
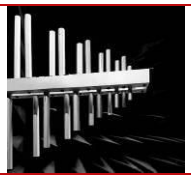
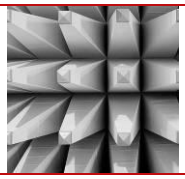

CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-6965/13-04-06-A

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
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Phone: + 49 681 5 98 - 0
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Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-01
Area of Testing:
Radio Communications & Compatibility Testing (RCT)

Applicant

Sony Mobile Communications AB
Nya Vattentornet
22188 Lund / SWEDEN
Phone: +46 46 19 30 00
Fax: -/-
Contact: Mikael Nilsson
e-mail: Micke.nilsson@sonymobile.com
Phone: +46 7 03 22 75 03

Manufacturer

Sony Mobile Communications AB
Nya Vattentornet
22188 Lund / SWEDEN

Test standard/s

47 CFR Part 22	Title 47 of the Code of Federal Regulations; Chapter I; Part 22 - Public mobile services

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**Smart Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/II/IV/V/VIII; LTE FDD1/2/3/4/5/7/8/13/17/20; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS**
Type name:	**PM-0740-BV**
FCC ID:	**PY7PM-0740**
Frequency:	LTE FDD 5: 824 MHz – 849 MHz
Technology tested:	LTE FDD 5
Antenna:	Integrated antenna
Power supply:	3.7 V DC by Li - polymer battery
Temperature range:	-30°C to +60°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:

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2014.01.22 15:30:43 +01'00'

Andreas Luckenbill
Expert

Test performed:

cn=Marco Bertolino, o=CETECOM ICT Services GmbH, ou=BTL-100826, email=marco.bertolino@cetecom.com, c=DE
2014.01.22 15:31:55 +01'00'

Marco Bertolino
Testing Manager

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report is electronically signed and valid without handwritten signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

2.2 Application details

Date of receipt of order:	2013-11-29
Date of receipt of test item:	2013-12-02
Start of test:	2013-12-04
End of test:	2013-12-19
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 22		Title 47 of the Code of Federal Regulations; Chapter I; Part 22 - Public mobile services

4 Test environment

Temperature:	T_{nom}	+22 °C	during room temperature tests
	T_{max}	+60 °C	during high temperature tests
	T_{min}	-30 °C	during low temperature tests
Relative humidity content:		42 %	
Barometric pressure:		not relevant for this kind of testing	
Power supply:	V_{nom}	3.7 V	DC by Li - polymer battery
	V_{max}	4.4 V	
	V_{min}	3.3 V	

5 Test item

Kind of test item	**:**	**Smart Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/II/IV/V/VIII; LTE FDD1/2/3/4/5/7/8/13/17/20; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS**
Type name	**:**	**PM-0740-BV**
S/N serial number	**:**	**Cond: CB5A1W1HRO, CB5A1W1HP7** **Rad: CB5A1W1HQ9, CB5A1W1HRX**
HW hardware status	**:**	**AP1.1**
SW software status	**:**	**17.0.A.0.256**
Frequency band [MHz]	**:**	**LTE FDD 5: 824 MHz – 849 MHz**
Type of modulation	**:**	**QPSK, 16 – QAM**
Antenna	**:**	**Integrated antenna**
Power supply	**:**	**3.7 V DC by Li - polymer battery**
Temperature range	**:**	**-30°C to +60 °C**

5.1 Additional information

Test setup- and EUT-photos are included in test report: 1-6965/13-04-01_AnnexA
1-6965/13-04-01_AnnexB
1-6965/13-04-01_AnnexC

6 Test laboratories sub-contracted

None

7 Summary of measurement results

☒	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	CFR Part 22	passed	2014-01-22	-/-

7.1 LTE band V

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
RF Output Power	Nominal	Nominal	☒	☐	☐	☐	-/-
Frequency Stability	Nominal	Nominal	☒	☐	☐	☐	-/-
Spurious Emissions Radiated	Nominal	Nominal	☒	☐	☐	☐	-/-
Spurious Emissions Conducted	Nominal	Nominal	☒	☐	☐	☐	-/-
Block Edge Compliance	Nominal	Nominal	☒	☐	☐	☐	-/-
Occupied Bandwidth	Nominal	Nominal	☒	☐	☐	☐	-/-

Note: NA = Not applicable; NP = Not performed

8 RF measurements

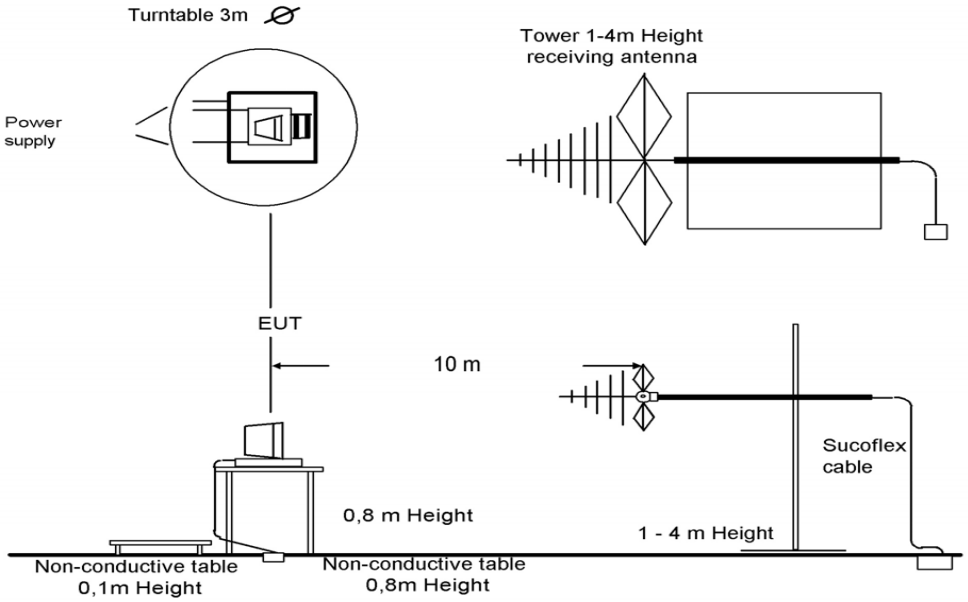
8.1 Description of test setup

For the spurious measurements we use the substitution method according TIA/EIA 603.

8.1.1 Radiated measurements

The radiated emissions from the EUT are performed in a semi anechoic chamber. The EUT is placed on a conductive turntable and powered with nominal voltage. The signalling is performed either from outside the chamber with a signalling unit (AP or other) by air link using a signalling antenna or directly by special test software from the customer.

Semi anechoic chamber



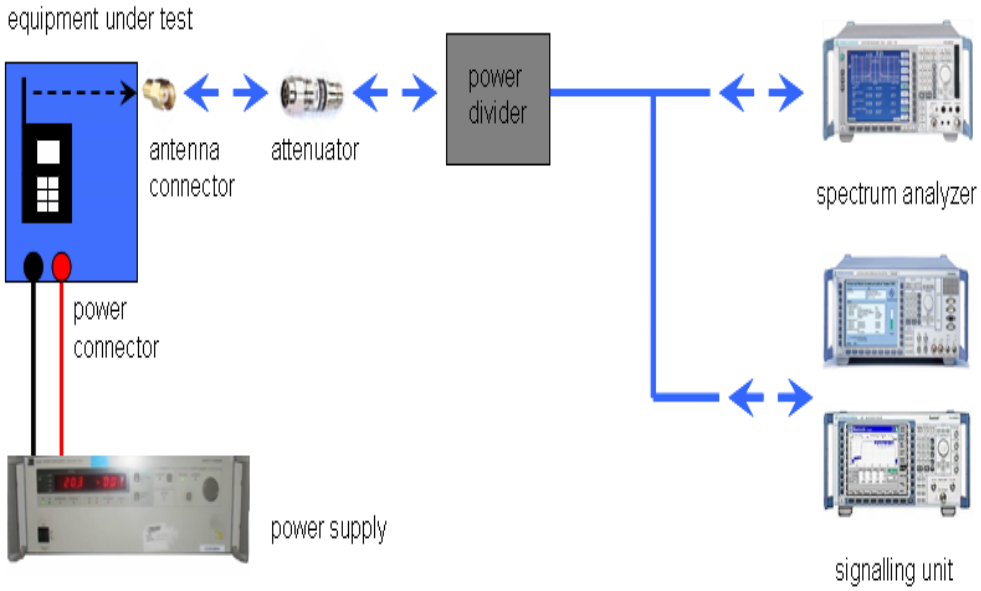
Picture 1: Diagram radiated measurements

9 kHz - 30 MHz:	active loop antenna
30 MHz – 1 GHz:	tri-log antenna
> 1 GHz:	horn antenna

Frequency being measured f	Measuring receiver bandwidth 6 dB	Spectrum analyser bandwidth 3dB
f < 150 kHz	200 Hz or	300 Hz
150 kHz ≤ f < 30 MHz	9 kHz or	10 kHz
30 MHz ≤ f < 1000 MHz	120 kHz or	100 kHz
1000 MHz ≤ f		1 MHz
NOTE: Specific requirements in CEPT/ERC/Recommendation 70-03 [2] shall be applied where applicable.		

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the signalling unit (AP or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm. If special software is used, there is no power divider necessary.



Picture 2: Diagram conducted measurements

The term measuring receiver refers to either a selective voltmeter or a spectrum analyser.

Frequency being measured f	Measuring receiver bandwidth 6 dB	Spectrum analyser bandwidth 3dB
f < 150 kHz	200 Hz or	300 Hz
150 kHz ≤ f < 25 MHz	9 kHz or	10 kHz
25 MHz ≤ f < 1000 MHz	120 kHz or	100 kHz
1000 MHz ≤ f		1 MHz
NOTE: Specific requirements in CEPT/ERC/Recommendation 70-03 [2] shall be applied where applicable.		

8.2 Results LTE band V

The EUT was set to transmit the maximum power.

8.2.1 RF output power

Description:

This paragraph contains average power, peak output power and ERP 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
Measured with CMW500

Limits:

FCC	-/-
Nominal Peak Output Power	
+38.45 dBm 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.	

Results:

Output Power (conducted)						
Bandwidth (MHz)	**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	824.7	1 RB low	23.7	4.68	22.9	5.32
		1 RB high	23.6	4.75	22.8	5.34
		50% RB mid	23.7	4.76	22.6	5.66
		100% RB	22.7	5.53	21.5	6.39
	836.5	1 RB low	23.8	5.67	22.6	4.74
		1 RB high	23.8	5.72	22.6	4.78
		50% RB mid	23.7	5.62	22.9	4.87
		100% RB	22.8	6.16	21.7	5.63
	848.3	1 RB low	23.5	4.49	22.5	5.68
		1 RB high	23.5	4.57	22.6	5.67
		50% RB mid	23.4	4.90	22.4	5.77
		100% RB	22.5	5.94	21.5	6.28
3	825.5	1 RB low	23.8	5.35	22.8	4.72
		1 RB high	23.6	5.36	22.7	4.74
		50% RB mid	22.5	5.81	21.3	4.88
		100% RB	22.6	6.33	21.5	5.68
	836.5	1 RB low	23.8	4.71	22.6	5.64
		1 RB high	23.7	4.73	22.4	5.72
		50% RB mid	22.8	4.80	21.7	5.63
		100% RB	22.7	5.65	21.6	6.38
	847.5	1 RB low	23.7	5.73	22.5	4.77
		1 RB high	23.6	5.86	22.3	4.75
		50% RB mid	22.4	5.45	21.4	4.80
		100% RB	22.4	6.26	21.4	5.42
5	826.5	1 RB low	23.7	4.71	22.7	5.50
		1 RB high	23.6	4.77	22.6	5.54
		50% RB mid	22.5	4.99	21.4	5.85
		100% RB	22.6	5.69	21.5	6.59
	836.5	1 RB low	23.6	5.02	23.0	4.77
		1 RB high	23.7	5.03	23.0	4.80
		50% RB mid	22.7	5.91	21.6	5.04
		100% RB	22.6	6.95	21.6	5.66
	846.5	1 RB low	23.6	4.87	22.4	5.88
		1 RB high	23.5	4.84	22.3	5.78
		50% RB mid	22.6	5.05	21.5	5.96
		100% RB	22.6	5.67	21.6	6.70

10	829	1 RB low	23.8	5.20	22.9	4.53
		1 RB high	23.5	4.73	22.7	4.51
		50% RB mid	22.4	5.86	21.5	4.98
		100% RB	22.5	6.73	21.5	6.19
	836.5	1 RB low	23.7	4.50	22.5	5.06
		1 RB high	23.7	4.63	22.4	5.60
		50% RB mid	22.7	4.99	21.7	5.80
		100% RB	22.7	6.03	21.6	6.48
	844	1 RB low	23.7	5.69	22.5	4.66
		1 RB high	23.6	5.00	22.2	4.58
		50% RB mid	22.7	6.07	21.5	5.16
		100% RB	22.7	7.11	21.5	6.47
Measurement uncertainty			± 0.5 dB			

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

Output Power (radiated)			
Bandwidth (MHz)	**Frequency (MHz)**	**Average Output Power (dBm) QPSK**	**Average Output Power (dBm) 16-QAM**
1.4	824.7	18.0	17.2
	836.5	18.9	18.0
	848.3	18.6	17.7
3	825.5	18.1	17.1
	836.5	18.9	17.7
	847.5	18.8	17.6
5	826.5	18.0	17.0
	836.5	18.8	18.1
	846.5	18.7	17.5
10	829.0	18.1	17.2
	836.5	18.8	17.6
	844.0	18.8	17.6
Measurement uncertainty		± 3.0 dB	

Result: **Passed**

8.2.2 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 4180 (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 +60°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.

Measurement:

Measurement parameters	
Detector:	Measured with CMW500
Sweep time:	
Video bandwidth:	
Resolution bandwidth:	
Span:	
Trace-Mode:	

Limits:

FCC	-/-
Frequency Stability	
± 0.1 ppm	

Results:

AFC FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	11	0.00000132	0.0132
3.4	10	0.00000120	0.0120
3.5	9	0.00000108	0.0108
3.6	0	0.00000000	0.0000
3.7	2	0.00000024	0.0024
3.8	0	0.00000000	0.0000
3.9	-3	-0.00000036	-0.0036
4.0	10	0.00000120	0.0120
4.1	-4	-0.00000048	-0.0048
4.2	-5	-0.00000060	-0.0060
4.3	9	0.00000108	0.0108
4.4	11	0.00000132	0.0132

AFC FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	11	0.00000132	0.0132
-20	8	0.00000096	0.0096
-10	-4	-0.00000048	-0.0048
± 0	-7	-0.00000084	-0.0084
10	10	0.00000120	0.0120
20	4	0.00000048	0.0048
30	4	0.00000048	0.0048
40	-5	-0.00000060	-0.0060
50	-8	-0.00000096	-0.0096
60	-3	-0.00000036	-0.0036

Result: **Passed**

8.2.3 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 C63.4:2009 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 9 kHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 846.6 MHz. To cover this measurements are made up to 12.75 GHz. The resolution bandwidth is set as outlined in Part 22.917. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band V.

The final open field emission (here 10m semi-anechoic chamber listed by FCC) test procedure is as follows:

a) The test item was placed on a 0.8 meter high non-conductive stand at a 3 meter test distance from the receive antenna.
b) The antenna output was terminated in a 50 ohm load (if possible).
c) A double ridged wave guide antenna was placed on an adjustable height antenna mast 3 meters from the test item for emission measurements.
d) Detected emissions were maximized at each frequency by rotating the test item and adjusting the receive antenna height and polarization. The maximum meter reading was recorded. The radiated emission measurements of the harmonics of the transmit frequency through the 10th harmonic were measured with peak detector and 1 MHz bandwidth. If the harmonic could not be detected above the noise floor, the ambient level was recorded. The equivalent power into a dipole antenna was calculated from the field intensity levels measured at 3 meters.
e) Now each detected emissions were substituted by the substitution method, in accordance with the TIA/EIA 603.

Measurement:

Measurement parameters	
Detector:	Peak
Sweep time:	2 sec.
Video bandwidth:	below 150 kHz: 200 Hz 150 kHz ≤ f < 30 MHz: 9 kHz 30 MHz ≤ f < 1000 MHz: 100 kHz Above 1 GHz: 1 MHz
Resolution bandwidth:	below 150 kHz: 200 Hz 150 kHz ≤ f < 30 MHz: 9 kHz 30 MHz ≤ f < 1000 MHz: 100 kHz Above 1 GHz: 1 MHz
Span:	100 MHz Steps
Trace-Mode:	Max Hold

Limits:

FCC	-/-
Spurious Emissions Radiated	
Attenuation ≥ 43 + 10log(P) (P, Power in Watts)	
-13 dBm	

Results:

Radiated emissions measurements were made only at the center carrier frequency of the LTE band V (836.5 MHz). It was decided that measurements at this carrier frequency would be sufficient to demonstrate compliance with emissions limits because it was seen that all the significant spurs occur well outside the band and no radiation was seen from a carrier in one block of the LTE band V into any of the other blocks. The equipment must still, however, meet emissions requirements with the carrier at all frequencies over which it is capable of operating and it is the manufacturer's responsibility to verify this.

The final open field radiated levels are presented on the next pages.
All measurements were done in horizontal and vertical polarization; the plots show the worst case.
The plots show only the middle channel. If spurious were detected, the lowest and highest channel were checked too. The found values are stated in the table below.

As can be seen from this data, the emissions from the test item were within the specification limit.

QPSK:

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1658.0	-	2	1673.0	-/-	2	1688.0	-
3	2487.0	-	3	2509.5	-56.0	3	2532.0	-
4	3316.0	No peaks detected.	4	3346.0	No peaks detected.	4	3376.0	No peaks detected.
5	4145.0		5	4182.5		5	4220.0	
6	4974.0		6	5019.0		6	5064.0	
7	5803.0		7	5855.5		7	5908.0	
8	6632.0		8	6692.0		8	6752.0	
9	7461.0		9	7528.5		9	7596.0	
10	8290.0		10	8365.0		10	8440.0	
Measurement uncertainty				± 3dB				

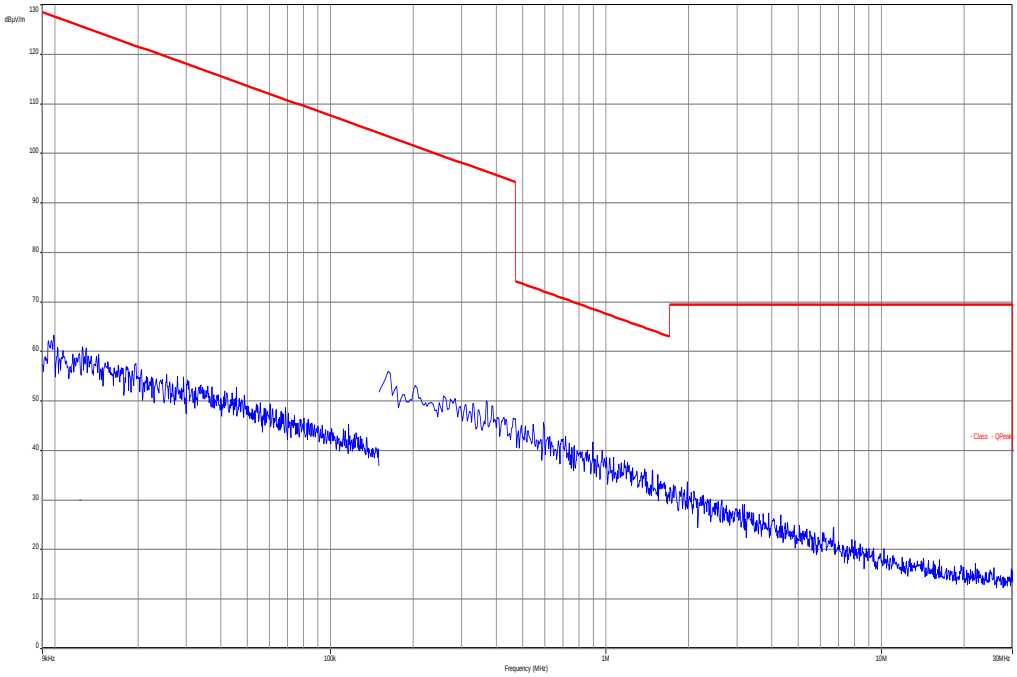
16-QAM:

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1658.0	No peaks detected.	2	1673.0	No peaks detected.	2	1688.0	No peaks detected.
3	2487.0		3	2509.5		3	2532.0	
4	3316.0		4	3346.0		4	3376.0	
5	4145.0		5	4182.5		5	4220.0	
6	4974.0		6	5019.0		6	5064.0	
7	5803.0		7	5855.5		7	5908.0	
8	6632.0		8	6692.0		8	6752.0	
9	7461.0		9	7528.5		9	7596.0	
10	8290.0		10	8365.0		10	8440.0	
Measurement uncertainty		± 3dB						

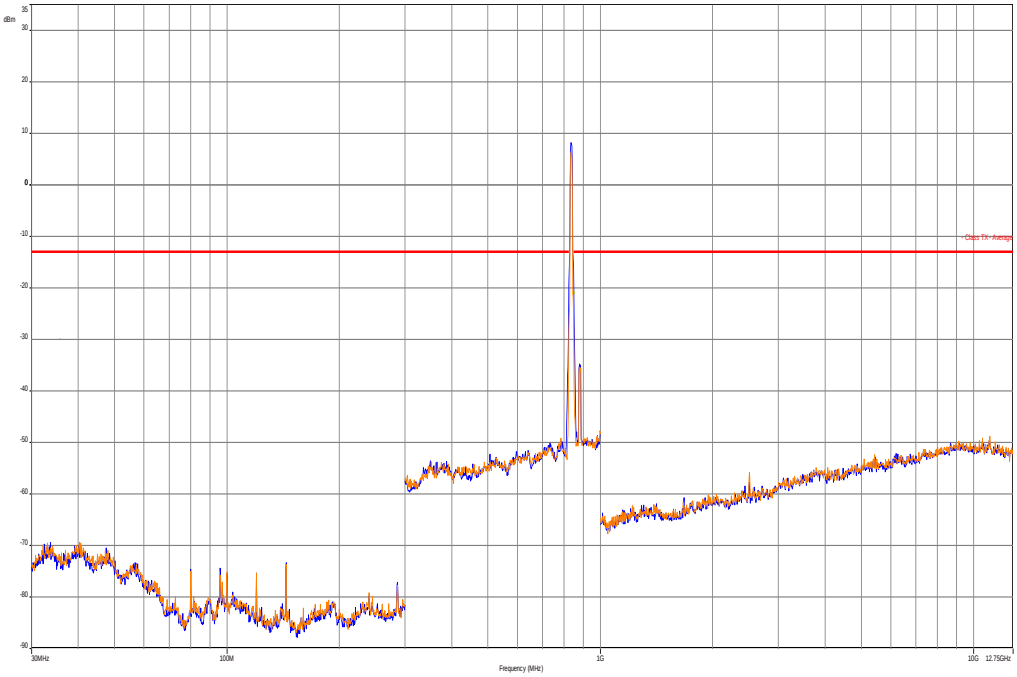
Result: **Passed**

QPSK with 10 MHz channel bandwidth

Plot 1: Channel 20525 (Traffic mode up to 30 MHz)

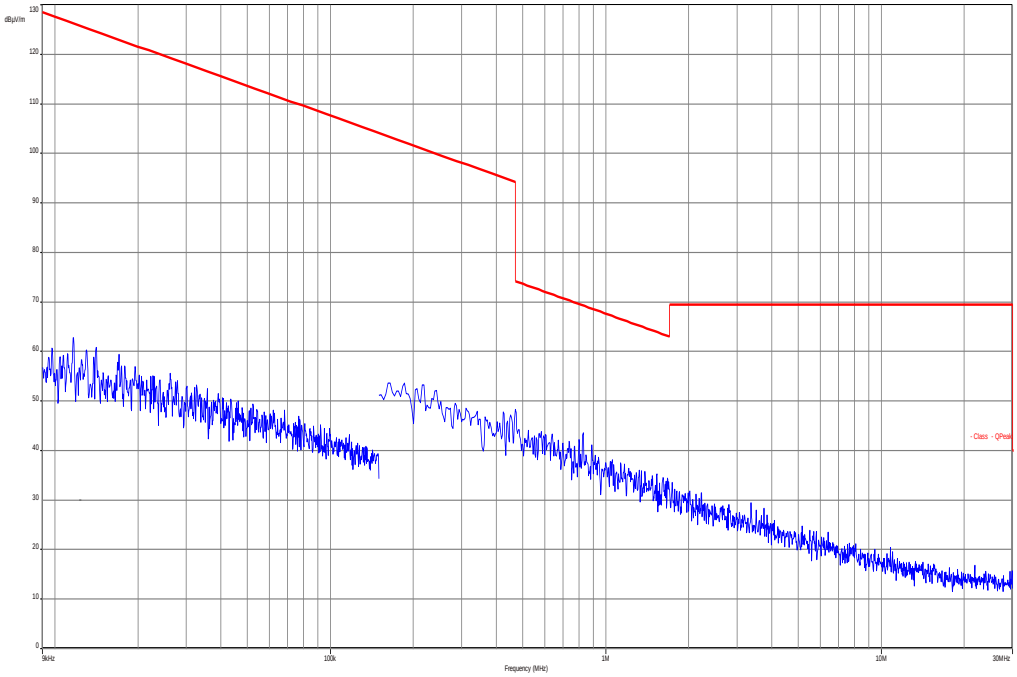


Plot 2: Channel 20525 (30 MHz – 12.75 GHz)

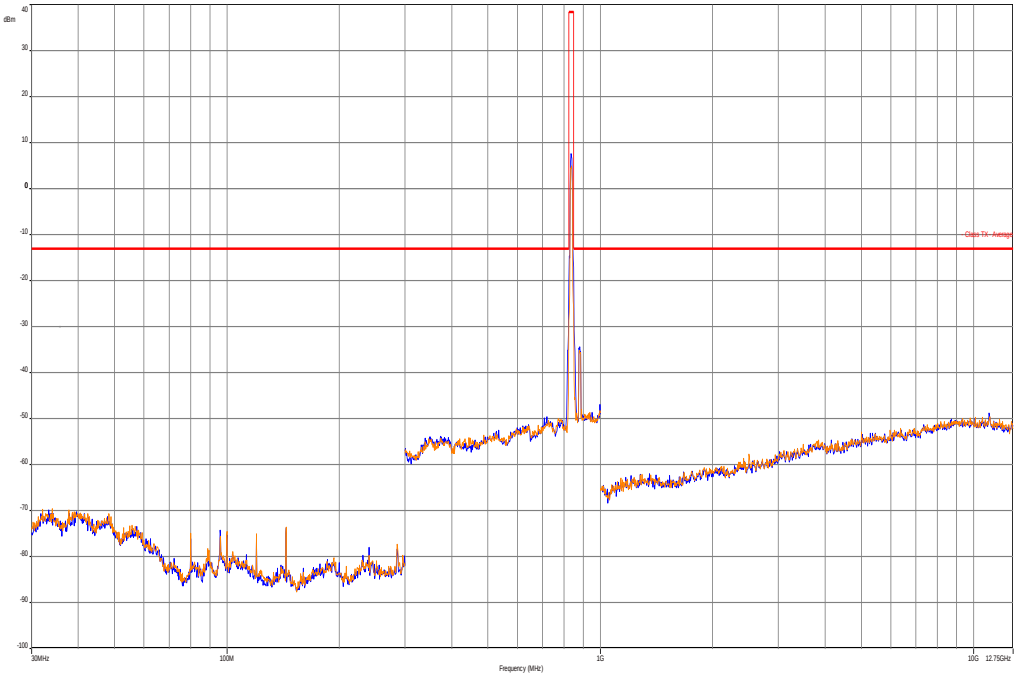


16-QAM with 10 MHz channel bandwidth

Plot 3: Channel 20525 (Traffic mode up to 30 MHz)



Plot 4: Channel 20525 (30 MHz – 12.75 GHz)



8.2.4 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 CFR 2.1057 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:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Resolution bandwidth:	Pre-measurement with 1 MHz On spurious detection re-measurement below 1 GHz with 100 kHz Above 1 GHz with 1 MHz
Span:	30 MHz – 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	-/-
Spurious Emissions Conducted	
Attenuation ≥ 43 + 10log(P) (P, Power in Watts)	
-13 dBm	

Results: for 1.4 MHz channel bandwidth

QPSK

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1649.4	No emissions detected.	2	1673.0	No emissions detected.	2	1696.6	No emissions detected.
3	2474.1		3	2509.5		3	2544.9	
4	3298.8		4	3346.0		4	3393.2	
5	4123.5		5	4182.5		5	4241.5	
6	4948.2		6	5019.0		6	5089.8	
7	5772.9		7	5855.5		7	5938.1	
8	6597.6		8	6692.0		8	6786.4	
9	7422.3		9	7258.5		9	7634.7	
10	8247.0		10	8365.0		10	8483.0	
Measurement uncertainty			± 0.5dB					

16-QAM

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1649.4	No emissions detected.	2	1673.0	No emissions detected.	2	1696.6	No emissions detected.
3	2474.1		3	2509.5		3	2544.9	
4	3298.8		4	3346.0		4	3393.2	
5	4123.5		5	4182.5		5	4241.5	
6	4948.2		6	5019.0		6	5089.8	
7	5772.9		7	5855.5		7	5938.1	
8	6597.6		8	6692.0		8	6786.4	
9	7422.3		9	7258.5		9	7634.7	
10	8247.0		10	8365.0		10	8483.0	
Measurement uncertainty			± 0.5dB					

Results: for 3 MHz channel bandwidth

QPSK

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1651.0	No emissions detected.	2	1673.0	No emissions detected.	2	1695.0	No emissions detected.
3	2476.5		3	2509.5		3	2542.5	
4	3302.0		4	3346.0		4	3390.0	
5	4127.5		5	4182.5		5	4237.5	
6	4953.0		6	5019.0		6	5085.0	
7	5778.5		7	5855.5		7	5932.5	
8	6604.0		8	6692.0		8	6780.0	
9	7429.5		9	7258.5		9	7627.5	
10	8255.0		10	8365.0		10	8475.0	
Measurement uncertainty			± 0.5dB					

16-QAM

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1651.0	No emissions detected.	2	1673.0	No emissions detected.	2	1695.0	No emissions detected.
3	2476.5		3	2509.5		3	2542.5	
4	3302.0		4	3346.0		4	3390.0	
5	4127.5		5	4182.5		5	4237.5	
6	4953.0		6	5019.0		6	5085.0	
7	5778.5		7	5855.5		7	5932.5	
8	6604.0		8	6692.0		8	6780.0	
9	7429.5		9	7258.5		9	7627.5	
10	8255.0		10	8365.0		10	8475.0	
Measurement uncertainty			± 0.5dB					

Results: for 5 MHz channel bandwidth

QPSK

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1653.0	No emissions detected.	2	1673.0	No emissions detected.	2	1693.0	No emissions detected.
3	2479.5		3	2509.5		3	2539.5	
4	3306.0		4	3346.0		4	3386.0	
5	4132.5		5	4182.5		5	4232.5	
6	4959.0		6	5019.0		6	5079.0	
7	5785.5		7	5855.5		7	5925.5	
8	6612.0		8	6692.0		8	6772.0	
9	7438.5		9	7528.5		9	7618.5	
10	8265.0		10	8365.0		10	8465.0	
Measurement uncertainty			± 0.5dB					

16-QAM

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1653.0	No emissions detected.	2	1673.0	No emissions detected.	2	1693.0	No emissions detected.
3	2479.5		3	2509.5		3	2539.5	
4	3306.0		4	3346.0		4	3386.0	
5	4132.5		5	4182.5		5	4232.5	
6	4959.0		6	5019.0		6	5079.0	
7	5785.5		7	5855.5		7	5925.5	
8	6612.0		8	6692.0		8	6772.0	
9	7438.5		9	7528.5		9	7618.5	
10	8265.0		10	8365.0		10	8465.0	
Measurement uncertainty			± 0.5dB					

Results: for 10 MHz channel bandwidth

QPSK

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1658.0	No emissions detected.	2	1673.0	No emissions detected.	2	1688.0	No emissions detected.
3	2487.0		3	2509.5		3	2532.0	
4	3316.0		4	3346.0		4	3376.0	
5	4145.0		5	4182.5		5	4220.0	
6	4974.0		6	5019.0		6	5064.0	
7	5803.0		7	5855.5		7	5908.0	
8	6632.0		8	6692.0		8	6752.0	
9	7461.0		9	7528.5		9	7596.0	
10	8290.0		10	8365.0		10	8440.0	
Measurement uncertainty		± 0.5dB						

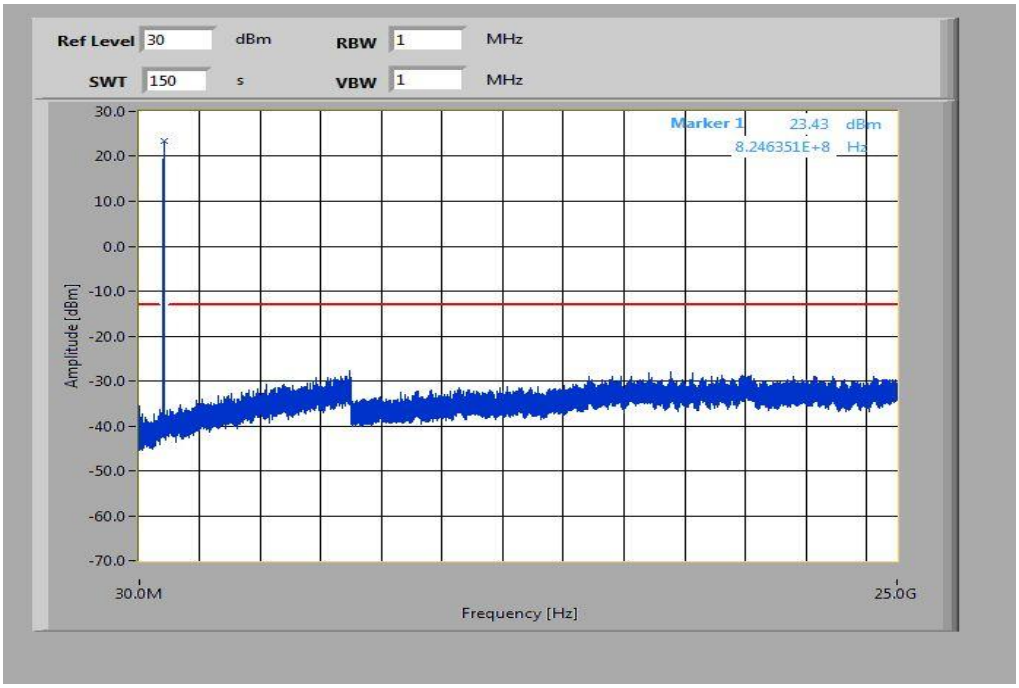
16-QAM

Spurious Emission Level (dBm)								
Harmonic	Lowest channel Freq. (MHz)	Level [dBm]	Harmonic	Middle channel Freq. (MHz)	Level [dBm]	Harmonic	Highest channel Freq. (MHz)	Level [dBm]
2	1658.0	No emissions detected.	2	1673.0	No emissions detected.	2	1688.0	No emissions detected.
3	2487.0		3	2509.5		3	2532.0	
4	3316.0		4	3346.0		4	3376.0	
5	4145.0		5	4182.5		5	4220.0	
6	4974.0		6	5019.0		6	5064.0	
7	5803.0		7	5855.5		7	5908.0	
8	6632.0		8	6692.0		8	6752.0	
9	7461.0		9	7528.5		9	7596.0	
10	8290.0		10	8365.0		10	8440.0	
Measurement uncertainty		± 0.5dB						

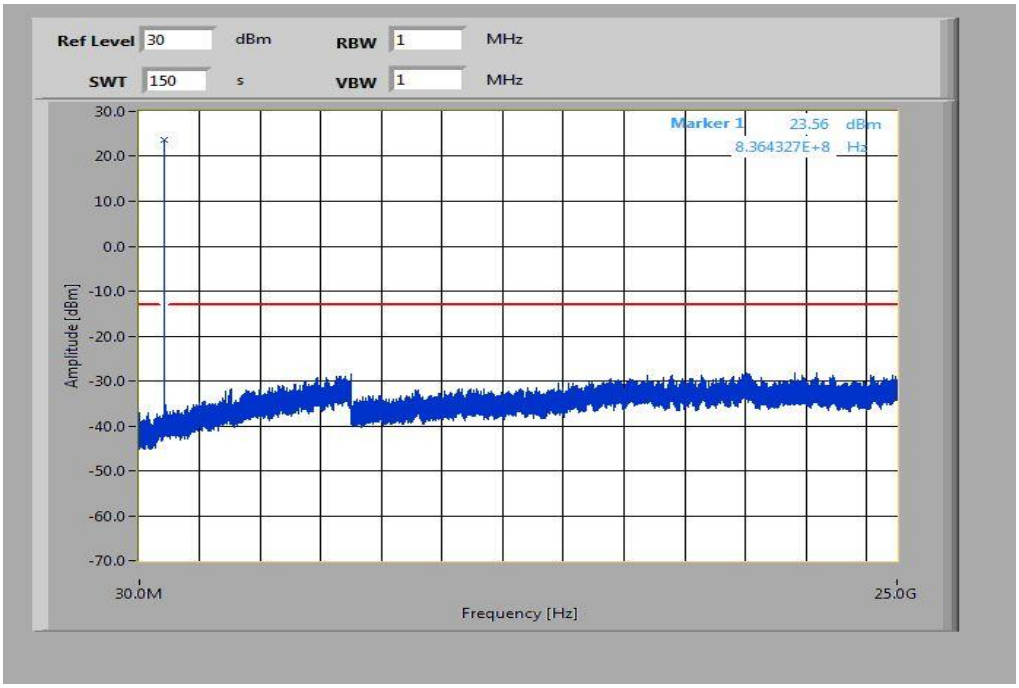
Result: Passed

Plots: QPSK with 1.4 MHz channel bandwidth

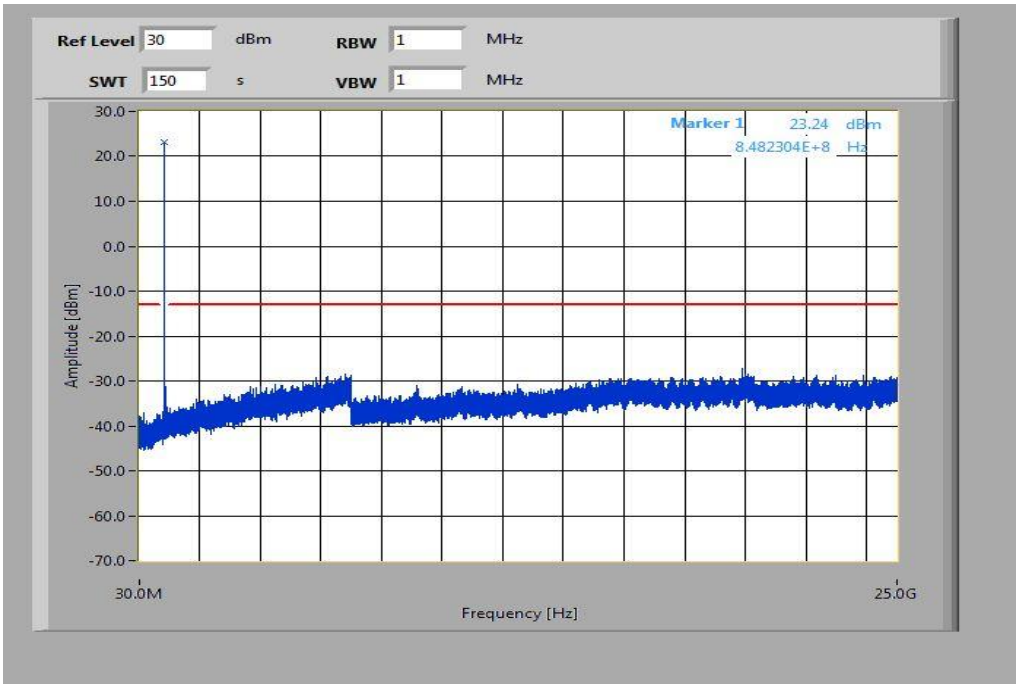
Plot 1: Lowest Channel (30 MHz - 25 GHz)



Plot 2: Middle Channel (30 MHz - 25 GHz)

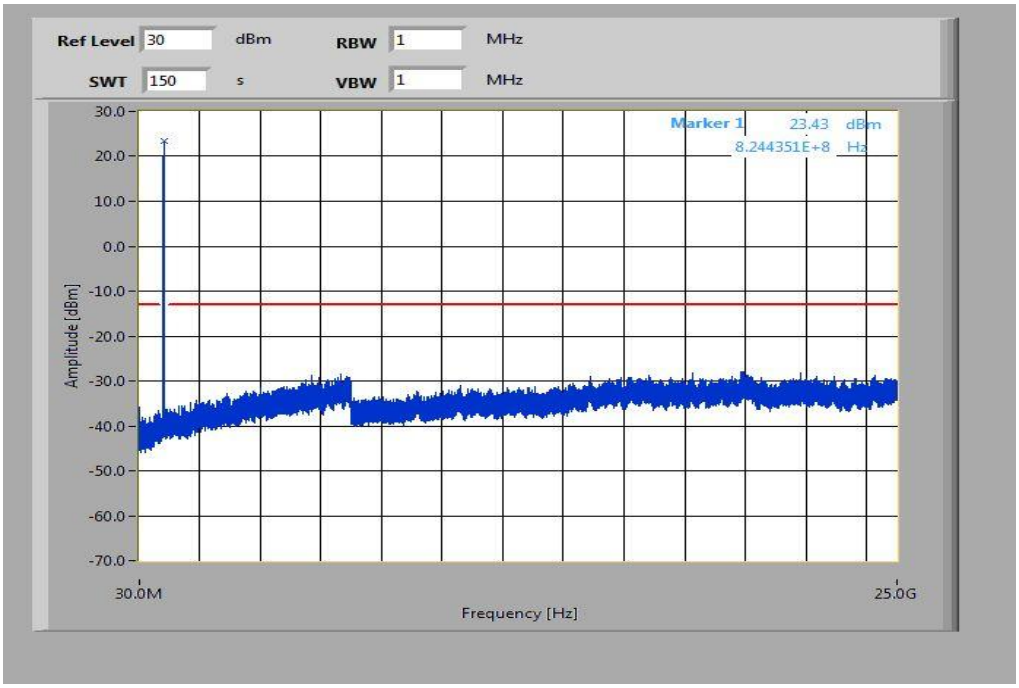


Plot 3: Highest Channel (30 MHz - 25 GHz)

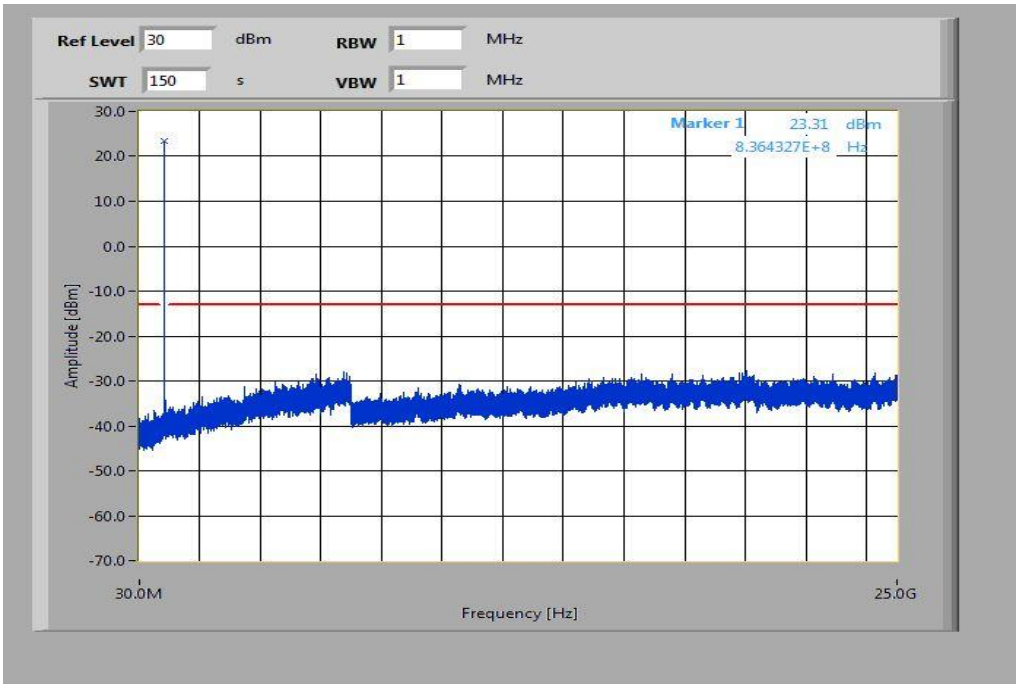


Plots: 16-QAM with 1.4 MHz channel bandwidth

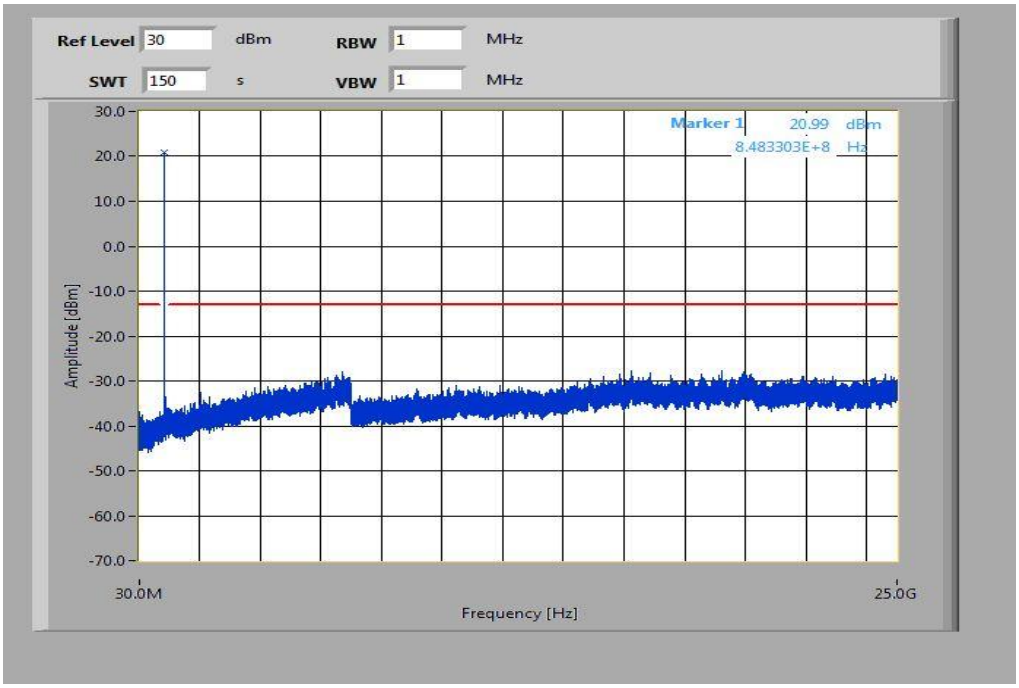
Plot 4: Lowest Channel (30 MHz - 25 GHz)



Plot 5: Middle Channel (30 MHz - 25 GHz)

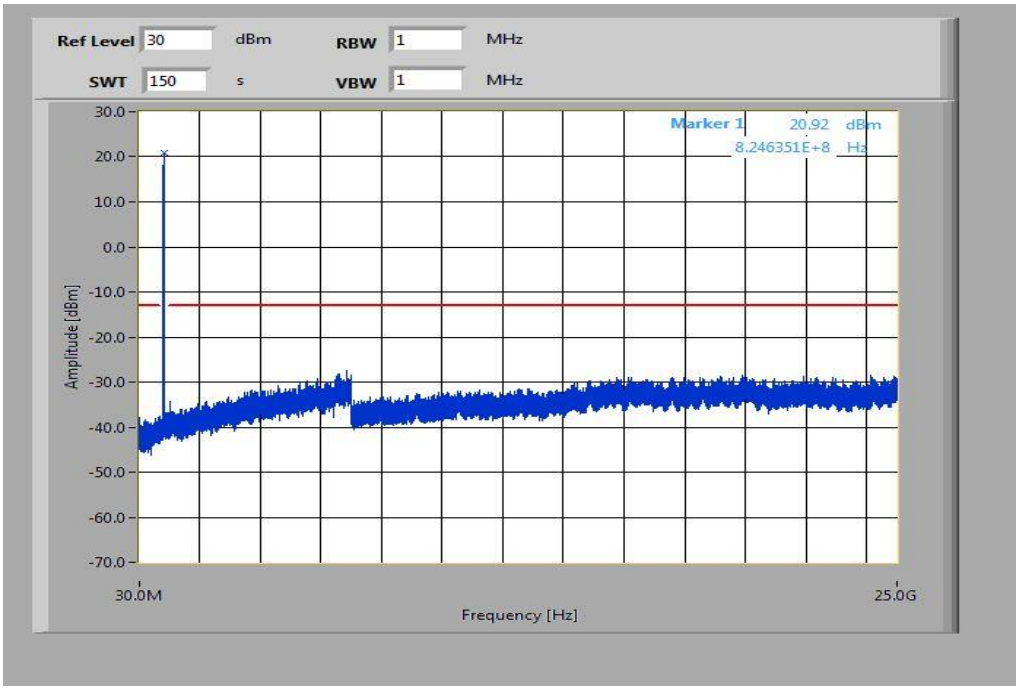


Plot 6: Highest Channel (30 MHz - 25 GHz)

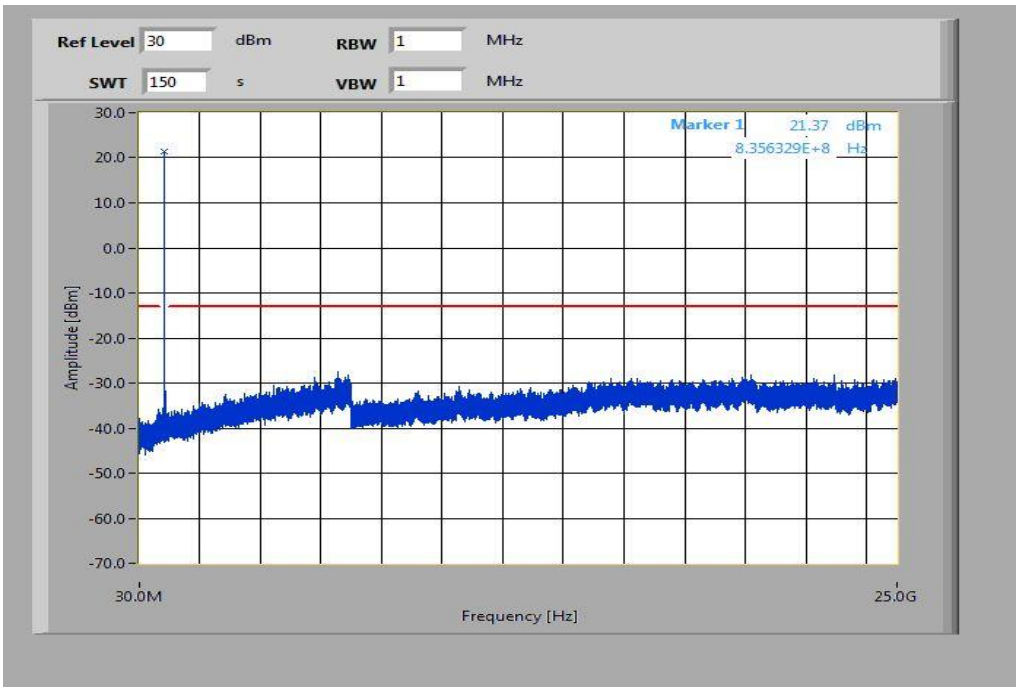


Plots: QPSK with 3 MHz channel bandwidth

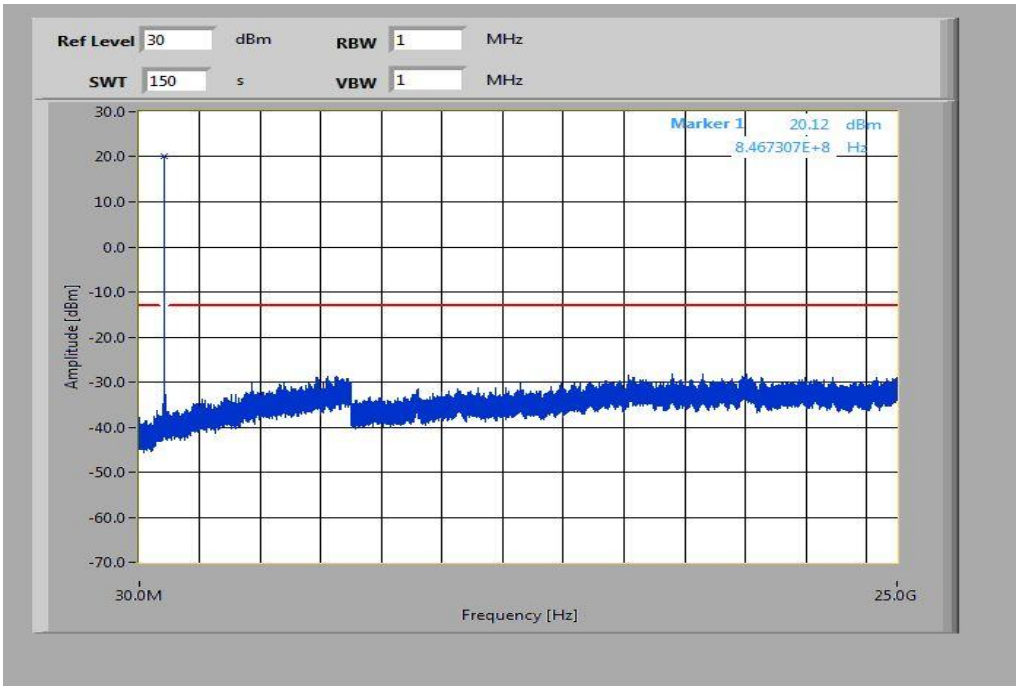
Plot 1: Lowest Channel (30 MHz - 25 GHz)



Plot 2: Middle Channel (30 MHz - 25 GHz)

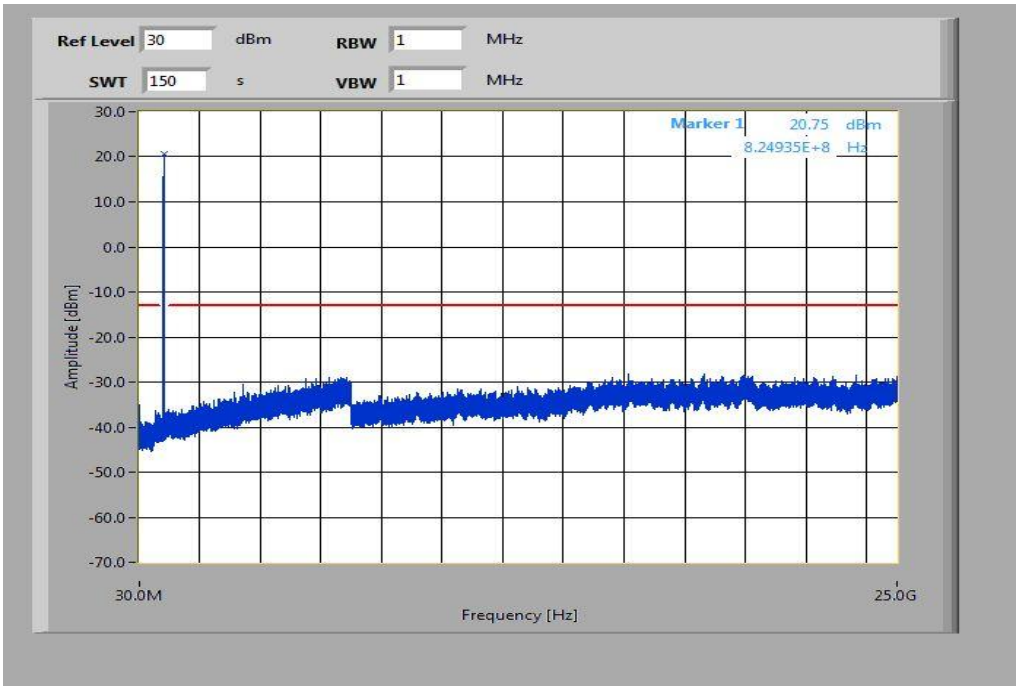


Plot 3: Highest Channel (30 MHz - 25 GHz)

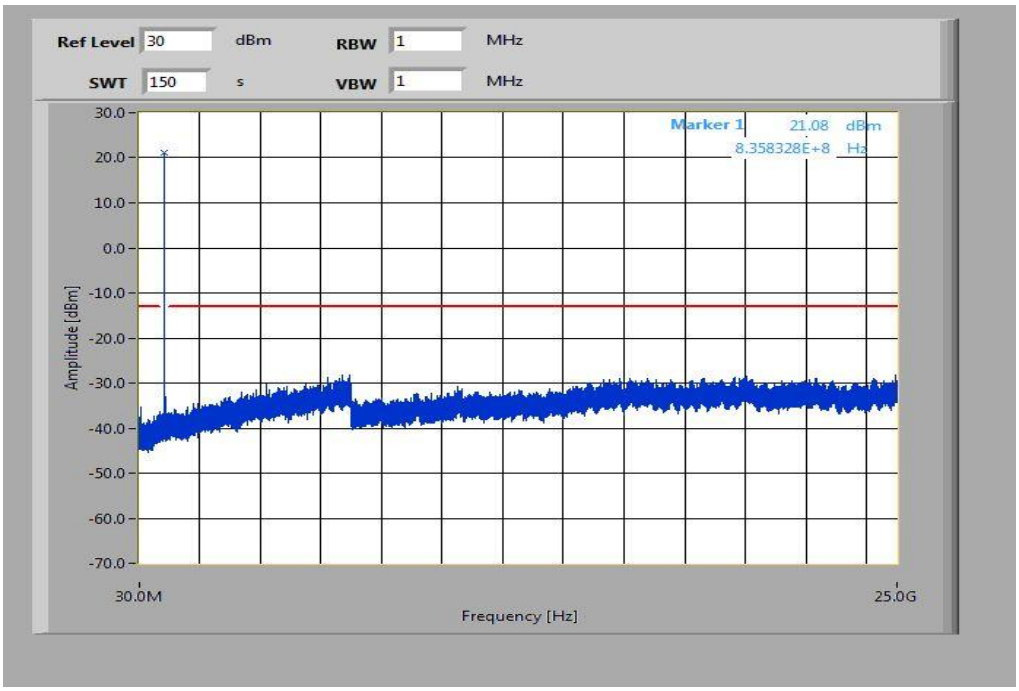


Plots: 16-QAM with 3 MHz channel bandwidth

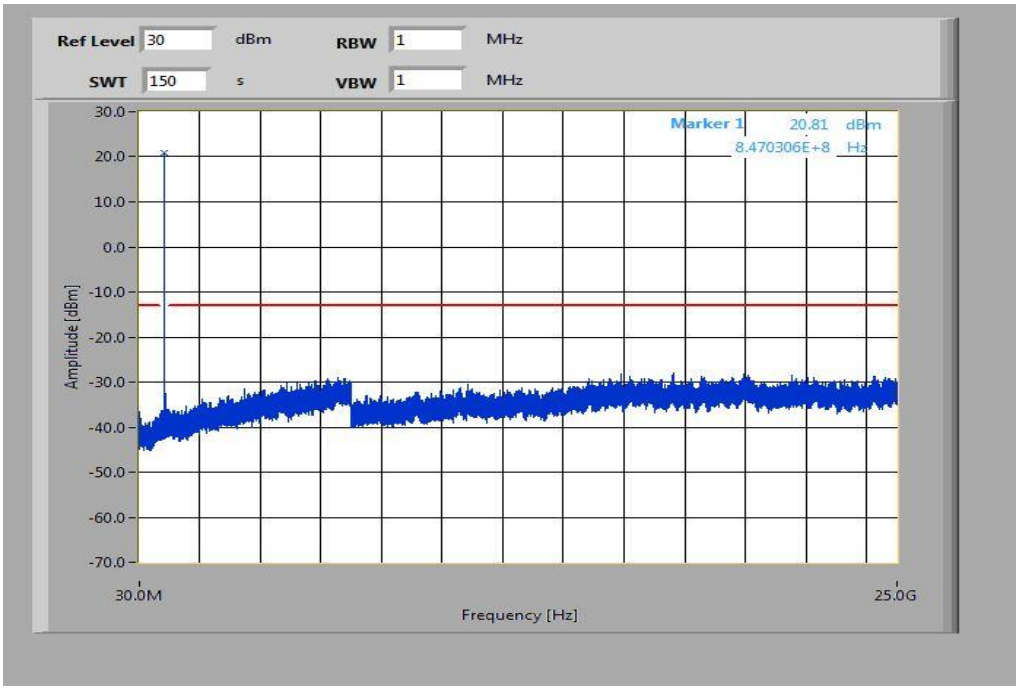
Plot 4: Lowest Channel (30 MHz - 25 GHz)



Plot 5: Middle Channel (30 MHz - 25 GHz)

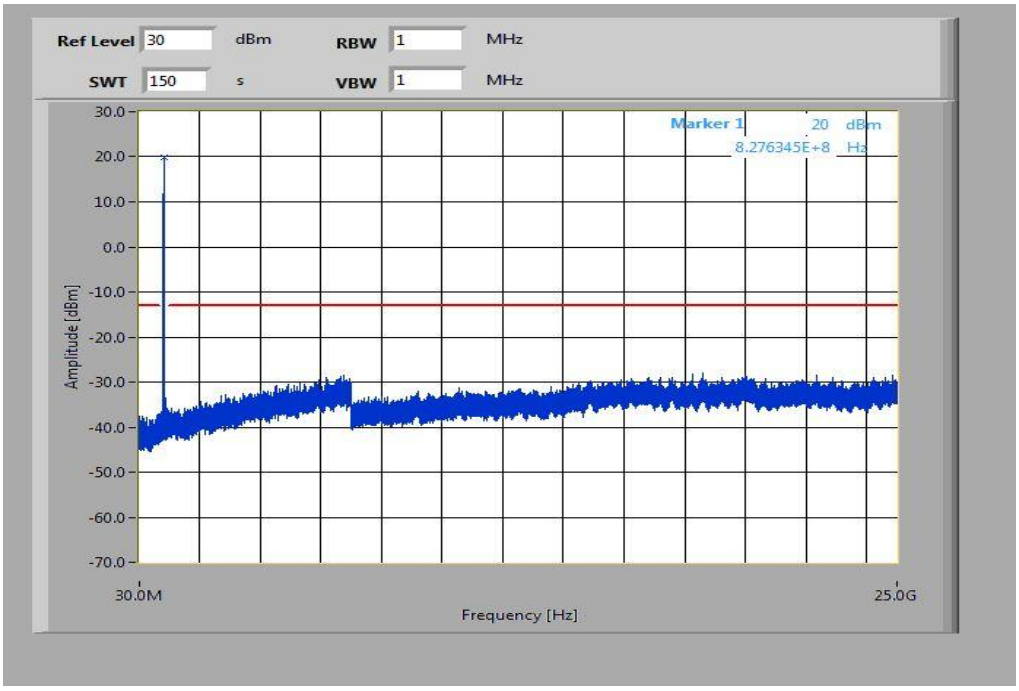


Plot 6: Highest Channel (30 MHz - 25 GHz)

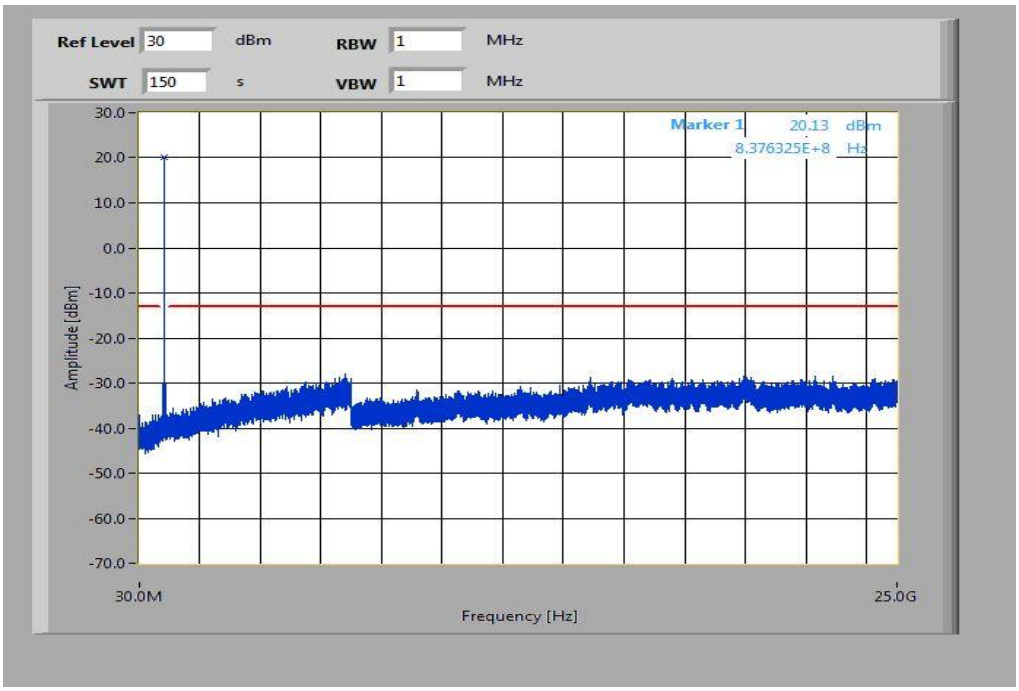


Plots: QPSK with 5 MHz channel bandwidth

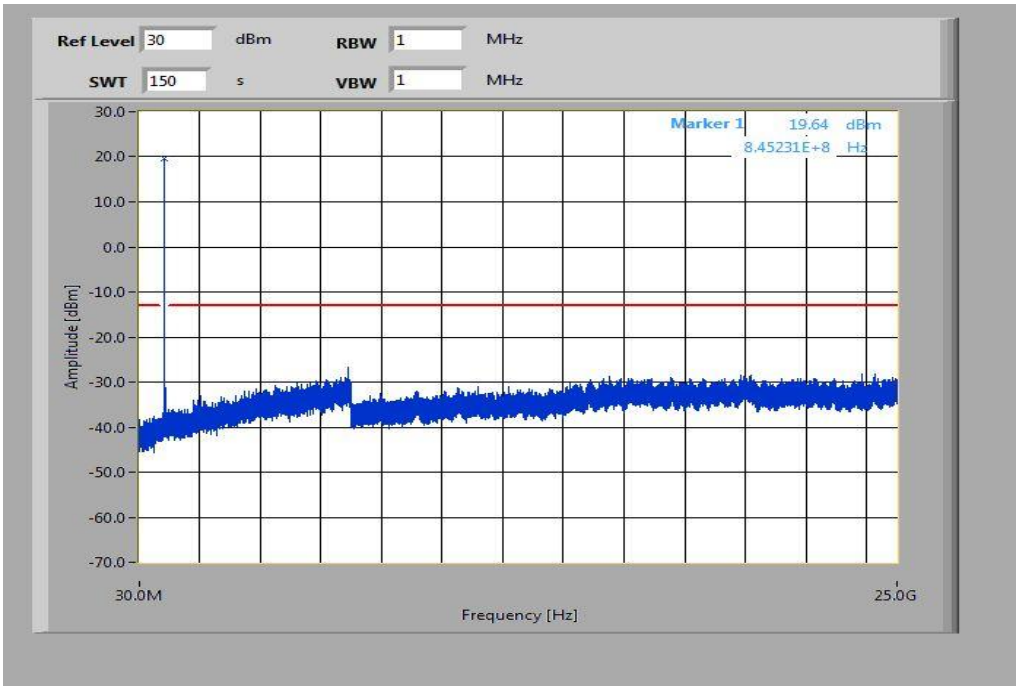
Plot 1: Lowest Channel (30 MHz - 25 GHz)



Plot 2: Middle Channel (30 MHz - 25 GHz)

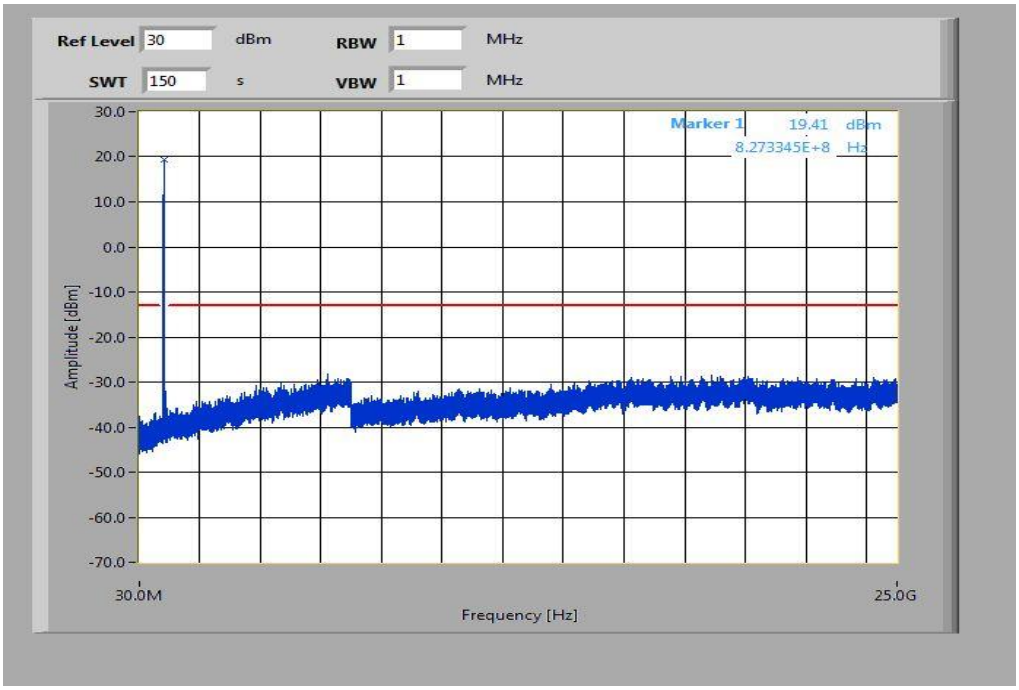


Plot 3: Highest Channel (30 MHz - 25 GHz)

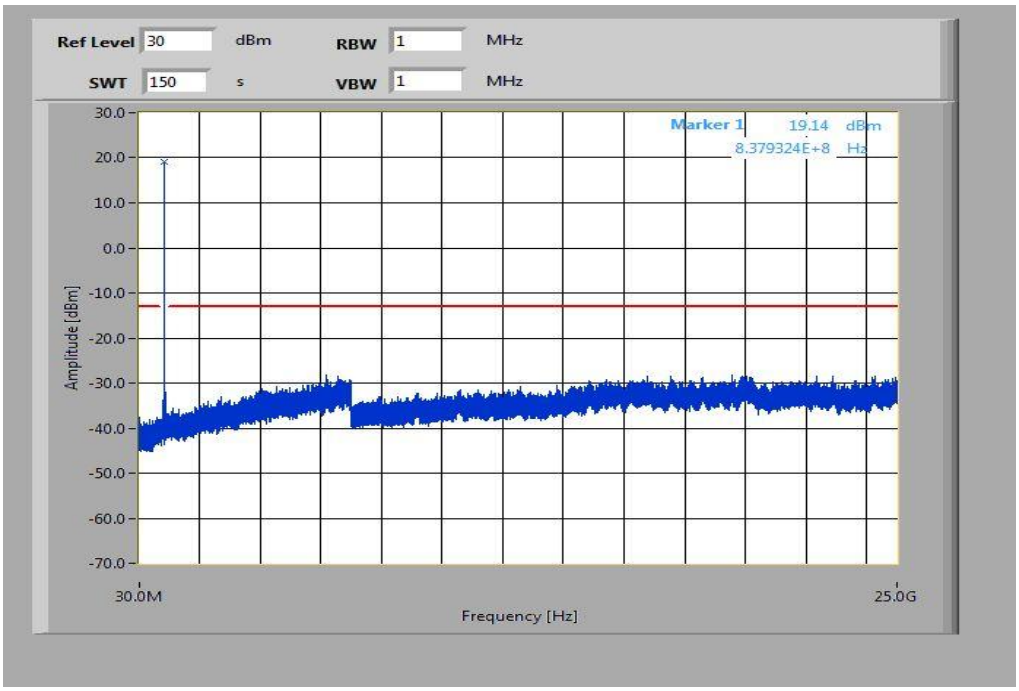


Plots: 16-QAM with 5 MHz channel bandwidth

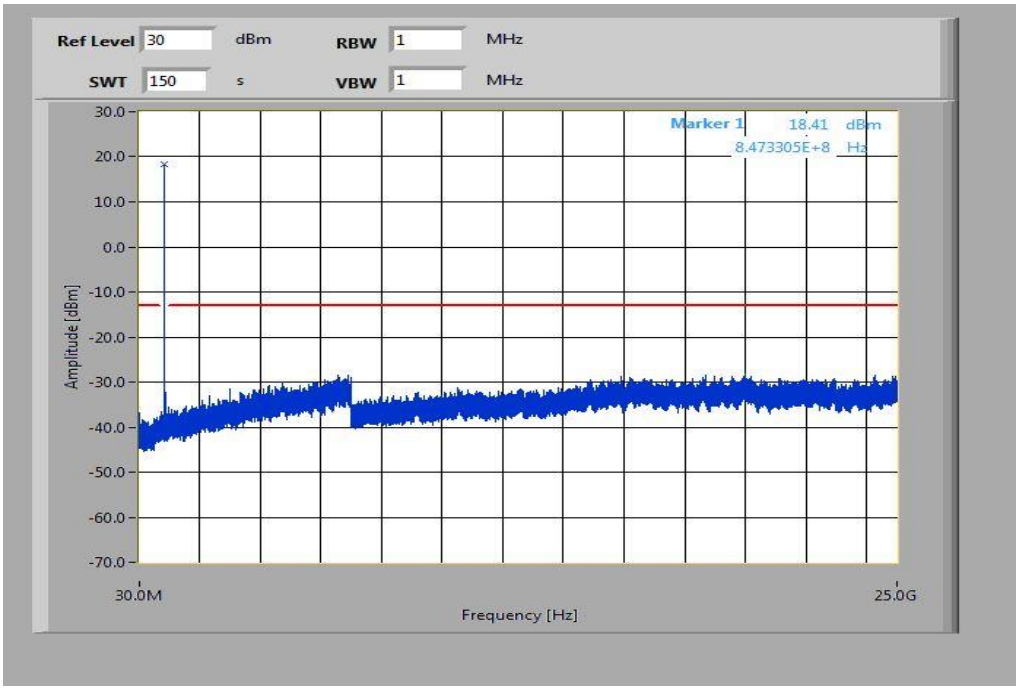
Plot 4: Lowest Channel (30 MHz - 25 GHz)



Plot 5: Middle Channel (30 MHz - 25 GHz)

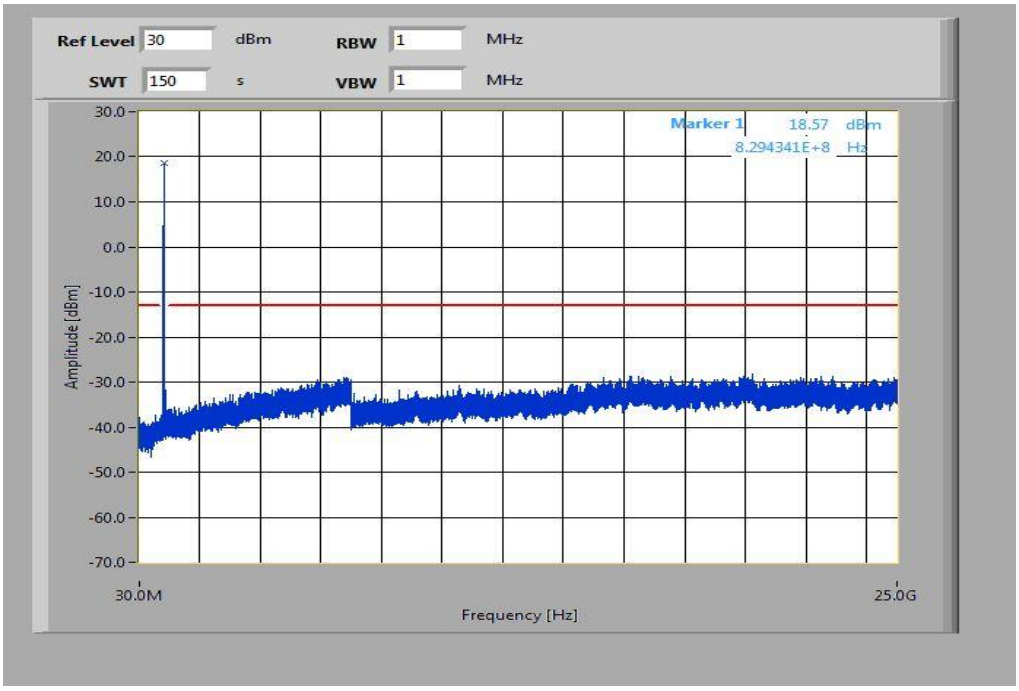


Plot 6: Highest Channel (30 MHz - 25 GHz)

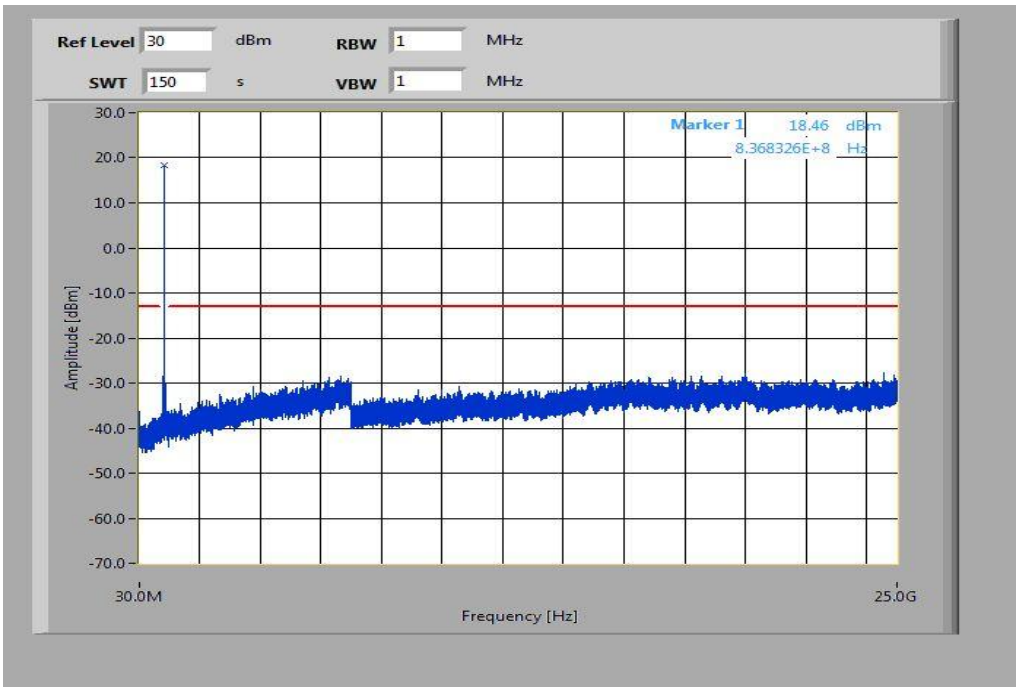


Plots: QPSK with 10 MHz channel bandwidth

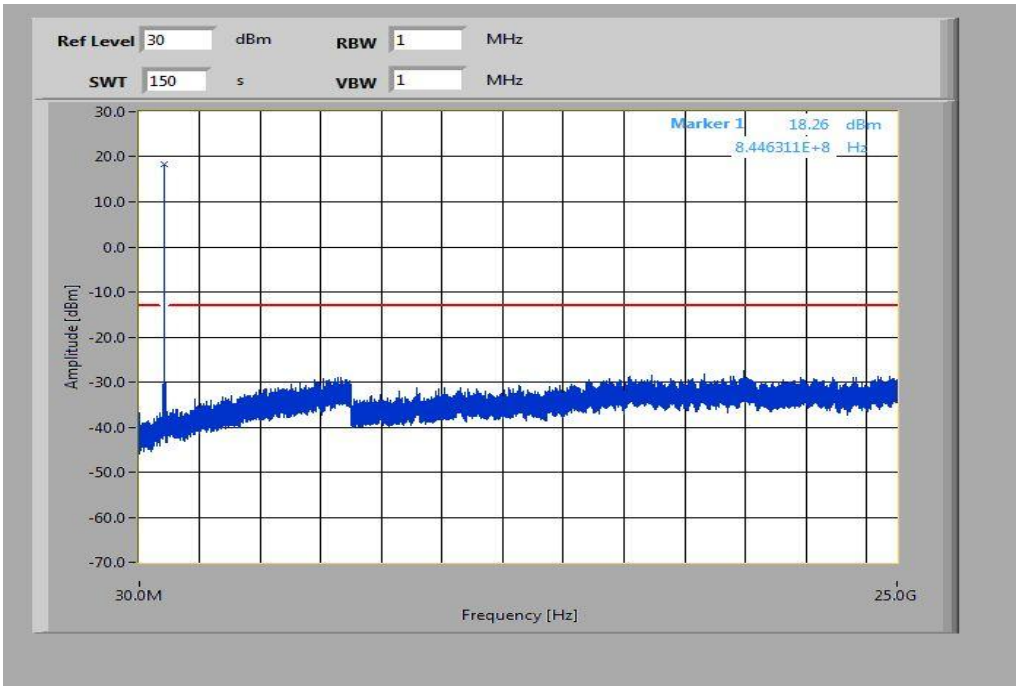
Plot 1: Lowest Channel (30 MHz - 25 GHz)



Plot 2: Middle Channel (30 MHz - 25 GHz)

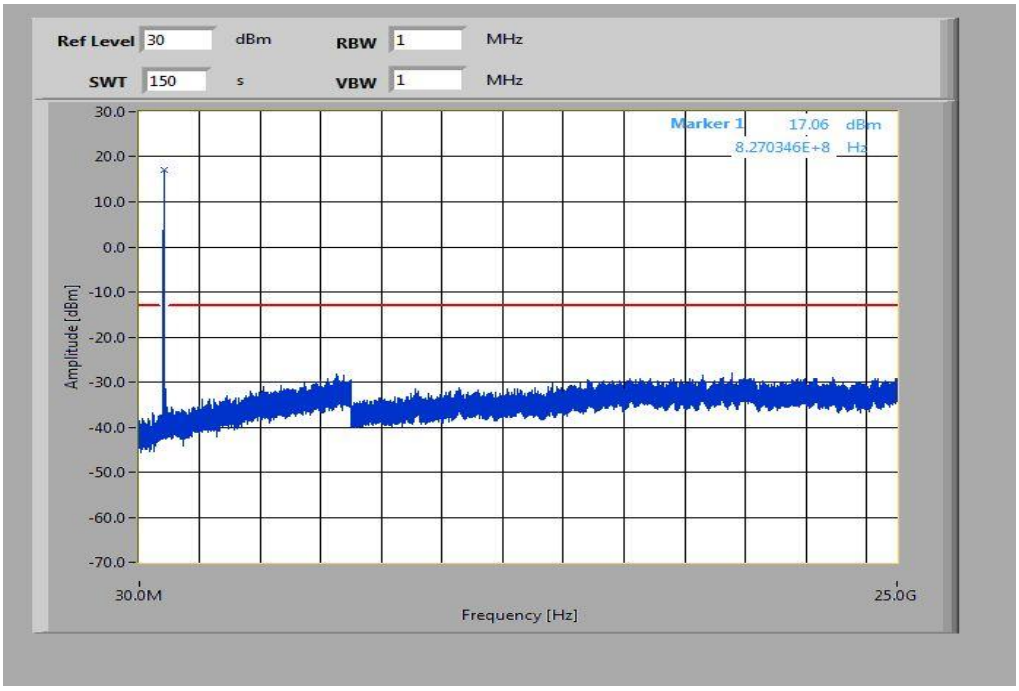


Plot 3: Highest Channel (30 MHz - 25 GHz)

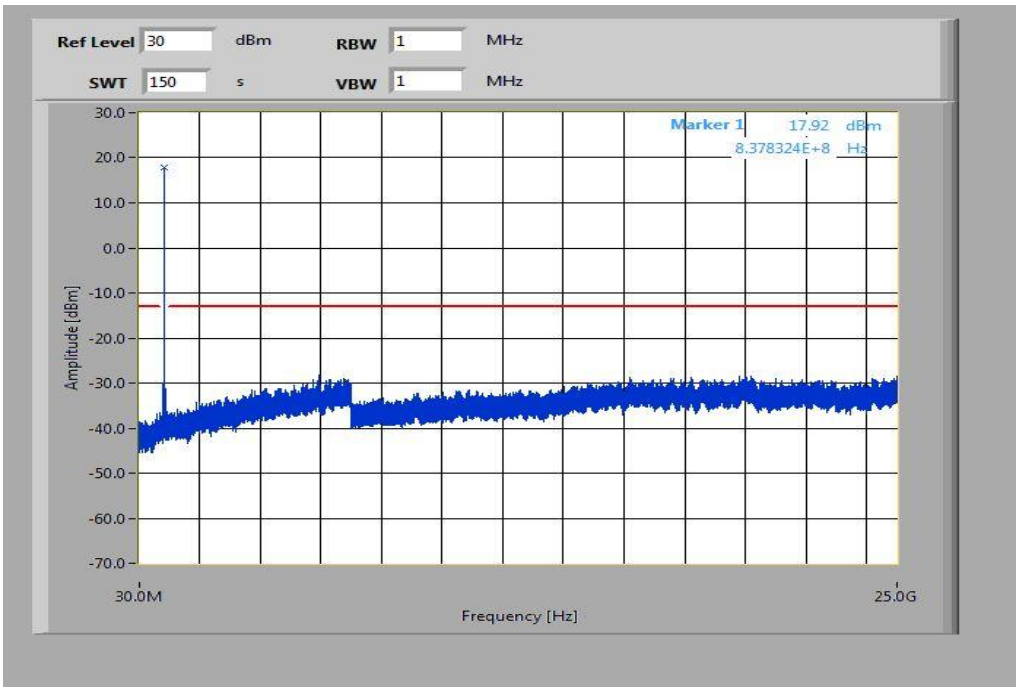


Plots: 16-QAM with 10 MHz channel bandwidth

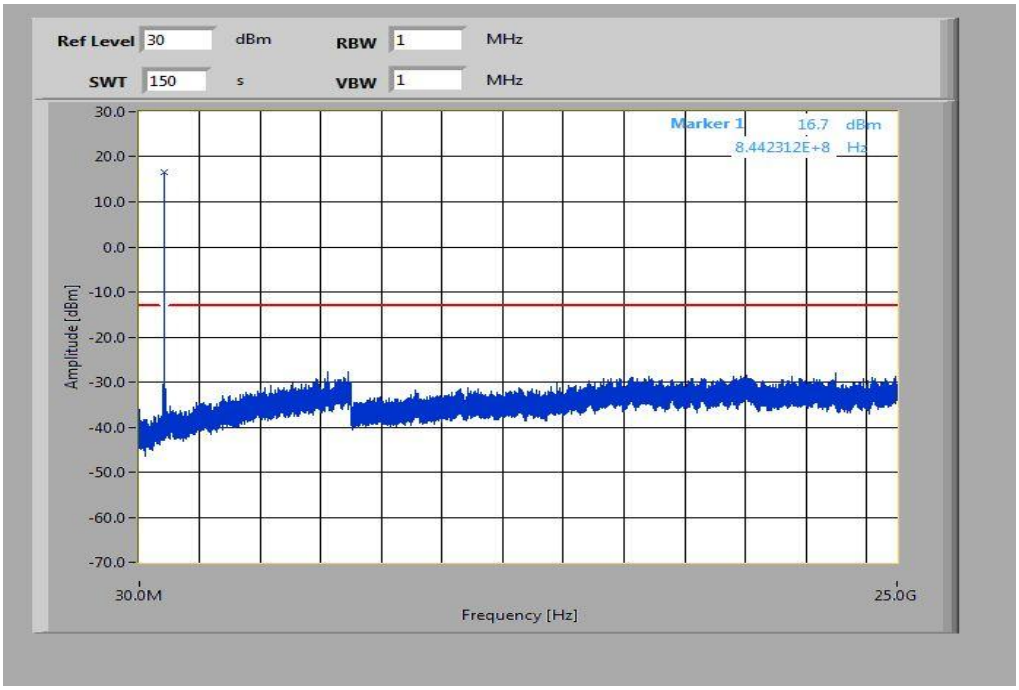
Plot 4: Lowest Channel (30 MHz - 25 GHz)



Plot 5: Middle Channel (30 MHz - 25 GHz)



Plot 6: Highest Channel (30 MHz - 25 GHz)



8.2.5 Block edge compliance

Description:

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

Measurement:

Measurement parameters	
Detector:	RMS
Sweep time:	60 s
Video bandwidth:	30 kHz
Resolution bandwidth:	30 kHz
Span:	1 MHz
Trace-Mode:	Max Hold

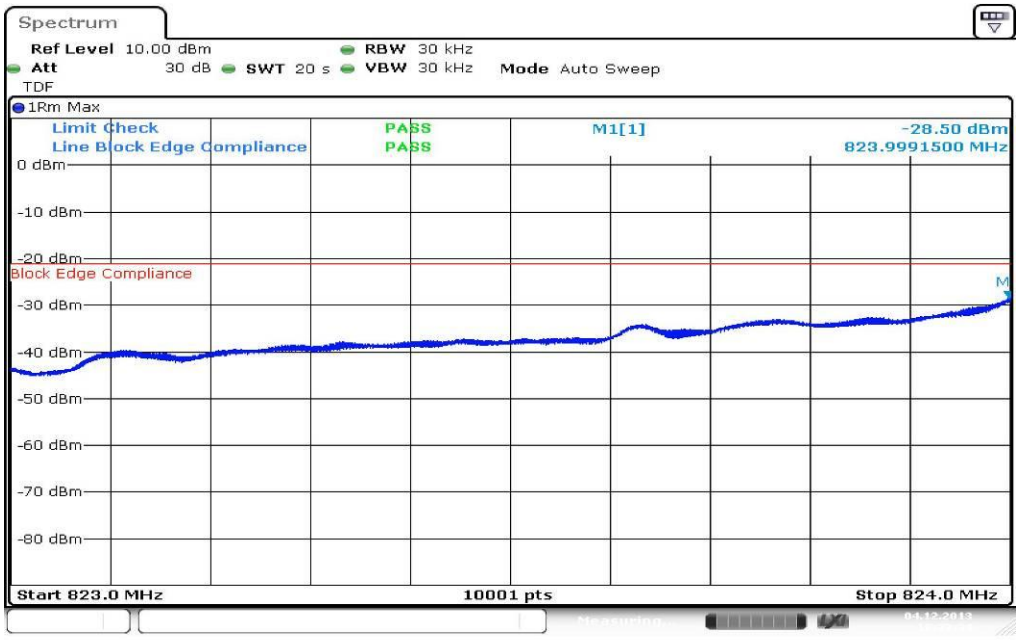
Limits:

FCC	-/-
Block Edge Compliance	
Part 22.917 specifies that “the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.” However, in publication number 890810, The FCC Office of Engineering and Technology specified the following correction to the limits when a resolution bandwidth smaller than 1% of the emission bandwidth is used: “An alternative is to add an additional correction factor of 10 Log (RBW1/ RBW2) to the 43 +10 log(P) limit. RBW1 is the narrower measurement resolution bandwidth and RBW2 is either the 1% emissions bandwidth or 1 MHz.” When using a 30 kHz bandwidth, this yields a -5.23 adjustment to the limit [10 log(30kHz/100kHz) = -5.23]. When this adjustment is applied to the limit, the limit becomes -18.23 dBm.	
-18.23 dBm	

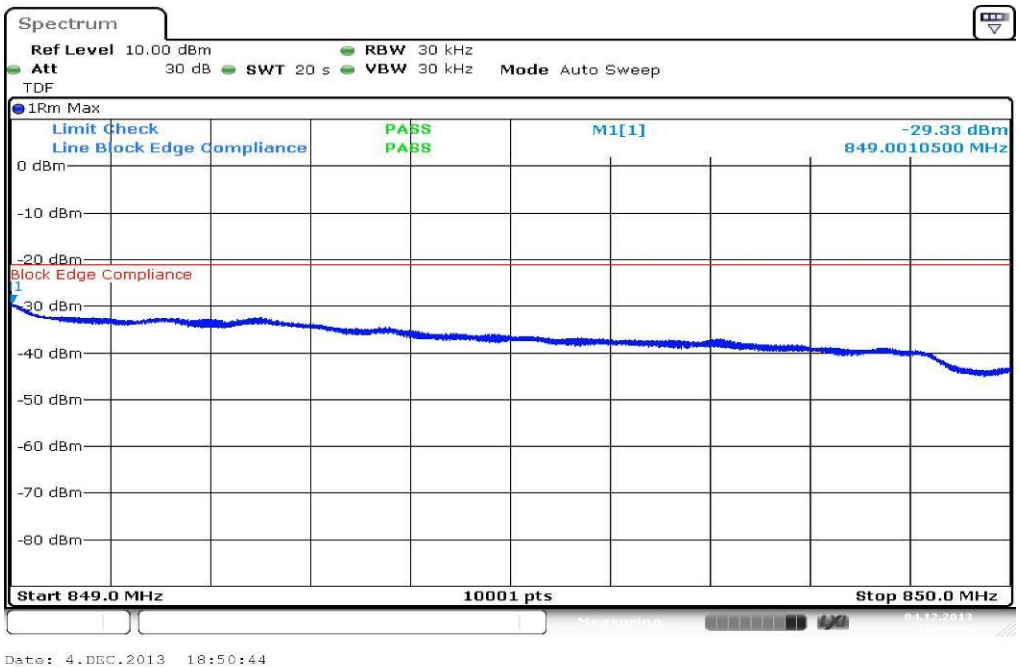
The limit line in the plots is the over all LTE bands and channel bandwidths worst case -21.24 dBm.

Results: **1.4 MHz channel bandwidth**

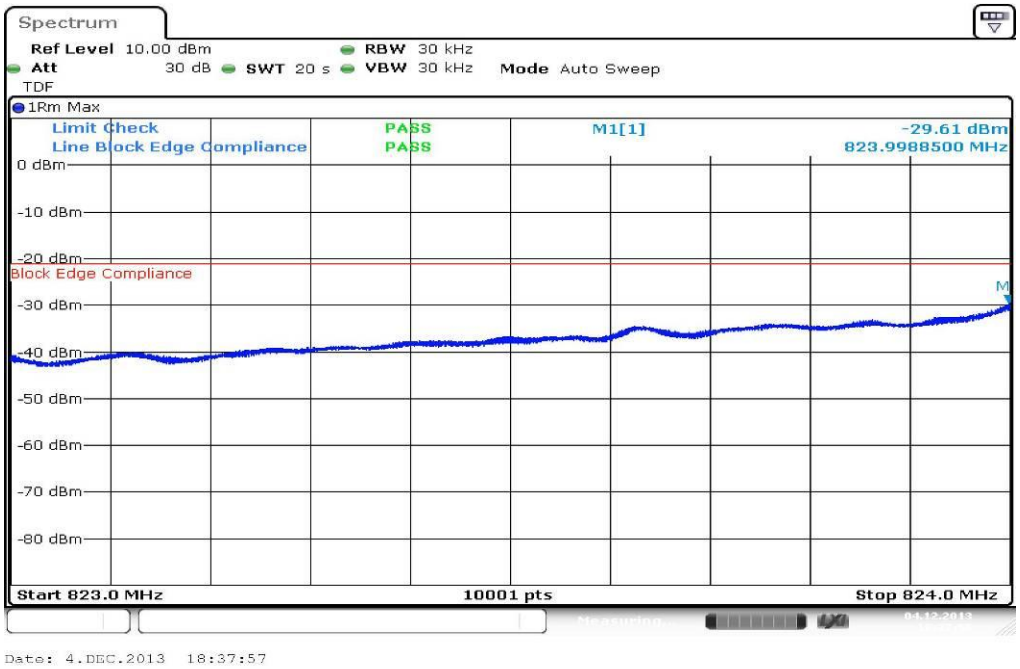
Plot 1: Lowest channel – QPSK



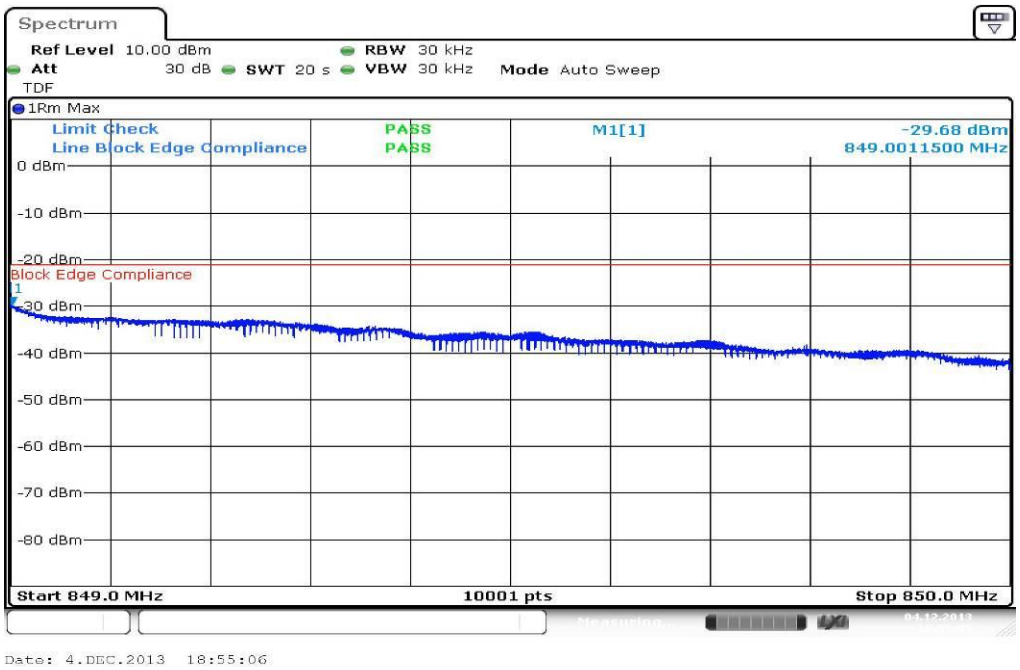
Plot 2: Highest channel – QPSK



Plot 3: Lowest channel – 16-QAM

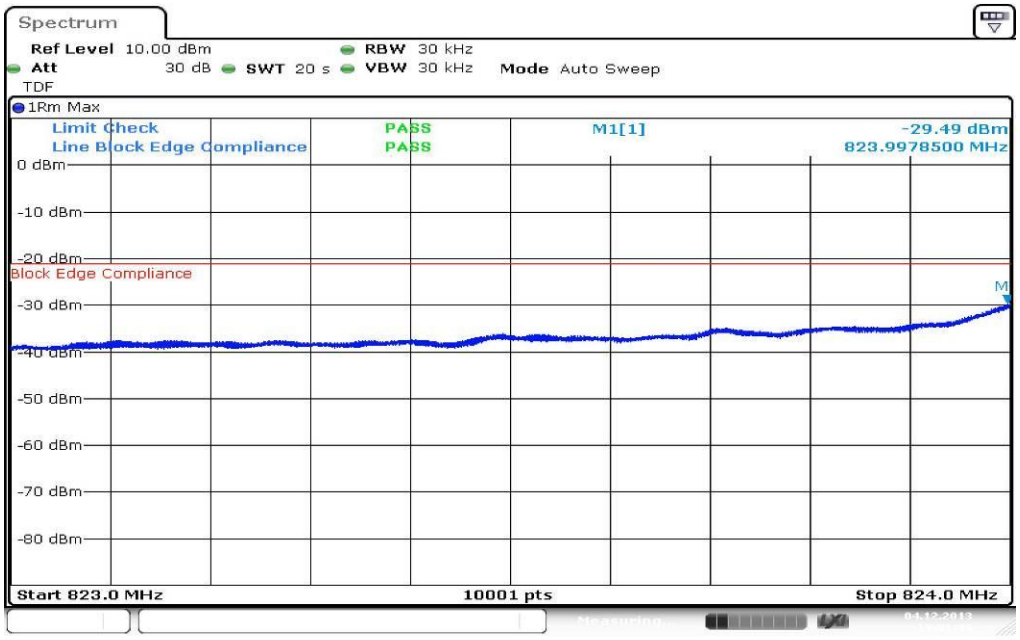


Plot 4: Highest channel – 16-QAM

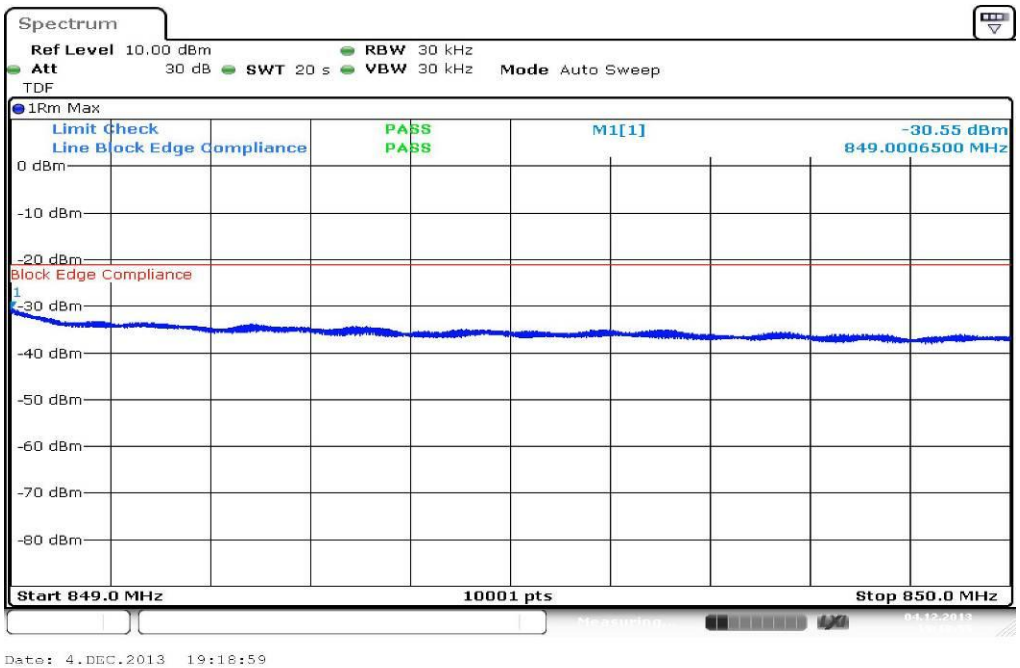


Results: **3 MHz channel bandwidth**

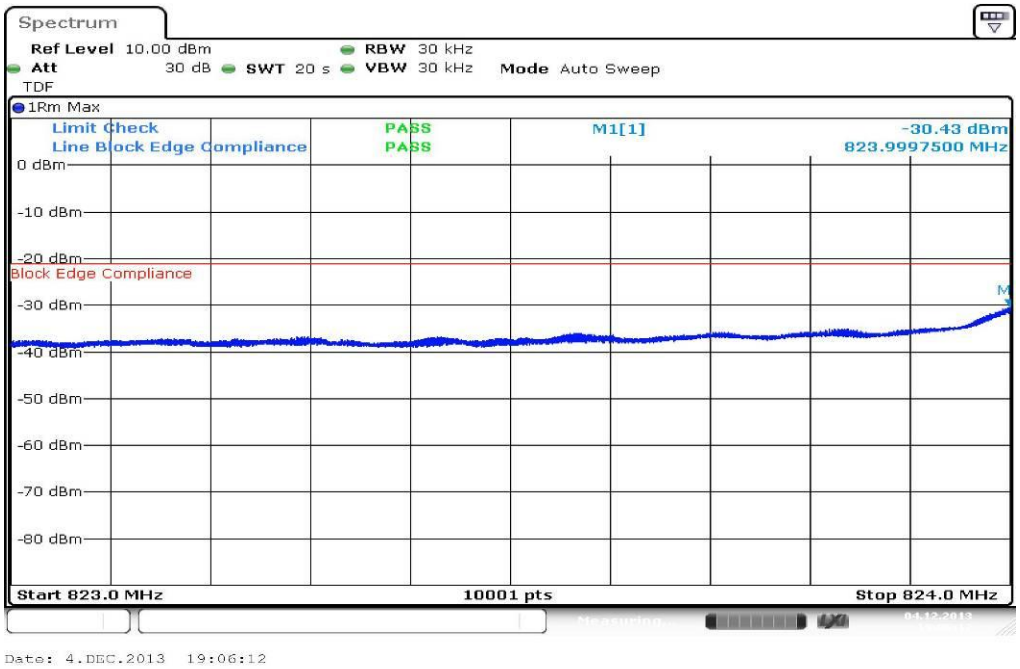
Plot 1: Lowest channel – QPSK



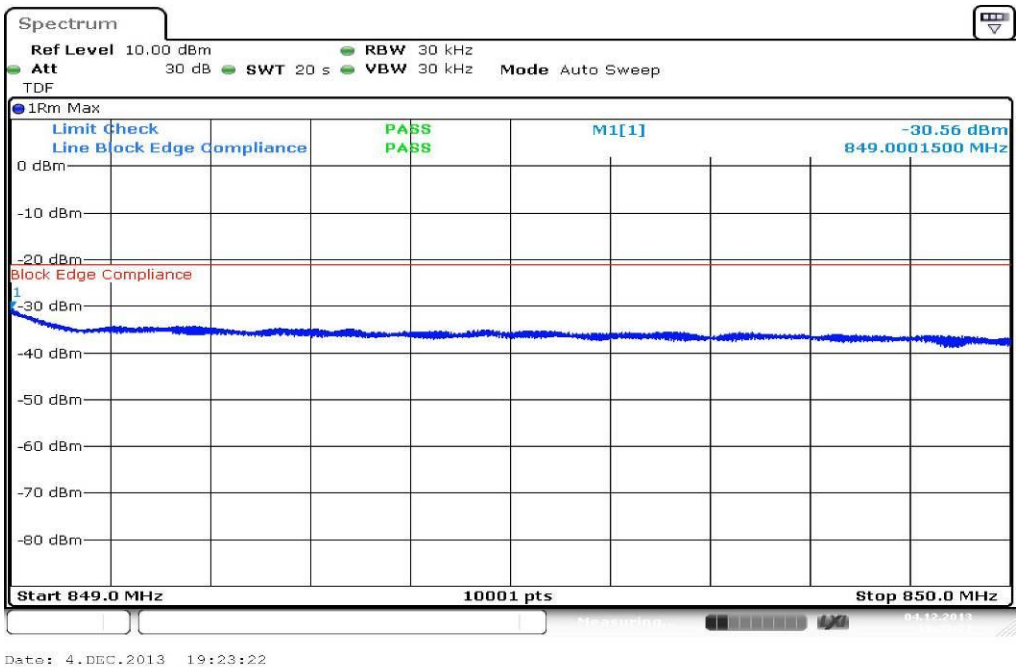
Plot 2: Highest channel – QPSK



Plot 3: Lowest channel – 16-QAM

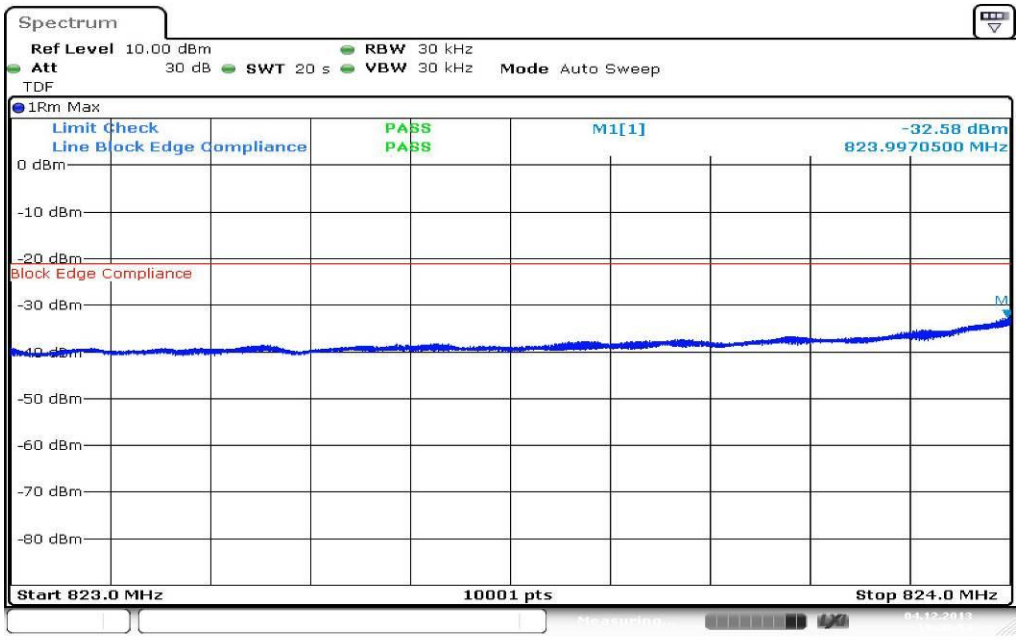


Plot 4: Highest channel – 16-QAM

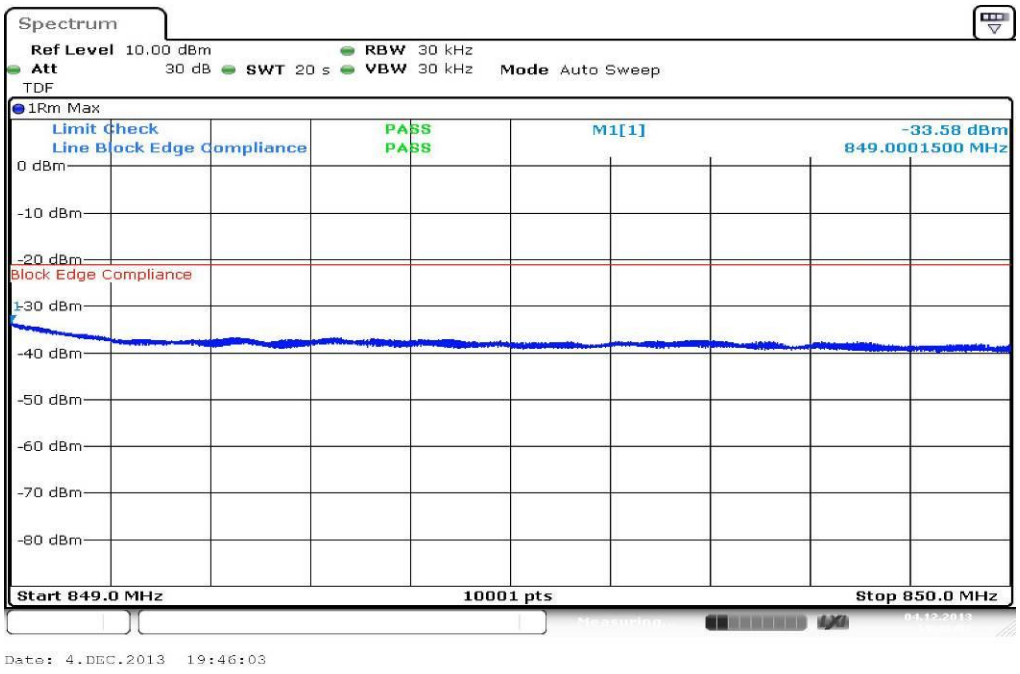


Results: **5 MHz channel bandwidth**

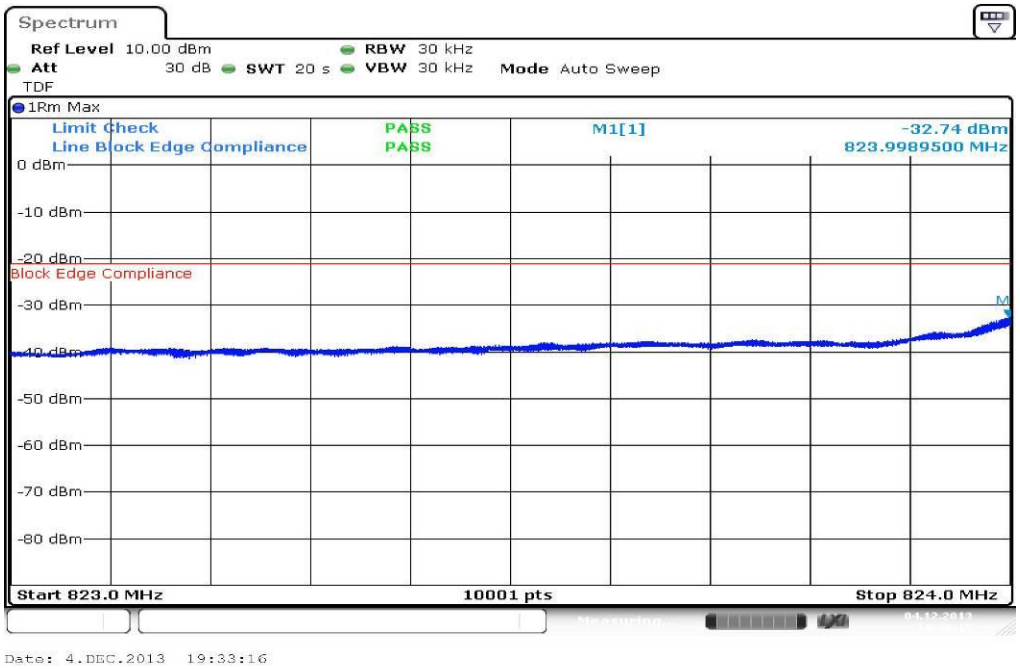
Plot 1: Lowest channel – QPSK



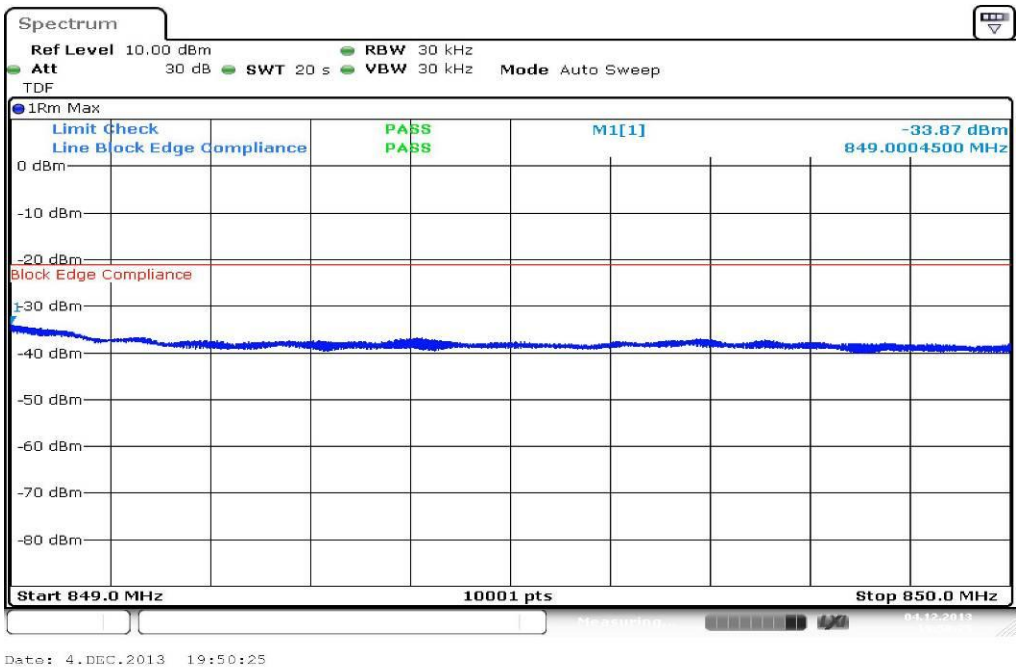
Plot 2: Highest channel – QPSK



Plot 3: Lowest channel – 16-QAM

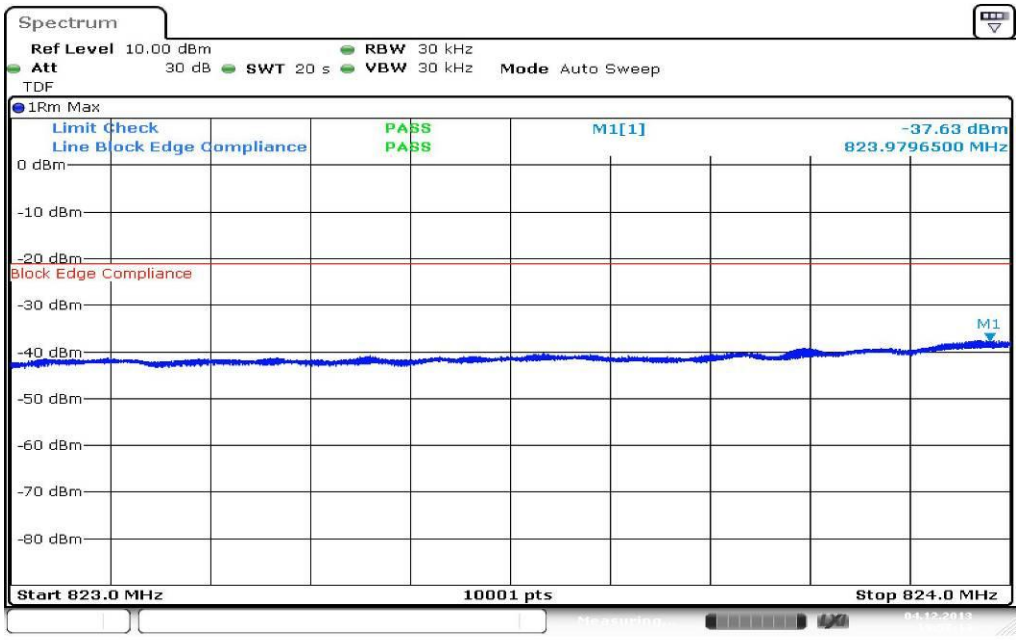


Plot 4: Highest channel – 16-QAM

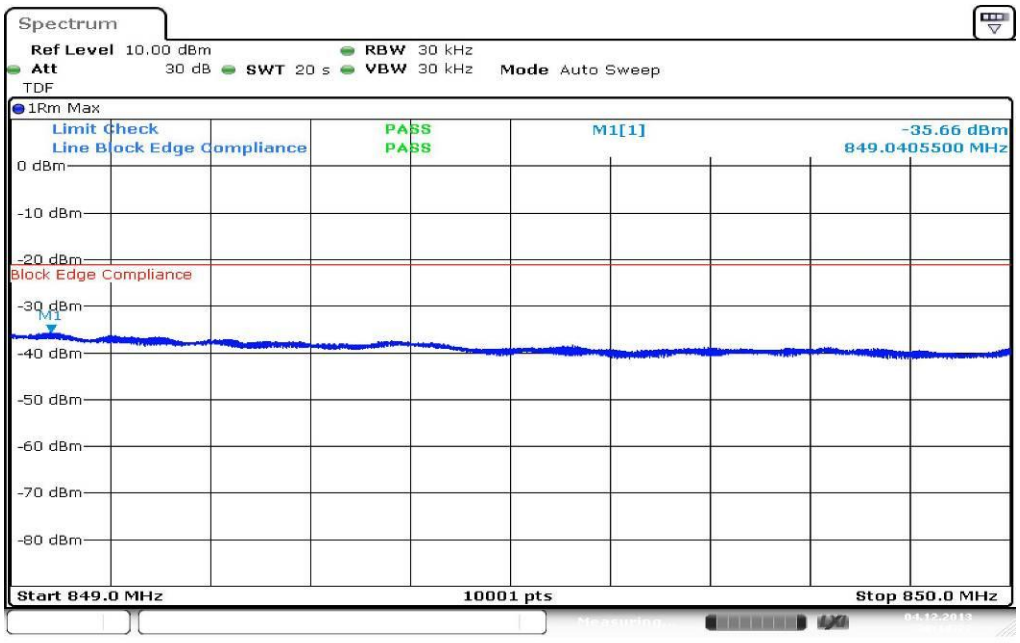


Results: **10 MHz channel bandwidth**

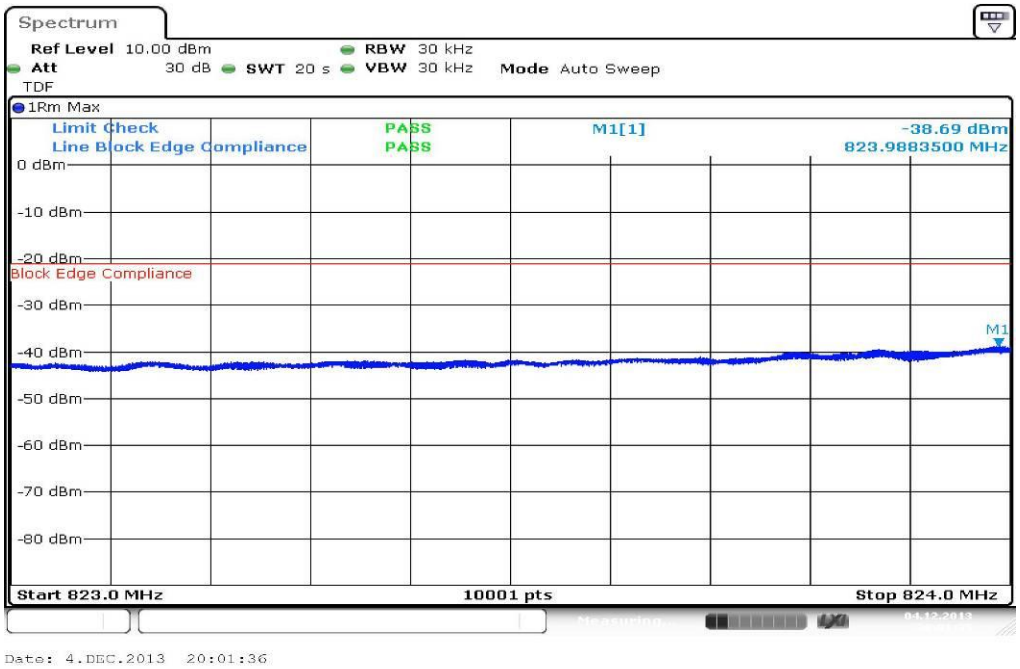
Plot 1: Lowest channel – QPSK



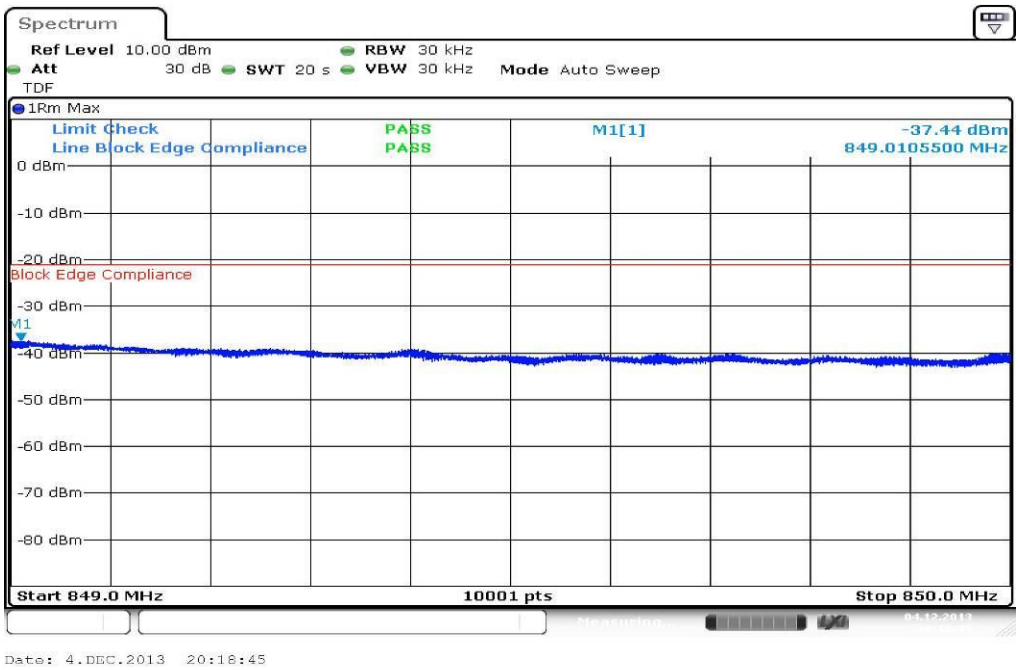
Plot 2: Highest channel – QPSK



Plot 3: Lowest channel – 16-QAM



Plot 4: Highest channel – 16-QAM



Result: **Passed**

8.2.6 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

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

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz to 2 MHz
Resolution bandwidth:	30 kHz to 500 kHz
Span:	2 x nominal BW
Trace-Mode:	Max Hold

Limits:

FCC	-/-
Occupied Bandwidth	
Spectrum must fall completely in the specified band	

Results:

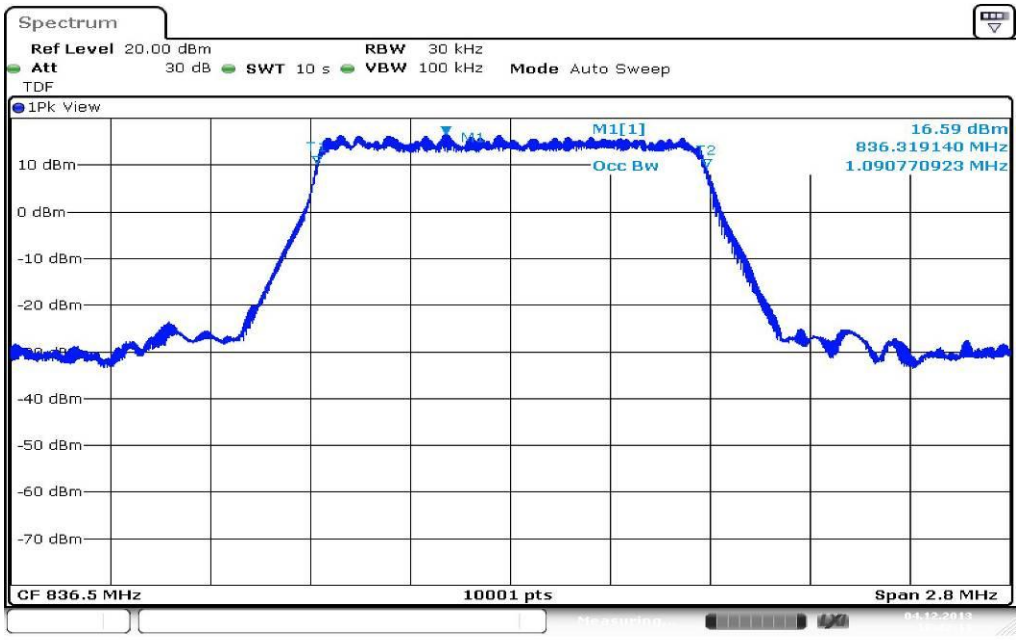
Occupied Bandwidth – QPSK		
Bandwidth (MHz)	**99% OBW (kHz)**	**26 dB bandwidth**
1.4	1091	1290
3.0	2726	3047
5.0	4494	4986
10.0	9053	10143
Measurement uncertainty	30 kHz to 300 kHz depending on channel bandwidth	

Occupied Bandwidth – 16-QAM		
Bandwidth (MHz)	**99% OBW (kHz)**	**26 dB bandwidth**
1.4	1096	1292
3.0	2723	3052
5.0	4507	5015
10.0	9053	10053
Measurement uncertainty	30 kHz to 300 kHz depending on channel bandwidth	

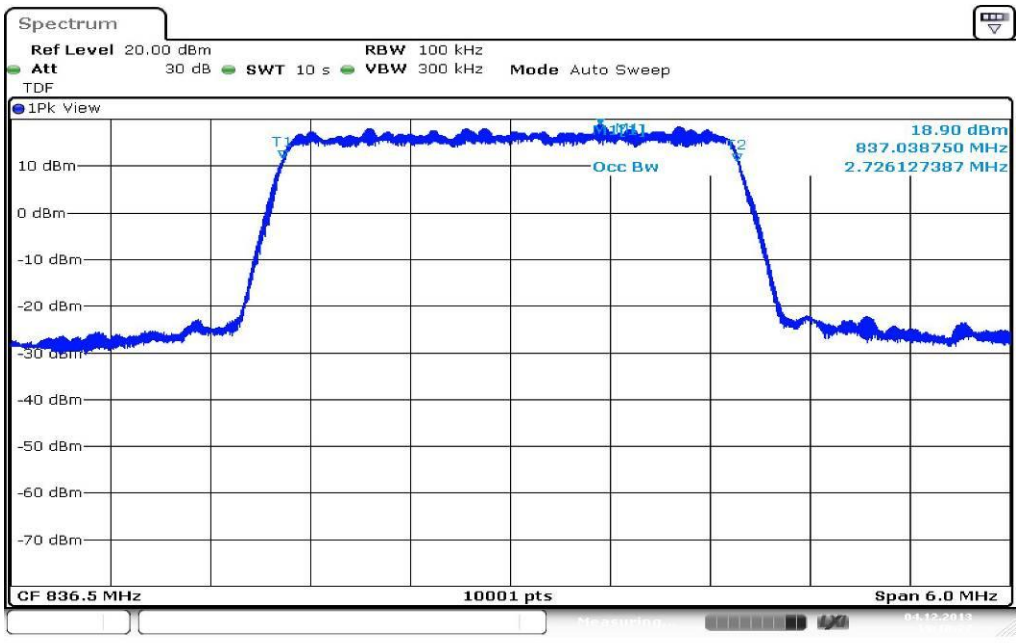
Result: **Passed**

Plots: QPSK

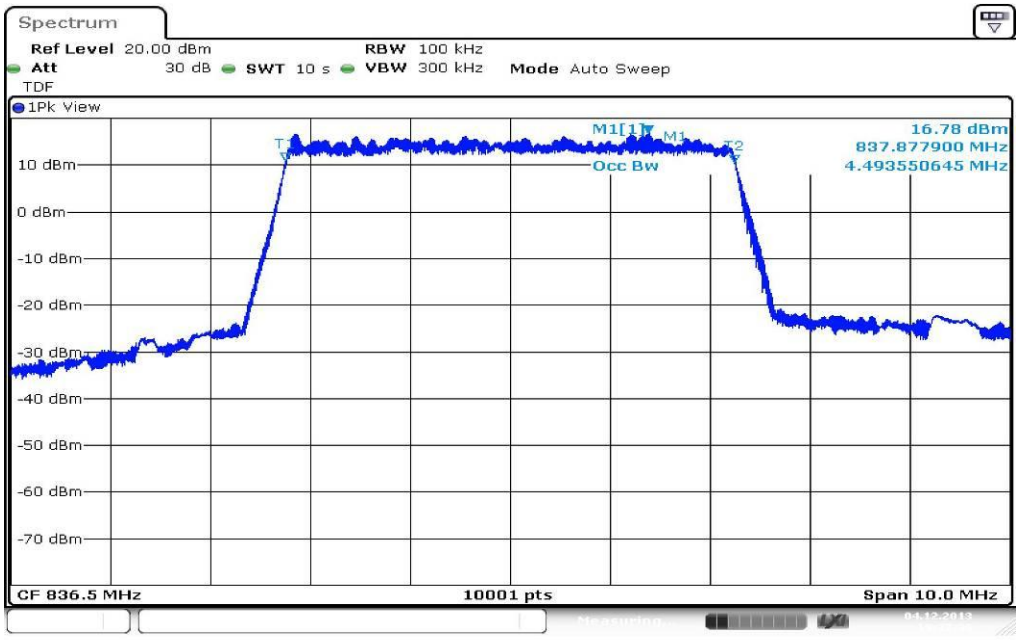
Plot 1: 1.4 MHz (99% - OBW)



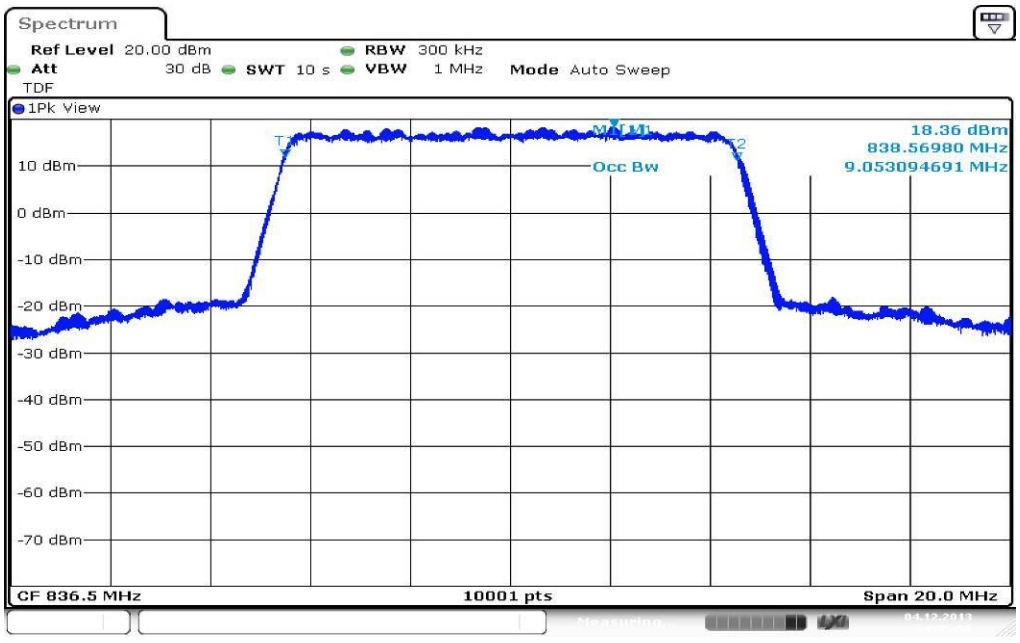
Plot 2: 3 MHz (99% - OBW)



Plot 3: 5 MHz (99% - OBW)

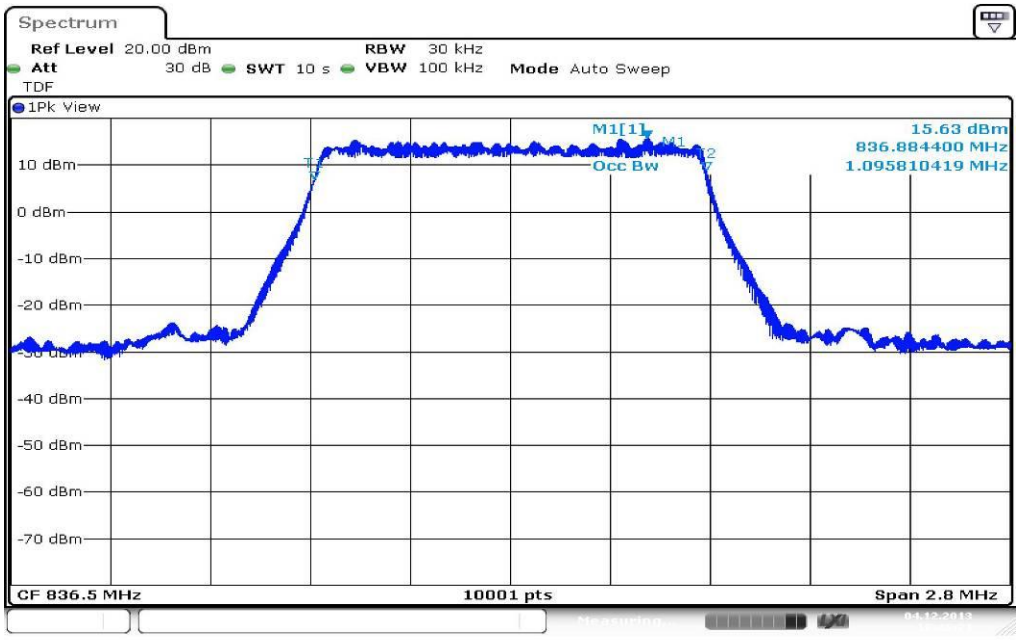


Plot 4: 10 MHz (99% - OBW)

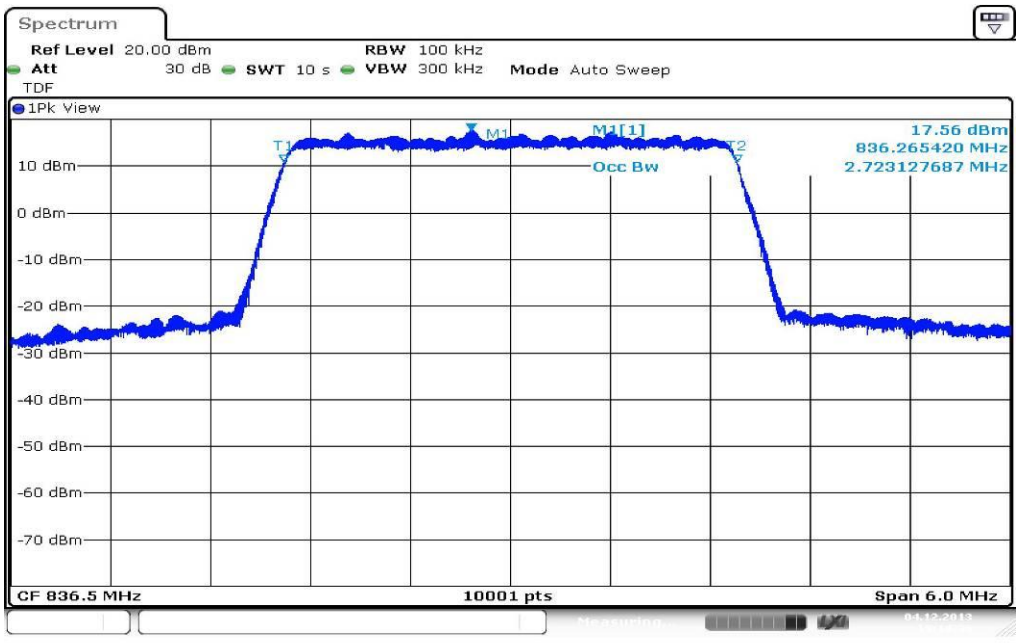


Plots: 16-QAM

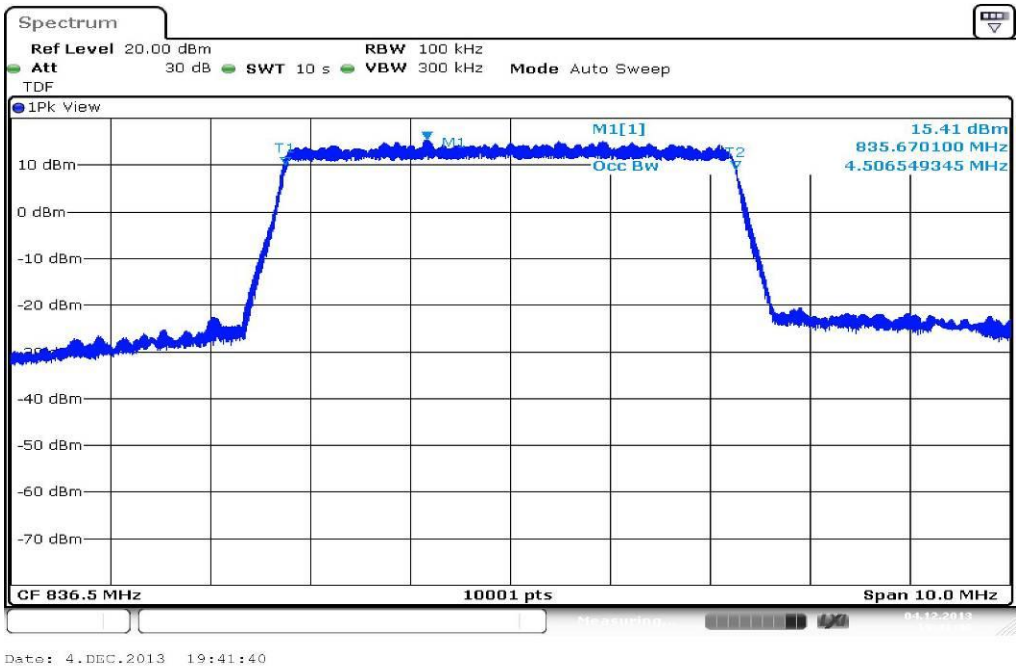
Plot 1: 1.4 MHz (99% - OBW)



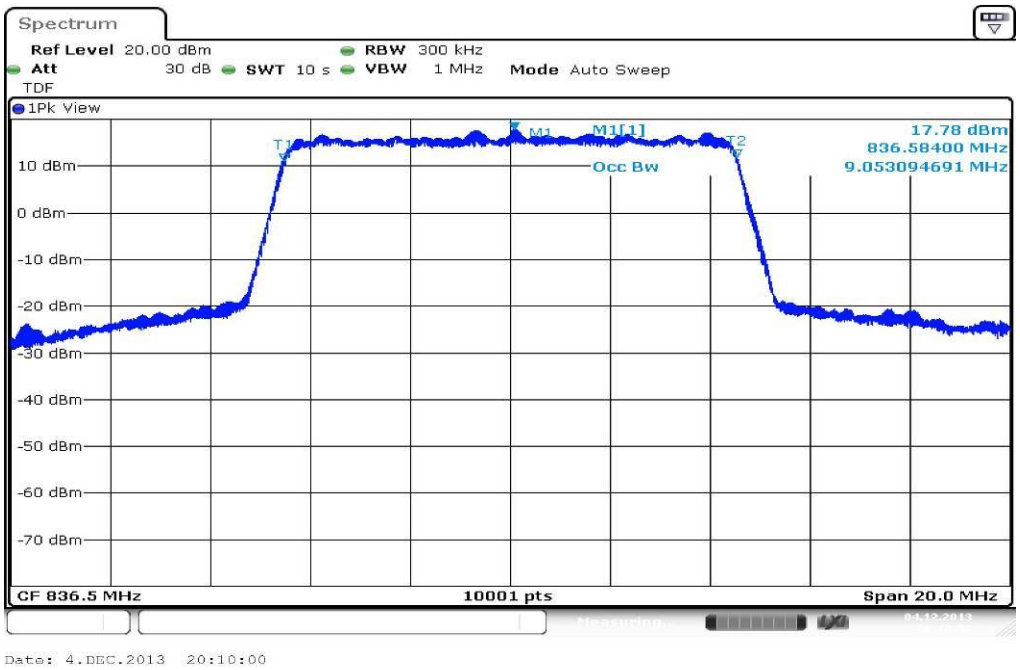
Plot 2: 3 MHz (99% - OBW)



Plot 3: 5 MHz (99% - OBW)



Plot 4: 10 MHz (99% - OBW)



9 Test equipment and ancillaries used for tests

Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and signalling equipment as well as measuring receivers and analyzers are connected to an external high-precision 10 MHz reference (GPS-based or rubidium frequency standard).

In order to simplify the identification of the equipment used at some special tests, some items of test equipment and ancillaries can be provided with an identifier or number in the equipment list below (Labor/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	12.01.2012	12.01.2015
2	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKl!	08.05.2013	08.05.2015
3	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
4	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
5	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
6	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
7	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
8	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
9	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKl!	14.10.2011	14.10.2014
10	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	21.02.2013	21.02.2014
11	11b	Microwave System Amplifier, 0.5-26.5 GHz	83017A	HP Meßtechnik	00419	300002268	ev		
12	A026	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000787	k	22.07.2013	22.07.2015
13	A029	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8205	300002442	k	19.07.2013	19.07.2015
14	n. a.	Temperature Test Chamber	VT 4002	Heraeus Voetsch	521/84193	300003889	Ve	26.09.2013	26.09.2015
15	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.10.2012	22.01.2014
16	n. a.	Power Supply 0-20V, 0-5A	6632B	Agilent Technologies	GB42110541	400000562	vlKl!	10.01.2013	10.01.2016
17	n. a.	Wideband Radio Communication Tester	CMW500	R&S	102375	300004187_0	k	16.07.2013	16.07.2015

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkI!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

10 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2014-01-15
A	Canada removed / EUT name changed	2014-01-22

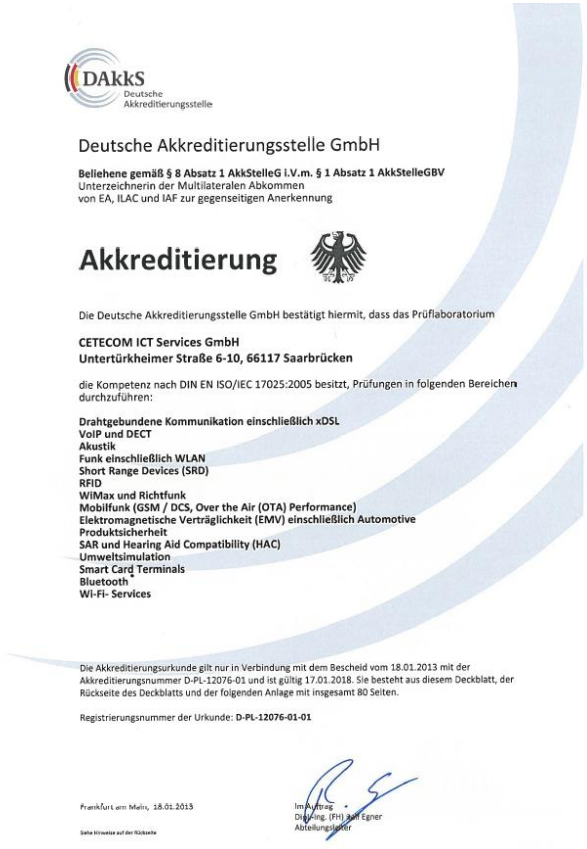
Annex B Further information

Glossary

AVG - Average
DUT - Device under test
EMC - Electromagnetic Compatibility
EN - European Standard
EUT - Equipment under test
ETSI - European Telecommunications Standard Institute
FCC - Federal Communication Commission
FCC ID - Company Identifier at FCC
HW - Hardware
IC - Industry Canada
Inv. No. - Inventory number
N/A - Not applicable
PP - Positive peak
QP - Quasi peak
S/N - Serial number
SW - Software

Annex C Accreditation Certificate

Front side of certificate



DAkkS
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Deutsche Akkreditierungsstelle GmbH

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Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

Drahtgebundene Kommunikation einschließlich xDSL
VoIP und DECT
Akustik
Funk einschließlich WLAN
Short Range Devices (SRD)
RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
Elektromagnetische Verträglichkeit (EMV) einschließlich Automotive
Produktsicherheit
SAR und Hearing Aid Compatibility (HAC)
Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi- Services

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Frankfurt am Main, 18.01.2013

Im Auftrag
Dipl.-Ing. (FH) Arti Egner
Abteilungsleiter

Siehe Hinweise auf der Rückseite

Back side of certificate

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Note:

The current certificate including annex is published on our website (see link below) or may be received from CETECOM ICT Services on request.

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