

HAC Test Report

Project Number: 3044696

Report Number: 3044696EMC33

Revision Level: 0

Client: Intermec Technologies Corporation

Equipment Under Test: Mobile Computer with AE37 AC Adapter

Model Name: CN51077X1200001

Model Number: 1015CP01S

Hardware Version: P2

FCC ID: EHA-1015CP01SX1

Applicable Standards: ANSI C63.19-2011

FCC Rule Parts: §20.19(b), §6.3(v), §7.3(v)

Report issued on: 25 June 2014

Test Result: Compliant

Tested by:



Fabian Nica, Engineering Technician

Reviewed by:



David Schramm, EMC Manager

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or Testing done by SGS International Electrical Approvals in connection with distribution or use of the product described in this report must be approved by SGS international Electrical Approvals in writing.

Table of Contents

1	GENERAL INFORMATION	3
1.1	CLIENT INFORMATION	3
1.2	TEST LABORATORY	3
1.3	GENERAL INFORMATION OF EUT	3
1.4	EQUIPMENT UNDER TEST	4
1.5	TEST RESULTS SUMMARY	4
1.6	TEST METHODOLOGY	5
2	TEST EQUIPMENT	6
2.1	MEASUREMENT UNCERTAINTY	7
3	SYSTEM VALIDATION SETUP DIAGRAM	8
4	WIRELESS DEVICE POSITIONING	9
5	SYSTEM VALIDATION PROCEDURE:	10
6	SYSTEM VALIDATION RESULTS	11
7	RF MEASUREMENT PROCEDURE	12
7.1	ANSI CATEGORIES	12
	7.1.1 WD RF audio interference level categories in logarithmic units	12
	7.1.2 System performance classification table	12
8	HAC RF EMISSIONS TEST RESULTS	13
8.1	E-FIELD TEST RESULTS	13
8.2	H-FIELD TEST RESULTS	14
9	REFERENCES	15
11	REVISION HISTORY	16

1 GENERAL INFORMATION

1.1 CLIENT INFORMATION

Name: Intermec Technologies Corp.
Address: 6001 36th Avenue W
City, State, Zip, Country: Everett, WA 988203, USA

1.2 TEST LABORATORY

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA
Type of lab: Testing Laboratory
Certificate Number: 3212.01

1.3 GENERAL INFORMATION OF EUT

Mode of Operation: GSM 850, GSM PCS 1900, WCDMA Band V, WCDMA Band II and CDMA 1xRTT
Frequency Range: GSM850 (824.0-849MHz), GSM1900 PCS (1850-1910MHz), WCDMA Band V , UTRA/FDD (824-849MHz), CDMA2000 1xRTT RC3 (Band Class 0 824-849MHz), CDMA2000 1xRTT RC1 (Band Class 1 1850-1910MHz)
Serial Number: 077X1200001
Build Version: 2.00.00.0371
Firmware Version: 02.893
Antenna: Integral
Battery Type: Li-Ion Battery
Rated Voltage: 3.7 VDC, 3900mAh, Rechargeable Battery
Accessories: None

Sample Received Date: 13 June 2013
Dates of testing: 11-15 October 2013

1.4 EQUIPMENT UNDER TEST

EUT	Mobile Computer
Normal operation:	Held to head
Body Worn Accessory	NA
Device category:	Portable
Exposure category:	General Population/Uncontrolled Exposure
Sample Modification:	No modifications made

Air Interface	Band MHz	Type	C63.19 Tested	Simultaneous Transmission	OTT	Power Reduction
GSM	850	VO	Yes	BT/WiFi	NA	NA
	1900	DT	NA			
WCDMA	850	VO	Yes	BT/WiFi	NA	NA
	1900	DT	NA			
CDMA	800	VO	Yes	BT/WiFi	NA	NA
	1900	DT	NA			
WiFi	2450	VD ¹	No	BT, GSM, WCDMA, CDMA	Yes	NA
BT	2450	DT	NA	WiFi, GSM, WCDMA, CDMA	NA	NA

VO = CMRS Voice Service
 DT = Digital Transport
 VD = CMRS IP Voice and Digital Transport
 1 = No associated T-Coil measurement has been made in accordance with 285076 D02 T-Coil testing for CMRS IP

1.5 TEST RESULTS SUMMARY

E-Field Test Data						
Plot Scan #	Band	Ch	Freq. MHz	Peak E-Field V/m	Drift dB	M-Rating
E2	GSM 850	190	836.6	215.2	0.05	M3
E4	WCDMA Band V	4132	826.4	80.73	-0.08	M4
E7	CDMA 1xRTT	1013	824.7	85.84	-0.06	M4
E10	GSM 1900	512	1850.2	52.48	0.77	M4
E13	WCDMA Band II	9262	1852.4	32.31	-0.12	M4
E16	CDMA 1xRTT	25	1851.25	30.5	0	M4
H-Field Test Data						
Plot Scan #	Band	Ch	Freq. MHz	Peak H-Field A/m	Drift dB	M-Rating
H3	GSM 850	251	848.8	0.334	-0.1	M4
H6	WCDMA Band V	4233	846.6	0.398	0.05	M4
H9	CDMA 1xRTT	777	848.31	0.14	0.03	M4
H10	GSM 1900	512	1850.2	0.15	-0.06	M4
H13	WCDMA Band II	9262	1852.4	0.075	-0.22	M4
H16	CDMA 1xRTT	25	1851.25	0.074	-0.11	M4
Overall M Rating						M3

1.6 TEST METHODOLOGY

Testing was performed in accordance with the ANSI C63.19-2011 methods of measurement of compatibility between a wireless device and hearing aids. FCC published KDB 285076 D01 HAC Guidance v04 were followed.

2 TEST EQUIPMENT

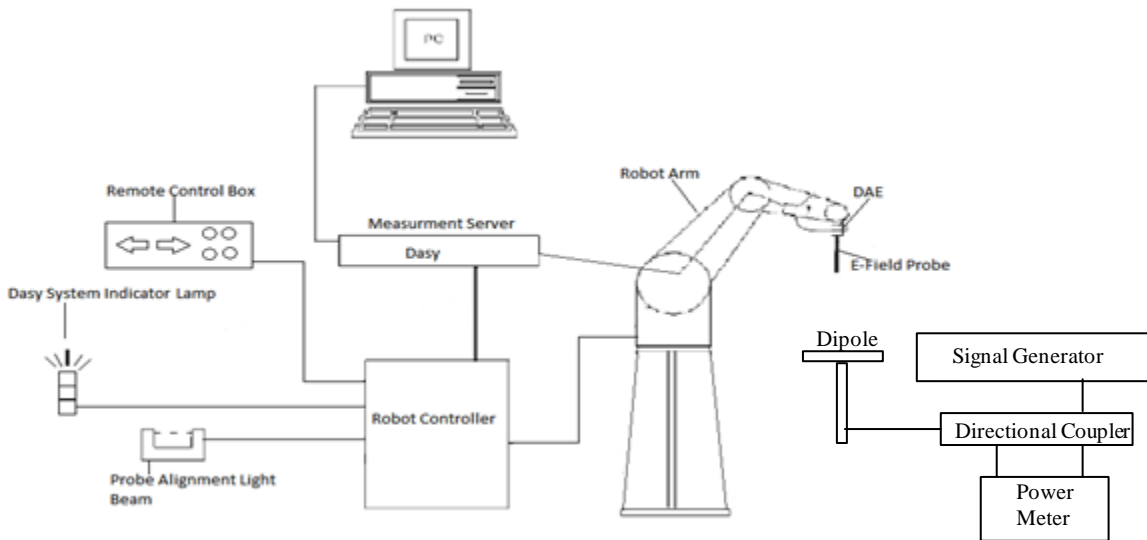
Equipment	Model	Manufacturer	Serial Number	Cal Due Date
Dasy5 Controller	SP1D	Stäubli	S-1188	NA
Probe Alignment Light Beam	LB5/80	SPEAG	SEUKS030AA	NA
Data Acquisition Electronics	DAE4	SPEAG	1287	NA
System Validation Dipole	CD835V3	SPEAG	1060	6 Dec 2013
System Validation Dipole	CD1880V3	SPEAG	1047	6 Dec 2013
E-Field Probe	ER3DV6	SPEAG	2308	7 Dec 2013
H-Field Probe	H3DV6	SPEAG	6145	7 Dec 2013
Device Holder	Hac Test Arch	SPEAG	1163	NA
Power Meter	E4419B	Agilent	G839511059	26 Aug 2014
Power Sensor	8481A	Agilent	2702A61269	19 Aug 2014
Power Sensor	8481A	Agilent	MY41094585	19 Aug 2014
Dual Directional Coupler	778D	Hewlett Packard	2604A13577	22 Oct 2015
Signal Generator	SMB100A	Rohde & Schwarz	104999	18 June 2014
PC	HP Compaq 8000 Elite	HP	CZC1231RWS	NA
Radio Communication Tester	CMU 200	Rohde & Schwarz	100432	25 Sep 2014

Note: The calibration period equipment is 1 year and 2 year period for Directional Couplers.

2.1 MEASUREMENT UNCERTAINTY

HAC Uncertainty Budget According to ANSI C63.19 [1], [2]							
Error Description	Uncertainty value	Prob. Dist.	Div.	(c_i) E	(c_i) H	Std. Unc. E	Std. Unc. H
Measurement System							
Probe Calibration	±5.1 %	N	1	1	1	±5.1 %	±5.1 %
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %
Sensor Displacement	±16.5 %	R	$\sqrt{3}$	1	0.145	±9.5 %	±1.4 %
Boundary Effects	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %
Phantom Boundary Effect	±7.2 %	R	$\sqrt{3}$	1	0	±4.1 %	±0.0 %
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %
Scaling to Peak Envelope Power	±2.0 %	R	$\sqrt{3}$	1	1	±1.2 %	±1.2 %
System Detection Limit	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %
RF Ambient Conditions	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %
RF Reflections	±12.0 %	R	$\sqrt{3}$	1	1	±6.9 %	±6.9 %
Probe Positioner	±1.2 %	R	$\sqrt{3}$	1	0.67	±0.7 %	±0.5 %
Probe Positioning	±4.7 %	R	$\sqrt{3}$	1	0.67	±2.7 %	±1.8 %
Extrap. and Interpolation	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %
Test Sample Related							
Device Positioning Vertical	±4.7 %	R	$\sqrt{3}$	1	0.67	±2.7 %	±1.8 %
Device Positioning Lateral	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %
Device Holder and Phantom	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %
Phantom and Setup Related							
Phantom Thickness	±2.4 %	R	$\sqrt{3}$	1	0.67	±1.4 %	±0.9 %
Combined Std. Uncertainty						±15.3 %	±10.9 %
Expanded Std. Uncertainty on Power						±30.6 %	±21.8 %
Expanded Std. Uncertainty on Field						±15.3 %	±10.9 %

3 SYSTEM VALIDATION SETUP DIAGRAM

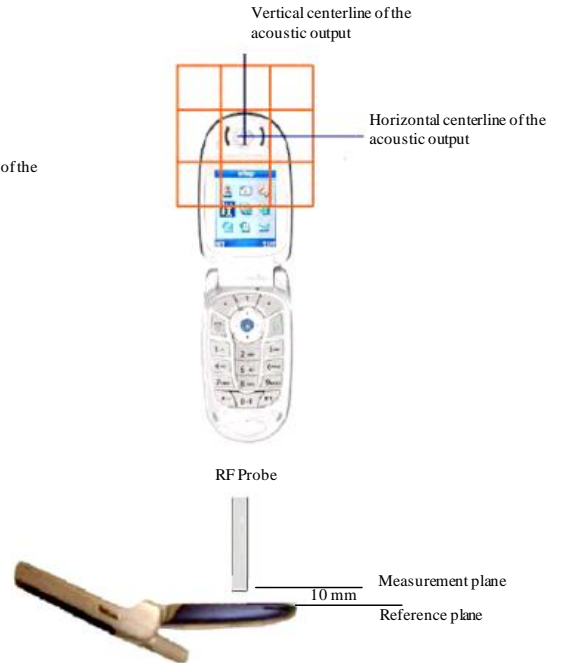


The Dasy5 HAC test system consists of:

- 1 Stäubli Robot and system controller cabinet
- 1 Electro Optical Converter mounted on robots arm
- Robot stand
- Robot remote controller
- Light beam for E-field probe alignment
- DASY5 measurement server
- Hand-Held/ Laptop device holder
- HP PC with DASY5 software
- Data Acquisition Electronics(DAE)
- System validation dipole kit
- E/H-field probe
- Warning lamps
- Signal Generator
- Dual Directional Coupler
- Power Meter

4 WIRELESS DEVICE POSITIONING

- Area 5 x 5 cm with 9 subgrids
- Parallel to speaker area
- 15 / 10 mm distance
- Centered to acoustic output



5 SYSTEM VALIDATION PROCEDURE:

A calibrated dipole antenna per ANSI C63.19-2011 requirements was placed under the HAC Test Arch in the position normally occupied by the WD position. The dipoles are calibrated to a known electric and magnetic field at a specified forward power.

E and/or H-Field calibrations were performed prior to start of testing to verify correct operation.

- The appropriate probe was selected and installed into the DAE.
- Probe and its cables were placed parallel to the coaxial feed of the dipole.
- Correct position of the test arch's four reference points was checked.
- Appropriate dipole was selected and installed in the test position under the HAC Test Arch.
- Appropriate dipole was illuminated with $P=100\text{mW}$ (20 dBm) of forward power and adjusted for return loss. This is the input power used by the calibration lab.
- The center point of the probe sensor element was set to 15mm from the closest surface of the dipole element.
- DASY52 profile was used to measure the maximum field strength along the dipole length for E-Field and record the two maximum values found near the dipole ends.
- An average of the two maximum values for E-field and H-field results were compared with calibration certificated and verified to be in tolerance.

System validation plots are shown in the appendix section of this report.

6 SYSTEM VALIDATION RESULTS

Date	Dipole	f(MHz)	Input Power (mW)	E-Field (V/m)	E-Field Calibration Target (V/m)	E-field Deviation from Calibration (%)
10/11/2013	CD835V3	835	100	61.93	61.87	0.1
10/11/2013	CD1880V3	1880	100	70.63	71.77	-1.6
10/15/2013	CD835V3	835	100	59.77	61.87	-3.4
10/15/2013	CD1880V3	1880	100	73.9	71.77	3.0

Notes:

1. Maximum E-Field was evaluated and compared to the target values provided by the calibration Lab.
2. Please see appendix for detailed measurement plots and data.

7 RF MEASUREMENT PROCEDURE

- a) Proper operation of the probe, measurement system and instrumentation position was confirmed.
- b) WD was positioned in its proper test position according to Section 4 diagram of this report.
- c) A grid of 50mm X 50mm was scanned. This grid is divided into nine evenly sized sub grids.
- d) Once scan was completed a reading of each measurement point was recorded.
- e) The five lowest contiguous sub grids around the center grid were identified.
- f) Three sub grids of the maximum readings are eliminated.
- g) This identifies the six areas which are used to determine the WD highest emissions.
- h) Once highest field reading from step g is identified the value is converted to RF audio interference level in V/m.

7.1 ANSI CATEGORIES

The procedure outlined in ANSI C63.19 was followed. Table below for the test criteria was used to assign the wireless device's M rating

7.1.1 WD RF AUDIO INTERFERENCE LEVEL CATEGORIES IN LOGARITHMIC UNITS

Emission Categories	E-field emissions	
	<960MHz	>960MHz
Category M1	50 to 55 dB (V/m)	40 to 45 dB (V/m)
Category M2	45 to 50 dB (V/m)	35 to 40 dB (V/m)
Category M3	40 to 45 dB (V/m)	30 to 35 dB (V/m)
Category M4	<40 dB (V/m)	<30 dB (V/m)

7.1.2 SYSTEM PERFORMANCE CLASSIFICATION TABLE

System Classification	Category sum hearing aid category + telephone category
Usable	Hearing aid category + telephone category = 4
Normal use	Hearing aid category + telephone category = 5
Excellent performance	Hearing aid category + telephone category = ≥ 6

8 HAC RF EMISSIONS TEST RESULTS

The results listed below summarize the data obtained after the device was tested in the operating conditions described previously. Measurement plots of the near field emissions are shown in the appendix section of this report.

8.1 E-FIELD TEST RESULTS

E-Field Test Data						
Plot Scan #	Band	Ch	Freq. MHz	Peak E-Field V/m	Drift dB	M-Rating
E1	GSM 850	128	824.2	189.2	0	M4
E2	GSM 850	190	836.6	215.2	0.05	M3
E3	GSM 850	251	848.8	175.5	0.02	M4
E4	WCDMA Band V	4132	826.4	80.73	-0.08	M4
E5	WCDMA Band V	4183	836.6	79.51	0.14	M4
E6	WCDMA Band V	4233	846.6	70.91	-0.05	M4
E7	CDMA 1xRTT	1013	824.7	85.84	-0.06	M4
E8	CDMA 1xRTT	384	836.52	77.98	-0.01	M4
E9	CDMA 1xRTT	777	848.31	72.89	0.03	M4
E10	GSM 1900	512	1850.2	52.48	0.77	M4
E11	GSM 1900	661	1880	39	0.06	M4
E12	GSM 1900	810	1909.8	34.48	0.14	M4
E13	WCDMA Band II	9262	1852.4	32.31	-0.12	M4
E14	WCDMA Band II	9400	1880	30.01	-0.18	M4
E15	WCDMA Band II	9538	1907.6	17.99	-0.14	M4
E16	CDMA 1xRTT	25	1851.25	30.5	0	M4
E17	CDMA 1xRTT	600	1880	23.32	-0.01	M4
E18	CDMA 1xRTT	1175	1908.75	17.56	-0.07	M4

8.2 H-FIELD TEST RESULTS

H-Field Test Data						
Plot Scan #	Band	Ch	Freq. MHz	Peak H-Field A/m	Drift dB	M-Rating
H1	GSM 850	128	824.2	0.314	0.03	M4
H2	GSM 850	190	836.6	0.334	-0.1	M4
H3	GSM 850	251	848.8	0.334	-0.1	M4
H4	WCDMA Band V	4132	826.4	0.388	-0.27	M4
H5	WCDMA Band V	4183	836.6	0.369	-0.02	M4
H6	WCDMA Band V	4233	846.6	0.398	0.05	M4
H7	CDMA 1xRTT	1013	824.7	0.113	0.02	M4
H8	CDMA 1xRTT	384	836.52	0.128	0.07	M4
H9	CDMA 1xRTT	777	848.31	0.14	0.03	M4
H10	GSM 1900	512	1850.2	0.15	-0.06	M4
H11	GSM 1900	661	1880	0.124	0.05	M4
H12	GSM 1900	810	1909.8	0.126	-0.12	M4
H13	WCDMA Band II	9262	1852.4	0.075	-0.22	M4
H14	WCDMA Band II	9400	1880	0.065	0.03	M4
H15	WCDMA Band II	9538	1907.6	0.066	-0.19	M4
H16	CDMA 1xRTT	25	1851.25	0.074	-0.11	M4
H17	CDMA 1xRTT	600	1880	0.071	0.16	M4
H18	CDMA 1xRTT	1175	1908.75	0.066	0.04	M4

9 REFERENCES

1. SPEAG DASY V52.6 User manual, May 2011
2. ANSI C63.19-2011 " American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids".

11 REVISION HISTORY

Revision Level	Description of changes	Revision Date
0	Initial release	21 Apr 2014
1	Added FCC ID to cover page	19 June 2014
2	Added Air Interface Matrix and updated KDB reference.	25 June 2014