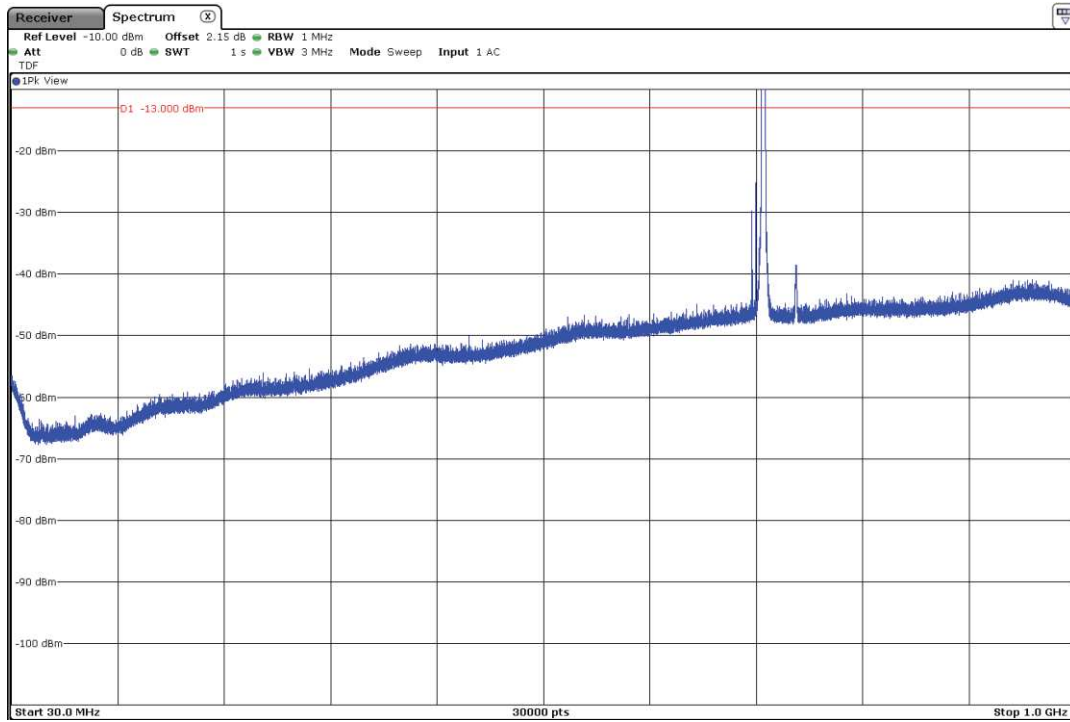
The peak above the limit is the LTE Band 12 carrier frequency (699.7 MHz)

- Middle Channel:



The peak above the limit is the LTE Band 12 carrier frequency (707.5 MHz).

- Highest Channel:

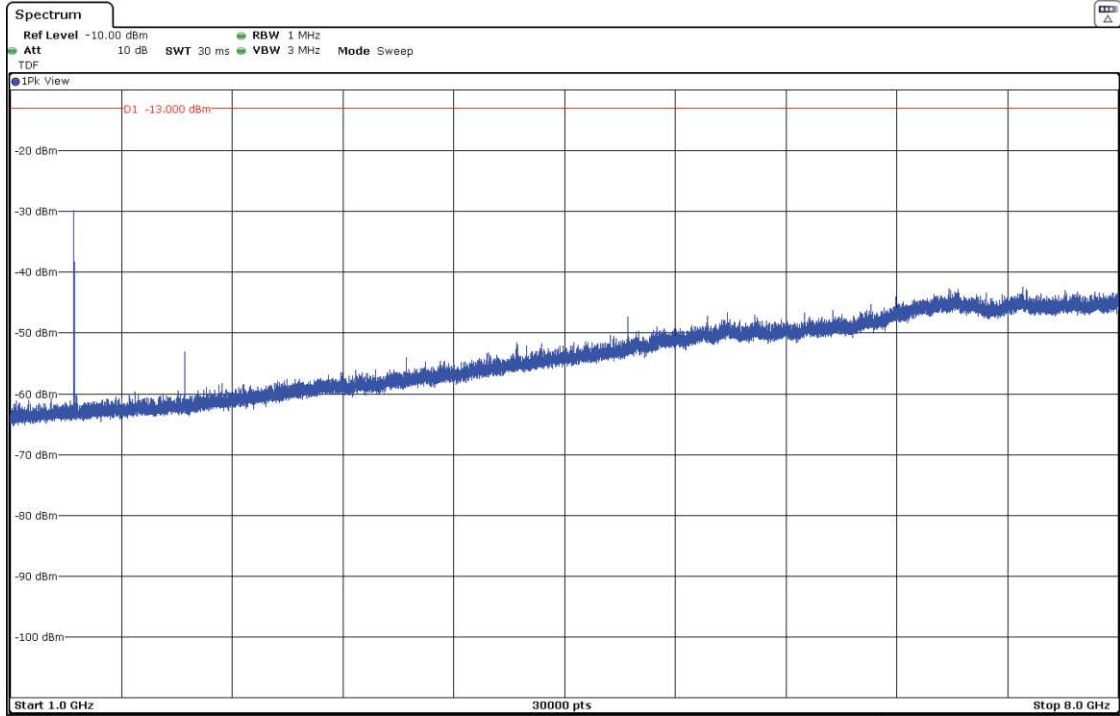


The peak above the limit is the LTE Band 12 carrier frequency (715.3 MHz).

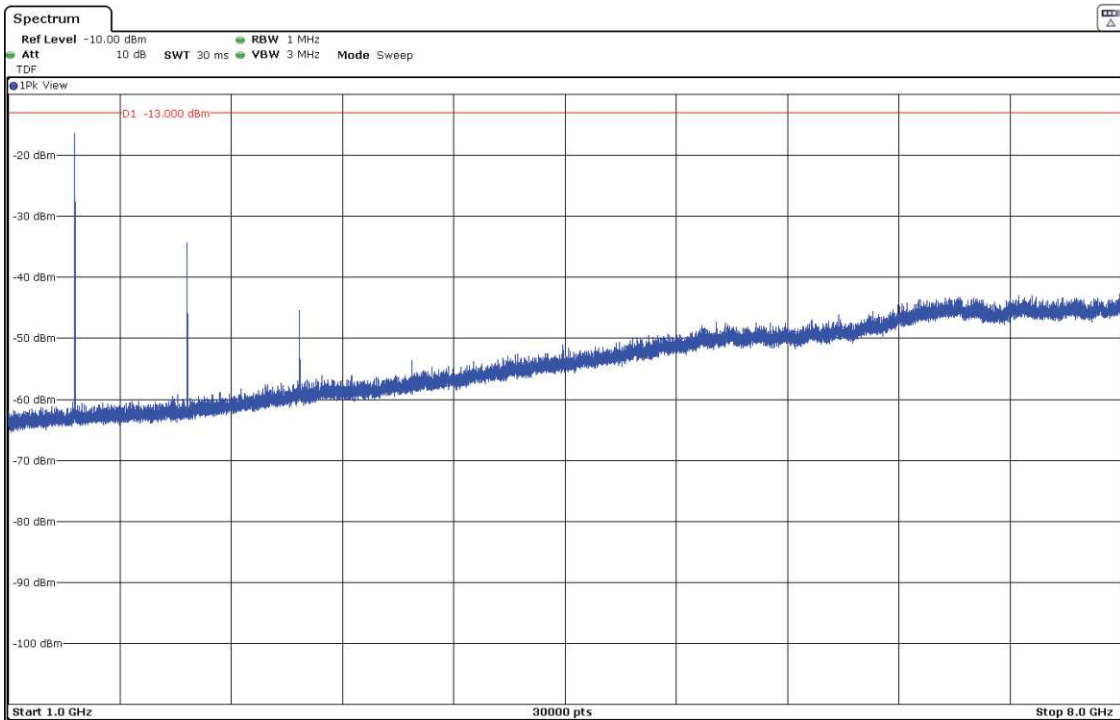


## FREQUENCY RANGE 1 - 8 GHz

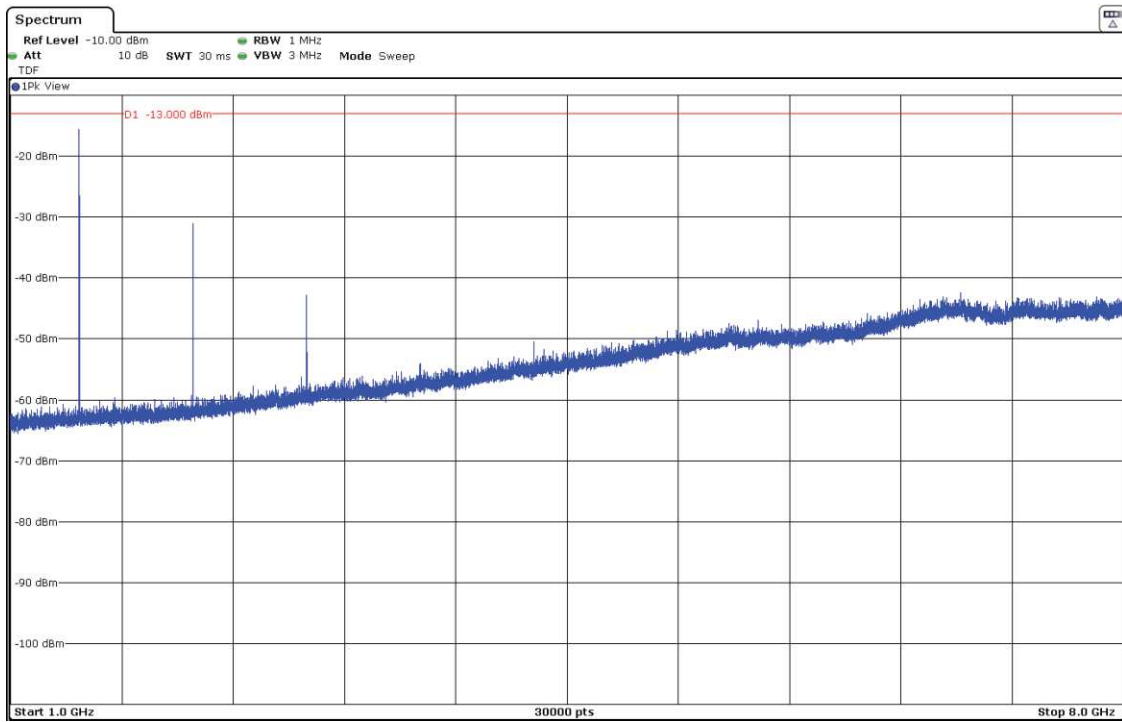
- Lowest Channel:



- Middle Channel:



- Highest Channel:



## LTE Band 13:

QPSK and 16QAM Modulations:

A preliminary scan determined the 16QAM modulation, BW=10 MHz, RB=1, Offset=49 as the worst case. The following tables and plots show the results for 16QAM modulation, BW=10 MHz, RB=1, Offset=49.

Antenna:

A preliminary scan determined the Backup antenna as the worst case. The following tables and plots show the results for Backup antenna.

### - Middle Channel:

#### Frequency range 30 MHz - 1 GHz

No spurious frequencies detected at less than 20 dB below the limit.

#### Frequency range 1 - 8 GHz

No spurious frequencies detected at less than 20 dB below the limit.

#### Frequency range 763 - 775 MHz

No spurious frequencies detected at less than 20 dB below the limit.

#### Frequency range 793 - 806 MHz

No spurious frequencies detected at less than 20 dB below the limit.

#### Frequency range 1559 - 1610 MHz

Spurious frequencies at less than 20 dB below the limit:

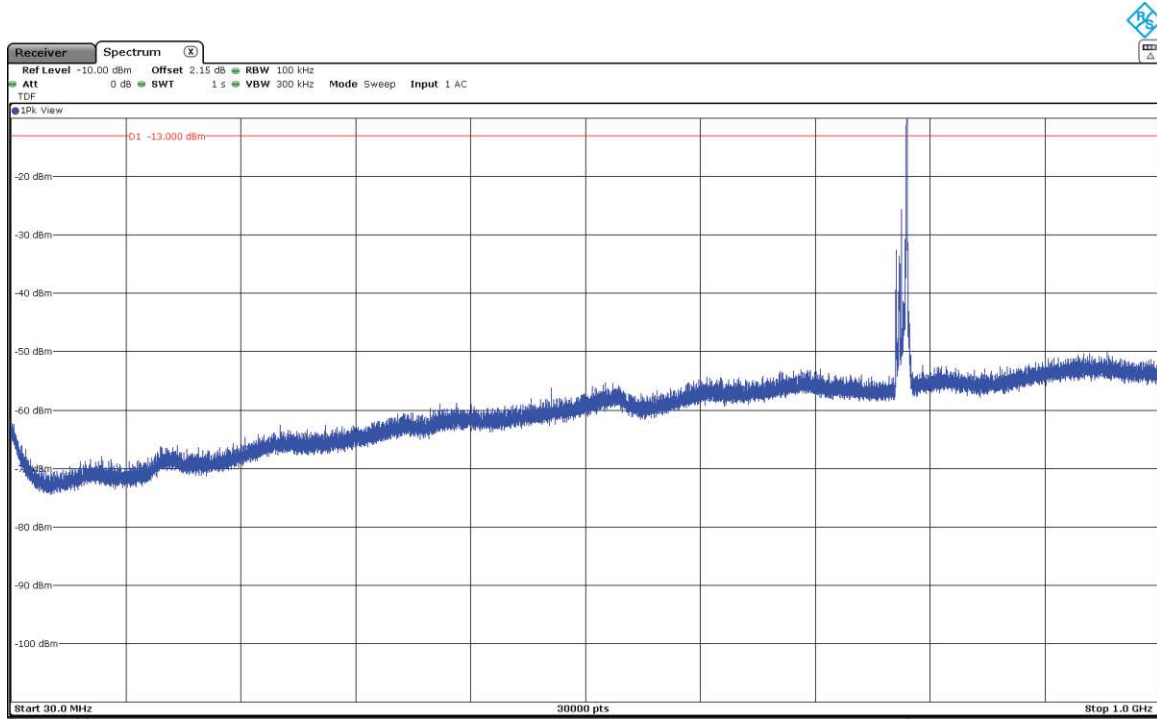
Spurious frequency (MHz)	Detector	E.I.R.P (dBm)	Polarization
1572.78	Peak	-41.25	V

Measurement uncertainty (dB)	<±4.86 for f < 1GHz <±5.13 for f ≥ 1 GHz up to 8 GHz
------------------------------	---

Verdict: PASS

## FREQUENCY RANGE 30 MHz - 1 GHz

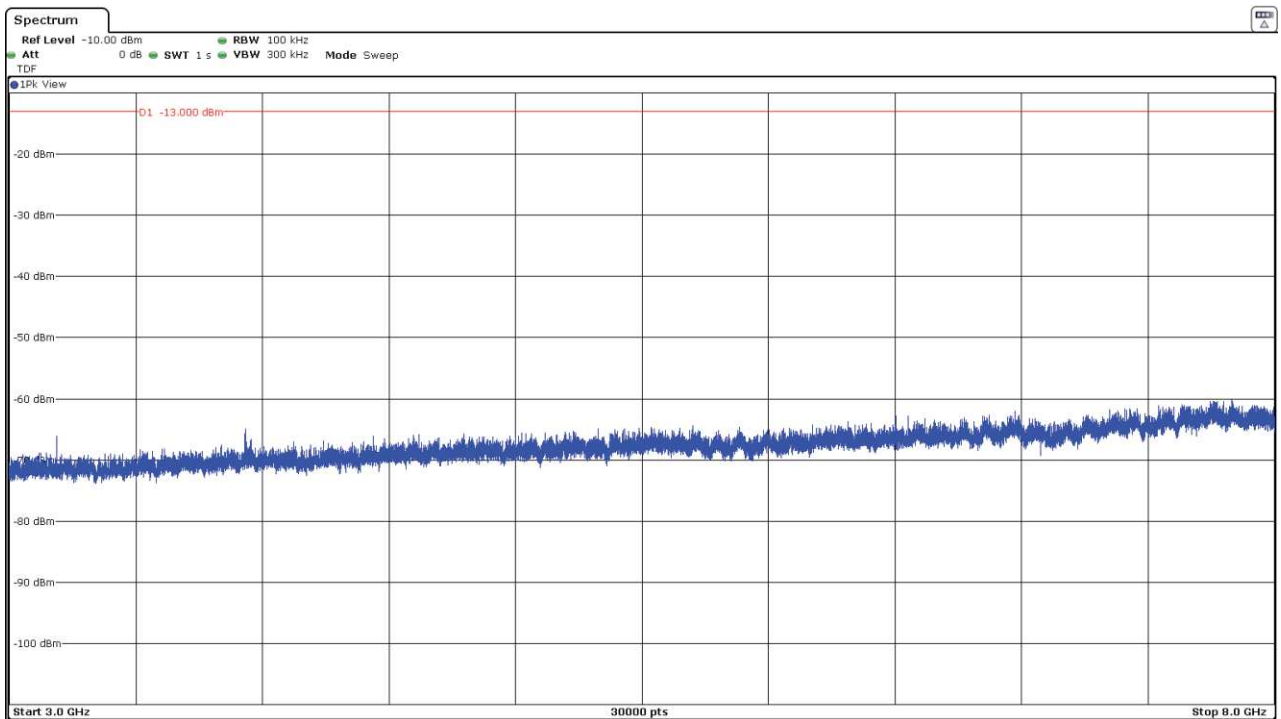
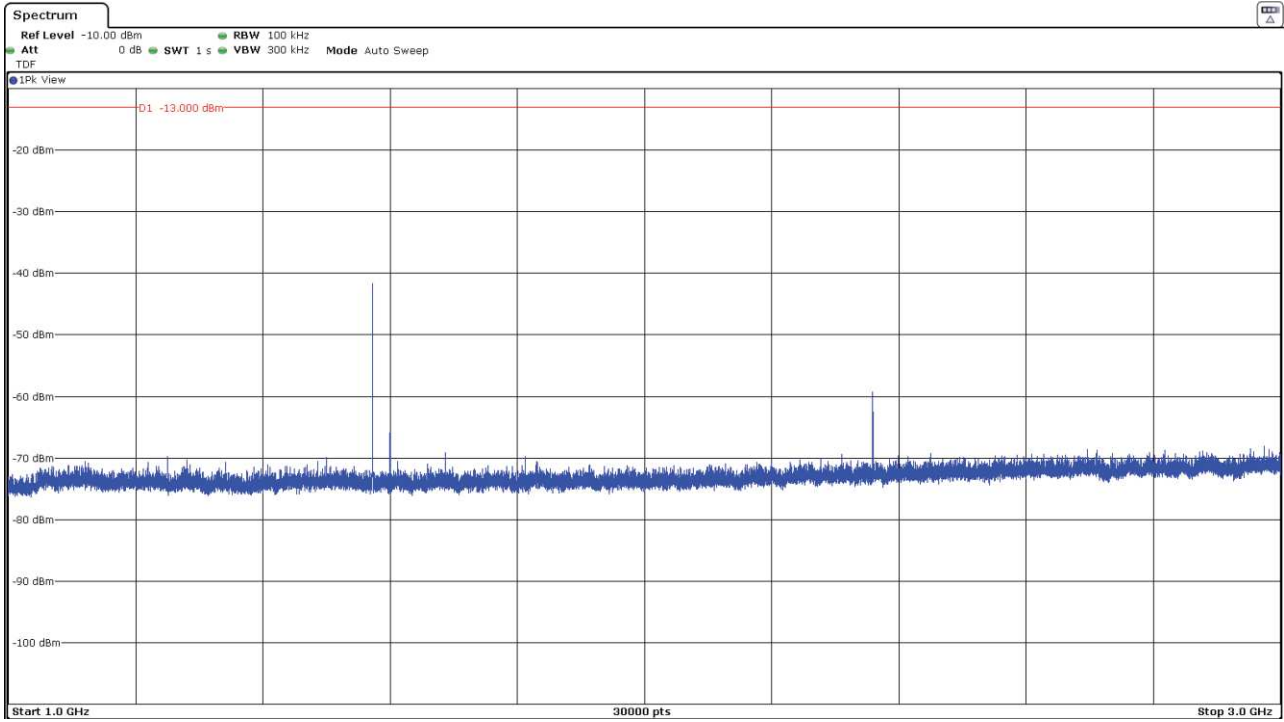
- Middle Channel:



The peak above the limit is the LTE Band 13 carrier frequency (782 MHz).

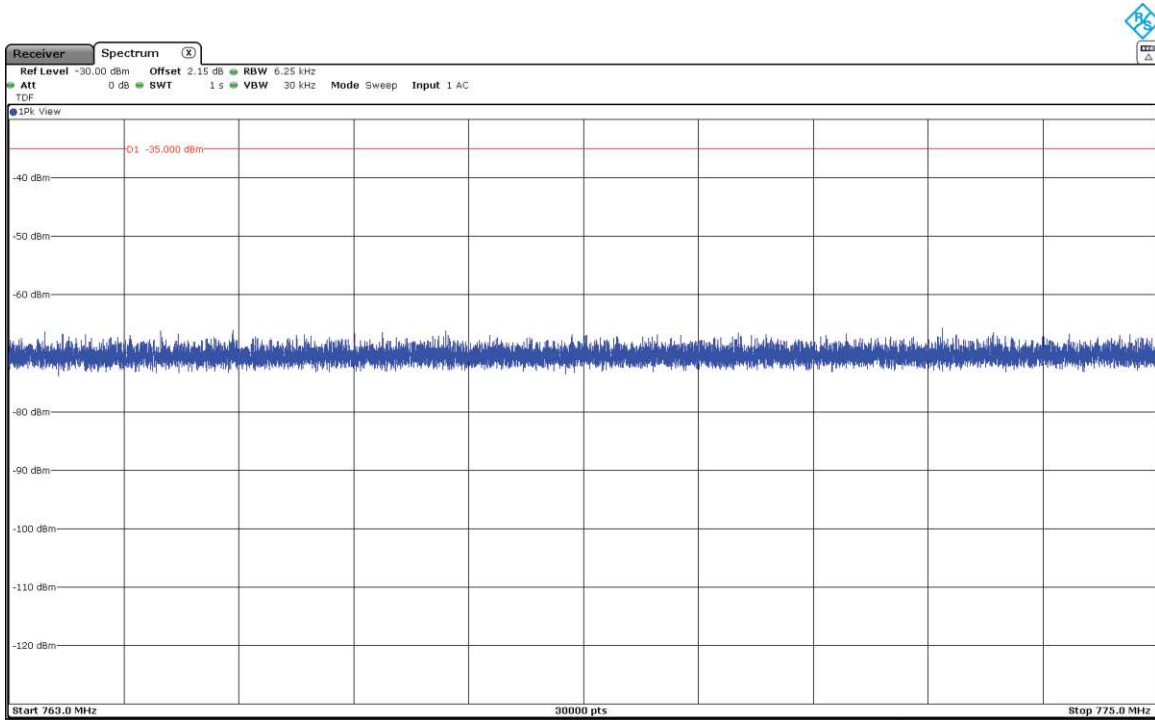
## FREQUENCY RANGE 1 - 8 GHz

- Middle Channel:



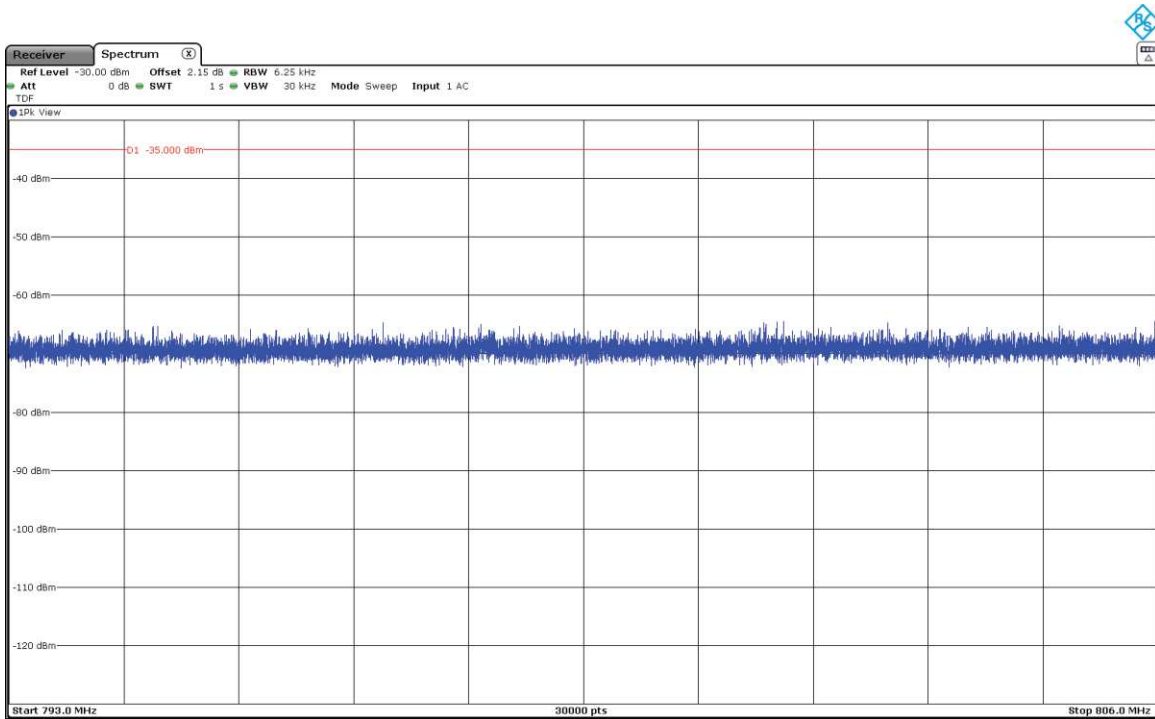
### FREQUENCY RANGE 763 - 775 MHz

- Middle Channel:



### FREQUENCY RANGE 793 - 806 MHz

- Middle Channel:



### FREQUENCY RANGE 1559 - 1610 MHz

- Middle Channel:

