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TEST REPORT

Report Number: 102506319LEX-001.1
Project Number: G102506319

Evaluation of Model Number: W40143

Tested to the SAR Criteria in

FCC Part 2.1093, RSS-102 Issue 5 per KDB 447498 D01 v06

For

3M Traffic Safety and Security Division

Test Performed by:	Test Authorized by:
Intertek 731 Enterprise Drive Lexington, KY 40510	3M Traffic Safety and Security Division 1838 Gunn Highway Odessa, FL 55144

Prepared by:________________________________**Date:**____8/15/2016____

Bryan Taylor, Team Leader

Approved by:________________________________**Date:**____8/15/2016____

James Sudduth, Senior Staff Engineer

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1.0 DOCUMENT HISTORY

Revision/ Project Number	Writer Initials	Date	Change
1.0 /G102506319	BCT	7/19/2016	Original document
1.1 /G102506319	BPL	8/15/2016	Fixed improper document merge settings

2.0 INTRODUCTION

At the request of 3M, the 3M Tracker – 3G GSM Variant was evaluated for SAR in accordance with IEEE Std 1528:2013, IEC62209-2:2010, and FCC Part 2.1093, RSS-102 Issue 5 per KDB 447498 D01 v06. Testing was performed at the Intertek facility in Lexington, Kentucky.

For the evaluation, the dosimetric assessment system DASY52 was used. The total uncertainty for the evaluation of the spatial peak SAR values averaged over a cube of 10g tissue mass had been assessed for this system to be ±22.2%.

The W40143 was tested at the maximum output power measured by Intertek. Maximum output power measurements are tabulated under Section 9.0 Tabular Test Results.

The maximum spatial peak SAR value for the sample device averaged over 10g was found to be:

Mode	Channel	Conducted Output Power (dBm)	Reported SAR_{10g} – Body Mode (W/kg)	Limit (W/kg)
WCDMA Band II	9400 (Mid)	23.78dBm	1.18	4.0
WCDMA Band V	4183 (Mid)	24.52dBm	0.59	4.0

Table 1: Maximum Measured SAR

Based on the worst-case data presented above, the 3M Tracker – 3G GSM Variant was found to be **compliant** with the 4.0 W/kg requirement for general population / uncontrolled exposure for devices used exclusively in extremity orientations.

Modifications made to test sample

Intertek implemented no modifications.

3.0 TEST SITE DESCRIPTION

The SAR test site located at 731 Enterprise Drive, Lexington KY 40510 is comprised of the SPEAG model DASY 5.2 automated near-field scanning system, which is a package, optimized for dosimetric evaluation of mobile radios [3]. This system is installed in an ambient-free shielded chamber. The ambient temperature is controlled to 22.0 $\pm 2^{O}$C. During the SAR evaluations, the RF ambient conditions are monitored continuously for signals that might interfere with the test results. The tissue simulating liquid is also stored in this area in order to keep it at the same constant ambient temperature as the room.

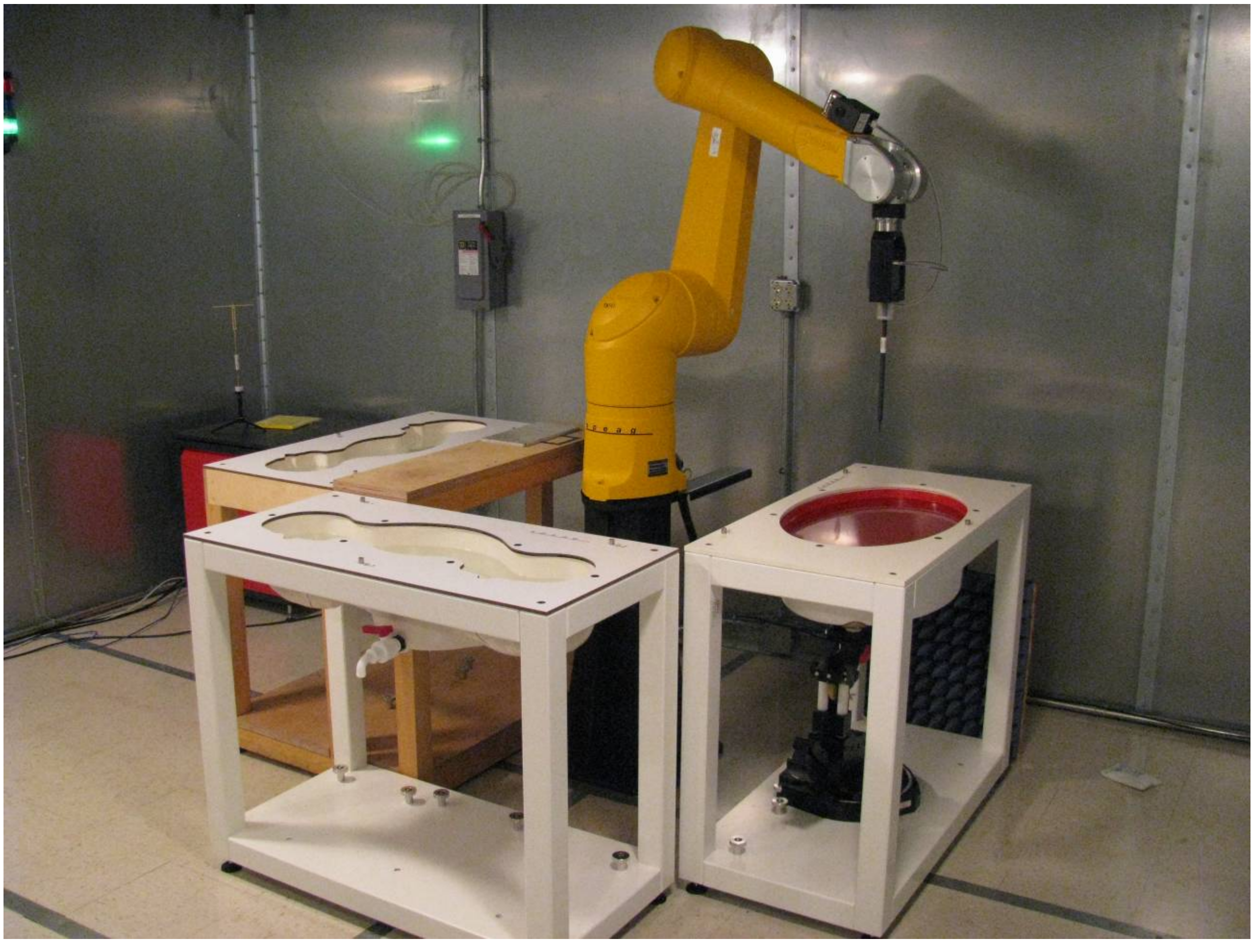


Figure 1: Intertek SAR Test Site

Measurement Equipment

The following major equipment/components were used for the SAR evaluation:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
SAR Probe	3516	Speag	EXDV3	12/16/15	12/16/16
System Verification Dipole	4d122	Speag	D835V2	9/17/15	9/17/16
System Verification Dipole	5d154	Speag	D1900V2	9/21/15	9/21/16
DAE	358	Speag	DAE4	9/16/15	9/16/16
Vector Signal Generator	257708	Rohde & Schwarz	SMBV100A	9/18/15	9/18/16
Network Analyzer	US39173983	Agilent	8753ES	3/17/16	3/17/17
USB Power Sensor	100155	Rohde & Schwarz	NRP-Z81	9/20/15	9/20/16
USB Power Sensor	100705	Rohde & Schwarz	NRP-Z51	12/17/15	12/17/16
Dielectric Probe Kit	1111	Speag	DAK-3.5	NCR	NCR
Spectrum Analyzer	3099	Rohde & Schwarz	FSP7	9/18/15	9/18/16
Base Station Simulator	119981	Rohde & Schwarz	CMU200	9/22/15	9/22/16
SAM Twin Phantom	1663	Speag	QD 000 P40 C	NCR	NCR
Oval Flat Phantom ELI 5.0	1108	Speag	QD OVA 002 A	NCR	NCR
6-axis robot	F11/5H1Y A/A/01	Staubli	RX-90	NCR	NCR

NCR – No Calibration Required

Table 2: Test Equipment Used for SAR Evaluation

Measurement Uncertainty

The Table below includes the uncertainty budget suggested by the IEEE Std 1528-2013 and determined by SPEAG for the DASY5 measurement System.

Error Description	Uncertainty Value	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std.Unc. (1g)	Std.Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effect	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Modulation Response	±2.4%	R	√3	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	√3	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±2.0%	R	√3	1	1	±1.2%	±1.2%	∞
Test sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	√3	1	1	±2.9%	±2.9%	∞
Power Scaling	±0.0%	R	√3	1	1	±0%	±0%	∞
Phantom and Setup								
Phantom Uncertainty	±6.1%	R	√3	1	1	±3.5%	±3.5%	∞
SAR Correction	±1.9%	R	√3	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)	±2.5%	R	√3	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity(mea.)	±2.5%	R	√3	0.26	0.26	±0.3%	±0.4%	∞
Temp unc. - Conductivity	±3.4%	R	√3	0.78	0.71	±1.5%	±1.4%	∞
Temp unc. - Permittivity	±0.4%	R	√3	0.23	0.26	±0.1%	±0.1%	∞
Combined Standard Uncertainty						±11.2%	±11.1%	361
Expanded STD Uncertainty						**±22.3%**	**±22.2%**	

Notes.

1. Worst Case uncertainty budget for DASY5 assessed according to IEEE 1528-2013. The budget is valid for the frequency range 300 MHz – 3 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerably smaller.

Error Description	Uncertainty Value	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std.Unc. (1g)	Std.Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.55%	N	1	1	1	±6.55%	±6.55%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effect	±2.0%	R	√3	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Modulation Response	±2.4%	R	√3	1	1	±1.4%	±1.4%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	√3	1	1	±3.9%	±3.9%	∞
Max. SAR Eval.	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
Test sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	√3	1	1	±2.9%	±2.9%	∞
Power Scaling	±0.0%	R	√3	1	1	±0%	±0%	∞
Phantom and Setup								
Phantom Uncertainty	±6.6%	R	√3	1	1	±3.8%	±3.8%	∞
SAR Correction	±1.9%	R	√3	1	0.84	±1.1%	±0.9%	∞
Liquid Conductivity (mea.)	±2.5%	R	√3	0.78	0.71	±1.1%	±1.0%	∞
Liquid Permittivity(mea.)	±2.5%	R	√3	0.26	0.26	±0.3%	±0.4%	∞
Temp unc. - Conductivity	±3.4%	R	√3	0.78	0.71	±1.5%	±1.4%	∞
Temp unc. - Permittivity	±0.4%	R	√3	0.23	0.26	±0.1%	±0.1%	∞
Combined Standard Uncertainty						±12.3%	±12.2%	748
Expanded STD Uncertainty						**±24.6%**	**±24.5%**	

Notes.

Worst Case uncertainty budget for DASY5 assessed according to IEEE 1528-2013. The budget is valid for the frequency range 3 GHz – 6 GHz and represents a worst-case analysis. Probe calibration error reflects uncertainty of the EX3D probe. For specific tests and configurations, the uncertainty could be considerably smaller.

4.0 JOB DESCRIPTION

At the request of 3M Traffic Safety and Security Division, SAR testing was performed on the W40143.

Test sample	
Manufacturer	3M Traffic Safety and Security Division
Model Number	W40143
Serial Number	2509
Receive Date	7/5/2016
Device Received Condition	Good, Production
Device Category	Portable
RF Exposure Category	General Population/Uncontrolled Environment
Antenna Type	Internal

Table 3: Product Information

Operating Bands	Frequency Range (MHz)	Modulation	Duty Cycle
WCDMA Band V	826.4 – 846.6MHz	WCDMA	100%
WCDMA Band II	1852.4 – 1907.6MHz	WCDMA	100%

Table 4: Operating Bands

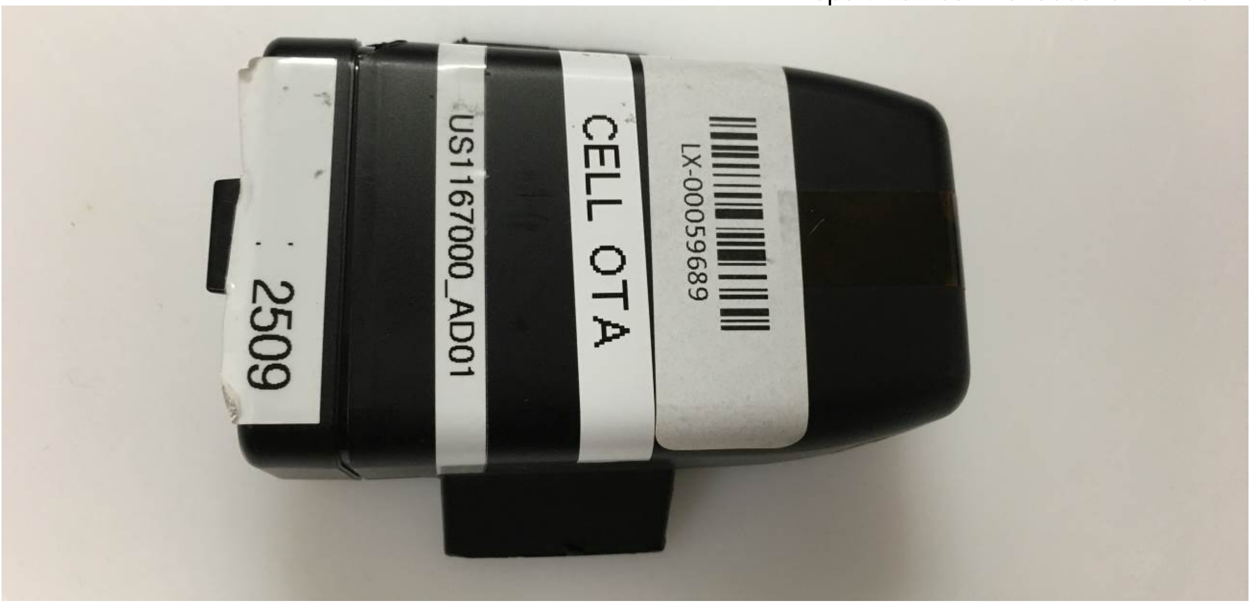


Figure 2: Test Sample Front

Figure 3: Test Sample Back

5.0 SYSTEM VERIFICATION

System Validation

Prior to the assessment, the system was verified to be within ±10% of the specifications by using the system validation kit. The system validation procedure tests the system against reference SAR values and the performance of probe, readout electronics and software. The test setup utilizes a phantom and reference dipole. The results from the system verifications with a dipole are shown below

.

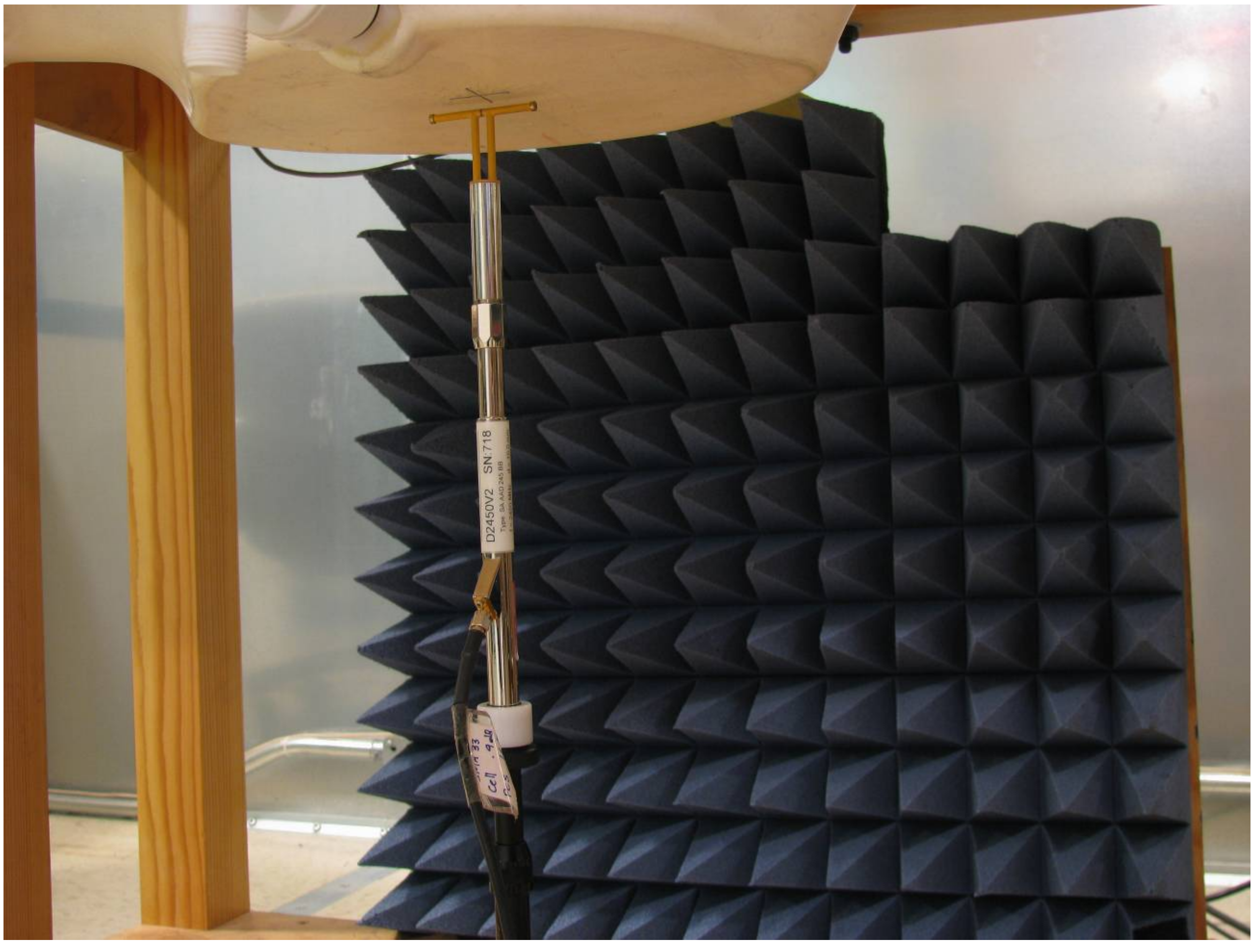


Figure 4: System Verification Setup

Reference Dipole Validation									
Ambient Temp (°C)	Fluid Temp (°C)	Frequency (MHz)	Dipole	Fluid Type	Dipole Power Input	Cal. Lab SAR (1g)	Measured SAR (1g)	% Error SAR (1g)	Date
23.1	22.1	835	D835V2	MSL900	1W	9.49	9.69	2.11	7/8/2016
23.1	22.1	1900	D1900V2	MSL1900	1W	39.9	42.1	5.51	7/5/2016

Table 5: Dipole Validation (1g)

Reference Dipole Validation									
Ambient Temp (°C)	Fluid Temp (°C)	Frequency (MHz)	Dipole	Fluid Type	Dipole Power Input	Cal. Lab SAR (10g)	Measured SAR (10g)	% Error SAR (10g)	Date
23.1	22.1	835	D835V2	MSL900	1W	6.22	6.41	3.05	7/8/2016
23.1	22.1	1900	D1900V2	MSL1900	1W	21.1	21.9	3.79	7/5/2016

Table 6: Dipole Validation (10g)

Measurement Uncertainty for System Validation

Source of Uncertainty	Value(dB)	Probability Distribution	Divisor	c_i	$u_i(y)$	$(u_i(y))^2$
Measurement System						
Probe Calibration	5.50	n1	1	1	5.50	30.250
Axial Isotropy	4.70	r	1.732	0.7	2.71	7.364
Hemispherical Isotropy	9.60	r	1.732	0.7	5.54	30.722
Boundary Effect	1.00	r	1.732	1	0.58	0.333
Linearity	4.70	r	1.732	1	2.71	7.364
System Detection Limits	1.00	r	1.732	1	0.58	0.333
Readout Electronics	0.30	n1	1	1	0.30	0.090
Response Time	0.80	r	1.732	1	0.46	0.213
Integration Time	2.60	r	1.732	1	1.50	2.253
RF Ambient Noise	3.00	r	1.732	1	1.73	3.000
RF Ambient Reflections	3.00	r	1.732	1	1.73	3.000
Probe Positioner	0.40	r	1.732	1	0.23	0.053
Probe Positioning	2.90	r	1.732	1	1.67	2.803
Max. SAR Eval.	1.00	r	1.732	1	0.58	0.333
Dipole / Generator / Power Meter Related						
Dipole positioning	2.90	n1	1	1	2.90	8.410
Dipole Calibration Uncertainty	0.68	r	1.732	1	0.39	0.154
Power Meter 1 Uncertainty (+20C to +25C)	0.13	n1	1	2	0.13	0.017
Power Meter 2 Uncertainty (+20C to +25C)	0.04	n1	1	3	0.04	0.002
Sig Gen VSWR Mismatch Error	1.80	n1	1	5	1.80	3.240
Sig Gen Resolution Error	0.01	n1	1	6	0.01	0.000
Sig Gen Level Error	0.90	n1	1	1	0.90	0.810
Phantom and Setup						
Phantom Uncertainty	4.00	r	1.732	1	2.31	5.334
Liquid Conductivity (target)	5.00	r	1.732	0.43	2.89	8.334
Liquid Conductivity (meas.)	2.50	n1	1	0.43	2.50	6.250
Liquid Permittivity (target)	5.00	r	1.732	0.49	2.89	8.334
Liquid Permittivity (meas.)	2.50	n1	1	0.49	2.50	6.250
Combined Standard Uncertainty		N1	1	1	11.63	135.247
Expanded Uncertainty		Normal k=	2		**23.26**	
Expanded Uncertainty	**is**	**23.3**	**for**	**Normal**	**k=**	**2**

Tissue Simulating Liquid Description and Validation

The dielectric parameters were verified to be within 5% of the target values prior to assessment. The dielectric parameters (ε_r, σ) are shown in Table 7. A recipe for the tissue simulating fluid used is shown in Table 9.

Measured Tissue Properties									
Tissue Type	Frequency Measure (MHz)	Permittivity Target	Conductivity Target	Permittivity Measure	Complex Permittivity	Conductivity Measure	Dielectric % Deviation	Conductivity % Deviation	Date
MSL835	824	55.2	0.97	54.3	21.27	0.97	1.63	0.45	7/8/2016
	836	55.2	0.97	53.8	21.21	0.99	2.54	1.63	
	850	55.2	0.98	53.1	21.14	1.00	3.80	1.94	

Table 7: Dielectric Parameter Validation

Measured Tissue Properties									
Tissue Type	Frequency Measure (MHz)	Permittivity Target	Conductivity Target	Permittivity Measure	Complex Permittivity	Conductivity Measure	Dielectric % Deviation	Conductivity % Deviation	Date
MSL1900	1850	53.3	1.52	54.1	14.87	1.53	1.50	0.62	7/5/2016
	1880	53.3	1.52	53.6	14.92	1.56	0.56	2.59	
	1910	53.3	1.52	53.1	14.96	1.59	0.38	4.51	

Table 8: Dielectric Parameter Validation

TYPICAL COMPOSITION OF INGREDIENTS FOR LIQUID TISSUE PHANTOMS. (450MHz to 2450 MHz data only)												
Ingredient (% by weight)	f (MHz)											
	450		835		915		1900		2450		5500	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56	54.9	70.45	62.7	68.64	65.53	78.67
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.36	0.5	0	0	0
Sugar	56.32	46.78	56	45	56.5	41.76	0	0	0	0	0	0
HEC	0.98	0.52	1	1	1	1.21	0	0	0	0	0	0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0	0	0	0	0	0
Triton X-100	0	0	0	0	0	0	0	0	36.8	0	17.235	10.665
DGBE	0	0	0	0	0	0	44.92	29.18	0	31.37	0	0
DGHE	0	0	0	0	0	0	0	0	0	0	17.235	10.665
Dielectric Constant	43.42	58	42.54	56.1	42	56.8	39.9	53.3	39.8	52.7		
Conductivity (S/m)	0.85	0.83	0.91	0.95	1	1.07	1.42	1.52	1.88	1.95		

Table 9: Tissue Simulating Fluid Recipe

Tissue Simulating Liquid for 5GHz, MBBL3500-5800V5 Manufactured by SPEAG (proprietary mixture)

Ingredients	(% by weight)
Water	78
Mineral oil	11
Emulsifiers	9
Additives and Salt	2

6.0 EVALUATION PROCEDURES

Prior to any testing, the appropriate fluid was used to fill the phantom to a depth of 15 cm ±0.2cm. The fluid parameters were verified and the dipole validation was performed as described in the previous sections.

Test Positions:

The Device was positioned against the SAM and flat phantom using the exact procedure described in IEEE Std 1528:2013, IEC62209-2:2010, and the Office of Engineering and Technology KDB 447498.

Reference Power Measurement:

The measurement probe was positioned at a fixed location above the reference point. A power measurement was made with the probe above this reference position so it could used for the assessing the power drift later in the test procedure.

Area Scan:

A coarse area scan was performed in order to find the approximate location of the peak SAR value. This scan was performed with the measurement probe at a constant height in the simulating fluid. A two dimensional spline interpolation algorithm was then used to determine the peaks and gradients within the scanned area. The area scan resolution conformed to the requirements of KDB 865664 as shown in Table 10.

Zoom Scan:

A zoom scan was performed around the approximate location of the peak SAR as determined from the area scan. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure. The zoom scan resolution conformed to the requirements of KDB 865664 as shown in Table 10.

<table>
<tr><th colspan="3"></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤ 15 mm
2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm
4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}</td><td>≤ 2 GHz: ≤ 8 mm
2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*
4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm
4 – 5 GHz: ≤ 3 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm
4 – 5 GHz: ≤ 2.5 mm
5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm
4 – 5 GHz: ≥ 25 mm
5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

Table 10: SAR Area and Zoom Scan Resolutions

Interpolation, Extrapolation and Detection of Maxima:

The probe is calibrated at the center of the dipole sensors which is located 1 to 2.7 mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated.

In DASY5, the choice of the coordinate system defining the location of the measurement points has no influence on the uncertainty of the interpolation, Maxima Search and extrapolation routines. The interpolation, extrapolation and maximum search routines are all based on the modified Quadratic Shepard's method.

Thereby, the interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation. The DASY5 routines construct a once-continuously differentiable function that interpolates the measurement values as follows:

- For each measurement point a trivariate (3-D) / bivariate (2-D) quadratic is computed. It interpolates the measurement values at the data point and forms a least-square fit to neighboring measurement values.
- The spatial location of the quadratic with respect to the measurement values is attenuated by an inverse distance weighting. This is performed since the calculated quadratic will fit measurement values at nearby points more accurate than at points located further away.
- After the quadratics are calculated for at all measurement points, the interpolating function is calculated as a weighted average of the quadratics.

There are two control parameters that govern the behavior of the interpolation method. One specifies the number of measurement points to be used in computing the least-square fits for the local quadratics. These measurement points are the ones nearest the input point for which the quadratic is being computed. The second parameter specifies the number of measurement points that will be used in calculating the weights for the quadratics to produce the final function. The input data points used there are the ones nearest the point at which the interpolation is desired. Appropriate defaults are chosen for each of the control parameters.

The trivariate quadratics that have been previously computed for the 3-D interpolation and whose input data are at the closest distance from the phantom surface, are used in order to extrapolate the fields to the surface of the phantom.

In order to determine all the field maxima in 2-D (Area Scan) and 3-D (Zoom Scan), the measurement grid is refined by a default factor of 10 and the interpolation function is used to evaluate all field values between corresponding measurement points. Subsequently, a linear search is applied to find all the candidate maxima. In a last step, non-physical maxima are removed and only those maxima which are within 2 dB of the global maximum value are retained.

Averaging and Determination of Spatial Peak SAR

The interpolated data is used to average the SAR over the 1g and 10g cubes by spatially discretizing the entire measured volume. The resolution of this spatial grid used to calculate the averaged SAR is 1mm or about 42875 interpolated points. The resulting volumes are defined as cubical volumes containing the appropriate tissue parameters that are centered at the location. The location is defined as the center of the incremental volume.

The spatial-peak SAR must be evaluated in cubical volumes containing a mass that is within 5% of the required mass. The cubical volume centered at each location, as defined above, should be expanded in all directions until the desired value for the mass is reached, with no surface boundaries of the averaging volume extending beyond the outermost surface of the considered region. In addition, the cubical volume should not consist of more than 10% of air. If these conditions are not satisfied then the center of the averaging volume is moved to the next location. Otherwise, the exact size of the final sampling cube is found using an inverse polynomial approximation algorithm, leading to results with improved accuracy. If one boundary of the averaging volume reaches the boundary of the measured volume during its expansion, it will not be evaluated at all. Reference is kept of all locations used and those not used for averaging the SAR. All average SAR values are finally assigned to the centered location in each valid averaging volume.

All locations included in an averaging volume are marked to indicate that they have been used at least once. If a location has been marked as used, but has never been assigned to the center of a cube, the highest averaged SAR value of all other cubical volumes which have used this location for averaging is assigned to this location. Only those locations that are not part of any valid averaging volume should be marked as unused. For the case of an unused location, a new averaging volume must be constructed which will have the unused location centered at one surface of the cube. The remaining five surfaces are expanded evenly in all directions until the required mass is enclosed, regardless of the amount of included air. Of the six possible cubes with one surface centered on the unused location, the smallest cube is used, which still contains the required mass.

If the final cube containing the highest averaged SAR touches the surface of the measured volume, an appropriate warning is issued within the post processing engine.

Power Drift Measurement:

The probe was positioned at precisely the same reference point and the reference power measurement was repeated. The difference between the initial reference power and the final one is referred to as the power drift. The power drift measurement was used to assess the output power stability of the test sample throughout the SAR scan.

RF Ambient Activity:

During the entire SAR evaluation, the RF ambient activity was monitored using a spectrum analyzer with an antenna connected to it. The spectrum analyzer was tuned to the frequency of measurement and with one trace set to max hold mode. In this way, it was possible to determine if at any point during the SAR measurement there was an interfering ambient signal. If an ambient signal was detected, then the SAR measurement was repeated.

7.0 CRITERIA

The following FCC limits for SAR apply to portable devices operating in the General Population/Uncontrolled Exposure environment:

Exposure (General Population/Uncontrolled Exposure environment)	SAR (W/kg)
Average over the whole body	0.08
Spatial Peak (1g)	1.60
Spatial Peak for hands, wrists, feet and ankles (10g)	4.00

8.0 TEST CONFIGURATION

The device is used exclusively around the ankle so it was evaluated against the extremity SAR limits. In order to get the device to match up against the flat phantom, the ankle strap and “ears” were cut off. All SAR scans were performed with a freshly charged battery. The test channels and operating modes were selected using a base station simulator set to force the device to transmit at maximum output power.

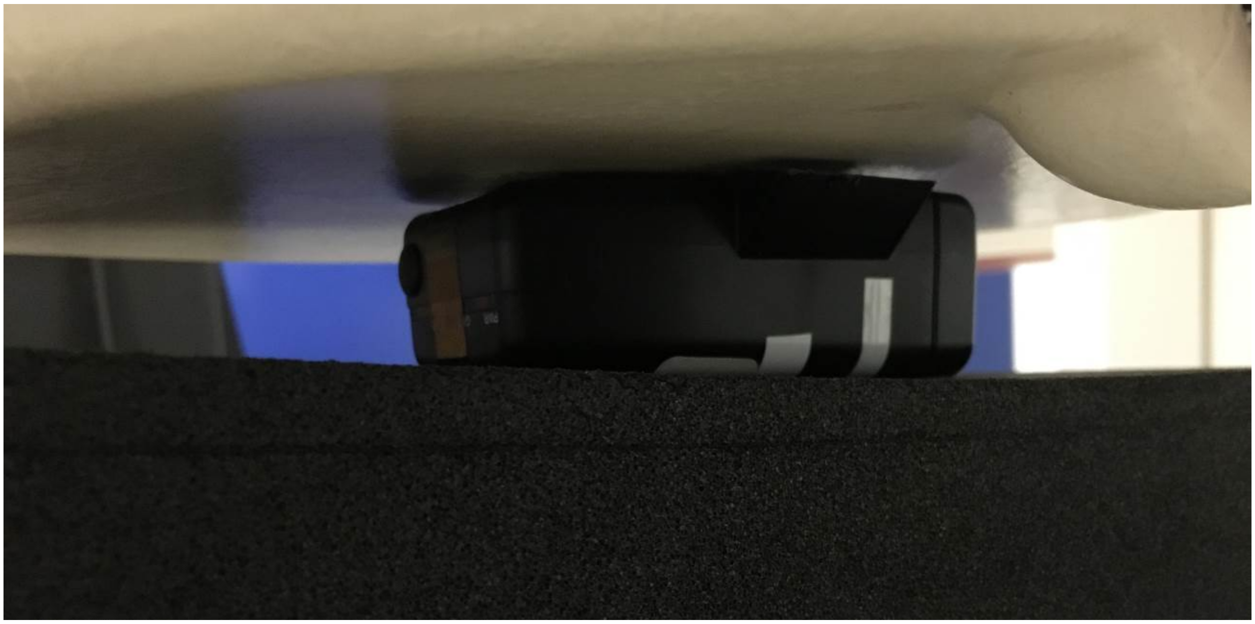


Figure 5: Test Setup (Back Side)

Figure 6: Test Setup (Front Side)

9.0 TABULAR TEST RESULTS

The results on the following page(s) were obtained when the device was transmitting at maximum output power. Detailed measurement data and plots, which reveal information about the location of the maximum SAR with respect to the device, are referenced are shown in APPENDIX – WCDMA Band II Plots and APPENDIX – WCDMA Band V Plots. The measured conducted output power was compared to the power declared by the manufacturer and used for scaling the measured SAR values.

The device was evaluated according to the specific requirements found in FCC KDB 447498 D01 v06[9] and 616217[8].

	Extremity SAR Results Using 1900MHz MSL.							
Date	TX Mode		Position	Power Drift (dB)	Measured SAR 10g (W/kg)	Reported SAR 10g (W/kg)	Measured Conducted Output Power (dBm)	Maximum Conducted Output Power (dBm)
	WCDMA Band V, Low Channel, 826.4MHz	Direct Contact with Phantom	Back					
			Front					
			Left					
			Right					
7/8/2016	WCDMA Band V, Mid Channel (4183), 836.6MHz	Direct Contact with Phantom	Back	0.06	0.3290	**0.2919**	24.52	24.00
			Front	-0.14	0.6750	**0.5988**	24.52	24.00
			Left	-0.24	0.2140	**0.1899**	24.52	24.00
			Right	-0.18	0.3800	**0.3371**	24.52	24.00
	WCDMA Band V, High Channel, 846.6MHz	Direct Contact with Phantom	Back					
			Front					
			Left					
			Right					
10g SAR Limit (Extremities) = 4.0								

Table 11: Extremity Mode SAR Results

	Extremity SAR Results Using 900MHz MSL.							
Date	TX Mode		Position	Power Drift (dB)	Measured SAR 10g (W/kg)	Reported SAR 10g (W/kg)	Measured Conducted Output Power (dBm)	Maximum Conducted Output Power (dBm)
	WCDMA Band II, Low Channel, 1852.4MHz	Direct Contact with Phantom	Back					
			Front					
			Left					
			Right					
7/5/2016	WCDMA Band II (9400), Mid Channel, 1880MHz	Direct Contact with Phantom	Back	-0.02	0.3560	**0.3745**	23.78	24.00
			Front	-0.18	1.1200	**1.1782**	23.78	24.00
			Left	-0.21	0.1430	**0.1504**	23.78	24.00
			Right	-0.19	0.2140	**0.2251**	23.78	24.00
	WCDMA Band II, High Channel, 1907.6MHz	Direct Contact with Phantom	Back					
			Front					
			Left					
			Right					
10g SAR Limit (Extremities) = 4.0								

Table 12: Extremity Mode SAR Results

10.0 SIMULTANEOUS TRANSMISSION AND SAR TEST EXCLUSIONS:

Simultaneous transmission Exclusions:

The device supports simultaneous transmission with the 418MHz / 433.92MHz radio certified under part 15.231 and the WCDMA radio. This simultaneous transmission condition was excluded based on the calculations shown in APPENDIX – SAR Exclusion Calculations.

SAR Test Exclusions:

The 418MHz / 433.92MHz radio which according to the manufacturer is used for the system activation, status updates and administration purposes, was excluded from the SAR test. See the calculations shown in APPENDIX – SAR Exclusion Calculations for further details.

11.0 REFERENCES

[1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, The Institute of electrical and Electronics Engineers, Inc., New York, NY 10017, 1992

[2] Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”, Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), FCC, Washington, D.C. 20554, 1997

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, “Automated E-field scanning system for dosimetric assessments”, *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.

[4] Niels Kuster, Ralph Kastle, and Thomas Schmid, “Dosimetic evaluation of mobile communications equipment with know precision”, IEICE Transactions on Communications, vol. E80-B, no. 5, pp.645-652, May 1997.

[5] NIS81, NAMAS, “The treatment of uncertainty in EMC measurement”, Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddinton, Middlesex, England, 1994.

[6] Barry N. Tayor and Chris E. Kuyatt, “Guidelines for evaluating and expressing the uncertainty of NIST measurement results”, Tech. Rep., National Institute of Standards and Technology, 1994.

[7] Federal Communications Commission, KDG 248227 D01 v02r02 - “SAR Measurement Procedures for 802.11 a/b/g Transmitters”

[8] Federal Communications Commission, KDB 648474 – “SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas”.

[9] Federal Communications Commission, KDB 447498 D01 v06 – “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”.

[10] Federal Communications Commission, KDB 616217 – “SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens”.

[11] Federal Communications Commission, KDB 450824 – “SAR Probe Calibration and System Verification Considerations for Measurements at 150MHz – 3GHz”.

[12] Federal Communications Commission, KDB 865664 – “SAR Measurement Requirements for 3-6GHz”.

[13] Federal Communications Commission, KDB 941225 – “SAR Measurement Procedures for 3G Devices”.

[14] ANSI, ANSI/IEEE C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.

12.0 APPENDIX – SAR EXCLUSION CALCULATIONS

Simultaneous transmission exclusion calculation

The 418 / 433.92MHz radio link can transmit at the same time as the cellular radio. According to the manufacturer it is used for the system activation, status updates and administration purposes. The cellular radio was measured for 10-g extremity SAR but the 418 / 433.92MHz radio met the standalone SAR exclusion threshold. The calculations below address the simultaneous transmission condition for SAR exclusion.

Estimated Standalone SAR for 418/433.92MHz radio:

According to KDB447498 Section 4.3.2 (b) for simultaneous transmission SAR test exclusion , when an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

[(*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.

In order to estimate the stand alone SAR for the 418 / 433.92MHz radio the following values are used:

- Max power of channel: 0.9mW (estimated from field strength reading)
- Min test distance: 5mm
- F(GHz): 0.43392GHz
- X: 18.75 (for 10-g SAR)

Estimated Standalone 10-g SAR for 418 / 433.92MHz radio is therefore:

(0.9mW / 5mm) x (0.66 / 18.75) = 0.18 * 0.0352 = 0.006W/kg

Simultaneous SAR exclusion (418/433.92MHz radio and cellular radio):

The worst case measured 10-g SAR from the cellular radio was 1.18W/kg

The estimated worst case SAR from the 418 / 433.92MHz radio was 0.006W/kg

The combined 10-g SAR between these two radios is 1.18W/kg + 0.006W/kg = 1.186W/kg.

Conclusion:

Since the sum of the worst case 10-g SAR value for the cellular radio and worst case estimated 10-g SAR value is less than the 10-g SAR limit (4W/kg), the simultaneous transmit condition is excluded from the actual SAR test.

13.0 APPENDIX – WCDMA BAND II PLOTS

Date/Time: 7/5/2016 2:10:01 PM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band II.da52:4

3m_WCDMA Band II, Mid Channel, Back (Strap) Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band II; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1880 MHz; σ = 1.51 S/m; ε_r = 53.28; ρ = 1000 kg/m^3

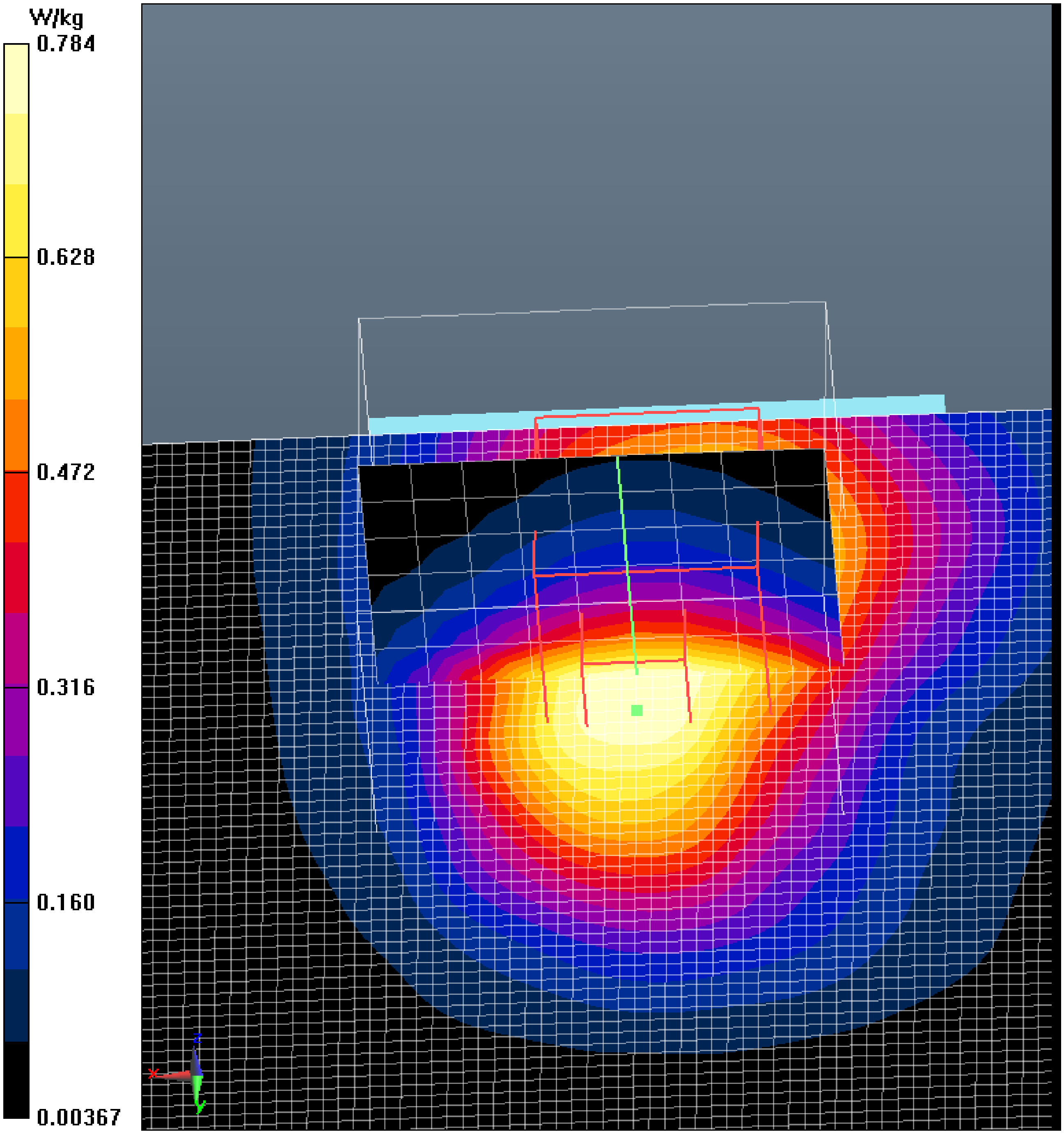
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(8.62, 8.62, 8.62); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Strap Side Mid Channel/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.784 W/kg

WWAN Flat-Section MSL Testing/Strap Side Mid Channel/Zoom Scan (10x9x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.667 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.869 W/kg
SAR(1 g) = 0.562 W/kg; SAR(10 g) = 0.356 W/kg
Maximum value of SAR (measured) = 0.758 W/kg


W/kg
0.784
0.628
0.472
0.316
0.160
0.00367

Date/Time: 7/5/2016 4:02:13 PM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band II.da52:4

1.1.1 3m_WCDMA Band II, Mid Channel, Front Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band II; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1880 MHz; σ = 1.51 S/m; ε_r = 53.28; ρ = 1000 kg/m^3

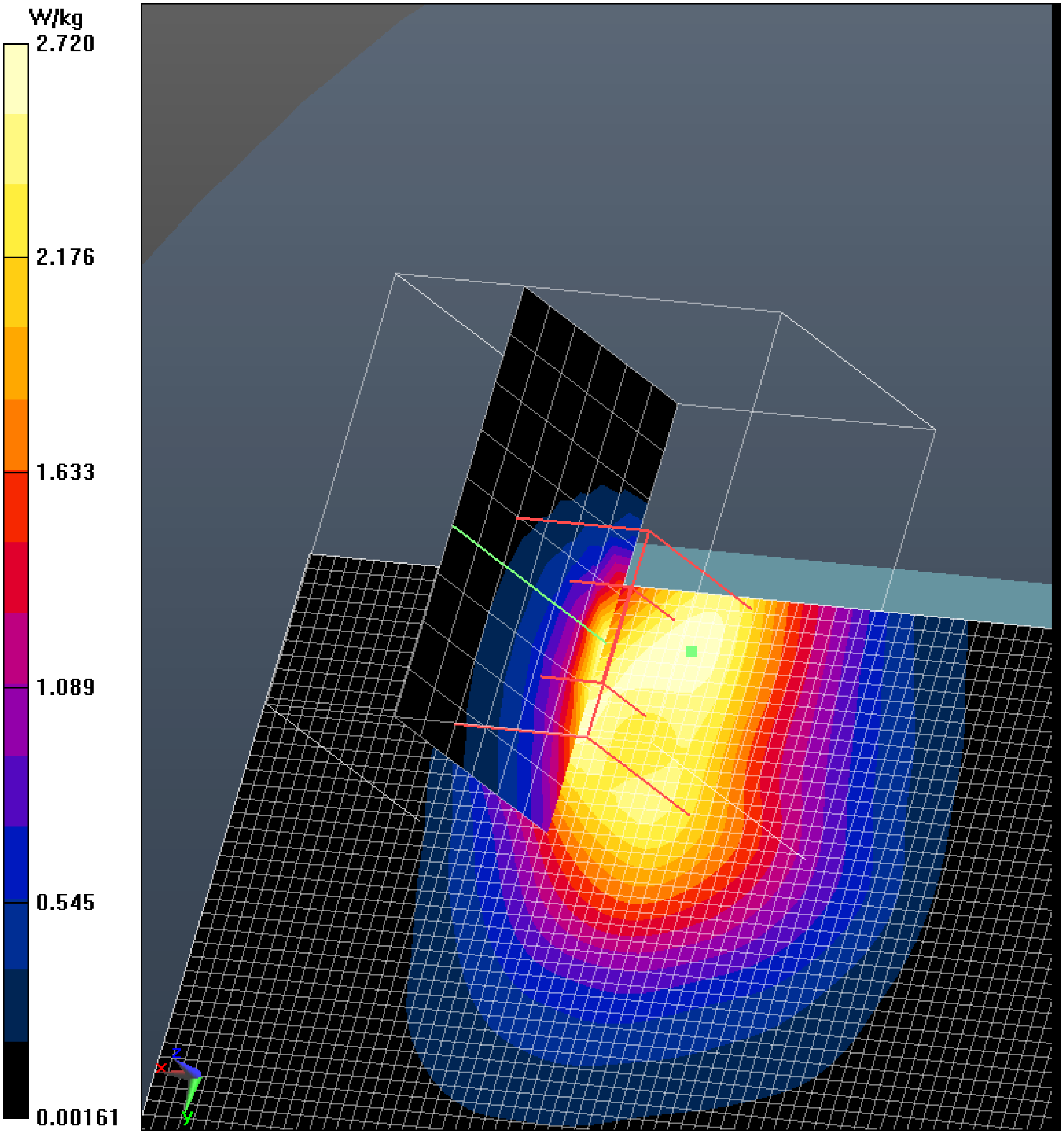
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(8.62, 8.62, 8.62); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Front Side Mid Channel/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.72 W/kg

WWAN Flat-Section MSL Testing/Front Side Mid Channel/Zoom Scan (10x10x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.737 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 5.94 W/kg
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.12 W/kg
Maximum value of SAR (measured) = 4.40 W/kg


W/kg
2.720
2.176
1.633
1.089
0.545
0.00161

Date/Time: 7/5/2016 8:32:02 AM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band II.da52:4

1.1.2 3m_WCDMA Band II, Mid Channel, Left Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band II; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1880 MHz; σ = 1.51 S/m; ε_r = 53.28; ρ = 1000 kg/m^3

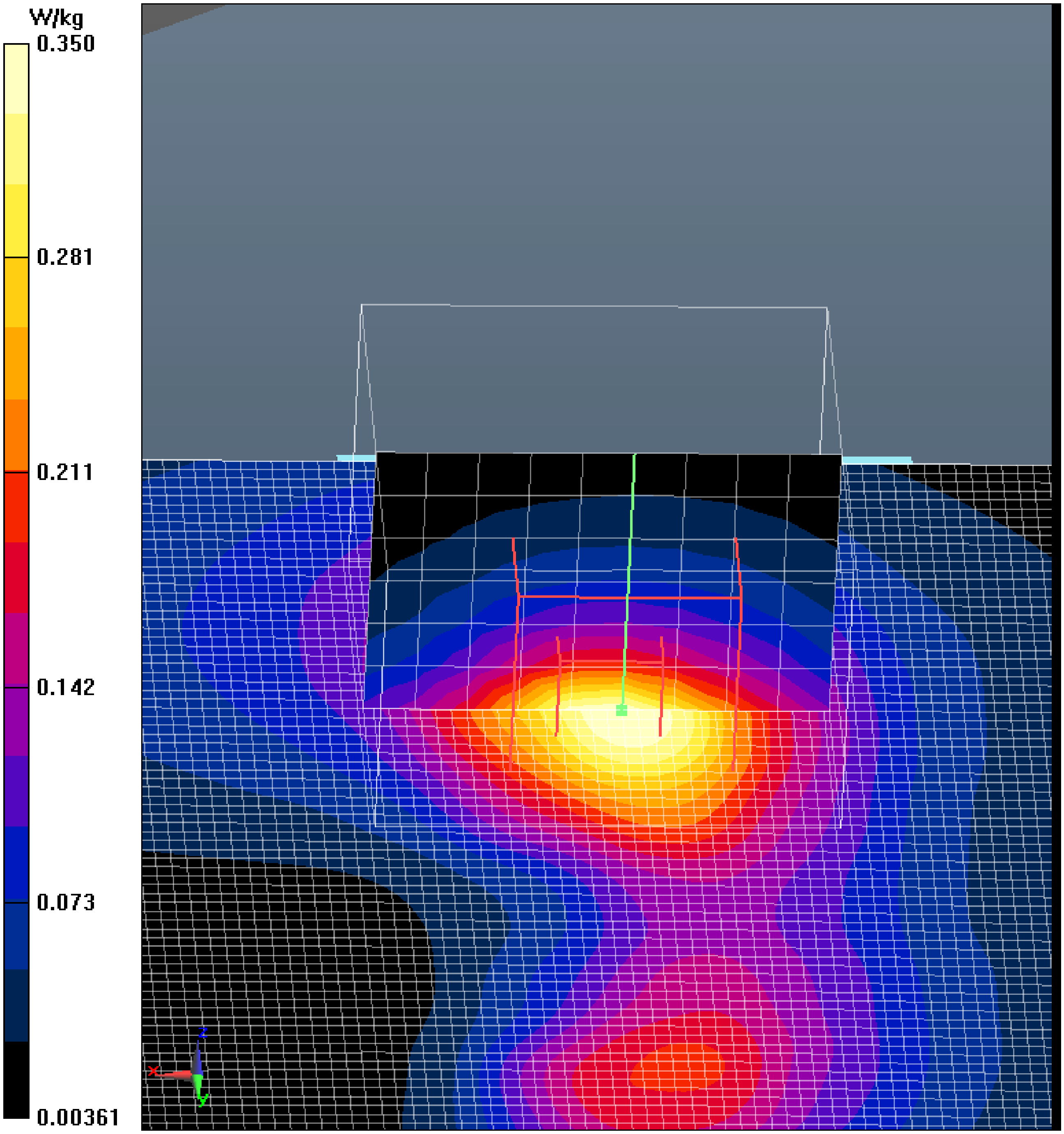
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(8.62, 8.62, 8.62); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Left side Mid Channel/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.350 W/kg

WWAN Flat-Section MSL Testing/Left side Mid Channel/Zoom Scan (10x10x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.763 V/m; Power Drift = -0.21 dB
Peak SAR (extrapolated) = 0.430 W/kg
SAR(1 g) = 0.247 W/kg; SAR(10 g) = 0.143 W/kg
Maximum value of SAR (measured) = 0.359 W/kg


W/kg
0.350
0.281
0.211
0.142
0.073
0.00361

Date/Time: 7/5/2016 9:33:28 AM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band II.da52:4

1.1.3 3m_WCDMA Band II, Mid Channel, Right Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band II; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1880 MHz; σ = 1.51 S/m; ε_r = 53.28; ρ = 1000 kg/m^3

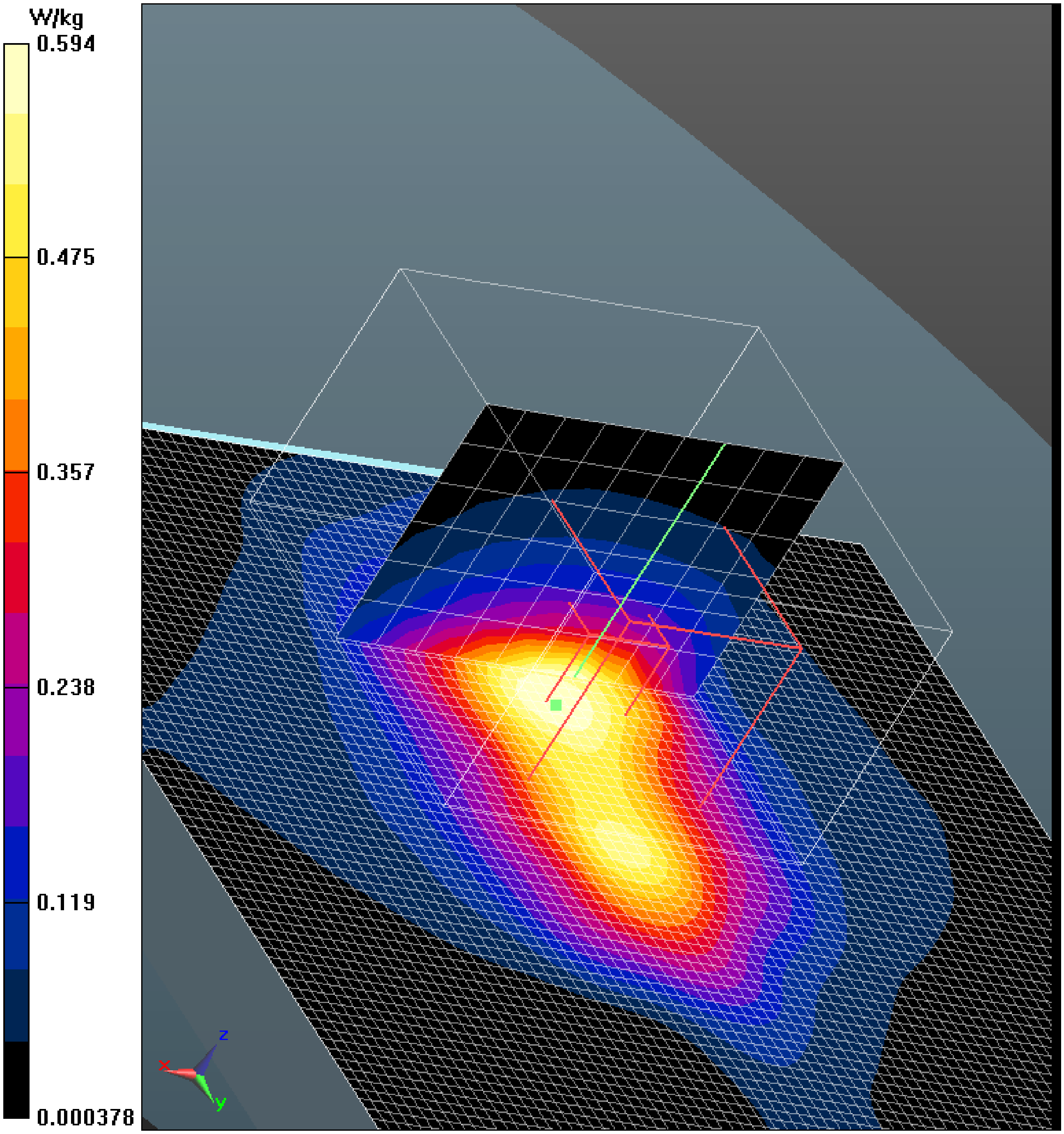
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(8.62, 8.62, 8.62); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Right side Mid Channel 2/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.594 W/kg

WWAN Flat-Section MSL Testing/Right side Mid Channel 2/Zoom Scan (10x10x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.496 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.766 W/kg
SAR(1 g) = 0.383 W/kg; SAR(10 g) = 0.214 W/kg
Maximum value of SAR (measured) = 0.603 W/kg


W/kg
0.594
0.475
0.357
0.238
0.119
0.000378
z
x
y

14.0 APPENDIX – WCDMA BAND V PLOTS

Date/Time: 7/8/2016 1:13:37 PM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band V.da52:4

1.1.4 3m_WCDMA Band V, Mid Channel, Back Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band V; Frequency: 836.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 1.01 S/m; ε_r = 52.6; ρ = 1000 kg/m^3

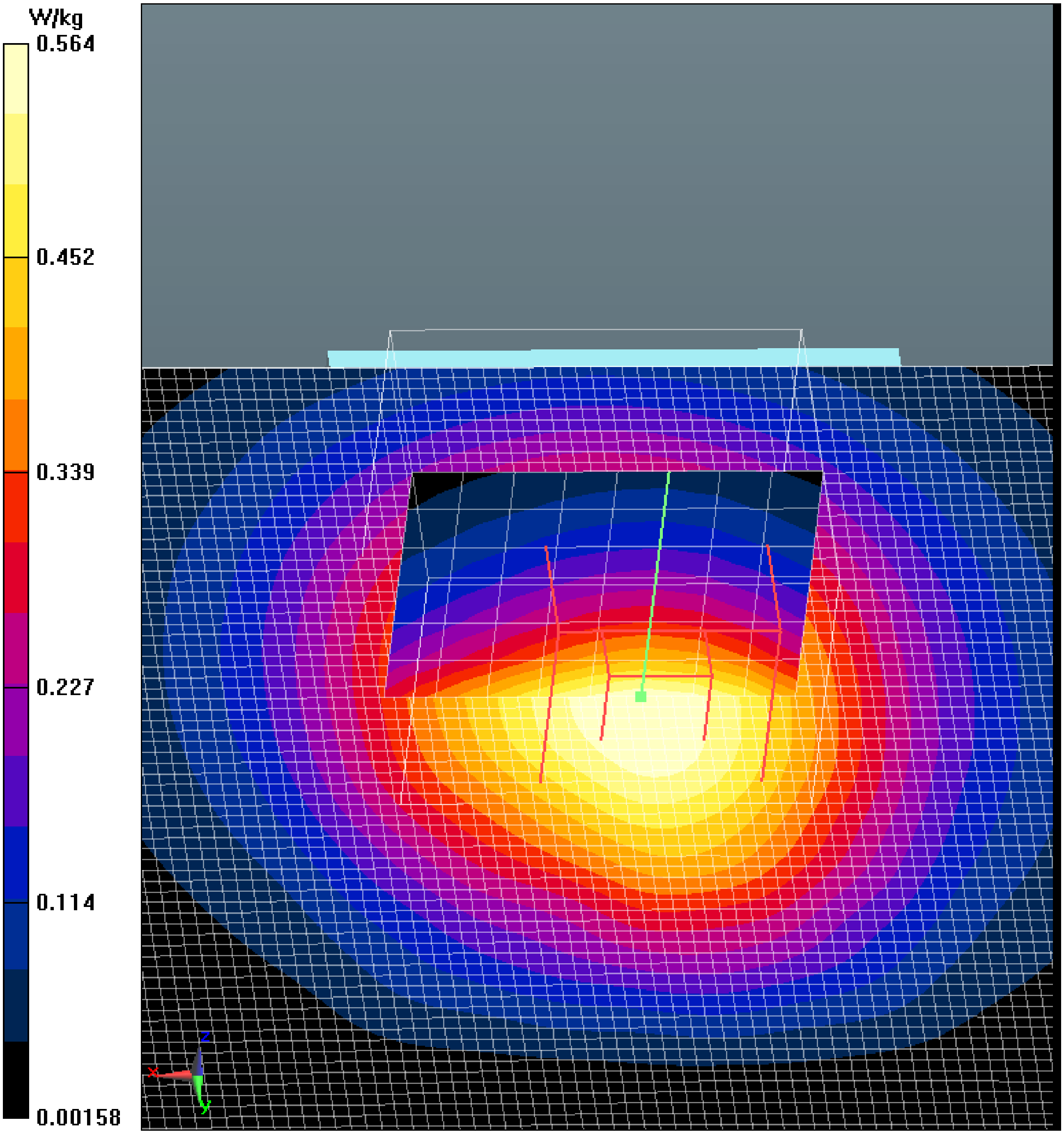
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(10.64, 10.64, 10.64); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Strap Side Mid Channel/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.564 W/kg

WWAN Flat-Section MSL Testing/Strap Side Mid Channel/Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.763 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.615 W/kg
SAR(1 g) = 0.461 W/kg; SAR(10 g) = 0.329 W/kg
Maximum value of SAR (measured) = 0.567 W/kg


W/kg
0.564
0.452
0.339
0.227
0.114
0.00158

Date/Time: 7/8/2016 2:02:37 PM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band V.da52:4

1.1.5 3m_WCDMA Band V, Mid Channel, Front Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band V; Frequency: 836.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 1.01 S/m; ε_r = 52.6; ρ = 1000 kg/m^3

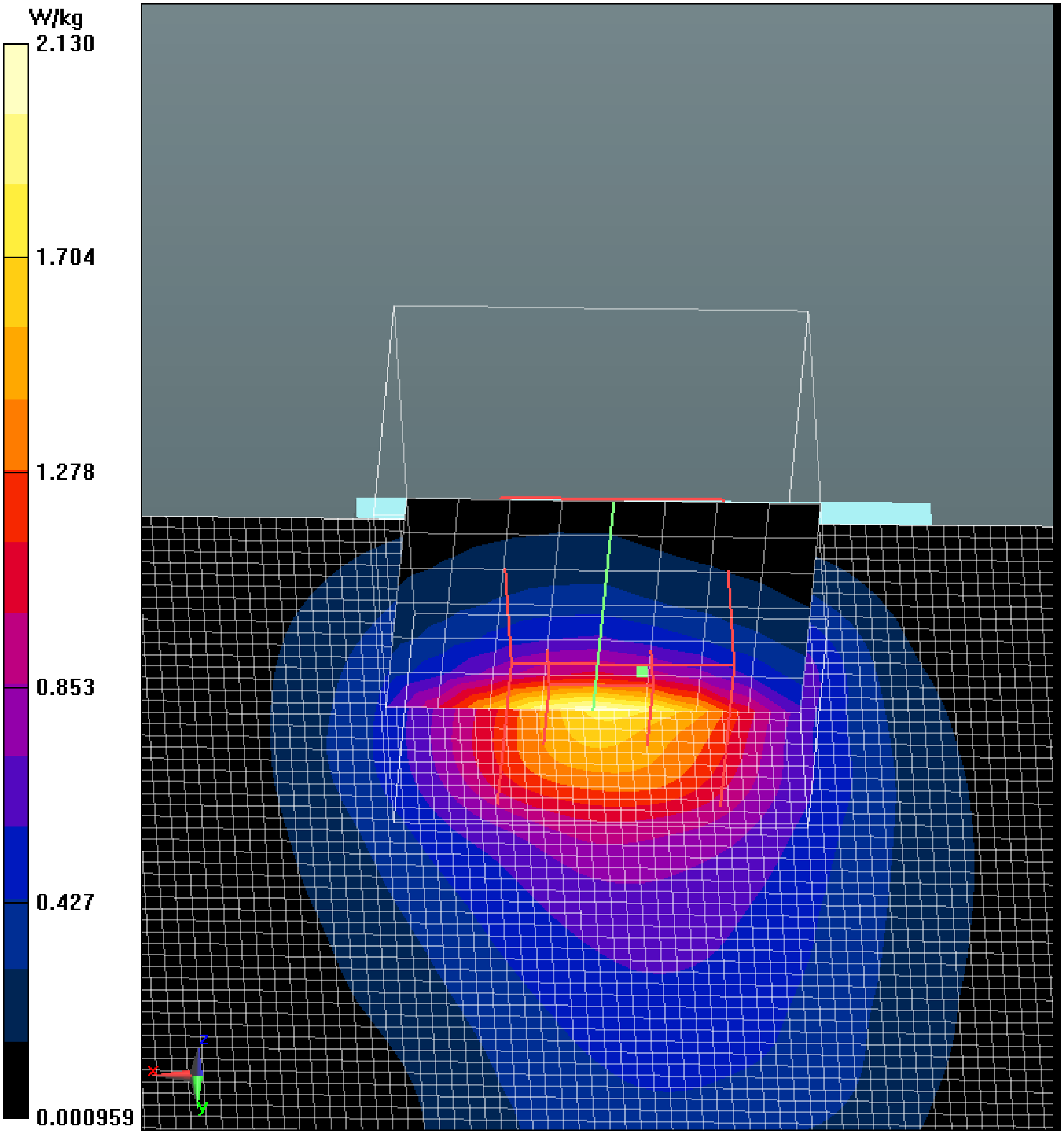
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(10.64, 10.64, 10.64); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Front Side Mid Channel/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.13 W/kg

WWAN Flat-Section MSL Testing/Front Side Mid Channel/Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.252 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 2.72 W/kg
SAR(1 g) = 1.29 W/kg; SAR(10 g) = 0.675 W/kg
Maximum value of SAR (measured) = 2.20 W/kg


W/kg
2.130
1.704
1.278
0.853
0.427
0.000959

Date/Time: 7/8/2016 2:46:43 PM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band V.da52:4

1.1.6 3m_WCDMA Band V, Mid Channel, Left Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band V; Frequency: 836.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 1.01 S/m; ε_r = 52.6; ρ = 1000 kg/m^3

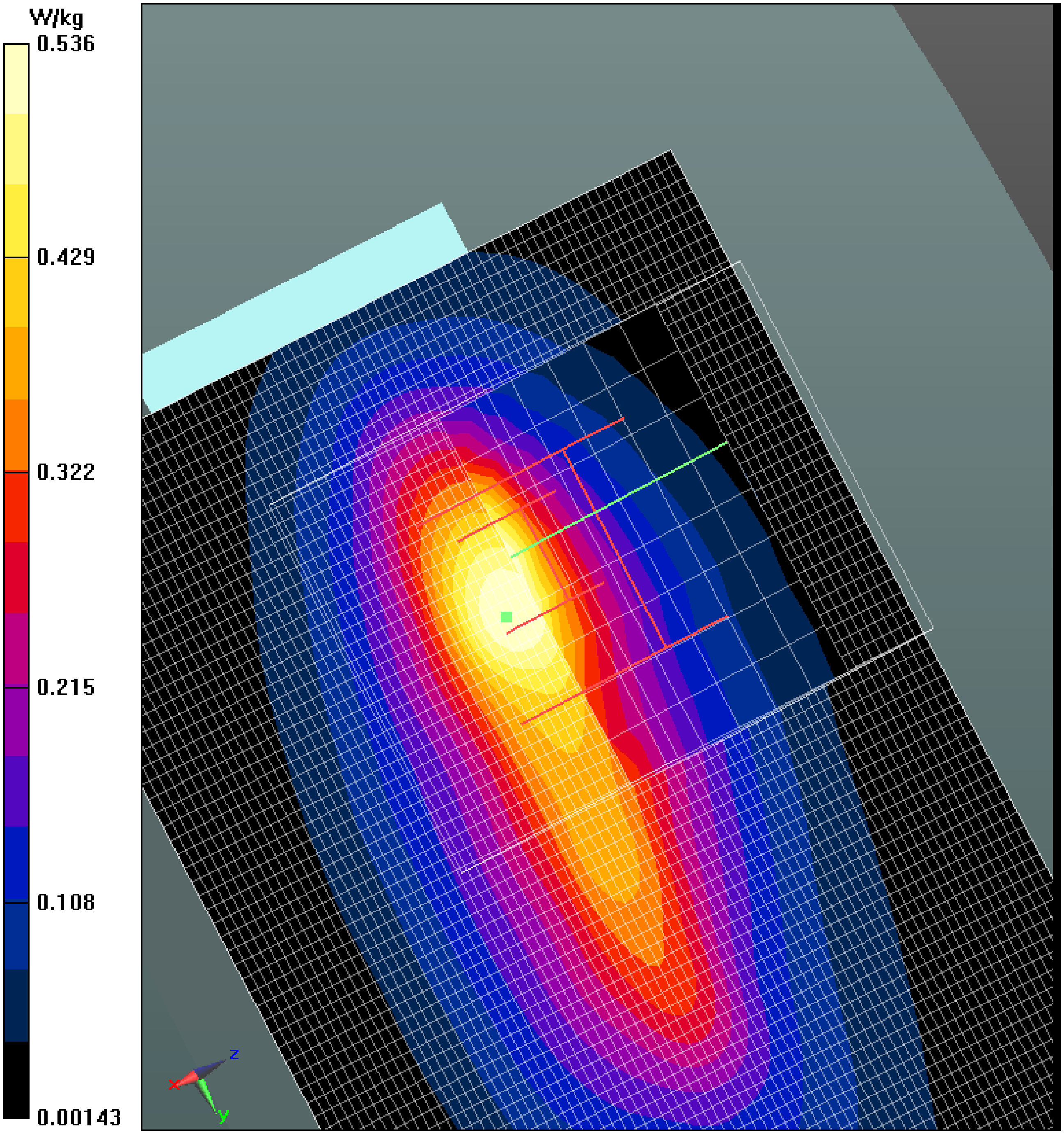
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(10.64, 10.64, 10.64); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Left Side Mid Channel/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.536 W/kg

WWAN Flat-Section MSL Testing/Left Side Mid Channel/Zoom Scan (10x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.561 V/m; Power Drift = -0.24 dB
Peak SAR (extrapolated) = 0.641 W/kg
SAR(1 g) = 0.362 W/kg; SAR(10 g) = 0.214 W/kg
Maximum value of SAR (measured) = 0.528 W/kg


W/kg
0.536
0.429
0.322
0.215
0.108
0.00143
z
x
y

Date/Time: 7/8/2016 3:28:25 PM

Test Laboratory: Intertek
File Name: 3m_WCDMA Band V.da52:4

1.1.7 3m_WCDMA Band V, Mid Channel, Right Side

Procedure Notes:

DUT: 3M Ankle Tracker; Serial:

Communication System: UID 0, Generic WCDMA (0); Communication System Band: Band V; Frequency: 836.6 MHz;Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 1.01 S/m; ε_r = 52.6; ρ = 1000 kg/m^3

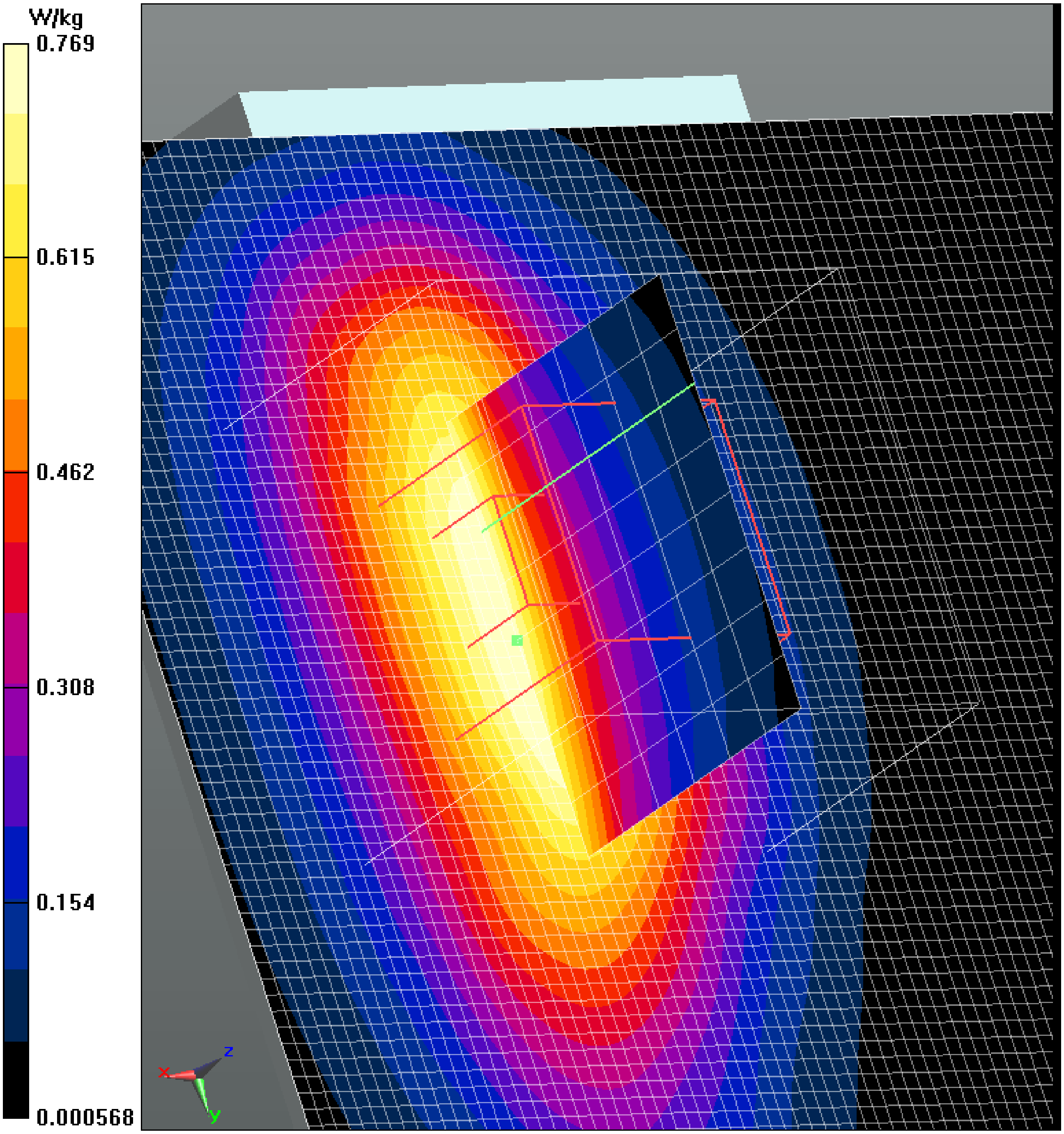
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV3 - SN3516; ConvF(10.64, 10.64, 10.64); Calibrated: 12/16/2015;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

WWAN Flat-Section MSL Testing/Right Side Mid Channel/Area Scan (81x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.769 W/kg

WWAN Flat-Section MSL Testing/Right Side Mid Channel/Zoom Scan (10x9x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.741 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.889 W/kg
SAR(1 g) = 0.574 W/kg; SAR(10 g) = 0.380 W/kg
Maximum value of SAR (measured) = 0.777 W/kg


W/kg
0.769
0.615
0.462
0.308
0.154
0.000568
z
x
y

15.0 APPENDIX – DIPOLE PLOTS

Date/Time: 7/8/2016 2:31:48 PM

Test Laboratory: Intertek
File Name: dipole cell band.da52:0

dipole cell band

Procedure Notes: Ambient Temp: 22.8C, Fluid Temp: 22.2C

DUT: Dipole 835 MHz D835V2; Serial: D835V2 - SN:4d122

Communication System: UID 0, CW (0); Communication System Band: D835 (835.0 MHz); Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 835 MHz; σ = 1.008 S/m; ε_r = 52.614; ρ = 1000 kg/m^3

Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

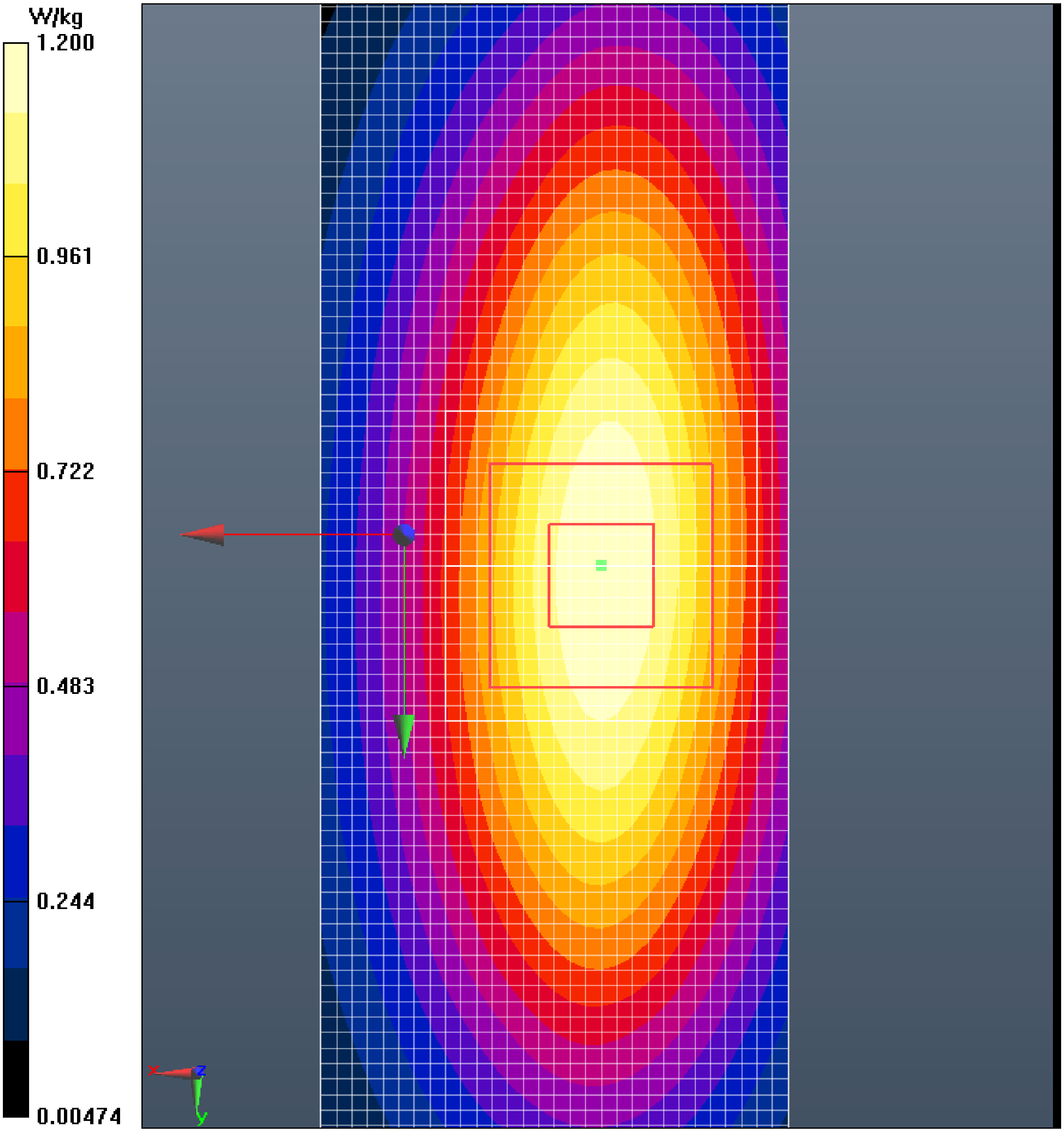
- Probe: EX3DV3 - SN3516; ConvF(10.64, 10.64, 10.64); Calibrated: 12/16/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=100 mW, dist=2.0mm (EX-Probe)/Area Scan (31x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 1.20 W/kg

System Performance Check at Frequencies below 1 GHz/d=15mm, Pin=100 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 35.231 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 14.3 W/kg
SAR(1 g) = 9.69 W/kg; SAR(10 g) = 6.41 W/kg
Normalized to target power = 1 W and actual power = 0.1 W

Maximum value of SAR (measured) = 10.4 W/kg


W/kg
1.200
0.961
0.722
0.483
0.244
0.00474

Date/Time: 7/5/2016 2:07:00 PM

Test Laboratory: Intertek
File Name: dipole pcs band.da52:2

dipole pcs band

Procedure Notes:

DUT: Dipole 1900 MHz D1900V2; Serial: D1900V2 - SN:xxx

Communication System: UID 0, Generic CDMA (0); Communication System Band: CDMA PCS Band; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1900 MHz; σ = 1.532 S/m; ε_r = 53.28; ρ = 1000 kg/m^3

Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

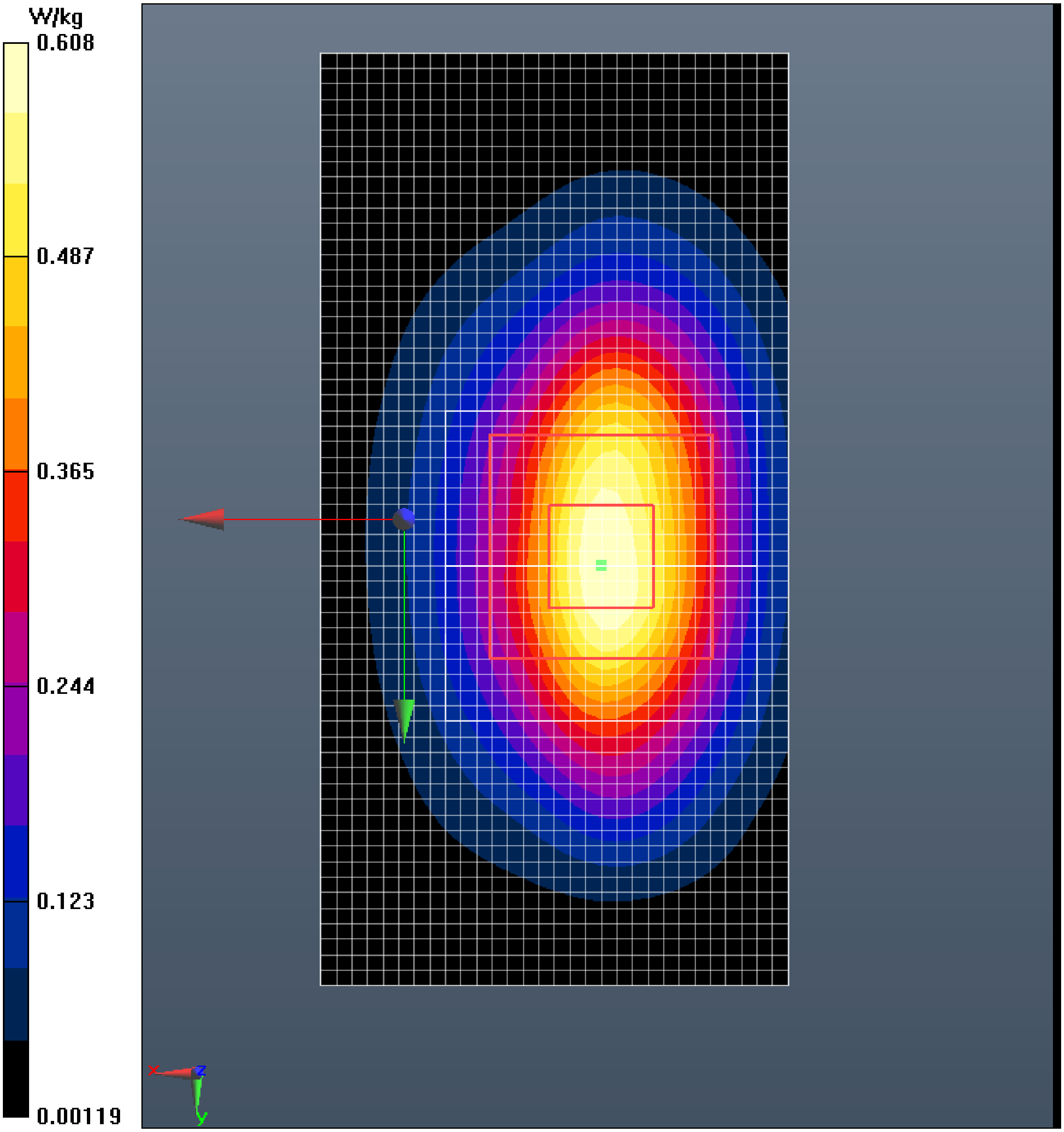
- Probe: EX3DV3 - SN3516; ConvF(8.62, 8.62, 8.62); Calibrated: 12/16/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 9/16/2015
- Phantom: SAM 2 with CRP v5.0; Type: QD000P40CD; Serial: TP:1663
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=100mW, dist=2.0mm (EX-Probe) 2 2 2/Area Scan (31x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.608 W/kg

System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=100mW, dist=2.0mm (EX-Probe) 2 2 2/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.565 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 76.3 W/kg
SAR(1 g) = 42.1 W/kg; SAR(10 g) = 21.9 W/kg
Normalized to target power = 1 W and actual power = 0.01 W

Maximum value of SAR (measured) = 60.1 W/kg


W/kg
0.608
0.487
0.365
0.244
0.123
0.00119

16.0 APPENDIX – SYSTEM VALIDATION SUMMARY

Per FCC KDB 865664, a tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters have been included in the summary table below. The validation was performed with reference dipoles using the required tissue equivalent media for system validation according to KDB 865664. Each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point. All measurements were performed using probes calibrated for CW signals. Modulations in the table above represent test configurations for which the SAR system has been validated. The SAR system was also validated with modulated signals per KDB 865664.

Frequency (MHz)	Date	Probe (SN#)	Probe (Model #)	Probe Calibration Point Frequency (MHz)	Probe Calibration Point Fluid Type	Dielectric Properties σ	Dielectric Properties ϵ_r	CW Validation Sensitivity	CW Validation Probe Linearity	CW Validation Probe Isotropy	Modulation Validation Mod. Type	Modulation Validation Duty Factor	Modulation Validation PAR
835	12/20/2015	3516	EX3DV3	835	Body	54.2	0.98	Pass	Pass	Pass	GMSK	Pass	N/A
900	12/20/2015	3516	EX3DV3	900	Body	54	1.02	Pass	Pass	Pass	GMSK	Pass	N/A
1750	12/20/2015	3516	EX3DV3	1800	Body	52.9	1.41	Pass	Pass	Pass	GMSK	Pass	N/A
1900	12/20/2015	3516	EX3DV3	1900	Body	52.7	1.48	Pass	Pass	Pass	GMSK	Pass	N/A