

# HAC Test Report

**Project Number:** 3637363

**Report Number:** 3637363EMC02

**Revision Level:** 2

**Client:** Intermec Technologies Corporation

**Equipment Under Test:** Mobile Computer

**Model Name:** CN70 / CN70e / CK70

**Model Number:** 1000CP01U-H1 / 1000CP02U-H1 / 1001CP01U-H1

**System Version:** W23.1.6.003

**FCC ID:** EHA-1000CP01UX1

**Applicable Standards:** ANSI C63.19-2011

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

**Report issued on:** 18 May 2015

**Test Result:** Compliant

Tested by:

  
Fabian Nica, Senior Engineering Technician

Reviewed by:

  
David Schramm, EMC/RF/SAR/HAC 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.

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## 1 GENERAL INFORMATION

### 1.1 CLIENT INFORMATION

Name: Intermec Technologies Corp.  
Address: 6001 36<sup>th</sup> 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  
Frequency Range: GSM850 and WCDMA Band V (824.0-849MHz)  
GSM1900 and WCDMA Band II (1850-1910MHz)  
Serial Number: 21721442038  
Build Version: CE OS 5.2.29077 (Build 29077.5.3.12.10)  
Firmware Version: System Version W23.1.6.003  
Antenna: Integral  
Battery Type: Li-Ion Battery  
Rated Voltage: 3.7 VDC, 4Ah, Rechargeable Battery  
Accessories: None

Sample Received Date: 9 December 2014  
Dates of testing: 11 December 2014

## 1.4 EQUIPMENT UNDER TEST

<b>EUT</b>	Mobile Computer
<b>Normal operation:</b>	Held to head
<b>Body Worn Accessory</b>	NA
<b>Device category:</b>	Portable
<b>Exposure category:</b>	General Population/Uncontrolled Exposure
<b>Sample Modification:</b>	No modifications made. There is no power reduction for HAC support

Air Interface	Band MHz	Type	C63.19 Tested	Simultaneous Transmission	OTT	Power Reduction
GSM	850	VO	Yes	BT/WiFi	NA	NA
	1900					
	GPRS/EDGE	DT	NA			
WCDMA	850	VO	Yes	BT/WiFi	NA	NA
	1900					
	HSPA	DT	NA			
WiFi	2450	VD <sup>1</sup>	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

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.

E-Field Test Data							
Plot Scan #	Band	Ch	Freq. MHz	Peak E-Field V/m	Peak E-Field dB (V/m)	Drift dB	M-Rating
G1	GSM 850	128	824.2	119.3	41.5	-0.01	M4
G2	GSM 850	190	836.6	132.3	42.4	-0.02	M4
G3	GSM 850	251	848.8	132.6	42.5	0.03	M4
W4	WCDMA Band V	4132	826.4	48.06	33.6	-0.18	M4
W5	WCDMA Band V	4183	836.6	47.36	33.5	0.08	M4
W6	WCDMA Band V	4233	846.6	44.35	32.9	-0.07	M4
G4	GSM 1900	512	1850.2	59.09	35.4	-0.28	M4
G5	GSM 1900	661	1880	53.63	34.6	0.01	M4
G6	GSM 1900	810	1909.8	45.44	33.1	0	M4
W1	WCDMA Band II	9262	1852.4	28.41	29.1	0.01	M4
W2	WCDMA Band II	9400	1880	33.28	30.4	-0.06	M4
W3	WCDMA Band II	9538	1907.6	27.38	28.7	0.16	M4
Overall M Rating							M4

## 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	16 Jan 2015
System Validation Dipole	CD1880V3	SPEAG	1047	16 Jan 2015
E-Field Probe	ER3DV6	SPEAG	2308	17 Jan 2015
Device Holder	HAC Test Arch	SPEAG	1163	NA
Power Meter	E4419B	Agilent	G839511059	8 Aug 2015
Power Sensor	8481A	Agilent	2702A61269	8 Aug 2015
Power Sensor	8481A	Agilent	MY41094585	8 Aug 2015
Dual Directional Coupler	778D	Hewlett Packard	2604A13577	06 Oct 2017
Signal Generator	SMB100A	Rohde & Schwarz	104999	18 June 2016
PC	HP Compaq 8000 Elite	HP	CZC1231RWS	NA
Radio Communication Tester	CMW 500	Rohde & Schwarz	127717	6 Dec 2015

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

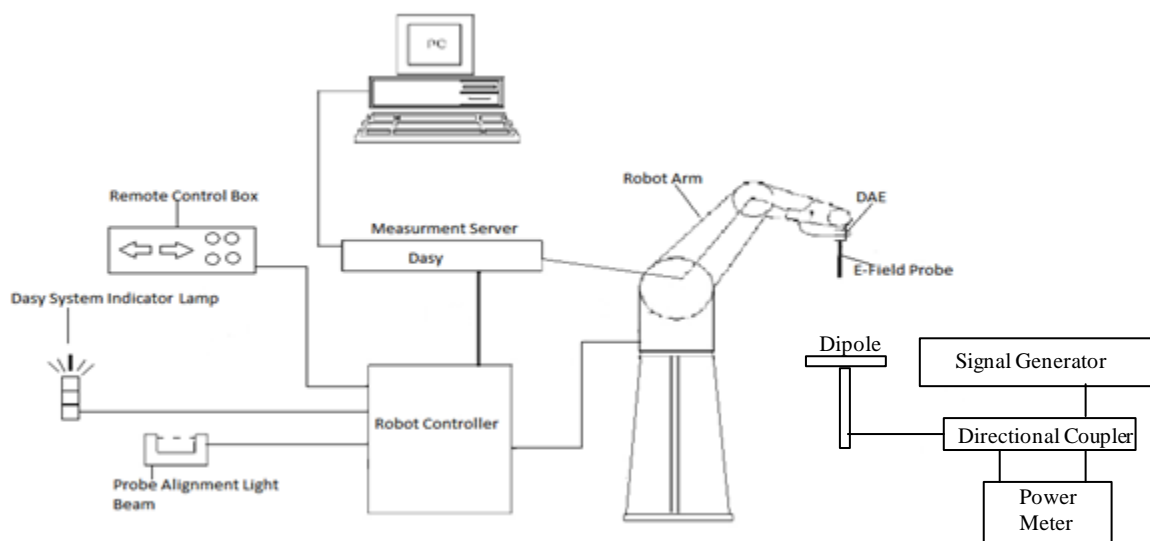
## 2.1 MEASUREMENT UNCERTAINTY

<b>Test Name:</b>	Hearing Aid Compatability - RF
<b>Instrument(s) Used:</b>	HAC Measurement Sytem
<b>Standard(s) Reference:</b>	ANSI C63.19

Symbol	Source of Uncertainty	Value	Probability Distribution	Divisor	ci E	Std. Unc. E
	<b>MEASUREMENT DESCRIPTION</b>					
	Probe Calibration	5.1%	N1	1	1	5.1%
	Axial Isotropy	4.7%	R	1.732	1	2.7%
	Sensor Displacement	16.5%	R	1.732	1	9.5%
	Boundry Effects	2.4%	R	1.732	1	1.4%
	Phantom Boundary Effects	7.2%	R	1.732	1	4.2%
	Linearity	4.7%	R	1.732	1	2.7%
	Scaling to PMR Calibration	10.0%	R	1.732	1	5.8%
	System Detection Limit	1.0%	R	1.732	1	0.6%
	Readout Electronics	0.3%	N1	1	1	0.3%
	Response Time	0.8%	R	1.732	1	0.5%
	Integration Time	2.6%	R	1.732	1	1.5%
	RF Ambient Conditions	3.0%	R	1.732	1	1.7%
	RF Reflections	12.0%	R	1.732	1	6.9%
	Probe Positioner	1.2%	R	1.732	1	0.7%
	Probe Positioning	4.7%	R	1.732	1	2.7%
	Extrapolation and Interpolation	1.0%	R	1.732	1	0.6%
	<b>Test sample related</b>					
	Test Positioning Vertical	4.7%	R	1.732	1	2.7%
	Test Positioning Lateral	1.0%	R	1.732	1	0.6%
	Device Holder and Phantom	2.4%	R	1.732	1	1.4%
	Power Drift	5.0%	R	1.732	1	2.9%
	<b>Phantom and Setup Related</b>					
	Phantom Thickness	2.4%	R	1.732	1	1.4%

uc(Fs)	Combined Standard Uncertainty	N1	1	16.3%
U(Fs)	Expanded Std. Uncertainty on Power	Normal k=	2	<b>32.6%</b>
U(Fs)	Expanded Std. Uncertainty on Field	Normal k=	2	<b>16.3%</b>

### 3 SYSTEM VALIDATION SETUP DIAGRAM



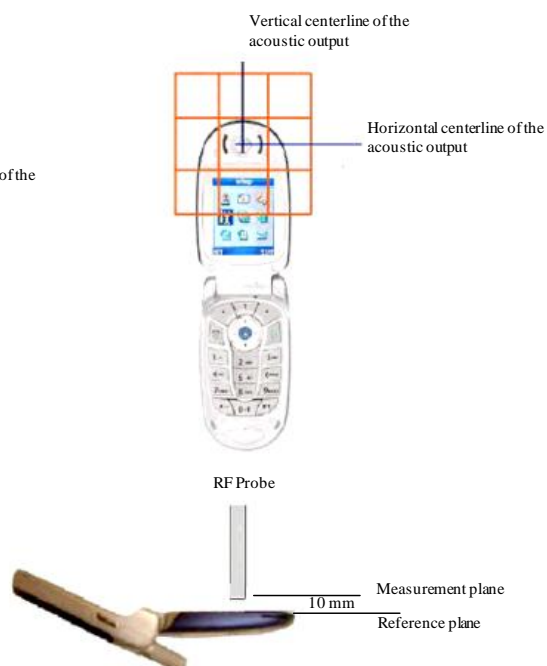
The Dasy5 HAC test system consists of:

- 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 (%)
12/11/2014	CD835V3	835	100	64.6	64.62	0.0
12/11/2014	CD1880V3	1880	100	70.06	71.34	-1.8

### 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

- Proper operation of the probe, measurement system and instrumentation position was confirmed.
- WD was positioned in its proper test position according to Section 4 diagram of this report.
- A grid of 50mm X 50mm was scanned. This grid is divided into nine evenly sized sub grids.
- Once scan was completed a reading of each measurement point was recorded.
- The five lowest contiguous sub grids around the center grid were identified.
- Three sub grids of the maximum readings are eliminated.
- This identifies the six areas which are used to determine the WD highest emissions.
- 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	
	AWF dB 0	AWF dB -5	AWF dB 0	AWF dB -5
Category M1	56 to 61 dB (V/m)	53.5 to 58.5 dB (V/m)	46 to 51 dB (V/m)	43.5 to 48.5 dB (V/m)
Category M2	51 to 56 dB (V/m)	48.5 to 53.5 dB (V/m)	41 to 46 dB (V/m)	38.5 to 43.5 dB (V/m)
Category M3	46 to 51 dB (V/m)	43.5 to 48.5 dB (V/m)	36 to 41 dB (V/m)	33.5 to 38.5 dB (V/m)
Category M4	<46 dB (V/m)	<43.5 dB (V/m)	<36 dB (V/m)	<33.5 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 = $\geq 6$

## 8 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".

## 10 REVISION HISTORY

Revision Level	Description of changes	Revision Date
0	Initial release	31 December 2014
1	Corrected model number typo.	31 December 2014
2	Corrected model numbers	18 May 2015