

TEST REPORT

Test report no.: 1-3815/11-01-02-A



Deutsche
Akkreditierungsstelle
D-PL-12076-01-01

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-12076-01-01
Area of Testing: Radio/Satellite Communications

Applicant

ELPRO - Buchs AG
Langäulistrasse 62
CH-9470 Buchs / SWITZERLAND
Phone: +41 8 17 50 03 11
Fax: +41 8 17 50 03 17
Contact: Jürg Siegenthaler
e-mail: jürg.siegenthaler@elpro.com
Phone: +41 8 17 50 03 11

Manufacturer

ELPRO - Buchs AG
Langäulistrasse 62
CH-9470 Buchs / SWITZERLAND

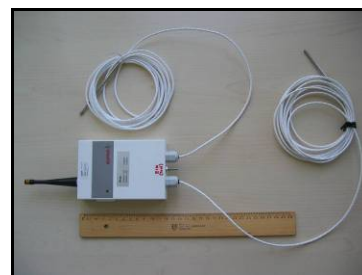
Test standard/s

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: Wireless Sensor
Model name: RT2e
FCC ID: Z45-E11645398
IC: 9954A-E11645398
Frequency [MHz]: 903 MHz – 927 MHz
Technology tested: Proprietary hopping system
Antenna: External antenna
Power Supply: 4.5 V DC by Battery
Temperature Range: -30°C to +55 °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:

Marco Bertolino
Testing Manager

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
8.1.1	Radiated measurements	6
8.1.2	Conducted measurements	7
8.2	Additional comments	7
8.3	RSP100 test report cover sheet / performance test data	8
9	Measurement results	9
9.1	Maximum output power	9
9.2	Antenna gain	12
9.1	Timing of the transmitter	13
9.2	Carrier frequency separation	15
9.3	Number of hopping channels	17
9.4	Spectrum bandwidth – 20 dB bandwidth	19
9.5	TX spurious emissions conducted	22
9.6	TX spurious emissions radiated	26
9.7	RX spurious emissions radiated	35
9.8	TX spurious emissions radiated < 30 MHz	40
10	Test equipment and ancillaries used for tests	43
11	Observations	44
Annex A	Photographs of the test setup	45
Annex B	External photographs of the EUT	47
Annex C	Internal photographs of the EUT	51
Annex D	Document history	56
Annex E	Further information	56
Annex F	Accreditation Certificate	57

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.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

The testing service provided by CETECOM ICT Services GmbH has been rendered under the current "General Terms and Conditions for CETECOM ICT Services GmbH".

CETECOM ICT Services GmbH will not be liable for any loss or damage resulting from false, inaccurate, inappropriate or incomplete product information provided by the customer.

Under no circumstances does the CETECOM ICT Services GmbH test report include any endorsement or warranty regarding the functionality, quality or performance of any other product or service provided.

Under no circumstances does the CETECOM ICT Services GmbH test report include or imply any product or service warranties from CETECOM ICT Services GmbH, including, without limitation, any implied warranties of merchantability, fitness for purpose, or non-infringement, all of which are expressly disclaimed by CETECOM ICT Services GmbH.

All rights and remedies regarding vendor's products and services for which CETECOM ICT Services GmbH has prepared this test report shall be provided by the party offering such products or services and not by CETECOM ICT Services GmbH.

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

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

2.2 Application details

Date of receipt of order:	2011-08-17
Date of receipt of test item:	2011-09-27
Start of test:	2011-09-27
End of test:	2011-10-12
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 Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

4 Test environment

Temperature:	T_{nom}	+22 °C during room temperature tests
	T_{max}	+55 °C during high temperature tests
	T_{min}	-30 °C during low temperature tests
Relative humidity content:		55 %
Barometric pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	4.5 V DC by Battery
	V_{max}	4.6 V
	V_{min}	4.0 V

5 Test item

Kind of test item	:	Wireless Sensor
Type identification	:	RT2e
S/N serial number	:	3545
HW hardware status	:	V1.1
SW software status	:	V1.3
Frequency band [MHz]	:	903 MHz – 927 MHz
Type of radio transmission	:	FHSS
Use of frequency spectrum	:	
Type of modulation	:	GFSK
Number of channels	:	61
Antenna	:	External antenna
Power supply	:	4.5 V DC by Battery
Temperature range	:	-30°C to +55 °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	2012-09-05	-/-

Test specification clause	Test case	Temperature conditions	Power source voltages	Pass	Fail	NA	NP	Results (max.)
§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
CFR 15.35(c) RSS Gen(Issue 3) / 4.5	Timing of the transmitter	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	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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§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

Note: NA = Not Applicable; NP = Not Performed

8 RF measurements

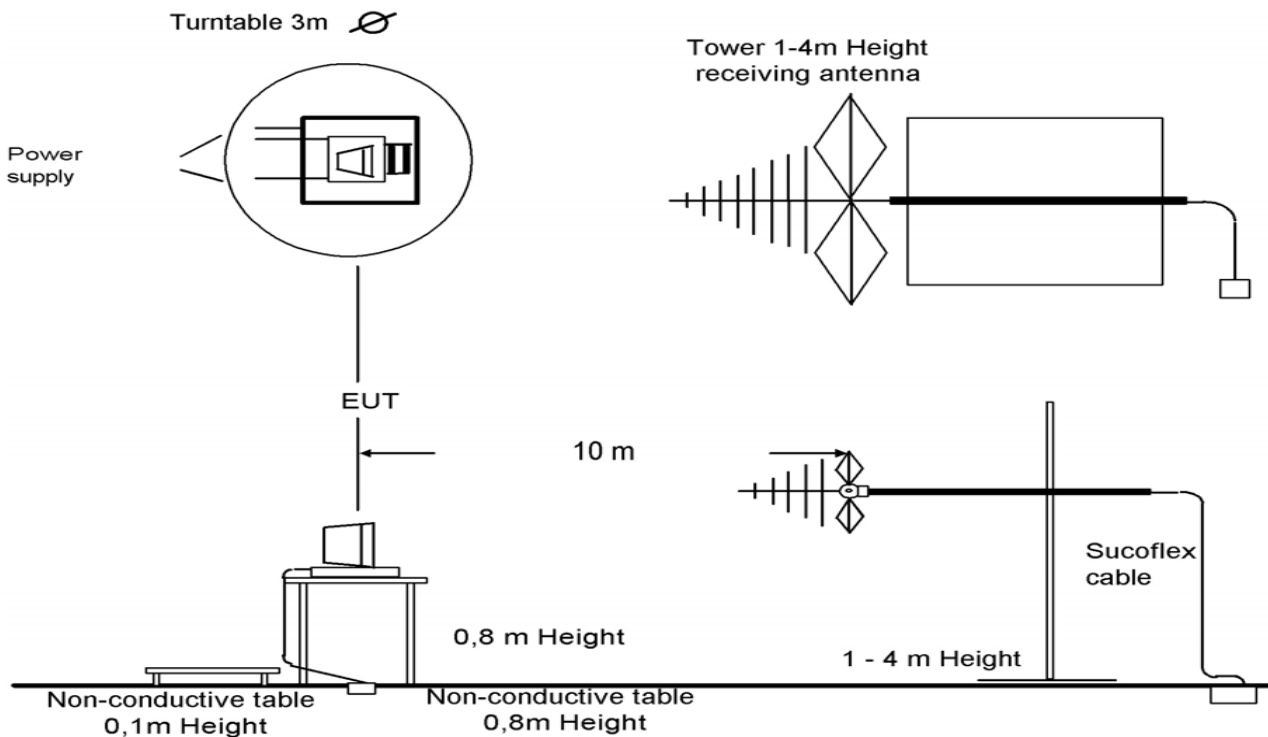
8.1 Description of test setup

8.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 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 C63.2-1996 clause 15 and ANSI C63.4-2009 clause 4.1.5. 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 C63-4-2009 clause 4.2.

Antennas are confirmed with ANSI C63.2-1996 item 15.

Semi anechoic chamber



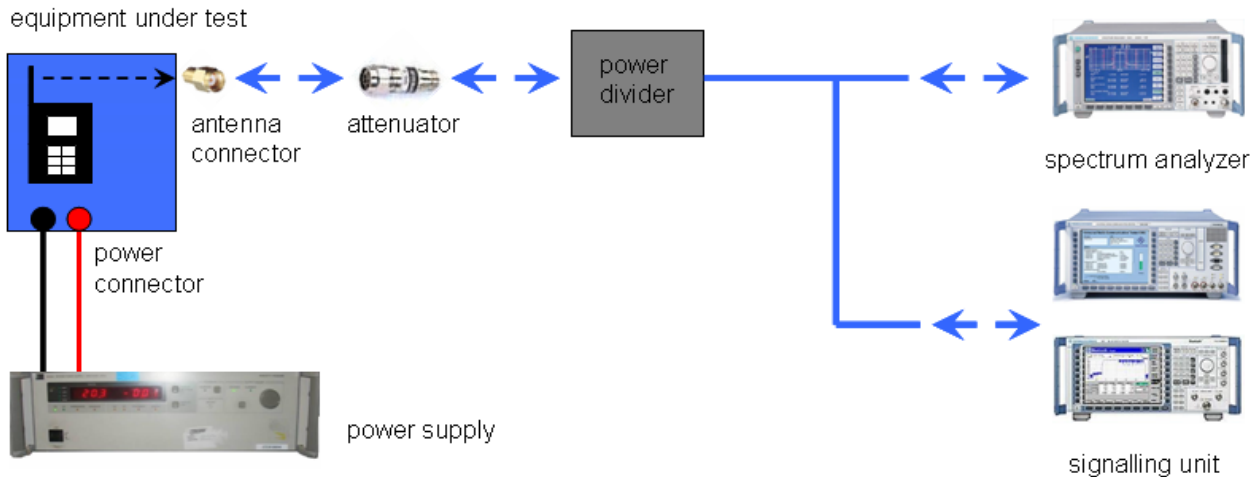
Picture 1: Diagram radiated measurements

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

The EUT is powered by an external power supply with nominal voltage

8.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is first 10dB attenuated before it is power divided (~6dB loss per branch). One of the signal paths is connected to the communication base Station (CMU200 or other), the other one is connected to the spectrum analyzer. The specific losses for both signal paths are first checked within a calibration. The measurement readings on the signalling unit/spectrum analyzer are corrected by the specific test set-up loss. The attenuator, power divider, signalling unit and the spectrum analyzer are impedance matched on 50 Ohm.



Picture 2: Diagram conducted measurements

8.2 Additional comments

Reference documents: None

Special test descriptions: None

Configuration descriptions: None

Test mode: ☐ No test mode available.

☒ Special software is used.
EUT is transmitting pseudo random data by itself

8.3 RSP100 test report cover sheet / performance test data

Test report number	:	1-3815/11-01-02-A
Equipment model number	:	RT2e
Certification number	:	9954A-E11645398
Manufacturer (complete address)	:	ELPRO - Buchs AG Langäulistrasse 62 CH-9470 Buchs / SWITZERLAND
Tested to radio standards specification no.	:	RSS 210, Issue 8, Annex 8
Open area test site IC No.	:	IC 3462C-1
Frequency range	:	903 MHz – 927 MHz
RF-power [W] (max.)	:	cond.: 20.14mW EIRP: 34.28mW
Occupied bandwidth (99%-BW) [kHz]	:	204
Type of modulation	:	GFSK
Emission designator (TRC-43)	:	204KFXD
Antenna information	:	External antenna
Transmitter spurious (worst case) [μV/m @ 3m]	:	240 μV/m @ 1854 MHz
Receiver spurious (worst case) [μV/m @ 3m]	:	177 μV/m (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:

2012-09-05

Date

Marco Bertolino

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:

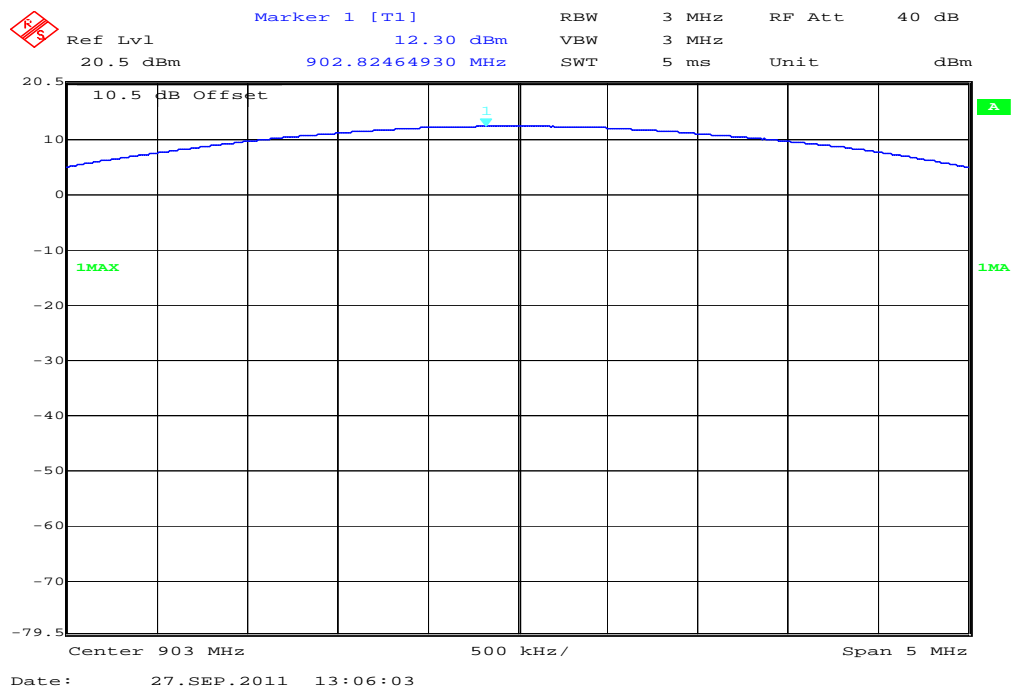
Modulation Channel	Maximum output power conducted [dBm]		
	Lowest 903 MHz	Middle 915 MHz	Highest 927 MHz
	12.30	12.63	13.04
Measurement uncertainty	± 1 dB		

Modulation Channel	Maximum output power radiated - EIRP [dBm]		
	Lowest	Middle	Highest
	14.96	14.77	15.35
Measurement uncertainty	± 3 dB		

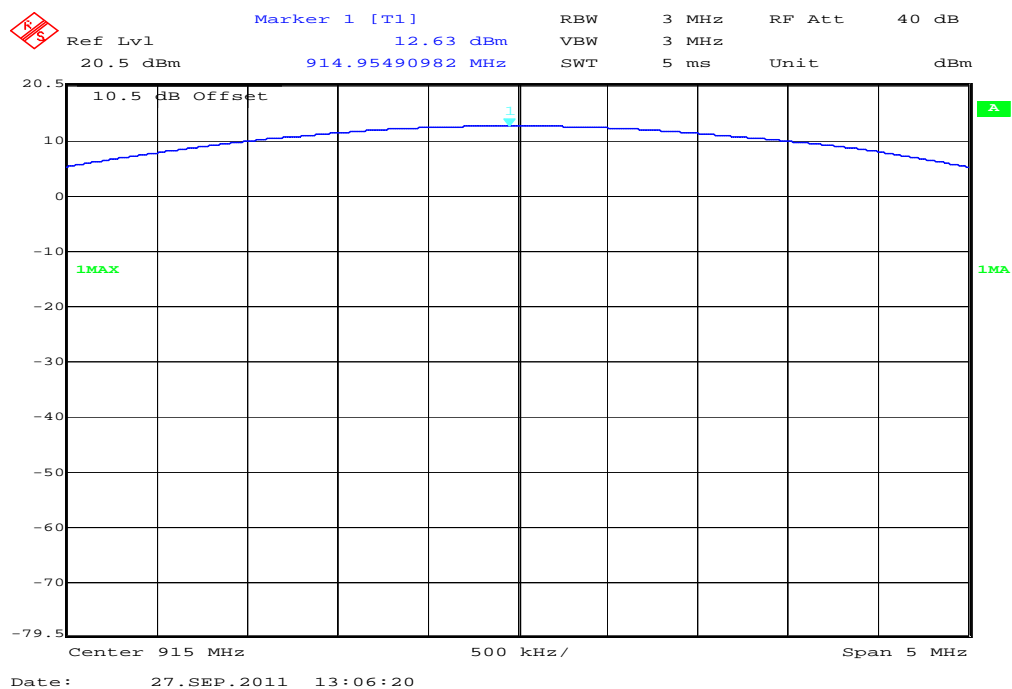
Result: The result of the measurement is passed.

Plots:

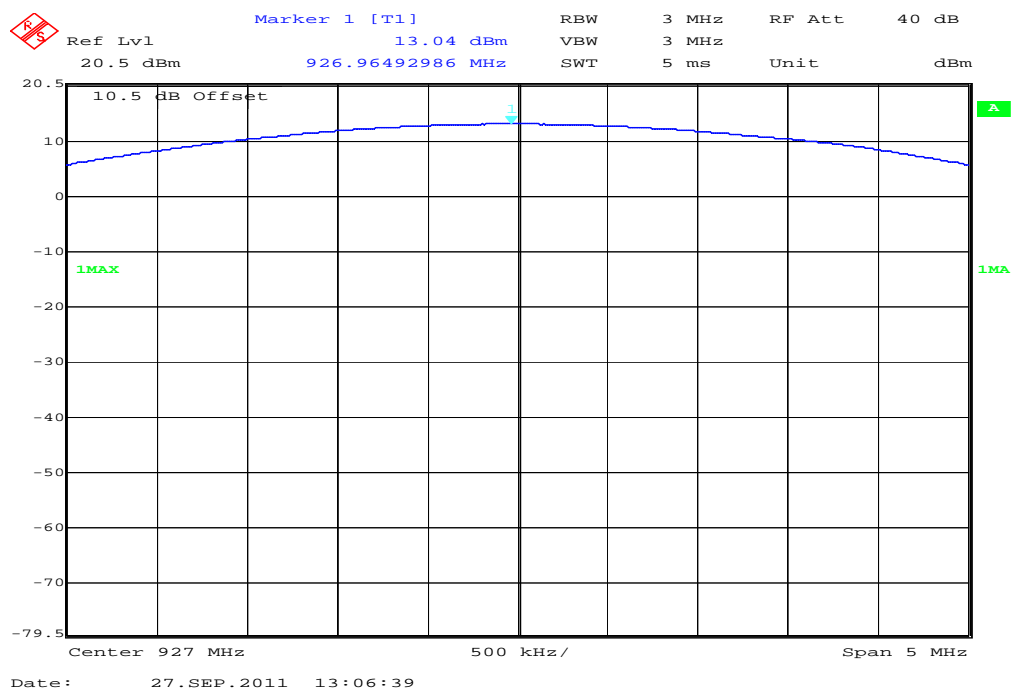
Plot 1: lowest channel



Plot 2: middle channel



Plot 3: highest channel



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
CFR Part 15.247 (b)(4)	RSS 210, Issue 8, A 8.4(2)
Antenna Gain	
6 dBi	

Results:

T_{nom}	V_{nom}	lowest channel	middle channel	highest channel
Conducted power [dBm] Measured		12.30	12.63	13.04
Radiated power [dBm] Measured		14.96	14.77	15.35
Gain [dBi] Calculated		2.66	2.14	2.31

Result: The result of the measurement is passed.

9.1 Timing of the transmitter

Measurement:

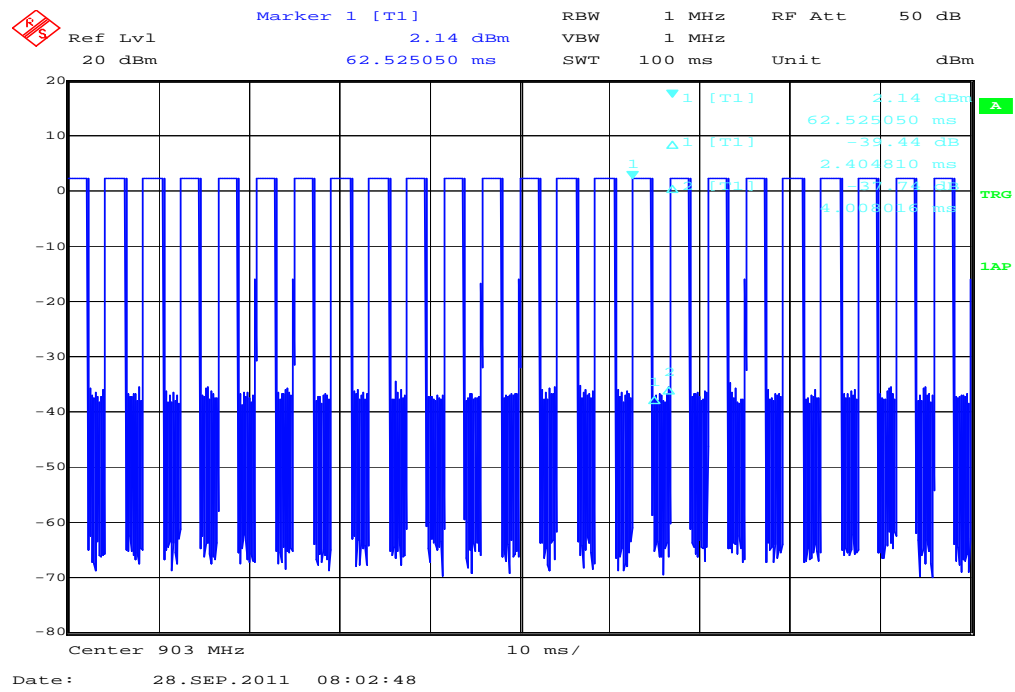
Measurement parameter	
Detector:	Peak
Sweep time:	See plot
Resolution bandwidth:	See plot
Video bandwidth:	See plot
Span:	Zero
Trace-Mode:	Single

Limits:

FCC	IC
CFR 15.35 (c)	RSS-GEN Issue 3 Section 4.5
Timing of the transmitter	
<p>When the field strength (or envelope power) is not constant or it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train, including blanking intervals within the pulse train, as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 second, the average value of field strength or output power shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.</p> <p>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: Transmit bursts (within 100ms)



Transmit time (Tx on) within 100 ms = 50 ms

The peak-to-average correction factor [dB] is calculated with $20\log [Tx\ on / 100ms]$.

peak-to-average correction factor [dB]: -6.00

Result: The result of the measurement is passed.

9.2 Carrier frequency separation

Description:

Measurement of the carrier frequency separation of a hopping system. The carrier frequency separation is constant for all modulation-modes. EUT in hopping mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	100 kHz
Resolution bandwidth:	100 kHz
Span:	4 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (a)(1)	RSS 210, Issue 8, A 8.1(b)
Carrier Frequency Separation	
Minimum 25 kHz or the 20 dB bandwidth of the hopping system whichever is greater.	

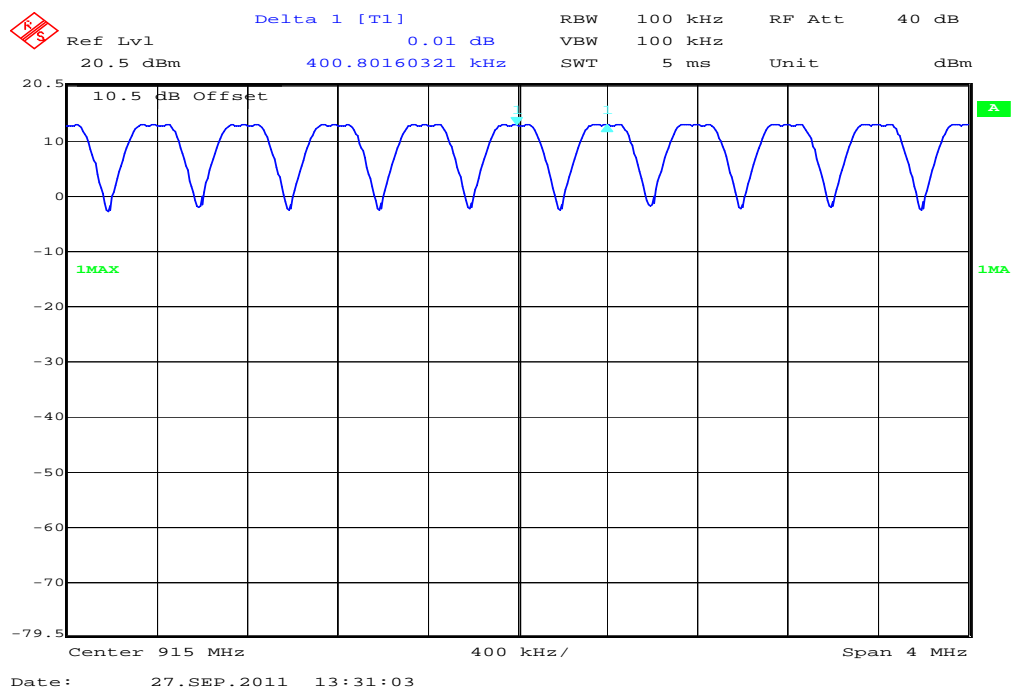
Result:

Carrier frequency separation	400 kHz
------------------------------	---------

Result: The result of the measurement is passed.

Plot:

Plot 1: Carrier frequency separation



9.3 Number of hopping channels

Description:

Measurement of the total number of used hopping channels. The number of hopping channels is constant for all modulation-modes. We use GFSK-modulation to show compliance. EUT in hopping mode.

Measurement:

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Video bandwidth:	500 kHz
Resolution bandwidth:	500 kHz
Span:	Plot 1: 900 – 915 MHz Plot 2: 915 – 930 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (a)(1)	RSS 210, Issue 8, A 8.1(d)
Number of hopping channels	
At least 15 non overlapping hopping channels	

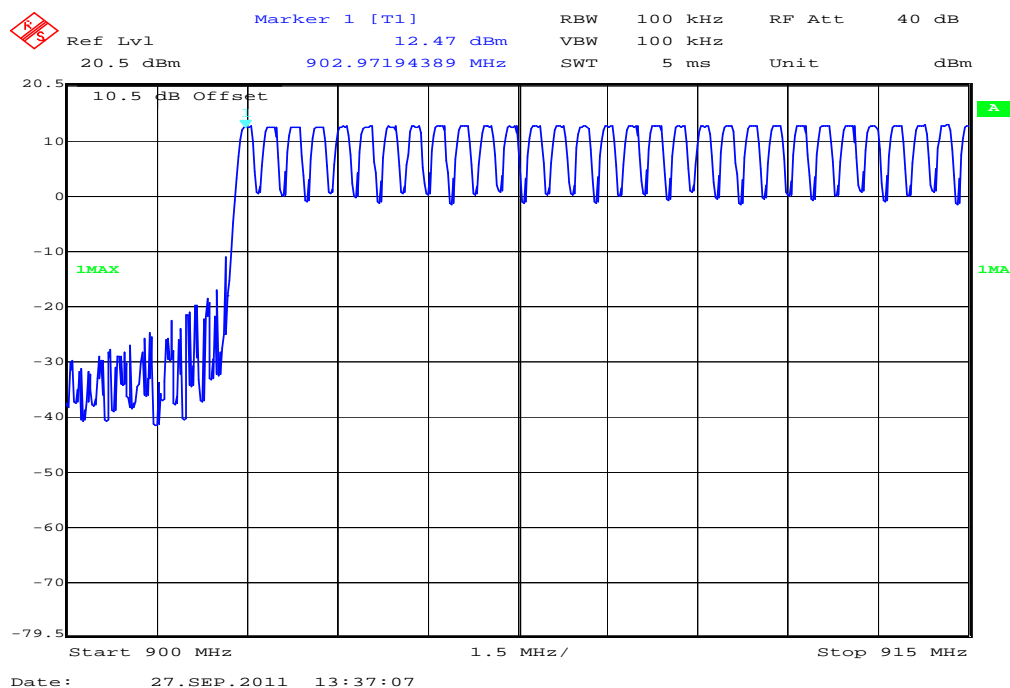
Result:

Number of hopping channels	61
----------------------------	----

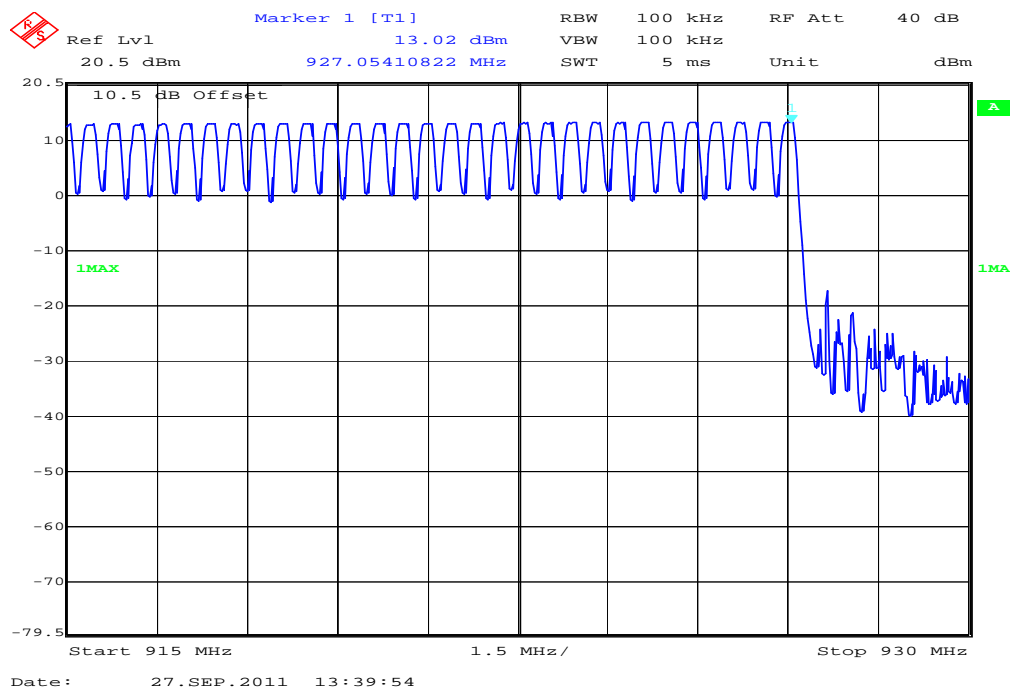
Result: The result of the measurement is passed.

Plots:

Plot 1: Number of hopping channels (GFSK modulation)



Plot 2: Number of hopping channels (GFSK modulation)



9.4 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:	1 kHz
Resolution bandwidth:	1 kHz
Span:	1 MHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247 (a)(1)	RSS 210, Issue 8, A 8.2(a)
Spectrum Bandwidth – 20 dB Bandwidth	
Systems using digital modulation techniques may operate in the 902–928 MHz band. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.	

Results:

Modulation Channel	20 dB BANDWIDTH [kHz]		
	Lowest	Middle	Highest
	204	204	202
Measurement uncertainty	± 1 kHz		

Result: The result of the measurement is passed.

Plot 3: highest channel



9.5 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 25 GHz
Trace-Mode:	Max Hold

Limits:

FCC	IC
CFR Part 15.247(d)	RSS 210, Issue 8, A 8.5
TX Spurious Emissions Conducted	
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	

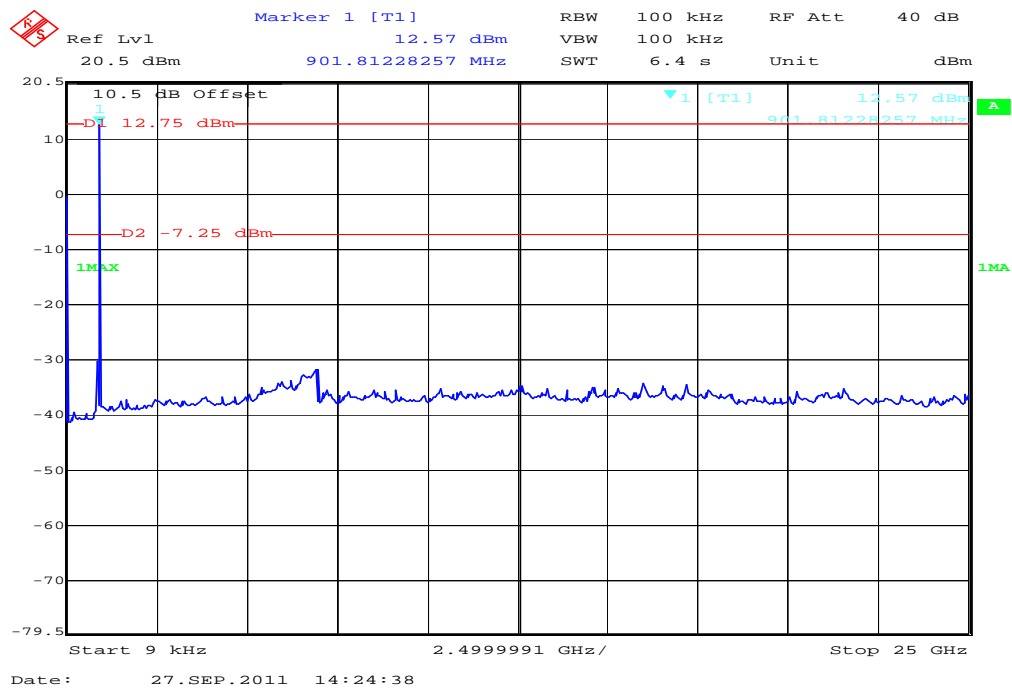
Results:

TX Spurious Emissions Conducted					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
Low			30 dBm		Operating frequency
No critical peaks found			-20 dBc		complies
Middle			30 dBm		Operating frequency
No critical peaks found			-20 dBc		complies
High			30 dBm		Operating frequency
No critical peaks found			-20 dBc		complies
Measurement uncertainty		± 3 dB			

Result: The result of the measurement is passed.

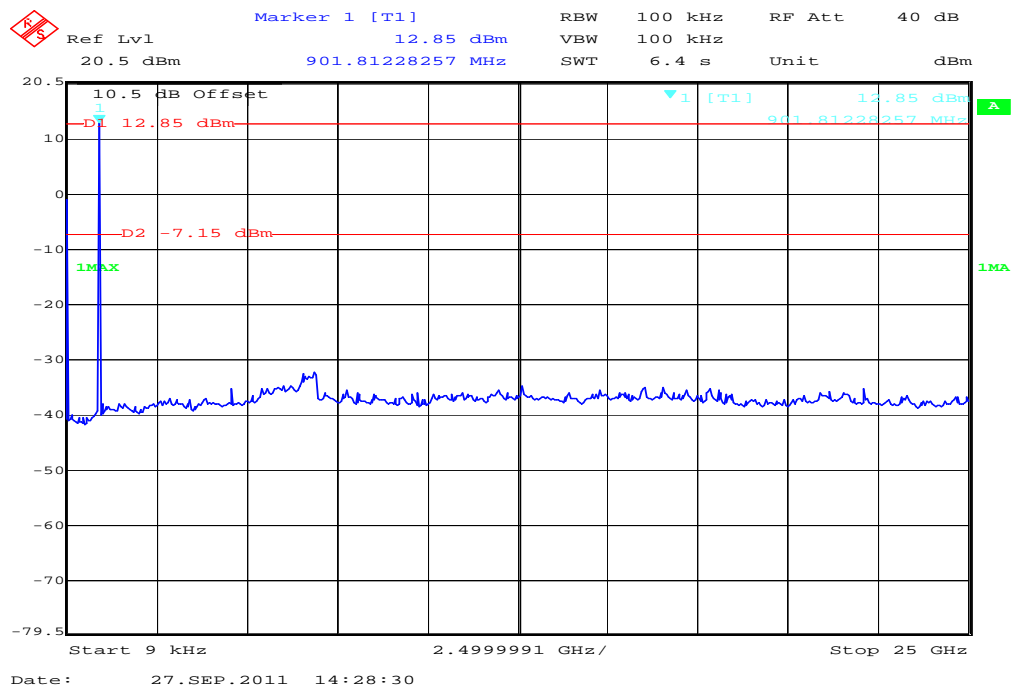
Plots:

Plot 1: lowest channel



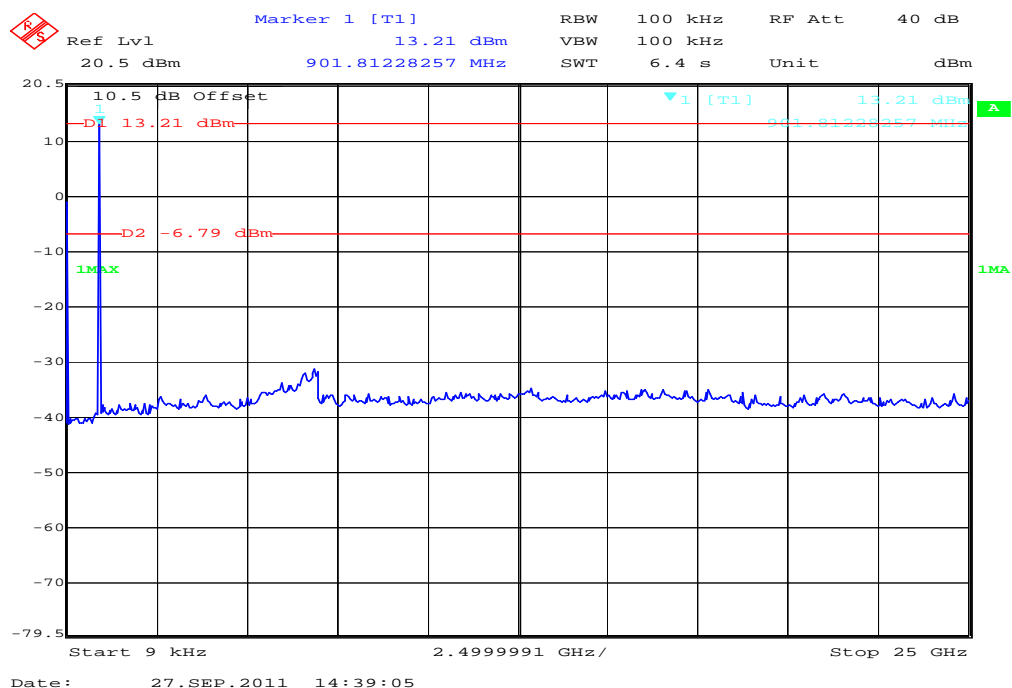
The peak at the beginning of the plot is the LO from the SA

Plot 2: middle channel



The peak at the beginning of the plot is the LO from the SA

Plot 3: highest channel



The peak at the beginning of the plot is the LO from the SA

9.6 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	
CFR Part 15.247(d)	RSS 210, Issue 8, A 8.5	
TX Spurious Emissions Radiated		
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)).		
§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 [dB μ V/m]								
Lowest			Middle			Highest		
F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]	F [MHz]	Detector	Level [dB μ V/m]
1016	AV*	34.70	1830	AV*	44.20	1159	AV*	36.40
1806	AV*	42.70	2745	AV*	44.90	1854	AV*	47.60
2709	AV*	41.90	3660	AV*	42.20	2781	AV*	46.60
2612	AV*	45.90				3708	AV*	43.10
Measurement uncertainty			± 3 dB					

*AV = 1 MHz / 10 Hz

Result: The result of the measurement is passed.

Plots:**Plot 1: Lowest channel, 30 MHz to 1 GHz, vertical & horizontal polarization****Common Information**

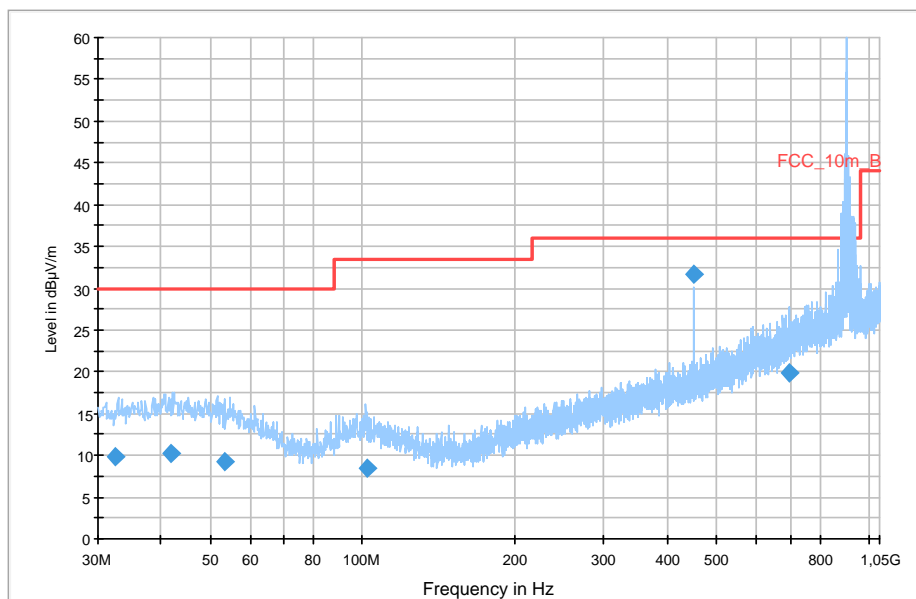
EUT:	RT2e
Serial Number:	unknown
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	TX903MHz
Operator Name:	Wolsdorfer
Comment:	battery powered; emissions in the area of 900 to 930 MHz are caused by the carrier

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Receiver:	[ESCI 3]
Level Unit:	dB μ V/m

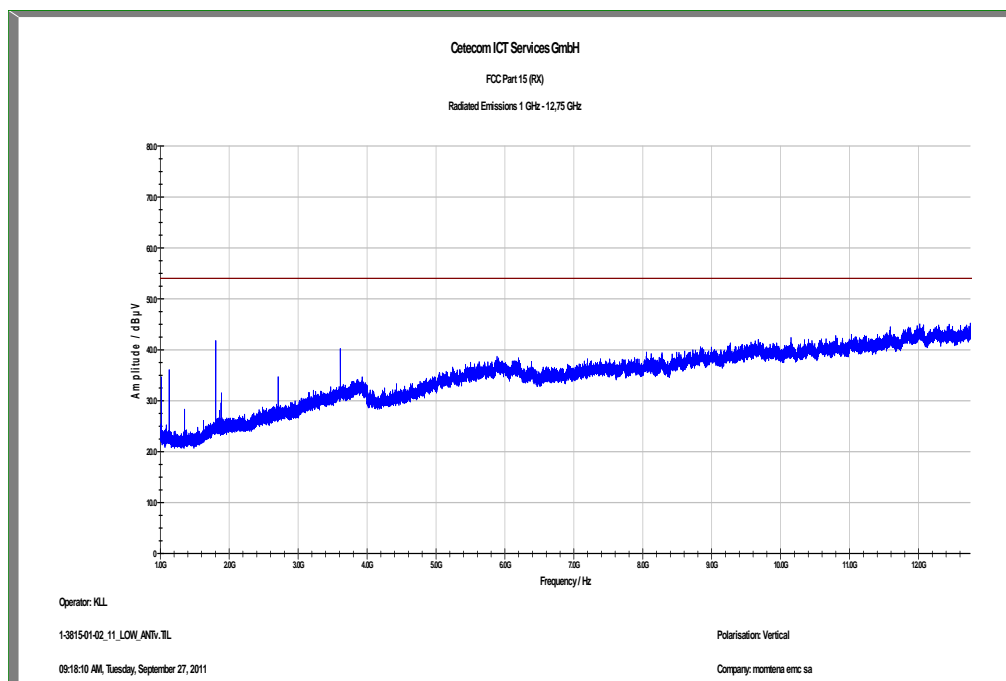
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

FCC_10m(B)_3

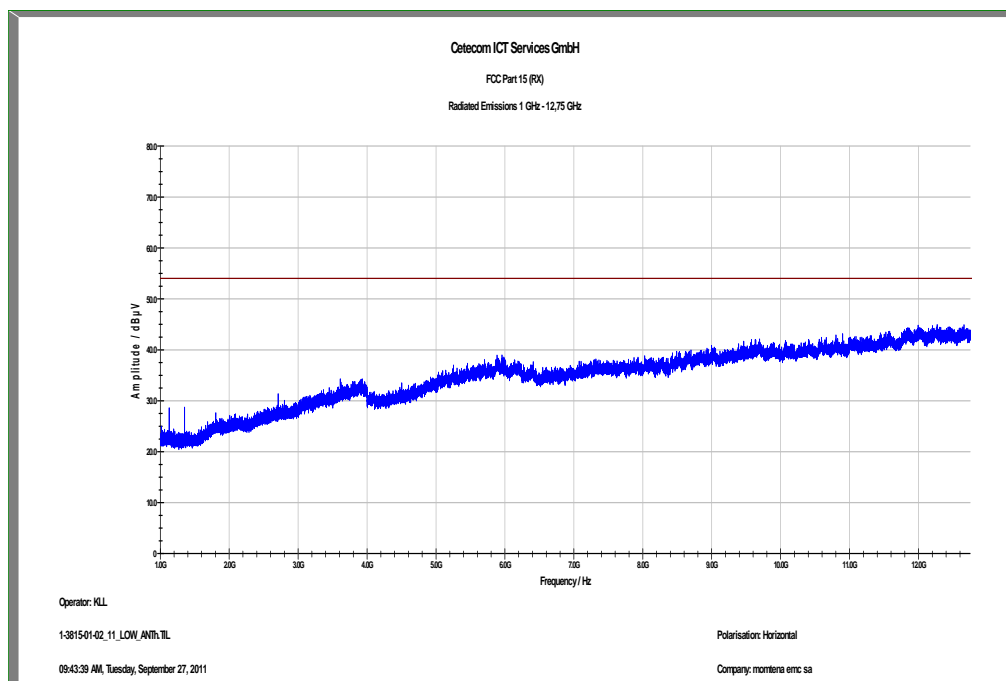
**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
32.389350	9.8	1000.0	120.000	123.0	H	259.0	12.8	20.2	30.0	
41.938350	10.2	1000.0	120.000	113.0	V	170.0	13.4	19.8	30.0	
53.443500	9.3	1000.0	120.000	170.0	H	8.0	13.0	20.7	30.0	
102.118350	8.5	1000.0	120.000	104.0	V	284.0	11.7	25.0	33.5	
451.485300	31.6	1000.0	120.000	98.0	V	-7.0	17.7	4.4	36.0	
695.414850	19.9	1000.0	120.000	120.0	V	8.0	22.4	16.1	36.0	

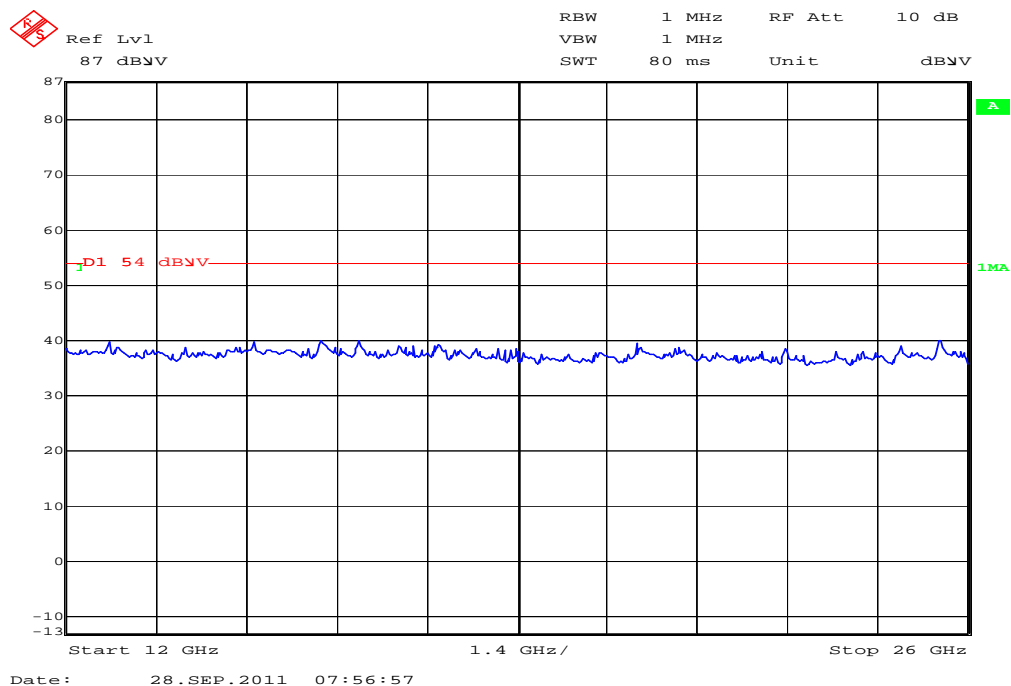
Plot 2: 1 GHz to 12.75 GHz, vertical polarization



Plot 3: Lowest channel, 1 GHz to 12.75 GHz, horizontal polarization



Plot 4: Lowest channel, 12 GHz to 25 GHz (valid for all channels)



Plot 5: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

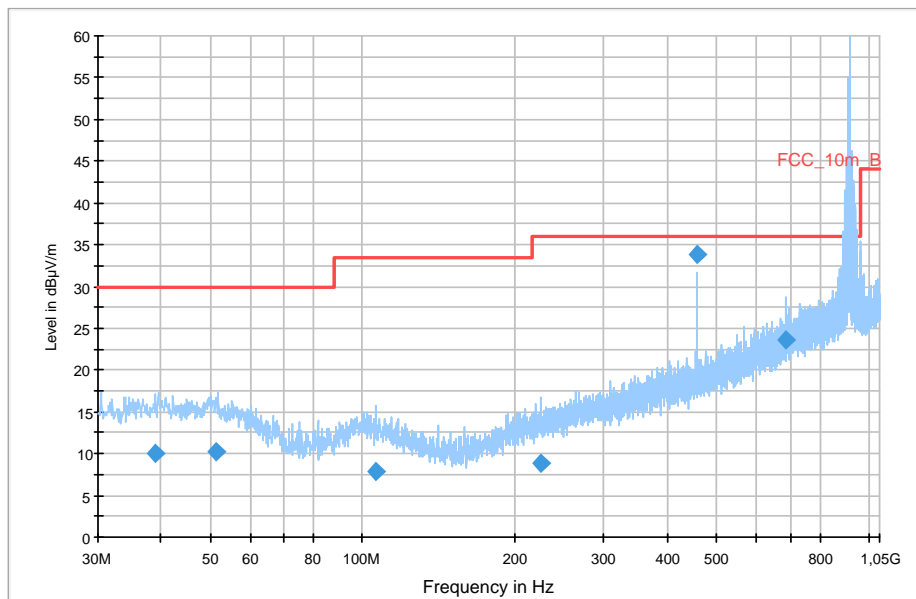
EUT: RT2e
 Serial Number: unknown
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX915MHz
 Operator Name: Wolsdorfer
 Comment: battery powered; emissions in the area of 900 to 930 MHz are caused by the carrier

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

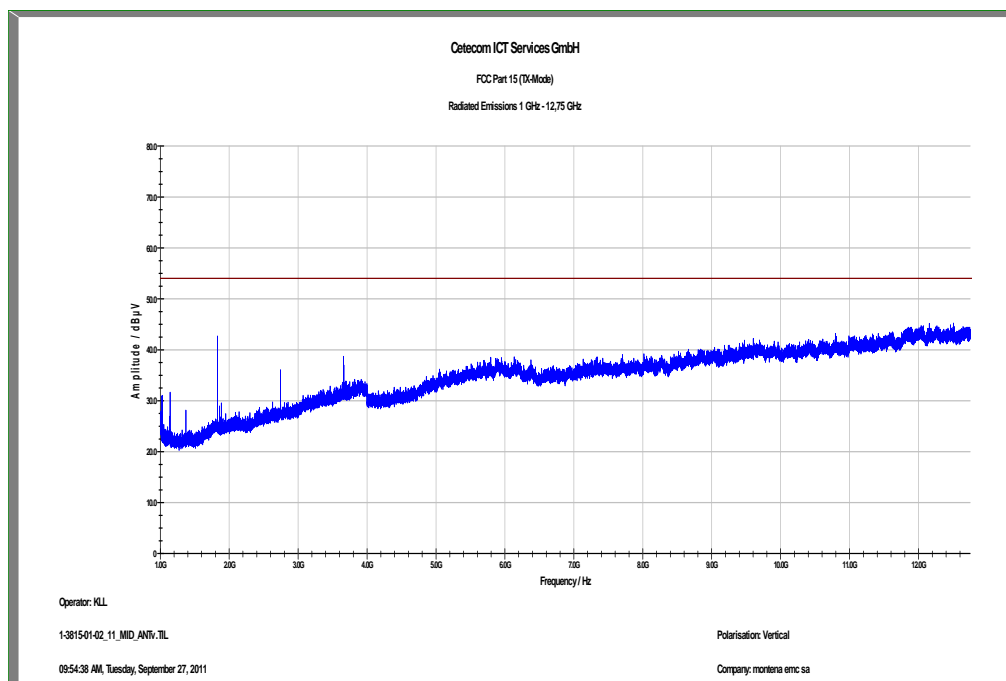
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

FCC_10m(B)_3

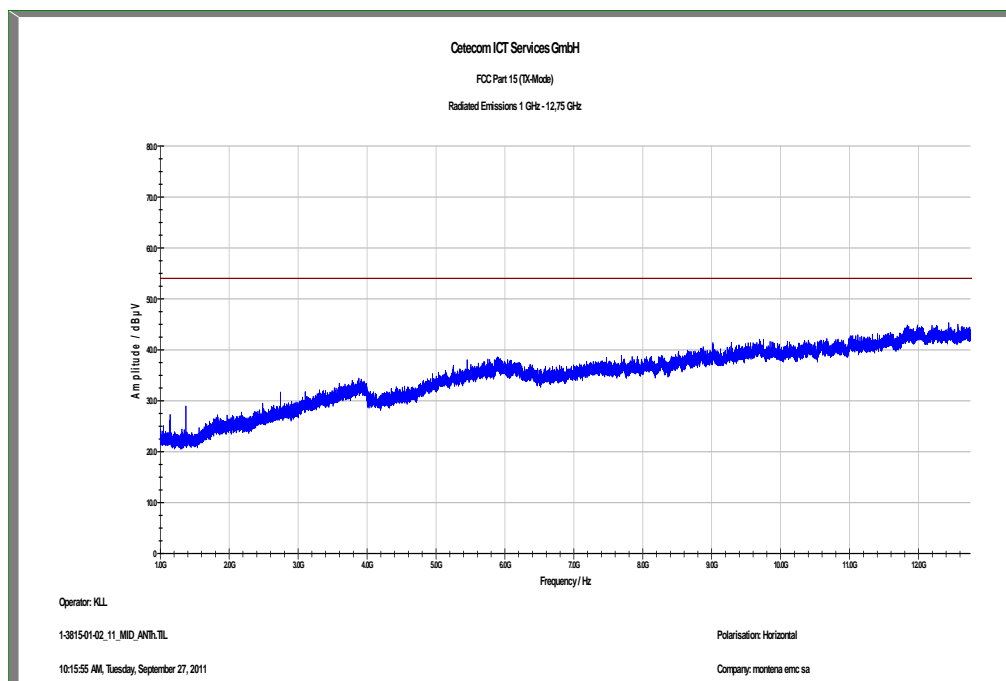
**Final Result 1**

Frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
39.044850	9.9	1000.0	120.000	170.0	H	82.0	13.4	20.1	30.0	
51.529050	10.3	1000.0	120.000	98.0	H	8.0	13.2	19.7	30.0	
105.885750	8.0	1000.0	120.000	113.0	V	185.0	11.4	25.5	33.5	
224.228400	8.8	1000.0	120.000	120.0	H	8.0	12.5	27.2	36.0	
457.528800	33.9	1000.0	120.000	98.0	V	8.0	17.8	2.1	36.0	
686.178750	23.5	1000.0	120.000	156.0	H	82.0	22.1	12.5	36.0	

Plot 6: Middle channel, 1 GHz to 12.75 GHz, vertical polarization



Plot 7: Middle channel, 1 GHz to 12.75 GHz, horizontal polarization



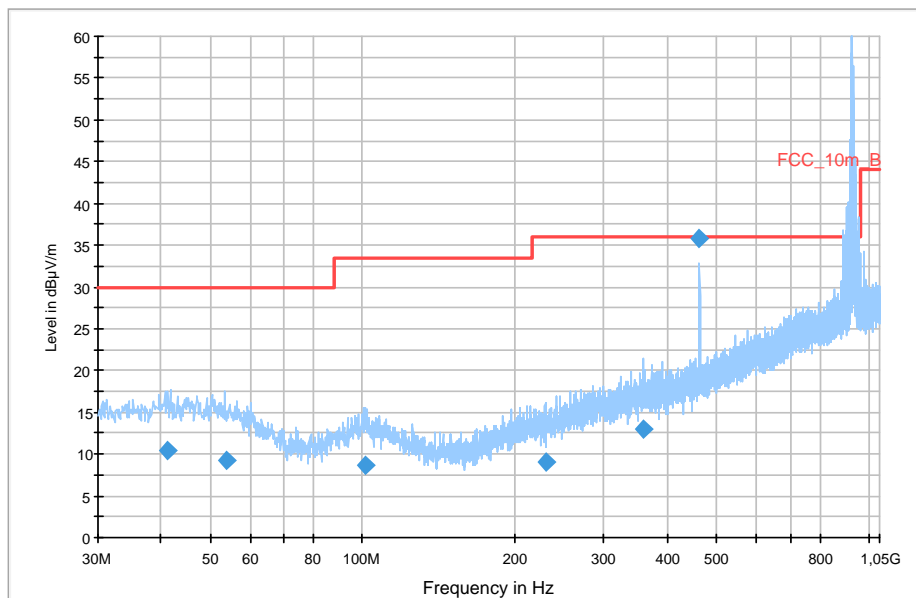
Plot 8: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

EUT: RT2e
 Serial Number: unknown
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: TX927MHz
 Operator Name: Wolsdorfer
 Comment: battery powered; emissions in the area of 900 to 930 MHz are caused by the carrier

Scan Setup: STAN_Fin [EMI radiated]

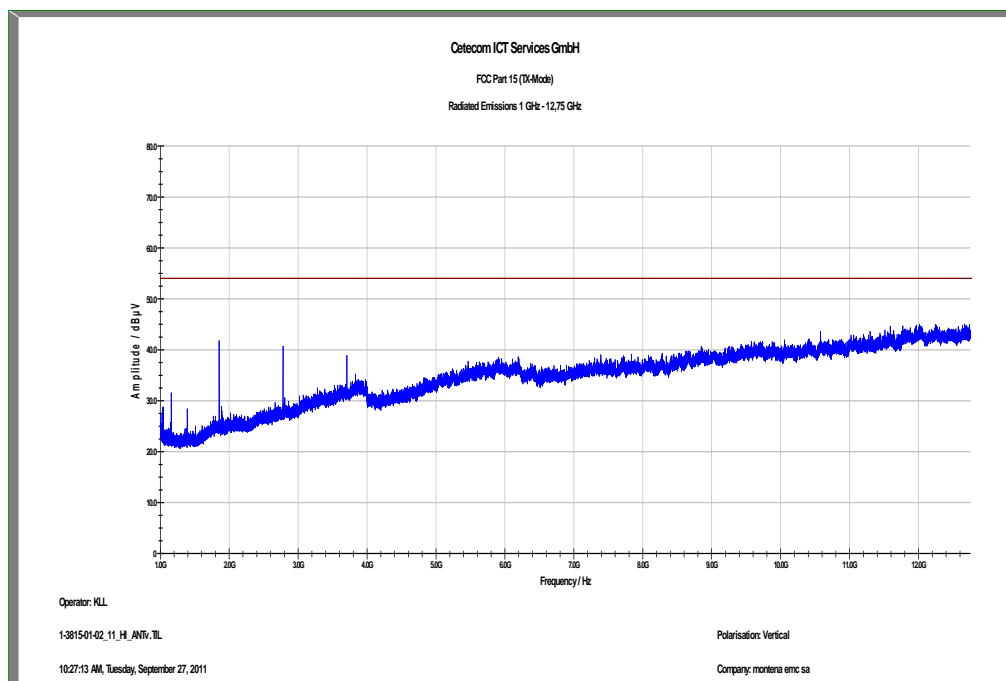
Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dBμV/m
Subrange **Step Size** **Detectors** **IF BW** **Meas. Time** **Preamp**
 30 MHz - 2 GHz 60 kHz QPK 120 kHz 1 s 20 dB

FCC_10m(B)_3

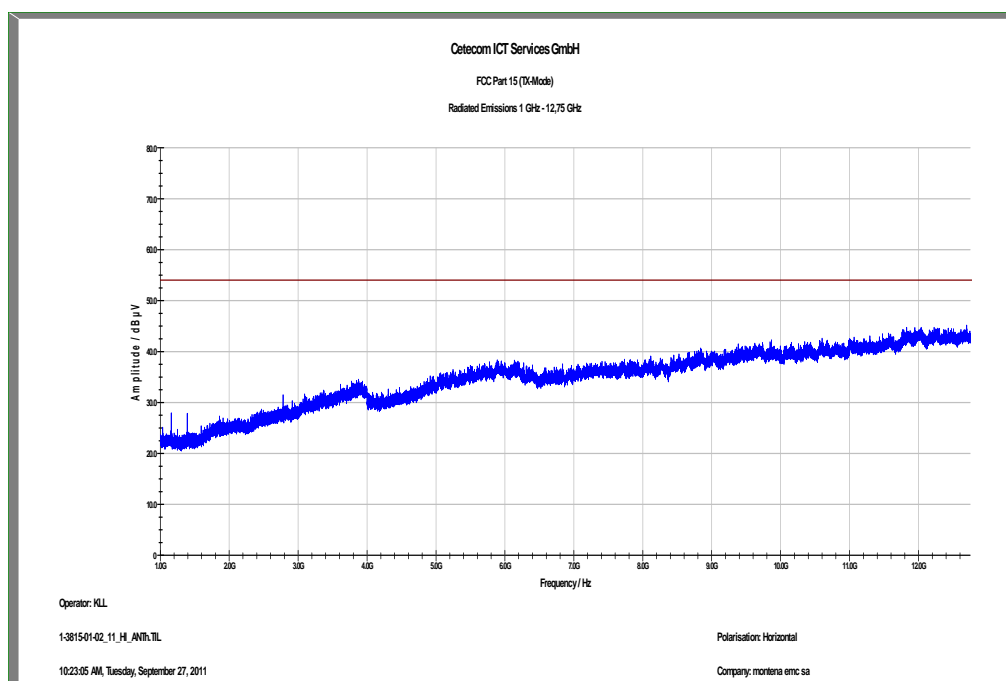
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
41.151150	10.5	1000.0	120.000	114.0	H	106.0	13.4	19.5	30.0	
53.889600	9.3	1000.0	120.000	105.0	H	261.0	13.0	20.7	30.0	
101.636400	8.7	1000.0	120.000	98.0	V	172.0	11.8	24.8	33.5	
230.613600	9.0	1000.0	120.000	162.0	H	284.0	12.7	27.0	36.0	
358.983000	13.0	1000.0	120.000	170.0	V	285.0	16.2	23.0	36.0	
463.468200	35.9	1000.0	120.000	98.0	V	12.0	17.9	-0.1	36.0	

Plot 9: Highest channel, 1 GHz to 12.75 GHz, vertical polarization



Plot 10: Highest channel, 1 GHz to 12.75 GHz, horizontal polarization



9.7 RX spurious emissions radiated

Description:

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

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
CFR Part 15.109		RSS Gen, Issue 2, 4.10
RX Spurious Emissions Radiated		
Frequency (MHz)	Field Strength (dB μ V/m)	Measurement distance
30 - 88	30.0	10
88 – 216	33.5	10
216 – 960	36.0	10
Above 960	54.0	3

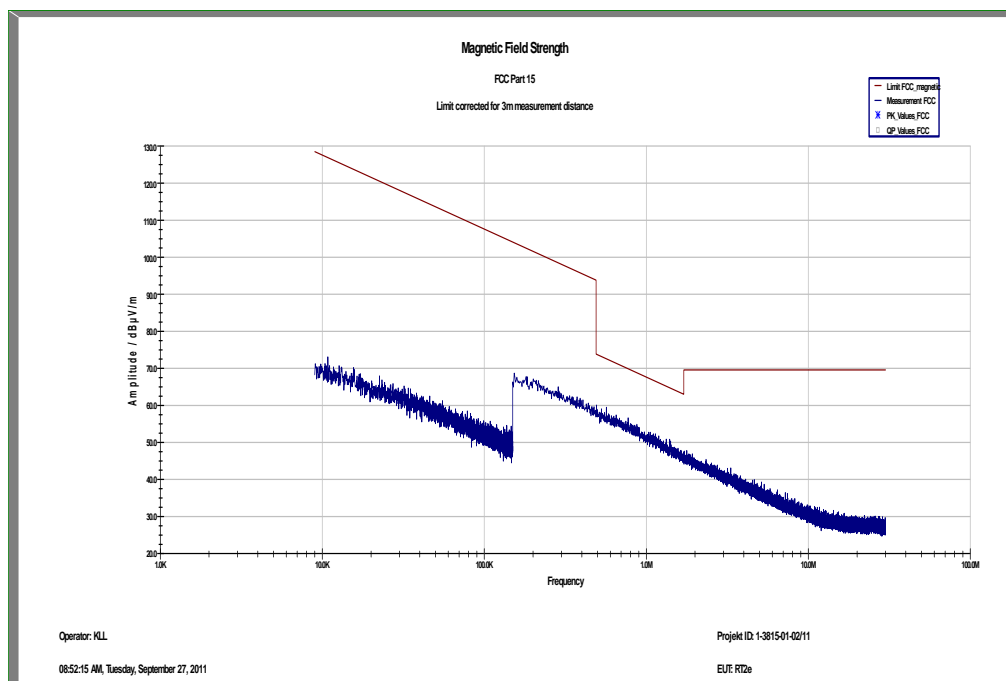
Results:

RX Spurious Emissions Radiated [dB μ V/m]		
F [MHz]	Detector	Level [dB μ V/m]
No critical peaks found		
Measurement uncertainty	± 3 dB	

Result: The result of the measurement is passed.

Plots: RX / Idle – mode

Plot 1: 9 kHz to 30 MHz



Plot 2: 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

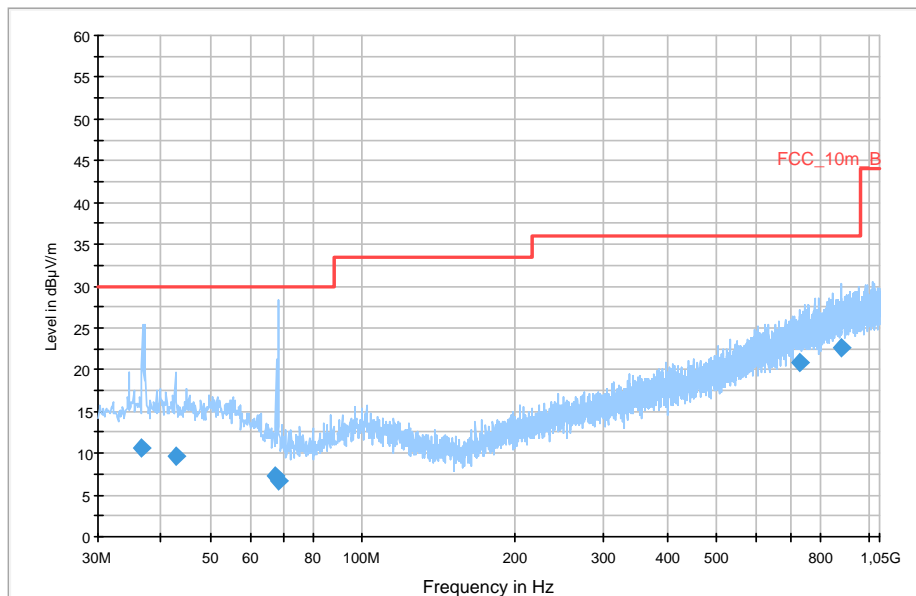
EUT: RT2e
 Serial Number: unknown
 Test Description: FCC part 15 class B @ 10 m
 Operating Conditions: RX
 Operator Name: Wolsdorfer
 Comment: battery powered;

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup: Electric Field (NOS)
 Receiver: [ESCI 3]
 Level Unit: dB μ V/m

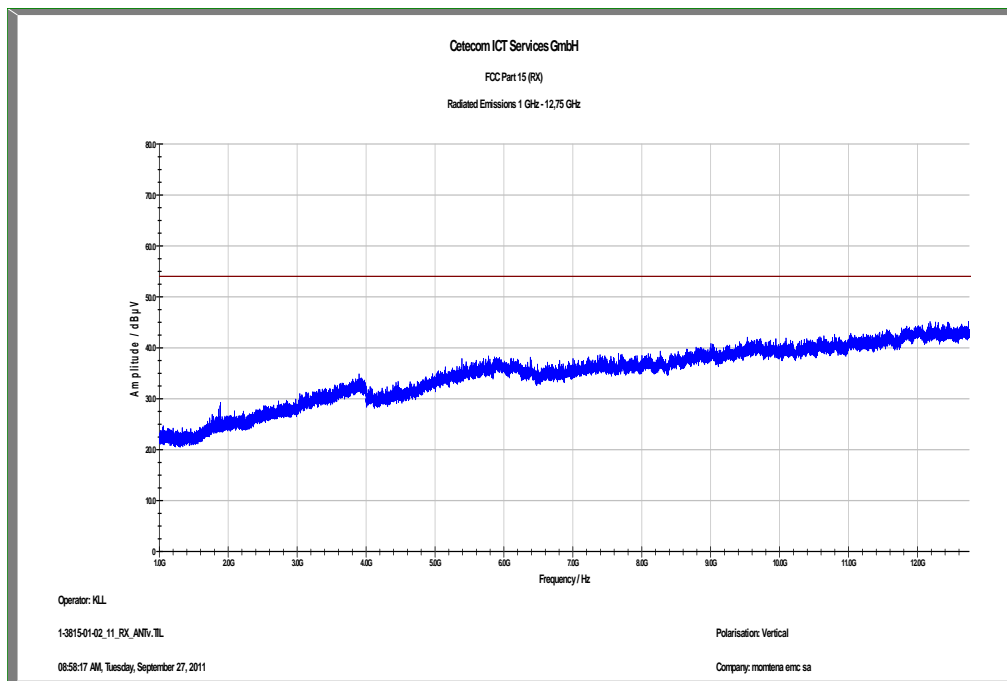
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
30 MHz - 2 GHz	60 kHz	QPK	120 kHz	1 s	20 dB

FCC_10m(B)_3

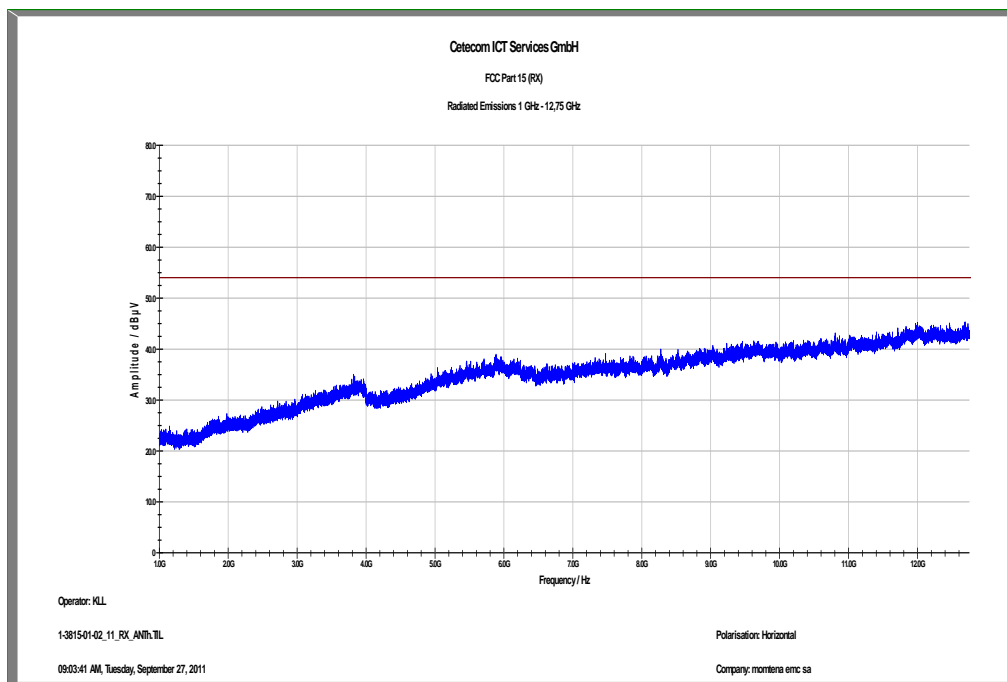
**Final Result 1**

frequency (MHz)	QuasiPeak (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dB μ V/m)	Comment
36.469200	10.6	1000.0	120.000	170.0	V	8.0	13.2	19.4	30.0	
42.892500	9.6	1000.0	120.000	170.0	V	106.0	13.3	20.4	30.0	
66.979200	7.2	1000.0	120.000	144.0	V	285.0	10.0	22.8	30.0	
68.126100	6.7	1000.0	120.000	106.0	V	286.0	9.7	23.3	30.0	
731.442750	20.8	1000.0	120.000	170.0	V	0.0	23.2	15.2	36.0	
883.985700	22.6	1000.0	120.000	144.0	H	-7.0	25.0	13.4	36.0	

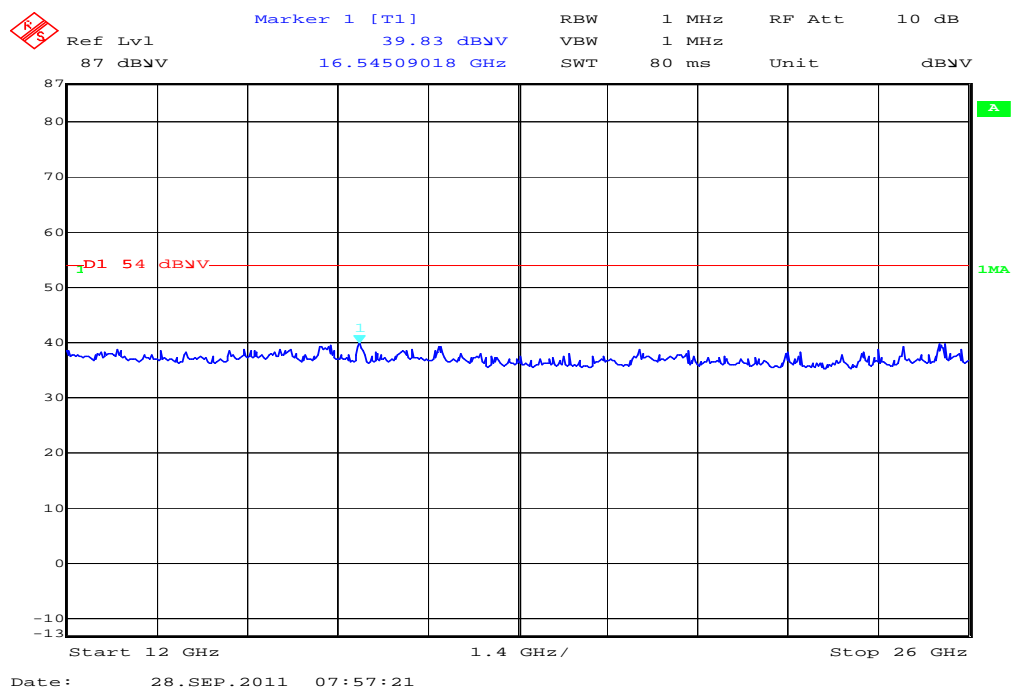
Plot 3: 1 GHz to 12.75 GHz, vertical polarization



Plot 4: 1 GHz to 12.75 GHz, horizontal polarization



Plot 5: 12 GHz to 25 GHz



9.8 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

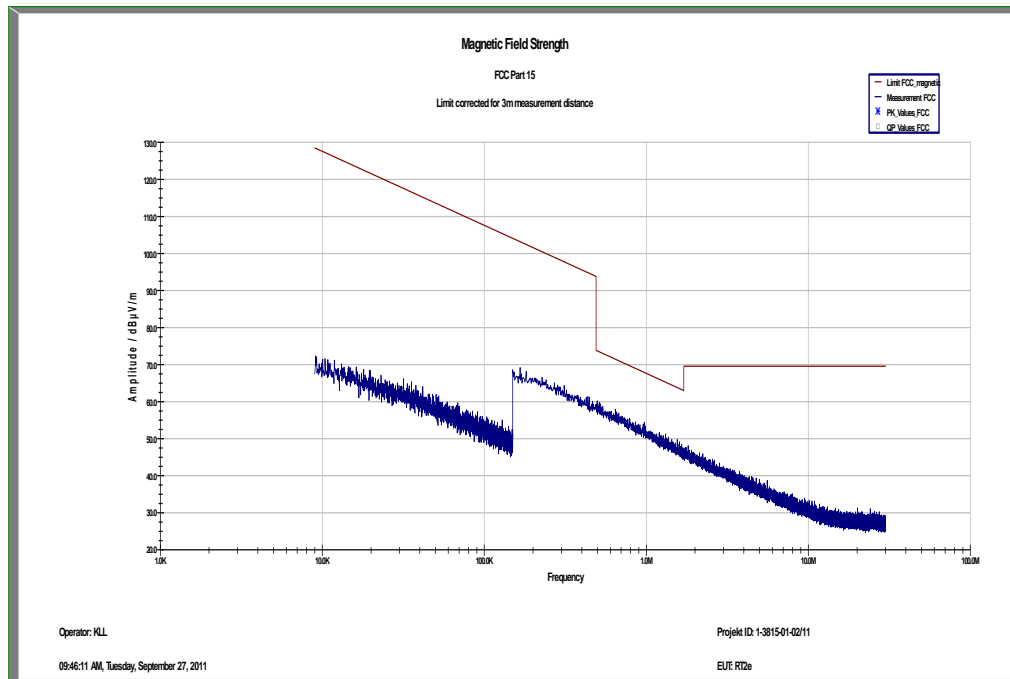
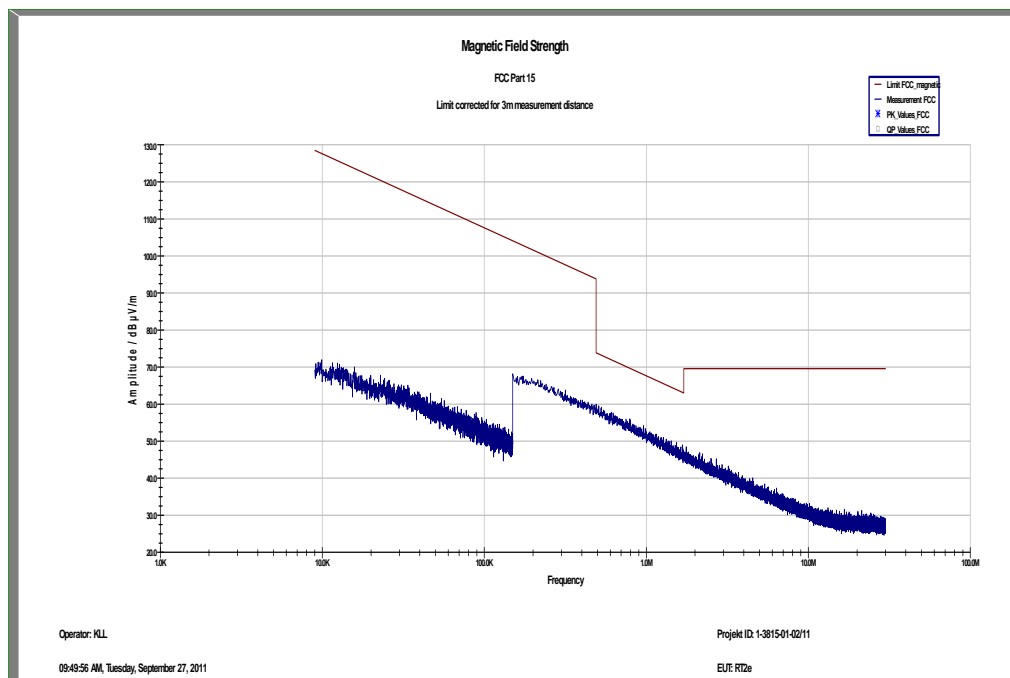
Limits:

FCC		IC
CFR Part 15.209(a)		RSS –Gen
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

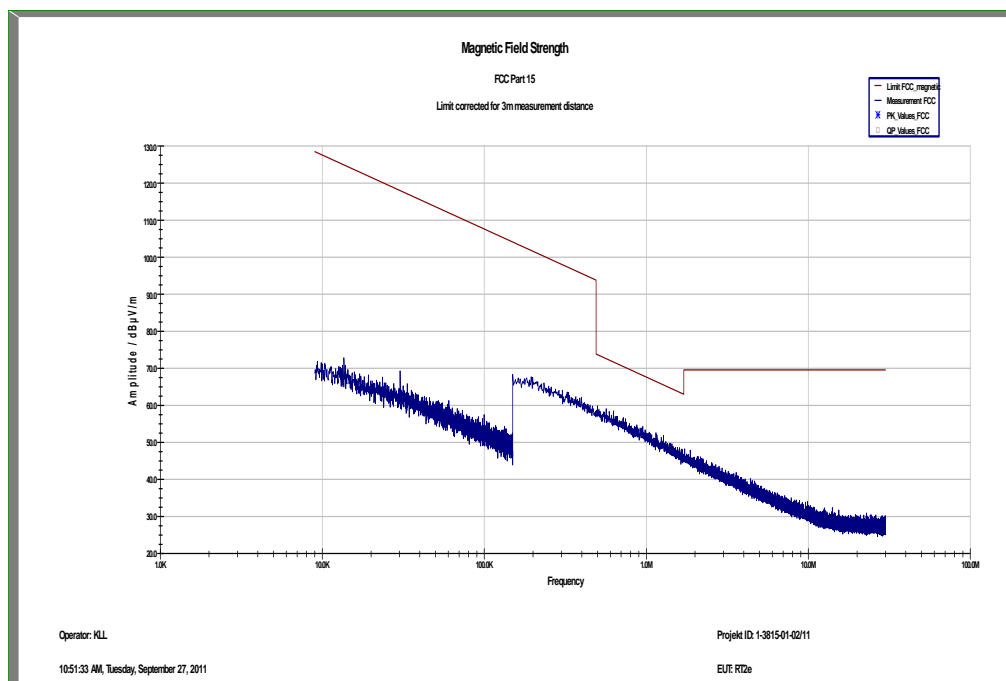
Results:

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

Result: The result of the measurement is passed.

Plots:**Plot 1: 9 kHz to 30 MHz (lowest channel)****Plot 2: 9 kHz to 30 MHz (middle channel)**

Plot 3: 9 kHz to 30 MHz (highest channel)



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 (Labor/Item).

No.	Lab / Item	Equipment	Type	Manufact.	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
2	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
3	n. a.	Coaxial Attenuator 30dB/500W	8325	Bird	1530	300001595	ev		
4	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vlKI!	11.05.2011	11.05.2013
5	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
6	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
7	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
8	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
9	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
10	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
11	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
12	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
13	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
14	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
15	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
16	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
17	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
18	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
19	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
20	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
21	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2012
22	n. a.	MXG Microwave Analog Signal Generator	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2012
23	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vlKI!	08.09.2010	08.09.2012
24	n. a.	TRILOG	VULB9163	Schwarzbeck	371	300003854	vlKI!	17.12.2008	17.12.2011

		Broadband Test-Antenna 30 MHz - 3 GHz							
25	19	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	9107-3697	300001605	Ve	19.10.2010	19.10.2012
26	n. a.	Signal Analyzer 20Hz- 26,5GHz-150 to + 30 DBM	FSiQ26	R&S	835111/0004	300002678	Ve	04.11.2010	04.11.2012

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

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:

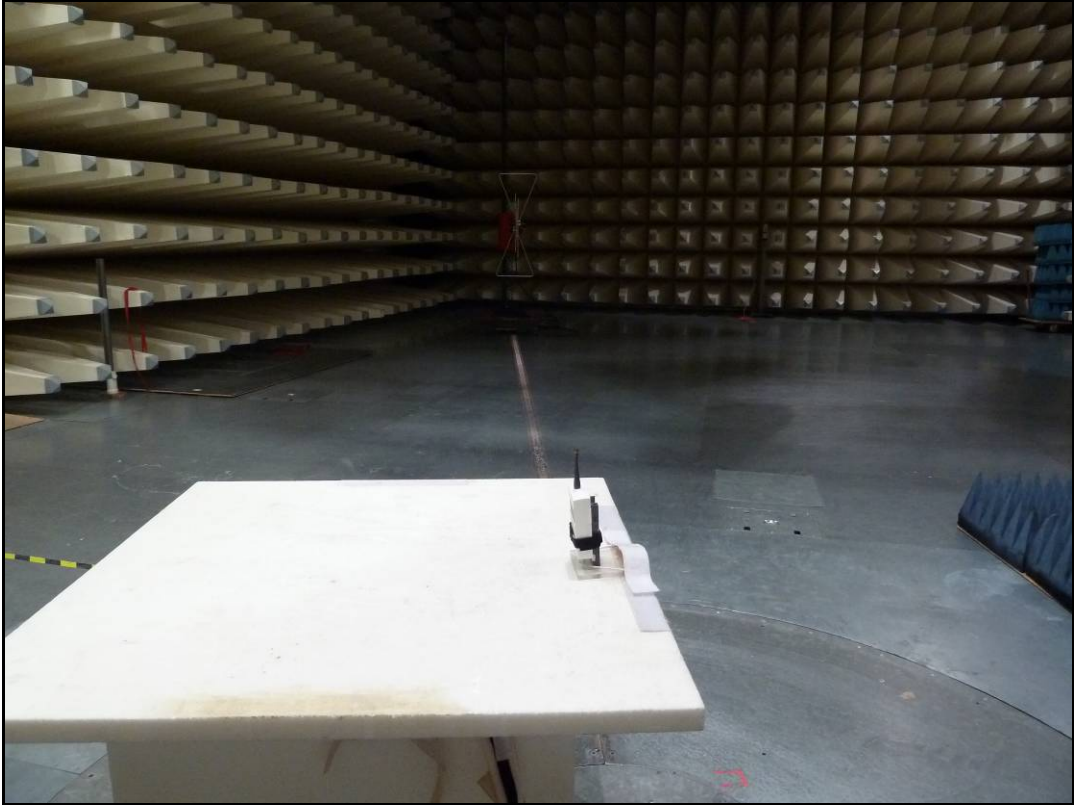
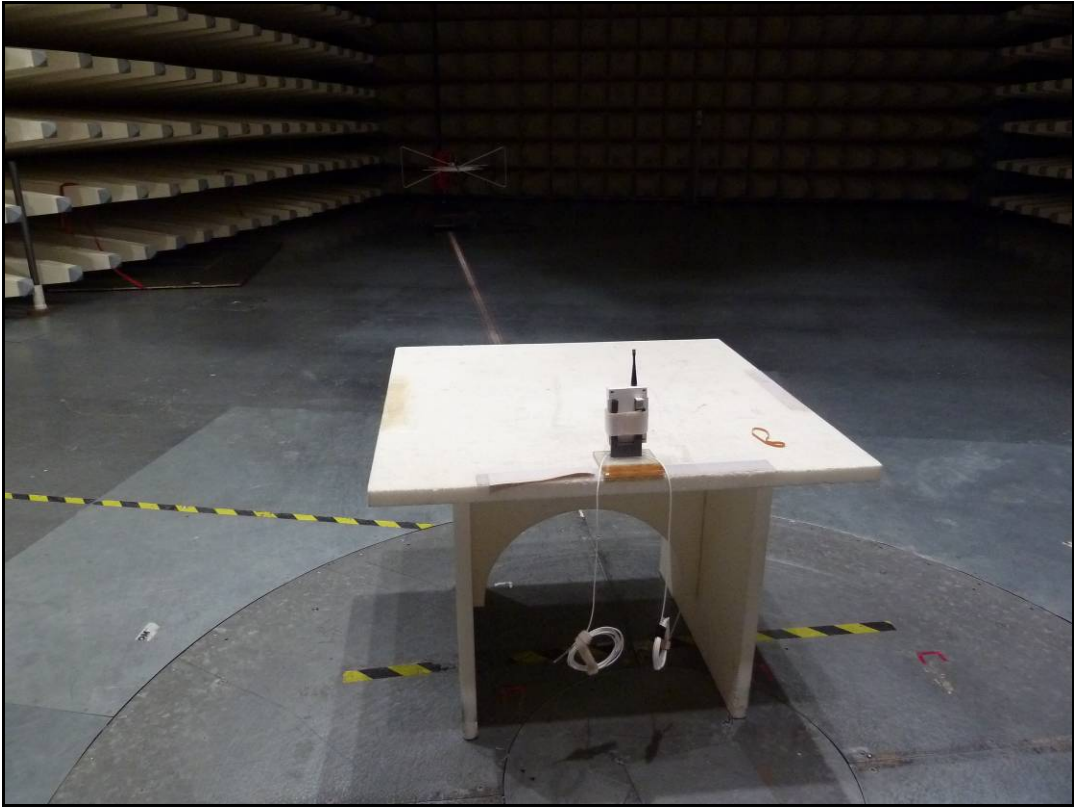


Photo 2:



Annex B External photographs of the EUT

Photo documentation

Photo 3:

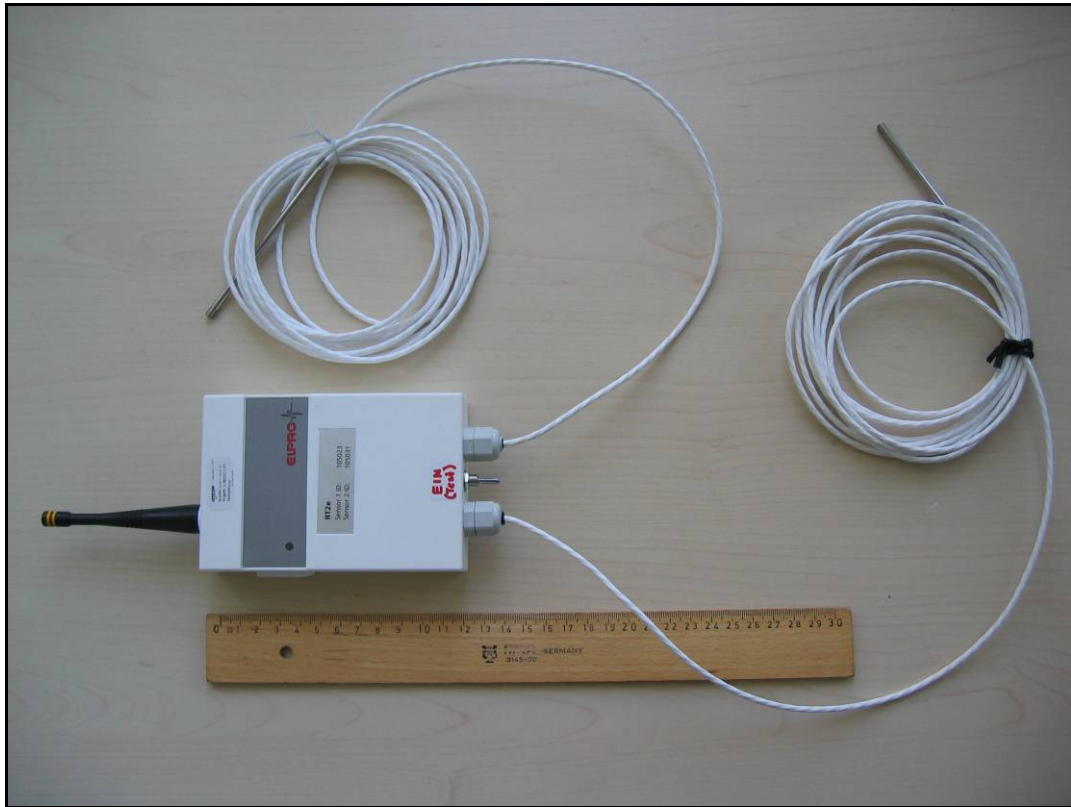


Photo 4:



Photo 5:



Photo 6:



Photo 7:



Photo 8:



Annex C Internal photographs of the EUT

Photo documentation

Photo 9:

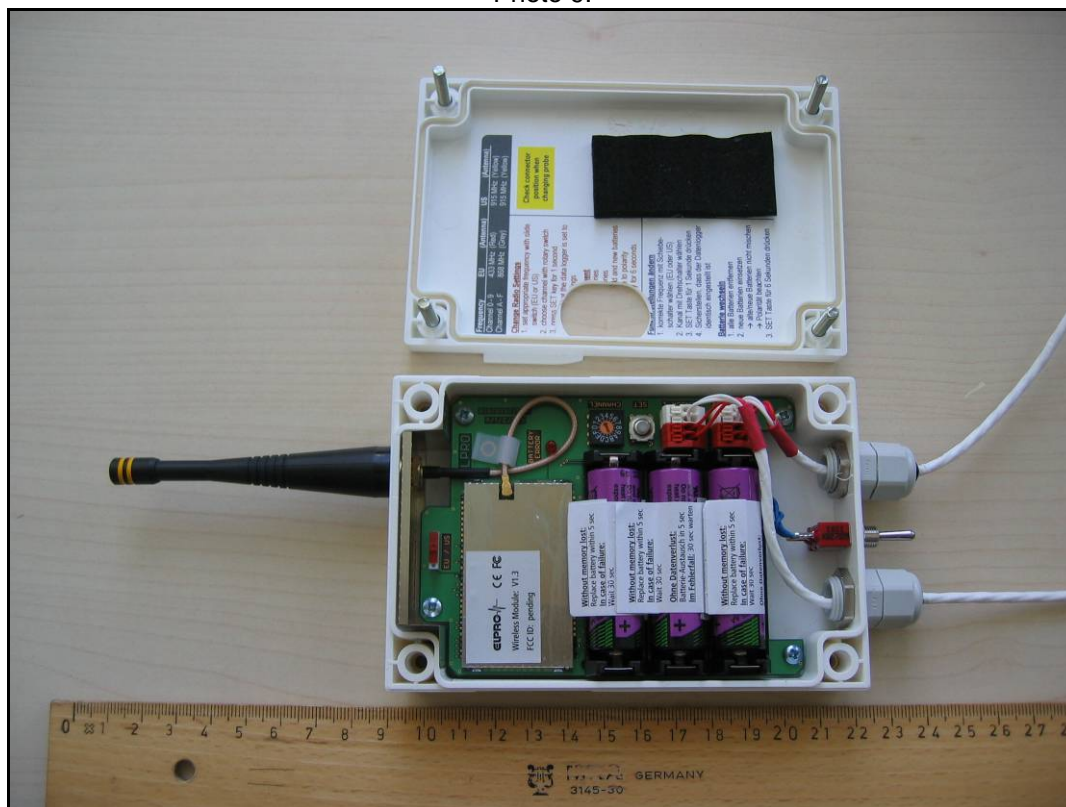


Photo 10:

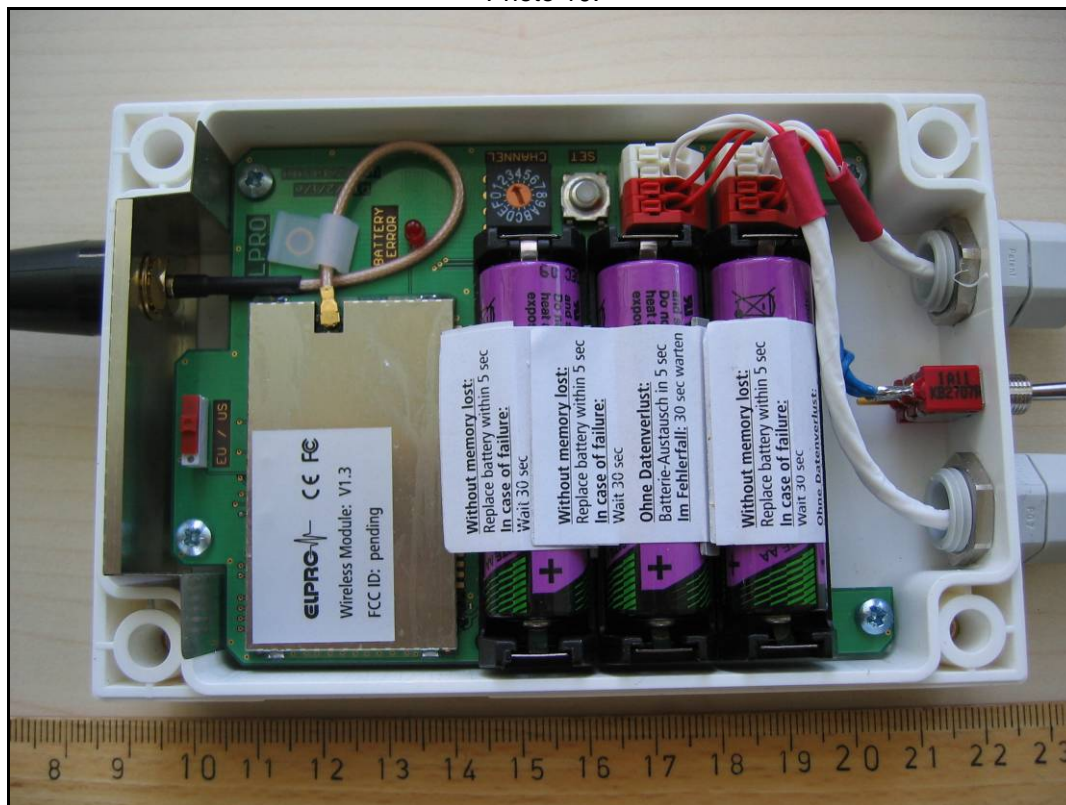


Photo 11:

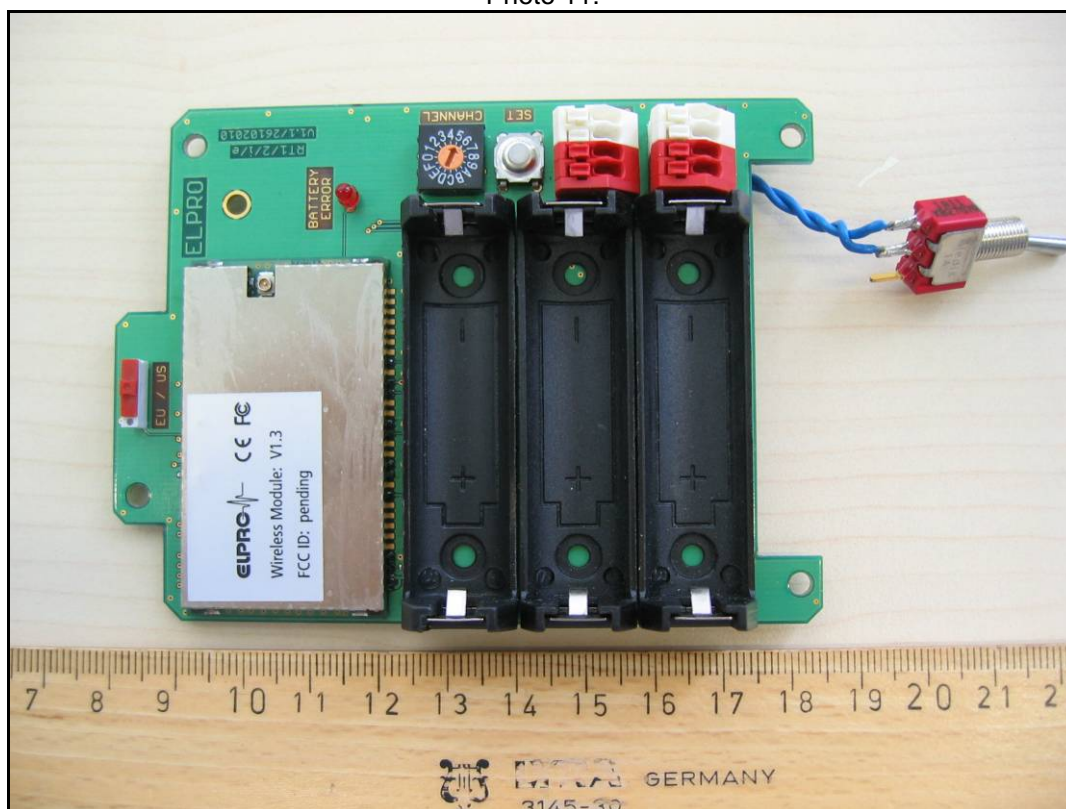


Photo 12:

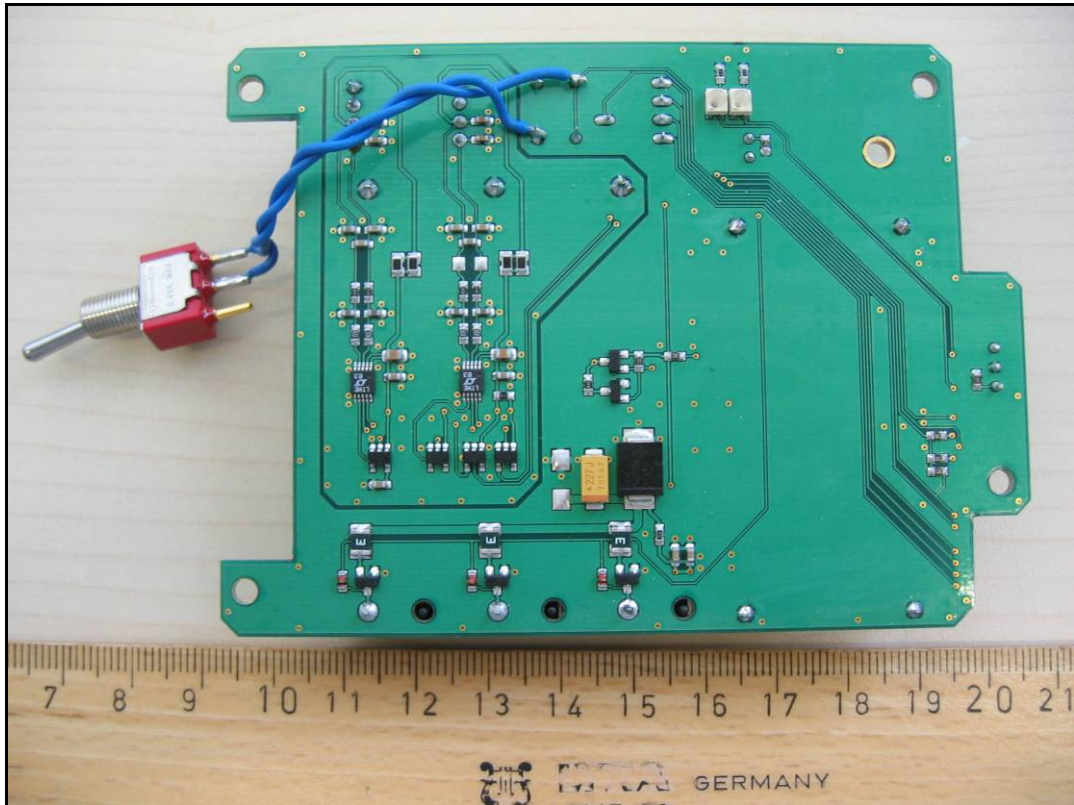


Photo 13:

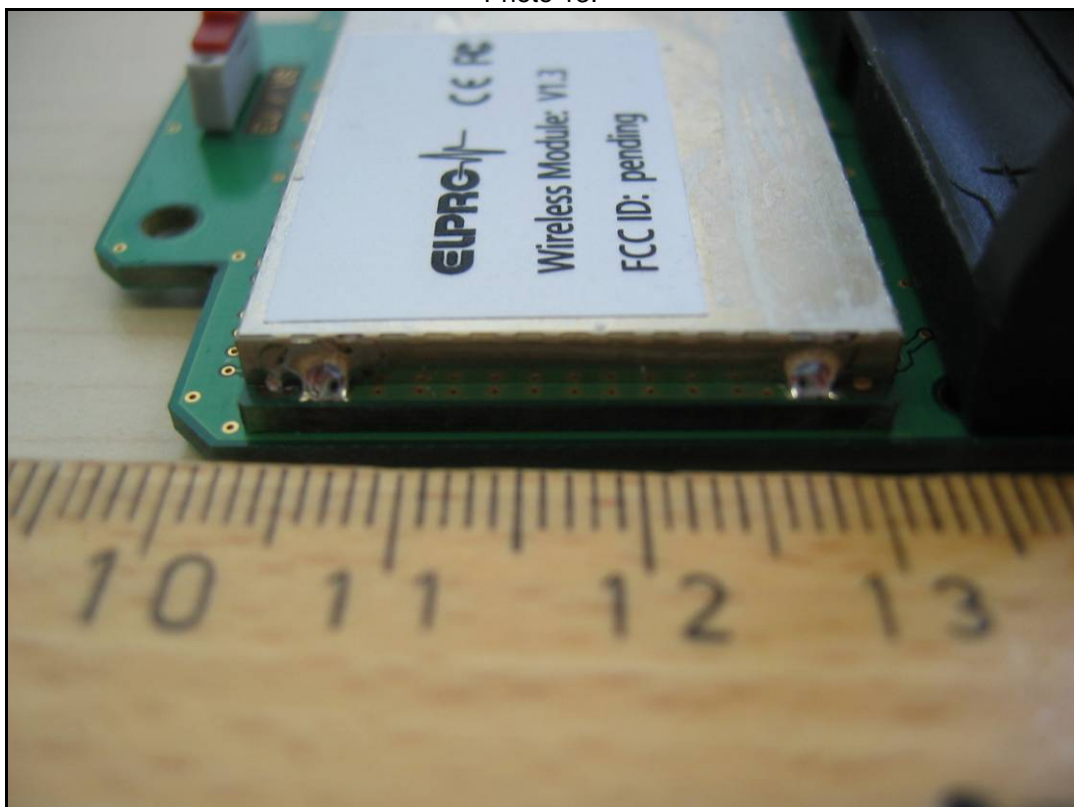


Photo 14:

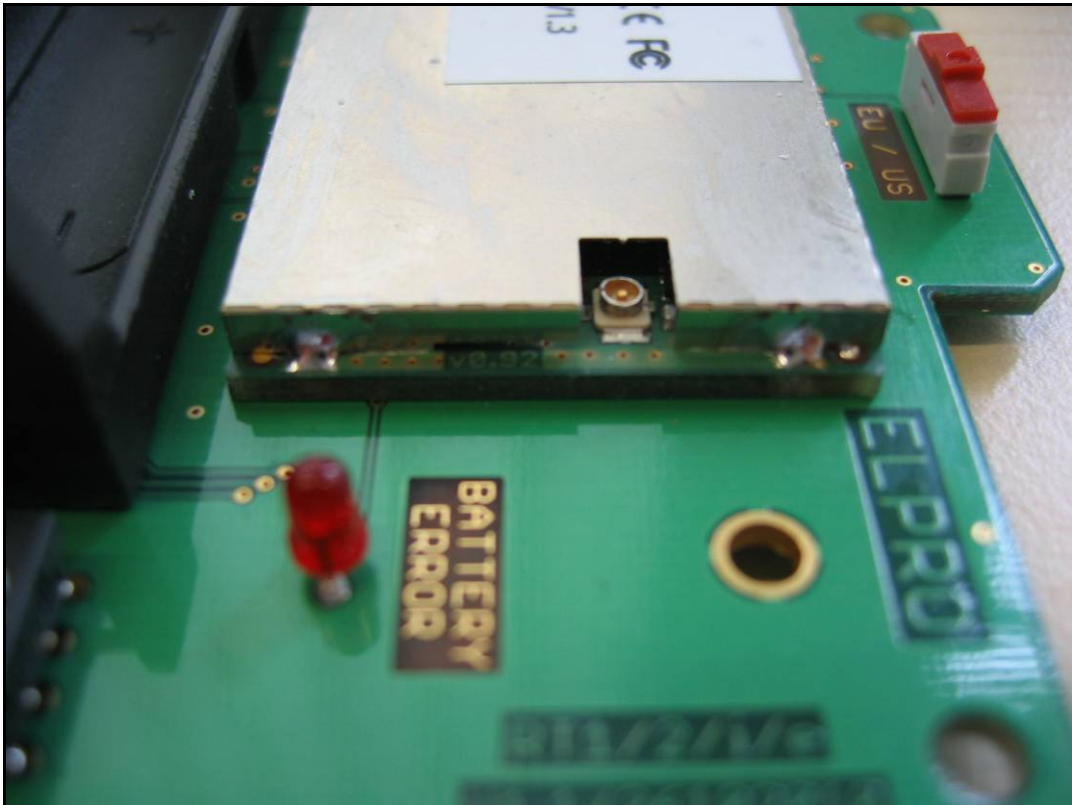


Photo 15:

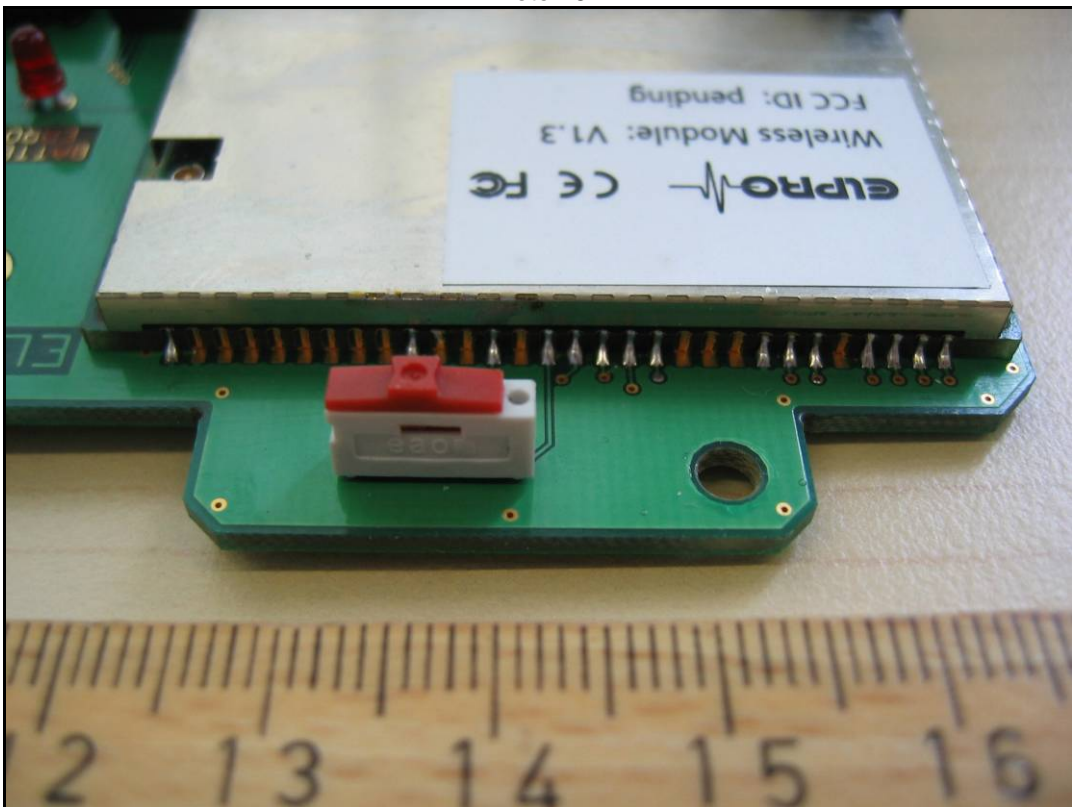


Photo 16:

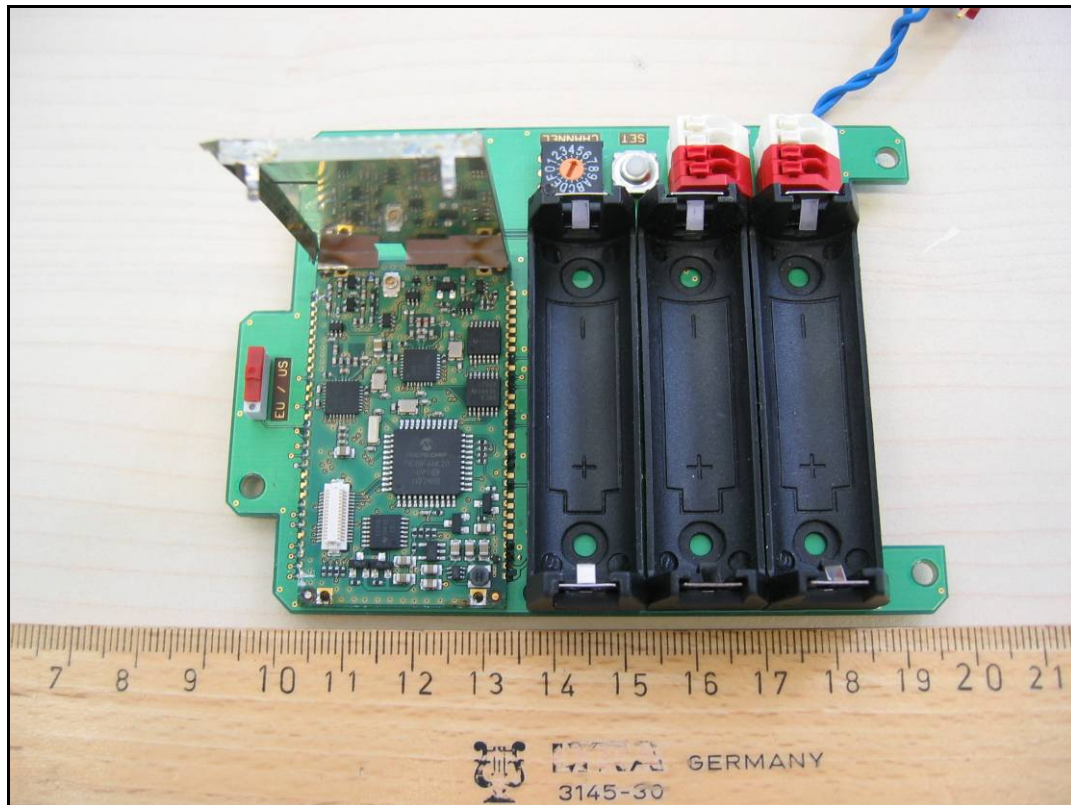
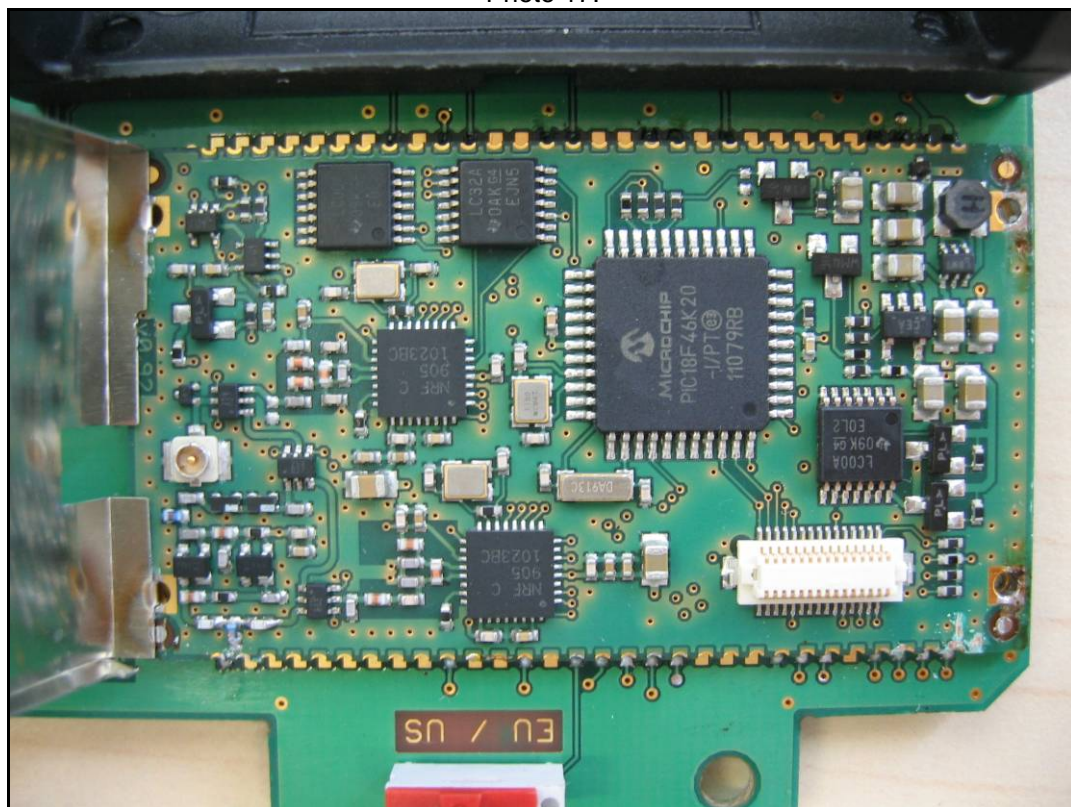


Photo 17:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2011-10-14
-A	Frequency range specified	2012-09-05

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 the certificate



Back side of the certificate

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

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