

Radio Satellite Communication
Untertürkheimer Straße 6–10, D-66117 Saarbrücken,
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Test report No.: 2_3102-01-01/02

This test report consists of 37 pages

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Recognized by the
Federal Communications Commission
FCC–Identification Number: 90462
TCB ID: DE 001



Accredited by the
German Accreditation Council
DAR–Registration Number

TTI–P–G 166/98



Independent ETSI
compliance test house



Accredited Bluetooth™ Test Facility (BQTF)

Test report No. : 2_3102-01-01/02
Applicant : HBC-radiomatic GmbH.
Type : cubix
FCC–ID No : NO9C100007

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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:

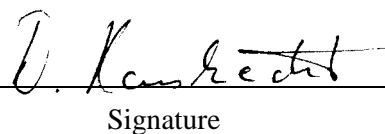
2003-02-13	RSC - 8411	Berg M.
Date	Section	Name



Signature

Technical responsibility for area of testing:

2003-02-13	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 : Michael.Berg@ict.cetecom.de

Internet : www.cetecom-ict.de

Accredited testing laboratory

Accredited by : Regulierungsbehörde für Telekommunikation und Post (RegTP)

Listed by : Federal Communications Commission (FCC)

Authority	Identification/Registration No.
RegTP	TTI-P-G 166/98-30
FCC	90462

1.3 Details of applicant

Name : HBC-radiomatic GmbH.

Street : Haller Str. 49 - 53

City : D-74564 Crailsheim

Country : Germany

Telephone: +49 (0) 7951 393-725

Telex : +49 (0) 7951 393-723

E-mail : Dhahn@radiomatic.com

Contact person:

Name : Mr. D. Hahn

Telephone : +49 (0) 7951 393-725

Telex : +49 (0) 7951 393-723

E-mail : Dhahn@radiomatic.com

1.4 Application details

Date of receipt of test item : 2002-12-19

Date of test : 2003-01-14

Person(s) who have been present during the test : Mr. Hahn ; Mr. Schulze

1.5 Test item

Type of equipment : Remote control for cranes
Type designation : cubix (with RF module TC690(transceiver))
Manufacturer : Same as applicant
Street :
City :
Country :
Serial number : - / -

Additional information :

Frequency : 902.125 to 927.875 MHz
Type of modulation : 115KF1D (2x FM-Deviation + BIT-Rate: 2x 50 kHz +15kBit)
Channel spacing : 250 kHz
Number of channels : 103
Antenna : Integral antenna
ERP : 92.9 dB μ /m or 44.157 mV/m
Power supply : 3.6V NiMH rechargeable battery
Temperature range : -20°C - +55°C
FCC ID : NO9C100007

1.6 Test specifications: **FCC Part 15 §15.209 / 15.107 / 15.109**
FCC Part 15 §15.249
CANADA RSS-210

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 are conform with specifications ANSI C63.2-1987 clause 15 and ANSI C63.4-1992 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 analyzers where the detector modes and resolution bandwidths over various frequency ranges are set according to requirement ANSI C63-4-1992 clause 4.2.

Antennas are 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 15.35, 15.107, 15.109, 15.209, 15.245 .

The product fulfills also the requirements for CANADA RSS-210

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

FINAL VERDICT : PASS

2.2 Test report

TEST REPORT

Test report no. : 2_3102-01-01/02

TEST REPORT REFERENCE

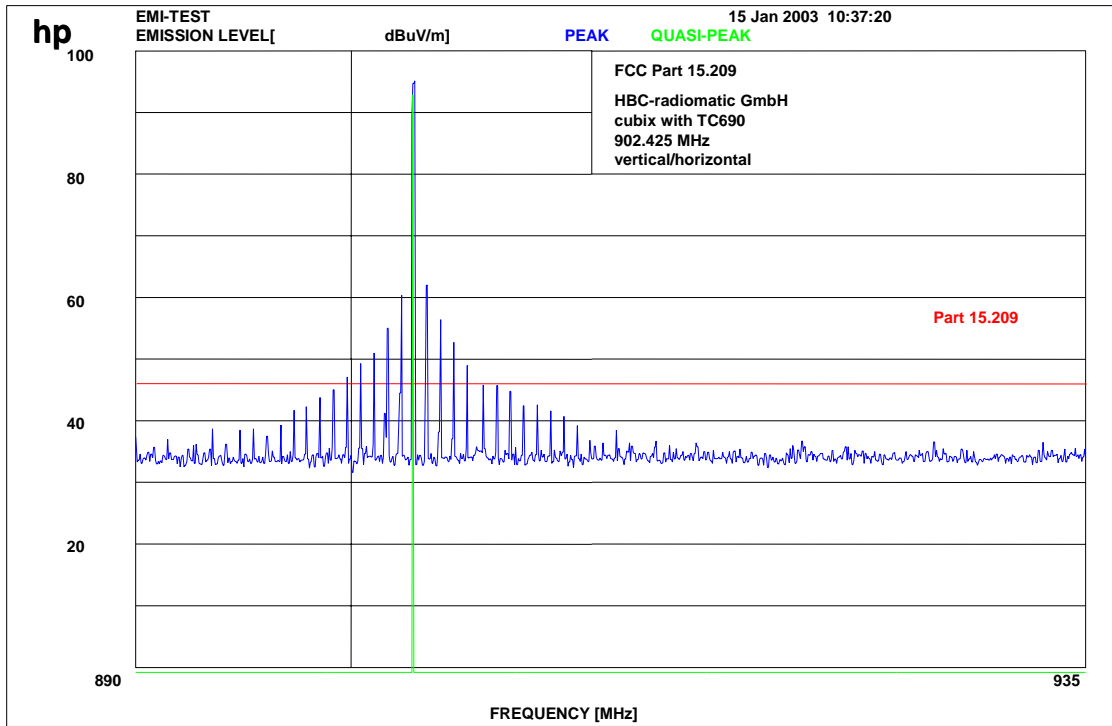
LIST OF MEASUREMENTS

PARAMETER TO BE MEASURED	PAGE
Field Strength of Fundamental (radiated) § 15.249 (a)	9
SPURIOUS EMISSION (radiated) § 15.249 (a)	12
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Field Strength of Fundamental (radiated)

§ 15.249 (a)

902.425 MHz



ERP : 92.9 dBu/m QP / 44.157mV/m

Limits

SUBCLAUSE § 15.249 (a)

Fundamental Frequency (MHz)	Field strength of Fundamental (mV/m)	Field strength of Harmonics (µV/m)
902 – 928	50	500
2400 – 2483.5	50	500
5725 – 5875	50	500
24.0 GHz – 24.25 GHz	250	2500

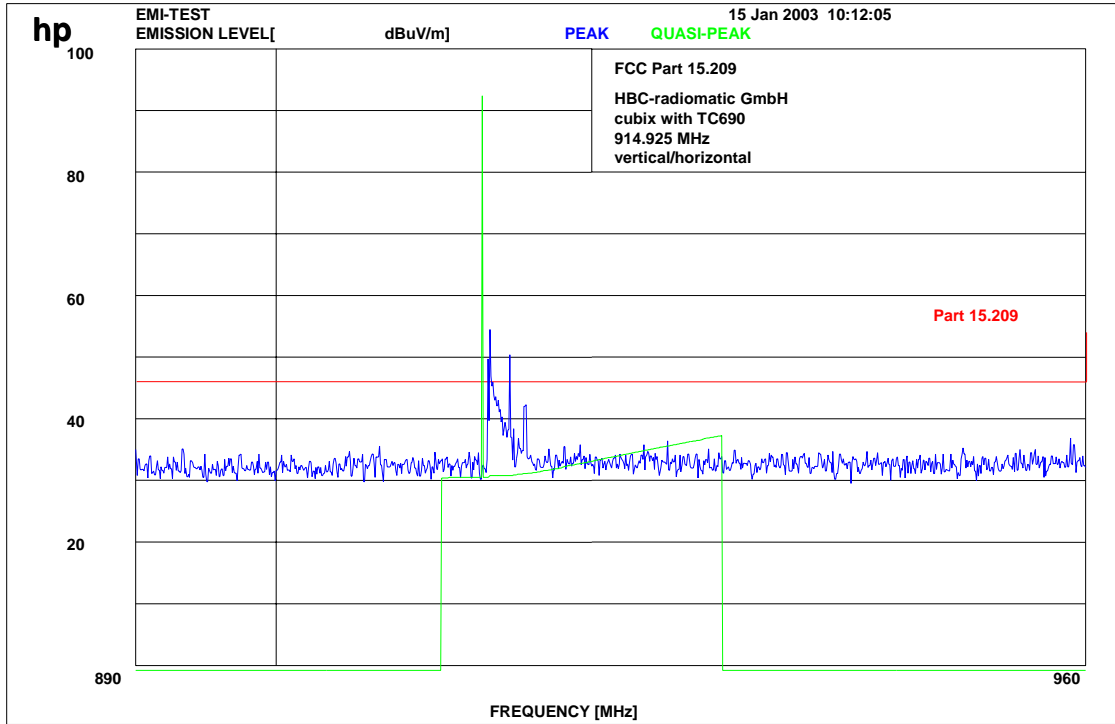
Measurement distance 3m

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Field Strength of Fundamental (radiated)

§ 15.249 (a)

914.925 MHz



ERP : 92.4 dBuV/m / 41.687 mV/m

Limits

SUBCLAUSE § 15.249 (a)

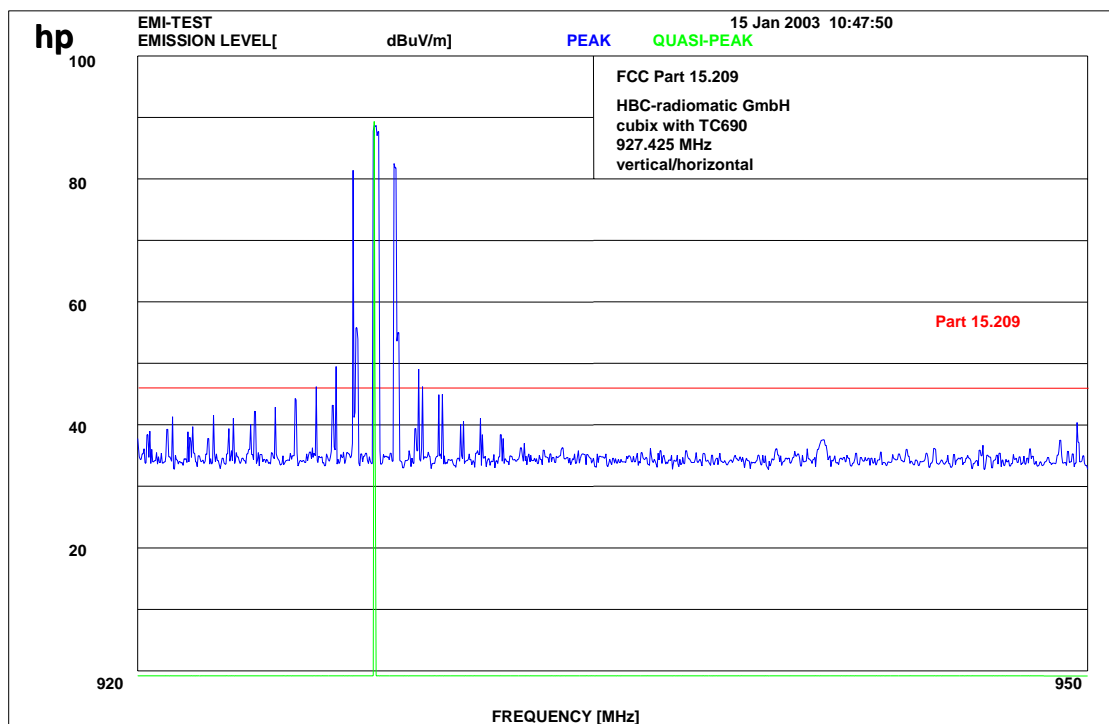
Fundamental Frequency (MHz)	Field strength of Fundamental (mV/m)	Field strength of Harmonics (µV/m)
902 – 928	50	500
2400 – 2483.5	50	500
5725 – 5875	50	500
24.0 GHz – 24.25 GHz	250	2500

Measurement distance 3m

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Field Strength of Fundamental (radiated)
927.425 MHz

§ 15.249 (a)



ERP : 89.7 dB μ V/m / 30.550 mV/m

Limits

SUBCLAUSE § 15.249 (a)

Fundamental Frequency (MHz)	Field strength of Fundamental (mV/m)	Field strength of Harmonics (μ V/m)
902 – 928	50	500
2400 – 2483.5	50	500
5725 – 5875	50	500
24.0 GHz – 24.25 GHz	250	2500

Measurement distance 3m

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

SPURIOUS EMISSION (radiated)

§ 15.249 (a)

All measurements were done in horizontal and vertical polarization, the plots shows the worst case. As can be seen from this data, the emissions from the test item were within the specification limit.

EMISSION LIMITATIONS					
f (MHz)	Detector	amplitude of emission (dBµV/m)	limit max. allowed emmission power (dBµV/m)	Margin (dB)	results
902.475 MHz					
902.475	QP	92.9	94		carrier
1804.95	AV	46.5	54	7.5	complies
914.925 MHz					
914.925	QP	92.4	94		carrier
1829.85	AV	40.9	54	13.1	complies
927.425 MHz					
927.425	QP	89.7	94		carrier
1854.85	AV	33.2	54	20.8	complies
Measurement uncertainty		± 1.9dB			

Limits

SUBCLAUSE § 15.249 (a)

Fundamental Frequency (MHz)	Field strength of Fundamental (mV/m)	Field strength of Harmonics (µV/m)
902 – 928	50 (94 dBµV/m)	500 (54 dBµV/m)
2400 – 2483.5	50 (94 dBµV/m)	500 (54 dBµV/m)
5725 – 5875	50 (94 dBµV/m)	500 (54 dBµV/m)
24.0 GHz – 24.25 GHz	250 (108 dBµV/m)	2500 (68 dBµV/m)

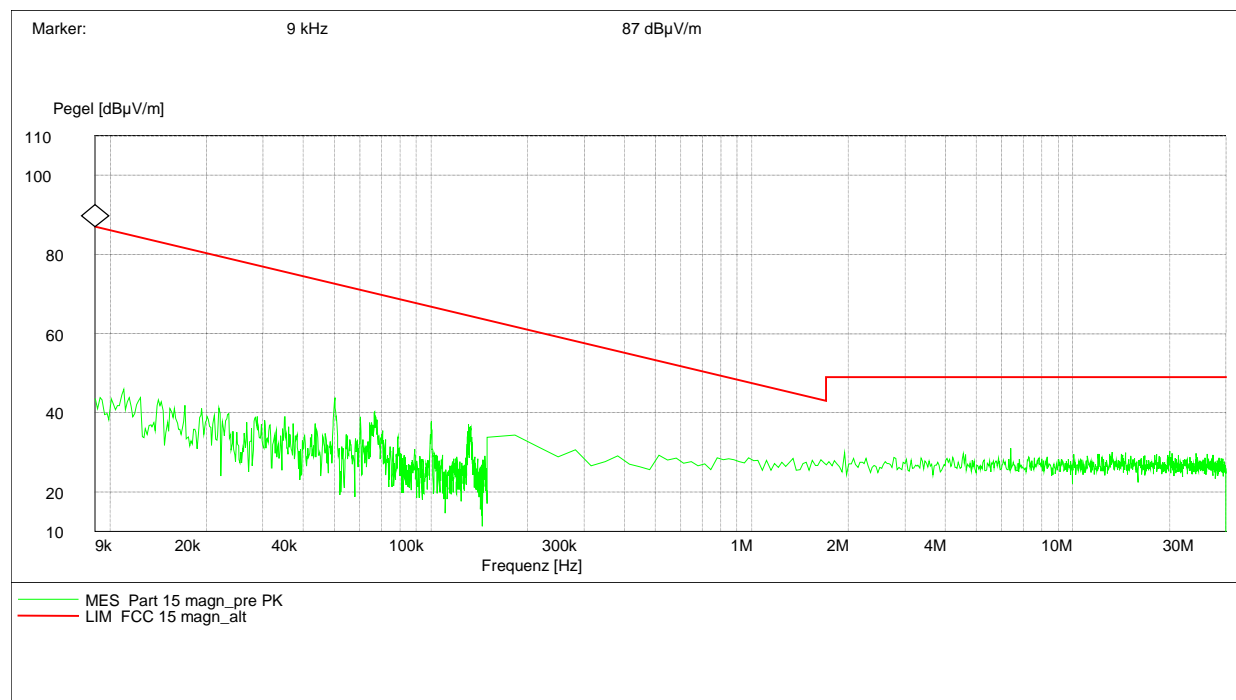
Measurement distance 3m

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

SPURIOUS EMISSION (radiated) < 30 MHz

§ 15.249

This plot is valid for all 3 Channels Rx , Tx mode and charging mode

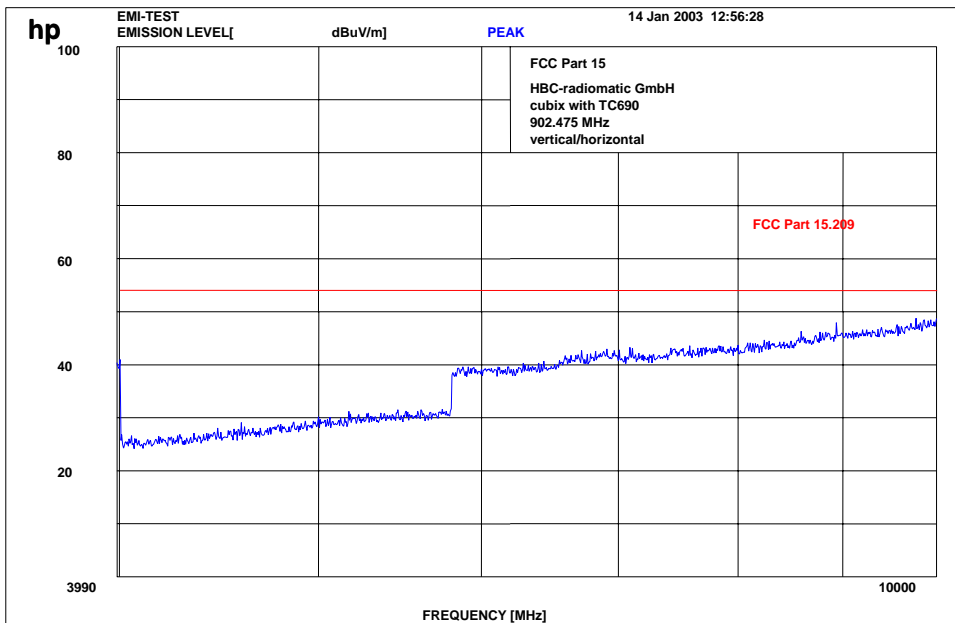
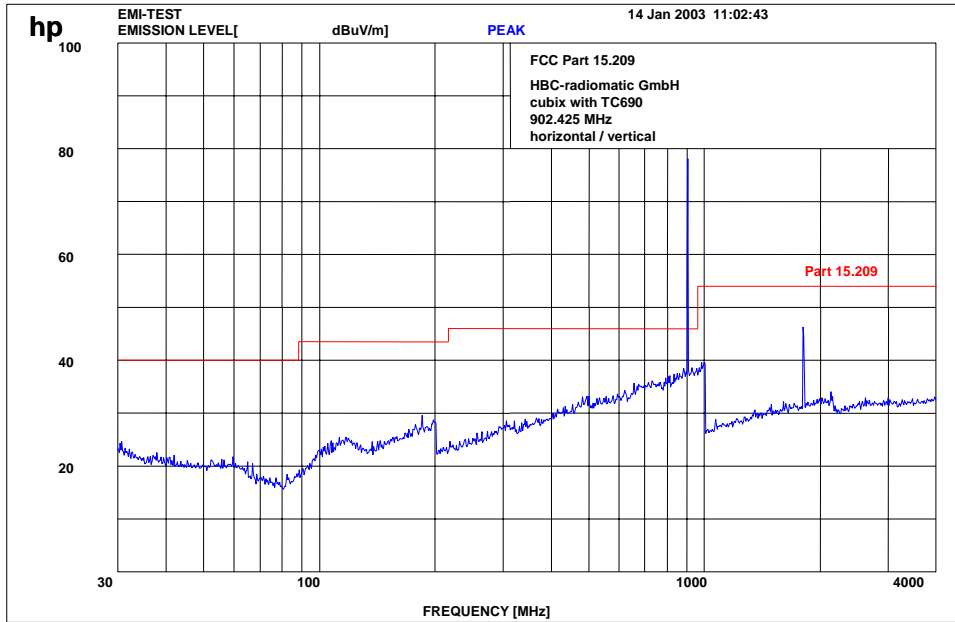


150 kHz - 30 MHz: Quasi Peak measurement, 9kHz Bandwidth, passive loop antenna.

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

SPURIOUS EMISSION (radiated) > 30 MHz
902.475 MHz

§ 15.231 (e)

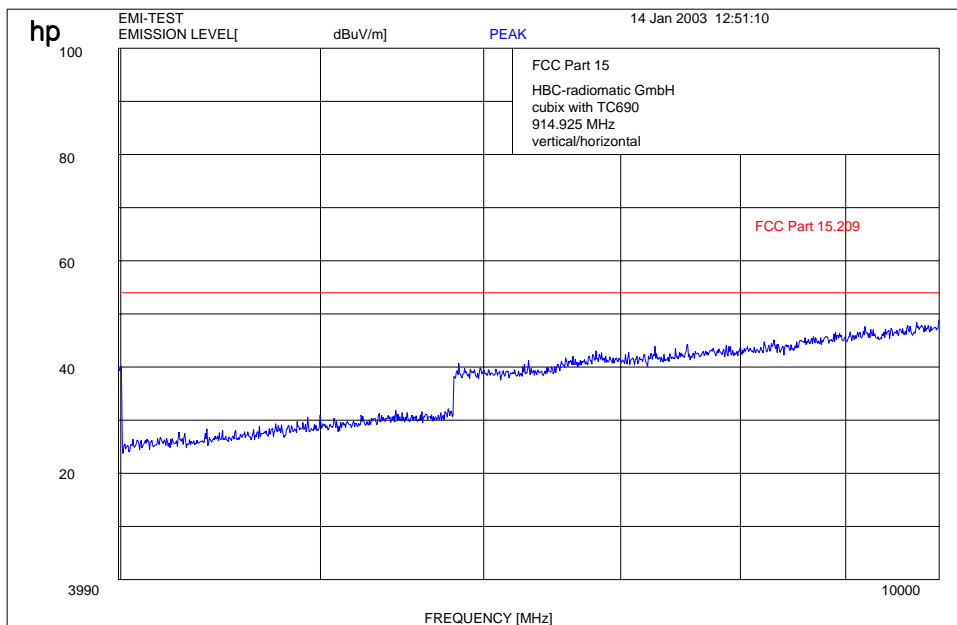
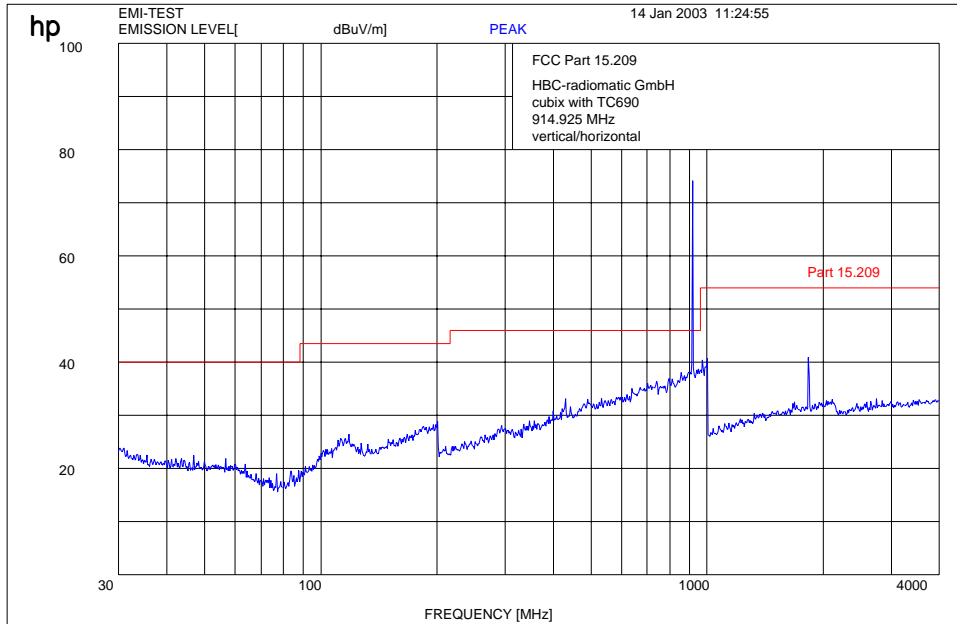


< 1GHz RBW / VBW 100 kHz
> 1 GHz RBW / VBW 1 MHz (Peak); RBW 1 MHz / VBW 10 Hz Average

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

SPURIOUS EMISSION (radiated) > 30 MHz
914.925 MHz

§ 15.231 (e)

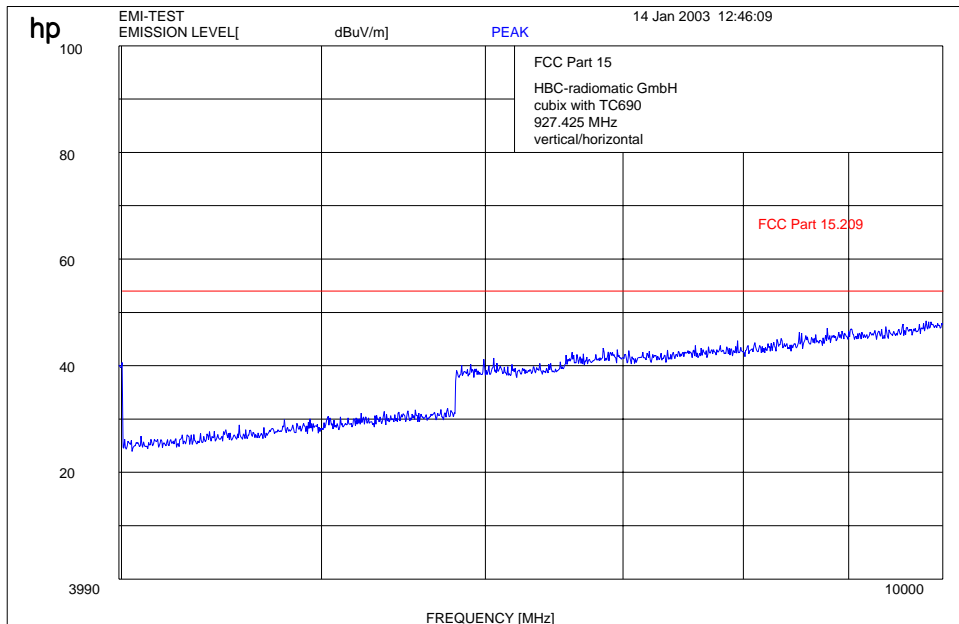
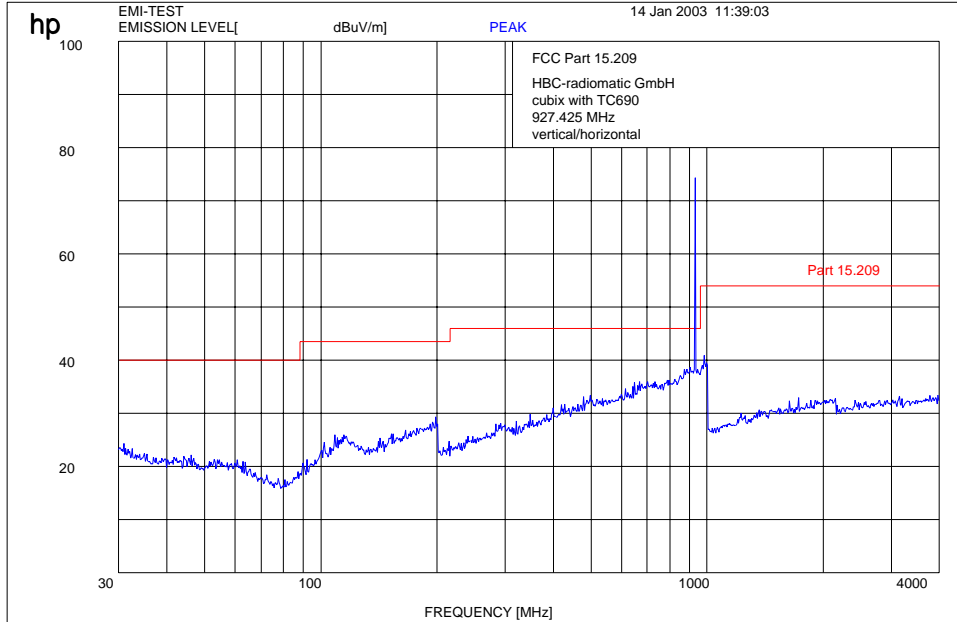


< 1GHz RBW / VBW 100 kHz
> 1 GHz RBW / VBW 1 MHz (Peak); RBW 1 MHz / VBW 10 Hz Average

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

SPURIOUS EMISSION (radiated) > 30 MHz
927.425 MHz

§ 15.249 (a)



< 1GHz RBW / VBW 100 kHz

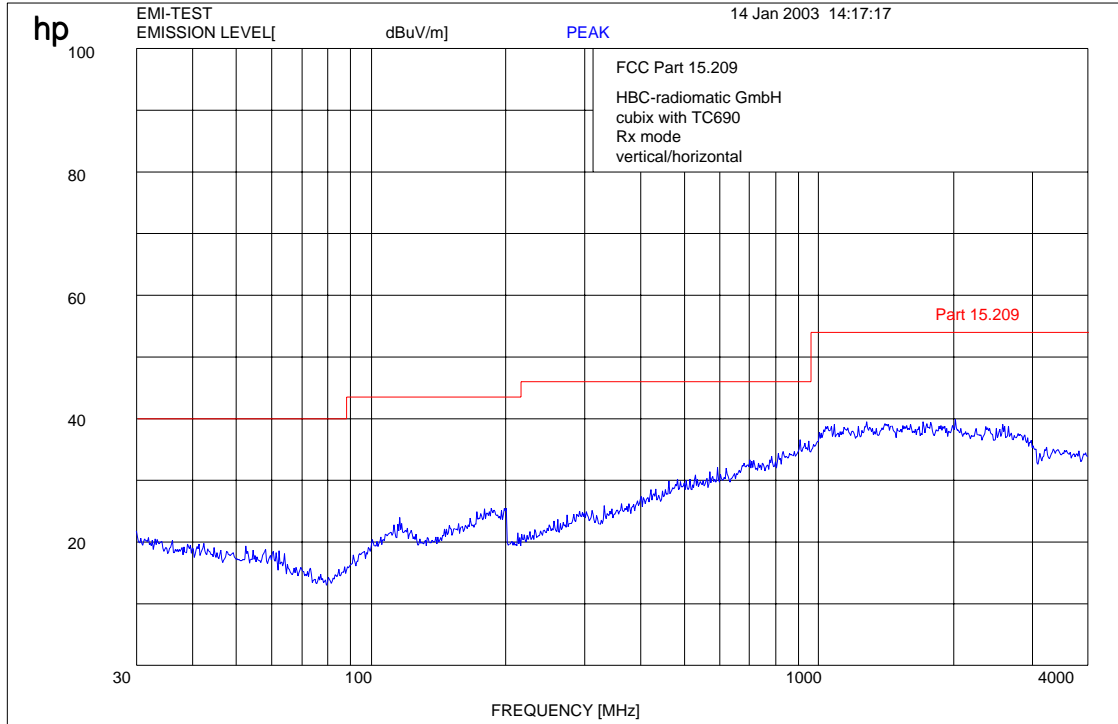
> 1 GHz RBW / VBW 1 MHz (Peak); RBW 1 MHz / VBW 10 Hz Average

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

RECEIVER SPURIOUS EMISSION(radiated)

§ 15.109

No peak found



< 1GHz RBW / VBW 100 kHz

> 1 GHz RBW / VBW 1 MHz (Peak); RBW 1 MHz / VBW 10 Hz Average

Limits

SUBCLAUSE § 15.109

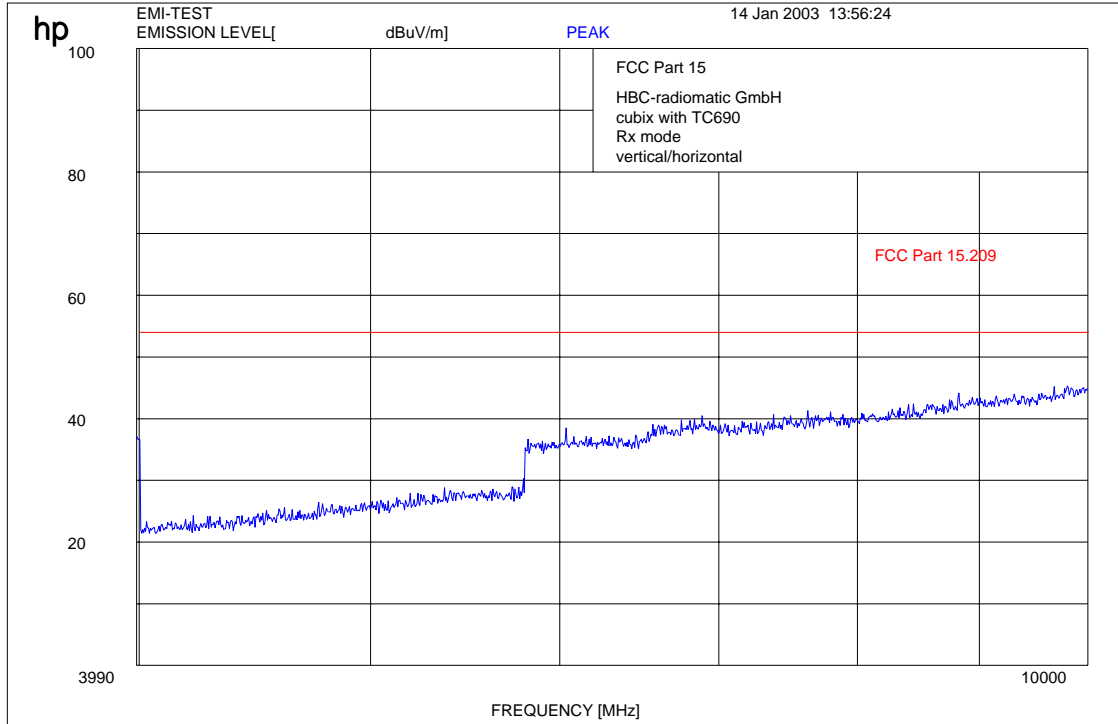
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30 / 29.5 dBµV/m	30
30 - 88	100 / 40 dBµV/m	3
88 - 216	150 / 43.5 dBµV/m	3
216 - 960	200 / 46 dBµV/m	3
above 960	500 / 54 dBµV/m	3

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

RECEIVER SPURIOUS EMISSION(radiated) 4 to 10 GHz

§ 15.109

No peak found



< 1GHz RBW / VBW 100 kHz
 > 1 GHz RBW / VBW 1 MHz (Peak); RBW 1 MHz / VBW 10 Hz Average

Limits

SUBCLAUSE § 15.109

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	500 / 54 dBµV/m	3

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)

Additional measurements for the ancillary equipment PART 15.109
 Measured with Charger (in charging mode is no transmission or receiving possible)

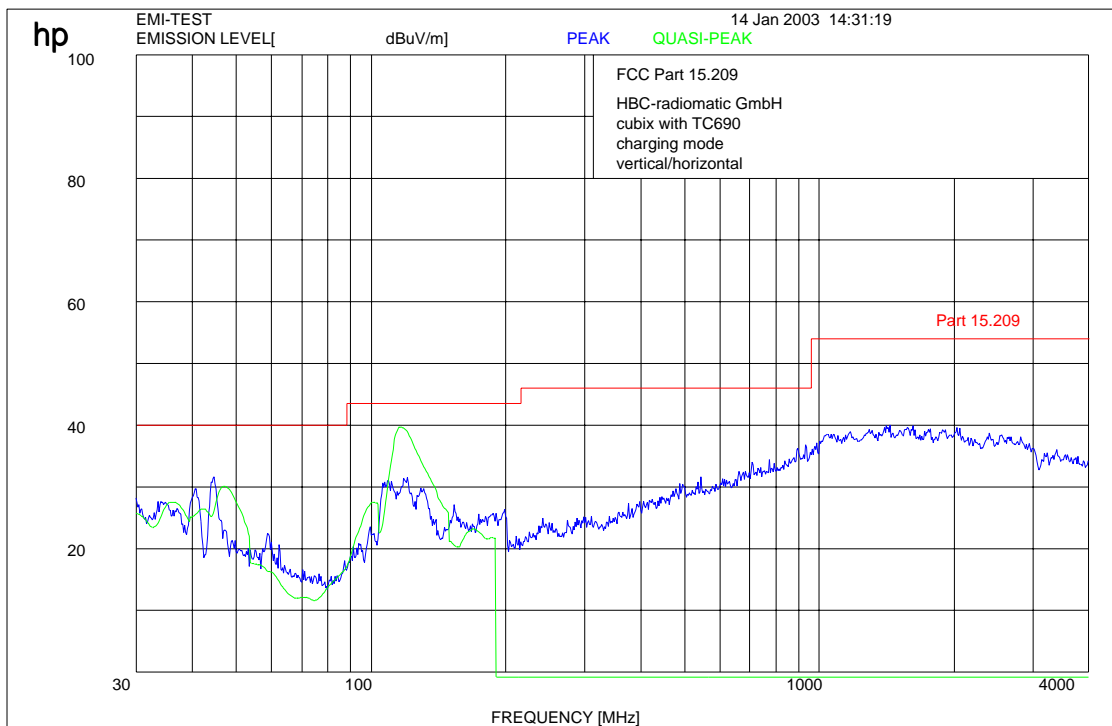
EMISSION LIMITATIONS					
f (MHz)	Detector	amplitude of emission (dBμV/m)	limit max. allowed emission power (dBμV/m)	Margin (dB)	results
Charging mode					
47.03	QP	30.1	40	9.9	Complies
115.62	QP	39.7	53.5	13.8	complies
Measurement uncertainty		± 1.9dB			

Limits

SUBCLAUSE § 15.109

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	500 / 54 dBμV/m	3

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
 (for reference numbers see test equipment listing)



< 1GHz RBW / VBW 100 kHz

> 1 GHz RBW / VBW 1 MHz (Peak); RBW 1 MHz / VBW 10 Hz Average

REFERENCE NUMBER(S) OF TEST EQUIPMENT USED
(for reference numbers see test equipment listing)

Conducted emissions

§ 15.107/207

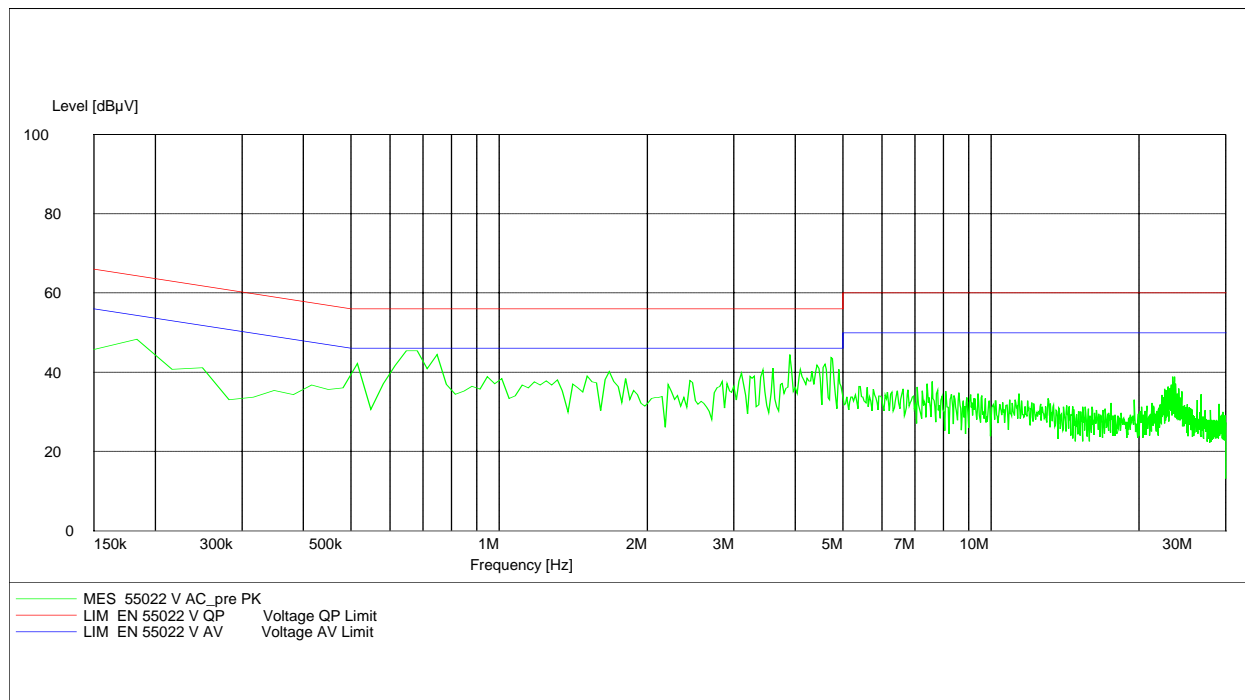
FCC Part 15

EN 55022

EUT: cubix with TC690 with AC/DC Charger
 Manufacturer: HBC-radiomatic GmbH
 Operation condition: charging mode
 Test Site: Room 006
 Operator: Berg
 Power Supply: 115V/AC / 60 Hz
 Comment:
 Start of Test: 14.01.03 / 13:51:44

SCAN TABLE: "EN 55022 V"

Short Description:	Voltage Mains 1.60					
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	7.5 kHz	MaxPeak	100.0 ms	10 kHz	ESH3-Z5 L1 1458
			Average			



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

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

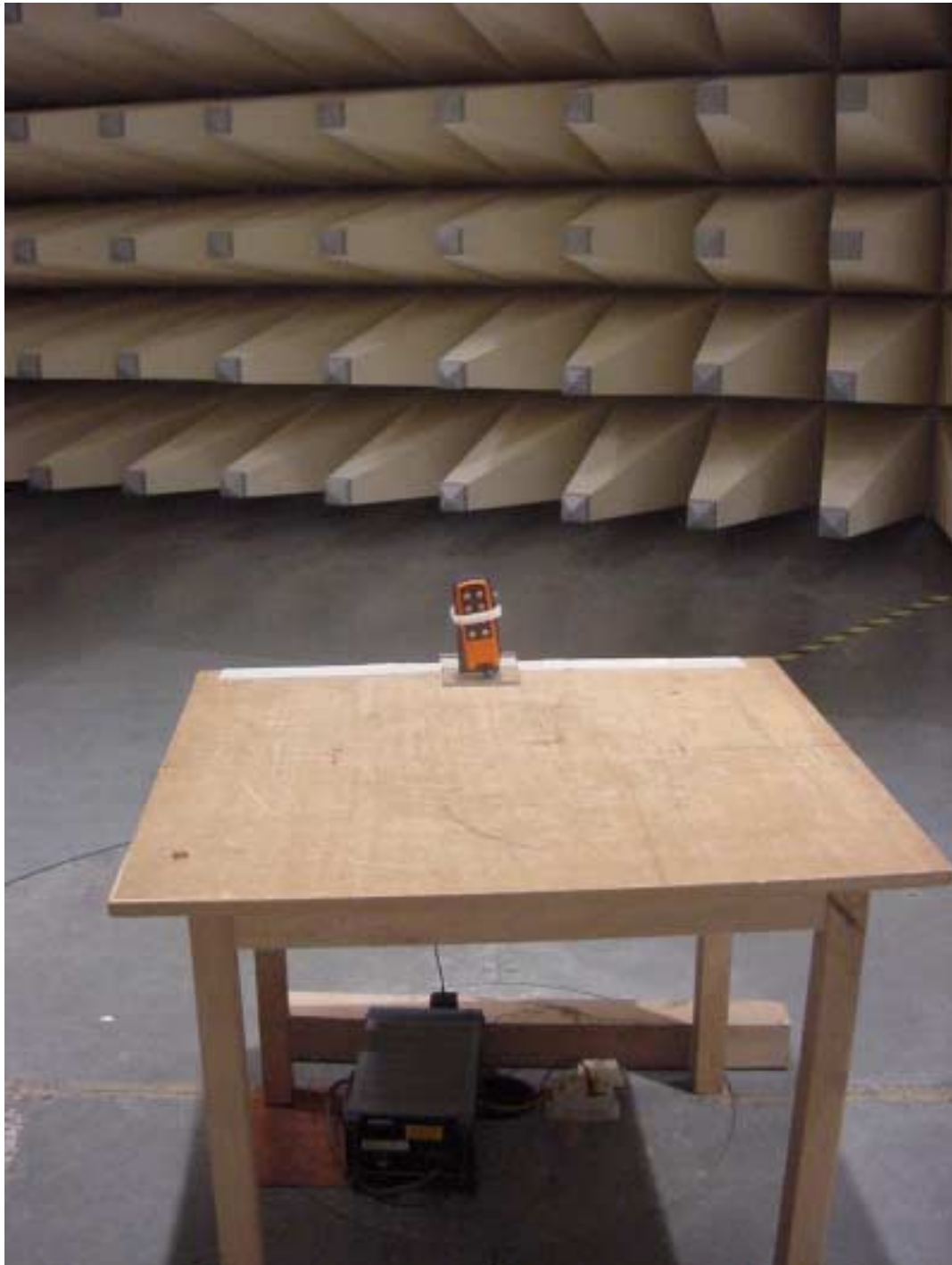
To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Type	Manufacturer	Serial No.
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				

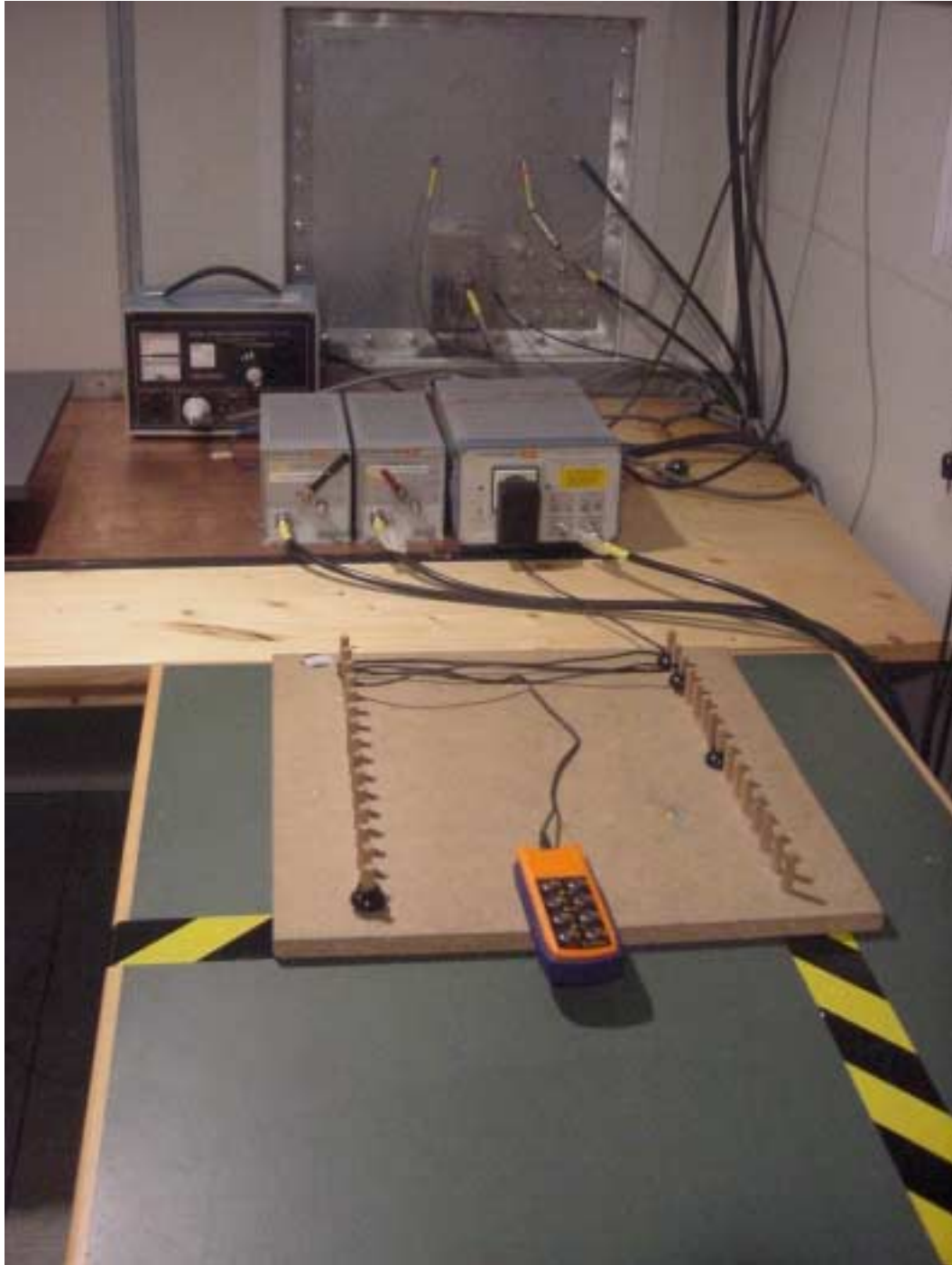
Test site



Test site



Test site



Photographs of the equipment

Photograph no.: 1



Photographs of the equipment

Photograph no.: 2



Photographs of the equipment

Photograph no.: 3



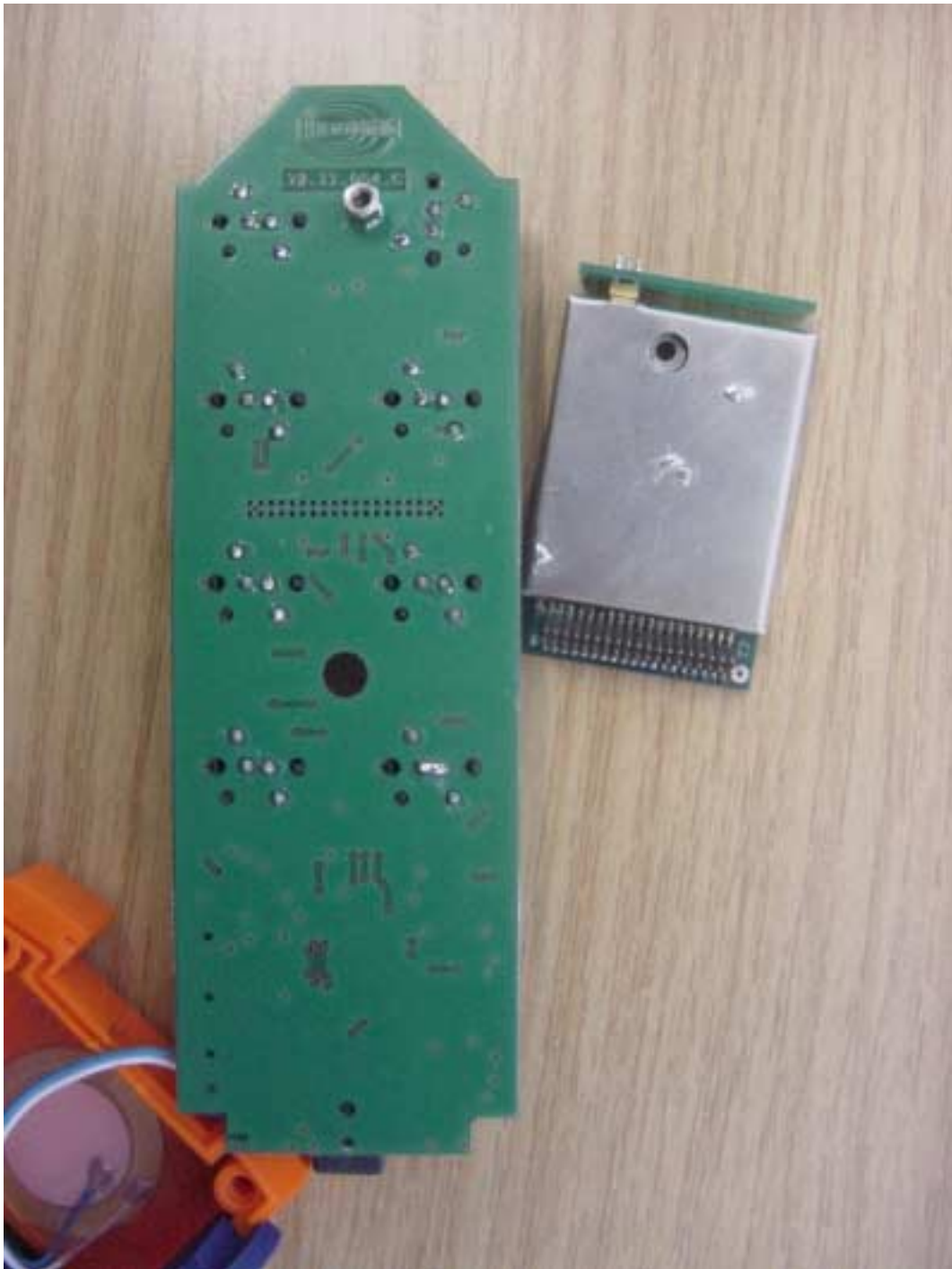
Photographs of the equipment

Photograph no.: 4



Photographs of the equipment

Photograph no.: 5



Photographs of the equipment

RF-module TC960

Photograph no.: 6



Photographs of the equipment

RF-module TC960 without shielding

Photograph no.: 7



Photographs of the equipment

Build in antenna

Photograph no.: 8



Photographs of the equipment

Build in antenna

Photograph no.: 9



Photographs of the equipment

Charger with changeable adapters

Photograph no.: 10



Photographs of the equipment

Charger with changeable adapters

Photograph no.: 11

