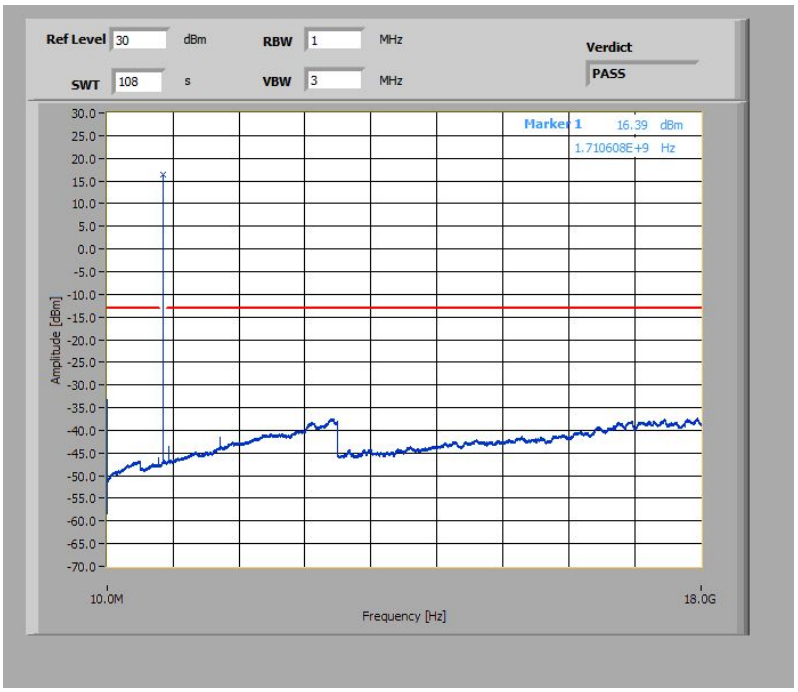
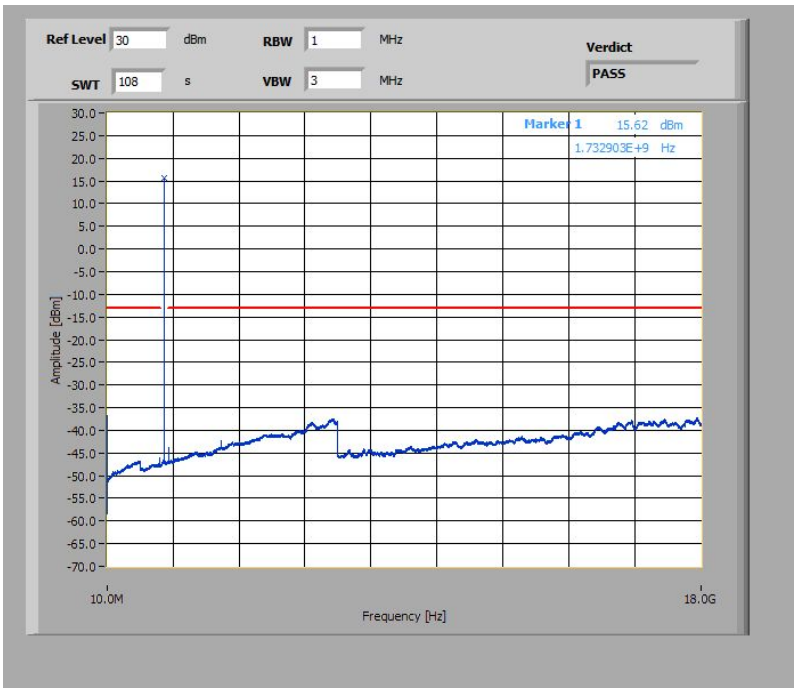
Plots for 1.4 MHz channel bandwidth, QPSK

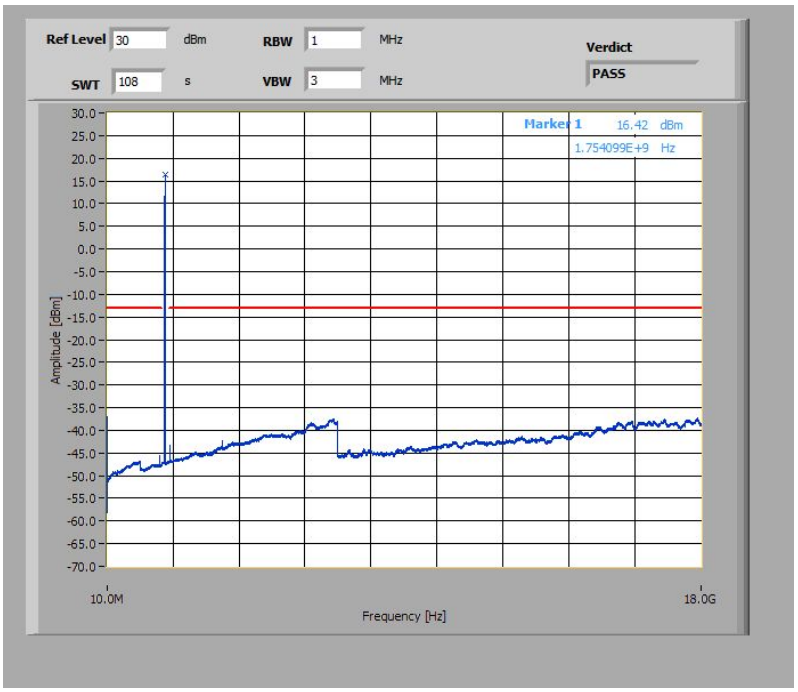
Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz

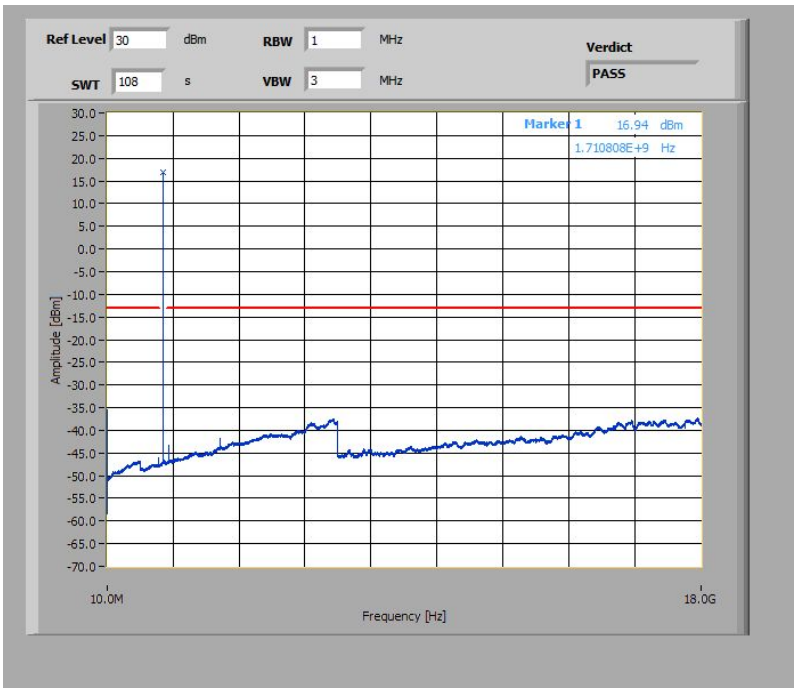


Plot 3: Highest channel, 10 MHz to 18 GHz

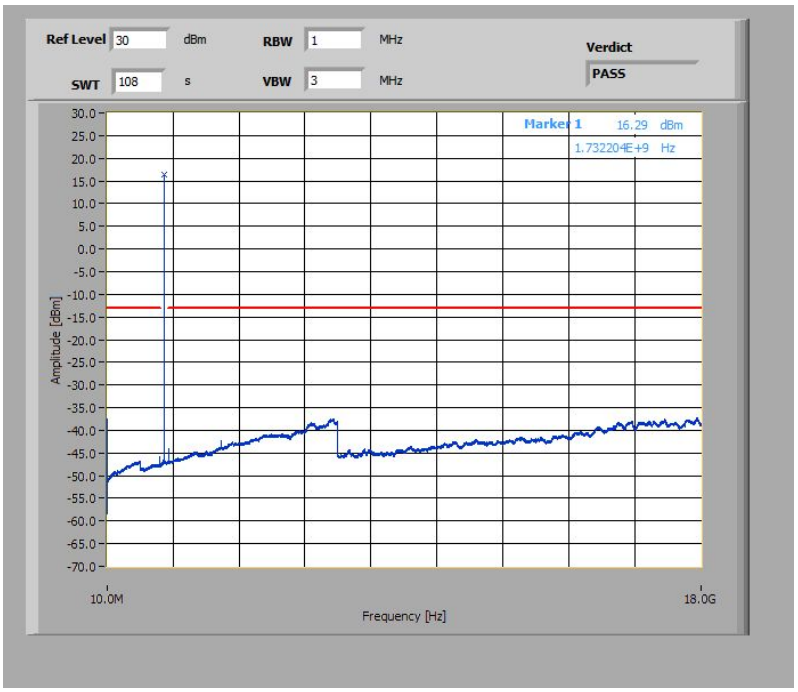


Plots for 1.4 MHz channel bandwidth, 16-QAM

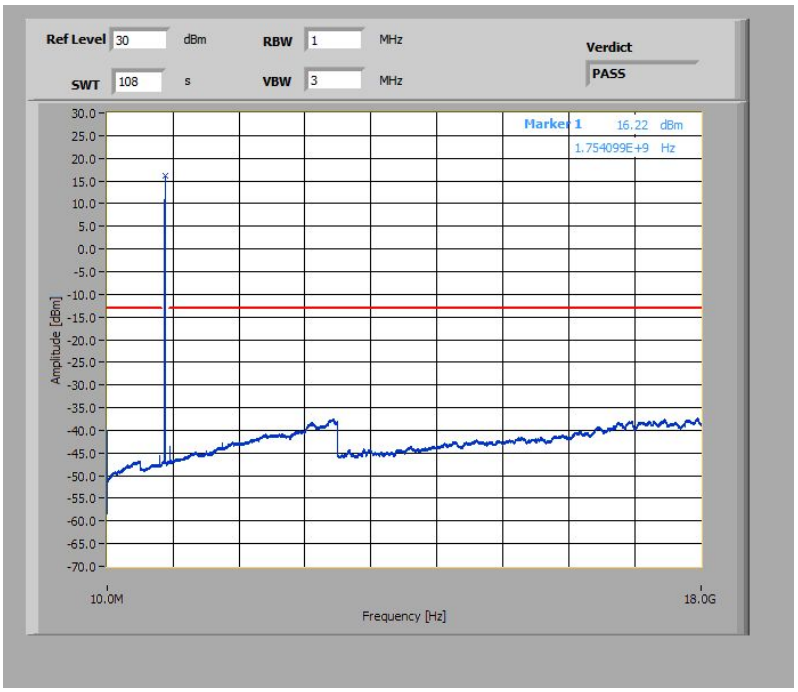
Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz



Plot 3: Highest channel, 10 MHz to 18 GHz



16.2.5 Block edge compliance

Description:

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

For the measurement the lowest, middle and highest channel bandwidth was used. If spurious were found the other bandwidths were measured, too.

Measurement:

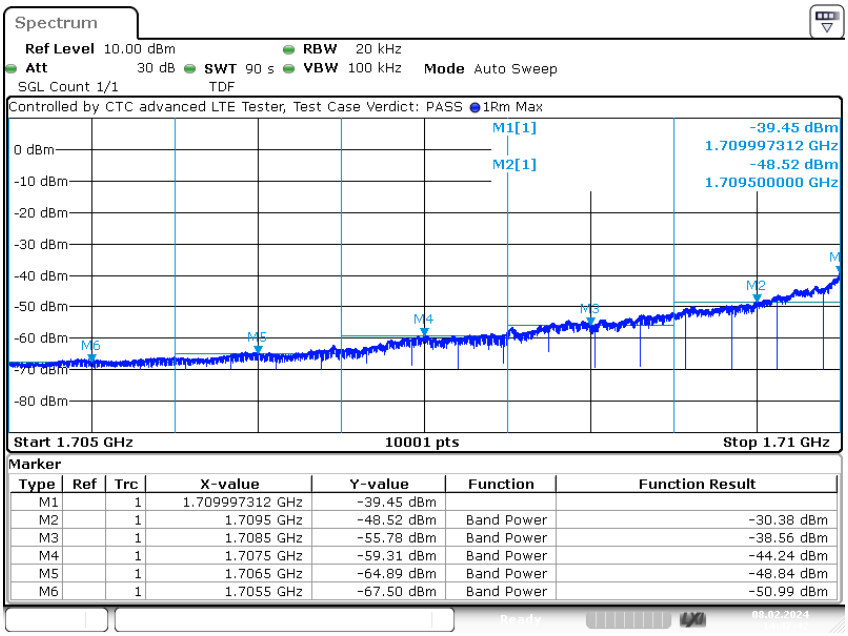
Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	100 kHz
Resolution bandwidth:	20 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

Limits:

FCC	ISED
§ 27.53(h)(1) & (3)	RSS-139, 6.6
(1) Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB. (3) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.	i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB. ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB.
-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	

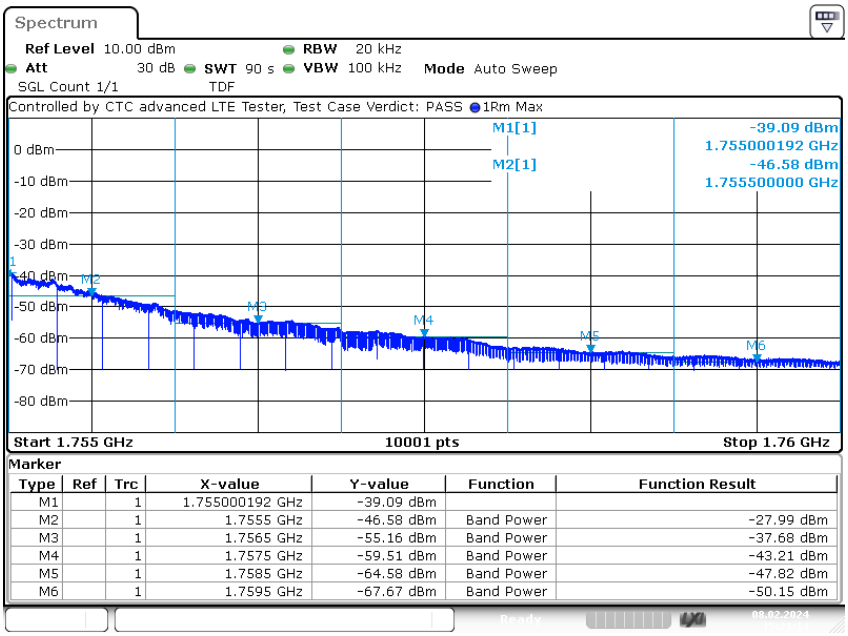
Results: **1.4 MHz channel bandwidth**

Plot 1: Lowest channel, QPSK modulation



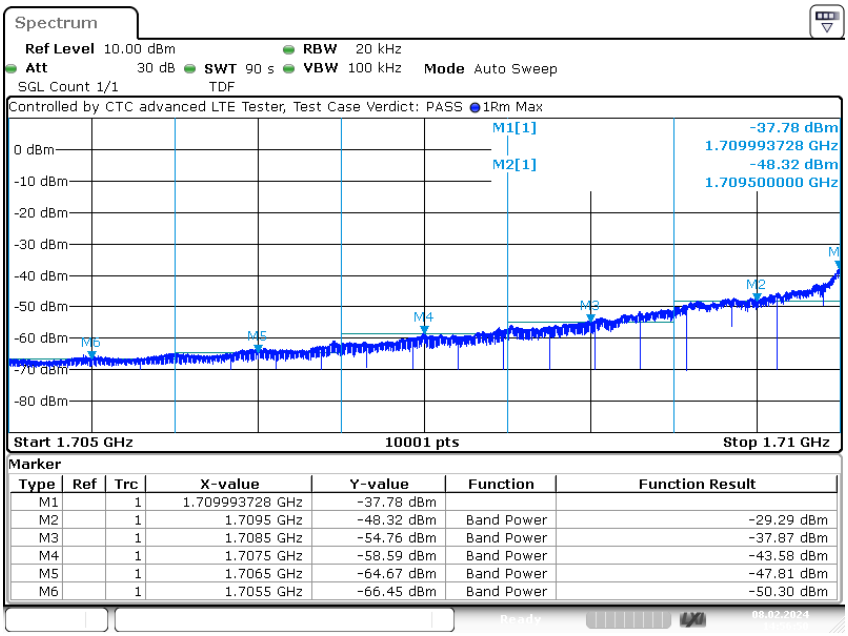
Date: 8.FEB.2024 14:47:42

Plot 2: Highest channel, QPSK modulation



Date: 8.FEB.2024 15:21:14

Plot 3: Lowest channel, 16 – QAM modulation

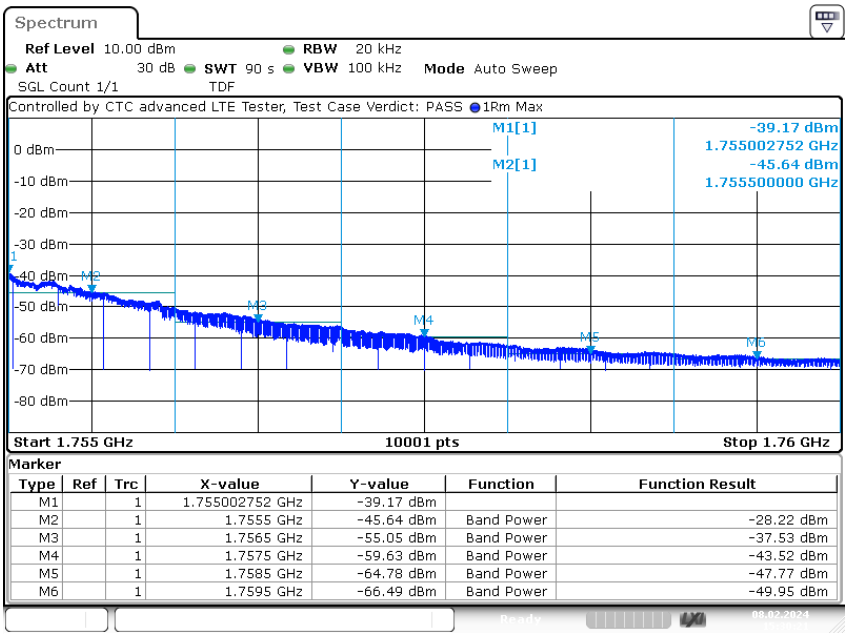


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.709993728 GHz	-37.78 dBm		
M2		1	1.7095 GHz	-48.32 dBm	Band Power	-29.29 dBm
M3		1	1.7085 GHz	-54.76 dBm	Band Power	-37.87 dBm
M4		1	1.7075 GHz	-58.59 dBm	Band Power	-43.58 dBm
M5		1	1.7065 GHz	-64.67 dBm	Band Power	-47.81 dBm
M6		1	1.7055 GHz	-66.45 dBm	Band Power	-50.30 dBm

Date: 8.FEB.2024 14:56:50

Plot 4: Highest channel, 16 – QAM modulation



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.755002752 GHz	-39.17 dBm		
M2		1	1.7555 GHz	-45.64 dBm	Band Power	-28.22 dBm
M3		1	1.7565 GHz	-55.05 dBm	Band Power	-37.53 dBm
M4		1	1.7575 GHz	-59.63 dBm	Band Power	-43.52 dBm
M5		1	1.7585 GHz	-64.78 dBm	Band Power	-47.77 dBm
M6		1	1.7595 GHz	-66.49 dBm	Band Power	-49.95 dBm

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16.2.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

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	

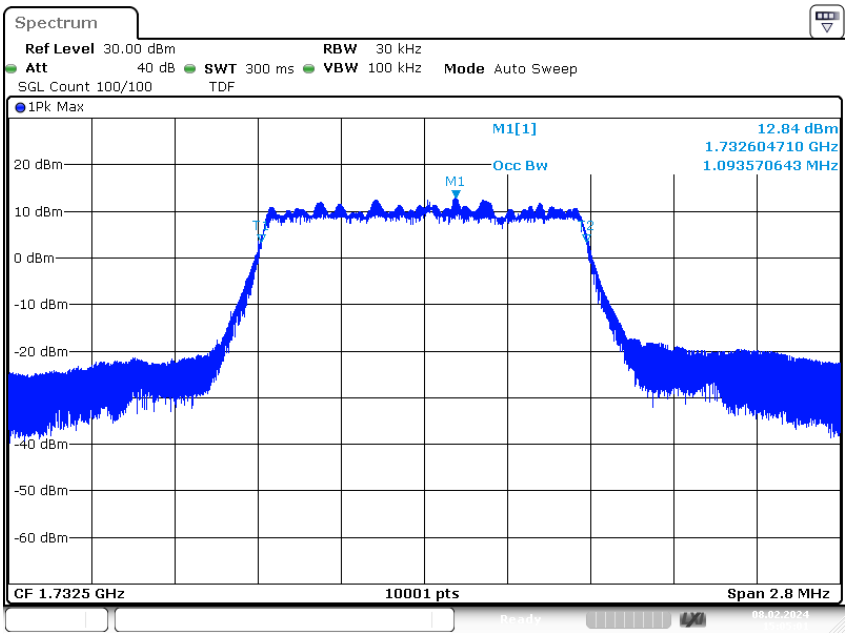
Results:

Occupied Bandwidth – QPSK		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
1710.7	1089	1277
1732.5	1094	1303
1754.3	1086	1290

Occupied Bandwidth – 16-QAM		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
1710.7	1091	1293
1732.5	1090	1281
1754.3	1091	1290

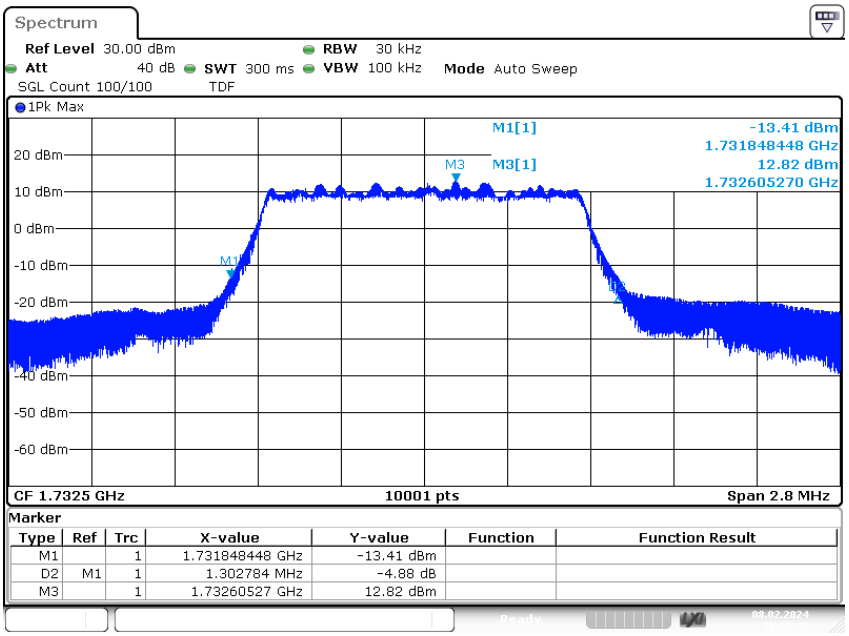
Plots: QPSK, worst case plots

Plot 1: mid channel, 99% OBW



Date: 8.FEB.2024 15:05:01

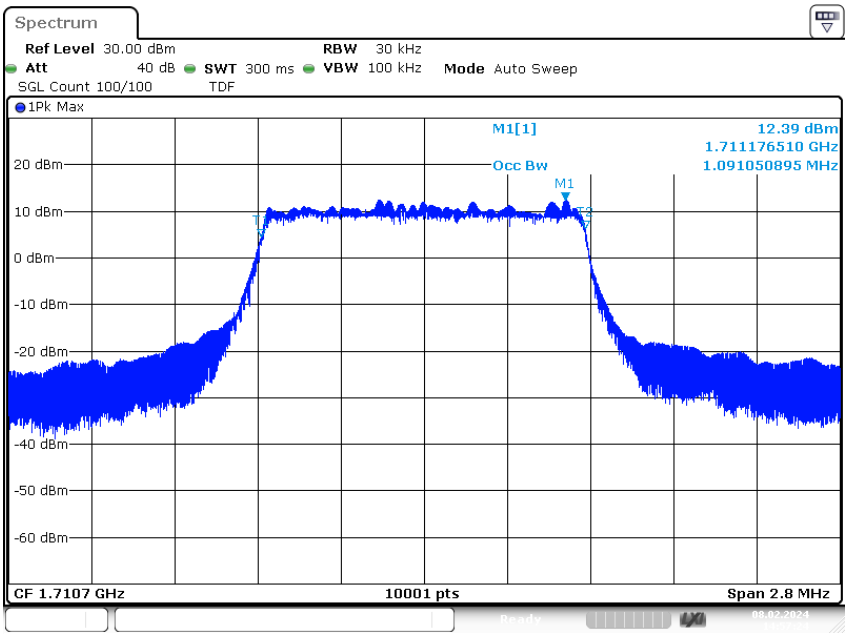
Plot 2: mid channel, -26 dBc OBW



Date: 8.FEB.2024 15:05:35

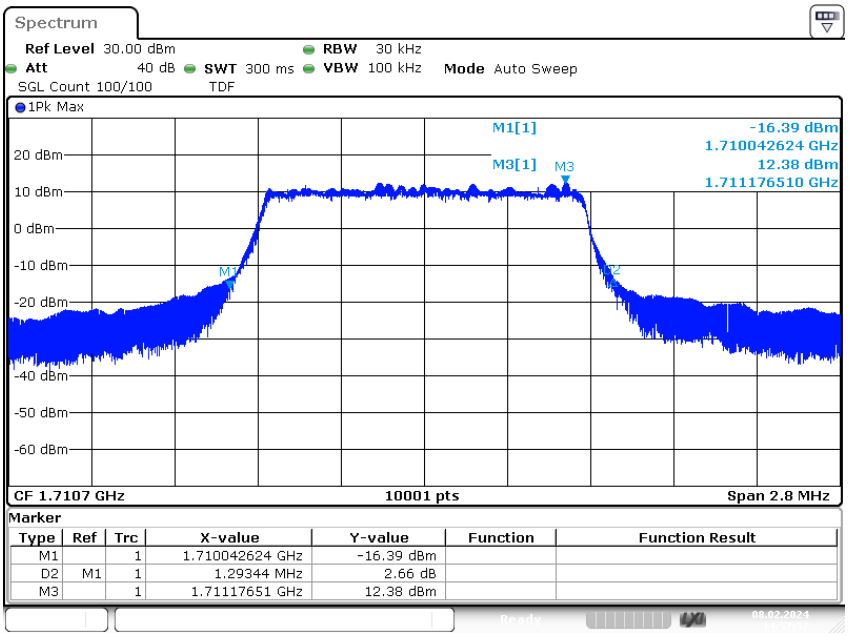
Plots: 16-QAM, worst case plots

Plot 1: low channel, 99% OBW



Date: 8.FEB.2024 14:57:24

Plot 2: low channel, -26 dBc OBW



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.710042624 GHz	-16.39 dBm		
D2	M1	1	1.29344 MHz	2.66 dB		
M3		1	1.71117651 GHz	12.38 dBm		

Date: 8.FEB.2024 14:57:57

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:

Output Power (conducted)						
Bandwidth (MHz)	**Channel No. / Frequency (MHz)**	**Resource block allocation**	**Average Output Power (dBm) QPSK**	**Peak to Average Ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak to Average Ratio (dB)**
1.4	23017 / 699.7	1 RB low	14,5	5,9	13,3	6,9
		1 RB high	14,4	5,9	13,4	6,9
		100% RB	12,4	6,6	12,5	7,3
	23095 / 707.5	1 RB low	14,5	5,9	13,3	7,0
		1 RB high	14,3	5,9	13,2	7,0
		100% RB	12,2	6,4	12,5	7,2
	23173 / 715.3	1 RB low	14,9	5,8	14,0	6,8
		1 RB high	14,7	5,9	13,8	6,9
		100% RB	12,7	6,5	12,9	7,2
3	23025 / 700.5	1 RB low	7,8	11,2	13,3	7,0
		1 RB high	14,3	6,0	13,3	7,0
		100% RB	12,5	6,6	12,6	7,3
	23095 / 707.5	1 RB low	14,5	5,9	12,5	7,7
		1 RB high	14,3	5,9	12,6	7,7
		100% RB	12,5	6,5	1,5	16,5
	23165 / 714.5	1 RB low	11,7	9,0	12,9	7,7
		1 RB high	14,6	5,9	13,5	7,0
		100% RB	12,7	6,4	12,8	7,2
5	23035 / 701.5	1 RB low	16,4	4,1	16,2	4,8
		1 RB high	16,2	4,2	16,1	4,8
		100% RB	15,2	4,8	14,2	5,7
	23095 / 707.5	1 RB low	16,3	4,1	15,9	4,7
		1 RB high	16,1	4,1	15,7	4,8
		100% RB	15,1	4,7	13,9	5,7
	23155 / 713.5	1 RB low	17,0	4,1	17,1	4,5
		1 RB high	16,9	4,1	16,9	4,6
		100% RB	15,6	4,7	14,7	5,6
10	23060 / 704.0	1 RB low	16,3	4,1	16,0	4,8
		1 RB high	16,0	4,2	16,0	4,8
		100% RB	15,3	4,7	15,3	5,5
	23095 / 707.5	1 RB low	16,2	4,1	15,7	4,8
		1 RB high	16,0	4,1	15,7	4,8
		100% RB	15,2	4,7	15,2	5,5
	23130 / 711.0	1 RB low	16,9	4,1	16,9	4,6
		1 RB high	16,7	4,1	16,7	4,6
		100% RB	15,7	4,8	15,9	5,4

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

Output Power (ERP)			
Bandwidth (MHz)	**Frequency (MHz)**	**Average Output Power (dBm) QPSK**	**Average Output Power (dBm) 16-QAM**
1.4	699.7	16,5	15,4
	707.5	16,6	15,4
	715.3	16,5	15,6
3	700.5	16,6	15,6
	707.5	16,6	14,7
	714.5	16,2	15,1
5	701.5	18,4	18,2
	707.5	18,4	18,0
	713.5	18,6	18,7
10	704.0	18,3	18,0
	707.5	18,3	17,8
	711.0	18,5	18,5

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:	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)
4.1	-6	-0.01
3.7	-8	-0.01
2.5	-9	-0.01

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-20	-0.03
-20	-22	-0.03
-10	-14	-0.02
± 0	-9	-0.01
10	-12	-0.02
20	-6	-0.01
30	4	0.01
40	8	0.01
50	13	0.02

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 7.1 setup A; 7.2 setup A, B
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:

QPSK

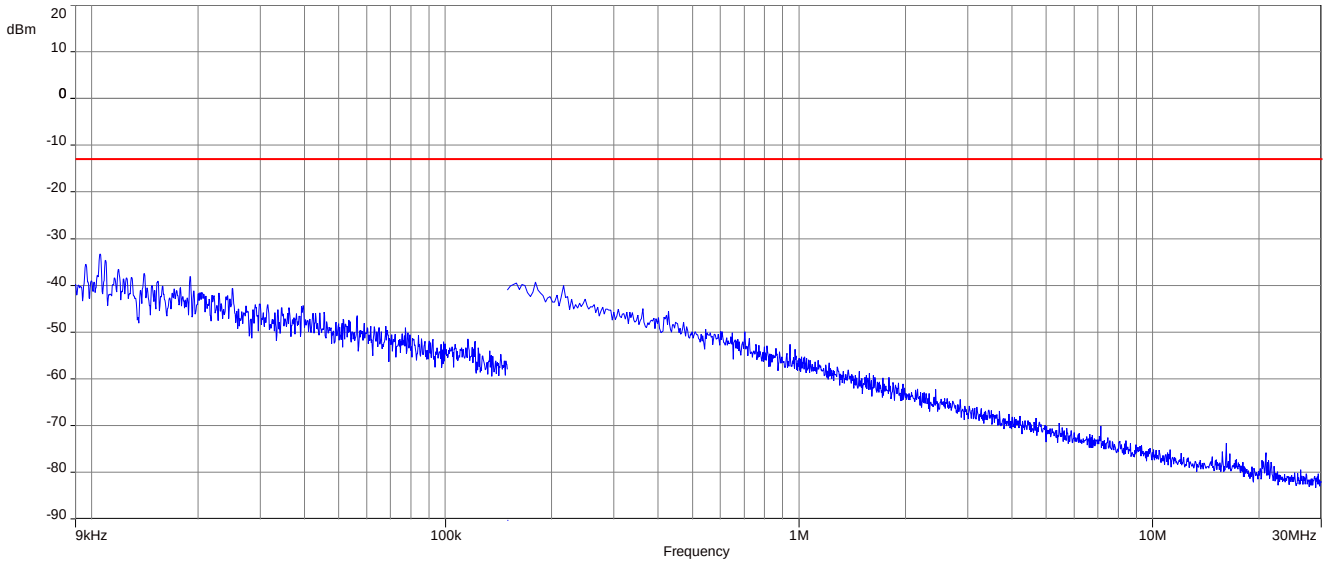
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

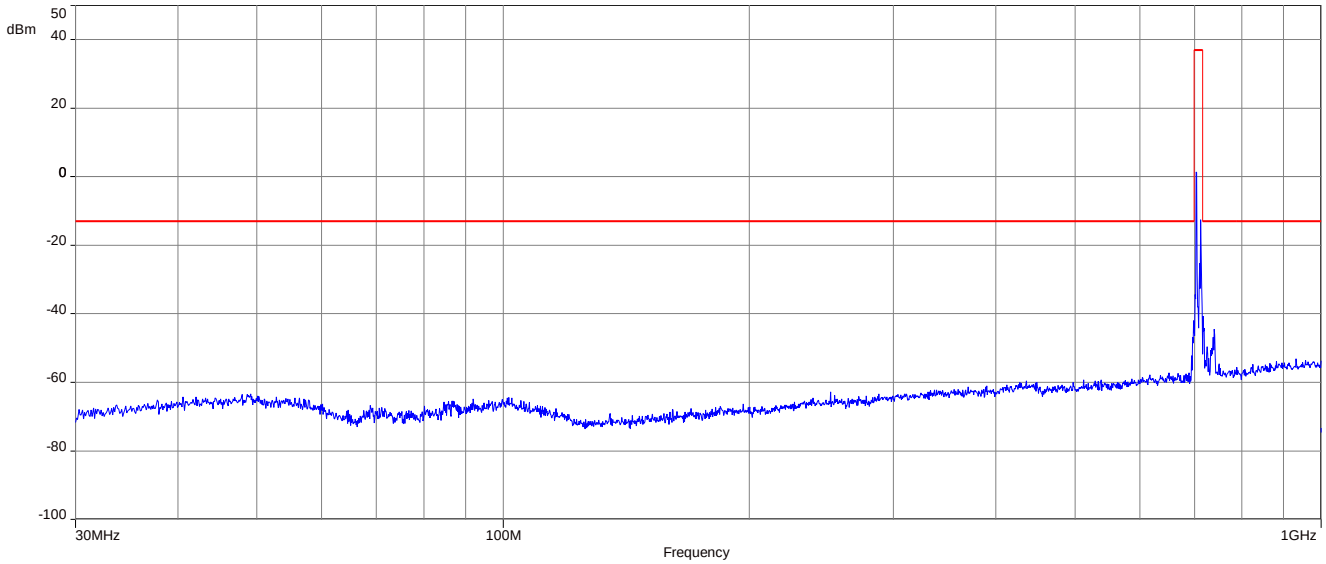
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

QPSK

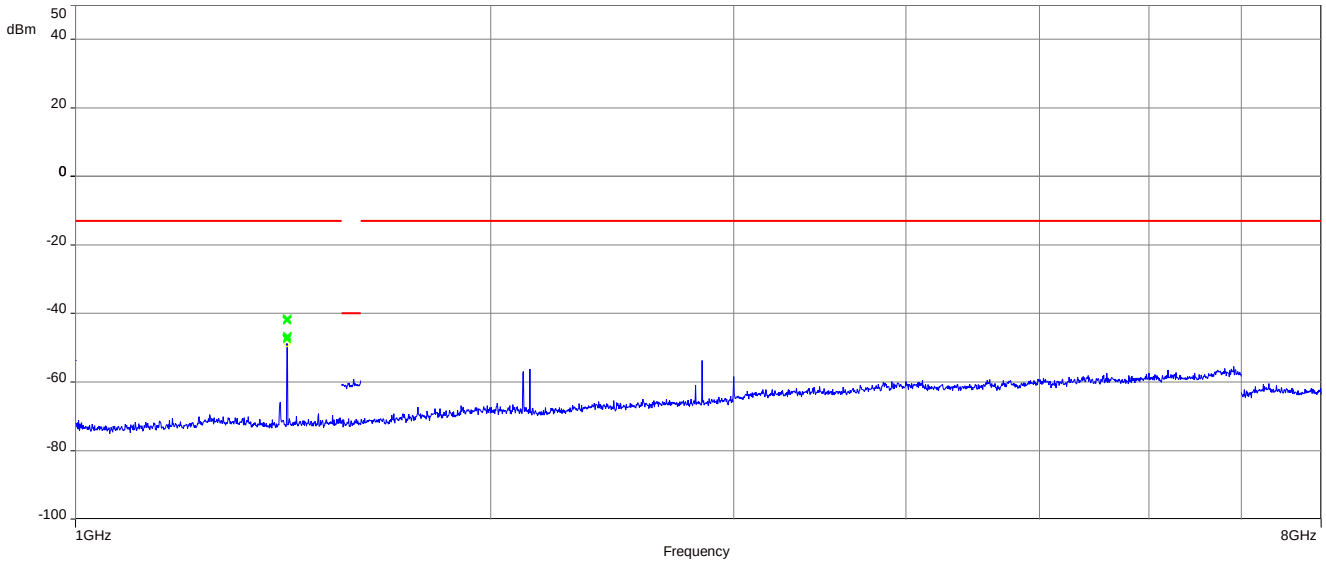
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz

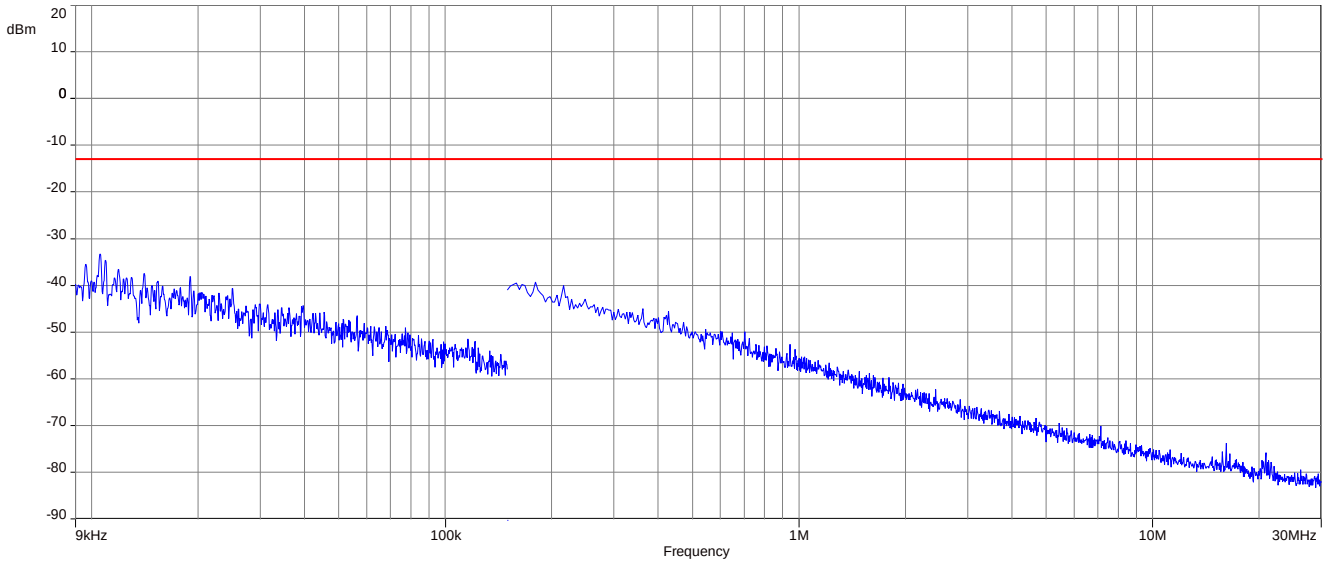


Plot 3: Middle channel, 1 GHz to 8 GHz

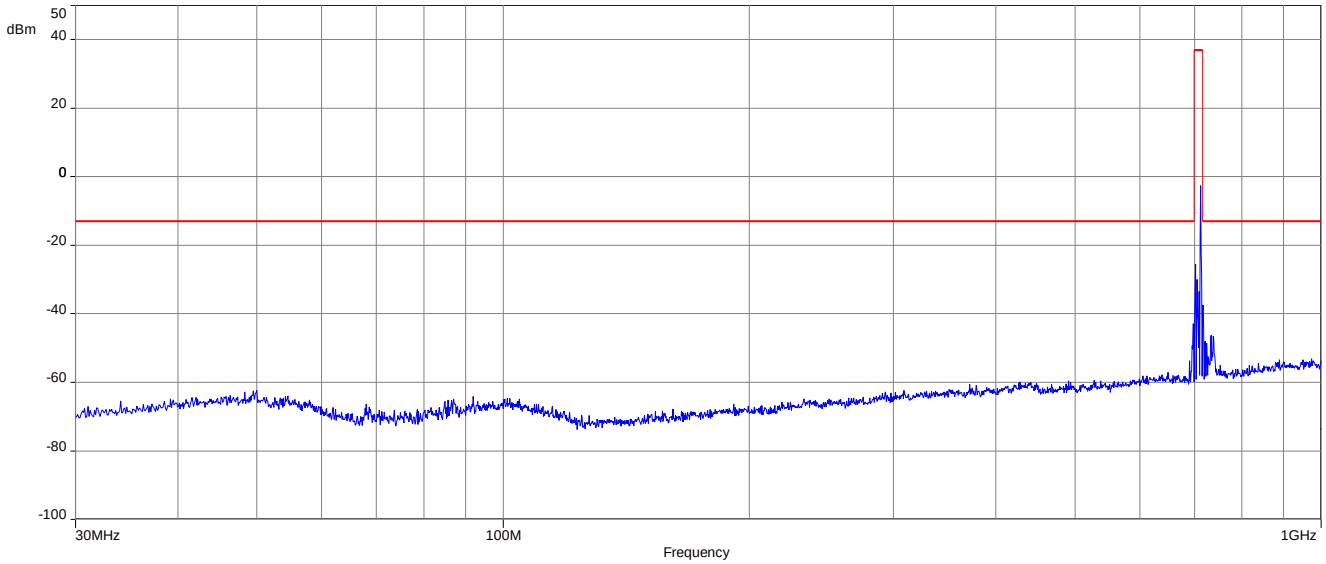


16-QAM

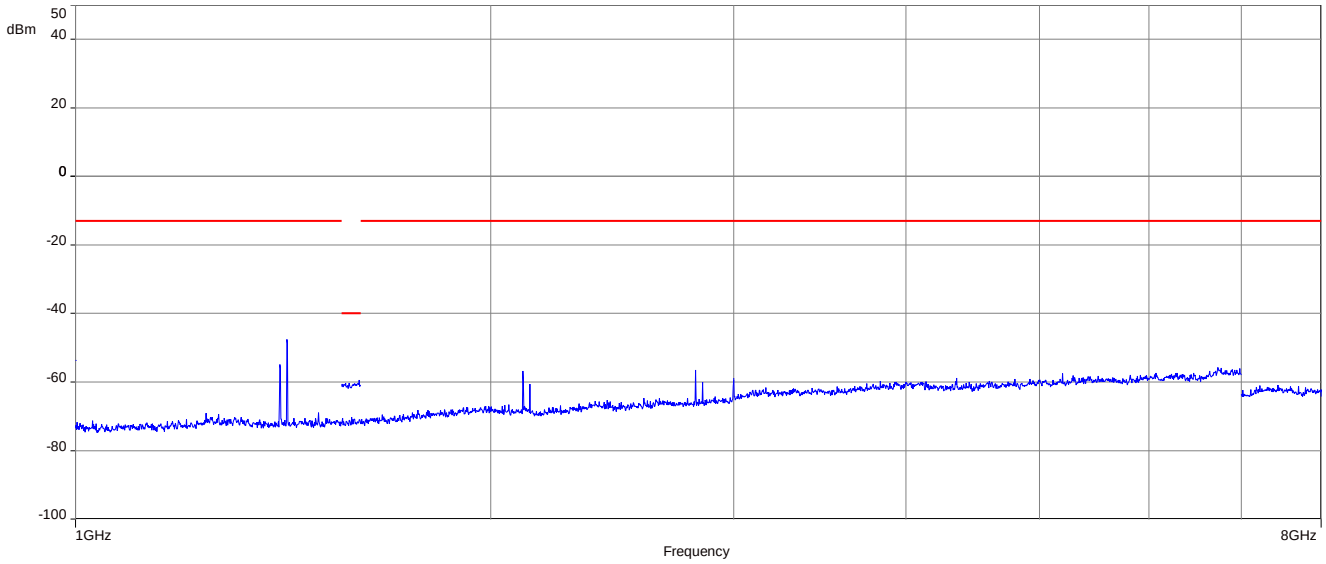
Plot 1: Middle channel, up to 30 MHz



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 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: for 1.4 MHz channel bandwidth

QPSK

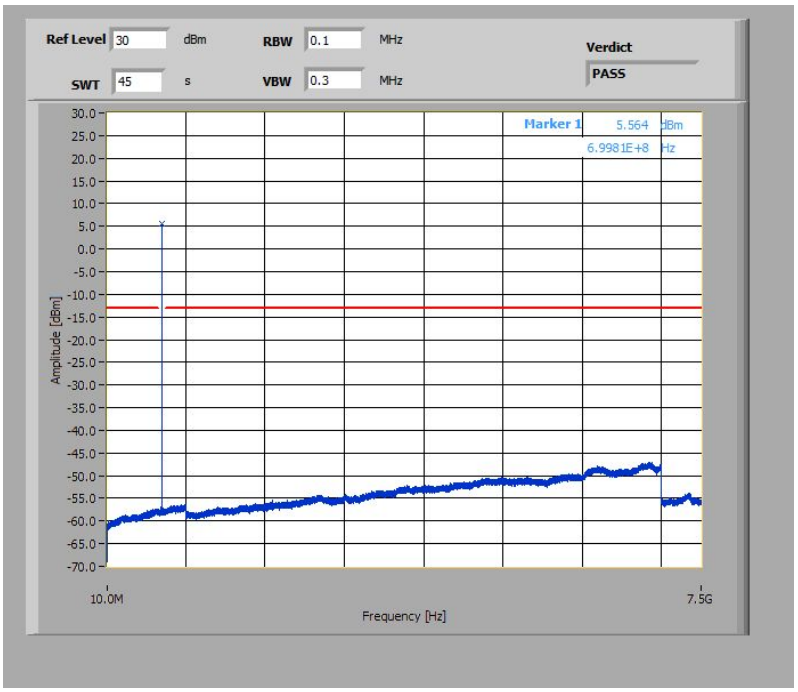
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

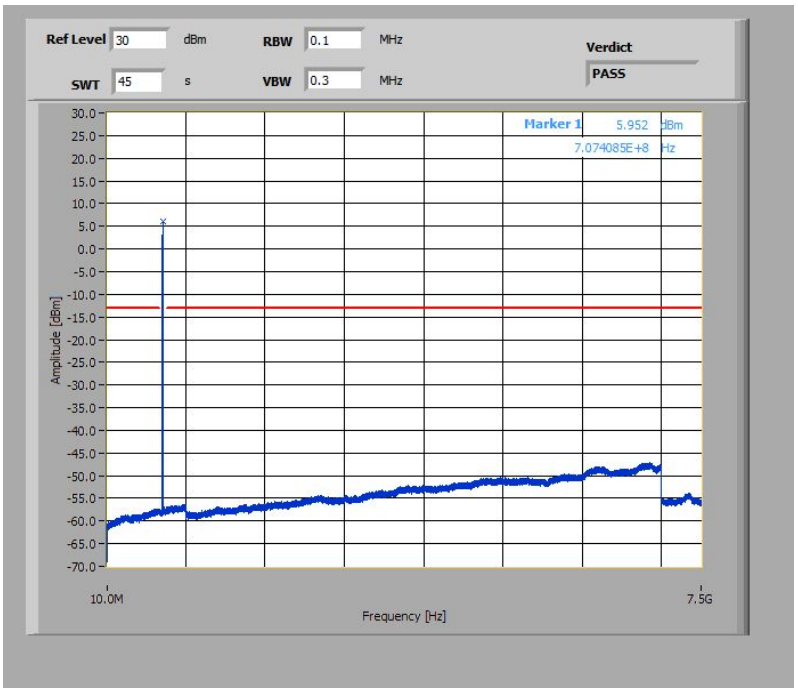
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

Plots for 1.4 MHz channel bandwidth, QPSK

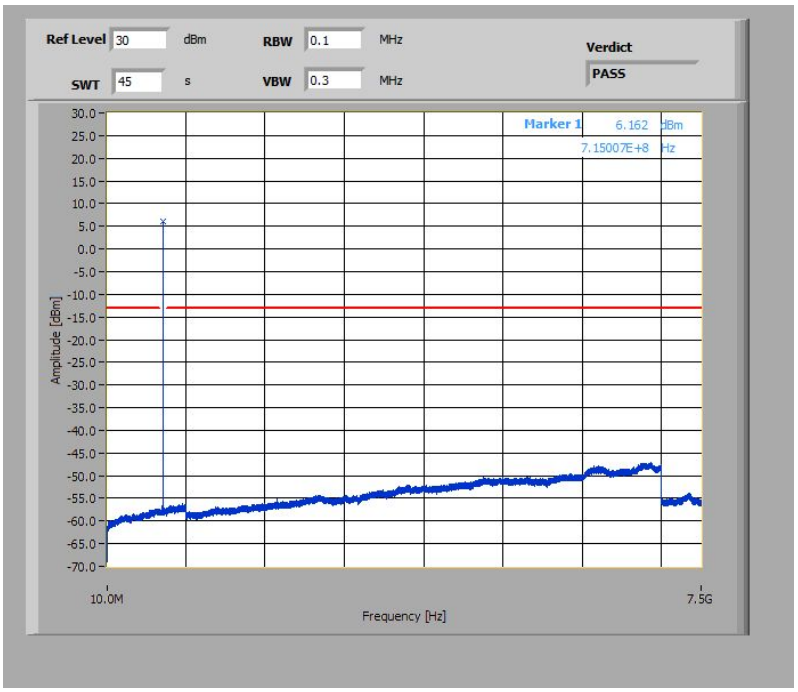
Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz

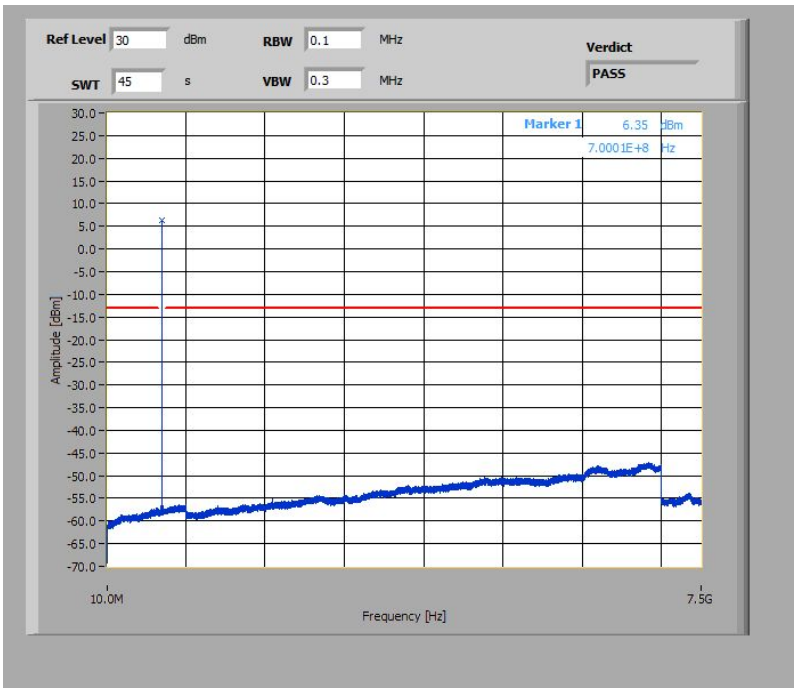


Plot 3: Highest channel, 10 MHz to 7.5 GHz

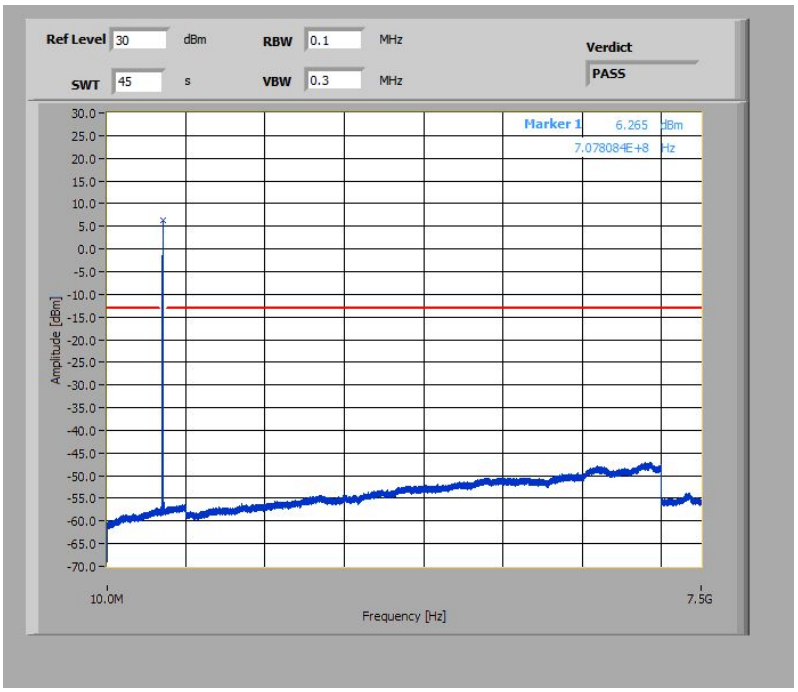


Plots for 1.4 MHz channel bandwidth, 16-QAM

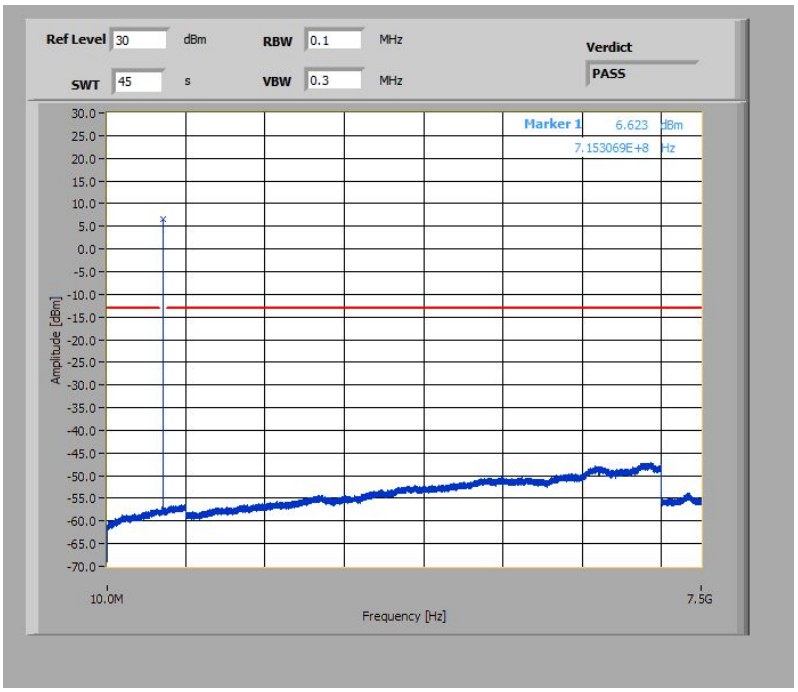
Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz



Plot 3: Highest channel, 10 MHz to 7.5 GHz



16.3.5 Block edge compliance

Description:

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

Measurement:

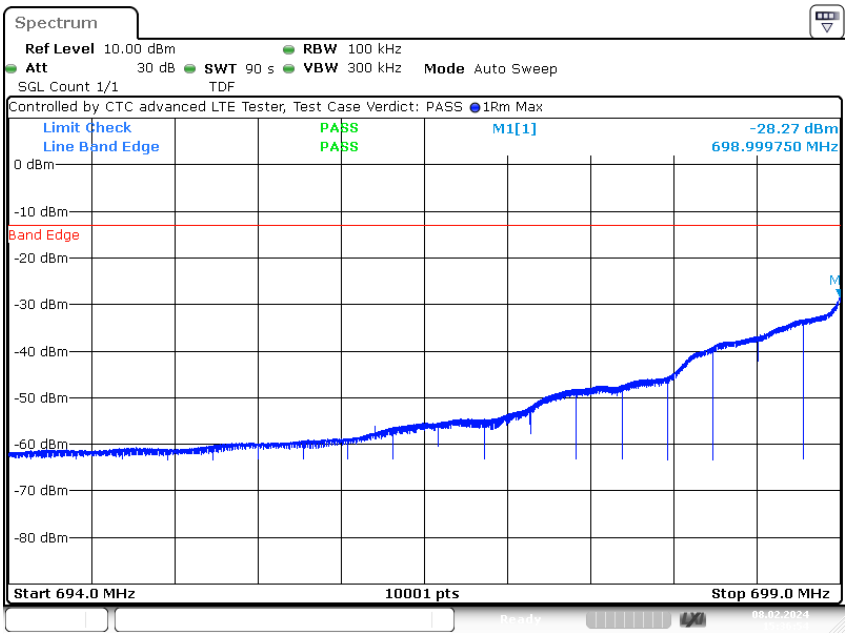
Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

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	

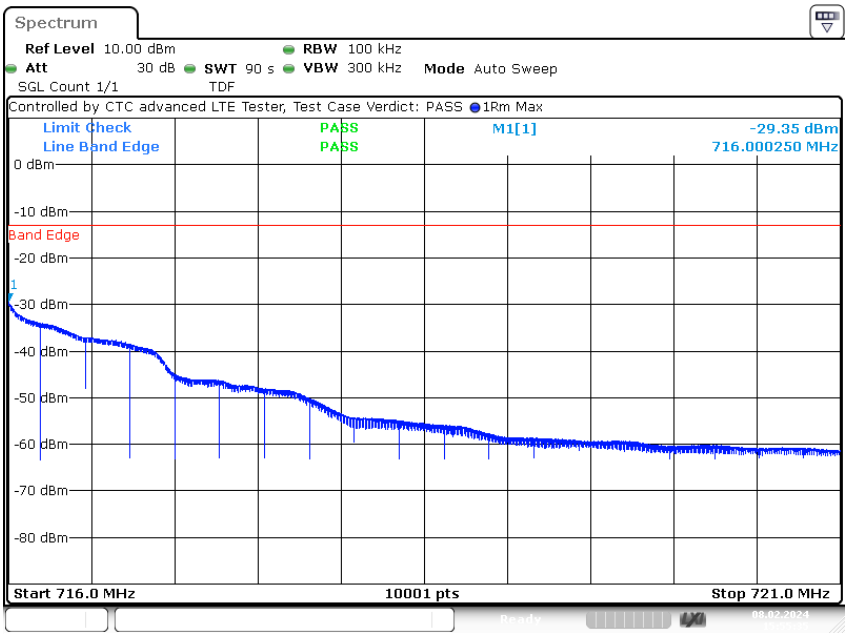
Results: **1.4 MHz channel bandwidth**

Plot 1: Lowest channel, QPSK modulation



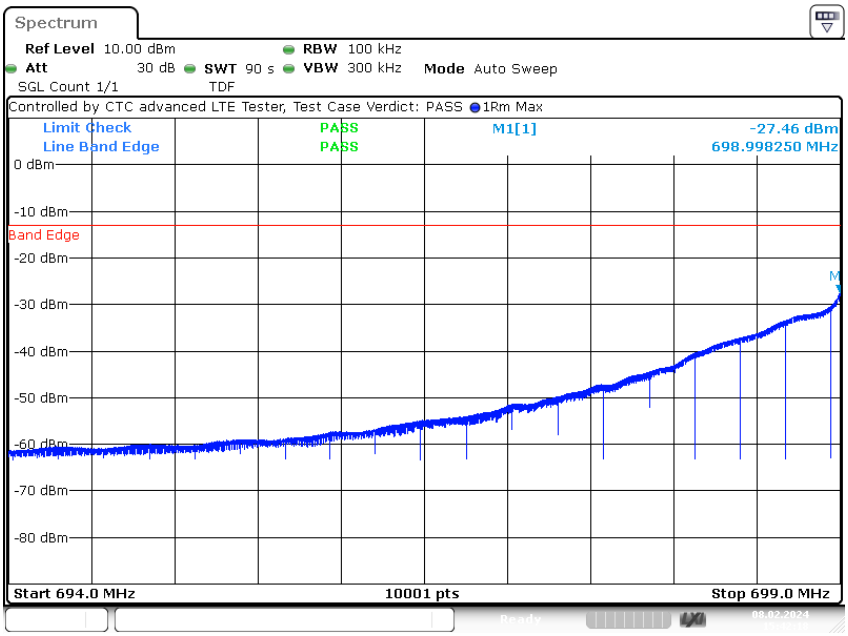
Date: 8.FEB.2024 15:36:54

Plot 2: Highest channel, QPSK modulation



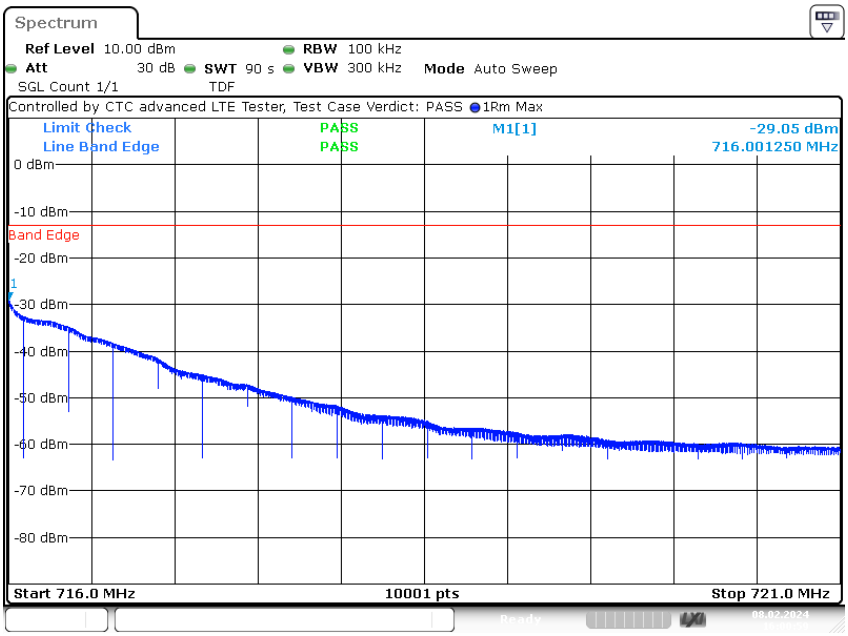
Date: 8.FEB.2024 15:55:35

Plot 3: Lowest channel, 16 – QAM modulation



Date: 8.FEB.2024 15:42:18

Plot 4: Highest channel, 16 – QAM modulation



Date: 8.FEB.2024 16:00:59

16.3.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

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	

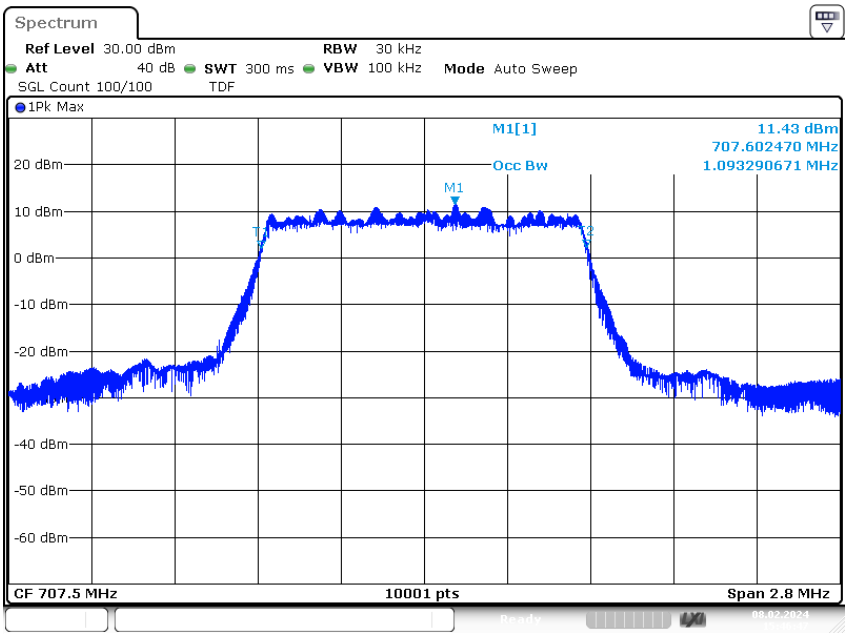
Results:

Occupied Bandwidth – QPSK		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
699.7	1090	1270
707.5	1093	1294
715.3	1088	1284

Occupied Bandwidth – 16-QAM		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
699.7	1092	1284
707.5	1090	1279
715.3	1092	1325

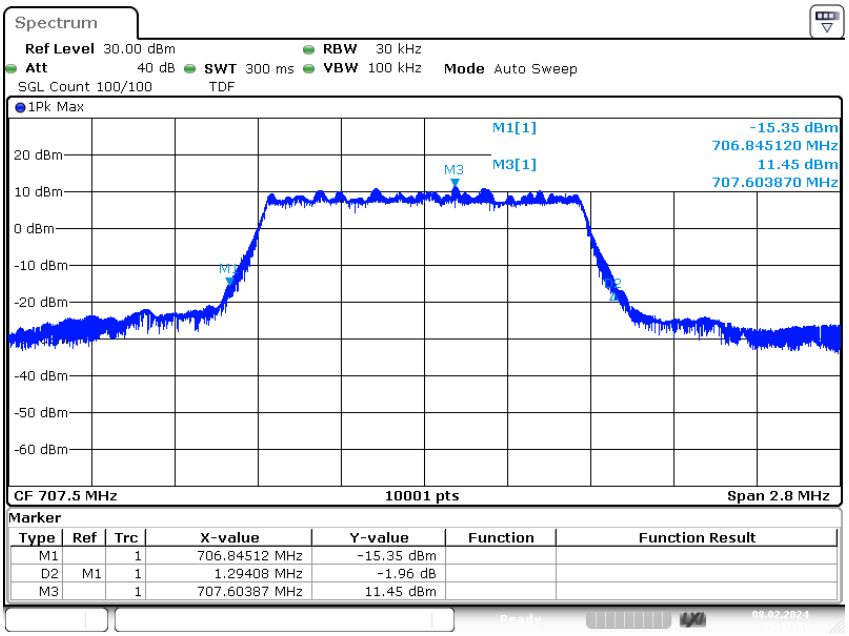
Plots: QPSK, worst case plots

Plot 1: mid channel, 99% OBW



Date: 8.FEB.2024 15:46:47

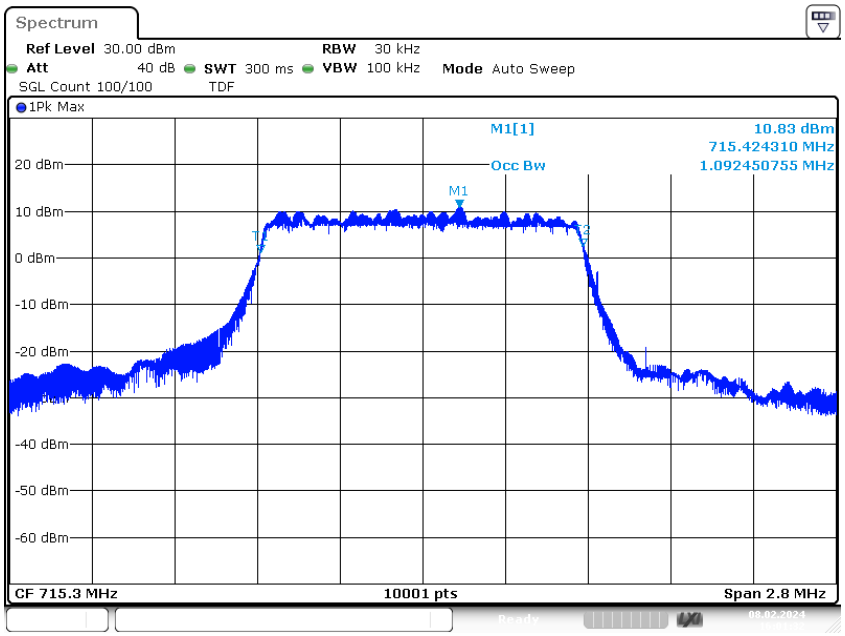
Plot 2: mid channel, -26 dBc OBW



Date: 8.FEB.2024 15:47:21

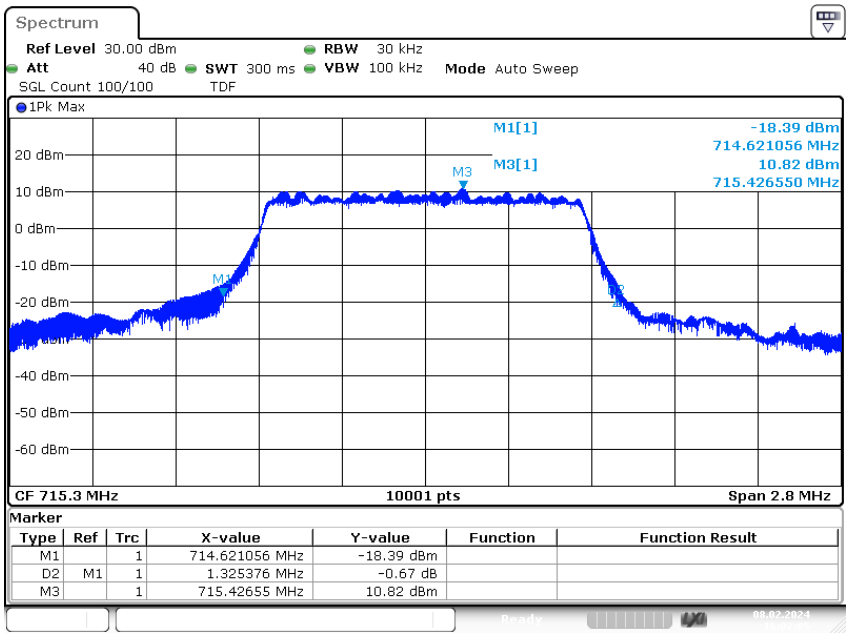
Plots: 16-QAM, worst case plots

Plot 1: high channel, 99% OBW



Date: 8.FEB.2024 16:01:32

Plot 2: high channel, -26 dBc OBW



Date: 8.FEB.2024 16:02:05

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:

Output Power (conducted)						
Bandwidth (MHz)	**Channel No. / Frequency (MHz)**	**Resource block allocation**	**Average Output Power (dBm) QPSK**	**Peak to Average Ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak to Average Ratio (dB)**
5	23205 / 779.5	1 RB low	17,9	3,9	17,6	4,4
		1 RB high	17,9	3,9	17,5	4,5
		100% RB	16,9	4,5	15,7	5,4
	23230 / 782	1 RB low	18,0	3,8	17,5	4,5
		1 RB high	17,8	3,9	17,4	4,5
		100% RB	16,8	4,4	15,8	5,4
	23255 / 784.5	1 RB low	18,5	3,8	18,4	4,1
		1 RB high	18,3	3,8	18,4	4,2
		100% RB	17,2	4,5	16,3	5,3
10	23230 / 782	1 RB low	17,8	3,9	17,5	4,5
		1 RB high	17,6	3,9	17,4	4,5
		100% RB	16,9	4,4	16,8	5,1

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

Output Power (ERP)			
Bandwidth (MHz)	**Frequency (MHz)**	**Average Output Power (dBm) QPSK**	**Average Output Power (dBm) 16-QAM**
5	779.5	18,6	18,3
	782.0	18,7	18,2
	784.5	19,0	18,9
10	782.0	18,5	18,2

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 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:	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)
4.1	-8	-0.01
3.7	-7	-0.01
2.5	-9	-0.01

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-23	-0.03
-20	-24	-0.03
-10	-17	-0.02
± 0	-10	-0.01
10	-6	-0.01
20	-8	-0.01
30	2	0.00
40	7	0.01
50	4	0.01

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 7.1 setup A; 7.2 setup A, B
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:

QPSK

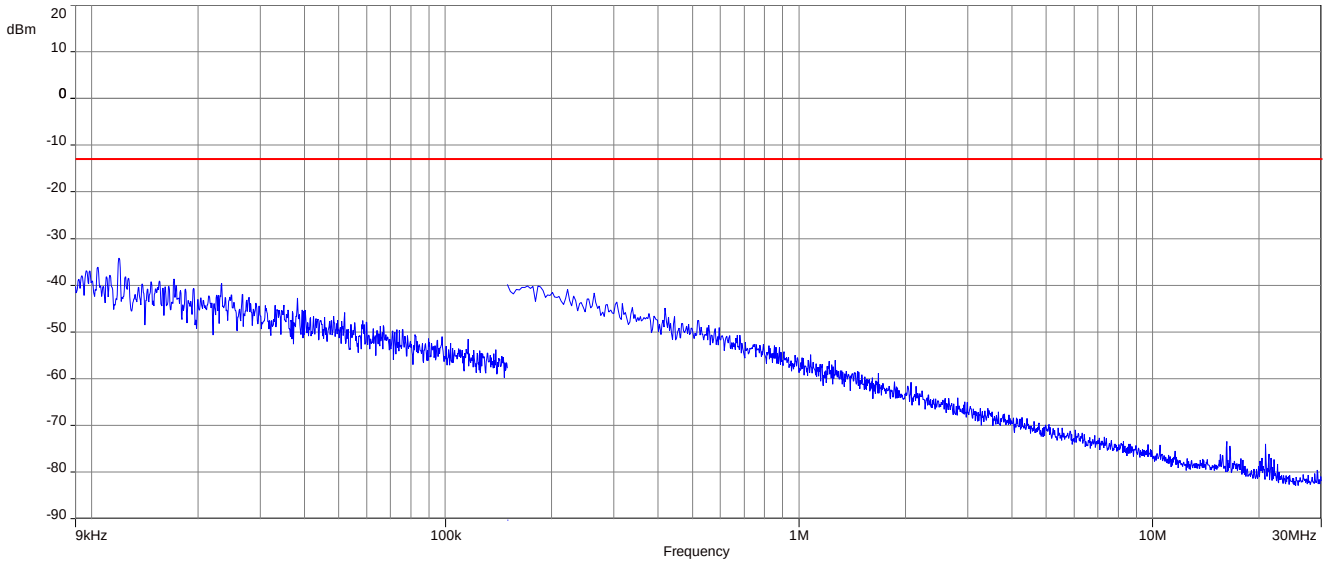
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

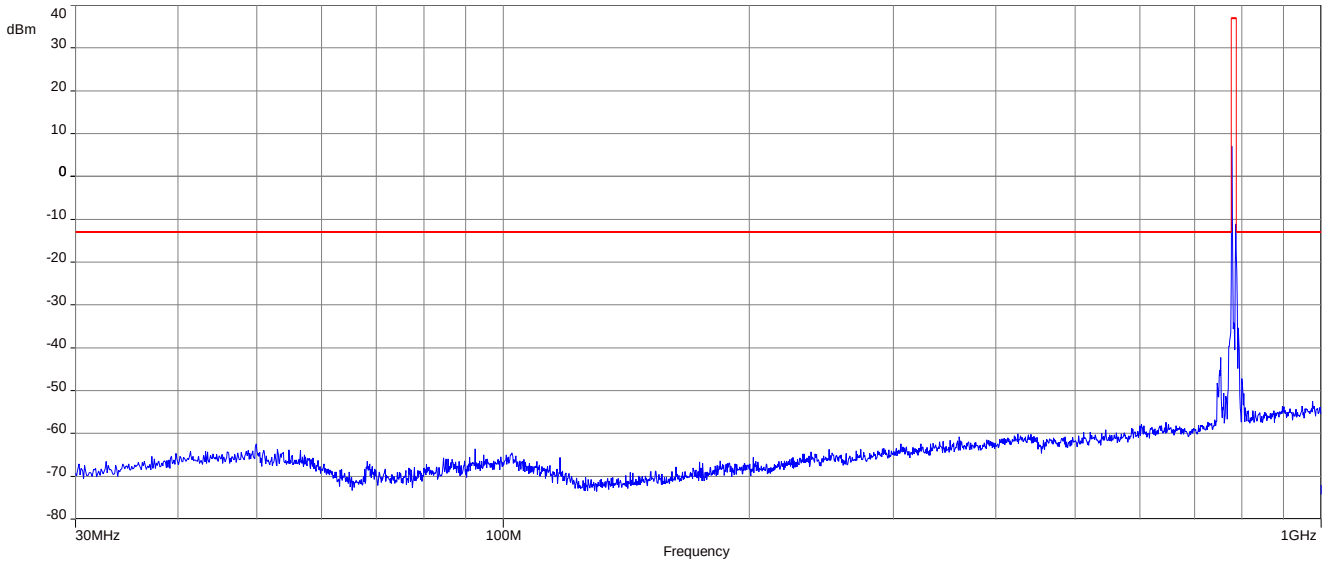
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

QPSK

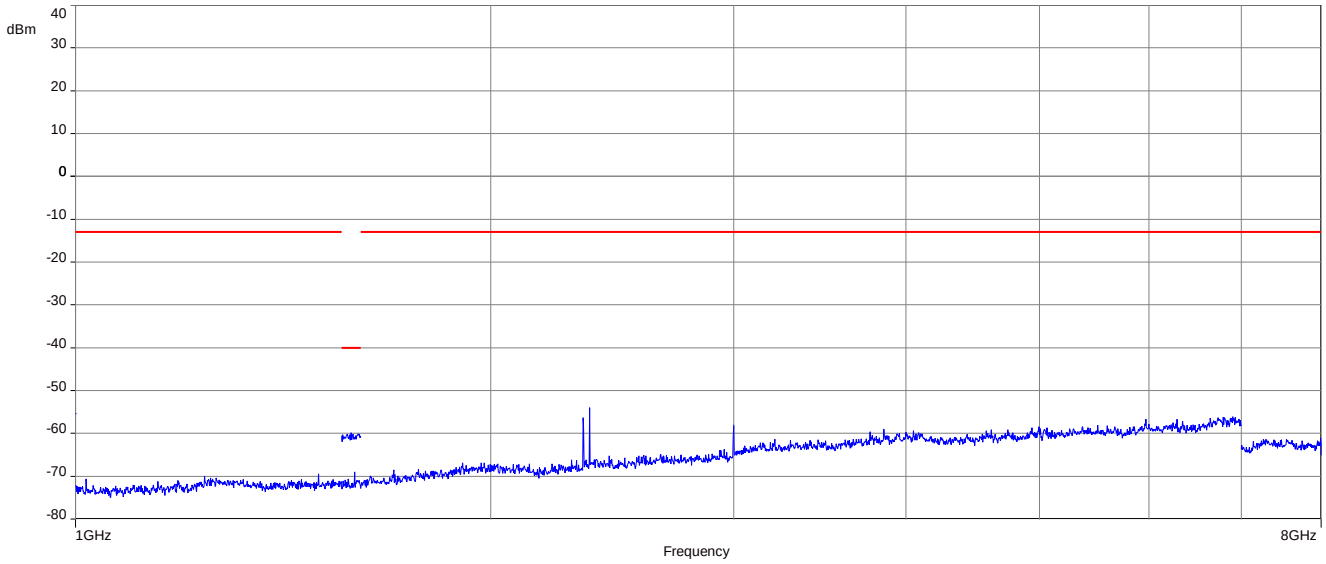
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz

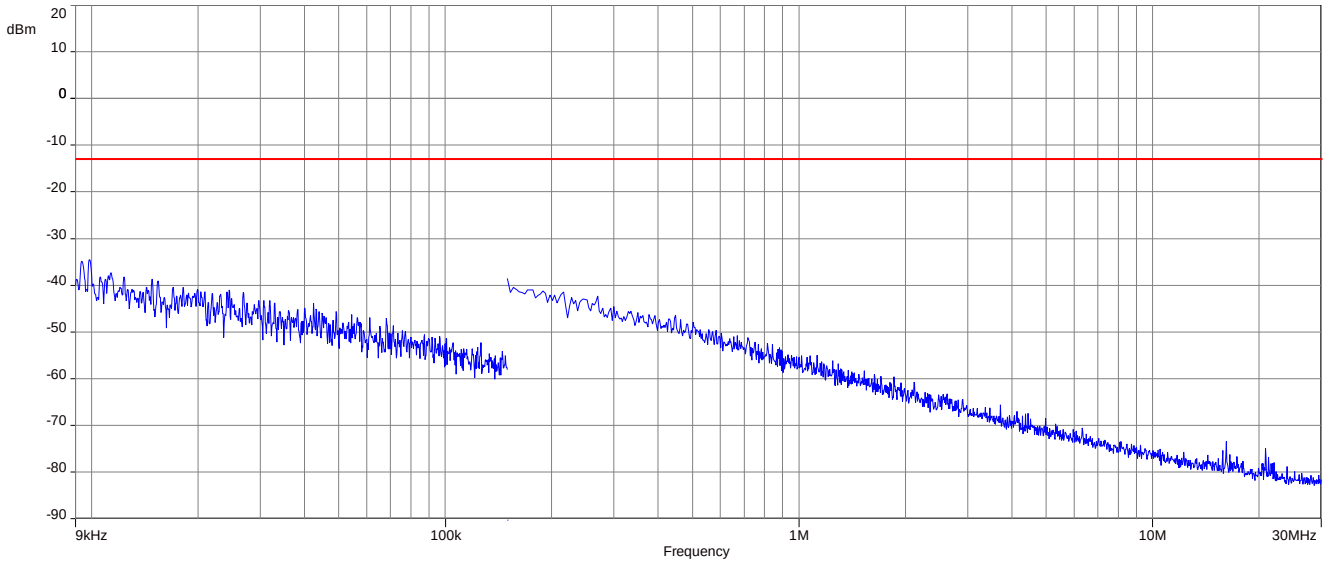


Plot 3: Middle channel, 1 MHz to 8 GHz

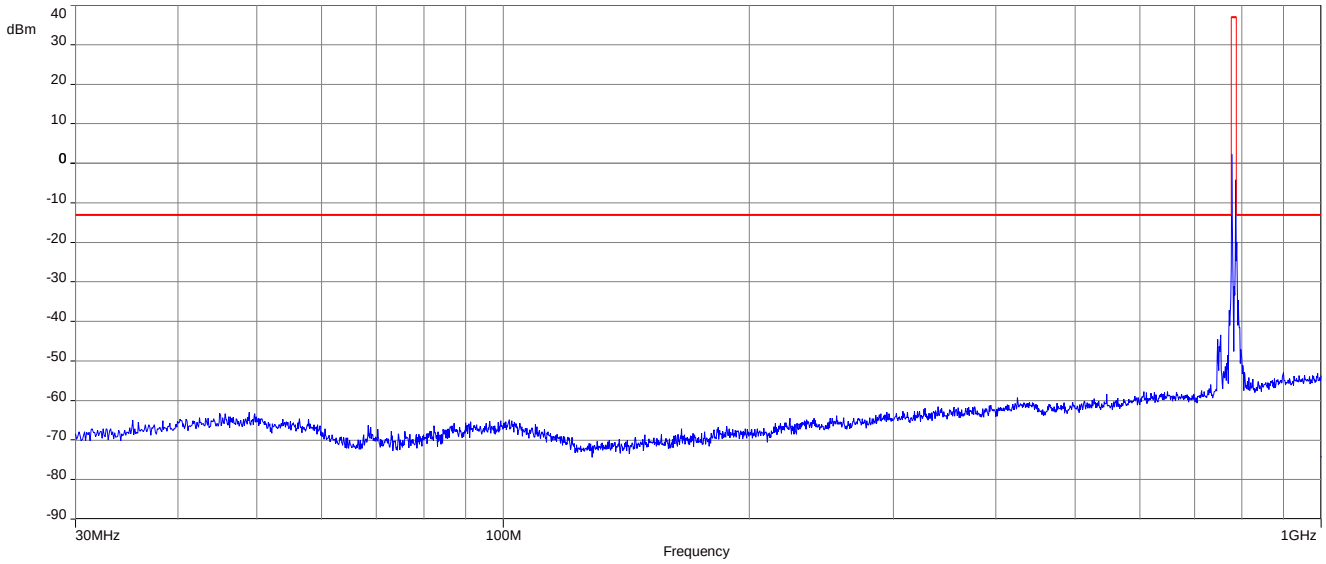


16-QAM

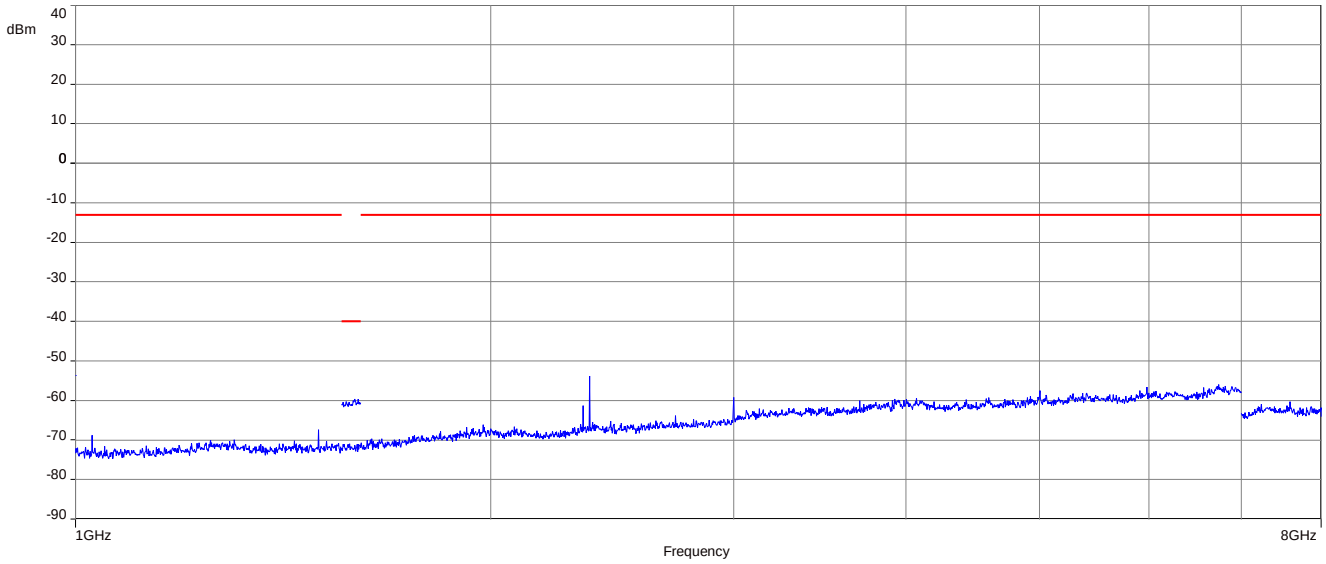
Plot 1: Middle channel, up to 30 MHz



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 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: **for 1.4 MHz channel bandwidth**

QPSK

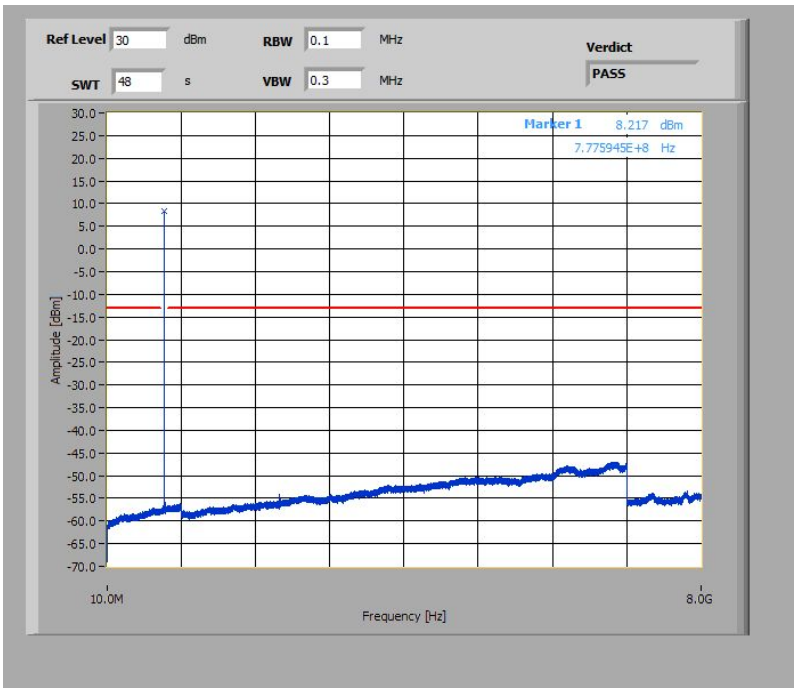
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

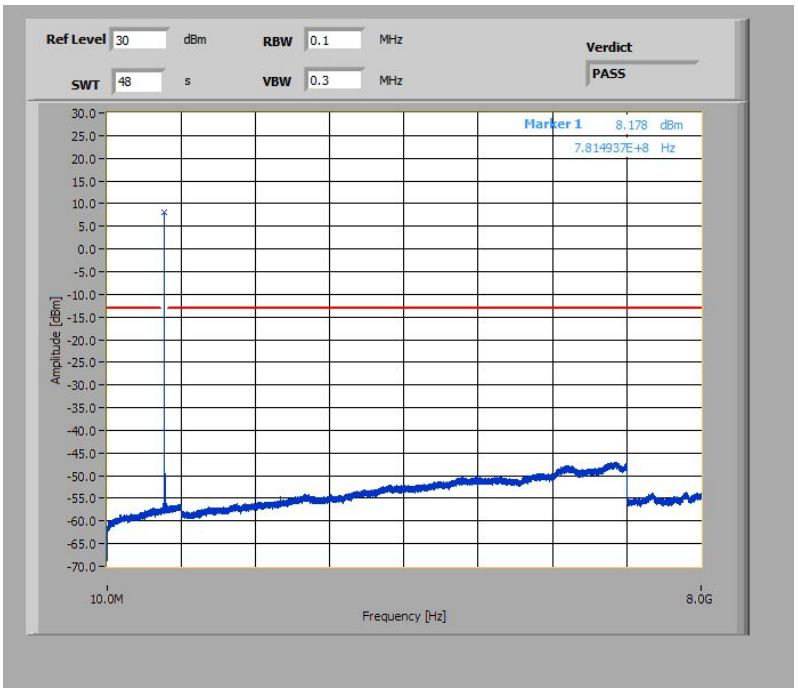
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

Plots for 1.4 MHz channel bandwidth, QPSK

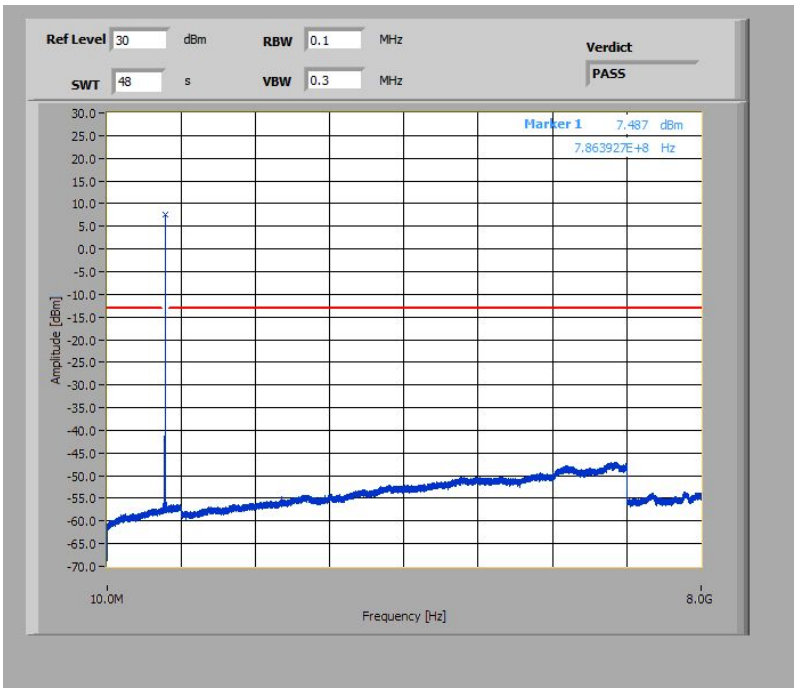
Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz

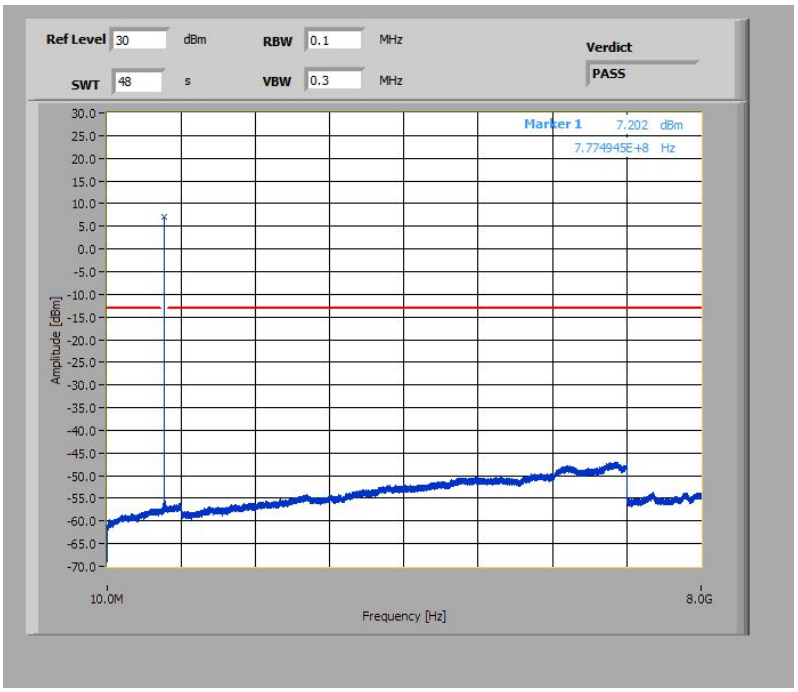


Plot 3: Highest channel, 10 MHz to 8 GHz

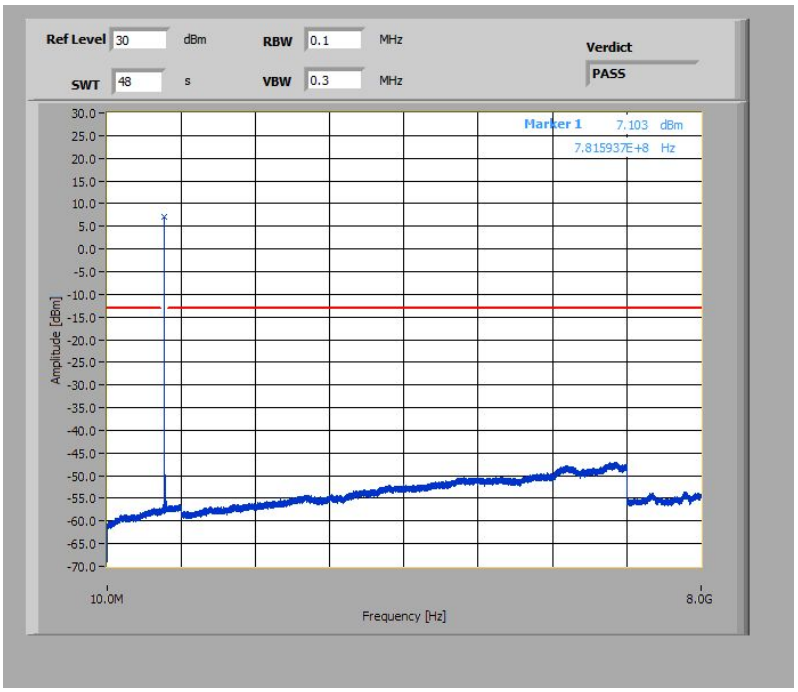


Plots for 1.4 MHz channel bandwidth, 16-QAM

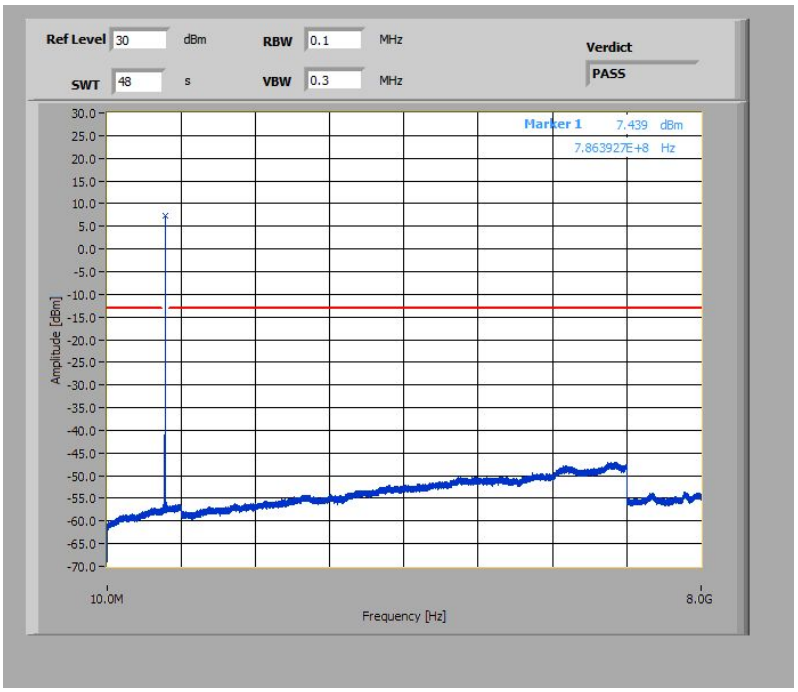
Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz



Plot 3: Highest channel, 10 MHz to 8 GHz



16.4.5 Block edge compliance

Description:

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

Measurement:

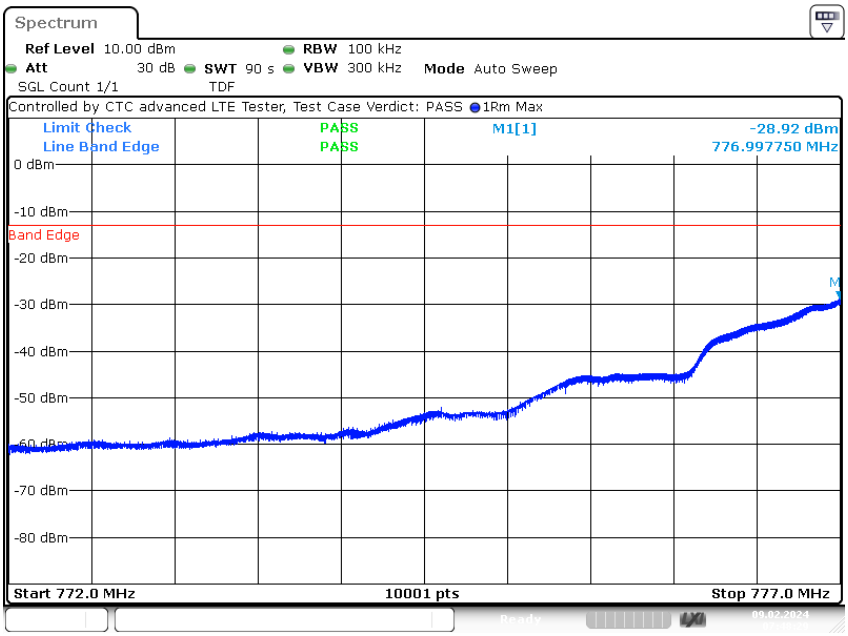
Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

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	

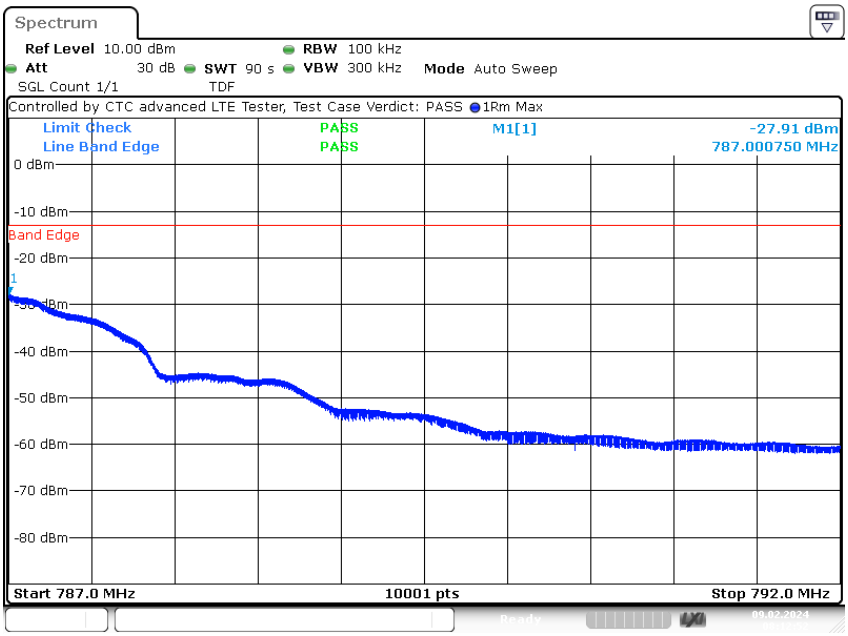
Results: **1.4 MHz channel bandwidth**

Plot 1: Lowest channel, QPSK modulation



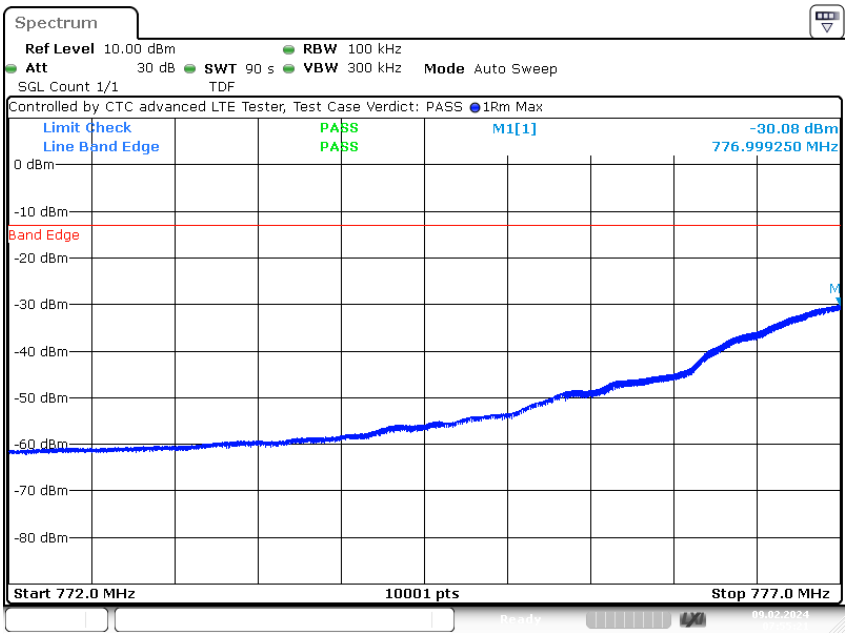
Date: 9.FEB.2024 07:48:29

Plot 2: Highest channel, QPSK modulation



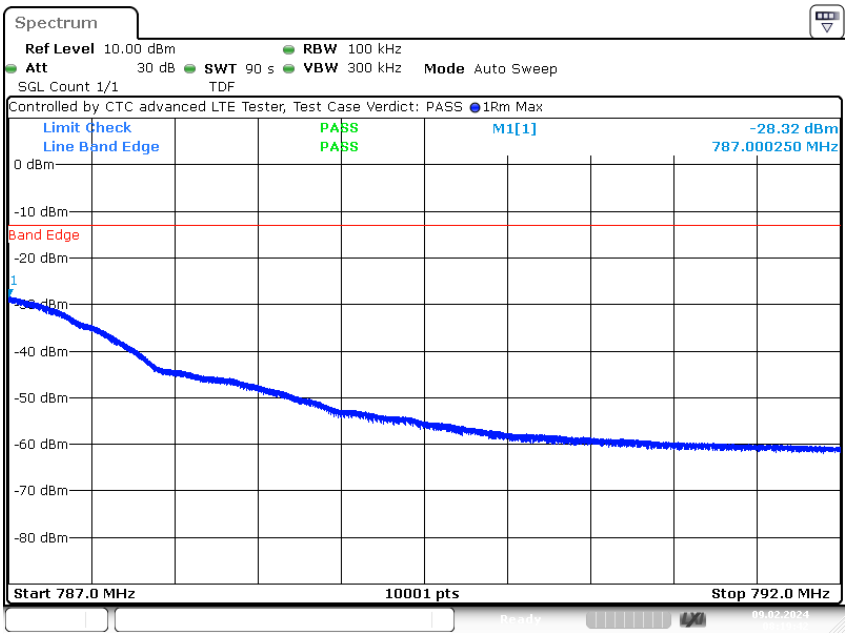
Date: 9.FEB.2024 08:12:52

Plot 3: Lowest channel, 16 – QAM modulation



Date: 9.FEB.2024 07:55:21

Plot 4: Highest channel, 16 – QAM modulation



Date: 9.FEB.2024 08:19:42

16.4.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

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	

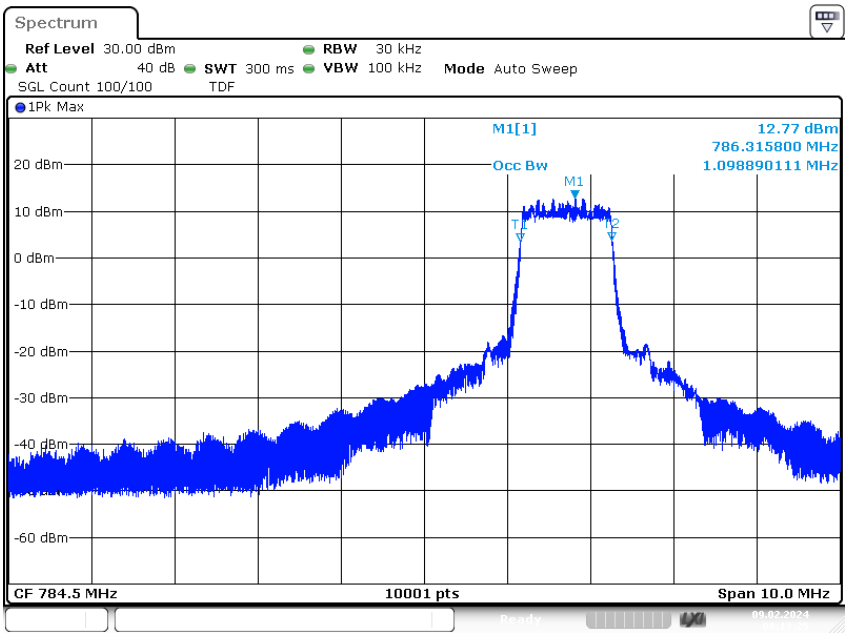
Results:

Occupied Bandwidth - QPSK		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
779.5	1099	1315
782.0	1096	1308
784.5	1099	1329

Occupied Bandwidth – 16-QAM		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
779.5	1107	1330
782.0	1102	1394
784.5	1099	1380

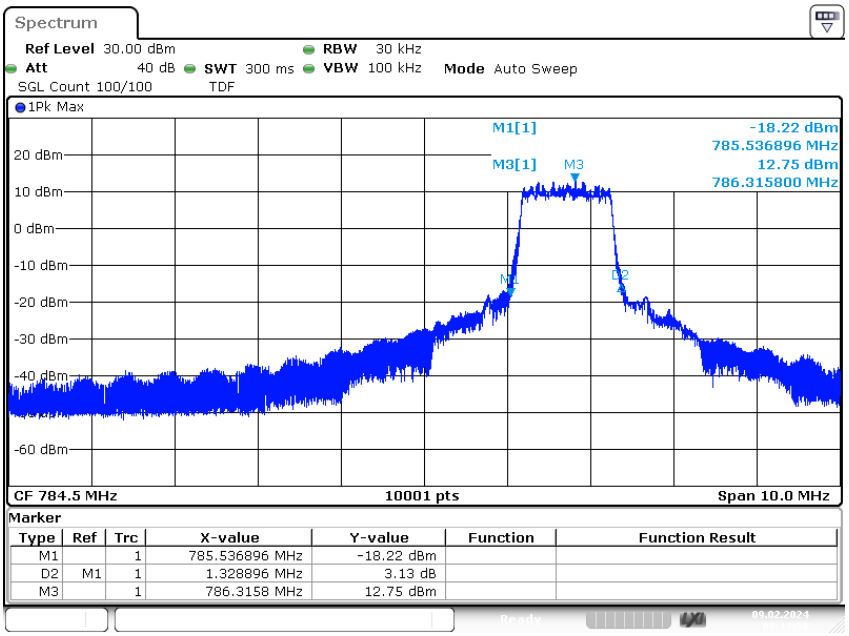
Plots: QPSK, worst case plots

Plot 1: high channel, 99% OBW



Date: 9.FEB.2024 08:13:25

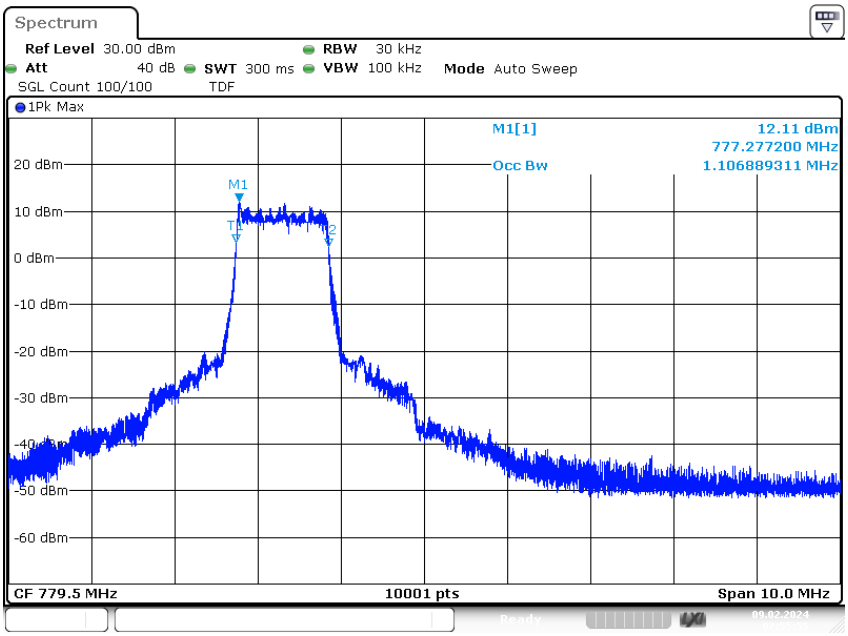
Plot 2: high channel, -26 dBc OBW



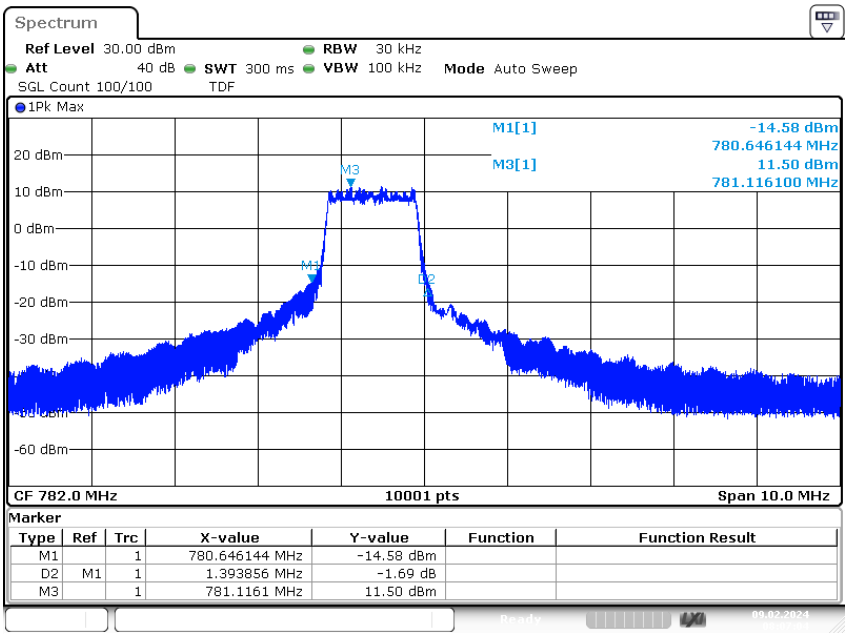
Date: 9.FEB.2024 08:13:58

Plots: 16-QAM, worst case plots

Plot 1: low channel, 99% OBW



Plot 2: mid channel, -26 dBc OBW



16.5 Results LTE band 26b

The EUT was set to transmit the maximum power.

16.5.1 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

Limits:

FCC
§ 90.635
b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).
Power: **50 ERP** PAPR: **-/-**

Results:

Results:

Output Power (conducted)						
Bandwidth (MHz)	**Channel No. / Frequency (MHz)**	**Resource block allocation**	**Average Output Power (dBm) QPSK**	**Peak to Average Ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak to Average Ratio (dB)**
1.4	26697 / 814.7	1 RB low	16,5	5,6	15,2	6,6
		1 RB high	16,3	5,7	15,3	6,6
		100% RB	14,5	6,2	14,5	7,0
	26740 / 819.0	1 RB low	16,5	5,6	15,2	6,6
		1 RB high	16,3	5,7	15,3	6,6
		100% RB	14,4	6,1	14,5	7,0
	26783 / 823.3	1 RB low	16,5	5,6	15,2	6,6
		1 RB high	16,3	5,7	15,3	6,6
		100% RB	14,4	6,1	14,5	7,0
3	26705 / 815.5	1 RB low	16,5	5,6	15,3	6,6
		1 RB high	16,3	5,7	15,3	6,6
		100% RB	14,5	6,3	14,6	6,9
	26740 / 819.0	1 RB low	16,5	5,6	15,3	6,6
		1 RB high	16,3	5,7	15,3	6,6
		100% RB	14,4	6,1	14,5	7,0
	26775 / 822.5	1 RB low	16,5	5,6	15,3	6,6
		1 RB high	16,4	5,7	15,3	6,6
		100% RB	14,4	6,1	14,6	7,0
5	26715 / 816.5	1 RB low	18,3	3,8	18,2	4,3
		1 RB high	18,1	3,9	18,1	4,4
		100% RB	17,3	4,5	16,2	5,4
	26740 / 819.0	1 RB low	18,2	3,9	18,2	4,3
		1 RB high	18,1	3,9	18,1	4,4
		100% RB	17,3	4,5	16,2	5,4
	26765 / 820.5	1 RB low	18,2	3,9	18,3	4,3
		1 RB high	18,2	3,9	18,2	4,4
		100% RB	17,4	4,5	16,3	5,4
10	26740 / 819.0	1 RB low	18,3	3,9	18,1	4,3
		1 RB high	17,9	3,9	18,0	4,4
		100% RB	17,3	4,4	17,2	5,1
	26740 / 819.0	1 RB low	18,2	3,9	18,2	4,3
		1 RB high	17,9	3,9	18,0	4,4
		100% RB	17,3	4,4	17,2	5,1
	26715 / 819.0	1 RB low	18,2	3,9	18,1	4,3
		1 RB high	17,9	3,9	18,0	4,4
		100% RB	17,3	4,4	17,1	5,2

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

Output Power (ERP)			
Bandwidth (MHz)	**Frequency (MHz)**	**Average Output Power (dBm) QPSK**	**Average Output Power (dBm) 16-QAM**
1.4	814.7	16,5	15,3
	819.0	16,5	15,3
	823.3	16,5	15,3
3	815.5	16,5	15,3
	819.0	16,5	15,3
	822.5	16,5	15,3
5	816.5	18,3	18,2
	819.0	18,2	18,2
	820.5	18,2	18,3
10	-/-	-/-	-/-
	819.0	18,2	18,2
	-/-	-/-	-/-

16.5.2 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:	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

Limits:

FCC
§ 90.213 (Mobile Station, 814 – 824 MHz)
The carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table 1 to §90.213(a).
± 2.5 ppm

Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.1	7	0.01
3.7	10	0.01
2.5	11	0.01

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-23	-0.03
-20	-11	-0.01
-10	-13	-0.02
± 0	1	0.00
10	-2	0.00
20	7	0.01
30	-11	-0.01
40	-19	-0.02
50	6	0.01

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

16.5.3 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 824 MHz. Measured up to 8 GHz. The resolution bandwidth is set as outlined in Part 90. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 26b.

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 7.1 setup A; 7.2 setup A, B
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13

Limits:

FCC
§ 90.691 (a)(2)
For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.
-13 dBm

Results:

QPSK

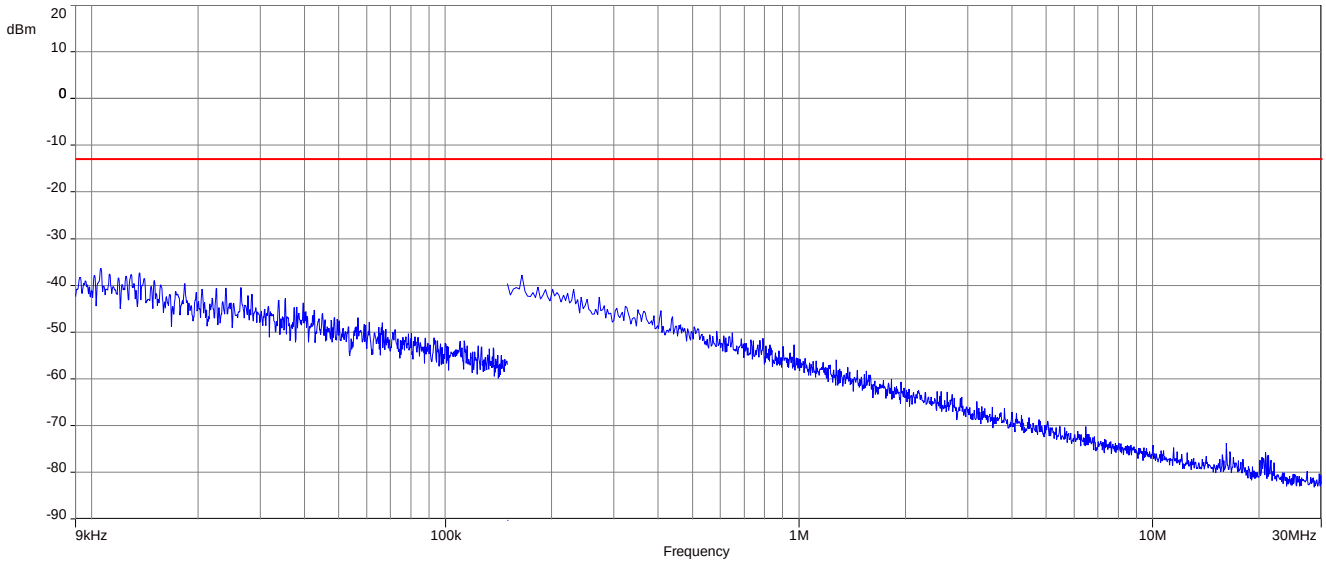
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

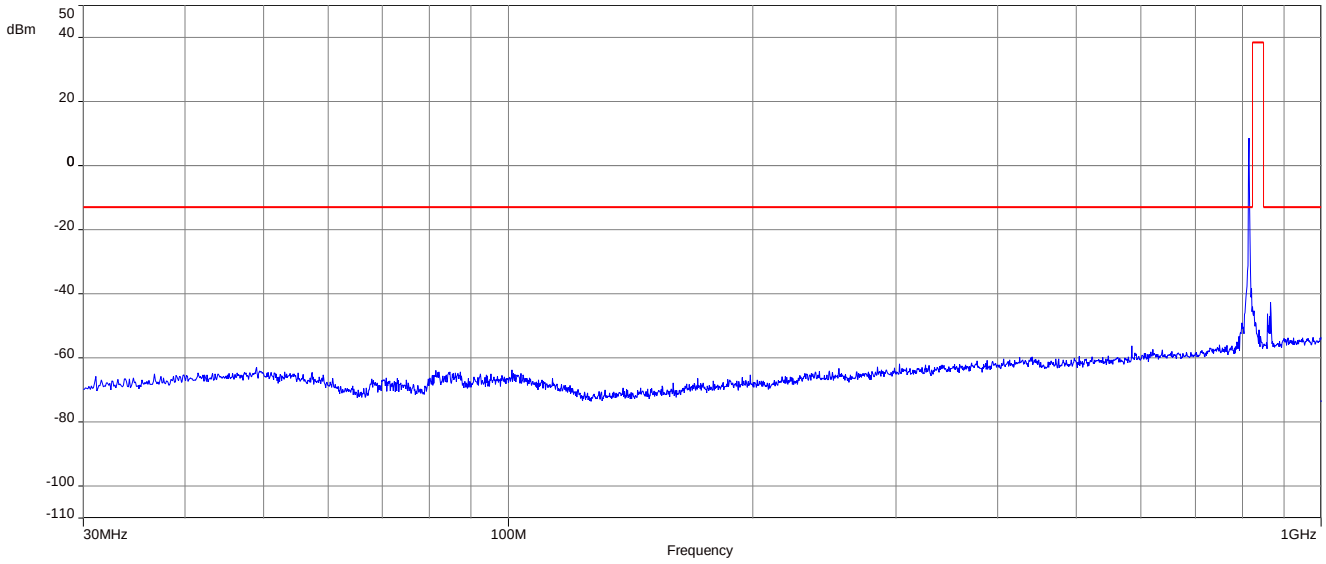
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

QPSK

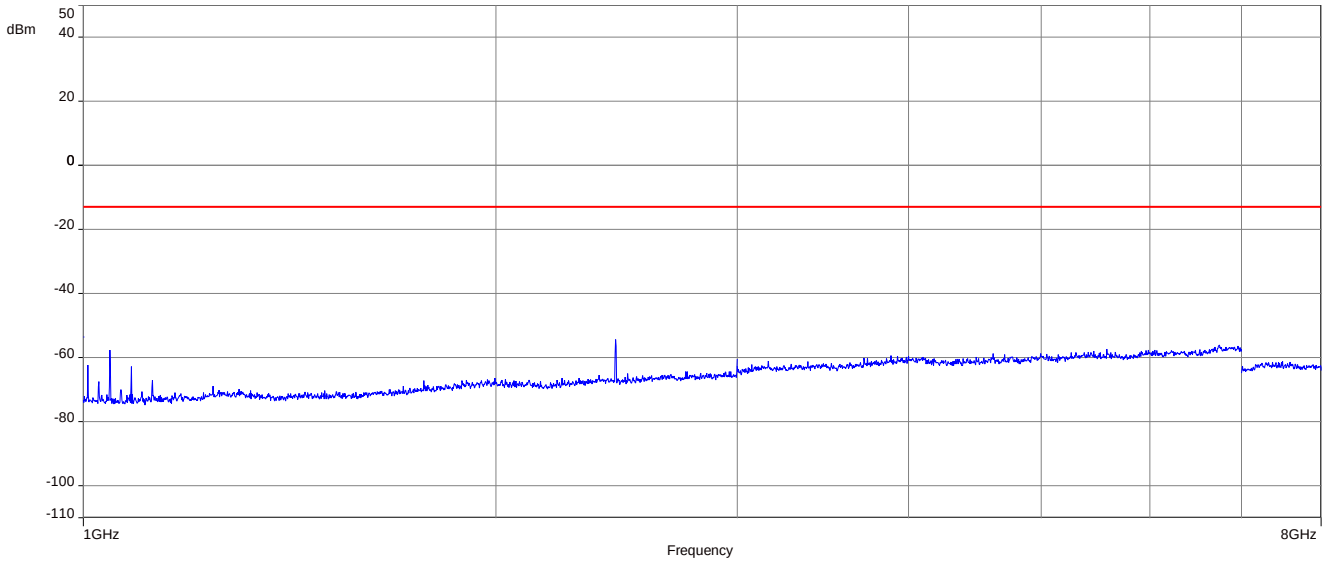
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz

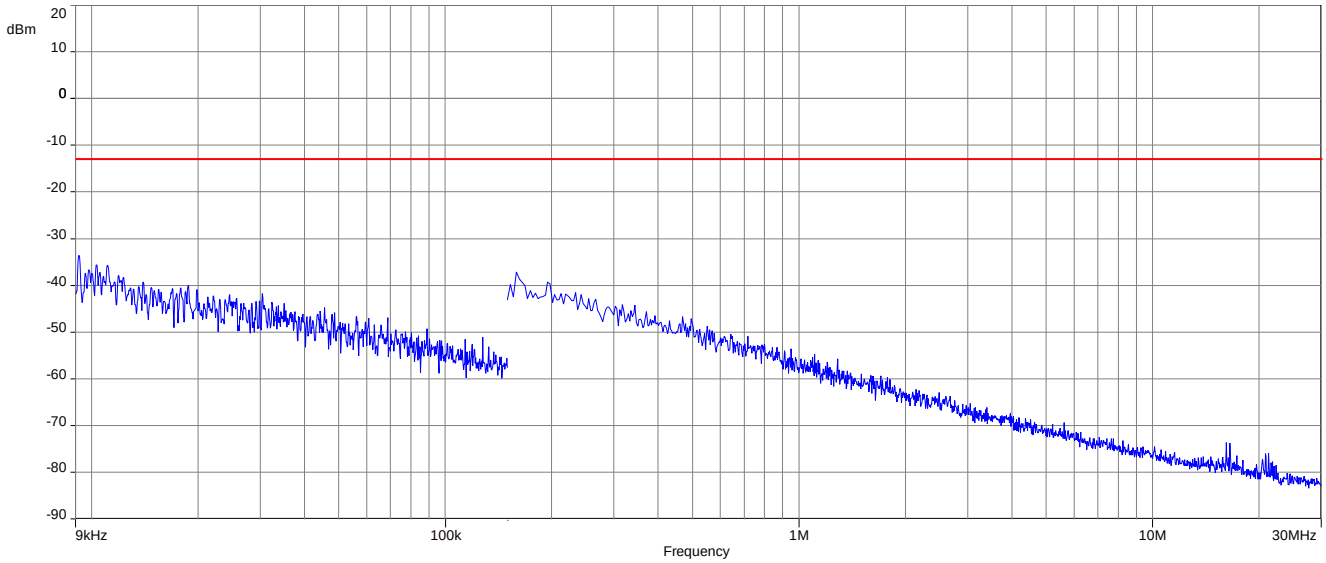


Plot 3: Middle channel, 1 MHz to 8 GHz

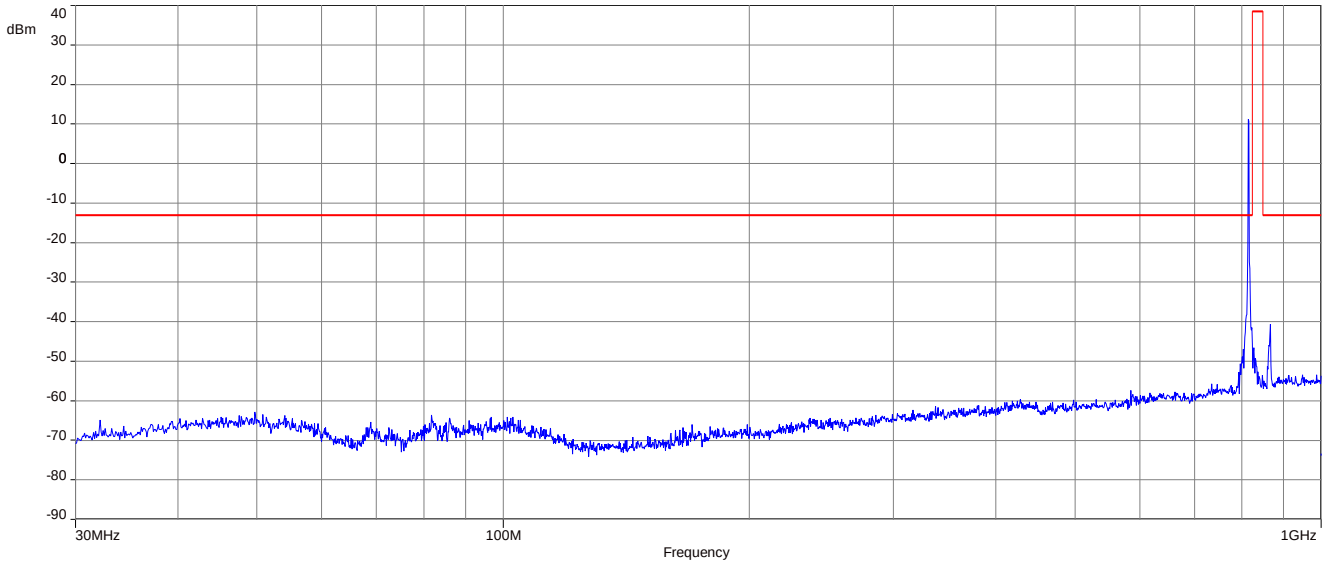


16-QAM

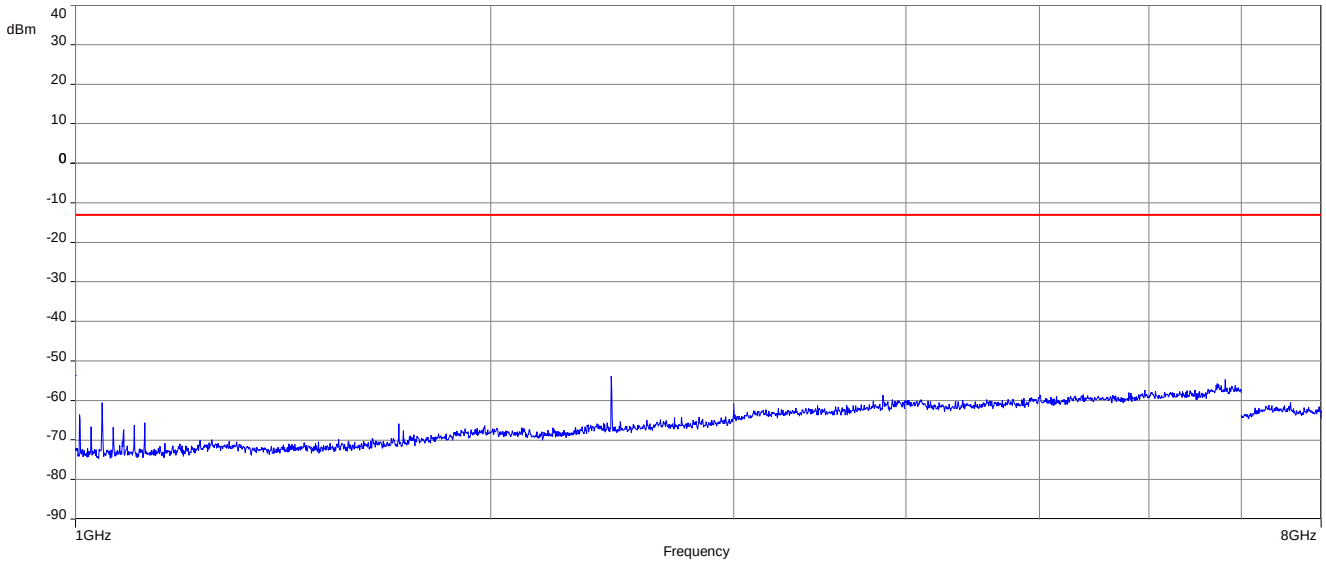
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz



Plot 3: Middle channel, 1 MHz to 8 GHz



16.5.4 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
§ 90.691 (a)(2)
For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.
-13 dBm

Results: **for 1.4 MHz channel bandwidth**

QPSK

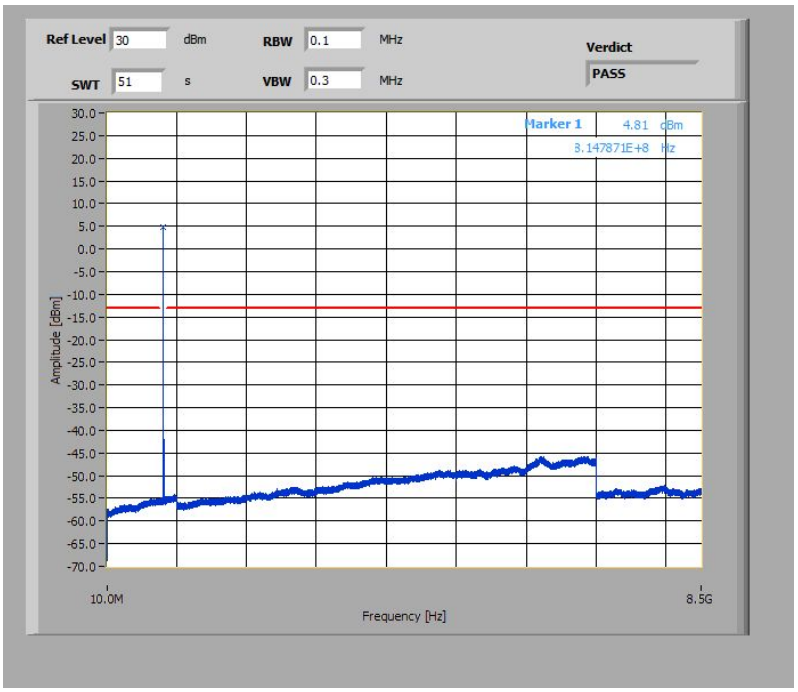
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

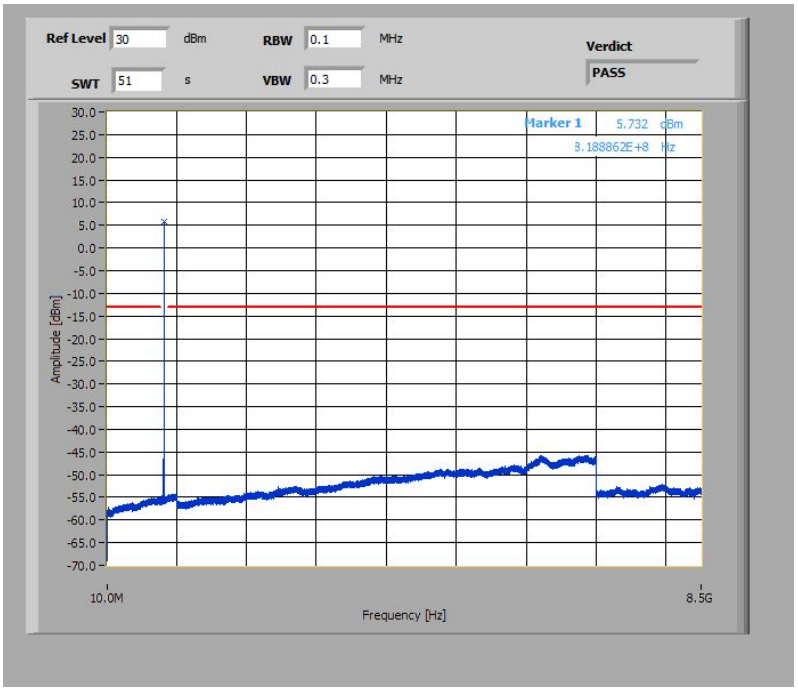
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

Plots for 1.4 MHz channel bandwidth, QPSK

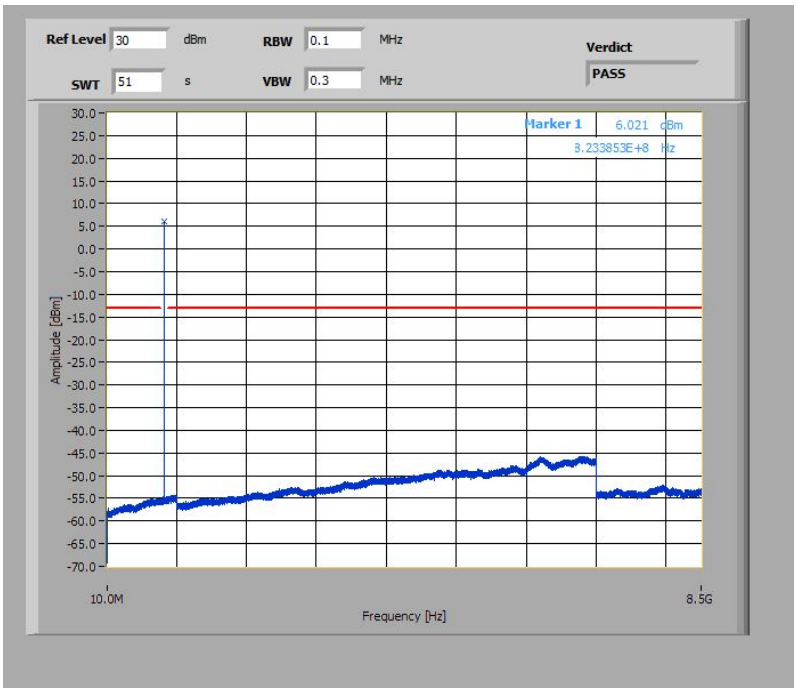
Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz

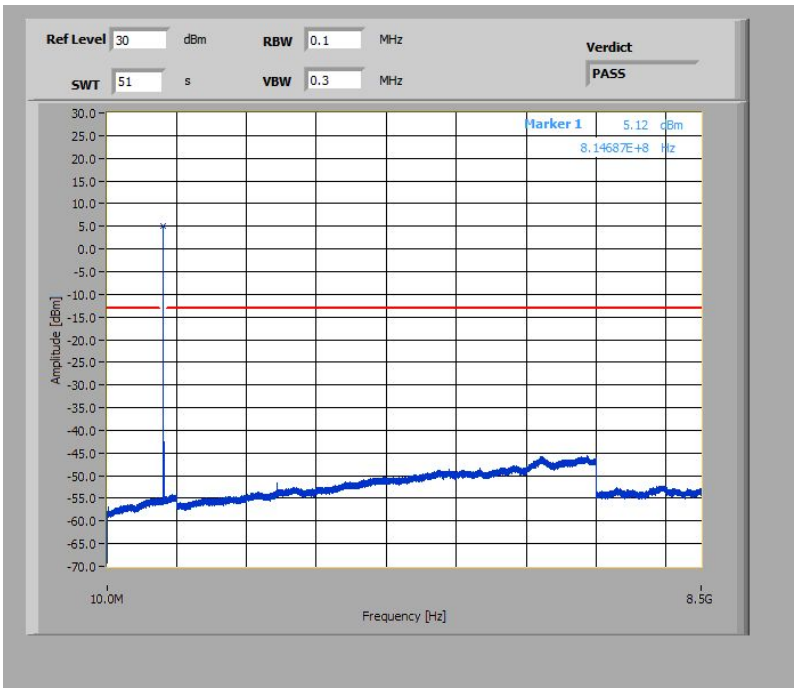


Plot 3: Highest channel, 10 MHz to 8 GHz

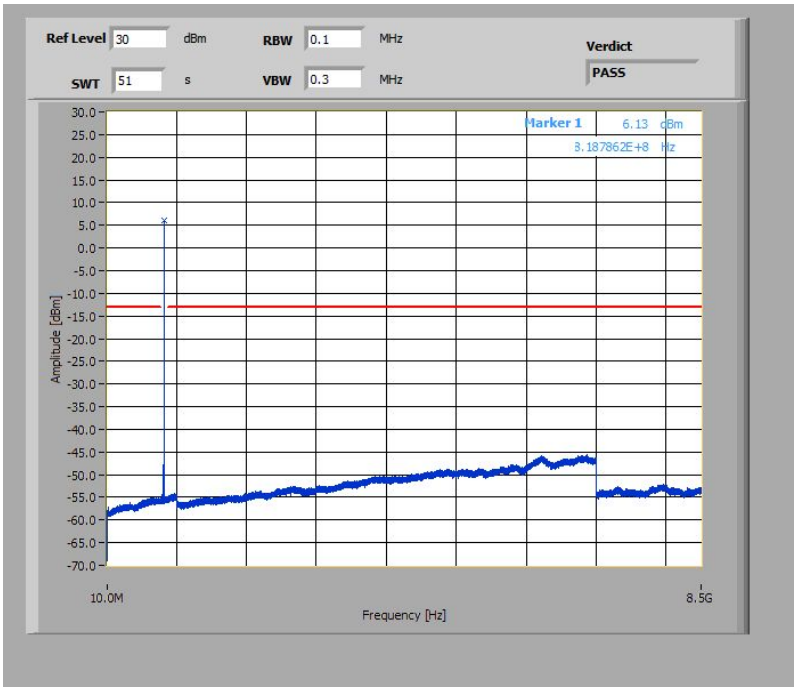


Plots for 1.4 MHz channel bandwidth, 16-QAM

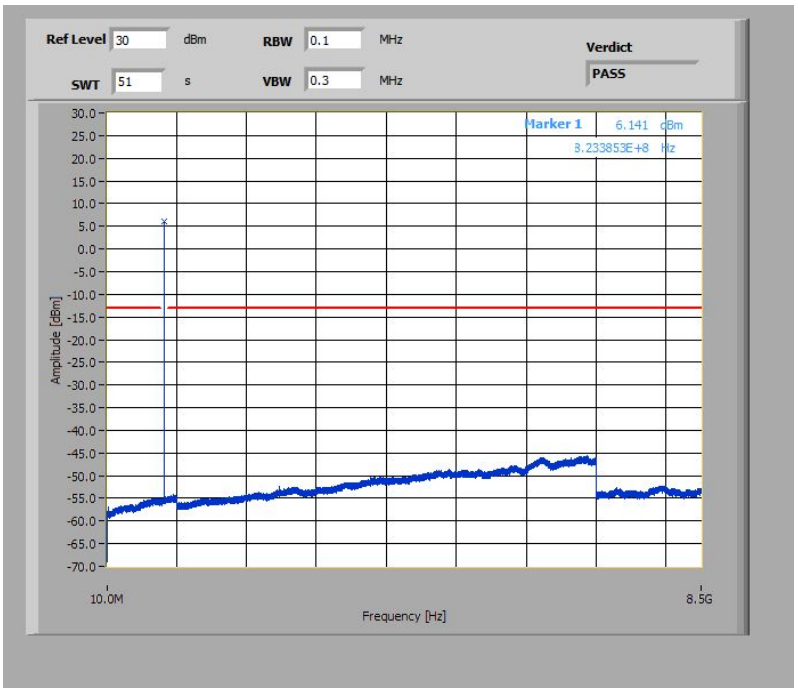
Plot 1: Lowest channel, 10 MHz to 8 GHz



Plot 2: Middle channel, 10 MHz to 8 GHz



Plot 3: Highest channel, 10 MHz to 8 GHz



16.5.5 Block edge compliance

Description:

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

Measurement:

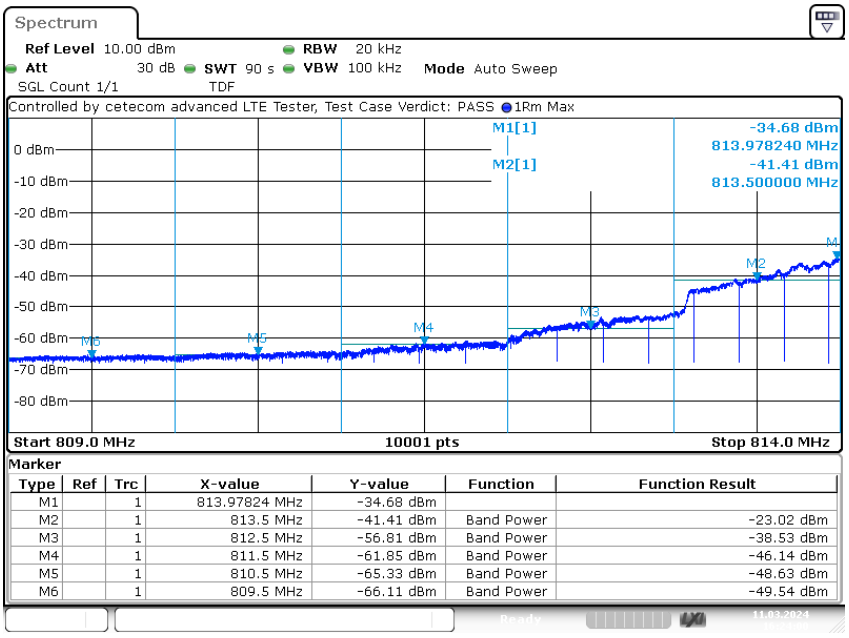
Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051

Limits:

FCC
§ 90.691 (a)(1)
For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
-20 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: **1.4 MHz channel bandwidth**

Plot 1: Lowest channel, QPSK modulation

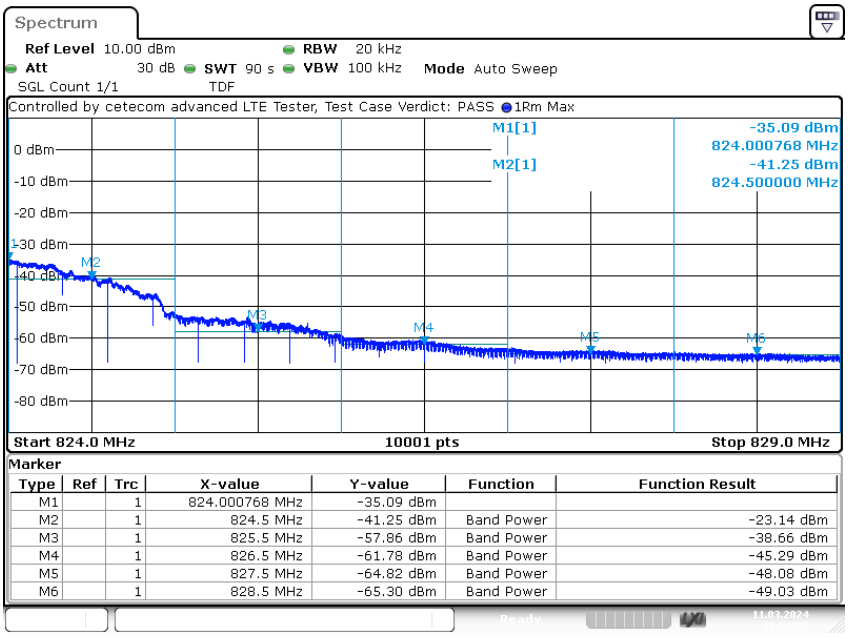


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	813.97824 MHz	-34.68 dBm		
M2		1	813.5 MHz	-41.41 dBm	Band Power	-23.02 dBm
M3		1	812.5 MHz	-56.81 dBm	Band Power	-38.53 dBm
M4		1	811.5 MHz	-61.85 dBm	Band Power	-46.14 dBm
M5		1	810.5 MHz	-65.33 dBm	Band Power	-48.63 dBm
M6		1	809.5 MHz	-66.11 dBm	Band Power	-49.54 dBm

Date: 11.MAR.2024 16:24:00

Plot 2: Highest channel, QPSK modulation

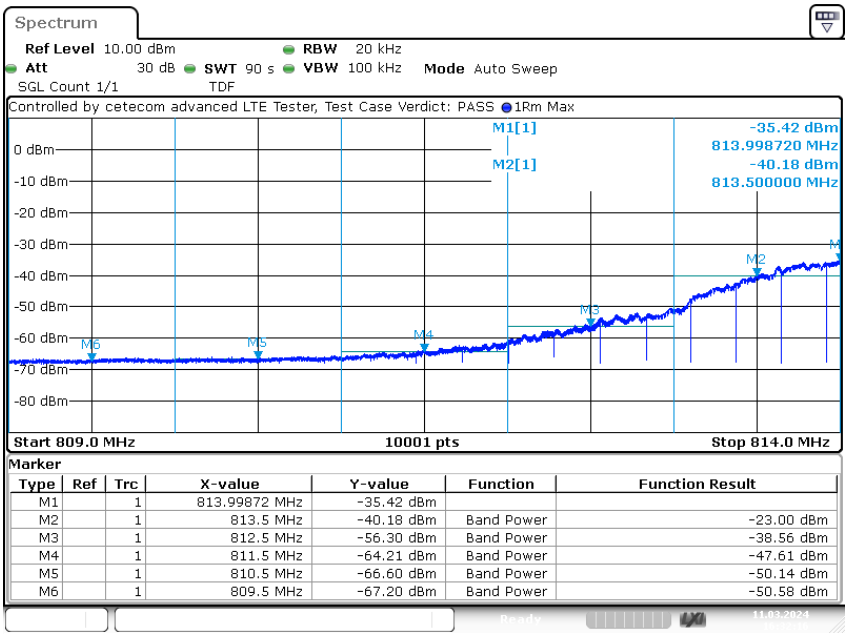


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	824.000768 MHz	-35.09 dBm		
M2		1	824.5 MHz	-41.25 dBm	Band Power	-23.14 dBm
M3		1	825.5 MHz	-57.86 dBm	Band Power	-38.66 dBm
M4		1	826.5 MHz	-61.78 dBm	Band Power	-45.29 dBm
M5		1	827.5 MHz	-64.82 dBm	Band Power	-48.08 dBm
M6		1	828.5 MHz	-65.30 dBm	Band Power	-49.03 dBm

Date: 11.MAR.2024 16:53:55

Plot 3: Lowest channel, 16 – QAM modulation

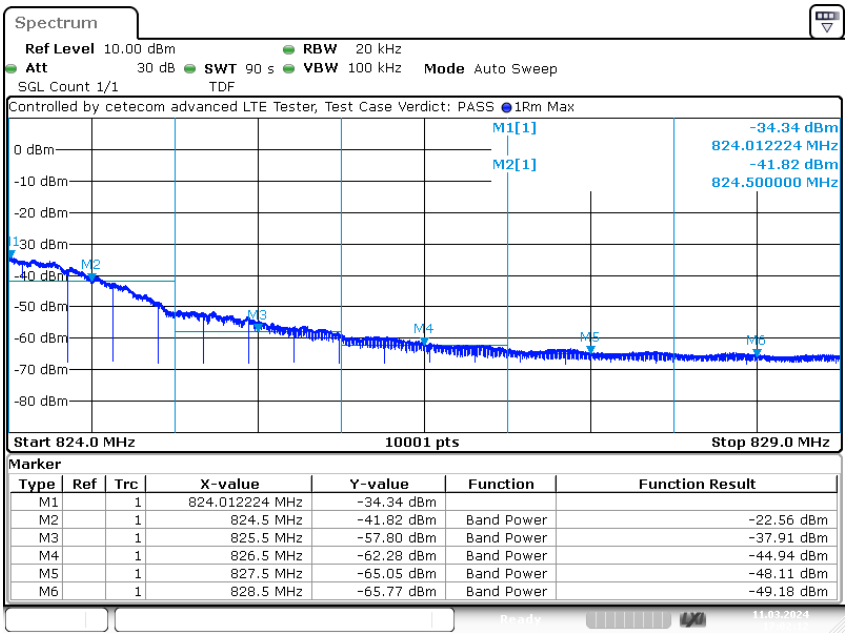


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	813.99872 MHz	-35.42 dBm		
M2		1	813.5 MHz	-40.18 dBm	Band Power	-23.00 dBm
M3		1	812.5 MHz	-56.30 dBm	Band Power	-38.56 dBm
M4		1	811.5 MHz	-64.21 dBm	Band Power	-47.61 dBm
M5		1	810.5 MHz	-66.60 dBm	Band Power	-50.14 dBm
M6		1	809.5 MHz	-67.20 dBm	Band Power	-50.58 dBm

Date: 11.MAR.2024 16:32:16

Plot 4: Highest channel, 16 – QAM modulation



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	824.012224 MHz	-34.34 dBm		
M2		1	824.5 MHz	-41.82 dBm	Band Power	-22.56 dBm
M3		1	825.5 MHz	-57.80 dBm	Band Power	-37.91 dBm
M4		1	826.5 MHz	-62.28 dBm	Band Power	-44.94 dBm
M5		1	827.5 MHz	-65.05 dBm	Band Power	-48.11 dBm
M6		1	828.5 MHz	-65.77 dBm	Band Power	-49.18 dBm

Date: 11.MAR.2024 17:02:11

16.5.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

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
§ 2.1049
Reporting only

FCC	ISED
§ 2.1049	-/-
Reporting only	

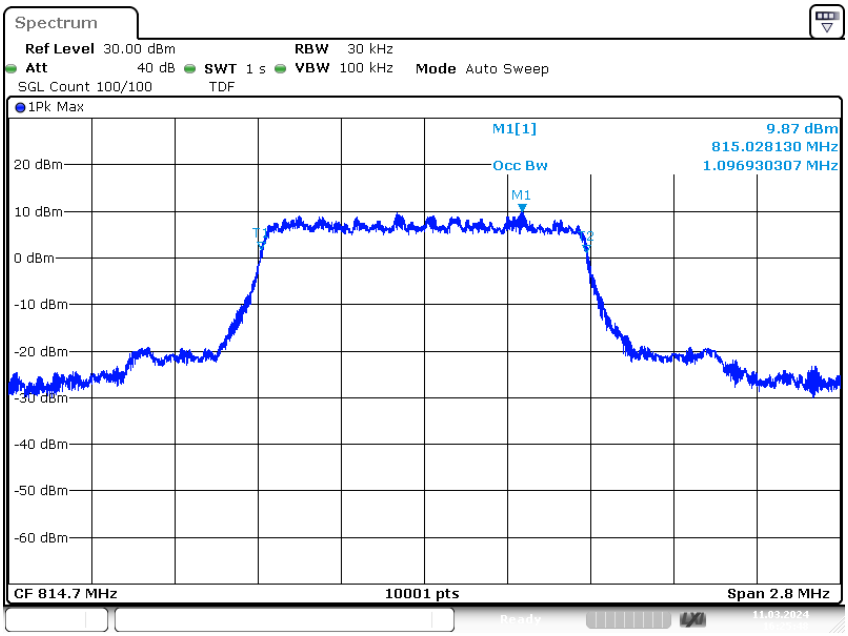
Results:

Occupied Bandwidth - QPSK		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
814.7	1097	1331
819.0	1094	1336
823.3	1097	1323

Occupied Bandwidth – 16-QAM		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
814.7	1094	1293
819.0	1095	1317
823.3	1096	1282

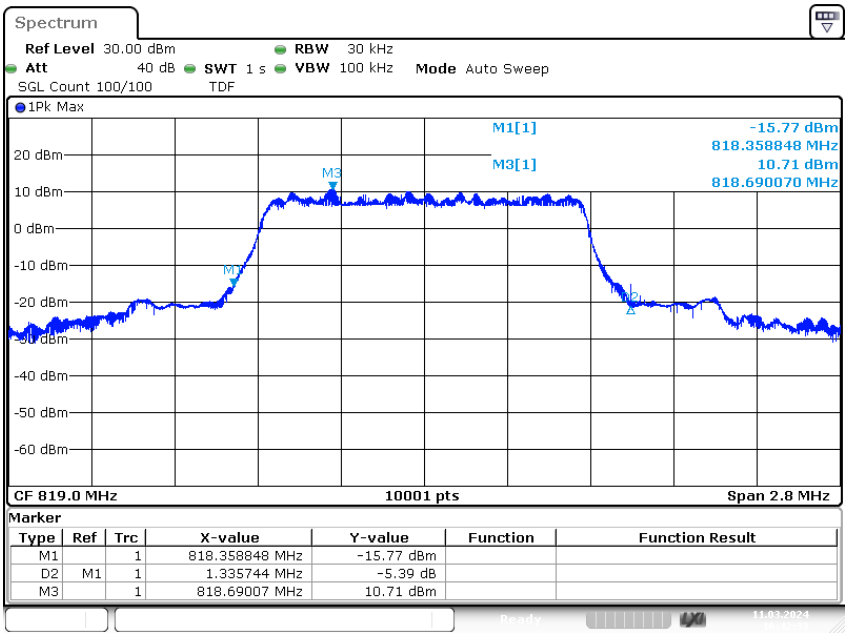
Plots: QPSK, worst case plots

Plot 1: low channel, 99% OBW



Date: 11.MAR.2024 16:25:48

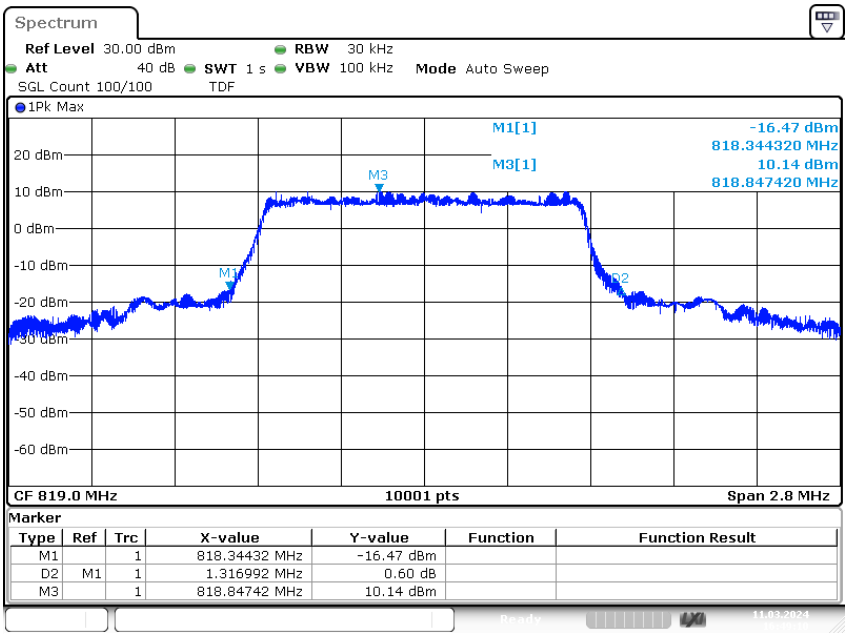
Plot 2: mid channel, -26 dBc OBW



Date: 11.MAR.2024 16:42:33

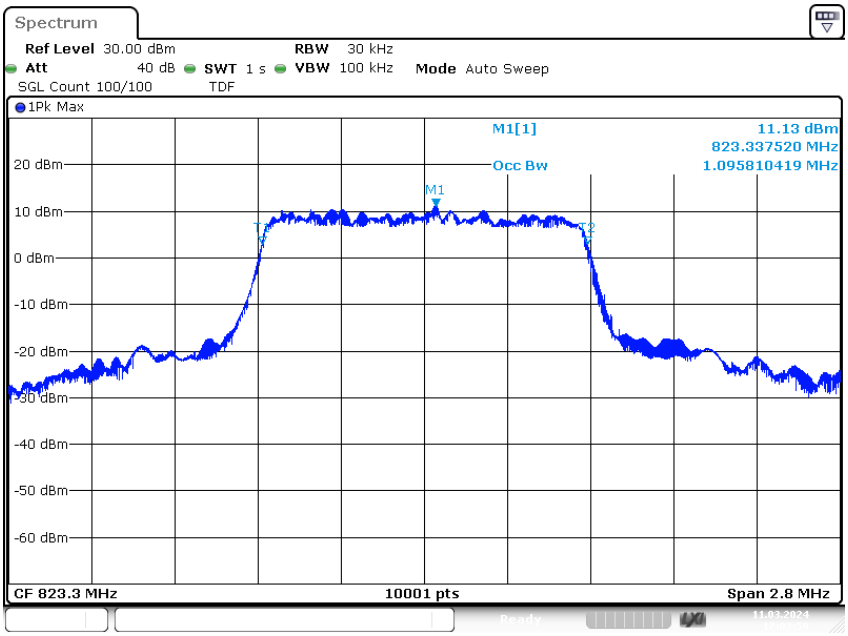
Plots: 16-QAM, worst case plots

Plot 1: mid channel, -26 dBc OBW



Date: 11.MAR.2024 16:49:09

Plot 2: high channel, 99% OBW



Date: 11.MAR.2024 17:03:59

16.6 Results LTE band 66

The EUT was set to transmit the maximum power.

16.6.1 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(d)(4) & (5)	RSS-139, 6.5
(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. (5) In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.	The equivalent isotropically radiated power (e.i.r.p.) for mobile and portable transmitters shall not exceed one watt. In addition, the peak to average power ratio (PAPR) of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.
Power: **33 dBm EIRP** PAPR: **13 dB**	

Results:

Output Power (conducted)						
Bandwidth (MHz)	**Channel No. / Frequency (MHz)**	**Resource block allocation**	**Average Output Power (dBm) QPSK**	**Peak to Average Ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak to Average Ratio (dB)**
1.4	1710.7	1 RB low	17,7	5,9	16,3	7,1
		1 RB high	17,5	6,0	16,3	7,1
		100% RB	15,6	6,8	15,6	7,4
	1745	1 RB low	17,6	6,1	16,4	7,2
		1 RB high	17,5	6,1	16,4	7,2
		100% RB	15,5	6,8	15,6	7,5
	1779.3	1 RB low	17,5	6,1	16,6	7,1
		1 RB high	17,4	6,2	16,5	7,1
		100% RB	15,5	7,0	15,5	7,6
3	1711.5	1 RB low	17,7	5,9	15,5	7,9
		1 RB high	17,5	6,0	16,3	7,1
		100% RB	14,7	7,5	14,8	8,2
	1745	1 RB low	17,6	6,1	16,4	7,2
		1 RB high	17,4	6,2	16,2	7,3
		100% RB	5,0	16,8	14,3	8,6
	1778.5	1 RB low	17,4	6,1	16,2	7,2
		1 RB high	17,2	6,2	16,2	7,2
		100% RB	15,4	6,9	15,7	7,5
5	1712.5	1 RB low	19,5	4,2	19,4	4,8
		1 RB high	19,3	4,3	19,2	4,9
		100% RB	18,3	4,9	17,4	5,9
	1745	1 RB low	19,4	4,3	19,0	5,0
		1 RB high	19,1	4,4	18,8	5,0
		100% RB	18,1	5,0	17,1	6,1
	1777.5	1 RB low	19,6	4,3	19,5	4,8
		1 RB high	19,4	4,3	19,3	4,9
		100% RB	18,4	5,0	17,3	6,0

10	1715	1 RB low	19,5	4,2	19,3	4,8
		1 RB high	19,2	4,3	19,2	4,9
		100% RB	18,3	4,9	18,4	5,6
	1745	1 RB low	19,2	4,3	18,9	5,0
		1 RB high	18,9	4,4	18,7	5,1
		100% RB	18,3	5,0	18,1	5,8
	1775	1 RB low	19,1	4,4	18,9	5,0
		1 RB high	19,2	4,4	19,2	4,9
		100% RB	17,9	5,1	18,0	5,8
15	1717.5	1 RB low	19,2	4,2	19,2	4,8
		1 RB high	19,1	4,3	19,2	4,8
		100% RB	19,2	4,6	19,3	5,1
	1745	1 RB low	19,2	4,3	18,8	5,0
		1 RB high	19,0	4,4	18,8	5,0
		100% RB	18,9	4,7	18,9	5,4
	1772.5	1 RB low	19,5	4,3	19,5	4,7
		1 RB high	19,1	4,4	19,4	4,8
		100% RB	19,1	4,8	19,2	5,2
20	1720	1 RB low	18,9	4,2	18,9	4,8
		1 RB high	18,9	4,3	18,8	4,9
		100% RB	18,9	4,6	19,0	5,1
	1745	1 RB low	19,0	4,2	18,5	5,0
		1 RB high	18,6	4,4	18,4	5,0
		100% RB	18,8	4,7	18,8	5,3
	1770	1 RB low	19,4	4,3	19,2	4,8
		1 RB high	19,1	4,3	19,0	4,9
		100% RB	19,0	4,8	19,1	5,2

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

Output Power (EIRP)			
Bandwidth (MHz)	**Frequency (MHz)**	**Average Output Power (dBm) QPSK**	**Average Output Power (dBm) 16-QAM**
1.4	1710.7	17,8	16,4
	1745	17,7	16,5
	1779.3	17,6	16,7
3	1711.5	17,8	16,7
	1745	17,7	16,5
	1778.5	17,5	16,3
5	1712.5	19,6	19,5
	1745	19,5	19,1
	1777.5	19,7	19,6
10	1715	19,6	19,4
	1745	19,3	19,0
	1775	19,3	19,3
15	1717.5	19,3	19,4
	1745	19,3	19,0
	1772.5	19,6	19,6
20	1720	19,0	19,1
	1745	19,1	18,9
	1770	19,5	19,3

16.6.2 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:	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-139, 6.4
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 stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

Results:

FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
4.1	-43	-0.02
3.7	-40	-0.02
2.5	-39	-0.02

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-18	-0.01
-20	-29	-0.02
-10	-59	-0.03
± 0	-17	-0.01
10	-26	-0.02
20	-43	-0.02
30	-19	-0.01
40	11	-0.01
50	1	0.00

16.6.3 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 1780 MHz. Measured up to 18 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 66.

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 7.1 setup A; 7.2 setup A, B
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1053 ISED: RSS-Gen, 6.13

Limits:

FCC	ISED
§ 27.53(h)(1) & (3)	RSS-139, 6.6
(1) Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB. (3) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.	i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB. ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB.
-13 dBm	

Results:

QPSK

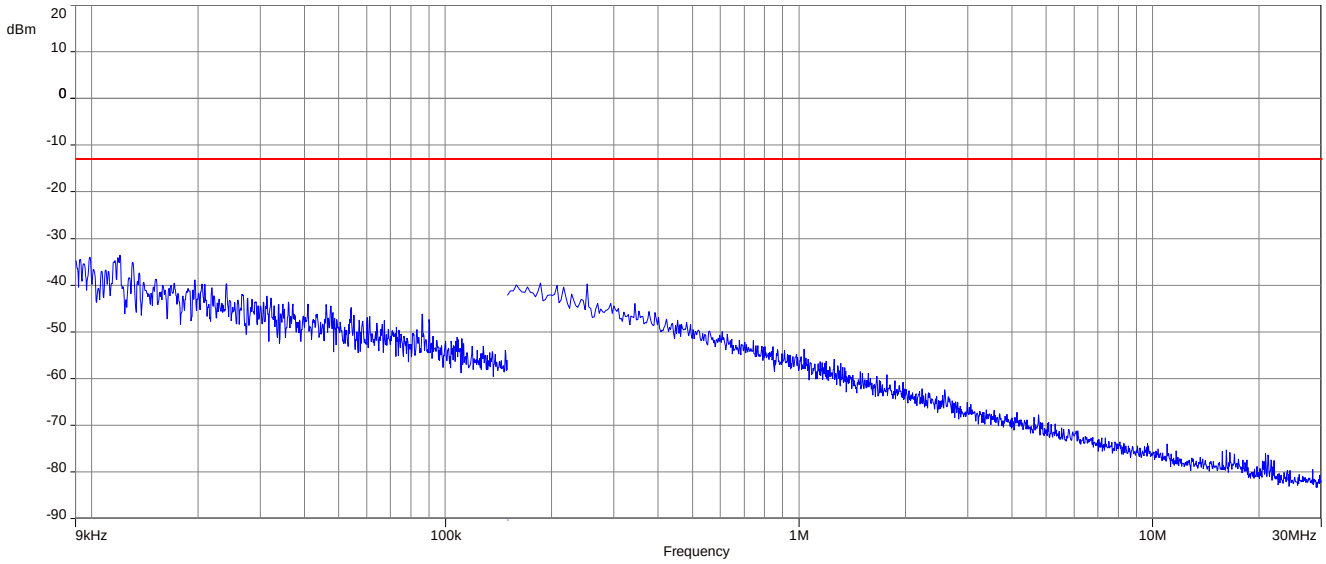
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

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.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

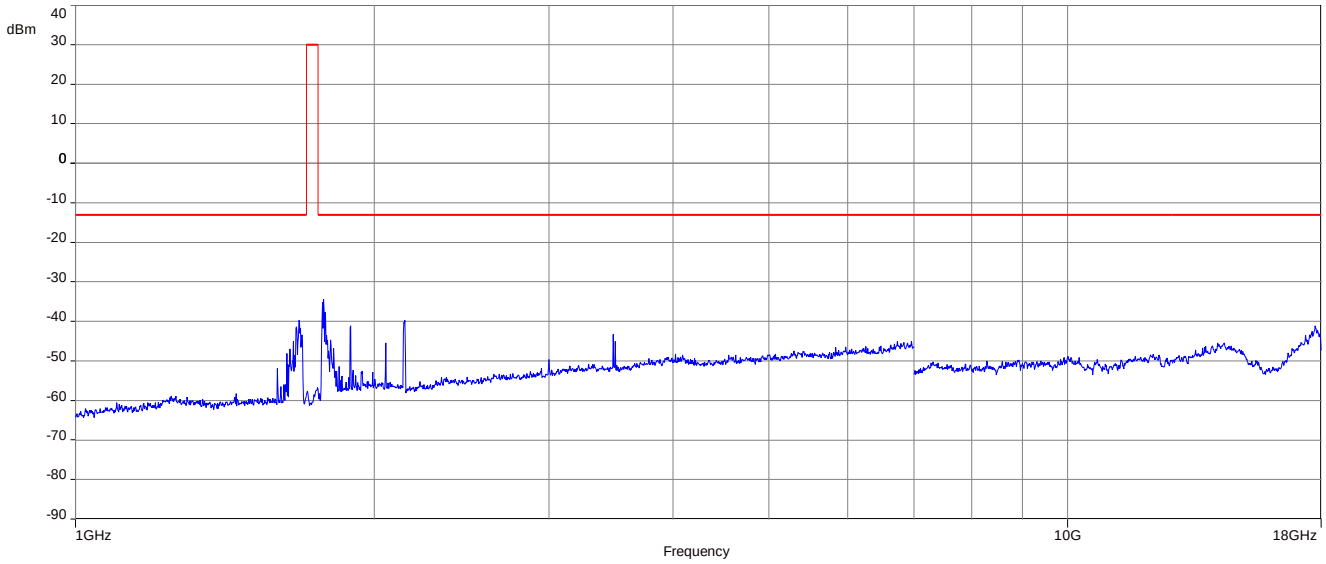
QPSK

Plot 1: Middle channel, up to 30 MHz



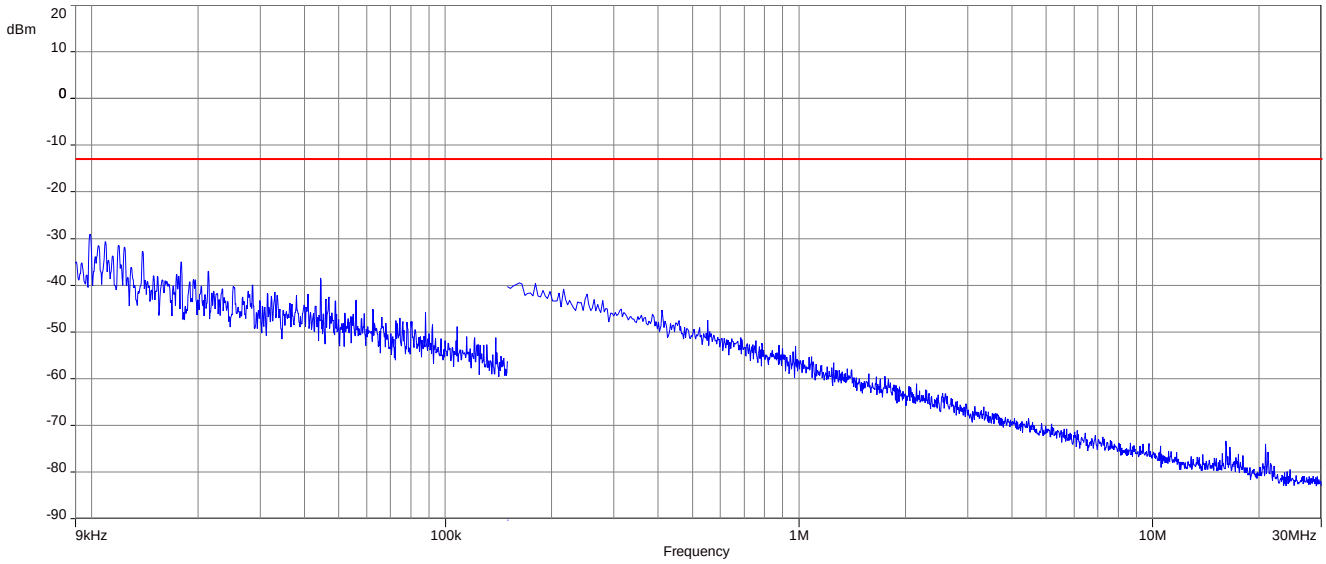
Plot 2: Middle channel, 30 MHz to 1 GHz

Plot 3: Middle channel, 1 MHz to 18 GHz

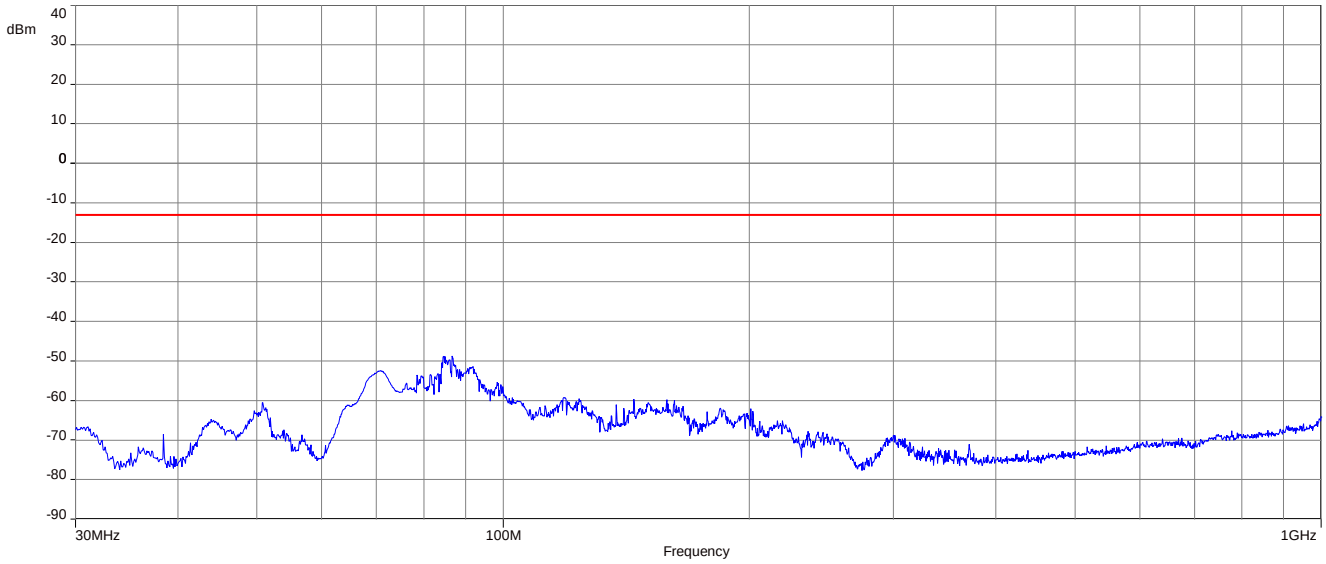


16-QAM

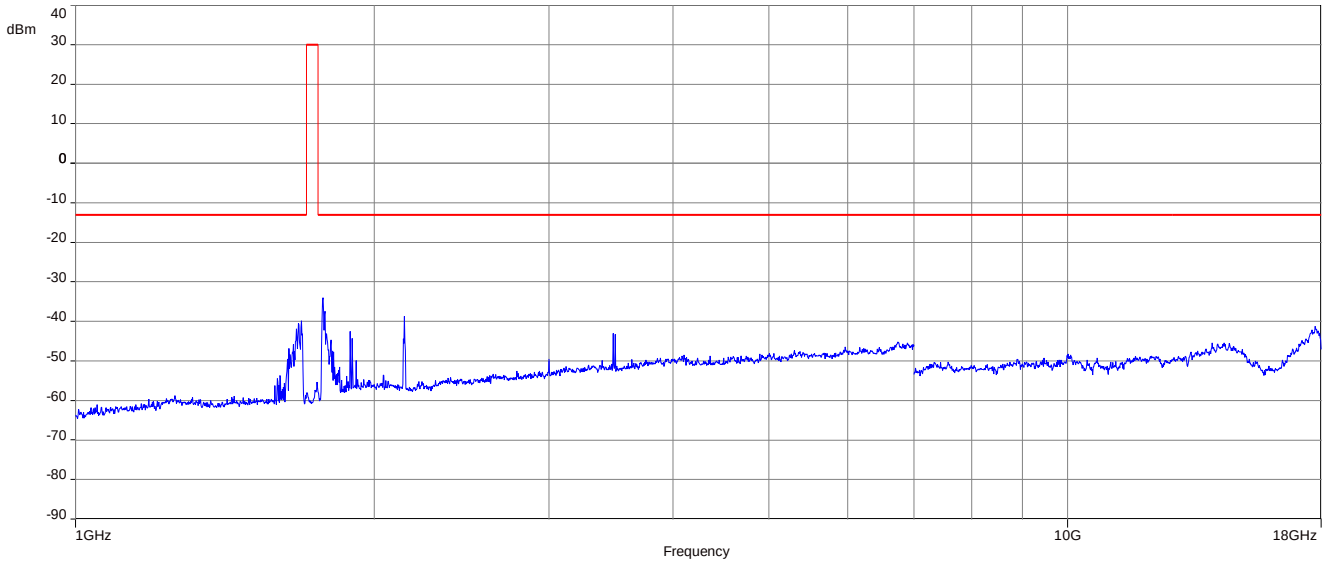
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz



Plot 3: Middle channel, 1 MHz to 18 GHz



16.6.4 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.

For the measurement the lowest, middle and highest channel bandwidth was used. If spurious were found the other bandwidths were measured, too.

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	10 MHz – 18 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(h)(1) & (3)	RSS-139, 6.6
(1) Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB. (3) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.	i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB. ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB.
-13 dBm	

Results: **for 1.4 MHz channel bandwidth**

QPSK

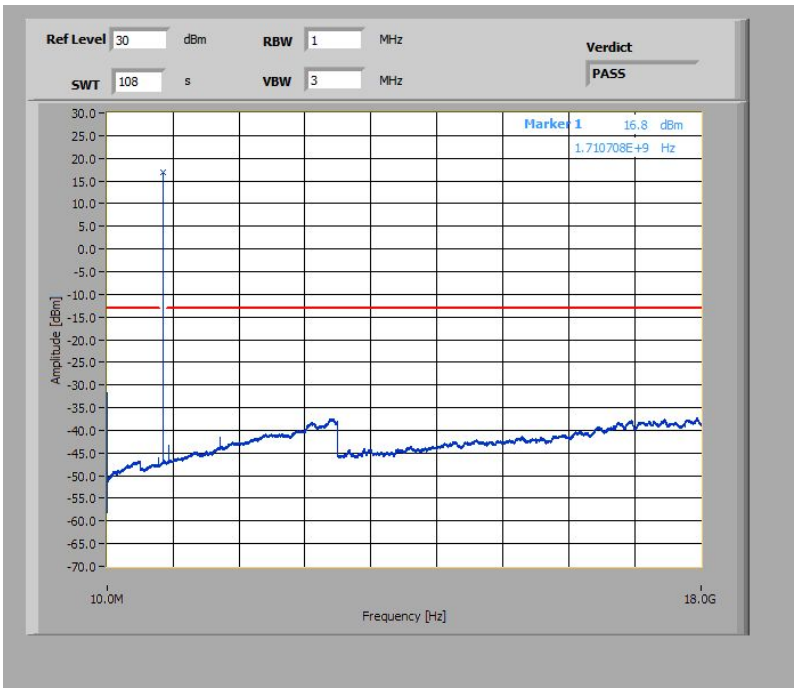
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

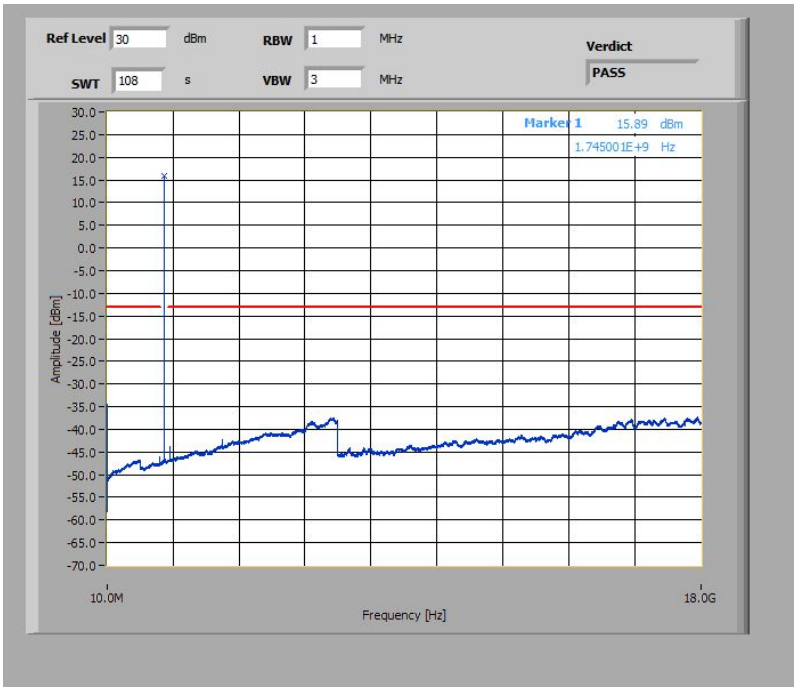
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

Plots for 1.4 MHz channel bandwidth, QPSK

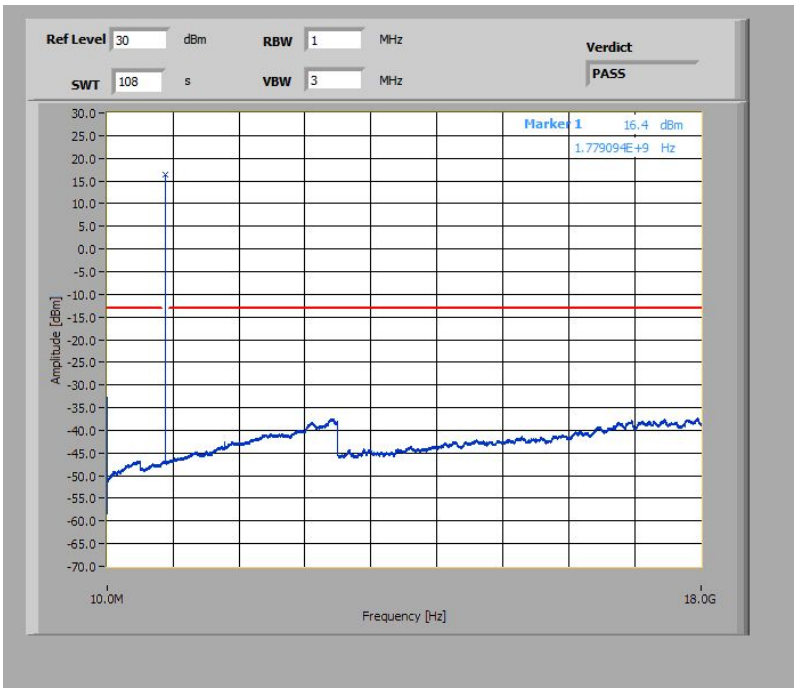
Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz

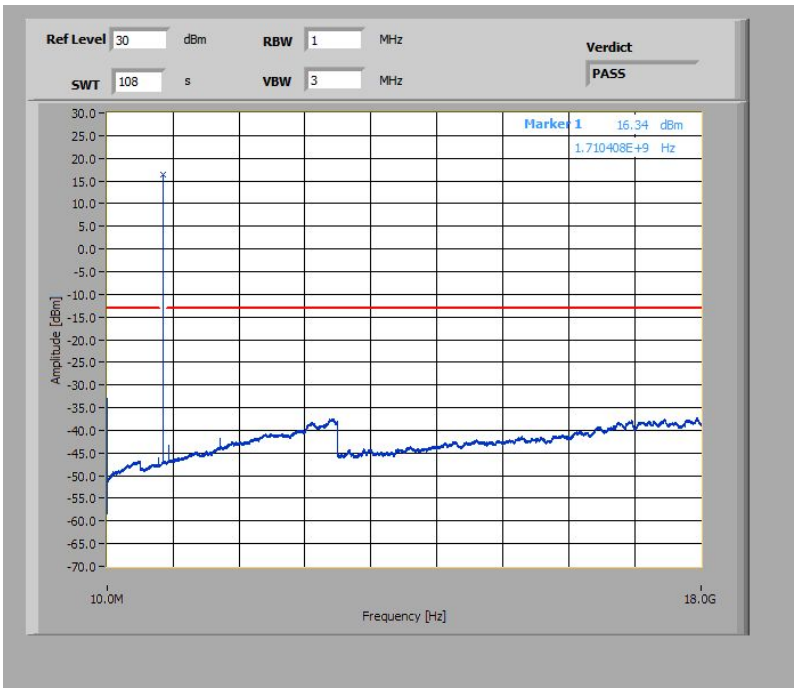


Plot 3: Highest channel, 10 MHz to 18 GHz

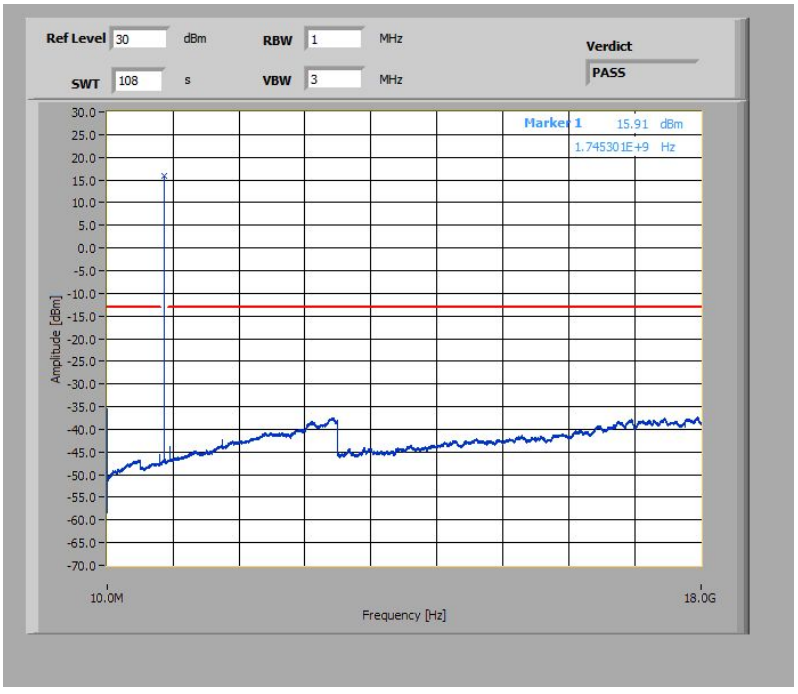


Plots for 1.4 MHz channel bandwidth, 16-QAM

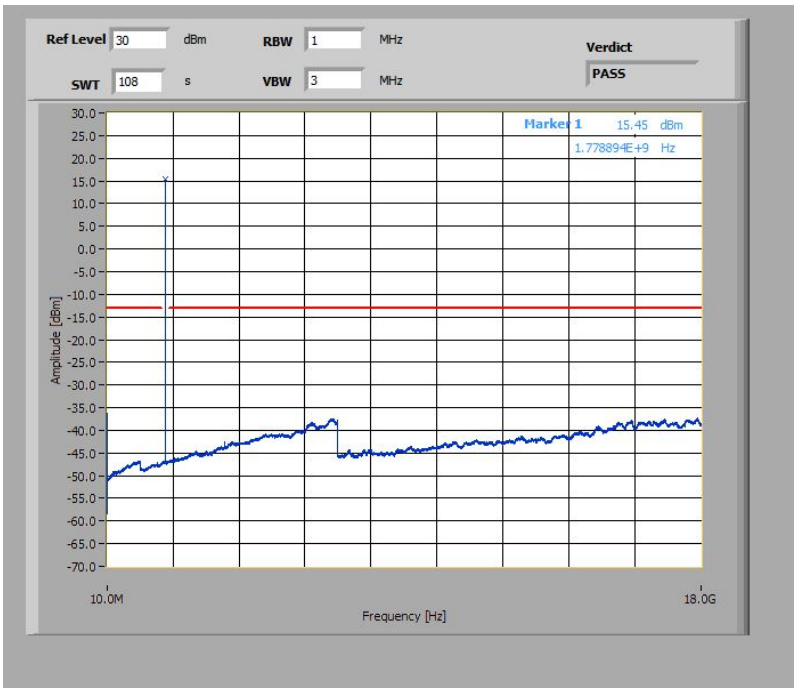
Plot 1: Lowest channel, 10 MHz to 18 GHz



Plot 2: Middle channel, 10 MHz to 18 GHz



Plot 3: Highest channel, 10 MHz to 18 GHz



16.6.5 Block edge compliance

Description:

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

For the measurement the lowest, middle and highest channel bandwidth was used. If spurious were found the other bandwidths were measured, too.

Measurement:

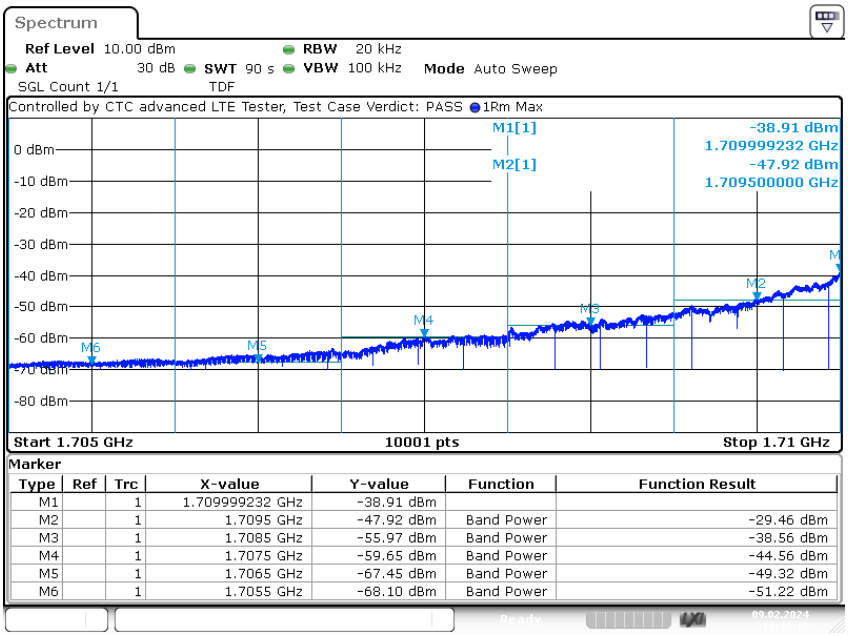
Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	100 kHz
Resolution bandwidth:	20 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.2 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

Limits:

FCC	ISED
§ 27.53(h)(1) & (3)	RSS-139, 6.6
(1) Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB. (3) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.	i. In the first 1.0 MHz bands immediately outside and adjacent to the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power per any 1% of the emission bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB. ii. After the first 1.0 MHz outside the equipment's smallest operating frequency block, which can contain the equipment's occupied bandwidth, the emission power in any 1 MHz bandwidth shall be attenuated below the transmitter output power P (in dBW) by at least 43 + 10 log10 (P) (watts) dB.
-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	

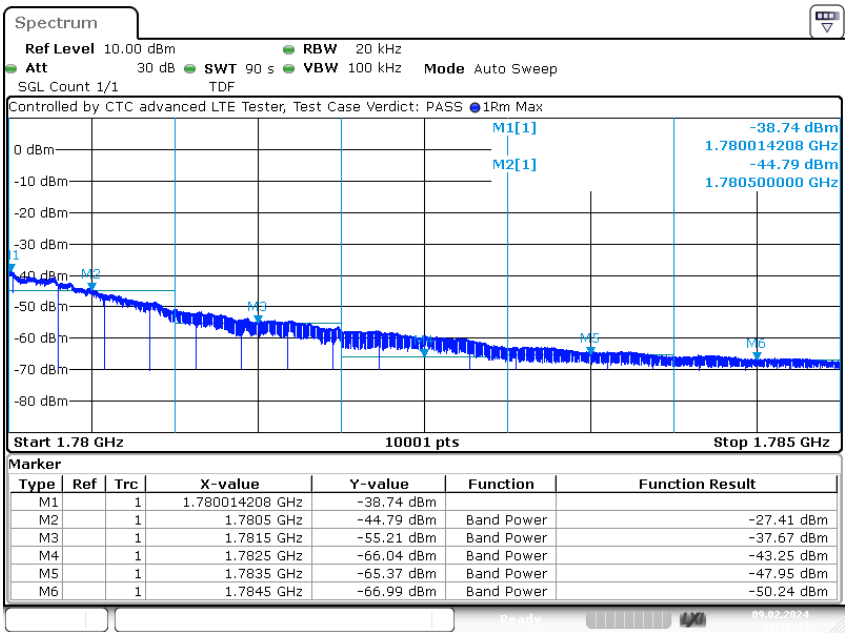
Results: **1.4 MHz channel bandwidth**

Plot 1: Lowest channel, QPSK modulation



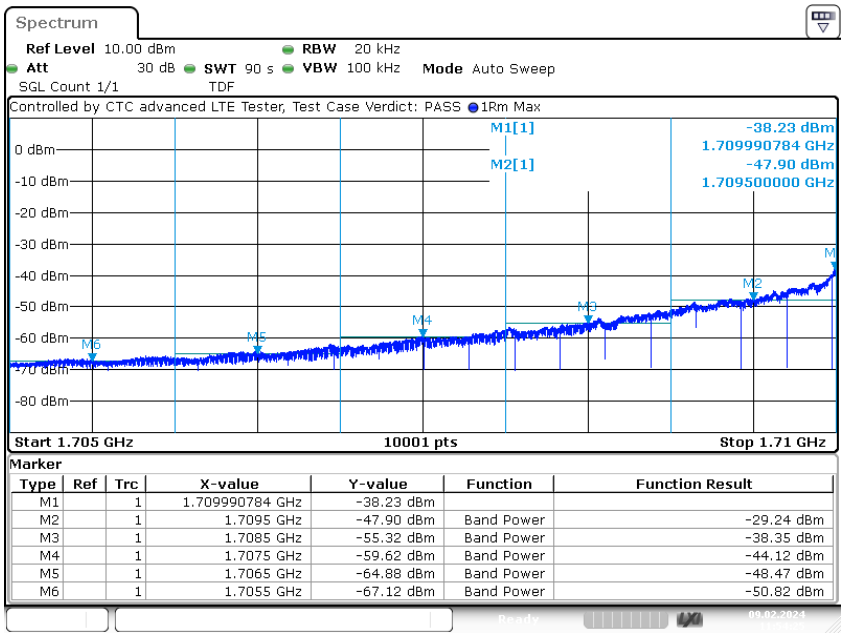
Date: 9.FEB.2024 11:45:18

Plot 2: Highest channel, QPSK modulation



Date: 9.FEB.2024 12:18:44

Plot 3: Lowest channel, 16 – QAM modulation

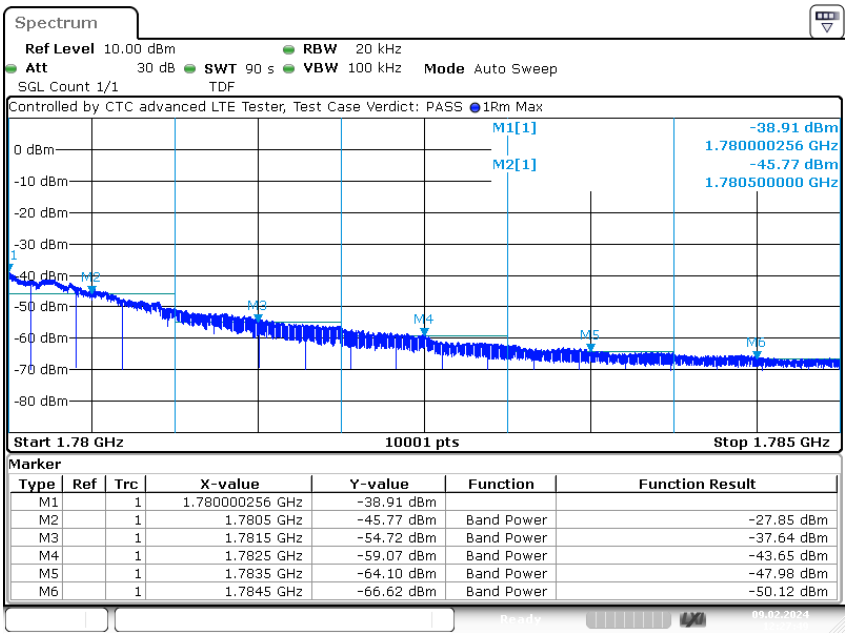


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.709990784 GHz	-38.23 dBm		
M2		1	1.7095 GHz	-47.90 dBm	Band Power	-29.24 dBm
M3		1	1.7085 GHz	-55.32 dBm	Band Power	-38.35 dBm
M4		1	1.7075 GHz	-59.62 dBm	Band Power	-44.12 dBm
M5		1	1.7065 GHz	-64.88 dBm	Band Power	-48.47 dBm
M6		1	1.7055 GHz	-67.12 dBm	Band Power	-50.82 dBm

Date: 9.FEB.2024 11:54:25

Plot 4: Highest channel, 16 – QAM modulation



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.780000256 GHz	-38.91 dBm		
M2		1	1.7805 GHz	-45.77 dBm	Band Power	-27.85 dBm
M3		1	1.7815 GHz	-54.72 dBm	Band Power	-37.64 dBm
M4		1	1.7825 GHz	-59.07 dBm	Band Power	-43.65 dBm
M5		1	1.7835 GHz	-64.10 dBm	Band Power	-47.98 dBm
M6		1	1.7845 GHz	-66.62 dBm	Band Power	-50.12 dBm

Date: 9.FEB.2024 12:27:49

16.6.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

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	

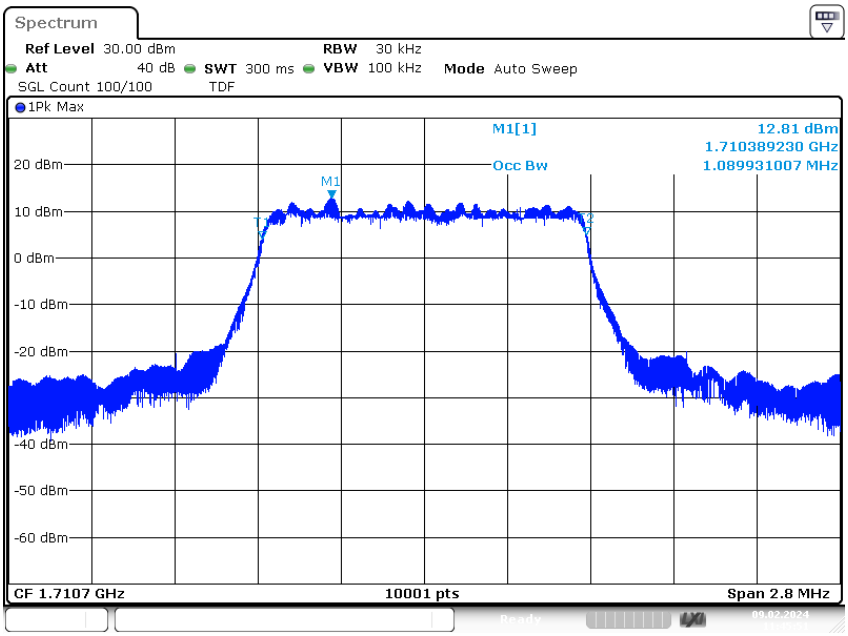
Results:

Occupied Bandwidth – QPSK		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
1710.7	1090	1284
1745	1094	1301
1779.3	1086	1292

Occupied Bandwidth – 16-QAM		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
1710.7	1091	1281
1745	1092	1276
1779.3	1092	1291

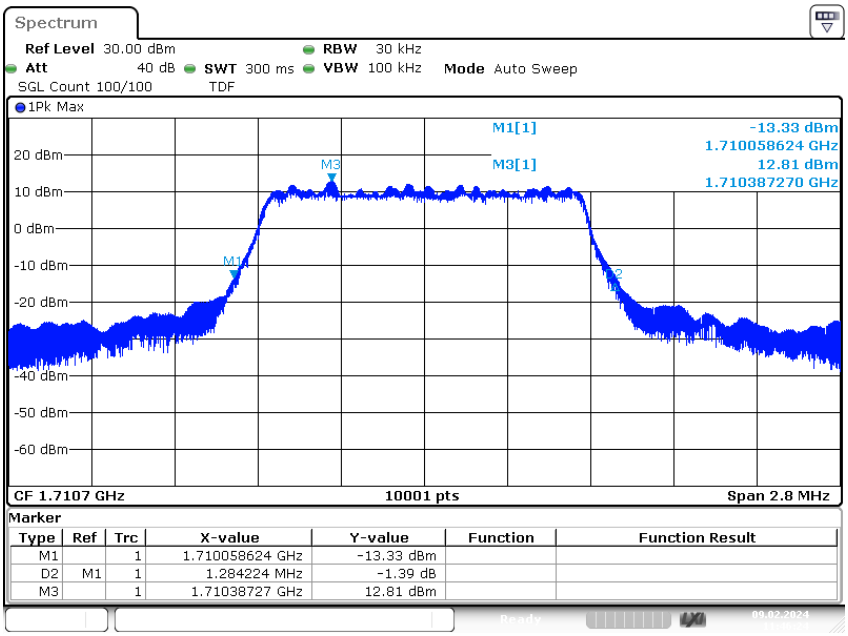
Plots: QPSK

Plot 1: low channel, 99% OBW



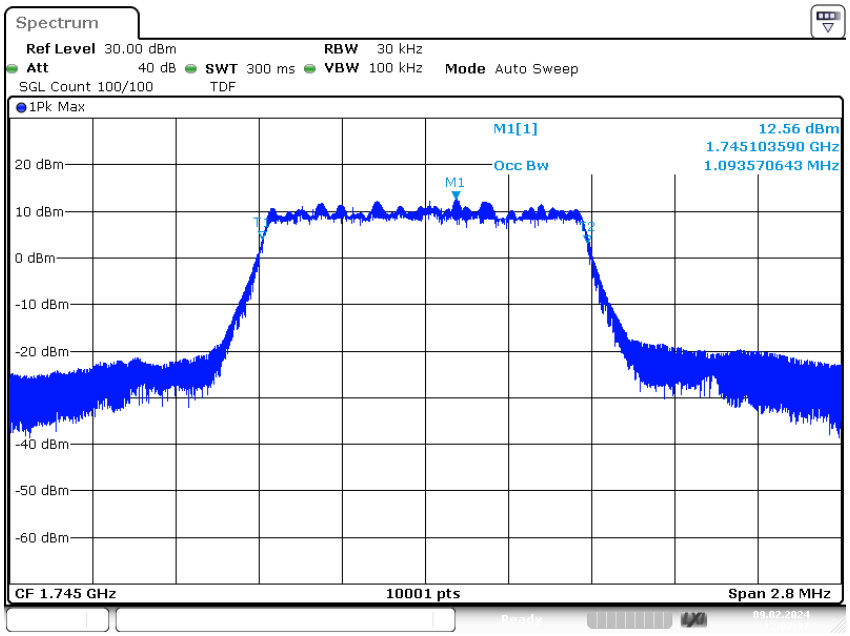
Date: 9.FEB.2024 11:45:51

Plot 2: low channel, -26 dBc OBW



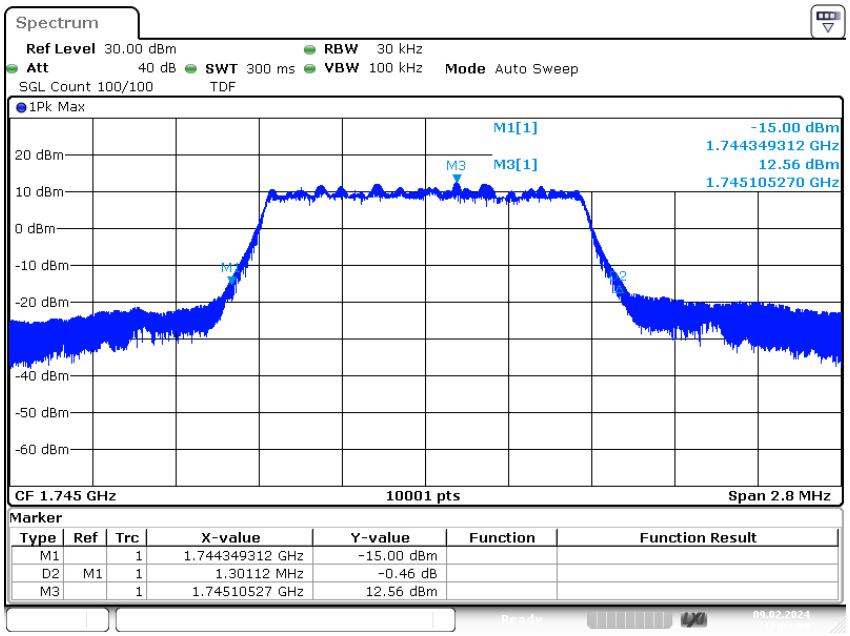
Date: 9.FEB.2024 11:46:24

Plot 3: mid channel, 99% OBW



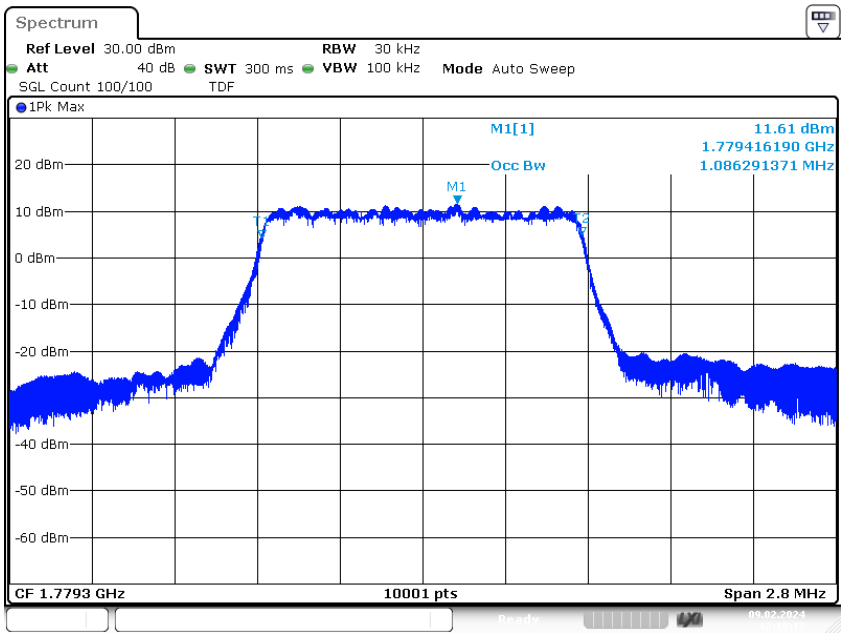
Date: 9.FEB.2024 12:02:37

Plot 4: mid channel, -26 dBc OBW



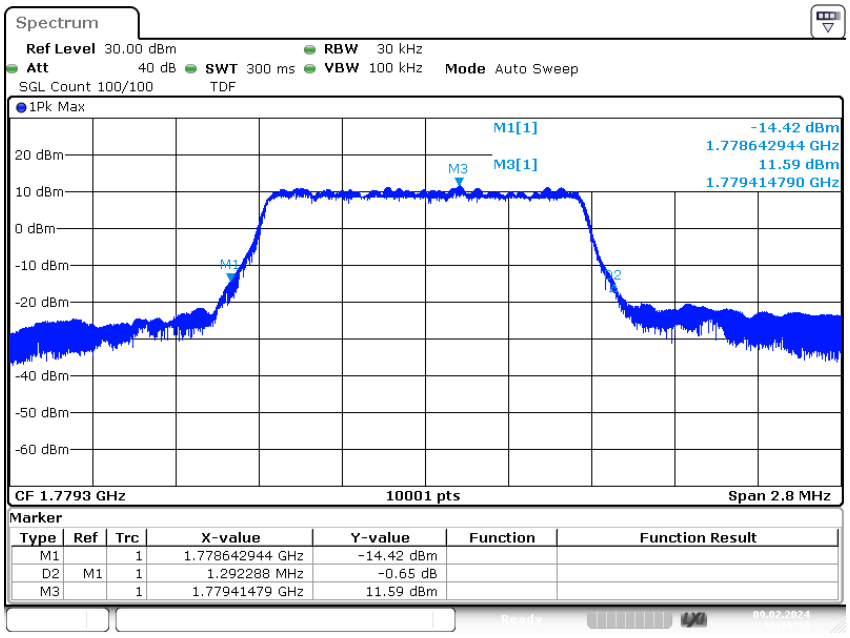
Date: 9.FEB.2024 12:03:09

Plot 5: high channel, 99% OBW



Date: 9.FEB.2024 12:19:17

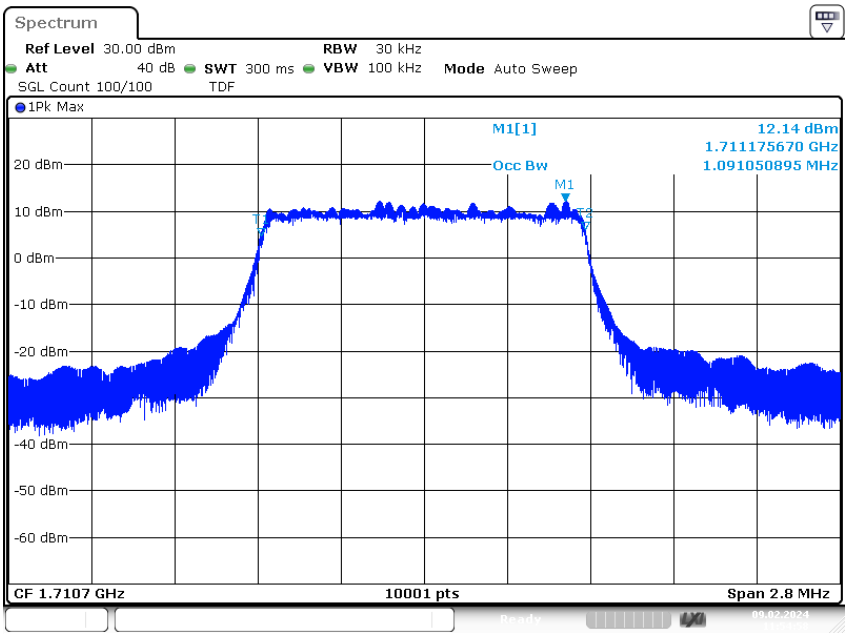
Plot 6: high channel, -26 dBc OBW



Date: 9.FEB.2024 12:19:50

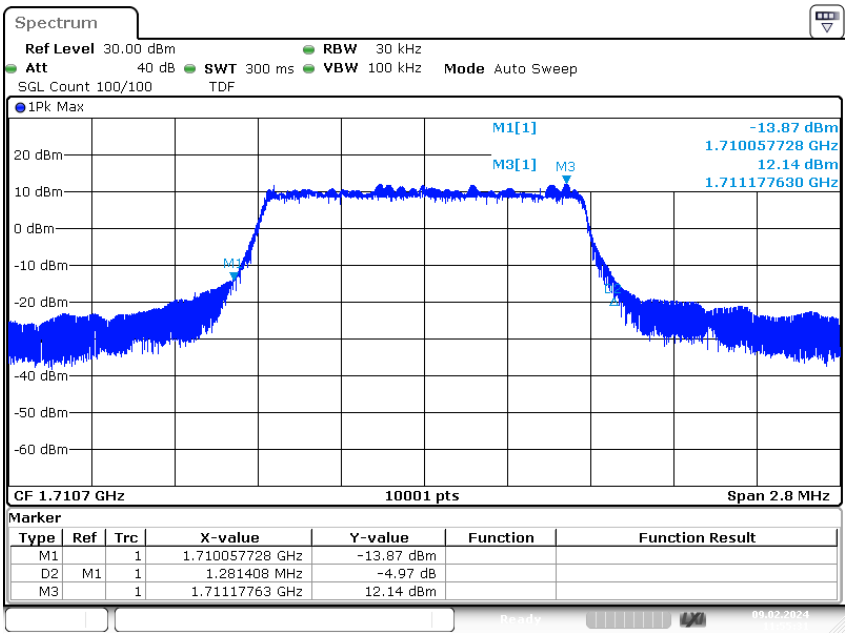
Plots: 16-QAM

Plot 1: low channel, 99% OBW



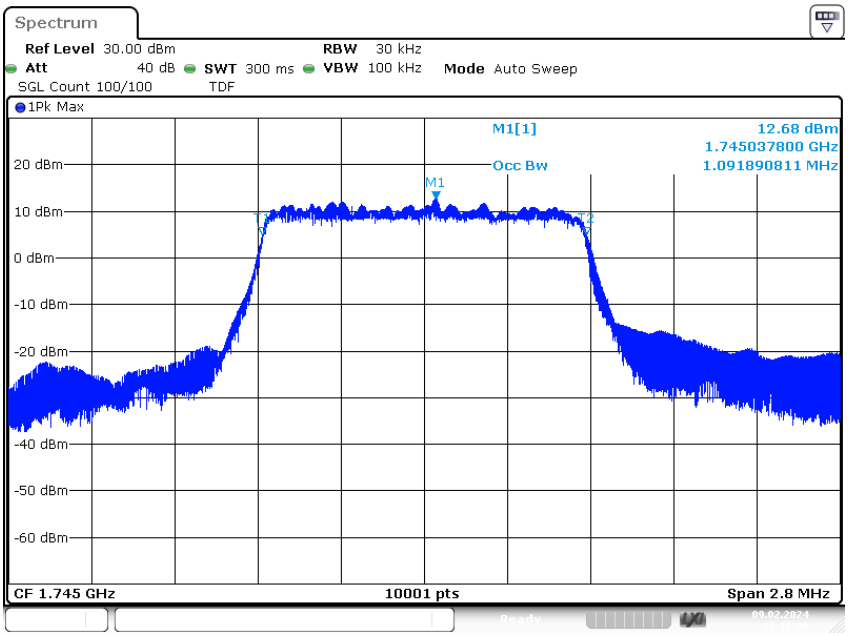
Date: 9.FEB.2024 11:54:58

Plot 2: low channel, -26 dBc OBW



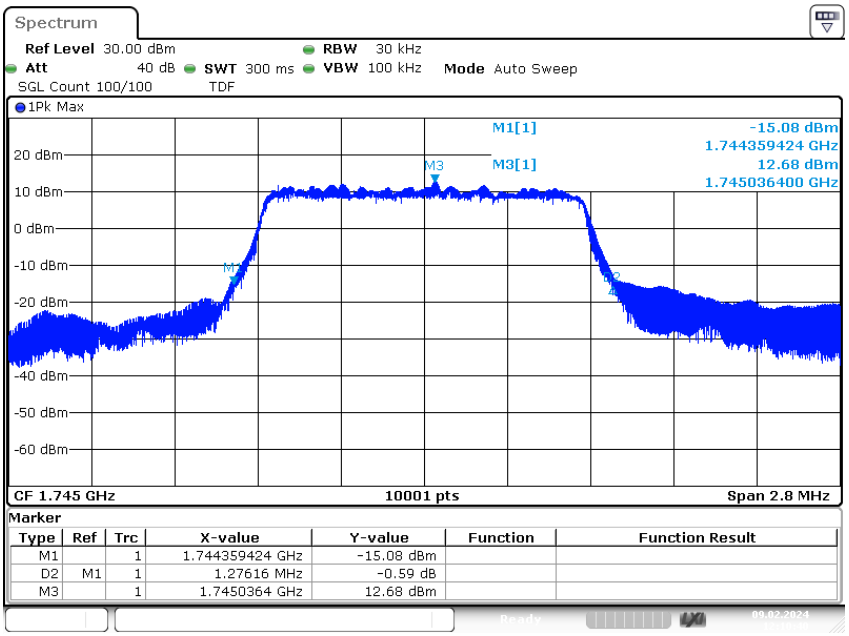
Date: 9.FEB.2024 11:55:31

Plot 3: mid channel, 99% OBW



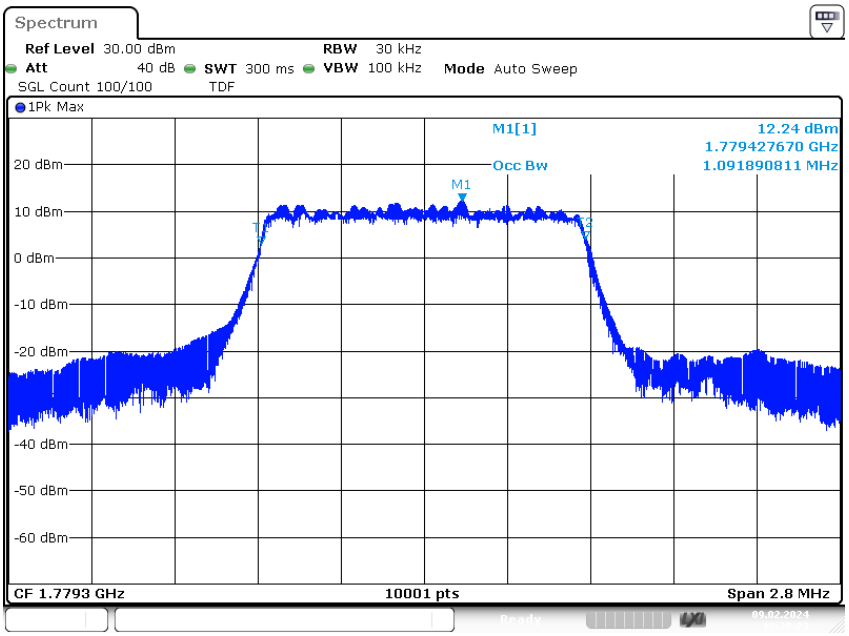
Date: 9.FEB.2024 12:10:08

Plot 4: mid channel, -26 dBc OBW



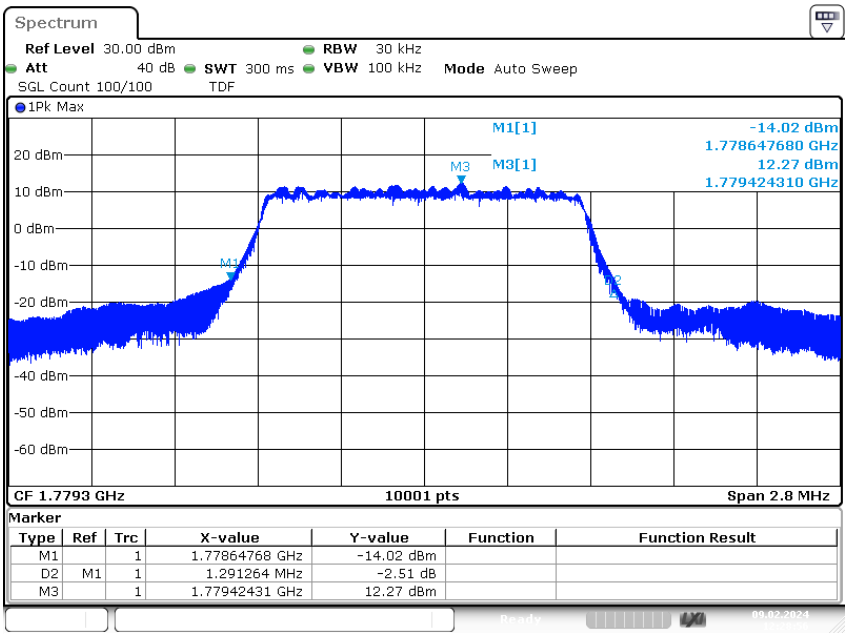
Date: 9.FEB.2024 12:10:40

Plot 5: high channel, 99% OBW



Date: 9.FEB.2024 12:28:23

Plot 6: high channel, -26 dBc OBW



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	1.77864768 GHz	-14.02 dBm		
D2	M1	1	1.291264 MHz	-2.51 dB		
M3		1	1.77942431 GHz	12.27 dBm		

Date: 9.FEB.2024 12:28:56

16.7 Results LTE band 85

The EUT was set to transmit the maximum power.

16.7.1 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:

Output Power (conducted)						
Bandwidth (MHz)	**Channel No. / Frequency (MHz)**	**Resource block allocation**	**Average Output Power (dBm) QPSK**	**Peak to Average Ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak to Average Ratio (dB)**
5	134027 / 700.5	1 RB low	17,2	3,9	17,0	4,5
		1 RB high	17,2	3,9	16,9	4,5
		100% RB	16,3	4,6	15,2	5,4
	134092 / 707.0	1 RB low	17,3	3,8	16,9	4,5
		1 RB high	17,1	3,9	16,8	4,5
		100% RB	16,2	4,5	15,2	5,4
	134157 / 713.5	1 RB low	17,9	3,7	17,9	4,1
		1 RB high	17,7	3,8	17,8	4,2
		100% RB	16,6	4,5	15,7	5,4
10	134052 / 703.0	1 RB low	17,2	3,9	16,8	4,5
		1 RB high	16,9	3,9	16,9	4,4
		100% RB	16,4	4,4	16,3	5,1
	134092 / 707.0	1 RB low	17,2	3,8	16,8	4,4
		1 RB high	17,0	3,9	16,7	4,5
		100% RB	16,3	4,5	16,3	5,1
	134132 / 711.0	1 RB low	17,7	3,7	17,7	4,1
		1 RB high	17,5	3,8	17,6	4,2
		100% RB	16,6	4,5	16,8	5,0

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

Output Power (ERP)			
Bandwidth (MHz)	**Frequency (MHz)**	**Average Output Power (dBm) QPSK**	**Average Output Power (dBm) 16-QAM**
5	700.5	19,3	19,1
	707.0	19,4	19,0
	713.5	19,7	19,7
10	703.0	19,3	19,0
	707.0	19,3	18,9
	711.0	19,5	19,5

16.7.2 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:	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)
4.1	12	0.02
3.7	14	0.02
2.5	15	0.02

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (ppm)
-30	-13	-0.02
-20	-16	-0.02
-10	-7	-0.01
± 0	-11	-0.02
10	4	0.01
20	12	0.02
30	26	0.04
40	14	0.02
50	3	0.00

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

16.7.3 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 716 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 85.

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 7.1 setup A; 7.2 setup A, B
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:

QPSK

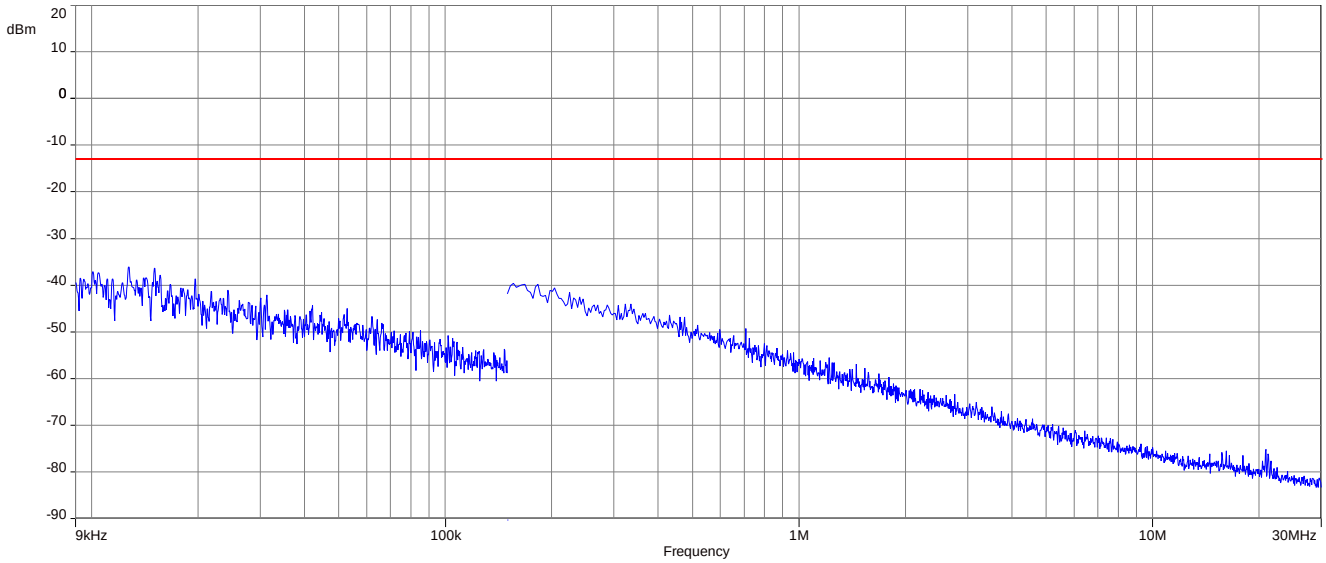
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

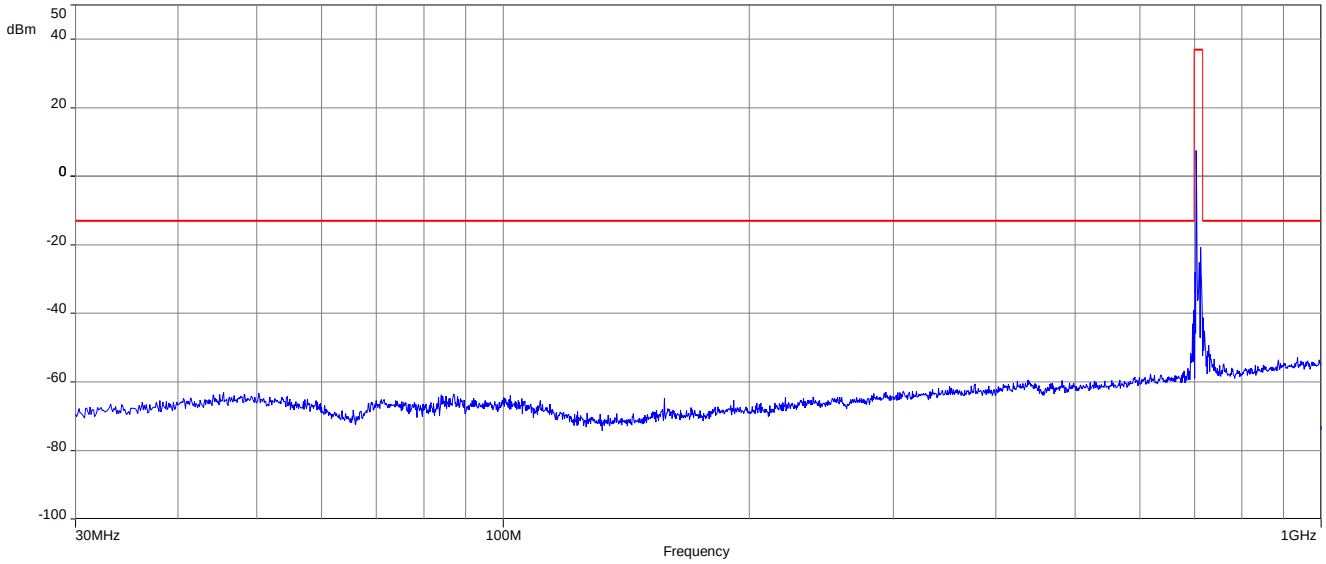
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-		All detected emissions are more than 20 dB below the limit.		-/-	
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

QPSK

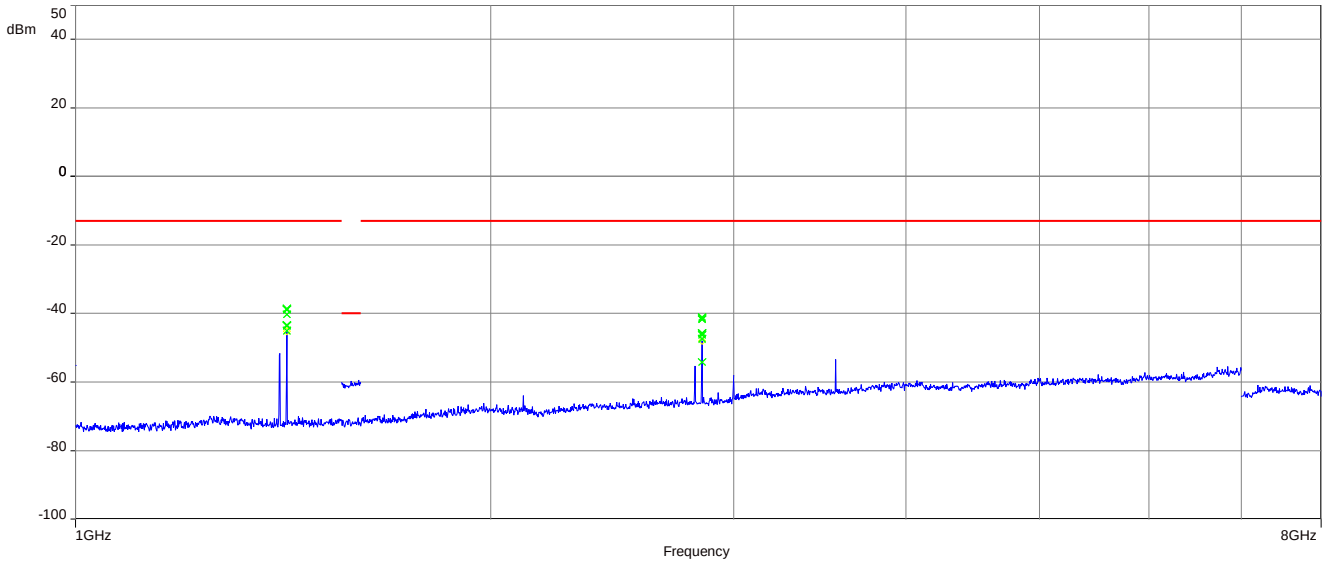
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz

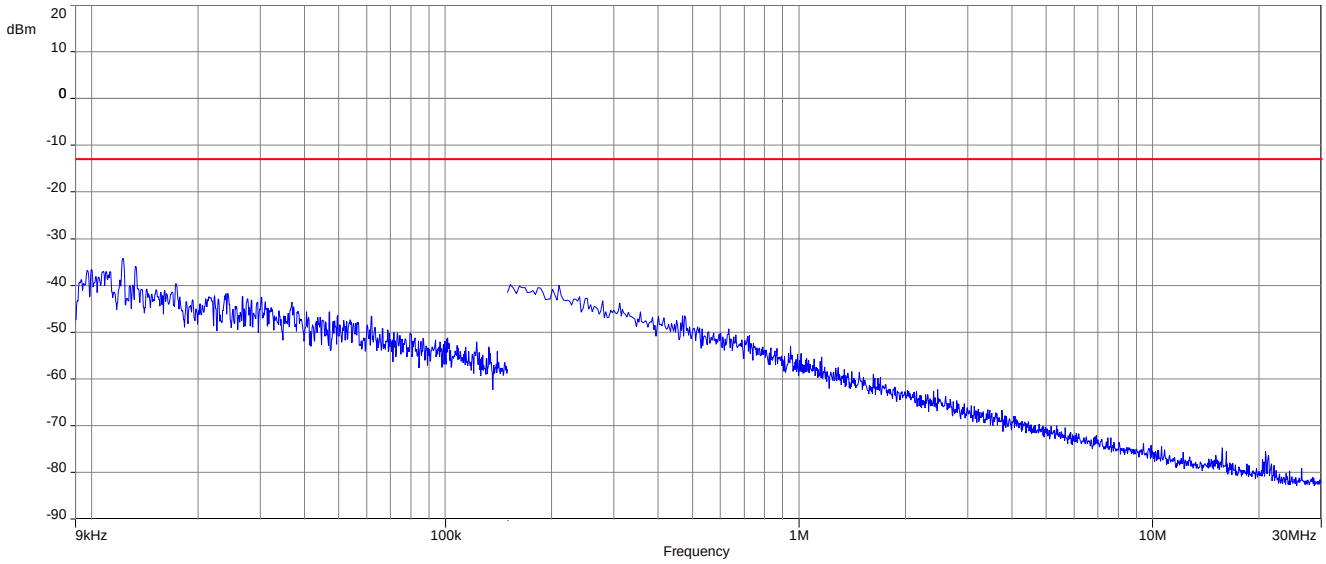


Plot 3: Middle channel, 1 MHz to 8 GHz

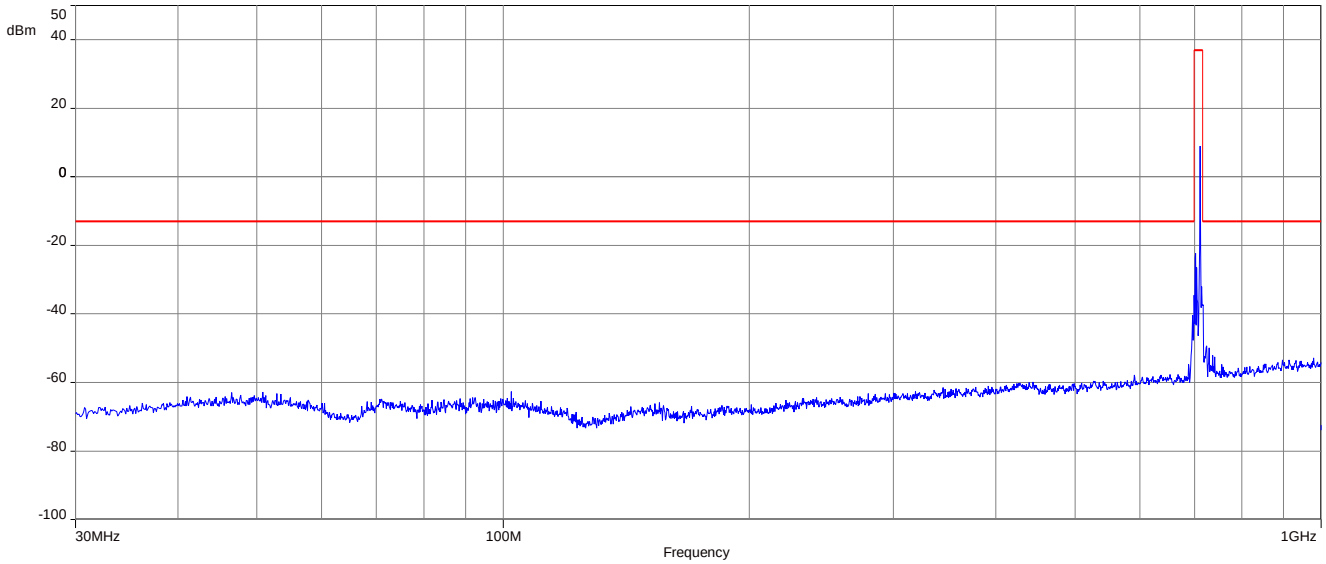


16-QAM

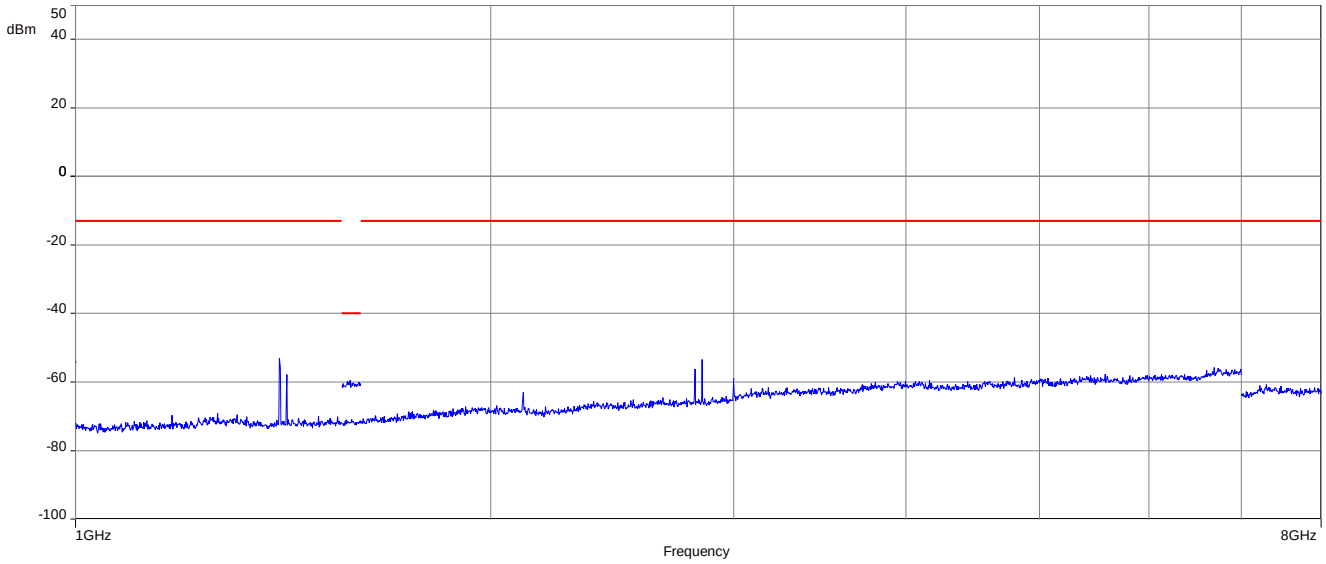
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 1 GHz



Plot 3: Middle channel, 1 MHz to 8 GHz



16.7.4 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 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: **for 1.4 MHz channel bandwidth**

QPSK

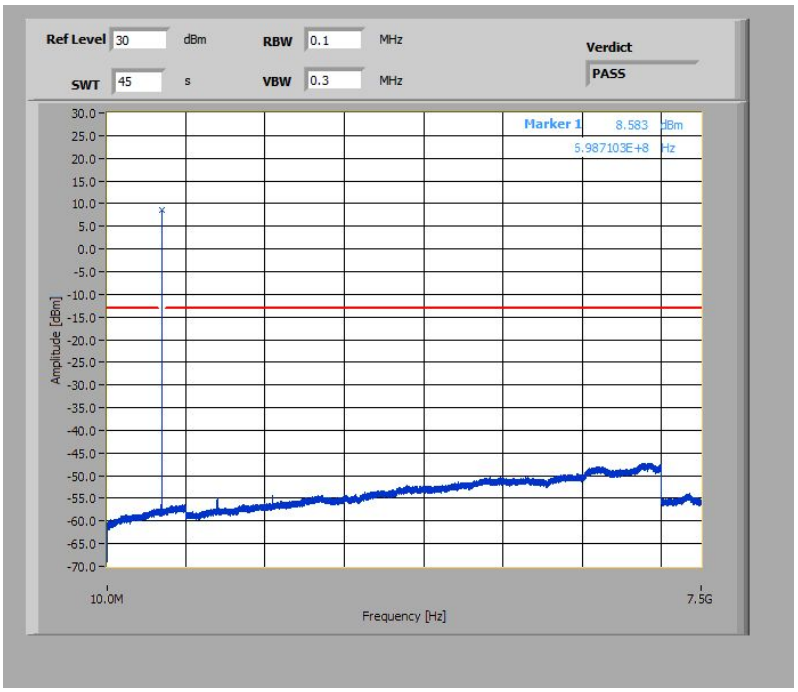
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

16-QAM

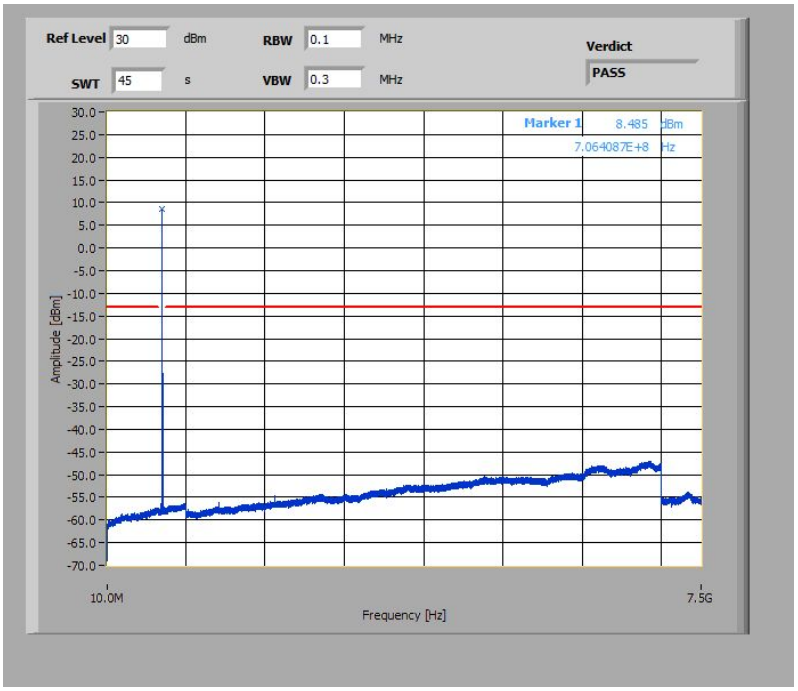
Spurious Emission Level					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-
-/-	-/-	-/-	-/-	-/-	-/-

Plots for 1.4 MHz channel bandwidth, QPSK

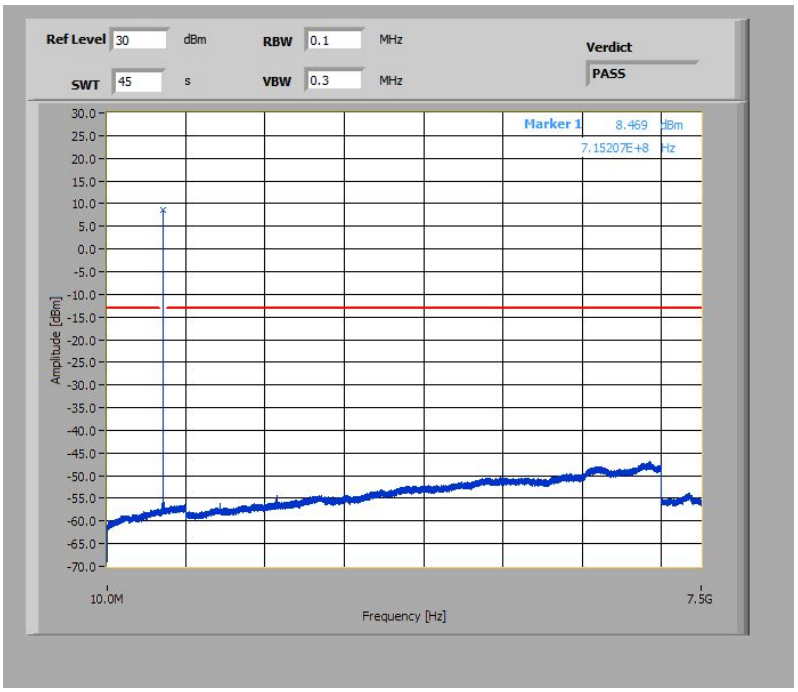
Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz

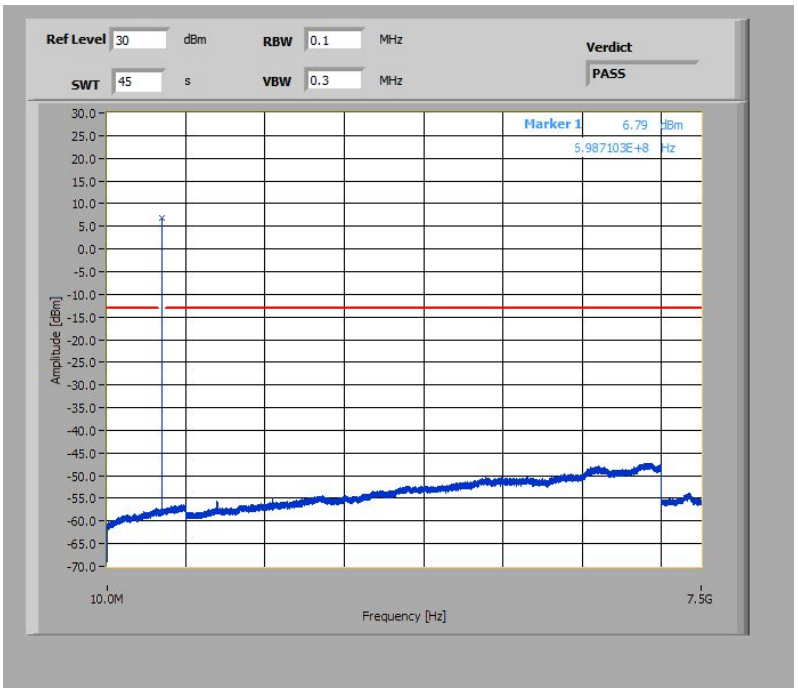


Plot 3: Highest channel, 10 MHz to 7.5 GHz

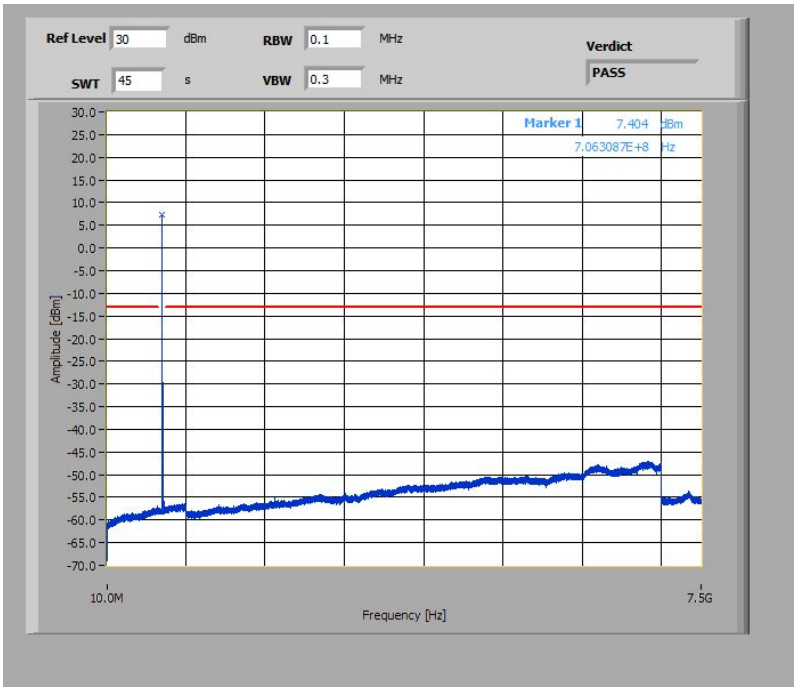


Plots for 1.4 MHz channel bandwidth, 16-QAM

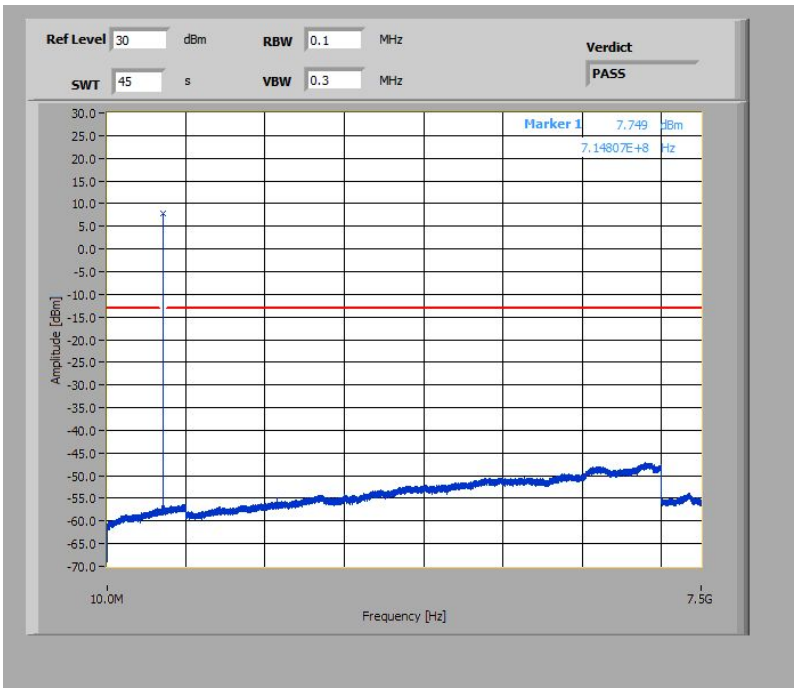
Plot 1: Lowest channel, 10 MHz to 7.5 GHz



Plot 2: Middle channel, 10 MHz to 7.5 GHz



Plot 3: Highest channel, 10 MHz to 7.5 GHz



16.7.5 Block edge compliance

Description:

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

Measurement:

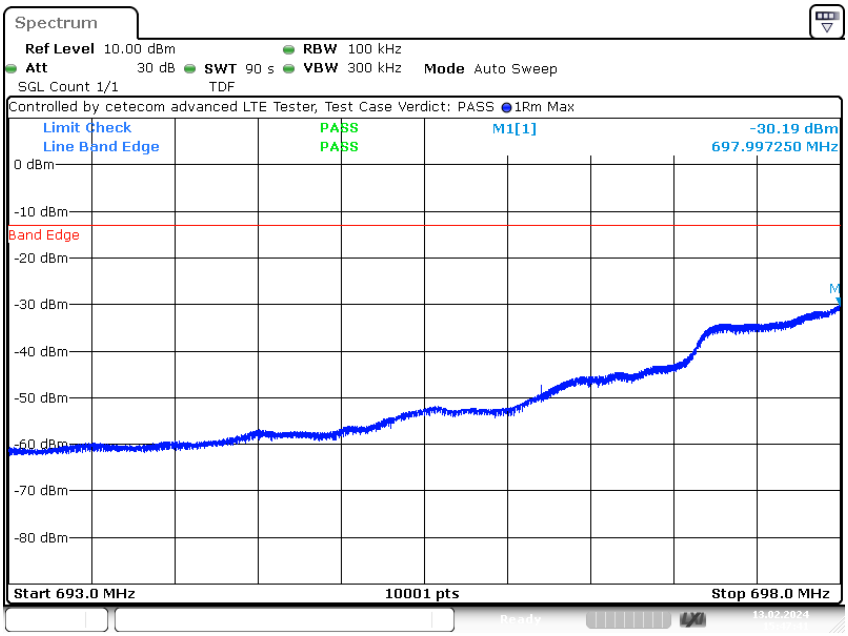
Measurement parameters	
Detector:	RMS
Sweep time:	180s
Video bandwidth:	300 kHz
Resolution bandwidth:	100 kHz
Span:	1 MHz
Trace-Mode:	Max Hold
Used equipment:	See chapter 7.4 setup A
Measurement uncertainty:	See chapter 9
Measurement procedure	FCC: § 2.1051 ISED: RSS-Gen, 6.13

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	

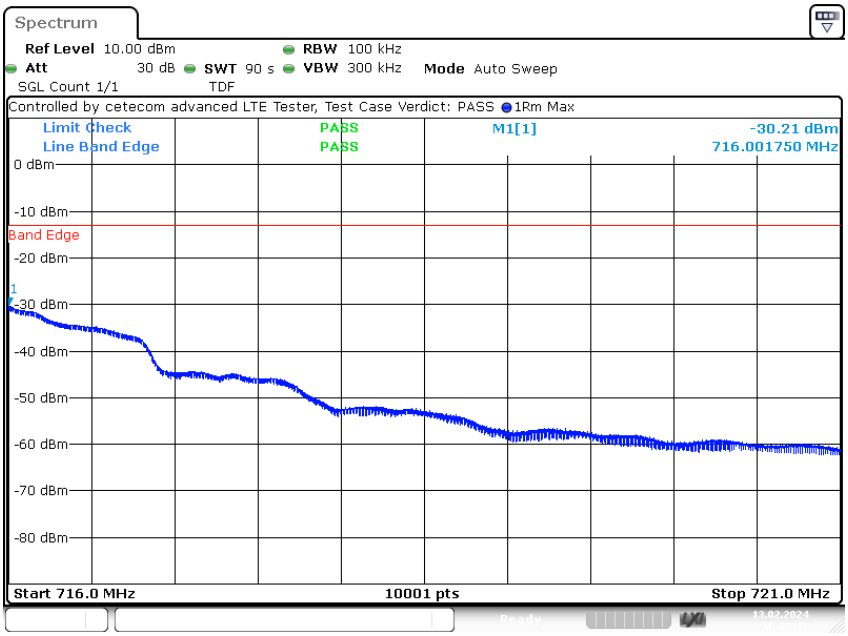
Results: **1.4 MHz channel bandwidth**

Plot 1: Lowest channel, QPSK modulation



Date: 13.FEB.2024 15:47:41

Plot 2: Highest channel, QPSK modulation



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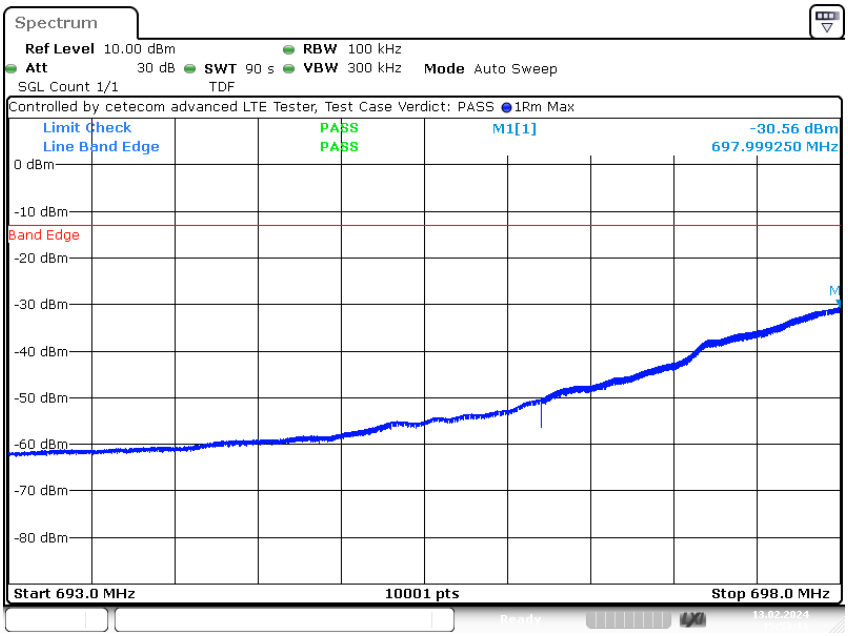
Plot 3: Lowest channel, 16 – QAM modulation



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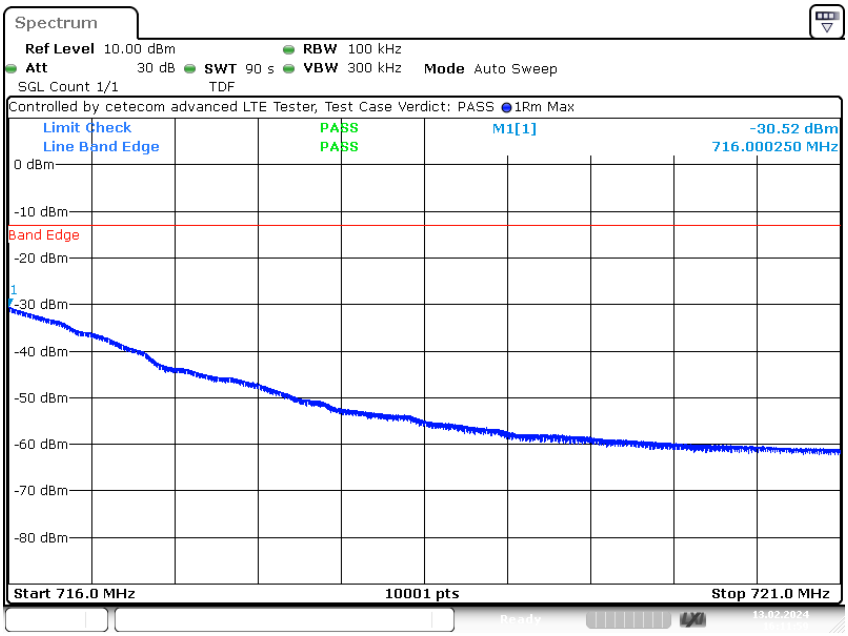
Plot 4: Highest channel, 16 – QAM modulation



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16.7.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

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	

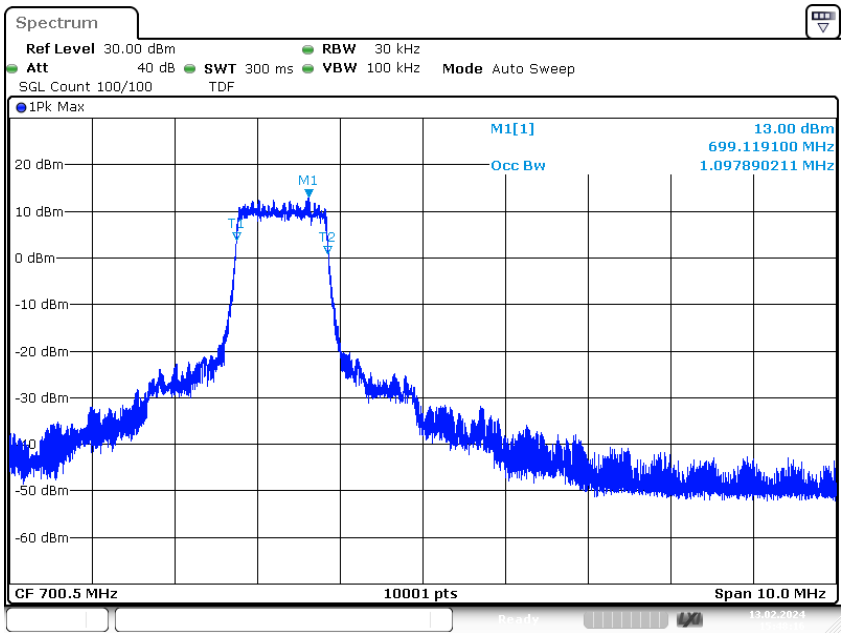
Results:

Occupied Bandwidth – QPSK		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
699.7	1098	1302
707.5	1094	1263
715.3	1096	1313

Occupied Bandwidth – 16-QAM		
Frequency (MHz)	**99% OBW (kHz)**	**-26 dBc BW (kHz)**
699.7	1105	1318
707.5	1098	1316
715.3	1098	1390

Plots: QPSK, worst case plots

Plot 1: low channel, 99% OBW



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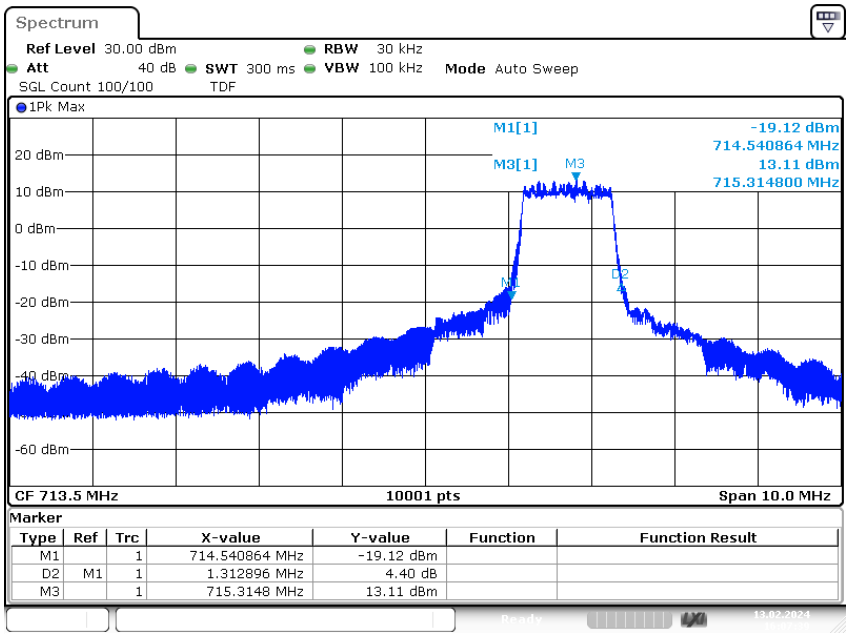
Plot 2: high channel, -26 dBc OBW



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	714.540864 MHz	-19.12 dBm		
D2	M1	1	1.312896 MHz	4.40 dB		
M3		1	715.3148 MHz	13.11 dBm		

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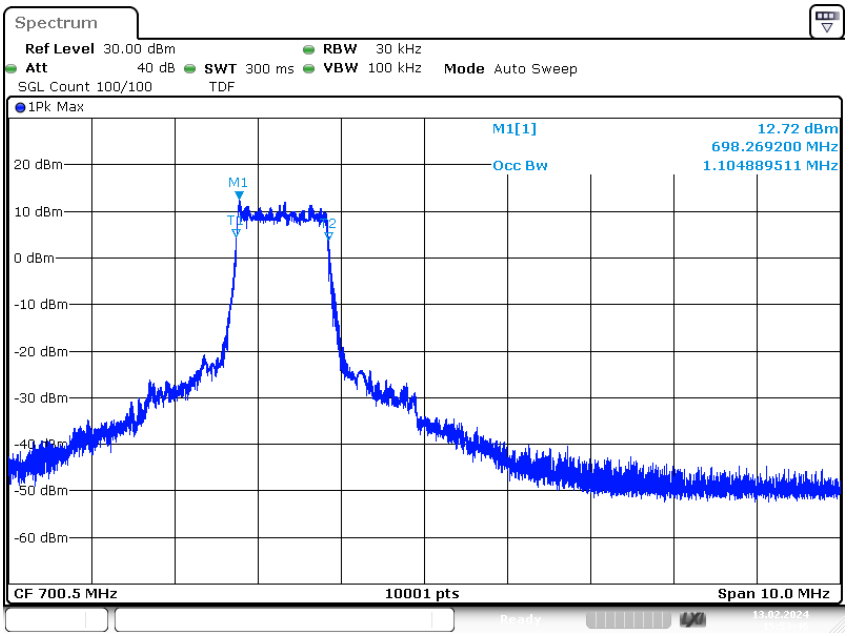
Plots: 16-QAM, worst case plots

Plot 1: low channel, 99% OBW



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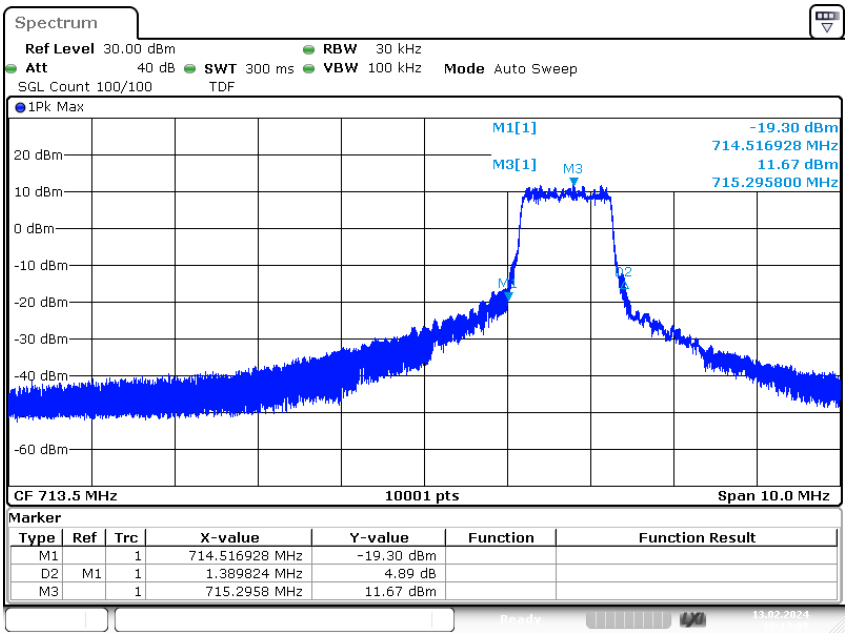
Plot 2: high channel, -26 dBc OBW



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17 Observations

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

18 Glossary

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

19 Document history

Version	Applied changes	Date of release
-/-	Draft	2024-09-04

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