

# NORTHWEST EMC

## Intermec Technologies Corporation IP30C RFID Reader with 70 Series Handheld Computers

Extremity SAR Evaluation Report #: INMC0920 Rev. 1

Evaluated to the following SAR Specification:

FCC 2.1093:2015



NVLAP Lab Code: 200630-0

*This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety*

# CERTIFICATE OF TEST

**Last Date of Test: May 11, 2015**  
**Intermec Technologies Corporation**  
**Model: IP30C RFID Reader with 70 Series Handheld Computers**

## Applicable Standard

| Test Description | Specification   | Test Method                              | Pass/Fail |
|------------------|-----------------|------------------------------------------|-----------|
| SAR Evaluation   | FCC 2.1093:2015 | IEEE Std 1528:2003                       | Pass      |
|                  |                 | FCC KDB 447498 D01 v05r02                |           |
|                  |                 | FCC KDB 941225 D01 v03                   |           |
|                  |                 | FCC KDB 865664 D01 v01r03 and D02 v01r01 |           |

## Highest SAR Values:

| FCC Equipment Class | Device                          | Frequency Bands (MHz) | Extremity SAR (W/kg)          | Limit (W/kg) | Exposure Environment |
|---------------------|---------------------------------|-----------------------|-------------------------------|--------------|----------------------|
|                     |                                 |                       | 10g                           | 10g          |                      |
| DSS                 | RFID in IP30C                   | 915                   | 0.46<br>3.17 <sup>Note1</sup> | 4.0          | General Population   |
| PCE                 | UMTS in FCC ID: EHA-1000CP01SX1 | 835                   | 0.01                          |              |                      |
|                     |                                 | 1700                  | 0.08                          |              |                      |
|                     |                                 | 1900                  | 0.02                          |              |                      |
| PCE                 | UMTS in FCC ID: EHA-1000CP01UX1 | 835                   | 0.11                          |              |                      |
|                     |                                 | 1900                  | 0.04                          |              |                      |
| PCE                 | CDMA in FCC ID: EHA-1000CP01CX2 | 835                   | 0.07                          |              |                      |
|                     |                                 | 1900                  | 0.02                          |              |                      |

Note 1: Non-standard setup based upon guidance from the FCC. The operational description contains additional information.

## Deviations From Test Standards

None

## Approved By:



Don Facteau, IS Manager

*Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.*

# REVISION HISTORY

| Revision Number | Description                                                                                                                                                      | Date         | Page Number                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------------------------------|
| 01              | SAR test data and setup photos were added for a non-standard setup based upon guidance from the FCC. The operational description contains additional information | May 12, 2015 | Various in SAR Test Data and SAR Test Setup Photos |

# ACCREDITATIONS AND AUTHORIZATIONS

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## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

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## Canada

**IC** - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

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## European Union

**European Commission** – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

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## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

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## Korea

**MSIP / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

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## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

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## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

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## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

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## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

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## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

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## Vietnam

**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

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## SCOPE

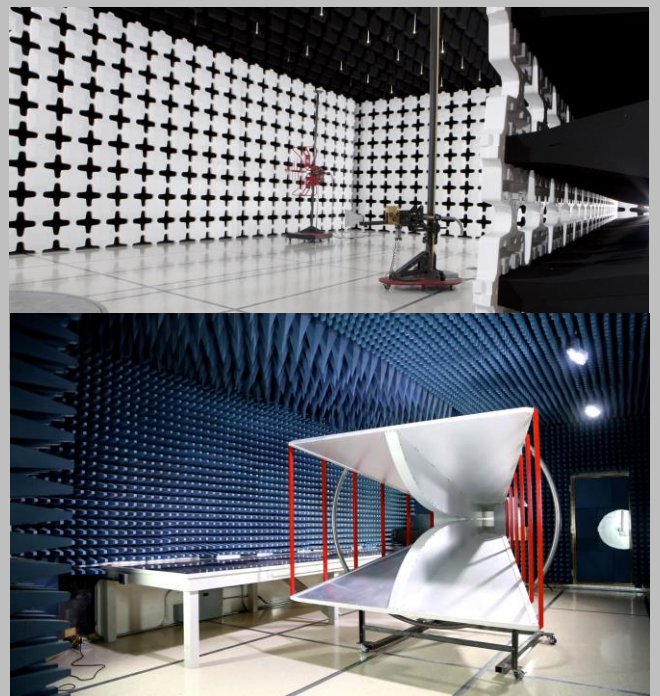
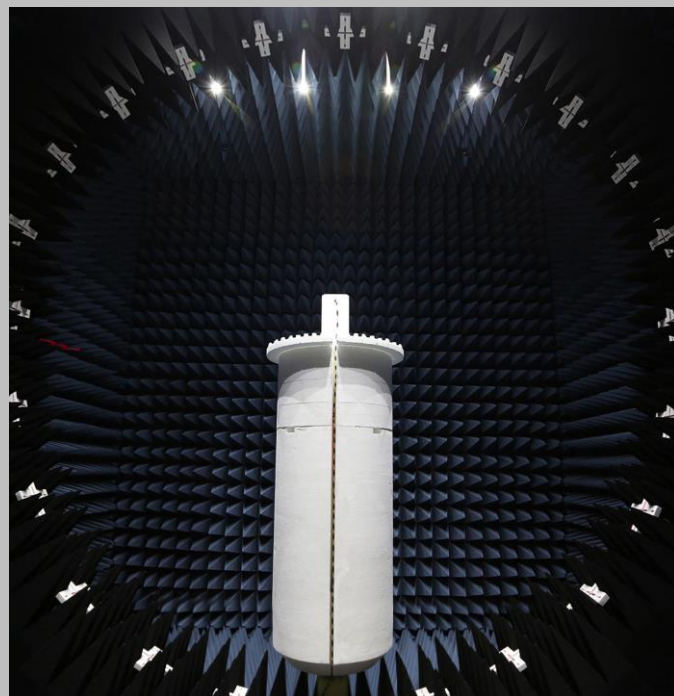
For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>  
<http://gsi.nist.gov/global/docs/cabs/designations.html>

# FACILITIES



|                                                                                     |                                                                                                             |                                                                                            |                                                                                                   |                                                                                        |                                                                                                          |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>California</b><br>Labs OC01-13<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918 | <b>Minnesota</b><br>Labs MN01-08, MN10<br>9349 W Broadway Ave.<br>Brooklyn Park, MN 55445<br>(612)-638-5136 | <b>New York</b><br>Labs NY01-04<br>4939 Jordan Rd.<br>Elbridge, NY 13060<br>(315) 554-8214 | <b>Oregon</b><br>Labs EV01-12<br>22975 NW Evergreen Pkwy<br>Hillsboro, OR 97124<br>(503) 844-4066 | <b>Texas</b><br>Labs TX01-09<br>3801 E Plano Pkwy<br>Plano, TX 75074<br>(469) 304-5255 | <b>Washington</b><br>Labs NC01-05<br>19201 120 <sup>th</sup> Ave NE<br>Bothell, WA 9801<br>(425)984-6600 |
| <b>NVLAP</b>                                                                        |                                                                                                             |                                                                                            |                                                                                                   |                                                                                        |                                                                                                          |
| NVLAP Lab Code: 200676-0                                                            | NVLAP Lab Code: 200881-0                                                                                    | NVLAP Lab Code: 200761-0                                                                   | NVLAP Lab Code: 200630-0                                                                          | NVLAP Lab Code:201049-0                                                                | NVLAP Lab Code: 200629-0                                                                                 |
| <b>Industry Canada</b>                                                              |                                                                                                             |                                                                                            |                                                                                                   |                                                                                        |                                                                                                          |
| 2834B-1, 2834B-3                                                                    | 2834E-1                                                                                                     | N/A                                                                                        | 2834D-1, 2834D-2                                                                                  | 2834G-1                                                                                | 2834F-1                                                                                                  |
| <b>BSMI</b>                                                                         |                                                                                                             |                                                                                            |                                                                                                   |                                                                                        |                                                                                                          |
| SL2-IN-E-1154R                                                                      | SL2-IN-E-1152R                                                                                              | N/A                                                                                        | SL2-IN-E-1017                                                                                     | SL2-IN-E-1158R                                                                         | SL2-IN-E-1153R                                                                                           |
| <b>VCCI</b>                                                                         |                                                                                                             |                                                                                            |                                                                                                   |                                                                                        |                                                                                                          |
| A-0029                                                                              | A-0109                                                                                                      | N/A                                                                                        | A-0108                                                                                            | A-0201                                                                                 | A-0110                                                                                                   |
| <b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA</b>     |                                                                                                             |                                                                                            |                                                                                                   |                                                                                        |                                                                                                          |
| US0158                                                                              | US0175                                                                                                      | N/A                                                                                        | US0017                                                                                            | US0191                                                                                 | US0157                                                                                                   |



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

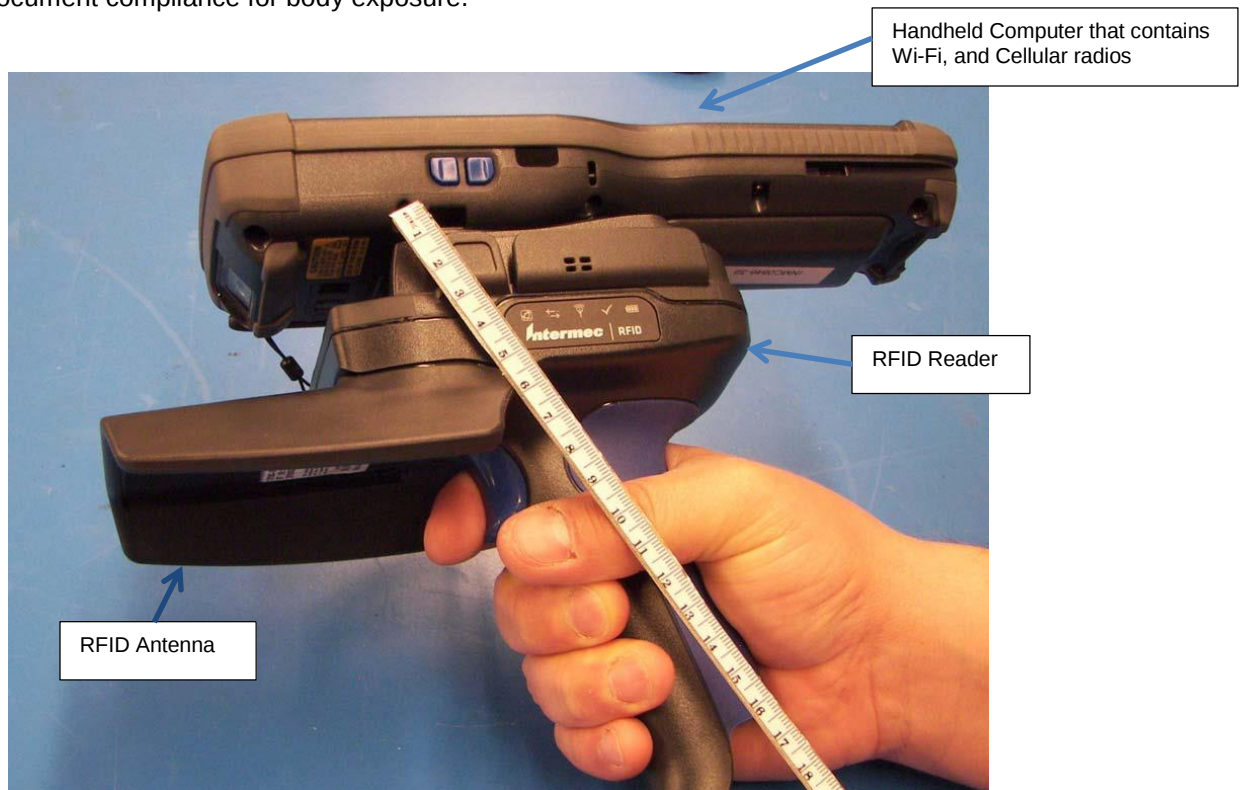
|                          |                                                     |
|--------------------------|-----------------------------------------------------|
| Company Name:            | Intermec Technologies Corporation                   |
| Address:                 | 16201 25th Ave W                                    |
| City, State, Zip:        | Lynnwood, WA 98087                                  |
| Test Requested By:       | Sean MacKeller                                      |
| Model:                   | IP30C RFID Reader with 70 Series Handheld Computers |
| First Date of Test:      | May 1, 2015                                         |
| Last Date of Test:       | May 11, 2015                                        |
| Receipt Date of Samples: | April 30, 2015                                      |
| Equipment Design Stage:  | Production                                          |
| Equipment Condition:     | No Damage                                           |

## Information Provided by the Party Requesting the Test

### Functional Description of the EUT:

The Intermec IM11 is a previously certified RFID module (FCC ID: EHA-IM11) that is be installed in the Intermec IP30C handheld RFID reader. The IP30C also contains a WT12 (Bluegiga) Bluetooth module (FCC ID: QOQWT12) that sends the data read by the IM11 to the Intermec 70 series handheld computers clipped to the top of the IP30C (FCC ID: EHA-1000CP01X2, FCC ID: EHA-1000CP01UX1, FCC ID: EHA-1000CP01CX2, FCC ID: EHA-1000CP01SX1).

The IP30C will only be used while held in the hand. The RFID reader transmits only when the trigger on the handle is pulled. This prevents transmission while near the head or torso. Separate MPE reports have been prepared to document compliance for body exposure.



# PRODUCT DESCRIPTION

The hand exposure must be evaluated for extremity SAR per the procedures of FCC KDB 447498. There are three steps: (1) determine which radios are eligible for stand-alone extremity SAR test exclusion, (2) measure extremity SAR for those radios that cannot be excluded from SAR evaluation, and estimate SAR for those radios that are excluded, and (3) sum the SAR values (measured or estimated as applicable) to determine if simultaneous transmission SAR test exclusion applies.

## Stand-alone Extremity SAR Test Exclusion:

### FCC KDB 447498 D01 v05r02 Section 4.3.1

"1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR, where

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

2) At 100 MHz to 6 GHz and for test separation distances  $> 50$  mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B:<sup>27</sup>

- a)  $[\text{Power allowed at numeric threshold for 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)] \text{ mW}$ , at 100 MHz to 1500 MHz
- b)  $[\text{Power allowed at numeric threshold for 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) \cdot 10] \text{ mW}$  at  $> 1500$  MHz and  $\leq 6$  GHz"

| Test Separation Distances $< 50$ mm |                      |            |                         |                             |                     |            |           |
|-------------------------------------|----------------------|------------|-------------------------|-----------------------------|---------------------|------------|-----------|
|                                     | Output Power<br>(mW) | Duty Cycle | Test Separation<br>(mm) | Transmit Frequency<br>(GHz) | Exclusion Threshold | Spec       | Exposure  |
| RFID in IP30C                       | 938                  | 0.5        | 30                      | 0.90275                     | 14.9                | $\leq 7.5$ | Extremity |

# PRODUCT DESCRIPTION

| Test Separation Distances > 50 mm |              |            |                 |                    |                     |                                                           |        |           |
|-----------------------------------|--------------|------------|-----------------|--------------------|---------------------|-----------------------------------------------------------|--------|-----------|
|                                   | Output Power | Duty Cycle | Test Separation | Transmit Frequency | Exclusion Threshold | Power allowed at the numeric threshold for 50mm in Step 1 | Spec   | Exposure  |
|                                   | (mW)         |            | (mm)            | (GHz)              | (mW)                | (mW)                                                      | (mW)   |           |
| Bluetooth in IP30C                | 3            | 1          | 52              | 2.402              | 3.3                 | 242                                                       | 262.0  | Extremity |
| Wi-Fi in all Handhelds            | 53           | 1          | 90              | 2.462              | 53.2                | 239                                                       | 639.0  | Extremity |
|                                   | 25           | 1          | 90              | 5.22               | 25.1                | 164                                                       | 564.1  | Extremity |
|                                   | 25           | 1          | 90              | 5.3                | 24.5                | 163                                                       | 562.9  | Extremity |
|                                   | 20           | 1          | 90              | 5.6                | 19.5                | 158                                                       | 558.5  | Extremity |
|                                   | 17           | 1          | 90              | 5.875              | 17.0                | 155                                                       | 554.7  | Extremity |
|                                   | 7            | 1          | 90              | 2.48               | 7.0                 | 238                                                       | 638.1  | Extremity |
| Bluetooth in all Handhelds        | 7            | 1          | 90              | 2.48               | 7.0                 | 238                                                       | 638.1  | Extremity |
| UMTS in FCC ID: EHA-1000CP01SX1   | 1122         | 0.5        | 90              | 0.8366             | 561.0               | 820                                                       | 1043.1 | Extremity |
|                                   | 442          | 1          | 90              | 1.753              | 442.0               | 283                                                       | 683.2  | Extremity |
|                                   | 1549         | 0.5        | 90              | 1.88               | 774.4               | 547                                                       | 947.0  | Extremity |
| UMTS in FCC ID: EHA-1000CP01UX1   | 1370         | 0.5        | 90              | 0.8488             | 685.0               | 814                                                       | 1040.4 | Extremity |
|                                   | 1130         | 0.5        | 90              | 1.88               | 565.0               | 547                                                       | 947.0  | Extremity |
| CDMA in FCC ID: EHA-1000CP01CX2   | 667          | 1          | 90              | 0.8361             | 667.0               | 410                                                       | 633.1  | Extremity |
|                                   | 1148         | 1          | 90              | 1.8516             | 1148.0              | 276                                                       | 675.6  | Extremity |

The RFID and CDMA radios are not eligible for stand-alone extremity SAR test exclusion. Also, the UMTS radios have levels close to the exclusion threshold. As a result, stand-alone SAR testing was performed on those radios as documented in this report.

## Stand-alone Extremity SAR Estimation

For those radios that were excluded from standalone extremity SAR testing, the standalone extremity SAR is estimated to be 1 W/kg for 10-g SAR per the procedures of FCC KDB 447498:

### FCC KDB 447498 D01 v05r02 Section 4.3.2 of KDB 447498

*"When the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:*

- (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm) · [√f(GHz)/x] W/kg for test separation distances ≤ 50 mm; where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.*
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.<sup>31</sup>"*

# PRODUCT DESCRIPTION

## Simultaneous Extremity SAR Test Exclusion

*"When the sum of 1-g or 10-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit, SAR test exclusion applies to that simultaneous transmission configuration."*

The extremity SAR limit for general population/uncontrolled exposure is 4 W/kg for 10-g. For each simultaneous transmitting antenna combination, the SAR values (measured or estimated as applicable) are summed for comparison to the limit. Note that the Wi-Fi and Bluetooth radios cannot transmit simultaneously:

| Simultaneous Transmission Configuration                                        | Reported SAR (1)<br>W/kg | Reported SAR (2)<br>W/kg | Estimated SAR (3)<br>W/kg | Sum<br>W/kg |
|--------------------------------------------------------------------------------|--------------------------|--------------------------|---------------------------|-------------|
| (1) UMTS in FCC ID:<br>EHA-10000CP01SX1<br>(2) RFID<br>(3) Wi-Fi or Bluetooth  | 0.08                     | 0.46                     | 1.0                       | 1.54        |
| (1) UMTS in FCC ID:<br>EHA-1000CP01UX1<br>(2) RFID<br>(3) Wi-Fi or Bluetooth   | 0.11                     | 0.46                     | 1.0                       | 1.57        |
| (1) CDMA in FCC ID:<br>EHA-1000CP01CX2<br>(2) RFID<br>(3) Wi-Fi or Bluetooth   | 0.07                     | 0.46                     | 1.0                       | 1.53        |
| (1) No WWAN in FCC ID:<br>EHA-1000CP01X2<br>(2) RFID<br>(3) Wi-Fi or Bluetooth | N/A                      | 0.46                     | 1.0                       | 1.46        |

The sum of the calculated SAR is less than the extremity SAR limit of 4.0 W/kg; therefore the simultaneous transmission configuration is excluded from SAR testing.

## Testing Objective:

To demonstrate compliance of the Intermec IP30C combined with Intermec 70 series handheld computers with the SAR requirements of FCC 2.1093

# CONFIGURATIONS

## Configuration INMC0920- 1

| Software/Firmware Running during test |         |
|---------------------------------------|---------|
| Description                           | Version |
| RFID Lab                              | v0.64   |

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 2) | Intermec Technologies Corporation | 1000CP02S         | EHA-1000CP01SX1   | 178U1191040   |

| Peripherals in test setup boundary   |                                   |                   |               |
|--------------------------------------|-----------------------------------|-------------------|---------------|
| Description                          | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                        | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| 3.7 V Internal Battery CN70 (test 2) | Intermec Technologies Corporation | 318-043-002       | 09861105060   |

| Remote Equipment Outside of Test Setup Boundary |                                   |                   |               |
|-------------------------------------------------|-----------------------------------|-------------------|---------------|
| Description                                     | Manufacturer                      | Model/Part Number | Serial Number |
| Mobile to RFID Adapter CN70                     | Intermec Technologies Corporation | 710-205-001       | None          |
| Mobile Computer (RFID Control Unit)             | Intermec Technologies Corporation | 1001CP01U         | 06021444004   |
| 3.7 V Internal Battery CK70 (control unit)      | Intermec Technologies Corporation | 318-046-011       | 30861307552   |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# CONFIGURATIONS

## Configuration INMC0920- 2

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 2) | Intermec Technologies Corporation | 1000CP02S         | EHA-1000CP01SX1   | 178U1191040   |

| Peripherals in test setup boundary   |                                   |                   |               |
|--------------------------------------|-----------------------------------|-------------------|---------------|
| Description                          | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                        | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| 3.7 V Internal Battery CN70 (test 2) | Intermec Technologies Corporation | 318-043-002       | 09861105060   |
| Mobile to RFID Adapter CN70          | Intermec Technologies Corporation | 710-205-001       | None          |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# CONFIGURATIONS

## Configuration INMC0920- 3

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 3) | Intermec Technologies Corporation | 1001CP01S         | EHA-1000CP01SX1   | 28311047275   |

| Peripherals in test setup boundary   |                                   |                   |               |
|--------------------------------------|-----------------------------------|-------------------|---------------|
| Description                          | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                        | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| 3.7 V Internal Battery CK70 (test 3) | Intermec Technologies Corporation | 318-046-011       | 31361303966   |
| Mobile to RFID Adapter CK70          | Intermec Technologies Corporation | Unknown           | None          |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# CONFIGURATIONS

## Configuration INMC0920- 4

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 2) | Intermec Technologies Corporation | 1000CP02S         | EHA-1000CP01SX1   | 178U1191040   |

| Peripherals in test setup boundary   |                                   |                   |               |
|--------------------------------------|-----------------------------------|-------------------|---------------|
| Description                          | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                        | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| 3.7 V Internal Battery CN70 (test 2) | Intermec Technologies Corporation | 318-043-002       | 09861105060   |
| Mobile to RFID Adapter CN70          | Intermec Technologies Corporation | 710-205-001       | None          |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# CONFIGURATIONS

## Configuration INMC0920- 5

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 5) | Intermec Technologies Corporation | 1000CP01U         | EHA-1000CP01UX1   | 06521442001   |

| Peripherals in test setup boundary    |                                   |                   |               |
|---------------------------------------|-----------------------------------|-------------------|---------------|
| Description                           | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                         | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| Mobile to RFID Adapter CN70           | Intermec Technologies Corporation | 710-205-001       | None          |
| 3.7 V Internal Battery CN70v (test 5) | Intermec Technologies Corporation | 318-043-012       | 34561301329   |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# CONFIGURATIONS

## Configuration INMC0920- 6

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 6) | Intermec Technologies Corporation | 10001CP01U        | EHA-1000CP01UX1   | 06021444012   |

| Peripherals in test setup boundary   |                                   |                   |               |
|--------------------------------------|-----------------------------------|-------------------|---------------|
| Description                          | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                        | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| 3.7 V Internal Battery CK70 (test 6) | Intermec Technologies Corporation | 318-046-011       | 30861308349   |
| Mobile to RFID Adapter CK70          | Intermec Technologies Corporation | Unknown           | None          |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# CONFIGURATIONS

## Configuration INMC0920- 7

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 7) | Intermec Technologies Corporation | 1000CP01C         | EHA-1000CP01CX2   | 24411047064   |

| Peripherals in test setup boundary   |                                   |                   |               |
|--------------------------------------|-----------------------------------|-------------------|---------------|
| Description                          | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                        | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| Mobile to RFID Adapter CN70          | Intermec Technologies Corporation | 710-205-001       | None          |
| 3.7 V Internal Battery CN70 (test 7) | Intermec Technologies Corporation | 318-043-002       | 16961000163   |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# CONFIGURATIONS

## Configuration INMC0920- 8

| EUT                      |                                   |                   |                   |               |
|--------------------------|-----------------------------------|-------------------|-------------------|---------------|
| Description              | Manufacturer                      | Model/Part Number | FCC ID:           | Serial Number |
| RFID Reader              | Intermec Technologies Corporation | IP30C             | EHA-IM11, QOQWT12 | 0420150003    |
| Mobile Computer (test 8) | Intermec Technologies Corporation | 1000CP02C         | EHA-1000CP01CX2   | 24511047015   |

| Peripherals in test setup boundary   |                                   |                   |               |
|--------------------------------------|-----------------------------------|-------------------|---------------|
| Description                          | Manufacturer                      | Model/Part Number | Serial Number |
| AC/DC Adapter                        | Intermec Technologies Corporation | A3 Power Supply   | 492           |
| Mobile to RFID Adapter CN70          | Intermec Technologies Corporation | 710-205-001       | None          |
| 3.7 V Internal Battery CN70 (test 8) | Intermec Technologies Corporation | 318-043-012       | 35061300052   |

| Cables         |         |            |         |                 |               |
|----------------|---------|------------|---------|-----------------|---------------|
| Cable Type     | Shield  | Length (m) | Ferrite | Connection 1    | Connection 2  |
| DC Power Cable | Unknown | 1.8m       | No      | AC/DC Adapter   | Host Computer |
| AC Power Cable | Unknown | 2.2m       | No      | AC/DC Adapter   | AC Mains      |
| DC Leads       | No      | 3m         | No      | DC Power Supply | RFID Reader   |

# MODIFICATIONS

## Equipment Modifications

| Item | Date      | Test                 | Modification                         | Note                                                                | Disposition of EUT                                |
|------|-----------|----------------------|--------------------------------------|---------------------------------------------------------------------|---------------------------------------------------|
| 1    | 4/30/2015 | Operational Checkout | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 2    | 5/1/2015  | SAR                  | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 3    | 5/4/2015  | SAR                  | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 4    | 5/5/2015  | SAR                  | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |
| 5    | 5/11/2015 | SAR                  | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Northwest EMC following the test. |

# TISSUE – EQUIVALENT LIQUID NARRATIVE

## Characterization of tissue-equivalent liquid dielectric properties

Per IEEE 1528: 2003, Section 5.2.2, the permittivity and conductivity of the tissue material should be measured at least within 24 hours of any full-compliance test. The measured values must be within +/- 5% of the target values. The temperature variation in the liquid during SAR measurements must be within +/- 2 degrees C of that recorded when the dielectric properties were measured.

The dielectric parameters of the tissue-equivalent liquids were measured within 24 hours of the start of testing using the SPEAG DAKS:200 dielectric assessment kit. The dielectric measurements were made across the frequency range of the liquid. The attached data sheets show that the dielectric parameters of the liquid were within the required 5% tolerances.

## Target values of dielectric parameters

Per KDB 865664 D01 v01r01, Appendix A.1:

"The head tissue dielectric parameters recommended by IEEE Std 1528-2003 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in 1528 are derived from tissue dielectric parameters computed from the 4-Cole-Cole equations described above and extrapolated according to the head parameters specified in 1528."

| Target Frequency | Head         |                | Body         |                |
|------------------|--------------|----------------|--------------|----------------|
| (MHz)            | $\epsilon_r$ | $\sigma$ (S/m) | $\epsilon_r$ | $\sigma$ (S/m) |
| 150              | 52.3         | 0.76           | 61.9         | 0.80           |
| 300              | 45.3         | 0.87           | 58.2         | 0.92           |
| 450              | 43.5         | 0.87           | 56.7         | 0.94           |
| 835              | 41.5         | 0.90           | 55.2         | 0.97           |
| 900              | 41.5         | 0.97           | 55.0         | 1.05           |
| 915              | 41.5         | 0.98           | 55.0         | 1.06           |
| 1450             | 40.5         | 1.20           | 54.0         | 1.30           |
| 1610             | 40.3         | 1.29           | 53.8         | 1.40           |
| 1800 – 2000      | 40.0         | 1.40           | 53.3         | 1.52           |
| 2450             | 39.2         | 1.80           | 52.7         | 1.95           |
| 3000             | 38.5         | 2.40           | 52.0         | 2.73           |
| 5800             | 35.3         | 5.27           | 48.2         | 6.00           |

( $\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho = 1000 \text{ kg/m}^3$ )

# TISSUE – EQUIVALENT LIQUID NARRATIVE

## Composition of Ingredients for Liquid Tissue Phantoms

Northwest EMC uses tissue-equivalent liquids prepared by SPEAG and confirmed by them to be within +/- 5% from the target values. Their recipes are based upon the following formulations as found in IEEE 1528: 2003, Annex C:

“The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.”

| Ingredients<br>(% by weight) | Frequency (MHz) |       |       |      |       |       |       |      |      |      |
|------------------------------|-----------------|-------|-------|------|-------|-------|-------|------|------|------|
|                              | 450             |       | 835   |      | 915   |       | 1900  |      | 2450 |      |
| Tissue Type                  | Head            | Body  | Head  | Body | Head  | Body  | Head  | Body | Head | Body |
| Water                        | 38.56           | 51.16 | 41.45 | 52.4 | 41.05 | 56.0  | 54.9  | 40.4 | 62.7 | 73.2 |
| Salt (NaCl)                  | 3.95            | 1.49  | 1.45  | 1.4  | 1.35  | 0.76  | 0.18  | 0.5  | 0.5  | 0.04 |
| Sugar                        | 56.32           | 46.78 | 56.0  | 45.0 | 56.5  | 41.76 | 0.0   | 58.0 | 0.0  | 0.0  |
| HEC                          | 0.98            | 0.52  | 1.0   | 1.0  | 1.0   | 1.21  | 0.0   | 1.0  | 0.0  | 0.0  |
| Bactericide                  | 0.19            | 0.05  | 0.1   | 0.1  | 0.1   | 0.27  | 0.0   | 0.1  | 0.0  | 0.0  |
| Triton X-100                 | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0  | 36.8 | 0.0  |
| DGBE                         | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 44.92 | 0.0  | 0.0  | 26.7 |
| Dielectric Constant          | 43.42           | 58.0  | 42.54 | 56.1 | 42.0  | 56.8  | 39.9  | 54.0 | 39.8 | 52.5 |
| Conductivity (S/m)           | 0.85            | 0.83  | 0.91  | 0.95 | 1.0   | 1.07  | 1.42  | 1.45 | 1.88 | 1.78 |

Salt: 99<sup>+</sup>% Pure Sodium Chloride

Sugar: 98<sup>+</sup>% Pure Sucrose

Water: De-ionized, 16 M $\Omega$ <sup>+</sup> resistivity

HEC: Hydroxyethyl Cellulose

DGBE: 99<sup>+</sup>% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

# TISSUE – EQUIVALENT LIQUID

|            |                      |                     |        |
|------------|----------------------|---------------------|--------|
| Date:      | 05/01/2015           | Temperature:        | 22.3°C |
| Tissue:    | Body, MSL900, 900MHz | Liquid Temperature: | 22°C   |
| Tested By: | Ethan Schoonover     | Relative Humidity:  | 40.2   |
| Job Site:  | EV08                 | Bar. Pressure:      | 1014   |

## TEST SPECIFICATIONS

|                 |                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------|
| Specification:  | Method:                                                                                     |
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## RESULTS

|                 | Actual Values         |              | Target Values         |              | Deviation (%)         |              |
|-----------------|-----------------------|--------------|-----------------------|--------------|-----------------------|--------------|
| Frequency (MHz) | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity |
| 900             | 56.37                 | 1.02         | 55.0                  | 1.05         | -2.49                 | 2.86         |

| Frequency (MHz) | Relative Permittivity | Conductivity |
|-----------------|-----------------------|--------------|
| 400             | 60.98                 | 0.613        |
| 420             | 60.76                 | 0.627        |
| 440             | 60.64                 | 0.625        |
| 465             | 60.22                 | 0.652        |
| 485             | 60                    | 0.672        |
| 510             | 59.72                 | 0.686        |
| 530             | 59.6                  | 0.702        |
| 555             | 59.42                 | 0.723        |
| 575             | 59.12                 | 0.744        |
| 595             | 58.94                 | 0.754        |
| 620             | 59.02                 | 0.781        |
| 640             | 58.67                 | 0.804        |
| 665             | 57.96                 | 0.816        |
| 685             | 58.09                 | 0.829        |
| 710             | 57.87                 | 0.851        |
| 730             | 57.78                 | 0.867        |
| 755             | 57.55                 | 0.89         |
| 775             | 57.35                 | 0.905        |
| 795             | 57.12                 | 0.925        |
| 820             | 56.97                 | 0.947        |
| 840             | 56.67                 | 0.962        |
| 865             | 56.5                  | 0.988        |
| 885             | 56.34                 | 1.007        |
| 900             | 56.37                 | 1.02         |
| 910             | 56.14                 | 1.026        |
| 930             | 56                    | 1.047        |
| 955             | 55.82                 | 1.075        |
| 975             | 55.68                 | 1.09         |
| 995             | 55.52                 | 1.111        |

# TISSUE – EQUIVALENT LIQUID

|            |                      |                     |        |
|------------|----------------------|---------------------|--------|
| Date:      | 05/04/2015           | Temperature:        | 23°C   |
| Tissue:    | Body, MSL900, 900MHz | Liquid Temperature: | 22.3°C |
| Tested By: | Ethan Schoonover     | Relative Humidity:  | 40.6   |
| Job Site:  | EV08                 | Bar. Pressure:      | 1015   |

## TEST SPECIFICATIONS

|                 |                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------|
| Specification:  | Method:                                                                                     |
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## RESULTS

|                 | Actual Values         |              | Target Values         |              | Deviation (%)         |              |
|-----------------|-----------------------|--------------|-----------------------|--------------|-----------------------|--------------|
| Frequency (MHz) | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity |
| 900             | 56.69                 | 1.028        | 55.0                  | 1.05         | -3.07                 | 2.1          |

| Frequency (MHz) | Relative Permittivity | Conductivity |
|-----------------|-----------------------|--------------|
| 400             | 61.67                 | 0.585        |
| 420             | 61.54                 | 0.599        |
| 440             | 61.53                 | 0.611        |
| 465             | 60.96                 | 0.63         |
| 485             | 60.77                 | 0.648        |
| 510             | 60.48                 | 0.67         |
| 530             | 60.3                  | 0.682        |
| 555             | 60.07                 | 0.707        |
| 575             | 59.7                  | 0.729        |
| 595             | 59.8                  | 0.74         |
| 620             | 59.21                 | 0.767        |
| 640             | 58.87                 | 0.787        |
| 665             | 59.01                 | 0.811        |
| 685             | 58.7                  | 0.822        |
| 710             | 58.44                 | 0.844        |
| 730             | 58.3                  | 0.862        |
| 755             | 58.09                 | 0.885        |
| 775             | 57.85                 | 0.907        |
| 795             | 57.73                 | 0.924        |
| 820             | 57.41                 | 0.948        |
| 840             | 57.21                 | 0.967        |
| 865             | 56.98                 | 0.996        |
| 885             | 56.71                 | 1.012        |
| 900             | 56.69                 | 1.028        |
| 910             | 56.53                 | 1.038        |
| 930             | 56.4                  | 1.06         |
| 955             | 56.14                 | 1.081        |
| 975             | 55.97                 | 1.1          |
| 995             | 55.83                 | 1.124        |

# TISSUE – EQUIVALENT LIQUID

|            |                        |                     |        |
|------------|------------------------|---------------------|--------|
| Date:      | 05/05/2015             | Temperature:        | 24.2°C |
| Tissue:    | Body, MSL1750, 1800MHz | Liquid Temperature: | 21.9°C |
| Tested By: | Ethan Schoonover       | Relative Humidity:  | 34.8   |
| Job Site:  | EV08                   | Bar. Pressure:      | 1019   |

## TEST SPECIFICATIONS

|                 |                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------|
| Specification:  | Method:                                                                                     |
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## RESULTS

|                 | Actual Values         |              | Target Values         |              | Deviation (%)         |              |
|-----------------|-----------------------|--------------|-----------------------|--------------|-----------------------|--------------|
| Frequency (MHz) | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity |
| 1800            | 51.92                 | 1.538        | 53.3                  | 1.52         | 2.59                  | -1.18        |

| Frequency (MHz) | Relative Permittivity | Conductivity |
|-----------------|-----------------------|--------------|
| 1000            | 55                    | 0.741        |
| 1035            | 54.96                 | 0.774        |
| 1070            | 54.95                 | 0.808        |
| 1110            | 54.71                 | 0.838        |
| 1145            | 54.46                 | 0.862        |
| 1185            | 54.36                 | 0.899        |
| 1220            | 54.37                 | 0.951        |
| 1255            | 54.09                 | 0.973        |
| 1295            | 53.8                  | 1            |
| 1330            | 53.71                 | 1.041        |
| 1370            | 53.61                 | 1.074        |
| 1405            | 53.51                 | 1.111        |
| 1440            | 53.4                  | 1.151        |
| 1480            | 53.21                 | 1.197        |
| 1515            | 53.04                 | 1.23         |
| 1555            | 52.86                 | 1.27         |
| 1590            | 52.73                 | 1.308        |
| 1625            | 52.64                 | 1.346        |
| 1665            | 52.45                 | 1.389        |
| 1700            | 52.32                 | 1.43         |
| 1740            | 52.14                 | 1.47         |
| 1775            | 51.95                 | 1.516        |
| 1800            | 51.92                 | 1.538        |
| 1810            | 51.87                 | 1.555        |
| 1850            | 51.71                 | 1.601        |
| 1885            | 51.51                 | 1.655        |
| 1925            | 51.42                 | 1.697        |
| 1960            | 51.27                 | 1.725        |
| 2000            | 51.05                 | 1.77         |

# TISSUE – EQUIVALENT LIQUID

|            |                        |                     |        |
|------------|------------------------|---------------------|--------|
| Date:      | 05/04/2015             | Temperature:        | 23.6°C |
| Tissue:    | Body, MSL1900, 1900MHz | Liquid Temperature: | 23°C   |
| Tested By: | Ethan Schoonover       | Relative Humidity:  | 42.3   |
| Job Site:  | EV08                   | Bar. Pressure:      | 1019   |

## TEST SPECIFICATIONS

|                 |                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------|
| Specification:  | Method:                                                                                     |
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## RESULTS

|                 | Actual Values         |              | Target Values         |              | Deviation (%)         |              |
|-----------------|-----------------------|--------------|-----------------------|--------------|-----------------------|--------------|
| Frequency (MHz) | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity |
| 1900            | 53.12                 | 1.503        | 53.3                  | 1.52         | 0.34                  | 1.12         |

| Frequency (MHz) | Relative Permittivity | Conductivity |
|-----------------|-----------------------|--------------|
| 1000            | 56.15                 | 0.642        |
| 1035            | 56.11                 | 0.665        |
| 1070            | 55.97                 | 0.694        |
| 1110            | 55.82                 | 0.731        |
| 1145            | 55.67                 | 0.749        |
| 1185            | 55.58                 | 0.783        |
| 1220            | 55.55                 | 0.818        |
| 1255            | 55.45                 | 0.834        |
| 1295            | 55.43                 | 0.885        |
| 1330            | 55.26                 | 0.922        |
| 1370            | 55.1                  | 0.957        |
| 1405            | 54.97                 | 0.989        |
| 1440            | 54.83                 | 1.025        |
| 1480            | 54.72                 | 1.067        |
| 1515            | 54.53                 | 1.097        |
| 1555            | 54.39                 | 1.136        |
| 1590            | 54.24                 | 1.176        |
| 1625            | 54.14                 | 1.211        |
| 1665            | 53.98                 | 1.249        |
| 1700            | 53.88                 | 1.29         |
| 1740            | 53.77                 | 1.329        |
| 1775            | 53.6                  | 1.374        |
| 1810            | 53.5                  | 1.41         |
| 1850            | 53.34                 | 1.45         |
| 1885            | 53.22                 | 1.489        |
| 1900            | 53.12                 | 1.503        |
| 1925            | 53.15                 | 1.529        |
| 1960            | 52.93                 | 1.565        |
| 2000            | 52.79                 | 1.612        |

# TISSUE – EQUIVALENT LIQUID

|            |                      |                     |         |
|------------|----------------------|---------------------|---------|
| Date:      | 05/11/2015           | Temperature:        | 23.4°C  |
| Tissue:    | Body, MSL900, 900MHz | Liquid Temperature: | 22.2°C  |
| Tested By: | Ethan Schoonover     | Relative Humidity:  | 49.8%   |
| Job Site:  | EV08                 | Bar. Pressure:      | 1012 mb |

## TEST SPECIFICATIONS

## RESULTS

| Frequency<br>(MHz) | Actual Values         |              | Target Values         |              | Deviation (%)         |              |
|--------------------|-----------------------|--------------|-----------------------|--------------|-----------------------|--------------|
|                    | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity | Relative Permittivity | Conductivity |
| 900                | 56.99                 | 1.029        | 55.0                  | 1.05         | -3.62                 | 2            |

| Frequency<br>(MHz) | Relative Permittivity | Conductivity |
|--------------------|-----------------------|--------------|
| 400                | 61                    | 0.575        |
| 420                | 60.94                 | 0.592        |
| 440                | 60.92                 | 0.599        |
| 465                | 60.4                  | 0.618        |
| 485                | 60.16                 | 0.641        |
| 510                | 60.17                 | 0.662        |
| 530                | 60.14                 | 0.677        |
| 555                | 60.17                 | 0.7          |
| 575                | 59.73                 | 0.718        |
| 595                | 59.62                 | 0.744        |
| 620                | 59.22                 | 0.764        |
| 640                | 59.29                 | 0.783        |
| 665                | 59.14                 | 0.795        |
| 685                | 59.04                 | 0.823        |
| 710                | 58.78                 | 0.845        |
| 730                | 58.66                 | 0.861        |
| 755                | 58.41                 | 0.885        |
| 775                | 58.16                 | 0.905        |
| 795                | 57.97                 | 0.922        |
| 820                | 57.68                 | 0.949        |
| 840                | 57.48                 | 0.966        |
| 865                | 57.26                 | 0.993        |
| 885                | 57.03                 | 1.009        |
| 900                | 56.99                 | 1.029        |
| 910                | 56.83                 | 1.041        |
| 930                | 56.7                  | 1.064        |
| 955                | 56.53                 | 1.092        |
| 975                | 56.34                 | 1.112        |
| 995                | 56.18                 | 1.14         |

# SAR SYSTEM VERIFICATION NARRATIVE

## REQUIREMENT

Per IEEE 1528, Section 8.2.1, "System checks are performed prior to compliance tests and the results must always be within  $\pm 10\%$  of the target value corresponding to the test frequency, liquid, and the source used. The target values are 1 g or 10 g averaged SAR values measured on systems having current system validation and calibration status, and using the system check setup as shown in Figure 14. These target values should be determined using a standard source."

## TEST DESCRIPTION

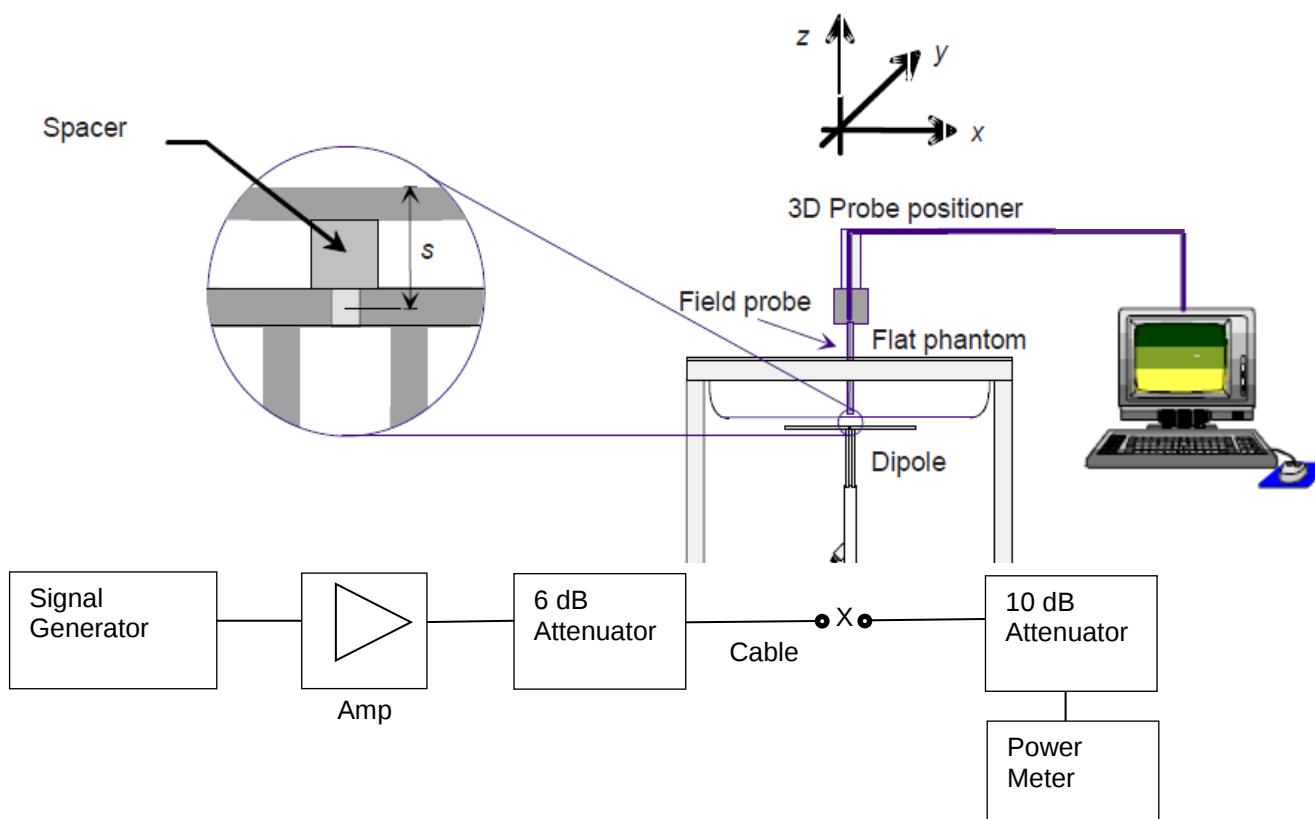
Within 24 hours of a measurement, then every 72 hours thereafter, Northwest EMC used the system validation kit (calibrated reference dipole) to test whether the system was operating within its specifications. The validation was performed in the indicated bands by making SAR measurements of the reference dipole with the phantom filled with the tissue-equivalent liquid. First, a signal generator and power amplifier were used to produce a 100mW level as measured with a power meter at the antenna terminals of the dipole (X). Then, the reference dipole was positioned below the bottom of the phantom and centered with its axis parallel to the longest side of the phantom. A low loss and low relative permittivity spacer was used to establish the correct distance between the center axis of the reference dipole and the liquid.

For the reference dipoles, the spacing distance  $s$  is given by:

$s = 15\text{mm}$ ,  $\pm 0.2\text{mm}$  for  $300\text{MHz} \leq f \leq 1000 \text{ MHz}$ :

$s = 10\text{mm}$ ,  $\pm 0.2\text{mm}$  for  $1000\text{MHz} \leq f \leq 6000\text{MHz}$

The measured 1 g and 10 g spatial average SAR values were normalized to a 1W dipole input power for comparison to the calibration data. The results are summarized in the attached table. The deviation is less than 10% in all cases, indicating that the system performance check was within tolerance.



# SAR SYSTEM VERIFICATION

## TEST SPECIFICATIONS

| Specification:  | Method:                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------|
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## RESULTS

| Date     | Liquid part number and frequency | Conducted Power into the Dipole (dBm) | Correction Factor | Measured |      | Normalized to 1W |       | Target<br>(Normalized to 1W)<br>Get from Dipole Calibration Certificate |       | % Difference |       |
|----------|----------------------------------|---------------------------------------|-------------------|----------|------|------------------|-------|-------------------------------------------------------------------------|-------|--------------|-------|
|          |                                  |                                       |                   | 1g       | 10g  | 1g               | 10g   | 1g                                                                      | 10g   | 1g           | 10g   |
| 5/1/2015 | MSL 900 (900 MHz)                | 20.00                                 | 10.00             | 1.06     | 0.69 | 10.60            | 6.93  | 10.90                                                                   | 7.07  | -2.75        | -1.98 |
| 5/4/2015 | MSL 1900 (1900 MHz)              | 20.00                                 | 10.00             | 4.19     | 2.22 | 41.90            | 22.20 | 40.40                                                                   | 21.40 | 3.71         | 3.74  |
| 5/5/2015 | MSL 1750 (1750 MHz)              | 20.00                                 | 10.00             | 3.84     | 2.07 | 38.40            | 20.70 | 37.80                                                                   | 20.40 | 1.59         | 1.47  |

# SAR SYSTEM VERIFICATION

|                |                  |                          |         |
|----------------|------------------|--------------------------|---------|
| Tested By:     | Ethan Schoonover | Room Temperature (°C):   | 23.2°C  |
| Date:          | 5/1/2015         | Liquid Temperature (°C): | 22°C    |
| Configuration: | 1                | Humidity (%RH):          | 40.2    |
|                |                  | Bar. Pressure (mb):      | 1014 mb |

## MSL900 System Check\_900MHz 5-1-15

**DUT: Dipole 900 MHz D900V2; Type: D900V2; Serial: D900V2 -**

Communication System: UID 0, CW (0); Communication System Band: D900 (900.0 MHz); Frequency: 900 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 900$  MHz;  $\sigma = 1.02$  S/m;  $\epsilon_r = 56.372$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**System Check/System Check/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm  
Maximum value of Total (measured) = 34.00 V/m

**System Check/System Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 31.98 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.56 W/kg

**SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.693 W/kg**

Maximum value of SAR (measured) = 1.06 W/kg

**System Check/System Check/Area Scan (71x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

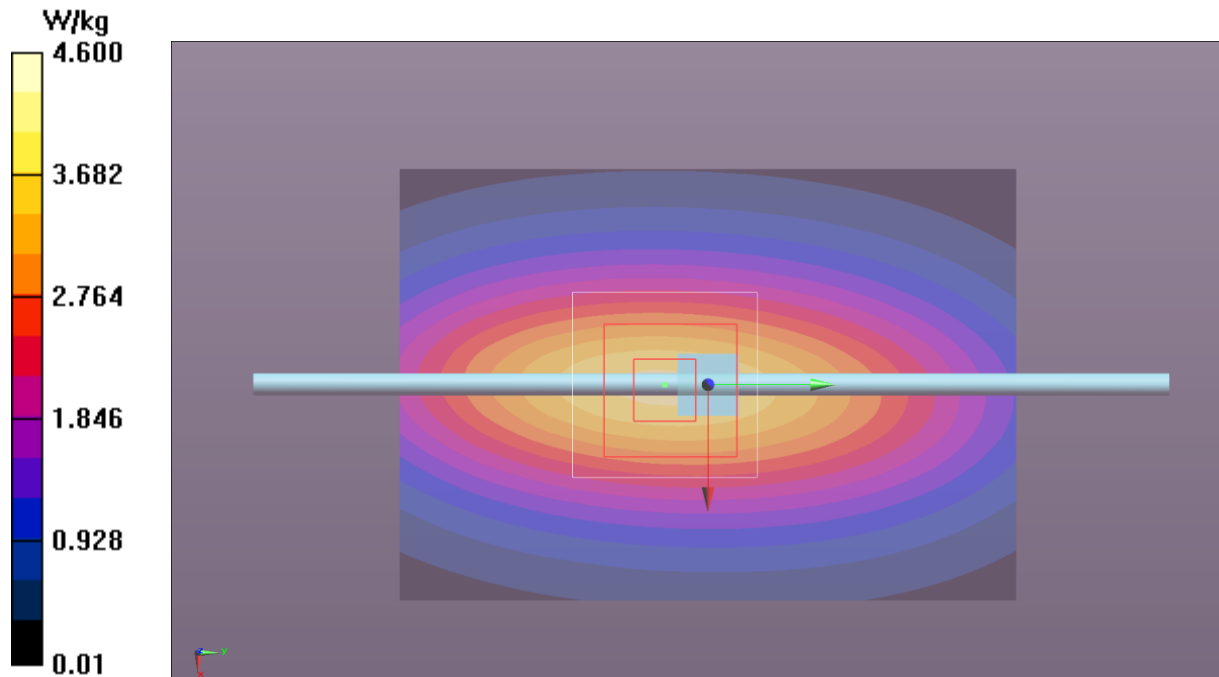
Maximum value of SAR (interpolated) = 1.05 W/kg

Maximum value of SAR (measured) = 1.18 W/kg

   
Approved By

# SAR SYSTEM VERIFICATION

MSL900 System Check\_900MHz 5-1-15



# SAR SYSTEM VERIFICATION

|                |                  |                          |         |
|----------------|------------------|--------------------------|---------|
| Tested By:     | Ethan Schoonover | Room Temperature (°C):   | 23.6°C  |
| Date:          | 5/4/2015         | Liquid Temperature (°C): | 23°C    |
| Configuration: | 1                | Humidity (%RH):          | 42.3    |
|                |                  | Bar. Pressure (mb):      | 1015 mb |

## MSL1900 System Check\_1900MHz 5-4-15

**DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 -**

Communication System: UID 10000, CW; Communication System Band: D1900 (1900.0 MHz); Frequency: 1900 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.503$  S/m;  $\epsilon_r = 53.12$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**System Check/System Check/Area Scan (51x61x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm  
Maximum value of SAR (interpolated) = 4.29 W/kg

**System Check/System Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.80 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 7.56 W/kg

**SAR(1 g) = 4.19 W/kg; SAR(10 g) = 2.22 W/kg**

Maximum value of SAR (measured) = 4.23 W/kg

**System Check/System Check/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

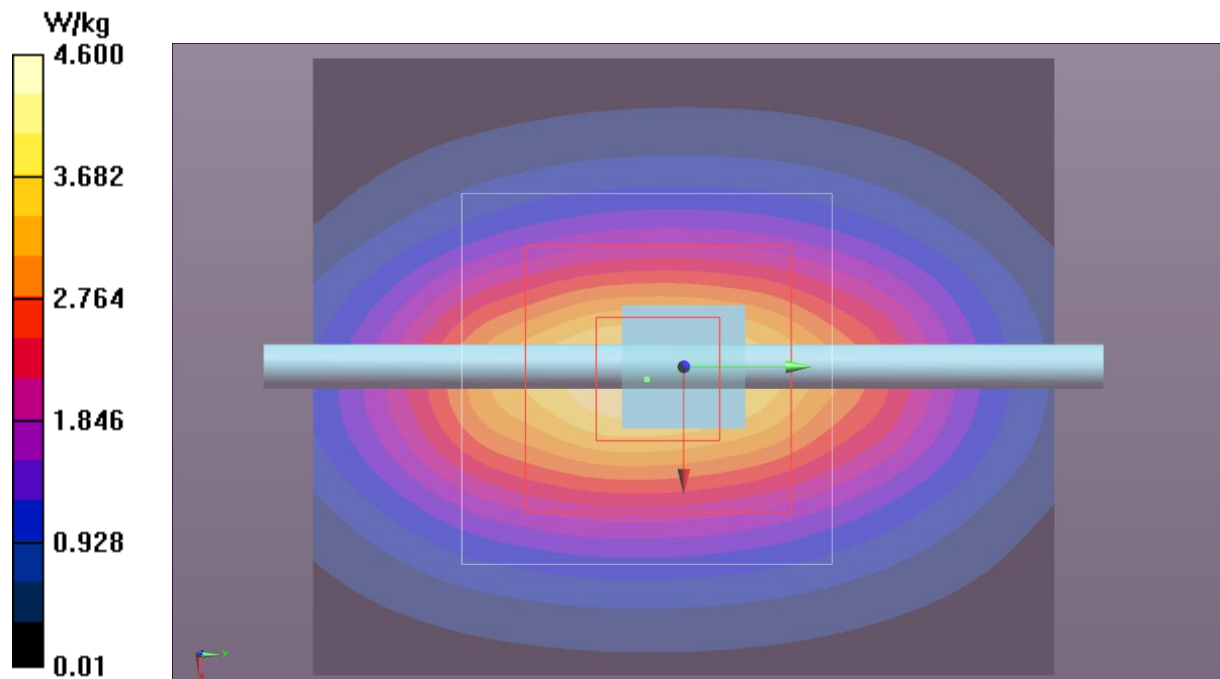
Maximum value of Total (measured) = 55.29 V/m

Maximum value of SAR (measured) = 4.60 W/kg

   
Approved By

# SAR SYSTEM VERIFICATION

MSL1900 System Check\_1900MHz 5-4-15



# SAR SYSTEM VERIFICATION

|                |                  |                          |         |
|----------------|------------------|--------------------------|---------|
| Tested By:     | Ethan Schoonover | Room Temperature (°C):   | 24.2°C  |
| Date:          | 5/5/2015         | Liquid Temperature (°C): | 21.9°C  |
| Configuration: | 1                | Humidity (%RH):          | 34.8%   |
|                |                  | Bar. Pressure (mb):      | 1015 mb |

## MSL1750 System Check\_1750MHz 5-5-15

**DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2 -**

Communication System: UID 0, CW (0); Communication System Band: D1750 (1750.0 MHz); Frequency: 1750 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $f = 1750$  MHz;  $\sigma = 1.483$  S/m;  $\epsilon_r = 52.066$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**System Check/System Check/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm  
Maximum value of Total (measured) = 50.74 V/m

**System Check/System Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.31 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 6.74 W/kg

**SAR(1 g) = 3.84 W/kg; SAR(10 g) = 2.07 W/kg**

Maximum value of SAR (measured) = 3.89 W/kg

**System Check/System Check/Area Scan (51x61x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

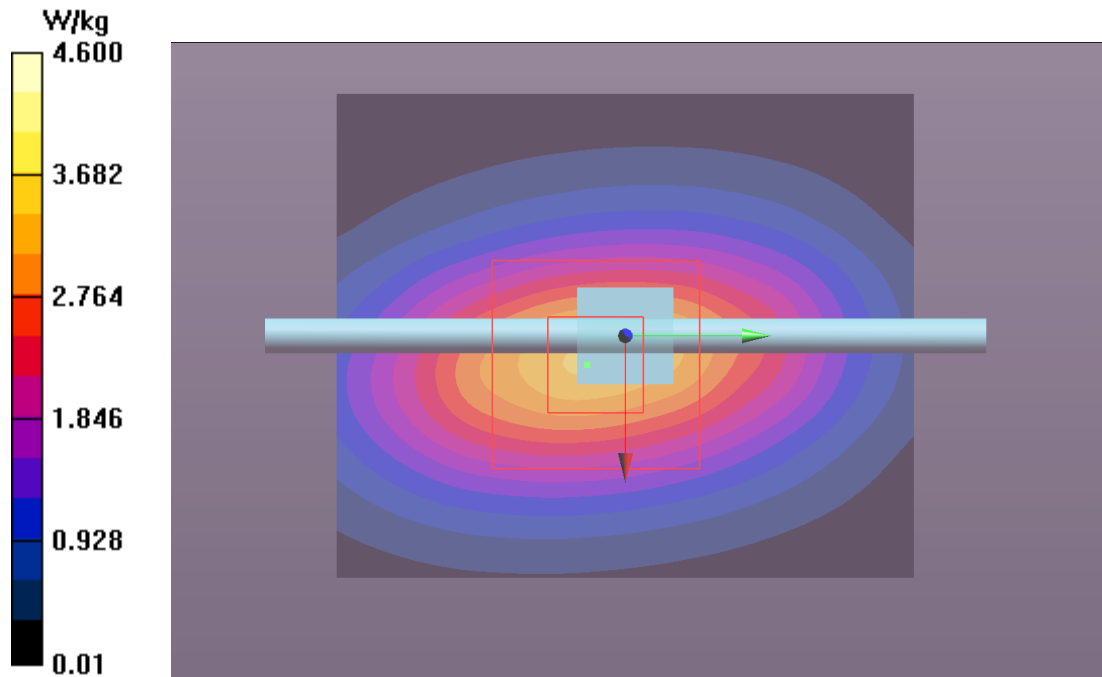
Maximum value of SAR (interpolated) = 3.99 W/kg

Maximum value of SAR (measured) = 3.82 W/kg

   
Approved By

# SAR SYSTEM VERIFICATION

MSL1750 System Check\_1750MHz 5-5-15



# OUTPUT POWER

Only the channels and modulation for each band that produced the highest report SAR in the original cellular filings were tested for this configuration. An Anritsu test set, Model MT8820C, was used to control the EUT. The following software applications were installed on the test set:

|          |            |
|----------|------------|
| GSM:     | 22.18 #006 |
| W-CDMA:  | 22.30 #018 |
| CDMA2000 | 22.24 #009 |

This provided all the necessary tools to operate the EUT in the prescribed manner without any difficulties or equipment limitations.

## GPRS

Per FCC KDB 941225, “SAR must be measured according to these maximum output conditions”

- When multiple slots can be used, the device should be tested to account for the maximum source-based time-averaged output power. Measure GMSK and 8PSK modulations for both one and two time slots.

## WCDMA

Per FCC KDB 941225, measurements for WCDMA, HSDPA, and HSUPA were made according to the procedures in section 5.2 of 3GPP2 TS 34.121.

- Use the appropriate RMC or AMR with TPC (transmit power control ) set to all “1”s for WCDMA/HSDPA or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Maximum output power for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HSDPA, HSPA) should be measured
- Voice mode is measured using a 12.2 kbps RMC with TPC bits configured to all “1”s.
- 12.2 kbps AMR is measured with a 3.4 kbps SRB (signaling radio bearer)
- HSPA is measured with HS-DPCCH, E-DPCCH and E-DPDCH all enabled and a 12.2 kbps RMC. FRC is configured according to HS-DPCCH Sub-Test 1 using H-set 1 and QPSK.

The Anritsu MT8820C test set was configured as follows:

### WCDMA Rel99

- Set a ‘Test Loop Mode’ = Mode 1
- Set ‘Signal Channel Coding’ = Reference Measurement Channel
- Set ‘Prioritized Max DL rate’ = 12.2 k
- Set ‘Power Control Bit Pattern’ = (All 1)

# OUTPUT POWER

## EVDO Rel 0

Per FCC KDB 941225, measurements for EVDO Rel 0 were made according to the procedures in section 3.1.2.3.4 of 3GPP2 C.S0033-0/TIA-866. The results are tabulated on the following pages.

The Anritsu MT8820C test set was configured as follows:

- Set 'Standard:' = 1xEV-DO
- Set 'Output Level (Fwd)' = -105.5 dBm/1.23 MHz
- Set 'Protocol Revision' = 0: IS-856-0
- Set 'Input Level Set mode' = Manual
- Set 'Input Level (Rev)' = 30 dBm
- Set 'Forward Link, Traffic Channel Data Rate' = 307.2 kbps (2 slot)
- Set 'Reverse Link, Data Channel Rate' = 153.6 kbps
- Access Parameters
  - Open Loop Adjust = 81
  - Probe Initial Adjust = 15
  - Probe Power Step = 7.5 dB
  - Probe Num Step = 15
  - Probe Sequence Max = 15

## EVDO Rev A

For EVDO Rev A mode, measurements were made according to the procedures in section 4.3.4 of 3GPP2 C.S0033-A. The results are tabulated on the following pages.

The Anritsu MT8820C test set was configured as follows:

- Set 'Standard:' = 1xEV-DO
- Set 'Output Level (Fwd)' = -60 dBm/1.23 MHz
- Set 'Protocol Revision' = A: IS-856-A
- Set 'Application Protocol' = FETAP +RETAP
- Set 'Input Level Set mode' = Manual
- Set 'Input Level (Rev)' = 30 dBm
- Set 'Forward Link, Traffic Channel Transmission Format = 0x04 (1024, 2, 128) : 307.2 kbps
- Access Parameters
  - Open Loop Adjust = 81
  - Probe Initial Adjust = 15
  - Probe Power Step = 7.5 dB
  - Probe Num Step = 15
  - Probe Sequence Max = 15

## 915 MHz RFID

The RFID Reader was tested using special test software provided by the manufacturer. The duty cycle was 100%. The channel with the highest conducted output power from the original grant was tested for SAR.

Output power measurements are on the following pages.

# OUTPUT POWER

|                   |                                                     |                    |          |
|-------------------|-----------------------------------------------------|--------------------|----------|
| EUT:              | IP30C RFID Reader with 70 Series Handheld Computers | Work Order:        | INMC0920 |
| Serial Number:    | See configurations section of report                | Date:              | 5/1/15   |
| Customer:         | Intermec Technologies Corporation                   | Temperature:       | 22.5°C   |
| Attendees:        | None                                                | Relative Humidity: | 40%      |
| Customer Project: | None                                                | Bar. Pressure:     | 1018mb   |
| Tested By:        | Jared Ison                                          | Job Site:          | EV06     |
| Power:            | 3.7 VDC                                             | Configuration:     | INMC0920 |

## TEST SPECIFICATIONS

|                 |                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| Specification:  | Method:                                                                                                               |
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 941225 D01 v03<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## COMMENTS

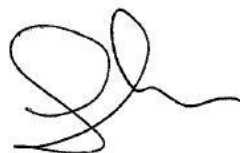
None

## DEVIATIONS FROM TEST STANDARD

None

## RESULTS

| EUT                          | Radio      | Frequency Band | Frequency (MHz) | Channel | Data Rate                | Output Power (dBm) |
|------------------------------|------------|----------------|-----------------|---------|--------------------------|--------------------|
| IP30C                        | RFID       | 900            | 902.75          | 5       | 340                      | 22.17              |
| 1000CP02S<br>S/N 178U1191040 | GPRS       | Cellular       | 836.6           | 190     | GMSK (CS-4)              | 33.07              |
| 1001CP01S<br>S/N 28311047275 | WCDMA      | AWS 1700       | 1735.4          | 1427    | 12.2 kbps RMC            | 23.99              |
| 1000CP02S<br>S/N 178U1191040 | WCDMA      | PCS            | 1852.4          | 9262    | 12.2 kbps RMC            | 24.37              |
| 1000CP01U<br>S/N 7004        | WCDMA      | Cellular       | 836.6           | 4183    | 12.2 kbps RMC            | 22.23              |
| 1001CP01U<br>S/N 06021444012 | WCDMA      | PCS            | 1880            | 9400    | 12.2 kbps RMC            | 24.13              |
| 1000CP01C<br>S/N 24411047064 | EVDO Rel 0 | Cellular       | 836.52          | 384     | FTAP 307.2<br>RTAP 153.6 | 24.08              |
| 1000CP02C<br>S/N 24511047015 | EVDO RevA  | PCS            | 1880            | 600     | FTAP 307.2<br>RETAP 4096 | 24.31              |



Tested By

# OUTPUT POWER

|                   |                                                     |                    |          |
|-------------------|-----------------------------------------------------|--------------------|----------|
| EUT:              | IP30C RFID Reader with 70 Series Handheld Computers | Work Order:        | INMC0920 |
| Serial Number:    | See configurations section of report                | Date:              | 5/11/15  |
| Customer:         | Intermec Technologies Corporation                   | Temperature:       | 22.5°C   |
| Attendees:        | None                                                | Relative Humidity: | 40%      |
| Customer Project: | None                                                | Bar. Pressure:     | 1018mb   |
| Tested By:        | Rod Peloquin                                        | Job Site:          | EV06     |
| Power:            | 3.7 VDC                                             | Configuration:     | INMC0920 |

## TEST SPECIFICATIONS

|                 |                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| Specification:  | Method:                                                                                                               |
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 941225 D01 v03<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## COMMENTS

Non-standard setup based upon guidance from the FCC. The operational description contains additional information.

## DEVIATIONS FROM TEST STANDARD

None

## RESULTS

| EUT   | Radio | Frequency Band | Frequency (MHz) | Channel | Data Rate | Output Power (dBm) |
|-------|-------|----------------|-----------------|---------|-----------|--------------------|
| IP30C | RFID  | 900            | 902.75          | 5       | 340       | 13.8               |



Tested By

# TEST RESULTS

## Test Configurations

### Test Locations

The IP30C RFID reader will only be used while held in the hand. The RFID reader transmits only when the trigger on the handle is pulled. This prevents transmission while near the head or torso. Separate MPE reports have been prepared to document compliance for body exposure.

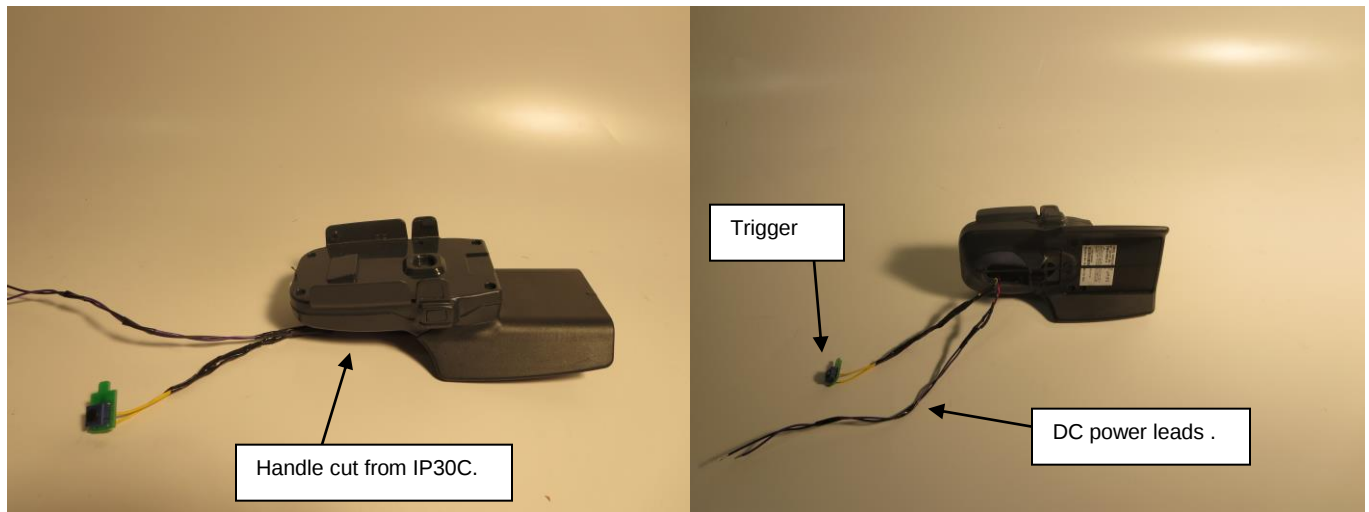
Based upon the calculations of KDB 447498 D01 v05r02, Section 4.3.2, the standalone extremity SAR must be measured for the cellular and RFID radios. .

The photos below show that the RFID Reader is handheld using a plastic pistol grip. The battery fits into the handle. Nothing else is in the handle. The RFID Reader antenna is above and in front of the handle. An Intermec 70 series handheld computer is snapped on top of the RFID Reader. It contains Wi-Fi and Cellular radios. Bluetooth radios in the top of the Reader and in the handheld provide the communication link between the two devices.

For SAR testing the battery was removed from the handle and the DC power leads were extended to a laboratory power supply. The handle was cut along the line that represents the closest spacing of the antennas to the user's hand. With the handle removed, the RFID Reader with handheld computer unit was placed against the flat phantom with the cut placed at 0mm spacing. This provided the 9cm spacing to the handheld as seen in the photos and also representative spacing and orientation to the RFID antenna. The area scans and subsequent zoom scans were limited to an area near the handle and not extending along the length of the RFID antenna.



The battery was removed from handle, then the handle was cut along the dotted line so it could be placed against the flat phantom at the correct distance from the hand placement



## Summary

The following table summarizes the measured SAR values. The EUT was transmitting at nearly 100% duty cycle.

Per FCC KDB 447498, the measured SAR values were scaled to the maximum tune-up tolerance limit. The results are referred to as the "Reported SAR" values. The following formula was used to calculate the linear SAR scaling factor:

$$\text{SAR scaling factor} = 10^{((\text{Maximum Rated Power}^1 \text{ (dBm)} - \text{Measured Power (dBm)}) / 10)}$$

Per FCC KDB 447498, SAR must be measured on the channel with the highest conducted output power. When the SAR measured on the highest output channel is  $> 2.0 \text{ W/kg}$  for 10-g, SAR evaluation for the other required test channels is necessary.

# SAR TEST DATA

|            |                                                     |                   |          |
|------------|-----------------------------------------------------|-------------------|----------|
| EUT:       | IP30C RFID Reader with 70 Series Handheld Computers | Work Order:       | INMC0920 |
| Customer:  | Intermec Technologies Corporation                   | Job Site:         | EV08     |
| Attendees: | None                                                | Customer Project: | None     |

## TEST SPECIFICATIONS

|                 |                                                                                                                       |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| Specification:  | Method:                                                                                                               |
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 941225 D01 v03<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## COMMENTS

A non-standard setup was used for SAR testing based on guidance from the FCC. The operational description contains additional information.

The extremity SAR limit for general population / uncontrolled exposure is 4 W/kg for 10-g.

## DEVIATIONS FROM TEST STANDARD

None

| EUT   | Radio | Transmit Frequency (MHz) | Transmit Channel | Transmit Mode | Data Rate | Power Drift During Test (dB) | Measured Output Power (dBm) | Maximum Rated Output Power (dBm) | Power Scaling Factor | Measured SAR Level 10g (W/kg) | Reported SAR Level 10g (W/kg) | Test # |
|-------|-------|--------------------------|------------------|---------------|-----------|------------------------------|-----------------------------|----------------------------------|----------------------|-------------------------------|-------------------------------|--------|
| IP30C | RFID  | 902.75                   | 5                | PRASK         | 340       | -0.53                        | 13.8                        | 30                               | 41.69                | 0.075                         | 3.17                          | 9      |

# SAR TEST DATA

|                |                      |                          |      |
|----------------|----------------------|--------------------------|------|
| Tested By:     | Ethan Schoonover     | Room Temperature (°C):   | 23.2 |
| 22.2           | 5/11/2015 3:06:17 PM | Liquid Temperature (°C): | 22.2 |
| Serial Number: | 04201500003          | Humidity (%RH):          | 49.8 |
| Configuration: | INMC0920-            | Bar. Pressure (mb):      | 1012 |
| Comments:      | None                 |                          |      |

## Test 9

**DUT: RFID and Computer Combo; Type: IP30C;** Communication System: UID 0, CW (0); Communication System Band: D900 (900.0 MHz); Frequency: 902.75 MHz; Communication System PAR: 0 dB; PMF: 1  
Medium parameters used (interpolated):  $f = 902.75$  MHz;  $\sigma = 1.032$  S/m;  $\epsilon_r = 56.956$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x41x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.139 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.10 V/m; Power Drift = -0.53 dB

Peak SAR (extrapolated) = 0.138 W/kg

**SAR(1 g) = 0.104 W/kg; SAR(10 g) = 0.075 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.116 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.131 W/kg

**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

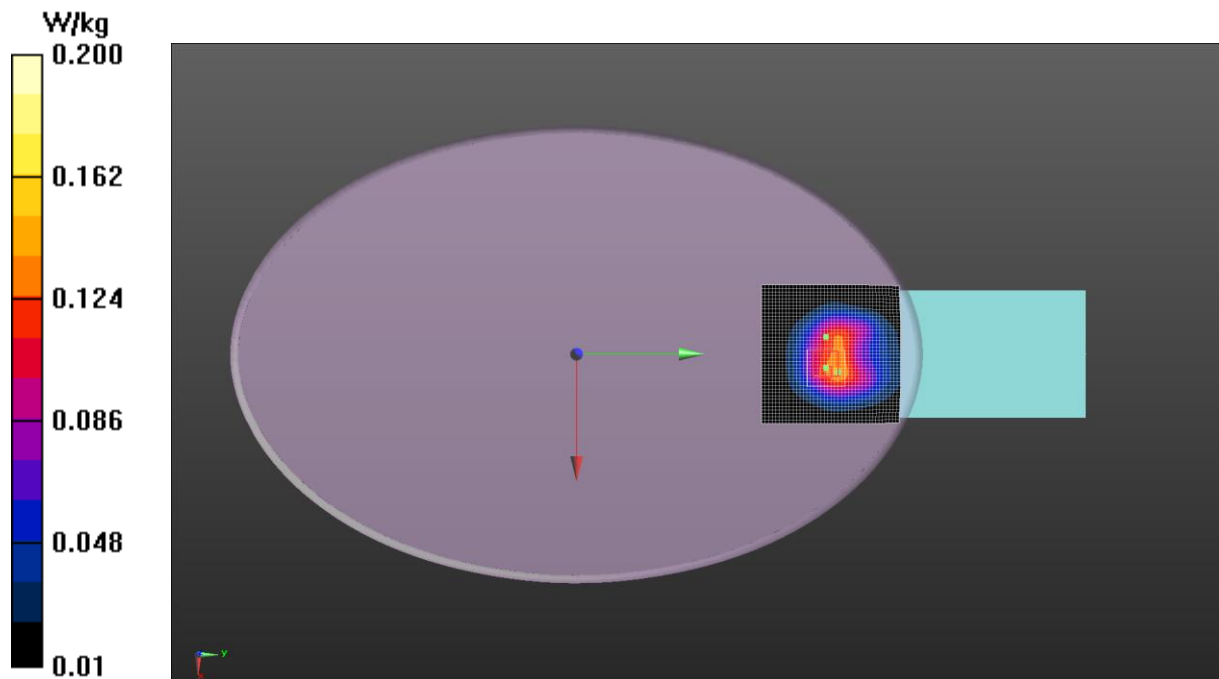
Maximum value of Total (measured) = 8.910 V/m

Maximum value of SAR (measured) = 0.0819 W/kg

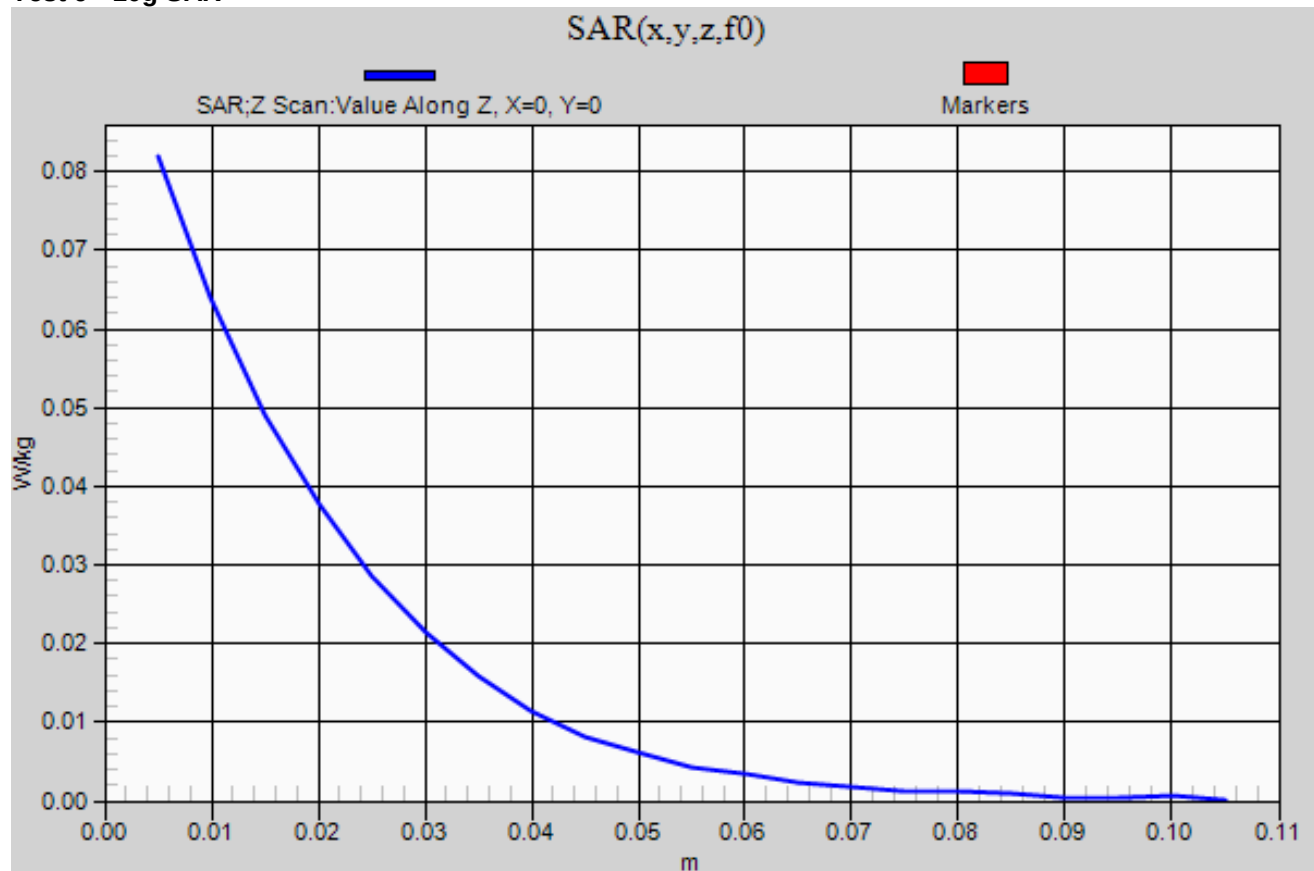
   
Approved By

# SAR TEST DATA

## Test 9



## Test 9 - 10g SAR



# SAR TEST DATA

|            |                                                     |                   |          |
|------------|-----------------------------------------------------|-------------------|----------|
| EUT:       | IP30C RFID Reader with 70 Series Handheld Computers | Work Order:       | INMC0920 |
| Customer:  | Intermec Technologies Corporation                   | Job Site:         | EV08     |
| Attendees: | None                                                | Customer Project: | None     |

## TEST SPECIFICATIONS

| Specification:  | Method:                                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------------------------------|
| FCC 2.1093:2015 | IEEE Std 1528:2003<br>FCC KDB 447498 D01 v05r02<br>FCC KDB 941225 D01 v03<br>FCC KDB 865664 D01 v01r03 and D02 v01r01 |

## COMMENTS

Tested on flat phantom (body) with cut handle of IP30C at 0cm spacing. The extremity SAR limit for general population / uncontrolled exposure is 4 W/kg for 10-g.

## DEVIATIONS FROM TEST STANDARD

None

## RESULTS

| EUT                             | Radio | Transmit Frequency (MHz) | Transmit Channel | Transmit Mode     | Data Rate             | Power Drift During Test (dB) | Measured Output Power (dBm) | Maximum Rated Output Power (dBm) | Power Scaling Factor | Measured SAR Level 10g (W/kg) | Reported SAR Level 10g (W/kg) | Test # |
|---------------------------------|-------|--------------------------|------------------|-------------------|-----------------------|------------------------------|-----------------------------|----------------------------------|----------------------|-------------------------------|-------------------------------|--------|
| IP30C                           | RFID  | 902.75                   | 5                | PRASK             | 340                   | Note 1                       | 22.17                       | 30                               | 6.07                 | 0.076                         | 0.46                          | 1      |
| 1000CP02S<br>S/N<br>178U1191040 | UMTS  | 836.6                    | 190              | GPRS/ 1 slot      | GMSK (CS-4)           | 0.07                         | 33.07                       | 34                               | 1.24                 | 0.01                          | 0.01                          | 2      |
| 1001CP01S<br>S/N<br>28311047275 | UMTS  | 1735.4                   | 1427             | WCDMA Test Loop 1 | 12.2 kbps RMC         | Note 1                       | 23.99                       | 25                               | 1.26                 | 0.06                          | 0.08                          | 3      |
| 1000CP02S<br>S/N<br>178U1191040 | UMTS  | 1852.4                   | 9262             | WCDMA Test Loop 1 | 12.2 kbps RMC         | Note 1                       | 24.37                       | 25                               | 1.16                 | 0.02                          | 0.02                          | 4      |
| 1000CP01U<br>S/N 7004           | UMTS  | 836.6                    | 4183             | WCDMA Test Loop 1 | 12.2 kbps RMC         | -0.02                        | 22.23                       | 25                               | 1.89                 | 0.06                          | 0.11                          | 5      |
| 1001CP01U<br>S/N<br>06021444012 | UMTS  | 1880                     | 9400             | WCDMA Test Loop 1 | 12.2 kbps RMC         | Note 1                       | 24.13                       | 25                               | 1.22                 | 0.03                          | 0.04                          | 6      |
| 1000CP01C<br>S/N<br>24411047064 | CDMA  | 836.52                   | 384              | EV-DO Rel 0       | FTAP 307.2 RTAP 153.6 | Note 1                       | 24.08                       | 25                               | 1.24                 | 0.06                          | 0.07                          | 7      |
| 1000CP02C<br>S/N<br>24511047015 | CDMA  | 1880                     | 600              | EV-DO Rev A       | FTAP 307.2 RETAP 4096 | 0.03                         | 24.31                       | 25                               | 1.17                 | 0.02                          | 0.02                          | 8      |

Note 1: Due to the low value of measured SAR, the power drift measurement was made close to the measurement noise floor and is therefore inaccurate.

# SAR TEST DATA

|                |                     |                          |      |
|----------------|---------------------|--------------------------|------|
| Tested By:     | Jared Ison          | Room Temperature (°C):   | 23.2 |
| Date:          | 5/4/2015 9:44:25 AM | Liquid Temperature (°C): | 22   |
| Serial Number: | 420150003           | Humidity (%RH):          | 40.2 |
| Configuration: | 1                   | Bar. Pressure (mb):      | 1014 |
| Comments:      | None                |                          |      |

## Test 1d

**DUT: RFID and Computer Combo; Type: IP30C; Serial: 04201500003**

Communication System: UID 0, CW (0); Communication System Band: D900 (900.0 MHz); Frequency: 902.75 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used (interpolated):  $f = 902.75$  MHz;  $\sigma = 1.032$  S/m;  $\epsilon_r = 56.66$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0754 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.310 V/m; Power Drift = 0.39 dB

Peak SAR (extrapolated) = 0.167 W/kg

**SAR(1 g) = 0.119 W/kg; SAR(10 g) = 0.076 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.142 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0801 W/kg

**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

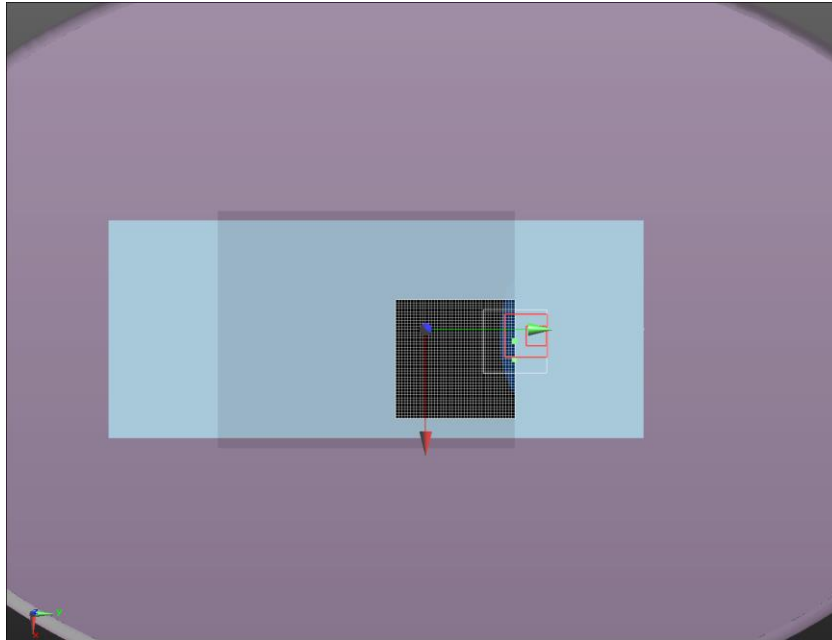
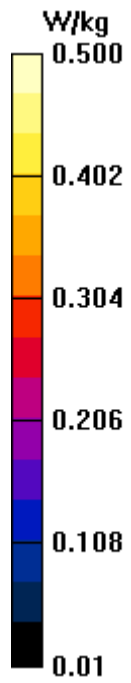
Maximum value of Total (measured) = 8.230 V/m

Maximum value of SAR (measured) = 0.0699 W/kg

   
**Approved By**

# SAR TEST DATA

Test 1d



# SAR TEST DATA

|                |             |                          |      |
|----------------|-------------|--------------------------|------|
| Tested By:     | Jared Ison  | Room Temperature (°C):   | 23   |
| Date:          | 5/4/2015    | Liquid Temperature (°C): | 22.3 |
| Serial Number: | 04201500003 | Humidity (%RH):          | 40.6 |
| Configuration: | 2           | Bar. Pressure (mb):      | 1015 |
| Comments:      | None        |                          |      |

## Test 2

**DUT: RFID and Computer Combo; Type: IP30C; Serial: 04201500003**

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 836.6 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.965$  S/m;  $\epsilon_r = 57.196$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0212 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.637 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.0250 W/kg

**SAR(1 g) = 0.019 W/kg; SAR(10 g) = 0.014 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0212 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0193 W/kg

**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

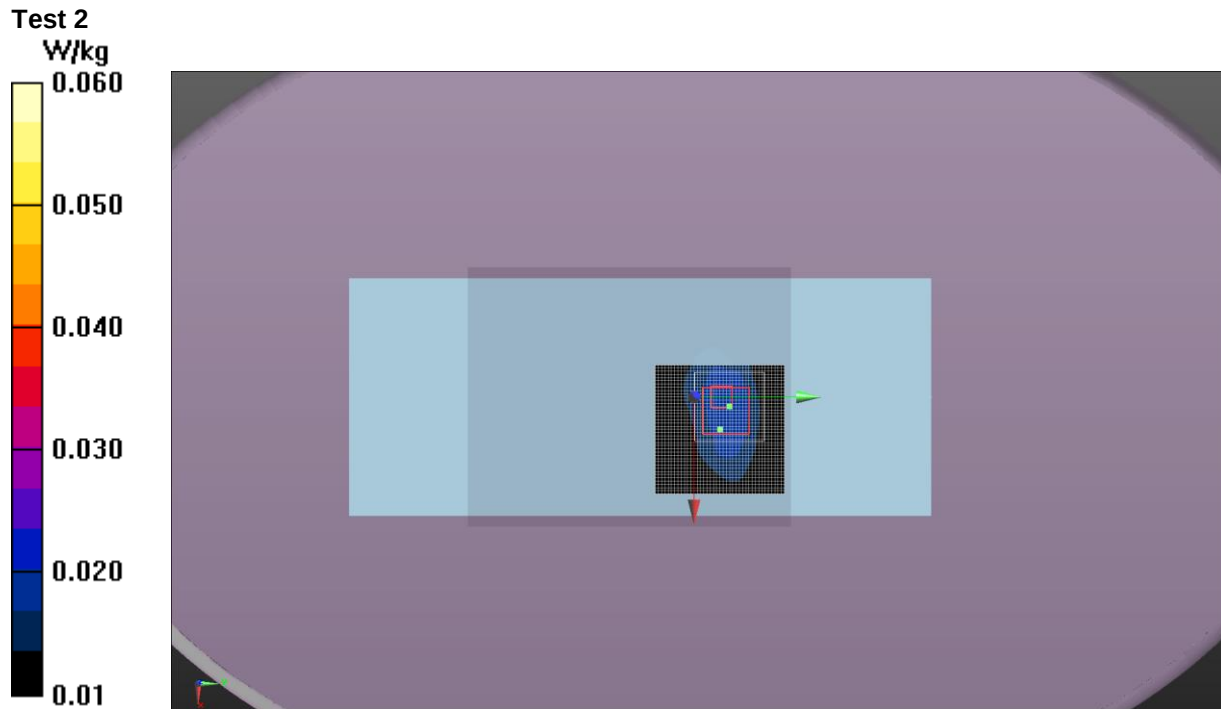
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of Total (measured) = 3.962 V/m

Maximum value of SAR (measured) = 0.0151 W/kg

   
Approved By

# SAR TEST DATA



# SAR TEST DATA

|                |             |                          |        |
|----------------|-------------|--------------------------|--------|
| Tested By:     | Jared Ison  | Room Temperature (°C):   | 24.2   |
| Date:          | 5/5/2015    | Liquid Temperature (°C): | 21.9   |
| Serial Number: | 28311047275 | Humidity (%RH):          | 34.8   |
| Configuration: | 3           | Bar. Pressure (mb):      | 1019.3 |
| Comments:      | None        |                          |        |

## Test 3

**DUT: RFID and Computer Combo; Type: 1001CP01S; Serial: 28311047275**

Communication System: UID 0, CW (0); Communication System Band: D1750 (1750.0 MHz); Frequency: 1735.4 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used (interpolated):  $f = 1735.4$  MHz;  $\sigma = 1.467$  S/m;  $\epsilon_r = 52.123$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.122 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.982 V/m; Power Drift = 0.98 dB

Peak SAR (extrapolated) = 0.154 W/kg

**SAR(1 g) = 0.096 W/kg; SAR(10 g) = 0.060 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.118 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.112 W/kg

**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

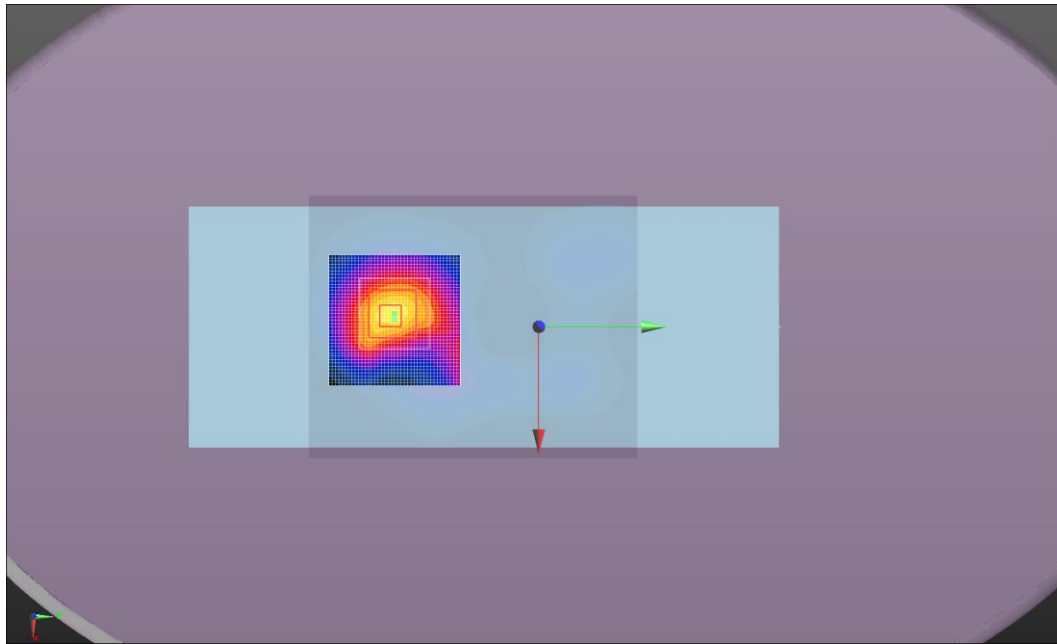
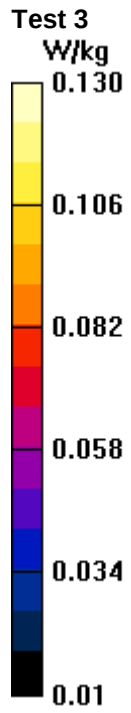
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of Total (measured) = 7.799 V/m

Maximum value of SAR (measured) = 0.0892 W/kg

   
**Approved By**

# SAR TEST DATA



# SAR TEST DATA

|                |             |                          |      |
|----------------|-------------|--------------------------|------|
| Tested By:     | Jared Ison  | Room Temperature (°C):   | 23.6 |
| Date:          | 5/4/2015    | Liquid Temperature (°C): | 23   |
| Serial Number: | 178u1191040 | Humidity (%RH):          | 42.3 |
| Configuration: | 4           | Bar. Pressure (mb):      | 1015 |
| Comments:      | None        |                          |      |

## Test 4

**DUT: RFID and Computer Combo; Type: 1000CP02S; Serial: 178u1191040**

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1852.4 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used (interpolated):  $f = 1852.4$  MHz;  $\sigma = 1.454$  S/m;  $\epsilon_r = 53.316$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0358 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.111 V/m; Power Drift = 4.16 dB

Peak SAR (extrapolated) = 0.0600 W/kg

**SAR(1 g) = 0.036 W/kg; SAR(10 g) = 0.023 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0427 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0353 W/kg

**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

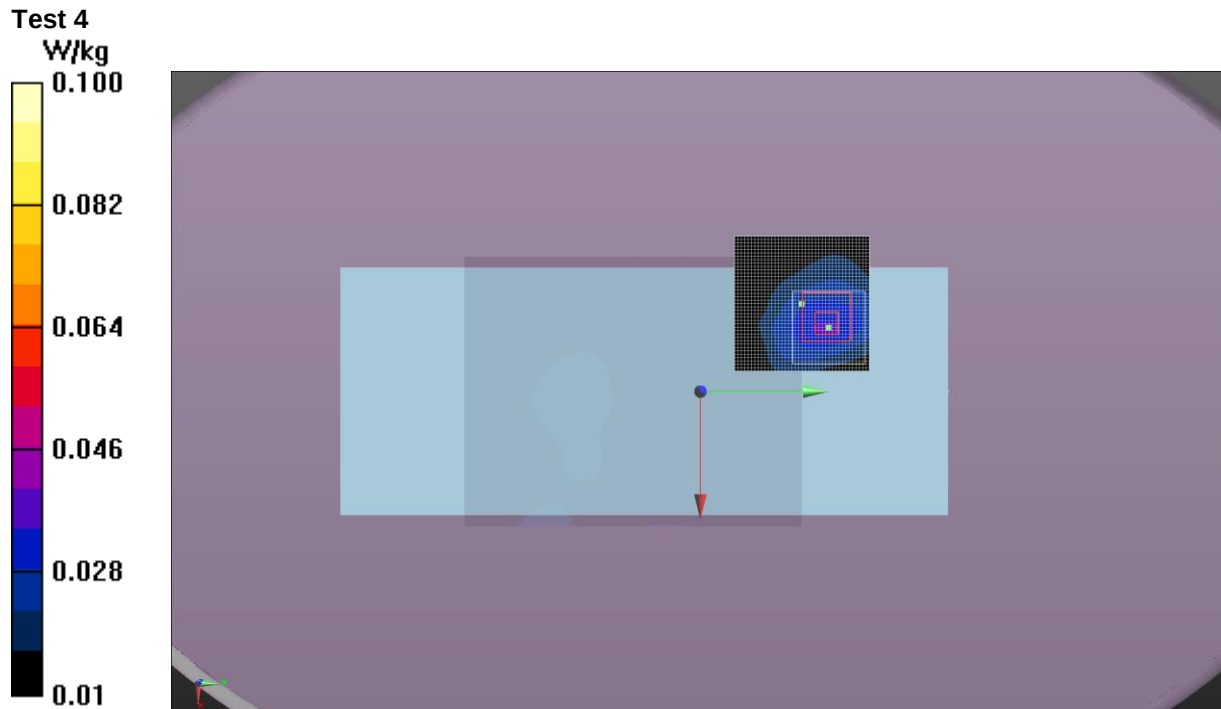
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of Total (measured) = 6.514 V/m

Maximum value of SAR (measured) = 0.0617 W/kg

   
**Approved By**

# SAR TEST DATA



# SAR TEST DATA

|                |             |                          |      |
|----------------|-------------|--------------------------|------|
| Tested By:     | Jared Ison  | Room Temperature (°C):   | 23.8 |
| Date:          | 5/4/2015    | Liquid Temperature (°C): | 22.3 |
| Serial Number: | 06521442001 | Humidity (%RH):          | 40.6 |
| Configuration: | 5           | Bar. Pressure (mb):      | 1015 |
| Comments:      | None        |                          |      |

## Test 5

**DUT: RFID and Computer Combo; Type: 1000CP01U; Serial: 06521442001**

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 836.6 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used (interpolated):  $f = 836.6$  MHz;  $\sigma = 0.965$  S/m;  $\epsilon_r = 57.196$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.107 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.17 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.109 W/kg

**SAR(1 g) = 0.084 W/kg; SAR(10 g) = 0.062 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0917 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0948 W/kg

**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

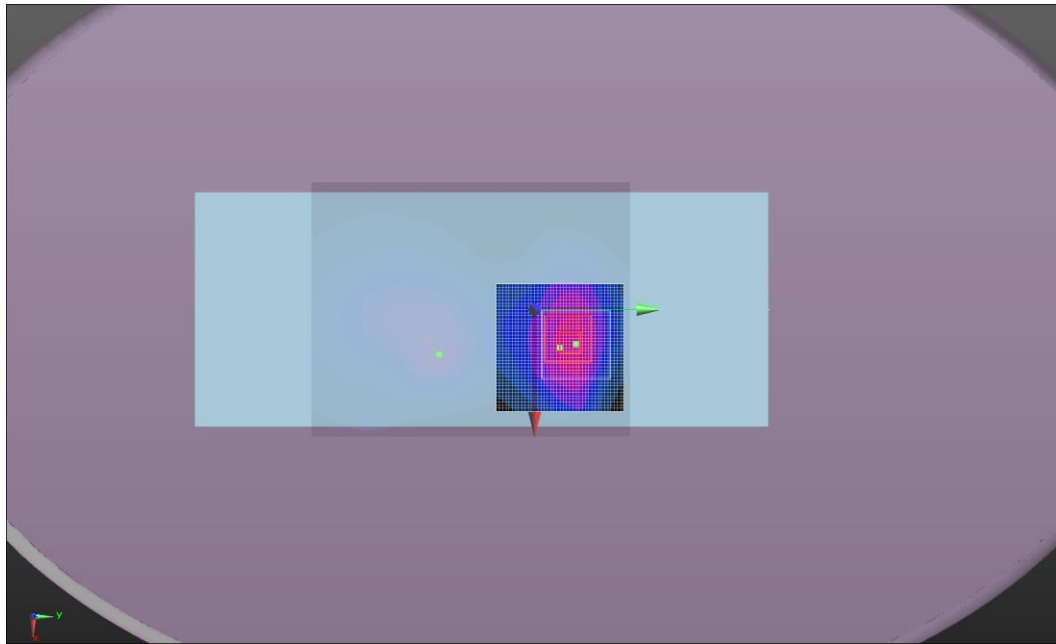
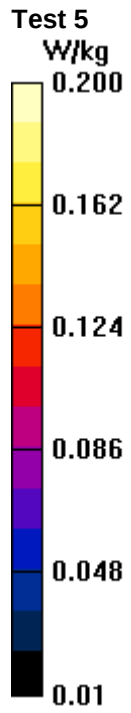
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of Total (measured) = 8.638 V/m

Maximum value of SAR (measured) = 0.0720 W/kg

   
**Approved By**

# SAR TEST DATA



# SAR TEST DATA

|                |             |                          |        |
|----------------|-------------|--------------------------|--------|
| Tested By:     | Jared Ison  | Room Temperature (°C):   | 24.2   |
| Date:          | 5/5/2015    | Liquid Temperature (°C): | 21.9   |
| Serial Number: | 06021444012 | Humidity (%RH):          | 34.8   |
| Configuration: | 6           | Bar. Pressure (mb):      | 1019.3 |
| Comments:      | None        |                          |        |

## Test 6

**DUT: RFID and Computer Combo; Type: 1001CP01U; Serial: 06021444012**

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1880 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.485$  S/m;  $\epsilon_r = 53.198$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASYS2 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

Maximum value of SAR (interpolated) = 0.0697 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.637 V/m; Power Drift = -0.22 dB

Peak SAR (extrapolated) = 0.0660 W/kg

**SAR(1 g) = 0.046 W/kg; SAR(10 g) = 0.032 W/kg**

Maximum value of SAR (measured) = 0.0528 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.0635 W/kg

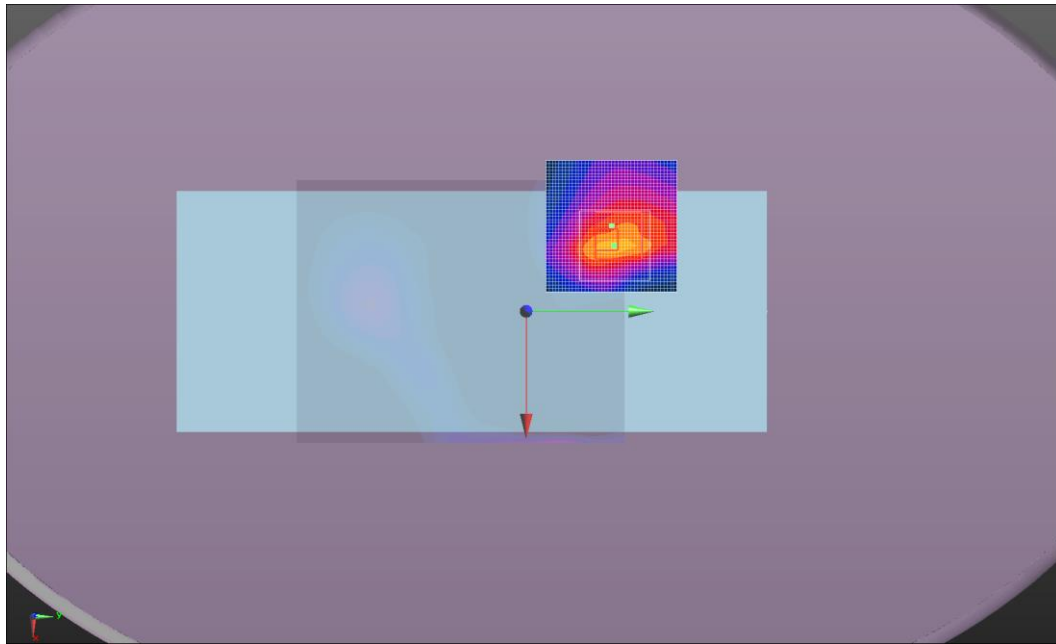
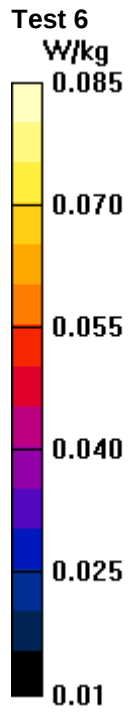
**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of Total (measured) = 5.109 V/m

Maximum value of SAR (measured) = 0.0388 W/kg

   
Approved By

# SAR TEST DATA



# SAR TEST DATA

|                |             |                          |      |
|----------------|-------------|--------------------------|------|
| Tested By:     | Jared Ison  | Room Temperature (°C):   | 23   |
| Date:          | 5/4/2015    | Liquid Temperature (°C): | 22.3 |
| Serial Number: | 178U1191040 | Humidity (%RH):          | 40.6 |
| Configuration: | 7           | Bar. Pressure (mb):      | 1015 |
| Comments:      | None        |                          |      |

## Test 7

**DUT: RFID and Computer Combo; Type: 1000CP01C; Serial: 178U1191040**

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 836.52 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used (interpolated):  $f = 836.52$  MHz;  $\sigma = 0.965$  S/m;  $\epsilon_r = 57.196$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASYS2 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.107 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.53 V/m; Power Drift = -0.33 dB

Peak SAR (extrapolated) = 0.111 W/kg

**SAR(1 g) = 0.086 W/kg; SAR(10 g) = 0.062 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0949 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.0943 W/kg

**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

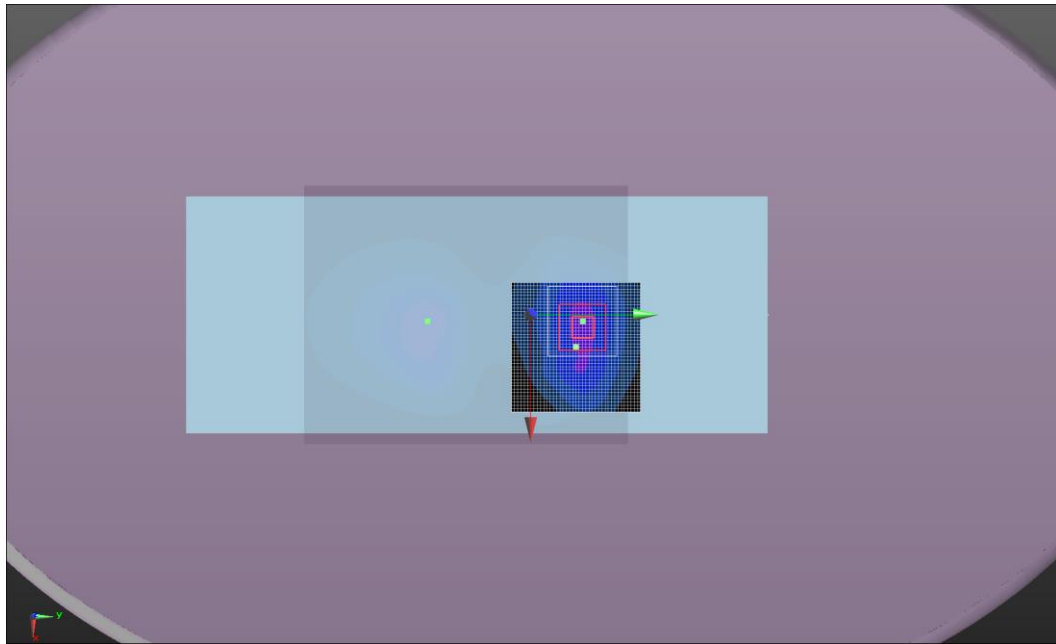
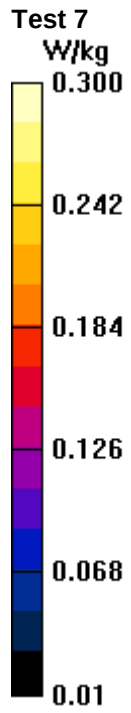
[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of Total (measured) = 8.763 V/m

Maximum value of SAR (measured) = 0.0741 W/kg

   
**Approved By**

# SAR TEST DATA



# SAR TEST DATA

|                |             |                          |        |
|----------------|-------------|--------------------------|--------|
| Tested By:     | Jared Ison  | Room Temperature (°C):   | 24.2   |
| Date:          | 5/5/2015    | Liquid Temperature (°C): | 21.9   |
| Serial Number: | 24511047015 | Humidity (%RH):          | 34.8   |
| Configuration: | 8           | Bar. Pressure (mb):      | 1019.3 |
| Comments:      | None        |                          |        |

## Test 8

**DUT: RFID and Computer Combo; Type: 1000CP02C; Serial: 24511047015**

Communication System: UID 0, CW (0); Communication System Band: D1900 (1900.0 MHz); Frequency: 1880 MHz; Communication System PAR: 0 dB; PMF: 1

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.485$  S/m;  $\epsilon_r = 53.198$ ;  $\rho = 1000$  kg/m<sup>3</sup>, Medium parameters used:  $\sigma = 0$  S/m,  $\epsilon_r = 1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- DASYS2 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Body/Body/Reference scan (41x51x1):** Interpolated grid: dx=3.000 mm, dy=3.000 mm

Maximum value of SAR (interpolated) = 0.0473 W/kg

**Body/Body/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.911 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.0600 W/kg

**SAR(1 g) = 0.038 W/kg; SAR(10 g) = 0.024 W/kg**

Maximum value of SAR (measured) = 0.0458 W/kg

**Body/Body/Area scan (41x41x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.0469 W/kg

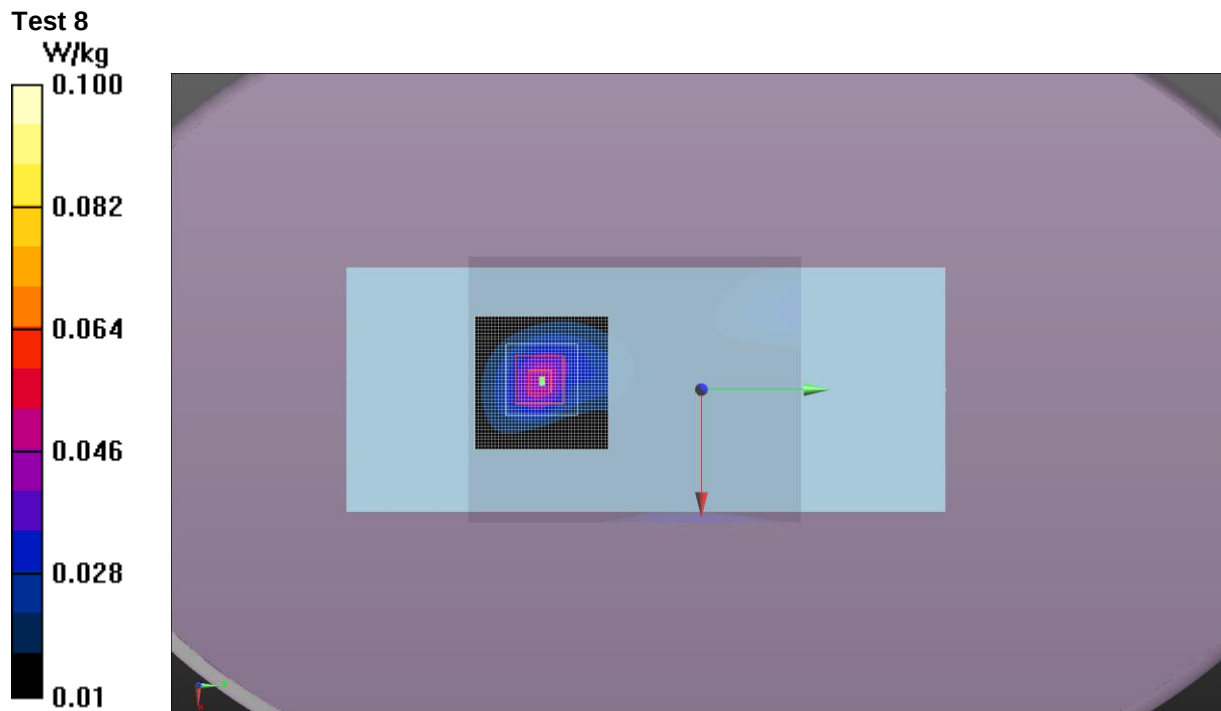
**Body/Body/Z Scan (1x1x21):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Maximum value of Total (measured) = 4.562 V/m

Maximum value of SAR (measured) = 0.0309 W/kg

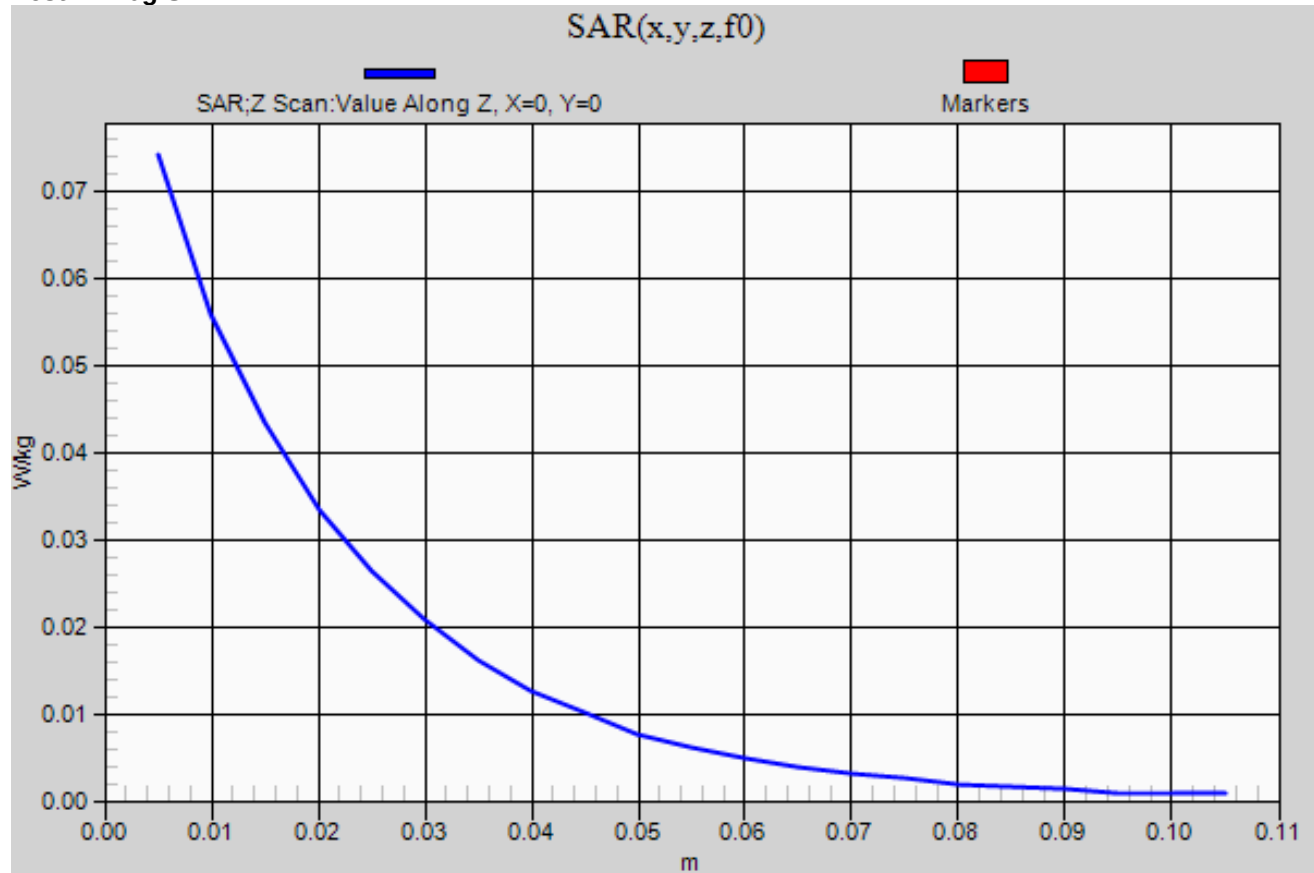
   
Approved By

# SAR TEST DATA



# SAR TEST DATA

## Test 7 - 10g SAR



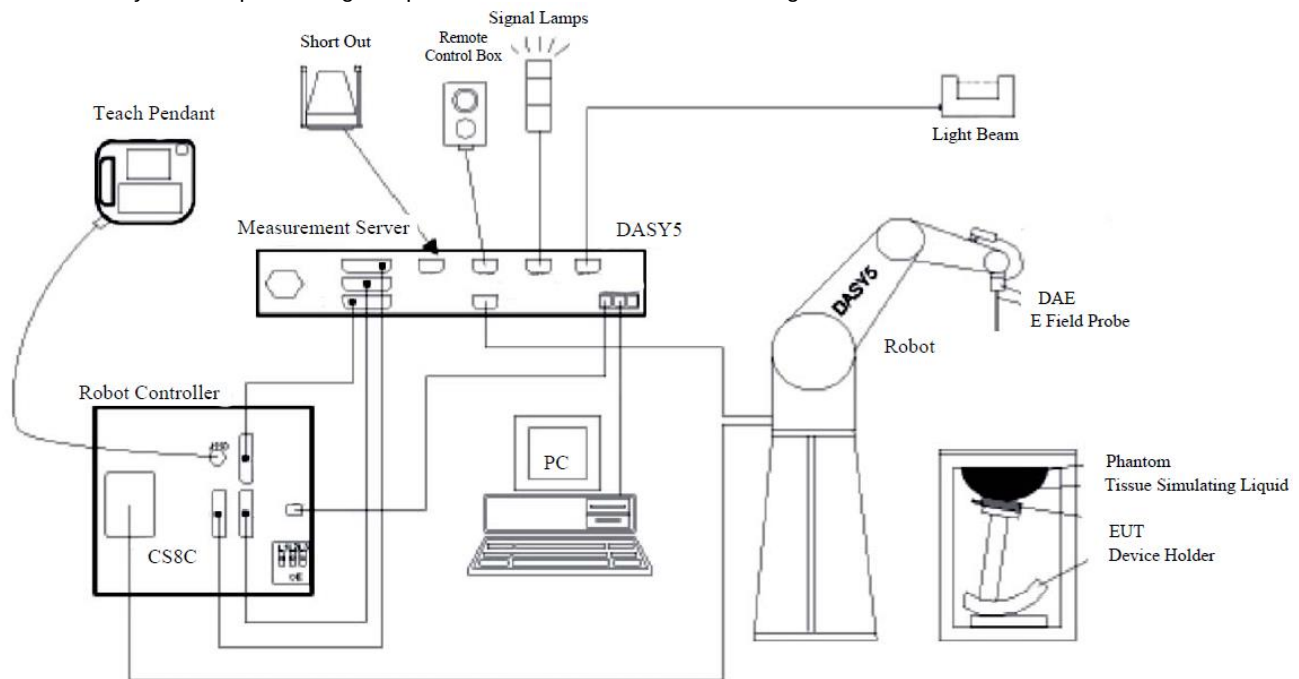
# SYSTEM AND TEST SITE DESCRIPTION

## SAR MEASUREMENT SYSTEM

### Schmid & Partner Engineering AG, DASY52

Northwest EMC selected the leader in SAR evaluation systems to provide the measurement tools for this evaluation. SPEAG's DASY52 is the fastest and most accurate scanner on the market. It is fully compatible with all world-wide standards for transmitters operating at the ear or within 20cm of the body. It provides full compatibility with IEC 62209-1, IEC 62209-2, IEEE 1528 as well as national adaptations such as FCC OET-65c and Korean Std. MIC #2000-93

The DASY52 system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom, oval flat phantom, device holder, tissue simulating liquids, and validation dipole kits.

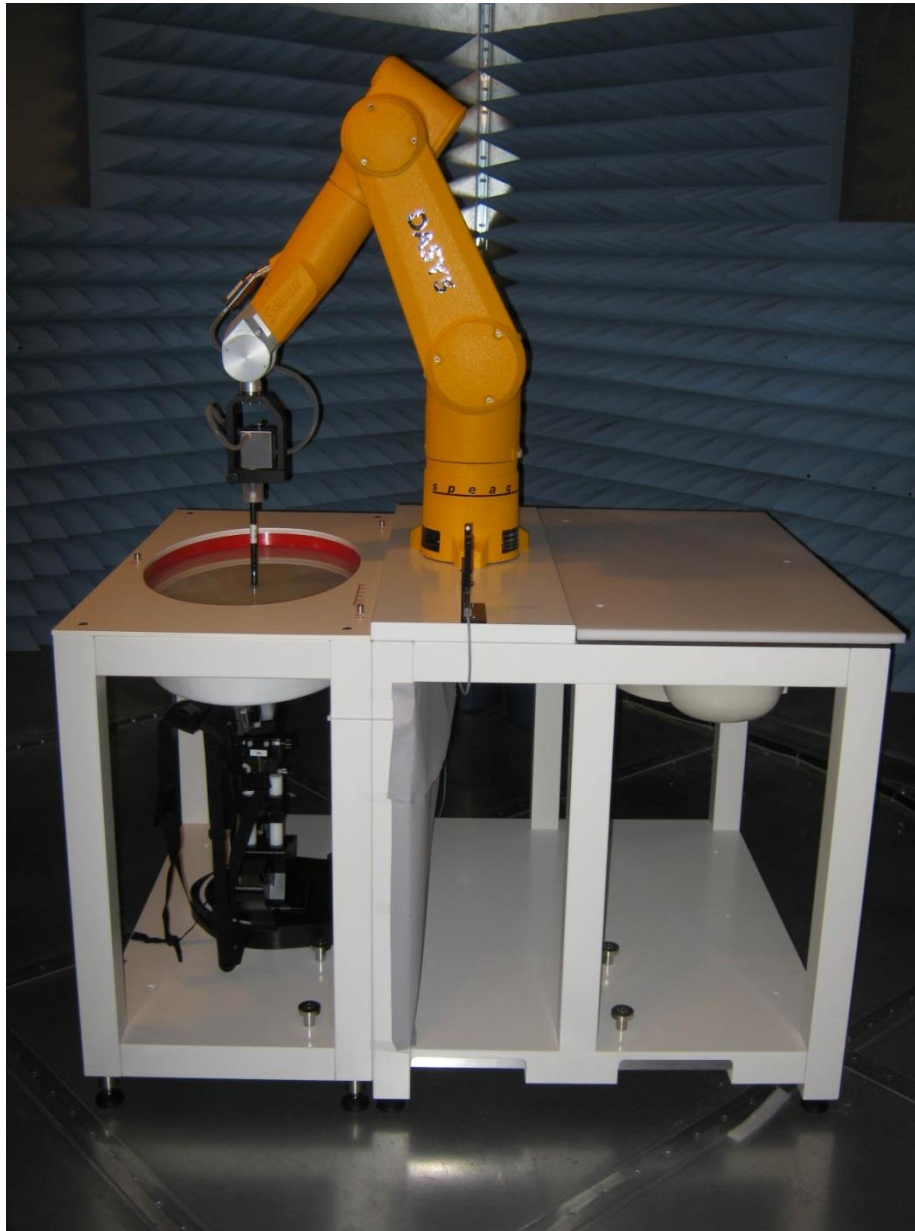
# SYSTEM AND TEST SITE DESCRIPTION

## TEST SITE

### Northwest EMC, Lab EV08

The SAR measurement system is located in a semi-anechoic chamber. This provides an ambient free environment that also eliminates reflections.

The chamber is 12 ft wide by 16 ft long x 8 ft high. A dedicated HVAC unit provides +/- 1 degree C temperature control.



# TEST EQUIPMENT

## TEST EQUIPMENT

| Description                                                                            | Manufacturer            | Model         | ID  | Last Cal.           | Interval |
|----------------------------------------------------------------------------------------|-------------------------|---------------|-----|---------------------|----------|
| Amplifier                                                                              | Mini Circuits           | ZHL-5W-2G-S+  | TRZ | NCR <sup>1</sup>    | 0 mo     |
| Antenna, Dipole 1750MHz SAR                                                            | SPEAG                   | D1750v2       | ADN | 11/04/2014          | 12 mo    |
| Antenna, Dipole 1900MHz Sar                                                            | SPEAG                   | D1900v2       | ADO | 11/03/2014          | 12 mo    |
| Antenna, Dipole 900 MHz SAR                                                            | SPEAG                   | D900V2        | ADP | 11/03/2014          | 12 mo    |
| Body Solution                                                                          | SPEAG                   | MSL 900       | SAT | At start of testing |          |
| Body Solution                                                                          | SPEAG                   | MSL 1750      | SAQ | At start of testing |          |
| Body Solution                                                                          | SPEAG                   | MSL 1900      | SAO | At start of testing |          |
| DAE                                                                                    | SPEAG                   | SD 000 D04 EJ | SAH | 11/03/2014          | 12 mo    |
| DASY5 Measurement Server                                                               | Staeubli                | DAYS5         | SAK | 11/01/2013          | 36 mo    |
| Device Holder                                                                          | SPEAG                   | N/A           | SAW | NCR                 | 0 mo     |
| Dielectric Assessment Kit                                                              | SPEAG                   | DAKS:200      | IPR | 03/06/2014          | 36 mo    |
| Light Beam Unit                                                                        | SPEAG                   | SE UKS 030 AA | SAD | NCR                 | 0 mo     |
| Phantom, 2mm Oval ELI4 (Body)                                                          | SPEAG                   | QD OVA 001 BB | SAC | NCR                 | 0 mo     |
| Power Meter                                                                            | Agilent                 | N1913A        | SQR | 10/30/2014          | 12 mo    |
| Power Sensor                                                                           | Agilent                 | E9300H        | SQO | 10/30/2014          | 12 mo    |
| Radio Communication Analyzer                                                           | Anritsu                 | MT8820C       | AFK | NCR                 | 0 mo     |
| RF Vector Signal Generator (FOR REFERENCE ONLY) with associated cables and attenuators | Agilent                 | V2920A        | TIH | NCR <sup>1</sup>    | 0 mo     |
| Robot Arm                                                                              | Staeubli                | TX60LSPEAG    | SAA | NCR                 | 0 mo     |
| Robot Chasis and power Supply                                                          | Staeubli                | N/A           | SAJ | NCR                 | 0 mo     |
| Robot Controller                                                                       | Staeubli                | CS8C          | SAI | NCR                 | 0 mo     |
| SAR Probe                                                                              | SPEAG                   | ES3DV3        | SAF | 11/07/2014          | 12 mo    |
| Thermometer                                                                            | Omega Engineering, Inc. | HH311         | DUI | 01/26/2015          | 36 mo    |

Note 1: The output of the signal generator / amplifier is verified with the calibrated power meter listed above.

# MEASUREMENT UNCERTAINTY

## MEASUREMENT UNCERTAINTY BUDGETS PER IEEE 1528:2003

### 300-3000 MHz Range

| Uncertainty Component                                                            | Tolerance<br>(+/- %) | Probability<br>Distribution | Divisor | $c_i$ (1g) | $c_i$ (10g) | $u_i$ (1g)<br>(+/-%) | $u_i$ (10g)<br>(+/-%) | $v_i$    |
|----------------------------------------------------------------------------------|----------------------|-----------------------------|---------|------------|-------------|----------------------|-----------------------|----------|
| <b>Measurement System</b>                                                        |                      |                             |         |            |             |                      |                       |          |
| Probe calibration (k=1)                                                          | 5.5                  | normal                      | 1       | 1          | 1           | 5.5                  | 5.5                   | $\infty$ |
| Axial isotropy                                                                   | 4.7                  | rectangular                 | 1.732   | 0.707      | 0.707       | 1.9                  | 1.9                   | $\infty$ |
| Hemispherical isotropy                                                           | 9.6                  | rectangular                 | 1.732   | 0.707      | 0.707       | 3.9                  | 3.9                   | $\infty$ |
| Boundary effect                                                                  | 1.0                  | rectangular                 | 1.732   | 1          | 1           | 0.6                  | 0.6                   | $\infty$ |
| Linearity                                                                        | 4.7                  | rectangular                 | 1.732   | 1          | 1           | 2.7                  | 2.7                   | $\infty$ |
| System detection limits                                                          | 1.0                  | rectangular                 | 1.732   | 1          | 1           | 0.6                  | 0.6                   | $\infty$ |
| Readout electronics                                                              | 0.3                  | normal                      | 1       | 1          | 1           | 0.3                  | 0.3                   | $\infty$ |
| Response time                                                                    | 0.8                  | rectangular                 | 1.732   | 1          | 1           | 0.5                  | 0.5                   | $\infty$ |
| Integration time                                                                 | 2.6                  | rectangular                 | 1.732   | 1          | 1           | 1.5                  | 1.5                   | $\infty$ |
| RF ambient conditions - noise                                                    | 1.7                  | rectangular                 | 1.732   | 1          | 1           | 1.0                  | 1.0                   | $\infty$ |
| RF Ambient Reflections                                                           | 0.0                  | rectangular                 | 1.732   | 1          | 1           | 0.0                  | 0.0                   | $\infty$ |
| Probe positioner mechanical tolerance                                            | 0.4                  | rectangular                 | 1.732   | 1          | 1           | 0.2                  | 0.2                   | $\infty$ |
| Probe positioner with respect to phantom shell                                   | 2.9                  | rectangular                 | 1.732   | 1          | 1           | 1.7                  | 1.7                   | $\infty$ |
| Extrapolation, interpolation, and integration algorithms for max. SAR evaluation | 1.0                  | rectangular                 | 1.732   | 1          | 1           | 0.6                  | 0.6                   | $\infty$ |
| <b>Test Sample Related</b>                                                       |                      |                             |         |            |             |                      |                       |          |
| Device Positioning                                                               | 2.9                  | normal                      | 1       | 1          | 1           | 2.9                  | 2.9                   | 145      |
| Device Holder                                                                    | 3.6                  | normal                      | 1       | 1          | 1           | 3.6                  | 3.6                   | 5        |
| Power Drift                                                                      | 5.0                  | rectangular                 | 1.732   | 1          | 1           | 2.9                  | 2.9                   | $\infty$ |
| <b>Phantom and tissue parameters</b>                                             |                      |                             |         |            |             |                      |                       |          |
| Phantom Uncertainty - shell thickness tolerances                                 | 4.0                  | rectangular                 | 1.732   | 1          | 1           | 2.3                  | 2.3                   | $\infty$ |
| Liquid conductivity - deviation from target values                               | 5.0                  | rectangular                 | 1.732   | 0.64       | 0.43        | 1.8                  | 1.2                   | $\infty$ |
| Liquid conductivity - measurement uncertainty                                    | 6.5                  | normal                      | 1       | 0.64       | 0.43        | 4.2                  | 2.8                   | $\infty$ |
| Liquid permittivity - deviation from target values                               | 5.0                  | rectangular                 | 1.732   | 0.6        | 0.49        | 1.7                  | 1.4                   | $\infty$ |
| Liquid permittivity - measurement uncertainty                                    | 3.2                  | normal                      | 1       | 0.6        | 0.49        | 1.9                  | 1.6                   | $\infty$ |
| Combined Standard Uncertainty                                                    |                      |                             |         |            |             | RSS                  | 11.2                  | 10.6     |
| Expanded Measurement Uncertainty (95% Confidence/                                |                      |                             |         |            |             | normal (k=2)         | 22.5                  | 21.2     |