



## **Accredited testing-laboratory**

**DAR registration number: DAT-P-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.: 3463A-1 (IC)**

**Certification ID: DE 0001**

**Accreditation ID: DE 0002**

**Accredited Bluetooth® Test Facility (BQTF)**

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**Test report no. : 1-0746-01-03/08-A**  
**Type identification : XAC-40-1 / BAT54-Rail Client**  
**Applicant : LANCOM Systems GmbH**  
**FCC ID : U4Y-SE111**  
**Test standards : 47 CFR Part 15**

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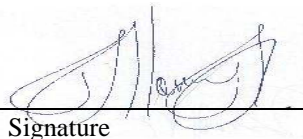
## 1 General information

### 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:

**2008-12-11**      **Daniel Muyunga**  
Date                      Name

Signature 

#### Technical responsibility for area of testing:

**2008-12-11**      **Stefan Bös**  
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: DAT-P-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:	LANCOM Systems GmbH
Street:	Adenauerstr. 20/B2
Town:	52146 Würselen
Country:	Germany
Telephone:	+49 (0) 2405 49936-0
Fax:	+49(0)2405 49936-99
Contact:	Herrn André Krautschick
E-mail:	Andre.Krautschick@lancom.de
Telephone:	+49 (0)2405 49936-443

## 1.4 Application details

Date of receipt of order:	2008-09-22
Date of receipt of test item:	2008-11-05
Date of start test:	2008-11-05
Date of end test:	2008-12-11
Persons(s) who have been present during the test:	-/-

## 2 Test standard/s:

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

## Technical tests

### 2.1 Details of manufacturer

Name:	LANCOM Systems GmbH
Street:	Adenauerstr. 20/B2
Town:	52146 Würselen
Country:	Germany

#### 2.1.1 Test item

Kind of test item	:	WLAN Client
Type identification	:	XAC-40-1 / BAT54-Rail Client
S/N serial number	:	4001189118000263 4001189118000264 (EUT)
HW hardware status	:	-/-
SW software status	:	-/-
Frequency Band [MHz]	:	2400 - 2483,5 5180 - 5240 5745 - 5825
Type of Modulation	:	DSSS, OFDM
Number of channels	:	11 (2400 - 2483.5) 4 (5180 - 5240) 5 (5745 - 5825)
Antenna	:	External antenna (see pictures)
Power Supply	:	115 V AC by mains voltage
Temperature Range	:	-20 °C to +50 °C

**FCC ID: U4Y-SE111**

### 2.1.2 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

### 2.1.3 Extreme conditions testing values

Description	Shortcut	Unit	Value
Nominal Temperature	T <sub>nom</sub>	°C	+23
Nominal Humidity	H <sub>nom</sub>	%	42
Nominal Power Source	V <sub>nom</sub>	V	115

Type of power source: **AC by mains voltage**

Deviations from these values are reported in chapter 2

### 3 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	PASS	2008-12-11	-/-

Test Specification Clause	Test Case	Pass	Fail	Not applicable	Not performed
None	Antenna Gain				Yes
§15.247 (e)	Peak power spectral density				Yes
§15.247(a)(2)	Spectrum Bandwidth of a DSSS System / 6dB BW				Yes
§15.247(a)(2)	Spectrum Bandwidth of a DSSS System / 20dB BW				Yes
§ 15.247 (b)(3)	Maximum output power (conducted)				Yes
§ 15.247 (b)(3)	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
§ 15.209	Spurious Emission -radiated (Transmitter)	Yes			
§ 15.109	Spurious Emissions-radiated (Receiver)	Yes			
§ 15.209	Spurious Emissions-radiated <30 MHz	Yes			
§ 15.107/207	Conducted Emissions <30 MHz				Yes



## 4 RF measurement testing

### 4.1 Description of test set-up

#### 4.1.1 Radiated measurements

The radiated measurements are performed in vertical and horizontal plane in the frequency range from 9 kHz to 20 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 set-ups 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.

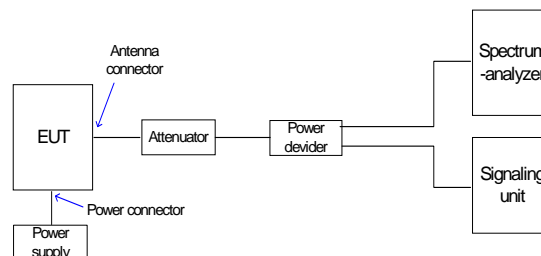
Antennas are confirmed with ANSI C63.2-1996 item 15.

- 9 kHz - 150 MHz: Quasi Peak measurement, 200 Hz Bandwidth, passive loop antenna.
- 150 kHz - 30 MHz: Quasi Peak measurement, 9 kHz Bandwidth, passive loop antenna.
- 30 MHz - 200 MHz: Quasi Peak measurement, 120 kHz Bandwidth, biconical antenna
- 200MHz - 1GHz: Quasi Peak measurement, 120 kHz Bandwidth, log periodic antenna
- >1GHz: Average, RBW 1MHz, VBW 10 Hz, wave guide horn

All measurement settings are according to FCC 15.209 and 15.207

#### 4.1.2 Conducted measurements

The EUT's RF signal is coupled out by the antenna connector which is supplied by the manufacturer. The signal is connected to the spectrum analyzer. The specific losses for signal path are first checked within a calibration. The measurement readings on the 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.



#### 4.2 Referenced Documents

None

#### 4.3 Additional comments

The equipment under test (EUT) is a dual-band wireless LAN Client (2.4 and 5 GHz) that uses two separate and collocated external antennas for transmit and/or receive functions.

In this report the radiated spurious emission tests were carried out using two different types of external antennas provided by the manufacturer:

Antenna 1: Extender I-60AG (See pictures)

Antenna 2: WLAN dual-band rod antenna (See pictures)

For the radiated spurious emission measurements in the 2.4 GHz band, two dual-band rod antennas were connected to the main and auxiliary ports of the EUT.

For the 5 GHz band, the Extender I-60AG antenna was connected to main port and the dual-band rod antenna to the auxiliary port.

#### 4.4 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.

**Not performed**

	low channel	mid channel	high channel
Conducted power [dBm] <i>(measured)</i>	--	--	--
Radiated power [dBm] <i>(measured)</i>	--	--	--
Gain [dBi] <i>(calculated)</i>	--	--	--

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**4.5 Peak Power Spectral density (digitally modulated systems) §15.247(e)**

**Not performed**

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
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**4.6 Spectrum Bandwidth of a DSSS System / 6 dB Bandwidth §15.247(a)(2)**

Not performed

Results:

Test conditions		6 dB BANDWIDTH [MHz]		
Frequency [MHz]				
T <sub>nom</sub>	V <sub>nom</sub>	--	--	--
Measurement uncertainty		±1kHz		

RBW: 100 kHz / VBW 100 kHz

Limits:

Under normal test conditions only	> 500 kHz
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**4.7 Spectrum Bandwidth of a DSSS System / 20 dB Bandwidth**

Not performed

Results:

Test conditions		20 dB BANDWIDTH [MHz]		
Frequency [MHz]				
T <sub>nom</sub>	V <sub>nom</sub>	--	--	--
Measurement uncertainty		±1kHz		

RBW: 100 kHz / VBW 100 kHz

**4.8 Maximum output power (conducted) §15.247 (b)(3)**

Not performed

Results:

Test conditions		Max. peak output power [dBm]			
Frequency [MHz]					
T <sub>nom</sub>	V <sub>nom</sub>	PK			
		PK corrected			
De facto EIRP (Peak) [dBm]					
Antenna gain: [dBi]					
Measurement uncertainty		±3dB			

RBW / VBW: 10 MHz

Remark:

The correction factor is calculated by  $10 \times \log(\text{measured BW} / \text{used BW})$  [dB]

Limits:

Under normal test conditions only, for frequency range 2400-2483.5 MHz	Max. 1.0 Watt / 30 dBm
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**4.9 Max. peak output power (radiated) §15.247 (b)(3)**

**Not performed**

**B mode**

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		2412	2437	2462
T <sub>nom</sub>	V <sub>nom</sub>			
Measurement uncertainty		±3dB		

RBW / VBW: 20/30 MHz

Measured at a distance of 3m

**G mode**

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		2412	2437	2462
T <sub>nom</sub>	V <sub>nom</sub>			
Measurement uncertainty		±3dB		

RBW / VBW: 50/30 MHz

Measured at a distance of 3m

**A mode**

Results:

Test conditions		Max. peak output power EIRP [dBm]		
Frequency [MHz]		5180	5220	5240
T <sub>nom</sub>	V <sub>nom</sub>			
Frequency [MHz]		5745	5785	5825
T <sub>nom</sub>	V <sub>nom</sub>			
Measurement uncertainty		±3dB		

RBW / VBW: 50/30 MHz

Measured at a distance of 3m

---

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

**Not performed**

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)).
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**4.11 Band-edge compliance of radiated emissions §15.205**

Not performed

Results & Limits:

Radiated field strength

The field strength was measured with an EMI measuring receiver and 1 MHz RBW / VBW for peak and with 1MHz RBW / 10Hz VBW for average at a distance of 3m.

high channel	setup	measured value (3m)	correction factor (3m)	calculated value (3m)
Max. peak value	1 MHz RBW 1 MHz VBW	dB $\mu$ V/m	-6.3 dB	dB $\mu$ V/m
Max. average value	1 MHz RBW 10 Hz VBW	dB $\mu$ V/m	-6.3 dB	dB $\mu$ V/m
Delta value	Peak 300 kHz RBW/VBW	dB		
Value at band edge	limit 54 dB $\mu$ V/m			dB $\mu$ V/m
Statement:				<b>Complies</b>

**4.12 Spurious Emissions - conducted (Transmitter) §15.247 (c)**

**Not performed**

Result & Limits:

Emission Limitations					
f [MHz]		amplitude of emission [dBm]	limit max. allowed emission power	actual attenuation below frequency of operation [dB]	results
2412			30 dBm	-	Operating frequency
			-20 dBc		
2437			30 dBm		Operating frequency
			-20 dBc		
2462			30 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)).
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Note: For emissions that fall into restricted bands you find the radiated emissions later in the report.

### 4.13 Spurious Emissions - radiated (Transmitter) §15.209

#### B Mode

Plot 1: 0.03 - 1 GHz (middle channel)

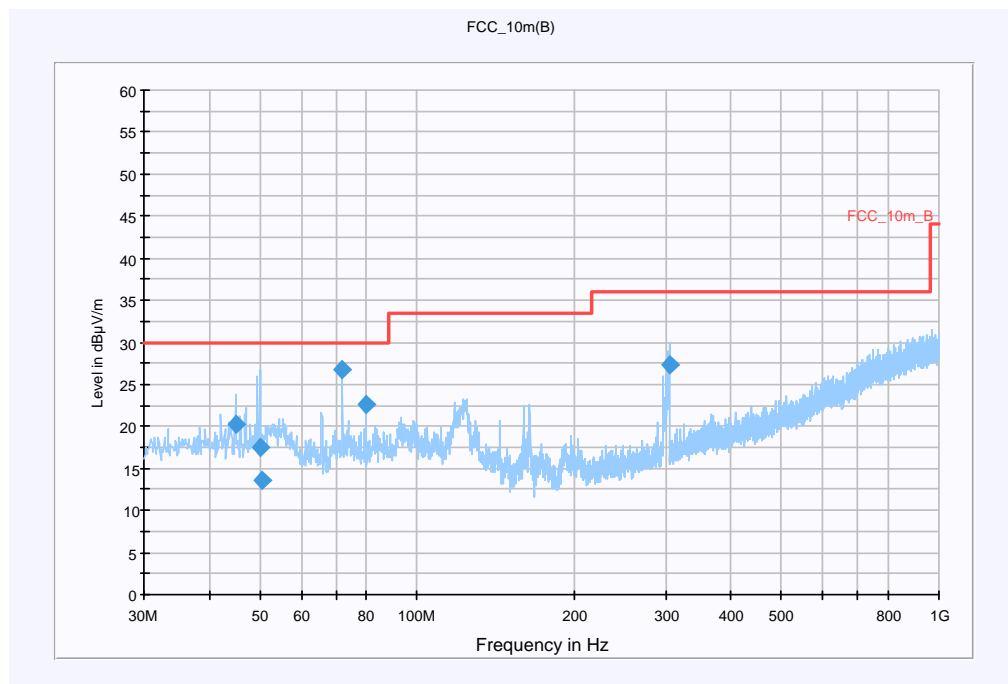
#### Information

EUT:	BAT54-Rail Client + Riwo 15.0740
Serial Number:	4001189118000264 + Engineering sample No.: 1
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	TX 92 Mbit/s/ 802.11b Ch 6
Operator Name:	Hennemann
Comment:	AC: 115 V / 60 Hz; ETH-cable: STP

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



#### Final Result

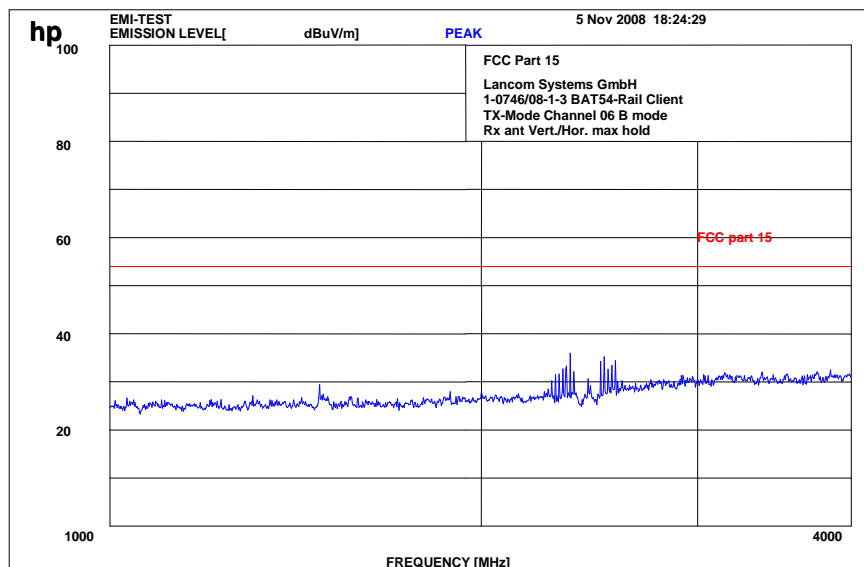
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
44.982200	20.3	15000.000	120.000	200.0	V	348.0	13.4	9.7	30.0
49.991950	17.5	15000.000	120.000	200.0	V	222.0	13.5	12.5	30.0
50.671100	13.6	15000.000	120.000	254.0	V	226.0	13.5	16.4	30.0
72.008750	26.7	15000.000	120.000	218.0	V	321.0	9.5	3.3	30.0
79.987700	22.7	15000.000	120.000	230.0	V	-1.0	9.4	7.3	30.0
304.128150	27.3	15000.000	120.000	367.0	H	272.0	14.8	8.7	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

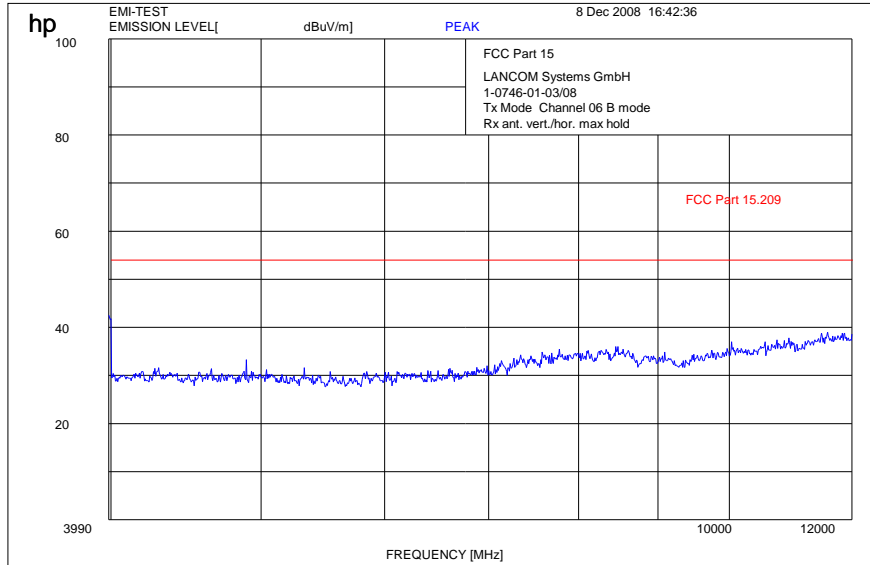
EMC 32 Version 6.30.10 + Service Pack 2

Plot 2: 1 - 4 GHz (middle channel)

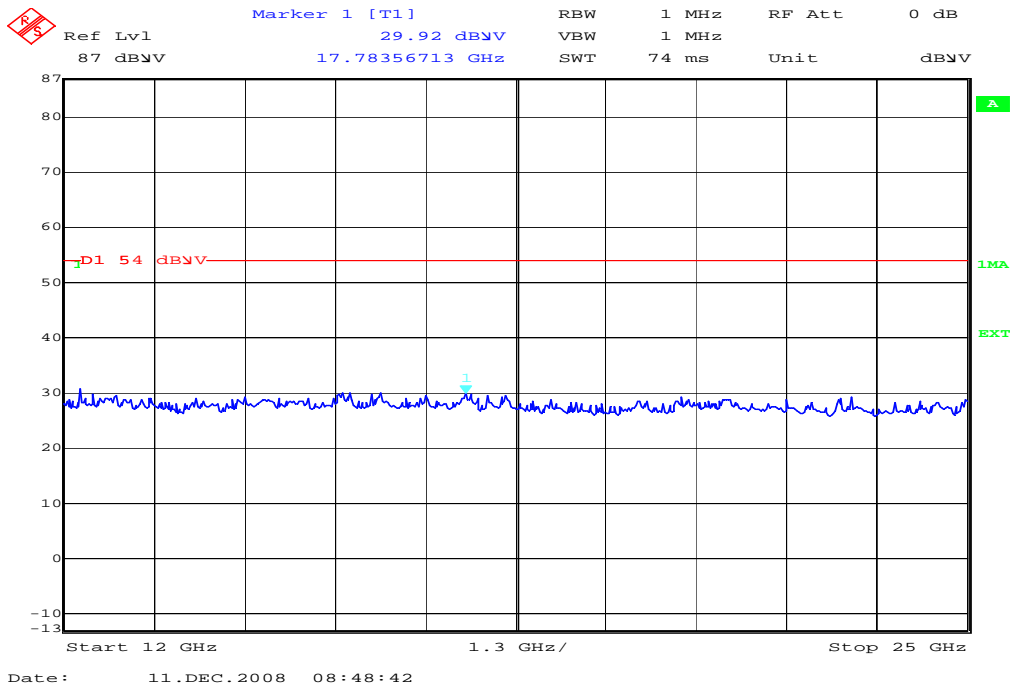


Signal suppressed with a 2.4 GHz band notch filter

Plot 3: 4- 12 GHz (middle channel)



Plot 4: 12 – 25 GHz (middle channel)





## G Mode

Plot 1: 0.03 - 1 GHz (middle channel)

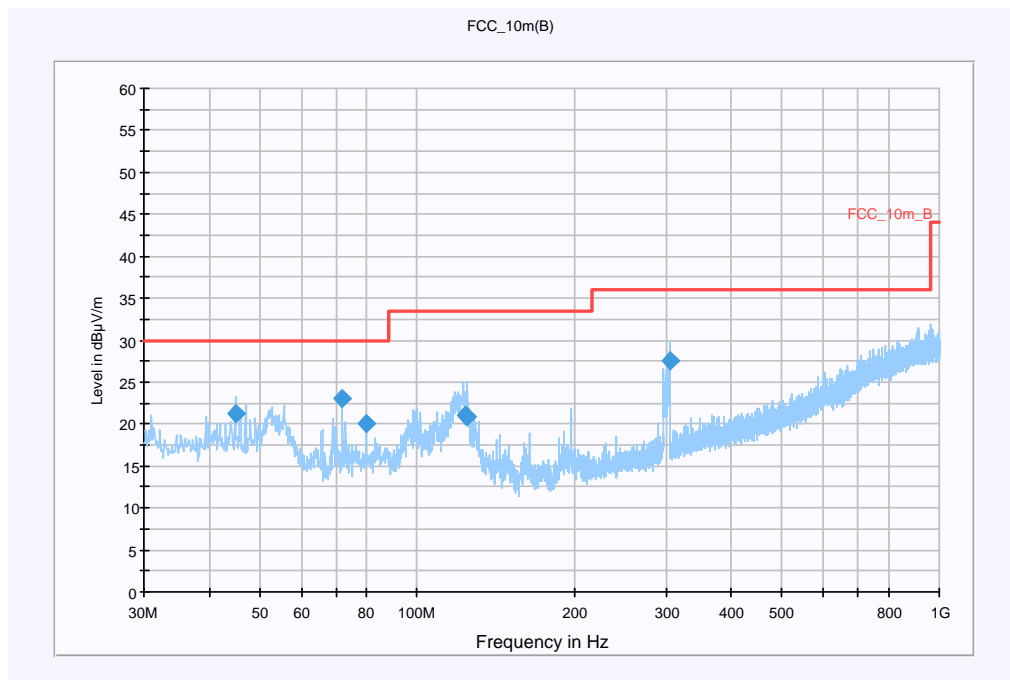
### Information

EUT:	BAT54-Rail Client + Riwo 15.0740
Serial Number:	4001189118000264 + Engineering sample No.: 1
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	TX 87 Mbit/s/ 802.11g Ch 6
Operator Name:	Hennemann
Comment:	AC: 115 V / 60 Hz; ETH-cable: STP

### Scan Setup: FCC\_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB $\mu$ V/m

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



### Final Result

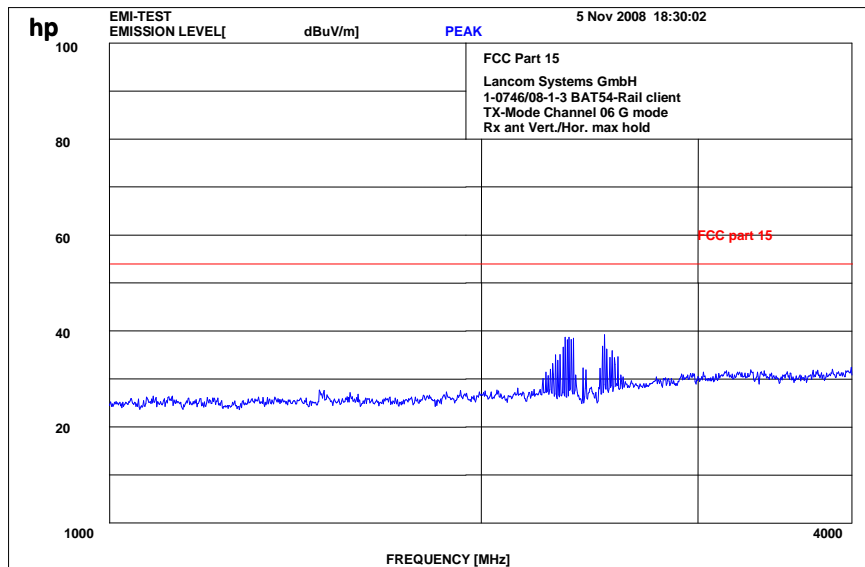
Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
44.990000	21.2	15000.000	120.000	119.0	V	278.0	13.4	8.8	30.0
72.002900	22.9	15000.000	120.000	200.0	V	140.0	9.5	7.1	30.0
79.998100	20.0	15000.000	120.000	291.0	V	347.0	9.4	10.0	30.0
123.259700	21.1	15000.000	120.000	200.0	V	141.0	10.3	12.4	33.5
124.974350	20.8	15000.000	120.000	214.0	V	86.0	10.1	12.7	33.5
304.162900	27.6	15000.000	120.000	287.0	H	293.0	14.8	8.4	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 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

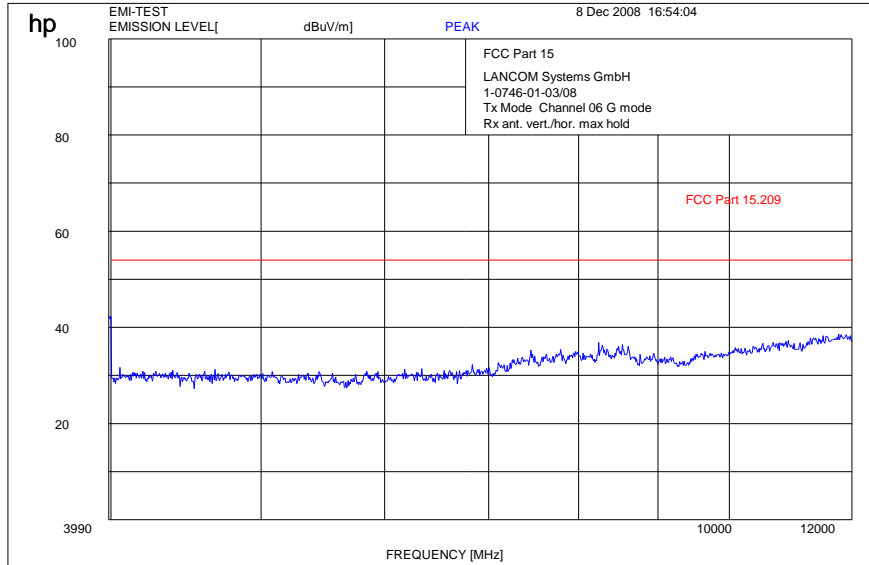
Plot 2: 1 - 4 GHz (middle channel)



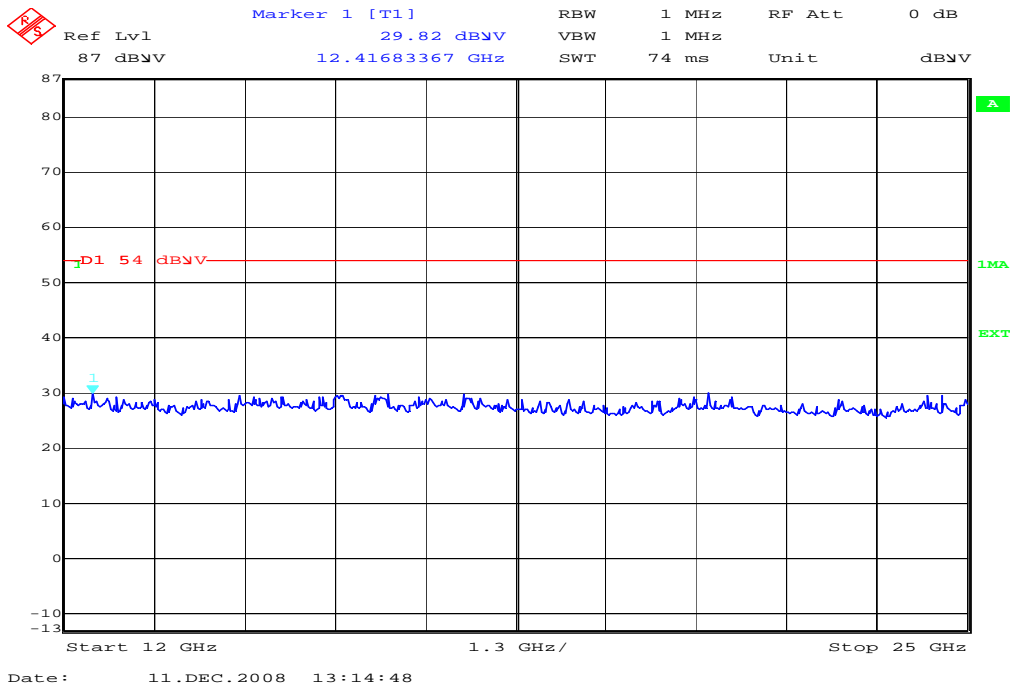
Signal suppressed with a 2.4 GHz band notch filter



Plot 3: 4- 12 GHz (middle channel)



Plot 4: 12- 25 GHz (middle channel)



Results:

SPURIOUS EMISSIONS LEVEL §15.209								
2412 MHz			2437 MHz			2462 MHz		
F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]	F [MHz]	Detector	Level [dBµV/m]
			<b>No critical peaks detected</b>					
For spurious emissions from 30 MHz up to 1 GHz, please also see table below plots								
Measurement uncertainty			±3 dB					

f < 1 GHz : RBW/VBW: 100 kHz

f ≥ 1GHz : RBW/VBW: 1 MHz

**A Mode (5.180 – 5.240 MHz)**

Plot 1: 0.03 - 1 GHz (middle channel)

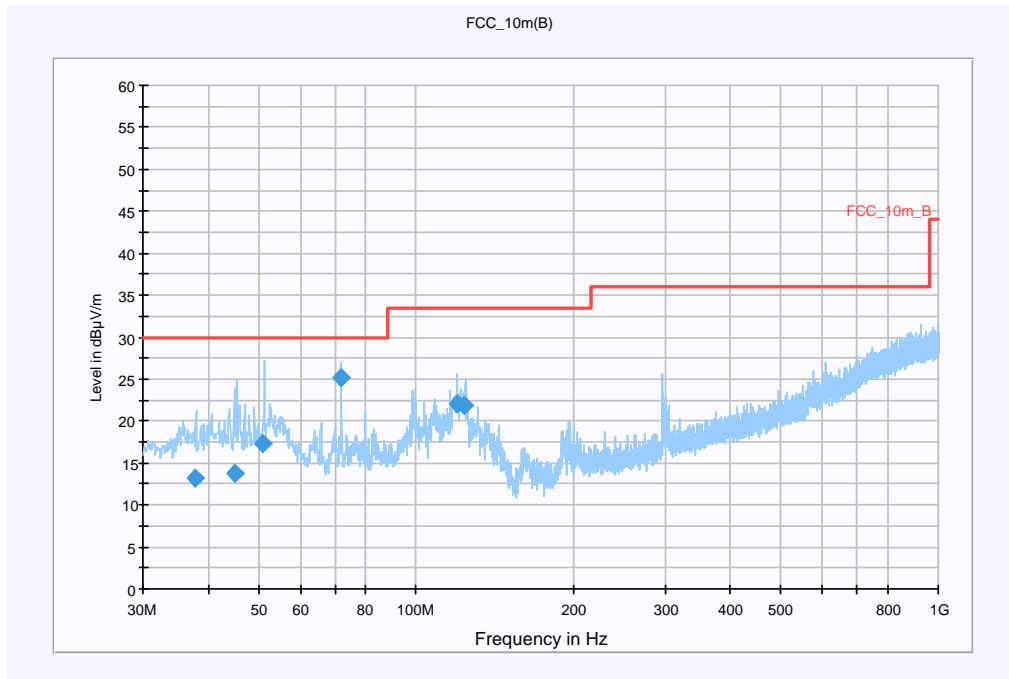
**Information**

EUT:	BAT54-Rail Client + Riwo 15.0740
Serial Number:	4001189118000264 + Engineering sample No.: 1
Test Description:	FCC part 15 class B @ 10 m
Operating Conditions:	TX 84 Mbit/s/ 802.11a Ch 36
Operator Name:	Hennemann
Comment:	AC: 115 V / 60 Hz; ETH-cable: STP

**Scan Setup: FCC\_Fin [EMI radiated]**

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB $\mu$ V/m

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



**Final Result 1**

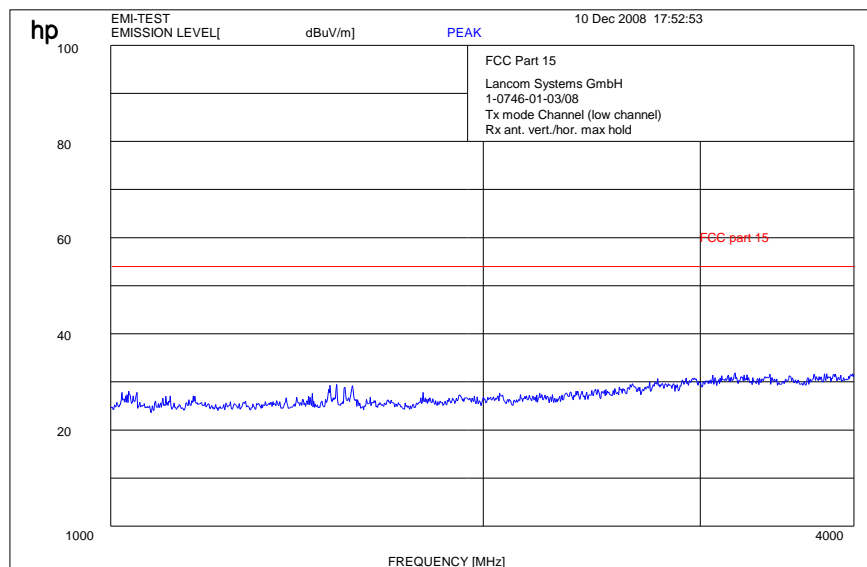
Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
37.843950	13.2	15000.000	120.000	200.0	V	129.0	13.4	16.8	30.0
44.848100	13.8	15000.000	120.000	100.0	V	222.0	13.4	16.2	30.0
51.001550	17.3	15000.000	120.000	100.0	V	171.0	13.4	12.7	30.0
72.000800	25.2	15000.000	120.000	200.0	V	233.0	9.5	4.8	30.0
119.961350	22.1	15000.000	120.000	186.0	V	337.0	10.5	11.4	33.5
124.074900	21.9	15000.000	120.000	118.0	V	58.0	10.2	11.6	33.5

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

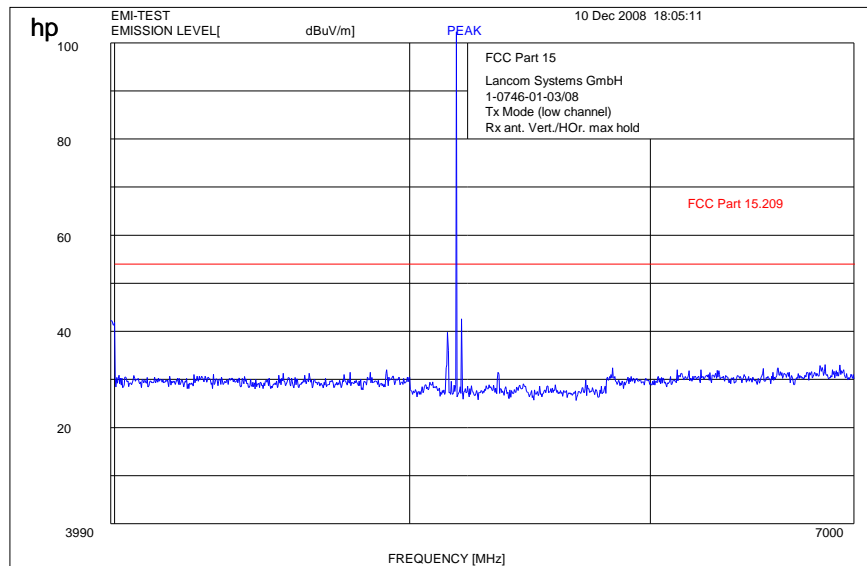
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW ---, CAL 08.04.2010 Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction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

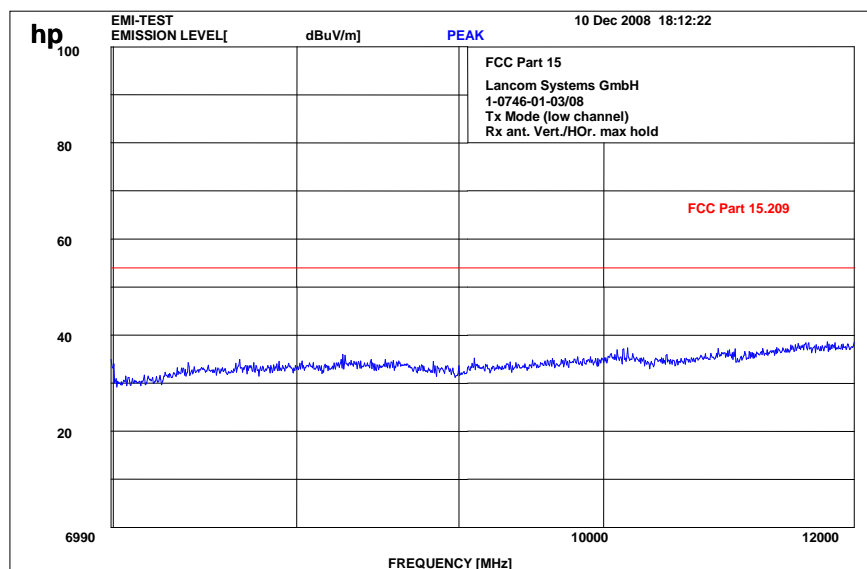
Plot 2: 1 - 4 GHz (middle channel)



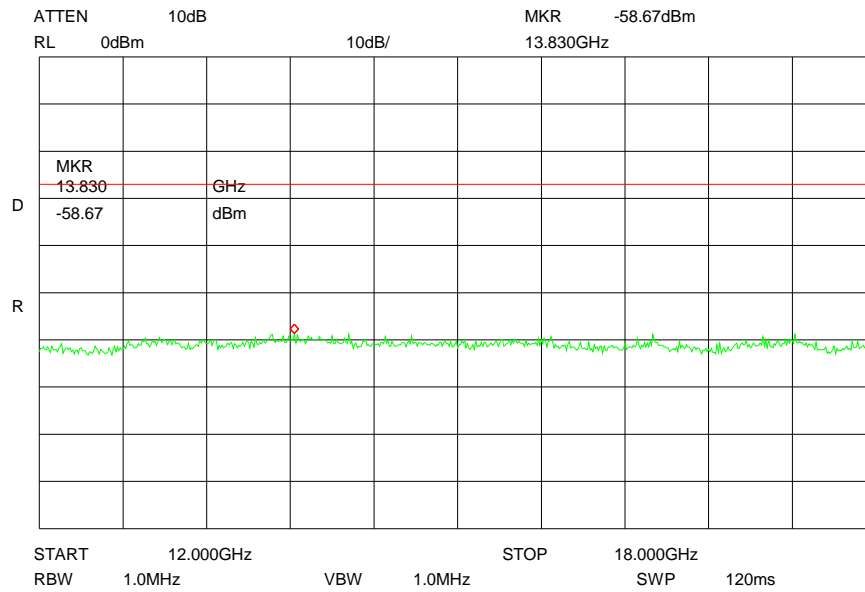
Plot 3: 4- 7 GHz (middle channel)



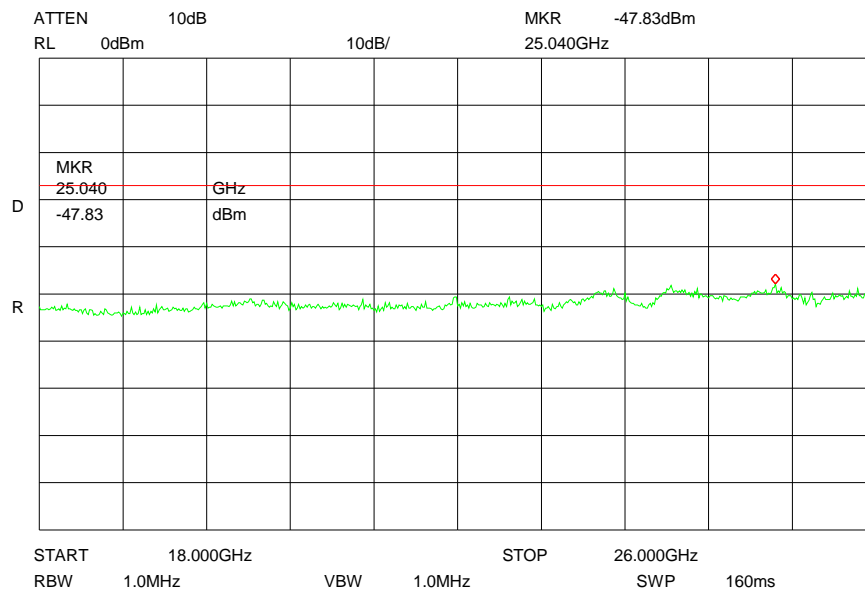
Plot 4: 7- 12 GHz (middle channel)



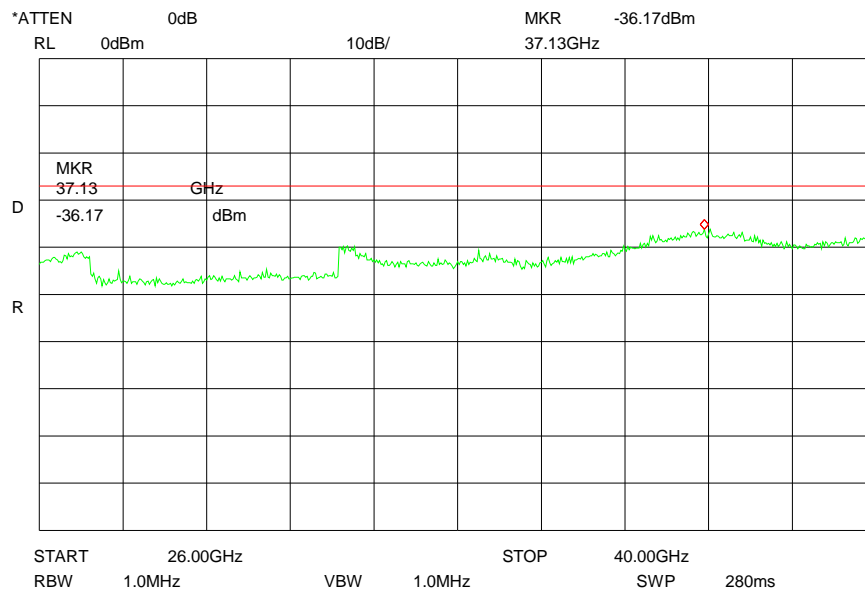
Plot 5: 12- 18 GHz (middle channel)



Plot 6: 18- 26 GHz (middle channel)



Plot 7: 26- 40 GHz (middle channel)



Results:

SPURIOUS EMISSIONS LEVEL §15.407								
5180 MHz			-/-			-/-		
F [MHz]	Detector	Level [dBμV/m]	F [MHz]	Detector	Level [dBμV/m]	F [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

Limits:

Under normal test conditions only	See plots
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## A Mode (5.745 – 5.825 MHz)

Plot 1: 0.03 - 1 GHz (middle channel)

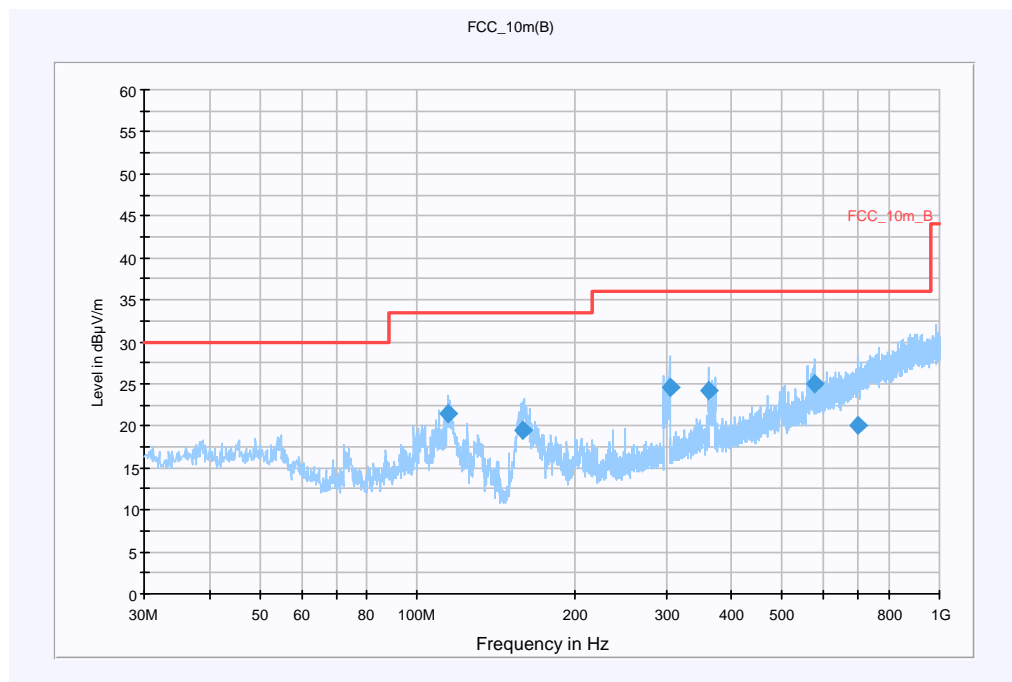
### Common Information

EUT:	BAT54-Rail Client
Serial Number:	4001189118000264
Test Description:	FCC Part 15b @ 10 m
Operating Conditions:	TX 11 MBit/s 802.11a Ch 151
Operator Name:	Hennemann
Comment:	AC: 115 V / 60 Hz; ETH-cable: STP

### Scan Setup: FCC\_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dB $\mu$ V/m

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



### Final Result

Frequency (MHz)	QuasiPeak (dB $\mu$ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V/m)
114.703950	21.4	15000.000	120.000	131.0	V	114.0	11.0	12.1	33.5
159.820600	19.5	15000.000	120.000	113.0	V	69.0	9.4	14.0	33.5
304.236850	24.5	15000.000	120.000	200.0	V	184.0	14.8	11.5	36.0
361.488600	24.3	15000.000	120.000	376.0	H	177.0	16.3	11.7	36.0
574.666650	25.0	15000.000	120.000	323.0	V	171.0	20.2	11.0	36.0
695.178450	20.0	15000.000	120.000	188.0	V	127.0	22.5	16.0	36.0

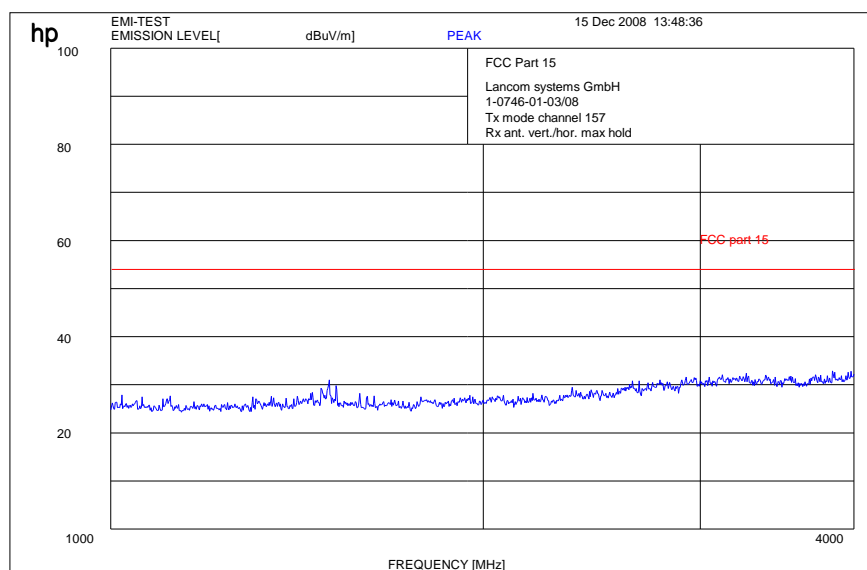


**Hardware Setup: EMI radiated\Electric Field (NOS) - [EMI radiated]**

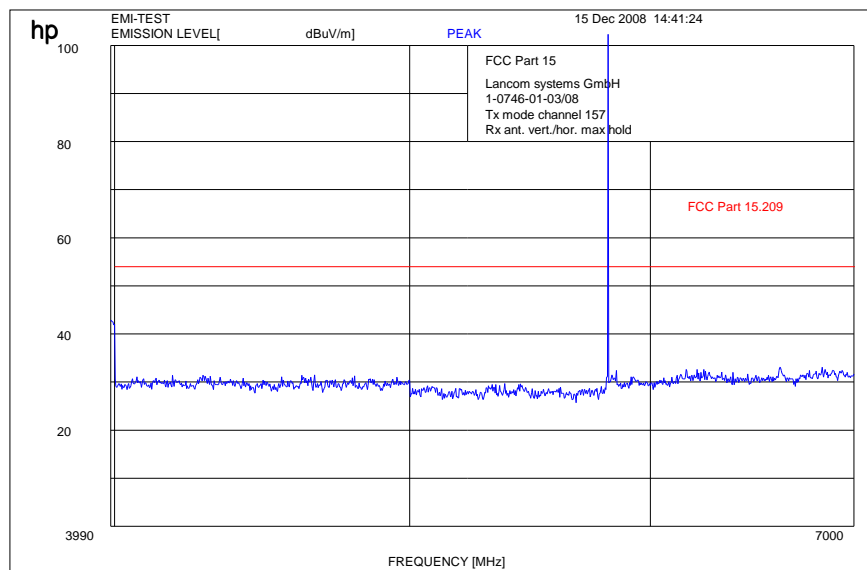
Subrange 1	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW ---, CAL 08.04.2010 Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction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

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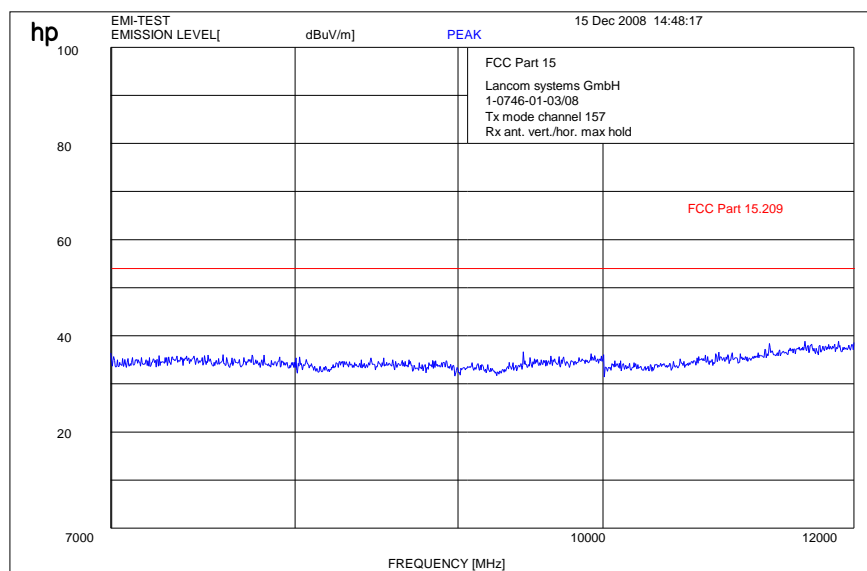
Plot 2: 1 - 4 GHz (middle channel)



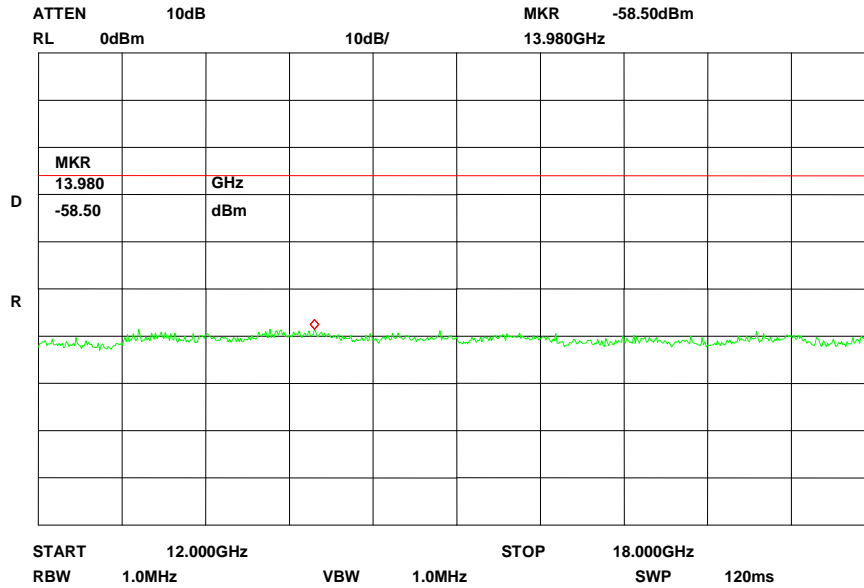
Plot 3: 4- 7 GHz (middle channel)



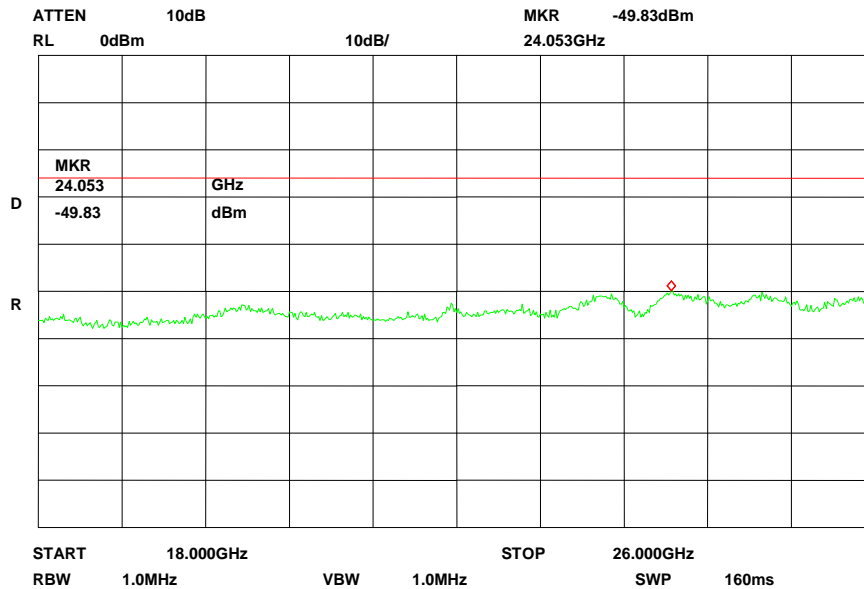
Plot 4: 7- 12GHz (middle channel)



Plot 5: 12- 18 GHz (middle channel)



Plot 6: 18- 26 GHz (middle channel)





**4.14 Spurious Emissions - radiated (Receiver) §15.109 / 209**

Plot 1: 0.03 - 1 GHz

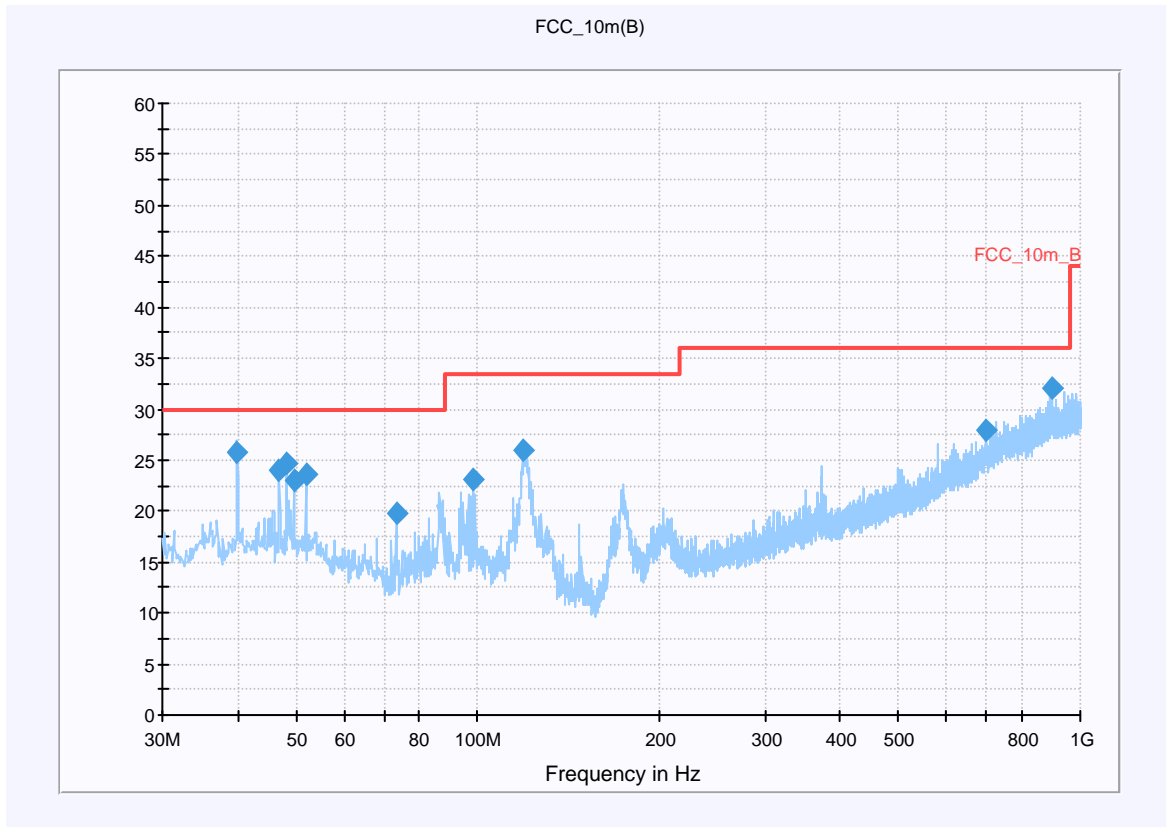
**Information**

EUT:	BAT54-Rail Client + Friwo 15.0740
Serial Number:	4001189118000264 + Engineering Sample No. 1
Test Description:	FCC part 15 B class B @ 10 m
Operating Conditions:	WLAN idle
Operator Name:	Hennemann
Comment:	AC: 115 V / 60 Hz; ETH-cable: STP

**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



**Final Result**

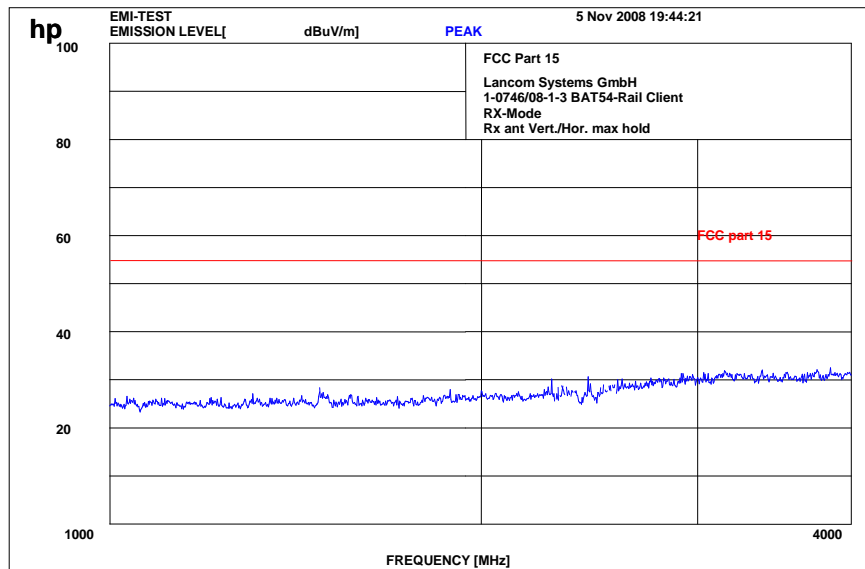
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
39.942500	26.9	15000.000	120.000	200.0	V	91.0	13.6	3.1	30.0
46.853750	24.0	15000.000	120.000	291.0	V	181.0	13.5	6.0	30.0
48.187500	24.2	15000.000	120.000	200.0	V	226.0	13.5	5.8	30.0
49.642500	22.8	15000.000	120.000	214.0	V	136.0	13.5	7.2	30.0
51.946250	23.7	15000.000	120.000	287.0	V	226.0	13.4	6.3	30.0
73.286250	18.9	15000.000	120.000	119.0	V	224.0	9.5	11.1	30.0
98.385000	23.6	15000.000	120.000	100.0	V	179.0	12.1	6.4	33.5
119.361250	26.6	15000.000	120.000	200.0	V	91.0	10.6	4.8	33.5
698.936250	27.2	15000.000	120.000	186.0	V	224.0	22.6	8.8	36.0
901.181250	32.1	15000.000	120.000	118.0	V	316.0	25.8	3.9	36.0

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

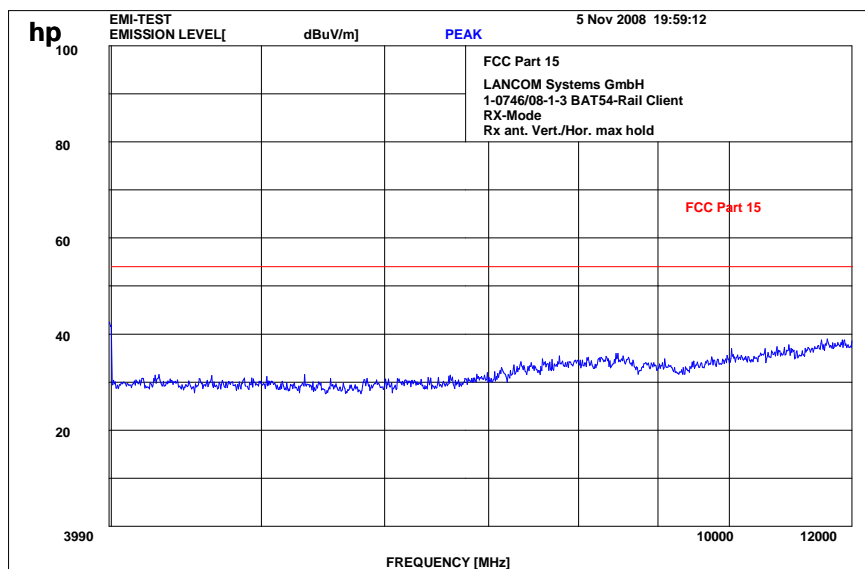
<b>Subrange 1</b>	
Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 3.32, CAL 07.01.2009
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW ---, CAL 08.04.2010 Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113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

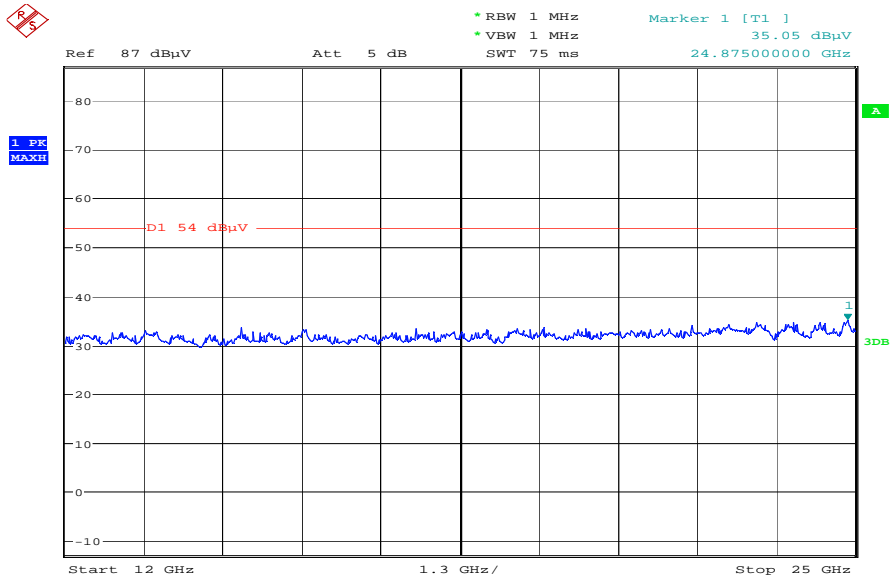
Plot 2: 1 - 4 GHz



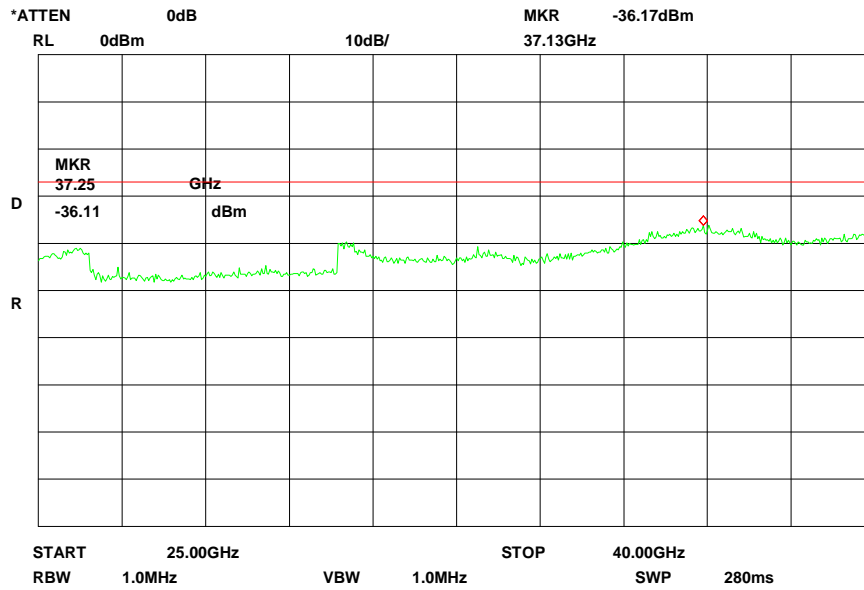
Plot 3: 4- 12 GHz



Plot 4: 12 – 25 GHz



Plot 5: 25- 40 GHz





Results:

Spurious Emissions level [dB $\mu$ V/m]		
f[MHz]	Detector	Level [dB $\mu$ V/m]
Measurement uncertainty		$\pm 3$ dB

f < 1 GHz : RBW/VBW: 100 kHz

f  $\geq$  1GHz : RBW/VBW: 1 MHz

See above plots

Measurement distance see table

**Limits:** § 15.109

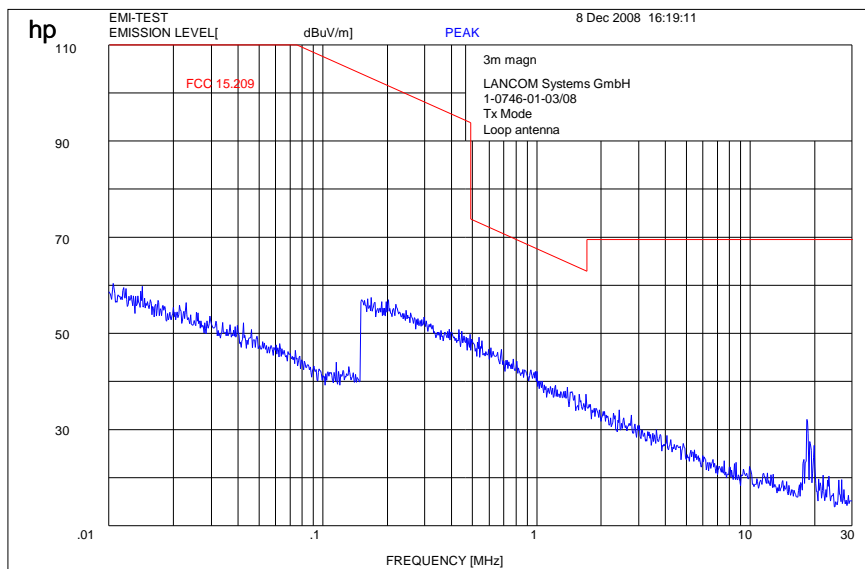
Frequency (MHz)	Field strength (dB $\mu$ V/m)	Measurement distance (m)
30 - 88	30.0	10
88 - 216	33.5	10
216 - 960	36.0	10
above 960	54.0	3

**4.15 Spurious Emissions - radiated <30 MHz §15.209**

Measured at 3 m distance.

Values recalculated with 40 dB/decade according to FCC rules.

Plot 1:



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
30 - 88	100 / 40 dBµV/m	3
88 - 216	150 / 43.5 dBµV/m	3
216 - 960	200 / 46 dBµV/m	3
above 960	54 dBµV/m	3

#### 4.16 AC Line Conducted Emissions <30 MHz §15.107/207

Not performed

Limits:

Under normal test conditions only	See plots
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## 5 Test equipment and ancillaries used for tests

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

All reported calibration intervals are calibrations according to the EN/ISO/IEC 17025 standard. These calibrations were performed from an accredited external calibration laboratory.

Additional to these calibrations the laboratory performed comparison measurements with other calibrated systems and performed a weekly chamber inspection.

All used devices are connected with a 10 MHz external reference.

According to the manufacturers' instruction is it possible to establish a calibration interval for the FSP unit of 24 month, if the device has an external 10 MHz reference.

### *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	Spektrum Analyzer 8566B	HP	3138A07614	300001207	13.12.2007	24	13.12.2009
5	Spektrum Analyzer Display 85662A	HP	3144A28627	300001208	13.12.2007	24	13.12.2009
6	Quasi-Peak-Adapter 85650A	HP	2811A01204	300002308	13.12.2007	24	13.12.2009
7	RF-Preselector 85685A	HP	2837A00778	300002448	13.12.2007	24	13.12.2009
8	PC Vectra VL	HP		300001688	n.a.		
9	Software EMI	HP		300000983	n.a.		
10	Measurement System 2						
11	FSP 30	R&S	100886	300003575	25.08.2008	24	25.08.2010
12	PC	F+W			n.a.		
13	TILE	TILE			n.a.		
14	Biconical antenna	EMCO	S/N: 860 942/003		Monthly verification (System cal.)		
15	Log. Period. Antenna 3146	EMCO	2130	300001603	Monthly verification (System cal.)		
16	Double Ridged Antenna HP 3115P	EMCO	3088	300001032	Monthly verification (System cal.)		
17	Active Loop Antenna 6502	EMCO	2210	300001015	Monthly verification (System cal.)		
18	Power Supply 6032A	HP	2818A03450	300001040	12.05.2007	36	12.05.2010
19	Busisolator	Kontron		300001056	n.a.		
20	Leitungsteiler 11850C	HP		300000997	Monthly verification (System cal.)		
21	Power attenuator 8325	Byrd	1530	300001595	Monthly verification (System cal.)		
22	Band reject filter WRCG1855/1910	Wainwright	7	300003350	Monthly verification (System cal.)		
23	Band reject filter WRCG2400/2483	Wainwright	11	300003351	Monthly verification (System cal.)		

**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	Fast CPU SM-B50	R&S	To 10	3000002681	s.No.10		
15	FM Modulator SM-B5	R&S	835676/033	3000002681	s.No.10		
16	RF-Generator SMIQ03 (B2 Signal)	R&S	835541/055	3000002681-0001	25.08.2008	36	25.08.2011
17	Modulation Coder SMIQ-B20	R&S	To 16	3000002681	s.No.16		
18	Data Generator SMIQ-B11	R&S	To 16	3000002681	s.No.16		
19	RF Rear Connection SMIQ-B19	R&S	To 16	3000002681	s.No.16		
20	Fast CPU SM-B50	R&S	To 16	3000002681	s.No.16		
21	FM Modulator SM-B5	R&S	836061/022	3000002681	s.No.16		
22	RF-Generator SMP03 (B3 Signal)	R&S	835133/011	3000002681-0003	26.08.2008	36	26.08.2011
23	Attenuator SMP-B15	R&S	835136/014	3000002681	S.No.22		
24	RF Rear Connection SMP-B19	R&S	834745/007	3000002681	S.No.22		
25	Power Meter NRVD	R&S	835430/044	3000002681-0004	26.08.2008	24	26.08.2010
26	Power Sensor NRVD-Z1	R&S	833894/012	3000002681-0013	26.08.2008	24	26.08.2010
27	Power Sensor NRVD-Z1	R&S	833894/011	3000002681-0010	26.08.2008	24	26.08.2010
28	Rubidium Standard RUB	R&S		3000002681-0009	27.08.2008	24	27.08.2010
29	Switching and Signal Conditioning Unit SSCU	R&S	338864/003	3000002681-0006	Verified with path compensation		
30	Laser Printer HP Deskjet 2100	HP	N/A	3000002681-0011	n.a.		
31	19" Rack	R&S	11138363000004	3000002681	n.a.		
32	RF-cable set	R&S	N/A	3000002681	n.a.		
33	IEEE-cables	R&S	N/A	3000002681	n.a.		
34	Sampling System FSIQ-B70	R&S	835355/009	3000002681	s.No.7		
35	RSP programmable attenuator	R&S	834500/010	3000002681-0007	26.08.2008	24	26.08.2010
36	Signalling Unit	R&S	838312/011	3000002681	n.a.		
37	NGPE programmable Power Supply for EUT	R&S	192.033.41	3000002681			
39	Power Splitter 6005-3	Inmet Corp.	none	300002841	23.12.2006	24	23.12.2008
40	SMA Cables SPS-1151-985-SPS	Insulated Wire	different	different	n.a.		
41	CBT32 with EDR Signaling Unit	R&S					
42	Coupling unit	Narda	N/A	--	n.a.		
43	2xSwitch Matrix PSU	R&S	872584/021	300001329	n.a.		
44	RF-cable set	R&S	N/A	different	n.a.		
45	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	9163-295	-/-	-/-	30.04.2008	24	30.04.2010
3	Amplifier - 0518C-138	Veritech Microwave Inc.	-/-	-/-	-/-	-/-	-/-
4	Switch - 3488A	HP		300000368	-/-	-/-	-/-
5	EMI Test receiver - ESCI	R&S	100083	300003312	31.01.2007	24	31.01.2009
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	-/-	-/-	-/-	-/-

## 6 Photographs of the Test Set-up

Photo documentation

Photo 1:

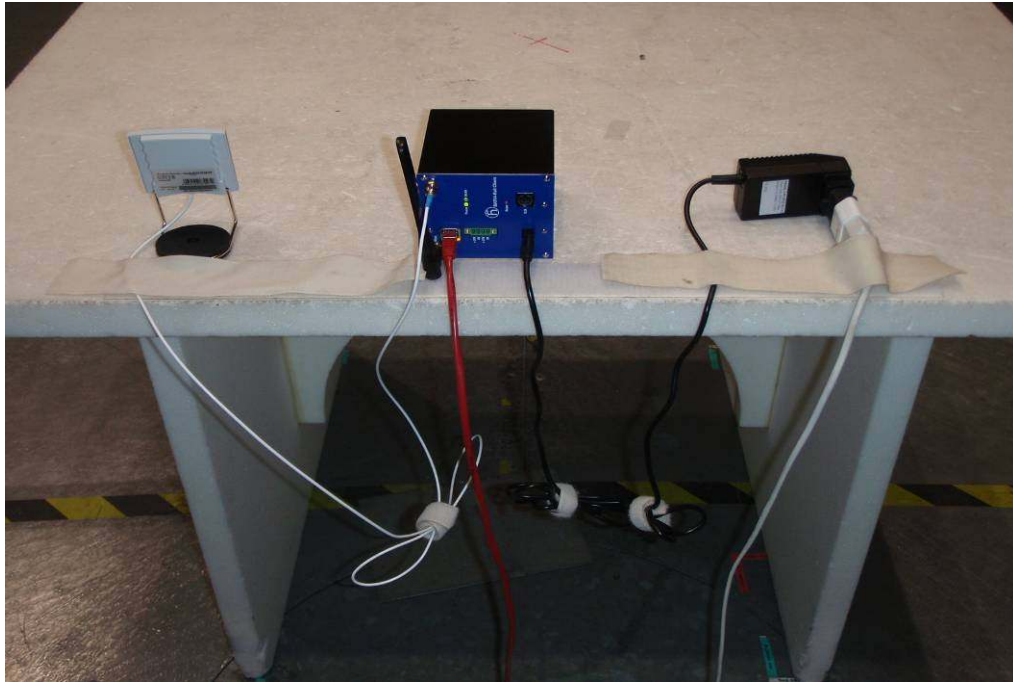


Photo 2:



## 7 Photographs of the EUT

Photo documentation

Photo 3:





Photo 4:



Photo 5:



Photo 6:



Photo 7:

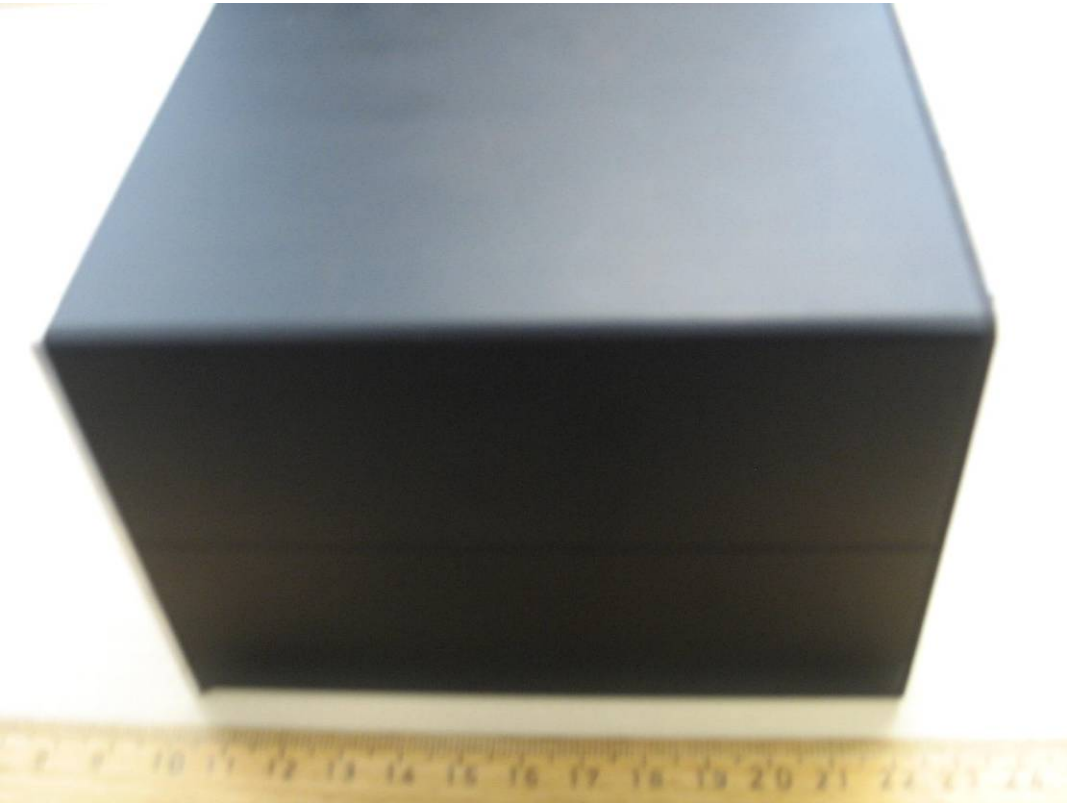


Photo 8:



Photo 9:

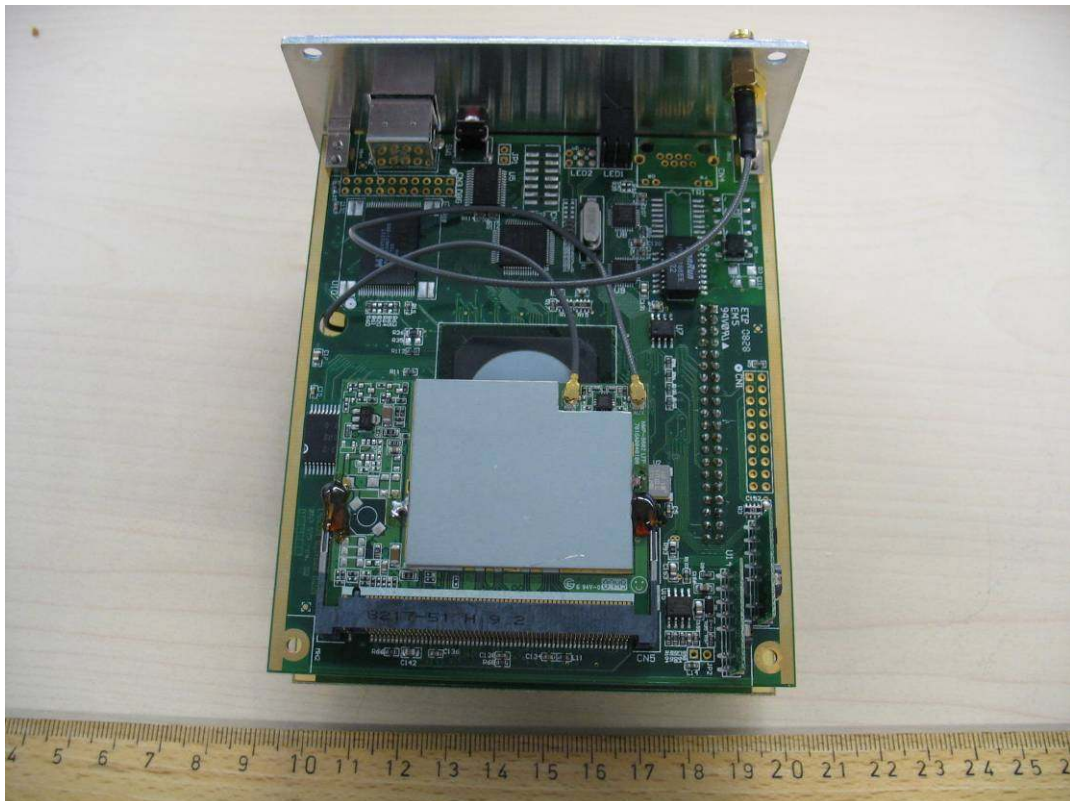


Photo 10:

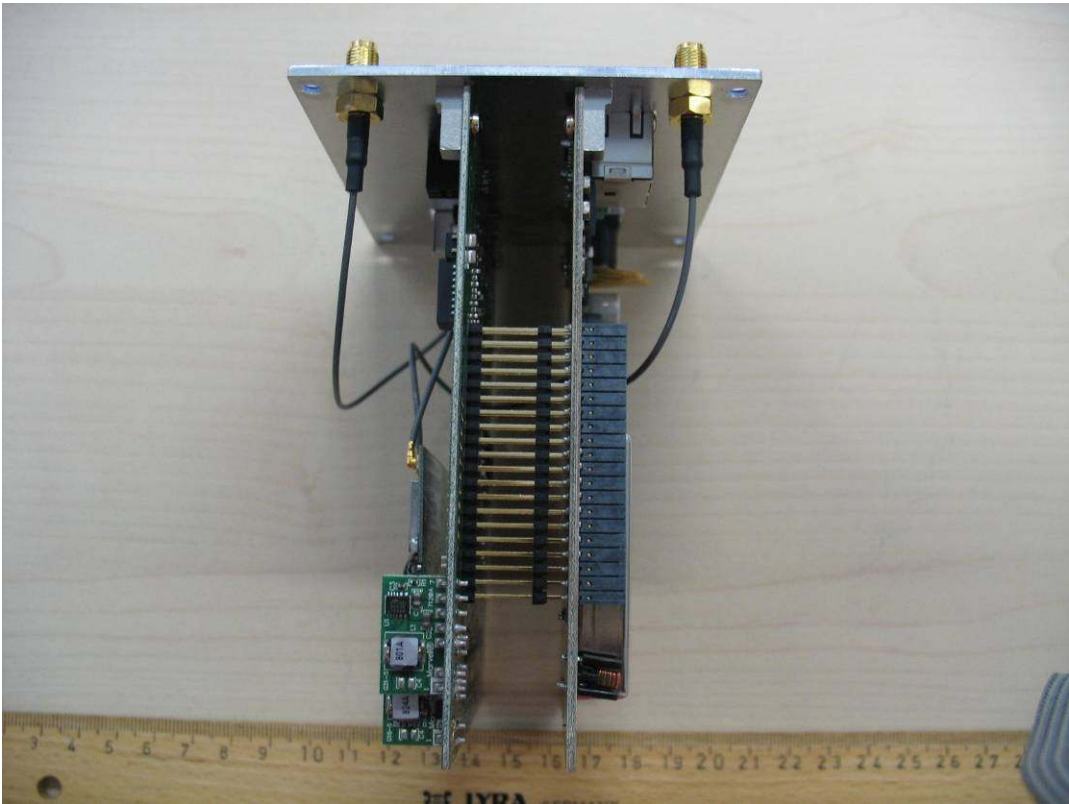


Photo 11:



Photo 12:

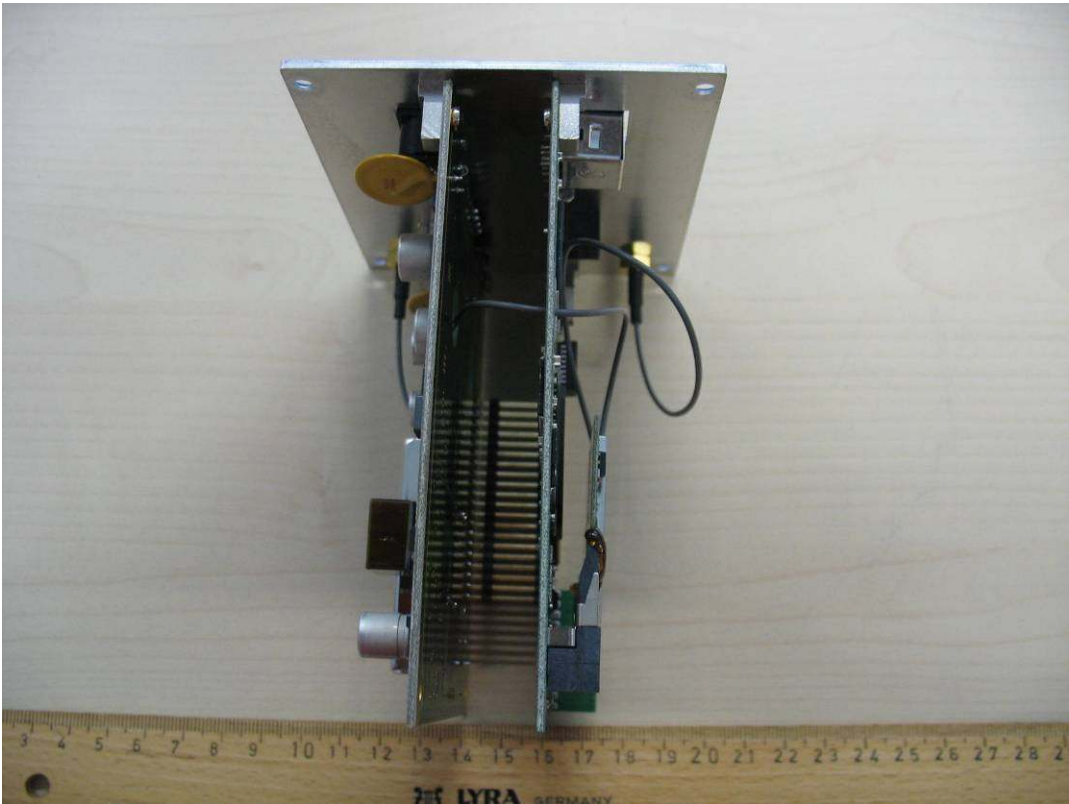


Photo 13:

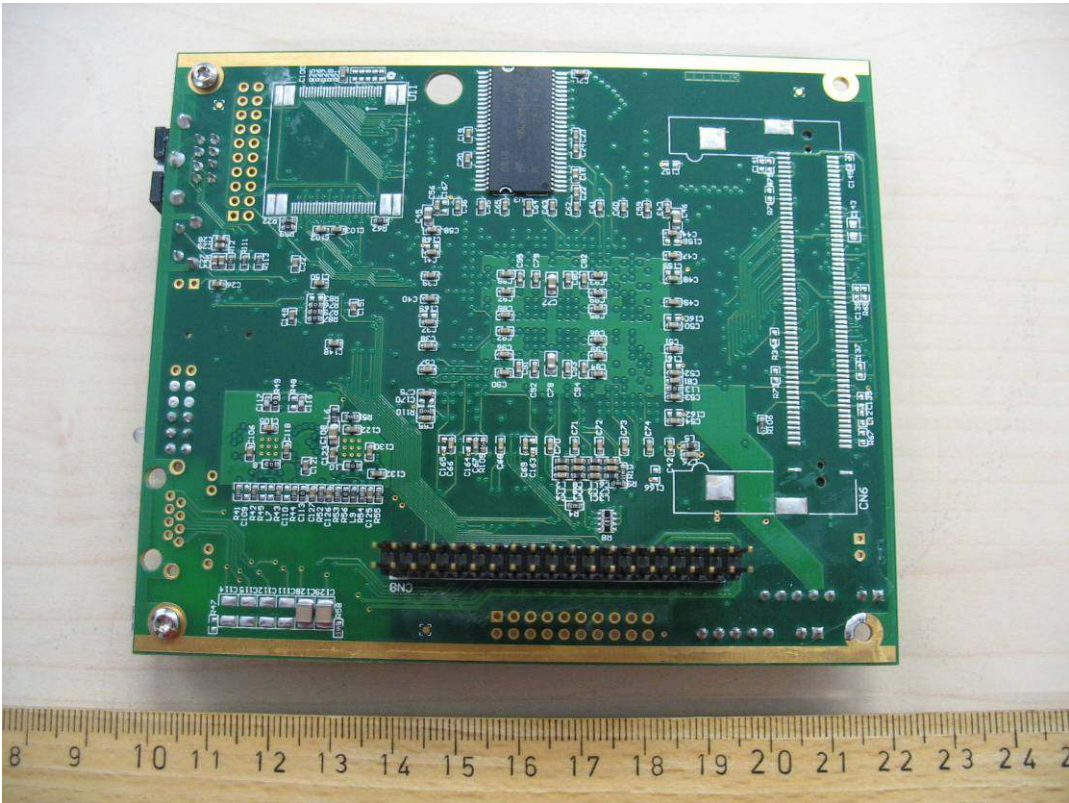


Photo 14:

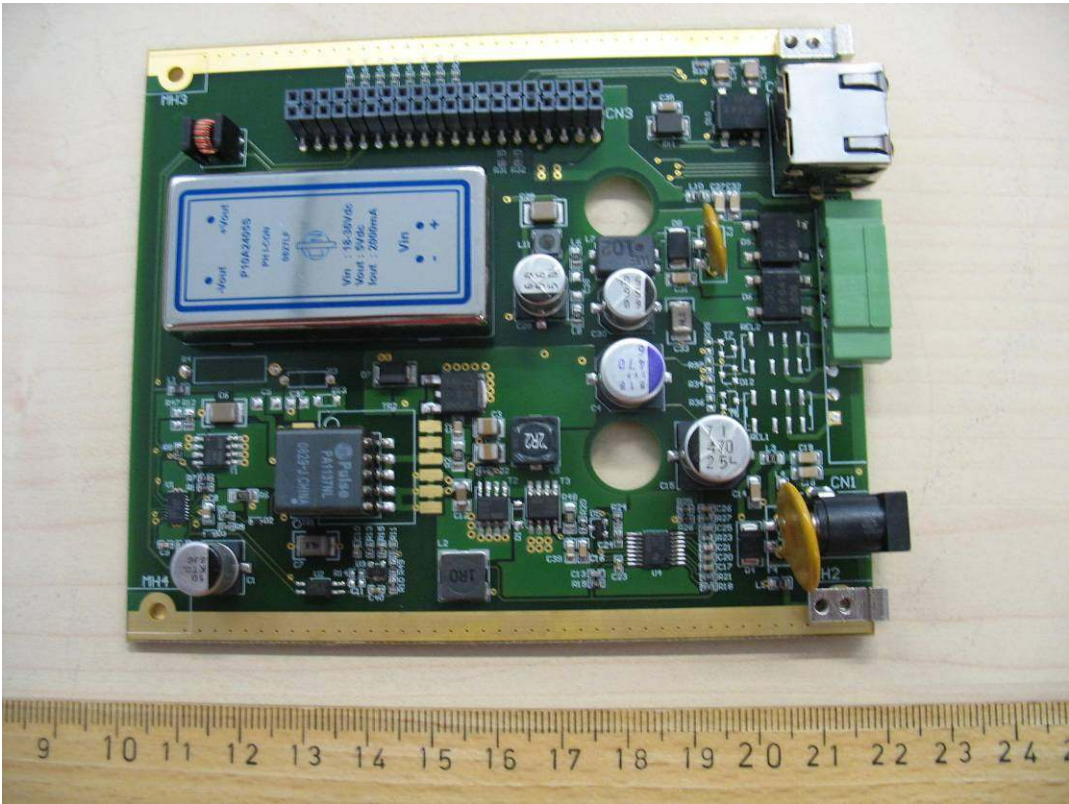


Photo 15:

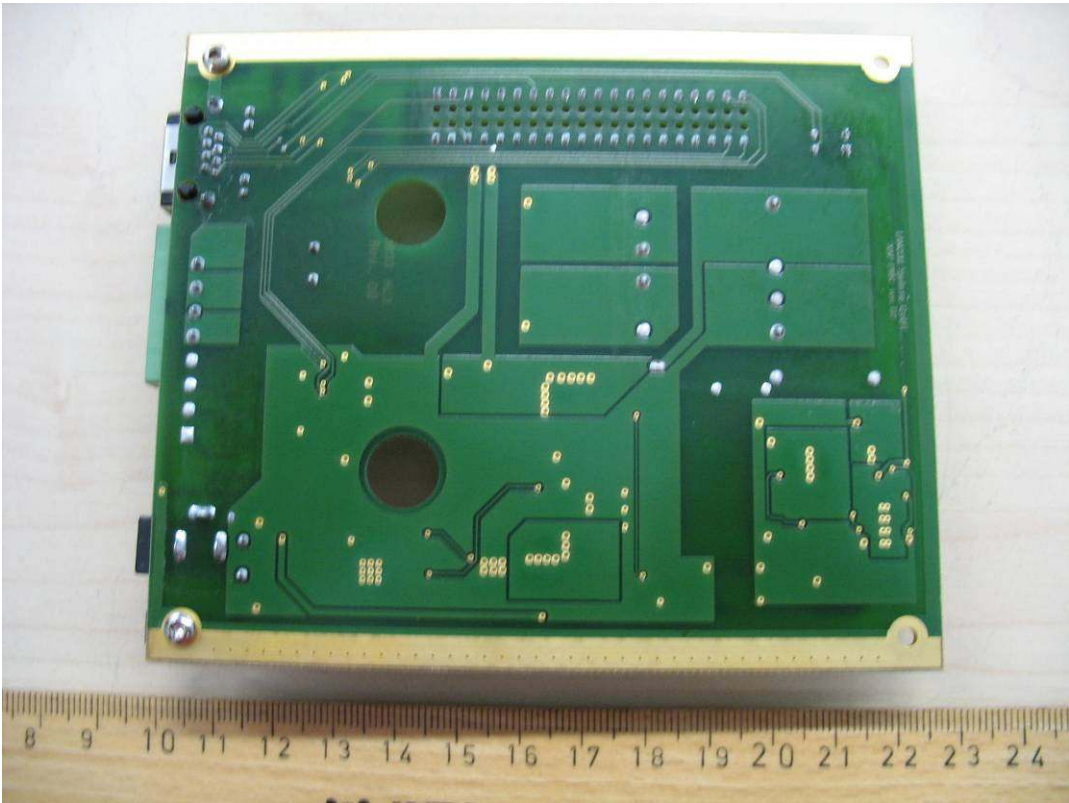


Photo 16:

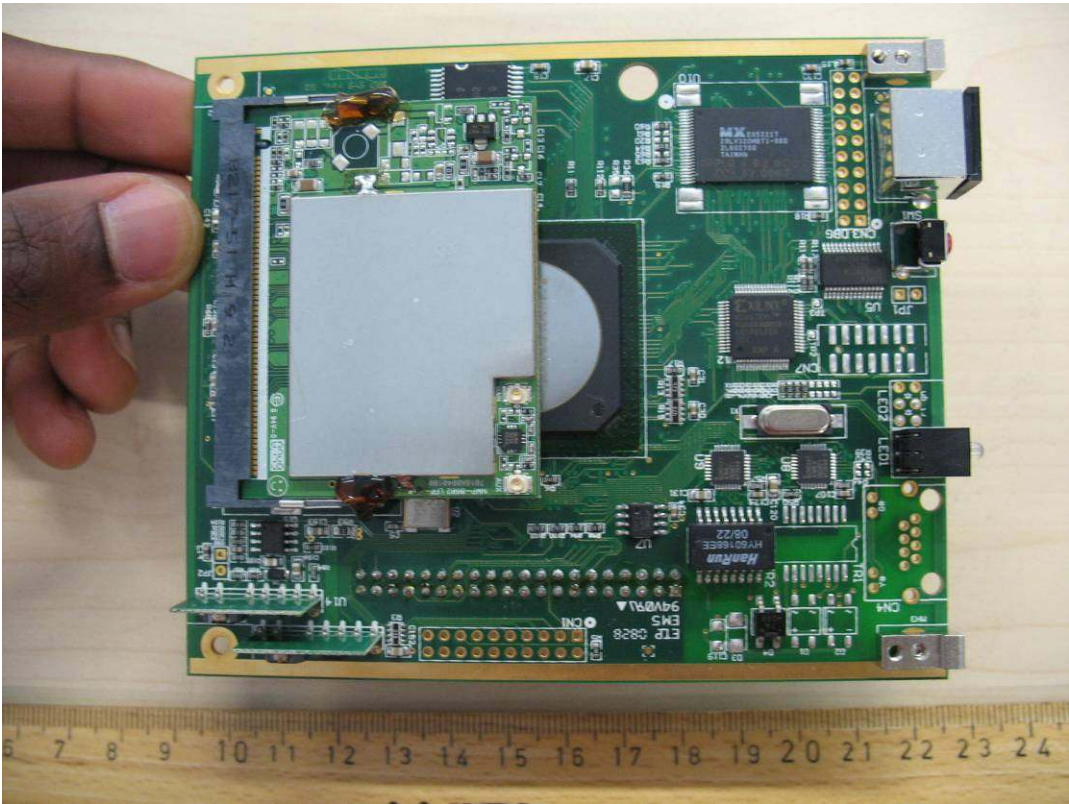


Photo 17: antenna 1



Photo 18: antenna 1



Photo 19: antenna 2





Photo 20:

