TEST REPORT # EMCC-081095AA/051008FA, 2008-12-12

EQUIPMENT UNDER TEST:

Trade Name:	Transponder
Model:	CRS015
Serial No:	none
Equipment Category:	Transmitter
Manufacturer:	WEER s.r.l.
Address:	Regione San Vito, 32/A 14042 Calamandrana (AT) Italy
Phone:	+39-0141 718079
Cell:	+39-334 2007399
E-mail	mauro.santamaria@weer.it

RELEVANT STANDARD(S): 47 CFR Part 15C

MEASUREMENT PROCEDURE USED:

☒ ANSI C63.4-2003 ☐ FCC/OET MP-4 (1987) ☐ Other

TEST REPORT PREPARED BY:

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Reinhard Sauerschell

TEST OF WEER S.R.L. TRANSMITTER TRANSPONDER MODEL CRS015 TO 47 CFR PART 15C

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1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15.223 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. This test report shall not be reproduced except in full without the written permission of EMCC DR. RAŠEK GmbH & Co. KG.

1.3 Test Location

Company Name:	EMCCons DR. RAŠEK GmbH & Co. KG
Street:	Moggast, Boelwiese 8
City:	91320 Ebermannstadt
Country:	Germany
Laboratory:	EMCCons DR. RAŠEK GmbH & Co. KG Test Laboratory IV located at Stoernhofer Berg 15, 91364 Unterleinleiter, Germany This site has been fully described in a report submitted to the FCC, and accepted in the letter dated January 18, 2008, Registration Number 878769.
Phone:	+49-9194-9016
Fax:	+49-9194-8125
E-Mail:	emc.cons@emcc.de
Web:	www.emcc.de

1.4 Manufacturer

Company Name:	WEER s.r.l.
Street:	Regione San Vito, 32/A
City:	14042 Calamandrana (AT)
Country:	Italy
Name for contact purposes:	Mr Mauro Santamaria
Phone:	+39-0141 718079
Cell:	+39-334 2007399
E-mail:	mauro.santamaria@weer.it

1.5 Dates

Date of receipt of EUT:	CW 49/2008
Test date:	CW 50/2008

2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT)

Trade Name:	Transponder
Model:	CRS015
Serial Number:	none
FCC ID:	WYGCRS015
Application:	Active transponder for a timing system
Power:	2.4 V Ni-Mh battery
Transmit Frequency:	6.78 MHz, one RF channel
Modulation:	ASK
Emission designator:	A1D
Generated frequency in EUT:	6.78 MHz
Antenna:	internal, integral inductive antenna
Interface ports:	charging input
Variants:	none
Remarks:	none

2.2 EUT Peripherals

None.

2.3 Mode of Operation during Testing

The transmitter was tested in a typical fashion. During preliminary and final emission tests transmitter was activated to investigate a worst case emission mode.

2.4 Modifications required for Compliance

None.

3 TEST RESULTS SUMMARY

Summary of Test Results for the following EUT:

Manufacturer: WEER s.r.l.
Device: Transponder
Model No.: CRS015
Serial Number: none

Requirement	47 CFR Section	Report Section	Test Result
Antenna Requirement	15.203	4	Pass
AC Line Conducted Emissions	15.207	5	N.A.
Radiated Spurious Emissions	15.223(b), 15.209, 15.205(b)	6	Pass
Field Strength Limits (Fundamental)	15.223(a)	6	Pass

N.A. – Not applicable. The EUT is battery powered, only.

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 - 2003 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: Karlheinz Kraft
Issuance Date: 2008-12-12

4 ANTENNA REQUIREMENT

Test Requirement: FCC 47 CFR, Part 15C

4.1 Regulation

15.203 An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

According to DA 00-2225 "OET Extends Effective Date of Antenna Connector Requirement Indefinitely", dated September 28, 2000, the OET extends the effective date of Public Notice, DA 00-1087, indefinitely.

4.2 Result

Manufacturer:	WEER s.r.l.
Device:	Transponder
Model No.:	CRS015
Serial Number:	none

The antenna is a permanently attached internal antenna (inductive antenna on the PCB).

The EUT meets the requirements of this section.

5 CONDUCTED EMISSIONS TEST

Test Requirement: FCC 47 CFR, Part 15C
Test Procedure: ANSI C63.4-2003

5.1 Regulation

Section 15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator 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 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak (QP)	Average (AV)
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Section 15.207 (c) 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.

5.1 Test Equipment

Not applicable.

5.2 Test Procedures

Not applicable.

5.3 Test Results

Manufacturer: WEER s.r.l.
Device: Transponder
Model No.: CRS015
Serial Number: none

The EUT is battery powered only. Therefore - according to Section 15.207 (d) - conducted emissions measurements to demonstrate compliance with the conducted limits are not required.

6 RADIATED EMISSIONS TESTS

Test Requirement: FCC 47 CFR, Part 15C
Test Procedure: ANSI C63.4-2003

6.1 Regulation

Section 15.33 Frequency range of radiated measurements:
(a) Unless otherwise noted in the specific rule section under which the equipment operates for an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:
(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1)-(a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this Section, whichever is the higher frequency range of investigation.
(b) For unintentional radiators *[Remark: Applies to the receiver part / receive mode]*:
(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 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

(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.
The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part:
(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. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance

with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.
Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.
(b) On any frequency of 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 in this part, e.g., see § 15.255. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. Measurement of AC power line conducted emissions are performed using a CISPR quasipeak detector, even for devices for which average radiated emission measurements are specified.
(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Section 15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88–216	150	3
216–960	200	3
Above 960	500	3

(b) In the emission table above, the tighter limit applies at the band edges.
(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§ 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.
(f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.

Section 15.223 Operation in the band 1.705 - 10 MHz.
(a) The field strength of any emission within the band 1.705-10.0 MHz shall not exceed 100 microvolts/meter at a distance of 30 meters. However, if the bandwidth of the emission is less than 10% of the center frequency, the field strength shall not exceed 15 microvolts/meter or (the bandwidth of the device in kHz) divided by (the center frequency of the device in MHz) microvolts/meter at a distance of 30 meters, whichever is the higher level. For the purposes of this Section, bandwidth is determined at the points 6 dB down from the modulated carrier. The emission limits in this paragraph are based on measurement instrumentation employing an average detector. The provisions in Section 15.35(b) for limiting peak emissions apply.
(b) The field strength of emissions outside of the band 1.705-10.0 MHz shall not exceed the general radiated emission limits in Section 15.209.

6.2 Test Equipment

Type	Manufacturer/ Model No.	EMCC Ident No.	Last Calibration	Next Calibration
Loop Antenna (1.7 MHz - 30 MHz)	Rohde & Schwarz HFH2-Z2	374	2008-09	2010-09
Receiver (1.7 MHz - 30 MHz)	Rohde & Schwarz ESS	339	2008-11	2009-11
Antenna (30 MHz - 1 GHz)	EMCO Model 3143	898	2007-09	2009-09

6.3 Test Procedures

Portable, small, lightweight, or modular devices that may be hand-held, worn on the body, or placed on a table during operation shall be positioned on a nonconducting platform, the top of which is 80 cm above the reference groundplane. Ceiling and wall-mounted devices shall also be positioned on a tabletop for testing purposes.

The EUT was tested on a 0.8 meter high support.

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 *[Remark: Not applicable]*. All tests performed with the EUT placed in two positions (standing and flat lying) on the nonconductive platform. Worst case emissions are listed under chapter: test results.

The internal batteries were charged at the beginning of the tests.

Radiated Emissions Test Characteristics	
Frequency range	1.7 MHz –1,000 MHz
Test distance	3 m*
Test instrumentation resolution bandwidth	10 kHz (1.7 MHz - 30 MHz)
	120 kHz (30 MHz - 1,000 MHz)
Receive antenna scan height	1 m, fixed height (H-field, f < 30 MHz) 1 m - 4 m (E-field, f > 30 MHz)
Receive antenna polarization	Horizontal (H-field, f < 30 MHz)
	Vertical/Horizontal (E-field, f > 30 MHz)

* According to Section 15.31 (f)(1): At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. (...) When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).
According to Section 15.31 (f)(2) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer

distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

6.4 Calculation of Field Strength Limit

Fundamental field strength limits for the band 1.705 to 10 MHz, where the bandwidth is less than 10 % of the center frequency:

µV/m at 30 meters = 15 µV/m corresponds with 23.5 dBµV/m.

6.5 Calculation of Average Correction Factor

The average correction factor is computed by analyzing the "worst case" on time in any 100 mSec time period and using the formula:

Corrections Factor (dB) = 20*log (worst case on time/100 mSec)

Procedure during test:
The relationship between average and peak mode reading has been confirmed by direct measurement using the receiver's average and peak detectors.

All emission measurements performed using the test receiver's average detector and the max. hold facility; i.e. the average value measured directly without the necessity of additional correction factor.

6.6 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 dBµV/m
RA = Receiver Amplitude in dBµV
AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB
Assume a receiver reading of 23.5 dBµV 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 dBµV/m. The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
FS = 23.5 + 7.4 + 1.1 = 32 [dBµV/m]
Level in µV/m = Common Antilogarithm (32/20) = 39.8

Note: For measurement up to 1000 MHz the Antenna Factor already includes the cable attenuation.

For test distance other than what is specified, but fulfilling the requirements of Section 15.31 (f)(1) the field strength is calculated by adding additionally an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements). The basic equation with a sample calculation is as follows:
FS = FST + DF
where
FS = Field Strength in dBµV/m
FST = Field Strength at test distance in dBµV/m
DF = Distance Extrapolation Factor in dB,
where DF = 20 log (Dtest/Dspec) where Dtest = Test Distance and Dspec = Specified Distance
Assume the tests performed at a reduced Test Distance of 1.5 m instead of the Specified Distance of 3 m giving a Distance Extrapolation Factor of DF = 20 log(1.5m/3m) = -6 dB.

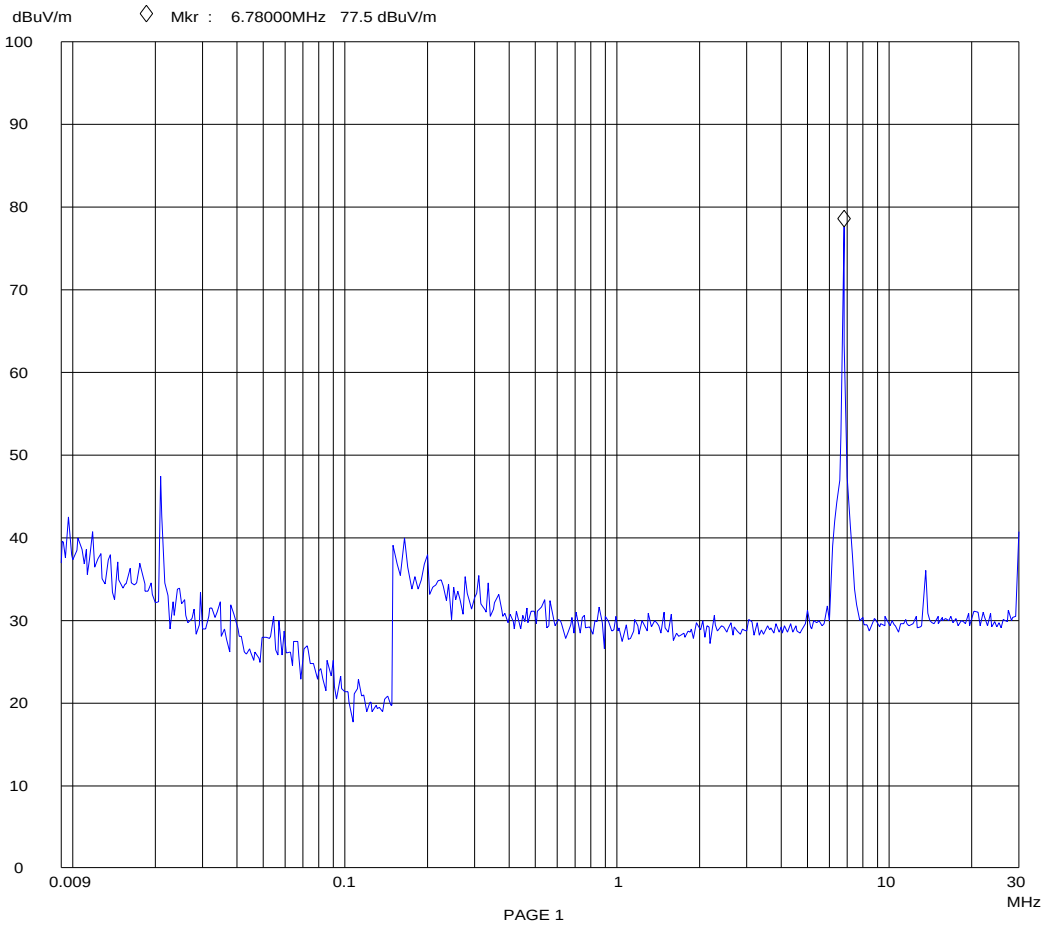
Assuming a measured field strength level of 32 dBµV/m is obtained. The Distance Factor of -6 dB is added, giving a field strength of 26 dBµV/m. The 26 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
FS = 23.5 + 7.4 + 1.1 - 6 = 26 [dBµV/m]
Level in µV/m = Common Antilogarithm (26/20) = 20

Same calculation is used accordingly with an inverse linear distance extrapolation factor of 40 dB/decade to Section 15.31 (f)(2) for frequencies below 30 MHz.

6.7 Test Results

6.7.1 Prescan

Magnetic field 9 kHz to 30 MHz at distance 3 m in FAR:



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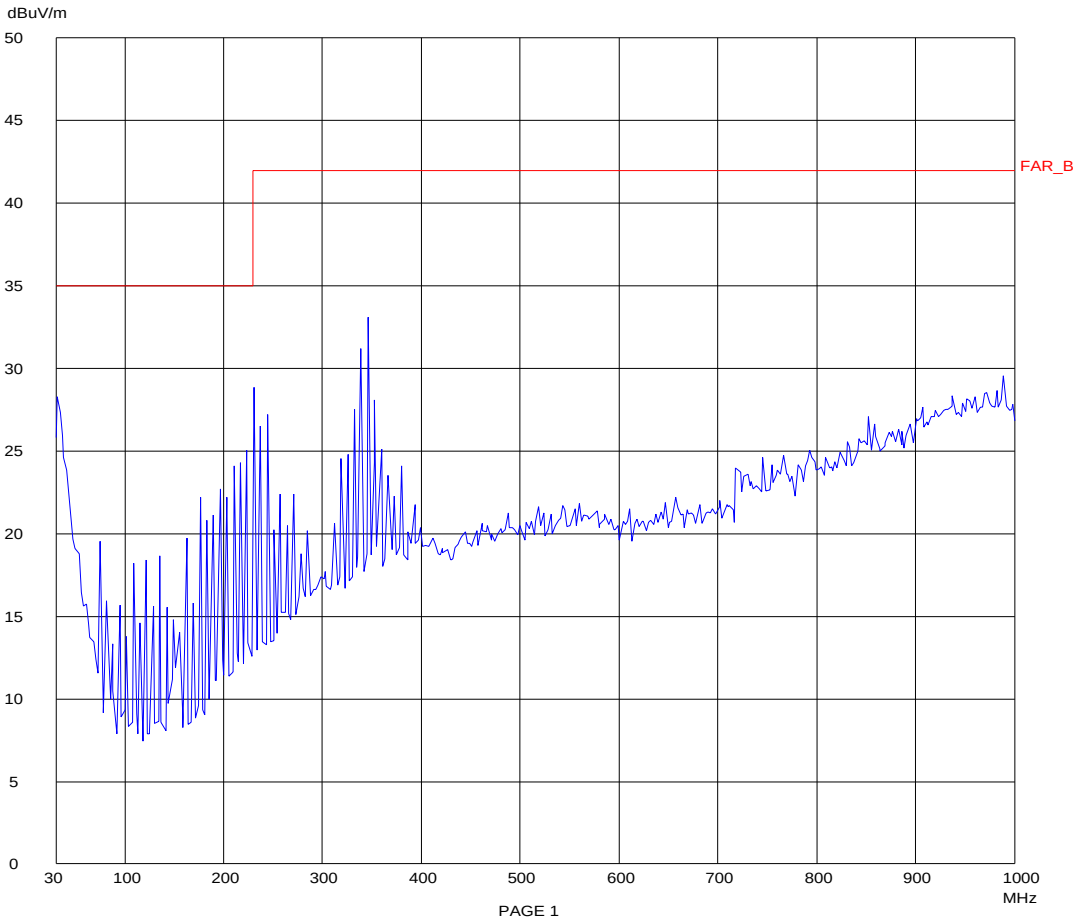
Electric field 30 MHz to 1 GHz at distance 3 m in FAR:



**TEST OF WEER S.R.L. TRANSMITTER TRANSPONDER
MODEL CRS015 TO 47 CFR PART 15C**

6.7.2 6 dB Bandwidth

EMCCons DR. RASEK 08. Dec 08 18:07

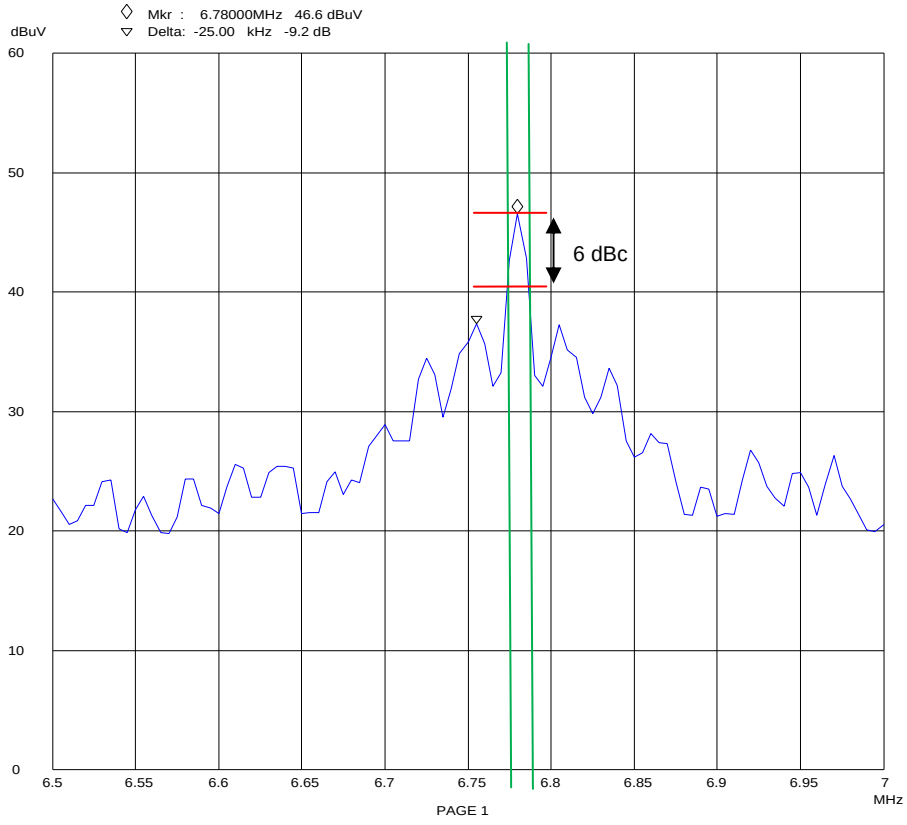
Radiated Emissions Prescan in FAR, d=3m

EUT:	CRS-015 & CRS-120 & pendulum CRS-015
Manuf:	WEER s.r.l.
Op Cond:	normal operation, PC running software
Operator:	K.Kraft
Test Spec:	EN 55022 class B
Comment:	1 sides, horizontal polarisation.
	FAR limit according to prEN 50147-3:2000

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
6.5M	7M	5k	10k	AV	100ms	AUTO	LN ON	60dB

Final Measurement: x Hor-Max / + Vert-Max
Meas Time: 1 s
Subranges: 25
Acc Margin: 15dB



The 6 dB bandwidth is << 100 kHz, therefore the field strength limit for the carrier is 15 microvolts/meter (= 23.5 dBµV/m).

6.7.3 Final results

FINAL RESULTS: PRODUCT EMISSIONS DATA												
No	Emission Frequency [MHz]	Receiver Mode and Bandwidth [kHz]	Test Distance [m]	Receiver Reading RA [dB(µV)]	Correction Factor AF+CF [dB(1/m)]	DF [dB]	Result = Corrected Reading FS [dB(µV/m)]	Spec Limit [dB(µV/m)]	Polarization Antenna	Polarization EUT	Margin [dB]	Notes
1	6.780	10, AV	3	34	20	40	14	23.5 AV	h	v	9.5	
		10, PK	3	57.5	20	40	37.5	43.5 PK	h	v	6	
2	13.56	10, QP	3	17	20	40	-3	30 QP	h	v	33	
3	176.3	120, QP	3	15	10.3	0	25.3	43.5 QP	v	v	18.2	
4	230.6	120, QP	3	15.6	13.2	0	28.8	46 QP	h	h	17.2	
5	244.1	120, QP	3	17	14	0	31	46 QP	h	v	15	
6	339	120, QP	3	19.3	16.9	0	36.2	46 QP	v	v	9.8	
7	345.8	120, QP	3	19	16.9	0	35.9	46 QP	h	v	10.1	

Manufacturer: WEER s.r.l.
Device: Transponder
Model No.: CRS015
Serial Number: none

The EUT meets the requirements of this section.

Test Personnel: Karlheinz Kraft

Test Date: 2008-12-04 to 2008-12-11

7 MISCELLANEOUS COMMENTS AND NOTES

None.

8 LIST OF ANNEXES

The following annexes are separated parts to this test report. These annexes may be file attachments for electronic filing.

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Annex 1	Photographs of test setups	4
Annex 2	Photographs of equipment under test (EUT) external views	3
Annex 3	Photographs of equipment under test (EUT) internal views	3