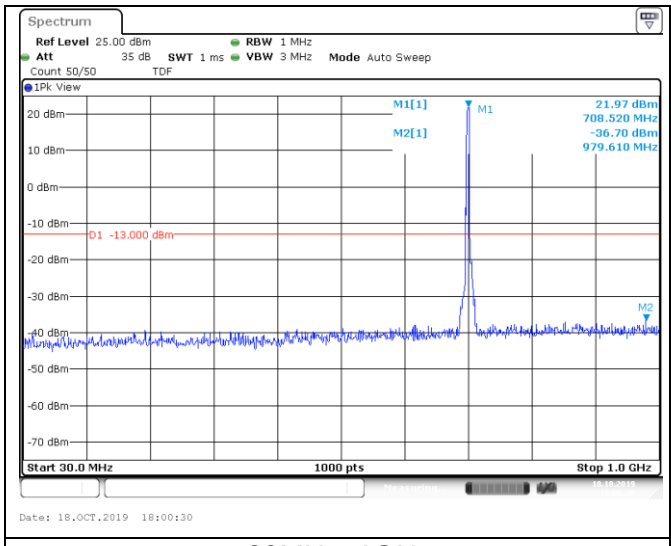
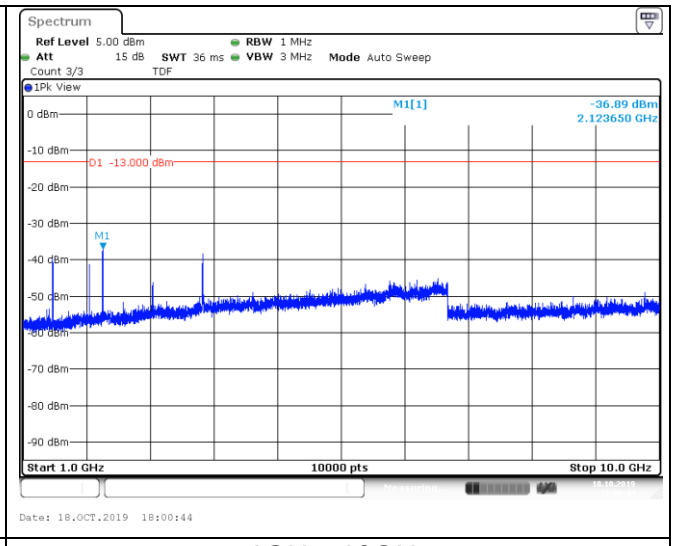
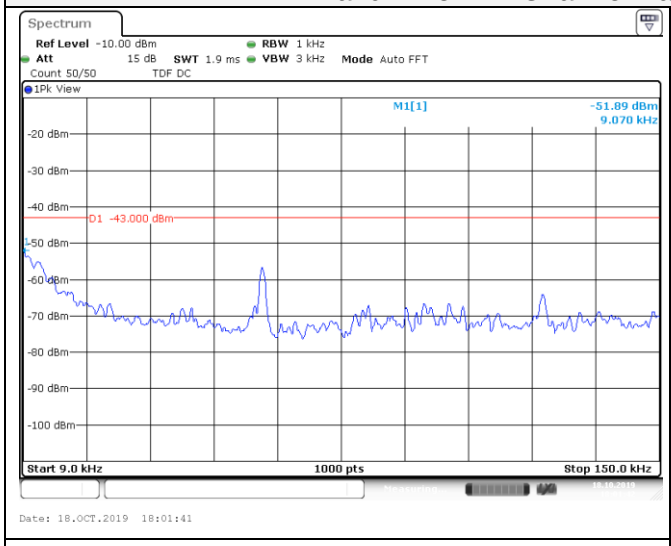


30MHz~1GHz

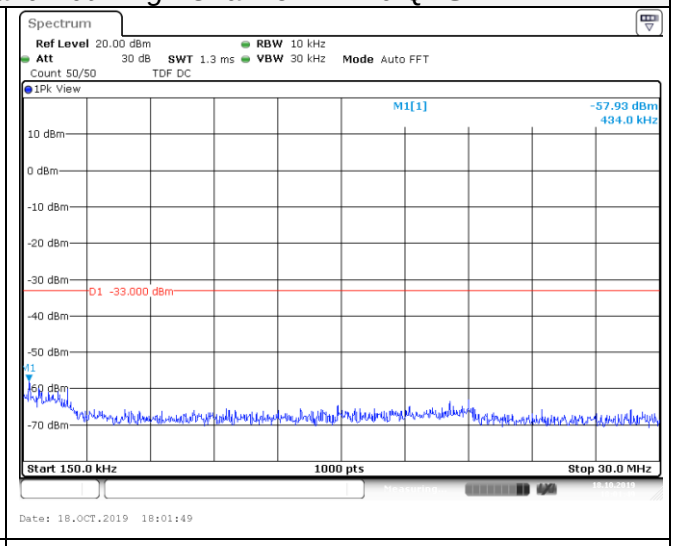


1GHz~10GHz

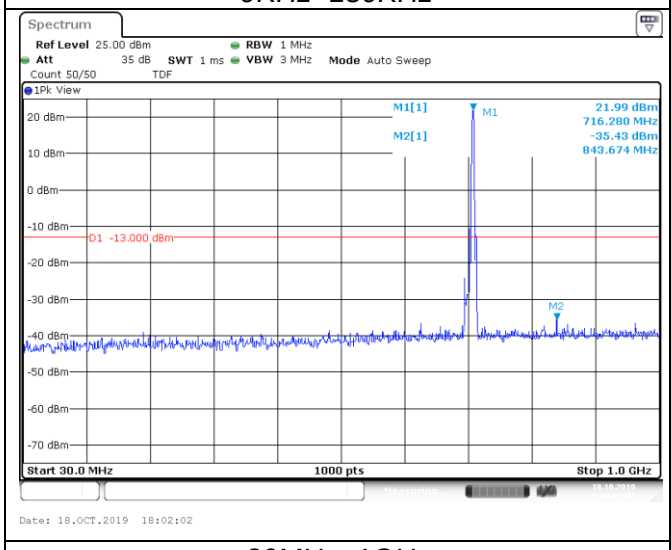
LTE FDD Band 12-3MHz Channel Bandwidth High Channel 1RB#0 QPSK



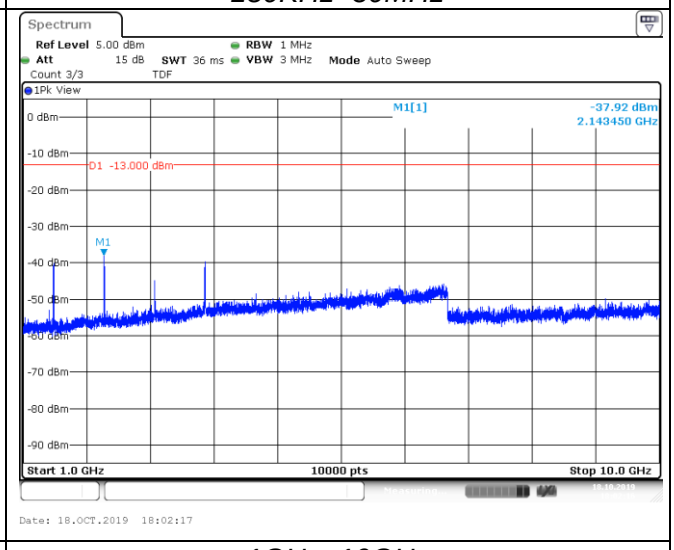
9KHz~150KHz



150KHz~30MHz

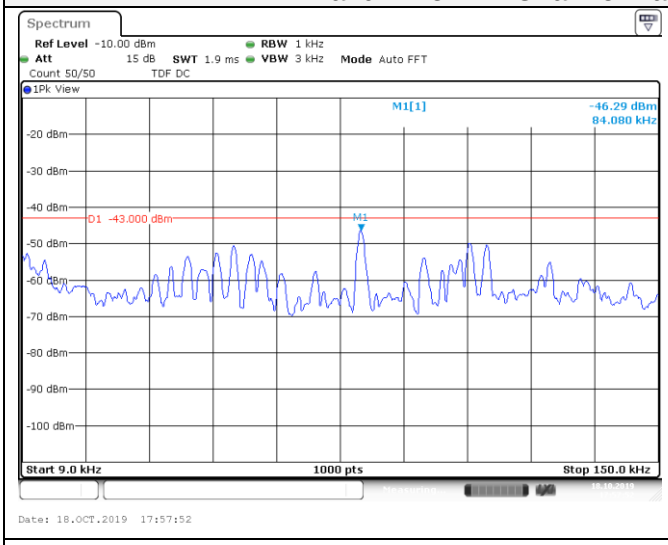


30MHz~1GHz

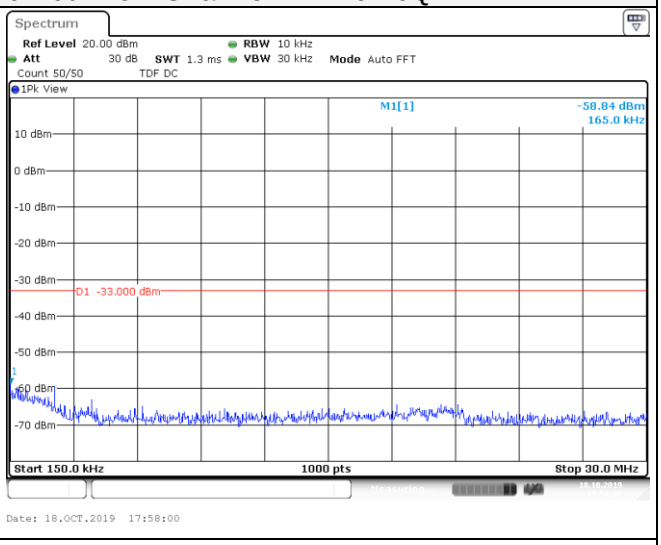


1GHz~10GHz

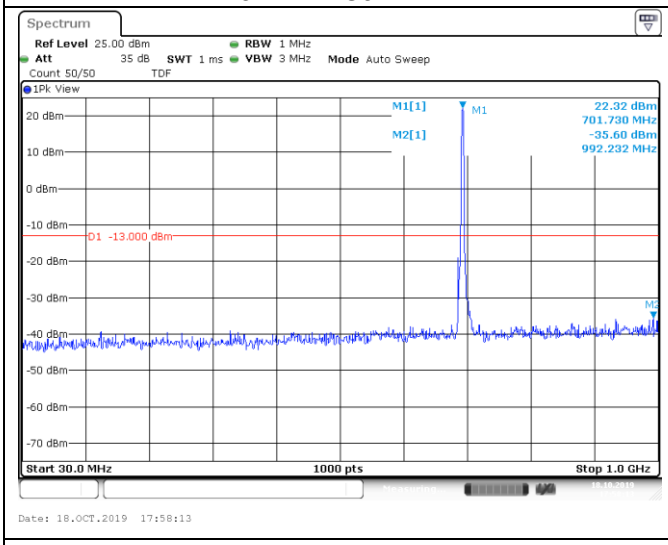
LTE FDD Band 12-3MHz Channel Bandwidth Low Channel 1RB#0 16QAM



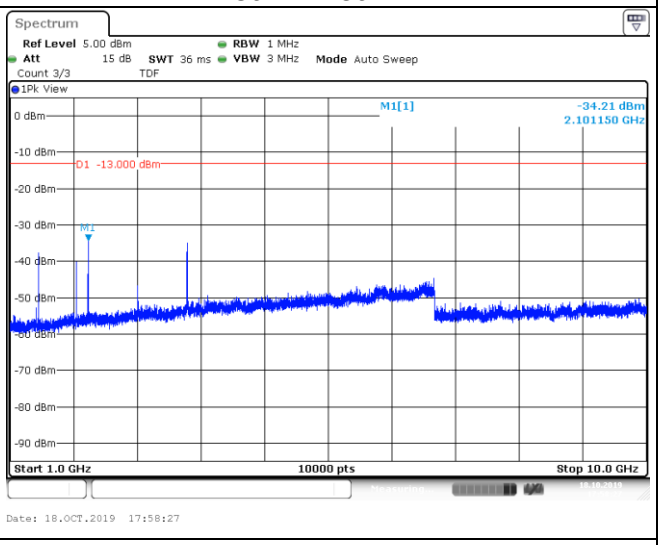
9KHz~150KHz



150KHz~30MHz

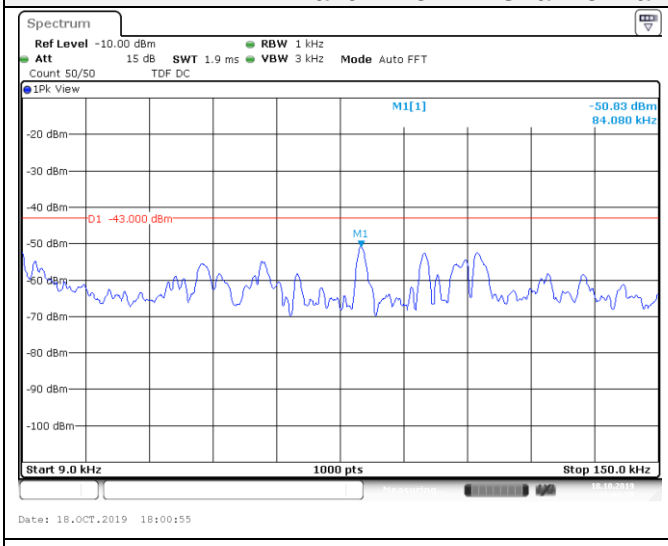


30MHz~1GHz

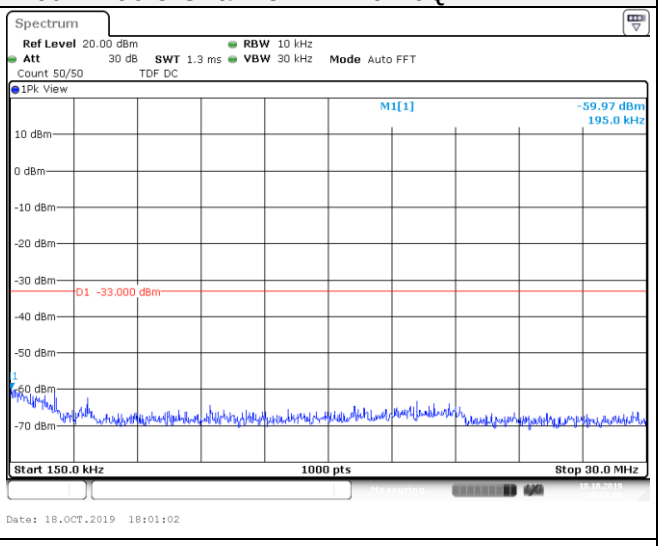


1GHz~10GHz

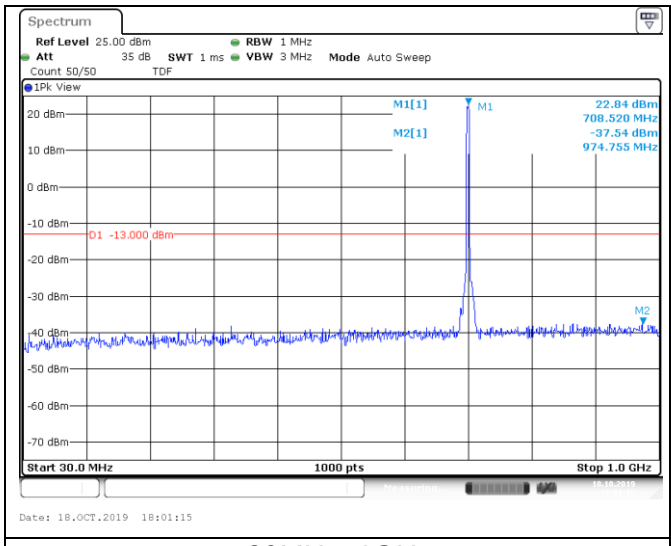
LTE FDD Band 12-3MHz Channel Bandwidth Middle Channel 1RB#0 16QAM



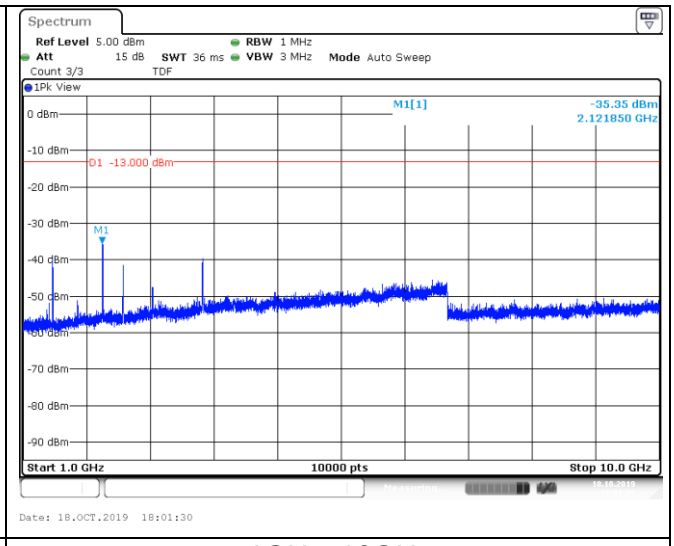
9KHz~150KHz



150KHz~30MHz

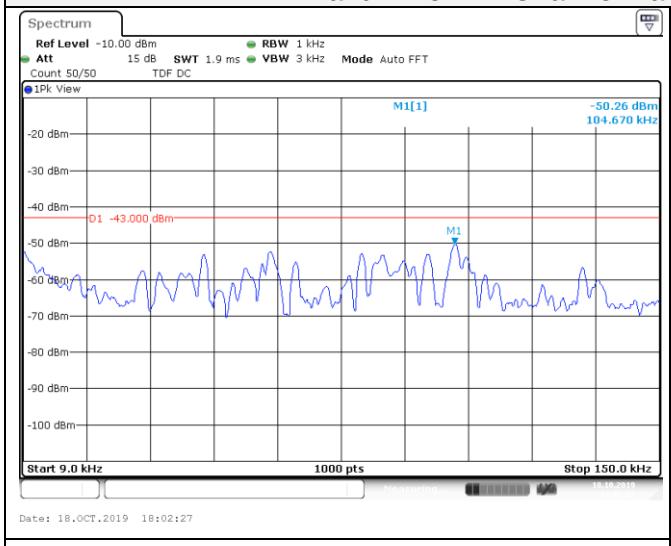


30MHz~1GHz

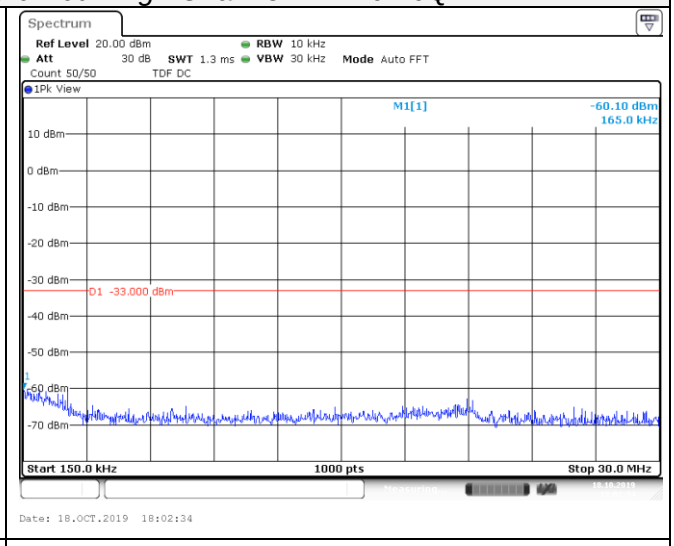


1GHz~10GHz

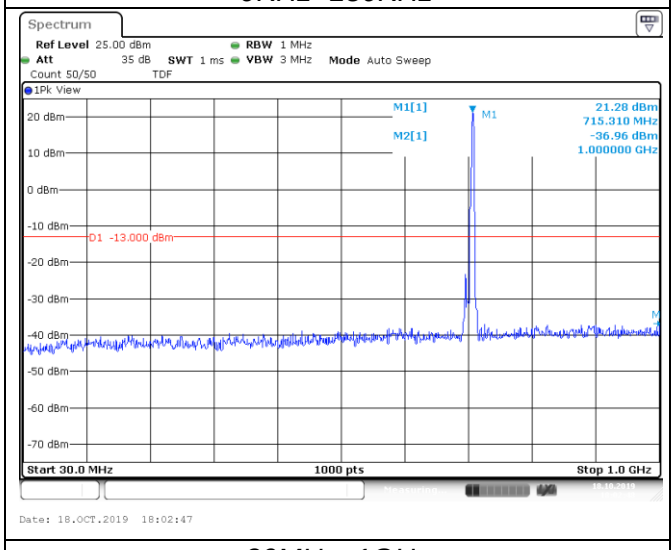
LTE FDD Band 12-3MHz Channel Bandwidth High Channel 1RB#0 16QAM



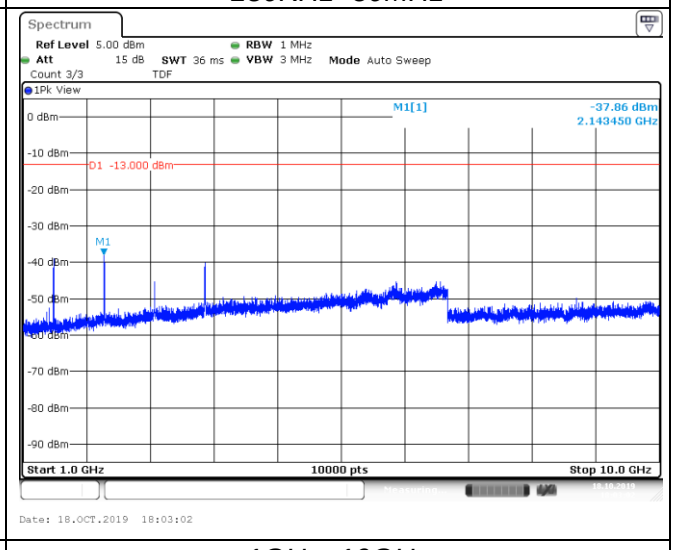
9KHz~150KHz



150KHz~30MHz

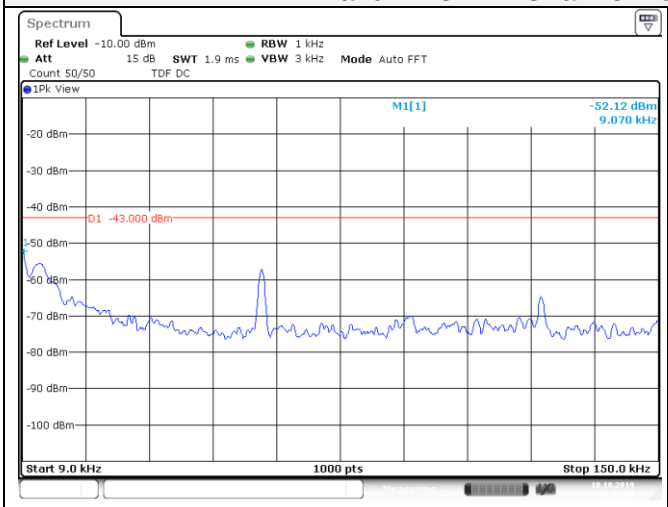


30MHz~1GHz

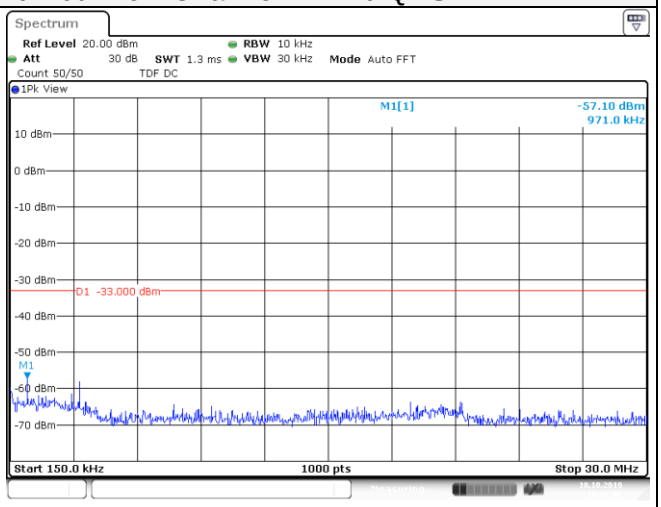


1GHz~10GHz

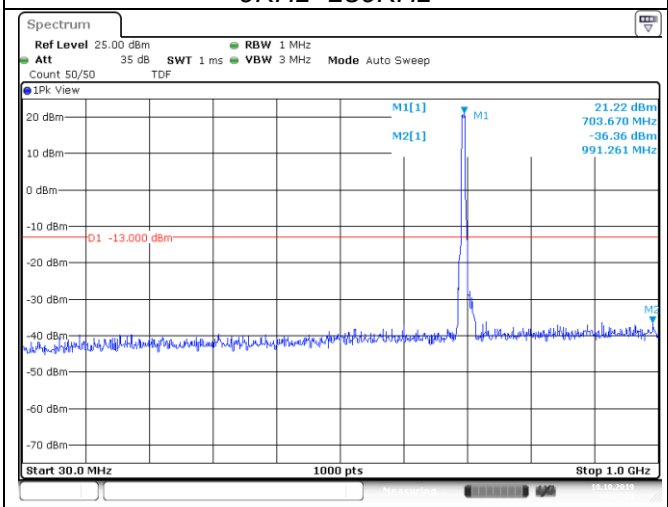
LTE FDD Band 12-5MHz Channel Bandwidth Low Channel 1RB#0 QPSK



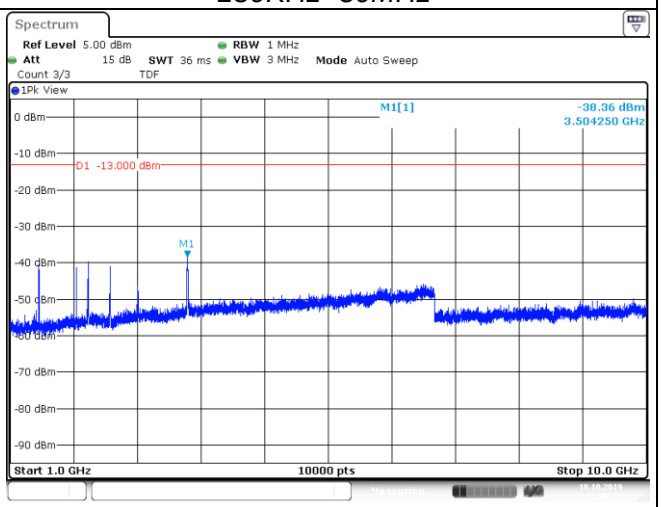
9KHz~150KHz



150KHz~30MHz

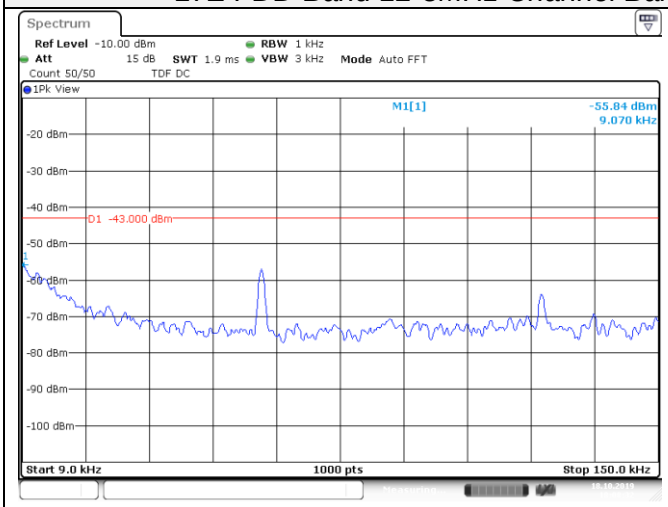


30MHz~1GHz

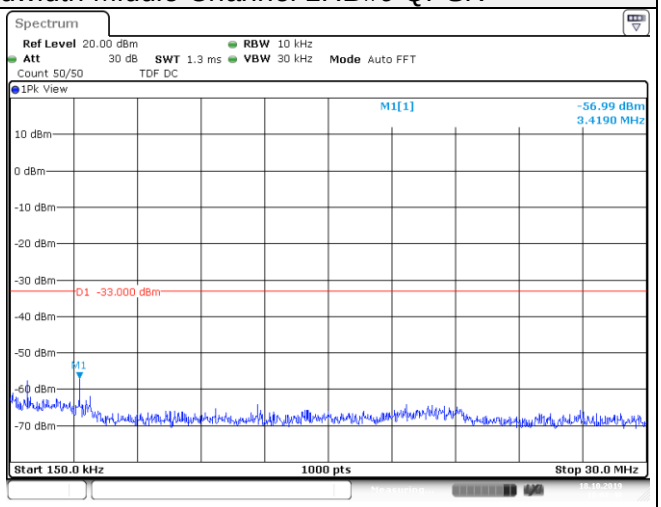


1GHz~10GHz

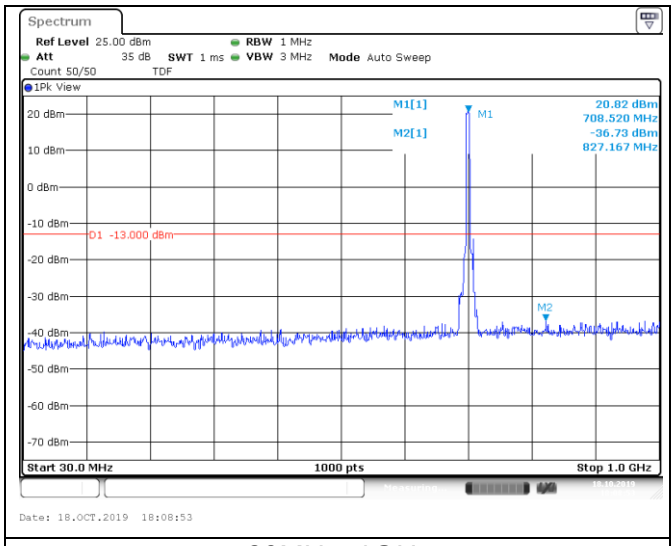
LTE FDD Band 12-5MHz Channel Bandwidth Middle Channel 1RB#0 QPSK



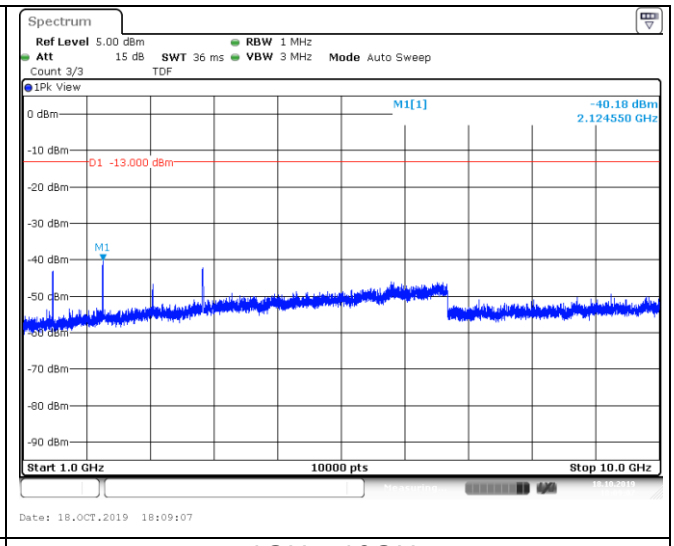
9KHz~150KHz



150KHz~30MHz

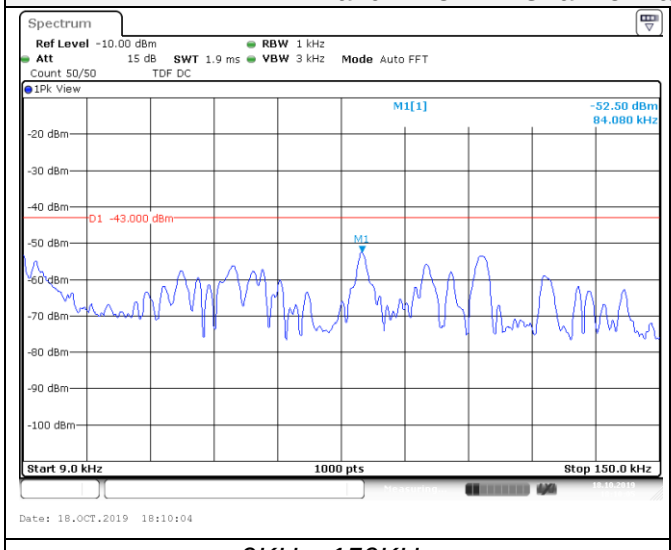


30MHz~1GHz

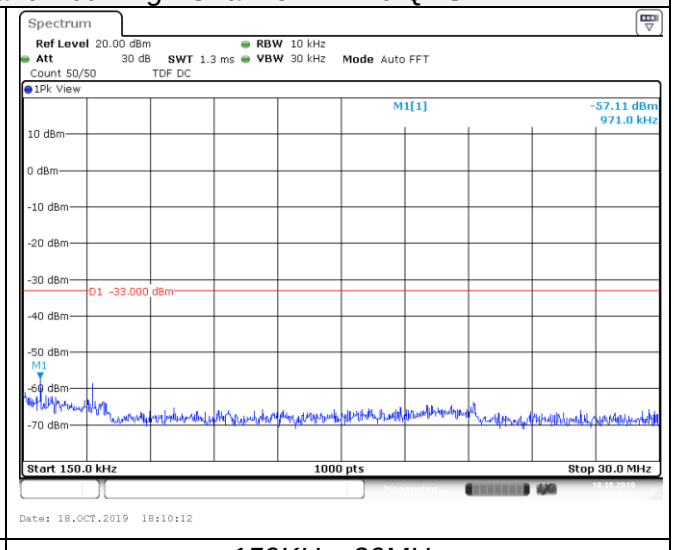


1GHz~10GHz

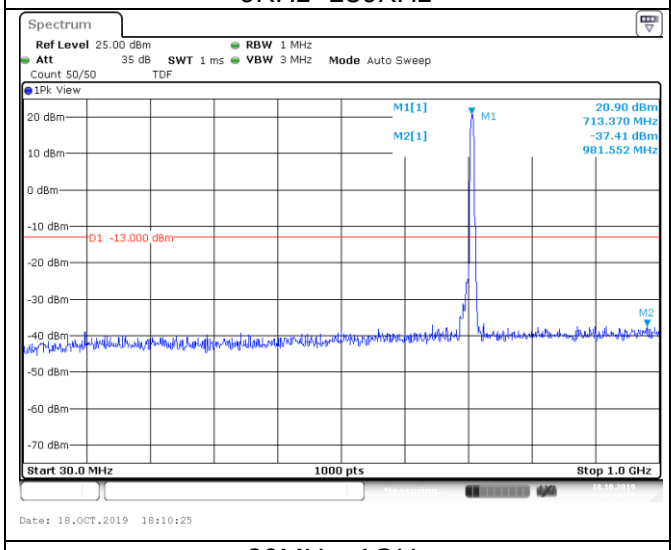
LTE FDD Band 12-5MHz Channel Bandwidth High Channel 1RB#0 QPSK



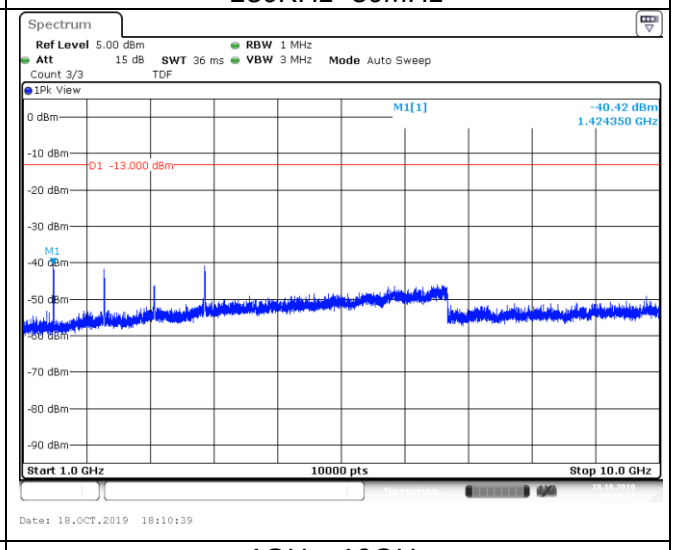
9KHz~150KHz



150KHz~30MHz

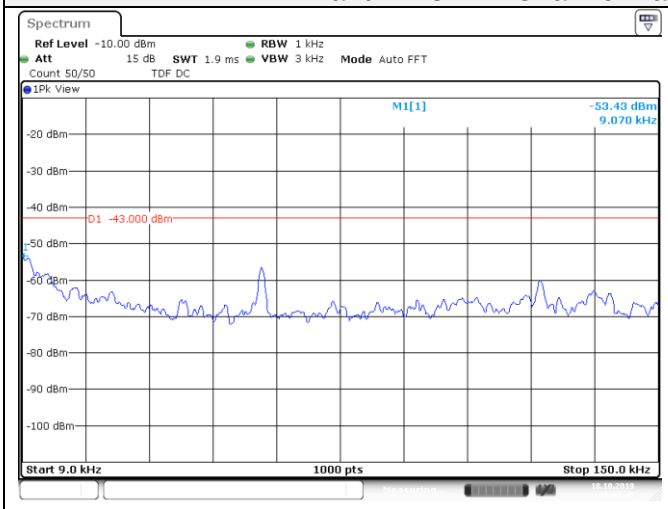


30MHz~1GHz

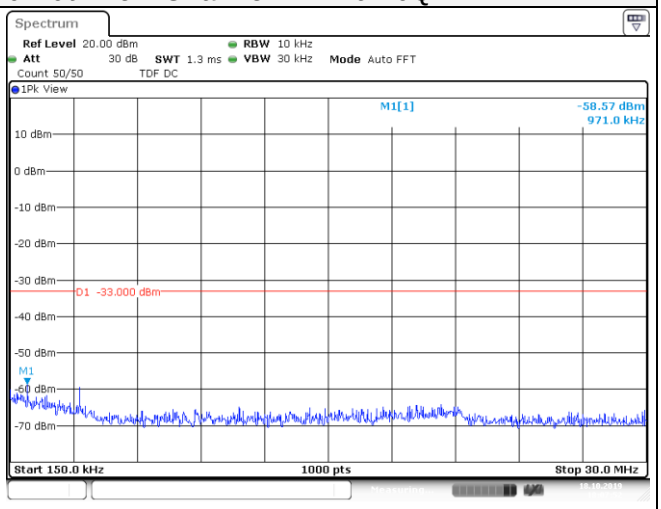


1GHz~10GHz

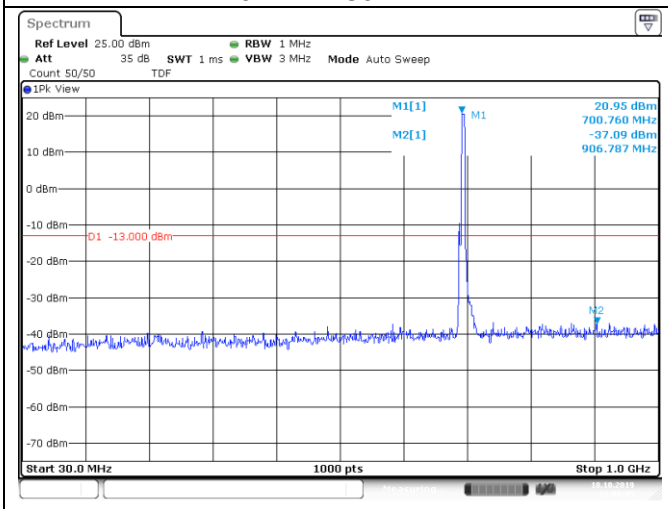
LTE FDD Band 12-5MHz Channel Bandwidth Low Channel 1RB#0 16QAM



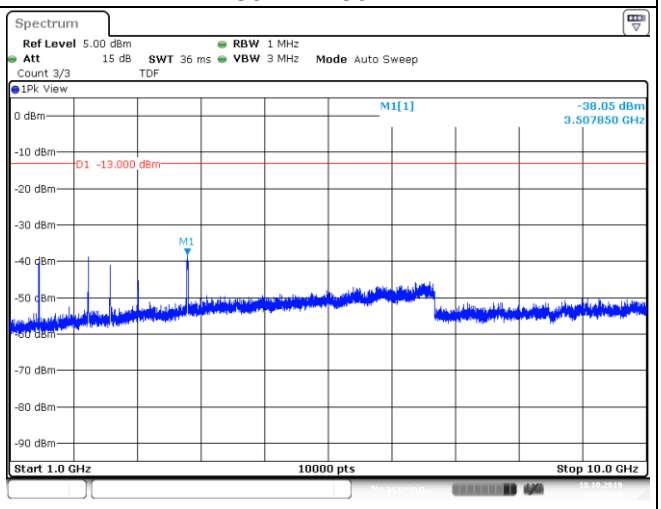
9KHz~150KHz



150KHz~30MHz

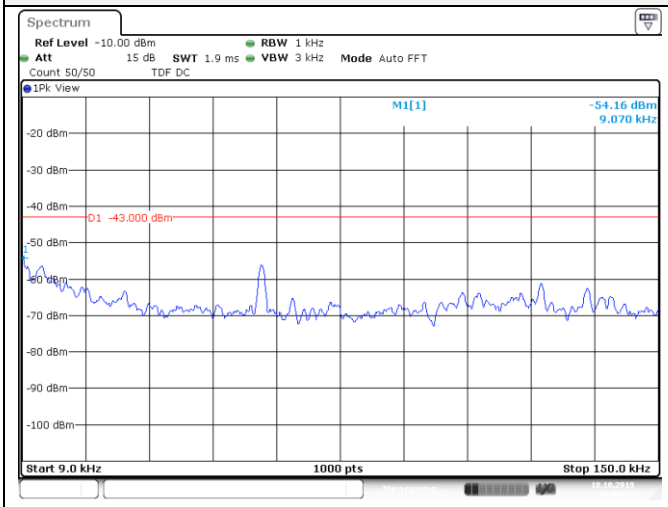


30MHz~1GHz

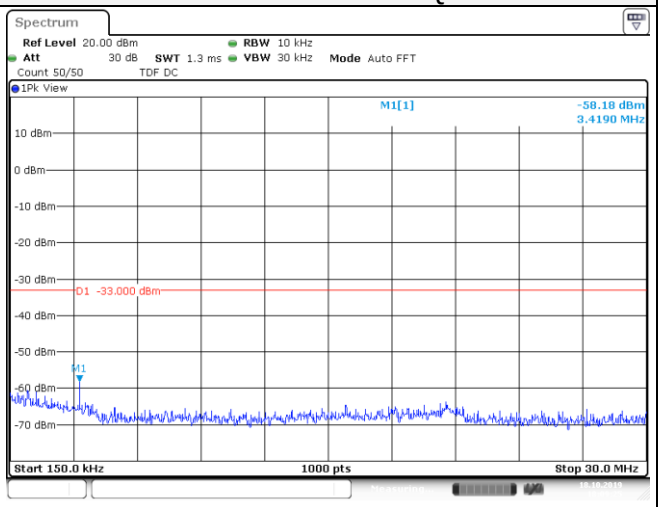


1GHz~10GHz

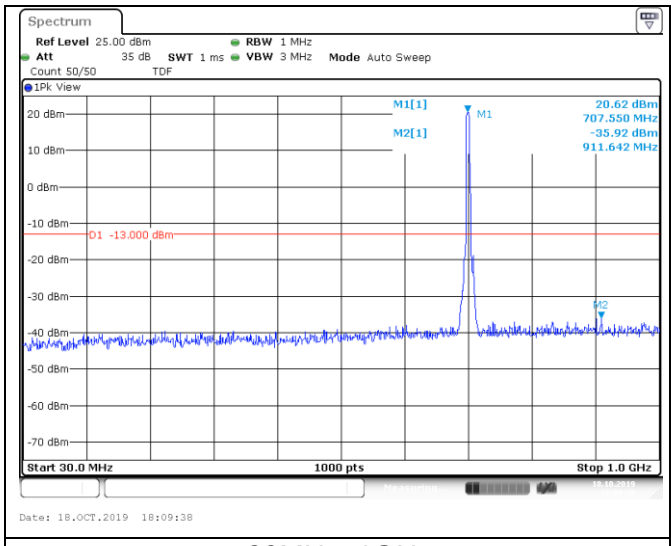
LTE FDD Band 12-5MHz Channel Bandwidth Middle Channel 1RB#0 16QAM



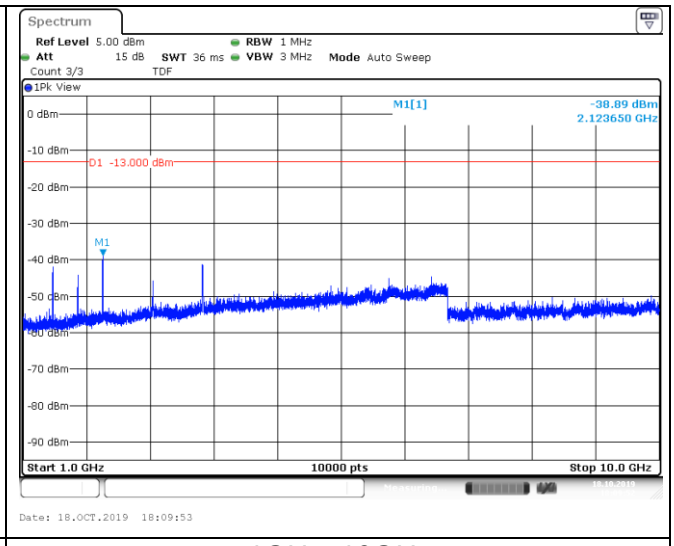
9KHz~150KHz



150KHz~30MHz

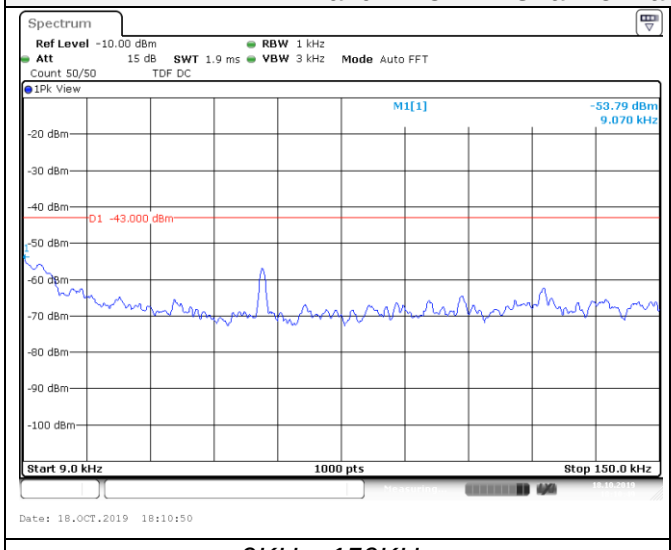


30MHz~1GHz

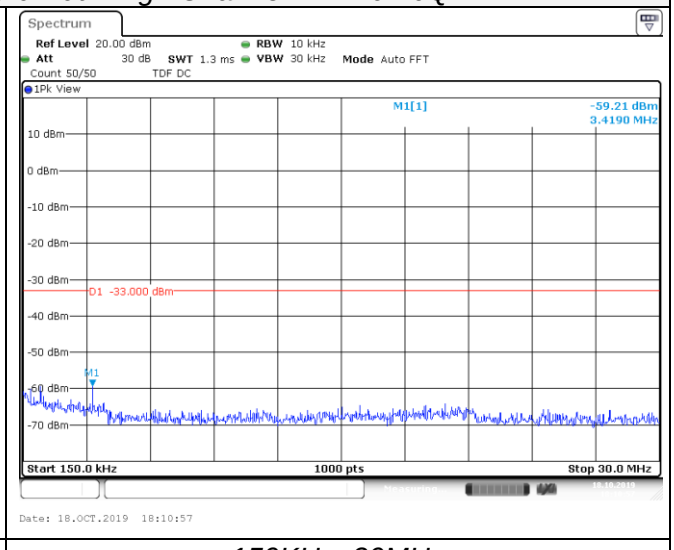


1GHz~10GHz

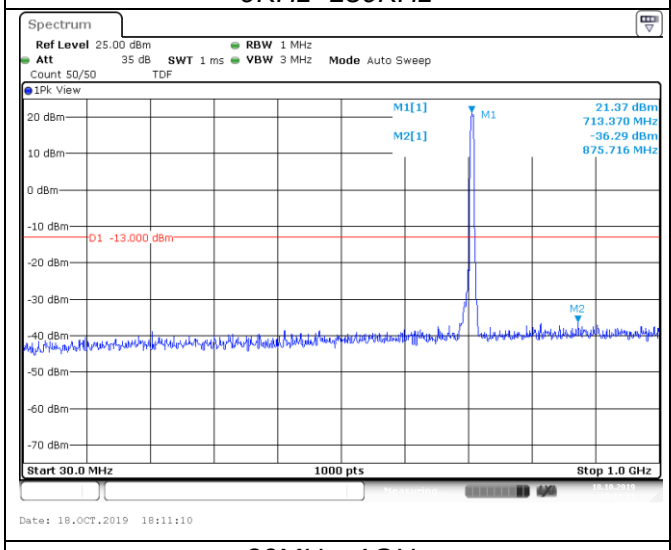
LTE FDD Band 12-5MHz Channel Bandwidth High Channel 1RB#0 16QAM



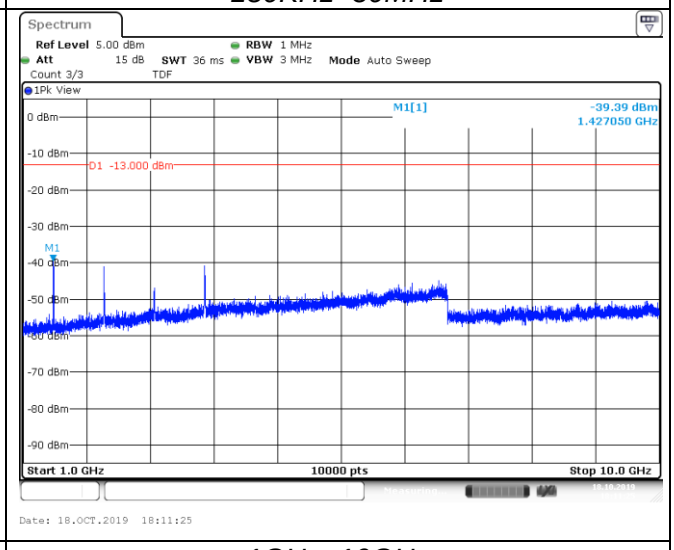
9KHz~150KHz



150KHz~30MHz

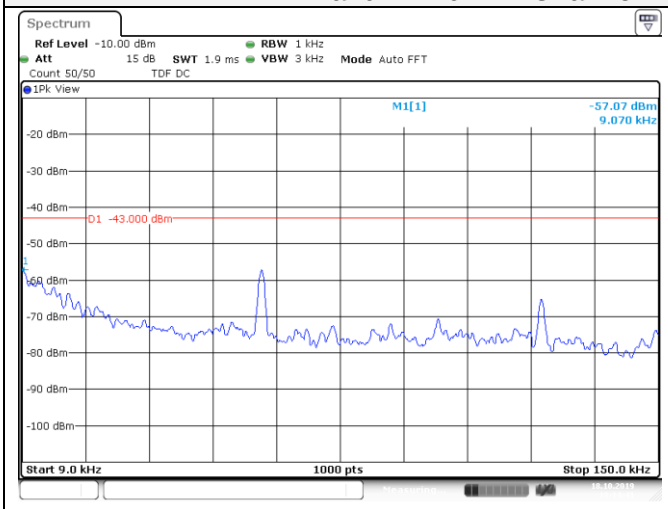


30MHz~1GHz

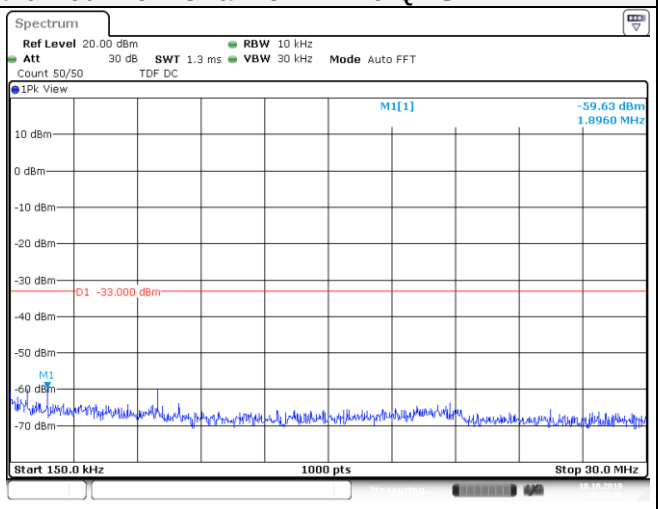


1GHz~10GHz

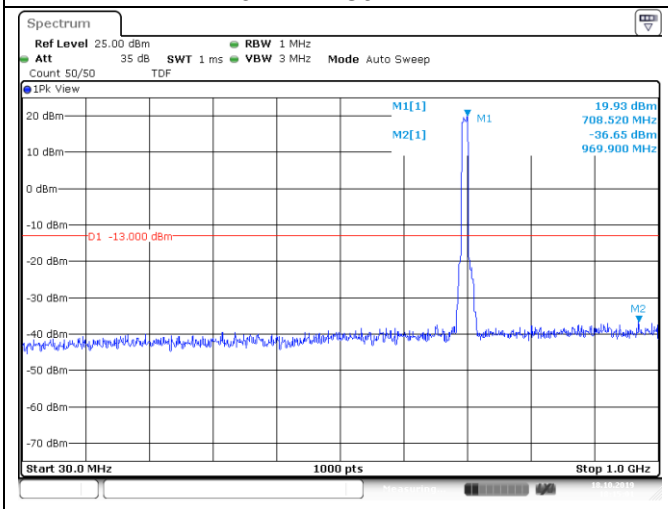
LTE FDD Band 12-10MHz Channel Bandwidth Low Channel 1RB#0 QPSK



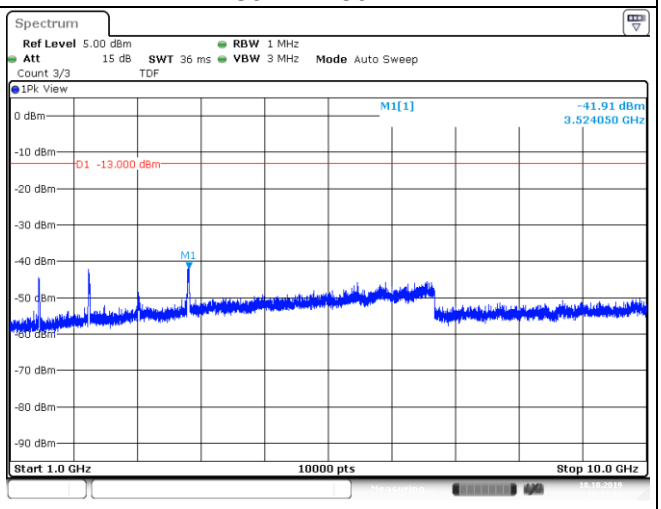
9KHz~150KHz



150KHz~30MHz

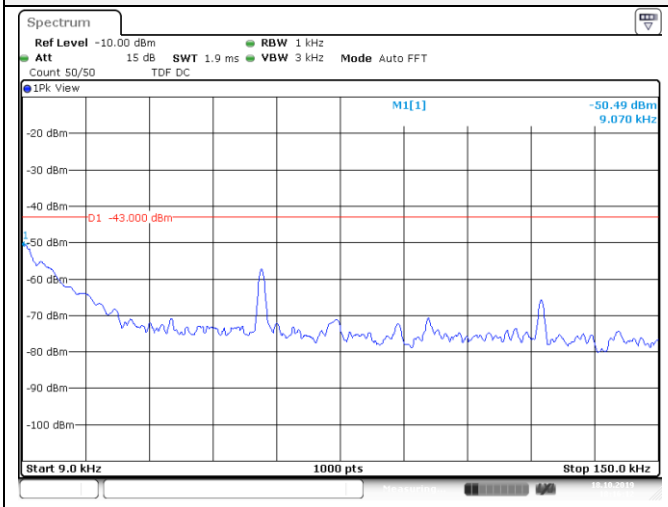


30MHz~1GHz

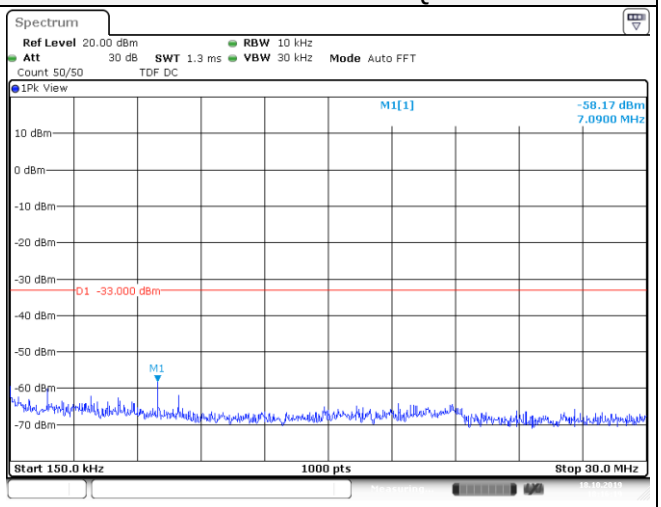


1GHz~10GHz

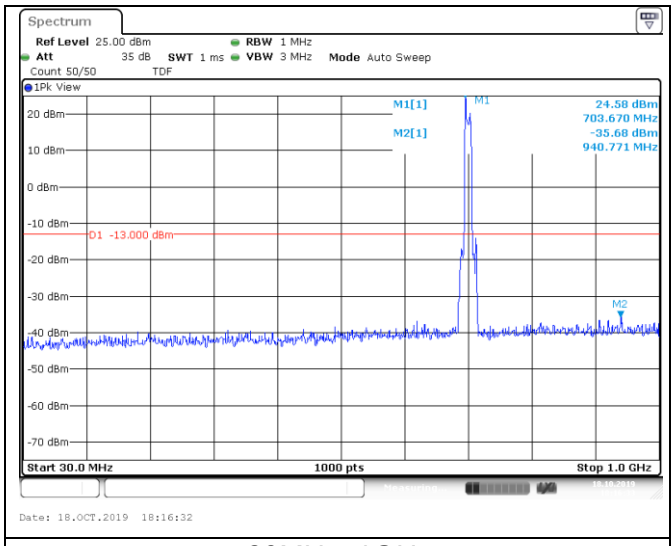
LTE FDD Band 12-10MHz Channel Bandwidth Middle Channel 1RB#0 QPSK



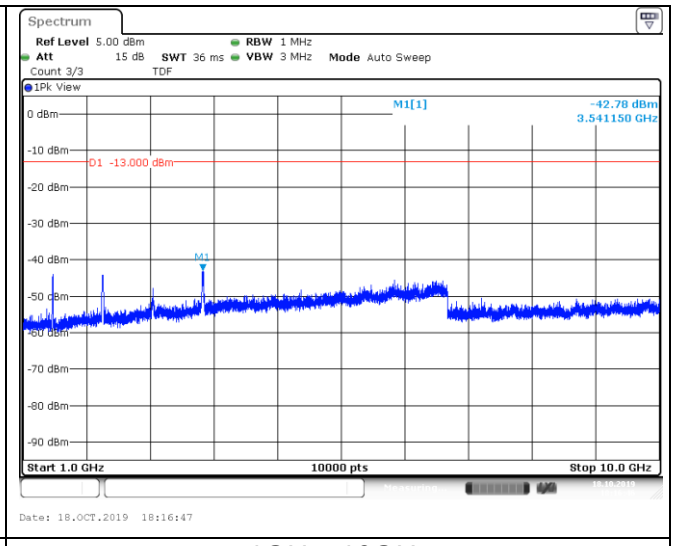
9KHz~150KHz



150KHz~30MHz

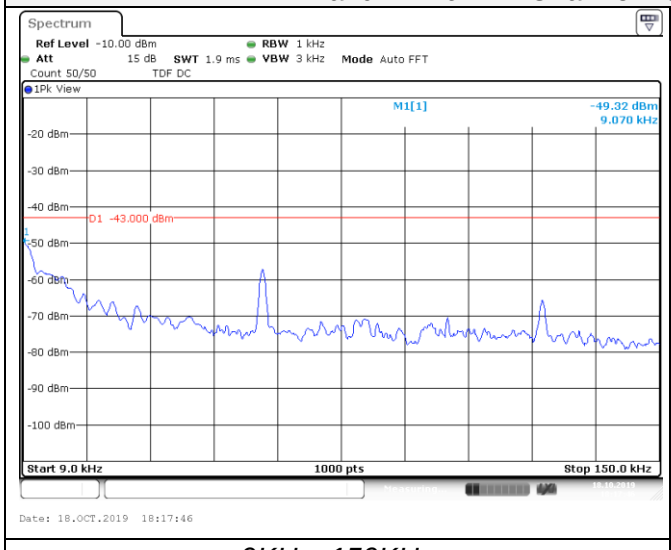


30MHz~1GHz

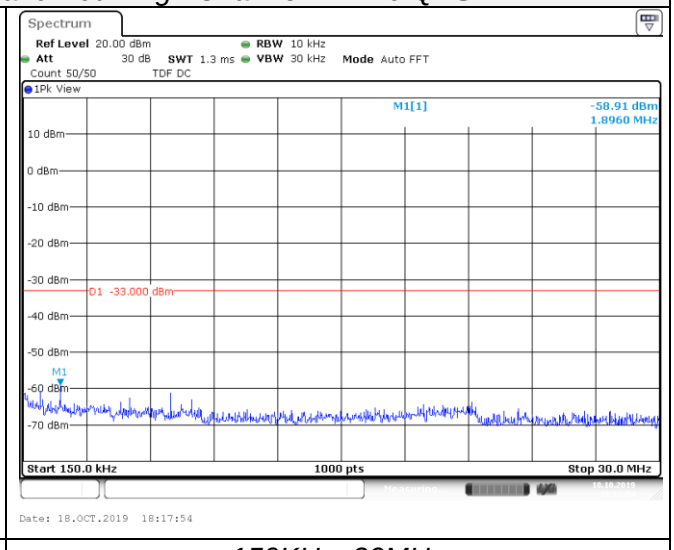


1GHz~10GHz

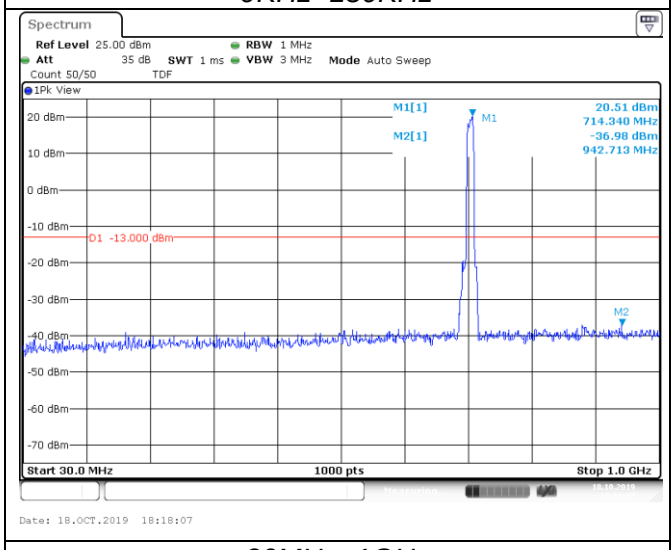
LTE FDD Band 12-10MHz Channel Bandwidth High Channel 1RB#0 QPSK



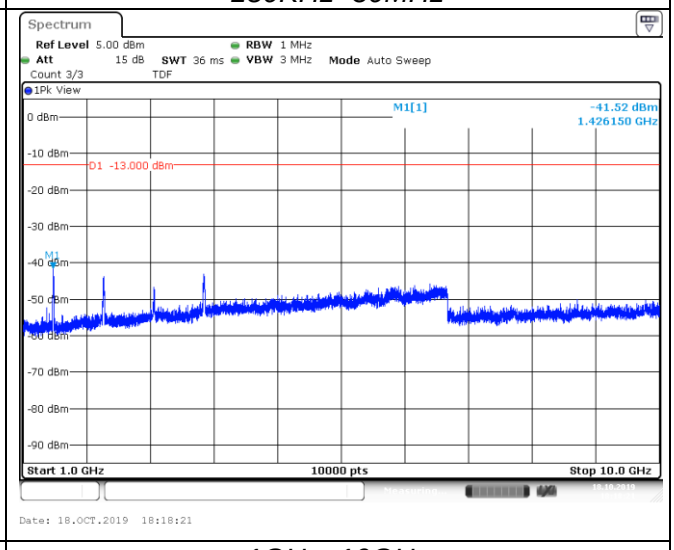
9KHz~150KHz



150KHz~30MHz

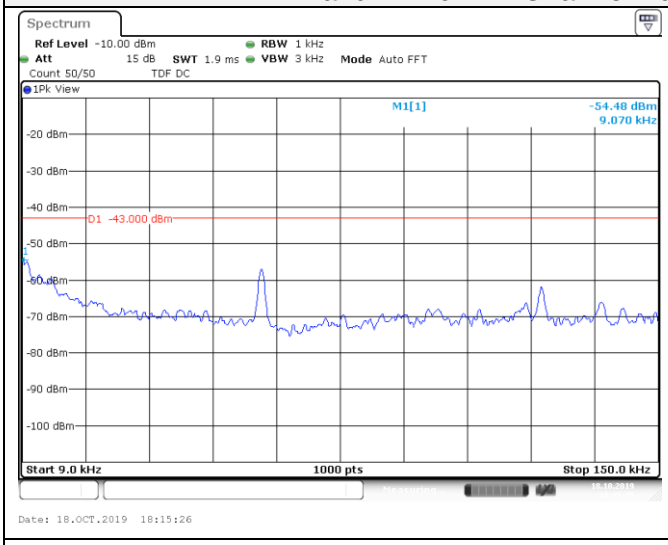


30MHz~1GHz

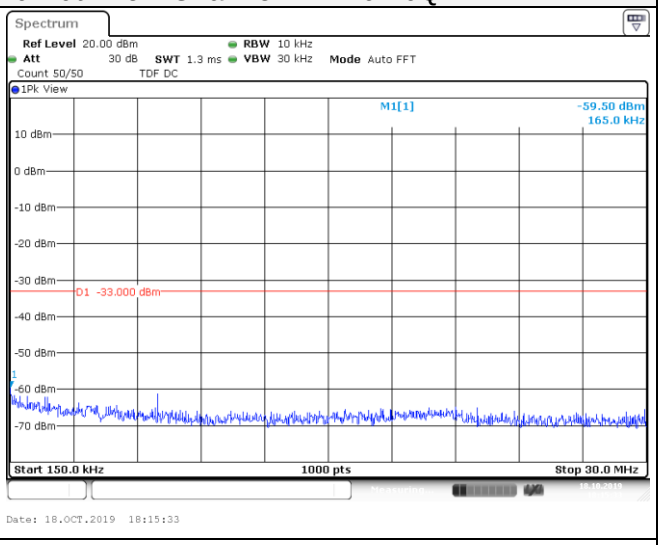


1GHz~10GHz

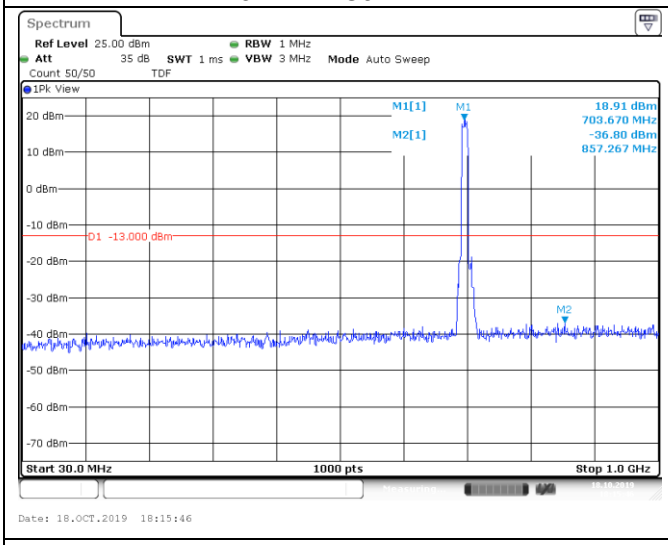
LTE FDD Band 12-10MHz Channel Bandwidth Low Channel 1RB#0 16QAM



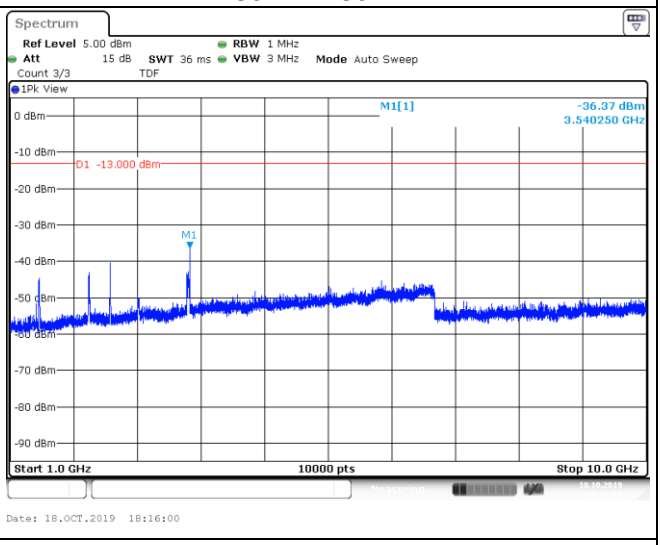
9KHz~150KHz



150KHz~30MHz

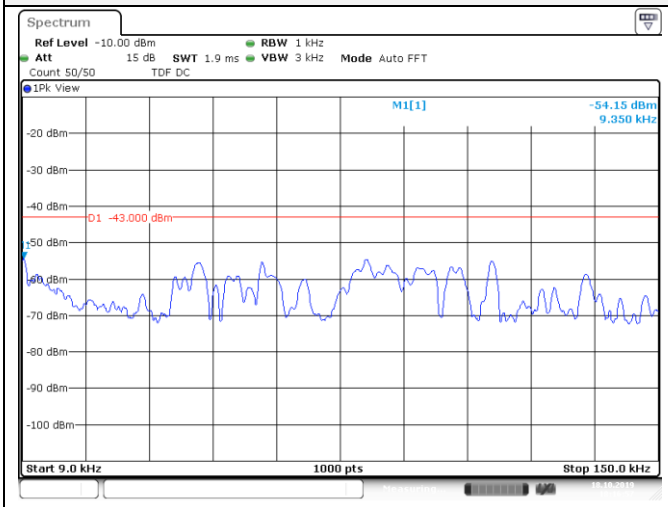


30MHz~1GHz

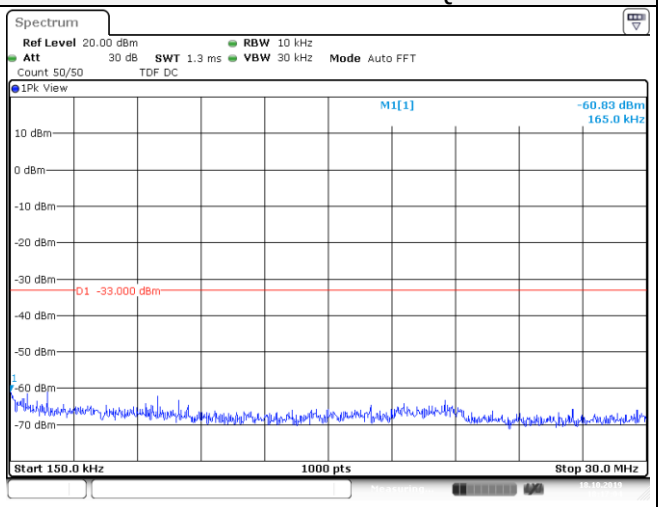


1GHz~10GHz

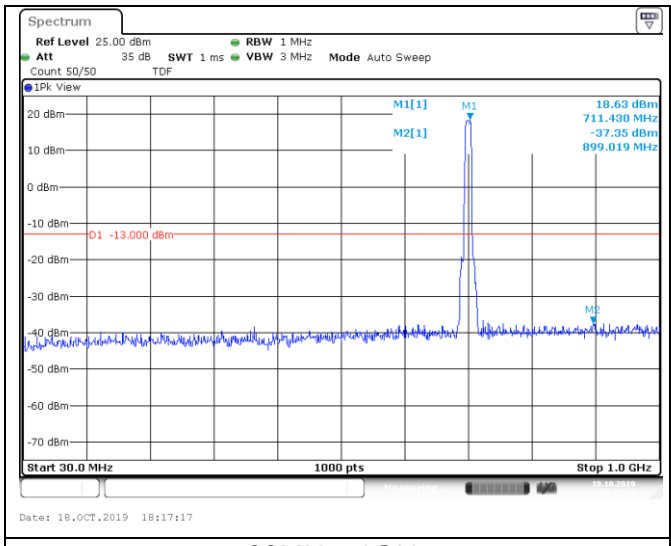
LTE FDD Band 12-10MHz Channel Bandwidth Middle Channel 1RB#0 16QAM



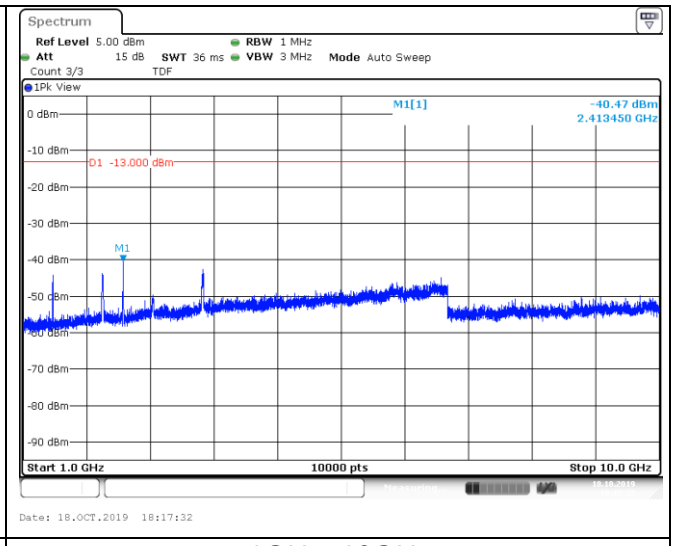
9KHz~150KHz



150KHz~30MHz

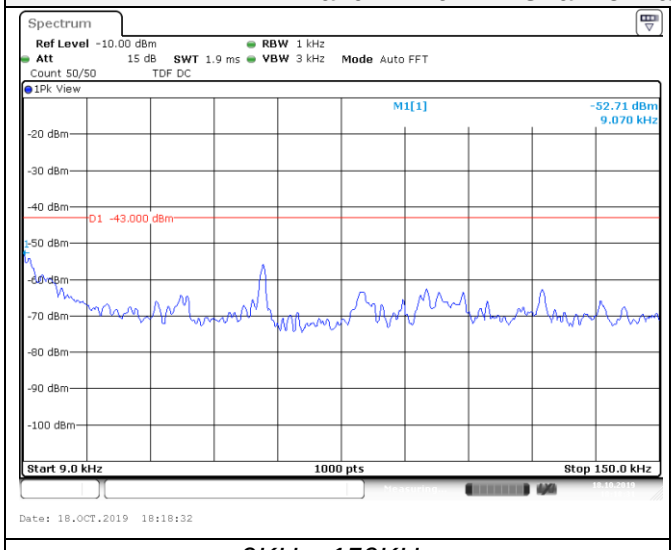


30MHz~1GHz

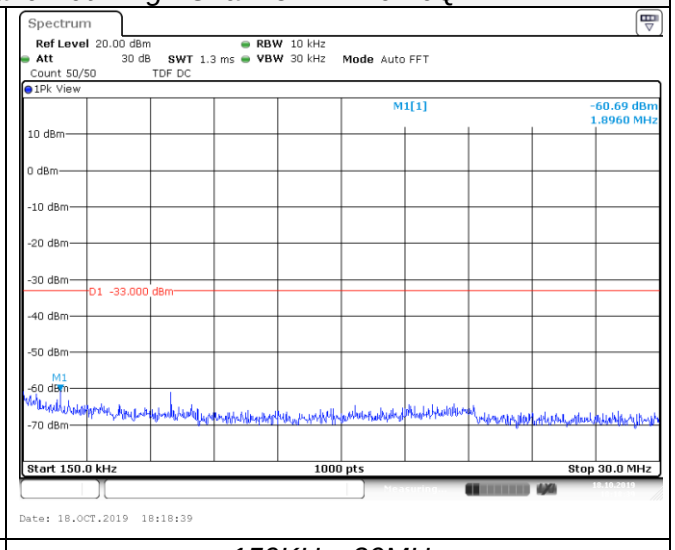


1GHz~10GHz

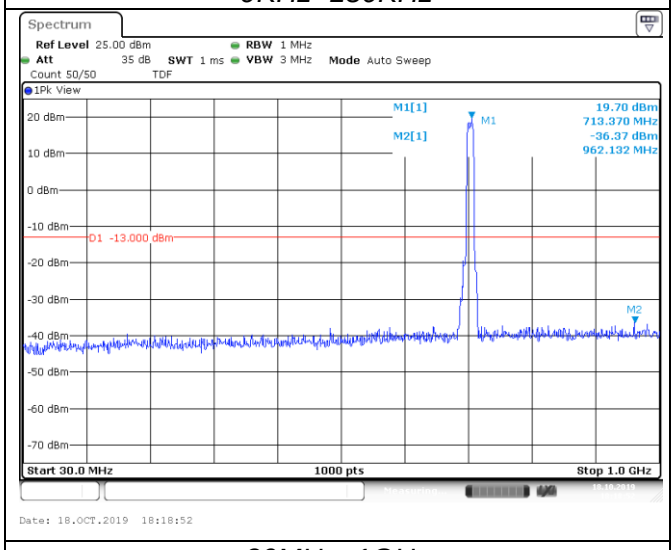
LTE FDD Band 12-10MHz Channel Bandwidth High Channel 1RB#0 16QAM



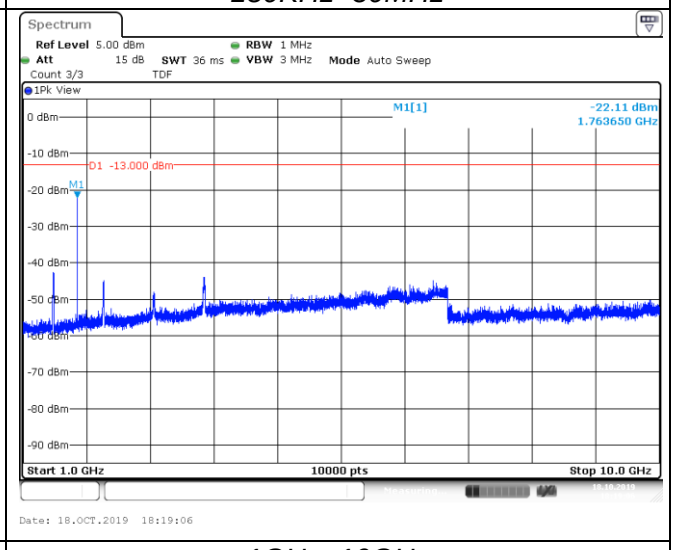
9KHz~150KHz



150KHz~30MHz



30MHz~1GHz



1GHz~10GHz

Radiated Measurement:

Remark:
1. *We were tested all RB Configuration refer 3GPP TS136 521 for each Channel Bandwidth of LTE FDD Band 12; recorded worst case for each Channel Bandwidth of LTE FDD Band 12 @ QPSK modulation.*
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 12_Channel Bandwidth 1.4MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1399.4	-37.28	2.86	3.00	7.25	-32.89	-13.00	19.89	H
2099.1	-41.84	2.94	3.00	9.53	-35.25	-13.00	22.25	H
1399.4	-35.29	2.86	3.00	7.25	-30.90	-13.00	17.90	V
2099.1	-39.23	2.94	3.00	9.53	-32.64	-13.00	19.64	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-37.11	2.88	3.00	7.31	-32.68	-13.00	19.68	H
2122.5	-42.72	2.97	3.00	9.55	-36.14	-13.00	23.14	H
1415.0	-34.53	2.88	3.00	7.31	-30.10	-13.00	17.10	V
2122.5	-40.71	2.97	3.00	9.55	-34.13	-13.00	21.13	V

LTE FDD Band 12_Channel Bandwidth 1.4MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1430.6	-38.65	2.91	3.00	7.82	-33.74	-13.00	20.74	H
2145.9	-43.26	3.05	3.00	9.66	-36.65	-13.00	23.65	H
1430.6	-36.70	2.91	3.00	7.82	-31.79	-13.00	18.79	V
2145.9	-40.92	3.05	3.00	9.66	-34.31	-13.00	21.31	V

LTE FDD Band 12_Channel Bandwidth 3MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1401.0	-36.92	2.86	3.00	7.25	-32.53	-13.00	19.53	H
2101.5	-41.43	2.94	3.00	9.53	-34.84	-13.00	21.84	H
1401.0	-34.89	2.86	3.00	7.25	-30.50	-13.00	17.50	V
2101.5	-39.61	2.94	3.00	9.53	-33.02	-13.00	20.02	V

LTE FDD Band 12_Channel Bandwidth 3MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-37.84	2.88	3.00	7.31	-33.41	-13.00	20.41	H
2122.5	-40.68	2.97	3.00	9.55	-34.10	-13.00	21.10	H
1415.0	-35.38	2.88	3.00	7.31	-30.95	-13.00	17.95	V
2122.5	-38.58	2.97	3.00	9.55	-32.00	-13.00	19.00	V

LTE FDD Band 12_Channel Bandwidth 3MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1429.0	-39.95	2.91	3.00	7.82	-35.04	-13.00	22.04	H
2143.5	-42.49	3.05	3.00	9.66	-35.88	-13.00	22.88	H
1429.0	-37.30	2.91	3.00	7.82	-32.39	-13.00	19.39	V
2143.5	-40.73	3.05	3.00	9.66	-34.12	-13.00	21.12	V

LTE FDD Band 12_Channel Bandwidth 5MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1403.0	-38.73	2.86	3.00	7.25	-34.34	-13.00	21.34	H
2104.5	-44.01	2.94	3.00	9.53	-37.42	-13.00	24.42	H
1403.0	-36.70	2.86	3.00	7.25	-32.31	-13.00	19.31	V
2104.5	-41.53	2.94	3.00	9.53	-34.94	-13.00	21.94	V

LTE FDD Band 12_Channel Bandwidth 5MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-36.75	2.88	3.00	7.31	-32.32	-13.00	19.32	H
2122.5	-39.92	2.97	3.00	9.55	-33.34	-13.00	20.34	H
1415.0	-34.10	2.88	3.00	7.31	-29.67	-13.00	16.67	V
2122.5	-38.07	2.97	3.00	9.55	-31.49	-13.00	18.49	V

LTE FDD Band 12_Channel Bandwidth 5MHz_QPSK_ High Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1427.0	-37.25	2.91	3.00	7.82	-32.34	-13.00	19.34	H
2140.5	-41.00	3.05	3.00	9.66	-34.39	-13.00	21.39	H
1427.0	-34.49	2.91	3.00	7.82	-29.58	-13.00	16.58	V
2140.5	-38.28	3.05	3.00	9.66	-31.67	-13.00	18.67	V

LTE FDD Band 12_Channel Bandwidth 10MHz_QPSK_ Low Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	Peak EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1408.0	-39.61	2.86	3.00	7.25	-35.22	-13.00	22.22	H
2112.0	-41.31	2.94	3.00	9.53	-34.72	-13.00	21.72	H
1408.0	-37.97	2.86	3.00	7.25	-33.58	-13.00	20.58	V
2112.0	-38.79	2.94	3.00	9.53	-32.20	-13.00	19.20	V

LTE FDD Band 12_Channel Bandwidth 10MHz_QPSK_ Middle Channel

Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1415.0	-39.14	2.88	3.00	7.31	-34.71	-13.00	21.71	H
2122.5	-42.04	2.97	3.00	9.55	-35.46	-13.00	22.46	H
1415.0	-37.19	2.88	3.00	7.31	-32.76	-13.00	19.76	V
2122.5	-40.09	2.97	3.00	9.55	-33.51	-13.00	20.51	V

LTE FDD Band 12_Channel Bandwidth 10MHz_QPSK_ High Channel

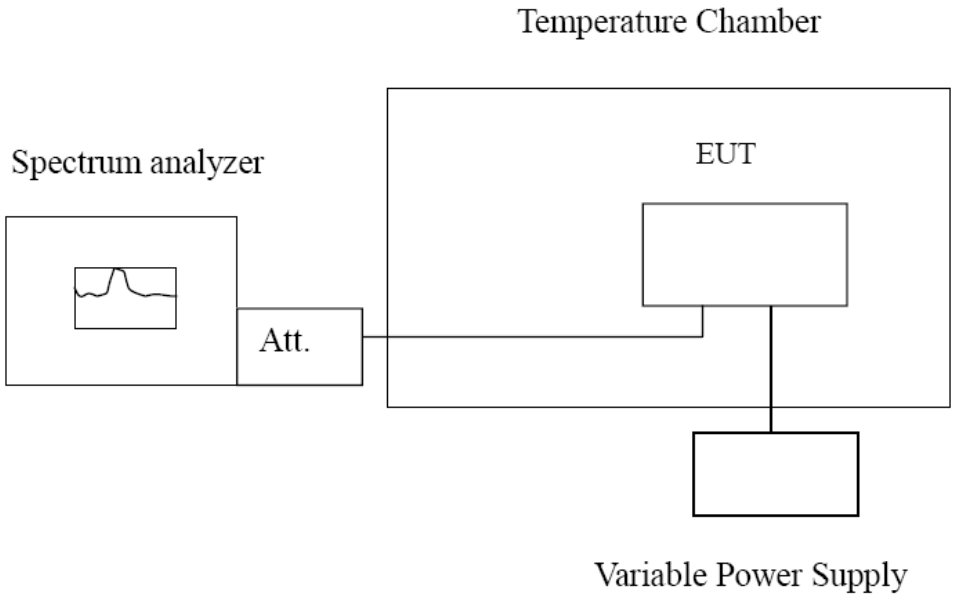
Frequency (MHz)	P_{Mea} (dBm)	P_{cl} (dB)	Distance (m)	G_a Antenna Gain(dB)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarization
1422.0	-40.82	2.91	3.00	7.82	-35.91	-13.00	22.91	H
2133.0	-39.91	3.05	3.00	9.66	-33.30	-13.00	20.30	H
1422.0	-38.71	2.91	3.00	7.82	-33.80	-13.00	20.80	V
2133.0	-37.91	3.05	3.00	9.66	-31.30	-13.00	18.30	V

3.6 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 12, 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 12; recorded worst case.

LTE Band 12, 1.4MHz bandwidth (worst case of all bandwidths)

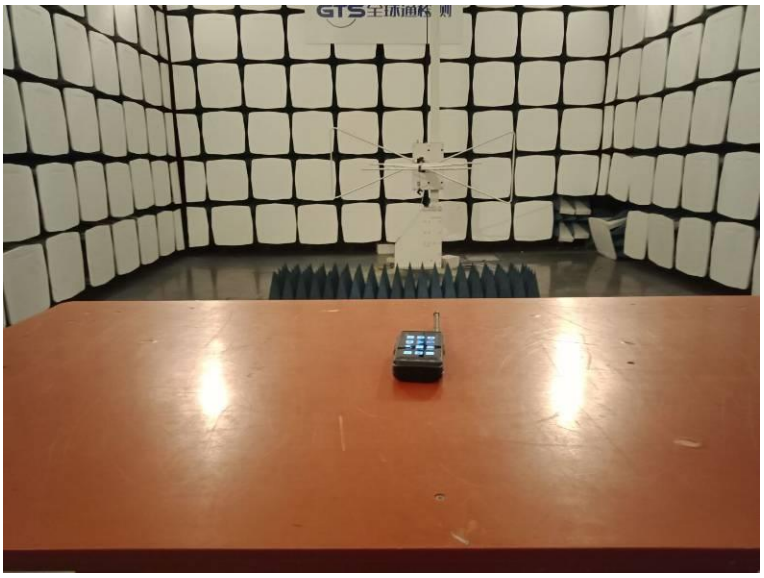
Frequency Error vs Voltage

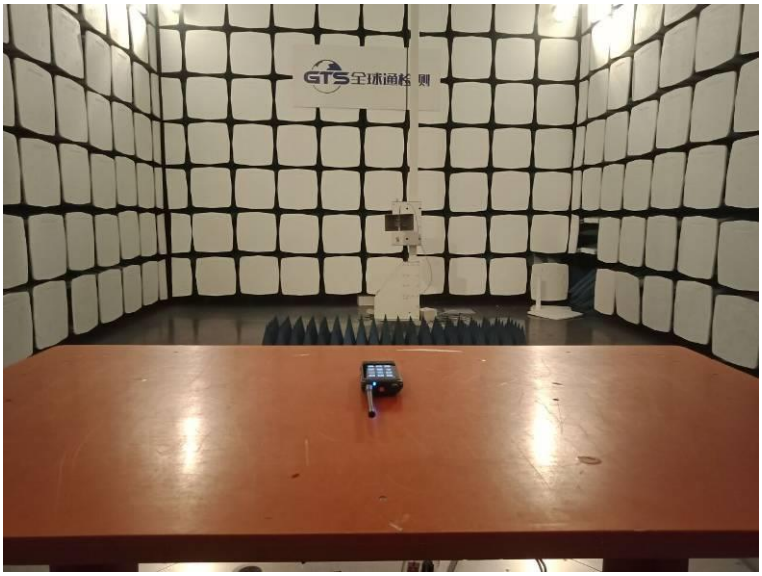
Voltage (V)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
3.80	6.56	3.76	0.00927	0.00531	2.50
4.37	8.38	3.74	0.01184	0.00529	2.50
3.23	-2.04	-9.79	-0.00288	-0.01384	2.50

Frequency Error vs Temperature

Temperature (℃)	Frequency error (Hz)		Frequency error (ppm)		Limit (ppm)
	QPSK	16QAM	QPSK	16QAM	
-30°	-4.11	6.34	-0.00581	0.00896	2.50
-20°	-4.16	-5.13	-0.00588	-0.00725	2.50
-10°	-1.26	9.92	-0.00178	0.01402	2.50
0°	-0.69	-3.24	-0.00098	-0.00458	2.50
10°	6.44	5.02	0.00910	0.00710	2.50
20°	-4.04	-4.49	-0.00571	-0.00635	2.50
30°	6.41	-7.94	0.00906	-0.01122	2.50
40°	-6.47	5.29	-0.00914	0.00748	2.50
50°	-1.87	-8.04	-0.00264	-0.01136	2.50

4 Test Setup Photos of the EUT





5 Photos of the EUT

Reference to the test report No. GTS20191021009-1-9-1

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