

TEST REPORT

Test report no.: 1-9720/15-01-03



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

Testing laboratory

CETECOM ICT Services GmbH

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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 & EMC (RCE)

Applicant

Valeo Comfort and Driving Assistance

Europarc - 76 rue Auguste Perret

F-94046 CRETEIL / FRANCE

Phone: +33 1 48 84 57 14

Contact: Jerome Hugot

e-mail: jerome.hugot@valeo.com

Manufacturer

Valeo Sistemas Electronicos, S. de R.L. de C.V

Carretera Matamoros Mazatlan, km 99, Brecha 115

Colonia Celanese

88920 Rio Bravo / Mexico

Test standard/s

47 CFR Part 15

Title 47 of the Code of Federal Regulations; Chapter I
Part 15 - Radio frequency devices

RSS - 210 Issue 8

Spectrum Management and Telecommunications - Radio Standards Specification
Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I
Equipment

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

Test Item

Kind of test item: Transmitter, Rigid- Flap Key

Model name: IK2C

FCC ID: N5F-IK2C

IC: 3248A-IK2C

Frequency: 902.375 MHz; 903.425 MHz

Technology tested: Proprietary

Antenna: Integrated antenna

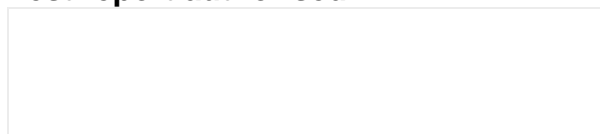
Power supply: 3.0 V DC by battery (CR2032)

Temperature range: -10°C to +50°C



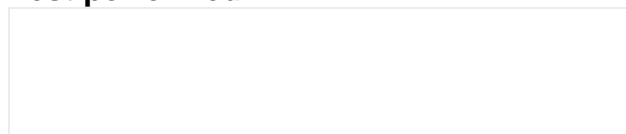
This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorised:



Marco Bertolino
Lab Manager
Radio Communications & EMC

Test performed:



David Lang
Lab Manager
Radio Communications & EMC

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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2.2 Application details

Date of receipt of order:	2014-03-27
Date of receipt of test item:	2014-04-10
Start of test:	2014-04-10
End of test:	2014-04-09
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	-/-	Title 47 of the Code of Federal Regulations; Chapter I Part 15 - Radio frequency devices
RSS - 210 Issue 8	2010-12	Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
RSS - 210 Issue 8 Amendment 1	2015-02	RSS-210, Amendment 1 — Licence-Exempt, Low-Power Radio Apparatus Operating in the Television Bands (February 2015)

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+50 °C during high temperature tests
	T_{min}	-10 °C during low temperature tests
Relative humidity content:		45 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.0 V DC by battery (CR2032)
	V_{max}	3.6 V
	V_{min}	2.3 V

5 Test item

Kind of test item	:	Transmitter, Rigid- Flap Key
Type identification	:	IK2C
PMN	:	3248A-IK2C
HVIN	:	3248A-IK2C
FVIN	:	-/-
HMN	:	-/-
S/N serial number	:	Not available!
HW hardware status	:	B011892_01
SW software status	:	V3.3
Frequency band	:	902.375 MHz; 903.425 MHz
Type of radio transmission	:	single carrier
Use of frequency spectrum	:	
Type of modulation	:	FSK
Number of channels	:	2
Antenna	:	Integrated antenna
Power supply	:	3.0 V DC by battery (CR2032)
Temperature range	:	-10°C to +50 °C

5.1 Additional information

Test setup- and EUT-photos are included in test report: 1-9720/15-01-02_Annex A
 1-9720/15-01-02_Annex B
 1-9720/15-01-02_Annex D

6 Test laboratories sub-contracted

None

7 Description of the test setup

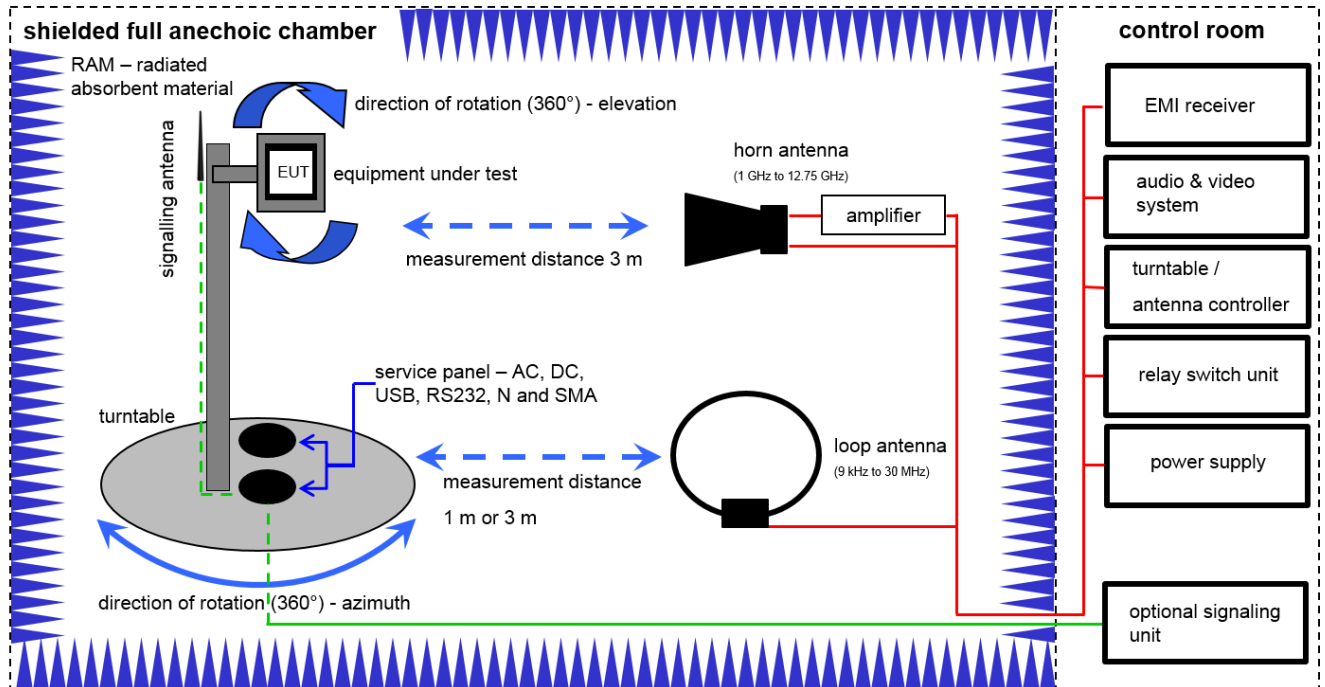
Typically, the calibrations of the test apparatus are commissioned to and performed by an accredited calibration laboratory. The calibration intervals are determined in accordance with the DIN EN ISO/IEC 17025. In addition to the external calibrations, the laboratory executes comparison measurements with other calibrated test systems or effective verifications. Weekly chamber inspections and range calibrations are performed. Where possible, rf-generating and 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 (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
vkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

7.1 Radiated measurements (9 kHz – 30 MHz and 1 GHz – 10 GHz)

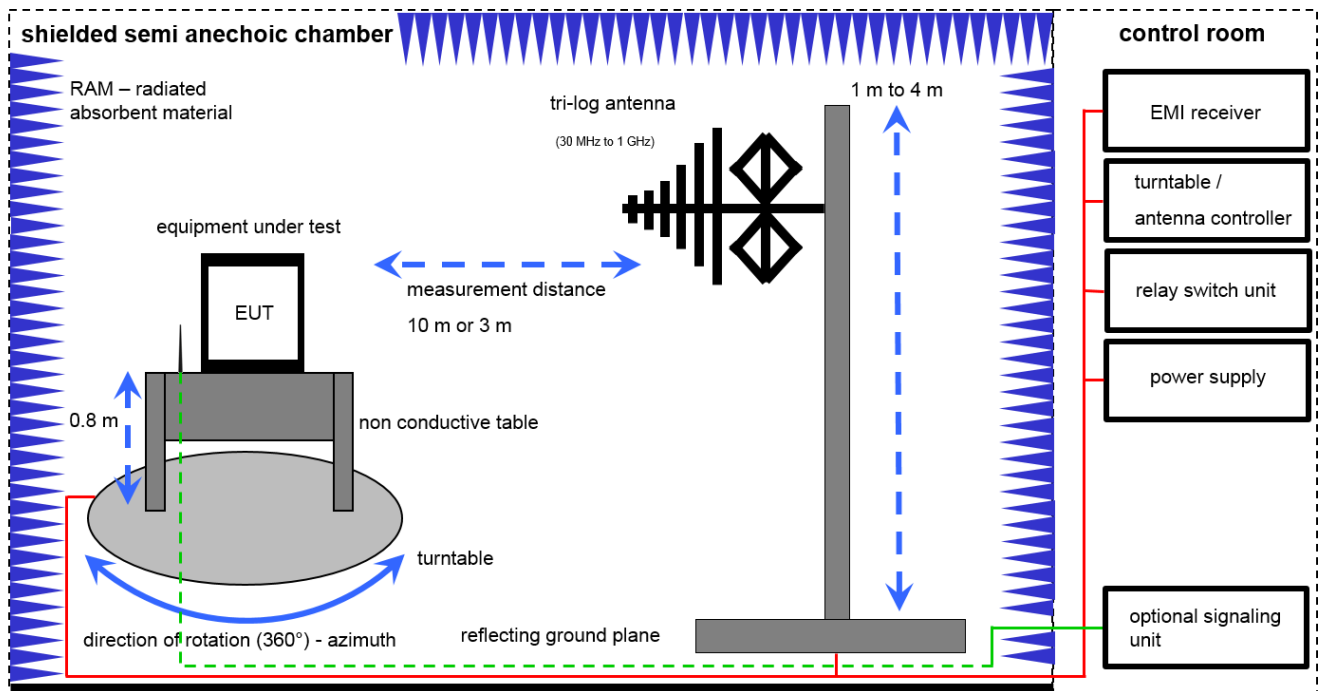


Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
2	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
3	90	MXE EMI Receiver 20 Hz to 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	06.03.2015	06.03.2016
4	90	4U RF Switch Platform	L4491A	Agilent Technologies	MY50000037	300004509	ne		
5	45	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	26.01.2015	26.01.2016
6	45	Breitband Doppelsteg-Hornantenne	BBHA9120 B	Schwarzbeck	188	300003896	k	10.06.2013	10.06.2015

7.2 Radiated measurements (30 MHz – 1 GHz)

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 1 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63. These antennas can be moved over the height range between 1.0 m and 4.0 m in order to search for maximum field strength emitted from EUT. The measurement distances between EUT and receiving antennas are indicated in the test setups for the various frequency ranges. For each measurement, the EUT is rotated in all three axes until the maximum field strength is received. The wanted and unwanted emissions are received by spectrum analysers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63.

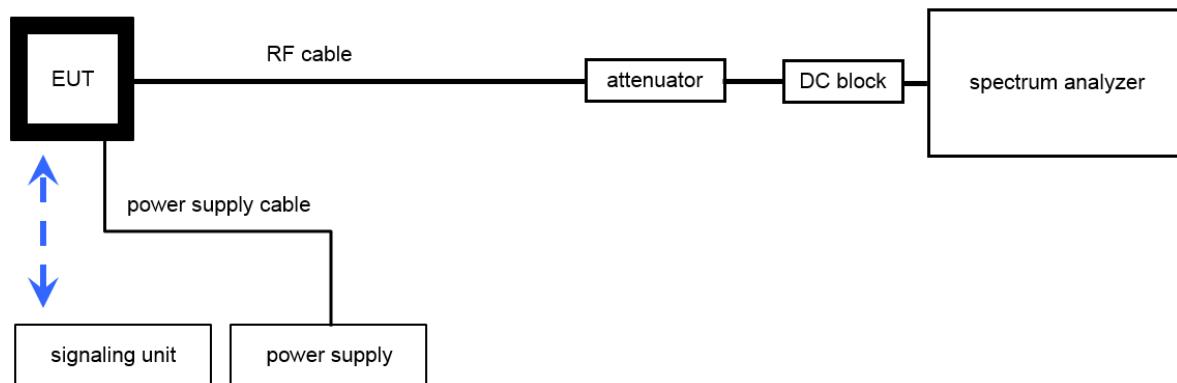


Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	45	Switch-Unit	3488A	HP	2719A14505	300000368	g		
2	45	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	26.01.2015	26.01.2016
3	45	Antenna Tower	Model 2175	ETS-Lindgren	64762	300003745	izw		
4	45	Positioning Controller	Model 2090	ETS-Lindgren	64672	300003746	izw		
5	45	Turntable Interface-Box	Model 105637	ETS-Lindgren	44583	300003747	izw		
6	45	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	22.04.2014	22.04.2016

7.3 Conducted measurements

Conducted measurements normal conditions



Equipment table:

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Signal Analyzer 20Hz-26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	22.01.2015	22.01.2017

8 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	47 CFR Part 15 RSS – 210 Issue 8	See table!	2015-06-12	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Results
§ 15.35 ©/ RSS-GEN Issue 2	Timing of the transmitter (Duty cycle correction factor)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§ 15.231 (a) (1)/ RSS-210 Issue 8	Switch off time	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.249(a)	Field strength of emissions (wanted signal)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§2.1049	Occupied bandwidth (99% bandwidth)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.231 ©	Occupied bandwidth (90% bandwidth)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a) / §15.249(b)(1)(2)(3)	Field strength of emissions (spurious)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.207(a)	Conducted emissions < 30 MHz	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Battery powered
§15.109	Field strength of emissions (spurious)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

Note: NA = Not Applicable; NP = Not Performed

9 RF measurement testing

9.1 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode: ☐ Normal operation, no special test mode available.

☒ Special software is used

10 Measurement results

10.1 Timing of the transmitter

Measurement:

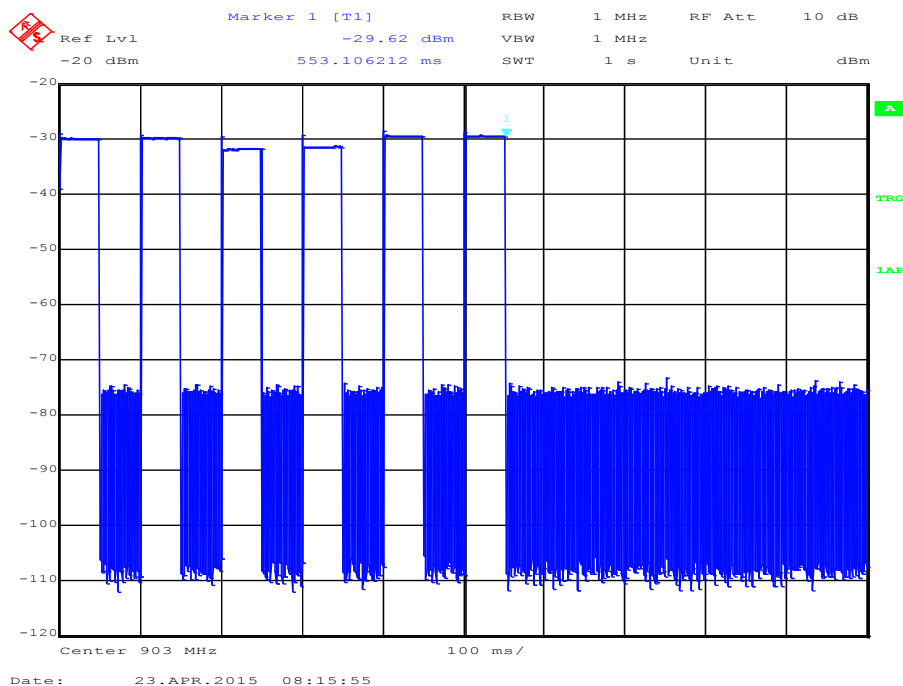
Measurement parameter	
Detector:	Peak
Sweep time:	1 s / 300 ms
Resolution bandwidth:	1 MHz
Video bandwidth:	1 MHz
Span:	Zero span
Trace-Mode:	Clear write / Trigger video / single sweep

Limits:

FCC	IC
CFR Part SUBCLAUSE § 15.35 ©	RSS-GEN Issue 2 Section 4.5
Timing of the transmitter	
<p>© Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.</p>	

Result:

Plot 1: Pulse train

**Manufacturer statement:**

1.) Lock/unlock function:

Transmit time (Tx on 1) = 50.4 ms

Duty cycle = 50.4 % (100 ms range)

The peak-to-average correction factor is calculated with $20 \log [Tx \text{ on} / (Tx \text{ on} + Tx \text{ off})]$.
 Hereby the peak-to-average correction factor is.

Peak-to-average correction factor: 6.0 dB

the average factor of 6dB is applicable for higher frequency at 1GHz.

Verdict: **Complies**

10.2 Switch off time**Measurement:**

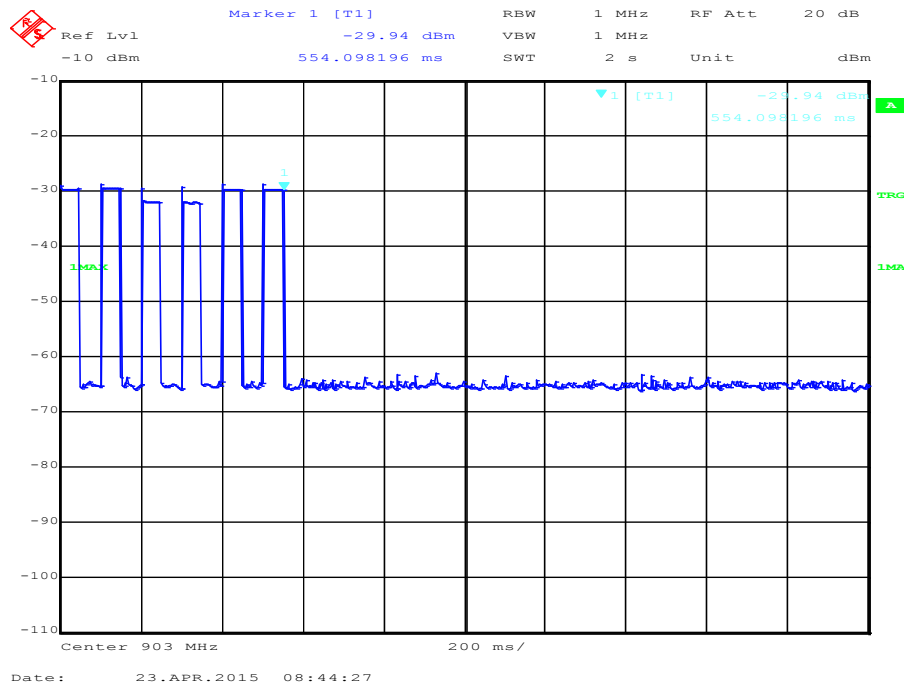
Measurement parameter	
Detector:	Peak
Sweep time:	1 s
Resolution bandwidth:	3 kHz
Video bandwidth:	3 kHz
Span:	Zero span
Trace-Mode:	Clear write / Trigger video / single sweep

Limits:

FCC	IC
CFR Part SUBCLAUSE § 15.231 (a) (1)	RSS-GEN Issue 2 Section 4.5
Switch off time	
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.	

Results:

Plot 1: Pulse train



The EUT automatically ceases transmission within not more than 554 ms after releasing the switch.

Verdict: **Complies**

10.3 Field strength of emissions (wanted signal)

Description:

Measurement of the maximum radiated field strength of the wanted signal.

Measurement:

Measurement parameter	
Detector:	Pos-Peak
Sweep time:	Auto
Video bandwidth:	Auto
Resolution bandwidth:	1 MHz
Span:	max. 100 MHz
Trace-Mode:	Max Hold

Limits:

FCC		
Field strength of emissions		
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:		
Frequency [MHz]	Field Strength [dBμV/m]	Measurement distance
902 – 928 MHz	94	3

Result:

Test condition	Maximum field strength	
	Frequency [MHz]	Field strength [dBμV/m] @ 3 m
T_{nom} / V_{nom}	902.375	91.4
T_{nom} / V_{nom}	903.425	91.7
Measurement uncertainty	± 3 dB	

Verdict: **Complies**

10.4 Occupied bandwidth (99% bandwidth)

Description:

Measurement of the 99% bandwidth of the wanted signal.

Measurement:

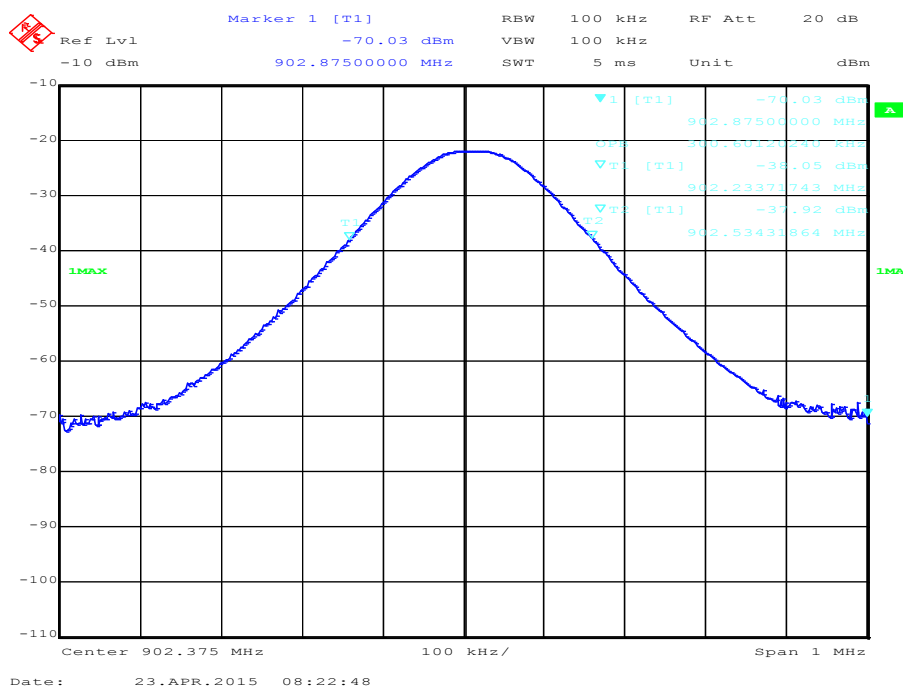
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	8 MHz
Trace-Mode:	Max Hold

Results:

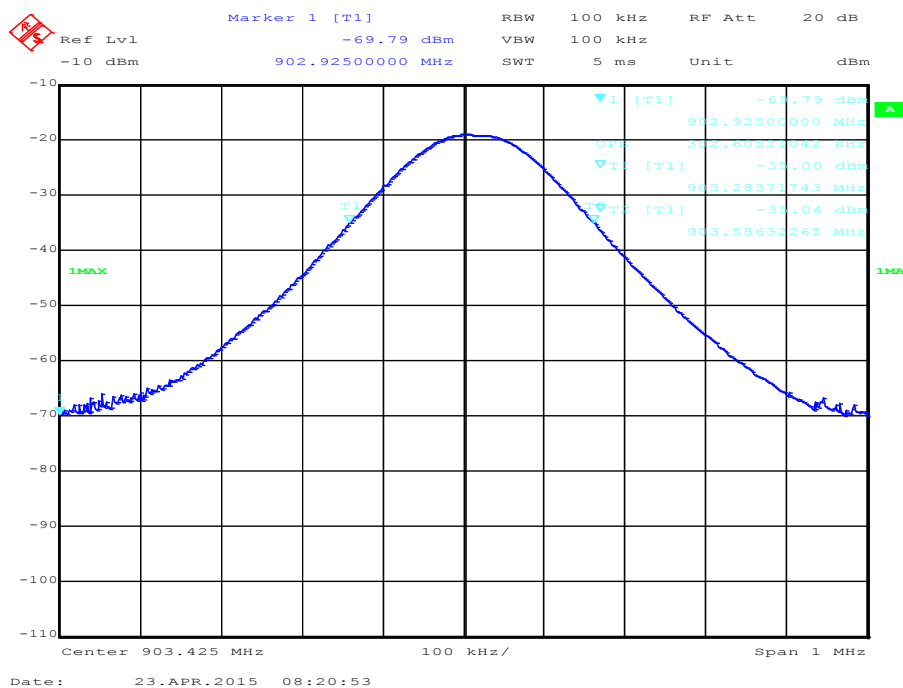
Test condition	Occupied bandwidth	
	Frequency [MHz]	Occupied bandwidth [kHz]
T_{nom} / V_{nom}	902.375	300.6
T_{nom} / V_{nom}	903.425	302.6
Measurement uncertainty	± 3 dB	

Verdict: **Complies**

Plot 1:



Plot 2:



10.5 Occupied bandwidth (90% bandwidth)

Description:

Measurement of the 99% bandwidth of the wanted signal.

Measurement:

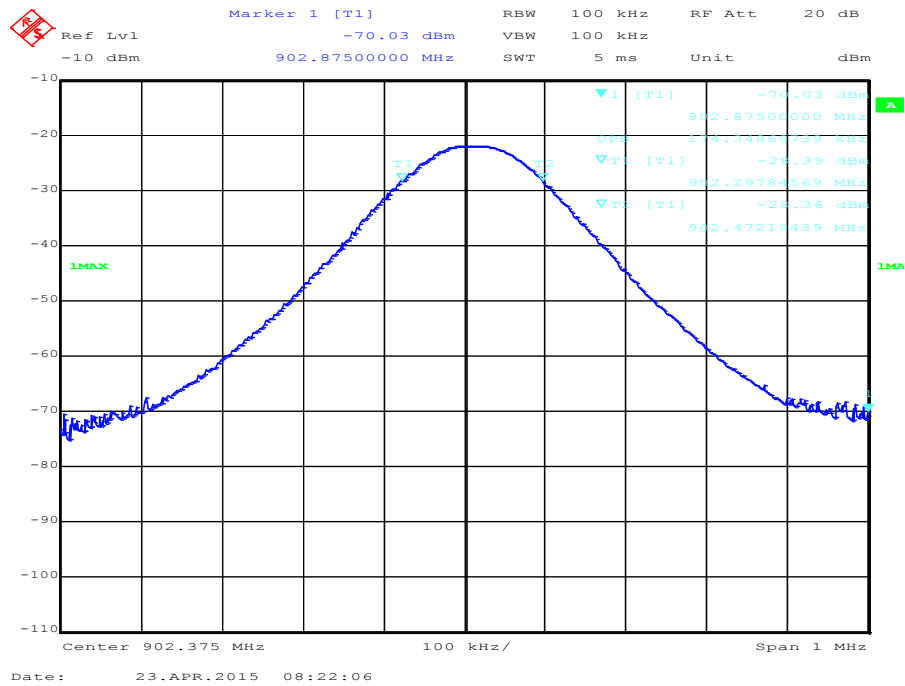
Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	8 MHz
Trace-Mode:	Max Hold

Results:

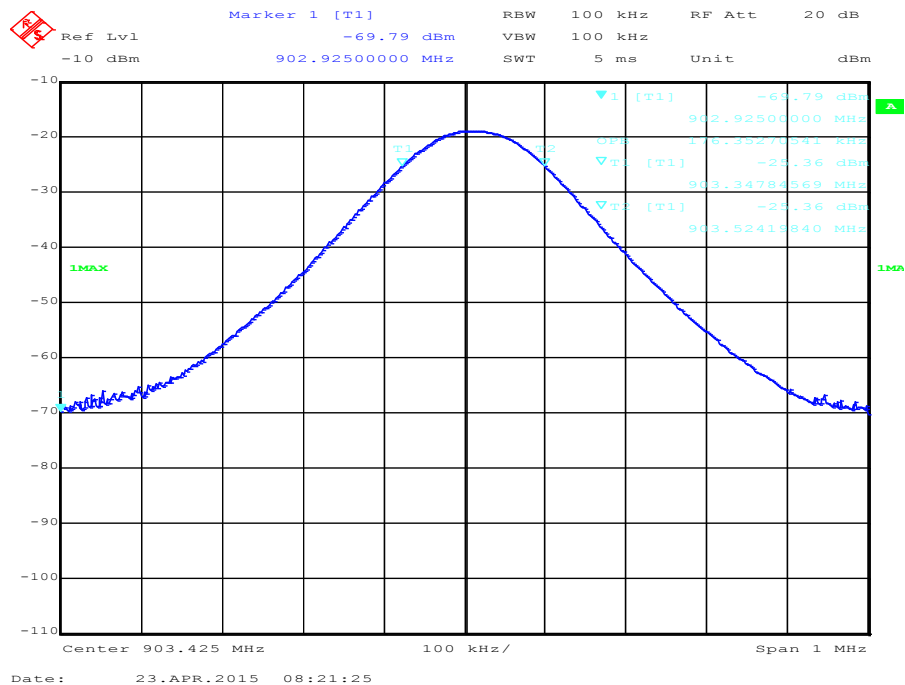
Test condition	Occupied bandwidth	
	Frequency [MHz]	Occupied bandwidth [kHz]
T_{nom} / V_{nom}	902.375	174.3
T_{nom} / V_{nom}	903.425	176.4
Measurement uncertainty	± 3 dB	

Verdict: **Complies**

Plot 1:



Plot 2:



10.6 Field strength of emissions (radiated spurious)

Description:

Measurement of the radiated spurious emissions in transmit mode.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Auto
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Frequency range:	30 MHz to 100 GHz
Trace-Mode:	Max Hold

Limits:

FCC		
Radiated Spurious Emissions		
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation.		
Frequency (MHz)	Field Strength (dBμV/m)	Measurement distance
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

Results:

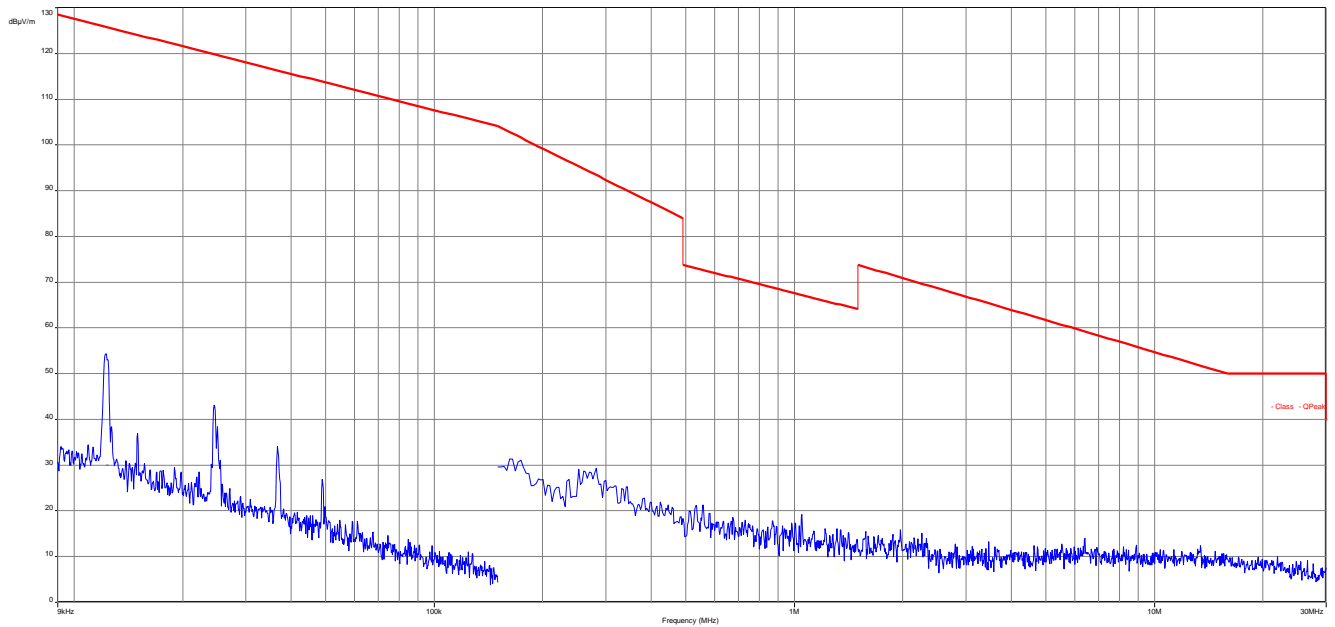
TX Spurious Emissions Radiated [dB μ V/m]								
TX 903.425 MHz			-/-			-/-		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
See result tables of the plots.								
Measurement uncertainty			± 3 dB					

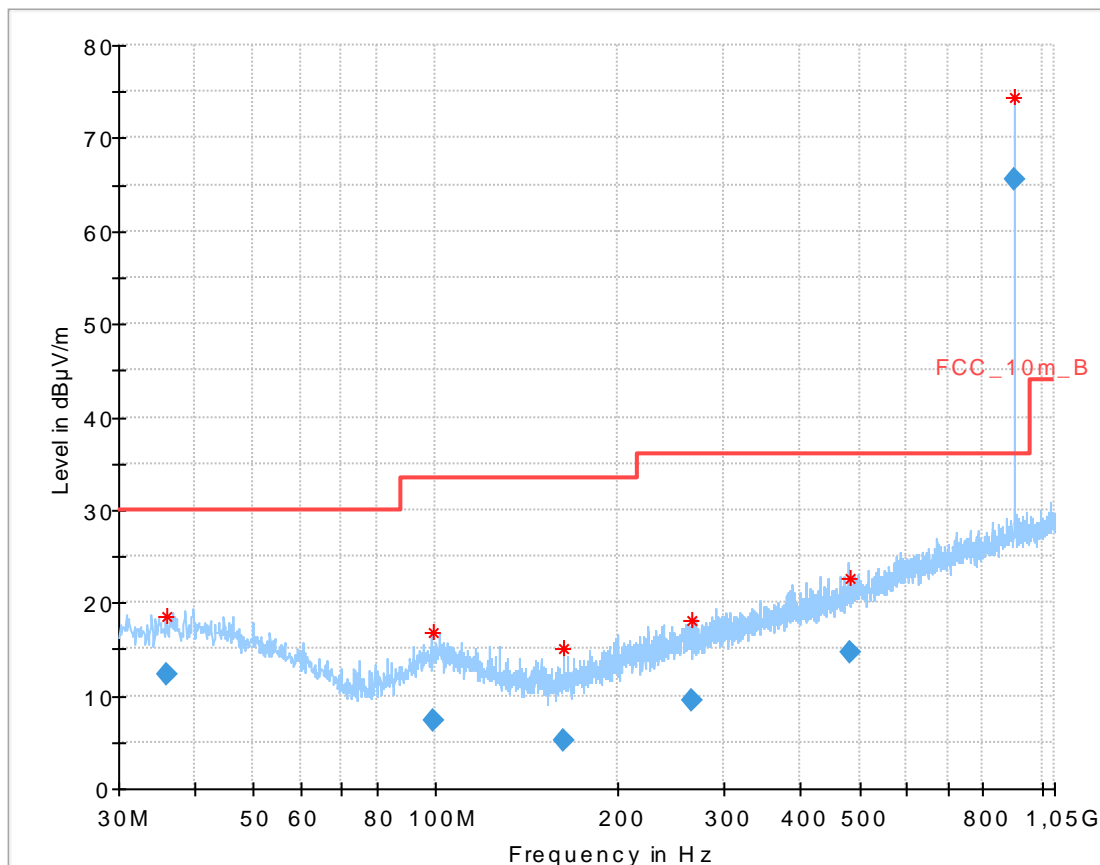
Verdict: **Complies**

The measurement of spurious emissions was only performed on the channel with the higher output field strength.

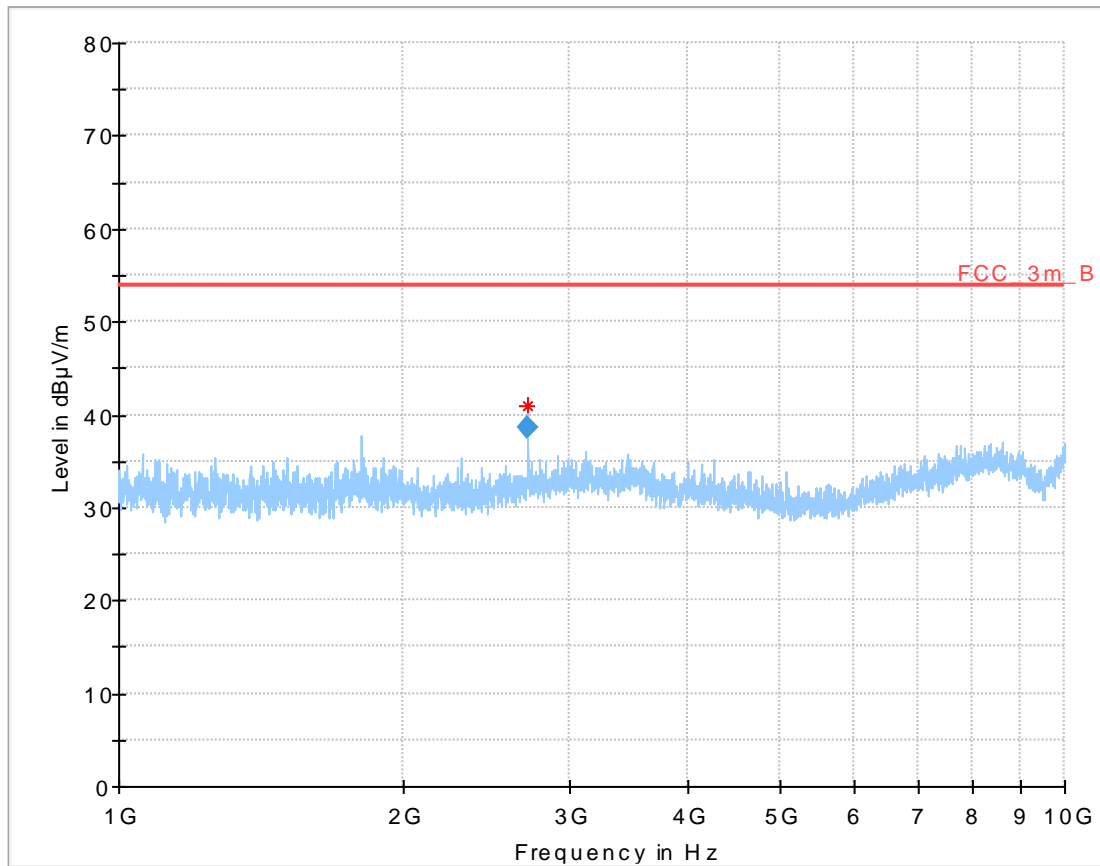
Plots:

Plot 1: 9 kHz to 30 MHz; 903.425



Plot 2: 30 MHz to 1 GHz, horizontal / vertical polarization – max hold; 903.425 MHz

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
36.022050	12.24	30.00	17.76	1000.0	120.000	170.0	V	10	13.8
98.763450	7.32	33.50	26.18	1000.0	120.000	170.0	H	10	12.0
162.050850	5.17	33.50	28.33	1000.0	120.000	170.0	H	261	9.2
264.790650	9.57	36.00	26.43	1000.0	120.000	101.0	V	260	13.7
482.697300	14.61	36.00	21.39	1000.0	120.000	170.0	H	-10	18.3
903.416250	65.55	36.00	-29.55	1000.0	120.000	101.0	V	100	24.1

Plot 3: 1 GHz to 10 GHz, horizontal / vertical polarization – max hold; 903.425 MHz

Frequency (MHz)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2710.374000	38.68	54.00	15.32	1000.0	1000.000	100.0	V	101	-3.6

11 Observations

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

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2015-06-11

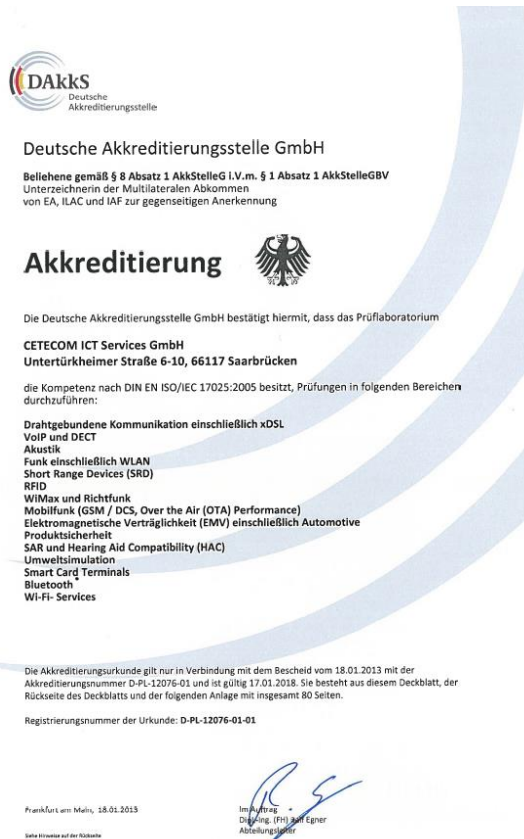
Annex B Further information

Glossary

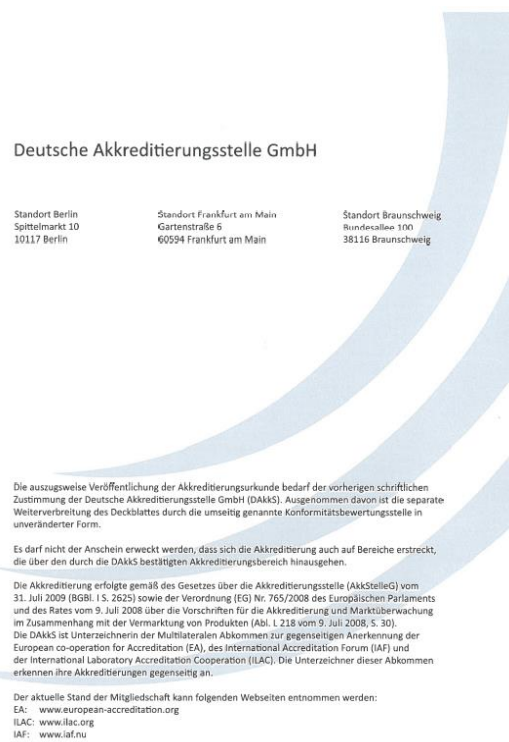
AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory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