Product Service

Choose certainty.
Add value.

Report On

Specific Absorption Rate Testing of the
Iridium Satellite LLC
Iridium Extreme 9575N Satellite Phone

FCC ID: Q639575N

COMMERCIAL-IN-CONFIDENCE

Document 75934781 Report 08 Issue 2 May 2017

Product Service

TÜV SÜD Product Service, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuv-sud.co.uk

REPORT ON	Specific Absorption Rate Testing of the Iridium Satellite LLC Iridium Extreme 9575N Satellite Phone Document 75934781 Report 08 Issue 2 May 2017
PREPARED FOR	Iridium Satellite LLC 1750 Tysons Boulevard Suite 1400 McLean VA 22101 United States
PREPARED BY	**Stephen Dodd** SAR Engineer
APPROVED BY	**Nigel Grigsby** Authorised Signatory
DATED	10 May 2017

This report has been up-issued to Issue 2 to amend 'Iridium Communications LLC ' to 'Iridium Satellite LLC'.

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

Specific Absorption Rate Testing of the
Iridium Satellite LLC
Iridium Extreme 9575N Satellite Phone

COMMERCIAL-IN-CONFIDENCE

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Specific Absorption Rate Testing of the Iridium Satellite LLC Iridium Extreme 9575N Satellite Phone to the requirements of KDB 447498 D01 v06 General RF Exposure Guidance.

Objective	To perform Specific Absorption Rate Testing to determine the Equipment Under Test's (EUT's) compliance with the requirements specified of KDB 447498 D01 v06 General RF Exposure Guidance, for the series of tests carried out.
Applicant	Iridium Satellite LLC
Manufacturer	Iridium Satellite LLC
Manufacturing Description	Iridium Extreme Satellite Phone
Model Number	9575N
Serial Number	E100C0
IMEI Number	300215060615020
Number of Samples Tested	1
Battery Model Number	BAT31001
Test Specification/Issue/Date	KDB 447498 D01 v06 General RF Exposure Guidance
Start of Test	05 December 2016
Finish of Test	24 January 2017
Related Document(s)	FCC 47CFR 2.1093: 2015 KDB 865664 – D01 v01r04 KDB 865664 – D02 v01r02 KDB 648474 – D04 v01r03 KDB 447498 – D01 v06 KDB 643646 – D01 v01r03 IC RSS-102 Issue 5 IEEE 1528-2013
Name of Engineer(s)	Stephen Dodd

1.2 BRIEF SUMMARY OF RESULTS

The measurements shown in this report were made in accordance with the procedures specified KDB 447498 D01 v06 General RF Exposure Guidance.

The maximum 1g volume averaged stand-alone SAR found during this Assessment:

Max 1g SAR (W/kg) Head	**1.11** (Measured)	**1.24** (Scaled)
Max 1g SAR (W/kg) Body	**0.16** (Measured)	**0.17** (Scaled)
The maximum 1g volume averaged SAR level measured for all the tests performed did not exceed the limits for General Population/Uncontrolled Exposure (W/kg) Partial Body of 1.6 W/kg.		

The maximum 1g volume averaged stand-alone Reported SAR found during this Assessment for each supported mode:

Band	Test Configuration	Max Reported SAR (W/kg)
1640 MHz	Head	1.24
1640 MHz	Front Of Face PTT	0.27
1640 MHz	Body	0.17

1.3 TEST RESULTS SUMMARY

1.3.1 System Performance / Validation Check Results

Prior to formal testing being performed a System Check was performed in accordance with KDB 865664 and the results were compared against published data in Standard IEEE 1528-2003. The following results were obtained: -

System performance / Validation results

Date	Dipole Used	Frequency (MHz)	Max 1g SAR (W/kg)*	Percentage Drift on Reference
05/12/2016	D1640 v2	1640 MHz	33.92	-0.82
06/12/2016	D1640 v2	1640 MHz	33.44	-2.79
06/12/2016	D1640 v2	1640 MHz	34.08	-0.35
07/12/2016	D1640 v2	1640 MHz	33.68	-1.52
19/01/2017	D1640 v2	1640 MHz	33.80	-1.17
20/01/2017	D1640 v2	1640 MHz	33.24	-2.81
23/01/2017	D1640 v2	1640 MHz	33.44	-2.22
24/01/2017	D1640 v2	1640 MHz	33.60	-1.75

*Normalised to a forward power of 1W

1.3.2 Results Summary Tables

1640 MHz Band Head (Antenna Retracted Position 1) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	1	1616.02	32.70	32.90	0.10	0.10	Figure 5
Left 15°	1	1616.02	32.70	32.90	0.16	0.17	Figure 6
Right Cheek	1	1616.02	32.70	32.90	0.25	0.26	Figure 7
Right 15°	1	1616.02	32.70	32.90	0.70	0.73	Figure 8
Right 15°	121	1621.02	32.60	32.90	1.04	1.11	Figure 9
Right 15°	240	1625.97	32.51	32.90	1.08	1.18	Figure 10
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Head (Antenna Retracted Position 2) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	1	1616.02	32.70	32.90	0.15	0.16	Figure 11
Left 15°	1	1616.02	32.70	32.90	0.37	0.39	Figure 12
Right Cheek	1	1616.02	32.70	32.90	0.24	0.25	Figure 13
Right 15°	1	1616.02	32.70	32.90	0.74	0.77	Figure 14
Right 15°	121	1621.02	32.60	32.90	0.74	0.79	Figure 15
Right 15°	240	1625.97	32.51	32.90	0.96	1.05	Figure 16
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Head (Antenna Retracted Position 3) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	1	1616.02	32.70	32.90	0.24	0.25	Figure 17
Left 15°	1	1616.02	32.70	32.90	0.64	0.67	Figure 18
Right Cheek	1	1616.02	32.70	32.90	0.18	0.19	Figure 19
Right 15°	1	1616.02	32.70	32.90	0.61	0.64	Figure 20
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Head (Antenna Semi-Extended Position 1) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	121	1621.02	37.41	37.90	0.15	0.17	Figure 21
Left 15°	121	1621.02	37.41	37.90	0.35	0.39	Figure 22
Right Cheek	121	1621.02	37.41	37.90	0.44	0.49	Figure 23
Right 15°	121	1621.02	37.41	37.90	0.96	1.07	Figure 24
Right 15°	1	1616.02	37.39	37.90	0.90	1.01	Figure 25
Right 15°	240	1625.97	37.37	37.90	0.95	1.07	Figure 26
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Head (Antenna Semi-Extended Position 2) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	121	1621.02	37.41	37.90	0.09	0.10	Figure 27
Left 15°	121	1621.02	37.41	37.90	0.75	0.84	Figure 28
Right Cheek	121	1621.02	37.41	37.90	0.26	0.29	Figure 29
Right 15°	121	1621.02	37.41	37.90	1.11	**1.24**	Figure 30
Right 15°	1	1616.02	37.39	37.90	1.09	1.23	Figure 31
Right 15°	240	1625.97	37.37	37.90	0.97	1.10	Figure 32
Left 15°	1	1616.02	37.39	37.90	0.76	0.85	Figure 33
Left 15°	240	1625.97	37.37	37.90	0.69	0.78	Figure 34
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Head (Antenna Semi-Extended Position 3) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
Left Cheek	121	1621.02	37.41	37.90	0.28	0.31	Figure 35
Left 15°	121	1621.02	37.41	37.90	0.53	0.59	Figure 36
Right Cheek	121	1621.02	37.41	37.90	0.24	0.27	Figure 37
Right 15°	121	1621.02	37.41	37.90	1.03	1.15	Figure 38
Right 15°	1	1616.02	37.39	37.90	1.00	1.12	Figure 39
Right 15°	240	1625.97	37.37	37.90	0.87	0.98	Figure 40
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Body (Antenna Retracted Position 1) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
19mm Rear Facing	1	1616.02	32.70	32.90	0.15	0.16	Figure 41
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Body (Antenna Retracted Position 2) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
19mm Rear Facing	1	1616.02	32.70	32.90	0.14	0.15	Figure 42
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Body (Antenna Retracted Position 3) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
19mm Rear Facing	1	1616.02	32.70	32.90	0.16	**0.17**	Figure 43
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Front Of Face PTT (Antenna Extended Position 1) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Of Face	121	1621.02	37.41	37.90	0.20	0.22	Figure 44
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1640 MHz Band Front Of Face PTT (Antenna Extended Position 2) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Of Face	121	1621.02	37.41	37.90	0.21	0.24	Figure 45
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

Product Service

1640 MHz Band Front Of Face PTT (Antenna Extended Position 3) Specific Absorbtion Rate (Maximum SAR) 1g Results

Test Position	Channel Number	Frequency (MHz)	Measured Average Power (dBm)	Tune Up (dBm)	Measured 1g SAR (W/kg)	Scaled 1g SAR (W/kg)	Scan Figure Number
25mm Front Of Face	121	1621.02	37.41	37.90	0.18	0.20	Figure 46
Limit for General Population (Uncontrolled Exposure) 1.6 W/kg (1g) KDB 447498 D01 - Testing of other required channels within the operation mode of a frequency band is not required when the reported 1g SAR for mid-band or highest output power channel is: ≤ 0.8W/kg when the transmission band is ≤ 100MHz ≤ 0.6W/kg when the transmission band is between 100MHz and 200MHz ≤ 0.4W/kg when the transmission band is ≥ 200MHz							

1.3.3 Standalone SAR Test Exclusion Considerations (KDB 447498 D01)

The 1g SAR Test exclusion thresholds for 100 MHz to 6 GHz *test separation distances* ≤ 50 mm are determined by:

[(*max power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] [√f (GHz)]* ≤ 3.0, where

- f (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.
- When the maximum test separation distance is < 5 mm, a distance of 5 mm is applied.

Band	Frequency (MHz)	Power (dBm)	Power (mW)	Test Position	Distance (mm)	Threshold	Test Exclusion
1640 MHz	1616.02	32.90	1949.85	Head Antenna Retracted	<5	495.7	No
1640 MHz	1621.02	37.90	6165.95	Head Antenna Extended	<5	1570.01	No
1640 MHz	1621.02	37.90	6165.95	Front Of Face PTT	25	314.0	No
1640 MHz	1616.02	32.90	2187.8	Body	19	130.5	No

1.3.4 Technical Description

A full technical description can be found in the manufacturer’s documentation.

1.3.5 Test Configuration and Modes of Operation

The testing was performed with an integral battery supplied and manufactured by Iridium Communications Inc. The battery was fully charged before each measurement and there were no external connections.

For each scan the device was configured into a continuous transmission test mode.

The EUT has an extendable antenna with a tip that can tilt 45° to the left and right.The extendable part is non-radiating only the tiltable tip radiates. When the device antenna is extended the EUT operates at its maximum output power level, when the device antenna is retracted the EUT operates in a reduced output power level.

The maximum transmit power levels were measured at the docking station antenna port.

For head SAR assessment, testing was performed with the device in the declared normal position of operation for the 1616.02 - 1625.97 MHz frequency band at maximum power with the antenna extended (retracted to various heights- see 1.3.6) and at a reduced power level with the antenna retracted. The device was placed against a Specific Anthropomorphic Mannequin (SAM) phantom. The phantom was filled with broad band simulant liquid. The dielectric properties were measured and found to be in accordance with the requirements for the dielectric properties specified in KDB 865665 D01. Testing was performed at both the left and right ear of the phantom at both handset positions stated in the applied specification. The device was tested with the antenna retracted and extended.

For body SAR assessment, testing was performed for the 1616.02 - 1625.97 MHz frequency band at maximum power (antenna retracted). The device was placed in its specific belt holder against the bottom of the elliptical phantom for all body testing. This created a separation distance of 19mm. The device was tested with the antenna retracted. The phantom was filled to a minimum depth of 150mm with the appropriate Body simulant liquid. The dielectric properties were in accordance with the requirements specified in KDB 865665 D01

For PTT SAR assessment, testing was performed for the 1616.02 - 1625.97 MHz frequency band at maximum power. Fast scans were used to determine the antenna position which yielded the highest SAR. The device was placed with a 25 mm separation distance from the bottom of the elliptical phantom. The phantom was filled to a minimum depth of 150 mm with the appropriate head simulant liquid. The dielectric properties were in accordance with the requirements specified in KDB 865665 D01. The device was tested with the antenna fully extended.

The Elliptical Phantom has dimensions of: 600 mm major axis and a 400 mm minor axis with a shell thickness of 2.00mm.

Testing was performed in each position at the frequency that gave the highest output power for each band. Some SAR levels were found to be greater than 0.80 W/kg therefore additional testing was required at the relevant frequencies / channels of the bands as per (KDB 447498 D01).

Included in this report are descriptions of the test method; the equipment used and an analysis of the test uncertainties applicable and diagrams indicating the locations of maximum SAR for each test position along with photographs indicating the positioning of the handset against the body as appropriate.

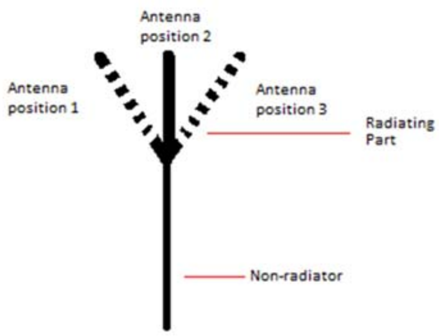
1.3.6 Deviations from Standard

When the antenna is fully extended the SPEAG DASY 52 System is unable to obtain enough measurement points for an accurate evaluation, due to the peak SAR value being outside of the measurement boundary. This issue applies to a total of twelve test positions- left cheek, left 15°,right cheek, right 15° for three antenna positions (left tilt, right tilt, straight).

As a solution to the problem, testing was completed in the following configuration:

The DUT was set to maximum operating power, the antenna was retracted by the minimum length required, to bring the peak SAR distribution into the measureable region, hence giving an over-estimation to the SAR values which would be seen in real time use.

Test Position	Antenna Retraction Depth (mm)
RH Cheek Antenna Position 1	50
RH Cheek Antenna Position 2	50
RH Cheek Antenna Position 3	60
RH 15 Tilt Antenna Position 1	40
RH 15 Tilt Antenna Position 2	50
RH 15 Tilt Antenna Position 3	40
LH Cheek Antenna Position 1	50
LH Cheek Antenna Position 2	50
LH Cheek Antenna Position 3	60
LH 15 Tilt Antenna Position 1	50
LH 15 Tilt Antenna Position 2	60
LH 15 Tilt Antenna Position 3	40



Product Service

1.4 FCC POWER MEASUREMENTS

1.4.1 Method

Conducted power measurements were made using a power meter.

1.4.2 Conducted Power Measurements

Antenna Extended

Mode	Frequency (MHz)	Duty Cycle (%)	Burst Average Power (dBm)
Voice	1616.02	9.69	37.39
Voice	1621.02	9.69	37.41
Voice	1625.97	9.69	37.37

Antenna Retracted

Mode	Frequency (MHz)	Duty Cycle (%)	Burst Average Power (dBm)
Voice	1616.02	9.69	32.70
Voice	1621.02	9.69	32.60
Voice	1625.97	9.69	32.51

The conducted power levels were measured at the docking station antenna port.

Product Service

SECTION 2

TEST DETAILS

Specific Absorption Rate Testing of the
Iridium Satellite LLC
Iridium Extreme 9575N Satellite Phone

2.1 DASY5 MEASUREMENT SYSTEM

2.1.1 System Description

The DASY5 system for performing compliance tests consists of the following items:

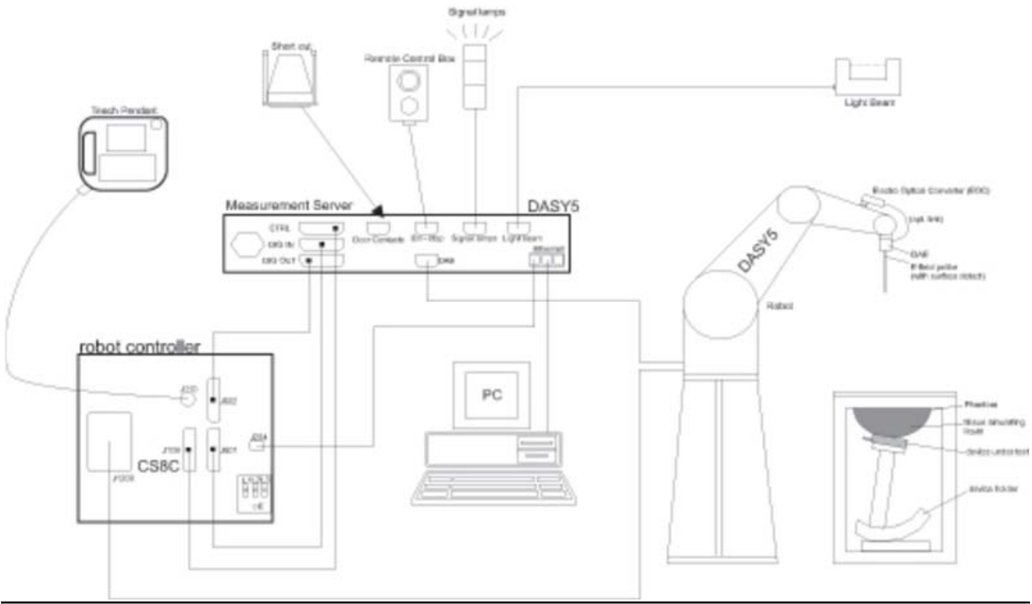


Figure 1 System Description Diagram

A standard high precision 6-axis robot (Stäubli 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 Win7 professional operating system and the DASY5 software.

Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.

The phantom, the device holder and other accessories according to the targeted measurement.

2.1.2 Probe Specification

The probes used by the DASY system are isotropic E-field probes, constructed with a symmetric design and a triangular core. The probes have built-in shielding against static charges and are contained within a PEEK enclosure material. These probes are specially designed and calibrated for use in liquids with high permittivities. The frequency range of the probes are from 6 MHz to 6 GHz.

2.1.3 Data Acquisition Electronics

The data acquisition electronics (DAE4 or DAE3) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

2.1.4 SAR Evaluation Description

The DASY5 software includes all numerical procedures necessary to evaluate the spatial peak SAR values.

Based on the IEEE 1528 standard, a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

The base for the evaluation is a "cube" measurement in a volume of 30mm3 (7x7x7 points). The measured volume must include the 1 g and 10 g cubes with the highest averaged SAR values. For that purpose, the centre of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan. If the 10g cube or both cubes are not entirely inside the measured volumes, the system issues a warning regarding the evaluated spatial peak values within the Post processing engine (SEMCAD X). This means that if the measured volume is shifted, higher values might be possible. To get the correct values you can use a finer measurement grid for the area scan. In complicated field distributions, a large grid spacing for the area scan might miss some details and give an incorrectly interpolated peak location.

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD X). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. extraction of the measured data (grid and values) from the Zoom Scan
2. calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. generation of a high-resolution mesh within the measured volume
4. interpolation of all measured values from the measurement grid to the high-resolution grid
5. extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. calculation of the averaged SAR within masses of 1 g and 10 g

2.1.5 Interpolation, Extrapolation and Detection of Maxima

The probe is calibrated at the centre of the dipole sensors which is located 1 to 2.7mm 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 [1].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 neighbouring 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 behaviour 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.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extrema of the SAR distribution. The uncertainty on the locations of the extrema is less than 1/20 of the grid size. Only local maxima within 2 dB of the global maximum are searched and passed for the Zoom Scan measurement.

In the Zoom Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

2.1.6 Averaging and Determination of Spacial Peak SAR

The interpolated data is used to average the SAR over the 1g and 10g cubes by spatially discretising 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 cantered at the location. The location is defined as the centre of the incremental volume (voxel).

The spatial-peak SAR must be evaluated in cubical volumes containing a mass that is within 5%of the required mass. The cubical volume centred 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 centre 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 centred 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 centre 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 centred 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 centred 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.

Product Service

2.1.7 Head Test Positions

This recommended practice specifies exactly two test positions for the handset against the head phantom, the “Cheek” position and the “tilted” position. The handset should be tested in both positions on the left and right sides of the SAM phantom. In each test position the centre of the earpiece of the device is placed directly at the entrance of the auditory canal. The angles mentioned in the test positions used are referenced to the line connecting both auditory canal openings. The plane this line is on is known as the reference plane. Testing is performed on the right and left-hand sides of the generic phantom head.

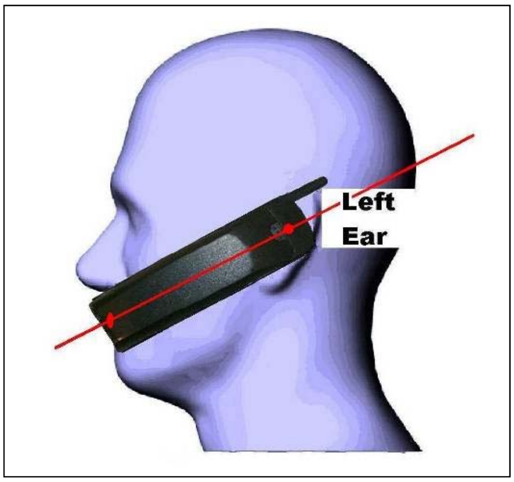


Figure 2 Side view of mobile next to head showing alignment

<u>The Cheek Position</u>
The Cheek Position is where the mobile is in the reference plane and the line between the mobile and the line connecting both auditory canal openings is reduced until any part of the mobile touches any part of the generic twin phantom head.

<u>The 15° Position</u>
The 15° Position is where the mobile is in the reference Cheek position and the phone is kept in contact with the auditory canal at the earpiece; the bottom of the phone is then tilted away from the phantom mouth by 15°.

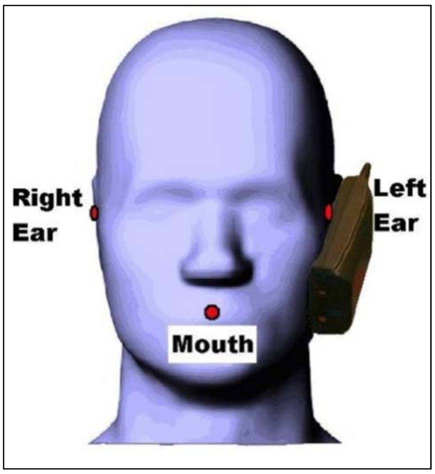


Figure 3 Cheek position

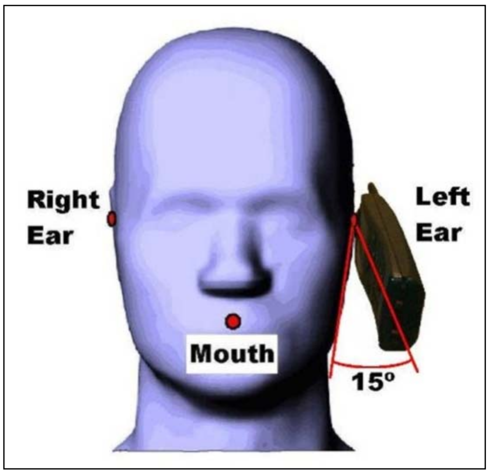


Figure 4 15º Tilt Position

2.2 HEAD SAR TEST RESULTS

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 1	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.02 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.15 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.10 W/kg

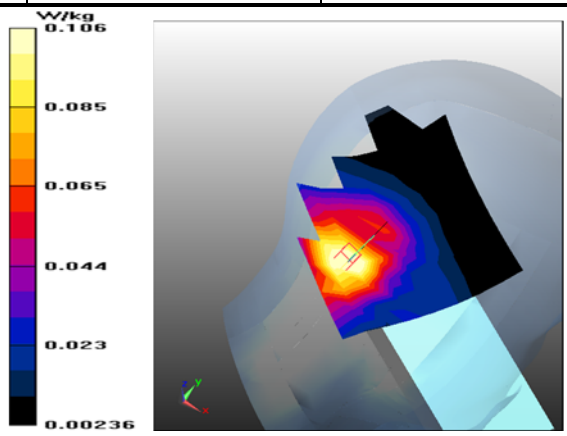


Figure 5: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 1	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.12 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.27 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.17 W/kg

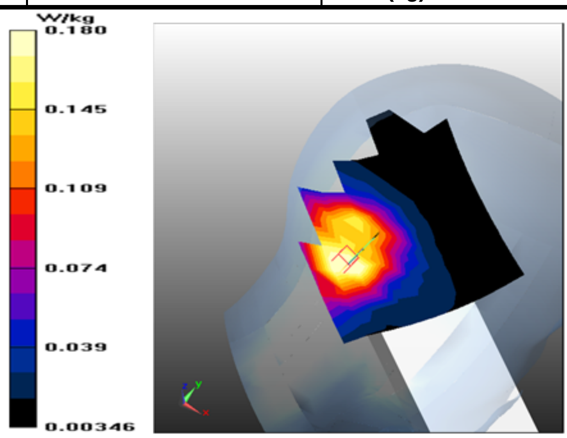


Figure 6: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 1	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.12 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.41 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.26 W/kg

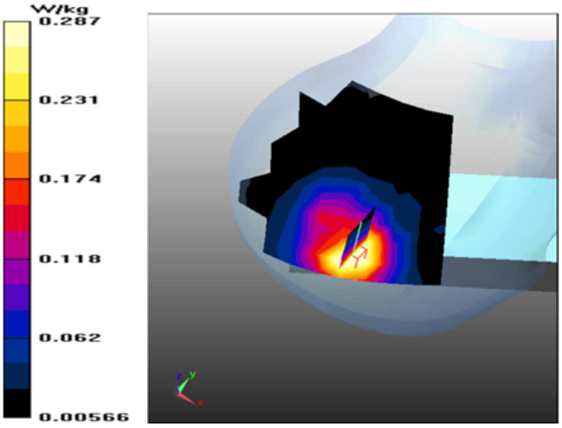


Figure 7: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 1	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	-0.02 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.16 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.73 W/kg

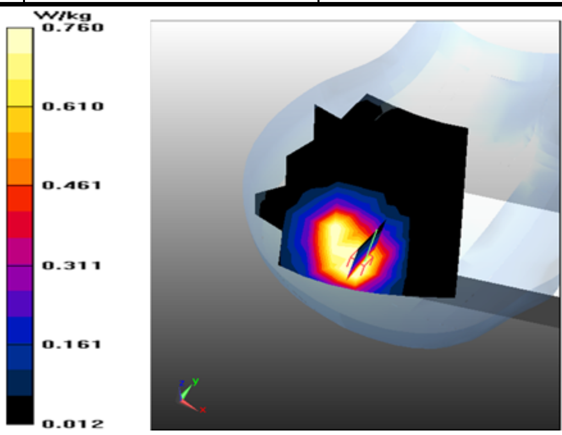


Figure 8: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.297 S/m
DUT CONFIGURATION:	Antenna Retracted Position 1	**RELATIVE PERMITTIVITY:**	42.279 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	-0.07 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.71 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.11 W/kg

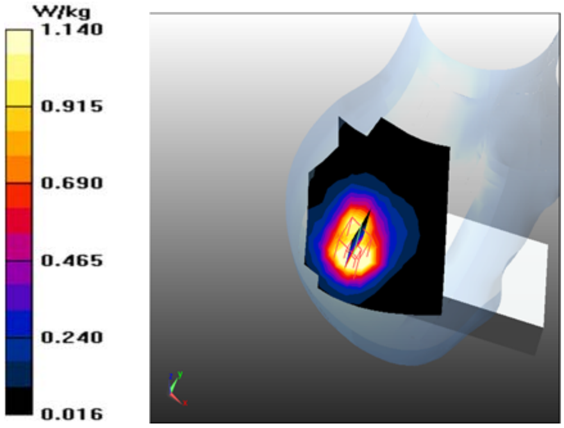


Figure 9: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.3 S/m
DUT CONFIGURATION:	Antenna Retracted Position 1	**RELATIVE PERMITTIVITY:**	42.272 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1625.97 MHz	**DRIFT:**	-0.13 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.78 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.18 W/kg

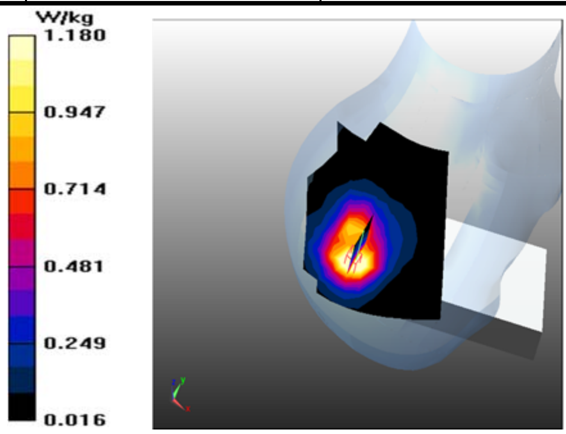


Figure 10: SAR Head Testing Results for the Iridium Extreme 9575N at 1625.97 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 2	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	-0.19 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.21 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.16 W/kg

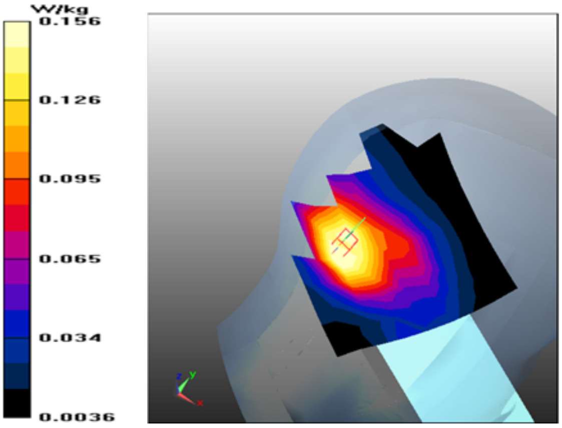


Figure 11: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 2	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.05 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.61 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.39 W/kg

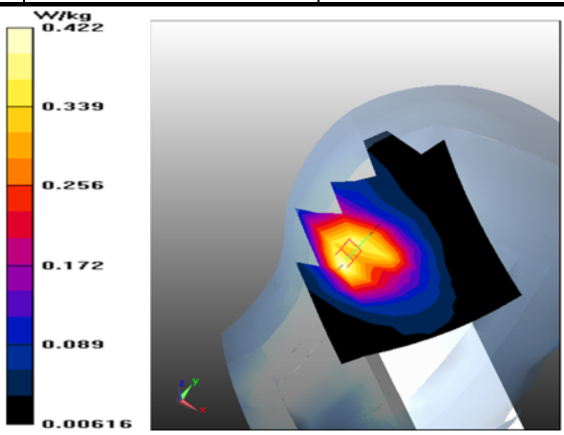


Figure 12: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 2	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.13 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.37 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.25 W/kg

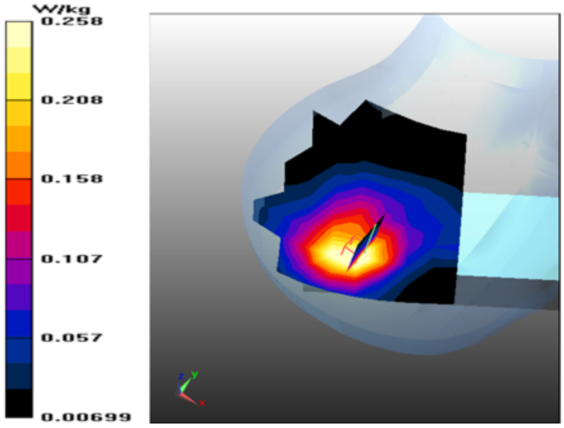


Figure 13: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 2	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.13 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.29 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.77 W/kg

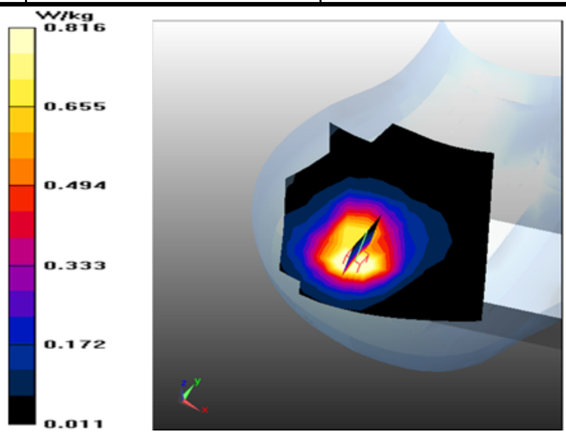


Figure 14: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.2 °C
DATE:	07/12/2016	**RELATIVE HUMIDITY:**	41.0 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.297 S/m
DUT CONFIGURATION:	Antenna Retracted Position 2	**RELATIVE PERMITTIVITY:**	42.279 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	-0.03 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.21 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.79 W/kg

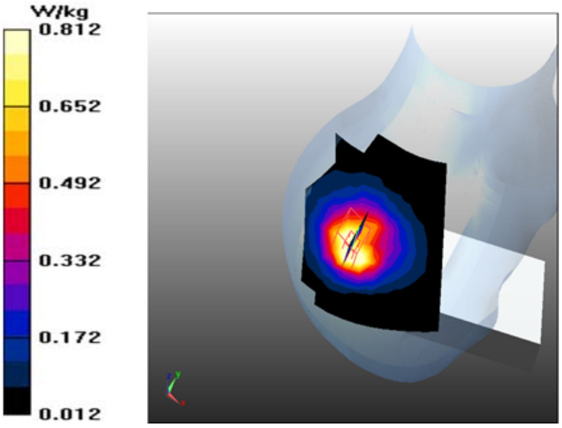


Figure 15: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.2 °C
DATE:	07/12/2016	**RELATIVE HUMIDITY:**	41.0 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.3 S/m
DUT CONFIGURATION:	Antenna Retracted Position 2	**RELATIVE PERMITTIVITY:**	42.272 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1625.97 MHz	**DRIFT:**	0.13 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.63 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.05 W/kg

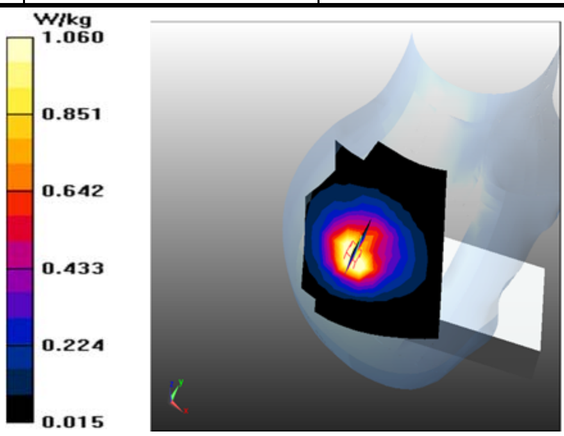


Figure 16: SAR Head Testing Results for the Iridium Extreme 9575N at 1625.97 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 3	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.14 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.37 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.25 W/kg

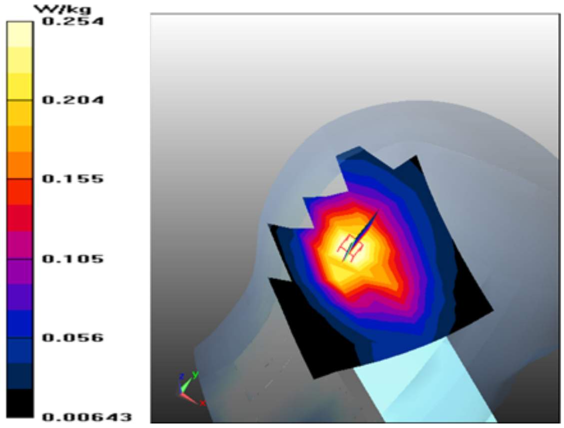


Figure 17: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 3	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.02 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.99 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.67 W/kg

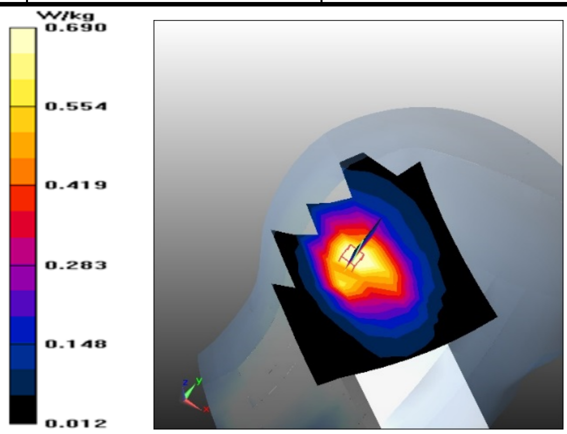


Figure 18: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 3	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	-0.14 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.26 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.19 W/kg

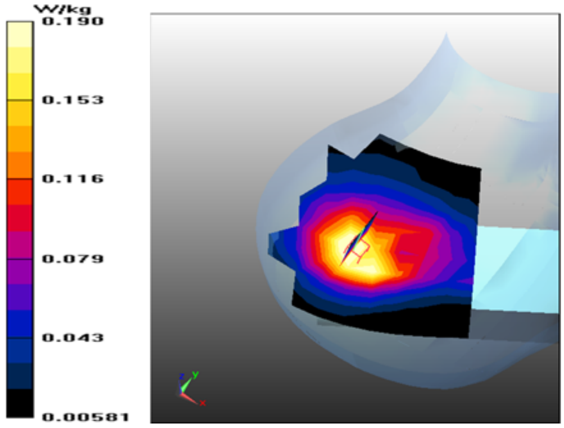


Figure 19: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.294 S/m
DUT CONFIGURATION:	Antenna Retracted Position 3	**RELATIVE PERMITTIVITY:**	42.286 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.06 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.99 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.64 W/kg

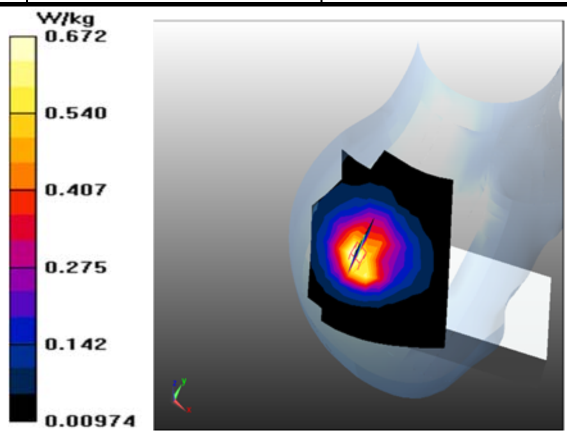


Figure 20: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	19/01/2017	**RELATIVE HUMIDITY:**	18.2 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 1	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.18 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.22 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.17 W/kg

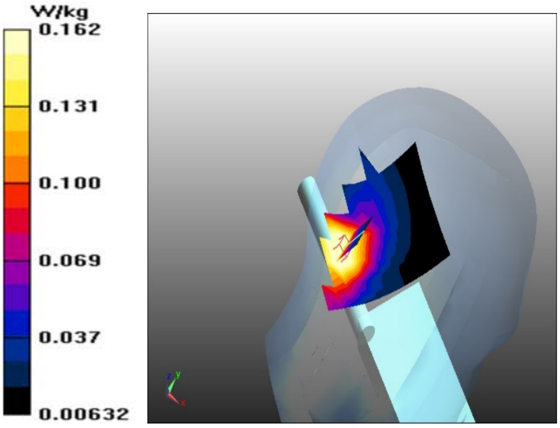


Figure 21: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	19/01/2017	**RELATIVE HUMIDITY:**	18.2 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 1	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.11 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.53 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.39 W/kg

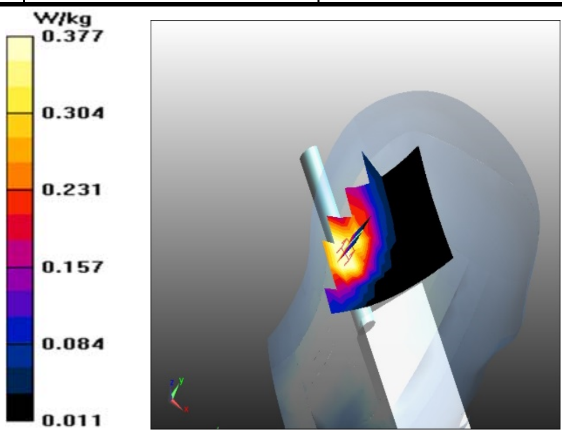


Figure 22: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	20/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 1	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.19 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.66 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.49 W/kg

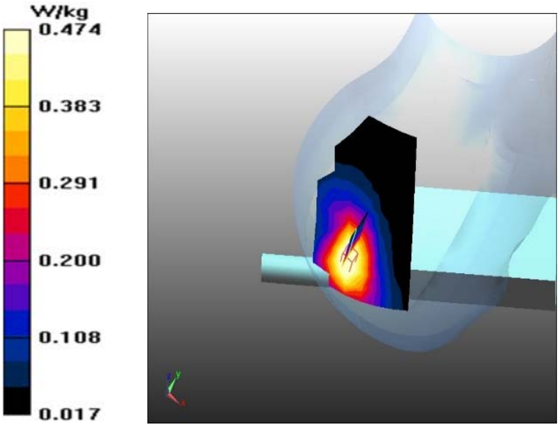


Figure 23: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	23/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.279 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 1	**RELATIVE PERMITTIVITY:**	41.882 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.18 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.55 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.07 W/kg

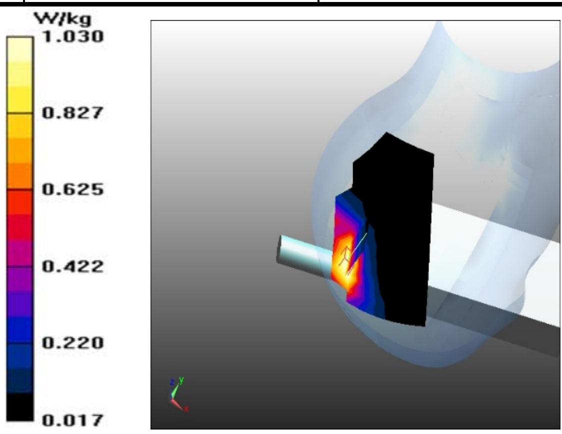


Figure 24: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	23/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.277 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 1	**RELATIVE PERMITTIVITY:**	41.887 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.06 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.46 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.01 W/kg

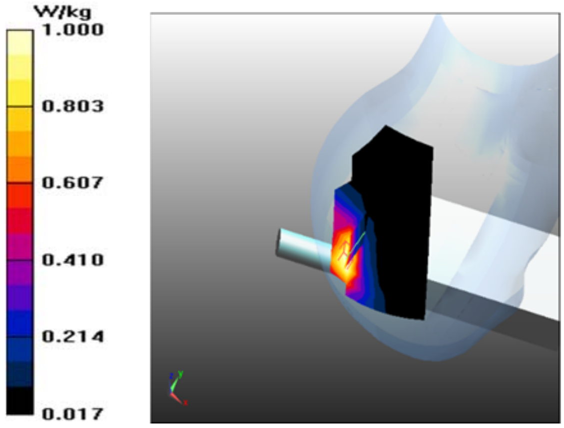


Figure 25: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	23/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.282 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 1	**RELATIVE PERMITTIVITY:**	41.877 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1625.97 MHz	**DRIFT:**	0.00 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.63 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.07 W/kg

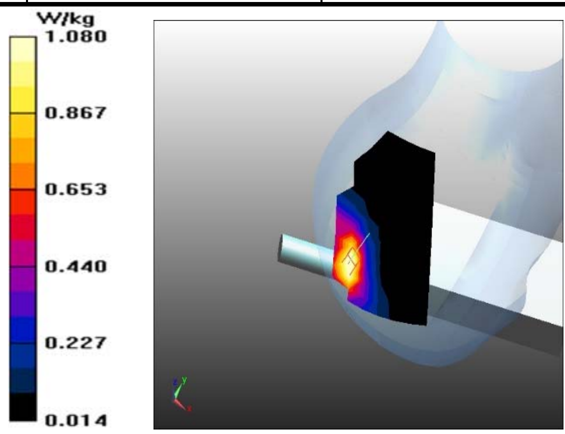


Figure 26: SAR Head Testing Results for the Iridium Extreme 9575N at 1625.97 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	19/01/2017	**RELATIVE HUMIDITY:**	18.2 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.07 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.12 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.10 W/kg

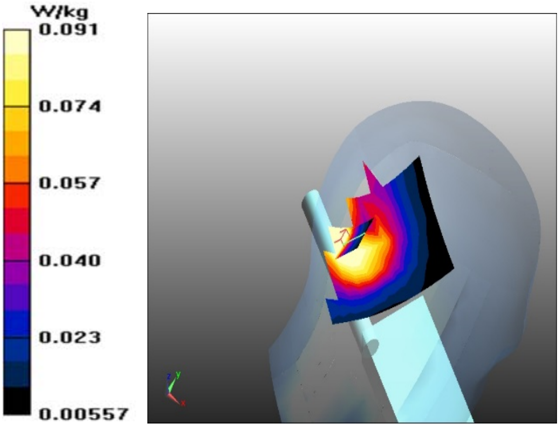


Figure 27: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	19/01/2017	**RELATIVE HUMIDITY:**	18.2 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.07 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.09 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.84 W/kg

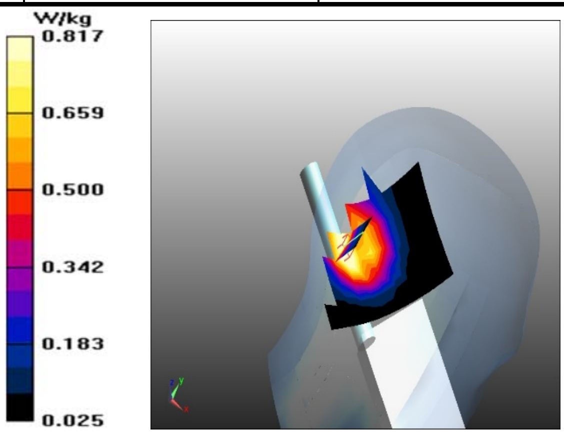


Figure 28: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	20/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.07 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.37 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.29 W/kg

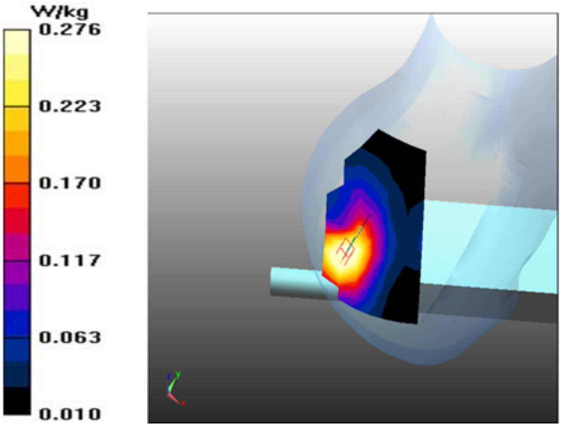


Figure 29: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	20/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.04 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.88 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.24 W/kg

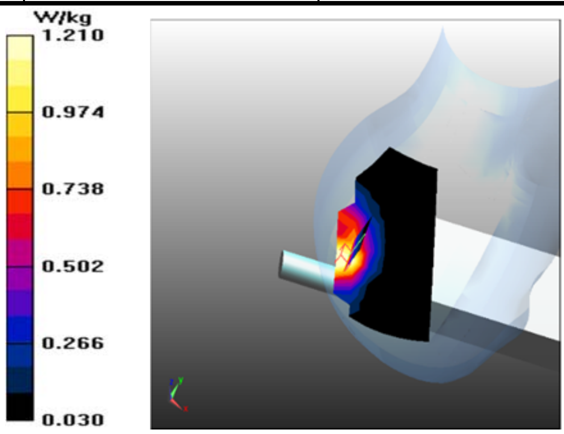


Figure 30: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	20/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.287 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.732 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.18 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.85 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.23 W/kg

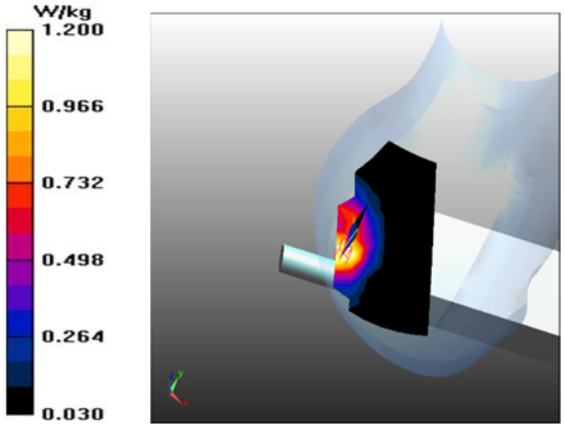


Figure 31: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	20/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.293 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.717 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1625.97 MHz	**DRIFT:**	0.12 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.61 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.10 W/kg

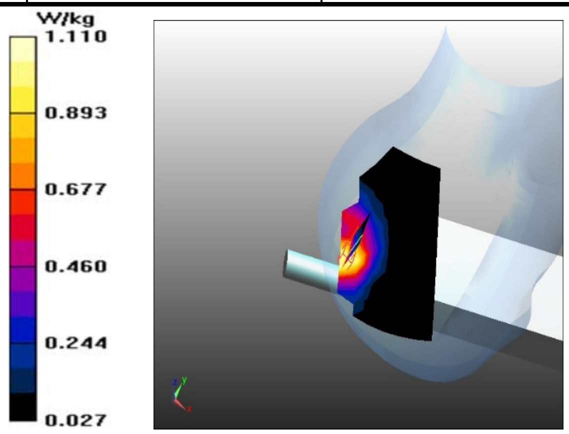


Figure 32: SAR Head Testing Results for the Iridium Extreme 9575N at 1625.97 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	21.9 °C
DATE:	24/01/2017	**RELATIVE HUMIDITY:**	23.3 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.277 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.887 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.04 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.13 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.85 W/kg

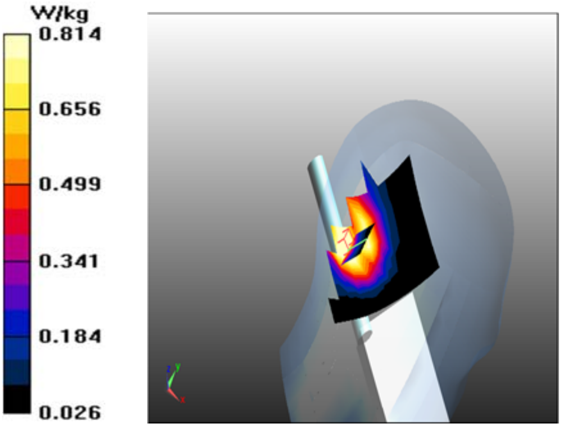


Figure 33: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	21.9 °C
DATE:	24/01/2017	**RELATIVE HUMIDITY:**	23.3 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.282 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 2	**RELATIVE PERMITTIVITY:**	41.878 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1625.97 MHz	**DRIFT:**	0.11 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.12 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.78 W/kg

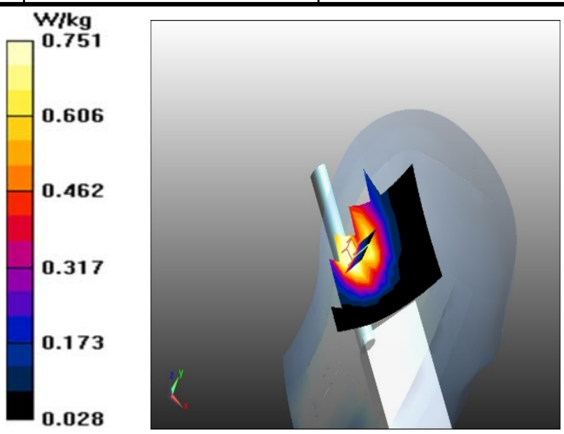


Figure 34: SAR Head Testing Results for the Iridium Extreme 9575N at 1625.97 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	19/01/2017	**RELATIVE HUMIDITY:**	18.2 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 3	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Left - Cheek	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.19 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.40 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.31 W/kg

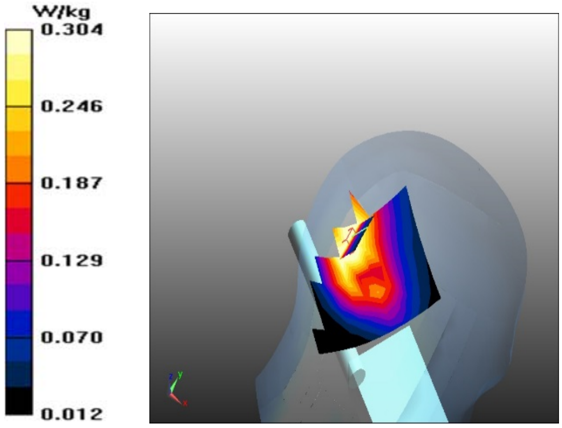


Figure 35: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	19/01/2017	**RELATIVE HUMIDITY:**	18.2 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 3	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Left - 15°	**LIQUID TEMPERATURE:**	21.1 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.11 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.83 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.59 W/kg

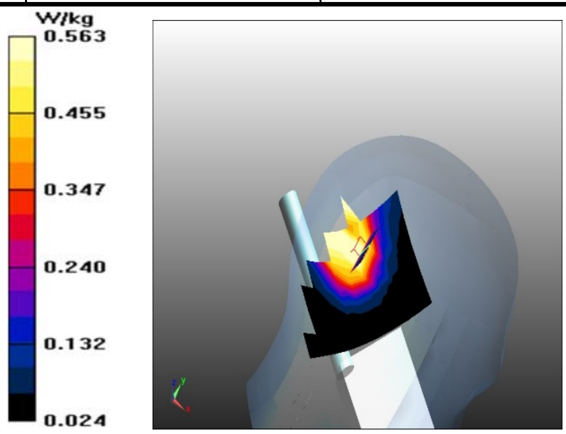


Figure 36: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	20/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.29 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 3	**RELATIVE PERMITTIVITY:**	41.724 ε_r
DUT POSITION:	Right - Cheek	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.00 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.36 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.27 W/kg

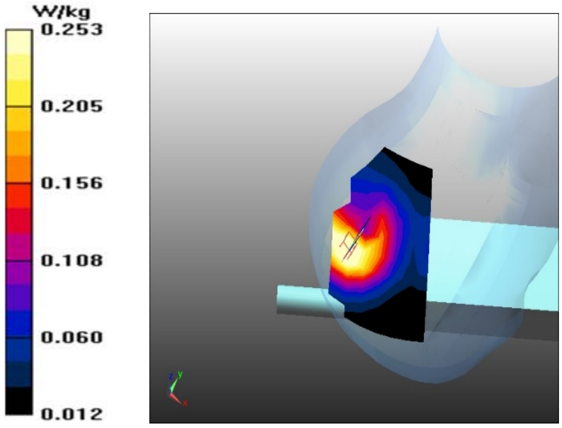


Figure 37: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	23/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.279 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 3	**RELATIVE PERMITTIVITY:**	41.882 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.02 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.64 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.15 W/kg

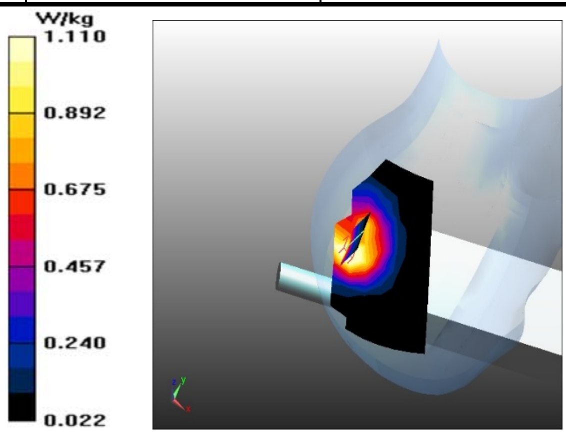


Figure 38: SAR Head Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	23/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.277 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 3	**RELATIVE PERMITTIVITY:**	41.887 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	-0.07 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.55 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	1.12 W/kg

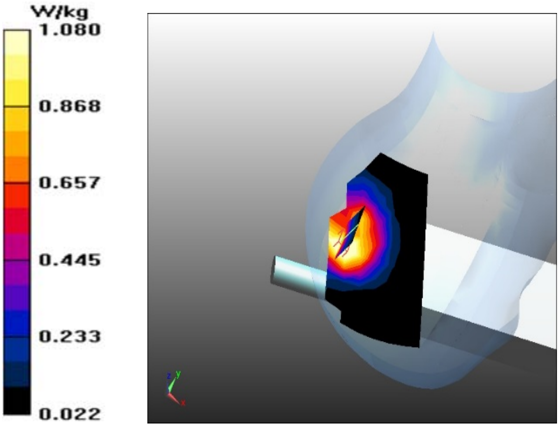


Figure 39: SAR Head Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.4 °C
DATE:	23/01/2017	**RELATIVE HUMIDITY:**	16.5 %
PHANTOM:	QD000P40CD	**CONDUCTIVITY:**	1.282 S/m
DUT CONFIGURATION:	Antenna Semi-Extended Position 3	**RELATIVE PERMITTIVITY:**	41.877 ε_r
DUT POSITION:	Right - 15°	**LIQUID TEMPERATURE:**	20.9 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1625.97 MHz	**DRIFT:**	0.13 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	1.32 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.98 W/kg

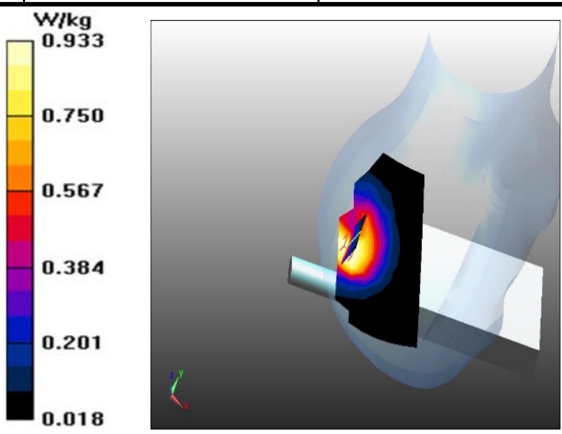


Figure 40: SAR Head Testing Results for the Iridium Extreme 9575N at 1625.97 MHz.

2.3 BODY SAR TEST RESULTS

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.394 S/m
DUT CONFIGURATION:	Antenna Retracted Position 1 (Belt Holder)	**RELATIVE PERMITTIVITY:**	55.122ε_r
DUT POSITION:	19mm - Rear Facing	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	-0.04 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.23 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.16 W/kg

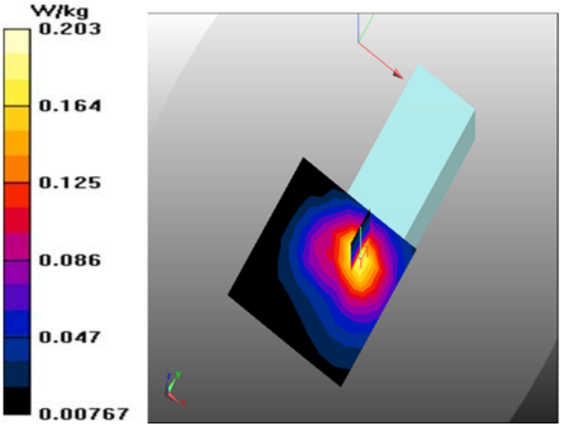


Figure 41: SAR Body Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.394 S/m
DUT CONFIGURATION:	Antenna Retracted Position 2 (Belt Holder)	**RELATIVE PERMITTIVITY:**	55.122 ε_r
DUT POSITION:	19mm - Rear Facing	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.18 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.21 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.15 W/kg

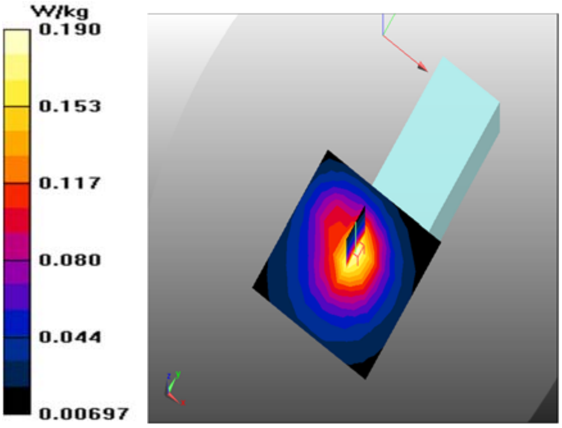


Figure 42: SAR Body Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

Product Service

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	22.6 °C
DATE:	06/12/2016	**RELATIVE HUMIDITY:**	35.7 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.394 S/m
DUT CONFIGURATION:	Antenna Retracted Position 3 (Belt Holder)	**RELATIVE PERMITTIVITY:**	55.122 ε_r
DUT POSITION:	19mm - Rear Facing	**LIQUID TEMPERATURE:**	21.2 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1616.02 MHz	**DRIFT:**	0.03 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.21 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.17 W/kg

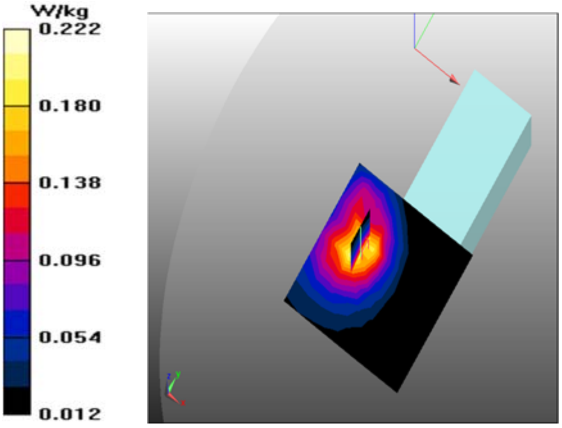


Figure 43: SAR Body Testing Results for the Iridium Extreme 9575N at 1616.02 MHz.

COMMERCIAL-IN-CONFIDENCE

2.4 FRONT OF FACE PTT HEAD SAR RESULTS

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	21.3 °C
DATE:	05/12/2016	**RELATIVE HUMIDITY:**	26.3 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.297 S/m
DUT CONFIGURATION:	Antenna Extended Position 1 (PTT)	**RELATIVE PERMITTIVITY:**	42.279 ε_r
DUT POSITION:	25mm - Front Face	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	-0.07dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.29 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.22 W/kg

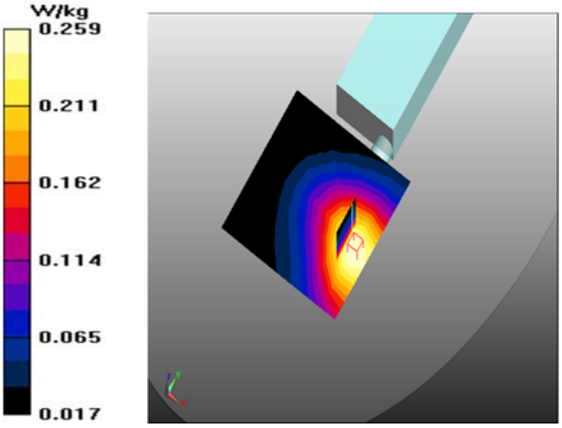


Figure 44: SAR Body Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SOFTWARE VERSION:	52.8.8(1258)	**AMBIENT TEMPERATURE:**	21.3 °C
DATE:	05/12/2016	**RELATIVE HUMIDITY:**	26.3 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.297 S/m
DUT CONFIGURATION:	Antenna Extended Position 2 (PTT)	**RELATIVE PERMITTIVITY:**	42.279 ε_r
DUT POSITION:	25mm - Front Face	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	-0.16 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.33 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.24 W/kg

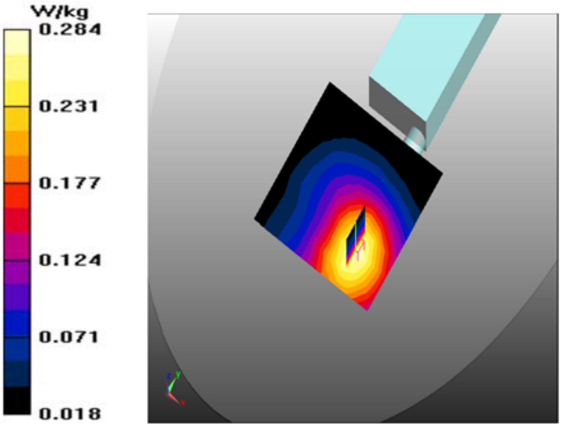


Figure 45: SAR Body Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

Product Service

SOFTWARE VERSION	52.8.8(1258)	**AMBIENT TEMPERATURE:**	21.3 °C
DATE:	05/12/2016	**RELATIVE HUMIDITY:**	26.3 %
PHANTOM:	QDOVA003-FB	**CONDUCTIVITY:**	1.297 S/m
DUT CONFIGURATION:	Antenna Extended Position 3 (PTT)	**RELATIVE PERMITTIVITY:**	42.279 ε_r
DUT POSITION:	25mm - Front Face	**LIQUID TEMPERATURE:**	21.0 °C
RAT:	N/A	**SCAN TYPE:**	Full
FREQUENCY:	1621.02 MHz	**DRIFT:**	0.19 dB
MODULATION:	DE-QPSK	**PEAK SAR:**	0.28 W/kg
DUTY CYCLE:	9.2 %	**SAR (1g):**	0.20 W/kg

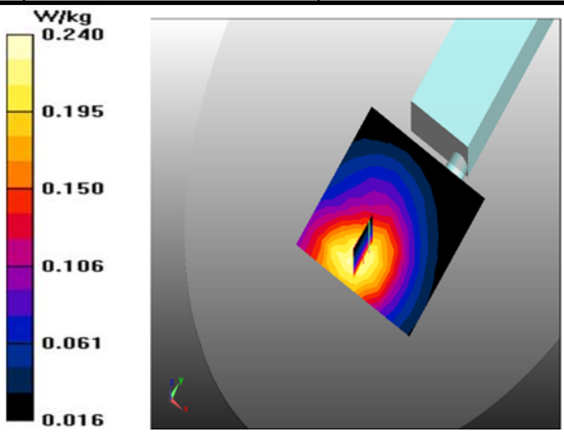


Figure 46: SAR Body Testing Results for the Iridium Extreme 9575N at 1621.02 MHz.

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

The following test equipment was used at TÜV SÜD Product Service:

Instrument Description	Manufacturer	Model Type	TE Number	Cal Period (months)	Calibration Due Date
10MHz - 2.5GHz, 3W, Amplifier	Vectawave Technology	VTL5400	51	-	TU
Power Sensor	Rohde & Schwarz	NRV-Z1	60	12	16-Jun-2017
Signal Generator	Hewlett Packard	ESG4000A	61	12	12-Jul-2017
Attenuator (20dB, 10W)	Weinschel	37-20-34	482	12	26-Oct-2017
Bi-directional Coupler	IndexSar Ltd	7401 (VDC0830-20)	2414	-	TU
Thermometer	Digitron	T208	64	12	13-May-2017
Hygrometer	Rotronic	I-1000	2784	12	26-Apr-2017
Power Sensor	Rohde & Schwarz	NRV- Z5	2878	12	16-Jun-2017
Dual Channel Power Meter	Rohde & Schwarz	NRVD	3259	12	16-Jun-2017
Data Acquisition Electronics	Speag	DAE 4 - SD 000 D04 BM	4689	12	8-Dec-2016**
Data Acquisition Electronics	Speag	DAE 4 - SD 000 D04 BM	4689	12	12-Dec-2017**
Measurement Server	Speag	DASY 5 Measurement Server	4692	-	TU
Body Phantom	Speag	ELI Phantom	4699	-	TU
Dosimetric SAR Probe	Speag	EX3DV4	4700	12	15-Dec-2016**
Dosimetric SAR Probe	Speag	EX3DV4	4700	12	16-Dec-2017**
Mounting Platform for TX90XL Robot and Phantoms	Speag	MP6C-TX90XL Mounting Platform Extended	4702	-	TU
Head Phantom	Speag	Twin Sam Phantom	4703	-	TU
Robot	Speag	TX90 XLspeag Robot	4704	-	TU
1640 MHz Dipole	Speag	D1640V2	4796	12	14-Dec-2016**
1640 MHz Dipole	Speag	D1640V2	4796	12	14-Dec-2017**
HBBL Fluid	Speag	Batch 1	N/A	Weekly	30-Jan-2017
MBBL Fluid	Speag	Batch 1	N/A	Weekly	30-Jan-2017

** Dosimetric SAR Probe, Data Acquisition Electronics, 1640 MHz Dipole sent for annual calibration mid testing.

3.2 TEST SOFTWARE

The following software was used to control the TÜV SÜD Product Service DASY System.

Instrument	Version Number
DASY system	52.8.8(1258)

3.3 DIELECTRIC PROPERTIES OF SIMULANT LIQUIDS

The fluid properties of the simulant fluids used during routine SAR evaluation meet the dielectric properties required KDB 865665.

The dielectric properties of the tissue simulant liquids used for the SAR testing at TÜV SÜD Product Service are as follows:-

Fluid Type and Frequency	Relative Permittivity Target	Relative Permittivity Measured	Conductivity Target	Conductivity Measured	Date
MBBL @ 1640 MHz	53.72	54.43	1.42	1.38	23/01/17
HBBL @ 1640 MHz	40.25	41.86	1.31	1.29	23/01/17

3.4 TEST CONDITIONS

3.4.1 Test Laboratory Conditions

Ambient temperature: Within +15.0°C to +35.0°C.
The actual temperature during the testing ranged from 21.3°C to 22.6°C.
The actual humidity during the testing ranged from 16.5% to 41.0% RH.

3.4.2 Test Fluid Temperature Range

Frequency	Body / Head Fluid	Min Temperature °C	Max Temperature °C
1640 MHz	MBBL	21.0	21.2
1640 MHz	HBBL	20.9	21.2

3.4.3 SAR Drift

The SAR Drift was within acceptable limits during scans. The maximum SAR Drift was recorded as -0.190 dB for head and 0.180 dB for body.

Product Service

3.5 MEASUREMENT UNCERTAINTY

Fast SAR Measurements, 300 MHz to 3 GHz Using Probe EX3DV4 - SN3759

Source of Uncertainty	Uncertainty ± %	Probability distribution	Div	c_i (1g)	Standard Uncertainty ± % (1g)	v_i (v_{eff})
Measurement System						
Probe calibration	6.0	N	1.00	0.00	0.0	
Axial Isotropy	4.7	R	1.73	0.70	1.9	Infinity
Hemispherical Isotropy	9.6	R	1.73	0.70	3.9	Infinity
Boundary effect	1.0	R	1.73	1.00	0.6	Infinity
Linearity	4.7	R	1.73	1.00	2.7	Infinity
System Detection limits	1.0	R	1.73	1.00	0.6	Infinity
Modulation response	2.4	R	1.73	1.00	1.4	Infinity
Readout electronics	0.3	N	1.00	0.00	0.0	
Response time	0.8	R	1.73	0.00	0.0	
Integration time	2.6	R	1.73	1.00	1.5	Infinity
RF ambient noise	3.0	R	1.73	1.00	1.7	Infinity
RF ambient reflections	3.0	R	1.73	0.00	0.0	
Probe positioner	0.4	R	1.73	1.00	0.2	Infinity
Probe positioning	2.9	R	1.73	1.00	1.7	Infinity
Spatial x-y-Resolution	10.0	R	1.73	1.00	5.8	Infinity
Fast SAR z-Approximation	7.0	R	1.73	1.00	4.0	Infinity
Test sample related						
Device Positioning	2.9	N	1.00	1.00	2.9	145
Device Holder	3.6	N	1.00	1.00	3.6	5
Input Power and SAR Drift	5.0	R	1.73	1.00	2.9	Infinity
Phantom and Setup						
Phantom uncertainty	6.1	R	1.73	1.00	3.5	Infinity
SAR Correction	1.9	R	1.73	0.00	0.0	
Liquid conductivity Meas.	2.5	R	1.73	0.00	0.0	
Liquid Permittivity Meas.	2.5	R	1.73	0.00	0.0	
Temp. Unc. Conductivity	3.4	R	1.73	0.00	0.0	
Temp. Unc. Permittivity	0.4	R	1.73	0.00	0.0	
Combined Standard Uncertainty		RSS			11.4	
Expanded Standard Uncertainty		K=2			22.7	

Full SAR Measurements, 300 MHz to 3 GHz Using Probe EX3DV4 - SN3759

Source of Uncertainty	Uncertainty ± %	Probability distribution	Div	c_i (1g)	Standard Uncertainty ± % (1g)	v_i (v_{eff})
Measurement System						
Probe calibration	6.0	N	1.00	1.00	6.0	Infinity
Axial Isotropy	4.7	R	1.73	0.70	1.9	Infinity
Hemispherical Isotropy	9.6	R	1.73	0.70	3.9	Infinity
Boundary effect	1.0	R	1.73	1.00	0.6	Infinity
Linearity	4.7	R	1.73	1.00	2.7	Infinity
System Detection limits	1.0	R	1.73	1.00	0.6	Infinity
Modulation response	2.4	R	1.73	1.00	1.4	Infinity
Readout electronics	0.3	N	1.00	1.00	0.3	Infinity
Response time	0.8	R	1.73	1.00	0.5	Infinity
Integration time	2.6	R	1.73	1.00	1.5	Infinity
RF ambient noise	3.0	R	1.73	1.00	1.7	Infinity
RF ambient reflections	3.0	R	1.73	1.00	1.7	Infinity
Probe positioner	0.4	R	1.73	1.00	0.2	Infinity
Probe positioning	2.9	R	1.73	1.00	1.7	Infinity
Max SAR Evaluation	2.0	R	1.73	1.00	1.2	Infinity
Test sample related						
Device Positioning	2.9	N	1.00	1.00	2.9	145
Device Holder	3.6	N	1.00	1.00	3.6	5
Input Power and SAR Drift	5.0	R	1.73	1.00	2.9	Infinity
Phantom and Setup						
Phantom uncertainty	6.1	R	1.73	1.00	3.5	Infinity
SAR Correction	1.9	R	1.73	1.00	1.1	Infinity
Liquid conductivity Meas.	2.5	R	1.73	0.78	1.1	Infinity
Liquid Permittivity Meas.	2.5	R	1.73	0.23	0.3	Infinity
Temp. Unc. Conductivity	3.4	R	1.73	0.78	1.5	Infinity
Temp. Unc. Permittivity	0.4	R	1.73	0.23	0.1	Infinity
Combined Standard Uncertainty		RSS			11.1	361
Expanded Standard Uncertainty		K=2			22.2	

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).

Product Service

ANNEX A

PROBE CALIBRATION REPORT

TÜV SÜD
Product Service

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **TüV SüD UK**

Certificate No: **EX3-3759_Dec15**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3759
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	December 15, 2015

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 15, 2015

TÜV SÜD Product Service

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Product Service

Probe EX3DV4

SN:3759

Manufactured:	March 16, 2010
Repaired:	December 10, 2015
Calibrated:	December 15, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

Product Service

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3759

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.49	0.46	0.47	± 10.1 %
DCP (mV)[B]	101.8	101.0	100.0	

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $ms.V^{-2}$	T2 $ms.V^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	41.28	306.2	35.05	12.52	0.734	4.994	0.677	0.253	1.005
Y	42.65	317.1	35.18	10.52	0.844	4.984	1.558	0.202	1.008
Z	42.8	317.1	34.69	9.763	1.004	4.978	1.769	0.118	1.007

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.

Product Service

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3759

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	43.5	0.87	10.35	10.35	10.35	0.18	1.30	± 13.3 %
750	41.9	0.89	9.60	9.60	9.60	0.46	0.92	± 12.0 %
835	41.5	0.90	9.14	9.14	9.14	0.40	0.93	± 12.0 %
900	41.5	0.97	8.93	8.93	8.93	0.29	1.21	± 12.0 %
1640	40.3	1.29	7.98	7.98	7.98	0.36	0.85	± 12.0 %
1750	40.1	1.37	7.88	7.88	7.88	0.34	0.91	± 12.0 %
1900	40.0	1.40	7.58	7.58	7.58	0.38	0.80	± 12.0 %
2100	39.8	1.49	7.73	7.73	7.73	0.37	0.84	± 12.0 %
2450	39.2	1.80	6.98	6.98	6.98	0.34	0.94	± 12.0 %
2600	39.0	1.96	6.76	6.76	6.76	0.39	0.85	± 12.0 %
5200	36.0	4.66	5.04	5.04	5.04	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.84	4.84	4.84	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.69	4.69	4.69	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.32	4.32	4.32	0.50	1.80	± 13.1 %
5800	35.3	5.27	4.48	4.48	4.48	0.50	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3759

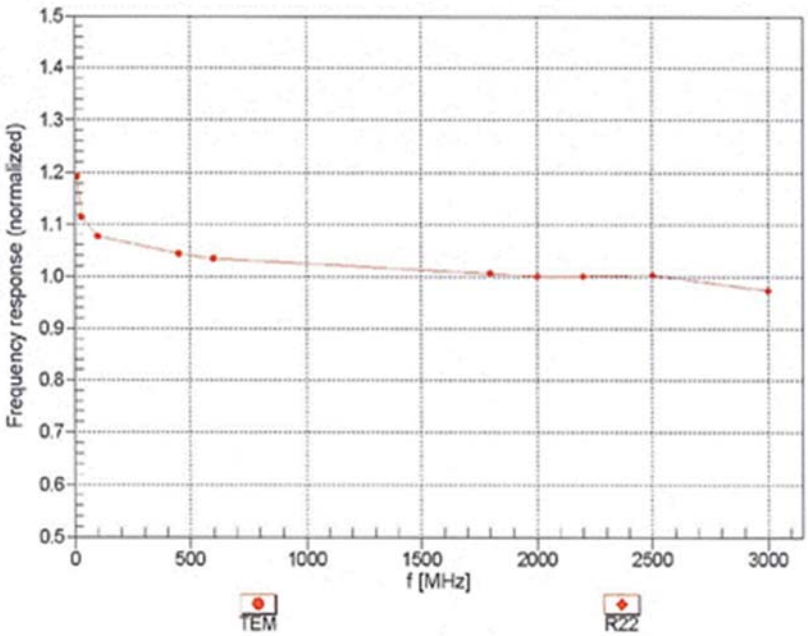
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	56.7	0.94	10.63	10.63	10.63	0.10	1.30	± 13.3 %
750	55.5	0.96	9.31	9.31	9.31	0.27	1.31	± 12.0 %
835	55.2	0.97	9.17	9.17	9.17	0.44	0.90	± 12.0 %
900	55.0	1.05	9.14	9.14	9.14	0.25	1.30	± 12.0 %
1640	53.8	1.40	7.88	7.88	7.88	0.34	1.00	± 12.0 %
1750	53.4	1.49	7.49	7.49	7.49	0.36	0.92	± 12.0 %
1900	53.3	1.52	7.31	7.31	7.31	0.39	0.85	± 12.0 %
2100	53.2	1.62	7.61	7.61	7.61	0.44	0.80	± 12.0 %
2450	52.7	1.95	7.03	7.03	7.03	0.36	0.86	± 12.0 %
2600	52.5	2.16	6.78	6.78	6.78	0.36	0.95	± 12.0 %
5200	49.0	5.30	4.45	4.45	4.45	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.29	4.29	4.29	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.73	3.73	3.73	0.60	1.90	± 13.1 %
5600	48.5	5.77	3.59	3.59	3.59	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.87	3.87	3.87	0.60	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

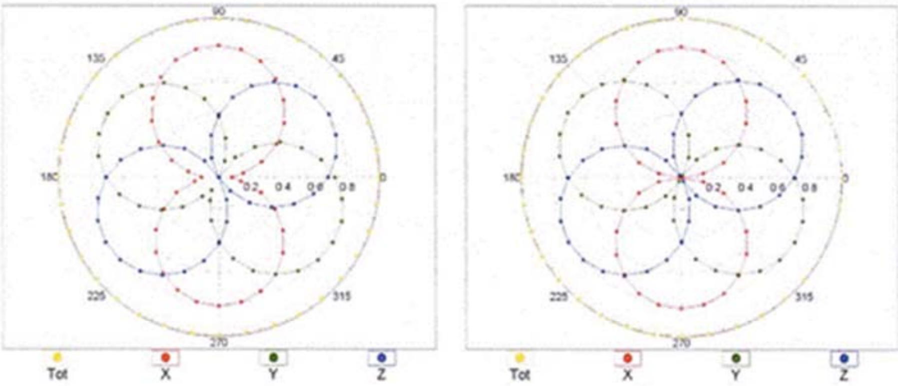


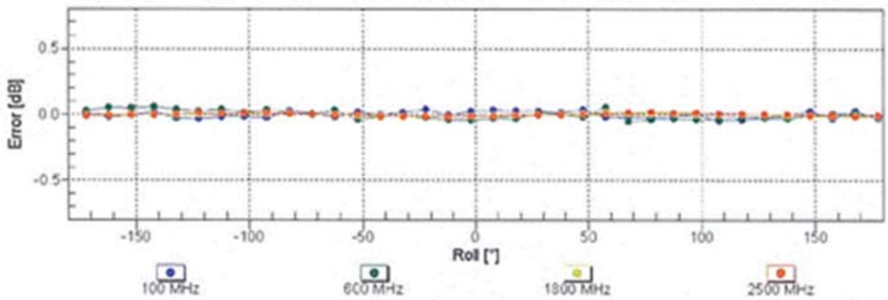
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM

f=1800 MHz,R22



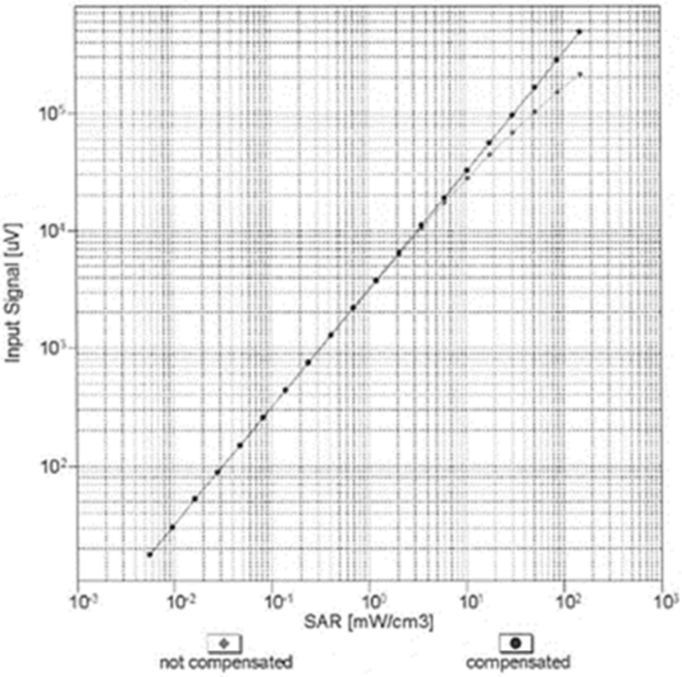


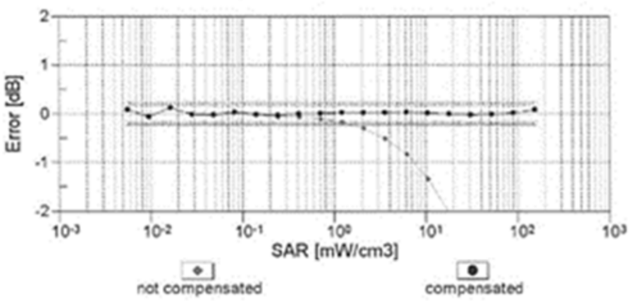
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Product Service

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)

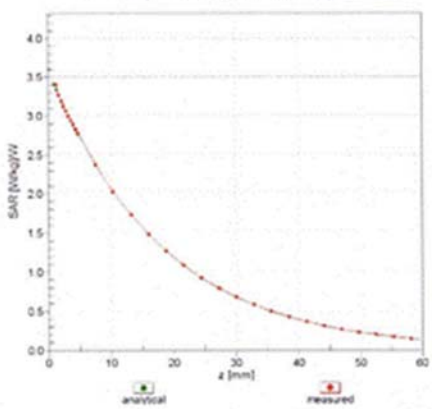




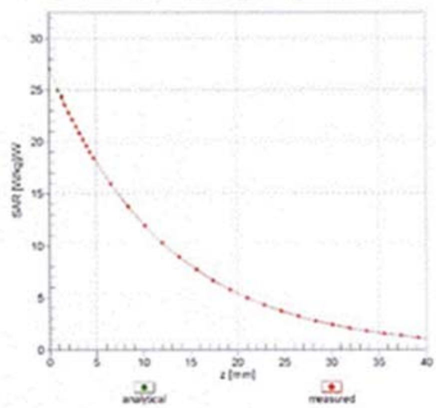
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

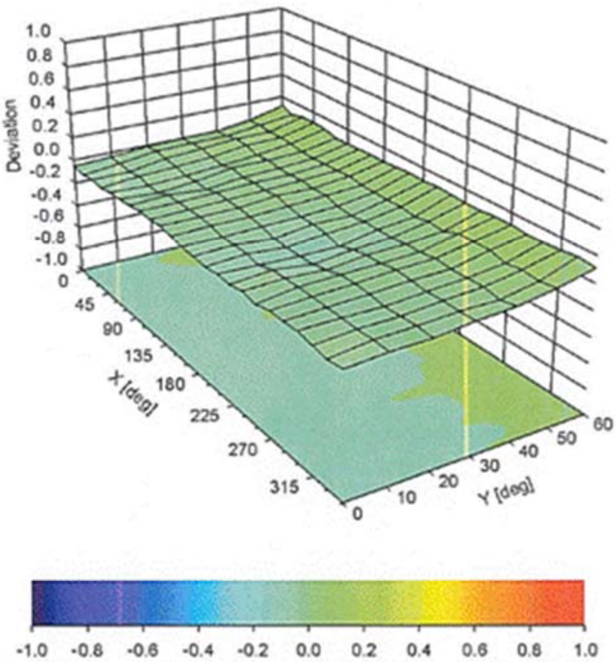


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Product Service

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3759

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	27.8
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm