

LTE Band 25:

QPSK and 16QAM Modulations:

A preliminary scan determined the 16QAM modulation, BW = 5 MHz, RB Size = 1, RB Offset = 0, Narrowband = 0 as the worst case. The following tables and plots show the results for this worst-case configuration.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 20 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 - 20 GHz:

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

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 20 GHz:

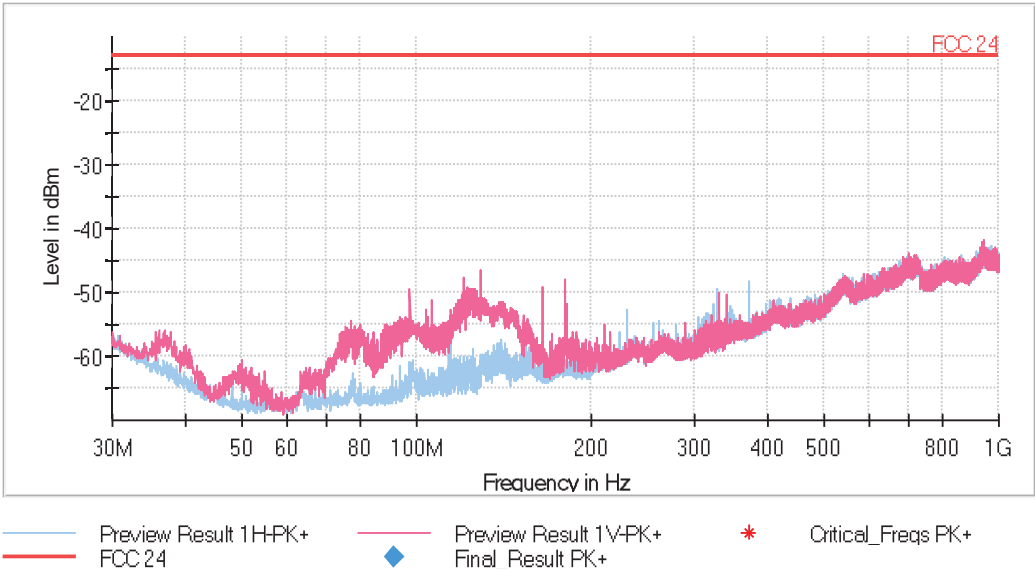
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB):	<± 5.17 for f ≥ 30 MHz up to 1 GHz
	<± 4.11 for f ≥ 1 GHz up to 3 GHz
	<± 5.13 for f ≥ 3 GHz up to 18 GHz
	<± 4.81 for f ≥ 18 GHz up to 20 GHz

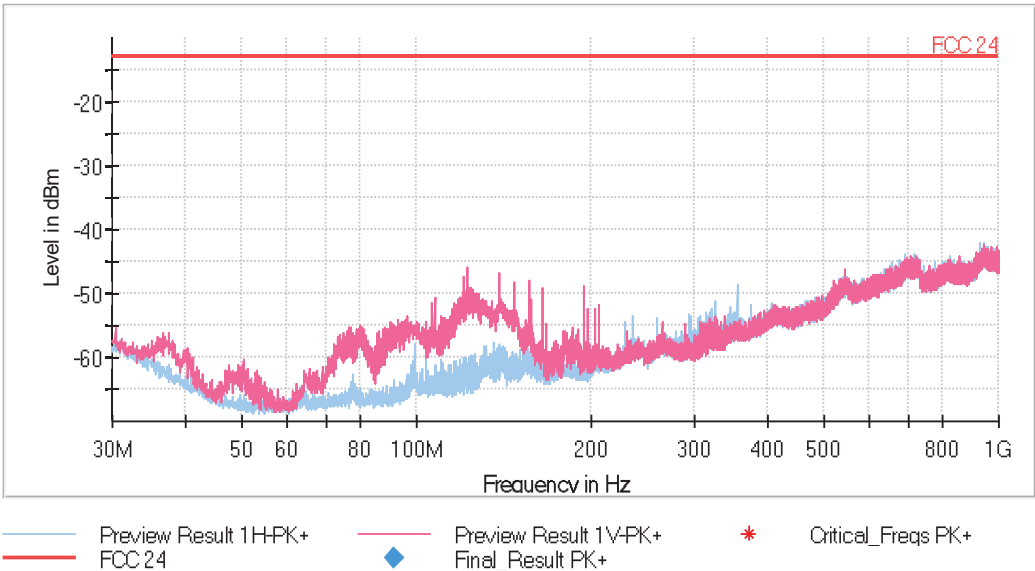
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

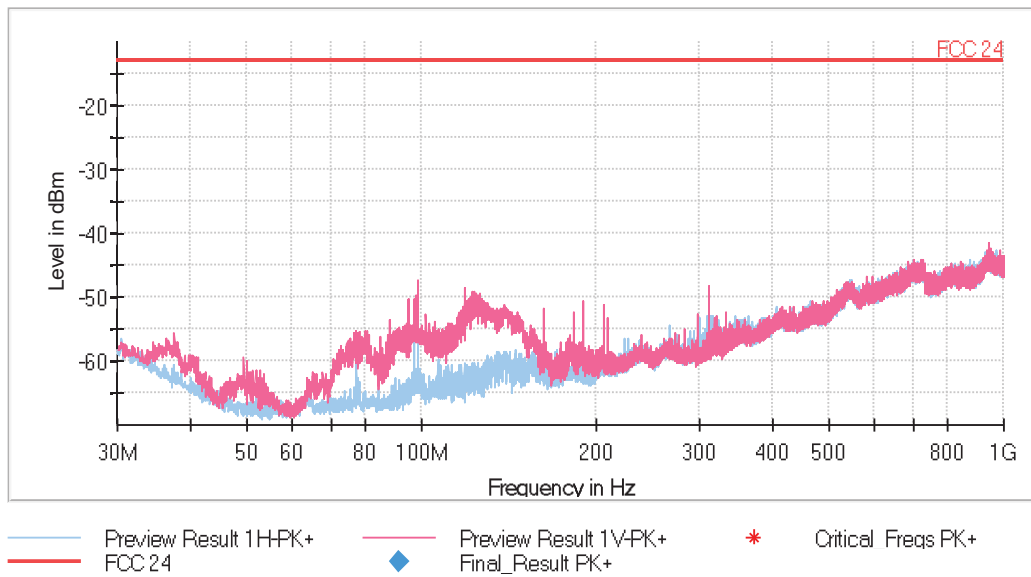
- Low Channel:



- Middle Channel:

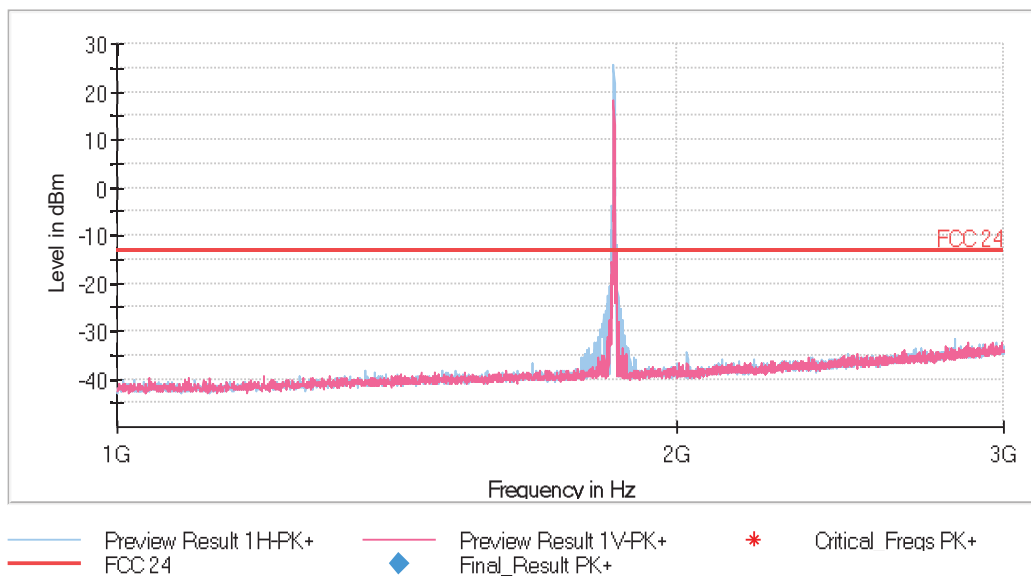


- High Channel:



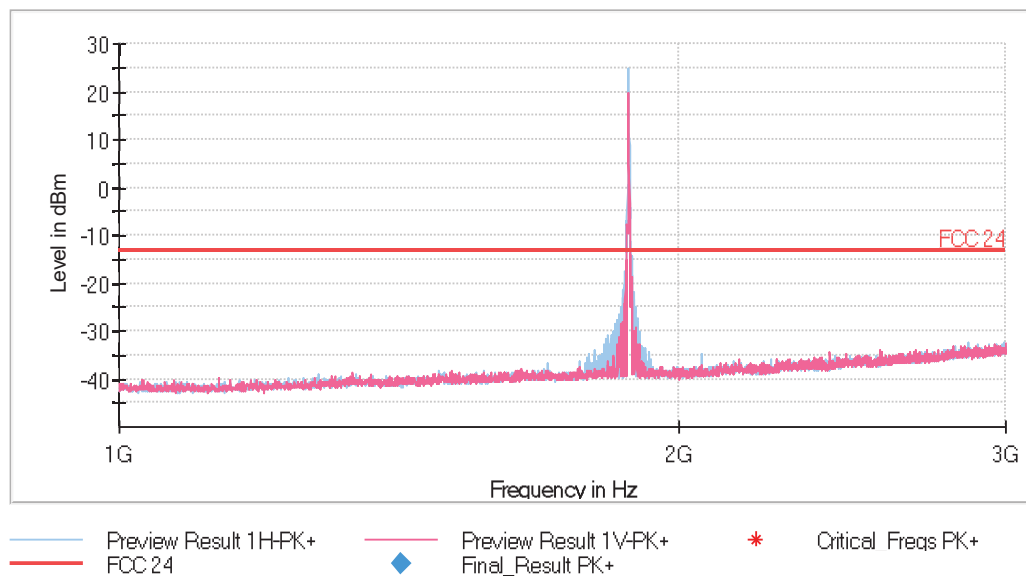
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



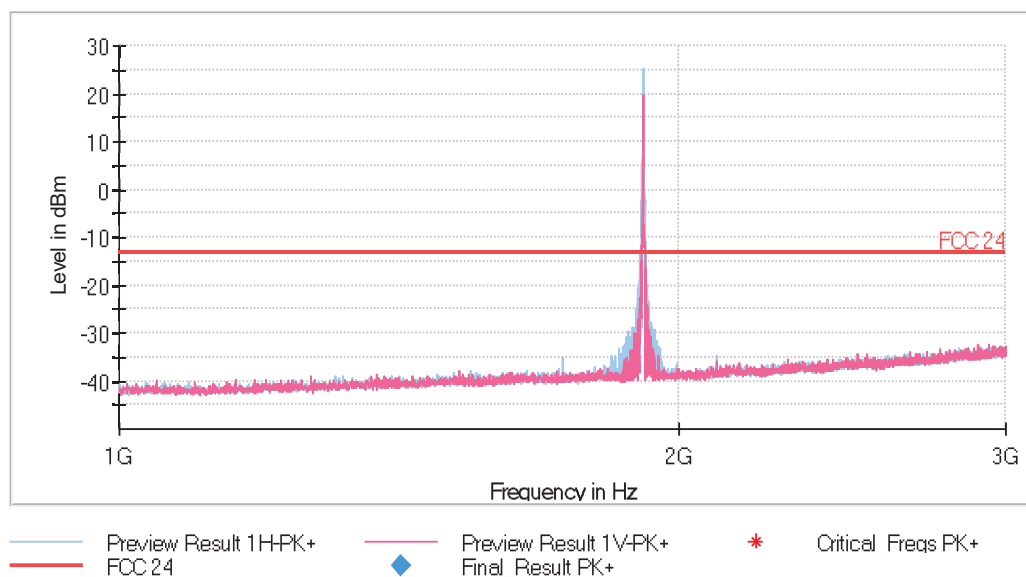
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

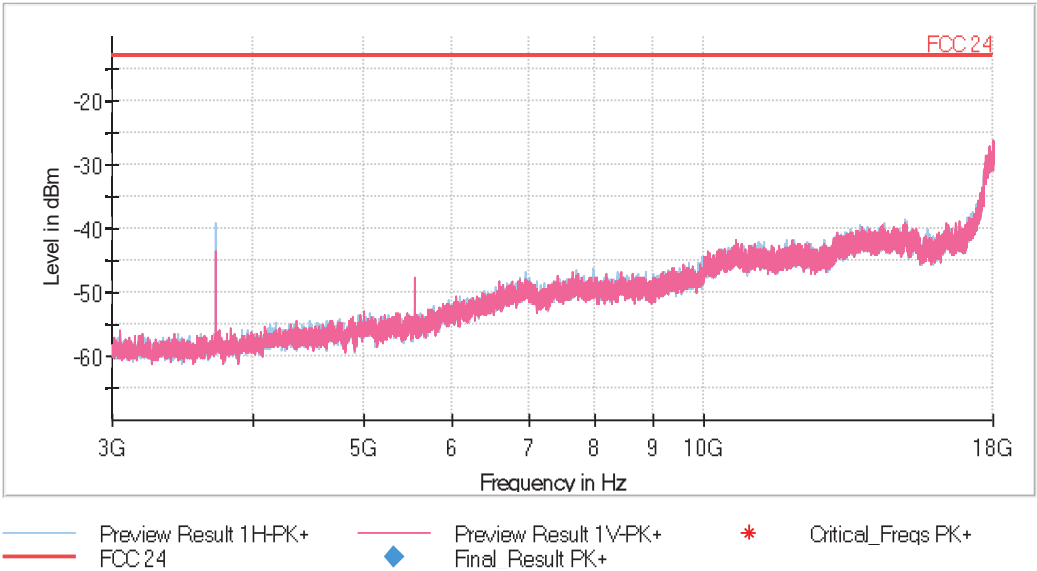
- High Channel:



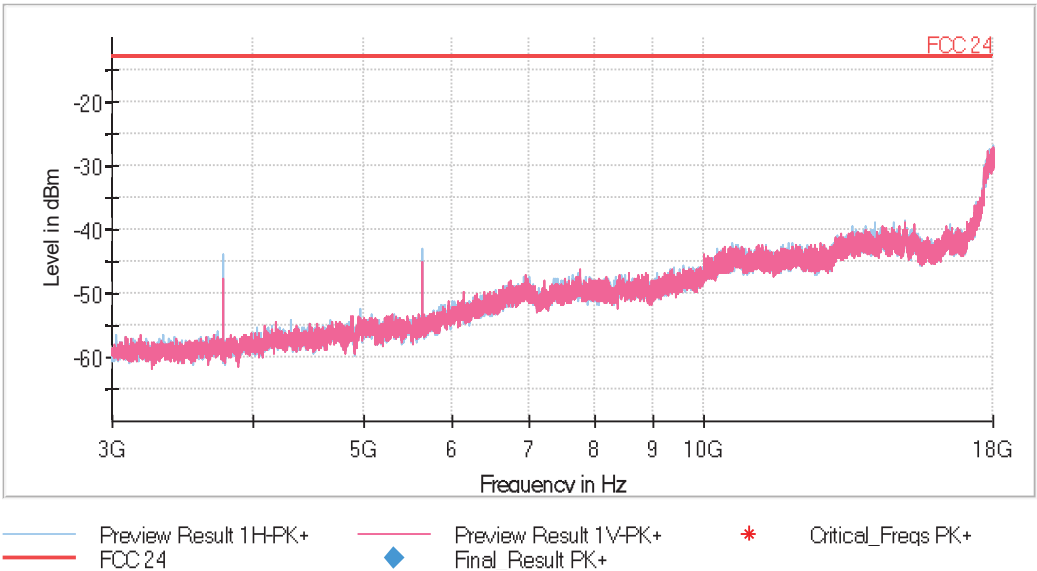
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 18 GHz (worst case):

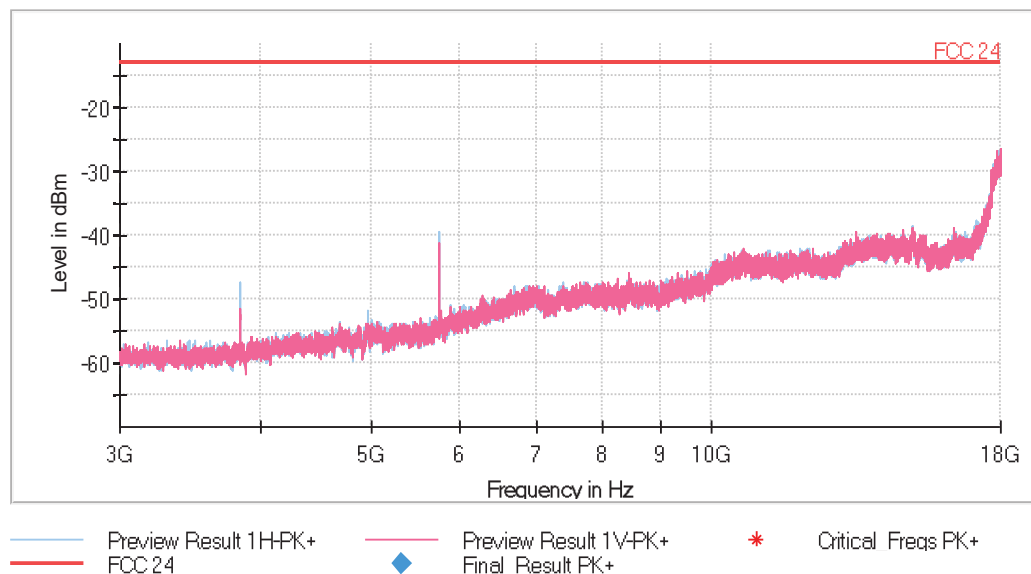
- Low Channel:



- Middle Channel:

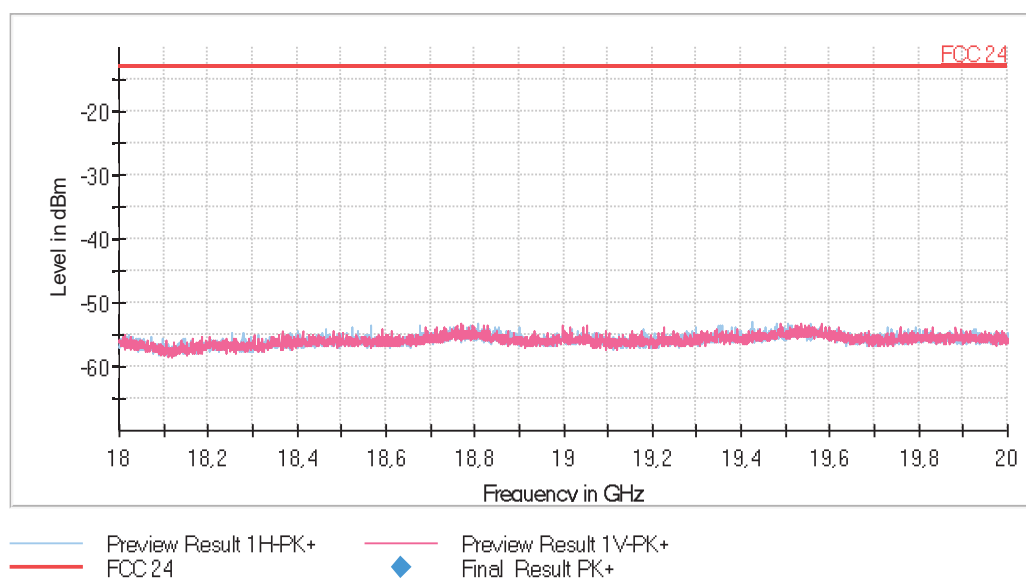


- High Channel:

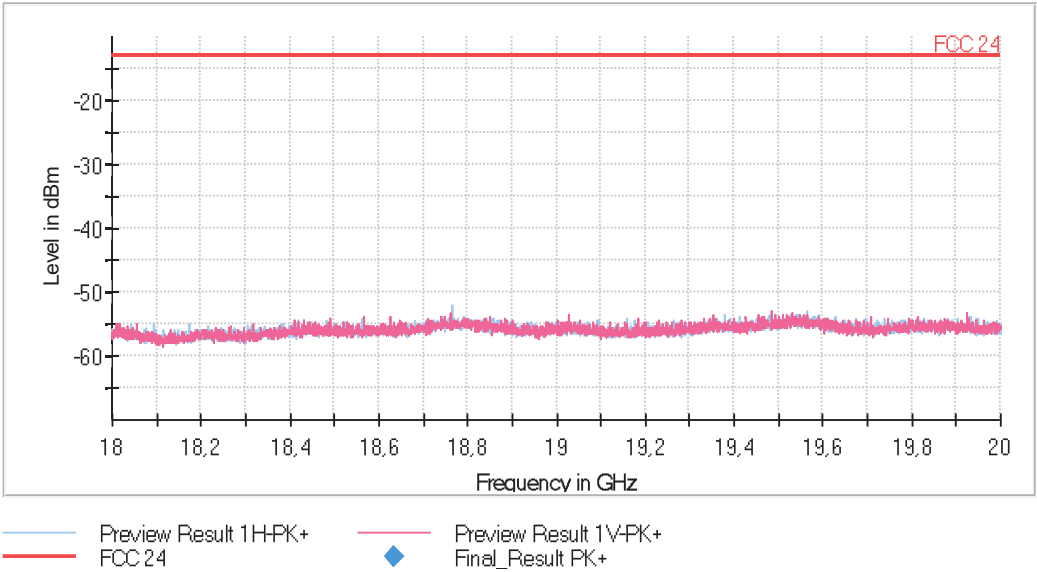


FREQUENCY RANGE 18 - 20 GHz (worst case):

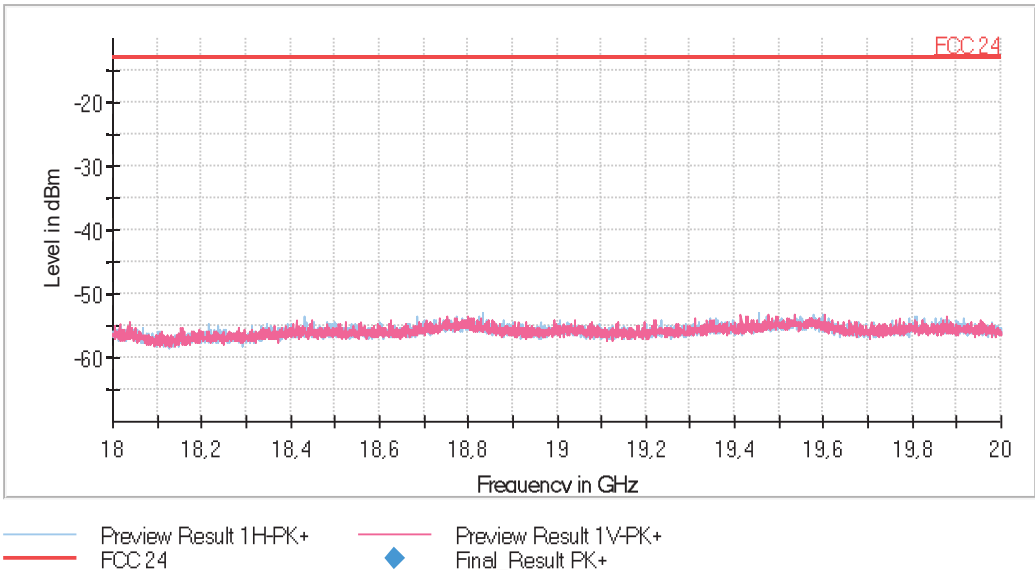
- Low Channel:



- Middle Channel:



- High Channel:



Appendix C: Test results for FCC Part 27 / IC RSS-130, IC RSS-139.

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TEST CONDITIONS53

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TEST CONDITIONS

POWER SUPPLY (V):

Vn: 120 Vac

Type of Power Supply: AC Voltage mains.

The subscript 'n' indicates nominal voltage test conditions.

ANTENNA:

Declared Gain for antennas:

Band	Gain (dBi)	Antenna type
LTE Band 4	+4.5	External
LTE Band 12	+2.0	External
LTE Band 13	+2.0	External
LTE Band 66	+4.5	External

TEST FREQUENCIES:

LTE Band 4. QPSK AND 16QAM MODULATIONS.

	Channel per Nominal Bandwidth (Frequency, MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	19957 (1710.7)	19965 (1711.5)	19975 (1712.5)	20000 (1715.0)	20025 (1717.5)	20050 (1720.0)
Middle	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)	20175 (1732.5)
High	20393 (1754.3)	20385 (1753.5)	20375 (1752.5)	20350 (1750.0)	20325 (1747.5)	20300 (1745.0)

LTE Band 12: QPSK AND 16QAM MODULATIONS.

	Channel per Nominal Bandwidth (Frequency, MHz)			
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz
Low	23017 (699.7)	23025 (700.5)	23035 (701.5)	23060 (704.0)
Middle	23095 (707.5)	23095 (707.5)	23095 (707.5)	23095 (707.5)
High	23173 (715.3)	23165 (714.5)	23155 (713.5)	23130 (711.0)

LTE Band 13: QPSK AND 16QAM MODULATIONS.

	Channel per Nominal Bandwidth (Frequency, MHz)	
	BW = 5 MHz	BW = 10 MHz
Low	23205 (779.5)	N/A
Middle	23230 (782.0)	23230 (782.0)
High	23255 (784.5)	N/A

LTE Band 66: QPSK AND 16QAM MODULATIONS.

	Channel per Nominal Bandwidth (Frequency, MHz)			
	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Low	131997 (1712.5)	132022 (1715.0)	132047 (1717.5)	132072 (1720.0)
Middle	132322 (1745.0)	132322 (1745.0)	132322 (1745.0)	132322 (1745.0)
High	132647 (1777.5)	132622 (1775.0)	132597 (1772.5)	132572 (1770.0)

Radiated Emissions

SPECIFICATION:

FCC §27.53 (c):

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. Compliance is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

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. Compliance is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment

FCC §27.53 (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.

FCC §27.53 (h), RSS-139, Clause 6.6:

According to specification, 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 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. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

RSS-130 Clause 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.

RSS-130, Clause 4.7.2:

The power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least $65 + 10 \log_{10} P$ (watts), dB, for mobile and portable equipment.

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

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

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

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

METHOD:

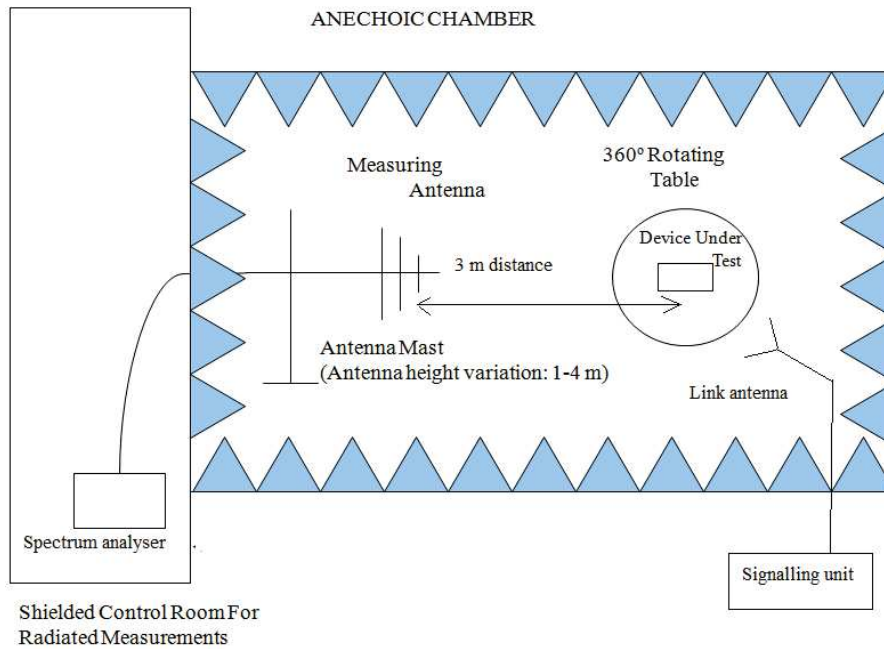
The measurement was performed with the EUT inside an anechoic chamber. The spectrum was scanned from 30 MHz to at least the 10th harmonic of the highest frequency generated within the equipment.

The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements from 30 MHz up to 18 GHz.

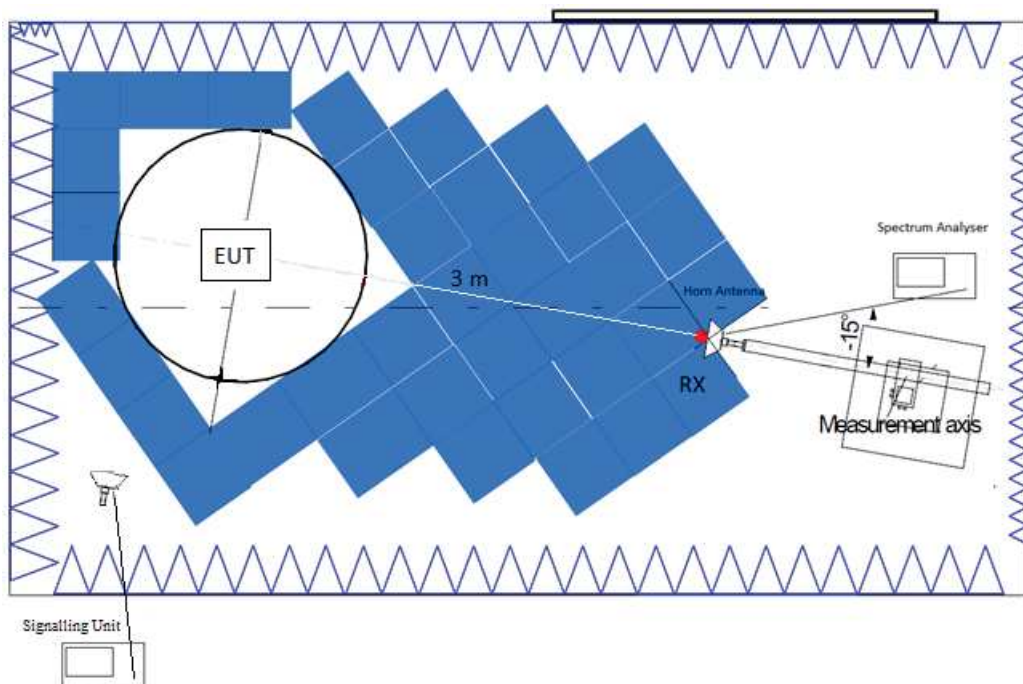
Detected emissions were maximized at each frequency by rotating the EUT and adjusting the measuring antenna height and polarization. The maximum meter reading was recorded.

TEST SETUP:

Radiated measurements below 1 GHz.



Radiated measurements between 1 GHz and 18 GHz.



RESULTS:

LTE Band 4:

QPSK and 16QAM Modulations:

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

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 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 - 18 GHz:

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

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

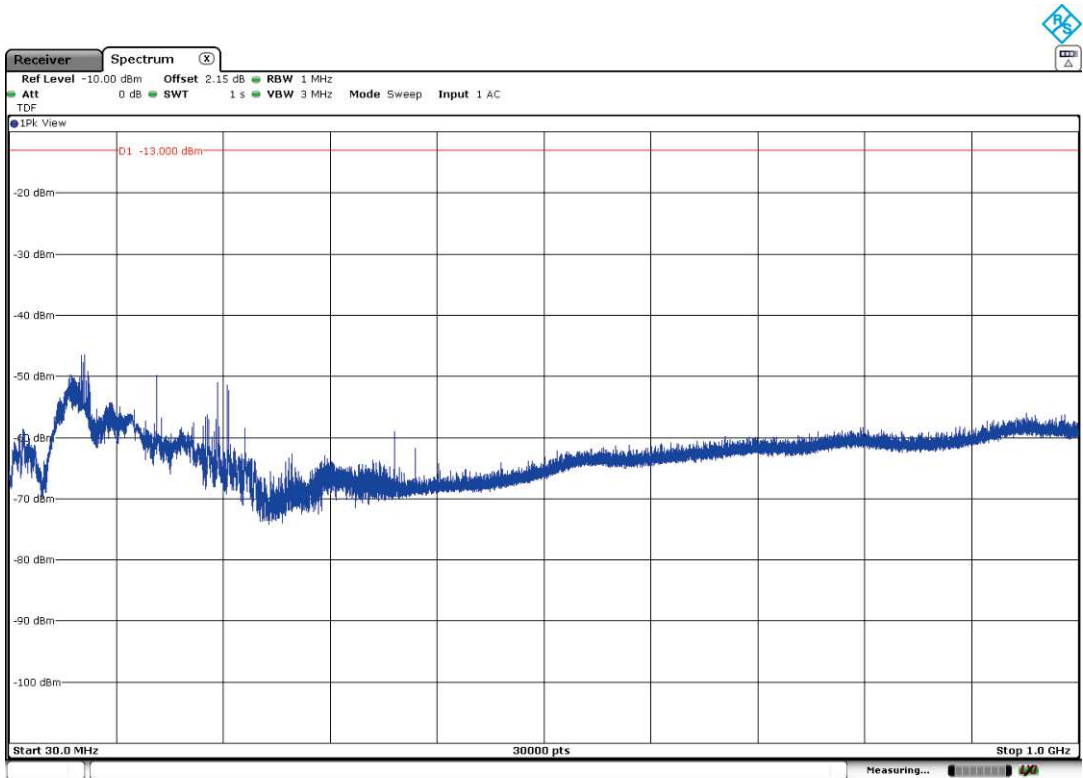
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB):	<± 5.17 for f ≥ 30 MHz up to 1 GHz
	<± 4.11 for f ≥ 1 GHz up to 3 GHz
	<± 5.13 for f ≥ 3 GHz up to 18 GHz

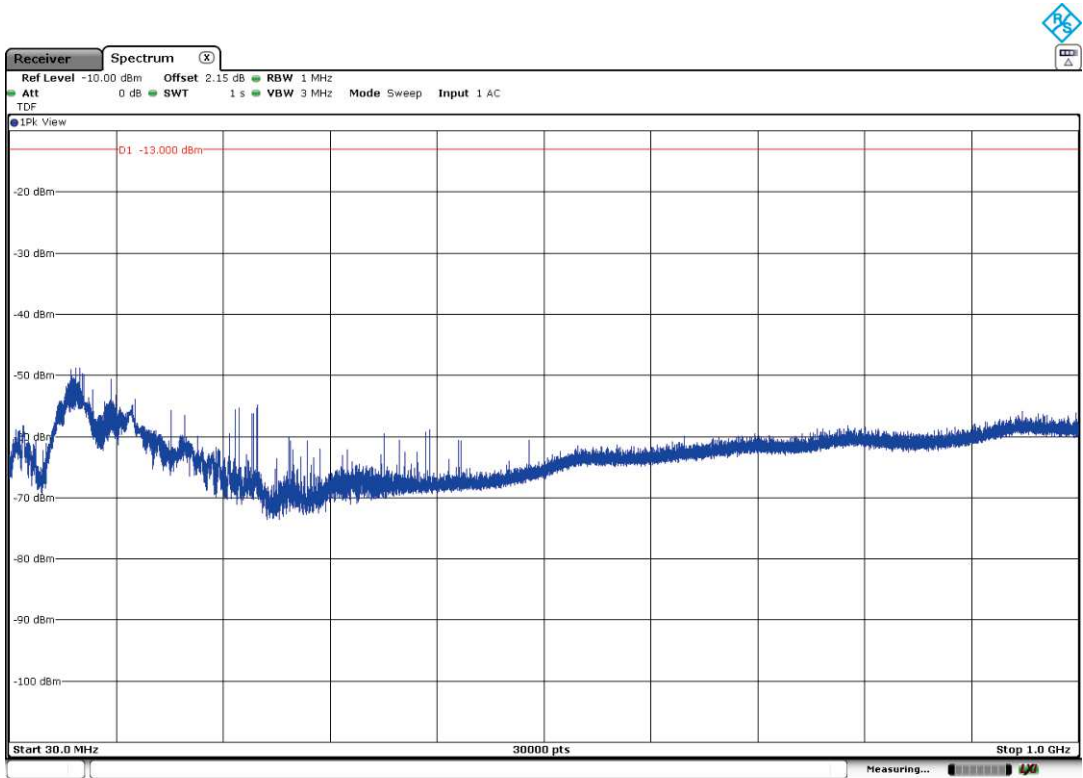
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

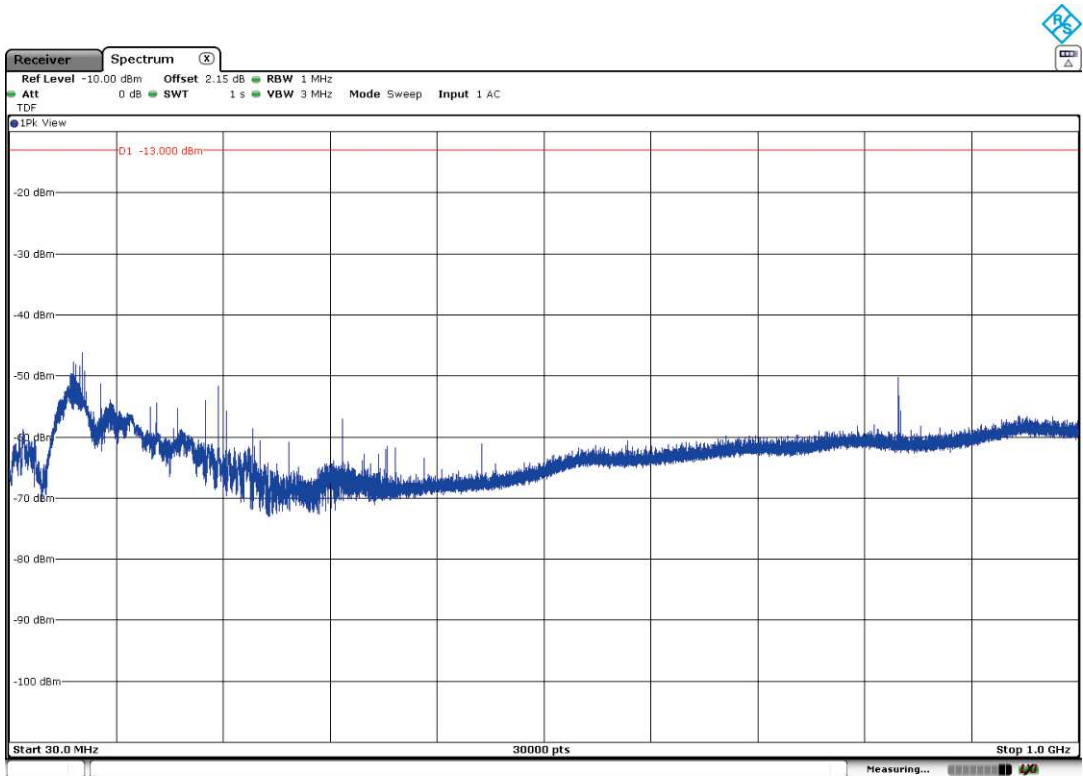
- Low Channel:



- Middle Channel:

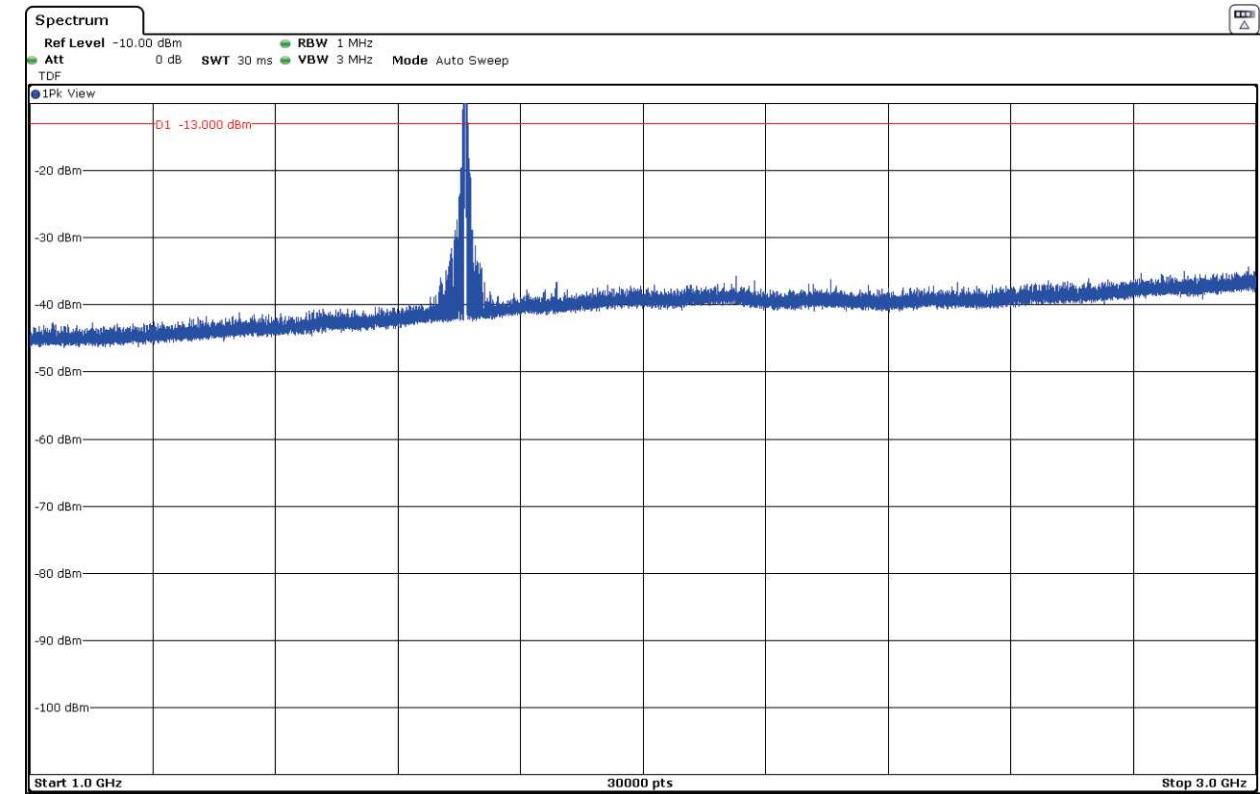


- High Channel:



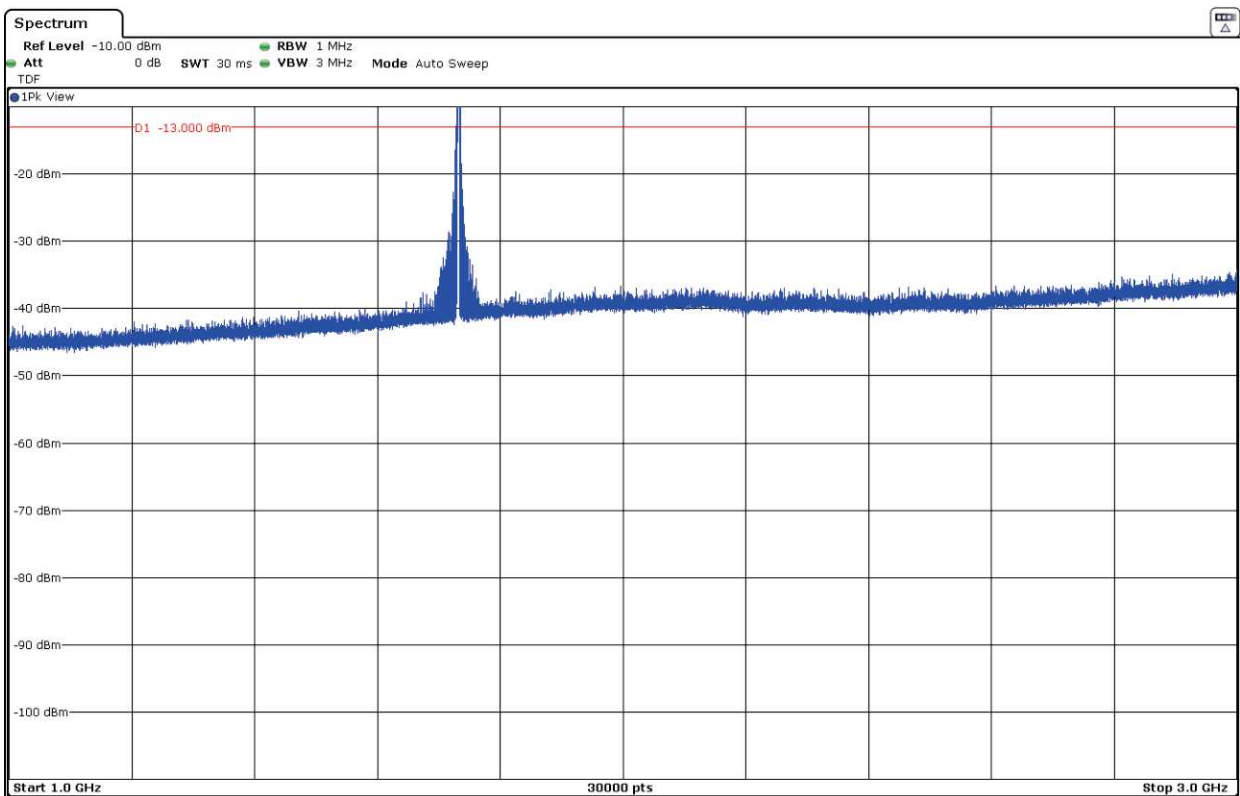
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



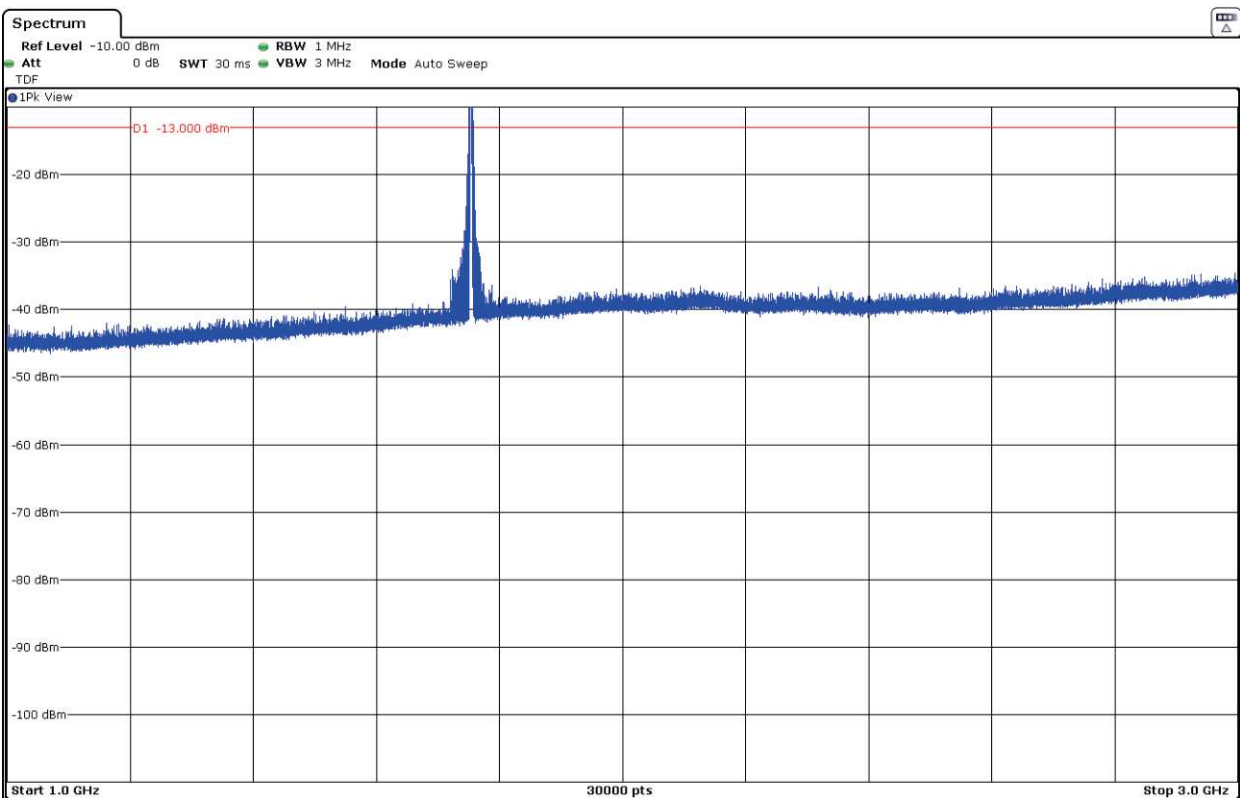
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

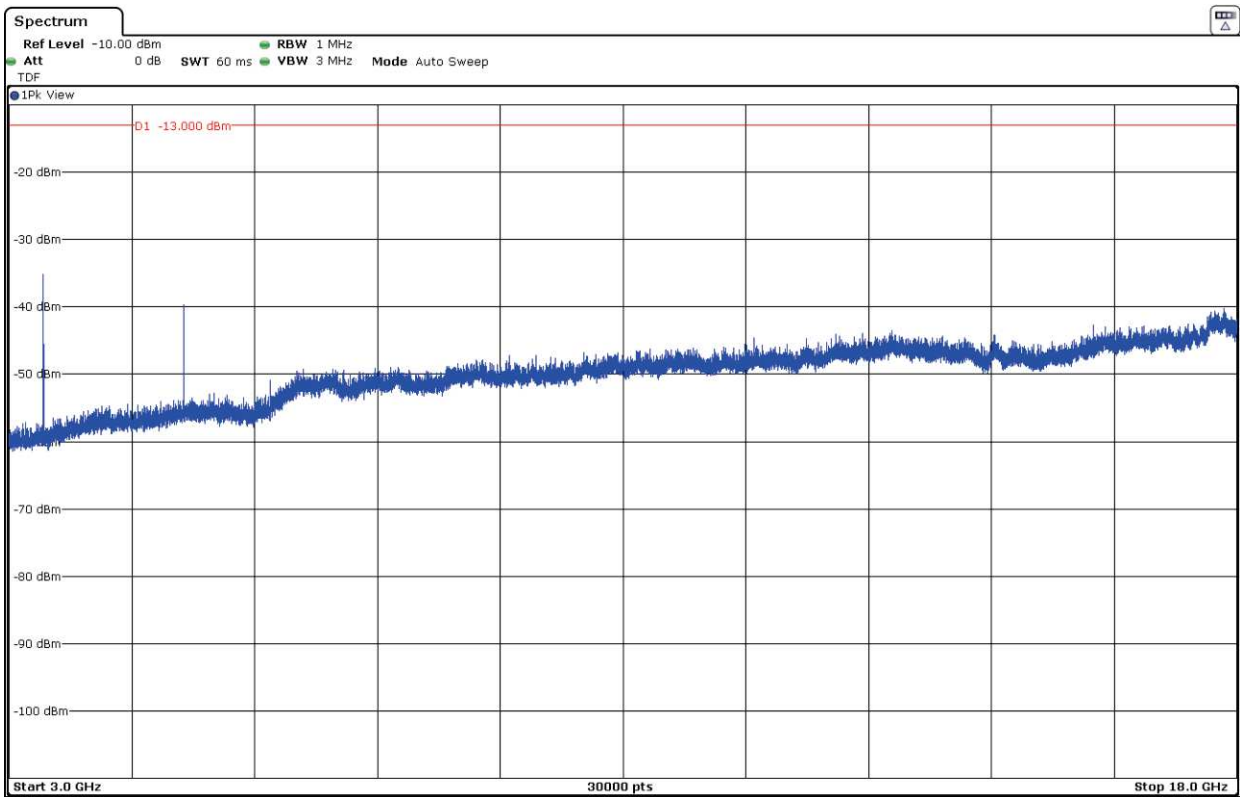
- High Channel:



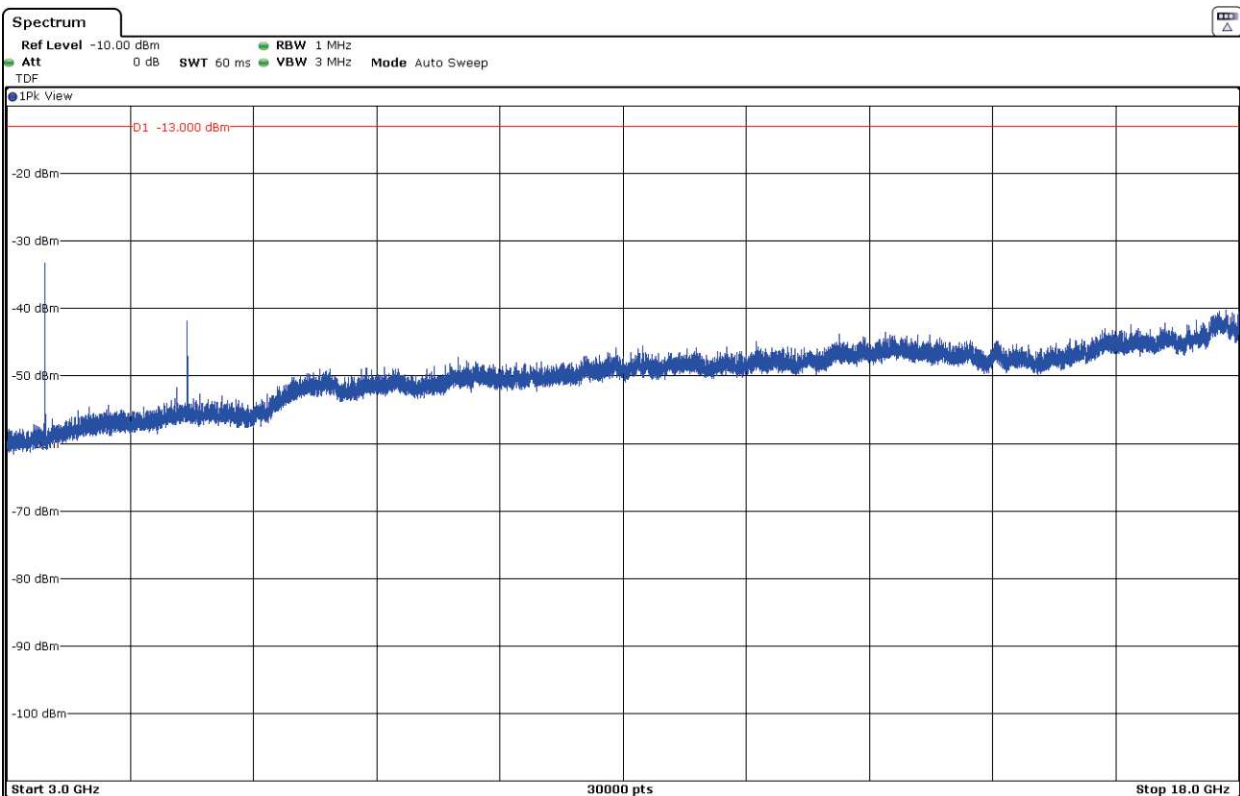
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 3 - 18 GHz (worst case):

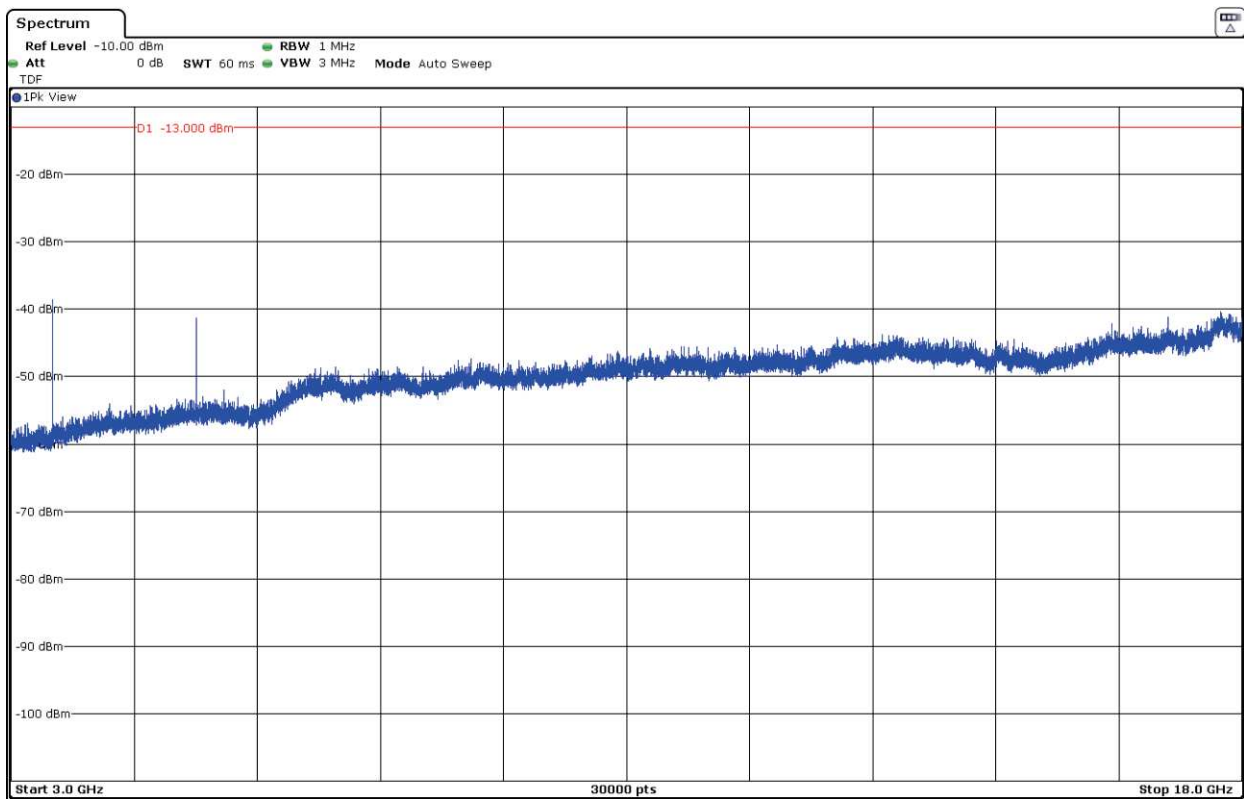
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 12:

QPSK and 16QAM Modulations:

A preliminary scan determined the QPSK modulation, BW = 5 MHz, RB Size = 1, RB Offset = 0, Narrowband = 0 as the worst case. The following tables and plots show the results for this worst-case configuration.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 8 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 - 8 GHz:

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

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 8 GHz:

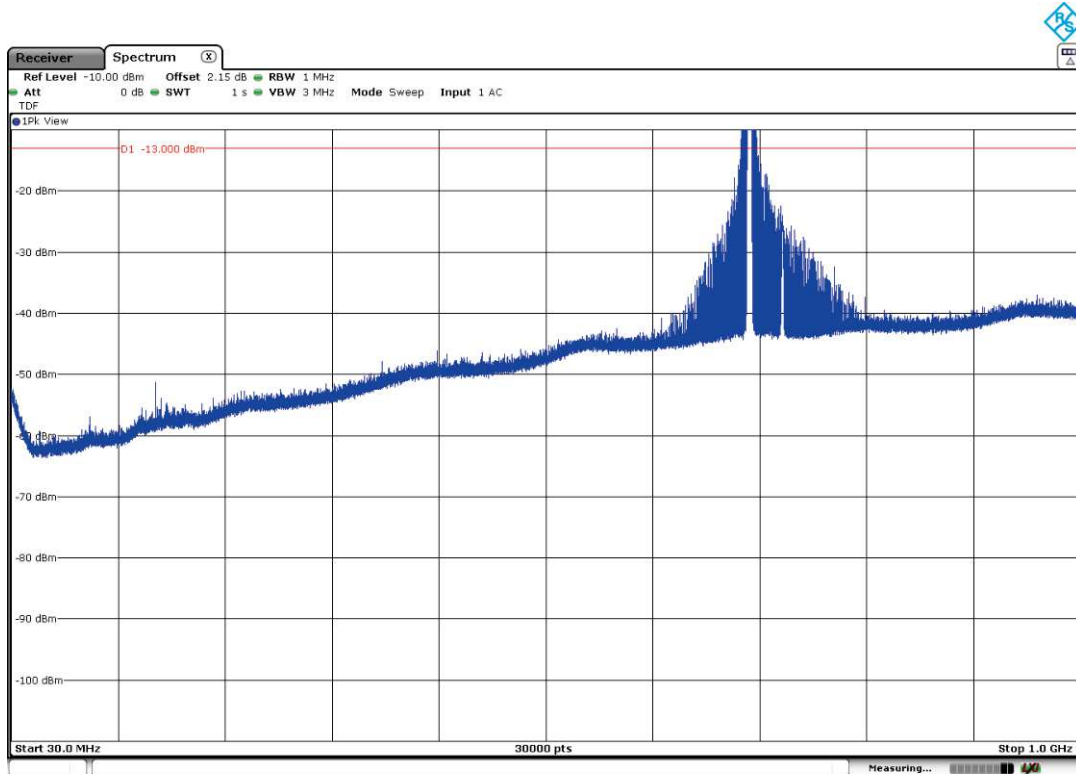
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB):	<± 4.89 for $f \geq 30$ MHz up to 1 GHz <± 5.13 for $f \geq 1$ GHz up to 8 GHz
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Verdict: PASS

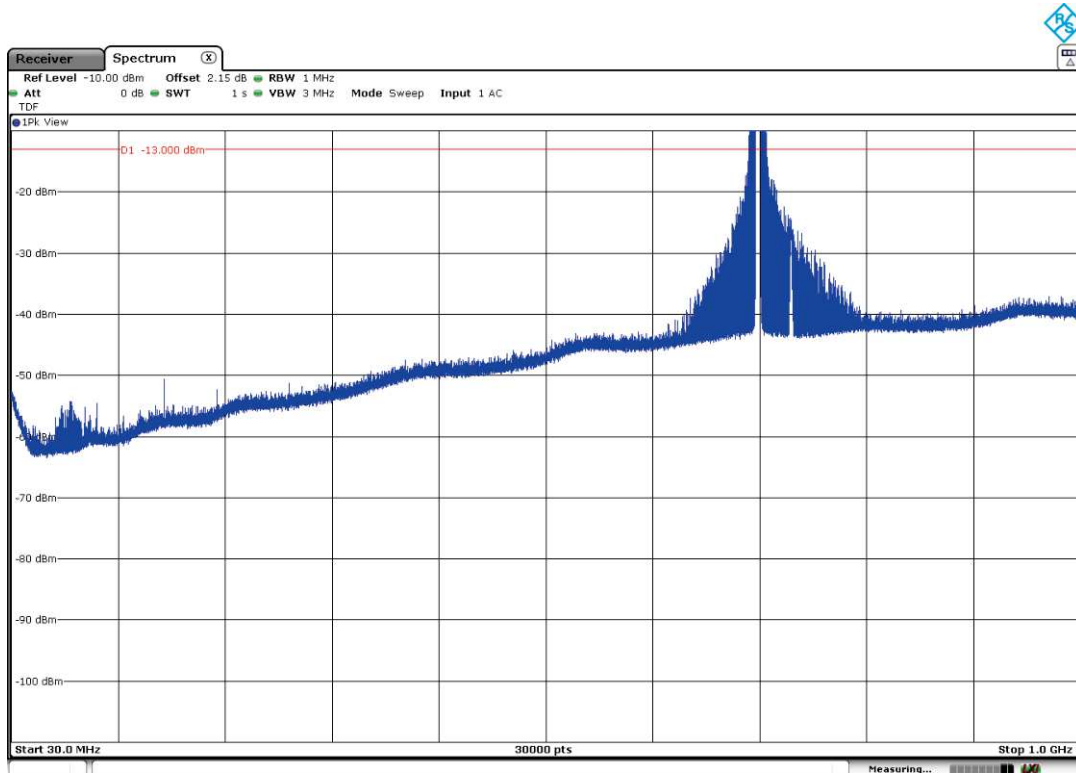
FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

- Low Channel:



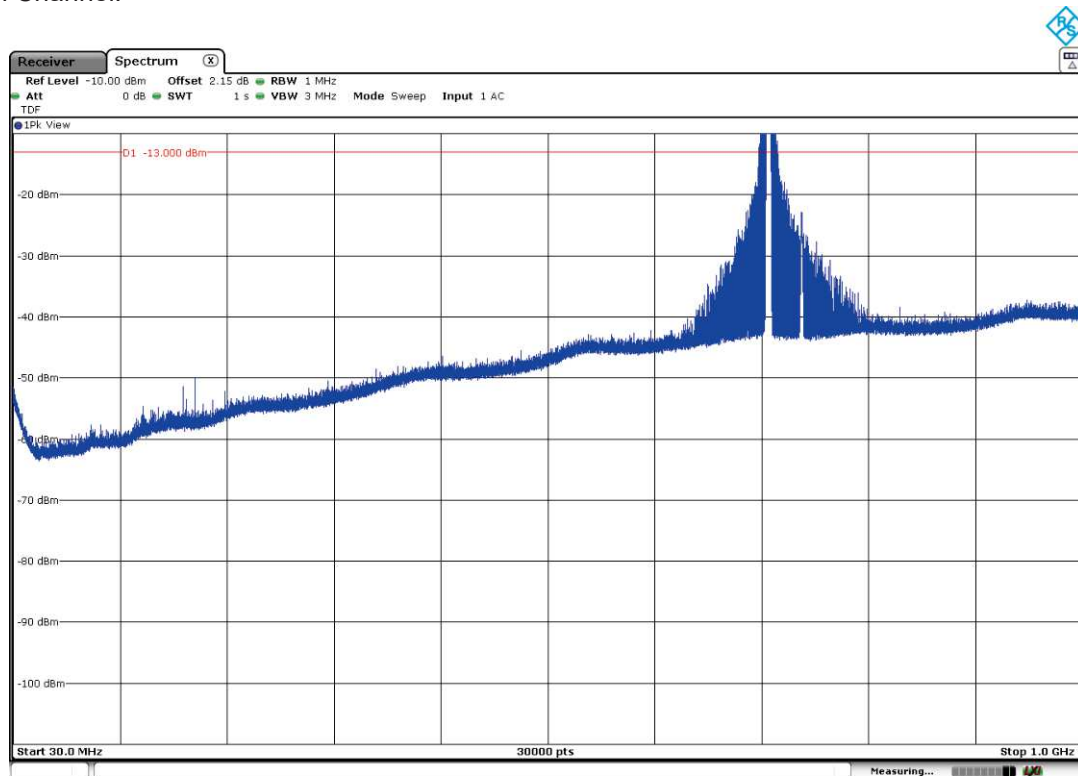
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

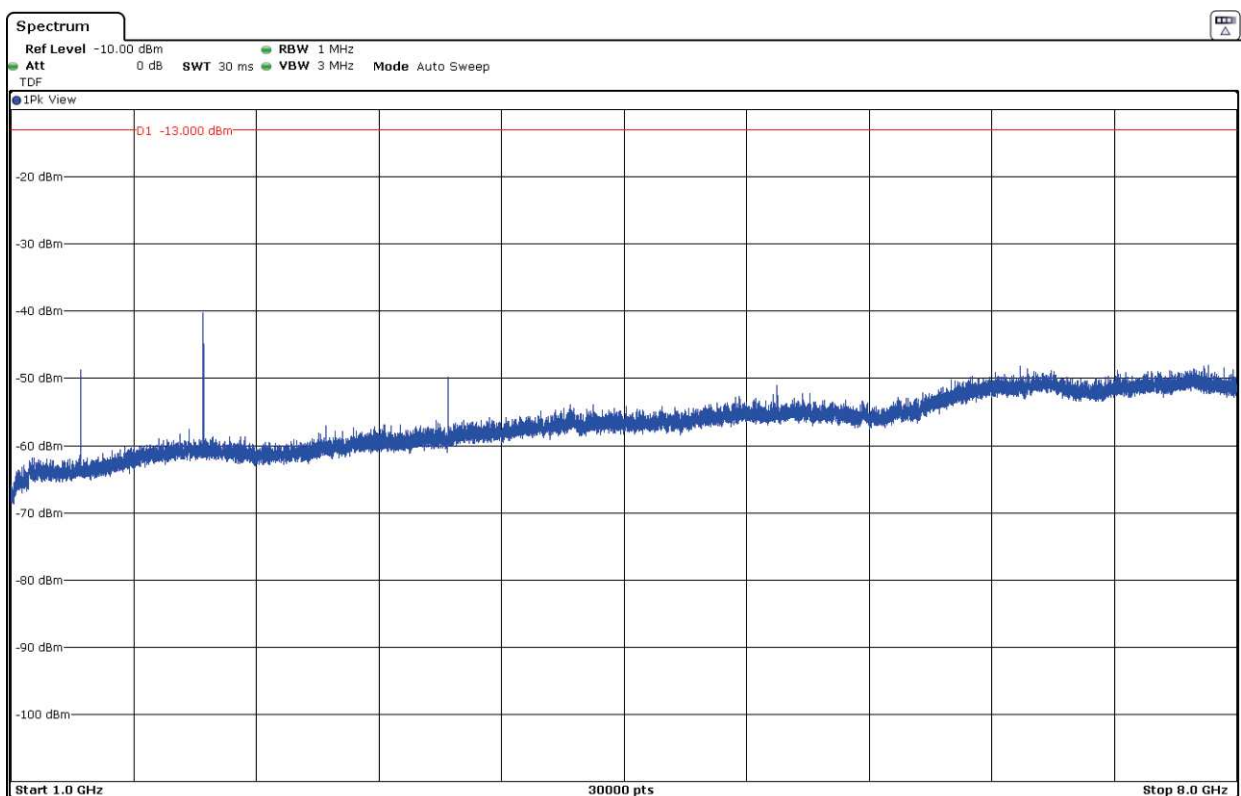
- High Channel:



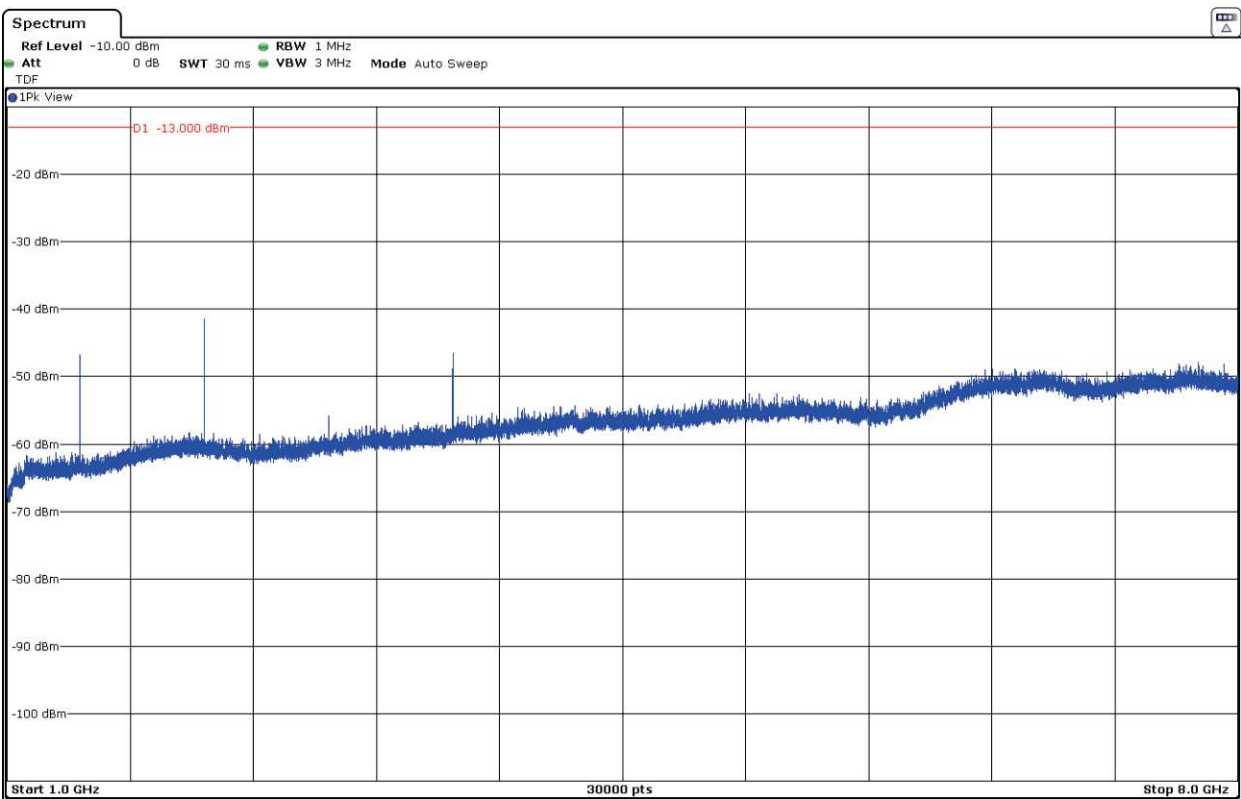
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 1 - 8 GHz (worst case):

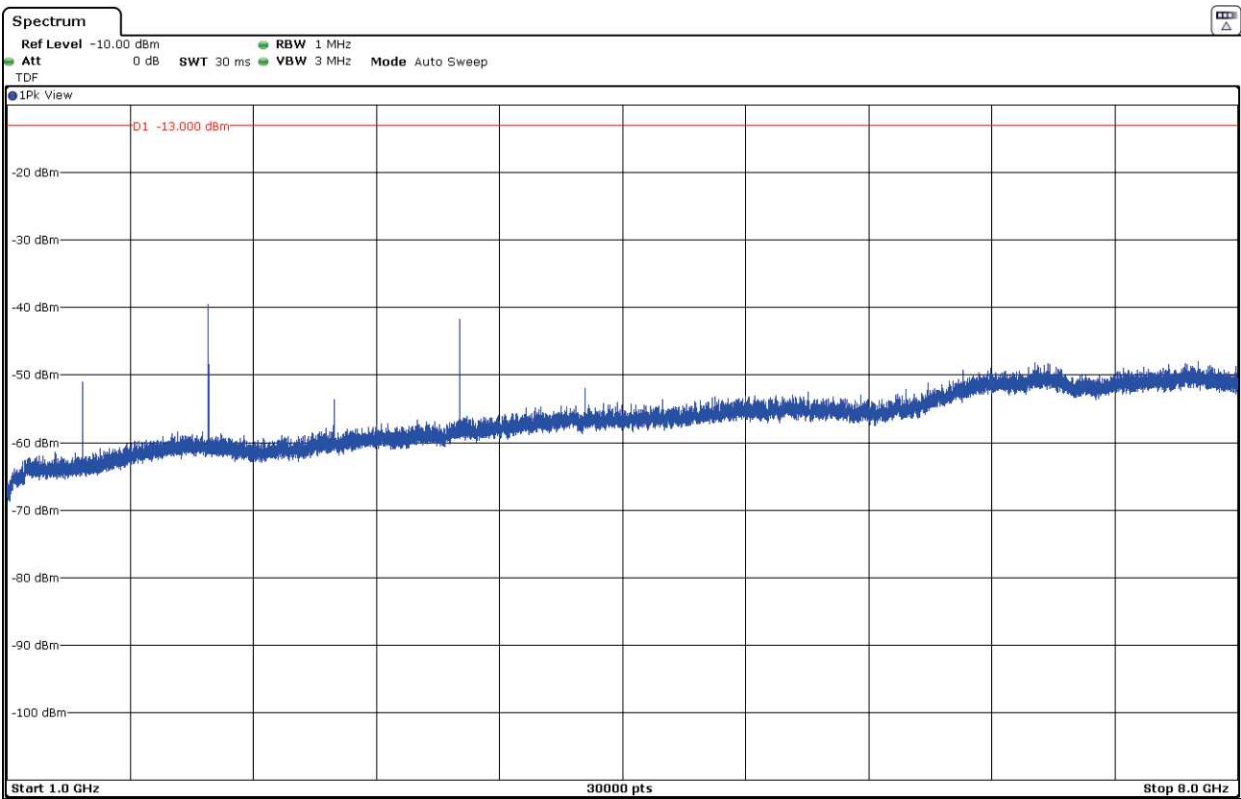
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 13

QPSK and 16QAM Modulations:

A preliminary scan determined the 16QAM modulation, BW = 5 MHz, RB Size = 1, RB Offset = 0, Narrowband = 0 as the worst case. The following tables and plots show the results for this worst-case configuration.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 8 GHz:

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

Frequency range 763 MHz – 775 MHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P. (dBm)	Polarization
774.9998	RMS	-41.70	H

Frequency range 793 MHz – 806 MHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P. (dBm)	Polarization
796.9886	RMS	-53.80	H

Frequency range 1559 MHz – 1610 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 - 8 GHz:

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

Frequency range 763 MHz – 775 MHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P. (dBm)	Polarization
774.9270	RMS	-50.50	H

Frequency range 793 MHz – 806 MHz:

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

Frequency range 1559 MHz – 1610 MHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P. (dBm)	Polarization
1559.6962	RMS	-53.90	V

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 8 GHz:

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

Frequency range 763 MHz – 775 MHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P. (dBm)	Polarization
774.8850	RMS	-53.70	H

Frequency range 793 MHz – 806 MHz:

Spurious frequencies at less than 20 dB below the limit:

Spurious frequency (MHz)	Detector	E.I.R.P. (dBm)	Polarization
801.9888	RMS	-54.56	H

Frequency range 1559 MHz – 1610 MHz:

Spurious frequencies at less than 20 dB below the limit:

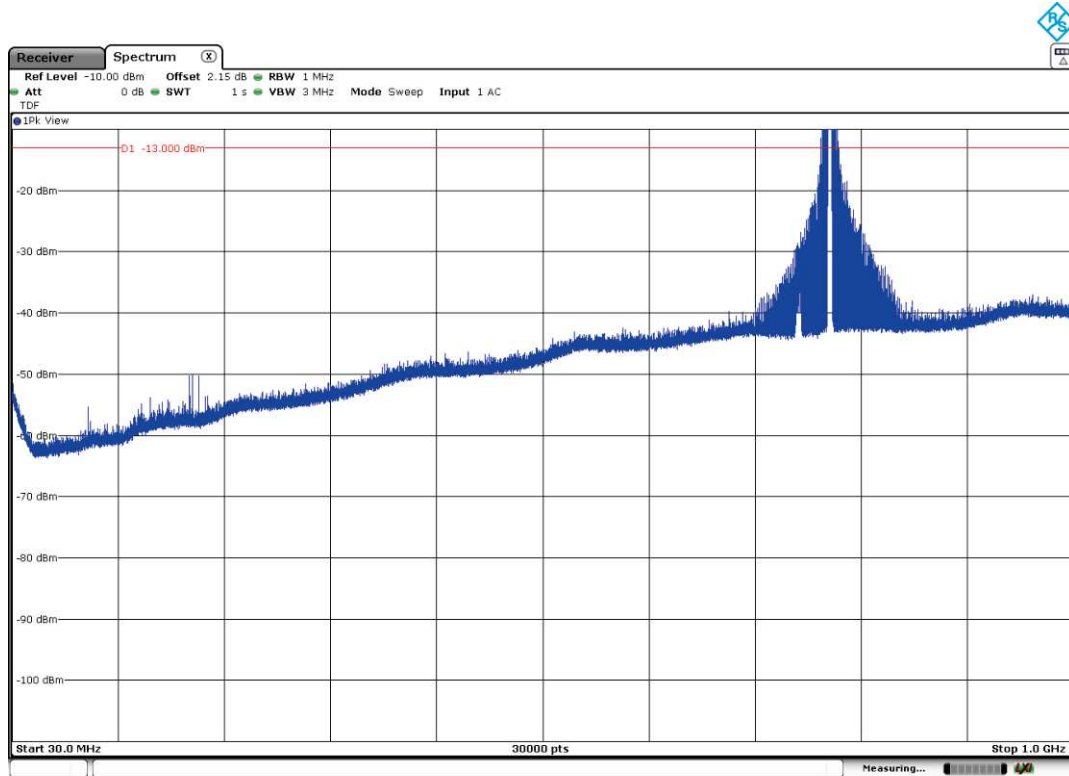
Spurious frequency (MHz)	Detector	E.I.R.P. (dBm)	Polarization
1564.7622	RMS	-51.80	H

Measurement Uncertainty (dB): <± 4.89 for f ≥ 30 MHz up to 1 GHz
 <± 5.13 for f ≥ 1 GHz up to 8 GHz

Verdict: PASS

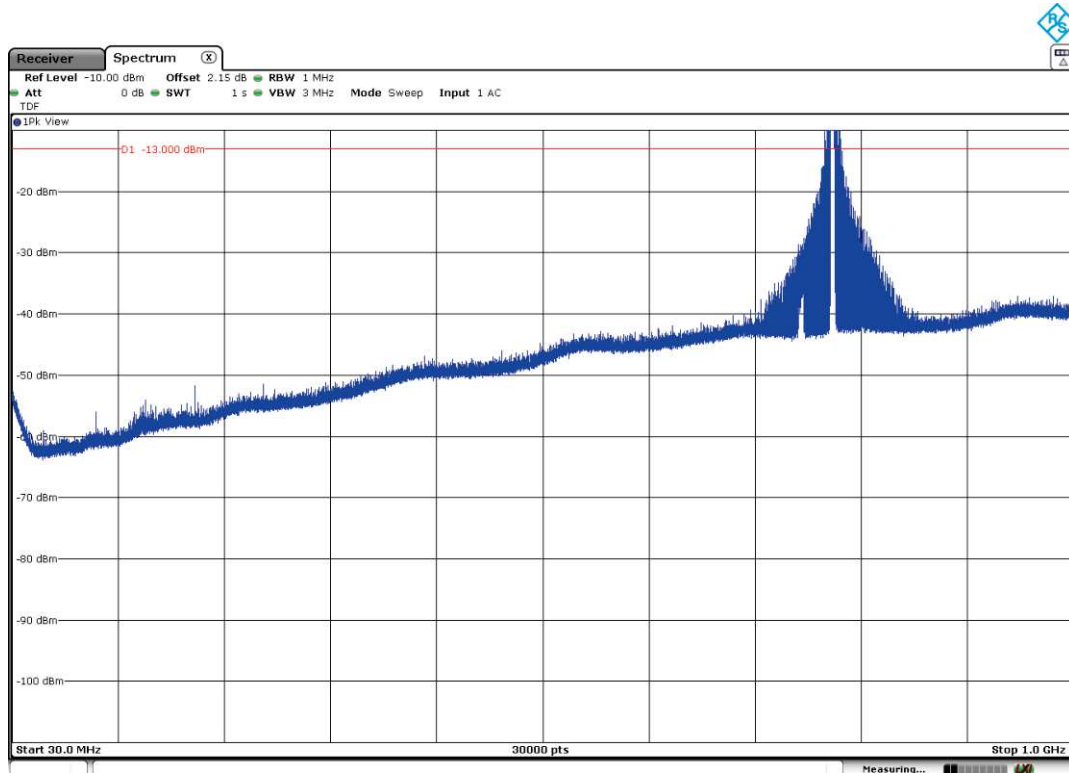
FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

- Low Channel:



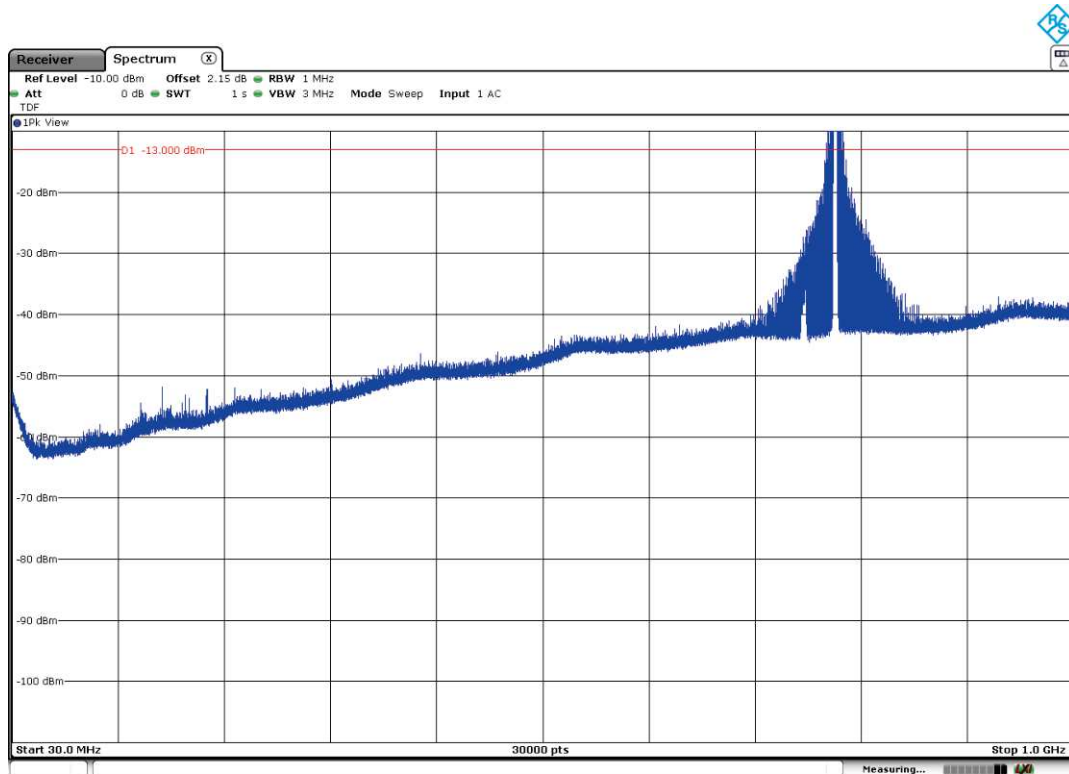
The peak above the limit is the carrier frequency.

- Middle Channel:



The peak above the limit is the carrier frequency.

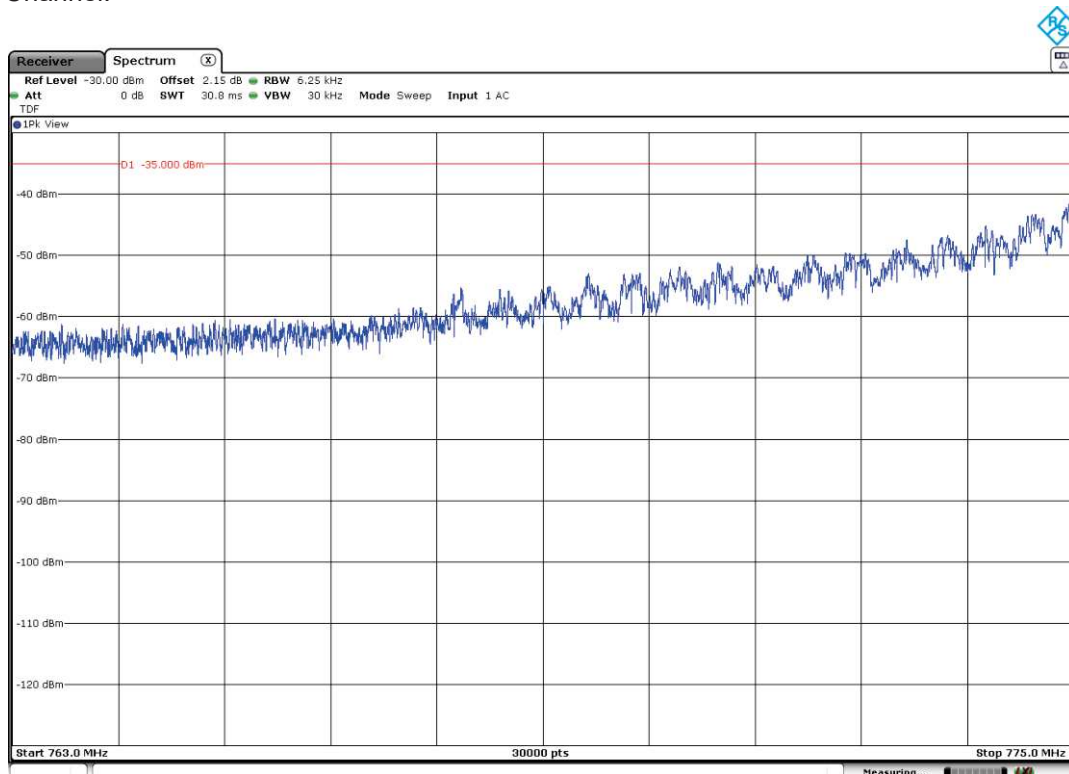
- High Channel:



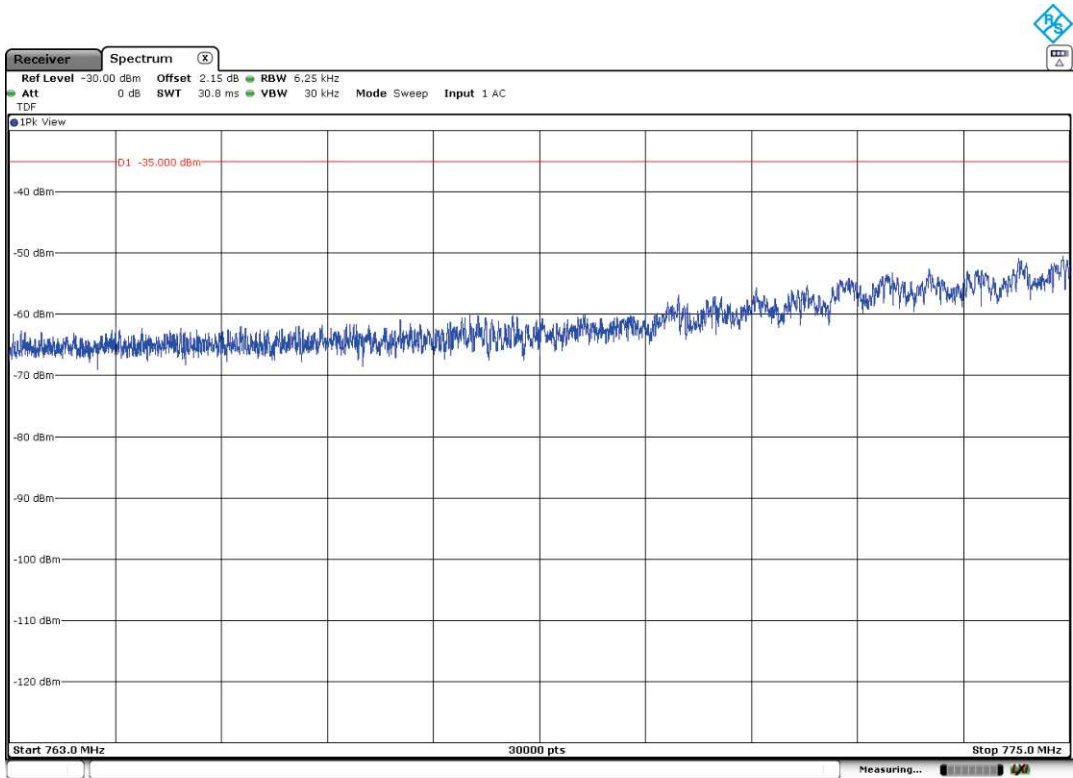
The peak above the limit is the carrier frequency.

FREQUENCY RANGE 763 - 775 MHz:

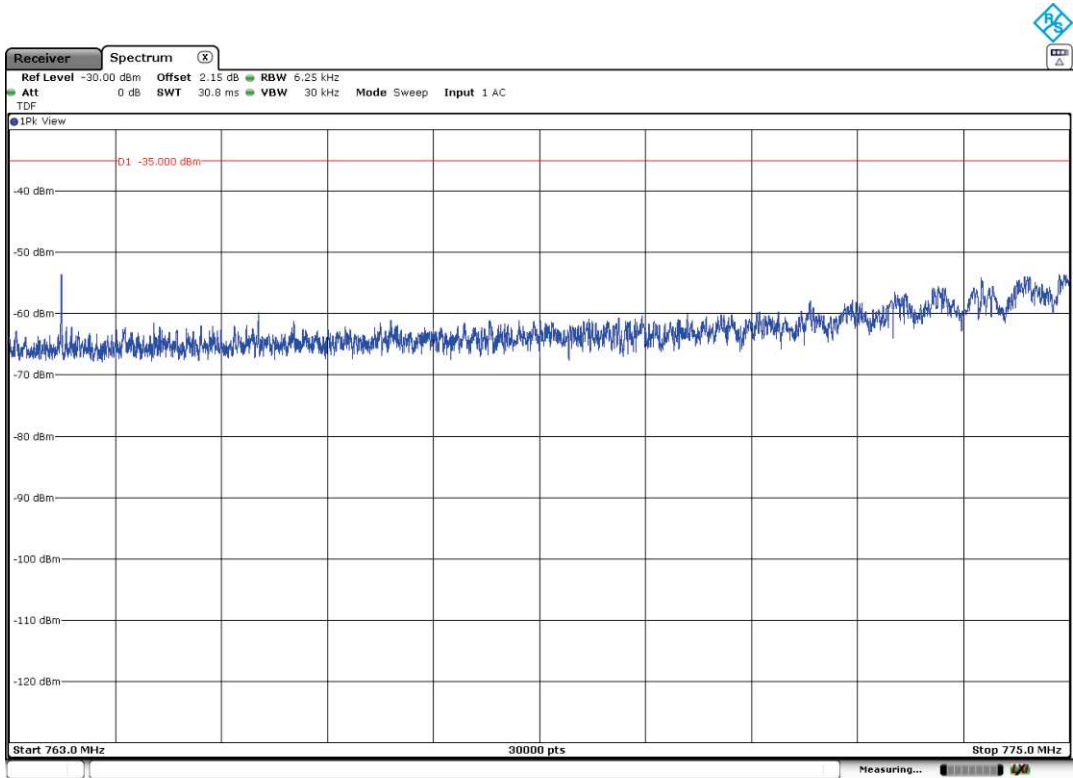
- Low Channel:



- Middle Channel:

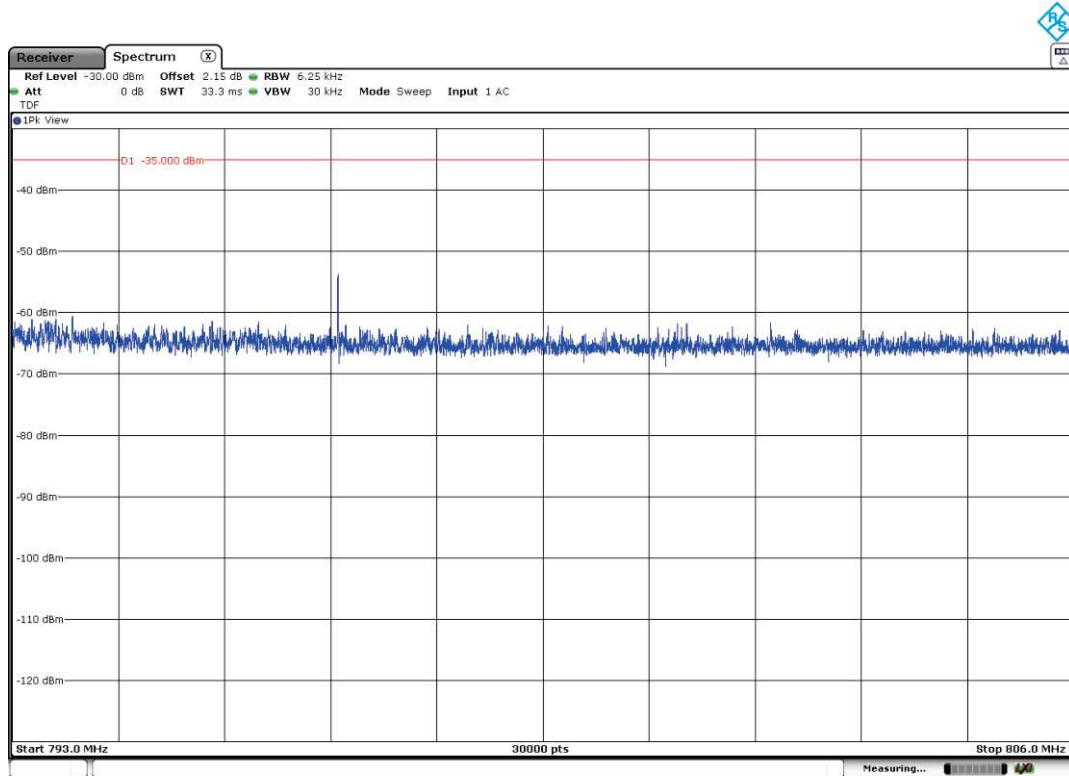


- High Channel:

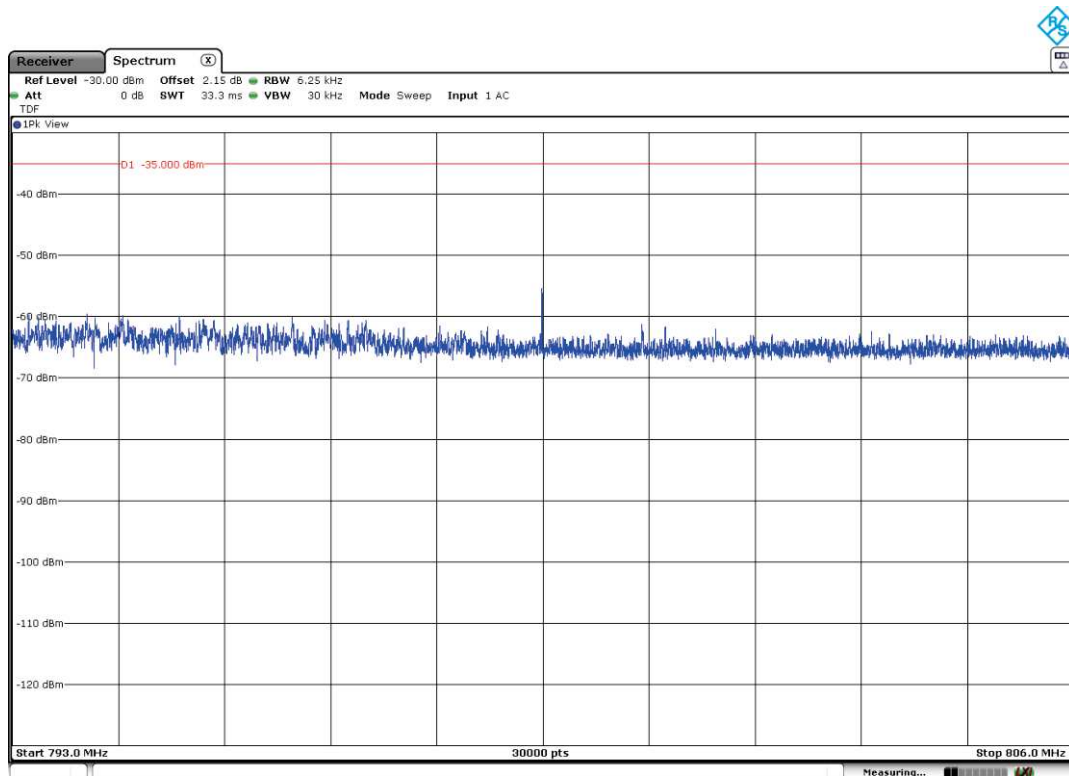


FREQUENCY RANGE 793 - 806 MHz:

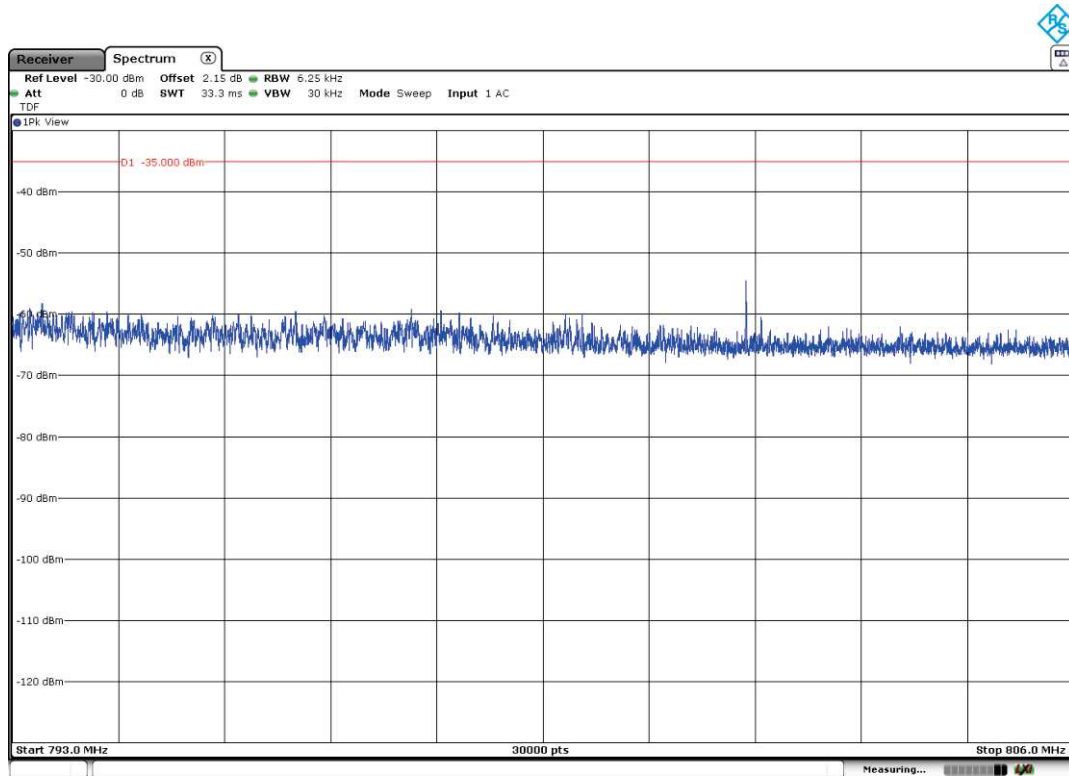
- Low Channel:



- Middle Channel:

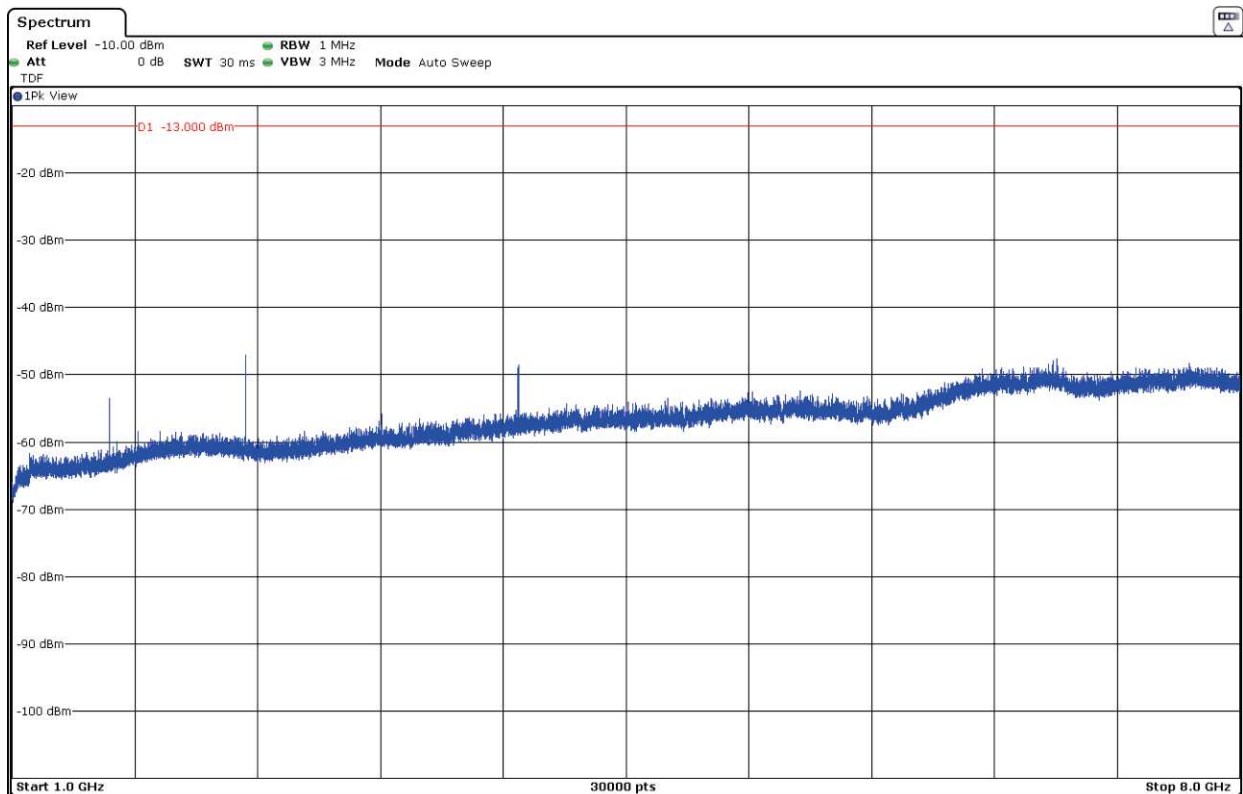


- High Channel:

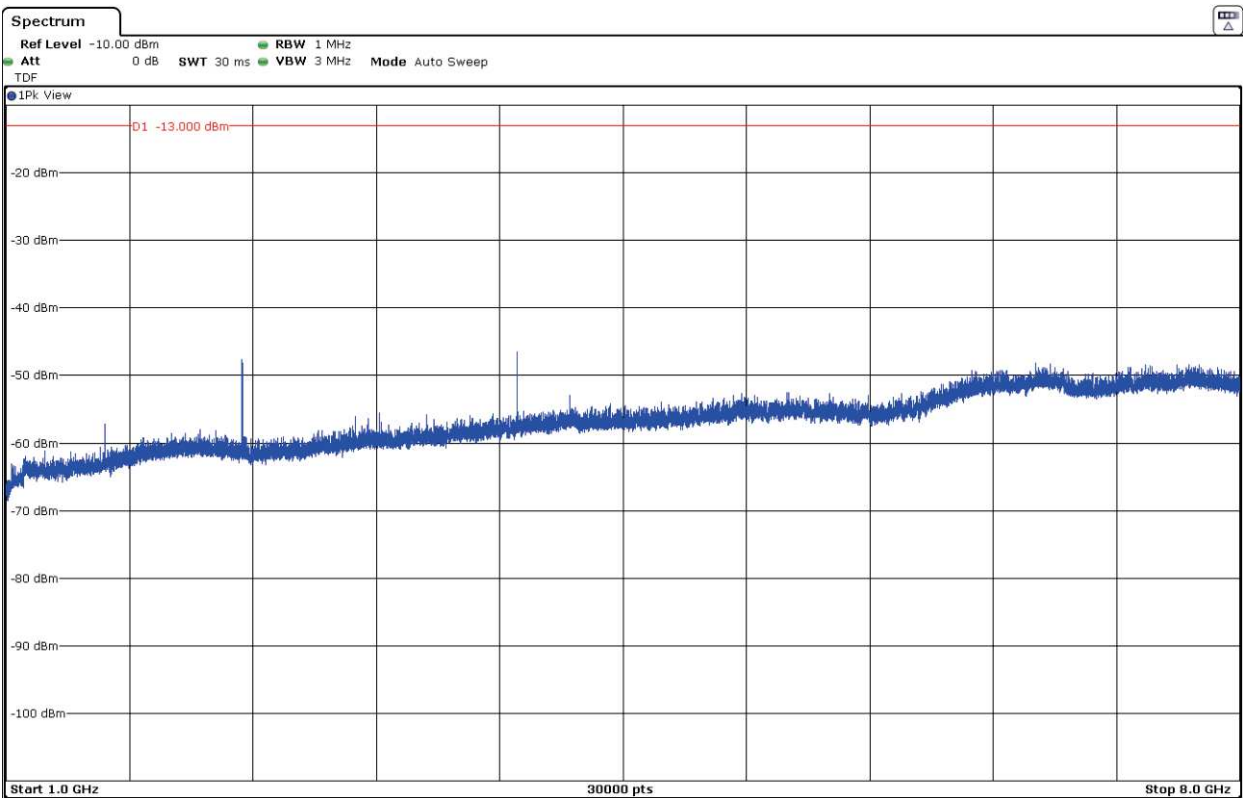


FREQUENCY RANGE 1 - 8 GHz (worst case):

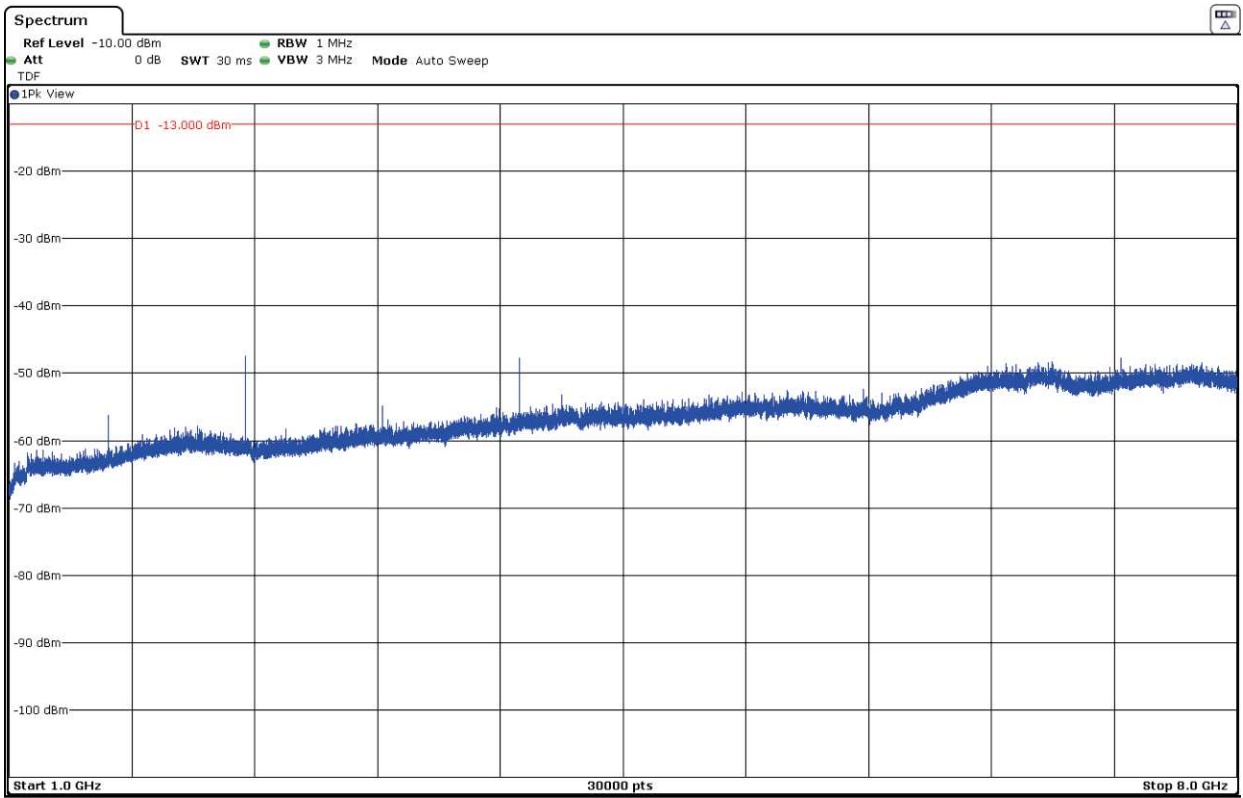
- Low Channel:



- Middle Channel:

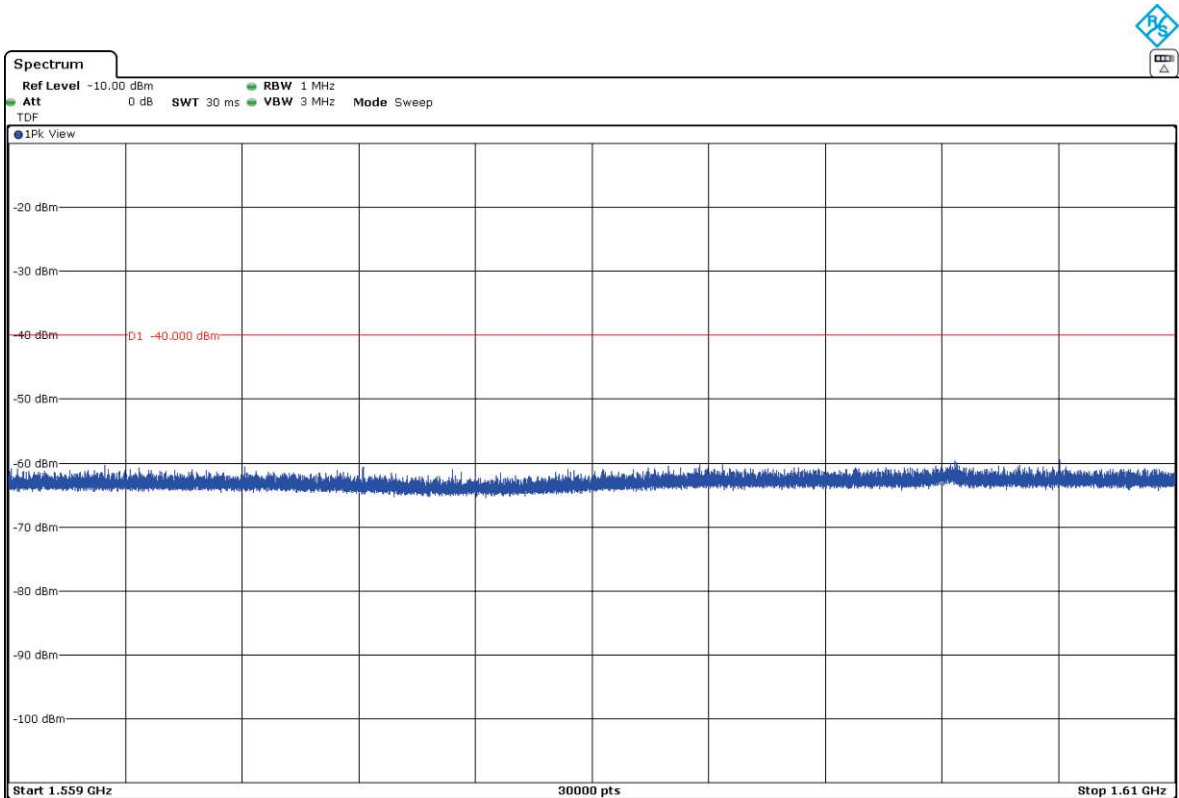


- High Channel:

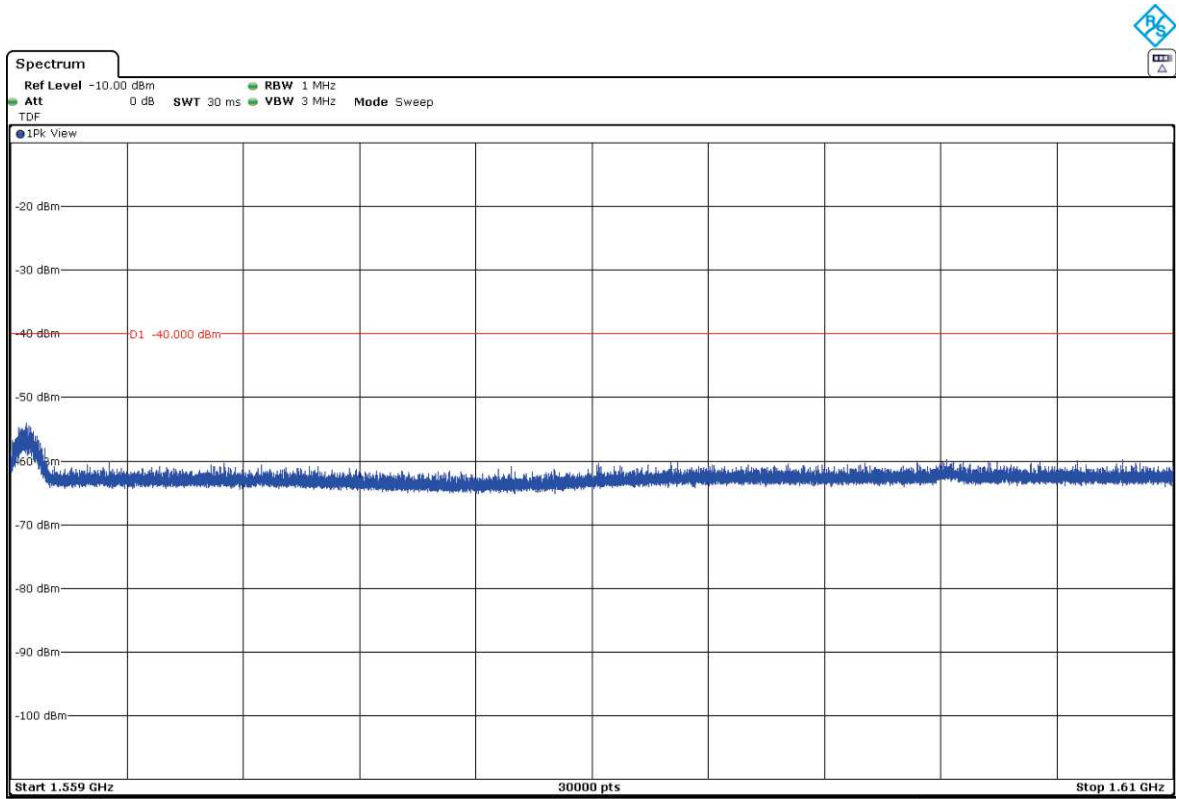


FREQUENCY RANGE 1.559 – 1.610 GHz:

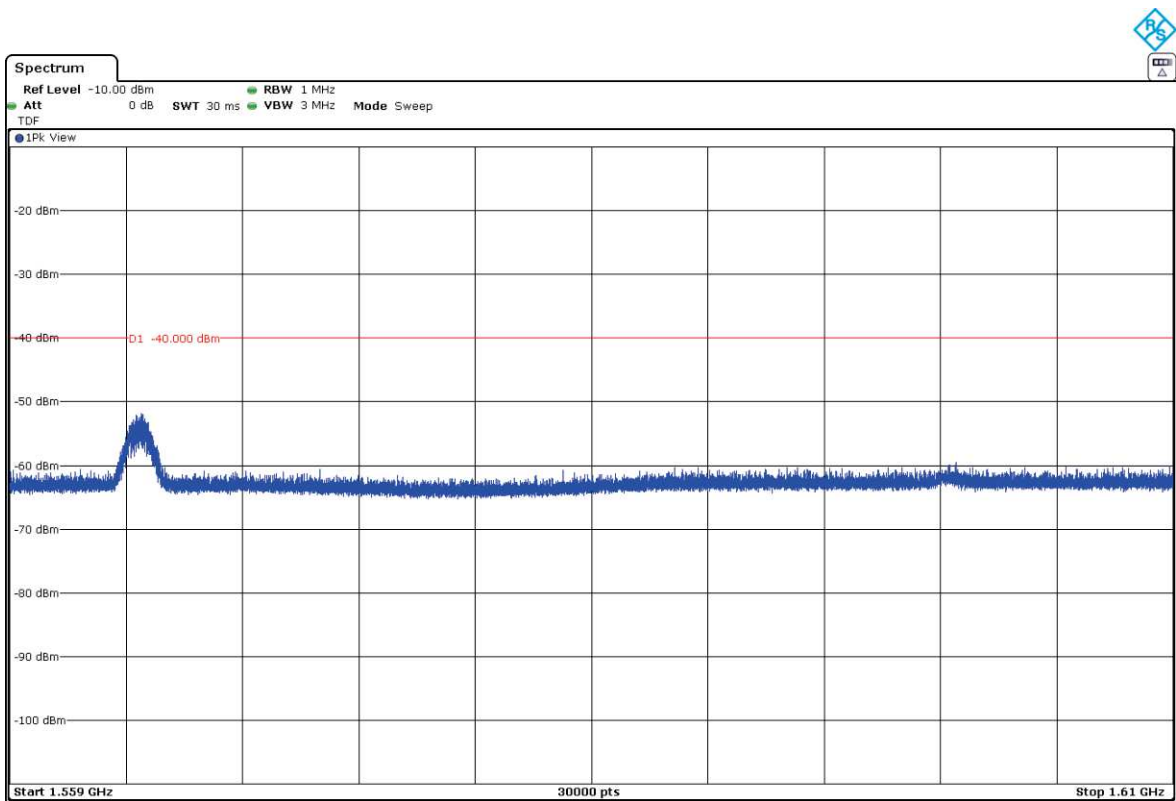
- Low Channel:



- Middle Channel:



- High Channel:



LTE Band 66:

QPSK and 16QAM Modulations:

A preliminary scan determined the 16QAM modulation, BW = 20 MHz, RB Size = 1, RB Offset = 0, Narrowband = 0 as the worst case. The following tables and plots show the results for this worst-case configuration.

- Low Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 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 - 18 GHz:

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

- High Channel:

Frequency range 30 MHz - 1 GHz:

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

Frequency range 1 - 18 GHz:

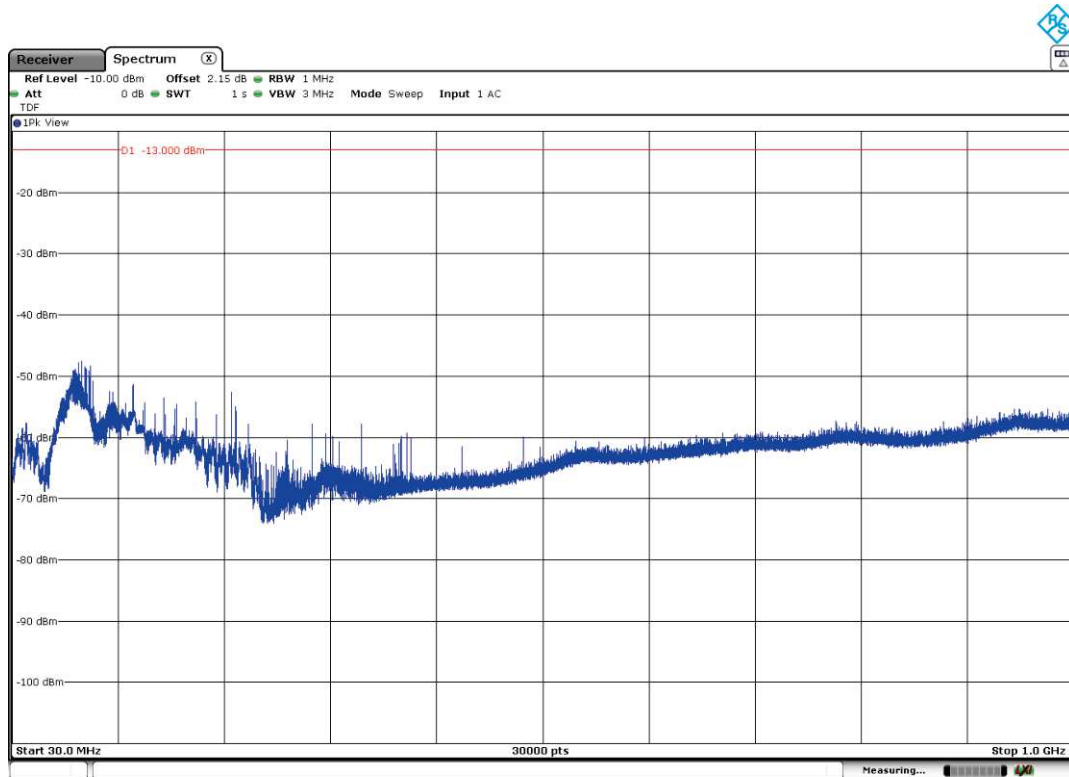
No spurious frequencies at less than 20 dB below the limit.

Measurement Uncertainty (dB):	<± 5.17 for f ≥ 30 MHz up to 1 GHz
	<± 4.11 for f ≥ 1 GHz up to 3 GHz
	<± 5.13 for f ≥ 3 GHz up to 18 GHz

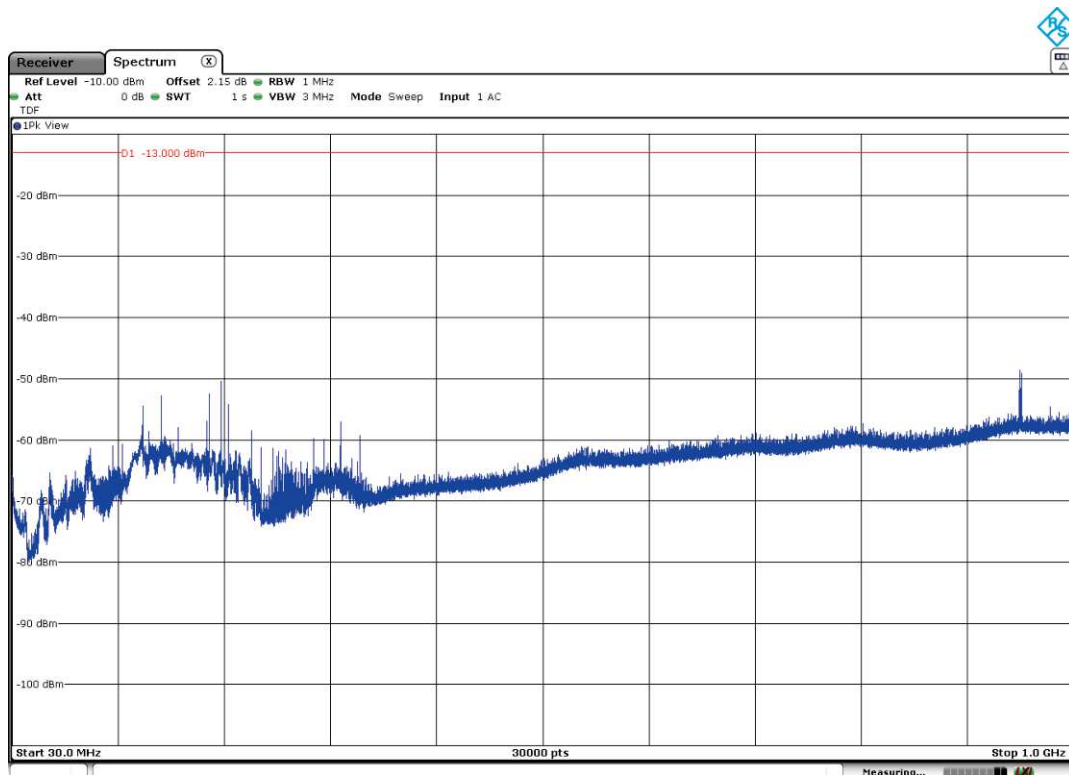
Verdict: PASS

FREQUENCY RANGE 30 MHz - 1 GHz (worst case):

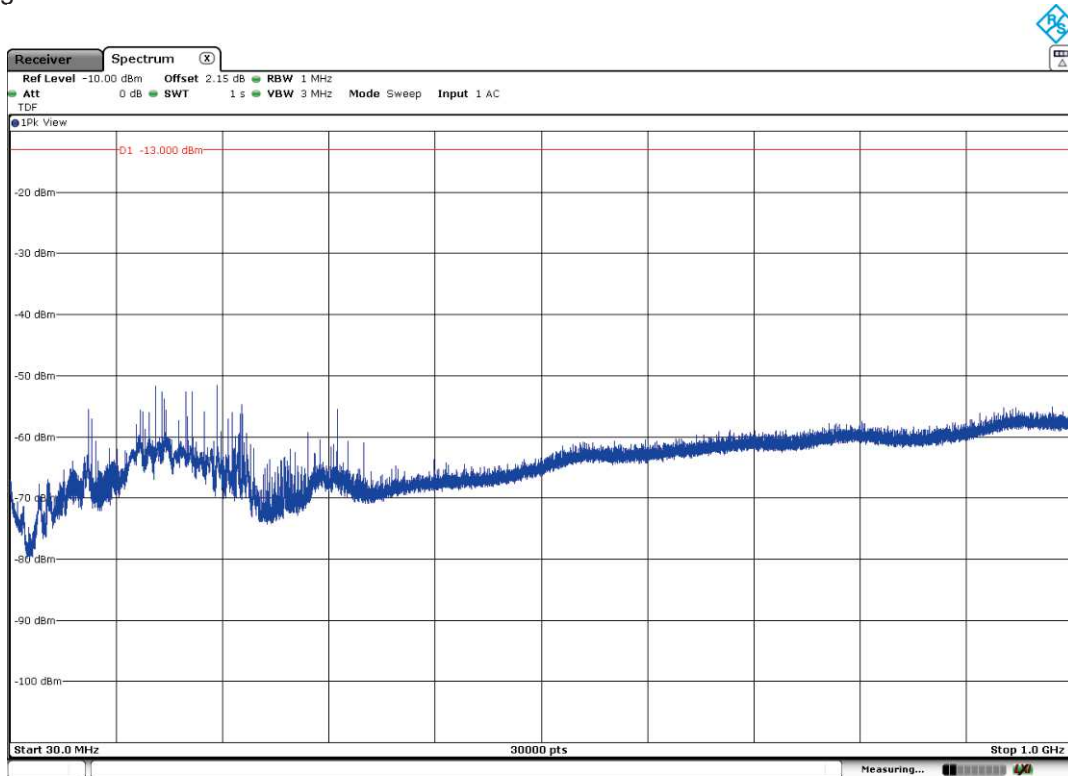
- Low Channel:



- Middle Channel:

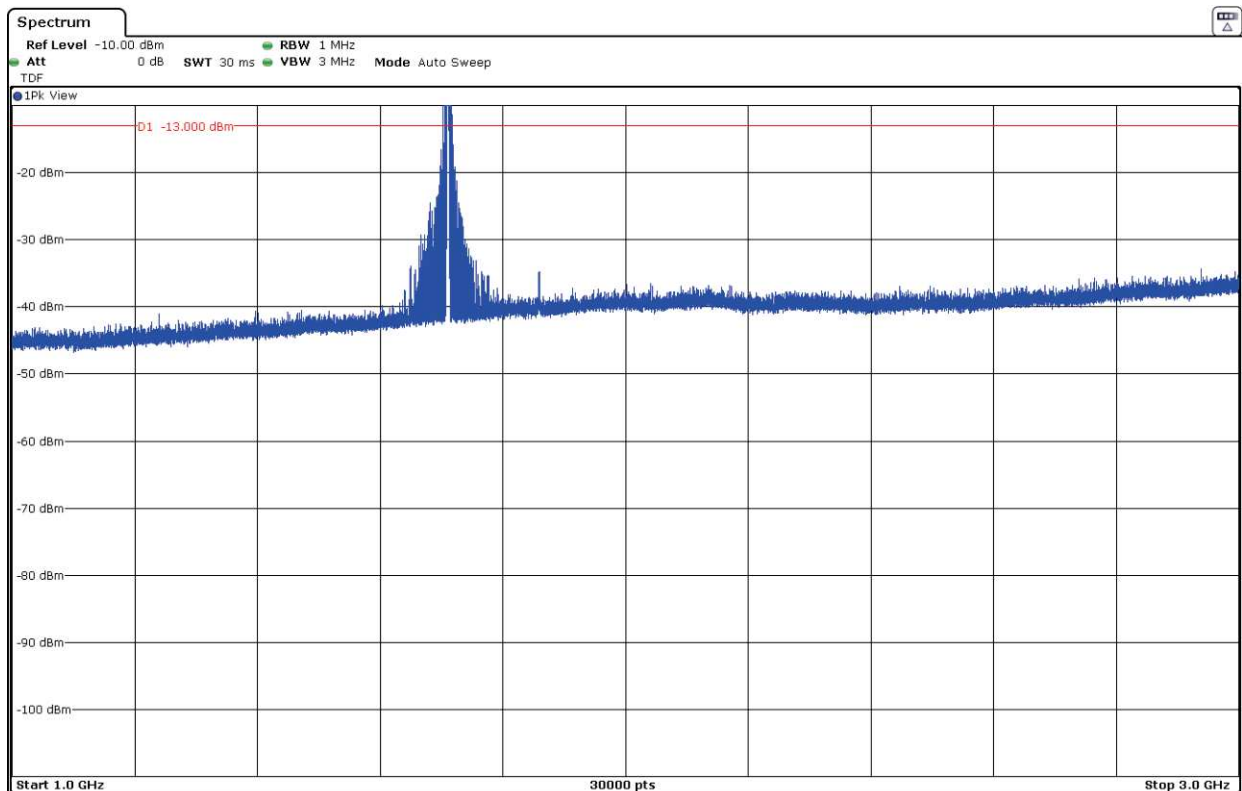


- High Channel:



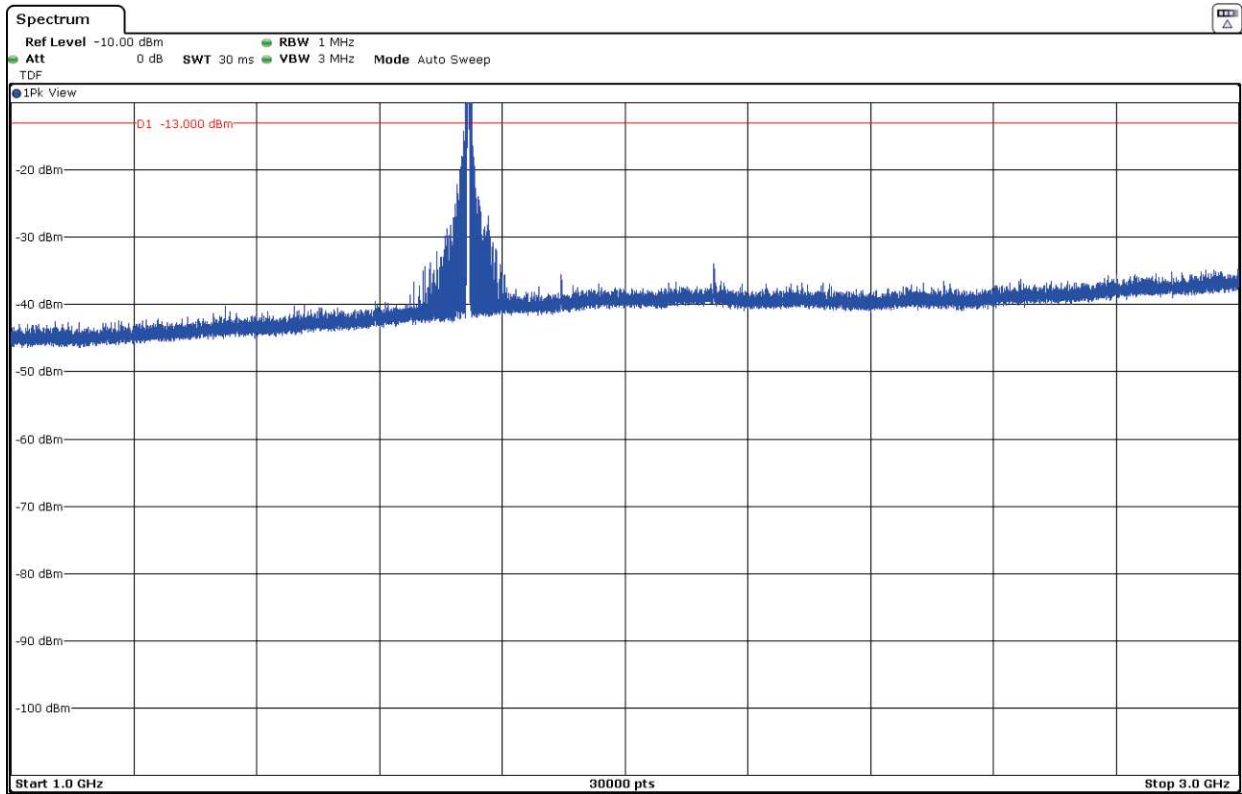
FREQUENCY RANGE 1 - 3 GHz (worst case):

- Low Channel:



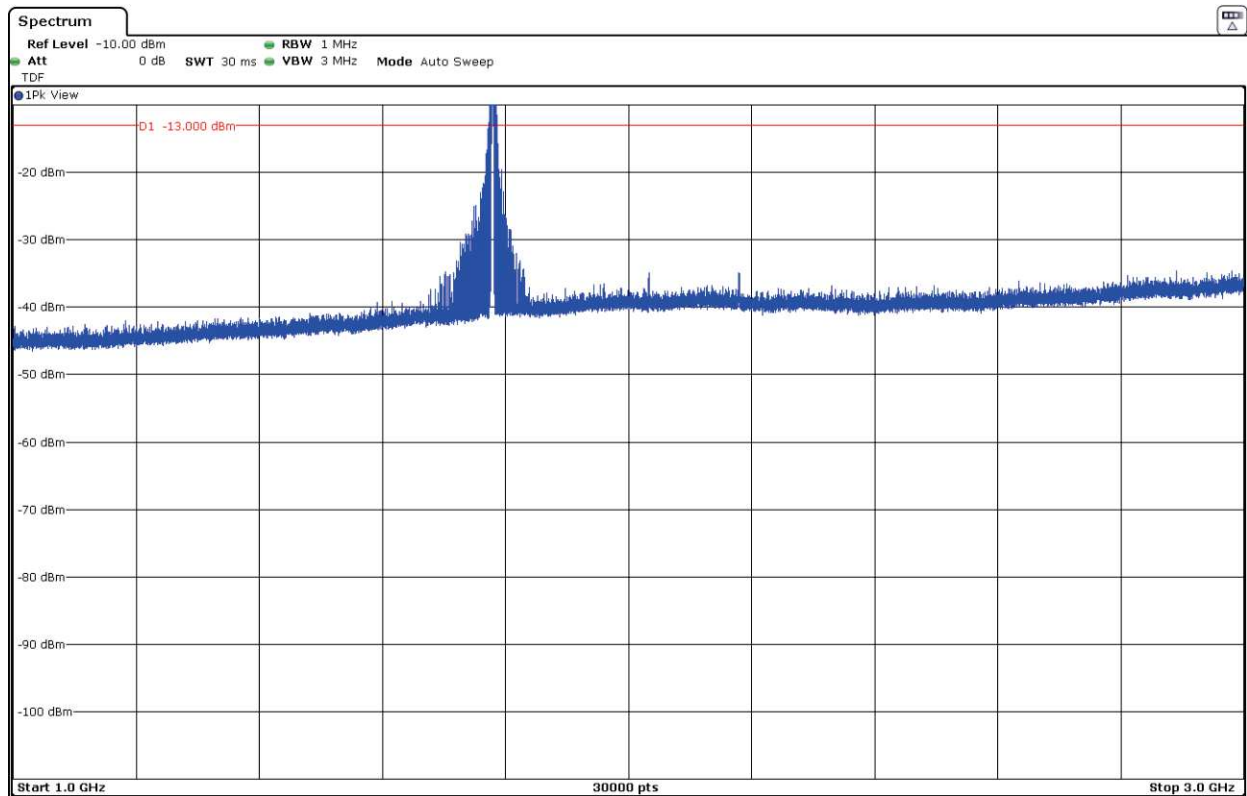
The peak above the limit is the carrier frequency. The right peak is the Downlink signal.

- Middle Channel:



The peak above the limit is the carrier frequency. The right peak is the Downlink signal.

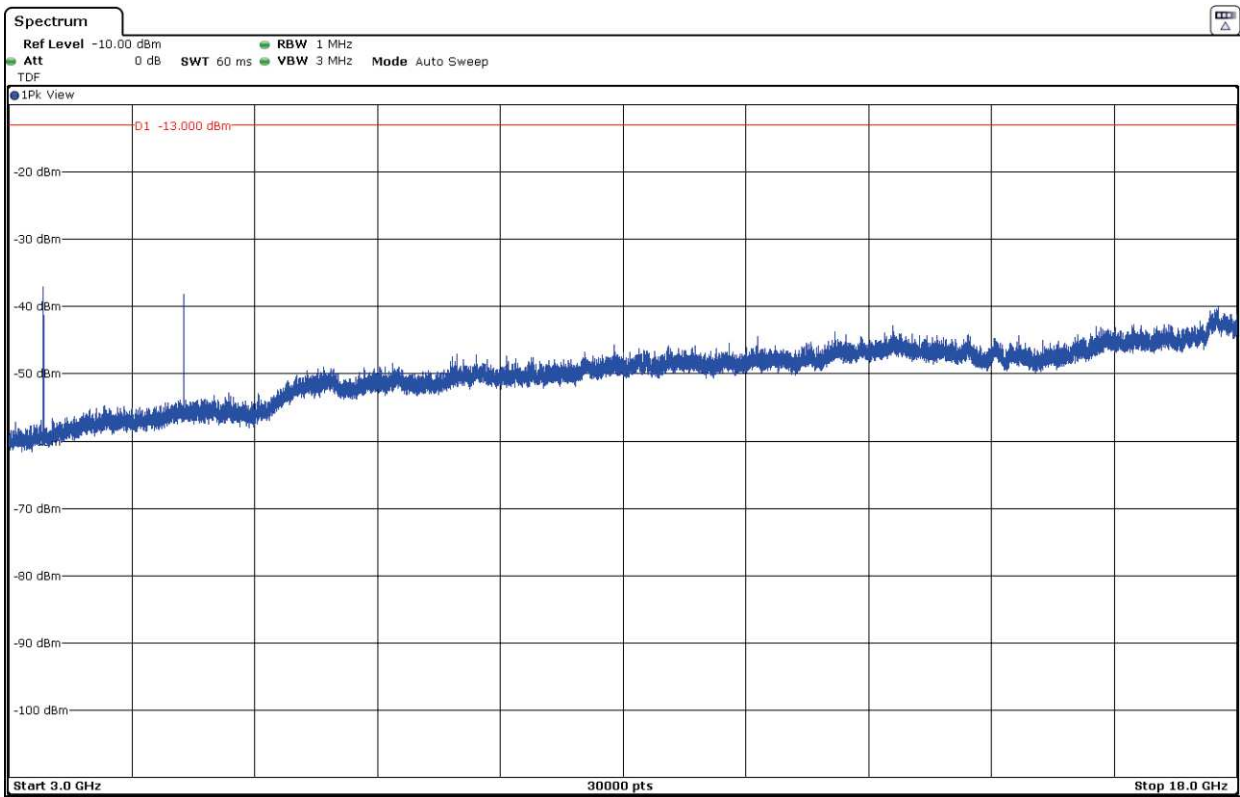
- High Channel:



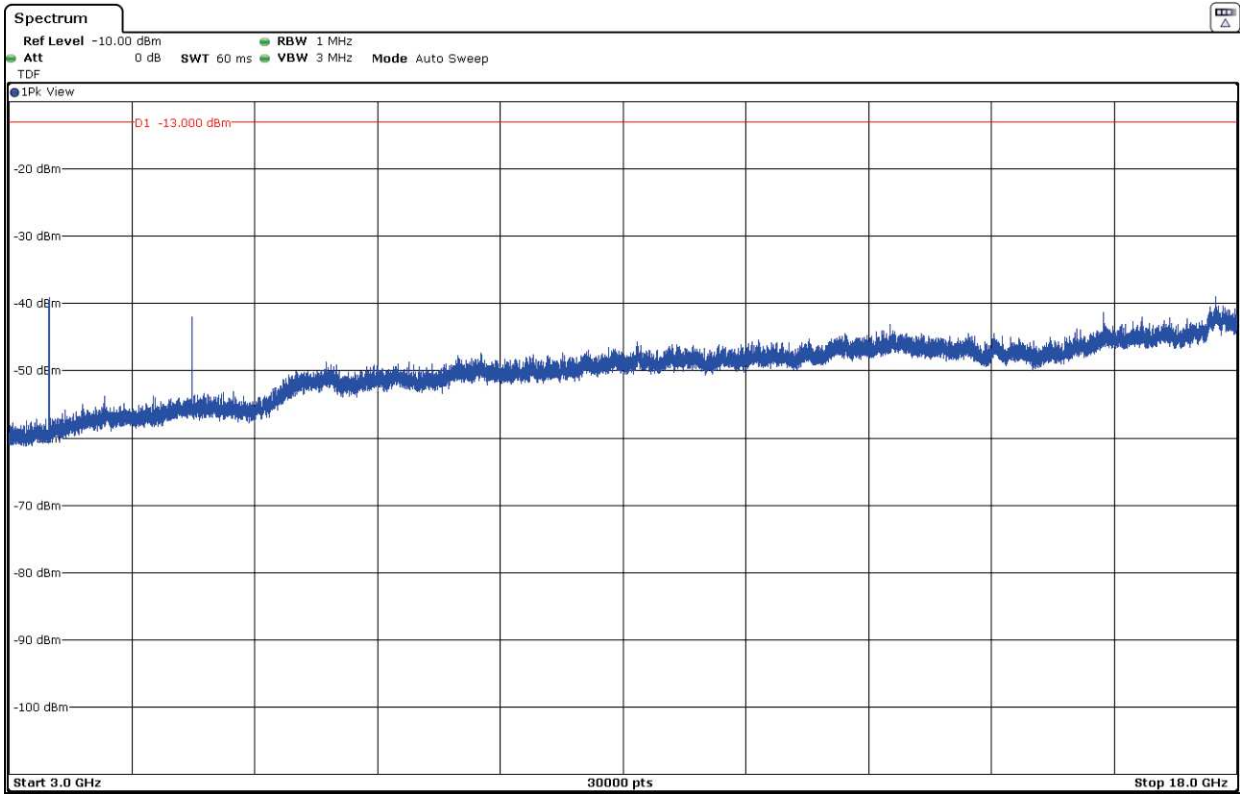
The peak above the limit is the carrier frequency. The other peak is the Downlink signal.

FREQUENCY RANGE 3 - 18 GHz (worst case):

- Low Channel:



- Middle Channel:



- High Channel:

