



TEST REPORT

Test report no.: 1-6965/13-06-07-A



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 Communications & Compatibility Testing (RCT)

Applicant

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Manufacturer

Sony Mobile Communications AB
Nya Vattentorget
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 services

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

Test Item

Kind of test item: Tablet PC GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDDI/II/IV/V/VIII; LTE FDD1/2/3/4/5/7/8; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS
Type name: TM-0043-BV
FCC ID: PY7TM-0043
Frequency: LTE FDD 4: 1710 MHz to 1755 MHz
LTE FDD 7: 2500 MHz to 2570 MHz
Technology tested: LTE FDD
Antenna: Integrated antenna
Power supply: 3.7V DC by Li - polymer battery

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:

Stefan Bös
Senior Testing Manager

Test performed:

Andreas Luckenbill
Expert

1 Table of contents

1	Table of contents	2
2	General information	3
2.1	Notes and disclaimer	3
2.2	Application details.....	3
3	Test standard/s	3
4	Test environment.....	4
5	Test item	4
5.1	Additional information	4
6	Test laboratories sub-contracted	4
7	Summary of measurement results	5
7.1	LTE – Band 4	5
7.2	LTE – Band 7	5
8	RF measurements	6
8.1	Description of test setup	6
8.1.1	Radiated measurements.....	6
8.2	LTE technologies supported by EUT	7
8.3	Results LTE – Band 4.....	8
8.3.1	RF output power	8
8.3.2	Spurious emissions radiated	10
8.4	Results LTE – Band 7	17
8.4.1	RF output power	17
8.4.2	Spurious emissions radiated	19
9	Test equipment and ancillaries used for tests	26
10	Observations	26
Annex A	Document history	27
Annex B	Further information.....	27
Annex C	Accreditation Certificate	28

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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In no case this test report can be considered as a Letter of Approval.

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:	2013-12-17
Date of receipt of test item:	2013-12-17
Start of test:	2013-12-17
End of test:	2013-12-20
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 27		Title 47 of the Code of Federal Regulations; Chapter I; Part 27 - Miscellaneous wireless communications services

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	No tests under extreme conditions
	T_{min}	No tests under extreme conditions
Relative humidity content:		30 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.7 V DC by Li - polymer battery
	V_{max}	No tests under extreme conditions
	V_{min}	No tests under extreme conditions

5 Test item

Kind of test item	:	Tablet PC GPRS/EGPRS 850/900/1800/1900; UMTS HSPA FDD/III/IV/V/VIII; LTE FDD1/2/3/4/5/7/8; WLAN b/g/n/a/ac; BT 4.0; RFID; A-GPS
Type name	:	TM-0043-BV
S/N serial number	:	Rad. CB51267QHS, CB51267QLF
HW hardware status	:	AP1
SW software status	:	17.0.A.0.274
Frequency band [MHz]	:	LTE FDD 4: 1710 MHz to 1755 MHz LTE FDD 7: 2500 MHz to 2570 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: 1-6965/13-06-01_AnnexA
1-6965/13-06-01_AnnexB
1-6965/13-06-01_AnnexC

Reference documents: Main test report: 1-6965/13-05-05-A / PY7TM-0040 (conducted values)

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	2014-01-24	Deta test report according manufacturer test plan.

7.1 LTE – Band 4

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
Frequency Stability	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
Spurious Emissions Conducted	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
Block Edge Compliance	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
Occupied Bandwidth	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-

Note: NA = Not applicable; NP = Not performed

7.2 LTE – Band 7

Test Case	temperature conditions	power source voltages	Pass	Fail	NA	NP	Remark
RF Output Power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
Frequency Stability	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
Spurious Emissions Radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
Spurious Emissions Conducted	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
Block Edge Compliance	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
Occupied Bandwidth	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-

Note: NA = Not applicable; NP = Not performed

8 RF measurements

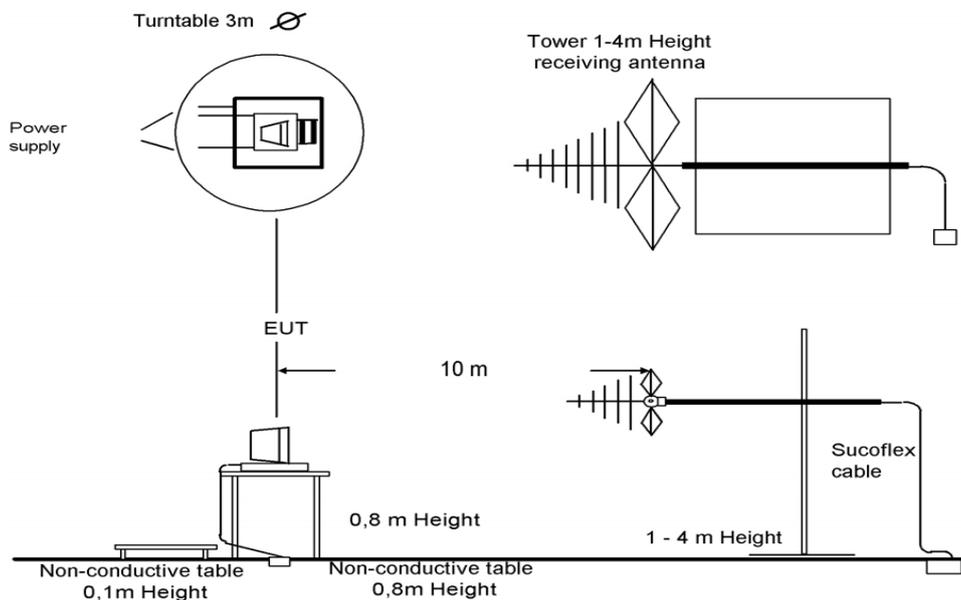
8.1 Description of test setup

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

8.2 LTE technologies supported by EUT

Channel bandwidth

	Band 4	Band 7
[MHz]		
1.4	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
15	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

8.3 Results LTE – Band 4

The EUT was set to transmit the maximum power.

8.3.1 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:	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
Average E.I.R.P. Output Power
+30.00 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:

The output power radiated is measured with the mode which has the highest conducted output power. For conducted values see Cetecom test report: 1-6965/13-05-05-A.

Output Power (radiated)			
Bandwidth (MHz)	Frequency (MHz)	Average Output Power (dBm)	Average Output Power (dBm)
		QPSK	16-QAM
1.4	1710.7	25.4	24.5
	1732.5	25.5	24.5
	1754.3	25.5	24.4
3	1711.5	25.4	24.5
	1732.5	25.4	24.2
	1753.5	25.5	24.2
5	1712.5	25.3	24.3
	1732.5	25.3	24.8
	1752.5	25.3	24.2
10	1715.0	25.4	24.5
	1732.5	25.4	24.2
	1750.0	25.5	24.2
15	1717.5	25.3	24.5
	1732.5	25.4	24.9
	1747.5	25.4	24.2
20	1720.0	25.4	24.5
	1732.5	25.2	24.5
	1745.0	25.2	24.4
Measurement uncertainty		± 3.0 dB	

Result: **Passed**

8.3.2 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 1755 MHz. Measured up to 25 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 sec.
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
Spurious Emissions Radiated
Attenuation $\geq 43 + 10\log(P)$ (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 4 (1712.5 MHz, 1732.5 MHz and 1752.5 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 4 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 with full resource blocks. 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)					
Lowest channel		Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
	No peaks detected.		No peaks detected.		No peaks detected.
Measurement uncertainty			± 3dB		

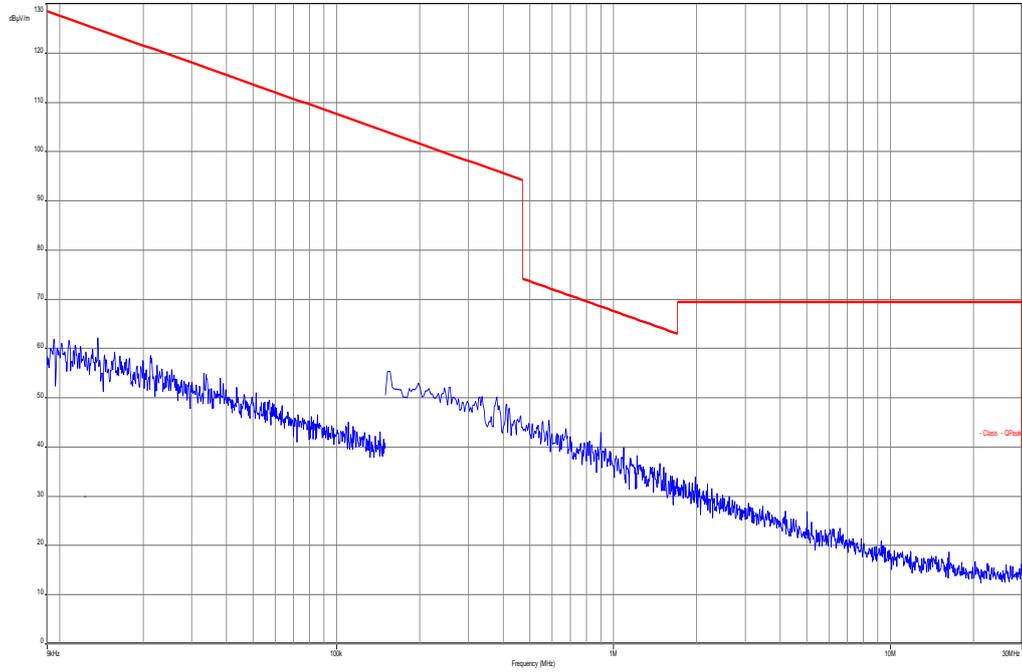
16-QAM

Spurious Emission Level (dBm)					
Lowest channel		Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
	No peaks detected.		No peaks detected.		No peaks detected.
Measurement uncertainty			± 3dB		

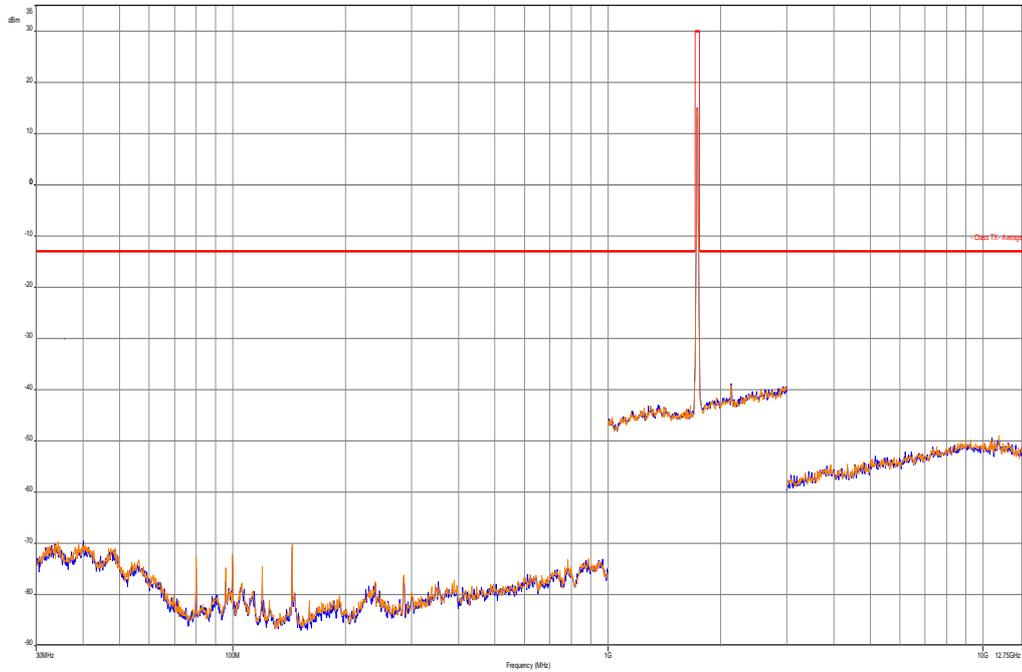
Result: Passed

QPSK with 10 MHz channel bandwidth

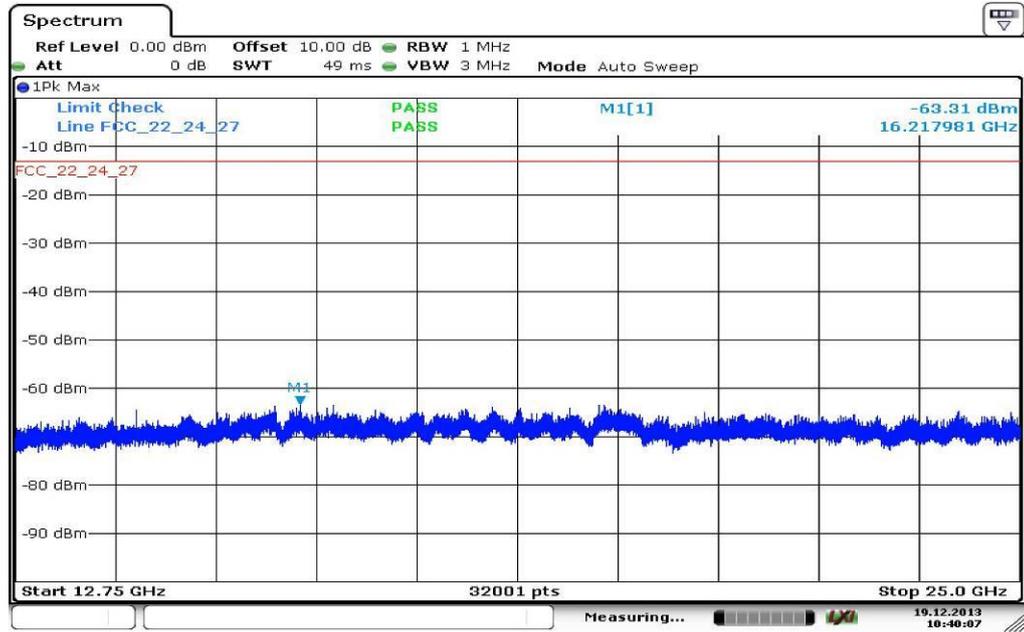
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 12.75 GHz

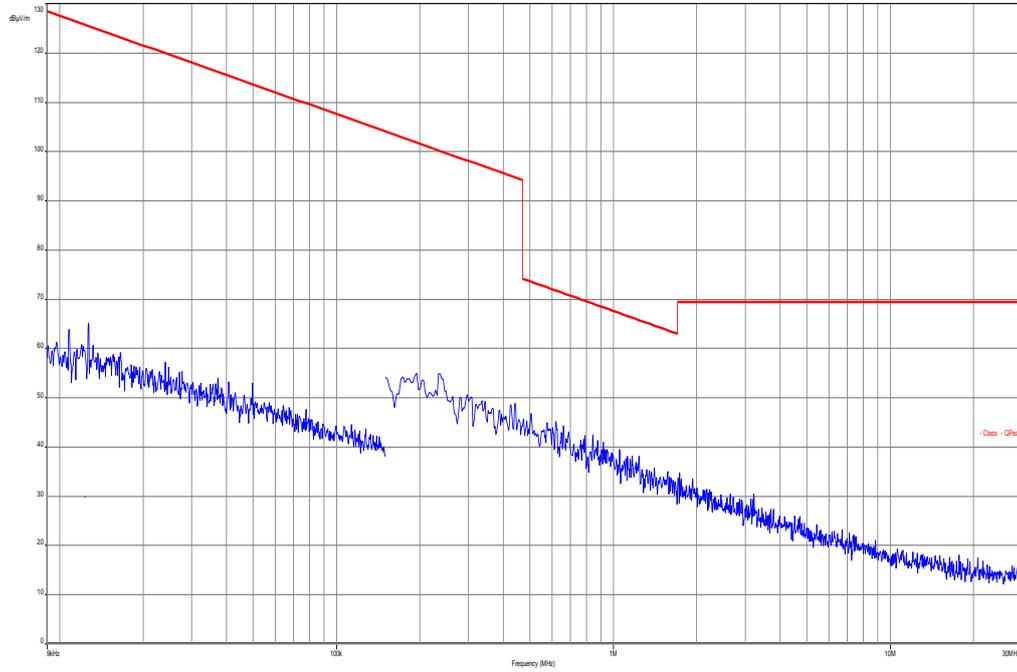


Plot 3: Middle channel, 12 GHz to 25 GHz

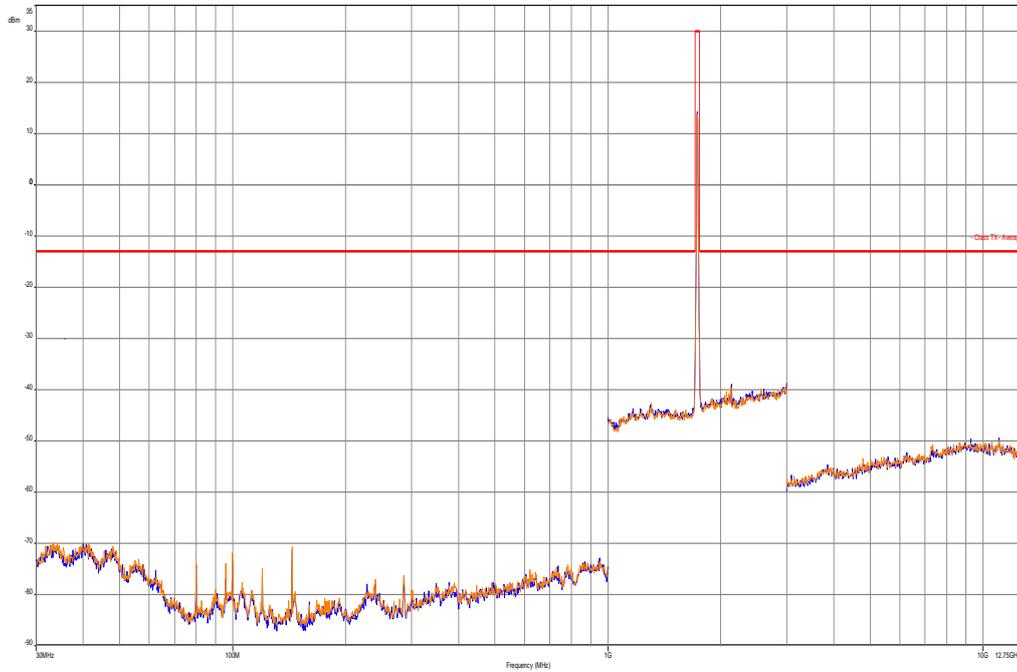


16-QAM with 10 MHz channel bandwidth

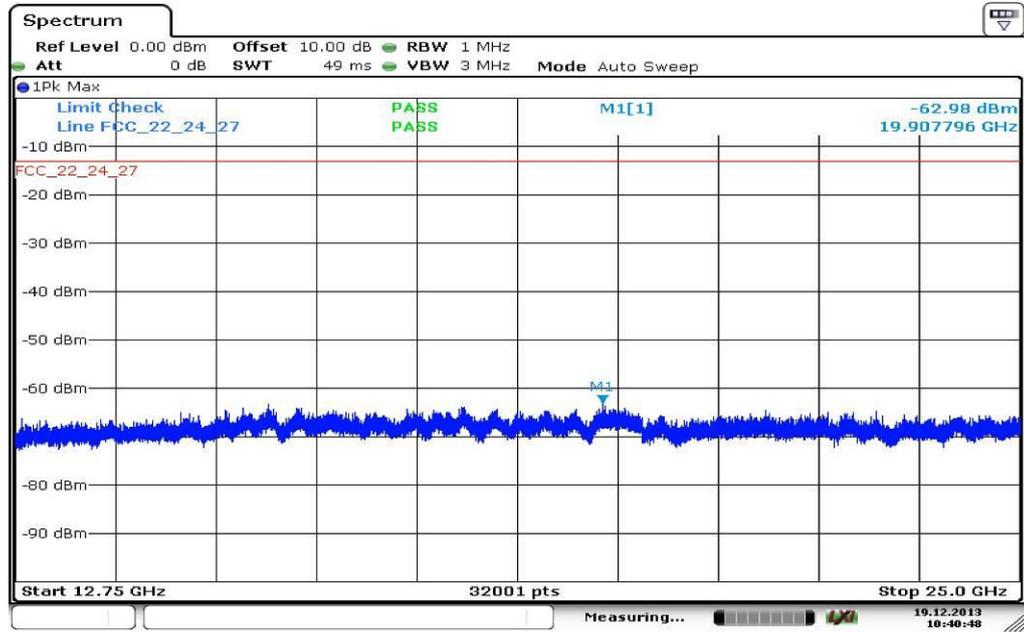
Plot 4: Middle channel, up to 30 MHz



Plot 5: Middle channel, 30 MHz to 12.75 GHz



Plot 6: Middle channel, 12 GHz to 25 GHz



8.4 Results LTE – Band 7

The EUT was set to transmit the maximum power.

8.4.1 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:	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
AVG: 33 dBm
Max Output Power
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 (radiated)			
Bandwidth (MHz)	Frequency (MHz)	Average Output Power (dBm)	Average Output Power (dBm)
		QPSK	16-QAM
5	2502.5	24.5	23.8
	2535	25.0	24.2
	2567.5	24.6	23.3
10	2505	25.1	24.5
	2535	25.1	23.9
	2565	24.6	23.4
15	2507.5	25.4	24.8
	2535	25.1	24.3
	2562.5	24.5	23.3
20	2510	25.1	24.6
	2535	25.0	24.2
	2560	24.3	23.7
Measurement uncertainty		± 3.0 dB	

Result: Passed

8.4.2 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 2569.3 MHz. This was rounded up to 26 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 7.

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 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
Spurious Emissions Radiated
Attenuation $\geq 43 + 10\log(P)$ (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 7. 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 7 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 with full resource blocks. 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)					
Lowest channel		Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
	No peaks detected.		No peaks detected.		No peaks detected.
Measurement uncertainty			± 3dB		

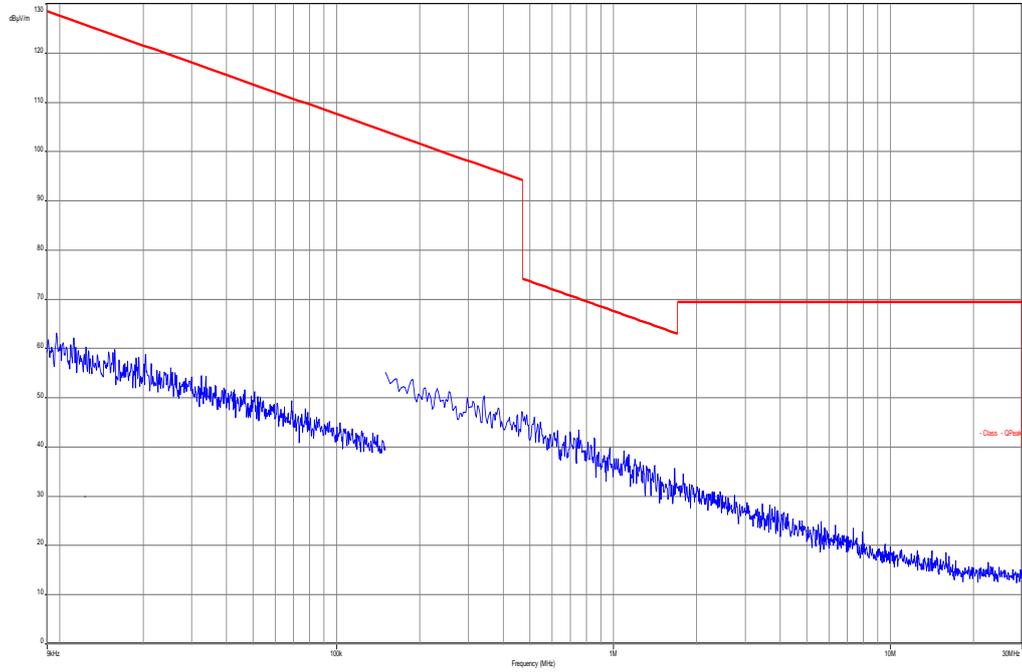
16-QAM

Spurious Emission Level (dBm)					
Lowest channel		Middle channel		Highest channel	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
	No peaks detected.		No peaks detected.		No peaks detected.
Measurement uncertainty			± 3dB		

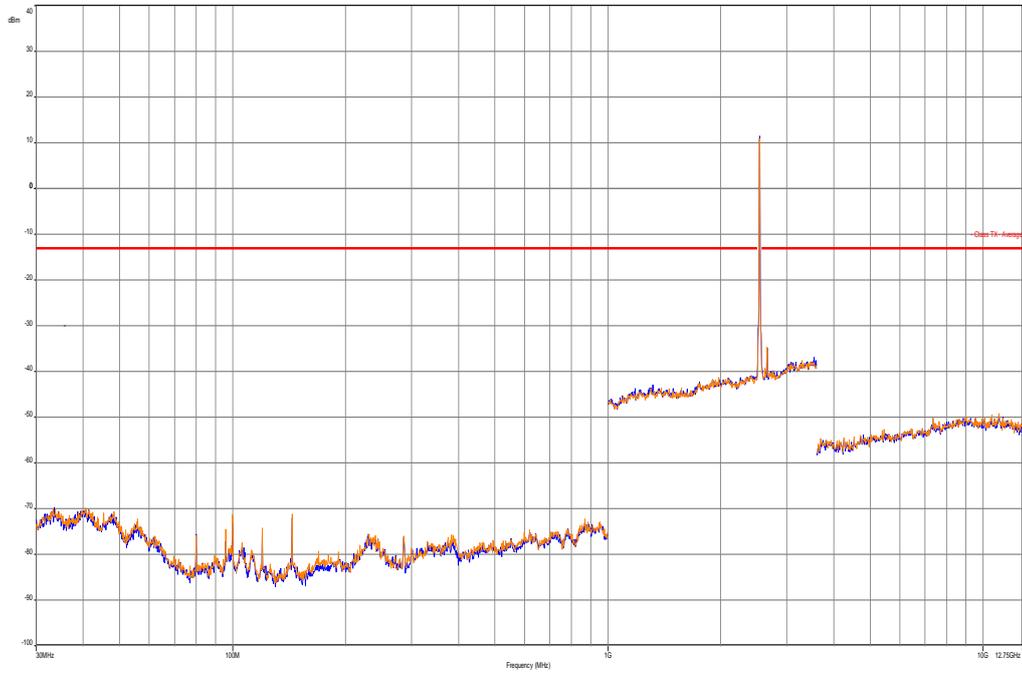
Result: Passed

QPSK with 10 MHz channel bandwidth

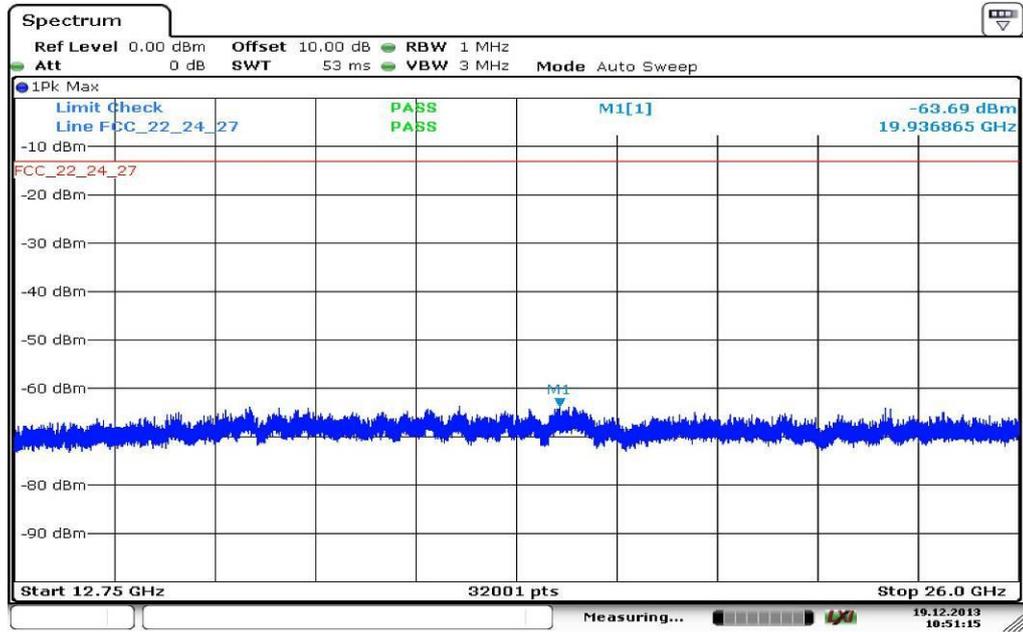
Plot 1: Middle channel, up to 30 MHz



Plot 2: Middle channel, 30 MHz to 12.75 GHz



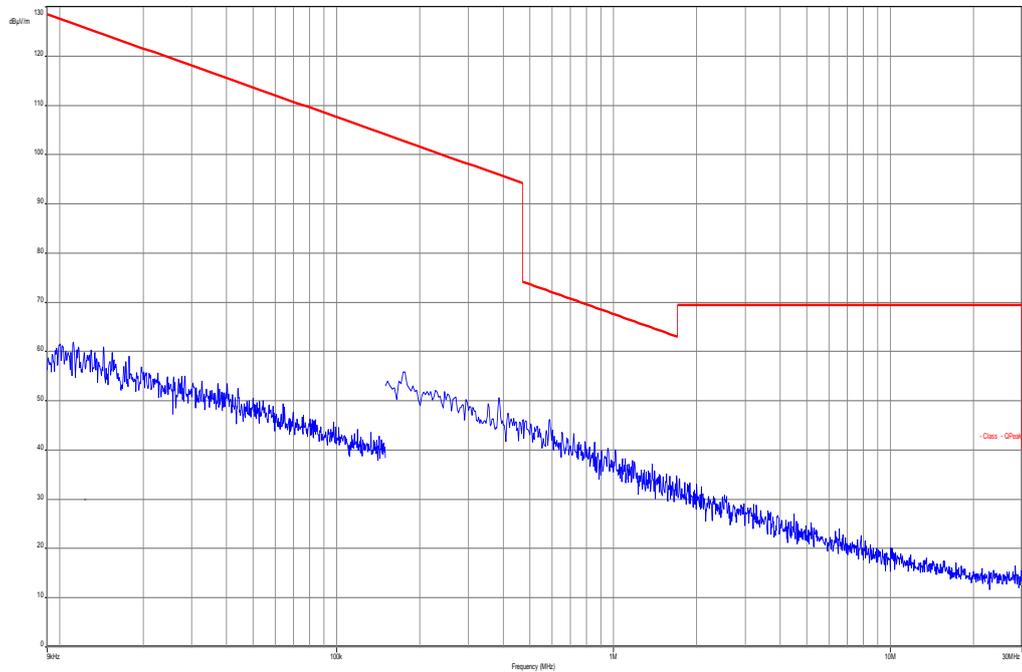
Plot 3: Middle channel, 12 GHz to 26 GHz



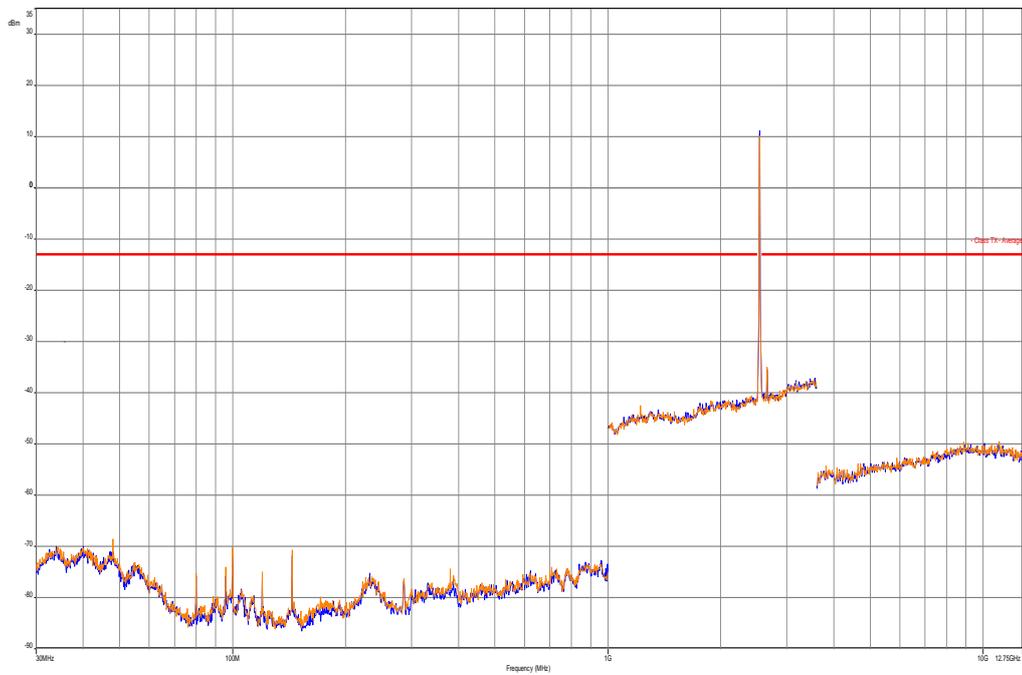
Date: 19.DEC.2013 10:51:15

16-QAM with 10 MHz channel bandwidth

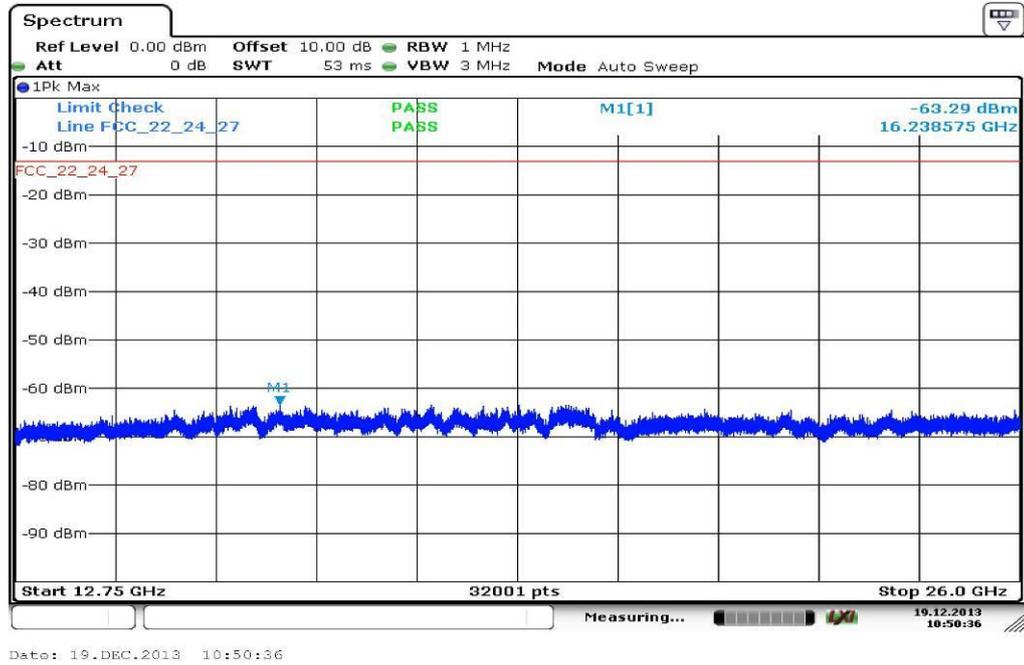
Plot 4: Middle channel, up to 30 MHz



Plot 5: Middle channel, 30 MHz to 12.75 GHz



Plot 6: Middle channel, 12 GHz to 26 GHz



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.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vKl!	08.05.2013	08.05.2015
2	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
3	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
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	vKl!	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	n. a.	Wideband Radio Communication Tester	CMW500	R&S	102375	300004187_0	k	16.07.2013	16.07.2015
12	n. a.	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.10.2012	22.01.2014

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
vKl!	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

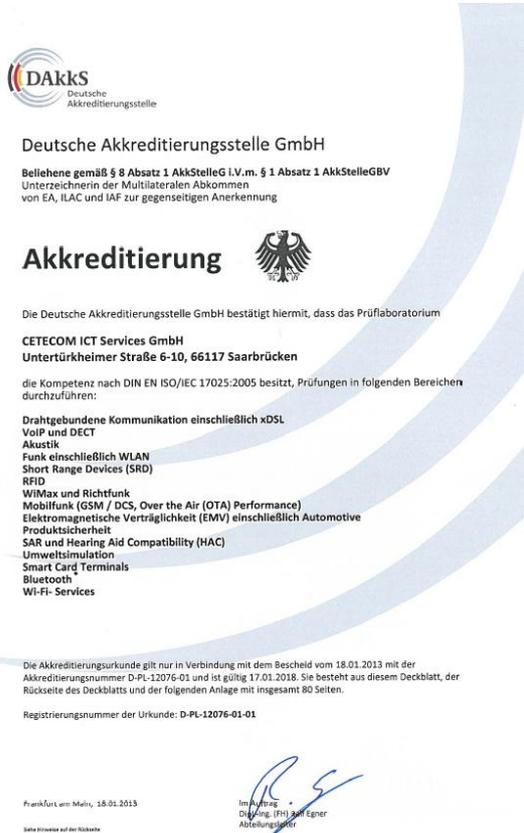
Version	Applied changes	Date of release
1.0	Initial release	2014-01-23
-A	Editorial changes	2014-01-24

Annex B Further information**Glossary**

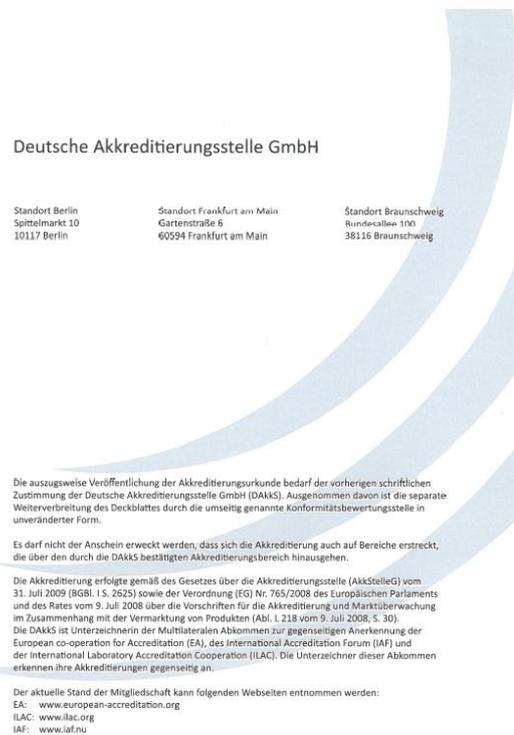
AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory 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



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/eu/de/cetecom-group/europa/deutschland-saarbruecken/akkreditierungen.html>