16.3 Results LTE band 12

The EUT was set to transmit the maximum power.

16.3.1 RF output power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

To determine the Peak-To-Average Power Ratio (PAPR) the measurement was performed with the Power Complementary Cumulative Distribution Function (CCDF).

Measurement parameters	
Detector:	Sample
AQT:	See plot
Resolution bandwidth:	1 MHz
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1046 ISED: RSS-Gen, 6.12

Limits:

FCC	ISED
47 CFR 27.50(c)(9)	RSS-130, 4.6.1 & 4.6.3
Portable stations (hand-held devices) in the 600 MHz uplink band and the 698-746 MHz band, and fixed and mobile stations in the 600 MHz uplink band are limited to 3 watts ERP.	4.6.1: The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission. 4.6.3: The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.
Power: **34.77 dBm ERP** PAPR: **13 dB** (ISED only)	

Results:

Sub-Carrier Spacing [kHz]	Modulation	Number of Tones	Average Output Power [dBm] Channel No / Frequency [MHz]			Peak to Average Ratio [dB] Channel No / Frequency [MHz]		
			23011 / 699.1	23095 / 707.5	23179 / 715.9	23011 / 699.1	23095 / 707.5	23179 / 715.9
3.75	BPSK	1T0	19.69	19.93	20.26	1.86	1.83	1.83
		1T47	19.63	19.87	20.18	1.86	1.86	1.86
	QPSK	1T0	19.72	19.89	20.33	1.68	1.68	1.71
		1T47	19.62	19.99	20.21	0.93	1.71	0.90
15	BPSK	1T0	19.54	19.91	20.04	1.59	1.62	1.59
		1T11	19.62	19.86	20.20	1.65	1.65	1.65
	QPSK	1T0	19.72	19.86	20.42	1.59	1.57	1.54
		1T11	19.49	19.95	20.19	0.46	1.57	0.46
		12T0	17.82	18.01	18.35	5.74	5.80	5.45

The radiated output power is measured in the mode with the highest conducted output power.

Output Power (ERP)			
Sub-Carrier Spacing [kHz]	Frequency (MHz)	Average Output Power (dBm) BPSK	Average Output Power (dBm) QPSK
3.75	699.1	12.79	12.82
	707.5	12.73	12.79
	715.9	12.86	12.93
15	699.1	12.72	12.82
	707.5	12.71	12.75
	715.9	12.80	13.02

16.3.2 Frequency stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMW500 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with V_{nom}, connected to the CMW500 and in a simulated call on channel 1412 (centre channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Remeasure carrier frequency at room temperature with V_{nom}. Vary supply voltage from V_{min} to V_{max}, in 0.1 Volt steps remeasuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.
6. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

This measurement was performed with the highest channel bandwidth supported from the EUT on the middle channel

Measurement:

Measurement parameters	
Detector:	
Sweep time:	
Video bandwidth:	Measured with CMW500
Resolution bandwidth:	
Span:	
Trace-Mode:	
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1055 ISED: RSS-Gen, 6.11

Limits:

FCC	ISED
§ 27.54	RSS-130, 4.5
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.	The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
3.2	-16	-0.0226
3.6	-16	-0.0226
4.0	-16	-0.0226

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	17	0.0240
-20	18	0.0254
-10	20	0.0283
± 0	-16	-0.0226
10	-11	-0.0155
20	-16	-0.0226
30	-15	-0.0212
40	-37	-0.0523
50	-24	-0.0339

Additional measurements for RSS-130 (4.3 b)

f_L = MHz	f_H = MHz
f_L − (max freq. error) = MHz	f_H + (max freq. error) = MHz

16.3.3 Spurious emissions radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 711 MHz. Measured up to 8 GHz. The resolution bandwidth is set as outlined in Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 12.

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	2 sec.
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	100 MHz Steps
Trace mode:	Max Hold
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13

Limits:

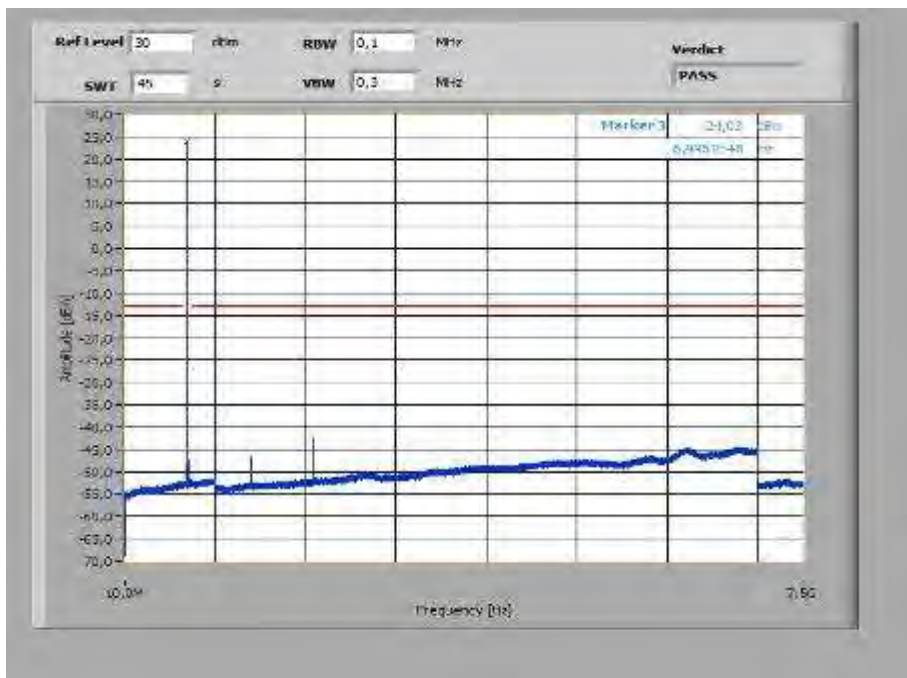| FCC	ISED
§ 27.53(g)	RSS-130, 4.7.1
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
-13 dBm	

Results:

BPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		**MIDDLE CHANNEL**		**HIGHEST CHANNEL**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

QPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		**MIDDLE CHANNEL**		**HIGHEST CHANNEL**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

BPSK

Plot 1: Middle channel, up to 30 MHz

Plot 2: Middle channel, 30 MHz to 1 GHz

Plot 3: Middle channel, 1 GHz to 8 GHz

QPSK

Plot 1: Middle channel, up to 30 MHz
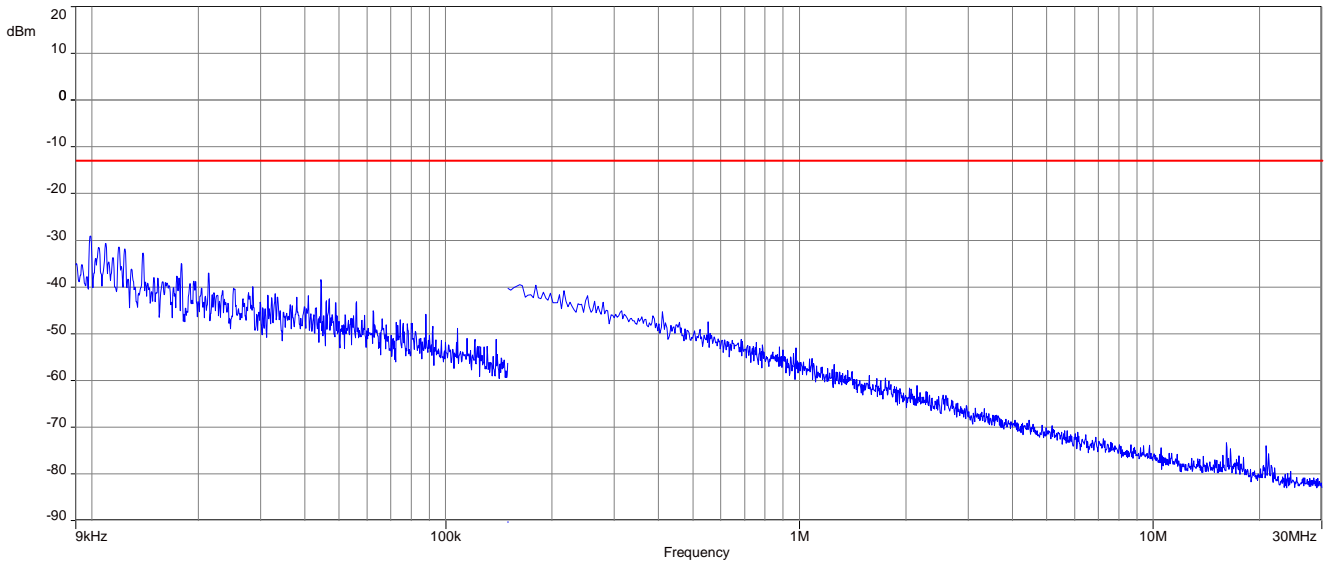
Plot 2: Middle channel, 30 MHz to 1 GHz
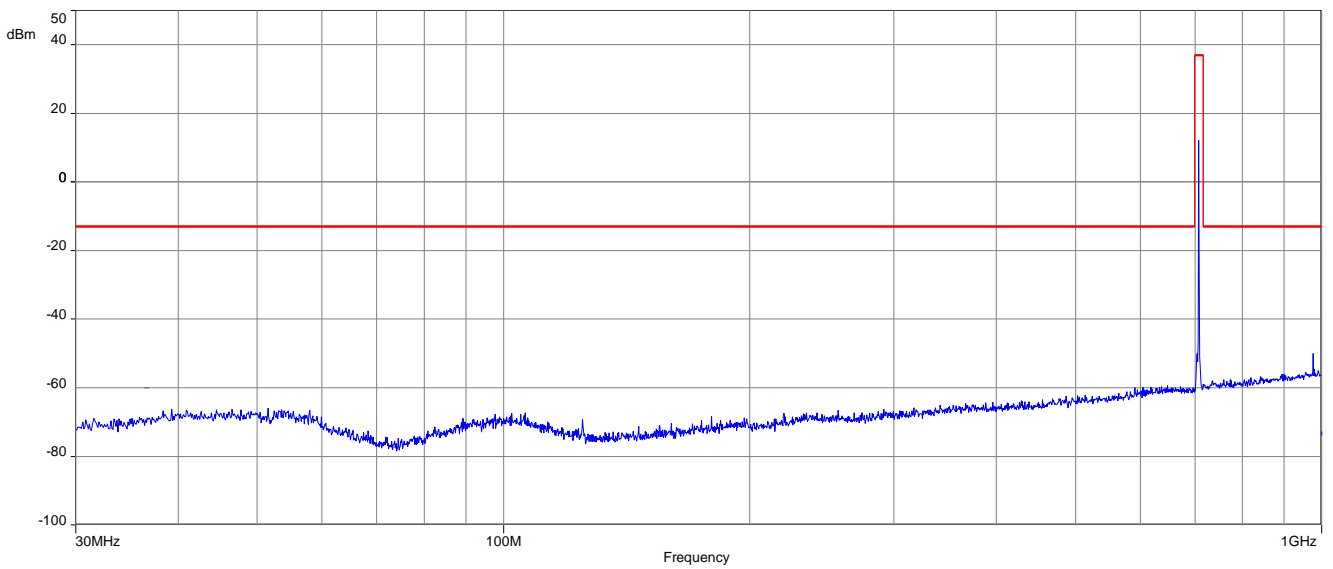
Plot 3: Middle channel, 1 GHz to 8 GHz
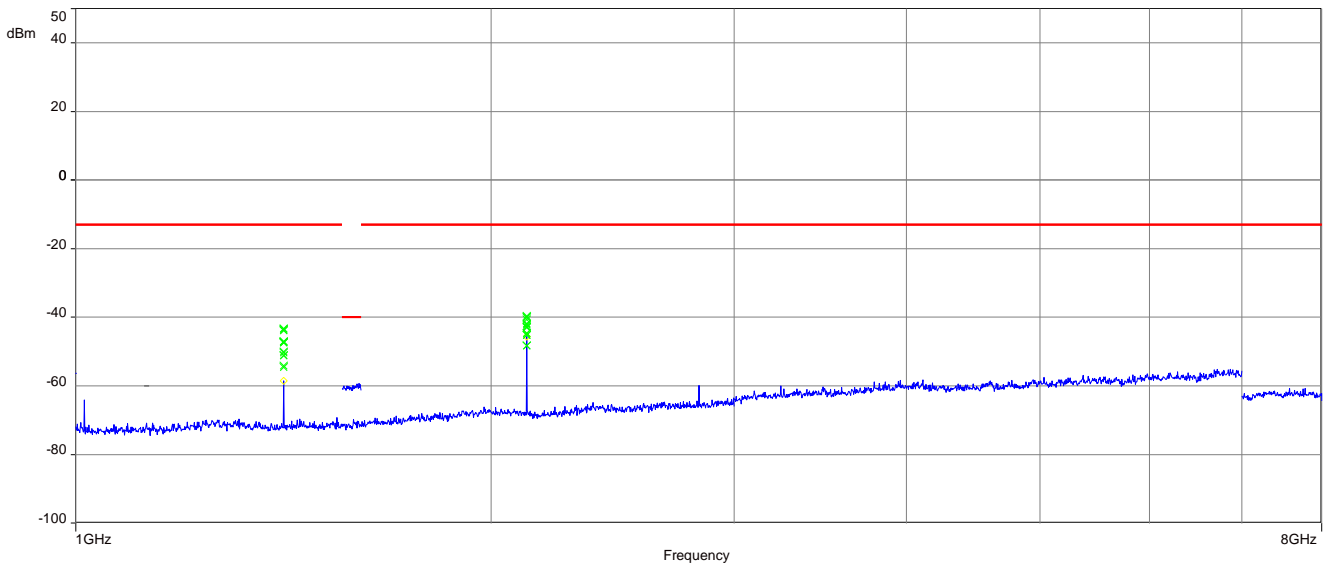
16.3.4 Spurious emissions conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.
1. Determine frequency range for measurements: From § 2.1057 & RSS-Gen, 6.13.2 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency.
2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	10 MHz − 7.5 GHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

Limits:

FCC	ISED
§ 27.53(g)	RSS-130, 4.7.1
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10} p$ (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
-13 dBm	

Results:

BPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		**MIDDLE CHANNEL**		**HIGHEST CHANNEL**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
1398.2	-/-	1415.0	-/-	1431.8	-/-
2097.3	-/-	2122.5	-/-	2147.7	-/-
2796.4	-/-	2830.0	-/-	2863.6	-/-
3495.5	-/-	3537.5	-/-	3579.5	-/-
4194.6	-/-	4245.0	-/-	4295.4	-/-
4893.7	-/-	4952.5	-/-	5011.3	-/-
5592.8	-/-	5660.0	-/-	5727.2	-/-
6291.9	-/-	6367.5	-/-	6443.1	-/-
6991.0	-/-	7075.0	-/-	7159.0	-/-

QPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		**MIDDLE CHANNEL**		**HIGHEST CHANNEL**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
1398.2	-/-	1415.0	-/-	1431.8	-/-
2097.3	-/-	2122.5	-/-	2147.7	-/-
2796.4	-/-	2830.0	-/-	2863.6	-/-
3495.5	-/-	3537.5	-/-	3579.5	-/-
4194.6	-/-	4245.0	-/-	4295.4	-/-
4893.7	-/-	4952.5	-/-	5011.3	-/-
5592.8	-/-	5660.0	-/-	5727.2	-/-
6291.9	-/-	6367.5	-/-	6443.1	-/-
6991.0	-/-	7075.0	-/-	7159.0	-/-

Plots: BPSK

Plot 1: Lowest Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@0 tones

Plot 2: Middle Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@0 tones

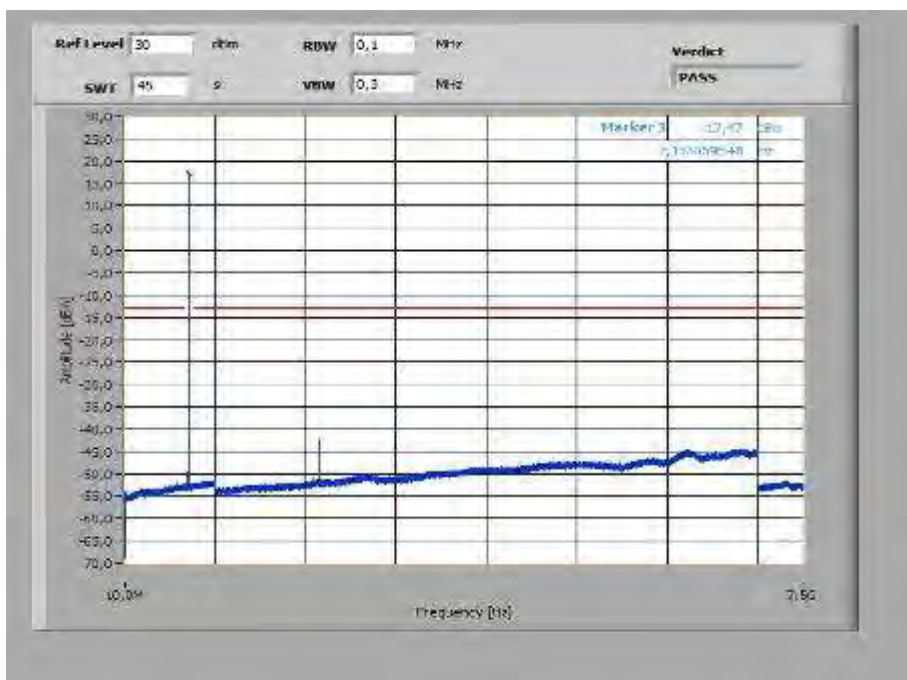**Plot 3:** Highest Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@0 tones

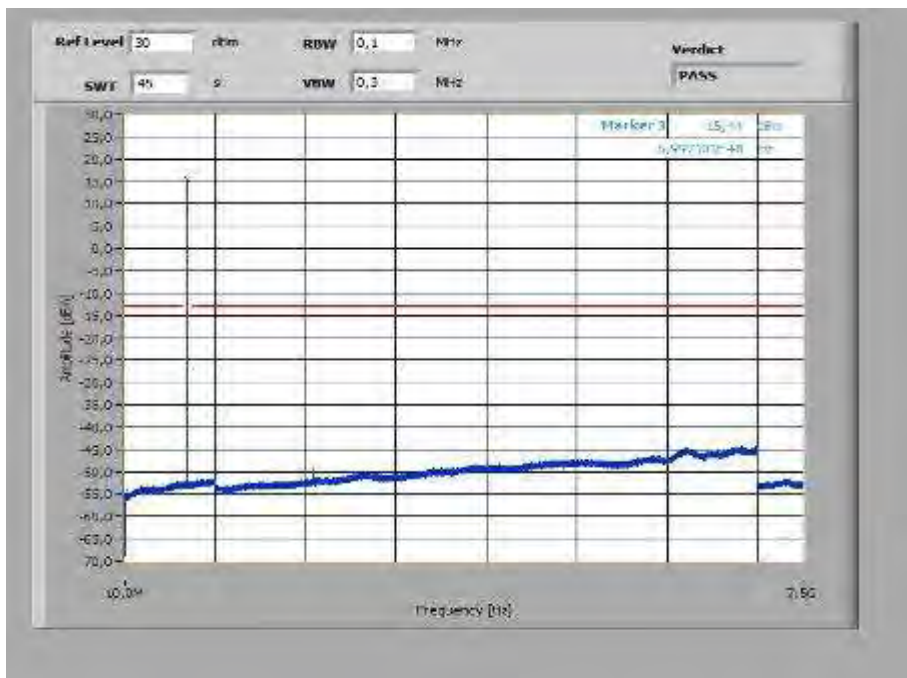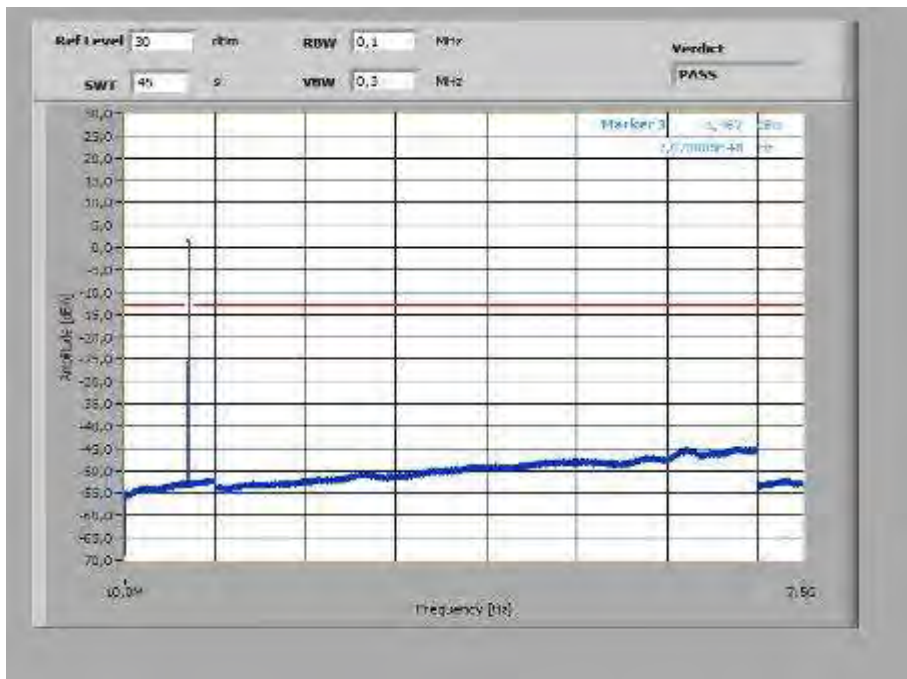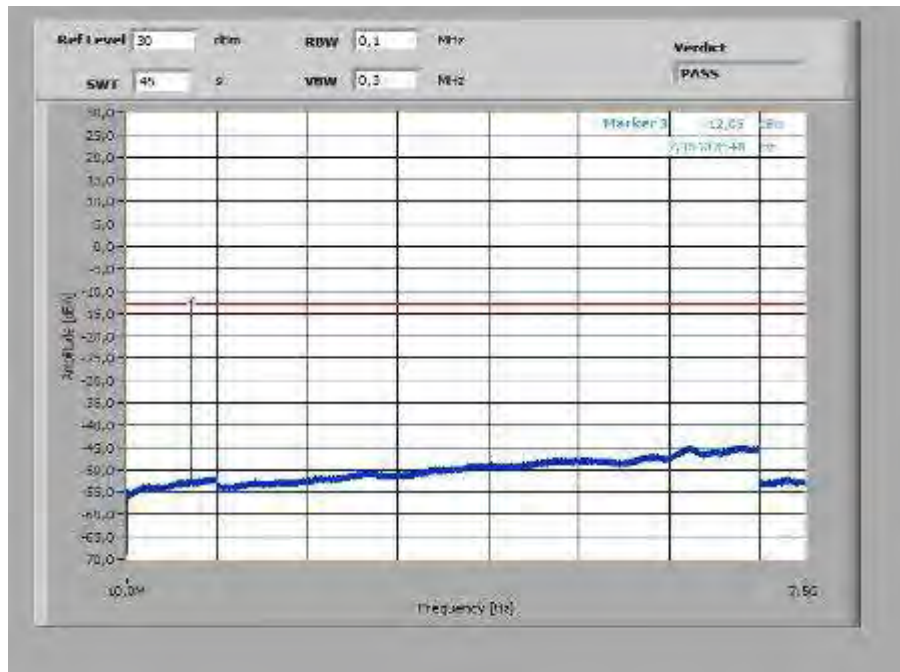**Plot 4:** Lowest Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@47 tones

Plot 5: Middle Channel (10 MHz − 7.5 GHz), spacing 3.75 kHz, 1@47 tones

Plot 6: Highest Channel (10 MHz − 7.5 GHz), spacing 3.75 kHz, 1@47 tones

Plot 7: Lowest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@0 tones

Plot 8: Middle Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@0 tones

Plot 9: Highest Channel (10 MHz − 7.5 GHz), spacing 15 kHz, 1@0 tones

Plot 10: Lowest Channel (10 MHz − 7.5 GHz), spacing 15 kHz, 1@11 tones

Plot 11: Middle Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@11 tones

Plot 12: Highest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@11 tones

Plots: QPSK

Plot 1: Lowest Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@0 tones

Plot 2: Middle Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@0 tones

Plot 3: Highest Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@0 tones

Plot 4: Lowest Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@47 tones

Plot 5: Middle Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@47 tones

Plot 6: Highest Channel (10 MHz – 7.5 GHz), spacing 3.75 kHz, 1@47 tones

Plot 7: Lowest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@0 tones

Plot 8: Middle Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@0 tones

Plot 9: Highest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@0 tones

Plot 10: Lowest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@11 tones

Plot 11: Middle Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@11 tones

Plot 12: Highest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 1@11 tones

Plot 13: Lowest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 12@0 tones

Plot 14: Middle Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 12@0 tones

Plot 15: Highest Channel (10 MHz – 7.5 GHz), spacing 15 kHz, 12@0 tones

16.3.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

Limits:

FCC	ISED
§ 27.53(g)	RSS-130, 4.7.1
For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
-13 dBm Correction factor according to KDB 890810 if RBW < 1 % emission bandwidth: ☒N/A here ☐10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z	

Results: BPSK

Plot 1: Lowest channel, spacing 3.75 kHz, 1@0 tones

Date: 1.APR.2022 16:38:38

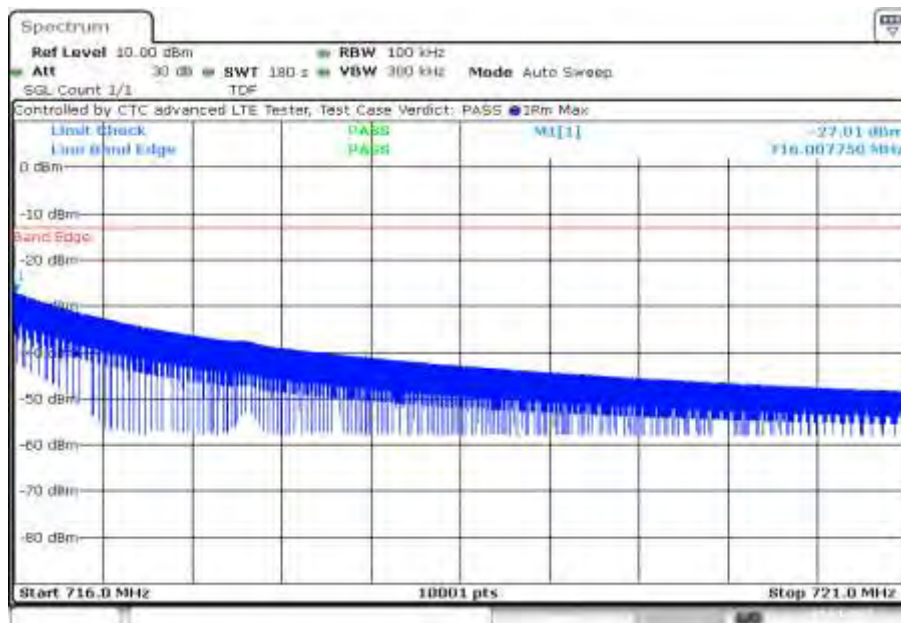**Plot 2:** Highest channel, spacing 3.75 kHz, 1@0 tones
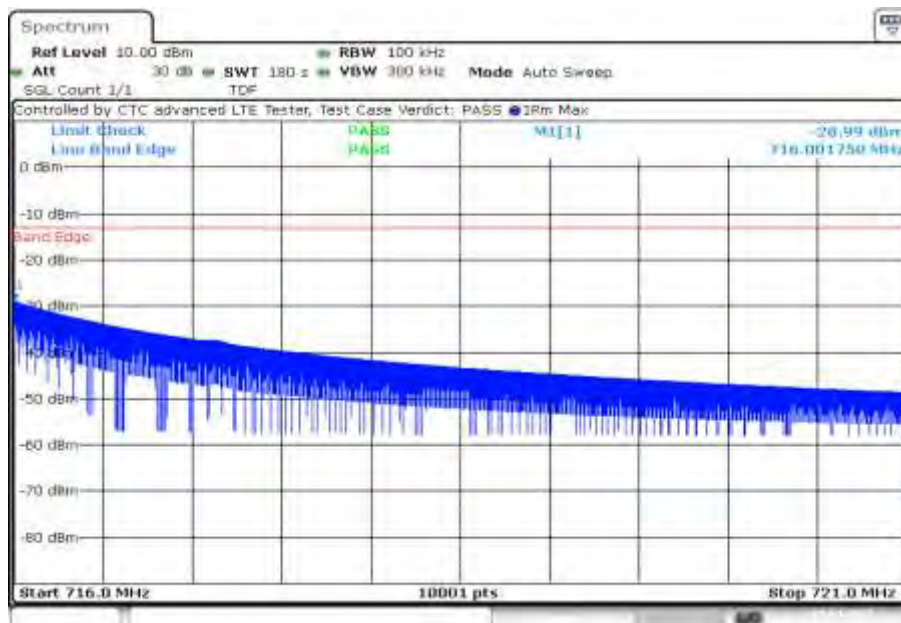
Date: 1.APR.2022 19:52:37

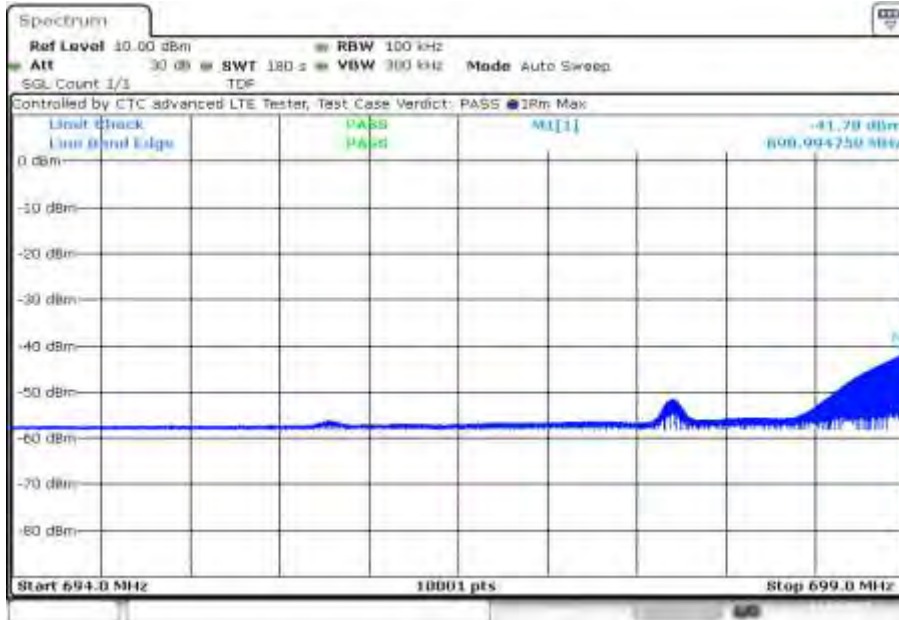**Plot 3:** Lowest channel, spacing 3.75 kHz, 1@47 tones
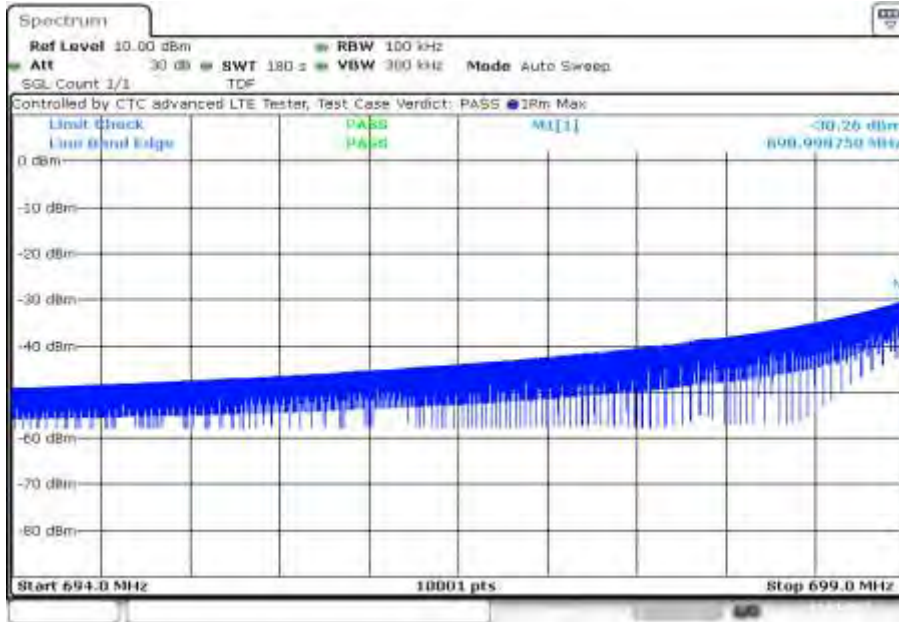
Date: 1.APR.2022 16:50:55

Plot 4: Highest channel, spacing 3.75 kHz, 1@47 tones
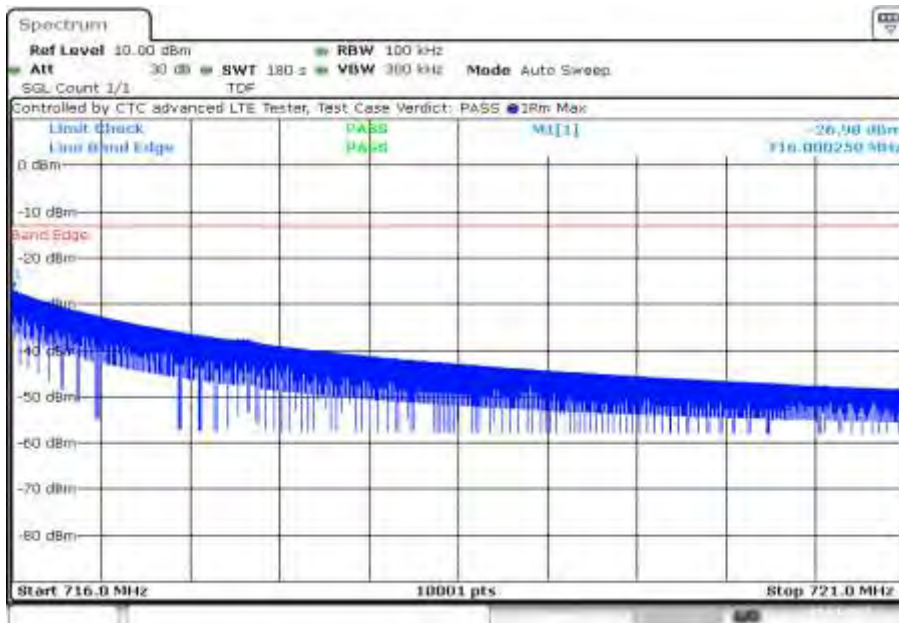
Date: 1.APR.2022 20:04:51

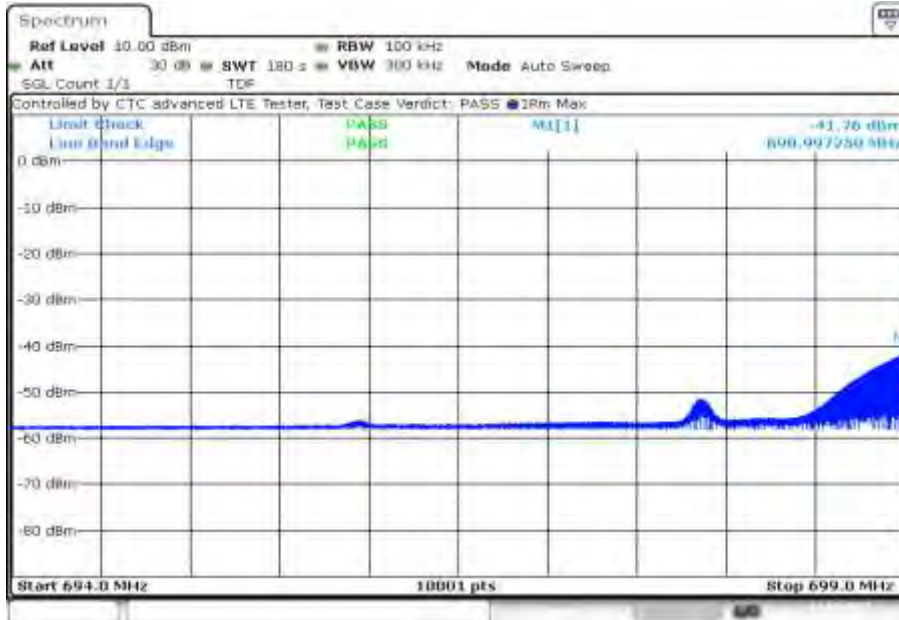**Plot 5:** Lowest channel, spacing 15 kHz, 1@0 tones
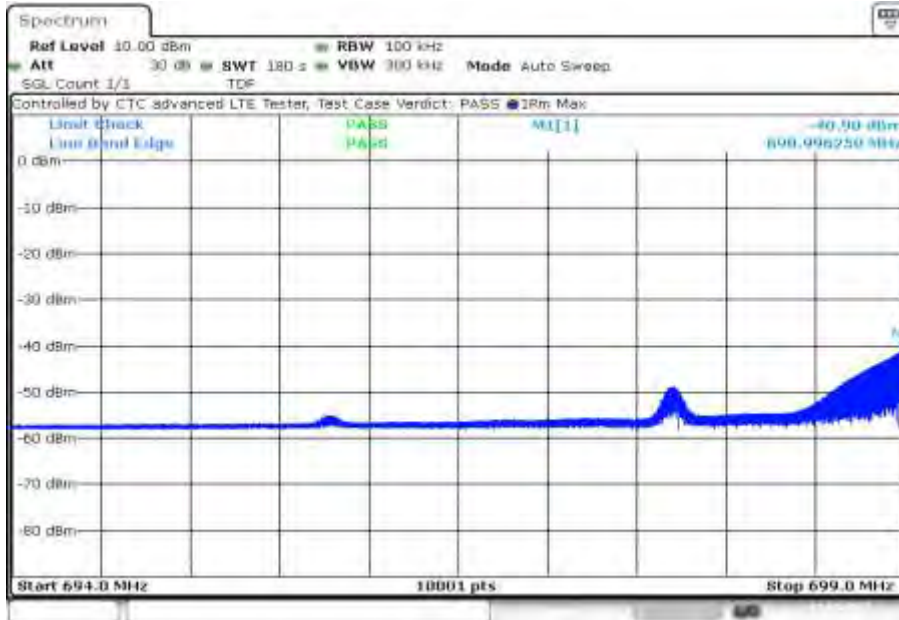
Date: 1.APR.2022 17:28:12

Plot 6: Highest channel, spacing 15 kHz, 1@0 tones
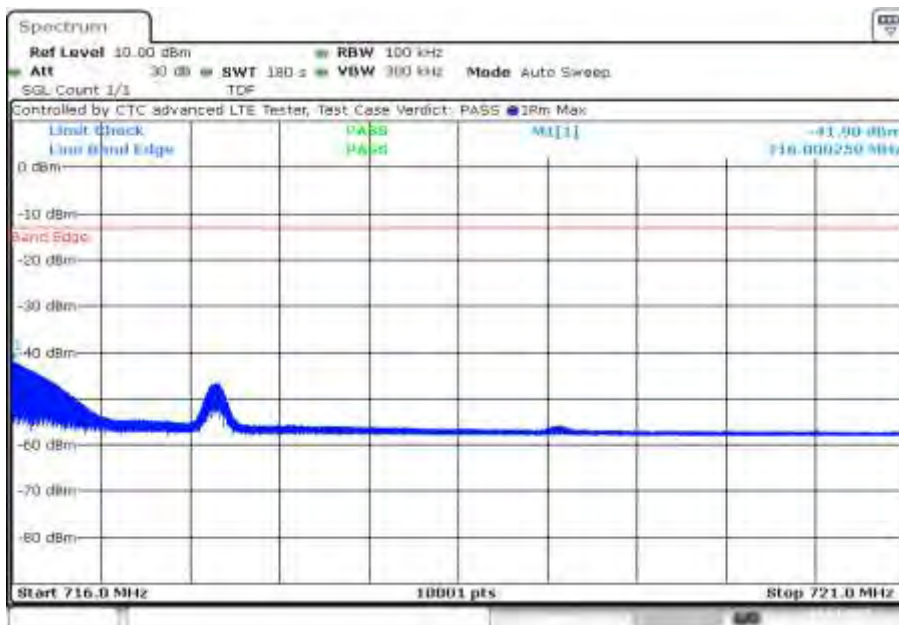
Date: 1.APR.2022 20:41:59

Plot 7: Lowest channel, spacing 15 kHz, 1@11 tones
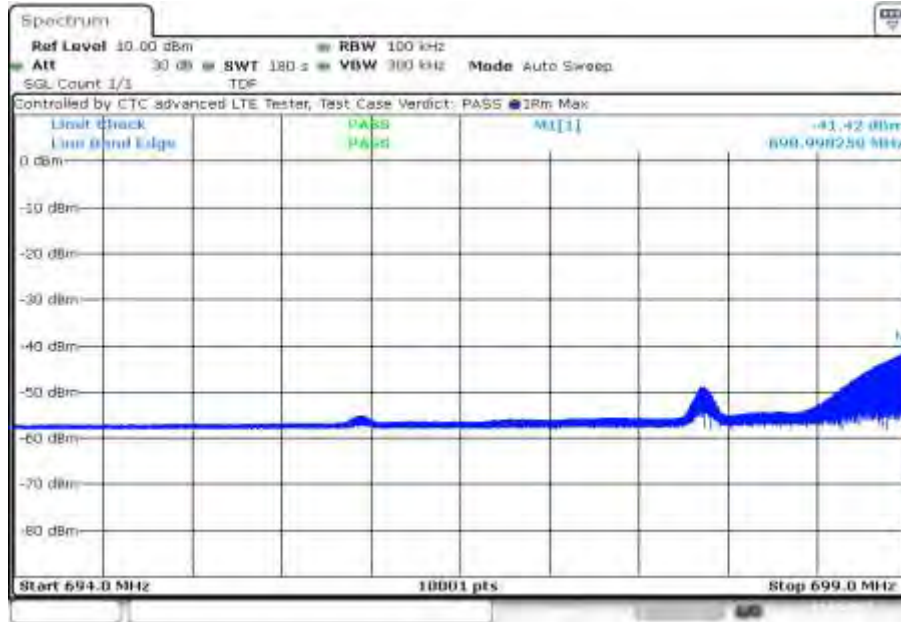
Date: 1.APR.2022 17:40:27

Plot 8: Highest channel, spacing 15 kHz, 1@11 tones

Date: 1.APR.2022 20:54:12

Results: QPSK

Plot 1: Lowest channel, spacing 3.75 kHz, 1@0 tones
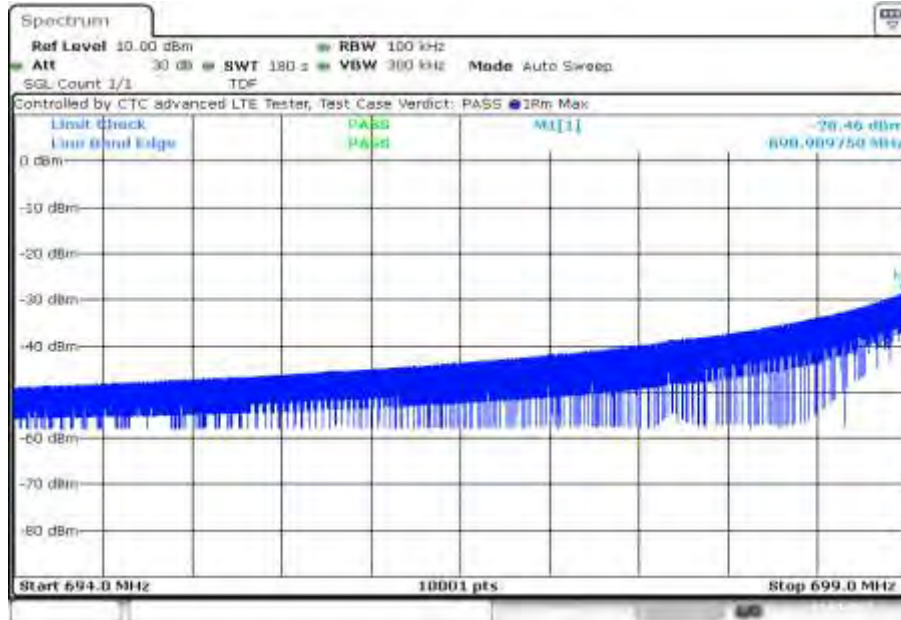
Date: 1.APR.2022 17:03:11

Plot 2: Highest channel, spacing 3.75 kHz, 1@0 tones
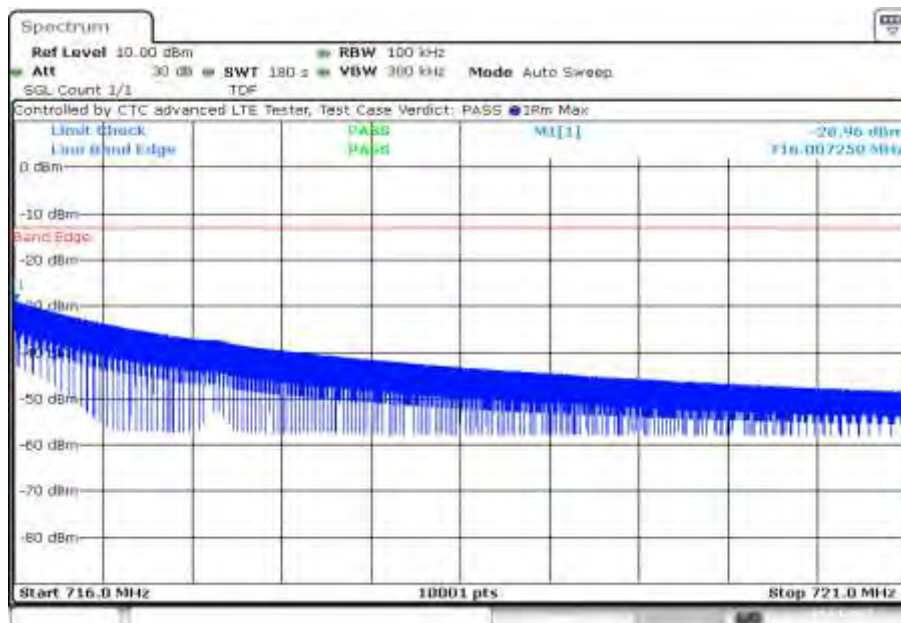
Date: 1.APR.2022 20:17:06

Plot 3: Lowest channel, spacing 3.75 kHz, 1@47 tones
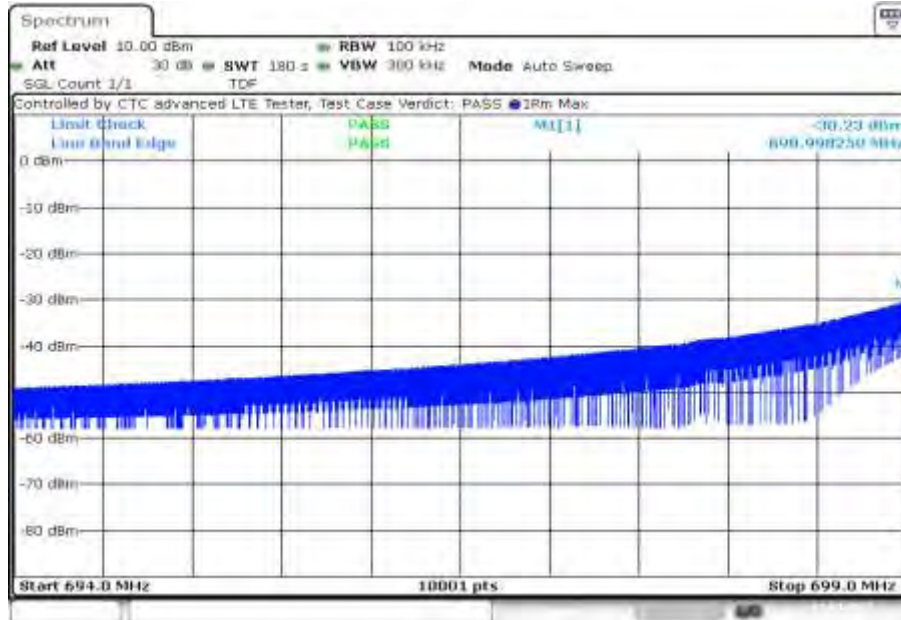
Date: 1.APR.2022   17:15:27

Plot 4: Highest channel, spacing 3.75 kHz, 1@47 tones

Date: 1.APR.2022   20:29:20

Plot 5: Lowest channel, spacing 15 kHz, 1@0 tones

Date: 1.APR.2022 17:52:42

Plot 6: Highest channel, spacing 15 kHz, 1@0 tones

Date: 1.APR.2022 21:06:26

Plot 7: Lowest channel, spacing 15 kHz, 1@11 tones

Date: 1.APR.2022 18:04:58

Plot 8: Highest channel, spacing 15 kHz, 1@11 tones

Date: 1.APR.2022 21:18:40

Plot 9: Lowest channel, spacing 15 kHz, 12@0 tones
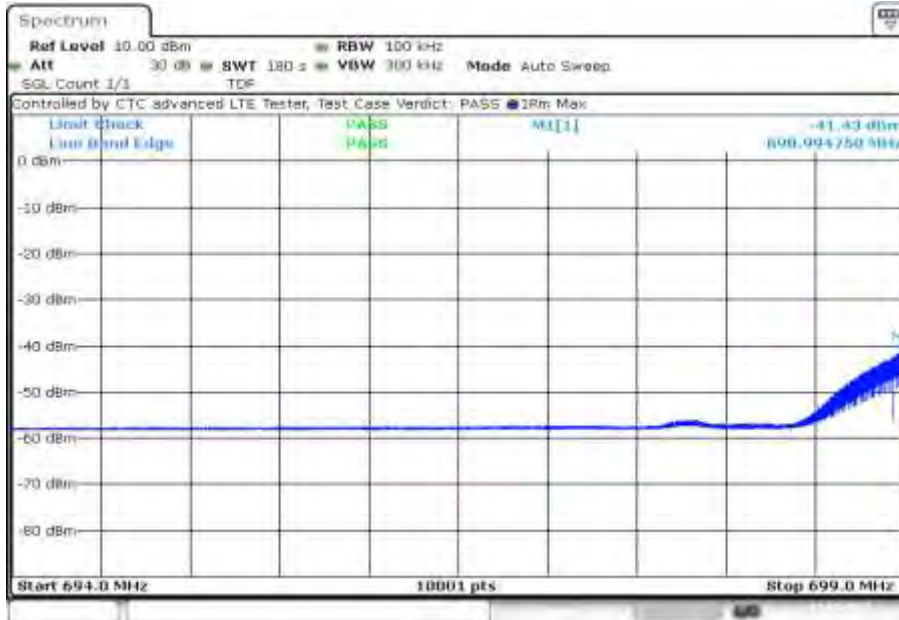
Date: 1.APR.2022 18:17:13

Plot 10: Highest channel, spacing 15 kHz, 12@0 tones
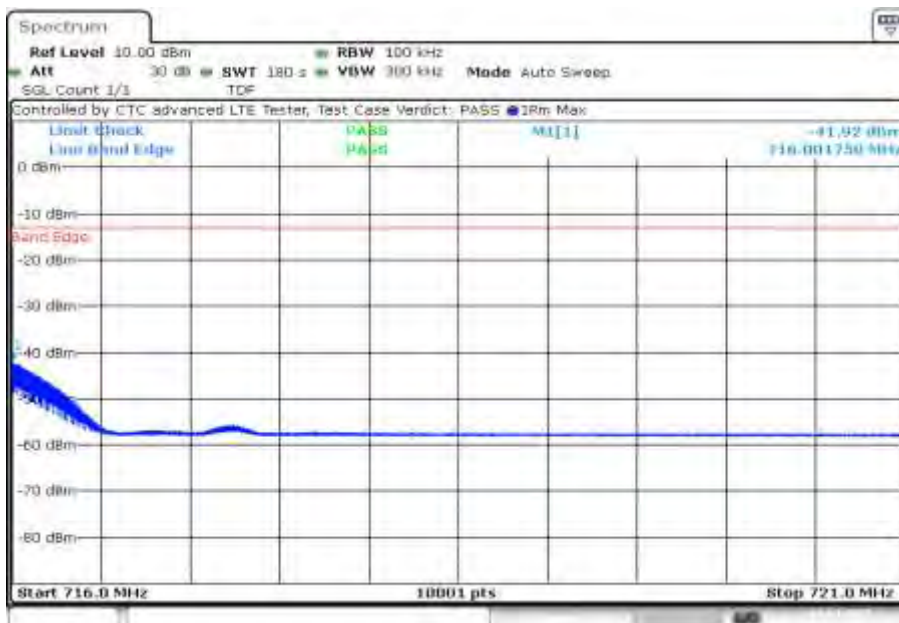
Date: 1.APR.2022 21:30:54

16.3.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the mid frequencies of the LTE band 12 frequency band. The table below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Part 27.53 requires a measurement bandwidth of at least 1% of the occupied bandwidth.

Measurement parameters	
Detector:	Peak
Sweep time:	180s
Video bandwidth:	100 kHz
Resolution bandwidth:	30 kHz
Span:	2 x nominal bandwidth
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7

Limits:

FCC	ISED
§ 2.1049	RSS-Gen, 6.7
Reporting only	

Results:

Occupied Bandwidth − BPSK		
Mode	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
Low channel / spacing 3.75 kHz; 1@0 tones	62	40
Mid channel / spacing 3.75 kHz; 1@0 tones	62	39
High channel / spacing 3.75 kHz; 1@0 tones	62	39
Low channel / spacing 3.75 kHz; 1@47 tones	63	38
Mid channel / spacing 3.75 kHz; 1@47 tones	62	38
High channel / spacing 3.75 kHz; 1@47 tones	63	38
Low channel / spacing 15 kHz; 1@0 tones	121	99
Mid channel / spacing 15 kHz; 1@0 tones	121	104
High channel / spacing 15 kHz; 1@0 tones	124	117
Low channel / spacing 15 kHz; 1@11 tones	125	104
Mid channel / spacing 15 kHz; 1@11 tones	118	98
High channel / spacing 15 kHz; 1@11 tones	119	118

Occupied Bandwidth − QPSK		
Mode	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
Low channel / spacing 3.75 kHz; 1@0 tones	71	39
Mid channel / spacing 3.75 kHz; 1@0 tones	70	38
High channel / spacing 3.75 kHz; 1@0 tones	70	38
Low channel / spacing 3.75 kHz; 1@47 tones	72	39
Mid channel / spacing 3.75 kHz; 1@47 tones	69	39
High channel / spacing 3.75 kHz; 1@47 tones	72	38
Low channel / spacing 15 kHz; 1@0 tones	125	115
Mid channel / spacing 15 kHz; 1@0 tones	119	117
High channel / spacing 15 kHz; 1@0 tones	128	117
Low channel / spacing 15 kHz; 1@11 tones	121	115
Mid channel / spacing 15 kHz; 1@11 tones	128	130
High channel / spacing 15 kHz; 1@11 tones	131	130
Low channel / spacing 15 kHz; 12@0 tones	183	246
Mid channel / spacing 15 kHz; 12@0 tones	186	251
High channel / spacing 15 kHz; 12@0 tones	187	252

Plots: BPSK

Plot 1: low channel (99% - OBW), spacing 3.75 kHz, 1@0 tones
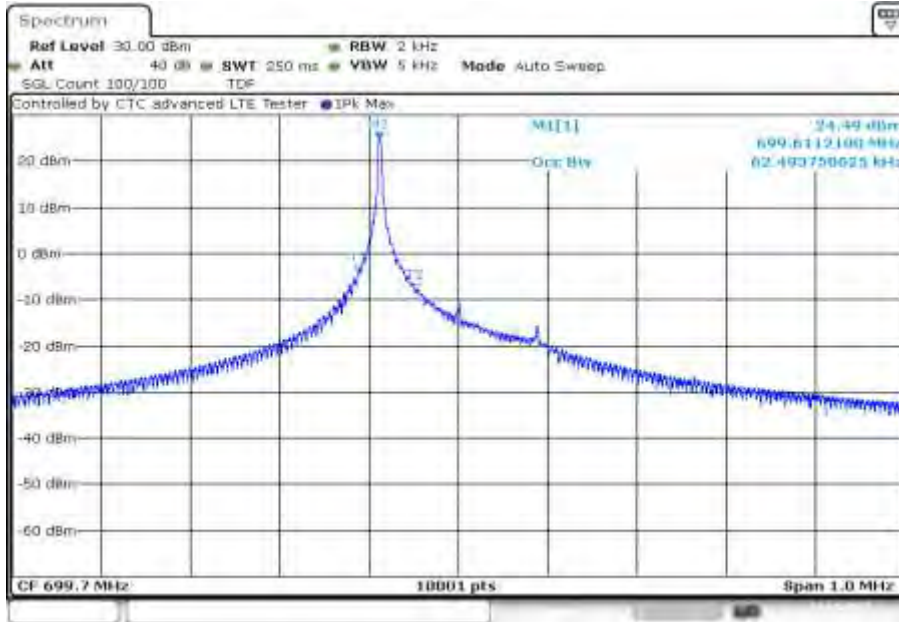
Date: 13.APR.2022 10:28:13

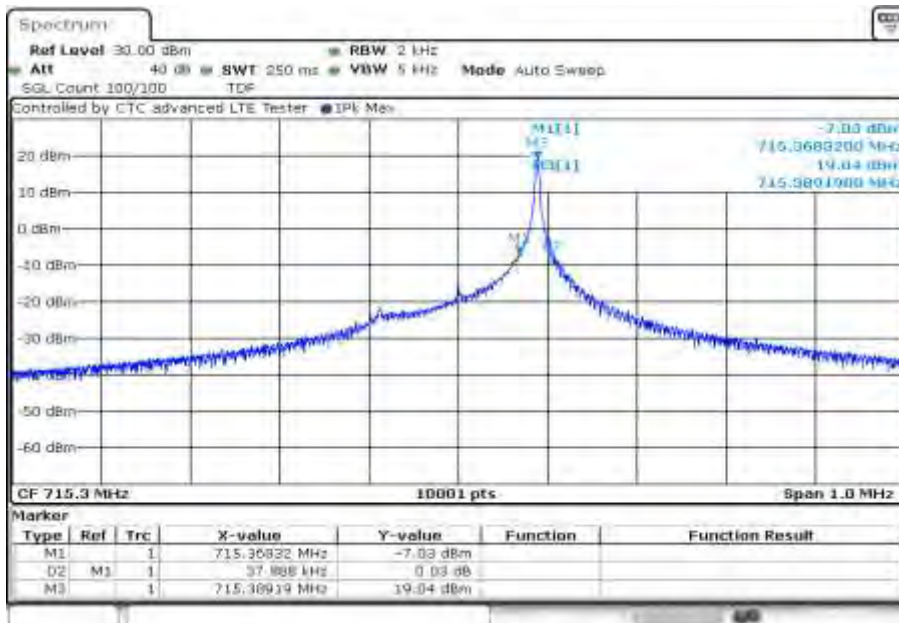**Plot 2:** low channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones
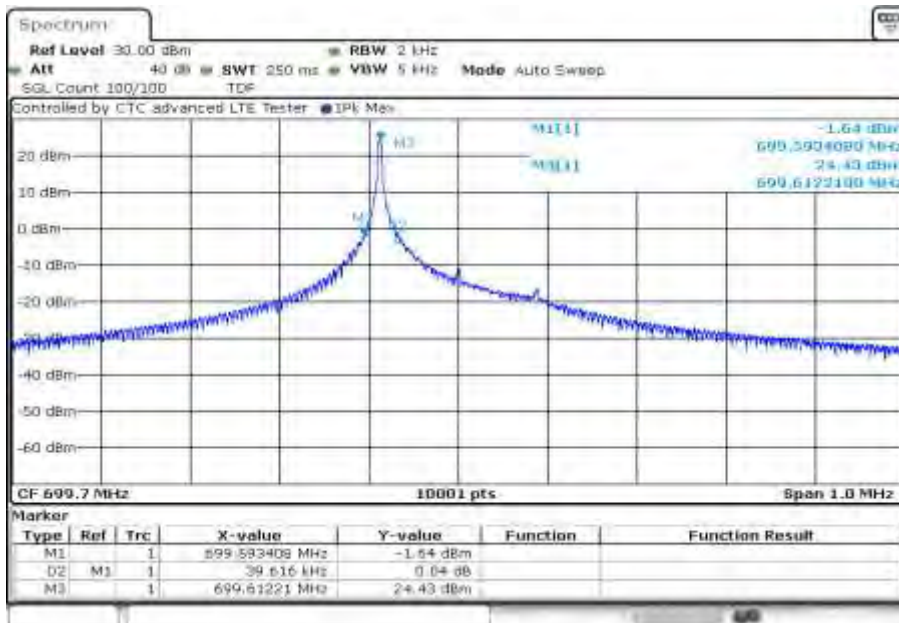
Date: 13.APR.2022 10:28:41

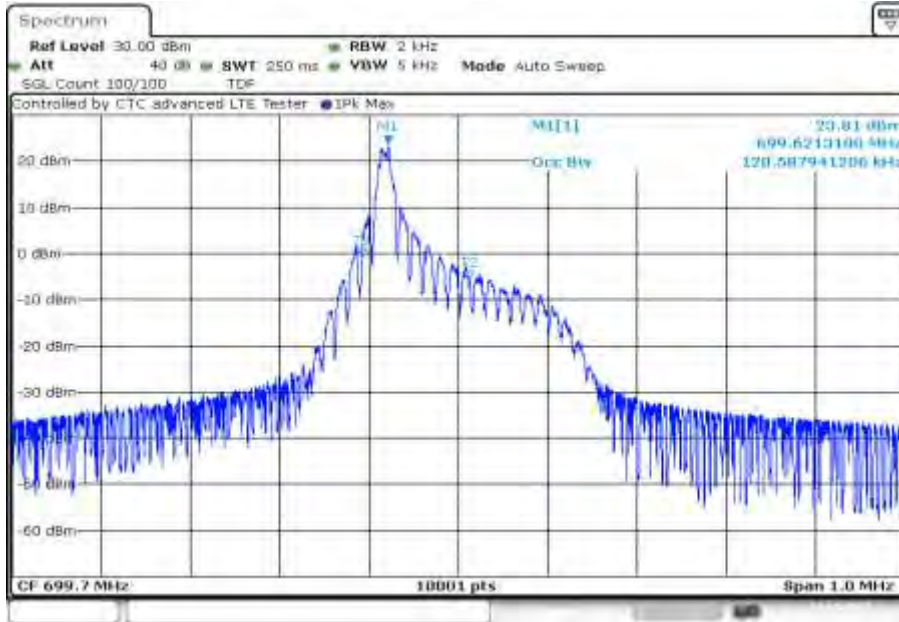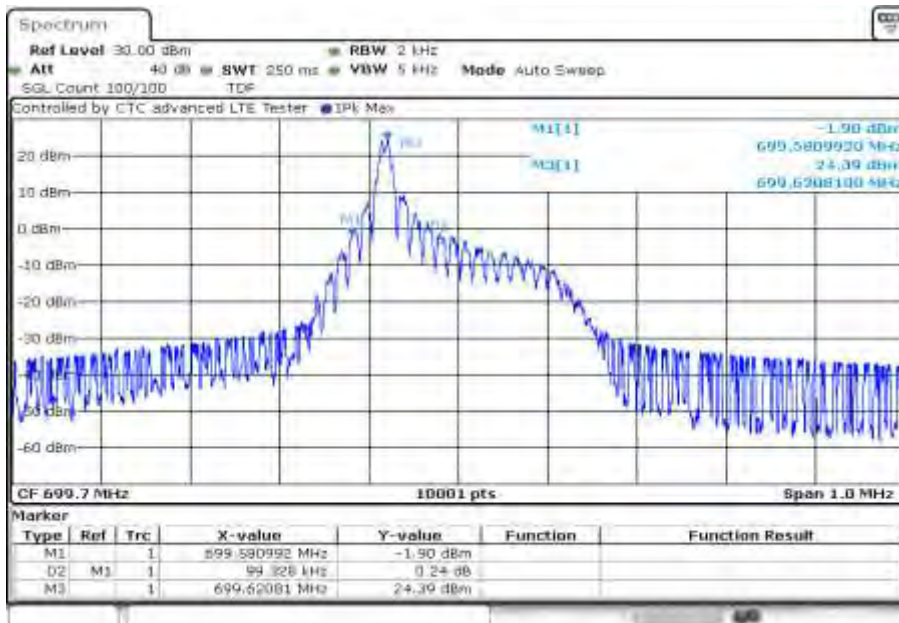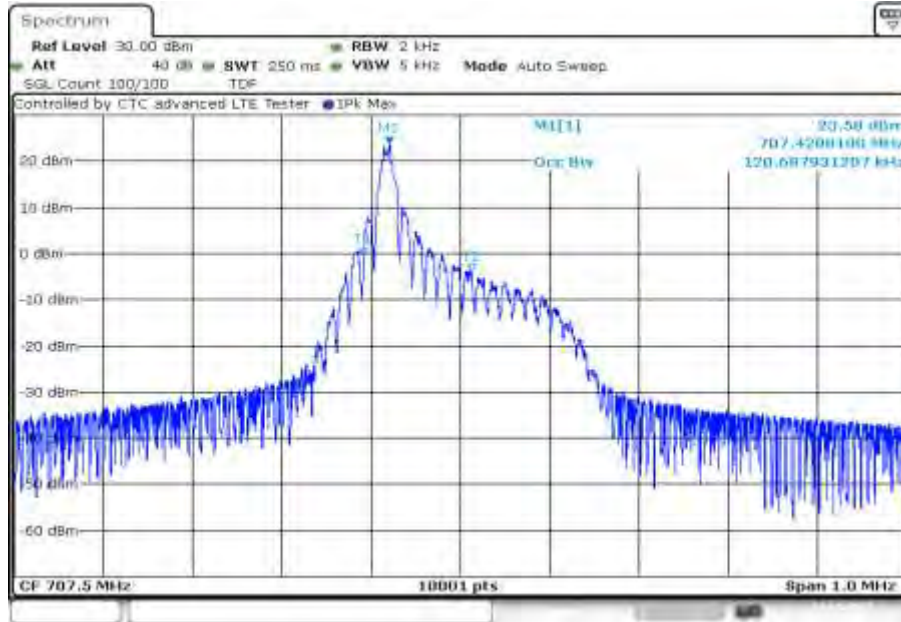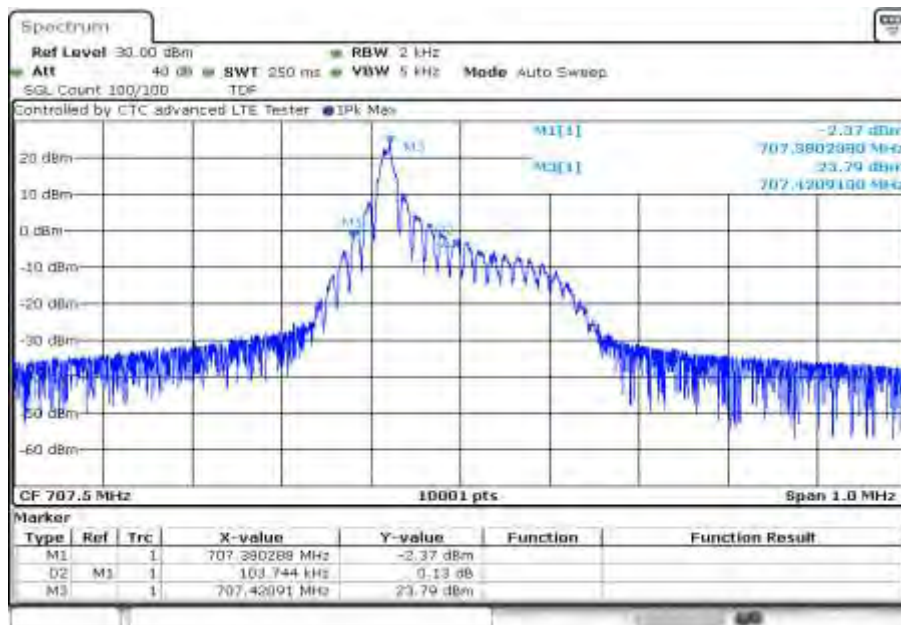**Plot 3:** mid channel (99% - OBW), spacing 3.75 kHz, 1@0 tones
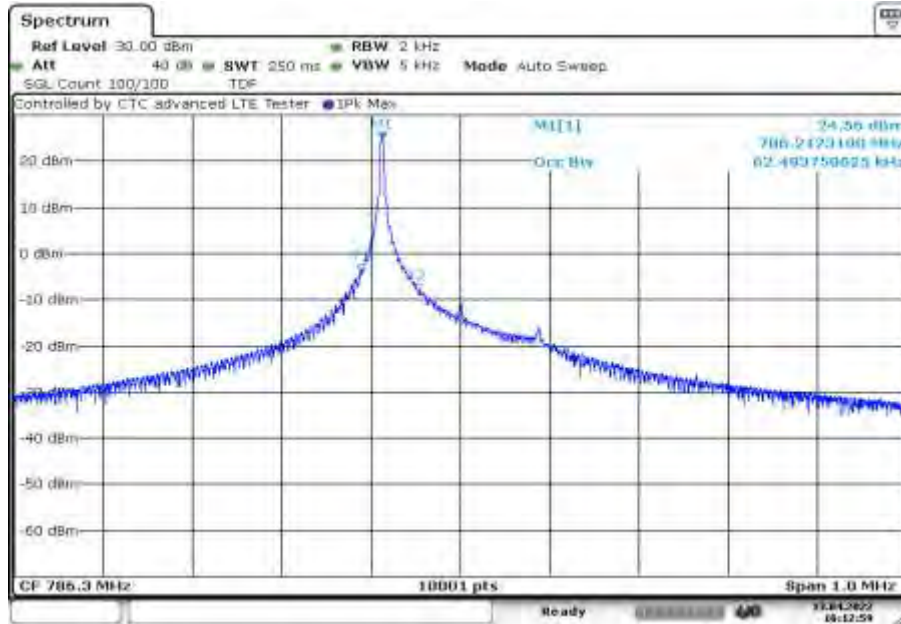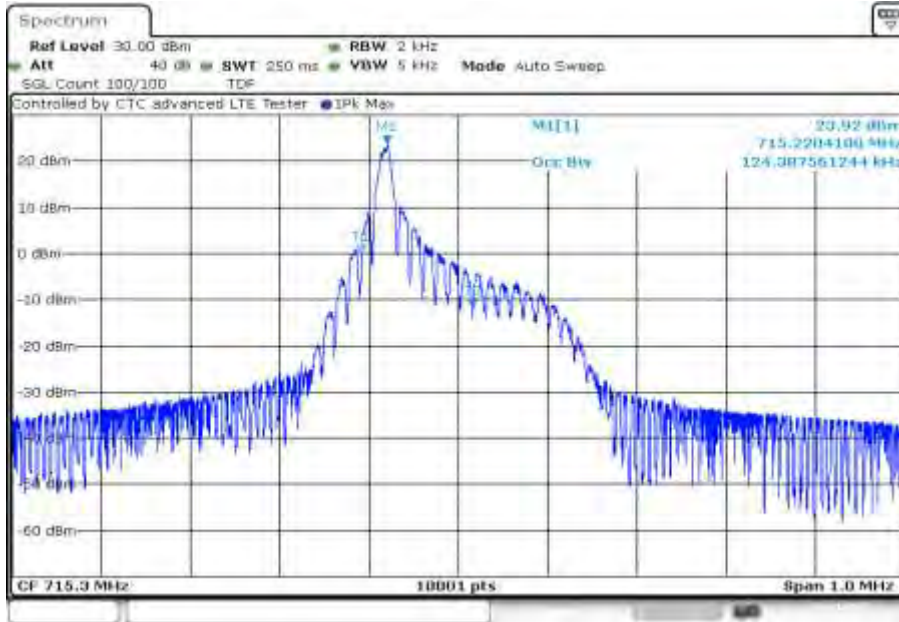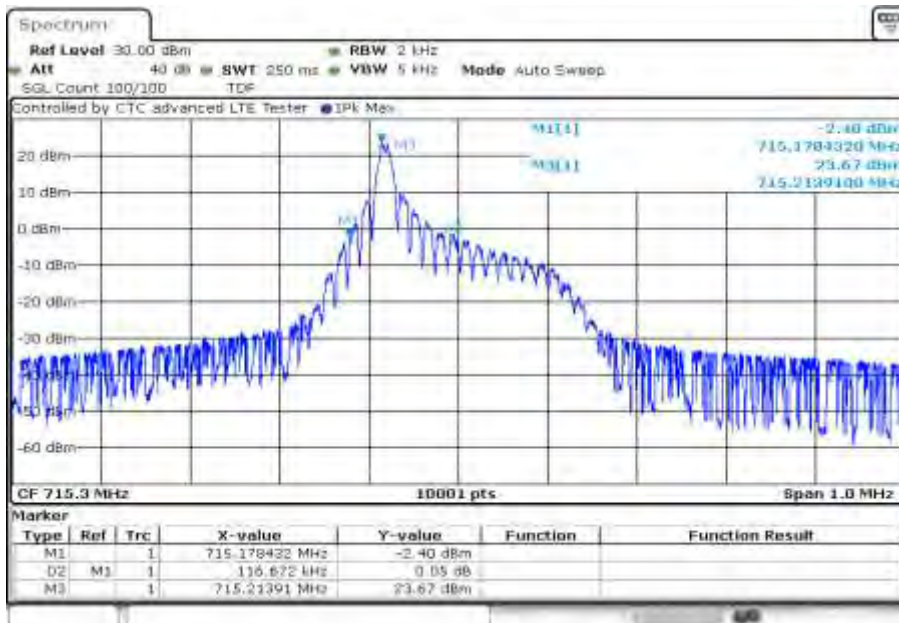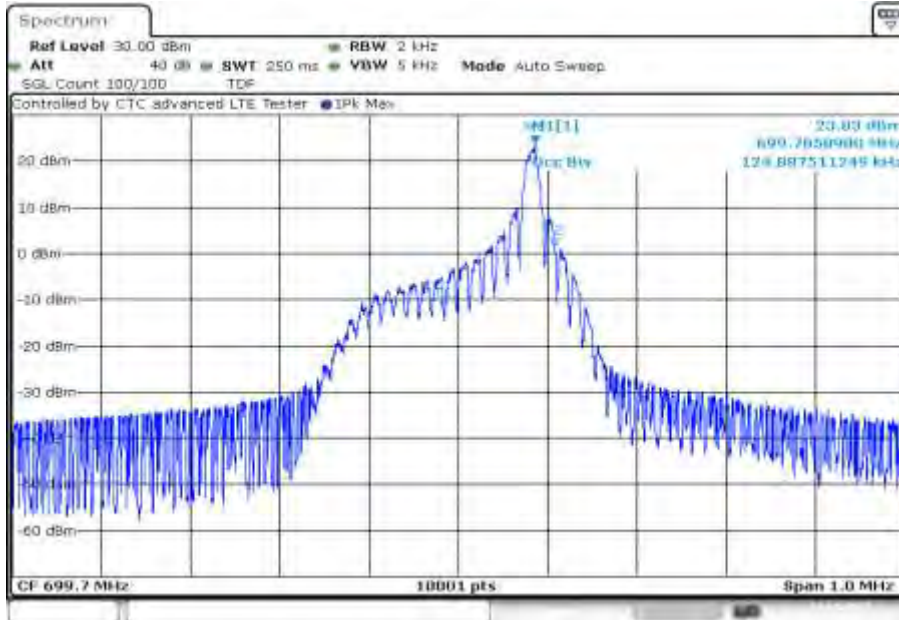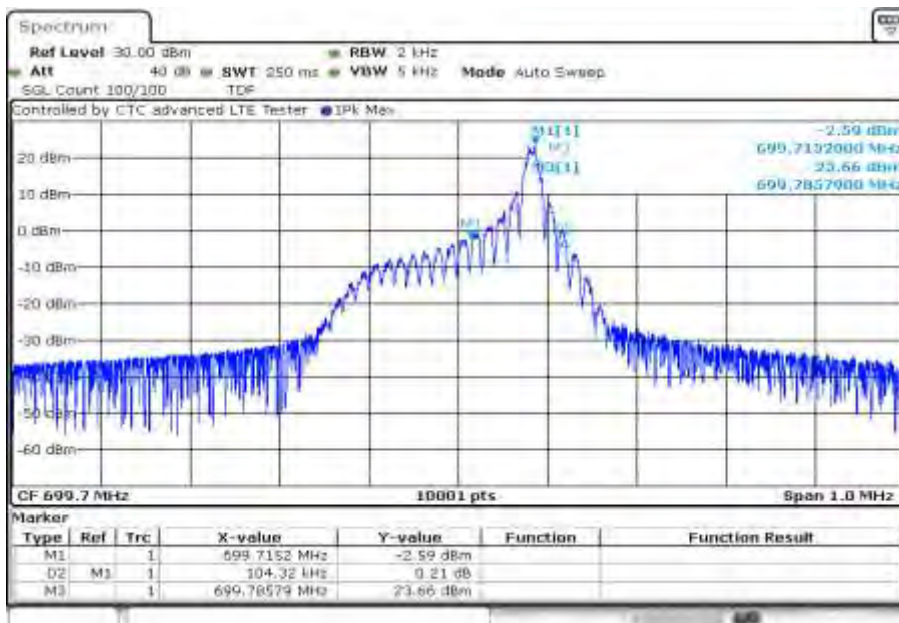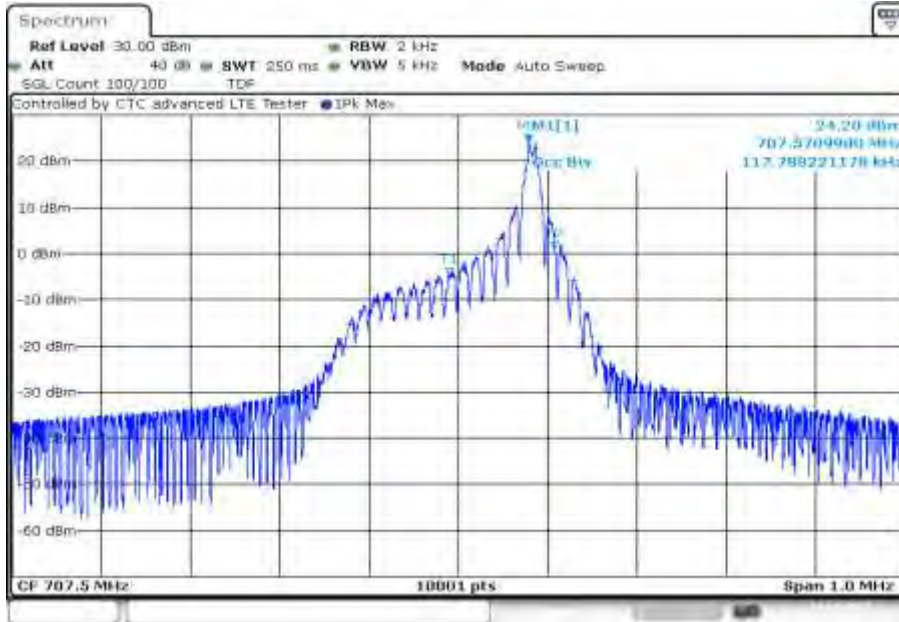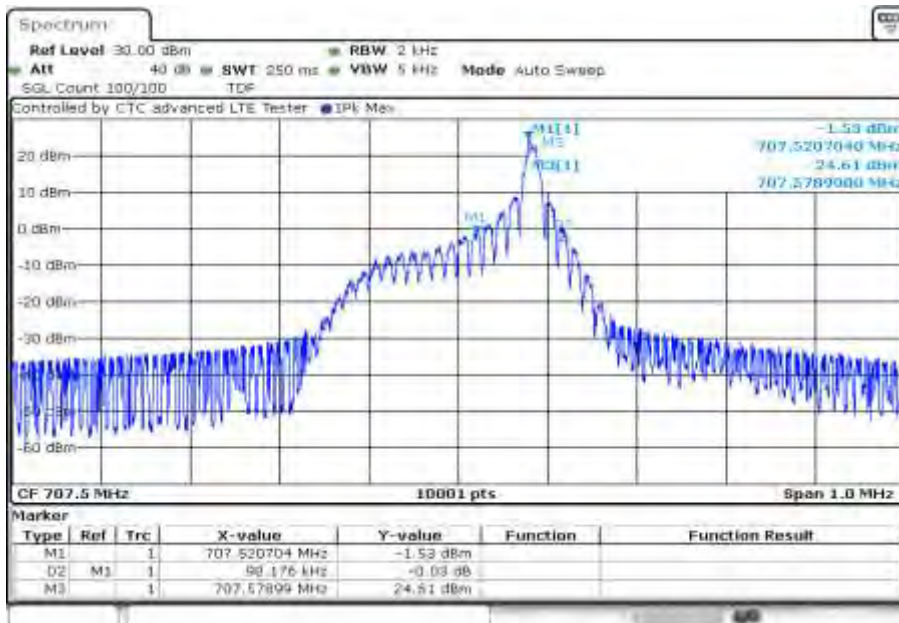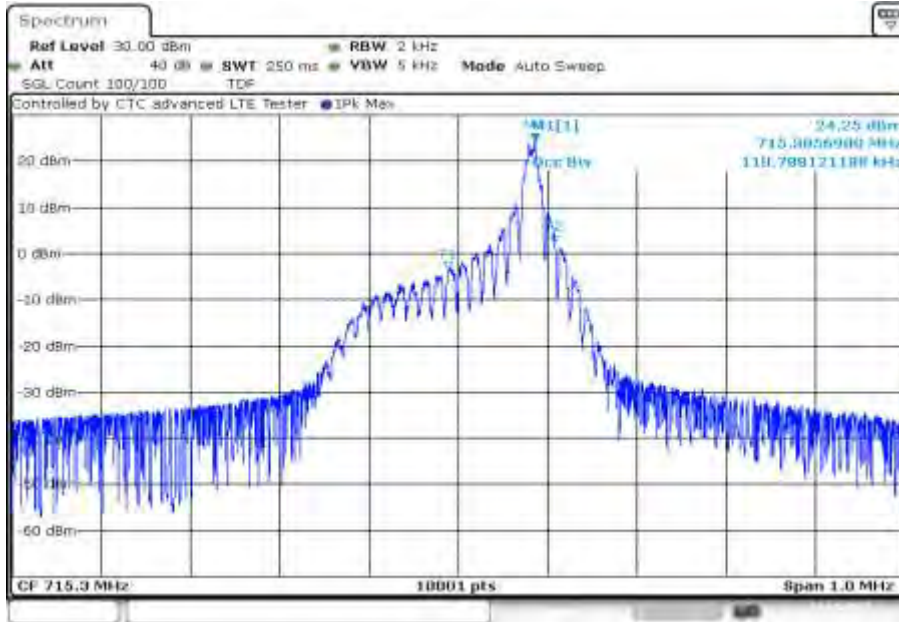

Date: 13.APR.2022 16:12:59

Plot 4: mid channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones
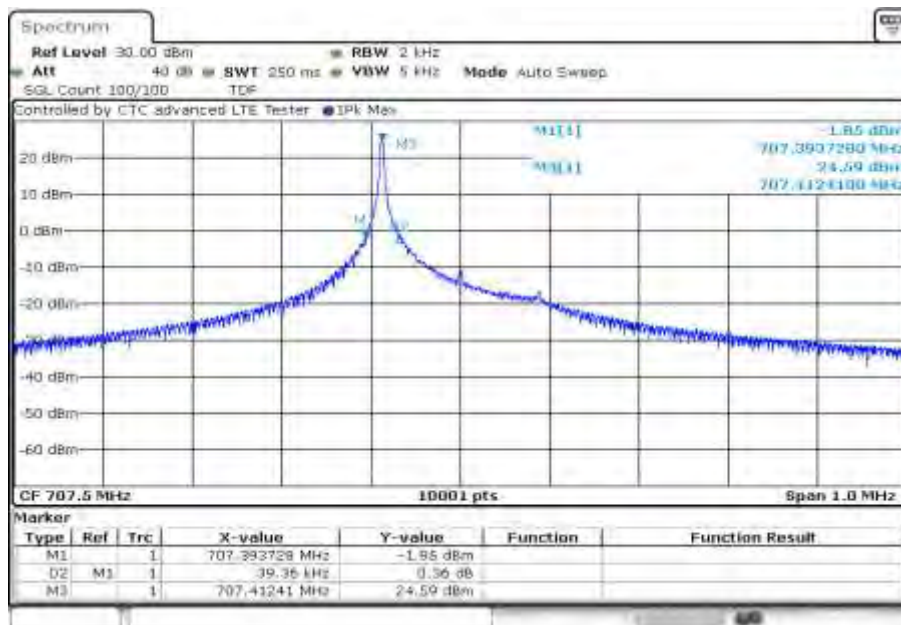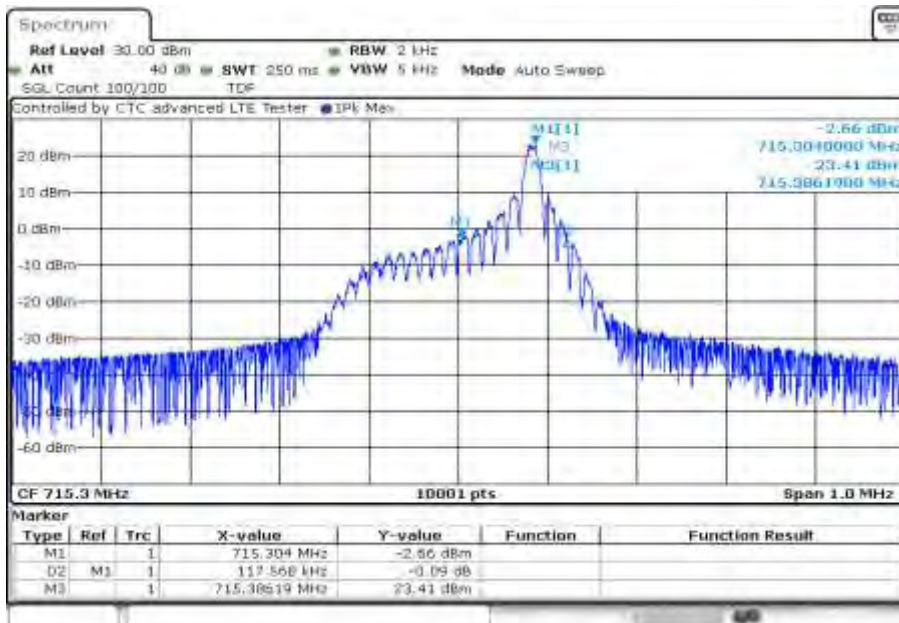

Date: 13.APR.2022 10:38:59

Plot 5: high channel (99% - OBW), spacing 3.75 kHz, 1@0 tones
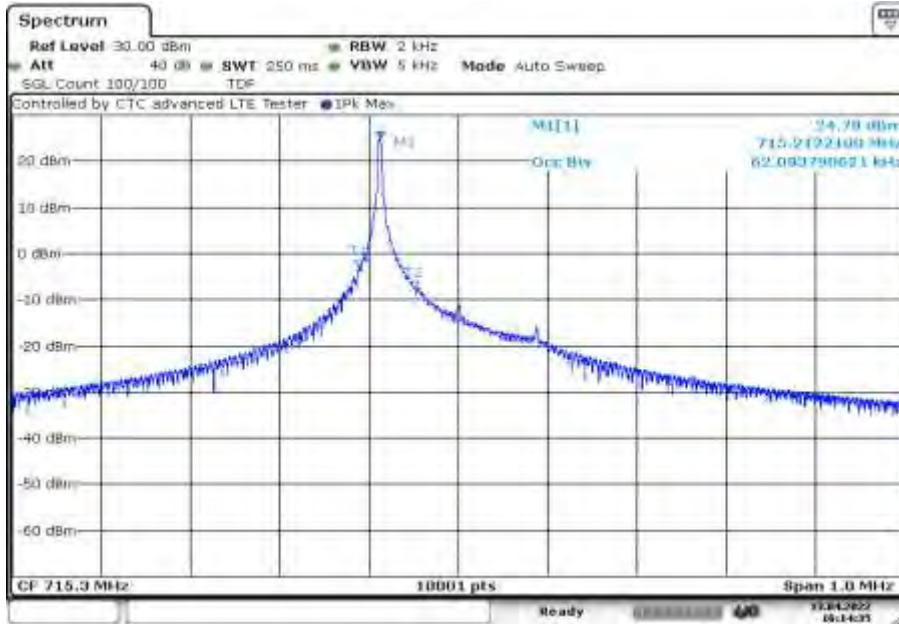
Date: 13.APR.2022 16:14:35

Plot 6: high channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones
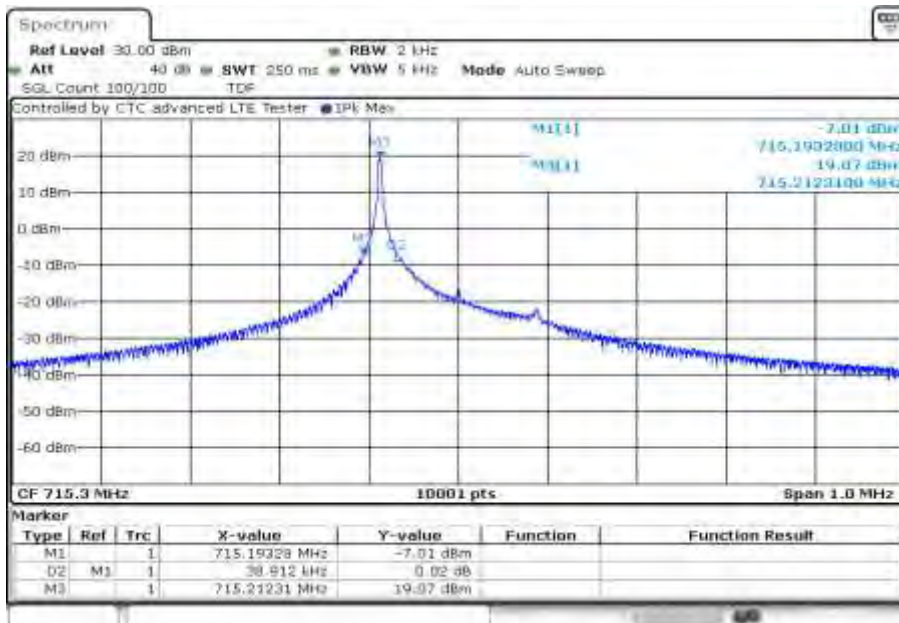
Date: 13.APR.2022 10:49:24

Plot 7: low channel (99% - OBW), spacing 3.75 kHz, 1@47 tones
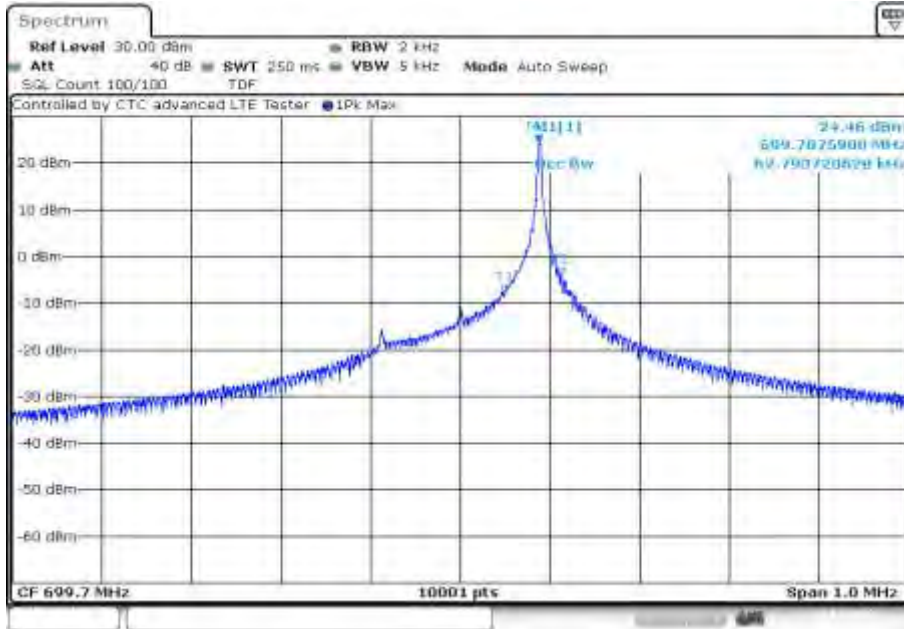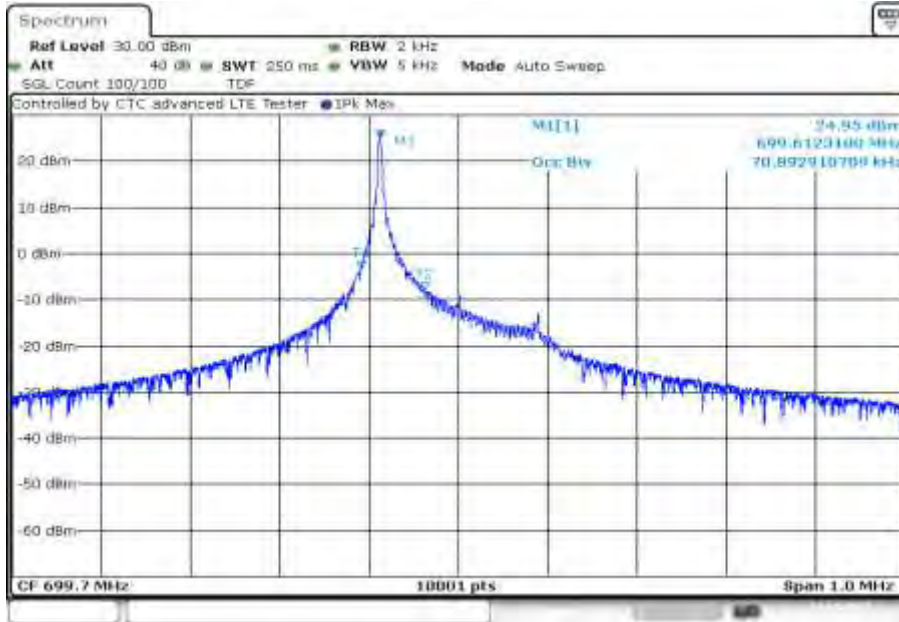

Date: 13.APR.2022 10:29:18

Plot 8: low channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones
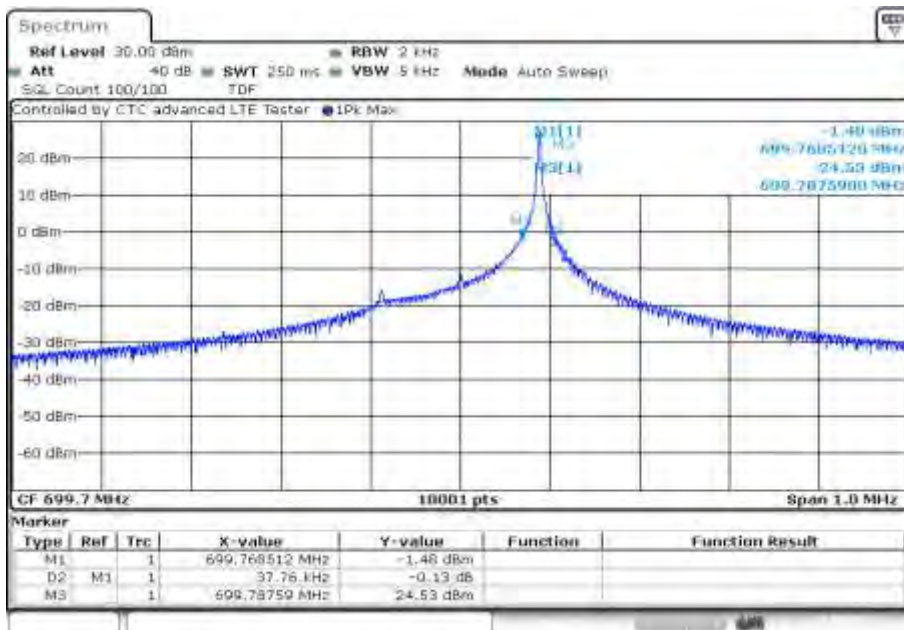
Date: 13.APR.2022 10:29:47

Plot 9: mid channel (99% - OBW), spacing 3.75 kHz, 1@47 tones
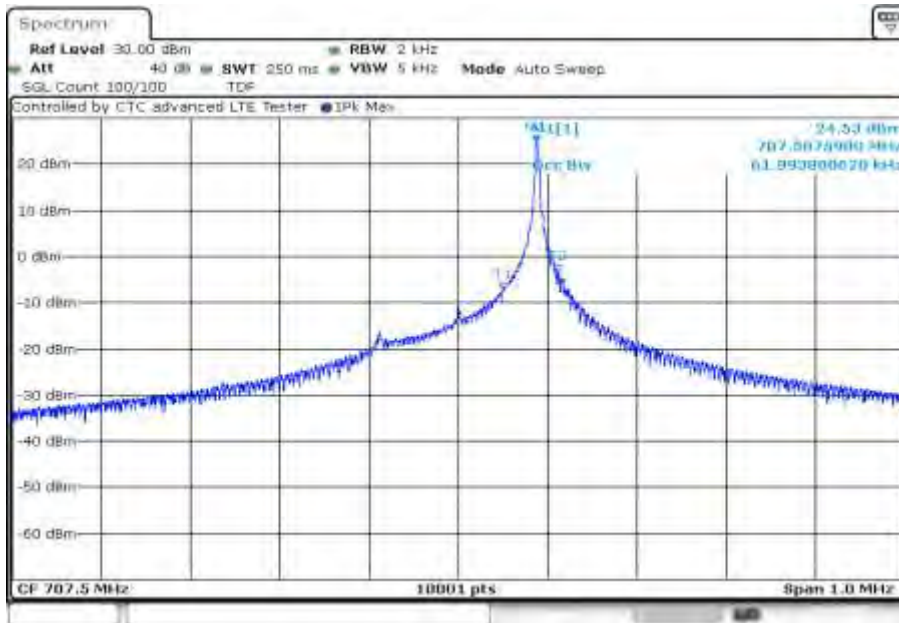
Date: 13.APR.2022 10:39:37

Plot 10: mid channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones
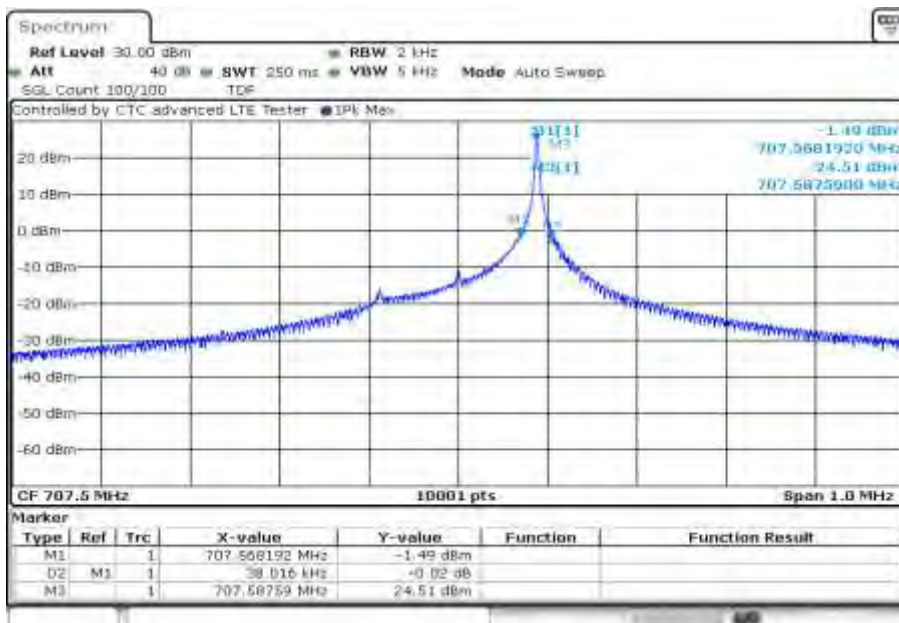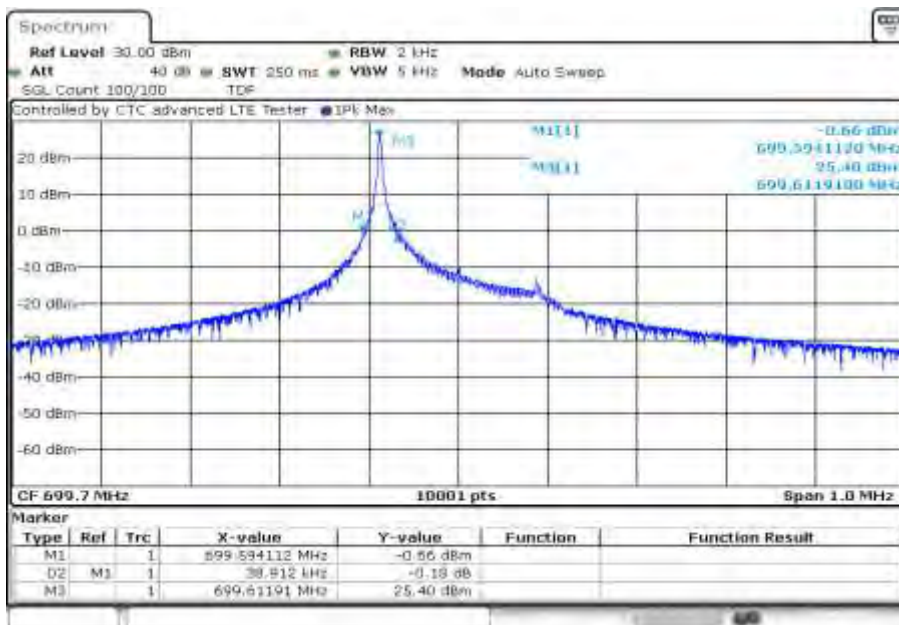

Date: 13.APR.2022 10:40:05

Plot 11: high channel (99% - OBW), spacing 3.75 kHz, 1@47 tones
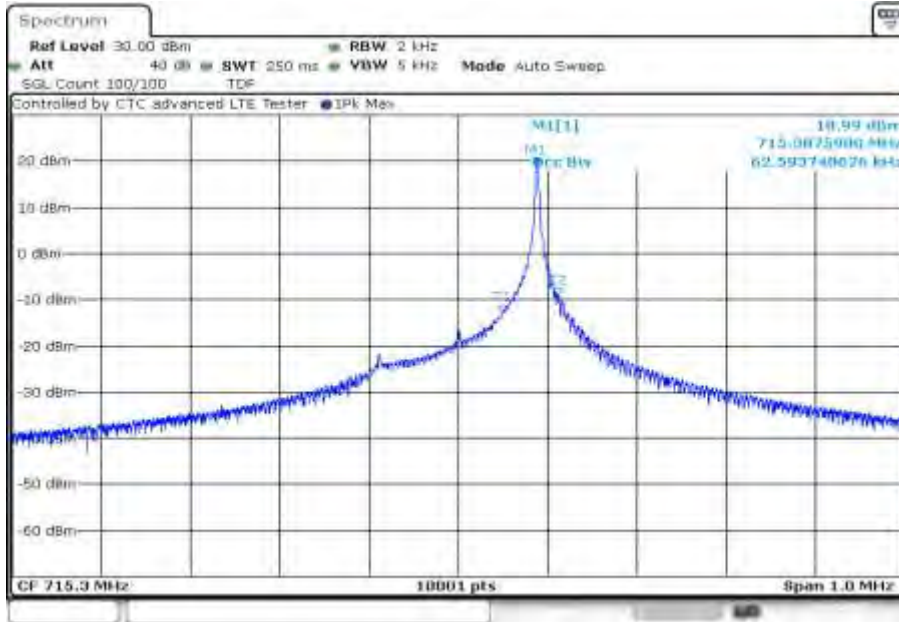
Date: 13.APR.2022 10:50:01

Plot 12: high channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 10:50:30

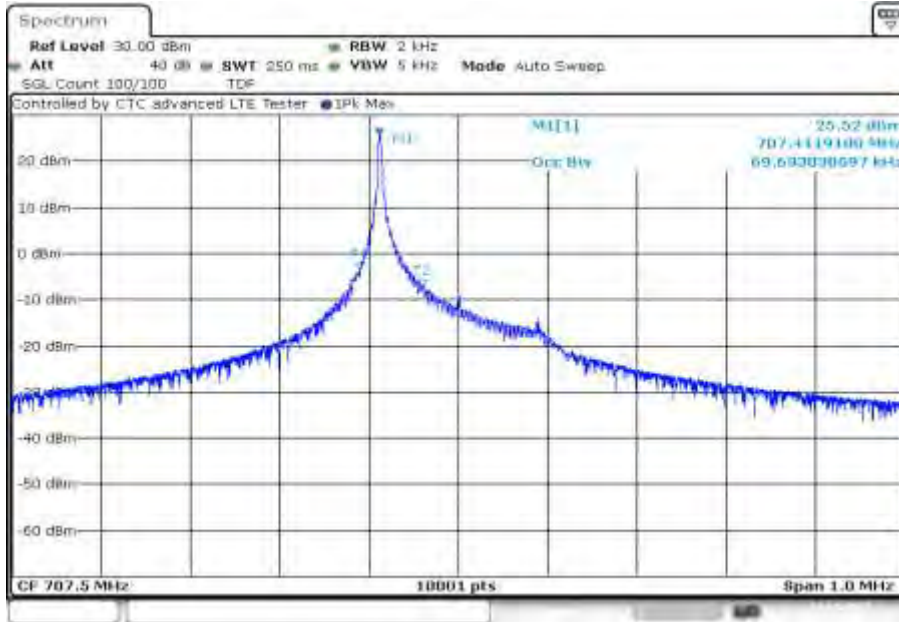**Plot 13:** low channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:32:50

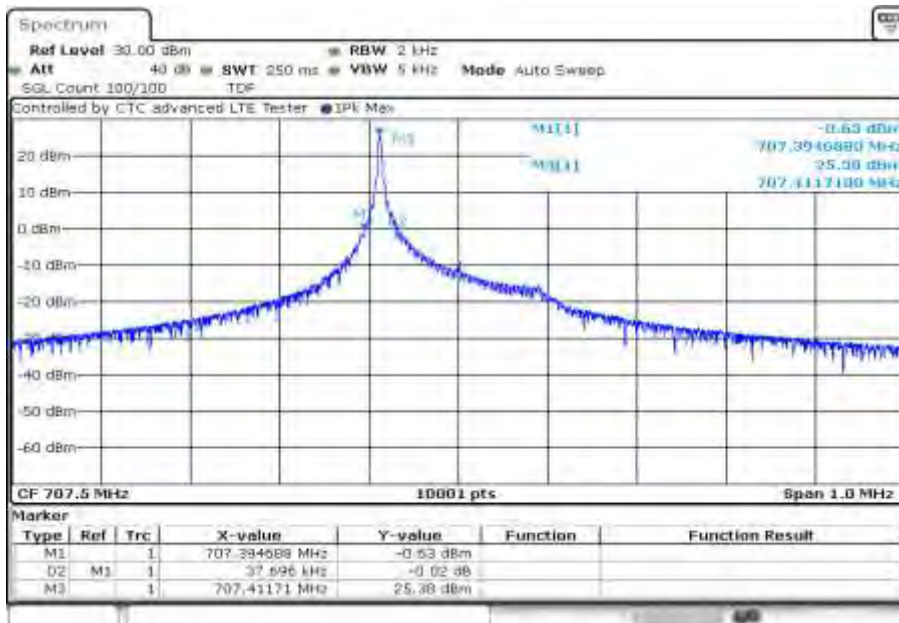**Plot 14:** low channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:33:18

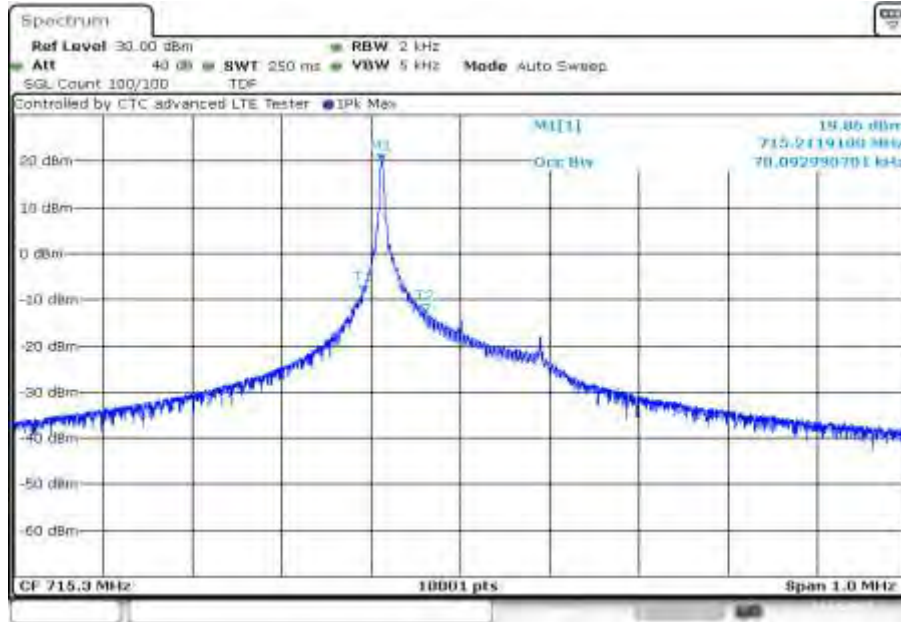**Plot 15:** mid channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:43:09

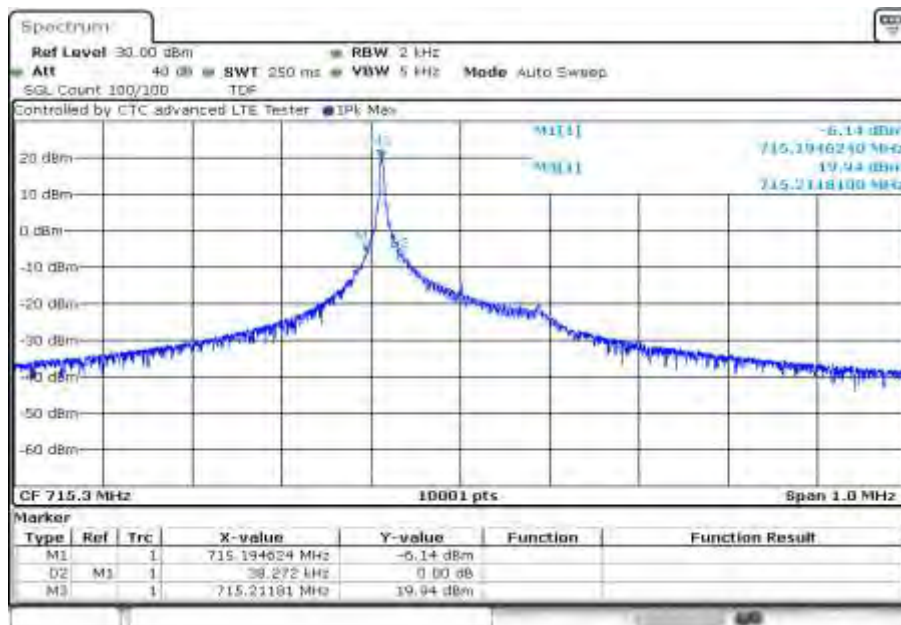**Plot 16:** mid channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:43:37

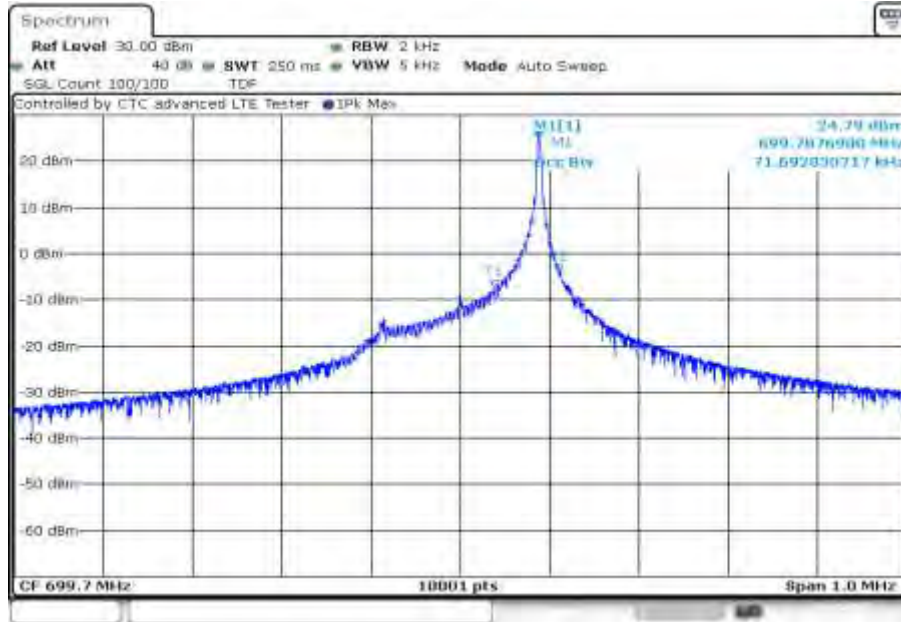**Plot 17:** high channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:53:35

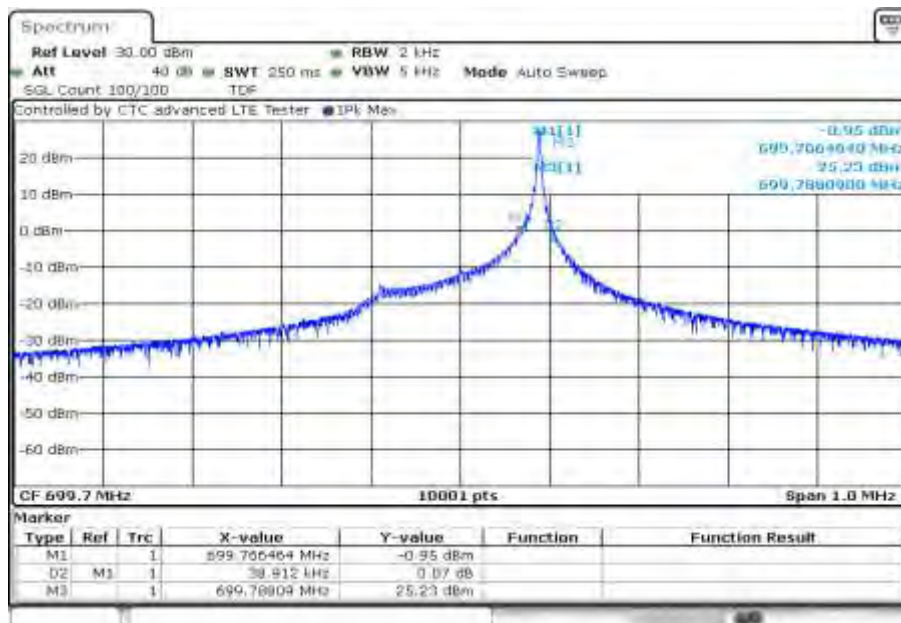**Plot 18:** high channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:54:03

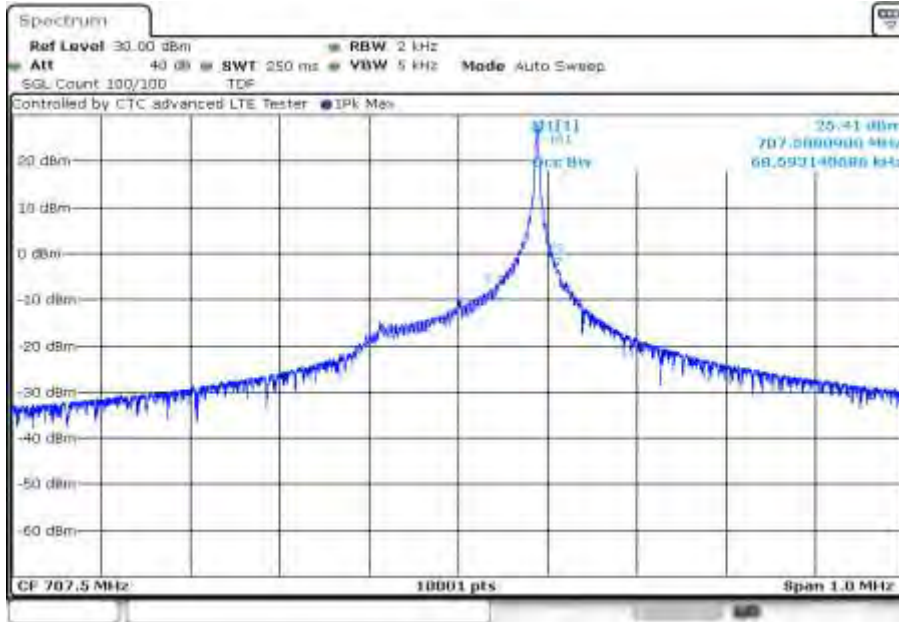**Plot 19:** low channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:33:56

Plot 20: low channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:34:24

Plot 21: mid channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:44:15

Plot 22: mid channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:44:43

Plot 23: high channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:54:40

Plot 24: high channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:55:08

Plots: QPSK

Plot 1: low channel (99% - OBW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 10:30:24

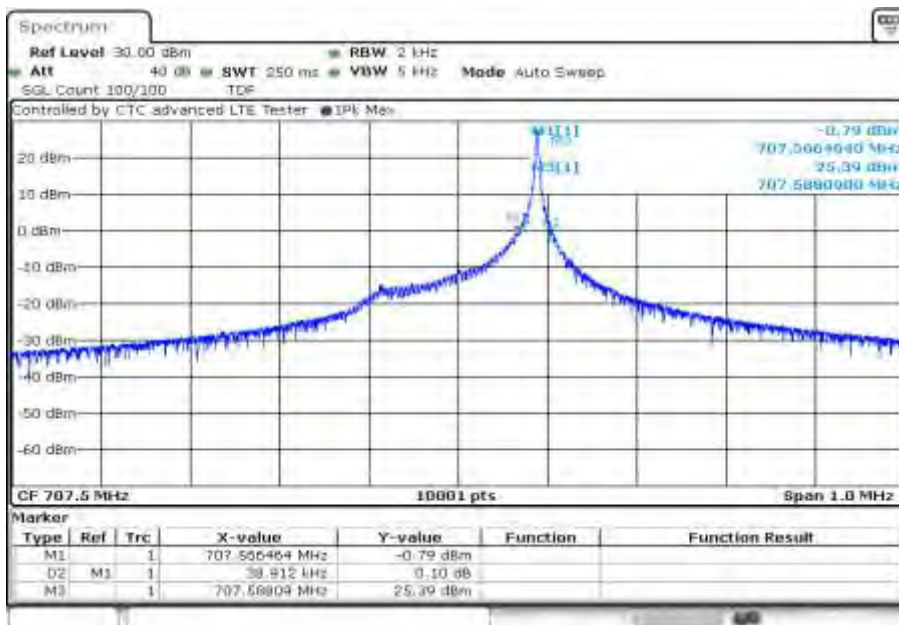**Plot 2:** low channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 10:30:52

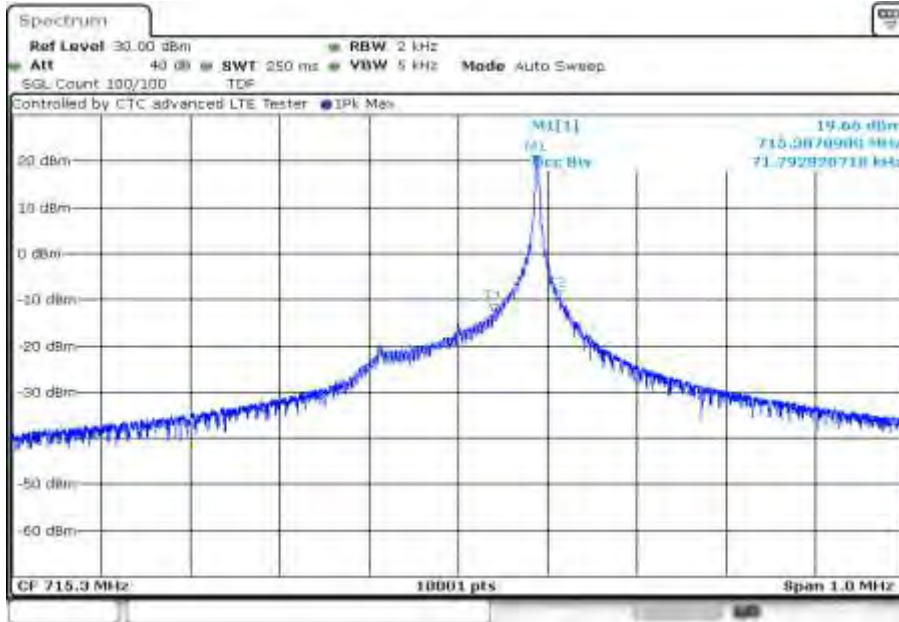**Plot 3:** mid channel (99% - OBW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 10:40:43

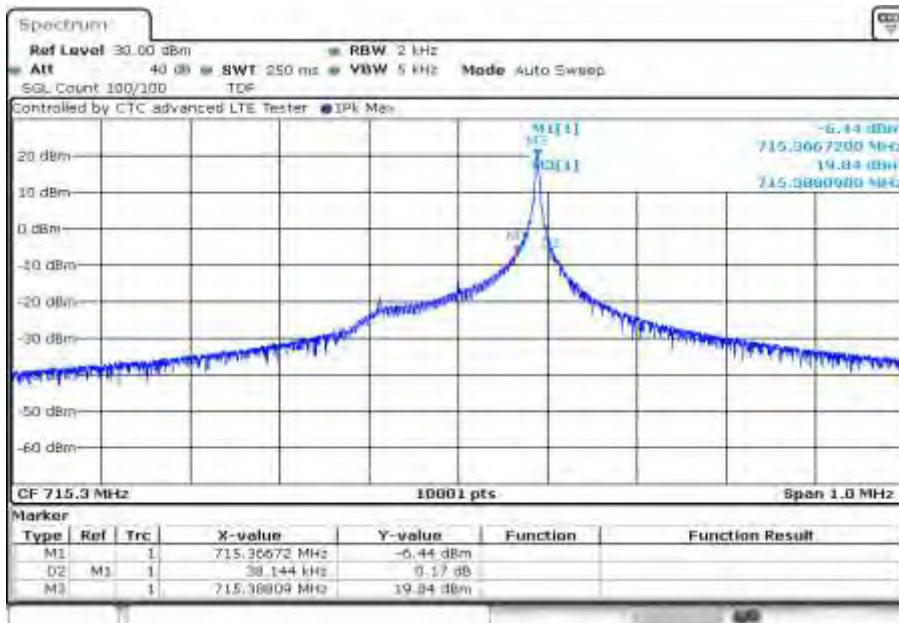**Plot 4:** mid channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 10:41:11

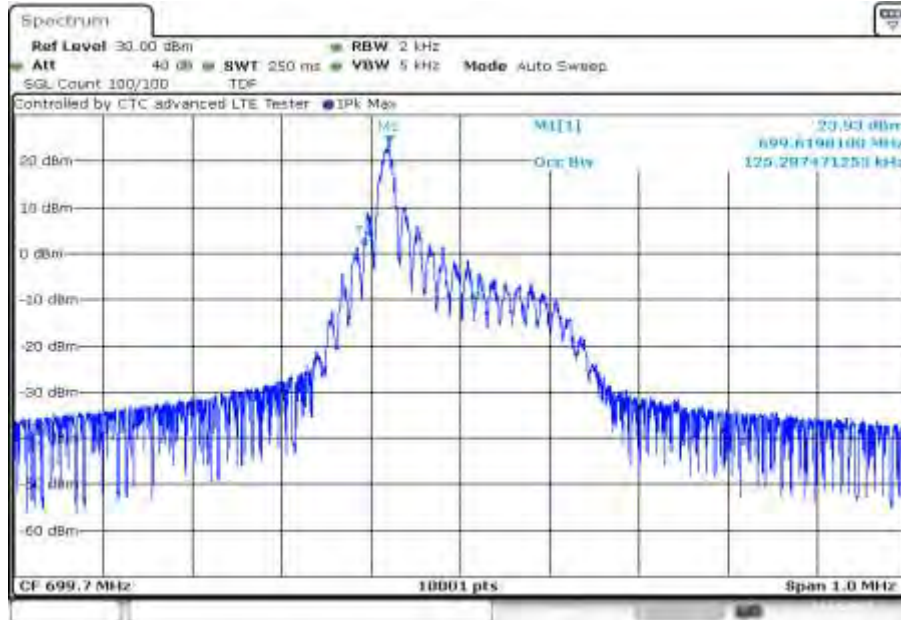**Plot 5:** high channel (99% - OBW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 10:51:07

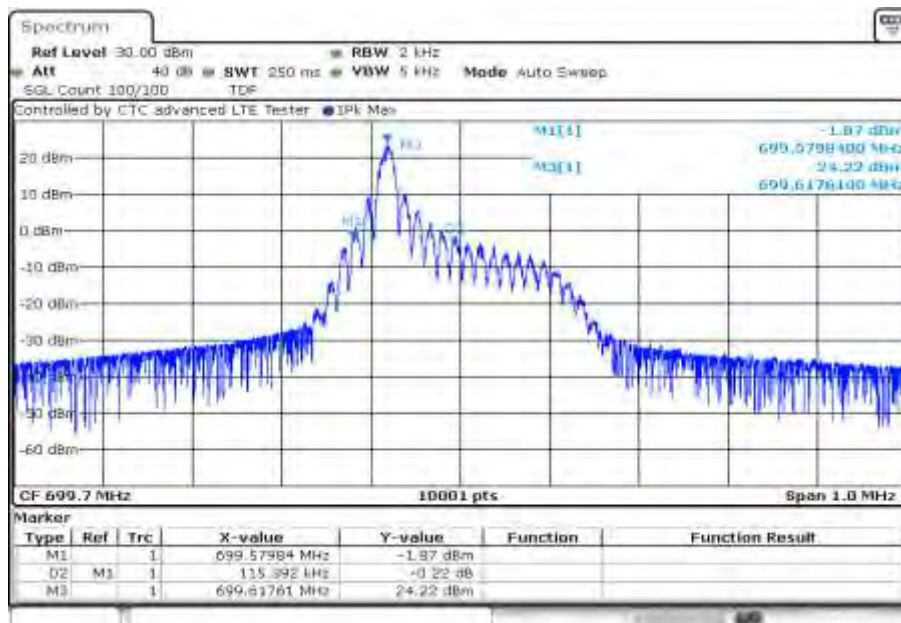**Plot 6:** high channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 10:51:35

Plot 7: low channel (99% - OBW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 10:31:30

Plot 8: low channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 10:31:59

Plot 9: mid channel (99% - OBW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 10:41:48

Plot 10: mid channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 10:42:17

Plot 11: high channel (99% - OBW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 10:52:13

Plot 12: high channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 10:52:41

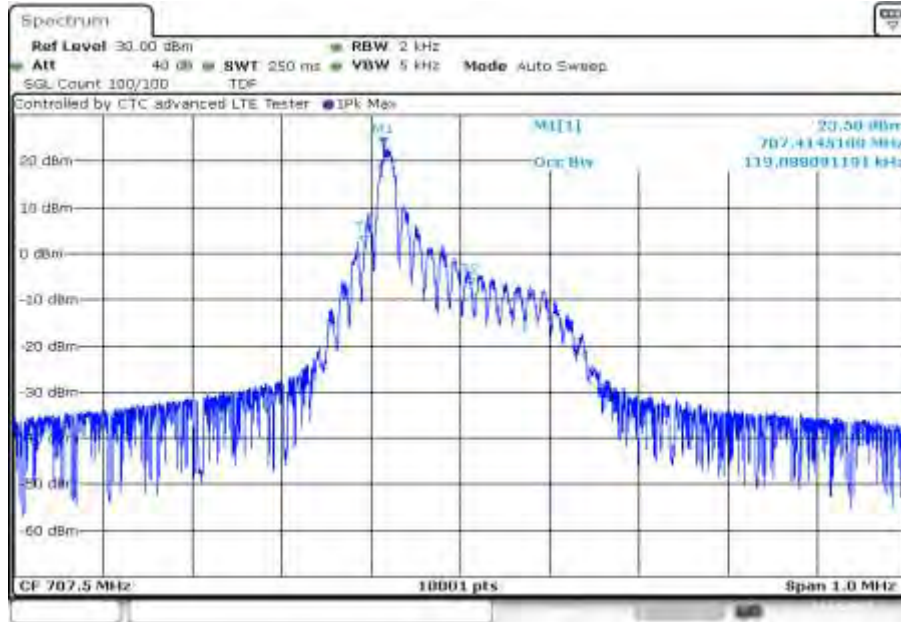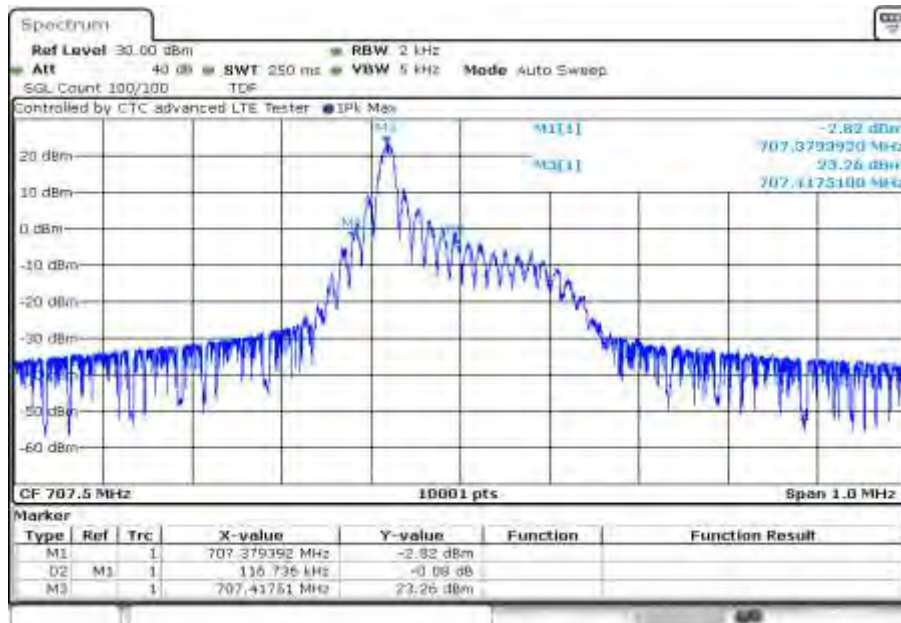**Plot 13:** low channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:35:02

Plot 14: low channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:35:30

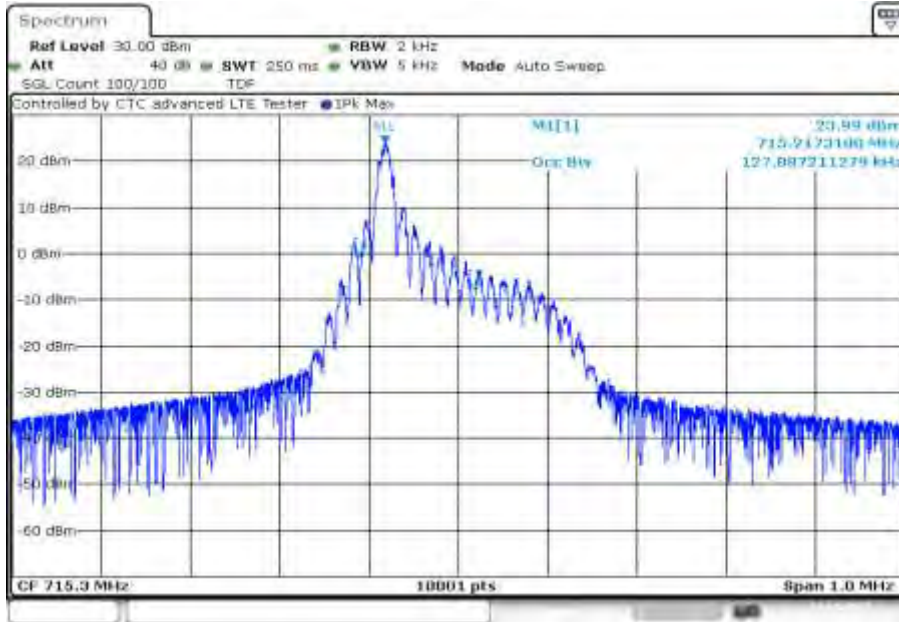**Plot 15:** mid channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:45:21

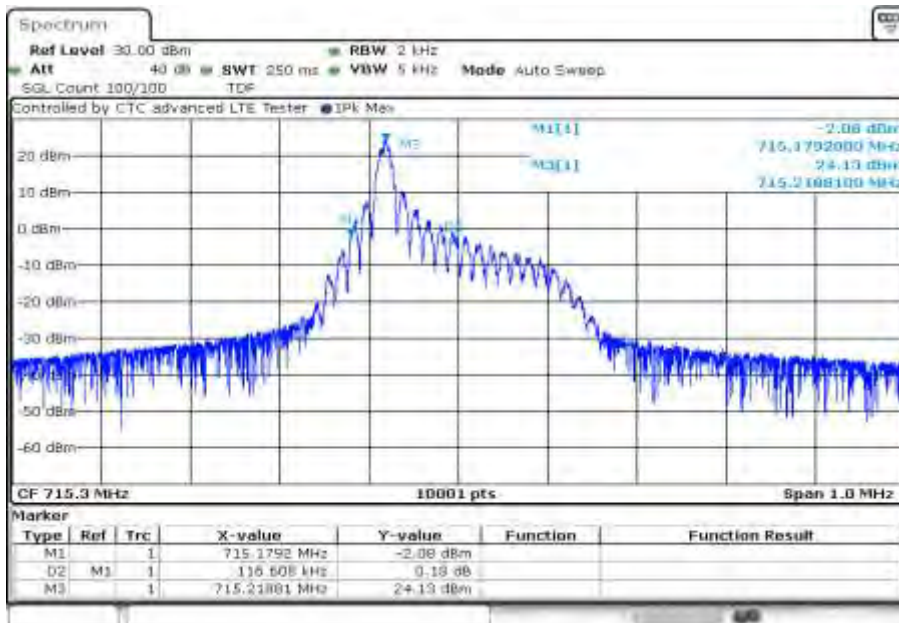**Plot 16:** mid channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:45:49

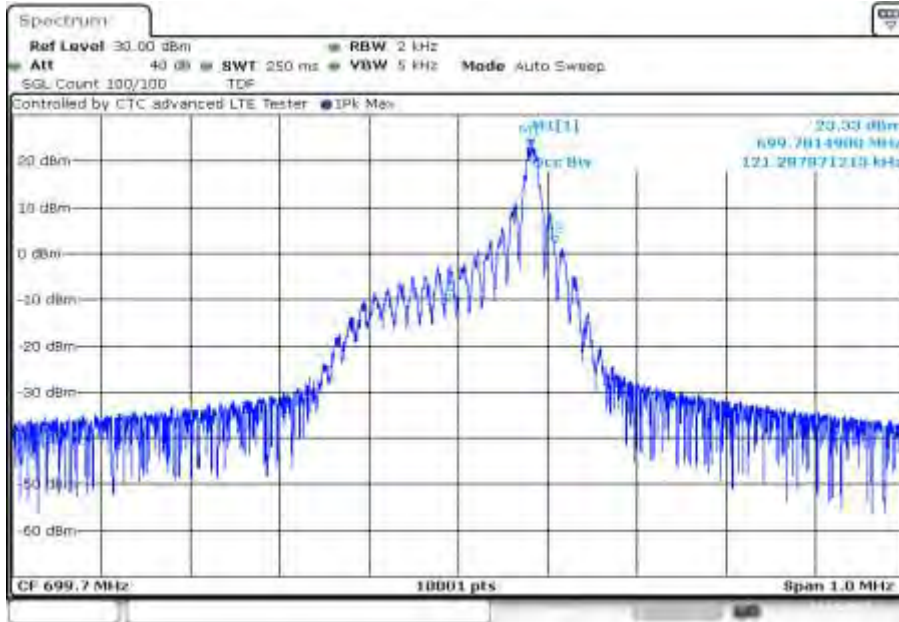**Plot 17:** high channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:55:46

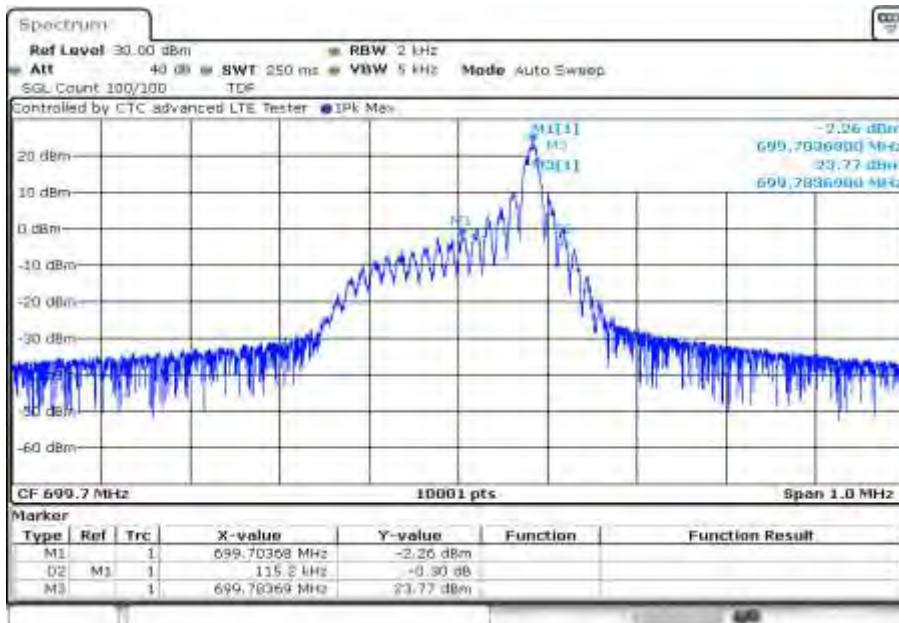**Plot 18:** high channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 10:56:14

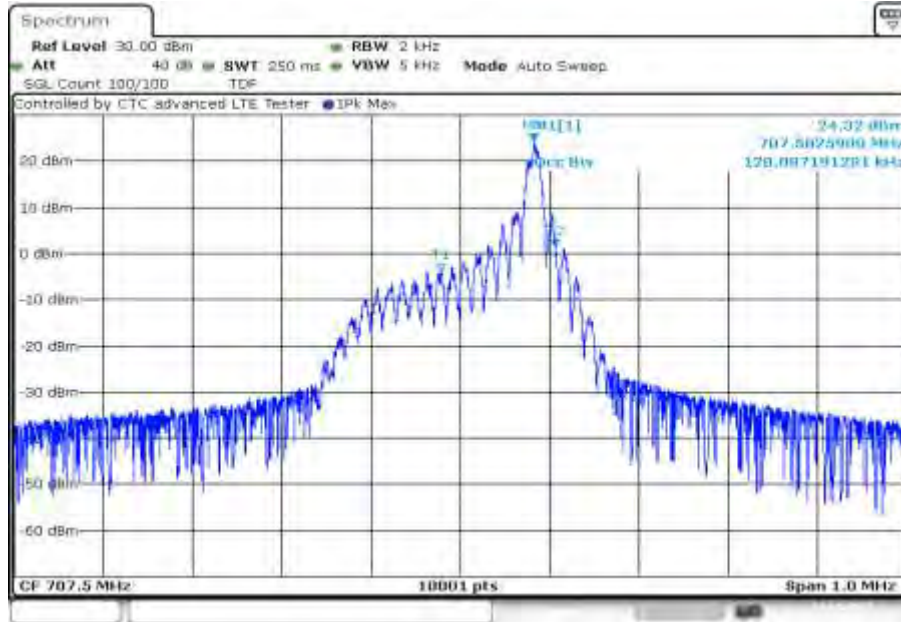**Plot 19:** low channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:36:07

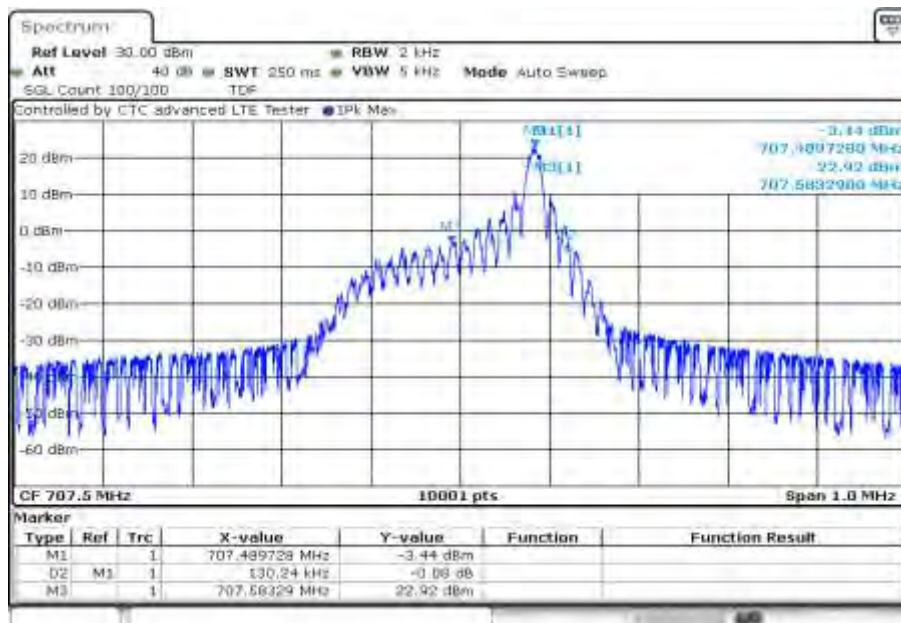**Plot 20:** low channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:36:36

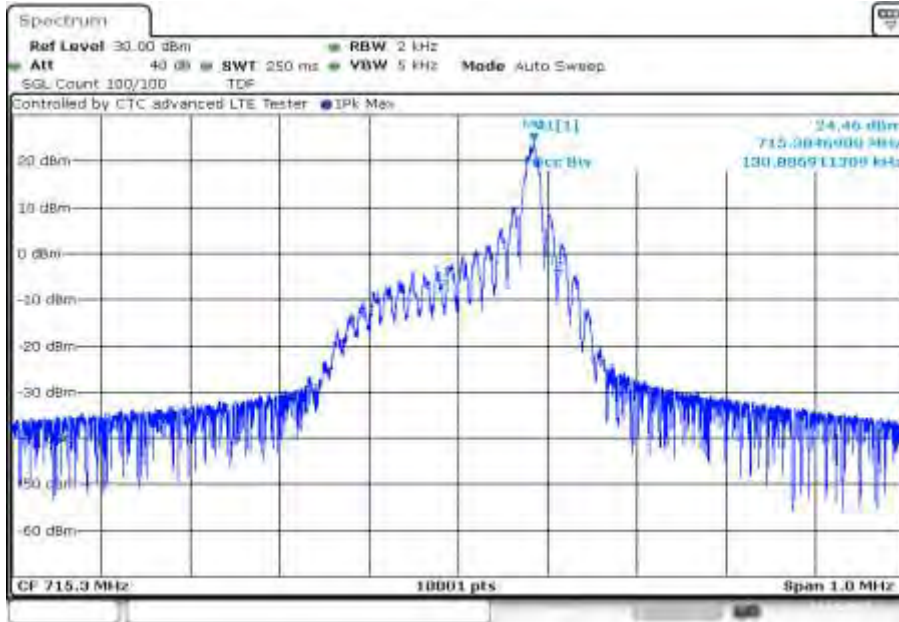**Plot 21:** mid channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:46:27

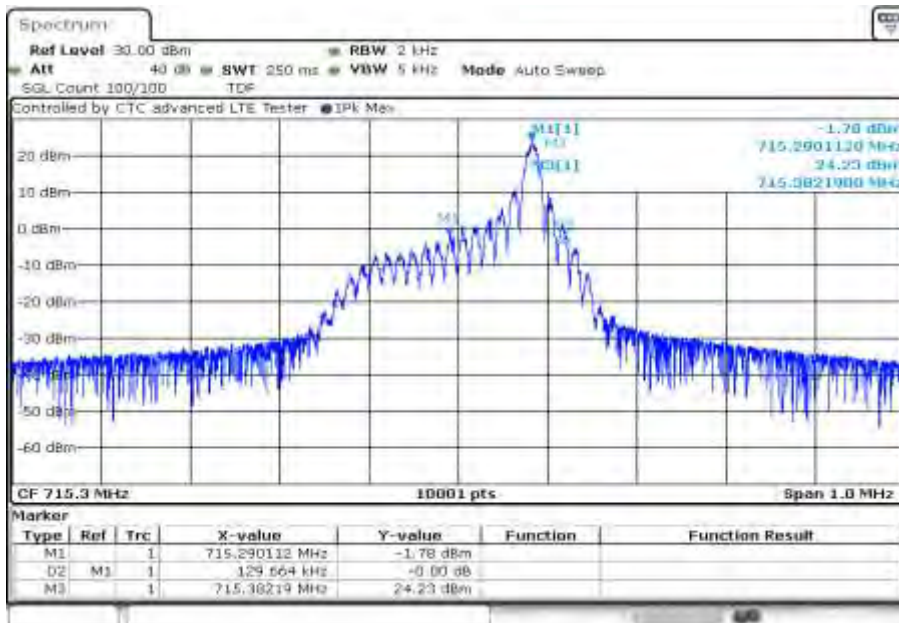**Plot 22:** mid channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:46:55

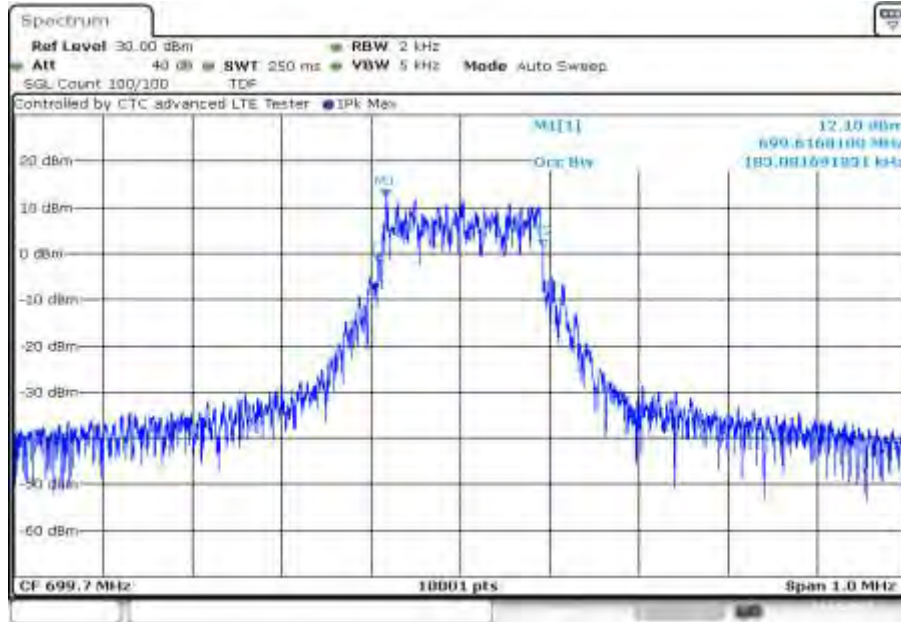**Plot 23:** high channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:56:52

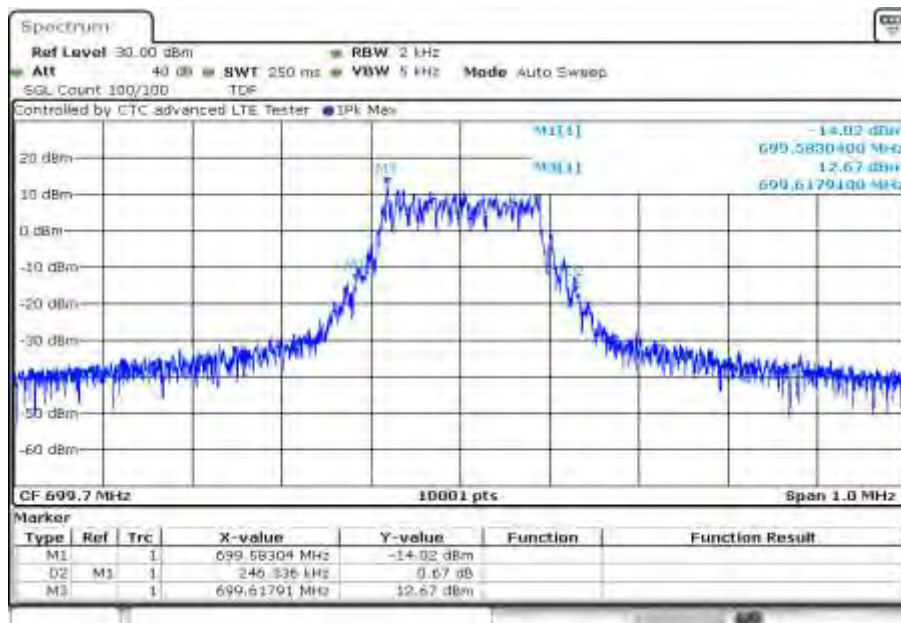**Plot 24:** high channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 10:57:20

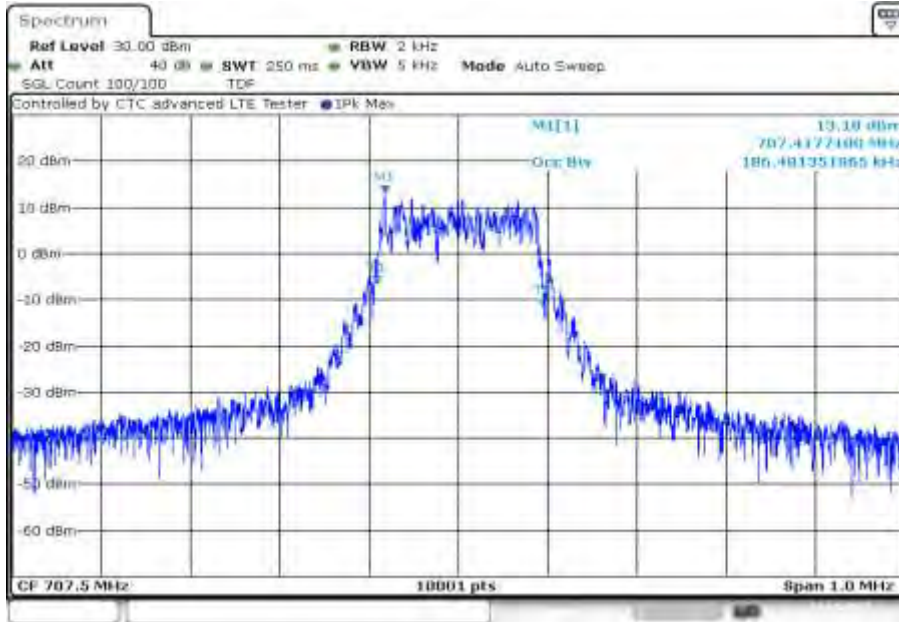**Plot 25:** low channel (99% - OBW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 10:37:13

Plot 26: low channel (-26 dBc BW), spacing 15 kHz, 12@0 tones
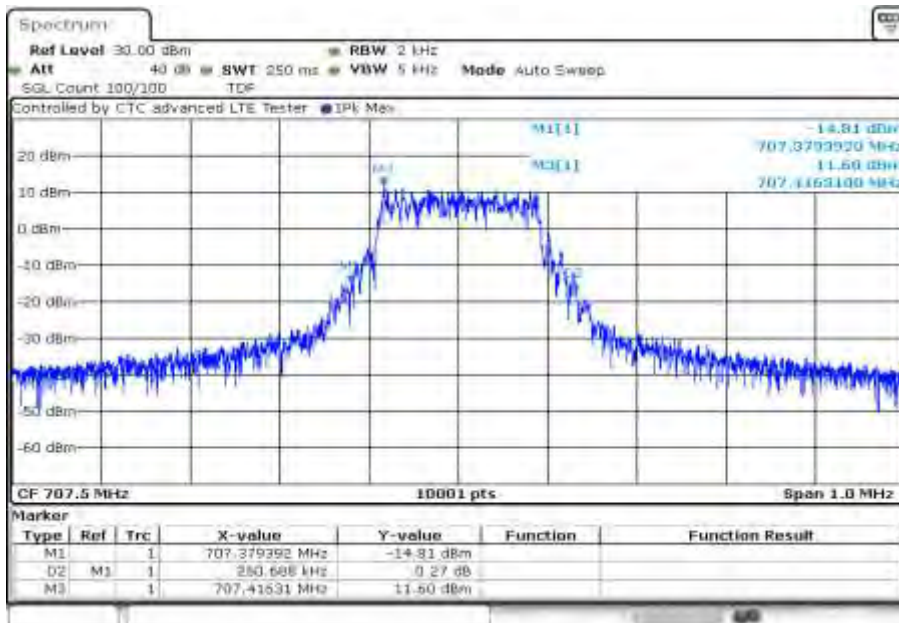

Date: 13.APR.2022 10:37:42

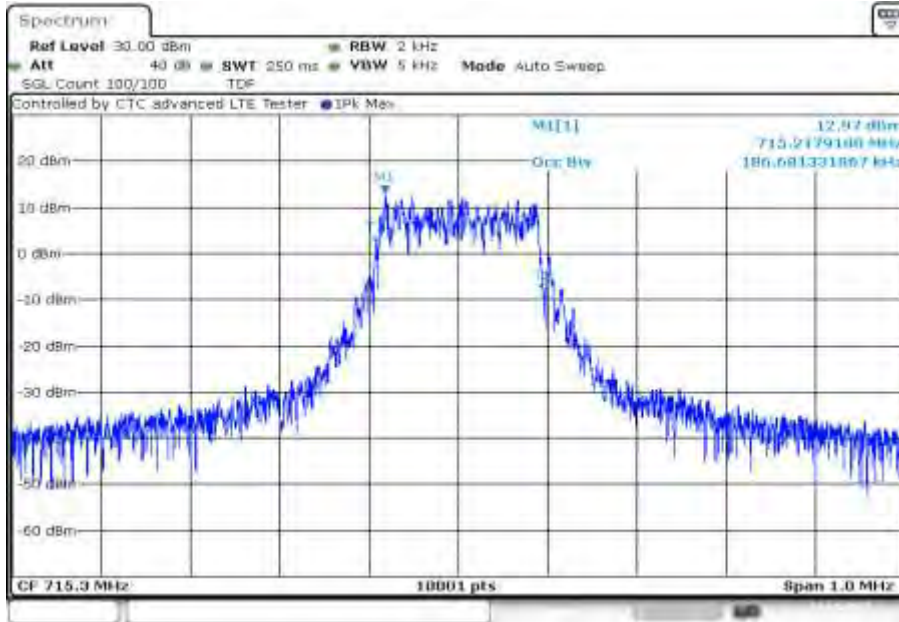**Plot 27:** mid channel (99% - OBW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 10:47:32

Plot 28: mid channel (-26 dBc BW), spacing 15 kHz, 12@0 tones
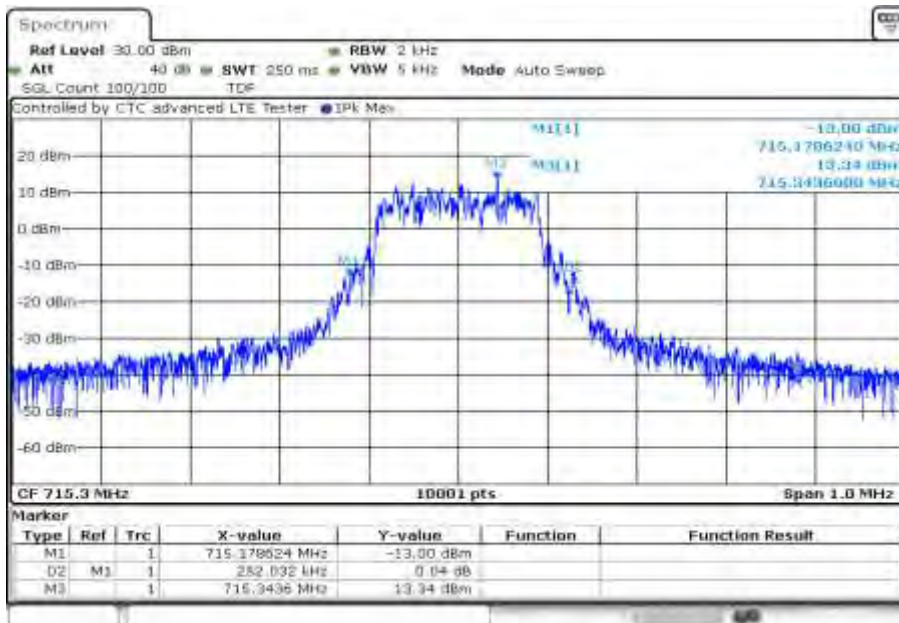

Date: 13.APR.2022 10:48:00

Plot 29: high channel (99% - OBW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 10:57:57

Plot 30: high channel (-26 dBc BW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 10:58:25

16.4 Results LTE band 13

The EUT was set to transmit the maximum power.

16.4.1 RF output power

Description:

This paragraph contains average power, peak output power and EIRP measurements for the mobile station. In all cases, the peak output power is within the required mask (this mask is specified in the JTC standards, TIA PN3389 Vol. 1 Chap 7, and is no FCC requirement).

Measurement:

The mobile was set up for the maximum output power with pseudo random data modulation.

To determine the Peak-To-Average Power Ratio (PAPR) the measurement was performed with the Power Complementary Cumulative Distribution Function (CCDF).

Measurement parameters	
Detector:	Sample
AQT:	See plot
Resolution bandwidth:	1 MHz
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1046 ISED: RSS-Gen, 6.12

Limits:

FCC	ISED
§ 27.50(b)(10)	RSS-130, 4.6.1 & 4.6.3
Portable stations (hand-held devices) transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands are limited to 3 watts ERP.	4.6.1: The transmitter output power shall be measured in terms of average power. In addition, the peak-to-average power ratio (PAPR) of the transmitter shall not exceed 13 dB for more than 0.1% of the time and shall use a signal corresponding to the highest PAPR during periods of continuous transmission. 4.6.3: The e.r.p. shall not exceed 30 watts for mobile equipment and outdoor fixed subscriber equipment. The e.r.p. shall not exceed 3 watts for portable equipment and indoor fixed subscriber equipment.
Power: **34.77 dBm ERP** PAPR: **13 dB** (ISED only)	

Results:

Sub-Carrier Spacing [kHz]	Modulation	Number of Tones	Average Output Power [dBm] Channel No / Frequency [MHz]			Peak to Average Ratio [dB] Channel No / Frequency [MHz]		
			23181 / 777.1	23230 / 782.0	23279 / 786.9	23181 / 777.1	23230 / 782.0	23279 / 786.9
3.75	BPSK	1T0	19.83	19.55	19.45	1.88	1.91	1.91
		1T47	19.47	19.55	19.49	0.29	1.88	1.88
	QPSK	1T0	19.65	19.54	19.53	0.29	0.26	0.32
		1T47	19.58	19.54	19.48	1.62	1.62	1.62
15	BPSK	1T0	19.57	19.80	19.78	1.65	1.57	1.57
		1T11	19.91	19.60	19.58	1.62	1.62	1.62
	QPSK	1T0	19.83	19.50	19.76	1.62	1.65	1.65
		1T11	19.60	19.53	19.70	0.49	0.46	1.59
		12T0	17.73	17.84	17.72	5.68	5.88	5.97

The radiated output power is measured in the mode with the highest conducted output power.

Output Power (ERP)			
Sub-Carrier Spacing [kHz]	Frequency (MHz)	Average Output Power (dBm) BPSK	Average Output Power (dBm) QPSK
3.75	777.1	14.63	14.45
	782.0	14.25	14.24
	786.9	13.99	14.03
15	777.1	14.71	14.63
	782.0	14.50	14.23
	786.9	14.28	14.26

16.4.2 Frequency stability

Description:

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the mobile station in a "call mode". This is accomplished with the use of a R&S CMW500 DIGITAL RADIOCOMMUNICATION TESTER.

1. Measure the carrier frequency at room temperature.
2. Subject the mobile station to overnight soak at -30 C.
3. With the mobile station, powered with V_{nom}, connected to the CMW500 and in a simulated call on channel 782 (center channel), measure the carrier frequency. These measurements should be made within two minutes of powering up the mobile station, to prevent significant self warming.
4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
5. Re-measure carrier frequency at room temperature with V_{nom}. Vary supply voltage from V_{min} to V_{max}, in 0.1 Volt steps re-measuring carrier frequency at each voltage. Pause at V_{nom} for 1.5 hours unpowered, to allow any self heating to stabilize, before continuing.
6. At all temperature levels hold the temperature to +/- 0.5°C during the measurement procedure.

This measurement was performed with the highest channel bandwidth supported from the EUT on the middle channel

Measurement:

Measurement parameters	
Detector:	Measured with CMW500
Sweep time:	
Video bandwidth:	
Resolution bandwidth:	
Span:	
Trace-Mode:	
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1055 ISED: RSS-Gen, 6.11

Limits:

FCC	ISED
§ 27.54	RSS-130, 4.5
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.	The frequency stability shall be sufficient to ensure that the occupied bandwidth remains within each frequency block range when tested at the temperature and supply voltage variations specified in RSS-Gen.

Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
3.2	-60	-0.0767
3.6	-60	-0.0767
4.0	-60	-0.0767

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	32	0.0409
-20	31	0.0396
-10	27	0.0345
± 0	16	0.0205
10	19	0.0243
20	-60	-0.0767
30	-39	-0.0499
40	-30	-0.0384
50	-37	-0.0473

Additional measurements for RSS-130 (4.3 b)

f_L = MHz	f_H = MHz
f_L − (max freq. error) = MHz	f_H + (max freq. error) = MHz

16.4.3 Spurious emissions radiated

Description:

The following steps outline the procedure used to measure the radiated emissions from the mobile station. The site is constructed in accordance with ANSI C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 782 MHz. Measured up to 8 GHz. The resolution bandwidth is set as outlined in Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 13.

Measurement:

Measurement parameters	
Detector:	Peak / RMS
Sweep time:	2 sec.
Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Span:	100 MHz Steps
Trace mode:	Max Hold
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13

Limits:

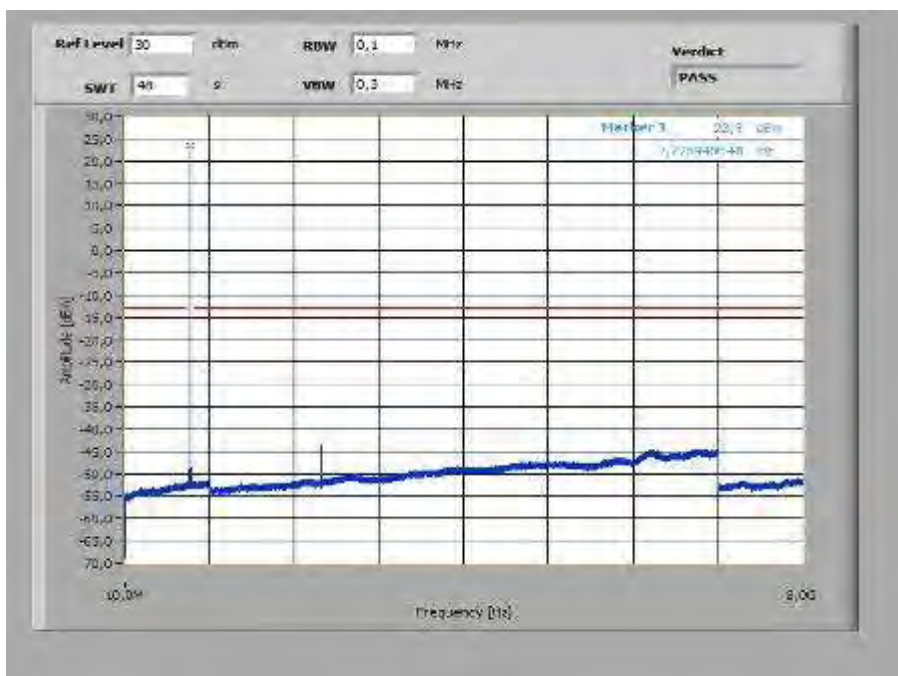| FCC	ISED
$ 27.53(c)	RSS-130, 4.7.1
(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
-13 dBm	

Results:

BPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		**MIDDLE CHANNEL**		**HIGHEST CHANNEL**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	1564.0	-42.8	-/-	-/-
	-/-		-45.4		-/-
-/-	-/-	All other detected emissions are more than 20 dB below the limit.		-/-	-/-
	-/-				-/-
-/-	-/-	-/-	-/-	-/-	-/-
	-/-		-/-		-/-

QPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		**MIDDLE CHANNEL**		**HIGHEST CHANNEL**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	1564.0	-42.9	-/-	-/-
	-/-		-45.7		-/-
-/-	-/-	All other detected emissions are more than 20 dB below the limit.		-/-	-/-
	-/-				-/-
-/-	-/-	-/-	-/-	-/-	-/-
	-/-		-/-		-/-

BPSK

Plot 1: Middle channel, up to 30 MHz

Plot 2: Middle channel, 30 MHz to 1 GHz

Plot 3: Middle channel, 1 MHz to 8 GHz

QPSK

Plot 1: Middle channel, up to 30 MHz
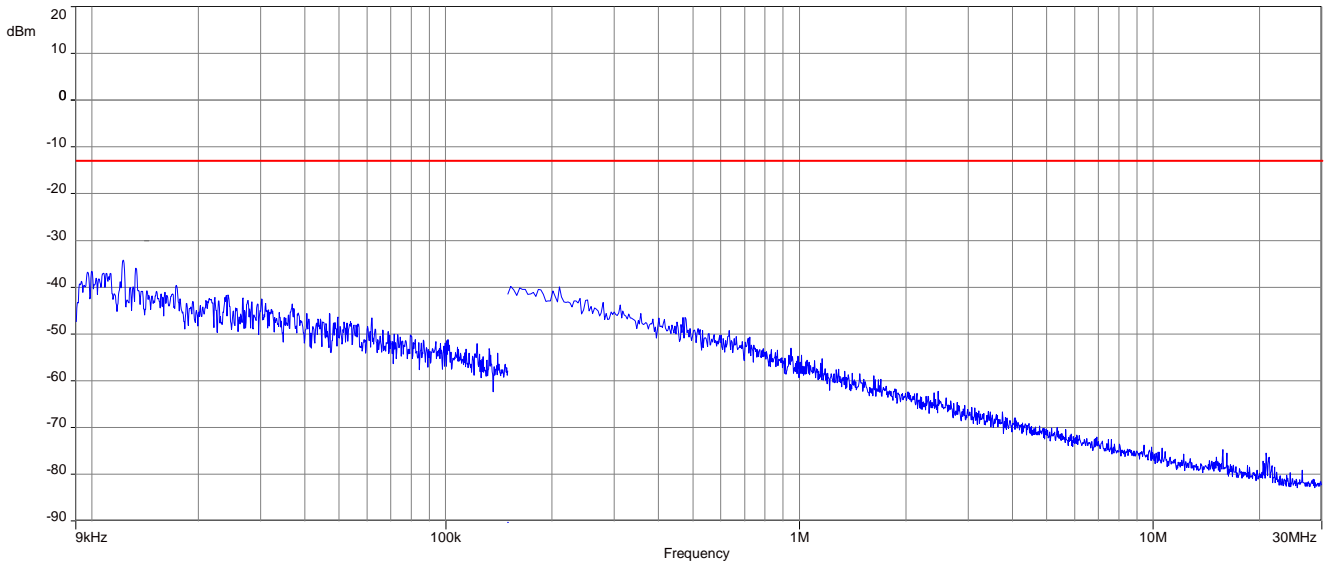
Plot 2: Middle channel, 30 MHz to 1 GHz
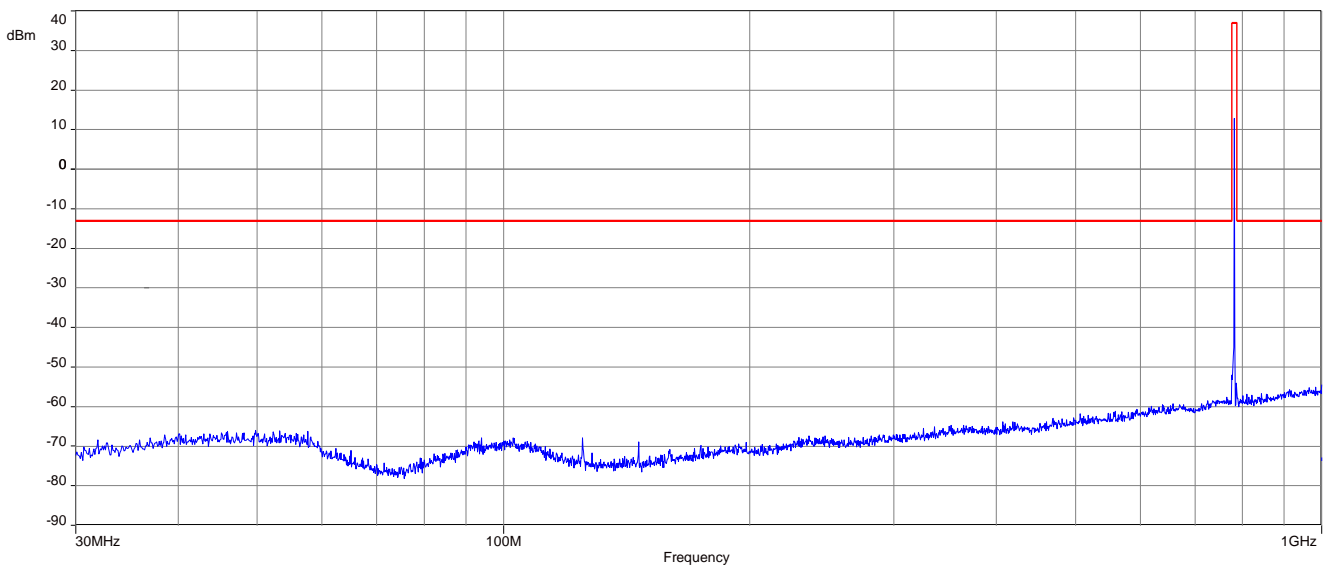
Plot 3: Middle channel, 1 MHz to 8 GHz
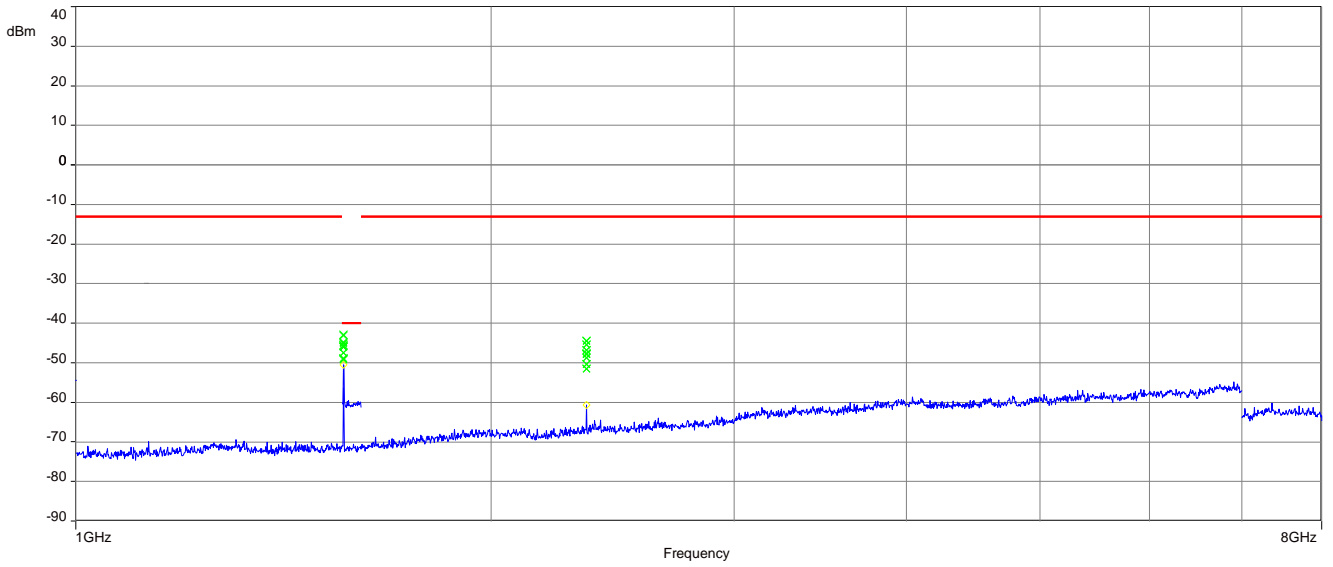
16.4.4 Spurious emissions conducted

Description:

The following steps outline the procedure used to measure the conducted emissions from the mobile station.
1. Determine frequency range for measurements: From § 2.1057 & RSS-Gen, 6.13.2 the spectrum should be investigated from the lowest radio frequency generated in the equipment up to at least the 10th harmonic of the carrier frequency. For the mobile station equipment tested data taken from 10 MHz to 8 GHz.
2. Determine mobile station transmits frequencies: below outlines the band edge frequencies pertinent to conducted emissions testing.

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	10 MHz − 8 GHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

Limits:

FCC	ISED
$ 27.53(c)	RSS-130, 4.7.1
(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least $43 + 10 \log_{10}$ p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
-13 dBm	

Results:

BPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		MIDDLE CHANNEL		HIGHEST CHANNEL	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
1554.2	-/-	1564.0	-/-	1573.8	-/-
2331.3	-/-	2346.0	-/-	2360.7	-/-
3108.4	-/-	3128.0	-/-	3147.6	-/-
3885.5	-/-	3910.0	-/-	3934.5	-/-
4662.6	-/-	4692.0	-/-	4721.4	-/-
5439.7	-/-	5474.0	-/-	5508.3	-/-
6216.8	-/-	6256.0	-/-	6295.2	-/-
6993.9	-/-	7038.0	-/-	7082.1	-/-
7771.0	-/-	7820.0	-/-	7869.0	-/-

QPSK

SPURIOUS EMISSION LEVEL					
LOWEST CHANNEL		MIDDLE CHANNEL		HIGHEST CHANNEL	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
1554.2	-/-	1564.0	-/-	1573.8	-/-
2331.3	-/-	2346.0	-/-	2360.7	-/-
3108.4	-/-	3128.0	-/-	3147.6	-/-
3885.5	-/-	3910.0	-/-	3934.5	-/-
4662.6	-/-	4692.0	-/-	4721.4	-/-
5439.7	-/-	5474.0	-/-	5508.3	-/-
6216.8	-/-	6256.0	-/-	6295.2	-/-
6993.9	-/-	7038.0	-/-	7082.1	-/-
7771.0	-/-	7820.0	-/-	7869.0	-/-

Plots: BPSK

Plot 1: Lowest Channel (10 MHz − 8 GHz), spacing 3.75 kHz, 1@0 tones

Plot 2: Middle Channel (10 MHz − 8 GHz), spacing 3.75 kHz, 1@0 tones

Plot 3: Highest Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@0 tones
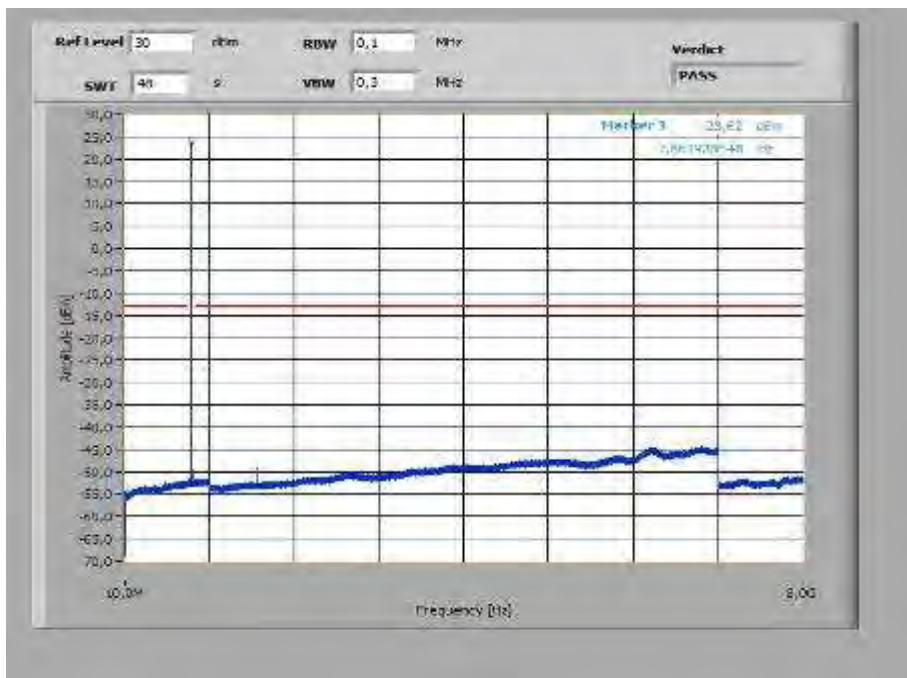

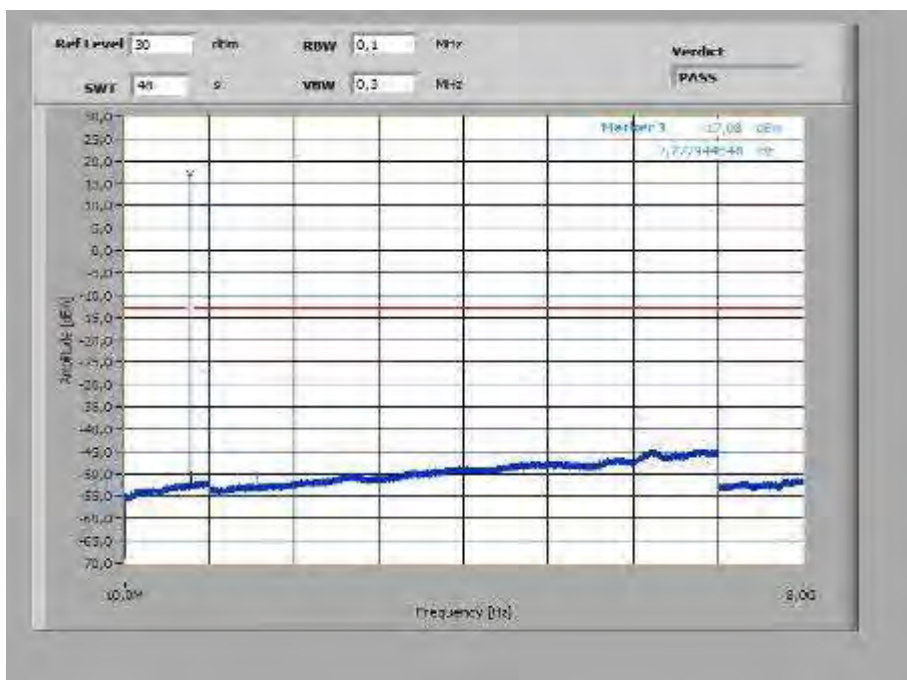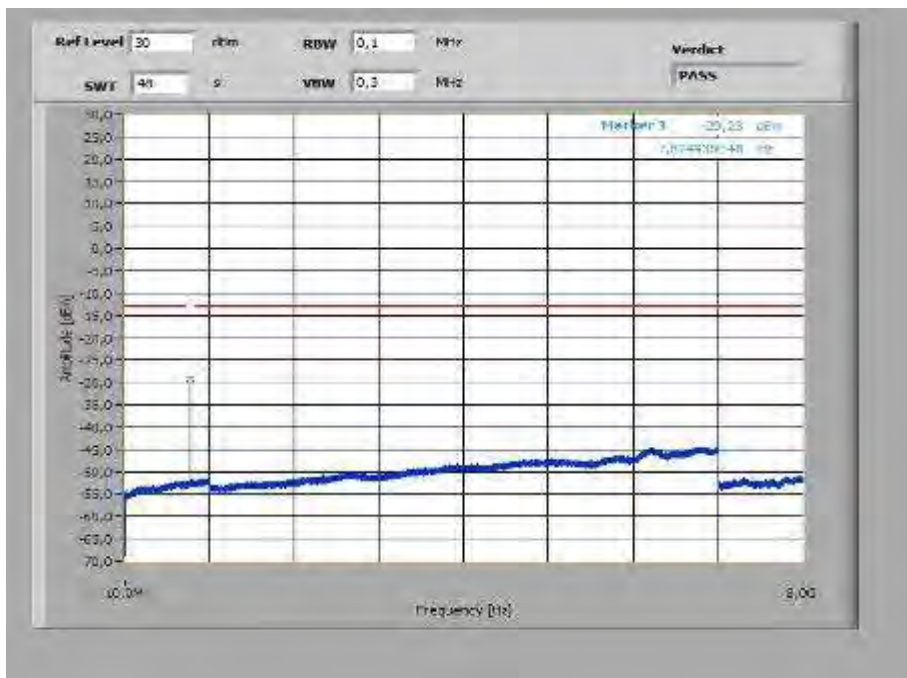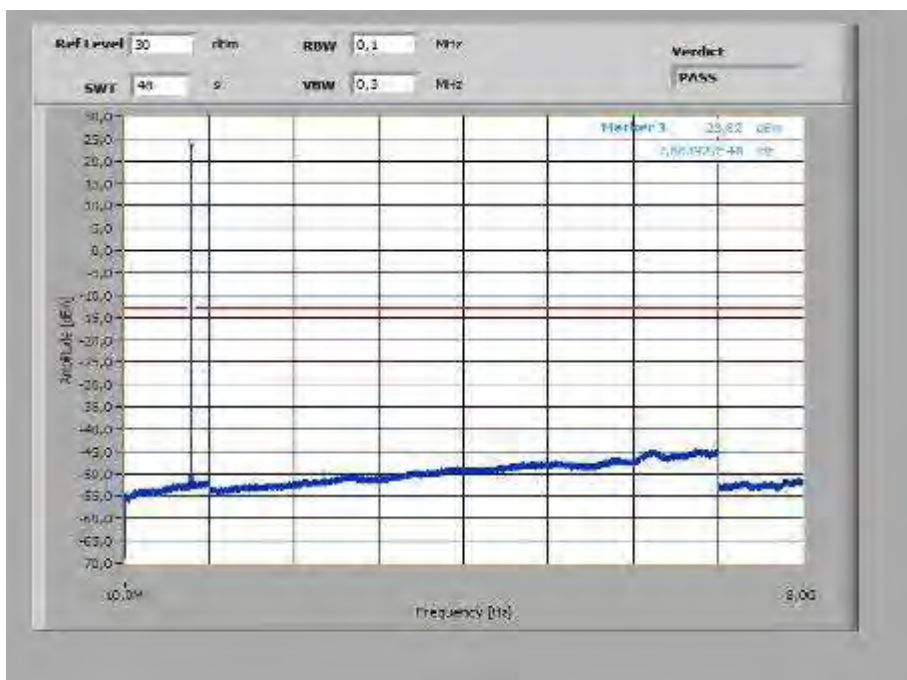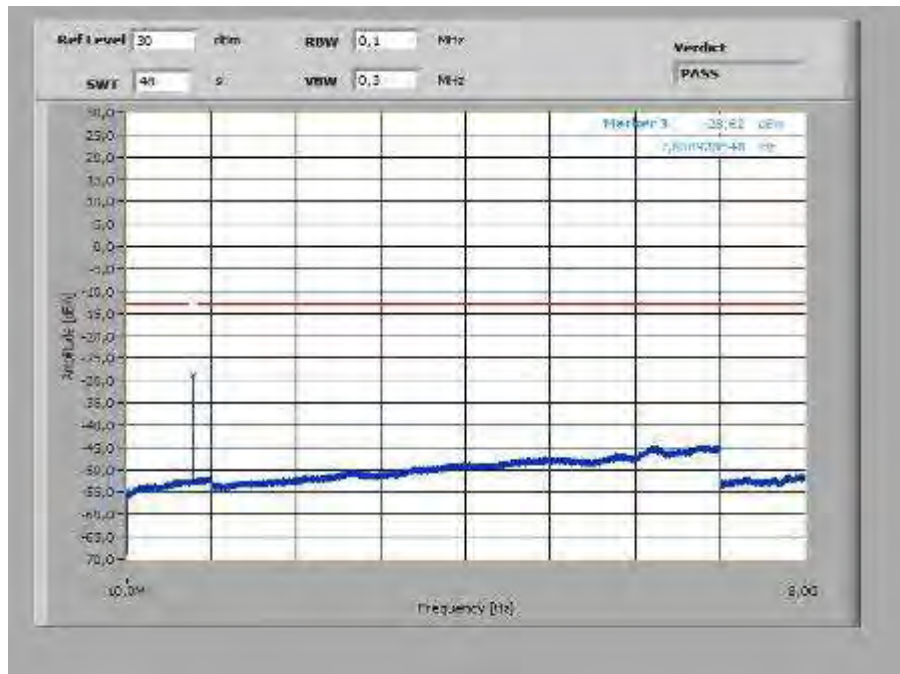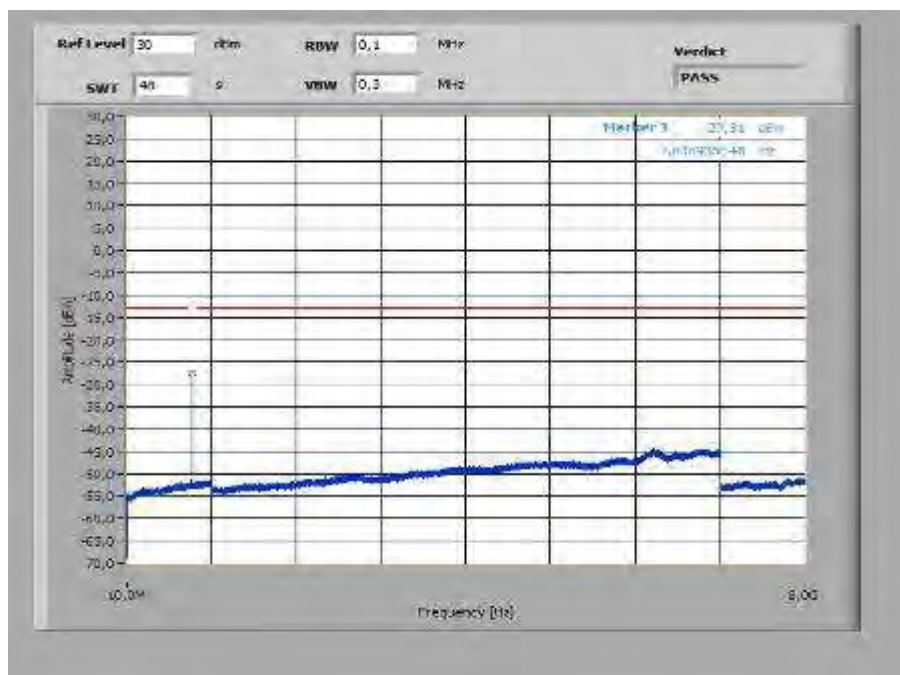**Plot 4:** Lowest Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@47 tones

Plot 5: Middle Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@47 tones

Plot 6: Highest Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@47 tones

Plot 7: Lowest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@0 tones

Plot 8: Middle Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@0 tones

Plot 9: Highest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@0 tones

Plot 10: Lowest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@11 tones

Plot 11: Middle Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@11 tones

Plot 12: Highest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@11 tones

Plots: QPSK

Plot 1: Lowest Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@0 tones

Plot 2: Middle Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@0 tones

Plot 3: Highest Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@0 tones

Plot 4: Lowest Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@47 tones

Plot 5: Middle Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@47 tones

Plot 6: Highest Channel (10 MHz – 8 GHz), spacing 3.75 kHz, 1@47 tones

Plot 7: Lowest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@0 tones

Plot 8: Middle Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@0 tones

Plot 9: Highest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@0 tones

Plot 10: Lowest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@11 tones

Plot 11: Middle Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@11 tones

Plot 12: Highest Channel (10 MHz – 8 GHz), spacing 15 kHz, 1@11 tones

Plot 13: Lowest Channel (10 MHz – 8 GHz), spacing 15 kHz, 12@0 tones

Plot 14: Middle Channel (10 MHz – 8 GHz), spacing 15 kHz, 12@0 tones

Plot 15: Highest Channel (10 MHz – 8 GHz), spacing 15 kHz, 12@0 tones

16.4.5 Block edge compliance

Description:

The spectrum at the band edges must comply with the spurious emissions limits.

Measurement:

Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

Limits:

FCC	ISED
$ 27.53(c)	RSS-130, 4.7.1
(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following: (c)(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB.	The unwanted emissions in any 100 kHz bandwidth on any frequency outside the low frequency edge and the high frequency edge of each frequency block range(s), shall be attenuated below the transmitter power, P (dBW), by at least 43 + 10 log10 p (watts), dB. However, in the 100 kHz band immediately outside of the equipment's frequency block range, a resolution bandwidth of 30 kHz may be employed.
-13 dBm Correction factor according to KDB 890810 if RBW < 1 % emission bandwidth: ☒N/A here ☐10 log (RBW1/RBW2) = X dB; whereas: RBW1 = Y, RBW2 = Z	

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Results: BPSK

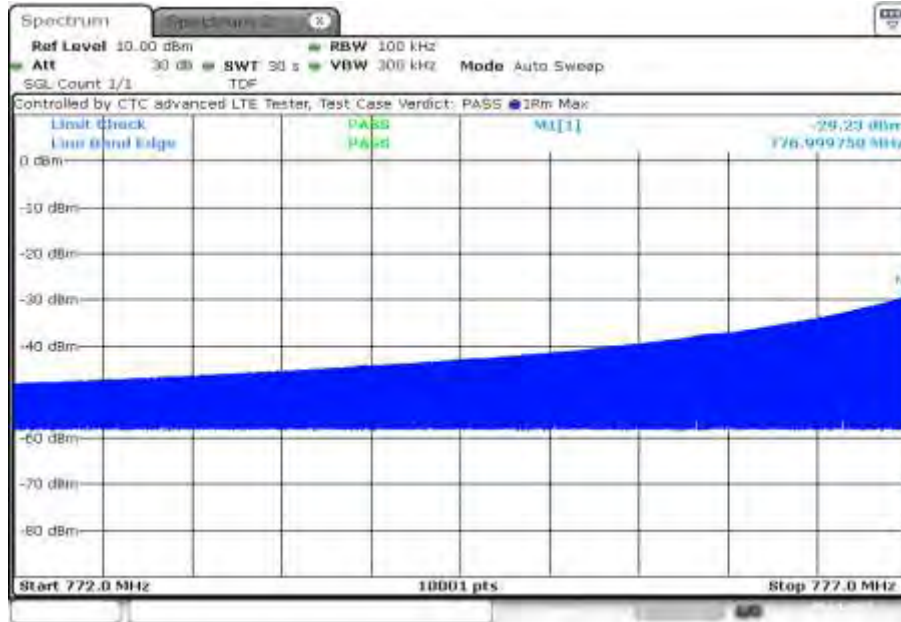**Plot 1:** Lowest channel, spacing 3.75 kHz, 1@0 tones

Date: 5.APR.2022 07:50:05

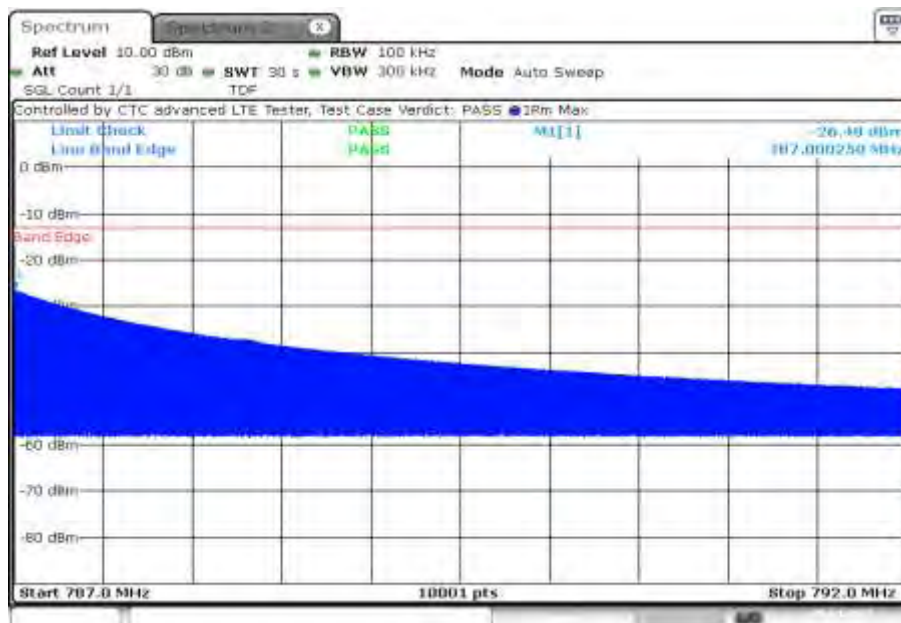**Plot 2:** Highest channel, spacing 3.75 kHz, 1@0 tones

Date: 5.APR.2022 09:27:07
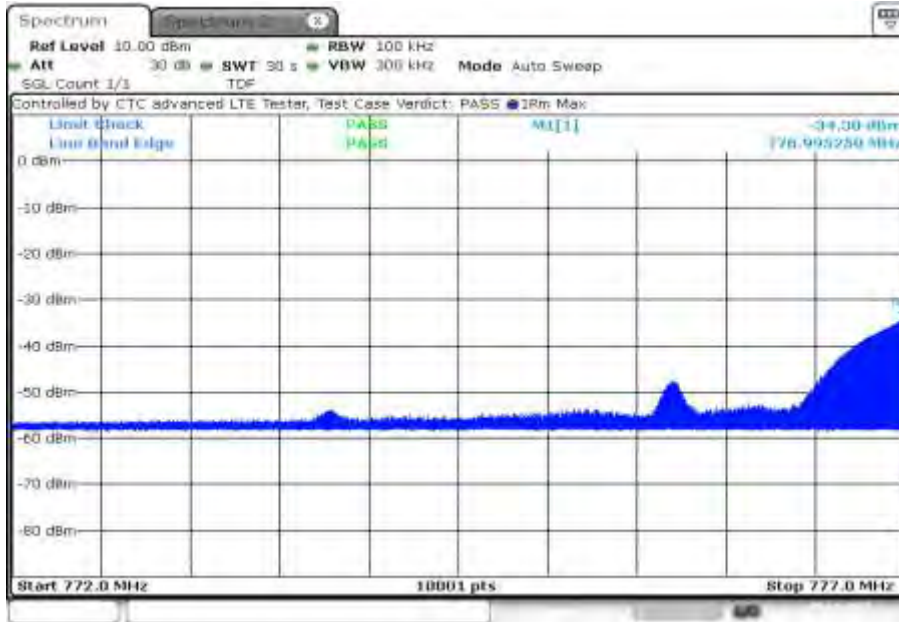
Plot 3: Lowest channel, spacing 3.75 kHz, 1@47 tones

Date: 5.APR.2022 07:55:39
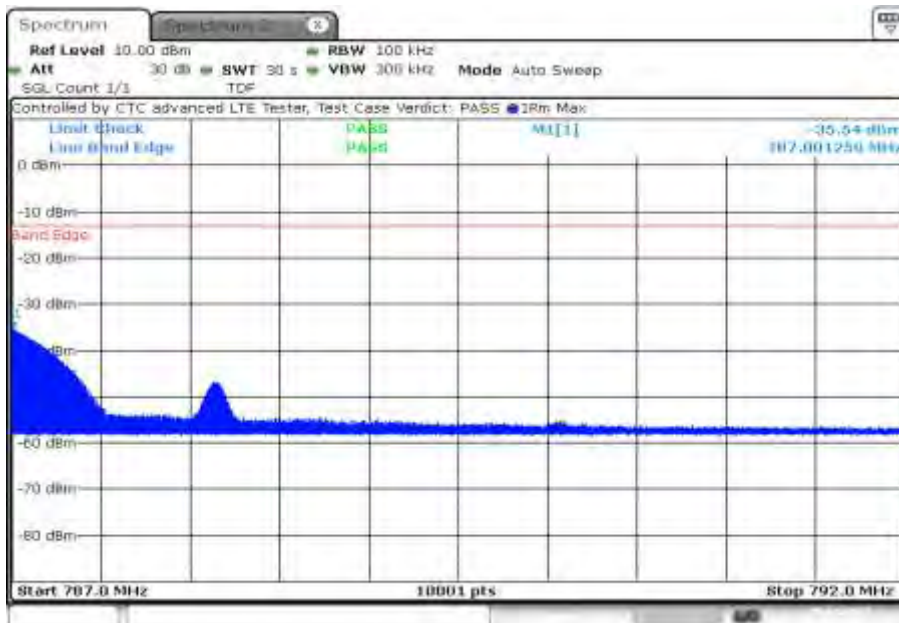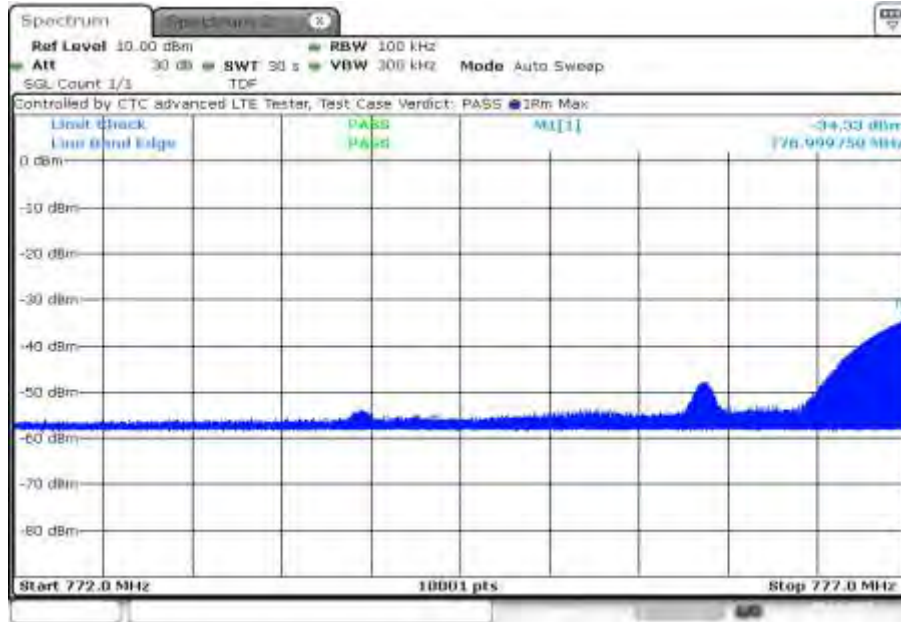
Plot 4: Highest channel, spacing 3.75 kHz, 1@47 tones
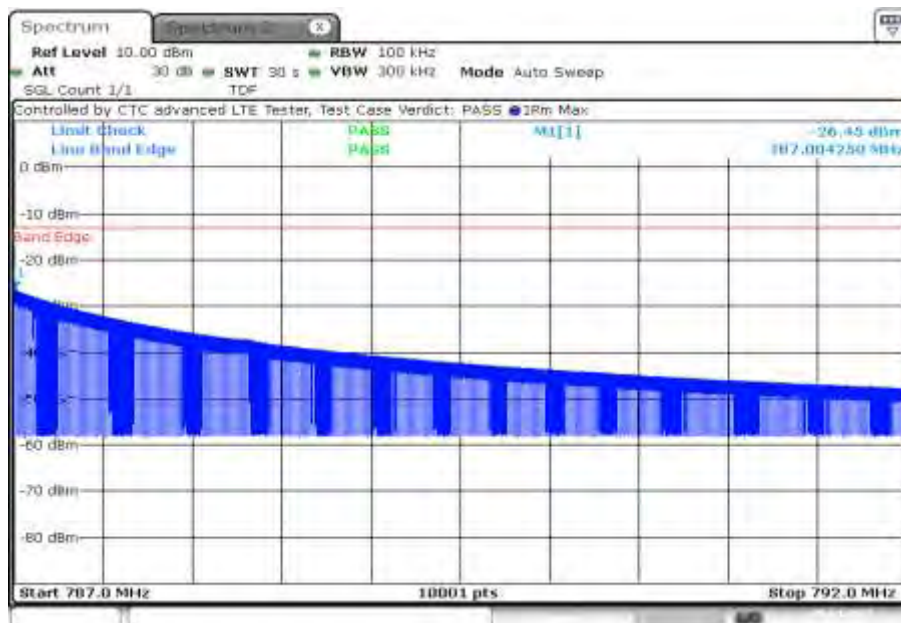
Date: 5.APR.2022 09:32:41

Plot 5: Lowest channel, spacing 15 kHz, 1@0 tones
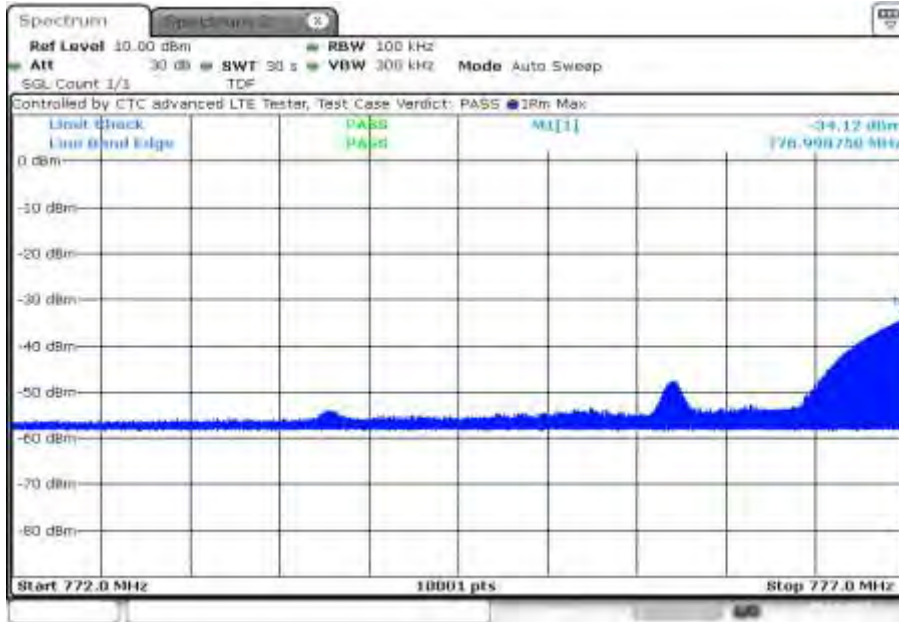
Date: 5.APR.2022 08:12:55

Plot 6: Highest channel, spacing 15 kHz, 1@0 tones
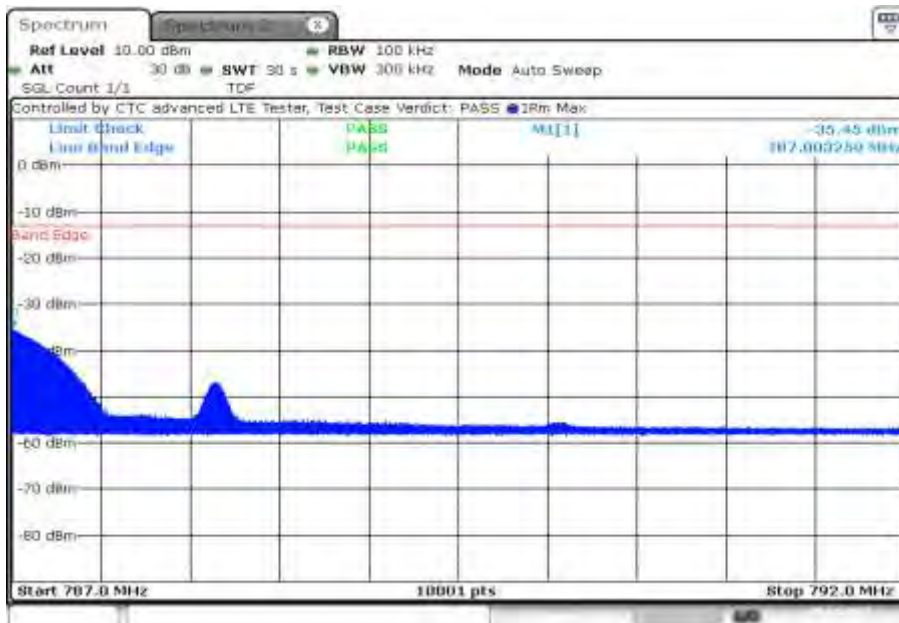
Date: 5.APR.2022 09:49:51

Plot 7: Lowest channel, spacing 15 kHz, 1@11 tones
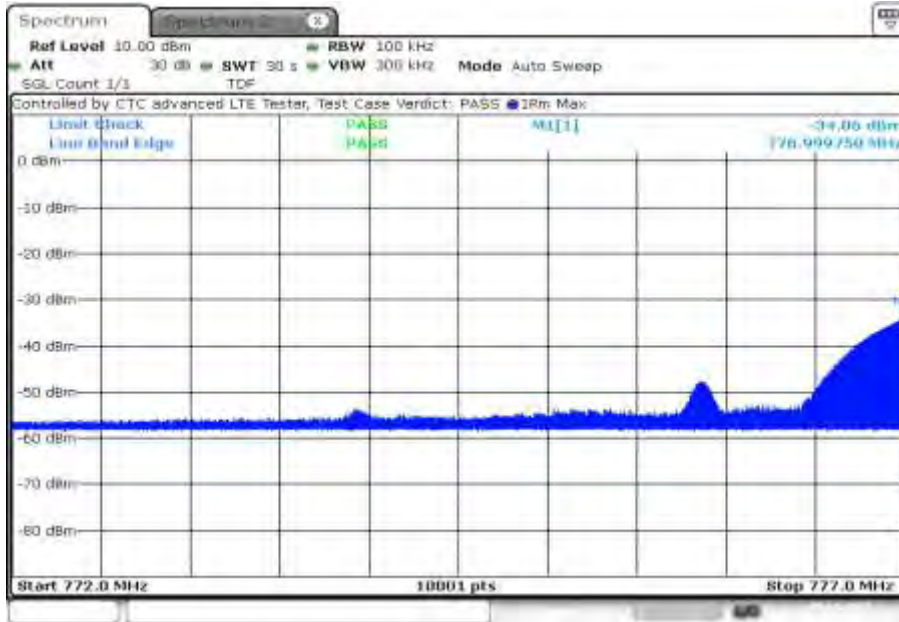
Date: 5.APR.2022 08:18:29

Plot 8: Highest channel, spacing 15 kHz, 1@11 tones
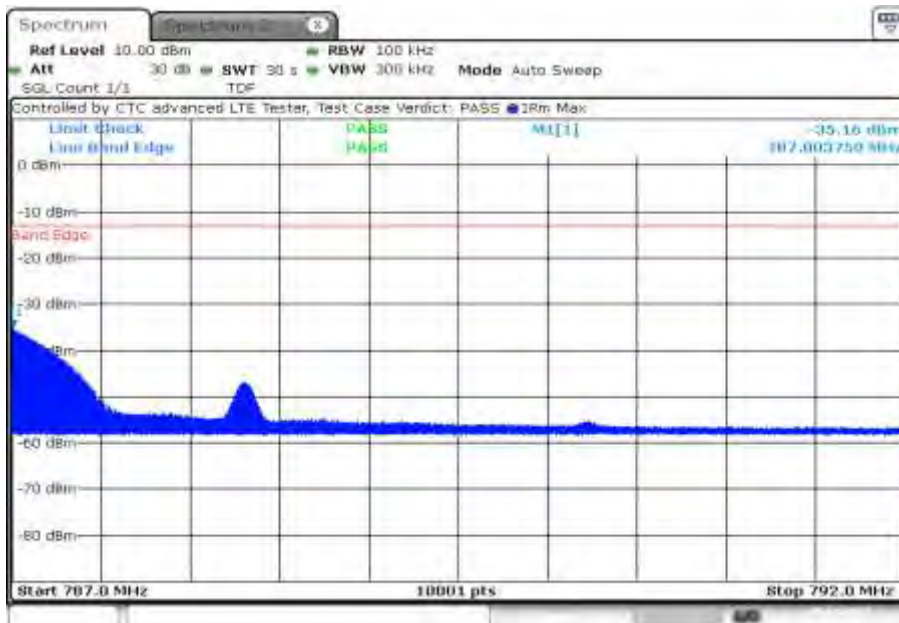
Date: 5.APR.2022 09:55:25

Results: QPSK

Plot 1: Lowest channel, spacing 3.75 kHz, 1@0 tones
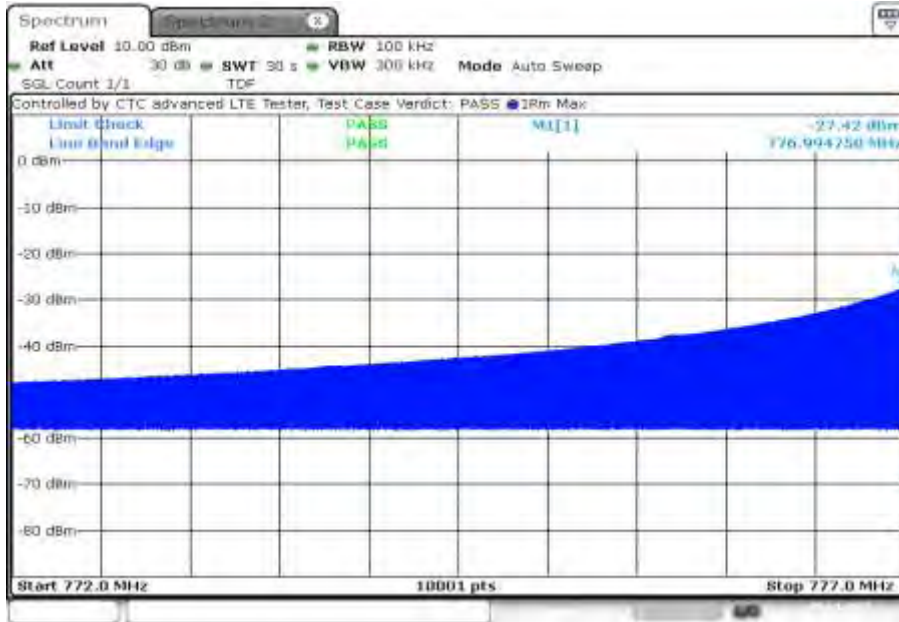
Date: 5.APR.2022 08:01:13

Plot 2: Highest channel, spacing 3.75 kHz, 1@0 tones
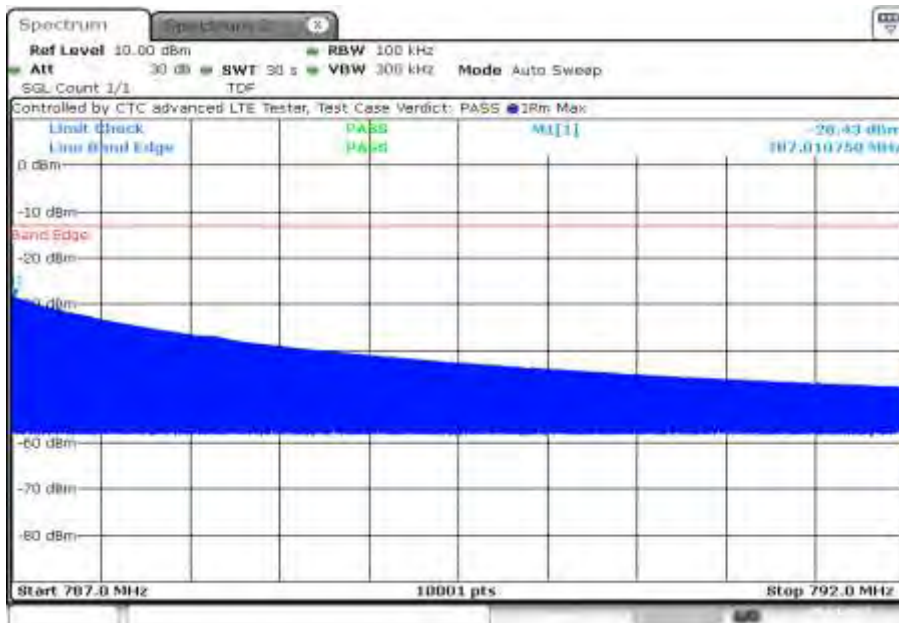
Date: 5.APR.2022 09:38:16

Plot 3: Lowest channel, spacing 3.75 kHz, 1@47 tones

Date: 5.APR.2022 08:06:48

Plot 4: Highest channel, spacing 3.75 kHz, 1@47 tones

Date: 5.APR.2022 09:43:50

Plot 5: Lowest channel, spacing 15 kHz, 1@0 tones

Date: 5.APR.2022 08:24:03

Plot 6: Highest channel, spacing 15 kHz, 1@0 tones

Date: 5.APR.2022 10:01:00

Plot 7: Lowest channel, spacing 15 kHz, 1@11 tones

Date: 5.APR.2022 08:29:38

Plot 8: Highest channel, spacing 15 kHz, 1@11 tones
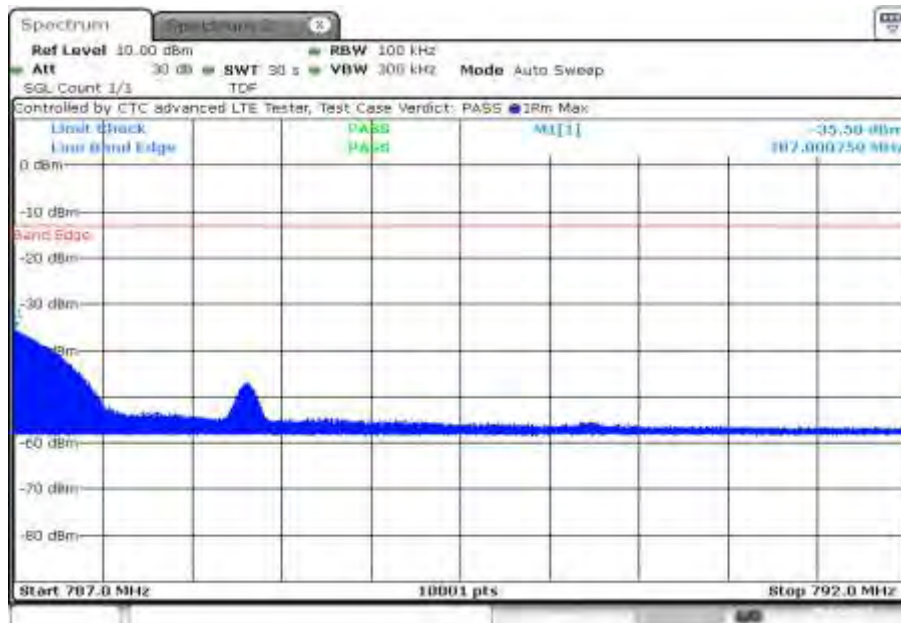
Date: 5.APR.2022 10:06:34

Plot 9: Lowest channel, spacing 15 kHz, 12@0 tones
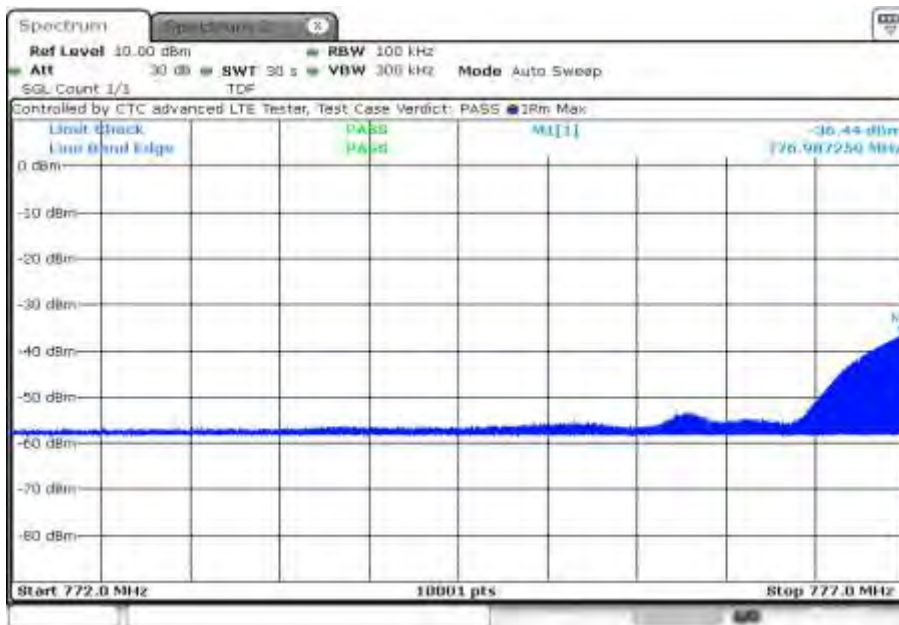
Date: 5.APR.2022 08:35:12

Plot 10: Highest channel, spacing 15 kHz, 12@0 tones
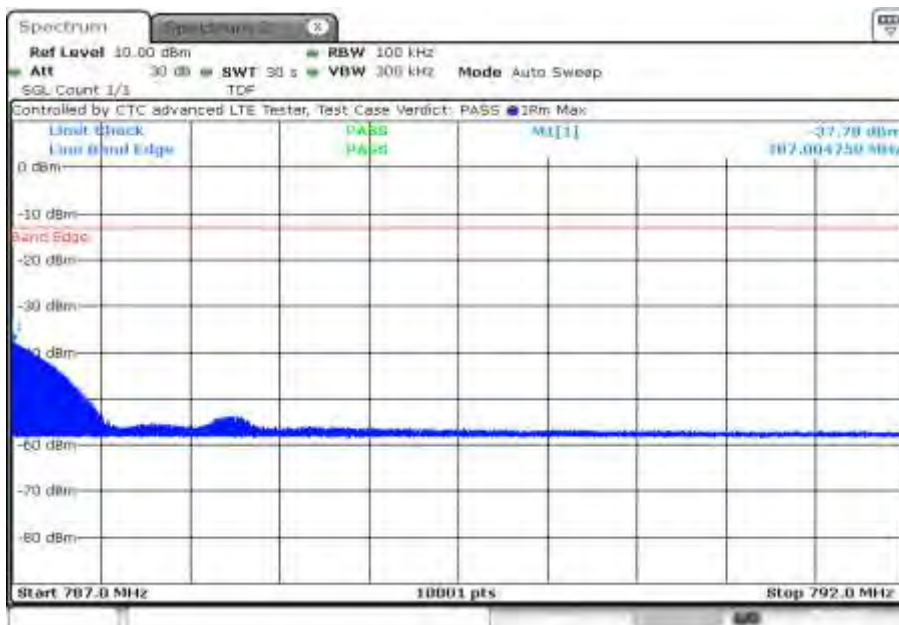
Date: 5.APR.2022 10:12:09

16.4.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the mid frequencies of the LTE band 13 frequency band. The table below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

Part 27.53 requires a measurement bandwidth of at least 1% of the occupied bandwidth.

Measurement parameters	
Detector:	Peak
Sweep time:	180s
Video bandwidth:	100 kHz
Resolution bandwidth:	300 kHz
Span:	2 x nominal bandwidth
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1049 ISED: RSS-Gen, 6.7

Limits:

FCC	ISED
§ 2.1049	RSS-Gen, 6.7
Reporting only	

Results:

Occupied Bandwidth − BPSK		
Mode	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
Low channel / spacing 3.75 kHz; 1@0 tones	62	39
Mid channel / spacing 3.75 kHz; 1@0 tones	63	40
High channel / spacing 3.75 kHz; 1@0 tones	62	39
Low channel / spacing 3.75 kHz; 1@47 tones	61	38
Mid channel / spacing 3.75 kHz; 1@47 tones	62	38
High channel / spacing 3.75 kHz; 1@47 tones	62	38
Low channel / spacing 15 kHz; 1@0 tones	115	117
Mid channel / spacing 15 kHz; 1@0 tones	120	103
High channel / spacing 15 kHz; 1@0 tones	120	111
Low channel / spacing 15 kHz; 1@11 tones	122	102
Mid channel / spacing 15 kHz; 1@11 tones	125	120
High channel / spacing 15 kHz; 1@11 tones	127	128

Occupied Bandwidth − QPSK		
Mode	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
Low channel / spacing 3.75 kHz; 1@0 tones	67	39
Mid channel / spacing 3.75 kHz; 1@0 tones	69	38
High channel / spacing 3.75 kHz; 1@0 tones	72	42
Low channel / spacing 3.75 kHz; 1@47 tones	68	39
Mid channel / spacing 3.75 kHz; 1@47 tones	71	39
High channel / spacing 3.75 kHz; 1@47 tones	69	38
Low channel / spacing 15 kHz; 1@0 tones	117	114
Mid channel / spacing 15 kHz; 1@0 tones	119	114
High channel / spacing 15 kHz; 1@0 tones	122	116
Low channel / spacing 15 kHz; 1@11 tones	117	115
Mid channel / spacing 15 kHz; 1@11 tones	120	103
High channel / spacing 15 kHz; 1@11 tones	117	116
Low channel / spacing 15 kHz; 12@0 tones	186	249
Mid channel / spacing 15 kHz; 12@0 tones	183	246
High channel / spacing 15 kHz; 12@0 tones	186	246

Plots: BPSK

Plot 1: low channel (99% - OBW), spacing 3.75 kHz, 1@0 tones
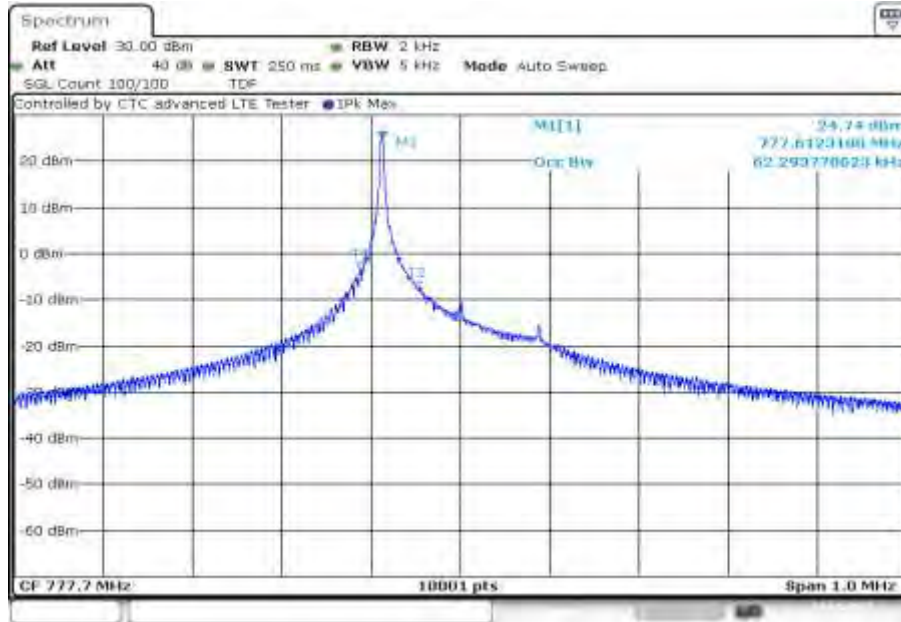
Date: 13.APR.2022 07:53:44

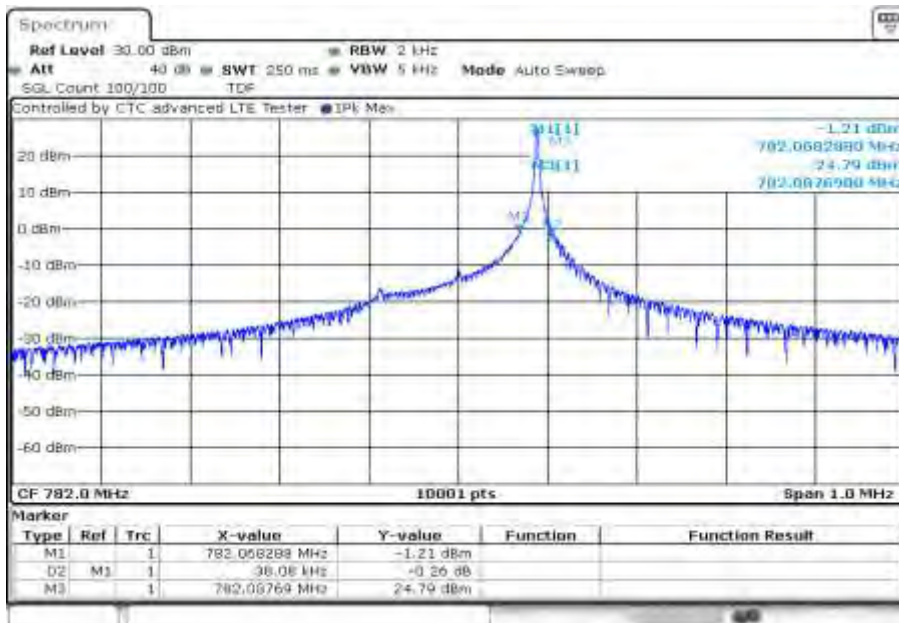**Plot 2:** low channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones
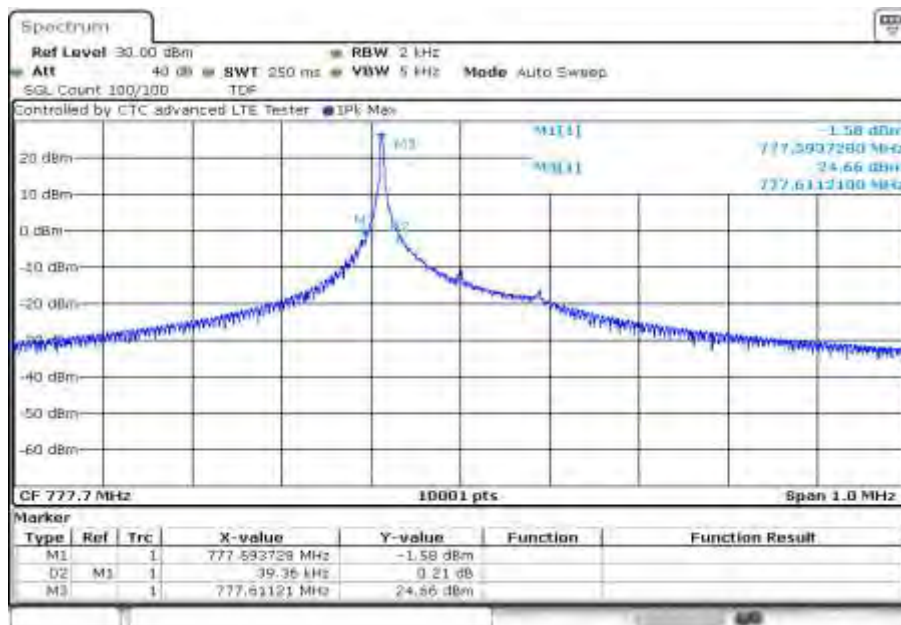
Date: 13.APR.2022 07:54:13

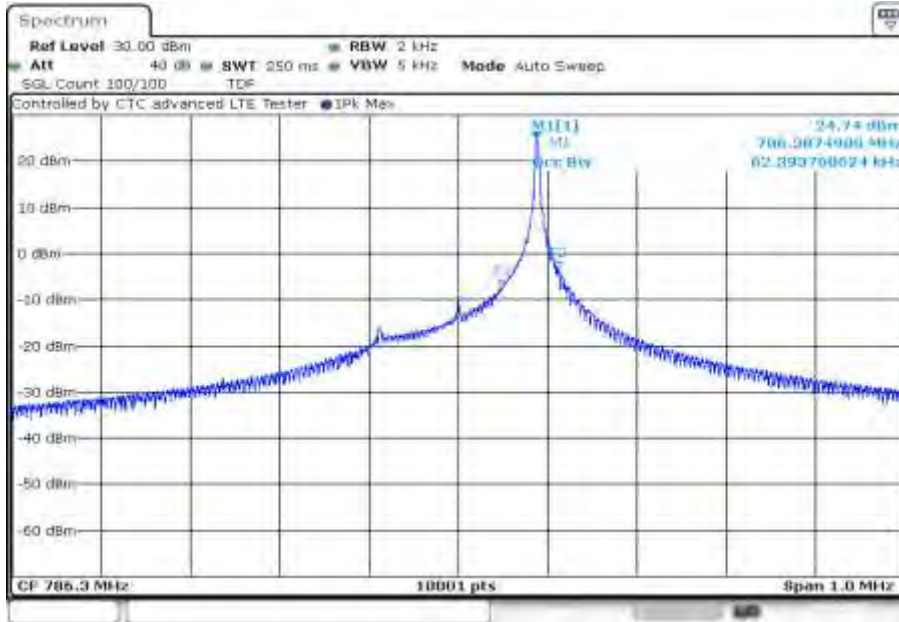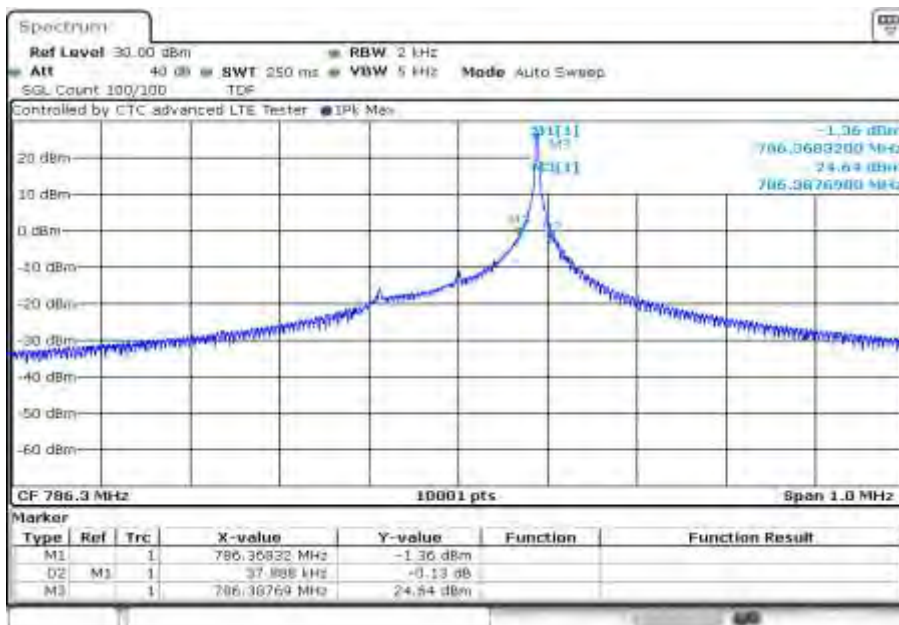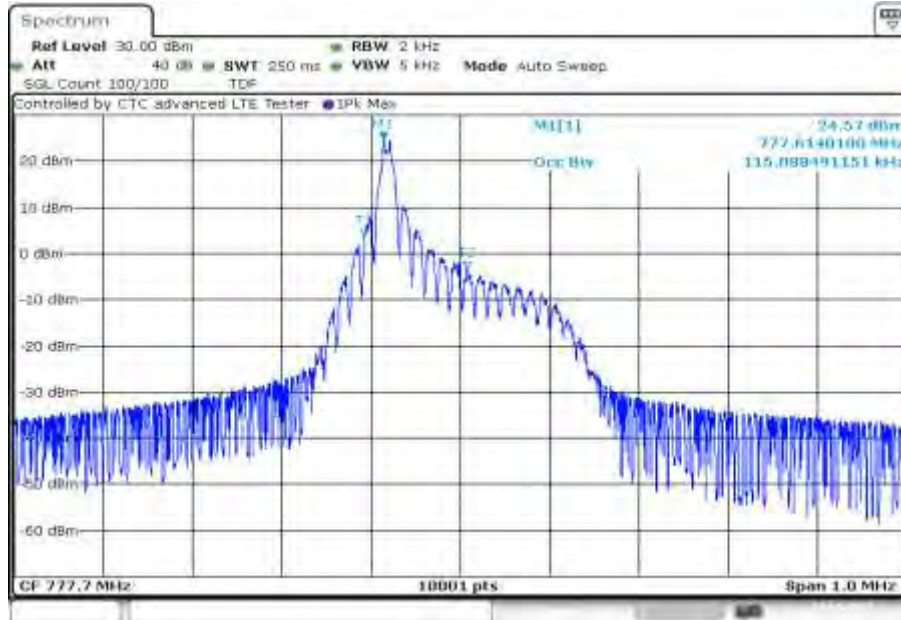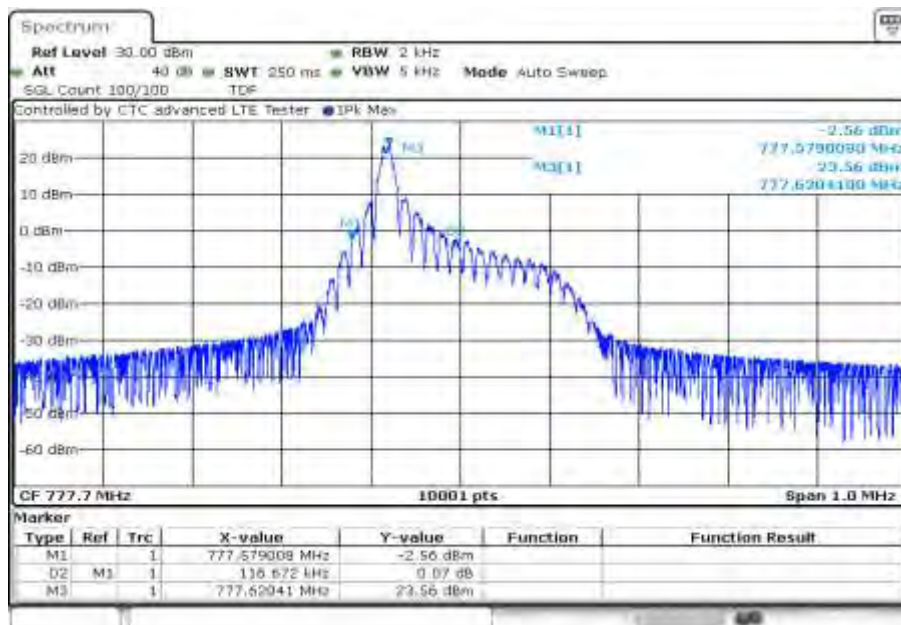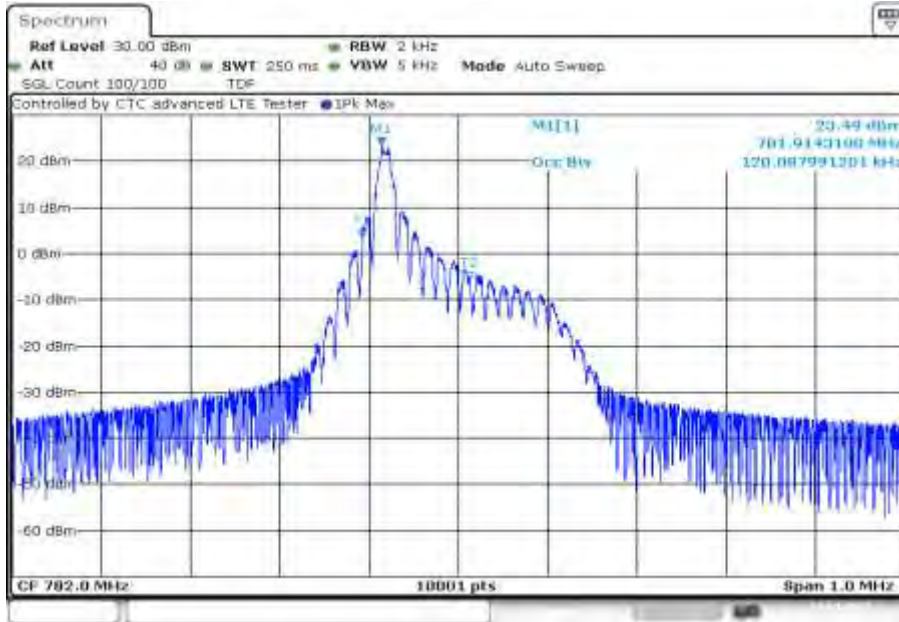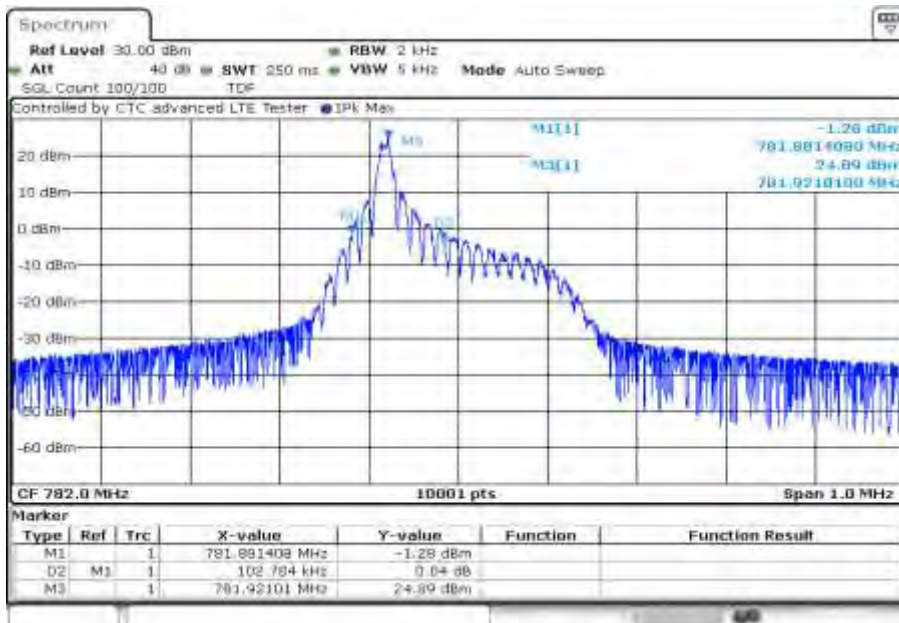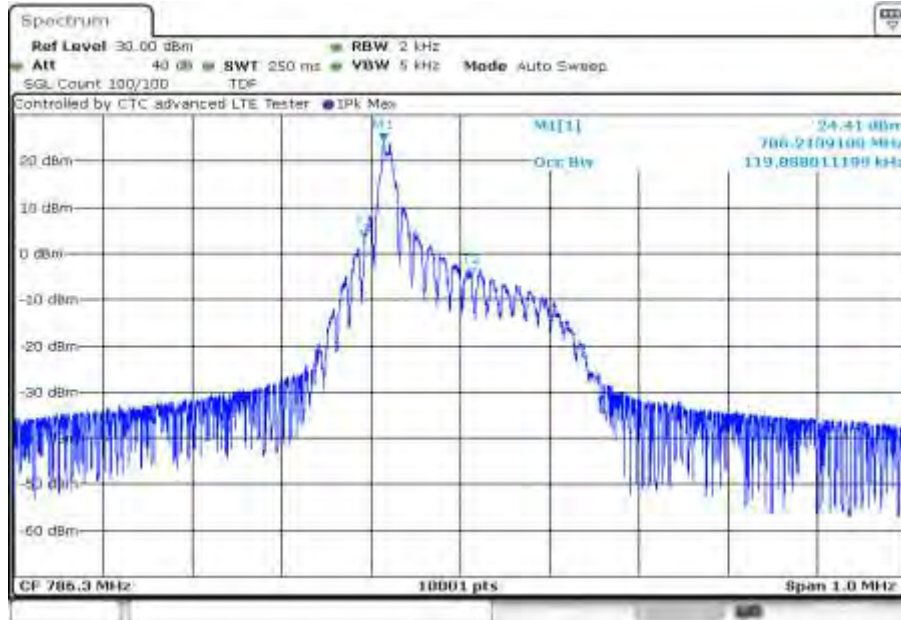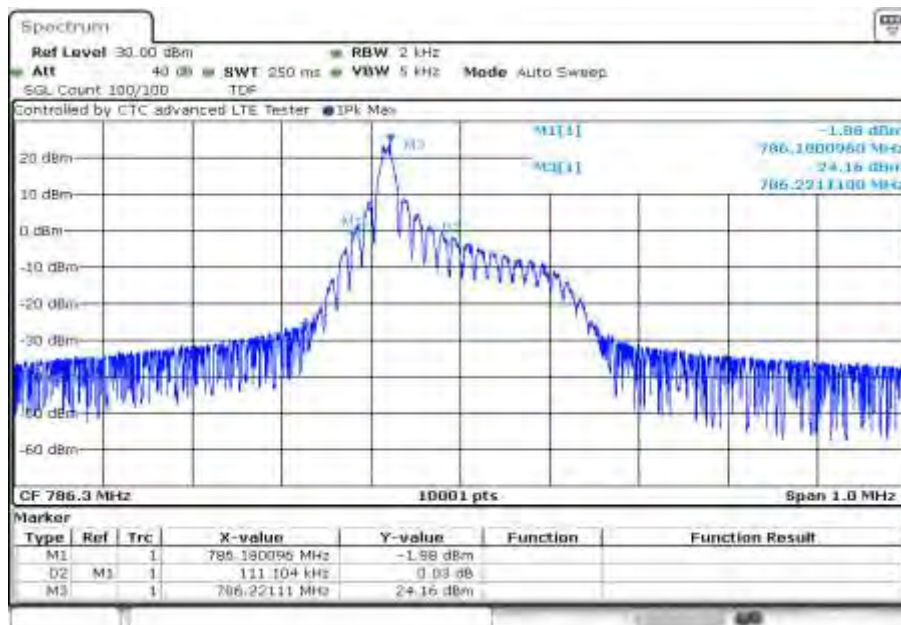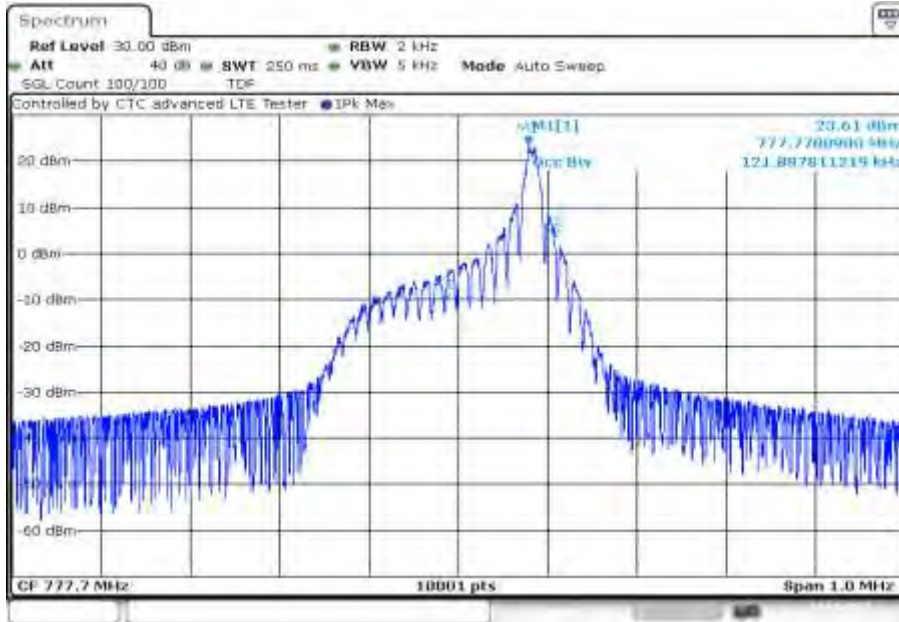**Plot 3:** mid channel (99% - OBW), spacing 3.75 kHz, 1@0 tones
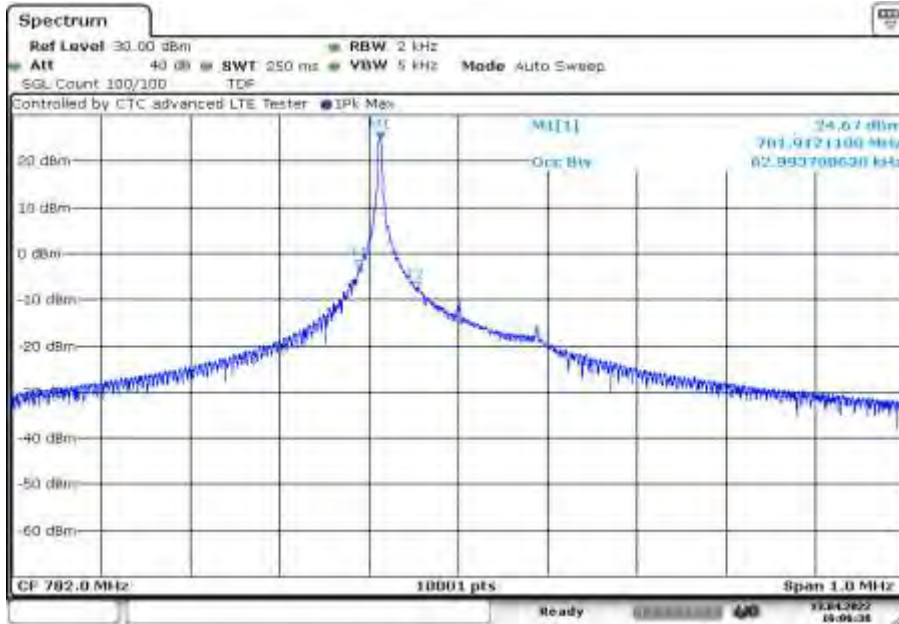
Date: 13.APR.2022 16:06:38

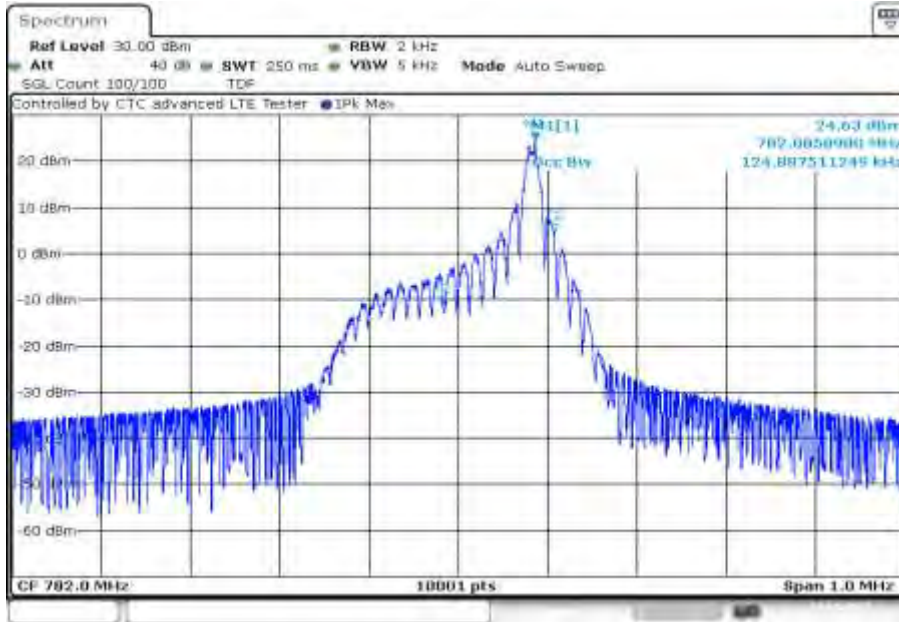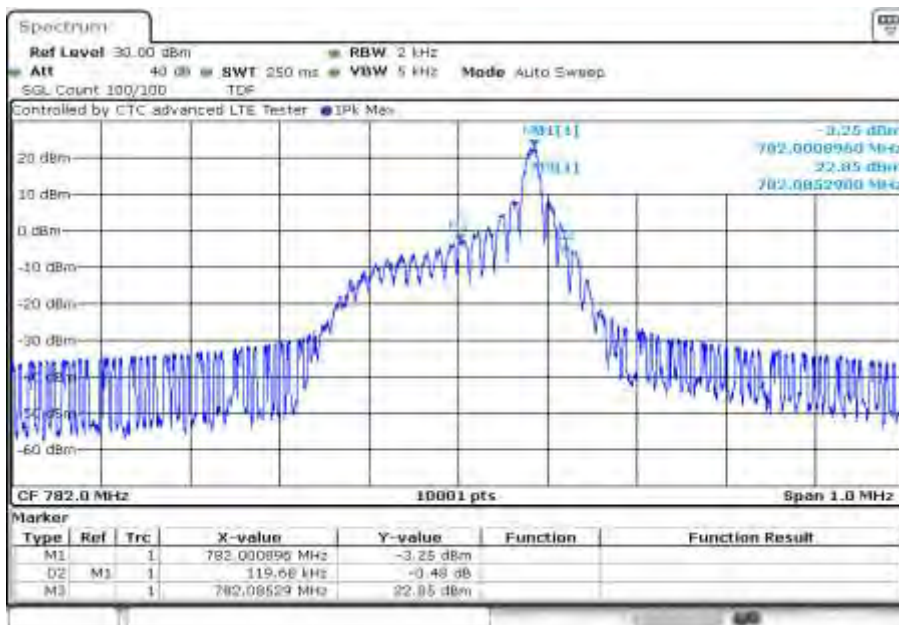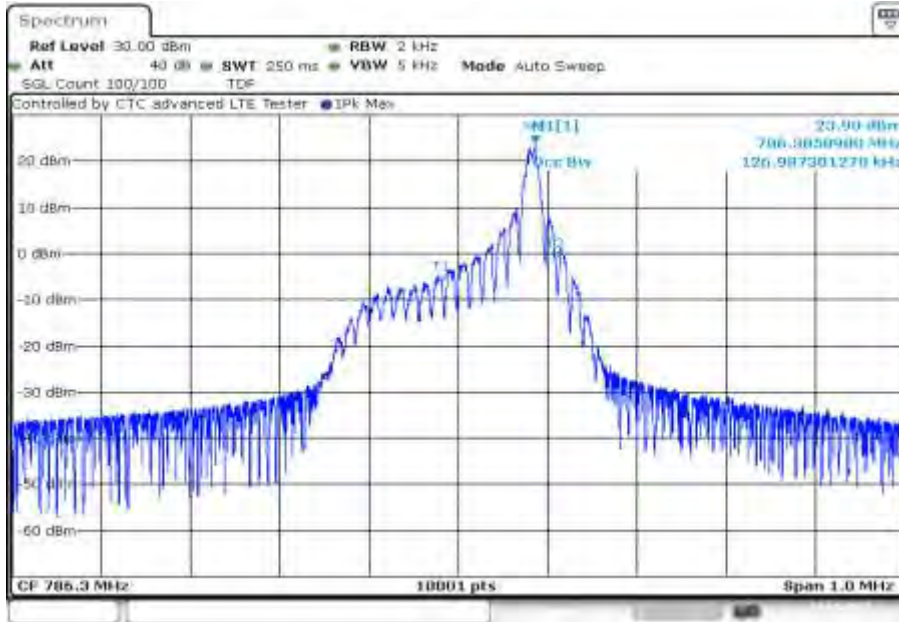**Plot 4:** mid channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

| Marker						
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	781.893632 MHz	-1.54 dBm		
D2	M1	1	39.552 kHz	0.09 dB		
M3		1	781.91121 MHz	24.69 dBm		
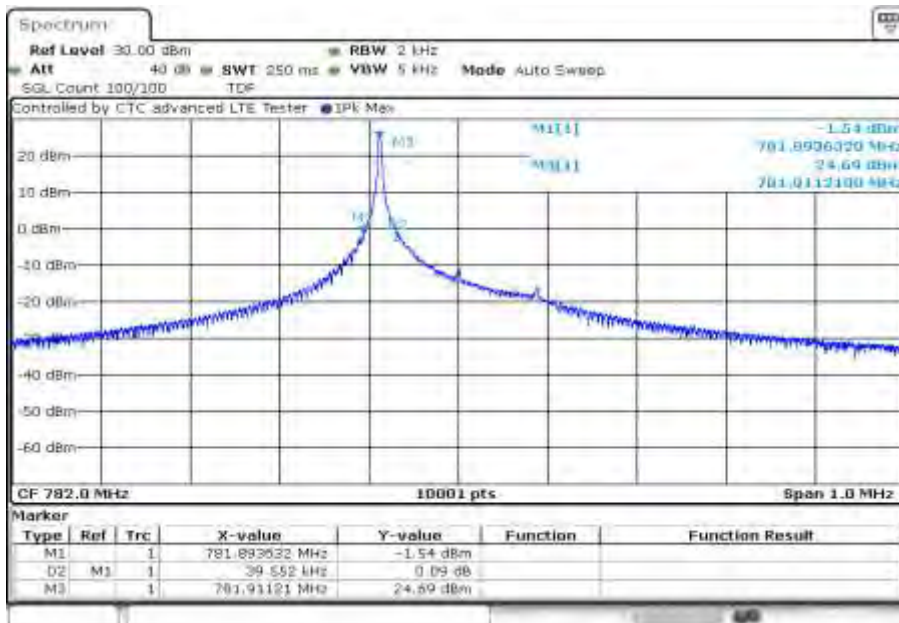
Date: 13.APR.2022 08:04:37

Plot 5: high channel (99% - OBW), spacing 3.75 kHz, 1@0 tones
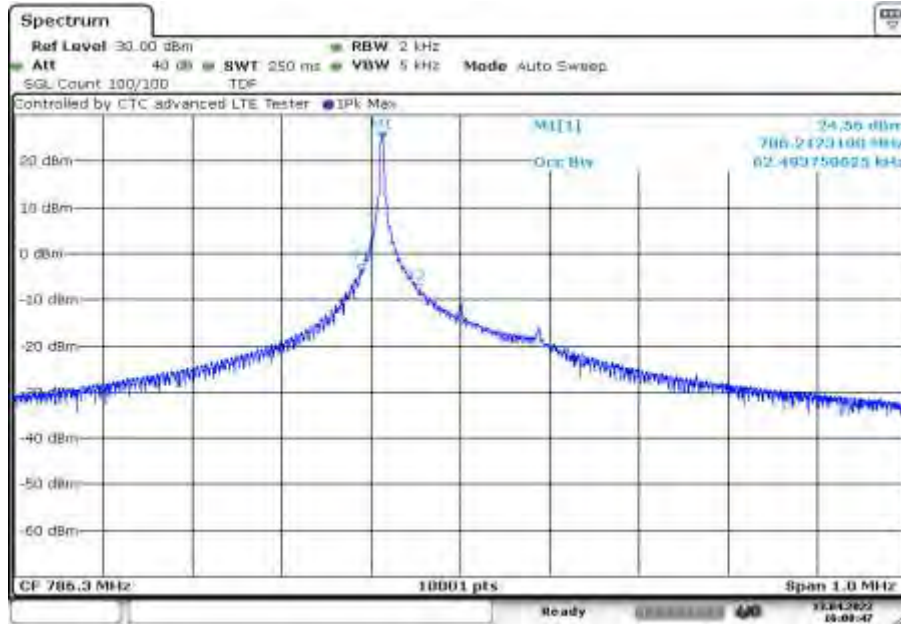
Date: 13.APR.2022 16:08:47

Plot 6: high channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

Marker						
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	785.192895 MHz	-1.56 dBm		
D2	M1	1	39.232 kHz	0.11 dB		
M3		1	786.21241 MHz	24.62 dBm		
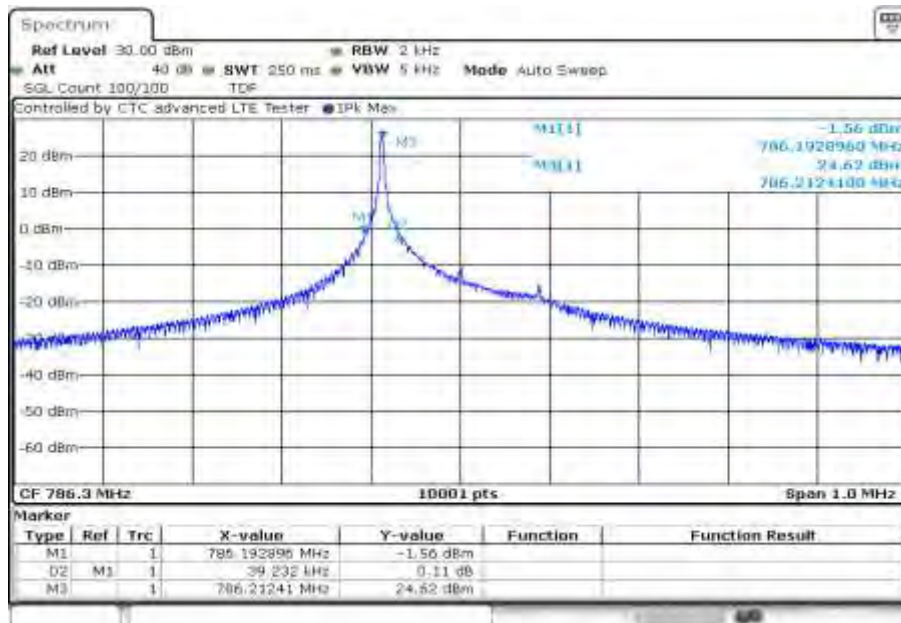
Date: 13.APR.2022 08:15:05

Plot 7: low channel (99% - OBW), spacing 3.75 kHz, 1@47 tones
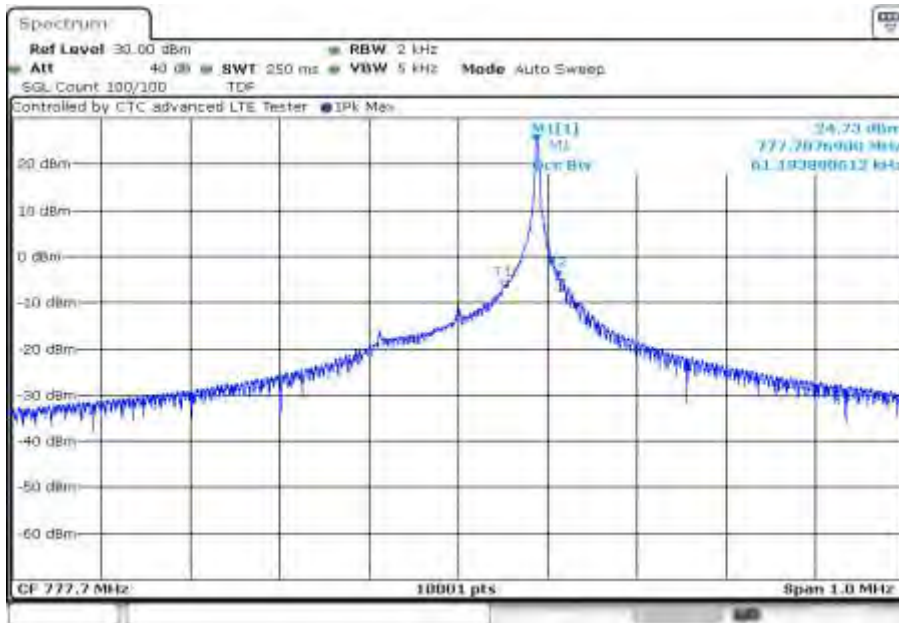
Date: 13.APR.2022 07:54:52

Plot 8: low channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones
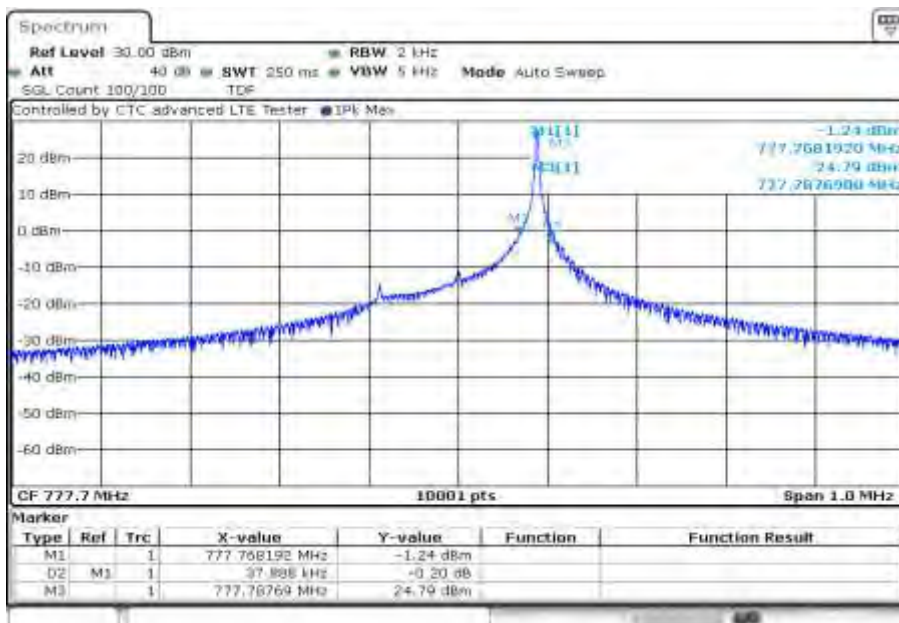
Date: 13.APR.2022 07:55:21

Plot 9: mid channel (99% - OBW), spacing 3.75 kHz, 1@47 tones
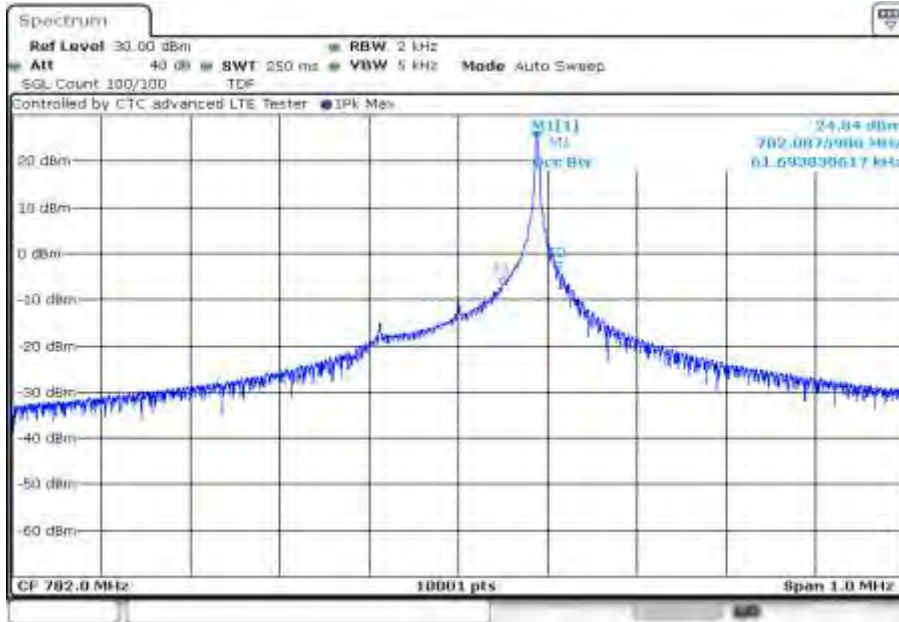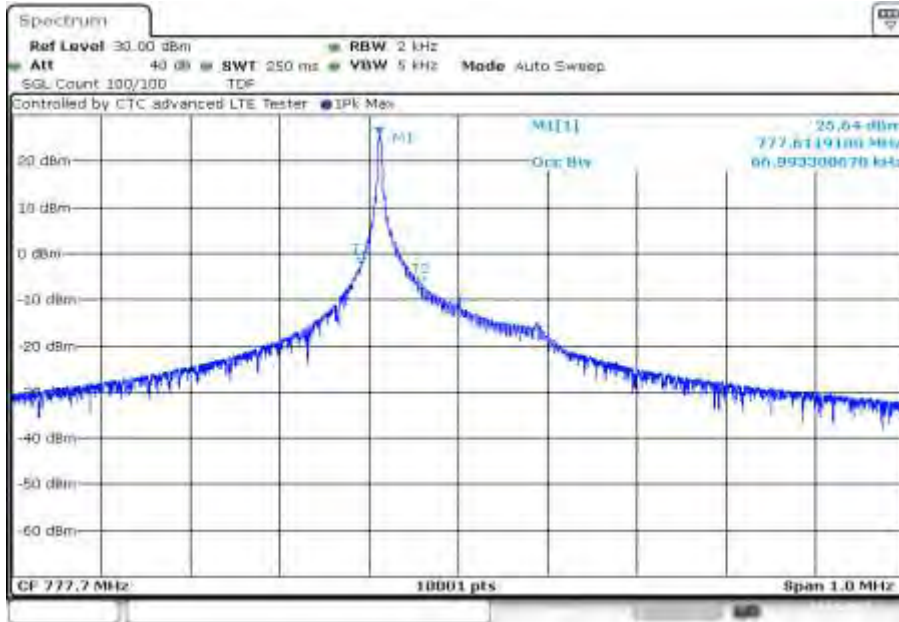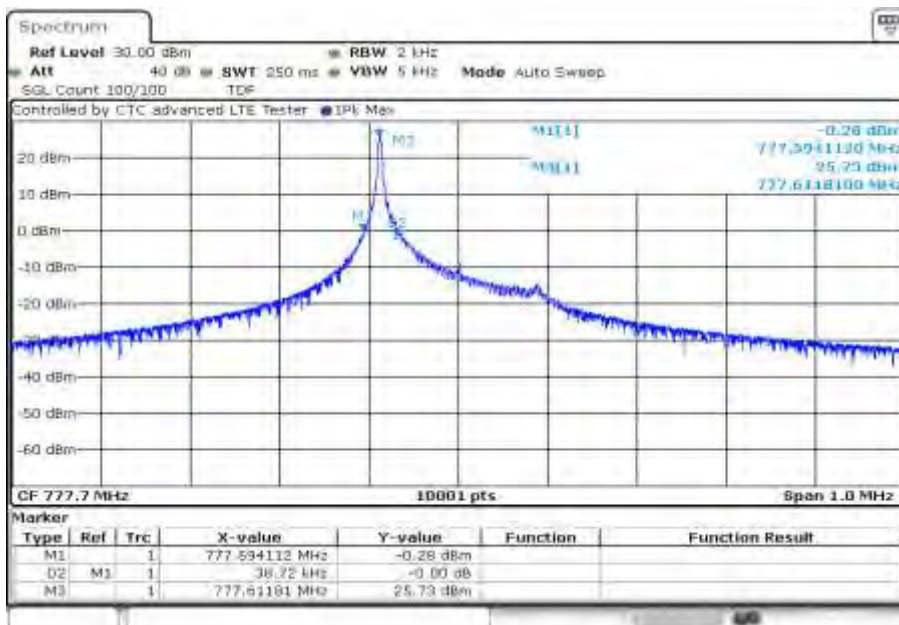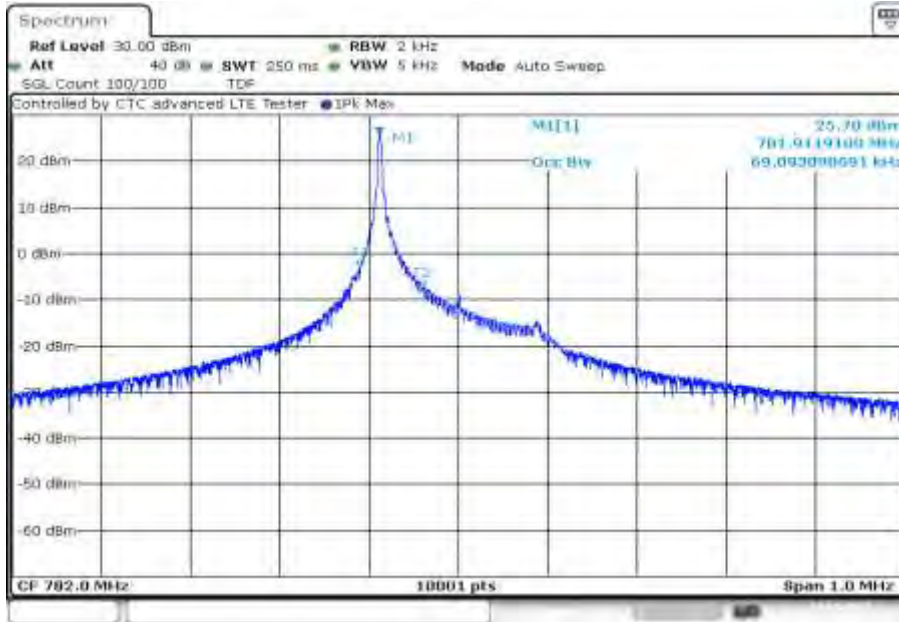

Date: 13.APR.2022 08:05:16

Plot 10: mid channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 08:05:45

Plot 11: high channel (99% - OBW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 08:15:43

Plot 12: high channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 08:16:12

Plot 13: low channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 07:58:22

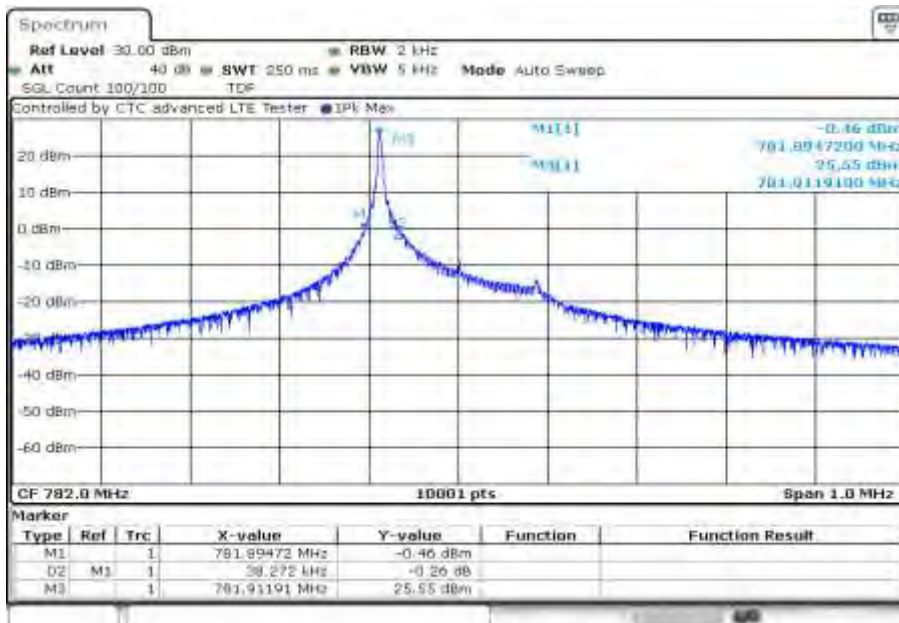**Plot 14:** low channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 07:58:51

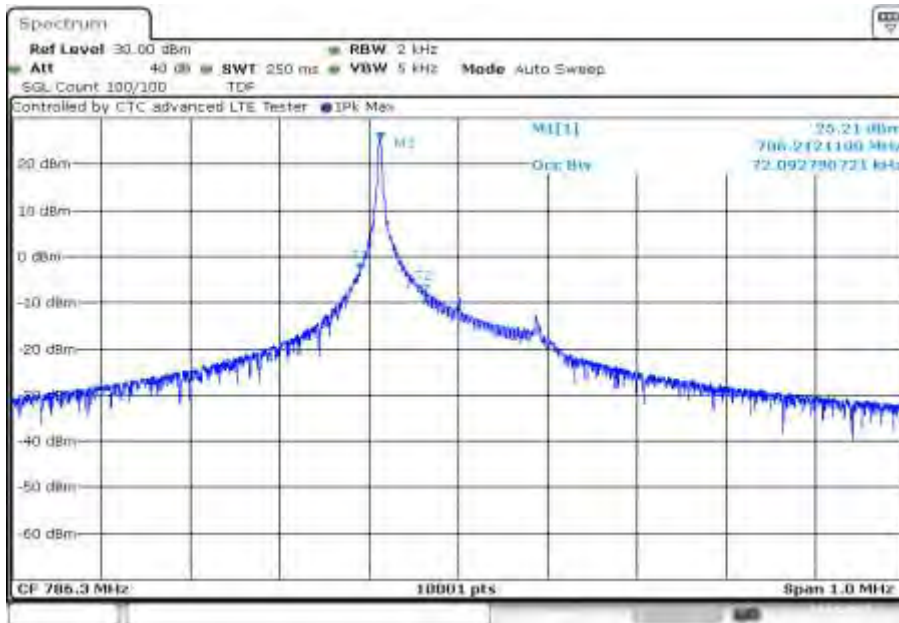**Plot 15:** mid channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:08:48

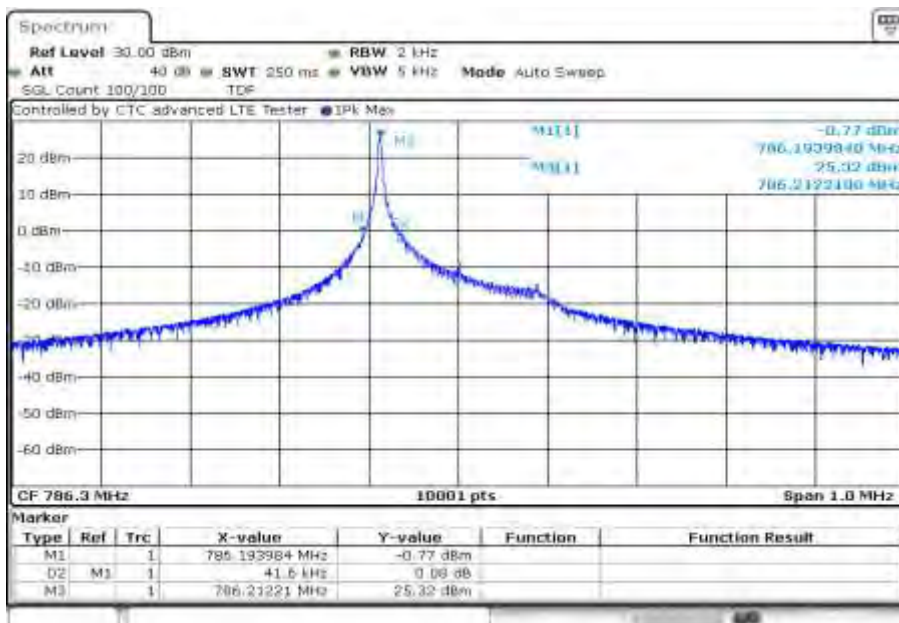**Plot 16:** mid channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:09:17

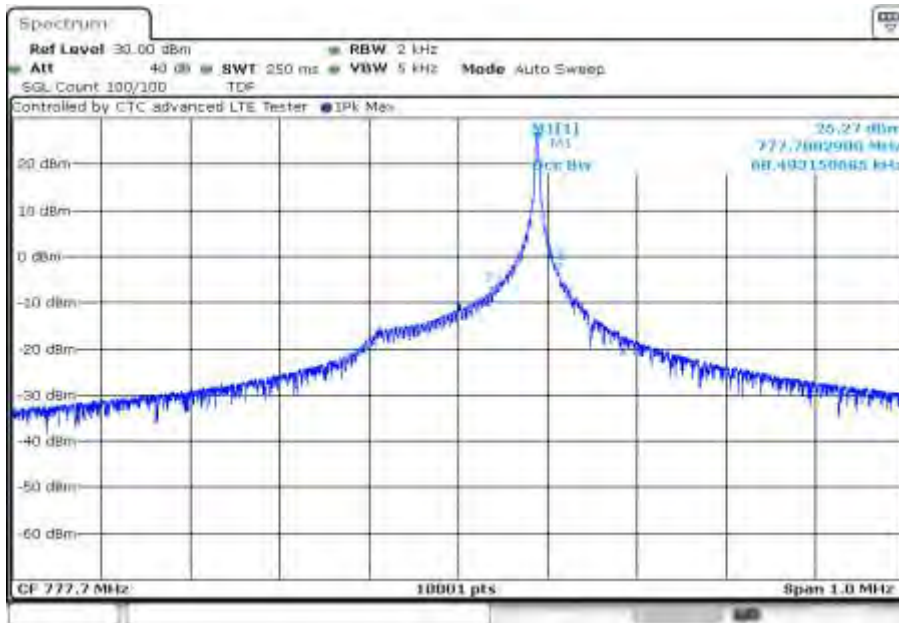**Plot 17:** high channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:19:11

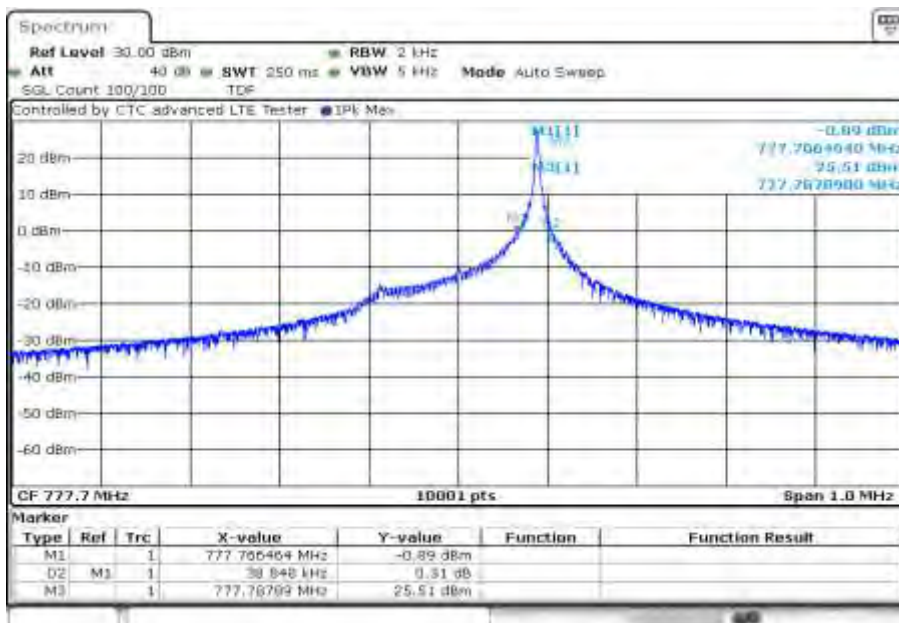**Plot 18:** high channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:19:40

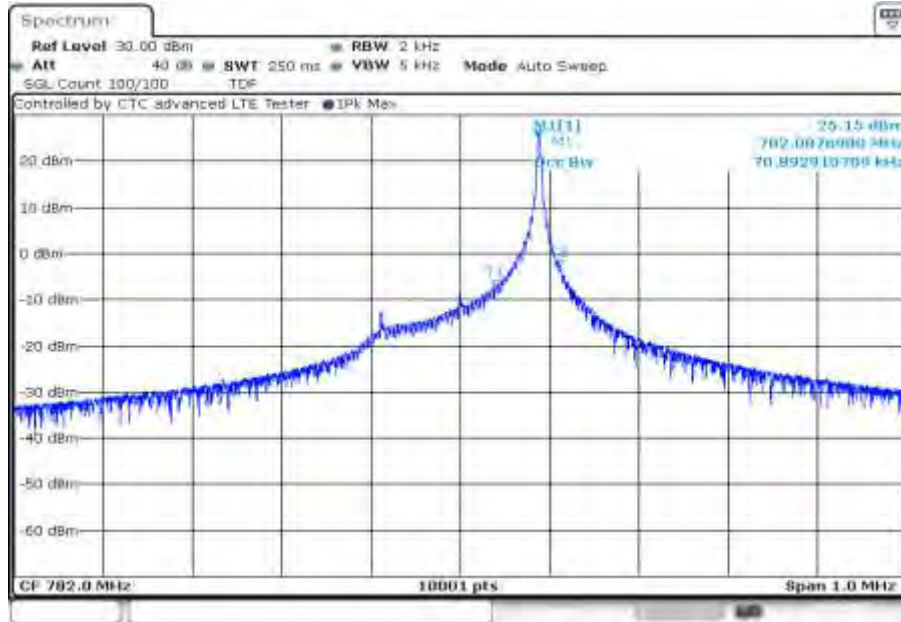**Plot 19:** low channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 07:59:30

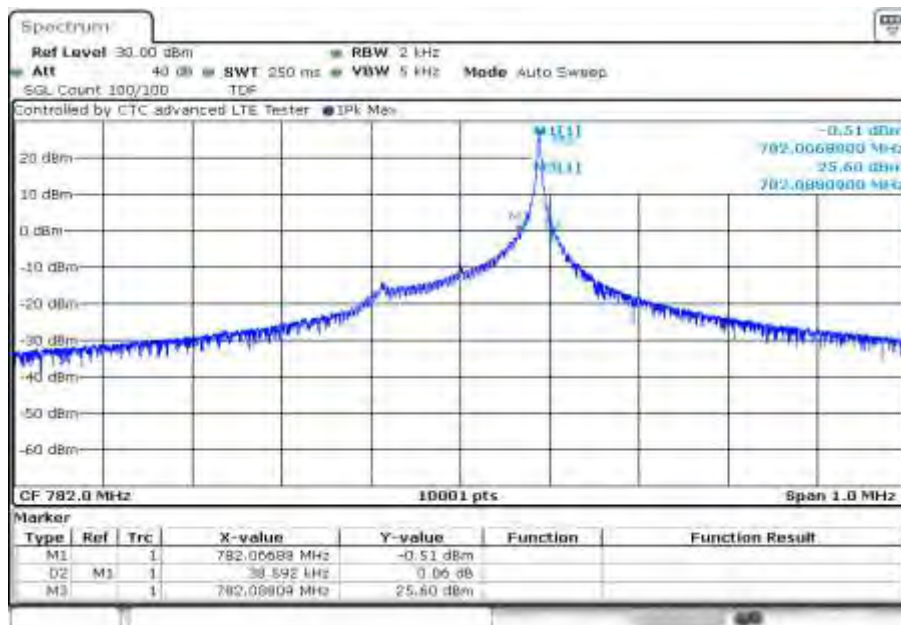**Plot 20:** low channel (-26 dBc BW), spacing 15 kHz, 1@11 tones
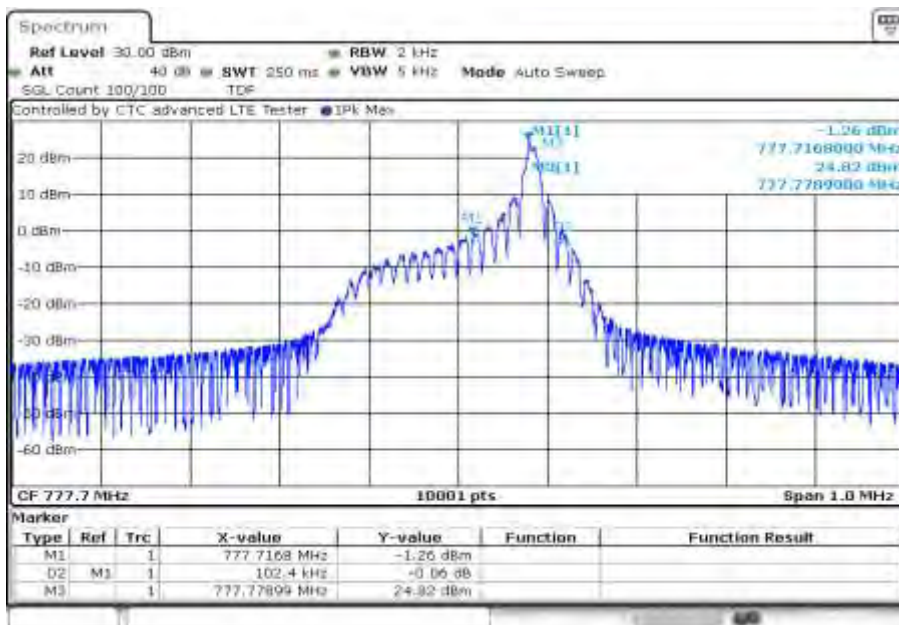
Date: 13.APR.2022 07:59:59

Plot 21: mid channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:09:55

Plot 22: mid channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:10:24

Plot 23: high channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:20:18

Plot 24: high channel (-26 dBc BW), spacing 15 kHz, 1@11 tones
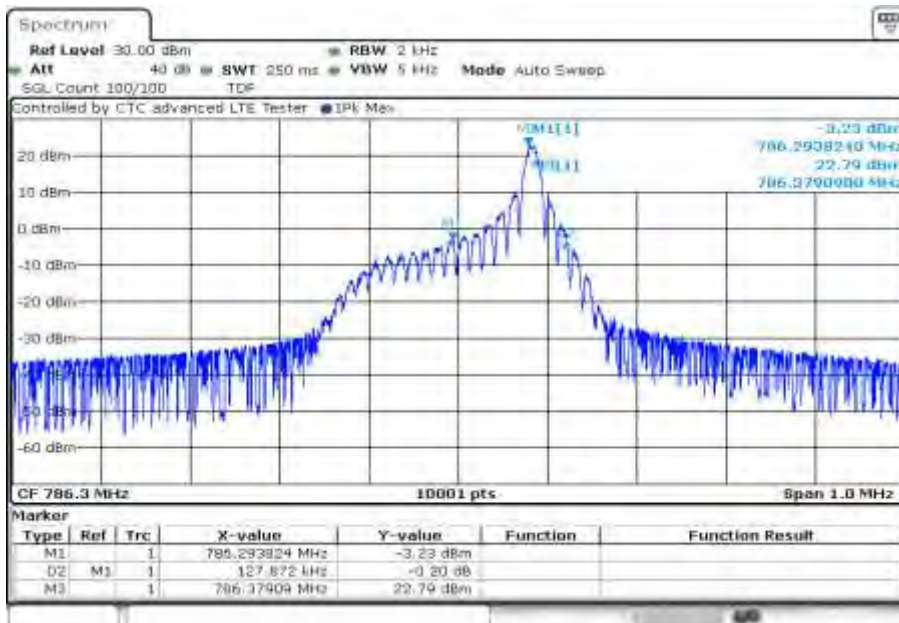
Date: 13.APR.2022 08:20:47

Plots: QPSK

Plot 1: low channel (99% - OBW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 07:56:00

Plot 2: low channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 07:56:29

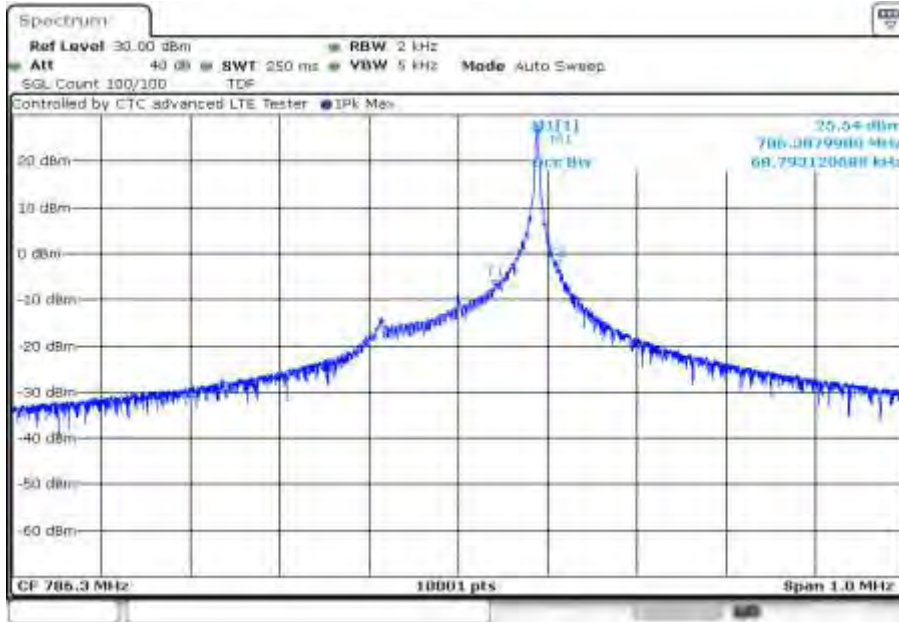**Plot 3:** mid channel (99% - OBW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 08:06:24

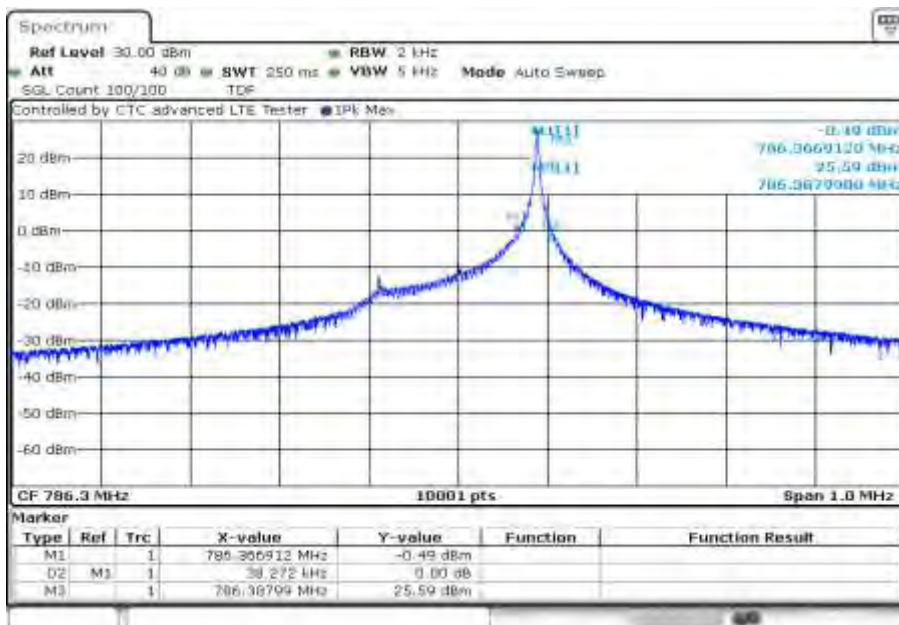**Plot 4:** mid channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 08:06:53

Plot 5: high channel (99% - OBW), spacing 3.75 kHz, 1@0 tones
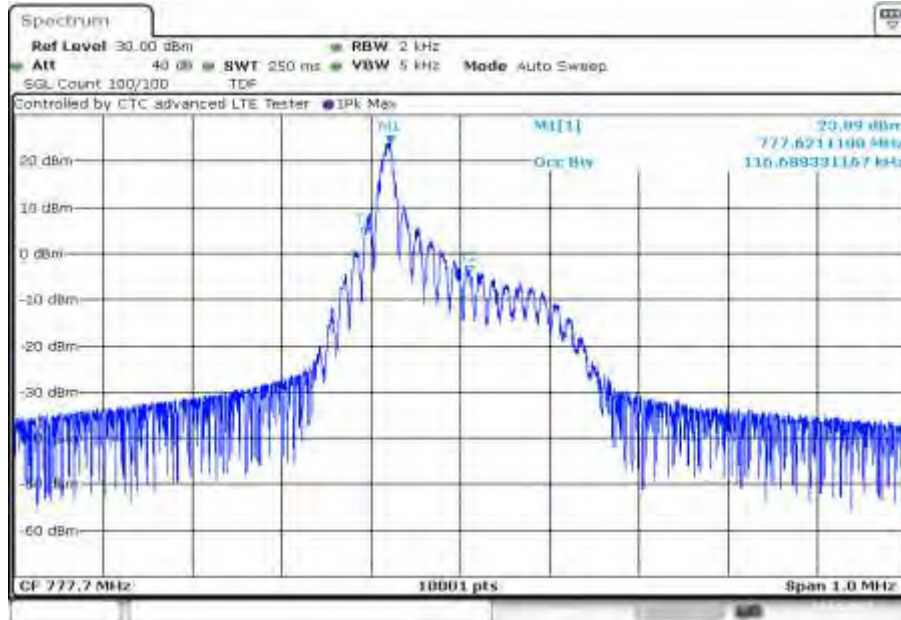

Date: 13.APR.2022 08:16:50

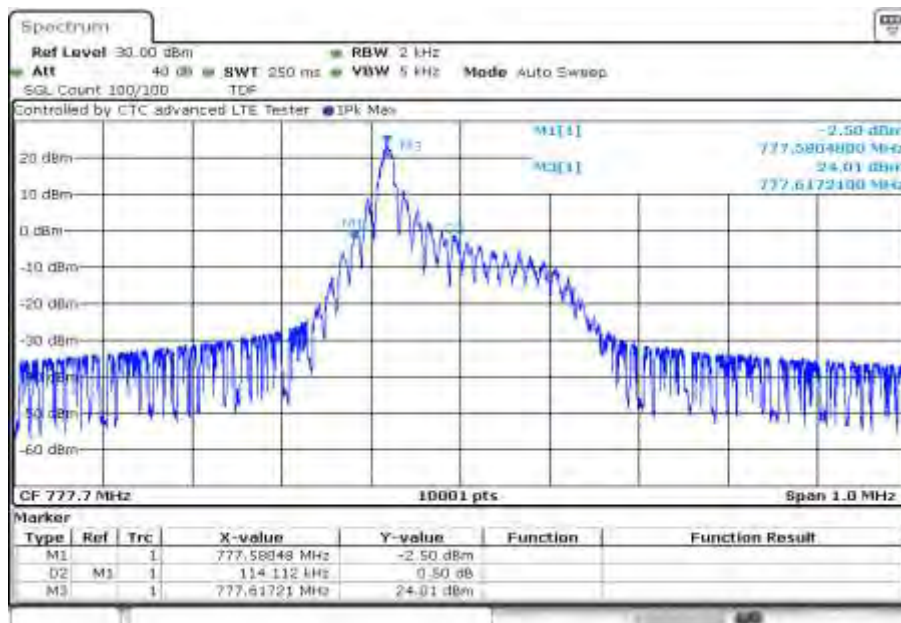**Plot 6:** high channel (-26 dBc BW), spacing 3.75 kHz, 1@0 tones

Date: 13.APR.2022 08:17:19

Plot 7: low channel (99% - OBW), spacing 3.75 kHz, 1@47 tones
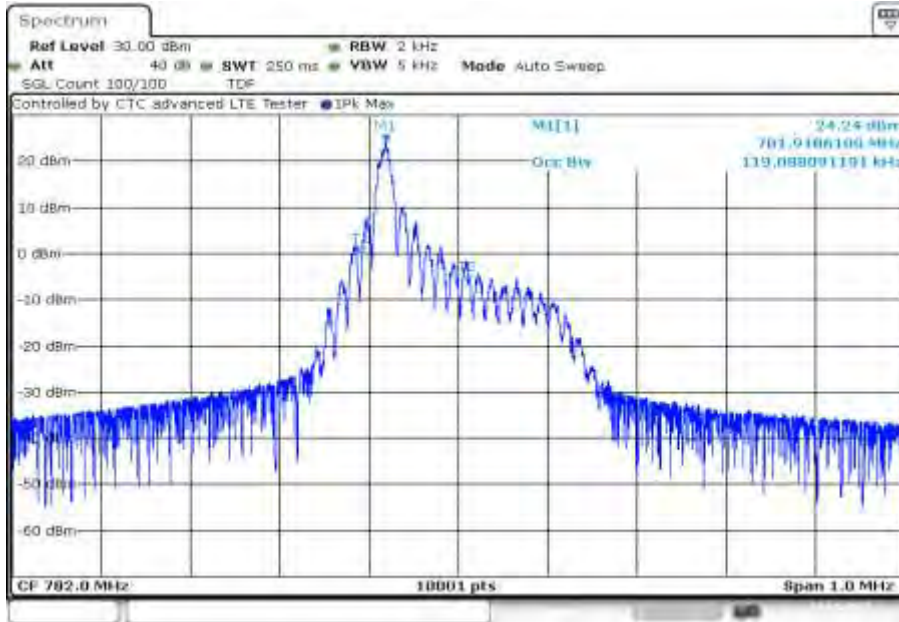

Date: 13.APR.2022 07:57:07

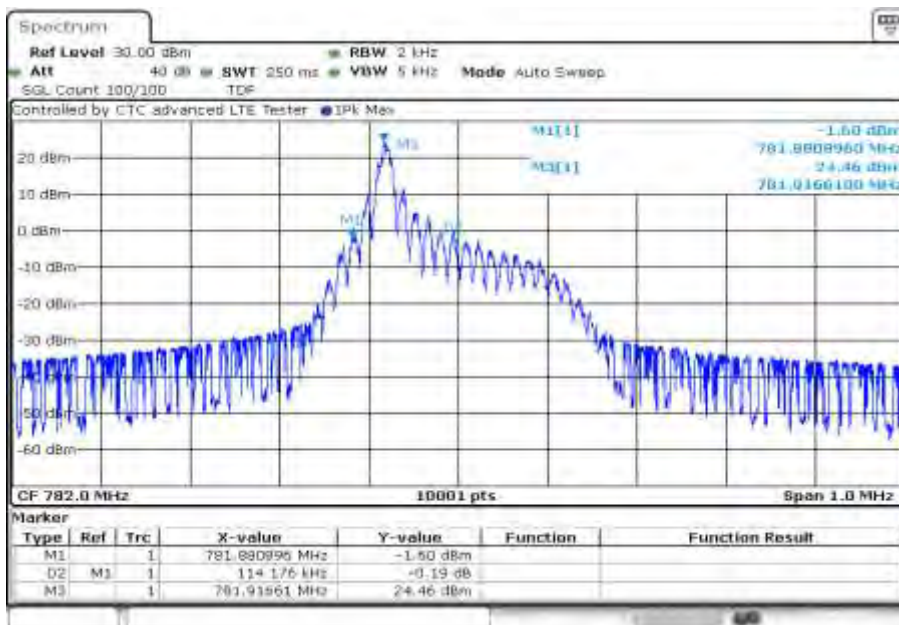**Plot 8:** low channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 07:57:36

Plot 9: mid channel (99% - OBW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 08:07:31

Plot 10: mid channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 08:08:00

Plot 11: high channel (99% - OBW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 08:17:57

Plot 12: high channel (-26 dBc BW), spacing 3.75 kHz, 1@47 tones

Date: 13.APR.2022 08:18:26

Plot 13: low channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:00:37

Plot 14: low channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:01:06

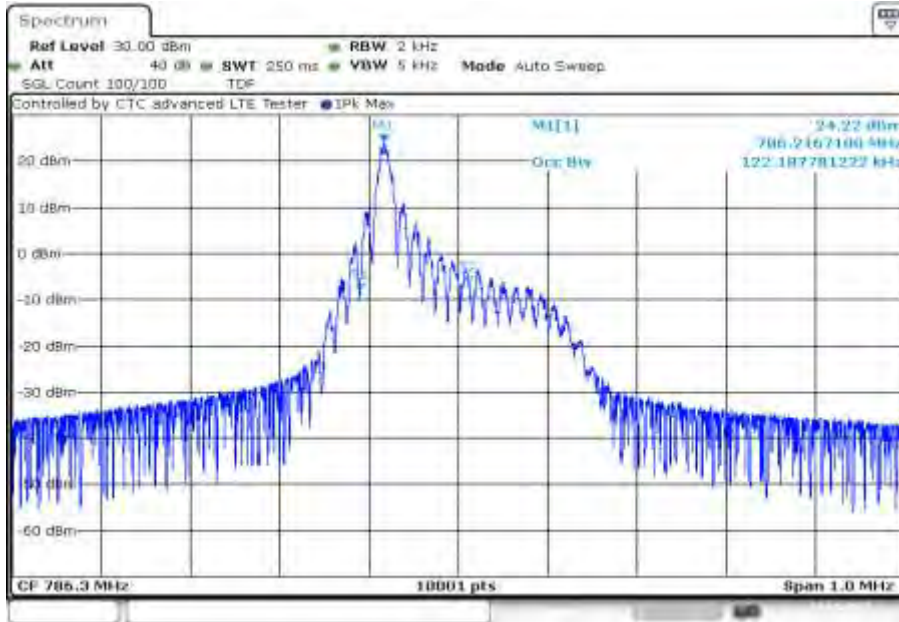**Plot 15:** mid channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:11:03

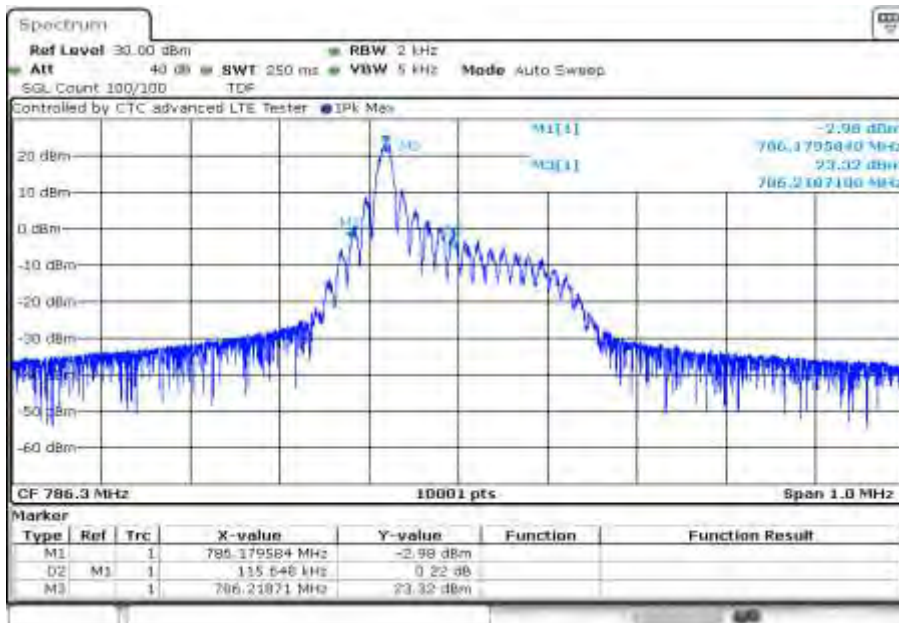**Plot 16:** mid channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:11:32

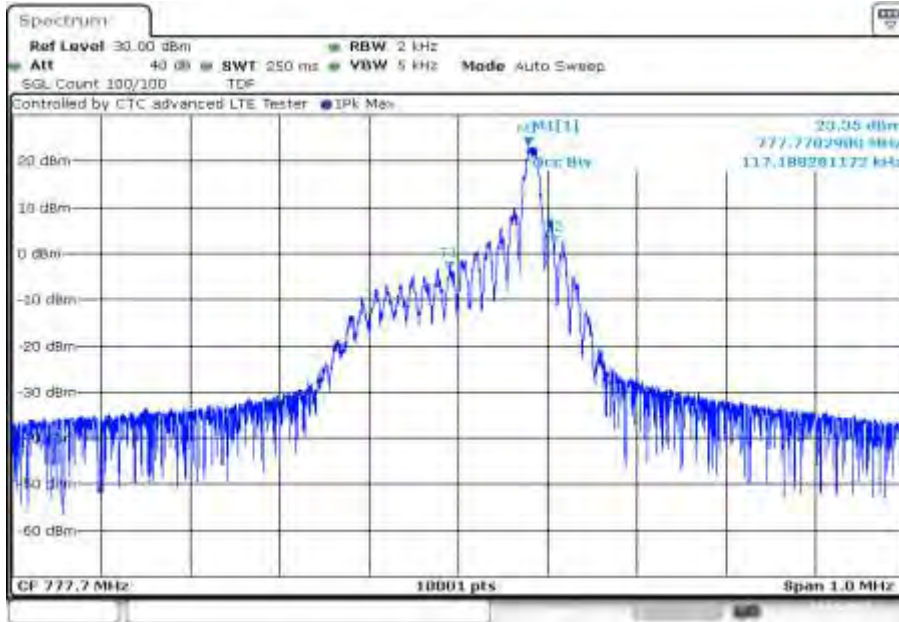**Plot 17:** high channel (99% - OBW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:21:25

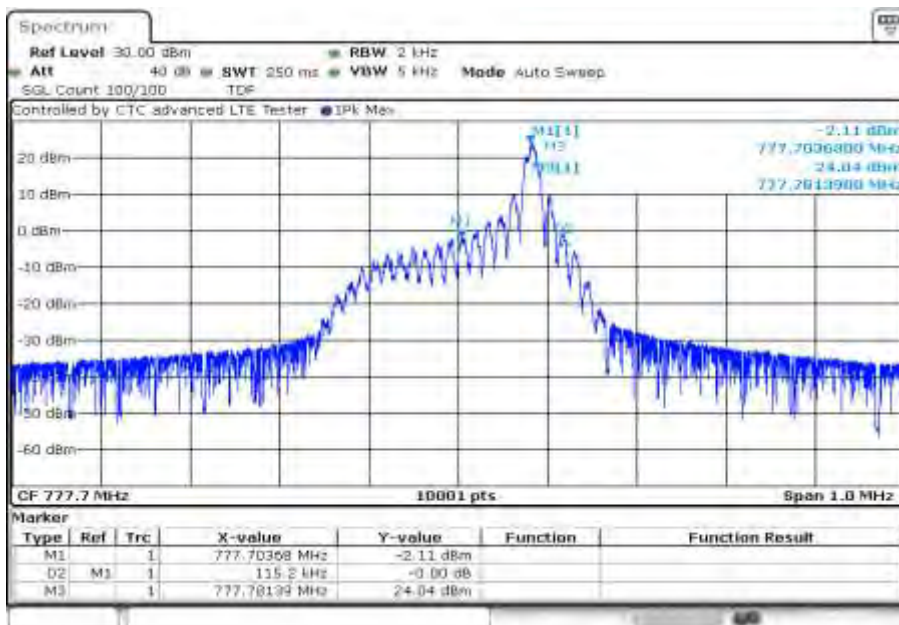**Plot 18:** high channel (-26 dBc BW), spacing 15 kHz, 1@0 tones

Date: 13.APR.2022 08:21:54

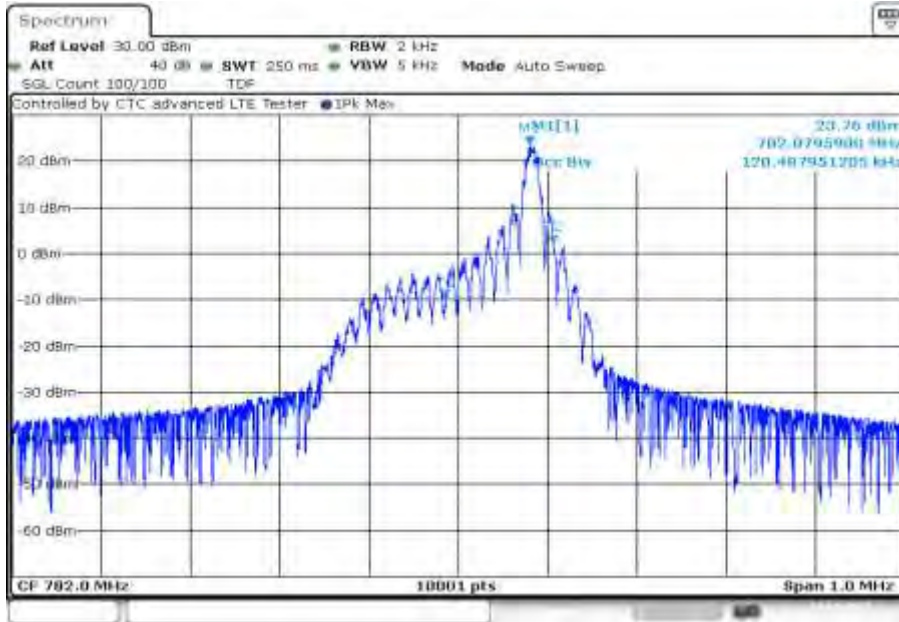**Plot 19:** low channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:01:45

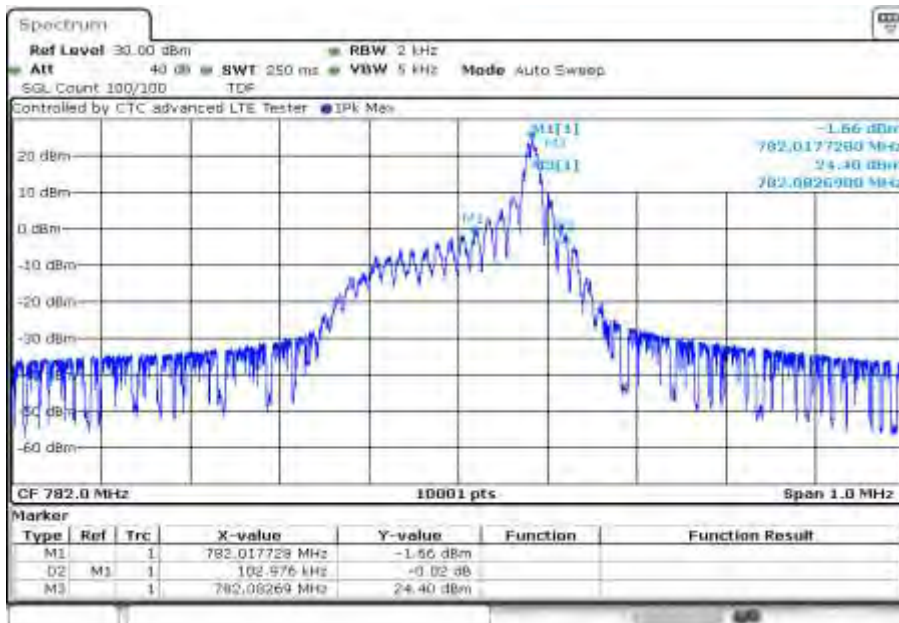**Plot 20:** low channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:02:14

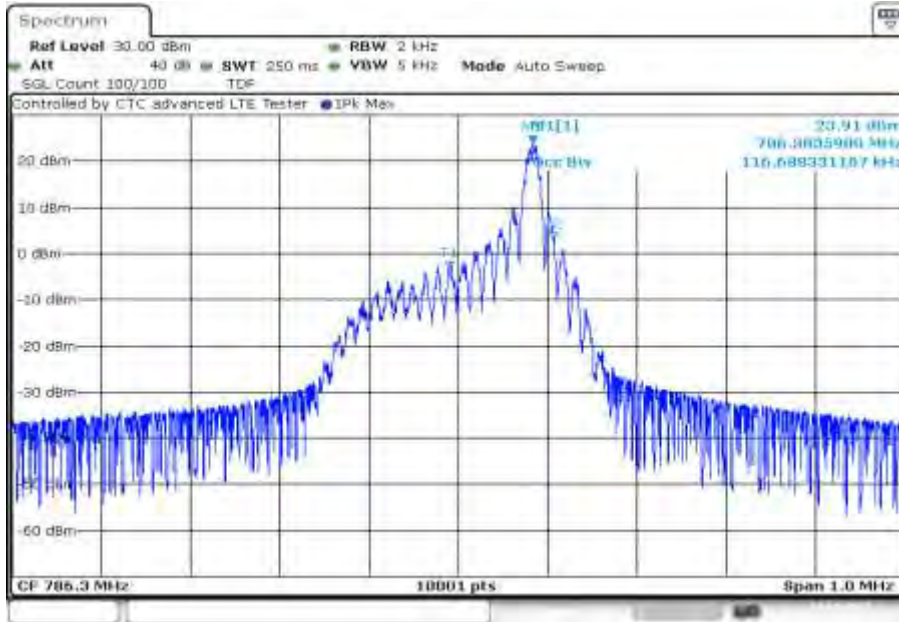**Plot 21:** mid channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:12:10

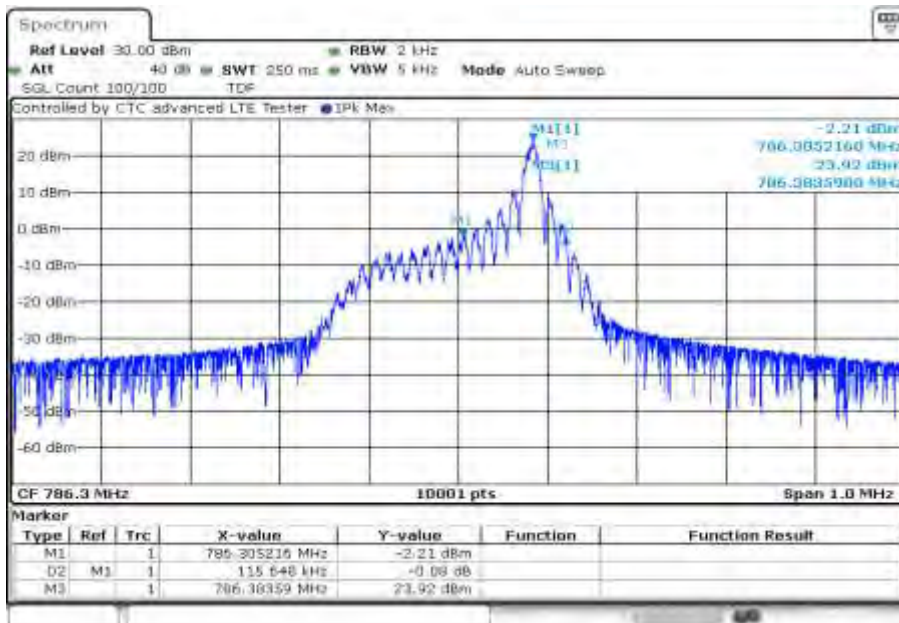**Plot 22:** mid channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:12:39

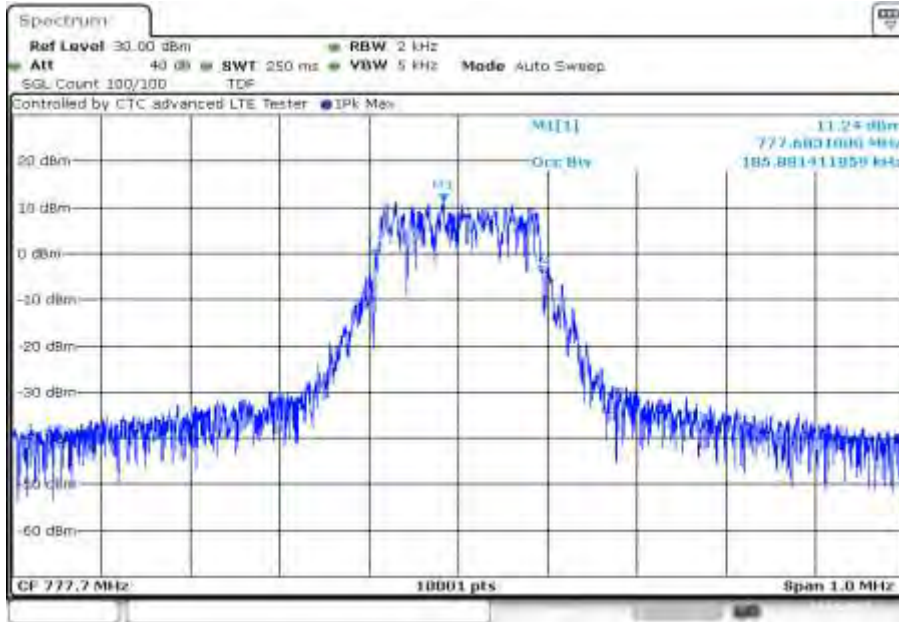**Plot 23:** high channel (99% - OBW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:22:32

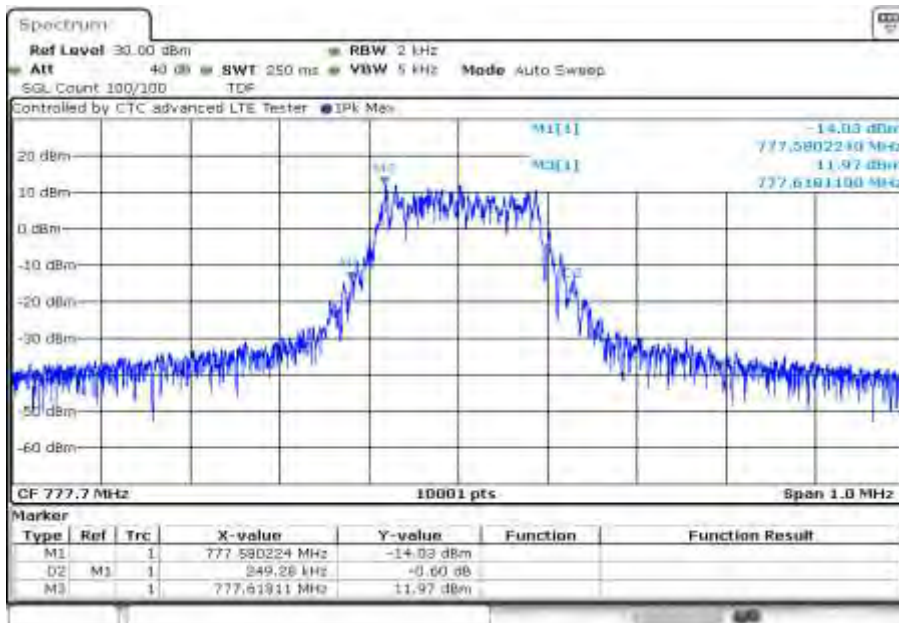**Plot 24:** high channel (-26 dBc BW), spacing 15 kHz, 1@11 tones

Date: 13.APR.2022 08:23:01

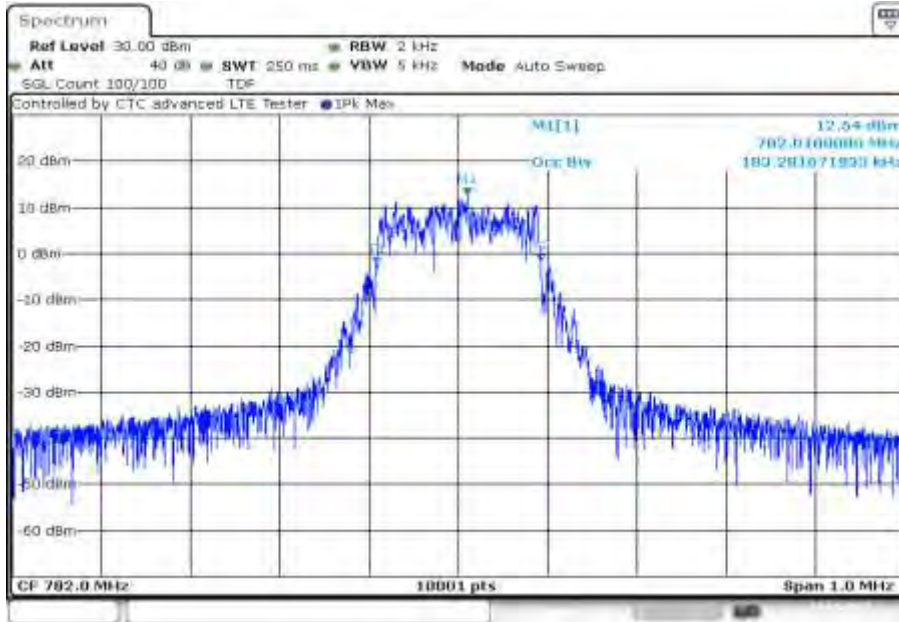**Plot 25:** low channel (99% - OBW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 08:02:52

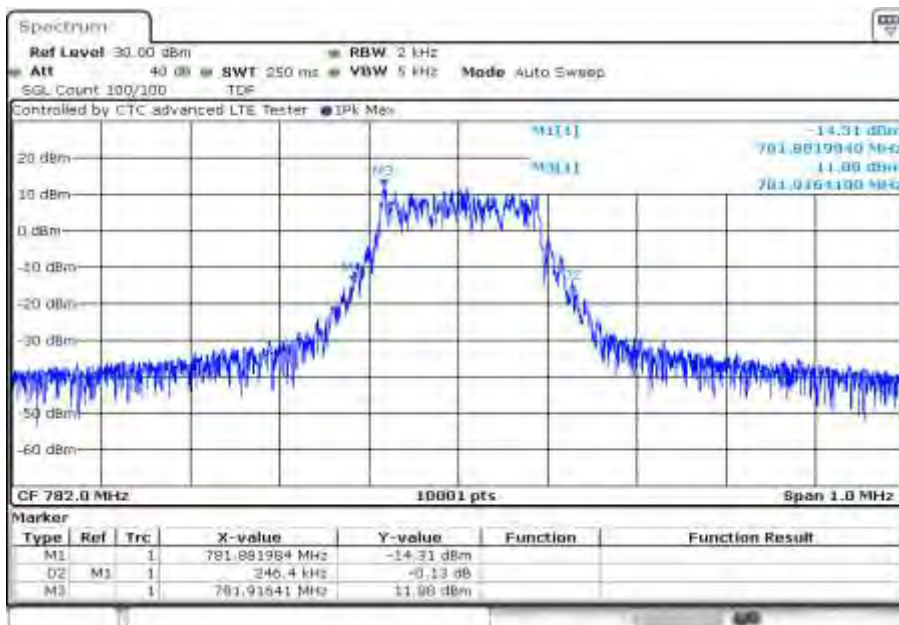**Plot 26:** low channel (-26 dBc BW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 08:03:21

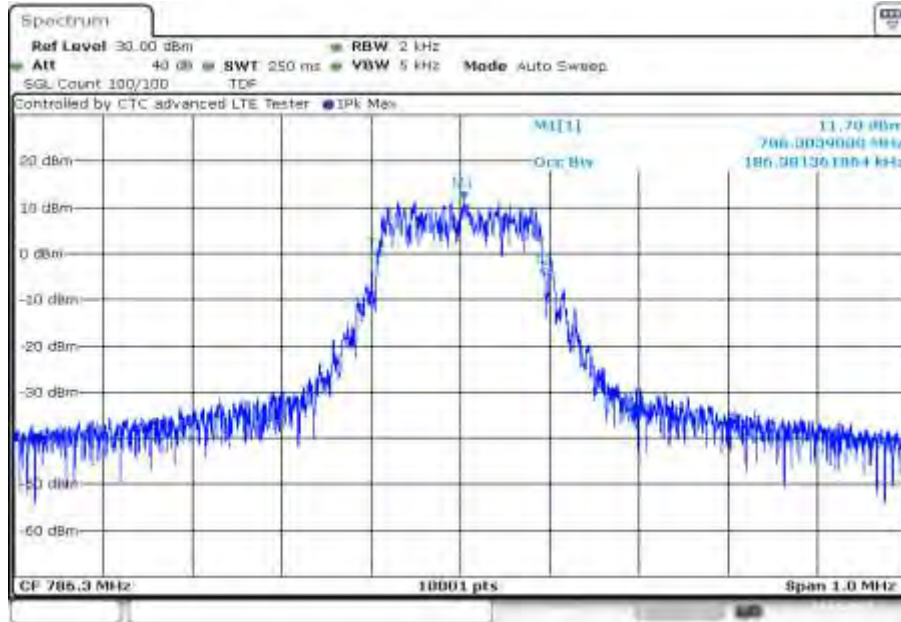**Plot 27:** mid channel (99% - OBW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 08:13:17

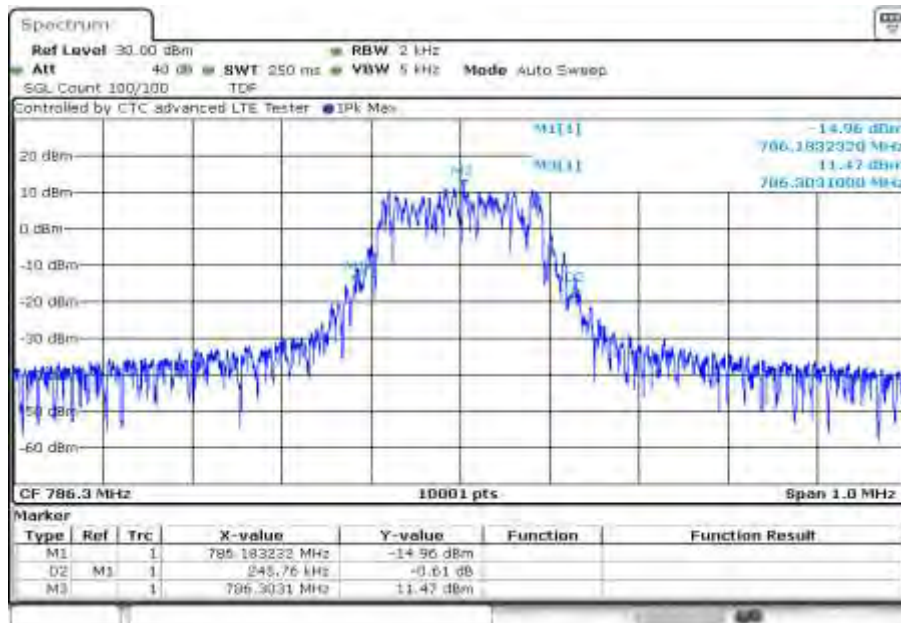**Plot 28:** mid channel (-26 dBc BW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 08:13:46

Plot 29: high channel (99% - OBW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 08:23:39

Plot 30: high channel (-26 dBc BW), spacing 15 kHz, 12@0 tones

Date: 13.APR.2022 08:24:08

17   Observations

No observations except those reported with the single test cases have been made.

18   Glossary

EUT	Equipment under test
DUT	Device under test
UUT	Unit under test
GUE	GNSS User Equipment
ETSI	European Telecommunications Standards Institute
EN	European Standard
FCC	Federal Communications Commission
FCC ID	Company Identifier at FCC
IC	Industry Canada
PMN	Product marketing name
HMN	Host marketing name
HVIN	Hardware version identification number
FVIN	Firmware version identification number
EMC	Electromagnetic Compatibility
HW	Hardware
SW	Software
Inv. No.	Inventory number
S/N or SN	Serial number
C	Compliant
NC	Not compliant
NA	Not applicable
NP	Not performed
PP	Positive peak
QP	Quasi peak
AVG	Average
OC	Operating channel
OCW	Operating channel bandwidth
OBW	Occupied bandwidth
OOB	Out of band
DFS	Dynamic frequency selection
CAC	Channel availability check
OP	Occupancy period
NOP	Non occupancy period
DC	Duty cycle
PER	Packet error rate
CW	Clean wave
MC	Modulated carrier
WLAN	Wireless local area network
RLAN	Radio local area network
DSSS	Dynamic sequence spread spectrum
OFDM	Orthogonal frequency division multiplexing
FHSS	Frequency hopping spread spectrum
GNSS	Global Navigation Satellite System
C/N_0	Carrier to noise-density ratio, expressed in dB-Hz

19   Document history

Version	Applied changes	Date of release
-/-	Initial release	2022-04-14

20   Accreditation Certificate – D-PL-12076-01-04

first page	last page

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-04e.pdf

or
https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-04_Canada_TCEMC.pdf

21 Accreditation Certificate – D-PL-12076-01-05

first page	last page

Note: The current certificate annex is published on the websites (link see below).

https://www.dakks.de/files/data/as/pdf/D-PL-12076-01-05e.pdf

or

https://ctcadvanced.com/app/uploads/2020/06/D-PL-12076-01-05_TCB_USA.pdf

############################ END OF TEST REPORT ############################