



Test report No:  
 NIE: 62199RRF.001

**Partial Test report**  
**REFERENCE STANDARD:**  
**USA FCC Part 22 & Part 24 & Part 27 & Part 90**  
**CANADA RSS-130, RSS-132, RSS-133, RSS-139 &**  
**RSS-199**

(*) Identification of item tested	Convertible PC with WiFi/BT and Cellular connectivity
(*) Trademark	HP
(*) Model and /or type reference tested	HSN-I32C
Other identification of the product	FCC ID: B94HNI32PD IC: 466X-HNI32PD
(*) Features	Data not provided
Manufacturer	HP INC. 1501 Page Mill Road Palo Alto, CA 94304, USA
Test method requested, standard	USA FCC Part 22 10-1-18 Edition. USA FCC Part 24 10-1-18 Edition. USA FCC Part 27 10-1-18 Edition. USA FCC Part 90 10-1-18 Edition. CANADA RSS-130 Issue 1, Oct. 2013. CANADA RSS-132 Issue 3, Jan. 2013. CANADA RSS-133 Issue 6, Jan. 2013. CANADA RSS-139 Issue 3, Jul. 2015. CANADA RSS-199 Issue 3, Dec. 2016. ANSI C63.26-2015. ANSI/TIA-603-E: 2016. KDB 971168 D01 Power Meas License Digital Systems v03r01, April. 2018.
Approved by (name / position & signature)	Jose Carlos Luque RF Lab. Supervisor

Date of issue	2019-09-18
Report template No	FDT08_22 (* "Data provided by the client")

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## Competences and guarantees

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DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

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## General conditions

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1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

## Uncertainty

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Uncertainty (factor  $k=2$ ) was calculated according to the DEKRA Testing and Certification internal document PODT000.

## Data provided by the client

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The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of a convertible PC with WiFi/BT and Cellular connectivity.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

## Usage of samples

Samples undergoing test have been selected by: the client.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
62199D/001	Convertible PC	ELITEBOOK	000919008C	2019/07/26
62199D/002	AC/DC adapter	TPN-TA02	---	2019/07/26

1. Sample S/01 has undergone the following test(s):

All radiated tests indicated in Appendixes A, B, C and D.

## Test sample description

Ports..... :	Port name and description	Cable				
		Specified length [m]	Attached during test	Shielded		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
			<input type="checkbox"/>	<input type="checkbox"/>		
Supplementary information to the ports..... :	N/A					
Rated power supply .....	Voltage and Frequency	Reference poles				
		L1	L2	L3	N	PE
	<input checked="" type="checkbox"/>	AC: 120 Vac	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	DC:				
<input type="checkbox"/>	DC:					
Rated Power .....						
Clock frequencies.....						
Other parameters .....						
Software version .....						
Hardware version .....						
Dimensions in cm (L x W x D).....						
Mounting position .....	<input type="checkbox"/>	Table top equipment				
	<input type="checkbox"/>	Wall/Ceiling mounted equipment				
	<input type="checkbox"/>	Floor standing equipment				
	<input checked="" type="checkbox"/>	Hand-held equipment				

	<input type="checkbox"/> Other:		
Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	N/A		
Accessories (not part of the test item) .....	Description	Type	Manufacturer
Documents as provided by the applicant .....	Description	File name	Issue date

## Identification of the client

HP INC.  
 1501 Page Mill Road Palo Alto, CA 94304, USA

## Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-08-01
Date (finish)	2019-08-06

## Document history

Report number	Date	Description
62199RRF.001	2019-09-18	First release

## Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

## Remarks and comments

The laptop supports UMTS and LTE, without UL carrier aggregation. The applicable frequency bands and operating modes are identified in the following table, where North America bands are shown in bold.

Mode	Bands	Supportes TX Mode			
		WCDMA	HSDPA	HSUPA	DC-HSDPA
WCDMA / HSPA +	FDD I (1920 to 1980 MHz)	X	X	X	X
	<b>FDD II (1850 to 1910 MHz)</b>	X	X	X	X
	<b>FDD IV (1710 to 1755 MHz)</b>	X	X	X	X
	<b>FDD V (824 to 849 MHz)</b>	X	X	X	X
	FDD VIII (888 to 915 MHz)	X	X	X	X

Mode	Bands	Supportes Channel Bandwidth (MHz)					
		1.4	3	5	10	15	20
LTE FDD	Band 1 (1920 to 1980 MHz )			X	X	X	X
	<b>Band 2 (1850 to 1910 MHz)</b>	X	X	X	X	X	X
	Band 3 (1710 to 1785 MHz)	X	X	X	X	X	X
	<b>Band 4 (1710 to 1755 MHz)</b>	X	X	X	X	X	X
	<b>Band 5 (824 to 849 MHz)</b>	X	X	X	X		
	<b>Band 7 (2500 to 2570 MHz)</b>			X	X	X	X
	Band 8 (880 to 915 MHz)	X	X	X	X		
	Band 11 (1427.9 to 1447.9 MHz)			X	X		
	<b>Band 12 (699 to 716 MHz)</b>	X	X	X	X		
	<b>Band 13 (777 to 787 MHz)</b>			X	X		
	<b>Band 17 (704 to 716 MHz)</b>			X	X		
	Band 18 (815 to 830 MHz)			X	X	X	
	Band 19 (830 to 845 MHz)			X	X	X	
	Band 20 (832 to 862 MHz)			X	X	X	X
	Band 21 (1447.9 to 1462.9 MHz)			X	X	X	
	<b>Band 26 (814 to 849 MHz)</b>	X	X	X	X	X	
	Band 28 (703 to 748 MHz)		X	X	X	X	X
	Band 29 (717 to 728 MHz)	Downlink only					
	<b>Band 30 (2305 to 2315 MHz)</b>			X	X		
<b>Band 66 (1710 to 1780 MHz)</b>	X	X	X	X	X	X	
LTE TDD	<b>Band 38 (2570 to 2620 MHz)</b>			X	X	X	X
	Band 39 (1880 to 1920 MHz)			X	X	X	X
	Band 40 (2300 to 2400 MHz)			X	X	X	X
	<b>Band 41 (2496 to 2690 MHz)</b>			X	X	X	X

The manufacturer confirmed after the study received by the test laboratory that the worst cases were WCDMA bands II, IV, V and LTE bands 2, 4, 13, 17, 26, 41.

The tests have been performed by the technical personnel: Francisco J. Alcaide and Jose M. Jiménez.

Used instrumentation:

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	Multi Device Controller EMCO 2090	N.A.	N.A.
3.	AC power supply CHROMA 6490	2018/09	2020/09
4.	EMI Test Receiver ROHDE AND SCHWARZ ESR7	2018/10	2020/10
5.	RF Pre-amplifier, 38 dB, 30 MHz-6 GHz BONN ELEKTRONIK BLNA 0360-01N	2019/02	2020/02
6.	Biconical/Log Antenna 30 MHz-6 GHz ETS LINDGREN 3142E	2017/07	2020/04
7.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSW50	2018/02	2020/02
8.	Pre-amplifier G>30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-1M	2019/04	2020/04
9.	Broadband Horn antenna 1-18GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2016/11	2019/11
10.	Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170	2018/07	2021/07
11.	RF pre-amplifier 18-40 GHz NARDA JS44-18004000-33-8P	2019/02	2020/02
12.	Wideband Radio Communication Tester R&S CMW500	2019/05	2020/05
13.	Wideband Radio Communication Tester R&S CMW500	2019/05	2020/05
14.	Wideband Radio Communication Tester R&S CMW500	2019/02	2020/02

## Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

## Summary

FCC PART 22/CANADA RSS-132 PARAGRAPH		
Requirement – Test case	Verdict	Remark
Clause 22.913/RSS-132 Clause 5.4: RF output power	N/M	(2)
Clause 2.1047/RSS-132 Clause 5.2: Modulation characteristics	N/M	(2)
Clause 22.355/RSS-132 Clause 5.3: Frequency stability	N/M	(2)
Clause 2.1049: Occupied Bandwidth	N/M	(2)
Clause 22.917/RSS-132 Clause 5.5: Spurious emissions at antenna terminals	N/M	(2)
Clause 22.917/RSS-132 Clause 5.5: Radiated emissions	P	(1)
<p><u>Supplementary information and remarks:</u></p> <p>(1) HSDPA modulation mode has not been tested to prove USA FCC Part 22 and Part 24 compliance because it is an improved mode of operation only for Downlink (UE reception), but using the normal WCDMA mode for UL (Up Link, UE transmission). Therefore HSDPA has no associated a Power class or modulation scheme different than WCDMA mode for the UL transmission.</p> <p>Taking into account the above comments, testing in HSDPA modulation mode is redundant for FCC Part 22 and Part 24 as it is the same as WCDMA mode as long as UE transmission is concerned. WCDMA modulation mode has been tested as indicated on the present test report.</p> <p>(2) Test not requested.</p>		

FCC PART 24/CANADA RSS-133 PARAGRAPH		
Requirement – Test case	Verdict	Remark
Clause 24.232/RSS-133 Clause 6.4: RF output power	N/M	(2)
Clause 2.1047/RSS-133 Clause 6.2: Modulation characteristics	N/M	(2)
Clause 24.235/RSS-133 Clause 6.3: Frequency stability	N/M	(2)
Clause 2.1049: Occupied Bandwidth	N/M	(2)
Clause 24.238/RSS-133 Clause 6.5: Spurious emissions at antenna terminals	N/M	(2)
Clause 24.238/RSS-133 Clause 6.5: Radiated emissions	P	(1)
<p><u>Supplementary information and remarks:</u></p> <p>(1) HSDPA modulation mode has not been tested to prove USA FCC Part 22 and Part 24 compliance because it is an improved mode of operation only for Downlink (UE reception), but using the normal WCDMA mode for UL (Up Link, UE transmission). Therefore HSDPA has no associated a Power class or modulation scheme different than WCDMA mode for the UL transmission.</p> <p>Taking into account the above comments, testing in HSDPA modulation mode is redundant for FCC Part 22 and Part 24 as it is the same as WCDMA mode as long as UE transmission is concerned. WCDMA modulation mode has been tested as indicated on the present test report.</p> <p>(2) Test not requested.</p>		

FCC PART 27/CANADA RSS-130 /CANADA RSS-139/CANADA RSS-199 PARAGRAPH		
Requirement – Test case	Verdict	Remark
Clause 27.50 / RSS-139 Clause 6.5. / RSS-130 Clause 4.4. / RSS-199 Clause 4.4: RF output power	N/M	(1)
Clause 2.1047 / RSS-139 Clause 6.2. / RSS-130 Clause 4.1./ RSS-199 Clause 4.1: Modulation characteristics	N/M	(1)
Clause 27.54 / RSS-139 Clause 6.4. / RSS-130 Clause 4.3. / RSS-199 Clause 4.3: Frequency stability	N/M	(1)
Clause 2.1049: Occupied Bandwidth	N/M	(1)
Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6. / RSS-199 Clause 4.5: Spurious emissions at antenna terminals	N/M	(1)
Clause 27.53 / RSS-139 Clause 6.6. / RSS-130 Clause 4.6. / RSS-199 Clause 4.5: Radiated emissions	P	
<u>Supplementary information and remarks:</u> (1) Test not requested.		

FCC PART 90 PARAGRAPH		
Requirement – Test case	Verdict	Remark
Clause 90.635 (b): RF output power	N/M	(1)
Clause 2.1047: Modulation characteristics	N/M	(1)
Clause 90.213 Frequency stability	N/M	(1)
Clause 2.1049: Occupied Bandwidth	N/M	(1)
Clause 90.691 Spurious emissions at antenna terminals (Emission mask requirements for EA-based systems)	N/M	(1)
Clause 90.691: Radiated emissions	P	
<u>Supplementary information and remarks:</u> (1) Test not requested.		

## Appendix A: Test results for FCC PART 22 / CANADA RSS-132

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## TEST CONDITIONS

Power supply (V):

Vnom = 120 Vac

Vmax = N/A

Vmin = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = AC Voltage from AC/DC adapter.

Type of antenna = Internal antenna

Modes supported by the equipment:

- Notebook mode.
- Tablet mode.

TEST FRECUENCIES:

WCDMA AND HSUPA MODULATION (Band V)

Lowest channel (4132): 826.4 MHz

Middle channel (4182): 836.4 MHz

Highest channel (4233): 846.6 MHz

## Radiated emissions

### SPECIFICATION

FCC § 22.917

RSS-132. Clause 5.5.

### 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 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. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Each detected emission is substituted by the Substitution method, in accordance with the ANSI/TIA-603-E.

#### Measurement Limit:

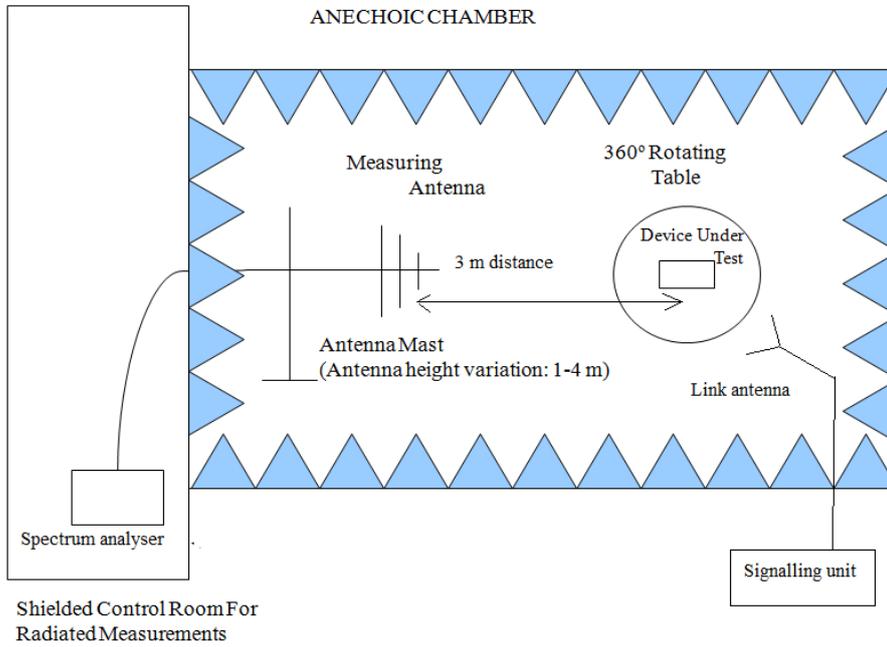
According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

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

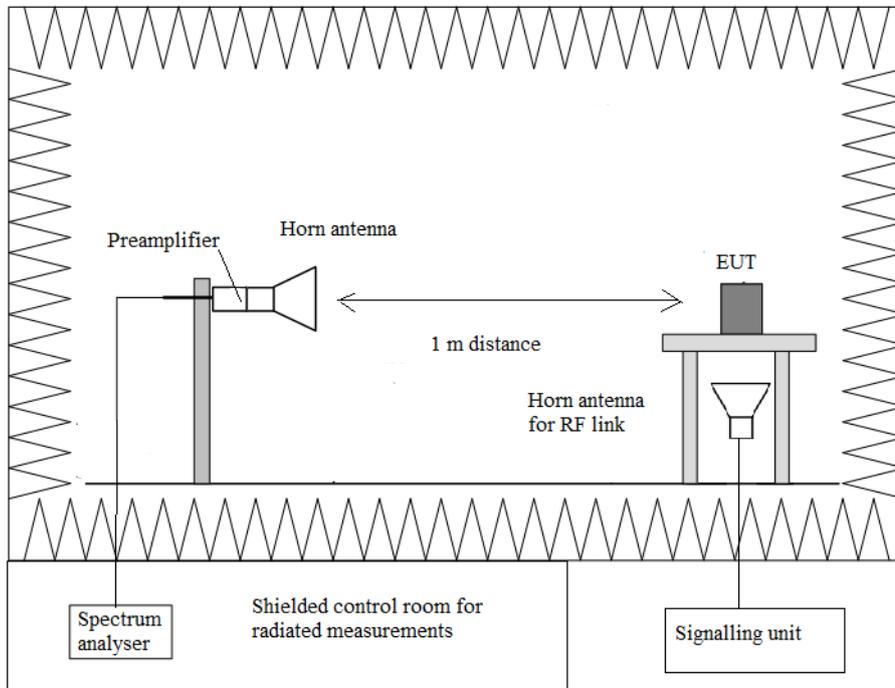
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = - 13 \text{ dBm}$$

**TEST SETUP**

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.

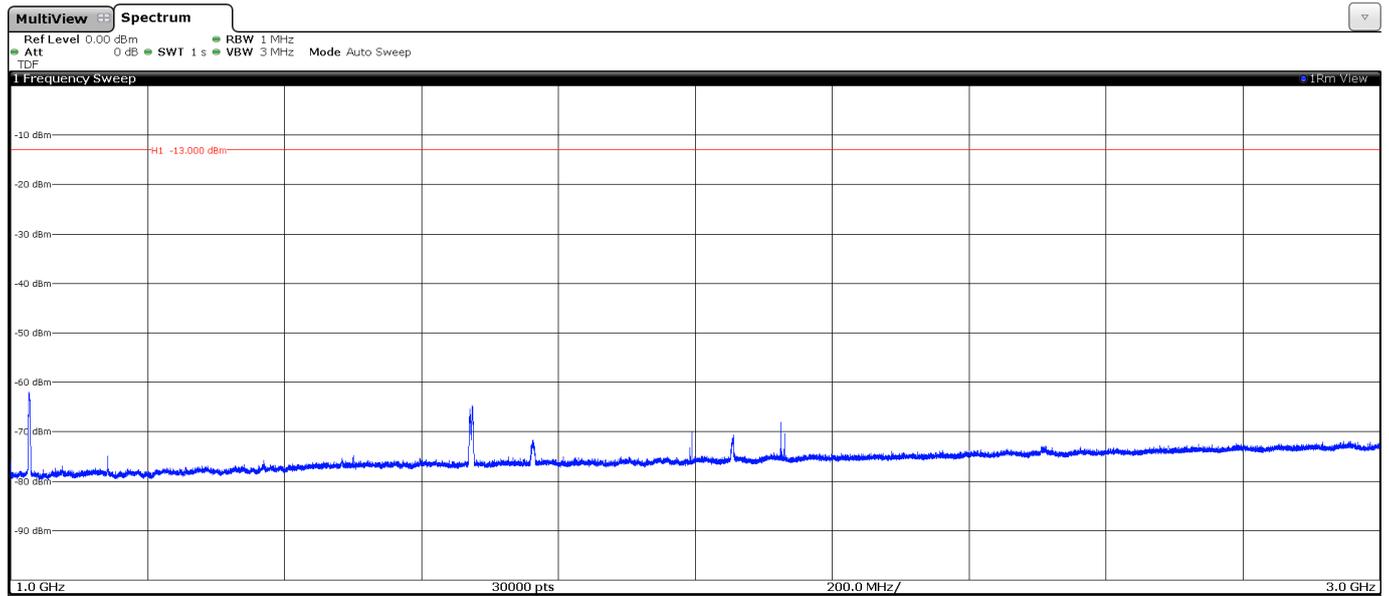


### WCDMA Band:

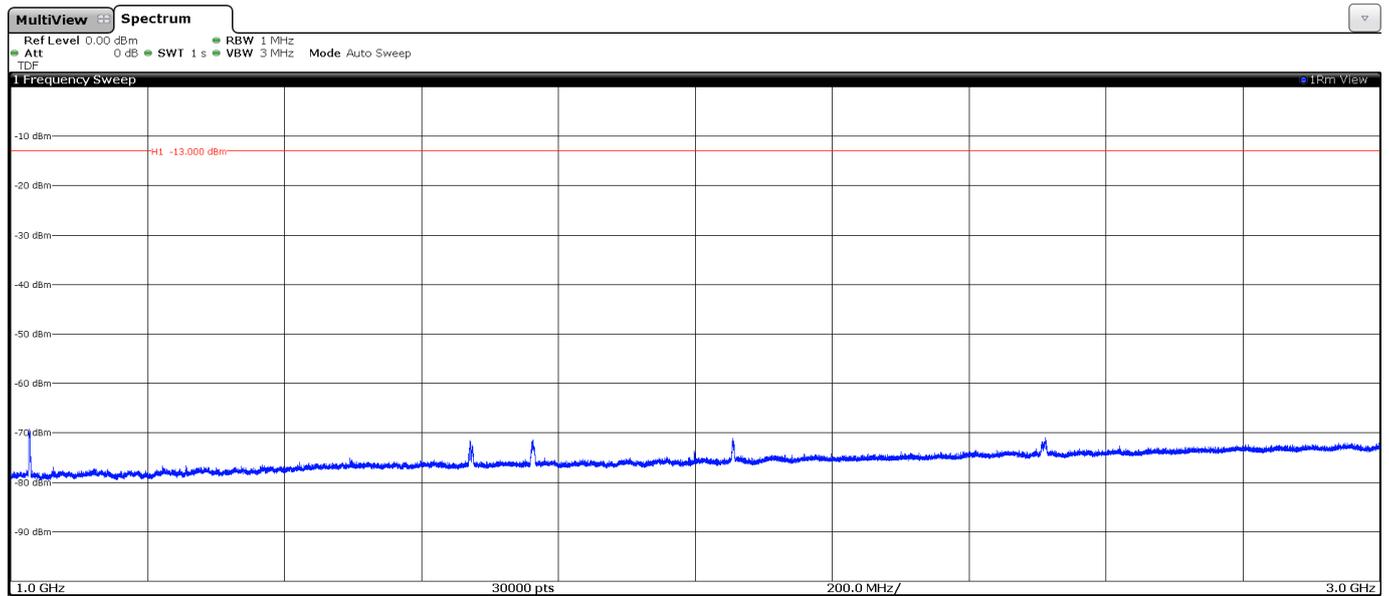
A preliminary scan determined the WCDMA BAND V - Mid channel - 836.4 MHz - BW 5 MHz QPSK modulation as the worst case.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closet to limit:

Frequency (MHz)	Mode	Polarization	E.I.R.P (dBm)
1026.767	Notebook	Horizontal	-61.98
1027.233	Tablet	Horizontal	-69.24

WORST CASE: Notebook mode

The following tables and plots show the results for this configuration: WCDMA BAND V - Middle channel - 836.4 MHz - BW 5 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: MIDDLE

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

**WCDMA MODULATION (Band V)**

CHANNEL: MIDDLE

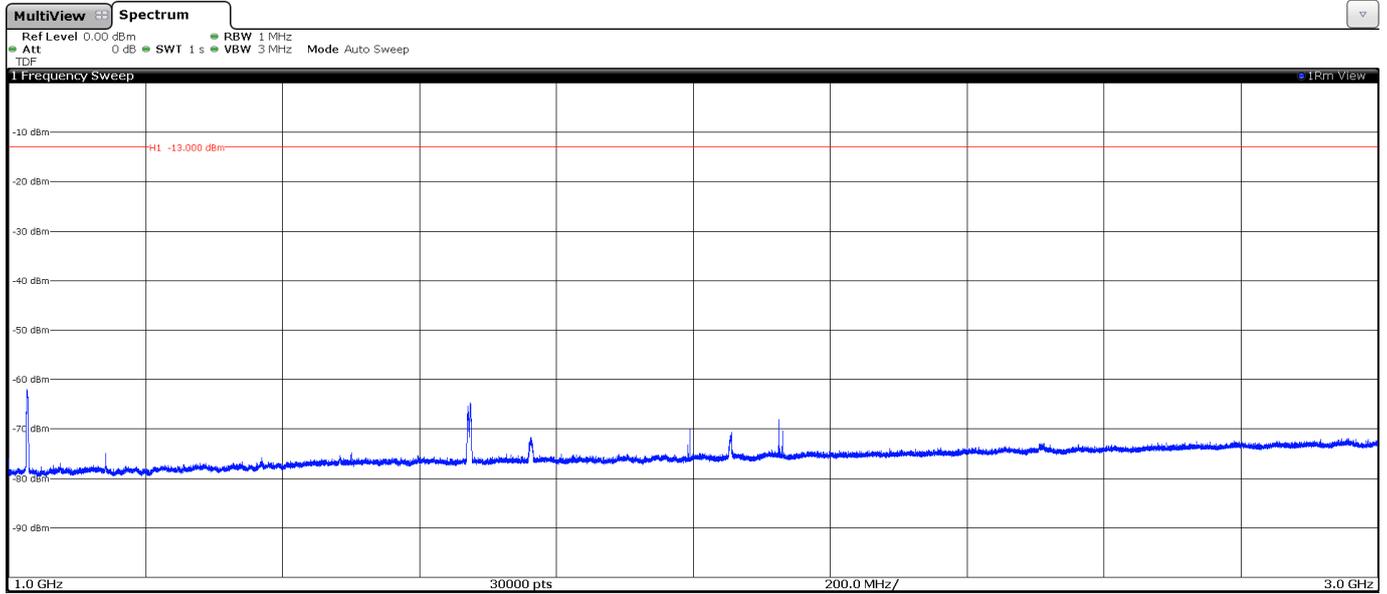


Note: The peak above the limit is the carrier frequency. The peak at 881.5MHz corresponds to the downlink signal

FREQUENCY RANGE 1 GHz to 3 GHz.

**WCDMA MODULATION (Band V)**

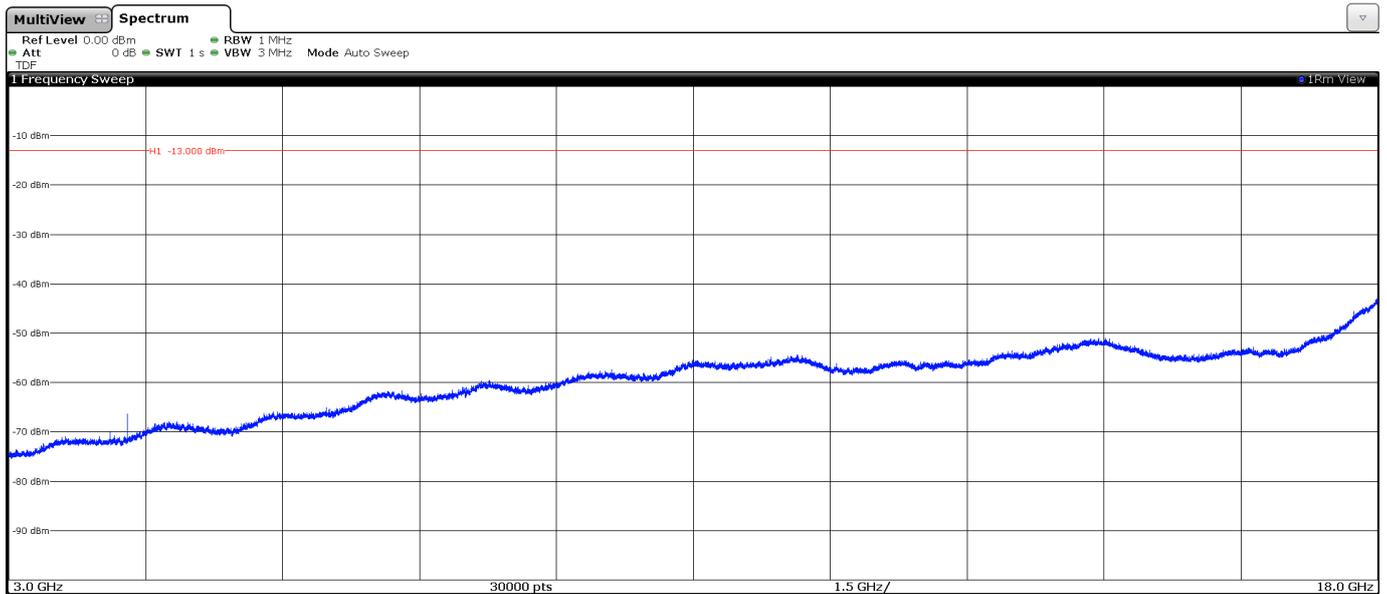
CHANNEL: MIDDLE



FREQUENCY RANGE 3 GHz to 18 GHz.

**WCDMA MODULATION (Band V)**

CHANNEL: MIDDLE



## Appendix B: Test results for FCC PART 24/ CANADA RSS-133

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TEST CONDITIONS.....	23
Radiated emissions .....	25

## TEST CONDITIONS

Power supply (V):

Vnom = 120 Vac

Vmax = N/A

Vmin = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = AC Voltage from AC/DC adapter.

Type of antenna = Internal antenna

Modes supported by the equipment:

- Notebook mode.
- Tablet mode.

TEST FREQUENCIES:

WCDMA AND HSUPA MODULATION (Band II)

Lowest channel (9262): 1852.4 MHz

Middle channel (9400): 1880.0 MHz

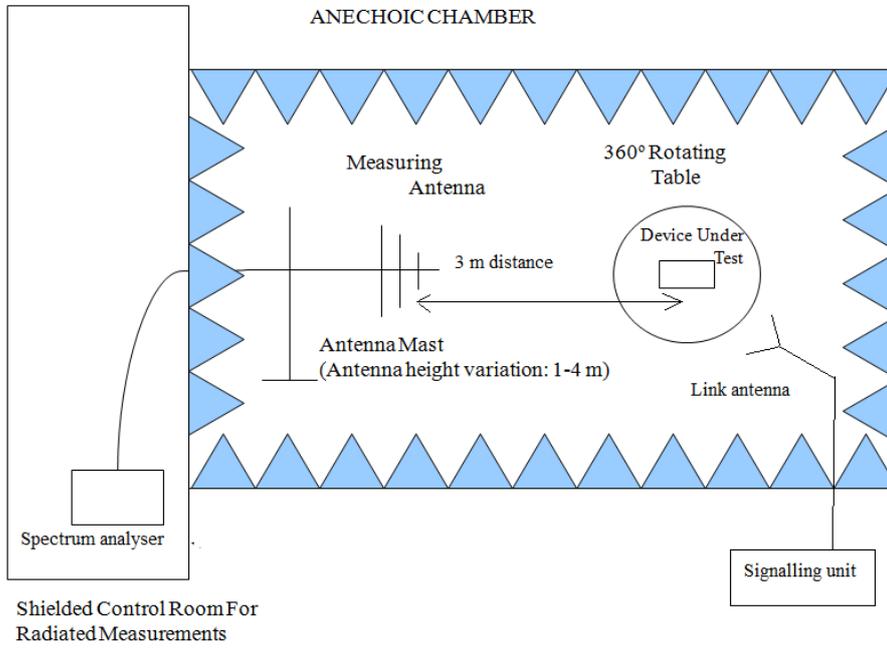
Highest channel (9538): 1907.6 MHz

LTE. QPSK AND 16QAM MODULATION (BAND 2)

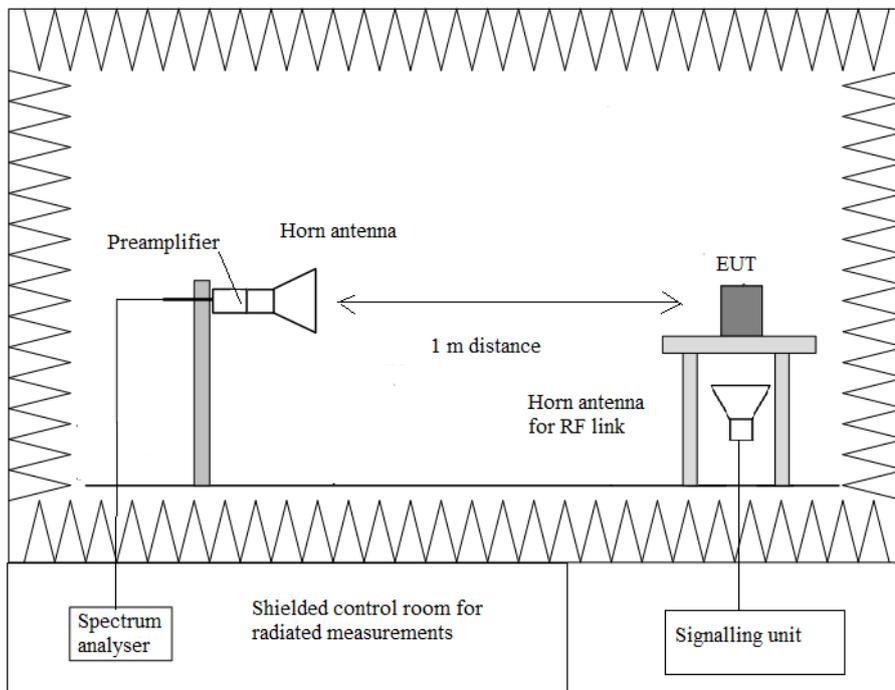
	Channel (Frequency. MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Lowest	18607 (1850.7)	18615 (1851.5)	18650 (1852.5)	18675 (1855)	18675 (1857.5)	18700 (1860)
Middle	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)	18900 (1880)
Highest	19193 (1909.3)	19185 (1908.5)	19150 (1907.5)	19150 (1905)	19125 (1902.5)	19100 (1900)

## TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



## Radiated emissions

### SPECIFICATION

FCC § 24.238

RSS-133. Clause 6.5.

### 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 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. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Each detected emission is substituted by the Substitution method, in accordance with the ANSI/TIA-603-E.

#### Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

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

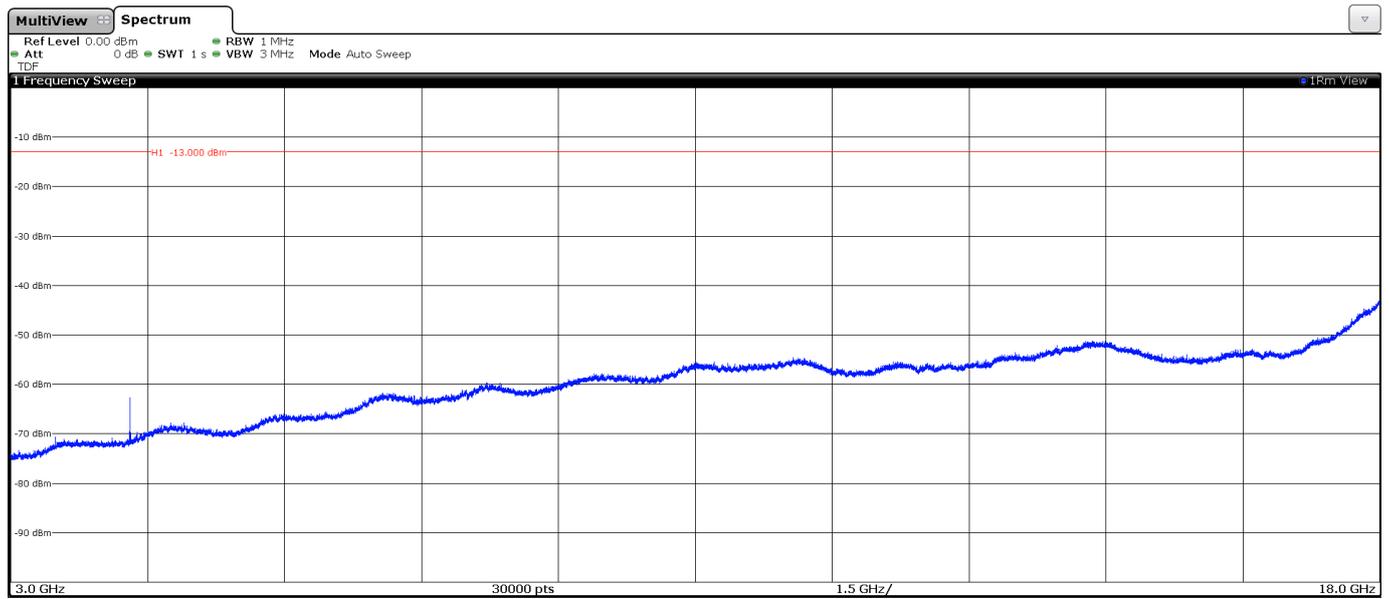
$$P_o \text{ (dBm)} - [43 + 10 \log (P_o \text{ in mwatts}) - 30] = - 13 \text{ dBm}$$

### WCDMA Band:

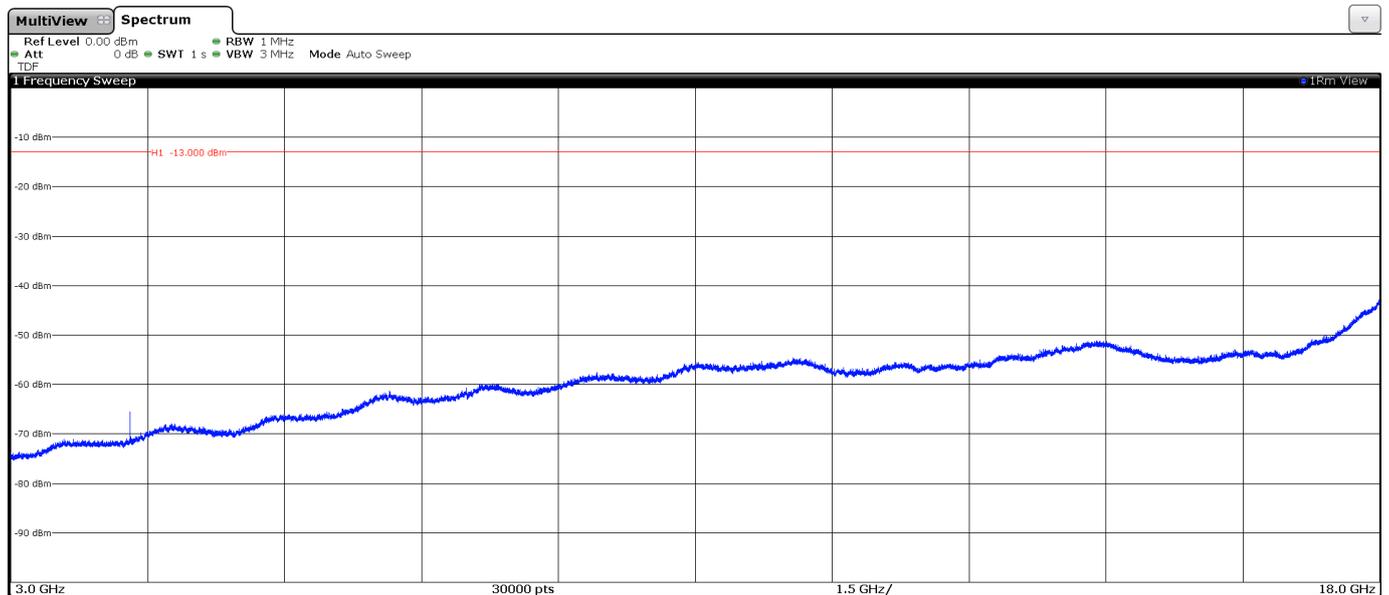
A preliminary scan determined the WCDMA BAND II – Highest channel – 1907.6 MHz - BW 5 MHz QPSK modulation as the worst case.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closet to limit:

Frequency (MHz)	Mode	Polarization	E.I.R.P (dBm)
4310.360	Notebook	Vertical	-63.30
4310.250	Tablet	Vertical	-65.52

WORST CASE: Notebook mode

The following tables and plots show the results for this configuration: WCDMA BAND II – Highest channel – 1907.6 MHz - BW 5 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: HIGHEST

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 18 GHz-26.5 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

Verdict: PASS

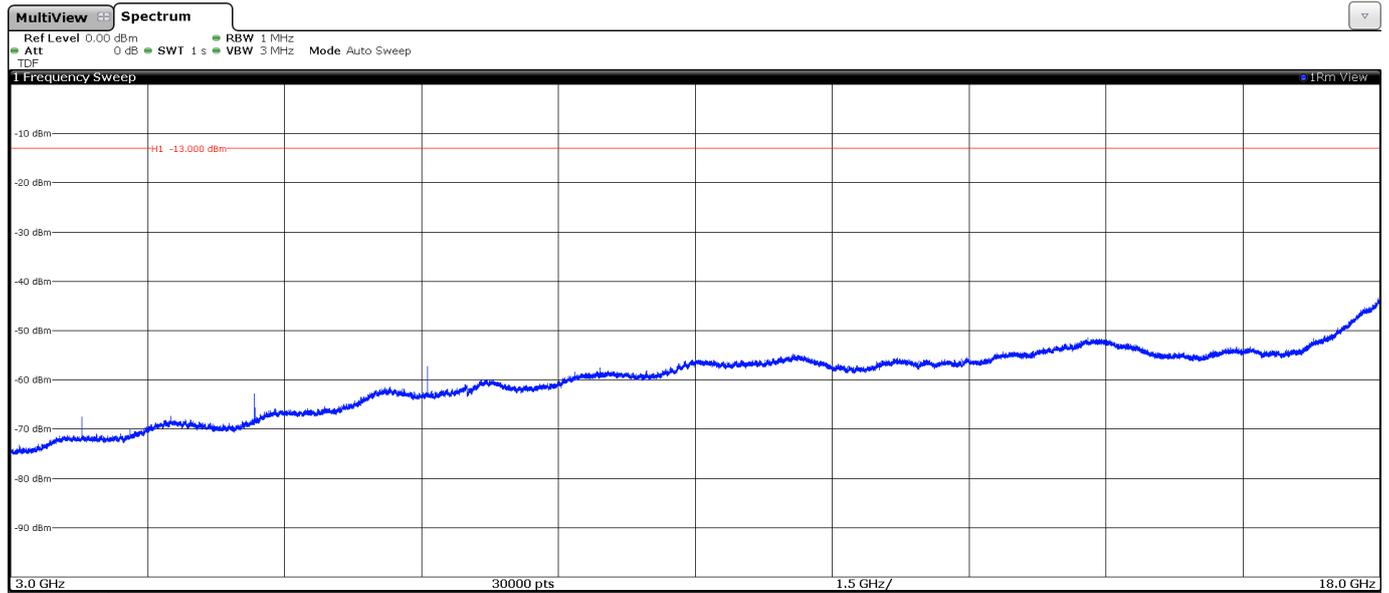
### LTE Band:

LTE Band 2 QPSK AND 16QAM MODULATION. BW = 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15MHz and 20MHz.

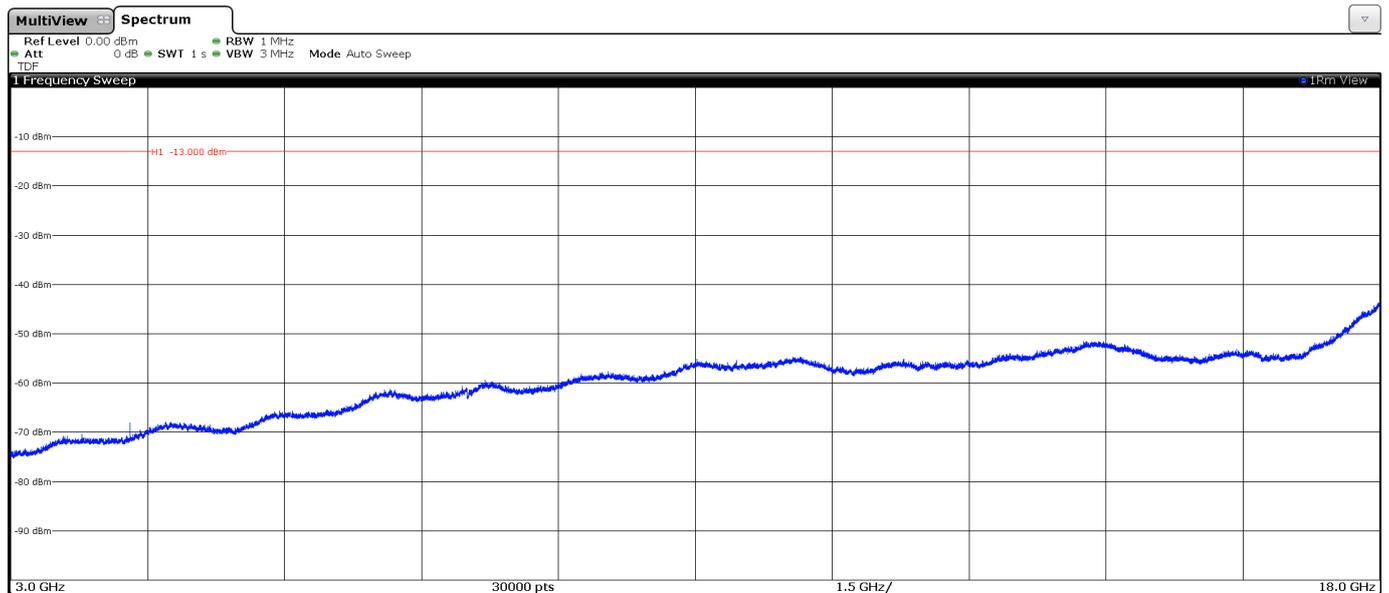
A preliminary scan determined the Highest channel 1909.3 MHz with QPSK modulation and 20 MHz bandwidth as the worst case. The configuration of Resource Blocks was used RB=1 no offset.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closets to limit:

Frequency (MHz)	Mode	Polarization	E.I.R.P (dBm)
3782.120	Notebook	Horizontal	-67.70
5673.480	Notebook	Horizontal	-63.86
7564.340	Notebook	Horizontal	-57.11
4306.360	Tablet	Horizontal	-68.16

WORST CASE: Notebook mode

The following tables and plots show the results for this configuration: LTE Band 2 - Highest channel -1909.3 MHz - BW 20 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: HIGHEST

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 18 GHz-26.5 GHz.**

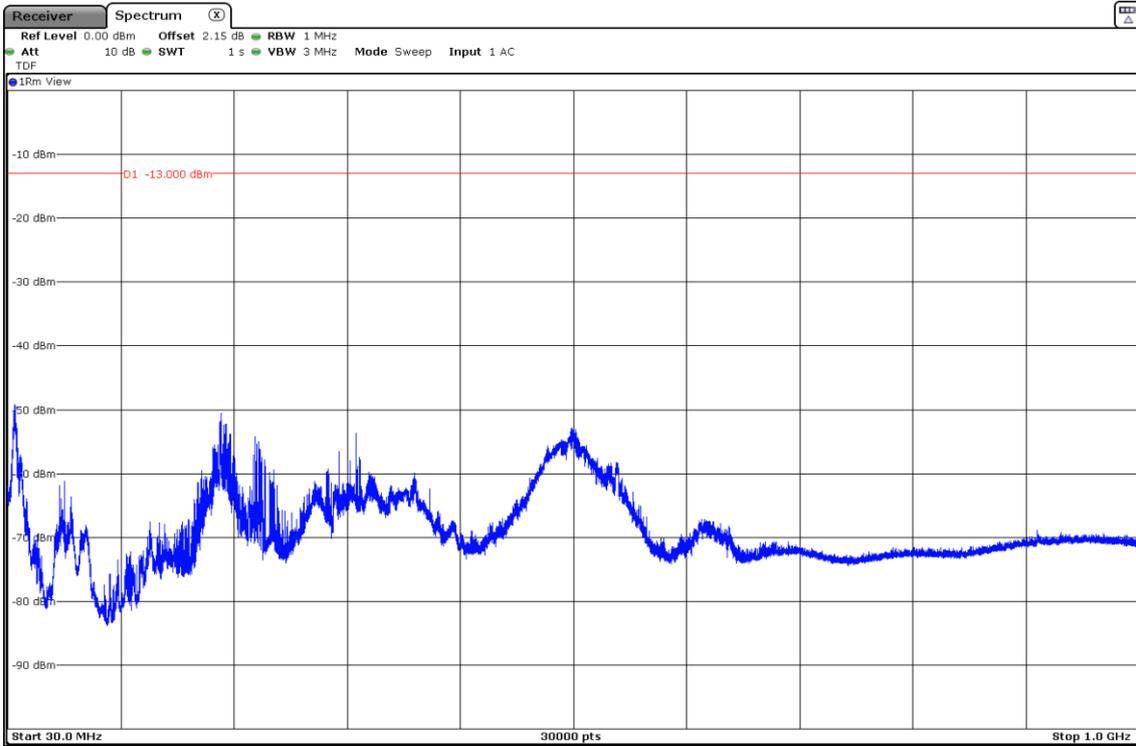
No radiated spurious signals were detected at less than 20 dB respect to the limit.

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

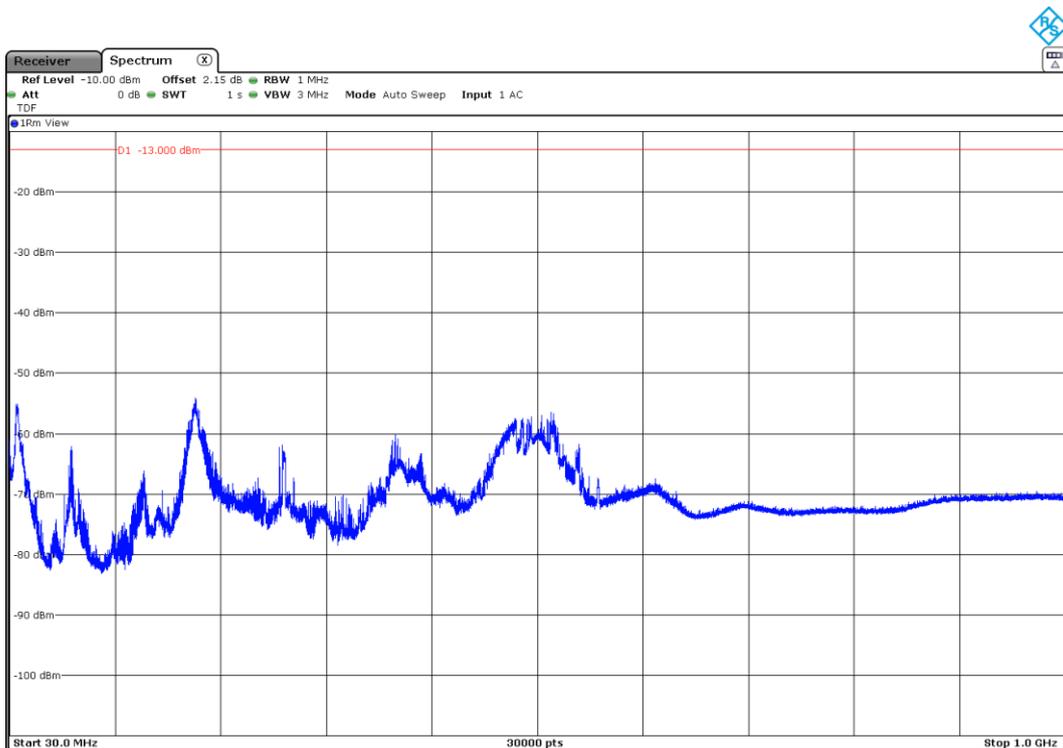
**WCDMA MODULATION (Band II)**

CHANNEL: HIGHEST



**LTE Band 2 - QPSK MODULATION. BW=20 MHz**

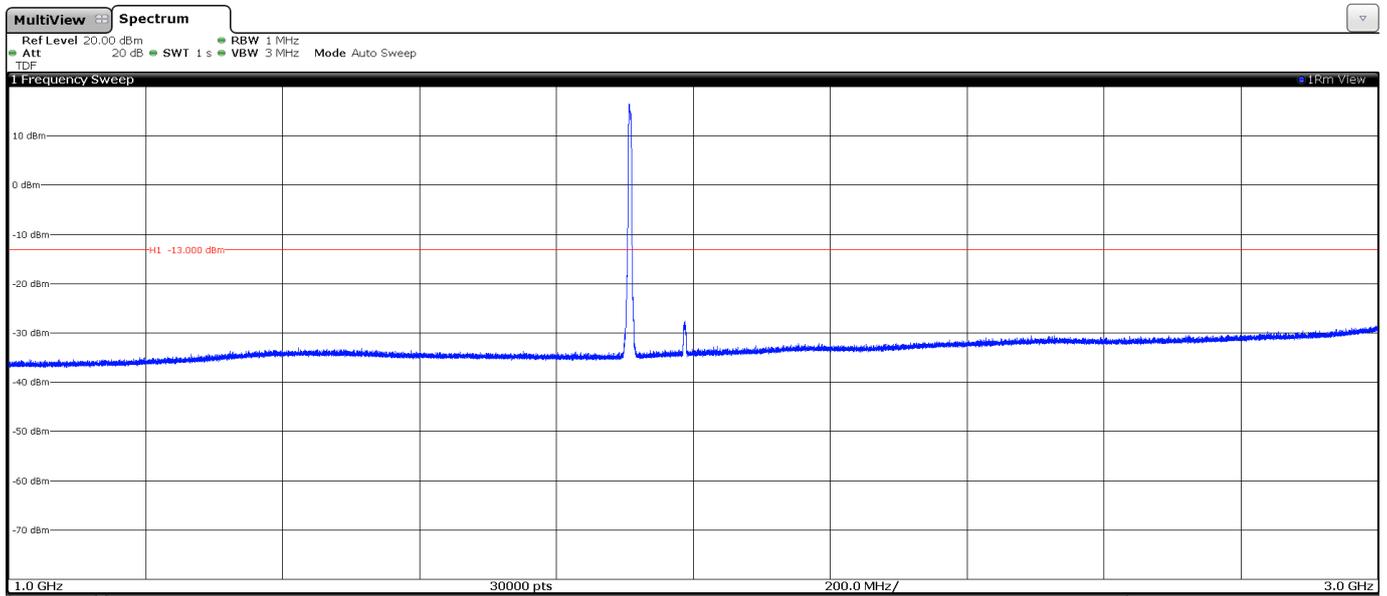
CHANNEL: HIGHEST



FREQUENCY RANGE 1 GHz to 3 GHz.

### WCDMA MODULATION (Band II)

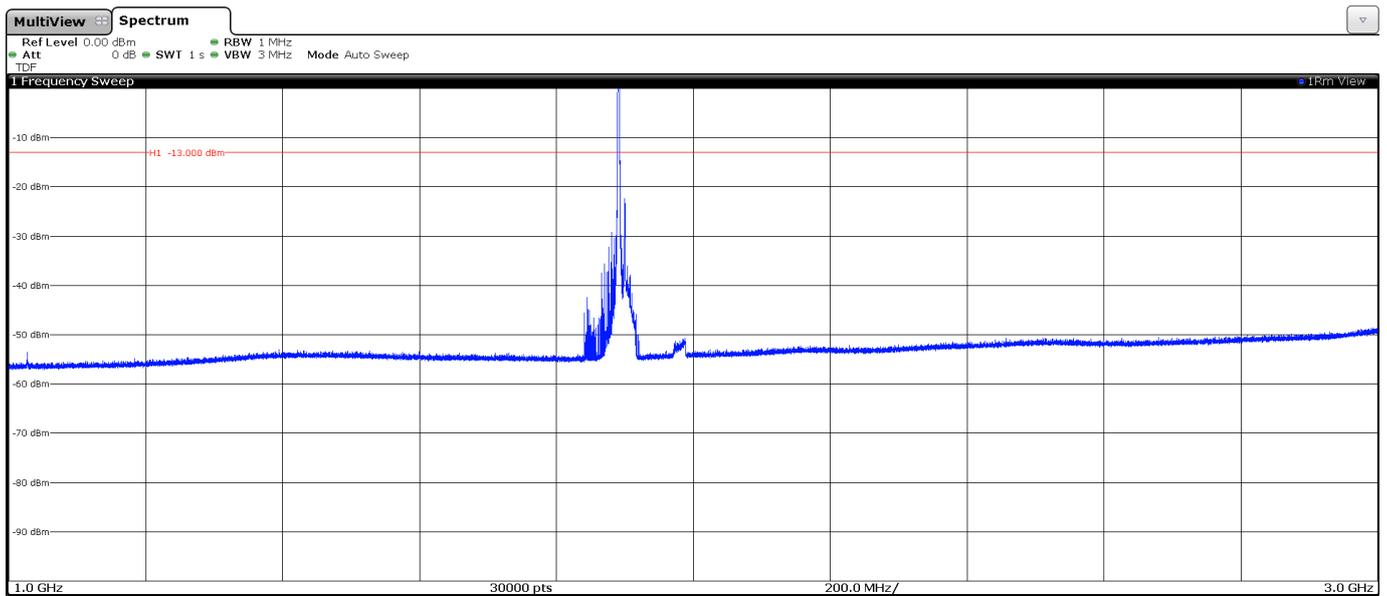
CHANNEL: HIGHEST



Note: The peak above the limit is the carrier frequency

### LTE Band 2 QPSK MODULATION. BW=20 MHz

CHANNEL: HIGHEST

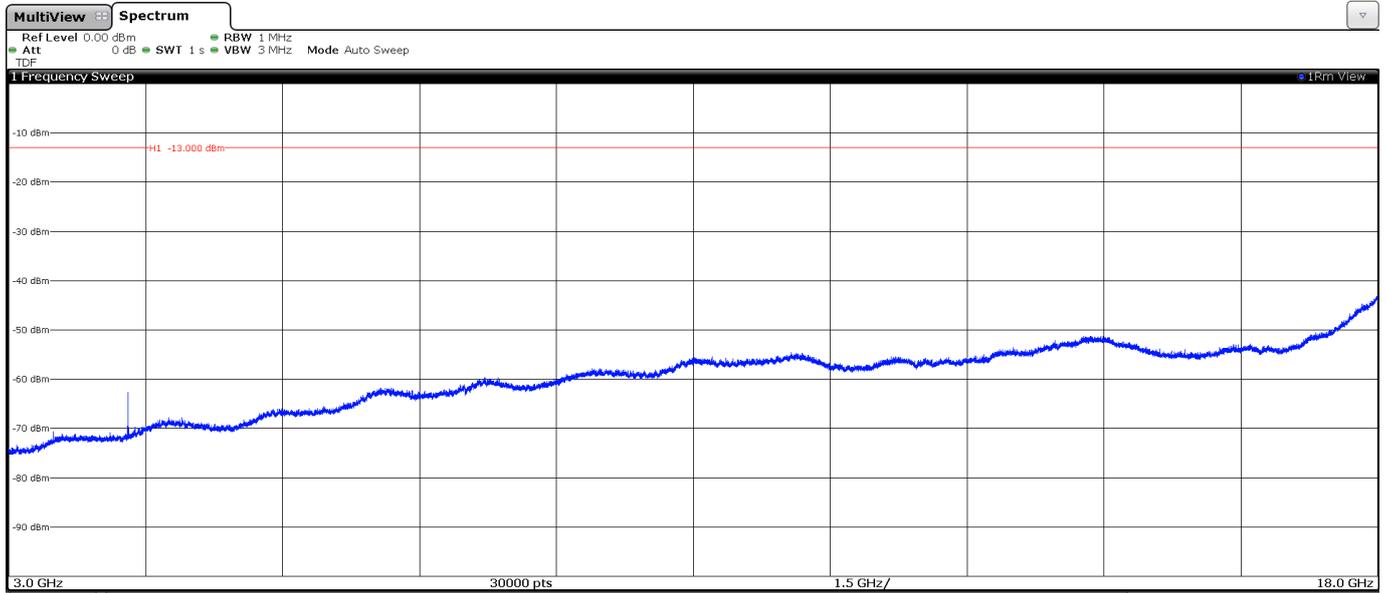


Note: The peak above the limit is the carrier frequency

FREQUENCY RANGE 3 GHz to 18 GHz.

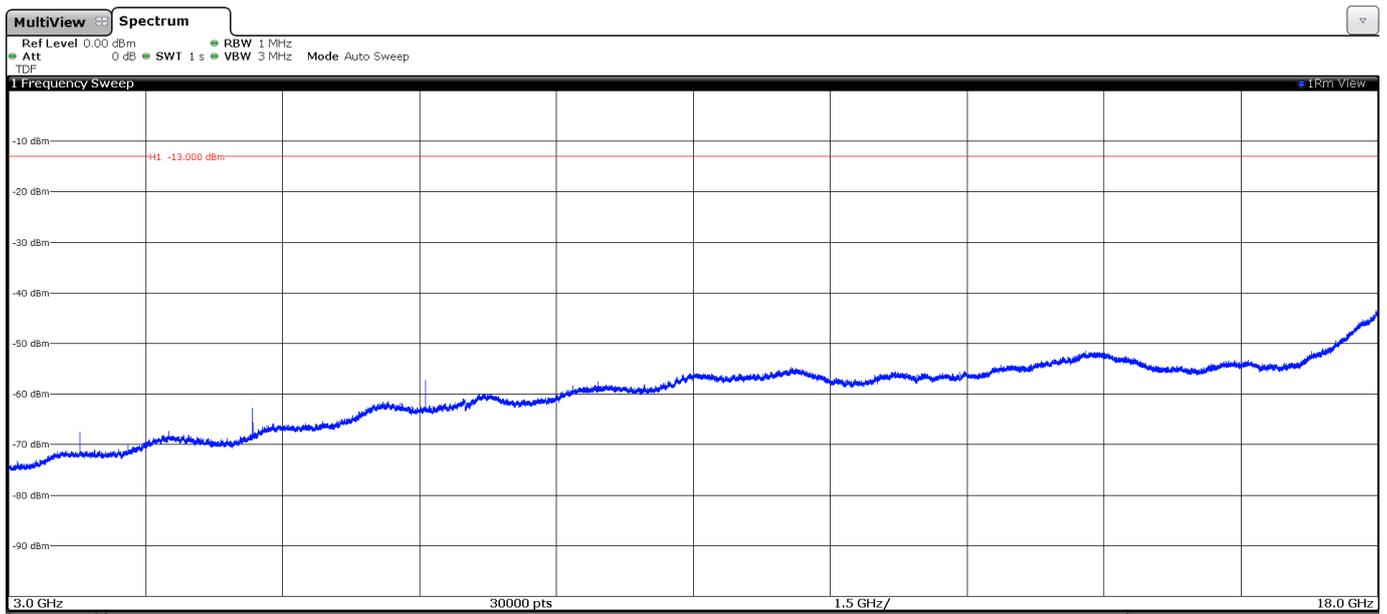
**WCDMA MODULATION (Band II)**

CHANNEL: HIGHEST



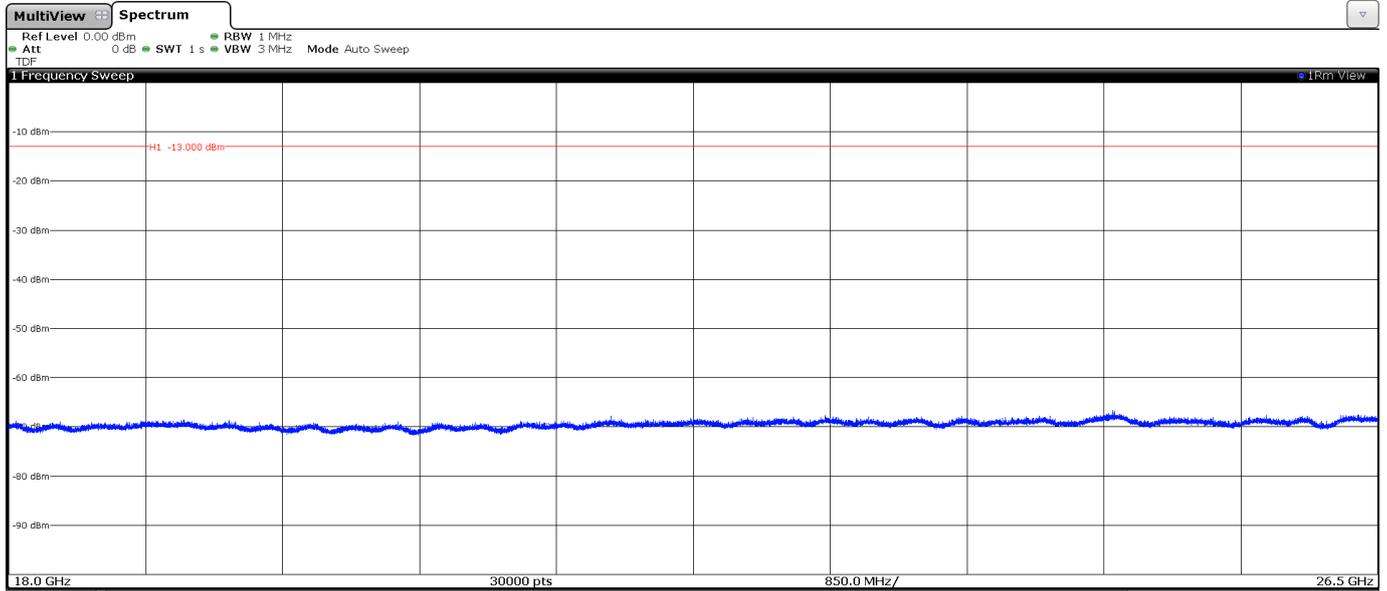
**LTE Band 2 QPSK MODULATION. BW=20 MHz**

CHANNEL: HIGHEST

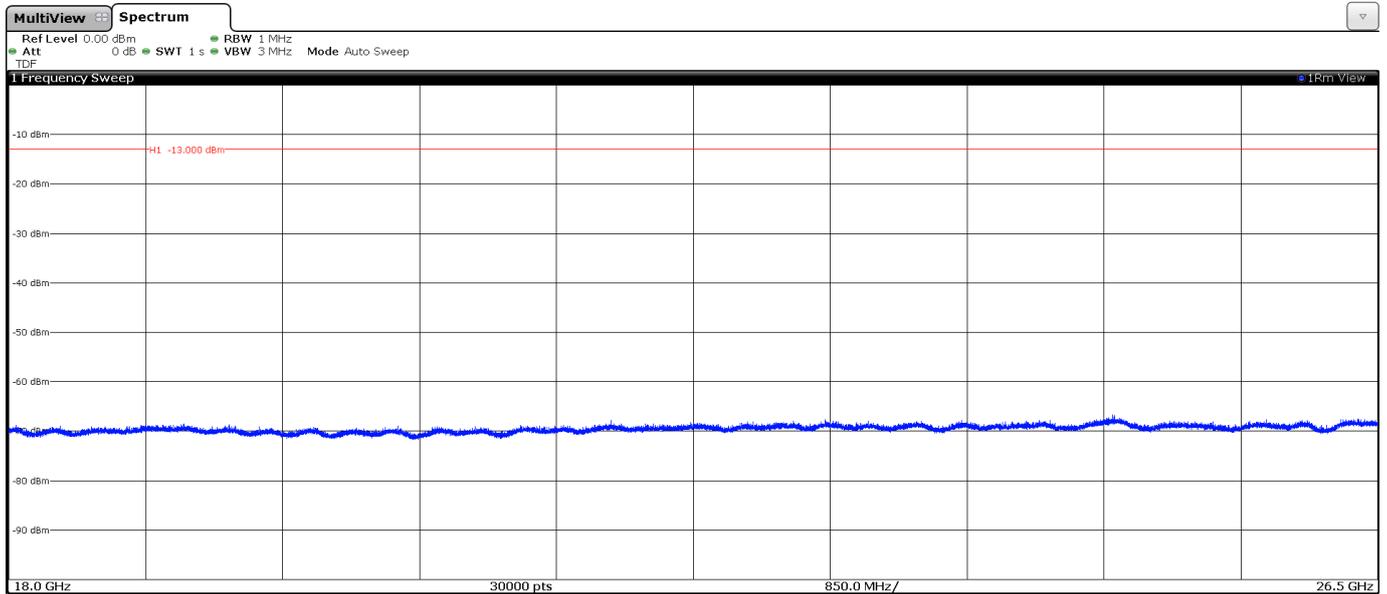


FREQUENCY RANGE 18 GHz to 26.5 GHz.

**WCDMA MODULATION (Band II)**  
**CHANNEL: HIGHEST**



**LTE Band 2 QPSK MODULATION. BW=20 MHz**  
**CHANNEL: HIGHEST**



## Appendix C: Test results for FCC PART 27/CANADA RSS-130 & RSS-139 & RSS-199

## INDEX

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Radiated emissions .....	38

## TEST CONDITIONS

Power supply (V):

Vnom = 120 Vac

Vmax = N/A

Vmin = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = AC Voltage from AC/DC adapter.

Type of antenna = Internal antenna

Modes supported by the equipment:

- Notebook mode.
- Tablet mode.

TEST FREQUENCIES:

WCDMA AND HSUPA MODULATION (Band IV)

Lowest channel (1312): 1712.4 MHz

Middle channel (1413): 1732.6 MHz

Highest channel (1513): 1752.6 MHz

LTE. QPSK AND 16QAM MODULATION (BAND 4)

	Channel (Frequency. MHz)					
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Lowest	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)
Highest	20393 (1754.3)	20385 (1753.5)	20375 (1752.5)	20350 (1750.0)	20325 (1747.5)	20300 (1745.0)

LTE. QPSK AND 16QAM MODULATION (BAND 13)

	Channel (Frequency, MHz)	
	BW = 5 MHz	BW = 10 MHz
Lowest	23205 (779.5)	N/A
Middle	23230 (782.0)	23230 (782.0)
Highest	23255 (784.5)	N/A

LTE. QPSK AND 16QAM MODULATION (BAND 17)

	Channel (Frequency, MHz)	
	BW = 5 MHz	BW = 10 MHz
Lowest	23755 (706.5)	23780 (709.0)
Middle	23790 (710.0)	23790 (710.0)
Highest	23825 (713.5)	23800 (711.0)

LTE. QPSK AND 16QAM MODULATION (BAND 41)

	Channel (Frequency, MHz)			
	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz	BW = 20 MHz
Lowest	39675 (2498.5)	39700 (2501.0)	39725 (2503.5)	39750 (2506.0)
Middle	40620 (2593.0)	40620 (2593.0)	40620 (2593.0)	40620 (2593.0)
Highest	41565 (2687.5)	41540 (2685.0)	41515 (2682.5)	41490 (2680.0)

## Radiated emissions

### SPECIFICATION

#### WCDMA BAND IV.

FCC §27.53 (h). RSS-139 Clause 6.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

#### LTE BAND 4

FCC §27.53 (h). RSS-139 Clause 6.6.

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

#### LTE BAND 13

FCC §27.53 (c) & (f).

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.

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.

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.

RSS-130 Clause 4.6.

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.

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.

The e.i.r.p. in the band 1559-1610 MHz shall not exceed  $-70$  dBW ( $-40$  dBm) /MHz for wideband signal and  $-80$  dBW ( $-50$  dBm) for discrete emission with bandwidth less than 700 Hz.

## LTE BAND 17

### FCC27.53 (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. 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 Clause 4.6.

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.

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. The e.i.r.p. in the band 1559-1610 MHz shall not exceed -70 dBW (-40 dBm) /MHz for wideband signal and -80 dBW (-50 dBm) for discrete emission with bandwidth less than 700 Hz.

## LTE BAND 41.

### FCC §27.53 (m). RSS-199 Clause 4.5.

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.

At  $P_o$  transmitting power, the specified minimum attenuation becomes  $40+10 \log(P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [40 + 10 \log(P_o \text{ in mwatts}) - 30] = -10 \text{ dBm.}$$

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  $55+10 \log(P_o)$ , and the level in dBm relative  $P_o$  becomes:

$$P_o \text{ (dBm)} - [55 + 10 \log(P_o \text{ in mwatts}) - 30] = -25 \text{ dBm.}$$

## 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.

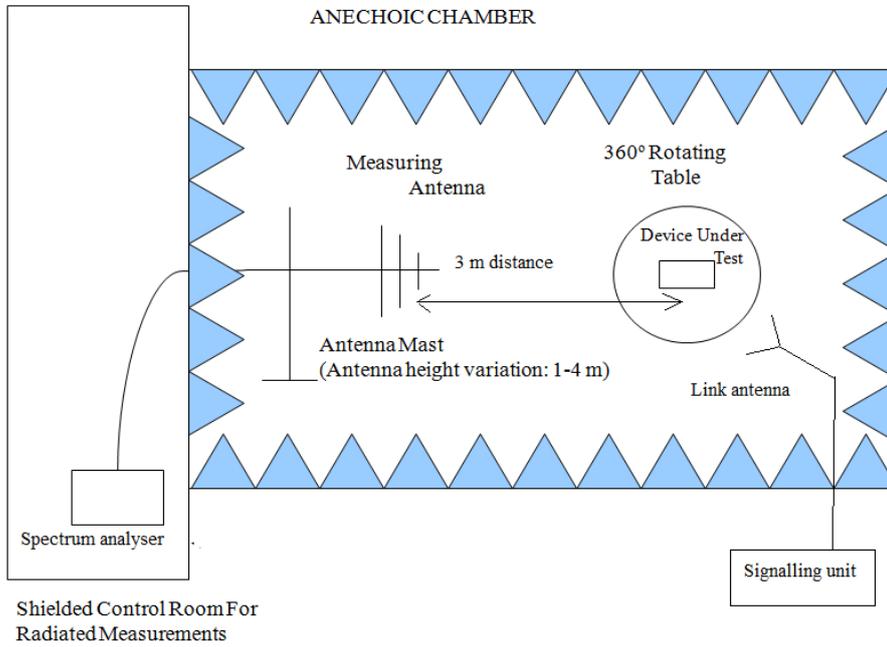
The EUT was placed on a non-conductive stand at a 3 meter distance from the measuring antenna for measurements below 1 GHz and at 1 m distance for measurements above 1 GHz.

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.

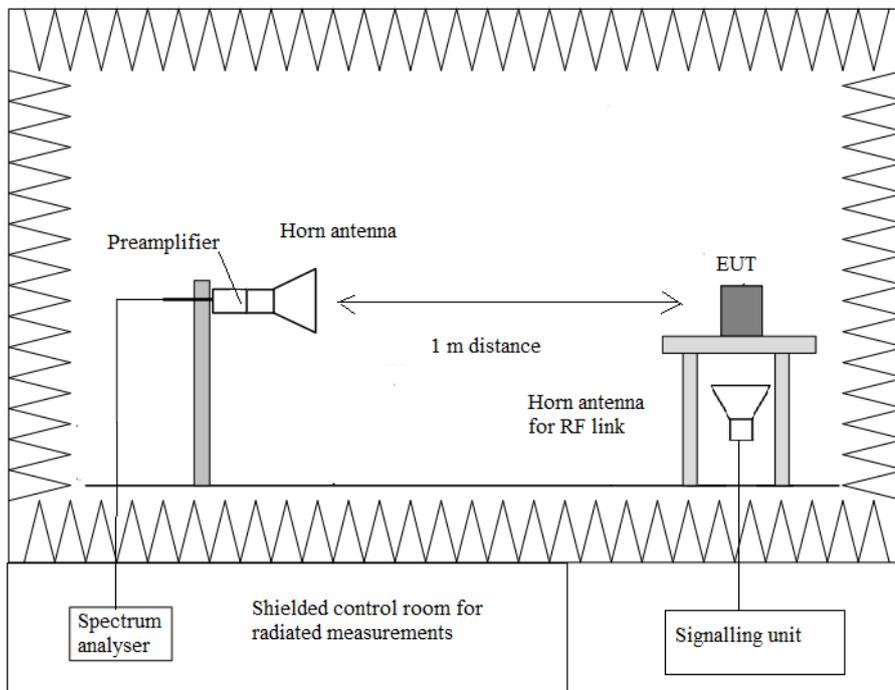
Each detected emission at less than 20 dB respect to the limit is substituted by the Substitution method in accordance with the ANSI/TIA-603-E.

**TEST SETUP**

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



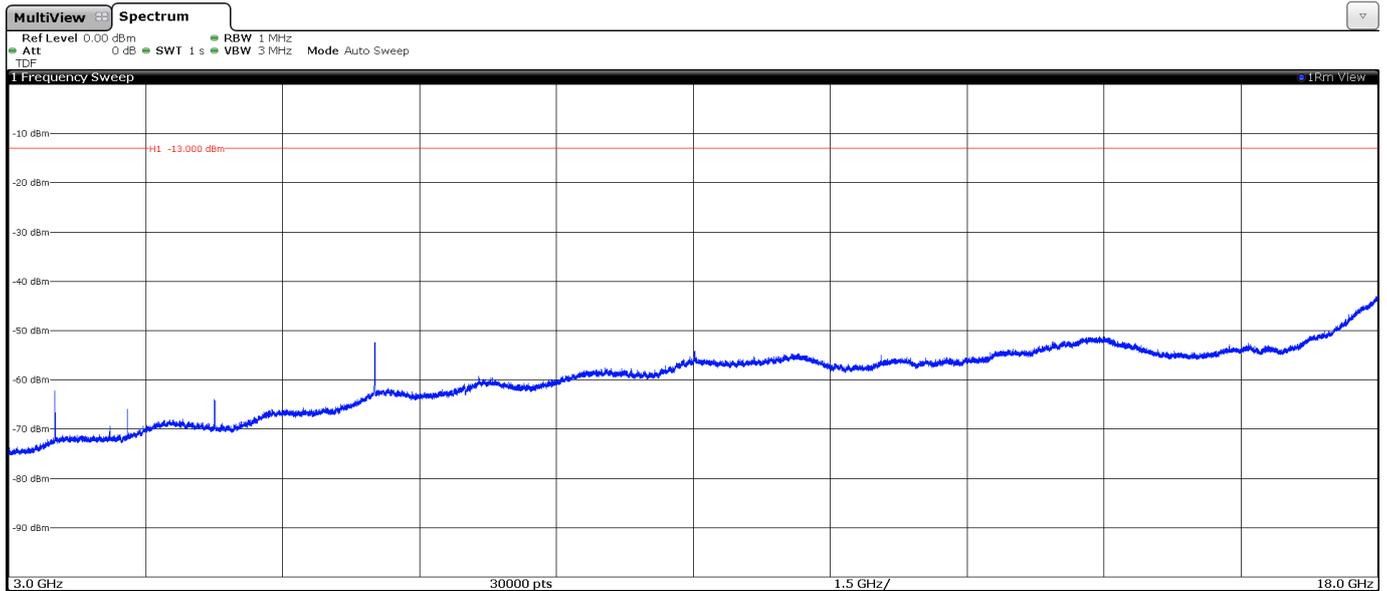
## RESULTS

### WCDMA Band:

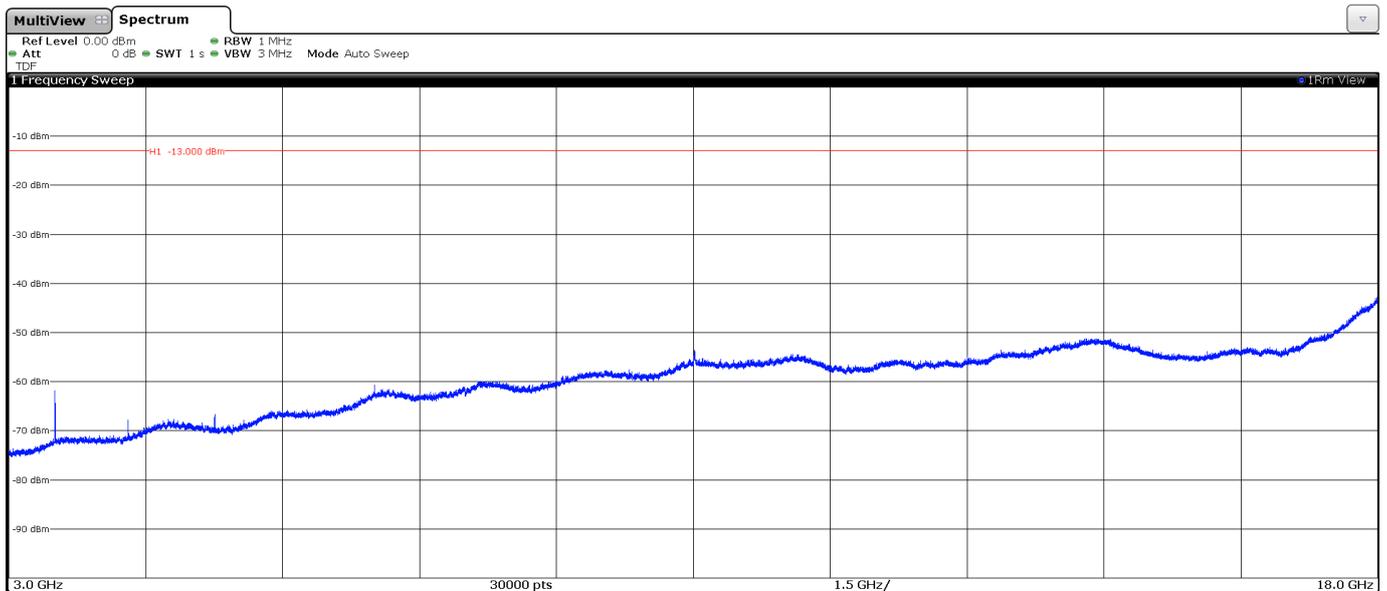
A preliminary scan determined the WCDMA BAND IV – Highest channel – 1752.6 MHz - BW 5 MHz QPSK modulation as the worst case.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closets to limit:

Frequency (MHz)	Mode	Polarization	E.I.R.P (dBm)
3503.750	Notebook	Vertical	-62.32
7010.750	Notebook	Vertical	-52.37
3506.750	Tablet	Horizontal	-61.81

WORST CASE: Notebook mode

The following tables and plots show the results for this configuration: WCDMA BAND IV– Highest channel – 1752.6 MHz - BW 5 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: HIGHEST

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 18 GHz-26.5 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

Verdict: PASS

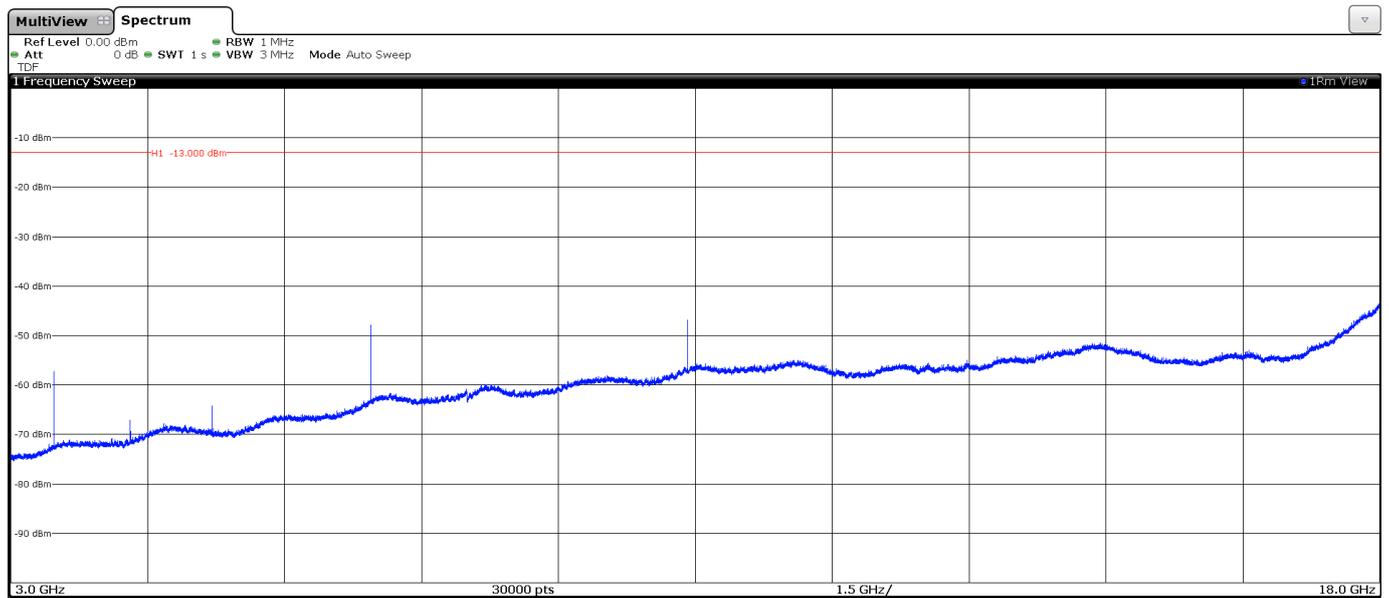
### LTE Band:

LTE QPSK AND 16QAM MODULATION. Band 4. BW = 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz.

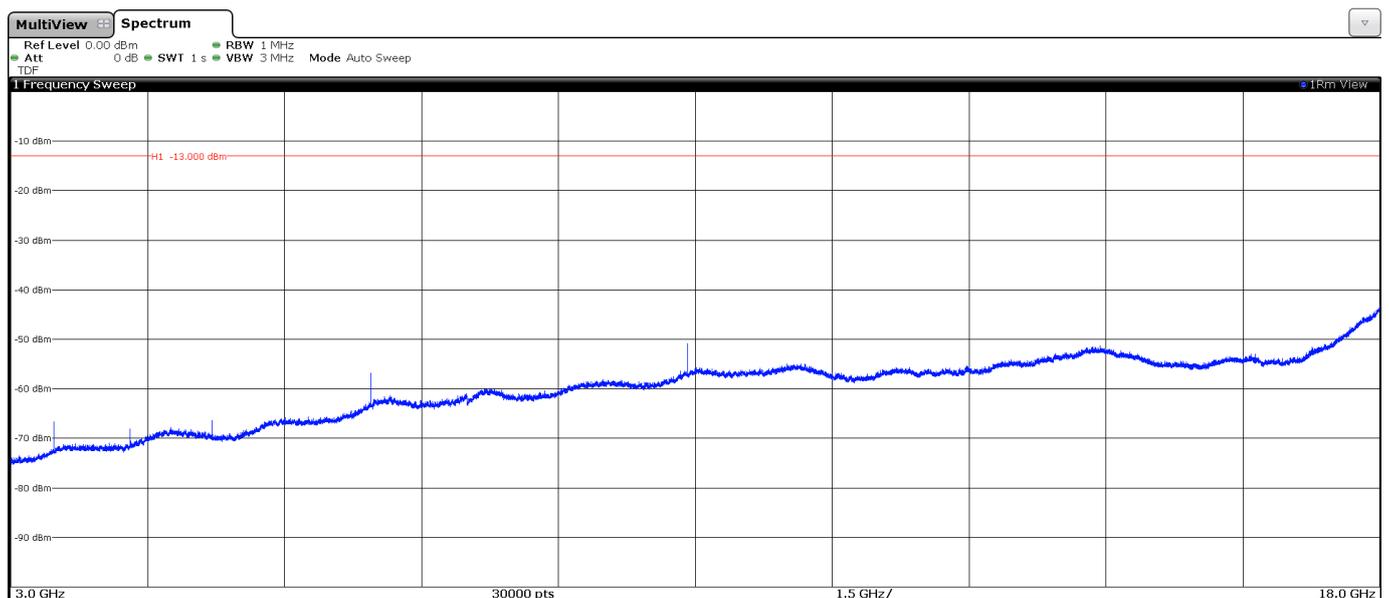
A preliminary scan determined the Highest channel 1745MHz with QPSK modulation and 20 MHz bandwidth as the worst case. The configuration of Resource Blocks was used RB=1 no offset.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closets to limit:

Frequency (MHz)	Mode	Polarization	E.I.R.P (dBm)
3472.250	Notebook	Vertical	-58.22
5208.500	Notebook	Vertical	-62.31
6944.750	Notebook	Vertical	-47.23
10416.250	Notebook	Vertical	-46.75
3472.250	Tablet	Horizontal	-66.72
5208.600	Tablet	Horizontal	-67.51
6944.750	Tablet	Horizontal	-56.81
10416.250	Tablet	Horizontal	-50.82

WORST CASE: Notebook mode

The following tables and plots show the results for this configuration: LTE Band 4 - Highest channel -1745 MHz - BW 20 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: HIGHEST

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

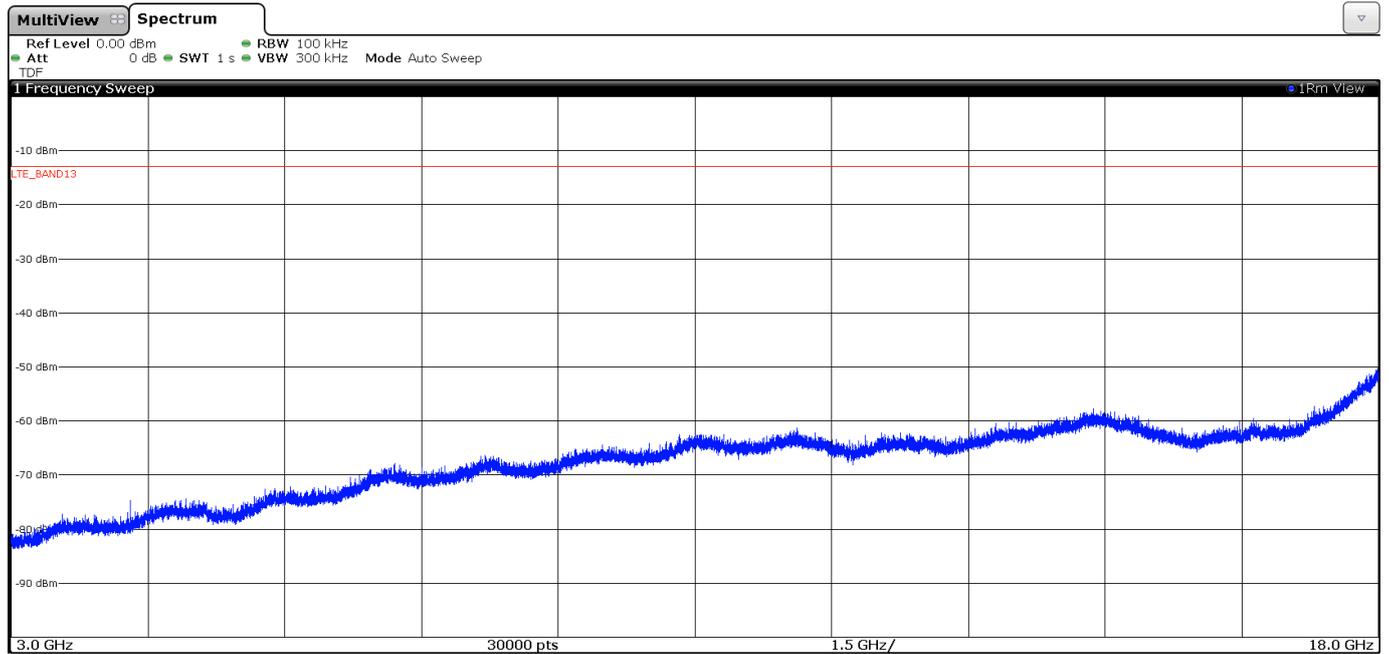
No radiated spurious signals were detected at less than 20 dB respect to the limit.

LTE QPSK AND 16QAM MODULATION. Band 13. BW = 5 MHz. and 10 MHz.

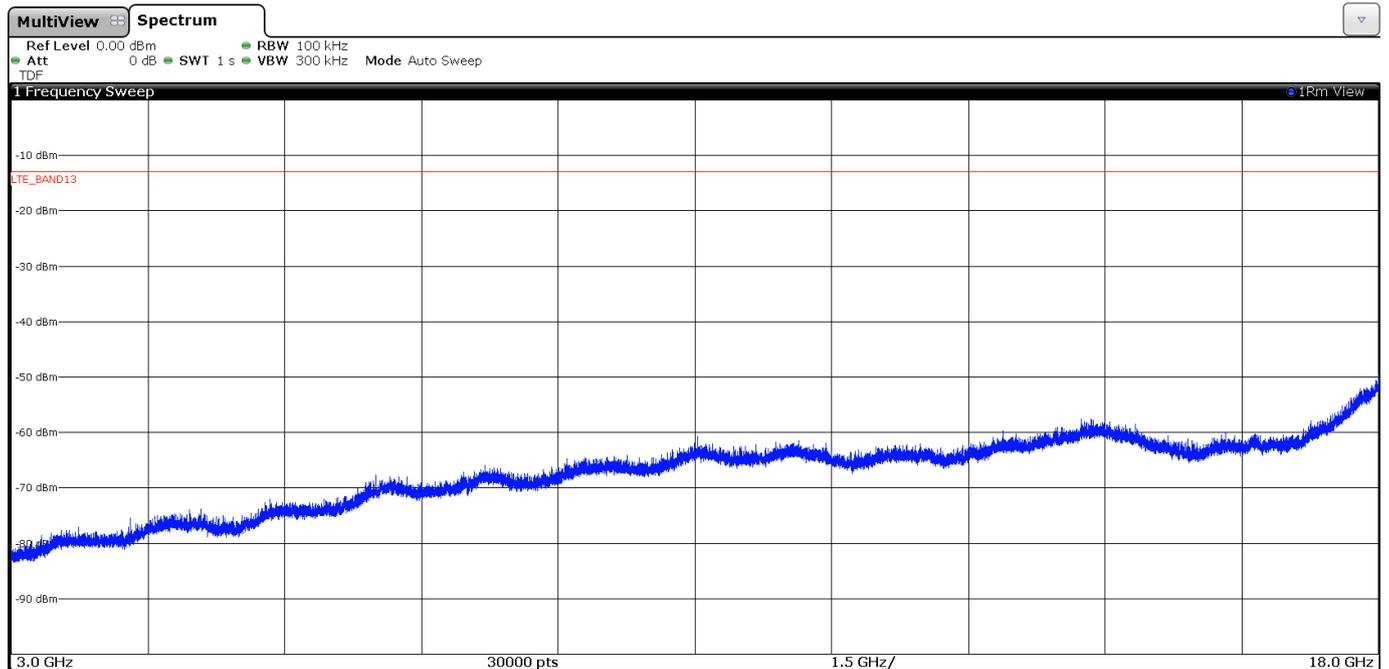
A preliminary scan determined the Middle channel 782 MHz with QPSK modulation and 10 MHz bandwidth as the worst case. The configuration of Resource Blocks was used RB=1 no offset.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closets to limit:

No relevant spurious were detected.

WORST CASE: Similar results for both modes. Results will be presented for Notebook mode.

The following tables and plots show the results for this configuration: LTE Band 13 – Middle channel -782 MHz - BW 10 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: MIDDLE

**Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

**Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

**Frequency range 3 GHz-18 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

**Frequency range 1559 MHz-1610 MHz.**

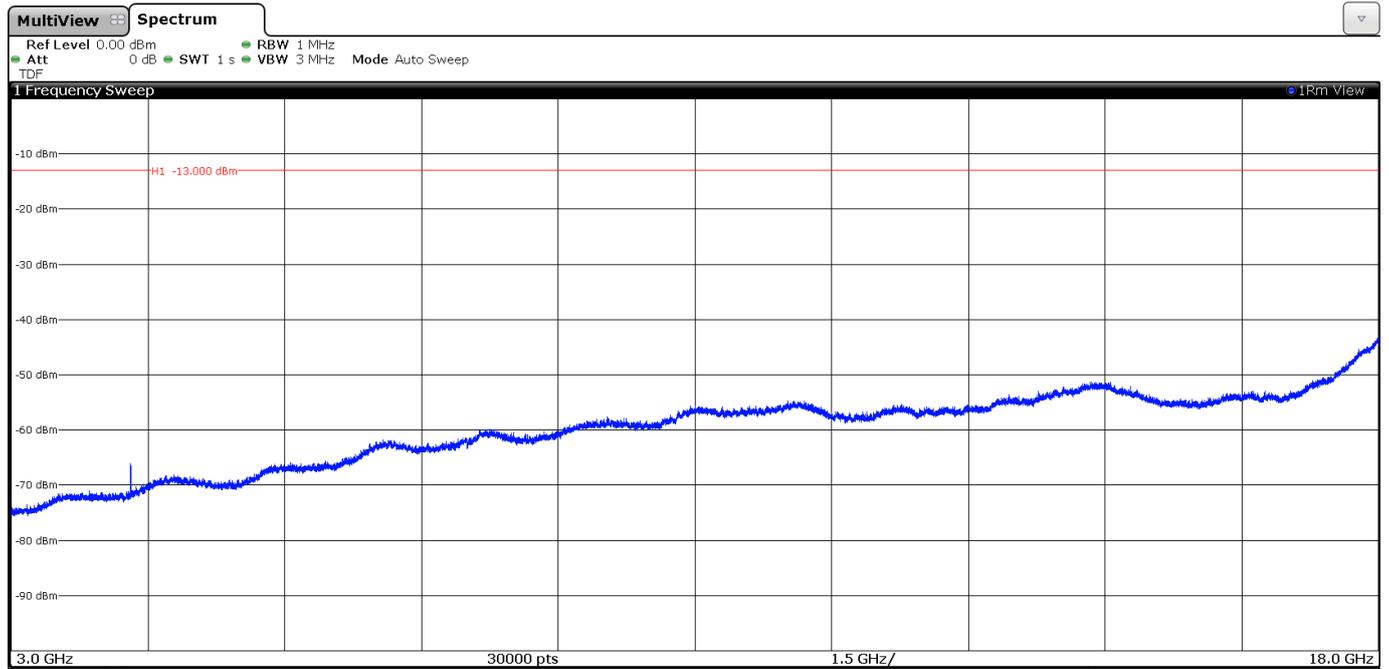
No radiated spurious signals were detected at less than 20 dB respect to the limit.

LTE QPSK AND 16QAM MODULATION. Band 17. BW = 5 MHz and 10MHz.

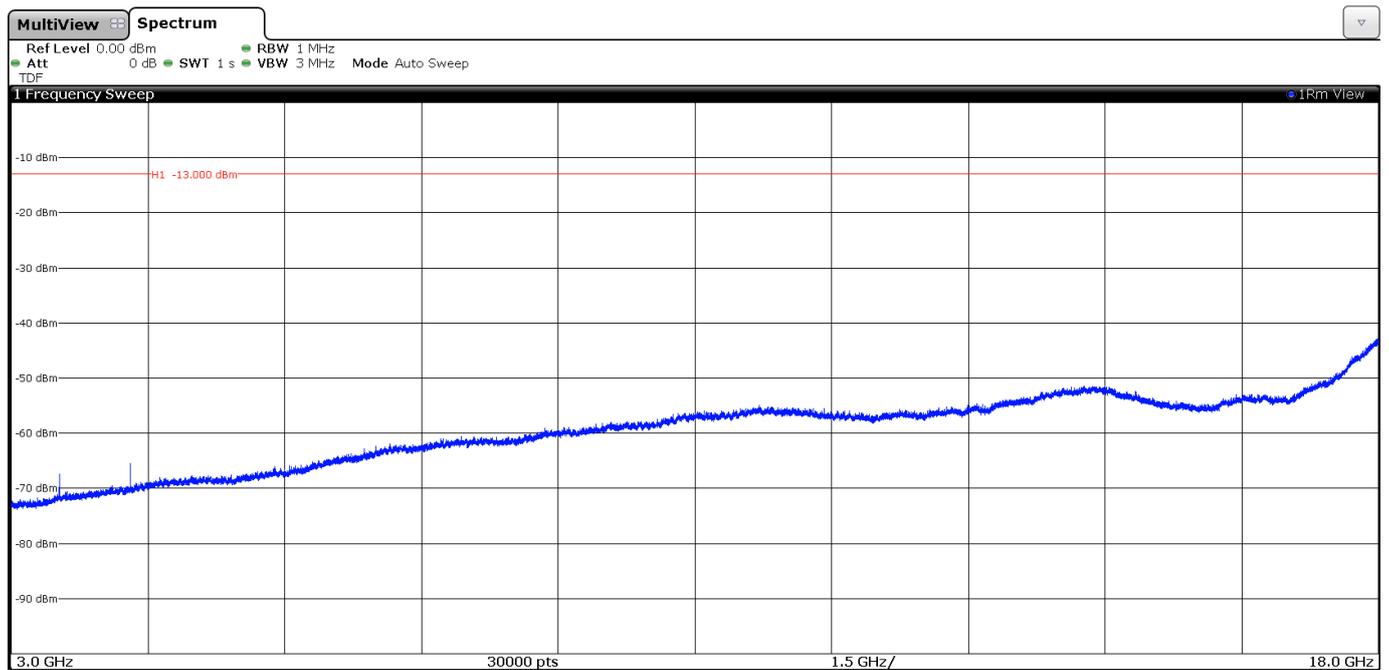
A preliminary scan determined the Middle channel 710MHz with QPSK modulation and 10 MHz bandwidth as the worst case. The configuration of Resource Blocks was used RB=1 no offset.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closets to limit:

No relevant spurious were detected.

WORST CASE: Similar results for both modes. Results will be presented for Notebook mode.

#### 1. CHANNEL: HIGHEST

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

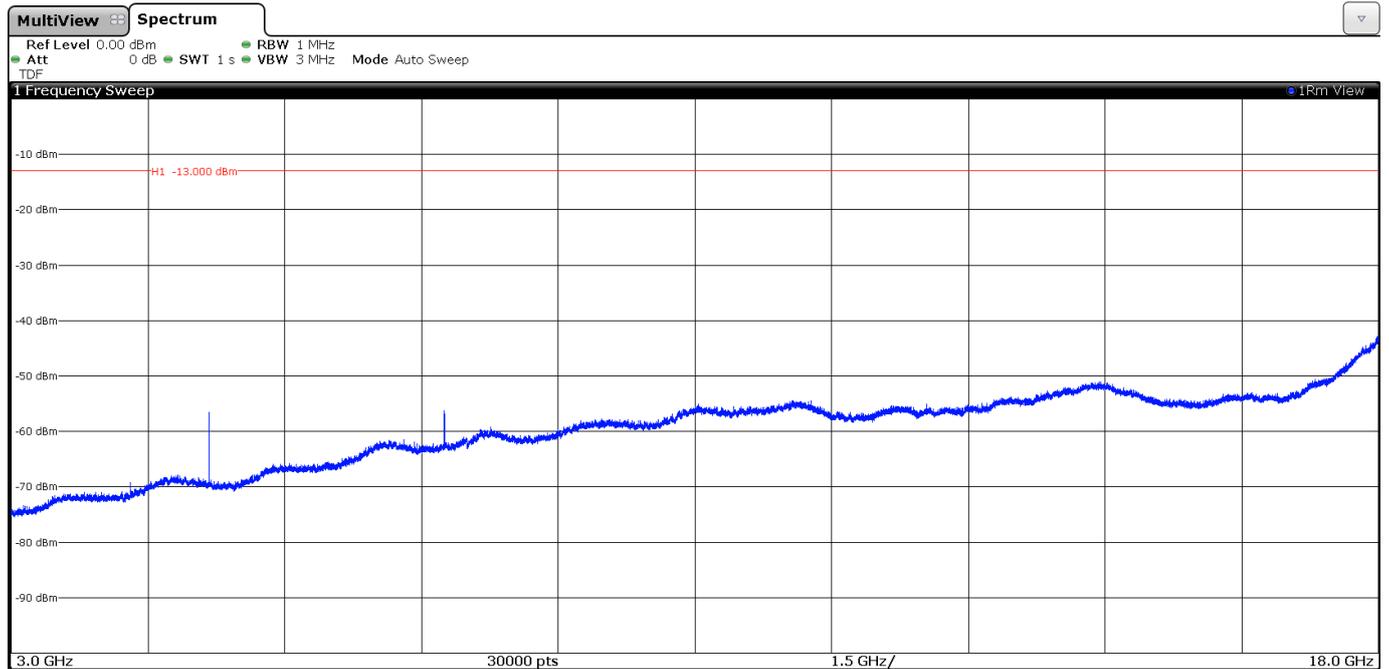
No radiated spurious signals were detected at less than 20 dB respect to the limit.

LTE QPSK AND 16QAM MODULATION. Band 41. BW = 5 MHz, 10MHz, 15MHz and 20 MHz.

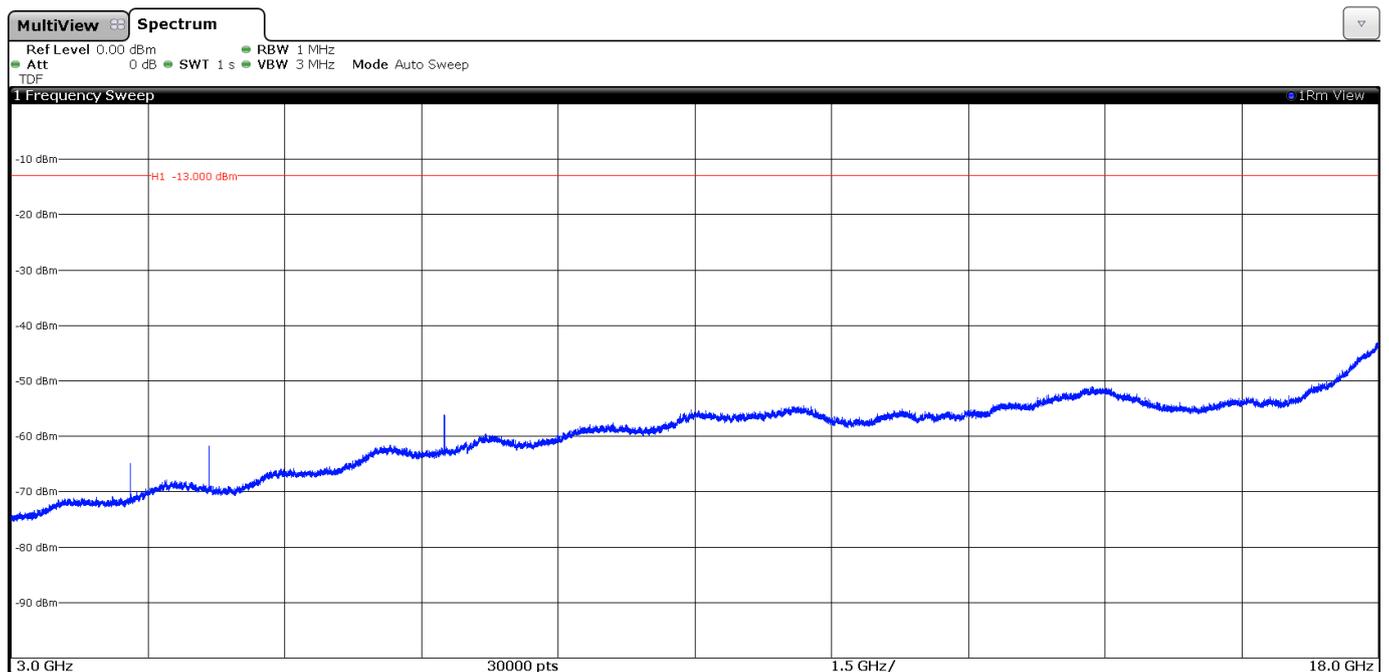
A preliminary scan determined the Highest channel 2593MHz with QPSK modulation and 20 MHz bandwidth as the worst case. The configuration of Resource Blocks was used RB=1 no offset.

### Preliminary scan to detect worst-case mode:

### Notebook mode



### Tablet mode



Spurious emissions closets to limit:

Frequency (MHz)	Mode	Polarization	E.I.R.P (dBm)
5168.250	Notebook	Horizontal	-56.59
7752.250	Notebook	Horizontal	-56.32
4310.250	Tablet	Vertical	-64.95
5168.250	Tablet	Vertical	-61.75
7752.250	Tablet	Vertical	-56.99

WORST CASE: Notebook mode

The following tables and plots show the results for this configuration: LTE Band 41 - Highest channel -2593 MHz - BW 20 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: HIGHEST

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

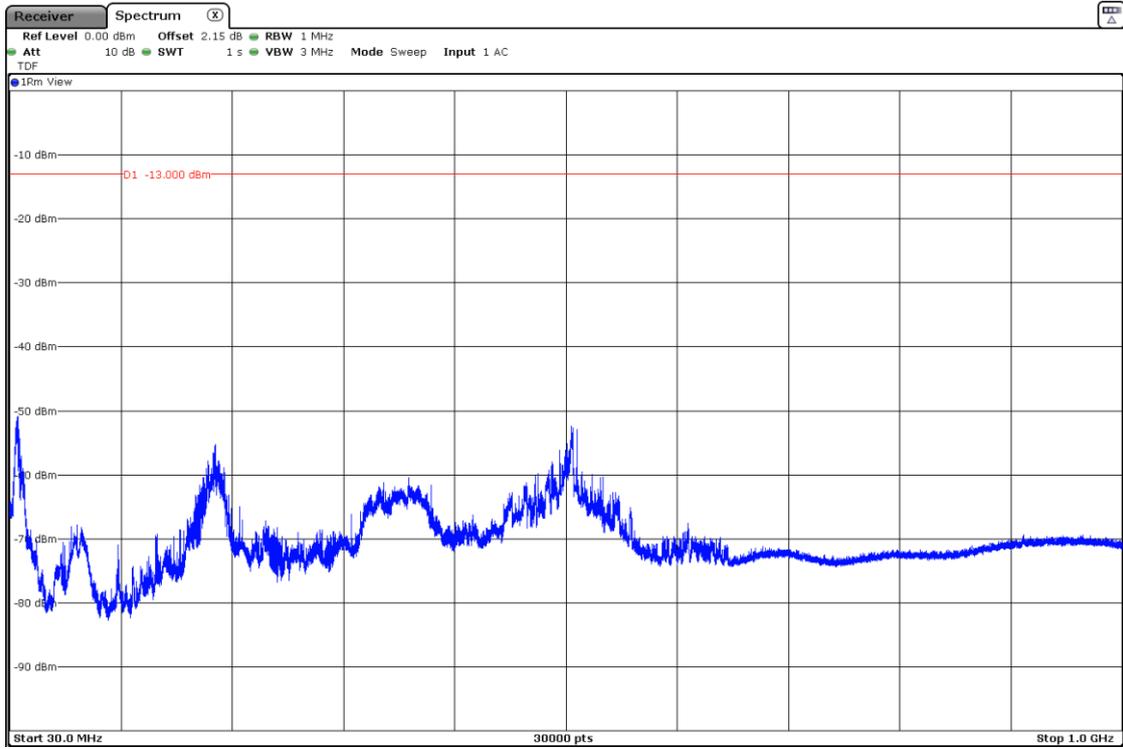
##### **Frequency range 18 GHz-26.5 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

FREQUENCY RANGE 30 MHz-1000 MHz.

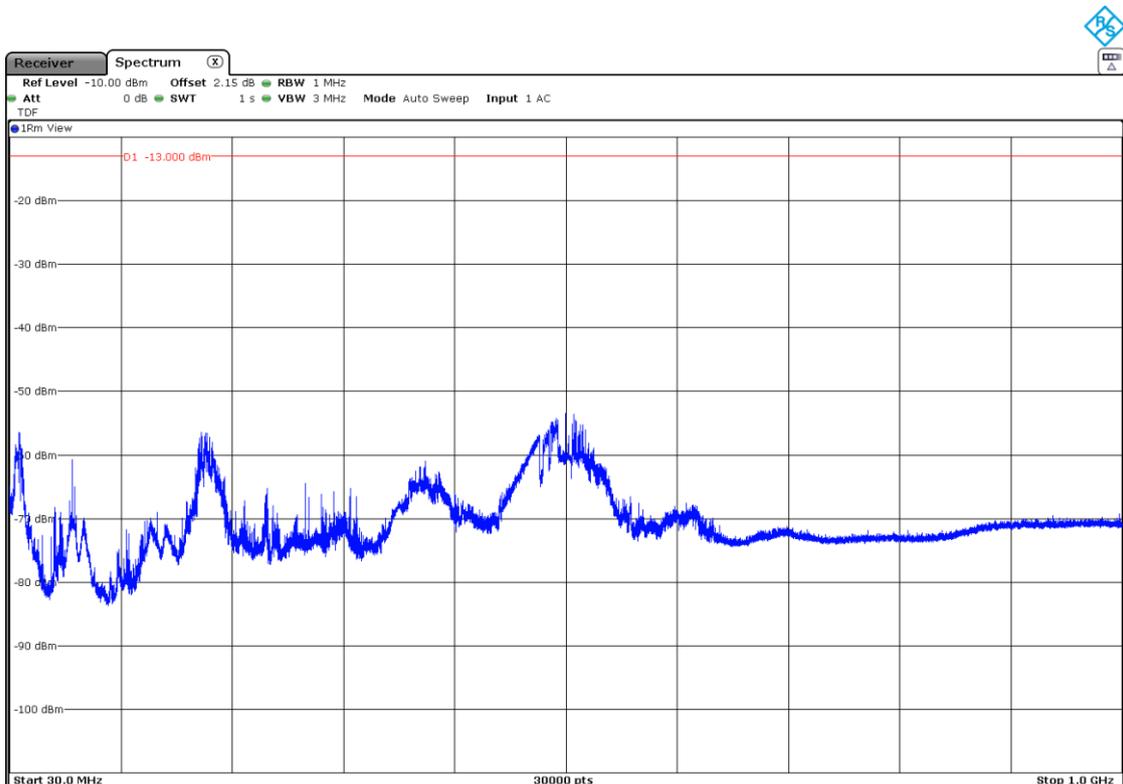
WCDMA MODULATION (Band IV)

CHANNEL: HIGHEST



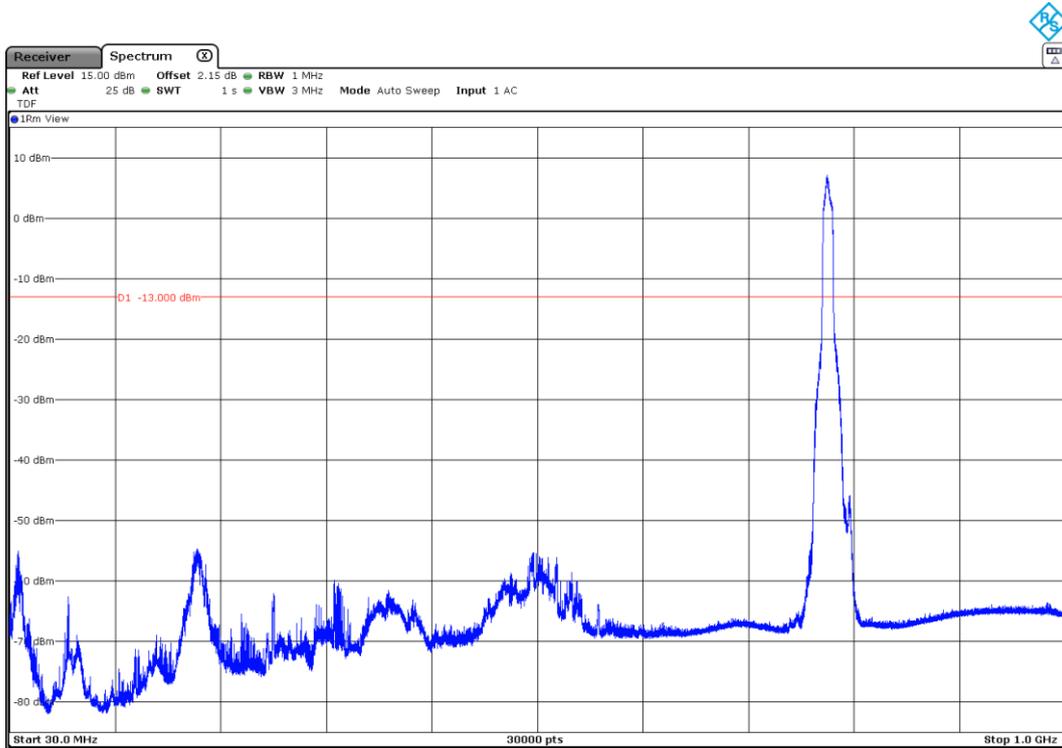
LTE Band 4 QPSK MODULATION. BW=20 MHz

CHANNEL: HIGHEST



### LTE Band 13 QPSK MODULATION. BW=10 MHz

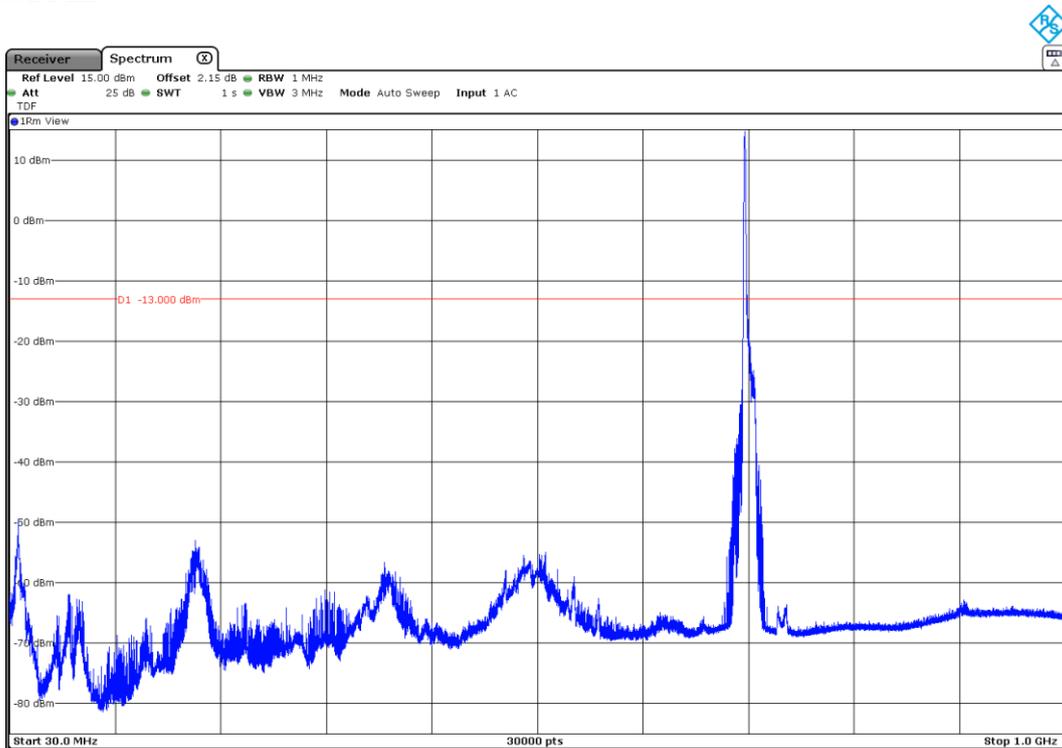
CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency.

### LTE Band 17. QPSK MODULATION. BW=10 MHz

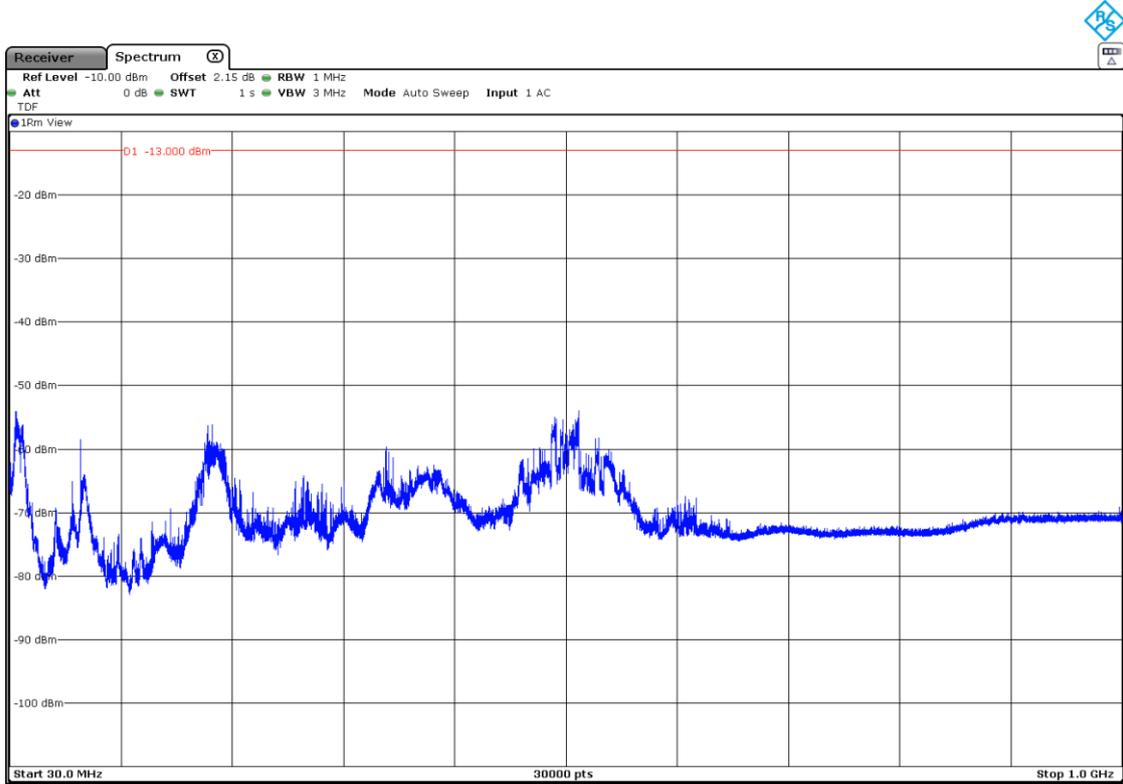
CHANNEL: MIDDLE



Note: The peak above the limit is the carrier frequency

### LTE Band 41. QPSK MODULATION. BW=20 MHz

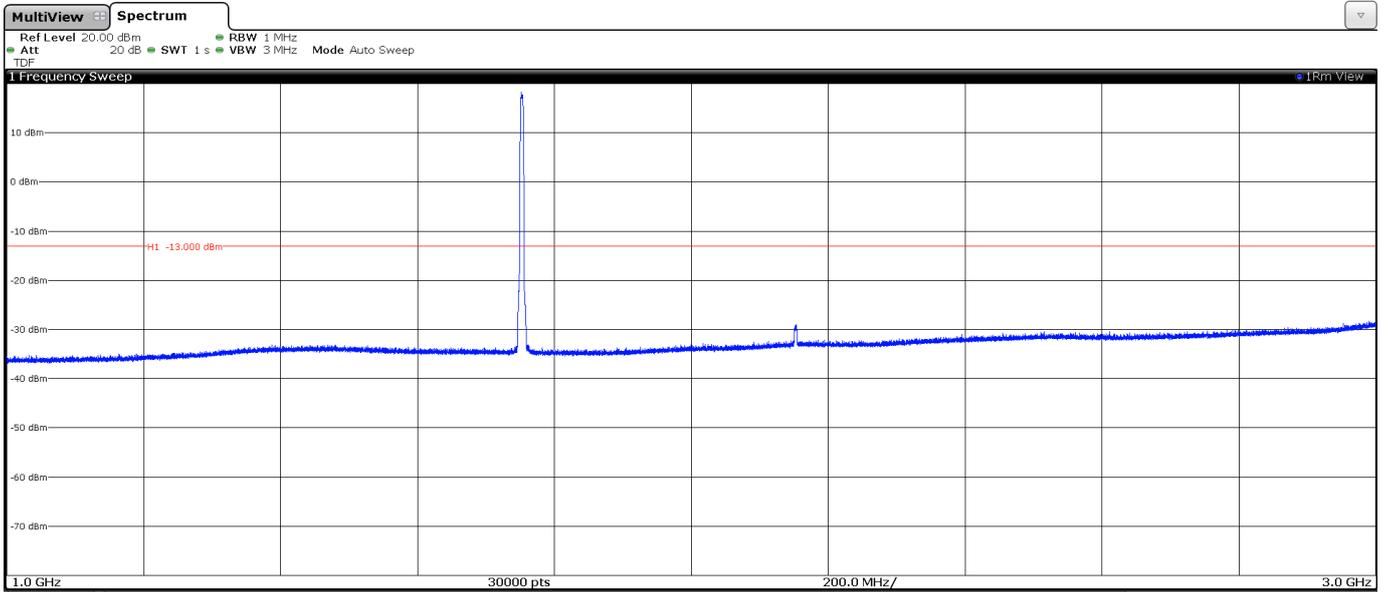
CHANNEL: HIGHEST



### Frequency range 1 GHz to 3 GHz.

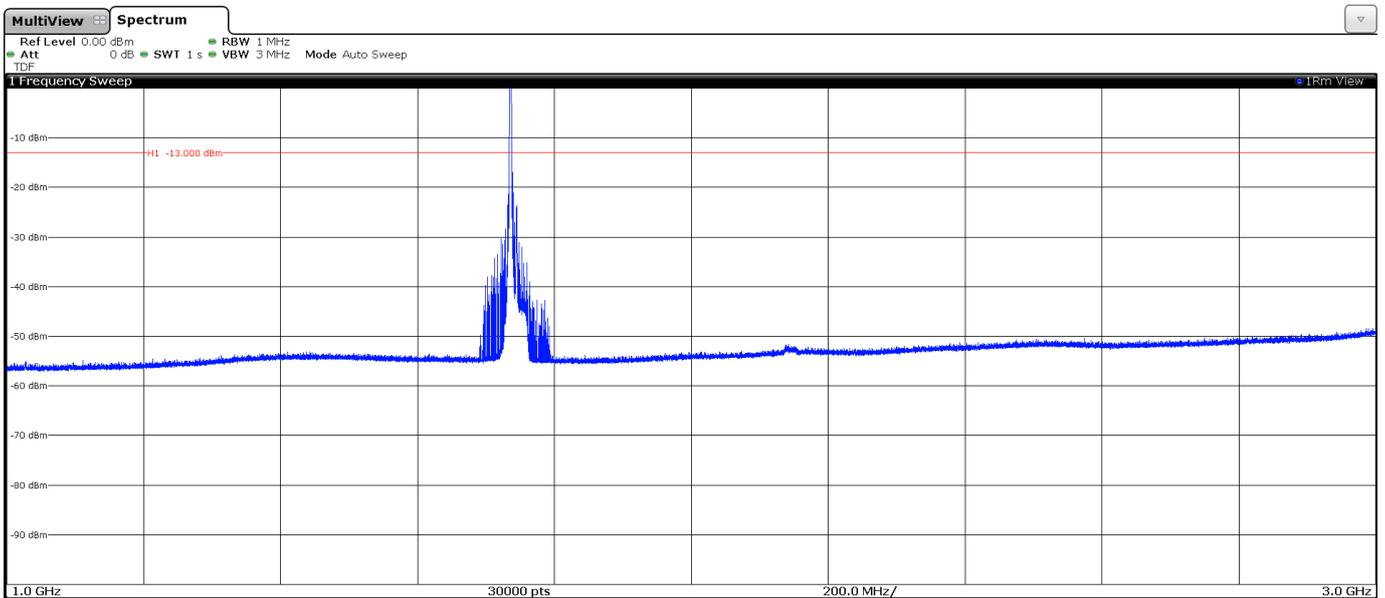
### WCDMA MODULATION (Band IV)

CHANNEL: HIGHEST



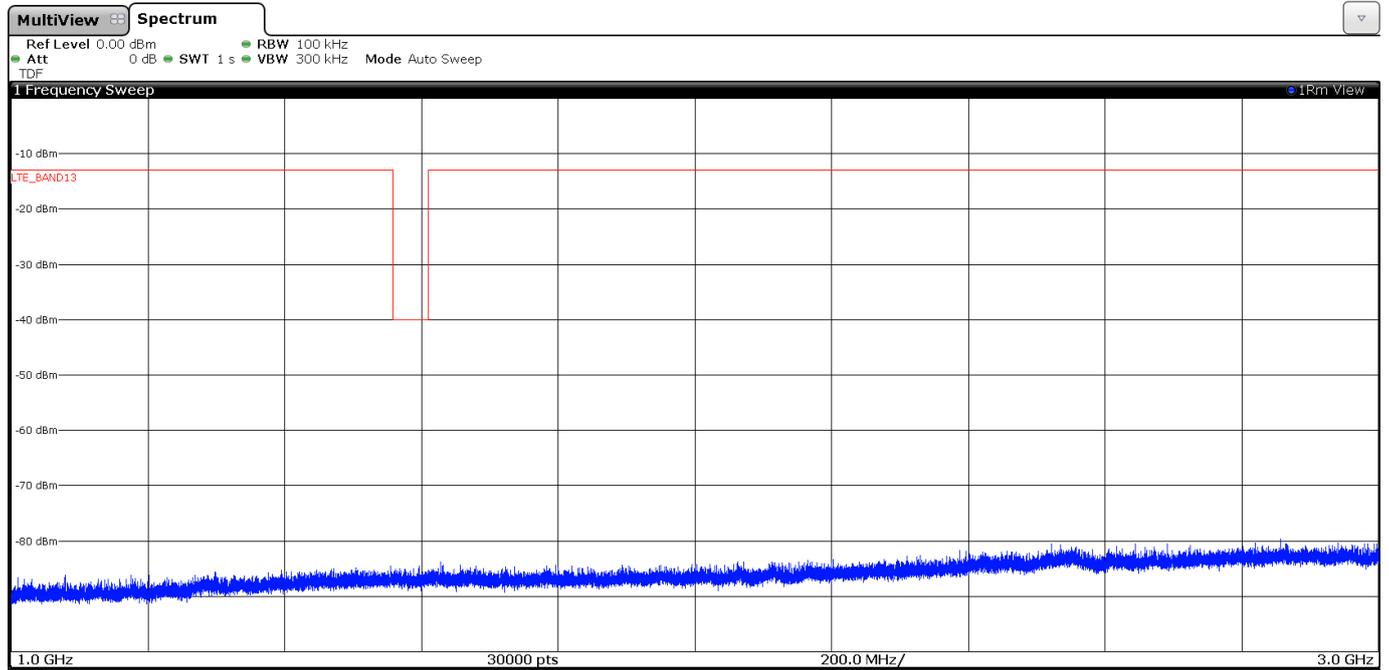
### LTE Band 4 QPSK MODULATION. BW=20 MHz.

CHANNEL: HIGHEST



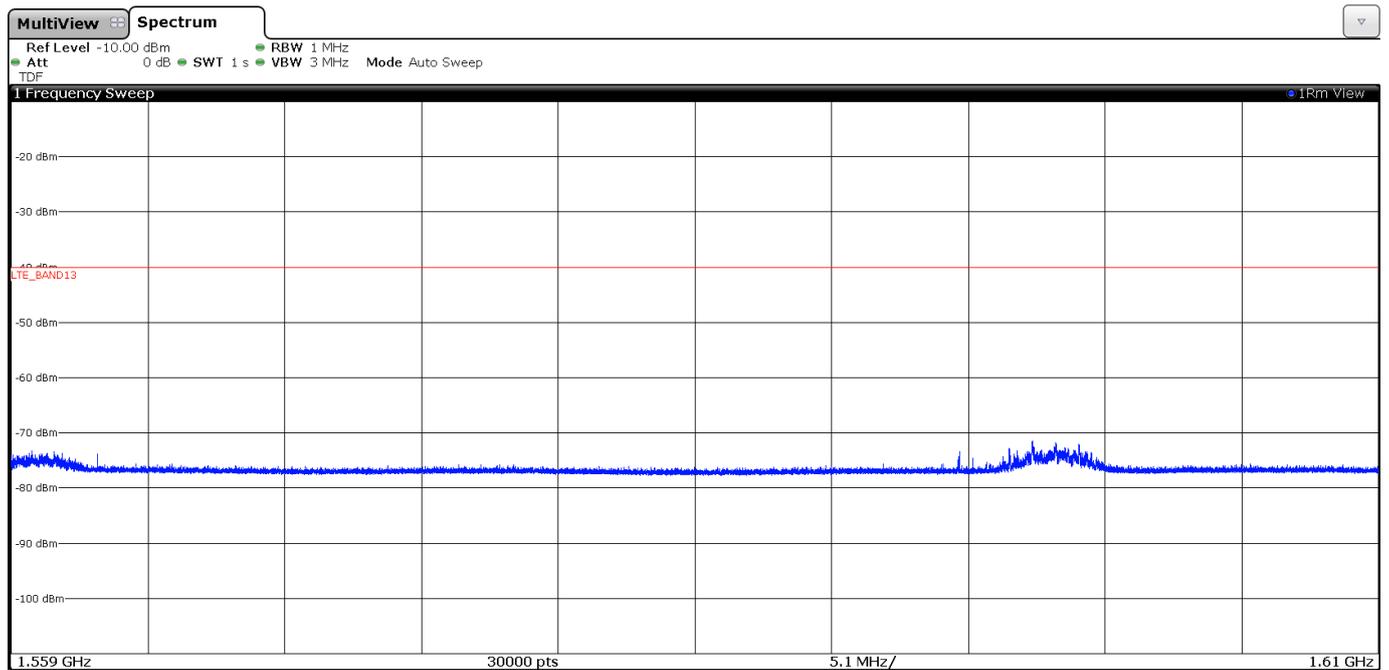
### LTE Band 13 QPSK MODULATION. BW=10 MHz.

CHANNEL: MIDDLE



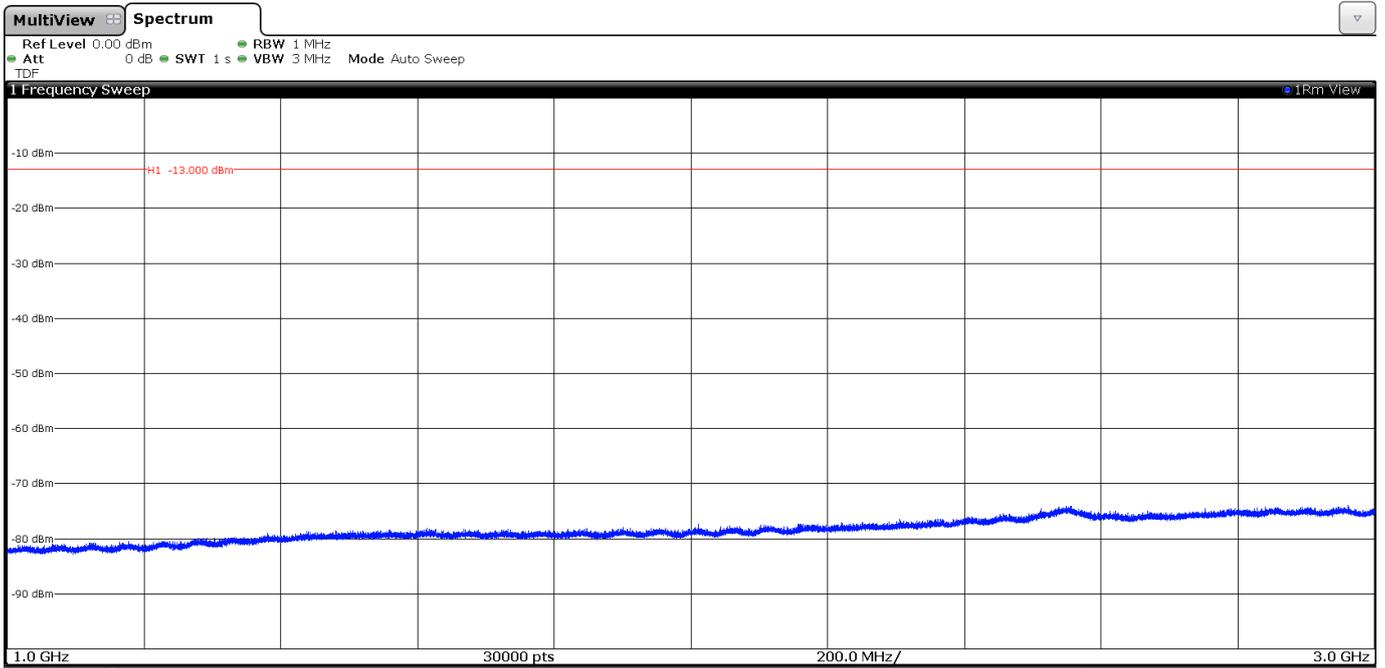
### LTE Band 13. Frequency range 1559 MHz to 1610 MHz.

CHANNEL: MIDDLE



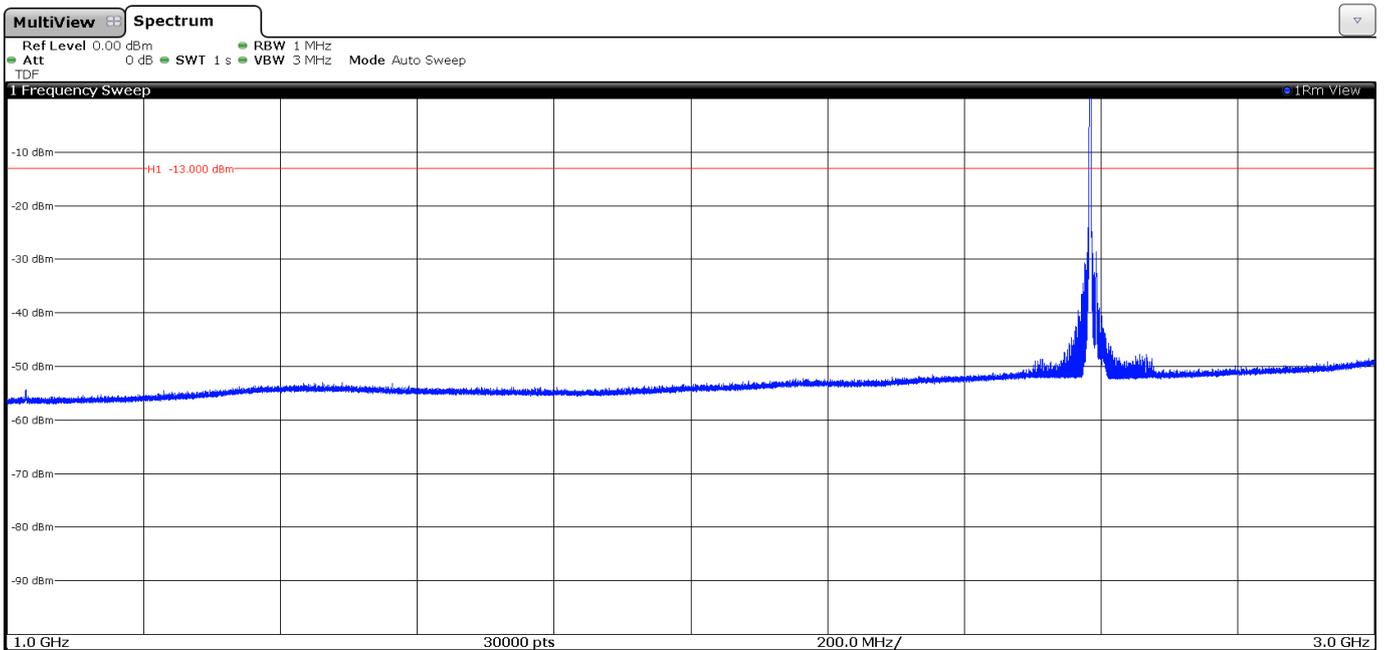
### LTE Band 17 QPSK MODULATION. BW=10 MHz.

CHANNEL: MIDDLE



### LTE Band 41 QPSK MODULATION. BW=20 MHz.

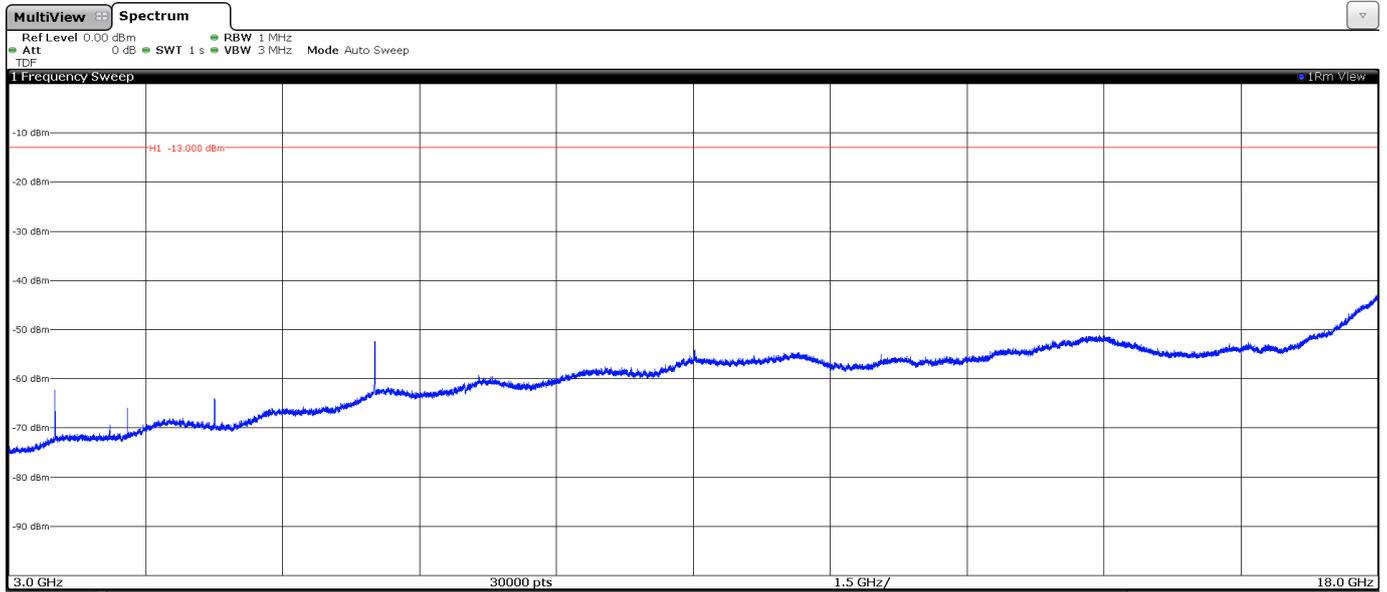
CHANNEL: HIGHEST



Frequency range 3 GHz to 18 GHz.

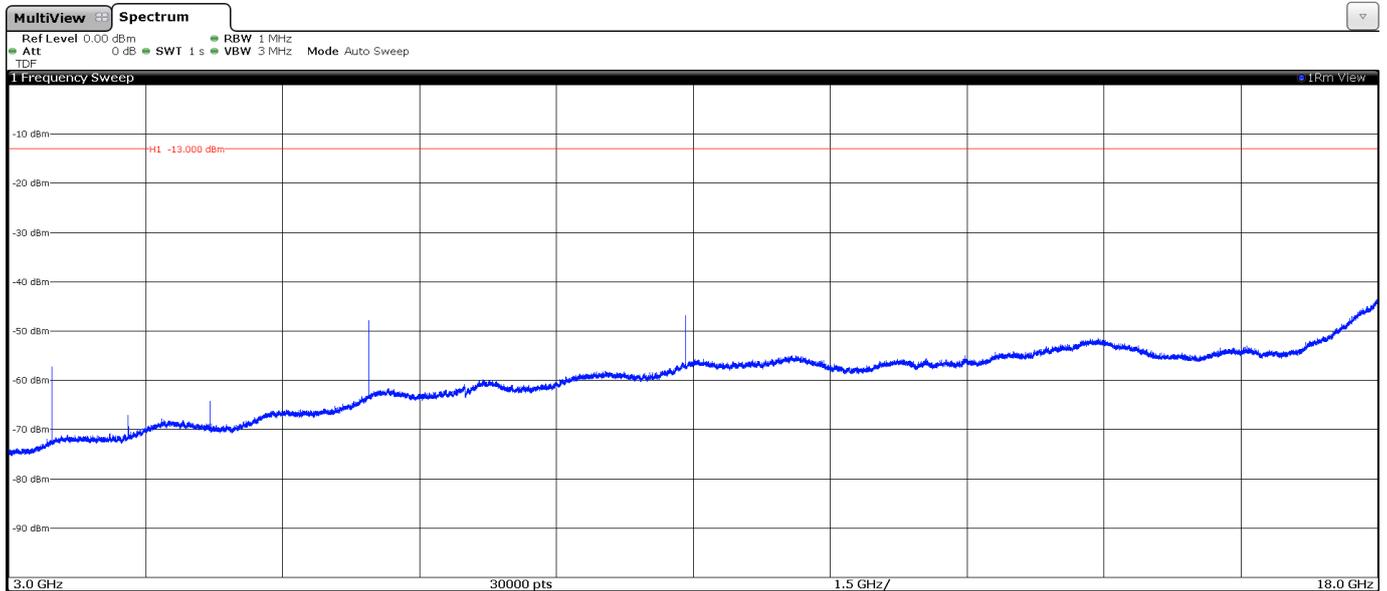
WCDMA MODULATION (Band IV)

CHANNEL: HIGHEST



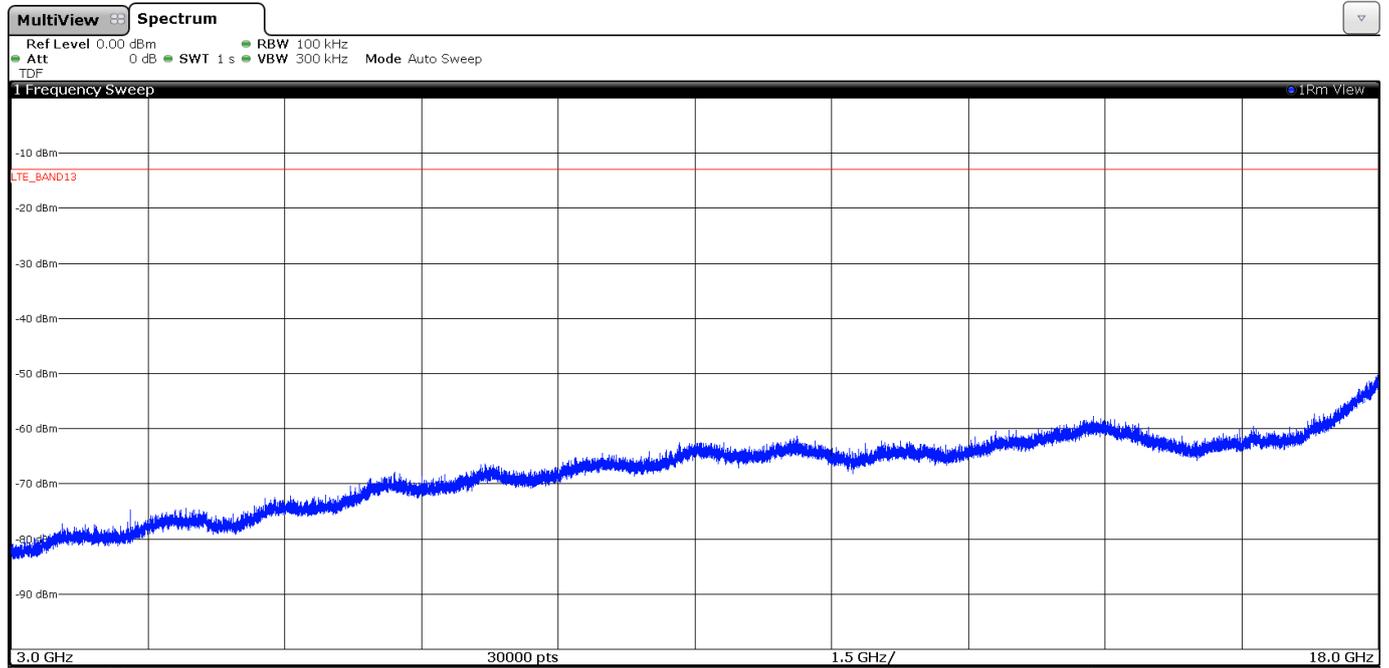
LTE Band 4 QPSK MODULATION. BW=20 MHz.

CHANNEL: HIGHEST



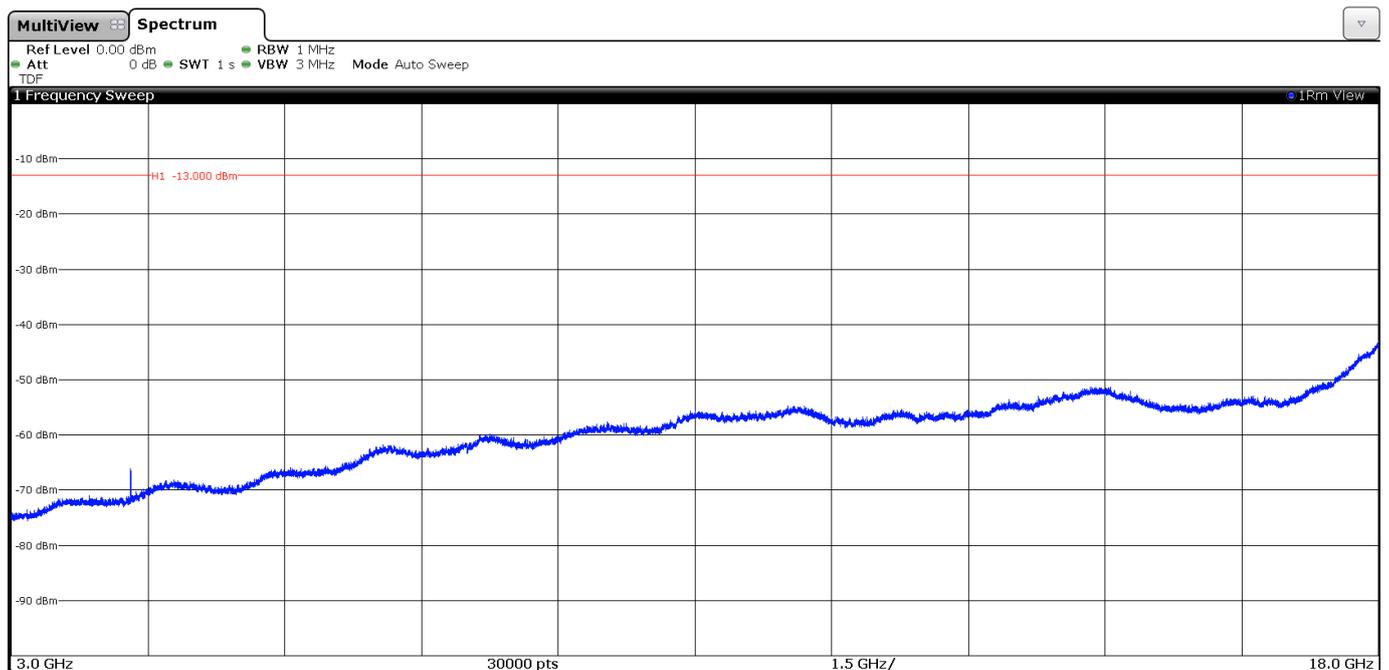
### LTE Band 13 QPSK MODULATION. BW=10 MHz.

CHANNEL: MIDDLE



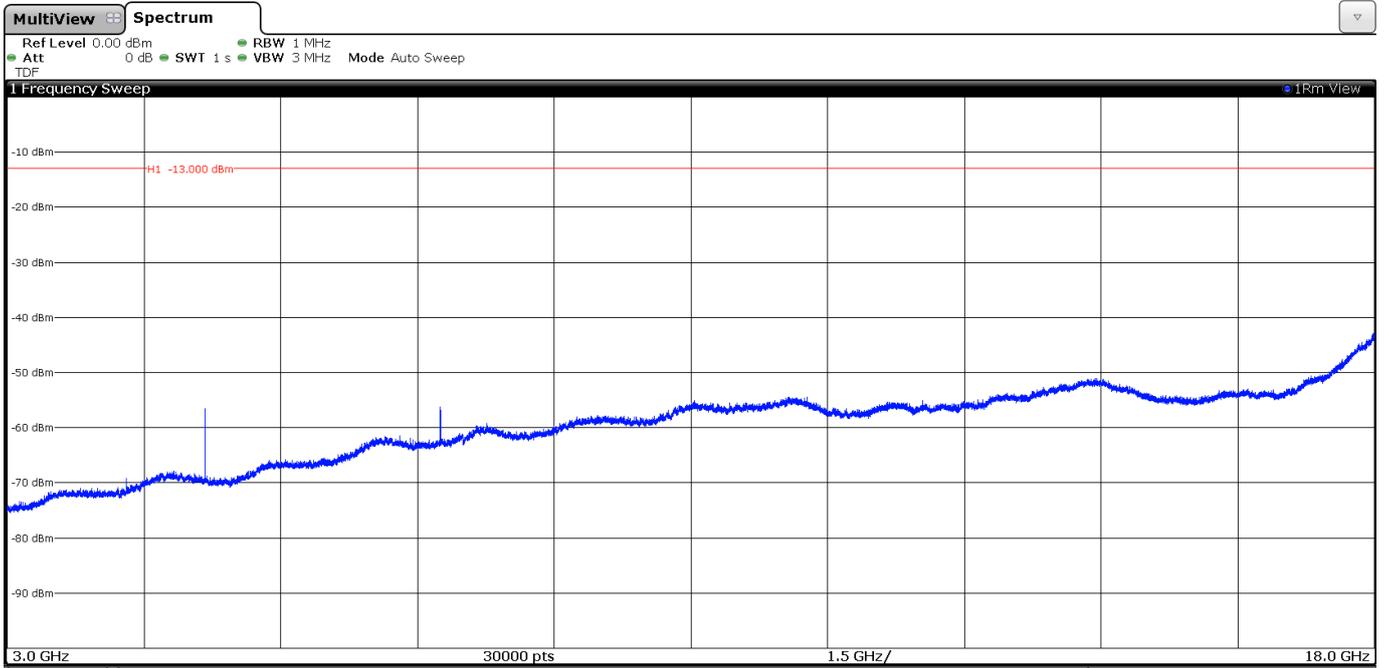
### LTE Band 17 QPSK MODULATION. BW=10 MHz.

CHANNEL: MIDDLE



### LTE Band 41 QPSK MODULATION. BW=20 MHz.

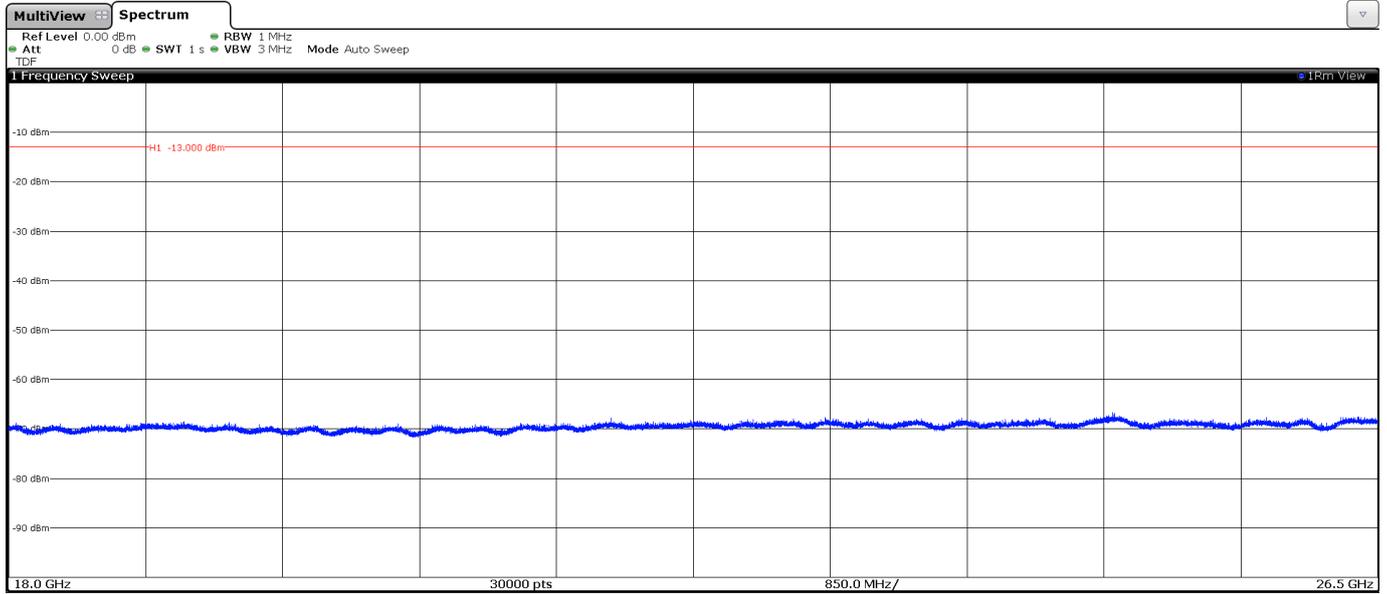
CHANNEL: HIGHEST



Frequency range 18 GHz to 26.5 GHz.

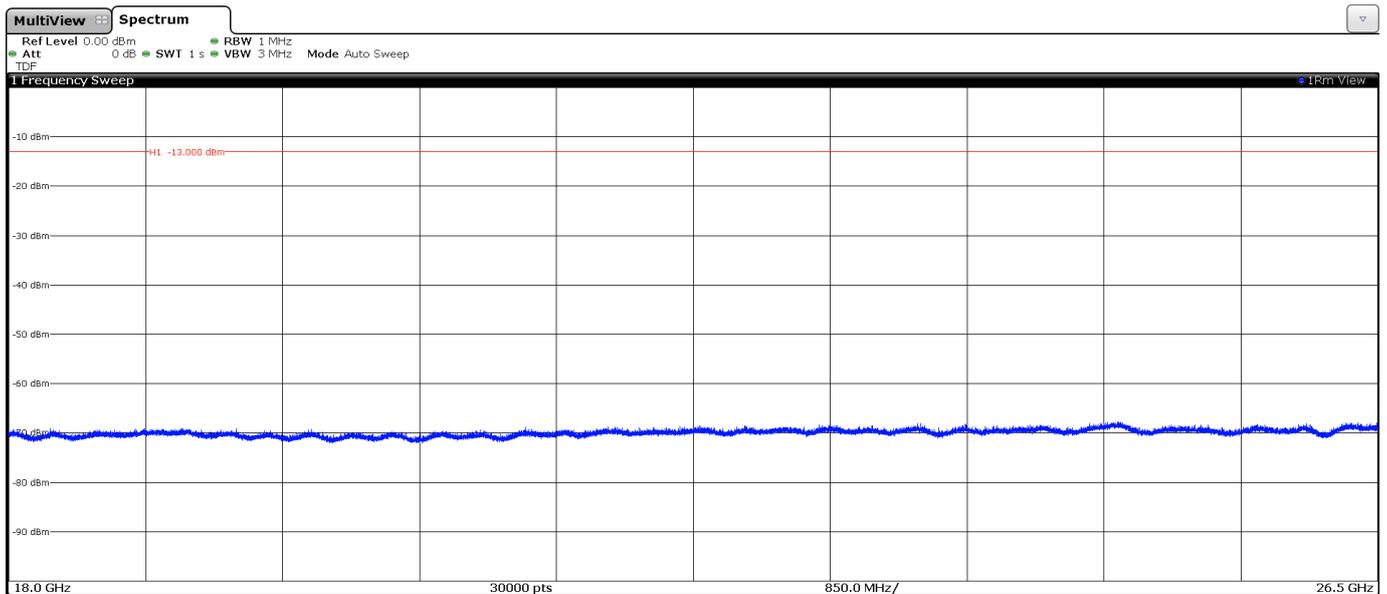
### WCDMA MODULATION (Band IV)

CHANNEL: HIGHEST



### LTE Band 41 QPSK MODULATION. BW=20 MHz.

CHANNEL: HIGHEST



## Appendix D: Test results for FCC PART 22 & 90/ CANADA RSS-132

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## TEST CONDITIONS

Power supply (V):

Vnom = 120 Vac

Vmax = N/A

Vmin = N/A

The subscripts nom, min and max indicate voltage test conditions (nominal, minimum and maximum respectively, as declared by the applicant).

Type of power supply = AC Voltage from AC/DC adapter.

Type of antenna = Internal antenna

Modes supported by the equipment:

- Notebook mode.
- Tablet mode.

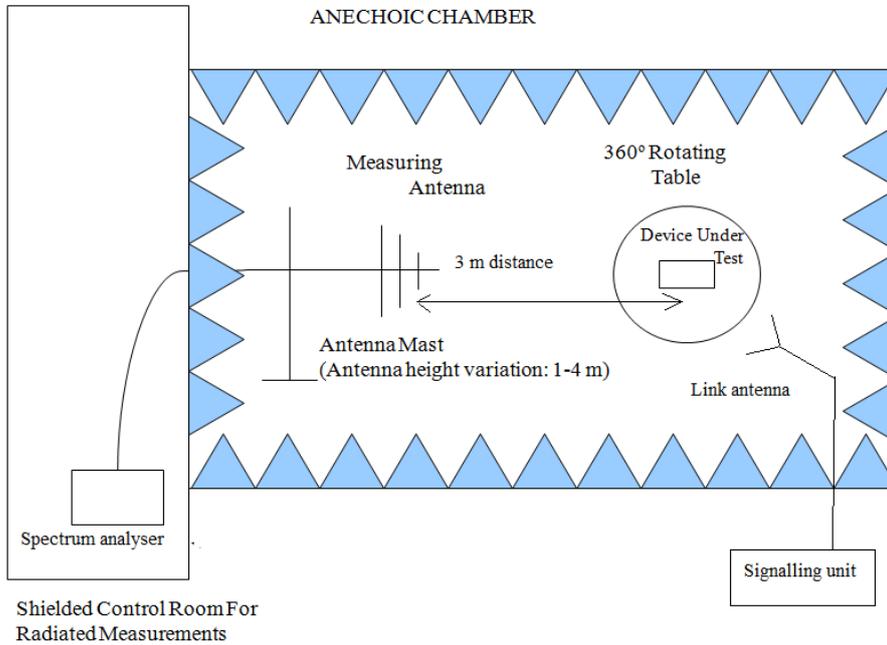
TEST FREQUENCIES:

LTE. QPSK AND 16QAM MODULATION (BAND 26)

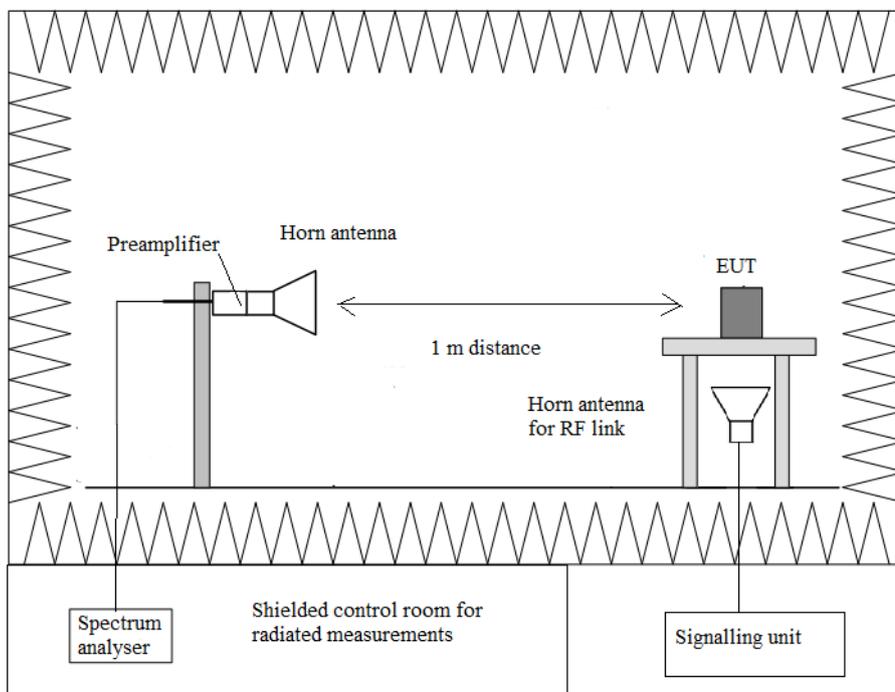
	Channel (Frequency, MHz)				
	BW = 1.4 MHz	BW = 3 MHz	BW = 5 MHz	BW = 10 MHz	BW = 15 MHz
Lowest	26797 (824.70)	26805 (825.50)	26815 (826.50)	26840 (829.00)	26865 (831.50)
Middle	26915 (836.50)	26915 (836.50)	26915 (836.50)	26915 (836.50)	26915 (836.50)
Highest	27033 (848.30)	27025 (847.50)	27015 (846.50)	26990 (844.00)	26965 (841.50)

## TEST SETUP

Radiated measurements below 1 GHz.



Radiated measurements above 1 GHz.



## Radiated emissions

### SPECIFICATION

FCC § 22.917

RSS-132. Clause 5.5.

FCC §2.1051, §90.691

Emission mask requirements for EA-based systems.

For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

### 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 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. The radiated emissions were measured with peak detector and 1 MHz bandwidth.

Each detected emission is substituted by the Substitution method, in accordance with the ANSI/TIA-603-E.

Measurement Limit:

According to specification, the power of emissions shall be attenuated below the transmitter power (P) by a factor of at least  $43 + 10 \log (P)$  dB. P in watts.

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

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

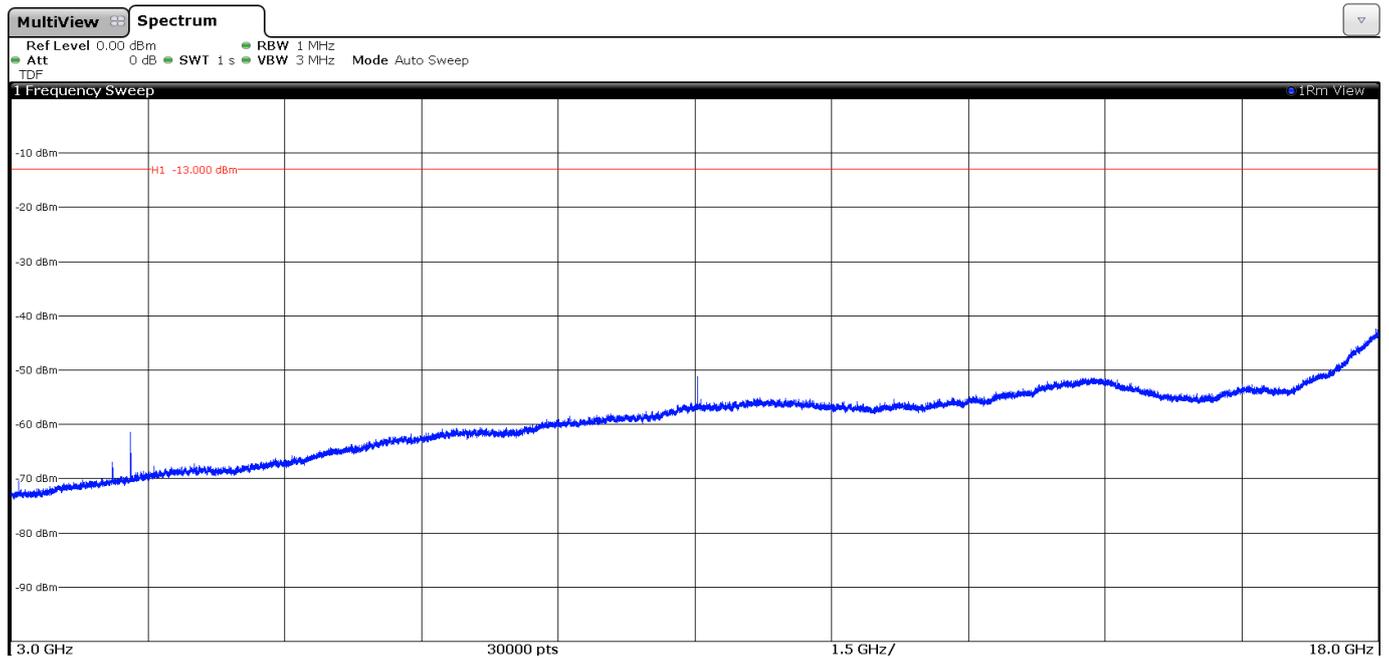
### LTE Band:

LTE Band 26 QPSK AND 16QAM MODULATION. BW = 1.4 MHz, 3 MHz, 5 MHz, 10 MHz and 15MHz.

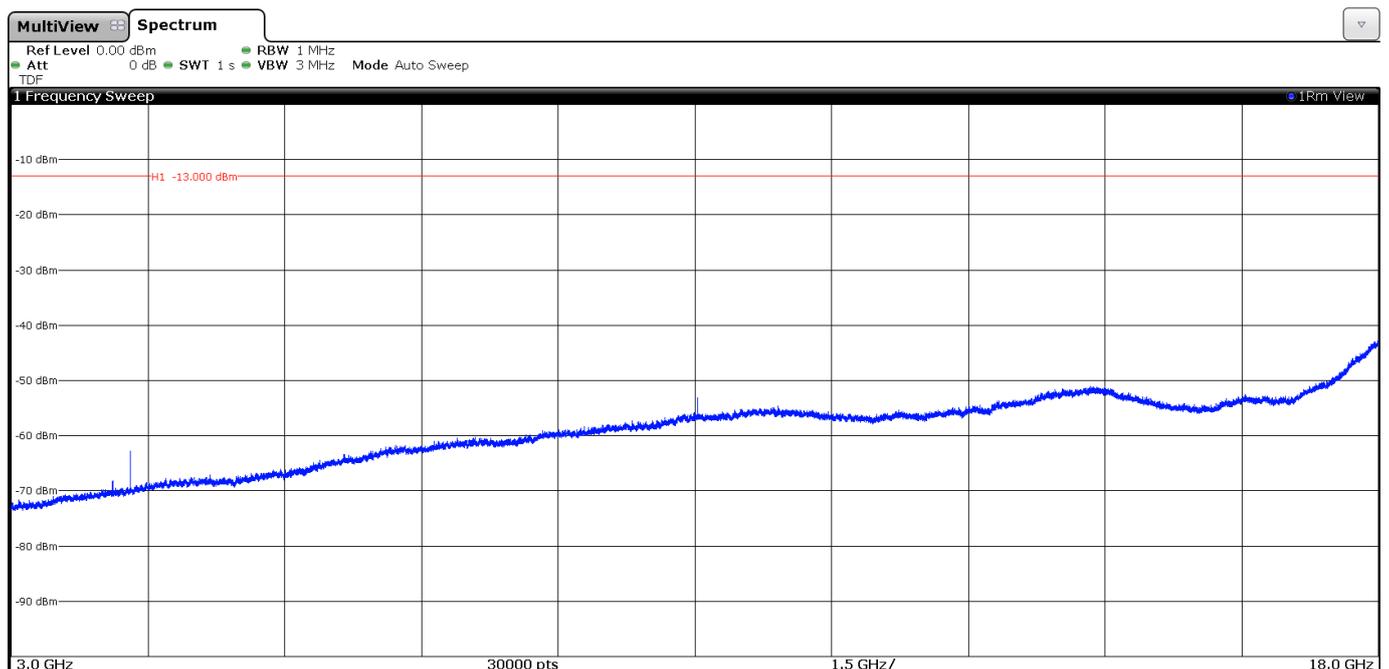
A preliminary scan determined the Highest channel 841.5 MHz with QPSK modulation and 15 MHz bandwidth as the worst case. The configuration of Resource Blocks was used RB=1 no offset.

### Preliminary scan to detect worst-case mode:

#### Notebook mode



#### Tablet mode



Spurious emissions closets to limit:

Frequency (MHz)	Mode	Polarization	E.I.R.P (dBm)
4310.250	Notebook	Vertical	-61.10
10531.020	Notebook	Vertical	-51.14
4310.250	Tablet	Vertical	-62.86
10531.020	Tablet	Vertical	-53.17

WORST CASE: Notebook mode

The following tables and plots show the results for this configuration: LTE Band 26 - Highest channel -841.5 MHz - BW 15 MHz QPSK modulation in Notebook mode.

#### 1. CHANNEL: HIGHEST

##### **Frequency range 30 MHz-1000 MHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 1 GHz-3 GHz.**

No radiated spurious signals were detected at less than 20 dB respect to the limit.

##### **Frequency range 3 GHz-18 GHz.**

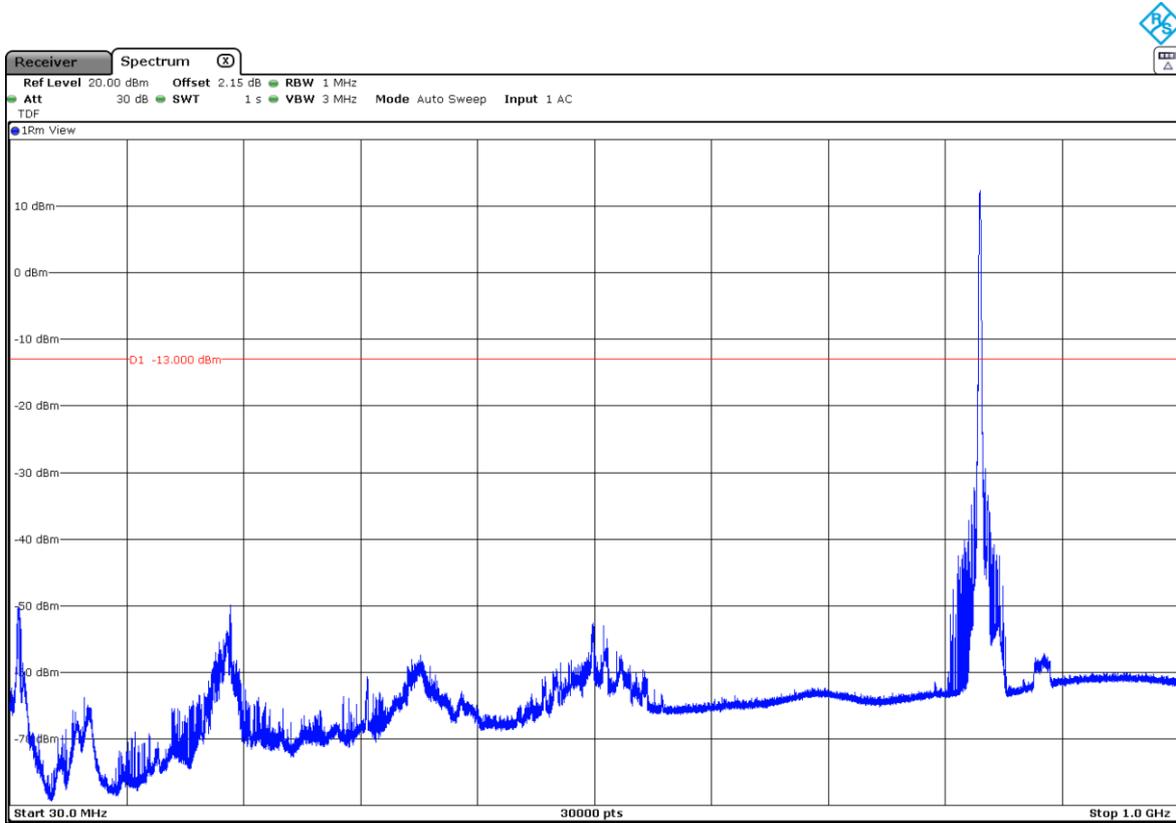
No radiated spurious signals were detected at less than 20 dB respect to the limit.

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

**LTE Band 26 - QPSK MODULATION. BW=15 MHz**

CHANNEL: HIGHEST

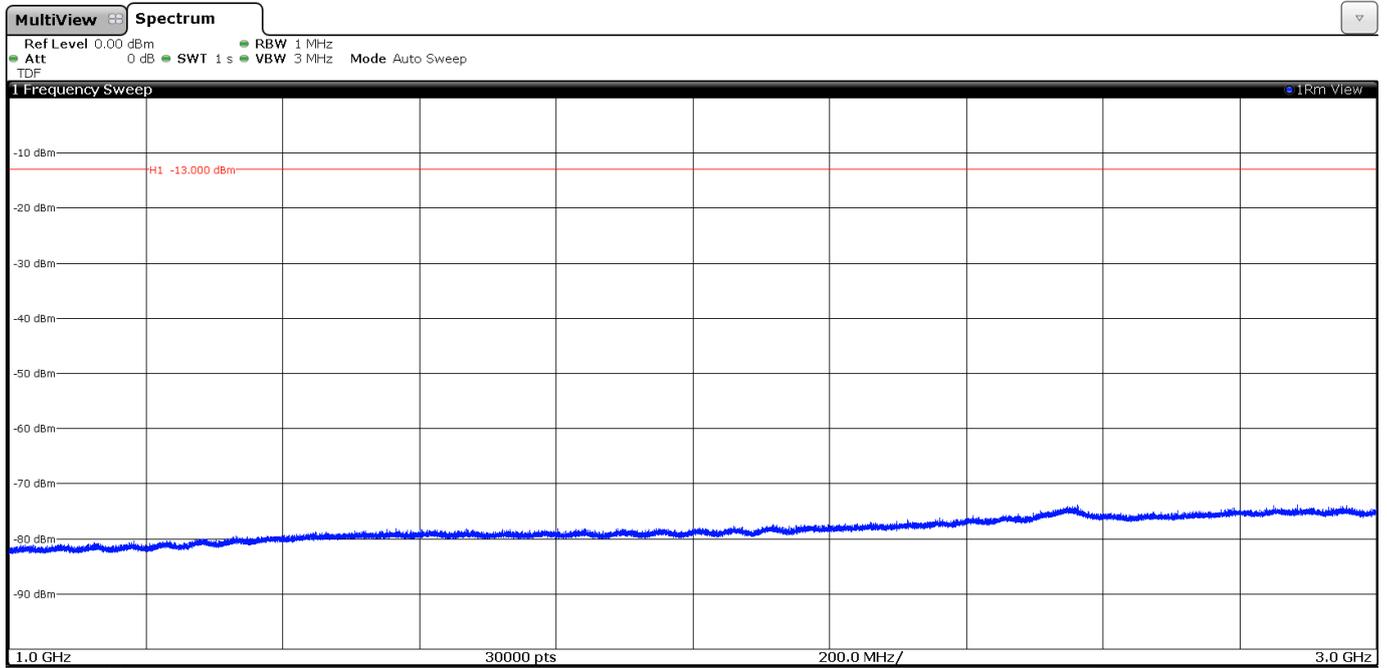


Note: The peak above the limit is the carrier frequency

FREQUENCY RANGE 1 GHz to 3 GHz.

**LTE Band 26 - QPSK MODULATION. BW=15 MHz**

**CHANNEL: HIGHEST**



FREQUENCY RANGE 3 GHz to 18 GHz.

**LTE Band 26 - QPSK MODULATION. BW=15 MHz**

**CHANNEL: HIGHEST**

