TEST A.5: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

LIMITS:	Product standard:	FCC Part 27 / IC IC RSS-130 and RSS-139
	Test standard:	FCC §2.1051 and § 27.53 / RSS-130 Clause 4.7 and RSS-139 Clause 6.6

LIMITS

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 Po transmitting power of 2 watts (33 dBm), the specified minimum attenuation becomes 43+10log (Po). and the level in dBm relative to Po becomes:

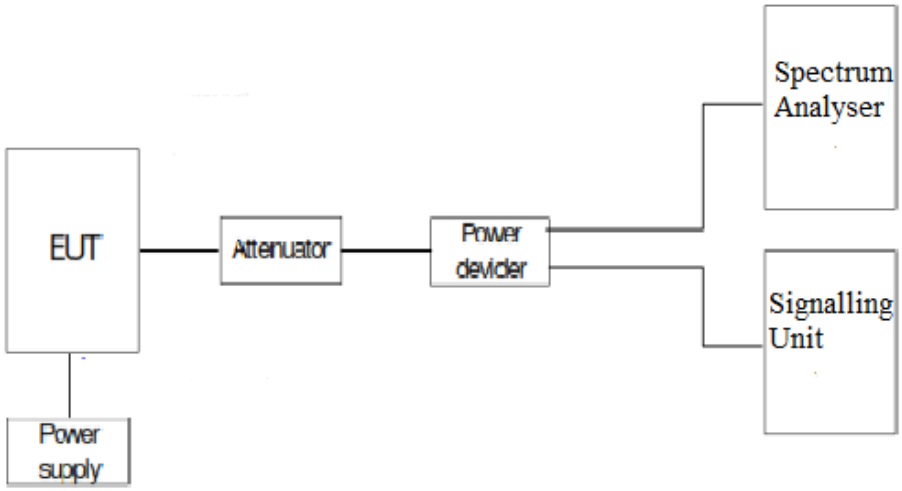
Po (dBm) – [43 + 10 log (Po in watts)] = -13 dBm

TEST SETUP

The EUT RF output connector was connected to a spectrum analyzer and to the Universal Radio Communication Tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-ohm attenuator and a power splitter.

The reading of the spectrum analyzer is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyzer.

For LTE mode the configuration of Resource Blocks and modulation which is the worst case for conducted power was used.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 4)
TEST RESULTS:	PASS

Frequency range 9 kHz – 26 GHz

LTE QPSK MODULATION. BW = 5 MHz

Lowest Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2113.65	-29.51	< ± 1.20

Middle Channel

No spurious signal was found in the frequency range for Lowest, Middle channel.

Highest Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2153.46	-28.98	< ± 1.20

LTE QPSK MODULATION. BW = 10 MHz

Lowest Channel

No spurious signal was found in the frequency range for Lowest channel.

Middle Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2133.15	-28.53	< ± 1.20

Highest Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2152.65	-27.60	< ± 1.20

TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 15 MHz

Lowest Channel

No spurious signal was found in the frequency range for Lowest channel.

Middle Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2129.90	-28.17	< ± 1.20

Highest Channel

No spurious signal was found in the frequency range for Highest channel.

LTE QPSK MODULATION. BW = 20 MHz

Lowest Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2116.90	-30.30	< ± 1.20

Middle Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2129.09	-30.11	< ± 1.20

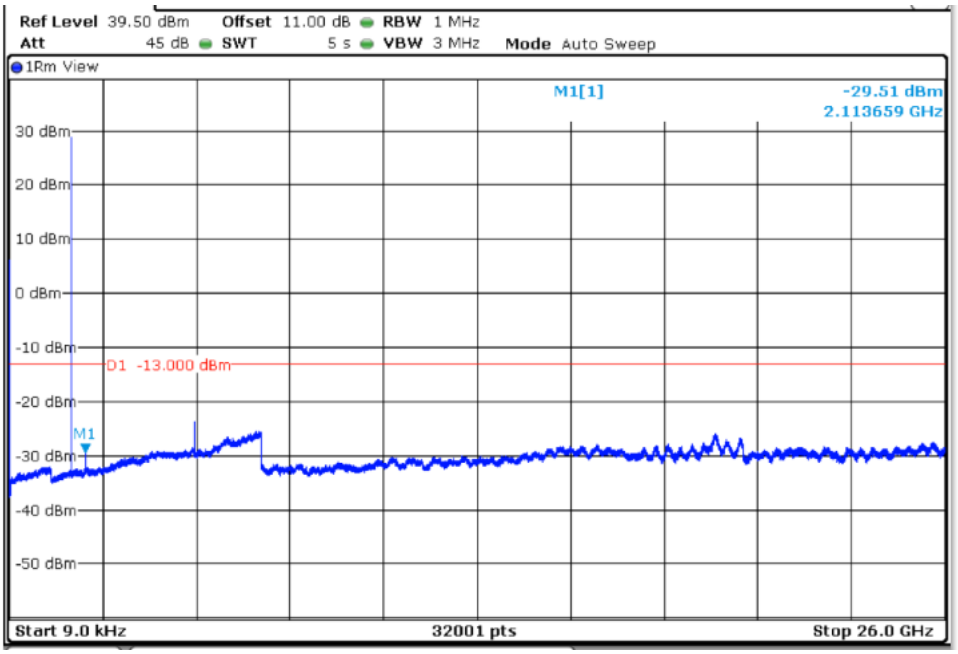
Highest Channel

Spurious frequency (MHz)	Level (dBm)	Measurement uncertainty (dB)
2149.40	-29.81	< ± 1.20

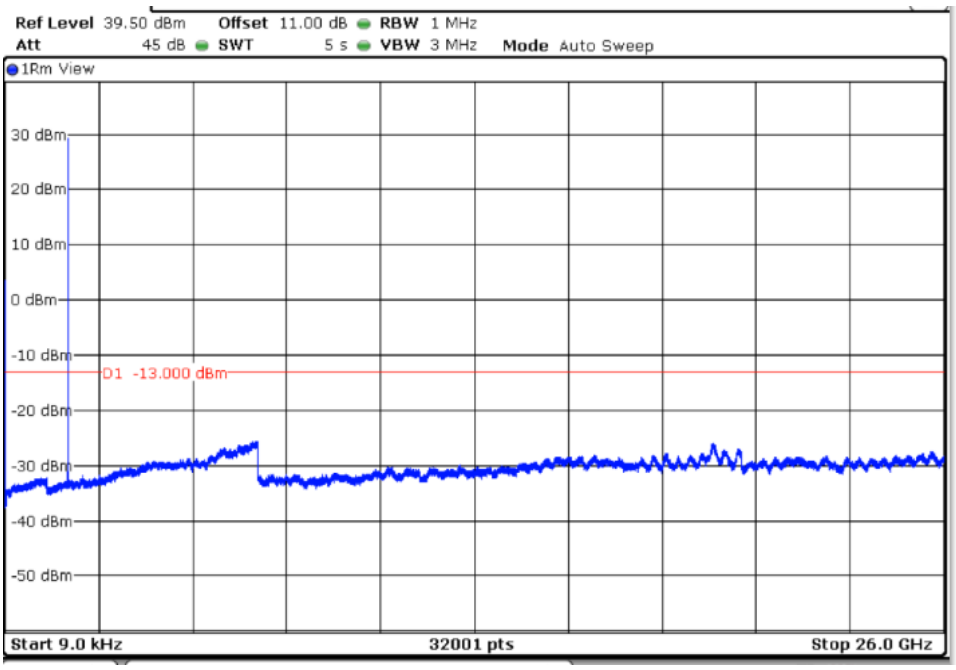
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 5 MHz

Lowest Channel

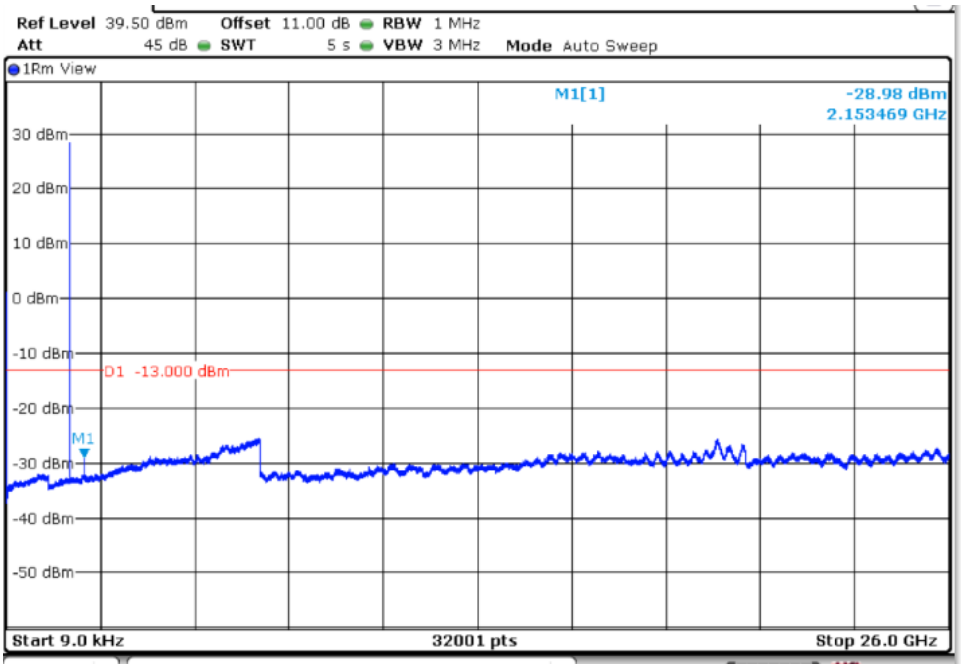


Middle Channel



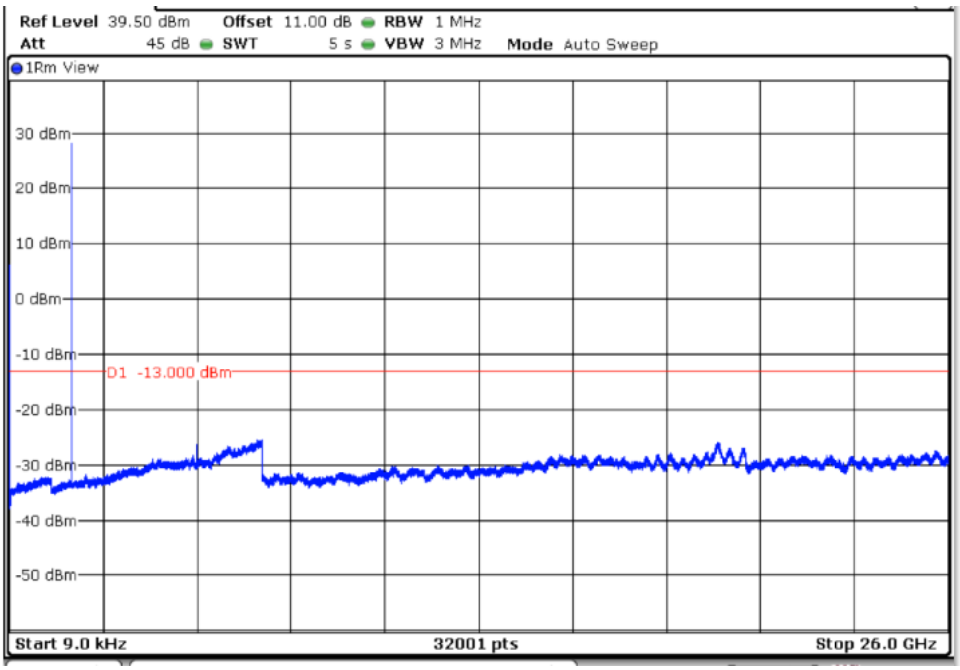
TEST RESULTS (Cont):	

Highest Channel



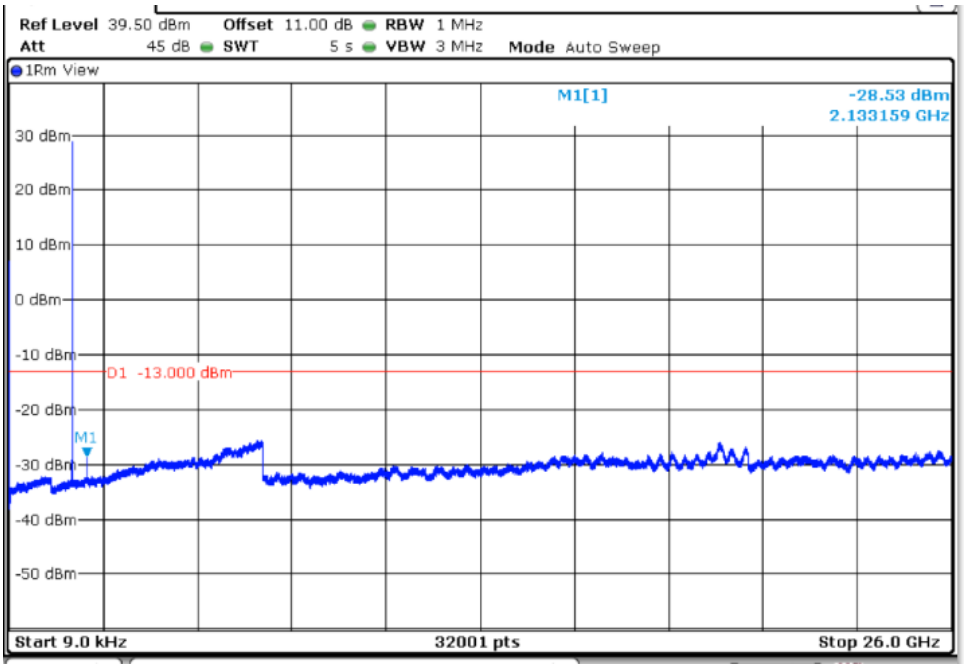
LTE QPSK MODULATION. BW = 10 MHz

Lowest Channel

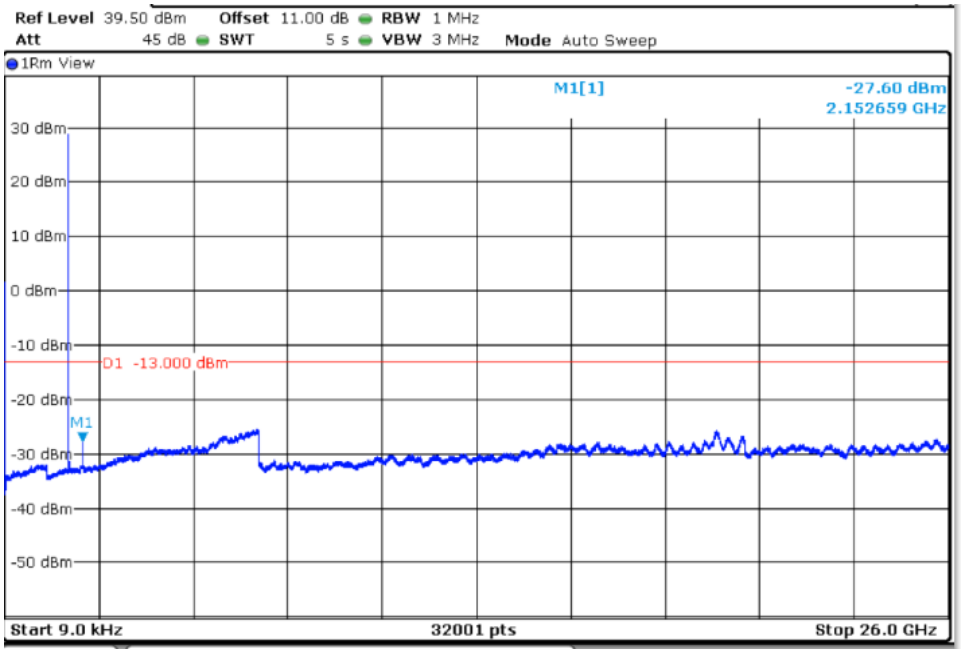


TEST RESULTS (Cont):	

Middle Channel



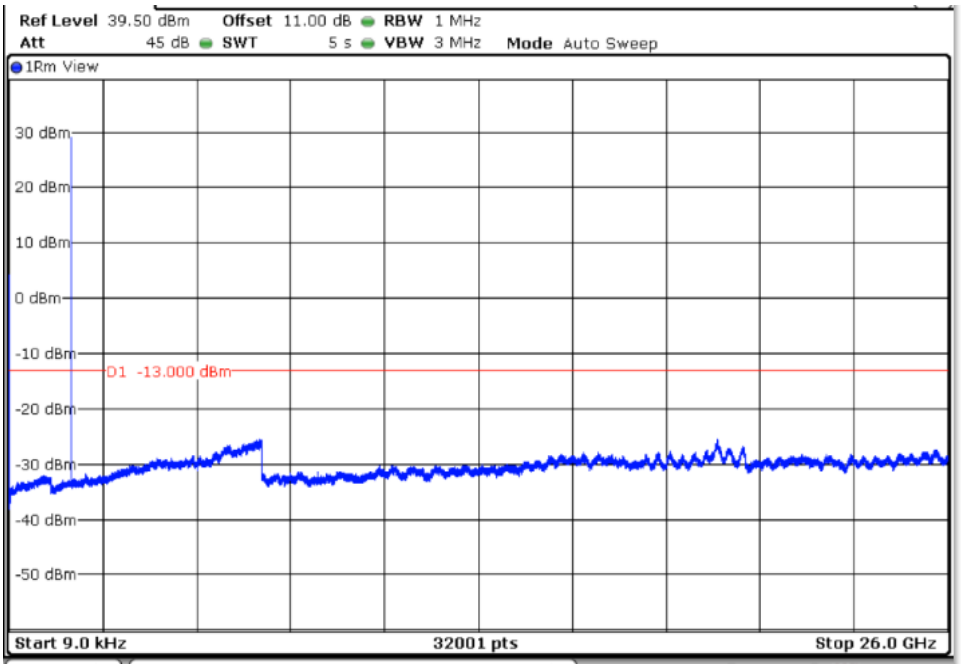
Highest Channel



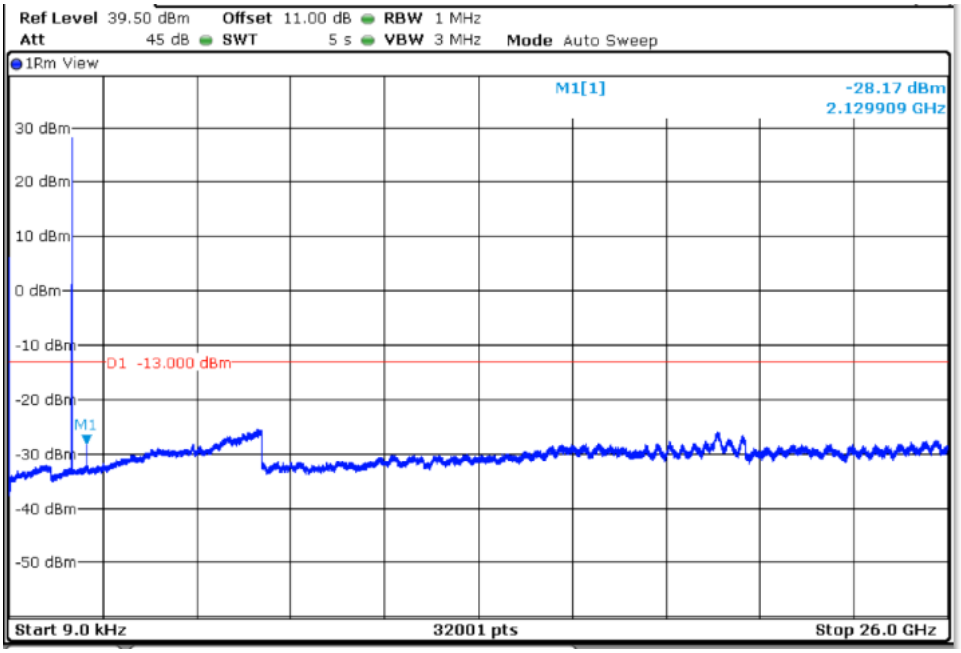
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 15 MHz

Lowest Channel

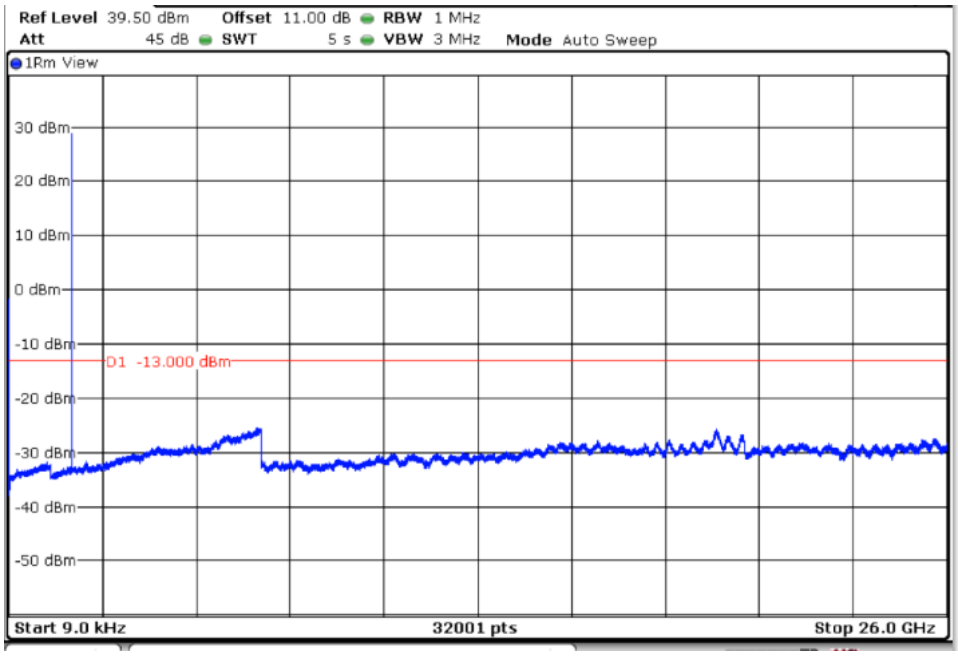


Middle Channel



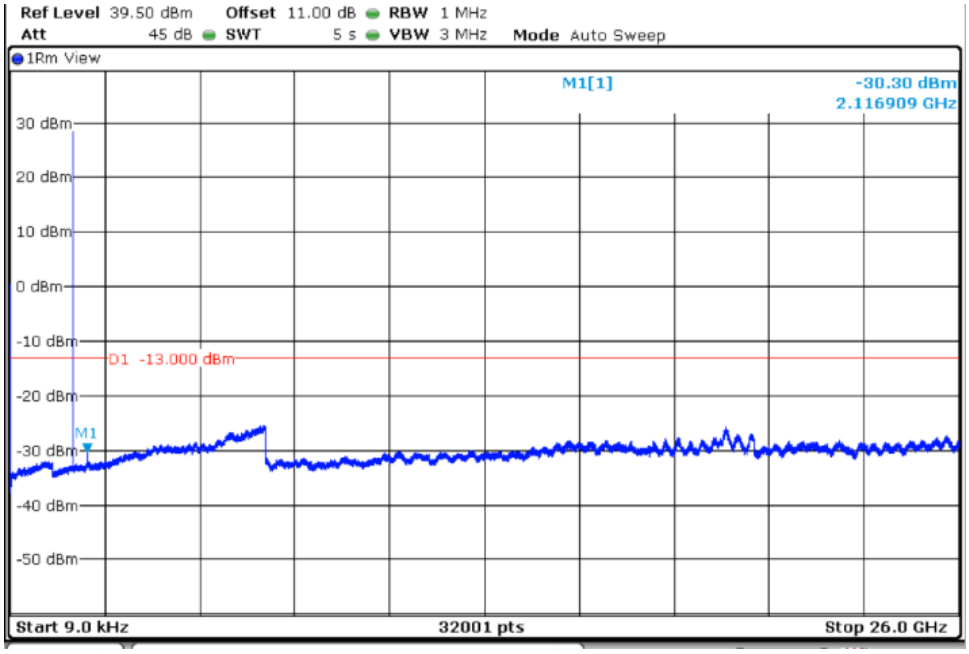
TEST RESULTS (Cont):	

Highest Channel



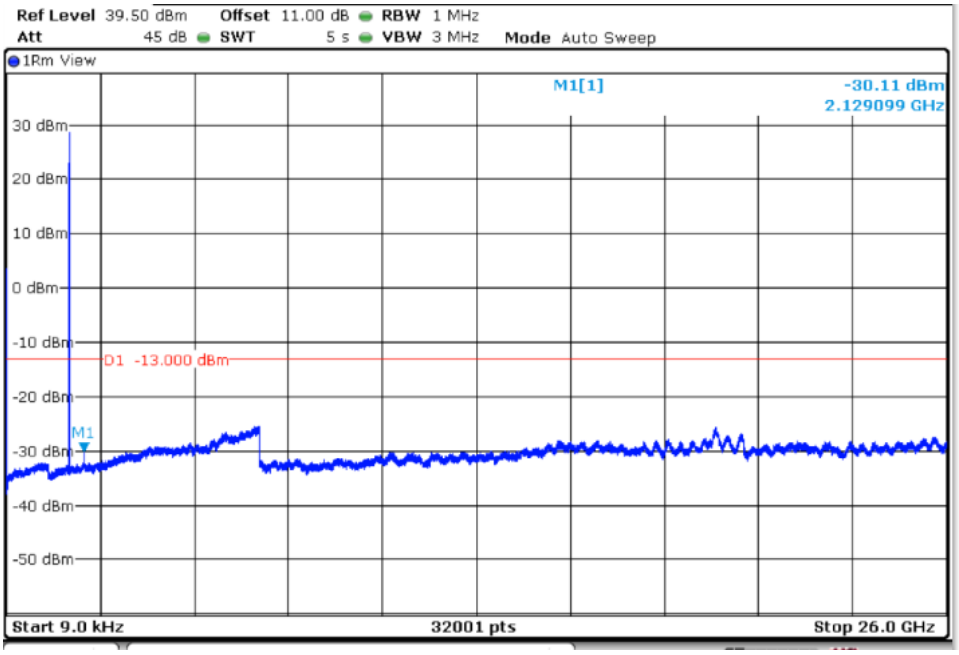
LTE QPSK MODULATION. BW = 20 MHz

Lowest Channel

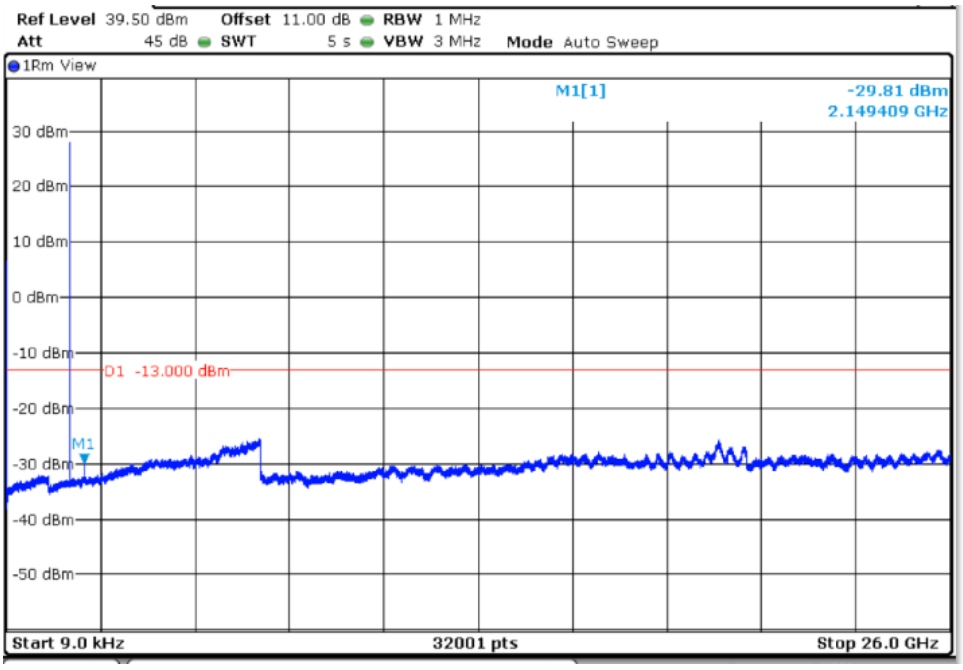


TEST RESULTS (Cont):	

Middle Channel



Highest Channel



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (Band 12)
TEST RESULTS:	PASS

Frequency range 9 kHz – 20 GHz

LTE QPSK MODULATION. BW = 5 MHz

No spurious signal was found for Lowest, Middle and Highest channels.

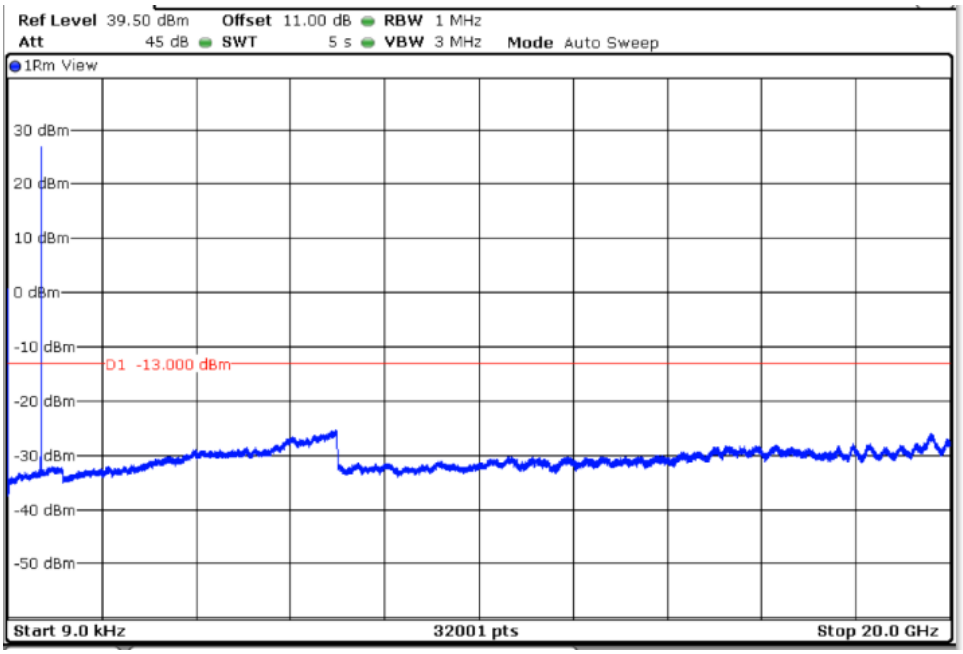
LTE QPSK MODULATION. BW = 10 MHz

No spurious signal was found for Lowest, Middle and Highest channels.

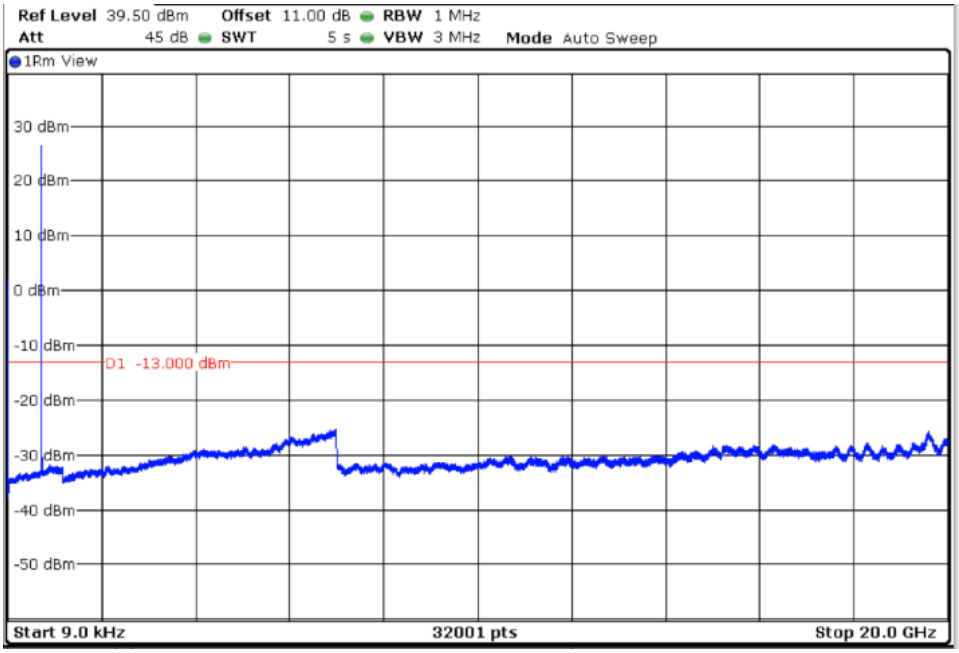
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 5 MHz

Lowest Channel

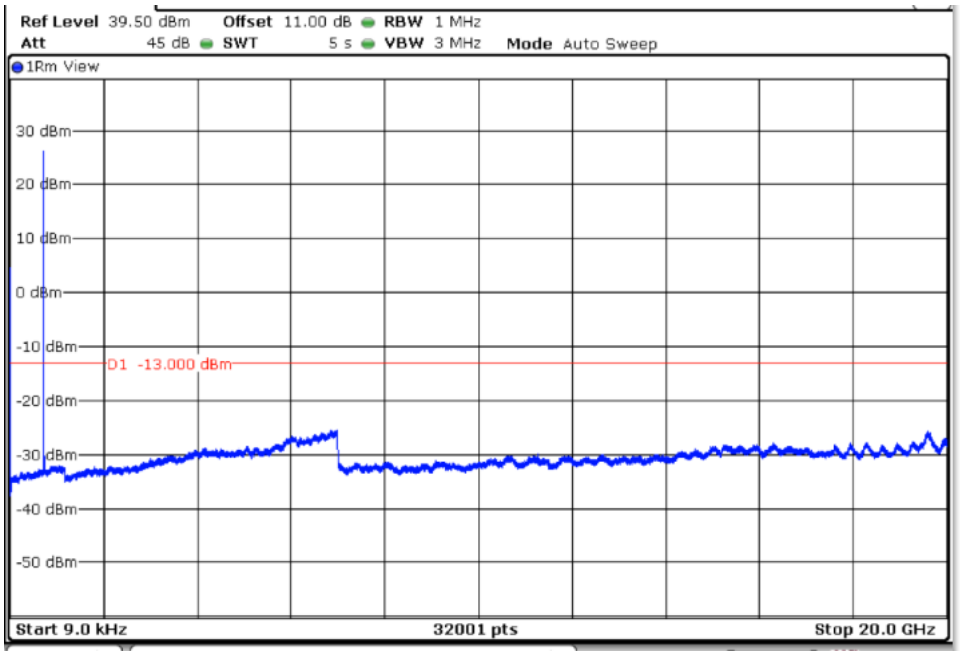


Middle Channel



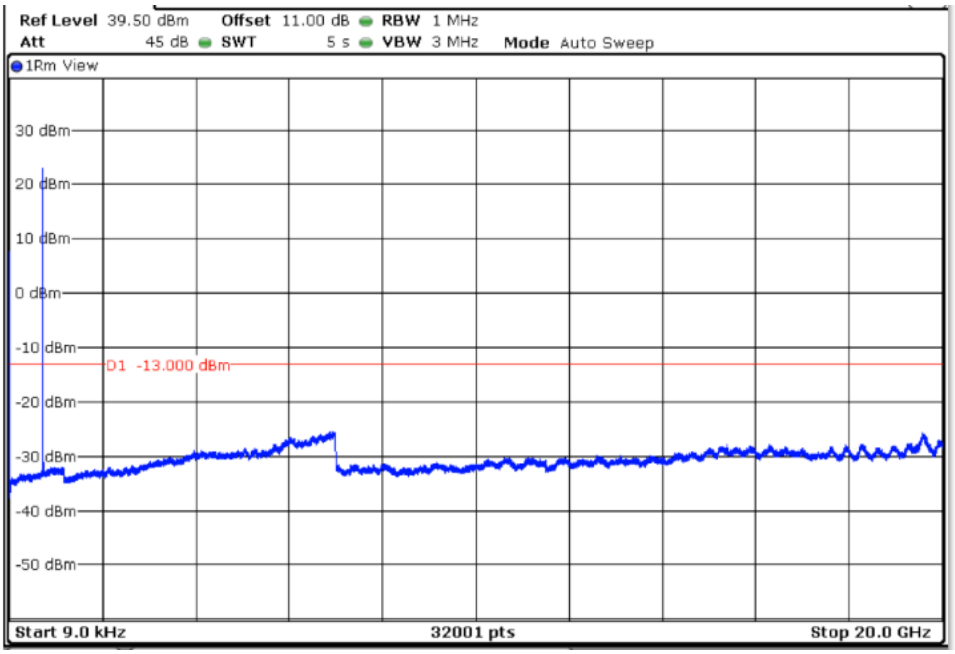
TEST RESULTS (Cont):	

Highest Channel



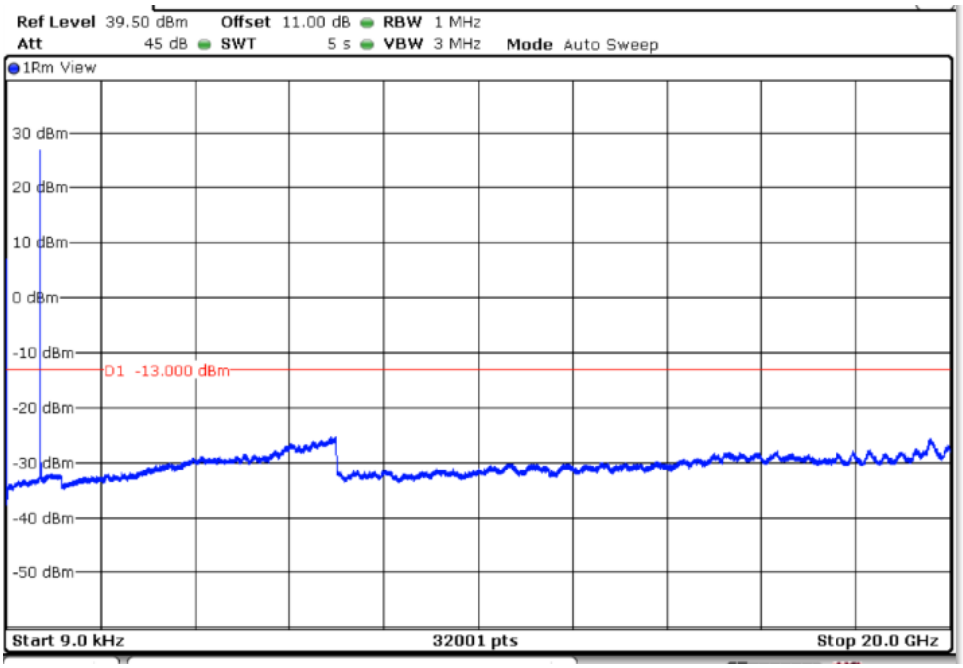
LTE QPSK MODULATION. BW = 10 MHz

Lowest Channel

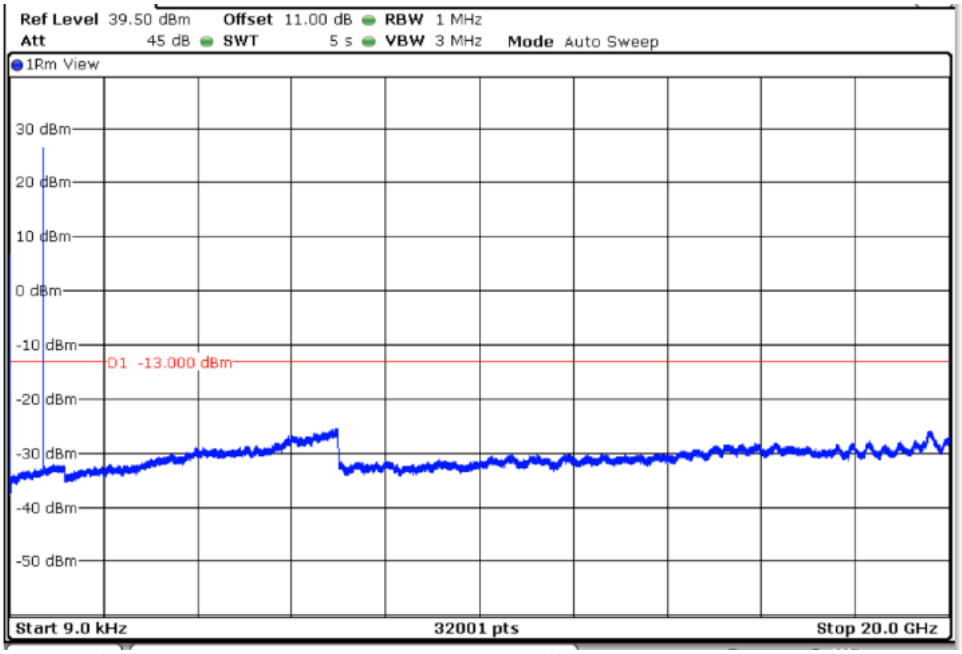


TEST RESULTS (Cont):	

Middle Channel



Highest Channel



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (Band 13)
TEST RESULTS:	PASS

Frequency range 9 kHz – 20 GHz

LTE QPSK MODULATION. BW = 5 MHz

No spurious signal was found for Lowest, Middle and Highest channels.

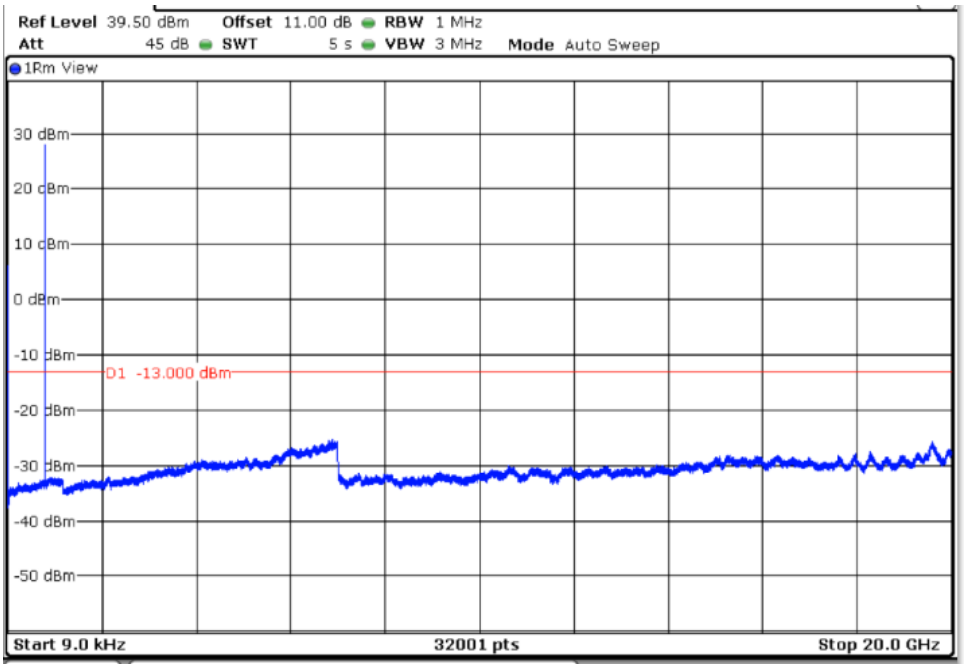
LTE QPSK MODULATION. BW = 10 MHz

No spurious signal was found for Middle channel.

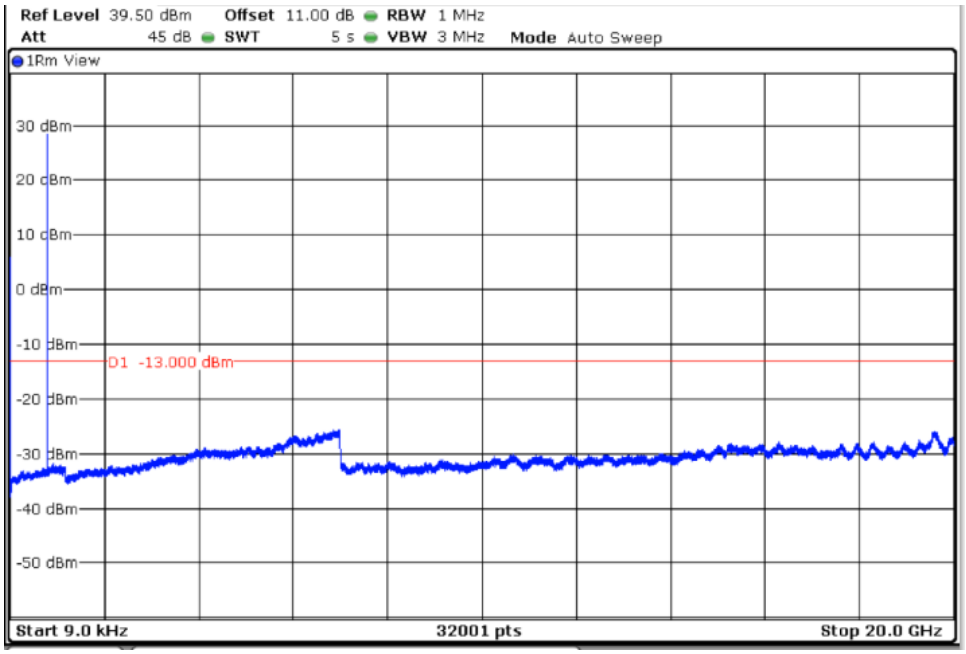
TEST RESULTS (Cont):	

LTE QPSK MODULATION. BW = 5 MHz

Lowest Channel

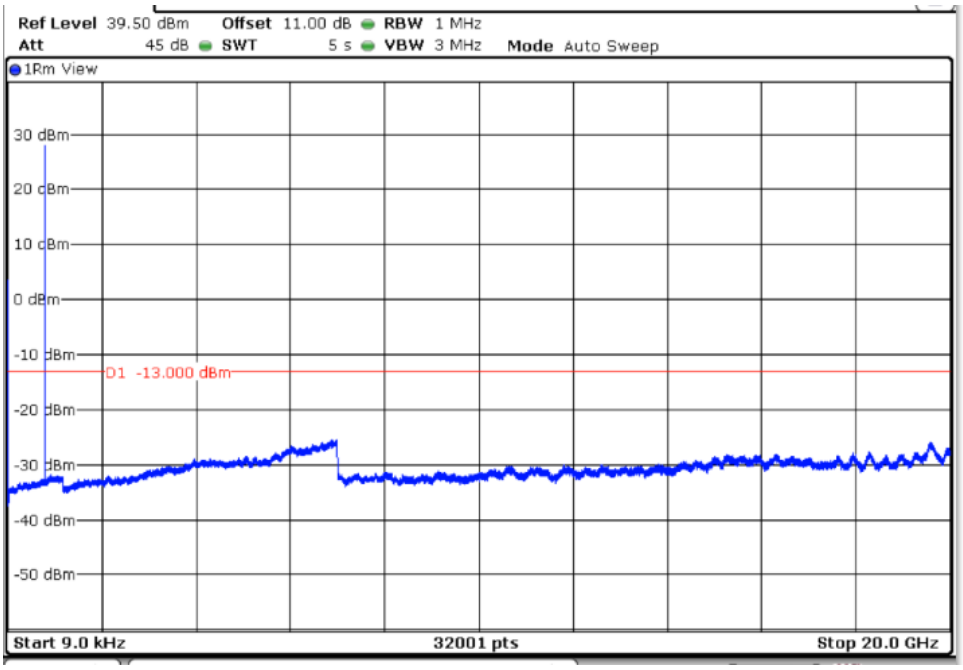


Middle Channel



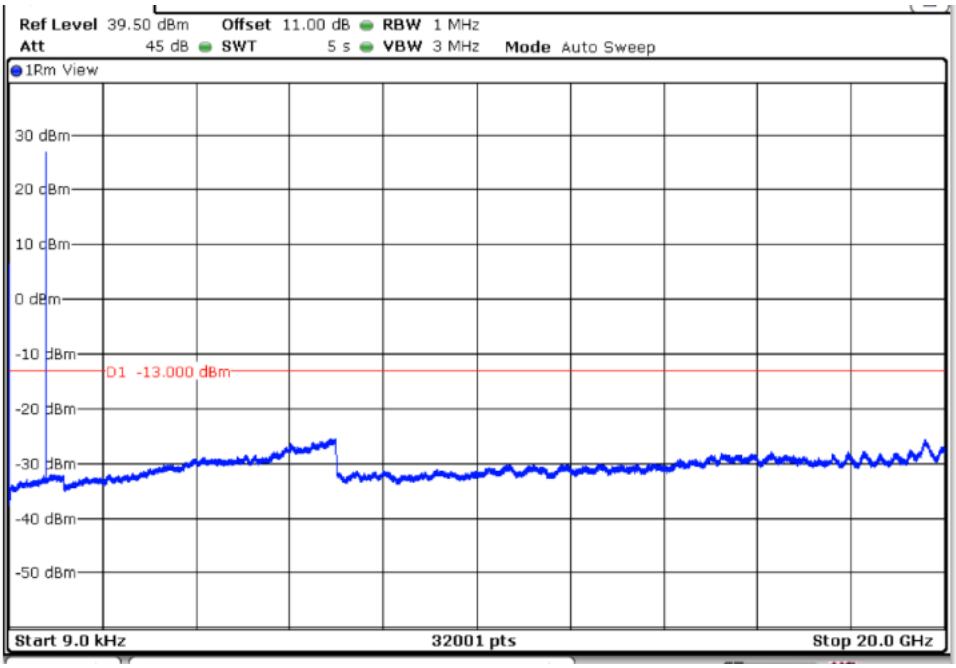
TEST RESULTS (Cont):	

Highest Channel



LTE QPSK MODULATION. BW = 10 MHz

Middle Channel



TEST A.6: SPURIOUS EMISSIONS AT ANTENNA TERMINALS AT BLOCK EDGES

LIMITS:	Product standard:	FCC Part 27 / IC RSS-130 and RSS-139
	Test standard:	FCC § 27.53 / RSS-130 Clause 4.7 and RSS-139 Clause 6.6

LIMITS

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 Po transmitting power of 2 watts (33 dBm), the specified minimum attenuation becomes 43+10log (Po). and the level in dBm relative to Po becomes:

Po (dBm) – [43 + 10 log (Po in watts)] = -13 dBm

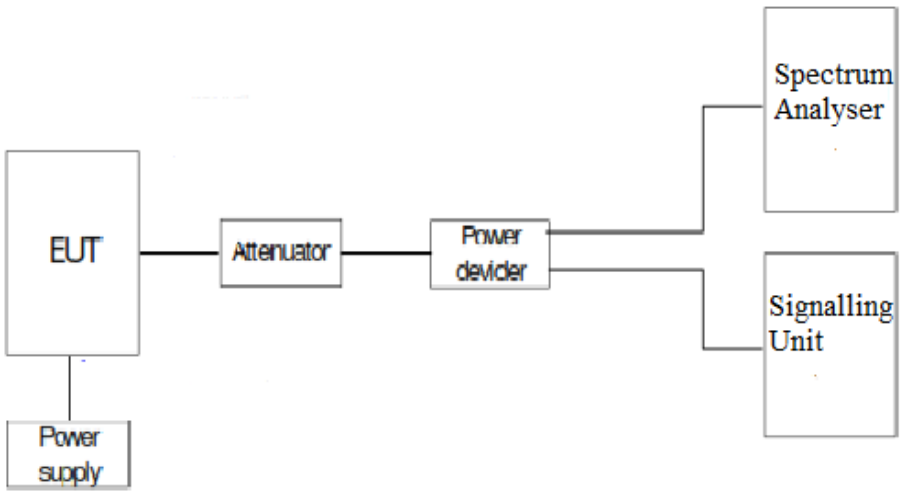
TEST SETUP

The EUT RF output connector was connected to a spectrum analyzer and to the Universal Radio Communication Tester R&S CMW500 (selecting maximum transmission power of the EUT and different modes of modulation) using a 50-ohm attenuator and a power splitter.

The reading of the spectrum analyzer is corrected with the attenuation loss of connection between output terminal of EUT and input of the spectrum analyzer.

For LTE mode the configuration of modulation which is the worst case for conducted power was used.

As indicated in FCC part 27.53 (h) (3), in the 1 MHz bands immediately outside and adjacent to the licensee's frequency block or band, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 4)
TEST RESULTS:	PASS

LTE QPSK MODULATION	RB=1. Offset =0. BW = 5 MHz	RB=1. Offset =0. BW = 10 MHz	RB=1. Offset =0. BW = 15 MHz	RB=1. Offset =0. BW = 20 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-16.25	-30.90	-31.43	-36.32

LTE QPSK MODULATION:	RB= 6. Offset =0. BW = 5 MHz	RB= 6. Offset =0. BW = 10 MHz	RB=6. Offset =0. BW = 15 MHz	RB= 6. Offset =0. BW = 20 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-17.31	-18.78	-22.51	-35.85

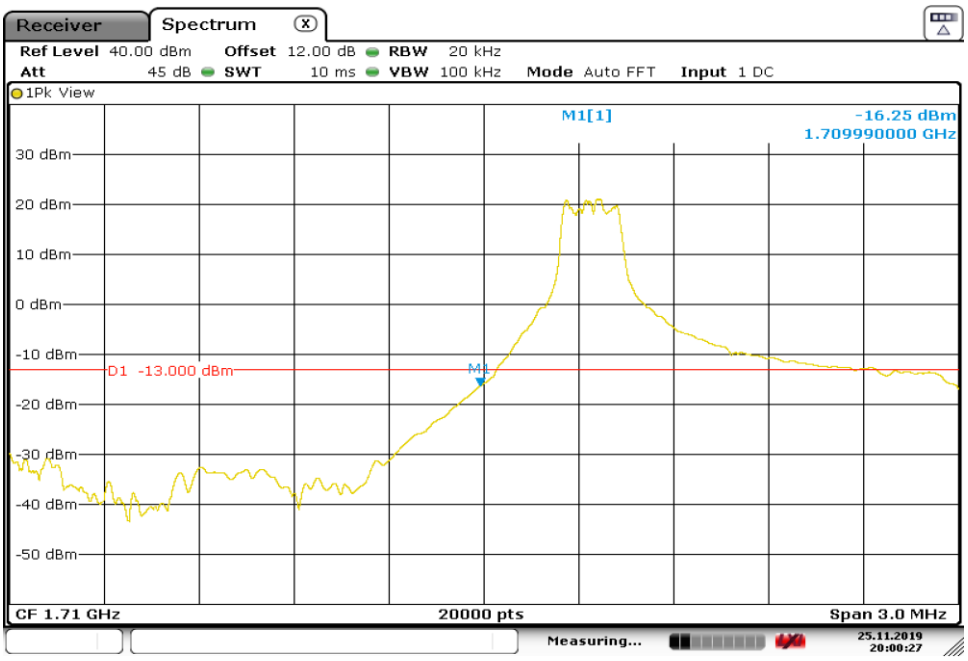
LTE QPSK MODULATION:	RB= 1. Offset=5. BW = 5 MHz	RB= 1. Offset=5. BW = 10 MHz	RB= 1. Offset=5. BW = 15 MHz	RB= 1. Offset=5. BW = 20 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-16.68	-28.38	-29.90	-35.64

LTE QPSK MODULATION:	RB= 6. Offset =0. BW = 5 MHz	RB= 6. Offset =0. BW = 10 MHz	RB= 6. Offset =0. BW = 15 MHz	RB= 6. Offset =0. BW = 20 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-15.35	-18.64	-18.76	-33.82

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 5 MHz

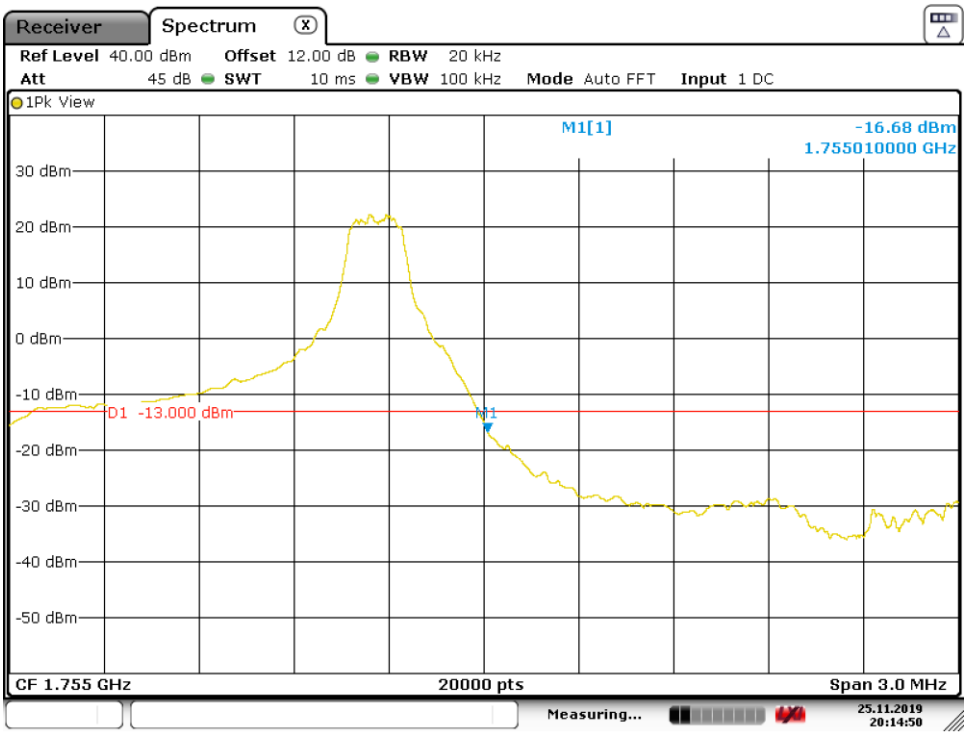
Lowest Channel



Date: 25.NOV.2019 20:00:27

LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 5 MHz

Highest Channel

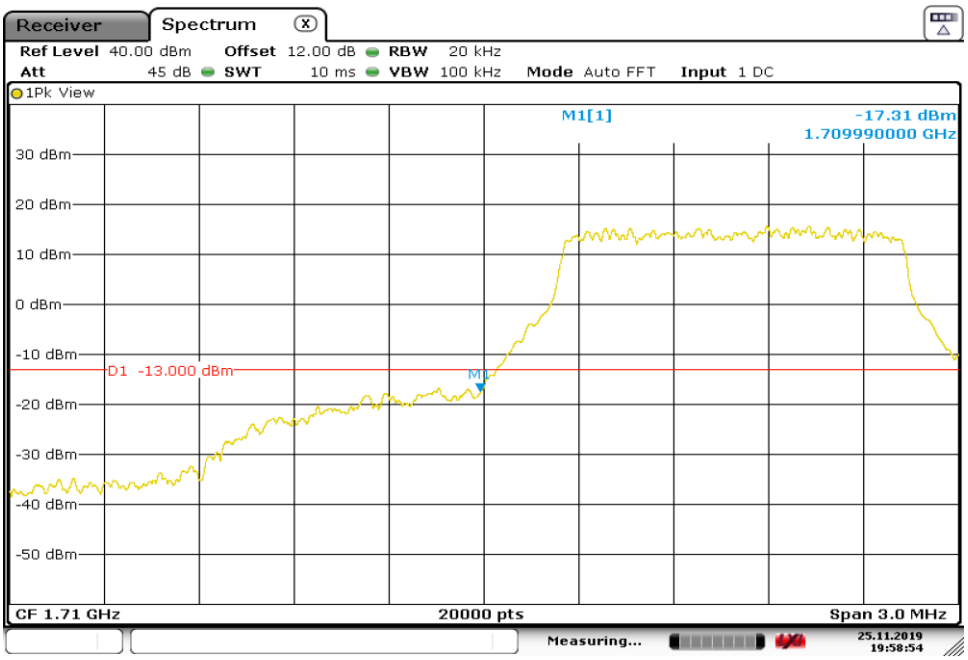


Date: 25.NOV.2019 20:14:50

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

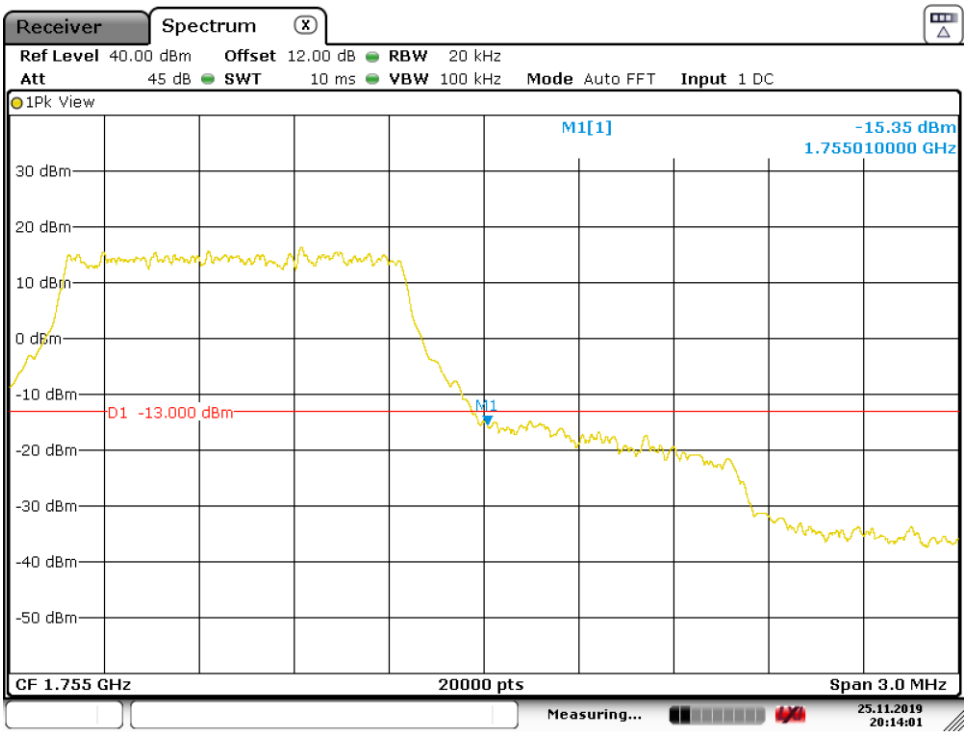
Lowest Channel



Date: 25.NOV.2019 19:58:54

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

Highest Channel

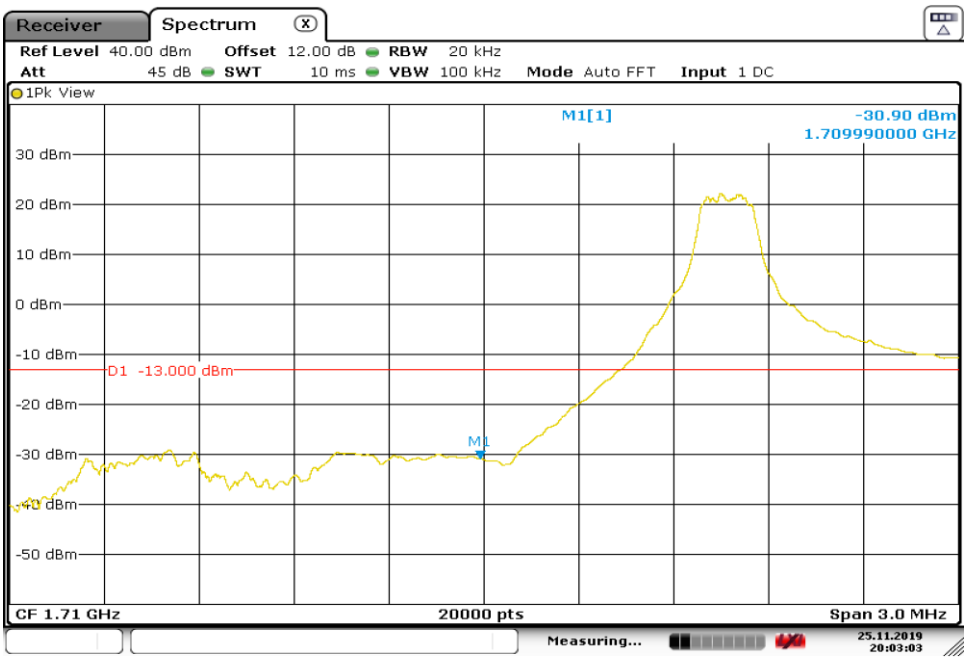


Date: 25.NOV.2019 20:14:01

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 10 MHz

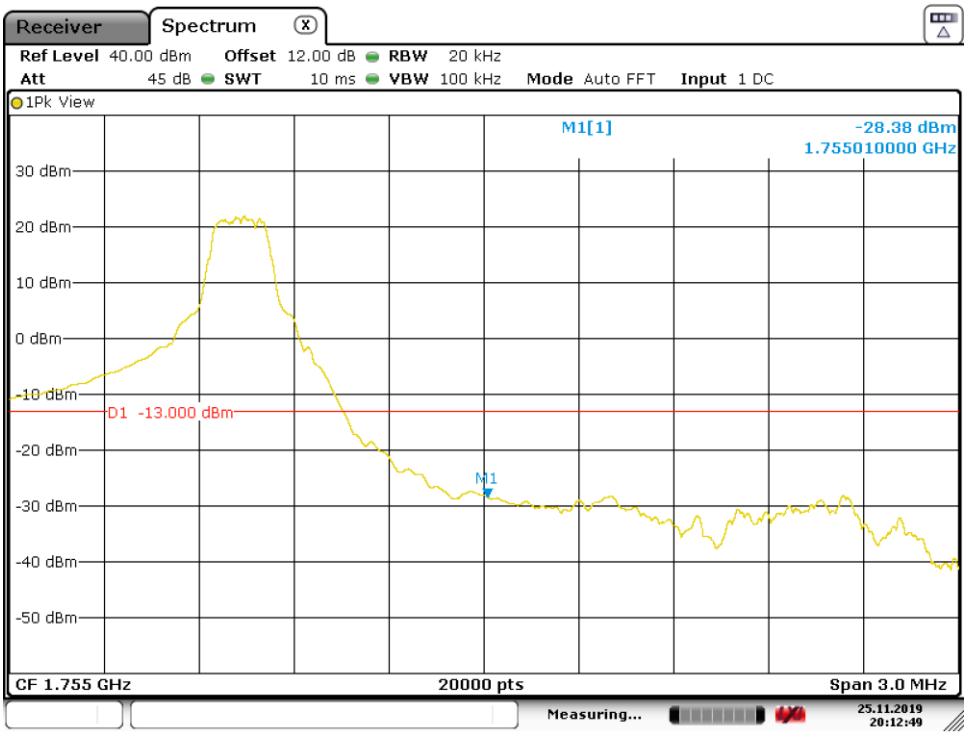
Lowest Channel



Date: 25.NOV.2019 20:03:03

LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 10 MHz

Highest Channel

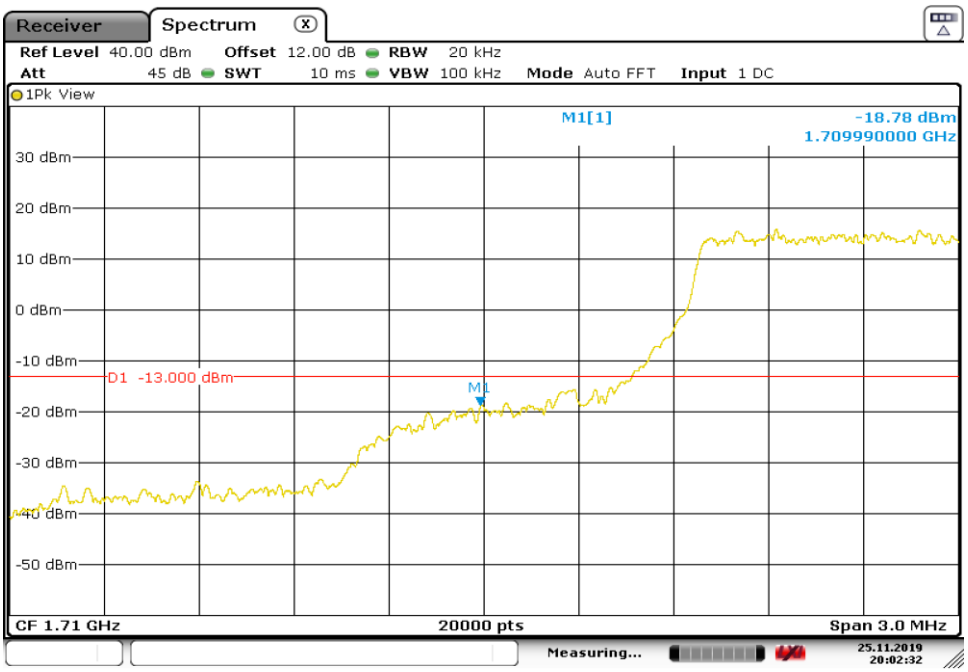


Date: 25.NOV.2019 20:12:49

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

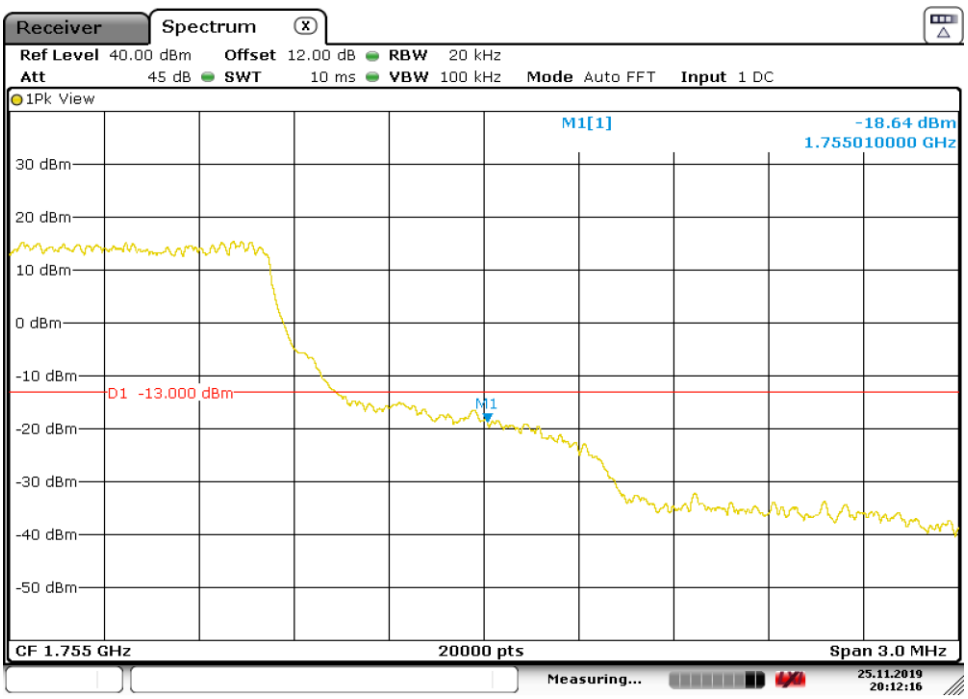
Lowest Channel



Date: 25.NOV.2019 20:02:32

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

Highest Channel

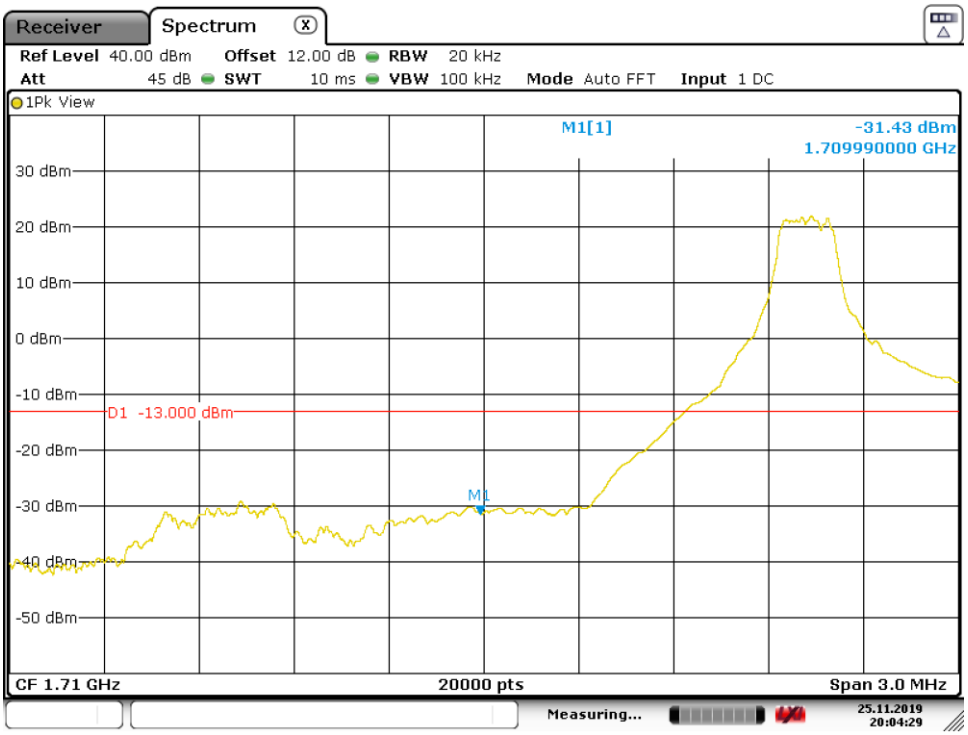


Date: 25.NOV.2019 20:12:16

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 15 MHz

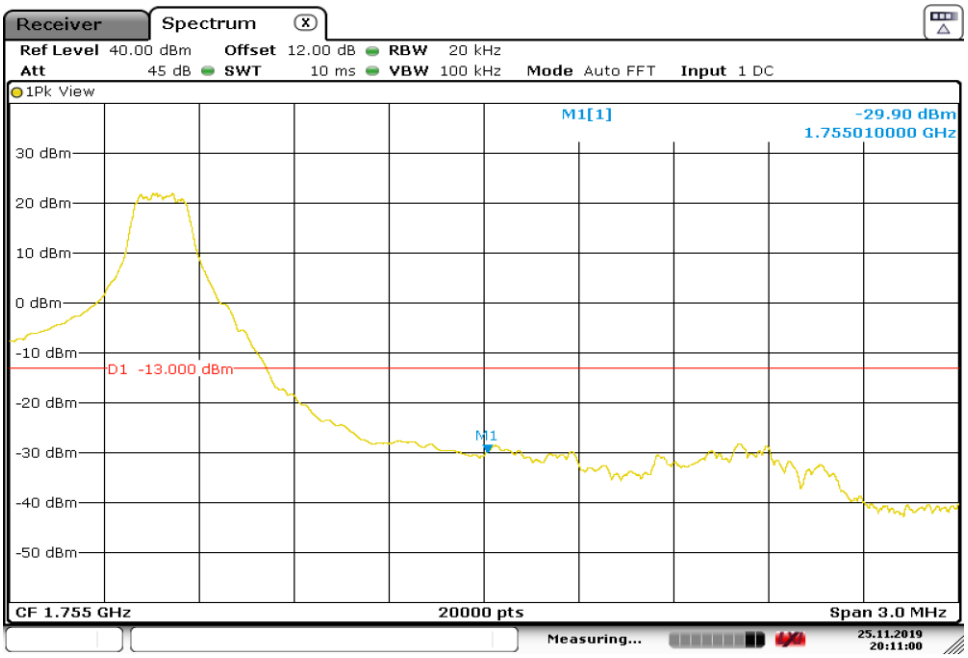
Lowest Channel



Date: 25.NOV.2019 20:04:29

LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 15 MHz

Highest Channel



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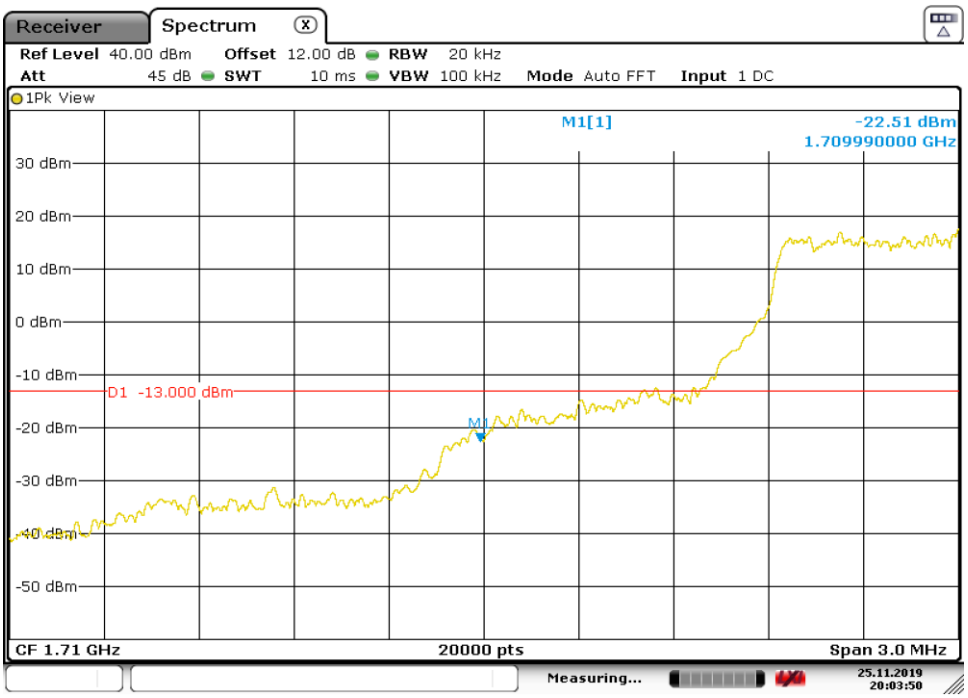
TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 15 MHz

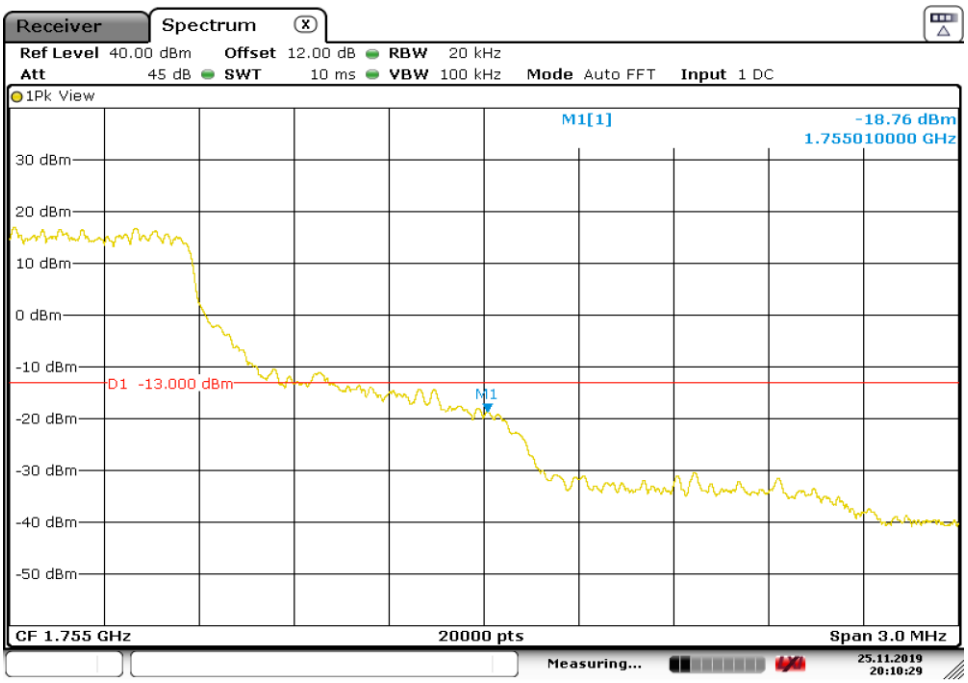
Lowest Channel



Date: 25.NOV.2019 20:03:51

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 15 MHz

Highest Channel

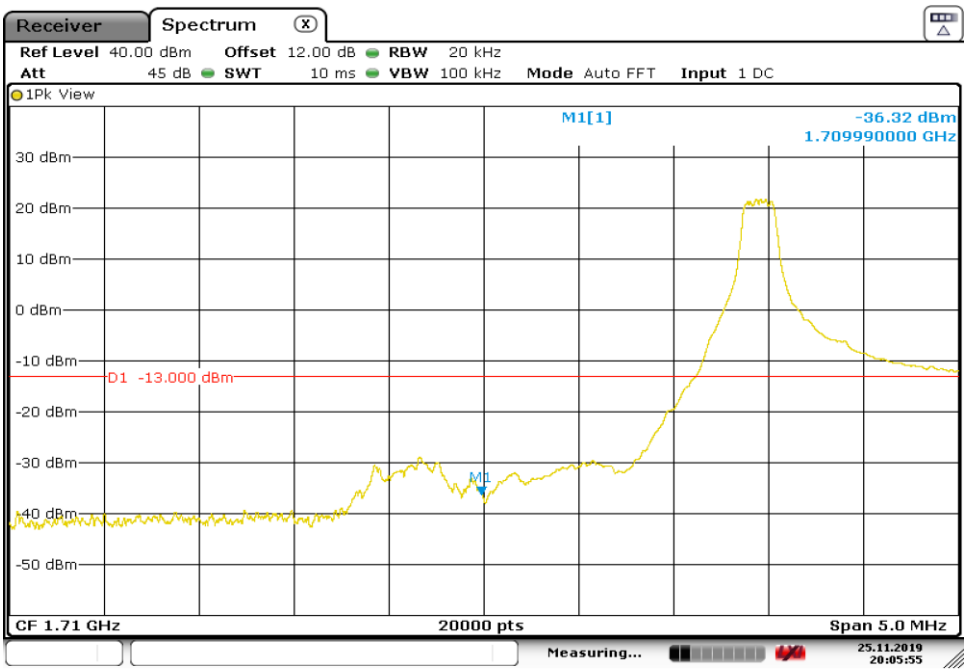


Date: 25.NOV.2019 20:10:29

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 20 MHz

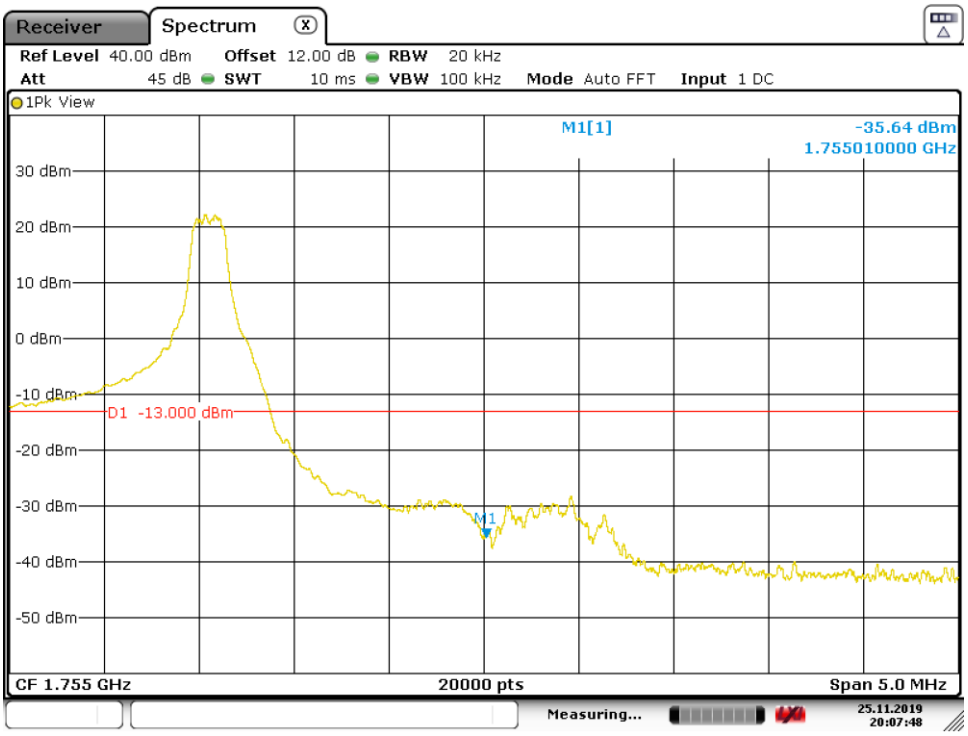
Lowest Channel



Date: 25.NOV.2019 20:05:56

LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 20 MHz

Highest Channel

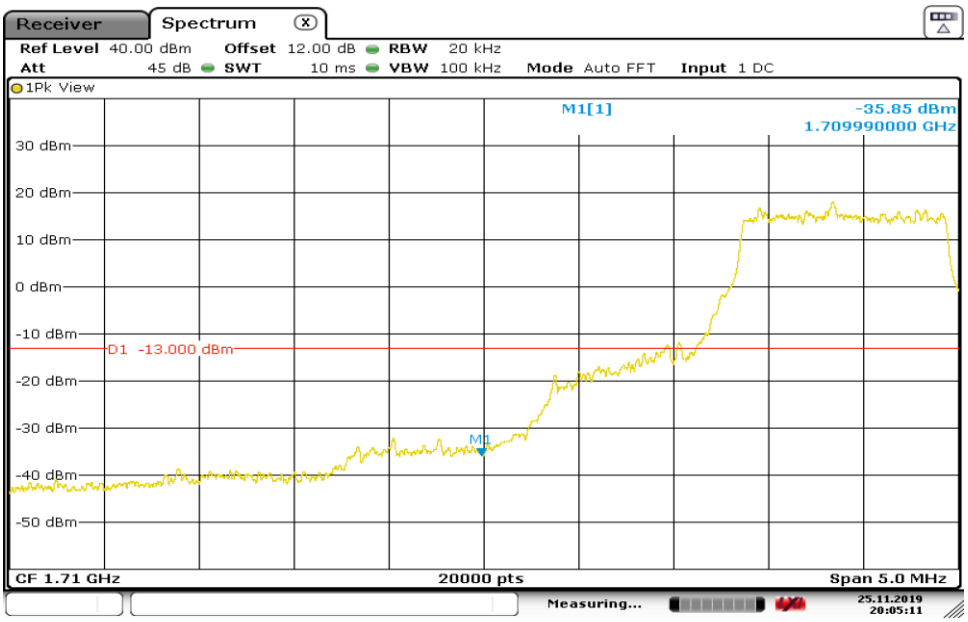


Date: 25.NOV.2019 20:07:48

TEST RESULTS (Cont):	

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 20 MHz

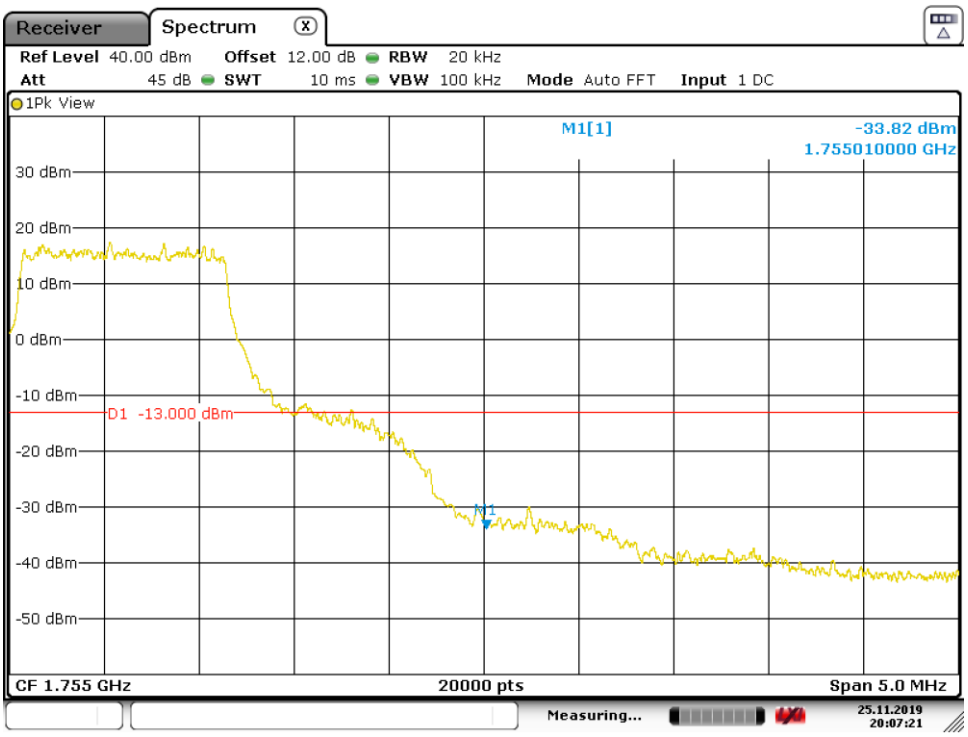
Lowest Channel



Date: 25.NOV.2019 20:05:10

LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 20 MHz

Highest Channel



Date: 25.NOV.2019 20:07:22

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (Band 12)
TEST RESULTS:	PASS

LTE QPSK MODULATION	RB=1. Offset =0. BW = 5 MHz	RB=1. Offset =0. BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-23.31	-30.52

LTE QPSK MODULATION:	RB= 6. Offset =0. BW = 5 MHz	RB= 6. Offset =0. BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-14.43	-20.15

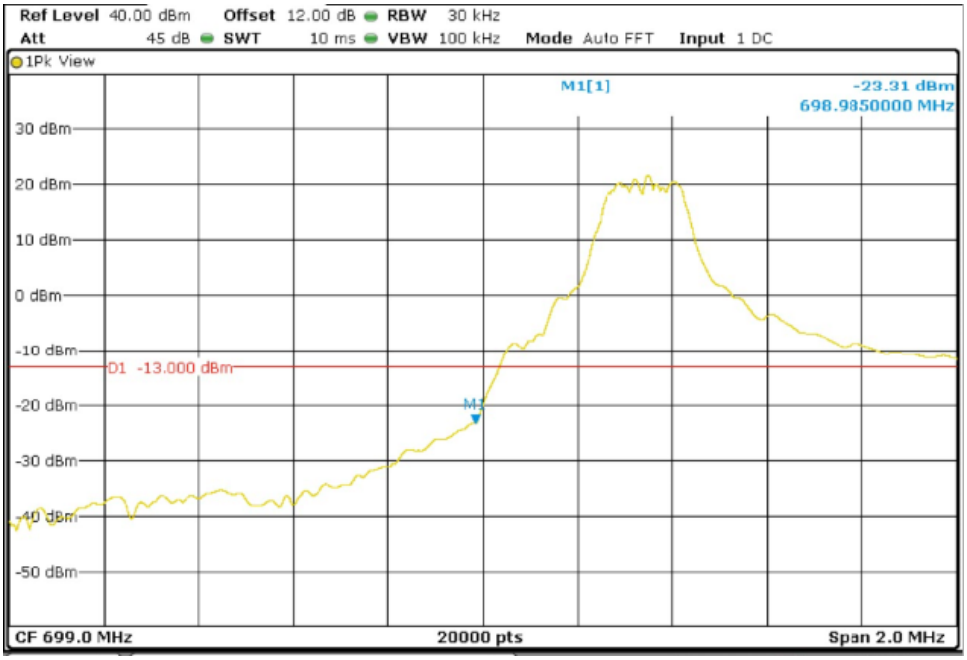
LTE QPSK MODULATION:	RB= 1. Offset=5. BW = 5 MHz	RB= 1. Offset=5. BW = 10 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-19.98	-33.77

LTE QPSK MODULATION:	RB= 6. Offset =0. BW = 5 MHz	RB= 6. Offset =0. BW = 10 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-16.89	-24.54

TEST RESULTS (Cont):	

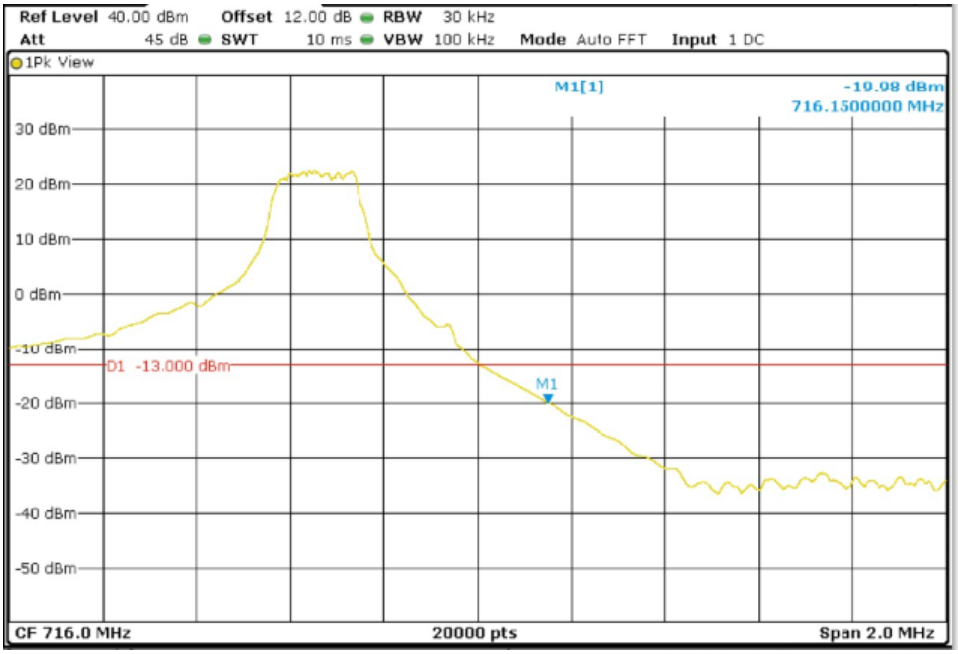
LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 5 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 5 MHz

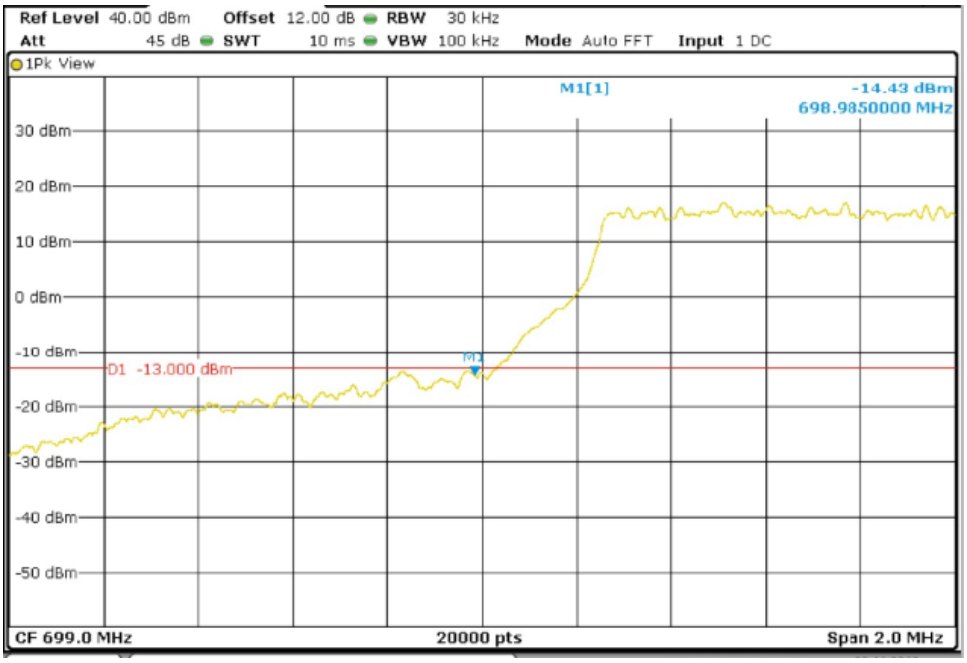
Highest Channel



TEST RESULTS (Cont):	

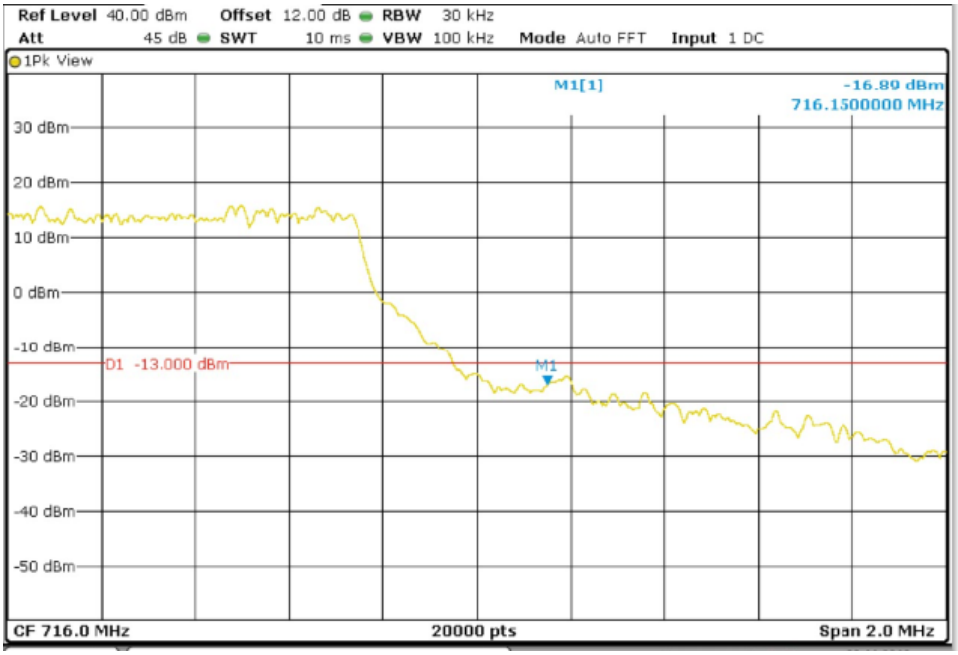
LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

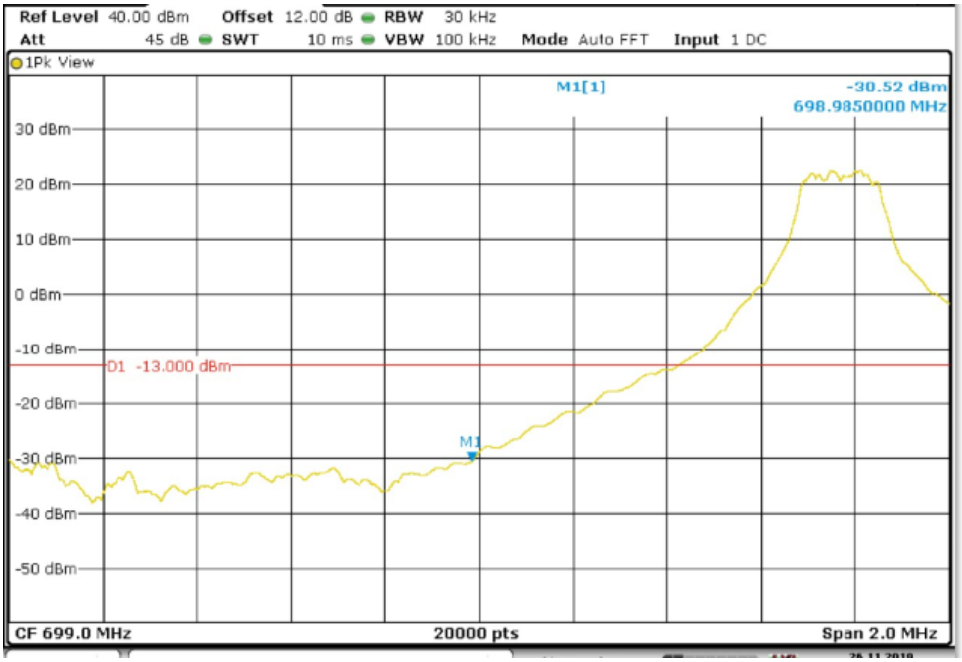
Highest Channel



TEST RESULTS (Cont):	

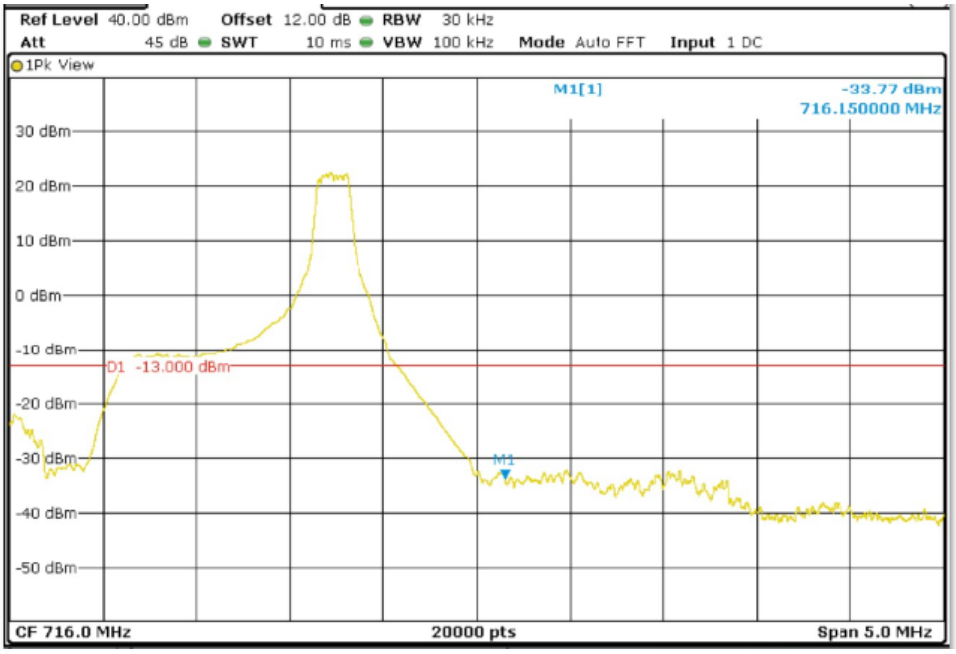
LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 10 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 10 MHz

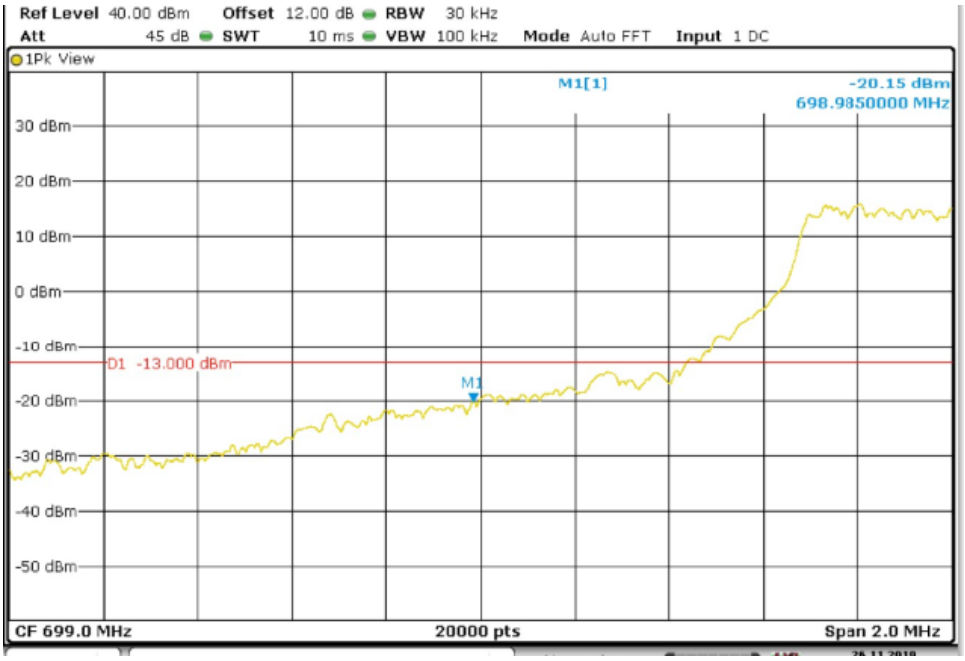
Highest Channel



TEST RESULTS (Cont):	

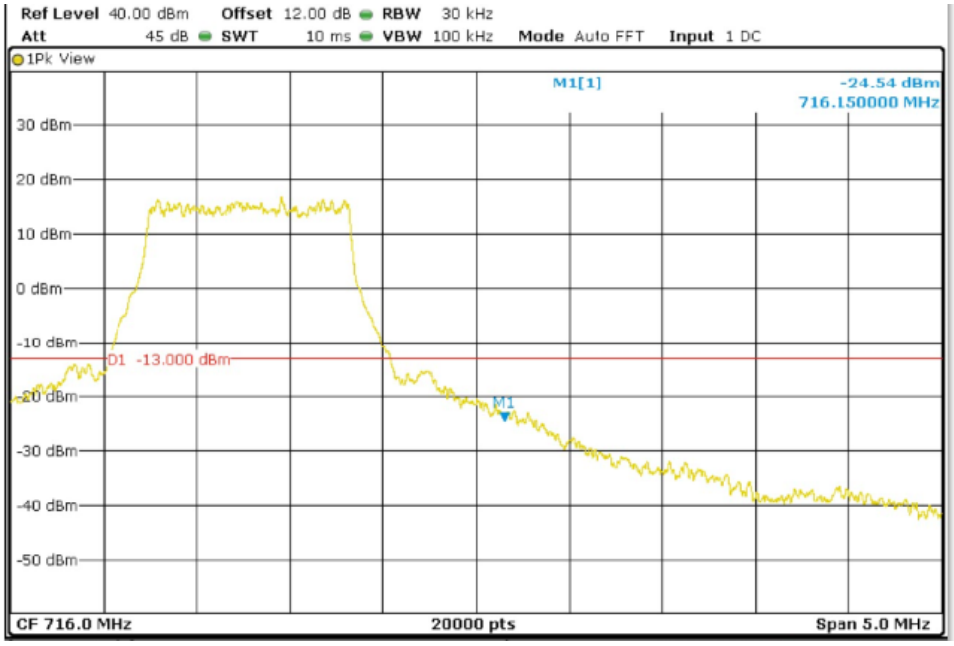
LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

Highest Channel



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (Band 13)
TEST RESULTS:	PASS

LTE QPSK MODULATION	RB=1. Offset =0. BW = 5 MHz	RB=1. Offset =0. BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-14.48	-34.25

LTE QPSK MODULATION:	RB= 6. Offset =0. BW = 5 MHz	RB= 6. Offset =0. BW = 10 MHz
Maximum measured level at lowest Block Edge at antenna port (dBm)	-16.17	-20.3

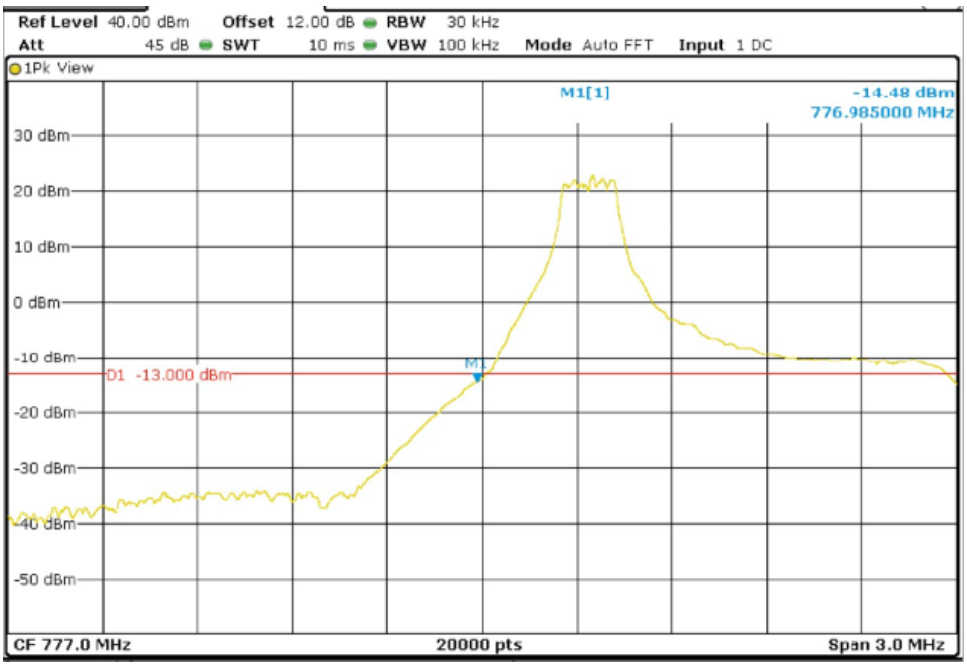
LTE QPSK MODULATION:	RB= 1. Offset=5. BW = 5 MHz	RB= 1. Offset=5. BW = 10 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-16.64	-28.14

LTE QPSK MODULATION:	RB= 6. Offset =0. BW = 5 MHz	RB= 6. Offset =0. BW = 10 MHz
Maximum measured level at highest Block Edge at antenna port (dBm)	-17.84	-21.68

TEST RESULTS (Cont):	

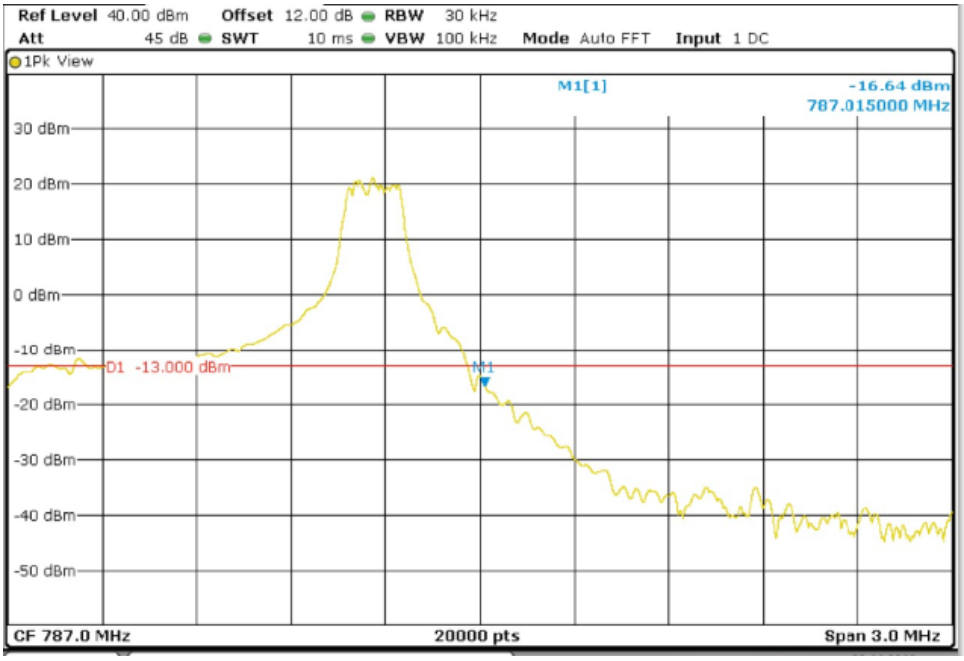
LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 5 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 5 MHz

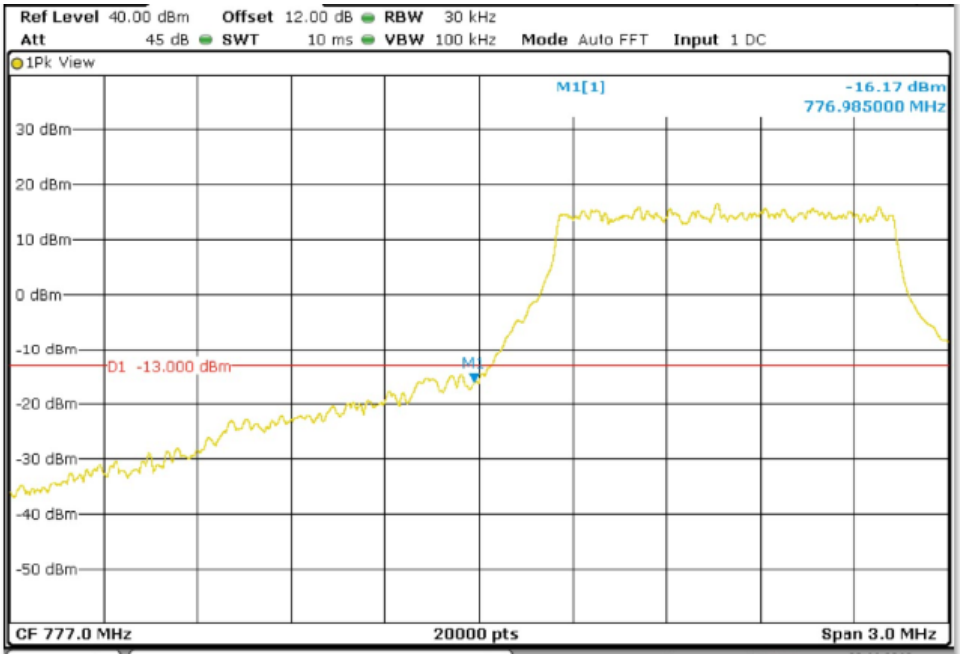
Highest Channel



TEST RESULTS (Cont):	

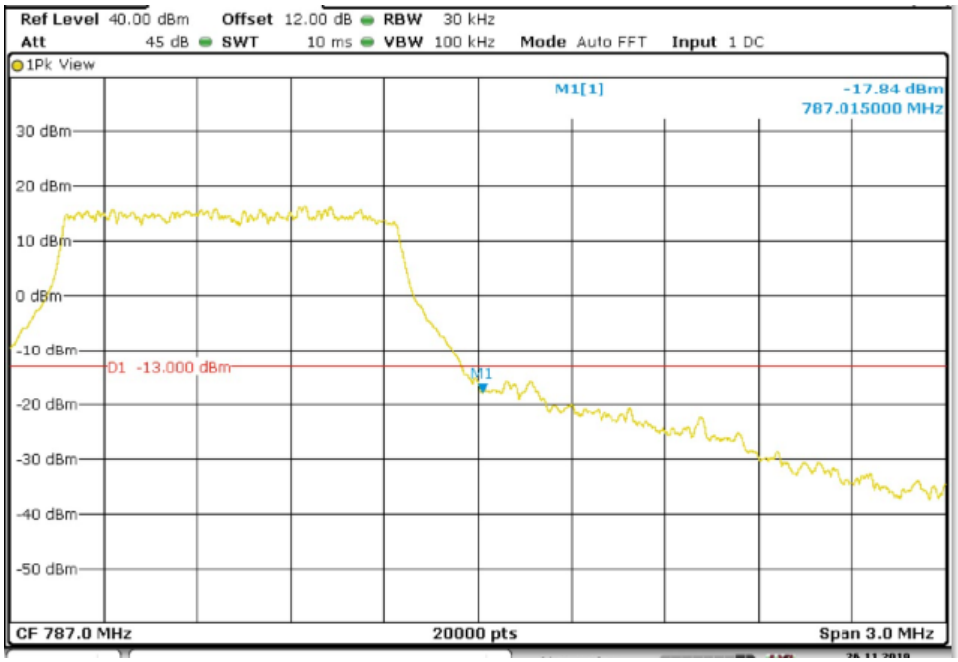
LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 5 MHz

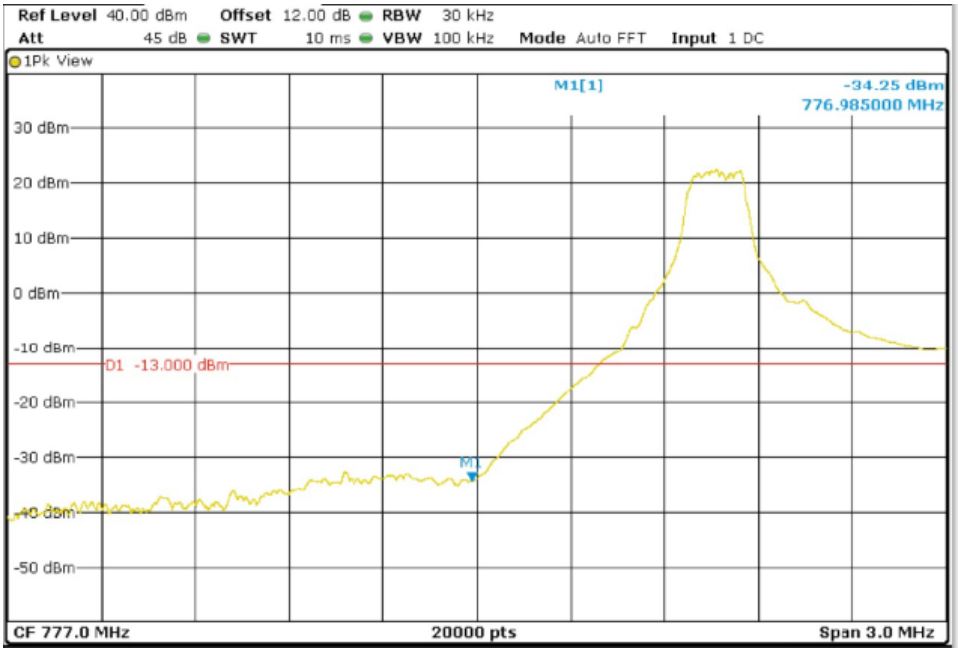
Highest Channel



TEST RESULTS (Cont):	

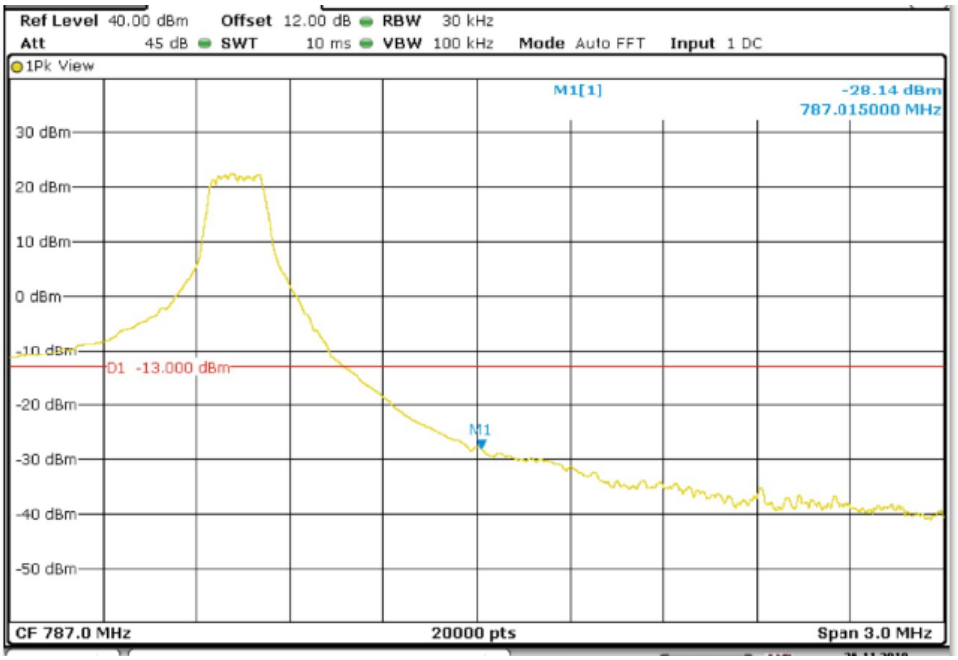
LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 10 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 1. Offset = 5. BW = 10 MHz

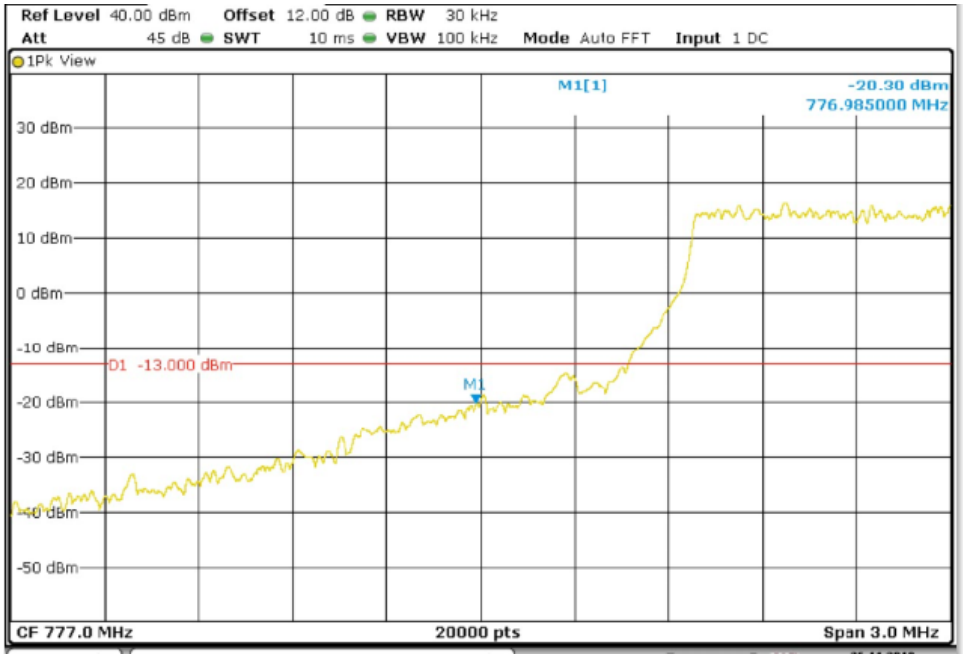
Highest Channel



TEST RESULTS (Cont):	

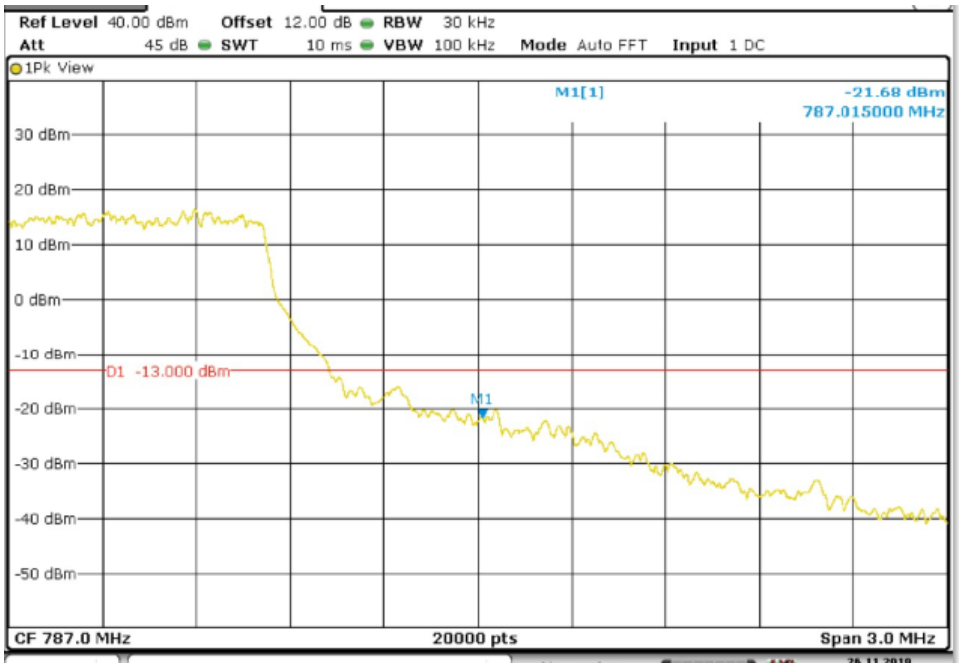
LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

Lowest Channel



LTE QPSK MODULATION. RB = 6. Offset = 0. BW = 10 MHz

Highest Channel



TEST A.7: RADIATED EMISSIONS

LIMITS:	Product standard:	FCC Part 27 / IC RSS-130 and 139
	Test standard:	FCC §2.1053 and §27.53 / RSS-130 Clause 4.7 and RSS-139 Clause 6.6

LIMITS

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 Po transmitting power of 2 watts (33 dBm), the specified minimum attenuation becomes 43+10log (Po). and the level in dBm relative to Po becomes:

Po (dBm) – [43 + 10 log (Po in watts)] = -13 dBm

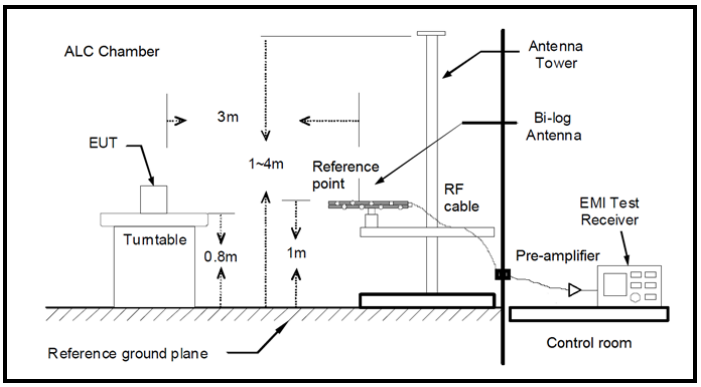
TEST SETUP

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.

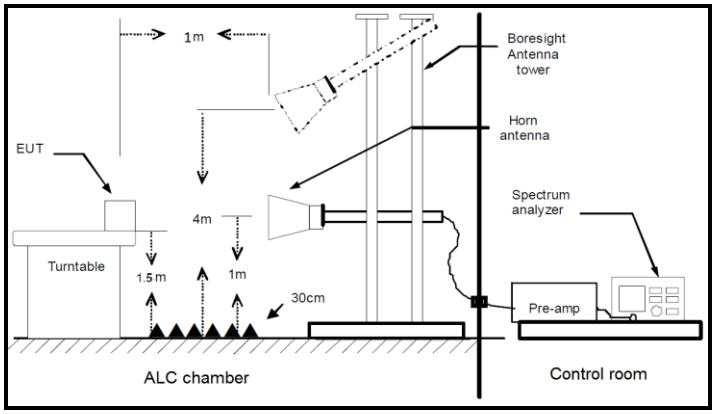
The EUT was placed on a non-conductive stand at a 3-meter distance from the measuring antenna for measurements below 1 GHz and at 1-meter distance for measurements above 1 GHz.

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

Radiated measurements < 1GHz



Radiated measurements > 1GHz



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (Band 4)
TEST RESULTS:	PASS

RESULTS

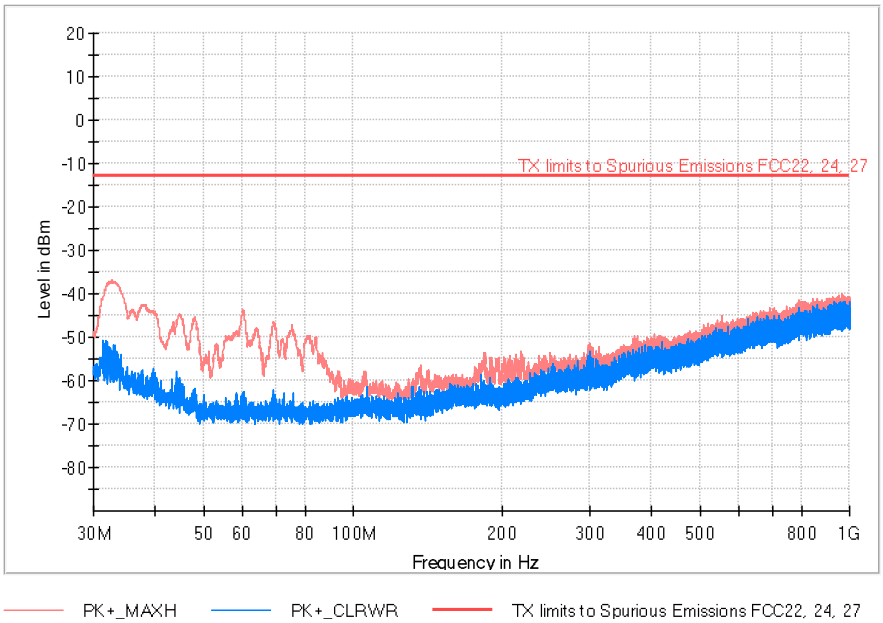
A preliminary scan determined the QPSK 5 MHz bandwidth as the worst case. The configuration of Resource Blocks which is the worst case for conducted power was used.

The following plots show the results for this configuration.

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 5 MHz

TEST RESULTS (Cont):	Low Channel

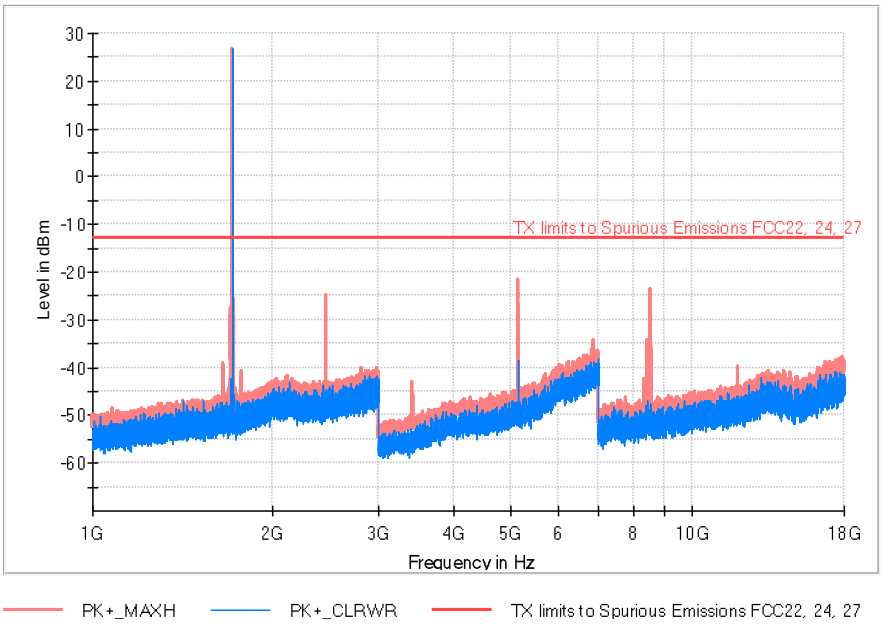
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)
32.683667	-54.29	-36.96
60.037667	-63.17	-43.74
299.789333	-56.85	-51.31

TEST RESULTS (Cont):	Low Channel

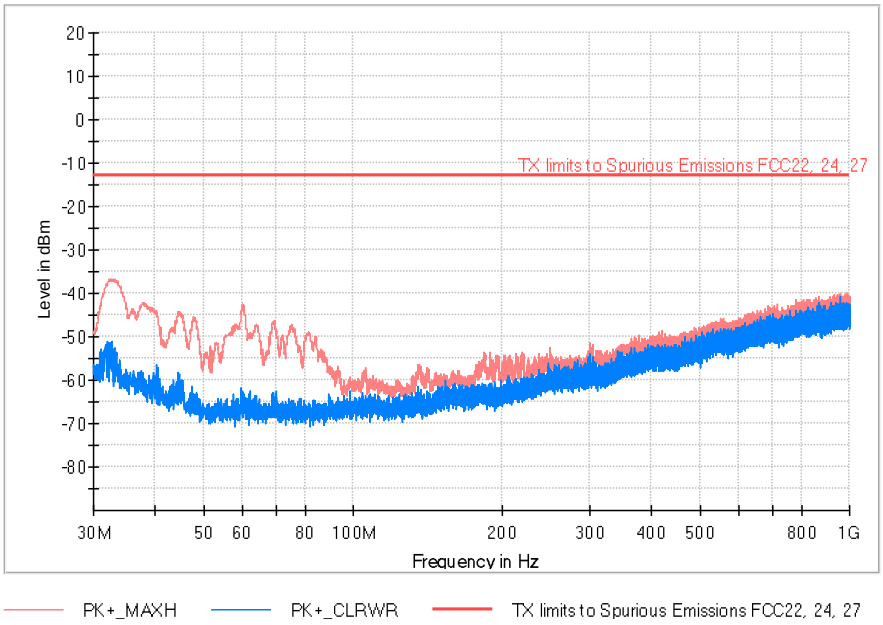
FREQUENCY RANGE: 1-18 GH



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
1714.533333	26.82	26.82	Fundamental UL
2449.266667	-47.54	-24.76	
3428.500000	-54.62	-43.07	
3428.500000	-54.62	-43.07	
5144.000000	-52.30	-21.57	
8553.500000	-52.03	-23.60	
12002.500000	-48.65	-39.92	

TEST RESULTS(Cont.):	Middle Channel

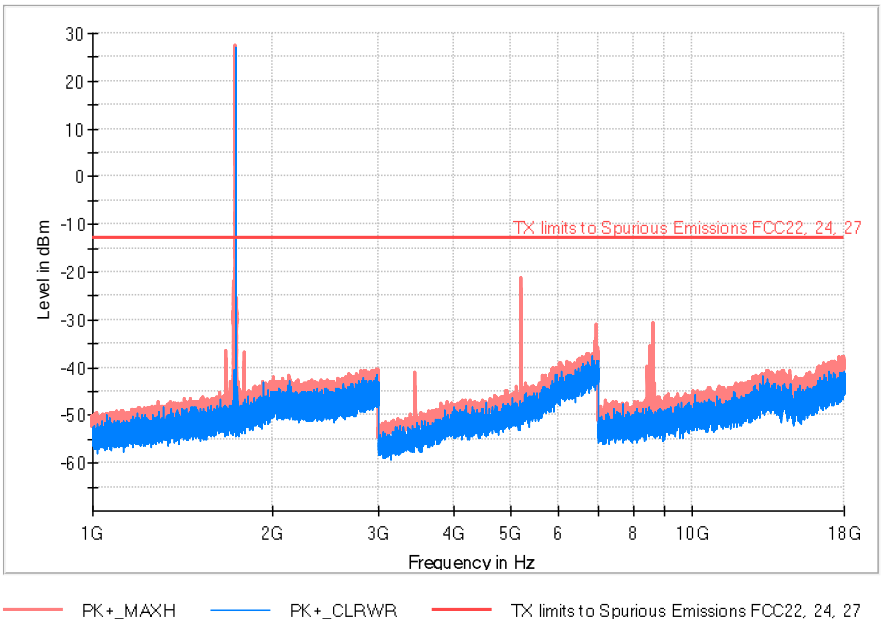
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)
32.748333	-51.52	-36.74
60.167000	-66.65	-42.84
300.274333	-60.11	-51.33

TEST RESULTS (Cont):	Middle Channel

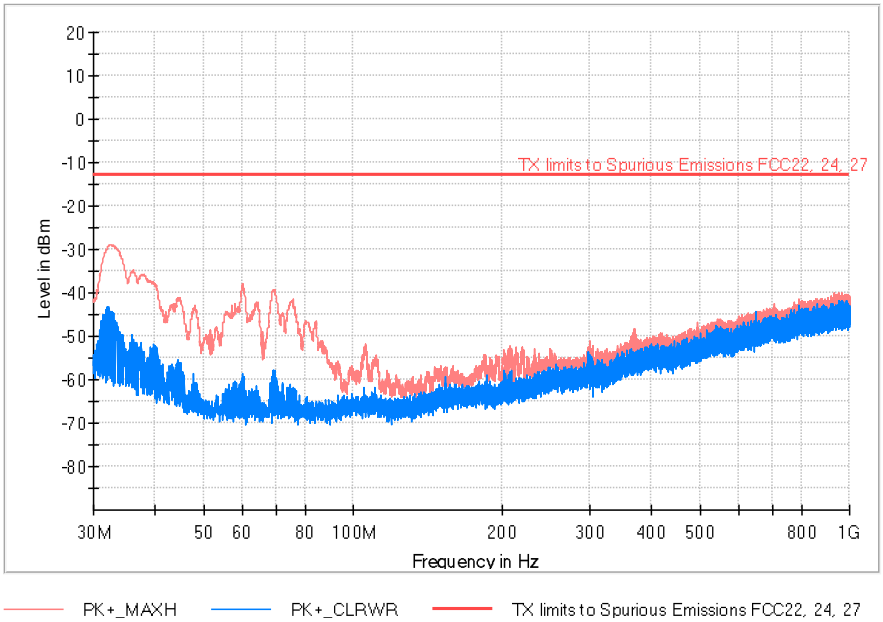
FREQUENCY RANGE: 1-18 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
1673.133333	-51.35	-36.56	
1734.600000	26.50	27.38	Fundamental UL
1796.333333	-51.50	-37.02	
3469.000000	-56.08	-41.26	
5204.000000	-49.98	-21.24	
6938.500000	-38.46	-30.95	
8533.500000	-49.61	-35.73	
8652.000000	-53.52	-30.86	

TEST RESULTS(Cont.):	High Channel

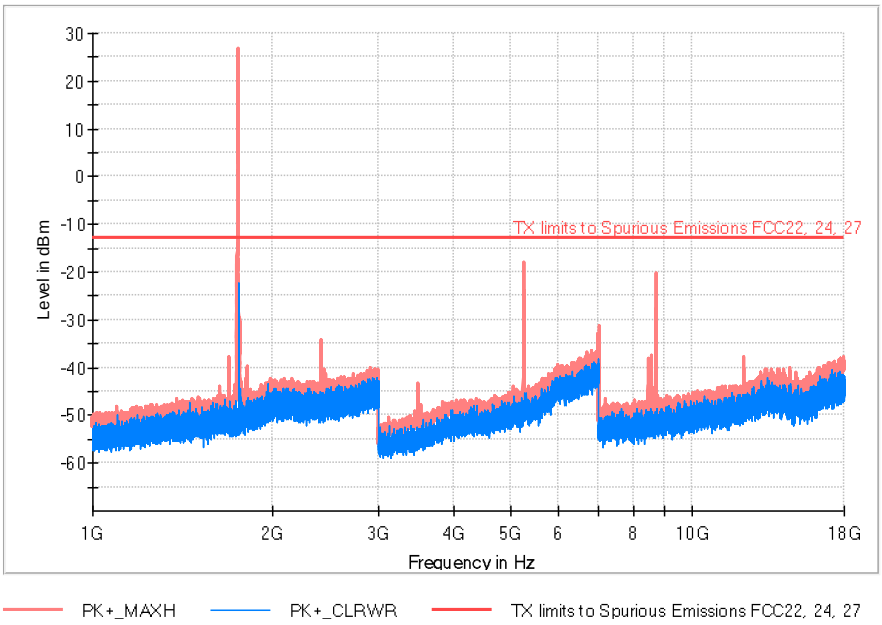
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)
32.716000	-45.15	-28.86
60.005333	-58.65	-37.90
299.821667	-54.69	-51.10

TEST RESULTS (Cont):	High Channel

FREQUENCY RANGE: 1-18 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
1750.933333	-29.37	26.72	Fundamental UL
2416.733333	-48.08	-34.39	
3509.000000	-57.07	-43.26	
5264.000000	-47.75	-17.89	
7019.000000	-52.75	-31.42	
8773.000000	-52.77	-20.43	
12283.000000	-48.26	-37.89	

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (Band 12)
TEST RESULTS:	PASS

RESULTS

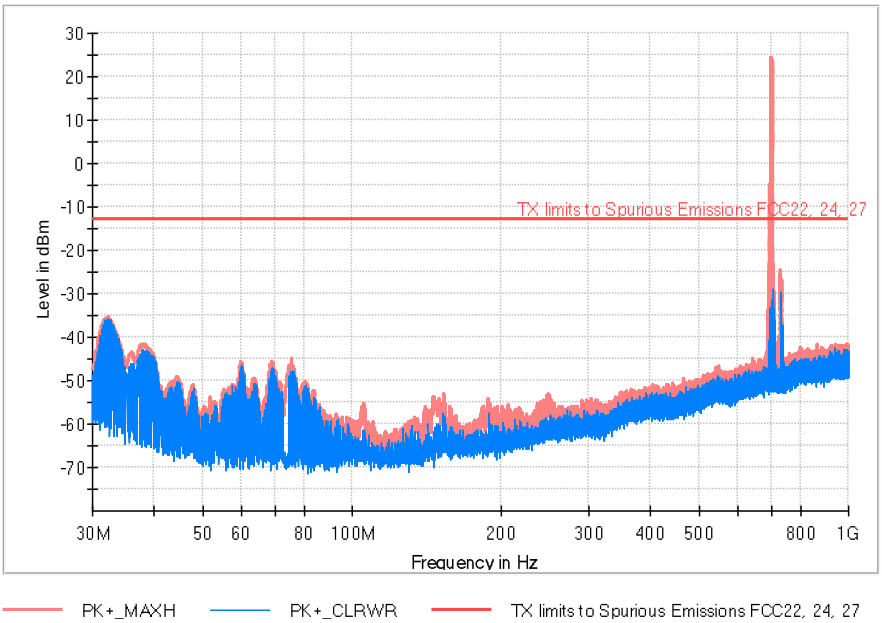
A preliminary scan determined the QPSK 5 MHz bandwidth as the worst case. The configuration of Resource Blocks which is the worst case for conducted power was used.

The following plots show the results for this configuration.

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 5 MHz

TEST RESULTS (Cont):	Low Channel

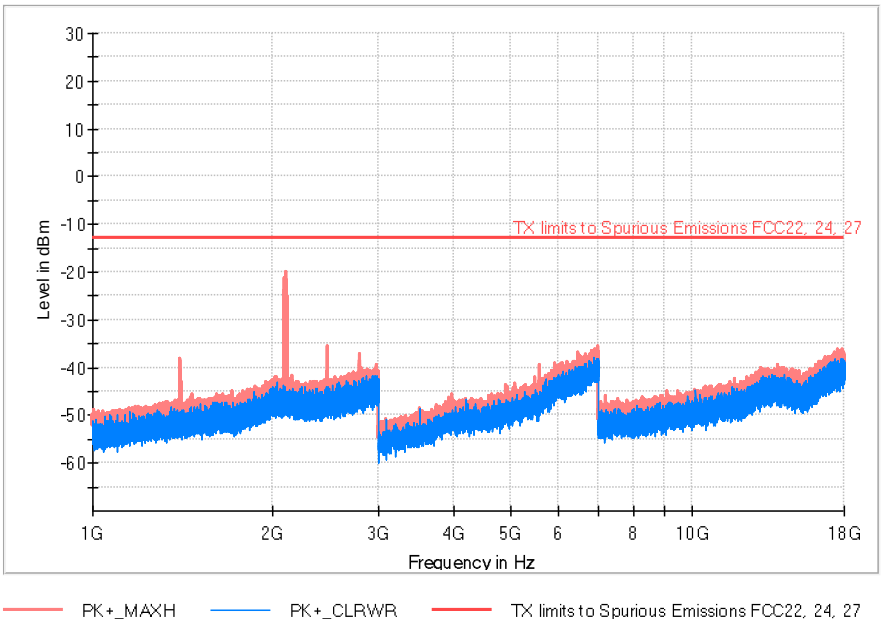
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
32.360333	-36.06	-35.42	
75.557667	-47.90	-44.93	
189.144667	-60.72	-54.28	
703.632667	-37.34	23.67	Fundamental UL
732.118333	-47.68	-24.76	Fundamental DL

TEST RESULTS (Cont):	Low Channel

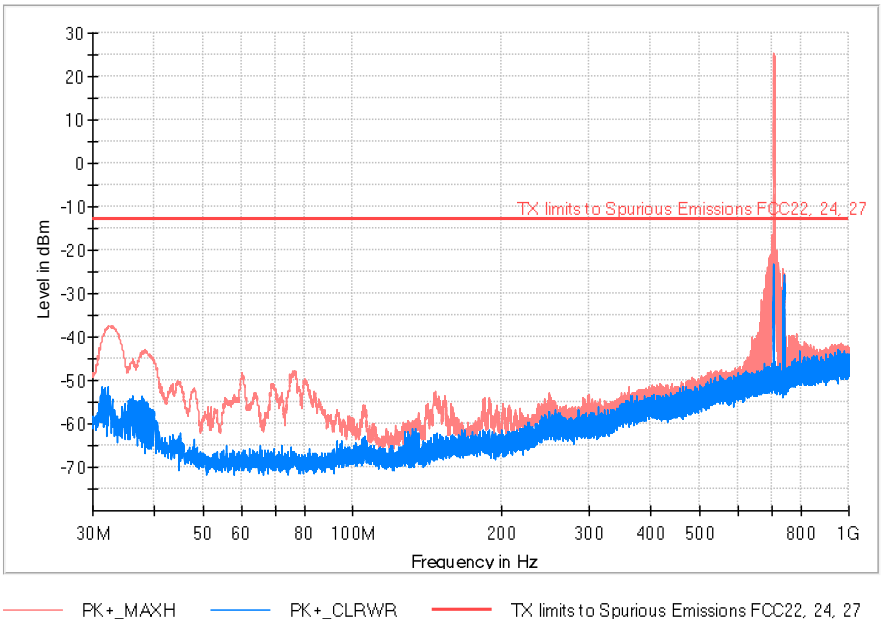
FREQUENCY RANGE: 1-18 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)
1398.933333	-52.68	-38.34
2110.533333	-48.09	-20.00
2470.400000	-47.44	-35.44
2797.133333	-46.05	-37.27

TEST RESULTS (Cont):	Middle Channel

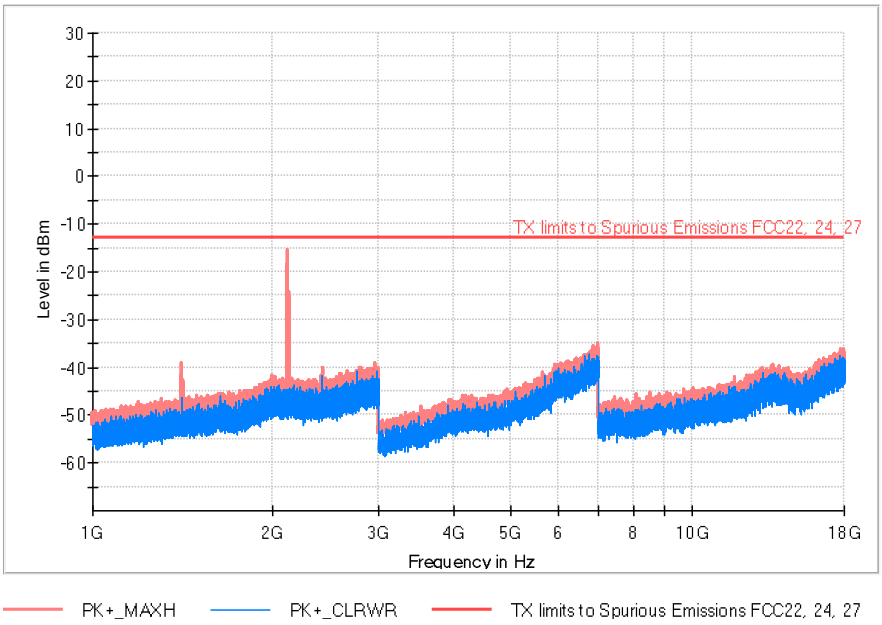
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
32.457333	-53.47	-37.35	
76.139667	-68.26	-48.33	
147.370000	-64.93	-52.36	
705.443333	-51.23	25.19	Fundamental UL
735.578000	-50.36	-24.20	Fundamental DL

TEST RESULTS (Cont):	Middle Channel

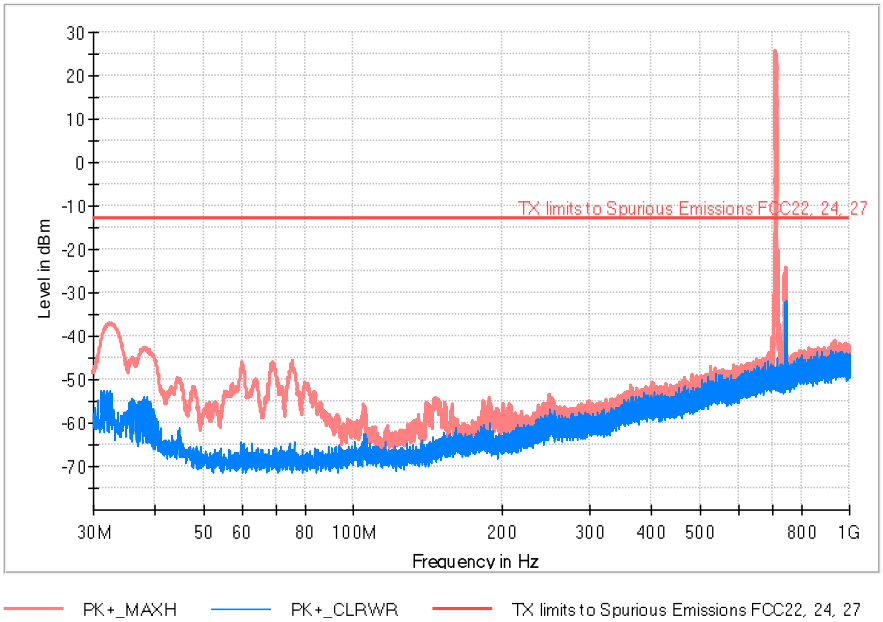
FREQUENCY RANGE: 1-18 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)
1410.866667	-50.07	-39.10
2116.466667	-48.52	-15.52
11814.500000	-44.45	-42.15

TEST RESULTS(Cont.):	High Channel

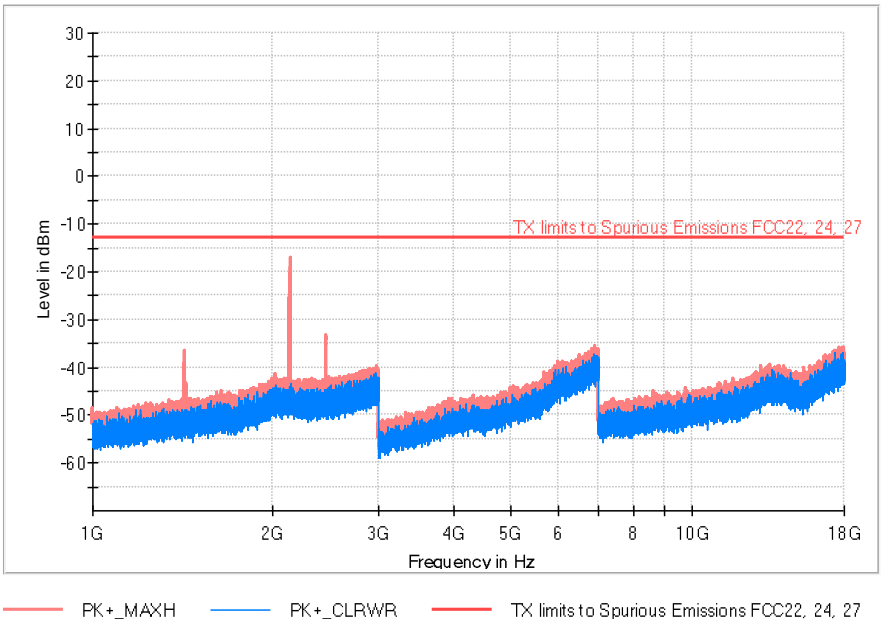
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
32.263333	-62.31	-37.02	
75.557667	-65.95	-45.86	
715.143333	-49.38	24.74	Fundamental UL
745.342667	-49.18	-24.29	Fundamental DL

TEST RESULTS (Cont):	High Channel

FREQUENCY RANGE: 1-18 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)
1422.866667	-51.64	-36.43
2147.066667	-47.45	-17.14
2453.133333	-45.90	-33.22

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (Band 13)
TEST RESULTS:	PASS

RESULTS

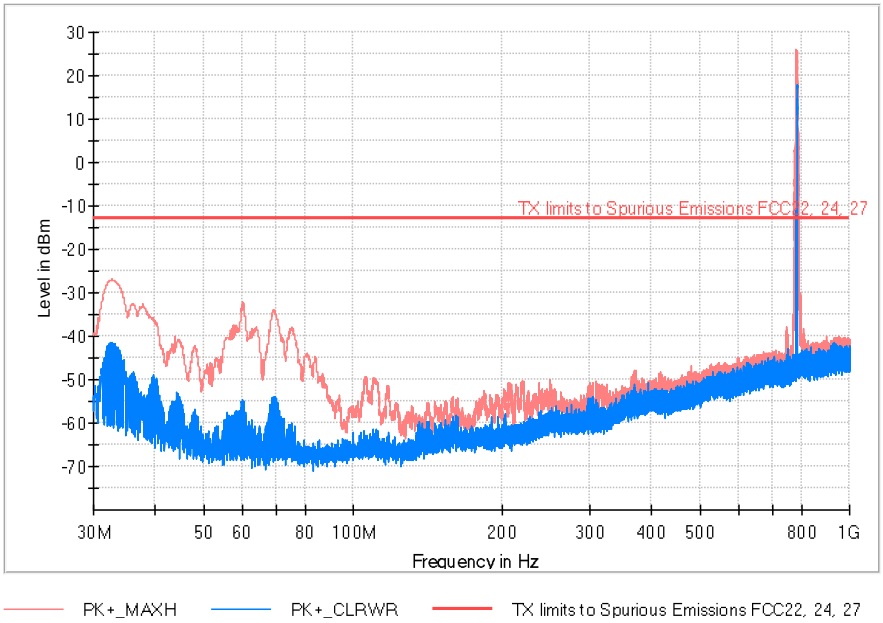
A preliminary scan determined the QPSK 10 MHz bandwidth as the worst case. The configuration of Resource Blocks which is the worst case for conducted power was used.

The following plots show the results for this configuration.

LTE QPSK MODULATION. RB = 1. Offset = 0. BW = 10 MHz

TEST RESULTS (Cont):	Middle Channel

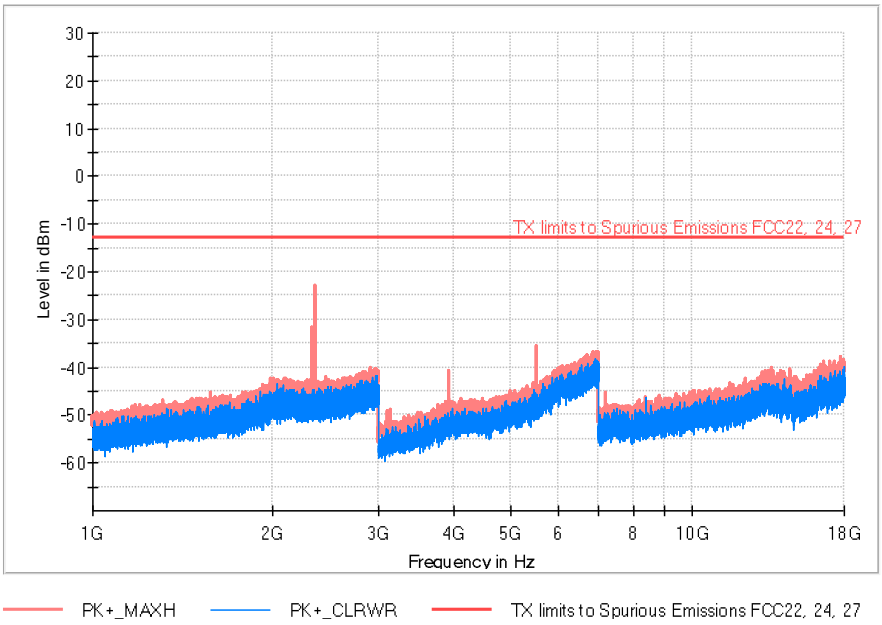
FREQUENCY RANGE: 30-1000 MHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)	Comment
32.651333	-41.89	-26.90	
59.908333	-55.72	-32.30	
248.929000	-60.36	-50.12	
479.886000	-52.62	-46.93	
746.894667	-46.31	-37.80	Fundamental DL
786.373667	17.72	25.88	Fundamental UL

TEST RESULTS (Cont):	Middle Channel

FREQUENCY RANGE: 1-18 GHz



Frequency (MHz)	PK+_CLRWR (dBm)	PK+_MAXH (dBm)
2333.600000	-49.69	-31.63
2358.200000	-48.99	-23.04
3931.000000	-51.54	-40.74
5505.000000	-48.67	-35.62
7190.000000	-49.79	-45.45