

**TEST REPORT # EMCC-950295AOA, 2000-NOV-21**

**EQUIPMENT UNDER TEST:**

Trade Name: S435  
Model: RMS435200.0US  
Serial No: None  
Equipment Category: Receiver  
Manufacturer: CARDIN ELETTRONICA SPA  
Address: Via Raffaello 36  
31020 S. Vendemiano (TV)  
Italy  
  
Phone: +39-0438-401818  
Fax: +39-0438-401831

**RELEVANT STANDARD:** 47 CFR Part 15B - Unintentional Radiators

**MEASUREMENT PROCEDURE USED:**

ANSI C63.4-1992       FCC/OET MP-4 (1987)       Other

**TEST REPORT PREPARED BY:**

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**TEST PERSONNEL:**

Reinhard Sauerschell

**SIGNATURE OF THE COMPANY OFFICIAL:**



Dr. Werner G. Rašek  
- President-

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**TEST OF CARDIN ELETTRONICA SPA S435 MODEL RMS435200.0US TO 47 CFR PART 15B - UNINTENTIONAL RADIATORS**

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## 1 GENERAL INFORMATION

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### 1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unintentional radiators operating under section 15.101 ff. of the Code of Federal Regulations title 47.

### 1.2 Limits and Reservations

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report.

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### 1.3 Test Location

Company Name: EMCC DR. RAŠEK  
Street: Moggast 72-74  
City: 91320 Ebermannstadt  
Country: Germany  
Laboratory: Test Laboratory of EMCC DR. RAŠEK  
FCC Registration Number: 90566  
This site has been fully described in a report submitted to the FCC, and accepted in the letter dated February 09, 2000 Registration Number 90566.

Phone: +49-9194-9016  
Fax: +49-9194-8125  
E-Mail: emc.cons@emcc.de  
Web: www.emcc.de

### 1.4 Manufacturer

Company Name: CARDIN ELETTRONICA SPA  
Street: Via Raffaello 36  
City: 31020 S. Vendemiano (TV)  
Country: Italy

Name for contact purposes: Mr. Maurizio Terruso  
Phone: +39-0438-401818  
Fax: +39-0438-401831  
E-mail: cert@cardin.it

### 1.5 Dates

Date of receipt of EUT: CW 42/2000  
Test date: CW 42-43/2000

## 2 PRODUCT DESCRIPTION

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### 2.1 Equipment Under Test (EUT)

Device:	Remote Control (RF) Superheterodyne Receiver for automatic opening systems and alarm systems
Model:	RMS435200.0US (2 channel <sup>1</sup> variant, most complex)
Serial Number:	None
Power:	12/24 VDC/AC from battery or power supply
Receive Frequency:	433.92 MHz, one RF channel
Antenna:	external
Interface ports:	relay output ports for switching purposes
FCC ID:	LH8RM-S435

The receiver to be tested is the most complex variant of the family. The less complex variant is the one channel variant (model: RMS435100.0US) and consists of the same printed circuit board, but with less assembled devices, i.e. output stage with relay is installed for one time.

### 2.2 Configuration and Peripherals of EUT

The EUT was tested as stand-alone device, but with AC/DC power supply EA 3050, SN 001 (standard power supply with transformer, bridge rectifier and capacitor, no further electronical regulator). The antenna (16 cm rod antenna) provided by the manufacturer was installed and used during tests. Cables were attached to the relay output ports.

### 2.3 Mode of Operation During Testing

The receiver were tested in a typical fashion. During testing the receiver operated with and without its appropriate receive signal.

### 2.4 Modifications Required for Compliance

None.

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<sup>1</sup> The expression channel refers here not to the RF channel, it is a command or operational channel.

### 3 TEST RESULTS SUMMARY

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#### Summary of Test Results Receiver, model RMS435200.0US

Requirement	CFR Section	Report Section	Test Result
Conducted Emissions	15.107	4	Pass
Radiated Spurious Emissions	15.109, 15.205(b)	5	Pass

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4 - 1992 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report.

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report.

Test Personnel: Reinhard Sauerschell  
Issuance Date: 2000-11-21

## 4 CONDUCTED EMISSIONS TESTS

Test Requirement: FCC CFR47, Part 15B

Test Procedure: ANSI C63.4:1992

### 4.1 Regulation

Section 15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

Section 15.107 (f) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

### 4.2 Test Equipment

Type	Manufacturer/ Model No.	Serial No.	Last Calibration	Next Calibration
Receiver (30 MHz - 1 GHz)	Rohde & Schwarz ESS	825132/015	March 2000	March 2001
V-LISN 50 ohms/(50 $\mu$ H + 5 ohms)	Schwarzbeck NNLA8119(mod) (NSLK8127)	253	May 2000	May 2002

### 4.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Floor standing equipment is placed directly on the groundplane. Any supplemental grounding mechanisms are connected, if appropriate. The EUT is connected to its associated peripherals, with any excess I/O cabling bundled to approximately 1 meter. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN circuit. The LISNs are bonded to the groundplane.

Conducted measurements are made on each current carrying conductor with respect to ground.

The EUT was tested as a tabletop equipment, connected with the power supply to provide the 24 VAC operation power. During testing the receiver operated with and without its appropriate receive signal. The initial step in collecting conducted data is a peak scan of the measurement range with an EMI test receiver. The significant peaks are then measured with quasi-peak detector.

Worst case conducted emissions are listed under chapter: test results.

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<b>Conducted Emissions Test Characteristics</b>	
Frequency range	0.45 MHz - 30.0 MHz
Test instrumentation resolution bandwidth	9 kHz
Lines Tested	Line 1 (L) / Line 2 (N)

#### 4.4 Test Results

Device: Remote Control (RF) Superheterodyne Receiver for automatic opening systems and alarm systems  
 Model: RMS435200.0US

PRODUCT EMISSIONS QUASI PEAK DATA							
No	Tested Line	Emission Frequency	Receiver Mode and Bandwidth	Result	Spec Limit	Margin	Remarks
		[MHz]	[kHz]	[dBμV]	[dBμV]	[dB]	
1	L	5.02	9 / QP	28.0	48.0	20.0	
2	L	15.065	9 / QP	31.3	48.0	16.7	
3	L	25.105	9 / QP	23.5	48.0	24.5	
<b>all other emissions more than 25 dB below the limit</b>							

Same results with and without appropriate receive signal.  
 Same results with 12 VAC/DC and 24 VDC supply voltage.

**Judgment: The EUT meets the requirements of this section.**

Test Personnel: Reinhard Sauerschell

Test Date: 2000-10-18

## 5 RADIATED EMISSIONS TEST

Test Requirement: FCC CFR47, Part 15B

Test Procedure: ANSI C63.4:1992

### 5.1 Regulation

Section 15.109 Radiated emission limits. (a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	100
88 - 216	150
216 - 960	200
Above 960	500

(c) In the emission tables above, the tighter limits apply at the band edges. Sections 15.33 and 15.35 which specify the frequency range over which the radiated emissions are to be measured and the detector functions and other measurement standards apply.

(f) For a receiver which employs terminals for the connection of an external receiving antenna, the receiver shall be tested to demonstrate compliance with the provisions of this Section with an antenna connected to the antenna terminals unless the antenna conducted power is measured as specified in Section 15.111(a). If a permanently attached receiving antenna is used, the receiver shall be tested to demonstrate compliance with the provisions of this Section.

Section 15.33 Frequency range of radiated measurements:

(b) For unintentional radiators: (1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3), for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the range device operates or tunes (MHz)	Upper frequency of measurement (MHz)
Below 1.705	30
1.705 - 108	1000
108 - 500	2000
500 - 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower



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(3) Except for a CB receiver, a receiver employing superheterodyne techniques shall be investigated from 30 MHz up to at least the second harmonic of the highest local oscillator frequency generated in the device. If such receiver is controlled by a digital device, the frequency range shall be investigated up to the higher of the second harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range specified for the digital device in paragraph (b)(1) of this Section.

Section 15.35 Measurement detector functions and bandwidths.

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. (...)

(b) On any frequency or frequencies above 1000 MHz, the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in the regulations, including emission measurements below 1000 MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules, e.g., see Section 15.255. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

## 5.2 Test Equipment

Type	Manufacturer/ Model No.	Serial No.	Last Calibration	Next Calibration
Receiver (30 MHz - 1 GHz)	Rohde & Schwarz ESS	825132/015	March 2000	March 2001
Antenna (30 MHz - 1 GHz)	EMCO 3143	9608-1316	Feb. 2000	Feb. 2001
Receiver (1 GHz - 2 GHz)	Rohde & Schwarz ESAI-D ESMI-RF ESMI-B1	833771/008 833827/002 832504/005	June 2000	Dec. 2001
Antenna (1 GHz - 2 GHz)	Schwarzbeck BBHA 9120 D	137	Oct. 1999	Oct. 2001

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### 5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that sits on a flush mounted metal turntable. Floor standing equipment is placed directly on the flush mounted metal turntable [*Remark: Not applicable*]. The EUT is connected to its associated peripherals with any excess I/O cabling bundled to approximately 1 meter [*Remark: No peripherals connected*].

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions.

<b>Radiated Emissions Test Characteristics</b>	
Frequency range	30 MHz - 2,000 MHz
Test distance	3 m
Test instrumentation resolution bandwidth	120 kHz (30 MHz - 1,000 MHz)
	1 MHz (1,000 MHz - 2,000 MHz)
Receive antenna scan height	1 m - 4 m
Receive antenna polarization	Vertical/Horizontal

### 5.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where

- FS = Field Strength in dB( $\mu$ V/m)
- RA = Receiver Amplitude in dB( $\mu$ V)
- AF = Antenna Factor in dB(1/m)
- CF = Cable Attenuation Factor in dB

Assume a receiver reading of 23.5 dB( $\mu$ V) is obtained. The Antenna Factor of 7.4 dB(1/m) and a Cable Factor of 1.1 dB are added, giving a field strength of 32 dB( $\mu$ V/m). The 32 dB( $\mu$ V/m) value can be mathematically converted to its corresponding level in  $\mu$ V/m.

$$FS = 23.5 \text{ dB}(\mu\text{V}) + 7.4 \text{ dB}(1/\text{m}) + 1.1 \text{ dB} = 32 \text{ dB}(\mu\text{V}/\text{m})$$

$$FS = 10^{(32/20)} \mu\text{V}/\text{m} = 39.8 \mu\text{V}/\text{m}$$

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## 5.5 Test Results

Device: Remote Control (RF) Superheterodyne Receiver for automatic opening systems and alarm systems  
 Model: RMS435200.0US

PRODUCT EMISSIONS										
No	Emission Frequency	Receiver Mode and Bandwidth	Test Distance	Receiver Reading	Correction Factor	Result = Corrected Reading FS	Spec Limit	Antenna Height	Polarization	Margin
	[MHz]	[kHz]	[m]	RA [dB(μV)]	AF+CF [dB(1/m)]	[dB(μV/m)]	[dB(μV/m)]	[m]	ANT	[dB]
1	433.43	QP 120	3	19	20.5	39.5	46	1.00	v	6.5
2	866.87	QP 120	3	7.1	27.0	34.1	46	1.00	v	11.9
3	1300	AV, 1000	3	4.6	26.8	31.4	54	1.00	h	22.6
		Pk, 1000	3	16.2*	26.8	43.0*	54 + 20 = 74	1.00	h	31

Same results with and without appropriate receive signal.  
 Same results with 12 VAC/DC and 24 VDC supply voltage.

Remark: \* noise floor

**Judgment: The EUT meets the requirements of this section.**

Test Personnel: Reinhard Sauerschell

Test Date: 2000-10-24

## 6 MISCELLANEOUS COMMENTS AND NOTES

None.

## 7 LIST OF ANNEXES

Following annexes are separated parts to this test report.

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