TEST RESULT SUMMARY

FCC PART 15 SUBPART C
Section 15.245

MANUFACTURER'S NAME	DICKEY-john Corporation
NAME OF EQUIPMENT	RVS III
TYPE OF EQUIPMENT	Radar Velocity Sensor
MODEL NUMBER	**46783-1000**
MANUFACTURER'S ADDRESS	5200 DICKEY-john Road Auburn IL 62615
TEST REPORT NUMBER	WC403022
TEST DATE	23 June 2004

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 15.245.

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 15.245.

Date: 21 December 2004

Location: Taylors Falls MN USA

J. C. Sausen
Tested By

T. K. Swanson
Reviewed By

Not Transferable

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

Test Report File No.	:	**WC403022**	Date of issue:	21 December 2004

Model / Serial No.	:	**46783-1000 / 001**
Product Name	:	RVS III
Product Type	:	Radar Velocity Sensor
Applicant	:	DICKEY-john Corporation
Manufacturer	:	DICKEY-john Corporation
License holder	:	DICKEY-john Corporation
Address	:	5200 DICKEY-john Road
	:	Auburn IL 62615
Test Result	:	■ **Positive** ☐ **Negative**
Test Project Number Reference(s)	:	**WC403022**
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

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

D I R E C T O R Y - EMISSIONS

			Page(s)
A)	**Documentation**		
	Test report		1 - 10
	Directory		2
	Test Regulations		3
	Deviations from standard / Summary		10
	Test-setups (Photos)		10 - 13
	Test-setup (drawing)		Appendix A
B)	**Test data**		
	Conducted emissions	10/150 kHz - 30 MHz	5
	Radiated emissions	10 kHz - 30 MHz	5
	Radiated emissions	30 MHz - 1000 MHz	6, 9
	Interference power	30 MHz - 300 MHz	6
	Equivalent Radiated emissions	1 GHz - 110 GHz	7, 9
C)	**Appendix A**		
	Fundamental Power Data Summary		A2
	Test Data Sheets		A3 – A5
D)	**Appendix B**		
	Constructional Data Form(s) and/or Product Information Form(s)		B1 – B7
E)	**Appendix C**		
	Measurement Protocol		C1 - C2

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

EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

☐ - EN 50081-1 / 1991

☐ - EN 55011 / 1998 w/Amendment A1:1999 ☐ - 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

■ - FCC Part 15 Subpart C Section 15.245

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

Environmental conditions in the lab:

	Actual
Temperature	: 23 °C
Relative Humidity	: 52 %
Atmospheric pressure	: 99.0 kPa
Power supply system	: 12 VDC

Sign Explanations:

☐ - not applicable
■ - applicable

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

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)

at a test distance of :

☐ - 3 meters
☐ - 30 meters

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

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 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 2-03, due 2-05.
☐ - 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
■ -	3204	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	24-Oct-04
■-	8052	8566B	Hewlett-Packard	Spectrum Analyzer	2115a00853	14-Aug-04
■ -	8051	85662A	Hewlett-Packard	Analyzer Display	2112A02220	14-Aug-04
■	2682	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	14-Aug-04
■ -	2668	8447D	Electro-Mechanics (EMCO)	Preamplifier	1937A02209	Code B

Cal Code B = Calibration verification performed internally. Cal Code Y = Calibration not required when used with other calibrated equipment.

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

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

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

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 110 GHz were performed in a horizontal and vertical polarization 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

at a test distance of:

■ - 1 meter
■ - 3 meters
☐ - 10 meters

Test equipment used:

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■-	8052	8566B	Hewlett-Packard	Spectrum Analyzer	2115a00853	14-Aug-04
■ -	8051	85662A	Hewlett-Packard	Analyzer Display	2112A02220	14-Aug-04
■	2682	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	14-Aug-04
■-	3957	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B
■ -	2075	3115	Electro-Mechanics (EMCO)	Ridge Guide Ant. 1-18 GHz	9001-3275	19-Nov-04
■ -	2127	11975A	Hewlett Packard	Amplifier 2- 8 GHz	2738A01200	Code B
■ -	2662	11970K	Hewlett-Packard	Harm Mixer – 18-26.5 GHz	2332A01170	11-Jun-06
■ -	2661	11970A	Hewlett-Packard	Harm Mixer – 26.5-40 GHz	2332A01861	11-Jun-06
■ -	2919	11970U	Hewlett-Packard	Harm Mixer – 40-60 GHz	3003A01395	11-Jun-06
■ -	2920	11970V	Hewlett-Packard	Harm Mixer – 50-75 GHz	2521A01172	23-Oct-04
■ -	2922	11970W	Hewlett-Packard	Harm Mixer – 75-110 GHz	2521A01336	23-Oct-04
■ -	2788	3116	Electro-Mechanics (EMCO)	Ridge Guide Ant 18-40 GHz	2005	11-Jul-04
■ -	2916	10-7025		Horn Antenna - 75-110 GHz		N/A
■ -	2917	15-7025		Horn Antenna – 50-75 GHz		N/A
■ -	2918	19-7025		Horn Antenna – 40-60 GHz		N/A

Cal Code B = Calibration verification performed internally. Cal Code Y = Calibration not required when used with other calibrated equipment.

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

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

☐ - _____

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

☐ - _____

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

Emission Test Results:

Fundamental Field Strength [15.245 (b)]

The requirements are ■ - MET ☐ - NOT MET

Minimum margin of compliance 3 dB at 24.13 GHz [15.245(b)]

Remarks: The fundamental was measured to be 124.8 dBuV/m (1737.8 mV/m) in peak mode compared to a limit of 127.95 dBuV/m (2500mV/m). See data summary table on page A2.

Harmonic Emissions [15.245 (b)(1)]

The requirements are ■ - MET ☐ - NOT MET

Minimum margin of compliance for Harmonics >10 dB at GHz [15.245(b)(1)]

Remarks: No harmonic emissions detected above the noise level of the measuring system. The noise level of the measuring system is a minimum of 10 dB below the limit.

Radiated Emissions outside of the specified frequency bands [15.245 (b)(3)]

The requirements are ■ - MET ☐ - NOT MET

Minimum margin of compliance for spurious emissions >10 dB at MHz [15.245(b)(3)]

Remarks: No emissions detected above the noise level of the measuring system. The noise level of the measuring system is a minimum of 10 dB below the limit.

Band Edge Compliance [15.245 (b)(3)]

The requirements are ■ - MET ☐ - NOT MET

Remarks: Allowed band is 24.075 GHz to 24.175 GHz. (See page A5 for band edge plot).

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

DEVIATIONS FROM STANDARD:

None

GENERAL REMARKS:

At the time of test, the EUT was identified as Radar Ground Speed Radar Model Number X1. Notification of a change in equipment identification to Radar Velocity Sensor Model Number 46783-1000 was received from the manufacturer and is on file with TÜV Product Service.

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: 23 June 2004

Testing End Date: 23 June 2004

- TÜV PRODUCT SERVICE INC -

Thomas K. Swanson

T. K. Swanson
Reviewed By

J C Sausen

Tested By:
J. C. Sausen

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 photo(s):
Conducted emission 10/150 kHz - 30 MHz

Not Applicable

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 photo(s):
Radiated emission 30 MHz - 110000 MHz

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 photo(s):
Radiated emission 30 MHz - 110000 MHz

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

Appendix A

Test Data Sheets

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

Fundamental Frequency and Power results

Fundamental Frequency	Power	Power Limit	Margin of compliance
24.130 GHz	124.8 dBuV/m	128 dBuV/m	3.2 dB

Fundamental:

Measurement Distance: 3 meters
Fundamental Signal: 24.130 GHz
Uncorrected Peak Level: 79.3 dBuV (Maximized EUT / Antenna orientation)
ACF: 45.5 dB/m
Corrected Field Strength: 79.3 dBuV + 45.5 dB ACF = 124.8 dBuV/m Pk
Limit: 128dBuV/m
Delta From Limit: -3.2dB (Pass)

RADIATED EMISSIONS

Test Report #:	3022 Run 1	Test Area:	LTS		
EUT Model #:	Ground speed radar	Date:	7/1/04		
EUT Serial #:		EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:				Air Pressure:	99.0 kPa
Customer:	DICKEY-john			Rel. Humidity:	52.0 %
EUT Description:					
Notes:					
Data File Name:	3022-1-rad.dat			Page:	1 of 1

List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 EN 55011 B Grp 1 10 m	DELTA2
No significant EUT emissions detected 30 MHz to 1000 MHz, vert and hor ant.						
No significant EUT emissions detected 1 GHz to 18 GHz, vert and hor ant.						
18.0 GHz	40.68 Av	13.5 / 47.5 / 44.4 / 0.0	57.28	V / 1.00 / 0	n/a	n/a
18.0 GHz	47.8 Pk	13.5 / 47.5 / 44.4 / 0.0	64.4	V / 1.00 / 0	n/a	n/a
The above measurements at 18 GHz are instrument noise floor measurements.						

Tested by: J. C. Sausen — Printed — Signature

Reviewed by: TKS — Printed — Signature

RADIATED EMISSIONS

Test Report #:	3022 Run 2	Test Area:	LTS		
EUT Model #:	Ground speed radar	Date:	7/1/04		
EUT Serial #:		EUT Power:	12 VDC	Temperature:	23.0 °C
Test Method:				Air Pressure:	99.0 kPa
Customer:	DICKEY-john			Rel. Humidity:	52.0 %
EUT Description:					
Notes:					
Data File Name:	3022.dat			Page:	1 of 1

Harmonics: No Emissions detected to 24 - 100 GHz.

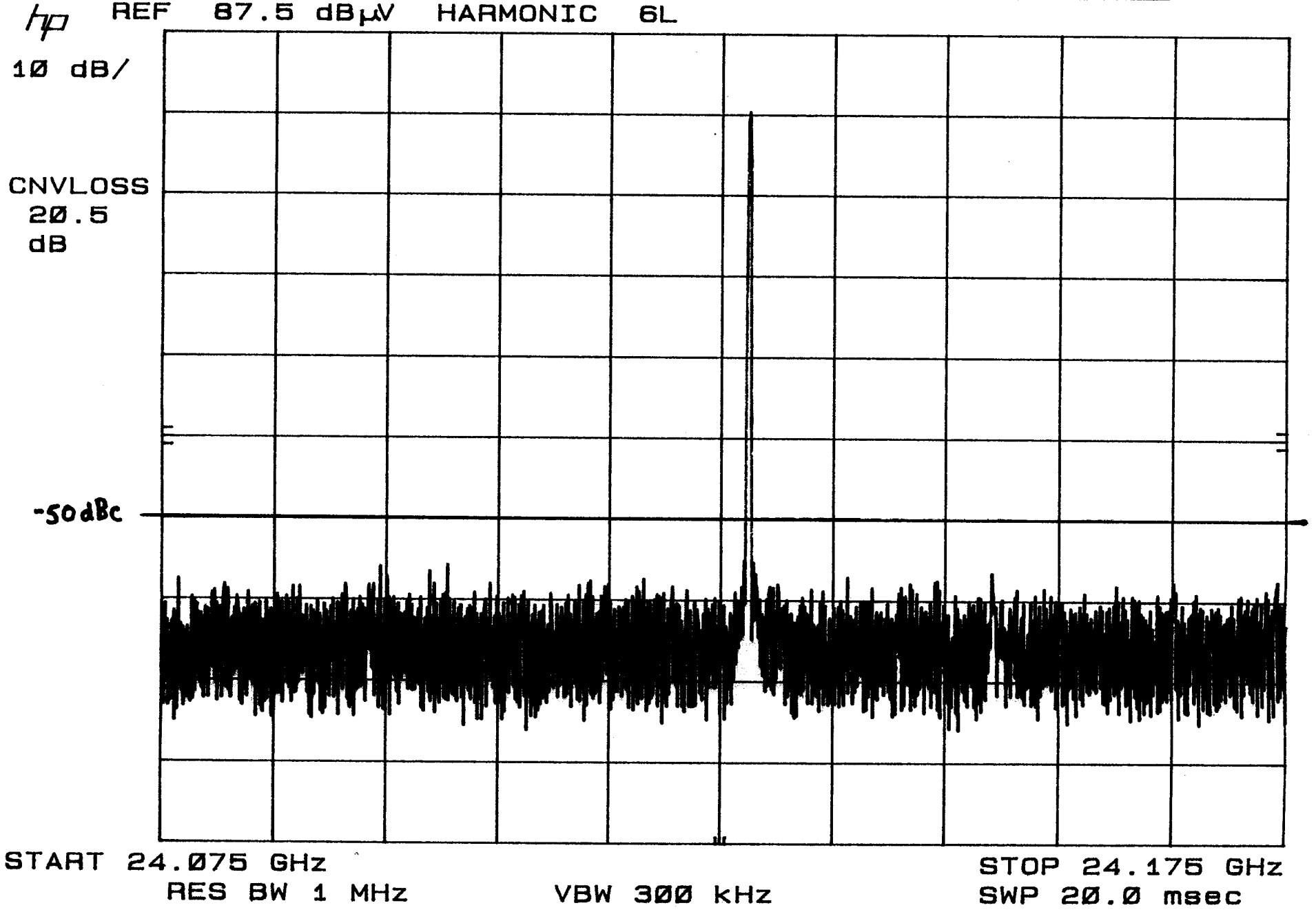
Tested by: J. C. Sausen — Printed — Signature

Reviewed by: TKS — Printed — Signature

Band Edge Plot

Test Report # WC403022 Test Area LTS Model # X1 Date 23 June 2004

EUT Power 13.7VDC Customer DICKEY-john Description Ground Speed Radar



Appendix B

Constructional Data Form(s)

and/or

Product Information Form(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

Form

EMC Test Plan and Constructional Data Form

TÜV AMERICA

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: DICKEY-john Corporation

Address: 5200 DICKEY-john Road

Contact: P. Layton Position: Product Development Manager

Phone: 217-438-2221 Fax: 217-438-6157

E-mail Address: playton@dickey-john.com

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

EUT Description: RADAR Velocity Sensor

EUT Name: RVS III

Model No.: 46783-xxxx Serial No.: 001

Product Options:

Configurations to be tested: Standard

Test Objective

- ☐ 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)

- ☒ FCC: Class ☐ A ☐ B Part C
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B
- ☐ Canada: Class ☐ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☒ Other: e-Mark

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: ☐ Attended by the customer ☒ Unattended by the customer

Form

TÜV AMERICA

EMC Test Plan and Constructional Data Form

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: 5 in Width: 5 in Height: 5 in Weight: 2 lbs

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: 12VDC (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: 0

Current (Amps/phase(max)): 0.5 Current (Amps/phase(nominal)): 0.3

Other _____

Other Special Requirements

N/A

Typical Installation and/or Operating Environment

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

EUT Power Cable

- ☒ Permanent OR ☐ Removable Length (in meters): _____
- ☐ Shielded OR ☐ Unshielded
- ☐ Not Applicable

Form

TÜV AMERICA

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

Type	Analog	Digital	During Test: Active	During Test: Passive	Qty	Shielding: Yes	Shielding: No	Shielding: Type	Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	☒	☐	2	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
Main interface	☐	☒	☒	☐		☐	☐	None	Single ended contacts	4 pin Amp CPC	Open collector	3	☐	☒
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐

Form

TÜV AMERICA

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: N/A

Description: N/A

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. Test as stationary (no target) and assure no false triggering occurs.

2.

3.

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

Description	Model #	Serial #	FCC ID #
None required			

Form

TÜV AMERICA

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc) This information is required for FCC & Taiwan testing.

Description	*Model #*	*Serial #*	*FCC ID #*
N/A			

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
16MHz	16MHz		Microprocessor

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
N/A			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*
N/A		

Form

TÜV AMERICA

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component # / Location
SMD Filter	TUSONIX	4700-008	2	+12V line / output line

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

Multi-layer PWB

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

Authorization Signatures

Customer authorization to perform tests according to this test plan. — Date: 26 OCT 04

PAUL LAYTON — Test Plan/CDF Prepared By (please print) — Date: 26 OCT 04

Appendix C

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

The test methods used comply with ANSI C63.4-2001 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

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 ±4.8 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 CISPR 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 CISPR 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 EN 55022 A
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 C63.4-2001 - "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 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 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 110000 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, 10 or 30 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. The transmitter is rotated through 3 orthogonal axes in order to determine the maximum emission levels.

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