TEST RESULT SUMMARY

FCC PART 15 Subpart C
Section 15.231

MANUFACTURER'S NAME	Ameritek Industries
NAME OF EQUIPMENT	90-010
TYPE OF EQUIPMENT	433.92 MHz Transmitter
MODEL NUMBER	**Golden Retriever**
MANUFACTURER'S ADDRESS	2420 Niagara Lane Plymouth MN 55447
TEST REPORT NUMBER	NC203528
TEST DATE	28 June 2002

According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15 Subpart C Section 15.231.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15 Subpart C Section 15.231.

Date: 05 November 2002

Location: Taylors Falls MN USA

G. S. Jakubowski
Test Engineer

T. K. Swanson
Reviewed By

Not Transferable

EMC EMISSION - T E S T R E P O R T

Test Report File No.	:	**NC203528**	Date of issue:	05 November 2002

Model No.	:	**Golden Retriever**
Product Name	:	90-010
Product Type	:	433.92 MHz Transmitter
Applicant	:	Ameritek Industries
Manufacturer	:	Ameritek Industries
License holder	:	Ameritek Industries
Address	:	2420 Niagara Lane
	:	Plymouth MN 55447

Test Result	:	■ **Positive** ☐ **Negative**
Test Project Number Reference(s)	:	**NC203528**
Total pages including Appendices		27

TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.

TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.

TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

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D I R E C T O R Y - EMISSIONS

			Page(s)
A)	**Documentation**		
	Test report		1 - 10
	Directory		2
	Test Regulations		3
	Deviation from standard / Summary		9
	Test-setups (Photos)		10
	Test-setup (drawing)		Appendix A
B)	**Test data results**		
	Conducted emissions	10/150 kHz - 30 MHz	N/A
	Radiated emissions electric field	30 MHz - 4400 MHz	6, 8
	Radiated emissions magnetic field	60 Hz - 30 MHz	N/A
	Interference power	30 MHz - 300 MHz	N/A
	Emission Bandwidth	433.92 MHz	6, 8
	Duty Cycle	433.92 MHz	6, 8
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C)	**Appendix A**		
	Test Data Sheets and Test Setup Drawing(s)		A2 – A8
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	Constructional Data Form		B2 – B7
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E)	**Appendix C**		
	Measurement Protocol		C1 - C2

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EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

☐ - EN 50081-1 / 1991

☐ - EN 55011 / 1991 ☐ - Group 1 ☐ - Group 2
☐ - Class A ☐ - Class B

☐ - EN 55013 / 1990

☐ - EN 55014 / 1987 ☐ - Household appliances and similar
☐ - Portable tools
☐ - Semiconductor devices

☐ - EN 55014 / A2:1990

☐ - EN 55014 / 1993 ☐ - Household appliances and similar
☐ - Portable tools
☐ - Semiconductor devices

☐ - EN 55015 / 1987

☐ - EN 55015 / A1:1990

☐ - EN 55015 / 1993

☐ - EN 55022 / 1987 ☐ - Class A ☐ - Class B

☐ - EN 55022 / 1994 ☐ - Class A ☐ - Class B

☐ - BS

☐ - VCCI ☐ - Class A ☐ - Class B

■ - FCC Part 15 Subpart C Section 15.231

☐ - AS 3548 (1992) ☐ - Class A ☐ - Class B

☐ - CISPR 11 (1990) ☐ - Group 1 ☐ - Group 2
☐ - Class A ☐ - Class B

☐ - CISPR 22 (1993) ☐ - Class A ☐ - Class B

■ - RSS-210 Issue 2 Rev. 1 Section 6.1.1 & 7.0

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Environmental conditions in the lab:

	Actual
Temperature	: 22 °C
Relative Humidity	: 65 %
Atmospheric pressure	: 99.0 kPa
Power supply system	: 3.2 VDC

Sign Explanations:

☐ - not applicable
■ - applicable

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Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE*) measurements were performed at the following test location:

■ - Test not applicable

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room
☐ - New Brighton Lab Shielded Room

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD*) measurements were performed at the following test location:

■ - Test not applicable

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)

Emissions Test Conditions: INTERFERENCE POWER

The *INTERFERENCE POWER* measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location:

■ - Test not applicable

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room
☐ - New Brighton Lab Shielded Room

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Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz- 4400 MHz, were tested in a horizontal and vertical polarization at the following test location:

☐ **- Test not applicable**

■ - Wild River Lab Large Test Site (Open Area Test Site) – NSA measurements made 7-01, due 7-02.
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)

at a test distance of :

■ - 3 meters
☐ - 10 meters
☐ - 30 meters

Test equipment used:

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	3202	EM-6917B	Electro-Metrics	Biconicalog Periodic 30-2000 MHz	102	9-24-02
■-	2665	ZHL-1042J	Mini-Circuits	Preamplifier	32296	9-12-02
■-	2690	8566B	Hewlett-Packard	Spectrum Analyzer (Unit F)	2430A00930	11-19-02
■ -	2678	85662A	Hewlett-Packard	Analyzer Display (Unit F)	2403A08134	11-19-02
■ -	2684	85650A	Hewlett-Packard	Quasi-Peak Adapter (Unit F)	2521A01006	11-19-02
■ -	2075	3115	Electro-Mechanics (EMCO)	Ridge Guide Ant. 2-18 GHz	9001-3275	10-20-02

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

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Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

☐ - Normal Operating Mode

■ - Constant transmit.

Configuration of the device under test:

■ - See Constructional Data Form in Appendix B - Page B2

☐ - See Product Information Form in Appendix B - beginning on Page B3

The following peripheral devices and interface cables were connected during the measurement:

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - unshielded power cable

☐ - unshielded cables

☐ - shielded cables MPS.No.: _____

☐ - customer specific cables

☐ - _____

☐ - _____

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Emission Test Results:

FCC 15.231 - Radiated emissions (electric field) 30 MHz - 4400 MHz

The requirements are ■ - MET ☐ - NOT MET

Minimum margin of compliance for fundamental	3 dB	at	433.92	MHz
Minimum margin of compliance for spurious < 1 GHz	9 dB	at	867.83	MHz
Minimum margin of compliance for spurious > 1 GHz	7 dB	at	1301.75	MHz

Remarks: The fundamental (433.92 MHz) was measured to be 77.5 dBuV/m or 7498.9 uV/m (97.5 dBuV/m minus 20 dB duty cycle correction factor) in average mode compared to an average limit of 80.8 dBuV/m (10996.67 uV/m). The 867.83 MHz signal was measured to be 51.6 dBuV/m or 380.2 uV/m (71.6 dBuV/m minus 20dB duty cycle correction factor) in peak mode compared to an average limit of 60.8 dBuV/m (1099.667 uV/m). At 1301.75 MHz, peak analyzer reading of 46.8 dBuV/m or 218.8 uV/m (66.8 dBuV/m minus 20 dB duty cycle correction factor) compared to an average limit of 54 dBuV/m (500 uV/m). The duty cycle correction factor is calculated by 20 log (9.75/100 msec) = -20dB.

FCC 15.231 (c) - Emission Bandwidth

The requirements are ■ - MET ☐ - NOT MET

Remarks: The bandwidth of the fundamental must be less than 0.25% of the center frequency, or 1.08 MHz.

Page A6 of A8 shows the bandwidth to be approximately 1.05 MHz.

FCC 15.35 (c) – Duty Cycle

The requirements are ■ - MET ☐ - NOT MET

Remarks: Duty cycle declared to be worst case is 4.875 msec/pulse, with 2 pulses per 100 msec. Duty Cycle Correction Factor = 20 log (9.75/100) or –20 dB. See plots on pages A7 and A8.

FCC 15.231 (a) – Signal Deactivation

The requirements are ■ - MET ☐ - NOT MET

Remarks: The transmitter is used to control a motorized shopping cart pushing device. This enables a person to return multiple shopping carts back to the location they came from. Commands can be sent from the transmitter to a receiver that controls the pushing device. These commands are slow speed (approx. 1 MPH), fast speed (approx. 2.5 MPH), honk horn, and stop. These commands are activated only while the respective push button on the control device, is held down. If no button is pushed, no transmissions are sent out, and the shopping cart pushing device reverts to an automatic stop.

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DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

SUMMARY:

The requirements according to the technical regulations are

■ - met

☐ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

☐ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 28 June 2002

Testing End Date: 28 June 2002

- TÜV PRODUCT SERVICE INC -

Thomas K. Swanson

T. K. Swanson
Reviewed By

G. S. Jakubowski

Tested By:
G. S. Jakubowski

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Test-setup photo(s):
Radiated emission 30 MHz – 4.4 GHz

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Appendix A

Test Data Sheets

and

Test Setup Drawing(s)

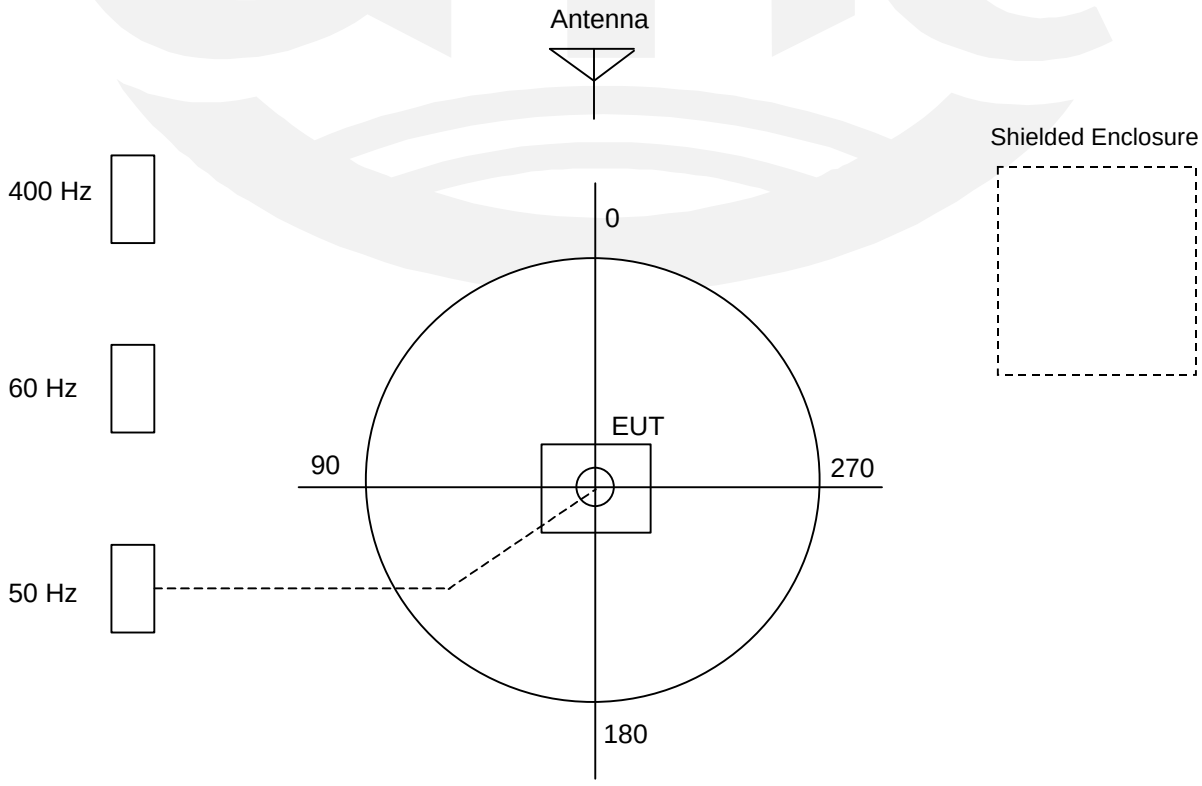
TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.
3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.
4. The circle is a 6.7 meter diameter turntable.
5. A ground plane is in the plane of this sheet.
6. The test sample is shown in the azimuthal position representing zero degrees.



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Radiated Electromagnetic Emissions

Test Report #:	**3528 Run 01**	Test Area:	LTS 3m		
Test Method:	N/A	Test Date:	28-Jun-2002		
EUT Model #:	Golden Retriever Transmitter	EUT Power:	3.2 VDC internal		
EUT Serial #:				Temperature:	22 °C
Manufacturer:	Ameritek			Relative Humidity:	65 %
EUT Description:	Hand held remote control Transmitter			Air Pressure:	99 kPa
Notes:	Intentional Radiator Test			Page:	1 of 3

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL PEAK (dBuV)	POL / HGT / AZ (m) (DEG)	FINAL with pk-ave correction (20 dB) (dBuV)	FCC 15.231(b) Limit (dBuV)
Antenna: LTS Bilog 3M SN 102						
Fundamental measured with ESVS 20						
Unmodulated						
Board on its back, Xmit antenna horizontal						
Maximized						
433.92	76.6 Av	2.4 / 16.6 / 0.0	95.6	H / 1.0 / 0.0	75.6	80.8
Board upright, xmit antenna vertical						
433.92	76.9 Av	2.4 / 16.6 / 0.0	95.9	V / 1.3 / 120.0	75.9	80.8
Board on its side, Xmit antenna horizontal						
433.92	78.5 Av	2.4 / 16.6 / 0.0	97.5	H / 1.0 / 38.0	77.5	80.8
This position used to complete testing						
EUT running with normal modulation						
Peak - Average correction factor calculated at 20.db relaxation						
Max'd						
867.83	45.8 Pk	3.5 / 22.2 / 0.0	71.6	H / 1.0 / 120.0	51.6	60.8
867.83	4.8 Av	3.5 / 22.2 / 0.0	30.6	H / 1.0 / 120.0	10.6	60.8

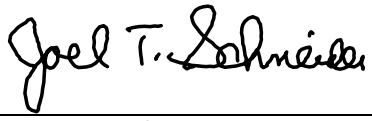
Tested by: G Jakubowski

Printed

Signature

Reviewed by: JTS

Printed



Signature

Radiated Electromagnetic Emissions

Test Report #:	**3528 Run 01**	Test Area:	LTS 3m			
Test Method:	N/A	Test Date:	28-Jun-2002			
EUT Model #:	Golden Retriever Transmitter	EUT Power:	3.2 VDC internal			
EUT Serial #:				Temperature:	22	°C
Manufacturer:	Ameritek			Relative Humidity:	65	%
EUT Description:	Hand held remote control Transmitter			Air Pressure:	99	kPa
Notes:	Intentional Radiator Test			Page:	2 of 3	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL PEAK (dBuV)	POL / HGT / AZ (m) (DEG)	FINAL with pk-ave correction (20 dB) (dBuV)	FCC 15.231(b) Limit (dBuV)
1-2GHz BPF						
1301.75	35.9 Pk	4.5 / 26.5 / 0.0	66.8	H / 1.1 / 270.0	46.8	54.0
1735.65	44.7 Pk	5.6 / 28.5 / 27.1	51.7	V / 1.0 / 0.0	31.7	60.8
Antenna: LTS Horn ID# 2075						
2-4GHz BPF						
Max'd						
2169.58	43.1 Pk	7.1 / 30.0 / 27.1	53.0	V / 1.0 / 265.0	33.0	60.8
2603.50	39.1 Pk	7.3 / 30.9 / 27.0	50.2	V / 1.2 / 204.0	30.2	60.8
No other significant emissions detected above 2603.5 MHz						
End scan 30MHz to 4.4GHz						

Tested by: G Jakubowski

Printed Signature

Reviewed by: JTS

Printed Signature

Radiated Electromagnetic Emissions

Test Report #:	**3528 Run 01**	Test Area:	LTS 3m			
Test Method:	N/A	Test Date:	28-Jun-2002			
EUT Model #:	Golden Retriever Transmitter	EUT Power:	3.2 VDC internal			
EUT Serial #:				Temperature:	22	°C
Manufacturer:	Ameritek			Relative Humidity:	65	%
EUT Description:	Hand held remote control Transmitter			Air Pressure:	99	kPa
Notes:	Intentional Radiator Test			Page:	3 of 3	

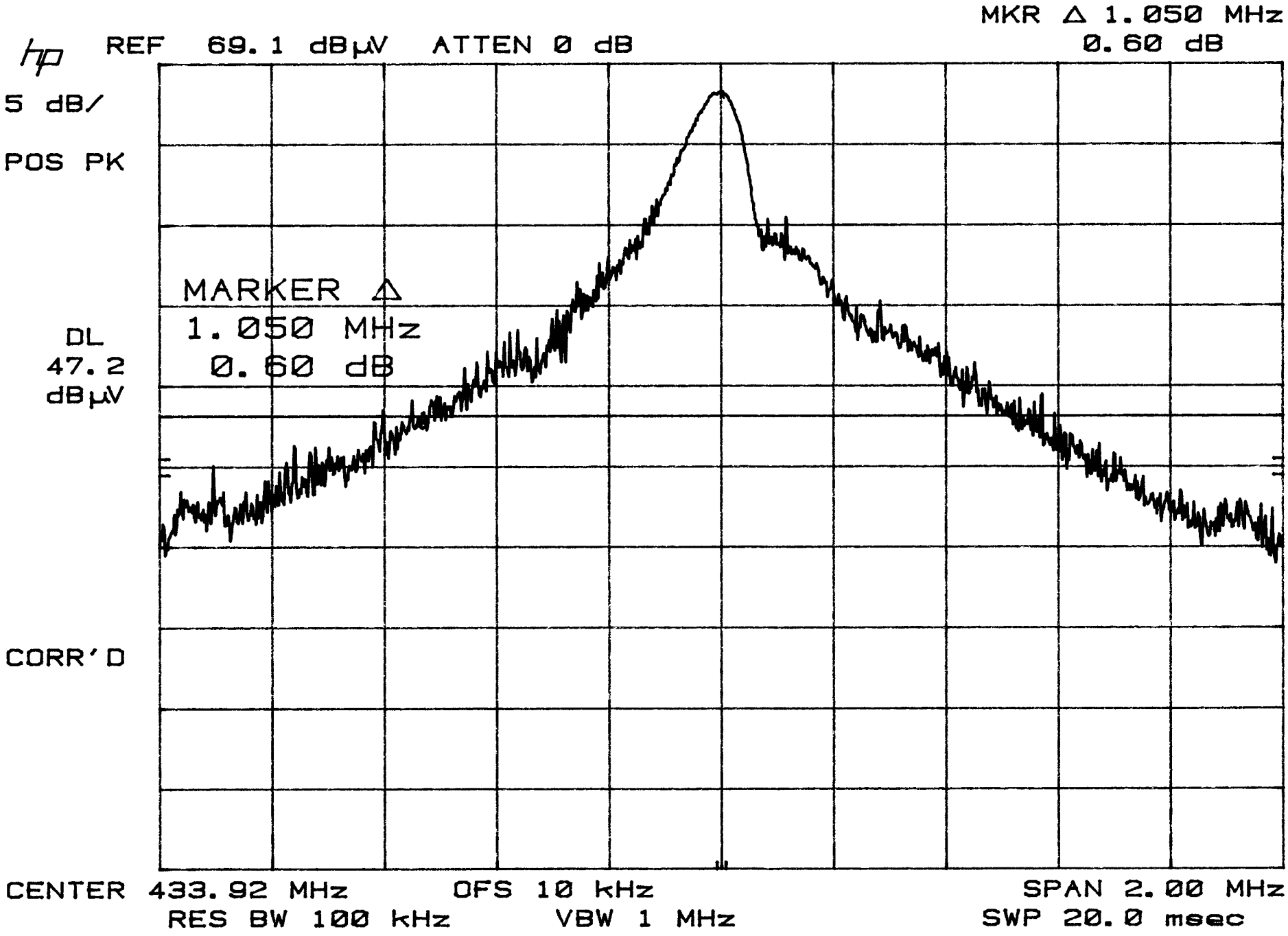
FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB/m) (dB)	FINAL PEAK (dBuV)	POL / HGT / AZ (m) (DEG)	FINAL with pk-ave correction (20 dB) (dBuV)	FCC 15.231(b) Limit (dBuV)
********** **MEASUREMENT SUMMARY** **********						
433.92	78.5 Av	2.4 / 16.6 / 0.0	97.5	H / 1.0 / 38.0	77.5	80.8
867.83	45.8 Pk	3.5 / 22.2 / 0.0	71.6	H / 1.0 / 120.0	51.6	60.8
1301.75	35.9 Pk	4.5 / 26.5 / 0.0	66.8	H / 1.1 / 270.0	46.8	54.0
1735.65	44.7 Pk	5.6 / 28.5 / 27.1	51.7	V / 1.0 / 0.0	31.7	60.8
2169.58	43.1 Pk	7.1 / 30.0 / 27.1	53.0	V / 1.0 / 265.0	33.0	60.8
2603.50	39.1 Pk	7.3 / 30.9 / 27.0	50.2	V / 1.2 / 204.0	30.2	60.8

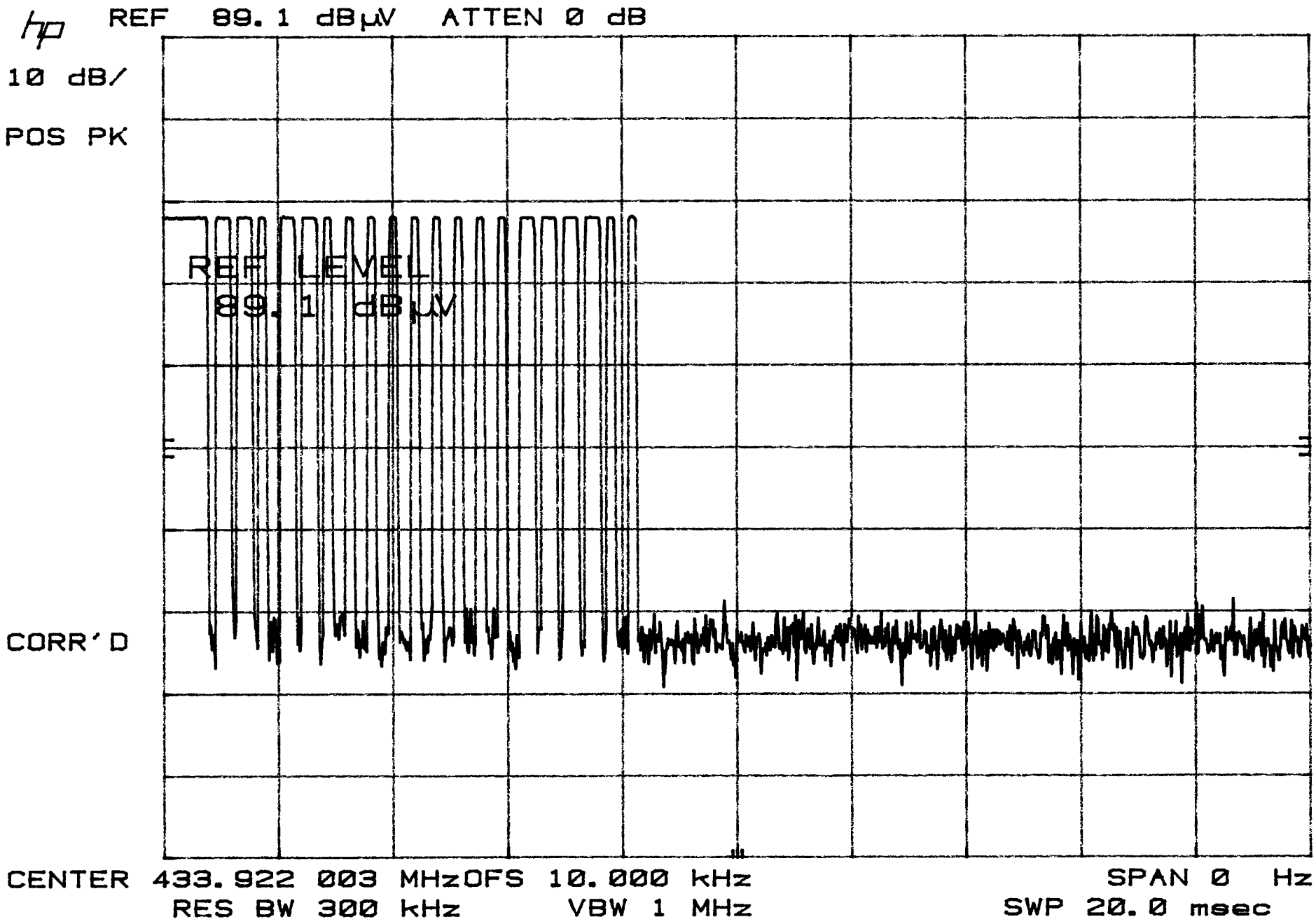
Tested by: G Jakubowski

Printed | Signature

Reviewed by: JTS

Printed | Signature


MKR Δ 1.050 MHz
0.60 dB
REF 69.1 dBµV
ATTEN 0 dB
5 dB/
POS PK
MARKER Δ
1.050 MHz
0.60 dB
DL
47.2
dBµV
CORR'D
CENTER 433.92 MHz
OFS 10 kHz
SPAN 2.00 MHz
RES BW 100 kHz
VBW 1 MHz
SWP 20.0 msec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10 dB/
POS PK
REF LEVEL
89.1 dBµV
CORR'D
CENTER 433.922 003 MHz
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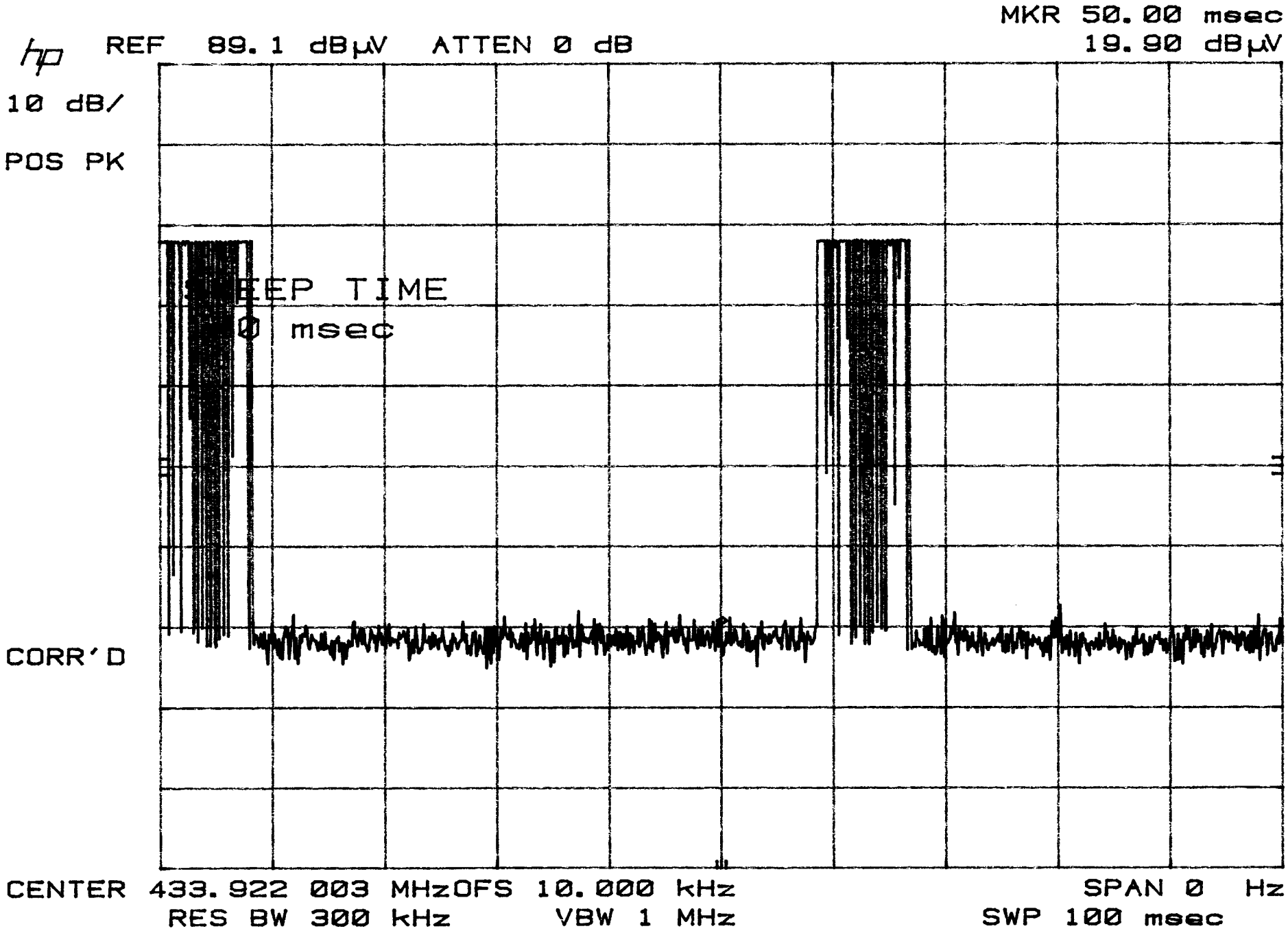
RES BW 300 kHz
VBW 1 MHz
SWP 20.0 msec


MKR 50.00 msec
19.90 dBµV
REF 89.1 dBµV ATTEN 0 dB
10 dB/
POS PK
SWEEP TIME
0 msec
CORR'D
CENTER 433.922 003 MHz
OFS 10.000 kHz
SPAN 0 Hz
RES BW 300 kHz
VBW 1 MHz
SWP 100 msec

Appendix B

Constructional Data Form

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Form

EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- ***NOTE: This information will be input into your test report as shown below.***
Press the F1 key at any time to get HELP for the current field selected.

Company: AMERITEK INDUSTRIES, INC.

Address: 2420 NIAGARA LANE

PLYMOUTH, MN 55447

Contact: GARY HOONSBEEN Position: PRESIDENT

Phone: 763 475 7002 Fax: 763 475 2293

E-mail Address: GARY@ameritekindustries.com

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description: 433.92 MHz Transmitter and Receiver

EUT Name: 90-010

Model No.: GOLDEN RETRIEVER Serial No.: NONE

Product Options: NONE

Configurations to be tested: TRANSMITTER AND RECEIVER

Test Objective

- [x] EMC Directive 89/336/EEC (EMC) Std: _____
- [ ] Machinery Directive 89/392/EEC (EMC Std: _____
- [ ] Medical Device Directive 93/42/EEC (EMC) Std: _____
- [ ] Vehicle Directive 72/245/EEC (EMC) Std: _____
- [ ] FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

- [x] FCC: Class [x] A [ ] B Part _____
- [ ] VCCI: Class [ ] A [ ] B
- [ ] BSMI: Class [ ] A [ ] B
- [ ] Canada: Class [ ] A [ ] B
- [ ] Australia: Class [ ] A [ ] B
- [ ] Other: _____

TÜV Product Service Certification Requested

- [ ] Attestation of Conformity (AoC)
- [ ] Certificate of Conformity (CoC)
- [ ] EMC Certification (used with Octagon Mark)
- [ ] Compliance Document

Protection Class (N/A for vehicles) [ ] Class I [ ] Class II [ ] Class III

(Press **F1** when field is selected to show additional information on Protection Class.)

Attendance

Test will be: [x] Attended by the customer [ ] Unattended by the customer

EMC Test Plan and Constructional Data Form

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Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TUV Product Service should:

☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____

☐ Continue testing to complete test series.

☐ Continue testing to define corrective action.

☐ Stop testing.

EUT Specifications and Requirements

Length: 9 inch Width: 6 inch Height: 3 inch Weight: 1 lb

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: Battery (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Industrial

EUT Power Cable

☐ Permanent OR ☐ Removable Length (in meters): _____

☐ Shielded OR ☐ Unshielded

☒ Not Applicable

EMC Test Plan and Constructional Data Form

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EUT Interface Ports and Cables

Interface			Shielding								
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable / Permanent
EXAMPLE: *RS232*	☐	☒	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒ / ☐
NONE	☐	☐		☐	☐						☐ / ☐
	☐	☐		☐	☐						☐ / ☐
	☐	☐		☐	☐						☐ / ☐
	☐	☐		☐	☐						☐ / ☐
	☐	☐		☐	☐						☐ / ☐
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EMC Test Plan and Constructional Data Form

TÜV PRODUCT SERVICE

EUT Software.

Revision Level: A

Description:

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. RECEIVER EMISSIONS

2. TRANSMITTER INTENTIONAL RADIATOR

3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
RECEIVER 433.92 MHx			
TRANSMITTER 433.92 MHz			

Form

EMC Test Plan and Constructional Data Form

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Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	*Model #*	*Serial #*	*FCC ID #*
NONE			

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
13.560 Mhz	433.92 MHz	PCB	TRANSMITTER
422.20 MHz	422.20 MHz	PCB	RECEIVER

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
NONE			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*
NONE		

Form

EMC Test Plan and Constructional Data Form

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Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*
NONE				

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

(PLEASE INSERT "**ELECTRONIC SIGNATURE**" BELOW IF POSSIBLE)

Authorization Signatures

Max Hendrickson — 10/31/02

Customer authorization to perform tests according to this test plan. — Date

MAX HENDRICKSON — 10/31/02

Test Plan/CDF Prepared By (please print) — Date

Reviewed by TÜV Product Service Associate — Date

Appendix C

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ±4.5 dB. The equipment comprising the test systems are calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dBµV and µV, the following conversions apply:

dBµV = 20(log µV)
µV = Inverse log(dBµV/20)

RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV), adding the antenna correction factor and cable loss factor (Factor dB) to it, then subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment A.

Example:

FREQ (MHz)	LEVEL (dBuV)		CABLE/ANT/PREAMP (dB)			FINAL (dBuV/m)		POL/HGT/AZ	(m)	(deg)	DELTA1 LIMIT
60.80	42.5Qp	+	1.2	+ 10.9	- 25.5 =	29.1		V	1.0	0.0 -	-10.9

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 4400 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.

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