

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

EQUIPMENT UNDER TEST :
APPARECCHIO IN PROVA :

**WIRELESS REMOTE CONTROL FOR BOATS WITH
ELECTRONIC ENGINES**

Mod. YACHT CONTROLLER

REFERENCE STANDARDS :
NORME DI RIFERIMENTO :

FCC 47 CFR Part 15

CUSTOMER:

RICHIEDENTE:

- **Dept. / Firm :** *MICRO DEVICE S.r.l.*
Ente / Società':
- **Mr.:** *SIG. GIUSEPPE BRIANZA*
Sig.:
- **Address:** *VIA BELLINI, 31/33 - 20095 CUSANO MILANINO (MI) - ITALY*
Indirizzo:
- **Tel. :** ++39 02/6131001 • **Telefax** ++39 02/66400086 • **E-mail:** mdevice@tin.it
Telefono : *Fax :* *e-mail*

Site of test execution: Via Campagna, 92 - 22020 Gaggino Faloppio (CO) - Italy
Località esecuzione prove:

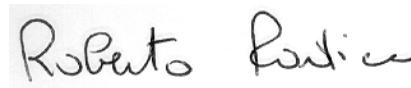
Date of test samples receipt: 20/01/04 **Date of start test:** 13/04/04
Data ricevimento campioni: *Data inizio prove:*

Date of end test: 13/04/04
Data fine prove:

Witness to the test:
Presenti alle prove:

Nobody / Nessuno
.....

Signature of the engineers:
Firma esecutore prove:


R. Radice
.....

Signature of the Laboratory Director:
Firma Direttore Laboratori:


R. Furfari
.....

The test results recorded in this Test Report are exclusively referred to the tested samples.

I risultati del presente rapporto di prova si riferiscono esclusivamente al campione sottoposto a prova.

Reproduction of this EMC-Test Report in whole or in part is prohibited without the written authorization of the Laboratory Director

La riproduzione di questo Rapporto in modo parziale o totale è PROIBITO senza l'autorizzazione scritta della Direzione del Laboratorio

0. CONTENTS

	Page	Rev	Date
0. CONTENTS	2	0	20/05/04
1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)	3	0	20/05/04
1.1 Identification	3	0	20/05/04
1.2 Technical data	3	0	20/05/04
1.3 Transmitter technical data	4	0	20/05/04
1.4 Modifications incorporated in E.U.T.	4	0	20/05/04
1.5 Ports identification	5	0	20/05/04
1.6 Auxiliary equipment	5	0	20/05/04
2. TEST CONDITIONS	6	0	20/05/04
2.1 Operating test modes and test conditions	6	0	20/05/04
2.2 Test overview	6	0	20/05/04
3. REFERENCE STANDARD FOR PERFORMED TESTS	7	0	20/05/04
4. Summary of test results	8	0	20/05/04
4.1 Tests	8	0	20/05/04
4.2 Emission limits	9	0	20/05/04
5. TEST RESULTS	10	0	20/05/04
6. EUT TECHNICAL DOCUMENTATION	17	0	20/05/04
6.1 Wiring diagrams	17	0	20/05/04
6.2 Technical manual	17	0	20/05/04
6.3 Photographic documentation	18	0	20/05/04

1. TECHNICAL INFORMATION OF EQUIPMENT UNDER TEST (EUT)

1.1 Identification

Brand name:	MICRODEVICE
Equipment :	WIRELESS REMOTE CONTROL FOR BOATS WITH ELECTRONIC ENGINES
Model name or No. :	YACHT CONTROLLER
Serial number :	Not present
FCC ID :	R86TX001YACHTCONT
Country of manufacturer:	ITALY

1.2 Technical data

FCC class:	Intentional Radiators
Supply voltage:	N° 2 Internal Battery 1,5V type AAA (LR06)
Typical usage :	On boats
EUT single or system:	Single
EUT dimensions :	55 x 98 x 40 mm

1.3 Transmitter technical data

TRANSMITTER

- Working Frequency : 916,5 MHz
- Frequency Range of Operation : 902 – 928 MHz
- Absorption : 30mA
- Antenna type : Integrated

1.4 Modifications incorporated in E.U.T.

The following items are the modifications introduced in the equipment under test :

- None

1.5 Ports identification

This section contains descriptions of all signal ports and AC/DC power input/output ports, the length and the type of the cable provided by manufacturer needed for the tests.

Moreover it is specified if the ports are ever or optionally connected.

Port		Description	Connection
1	Enclosure	Plastic surface	By pressure
2	AC power input/output ports	Line not present	*****
3	DC power input/output ports	N° 2 Internal battery 1,5V type AAA (LR06)	Battery support
4	Signals ports	Line not present	*****
<i>Note: During the tests all cables must be what provided the manufacturer or the same that used in the real employment of the EUT.</i>			

1.6 Auxiliary equipment

No auxiliary equipment

2. TEST CONDITIONS

2.1 Operating test modes and test conditions

The equipment has been tested according to the operative conditions described in the user/installation manual provided by the manufacturer and by following reference standards :

Reference Standard:

- FCC Part 15, Subpart C, Section 15.249

In the following table there are the operating conditions adopted during tests identified by an indicator (#..) at which has been referred the item “Operating condition of the equipment under test” of all technical sheets of the tests (see Section 4)

Operating condition	Description
#1	<i>Continuous transmission of bit stream.</i>

2.2 Test overview

Sample tested is the main model of a complete set of 915 MHz RF transmitters (see also Section 7).

The appliance is classified as “*intentional radiator*” in conformity to FCC Part 15 Sub. A §15.201, and it is subject to “*Certification*” procedure.

The application is mainly used as Yacht control; the deactivation of RF signal happens releasing the command pressure.

It is possible to declare that the appliance it is subject to additional requirements stated in §15.249

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

3. REFERENCE STANDARD FOR PERFORMED TESTS

<i>Reference standard :</i>	<i>Title :</i>
FCC Part 15 part A	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)
FCC Part 15 part C	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)
ANSI C63.4	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

4. SUMMARY OF TEST RESULTS

4.1 Tests

Port		Phenomena	Operating condition ¹	Result
1	Enclosure	Radiated emission	#1	Within the limit
		Frequency stability	Not applicable	
2	AC mains Input ports	RF Disturbance voltage: • continuous	Not applicable ²	
		Bandwidth of emission	Not applicable ²	
3	DC Power supply and Battery	Bandwidth of emission	#1	Within the limit

¹ Ref. Tab. of Section 2

² Not applicable: port not present in acc. To §15.207 (d)

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

4.2 Emission limits

Acc. to §15.249 for intentional radiator operated within the frequency band 902-928 MHz

Frequency (MHz)	Field Strength of fundamental at a distance of 3m ($\mu\text{V/m}$)	Field Strength of spurious emission at a distance of 3m ($\mu\text{V/m}$)
902 – 928	50	500

According to §15.209 all the other emission of the appliance shall not exceed the following levels:

Frequency (MHz)	Field Strength at a distance of 3m ($\mu\text{V/m}$)
30 - 88	100 **
88 – 216	150 **
216 – 960	200 **
Above 960	500

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

5. TEST RESULTS

TX – RADIATED FIELD 30 - 1000 MHZ	11
TX – SPURIOUS EMISSION 1 - 10 GHZ	14

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

**TEST
1.****TX – RADIATED FIELD 30 - 1000 MHZ****REFERENCE
DOCUMENT**

FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber
- **TEST EQUIPMENT USED FOR TEST:** EMI receiver Rohde & Schwarz Mod. ESMI
Chase Antenna Mod. CBL 6111 A
- **TESTED PORT:** Enclosure
- **EMISSION LIMITS:** Acc. to Section 15.209 + 15.249
of reference document
- **UNCERTAINTY OF MEASURE:** Combined uncertainty = ± 1.75 dB
Total uncertainty = $(k=2) \pm 3.5$ dB

TEST CONDITIONS:		MEASURED
Ambient temperature :	15 - 35 °C	24 $\pm$ 3 °C
Ambient humidity :	25 - 75 %rH	40 $\pm$ 5 %rH
Pressure :	85 - 106 kPa (860 mbar - 1060 mbar)	950 $\pm$ 50 mbar
Voltage :	N°2 Internal battery 1,5V	3 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1**RESULT: WITHIN THE LIMIT**

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

SCAN TABLE : “Radiated Emission”

Unit: dB μ V/m

Detector : Mode:

Curve1: Max Peak ClearWrite

Curve2: Avg ClearWrite

Subrange:

Start Frequency: 30.0 MHz Step Size: 80 kHz

Stop Frequency: 1000.0 MHz

Measure Time: 0.01 sec.

IF Bandwidth: 120 kHz

Receiver: ESXI

Probe Transducer: CHASE_6111_PRC

Signal Path: Path 4

System Transducer: RFin2-CP1/X11

Scan Mode: Lin

Add. Transducer: W71.01

Tracking Gen.: Off

Input: 2 DC

Preamplifier: 10 dB

Demodulation: FM Broad

RF att.: Coupled

Volume: 0.0%

Ref. Level: -50 dBm

Squelch: --

Min. RF att.: 0 dBm

Option: None

Autorange: On

Curve 1: On

Repetition: Single

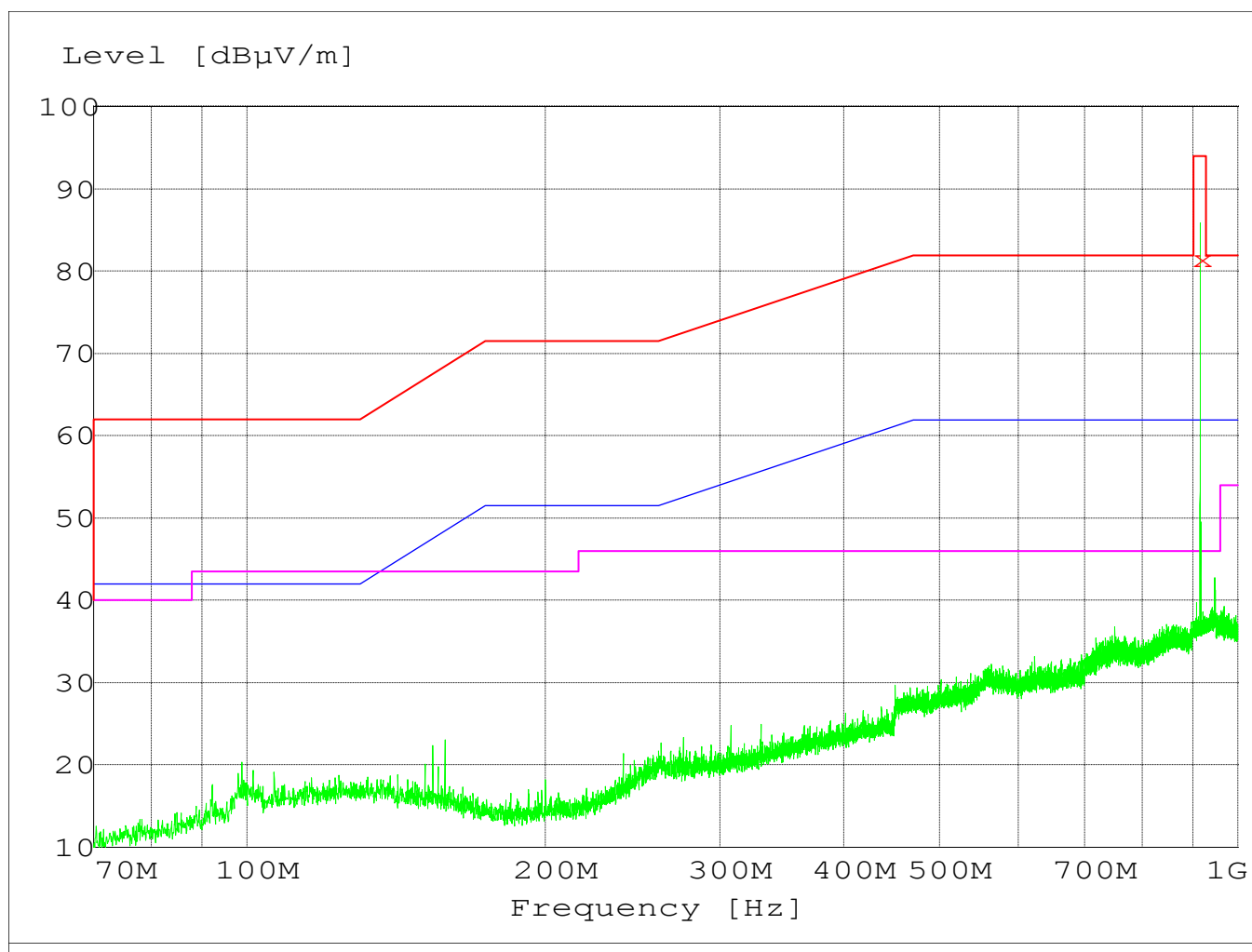
Curve 2: On

Stop Mark: On

Stop Message: On

Text: Connect antenna

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309



RESULTS

Frequency	Remark	Limits	Measured QP level	Measured level - Antenna Polarisation
MHz		dBμV/m	dBμV/m	
916.3200	Fundamental	93.98	81.50	HORIZONTAL

**TEST
2.****TX – SPURIOUS EMISSION 1 - 10 GHz****REFERENCE
DOCUMENT**

FCC PART 15 subpart C

- **TEST LOCATION:** Semi-anechoic chamber
- **TEST EQUIPMENT USED FOR TEST:** Spectrum Analyzer Rohde & Schwarz Mod. FSP (9kHz-40GHz)
Log-periodic Broadband Antenna mod. HL025
- **TESTED PORT:** Enclosure
- **EMISSION LIMITS:** Acc. to Section 15.209 of reference document
- **FREQUENCY BAND :** Fundamental Frequency to 10th harmonics acc. to §15.33 (a)
- **UNCERTAINTY OF MEASURE:** Combined uncertainty = ± 1.75 dB
Total uncertainty = $(k=2) \pm 3.5$ dB

TEST CONDITIONS:		MEASURED
Ambient temperature :	15 - 35 °C	24 $\pm$ 3 °C
Ambient humidity :	25 - 75 %rH	40 $\pm$ 5 %rH
Pressure :	85 - 106 kPa (860 mbar - 1060 mbar)	950 $\pm$ 50 mbar
Voltage :	N°2 Internal battery 1,5V	3 Vdc

OPERATING CONDITION (Rif. Section. 2) : #1**RESULT: WITHIN THE LIMIT**

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

SCAN TABLE : “Radiated Emission”

Unit: dB μ V/m

Detector : Mode:

Curve1: Max Peak ClearWrite

Curve2: -- ClearWrite

Subrange:

Start Frequency: 1000.0 MHz

Step Size: kHz

Stop Frequency: 9300.0 MHz

Probe Transducer: HL025

Measure Time: 0.01 sec.

IF Bandwidth: 1000 kHz

Receiver: FSP

Signal Path: Path 4

System Transducer: RFin2-CP1/X11

Scan Mode: Lin

Add. Transducer: W71.01

Tracking Gen.: Off

Input: 1

Preamplifier: 0 dB

Demodulation: FM Broad

RF att.: Coupled

Volume: 0.0%

Ref. Level: -50 dBm

Squelch: --

Min. RF att.: 0 dBm

Option: None

Autorange: On

Curve 1: On

Repetition: Single

Curve 2: Off

Stop Mark: On

Stop Message: On

Text: Connect antenna

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

In addition to the limits over mentioned, in according to Section 15.205 for restricted bands, the limit applied is 54 dB μ V/m

Measurement results

<i>Frequency</i> [MHz]	<i>Remark</i>	<i>AV Level</i> [dB μ V/m]	<i>+PK Level</i> [dB μ V/m]	<i>AV Limit</i> [dB μ V/m]
1832,900	Spurious	43,73	45,78	54,00
2749,351	Spurious	45,22	47,25	61,94
3665,800	Spurious	47,39	49,41	61.94
4582,250	Spurious	47,11	49,15	61.94
5498,698	Spurious	46,74	47,76	61.94
6415,149	Spurious	46,34	48,37	61.94
7331,610	Spurious	more than 20dB below limit	more than 20dB below limit	54,00
7400 < f < 10000	Spurious	more than 20dB below limit	more than 20dB below limit	54,00

6. EUT TECHNICAL DOCUMENTATION

6.1 Wiring diagrams

	<i>Document reference (n., edition, date, ...)</i>
WIRING DIAGRAM	Doc. No. TX_RF3 Issue date: 2004-06-10 Rev. 1 Sheet no. 1
PART LIST	Doc. No. TX_RF3 Issue date: 2004-06-10 Sheet no. 1

6.2 Technical manual

	<i>Document reference (n., edition, date, ...)</i>
TECHNICAL DATA	US-Uti_030921 sheet no. 20

Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

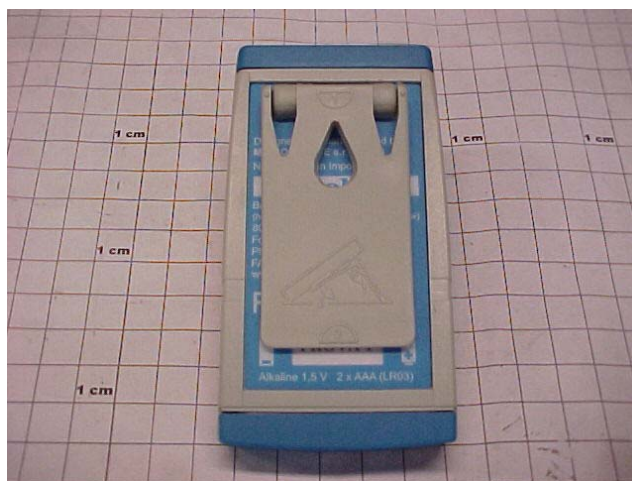
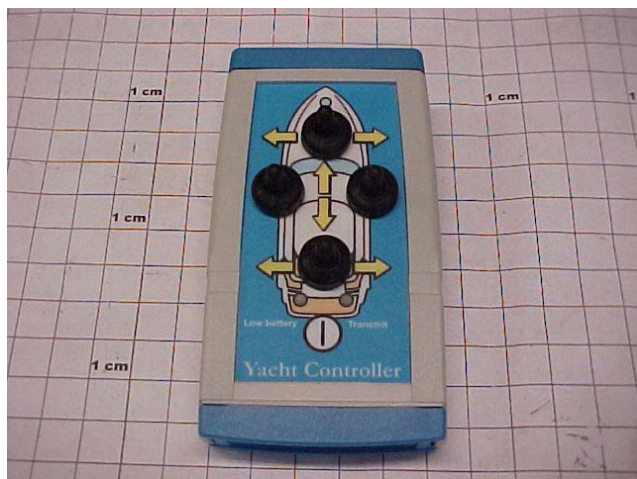
6.3 Photographic documentation

PHOTO N° 1 – EQUIPMENT UNDER TEST IDENTIFICATION



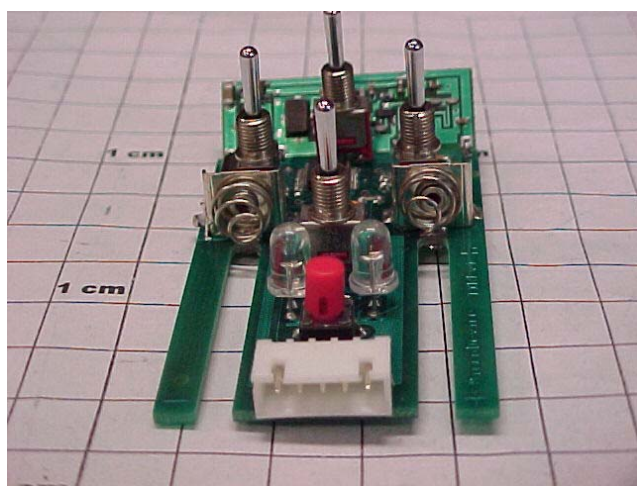
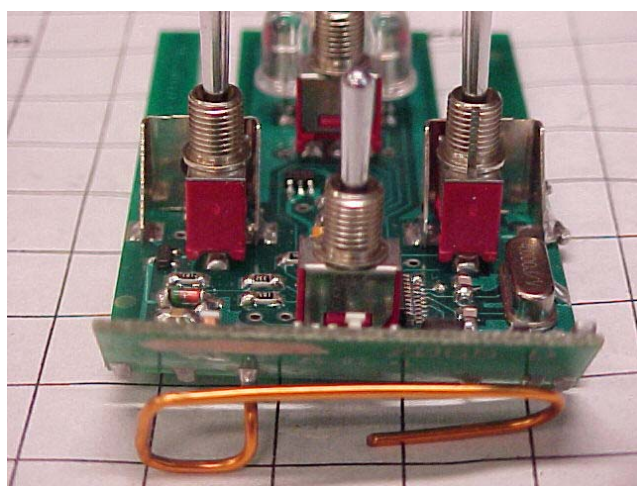
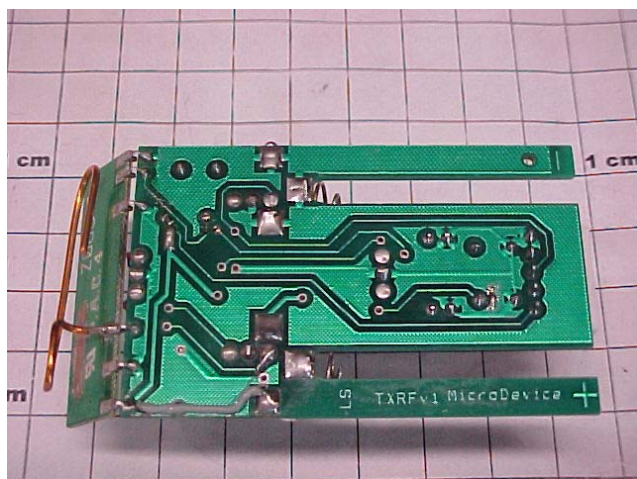
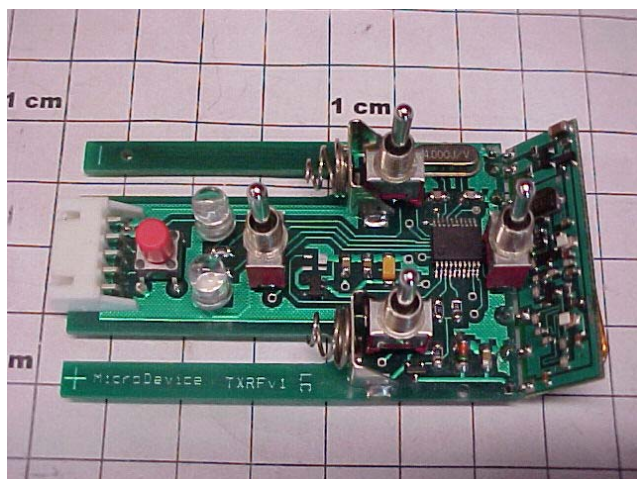
Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

PHOTO N° 2 – EQUIPMENT UNDER TEST IDENTIFICATION



Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

PHOTO N° 3 – INTERNAL VIEW



Prima Ricerca & SviluppoSrl soggetta a direzione e coordinamento da parte della Giovanni Maspero & C. S.p.A. – C.I. 02634780130
Sede legale : 22100 Tavernola (CO) Via Conciliazione, 1 Cod. FISC. e N. R.I. CO 02635860139
Sede operativa : Laboratori Via Campagna, 92 22020 Faloppio fraz. Gaggino (CO) Tel. +39 03135000.11 Fax +39 031991309

PHOTO N° 4 – SET-UP FOR EMISSION RADIATED TEST

