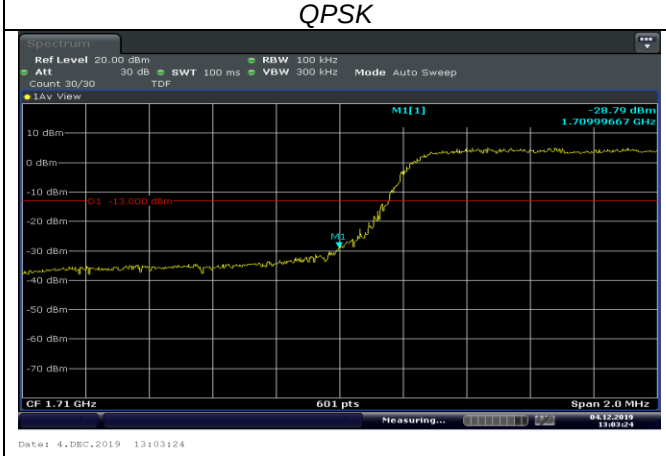
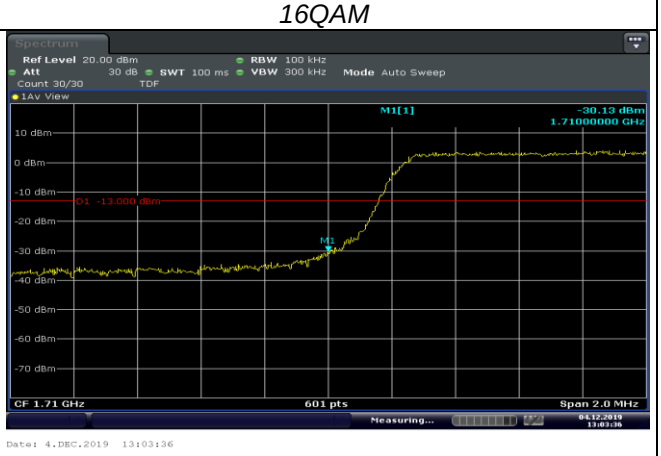
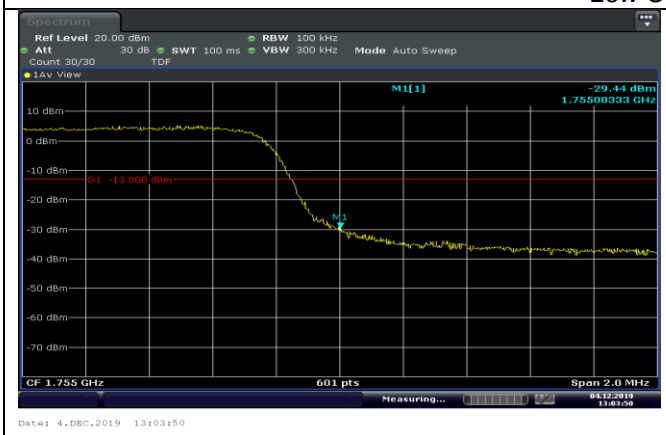
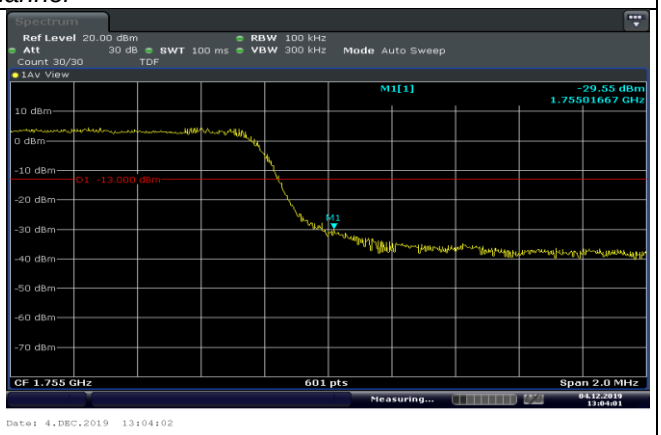
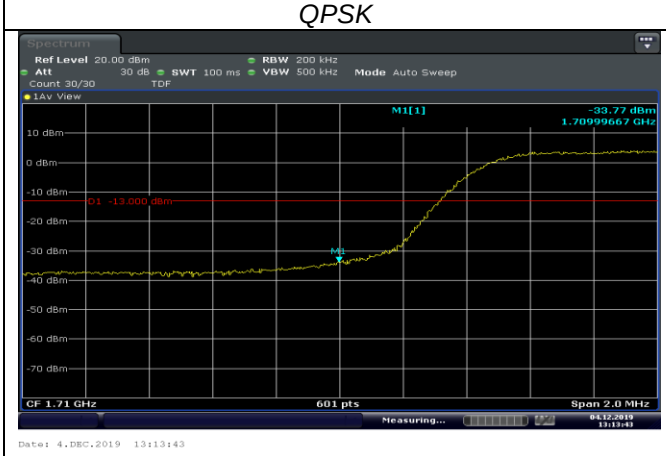
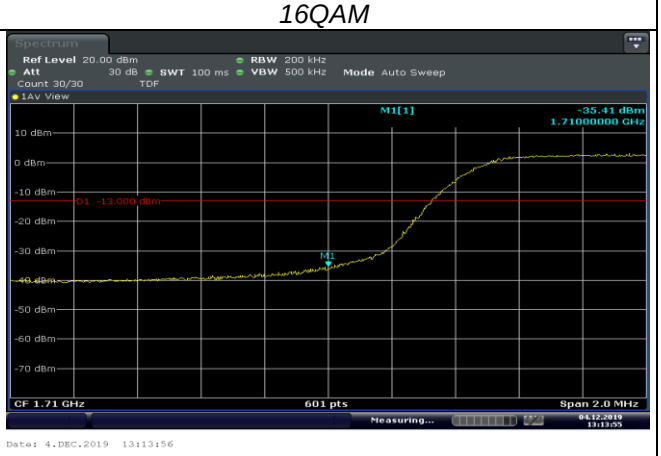
LTE FDD Band 4-5MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
25RB#0	25RB#0
Low Channel	
	
25RB#0	25RB#0
High Channel	

LTE FDD Band 4-10MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
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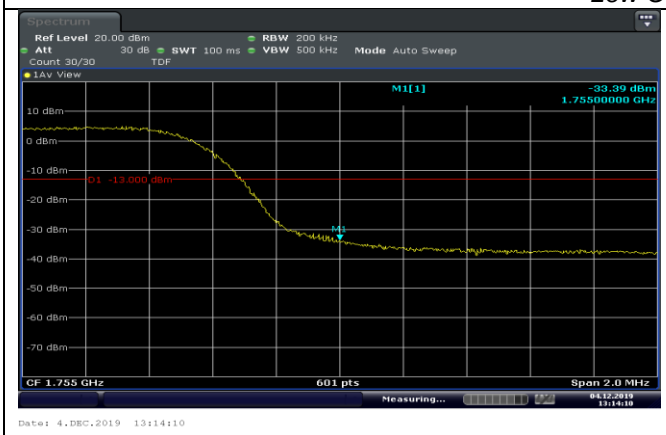
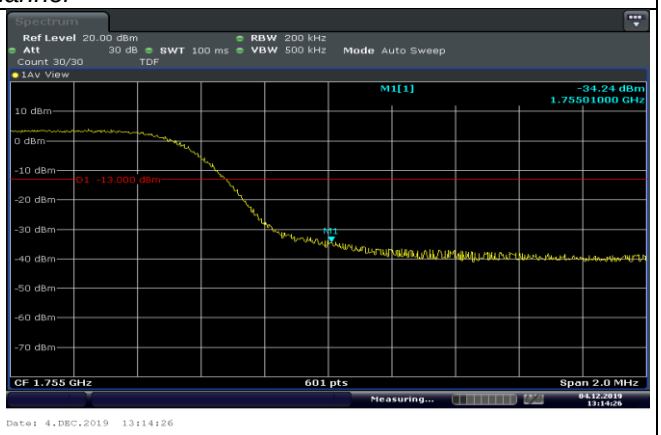
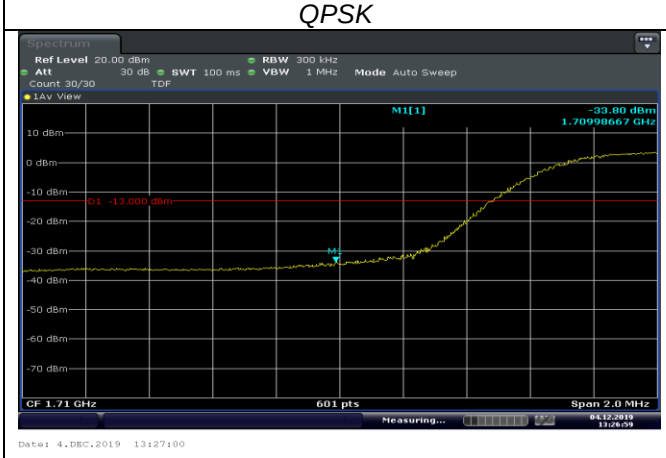
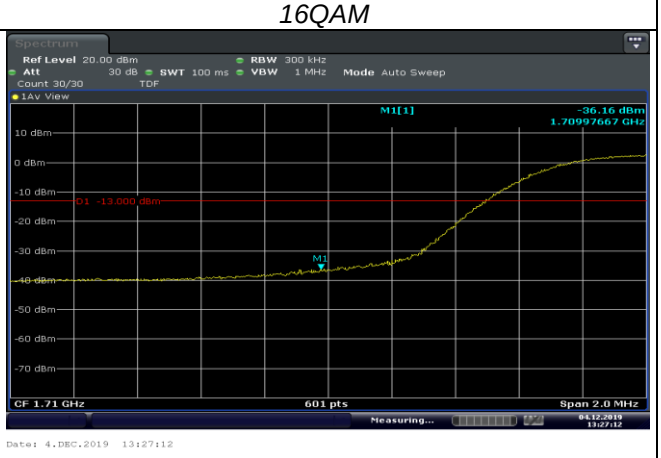
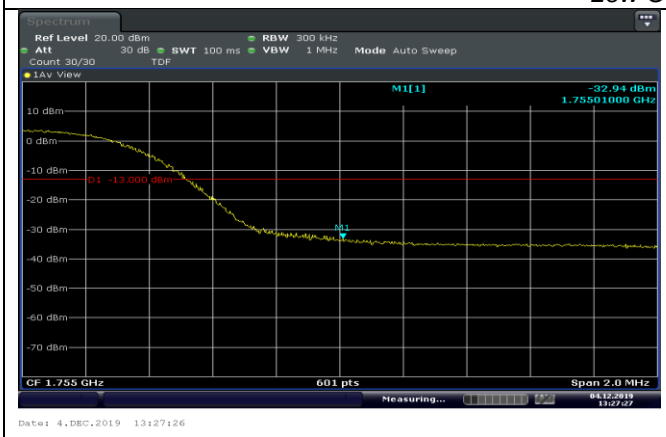
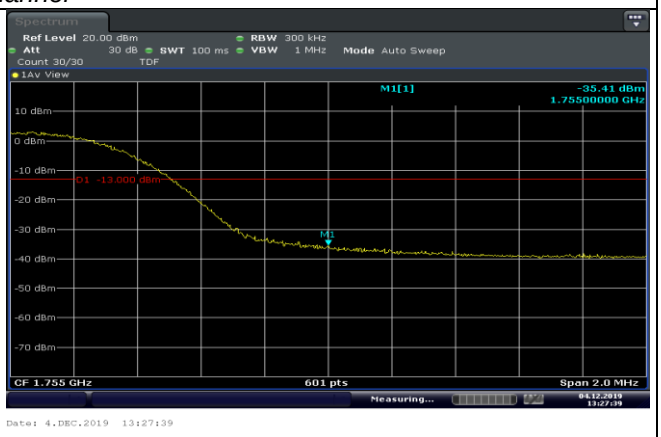
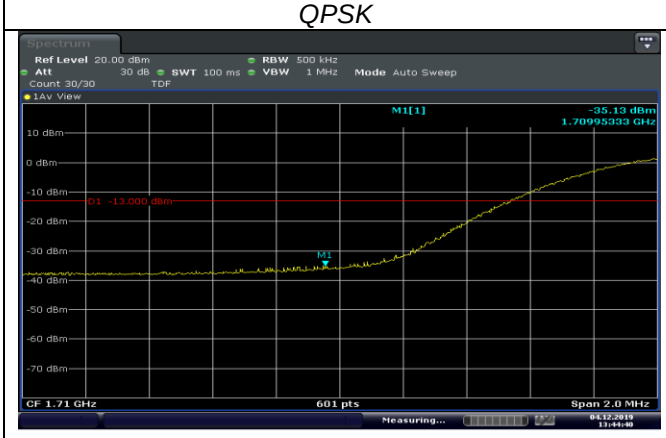
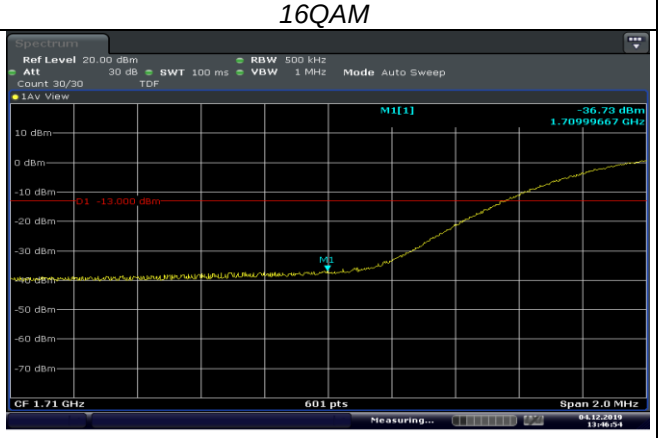
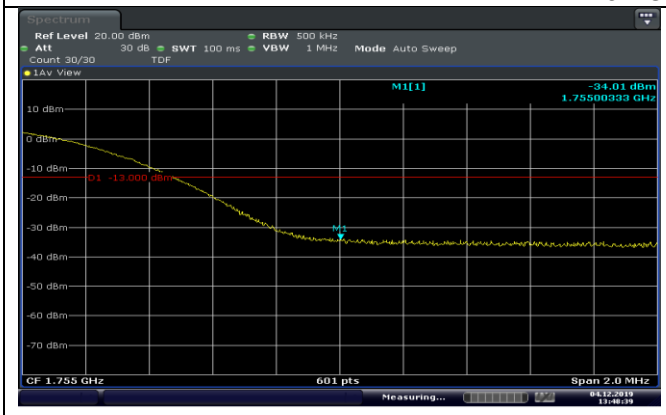
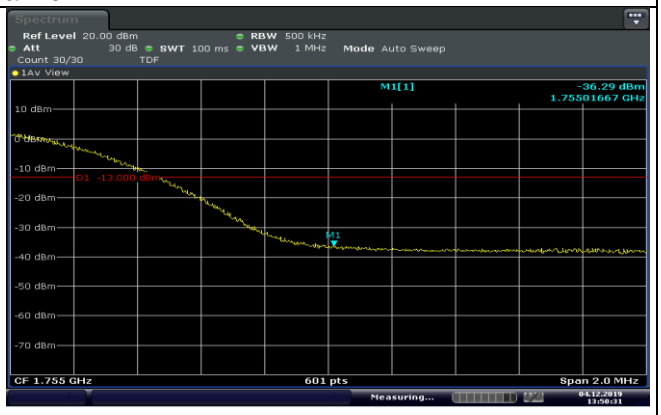
	
50RB#0	50RB#0
High Channel	

LTE FDD Band 4-15MHz Channel Bandwidth Band Edge Compliance	
QPSK	*16QAM*
	
75RB#0	*75RB#0*
Low Channel	
	
75RB#0	*75RB#0*
High Channel	

LTE FDD Band 4-20MHz Channel Bandwidth Band Edge Compliance	
QPSK	16QAM
	
100RB#0	100RB#0
Low Channel	
	
100RB#0	100RB#0
High Channel	

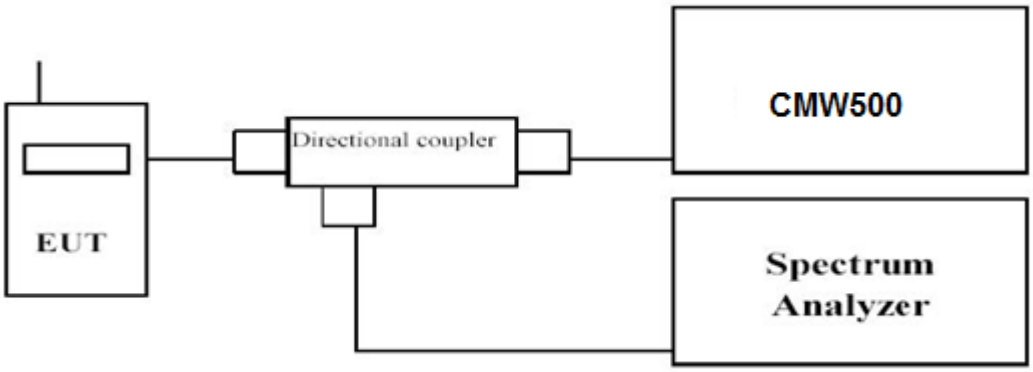
3.6 Spurious Emission

LIMIT

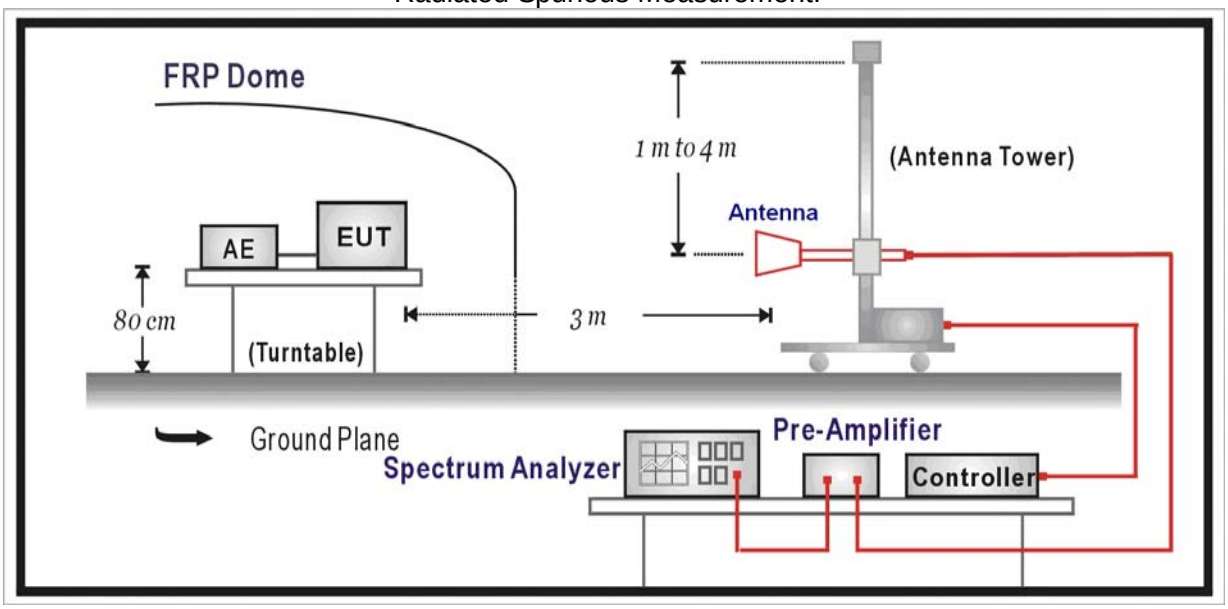
According to §27.53 (h): For operations in the 1710–1755 MHz and 2110–2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10(P) dB.

TEST CONFIGURATION

Conducted Spurious Measurement:



Radiated Spurious Measurement:



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

Conducted Spurious Measurement:

a. Place the EUT on a bench and set it in transmitting mode.
b. Connect a low loss RF cable from the antenna port to a spectrum analyzer and CMW500 by a Directional Couple.
c. EUT Communicate with CMW500, then select a channel for testing.
d. Add a correction factor to the display of spectrum, and then test.
e. The resolution bandwidth of the spectrum analyzer was set sufficient scans were taken to show the out of band Emission if any up to10th harmonic.
f. Please refer to following tables for test antenna conducted emissions.

Working Frequency	Sub range (GHz)	RBW	VBW	Sweep time (s)
LTE FDD Band 4	0.000009~0.000015	1KHz	3KHz	Auto
	0.000015~0.01	10KHz	30KHz	Auto
	0.01~20	1 MHz	3 MHz	Auto

Radiated Spurious Measurement:

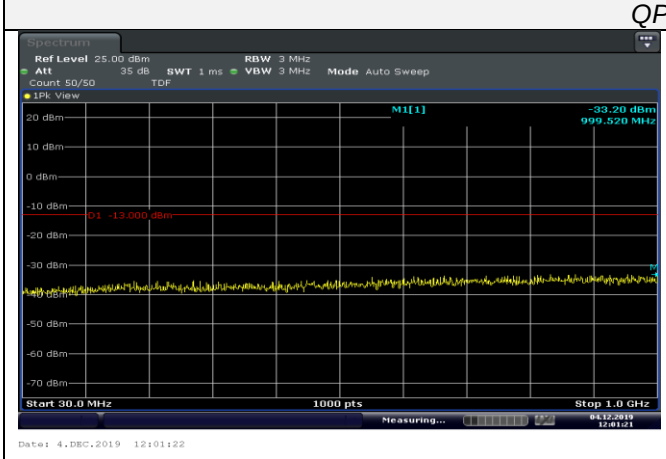
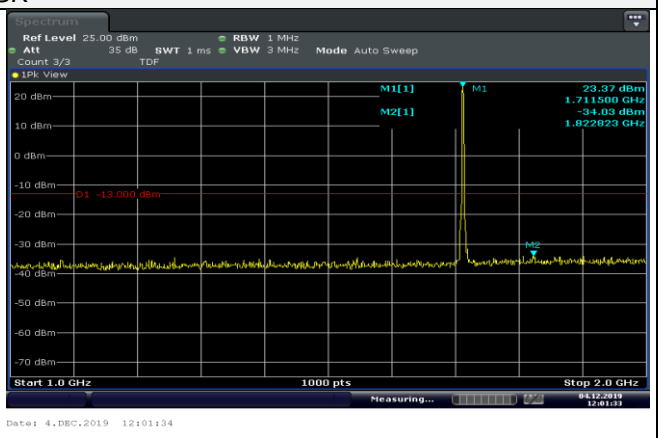
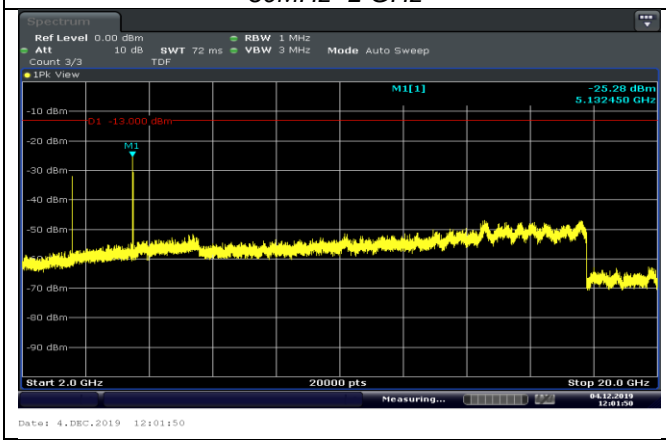
a. The EUT shall be placed at the specified height on a support, and in the position closest to normal use as declared by provider.
b. The test antenna shall be oriented initially for vertical polarization and shall be chosen to correspond to the frequency of the transmitter
c. The output of the test antenna shall be connected to the measuring receiver.
d. The transmitter shall be switched on and the measuring receiver shall be tuned to the frequency of the transmitter under test.
e. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
f. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
g. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
h. The maximum signal level detected by the measuring receiver shall be noted.
i. The transmitter shall be replaced by a substitution antenna.
j. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
k. The substitution antenna shall be connected to a calibrated signal generator.
l. If necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
m. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
n. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, that is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
o. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
p. The measure of the effective radiated power is the larger of the two levels recorded at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.
q. The resolution bandwidth of the spectrum analyzer was set at 100 kHz for Part 22 and 1MHz for Part 24. The frequency range was checked up to 10th harmonic.
r. Test site anechoic chamber refer to ANSI C63.

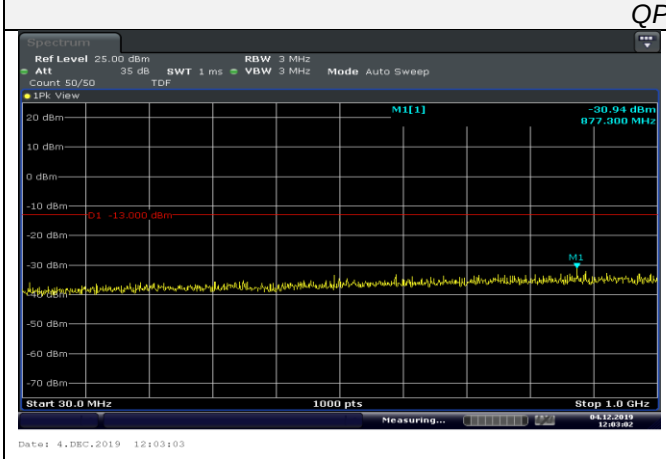
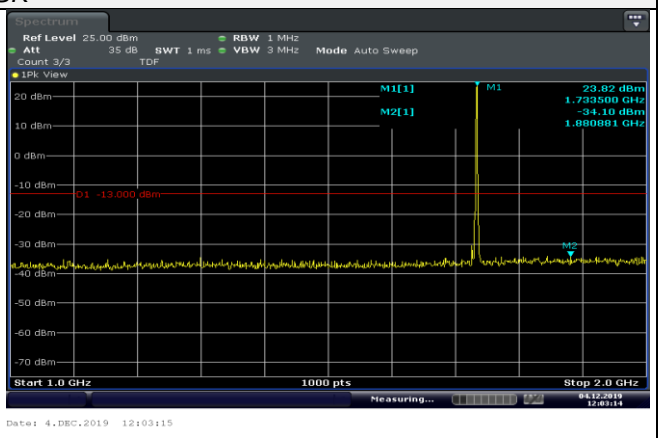
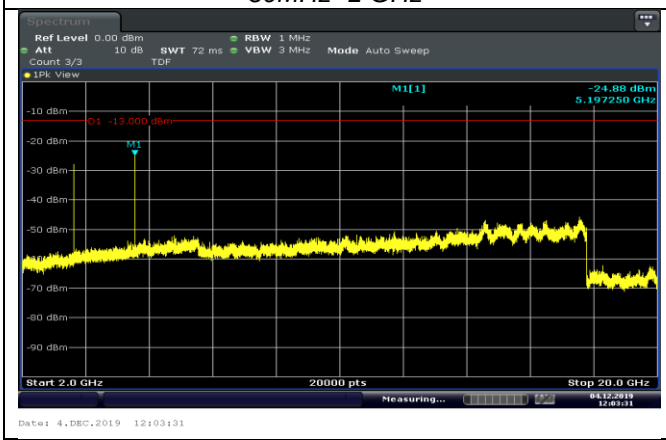
<u>TEST RESULTS</u>

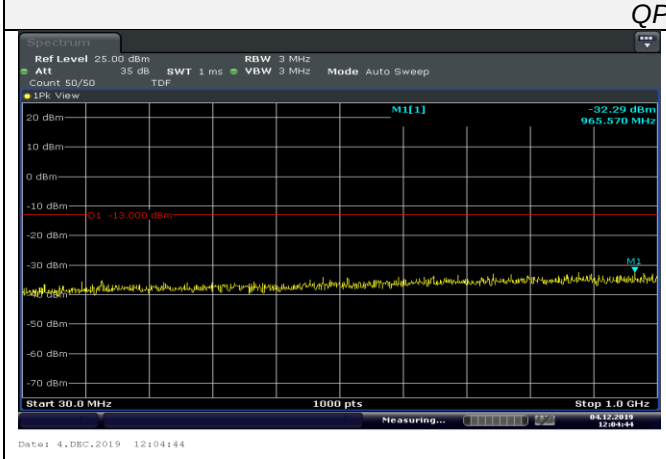
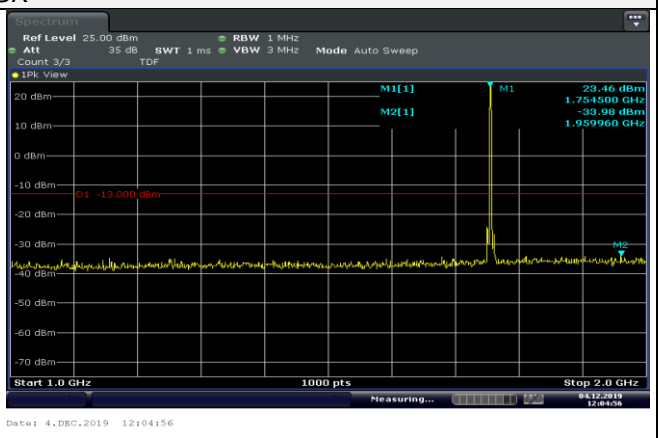
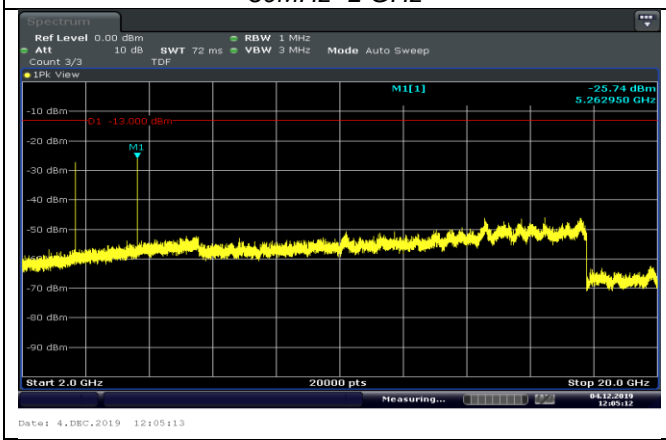
Remark:

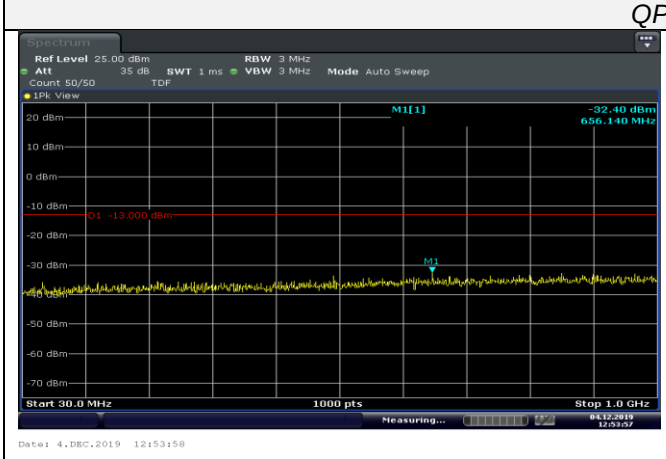
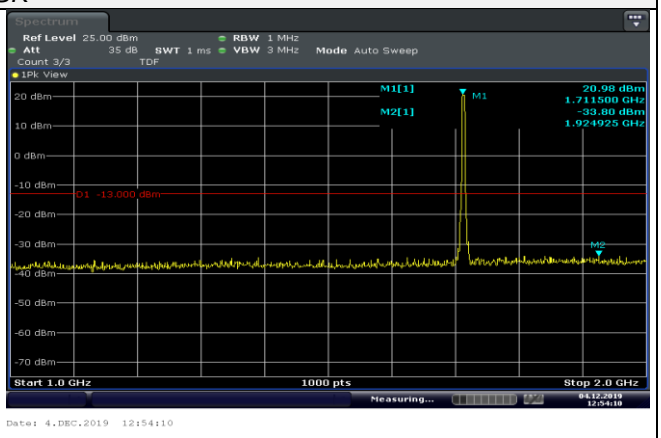
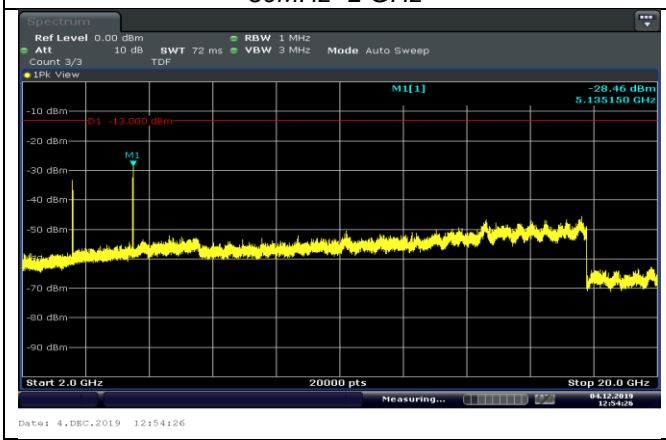
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4.*

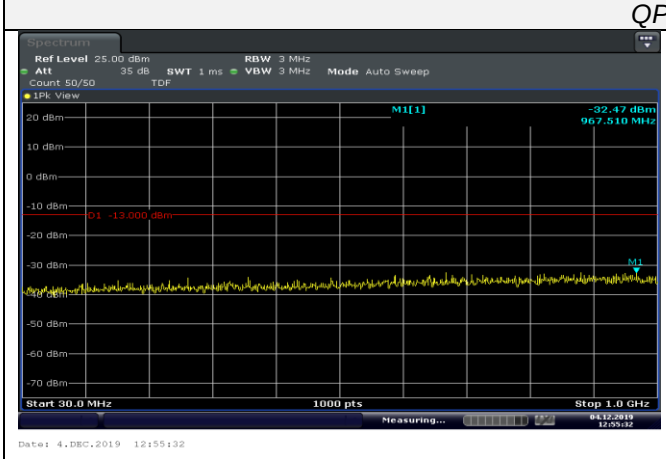
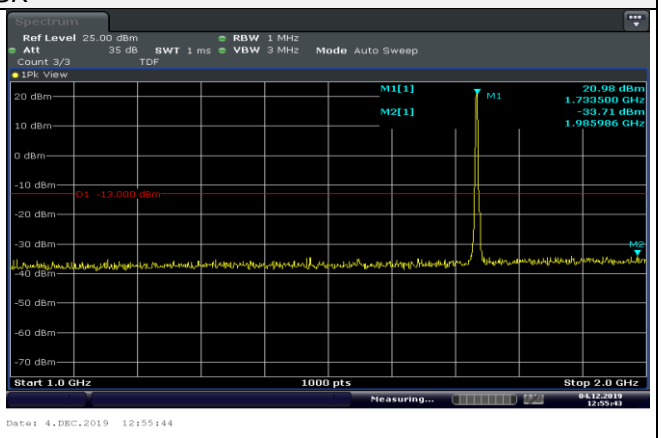
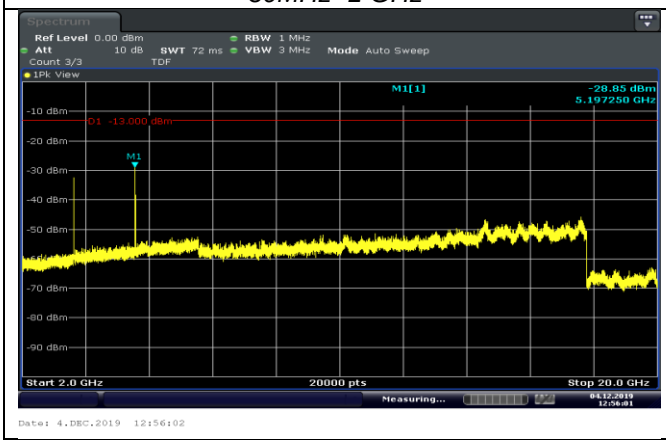
Conducted Measurement:

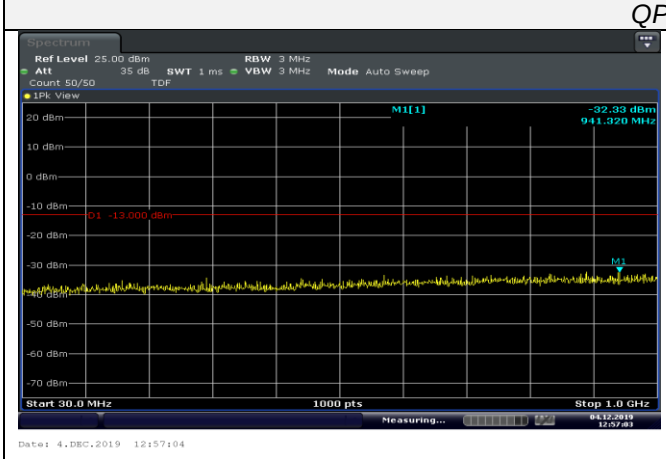
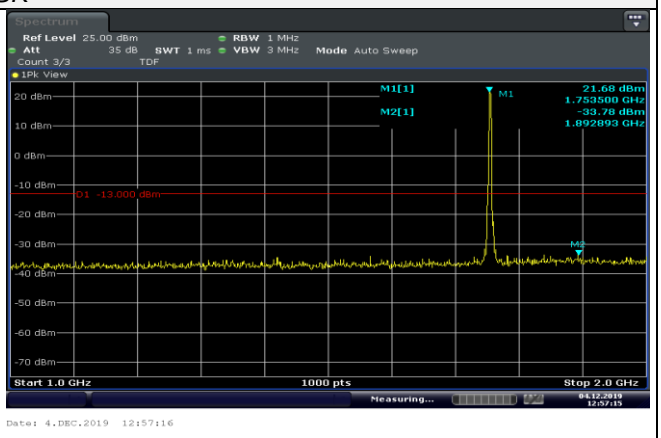
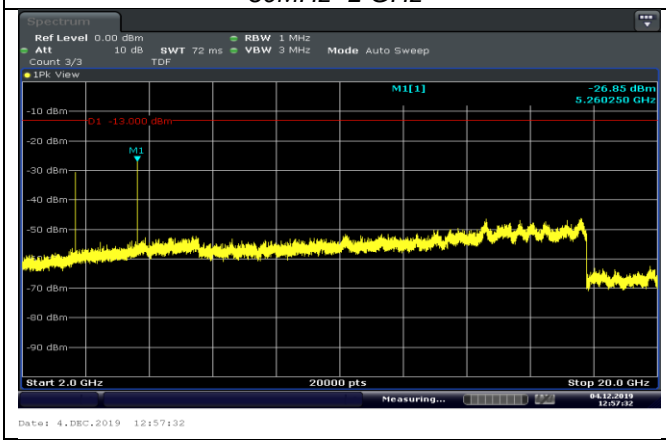
LTE FDD Band 4-1.4MHz Channel Bandwidth	
Low Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

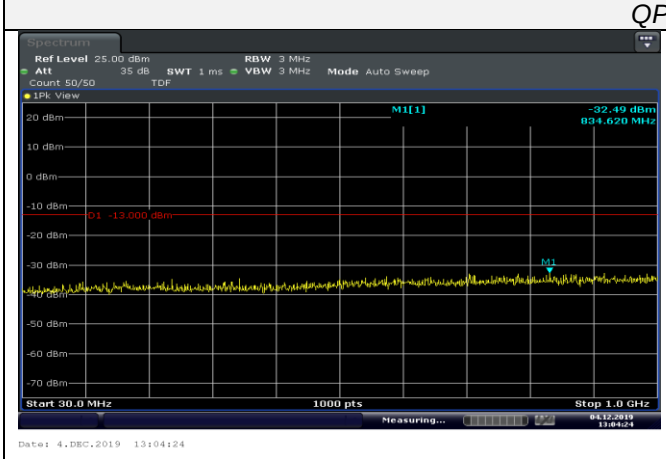
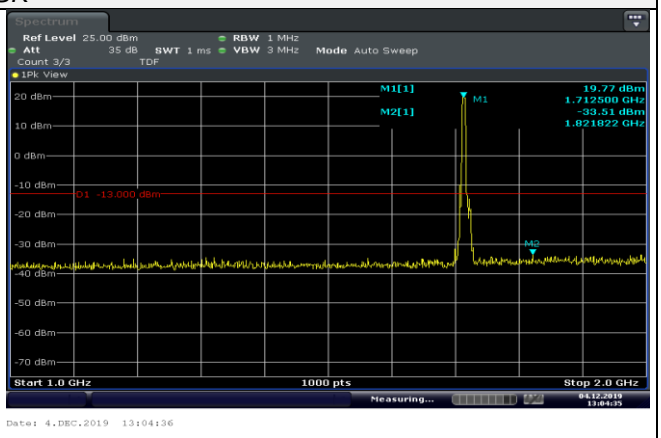
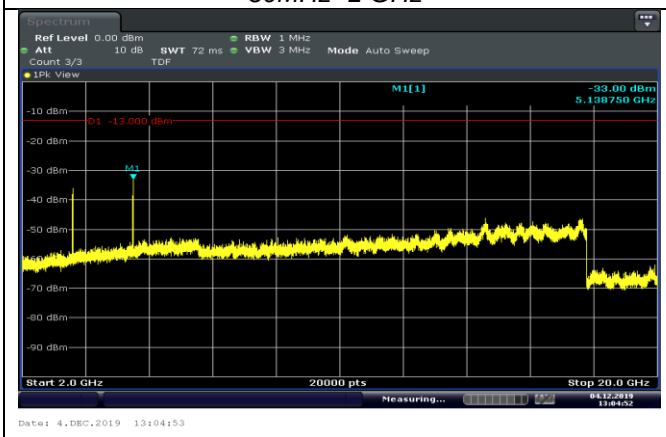
LTE FDD Band 4-1.4MHz Channel Bandwidth	
Mid Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

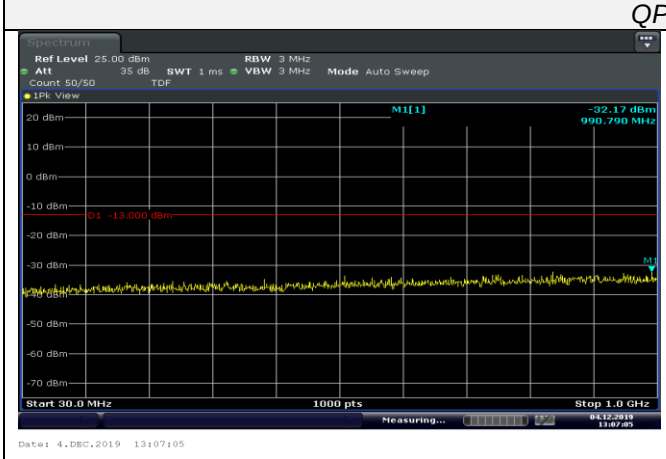
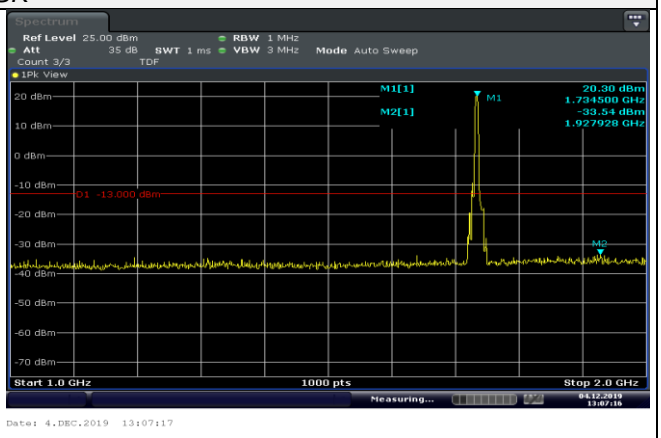
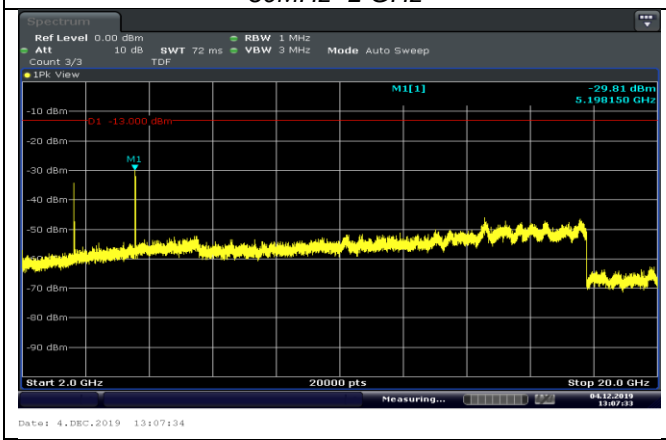
LTE FDD Band 4-1.4MHz Channel Bandwidth	
High Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

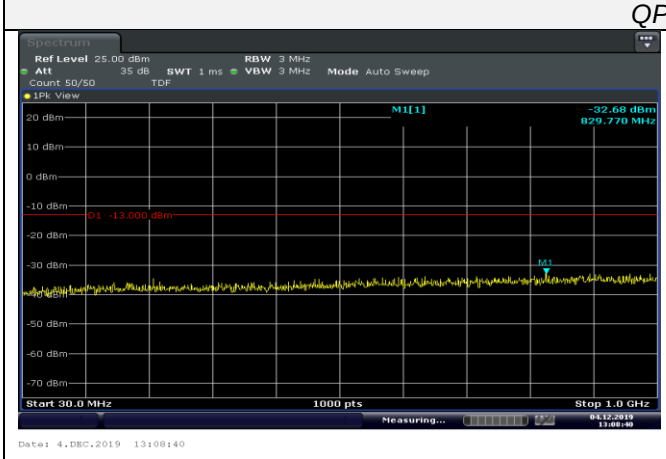
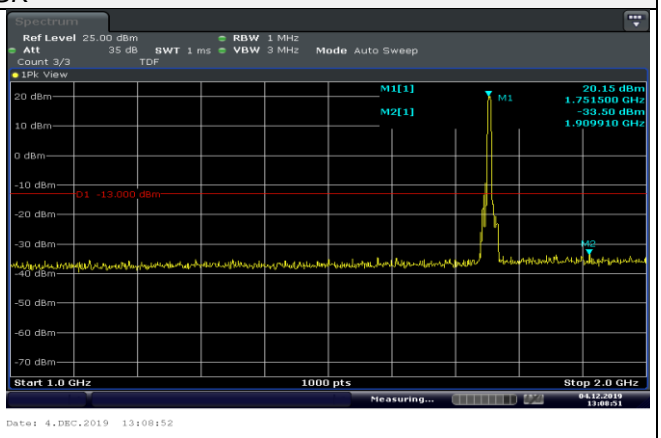
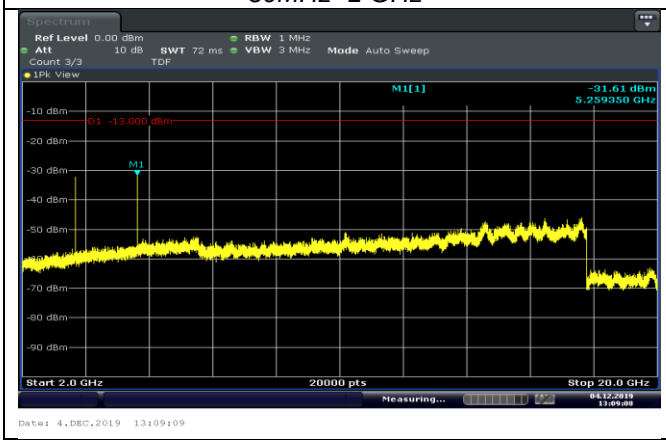
LTE FDD Band 4-3MHz Channel Bandwidth	
Low Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

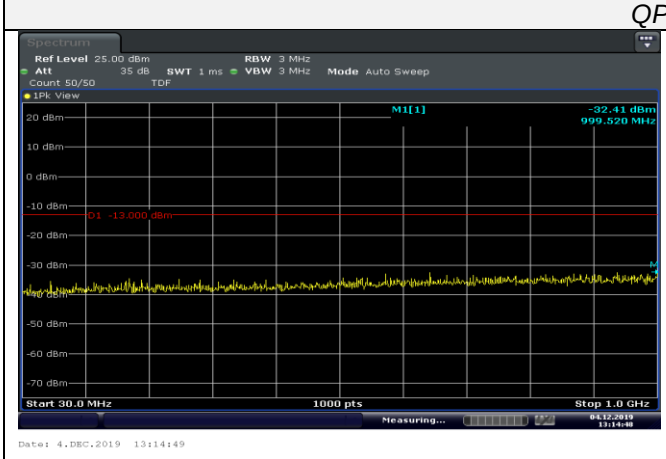
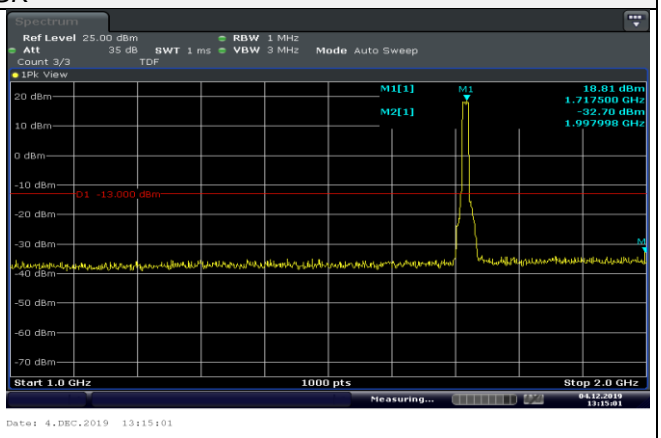
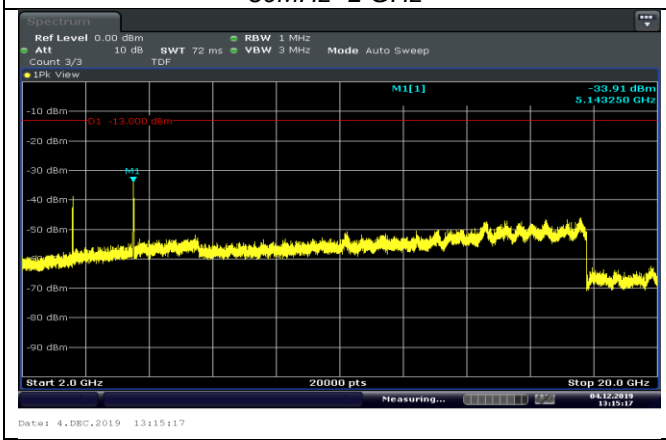
LTE FDD Band 4-3MHz Channel Bandwidth	
Mid Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

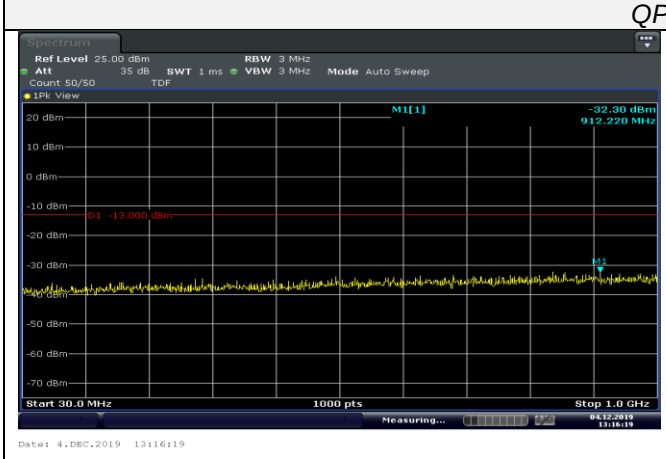
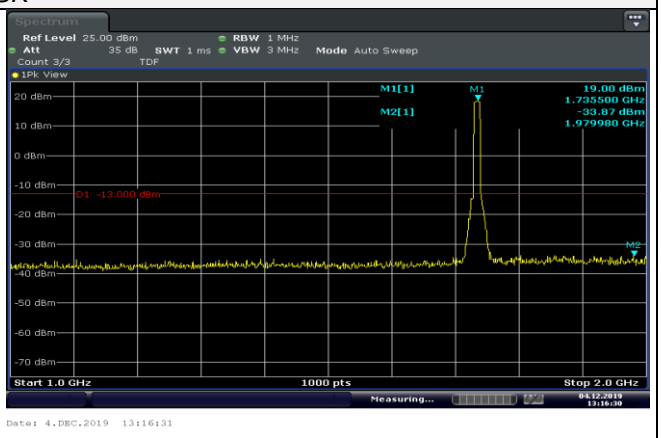
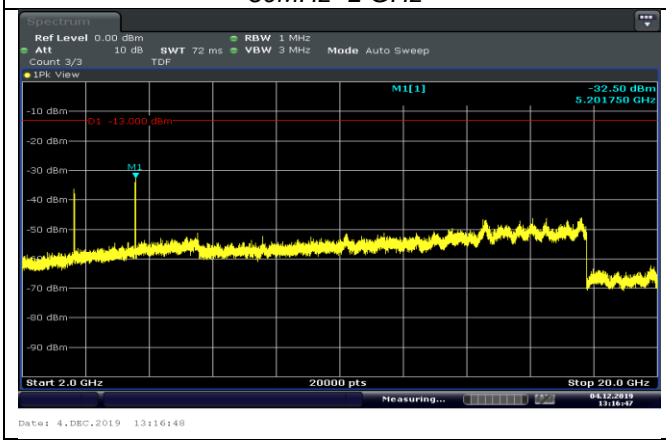
LTE FDD Band 4-3MHz Channel Bandwidth	
High Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

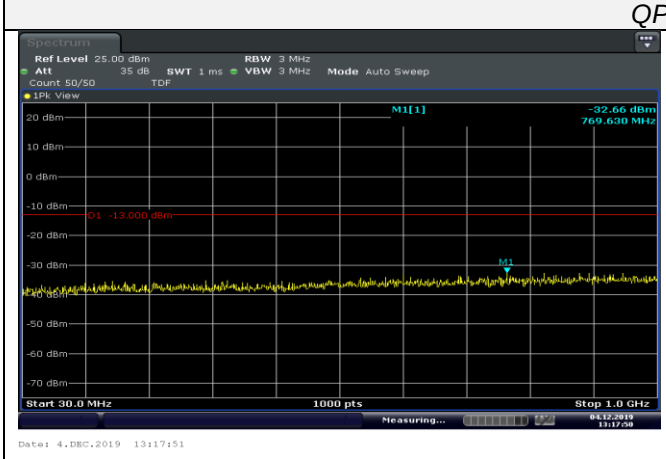
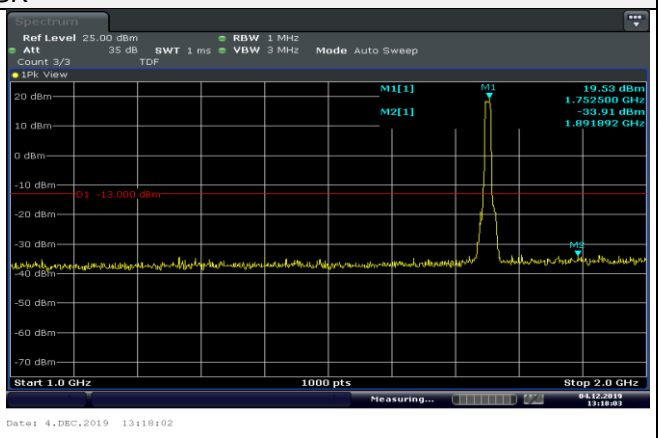
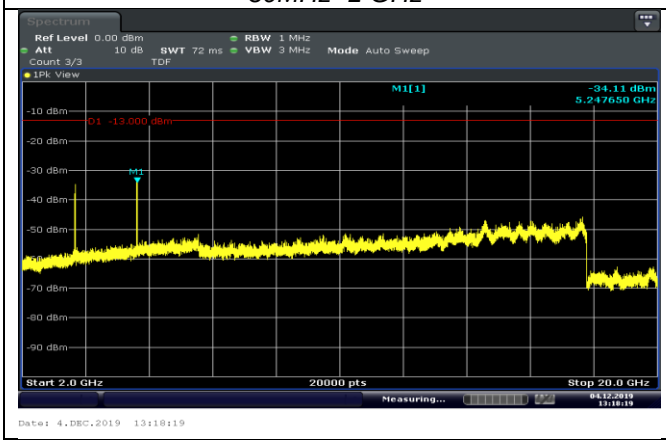
LTE FDD Band 4-5MHz Channel Bandwidth	
Low Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

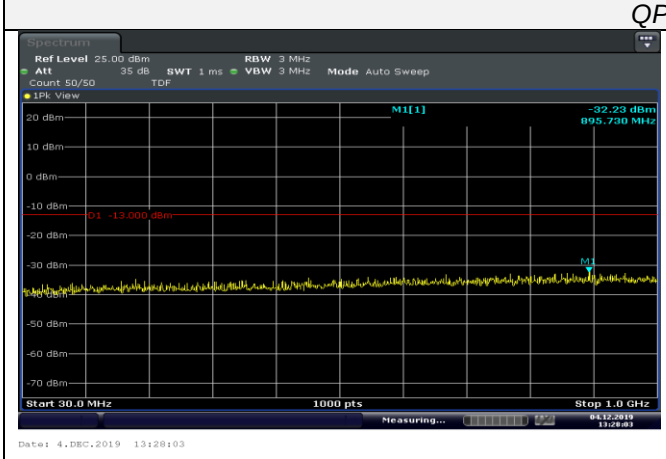
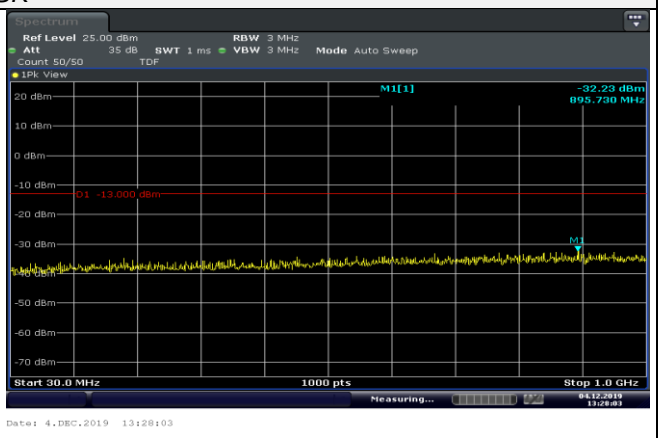
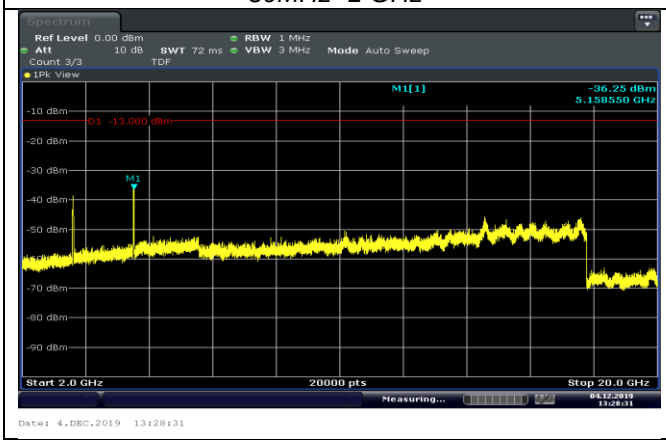
LTE FDD Band 4-5MHz Channel Bandwidth	
Mid Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

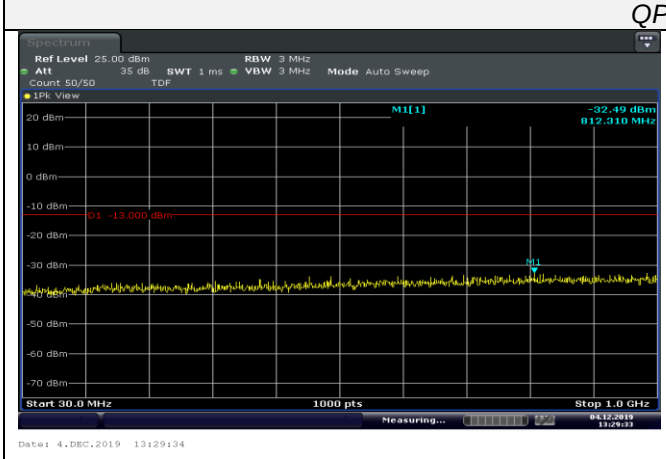
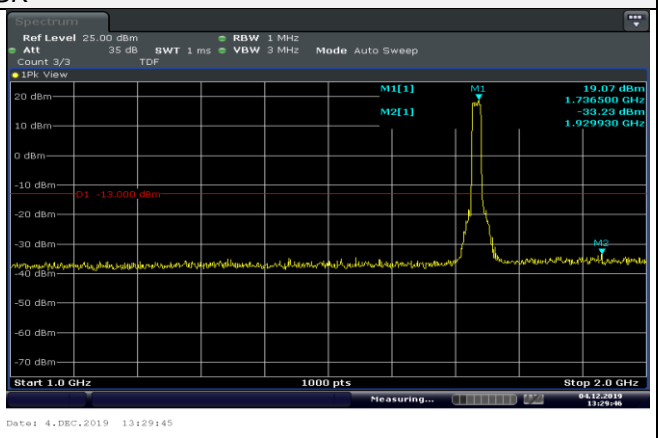
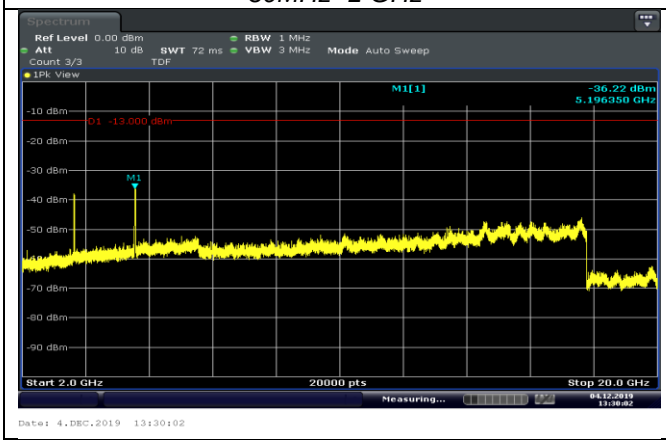
LTE FDD Band 4-5MHz Channel Bandwidth	
High Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

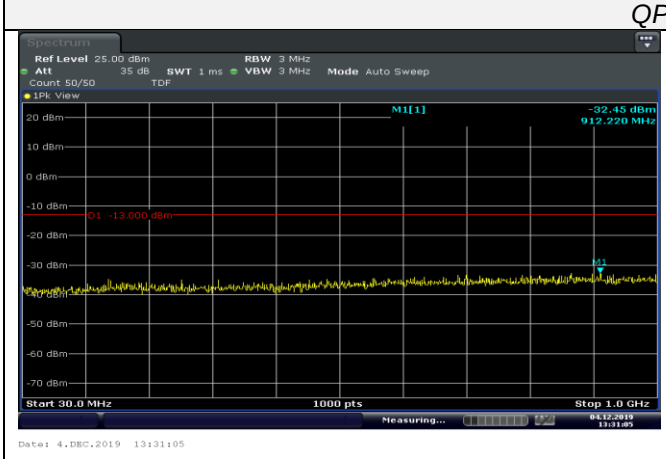
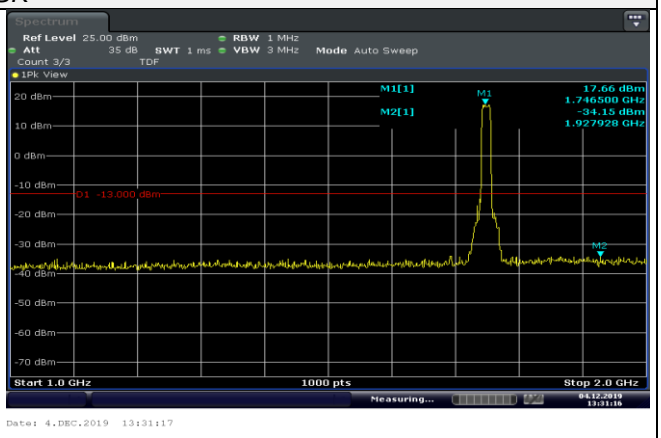
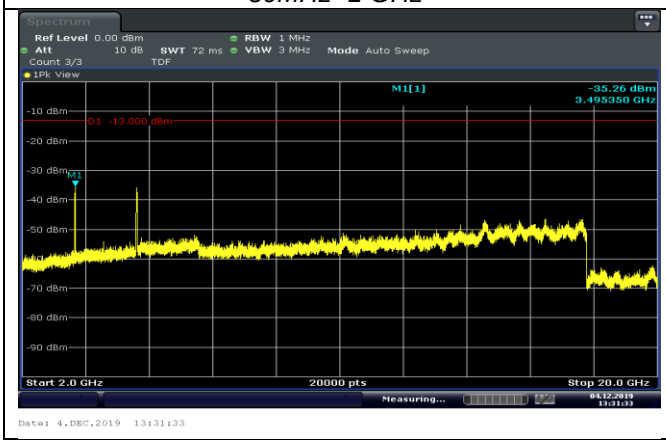
LTE FDD Band 4-10MHz Channel Bandwidth	
Low Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

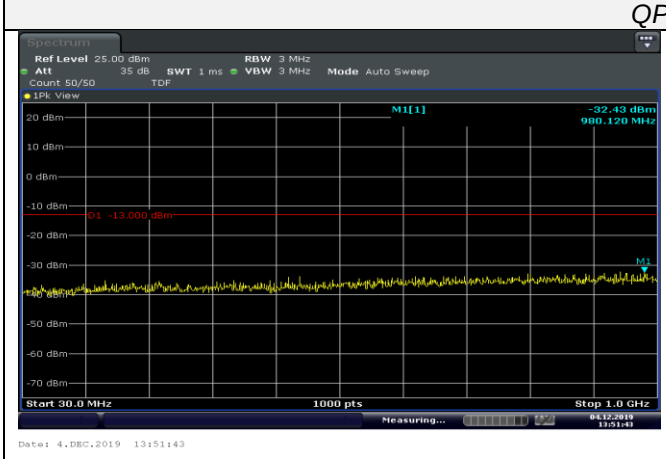
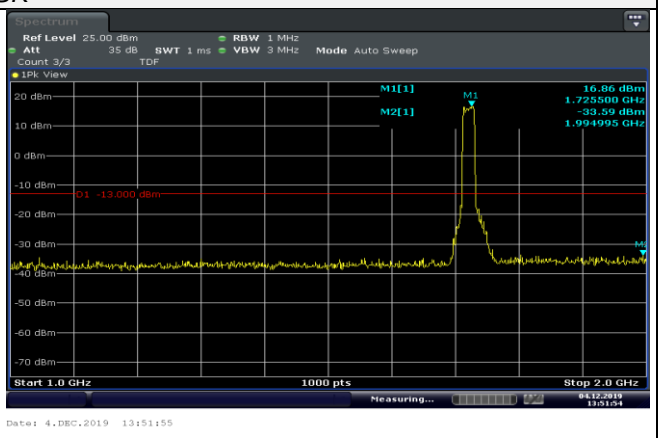
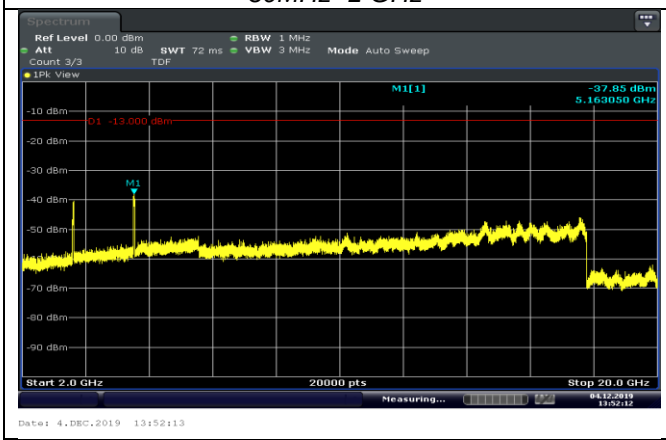
LTE FDD Band 4-10MHz Channel Bandwidth	
Mid Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

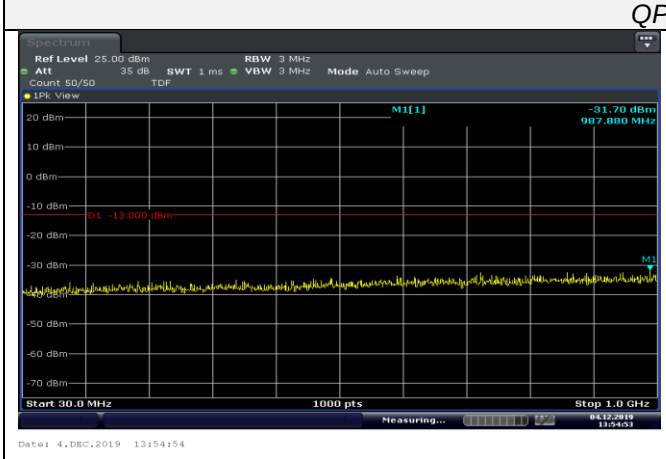
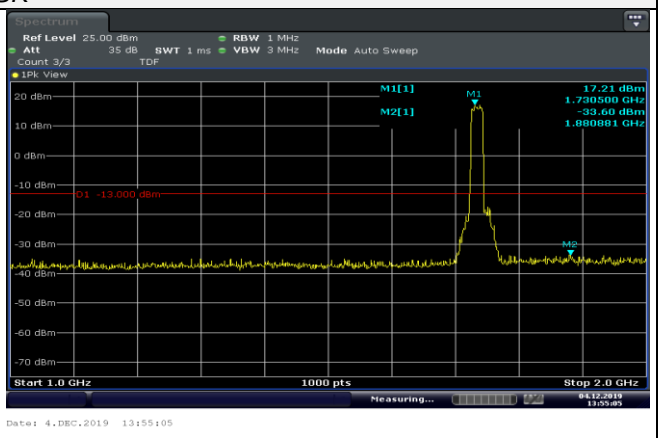
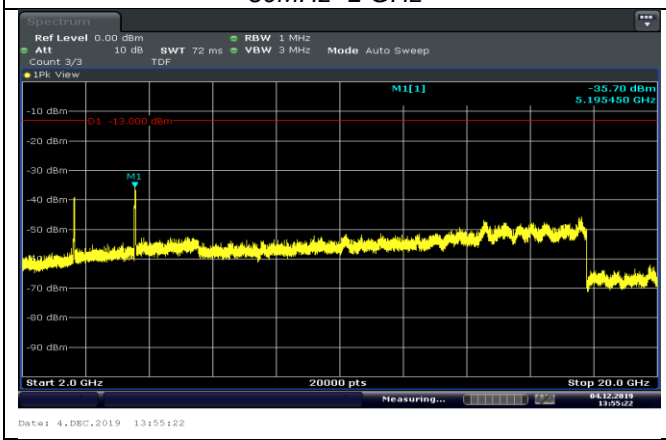
LTE FDD Band 4-10MHz Channel Bandwidth	
High Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

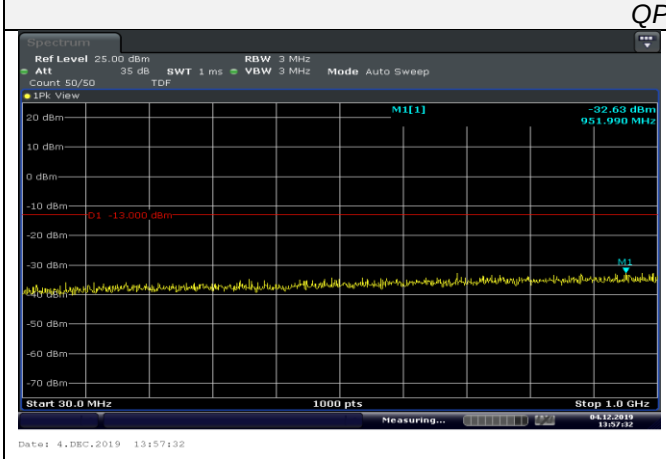
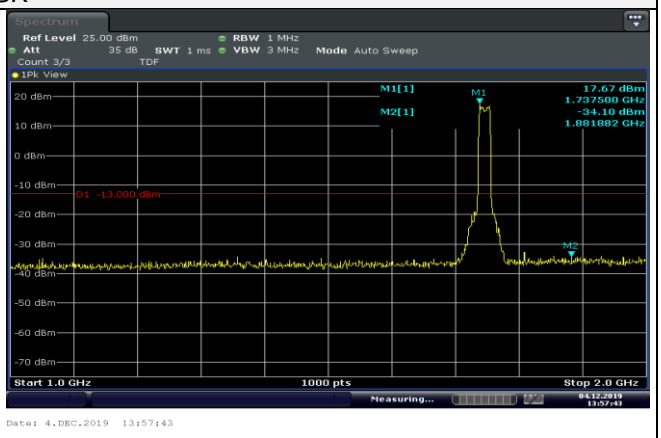
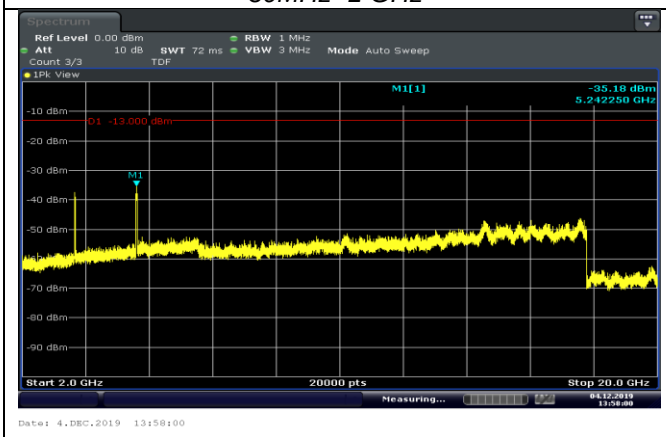
LTE FDD Band 4-15MHz Channel Bandwidth	
Low Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

LTE FDD Band 4-15MHz Channel Bandwidth	
Mid Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

LTE FDD Band 4-15MHz Channel Bandwidth	
High Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

LTE FDD Band 4-20MHz Channel Bandwidth	
Low Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

LTE FDD Band 4-20MHz Channel Bandwidth	
Mid Channel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

LTE FDD Band 4-20MHz Channel Bandwidth	
High CHannel	
QPSK	
	
30MHz~1 GHz	1 GHz ~2GHz
	
2 GHz ~20GHz	
1RB#0	

Radiated Measurement:

Remark:
1. *We were tested all RB Configuration for the model DL3 the Mode refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case for each Channel Bandwidth of LTE FDD Band 4*
2. *EIRP=P_{Mea}(dBm)-P_{cl}(dB) +G_a(dBi)*
3. *We were not recorded other points as values lower than limits.*
4. *Margin = Limit - EIRP*

LTE FDD Band 4_Channel Bandwidth 1.4MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3421.4	-43.35	4.02	3.00	12.45	-34.92	-13.00	21.92	H
5132.1	-46.47	5.11	3.00	13.38	-38.20	-13.00	25.20	H
3421.4	-46.28	4.02	3.00	12.45	-37.85	-13.00	24.85	V
5132.1	-49.32	5.11	3.00	13.38	-41.05	-13.00	28.05	V

LTE FDD Band 4_Channel Bandwidth 1.4MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-43.75	4.02	3.00	12.45	-35.32	-13.00	22.32	H
5197.5	-46.65	5.11	3.00	13.38	-38.38	-13.00	25.38	H
3465.0	-47.35	4.02	3.00	12.45	-38.92	-13.00	25.92	V
5197.5	-50.29	5.11	3.00	13.38	-42.02	-13.00	29.02	V

LTE FDD Band 4_Channel Bandwidth 1.4MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3508.6	-43.26	4.02	3.00	12.45	-34.83	-13.00	21.83	H
5262.9	-46.79	5.11	3.00	13.38	-38.52	-13.00	25.52	H
3508.6	-47.65	4.02	3.00	12.45	-39.22	-13.00	26.22	V
5262.9	-50.35	5.11	3.00	13.38	-42.08	-13.00	29.08	V

LTE FDD Band 4_Channel Bandwidth 3MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3423.0	-43.75	4.02	3.00	12.45	-35.32	-13.00	22.32	H
5134.5	-46.82	5.11	3.00	13.38	-38.55	-13.00	25.55	H
3423.0	-48.31	4.02	3.00	12.45	-39.88	-13.00	26.88	V
5134.5	-50.49	5.11	3.00	13.38	-42.22	-13.00	29.22	V

LTE FDD Band 4_Channel Bandwidth 3MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-43.83	4.02	3.00	12.45	-35.40	-13.00	22.40	H
5197.5	-45.76	5.11	3.00	13.38	-37.49	-13.00	24.49	H
3465.0	-47.62	4.02	3.00	12.45	-39.19	-13.00	26.19	V
5197.5	-51.37	5.11	3.00	13.38	-43.10	-13.00	30.10	V

LTE FDD Band 4_Channel Bandwidth 3MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3507.0	-43.75	4.02	3.00	12.45	-35.32	-13.00	22.32	H
5260.5	-46.43	5.11	3.00	13.38	-38.16	-13.00	25.16	H
3507.0	-47.68	4.02	3.00	12.45	-39.25	-13.00	26.25	V
5260.5	-51.45	5.11	3.00	13.38	-43.18	-13.00	30.18	V

LTE FDD Band 4_Channel Bandwidth 5MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3425.0	-43.26	4.02	3.00	12.45	-34.83	-13.00	21.83	H
5137.5	-46.85	5.11	3.00	13.38	-38.58	-13.00	25.58	H
3425.0	-47.72	4.02	3.00	12.45	-39.29	-13.00	26.29	V
5137.5	-51.62	5.11	3.00	13.38	-43.35	-13.00	30.35	V

LTE FDD Band 4_Channel Bandwidth 5MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-44.32	4.02	3.00	12.45	-35.89	-13.00	22.89	H
5197.5	-46.75	5.11	3.00	13.38	-38.48	-13.00	25.48	H
3465.0	-47.69	4.02	3.00	12.45	-39.26	-13.00	26.26	V
5197.5	-51.57	5.11	3.00	13.38	-43.30	-13.00	30.30	V

LTE FDD Band 4_Channel Bandwidth 5MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3505.0	-44.62	4.02	3.00	12.45	-36.19	-13.00	23.19	H
5257.5	-47.05	5.11	3.00	13.38	-38.78	-13.00	25.78	H
3505.0	-46.37	4.02	3.00	12.45	-37.94	-13.00	24.94	V
5257.5	-51.76	5.11	3.00	13.38	-43.49	-13.00	30.49	V

LTE FDD Band 4_Channel Bandwidth 10MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3430.0	-44.52	4.02	3.00	12.45	-36.09	-13.00	23.09	H
5145.0	-47.69	5.11	3.00	13.38	-39.42	-13.00	26.42	H
3430.0	-46.45	4.02	3.00	12.45	-38.02	-13.00	25.02	V
5145.0	-51.81	5.11	3.00	13.38	-43.54	-13.00	30.54	V

LTE FDD Band 4_Channel Bandwidth 10MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-45.31	4.02	3.00	12.45	-36.88	-13.00	23.88	H
5197.5	-48.06	5.11	3.00	13.38	-39.79	-13.00	26.79	H
3465.0	-47.45	4.02	3.00	12.45	-39.02	-13.00	26.02	V
5197.5	-51.69	5.11	3.00	13.38	-43.42	-13.00	30.42	V

LTE FDD Band 4_Channel Bandwidth 10MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3500.0	-46.03	4.02	3.00	12.45	-37.60	-13.00	24.60	H
5250.0	-48.86	5.11	3.00	13.38	-40.59	-13.00	27.59	H
3500.0	-47.75	4.02	3.00	12.45	-39.32	-13.00	26.32	V
5250.0	-51.91	5.11	3.00	13.38	-43.64	-13.00	30.64	V

LTE FDD Band 4_Channel Bandwidth 15MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3435.0	-45.68	4.02	3.00	12.45	-37.25	-13.00	24.25	H
5152.5	-48.75	5.11	3.00	13.38	-40.48	-13.00	27.48	H
3435.0	-47.61	4.02	3.00	12.45	-39.18	-13.00	26.18	V
5152.5	-51.83	5.11	3.00	13.38	-43.56	-13.00	30.56	V

LTE FDD Band 4_Channel Bandwidth 15MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-45.62	4.02	3.00	12.45	-37.19	-13.00	24.19	H
5197.5	-48.85	5.11	3.00	13.38	-40.58	-13.00	27.58	H
3465.0	-47.76	4.02	3.00	12.45	-39.33	-13.00	26.33	V
5197.5	-51.93	5.11	3.00	13.38	-43.66	-13.00	30.66	V

LTE FDD Band 4_Channel Bandwidth 15MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3495.0	-43.82	4.02	3.00	12.45	-35.39	-13.00	22.39	H
5242.5	-48.91	5.11	3.00	13.38	-40.64	-13.00	27.64	H
3495.0	-46.35	4.02	3.00	12.45	-37.92	-13.00	24.92	V
5242.5	-51.86	5.11	3.00	13.38	-43.59	-13.00	30.59	V

LTE FDD Band 4_Channel Bandwidth 20MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3440.0	-43.27	4.02	3.00	12.45	-34.84	-13.00	21.84	H
5160.0	-46.38	5.11	3.00	13.38	-38.11	-13.00	25.11	H
3440.0	-47.32	4.02	3.00	12.45	-38.89	-13.00	25.89	V
5160.0	-52.73	5.11	3.00	13.38	-44.46	-13.00	31.46	V

LTE FDD Band 4_Channel Bandwidth 20MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3465.0	-43.06	4.02	3.00	12.45	-34.63	-13.00	21.63	H
5197.5	-46.18	5.11	3.00	13.38	-37.91	-13.00	24.91	H
3465.0	-47.45	4.02	3.00	12.45	-39.02	-13.00	26.02	V
5197.5	-51.39	5.11	3.00	13.38	-43.12	-13.00	30.12	V

LTE FDD Band 4_Channel Bandwidth 20MHz_QPSK_ High Channel

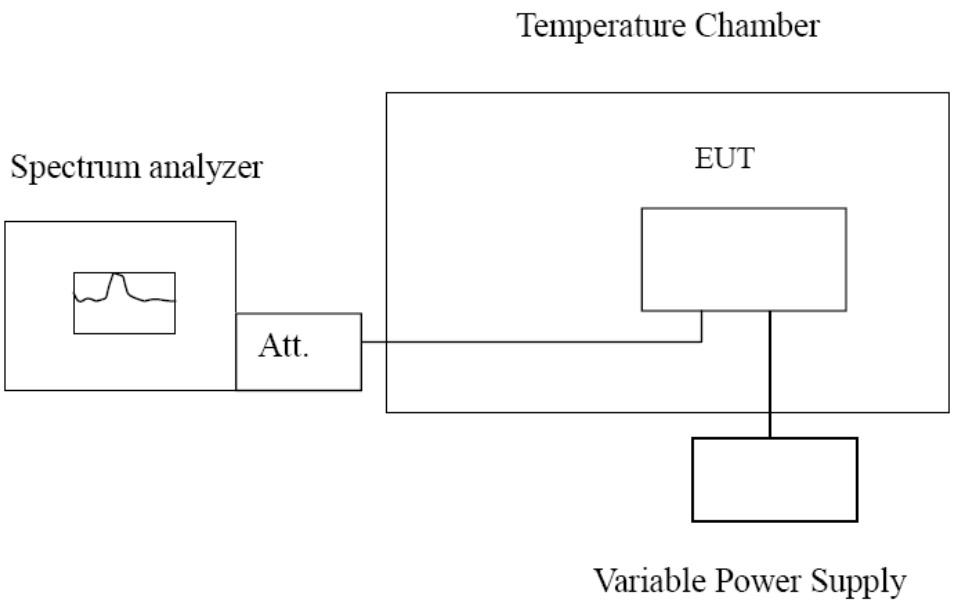
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Diatance	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
3490.0	-43.35	4.02	3.00	12.45	-34.92	-13.00	21.92	H
5235.0	-46.26	5.11	3.00	13.38	-37.99	-13.00	24.99	H
3490.0	-48.13	4.02	3.00	12.45	-39.70	-13.00	26.70	V
5235.0	-52.07	5.11	3.00	13.38	-43.80	-13.00	30.80	V

3.7 Frequency Stability under Temperature & Voltage Variations

LIMIT

According to §27.54, §2.1055 requirement, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation and should not exceed 2.5ppm.

TEST CONFIGURATION



TEST PROCEDURE

The EUT was setup according to EIA/TIA 603D

Frequency Stability Under Temperature Variations:
In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a “call mode”. This is accomplished with the use of R&S CMW500 DIGITAL RADIO COMMUNICATION TESTER.
1. Measure the carrier frequency at room temperature.
2. Subject the EUT to overnight soak at -30℃.
3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on middle channel for LTE band 4, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
4. Repeat the above measurements at 10℃ increments from -30℃ to +50℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments re-measuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.
6. Subject the EUT to overnight soak at +50℃.
7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
8. Repeat the above measurements at 10 ℃ increments from +50℃ to -30℃. Allow at least 1.5 hours at each temperature, unpowered, before making measurements
9. At all temperature levels hold the temperature to +/- 0.5℃ during the measurement procedure.

Frequency Stability Under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

TEST RESULTS

Remark:
1. We tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 4; recorded worst case

LTE Band 4, 1.4MHz bandwidth (worst case of all bandwidths) at 1RB#0 for Mid channel

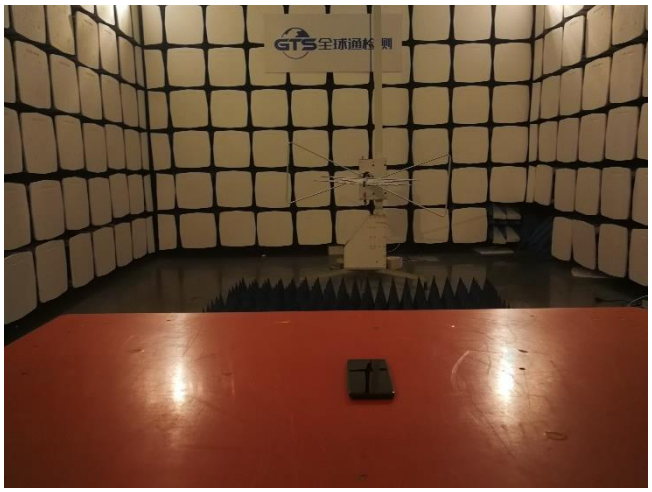
Frequency Error vs Voltage

Voltage (V)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
3.40	8.37	9.27	0.0048	0.0054	2.50
3.80	8.05	9.20	0.0046	0.0053	2.50
4.20	8.41	9.02	0.0049	0.0052	2.50

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
-30°	8.45	9.82	0.0049	0.0057	2.50
-20°	8.36	9.76	0.0048	0.0056	2.50
-10°	8.19	9.37	0.0047	0.0054	2.50
0°	8.85	9.82	0.0051	0.0057	2.50
10°	8.91	9.81	0.0051	0.0057	2.50
20°	8.79	9.63	0.0051	0.0056	2.50
30°	8.37	9.75	0.0048	0.0056	2.50
40°	8.42	9.83	0.0049	0.0057	2.50
50°	8.62	9.62	0.0050	0.0056	2.50

4 Test Setup Photos of the EUT



5 External and Internal Photos of the EUT

External Photos of EUT

Please refer to separated files for External Photos of the EUT.

Internal Photos of EUT

Please refer to separated files for Internal Photos of the EUT.

********** End of Report **********