

**EXHIBIT 2**

copy, for original see related application LH8 R-XRADO



CARDIN ELETTRONICA S.p.A.  
Via Raffaello, 36  
31020 - SAN VENDEMIANO ( TV )  
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P.I. 00681370268

**PRODUCT NAME**  
**XRADO\_US**

DATE 30/07/1998

Report accompanying the homologation request for appliances destined to be used as radio control devices. These devices are in the LPD range (LOW POWER DEVICES).

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## 1.0 INTRODUCTION

### Manufacturer's data

Cardin Elettronica S.p.A.  
Via Raffaello, 36  
31020 San Vendemiano ( TV )  
Tel . +39-438-401818  
Fax. +39-438-401831

### Product marketing and commercial name

The system consists of the following devices:

- |  |                    |
|--|--------------------|
| - two-channel transmitter (TX2)              | cod. T-XRADO2US    |
| - four-channel transmitter (TX4)             | cod. T-XRADO4US    |
| - one-channel mini receiver (RXM1CH)         | cod. R-XRADOM1.0US |
| - two-channel mini receiver (RXM2CH)         | cod. R-XRADOM2.0US |
| - one-channel slot-in receiver card (RXS1CH) | cod. R-XRADOS1.0US |
| - two-channel slot-in receiver card (RXS2CH) | cod. R-XRADOS2.0US |

Notes:

1. the two transmitter versions (two and four-channels) only differ from one and other by the number of functions (channels) which they are able to activate from a distance. The various containers differ from one and other by the number of buttons which depend on the model. By looking at the wiring diagram it can be seen that all the transmitters feature the same radio frequency section and that only the encode section differs, due to the number of channel functions. The radioelectric behavioural of the two devices is perfectly identical;
2. the four receiver versions use the same pcb card; the differences are only in the component lists.

### Technical report drawn up by:

Ing M. Terruso  
Resp. Certif. & Approvals - Cardin Elettronica S.p.A.

## 2.0 DESCRIPTION

### 2.1 GENERAL DESCRIPTION

- Radio control system model XRADO, consisting of one or more transmitters and one or more receivers;
- Carrier frequency in the UHF waveband at 433.90 MHz;
- Highly reliable encoding system guaranteed by the use of dynamic codes. The code is changed for each encoding transmission through the use of an encoding algorithm which only the receiver is able to recognize and therefore decide whether or not the code transmitted corresponds to the memorized code;
- Each transmitter factory set with its own individual code (different for each transmitter);
- The signal is made up of a 66 bit frame which permits a maximum of 268.435.456 transmitters each with its own individual code;
- The generated code is memorized in the receiver via radio.

### 2.2 USE AND APPLICATIONS

The radio control model XRADO permits the remote activation of electrical and electronic appliances and has its best use in the following areas:

- Automatic opening systems
- Alarm systems

and in all systems which require remote activation (without wires) using secret user codes in compliance with the local safety standards in force.

### 2.3 PRODUCT DESCRIPTION

#### 2.3.1 TRANSMITTERS

- Shock-proof container
- Overall dimensions 95 x 34 x 19 mm for XRADO
- Led indicating signal emission
- Access door permitting battery replacement and user code programming
- Power supply: pencil battery 12V(model GP23A)
- Versions with up to 4 channels
- Random code combinations with dynamic code transmission

*Description*

*Product code*

**Miniaturized transmitter 2 channel**  
**Miniaturized transmitter 4 channels**

**T-XRADO2US**  
**T-XRADO4US**

2.3.2 MINI RECEIVER

- Receiver housed in a plastic box for indoor applications
- Code programming and deleting by means of two push buttons on the pcb card
- LED indicating the code memorizing
- Max number of stored codes : 300
- Codes stored on EEPROM
- Microprocessor based logic
- overall dimensions : 95 x 75 x 25 mm
- Power supply : 12 - 24 V ac/dc
- Versions with up to 2 channels
- External connections through a 10 way terminal board

<i>Description</i>	<i>Product code</i>
<b>Mini Receiver 1 channel .....</b>	<b>R-XRADOM1.0US</b>
<b>Mini Receiver 2 channels .....</b>	<b>R-XRADOM2.0US</b>

2.3.3 CARD RECEIVER

- Slot-in card receiver
- Code programming and deleting by means of two push buttons on the pcb card
- LED indicating the code memorizing
- Max number of stored codes : 300
- Codes stored on EEPROM
- Microprocessor based logic
- Card dimensions : 70 x 51 mm
- Power supply : 24 V ac/dc
- Versions with up to 2 channels
- External connections through a 10 ways connector on devices designed to receive it

<i>Description</i>	<i>Product code</i>
<b>Card Receiver 1 channel.....</b>	<b>R-XRADOS1.0US</b>
<b>Card Receiver 2 channels .....</b>	<b>R-XRADOS2.0US</b>

### 3.0 ELECTRICAL CHARACTERISTICS

#### 3.1 TRANSMITTERS

Carrier frequency.....	433.92 MHz
Tolerance on the carrier frequency .....	$\pm 75$ KHz
Bandwith.....	> 25 KHz
Apparent power harmonic products.....	< -40 dBm
Arrarent radiated power .....	$\leq -20$ dBm
Modulation .....	AM/ ASK
Signal modulation.....	PCM
Power supply.....	12 V $\pm$ 10 %
.....	(alkaline battery GP23A)
Power consumption. max .....	30 mA
Working temperature.....	-10°C + +55 °C
Code combination N° .....	> 268.000.000

#### 3.2 RECEIVERS

Operating frequency .....	433.92 MHz
Local oscillator frequency.....	433.42 MHz
Intermediate frequency IF .....	500 KHz
Tolerance on the local oscillator frequency .....	$\pm 75$ KHz
Bandwith ( RF section ) .....	$\pm 1$ MHz
Local oscillator emissions .....	< -57 dBm ( < 2 nW )
Demodulation .....	AM / ASK
Bandwith of the BF signal (ON/OFF) .....	< 3 KHz
Input impedance .....	50 $\Omega$
Sensitivity .....	1.2 $\mu$ V
Mini receiver power supply :.....	12 or 24 V ac/dc
Slot-in receiver card power supply:.....	24 V ac/dc
Rest consumption .....	8 mA
Consumption with relay excited .....	35 mA
Maximum commutable power at the relay:	
dc load .....	28 W
ac load .....	60 VA
maximum voltage .....	48 Vac/dc
Excitation delay.....	30 mS + 1 Sec
Dropout delay.....	250 mS
Operating temperature range.....	-20°C + +60 °C

**EXHIBIT 3**





**ELECTRO MAGNETIC COMPATIBILITY CONSULTING**



Consultants · Test Laboratories  
 Technical Experts · Certification Institute  
 Competent Body per EU Directive 89/336/EEC  
 Accreditation BAPT # BPT-ZE-009/94-10  
 Accredited Test Labs  
 Radio Accredited Reg TP # TTI-P-G 094/94-30  
 EMC Accredited DA Tech # TTI-P-G 074/95-21  
 Vehicle Test Acknowledgement # KBA-P 00026-96  
 FCC Listing # 31040/SIT 1300F2

EMC CONS DR. RAŠEK · Moggast 74 · D-91320 Ebermannstadt · Germany

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 Via Raffaello 36

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I-31020 San Vendemiano (TV)

Consulting · Planning · Research · Development  
 Measuring · Expertises · Certification · Seminars

L

Your reference  
 5977

Our reference  
 Rg/g-X950295AKC

Date  
 1998-07-28

Telephone: +49 - 91 94 - 90 16  
 Telefax: +49 - 91 94 - 81 25  
 E-mail: 106111.2702@compuserve.com  
 Web site: http://www.emcc.de

**Measurements on CARDIN ELETTRONICA four channel miniature transmitter T-XRADO4US**

**Test Report # X950295AKC, 1998-07-28**

CARDIN ELETTRONICA four channel miniature transmitter T-XRADO4US without specific SN was tested at EMCC Dr. Rašek Laboratories, Moggast, D-91320 Ebermannstadt, Germany, according to 47 cfr part 15.

All tests required by 47 cfr part 15 were passed.

EMCC DR. RAŠEK

tested:

Guido Rasek

checked:

Reinhard Sauerschell

**36 Pages**  
**# 1 of 2**

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Our reference  
Rg/g-X950295AKC

Date  
1998-07-28

Page

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1. Field Strength Limits
2. Radiated Emissions Test (Prescan and final measurements, TX no key pressed)
3. RE (Prescan and final measurements, TX activated)
4. Range of Modulation Bandwidth
5. Antenna Factors
6. List of Test Instruments



Our reference  
Rg/g-X950295AKC

Date  
1998-07-28

Page  
1.

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## 1. Field Strength Limits

### 1.1 Calculation of field strength limit of the fundamental frequency according to § 15.231:

$$\text{Limit} = \frac{433.92 - 260}{470 - 260} * (12500 - 3750) + 3750$$

$$\text{Limit} = 10996.6 \mu\text{V/m} = 80.825 \text{ dB}\mu\text{V/m}$$

### 1.2 Calculation of field strength limit of spurious emissions according to § 15.231:

$$\text{Limit} = \frac{433.92 - 260}{470 - 260} * (1250 - 375) + 375$$

$$\text{Limit} = 1099,6 \mu\text{V/m} = 60.825 \text{ dB}\mu\text{V/m}$$

### 1.3 The transmitter is manually operated and complies with the provisions of § 15.231 (a). The transmitter is deactivated immediately after releasing the transmit key.

*le*

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EMCC DR.RASEK

23. Jul 98 15:01

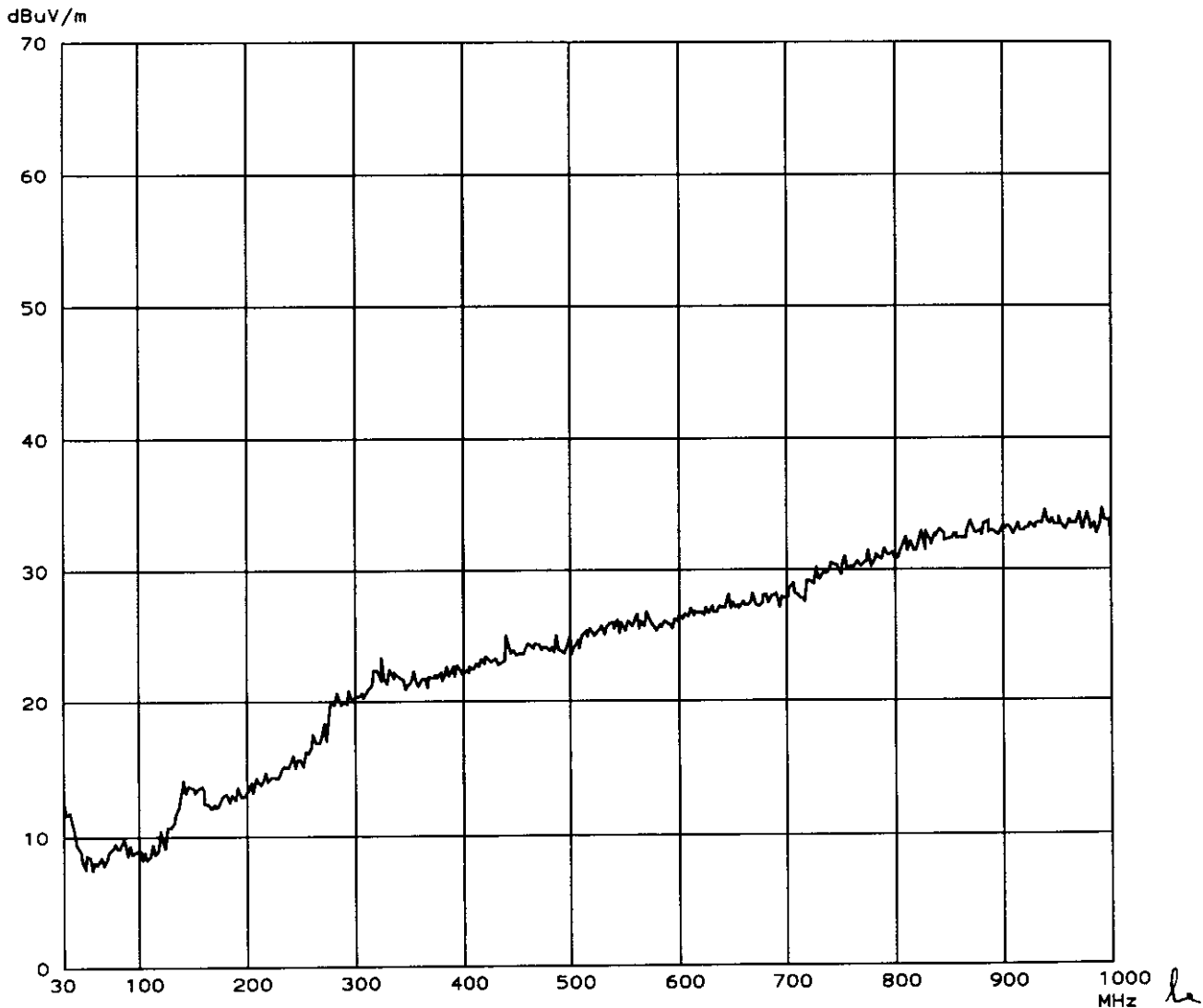
RADIATED INTERFERENCE TEST

EUT: four channel miniature TX T-XRAD04US  
 Manuf: Cardin Elettronica  
 Op Cond: no key pressed (deactivated)  
 Operator: Rasek  
 Test Spec: CFR Part 15  
 Comment: Horizontal Vertical 0, 90, 180, 270 Grad  
 Anechoic Chamber, maxhold measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	50k	120k	PK	2ms	AUTO	LN ON	60dB

Final Measurement: x Hor-Max / + Vert-Max Transducer No. Start Stop Name  
 Meas Time: 1 s 22 30M 1000M 3143#69  
 Subranges: 50  
 Acc Margin: 20dB



EMCC DR.RASEK  
RADIATED INTERFERENCE TEST

23. Jul 98 15:01

EUT: four channel minigote TX T-XRADO4US  
Manuf: Cardin Elettronica  
Op Cond: no key pressed (deactivated)  
Operator: Rasek  
Test Spec: CFR Part 15  
Comment: Horizontal Vertical 0, 90, 180, 270 Grad  
Anechoic Chamber,maxhold measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	50k	120k	PK	2ms	AUTO	LN ON	60dB

Prescan Measurement Results:

Frequency MHz	PK Level dBuV/m
30.45000	12.5
51.85000	8.5
86.20000	9.7
92.40000	9.2
120.80000	10.4
142.10000	14.2
146.45000	13.7
180.95000	13.1
203.85000	14.0
216.95000	14.8
242.10000	15.9
260.45000	17.5
277.70000	20.0
293.00000	20.7
319.10000	22.4
323.50000	23.4
353.45000	22.3
378.95000	22.1
393.75000	22.7
416.95000	23.2
421.10000	23.4
440.50000	25.0
460.60000	24.4
486.50000	25.0
514.00000	25.4
528.65000	25.7
543.10000	26.2
569.30000	26.8
586.15000	26.1
610.55000	27.1
645.35000	28.1
645.35000	28.1
668.00000	28.2
690.30000	28.2
727.05000	30.2
741.45000	30.5
753.80000	31.0
774.70000	31.4
789.35000	31.6
823.20000	32.9
828.25000	32.9
840.40000	33.1
882.60000	33.2
869.50000	33.7

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1998-07-28

2.3

885.70000	33.7
938.80000	34.5
938.80000	34.5
952.00000	34.0
992.35000	34.6
992.35000	34.6

23. Jul 98 15:01





Rg/g-X950295AKC

1998-07-28

2.5

EMCC DR. RASEK  
Moggast  
D-91320 Ebermannstadt

Projekt# <b>X950295AKC</b>	Date	Name
gemessen, tested:	23.07.98	Rasek <b>Rg</b>
geprüft, checked:	98-07-30	<b>Rg</b>

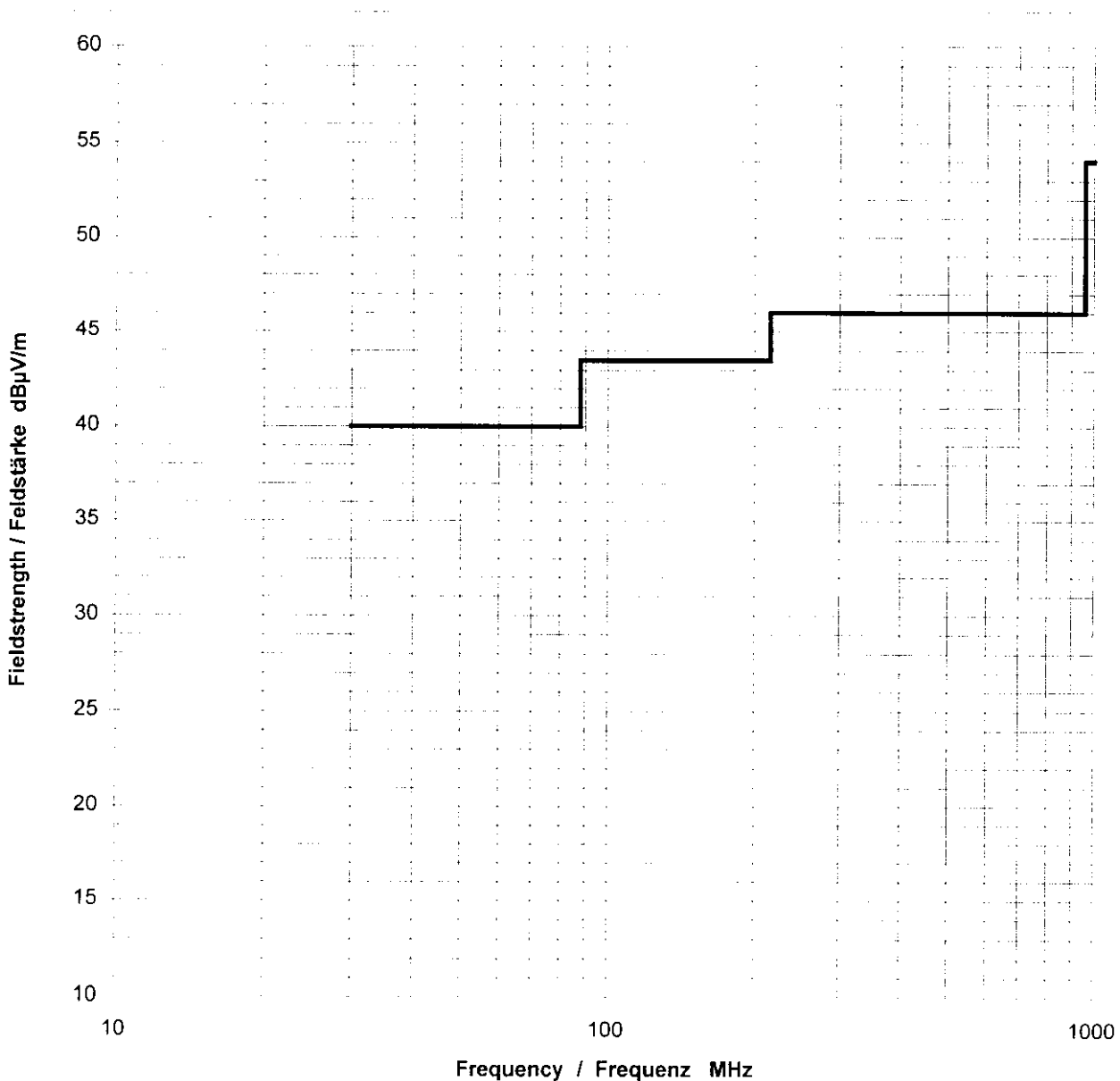
Field Intensity Test, Feldstärkemessung

FCC §15.109

Antenna: EMCO 3143, SN 1269 (3m)

Meßabstand, Test Distance: 3 m

Gerätetyp, Unit type:	four channel mineature TX T-XRADO4US
Ser.-Nr., S/N:	none
Betr.-Zustand, Oper. condition:	no key pressed, deactivated
Hersteller, Manufacturer:	Cardin Elettronica

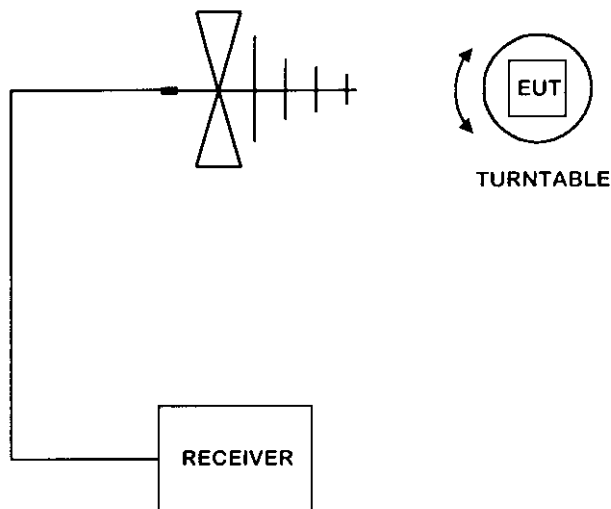


● Result, Meßergebnis    — Limit, Grenzwert



# MESSUNG GESTRAHLTER EMISSIONEN

## RADIATED EMISSIONS TEST / PRESCAN and final measurements 1 - 5 GHz



TEST SETUP FOR RADIATED EMISSIONS TEST

NETZ / MAINS  
DC / 50 Hz / 60 Hz / 400 Hz

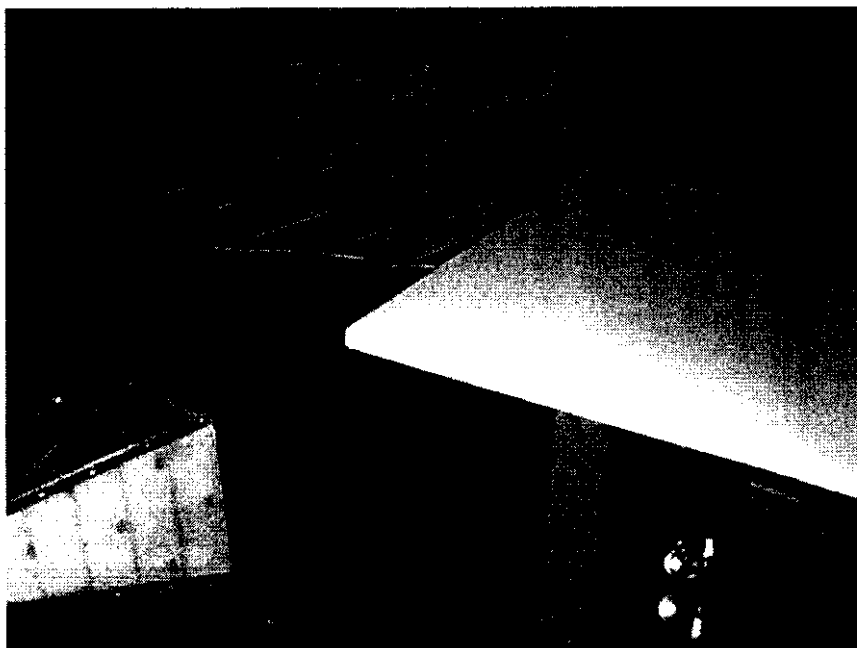
12 V internal battery

ANTENNE/ANTENNA

EMCO 3115

ABSTAND / DISTANCE  
 FROM ANTENNA TO EUT

prescan at 1 m  
 final measurements at 3 m



GERÄT / ANLAGE / DEVICE / SYSTEM

TYPE CARDIN ELETTRONICA four channel miniature TX T-XRADO4US

SN

PROJ. # X950295AKC

GEZEICHNET / DRAWN

GEPRÜFT / CHECKED

TAG / DAY

1998-07-24

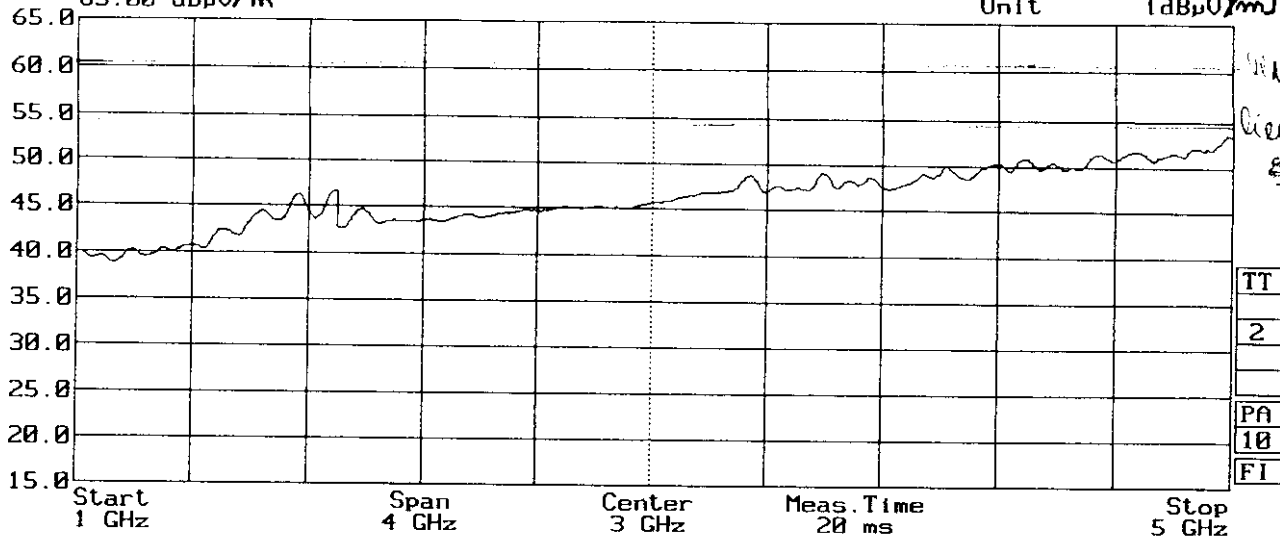
98-07-30

NAME

Rg  
 Ra

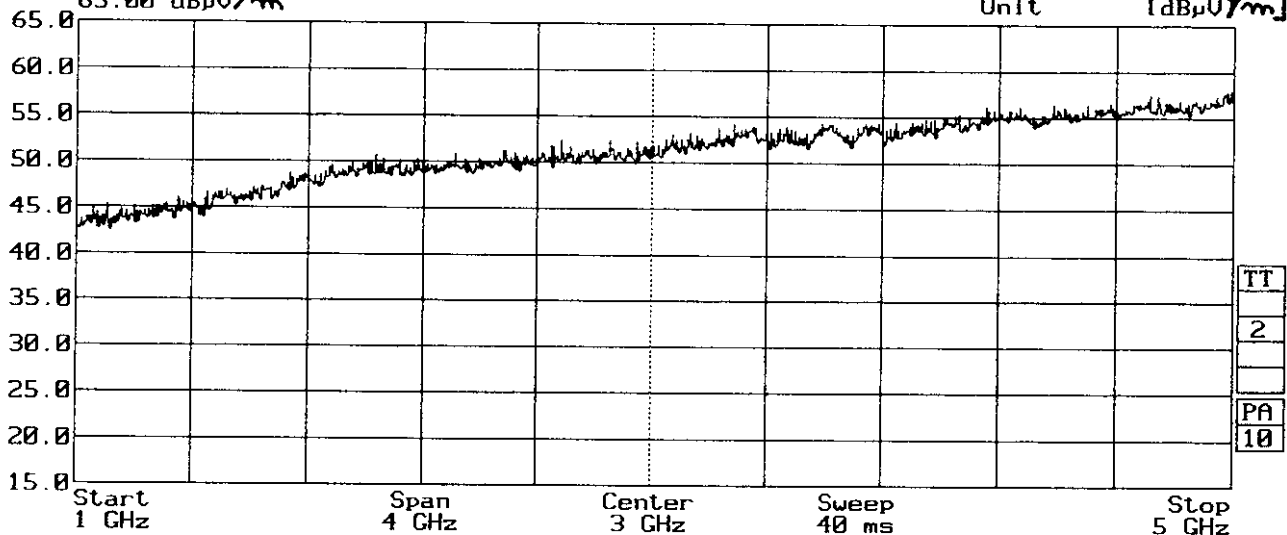
ES Date 23.Jul.'98 Time 17:17:47  
Ref.Lvl  
65.00 dBμV/m

Res.Bw 1 MHz[imp] T1:AV T3:  
TG.Lvl off T2: T4:  
Scan.Stp 500.000 kHz RF.Att Unit 10 dB  
[dBμV/m]



ES Date 23.Jul.'98 Time 17:27:05  
Ref.Lvl  
65.00 dBμV/m

Res.Bw 1 MHz[imp] Vid.Bw 3 MHz  
TG.Lvl off RF.Att Unit 0 dB  
CF.Stp 400.000 MHz [dBμV/m]



TX no key pressed (deactivated)

upper: final measurements with AV detector at 3 m distance

lower: prescan with PK detector at 1 m distance, vertical and horizontal max. hold, no emissions detected

EUT: CARDIN ELETTRONICA four channel miniature TX T-XRADO4US

h

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RADIATED INTERFERENCE TEST

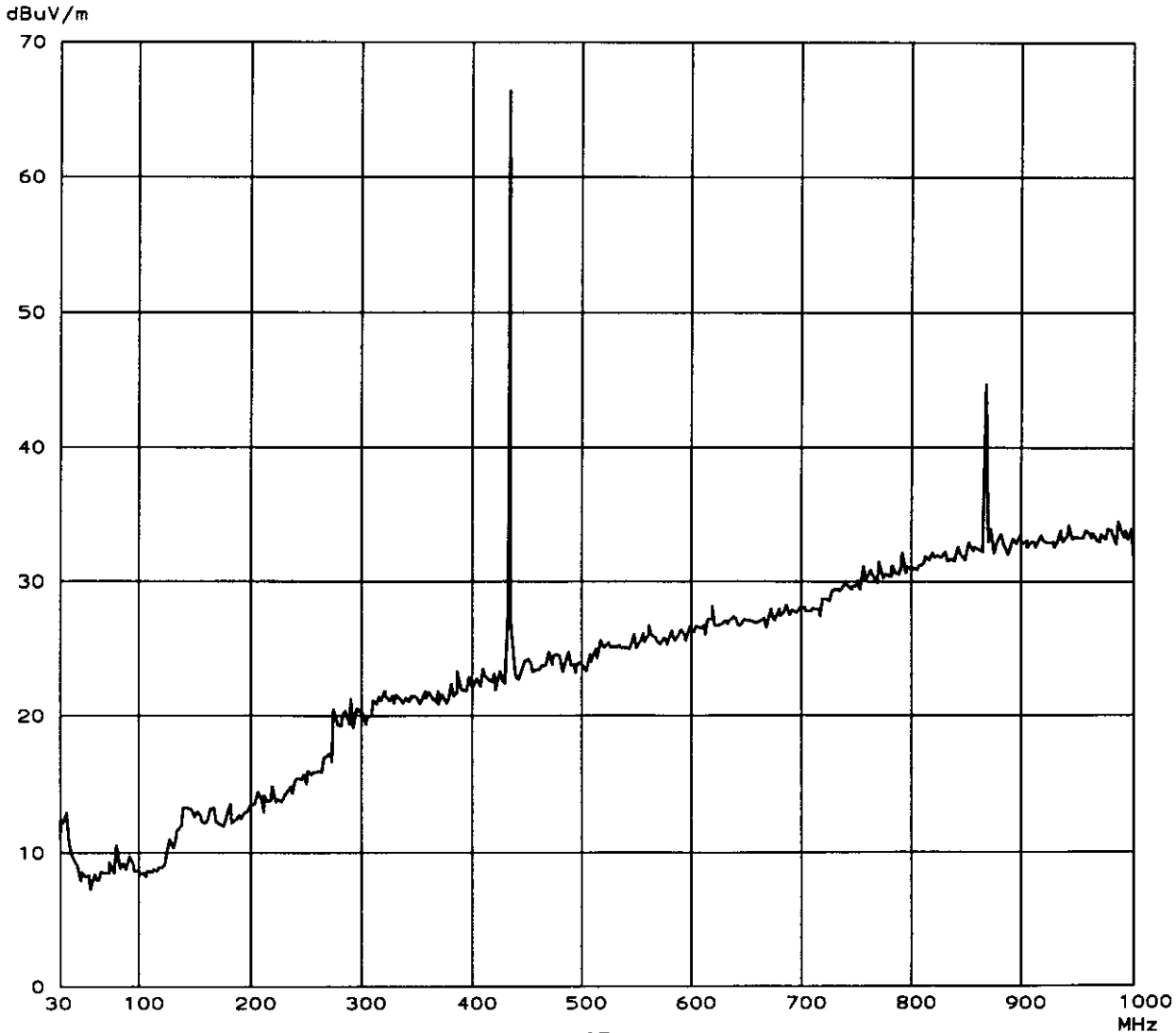
23. Jul 98 13:10

EUT: four channel miniature TX T-XRADO4US  
Manuf: Cardin Elettronica  
Op Cond: transmission mode  
Operator: Rasek  
Test Spec: CFR Part 15  
Comment: Horizontal Vertical 0, 90, 180, 270 Grad  
Anechoic Chamber, maxhold measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	50k	120k	PK	2ms	AUTO	LN ON	60dB

Final Measurement: x Hor-Max / + Vert-Max Transducer No. Start Stop Name  
 Meas Time: 1 s 22 30M 1000M 3143#69  
 Subranges: 50  
 Acc Margin: 20dB



*la*

EMCC DR.RASEK

23. Jul 98 13:10

RADIATED INTERFERENCE TEST

EUT: four channel miniature TX T-XRADO4US  
 Manuf: Cardin Elettronica  
 Op Cond: transmission mode  
 Operator: Rasek  
 Test Spec: CFR Part 15  
 Comment: Horizontal Vertical 0, 90, 180, 270 Grad  
 Anechoic Chamber,maxhold measurement

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
30M	1000M	50k	120k	PK	2ms	AUTO	LN ON	60dB

Prescan Measurement Results:

Frequency MHz	PK Level dBuV/m
36.25000	12.8
49.90000	8.6
79.95000	10.4
91.90000	9.7
125.25000	9.7
144.25000	13.2
146.80000	13.1
181.85000	13.5
203.60000	13.5
219.20000	14.9
241.15000	15.4
261.45000	16.0
274.20000	20.4
290.05000	21.2
320.80000	21.8
330.75000	21.6
357.35000	21.8
369.35000	21.8
386.50000	23.3
409.90000	23.5
433.90000	66.3
450.55000	24.2
469.60000	24.8
487.75000	24.7
512.40000	25.0
516.75000	25.6
547.30000	26.1
561.55000	26.8
590.90000	26.5
611.85000	26.8
619.70000	28.2
638.40000	27.4
666.25000	27.3
685.70000	28.3
702.55000	28.2
727.50000	29.3
740.15000	30.0
755.75000	31.1
770.20000	31.4
792.35000	32.1
819.65000	32.1
843.10000	32.6
852.35000	32.9
867.90000	44.7

Rg/g-X950295AKC

1998-07-28

3.3

899.15000	33.4
917.55000	33.4
935.15000	33.8
942.60000	34.2
977.05000	33.9
986.90000	34.5

23. Jul 98 13:10



**EMCC DR. RASEK**  
**Moggast**  
**D-91320 Ebermannstadt**

Projekt#	X950295AKC	Date	Name
gemessen, tested:		98-07-24	RG <i>lg</i>
geprüft, checked:		98-07-30	Sa <i>la</i>

**Field Intensity Test, Feldstärkemessung**

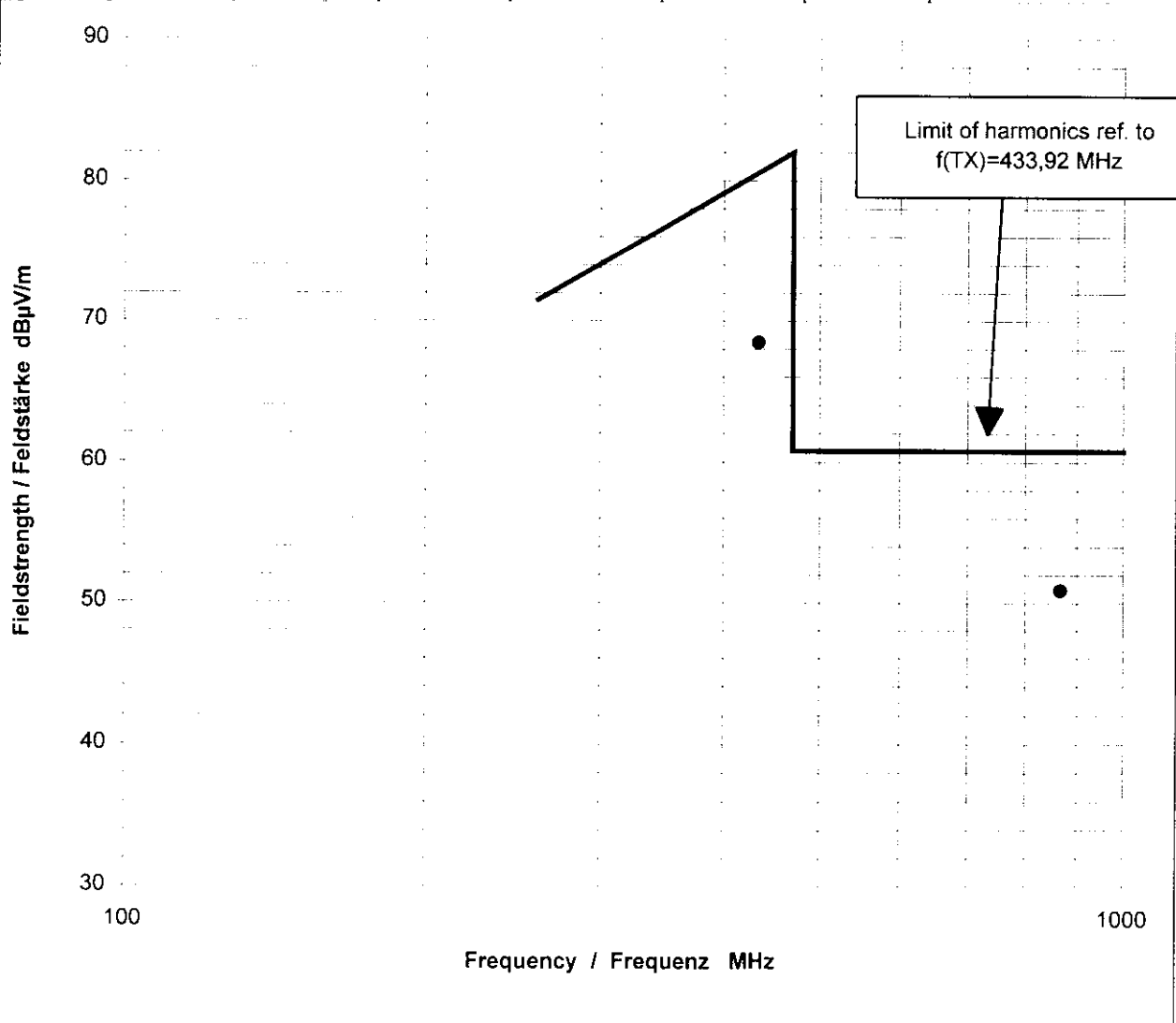
FCC §15.231

Antenna: EMCO 3143, SN 1269

Meßabstand, Test Distance: 3 m

Gerätetyp, Unit type:	T-XRADO4US
Ser.-Nr., S/N:	none
Betr.-Zustand, Oper. condition:	activated
Hersteller, Manufacturer:	CARDIN

Frequency Frequenz	Reading Anzeigewert	Antenna Faktor Antennenfaktor	Result Meßwert	Limit Grenzwert	Out of limits Überschreitung	Polarisation	Remarks Bemerkungen
MHz	dBµV	dB	dBµV/m	dBµV/m	dB		
433,9	49	19,5	68,5	80,8		v	AV, carrier
867,87	24	26,9	50,9	60,8		v	AV, 2nd harmonic



Rg/g-X950295AKC

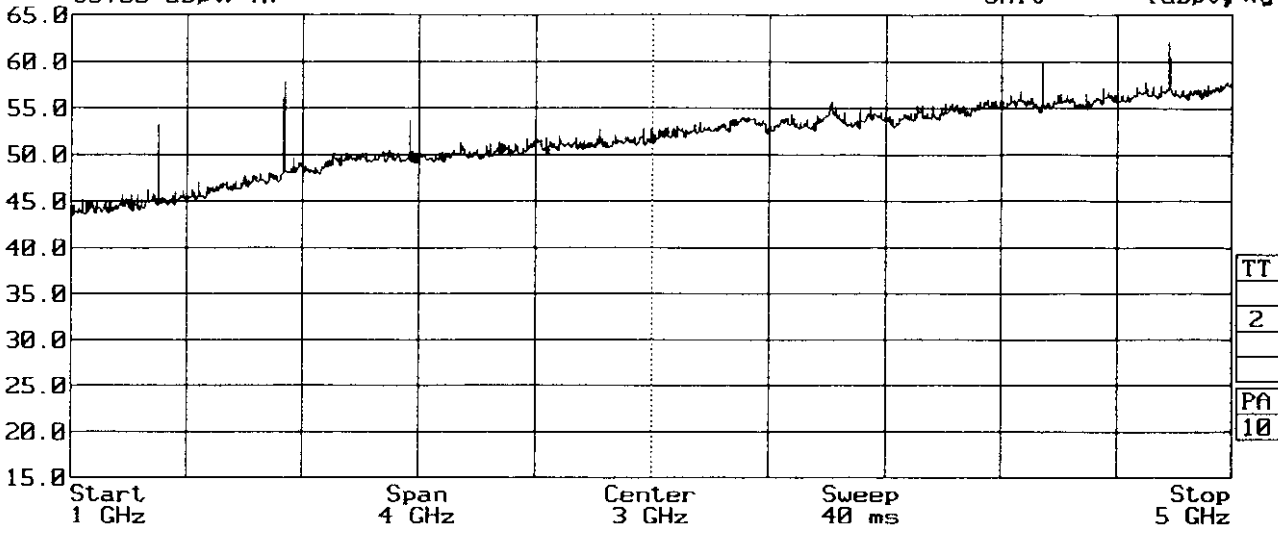
1998-07-28

3.7



Date 23 Jul '98 Time 17:37:39  
 Ref. Lvl 65.00 dBµV/m

Res. Bw 1 MHz [imp] Vid. Bw 3 MHz  
 TG. Lvl off  
 CF. Stp 400.000 MHz RF. Att Unit 0 dB [dBµV/m]



TX transmitting

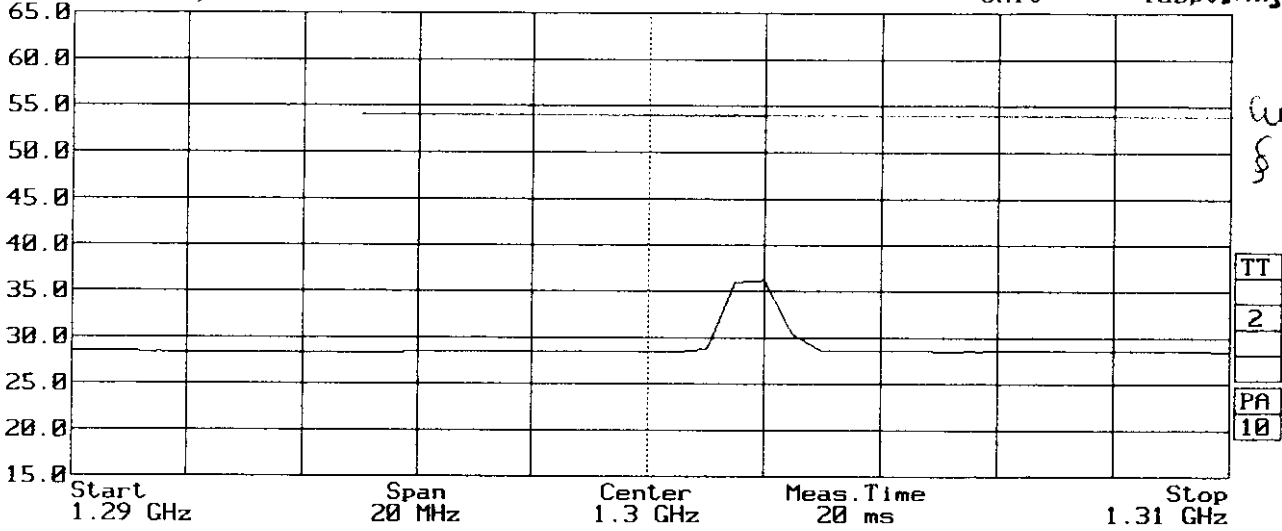
prescan at 1 m distance, PK detector, horizontal and vertical max. hold

EUT: CARDIN ELETTRONICA four channel miniature TX T-XRADO4US

*la*

Date 23 Jul '98 Time 18:10:07  
Ref. Lvl 65.00 dBµV/m

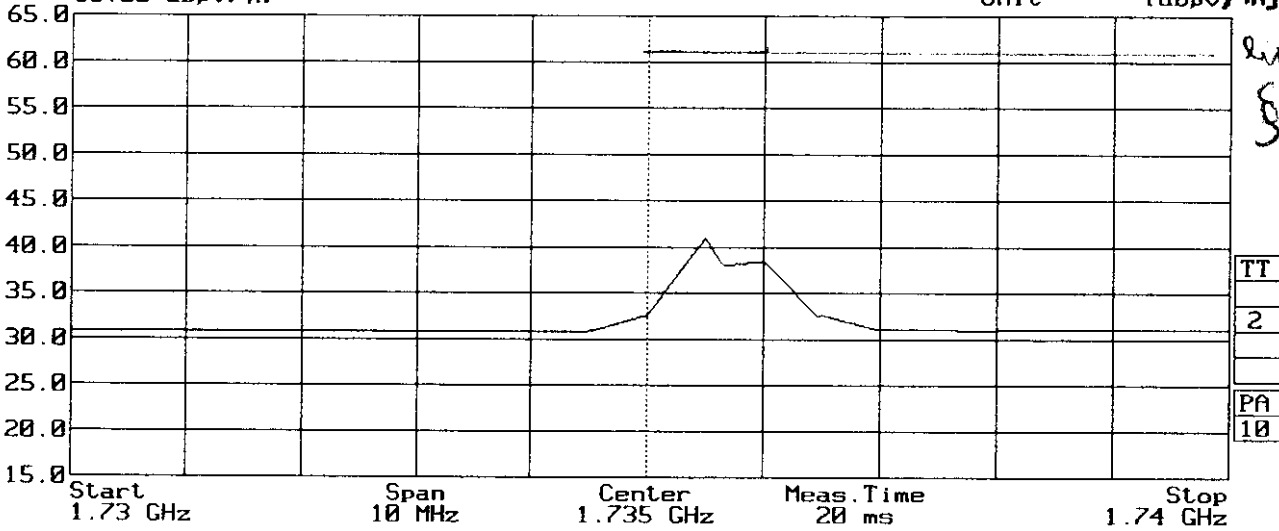
Res. Bw 1 MHz [imp] T1: AVG T3:  
TG. Lvl off T2: T4:  
Scan. Stp 500.000 kHz RF. Att 0 dB  
Unit [dBµV/m]



Limit acc. to § 15.209

Date 23 Jul '98 Time 18:17:39  
Ref. Lvl 65.00 dBµV/m

Res. Bw 1 MHz [imp] T1: AVG T3:  
TG. Lvl off T2: T4:  
Scan. Stp 500.000 kHz RF. Att 0 dB  
Unit [dBµV/m]



Limit acc. to § 15.231

final measurements with AV detector at 3 m distance,  
vertical and horizontal max. hold

EUT: CARDIN ELETTRONICA four channel miniature TX T-XRADO4US

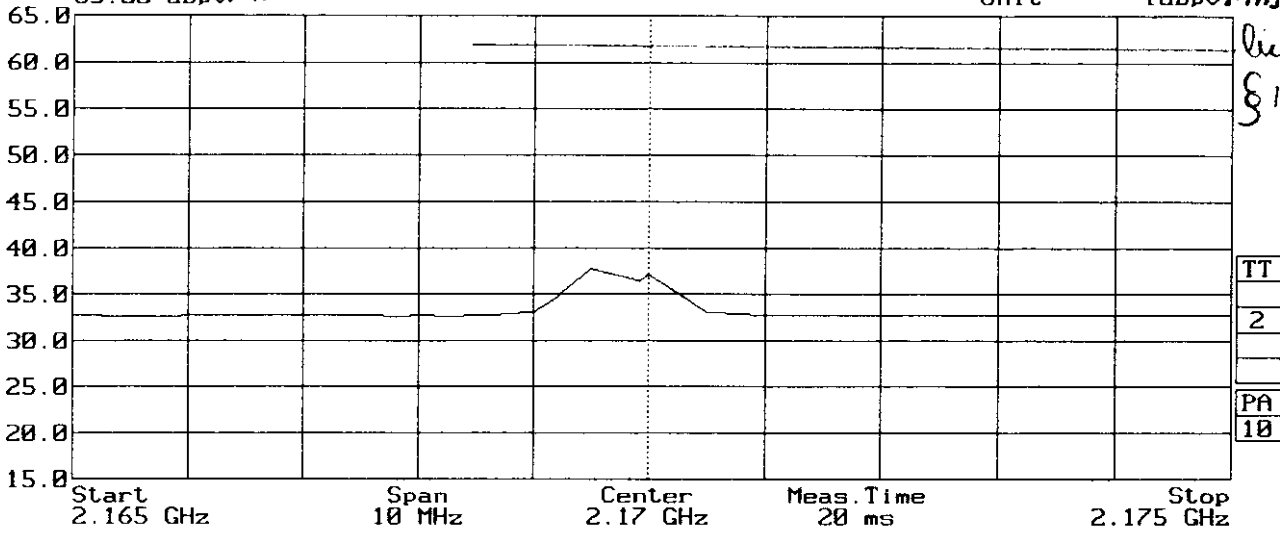
h





Date 23.Jul.'98 Time 18:25:11  
 Ref.Lvl  
 65.00 dBµV/m

Res.Bw 1 MHz [imp] T1: AVG T3:  
 TG.Lvl off T2: T4:  
 Scan.Stp 500.000 kHz RF.Att 0 dB  
 Unit [dBµV/m]

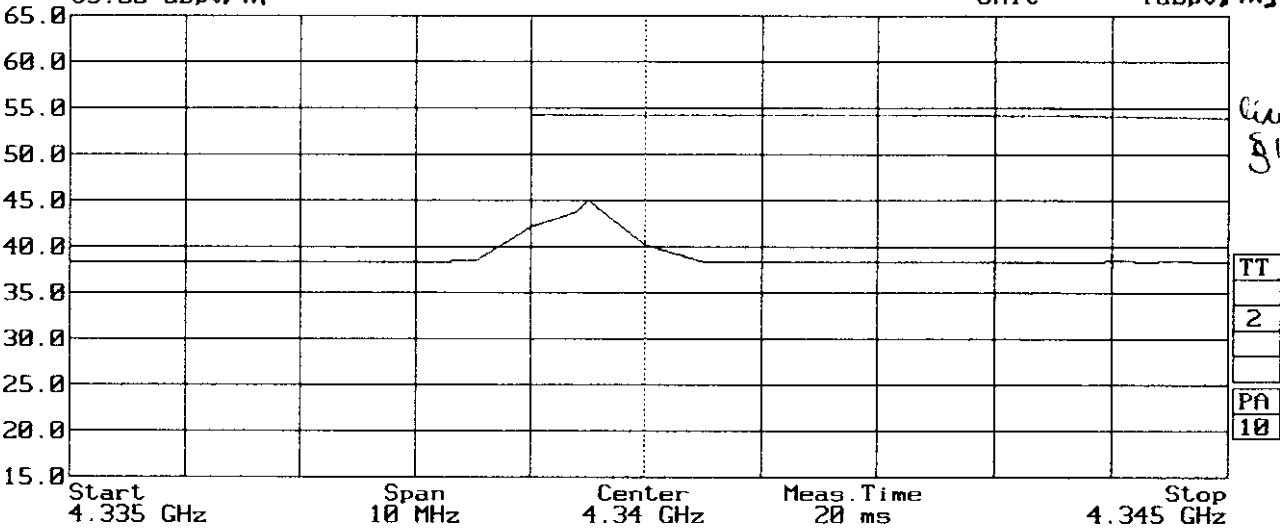


*Limit acc. to §15.231*



Date 23.Jul.'98 Time 18:30:09  
 Ref.Lvl  
 65.00 dBµV/m

Res.Bw 1 MHz [imp] T1: AVG T3:  
 TG.Lvl off T2: T4:  
 Scan.Stp 500.000 kHz RF.Att 0 dB  
 Unit [dBµV/m]



*Limit acc. to §15.209*

final measurements with AV detector at 3 m distance,  
 vertical and horizontal max. hold

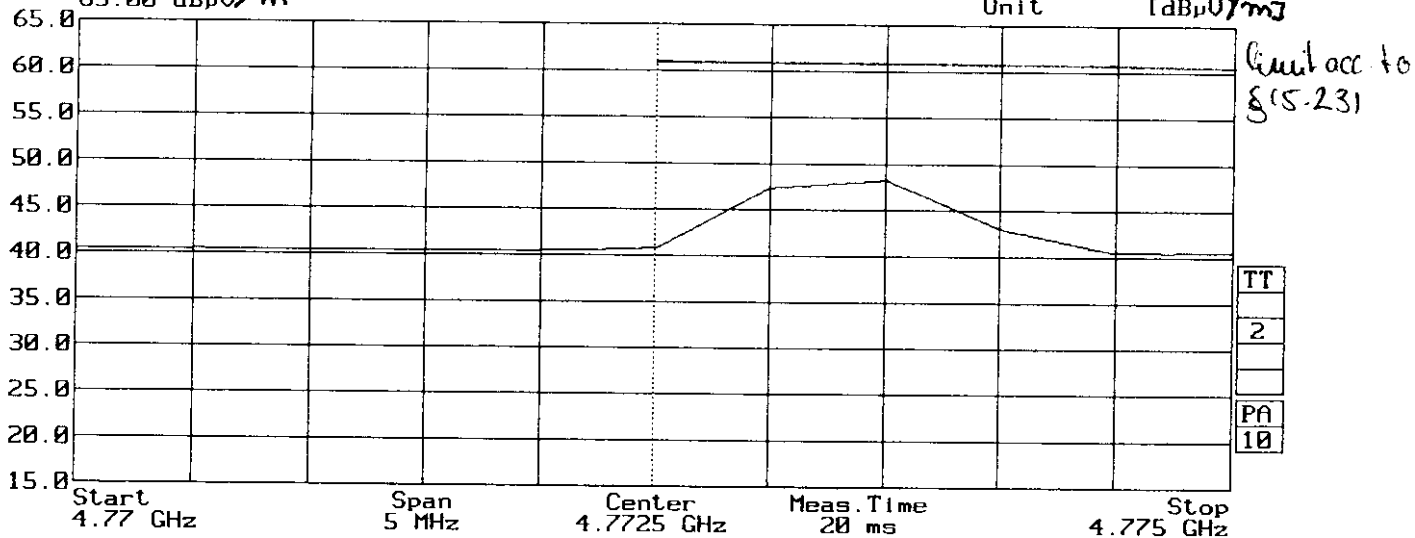
EUT: CARDIN ELETTRONICA four channel miniature TX T-XRADO4US

*h*



Date 23.Jul.'98 Time 18:38:10  
Ref.Lvl  
65.00 dBμV/m

Res.Bw 1 MHz [imp] T1: AVG T3:  
TG.Lvl off T2: T4:  
Scan.Stp 500.000 kHz RF.Att 0 dB  
Unit [dBμV/m]



final measurements with AV detector at 3 m distance,  
vertical and horizontal max. hold

Conclusion: all emissions within limits

EUT: CARDIN ELETTRONICA four channel miniature TX T-XRADO4US

*la*

**FELDFELDSTÄRKEMESSUNG / RADIATED EMISSIONS**

ANTENNA: EMCO 3315  
 ANTENNA DISTANCE: 3 m

47 CFR part 15

0  
0  
0

TEST BW	FREQU. Hz	ANZEIGE READING dB <sub>μ</sub> V	KORREKT. CORRECT. ANTENNA dB/m	KORREKT. CORRECT. BW dB	ERGEBNIS RESULT dB <sub>μ</sub> V/m	GRENZ- WERT LIMIT dB <sub>μ</sub> V/m	BEMERKUNGEN REMARKS	TEST BW kHz	FREQU. Hz	ANZEIGE READING dB <sub>μ</sub> V	KORREKT. CORRECT. ANTENNA dB/m	KORREKT. CORRECT. BW dB	ERGEBNIS RESULT dB <sub>μ</sub> V/m dB <sub>μ</sub> V/m MHz	GRENZ- WERT LIMIT dB <sub>μ</sub> V/m dB <sub>μ</sub> V/m MHz	BEMERKUNGEN REMARKS
	1,3 GHz				36	54	rest. band.								
	1,735 GHz				41	60,8									
	2,17 GHz				37	60,8									
	4,34 GHz				45	54	rest. band.								
	4,77 GHz				48	60,8									
conclusion: all emissions within limit															
GERÄT / ANLAGE / DEVICE / SYSTEM															
TYPE CARDIN ELETTRONICA four channel miniature TX T-XRADO4US															
SN															
										NAME		EMCC DR. RASEK			
										Rasek		Moggast			
										TAG / DAY		D-91320 Ebermannstadt			
										1998-07-23					
										98-07-30					
										GEPRÜFT / CHECKED					
										GEMESSEN / TESTED					
										PROJ. # X950295AKC					

Fernstudie 1998-07-28

**EXHIBIT 4**

copy, for original see related application LH8 R-XRADO

EMCC DR. RAŠEK  
Moggast  
D-91320 Ebermannstadt  
Germany  
T: +49-9194-9016  
F: +49-9194-8125

## POWER OF ATTORNEY

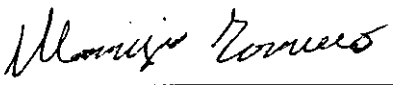
This is to confirm that we authorize

EMCC DR. RAŠEK  
Moggast 72-74  
D-91320 Ebermannstadt  
Germany  
T: +49-9194-9016  
F: +49-9194-8125

to apply at the FCC in USA for approvals for the product

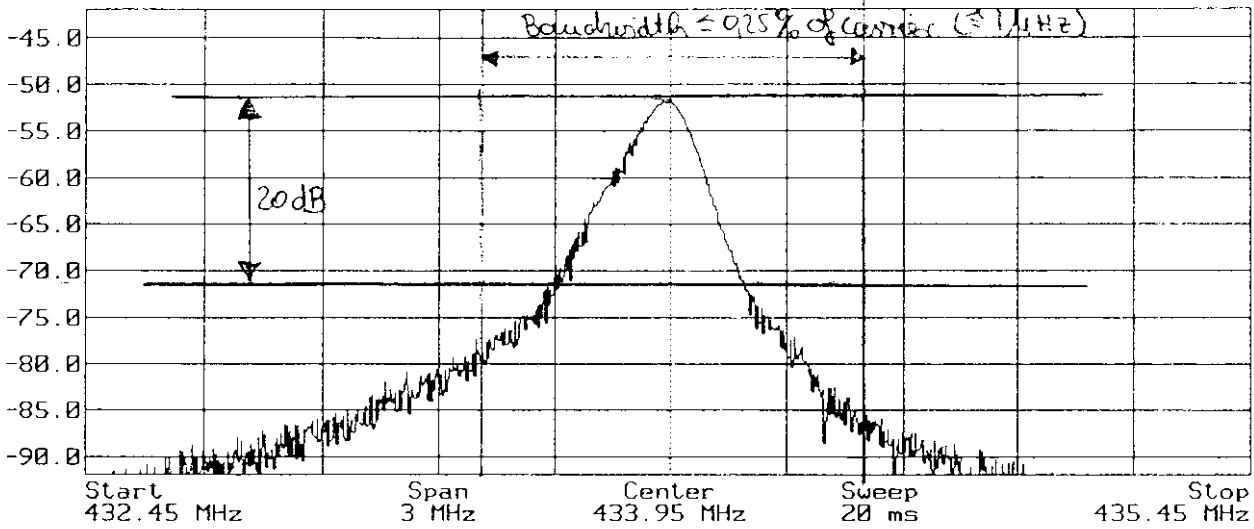
(type, model)	XRADO-US (TRANSMITTERS AND RECEIVERS)
---------------	---------------------------------------

in behalf of

(Company)	CARDIN ELETTRONICA S.P.A.
(Department)	R. & D.
(Street/#)	VIA RAFFAELLO, 36
(Town)	SAN VENEZIANO (TV)
(Country, Postal Code)	I - 31020
(Tel #)	+39/438/401818
(Fax #)	+39/438/401831
(Date)	27/07/98
(Signature, blue ink, stamp)	
(Name, print)	MAURIZIO TERRUSO



Date 24 Jul '98 Time 10:20:11  
 Res. Bw 120.8 kHz [3dB] Uid. Bw 300 kHz  
 Ref. Lvl -42.00 dBm TG. Lvl off  
 CF. Stp 2.000 kHz RF. Att 0 dB  
 Unit [dBm]



bandwidth emission acc. to § 15.231 (C);  
 bandwidth fulfills requirements

EUT: CARDIN ELETTRONICA four channel miniature TX T-XRADO4US

*la*

Antenna Factor	EMCO 3143	S/N 1269
Frequency MHz	Antenna Factor 3 m with cable attenuation (cable reel + 10 m coaxial line link) dB (1/m)	
26	13,3	
28	13,3	
30	13,2	
40	10,5	
50	7,4	
60	6,9	
70	8,5	
80	9,5	
90	9,1	
100	8,5	
110	8,3	
120	8,5	
130	9,5	
140	11,4	
150	11,8	
160	10,9	
170	10,7	
180	11	
190	11,4	
200	12	
225	12,9	
250	14,3	
275	15,7	
300	17,2	
325	17,6	
350	17,5	
375	17,8	
400	18,7	
425	19,1	
450	20,1	
475	20,7	
500	20,9	
525	22	
550	22,8	
575	22,9	
600	23,4	
625	23,8	
650	24,2	
675	24,4	
700	24,9	
725	24,9	
750	25,6	
775	25,9	
800	25,6	
825	26,3	
850	26,5	
875	27	
900	27,7	
925	27,5	
950	27,6	
975	28,2	
1000	28,8	

GAIN AND ANTENNA FACTORS  
EMCO MODEL 3115  
DOUBLE RIDGED GUIDE ANTENNA

S/N 2073

1 METER CALIBRATION (r = 1 m)

FREQUENCY (MHz)	NUMERIC GAIN $G_i$	POWER GAIN $g_i$ =10.log $G_i$	NUMERIC GAIN related to half-wave dipole $G_{D/2}$ = $G_i$ :1,64	POWER GAIN $g_{D/2}$ (dB) =10.log $G_{D/2}$ = $g_i$ -2,15dB	ANTENNA FACTOR (dB) af=20.log(9,76/ $\lambda$ . $G_i^{1/2}$ )
1000	4,189	6,22	2,55	4,07	24,0
1500	6,656	8,23	4,06	6,08	25,5
2000	7,049	8,48	4,30	6,33	27,8
2500	8,318	9,20	5,07	7,05	29,0
3000	7,929	8,99	4,83	6,84	30,8
4000	9,422	9,74	5,75	7,95	32,5
5000	10,497	10,21	6,40	8,06	34,0
6000	12,596	11,00	7,68	8,85	34,8
7000	12,365	10,92	7,54	8,77	36,2
8000	13,341	11,25	8,13	9,10	37,1
9000	15,008	11,76	9,15	9,61	37,6
10000	16,676	12,22	10,17	10,07	38,0
11000	14,571	11,63	8,88	9,49	39,4
12000	17,835	12,51	10,88	10,36	39,3
12400	29,209	14,66	17,81	12,51	37,5
13000	30,622	14,86	18,67	12,71	37,7
14000	29,391	14,68	17,92	12,53	38,5
15000	22,294	13,48	13,59	11,33	40,3
16000	37,688	15,76	22,98	13,61	38,6
17000	22,518	13,52	13,73	11,38	41,3
18000	30,017	14,77	18,30	12,63	40,6

SPECIFICATION COMPLIANCE TESTING FACTOR (1 METER SPACING) TO BE ADDED TO RECEIVER METER READING IN dB $\mu$ V TO CONVERT TO FIELD INTENSITY IN dB $\mu$ V/m.

POWER REQUIREMENTS FOR FIELD STRENGTHS AT SPACING r

$$E = (30 \cdot G_i \cdot P)^{1/2} / r$$

$$r = 1 \text{ m}$$

$$E = (30 \cdot G_i \cdot P)^{1/2}$$

$$r = 0,5477 \text{ m}$$

$$E = (100 \cdot G_i \cdot P)^{1/2}$$

$$e = 14,8 + 10 \cdot \log G_i + 10 \cdot \log P$$

$$e = 14,8 \text{ dB} + g_i + p$$

$$e = 20 \text{ dB} + g_i + p$$

- $g_i = 25 \text{ dB}$       $e = \text{ca. } p + 40$
- $g_i = 20 \text{ dB}$       $e = \text{ca. } p + 35$
- $g_i = 15 \text{ dB}$       $e = \text{ca. } p + 30$

- $g_i = 25 \text{ dB}$       $e = p + 45$
- $g_i = 20 \text{ dB}$       $e = p + 40$
- $g_i = 15 \text{ dB}$       $e = p + 35$

EMCC DR. RAŠEK  
Moggast  
D-01320 Ebermannstadt