

TEST REPORT

Test report no.: 1-3646-01-11/11



Testing laboratory

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Accredited test laboratory:

The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025
DAkkS registration number: D-PL-12076-01-01

Area of Testing: Radio/Satellite Communications

Applicant

ELMO COMPANY,LIMITED
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Meizen-Cho, Mizuho-Ku, Nagoyai 467-8567 / Japan
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Fax: +81-52-811-5179
Contact: Haruo Maeda
e-mail: maeda_haru@elmo.co.jp
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Manufacturer

ELMO COMPANY,LIMITED
6-14
Meizen-cho Mizuho-ku Nagoya 467-8567 / Japan

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:	Student Response System
Model name:	CRV-CK-1
FCC ID:	X3X-WUSBMDL
IC:	8804A-X3XWUSBMDL
Frequency:	2402 MHz – 2479 MHz
Power supply:	3.0 V DC by Battery
Temperature range:	-20 °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 performed:



Stefan Bös

Test report authorised:



Andreas Keller

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2 General information

2.1 Notes

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 generalisations 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.

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.

2.2 Application details

Date of receipt of order:	2011-07-11
Date of receipt of test item:	2011-08-29
Start of test:	2011-08-29
End of test:	2011-08-29
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}	-20 °C during low temperature tests
Relative humidity:		55 %
Air pressure:		not relevant for this kind of testing
Power supply:	V_{nom}	3.0 V DC by Battery 2* AA type
	V_{max}	V
	V_{min}	V

5 Test item

Kind of test item	:	Student Response System
Type identification	:	CRV-CK-1
S/N serial number	:	Rad. 34700103
HW hardware status	:	No information provided
SW software status	:	No information provided
Frequency band [MHz]	:	2400MHz – 2483.5MHz (lowest channel 2402MHz, highest channel 2479MHz)
Type of modulation	:	GFSK (DSSS)
Number of channels	:	No information provided
Antenna	:	Integrated antenna (printed PCB antenna)
Power supply	:	3.0 V DC by Battery 2* AA type
Temperature range	:	-20°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	2011-09-15	Tests performed acc. to customer demand

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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
§15.247(e) RSS 210 / A8.2(b)	Power spectral density	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth 6dB bandwidth	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
§15.247(a)(2) RSS 210 / A8.2(a)	Spectrum bandwidth 20dB bandwidth	Nominal	Nominal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
§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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
§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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-/-
§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
§15.107(a)	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

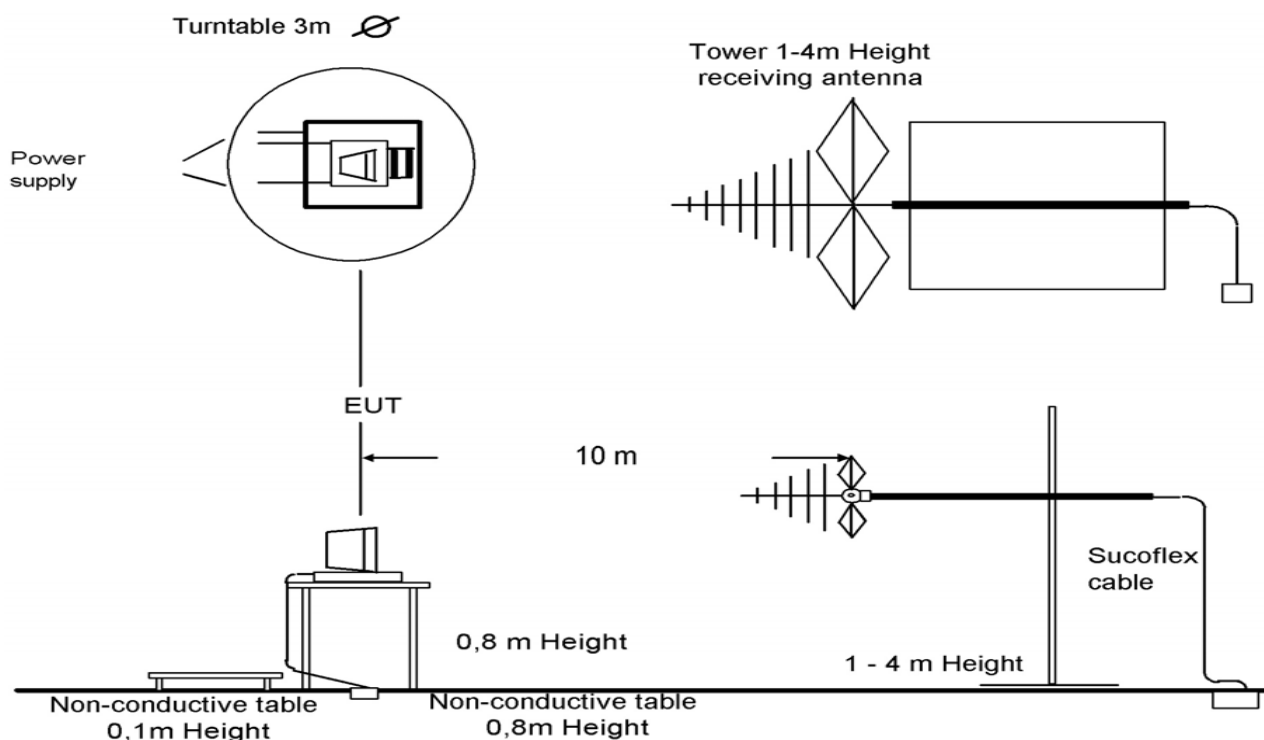
8.1 Description of test setup

8.1.1 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



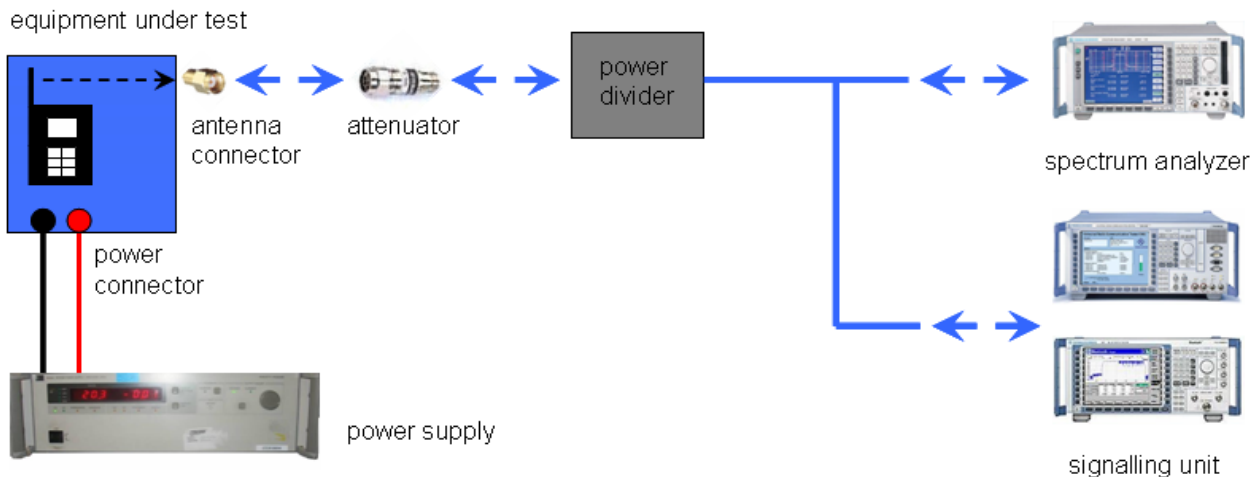
Picture 1: Diagram radiated measurements

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

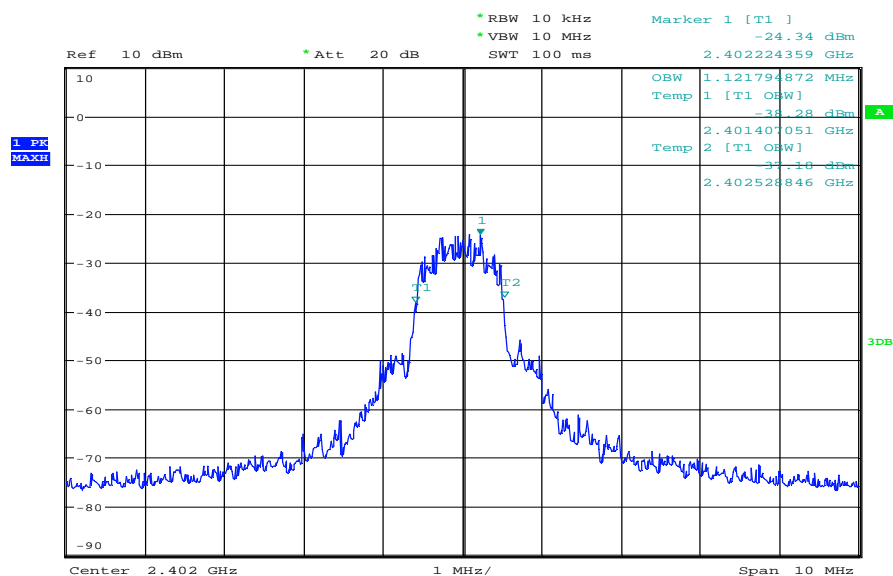
Special test descriptions: None

Configuration descriptions: None

Test mode:

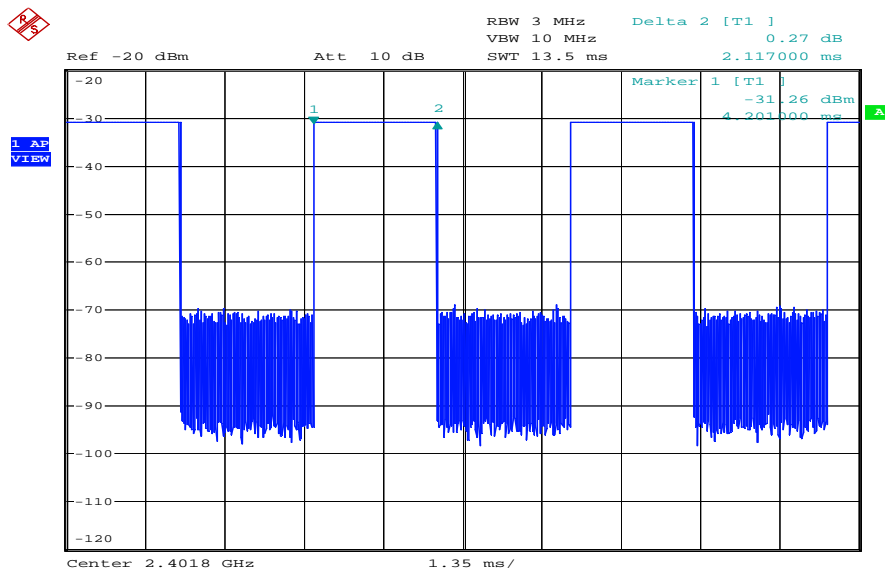
- ☐ No test mode available.
- ☒ Special software is used.
EUT is transmitting pseudo random data by itself

Plot 1: Lowest channel, 99% bandwidth (for information only)



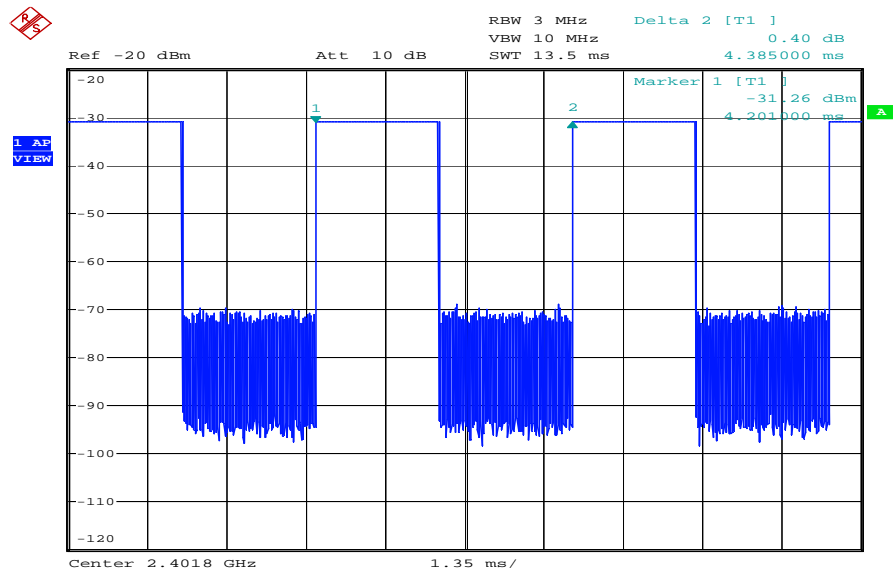
Date: 29.AUG.2011 12:54:31

Plot 2: Duty cycle evaluation, t_{on}



Date: 29.AUG.2011 09:08:00

Plot 3: Duty cycle evaluation, t_{tot}



Date: 29.AUG.2011 09:08:18

9 Measurement results

9.1 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		-2.5	-3.0	-3.3
Radiated power [dBm] Measured		-1.1	-1.4	-2.6
Gain [dBi] Calculated		1.4	1.6	0.7

Values of conducted measurements are taken from Cetecom report 1-3646-01-03/11

Result: The result of the measurement is passed.

9.2 Power spectral density

Not performed

9.3 Spectrum bandwidth – 6 dB bandwidth

Not performed

9.4 Spectrum bandwidth – 20 dB bandwidth

Not performed

9.5 Band edge compliance conducted

Not performed

9.6 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:	Lower Band: 2300 – 2400 MHz Higher Band: 2480 – 2500 MHz
Trace-Mode:	Max Hold

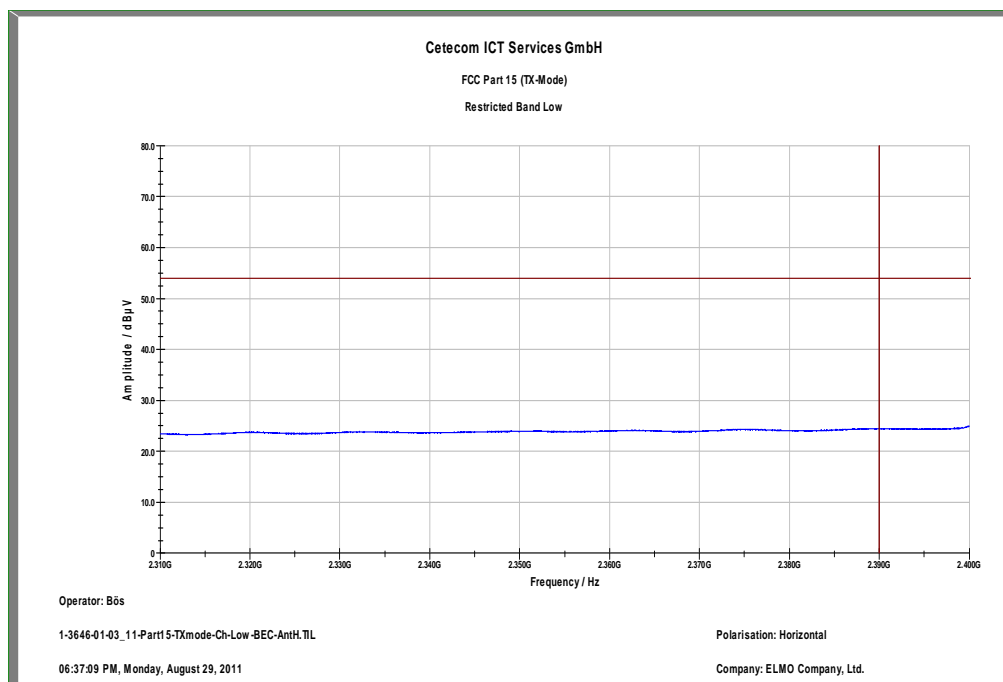
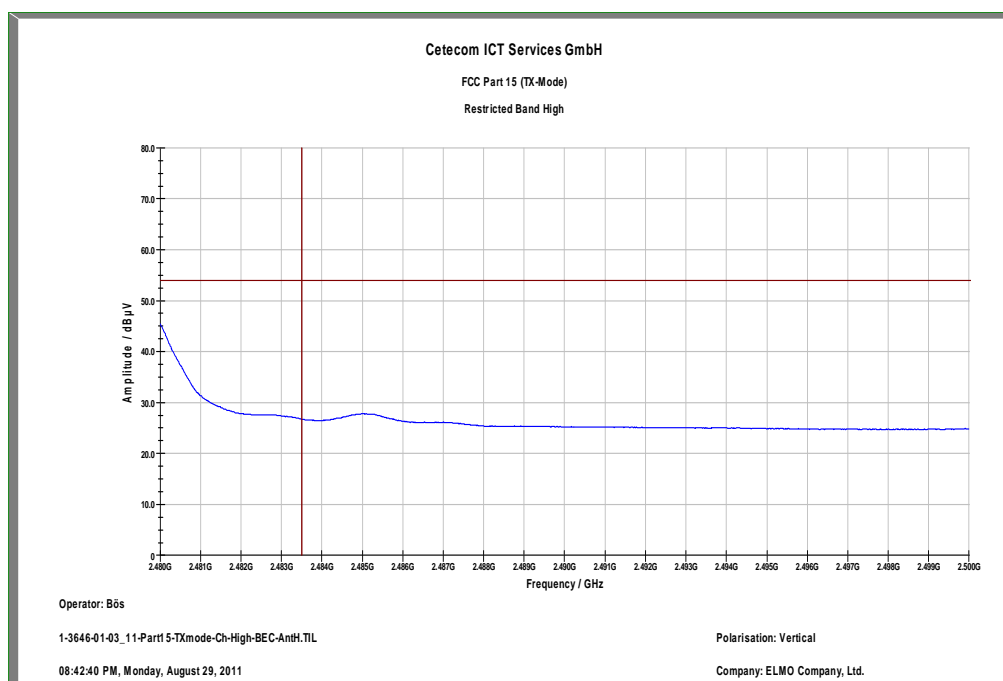
Limits:

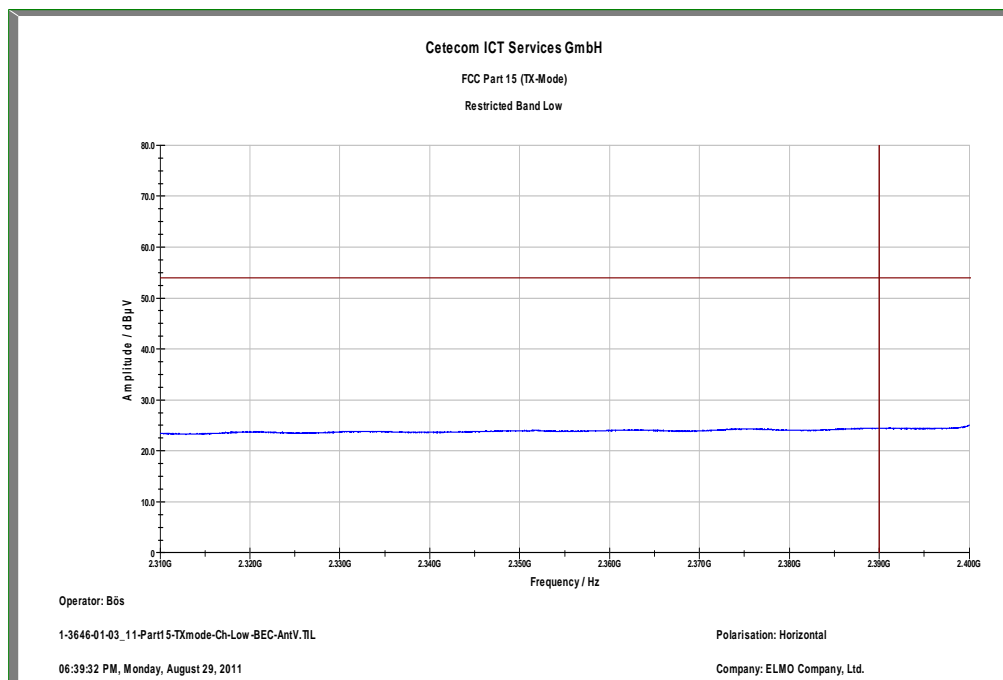
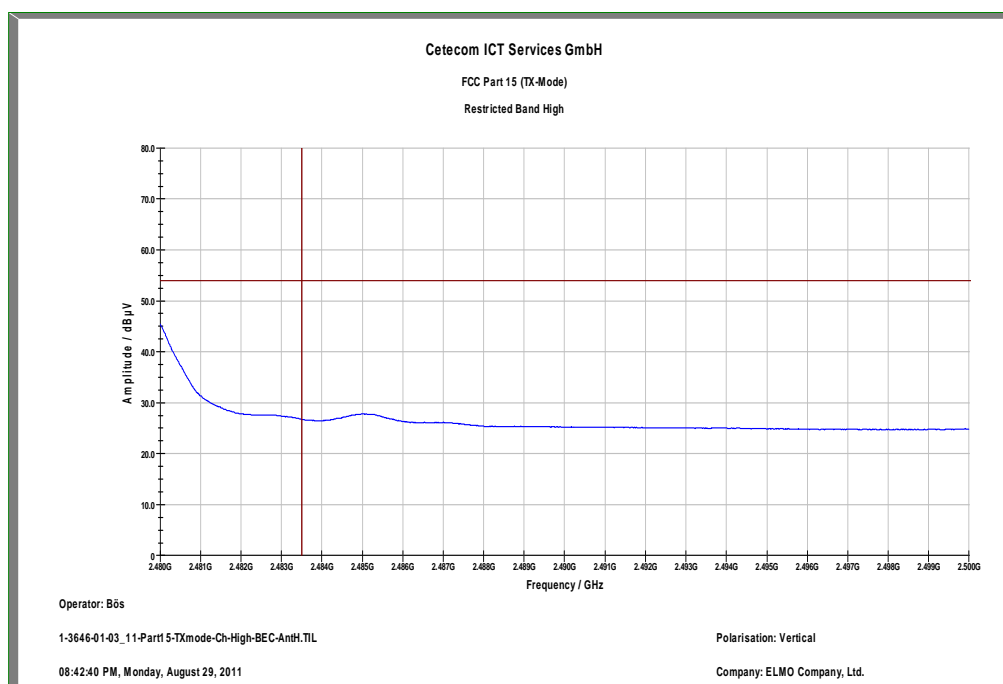
FCC	IC
CFR Part 15.205	RSS 210, Issue 8, A 8.5
Band Edge Compliance Radiated	
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 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 Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).	
54 dBµV/m AVG	

Result:

Szenario	Band Edge Compliance Radiated [dBµV/m]
Lower Band Edge	< 54 dBµV/m (see plots 1/3)
Upper Band Edge	< 54 dBµV/m (see plot 2/4)
Measurement uncertainty	± 3 dB

Result: The result of the measurement is passed.

Plots of measurements:**Plot 1:** TX mode, lower band edge, horizontal polarization**Plot 2:** TX mode, upper band edge, horizontal polarization

Plot 3: TX mode, lower band edge, vertical polarization**Plot 4:** TX mode, upper band edge, vertical polarization

9.7 TX spurious emissions conducted

Not performed

9.8 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]
1601	PK	25.5	1627	PK	36.8	1653	PK	37.3
3203	PK	29.8	2458	PK	29.3	3305	PK	35.3
			3255	PK	35.1	4958	PK	41.7
Measurement uncertainty			± 3 dB					

Result: The result of the measurement is passed.

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

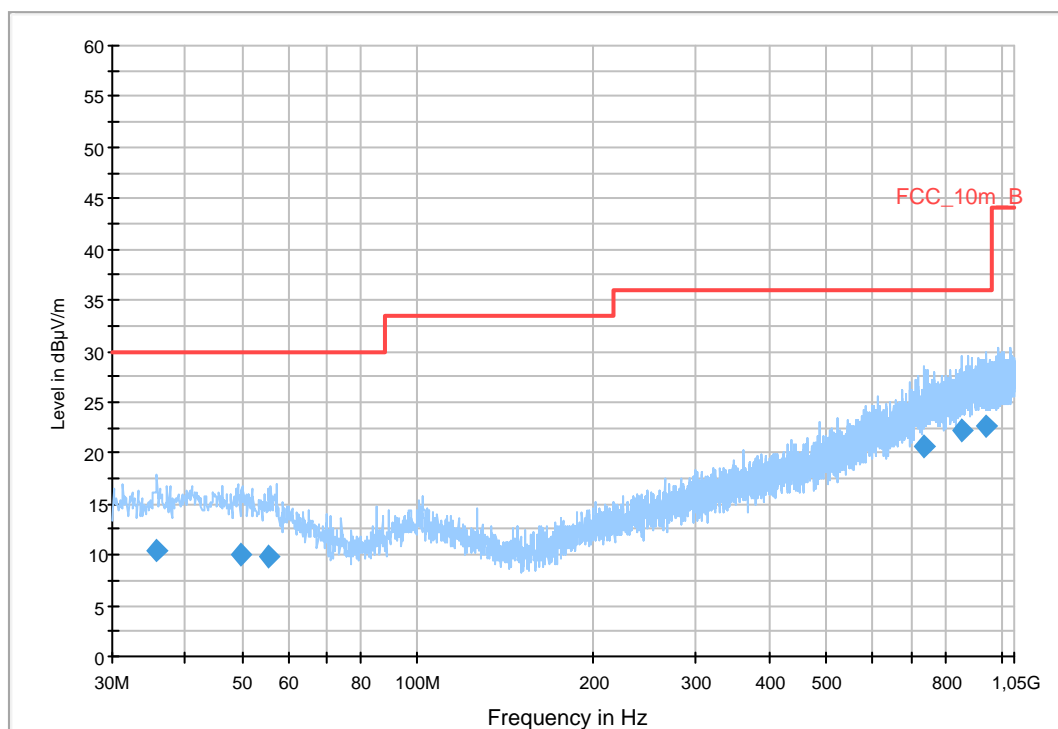
EUT: CRV-CK-1
 Serial Number: 34700103
 Test Description: FCC part 15 B class B @ 10 m
 Operating Conditions: TX low channel (2,402 GHz)
 Operator Name: Hennemann
 Comment: battery powered

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
35.741700	10.5	1000.0	120.000	170.0	V	-6.0	13.1	19.5	30.0	
49.546200	10.1	1000.0	120.000	98.0	V	8.0	13.4	19.9	30.0	
55.580400	9.8	1000.0	120.000	170.0	V	185.0	12.7	20.2	30.0	
734.406600	20.7	1000.0	120.000	98.0	V	91.0	23.3	15.3	36.0	
853.990500	22.1	1000.0	120.000	162.0	V	95.0	24.6	13.9	36.0	
940.873200	22.7	1000.0	120.000	170.0	H	178.0	25.3	13.3	36.0	

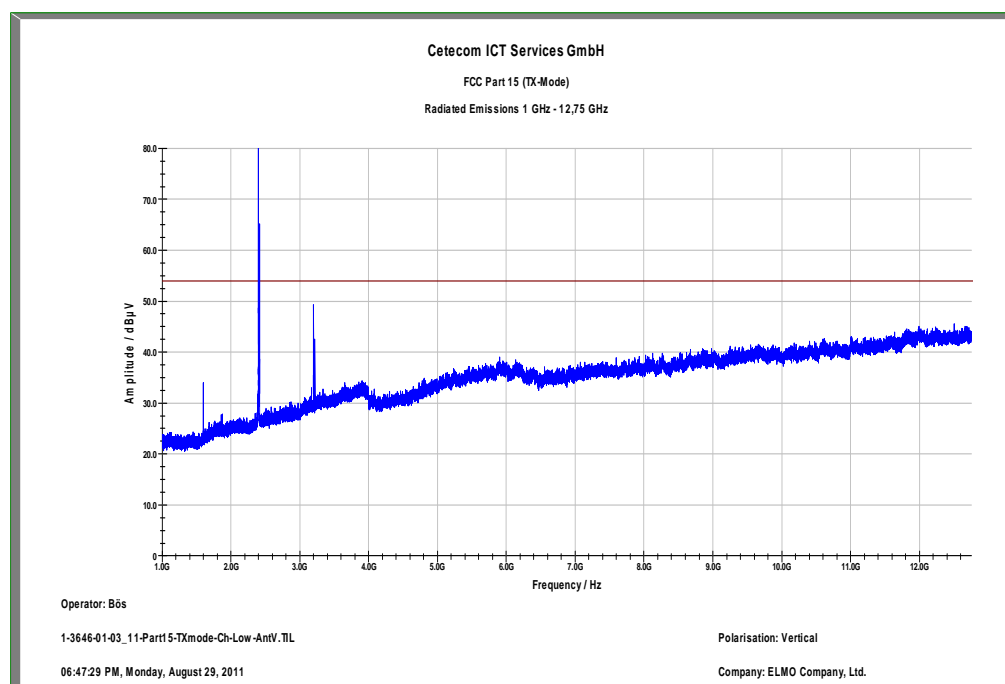
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

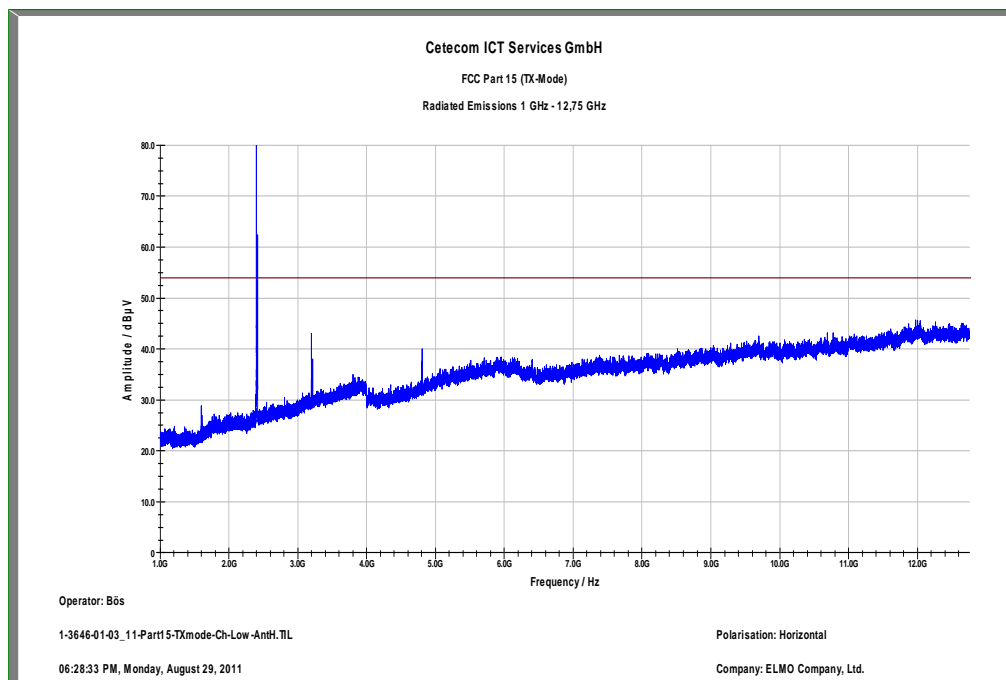
Frequency Range: 30 MHz - 2 GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 4.42Signal Path: without Notch
FW 1.0Antenna: 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 3.12Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9), FW REV 3.12

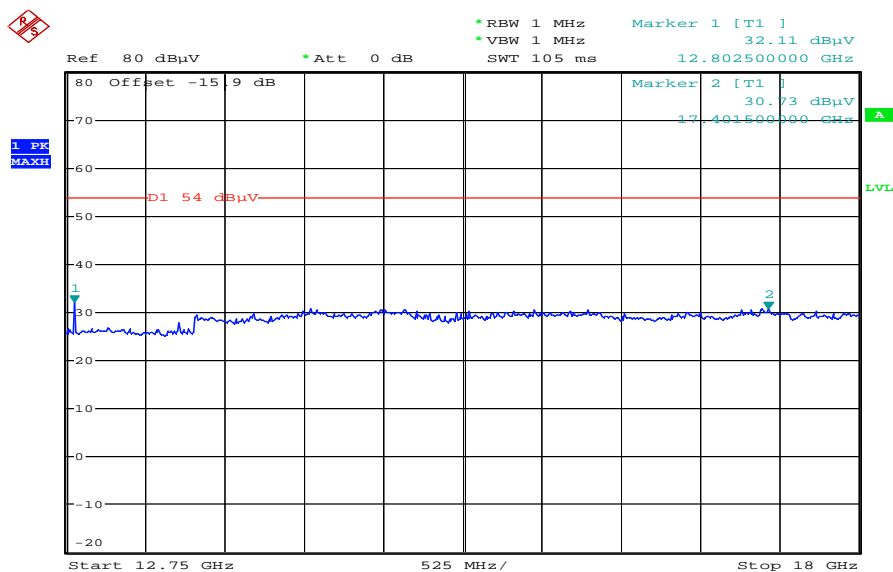
EMC 32 Version 8.10.00

Plot 2: Lowest channel, 1 GHz to 12.75 GHz, vertical polarization

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

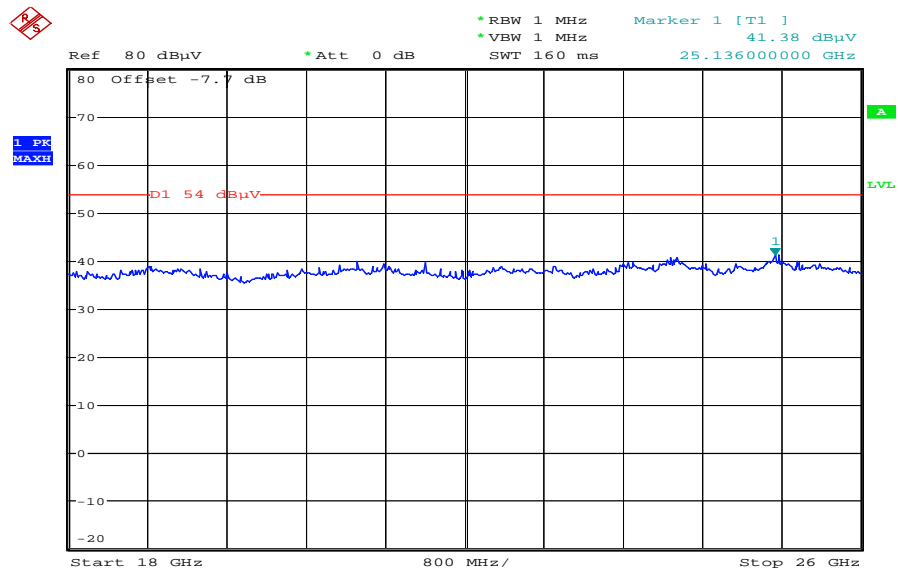


Plot 4: Lowest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 7.SEP.2011 14:57:16

Plot 5: Lowest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 7.SEP.2011 15:02:46

Plot 6: Middle channel, 30 MHz to 1 GHz, vertical & horizontal polarization

Common Information

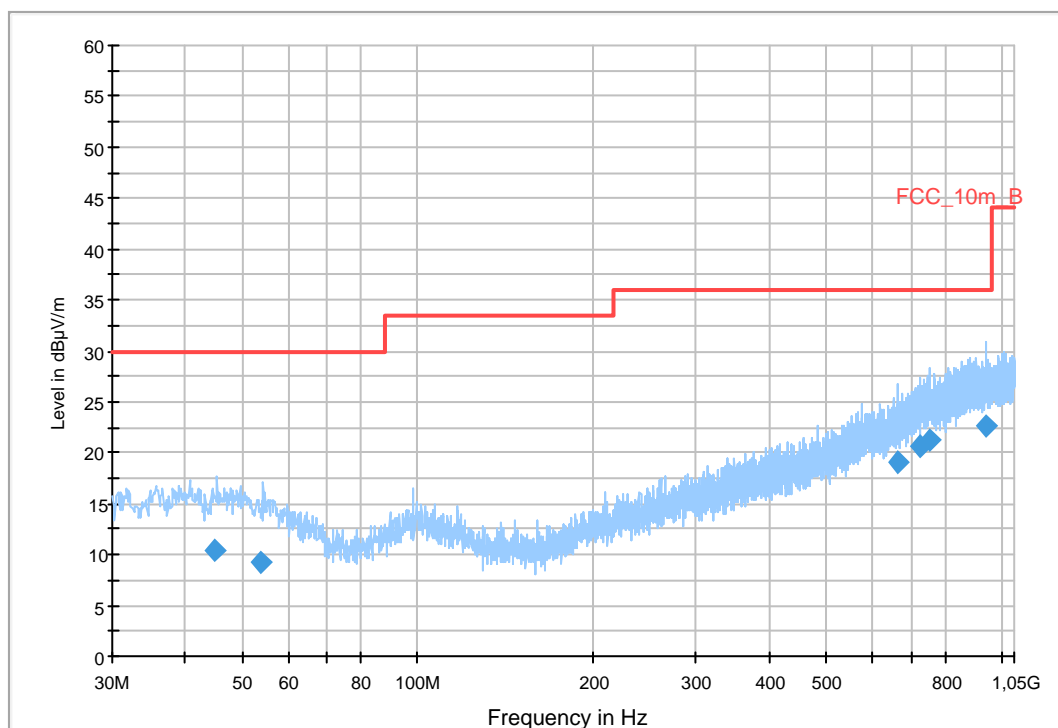
EUT: CRV-CK-1
 Serial Number: 34700103
 Test Description: FCC part 15 B class B @ 10 m
 Operating Conditions: TX middle channel (2,441 GHz)
 Operator Name: Hennemann
 Comment: battery powered

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
45.063900	10.4	1000.0	120.000	162.0	V	270.0	13.3	19.6	30.0	
53.761950	9.3	1000.0	120.000	170.0	H	85.0	13.0	20.7	30.0	
663.243600	19.0	1000.0	120.000	170.0	V	284.0	21.5	17.0	36.0	
727.067250	20.7	1000.0	120.000	170.0	H	8.0	23.1	15.3	36.0	
753.399300	21.2	1000.0	120.000	170.0	H	91.0	23.7	14.8	36.0	
938.500650	22.6	1000.0	120.000	170.0	V	106.0	25.3	13.4	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

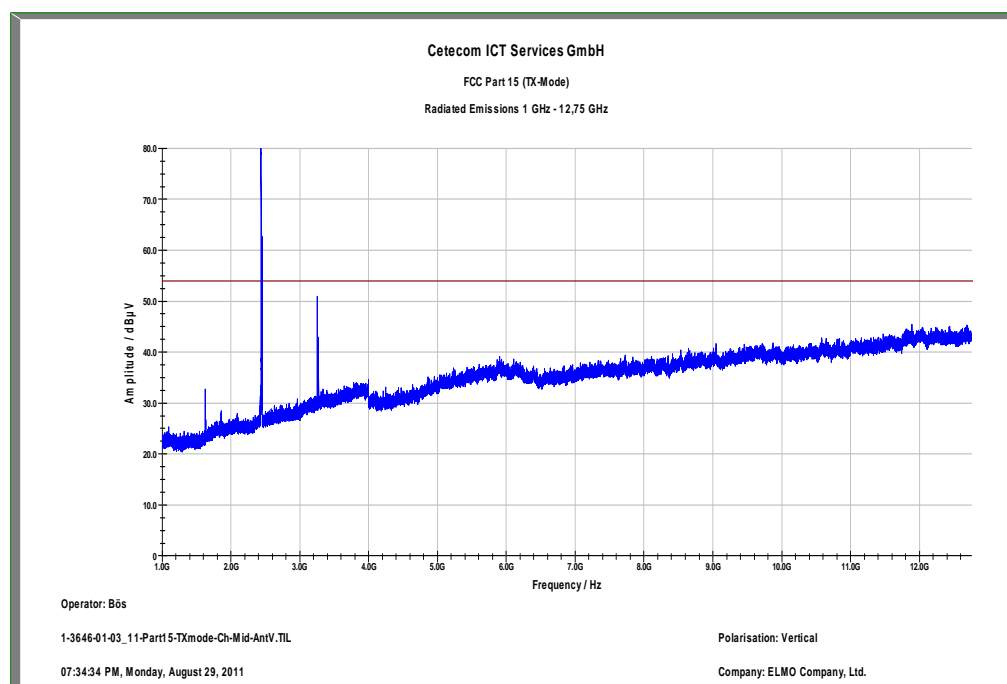
Antenna: VULB 9163
SN 9163-295, FW ---
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table (vertical): Cable_EN_1GHz (1005)
Correction Table (horizontal): Cable_EN_1GHz (1005)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

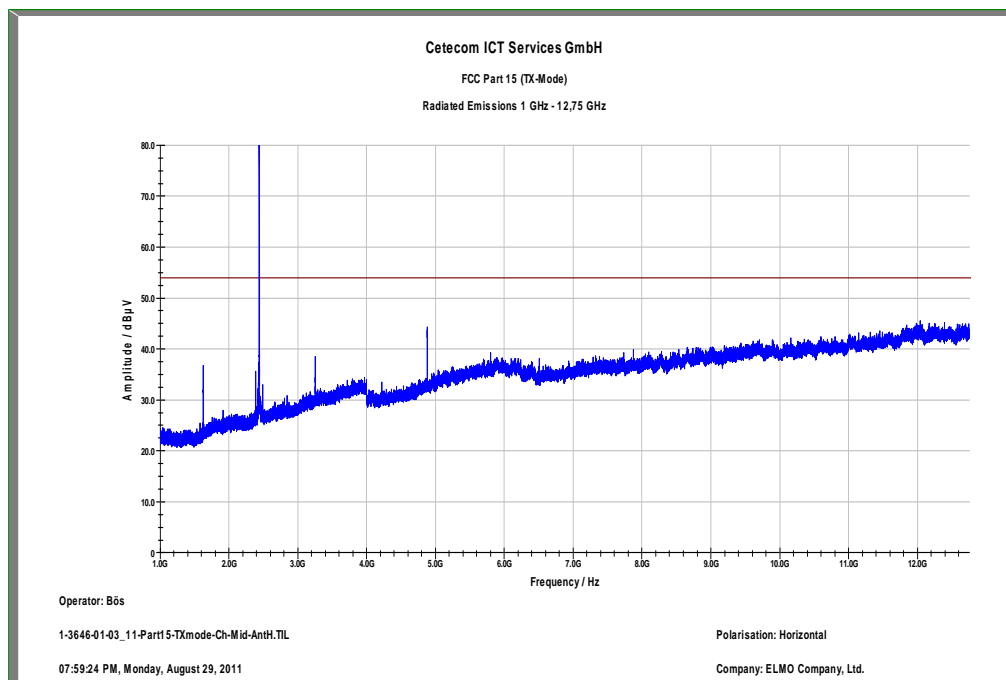
Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9), FW REV 3.12

EMC 32 Version 8.10.00

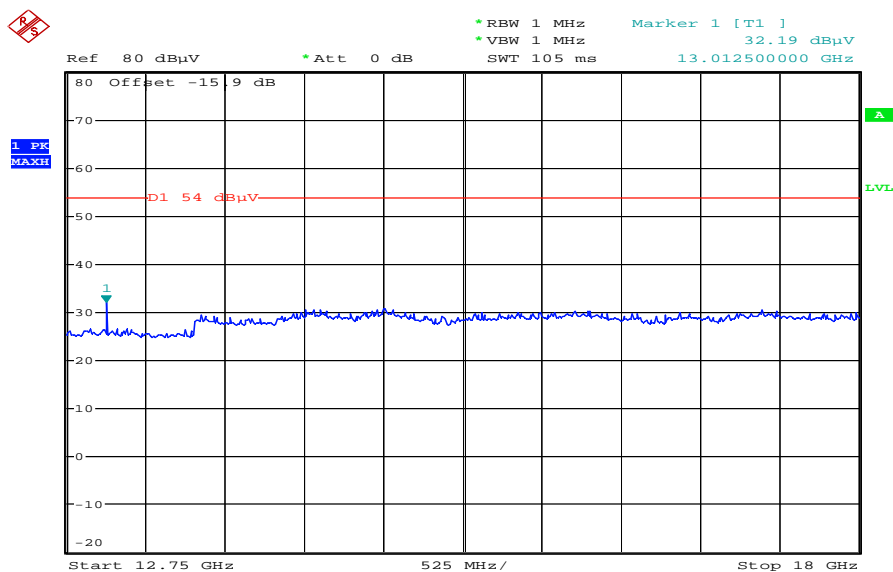
Plot 7: Middle channel, 1 GHz to 12.75 GHz, vertical polarization



Plot 8: Middle channel, 1 GHz to 12.75 GHz, horizontal polarization

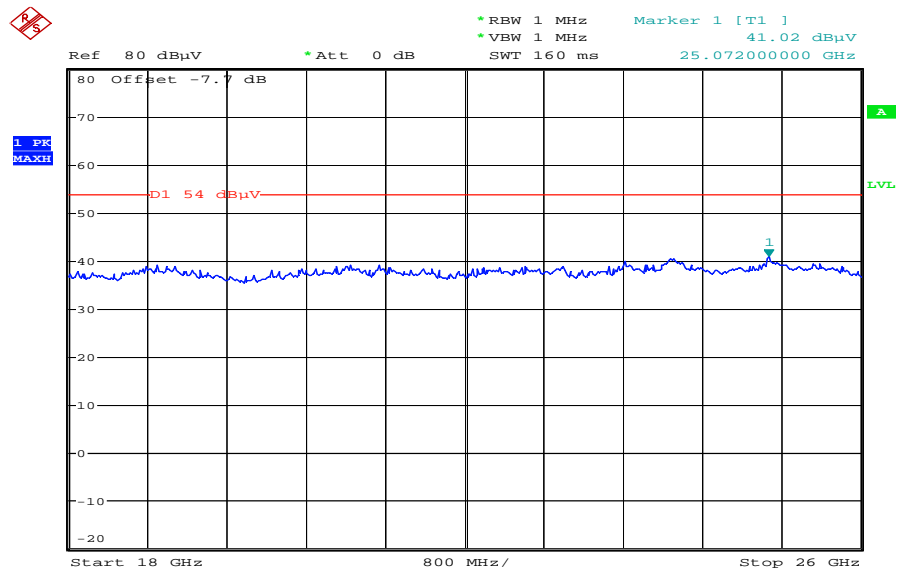


Plot 9: Middle channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 7.SEP.2011 14:58:30

Plot 10: Middle channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 7.SEP.2011 15:03:45

Plot 11: Highest channel, 30 MHz to 1 GHz, vertical & horizontal polarization

Common Information

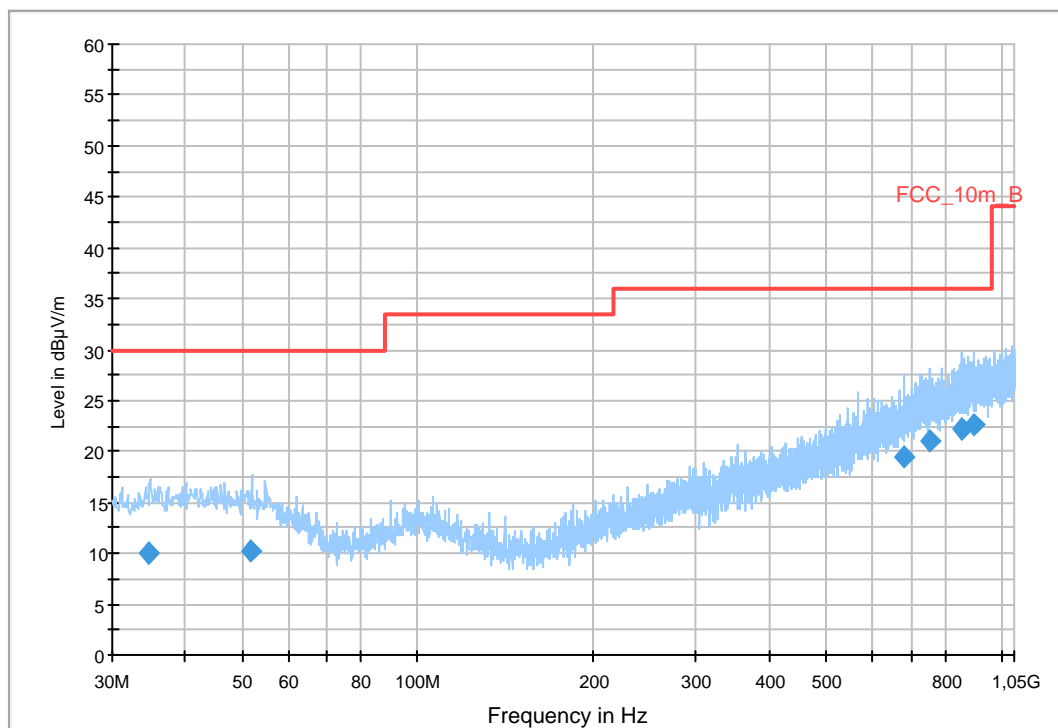
EUT: CRV-CK-1
 Serial Number: 34700103
 Test Description: FCC part 15 B class B @ 10 m
 Operating Conditions: TX high channel (2,479 GHz)
 Operator Name: Hennemann
 Comment: battery powered

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
34.678200	10.0	1000.0	120.000	106.0	V	170.0	13.0	20.0	30.0	
51.727350	10.1	1000.0	120.000	170.0	H	106.0	13.2	19.9	30.0	
680.502600	19.5	1000.0	120.000	170.0	H	-7.0	22.0	16.5	36.0	
751.261350	21.1	1000.0	120.000	170.0	H	-1.0	23.7	14.9	36.0	
852.644400	22.2	1000.0	120.000	98.0	H	271.0	24.6	13.8	36.0	
895.399950	22.7	1000.0	120.000	98.0	V	196.0	25.1	13.3	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

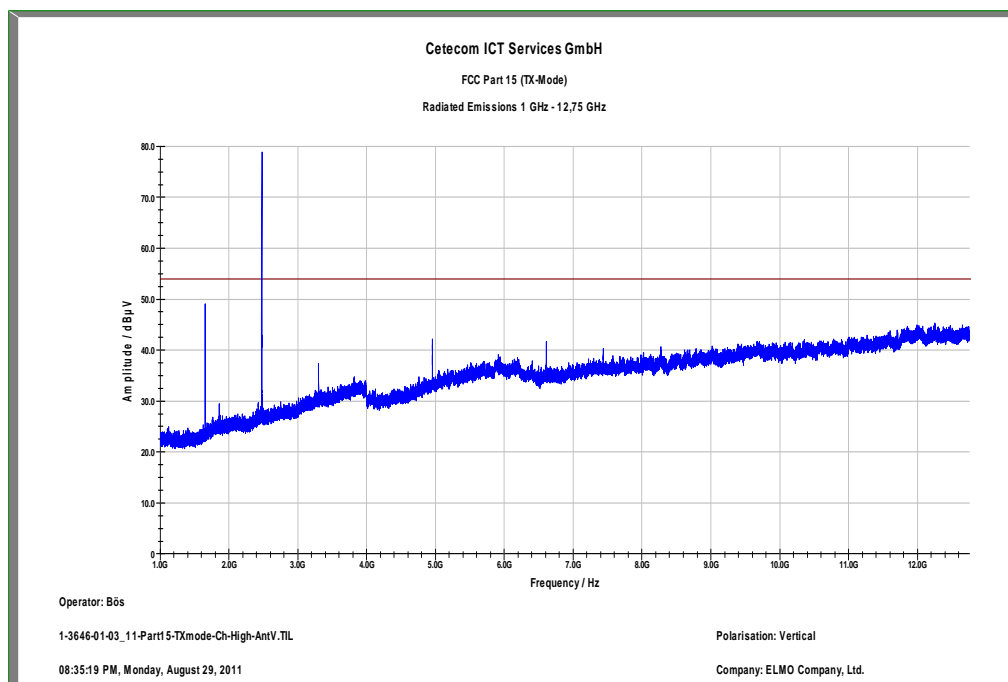
Antenna: VULB 9163
SN 9163-295, FW ---
Correction Table (vertical): VULP6113
Correction Table (horizontal): VULP6113
Correction Table (vertical): Cable_EN_1GHz (1005)
Correction Table (horizontal): Cable_EN_1GHz (1005)

Antenna Tower: Tower [EMCO 2090 Antenna Tower]
@ GPIB0 (ADR 8), FW REV 3.12

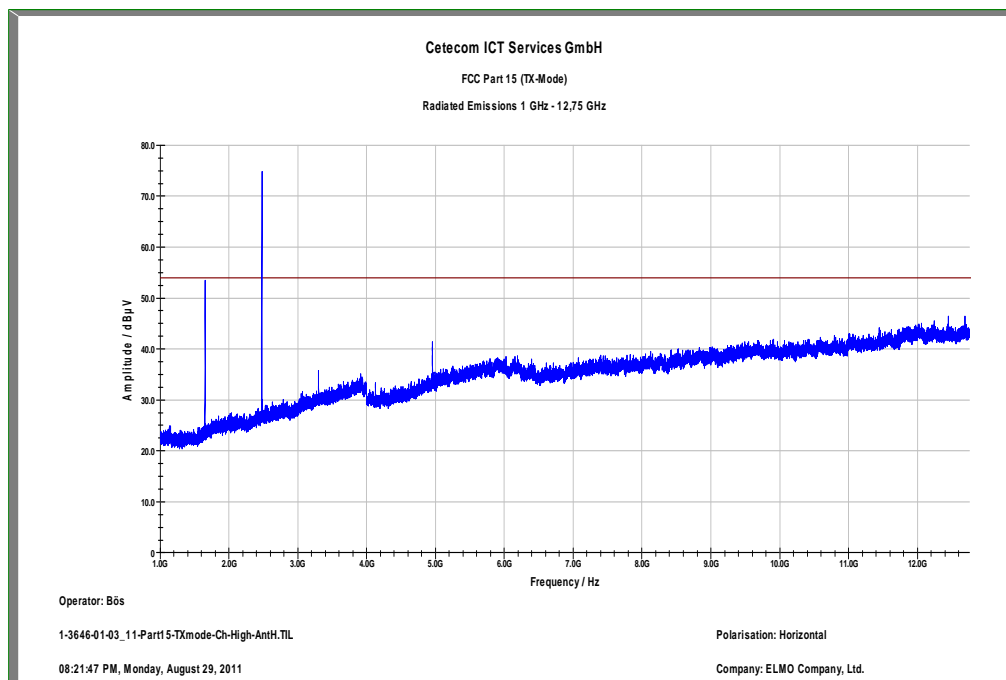
Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9), FW REV 3.12

EMC 32 Version 8.10.00

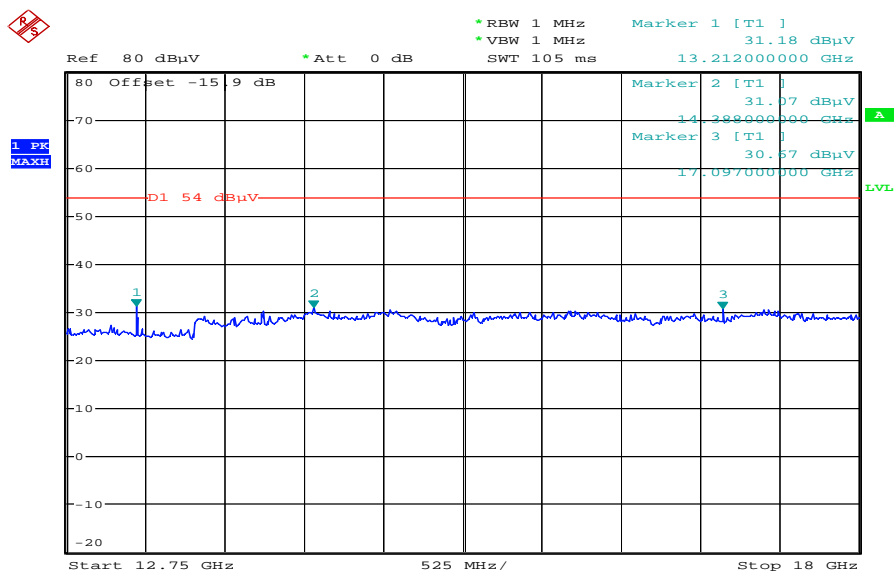
Plot 12: Highest channel, 1 GHz to 12.75 GHz, vertical polarization



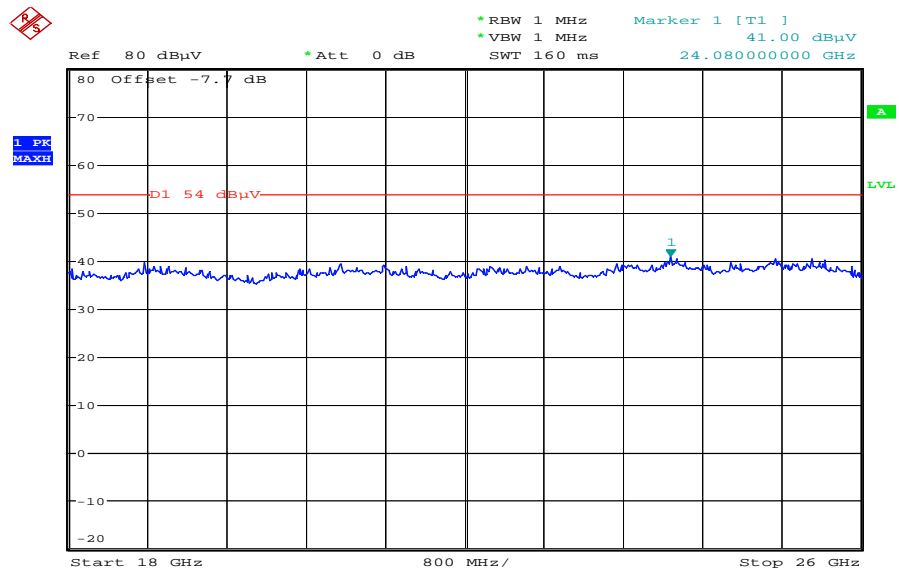
Plot 13: Highest channel, 1 GHz to 12.75 GHz, horizontal polarization



Plot 14: Highest channel, 12.75 GHz to 18 GHz, vertical & horizontal polarization



Plot 15: Highest channel, 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 7.SEP.2011 15:04:39

9.9 RX spurious emissions radiated

Description:

Measurement of the radiated spurious emissions in receive mode (middle 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 15.109		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 of measurements:**Plot 1:** 30 MHz to 1 GHz, vertical & horizontal polarization**Common Information**

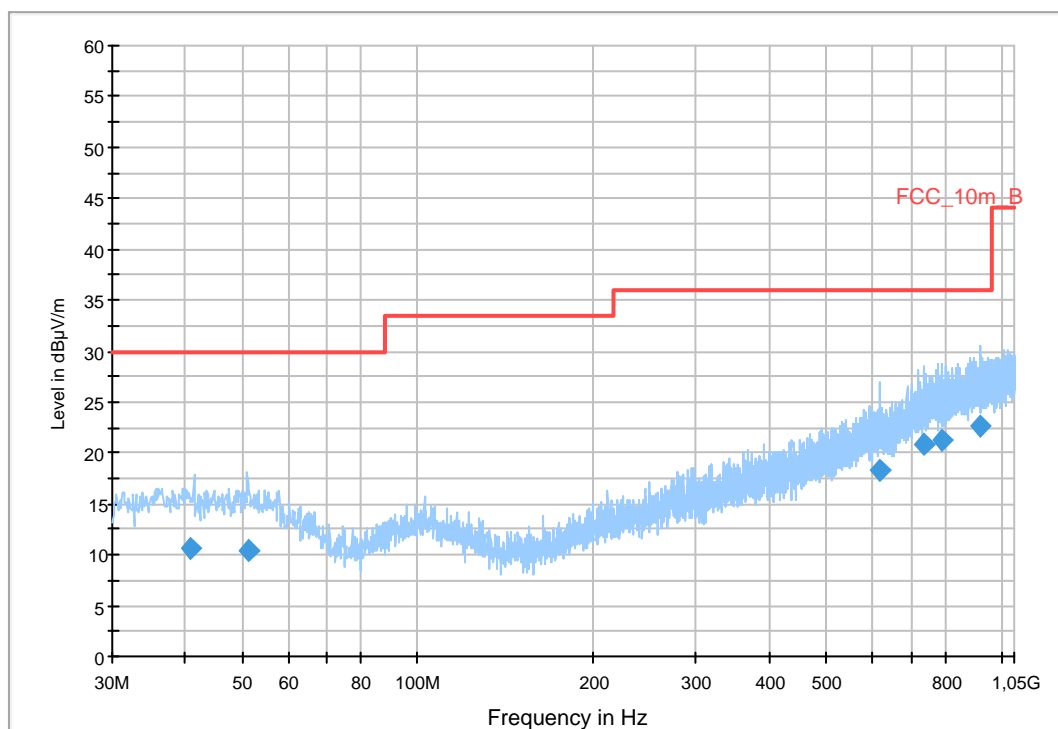
EUT: CRV-CK-1
 Serial Number: 34700103
 Test Description: FCC part 15 B class B @ 10 m
 Operating Conditions: RX middle channel (2,441 GHz)
 Operator Name: Hennemann
 Comment: battery powered

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
40.968300	10.7	1000.0	120.000	170.0	V	196.0	13.4	19.3	30.0	
51.184350	10.4	1000.0	120.000	170.0	H	8.0	13.3	19.6	30.0	
619.656600	18.4	1000.0	120.000	125.0	H	-6.0	20.9	17.6	36.0	
733.248150	20.8	1000.0	120.000	170.0	H	-7.0	23.3	15.2	36.0	
789.531450	21.2	1000.0	120.000	170.0	H	106.0	23.8	14.8	36.0	
916.056600	22.6	1000.0	120.000	105.0	H	-6.0	25.2	13.4	36.0	

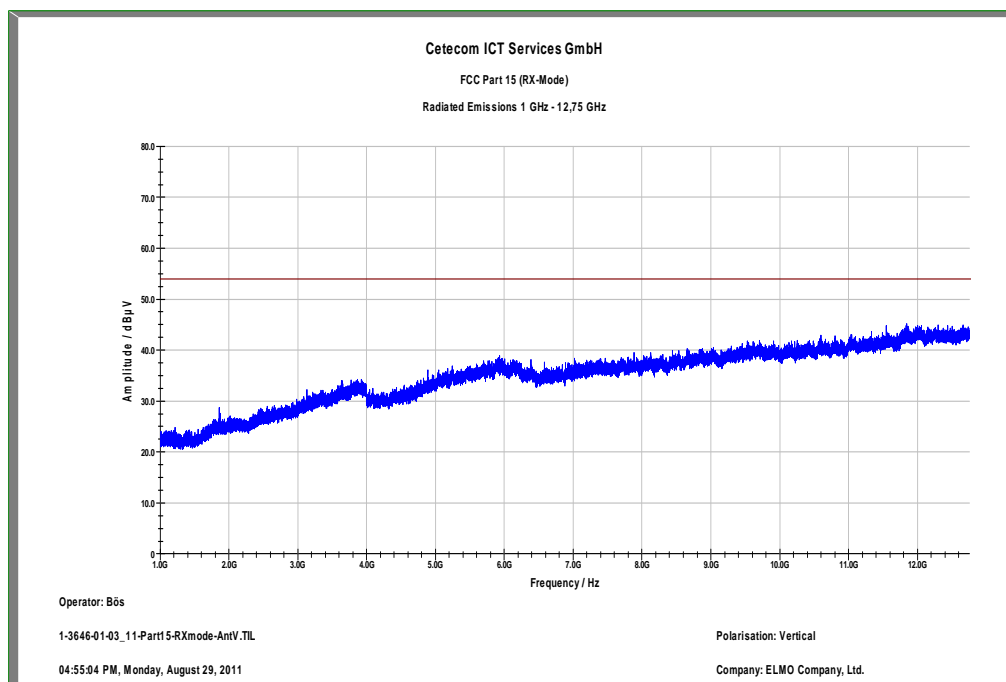
Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]

Subrange 1

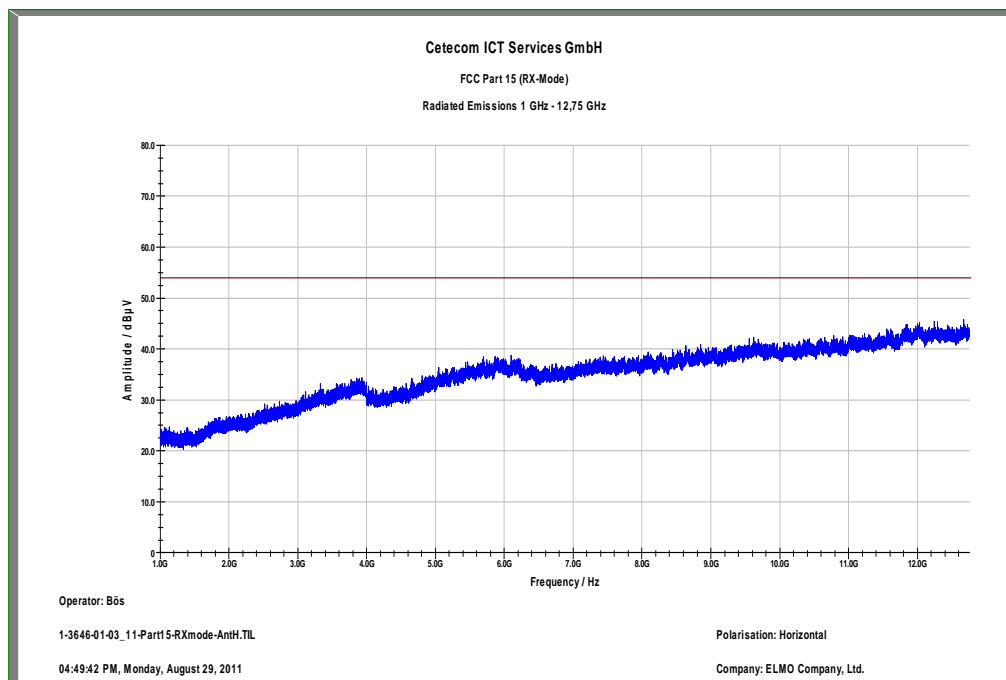
Frequency Range: 30 MHz - 2 GHz

Receiver: Receiver [ESCI 3]
@ GPIB0 (ADR 20), SN 100083/003, FW 4.42Signal Path: without Notch
FW 1.0Antenna: 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 3.12Turntable: Turntable [EMCO Turntable]
@ GPIB0 (ADR 9), FW REV 3.12

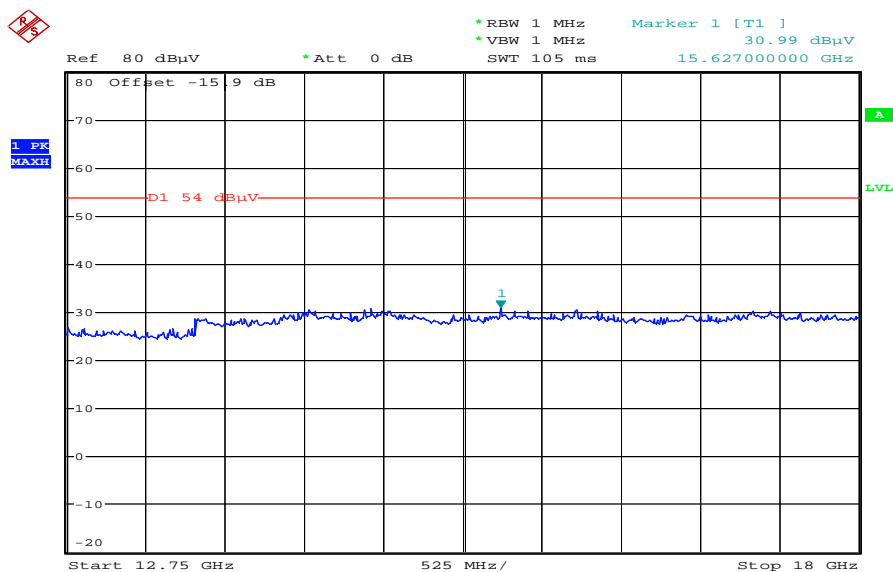
EMC 32 Version 8.10.00

Plot 2: 1 GHz to 12.75 GHz, vertical polarization

Plot 3: 1 GHz to 12.75 GHz, horizontal polarization

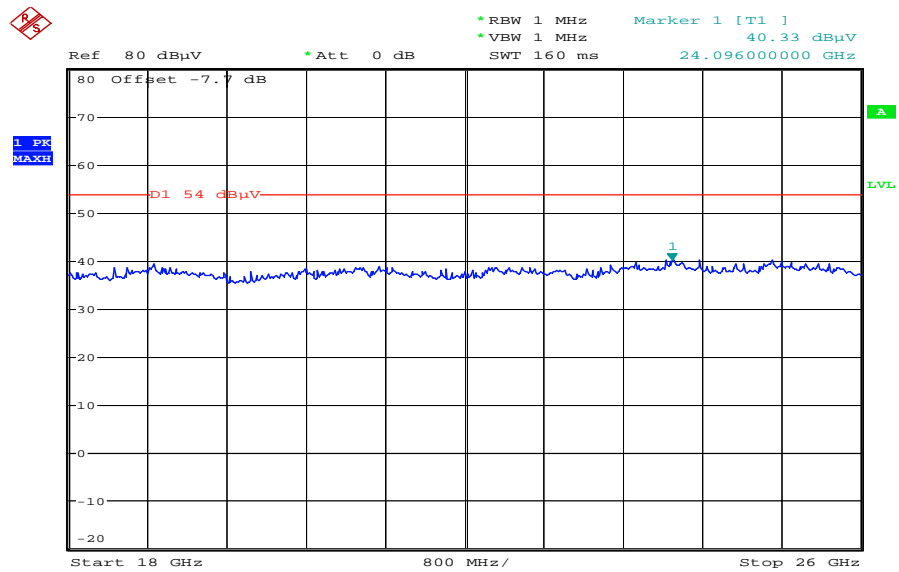


Plot 14: 12.75 GHz to 18 GHz, vertical & horizontal polarization



Date: 7.SEP.2011 15:00:16

Plot 15: 18 GHz to 26 GHz, vertical & horizontal polarization



Date: 7.SEP.2011 15:01:38

9.10 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

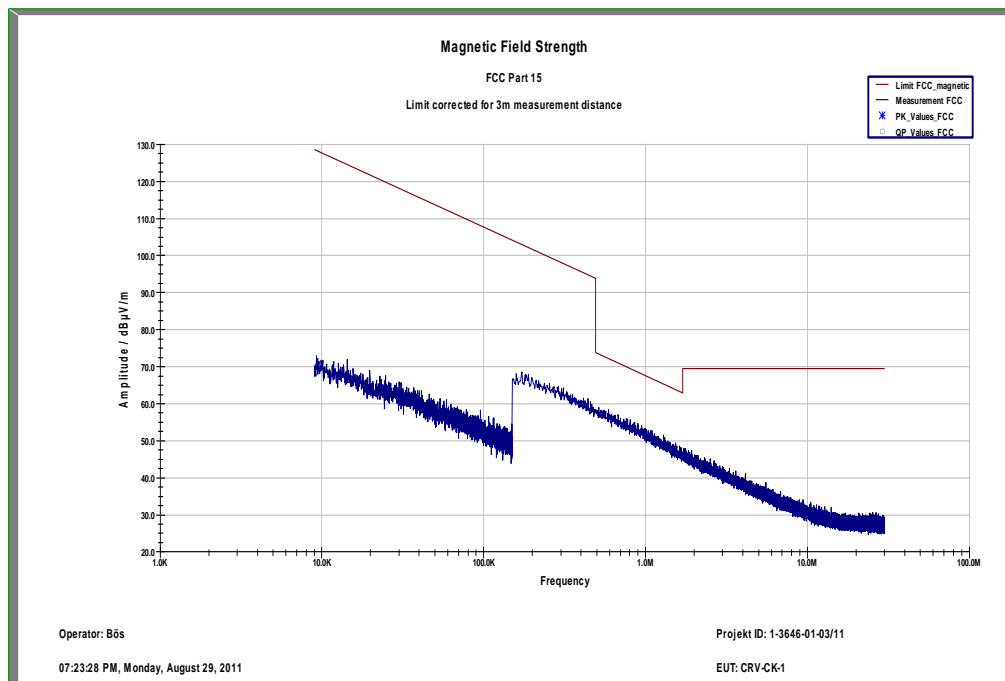
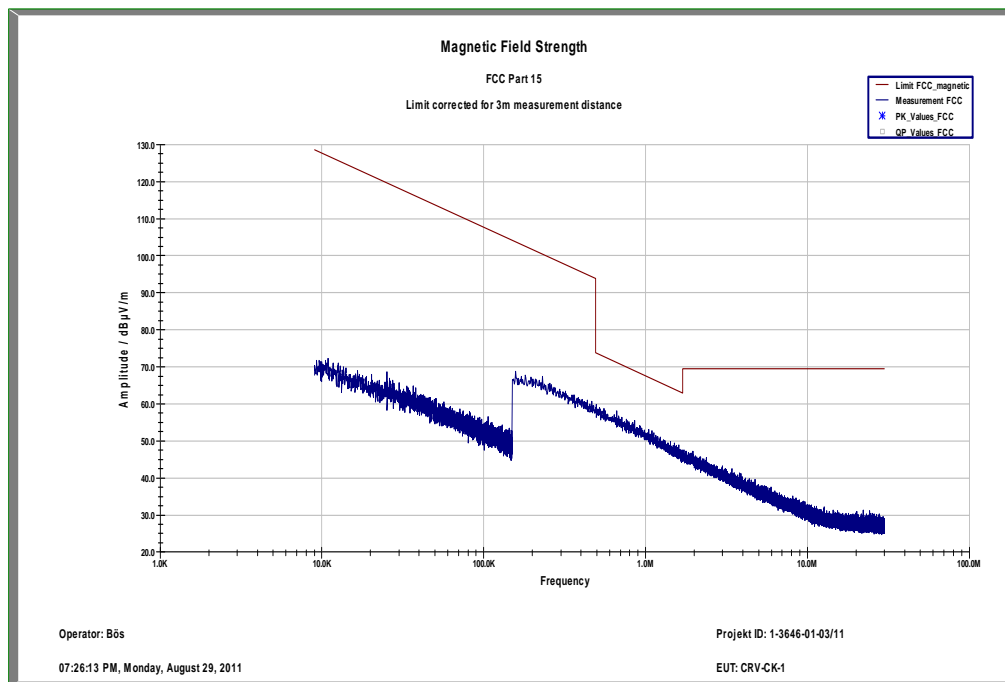
Limits:

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

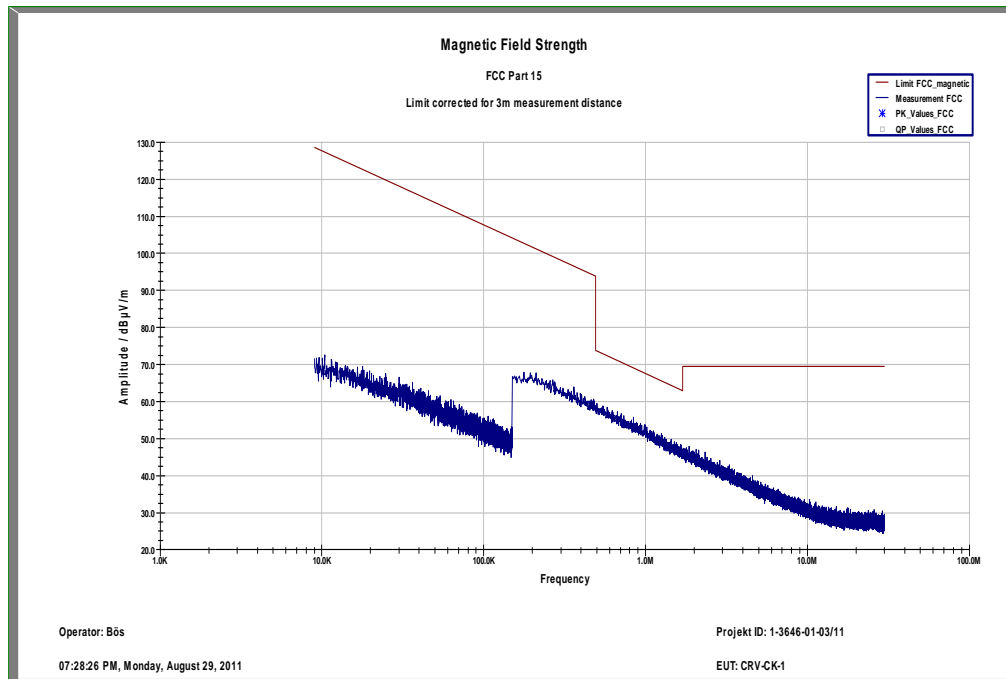
Results:

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

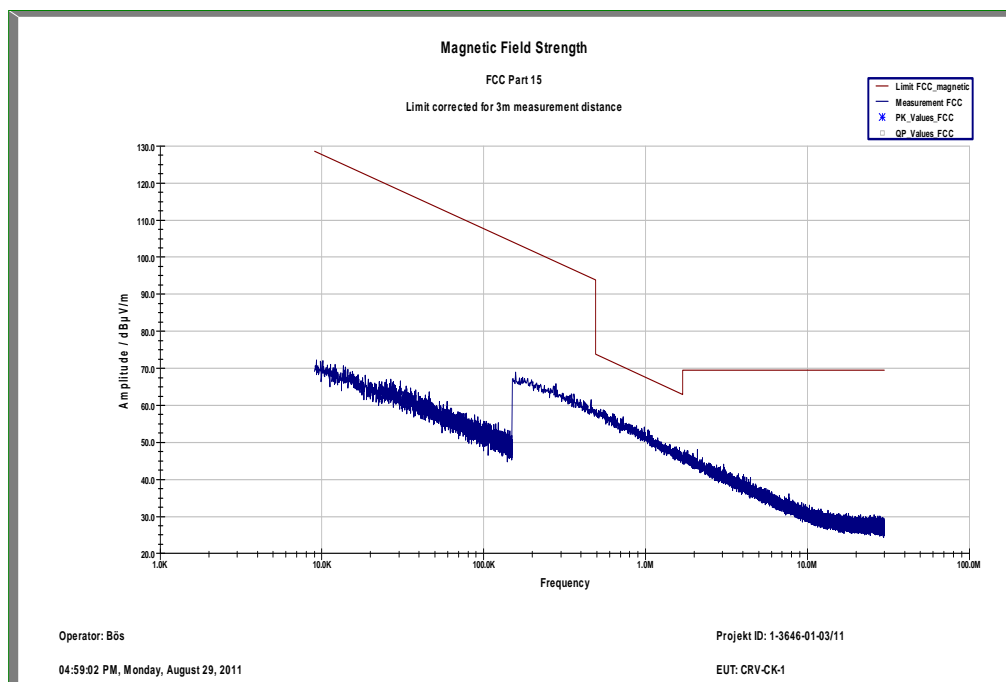
Result: The result of the measurement is passed.

Plots of measurements:**Plot 1: Lowest channel****Plot 2: Middle channel**

Plot 3: Highest channel



Plot 4: Receiving (middle channel)



9.11 TX spurious emissions conducted < 30 MHz

Not applicable

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.	Spectrum Analyzer 9kHz to 30GHz - 140...+30dBm	FSP30	R&S	100886	300003575	k	07.09.2010	07.09.2012
2	n. a.	Isolating Transformer	RT5A	Grundig	8041	300001626	g		
3	n. a.	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2818A03450	300001040	Ve	08.01.2009	08.01.2012
4	n. a.	Coaxial Attenuator 30dB/500W	8325	Bird	1530	300001595	ev		
5	n. a.	Double-Ridged Waveguide Horn Antenna 1-18.0GHz	3115	EMCO	8812-3088	300001032	vIKI!	11.05.2011	11.05.2013
6	n. a.	Active Loop Antenna	6502	EMCO	2210	300001015	ne		
7	n. a.	Anechoic chamber	FAC 3/5m	MWB / TDK	87400/02	300000996		23.03.2009	
8	Spec.A. 2_2e	System rack for EMI measurement solution	85900	HP I.V.	*	300000222	ne		
9	9	Artificial Mains 9 kHz to 30 MHz	ESH3-Z5	R&S	828576/020	300001210	Ve	06.01.2010	06.01.2012
10	n. a.	Relais Matrix	3488A	HP Meßtechnik	2719A15013	300001156	ne		
11	n. a.	Relais Matrix	PSU	R&S	890167/024	300001168	ne		
12	n. a.	Isolating Transformer	RT5A	Grundig	9242	300001263	ne		
13	n. a.	Three-Way Power Splitter, 50 Ohm	11850C	HP Meßtechnik		300000997	ne		
14	n. a.	Switch / Control Unit	3488A	HP	2605e08770	300001443	ne		
15	n. a.	Amplifier	js42-00502650-28-5a	Parzich GMBH	928979	300003143	ne		
16	n. a.	Band Reject filter	WRCG1855/1910-1835/1925-40/8SS	Wainwright	7	300003350	ev		
17	n. a.	Band Reject filter	WRCG2400/2483-2375/2505-50/10SS	Wainwright	11	300003351	ev		
18	n. a.	TILE-Software Emission	Quantum Change, Modell TILE-ICS/FULL	EMCO	none	300003451	ne		
19	n. a.	Highpass Filter	WHKX2.9/18G-12SS	Wainwright	1	300003492	ev		
20	n. a.	Highpass Filter	WHK1.1/15G-10SS	Wainwright	3	300003255	ev		
21	n. a.	Highpass Filter	WHKX7.0/18G-8SS	Wainwright	18	300003789	ne		
22	n. a.	PSA Spectrum Analyzer 3 Hz - 26.5 GHz	E4440A	Agilent Technologies	MY48250080	300003812	k	08.09.2010	08.09.2012
23	n. a.	MXG Microwave Analog Signal	N5183A	Agilent Technologies	MY47420220	300003813	k	13.09.2010	13.09.2012

		Generator							
24	n. a.	RF Filter Section 9kHz - 1GHz	N9039A	Agilent Technologies	MY48260003	300003825	vKI!	08.09.2010	08.09.2012
25	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	371	300003854	vKI!	17.12.2008	17.12.2011
26	45	Switch-Unit	3488A	HP Meßtechnik	2719A14505	300000368	g		
27	50	DC power supply, 60Vdc, 50A, 1200 W	6032A	HP Meßtechnik	2920A04466	300000580	ne		
28	n. a.	software	SPS_PHE 1.4f	Spitzberger & Spieß	B5981; 5D1081;B5979	300000210	ne		
29	n. a.	EMI Test Receiver	ESCI 1166.5950.03	R&S	100083	300003312	k	05.01.2011	05.01.2013
30	n. a.	Analyzer- Reference- System (Harmonics and Flicker)	ARS 16/1	SPS	A3509 07/0 0205	300003314	k	14.07.2011	14.07.2013
31	n. a.	Amplifier	JS42-00502650- 28-5A	MITEQ	1084532	300003379	ev		
32	n. a.	Antenna Tower	Model 2175	ETS- LINDGREN	64762	300003745	izw		
33	n. a.	Positioning Controller	Model 2090	ETS- LINDGREN	64672	300003746	izw		
34	n. a.	Turntable Interface-Box	Model 105637	ETS- LINDGREN	44583	300003747	izw		
35	n. a.	TRILOG Broadband Test-Antenna 30 MHz - 3 GHz	VULB9163	Schwarzbeck	295	300003787	k	01.04.2010	01.04.2012
36	n. a.	Spectrum- Analyzer	FSU26	R&S	200809	300003874	k	10.01.2011	10.01.2013

Agenda: Kind of Calibration

k calibration / calibrated
 ne not required (k, ev, izw, zw not required)
 ev periodic self verification
 Ve long-term stability recognized
 vKI! Attention: extended calibration interval
 NK! Attention: not calibrated

EK limited calibration
 zw cyclical maintenance (external cyclical maintenance)
 izw internal cyclical maintenance
 g blocked for accredited testing

*) next calibration ordered / currently in progress

Annex A Photographs of the test setup

Photo documentation:

Photo 1:

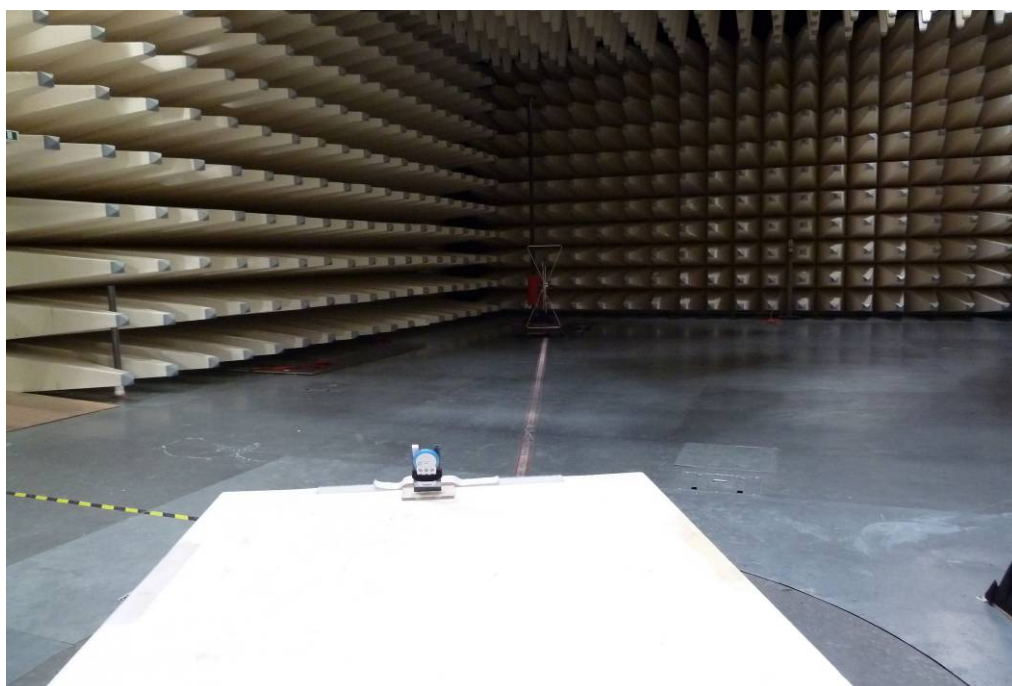


Photo 2:



Photo 3:

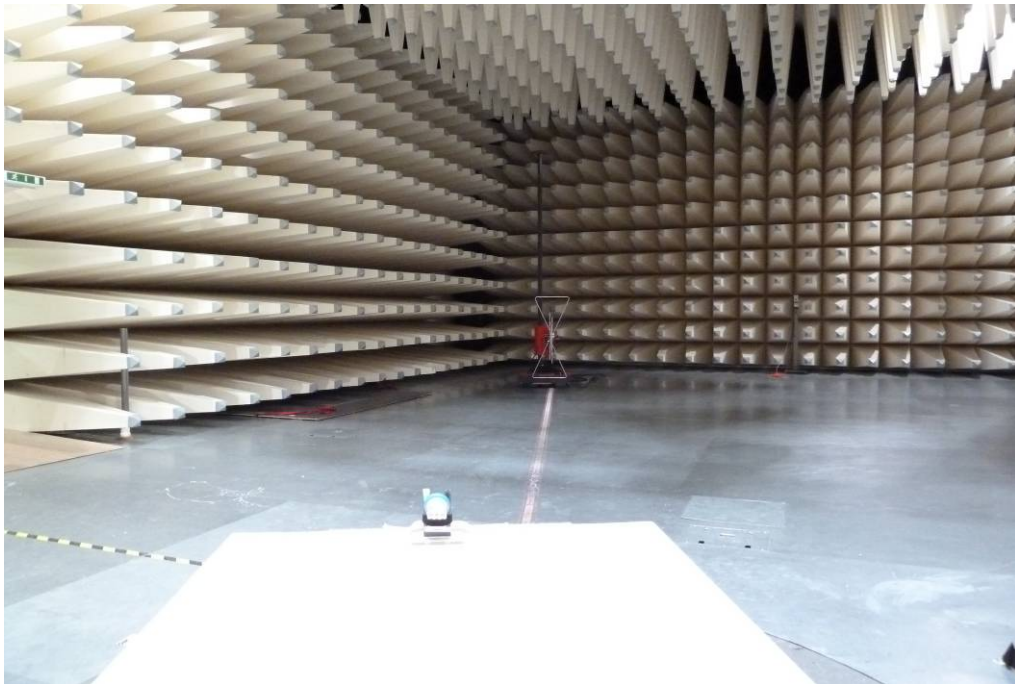


Photo 4: Measurements > 1GHz

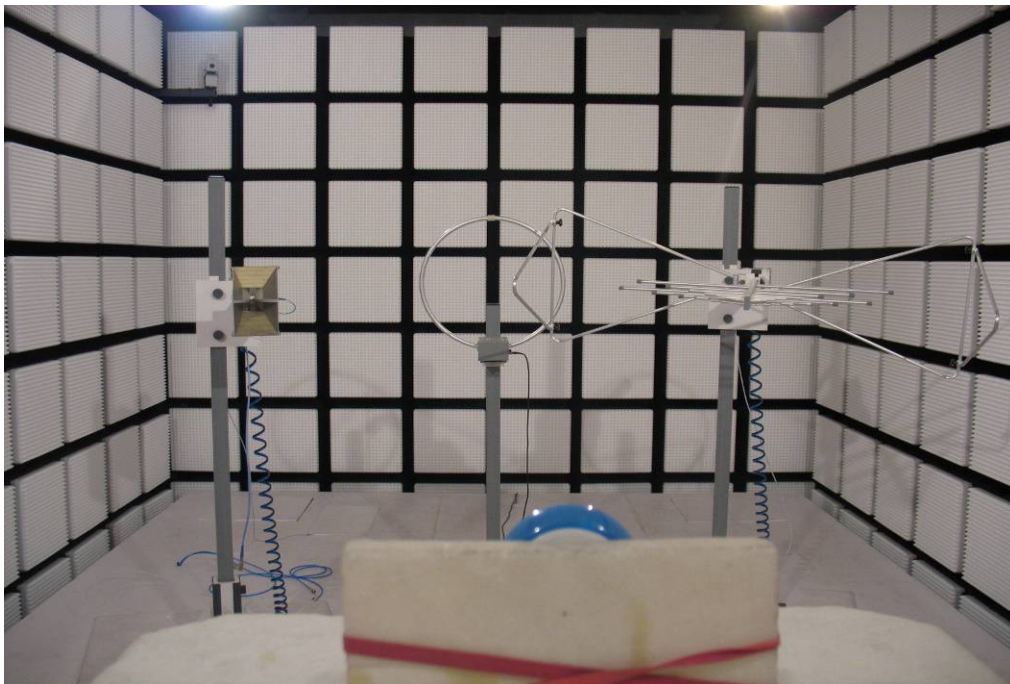
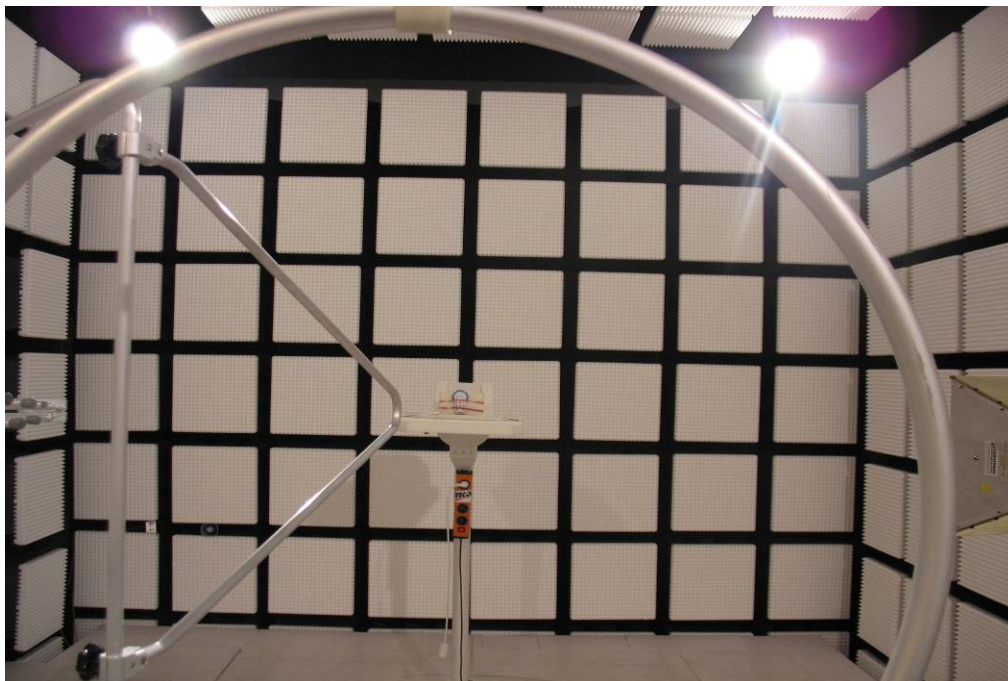


Photo 5: Measurements > 1GHz



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 documentation:

Photo 1:

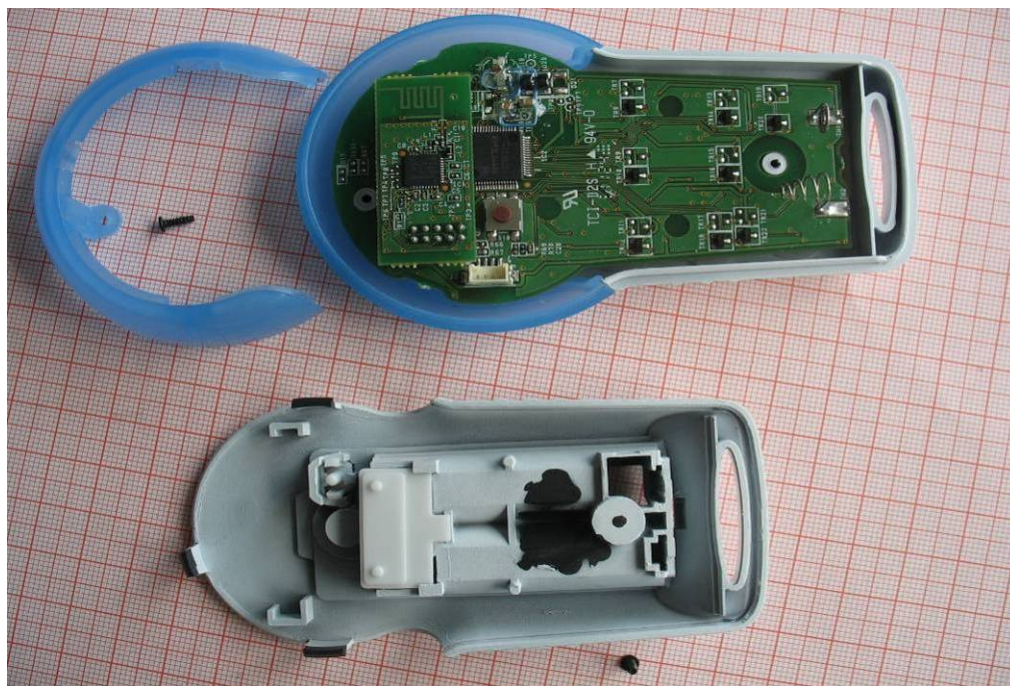


Photo 2:

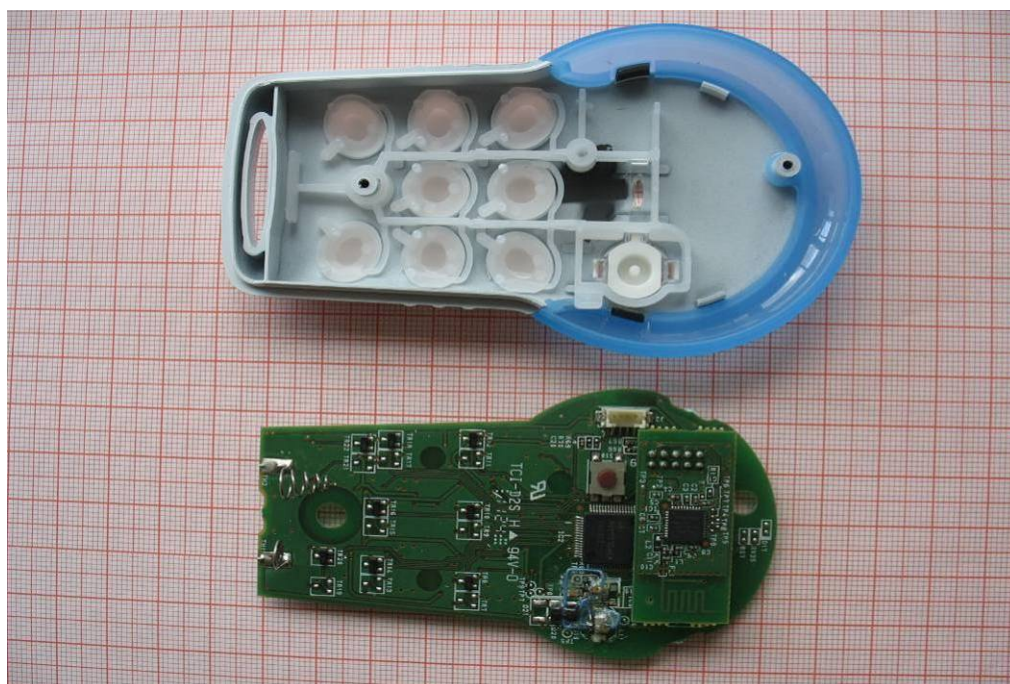


Photo 3:

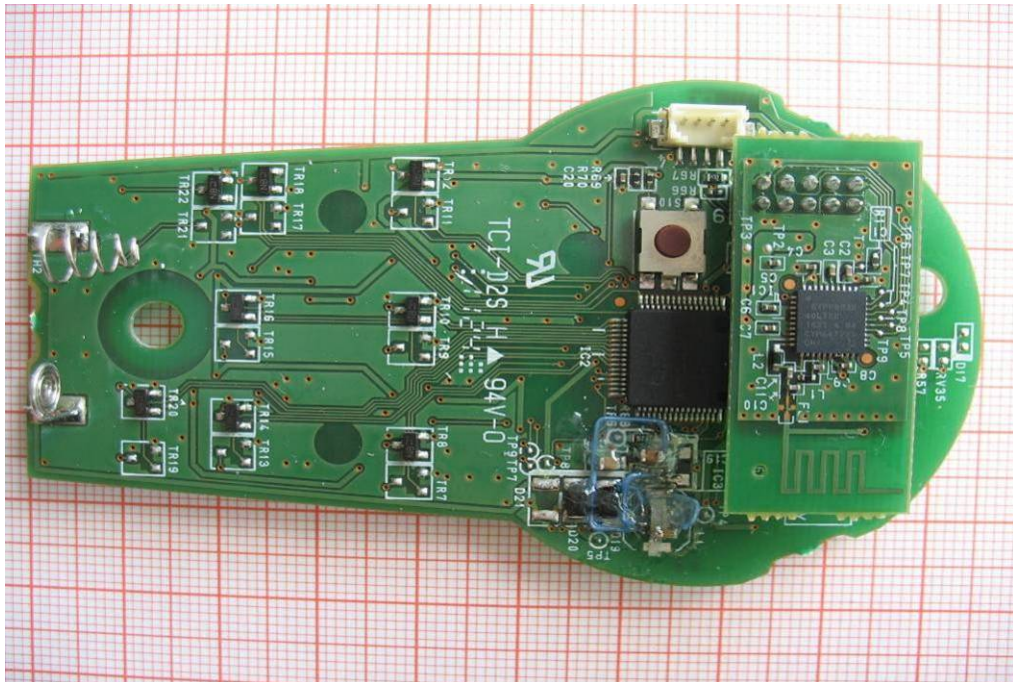


Photo 4:

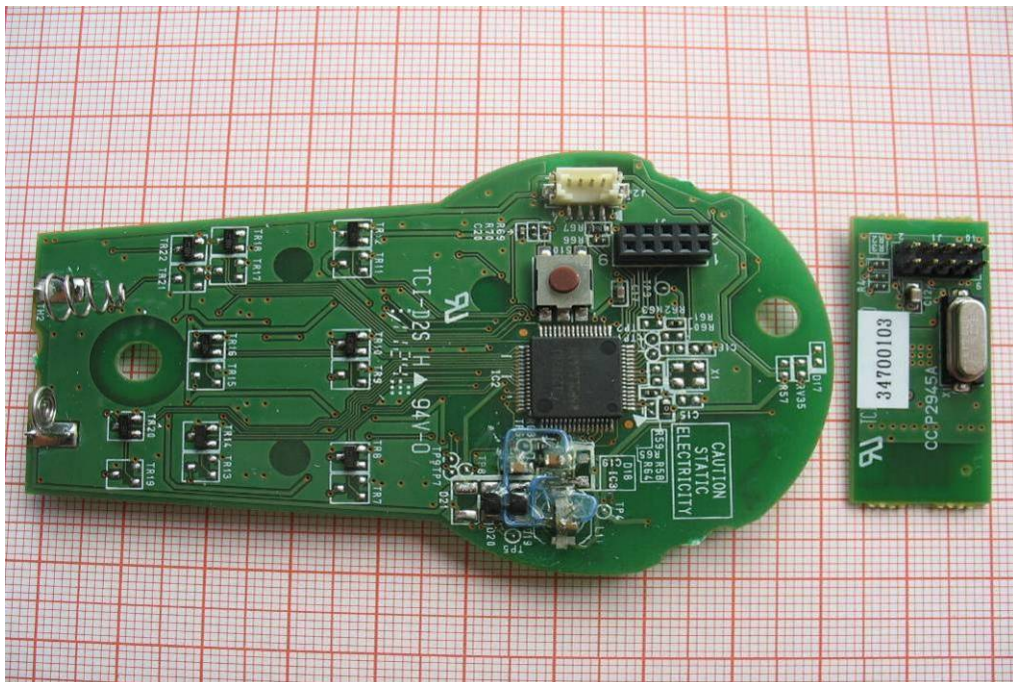


Photo 5:

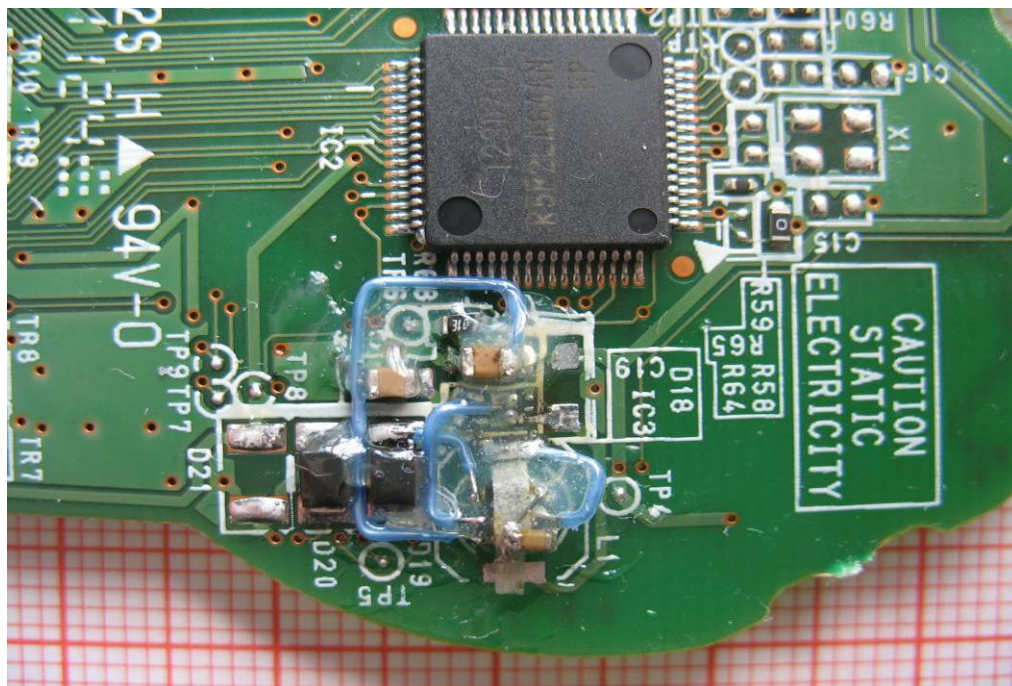


Photo 6:

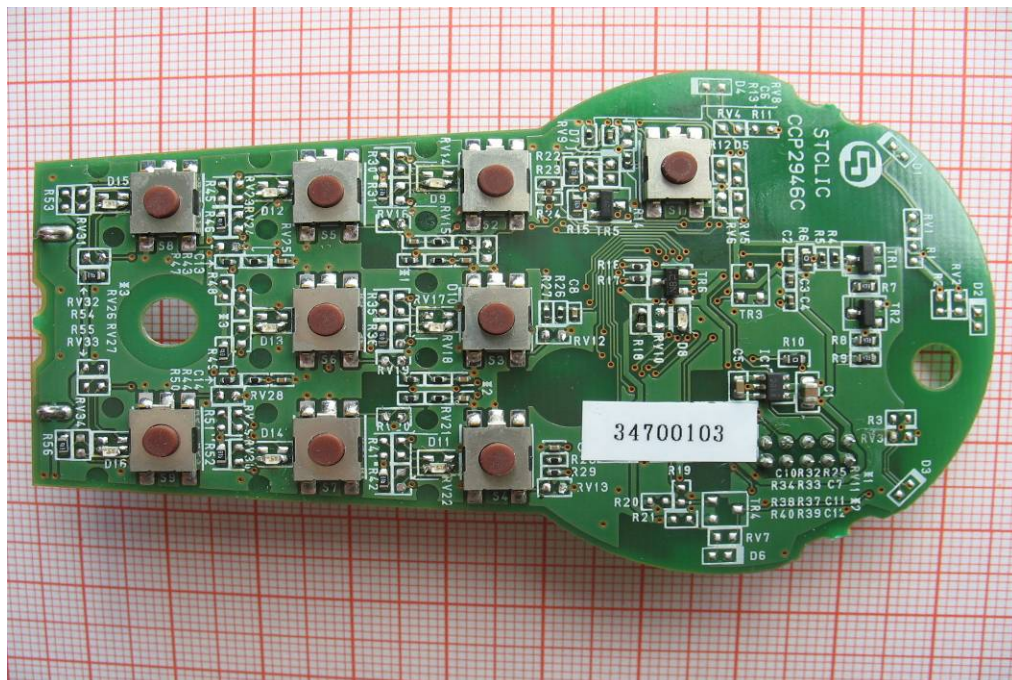


Photo 7:

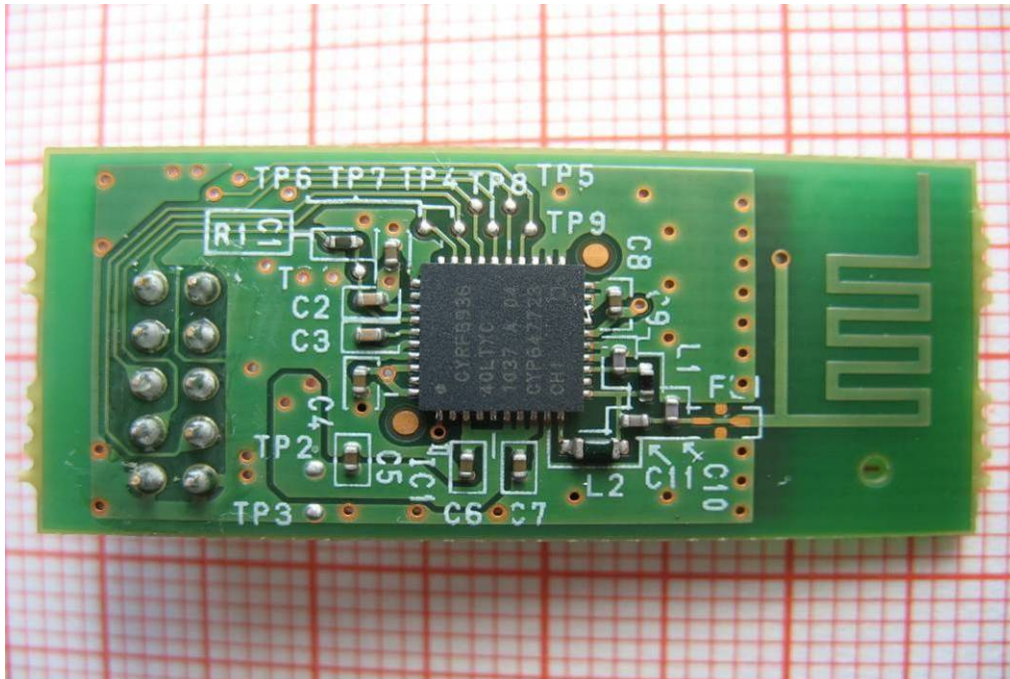
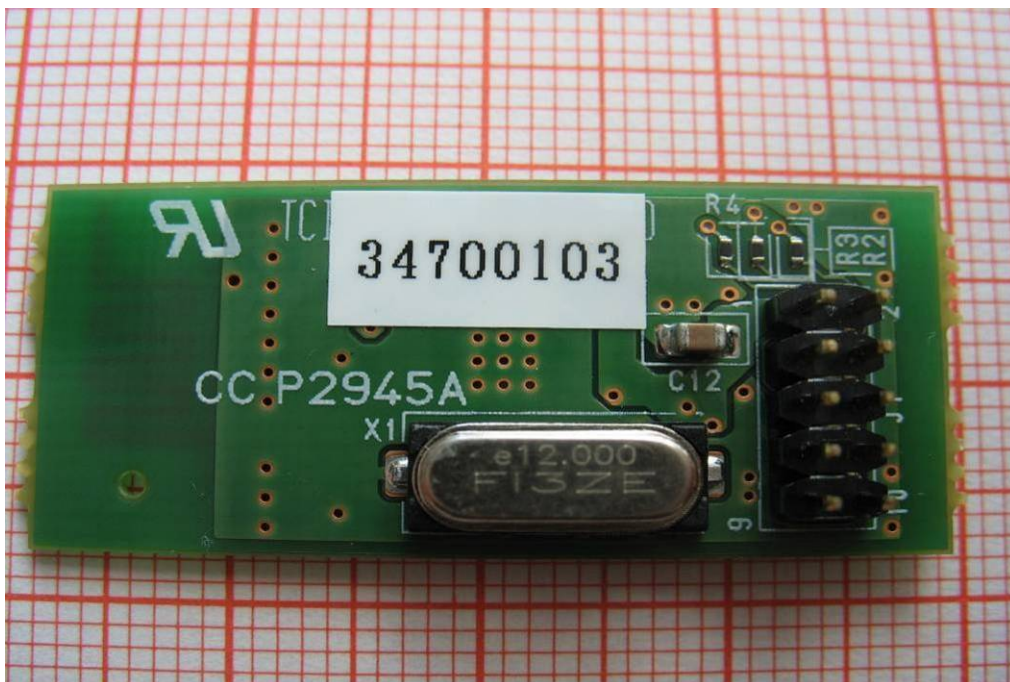


Photo 8:



Annex D Document history

Version	Applied changes	Date of release
1.0	Initial release	2011-09-15

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