

CETECOM ICT Services GmbH

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RSC-Laboratory

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Test report no.: 2-4650-01-02/07

Date: 2007-07-04

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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.	:	2-4650-01-02/07
Applicant	:	W.H. Mandolyn Intern. Ltd.
Type	:	DBT701 (Tx)
Test Standard	:	FCC Part 15
		RSS-210 Issue 7
FCC ID	:	PLJ DBT701
Certification No. IC	:	3981A-DBT701

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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:

2007-07-04

Gillmann



Date

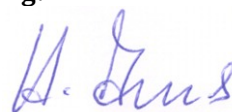
Name

Signature

Technical responsibility for area of testing:

2007-07-04

Ames



Date

Name

Signature

ETECOM ICT Services GmbH

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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 : Mandolyn Electronic Technology Inc.
Address : Unit 1003-8 Landmark North
City : Sheung Shul North
Country : Hong Kong
Phone : + 852-2670-9733
Fax : + 852-2673-6132

Contact : R. Wong

Phone : + 852-2670-9733
Fax : + 852-2673-6132

Contact person:

Date of receipt of application : 2007-06-26
Date of receipt of test item : 2007-07-02
Date(s) of test : 2007-07-02 to 2007-07-03
Date of report : 2007-07-04

1.4 Application details

Date of test: 2007-07-02 to 2007-07-03

1.5 Test item

Type of equipment : Remote Control Transmitter (Doorbell)
Type designation : DBT701(Tx)
Manufacturer : Mandolyn Electronic Technology Inc.
Street : Unit 1003-8 Landmark North
City : Sheung Shul North
Country : Hong Kong

Additional information :
Frequency : 434 MHz
Type of modulation : 144KA1D
Channel spacing : > 25 kHz
Number of channels : 1
Antenna (Tx) : printed antenna
Max. ERP : Peak: 77.2 dB μ V/m ;
Average: 65.5 dB μ V/m (at 3m distance)
Power supply (Tx) : 12 V via Batterie

FCC-ID : PLJDBT701
IC No : 3981A-DB701

1.6 Test specifications:

CANADA RSS-210 Issue 7
FCC Part15.231
FCC Part 15.209

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:



Date: 2007-07-04

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 C63.2-1996 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 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

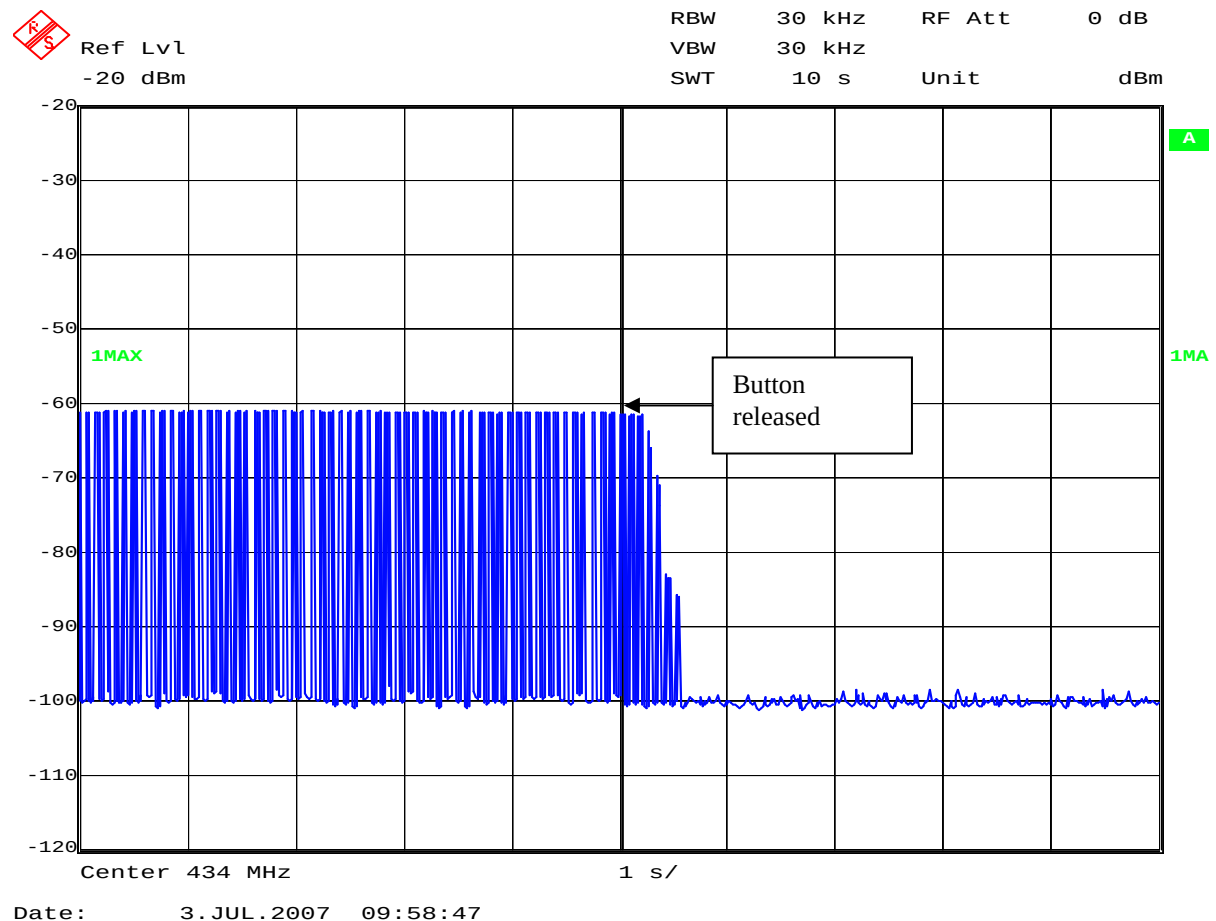
All measurement settings are according to FCC 15.109 / 209 and 15.107 / 207

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

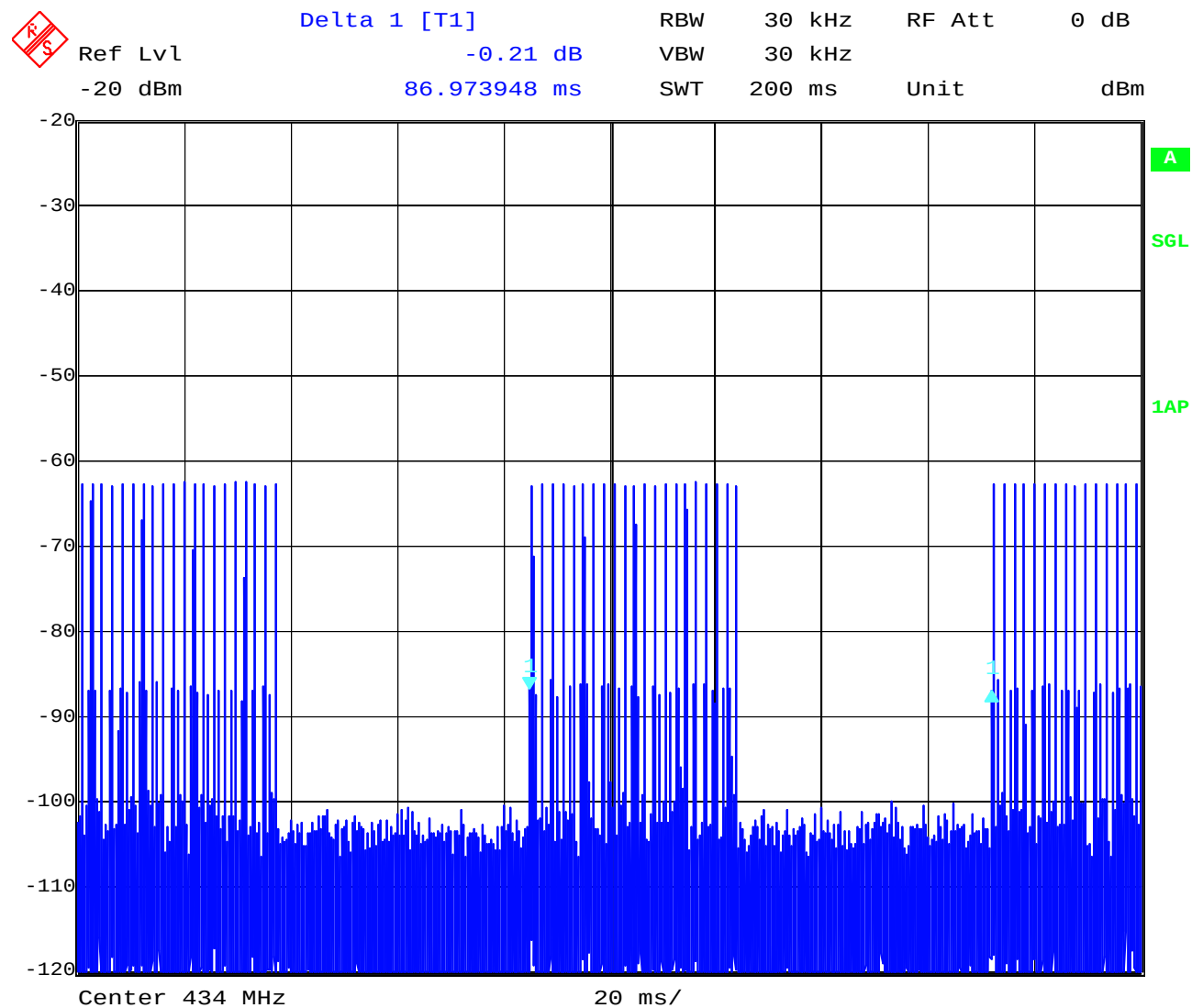
2.2.1 Timing behavior 15.231(a1)



Remark: the button was released at the middle of the screen. The tx stops after ~0.5 second.

Limit:

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 sec. of being released.

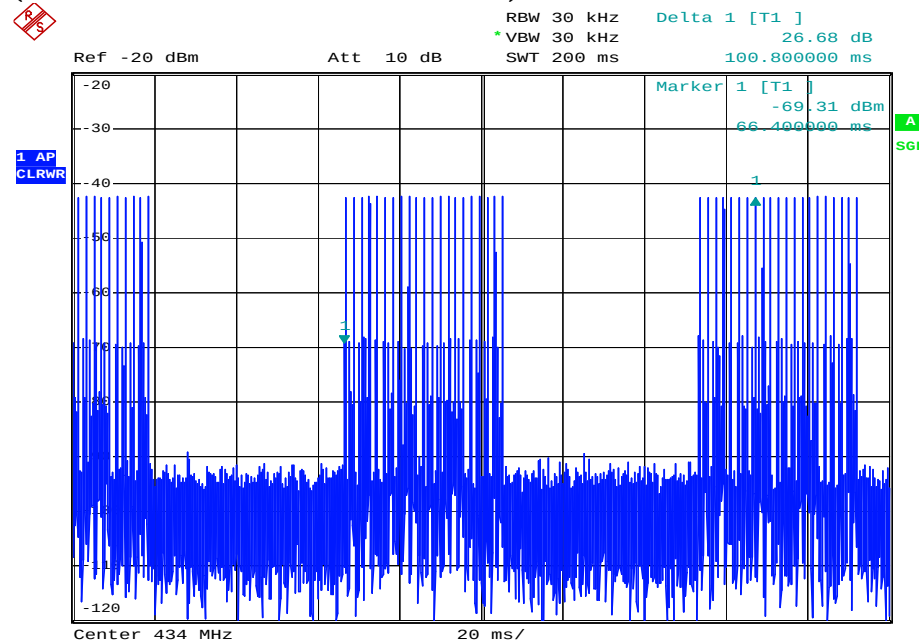


Date: 3.JUL.2007 10:01:48

Remark: the distance between two pulses – trains is 87 ms

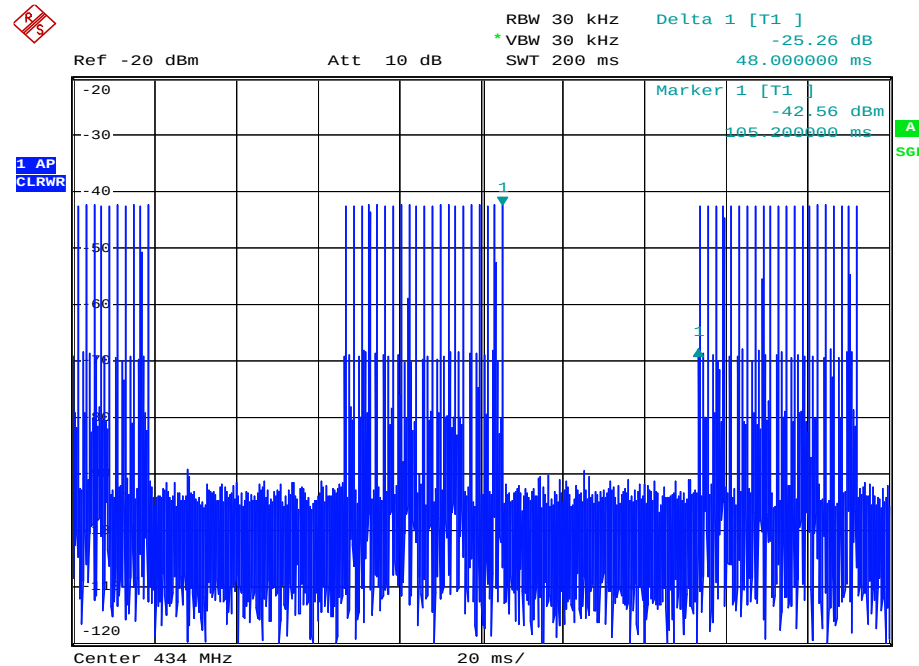
The length of 1puls – train is 87 ms

Pulse - train Reference timeslot (more than 1 Puls – train within 100 ms)



Date: 2.JUL.2007 13:17:00

Gab between 2 emission blocks is 48 ms



Date: 2.JUL.2007 13:17:55

Duty Cycle:

The reference timeslot is 100 ms FCC (15.35(c))

The complete pulstrain is 86 ms, the gap between two emission blocks is 48 ms

Within 100 ms we have more than 1 puls – train

(100 ms minus 48 ms = 52 ms / see plot 02:

As the duty cycle within the emission blocks about 50%, we have a total transmitting time of 26 ms

There fore the average correction factor is $20 \cdot \log 0.26 = -11.7$ dB

Every measured peak value has be corrected by – 11.7 dB

The calculated AVERAGE Value is :

77.2 dB μ V/m – 11.7 dB = 65.5 dB μ V/m at 3m distance.

The limit for 434 MHz according to FCC15.231 is 80.83 dB μ V/m.

The product complies with the FCC and IC requirements.

2.2.2 Field Strength 15.231(b1)

(RADIATED)

TEST CONDITIONS		MAXIMUM AVERAGE FIELD STRENGTH (µV/m)
Frequency 434 MHz		
T _{nom} (23)°C	V _{nom} 12 V (DC)	7 244 µV/m PEAK (77.2 dBµV/m) 1 883 µV/m AVERAGE (65.5 dBµV/m)
Maximum deviation from output power under extreme test conditions (dBc)		not applicable
Measurement uncertainty		±3dB

Limits: see below, or 15.209 (whichever limits permits a higher field strength.)

Frequency (MHz)	Field strength (µV/m)	Field strength of Spurious emissions (µV/m)
40.66-407	2250	225
70-130	1250	125
130-174	1 250 to 3 750 **	125 to 375 **
174-260	3750	375
260-470	3 750 to 12 500 **	375 to 1 250 **
Above 470	12500	1250
** linear interpolations		

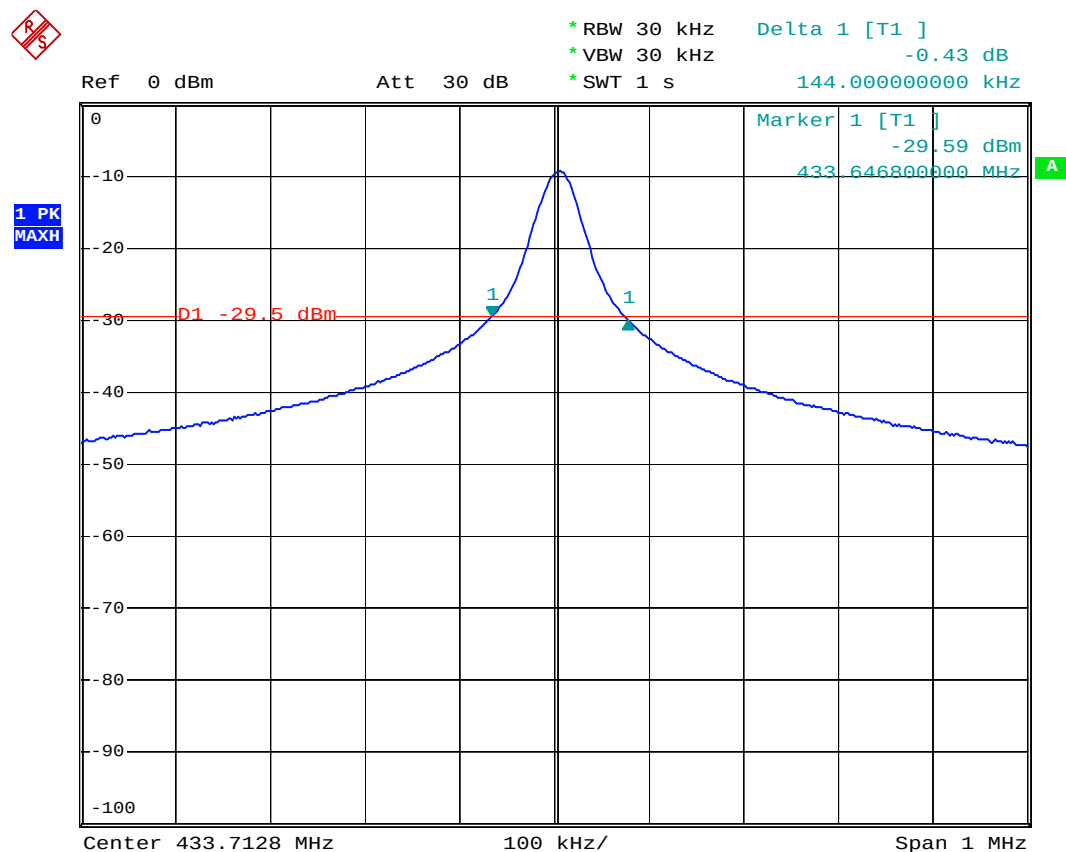
15.231(b1) Field Strengths and Frequency Bands

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
434	77.2 (Peak)	65.5 (AV)	80.8 dB μ V/m Average		Operating frequency
2 170	44.4 (Peak)	32.7 (AV)	62.0 dB μ V/m Average	-	pass
2 604	55.3 (Peak)	43.6 (AV)	62.0 dB μ V/m Average	-	pass
Measurement uncertainty			$\pm 3\text{dB}$		

Limits: see below, or 15.209 (whichever limits permits a higher field strength.)

Fundamental Frequency (MHz)	Field strength (μ V/m) of the fundamental	Field strength of Spurious emissions (μ V/m)
40.66-407	2250 / 67 dB μ V/m	225 / 47 dB μ V/m
70-130	1250 / 62 dB μ V/m	125 / 42 dB μ V/m
130-174	1250 to 3750 ** 62 – 71.5 dB μ V/m	125 to 375 ** 42 – 51.5 dB μ V/m
174-260	3750 / 71.5 dB μ V/m	375
260-470	2750 to 12500 ** 71.5 – 82 dB μ V/m	375 to 1250 ** 51.5 – 62 dB μ V/m
Above 470	12500 / 82 dB μ V/m	1250 / 62 dB μ V/m
** linear interpolations		

2.2.3 Bandwidth of Emissions 15.231(c)



Date: 2.JUL.2007 14:50:16

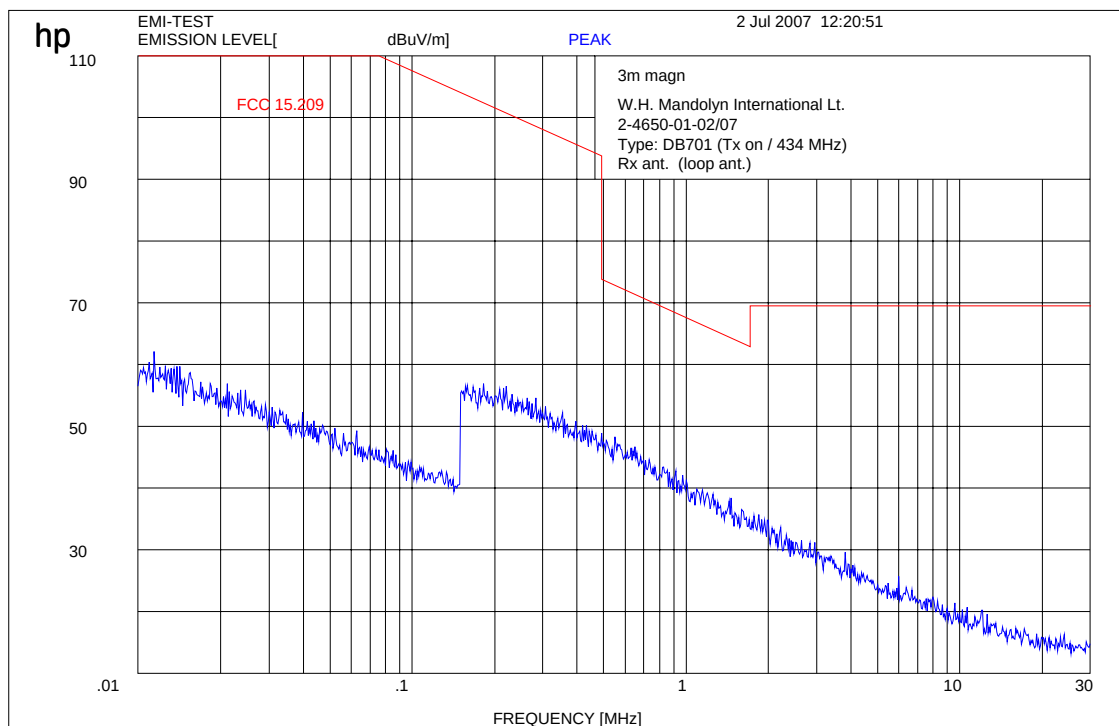
The occupied bandwidth (20 dB / 99%) is 144.0 kHz .

Limit

< 0.25% of the centre frequency, here 1.085 MHz

2.2.4 Spurious Emission (radiated)

9 kHz to 30 MHz



Setting : RBW/VBW 3 kHz

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))

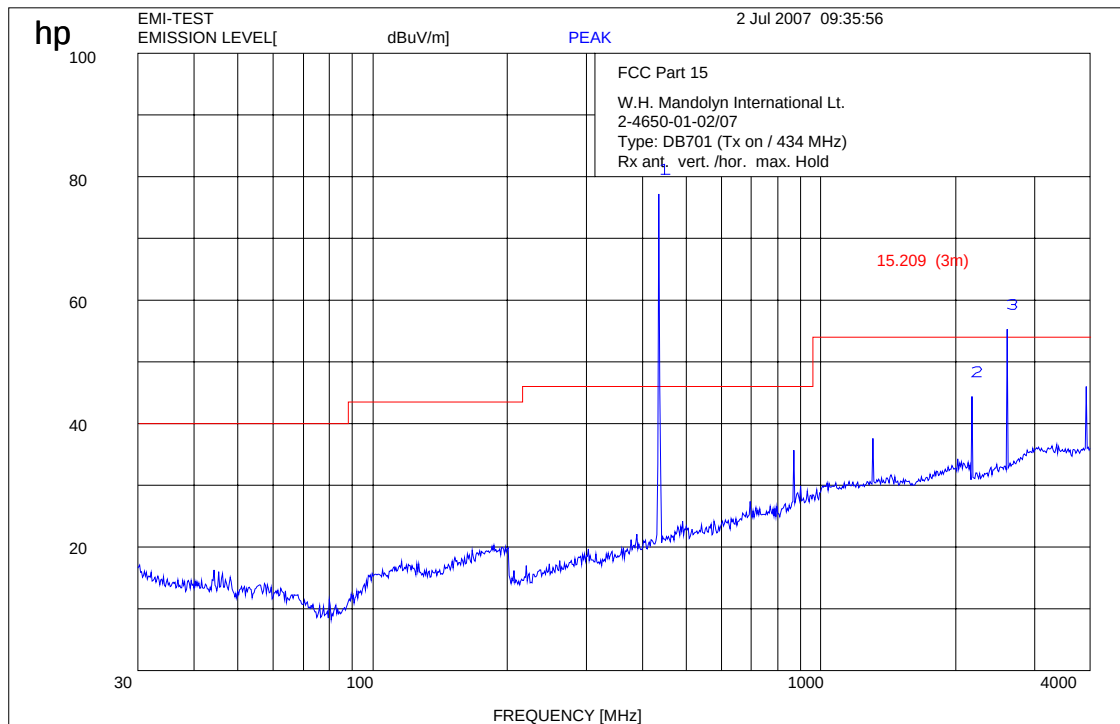
Measurement distance 3m

This measurement was done in 3 polarisation's, the plot shows the worst case

Limits: (general requirements)

Frequency	Field strength (µV/m)	Measuring distance (m)
0.009 to 0.490 MHz	2400/F(MHz)	300
0.490 to 1.705 MHz	24000/F(MHz)	30
1.705 to 30.0 MHz	30	30

30 MHz to 4 GHz

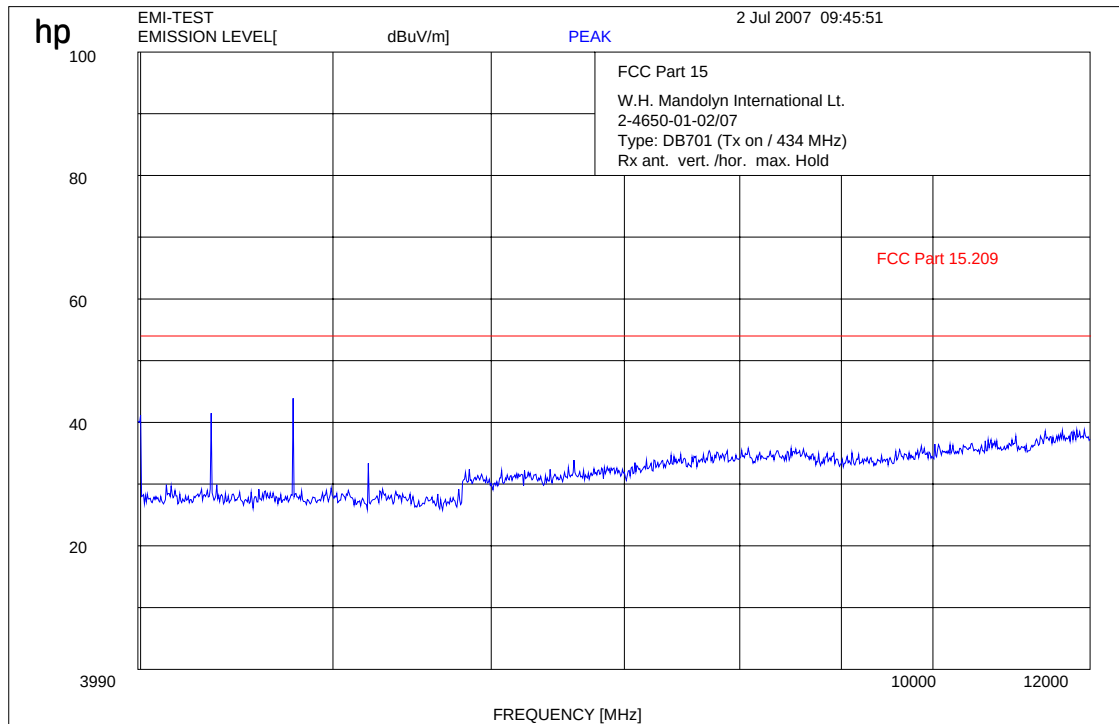


Setting : < 1 000 MHz RBW/VBW 100 kHz
> 1 000 MHz : RBW/VBW 1 MHz

Limits: see below, or 15.209 (whichever limits permits a higher field strength.)

Fundamental Frequency (MHz)	Field strength (µV/m)	Field strength of Spurious emissions (µV/m)
40.66-407	2250	225
70-130	1250	125
130-174	1 250 to 3 750 **	125 to 375 **
174-260	3750	375
260-470	3 750 to 12 500 **	375 to 1 250 **
Above 470	12500	1250
** linear interpolations		

4 GHz to 12 GHz



Setting : > 1 000 MHz : RBW/VBW 1 MHz

Limits: see below, or 15.209 (whichever limits permits a higher field strength.)

Frequency (MHz)	Field strength (µV/m)	Field strength of Spurious emissions (µV/m)
40.66-407	2250	225
70-130	1250	125
130-174	1 250 to 3 750 **	125 to 375 **
174-260	3750	375
260-470	3 750 to 12 500 **	375 to 1 250 **
Above 470	12500	1250
** 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

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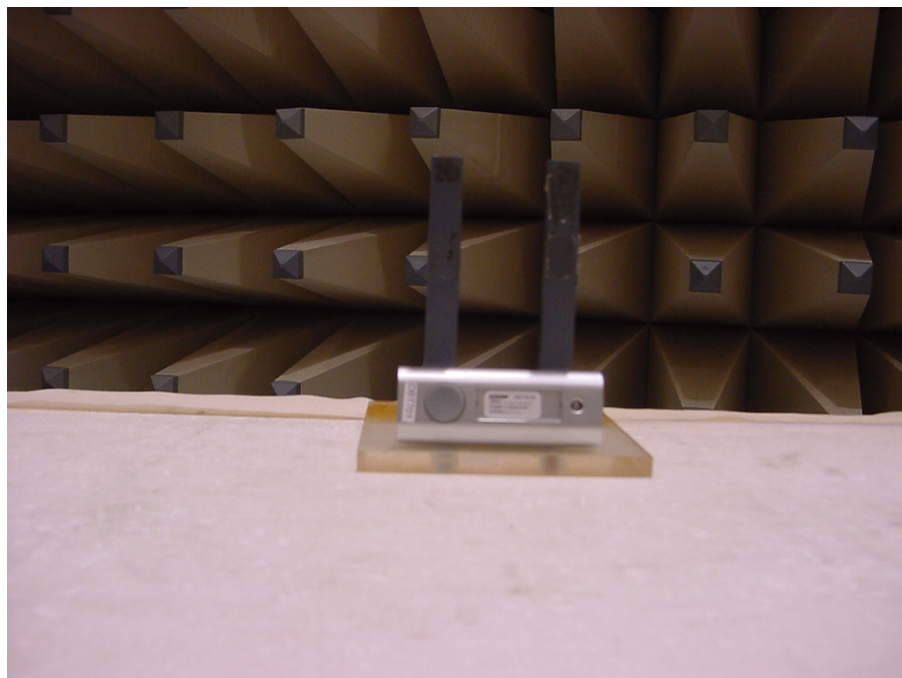
No	Instrument/Ancillary	Type	Manufacturer	Serial No.
36	Control Computer	HD 100	Deisel	100/322/93
37	Relay Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relay Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063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

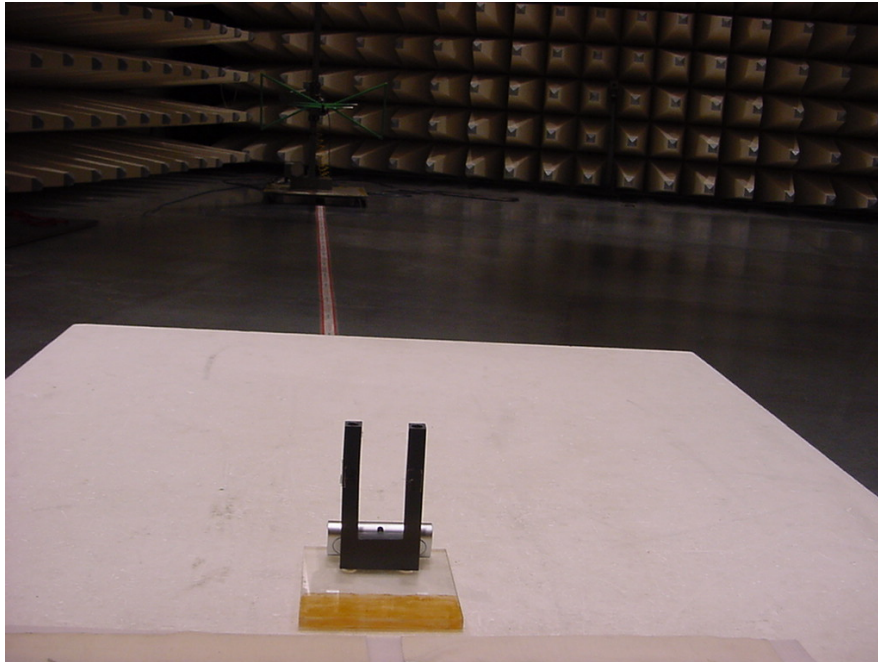
Tx Photo 1 (Radiated Emissions):



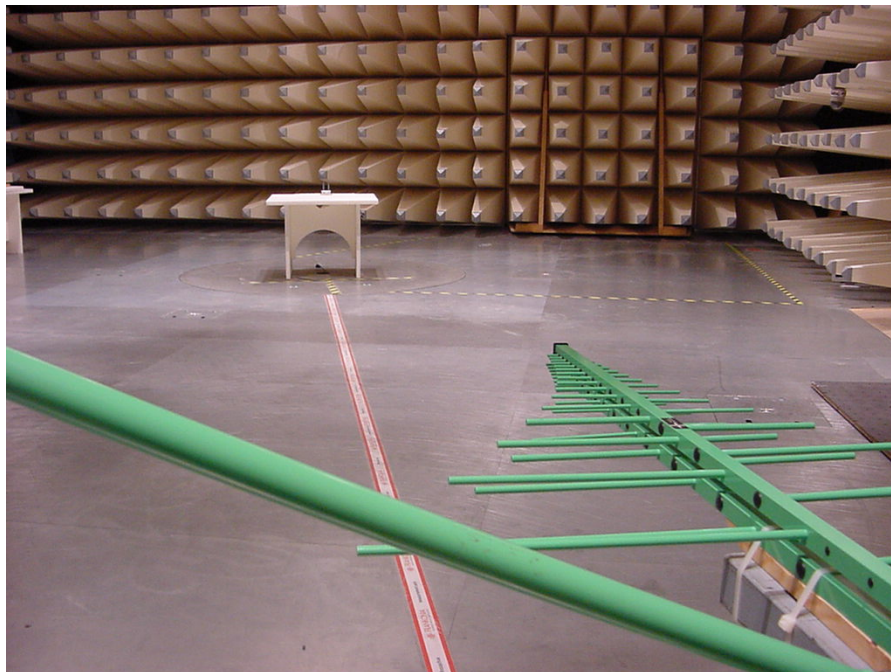
Tx Photo 2 (Radiated Emissions):



Tx Photo 3 (Radiated Emissions):



Tx Photo 4 (Radiated Emissions):



5 Photographs of test sample

Photograph no.: 1



Photograph no.: 2



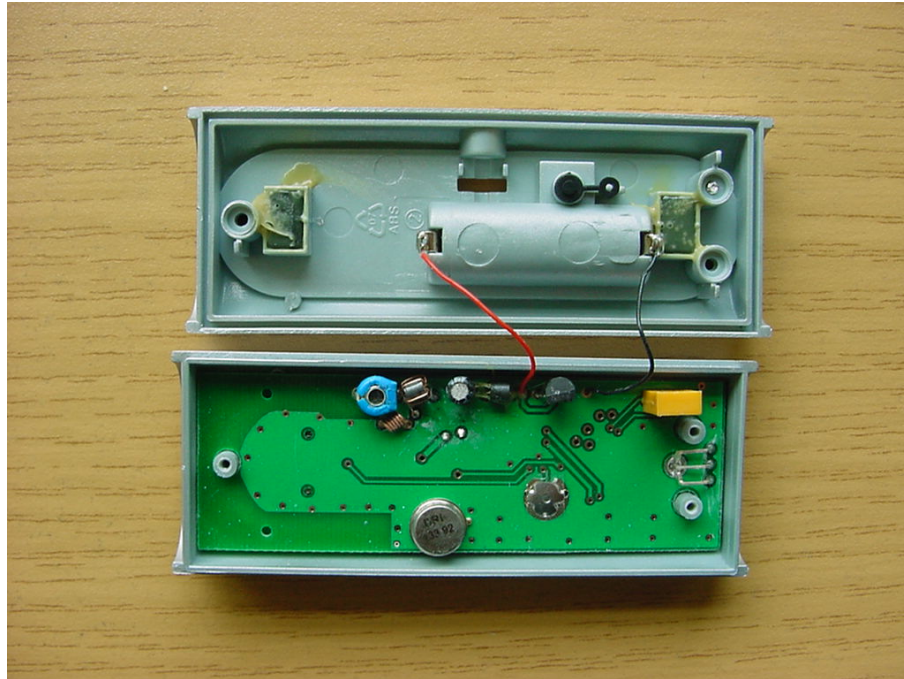
Photograph no.: 3



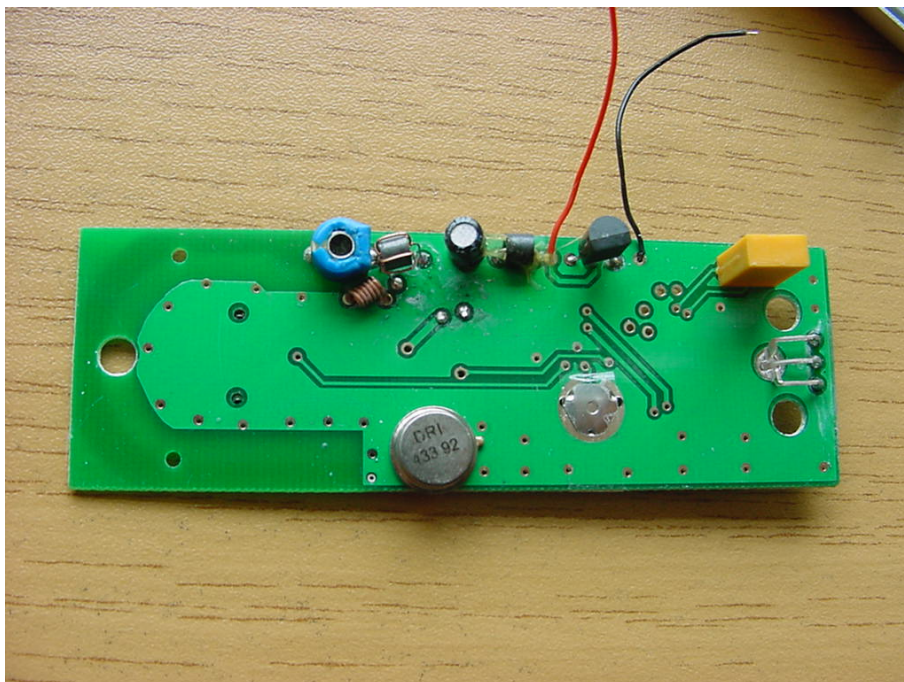
Photograph no.: 4



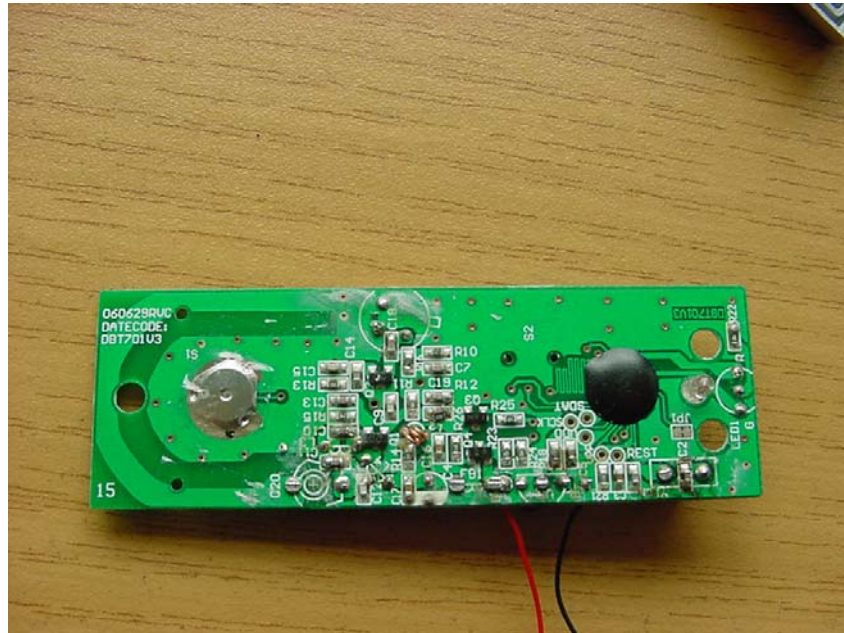
Photograph no.: 5



Photograph no.: 6



Photograph no.: 7



Photograph no.: 8

