

# TEST REPORT

*REPORT CERTIFICATE issued by a FCC listed Test Laboratory*

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**CUSTOMER AND  
MANUFACTURER:**

Q-MATIC Sweden AB  
Neongatan 8  
SE-413 53 Mölndal  
Sweden

Project No: 06271

**EQUIPMENT UNDER  
TEST (EUT):**

Remote Control Transmitter, "Wireless Terminal 433.92 MHz".  
Type PC1114C, s/n W00008631. FCC ID: RT2-10320211.  
Nominal Center frequency: 433.92 MHz.

**TEST SPEC.:**

47 CFR Ch. 1 (10-1-05 Edition):  
Part 15, Subpart C.  
Applicable Section: 15.231(a – d). Periodic operation in the  
band 40.66 – 40.70 and above 70 MHz.

**DATE OF TEST:**

March 10, 2006

**TEST SITE:**

Svenska EMC Lab AB, Karlskrona, Sweden.  
FCC registration number: 90967.  
Industry Canada registration number: IC 4328.

**TEST RESULT:**

The EUT (Equipment Under Test) did pass the above mentioned test.

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Approved, Karlskrona March 14, 2006



Hans Östergren  
Manager Svenska EMC Lab AB

**DATE OF RECEIPT:** March 8, 2006

**CONDITION OF EUT:** No remarks. Operates as intended.

**TEST PERSONNEL:** Svenska EMC Lab AB: Hans Östergren.

**DESCRIPTION OF THE EUT:**

The EUT is a hand held Short range remote control, used to "Call forward" a new customer in a Queue System. With integral Antenna and without any Antenna contact. Powered from build-in batteries. No cables could be connected to the EUT.  
EUT dimension: Approx. 20 mm thick and approx. diameter of 70 mm.

**CALIBRATION DECLARATION:**

The test equipment is calibrated as the calibration information in the Test Equipment list. Before starting of the tests the check points in the applicable Checklists were confirmed.

**ESTIMATED UNCERTAINTY:**

Expanded uncertainty ( $k = 2$ ), Field Strength, emission 9 kHz – 1000 MHz:  $\pm 2.4$  dB  
Expanded uncertainty ( $k = 2$ ), Field Strength, emission 1 to 5 GHz:  $\pm 3$  dB  
Frequency, 0.09 – 1000 MHz:  $\pm 10$  Hz  
Frequency, 1 – 5 GHz:  $\pm 10$  kHz  
The uncertainties are for a confidence level of not less than 95 %.

# **TEST EQUIPMENT:**

<b>Type/Manufacturer/Bandwidth</b>	<b>s/n</b>	<b>Calibration information</b>	
		<b>Date</b>	<b>Interval</b>
EMI Test System, Monitor EZM,	860157/014	0508	12 months
Rohde & Schwarz EP-6, 20 Hz - 1300 MHz			
Test Receiver, Rohde & Schwarz ESH-3,	894979/013	0508	12 months
9 kHz - 30 MHz			
Test Receiver, Rohde & Schwarz ESVP,	893497/006	0508	12 months
20 - 1300 MHz			
Plotter, Rohde & Schwarz DOP 2	893117/0008	0508	12 months
Spectrum Analyzer Tektronix 2755AP	B010111	0601	12 months
10 kHz - 21 GHz			
Spectrum Analyzer Tektronix 2712,	B023361	0601	12 months
10 kHz - 1,8 GHz			
Signal Amplifier, Mini-Circuits, ZHL-42	8607 01	0601	12 months
0.7 - 4.6 GHz			
Plotter, Tektronix HC-100	JP05851	NA	NA
Biconical Antenna, Schwarzbeck BBA9106	93-92196.1	0508	12 months
30 - 300 MHz			
Log-periodic Antenna, Schwarzbeck UHALP9107,	91071205	0508	12 months
300 - 1000 MHz			
Double Ridged Guide Antenna, EMCO 3115,	2338	0508	36 months
1 - 18 GHz			
Coaxial Cable, Sucoflex 104, l = 5 m	171288/4	0509	12 months
Coaxial Cable, Sucoflex 104, l = 0.5 m	180067/4	0509	12 months
Coaxial cable, H-100	05-1243	0509	12 months
Antenna Mast System, Jyske EMC, h = 1 - 4 m	93-90172	NA	NA
Turn Table, Jyske EMC	93-90171	NA	NA
Anechoic Chamber, 8 x 4.5 x 3 m	93-87151	0304	36 months
Open Area Test Site for 3 m antenna distance	-	0312	36 months
Oscilloscope, Tektronix 2230	B011088	0501	24 months
Digital Multimeter, Fluke 77	63430754R	0502	24 months

## TEST SET-UP AND PROCEDURE:

As laid out in ANSI C.63.4:2001 Document.  
Tested as hand-held equipment in 3 orthogonal directions.  
See Appendix 1.

## TEST CONDITIONS:

**Rating:** 6 VDC. (4 x 1.5 V batteries).  
**Voltage at test:** 6.25 VDC (new batteries).  
**Peripherals:** No peripherals.  
**Cables:** Not possible to connect any cable.  
**Configuration:** See photos in Appendix 2 to 4.  
**Operating Frequency:** 433.92 MHz nominal.  
**Effective radiated power:** Less than 1 mW.  
**Modulation:** No external modulation possible. The manufacturer's normal modulation was used.  
**Modulation data:** See Appendix 5 and 6.  
**Modifications:** No modifications.  
**Operating Condition:** The normal operating mode with deactivation time of 60 seconds was disabled. The transmitter switch was mechanical locked to get continuously transmitting at 100 % duty cycle. The normal operating mode is a short activation of the transmitter. An auto-shutoff function automatically stops the device from transmitting after 60 seconds if a button inadvertently gets pressed for a long period of time.  
**Ambient Humidity:** 36 % RH  
**Ambient temperature:** 19 °C.

## DESENSITIZATION FACTOR:

Not applicable.

## TEST PERFORMANCE:

### Section 15.231.

#### Applicable items:

##### 15.231(a)(1). Deactivation time.

After releasing the manual switch the transmitter was automatic deactivated in less than 0.1 seconds.  
Test instrument: Oscilloscope Tektronix 2230.

##### 15.231(b). Field strength of emission.

**Pre-test:** A pretest was performed in the Anechoic Chamber to determine the radiated frequencies. Measured frequency range 30 – 4500 MHz. The EUT was measured at an Antenna distance of 3 m. The antenna polarization was both vertical and horizontal during the test. The EUT was fixed in position by a wooden fixture and measured in 3 orthogonal directions to find the direction generating the highest emission. This position was then used at the final measurements. The only emission from EUT was from the fundamental and its harmonics. No sub harmonics or spurious emission was found. The emission was checked with a Peak detector.

#### Final Test:

Measured on the open area test site with EUT - Antenna distance of 3 m. The EUT was in the fixture and positioned to give maximum emission. The emission was maximized by rotating the table, varying the antenna height and the antenna polarization. Sec. 15.213(b)(2) specifies an Average detector or as an alternative a Quasi-peak detector. Sec. 15.35(a) specifies a peak detector if the repetition frequency is lower than 20 Hz. Peak limit is in this case the same as the QP limit.

##### 1. Fundamental ( $f_0$ ) and harmonic $2 \times f_0$ . < 1000 MHz.

The emission was measured with a Peak detector and also with a Quasi-Peak detector (RBW = 120 kHz, QP time = 1000 ms). The limit in 15.231(b) is compared to the measured level with a Peak detector in accordance with 15.35(a). See Appendix 9. Test instruments: Test Receiver, Rohde & Schwarz ESVP, 30 MHz - 1300 MHz. Antenna, Schwarzbeck UHALP9107, 300 - 1000 MHz.

##### 2. Harmonics, (3 to 10) $\times f_0$ . > 1000 MHz.

The emission was measured with the Spectrum Analyzer in max. hold and with a Peak Detector (RBW = 1 MHz, VBW = 1 MHz). The limit at 3 m distance is in this case the same as the Av.limit. See Appendix 9. Test instruments: S/A Tektronix 2755AP, 10 kHz – 21 GHz. Signal Amplifier, Mini-Circuits, ZHL-42, 0.8 – 4.5 GHz. Antenna: Double Ridged Guide, EMCO 3115, 1 – 18 GHz.

##### 15.231(c). Bandwidth.

The bandwidth was measured as dBc at the point's carrier minus 20 dB. Spectrum Analyzer in max. hold and with Peak Detector (RBW = 120 kHz, VBW = 300 kHz). See Appendix 7. Test instruments: Spectrum Analyzer Tektronix 2712, 10 kHz – 1.8 GHz. Antenna: Double Ridged Guide Antenna, EMCO 3115, 1 – 18 GHz.

### Section 2.1049

#### 2.1049(i). Occupied bandwidth.

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. Spectrum Analyzer in max. hold and with Peak Detector (RBW = 120 kHz, VBW = 300 kHz). The bandwidth was measured at  $\pm 0.5$  % points (= 99 % power as shown in diagram). See Appendix 8. Test instruments: Spectrum Analyzer Tektronix 2712, 10 kHz – 1.8 GHz. Antenna: Double Ridged Guide Antenna, EMCO 3115, 1 – 18 GHz.

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## TEST RESULTS:

### 15.231(a)(1). Deactivation time.

The limit is 5 seconds and the measured deactivation time is less than 0.1 second.

### 15.231(b). Field strength of emission.

#### Fundamental:

Margin to limit was with peak detector – 5.5 dB as worst case.

See Appendix 9.

#### Harmonics:

Margin to limit was with peak detector – 2.6 dB at 2169.31 MHz as worst case.

See Appendix 9.

### 15.231(c). Bandwidth.

The bandwidth was 360 kHz at – 20 dBc.

See Appendix 7.

### 2.1049(i). Occupied bandwidth.

The occupied bandwidth was 511 kHz.


See Appendix 8.

## CONCLUSION:

The Remote Control Transmitter, “Wireless Terminal 433.92 MHz”, Type PC1114C, s/n W00008631, FCC ID: RT2-10320211, with Nominal Center frequency of 433.92 MHz, did pass the above mentioned tests in Part 15, Subpart C.

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Karlskrona March 14, 2006



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Hans Östergren  
Manager Svenska EMC Lab AB  
Sr. EMC Engineer

**List over Appendixes.**

**Appendix No**

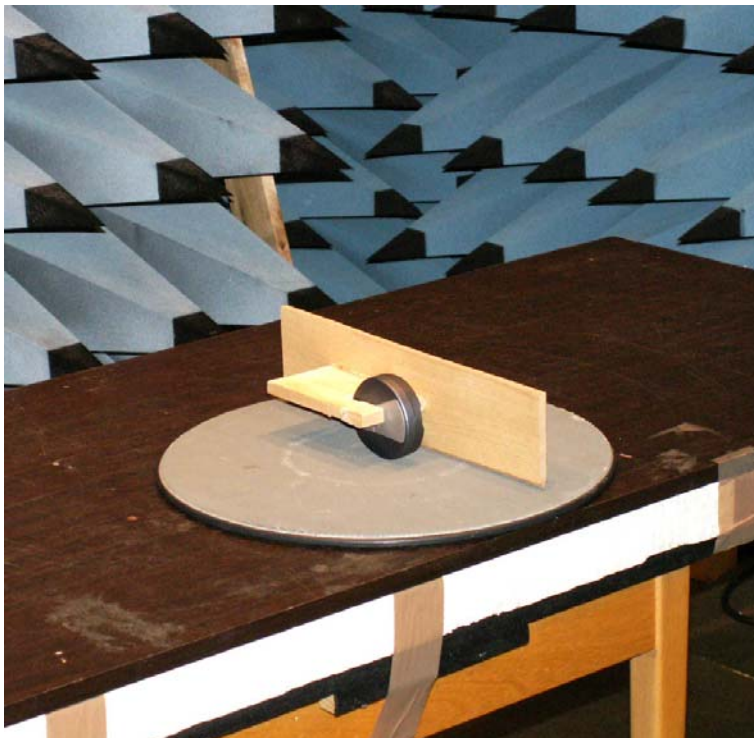
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1	Test set-up, photos
2	Configuration, photo
3	Configuration, photo
4	Configuration, photo
5	Modulation data
6	Modulation data
7	Bandwidth
8	Occupied bandwidth
9	Calculation of final emission levels

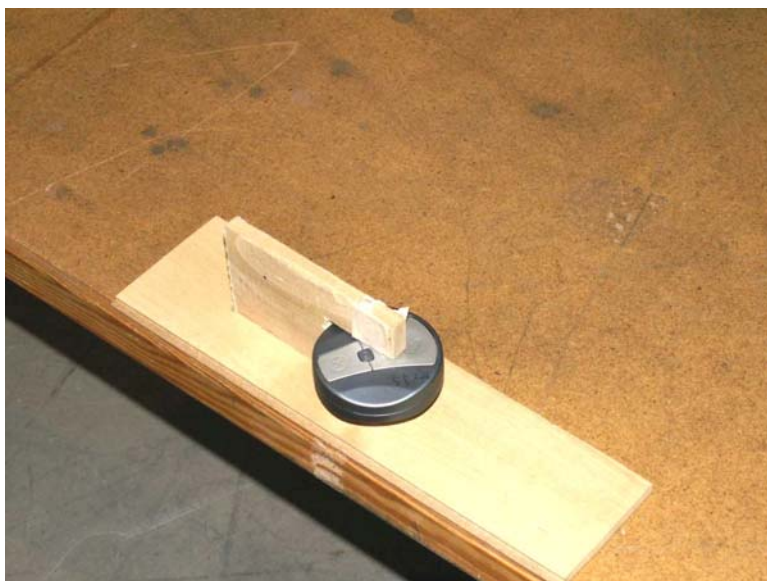


**Test set-up, EUT with wooden fixture**

**Pretest in absorber chamber**



**Final test on OATS**





### EuT. Configuration

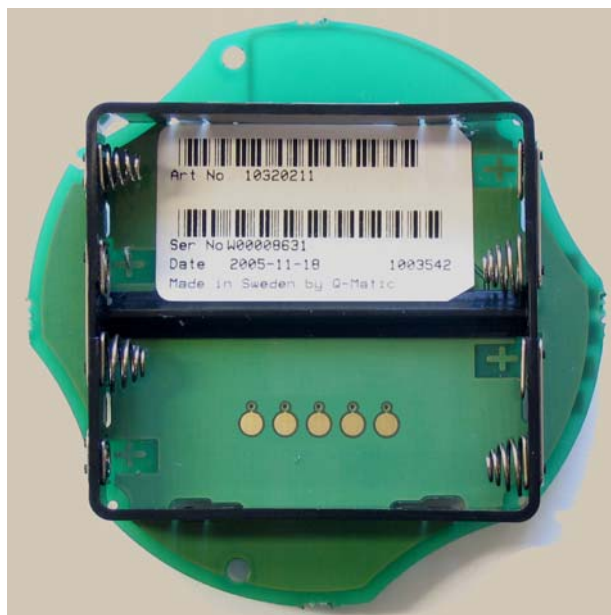


Bottom



Top

### EuT. Configuration



PCB bottom



PCB top

### EuT. Configuration

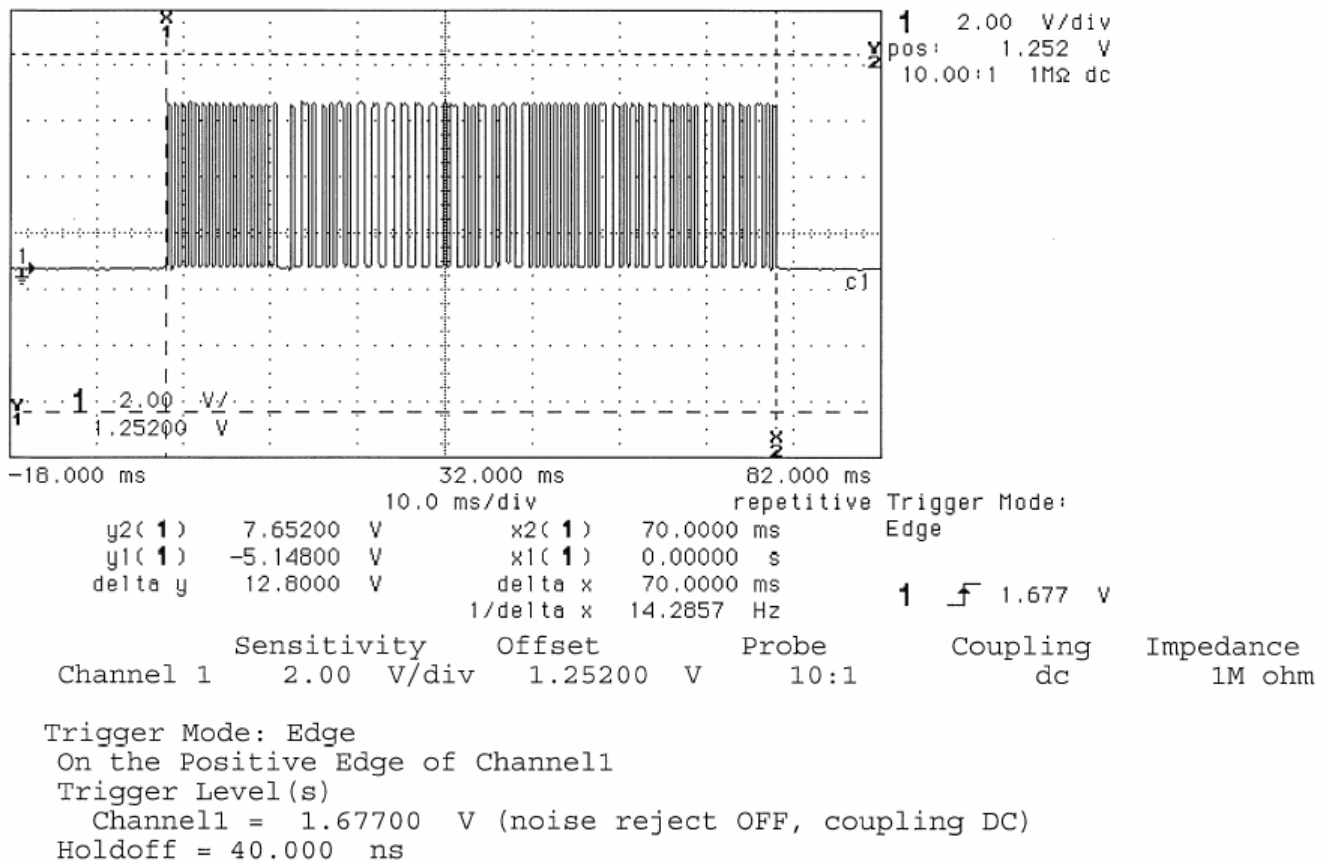


PCB bottom, with batteries

## Modulation data

Printed: 26 JAN 2004 at 11:49:50

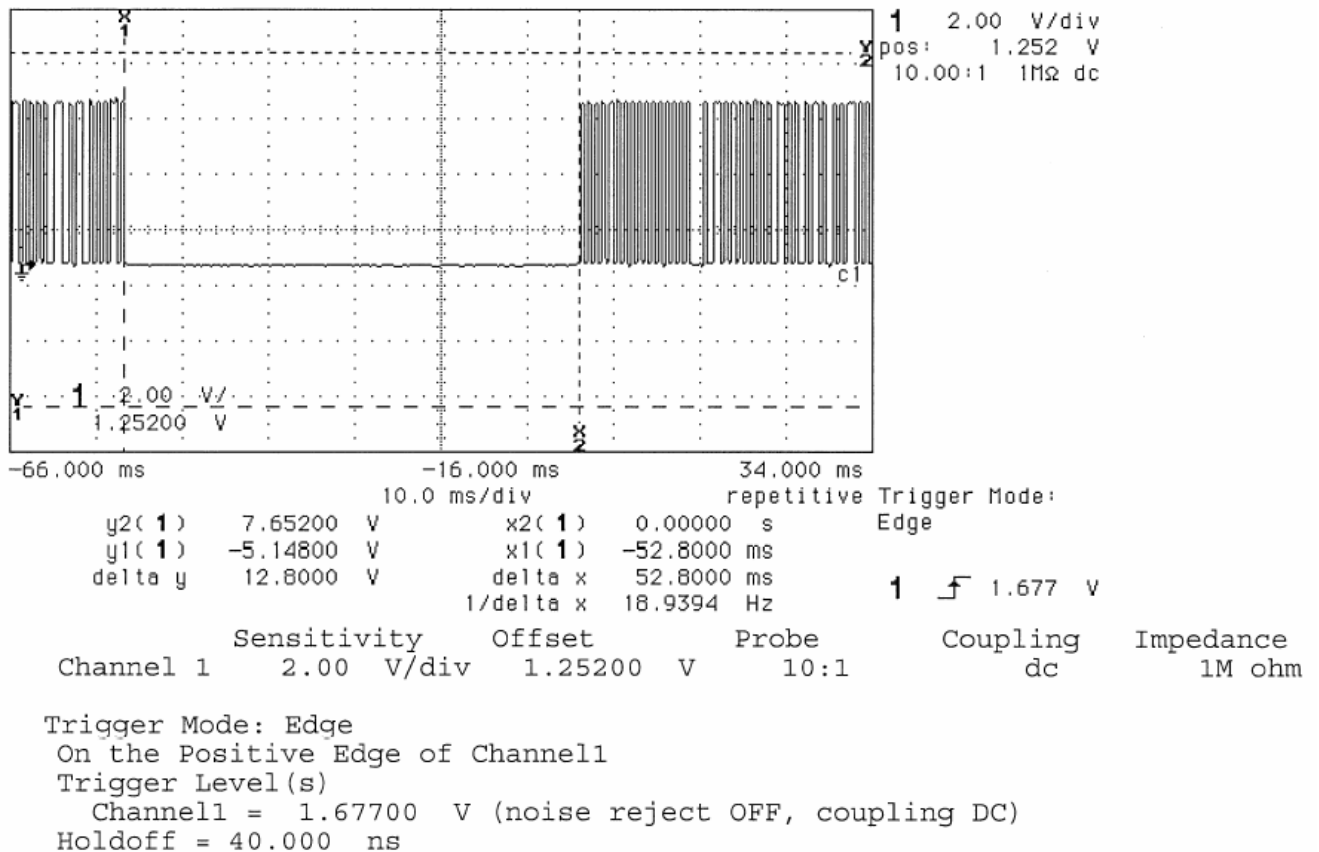
hp running-awaiting trigger



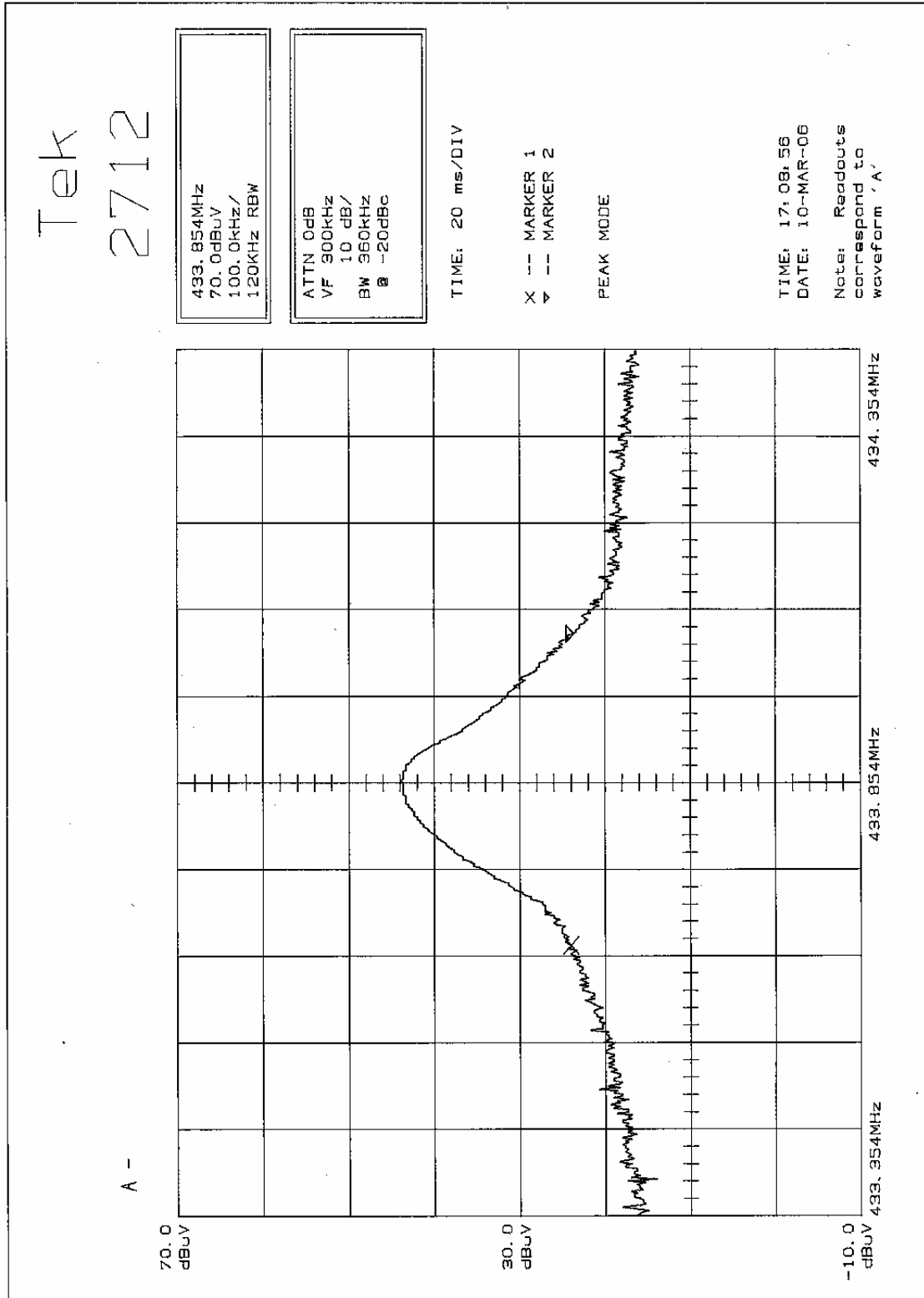
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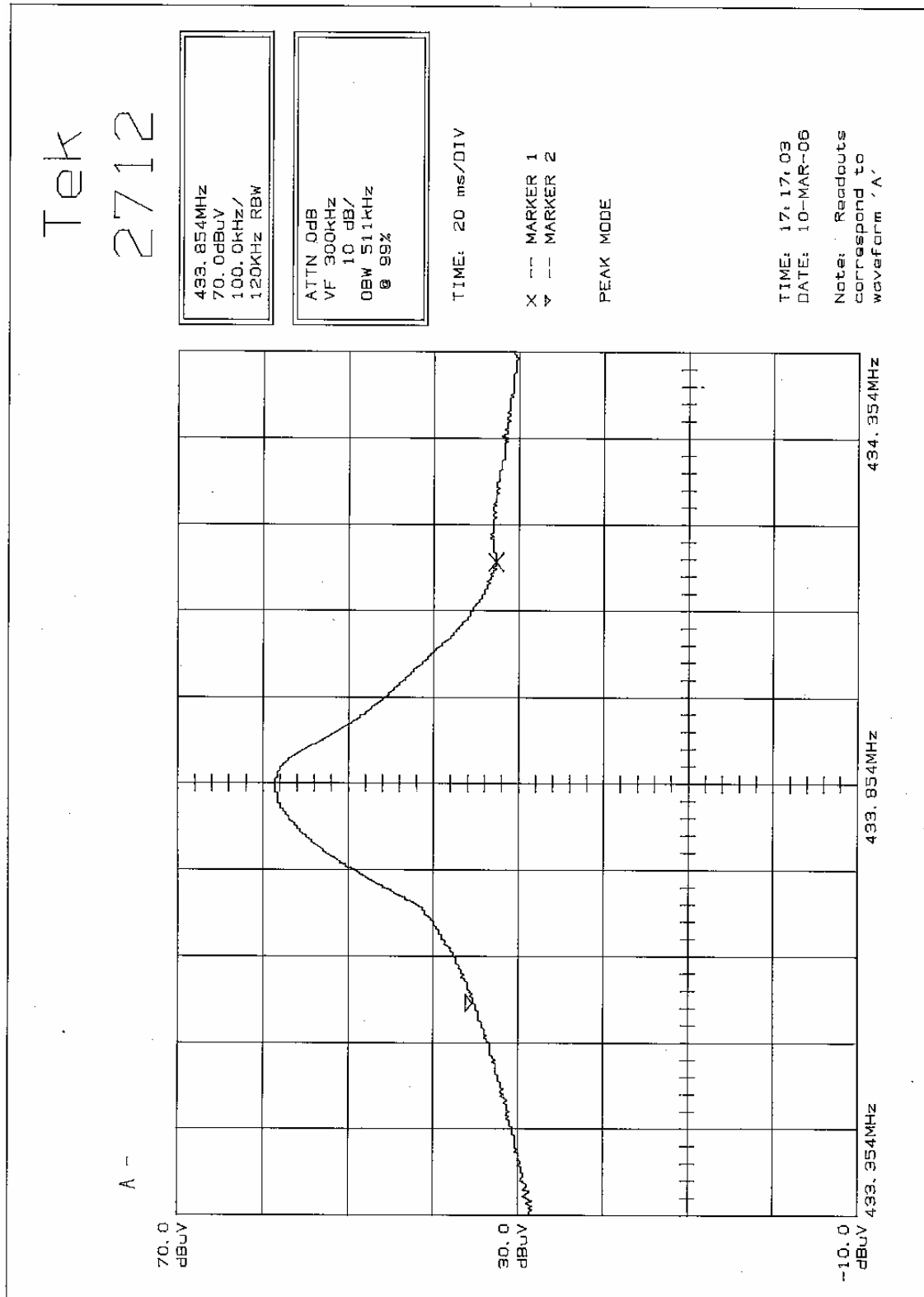
hp running-awaiting trigger



### Bandwidth



### Occupied bandwidth





### Radiated Fieldstrength Test. Calculation of Final Emission Levels.

**EUT:** Remote Control Transmitter, "Wireless Terminal 433.92 MHz".  
Type PC1114C, s/n W00008631. FCC ID: RT2-10320211.  
Nominal Center frequency: 433.92 MHz.

**Test spec.:** 47 Cfr Ch. 1 (10-1-05 Edition):  
Part 15, Subpart C.  
§ 15.231(b): Field strength of emission.  
Open Area Test Site, 3 m antenna distance.

**Date of Test:** March 10, 2006

**Operation:** The EUT was configured to continuously transmit at 100% duty cycle with normal modulation.

Field strength (dBμV/m) = Level (dBμV) + Antenna factor (dB) + cable loss (dB) – Gain (dB)

Tested frequency range: 30 – 4340 MHz.

Frequency	Level	Ampl. Gain	Cable loss	Af	Field strength	Limit (AV.)	Margin	Antenna height	Antenna polar.	Detector	Band-width
MHz	dBμV	dB	dB	dB	dBμV/m	dBμV/m	dB	m	V/H	Peak/QP	kHz
433,86	57.1	-	0.5	17.6	75.2	80.7	- 5.5	1-4	H	P	120
433,86	45.2	-	0.5	17.6	63.3	80.7	- 17.4	1-4	H	QP	120
867,72	19.9	-	0.9	24.0	44.8	62	- 17.2	1-4	H	P	120
867,72	12.3	-	0.9	24.0	37.2	62	- 24.8	1-4	H	QP	120
1301,60	54.8	30.0	1.3	25.9	52.0	62	- 10.0	1-4	H	P	1000
1735,46	57.6	30.0	1.3	27.7	56.6	62	- 5.4	1-4	H	P	1000
2169,31	60.4	31.0	1.4	28.6	59.4	62	- 2.6	1-4	H	P	1000
2603.18	47.6	31.0	1.4	29.8	47.8	62	- 14.2	1-4	H	P	1000
3037.05	40.4	30.5	1.5	30.4	41.8	62	- 20.2	1-4	H	P	1000
3470,93	41.2	29.5	1.6	31.6	44.9	62	- 17.1	1-4	H	P	1000
3904,77	34.0	31.0	1.7	32.9	37.6	62	- 24.4	1-4	H	P	1000
4338,63	50.4	30.5	1.8	33.0	53.7	62	- 8.3	1-4	H	P	1000

Notes: Pass