

CETECOM™
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consulting - testing - certification

TEST REPORT

Test report no.: 1-4254/12-62-18-A

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

Testing laboratory

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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/Satellite Communications

Applicant

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Manufacturer

Sony Mobile Communications AB
Nya Vattentornet
22188 Lund / SWEDEN

Test standard/s

47 CFR Part 27	Title 47 of the Code of Federal Regulations; Chapter I Part 27 - Miscellaneous Wireless Communications Service

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

Test Item

Kind of test item:	**GSM Mobile Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/II/IV/V/VIII; LTE FDD 1/2/4/5/17; WLAN a/b/g/n; BT 3.1; BT LE; RFID; FM Rx; A-GPS**
Model name:	**PM-0230-BV**
FCC ID:	**PY7PM-0230**
IC:	**4170B-PM0230**
Frequency:	LTE: 704 MHz to 716 MHz
Technology tested:	LTE
Antenna:	Integrated antenna
Power Supply:	3.7 V DC by Li - polymer battery
Temperature Range:	-30°C to +60 °C

Test report authorised:

2013-02-12 Andreas Luckenbill
Expert

Test performed:

2013-02-12 Marco Bertolino
Testing Manager

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2 General information

2.1 Notes and disclaimer

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2.2 Application details

Date of receipt of order:	2012-11-06
Date of receipt of test item:	2012-12-03
Start of test:	2012-12-03
End of test:	2012-12-11
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 27	2010-10	Title 47 of the Code of Federal Regulations; Chapter I Part 27 - Miscellaneous Wireless Communications Service

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:		48 %	
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	**:**	**GSM Mobile Phone GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/II/IV/V/VIII; LTE FDD 1/2/4/5/17; WLAN a/b/g/n; BT 3.1; BT LE; RFID; FM Rx; A-GPS**
Type identification	**:**	**PM-0230-BV**
S/N serial number	**:**	**Rad. CB5121Z4G3, CB5121Z4E1** **Cond. CB5121Z4FH, CB512322PD**
HW hardware status	**:**	**SP1.2 and 1B/63**
SW software status	**:**	**10.1.A.0.194, and 10.1.A.1.17**
Frequency band [MHz]	**:**	**LTE: 704 MHz to 716 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 1-4254/12-62-03

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 27	passed	2013-02-12	-/-

7.1 LTE – Band 17

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

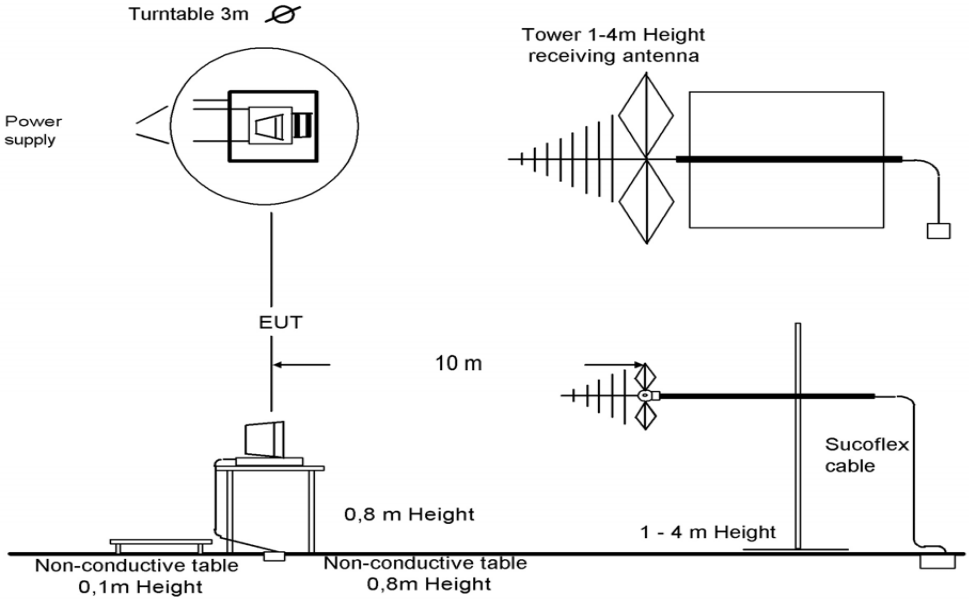
8.1 Description of test setup

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

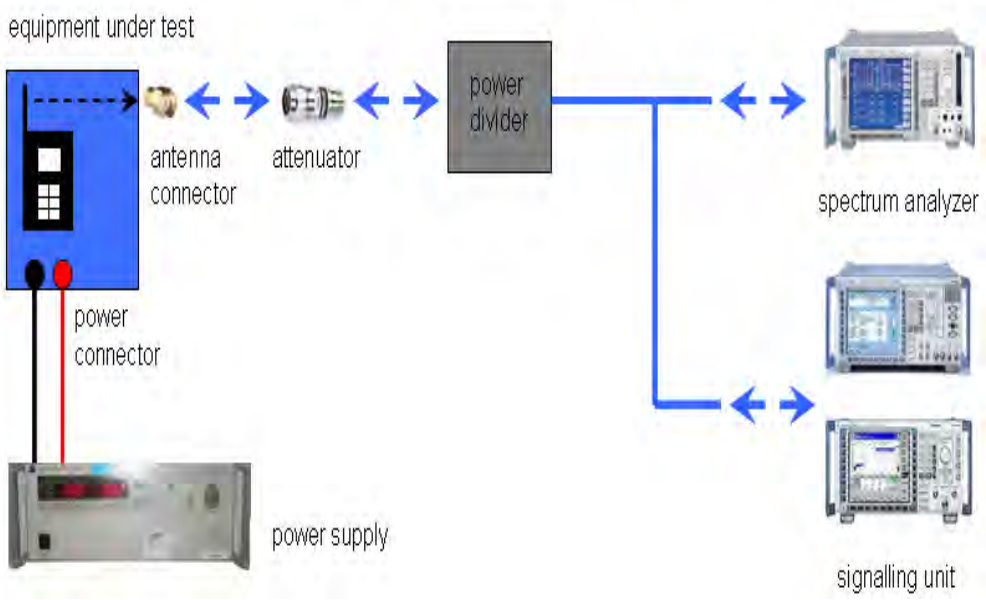


Picture 1: Diagram radiated measurements

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

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 LTE technologies supported by EUT

Channel bandwidth

	Band 17
[MHz]	Provided / not provided
1.4	☐
3	☐
5	☒
10	☒
15	☐
20	☐

Antenna

SISO	☐
SIMO	☐
MISO	☒
MIMO	☐

8.3 Results LTE – Band 17

The EUT was set to transmit the maximum power.

8.3.1 Antenna gain

Description:

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module

Results:

T_{nom}	V_{nom}	lowest channel	middle channel	highest channel
Conducted power [dBm]		23.2	23.3	23.0
Radiated power [dBm]		21.5	21.6	21.3
Gain [dBi] Calculated		-1.7	-1.7	-1.7

8.3.2 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:	Peak and RMS (Power in Burst)
Sweep time:	Auto
Video bandwidth:	Depends on Channel Bandwidth
Resolution bandwidth:	Depends on Channel Bandwidth
Span:	Zero Span
Trace-Mode:	Max Hold

Limits:

FCC
CFR Part 27.53 CFR Part 2.1046
Nominal Peak Output Power
+33.00 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)**
5	706.5	1 RB low	23.7	4.9	22.4	5.8
		1 RB high	23.7	4.8	22.5	5.7
		50% RB mid	22.6	5.9	21.6	7.1
		100% RB	22.6	6.2	21.5	7.4
	710.0	1 RB low	23.8	4.8	22.6	5.7
		1 RB high	23.8	4.8	22.6	5.6
		50% RB mid	22.8	5.6	21.6	7.0
		100% RB	22.6	6.0	21.5	7.4
	713.5	1 RB low	23.7	4.8	22.6	5.6
		1 RB high	23.5	5.0	22.1	6.0
		50% RB mid	22.5	6.0	21.6	7.1
		100% RB	22.4	6.3	21.5	7.5
10	709.0	1 RB low	23.7	5.0	22.4	5.9
		1 RB high	23.7	5.0	22.4	5.9
		50% RB mid	22.6	6.0	21.6	7.1
		100% RB	22.5	6.4	21.5	7.3
	710.0	1 RB low	23.8	5.1	22.5	5.9
		1 RB high	23.8	5.0	22.4	5.9
		50% RB mid	22.7	5.9	21.7	7.0
		100% RB	22.5	6.6	21.5	7.5
	711.0	1 RB low	23.7	5.1	22.4	5.9
		1 RB high	23.6	5.1	22.5	5.8
		50% RB mid	22.7	5.9	21.7	7.1
		100% RB	22.5	6.6	21.6	7.6
Measurement uncertainty			± 0.5 dB			

The output power was measured with the lowest supported channel bandwidth and with the number of resource blocks where the highest output power conducted was found.

All other bandwidths were calculated with the corresponding antenna gain (with full resource blocks).

Output Power (radiated)			
Bandwidth (MHz)	**Frequency (MHz)**	**Average Output Power (dBm) QPSK**	**Average Output Power (dBm) 16-QAM**
5	706.5	20.9	19.8
	710.0	20.9	19.8
	713.5	20.7	19.8
10	709.0	20.8	19.8
	710.0	20.8	19.8
	711.0	20.8	19.9
Measurement uncertainty		± 3.0 dB	

Result: **Passed**

8.3.3 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 +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.

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:	

Limits:

FCC
CFR Part 27.54 CFR Part 2.1055
Frequency Stability
< 2.5 ppm

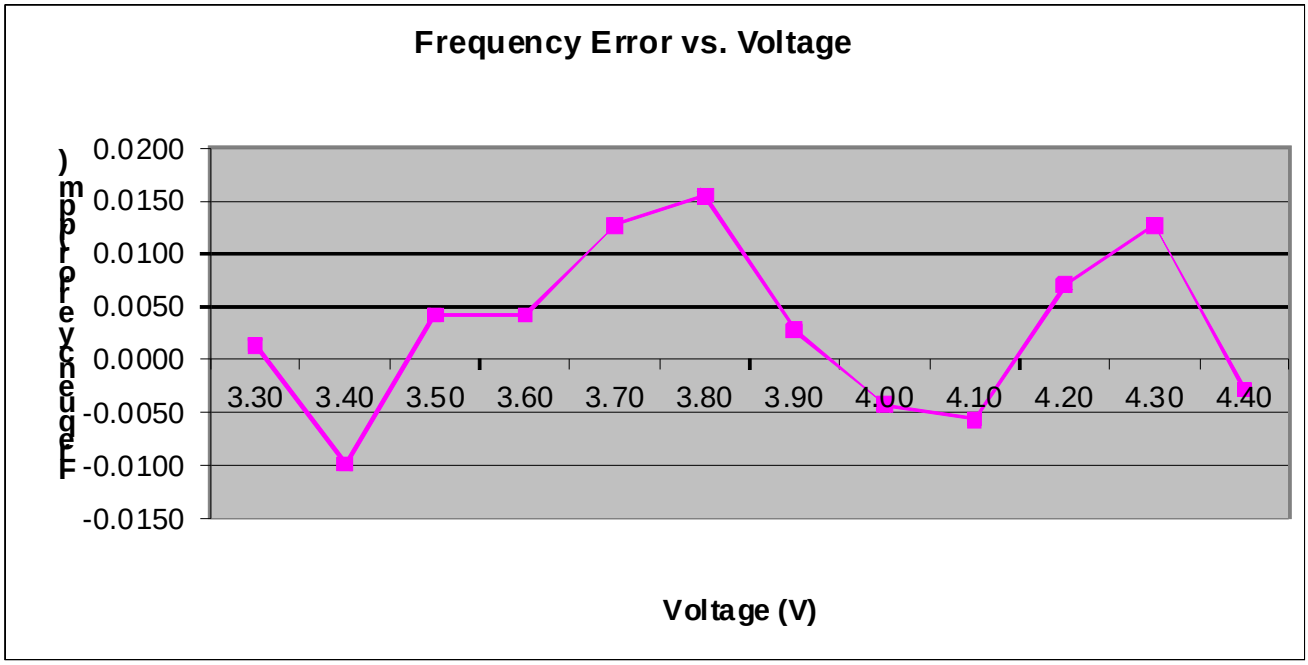
Results:

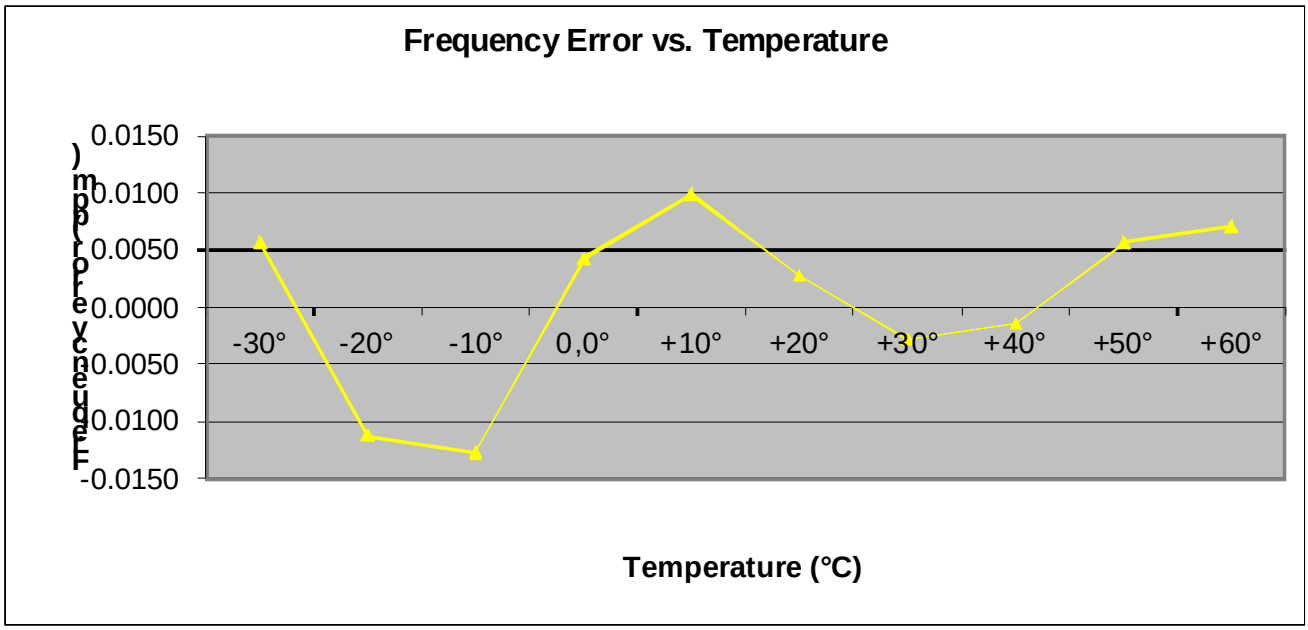
FREQ ERROR versus VOLTAGE

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
3.3	1	0.00000014	0.0014
3.4	-7	-0.00000099	-0.0099
3.5	3	0.00000042	0.0042
3.6	3	0.00000042	0.0042
3.7	9	0.00000127	0.0127
3.8	11	0.00000155	0.0155
3.9	2	0.00000028	0.0028
4.0	-3	-0.00000042	-0.0042
4.1	-4	-0.00000056	-0.0056
4.2	5	0.00000070	0.0070
4.3	9	0.00000127	0.0127
4.4	-2	-0.00000028	-0.0028

FREQ ERROR versus TEMPERATURE

Temperature (°C)	Frequency Error (Hz)	Frequency Error (%)	Frequency Error (ppm)
-30	4	0.00000056	0.0056
-20	-8	-0.00000113	-0.0113
-10	-9	-0.00000127	-0.0127
± 0	3	0.00000042	0.0042
10	7	0.00000099	0.0099
20	2	0.00000028	0.0028
30	-2	-0.00000028	-0.0028
40	-1	-0.00000014	-0.0014
50	4	0.00000056	0.0056
60	5	0.00000070	0.0070





Result: Passed

8.3.4 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 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 746 MHz. This was rounded up to 12 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 4.

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 s
Video bandwidth:	Below 1 GHz: 100 kHz Above 1 GHz: 1 MHz
Resolution bandwidth:	Below 1 GHz: 100 kHz Above 1 GHz: 1 MHz
Span:	100 MHz Steps
Trace-Mode:	Max Hold

Limits:

FCC
CFR Part 27.53(g) CFR Part 2.1053
Spurious Emissions Radiated
Attenuation ≥ 43 + 10log(P) (P, Power in Watts)
-13 dBm

Results:

Radiated emissions measurements were made only at the upper, center, and lower carrier frequencies of the LTE band 17 (706.5 MHz, 710.0 MHz and 713.5 MHz). It was decided that measurements at these three carrier frequencies 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 17 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 at the channel bandwidth and resource blocks with the highest output power. If spurious were detected, the lowest and highest channel and all supported channel bandwidths were checked, too.

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	1413.0	-	2	1420.0	-	2	1427.0	-
3	2119.5	-	3	2130.0	-	3	2140.5	-
4	2826.0	-	4	2840.0	-	4	2854.0	-
5	3532.5	-	5	3550.0	-	5	3567.5	-
6	4239.0	-	6	4260.0	-	6	4281.0	-
7	4945.5	-	7	4970.0	-	7	4994.5	-
8	5652.0	-	8	5680.0	-	8	5708.0	-
9	6358.5	-	9	6390.0	-	9	6421.5	-
10	7065.0	-	10	7100.0	-	10	7135.0	-
Measurement uncertainty			± 3dB					

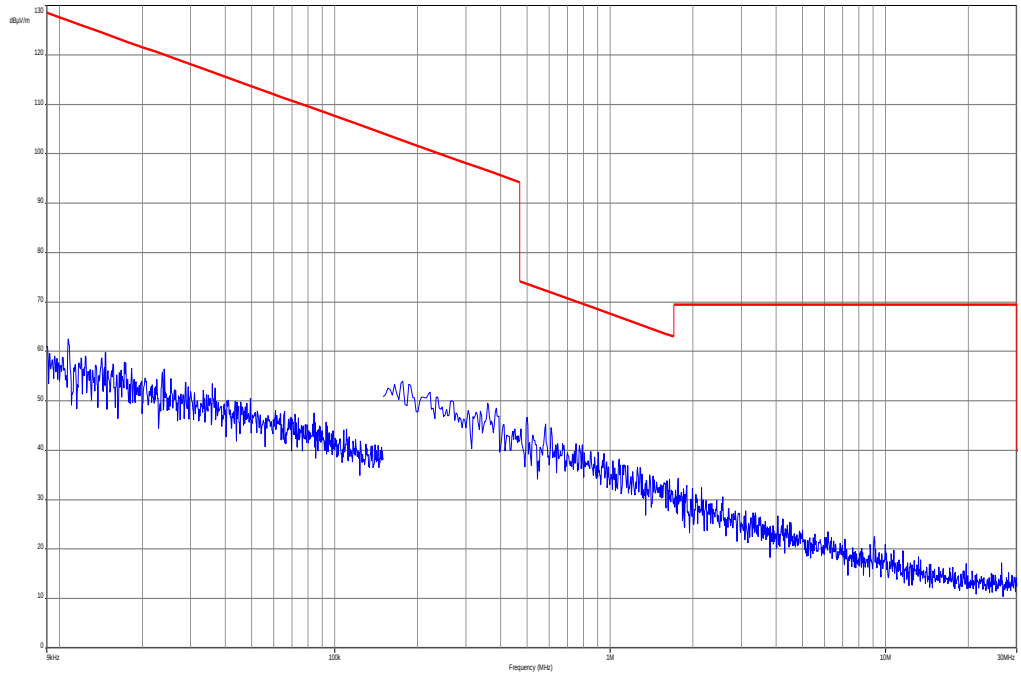
16-QAM

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	1413.0	-	2	1420.0	-	2	1427.0	-
3	2119.5	-	3	2130.0	-	3	2140.5	-
4	2826.0	-	4	2840.0	-	4	2854.0	-
5	3532.5	-	5	3550.0	-	5	3567.5	-
6	4239.0	-	6	4260.0	-	6	4281.0	-
7	4945.5	-	7	4970.0	-	7	4994.5	-
8	5652.0	-	8	5680.0	-	8	5708.0	-
9	6358.5	-	9	6390.0	-	9	6421.5	-
10	7065.0	-	10	7100.0	-	10	7135.0	-
Measurement uncertainty			± 3dB					

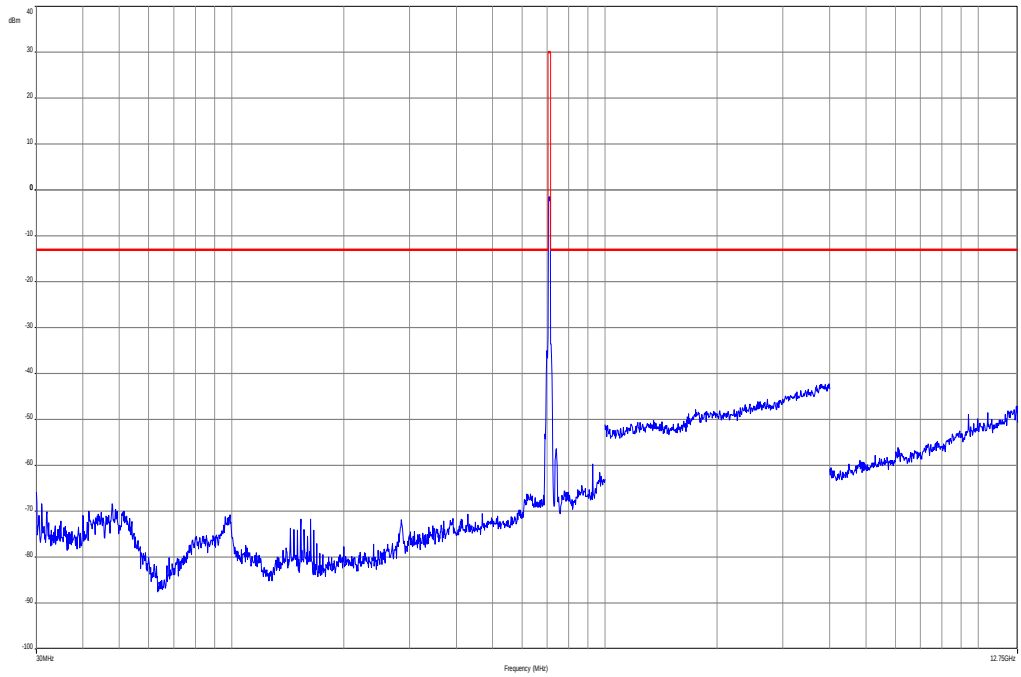
Result: **Passed**

QPSK with 10 MHz channel bandwidth

Plot 1: Channel 23790 (Traffic mode up to 30 MHz)

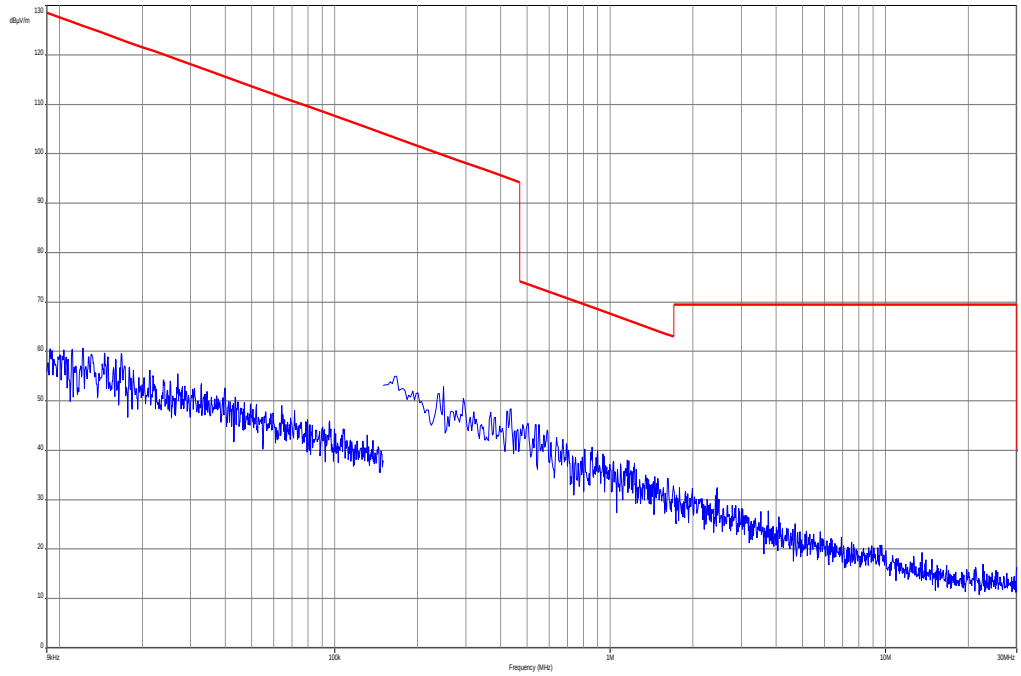


Plot 2: Channel 23790 (30 MHz – 12.75 GHz)

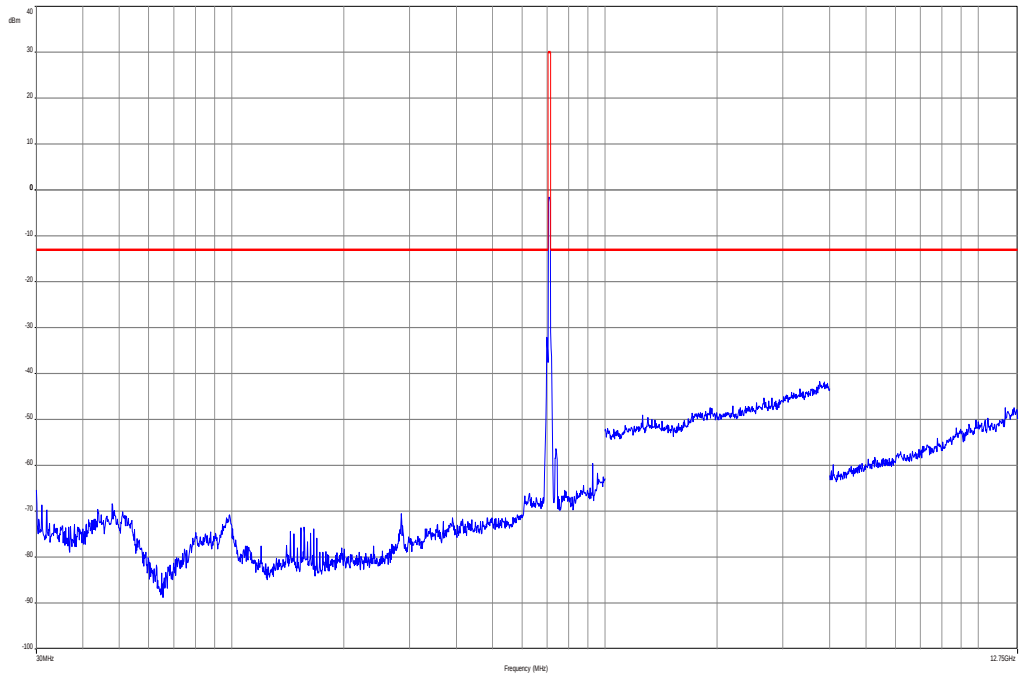


16-QAM with 10 MHz channel bandwidth

Plot 3: Channel 23790 (Traffic mode up to 30 MHz)



Plot 4: Channel 23790 (30 MHz – 12.75 GHz)



8.3.5 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. For the mobile station equipment tested, this equates to a frequency range of 13 MHz to 7460 MHz, data taken from 10 MHz to 12 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:	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:	10 MHz – 12 GHz
Trace-Mode:	Max Hold

Limits:

FCC
CFR Part 27.53(g) CFR Part 2.1053
Spurious Emissions Conducted
Attenuation ≥ 43 + 10log(P) (P, Power in Watts)
-13 dBm

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	1413.0	-	2	1420.0	-	2	1427.0	-
3	2119.5	-	3	2130.0	-	3	2140.5	-
4	2826.0	-	4	2840.0	-	4	2854.0	-
5	3532.5	-	5	3550.0	-	5	3567.5	-
6	4239.0	-	6	4260.0	-	6	4281.0	-
7	4945.5	-	7	4970.0	-	7	4994.5	-
8	5652.0	-	8	5680.0	-	8	5708.0	-
9	6358.5	-	9	6390.0	-	9	6421.5	-
10	7065.0	-	10	7100.0	-	10	7135.0	-
Measurement uncertainty			± 0.5dB					

16-QAM

SPURIOUS EMISSION LEVEL (dBm)								
Harmonic	Ch. 23755 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 23790 Freq. (MHz)	Level [dBm]	Harmonic	Ch. 23825 Freq. (MHz)	Level [dBm]
2	1413.0	-	2	1420.0	-	2	1427.0	-
3	2119.5	-	3	2130.0	-	3	2140.5	-
4	2826.0	-	4	2840.0	-	4	2854.0	-
5	3532.5	-	5	3550.0	-	5	3567.5	-
6	4239.0	-	6	4260.0	-	6	4281.0	-
7	4945.5	-	7	4970.0	-	7	4994.5	-
8	5652.0	-	8	5680.0	-	8	5708.0	-
9	6358.5	-	9	6390.0	-	9	6421.5	-
10	7065.0	-	10	7100.0	-	10	7135.0	-
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	1418.0	-	2	1420.0	-	2	1422.0	-
3	2127.0	-	3	2130.0	-	3	2133.0	-
4	2836.0	-	4	2840.0	-	4	2844.0	-
5	3545.0	-	5	3550.0	-	5	3555.0	-
6	4254.0	-	6	4260.0	-	6	4266.0	-
7	4963.0	-	7	4970.0	-	7	4977.0	-
8	5672.0	-	8	5680.0	-	8	5688.0	-
9	6381.0	-	9	6390.0	-	6	6399.0	-
10	7090.0	-	10	7100.0	-	10	7110.0	-
Measurement uncertainty			± 0.5dB					

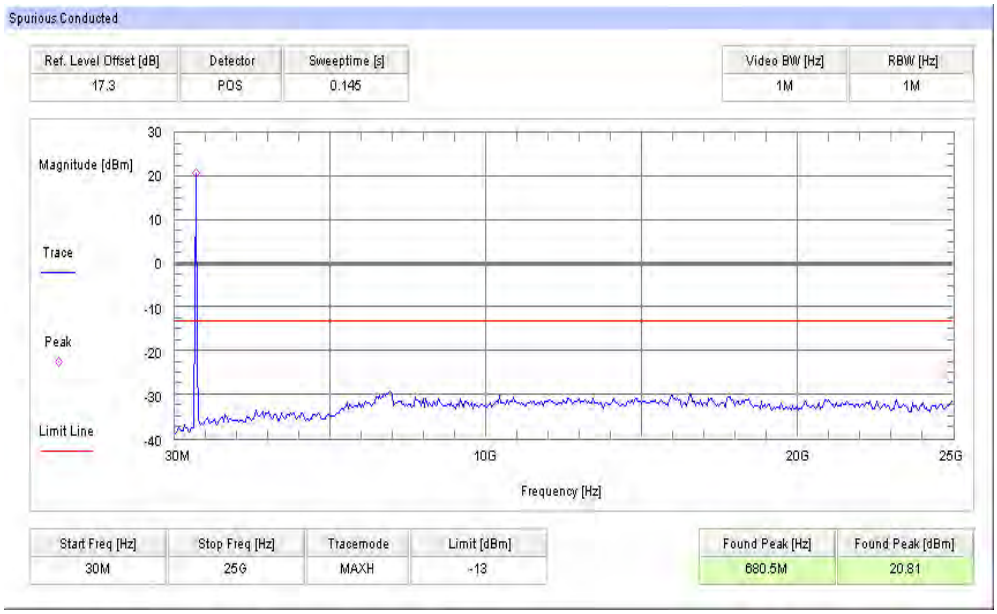
16-QAM

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	1418.0	-	2	1420.0	-	2	1422.0	-
3	2127.0	-	3	2130.0	-	3	2133.0	-
4	2836.0	-	4	2840.0	-	4	2844.0	-
5	3545.0	-	5	3550.0	-	5	3555.0	-
6	4254.0	-	6	4260.0	-	6	4266.0	-
7	4963.0	-	7	4970.0	-	7	4977.0	-
8	5672.0	-	8	5680.0	-	8	5688.0	-
9	6381.0	-	9	6390.0	-	6	6399.0	-
10	7090.0	-	10	7100.0	-	10	7110.0	-
Measurement uncertainty			± 0.5dB					

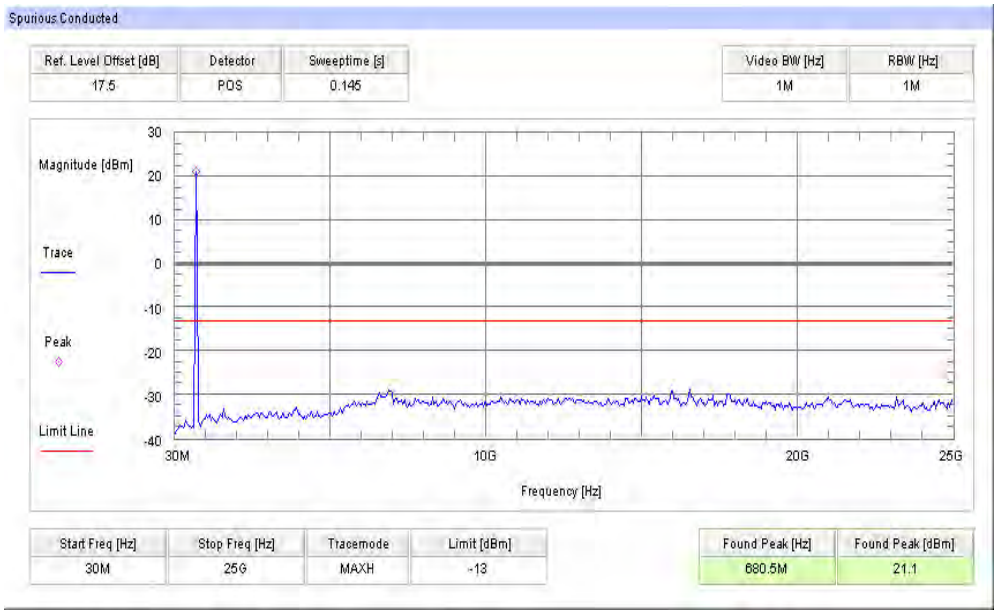
Result: Passed

Results: for 5 MHz channel bandwidth, QPSK

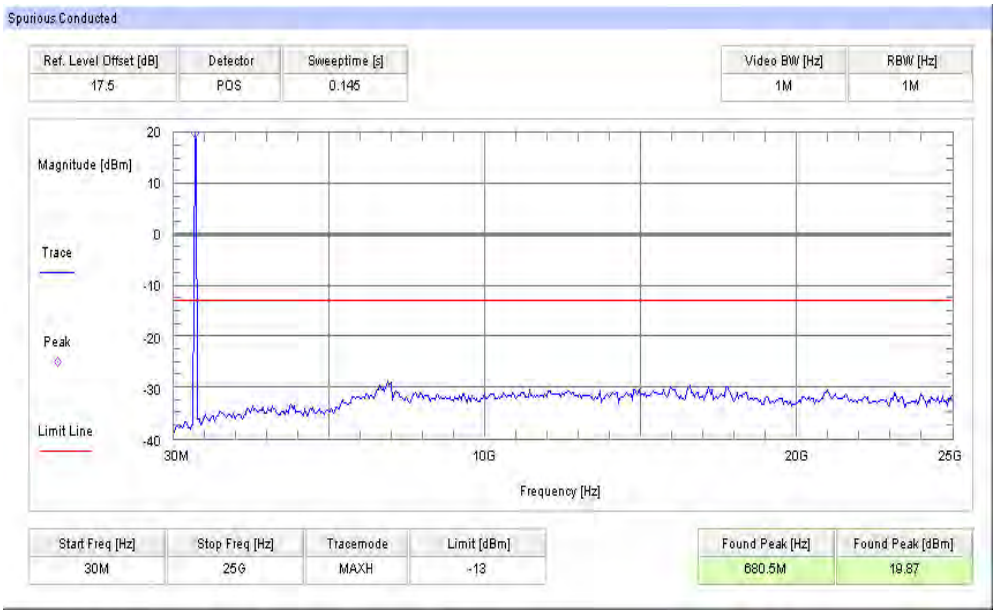
Plot 1: Lowest Channel (10 MHz - 12 GHz)



Plot 2: Middle Channel (10 MHz - 12 GHz)

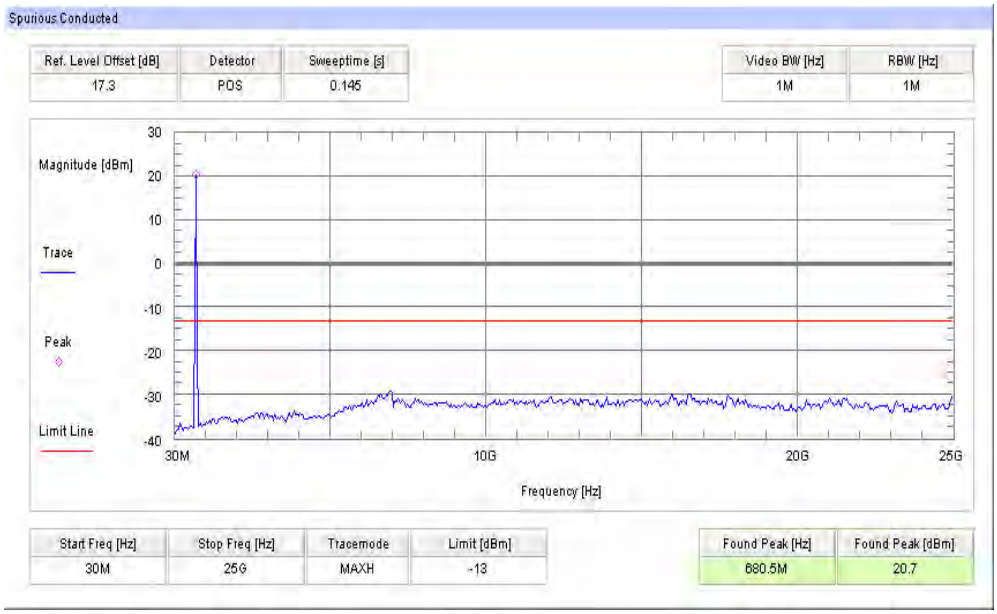


Plot 3: Highest Channel (10 MHz - 12 GHz)

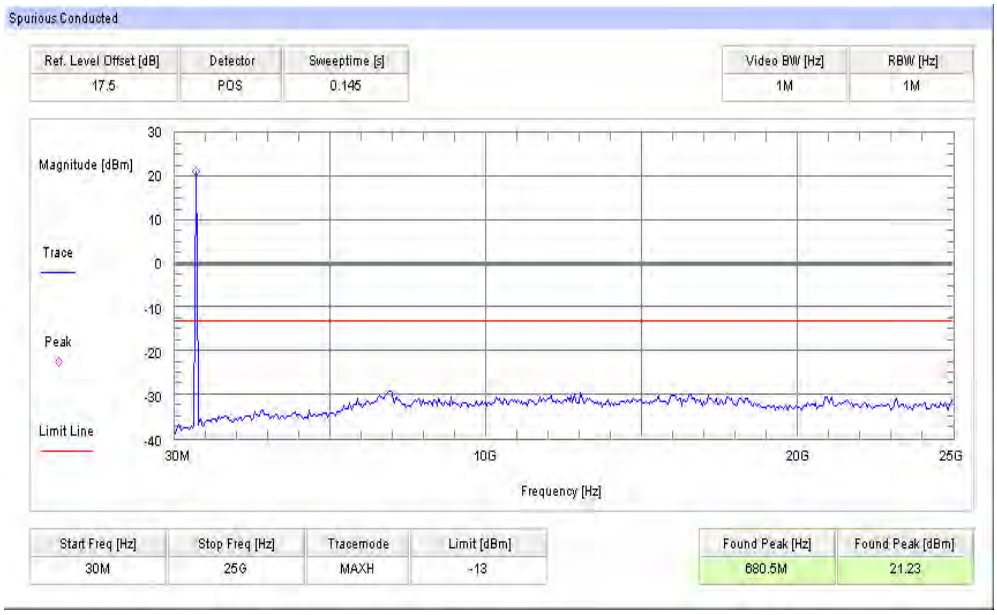


Results: for 5 MHz channel bandwidth, 16-QAM

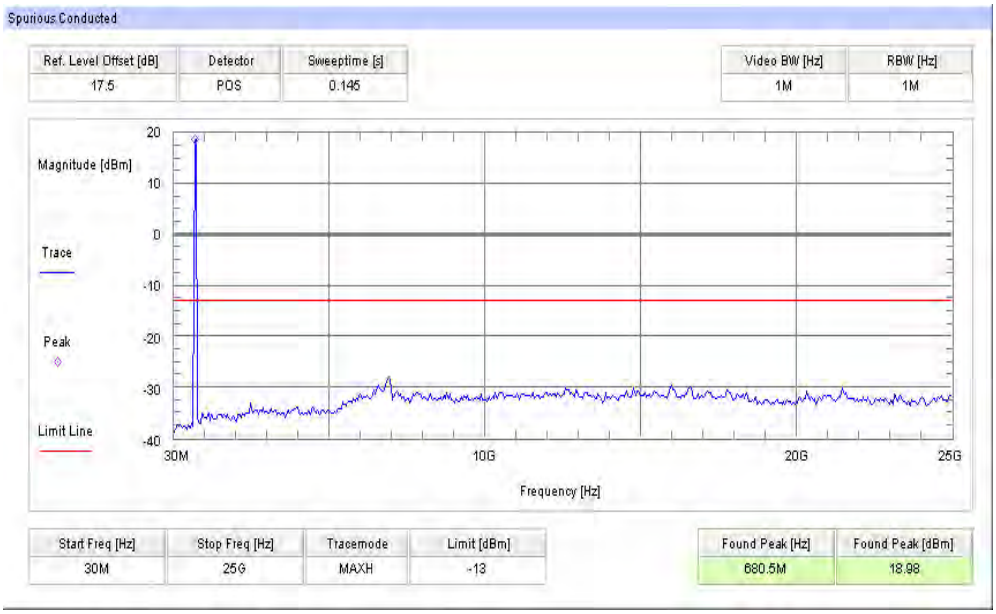
Plot 4: Lowest Channel (10 MHz - 12 GHz)



Plot 5: Middle Channel (10 MHz - 12 GHz)

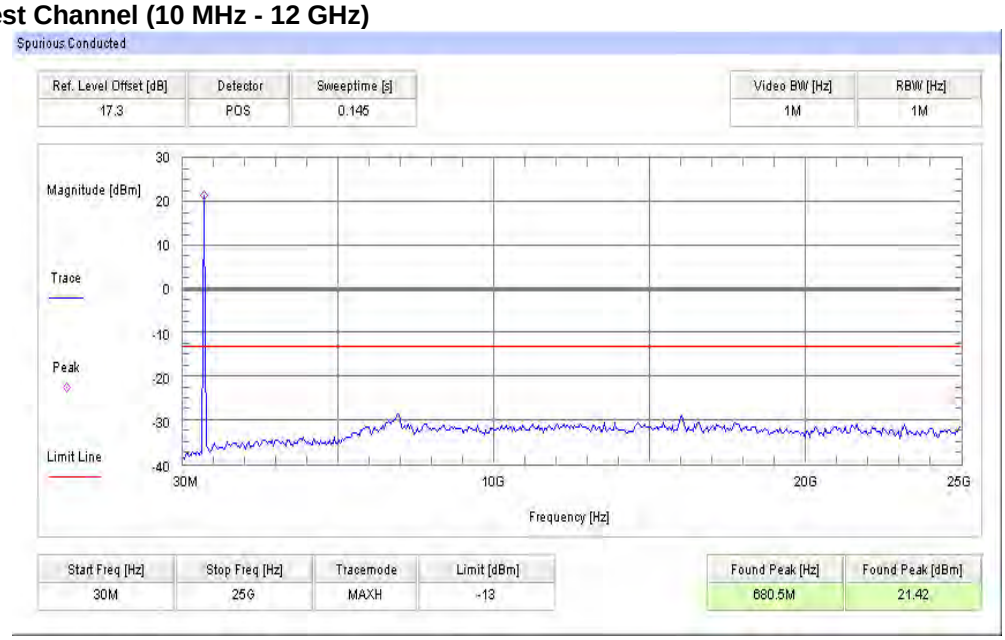


Plot 6: Highest Channel (10 MHz - 12 GHz)

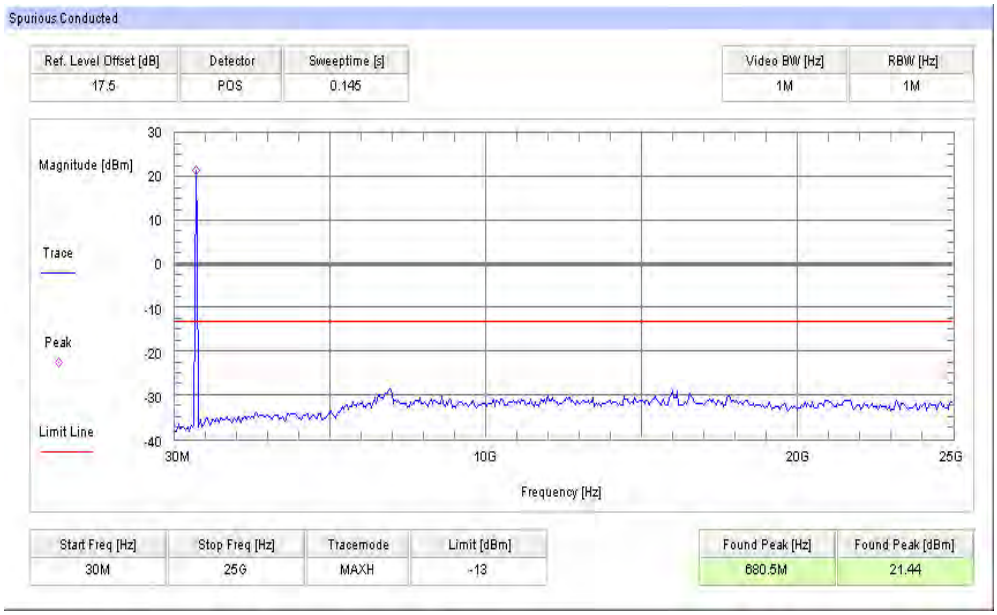


Results: for 10 MHz channel bandwidth, QPSK

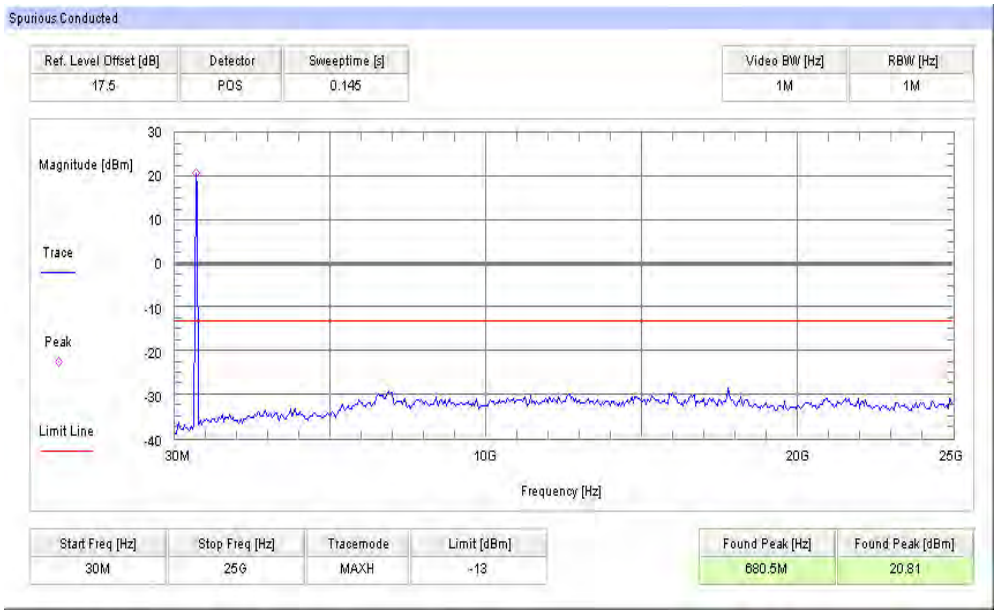
Plot 1: Lowest Channel (10 MHz - 12 GHz)



Plot 2: Middle Channel (10 MHz - 12 GHz)

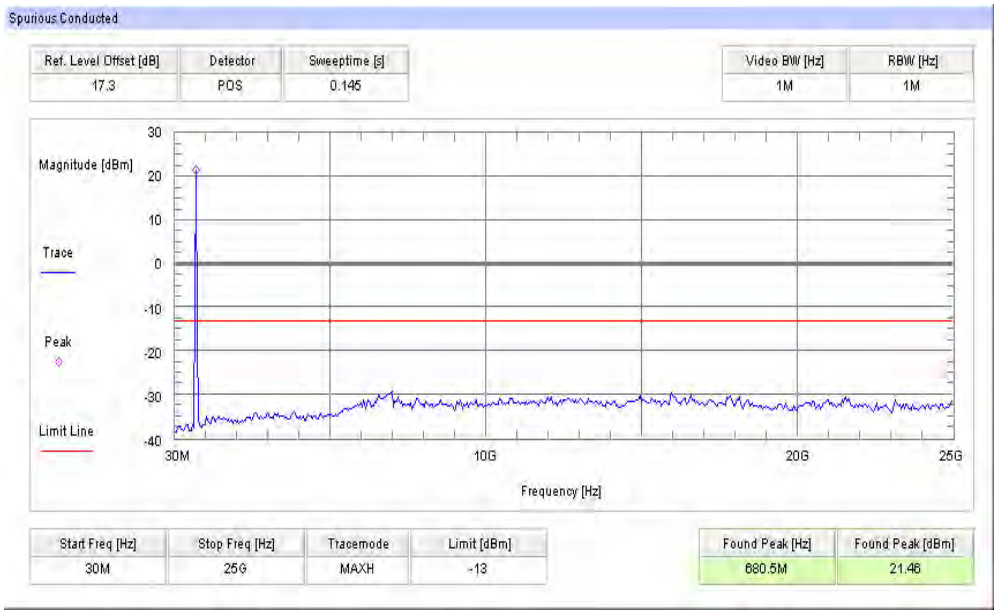


Plot 3: Highest Channel (10 MHz - 12 GHz)

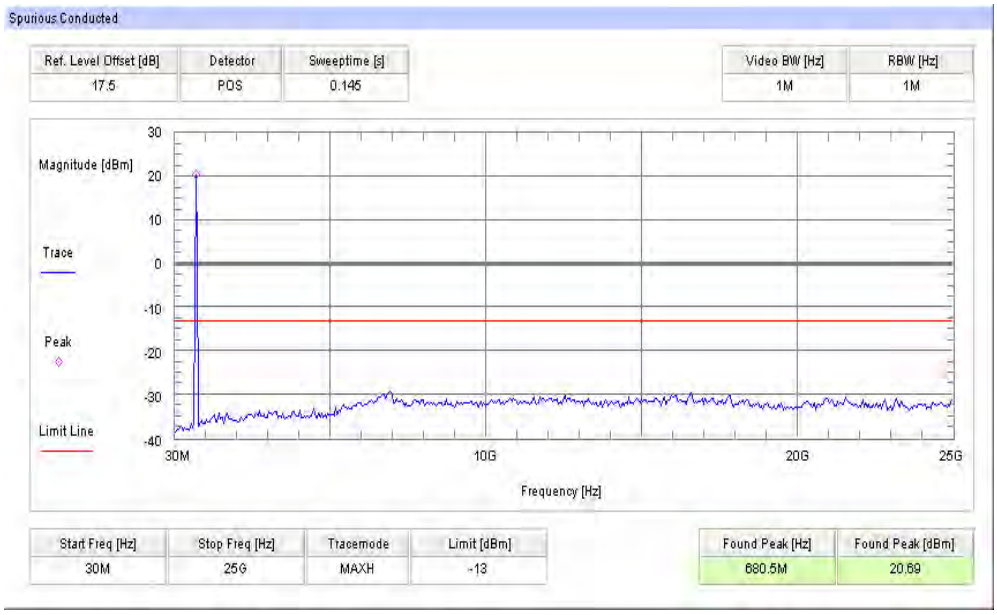


Results: for 10 MHz channel bandwidth, 16-QAM

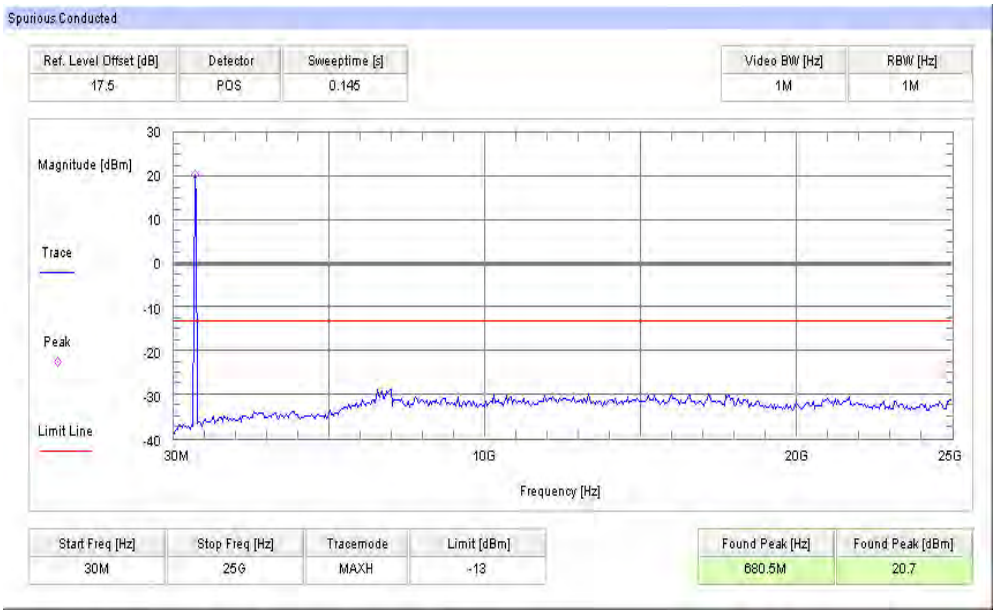
Plot 4: Lowest Channel (10 MHz - 12 GHz)



Plot 5: Middle Channel (10 MHz - 12 GHz)



Plot 6: Highest Channel (10 MHz - 12 GHz)



8.3.6 Block edge compliance

Description:

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

Measurement:

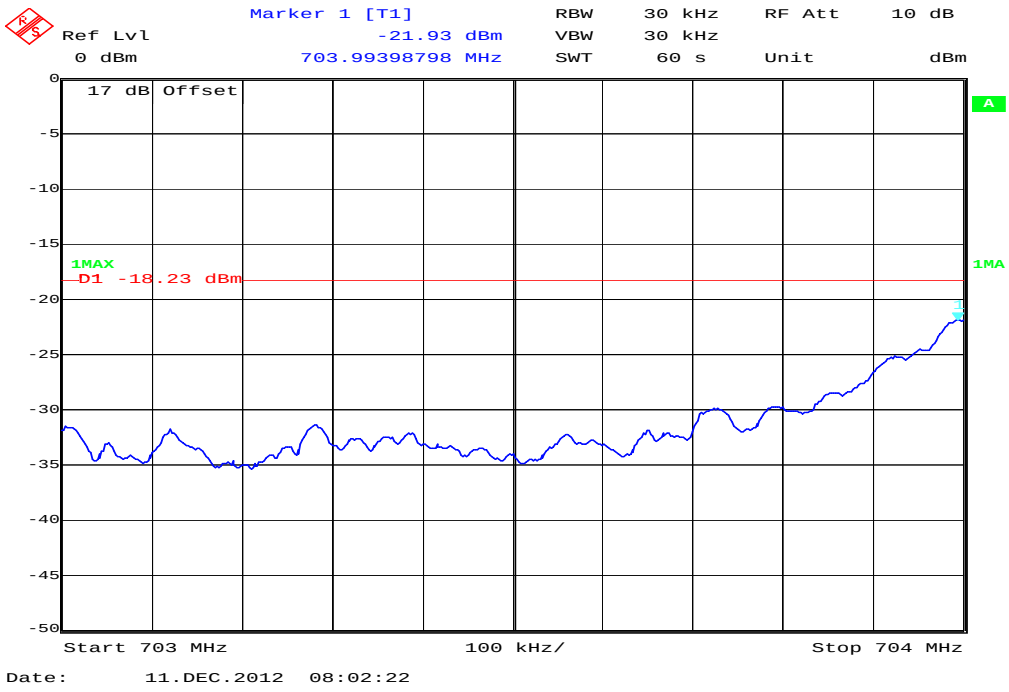
Measurement parameters	
Detector:	RMS
Sweep time:	60 sec.
Video bandwidth:	30 kHz
Resolution bandwidth:	30 kHz
Span:	1 MHz
Trace-Mode:	Max Hold

Limits:

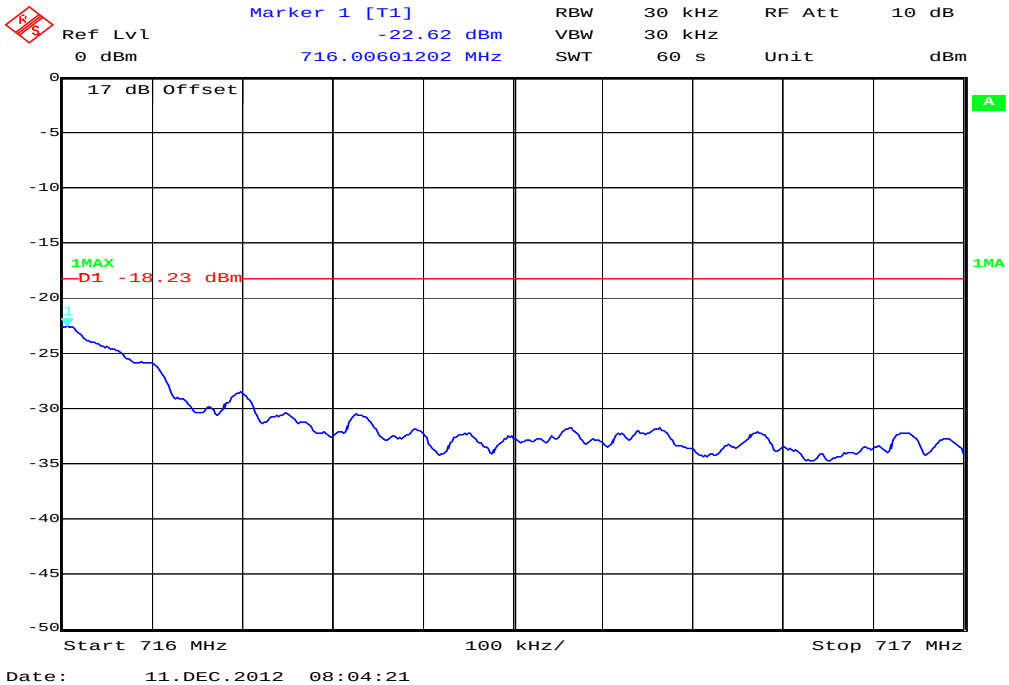
FCC
CFR Part 27.53(h) CFR Part 2.1053
Block Edge Compliance
Part 27.53 specifies that “the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.” However, in publication number 890810, 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.
worst case: -18.23 dBm

Results: 5 MHz channel bandwidth

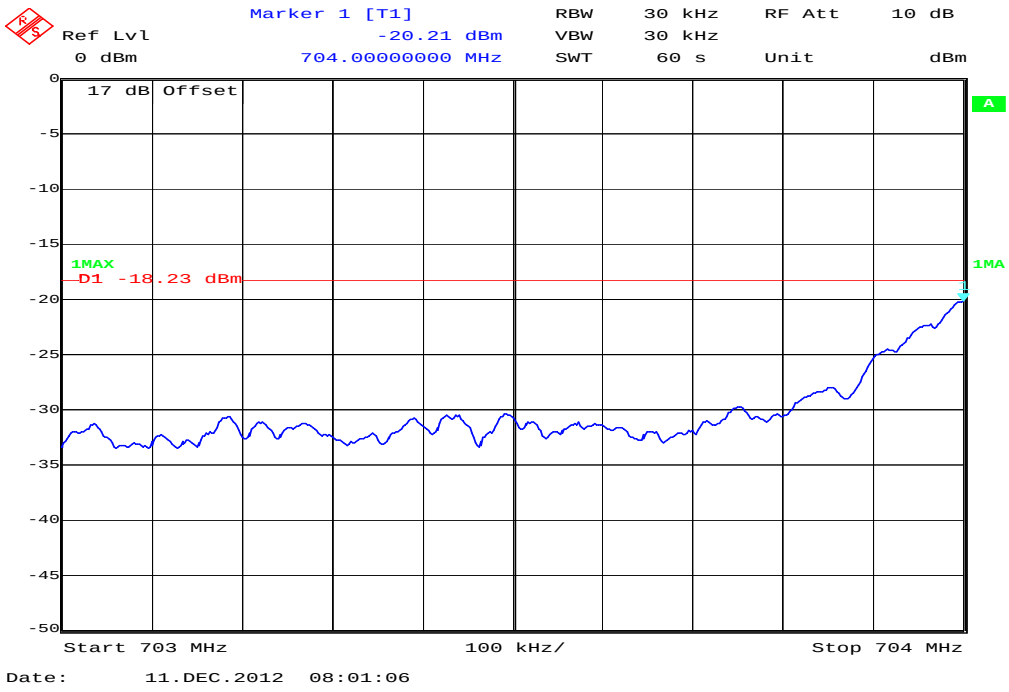
Plot 1: Lowest Channel– QPSK



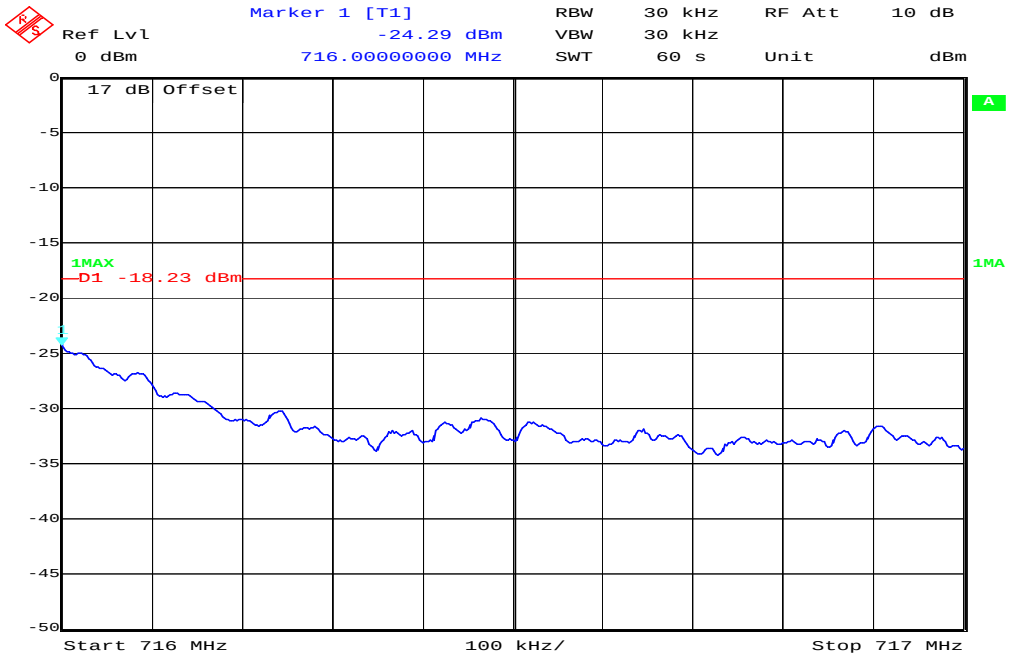
Plot 2: Highest Channel– QPSK



Plot 3: Lowest Channel– 16-QAM

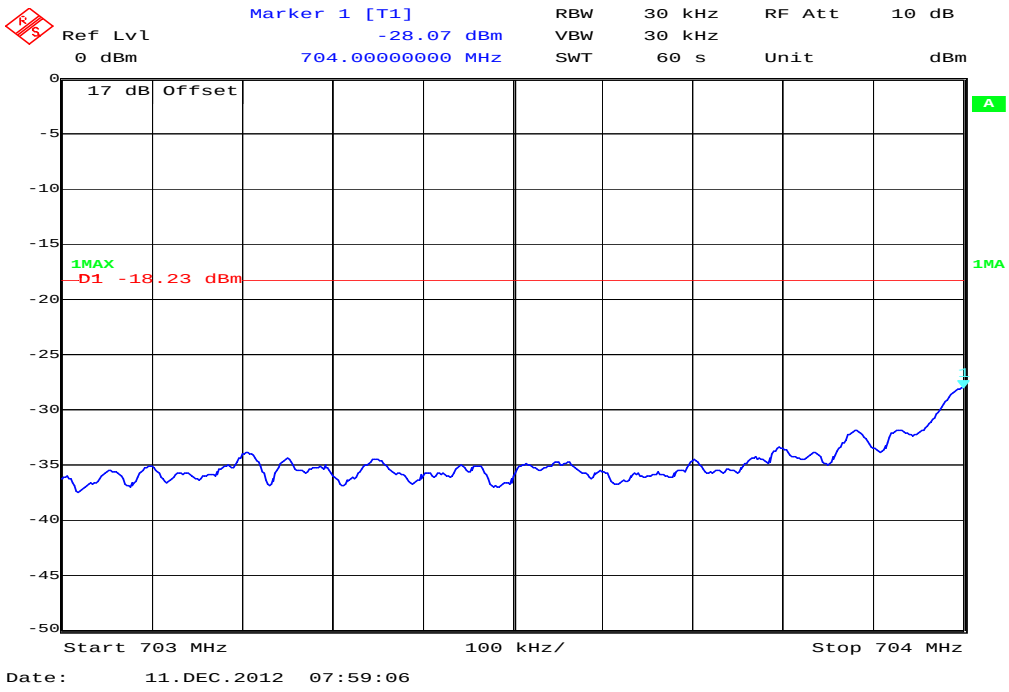


Plot 4: Highest Channel– 16-QAM

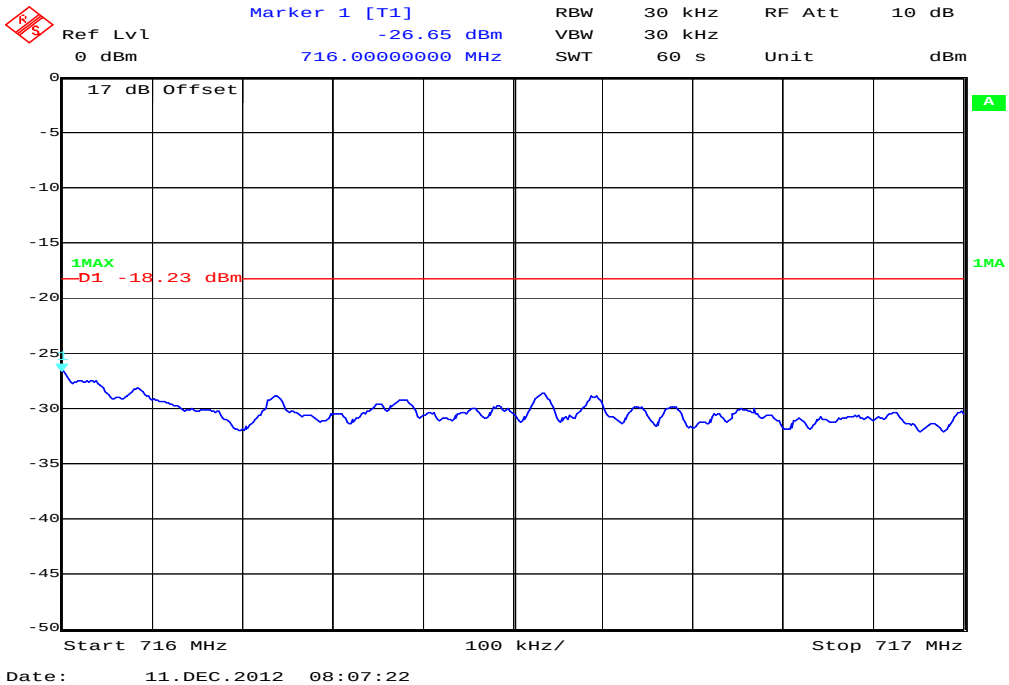


Results: 10 MHz channel bandwidth

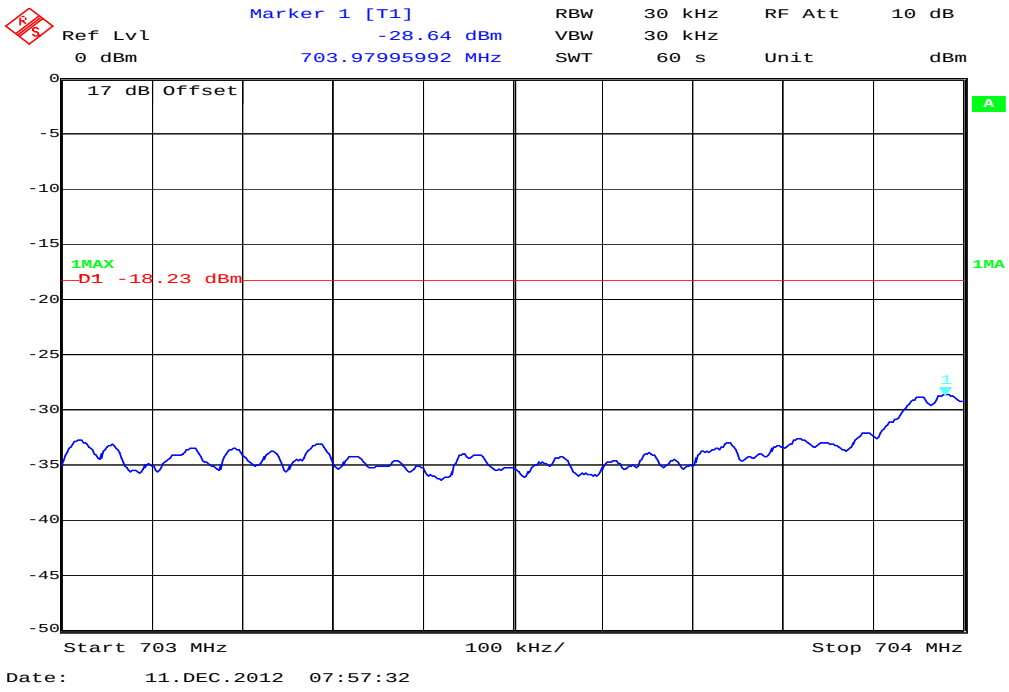
Plot 1: Lowest Channel– QPSK



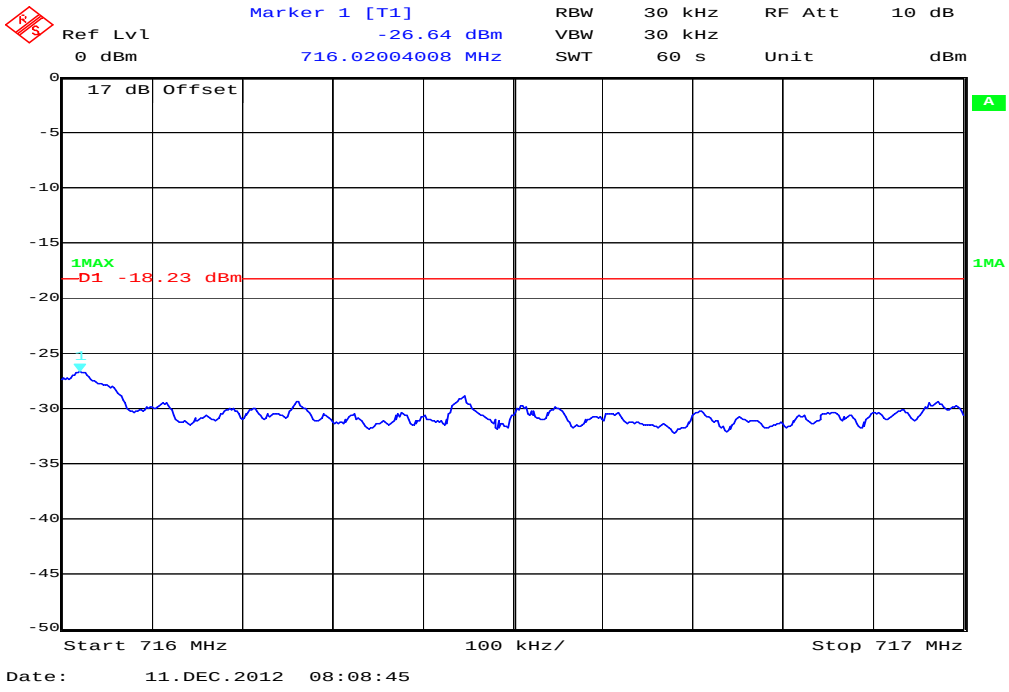
Plot 2: Highest Channel– QPSK



Plot 3: Lowest Channel– 16-QAM



Plot 4: Highest Channel– 16-QAM



Result: **Passed**

8.3.7 Occupied bandwidth

Description:

Measurement of the occupied bandwidth of the transmitted signal.

Measurement:

Similar to conducted emissions, occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the mid frequencies of the LTE band 17 frequency band. The table below lists the measured 99% power and -26dBc occupied bandwidths. Spectrum analyzer plots are included on the following pages.

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

Measurement parameters	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	Depends on Channel Bandwidth
Resolution bandwidth:	Depends on Channel Bandwidth
Span:	2 x nominal bandwidth
Trace-Mode:	Max Hold

Limits:

FCC
CFR Part 27.53(h) CFR Part 2.1049
Occupied Bandwidth
Spectrum must fall completely in the specified band

Results:

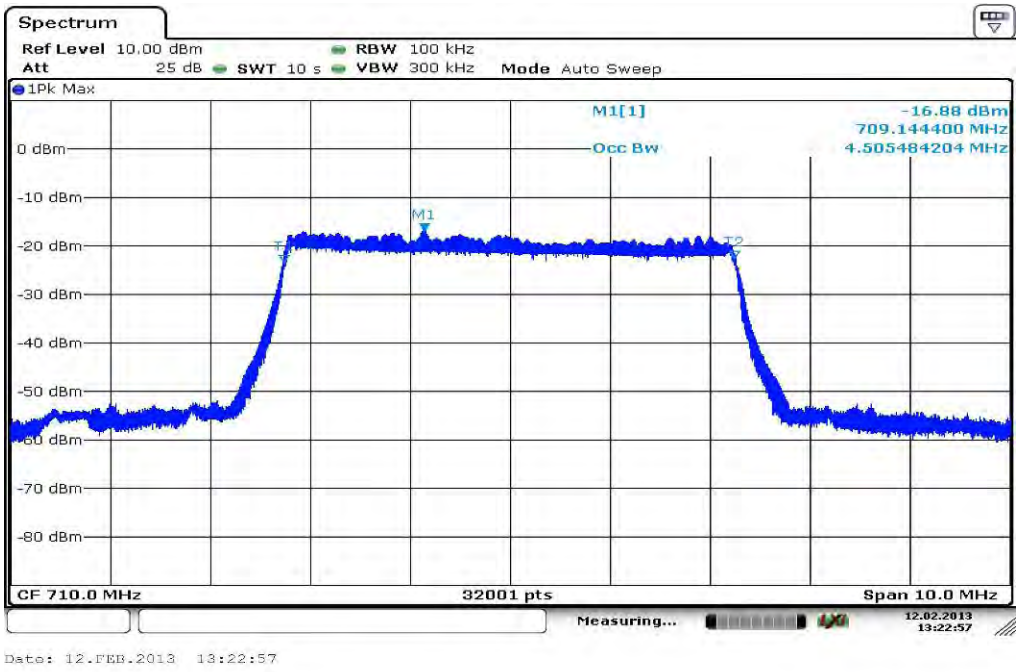
Occupied Bandwidth - QPSK	
Bandwidth [MHz]	**99% OBW (kHz)**
5	4505
10	9062
Measurement uncertainty	± 100 kHz

Occupied Bandwidth – 16-QAM	
Bandwidth [MHz]	**99% OBW (kHz)**
5	4512
10	9064
Measurement uncertainty	± 100 kHz

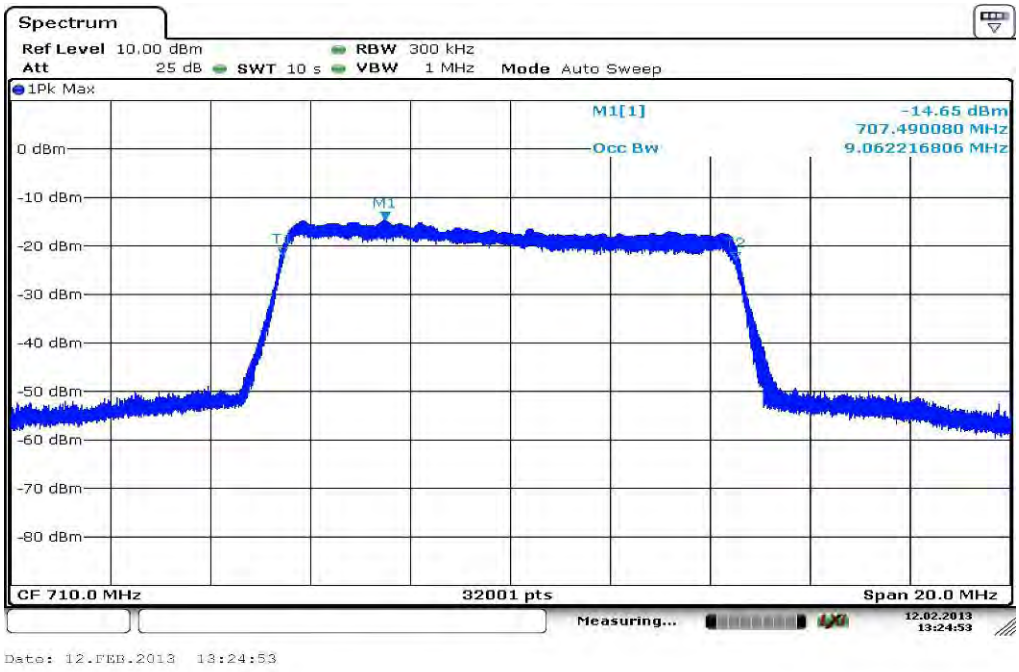
Result: **Passed**

Plots: QPSK

Plot 1: 5 MHz (99% - OBW)

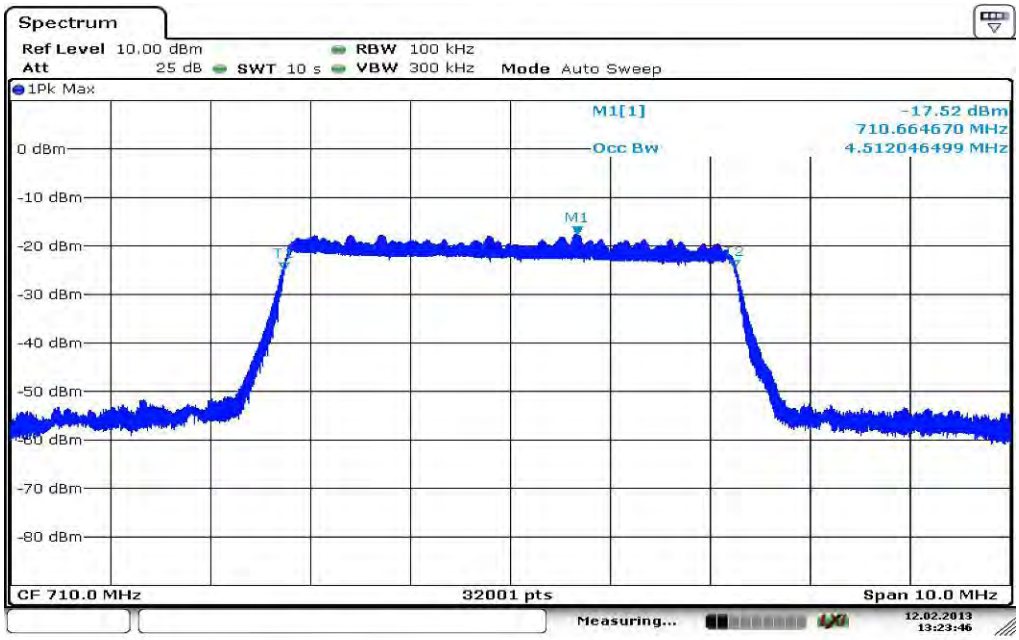


Plot 2: 10 MHz (99% - OBW)



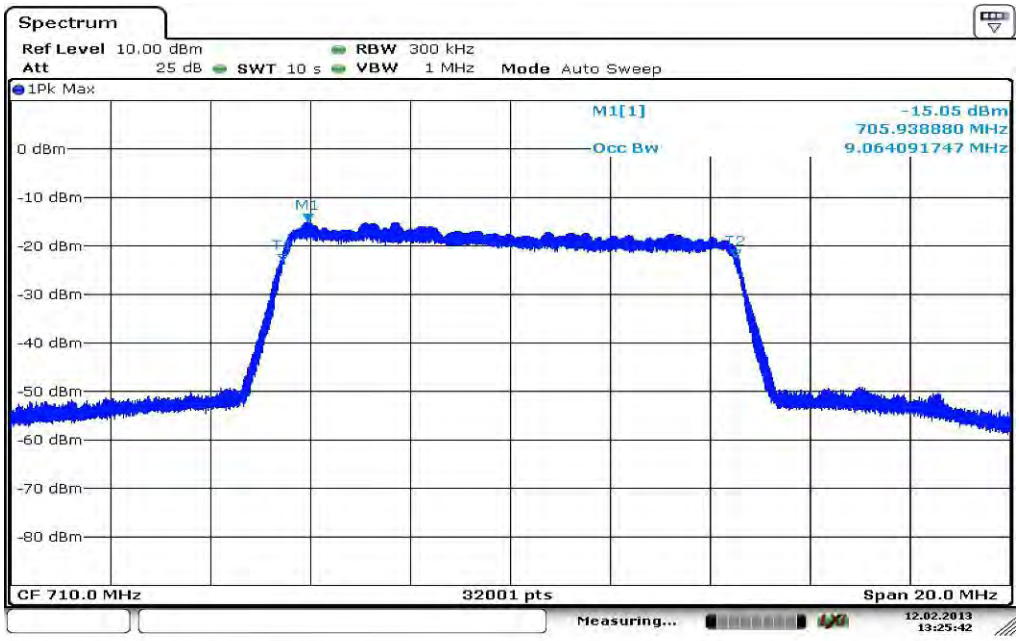
Plots: 16-QAM

Plot 1: 5 MHz (99% - OBW)



Date: 12.FEB.2013 13:23:46

Plot 2: 10 MHz (99% - OBW)



Date: 12.FEB.2013 13:25:43

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	vlKI!	11.05.2011	11.05.2013
3	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
4	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
5	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
6	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
7	9	Isolating Transformer	MPL IEC625 Bus Regeltrennt ravo	Erfi	91350	300001155	ne		
8	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
9	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
10	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
11	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vlKI!	14.10.2011	14.10.2014
12	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	19.12.2011	19.12.2012
13	CR 79	Std. Gain Horn Antenna 26.5-40.0 GHz	V637	Narda	7911	300001751	ne		
14	A025	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda		300000786	ne		
15	A027	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda		300000486	ne		
16	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2605e08770	300001443	ne		
17	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve		
18	n. a.	Power Supply 0-20V; 0-5A	6632B	HP	US37478366	400000117	vlKI!	20.08.2012	20.08.2014
19	n. a.	Wideband Radio Communication Tester	CMW500	R&S	102375	300004187_0			

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
1.0	Initial release	2012-12-11
-A	Editorial changes	2013-02-12

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

DAkkS Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH
German Accreditation Body

Entrusted according to Section 8 subsection1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV
Signatory to the Multilateral Agreements of
EA, ILAC and IAF for Mutual Recognition

Accreditation

The Deutsche Akkreditierungsstelle GmbH (German Accreditation Body) attests that the testing laboratory

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10
66117 Saarbrücken

is competent under the terms of DIN EN ISO/IEC 17025:2005 to carry out tests in the following fields:

Wired communications and DECT
Acoustic
Radio
Shirt Range Devices (SRD)
RFID
WiMax and Richtfunk
Mobile radio (GSM / DCS), Over the Air (OTA) Performance
Electromagnetic Compatibility (EMC) incl. Automotive
Product safety
SAR and Hearing Aid Compatibility (HAC)
Environmental simulation
Smart Card Terminals
Bluetooth
WI-FI-Services

The accreditation certificate shall only apply in connection with the notice of accreditation of 13.04.2011 with the accreditation number D-PL-12076-01 and is valid until 03.09.2014. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 62 pages.

Registration number of the certificate: **D-PL-12076-01-01**

Frankfurt am Main, 13.04.2011

This document is a translation. The definitive version is the original German accreditation certificate.

Deutsche Akkreditierungsstelle GmbH

Office Berlin
Spittelmarkt 10
10117 Berlin

Office Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Office Braunschweig
Bundesallee 100
38116 Braunschweig

The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkkS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkkS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkkS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Front side of certificate

Back side of certificate

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

http://www.cetecom.com/fileadmin/de/CETECOM_D_Saarbruecken/accreditations_Jan_2010/DAKKS_Akkredi_Urk_EN17025-En_incl_Annex.pdf