

Recognized by the
Federal Communications Commission
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: IC 3463A-1
TCB ID: DE 0001



Accredited by the
German Accreditation Council
DAR-Registration Number
DAT-P-176/94-D1



Independent ETSI
compliance test house



Accredited Bluetooth[®] Test Facility (BQTF)

Test report no. : 2-4706-01-02/07
Applicant : EnOcean GmbH
Type : PTM200C
Test Standard : FCC Part 15
RSS-210 Issue 7
FCC ID : SZV-PTM200C
Certification No. IC : 5713A-PTM200C

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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 1.5. 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:

2007-07-19

Gillmann



Date

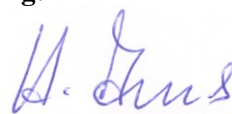
Name

Signature

Technical responsibility for area of testing:

2007-07-19

Ames



Date

Name

Signature

1.2 Testing laboratory

Company name:	Cetecom ICT Services GmbH
Address:	Untertürkheimerstr. 6-10 D-66117 Saarbrücken Germany
Laboratory accreditation:	DAR-Registration No. DAT-P-176/94-D1 Bluetooth Qualification Test Facility (BQTF) Federal Communications Commission (FCC) Identification/Registration No : 90462
Responsible for test laboratory:	Phone: +49 681 598 0 Fax: +46 681 598 9075 Email: info@ict.cetecom.de

1.3 Details of applicant

Name : EnOcean GmbH
Street : Kolpingring 18a
City : 82041 Oberhaching
Country : Germany
Telephone: + 49 (0) 89 6734 689 33
Fax : + 49 (0) 89 67 34 689 56

Contact person:

Name : Mr. Göttler
Telephone : + 49 (0) 89 6734 689 26
Fax : + 49 (0) 89 67 34 689 56
E-mail : Philipp.goettler@enocean.com

1.4 Application details

Date of test: 2007-07-19

1.5 Test item

Type of equipment : Remote Control Transmitter powered by switching
Type designation : PTM200C
Manufacturer : EnOcean GmbH
Street : Kolpingring 18a
City : 82041 Oberhaching
Country : Germany
Serial number : - / -
Additional information :
Frequency : 315 MHz
Type of modulation : 180KA1D
Number of channels : 1
Antenna : External wire antenna 25 cm
Max. ERP : Peak: 88.9 dB μ V/m @3m
Average: 74.3 dB μ V/m @3m
Transmitter spurious : AV 22.4 dB μ V/m at 3m (70 MHz)
Power supply : ~3 V via electro-dynamic system
FCC-ID : SZV-PTM200C
IC No : 5713A-PTM200C

1.6 Test specifications:

CANADA RSS-210 Issue 7
FCC Part15.231

ATTESTATION:

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

Signature:



Gillmann

Date: 2007-07-19

2 Technical test

2.1 Summary of test results

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 conform 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 conform with ANSI C63.2-1996 item 15.

150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.

30 MHz - 200 MHz: Quasi Peak measurement, 120KHz Bandwidth, biconical antenna

200MHz - 1GHz: Quasi Peak measurement, 120KHz Bandwidth, log periodic antenna

>1GHz: Average, RBW 1MHz, VBW 10 Hz, wave guide horn

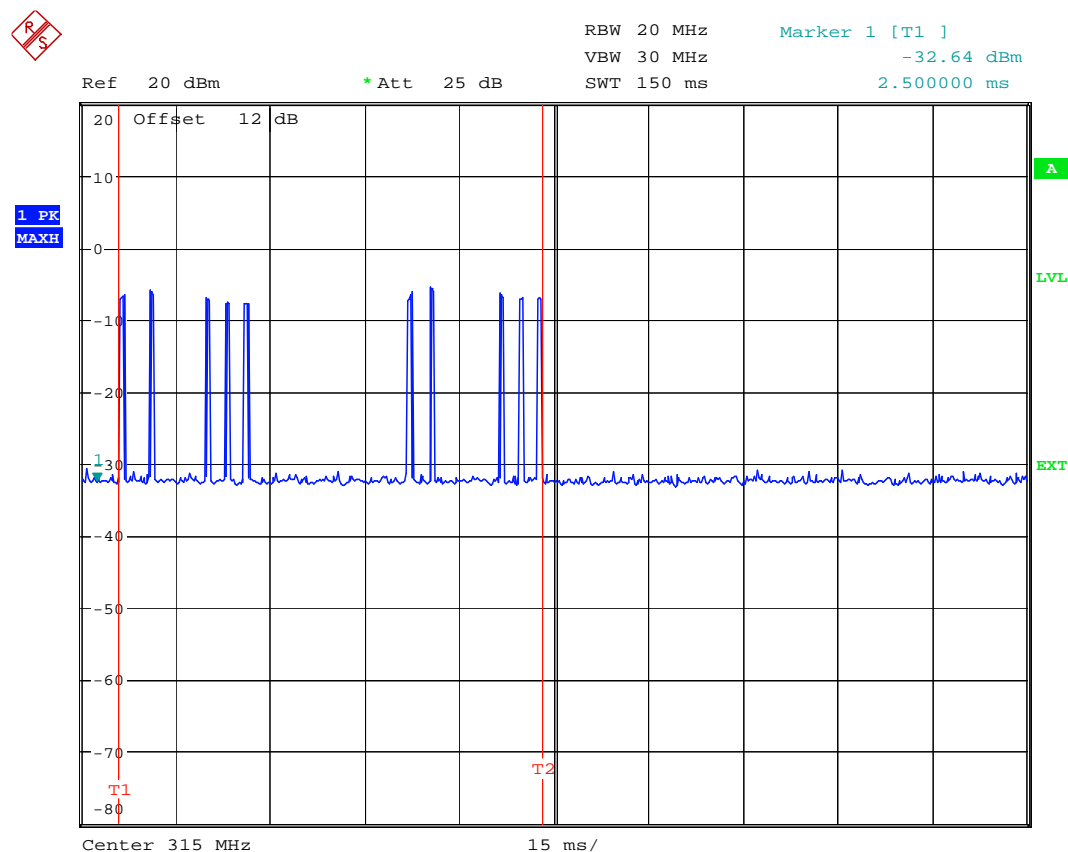
All measurement settings are according to FCC 15.109 and 15.107

The product fulfills the also the requirements for CANADA RSS-210

No deviations from the technical specification(s) were ascertained in the course of the tests performed.

2.2 Test results

2.2.1 Timing behavior 15.231(a1)



Date: 23.JUL.2007 10:56:49

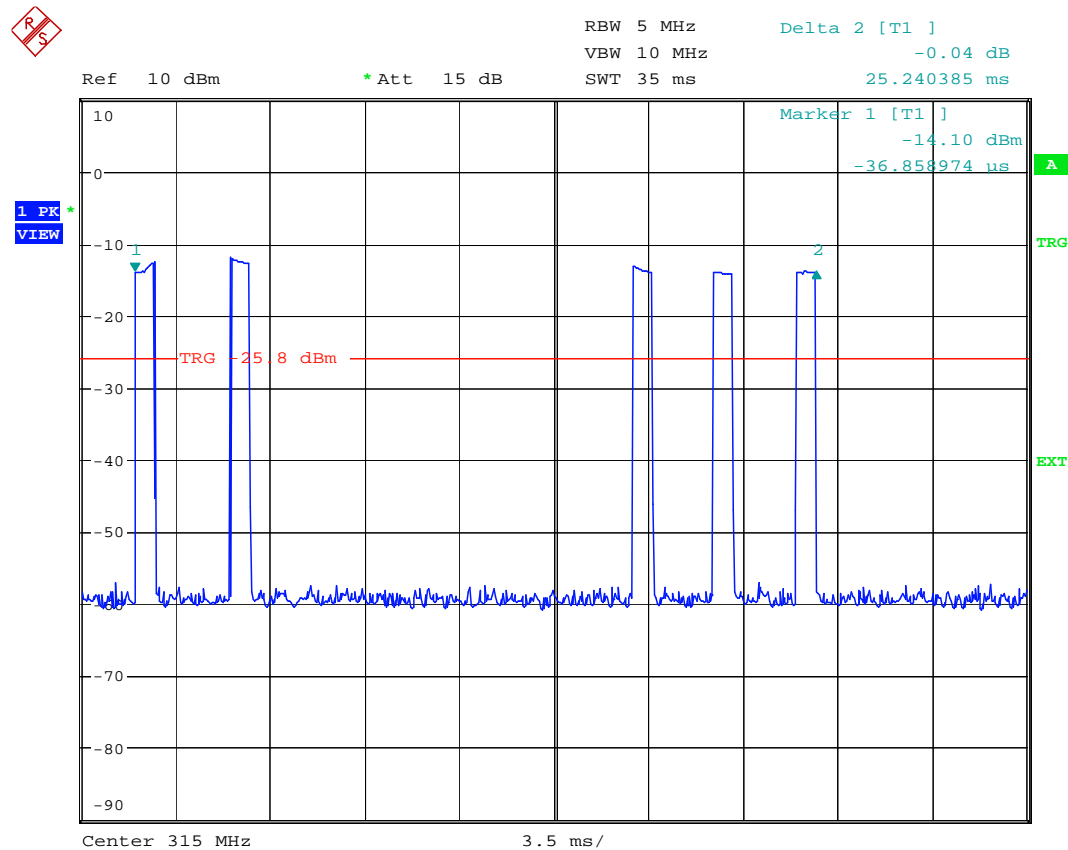
Remark: the distance between the two vertical red lines is 66 ms..

This is a regular behaviour, as the button switches two times each pressing. The time after the pulse train may be longer, depending on the manual switching on and off.

Limit: no periodic transmissions. Stops transmit within not more than 5 seconds of being released.

The transmitter transmits 2 packets with 5 pulses within max. 66 ms in regular periodic transmission.

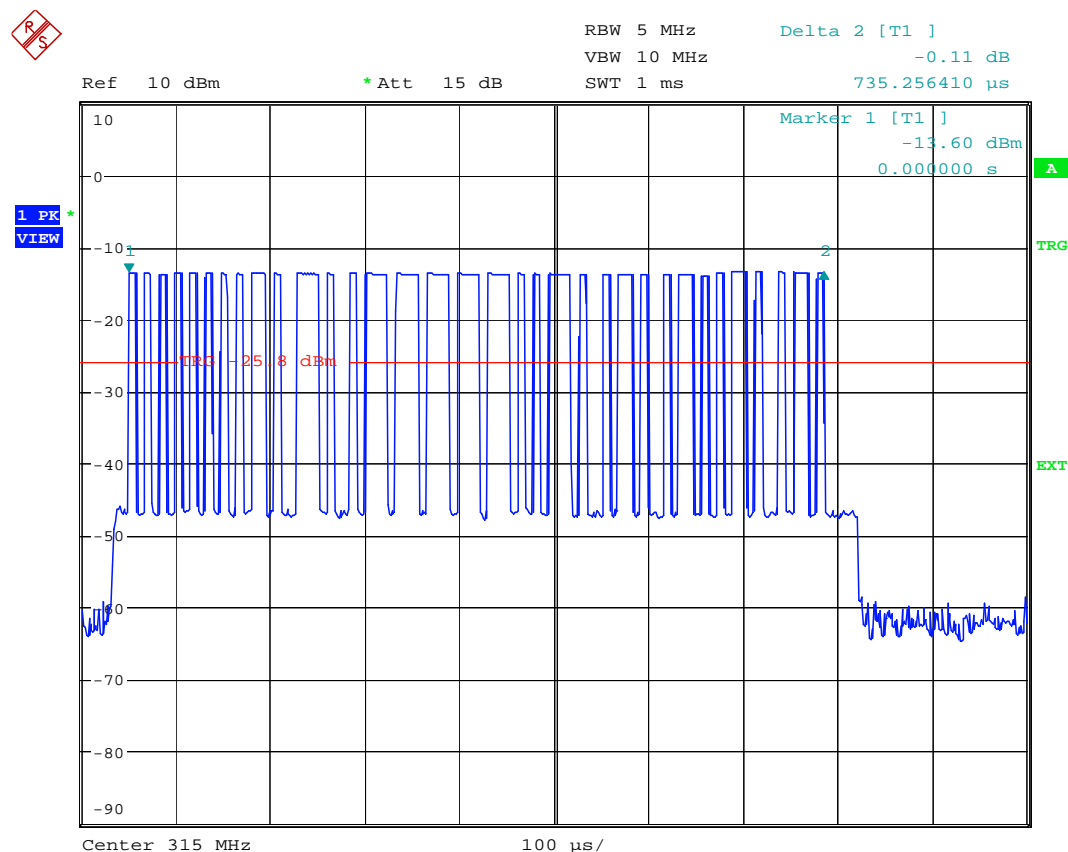
Below you see one such train consisting of 5 pulses.



Date: 19.JUL.2007 13:17:34

There are maximal 10 pulses possible within 100 ms. (worst case).

Pulse Train of one data burst



Date: 19.JUL.2007 13:19:50

Duty Cycle:

The length of one data burst is 700 µs. Within a burst the duty cycle is ~50%, ~ 350 µs.

Periodic transmissions:

One pulse train consists of 10 packets within 100 ms.

Added we have a TX-time $10 \cdot 350 \mu\text{s}$ within 100ms, this is a duty cycle of 3.5 %.

The average value is $(\text{Peak} - 10 \cdot \log(3.5/100)) = \text{Peak} - 14.6 \text{ dB}$.

Radiated field strength is 88.9 dBµV/m at 3m distance PEAK .

The calculated AVERAGE is $88.9 \text{ dB}\mu\text{V/m} - 14.6 \text{ dB} = 74.3 \text{ dB}\mu\text{V/m}$ at 3m distance.

The limit for 315 MHz according to FCC15.231 (b) is 75.6 dBµV/m.

The product complies with the FCC and IC requirements for non-periodic transmissions

2.2.2 Field Strength 15.231(b)

(RADIATED)

TEST CONDITIONS		MAXIMUM AVERAGE FIELD STRENGTH ($\mu\text{V/m}$)
Frequency 315 MHz		
T_{nom} (23)°C	V_{nom}	27.861 $\mu\text{V/m}$ PEAK (88.9 dB $\mu\text{V/m}$) 5188 $\mu\text{V/m}$ AVERAGE (74.3 dB $\mu\text{V/m}$)
Maximum deviation from output power under extreme test conditions (dBc)		not applicable
Measurement uncertainty		$\pm 3\text{dB}$

RBW/VBW : 300 kHz

Limit for 315 MHz : 6026 $\mu\text{V/m}$ (75.6 dB $\mu\text{V/m}$) Average

Limits: 15.231 (b)

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength of Spurious emissions ($\mu\text{V/m}$)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 **	125 to 375 **
174-260	3,750	375
260-470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250
** linear interpolations		

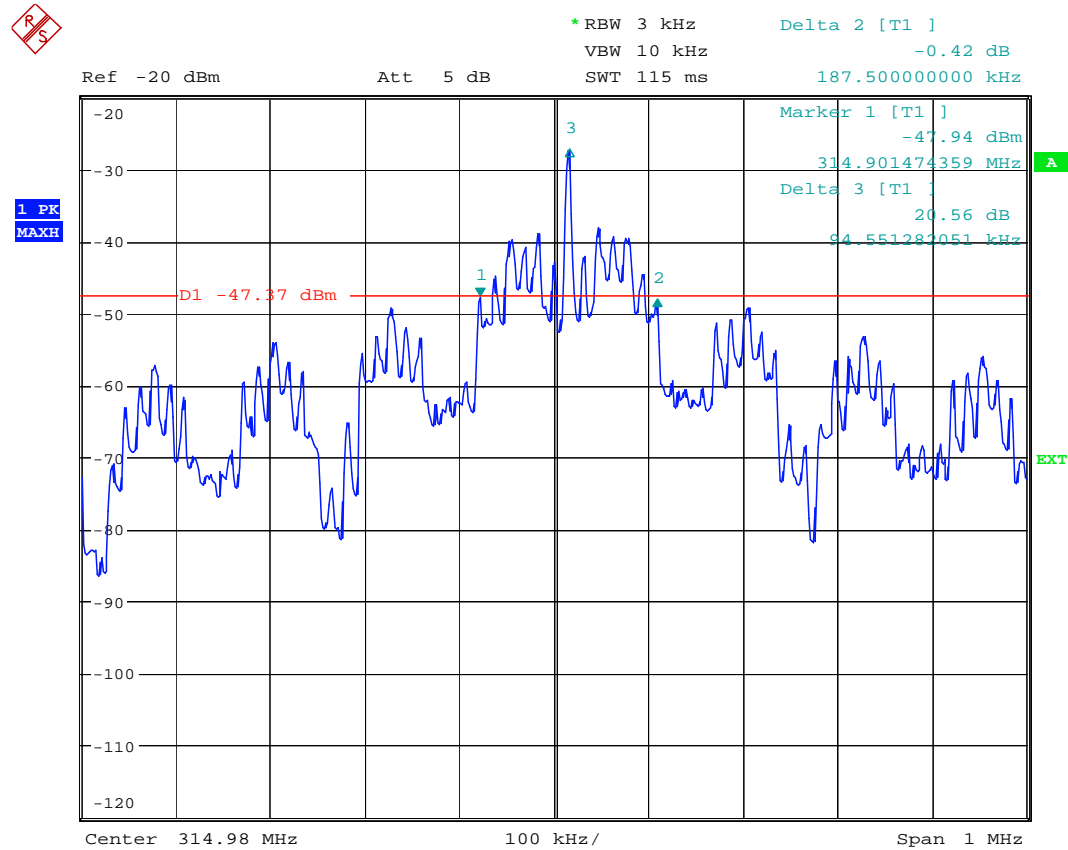
15.231(b) Field Strengths and Frequency Bands

EMISSION LIMITATIONS					
f (MHz)	amplitude of emission (dBµV/m) Peak	amplitude of emission (dBµV/m) Average	limit max. allowed emission power	Actual attenuation below frequency of operation (dB)	results
70.9	41.2 Peak	26.6 AV	55.6 dBµV/m Average	>20 dB	pass
630	43.2 Peak	28.6 AV	55.6 dBµV/m Average	>20 dB	pass
945	37.1 Peak	22.5 AV	55.6 dBµV/m Average	>20 dB	pass
Measurement uncertainty			± 3dB		

Limits: 15.231 (b)

Frequency (MHz)	Field strength (µV/m)	Field strength of Spurious emissions (µV/m)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 **	125 to 375 **
174-260	3,750	375
260-470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250
** linear interpolations		

2.2.3 Bandwidth of Emissions 15.231(c)



Date: 19.JUL.2007 13:33:06

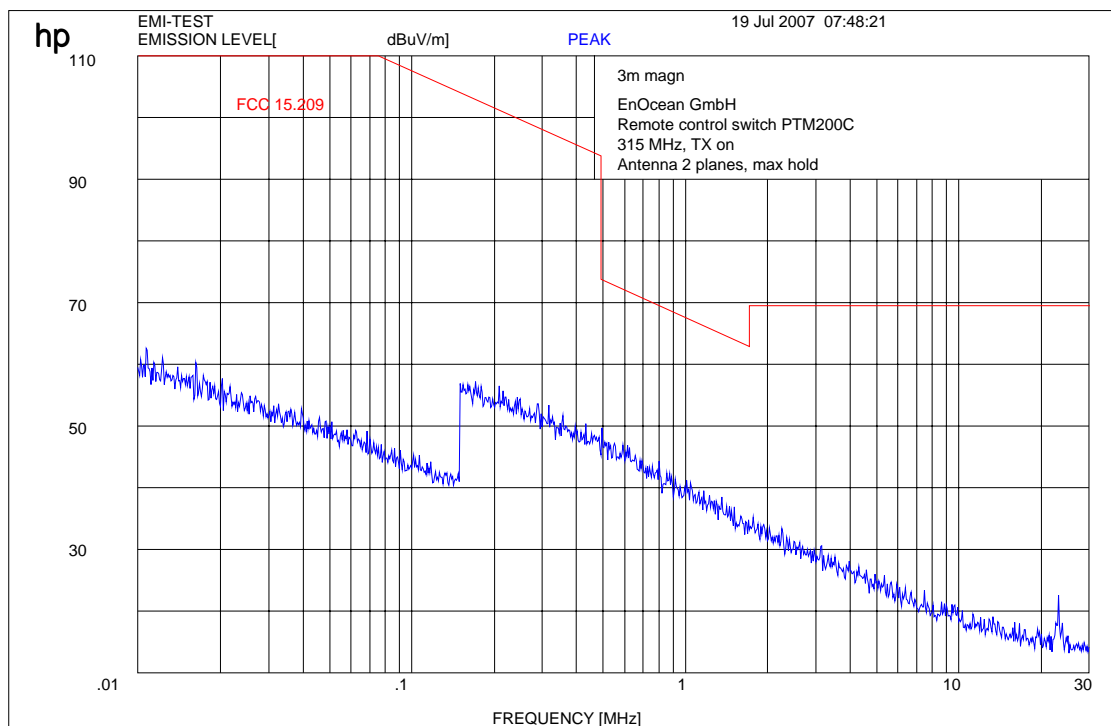
The occupied bandwidth (20 dB / 99%) is 187 kHz .

Limit

< 0.25% of the centre frequency, here 0.787 MHz

2.2.4 Spurious Emission (radiated)

9 kHz to 30 MHz



To convert the measuring distance from 3m to 30m and 30 to 300m a correction factor from 40 dB/decade was used (FCC15.31 (f)(2))

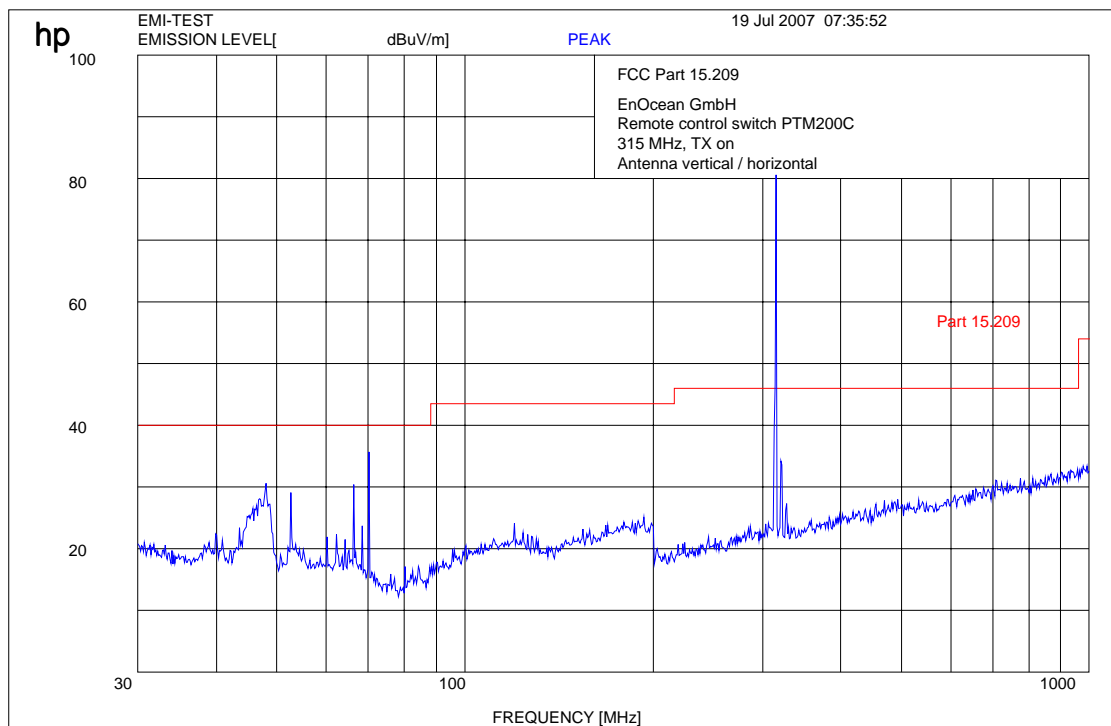
Measurement distance 3m

This measurement was done in 3 planes, the plot shows the worst case

Limits: (general requirements)

Frequency	Field strength ($\mu\text{V/m}$)	Measuring distance (m)
0.009 to 0.490 MHz	$2400/F(\text{MHz})$	300
0.490 to 1.705 MHz	$24000/F(\text{MHz})$	30
1.705 to 30.0 MHz	30	30

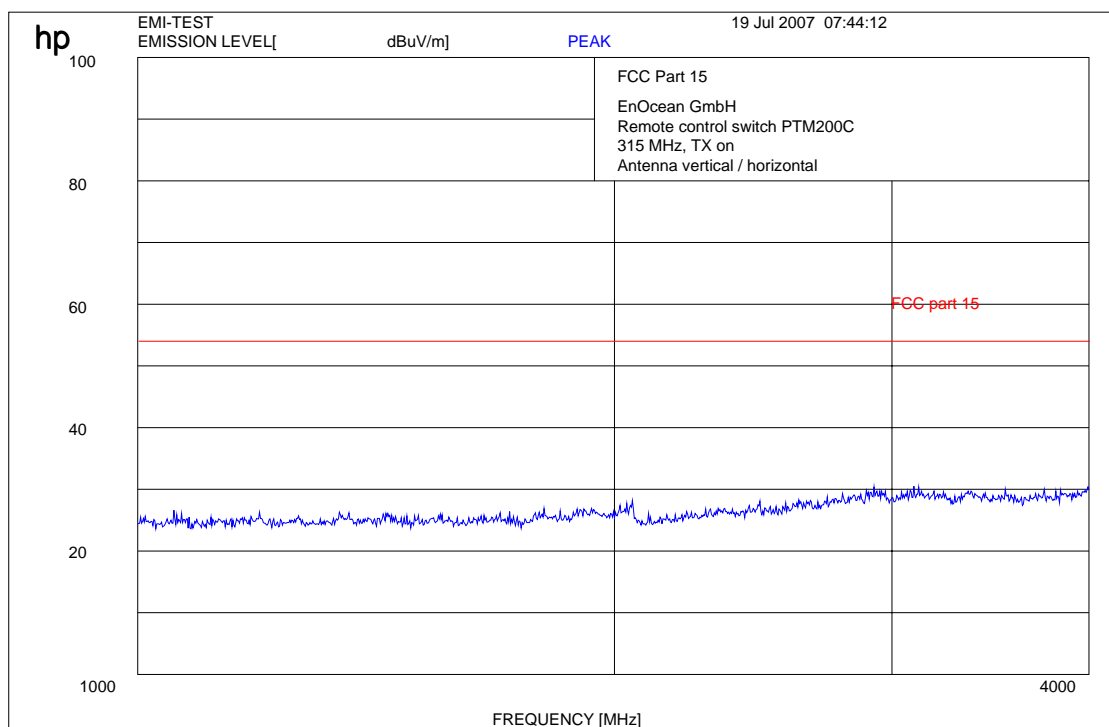
30 MHz to 1 GHz



Limits: 15.231 (e)

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength of Spurious emissions ($\mu\text{V/m}$)
40.66-40.7	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 **	125 to 375 **
174-260	3,750	375
260-470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250
** linear interpolations		

1 GHz to 4 GHz



Limits: 15.231 (e)

Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength of Spurious emissions ($\mu\text{V/m}$)
40.66-40.7	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750 **	125 to 375 **
174-260	3,750	375
260-470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250
** linear interpolations		

3 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.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Communication Analyzer	CMTA 54	Rohde & Schwarz	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012
08	Function Generator	AFGU	Rohde & Schwarz	862 480/032
09	Regulating Transformer	MPL	Erfi	91350
10	LISN	NNLA 8120	Schwarzbeck	8120331
11	Relay-Matrix	PSU	Rohde & Schwarz	893 285/020
12	Power-Meter	436 A	Hewlett-Packard	2101A12378
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616
15	Modulation Meter	9008	Racal-Dana	2647
16	Frequency Counter	5340 A	Hewlett-Packard	1532A03899
17	Anechoic Chamber	---	MWB	87400/002
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131
21	RF-Preselector	85685 A	Hewlett-Packard	2833A00768
22	Biconical Antenna	3104	Emco	3758
23	Log. Per. Antenna	3146	Emco	2130
24	Double Ridged Horn	3115	Emco	3088
25	EMI-Testreceiver	ESAI	Rohde & Schwarz	863 180/013
26	EMI-Analyzer-Display	ESAI-D	Rohde & Schwarz	862 771/008
27	Biconical Antenna	HK 116	Rohde & Schwarz	888 945/013
28	Log. Per. Antenna	HL 223	Rohde & Schwarz	825 584/002
29	Relay-Switch-Unit	RSU	Rohde & Schwarz	375 339/002
30	Highpass	HM985955	FSY Microwave	001
31	Amplifier	P42-GA29	Tron-Tech	B 23602
32	Anechoic Chamber		Frankonia	
33	Control Computer	PSM 7	Rohde & Schwarz	834 621/004
34	EMI Test Receiver	ESMI	Rohde & Schwarz	827 063/010
35	EMI Test Receiver	Display	Rohde & Schwarz	829 808/010

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Control Computer	HD 100	Deisel	100/322/93
37	Relay Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relay Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	Spectrum Monitor	EZM	Rohde & Schwarz	883 720/006
42	Measuring Receiver	ESH 3	Rohde & Schwarz	890 174/002
43	Measuring Receiver	ESVP	Rohde & Schwarz	891 752/005
44	Bicon Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002
48	Polarisation Network	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridged Horn Antenna 1-26.5 GHz	3115	EMCO	9107-3696
50	Microw. Sys. Amplifier 0.5- 26.5 GHz	8317A	Hewlett Packard	3123A00105
51	Audio Analyzer	UPD	Rohde & Schwarz	1030.7500.04
52	Controler	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Network	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Network	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	861 189/014
56	AC 2 Phase V-Network	ESH3-Z5	Rohde & Schwarz	894 981/019
57	AC-3 Phase V-Network	ESH2-Z5	Rohde & Schwarz	882 394/007
58	Power Supply	6032A	Rohde & Schwarz	2933A05441
59	RF-Test Receiver	ESVP.52	Rohde & Schwarz	881 487/021
60	Spectrum Monitor	EZM	Rohde & Schwarz	883 086/026
61	RF-Test Receiver	ESH3	Rohde & Schwarz	881 515/002
62	Relay Matrix	PSU	Rohde & Schwarz	882 943/029
63	Relay Matrix	PSU	Rohde & Schwarz	828 628/007
64	Spectrum Analyzer	FSIQ 26	Rohde & Schwarz	119.6001.27
65	Spectrum Analyzer	HP 8565E	Hewlett Packard	3473A00773
66				
67				
68				

4 Annex B: Photographs of Test site

Photo 1 (Radiated Emissions):

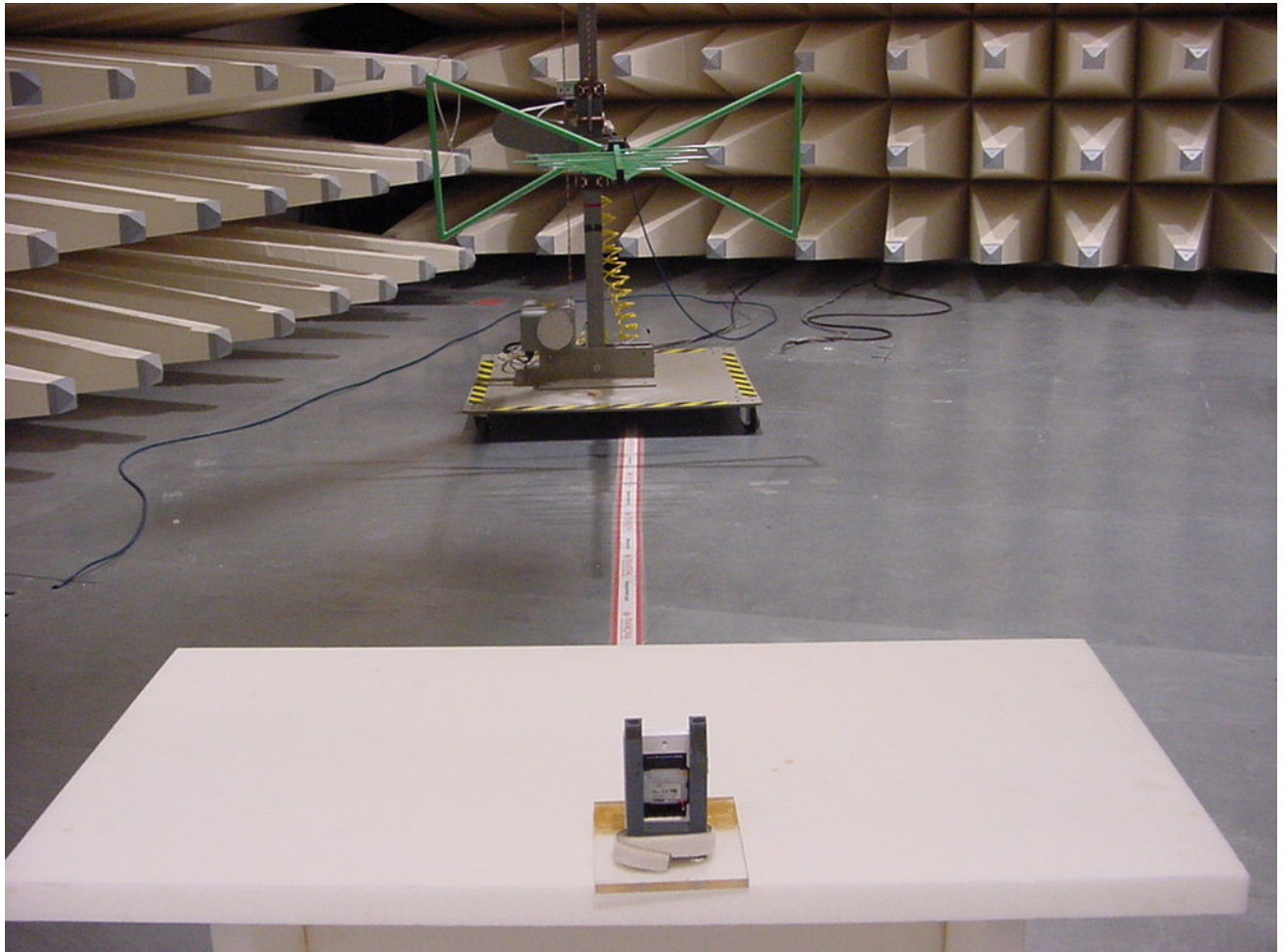
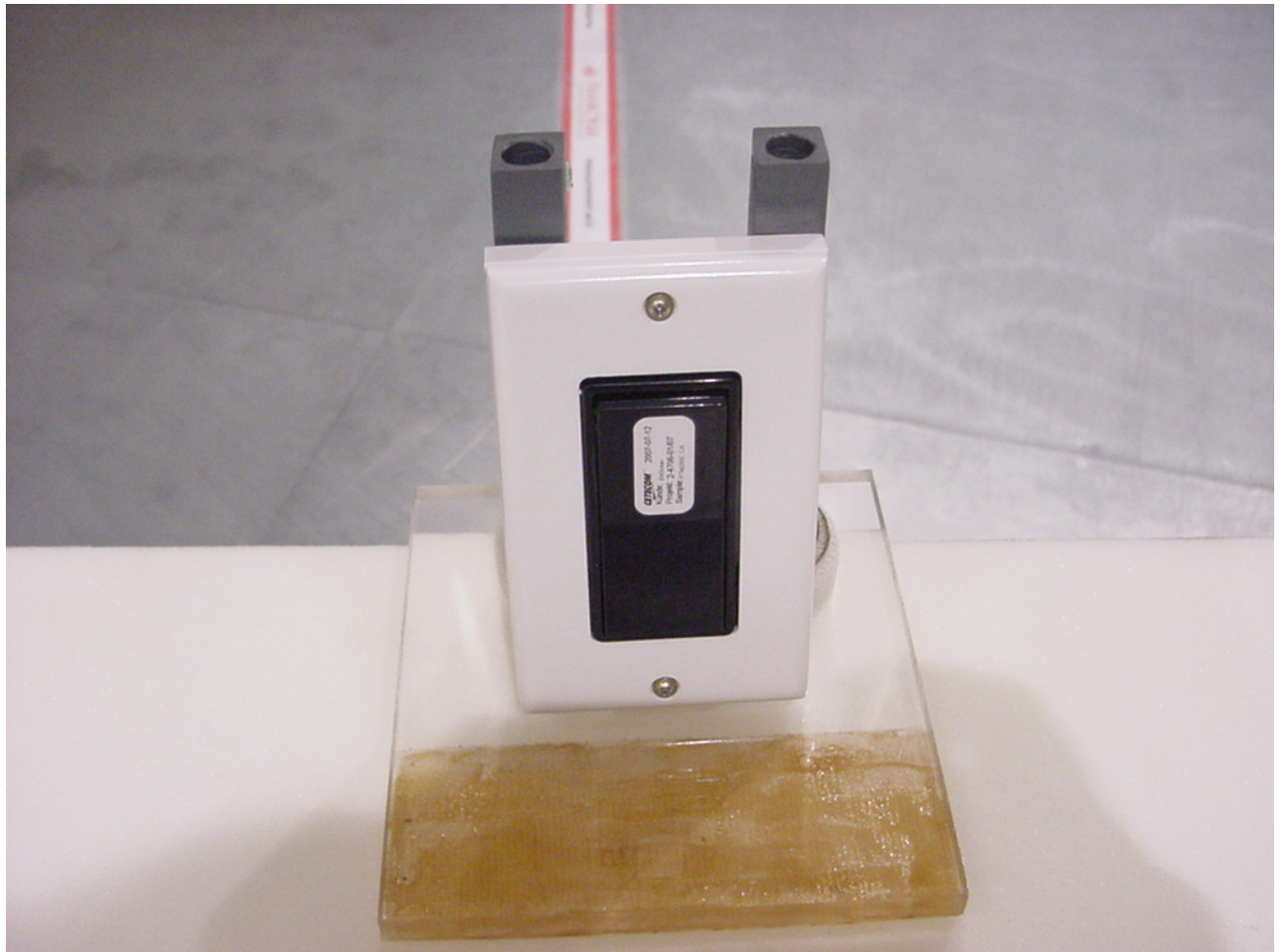


Photo 2 (Radiated Emissions):

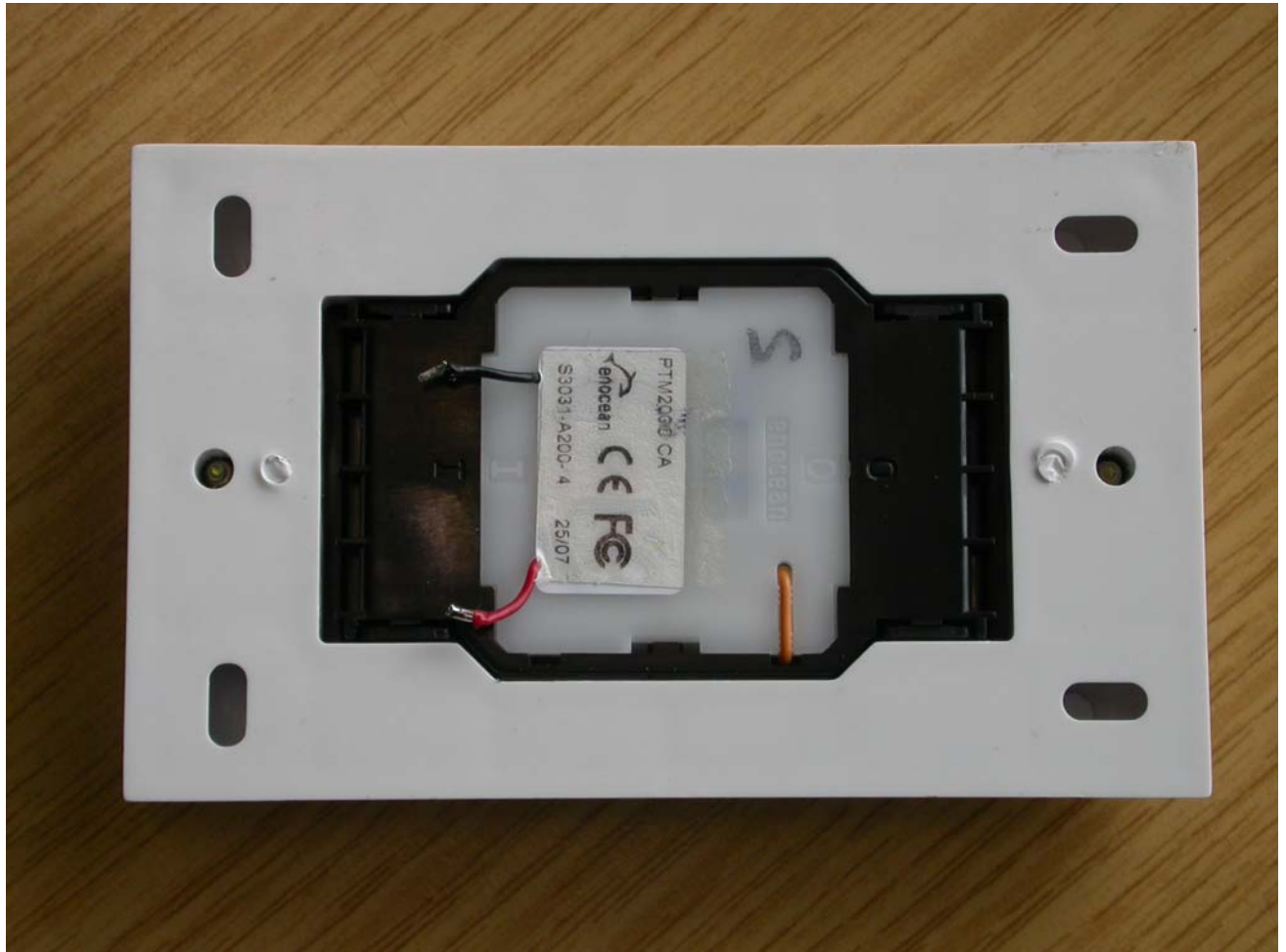


5 Photographs of test sample

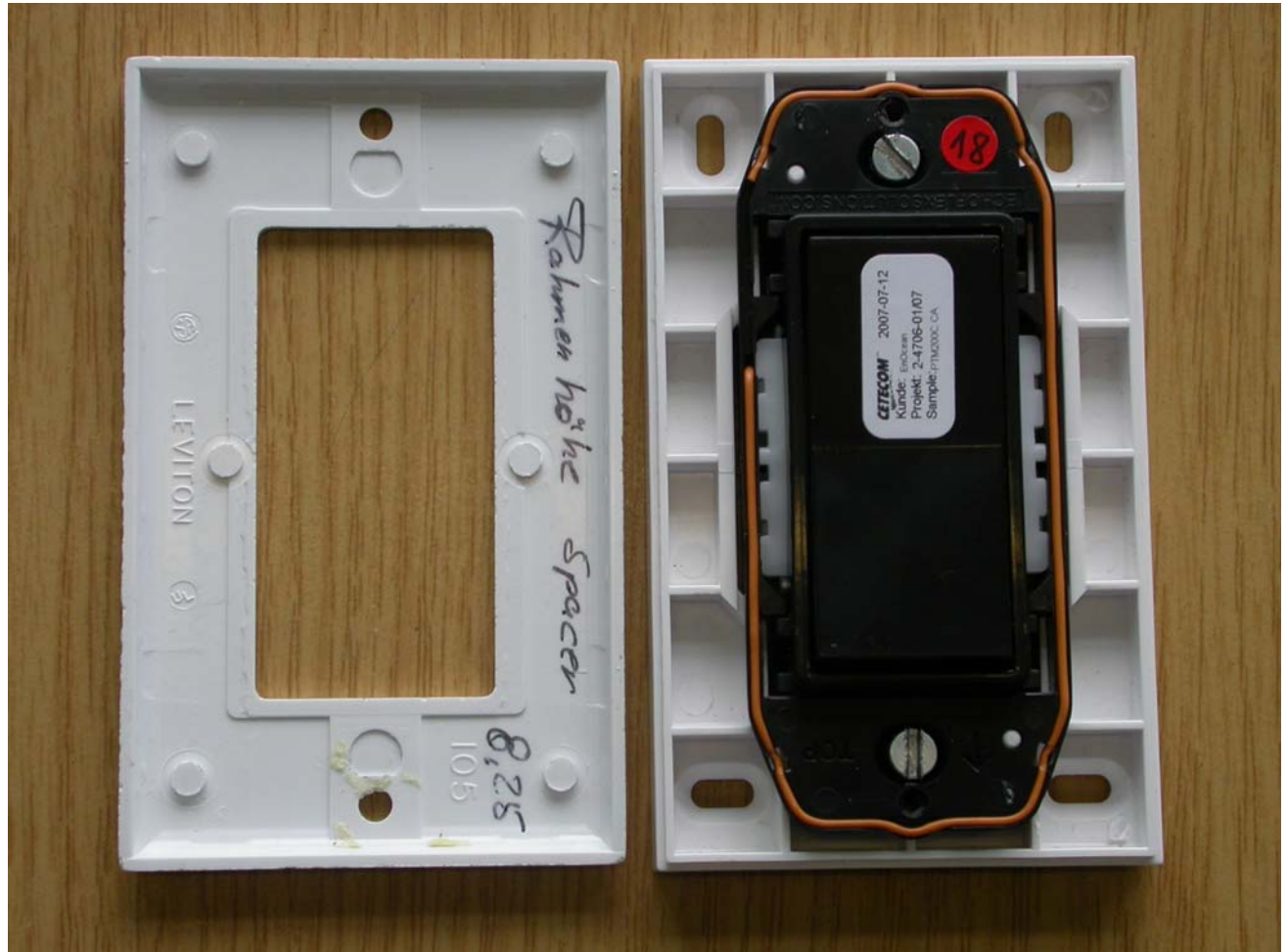
Photograph no.: 1



Photograph no.: 2



Photograph no.: 3



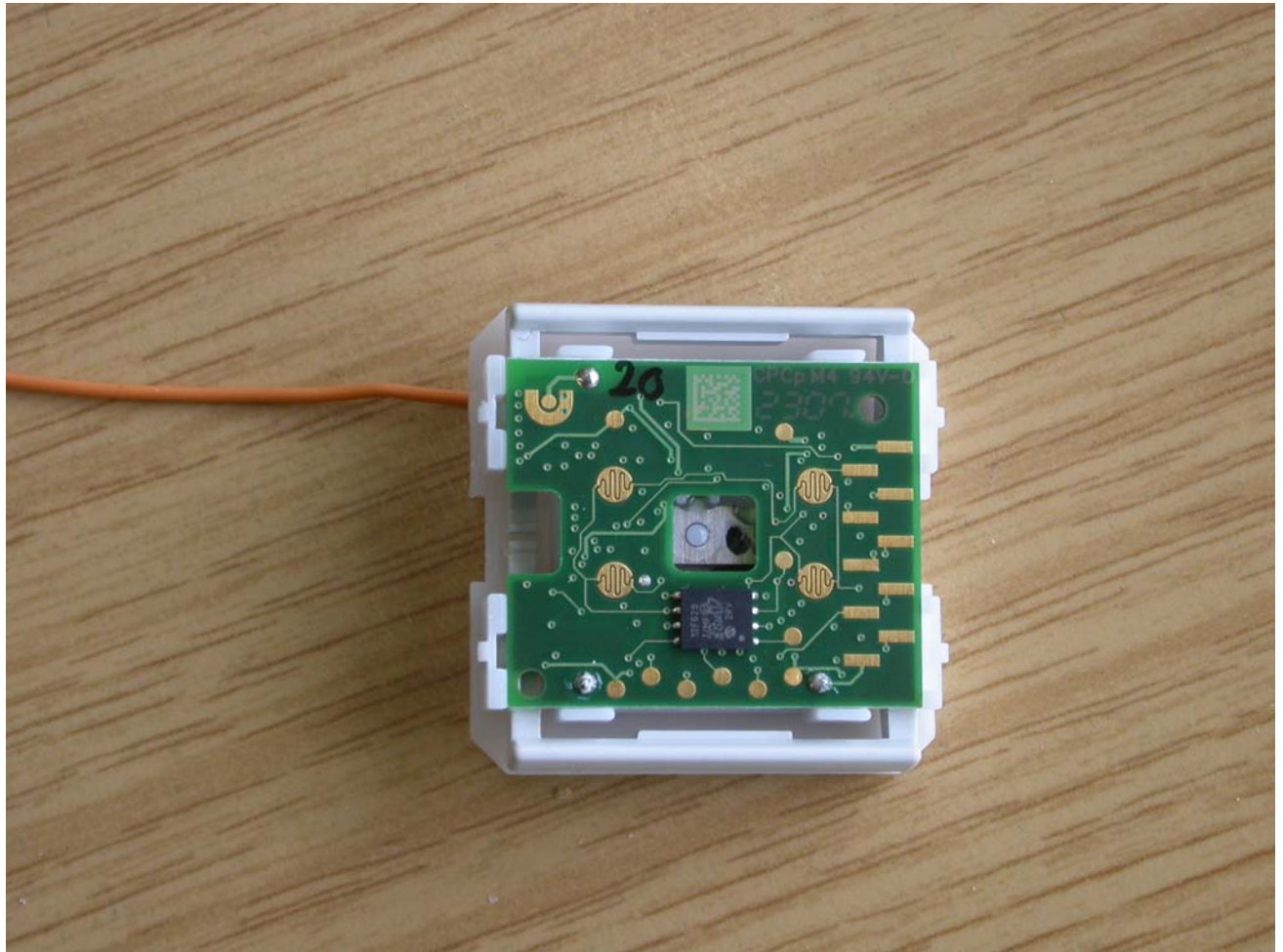
Photograph no.: 4



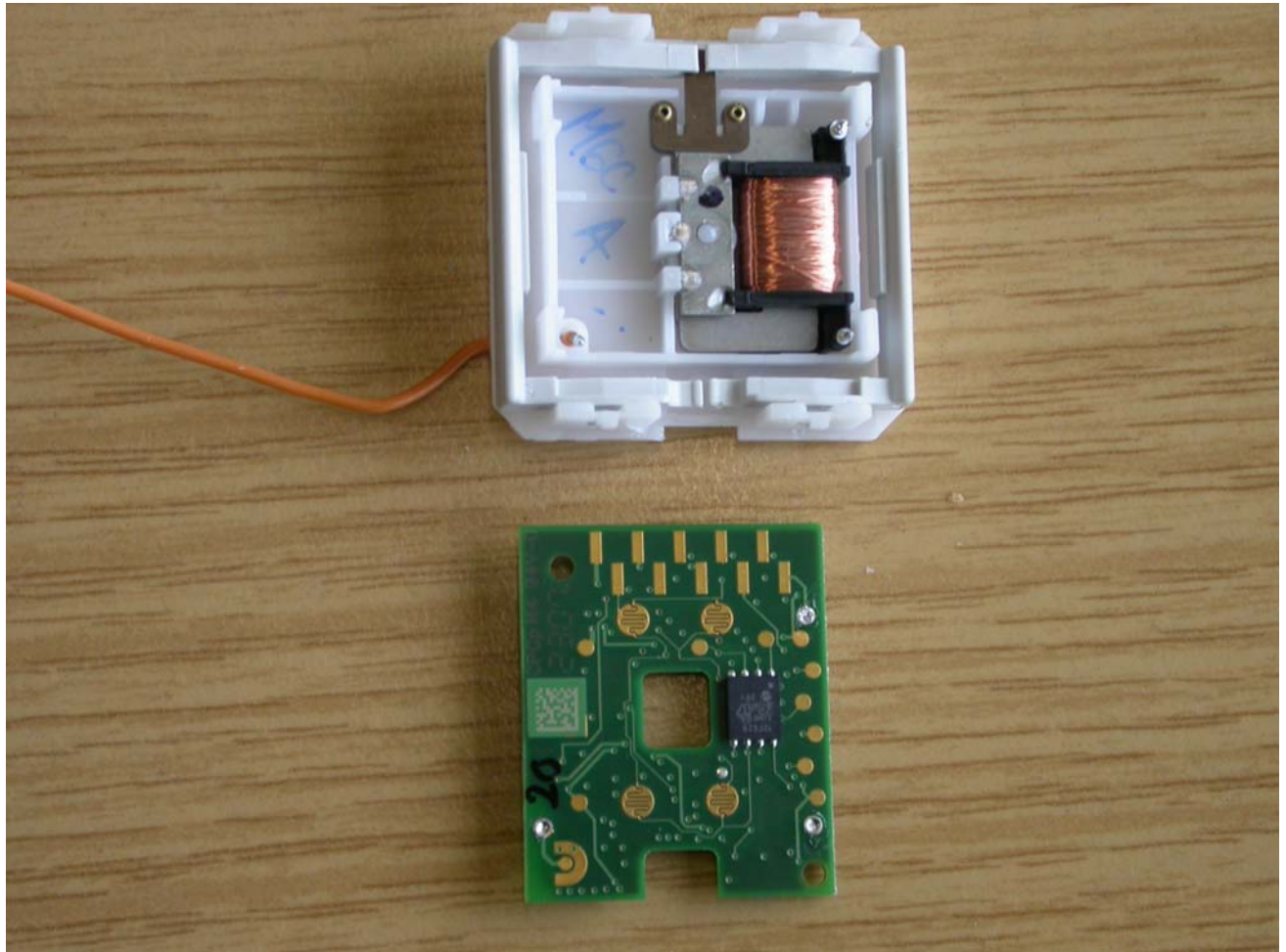
Photograph no.: 5



Photograph no.: 6



Photograph no.: 7



Photograph no.: 8

