TEST RESULT SUMMARY

FCC PART 15 SUBPART C
Section 15.245

MANUFACTURER'S NAME	Vansco Electronics LTD
NAME OF EQUIPMENT	740 True Ground Speed Sensor
MODEL NUMBER	**740001** **740030**
MANUFACTURER'S ADDRESS	1305 CLARENCE AVENUE R3T 1T4 WINNIPEG, MANITOBA CANADA
TEST REPORT NUMBER	NC301232
TEST DATE	27 May 2003

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

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.

Date: 17 July 2003

Location: Taylors Falls MN USA

G. S. Jakubowski
Tested By

J. T. Schneider
Reviewed By

Not Transferable

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

Test Report File No.	:	**NC301232**	Date of issue:	17 July 2003
Model No.	:	**740001** **740030**		
Product Name	:	740 True Ground Speed Sensor		
Applicant	:	Vansco Electronics LTD		
Manufacturer	:	Vansco Electronics LTD		
License holder	:	Vansco Electronics LTD		
Address	:	1305 CLARENCE AVENUE		
	:	R3T 1T4 WINNIPEG, MANITOBA CANADA		
Test Result	:	■ **Positive** ☐ **Negative**		
Test Project Number Reference(s)	:	**NC301232**		
Total pages including Appendices		31		

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

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

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Environmental conditions in the lab:

	Actual
Temperature	: 23 °C
Relative Humidity	: 24 %
Atmospheric pressure	: 100.0 kPa
Power supply system	: 12 VDC Battery

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)

at a test distance of :

☐ - 3 meters
☐ - 30 meters

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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 2-04.
☐ - 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	102	10-04-03
■-	2690	8566B	Hewlett-Packard	Spectrum Analyzer (Unit F)	2430A00930	12-02-03
■ -	2678	85662A	Hewlett-Packard	Analyzer Display (Unit F)	2403A08134	12-02-03
■ -	2684	85650A	Hewlett-Packard	Quasi-Peak Adapter (Unit F)	2521A01006	11-26-03
■-	2665	ZHL-1042J	Mini-Circuits	Preamplifier	32296	10-15-03

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

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Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 25 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
■ -	3202	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	10-04-03
■ -	2075	3115	Electro-Mechanics (EMCO)	Ridge Guide Ant. 1-18 GHz	9001-3275	11-13-03
■ -	2478	AWT-18037	Avantek	Preamplifier 8-18 GHz	1001-9226	4-17-04
■ -	2477	AFT-8434	Avantek	Preamplifier 4-8 GHz	2613A92801	4-17-04
■-	2690	8566B	Hewlett-Packard	Spectrum Analyzer (Unit F)	2430A00930	12-02-03
■ -	2678	85662A	Hewlett-Packard	Analyzer Display (Unit F)	2403A08134	12-02-03
■ -	2684	85650A	Hewlett-Packard	Quasi-Peak Adapter (Unit F)	2521A01006	11-26-03
■-	2665	ZHL-1042J	Mini-Circuits	Preamplifier	32296	10-15-03
■ -	2127	11975A	Hewlett Packard	Amplifier 2- 8 GHz	2738A01200	3-04-04
■ -	2662	11970K	Hewlett-Packard	Harm Mixer – 18-26.5 GHz	2332A01170	1-17-04
■ -	2788	3116	Electro-Mechanics (EMCO)	Ridge Guide Ant 18-40 GHz	2005	2-11-04

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

☐ - _____

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:

Fundamental Field Strength [15.245 (b)]

The requirements are ■ - MET ☐ - NOT MET

Minimum margin of compliance – Model 740001 4 dB at 24.136 GHz [15.245(b)]

Remarks: The fundamental was measured to be 123.5 dBuV/m (1496.236 mV/m) in average mode compared to a limit of 127.95 dBuV/m (2500mV/m).

Minimum margin of compliance – Model 740030 6 dB at 24.130 GHz [15.245(b)]

Remarks: The fundamental was measured to be 121.6 dBuV/m (1202 mV/m) in average mode compared to a limit of 127.95 dBuV/m (2500mV/m).

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 on either model.

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 25 dB at 353.89 MHz [15.245(b)(3)]

Remarks: Model 740030. No emissions detected on model 740001

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 pages A3 and A7 for band edge plots).

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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: 27 May 2003

Testing End Date: 27 May 2003

- TÜV PRODUCT SERVICE INC -

Joel T. Schneider
Chief Engineer

Tested By:
G. S. Jakubowski

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

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Test-setup photo(s):
Radiated emission 30 MHz - 25000 MHz

See Test Setup Exhibit

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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

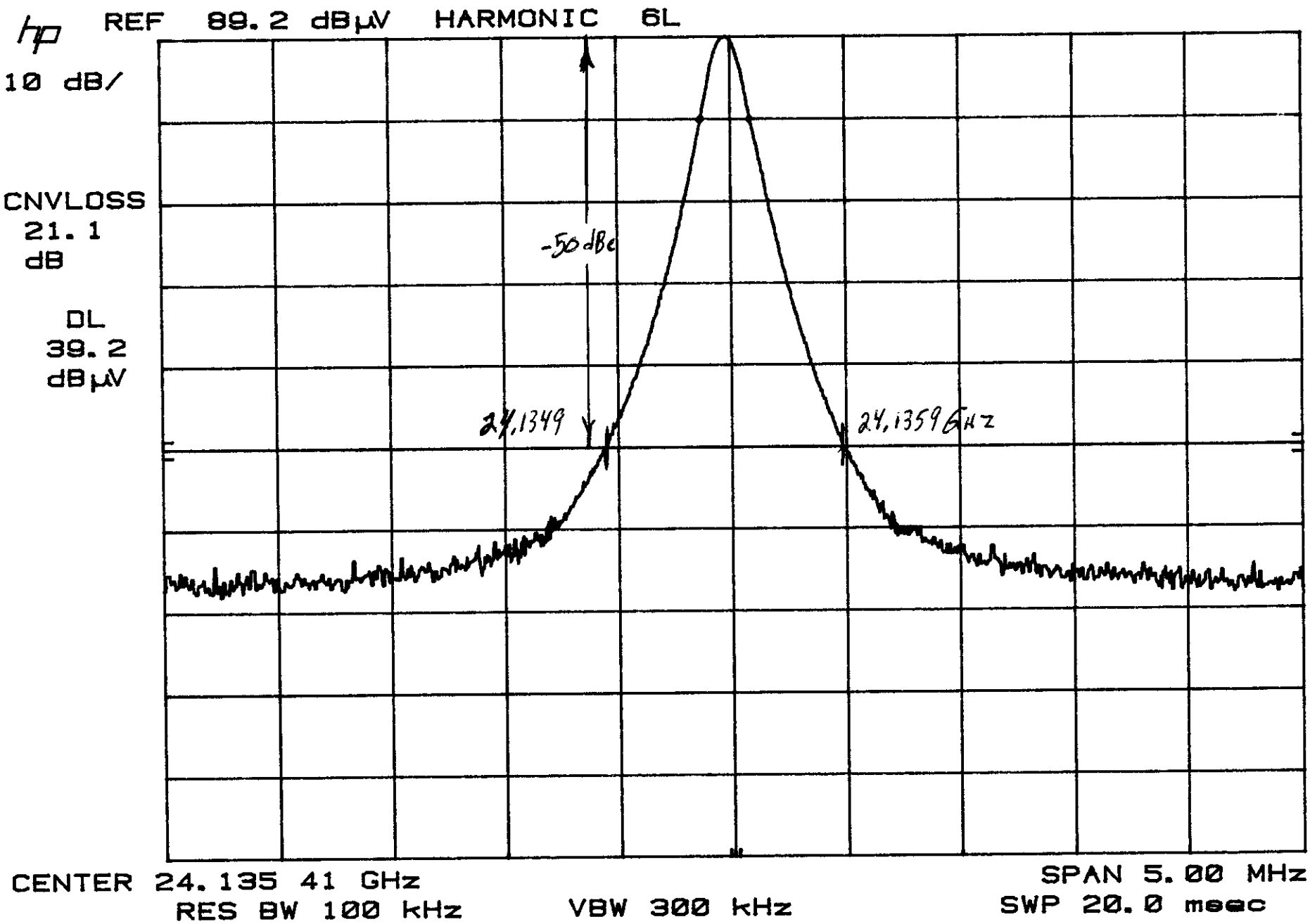
WILD RIVER LAB
Large Test Site

See Test Setup Exhibit

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

Report #: NC301232 Test Area: LTS-3 Date: 27 May, 2003 Manufacturer: Vansco Model #: 740 Serial #: 25796
Description: True Ground Speed Sensor - FCC version

-50 dBc Band Edge



Radiated Electromagnetic Emissions

Test Report #:	**1232 Run 02**	Test Area:	LTS 3m			
Test Method:	FCC part 15	Test Date:	27-May-2003			
EUT Model #:	740001	EUT Power:	12VDC			
EUT Serial #:	25796			Temperature:	22	°C
Manufacturer:	Vansco			Relative Humidity:	27	%
EUT Description:	True Ground Speed Sensor			Air Pressure:	99.1	kPa
Notes:	FCC version			Page:	1 of 1	

Fundamental frequency maximized
Fundamental frequency = 24.136GHz
Uncorrected measured level = 90.3dBuV
Receive antenna correction factor = 33.2dB
Corrected field strength level = 90.3dBuV + 33.2dB = 123.5dBuV/m @ 3 meters
4.5dB below the 128dBuV/m limit

No other significant emissions detected 18 - 100GHz

Tested by: G Jakubowski

Printed | Signature

Reviewed by: TKS

Printed | Signature

Radiated Electromagnetic Emissions

Test Report #:	**1232 Run 1**	Test Area:	LTS 3m		
Test Method:	FCC Part 15	Test Date:	27-May-2003		
EUT Model #:	740001	EUT Power:	12VDC		
EUT Serial #:	25796			Temperature:	23 °C
Manufacturer:	VANSCO			Relative Humidity:	24 %
EUT Description:	TRUE GROUND SPEED SENSOR			Air Pressure:	100 kPa
Notes:				Page:	1 of 2

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 FCC B (< 1GHz)	DELTA2 FCC B (> 1GHz)
235.92	31.6 Qp	1.3 / 11.5 / 28.3	16.1	H / 1.0 / 90.0	-29.9	N/A
294.91	31.8 Qp	1.5 / 13.0 / 28.2	18.1	H / 1.0 / 90.0	-27.9	N/A
353.89	29.7 Qp	1.7 / 15.2 / 28.2	18.4	H / 1.0 / 90.0	-27.6	N/A
MAXIMIZED.						
353.89	31.7 Qp	1.7 / 15.2 / 28.2	20.4	H / 1.0 / 132.0	-25.6	N/A
MAXED ANTENNA AND ROTATED EUT 360 DEGREES.						
NO NEW OR HIGHER EMISSIONS FOUND WITH VERTICAL POLARIZATION AT ALL AZIMUTHS.						
END OF SCAN 30 - 18000MHz.						

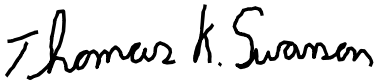
Tested by: RMJ

Printed

Signature

Reviewed by: TKS

Printed



Signature

Radiated Electromagnetic Emissions

Test Report #:	**1232 Run 1**	Test Area:	LTS 3m			
Test Method:	FCC Part 15	Test Date:	27-May-2003			
EUT Model #:	740001	EUT Power:	12VDC			
EUT Serial #:	25796			Temperature:	23	°C
Manufacturer:	VANSCO			Relative Humidity:	24	%
EUT Description:	TRUE GROUND SPEED SENSOR			Air Pressure:	100	kPa
Notes:				Page:	2 of 2	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV/m)	POL / HGT / AZ (m) (DEG)	DELTA1 FCC B (< 1GHz)	DELTA2 FCC B (> 1GHz)
********** **MEASUREMENT SUMMARY** **********						
353.89	31.7 Qp	1.7 / 15.2 / 28.2	20.4	H / 1.0 / 132.0	-25.6	N/A
294.91	31.8 Qp	1.5 / 13.0 / 28.2	18.1	H / 1.0 / 90.0	-27.9	N/A
235.92	31.6 Qp	1.3 / 11.5 / 28.3	16.1	H / 1.0 / 90.0	-29.9	N/A

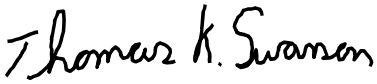
Tested by: RMJ

Printed

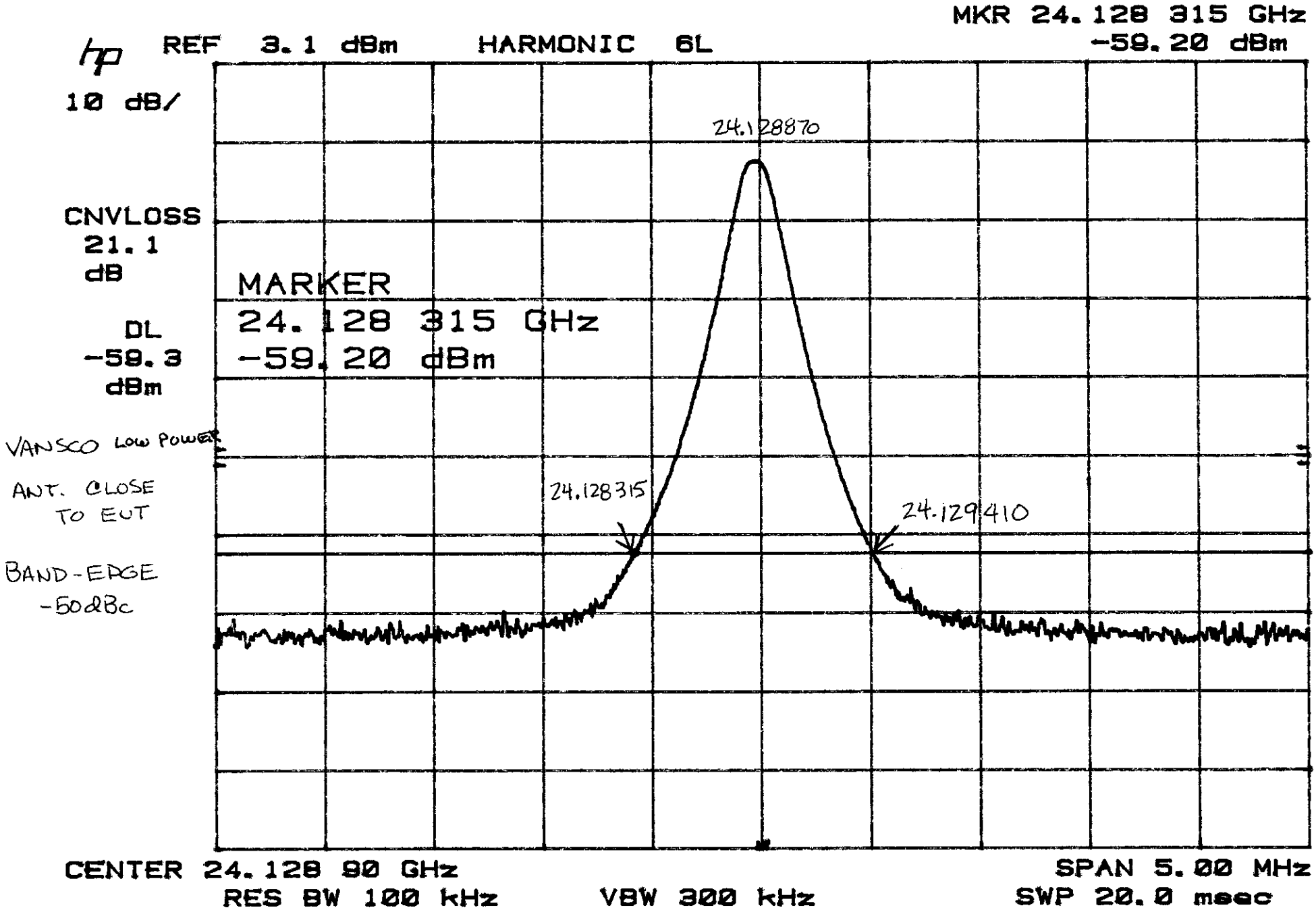
Signature

Reviewed by: TKS

Printed



Signature


MKR 24.128 315 GHz
-59.20 dBm
REF 3.1 dBm
HARMONIC 6L
10 dB/
CNVLOSS
21.1
dB
DL
-59.3
dBm
MARKER
24.128 315 GHz
-59.20 dBm
24.128870
24.128315
24.129410
VANSCO LOW POWER
ANT. CLOSE TO EUT
BAND-EDGE
-50dBc
CENTER 24.128 90 GHz
RES BW 100 kHz
VBW 300 kHz
SPAN 5.00 MHz
SWP 20.0 msec

Radiated Electromagnetic Emissions

Test Report #:	**2311 Run 02**	Test Area:	LTS 3m			
Test Method:		Test Date:	27-May-2003			
EUT Model #:	740030	EUT Power:	12VDC			
EUT Serial #:	25792			Temperature:	22	°C
Manufacturer:	Vansco			Relative Humidity:	27	%
EUT Description:	True Ground Speed Sensor			Air Pressure:	99.1	kPa
Notes:	EU version			Page:	1 of 1	

Fundamental frequency maximized
Fundamental frequency = 24.130GHz
Uncorrected measured level = 88.4dBuV
Receive antenna correction factor = 33.2dB
Corrected field strength level = 88.4dBuV + 33.2dB = 121.6dBuV/m @ 3 meters
20dB band width = 146.0kHz

Substitution method used to determine EIRP

Signal generator output power setting = 5.9dBm
Transmit horn gain = 12.0dB
EIRP = 5.9dBm + 12dB = 17.9dBm = 61.7mW
Below the 100mW limit

No other significant emissions detected 18 - 50GHz

Tested by: G Jakubowski

Printed | Signature

Reviewed by: TKS

Printed | Signature

Radiated Electromagnetic Emissions

Test Report #:	**2311 Run 01**	Test Area:	LTS 3m		
Test Method:	N/A	Test Date:	28-May-2003		
EUT Model #:	740030	EUT Power:	12VDC		
EUT Serial #:	25792			Temperature:	22 °C
Manufacturer:	Vansco			Relative Humidity:	35 %
EUT Description:	True ground speed sensor			Air Pressure:	99.1 kPa
Notes:	EU version			Page:	1 of 1

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 N/A	DELTA2 N/A
No significant emissions detected						
Antenna both horizontal & vertical						
1 to 4 meters high						
EUT rotated 360 degrees						
End scan 30-18000MHz						

Tested by: G Jakubowski

Printed

Signature

Reviewed by: TKS

Printed

Signature

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

TÜV AMERICA

EMC Test Plan and Constructional Data Form

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:	VANSCO ELECTRONICS LTD		
Address:	1305 CLARENCE AVENUE		
	R3T 1T4 WINNIPEG, MANITOBA		
	CANADA		
Contact:	Nikolai Tevs	Position:	Designer
Phone:	(204) 453-3339 ext. 375	Fax:	(204) 452-7156
E-mail Address:	Ntevs@Vansco.ca		

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

EUT Description	TRUE GROUND SPEED SENSOR		
EUT Name	1. 740 TRUE GROUND SPEED SENSOR (SP-UK) 2. 740 TRUE GROUND SPEED SENSOR (LP)		
Model No.:	1. 740060 2. 740030	Serial No.:	1. 25791 2. 25792
Product Options:	Radar present line tied to battery or gnd.		
Configurations to be tested:	Radar present line tied to battery		

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 15
- ☐ VCCI: Class ☐ A ☐ B
- ☐ BSMI: Class ☐ A ☐ B
- ☐ Canada: Class ☐ A ☐ B
- ☐ Australia: Class ☐ A ☐ B
- ☒ Other: Industy Canada RSS-210

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.)

Form

EMC Test Plan and Constructional Data Form

TÜV AMERICA

Attendance

Test will be: ☐ Attended by the customer ☒ Unattended by the customer

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: 3.60" Width: 3.89" Height: 3.88" Weight: 460 grams

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

# of Phases: N/A

Current (Amps/phase(max)): 120 mA Current (Amps/phase(nominal)): 100 mA

Other N/A

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): 0.5 m

☐ Shielded OR ☒ Unshielded

☐ Not Applicable

Form

EMC Test Plan and Constructional Data Form

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*	☒	☐
power and speed output	☐	☒	1	☐	☒	18 AWG,4/C SIOW	N/A	F2DB-14A624-EA	N/A	0	☐	☒
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
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	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
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Form

EMC Test Plan and Constructional Data Form

TÜV AMERICA

EUT Software.

Revision Level: 1.04 build 142

Description: The firmware samples an input frequency from the radar antenna. The frequency is directly proportional to the ground speed measured. It uses histogram-based filtering to remove artifacts such as noise and signal dropout. It generates an output frequency based on this filtered data.

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. Normal operating mode

2.

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 #
TGSS	740001	25792 / 25791	

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 #*
N/A			

Oscillator Frequencies

Frequency	*Derived Frequency*	*Component # / Location*	*Description of Use*
7.3728 MHz	N/A	Y1	Micro operation

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*
Murata	NFM61RH20T332T1	At the input of +12V

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***
Filter capacitor	N/A	X7R1U16V125C 10% 1206	5	C15, C9, C8, C1, C2
Filter capacitor	N/A	X7R .1U50V 125C 10%0805	6	C5, C6, C17, C18, C27, C28

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

All longer traces sandwiched between two ground plane layers.

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

Authorization Signatures

Rasvan Dragne	March 14, 2003
Customer authorization to perform tests according to this test plan.	Date
Danica Pantner/Paulo Rodriguez	March 14, 2003
Test Plan/CDF Prepared By (please print)	Date
Reviewed by TÜV Product Service Associate	Date

Form

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.

See Block Diagram Exhibit

Authorization Signatures

Rasvan Dragne	March 14, 2003
Customer authorization to perform tests according to this test plan.	Date
Danica Pantner	March 14, 2003
Test Plan/CDF Prepared By (please print)	Date
Reviewed by TÜV Product Service Associate	Date

Appendix C

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Conducted and radiated emission testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22 (1993), European Standard EN 55022 and Australian Standard AS 3548 (which are based on CISPR 22).

The Japanese standard, "Voluntary Control Council for Interference (VCCI) by Data Processing Equipment and Electronic Office Machines, Technical Requirements" is technically equivalent to CISPR 22 (1993). For official compliance, a conformance report must be sent to and accepted by the VCCI.

In compliance with FCC Docket 92-152, "Harmonization of Rules for Digital Devices Incorporate International Standards", testing for FCC compliance may be done following the ANSI C63.4-1992 procedures and using the CISPR 22 Limits.

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 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)	(dB/m)	(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

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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 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 25000 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.

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