

TEST RESULT SUMMARY

FCC PART 15 SUBPART C Section 15.231(e)

MANUFACTURER'S NAME	SIMS Deltec, Incorporated
NAME OF EQUIPMENT	Wireless Remote Monitoring System (WRMS) Transmitter
MODEL NUMBER	21-6330-51
MANUFACTURER'S ADDRESS	1265 Grey Fox Road St. Paul MN 55112
TEST REPORT NUMBER	W0277
TEST DATE	22 May 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.

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.

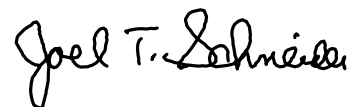
TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15.

Date: 11 September 2000

Location: Taylors Falls MN
USA



J. C. Sausen
Test Engineer



J. T. Schneider
Lead Engineer

Not Transferable

EMC EMISSION - TEST REPORT

Test Report File No. : **WC1G027701** Date of issue: 11 September 2000

Model / Serial No. : **21-6330-51 / Prototype**

Product Type : **Wireless Remote Monitoring System (WRMS) Transmitter**

Applicant : **SIMS Deltec, Incorporated**

Manufacturer : **SIMS Deltec, Incorporated**

License holder : **SIMS Deltec, Incorporated**

Address : **1265 Grey Fox Road**

: **St. Paul MN 55112**

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

Test Project Number : **W0277**

Reference(s)

Total pages including Appendices **29**

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

File No. WC1G027701, Page 1 of 12

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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 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55015 / 1993 | | |
| ☐ - EN 55022 / 1987 | | |
| ☐ - EN 55022 / 1994 | | |
| ☐ - BS | ☐ - Class A | ☐ - Class B |
| ☐ - VCCI | ☐ - Class A | ☐ - Class B |
| ☒ - FCC Part 15 Subpart C Section 15.231(e) | ☐ - Class A | ☐ - Class B |
| ☐ - 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 |

Environmental conditions in the lab:

	<u>Actual</u>
Temperature	: 24 °C
Relative Humidity	: 54 %
Atmospheric pressure	: 97.9 kPa
Power supply system	: 3.3 VDC

Sign Explanations:

- ☐ - not applicable
- ☒ - applicable



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:

- ☐ - 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

☒ - Test not applicable

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 6-99, due 6-00
- ☒ - 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	2430A00930	5-01
■ - 85662A	Hewlett-Packard	Analyzer Display	2403A08134	5-01
■ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2521A01006	5-01
■ - ZHL-1042J	Mini-Circuits	Preamplifier	H081296-16	3-01
■ - EM-6917B	Electro-Metrics	Biconicalog Periodic	106	12-00

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

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz – 4.2 GHz were performed in a horizontal and vertical polarization at the following test location :

- ☐ - 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 meters
- ☒ - 3 meters
- ☐ - 10 meters

☐ - Test not applicable

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Due
■ - 8566B	Hewlett-Packard	Spectrum Analyzer	2430A00930	5-01
■ - 85662A	Hewlett-Packard	Analyzer Display	2403A08134	5-01
■ - 85650A	Hewlett-Packard	Quasi-Peak Adapter	2521A01006	5-01
■ - ZHL-1042J	Mini-Circuits	Preamplifier	H081296-16	3-01
■ - EM-6917B	Electro-Metrics	Biconicalog Periodic	106	12-00
■ - 3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2483	12-00

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
- ☒ - Transmitter on.

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

Emission Test Results:

Conducted emissions 10/150 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated emissions (magnetic field) 10 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are ☒ - MET ☐ - NOT MET

Minimum limit margin for fundamental _____ 0.5 dB at _____ 418.0 MHz

Minimum limit margin for spurious _____ 27 dB at _____ 836.0 MHz

Remarks: The fundamental was measured to be 77.5 dBuV/m in peak mode, minus 5.75 dB (based on 51.6% duty cycle) to get average measurement, or 71.75 dBuV/m (3868 uV/m) compared to a limit of 72.3 dBuV/m (4133 uV/m). The second harmonic was measured to be 30.8 dBuV/m in peak mode, minus 5.75 dB (based on 51.6% duty cycle) to get average measurement, or 25.05 dBuV/m (17.9 uV/m) compared to an average limit of 52.3 dBuV/m (413 uV/m).

Interference Power at the mains and interface cables 30 MHz - 300 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Equivalent Radiated emissions 1 GHz - 4.2 GHz

The requirements are ☒ - MET ☐ - NOT MET

Minimum limit margin _____ 8 dB at _____ 3762.16 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: The noise level at the ninth harmonic was measured to be 51.8 dBuV/m in peak mode, minus 5.75 dB (based on 51.6% duty cycle) to get average measurement, or 46.05 dBuV/m (200 uV/m) compared to an average limit of 54 dBuV/m (501 uV/m).

DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

The bandwidth of the fundamental must be less than 0.25% of the center frequency, or 1.045 MHz. Page A6 of A7 shows the bandwidth to be less than 200 kHz. The transmitter is on for 10.32 msec/20 msec, so a duty cycle relaxation factor of $20 \log 51.6/100$, or 5.75 dB is used to convert peak readings to average readings. Page A7 of A7 shows the on/off times.

SUMMARY:

The requirements according to the technical regulations are

☒ - met

☐ - not met.

The device under test does

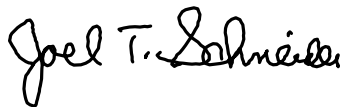
☒ - fulfill the general approval requirements mentioned on page 3.

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

Testing Start Date: 22 May 2000

Testing End Date: 22 May 2000

- TÜV PRODUCT SERVICE INC -



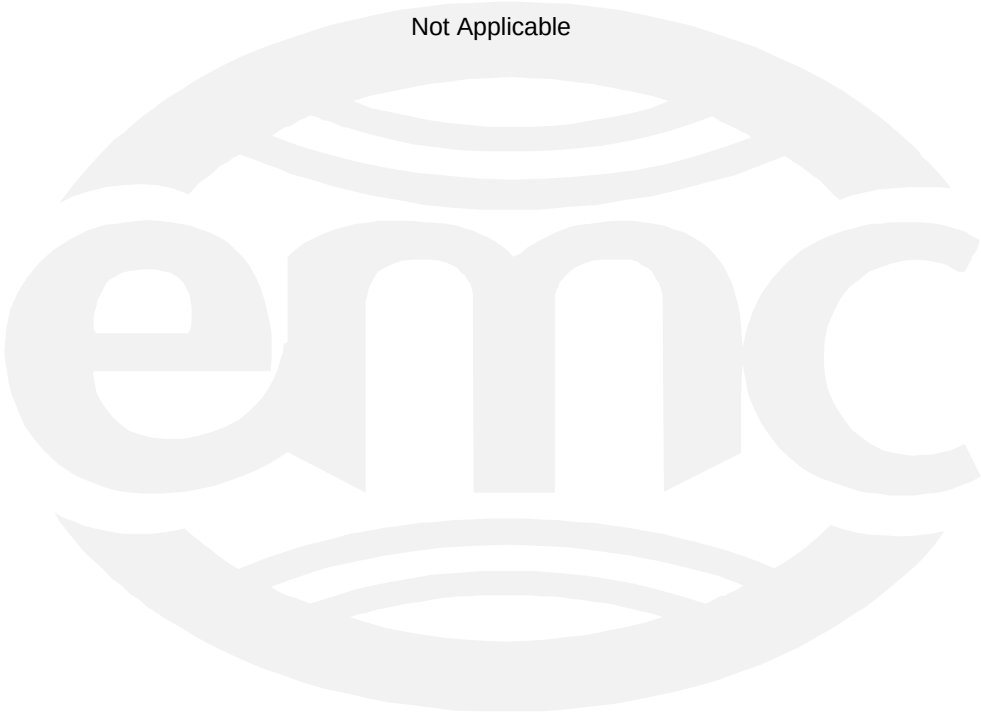
J. T. Schneider
Lead Engineer



Tested By:
J. C. Sausen

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

Not Applicable



Test-setup photo(s):
Radiated emission 30 MHz – 4.2 GHz

See Test-Setup Exhibit



Appendix A

Test Data Sheets
and
Test Setup Drawing(s)



TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Small Test Site (STS)

See Test-Setup Exhibit



Radiated Electromagnetic Emissions



Test Report #: **W0277 Run 02** Test Area: **STS 3m**

Test Method: **N/A** Test Date: **22-May-2000**

EUT Model #: **21-6330-51** EUT Power: _____

EUT Serial #: **prototype #'s 1 & 2** Temperature: **24** °C

Manufacturer: **Sims Deltec** Relative Humidity: **54** %

EUT Description: **CADD-Lynxs Transmitter** Air Pressure: **97.9** kPa

Notes: **PWA #: 71-0323**

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB).....(dB/m).....(dB)	FINAL PEAK (dBuV/m)	POL / HGT / AZ (m) (DEG)	FINAL AVERAGE (dBuV/m)	15.231 LIMIT (dBuV/m)
Note: Res BW & Video BW = 100 kHz:						
418.00	85.1 Pk	4.6 / 16.0 / 28.2	77.5	H / 1.0 / 252.0	71.75	72.3
418.00	79.9 Pk	4.6 / 16.0 / 28.2	72.3	V / 2.4 / 196.0	66.55	72.3
noise floor only:						
836.01	24.4 Pk	6.6 / 21.4 / 27.5	24.9	V / 2.4 / 196.0	19.15	52.3
eut harmonic:						
836.07	30.2 Pk	6.6 / 21.4 / 27.5	30.8	H / 1.0 / 0.0	26.05	52.3
Note Res BW and Video BW = 1 MHz						
noise floor:						
1254.07	25.9 Pk	8.6 / 22.4 / 27.3	29.7	H / 1.0 / 0.0	23.95	54
1254.07	29.9 Pk	8.6 / 22.4 / 27.3	33.7	V / 1.0 / 0.0	27.95	54
1672.07	33.0 Pk	10.6 / 25.6 / 27.5	41.7	V / 1.0 / 0.0	35.95	54
1672.07	31.5 Pk	10.6 / 25.6 / 27.5	40.2	H / 1.0 / 0.0	34.45	54
2090.16	30.0 Pk	11.5 / 27.6 / 27.5	41.5	H / 1.0 / 0.0	35.75	54
2090.16	31.7 Pk	11.5 / 27.6 / 27.5	43.2	V / 1.0 / 0.0	37.45	54
2508.16	31.9 Pk	12.6 / 28.4 / 28.2	44.7	V / 1.0 / 0.0	38.95	54
2508.16	31.4 Pk	12.6 / 28.4 / 28.2	44.3	V / 1.0 / 0.0	38.55	54
2926.16	31.6 Pk	13.8 / 30.4 / 28.2	47.6	V / 1.0 / 0.0	41.85	54
2926.16	28.9 Pk	13.8 / 30.4 / 28.2	45.0	H / 1.0 / 0.0	39.25	54
3344.16	28.0 Pk	15.1 / 31.3 / 28.1	46.3	H / 1.0 / 0.0	40.55	54
3344.16	28.4 Pk	15.1 / 31.3 / 28.1	46.7	H / 1.0 / 0.0	40.95	54
3762.16	31.4 Pk	16.8 / 32.1 / 28.5	51.8	V / 1.0 / 0.0	46.05	54
3762.16	27.9 Pk	16.8 / 32.1 / 28.5	48.2	H / 1.0 / 0.0	42.45	54

Tested by: **J. C. Sausen**

Printed

Signature

Reviewed by: **T. K. Swanson**

Printed

Signature

File No. WC1G027701, Page A3 of A7

Radiated Electromagnetic Emissions



Test Report #: W0277 Run 02 Test Area: STS 3m
Test Method: N/A Test Date: 22-May-2000
EUT Model #: 21-6330-51 EUT Power: _____
EUT Serial #: prototype #'s 1 & 2 Temperature: 24 °C
Manufacturer: Sims Deltec Relative Humidity: 54 %
EUT Description: CADD-Lynxs Transmitter Air Pressure: 97.9 kPa
Notes: PWA #: 71-0323

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB).....(dB/m).....(dB)	FINAL PEAK (dBuV/m)	POL / HGT / AZ (m) (DEG)	FINAL AVERAGE (dBuV/m)	15.231 LIMIT (dBuV/m)
4180.16	20.2 Pk	17.6 / 32.5 / 28.8	41.4	H / 1.0 / 0.0	35.65	54
4180.16	19.9 Pk	17.6 / 32.5 / 28.8	41.1	V / 1.0 / 0.0	35.35	54
No spurious emissions detected.						

Tested by: J. C. Sausen

Printed

Signature

Reviewed by: T. K. Swanson

Printed

Signature

File No. WC1G027701, Page A4 of A7

Radiated Electromagnetic Emissions



Test Report #: **W0277 Run 02** Test Area: **STS 3m**

Test Method: **N/A** Test Date: **22-May-2000**

EUT Model #: **21-6330-51** EUT Power: _____

EUT Serial #: **prototype #'s 1 & 2** Temperature: **24** °C

Manufacturer: **Sims Deltec** Relative Humidity: **54** %

EUT Description: **CADD-Lynxs Transmitter** Air Pressure: **97.9** kPa

Notes: **PWA #: 71-0323**

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL PEAK	POL / HGT / AZ	FINAL AVERAGE	15.231 LIMIT
(MHz)	(dBuV)	(dB).....(dB/m).....(dB)	(dBuV/m)	(m) (DEG)	(dBuV/m)	(dBuV/m)

***** MEASUREMENT SUMMARY *****						
418.00	90.7 Pk	4.6 / 16.0 / 28.2	77.5	H / 1.0 / 0.0	71.75	72.3
836.07	30.2 Pk	6.6 / 21.4 / 27.5	30.8	H / 1.0 / 0.0	26.05	52.3
1254.07	29.9 Pk	8.6 / 22.4 / 27.3	33.7	V / 1.0 / 0.0	27.95	54
1672.07	33.0 Pk	10.6 / 25.6 / 27.5	41.7	V / 1.0 / 0.0	35.95	54
2090.16	31.7 Pk	11.5 / 27.6 / 27.5	43.2	V / 1.0 / 0.0	37.45	54
2508.16	31.9 Pk	12.6 / 28.4 / 28.2	44.7	V / 1.0 / 0.0	38.95	54
2926.16	31.6 Pk	13.8 / 30.4 / 28.2	47.6	V / 1.0 / 0.0	41.85	54
3344.16	28.4 Pk	15.1 / 31.3 / 28.1	46.7	H / 1.0 / 0.0	40.95	54
3762.16	31.4 Pk	16.8 / 32.1 / 28.5	51.8	V / 1.0 / 0.0	46.05	54
4180.16	20.2 Pk	17.6 / 32.5 / 28.8	41.4	H / 1.0 / 0.0	35.65	54

Tested by: **J. C. Sausen**

Printed

Signature

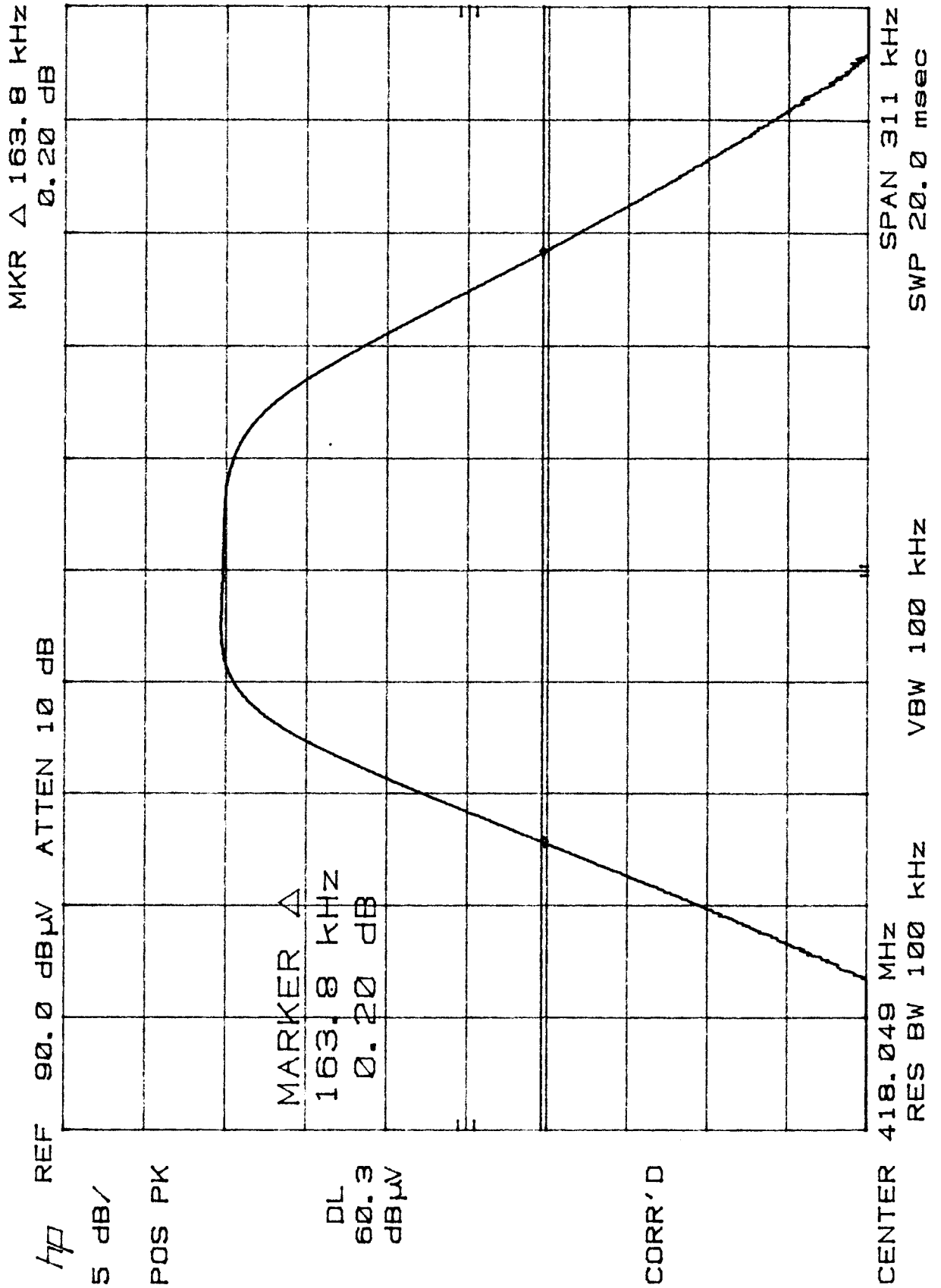
Reviewed by: **T. K. Swanson**

Printed

Signature

File No. WC1G027701, Page A5 of A7

0.25% of 418.05 = 1.045 MHz allowed BW



$$1.72(6) = 10.32 \text{ msec ontime}$$

$$20 \log 10.32/20 = -5.75 \text{ dB duty cycle correction}$$

MR Δ 1.720 msec
-0.20 dB

REF 90.0 dBμV ATTN 10 dB

hp

5 dB/

POS PK

MARKER Δ

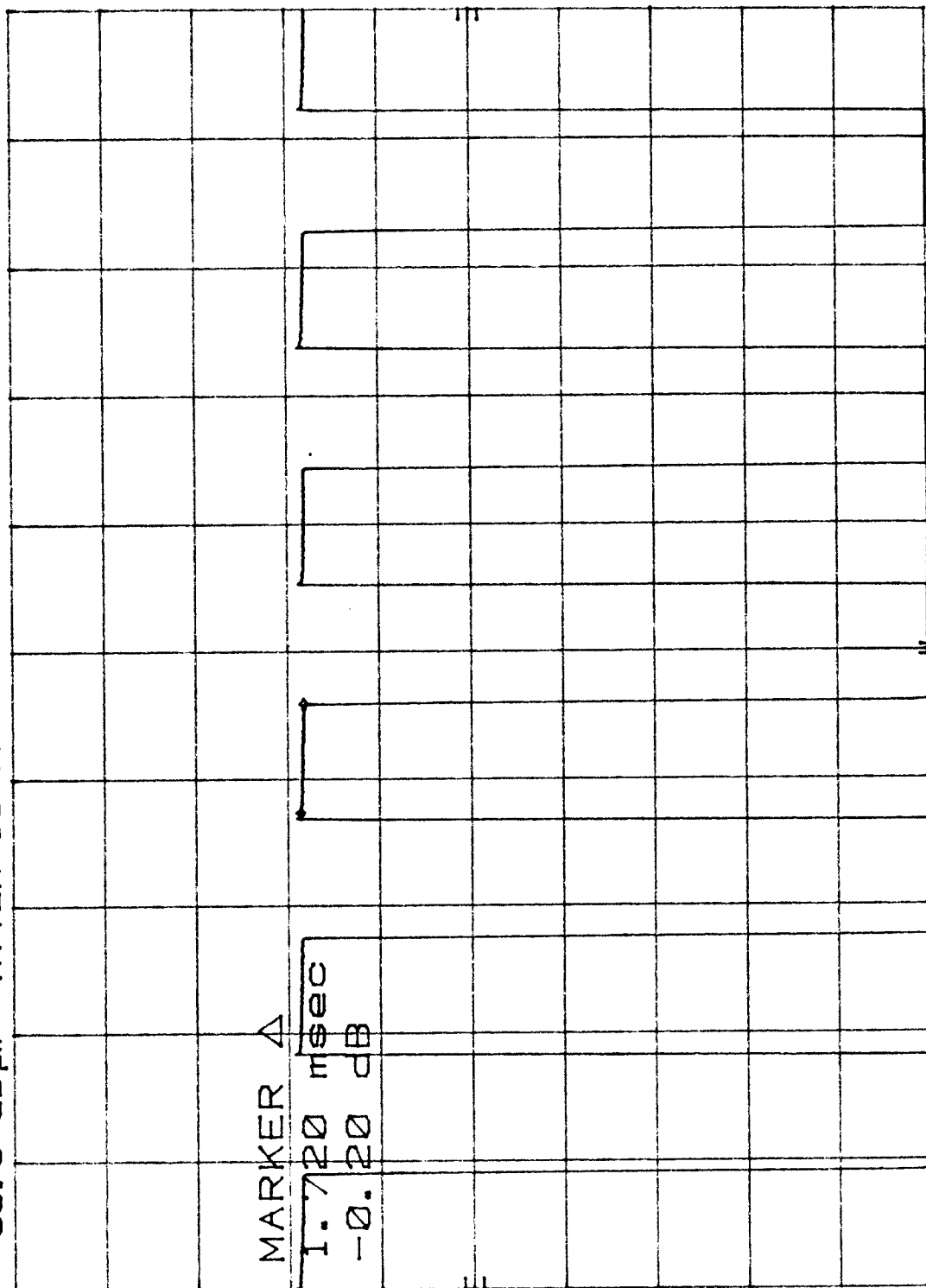
1.720 msec
-0.20 dB

CORR'D

CENTER 418.150 MHz
RES BW 1 MHz

VBW 1 MHz

SPAN 0 Hz
SWP 20.0 msec



Appendix B

Constructional Data Form



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: SIMS Deltec, Inc.

Address: 1265 Grey Fox Rd
St Paul
MN 55112

Contact: Ron Dohmen Position: Engineer

Phone: 651 628-7064 Fax: 651 628-7406

E-mail Address: ron.dohmen@deltec.com

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

EUT Description Wireless Remote Monitoring System (WRMS) Transmitter

EUT Name CADD-Lynx Transmitter

Model No.: 21-6330-51 Serial No.: ptototype #s 1 and 2

Product Options: n/a

Configurations to be tested: _____

Test Objective

- | | |
|---|---|
| ☐ EMC Directive 89/336/EEC (EMC)
Std: _____ | ☒ FCC: Class ☐ A ☐ B Part <u>15</u> |
| ☐ Machinery Directive 89/392/EEC (EMC)
Std: _____ | ☐ VCCI: Class ☐ A ☐ B |
| ☐ Medical Device Directive 93/42/EEC (EMC)
Std: _____ | ☐ BCIQ: Class ☐ A ☐ B |
| ☐ Vehicle Directive 72/245/EEC (EMC)
Std: _____ | ☐ Canada: Class ☐ A ☐ B |
| ☐ FDA Reviewers Guidance for Premarket
Notification Submissions (EMC) | ☐ Australia: Class ☐ A ☐ B |
| | ☐ Other: _____ |

TÜV Product Service Certification Requested

- | | |
|--|---|
| ☐ Attestation of Conformity (AoC) | ☐ International EMC Mark (IEM) |
| ☐ Certificate of Conformity (CoC) | ☐ 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

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: 93 mm Width: 59 mm Height: 27mm Weight: less than 75g
: _____

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

of Phases: na/

Current (Amps/phase(max)): 66 milliwatts Current (Amps/phase(nominal)): na/

Other n/a

Other Special Requirements**Typical Installation and/or Operating Environment**

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

EUT Power Cable

☒ Permanent OR ☐ Removable Length (in meters): 120 mm
☒ Shielded OR ☐ Unshielded
☐ Not Applicable

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	☒	☐
3.3 Volt Unipolar	☐	☒	1	☐	☒	Braid	Pins	1/8" Stereo	na/	0	☐	☒
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
	☐	☐		☐	☐						☐	☐
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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)

<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
n/a			

Oscillator Frequencies

<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
3.579545 MHz	n/a	crystal on PWA	clock

Power Supply

<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
n/a			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____
			☐ Switched-mode: (Frequency) _____ ☐ Linear ☐ Other: _____

Power Line Filters

<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>
n/a		

EMC Test Plan and Constructional Data Form

**Critical EMI Components (Capacitors, ferrites, etc.)**

<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
TVS	AVX	VC08LC18A500	2	PWA

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

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures

Ron Dohmen

8-22-00

Customer authorization to perform tests
according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

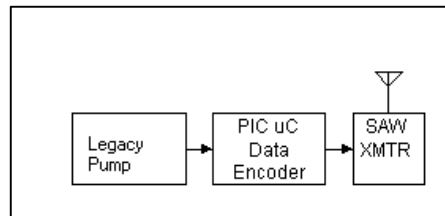
Date

Reviewed by TÜV Product Service Associate

Date

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.

**Authorization Signatures**

Ron Dohmen

8-22-00

Customer authorization to perform tests
according to this test plan._____
Date_____
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 its 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 dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

RADIATED EMISSIONS

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ V) and adding the antenna correction factor and cable loss factor and subtracting the preamplifier gain. The average reading is obtained by subtracting the duty cycle correction factor.

Example:

FREQ (MHz)	LEVEL (dB μ V)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)			FINAL(Pk) (dB μ V/m)	POL/HGT/AZ (m) (deg)			FINAL(Av)
418.0	85.1Pk +	4.6	+	16.0	-	28.2	=	77.5	V 1.0 0.0 71.75

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 μ H (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 4200 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 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.