

TEST RESULT SUMMARY

FCC PART 15 SUBPART C Section 15.245

MANUFACTURER'S NAME	Phoenix International Corporation
NAME OF EQUIPMENT	Accuspeed - Doppler Effect Speed Sensor
MODEL NUMBER	N/A
MANUFACTURER'S ADDRESS	1441 44 th Street NW Fargo ND 58102
TEST REPORT NUMBER	W0592
TEST DATE	18 May & 07 November 2000

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.

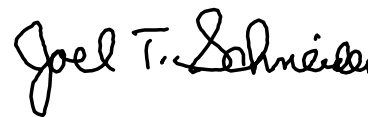
TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15 Subpart C Section 15.245.

Date: 22 January 2001

Location: Taylors Falls MN
USA



R. M. Johnson
Test Technician
Not Transferable



J. T. Schneider
Lead Engineer

EMC EMISSION - TEST REPORT

Test Report File No. : **WC1G059201** Date of issue: 22 January 2001

Serial No. : N/A / 10

Product Type : Accuspeed - Doppler Effect Speed Sensor

Applicant : Phoenix International Corporation

Manufacturer : Phoenix International Corporation

License holder : Phoenix International Corporation

Address : 1441 44th Street NW
: Fargo ND 58102

Test Result : ☒ **Positive** ☐ **Negative**

Test Project Number :
Reference(s) : **W0592**

Total pages including
Appendices : **14**

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

DIRECTORY - EMISSIONS

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EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

- | | | |
|--|---|------------------------------------|
| ☐ - EN 50081-1 / 1991 | ☐ - Group 1 | ☐ - Group 2 |
| ☐ - EN 55011 / 1991 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55013 / 1990 | ☐ - Household appliances and similar | |
| ☐ - EN 55014 / 1987 | ☐ - Portable tools | |
| | ☐ - Semiconductor devices | |
| ☐ - EN 55014 / A2:1990 | ☐ - Household appliances and similar | |
| ☐ - EN 55014 / 1993 | ☐ - Portable tools | |
| | ☐ - Semiconductor devices | |
| ☐ - EN 55015 / 1987 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55015 / A1:1990 | | |
| ☐ - EN 55015 / 1993 | | |
| ☐ - EN 55022 / 1987 | | |
| ☒ - FCC Part 15 Subpart C Section 15.245 | | |
| ☐ - BS | ☐ - Class A | ☐ - Class B |
| ☐ - VCCI | ☐ - Class A | ☐ - Class B |
| ☐ - FCC | ☐ - Class A | ☐ - Class B |
| ☐ - AS 3548 (1992) | | |
| ☐ - CISPR 11 (1990) | ☐ - Group 1 | ☐ - Group 2 |
| | ☐ - Class A | ☐ - Class B |
| ☐ - CISPR 22 (1993) | ☐ - Class A | ☐ - Class B |

Environmental conditions in the lab:

	<u>Actual</u>
Temperature	: 19 °C
Relative Humidity	: 42 %
Atmospheric pressure	: 99 kPa
Power supply system	: 12 VDC

Sign Explanations:

- ☐ - not applicable
☒ - applicable



CONDUCTED EMISSIONS on AC power leads

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

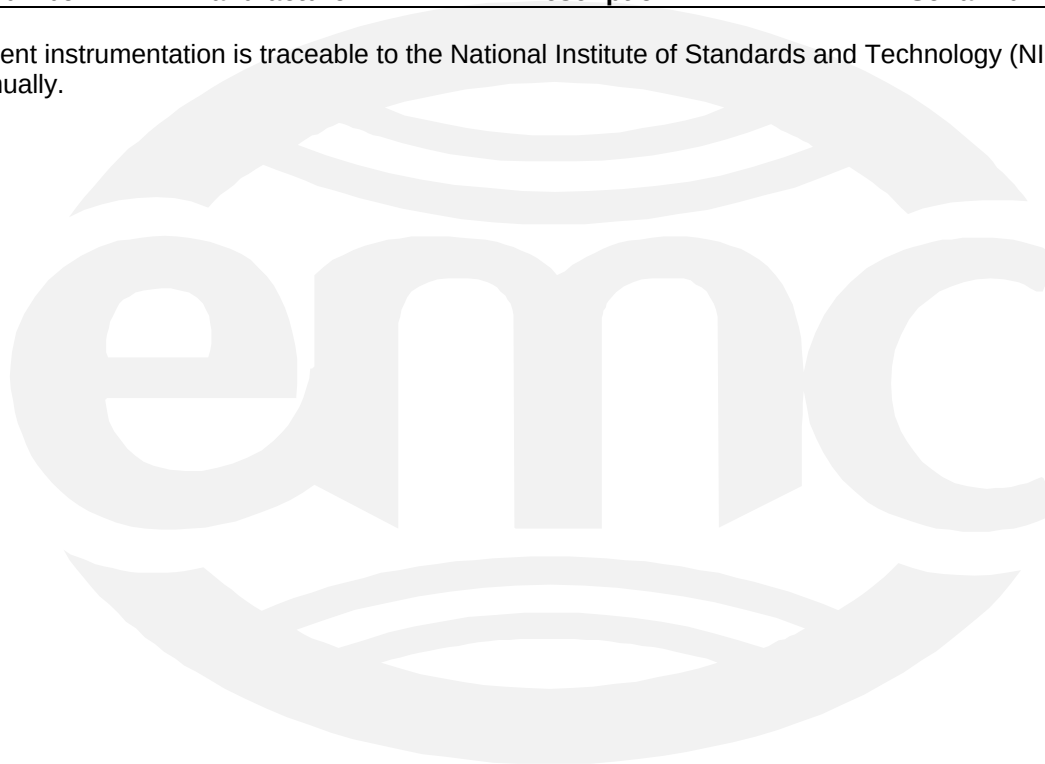
■ - Test not applicable

- ☐ - 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

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Due
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All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.



Field Strength of Fundamental

The fundamental was measured to have a field strength of 891.2 mV/m (119 dBuV/m) at 24112 MHz, compared to a limit of 2500 mV/m. The spectrum analyzer level of 74 dBuV + antenna factor/cable loss of 45 dB/m = 119 dBuV/m.

The Field Strength of Fundamental 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
- ☐ - 10 meters
- ☐ - 30 meters

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Due
■ - 8566B	Hewlett-Packard	Spectrum Analyzer	2221A01596	12-04-01
■ - 85662A	Hewlett-Packard	Analyzer Display	2152A03640	12-04-01
■ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	12-04-01
■ - 11970K	Hewlett-Packard	Ext. mixer 18-26.5 GHz	2332A01170	1-03
■ - 11975A	Hewlett-Packard	Amplifier to drive mixer	2738A01200	
■ - 3116	EMCO	Horn Antenna	2005	11-00

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

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 100 GHz using a spectrum analyzer (with external mixers) 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. The EUT is rotated through three orthogonal axes in order to determine the maximum position for emissions. The field strength levels were measured per ANSI C63.4.

Field Strength of Harmonics

The highest level harmonic was measured to have a field strength of 4.5 mV/m (73 dBuV/m) at 48224 MHz, compared to a limit of 25 mV/m. The spectrum analyzer level of 34 dBuV + antenna factor/cable loss of 39 dB/m = 73 dBuV/m.

Frequency (MHz)	Max. Analyzer reading	Factor	dBuV/m	mV/m	Limit(mV/m)	distance from EUT
48224	34	39	73	4.5	25	3 meters
72336	43	42	85	17.8	25	0.3 meters
No signal detected. The noise floor meets the 3 meter limit without extrapolation.						
96448	49	44	93	44.6	25	0.3 meters
No signal detected. Using 20 dB/decade extrapolation, this would put minimum discernible signal level at 4.5 mV/m at 3 meters.						

The Field Strength of Harmonic measurements were performed at the following test location:

☐ - Test not applicable

■ - Wild River Lab Large Test Site (Open Area Test Site)

at a test distance of :

- - 3 meters
- - 1 meters
- - 0.3 meters

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Due
■ - 8566B	Hewlett-Packard	Spectrum Analyzer	2221A01596	12-04-01
■ - 85662A	Hewlett-Packard	Analyzer Display	2152A03640	12-04-01
■ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	12-04-01
■ - 11970U	Hewlett-Packard	Ext. mixer 40-60 GHz	Id# 2919	1-03
■ - 11970V	Hewlett-Packard	Ext. mixer 50-75 GHz	Id# 2920	1-03
■ - 11970W	Hewlett-Packard	Ext. mixer 75-110 GHz	Id# 2922	1-03
■ - 11975A	Hewlett-Packard	Amplifier to drive mixer	2738A01200	
■ - 19-7025	Aerowave	Horn Antenna	ID# 2918	
■ - 15-7025	Aerowave	Horn Antenna	ID# 2917	
■ - 10-7025	Aerowave	Horn Antenna	ID# 2916	

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

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 100 GHz using a spectrum analyzer (with external mixers) and appropriate broadband linearly polarized antennas. 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. 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, but moved in closer if the signal levels are too low to measure at 3 meters. 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 EUT is rotated through three orthogonal axes in order to determine the maximum position for emissions. The field strength levels were measured per ANSI C63.4.

Field Strength of Spurious Emissions

The highest level spurious emission was measured to have a field strength of 42 $\mu\text{V/m}$ (32.5 dBuV/m) at 520 MHz, compared to a limit of 200 $\mu\text{V/m}$. The ten highest emission levels are listed below from 30 MHz to 100 GHz. The factor includes antenna factor + cable loss – preamplifier gain.

Frequency (MHz)	Max. Analyzer reading	Factor	dBuV/m	$\mu\text{V/m}$	Limit($\mu\text{V/m}$)	Pol/Hgt/Azimuth
520	38	-5.5	32.5	42	200	V / 1.3 / 270
560	35.6	-4.4	31.2	37	200	V / 1.0 / 270
680.1	32.4	-2.4	30.0	32	200	V / 1.0 / 0
320	40.5	-10.6	29.9	32	200	H / 1.0 / 144
640.1	32.9	-3	29.9	32	200	V / 1.0 / 0
720.1	30.7	-1.4	29.3	30	200	V / 1.0 / 0
440	35.6	-7	28.6	27	200	V / 1.0 / 180
760.1	28.7	-0.2	28.5	27	200	V / 1.0 / 90
920.1	26.4	2.1	28.5	27	200	V / 1.0 / 0
675.1	30.4	-2.4	28.0	26	200	V / 1.0 / 0

The Field Strength of Spurious emissions 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

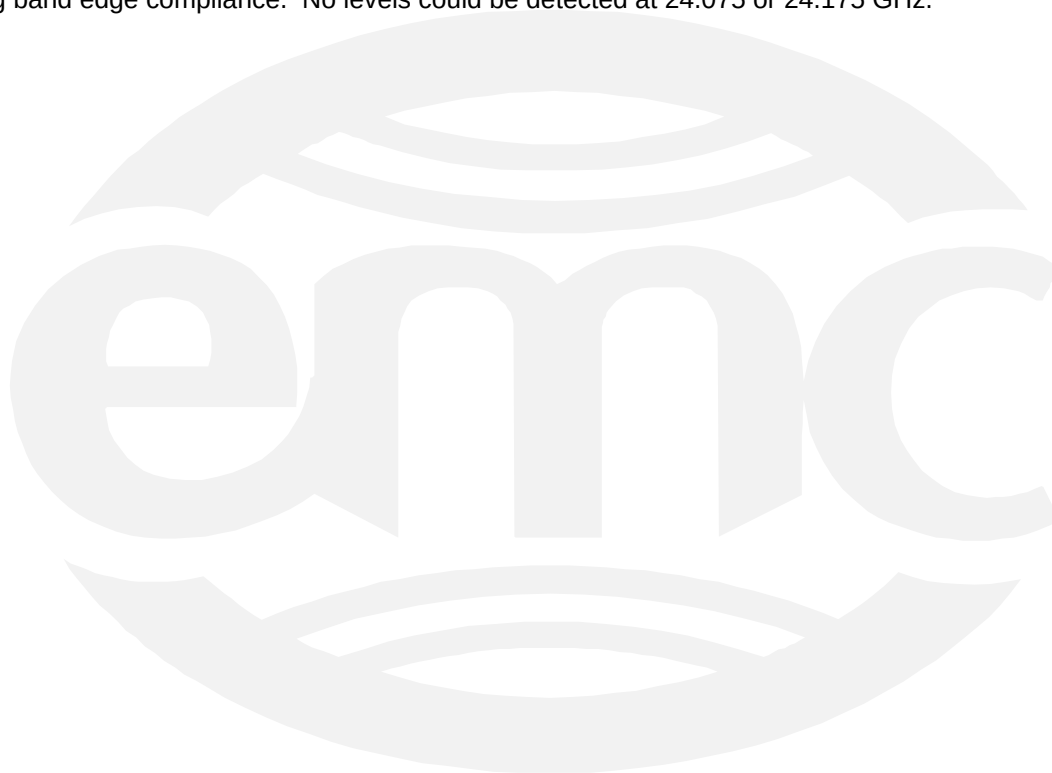
Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Due
■ - 8566B	Hewlett-Packard	Spectrum Analyzer	2221A01596	12-04-01
■ - 85662A	Hewlett-Packard	Analyzer Display	2152A03640	12-04-01
■ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	12-04-01
■ - 11970U	Hewlett-Packard	Ext. mixer 40-60 GHz	Id# 2919	1-03
■ - 11970V	Hewlett-Packard	Ext. mixer 50-75 GHz	Id# 2920	1-03
■ - 11970W	Hewlett-Packard	Ext. mixer 75-110 GHz	Id# 2922	1-03
■ - 11975A	Hewlett-Packard	Amplifier to drive mixer	2738A01200	
■ - 19-7025	Aerowave	Horn Antenna	ID# 2918	
■ - 15-7025	Aerowave	Horn Antenna	ID# 2917	
■ - 10-7025	Aerowave	Horn Antenna	ID# 2916	
■ - EM-6917B	Electro-Metrics	Biconicalog Antenna	101	9-01
■ - 3116	EMCO	Horn Antenna	2005	11-00
■ - 3115	EMCO	Horn Antenna	9001-3275	10-01
■ - ZHL-1042J	Mini-Circuits	Preamplifier	H072294-11	3-01
■ - AWT-18037	Avantek	Preamplifier	1001-9226	3-01
■ - AFT-8434	Avantek	Preamplifier	9112 Z221	3-01
■ - 11970K	Hewlett-Packard	Ext. mixer 18-26.5 GHz	2332A01170	1-03
■ - 11970A	Hewlett-Packard	Ext. mixer 26.5-40 GHz	ID# 2661	1-03

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

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 100 GHz using a spectrum analyzer (with external mixers) 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. 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, but moved in closer if the signal levels are too low to measure at 3 meters. 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 EUT is rotated through three orthogonal axes in order to determine the maximum position for emissions. The field strength levels were measured per ANSI C63.4.

The attached bandwidth plot show that the fundamental signal is in the noise level at 24.1078 GHz and 24.1148 GHz, demonstrating band edge compliance. No levels could be detected at 24.075 or 24.175 GHz.



MODEL=H5C

MKR Δ -3.88 MHz
BP 0.20 dB

REF 109.4 dB_{μV} HARMONIC 6L

10 dB/

CHVLOSS

20.4

dB

DL

50.8

dB_{μV}

MARKER Δ

-3.88 MHz

BP 0.20 dB

24.1078

24.1148

CENTER 24.1118 GHz

RES BW 1 MHz

VBW 300 kHz

SPAN 10.0 MHz

SWP 20.0 msec

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:

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

- | | |
|---|----------------|
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - _____ | Type : _____ |
| ☐ - unshielded power cable | |
| ☒ - unshielded cables | |
| ☐ - shielded cables | MPS.No.: _____ |
| ☐ - customer specific cables | |
| ☐ - _____ | |
| ☐ - _____ | |

DEVIATIONS FROM STANDARD:

None

GENERAL REMARKS:

SUMMARY:

The requirements according to the technical regulations are

■ - met

□ - **not** met.

The device under test does

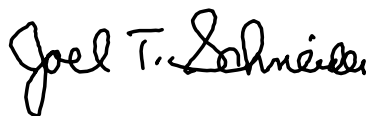
■ - fulfill the general approval requirements mentioned on page 3.

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

Testing Start Date: 18 May 2000

Testing End Date: 07 November 2000

- TÜV PRODUCT SERVICE INC -



Reviewed By:
J. T. Schneider



Tested By:
R. M. Johnson

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

See Test Setup Exhibit



Radiated emission test setup photos

See Test Setup Exhibit

