



TEST REPORT

Test report no.: 1-6404/13-02-02



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

ZF Friedrichshafen AG
Cherrystr. 1
91275 Auerbach / GERMANY
Phone: +49 9643 18-0
Fax: +49 964 318-333-1809
Contact: Thomas Boethe
e-mail: thomas.boethe@zf.com
Phone: +49 964 318-1809

Manufacturer

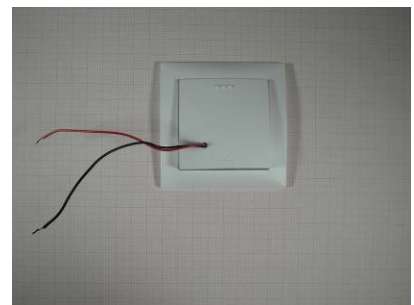
ZF Friedrichshafen AG
Cherrystr. 1
91275 Auerbach / GERMANY

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 - Licence-exempt Radio Apparatus (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: Energy Autarkic RF Lighting Switch
Model name: AFIS-2004
FCC ID: GDDAFIS2004
IC: 11057A-AFIS2004
Frequency: ISM band 2400 MHz to 2483.5 MHz
Technology tested: Proprietary data transmission
Antenna: Integrated chip antenna
Power supply: 5.0V DC by internal piezo element
Temperature range: -40°C to +85°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:



Stefan Bös
Senior Testing Manager

Test performed:



Tobias Wittenmeier
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
6	Test laboratories sub-contracted	4
7	Summary of measurement results	5
8	RF measurements	6
8.1	Description of test setup	6
8.2	Radiated measurements chamber F	6
8.3	Radiated measurements chamber C	7
8.4	Radiated measurements 12.75 GHz to 25 GHz	7
8.5	Conducted measurements	8
8.6	Additional comments	8
8.7	RSP100 test report cover sheet / performance test data	9
9	Measurement results	10
9.1	Maximum output power	10
9.2	Antenna gain	11
9.3	Power spectral density	12
9.4	Spectrum bandwidth – 6 dB bandwidth	14
9.5	Spectrum bandwidth – 20 dB bandwidth	16
9.6	Band edge compliance conducted	18
9.7	Band edge compliance radiated	20
9.8	TX spurious emissions conducted	22
9.9	TX spurious emissions radiated	24
9.10	RX spurious emissions radiated	30
9.11	TX spurious emissions radiated < 30 MHz	31
9.12	TX spurious emissions conducted < 30 MHz	33
10	Test equipment and ancillaries used for tests	34
11	Observations	35
Annex A	Photographs of the test setup	36
Annex B	External photographs of the EUT	40
Annex C	Internal photographs of the EUT	43
Annex D	Document history	45
Annex E	Further information	45
Annex F	Accreditation Certificate	46

2 General information

2.1 Notes and disclaimer

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

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

2.2 Application details

Date of receipt of order:	2014-03-05
Date of receipt of test item:	2014-03-06
Start of test:	2014-03-06
End of test:	2014-03-07
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15	2010-10	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 - Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+85 °C during high temperature tests
	T_{min}	-40 °C during low temperature tests
Relative humidity content:		55 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	5.0 V DC by internal piezo element
	V_{max}	9.0 V
	V_{min}	2.3 V

5 Test item

Kind of test item	:	Energy Autarkic RF Lighting Switch
Type identification	:	AFIS-2004
S/N serial number	:	Rad. 006 Cond. 012
HW hardware status	:	No information available
SW software status	:	No information available
Frequency band [MHz]	:	ISM band 2400 MHz to 2483.5 MHz
Type of radio transmission	:	single carrier
Use of frequency spectrum	:	
Type of modulation	:	QPSK
Number of channels	:	1
Antenna	:	Integrated chip antenna
Power supply	:	5.0 V DC by internal piezo element
Temperature range	:	-40°C to +85 °C

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 15 RSS 210, Issue 8, Annex 8	Passed	2014-03-31	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Results
§15.247(b)(4) RSS 210 / A8.4(2)	Antenna gain	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth 6dB bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth 20dB bandwidth	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(3) RSS-210 / A8.4(4)	Maximum output power	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	Band edge compliance conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205 RSS-210 / A8.5	Band edge compliance radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions conducted	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d) RSS-210 / A8.5	TX spurious emissions radiated	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109 RSS-Gen.	RX spurious emissions radiated	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	-/-
§15.209(a) RSS-Gen	TX spurious emissions radiated < 30 MHz	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.107(a) §15.207	Conducted emissions < 30 MHz	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	-/-

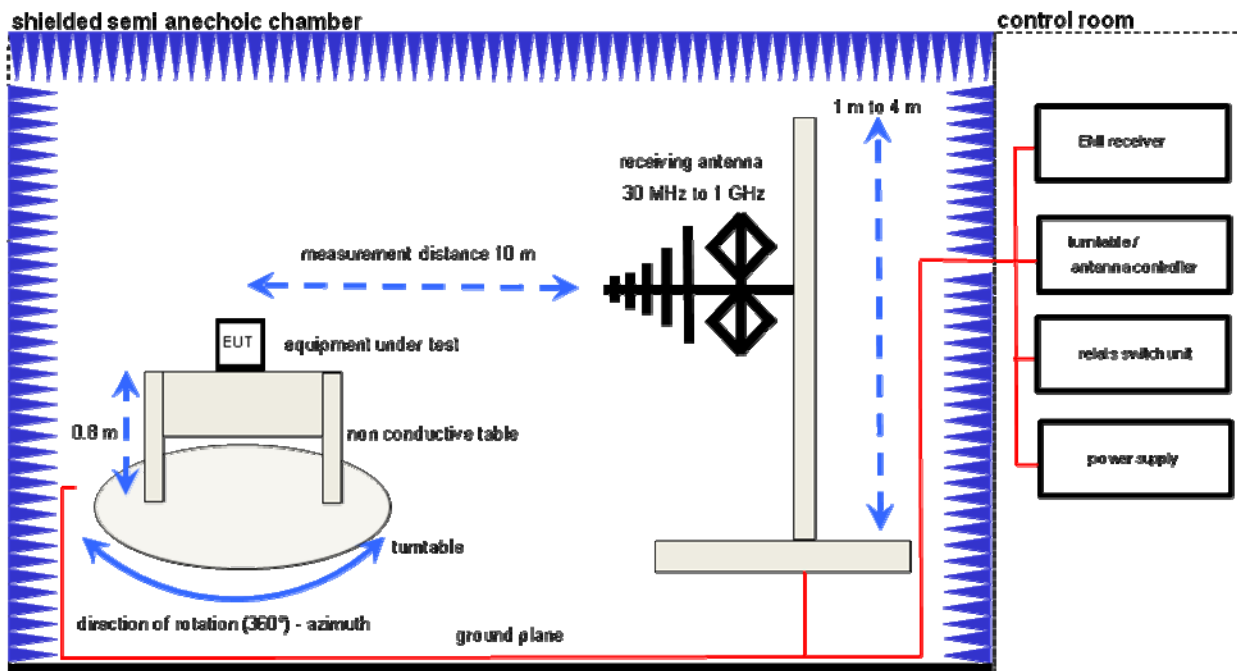
Note: NA = Not Applicable; NP = Not Performed

8 RF measurements

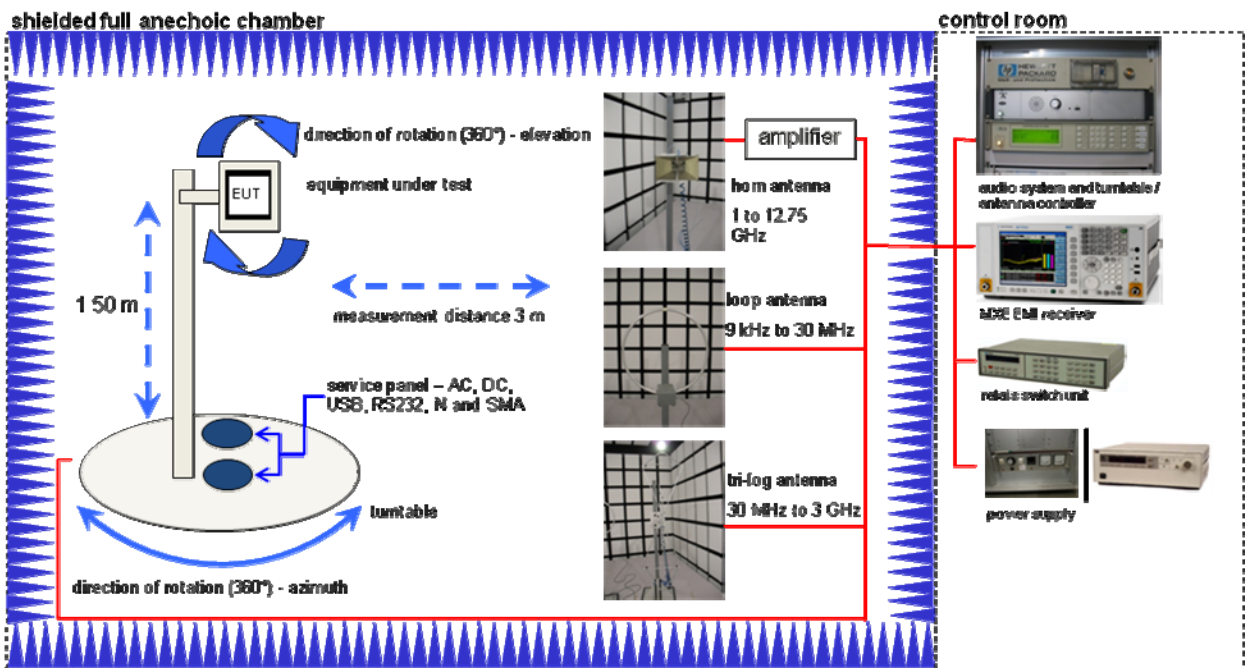
8.1 Description of test setup

8.2 Radiated measurements chamber F

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.



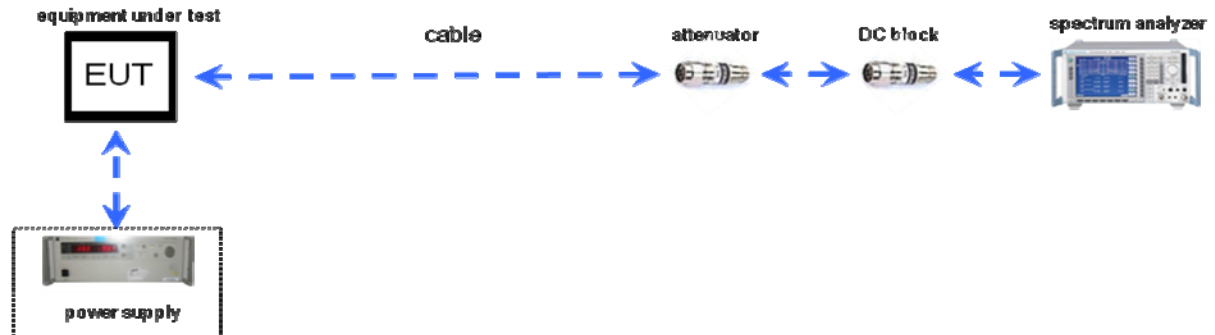
8.3 Radiated measurements chamber C



8.4 Radiated measurements 12.75 GHz to 25 GHz



8.5 Conducted measurements



8.6 Additional comments

Reference documents: None

Special test descriptions: The EUT only transmits on one single channel at 2480 MHz.

Configuration descriptions: None

Test mode:

- No test mode available.
- Special software is used.
EUT is transmitting pseudo random data by itself

8.7 RSP100 test report cover sheet / performance test data

Test report number	:	1-6404/13-02-02
Equipment model number	:	AFIS-2004
Certification number	:	11057A-AFIS2004
Manufacturer (complete address)	:	ZF Friedrichshafen AG Cherrystr. 1 91275 Auerbach / GERMANY
Tested to radio standards specification no.	:	RSS 210, Issue 8, Annex 8
Open area test site IC No.	:	IC 3462C-1
Frequency range	:	2480 MHz
RF-power [mW] (max.)	:	cond.: 1.24 EIRP: 3.43
Occupied bandwidth (99%-BW) [kHz]	:	2360
Type of modulation	:	QPSK
Emission designator (TRC-43)	:	2M36FXD
Antenna information	:	Internal chip antenna
Transmitter spurious (worst case)[dB μ V/m @ 3m]:	:	45.01 dB μ V/m @ 23.97 GHz (noise floor)

ATTESTATION:

DECLARATION OF COMPLIANCE:

I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above-mentioned Industry Canada standard(s); and that the equipment identified in this application has been subjected to all the applicable test conditions specified in the Industry Canada standards and all of the requirements of the standard have been met.

Laboratory manager:

2014-03-31

Tobias Wittenmeier

Date

Name

Signature

9 Measurement results

9.1 Maximum output power

Description:

Measurement of the maximum output power conducted and radiated

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Span:	3 MHz
Trace-Mode:	Max Hold

Result:

Modulation Channel	Maximum output power conducted [dBm]		
	2480 MHz	-/-	-/-
	0.93		
Measurement uncertainty	± 1 dB		

Modulation Channel	Maximum output power radiated - EIRP [dBm]		
	2480 MHz	-/-	-/-
	5.35		
Measurement uncertainty	± 3 dB		

Result: **Passed**

9.2 Antenna gain

Measurement:

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

Measurement parameters:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	3 MHz
Resolution bandwidth:	3 MHz
Span:	3 MHz
Trace-Mode:	Max hold

Limits:

FCC	IC
Antenna Gain	
6 dBi	

Results:

T _{nom}	V _{nom}	2480 MHz	-/-	-/-
Conducted power [dBm] Measured		0.93		
Radiated power [dBm] Measured		5.35		
Gain [dBi] Calculated		4.42		

Result: **Passed**

9.3 Power spectral density

Description:

Measurement of the power spectral density of a digital modulated system. The measurement is repeated at the lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	500 s
Video bandwidth:	3 kHz
Resolution bandwidth:	3 kHz
Span:	1.5 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
Power Spectral Density	
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration.	

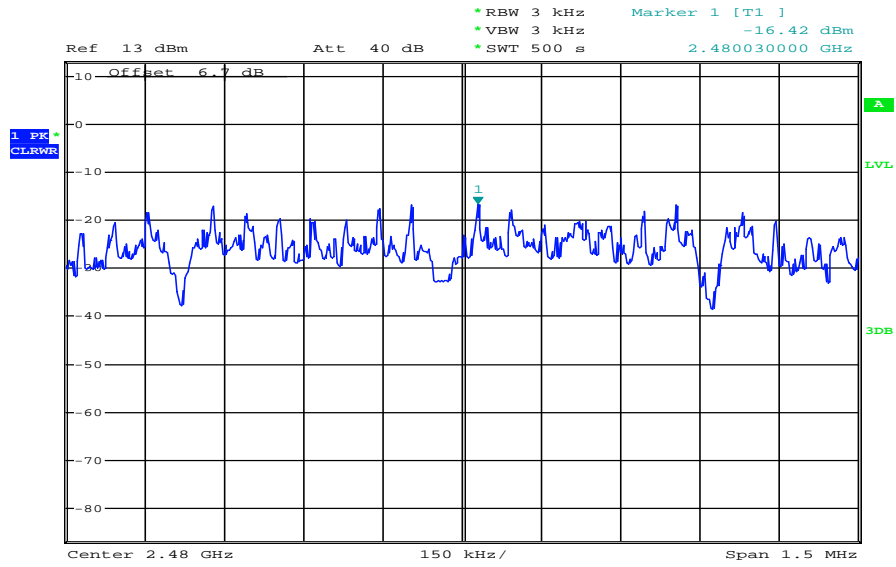
Results:

Modulation Channel	Power Spectral density [dBm/3kHz]		
	2480 MHz	-/-	-/-
	-16.42		
Measurement uncertainty	± 1.5 dB		

Result: **Passed**

Plots:

Plot 1: 2480 MHz



Date: 7.MAR.2014 11:23:44

9.4 Spectrum bandwidth – 6 dB bandwidth

Description:

Measurement of the 6 dB bandwidth of the modulated signal.

Measurement:

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

Limits:

FCC	IC
Spectrum Bandwidth – 6 dB Bandwidth	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

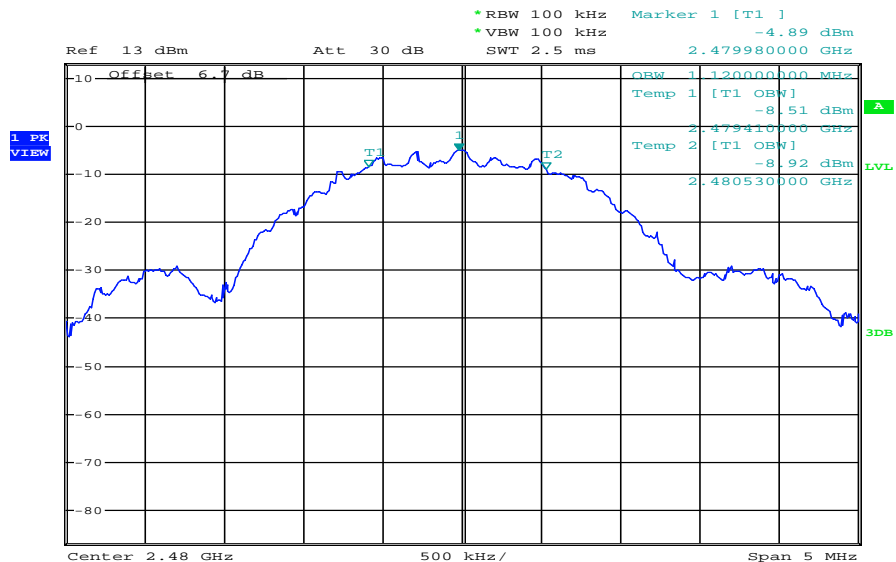
Results:

Modulation Channel	6 dB BANDWIDTH [MHz]		
	2480 MHz	-/-	-/-
	1.12		
Measurement uncertainty	± 100 kHz		

Result: Passed

Plots:

Plot 1: 2480 MHz



Date: 7.MAR.2014 11:27:39

9.5 Spectrum bandwidth – 20 dB bandwidth

Description:

Measurement of the 20 dB bandwidth of the modulated signal.

Measurement:

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

Limits:

FCC	IC
Spectrum Bandwidth – 20 dB Bandwidth	
Systems using digital modulation techniques may operate in the 2400–2483.5 MHz band. The minimum 6 dB bandwidth shall be at least 500 kHz.	

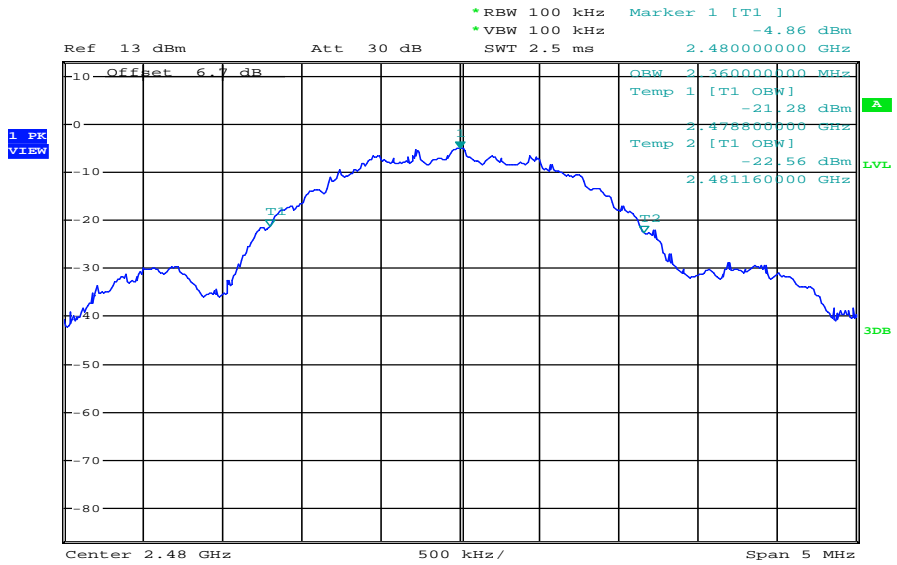
Results:

Modulation Channel	20 dB BANDWIDTH [MHz]		
	2480 MHz	-/-	-/-
	2.36		
Measurement uncertainty	± 100 kHz		

Result: Passed

Plots:

Plot 1: 2480 MHz



Date: 7.MAR.2014 11:25:51

9.6 Band edge compliance conducted

Description:

Measurement of the conducted band edge compliance. EUT is measured at the lower and upper band edge.

Measurement:

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

Limits:

FCC	IC
Band Edge Compliance Conducted	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.</p>	

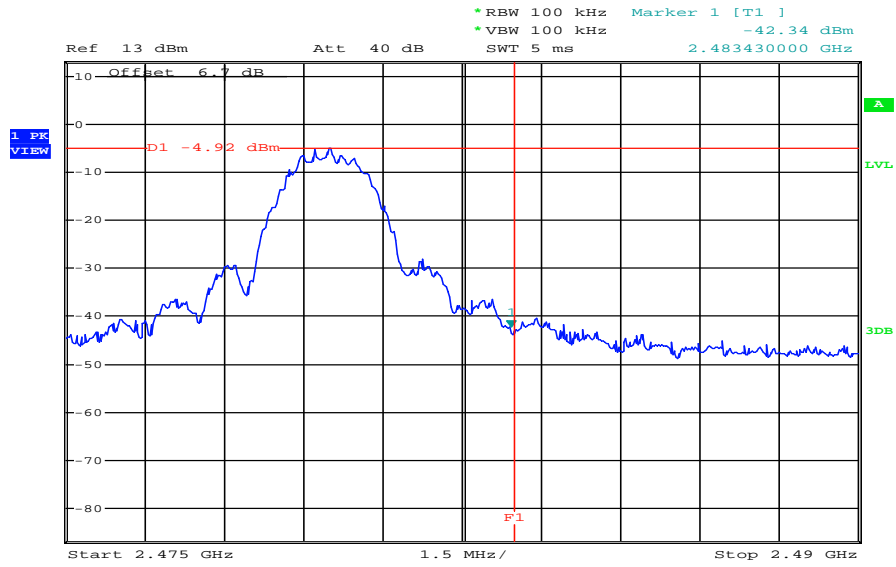
Result:

Scenario	Band Edge Compliance Conducted [dB]
Lower Band Edge	> 20 dB (not applicable)
Upper Band Edge	> 20 dB (see plot 1)
Measurement uncertainty	± 1.5 dB

Result: Passed.

Plots:

Plot 1: 2480 MHz



Date: 7.MAR.2014 11:34:10

9.7 Band edge compliance radiated

Description:

Measurement of the radiated band edge compliance. The EUT is turned in the position that results in the maximum level at the band edge. Then a sweep over the corresponding restricted band is performed. The EUT is set to the lowest channel for the lower restricted band and to the highest channel for the upper restricted band. Measurement distance is 3m.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	10 Hz
Resolution bandwidth:	1 MHz
Span:	See plot
Trace-Mode:	Max Hold

Limits:

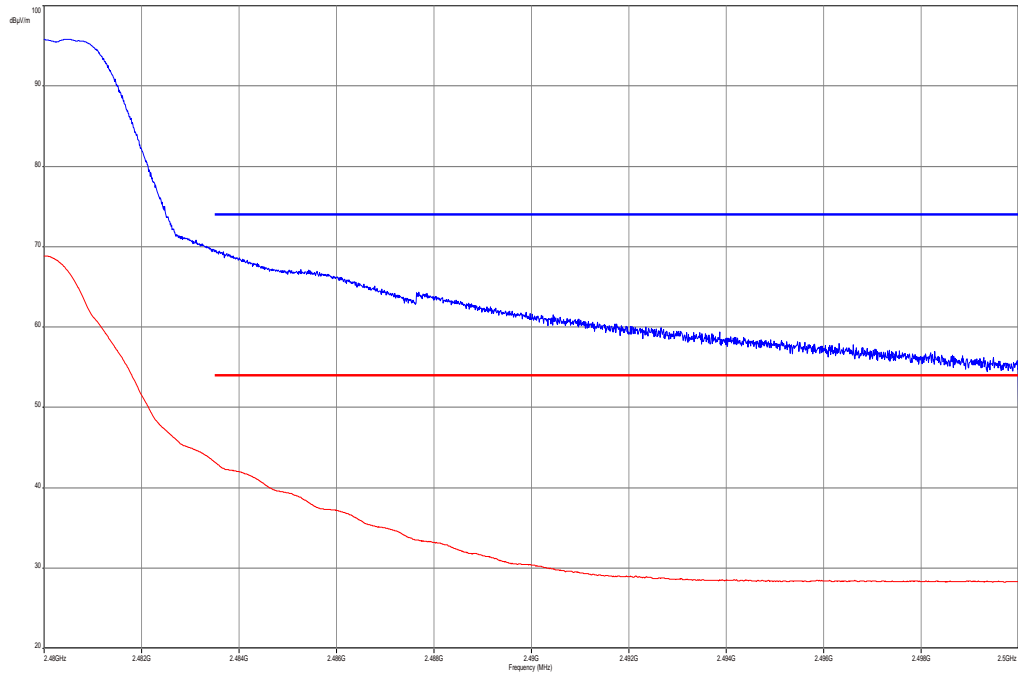
FCC	IC
Band Edge Compliance Radiated	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).</p>	
54 dB μ V/m AVG	

Result:

Scenario	Band Edge Compliance Radiated [dB μ V/m]
Lower Band Edge	< 54 dB μ V/m (not applicable)
Upper Band Edge	< 54 dB μ V/m (see plot 1)
Measurement uncertainty	\pm 3 dB

Plots:

Plot 1: upper band edge, horizontal & vertical polarization



Result: Passed

9.8 TX spurious emissions conducted

Description:

Measurement of the conducted spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 100 kHz
Span:	9 kHz to 26 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
TX Spurious Emissions Conducted	
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required</p>	

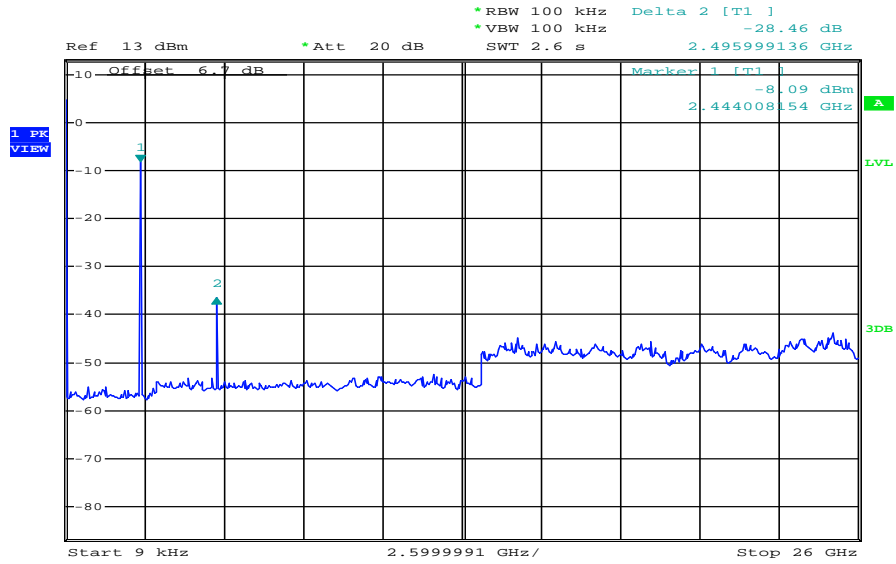
Results:

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2480 MHz			30 dBm		Operating frequency
<i>See plot</i>			-20 dBc	-28.46	complies
Measurement uncertainty			± 3 dB		

Result: Passed

Plots:

Plot 1: 2480 MHz



Date: 7.MAR.2014 11:39:39

9.9 TX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in transmit mode. The measurement is performed at lowest, middle and highest channel.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	Sweep: 100 kHz Remeasurement: 10 Hz
Resolution bandwidth:	F < 1 GHz: 100 kHz F > 1 GHz: 1 MHz
Span:	30 MHz to 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC	
TX Spurious Emissions Radiated		
<p>In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).</p>		
§15.209		
Frequency (MHz)	Field Strength (dBµV/m)	Measurement distance
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 [dBµV/m]								
Lowest			-/-			-/-		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
No traceable peaks found								
Measurement uncertainty			± 3 dB					

Result: Passed

Note: The limit was recalculated with 20 dB / decade (Part 15.31) for all radiated spurious emissions 30 MHz to 1 GHz from 3 meter limit to a 10 meter distance. (40dB/decade for emissions < 30MHz)

Plots:

Plot 1: 2480 MHz, 30 MHz to 1 GHz, vertical & horizontal polarization

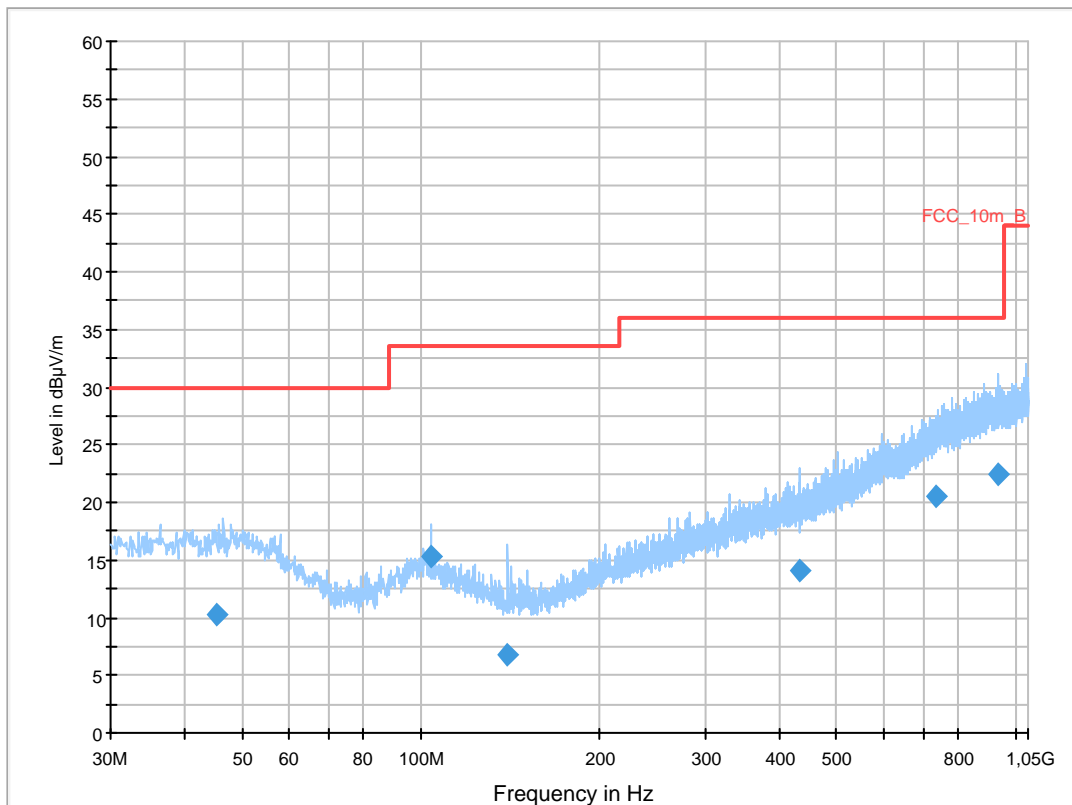
Common Information

Test Description: FCC part 15 class B
 Operating Conditions: active
 Operator Name: Wolsdorfer
 Comment: DC 3,3V

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESC1 3]
 Level Unit: dBµV/m

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
45.362100	10.2	1000.0	120.000	223.0	V	107.0	13.3	19.8	30.0	
103.678050	15.2	1000.0	120.000	200.0	V	220.0	11.6	18.3	33.5	
139.971300	6.8	1000.0	120.000	200.0	V	76.0	8.7	26.7	33.5	
433.700700	14.0	1000.0	120.000	200.0	V	49.0	17.4	22.0	36.0	
734.907300	20.6	1000.0	120.000	200.0	H	45.0	23.3	15.4	36.0	
936.653550	22.4	1000.0	120.000	169.0	H	94.0	25.3	13.6	36.0	

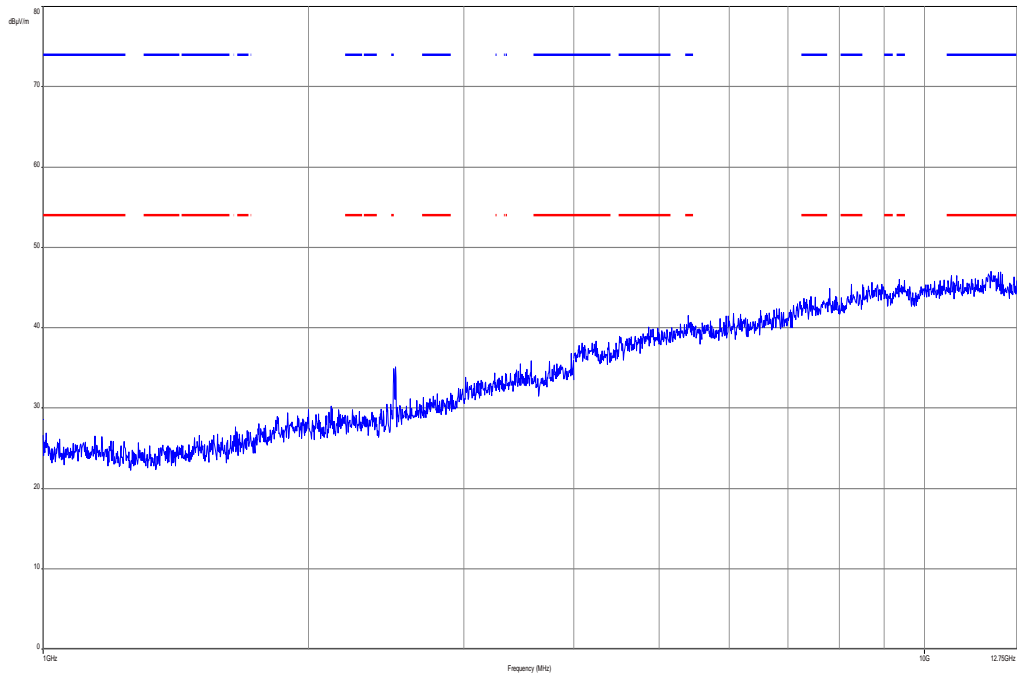
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table (vertical): Cable_EN_1GHz (1005) Correction Table (horizontal): Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

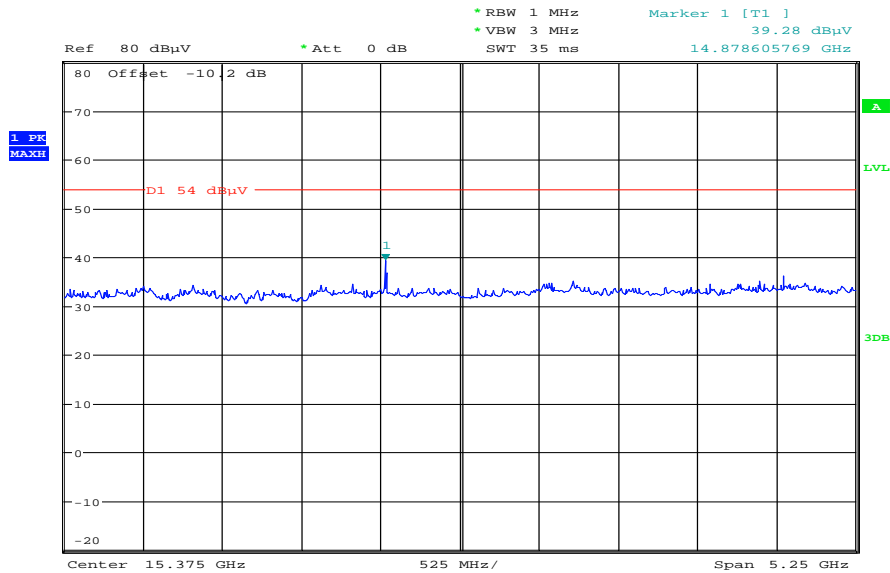
EMC 32 Version 8.52

Plot 2: 2480 MHz; 1 GHz to 12.75 GHz, vertical & horizontal polarization



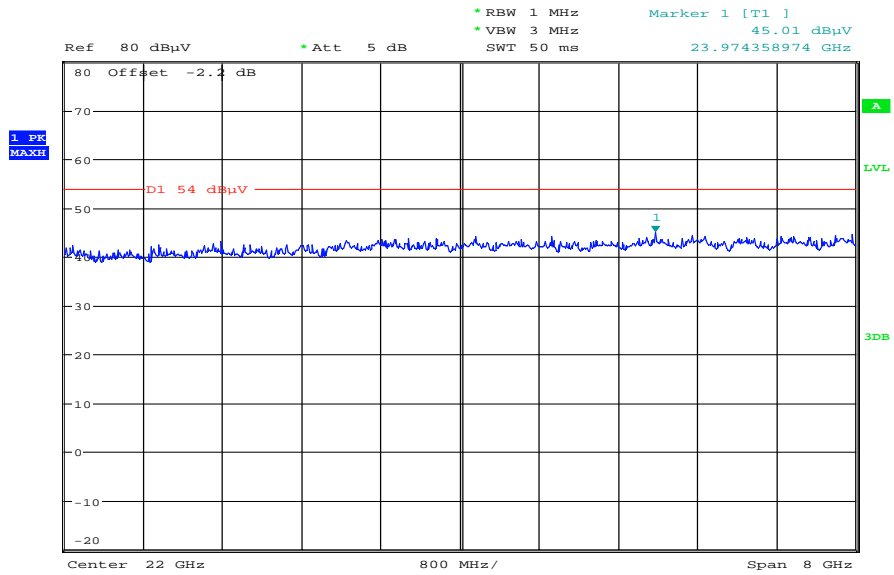
The carrier signal is notched with a 2.4 GHz band rejection filter.

Plot 3: 2480 MHz; 12 GHz to 18 GHz, vertical & horizontal polarization



Date: 6.MAR.2014 10:30:33

Plot 4: 2480 MHz; 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 6.MAR.2014 10:31:21

9.10 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in idle/receive mode.

Not applicable; no idle/ RX mode available. The EUT instantly starts transmitting after switching on the power supply.

9.11 TX spurious emissions radiated < 30 MHz

Description:

Measurement of the radiated spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 39. This measurement is representative for all channels and modes. If critical peaks are found channel 00 and channel 78 will be measured too. The limits are recalculated to a measurement distance of 3 m with 40 dB/decade according CFR Part 2.

Measurement:

Measurement parameter	
Detector:	Peak / Quasi Peak
Sweep time:	Auto
Video bandwidth:	F < 150 kHz: 200 Hz F > 150 kHz: 9 kHz
Resolution bandwidth:	F < 150 kHz: 1 kHz F > 150 kHz: 100 kHz
Span:	9 kHz to 30 MHz
Trace-Mode:	Max Hold

Limits:

FCC		IC
TX Spurious Emissions Radiated < 30 MHz		
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

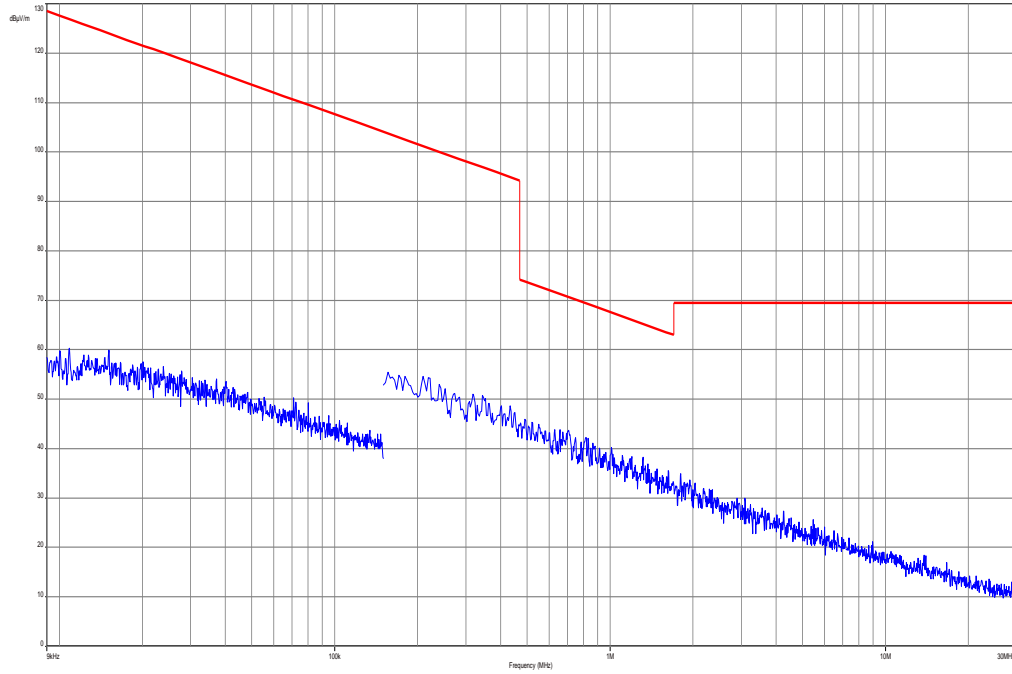
Results:

TX Spurious Emissions Radiated < 30 MHz [dBµV/m]		
F [MHz]	Detector	Level [dBµV/m]
No peaks detected!		
Measurement uncertainty	± 3 dB	

Result: Passed

Plot:

Plot 1: 2480 MHz; 9 kHz to 30 MHz



9.12 TX spurious emissions conducted < 30 MHz

Description:

Measurement of the conducted spurious emissions in transmit mode below 30 MHz. The EUT is set to channel 39. If critical peaks are found channel 00 and channel 78 will be measured too. Both power lines, phase and neutral line, are measured. Found peaks are remeasured with average and quasi peak detection to show compliance to the limits.

Not applicable; there is no possibility to connect the EUT to the main power supply. It contains an internal piezo element for power supply.

10 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 (Lab/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Power Supply	LA30/5GA	Zentro Elektronik	2046	300000711	NK!		
2	n. a.	Spectrum Analyzer 20 Hz - 50 GHz	FSU50	R&S	200012	300003443	Ve	09.10.2012	09.10.2014
3	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	12.01.2012	12.01.2015
4	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vKI!	08.05.2013	08.05.2015
5	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996	ev		
6	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	*	300000199	ne		
7	n. a.	Switch / Control Unit	3488A	HP Meßtechnik	2719A15013	300001156	ne		
8	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
9	90	Active Loop Antenna 10 kHz to 30 MHz	6502	Kontron Psychotech	8905-2342	300000256	k	13.06.2013	13.06.2015
10	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
11	n. a.	Band Reject filter	WRCG185 5/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
12	n. a.	Band Reject filter	WRCG240 0/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
13	n. a.	Highpass Filter	WHKX7.0/1 8G-8SS	Wainwright	18	300003789	ne		
14	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vKI!	14.10.2011	14.10.2014
15	n. a.	MXE EMI Receiver 20 Hz bis 26,5 GHz	N9038A	Agilent Technologies	MY51210197	300004405	k	21.02.2013	21.02.2015
16	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
17	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
18	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
19	n. a.	EMI Test Receiver	ESCI 3	R&S	100083	300003312	k	27.01.2014	27.01.2015
20	n. a.	Analyzer-Reference-System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	Ve	14.07.2012	14.01.2015
21	n. a.	Amplifier	JS42-00502650-	MITEQ	1084532	300003379	ev		

			28-5A						
22	n. a.	Antenna Tower	Model 2175	ETS-LINDGREN	64762	300003745	izw		
23	n. a.	Positioning Controller	Model 2090	ETS-LINDGREN	64672	300003746	izw		
24	n. a.	Turntable Interface-Box	Model 105637	ETS-LINDGREN	44583	300003747	izw		
25	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	12.04.2012	12.04.2014
26	n. a.	Spectrum-Analyzer	FSU26	R&S	200809	300003874	k	16.01.2013	16.01.2015

Agenda: Kind of Calibration

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

11 Observations

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

Annex A Photographs of the test setup

Photo documentation:

Photo 1:

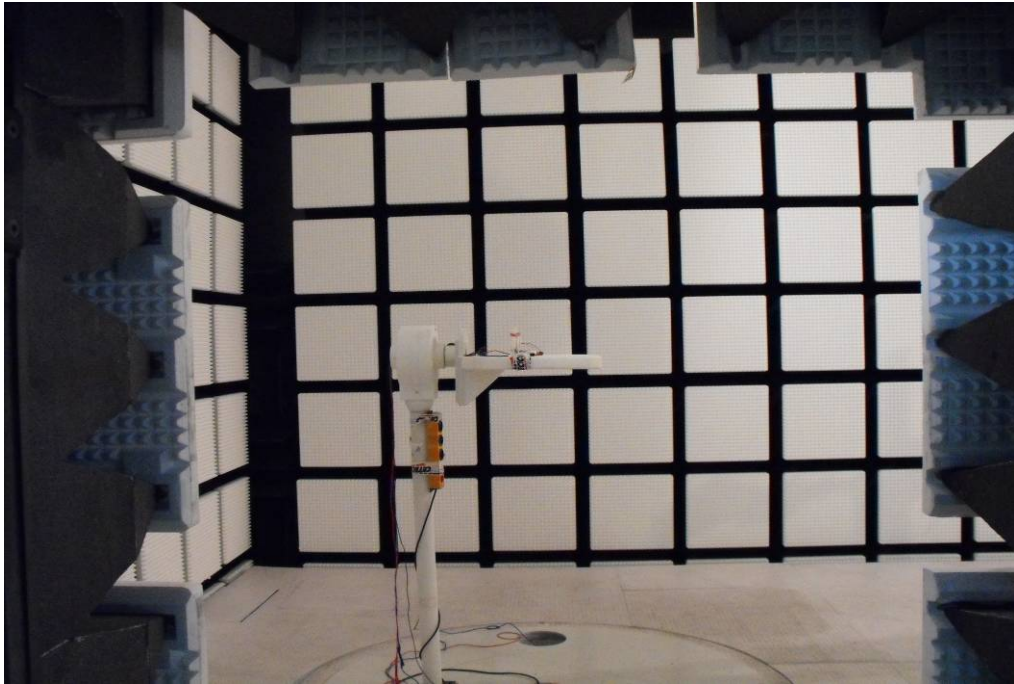


Photo 2:

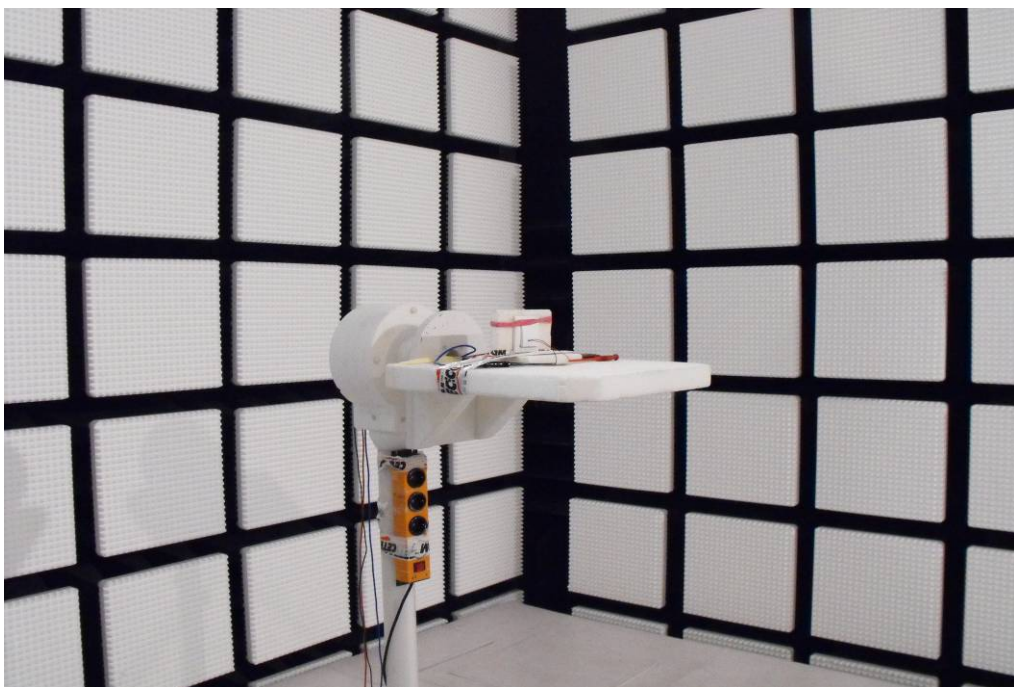


Photo 3:

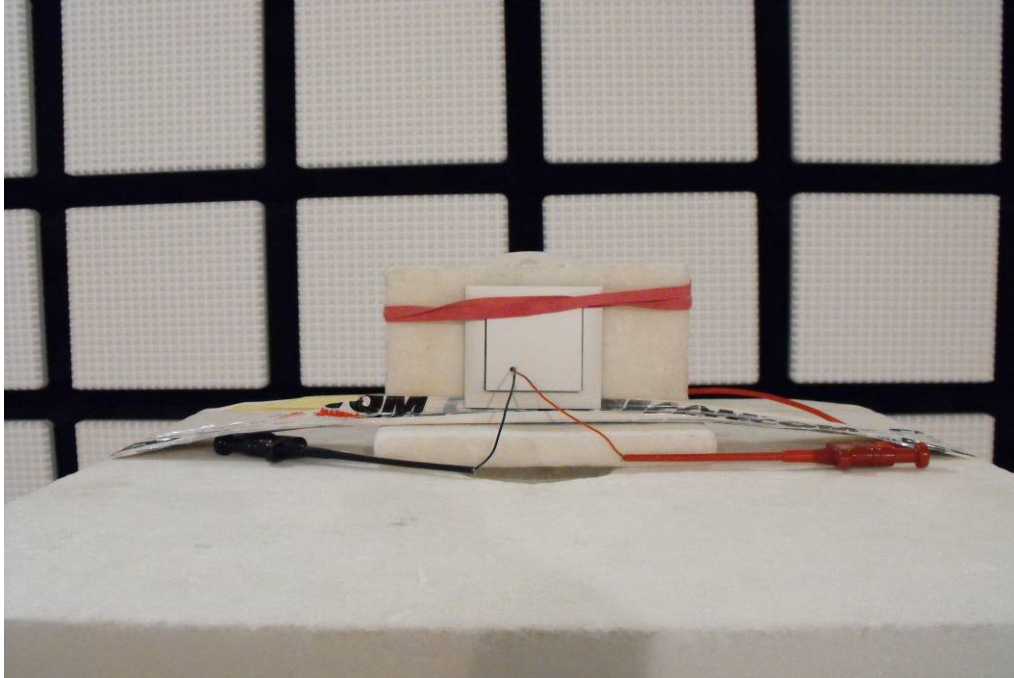


Photo 4:

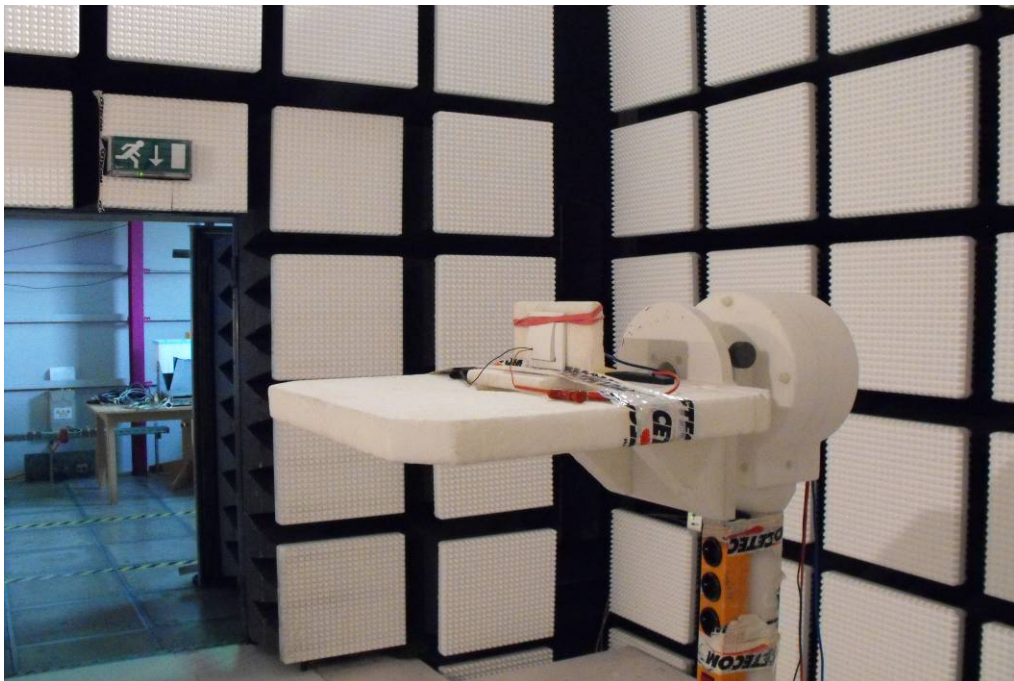


Photo 5:

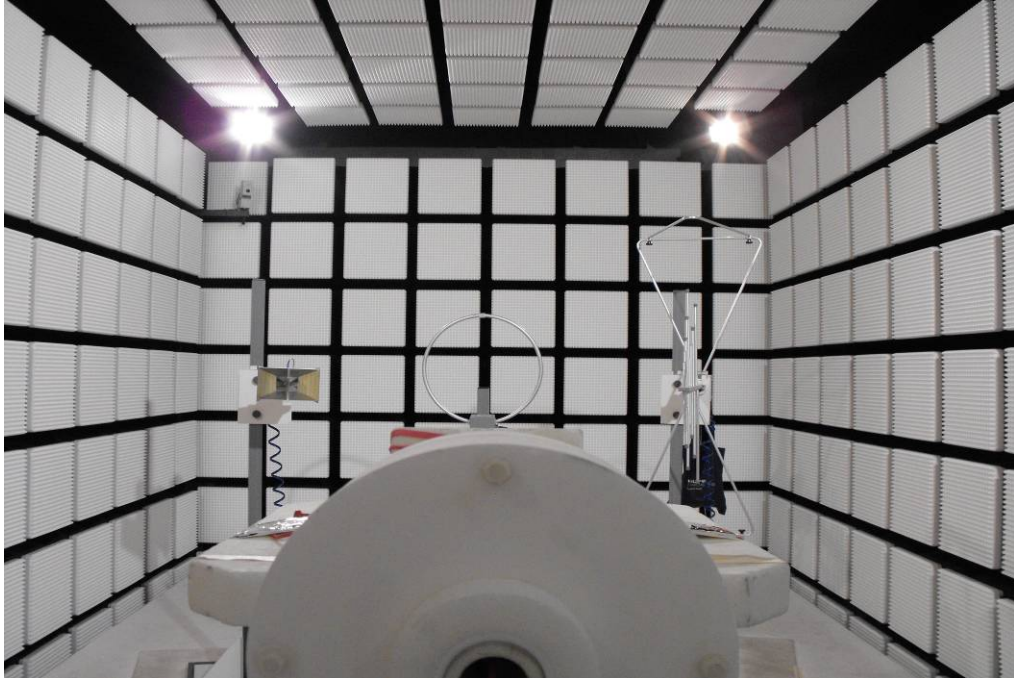


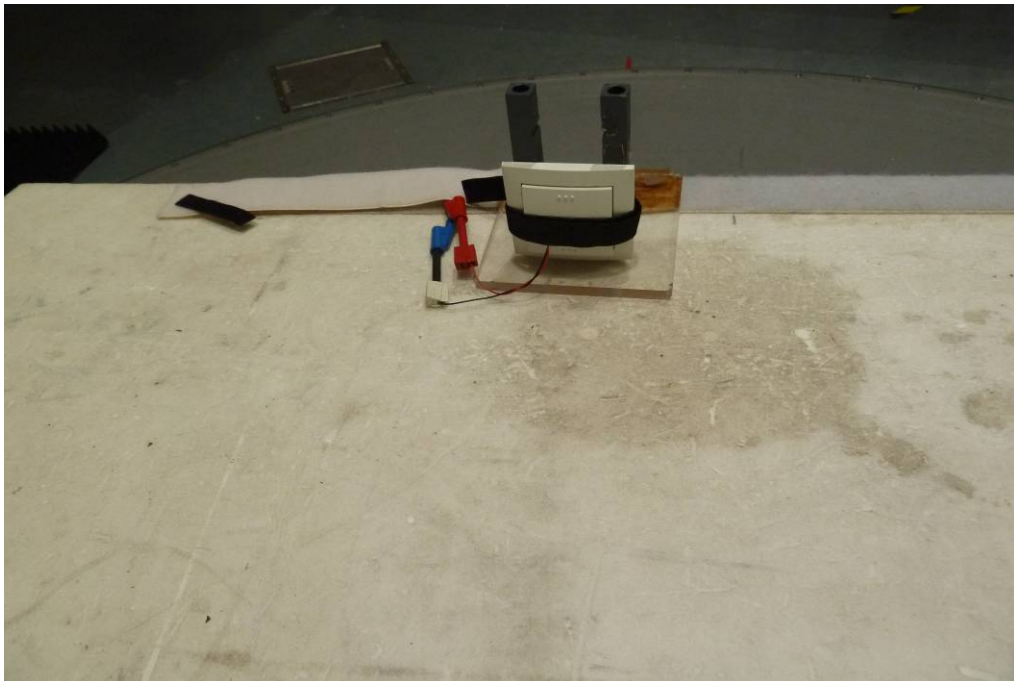
Photo 6:



Photo 7:



Photo 8:



Annex B External photographs of the EUT

Photo 1:



Photo 2:

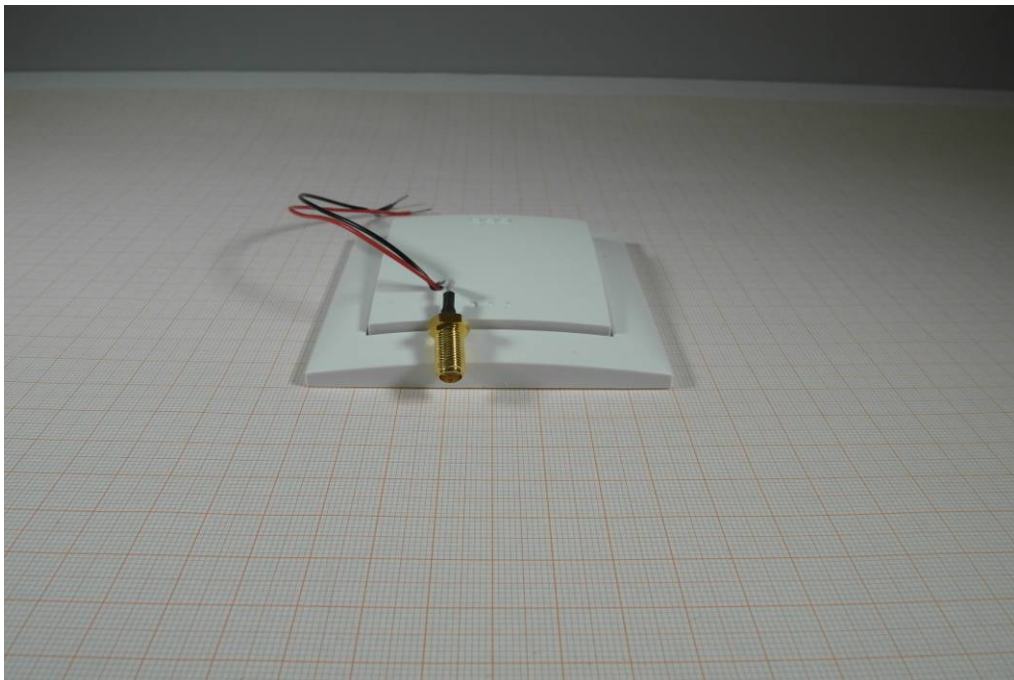


Photo 3:

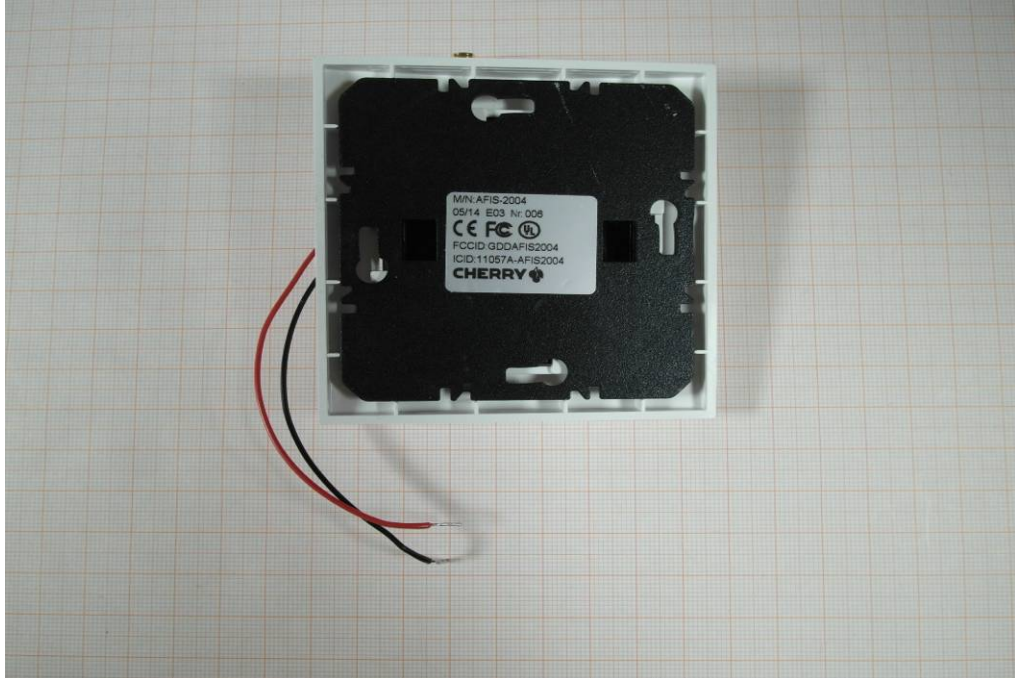


Photo 4:

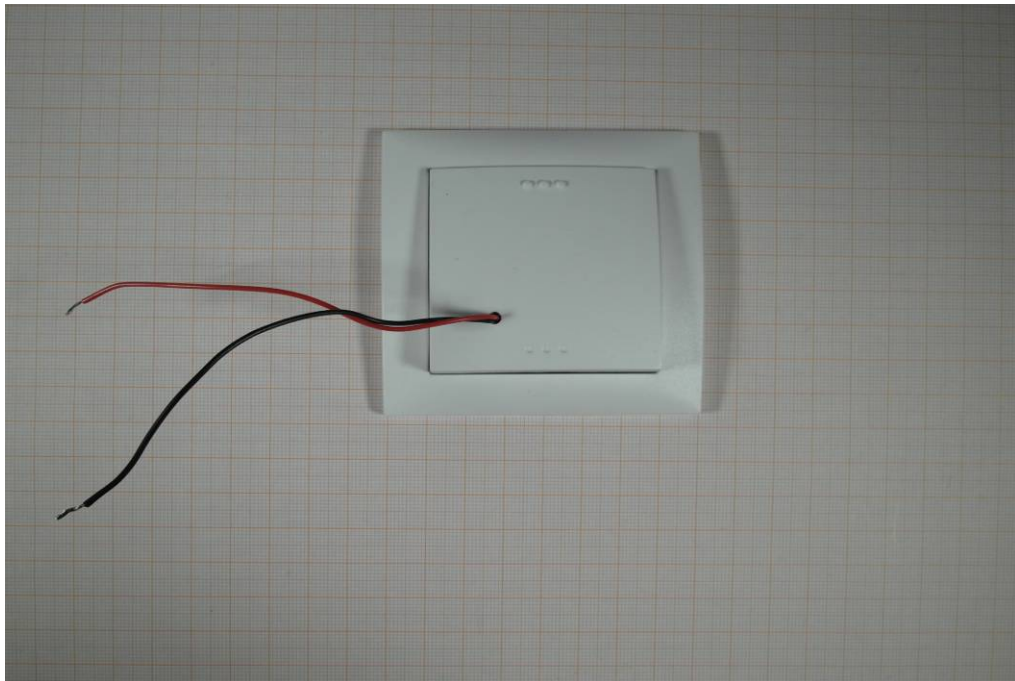


Photo 5:



Annex C Internal photographs of the EUT

Photo 1:

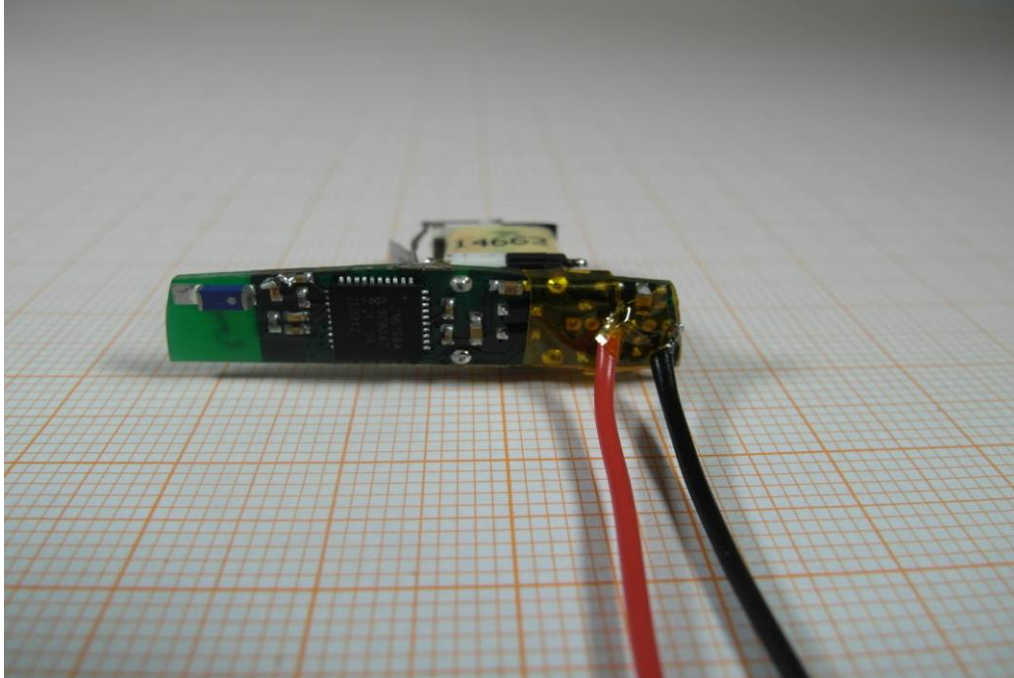


Photo 2:

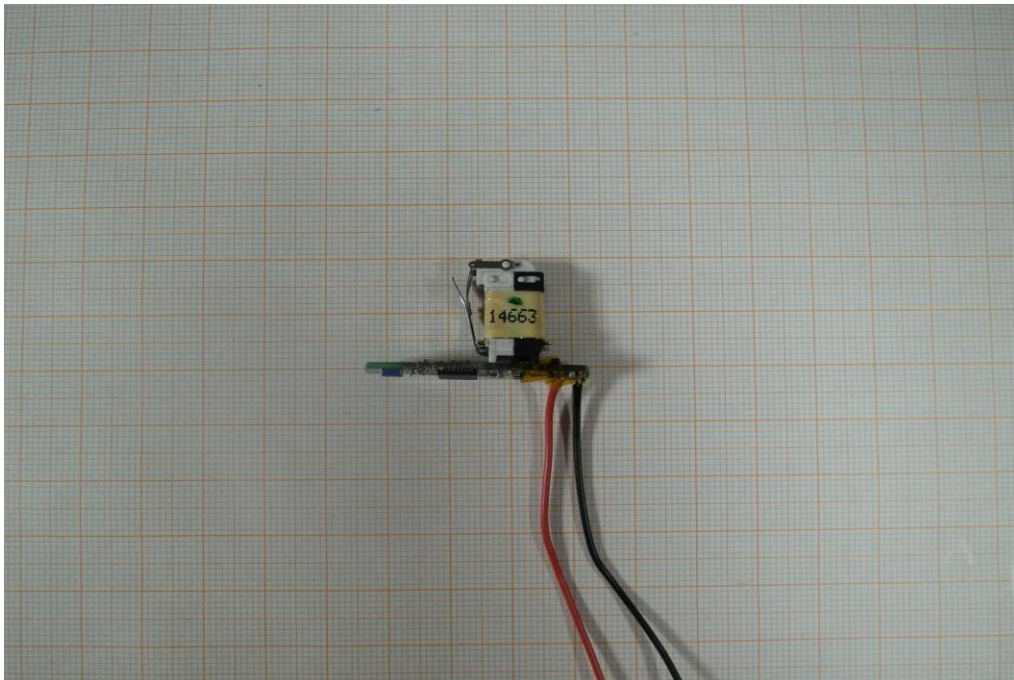
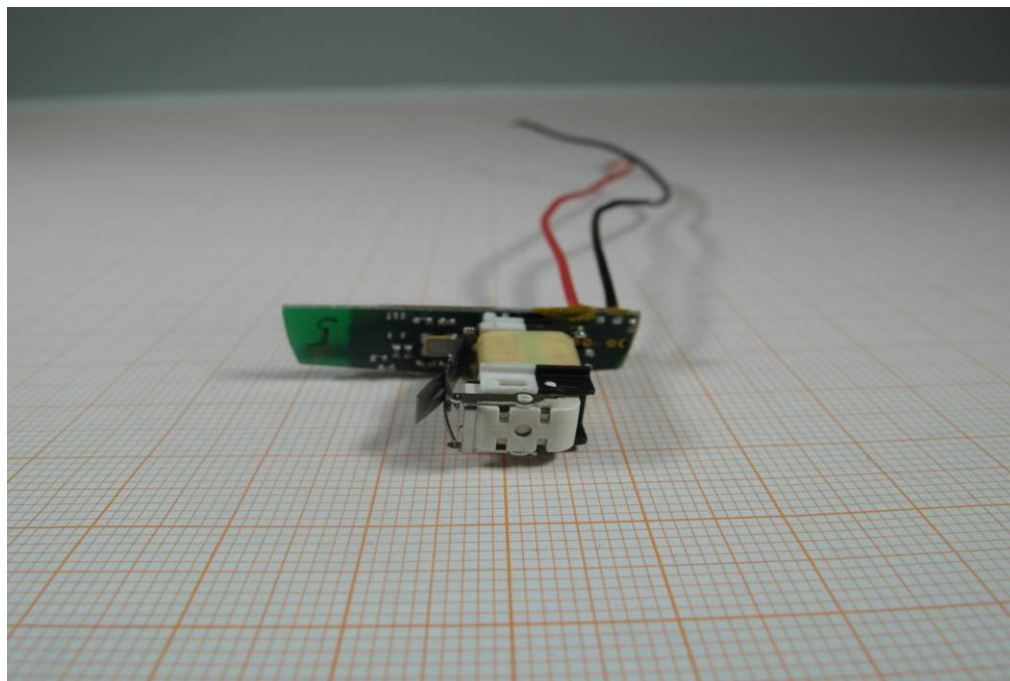


Photo 3:



Annex D Document history

Version	Applied changes	Date of release
	Initial release	2014-03-31

Annex E 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 F Accreditation Certificate

Front side of certificate



Deutsche Akkreditierungsstelle GmbH

Befehle 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 Akkreditierungskunde gilt nur in Verbindung mit dem Bescheid vom 18.01.2013 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 80 Seiten.

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

Frankfurt am Main, 18.01.2013
Siehe Hinweis auf der Rückseite

Im Auftrag
 Dr. Ingrid Pflüger
 Abteilungsleiter

Back side of certificate

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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.

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