

Radio Satellite Communication
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Test report No.: 2-3877-01-02/05

This test report consists of 25 pages

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



Accredited by the
German Accreditation Council
DAR-Registration Number
TTI-P-G 081/94-D0



Independent ETSI
compliance test house



Accredited Bluetooth® Test Facility (BQTF)

Test report No. :2-3877-01-02/05

Standard :FCC Part15

Applicant :Thermokon Sensortechnik

Type :SR04P

FCC-ID :S3N-SRXX

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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:

2005-03-08

RSC - 8414

Ames



Date

Section

Name

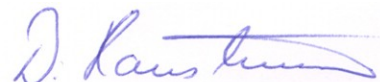
Signature

Technical responsibility for area of testing:

2005-03-08

RSC - 8412

Hausknecht D.



Date

Section

Name

Signature

1.2 Testing laboratory

CETECOM ICT Services GmbH

Untertürkheimer Straße 6 - 10

66117 Saarbrücken

Germany

Telephone : + 49 681 598 - 0

Telefax : + 49 681 598 - 9075

E-mail : info@ict.cetecom.de

Internet : www.cetecom-ict.de

Accredited testing laboratory

The test laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025.

DAR registration number: TTI-P-G-081/94-D0

Listed by: Federal Communications Commission (FCC)

Identification/Registration No: 90462

Anechoic chamber registration no.: 3463 (IC)

[Accredited Bluetooth® Test Facility \(BQTF\)](#)

1.3 Details of applicant

Name : Thermokon Sensortechnik GmbH

Street : Aarstrasse 6

City : D-35756 Mittenaar

Country : Germany

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Mobile :

Contact person:

Name : Mr. Dirk Debus

Telephone: + 49 (0) 2772 6501 120

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Mobile :

E-mail : d.debus@thermokon.de

1.4 Application details

Date of test: 2005-03-08

1.5 Test item

Type of equipment : Wireless temperature sensor
Type designation : SR04P
Manufacturer : - applicant -
Street :
City :
Country :
Serial number : - / -

Additional information :

Frequency : 868.3 MHz
Type of modulation : 200K0A1D
Channel spacing : >25 kHz
Number of channels : 1
Antenna : Soldered wire antenna 8.5 cm
Max. ERP : Peak: 92.6 dB μ V/m ; Average: 57.7 dB μ V/m (at 3m distance)
Power supply : 3.0V – 4.0V DC via solar cell or external battery
FCC-ID : S3N-SRXX
IC No :

1.6 Test specifications:

CANADA RSS-210 (11/2001)
FCC Part15.231

2 Technical test

2.1 Summary of test results

The radiated measurements were performed vertical and horizontal over the complete frequency range. We start at 1 m high with vertical receiving antenna and rotate the dish continuously. During rotation we use the antenna lift system to vary the high from 1 to 4 m. So we find maximum radiation output. At this points we do manual re-measurements. After this we do the same measurements in horizontal position of the receiving antenna. This (horizontal and vertical) is made for all the three planes of the test sample. We use the maximum received results.

The detector function and selection of bandwidth are according ANSI C63.2-1996 item 8.2.1 and ANSI C63.4-2003 Item 4.2.

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

150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, 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 MHz, wave-guide horn

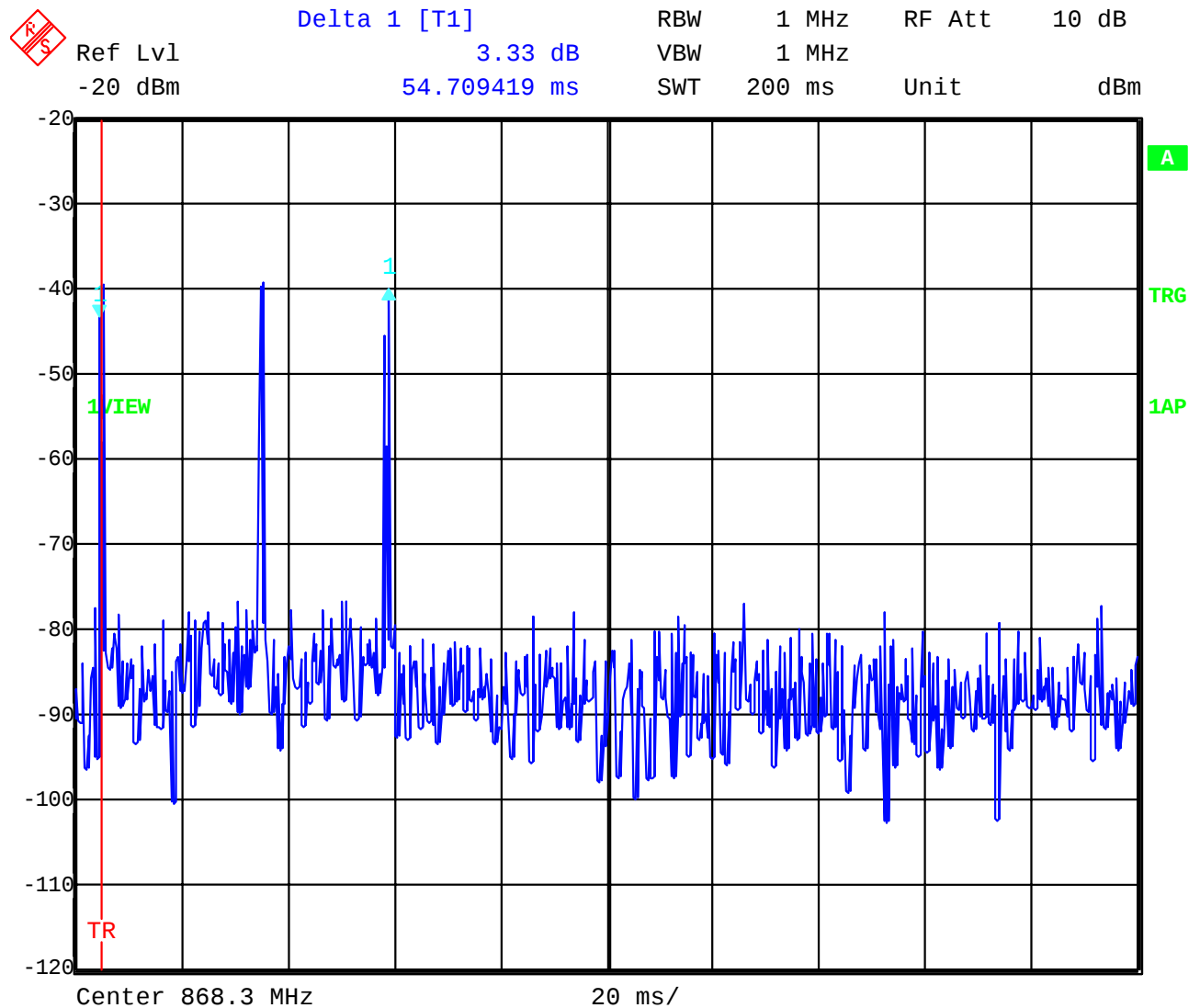
The product fulfills the also the requirements for CANADA RSS-210

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

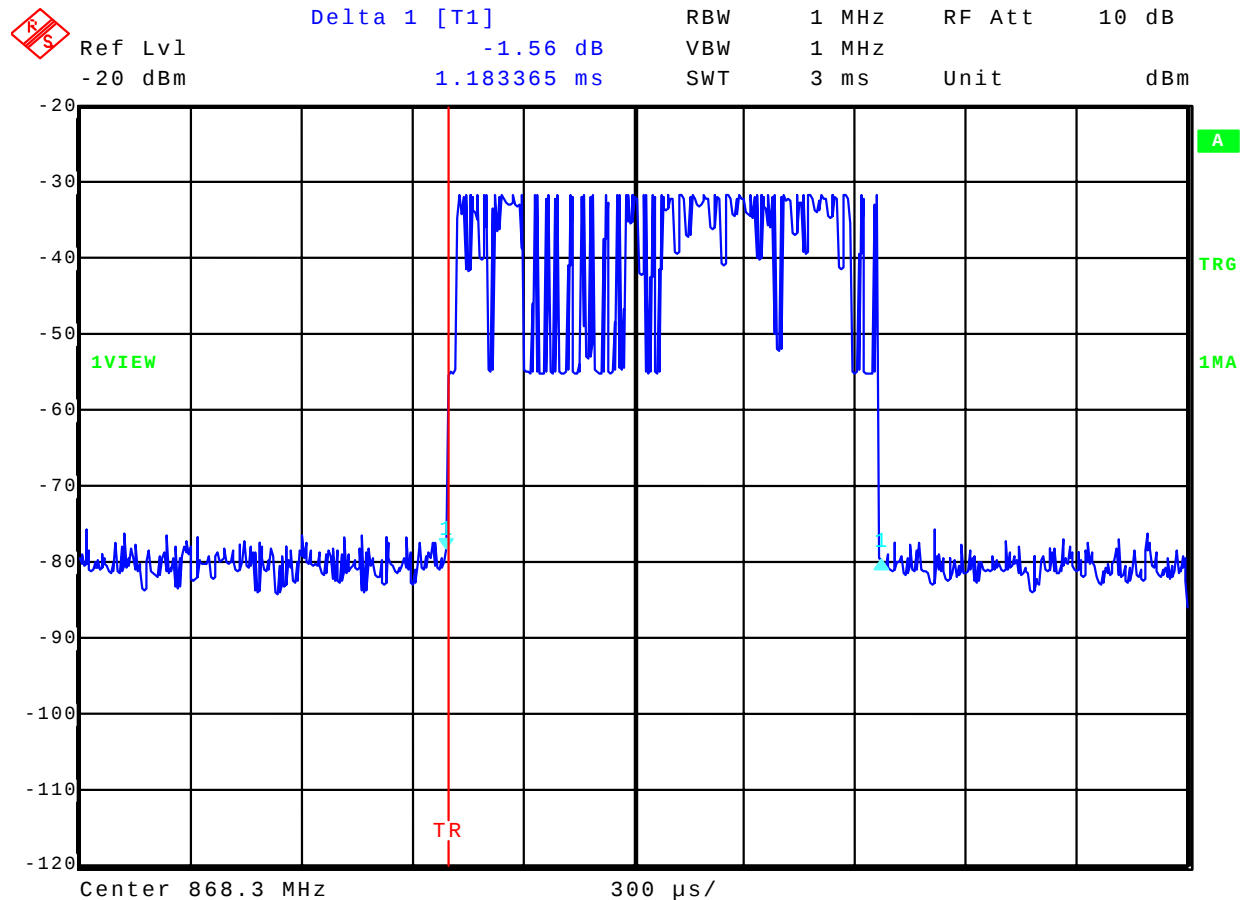
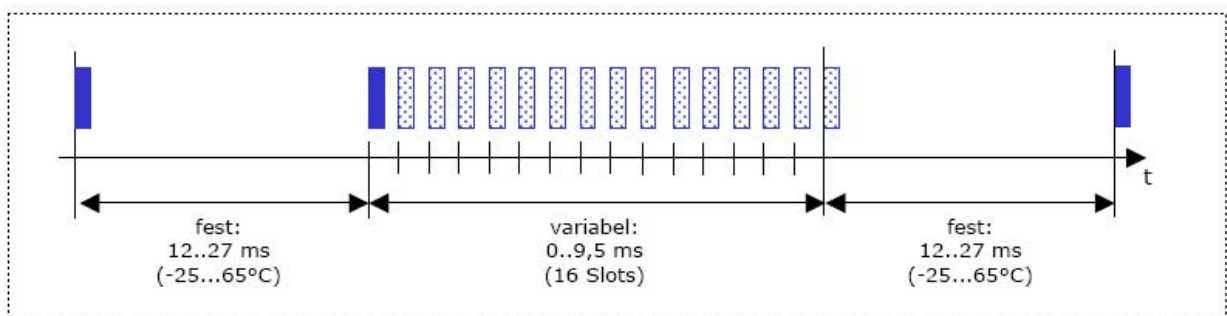
2.2 Test results

2.2.1 Timing behavior 15.231(a1)

The transmitter stops after having transmitted 3 packets within max. 63.3 ms



Pulse Train



Duty Cycle:

One pulse train is transmitted within min. 24 ms, max 63.3 ms, cyclic transmission of pulse train every 1.6 minutes.

The length of one packet is 1.2 ms. Within a packet the duty cycle is ~50%, ~ 0.6 ms.

One pulse train consists of 3 packets within 100 ms.

Added we have a TX-time 3×0.6 ms within 100ms, this is a duty cycle of 1.8%.

The average value is $(\text{Peak} - 20 \times \log(1.8/100)) = \text{Peak} - 34.9$ dB.

Radiated field strength is 92.6 dB μ V/m at 3m distance PEAK.

The calculated AVERAGE is $92.6 \text{ dB}\mu\text{V/m} - 34.9 \text{ dB} = 57.7 \text{ dB}\mu\text{V/m}$ at 3m distance.

The limit for 868.3 MHz according to FCC15.231(e) is 74 dB μ V/m.

The product complies with the FCC and IC requirements.

2.2.2 Field Strength 15.231(e)

(RADIATED)

TEST CONDITIONS		MAXIMUM AVERAGE FIELD STRENGTH (µV/m)
Frequency 868.3 MHz		
T _{nom} (23)°C	V _{nom} (3.0)V	42700 µV/m PEAK (92.6 dBµV/m) 767.4 µV/m AVERAGE (57.7 dBµV/m)
Maximum deviation from output power under extreme test conditions (dBc)		not applicable
Measurement uncertainty		±3dB

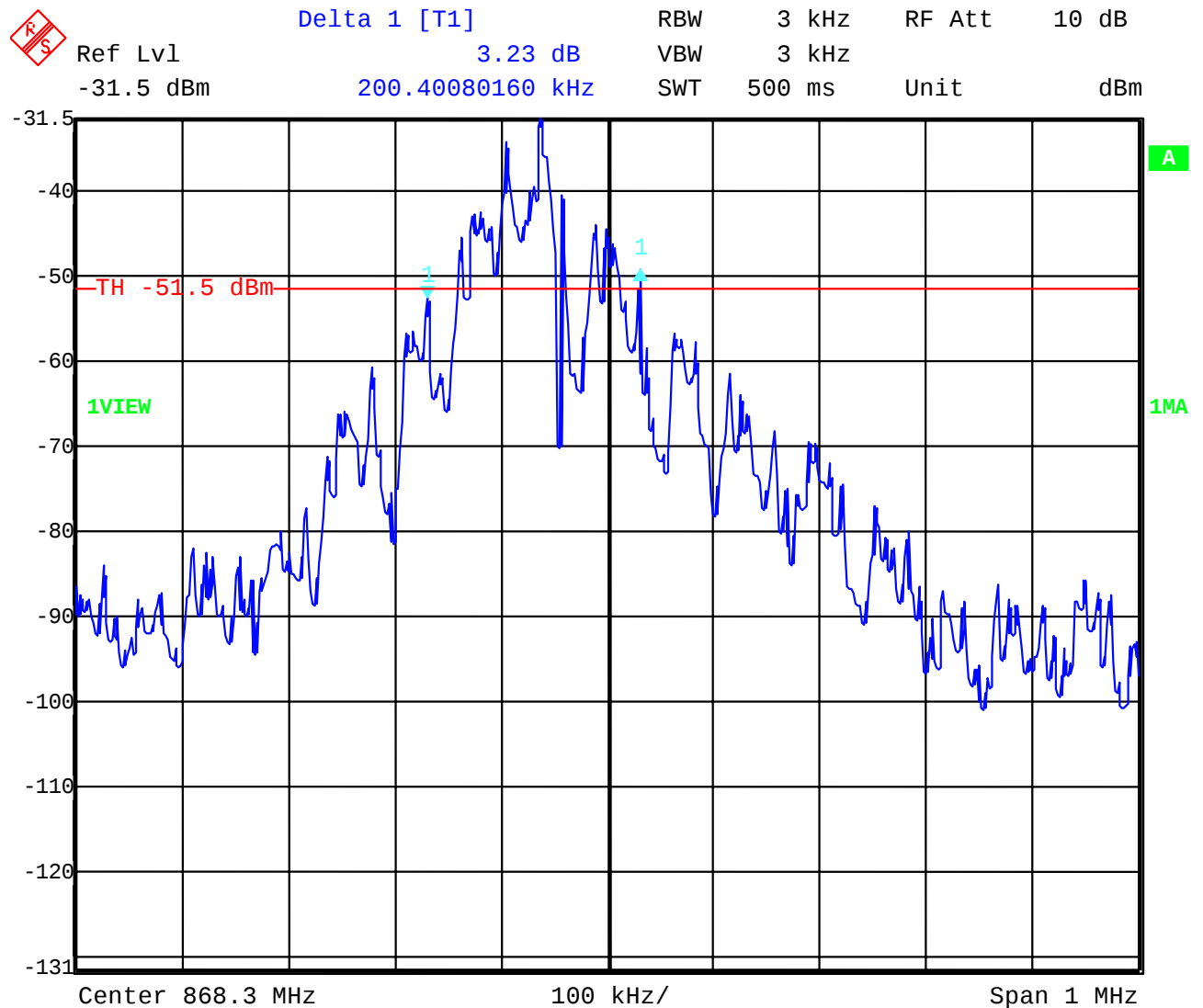
RBW/VBW : 1 MHz

Limit for 868.3 MHz : 5000 µV/m (74.0 dBµV/m)

15.231(e) Field Strengths and Frequency Bands

EMISSION LIMITATIONS					
f (MHz)	amplitude of emission (dB μ V/m) Peak	amplitude of emission (dB μ V/m) Average	limit max. allowed emission power	Actual attenuation below frequency of operation (dB)	results
868.3	92.6 Peak	57.7 AV	74.0 dB μ V/m Average		Operating frequency
1 736.6	75.0 Peak	40.1 AV	20 dBc/54.0 dB μ V/m	17.6	complies
2 604.9	53.2 Peak	18.3 AV	20 dBc/54.0 dB μ V/m	39.4	complies
Measurement uncertainty			$\pm 3\text{dB}$		

2.2.3 Bandwidth of Emissions 15.231(c)



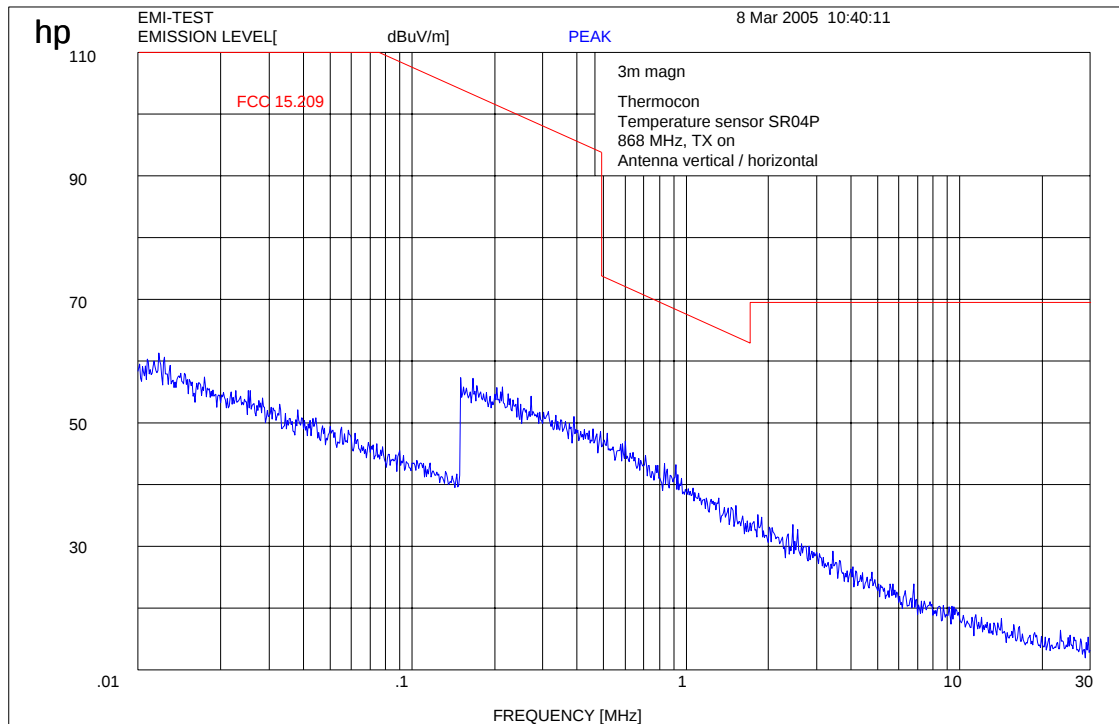
The occupied bandwidth (20 dB / 99%) is 200.4 kHz .

Limit

< 0.25% of the centre frequency, here 2.17 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))

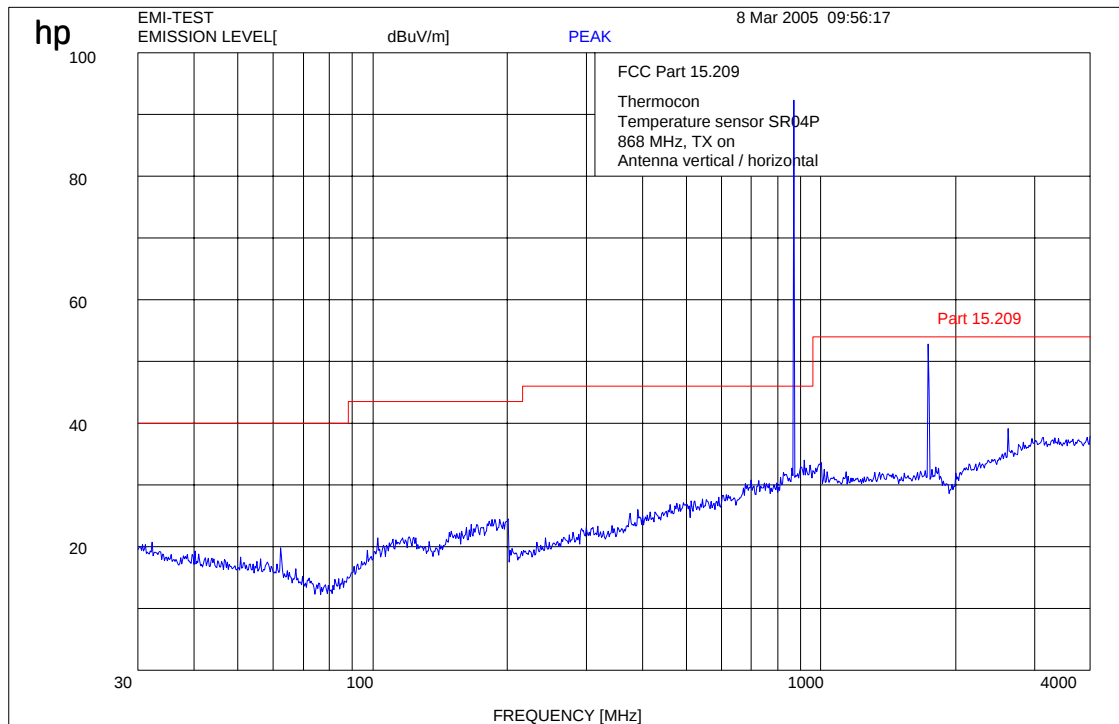
Measurement distance 3m

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

Limits: (general requirements, part 15.209)

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

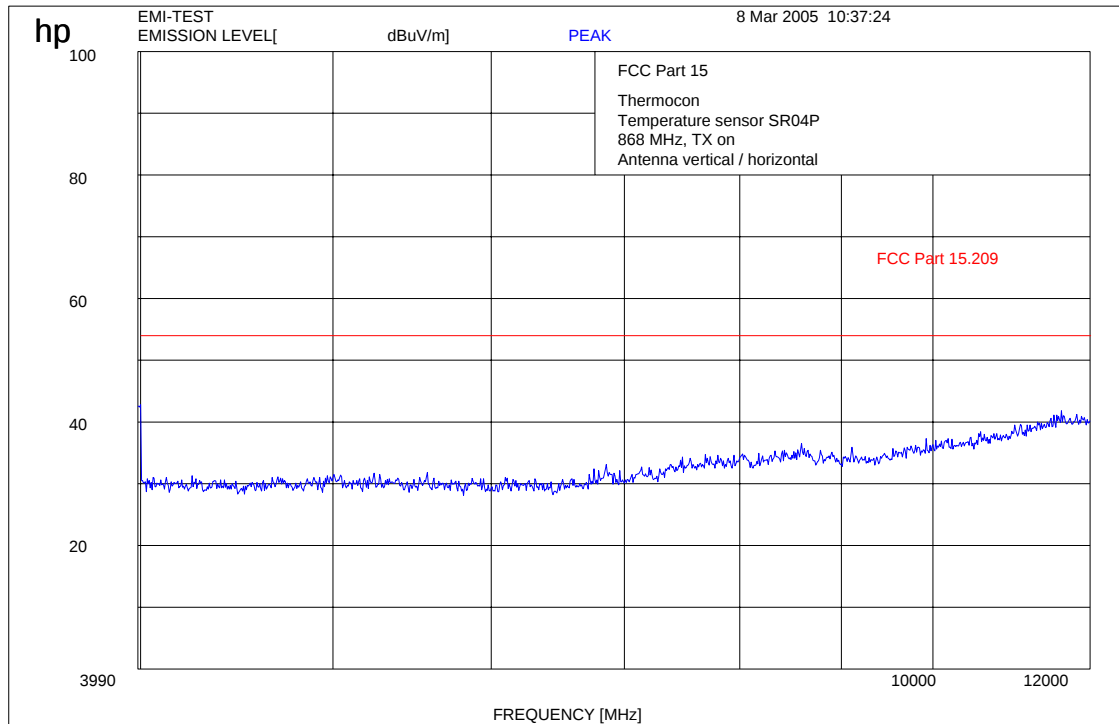
30 MHz to 4 GHz



Limits

Fundamental Frequency (MHz)	Field strength (µV/m)	Field strength of Spurious emissions (µV/m)
40.66-407	1000	100
70-130	500	50
130-174	500 to 1500 **	50 to 150 **
174-260	1500	150
260-470	1500 to 5000 **	150 to 500 **
Above 470	5000	500
** linear interpolations		

4 GHz to 12 GHz



Limits

Frequency (MHz)	Field strength (µV/m)	Field strength of Spurious emissions (µV/m)
40.66-407	1000	100
70-130	500	50
130-174	500 to 1500 **	50 to 150 **
174-260	1500	150
260-470	1500 to 5000 **	150 to 500 **
Above 470	5000	500
** linear interpolations		

3 Test equipment and ancillaries used for tests

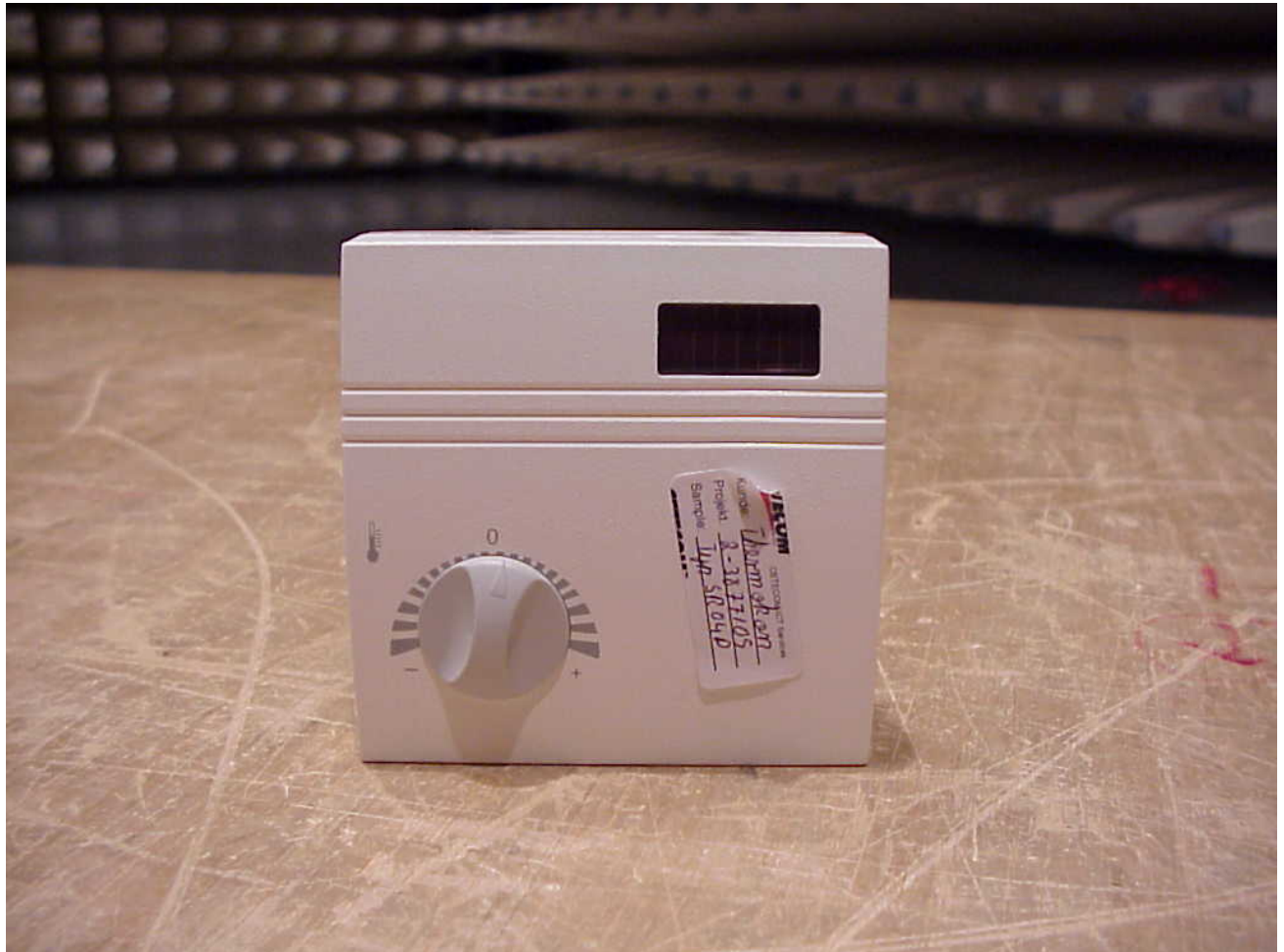
To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

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

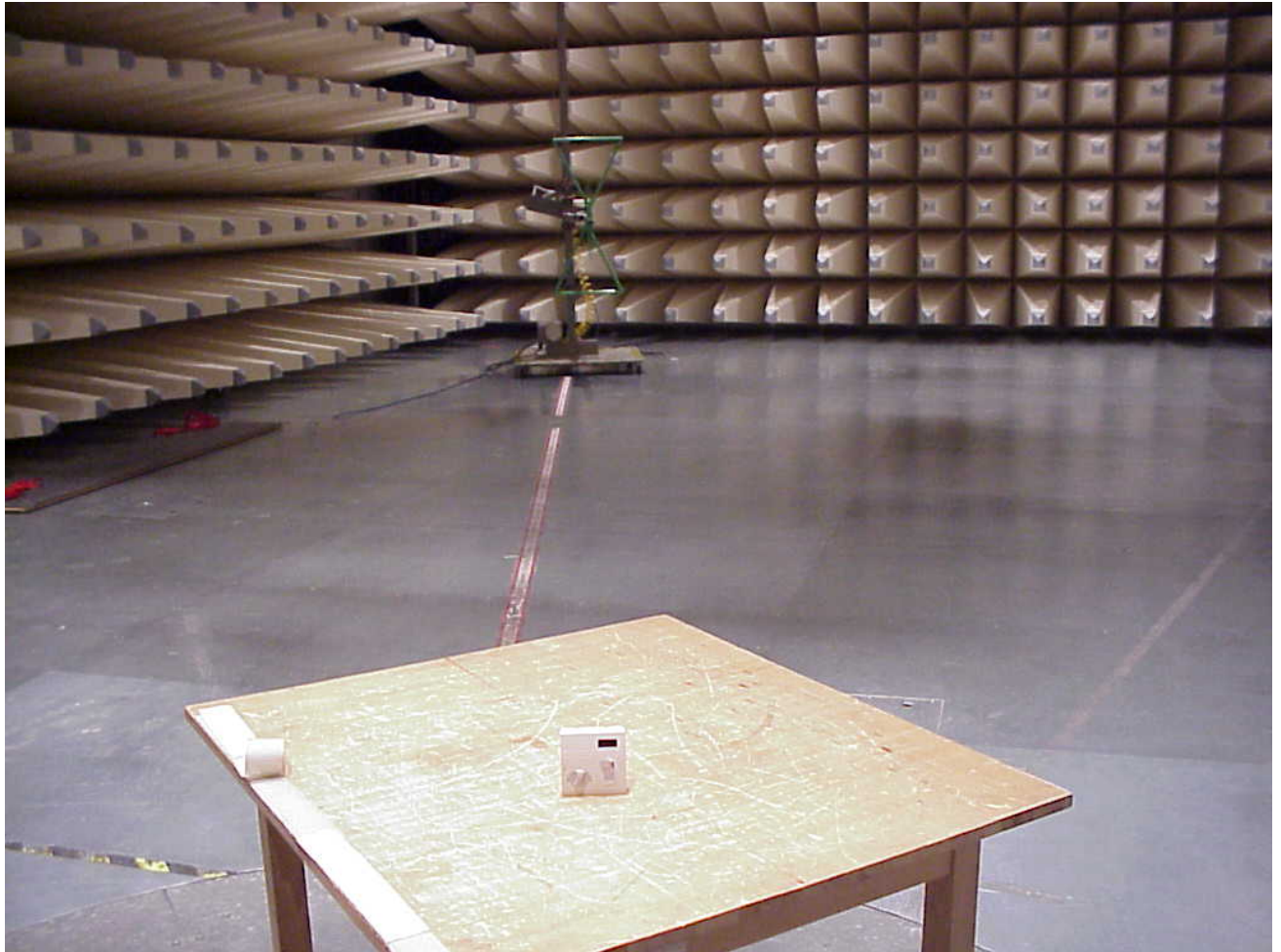
No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Control Computer	HD 100	Deisel	100/322/93
37	Relay Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relay Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
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				
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68				

4 Photographs of test site

Photograph no.: 1

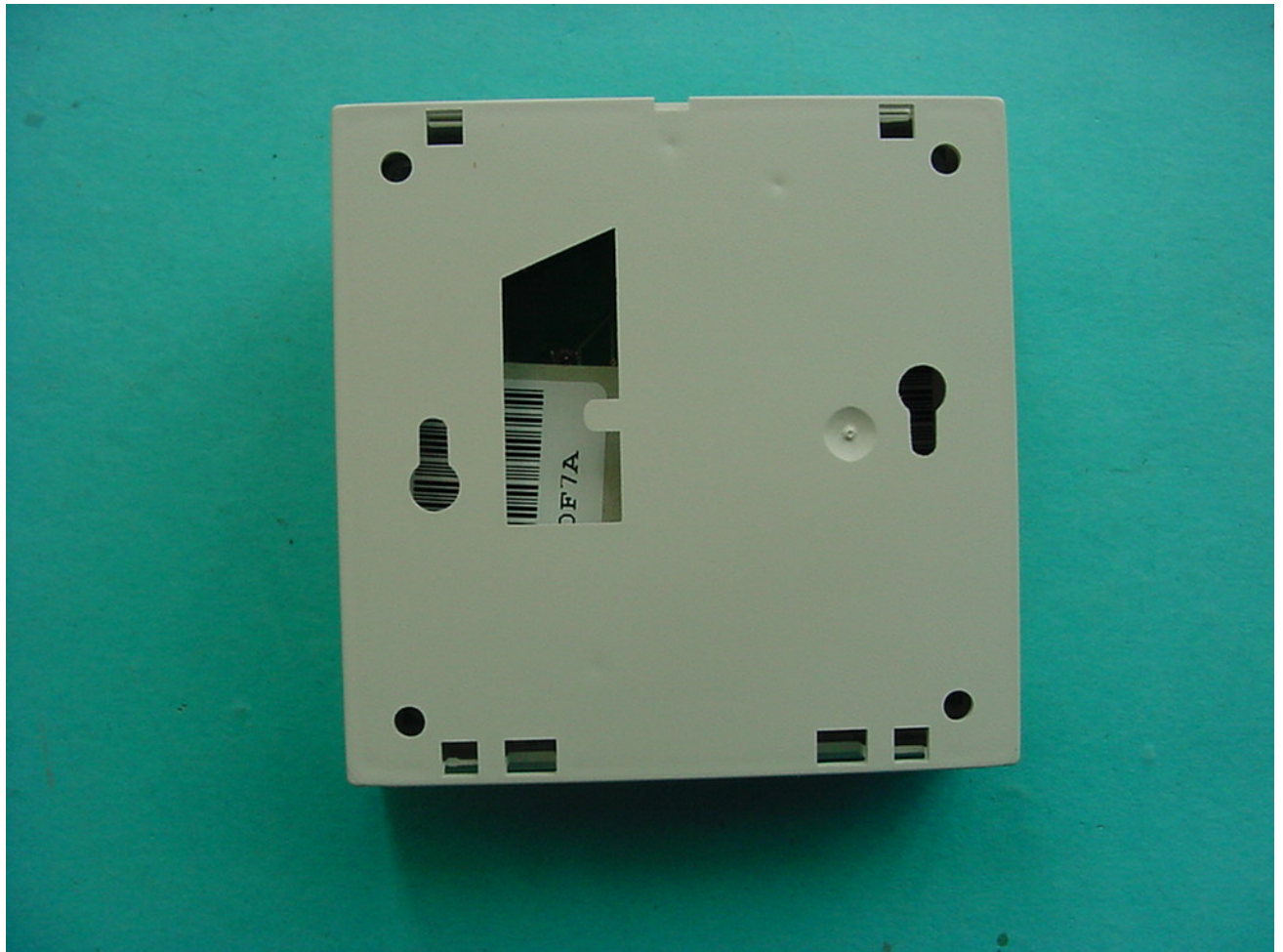


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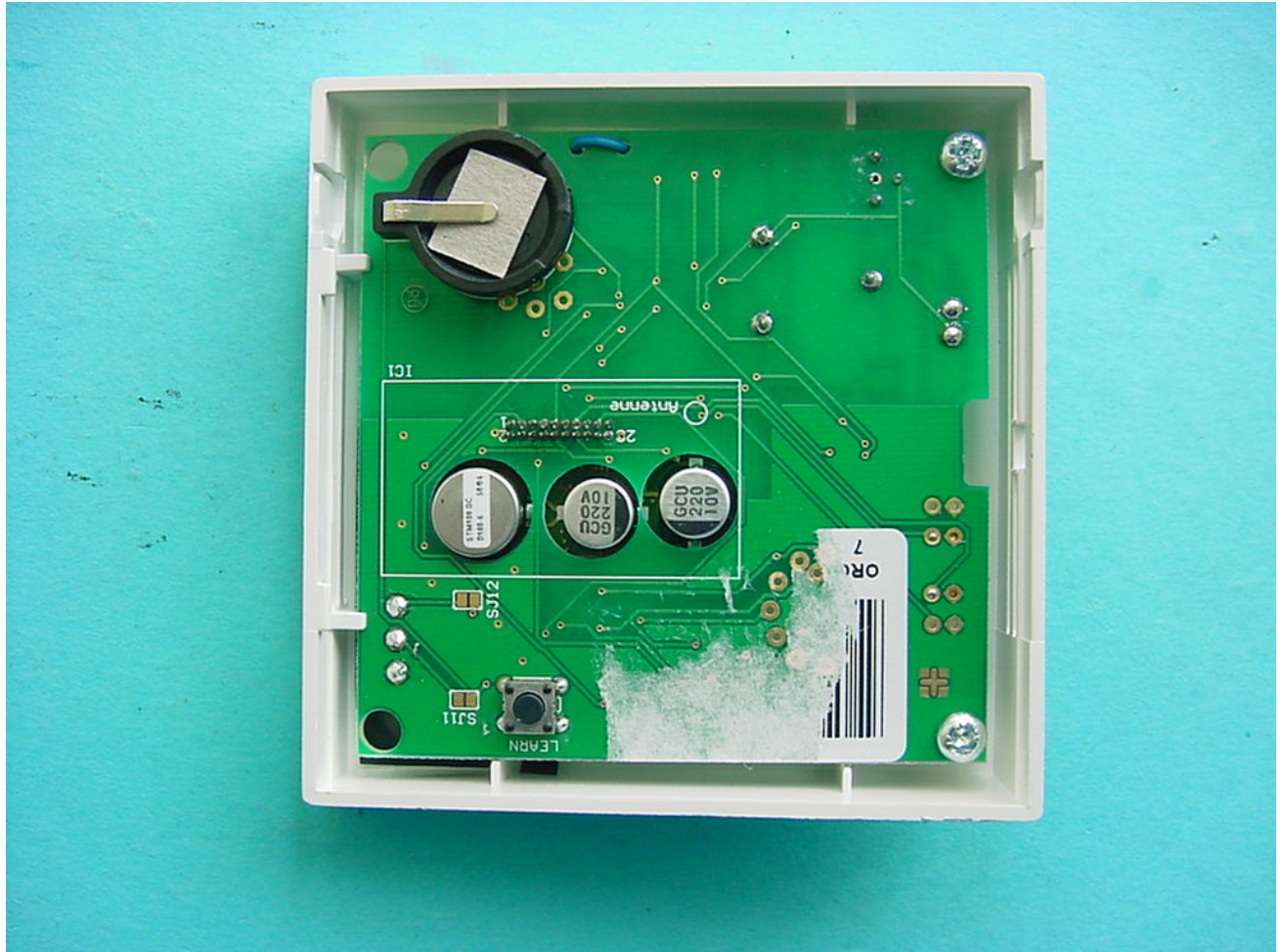


5 Photographs of test sample

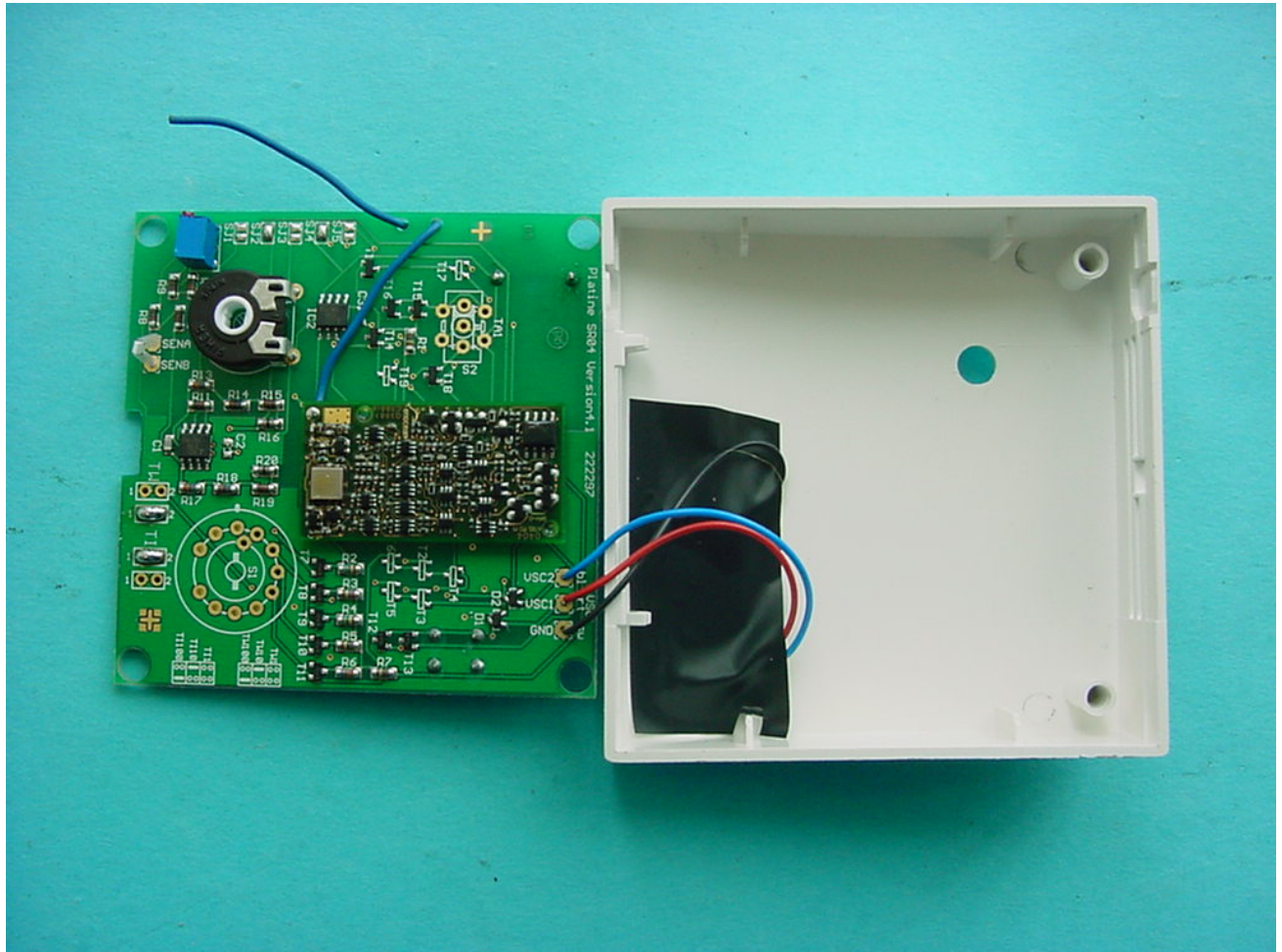
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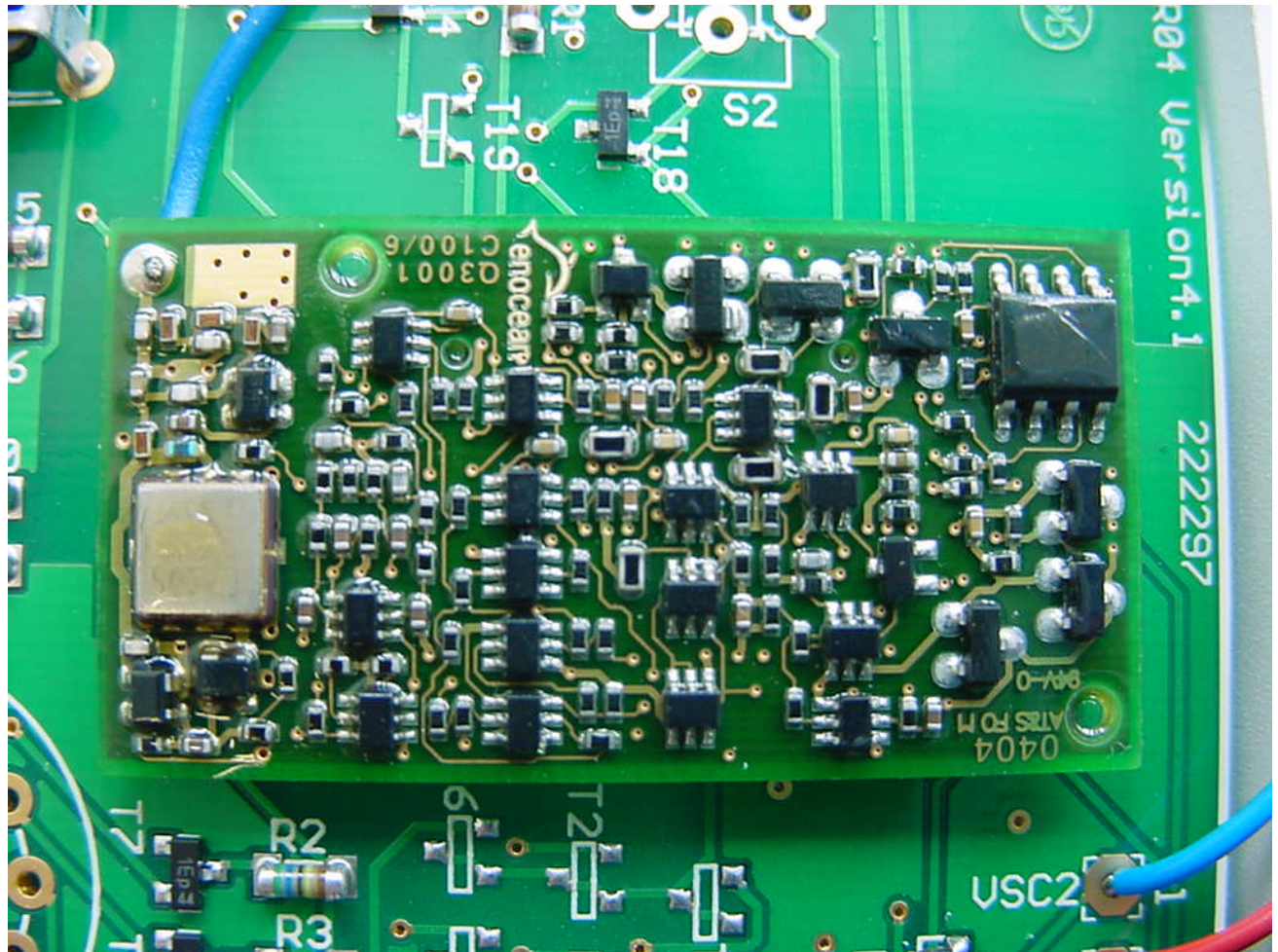
Photograph no.: 2



Photograph no.: 3



Photograph no.: 4



Photograph no.: 5

