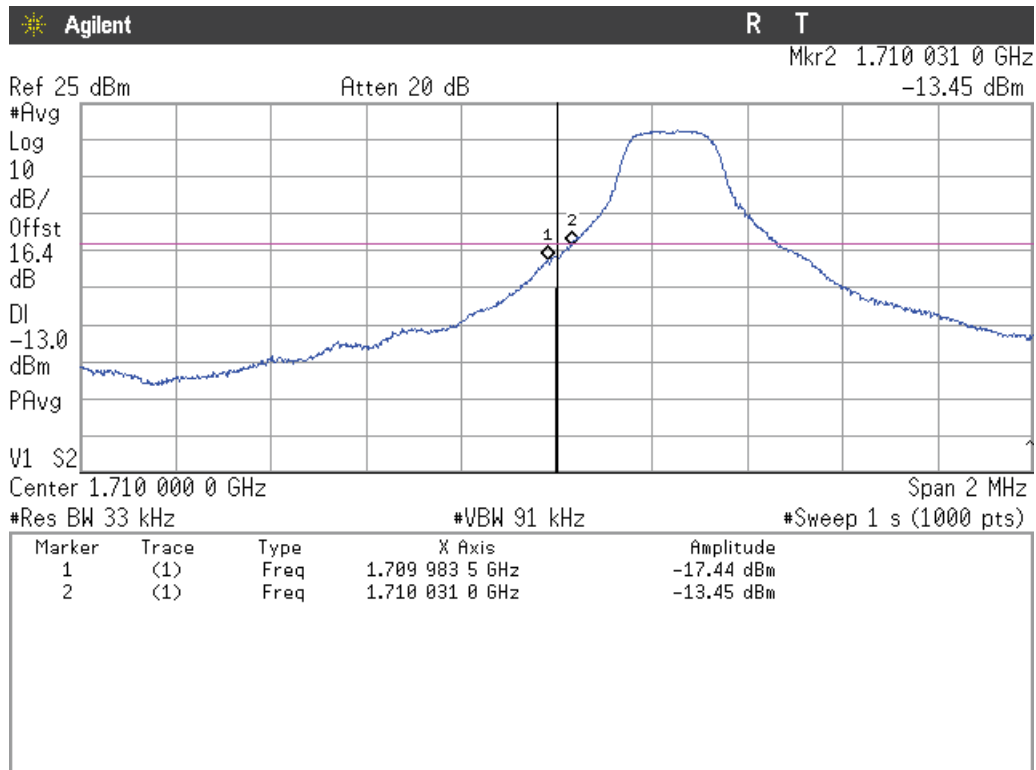
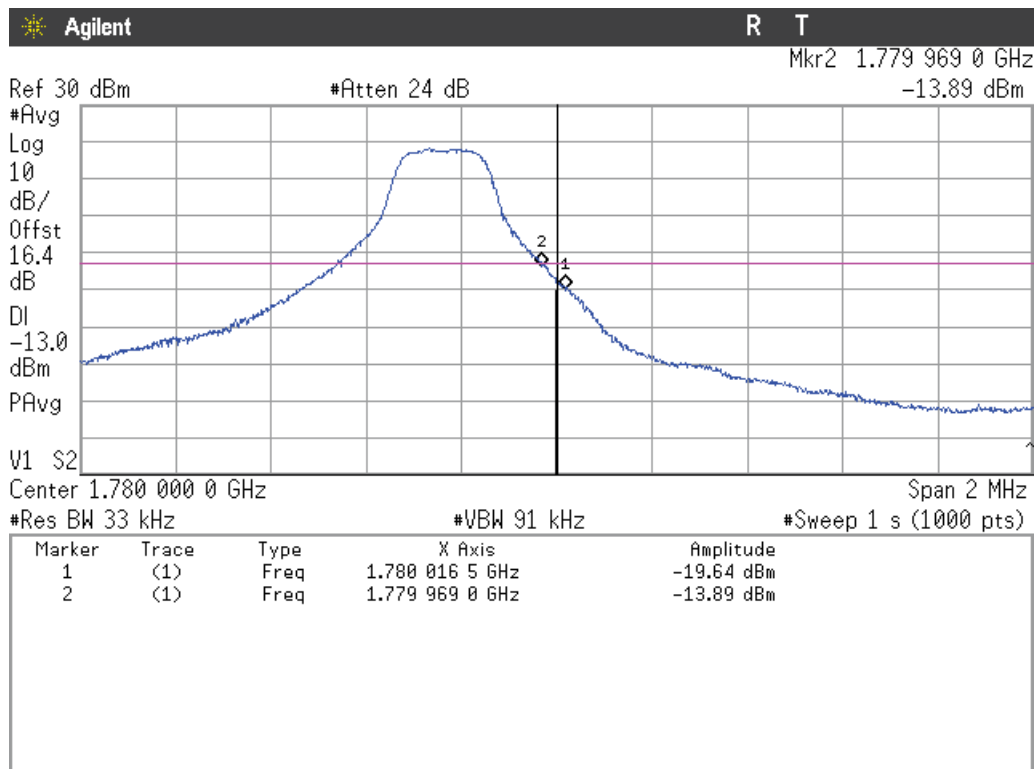


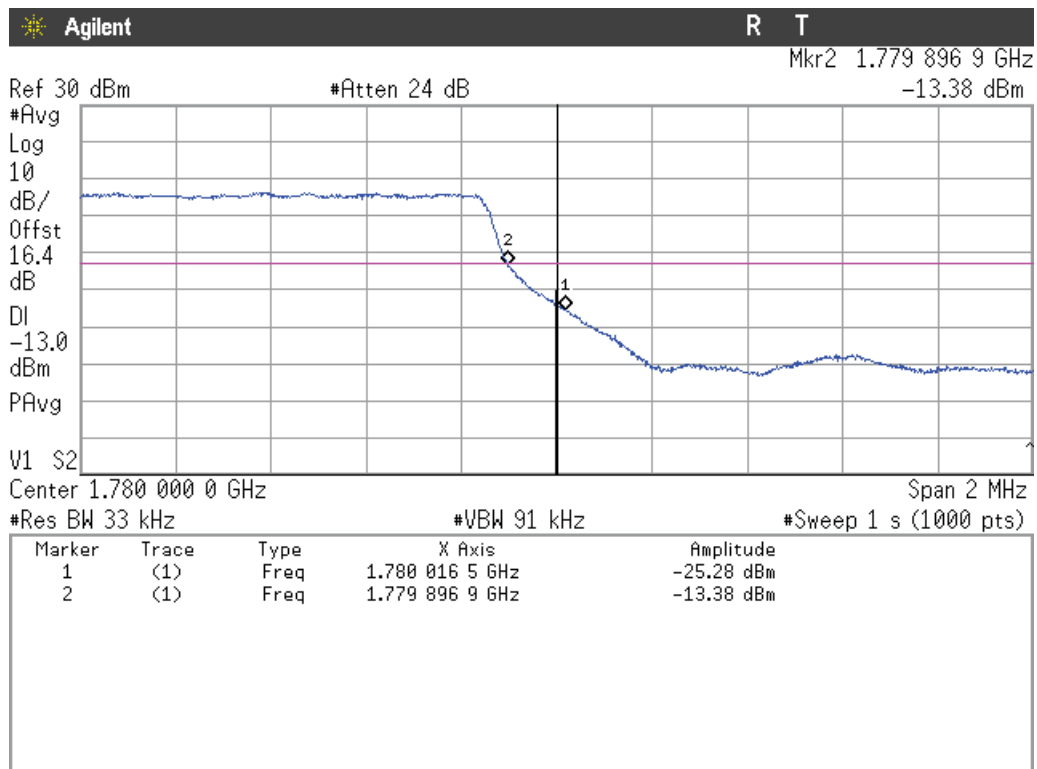
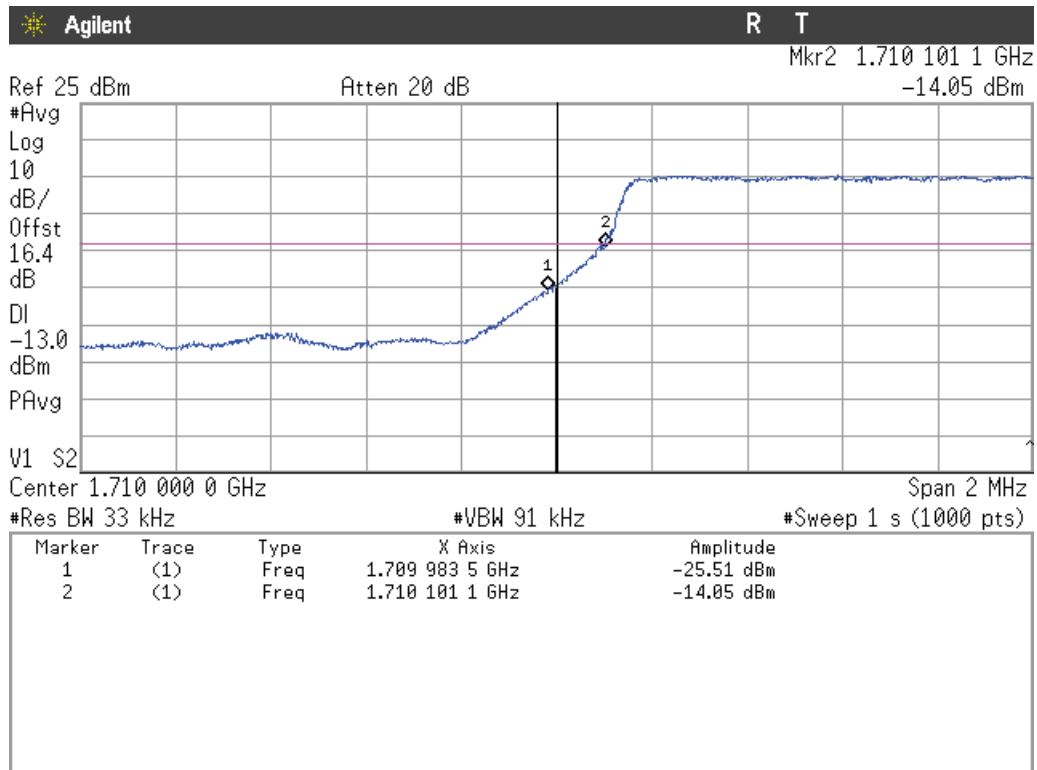
LTE Band 66. QPSK MODULATION. BW=3 MHz. RB=1. Offset=0. Lowest Block Edge:



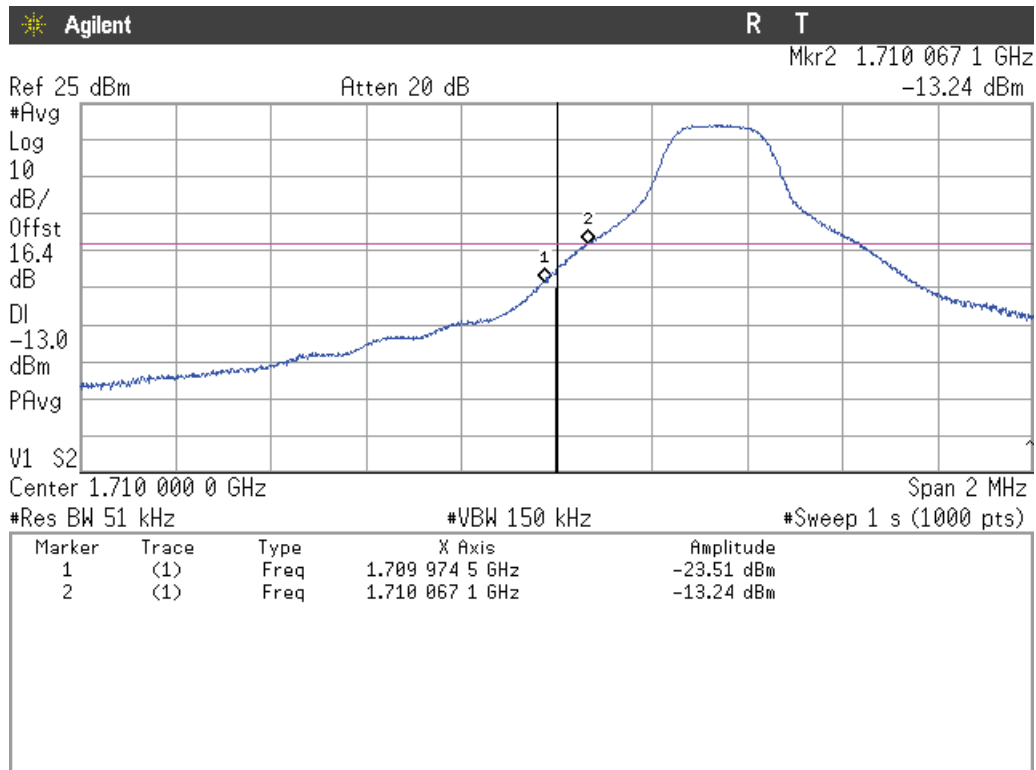
LTE Band 66. QPSK MODULATION. BW=3 MHz. RB=1. Offset=Max. Highest Block Edge:



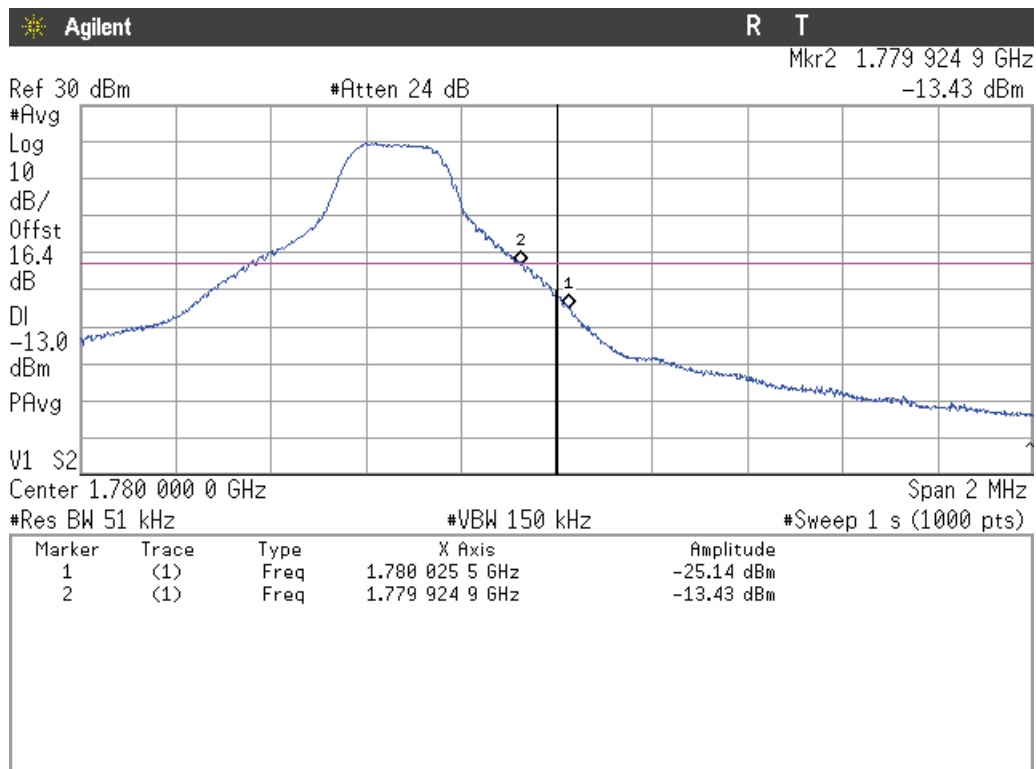
LTE Band 66. QPSK MODULATION. BW=3 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:



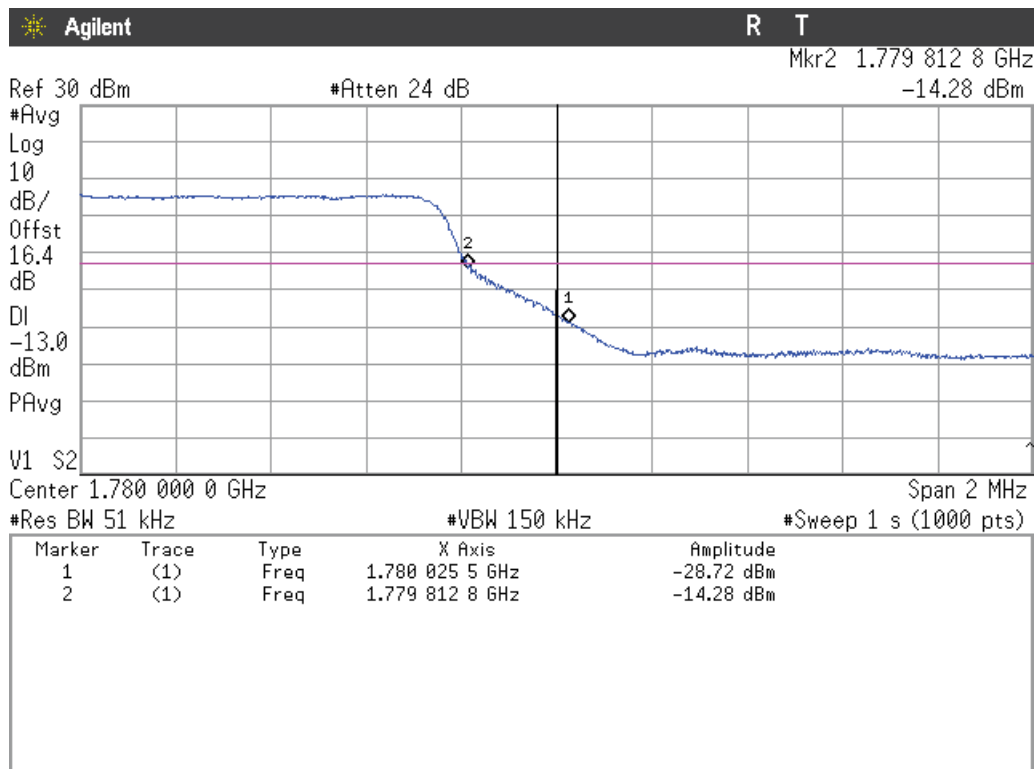
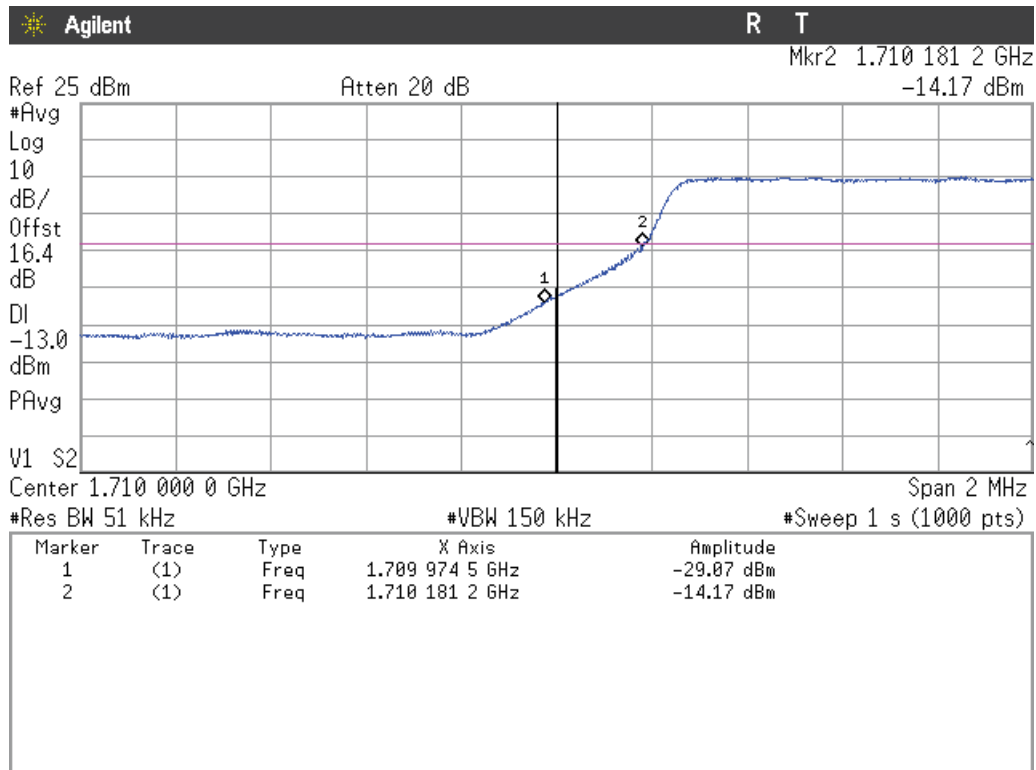
LTE Band 66. QPSK MODULATION. BW=5 MHz. RB=1. Offset=0. Lowest Block Edge:



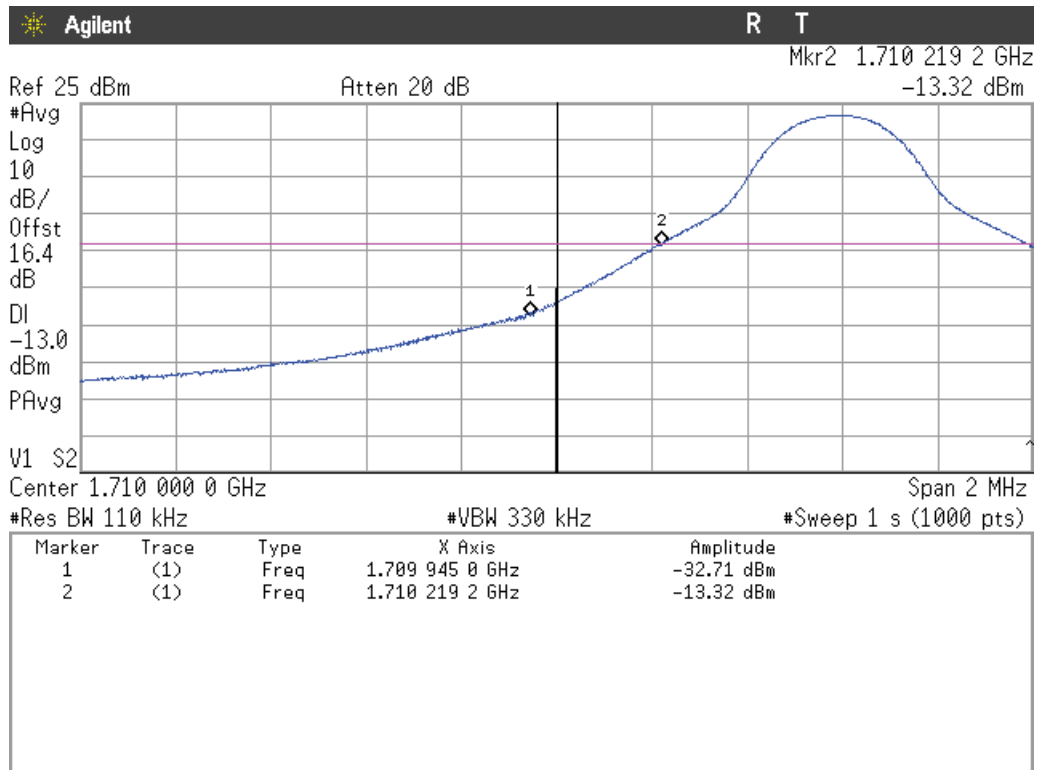
LTE Band 66. QPSK MODULATION. BW=5 MHz. RB=1. Offset=Max. Highest Block Edge:



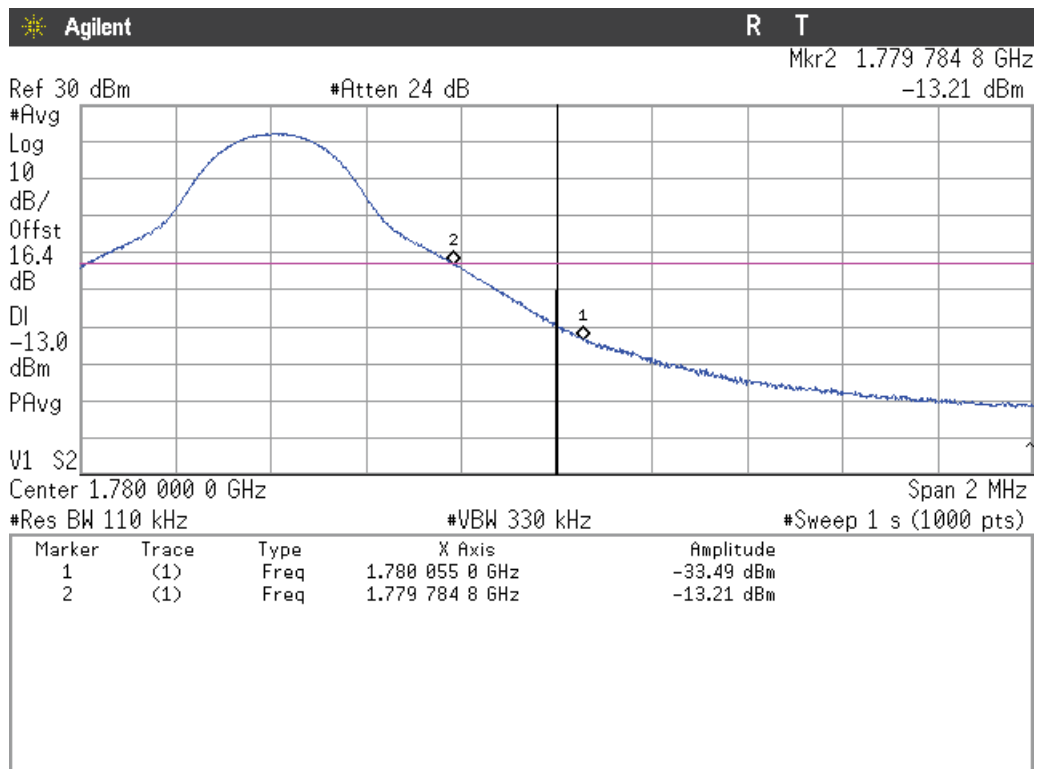
LTE Band 66. QPSK MODULATION. BW=5 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:



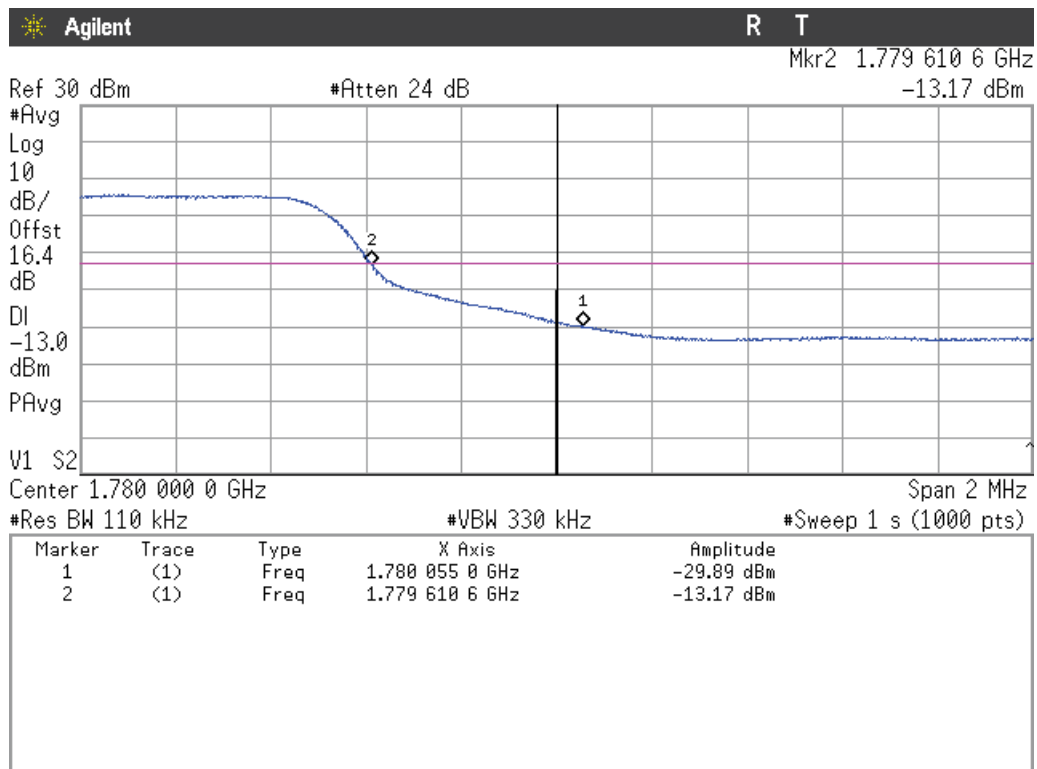
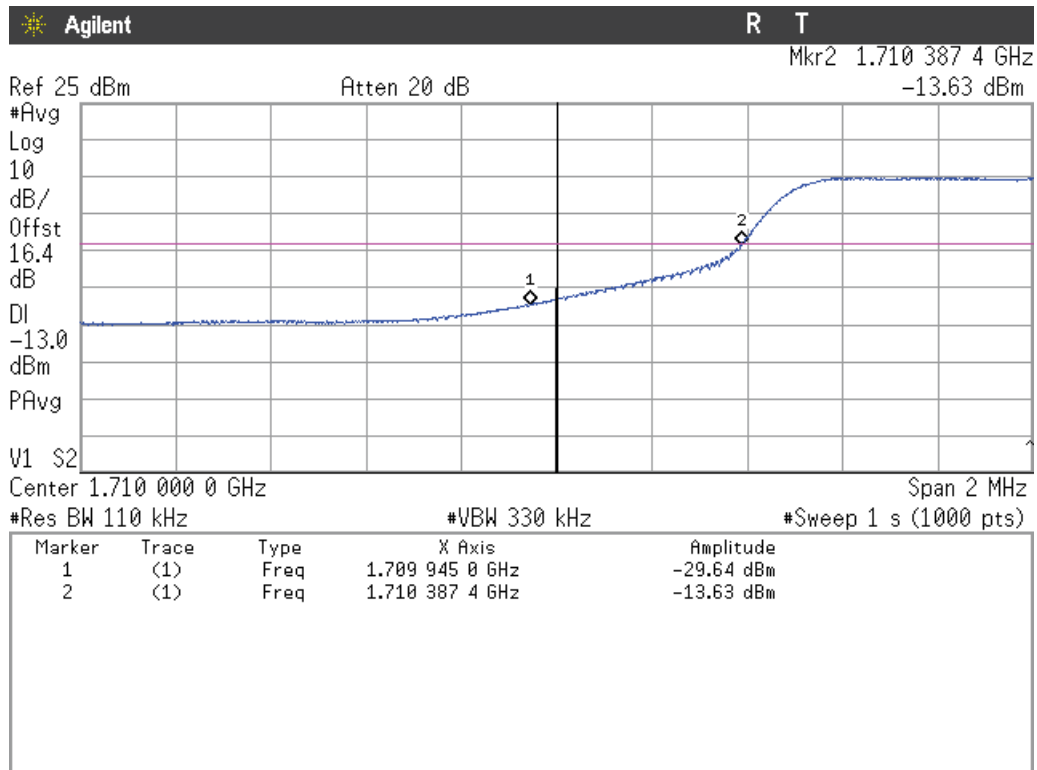
LTE Band 66. QPSK MODULATION. BW=10 MHz. RB=1. Offset=0. Lowest Block Edge:



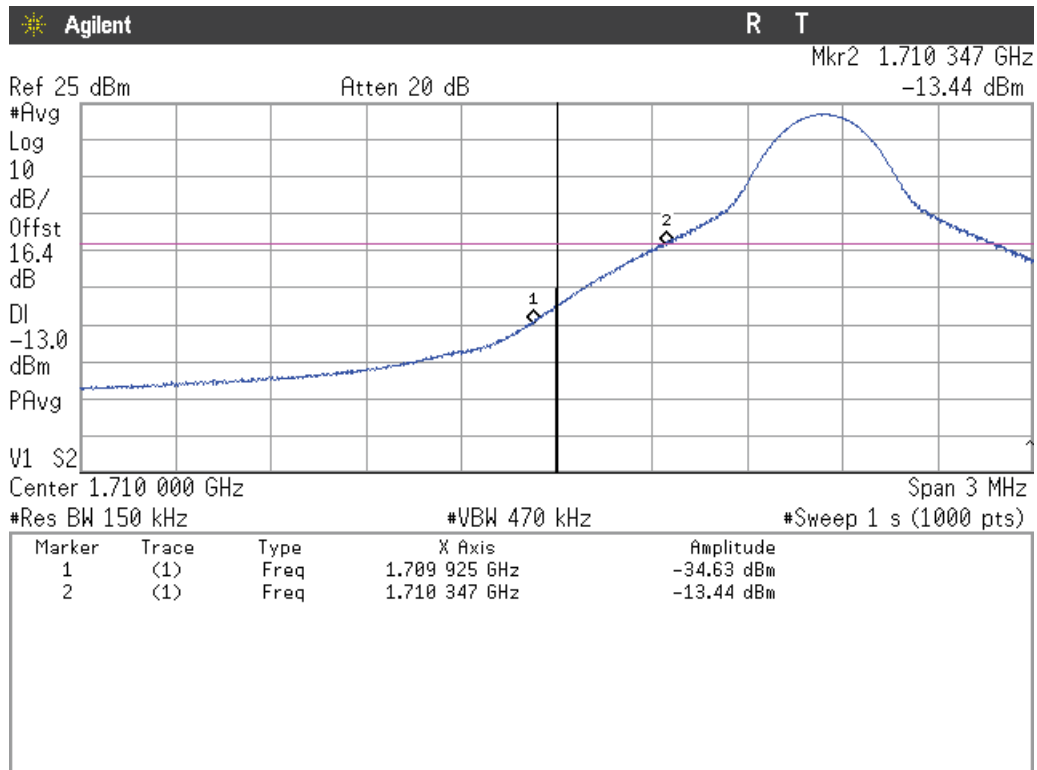
LTE Band 66. QPSK MODULATION. BW=10 MHz. RB=1. Offset=Max. Highest Block Edge:



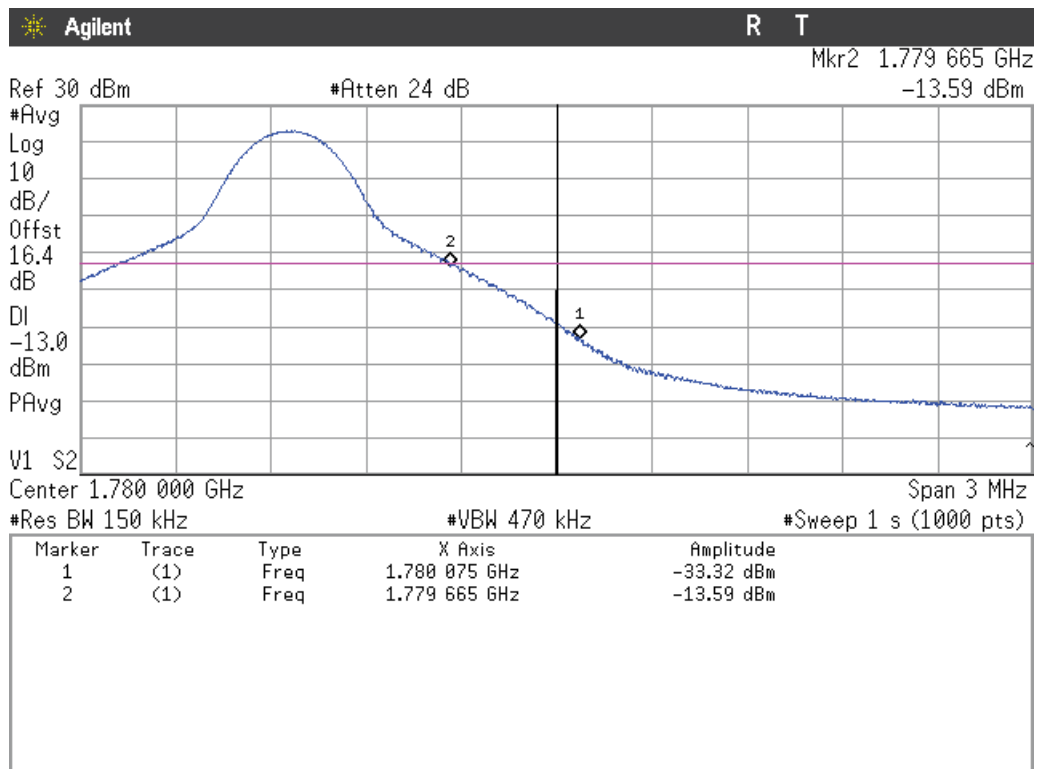
**LTE Band 66. QPSK MODULATION. BW=10 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:**



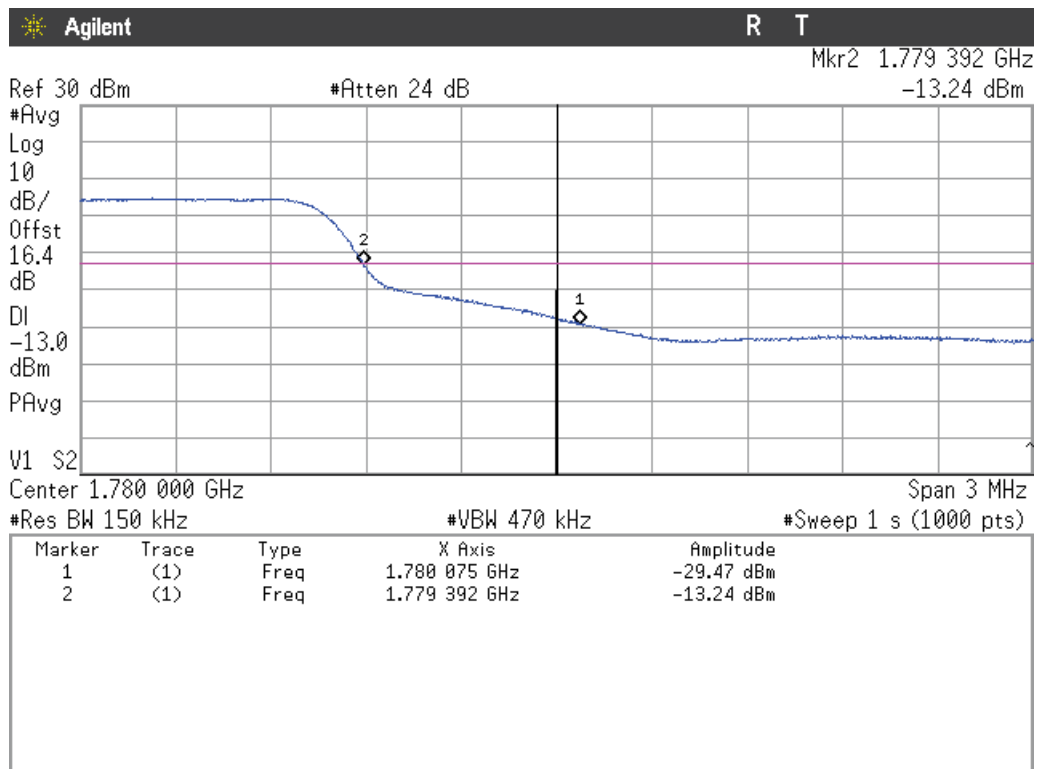
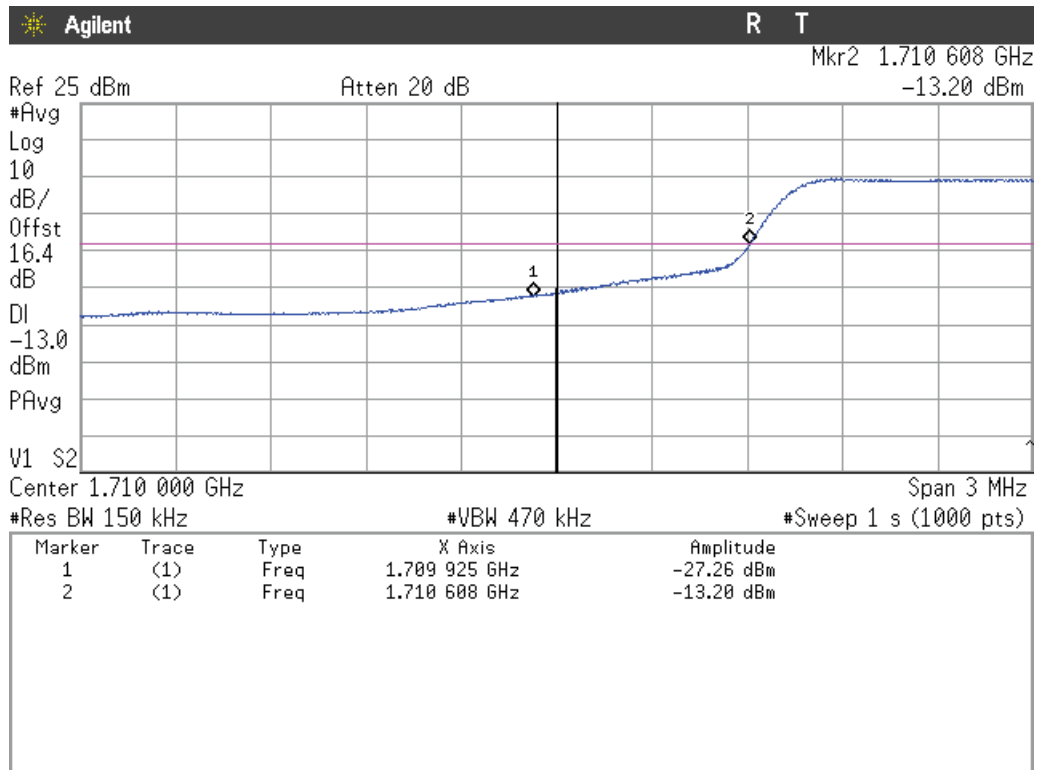
**LTE Band 66. QPSK MODULATION. BW=15 MHz. RB=1. Offset=0. Lowest Block Edge:**



**LTE Band 66. QPSK MODULATION. BW=15 MHz. RB=1. Offset=Max. Highest Block Edge:**

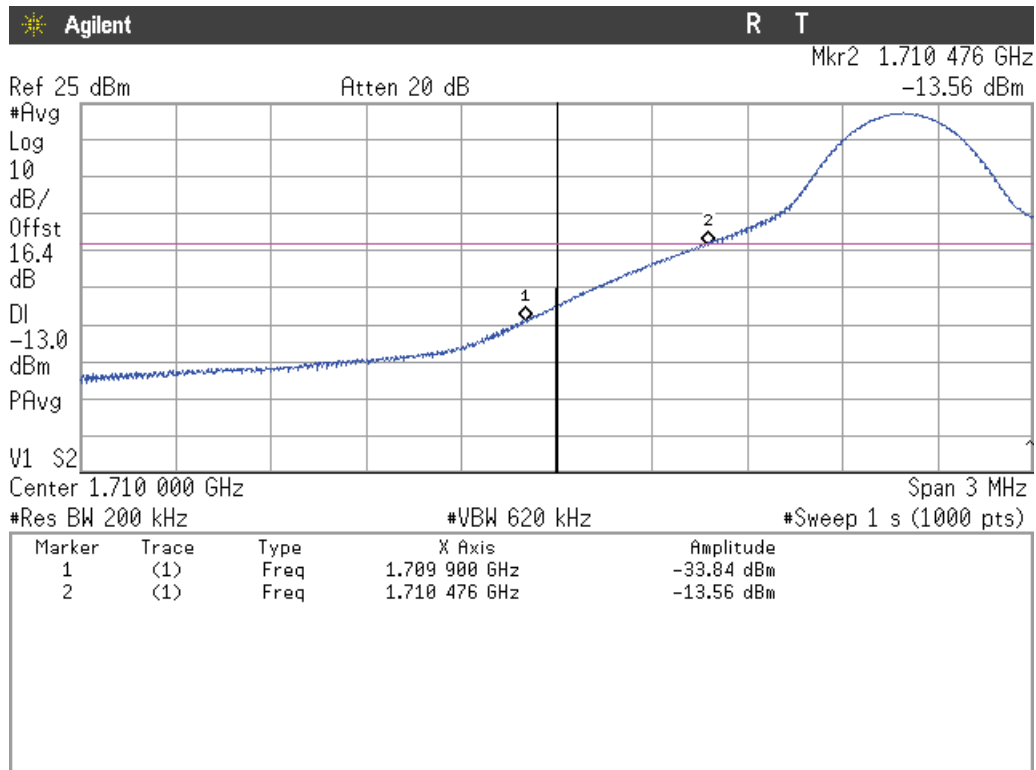


**LTE Band 66. QPSK MODULATION. BW=15 MHz. RB=All. Offset=0. Lowest and Highest Block Edges:**

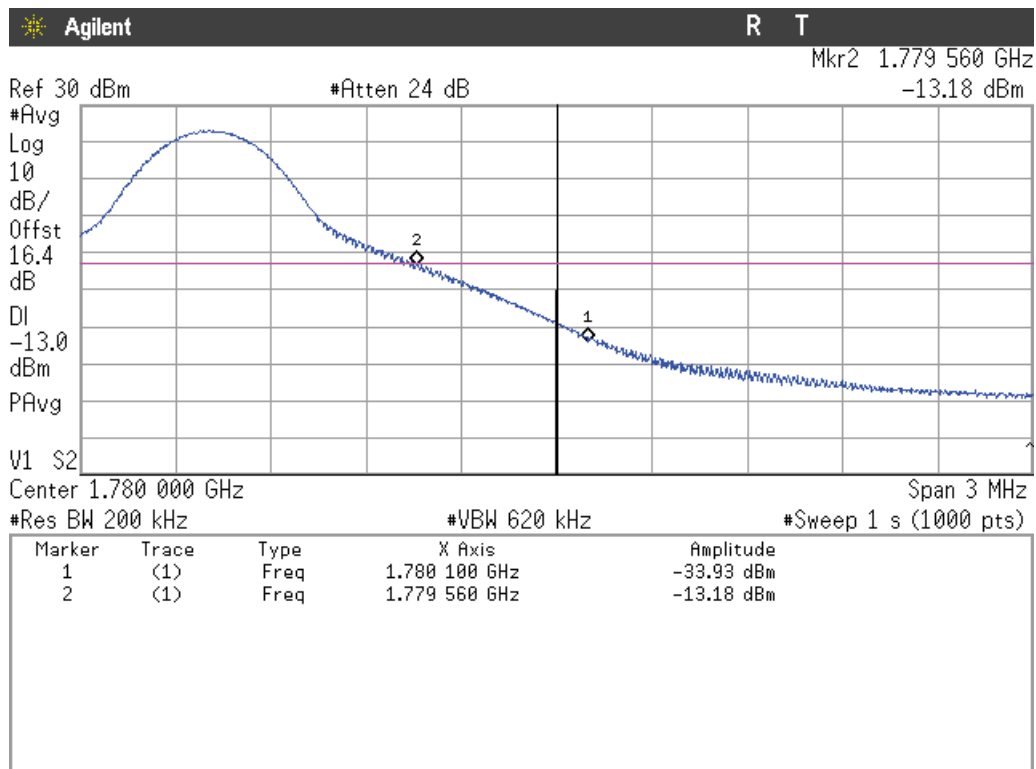




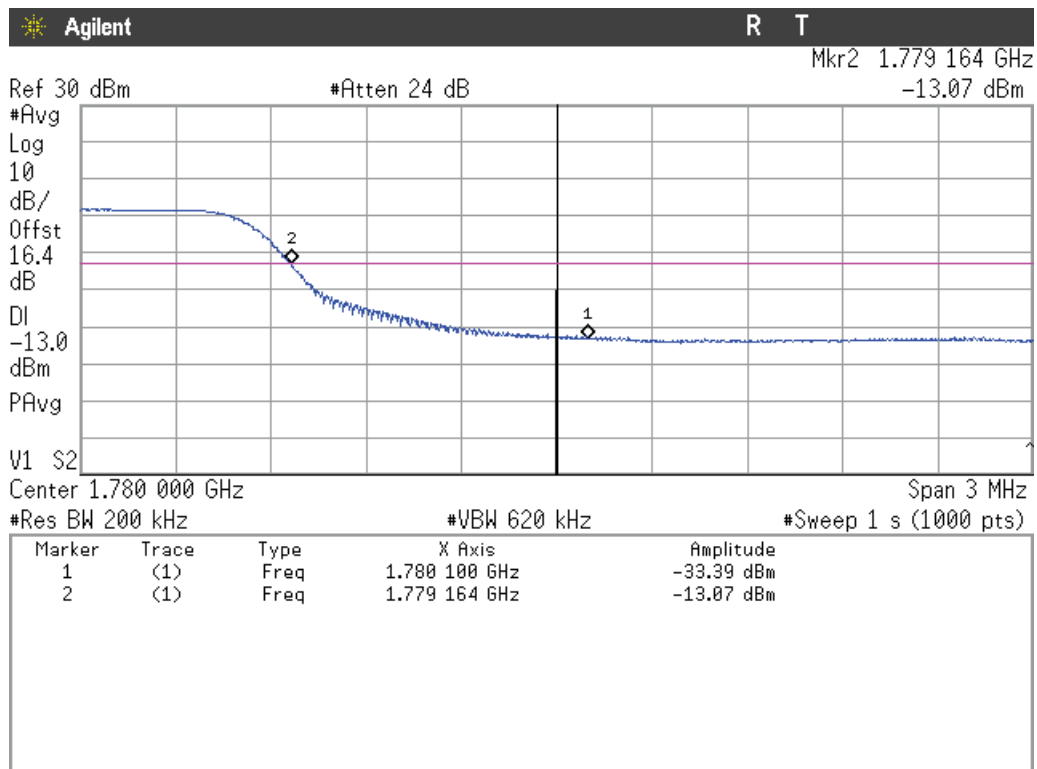
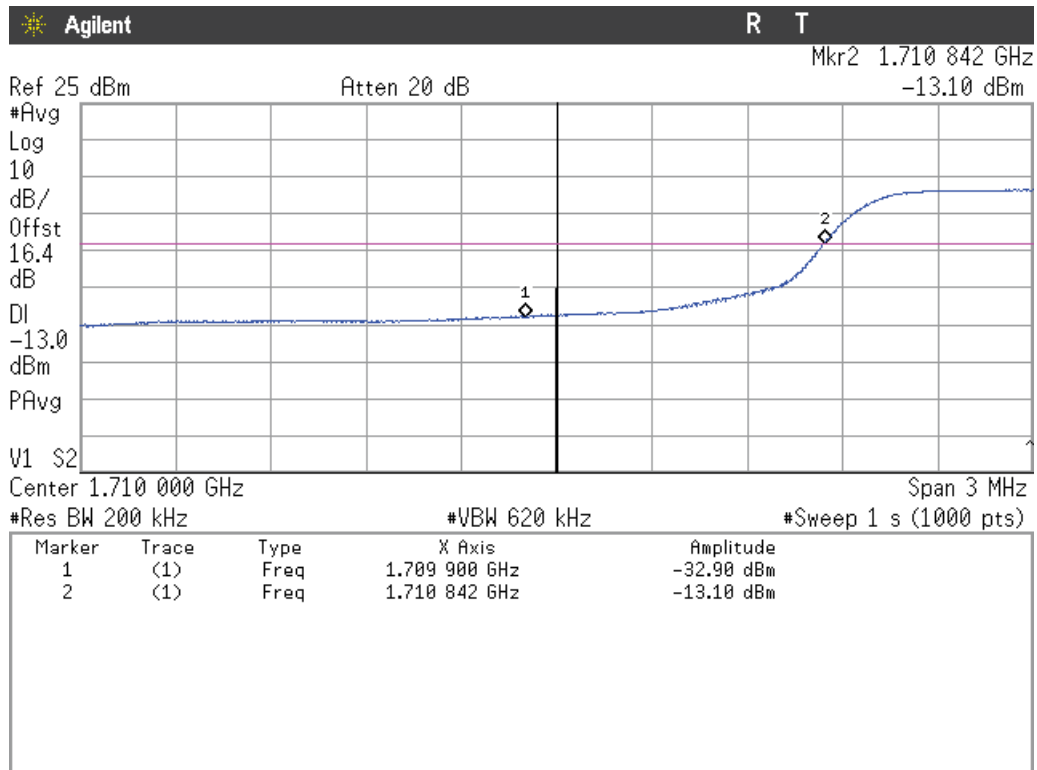
LTE Band 66. QPSK MODULATION. BW=20 MHz. RB=1. Offset=0. Lowest Block Edge:



LTE Band 66. QPSK MODULATION. BW=20 MHz. RB=1. Offset=Max. Highest Block Edge:



**LTE Band 66. QPSK MODULATION. BW=20 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, 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 12.** FCC §2.1053 & §27.53 (g) / RSS-130 Issue 1 Clause 4.6.1.

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 1 Clause 4.6.1:

4.6.1. The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate 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 the equipment's operating frequency range, a resolution bandwidth of 30 kHz may be employed.

LTE Band 12 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:

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

### 3. LTE Band 13. FCC §2.1053 & §27.53 (c) (2) (4) & (f) / RSS-130 Issue 1 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 1 Clause 4.6.1:

4.6.1. The power of any unwanted emissions in any 100 kHz bandwidth on any frequency outside the frequency range(s) within which the equipment is designed to operate 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 the equipment's operating frequency 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:

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

### 4. LTE Band 30. FCC §2.1053 & §27.53 (a) (4).

FCC §27.53 (a) (4)

(a) For operations in the 2305-2320 MHz band and the 2345-2360 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power P (with averaging performed only during periods of transmission) within the licensed band(s) of operation, in watts, by the following amounts:

(4) For mobile and portable stations operating in the 2305-2315 MHz and 2350-2360 MHz bands:

(i) By a factor of not less than:  $43 + 10 \log (P)$  dB on all frequencies between 2305 and 2320 MHz and on all frequencies between 2345 and 2360 MHz that are outside the licensed band(s) of operation, not less than  $55 + 10 \log (P)$  dB on all frequencies between 2320 and 2324 MHz and on all frequencies between 2341 and 2345 MHz, not less than  $61 + 10 \log (P)$  dB on all frequencies between 2324 and 2328 MHz and on all frequencies between 2337 and 2341 MHz, and not less than  $67 + 10 \log (P)$  dB on all frequencies between 2328 and 2337 MHz;

(ii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2300 and 2305 MHz,  $55 + 10 \log (P)$  dB on all frequencies between 2296 and 2300 MHz,  $61 + 10 \log (P)$  dB on all frequencies between 2292 and 2296 MHz,  $67 + 10 \log (P)$  dB on all frequencies between 2288 and 2292 MHz, and  $70 + 10 \log (P)$  dB below 2288 MHz;

(iii) By a factor of not less than  $43 + 10 \log (P)$  dB on all frequencies between 2360 and 2365 MHz, and not less than  $70 + 10 \log (P)$  dB above 2365 MHz.

#### LTE Band 30 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:

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

#### 5. 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:

$40 + 10 \log_{10} p$  from the channel edges to 5 MHz away

$43 + 10 \log_{10} p$  between 5 MHz and X MHz from the channel edges, and

$55 + 10 \log_{10} p$  at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than  $43 + 10 \log_{10} p$  on all frequencies between 2490.5 MHz and 2496 MHz, and  $55 + 10 \log_{10} p$  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  $P_o$  transmitting power, the specified minimum attenuation becomes  $43 + 10 \log (P_o)$ , and the level in dBm relative  $P_o$  becomes:

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

## 6. LTE Band 38. 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:

$40 + 10 \log_{10} p$  from the channel edges to 5 MHz away

$43 + 10 \log_{10} p$  between 5 MHz and X MHz from the channel edges, and

$55 + 10 \log_{10} p$  at X MHz and beyond from the channel edges

In addition, the attenuation shall not be less than  $43 + 10 \log_{10} p$  on all frequencies between 2490.5 MHz and 2496 MHz, and  $55 + 10 \log_{10} p$  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 38 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:

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

#### 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 non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

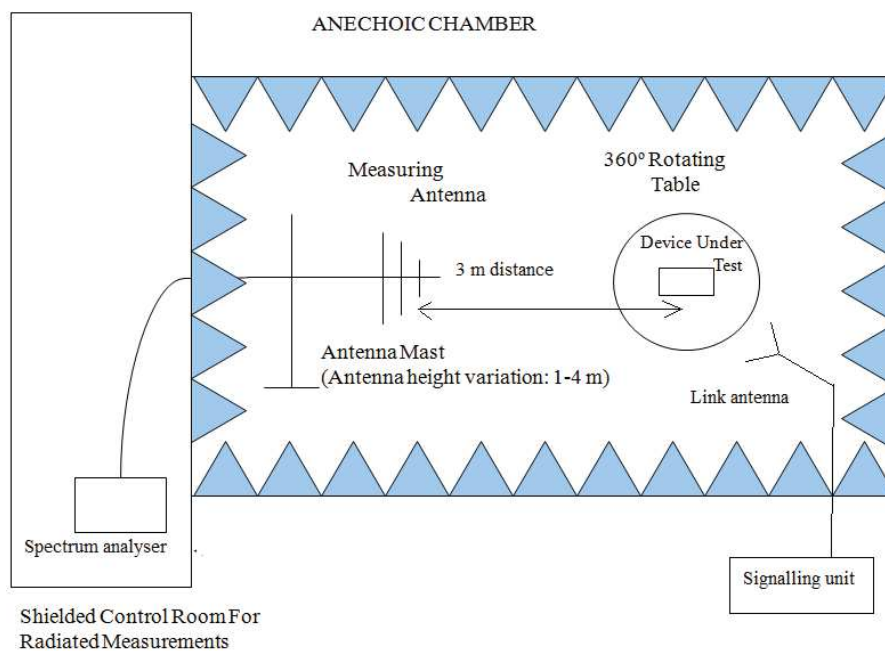
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

Each detected emission at less than 20 dB respect to the limit is substituted by the Substitution method in accordance with the ANSI/TIA-603-E: 2016.

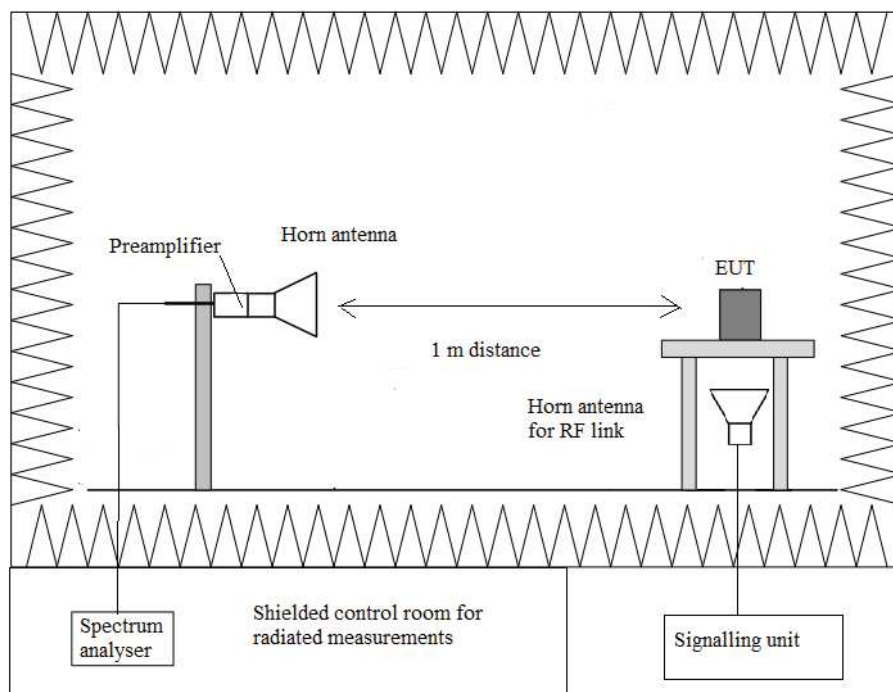


## TEST SETUP:

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.





## RESULTS:

### 3G Band IV:

WCDMA and HSUPA Modulations:

A preliminary scan determined the HSUPA modulation as the worst case.

#### **- Lowest Channel:**

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

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

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

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

#### **- Middle Channel:**

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

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

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

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

#### **- Highest Channel:**

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

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

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

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

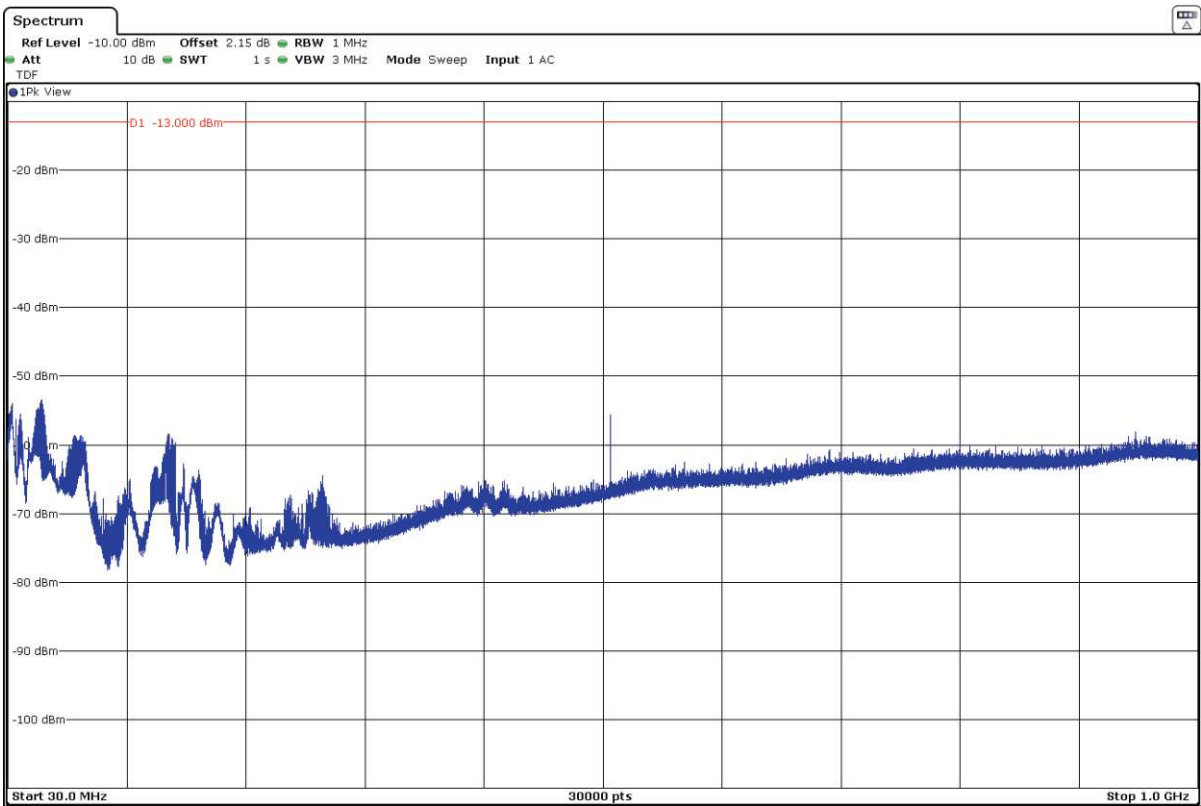
Measurement uncertainty (dB)	<±3.88 for f < 1GHz <±3.70 for f ≥ 1 GHz up to 18 GHz <±3.33 for f ≥ 18 GHz up to 20 GHz
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Verdict: PASS

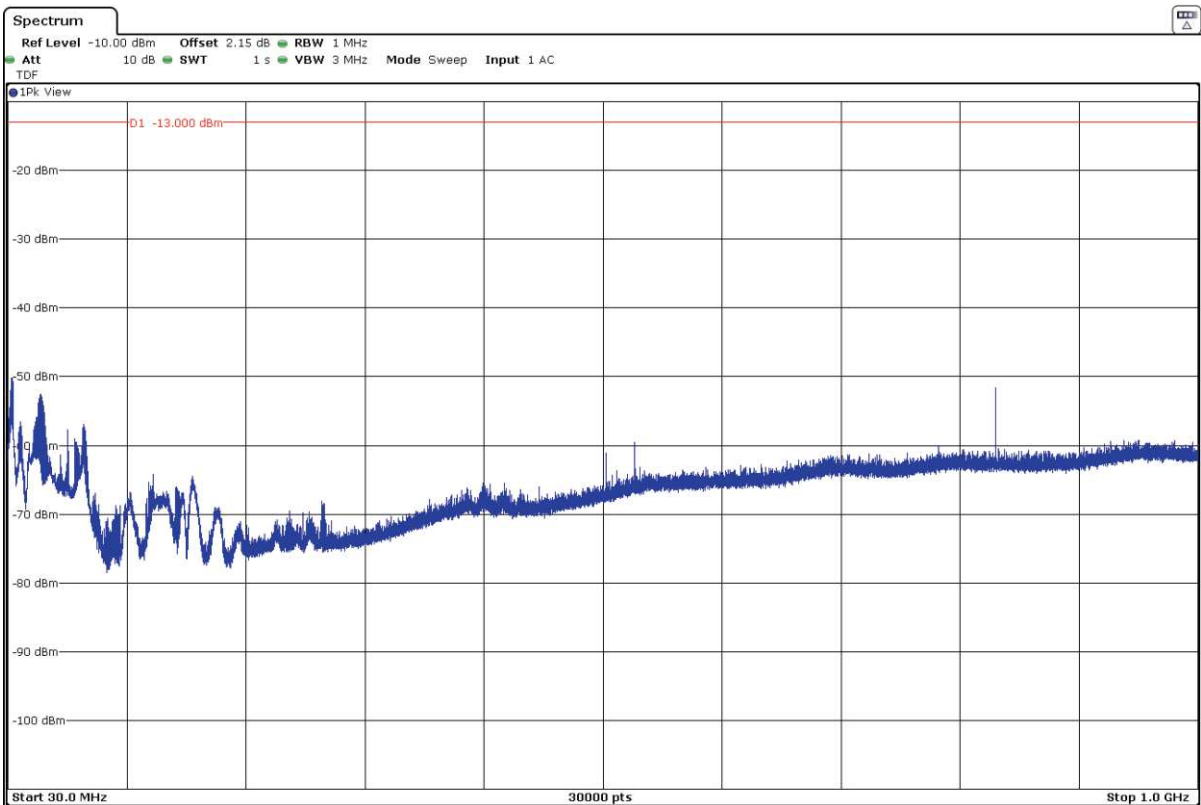
FREQUENCY RANGE 30 MHz - 1 GHz

HSUPA MODULATION

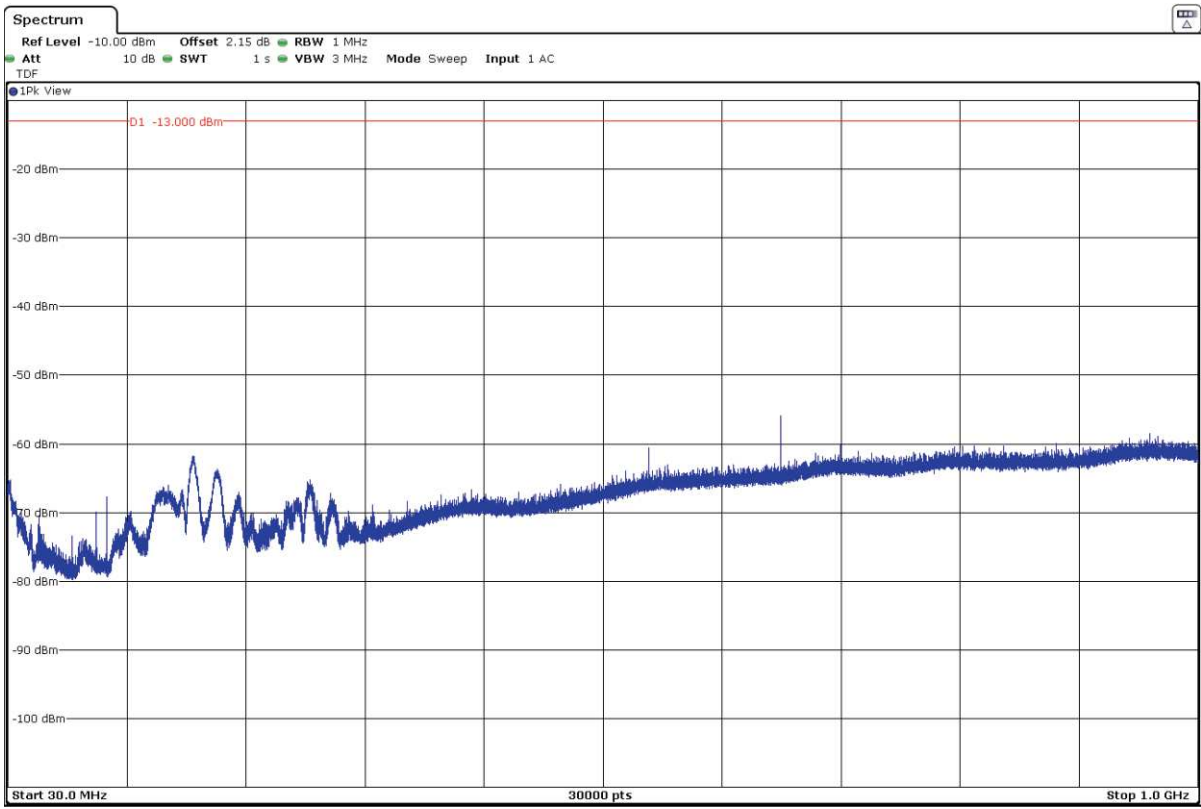
- Lowest Channel:



- Middle Channel:



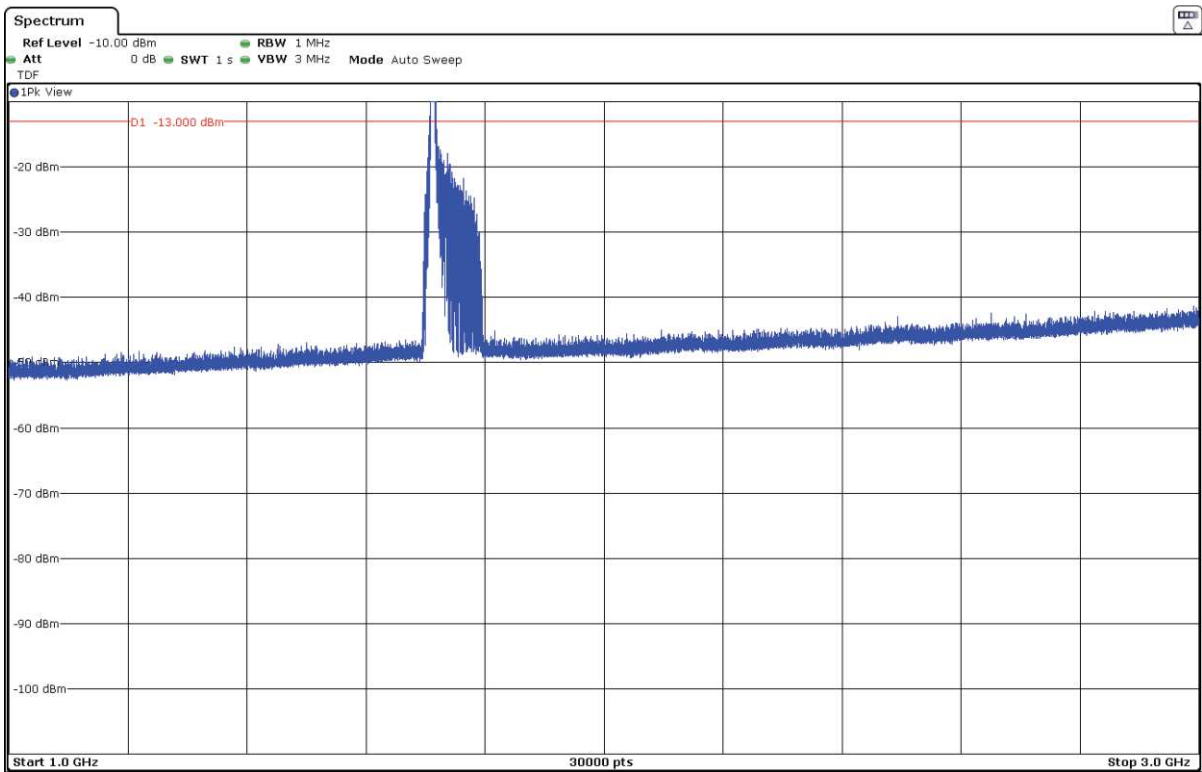
- Highest Channel:



FREQUENCY RANGE 1 - 3 GHz

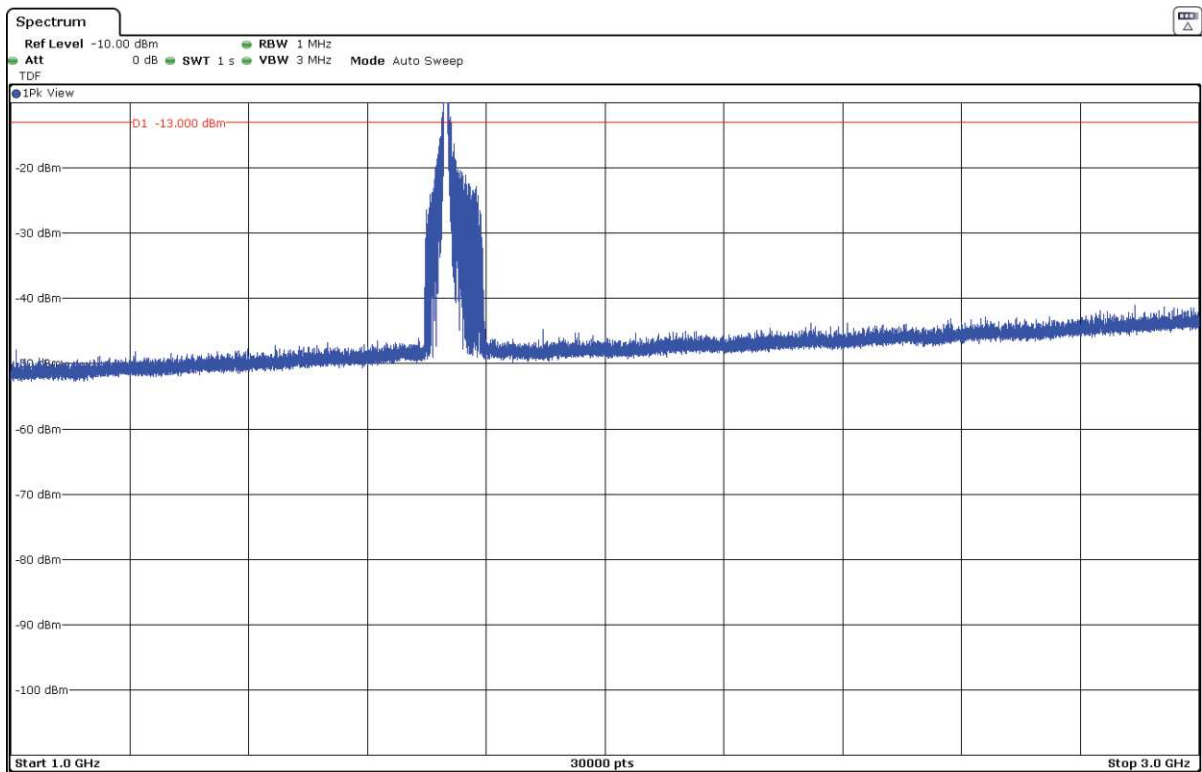
HSUPA MODULATION

- Lowest Channel:

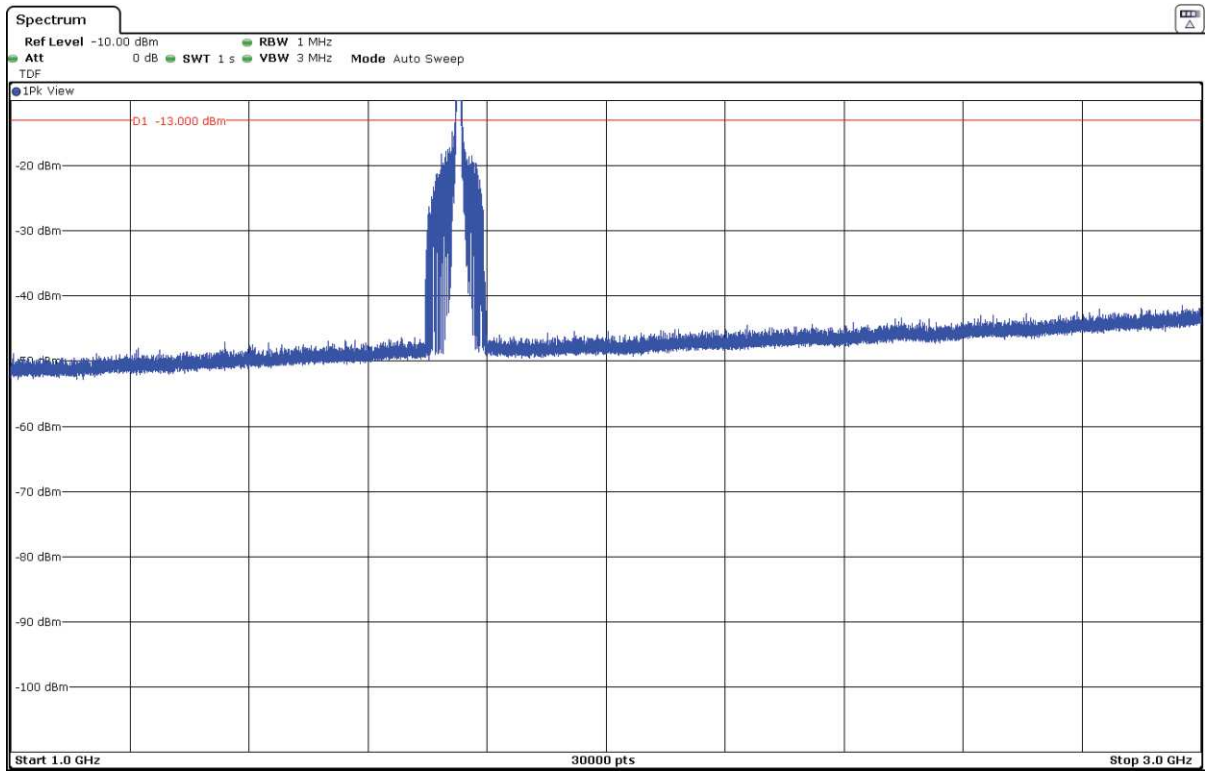


The peak above the limit is the carrier frequency:  
3G Band IV (1700 MHz).

- Middle Channel:

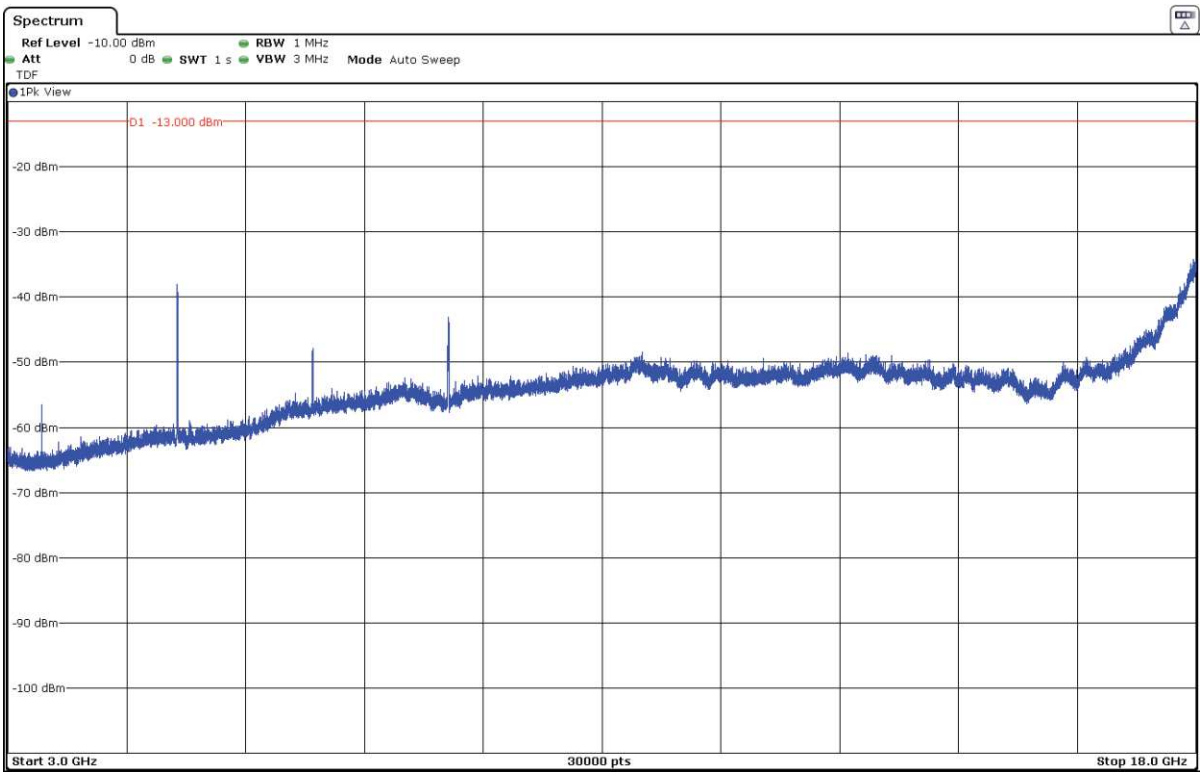


- Highest Channel:

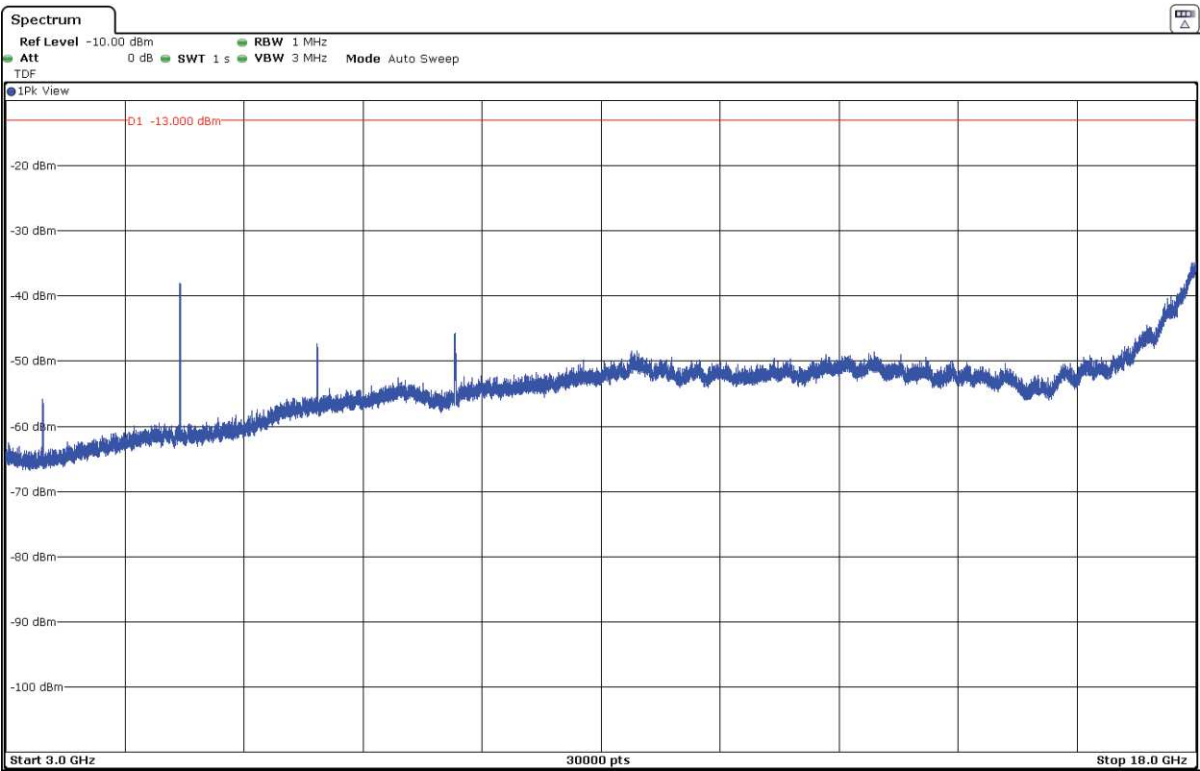


FREQUENCY RANGE 3 – 18 GHz

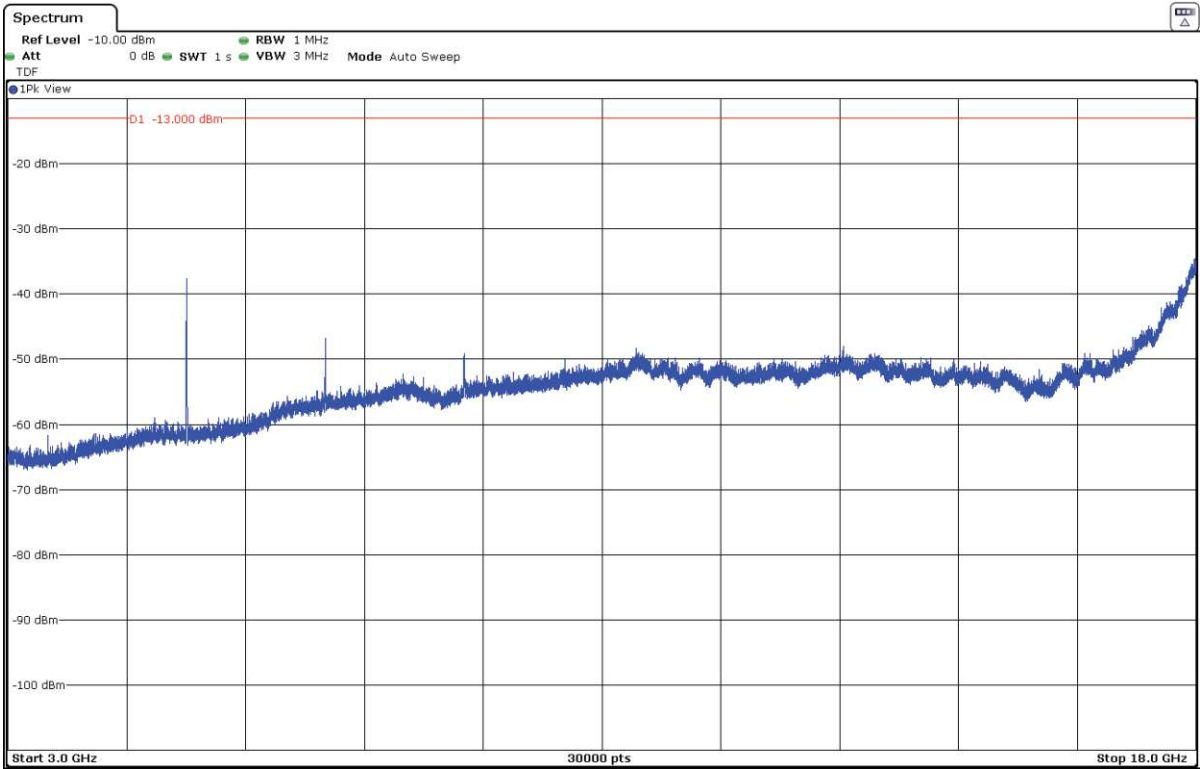
- Lowest Channel:



- Middle Channel:



- Highest Channel:



## **LTE Band 7:**

QPSK and 16QAM Modulations:

A preliminary scan determined the QPSK modulation, BW=20 MHz, RB=1, Offset=99 as the worst case.

### **- Lowest Channel:**

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

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

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

Spurious frequencies at less than 20 dB below the limit:

Frequency (GHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
7.55677	-48.10	V	-53.23	1.97	10.59	-44.61
12.59443	-53.10	V	-53.95	2.61	13.02	-43.54
15.11303	-59.81	H	-55.32	2.87	14.16	-44.04

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

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

### **- Middle Channel:**

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

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

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

Spurious frequencies at less than 20 dB below the limit:

Frequency (GHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain Gi (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
5.08763	-41.49	V	-54.94	1.59	11.81	-44.72
12.7195	-52.02	H	-52.48	2.62	12.92	-42.18
17.80745	-66.48	V	-43.23	3.18	6.49	-44.46

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

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



## - Highest Channel:

### Frequency range 30 MHz - 1 GHz

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

### Frequency range 1 - 26 GHz

Spurious frequencies at less than 20 dB below the limit:

Frequency (GHz)	Instrument reading (dBm)	Polarization	(1) Generator output (dBm)	(2) Cable loss (dB)	(3) Substitution antenna gain $G_i$ (respect to isotropic radiator) (dB)	E.I.R.P. (dBm) = (1) – (2) + (3)
5.13803	-38.08	V	-51.58	1.60	11.93	-41.25
7.70657	-46.43	V	-51.26	1.99	10.53	-42.7
12.84457	-50.25	V	-50.33	2.64	12.82	-40.14
17.98235	-66.48	V	-43.23	3.18	3.86	-42.54

### Frequency range 2490.5 – 2496 MHz

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

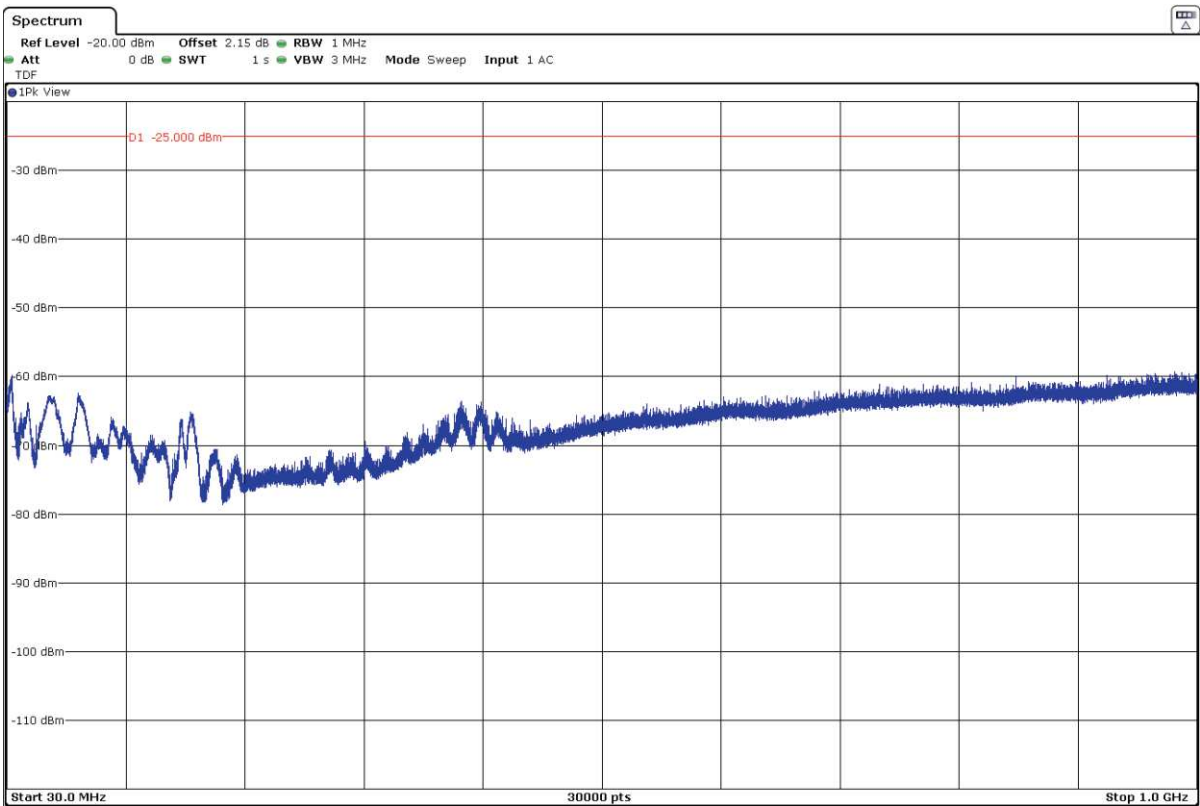
Measurement uncertainty (dB)	$\leq \pm 3.88$ for $f < 1$ GHz $\leq \pm 3.70$ for $f \geq 1$ GHz up to 18 GHz $\leq \pm 3.33$ for $f \geq 18$ GHz up to 20 GHz
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Verdict: PASS

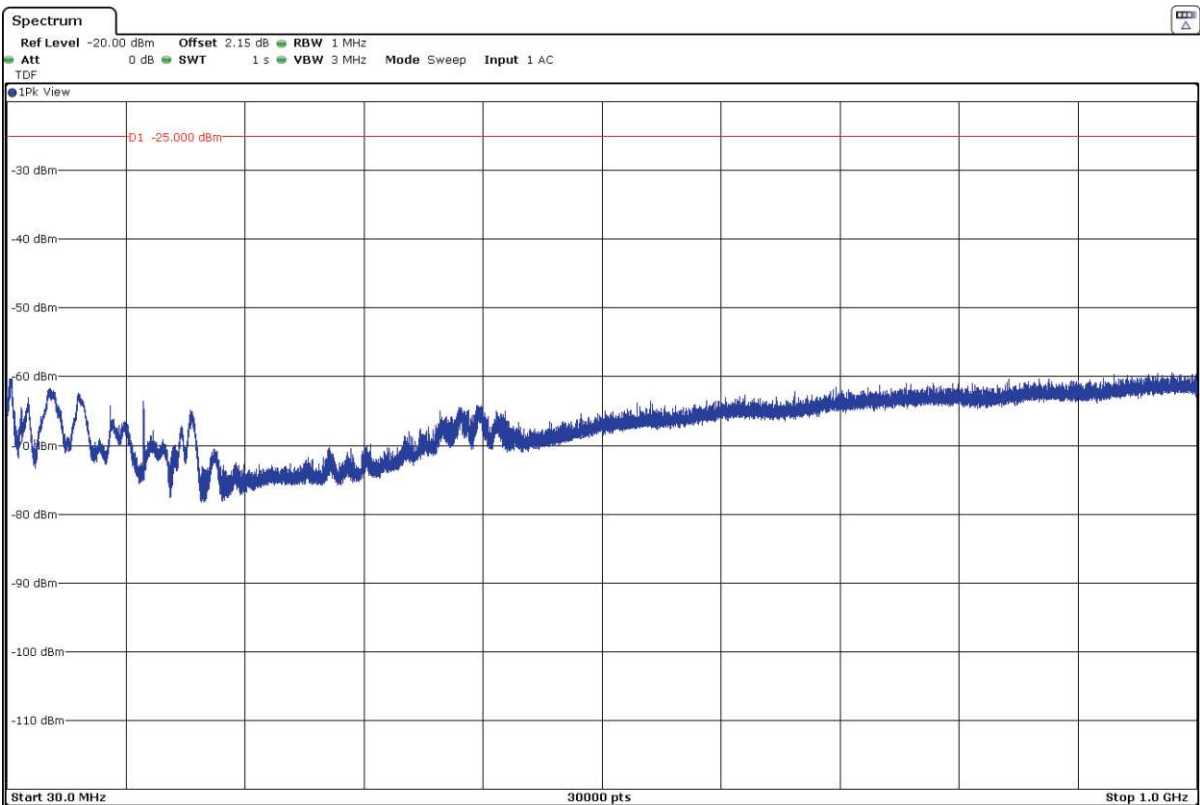
FREQUENCY RANGE 30 MHz - 1 GHz

QPSK MODULATION

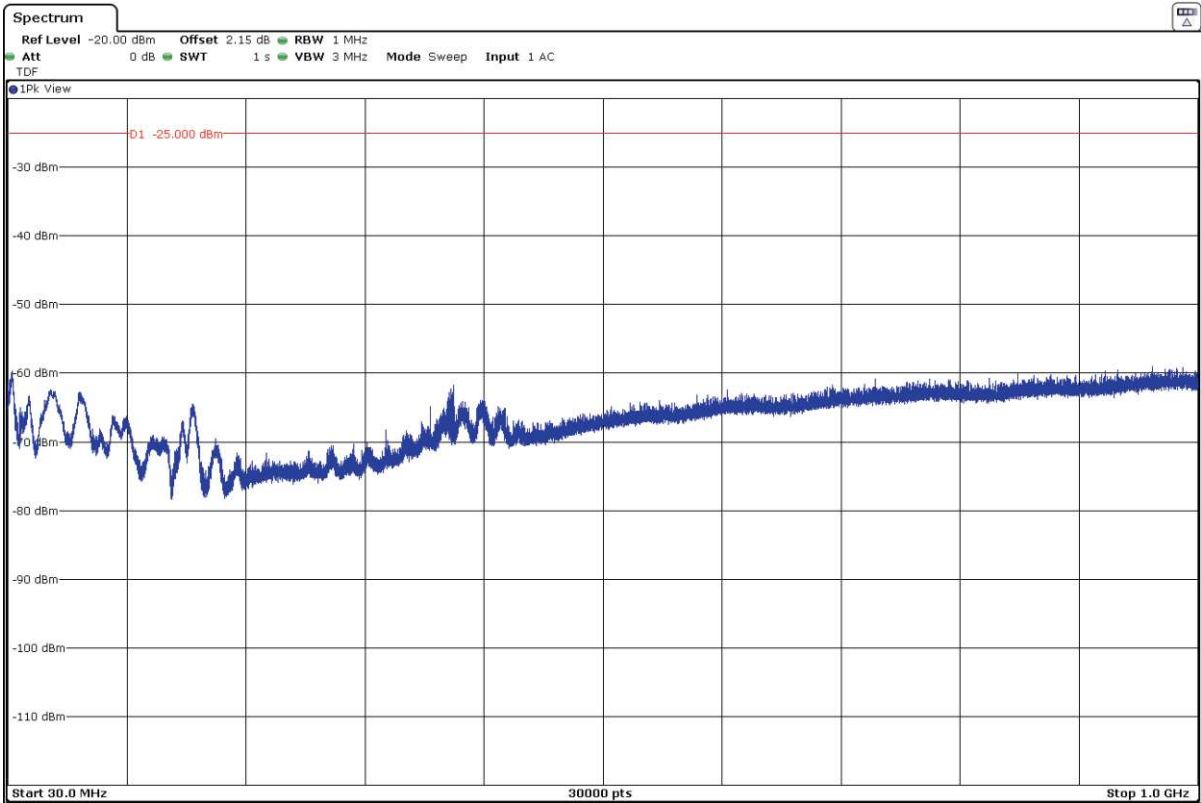
- Lowest Channel:



- Middle Channel:



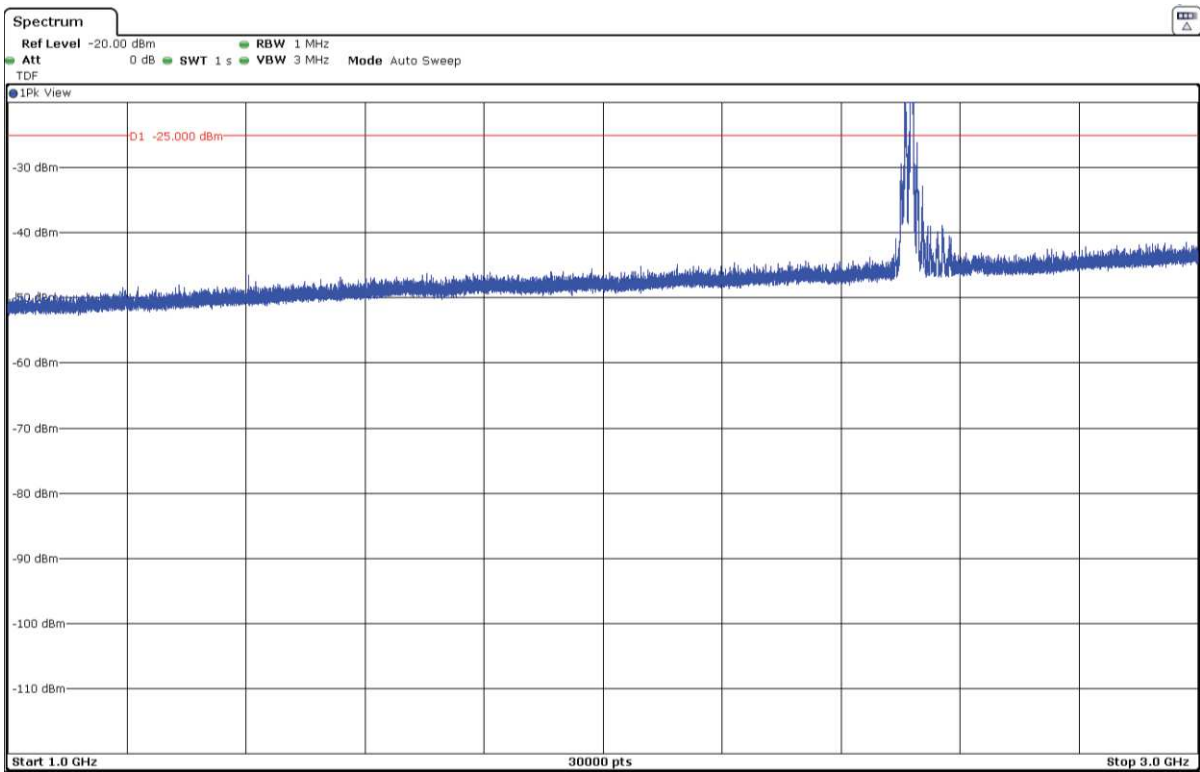
- Highest Channel:



FREQUENCY RANGE 1 - 3 GHz

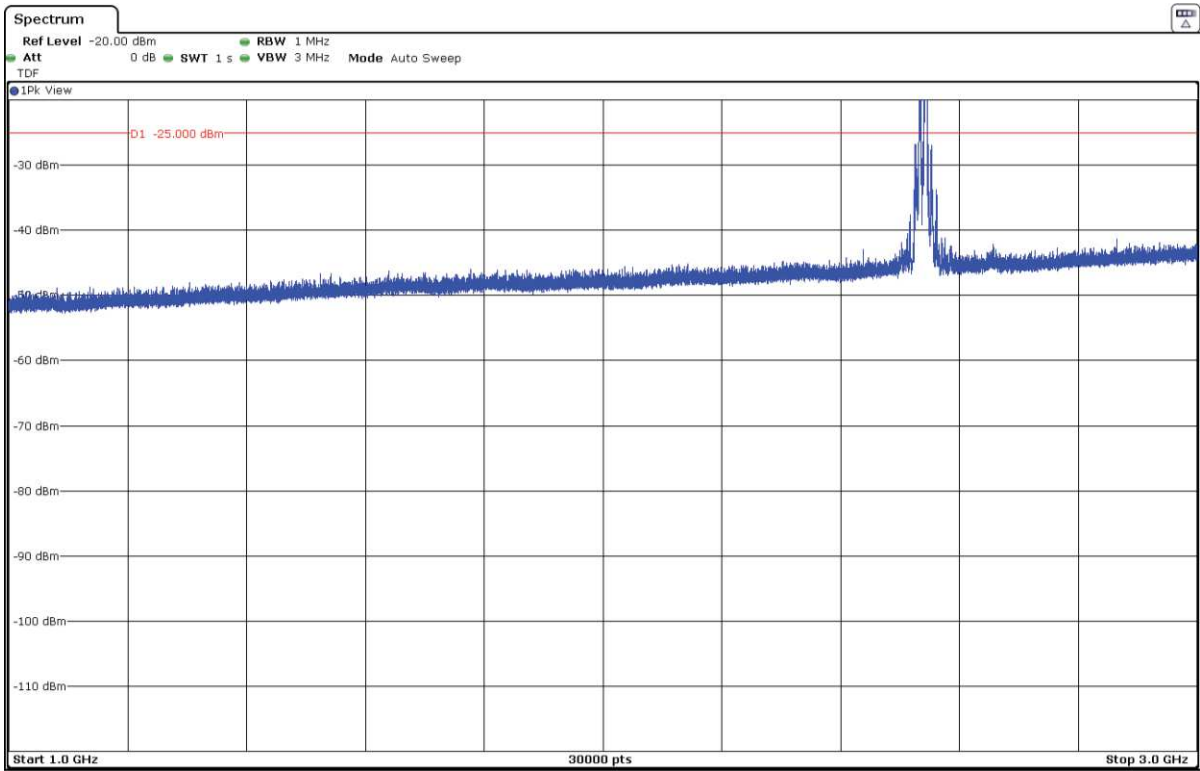
QPSK MODULATION

- Lowest Channel:



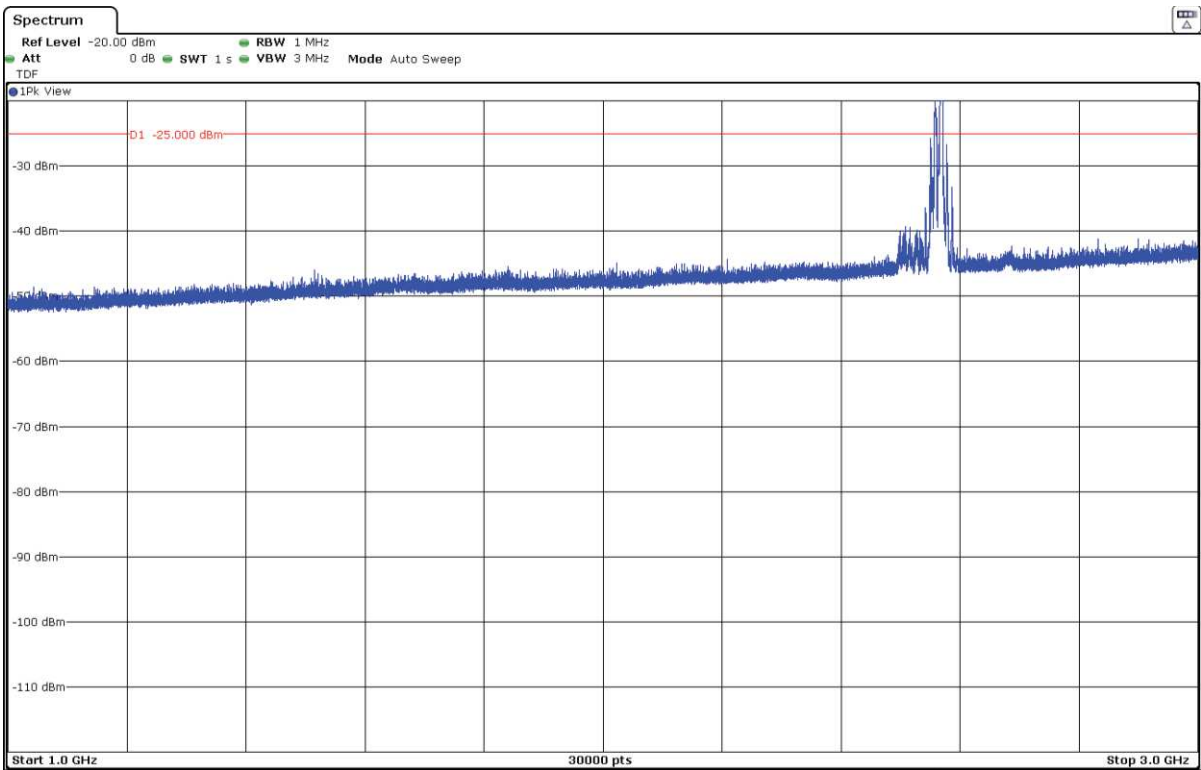
The peak above the limit is the carrier frequency:

- Middle Channel:



The peak above the limit is the carrier frequency:

- Highest Channel:



The peak above the limit is the carrier frequency:

FREQUENCY RANGE 3 – 17 GHz

- Lowest Channel:

