
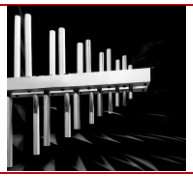
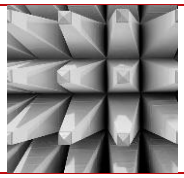

CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test report no.: 1-0042/15-01-07

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom.com
e-mail: ict@cetecom.com

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-12076-01-00

Applicant

Blackberry Limited
440 Phillip Street
Waterloo, ON N2L 5R9 / CANADA
Phone: +1 51 98 88 74 65
Fax: +1 51 98 88 69 06
Contact: Masud Attayi
e-mail: MAttayi@blackberry.com
Phone: +1 51 98 88 74 65 x72442

Manufacturer

Blackberry Limited
2200 University Avenue East
Waterloo, ON N2K 0A7 / CANADA

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:	**Blackberry GSM Phones**
Model name:	**RHM181LW (STV100-4)**
FCC ID:	**L6ARHM180LW**
IC:	**-/-**
Frequency:	LTE Band FDD 4, 13 and 17
Technology tested:	LTE FDD
Antenna:	Integrated antenna
Power supply:	3.7 V DC by Li - Ion 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 authorized:

cn=Andreas Luckenbill, o=CETECOM ICT Services GmbH, ou=LUC-111202, email=andreas.luckenbill@cetecom.com, c=DE
2015.09.29 16:31:31 +02'00'

Andreas Luckenbill
Lab Manager
Radio Communications & EMC

Test performed:

p.o.
cn=Mihail Dorongovskij, o=CETECOM ICT Services GmbH, ou=DOG-150526, email=mihail.dorongovskij@cetecom.com, c=DE
2015.09.29 10:25:23 +02'00'

Marco Bertolino
Lab Manager
Radio Communications & EMC

1 Table of contents

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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2.2 Application details

Date of receipt of order:	2015-06-08
Date of receipt of test item:	2015-07-27
Start of test:	2015-07-27
End of test:	2015-08-28
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 27	2015-07-27	Title 47 of the Code of Federal Regulations; Chapter I; Part 27 - Miscellaneous wireless communications services

3.1 Measurement guidance

Guidance	Version	Description
ANSI C63.4-2014	-/-	American national standard for methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	No tests under extreme conditions performed.
	T_{min}	No tests under extreme conditions performed.
Relative humidity content:		43 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.7 V DC by Li - Ion battery
	V_{max}	No tests under extreme conditions performed.
	V_{min}	No tests under extreme conditions performed.

5 Test item

Kind of test item	:	Blackberry GSM Phones
Type identification	:	RHM181LW (STV100-4)
PMN	:	-/-
HVIN	:	-/-
FVIN	:	-/-
HMN	:	-/-
S/N serial number	:	IMEI 004402243072794 (LTE band 4) IMEI 004402243073065 (LTE band 13, 17)
HW hardware status	:	CER-62543-001 Rev 1-x06-01 (mid and high bands) CER-62543-001 Rev 2-x06-01 (low bands)
SW software status	:	AAC056 (mid and high bands) AAC273 (low bands)
Frequency band	:	LTE Band 4 FDD 1710 MHz to 1755 MHz LTE Band 13 FDD 777 MHz to 787 MHz LTE Band 17 FDD 704 MHz to 716 MHz
Type of radio transmission **Use of frequency spectrum**	: :	OFDM
Type of modulation	:	QPSK, 16 – QAM
Antenna	:	Integrated antenna
Power supply	:	3.7 V DC by Li - Ion battery

5.1 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-0042/15-01-01_AnnexA
1-0042/15-01-01_AnnexC

6 Test laboratories sub-contracted

None

7 Description of the test setup

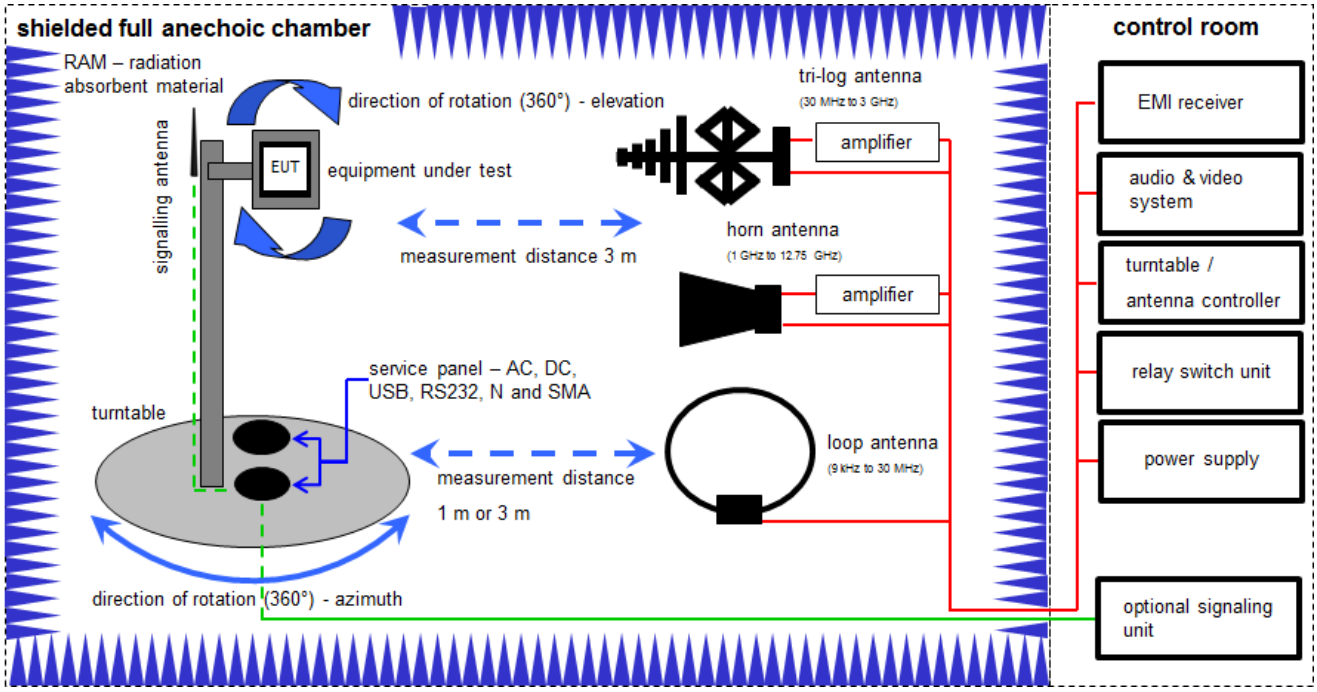
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, RF generating and signaling 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 (Lab/Item).

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
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Shielded fully anechoic chamber



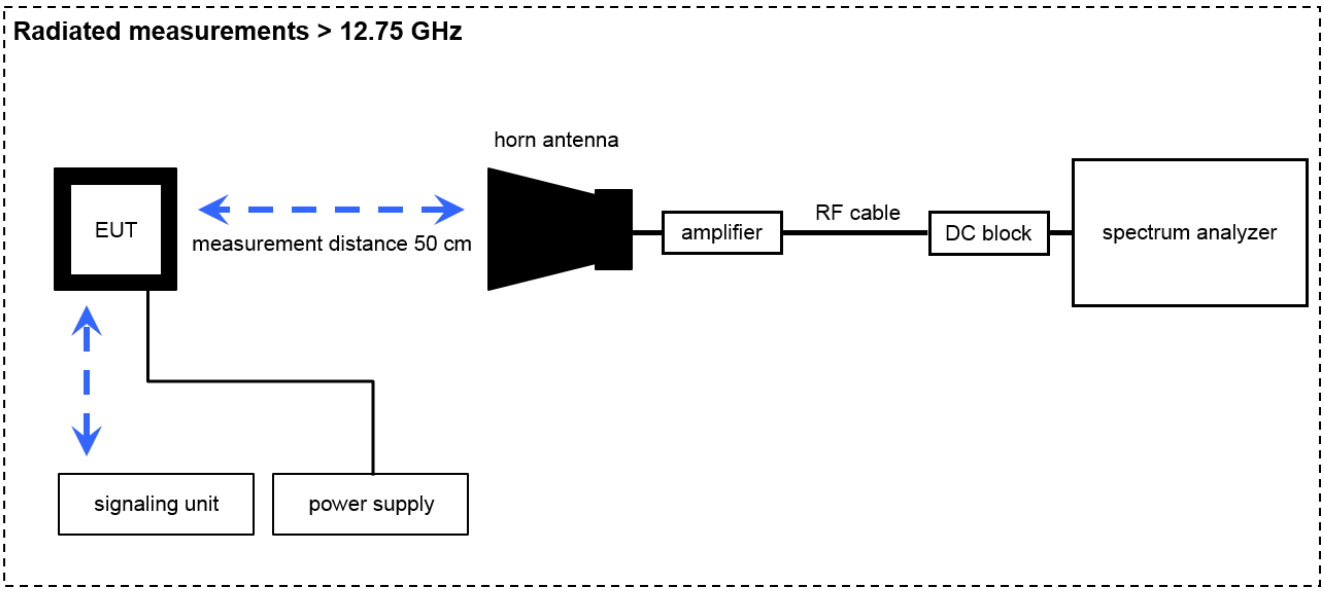
SS = U_R + CA + AF
(SS-signal strength; U_R-voltage at the receiver; CA-loss of the signal path; AF-antenna factor)

Example calculation:
SS [dBµV/m] = 40.0 [dBµV/m] + (-35.8) [dB] + 32.9 [dBµV/m] = 37.1 [dBµV/m] (71.61 µV/m)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9005-3440	300002190	vIKI!	20.05.2015	20.05.2017
2	A	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9709-5290	300000212	k	13.08.2015	13.08.2017
3	A	EMI Test Receiver 20Hz- 26,5GHz	ESU26	R&S	100037	300003555	k	22.01.2015	22.01.2016
4	A	Band Reject Filter	WRCG1710/1755-1690/1775-90/14SS	Wainwright	7	300003793	ne	-/-	-/-
5	A	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	318	300003696	k	22.04.2014	22.04.2017
6	A	Broadband Amplifier 0.5-18 GHz	CBLU5184540	CERNEX	22050	300004482	ev	-/-	-/-
7	A	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000032	300004510	ne	-/-	-/-
8	A	Wideband Radio Communication Tester	CMW500	R&S	102375	300004187	vIKI!	28.01.2015	28.01.2017

7.2 Radiated measurements > 12.75 GHz



OP = AV + D - G + CA
(OP-output power; AV-analyzer value; D-distance; G-antenna gain+amplifier gain; CA-loss signal path)

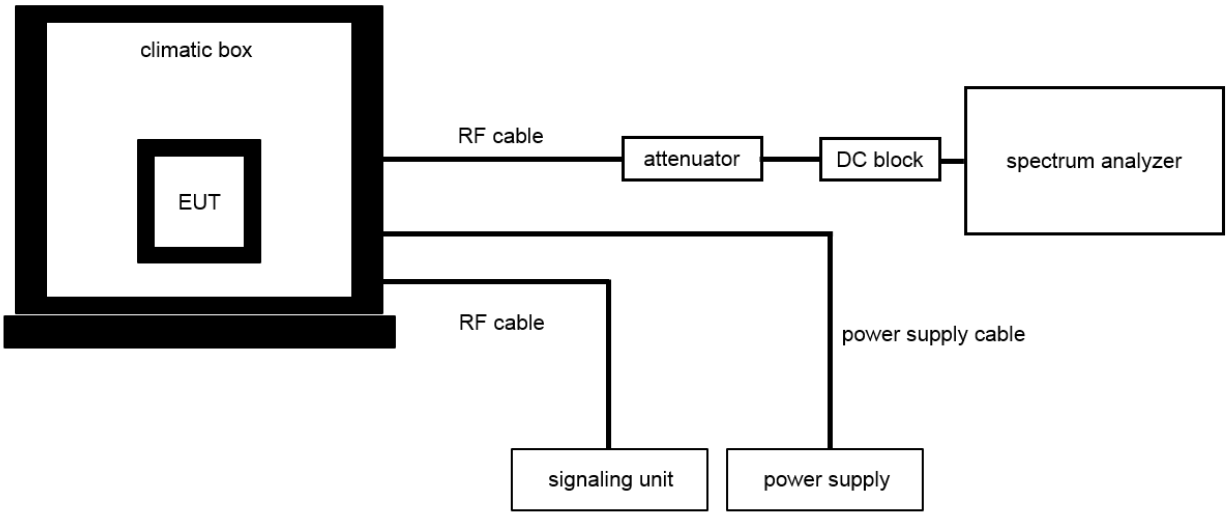
Example calculation:
OP [dBm] = -41.0 [dBm] + 26 [dB] - 20 [dB] + 5 [dB] = -30 [dBm] (1 µW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Std. Gain Horn Antenna 12.4 to 18.0 GHz	639	Narda	8402	300000786	ne	-/-	-/-
2	A	Std. Gain Horn Antenna 18.0 to 26.5 GHz	638	Narda	8402	300000486	ne	-/-	-/-
3	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016
4	A	Amplifier 2-40 GHz	JS32-02004000-57-5P	MITEQ	1777200	300004541	ev	-/-	-/-
5	A	RF-Cable	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 600918	400001182	ev	-/-	-/-
6	A	RF-Cable	ST18/SMAm/SMm/48	Huber & Suhner	Batch no. 127377	400001183	ev	-/-	-/-
7	A	DC-Blocker 0.1-40 GHz	8141A	Inmet	-/-	400001185	ev	-/-	-/-
8	A	Power Supply 0-20V; 0-5A	6632B	HP	US37478366	400000117	vlKI!	20.01.2015	20.01.2017
9	A	Wideband Radio Communication Tester	CMW500	R&S	102375	300004187	vlKI!	28.01.2015	28.01.2017

7.3 Conducted measurements

Conducted measurements normal & extreme conditions



OP = AV + CA
(OP-output power; AV-analyzer value; CA-loss signal path)

Example calculation:
OP [dBm] = 6.0 [dBm] + (11.7) [dB] = 17.7 [dBm] (58.88 mW)

Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne	-/-	-/-
2	A	Signal Analyzer 40 GHz	FSV40	R&S	101042	300004517	k	22.01.2015	22.01.2016
4	A	Wideband Radio Communication Tester	CMW500	R&S	102375	300004187	vIKI!	28.01.2015	28.01.2017
6	A	RF-Cable	ST18/SMAm/SMAm/ 72	Huber & Suhner	Batch no. 699714	400001184	ev	-/-	-/-
7	A	DC-Blocker 0.1-40 GHz	8141A	Inmet		400001185	ev	-/-	-/-
8	A	Coax Attenuator 10 dB 2W 0-40 GHz	MCL BW-K10-2W44+	Mini Circuits		400001186	ev	-/-	-/-

8 Measurement uncertainty

Measurement uncertainty	
Test case	**Uncertainty**
RF output power conducted	± 1 dB
RF output power radiated	± 3 dB
Frequency stability	± 20 Hz
Spurious emissions radiated below 30 MHz	± 3 dB
Spurious emissions radiated 30 MHz to 1 GHz	± 3 dB
Spurious emissions radiated 1 GHz to 12.75 GHz	± 3.7 dB
Spurious emissions radiated above 12.75 GHz	± 4.5 dB
Spurious emissions conducted	± 3 dB
Block edge compliance	± 3 dB
Occupied bandwidth	± RBW

9 Sequence of testing

9.1 Sequence of testing 9 kHz to 30 MHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details .
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.5 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with RMS (RMS / see ANSI C 63.4) detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

9.2 Sequence of testing 30 MHz to 1 GHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 10 or 3 meter (see ANSI C 63.4) – see each test details.
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.
-

Final measurement

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.
- The final measurement will be done with RMS (RMS / see ANSI C 63.4) detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

9.3 Sequence of testing 1 GHz to 12.75 GHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter (see ANSI C 63.4) – see each test details.
- The EUT was set into operation.

Premeasurement

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height is 1.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement

- The final measurement will be performed with minimum the six highest peaks according the requirements of the ANSI C63.4.
- According to the maximum found antenna polarization and turntable position of the premeasurement the software maximizes the peaks by rotating the turntable position (0° to 360°). This measurement is repeated for different EUT-table positions (0° to 150° in 30°-steps). This procedure is repeated for both antenna polarizations.
- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and RMS (RMS / see ANSI C 63.4) detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

9.4 Sequence of testing above 12.75 GHz

Setup

- The equipment was set up to simulate a typical usage like descripted in the user manual or described by manufacturer.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions as described in ANSI C 63.4.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 0.5 meter
- The EUT was set into operation.

Premeasurement

- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement

- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and RMS (RMS / see ANSI C 63.4) detector
- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

10 Summary of measurement results

☐	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☒	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC identifier	Description	verdict	date	Remark
RF-Testing	CFR Part 27	See table!	2015-09-29	Tests according to customer test list

10.1 LTE – Band 4

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

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

10.2 LTE – Band 13

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

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

10.3 LTE – Band 17

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

Note: C = Compliant; NC = Not compliant; NA = Not applicable; NP = Not performed

11 RF measurements

11.1 LTE technologies supported by EUT

Channel bandwidth

	Band 4	Band 13	Band 17
[MHz]			
1.4	☒	☐	☐
3	☒	☐	☐
5	☒	☒	☒
10	☒	☒	☒
15	☒	☐	☐
20	☒	☐	☐

11.2 Results LTE – Band 4

The EUT was set to transmit the maximum power.

11.2.1 RF output power

Description:

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

Measurement:

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

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

Measurement parameters	
Detector:	Sample
AQT:	15.6 ms
Resolution bandwidth:	40 MHz
Used equipment:	see chapter 7.1 – A and chapter 7.2 – A
Measurement uncertainty:	see chapter 8

Limits:

FCC	IC
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 worst case setting was evaluated at the 1.4 MHz bandwidth, 1 resource block and low resource block offset setting for lowest, middle and highest channel.

Output Power (radiated)				
Frequency (MHz)	**Average Output Power (dBm) QPSK**	**Peak-to-average-ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak-to-average-ratio (dB)**
1710.7	25.2	4.4	24.7	5.3
1732.5	22.1	4.8	23.1	4.0
1754.3	22.4	4.1	22.7	5.0

11.2.2 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 C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 1755 MHz. Measurement made 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 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 ≥ 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 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 the low, middle and high channels measured with the worst case settings evaluated in the previous chapter.

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

QPSK

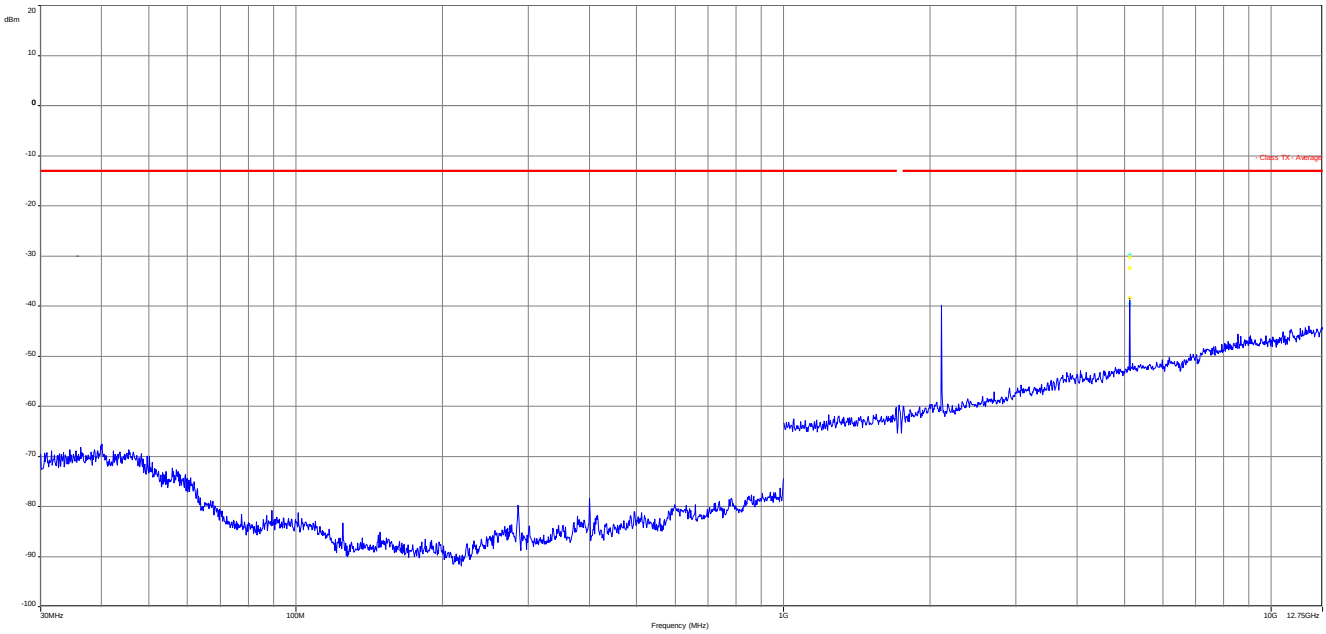
Spurious Emission Level (dBm)					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
5131	-29.7	5196	-29.2-	5262	-28.3
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
Measurement uncertainty		± 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]
5131	-25.9		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
Measurement uncertainty		± 3dB			

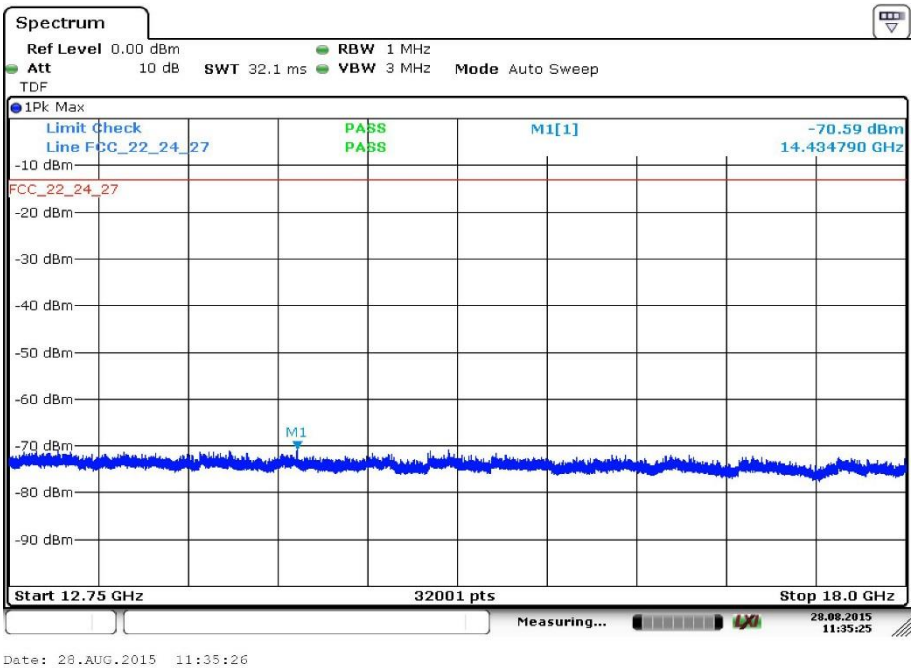
QPSK with 1.4 MHz channel bandwidth

Plot 1: Low channel, 30 MHz to 12.75 GHz

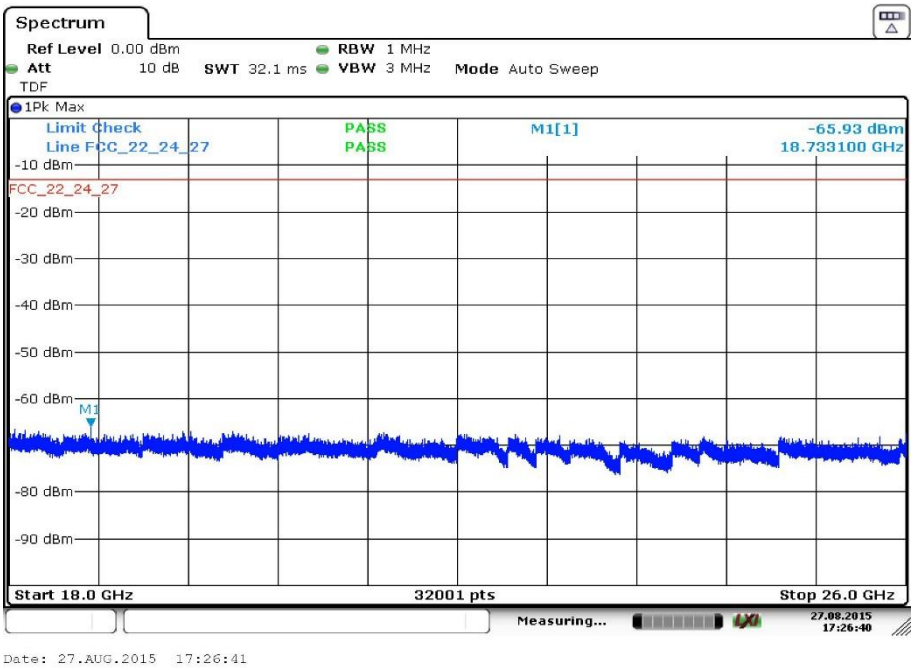


Carrier notched with 1.7 GHz rejection filter

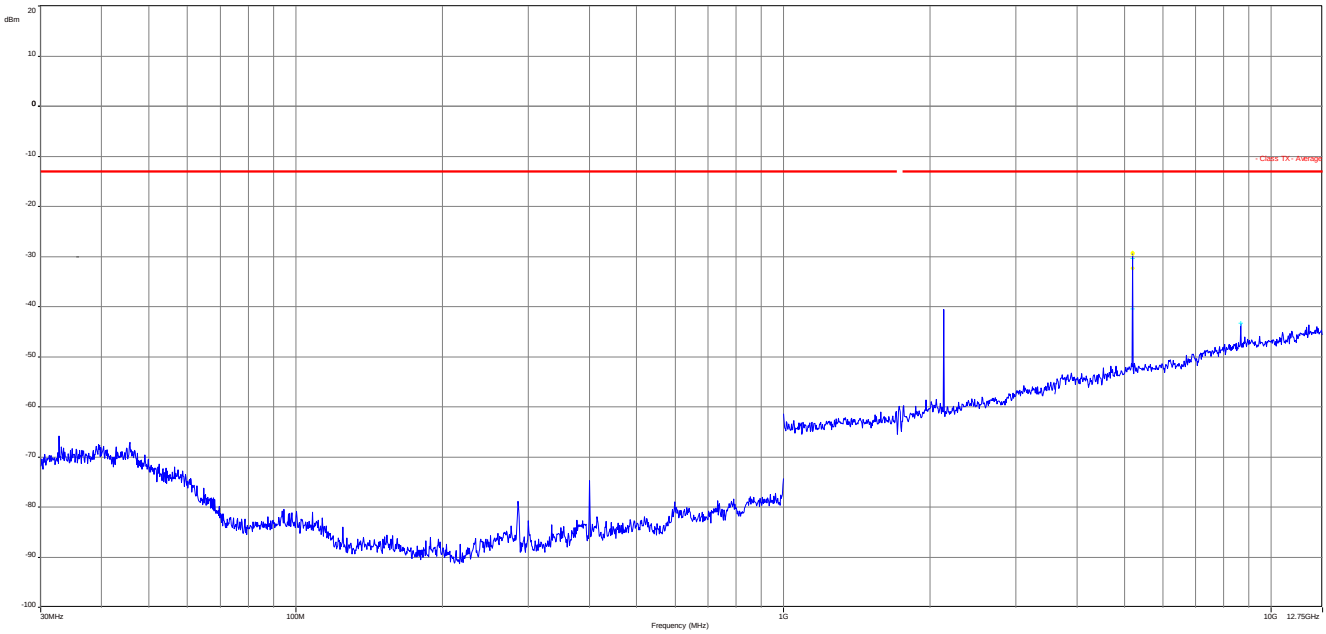
Plot 2: Low channel, 12.75 GHz to 18 GHz



Plot 3: Low channel, 18 GHz to 26 GHz

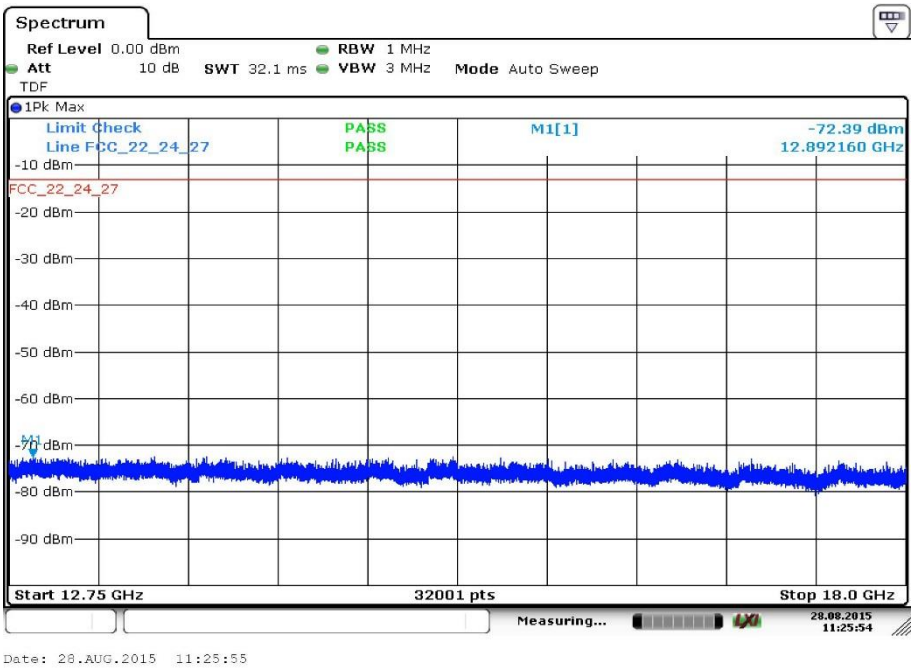


Plot 4: Middle channel, 30 MHz to 12.75 GHz

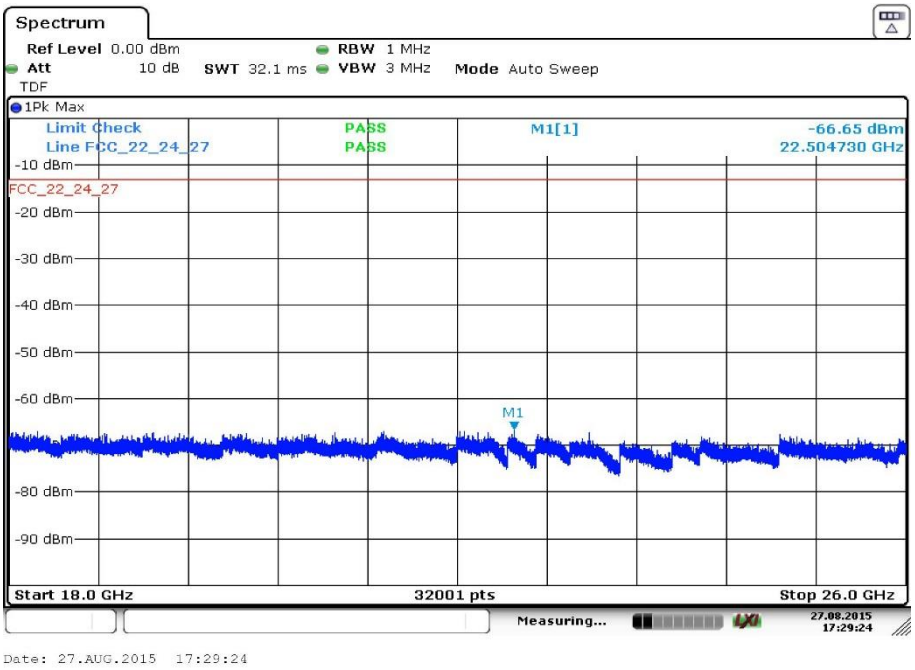


Carrier notched with 1.7 GHz rejection filter

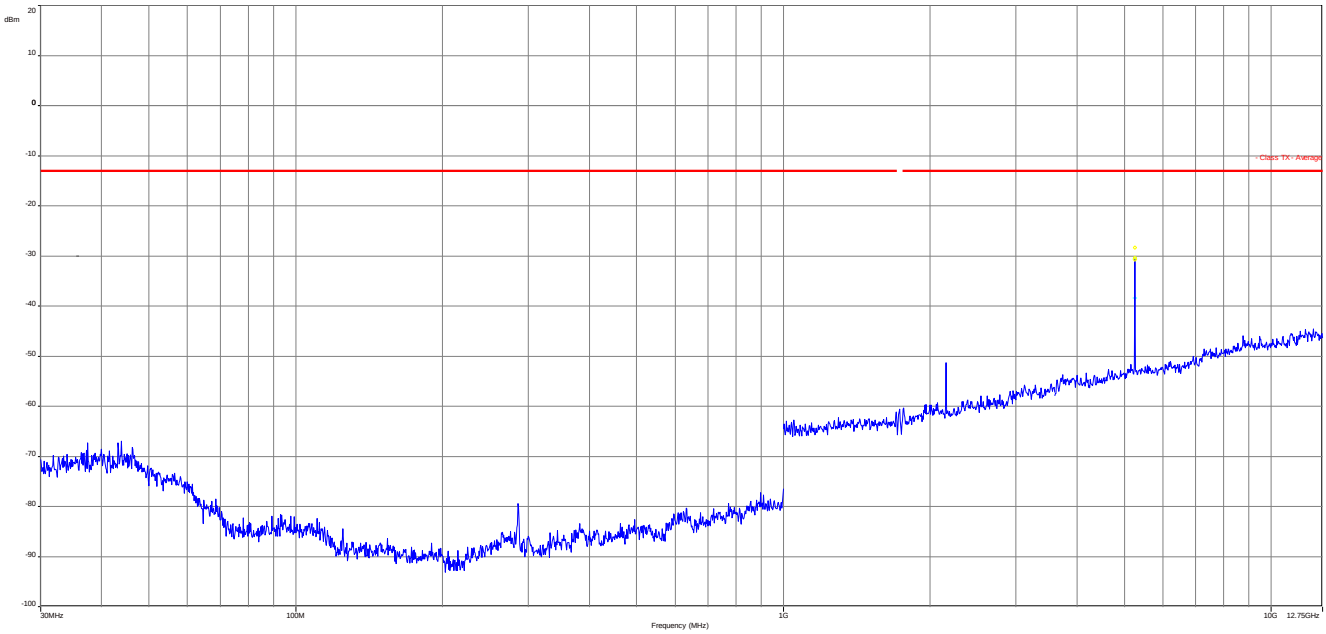
Plot 5: Middle channel, 12.75 GHz to 18 GHz



Plot 6: Middle channel, 18 GHz to 26 GHz

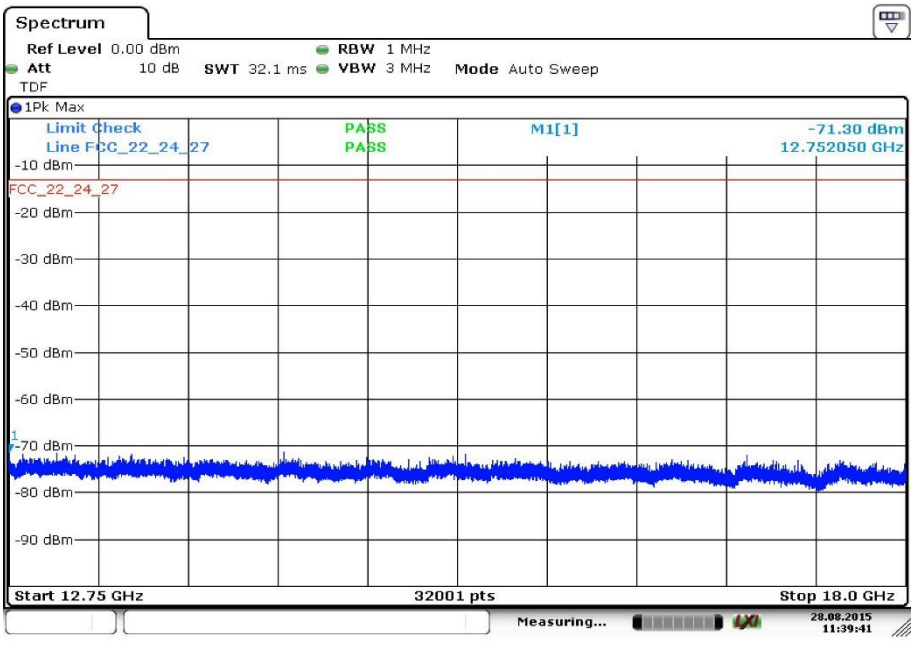


Plot 7: High channel, 30 MHz to 12.75 GHz

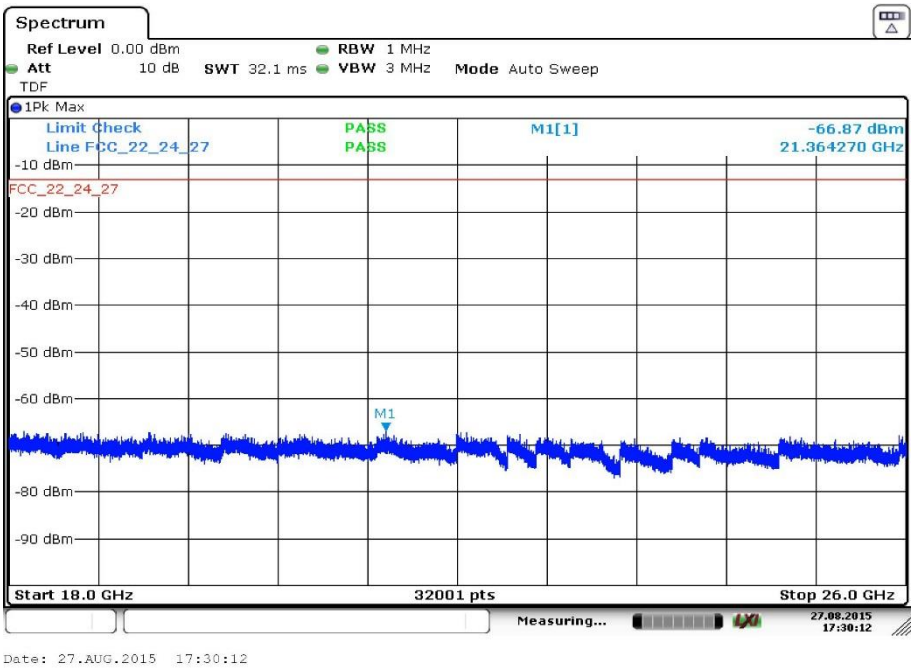


Carrier notched with 1.7 GHz rejection filter

Plot 8: High channel, 12.75 GHz to 18 GHz

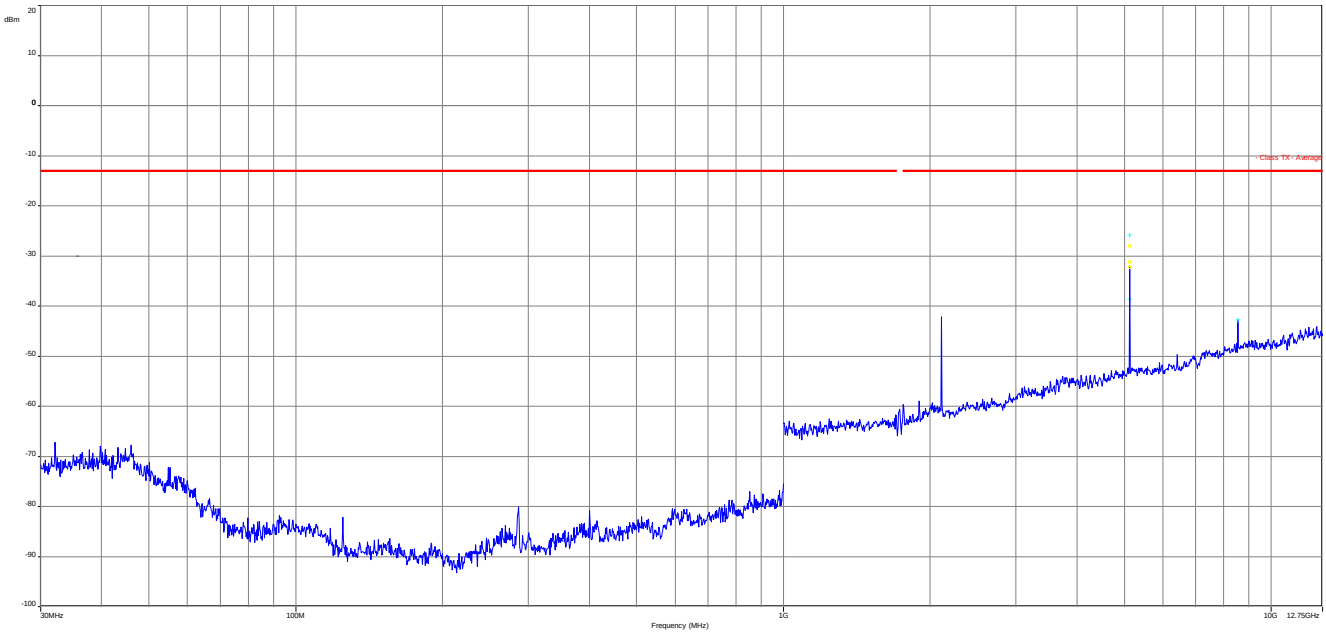


Plot 9: High channel, 18 GHz to 26 GHz



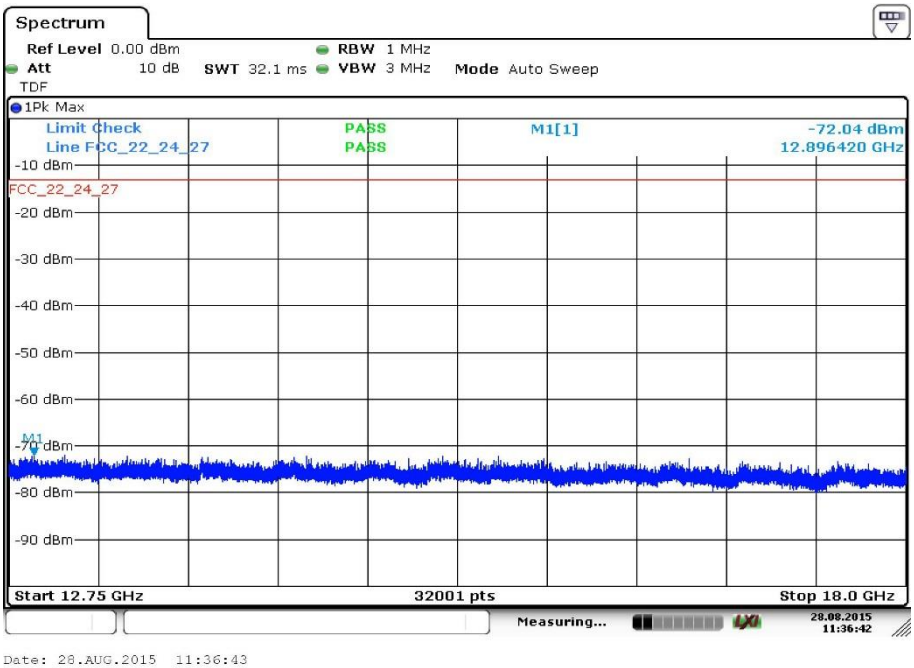
16-QAM with 1.4 MHz channel bandwidth

Plot 10: Low channel, 30 MHz to 12.75 GHz



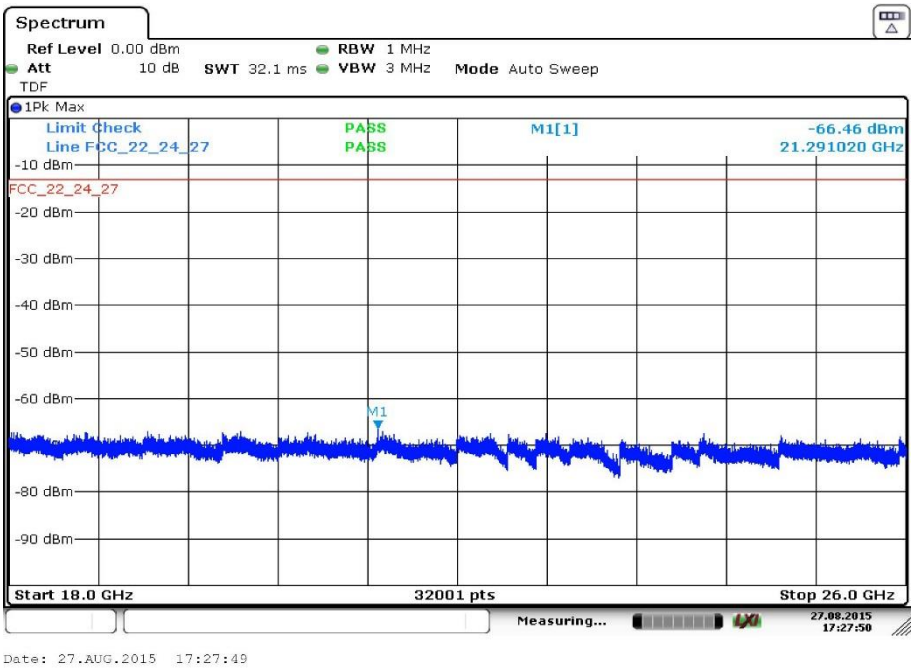
Carrier notched with 1.7 GHz rejection filter

Plot 11: Low channel, 12.75 GHz to 18 GHz

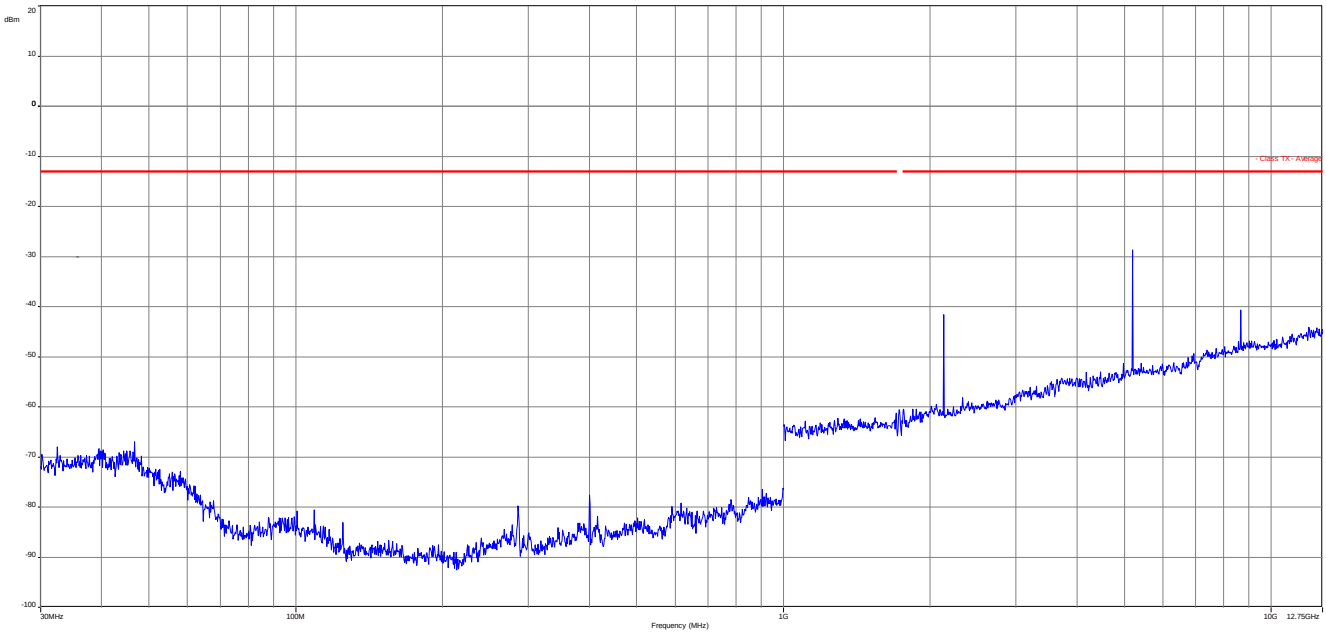


Date: 28.AUG.2015 11:36:43

Plot 12: Low channel, 18 GHz to 26 GHz

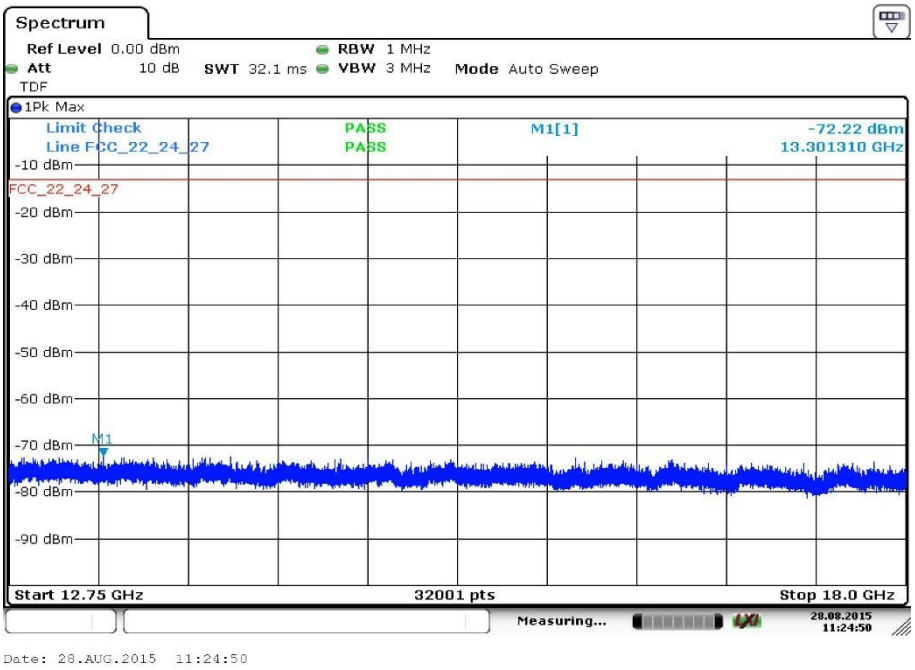


Plot 13: Middle channel, 30 MHz to 12.75 GHz

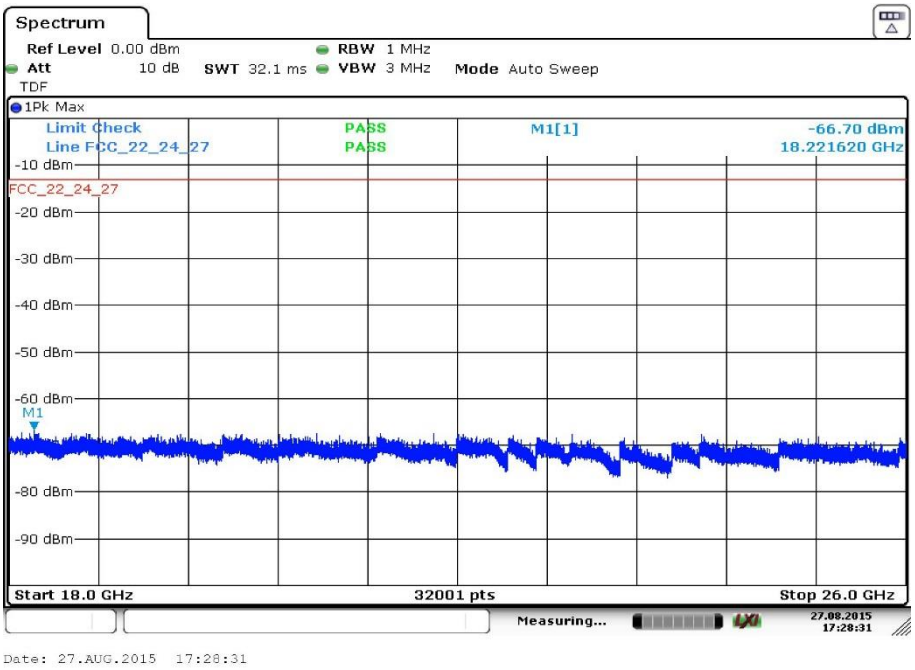


Carrier notched with 1.7 GHz rejection filter

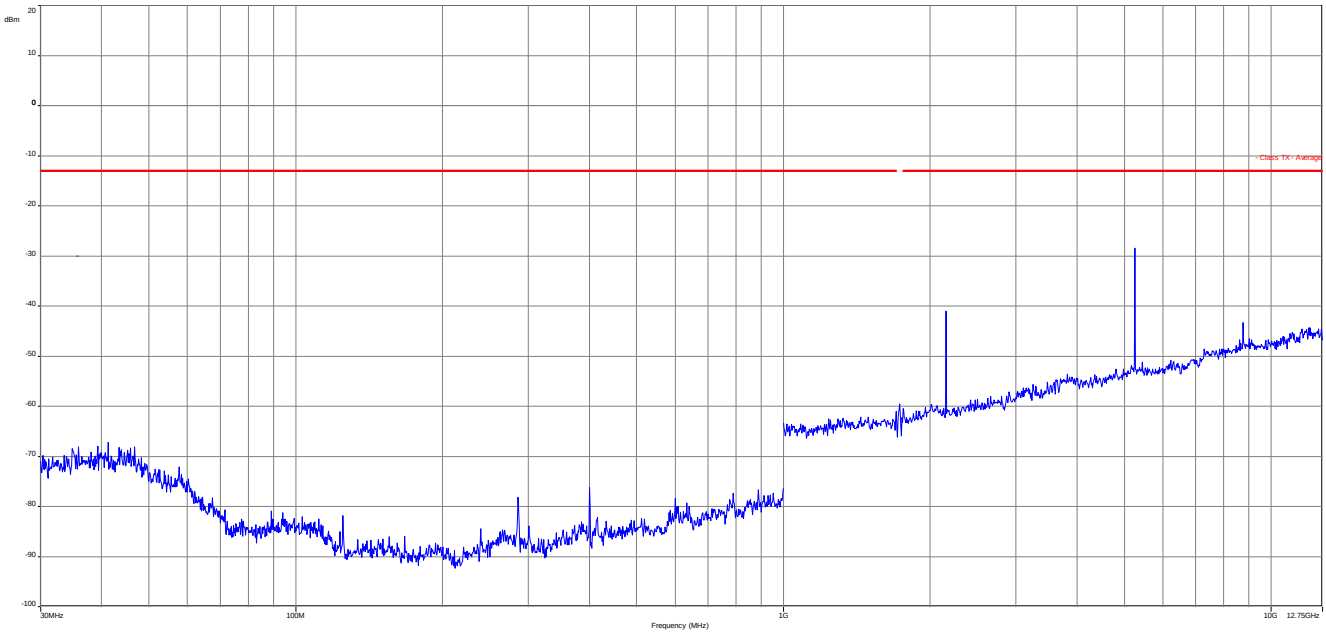
Plot 14: Middle channel, 12.75 GHz to 18 GHz



Plot 15: Middle channel, 18 GHz to 26 GHz

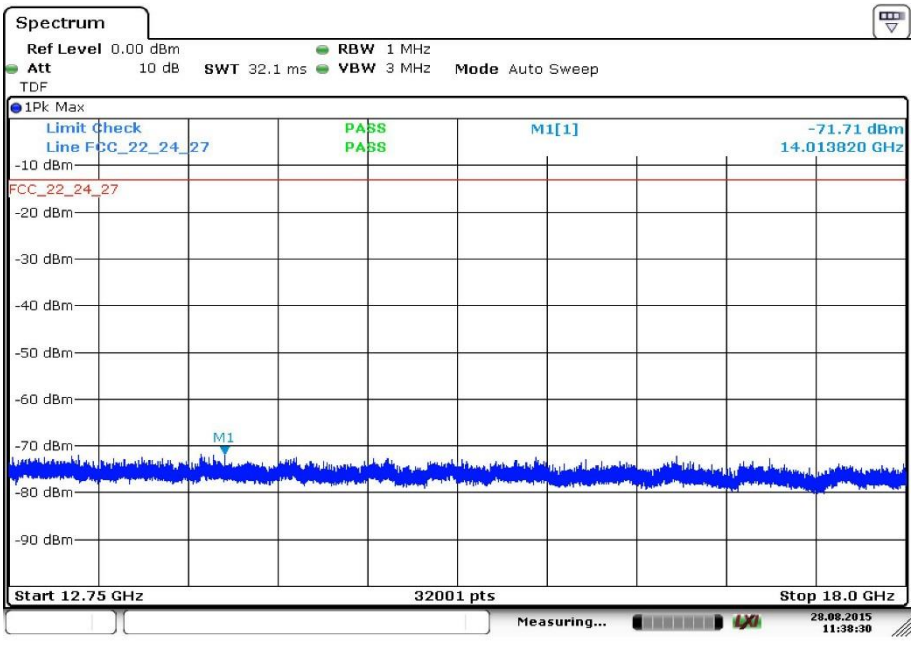


Plot 16: High channel, 30 MHz to 12.75 GHz

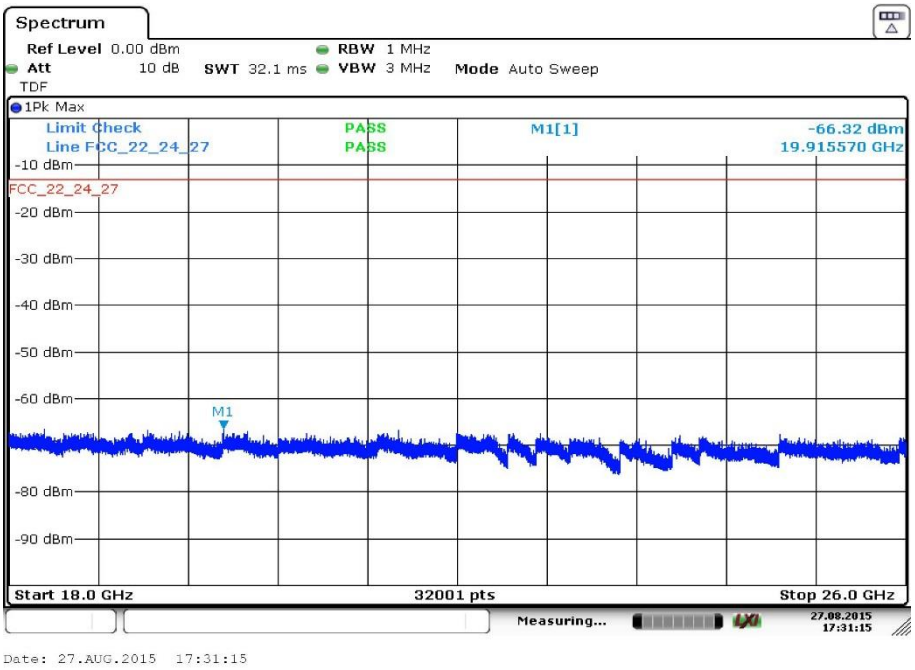


Carrier notched with 1.7 GHz rejection filter

Plot 17: High channel, 12.75 GHz to 18 GHz



Plot 18: High channel, 18 GHz to 26 GHz



11.3 Results LTE – Band 13

The EUT was set to transmit the maximum power.

11.3.1 RF output power

Description:

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

Measurement:

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

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

Measurement parameters	
Detector:	Sample
AQT:	15.6 ms
Resolution bandwidth:	40 MHz
Used equipment:	see chapter 7.1 – A and chapter 7.2 – A
Measurement uncertainty:	see chapter 8

Limits:

FCC	IC
Nominal Peak Output Power	
+35.00 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 worst case setting was evaluated at the 5 MHz bandwidth, 1 resource block and low resource block offset setting for lowest, middle and highest channel.

Output Power (radiated)				
Frequency (MHz)	**Average Output Power (dBm) QPSK**	**Peak-to-average-ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak-to-average-ratio (dB)**
779.5	20.8	3.8	18.6	4.2
782.0	18.3	4.8	21.1	4.1
784.5	21.8	4.0	18.5	5.0

11.3.2 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 C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 784.5 MHz. Measured up to 12.75 GHz. The resolution bandwidth is set as outlined in Part 27.53. The spectrum was scanned with the mobile station transmitting at carrier frequencies that pertain to low, mid and high channels of the LTE band 13.

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
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 13 (779.5 MHz, 782.0 MHz and 784.5 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 13 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 the low, middle and high channels measured with the worst case settings evaluated in the previous chapter.

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

QPSK

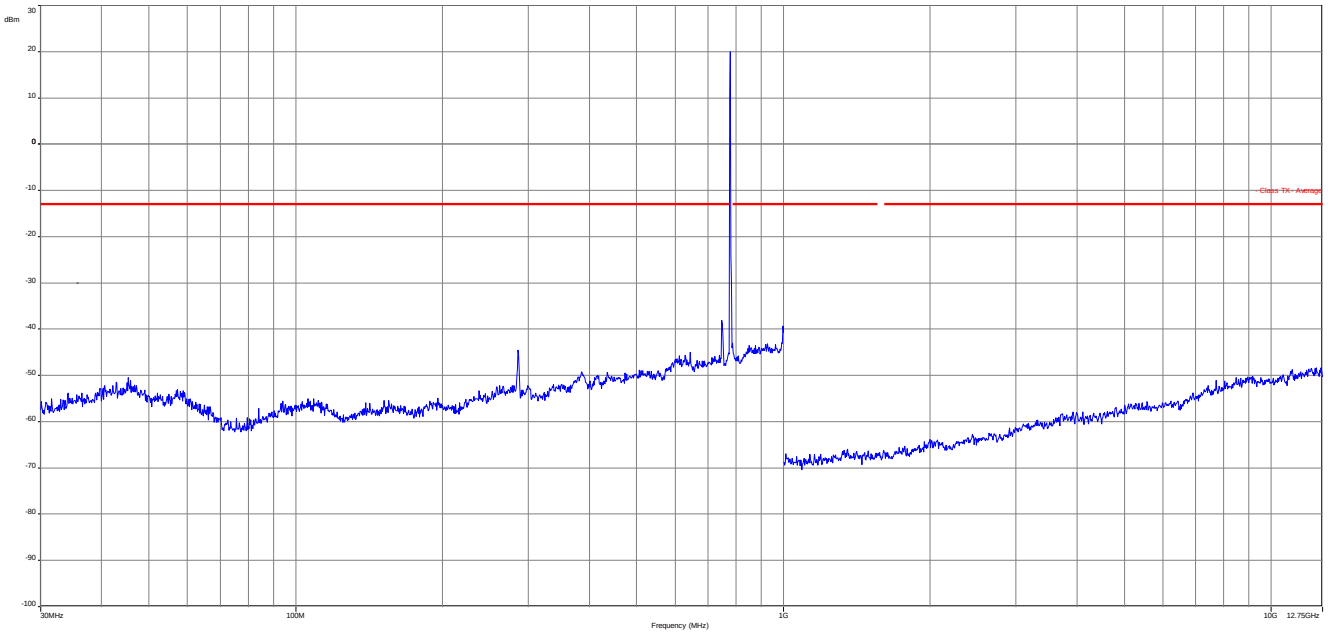
Spurious Emission Level (dBm)					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
All detected emissions are more than 20 dB below the limit.		All detected emissions are more than 20 dB below the limit.		All detected emissions are more than 20 dB below the limit.	
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
Measurement uncertainty		± 3dB			

16-QAM

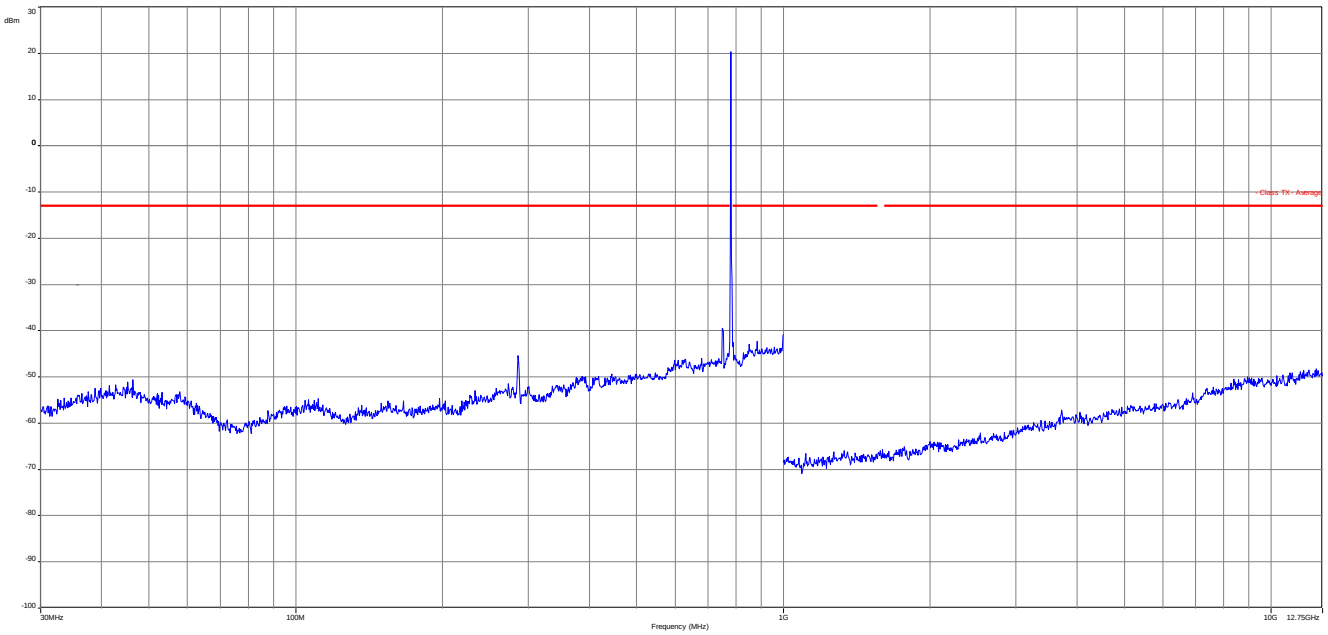
Spurious Emission Level (dBm)					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
All detected emissions are more than 20 dB below the limit.		All detected emissions are more than 20 dB below the limit.		All detected emissions are more than 20 dB below the limit.	
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
Measurement uncertainty		± 3dB			

QPSK with 5 MHz channel bandwidth

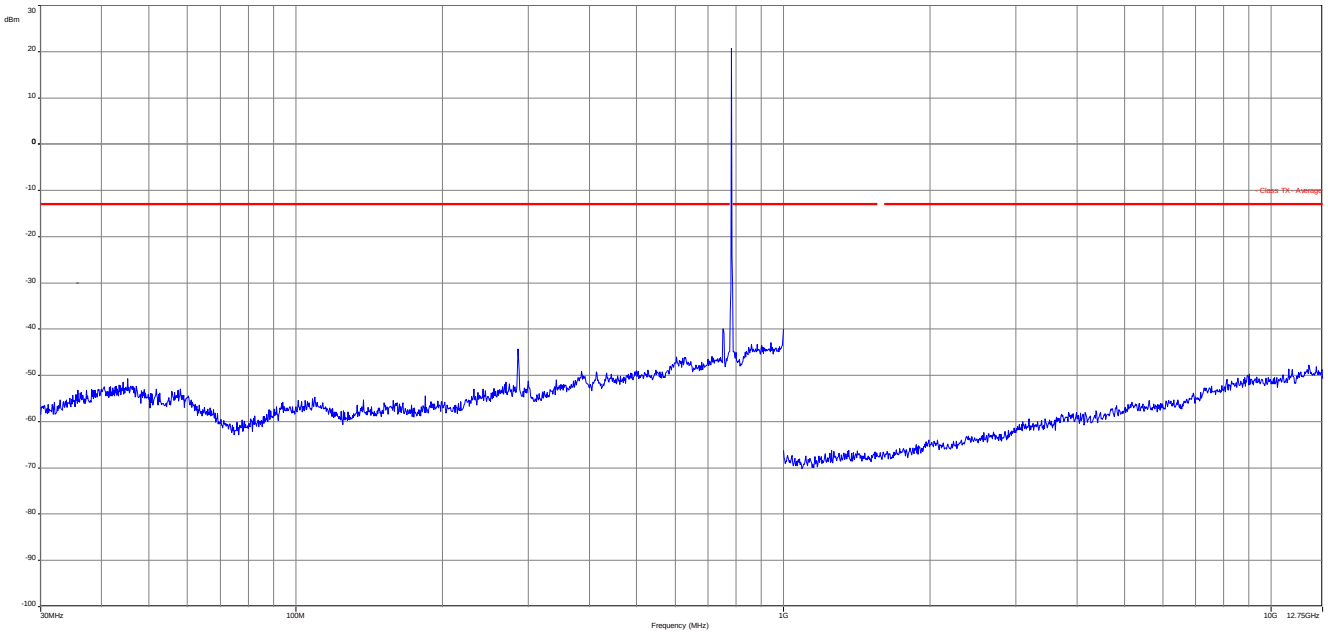
Plot 1: Low channel, 30 MHz to 12.75 GHz



Plot 2: Middle channel, 30 MHz to 12.75 GHz

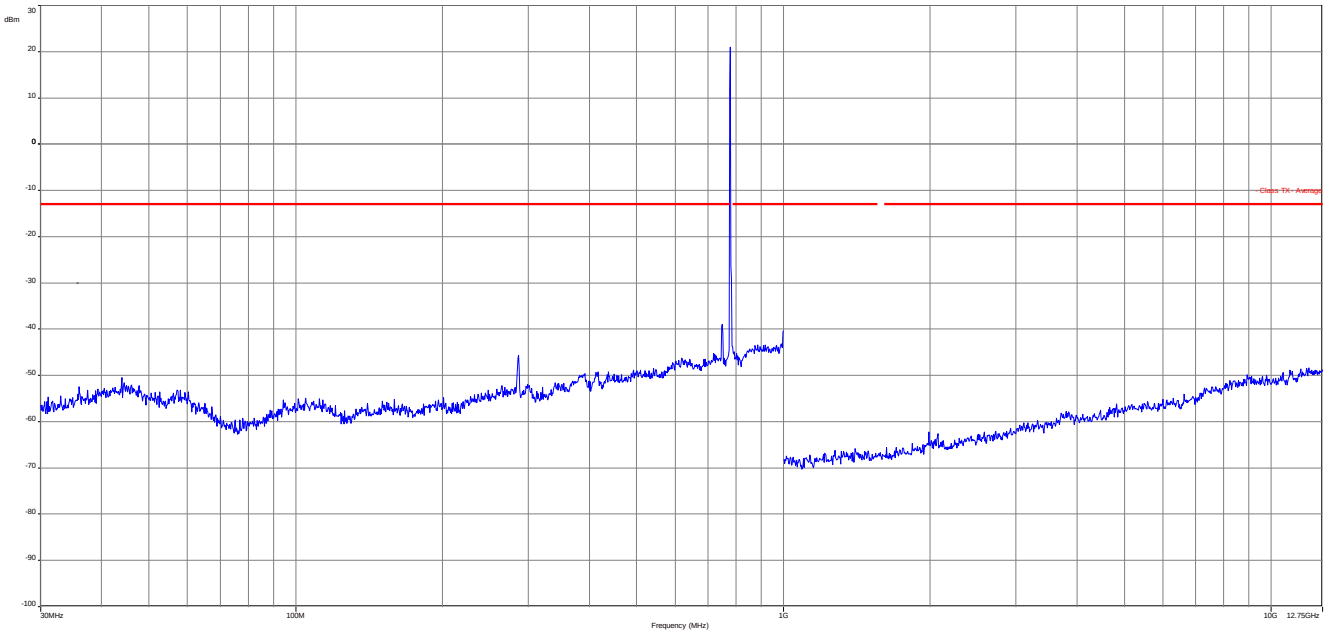


Plot 3: High channel, 30 MHz to 12.75 GHz

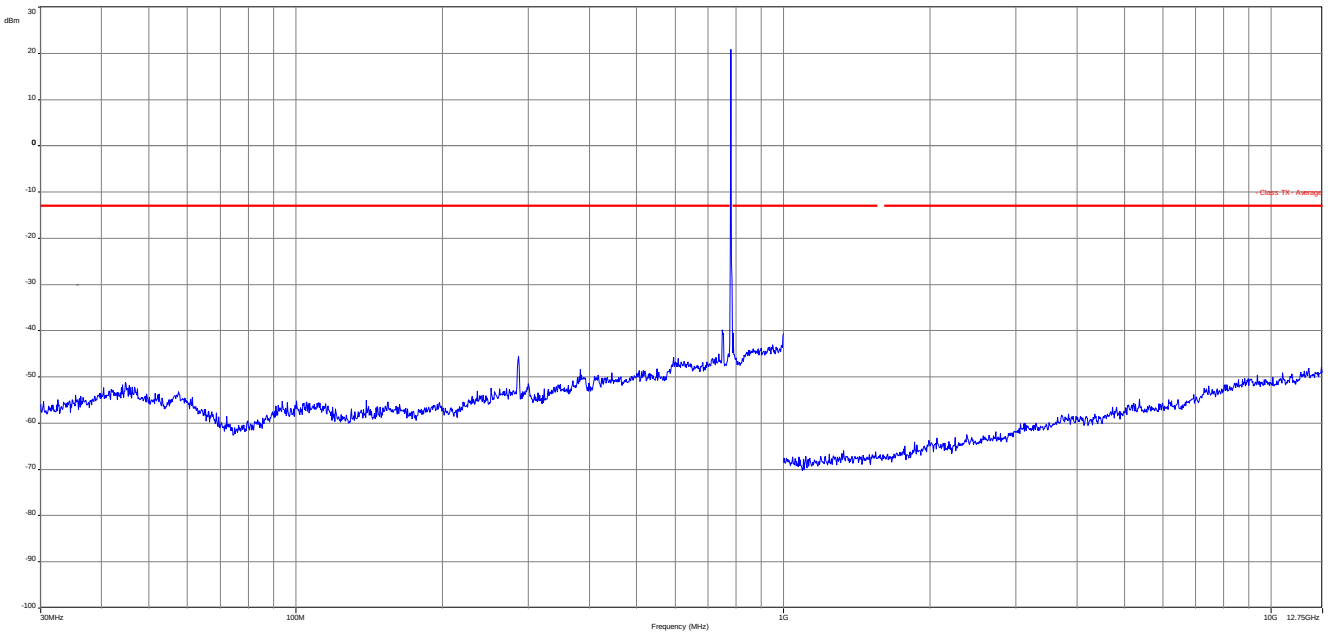


16-QAM with 5 MHz channel bandwidth

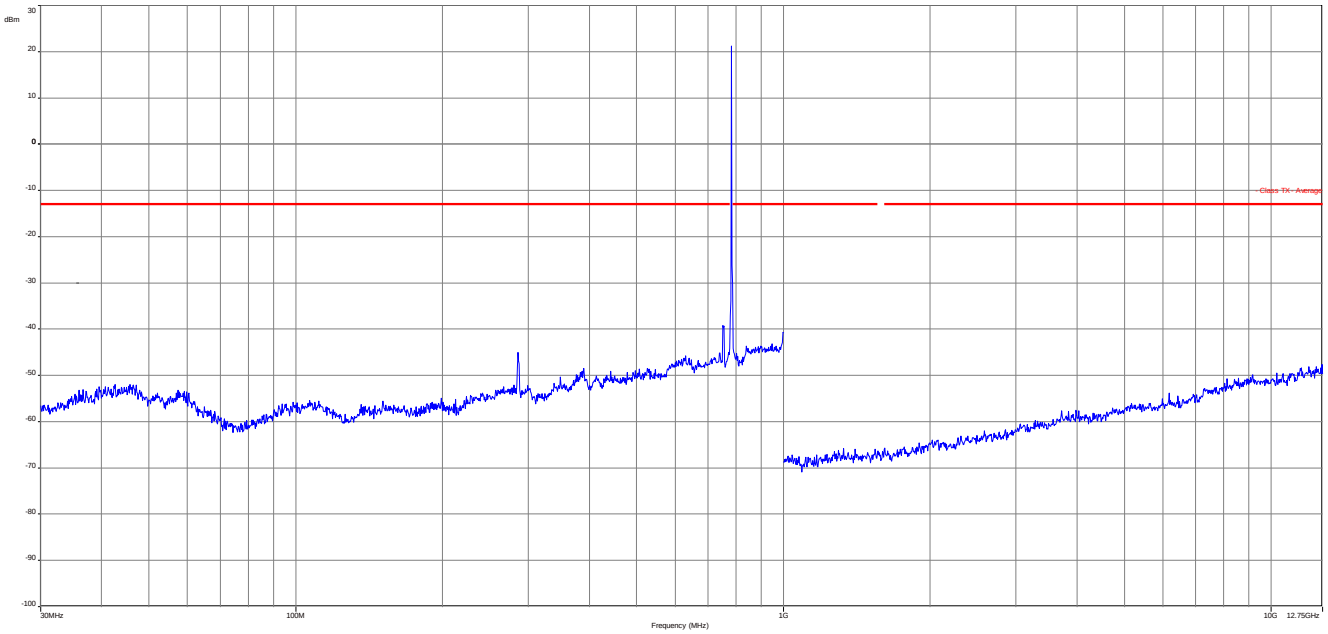
Plot 4: Low channel, 30 MHz to 12.75 GHz



Plot 5: Middle channel, 30 MHz to 12.75 GHz



Plot 16: High channel, 30 MHz to 12.75 GHz



11.4 Results LTE – Band 17

The EUT was set to transmit the maximum power.

11.4.1 RF output power

Description:

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

Measurement:

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

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

Measurement parameters	
Detector:	Sample
AQT:	15.6 ms
Resolution bandwidth:	40 MHz
Used equipment:	see chapter 7.1 – A and chapter 7.2 – A
Measurement uncertainty:	see chapter 8

Limits:

FCC	IC
34.77 dBm	37 dBm
Nominal Peak 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:

The worst case setting was evaluated at the 5 MHz bandwidth, 1 resource block and low resource block offset setting for lowest, middle and highest channel.

Output Power (radiated)				
Frequency (MHz)	**Average Output Power (dBm) QPSK**	**Peak-to-average-ratio (dB)**	**Average Output Power (dBm) 16-QAM**	**Peak-to-average-ratio (dB)**
706.5	16.1	5.0	15.8	5.3
710.0	14.6	5.7	15.0	4.7
713.5	17.4	4.6	16.7	5.5

11.4.2 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 C63.4:2014 requirements and is recognized by the FCC to be in compliance for a 3 and a 10 meter site. The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment, which is the transmitted carrier that can be as high as 716 MHz. Measurement is made up to 12.75 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 17.

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
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 the low, middle and high channels measured with the worst case settings evaluated in the previous chapter.

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

QPSK

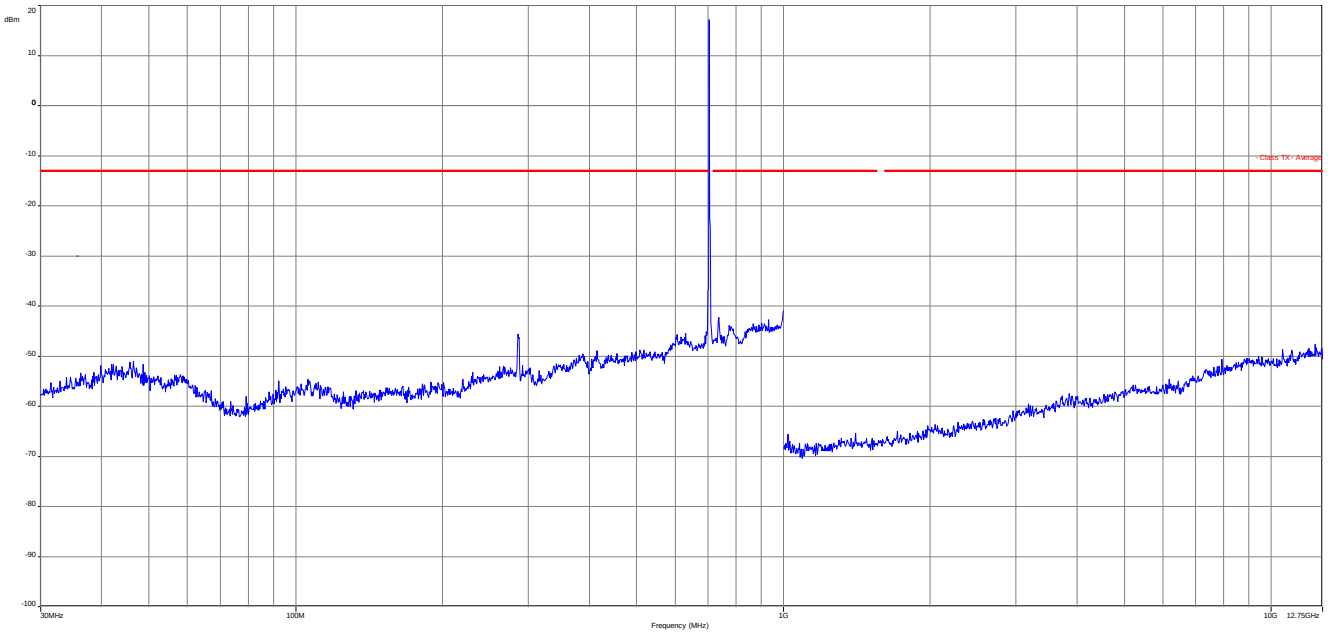
Spurious Emission Level (dBm)					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
All detected emissions are more than 20 dB below the limit.		All detected emissions are more than 20 dB below the limit.		2134	-49.3-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
Measurement uncertainty		± 3dB			

16-QAM

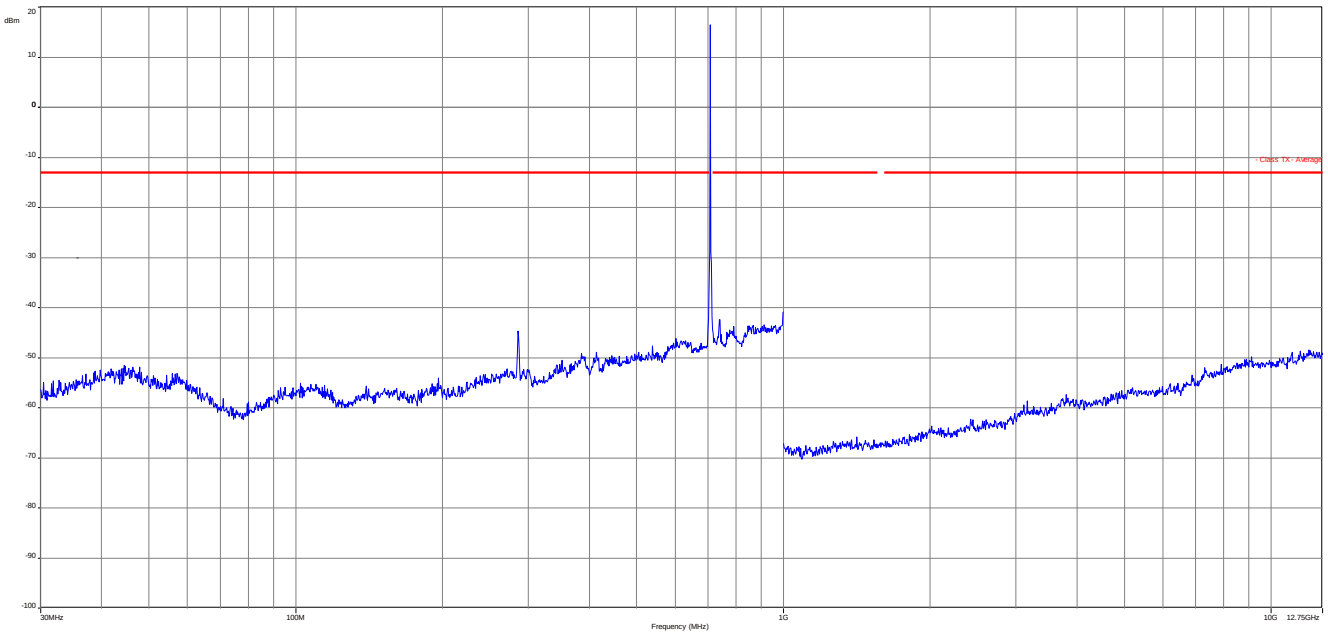
Spurious Emission Level (dBm)					
Lowest channel		**Middle channel**		**Highest channel**	
Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]	Spurious emissions	Level [dBm]
All detected emissions are more than 20 dB below the limit.		All detected emissions are more than 20 dB below the limit.		2134	-51.1
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
	-		-		-
Measurement uncertainty		± 3dB			

QPSK with 5 MHz channel bandwidth

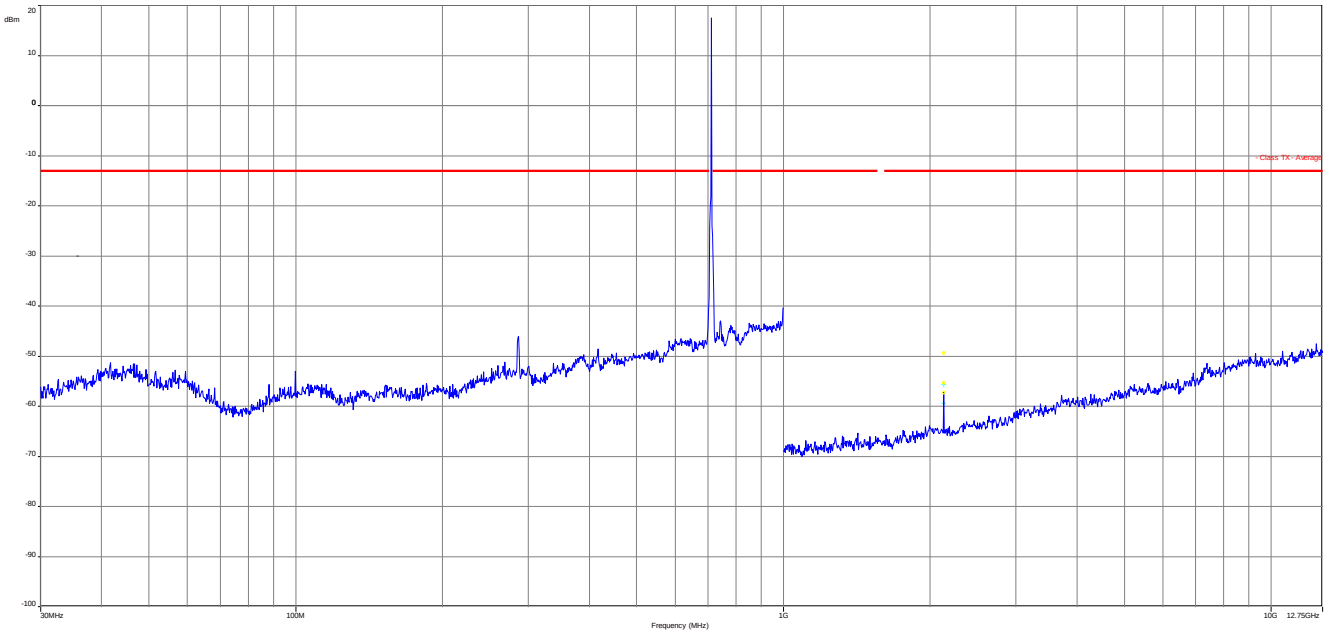
Plot 1: Low channel, 30 MHz to 12.75 GHz



Plot 2: Middle channel, 30 MHz to 12.75 GHz

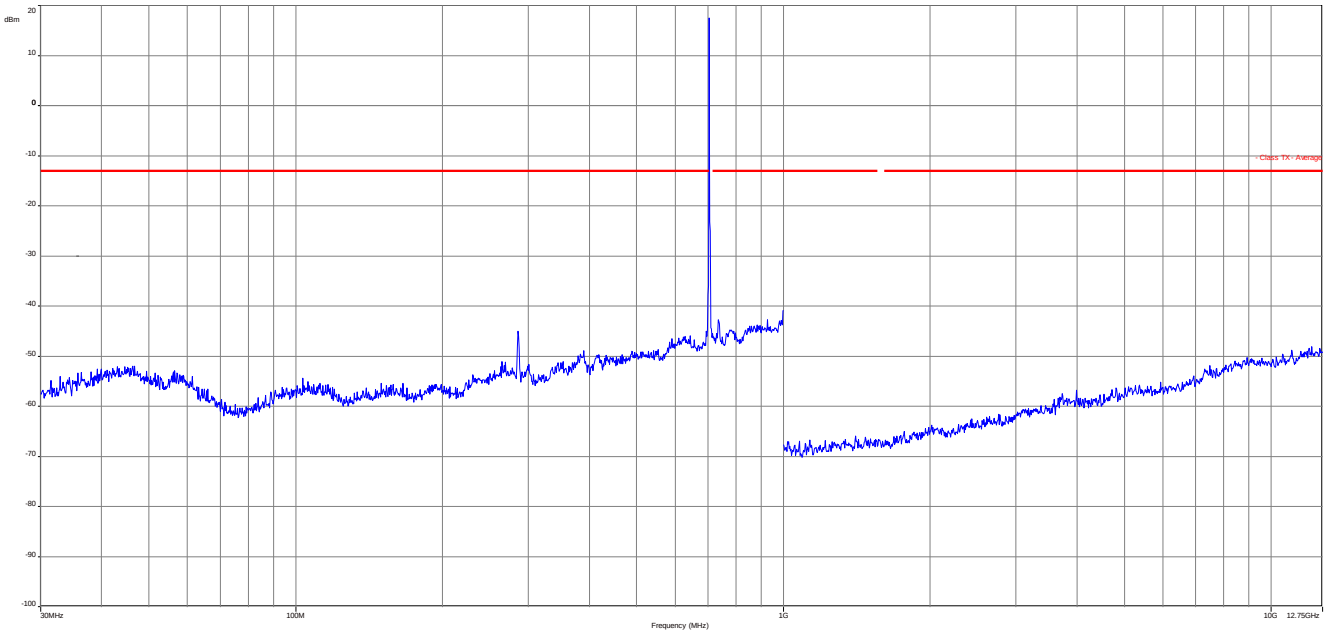


Plot 3: High channel, 30 MHz to 12.75 GHz

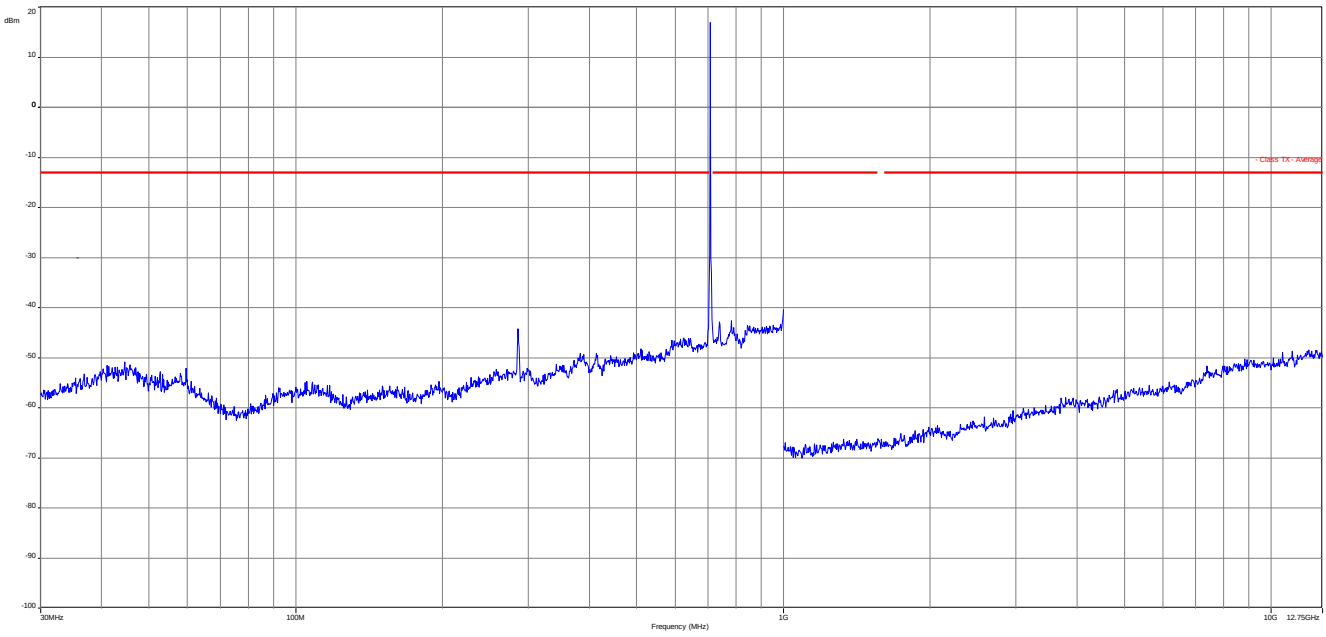


16-QAM with 5 MHz channel bandwidth

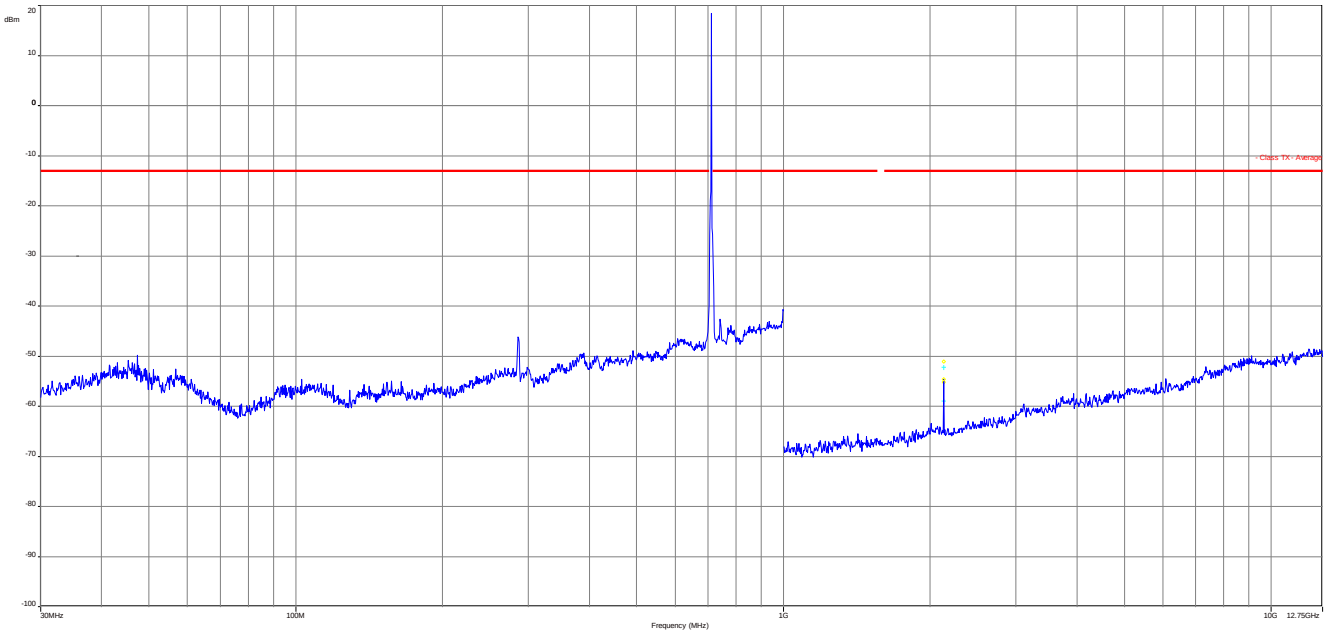
Plot 4: Low channel, 30 MHz to 12.75 GHz



Plot 5: Middle channel, 30 MHz to 12.75 GHz



Plot 6: High channel, 30 MHz to 12.75 GHz



12 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-09-29

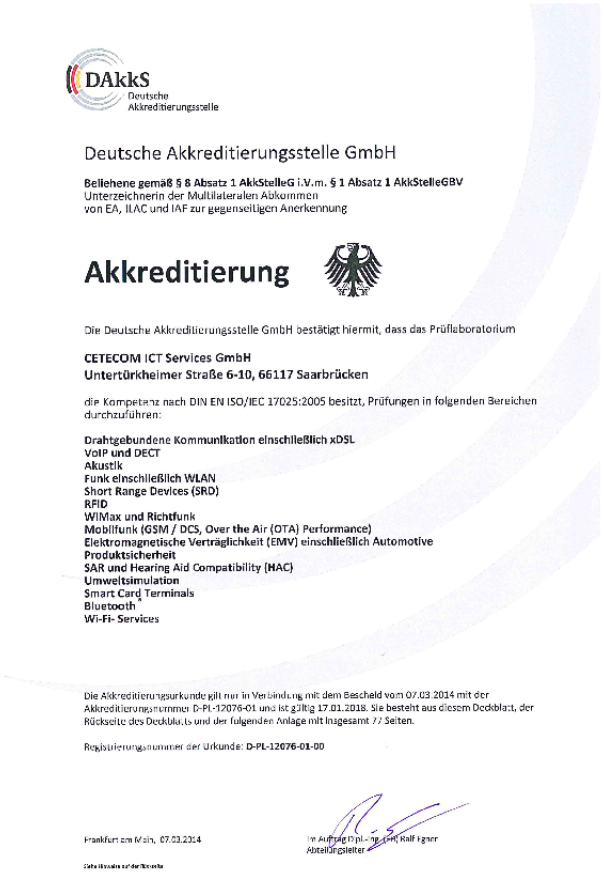
Annex B Further information

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
PMN		Product marketing name
HMN		Host marketing name
HVIN		Hardware version identification number
FVIN		Firmware version identification number

13 Accreditation Certificate

Front side of certificate



DAkkS
Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

Beliehene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
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

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 07.03.2014 mit der Akkreditierungsnummer D-PL-12076-01 und ist gültig 17.01.2018. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 77 Seiten.

Registrierungsnummer der Urkunde: **D-PL-12076-01-00**

Frankfurt am Main, 07.03.2014

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

Back side of certificate

Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

Die auszugsweise Veröffentlichung der Akkreditierungsurkunde bedarf der vorherigen schriftlichen Zustimmung der Deutsche Akkreditierungsstelle GmbH (DAkkS). Ausgenommen davon ist die separate Weiterverbreitung des Deckblattes durch die umseitig genannte Konformitätsbewertungsstelle in unveränderter Form.

Es darf nicht der Anschein erweckt werden, dass sich die Akkreditierung auch auf Bereiche erstreckt, die über den durch die DAkkS bestätigten Akkreditierungsbereich hinausgehen.

Die Akkreditierung erfolgte gemäß des Gesetzes über die Akkreditierungsstelle (AkkStelleG) vom 31. Juli 2009 (BGBl. I S. 2625) sowie der Verordnung (EG) Nr. 765/2008 des Europäischen Parlaments und des Rates vom 9. Juli 2008 über die Vorschriften für die Akkreditierung und Marktüberwachung im Zusammenhang mit der Vermarktung von Produkten (Abl. L 218 vom 9. Juli 2008, S. 30).
Die DAkkS ist Unterzeichnerin der Multilateralen Abkommen zur gegenseitigen Anerkennung der European co-operation for Accreditation (EA), des International Accreditation Forum (IAF) und der International Laboratory Accreditation Cooperation (ILAC). Die Unterzeichner dieser Abkommen erkennen ihre Akkreditierungen gegenseitig an.

Der aktuelle Stand der Mitgliedschaft kann folgenden Webseiten entnommen werden:
EA: www.european-accreditation.org
ILAC: www.ilac.org
IAF: www.iaf.nu

Note:

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

https://www.cetecom.com/en/cetecom-group/europe/germany-saarbruecken/accreditations.html