Accredited testing-laboratory

DAR registration number: DGA-PL-176/94-D1

Federal Motor Transport Authority (KBA)
DAR registration number: KBA-P 00070-97

Recognized by the Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3462C-1 (IC)
Certification ID: DE 0001
Accreditation ID: DE 0002

Accredited Bluetooth® Test Facility (BQTF)

Test report no.	**:**	**1-1887-01-06/09**
Type identification	**:**	**XL600**
Applicant	**:**	**RSI Video Technologies**
FCC ID	**:**	**X46XL00**
IC Certification No	**:**	**8816A-XL00**
Test standards	**:**	**47 CFR Part 15**
		RSS - 210 Issue 7

Table of contents

1 General information 3

1.1 Notes 3
1.2 Testing laboratory 4
1.3 Details of applicant 4
1.4 Application details 4

2 Test standard/s 5

3 Technical tests 6

3.1 Details of manufacturer 6
3.1.1 Test item 6
3.1.2 Additional EUT information For IC Canada (appendix 2) 7
3.1.3 RF Technical Brief Cover Sheet acc. To RSS-102 8
3.1.4 EUT operating modes 9
3.1.5 Extreme conditions testing values 9

4 Summary of Measurement Results and list of all performed test cases 10

5 RF measurement testing 11

5.1 Description of test set-up 11
5.1.1 Radiated measurements 11
5.1.2 Conducted measurements 11
5.2 Referenced documents 12
5.3 Additional comments 12
5.4 Antenna gain 12
5.5 MPE Calculation 12
5.6 Carrier frequency separation §15.247(a) (1) 13
5.7 Number of hopping channels §15.247(a)(1) 14
5.8 Time of occupancy (dwell time) §15.247(a) (1) (i) 15
5.9 Power Spectral density (Hybrid system in Inquiry mode/Page scan) §15.247(e) 17
5.10 Spectrum Bandwidth of a FHSS System / 20dB Bandwidth §15.247(a)(1) 18
5.11 Maximum output power (conducted) § 15.247 (b)(1) 20
5.12 Max. peak output power (radiated) § 15.247 (b)(1) 22
5.13 Band-edge compliance of conducted emissions §15.247 (d) 23
5.14 Band-edge compliance of radiated emissions §15.205 24
5.15 Spurious Emissions - conducted (Transmitter) § 15.247 (c)(1) 25
5.16 Spurious Emissions > 30 MHz- radiated (Transmitter) § 15.247 (c) (1) 27
5.17 Spurious Emissions - radiated (Receiver) § 15.109 38
5.18 Spurious Emissions < 30 MHz - Transmitter radiated § 15.209 41
5.19 Conducted Emissions <30 MHz § 15.107/207 43

6 Test equipment and ancillaries used for tests 44

7 Photographs of the Test Set-up 47

8 Photographs of the EUT 48

1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 3.1.1. The 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 the CETECOM ICT Services GmbH.

Test laboratory manager:

2010-02-06	**Meheza K. Walla**	
Date	Name	Signature

Technical responsibility for area of testing:

2010-02-06	**Stefan Boes**	
Date	Name	Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10
66117 Saarbrücken
Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
e-mail: info@ICT.cetecom.de
Internet: http://www.cetecom-ict.de

State of accreditation: **The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025**
DAR registration number: DGA-PL-176/94-D1

Accredited by: **Federal Motor Transport Authority (KBA)**
DAR registration number: KBA-P 00070-97

Testing location, if different from CETECOM ICT Services GmbH:

Name :
Street :
Town :
Country :
Phone :
Fax :

1.3 Details of applicant

Name:	**RSI Video Technologies**
Street:	**56, rue Jean Giraudoux - Bâtiment 60**
Town:	**67200 Strasbourg.**
Country:	**FRANCE**
Telephone:	**+33 (0) 3 90 20 66 96**
Fax:	**+33 (0) 3 90 20 66 36**
Contact:	**Thierry Petri**
E-mail:	**thierry.petri@rsivideotech.com**
Telephone:	**+33 (0) 3 90 20 66 96**

1.4 Application details

Date of receipt of order:	**2009-12-09**
Date of receipt of test item:	**2010-01-26**
Date of start test:	**2010-01-26**
Date of end test	**2010-02-06**
Persons(s) who have been present during the test:	**Mr. François Griset**

2 Test standard/s

47 CFR Part 15	**2008-07**	**Title 47 of the Code of Federal Regulations; Chapter I-Federal Communications Commission subchapter A - general, Part 15-Radio frequency devices**
RSS - 210 Issue 7	**2007-06**	**Spectrum Management and Telecommunications - Radio Standards Specification Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment**

3 Technical tests

3.1 Details of manufacturer

Name:	**RSI Video Technologies**
Street:	**56, rue Jean Giraudoux - Bâtiment 60**
Town:	**67200 Strasbourg.**
Country:	**FRANCE**

3.1.1 Test item

Kind of test item	:	**XL alarm Panel**
Type identification	:	**XL600**
S/N serial number	:	**F0105109230203F9**
HW hardware status	:	**-/-**
SW software status	:	**-/-**
Frequency Band [MHz]	:	**904.5 MHz – 926.1 MHz**
Type of Modulation	:	**GFSK**
Number of channels	:	**25**
Antenna	:	**Integrated antenna**
Power Supply	:	**4*1.5 V DC from alkaline battery LR20-AM1 (EUT)** **4*1.5 V DC from alkaline battery LR20-AM1 (Backup)**
Temperature Range	:	**-20 °C to +55 °C**

Max. power radiated: **17.08 dBm**
Max. power conducted: **15.59 dBm**

FCC ID: **X46XL00**
IC: **8816A-XL00**

3.1.2 Additional EUT information For IC Canada (appendix 2)

IC Registration Number:	**8816A-XL00**
Model Name:	**XL600**
Manufacturer (complete Address):	**RSI Video Technologies** **56, rue Jean Giraudoux - Bâtiment 60** **67200 Strasbourg.** **FRANCE**
Tested to Radio Standards Specification (RSS) No.:	**RSS-210 Issue 7**
Open Area Test Site Industry Canada Number:	**IC 3462C-1**
Frequency Range (or fixed frequency) [MHz]:	**904.5 MHz – 926.1 MHz**
RF: Power [W] (max):	**Rad. EIRP: 51.05 mW** **Conducted : 36.22 mW**
Antenna Type:	**Integrated antenna**
Occupied Bandwidth (99% BW) [kHz]:	**GFSK: 475**
Type of Modulation:	**GFSK**
Emission Designator (TRC-43):	**GFSK: 475KFXD**
Transmitter Spurious (worst case) [dBµV/m in 3m]:	**50.34**
Receiver Spurious (worst case) [dBµV/m in 3m]:	**49.28**

ATTESTATION:

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

Signature:

Test engineer: Meheza K. Walla Date: 2010-02-06

3.1.3 RF Technical Brief Cover Sheet acc. To RSS-102

All Fields must be completed with the requested information or the following codes: N/A for Not Applicable, N/P for Not Performed or N/V for Not Available. Where applicable, check appropriate box.

1. COMPANY NUMBER: **8816A**

2. MODEL NUMBER: **XL600**

3. MANUFACTURER: **RSI Video Technologies**

4. TYPE OF EVALUATION: **(c) RF Evaluation**

- Evaluated against exposure limits: General Public Use ☒ Controlled Use ☐
- Duty cycle used in evaluation: 99 %
- Standard used for evaluation: RSS-102 Issue 2 (2005-11)
- Measurement distance: 0.20 m
- RF value: 0.101 V/m □ A/m □ W/m^2 ☒

Measured ☐ Computed ☐ Calculated ☒

Declaration of RF Exposure Compliance

ATTESTATION:

I attest that the information provided in this test report are correct; that a Technical Brief was prepared and the information it contains is correct; that the device evaluation was performed or supervised by me; that applicable measurement methods and evaluation methodologies have been followed and that the device meets the SAR and/or RF exposure limits of RSS-102.

Signature:

Name: Meheza K. Walla
Title: Expert
Company: Cetecom ICT Services GmbH

3.1.4 EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional information
Op. 0	Normal mode	Normal temperature and power source conditions
Op. 1		low temperature, low power source conditions
Op. 2		low temperature, high power source conditions
Op. 3		high temperature, low power source conditions
Op. 4		high temperature, high power source conditions

*) EUT operating mode no. is used to simplify the test plan

3.1.5 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature	T_{nom}	°C	**+23**
Nominal Humidity	H_{nom}	%	**42**
Nominal Power Source	V_{nom}	V	**6**

Type of power source: **DC from alkaline battery LR20-AM1**

Deviations from these values are reported in chapter 2

4 Summary of Measurement Results and list of all performed test cases

☒ **No deviations from the technical specifications were ascertained**

☐ There were deviations from the technical specifications ascertained

TC identifier	Description	verdict	date	Remark
RF-Testing	FCC Part 15 §15.247 - CANADA RSS-210	PASS	2010-02-06	-/-

Test Specification Clause	Test Case	Pass	Fail	Not applicable	Not performed
None	Antenna Gain	Yes			
§15.247(a1)	Carrier frequency separation	Yes			
§15.247(a1)	Number of hopping channels	Yes			
§15.247(a)(1)(iii)	Time of occupancy (dwell time)	Yes			
§15.247(e)	Power Spectral density (Hybrid system in Inquiry mode/Page scan)			Yes	
§15.247(a)(1)	Spectrum Bandwidth of a FHSS System / 20dB Bandwith	Yes			
§ 15.247 (b)(1)	Maximum output power (conducted)	Yes			
§ 15.247 (b)(1)	Max. peak output power (radiated)	Yes			
§ 15.247 (d)	Band-edge compliance of conducted emissions	Yes			
§ 15.205	Band-edge compliance of radiated emissions	Yes			
§ 15.247 (d)	Spurious Emission - conducted (Transmitter)	Yes			
§ 15.247 (d)	Spurious Emission - radiated (Transmitter) >30 MHz	Yes			
§ 15.109	Spurious Emissions - radiated (Receiver)	Yes			
§ 15.209	Spurious Emissions - radiated (Transmitter) <30 MHz	Yes			
§ 15.107/207	Conducted Emissions <30 MHz			Yes	

5 RF measurement testing

5.1 Description of test set-up

5.1.1 Radiated measurements

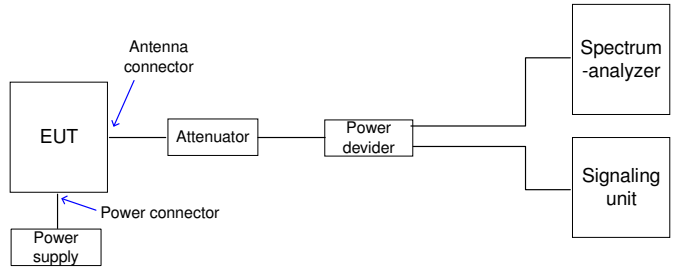
The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 25 GHz in semi-anechoic chambers. The EUT is positioned on a non-conductive support with a height of 0.80 m above a conductive ground plane that covers the whole chamber. The receiving antennas are confirmed with specifications ANSI C63.2-1996 clause 15 and ANSI C63.4-2003 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 C63-4-2003 clause 4.2.
Antennas are confirmed with ANSI C63.2-1996 item 15.

9 kHz - 150 kHz: Quasi Peak measurement, 200 Hz Bandwidth, active loop antenna.
150 kHz - 30 MHz: Quasi Peak measurement, 9 kHz Bandwidth, active loop antenna.
30 MHz - 200 MHz: Quasi Peak measurement, 120 kHz Bandwidth, bi-conical antenna
200MHz - 1GHz: Quasi Peak measurement, 120 kHz Bandwidth, log periodic antenna
>1GHz: Average, RBW 1MHz, VBW 10 Hz, waveguide horn

All measurements are done in accordance with the Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems DA 00-705 and Appendix A “BLUETOOTH APPROVALS”
The EUT is powered by an external power supply with nominal voltage. The signalling is performed from outside the chamber with a signalling unit (CMU200 or other) by air link using signalling antenna.

5.1.2 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.



5.2 Referenced documents

None

5.3 Additional comments

None

5.4 Antenna gain

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

	Low channel 904.5 MHz	Middle channel 915.3 MHz	High channel 926.1 MHz
Conducted power [dBm] Measured, GFSK modulation	15.59	15.48	15.42
Radiated power [dBm] Measured, GFSK modulation	17.02	17.08	16.89
Gain [dBi] Calculated	1.43	1.60	1.47

5.5 MPE Calculation

These equations are generally accurate in the far field of an antenna but will over predict power density in the near field, where they could be used for making a "worst case" prediction.

$S = PG/4\pi R^2$

Where S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units e.g. mW)
G = power gain of the antenna in the direction of interest relative to the isotropic radiator
R = distance to the centre of radiation of the antenna (appropriate units e.g. cm)

Or

$S = EIRP/4\pi R^2$ where EIRP = Equivalent Isotropically Radiated Power

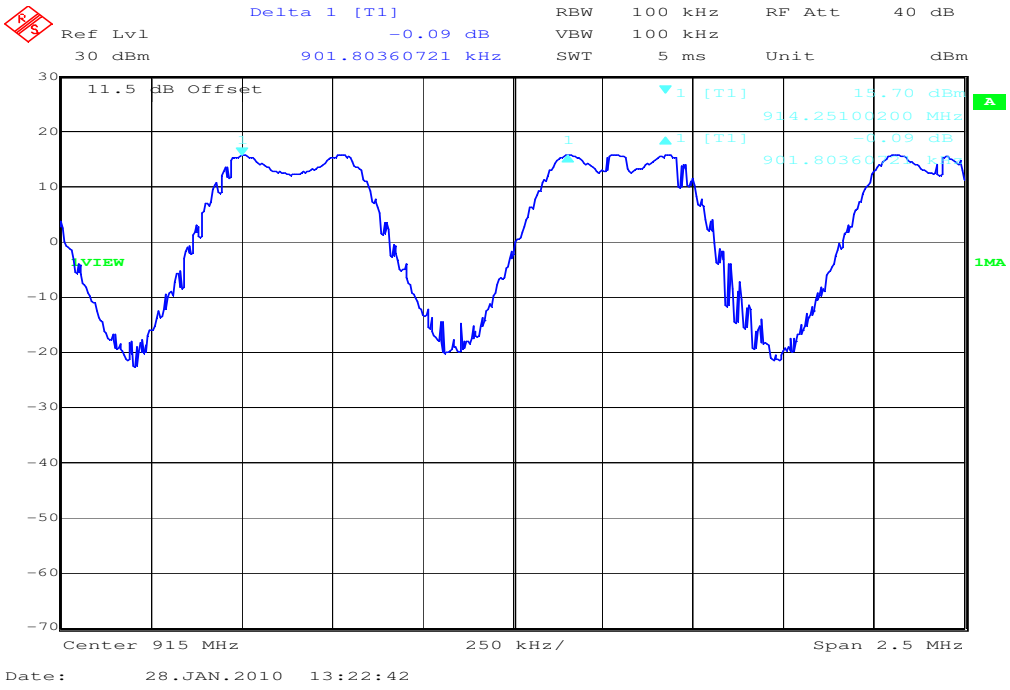
Calculation:
(Calculated for max. EIRP)
EIRP: 17.08 dBm (51.05 mW)
Calculated at distance of 20 cm:
Power density $= 51.05/4\pi(20)^2 = 0.0101$ mW/ cm^2

Limit:

1mW/ cm^2 is the reference level for general public exposure according to the OET Bulletin 65, Edition 97-01 Table 1.

5.6 Carrier frequency separation §15.247(a) (1)

Plot 1 of 1:



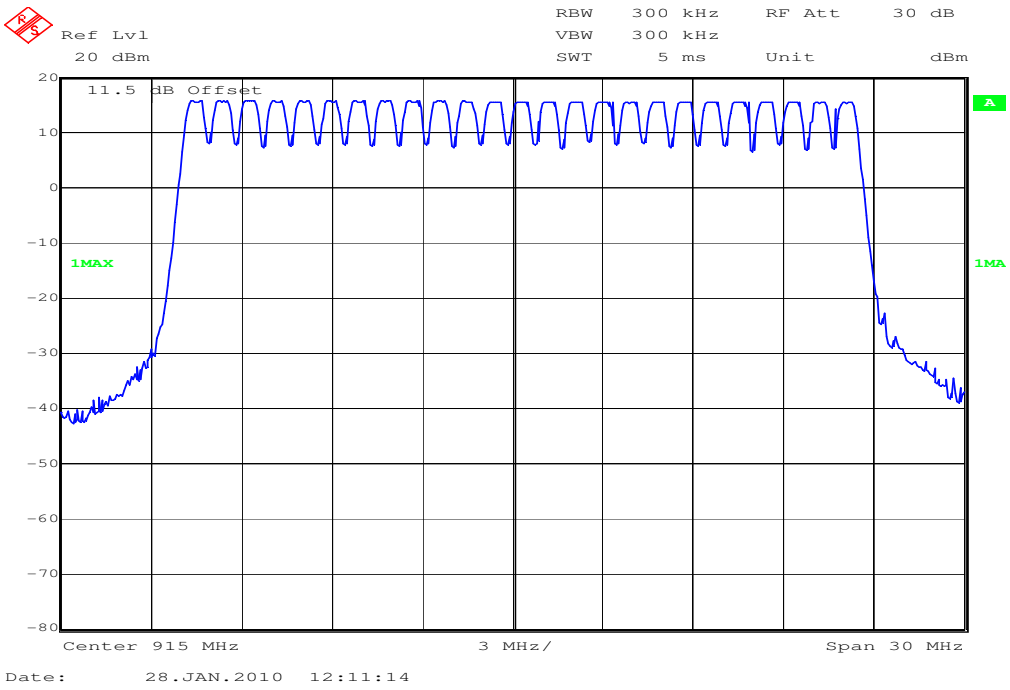
Result: Channel separation is: ~ 902 kHz

Limits:

Under normal test conditions only	Minimum 25 kHz or 20 dB Bandwidth of the hopping system

5.7 Number of hopping channels §15.247(a)(1)

Plot 1 of 1:



Result: The number of hopping channels is: 25

Limits:

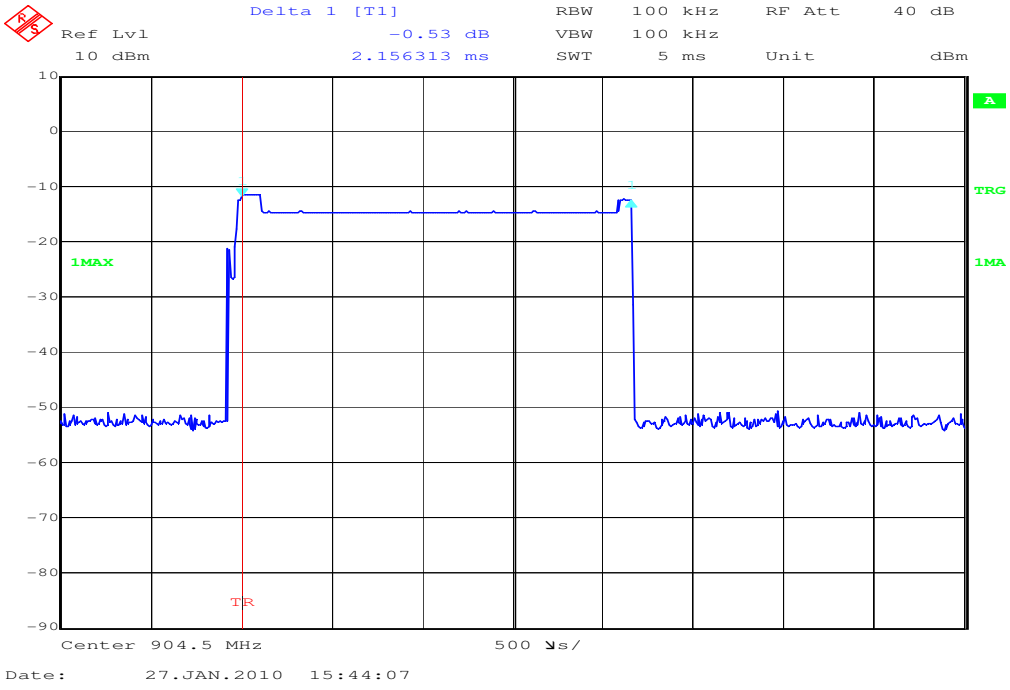
Under normal test conditions only	at least 15 non-overlapping channels

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

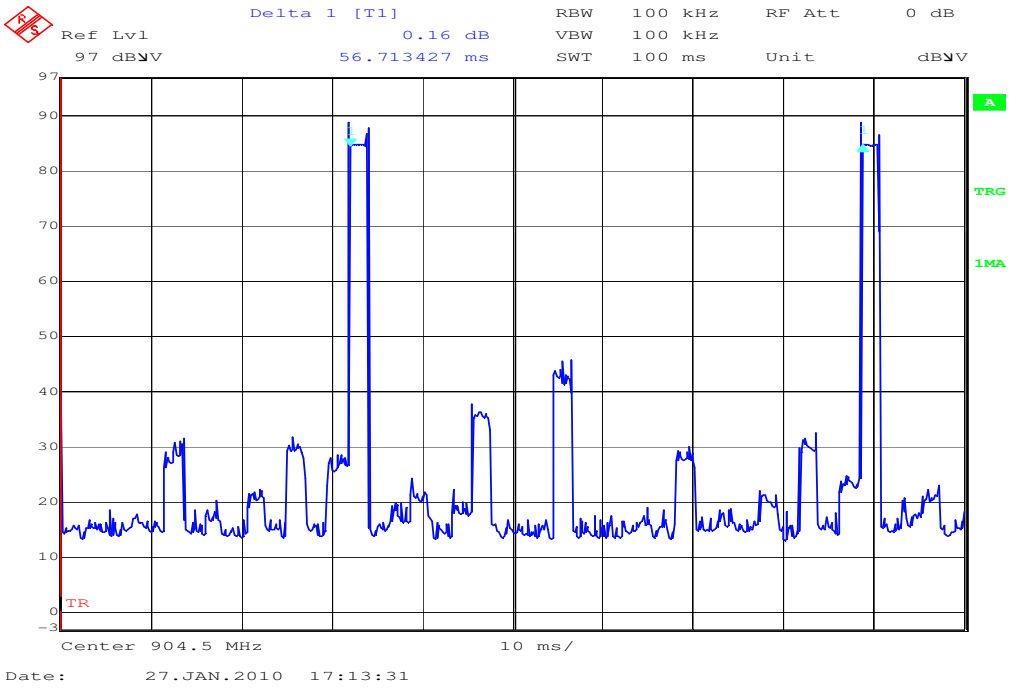
5.8 Time of occupancy (dwell time) §15.247(a) (1) (i)

(i) For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within 10 second period.

Plot 1:



Plot 2:



The calculation for a 10 second period is a follows:

Dwell time = time slot length * hop rate / number of hopping channels * 10

Dwell time = 2.15 ms * 440 / 25 * 10

According to plot 2, the hop rate (in a 1 s period) is calculated with 1s * 25 / 56.71 ms = 440 (in a 1 s period)

➔ Dwell time = 0.38 s < 0.4 s (in a 10 s period).

5.9 Power Spectral density (Hybrid system in Inquiry mode/Page scan) §15.247(e)

Not applicable!

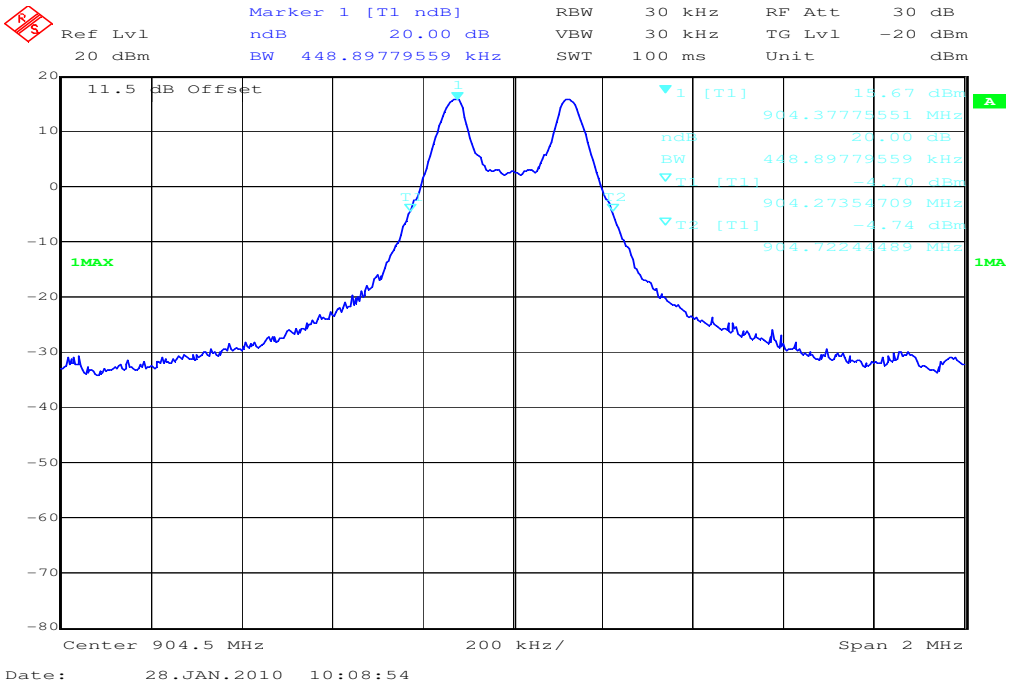
Result: Power density: - dBm/Hz = - dBm / 3 kHz
Correction factor from dBm/Hz to dBm / 3 kHz is +34.8 dB

Limits:

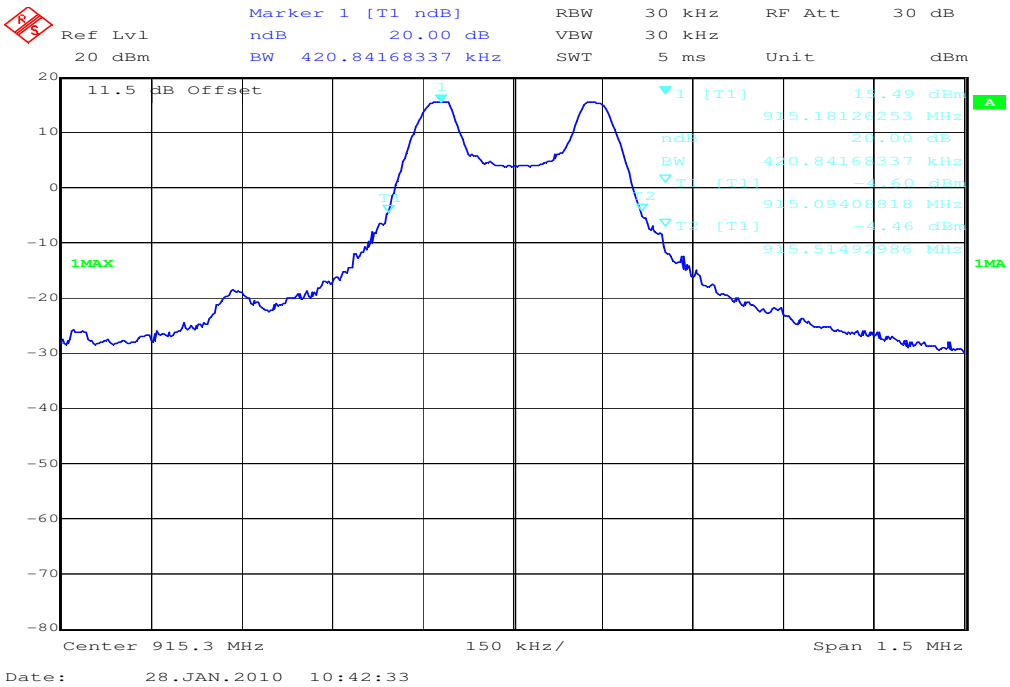
Under normal test conditions only	For digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission

5.10 Spectrum Bandwidth of a FHSS System / 20dB Bandwidth §15.247(a)(1)

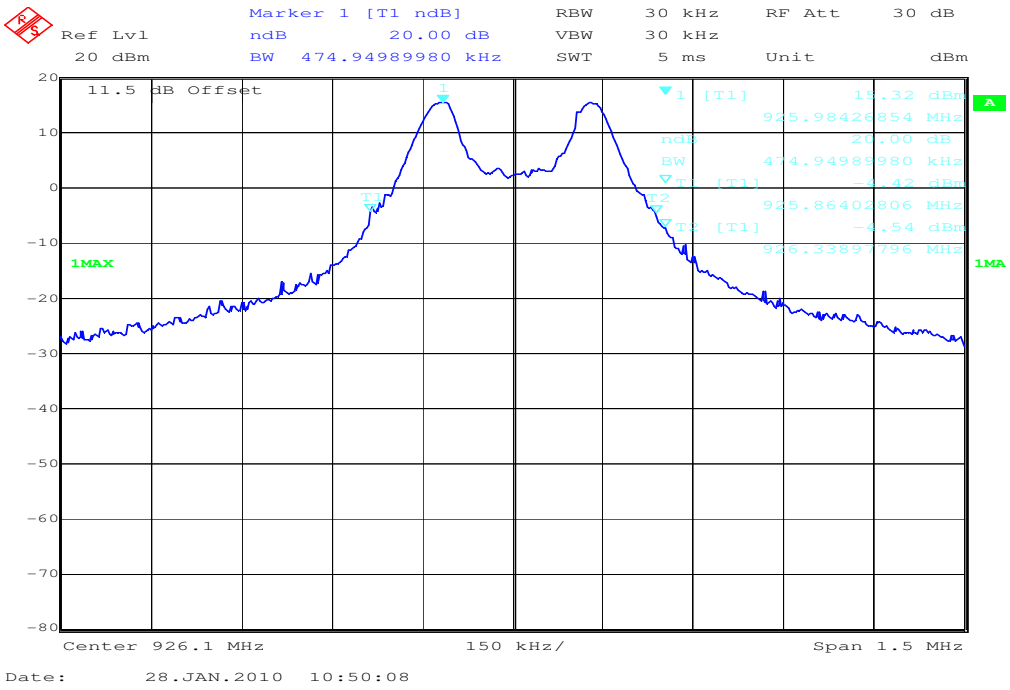
Plot 1 of 3



Plot 2 of 3



Plot 3 of 3



Result:

Test conditions		20 dB BANDWIDTH [kHz]		
Frequency [MHz]		904.5	915.3	926.1
T_{nom}	V_{nom}	449	421	475
Measurement uncertainty		± 30 kHz		

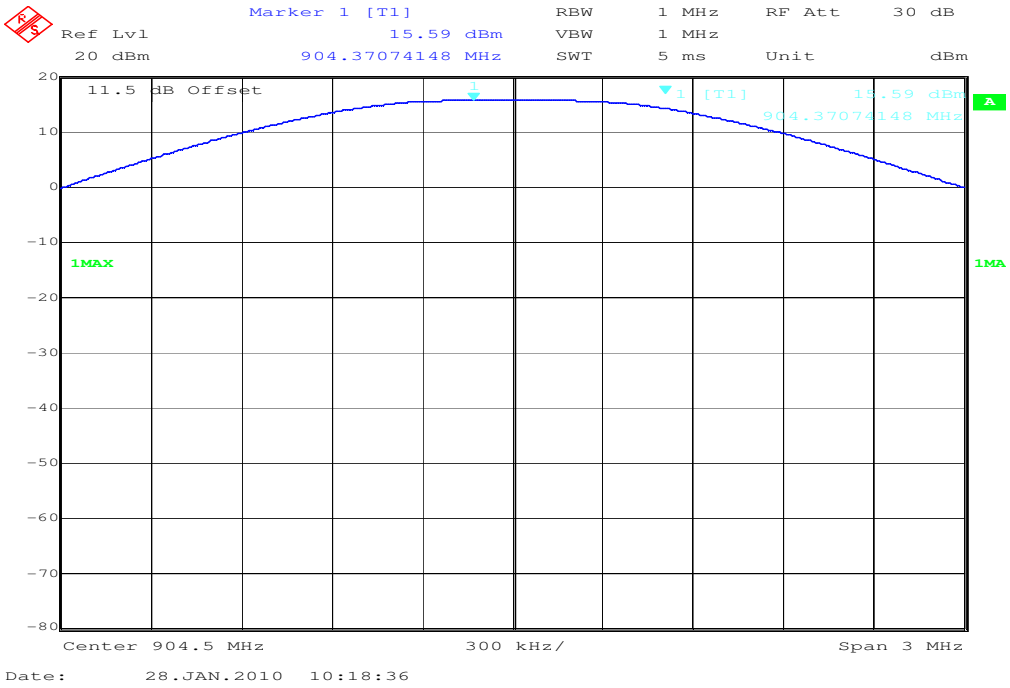
RBW: 30 kHz / VBW 30 kHz

Limits:

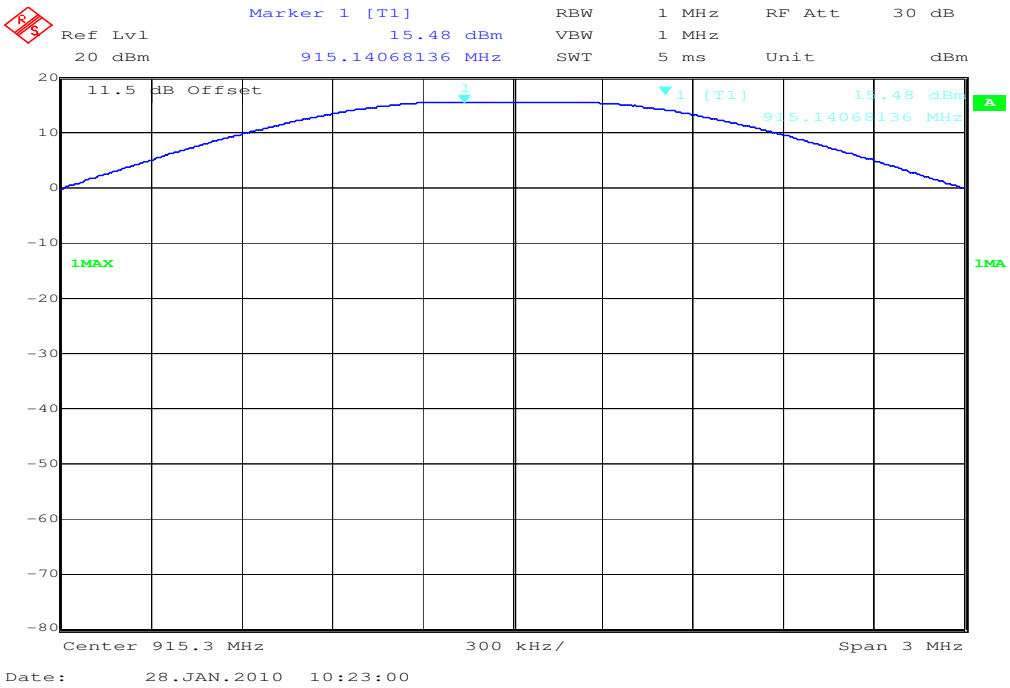
Under normal test conditions only	< 500 kHz

5.11 Maximum output power (conducted) § 15.247 (b)(1)

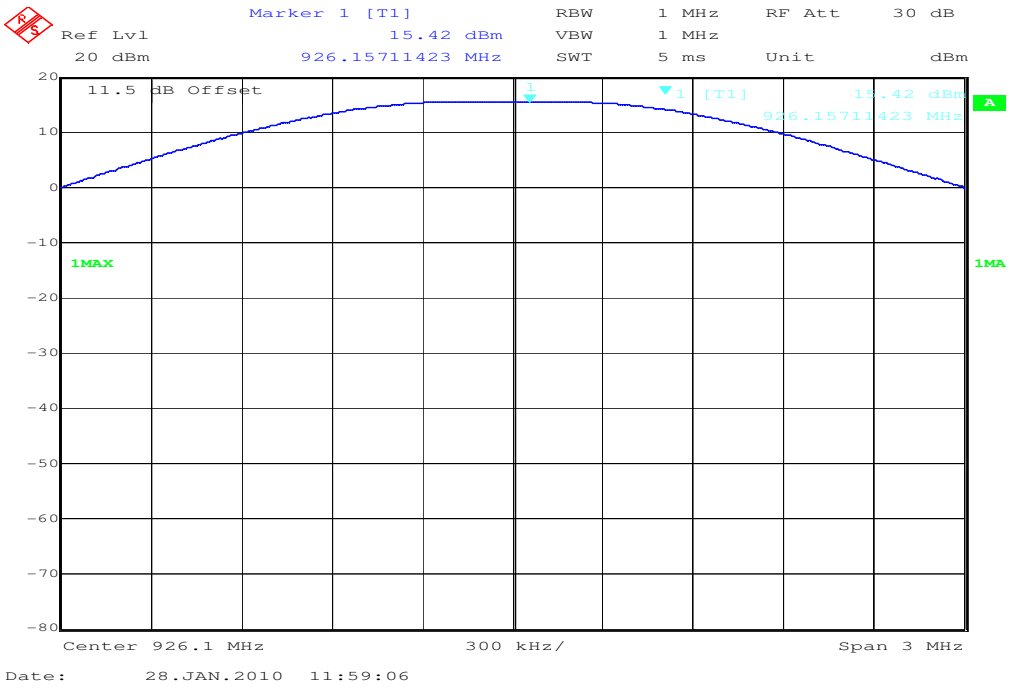
Plot 1 of 3



Plot 2 of 3



Plot 3 of 3



Results:

Test conditions		Max. peak output power [dBm]					
Frequency [MHz]		904.5		915.3		926.1	
T_{nom}	V_{nom}	PK	15.59	PK	15.48	PK	15.42
Measurement uncertainty		±3dB					

RBW / VBW: 1 MHz

Limits:

Under normal test conditions only, for frequency range 902 – 928 MHz	Max. 0.25 Watt (24 dBm)

5.12 Max. peak output power (radiated) § 15.247 (b)(1)

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		904.5	915.3	926.1
T_{nom}	V_{nom}	17.02	17.08	16.89
Measurement uncertainty		±3dB		

RBW / VBW: 1 MHz
Measured at a distance of 3m

Limits:

Under normal test conditions only, for frequency range 902 – 928 MHz	Max. 0.25 Watt (24 dBm)

5.13 Band-edge compliance of conducted emissions §15.247 (d)

No restricted band in the range ± 2 channel bandwidths of the Band-edges of the specified emission band! (608 MHz – 614 MHz and 960 MHz – 1240 MHz).

Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

Limits:

Under normal test conditions only	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)).

5.14 Band-edge compliance of radiated emissions §15.205

No restricted band in the range ± 2 channel bandwidths of the Band-edges of the specified emission band! (608 MHz – 614 MHz and 960 MHz – 1240 MHz).

Section 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

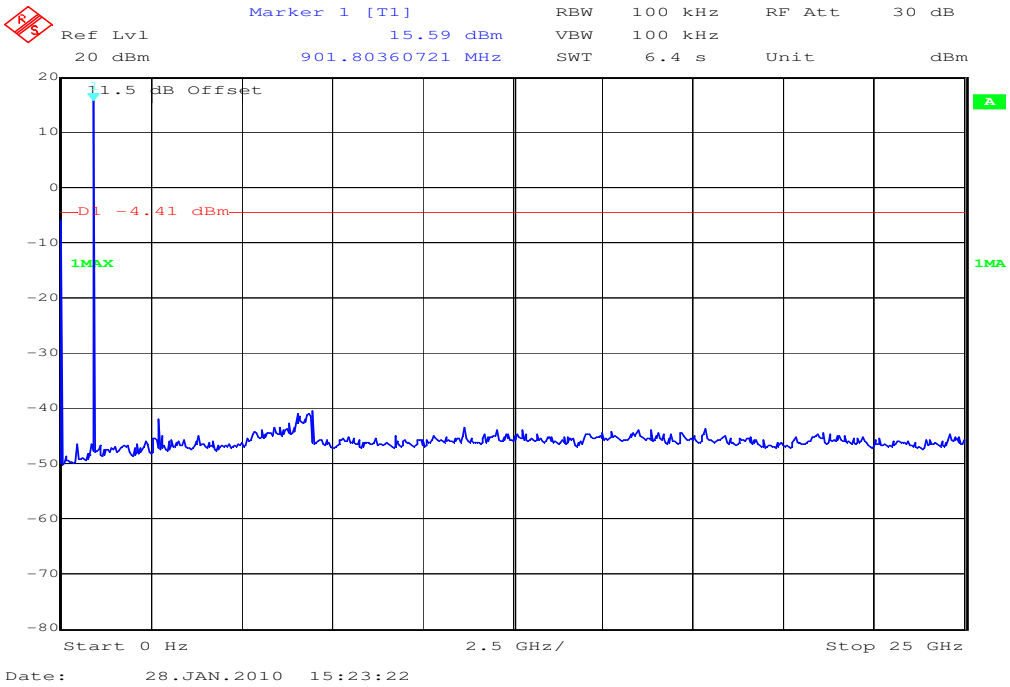
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

Limits:

Under normal test conditions only	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)).

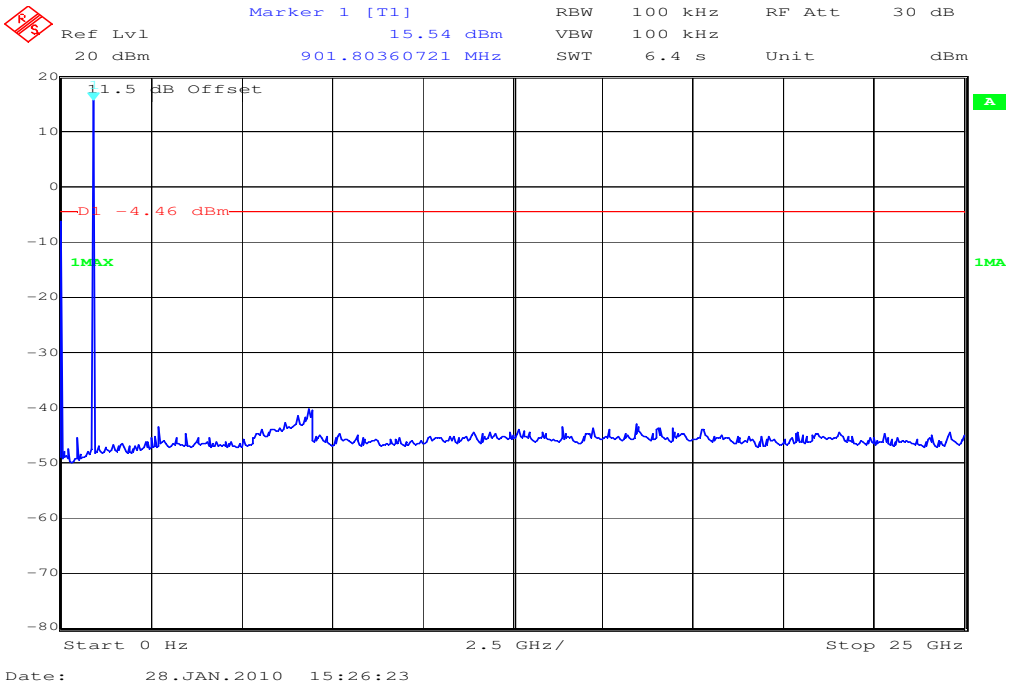
5.15 Spurious Emissions - conducted (Transmitter) § 15.247 (c)(1)

Plot 1 of 3: lowest channel



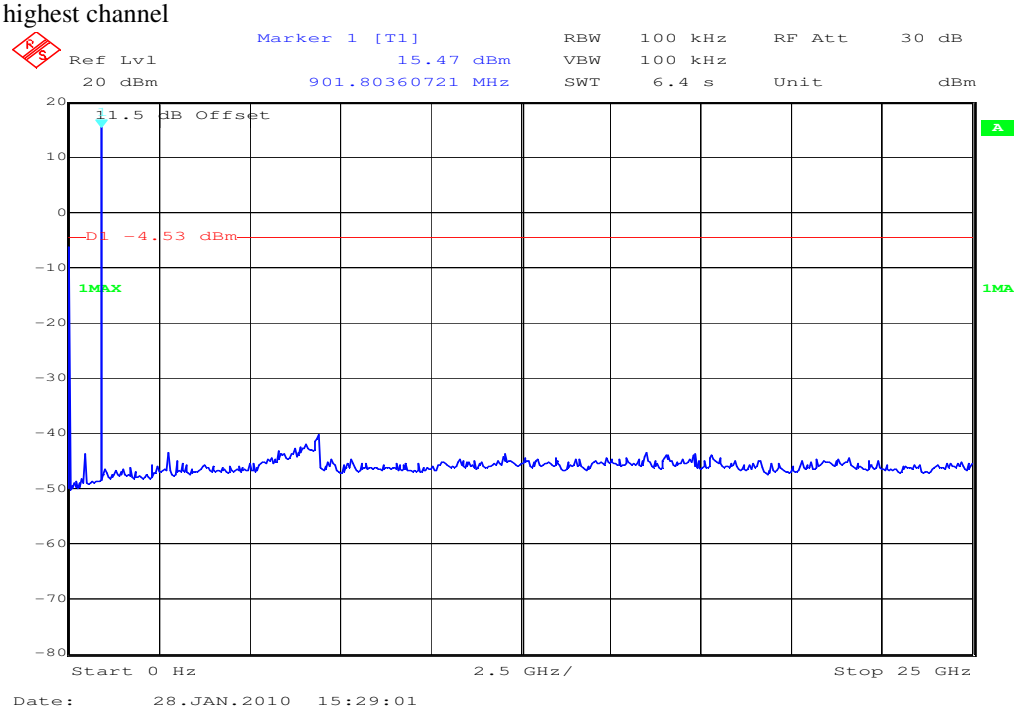
The peak at the left site of the plot is the local oscillator from the spectrum analyzer and not a spurious emission.

Plot 2 of 3: middle channel



The peak at the left site of the plot is the local oscillator from the spectrum analyzer and not a spurious emission.

Plot 3 of 3: highest channel



The peak at the left site of the plot is the local oscillator from the spectrum analyzer and not a spurious emission.

Result & Limits:

Emission Limitation					
Frequency [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
904.5		15.59	24 dBm		Operating frequency
			-20 dBc		
915.3		15.54	24 dBm		Operating frequency
			-20 dBc		
926.1		15.47	24 dBm		Operating frequency
			-20 dBc		
Measurement uncertainty			± 3dB		

F < 1 GHz: RBW: 100 kHz VBW: 100 kHz
F > 1 GHz: RBW: 1 MHz VBW: 1 MHz

Under normal test conditions only	In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. 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)).

Note: For emissions that fall into restricted bands you find the radiated emissions later in the report.

5.16 Spurious Emissions > 30 MHz- radiated (Transmitter) § 15.247 (c) (1)

Plot 1: 0.03 - 1 GHz, antenna vertical/horizontal (lowest channel)

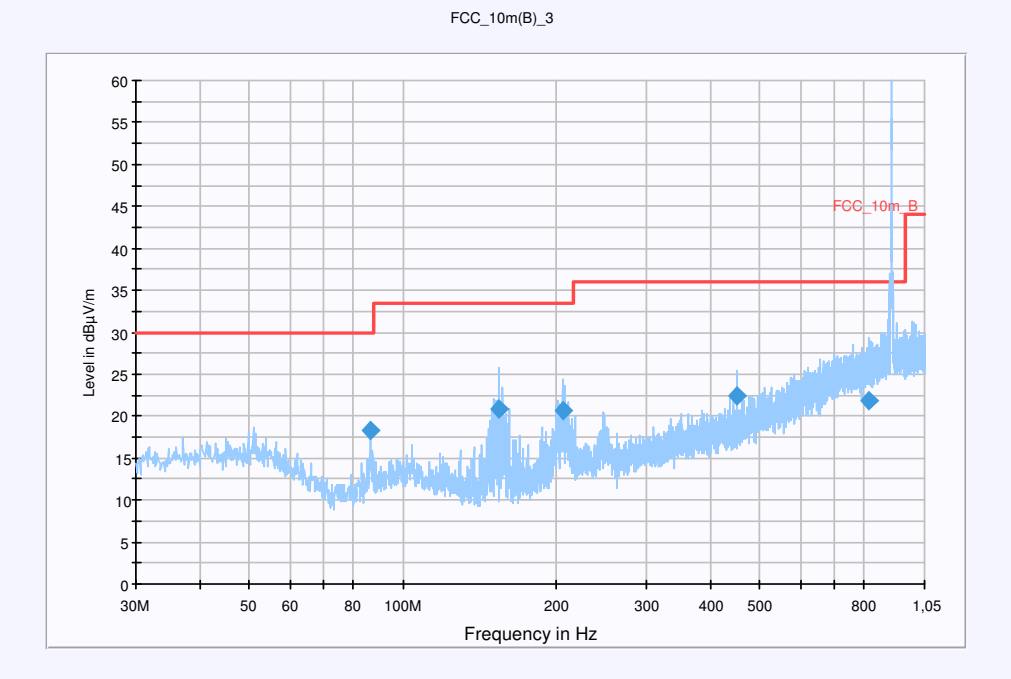
Information

EUT:	XL600
Serial Number:	F0105109230203F9
Test Description:	FCC Part 15
Operating Conditions:	GFSK Test mode, Low Channel
Operator Name:	Kraus
Comment:	Powered from 6V DC (Alkaline Battery)

Scan Setup: FCC_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



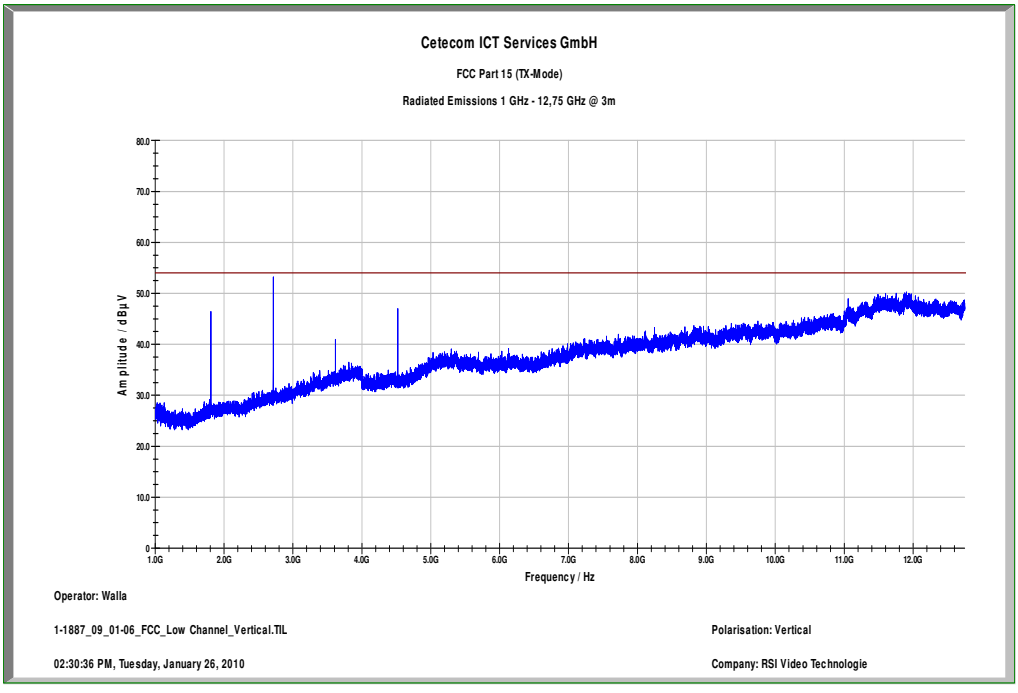
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
86.287350	18.3	15000.000	120.000	147.0	V	299.0	10.4	11.7	30.0
154.113000	20.9	15000.000	120.000	124.0	V	31.0	9.2	12.6	33.5
205.479600	20.7	15000.000	120.000	112.0	V	224.0	12.2	12.8	33.5
452.196900	22.5	15000.000	120.000	115.0	V	14.0	18.1	13.5	36.0
815.735400	21.8	15000.000	120.000	181.0	H	200.0	24.5	14.2	36.0

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

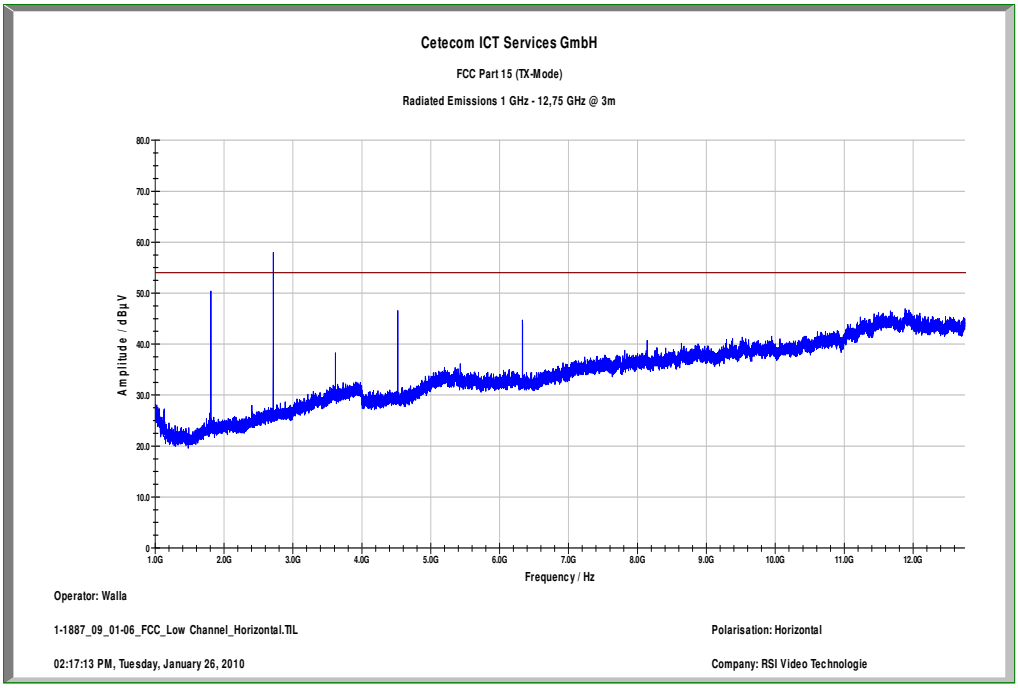
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3]
	@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch
	FW 1.0
Antenna:	VULB 9163
	SN 9163-295, FW ---, CAL 08.04.2010
	Correction Table (vertical): VULP6113
	Correction Table (horizontal): VULP6113
	Correction Table: Cabel with switch (0908)
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 6.30.10 + Service Pack 2

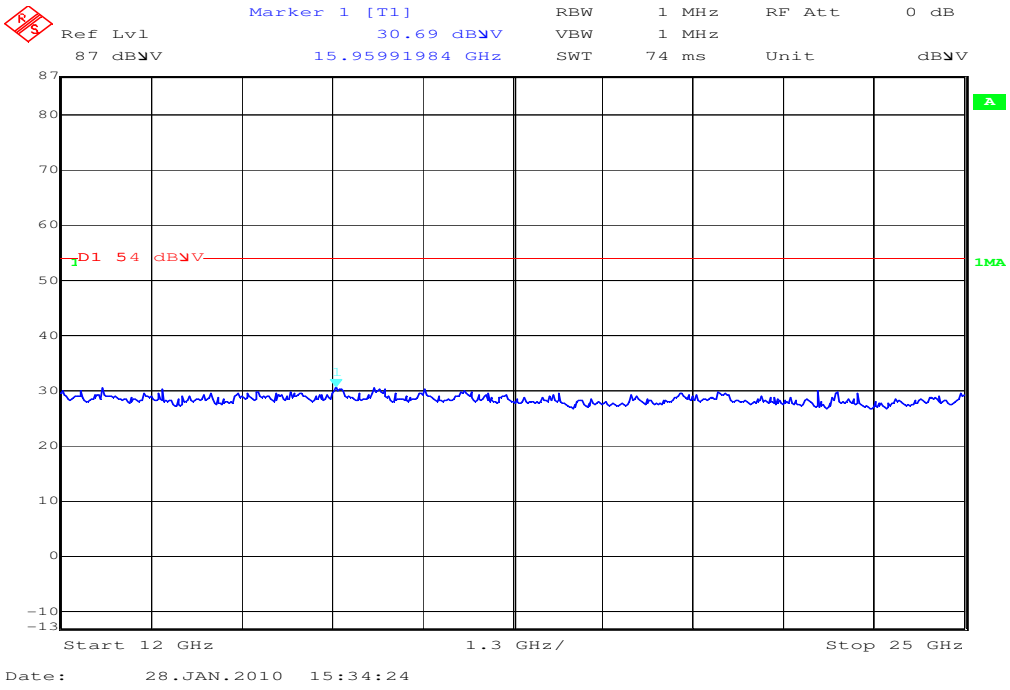
Plot 2: 1 - 12 GHz, antenna vertical (lowest channel)



Plot 3: 1 - 12 GHz, antenna horizontal (lowest channel)



Plot 4: 12 - 25 GHz, antenna vertical/horizontal (valid for all channels)



Plot 5: 0.03 - 1 GHz vertical/horizontal (middle channel)

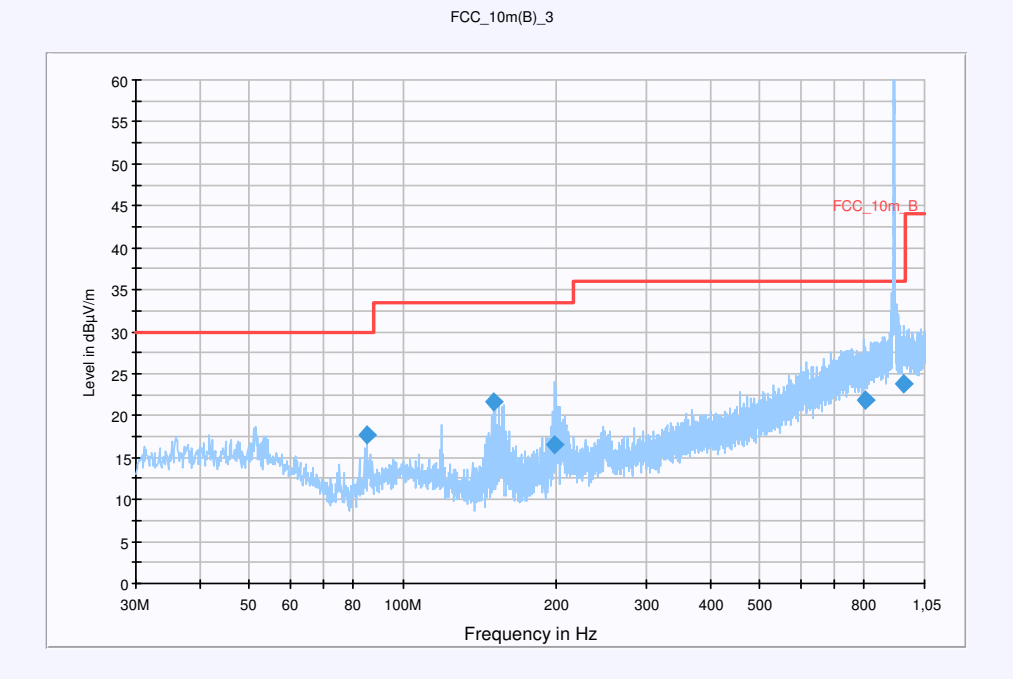
Information

EUT:	XL600
Serial Number:	F0105109230203F9
Test Description:	FCC Part 15
Operating Conditions:	GFSK Test mode, Middle Channel
Operator Name:	Kraus
Comment:	Powered from 6V DC (Alkaline Battery)

Scan Setup: FCC_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



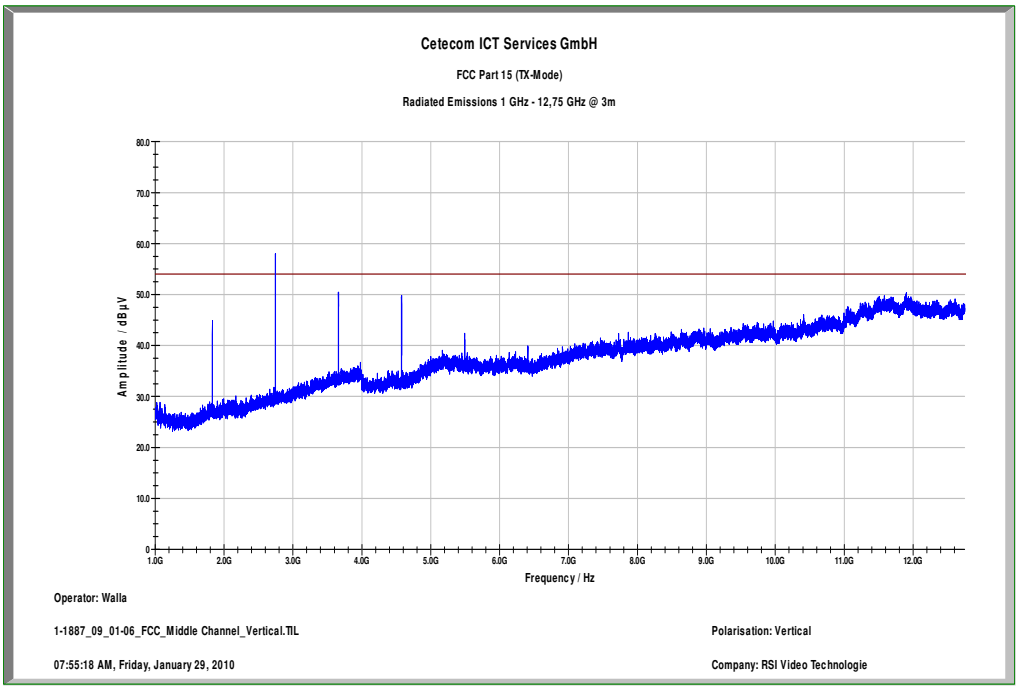
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
85.237650	17.7	15000.000	120.000	177.0	V	92.0	10.2	12.3	30.0
150.905400	21.6	15000.000	120.000	154.0	V	16.0	9.2	11.9	33.5
198.158700	16.5	15000.000	120.000	120.0	V	143.0	11.9	17.0	33.5
803.502750	21.8	15000.000	120.000	220.0	V	293.0	24.4	14.2	36.0
955.347750	23.8	15000.000	120.000	195.0	V	49.0	25.9	12.2	36.0

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

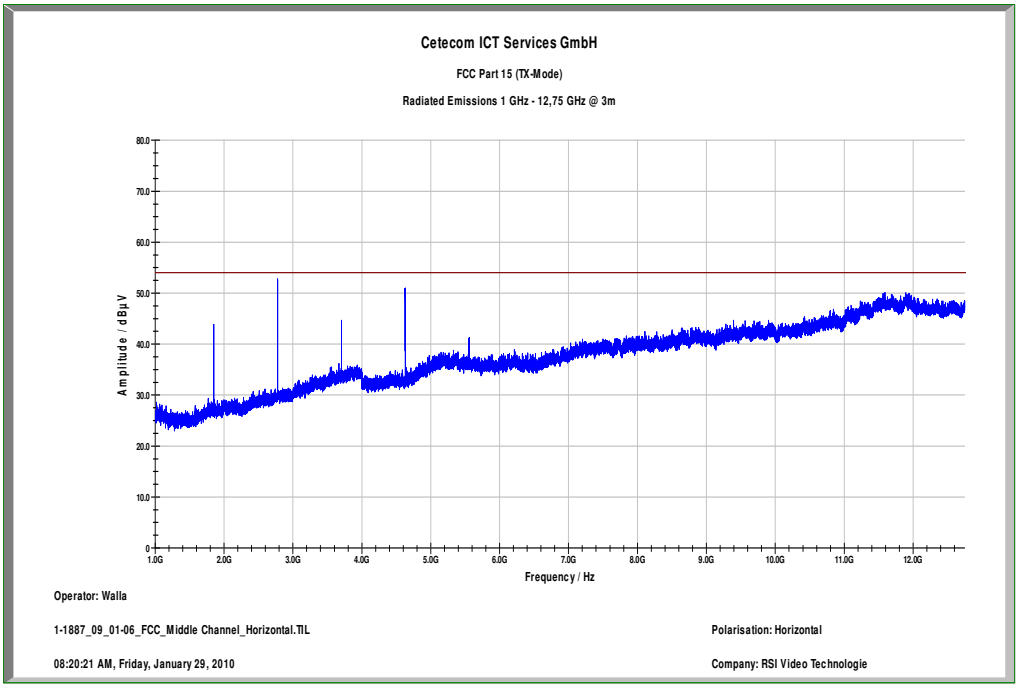
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3]
	@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch
	FW 1.0
Antenna:	VULB 9163
	SN 9163-295, FW ---, CAL 08.04.2010
	Correction Table (vertical): VULP6113
	Correction Table (horizontal): VULP6113
	Correction Table: Cabel with switch (0908)
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 6.30.10 + Service Pack 2

Plot 6: 1 - 12 GHz, antenna vertical (middle channel)



Plot 7: 1 - 12 GHz, antenna horizontal (middle channel)



Plot 8: 0.03 - 1 GHz, antenna vertical/horizontal (highest channel)

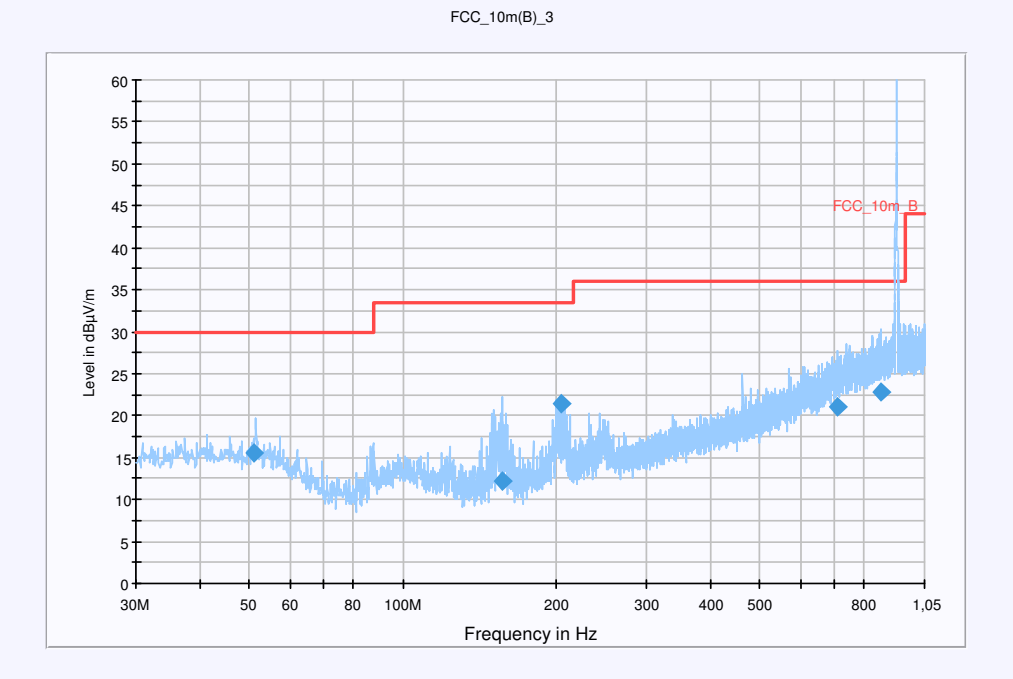
Information

EUT:	XL600
Serial Number:	F0105109230203F9
Test Description:	FCC Part 15
Operating Conditions:	GFSK Test mode, High Channel
Operator Name:	Kraus
Comment:	Powered from 6V DC (Alkaline Battery)

Scan Setup: FCC_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



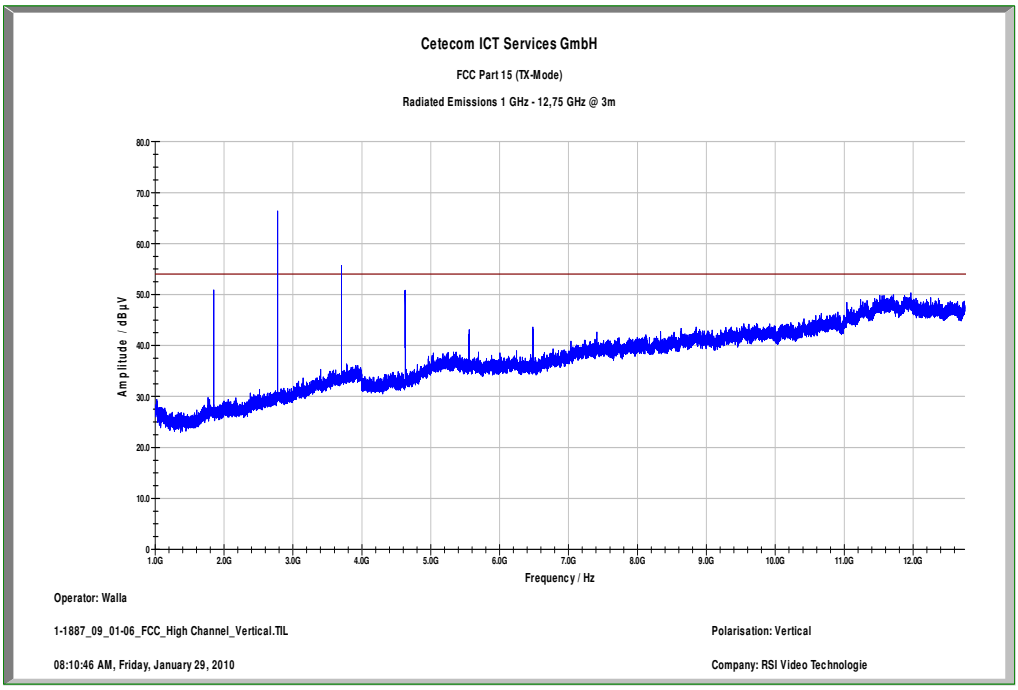
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
51.018300	15.6	15000.000	120.000	116.0	V	34.0	13.4	14.4	30.0
156.081000	12.2	15000.000	120.000	220.0	V	2.0	9.3	21.3	33.5
204.438900	21.5	15000.000	120.000	98.0	V	251.0	12.2	12.0	33.5
711.150300	21.0	15000.000	120.000	156.0	H	135.0	23.3	15.0	36.0
861.189450	22.8	15000.000	120.000	105.0	H	70.0	25.2	13.2	36.0

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

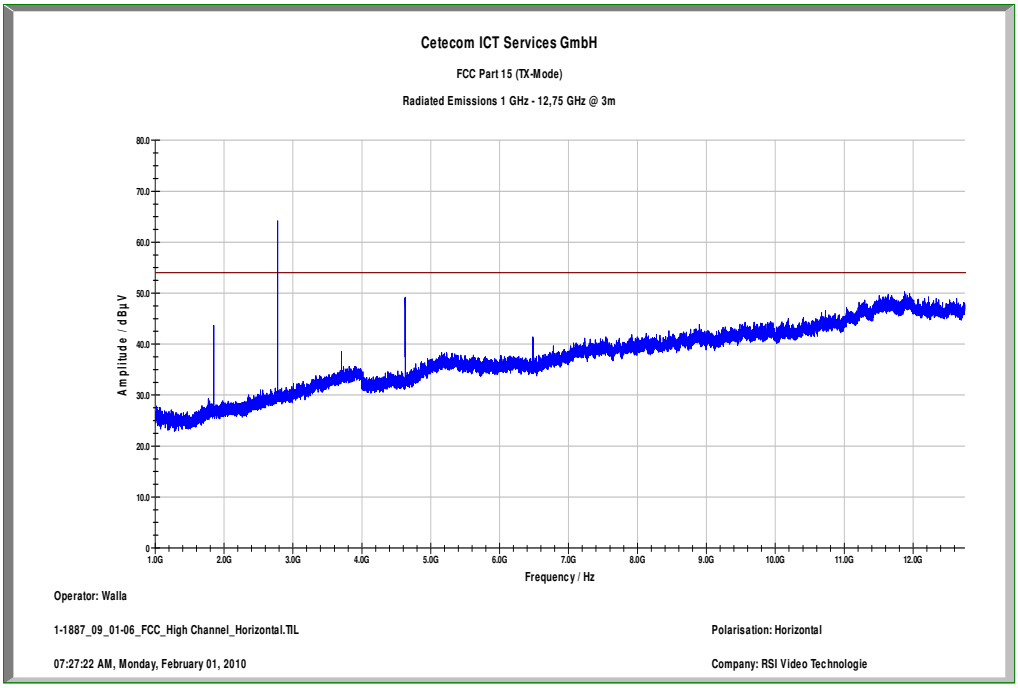
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3]
	@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch
	FW 1.0
Antenna:	VULB 9163
	SN 9163-295, FW ---, CAL 08.04.2010
	Correction Table (vertical): VULP6113
	Correction Table (horizontal): VULP6113
	Correction Table: Cabel with switch (0908)
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 6.30.10 + Service Pack 2

Plot 9: 1 - 12 GHz, antenna vertical (highest channel)



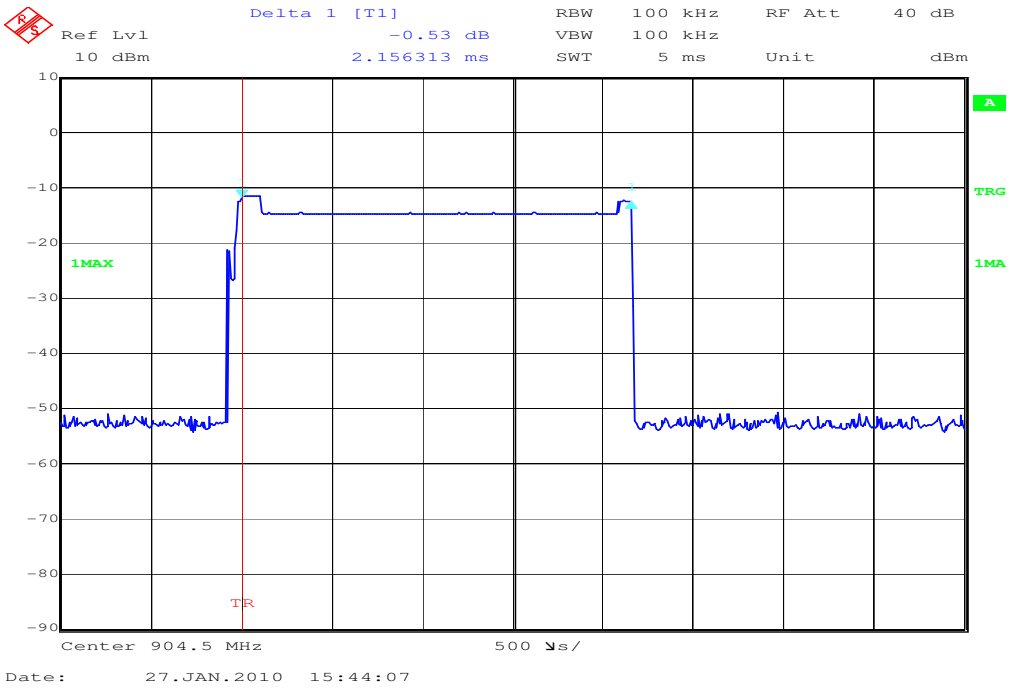
Plot 10: 1 - 12 GHz, antenna horizontal (highest channel)



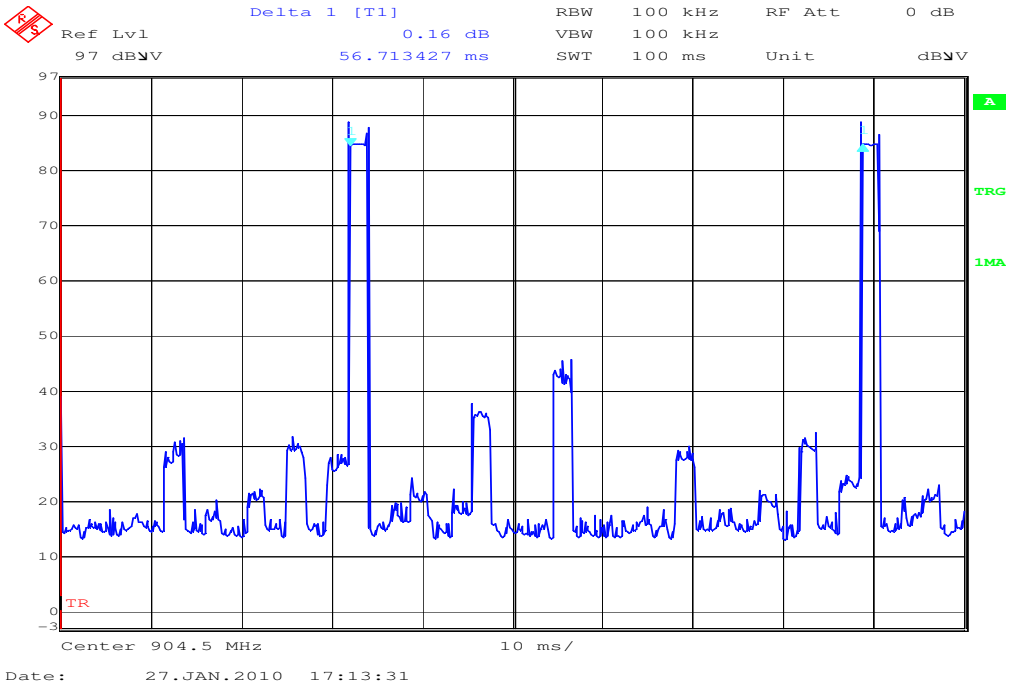
Results:

For radiated spurious emission the limits of 15.209 applies for all frequencies mentioned in 15.205. The average emission shall be determined by using Video averaging (VBW=10 Hz). If the dwell time of the hopping signal is less than 100 ms (per channel), the VBW=10 Hz reading may be adjusted by a factor F = 20log(dwell time/100 ms). In a period of 100 ms, we have a maximum of 2 transmissions and that gives the correction factor for spurious measurement **F = 20log(2*2.15/100) = -27.33 dB**

Plot 11:



Plot 12:



SPURIOUS EMISSIONS LEVEL [dBµV/m]								
904.5 MHz			915.3 MHz			926.1 MHz		
Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]	Frequency [MHz]	Detector	Level [dBµV/m]
1809	***Avg**	27.55	1831	***Avg**	30.67	1852	***Avg**	26.45
2713	***Avg**	39.74	2746	***Avg**	40.73	2778	***Avg**	39.98
3618	***Avg**	22.75	3661	***Avg**	24.35	3704	***Avg**	25.53
4522	***Avg**	30.68	4577	***Avg**	25.12	4631	***Avg**	22.42
6331	***Avg**	27.68	6408	***Avg**	19.78	5557	***Avg**	19.55
						6483	***Avg**	19.31
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz

***Avg:** Detector Average corrected with the correction factor F = -27.33 dB

Limits: **§ 15.247 (c)**

In any 100 kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. 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)).

Limits: **§ 15.209**

Frequency [MHz]	Field strength [µV/m]	Measurement distance (m)
30 - 88	100 (40 dBµV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBµV/m)	3
above 960	500 (54 dBµV/m)	3

5.17 Spurious Emissions - radiated (Receiver) § 15.109

Plot 1: 0.03 - 1 GHz vertical/horizontal (receiver)

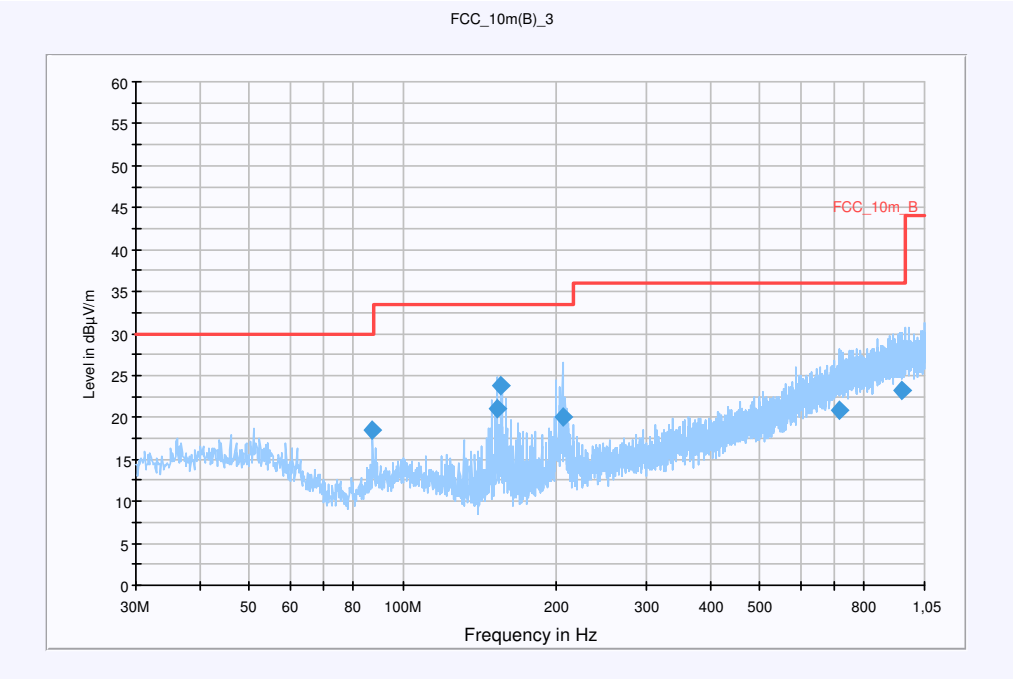
Information

EUT:	XL600
Serial Number:	F0105109230203F9
Test Description:	FCC Part 15
Operating Conditions:	GFSK Test mode, RX-Mode
Operator Name:	Kraus
Comment:	Powered from 6V DC (Alkaline Battery)

Scan Setup: FCC_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 1 GHz	QuasiPeak	120 kHz	15 s	Receiver



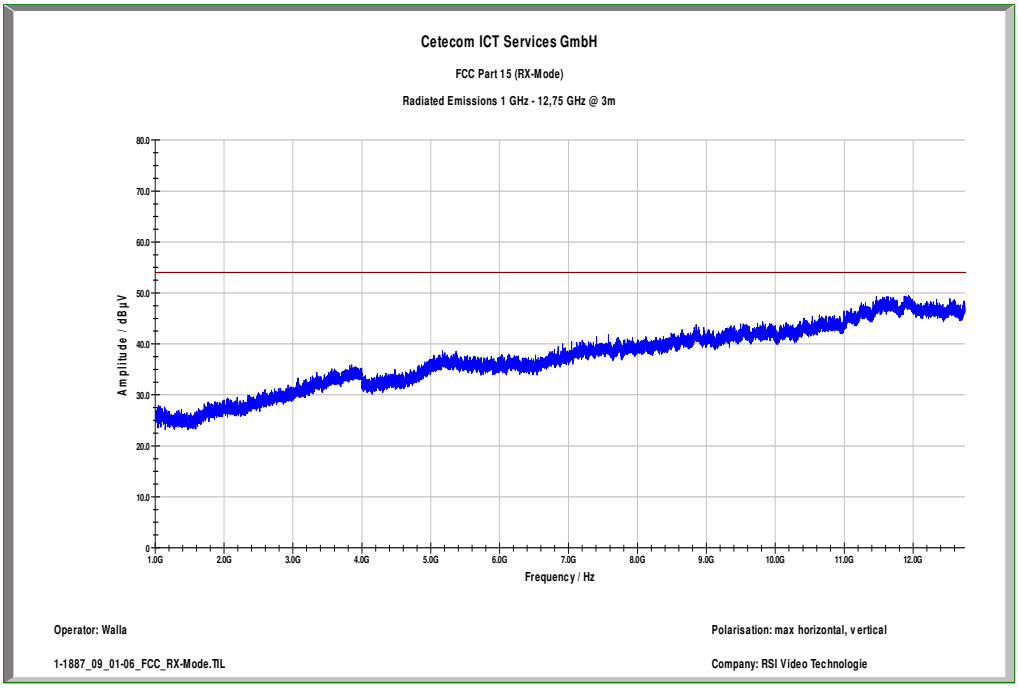
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
87.223050	18.5	15000.000	120.000	125.0	V	287.0	10.5	11.5	30.0
152.907900	21.1	15000.000	120.000	167.0	V	69.0	9.2	12.4	33.5
155.960550	23.8	15000.000	120.000	98.0	V	37.0	9.3	9.7	33.5
205.246950	20.1	15000.000	120.000	115.0	V	280.0	12.2	13.4	33.5
717.190650	20.8	15000.000	120.000	211.0	H	240.0	23.4	15.2	36.0
950.602050	23.2	15000.000	120.000	220.0	V	240.0	25.9	12.8	36.0

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

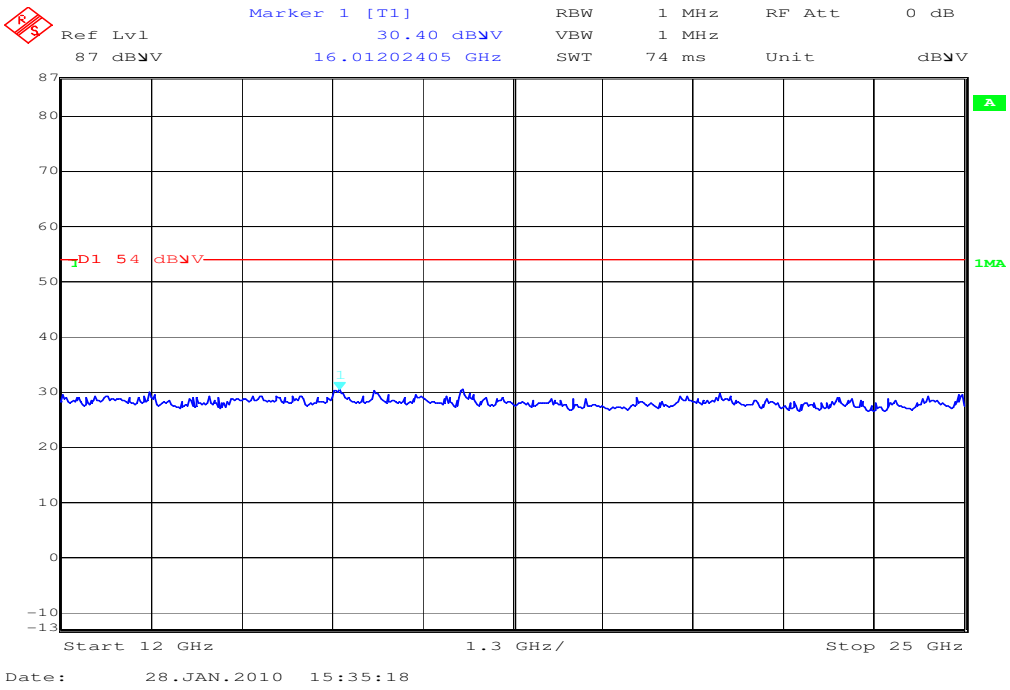
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3]
	@ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch
	FW 1.0
Antenna:	VULB 9163
	SN 9163-295, FW ---, CAL 08.04.2010
	Correction Table (vertical): VULP6113
	Correction Table (horizontal): VULP6113
	Correction Table: Cabel with switch (0908)
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 6.30.10 + Service Pack 2

Plot 2: 1 – 12 GHz, antenna vertical/horizontal (receiver)



Plot 3: 12 - 25 GHz vertical/horizontal (receiver)



Spurious Emissions level [dBµV/m]		
Frequency [MHz]	Detector	Level [dBµV/m]
No critical peaks detected!		
Measurement uncertainty	±3 dB	

f < 1 GHz: RBW/VBW: 100 kHz f ≥ 1GHz : RBW/VBW: 1 MHz
See above plots

Measurement distance see table

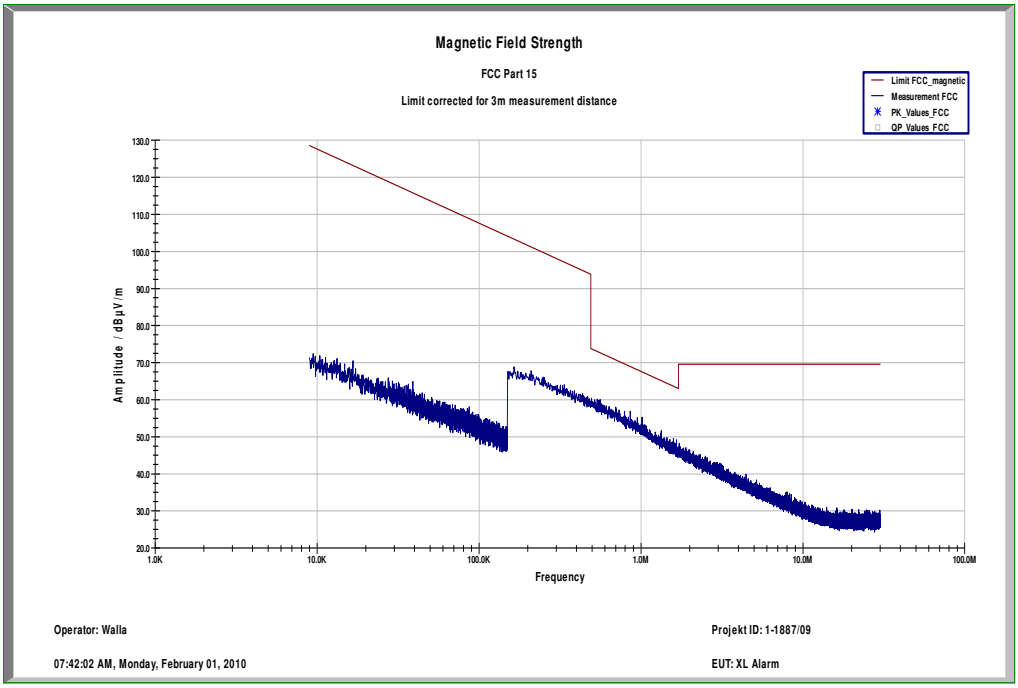
Limits: **§ 15.109**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100 (40 dBµV/m)	3
88 - 216	150 (43.5 dBµV/m)	3
216 - 960	200 (46 dBµV/m)	3
above 960	500 (54 dBµV/m)	3

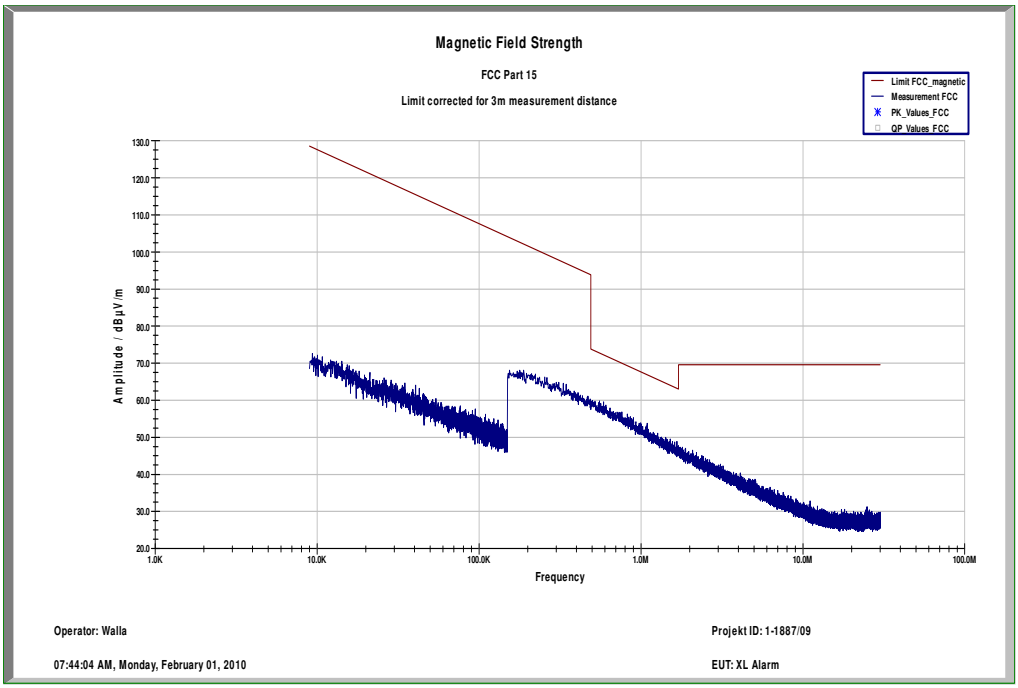
5.18 Spurious Emissions < 30 MHz - Transmitter radiated § 15.209

Measured at 10 m distance.
Values recalculated with 40 dB/decade according to FCC rules.

Plot 1: TX-Mode



Plot 2: RX-Mode



Limits:

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30

5.19 Conducted Emissions <30 MHz § 15.107/207

Not applicable!

Plot 1:

Limits:

Under normal test conditions only	See plots

6 Test equipment and ancillaries used for tests

In order to simplify the identification of the equipment used at each specific test, each item of test equipment and ancillaries are provided with an identifier or number in the equipment list below.

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).

Anechoic chamber C:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Anechoic chamber	MWB	87400/02	300000996	Monthly verification		
2	System-Rack 85900	HP I.V.	*	300000222	n.a.		
3	Measurement System 1						
4	PSA-Spektrumanalysator 3 Hz - 26.5 GHz (E4440A)	Agilent	MY48250080	300003812	05.08.2008	24	05.08.2010
5	EMI Preselector 9 kHz - 1 GHz (N9039A)	Agilent	MY48260003	300003825	19.08.2008	24	19.08.2010
6	Microwave Analog Signal Generator (N5183A)	Agilent	MY47420220	300003813	06.08.2008	24	06.08.2010
7	PC	F+W			n.a.		
8	TILE	TILE			n.a.		
9	TRILOG Super Broadband Antenna (VULB9163)	Schwarzbeck	371	300003854	Monthly verification (System cal.)		
10	Double Ridged Antenna 3115	EMCO	3088	300001032	Monthly verification (System cal.)		
11	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
12	Switch / Control Unit 3488A	HP	2719A15013	300001156	n.a.		
13	Power Supply 6032A	HP	2818A03450	300001040	08.01.2009	36	08.01.2012
14	Busisolator	Kontron		300001056	n.a.		
15	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
16	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
17	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
18	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		
19	Hochpassfilter WHK1.1/15G-10SS	Wainwright	3	300003255	Monthly verification (System cal.)		
20	Hochpassfilter WHKX2.9/18G-12SS	Wainwright	1	300003492	Monthly verification (System cal.)		
21	Hochpassfilter WHKX7.0/18G-8SS	Wainwright	18	300003789	Monthly verification (System cal.)		
22	Switch / Control Unit 3488A	HP	2605e08770	300001443	n.a.		
23	Trenntrafo RT5A	Grundig	9242	300001263	n.a.		
24	Relais Matrix PSU	R&S	890167/024	300001168	n.a.		
25	Netznachbildung ESH3-Z5	R&S	828576/020	300001210	n.a.		

SRD Laboratory Room 002:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	System Controller PSM 12	R&S	835259/007	3000002681-00xx	n.a.		
2	Memory Extension PSM-K10	R&S	To 1	3000002681	n.a.		
3	Operating Software PSM-B2	R&S	To 1	3000002681	n.a.		
4	19'' Monitor		22759020-ED	3000002681	n.a.		
5	Mouse		LZE 0095/6639	3000002681	n.a.		
6	Keyboard		G00013834L461	3000002681	n.a.		
7	Spectrum Analyser FSIQ 26	R&S	835540/018	3000002681-0005	10.01.2008	24	10.01.2010
8	Tracking Generator FSIQ-B10	R&S	835107/015	3000002681	s.No.7		
10	RF-Generator SMIQ03 (B1 Signal)	R&S	835541/056	3000002681-0002	26.08.2008	36	26.08.2011
11	Modulation Coder SMIQ-B20	R&S	To 10	3000002681	s.No.10		
12	Data Generator SMIQ-B11	R&S	To 10	3000002681	s.No.10		
13	RF Rear Connection SMIQ-B19	R&S	To 10	3000002681	s.No.10		
14	Broadband horn antenna (1-18 GHz)	EMCO	9107-3696	300001604	16.04.2008	24	16.04.2010
15	Broadband horn antenna (1-18 GHz)	EMCO	9107-3697	300001605	21.08.2008	24	21.08.2010
16	Std gain horn antenna (18-26.5 GHz)	Narda	Model no. 638	3000000486	n.a.		
17	Std gain horn antenna (18-26.5 GHz)	Narda	Model no. 638	3000000487	n.a.		
18	Sleeve dipole antenna Model 3126-880	ETS-Lindgren	00040887	3000000	n.a.		
19	Fast CPU SM-B50	R&S	To 10	3000002681	s.No.10		
20	FM Modulator SM-B5	R&S	835676/033	3000002681	s.No.10		
21	RF-Generator SMIQ03 (B2 Signal)	R&S	835541/055	3000002681-0001	25.08.2008	36	25.08.2011
22	Modulation Coder SMIQ-B20	R&S	To 16	3000002681	s.No.16		
23	Data Generator SMIQ-B11	R&S	To 16	3000002681	s.No.16		
24	RF Rear Connection SMIQ-B19	R&S	To 16	3000002681	s.No.16		
25	Fast CPU SM-B50	R&S	To 16	3000002681	s.No.16		
26	FM Modulator SM-B5	R&S	836061/022	3000002681	s.No.16		
27	RF-Generator SMP03 (B3 Signal)	R&S	835133/011	3000002681-0003	26.08.2008	36	26.08.2011
28	Attenuator SMP-B15	R&S	835136/014	3000002681	S.No.22		
29	RF Rear Connection SMP-B19	R&S	834745/007	3000002681	S.No.22		
30	Power Meter NRVD	R&S	835430/044	3000002681-0004	26.08.2008	24	26.08.2010
31	Power Sensor NRVD-Z1	R&S	833894/012	3000002681-0013	26.08.2008	24	26.08.2010
32	Power Sensor NRVD-Z1	R&S	833894/011	3000002681-0010	26.08.2008	24	26.08.2010
33	Rubidium Standard RUB	R&S		3000002681-0009	27.08.2008	24	27.08.2010
34	Switching and Signal Conditioning Unit SSCU	R&S	338864/003	3000002681-0006	Verified with path compensation		
35	Laser Printer HP Deskjet 2100	HP	N/A	3000002681-0011	n.a.		
36	19'' Rack	R&S	11138363000004	3000002681	n.a.		
37	RF-cable set	R&S	N/A	3000002681	n.a.		
39	IEEE-cables	R&S	N/A	3000002681	n.a.		
40	Sampling System FSIQ-B70	R&S	835355/009	3000002681	s.No.7		
41	RSP programmable attenuator	R&S	834500/010	3000002681-0007	26.08.2008	24	26.08.2010
42	Signalling Unit	R&S	838312/011	3000002681	n.a.		
43	NGPE programmable Power Supply for EUT	R&S	192.033.41	3000002681			
44	Power Splitter 6005-3	Inmet Corp.	none	300002841	23.12.2008	24	23.12.2010
45	SMA Cables SPS-1151-985-SPS	Insulated Wire	different	different	n.a.		

46	CBT32 with EDR Signaling Unit	R&S					
47	Coupling unit	Narda	N/A	--	n.a.		
48	2xSwitch Matrix PSU	R&S	872584/021	300001329	n.a.		
49	RF-cable set	R&S	N/A	different	n.a.		
50	IEEE-cables	R&S	N/A	--	n.a.		

Note: 3000002681-00xx inventoried as a system

Anechoic chamber F:

No	Equipment/Type	Manuf.	Serial Nr.	Inv. No. Cetecom	Last Calibration	Frequency (months)	Next Calibration
1	Control Computer	F+W	FW0502032	300003303	-/-	-/-	-/-
2	Trilog Antenna VULB 9163	Schwarzbeck	295	300003787	01.04.2008	24	01.04.2010
3	Amplifier - 0518C-138	Veritech Micro-wave Inc.	-/-	-/-	-/-	-/-	-/-
4	Switch - 3488A	HP		300000368	-/-	-/-	-/-
5	EMI Test receiver - ESCI	R&S	100083	300003312	01.06.2009	24	01.06.2011
6	Turntable Controller - 1061 3M	EMCO	1218	300000661	-/-	-/-	-/-
7	Tower Controller 1051 Controller	EMCO	1262	300000625	-/-	-/-	-/-
8	Tower - 1051	EMCO	1262	300000625	-/-	-/-	-/-
10	Ultra Notch-Filter Rejected band Ch. 62	WRCD	9	-/-	-/-	-/-	-/-

7 Photographs of the Test Set-up

Photo 1:

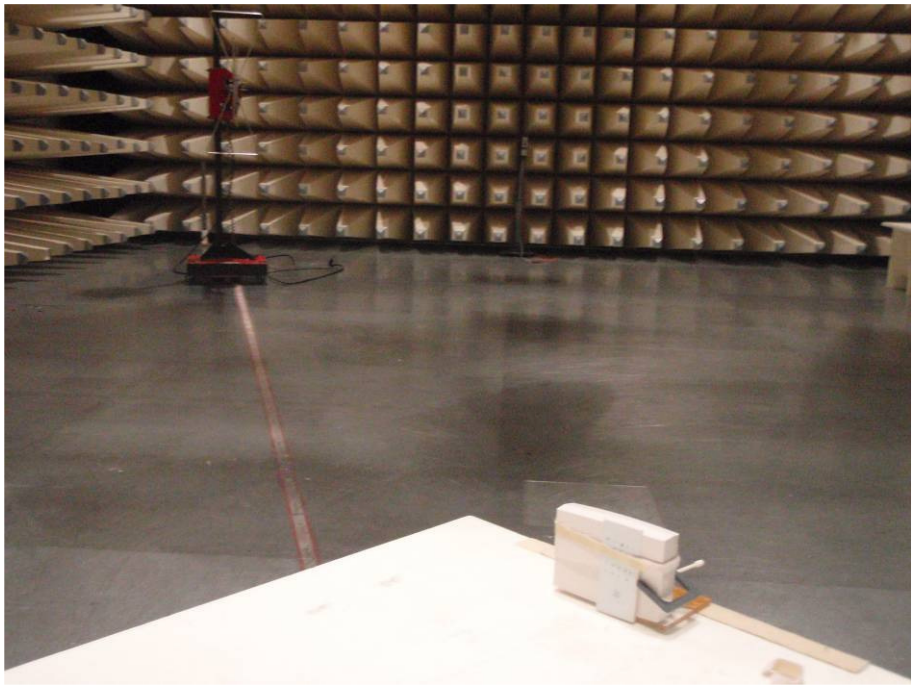
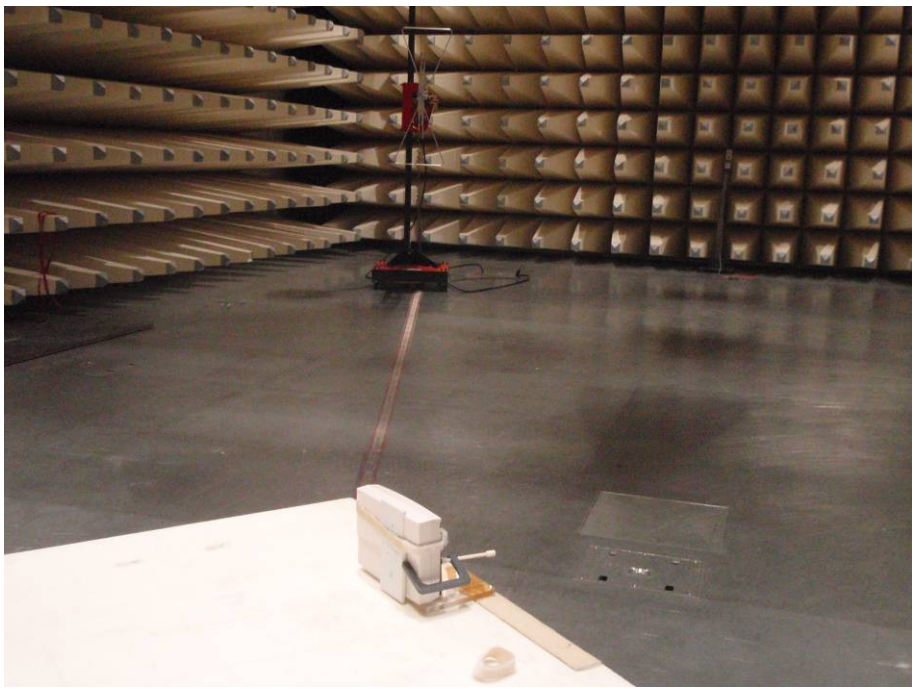


Photo 2



8 Photographs of the EUT

Photo 3:

Photo 4:

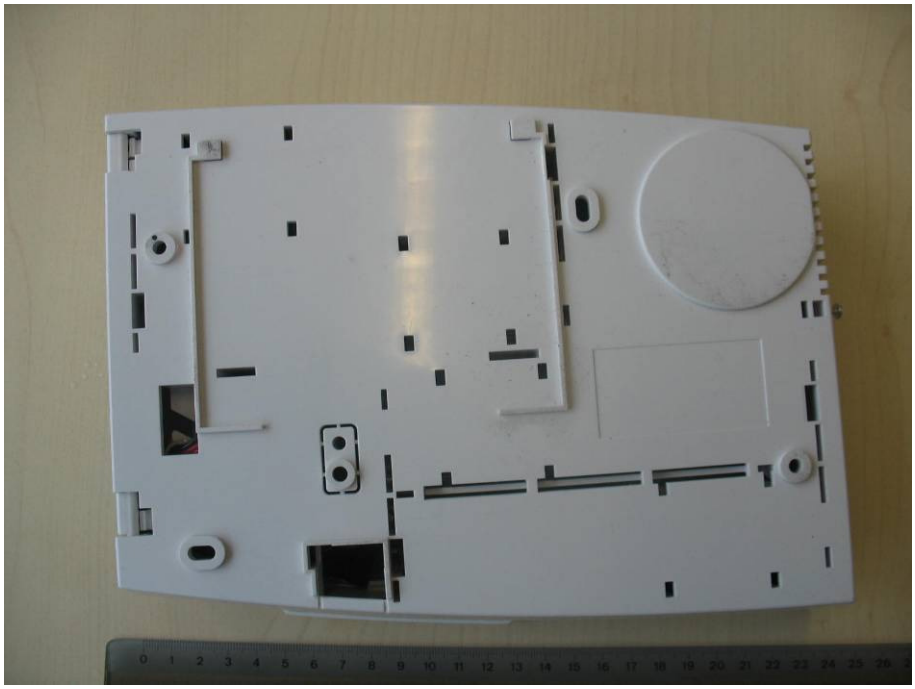


Photo 5:

Photo 6:

Photo 7:

Photo 8:

Photo 9:

Photo 10:

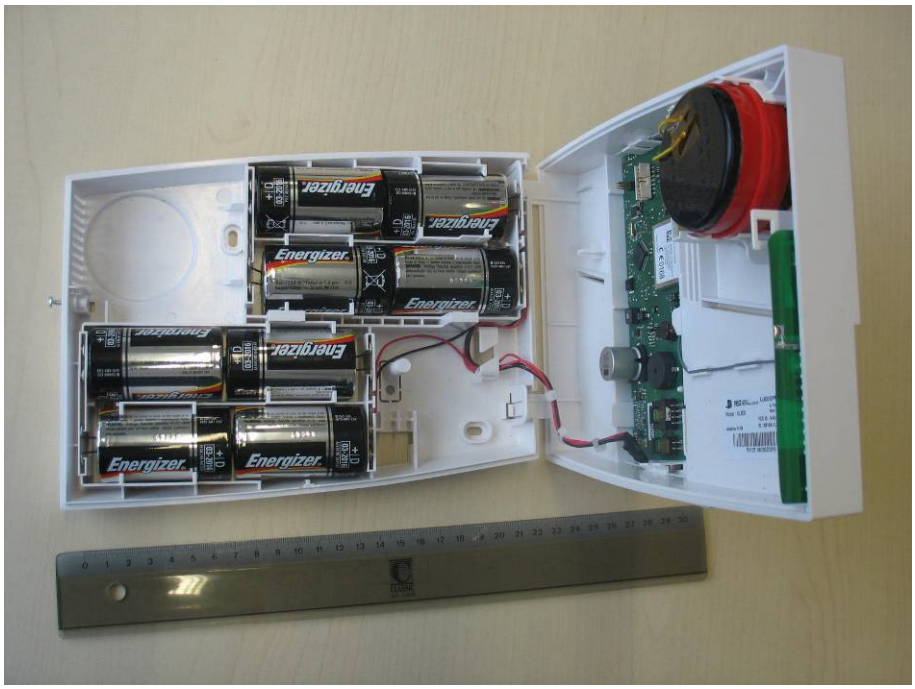


Photo 11:

Photo 12:

Photo 13:

Photo 14:

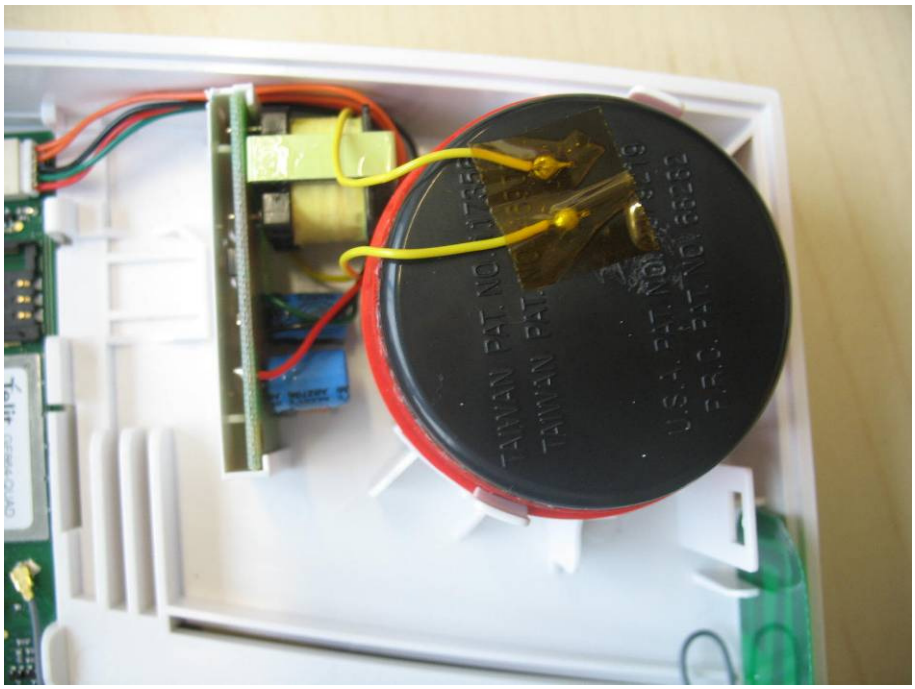


Photo 15:

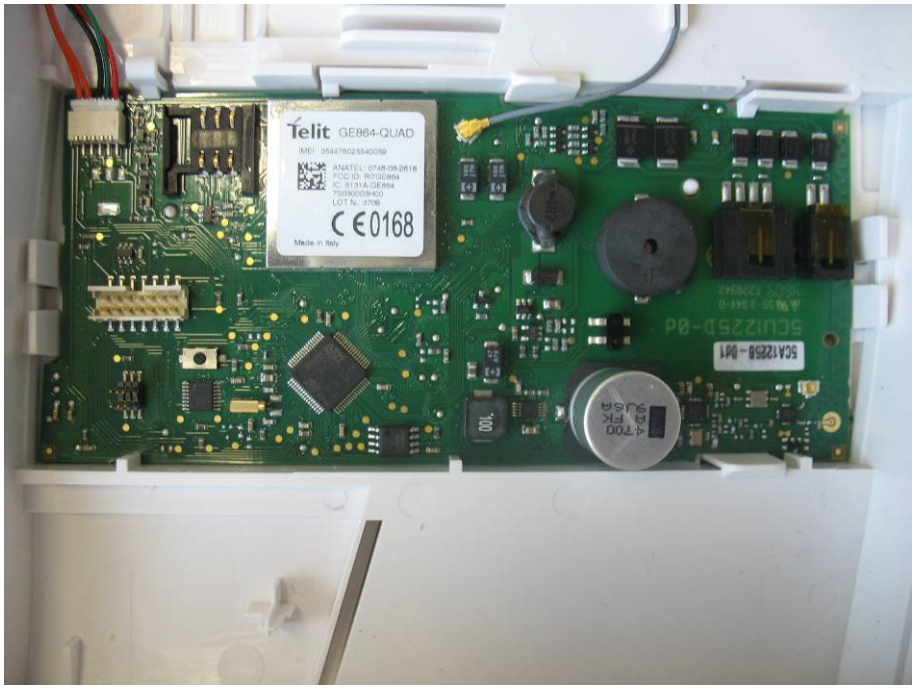


Photo 16:

Photo 17:

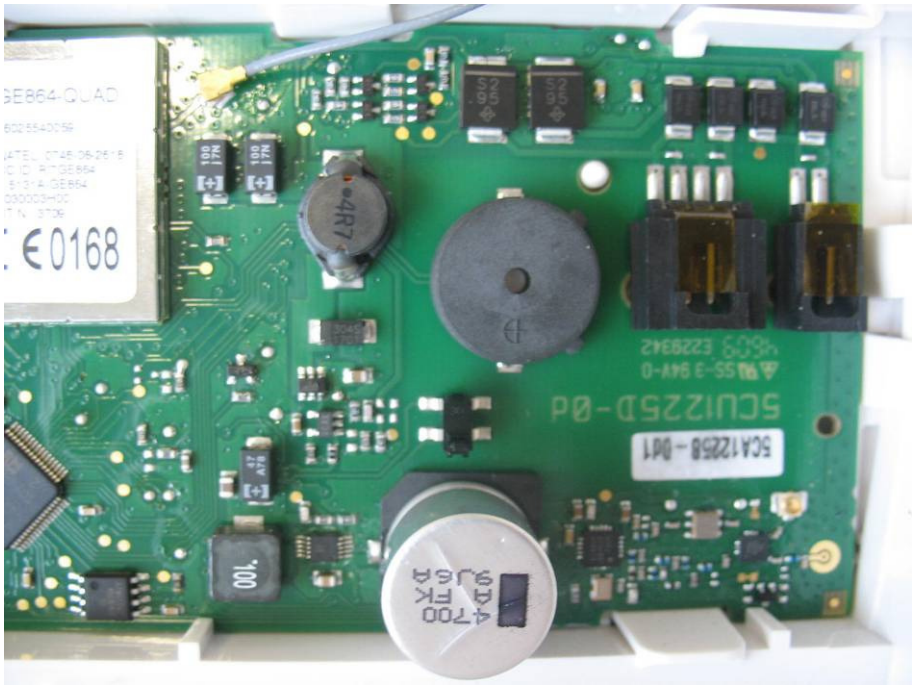


Photo 18:

Photo 19: